

TM 5-3810-306-34

TECHNICAL MANUAL

DIRECT SUPPORT AND GENERAL SUPPORT MAINTENANCE MANUAL FOR

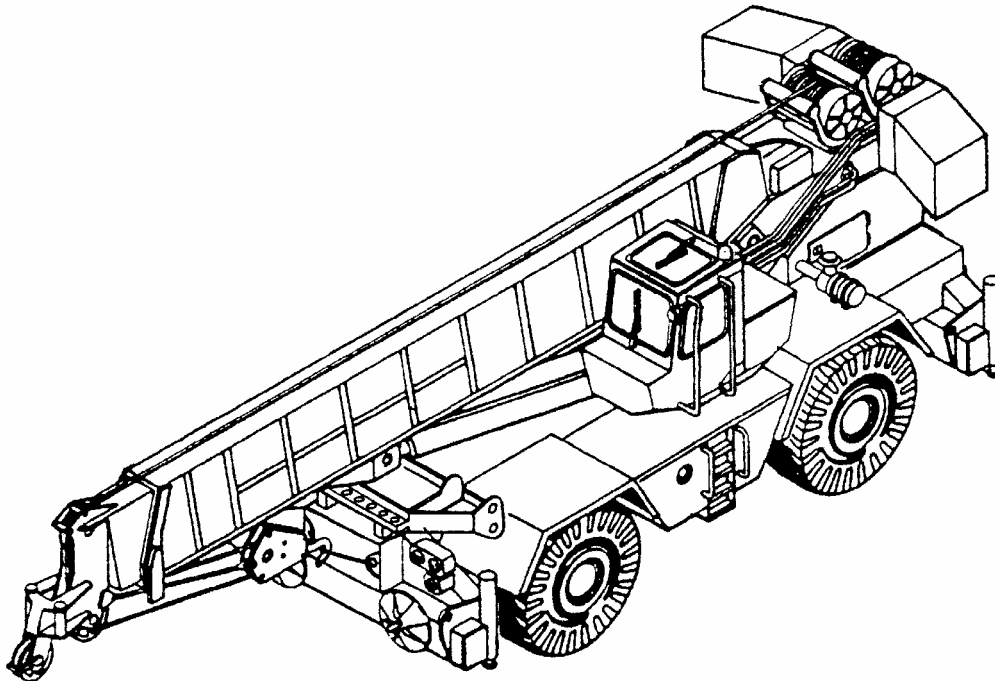
CONTAINER CRANE, 40 TON, ROUGH TERRAIN, MODEL RT875CC

NSN 3810-01-205-2716

and

ROUGH TERRAIN, MODEL RT875CCS

NSN 3810-01-497-1001



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This manual supersedes TM 5-3810-306-34, dated 25 February 1993.

HEADQUARTERS, DEPARTMENT OF THE ARMY

FEBRUARY 2007

WARNING**CARBON MONOXIDE (EXHAUST GAS) CAN KILL YOU**

Carbon monoxide is without color or smell, but can kill you. Breathing air with carbon monoxide produces symptoms of headache, dizziness, loss of muscular control, a sleepy feeling, and coma. Brain damage or death can result from heavy exposure. Carbon monoxide occurs in the exhaust fumes of fuel-burning heaters and internal combustion engines. Carbon monoxide can become dangerously concentrated under conditions of no air movement. Precautions must be followed to insure crew safety when the personnel heater, main or auxiliary engine of any vehicle is operated for any purpose.

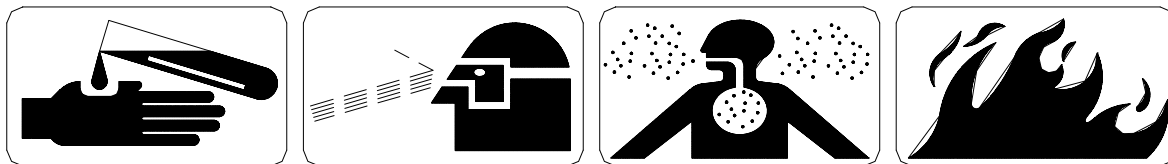
1. DO NOT OPERATE PERSONNEL HEATER OR ENGINE OF VEHICLE IN A CLOSED PLACE UNLESS THE PLACE HAS A LOT OF MOVING AIR.
2. DO NOT IDLE ENGINE FOR LONG PERIODS WITHOUT VENTILATOR BLOWER OPERATING. IF TACTICAL SITUATION PERMITS, OPEN HATCHES.
3. DO NOT DRIVE ANY VEHICLE WITH INSPECTION PLATES, COVER PLATES, OR ENGINE COMPARTMENT DOORS REMOVED UNLESS NECESSARY FOR MAINTENANCE PURPOSES.
4. BE ALERT AT ALL TIMES DURING VEHICLE OPERATION FOR EXHAUST ODORS AND EXPOSURE SYMPTOMS. IF EITHER IS PRESENT, IMMEDIATELY VENTILATE PERSONNEL COMPARTMENTS. IF SYMPTOMS PERSIST, REMOVE AFFECTED CREW TO FRESH AIR; KEEP WARM; DO NOT PERMIT PHYSICAL EXERCISE; IF NECESSARY, GIVE ARTIFICIAL RESPIRATION.

FOR ARTIFICIAL RESPIRATION, REFER TO FM 4-25.11.

5. BE AWARE: THE FIELD PROTECTIVE MASK FOR CHEMICAL-BIOLOGICAL-RADIOLOGICAL (CBR) PROTECTION WILL NOT PROTECT YOU FROM CARBON MONOXIDE POISONING.

THE BEST DEFENSE AGAINST CARBON MONOXIDE POISONING IS GOOD VENTILATION.

6. THE HEAT EXCHANGER IN THE HEATER CAB MUST BE INSPECTED ANNUALLY FOR CRACKS AND DAMAGE (MORE FREQUENTLY IF HEATER USAGE IS HEAVY). A DAMAGED HEAT EXCHANGER CAN LEAK POISONOUS GASES INTO THE CAB THAT COULD RESULT IN ILLNESS OR DEATH.

WARNING

DRY CLEANING SOLVENT P-D-680, Type III IS TOXIC AND FLAMMABLE. Wear protective goggles and gloves and use only in a well-ventilated area. Avoid contact with skin, eyes, and clothes and do not breathe vapors. Do not use near open flame or excessive heat. Flash point is 200° F (94° C). If you become dizzy while using DRY cleaning solvent, get fresh air immediately and get medical aid. If solvent contacts eyes, wash your eyes and get medical aid immediately.

WARNING

**COMPRESSED AIR USED FOR CLEANING PURPOSES WILL NOT EXCEED 30 PSI
USE ONLY WITH EFFECTIVE CHIP GUARDING AND PERSONAL PROTECTIVE
EQUIPMENT (GOGGLES/SHIELD, GLOVES, ETC.).**

WARNING

**DISCONNECT BATTERIES AT BATTERY DISCONNECT SWITCH (RT875CCS) OR AT
SHUNT (RT875CC) BEFORE PERFORMING ANY MAINTENANCE ON THE
ELECTRICAL SYSTEM**

1. SERIOUS BURNS MAY RESULT FROM ACCIDENTAL SHORTING OR GROUNDING OF LIVE CIRCUITS.
2. IF IT SHOULD BECOME NECESSARY TO PERFORM ELECTRICAL MAINTENANCE ON LIVE OR HOT CIRCUITS, REMOVE ALL RINGS, WATCHES, AND OTHER JEWELRY BEFORE PERFORMING MAINTENANCE AS SERIOUS BURNS RESULT FROM ACCIDENTAL GROUNDING OR SHORTING CIRCUITS.

WARNING

**EYE CONTACT WITH SILICONE RTV MATERIALS MAY CAUSE IRRITATION
IF EYE CONTACT TAKES PLACE, FLUSH THE EYES WITH WATER FOR 15 MINUTES
AND HAVE EYES EXAMINED BY A DOCTOR.**

WARNING

**EXERCISE EXTREME CARE AROUND PRESSURIZED HYDRAULIC SYSTEMS
DO NOT WORK ON A HYDRAULIC SYSTEM WHILE IT IS IN OPERATION OR UNTIL
ALL PRESSURE IS RELEASED.**

WARNING

**BEFORE STARTING ANY TROUBLESHOOTING OR MAINTENANCE PROCEDURES
BE SURE TO WEAR PROTECTIVE EYE COVERING TO INSURE PERSONAL SAFETY.
WHEN NECESSARY, ALSO WEAR GLOVES TO AVOID PERSONAL INJURY.**

WARNING

DO NOT ATTEMPT TO DEMOUNT OR MOUNT TIRES WITHOUT PROPER TRAINING

1. TIRE AND WHEEL ASSEMBLY SHALL BE PLACED IN A TIRE CAGE. HIGH PRESSURE INVOLVED CAN CAUSE TIRE AND RIM PARTS AND TOOLS TO FLY WITH EXPLOSIVE FORCE, CAUSING SEVERE INJURY OR DEATH TO PERSONNEL AND DAMAGE TO THE CRANE AND SURROUNDING AREA.
2. WHEN SEPARATING TIRE BEAD AND FLANGE, STAND TO SIDE OF TIRE BEAD SEPARATOR TO ENSURE THAT IF TOOL SLIPS OFF, THE OPERATOR WILL NOT BE INJURED.
3. DO NOT MIX TIRE RIM PARTS FROM DIFFERENT MANUFACTURERS. FAILURE TO FOLLOW THIS WARNING COULD RESULT IN SEVERE INJURY.

TM 5-3810-306-34

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HEADQUARTERS
DEPARTMENT OF THE ARMY
Washington D.C., 28 February 2007

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**DIRECT SUPPORT AND GENERAL SUPPORT MAINTENANCE MANUAL FOR
CONTAINER CRANE, 40-TON,
ROUGH TERRAIN, MODEL RT875CC
NSN 3810-01-205-2716
and
ROUGH TERRAIN, MODEL RT875CCS
NSN 3810-01-497-1001**

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CHAPTER 1

INTRODUCTION

Section I. GENERAL INFORMATION

SCOPE

Type of Manual: Direct Support and General Support Maintenance

Model Number and Equipment Name:

RT875CC - Container Crane, Rough Terrain Wheel Mounted, Hydraulic, Diesel Powered
 RT875CCS - Container Crane, Rough Terrain Wheel Mounted, Hydraulic, Diesel Powered
 (SLEP Model)

Purpose of Equipment: The crane is used to pick and position 40-foot ISO containers within a 22-foot load radius and 20-foot ISO containers within a 27-foot load radius at U.S. Army supply depots.

MAINTENANCE FORMS, RECORDS, AND REPORTS

Department of the Army forms and procedures used for equipment maintenance will be those prescribed by DA PAM 750-8, The Army Maintenance Management System.

Accidents involving injury to personnel or damage to materiel will be reported on DA Form 285 (Accident Report) in accordance with AR 385-40.

Explosives and ammunition malfunctions will be reported in accordance with AR75-1.

DESTRUCTION OF ARMY MATERIEL TO PREVENT ENEMY USE

Demolition of materiel to prevent enemy use will be in accordance with the requirement of TM 750-244-3 (Procedures for Destruction of Equipment to Prevent Enemy Use for U.S. Army).

PREPARATION FOR STORAGE OR SHIPMENT

Before the Container Crane is stored for a long period of time, shipped to a distant location, or returned to service after a period of time, certain guidelines/procedures must be followed. Refer to Chapter 18, Preparation for Storage and Shipment in TM 5-3810-306-20.

REPORTING EQUIPMENT IMPROVEMENT RECOMMENDATIONS (EIR)

If your RT875CC Container Crane needs improvement, let us know. Send us an EIR. You, the user, are the only one who can tell us what you don't like about your equipment. Let us know why you don't like the design. Put it on an SF 368 (Quality Deficiency Report). Mail it to us at U.S. Army Tank - Automotive Command, Attn: AMSTA-QRT, Warren, MI 48090. We'll send you a reply.

WARRANTY INFORMATION

The RT875CC Rough Terrain Container Crane was warranted by Grove Manufacturing Company for 12 months. Warranty starts on the date found on DA Form 2410 or DA Form 2408-16 in the logbook. Report all defects in materiel or workmanship to your supervisor who will take appropriate action. Refer to Warranty Technical Bulletin TB 5-3810-306-14.

Section II. EQUIPMENT DESCRIPTION AND DATA

EQUIPMENT CHARACTERISTICS, CAPABILITIES, AND FEATURES

RT875CC/RT875CCS Rough Terrain Container Crane

- Axle steering accomplished by utilizing hydraulic steer cylinders
- Welded steel frame
- Engine mounted at rear of crane
- Superstructure
- Sliding beam outriggers are integral with carrier frame
- Remote mounted six-speed transmission
- Four-wheel drive
- Load Moment Indicating (LMI) system

Capability and Features

- Automatic axle oscillation when superstructure travels more than 5 degrees from-travel position
- All crane functions controlled from cab
- Superstructure capable of 360 degree rotation in either direction
- Lifting is provided by main and auxiliary hoists
- Equipped with two section, trapezoidal boom
- Integral fifth wheel, to which rear axle is mounted, provides axle oscillation

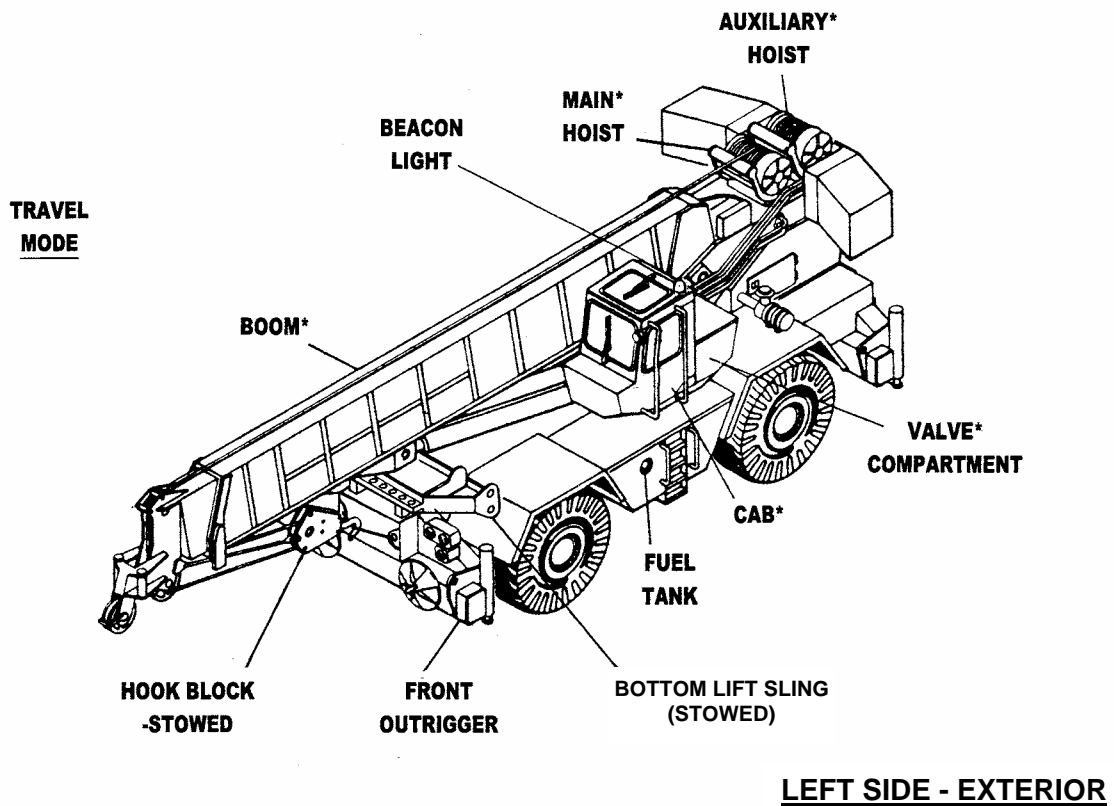
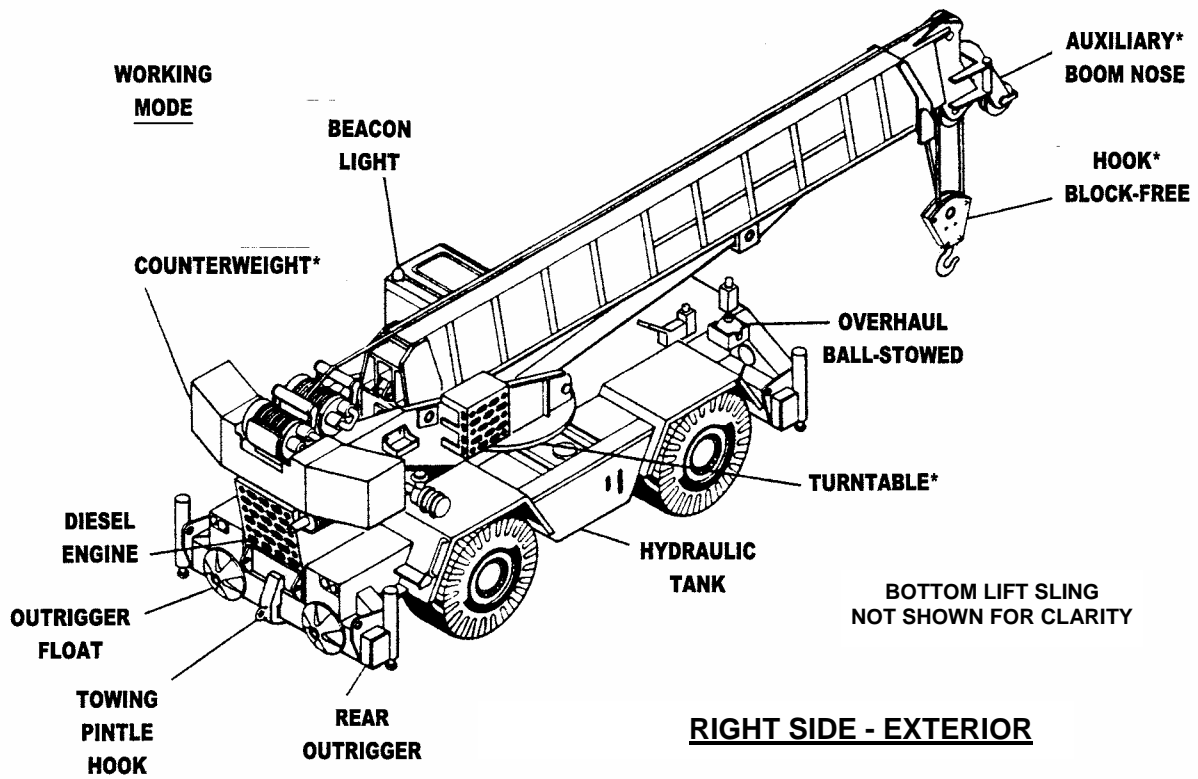
SLEP Modifications

The following is a list of the major changes/ system improvements that were effected by the SLEP.

- Upgraded load moment indicating system
- Improved emergency load lowering/ emergency steering system
- Bottom lift sling stowage brackets
- Additional boom floodlight and new cab area work light
- Hoist mirrors added
- Improved steps/carrier deck access
- New batteries and battery cables and battery disconnect added
- Low temperature hydraulic hoses and o-rings
- New cab heater
- Improved decals and new load chart
- New in-line fuel heater/water separator

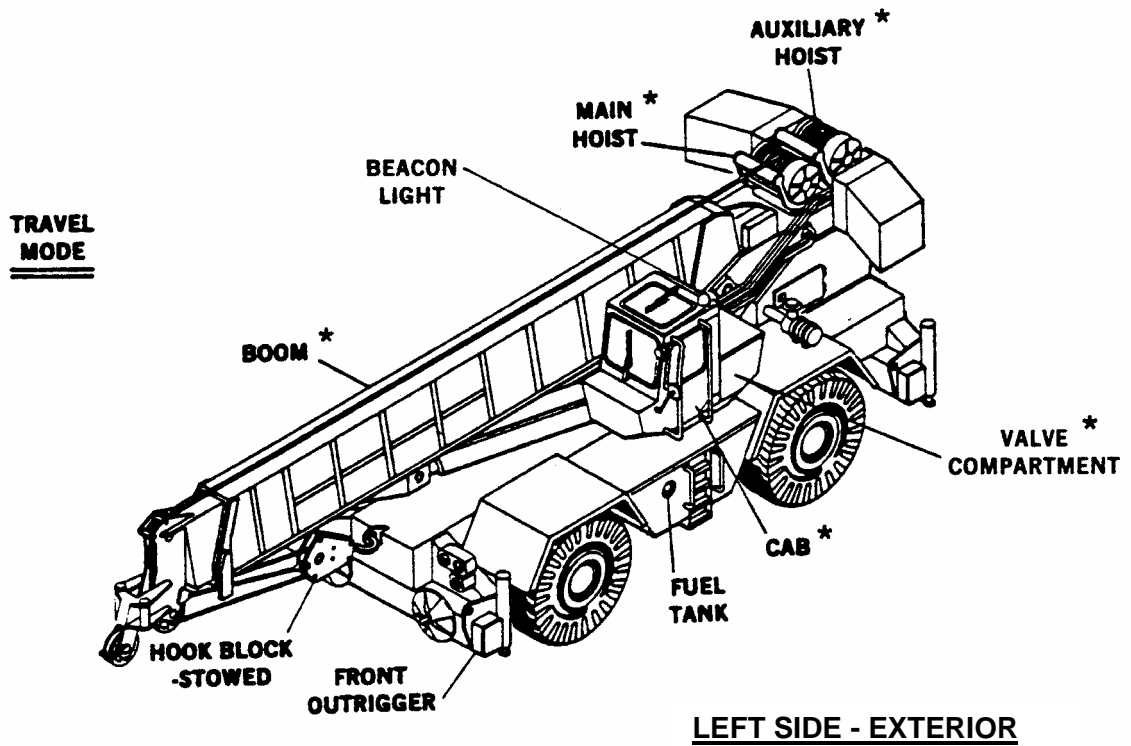
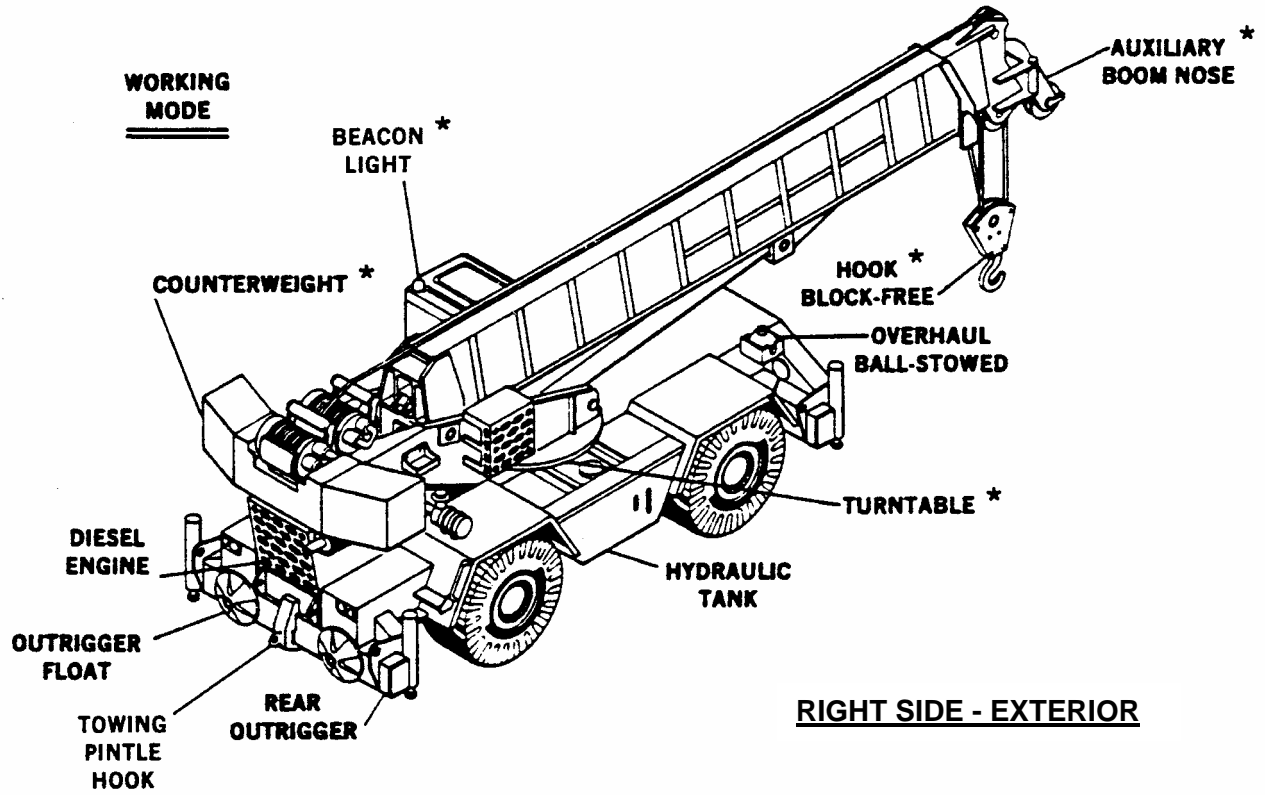
LOCATION AND DESCRIPTION OF MAJOR COMPONENTS

Counterweight.	Bolted onto turntable to be part of turntable assembly. Weighs 12,500 pounds.
Hook block.	Provides lifting capability when attached to hoist cable. Capable of lifting 40 tons and utilizes one-piece pivot block with a safety latch.
Overhaul Ball.	Mounted on the auxiliary boom-nose. Ball can be stored during travel. Capable of lifting 5 tons.
Hydraulic Tank.	165 gallon capacity. Supplies hydraulic oil to hydraulic valve banks. Located on right side of carrier frame. Uses a magnetized drain plug to collect metal particles in tank and a sight gauge to indicate oil level.
Rear Outrigger.	Mounted on rear stabilizer box. Extends when selector valve in outrigger control panel is operated. Stabilizes rear portion of crane during lifting operations.
Diesel Engine.	Cummins 6CTA8.3 turbo-charged diesel engine. Speed is controlled by a foot operated air throttle valve. Access to engine is gained through two side doors in hood assembly.
Boom.	Extends from 34 to 60 feet with one full powered telescoping section. Trapezoidal in design and uses one 6.50-inch telescope cylinder to extend and retract boom. Boom elevation is from -4°degrees (below horizontal) to +80 degrees. Supports main and auxiliary boom nose.
Main/Auxiliary Hoists	The hoists provide power for all load raising and lowering operations. Two hydraulic motors drive each hoist drum by means of a planetary gear reduction system. A metallic disc brake is also an integral part of the hoist assembly, and operates automatically when the control lever is in neutral.
Cab	Contains controls and indicators for travelling and crane operations. Enclosed in an all-steel, acoustically treated enclosure, surrounded with tinted safety glass.
Fuel Tank	Is a steel cylinder-type tank located below the left fender. Two connections on top of tank provide for fuel supply to engine and return of surplus from engine. Equipped with a lock type filter cap and fuel quantity sender. Fuel tank has a draw capacity of 100 gallons.
Outriggers	The outriggers, part of the carrier frame, are controlled and operated from the cab. They are full hydraulic, double box type. When positioned they provide a rigid four-point platform (fully extended and set) capable of supporting the machine and its maximum load capacity. Integral holding valves and floats are provided.



RT875CCS

NOTE: Items marked * form the crane's superstructure



RT875CC

NOTE: Items marked * form the crane's superstructure

EQUIPMENT DATA

General

Grove Manufacturing Co. Model No. RT875CC
Model No. RT875CCS
Rated Capacity See Load Chart, Appendix F, TM 5-3810-306-10
Drive 4 x 4
Gross Weight (RT875CC)..... 94,500 lbs (42,865 kg)
Gross Weight (RT875CCS) with bottom lift sling stowed..... 97,325 lbs (44,147 kg)
Gross Weight (RT875CCS) without bottom lift sling..... 95,800 lbs (43,455 kg)

NOTE

Dimensions listed are for a crane with all components fully retracted and in the travel mode.

Dimensions

Wheel Base 170 in. (431.8 cm)
Overall Crane Length 46.3 ft (14.1 m)
Overall Crane Width 144 in. (365.76 cm)
Overall Crane Height 156.75 in. (398.15 cm)
Tail-swing 171 in. (434.34 cm)
Curb Clearance Circle (4W Steer Mode) 50.2 ft (15.3 m)

Capacities

Fuel Tank 100 gal. (378.50 l)
Hydraulic Tank 165 gal. (624.52 l)
Coolant System 44 qts (41.6 l)
Engine Lubrication System 23.7 qts (22.42 l)
Hoists (each)..... 10 qts (9.46 l)
Swing Gearbox 15 qts (14.2 l)
Axle Planetary End 29 qts (27.45 l)
Axle Drive Unit 15 qts (14.2 l)
Transmission 34.4 qts (32.6 l)

Fire Extinguisher

Manufacturer..... Walter Kidde
Model 897213-10BC-23/4
Type Dry
Rating..... 10 BC
Weight..... 2.75 lbs (1.2 kg)

Engine

Manufacturer..... Cummins
Model 6CTA8.3
Type 6 cyl OHV, diesel
Combustion..... 4 cycle, turbo-charged, after-cooled

Engine (Continued)

Bore and Stroke 4.49 in. x 5.32 in.
 (114 mm x 135 mm)
 Displacement 504.5 cu in. (8.27 l)
 Horsepower (Gross) 250
 Torque (Gross) 650 ft lbs @ 1800 rpm

Cooling System 44 qts (41.6 l)
 Lube System 23.7 qts (22.5 l)
 Air Cleaner 2-stage, dry type
 RPM, Engine Idle 800 RPM
 RPM, Engine Full (Governed) 2500 RPM

Torque Converter

Manufacturer Clark
 Model C273.5
 Stall Torque Ratio 1.820:1
 Charge Pump..... 21 gpm (80 lpm)
 Pump Drive Ratio 0.95:1

Transmission

Manufacturer Clark
 Model R28661
 Speeds 6
 Gear Ratios
 1 13.91:1
 2 6.58:1
 3 2.41:1
 4 4.84:1
 5 2.29:1
 6 0.84:1

Axles

Manufacturer Rockwell
 Model PSC 1794
 Rings and Pinion Ratio 5.287:1
 Planetary Ratio 5.200:1
 Total Overall Ratio 27:490:1

Wheels and Tires

Manufacturer Grove
 Model 6-970-001386 (RT875CC)
 Lugs 24
 Torque 300 to 330 lb ft (41.47 to 45.62 kgm)
 Tire Size 29.5 x 25
 Ply Rating 28

Brakes

Manufacturer Rockwell
Model KDA-20004
Type Operator Air
Type Double Wedge

Steering Control Valve

Manufacturer Eaton
Model 211-1041-001
Displacement 47.5 cu in.
(778.69 cu cm) per revolution
Capacity 12 gpm (45.4 lpm)

Air Compressor

Manufacturer Cummins
Model 3051041
Number of Cylinders 1
Piston Displacement @ 1250 rpm 13.2 cfm (6230 cm³/sec)

Hydraulic Pumps

Manufacturer Commercial Shearing
Model - 3-section 313-9632-022
2-section 312-9320-536
Type Gear
Sections 1 - two section and 1 - three section
GPM 3 - 50 gpm (189 lpm) and
2 - 27 gpm (102.1 lpm)
@ 2400 rpm

Swing Motor

Manufacturer Char-Lynn
Model 101-1086
Type Gerotor
Displacement 17.9 cu in./rev. (293 cu cm)

Swing Gearbox

Manufacturer Grove
Model GB-200A
Type Gear Reduction
Reduction Ratio 20.2:1

Boom

Manufacturer Grove
Model (RT875CC) 2-187-910006
Model (RT875CCS) 2-187-900028

Boom (Continued)

Length 34.4 - 60.4 ft
 (10.5 - 18.4 m)
 Elevation -4° to +80°

Main and Auxiliary Hoists

Manufacturer..... Grove
 Model HO 30E-16
 Drum Dimensions
 Diameter 16-in. (40.64 cm)
 Length 16-in. (40.64 cm)
 Cable Capacity With Cable Dia. Of..... 0.75 in. (19 mm)
 16 inch (40.64 cm) Drum. 525 ft (160 m)
 Permissible Line Pull..... Refer to the Line Pulls
 and Reeving Info Chart in the Cab

Counterweight

Manufacturer..... Grove
 Model 2-187-200063
 Type Fixed-Bolted On
 Weight..... 12,500 lbs (5,670 k)

Outriggers

Manufacturer..... Grove
 Model (RT875CC) 2-187-100108
 Model (RT875CCS) 2-187-110068
 Type Double box beam and jack
 Extended Length 288 in. (731.52 cm)
 Retracted Length 133 in. (337.82 cm)

Hydraulic Swivel

Manufacturer..... Grove
 Model 6-364-001438
 Ports 11 with dual ports on #1

Air/Transmission Swivel

Manufacturer..... Grove
 Model 6-364-001600
 Air Ports 5
 Oil Ports 7

Electrical System

Type Single wire ground return (chassis)
 System Voltage 24
 Starting Voltage 24

Electrical System (Continued)

Alternator 65 AMP, 24 Volt

Batteries

Number 4

Rating 610 CCA @ 0°F

Emergency Steer Pump

Manufacturer..... John S. Barnes

Model 1380004

Type Gear

Capacity 5.3 gpm (20.1 lpm)

RPM..... 2400

Voltage..... 24 volts

Cab Heater (RT875CCS)

Manufacturer Hunter

Model DH22-22A

Type Internal Combustion

Voltage..... 24 volts (15 amp to start/3.5 amp to run)

Fuel (Consumption) DF-2 (6-1/2 hrs/gal.)

Ignition Solid State (6000 V)

Rating (Output) 15,000 BTU/hr

Cab Heater (RT875CC)

Manufacturer..... Webasto

Model 468-657

Type Internal Combustion

Voltage..... 24 volts

Fuel Diesel

Heat Output 15,000 Btu/hr

Bottom Lift Sling, 20 Ft / 40 Ft Self Leveling

Manufacturer..... Tandemloc, Inc.

Model Q2500AA-400

Weight 1,563 lbs (709 kg)

Lift Capacity (Containers and Contents)..... 67,200 pounds (30.48 MT)

Dimensions:

Length..... 8.35 feet (2.55 m)

Width..... 16 inches (40.6 cm)

Height 3.7 feet (112.8 cm)

Emergency Stowage System (RT875CCS)

Manufacturer Manitowoc Crane Group (Grove)

Part Number (Installation)..... 2-187-810070

SAFETY, CARE AND HANDLING

Safety

Your safety and that of others is always the number one consideration when working around machines. Safety is a matter of thoroughly understanding the job to be done and the application of good common sense. It is not just a matter of do's and don'ts. Stay clear of all moving parts.

Care and Handling

When performing maintenance, do not attempt to manually lift heavy parts when hoisting equipment should be used. Never locate or leave heavy parts in an unstable position. When raising a portion of a crane or a complete crane, ensure the crane is blocked securely and the weight is supported by blocks rather than by lifting equipment.

When using hoisting equipment, follow the hoist manufacturer's recommendations and use lifting devices that will allow you to achieve the proper balance of the assemblies being lifted and to ensure safe handling.

Unless otherwise specified, all removals requiring hoisting equipment should be accomplished using an adjustable lifting attachment. All supporting members (chains and cables) should be parallel to each other and as near perpendicular as possible to the top of the object being lifted.

Section III. PRINCIPLES OF OPERATION

INTRODUCTION

This section explains how major components in the RT875CC Container Crane work by providing a functional description and the theory of operation for each system's organizational level component.

ENGINE LUBRICATING SYSTEM

Gerotor

Oil flow begins as the gerotor type oil pump pulls oil from the oil pan through the rigid, internally mounted suction tube. The oil pump then delivers the oil through an internal drilling in the cylinder block to the oil pressure regulator, which is located in the oil cooler cover.

Pressure Regulating Valve

The pressure regulating valve relieves oil pressure during cold starting and regulates oil pressure after the oil is warm. The regulator valve remains closed until the oil pressure is approximately 315 kPa (45 PSI). When the oil pressure is greater than 315 kPa (45 PSI), the valve begins to open and pressure is relieved by allowing some of the oil to return to the pan. The valve plunger has a tapered shoulder which creates a variable opening to regulate the pressure.

Oil Cooler

From the regulator cavity, the oil flows through the cooler cover and cooler element. Coolant flowing past the plates of the element cools the oil.

Filter Bypass Valve

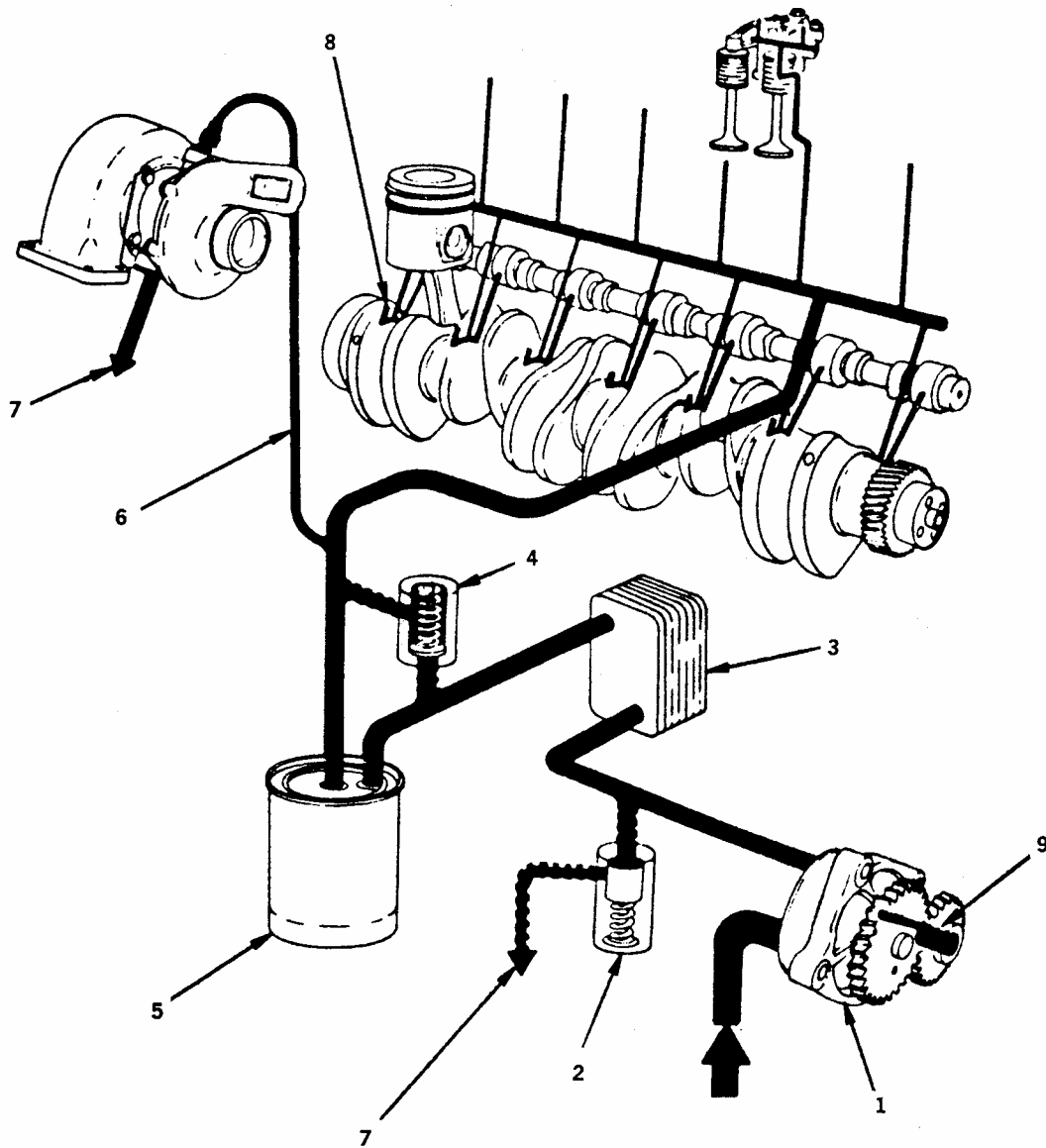
The oil cooler cover contains a bypass valve that will let the oil flow bypass a plugged oil filter. If the pressure drop across the oil filter exceeds 138 kPa (20 PSI), the bypass valve will open, allowing the oil to continue through the engine.

Oil Filter

From the cooler, the oil flows through a passage in the cooler cover to the oil filter. The filtered oil flows up to the center of the filter to the filter head.

Turbocharger and Cylinder Block

At the filter head, the oil flow is divided: A portion flows to the turbocharger; the rest flows down a passage in the cylinder block that connects to a cross drilling over the number 3 main bearing.



LEGEND

- 1. LUBRICATING OIL PUMP
- 2. PRESSURE REGULATING VALVE
- 3. OIL COOLER
- 4. FILTER BYPASS VALVE
- 5. OIL FILTER
- 6. TURBOCHARGER OIL SUPPLY
- 7. OIL RETURN TO PAN
- 8. PISTON COOLING NOZZLE
- 9. OIL PUMP IDLER GEAR

ENGINE LUBRICATION SYSTEM

FUEL SYSTEM

General

The function of the fuel system is to inject a metered quantity of clean, atomized fuel into the engine cylinders at a precise time near the end of the compression stroke of each piston. The components of the system contribute to the delivery of fuel to the cylinders.

The fuel system consists of the fuel tank, fuel-filters, strainer, water separator, fuel pump, and the fuel injectors. All components except the fuel tank are installed on the engine.

Fuel Tank

The fuel tank is a steel cylinder-type tank located on the left side of the crane. The fuel tank has a draw capacity of 100 gallons (379 liters). Two connections on top of the tank provide for fuel supply to the engine and return of surplus fuel from the engine. The tank is equipped with a lock-type filler cap and a fuel quantity sender unit which provides a signal to a fuel gauge on the instrument panel in the cab.

Fuel Filter and Strainer (Pre-filter) (RT875CC)

A replaceable spin-on type fuel filter is used in the fuel system to remove impurities. The filter is adjacent to the water separator.

The fuel strainer is mounted on the carrier frame rail on the right side of the engine. The unit includes a removable sediment bowl.

Fuel Filter (RT875CCS)

The engine fuel filter, which comes as a component of the engine, incorporates a replaceable-element-type filter to remove impurities from the fuel. The filter is mounted on the engine between the fuel pump and fuel injection pump.

Fuel Pump

The engine has a positive displacement gear-type metering fuel pump driven by an engine power take-off. The pump supplies fuel at low pressure to the injectors, where the high pressure necessary for atomization of the fuel is created.

The fuel oil is finely atomized as it is injected into the cylinder and ignited by the heat of the compression. It is metered before injection, to meet the load requirements imposed upon the engine.

Fuel Filter-Water Separator (RT875CC)

The replaceable spin-on type fuel filter-water separator removes water from the fuel before it reaches the engine. It is mounted on the right side of the engine.

The fuel mixture passes through the outer wrap of the first stage of the filter paper, where large droplets of water are formed as it is stripped from the fuel. The water falls out into the void between the two paper elements and goes to a reservoir in the bottom of the housing, where it can be drained through a petcock (knurled knob) at bottom of the shell.

Fuel Heater/Water Separator (RT875CCS)

The heated fuel filter/water separator removes water from the fuel before it reaches the engine. It is mounted on the top left rear of the engine. As fuel passes through the outer wrap of the first stage

of the filter paper, large droplets of water are formed as it is stripped from the fuel. The water falls out into the void between the two paper elements and goes to a reservoir in the bottom of the housing where it can be drained through a drain valve at the bottom of the housing. This filter is installed in the system between the fuel tank and pump and operates under suction.

The fuel filter/water separator also incorporates an electrically operated heater which is actuated by a temperature switch to warm the fuel whenever the temperature of the fuel is below 30° F (-1° C).

Injection Pump

Low pressure fuel from the fuel filter and head is sent to the injection pump at 140 kPa. The injection pump builds the high injection pressures required for combustion and routes the fuel through high pressure fuel lines to each injector. The injector pump is equipped with an emergency fuel shutoff solenoid.

Fuel Injectors

The engine uses a 17 mm closed-nozzle, hole-type injector. When the high-pressure fuel reaches the injector, the pressure lifts the needle valve against the spring tension to allow fuel to enter the combustion chamber.

Any leakage past the needle valve enters the fuel drain manifold. The manifold routes leakage from the injectors to the injection pump vent fitting. Fuel from the fitting is returned to the supply tank.

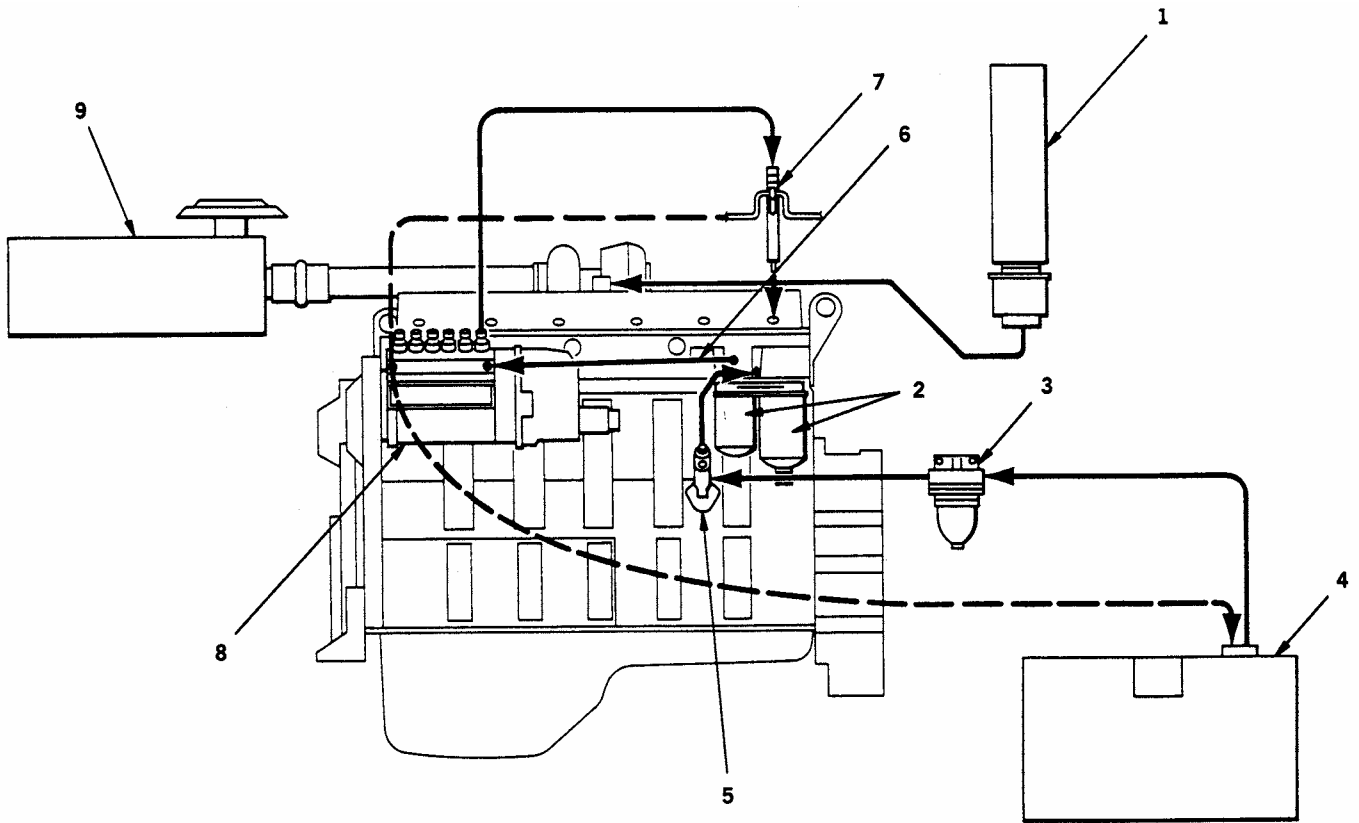
Quick Starting Kit

The quick starting system consists of an atomizer, valve assembly, starting aid bottle and temperature control. The quick start system is normally used during cold weather operations to facilitate engine starting. When the quick start system is used, starting aid from the bottle is passed through the atomizer into the air intake manifold where it mixes with the intake air to facilitate engine combustion. Temperature control prevents a hot engine being primed with the starting aid.

Air Cleaner

The engine air intake system consists of two air cleaners: one on each side of the engine hood assembly. The intake pipe also includes a restriction indicator to indicate a dirty air cleaner.

The air cleaners are the dry-type with replaceable primary and safety elements. Air is drawn through the air cleaner into the compressor side of the turbocharger. Intake air from the turbocharger flows through the cooling fins of the aftercooler before entering the intake manifold. The cooled air becomes more dense and contains more oxygen which allows more fuel to be injected increasing power output from the engine.



LEGEND

- 1. QUICK START AID
- 2. FUEL/WATER SEPARATOR
- 3. FUEL PRE-FILTER
- 4. FUEL TANK
- 5. LIFT PUMP
- 6. LOW PRESSURE SUPPLY LINE
- 7. INJECTOR
- 8. INJECTION PUMP
- 9. AIR CLEANER

————— FUEL FLOW
- - - - - FUEL RETURN LINE

FUEL SYSTEM

COOLING SYSTEM

General

The cooling system consists of the radiator, engine cooling circuit, thermostats, water pump, turbocharger aftercooler filter, and the connecting hoses. The temperature is controlled by two 180°F (82°C) thermostats located between the top of the engine and the top of the radiator.

The function of the cooling system is to maintain a specific operating temperature for the engine. Some of the heat generated by the engine is absorbed by the coolant flowing through the passages in the cylinder block and head. Then, heat is removed from the coolant as it flows through the radiator.

Radiator

The radiator has a capacity of 44 quarts (41.6 liters) and contains a mix of 50/50 antifreeze coolant and water. Coolant is stored in the radiator and is drawn by an integrally mounted water pump. Air forced through the fins of the radiator by a fan cools the coolant pumped through the radiator.

Water Pump

The water pump pulls coolant from the bottom of the radiator and pumps it through the engine back to the top of the radiator for cooling. Reduced or interrupted flow will result in the engine running hot. The pump is belt driven from the crankshaft pulley.

Coolant Overflow Tank

A coolant overflow tank is installed on the inside of the engine hood assembly. The tank collects excess coolant overflowing from the radiator.

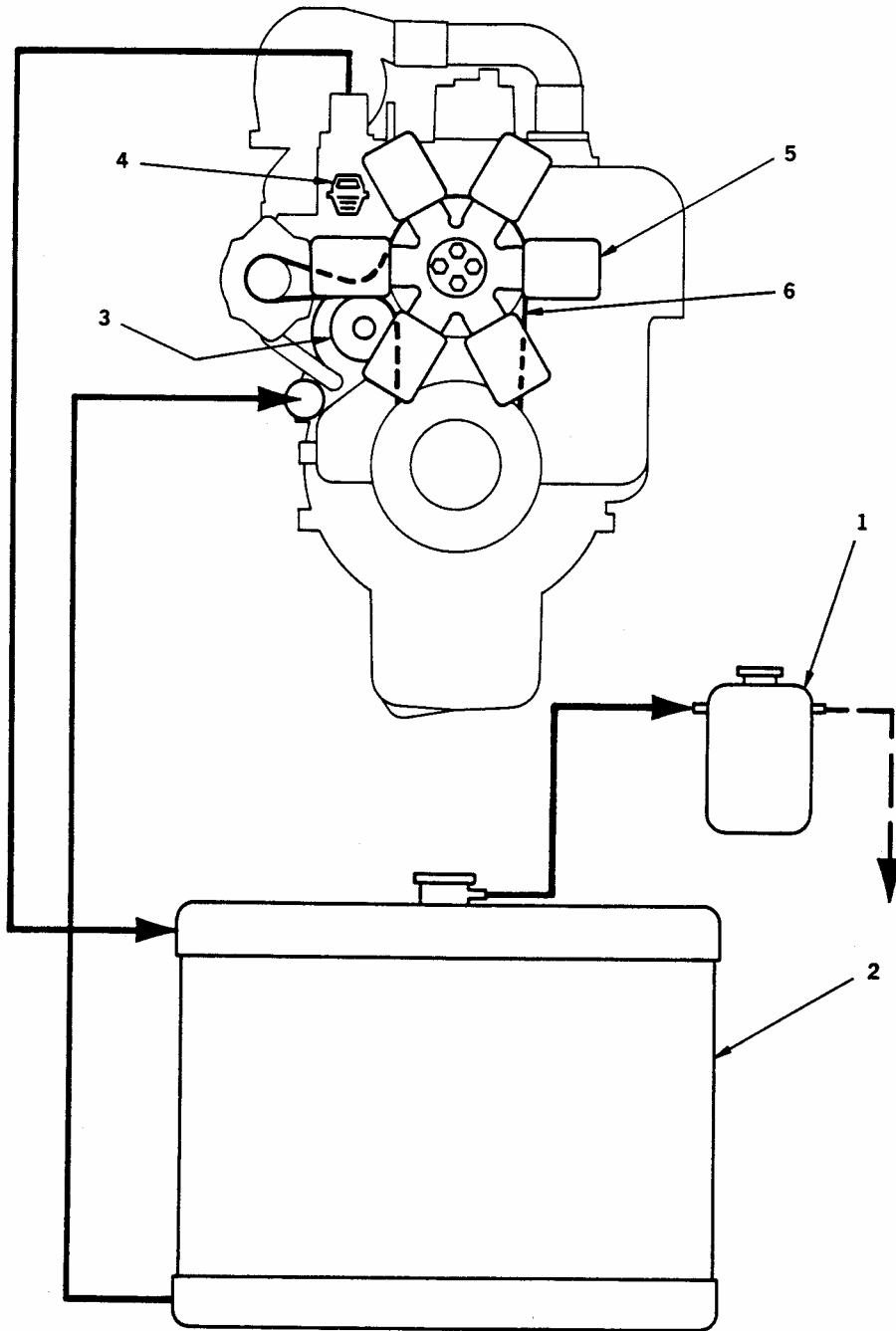
Fan Drive Belt

The fan drive belt is used to drive the fan, alternator, and water pump pulleys. An automatic belt tensioner is used to prevent belt slippage. A malfunction in the belt tensioner reduces pump impeller speed, coolant flow, and prevents the battery from charging properly.

Thermostats

From the liner cavities, the coolant flows through cast openings into the lower manifold, and into the thermostat cavity.

Thermostats control coolant temperature. When the coolant temperature is below operating temperature, the thermostats are closed, and coolant is bypassed to the water pump inlet. As coolant temperature increases to the intermediate range, both thermostats open, and coolant flow to the bypass will be partially restricted. At engine operating temperature the thermostats are open and the bypass is closed.



LEGEND

- 1. COOLANT OVERFLOW TANK
- 2. RADIATOR
- 3. WATER PUMP
- 4. THERMOSTATS
- 5. RADIATOR FAN
- 6. DRIVE BELT

————— COOLANT FLOW
- - - - - COOLANT OVERFLOW

COOLING SYSTEM

ELECTRICAL SYSTEM

General

The electrical system is 24-volt operation, consisting of an alternator and four lead-acid batteries, series-parallel connected. The system is the single wire ground return, utilizing the crane's superstructure as ground.

Batteries

The 12-volt batteries are located in a box on the left side of the machine behind the rear axle. Two batteries are connected in parallel to make two parallel sets. Both parallel sets are connected in series to provide the necessary 24-volts for the system.

A two-position battery disconnect switch is located below the battery box. The switch completes or interrupts the battery circuit by connecting or disconnecting the circuit to ground. (RT875CCS)

Starter

When the start button is depressed, the coils in the solenoid are energized creating a magnetic field. This field pulls in the plunger which causes the shift lever to push the drive assembly in mesh with the ring gear in the engine. At this time the plunger closes the circuit between the "BATTERY" terminal and the field coil.

The current passes through the field coil, then through the brushes until it reaches the armature. The current forms counteracting magnetic fields around the field coil and the armature, causing the armature to turn. The armature turns the drive assembly which cranks the engine through the ring gear.

When the engine starts, the start button is released. This causes the magnetic field in the solenoid to collapse and a return spring forces the plunger back to its original position. As this happens, the shift lever disengages the drive assembly from the ring gear teeth. The contact from the "BATTERY" to the field coil is also broken by the returning plunger, which causes the armature to stop turning.

Alternator

The alternator is mounted on the engine and is belt driven. It is a 65 amperage alternator with a 24-volt output terminal. The 24 volts from the alternator is supplied by a transformer - rectifier unit mounted on the end frame of the alternator. When the engine is running, the 24-volt terminal supplies the voltage to recharge the batteries and maintain them at a full state of charge.

Electrical Swivel

The electrical swivel center or collector ring assembly is secured by setscrews to a center post which is bolted to the spool of the air/transmission swivel. This allows the collector ring assembly to remain stationary with the chassis. The outer portion or brush assembly is spring mounted on two pins which are located on a mounting plate welded to the air/transmission swivel barrel. This allows the brush assembly to rotate with the superstructure. The springs on the mounting plate pins allow the swivel to float and not bind when the superstructure rotates.

Electrical power is transferred to and from the carrier and superstructure through the electrical swivel. The swivel has 42 slip rings.

SUPERSTRUCTURE

Distribution Panel

All electrical circuits are protected, and some controlled, from the printed circuit board (circuit breakers) located in the cab right side panel. The printed circuit board consists of a harness with four connectors, six relays, nine circuit breakers, and a flasher. The relays are energized to close their contacts any time the ignition switch is in the ON or ACC position.

Instrument Panel

The instrument panel is located in the cab section of the crane. It contains all of the controls and indicators that the operator will use during crane operation. Additional information on the instrument panel and its controls and indicators can be found in the Operator's Manual TM 5-3810-306-10.

Alarms

The backup alarm is located above the pintle hook on the carrier. It serves as a warning to personnel that the crane is traveling in reverse.

Superstructure Lighting (RT875CC)

Two lights mounted in the crane's superstructure are the cab floodlight and boom floodlight. The cab floodlight is located on the outside of the cab and is controlled by the operator by a swivel handle inside the cab. The boom floodlight is mounted on the telescoping boom and is used to illuminate the work area and hook block during night operations.

Superstructure Lighting (RT875CCS)

Four lights mounted in the crane's superstructure include a cab floodlight, a cab-mounted work area light, and two boom-mounted floodlights. The cab floodlight is located on the outside of the cab and is controlled by the operator via a swivel handle inside the cab. The cab-mounted work area light is mounted on the front of the cab, below the windshield. The light is controlled by a switch on the right side console. Two boom floodlights are mounted on the telescoping boom and can be used to illuminate the work area, boom nose, and/or hook block during night operations. The boom floodlights are also controlled by a toggle switch on the right side console.

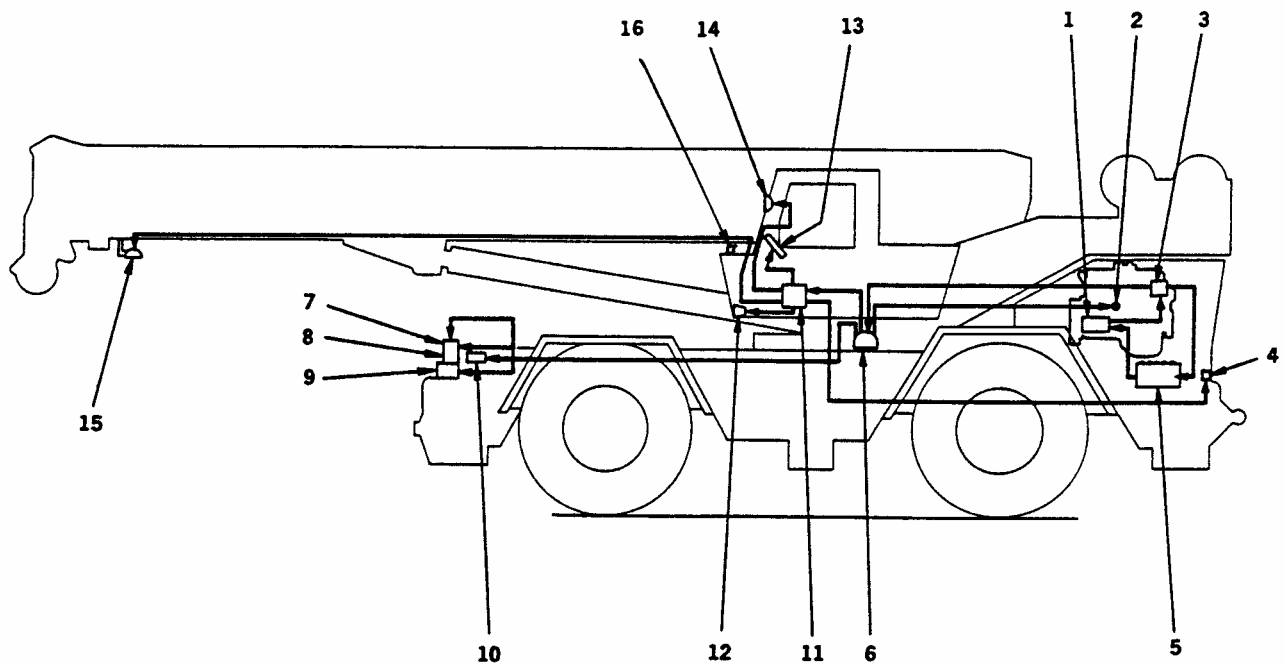
CARRIER FRAME

Sending Units and Switches

The electrical system provides electrical power to a variety of sending units and switches that monitor the systems in which they are installed. These sending units and switches transmit signals to indicators and warning lights in the operator's cab, allowing the operator to monitor the system and warn him of impending problems.

Carrier Frame Lighting

The operator controls lighting on the Carrier frame within the cab. All switches and indicators are located on the instrument panel. External carrier frame lighting includes: headlights, turn signals, clearance lights, and blackout lights.



LEGEND

CARRIER FRAME

- 1. STARTER
- 2. SENDING UNIT
- 3. ALTERNATOR
- 4. BACKUP ALARM
- 5. BATTERY
- 6. ELECTRICAL SWIVEL
- 7. TURN SIGNAL
- 8. HEADLIGHT
- 9. BLACKOUT LIGHT
- 10. CLEARANCE LIGHT

SUPERSTRUCTURE

- 11. DISTRIBUTION PANEL
- 12. HORN
- 13. INSTRUMENT PANEL
- 14. CAB FLOODLIGHT
- 15. BOOM FLOODLIGHTS
- 16. CAB WORKLIGHT

ELECTRICAL SYSTEM

AIR SYSTEM

General

The air system provides the air supply to operate the service brakes, the parking brake, the engine throttle, the transmission range shift and rear axle disconnect. The system also supplies air for the tire inflation system.

The air system is pressurized by an engine-mounted air compressor and this pressure is stored in three air reservoirs installed underneath the frame to the rear of the front axle. From these reservoirs, air is provided for operation of the above mentioned components.

An air pressure gauge is provided in the cab on the front console. The green arrow indicates primary air pressure, while the red arrow indicates secondary pressure.

Air Compressor and Air Governor

The compressor, mounted on and driven by the engine, is regulated by an air governor which vents the compressor when a pressure of 120 psi (827.4 kPa/8.27 bar) is sensed in the air system. When pressure drops to 100 psi (689.5 kPa/6.895 bar), the governor will allow the compressor to supply the air system to maintain proper system pressure.

Through reciprocating motion, the piston in the compressor compresses air with every cycle.

Air Dryer

The air dryer removes moisture from the air system by using a desiccant cartridge. Water is drained from the air dryer via the automatic drain valve.

Supply Reservoir

Compressed air passes through the air dryer to the supply reservoir. The supply reservoir helps cool heated air and contains an automatic drain valve to vent off condensed water from the cooling air. A 150 psi (1034.25 kPa/10.34 bar) safety valve is installed on the supply reservoir for excess pressure protection (from the supply reservoir, pressurized air flows to the primary and secondary reservoirs).

Automatic Drain Valve

The automatic drain valve is designed to eject moisture and contaminants from the air system reservoir upon a slight reduction in reservoir pressure. It operates automatically from ascending and descending reservoir pressures, has only one moving part, and requires no manual assistance of control lines from other sources. The valve has a die cast aluminum body and cover.

With no air pressure in the system, the inlet and exhaust valves are closed. Upon charging the system, a slight pressure opens the inlet valve which permits air and contaminants to collect in the sump. The inlet valve remains open when pressure is ascending in the system until maximum (governor cutout) pressure is reached. The spring action of the valve guide in the sump cavity closes the inlet valve. The valve and the exhaust valve are now closed.

When the reservoir pressure drops slightly (approximately 2 psi [13.8 kPa/.14 bar]), air pressure in the sump cavity opens the exhaust valve and ejects moisture and contaminants from the sump cavity until pressure in the sump cavity drops sufficiently to close the exhaust valve.

The length of time the exhaust valve remains open and the amount of moisture and contaminants ejected depends upon the sump pressure and the reservoir pressure drop that occurs each time air is used from the system.

Manual draining from the valve can be accomplished by using a tool to move the wire in the exhaust port upwards, holding it until draining is completed.

Single Check Valve

Inline single check valves are designed to allow air flow in one direction only, preventing the flow of air in the reverse direction. Inline single check valves are used in the air system to prevent air pressure in the supply reservoir from bleeding back into the dryer when the compressor is unloaded or shut down, or to prevent air pressure from bleeding back into the supply reservoir in the event of a major malfunction of the air system. An arrow indicating the direction of air flow is cast into the body of the check valve and should be pointed toward the reservoir supply tank.

Safety Valve

A safety valve is installed in the top of the supply reservoir to protect the air system against excessive air pressure buildup. The valve consists of a spring loaded ball valve subjected to reservoir pressure which permits air to exhaust from the reservoir to the atmosphere if the pressure rises above 150 psi (1034.3 kPa/10.3 bar). This pressure setting is nonadjustable and is determined by the force of the spring.

When the reservoir pressure decreases to approximately 135 psi (930.8 kPa/9.30 bar), the spring force will seat the ball check valve, sealing off reservoir pressure. The pressure setting of the safety valve is determined by the governor cut-out pressure.

Normally the safety valve remains inoperative and only functions if reservoir pressure exceeds 150 psi (1034.3 kPa/10.3 bar). Constant exhausting of air from the safety valve can be caused by a faulty safety valve, governor, compressor unloading mechanism, or a combination of any of these.

Primary Reservoir (Primary Air System)

The primary reservoir provides control and supply primary air pressure for the park brake system which includes the park brake (control) valve, spring brake control valve, park brake relay valve, and spring brake chambers of the service/park brake actuators.

Pressure Protection Valves

Three pressure protection valves are used in this air system. Two of the pressure protection valves are set at 85 psi (586kPa/5.86 bar) while the third is set at 75 psi (517.12 kPa/5.17 bar). The pressure protection valves are essentially check valves. They open approximately 10 to 15 psi (68.95 to 103.42 kPa/.689 to 1.03 bar) above their closing pressure. The 75 psi (517.12 kPa/5.17 bar) pressure protection valve for example, will open at approximately 85 to 90 psi (586 to 620.55 kPa/5.86 to 6.2 bar) and will close when pressure drops to 75 psi (517.12 kPa/5.17 bar). These valves protect a circuit if a line is ruptured and ensure a priority supply to the brakes.

Air entering the supply port is initially prevented from flowing out the delivery port by the inlet valve which is held closed by the pressure regulating spring above the piston. When sufficient air pressure builds beneath the piston to overcome the setting of the regulating spring, the piston will move, causing the inlet valve to unseat (open), and allow air to flow out the delivery port. As long as air pressure at the supply port and beneath the piston remains above the specified closing pressure, the inlet valve will remain open. Closing pressure is noted on the label affixed to the valve.

If for any reason system air pressure is decreased below the specified closing pressure, the regulating spring will move the piston closing the inlet valve. The remaining air pressure at either the supply or delivery side, (depending upon where the pressure drop has occurred) will be retained.

Air Swivel

The spool of the air/transmission swivel is attached by setscrews to a spool mounting plate which is bolted to the spool of the hydraulic swivel. This permits the air/transmission swivel spool to remain stationary with the chassis. The air/transmission swivel barrel is attached to the hydraulic swivel barrel by means of a slotted arm which secures it to a keying lug welded to the hydraulic swivel barrel. This permits both barrels to turn with the superstructure.

Foot Throttle Valve (Accelerator Control Valve)

The foot throttle valve is a treadle operated air valve mounted on the cab floor. The valve controls the air pressure to the throttle cylinder mounted on the engine which controls engine speed. Air pressure is supplied from the air swivel to the foot throttle valve.

Throttle Cylinder

The throttle cylinder is bracket mounted on the engine and connected to the engine throttle linkage. It moves the throttle lever in response to an air pressure from the foot throttle valve in the cab. The push tube adapter is threaded to permit connection to the throttle lever.

When the reservoir air pressure is below the pressure protection valve setting, the push tube extends to the fast idle position. When the pressure protection valve opens, the push tube returns to the slow idle position in which the adapter shoulder is in contact with the cylinder bushing.

At normal system pressures, control of the throttle cylinder is through the throttle valve and connecting line. When the foot throttle is depressed, air pressure is supplied through the throttle valve port and acts on the effective area of the throttle piston. When the force developed by the air pressure is greater than the force developed by the graduating spring on the opposite side of the throttle position, the push tube is extended toward the full throttle position to the extent of the air pressure delivered by the throttle valve.

As pressure is reduced or completely exhausted from the throttle cylinder through the throttle valve, the push tube is moved toward the idle position by the graduating spring.

Secondary Reservoir (Secondary Air System)

The secondary reservoir provides control and supply air for the service brake system including the service brake valve, service brake relay valve, and the service brake chamber of the service/park brake actuators.

Service Brake Relay Valve

The relay valve functions as a relay station to speed up the application, modulation, and release of the service brakes. It can be considered to be a remote mounted, air-controlled brake valve that releases or delivers air to the service/park brake actuators in response to the signals received from the service brake valve.

The rapid reaction of the relay valve to changes in control air pressures is in part due to the relatively small volume of air required to actuate the valve.

When the service brake pedal is depressed to actuate the service brake valve, control air pressure is delivered to the signal port (B) of the service brake relay valve. This results in the delivery of a proportionate amount of supply air pressure to the service/park brake actuators which in turn, apply the brakes.

When the service brake pedal is released, control air at the service brake valve is reduced. This causes the service brake relay valve to reduce the supply air pressure to the service/park brake actuators to release the brakes.

Service (Foot Pedal) Brake Valve

The service (foot pedal) brake valve is mounted to the cab floor. It is a treadle-operated type brake valve with two separate supply and delivery circuits. The valve provides the crane operator with a graduated control for applying and releasing the vehicle brakes.

Under normal operating conditions (e.g., all air system components operational), control air pressure to apply the service brakes is supplied by the secondary air system at port S2 on the service brake valve. When the crane operator depresses the foot pedal, the valve spool shifts in proportion to how far the pedal is depressed to allow control air pressure to exit the valve at port D2. The pressure exiting port D2 actuates a stop light switch on its way to the control signal port (B) of the service brake relay valve via air swivel port 3. The control pressure applied at the signal port results in a proportionate flow of secondary air system supply air to exit the service brake relay valve enroute to the service brake chambers in the service/park brake actuators which apply the service brakes.

When the service brake foot pedal is depressed, control air pressure from the primary air system also appears at port D1 of the service brake valve. This control pressure is applied to the "control" port of the spring brake control valve. If there is normal secondary air system pressure at the "reservoir" port of the spring brake control valve, the valve control spool will not shift. As a result, the D1 control air pressure is held at the spring brake valve and no further braking action occurs.

If the supply air pressure drops in either, but not both, the primary or secondary air systems, the intact system will continue to hold the spring brake actuators in the caged/brake released condition due to the shuttle valves in the supply and control air pressure lines to the park brake relay valve. The shuttle valves prevent the air pressure in the intact system from bleeding off in the non-functional system.

If the air pressure drops in both the primary and secondary air systems, the control pressure at the signal port (B) and the supply air pressure at port (S) of the park brake relay valve would drop accordingly. This drop in pressure would result in a reduction in the supply air pressure necessary to cage the springs in the park brake chambers of the service/park brake actuators which in turn,

will re-apply the brakes in proportion to the reduction in primary and secondary system air pressure. This brake application will occur with no action required by the crane operator.

If there is a loss of air pressure in the secondary air system only, the control and supply air pressure necessary to actuate the service brakes when the service brake foot pedal is depressed would be lost. The control and supply air pressure in the primary air system would still hold the springs in the park brake chambers in the caged/brakes released condition. The loss of secondary air system pressure would be detected at the “reservoir” port of the spring brake control valve. In response to low secondary air pressure, the valve control spool will shift according to the control air pressure supplied by the service brake valve exiting port D1 and entering spring brake control valve. This will apply a proportionate amount of control air pressure at control port B of the park brake relay valve causing it to exhaust supply air pressure from the primary air system exiting port D of the valve to the park brake chambers. The reduction in air pressure will release the springs in the park brake chambers and apply the parking brakes in the “service brake” mode.

Supply Dump Valve (RT875CCS)

The RT875CCS air brake system features a supply dump valve which covers a failure in the service brake valve, specifically the loss of control air pressure exiting port D2 of the valve. For example, if both the primary and secondary air systems have normal air pressure but there is no D2 control air pressure for the service brake relay valve due to an internal service brake valve failure or a ruptured air line, etc., the springs in the park brake chambers would remain caged (brakes released) and there would be no way to apply the service brakes. To reduce the consequence of such a failure, a supply dump valve was added. It “senses” a variation in the control pressures exiting ports D1 and D2 of the service brake valve. When the control pressures are approximately equal (within 22 psi), the supply dump valve which is normally open, remains open to allow primary air system control air pressure to pass through to the spring brake control valve to keep the park brake chamber springs caged/brakes released. However, if the control air pressures in D1 and D2 vary such that the pressure exiting D2 is at least 22 psi below that of D1, the supply dump valve will shift proportionately to the difference in air pressures. This shift will exhaust an equal amount of the primary air system control pressure entering the spring brake control valve which in turn will result in a reduction in the supply air pressure being applied to cage the park brake springs. These events will re-apply the parking brakes in the “service brake” mode until the operator releases the service brake pedal.

Low Pressure Indicating Switches

The low pressure indicating switch (there are two switches on the RT875CCS) provides a warning to the operator that one or both air systems are at a low pressure condition. The switch is electrically connected to a buzzer and an LED indicator light. The switch has a die cast body with a nylon cover, and employs a spring loaded O-ring diaphragm and piston. A gasket is used between the cover and body. The switch is provided with electrical contacts and a single terminal from connection to the electrical system. The contacts remain closed by spring force until the air pressure below the diaphragm is great enough to overcome the spring force. This pressure setting is approximately 75 psi (517 kPa/5.17 bar) and should be marked on a label affixed to the valve body.

When air pressure at the supply port and under the diaphragm is above 75 psi (517 kPa/5.17 bar), the electrical contacts remain open because the force exerted by air pressure underneath the diaphragm overcomes the force exerted by the spring above the diaphragm.

When air pressure below the diaphragm drops below 75 psi (517 kPa/5.17 bar), the spring exerts a force which is greater than the force exerted by the air pressure below the diaphragm. This causes the diaphragm and piston to move and allow the electrical contacts to close. This completes or closes the electrical circuit to the warning buzzer and the indicator light.

Stop Light Switches

A stop light switch is installed in the control air outlet port D2 (for the RT875CCS, there is also a stop light switch installed in port D1) of the service brake valve. The switch senses the control pressure (≥ 5 psi) in the brake air lines. Electrically, the switch is connected to illuminate the service stop lights on the rear of the machine with the MS51113 switch in the SERVICE Mode, when the brake pedal is pressed. With the MS51113 switch in the BLACKOUT Mode, the stop light illuminates the blackout stop lights when the brake pedal is pressed. The switch is an electro-pneumatic switch and is not a serviceable item. It must be replaced as a complete assembly.

When a brake application is made, air pressure from the brake valve enters the cavity below the diaphragm. The air pressure below the diaphragm moves the piston until it contacts the leaf spring. The leaf spring travels past a fulcrum at which point the leaf spring snaps a shorting bar which mates with the contact strips. The stop light electrical circuit is completed, lighting the stop lights before the brake applications pressure reaches 6 psi (41 kPa/0.41 bar).

Parking and Service Brakes

The top priority of the air system is to provide braking control and supply pressure. Each wheel has two park brake chambers and two service brake chambers. The park brake is spring-actuated and must be released by pressurized air to cage the springs. The park brakes on all four wheels are released by the park brake push-pull knob on the right hand console in the cab. Pushing down on the knob causes air pressure to enter the park brake chamber on each wheel and compress/cage the spring, releasing the brakes. At least 40 psi (275.8 kPa/2.75 bar) is required to keep the park brake valve engaged. If supply pressure to the valve drops below 40 psi (275.8 kPa/2.75 bar), the valve will release, applying the brakes.

The service brakes are applied by secondary air system pressure. Depressing the foot brake pedal on the cab floor causes pressurized air to enter the service brake chamber on each wheel, applying the brakes. In the event of a loss of supply pressure to the secondary air system, the spring brake control valve will allow the operator to release or bleed off the holding air pressure in the spring brake chamber by depressing the foot brake pedal to apply the parking brakes in the "service brakes" mode.

Spring Brake Control Valve

The function of the spring brake valve is to supply a specific, limited holdoff pressure to the parking brakes, and in the event of loss of secondary air system pressure, to modulate the parking brakes through the use of the spring brake control valve.

The valve has four air connected ports and a diaphragm protected exhaust port. Each air connection port is labeled with embossed letters to identify the ports.

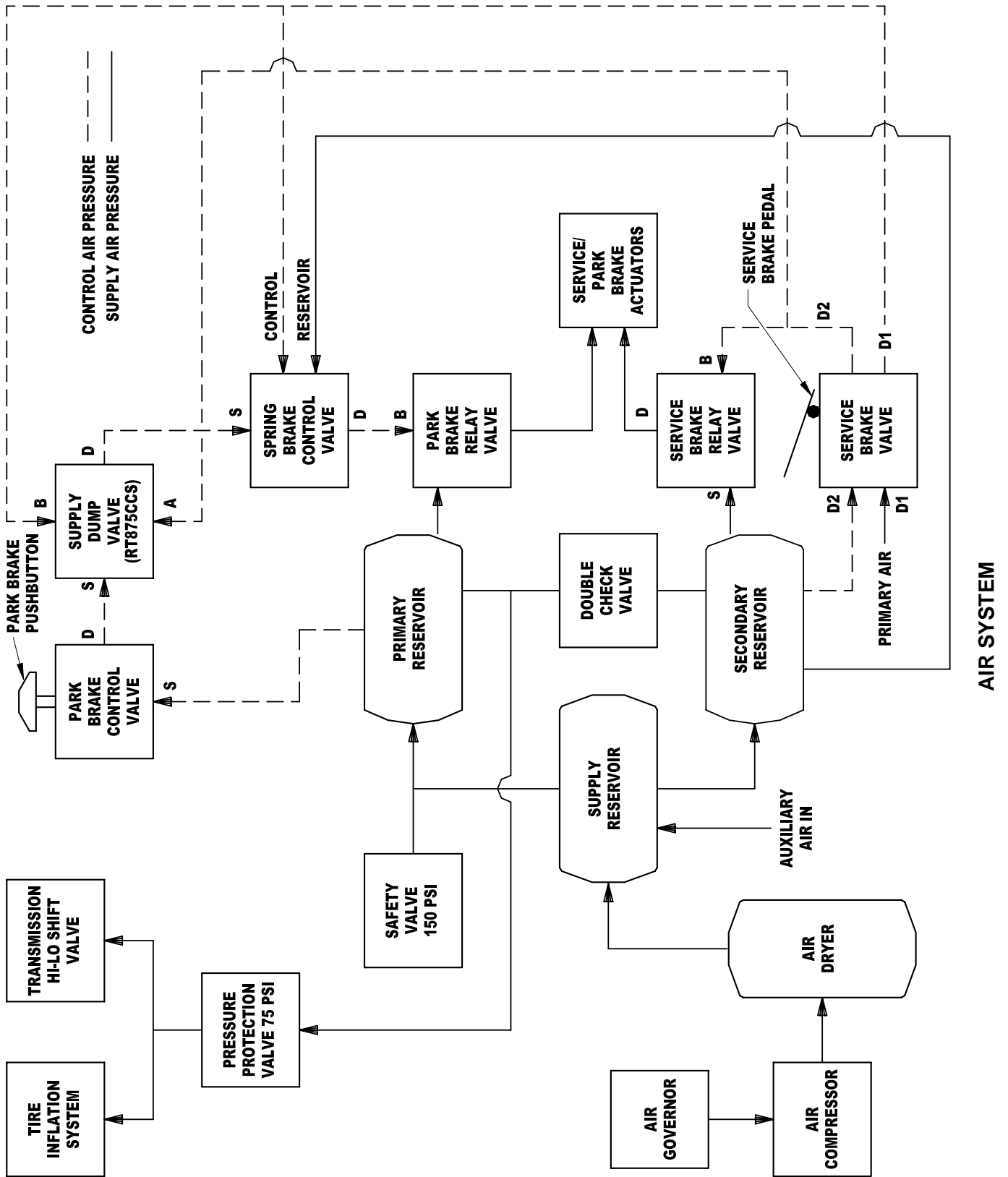
Initial control air pressure from primary and secondary air systems flow through the park valve and enters the spring brake control valve supply port by way of the supply dump valve. Control air entering the supply port flows past inlet and exhaust valve B to the under side of piston B and out the "delivery" port of the spring brake control valve to the park brake relay valve which in turn,

supplies air pressure to the park brake chambers in the service/park brake actuators. Air pressure from the secondary air system appears at the “reservoir” port of the spring brake control valve. This air remains under piston A as system pressure builds. With secondary air system pressure below approximately 55 psi (379 kPa/3.79 bar), the spring above piston A forces it into contact with inlet and exhaust valve A causing the exhaust to seal and the inlet to open.

With air system pressure above approximately 55 psi (379 kPa/3.80 bar) in the primary and secondary air systems, piston A has moved against the force of the spring above it, allowing the inlet of valve A to close and opening the hollow exhaust passage through piston A. When air pressure beneath piston B is approximately 95 psi (655 kPa/6.55 bar), piston B rises slightly against the force of the springs above it, allowing the inlet of valve B to close. The exhaust through valve B remains closed. The closing of the inlet portion of valve B traps approximately 95 psi (655 kPa/6.55 bar) in the hold-off cavity of the spring brake actuators while allowing full air system pressure to build elsewhere.

When a service brake application is made by depressing the service brake pedal, control air from the primary air system is delivered from the service brake valve (port D1) to the “control” port on the spring brake control valve. If the supply pressure in the secondary air system is normal at the “reservoir” port, there will be no movement of the internal components of the spring brake control valve.

With both air systems intact, the spring brake control valve supplies of control air pressure to the park brake relay valve when the park brake valve. With the park brake valve in the PARK position, supply air pressure to the park brake chamber in each service/park brake actuator is released. This uncages the springs and to set the brakes. The single check valve in the spring brake control valve assists this exhaust of air pressure from the spring brake chambers by allowing the air below piston B to flow back out the open exhaust of the park brake control valve. When air pressure below piston B has dropped sufficiently, piston B moves down opening the inlet of valve B thus providing an additional exhaust passage for air exhausting through the spring brake control valve from the park brake chambers.



HYDRAULIC SYSTEM

General

Each hydraulic valve bank is tapped with a pressure test port for checking the relief valve settings. The pressure settings can be checked by removing the appropriate test port plug and installing a flexible hose and pressure gauge.

The supply pressure and return circuit is made up of four (4) separate circuits which route oil from the two hydraulic pumps to the directional control valves for the individual operating circuits. The supply pressure and return circuit consists of the reservoir, hydraulic pumps, pump disconnects, oil cooler, oil filter, and an 11 port hydraulic swivel. The operating circuit's description and components begin with the circuit's directional control valve.

The supply pressure and return circuit uses ports 7, 8, 9, and 10 for pump supply and the dual port 11 for return.

Hydraulic Reservoir

The reservoir, attached to the right side of the carrier frame, has a useable capacity of 165 U.S. gallons (624.52 liters). The all-steel reservoir has an internally mounted full-flow filter and integral baffles that help cool the oil and prevent oil foaming.

Oil flows through hoses from the back of the reservoir to each hydraulic pump. The return oil also flows to the back of the reservoir, but on the opposite side of a baffle plate which acts to separate return and supply oil. Five return lines are connected to the back of the reservoir, three of them go directly into the reservoir and the other two go directly into the filter case inside the reservoir. The three lines that go directly into the reservoir are from the No. 1 port of the swivel and the drain from the integrated outrigger valve, steering relief valve, steer flow divider and hand pump.

A magnetized drain plug is located in the bottom of the reservoir to collect metal particles from the oil should the oil become contaminated.

A sight gauge is located on the front of the reservoir to indicate oil level. A breather cap (vent) is located on the top of the reservoir to allow air to enter or exhaust from the reservoir. It is most important that the breather be kept clean to prevent damage to the reservoir. A large round access cover on the top of the reservoir provides access for cleaning. This opening may also be used to fill the reservoir after it has been completely drained.

Oil Filter

The oil filter assembly is located in the reservoir. The assembly housing contains a replaceable 10 micron filter element through which most of the oil returning to the reservoir is directed. From a box manifold inside the reservoir, return oil enters the outer annular passage in the filter body assembly and flows upward into the head assembly and down into the center of the element. During normal operation, oil passes outward through, and is filtered by, the element and is exhausted into the annular housing surrounding it and downward through a tube into the reservoir.

With a clogged filter, pressure builds inside the filter element and head assembly forcing the spring loaded valve in the upper housing to unseat and bypass oil directly to the exhaust annulus. The white indicator post, normally visible in the head assembly window, moves downward with the bypass valve providing visual indication, from outside, of the degree of element blockage. Element bypass begins when internal pressure reaches 25 psi (172.4 kPa/1.72 bar). Total bypass is indicated by the top of the white indicator bar reaching the halfway mark on the window.

Three Section Pump

Section one of the hydraulic pump supplies the valve bank housing the main hoist boost, auxiliary hoist, and lift boost directional control valves. Oil flowing from the valve bank returns to the reservoir filter through the return manifold.

Section two of the hydraulic pump supplies the valve bank housing the main hoist and auxiliary hoist boost directional control valves. Oil flowing from the valve bank returns to the reservoir filter through the return manifold.

Section three of the hydraulic pump supplies the valve bank housing the lift, rear steer, and telescope directional control valves. Oil flowing from the valve bank returns to the reservoir control filter through the return manifold.

Two Section Pump

Section one of the hydraulic pump supplies the integrated outrigger valve, and subsequently the outrigger circuit. Pressure beyond flow from the integrated outrigger valve supplies the swing valve bank which controls the rotation of the crane superstructure.

Section two of the hydraulic pump supplies the rear axle lockout valve and the front steering control valve. Oil flowing from the valves returns to the reservoir filter through the return manifold.

Oil Cooler

An air cooled hydraulic oil cooler is mounted on the right side of the superstructure. The oil cooler consists of a hydraulic radiator, a hydraulic motor, a fan and a fan guard. The fan is driven by the motor which receives its oil flow from the pressure-beyond of the tele/rear steer/lift valve bank. The fan blows air through the cooling fins on the cooler. All of the hydraulic oil returns (from the major crane functions) through the dual return lines via swivel port No. 11. This line has a 15 psi (103.4 kPa/1.03 bar) in line check valve which is normally closed and does not permit flow. Normally all oil is routed to the return manifold, through the oil cooler, and on to the hydraulic filter in the reservoir.

When several hydraulic functions are being used at one time (i.e., hoisting, lifting, and telescoping), more oil has to flow through this one line causing a pressure buildup in the dual port return system. When this pressure reaches 15 psi (103.4 kPa/1.03 bar), the normally closed check valve will open and permit some oil to bypass the oil cooler and flow directly into the reservoir filter. When fewer functions are being used, the pressure in the system will decrease below 15 psi (103.4 kPa/1.03 bar) and the check valve will close.

As mentioned above, the oil cooler fan motor is driven by oil from the tele/rear steer/lift circuit when the control valve is in neutral. If any of the three functions is activated, the oil exhausts directly into the return manifold and the fan motor stops running. In addition, if the temperature of the oil in the return manifold falls below 111° F (44° C), an oil bypass valve will direct oil around the motor, causing the motor to stop. The motor will restart when the oil temperature reaches 120 degrees (49 degrees C).

Oil Cooler Motor

The hydraulic motor consists of two meshed gears in a closely fitted housing with inlet and outlet ports opposite each other. The two gears mesh and rotate together with only one gear coupled to the drive shaft. The motor torque is developed through pressure on the surfaces of the gear teeth. Oil enters the inlet exerting pressure on the gear teeth causing them to rotate. Oil is carried to the outlet port in chambers formed between the gear teeth and housing.

Hydraulic Pump Disconnect

This disconnect assembly is provided for cold weather starting and consists of a housing, lever, movable collar, and a sliding splined sleeve. Moving the lever actuates the movable collar within the housing which in turn slides the splined sleeve on the splined pump shaft to engage the sleeve with the splined shaft of the torque converter drive. The disconnect housing is initially filled with one pint of transmission fluid and during operation the torque converter will spray transmission fluid into the housing to lubricate the disconnect.

Relief Valve

Relief valves are used to protect a component, a circuit, or a system from over-pressurization. Most of the relief valves are located in the directional control valves, while others are part of a component.

Relief valves are checked and adjusted by causing a given circuit to reach its prescribed pressure limit (stall). At this point the relief valve opens, returning oil to the reservoir. Hydraulic motor circuits may be stalled by preventing rotation of the motor shaft prior to actuating the control valve. Cylinder circuits may be stalled by extending or retracting a cylinder to its limit of travel.

By placing a pressure gauge in the proper line or port, a pressure reading will indicate the point at which the relief valve opens. The needle on the meter face will climb until it reaches the relief valve setting. At that point the needle will stop climbing and fluctuate, indicating the relief valve is open and returning oil to the reservoir.

Correct relief valve adjustment is mandatory if any hydraulic circuit is to function properly. Settings must be within tolerances. Therefore, adjustment should be performed only by qualified technicians using the correct equipment, after the need for adjustment has established.

The hydraulic system utilizes four valve banks. Each valve bank has one main relief valve limiting maximum operating pressure of the component(s) in that circuit. In addition, circuit relief valves further limit operating pressures as required by circuit design.

Directional Control Valves

The directional control valves are located within the valve compartment behind the operator's cab. Access to the directional control valves is gained by lifting the access cover over the valve compartment and locking in place.

The directional control valves are four-way, three-position valves with either an open or closed spool. Whether a valve has an open or closed spool is determined by whether, with the spool in the neutral position, the work ports are open to the reservoir return passage. If the work ports are open to the reservoir return passage, the valve is classified as an open spool type: if they are not, the valve is a closed spool type. Additionally, the valve spool is spring loaded to the neutral position.

The open spool directional control valve is constructed with a through passage to allow flow to pass to the next valve(s) in the bank and on the reservoir when the valve spool is in the neutral position. By positioning the valve spool to a work position, the through passage is blocked and flow is diverted to the dead end parallel passage. This causes flow to be directed to the component's open supply work port. Return flow is routed from the return work port to the reservoir return passage by the opposite end of the valve spool. This flow pattern is applicable in either direction the valve may be positioned. If it is necessary to open more than one directional control valve in the same valve bank, it may be required to partially close or feather the valves that are located in the bank first, in regards to flow from the pump, in order to provide sufficient flow to the valves located last in the bank.

The closed spool directional control valve functions basically the same way as the open spool directional control valve in that the through passage of the valve must be blocked off by the valves' spool to divert flow to the dead end parallel passage. With flow diverted to the parallel passage, pressure then must unseat the load check valve to allow the flow to reach the open work port. The load check valve is provided to prevent back sliding of components which support heavy loads as is evidenced by the circuits this valve is used in. Return flow from the component is through the return work port to the reservoir return passage.

Integrated Outrigger Valve

The integrated outrigger valve is mounted near the center of the carrier frame in front of the front axle and is used for the control of the outrigger circuit. The valve consists of five subassemblies: two solenoid valves, an inlet section, an outlet section and a working section.

The solenoid valves are normally closed. They are used to control a pilot pressure that positions the spool within the working section. When the solenoid valves are de-energized, the springs maintain the spool in a centered position permitting oil to flow to the pressure beyond circuit.

The inlet section contains two inlet ports and a pressure gauge port. It also contains an adjustable main relief valve set at 2500 psi (17, 238 kPa/72.38 bar). This relief valve is an adjustable pilot operated type valve and relieves back to the reservoir through the exhaust (EX) port.

The working section is the open center type and contains a spring centered spool which allows oil to flow through the center to the pressure beyond circuit when the spool is centered. Work port A is cylinder spooled, or the oil is trapped in the function while the spool is in neutral. Work port B is open to the reservoir (when the spool is in neutral) due to the fact that there are two flats ground into the end land of the spool. These flats act as an orifice preventing the complete blockage of oil in this circuit. This prevents an unwanted pressure buildup in this circuit when the spool is in neutral. The flats are so small that when the circuit is being energized, the oil passing by these flats is negligible compared to the total volume of oil. The working section also contains two nonadjustable relief valves and a check valve. The port A relief valve is set at 300 to 400 psi (2069 to 2758 kPa/20.69 to 27.58 bar). The port B relief valve has full flow capability and is set to relieve at 2000 psi (13.791 kPa/137.91 bar). The check valve in the bottom of the working section, prevents a reverse flow of oil if the oil pressure in the working circuit is greater than the supply pressure.

The outlet section has two ports. One port, offset to the side is the return from the circuit supplied by ports A and B. The other port is for the power beyond circuit as long as the working section spool is in neutral.

Outrigger Control Valve Assembly

The solenoid valve stack assembly consists of four valve sections, four solenoid assemblies, and an assembly kit. By using the four valves assembled together, four separate components can be controlled by a single hydraulic source.

The valve is held in its normally closed position by a spring. When the solenoid is energized, the plunger assembly forces the spool to shift which opens the valve. De-energizing the solenoid causes spring pressure to shift the spool to its normally closed position.

Pilot Operated Check Valve

The pilot operated check valve is located in the port block on the outrigger stabilizer cylinder. The valve is normally closed and is opened by pilot pressure.

Hoist Motor Control Valve

The hoist motor control valve is designed to provide an even flow of oil to the hoist motors in both directions.

To drive the hoist motor in the raise direction, hydraulic oil flows through the in port and pushes to the free flow poppet off its seat. The oil then flows to the out port and onto the hoist drive motors.

When driving the hoist motors in the lower direction, oil from the directional control valve enters the out port. The pilot operated poppet is held shut by the adjustment spring until pilot pressure of sufficient force is secured at the pilot pressure port to move the pilot operated poppet off its seat. This allows flow to the return reservoir through the directional control valve.

An orifice plug is installed in the pilot pressure port to restrict back flow when the directional control valve is closed. The restriction prevents the pilot operated poppet from chattering on its seat.

A vent is provided that vents the area between the pilot piston seal and the free flow poppet and pilot operated poppet seals to prevent a hydraulic lock should weeping around the seals occur.

Swing Brake Valve

The glide swing brake valve is a proportionate valve. Pressing the brake pedal causes hydraulic oil to be transmitted to the top of the swing brake where pressure and spring tension proportionately apply the brake. The total force overcomes the brake release pressure and applies the brake.

When the brake valve is in the neutral position, oil from the top of the swing brake is allowed to pass through the center of the spool. The oil escapes from the spool through two pilot holes to the drain port. When the foot brake pedal is proportionately pressed, oil is routed around the groove on the spool through the pilot holes and is routed to the brake. When pressure builds to apply the brake, pressure also builds against the spool of the brake valve. This pressure will act against the greater surface area between the port end and the spool and tend to cut off the pressure port and compress the spring proportionate to the pressure applied to the pedal.

When the foot pedal is fully pressed, the pressure is routed directly to the brake. Since the spool is completely against the ported end cap there is no surface area to act upon, therefore full system pressure is available.

HOLDING VALVES

Cylinder Holding Valves

Three different holding valves are utilized on the crane, one in each lift cylinder and one in the telescope cylinder. The valves are installed in the port block of their respective cylinder.

Overcenter Valve

The overcenter valve is a normally closed valve used in the boom lift circuit to act as a fourth holding valve and to provide smooth operation during circuit activation. This valve provides static overload relief and thermal expansion relief as the control valves in the lift circuit have open centers.

An overcenter valve is basically a counterbalance valve with a pilot override, or assist, on the relief valve section. The load is raised by a free flow of oil through the check section. With the control valve centered, the load is locked (relief must be set at least 1.3 times higher than the maximum load induced pressure).

To lower the load, pilot pressure is required which effectively reduces the relief valve setting. This allows the load to be safely and smoothly controlled with minimum energy loss. If the load tries to run ahead of the pump, the relief section will throttle or close to prevent runaway.

Two Position Selector Valve

The two position selector valve is used to direct a regulated flow of pressure. When in the disengaged (knob pulled out) position, the flow is routed in a port A through the valve and out the IN port. In the engaged (knob pushed in) position the flow of oil is allowed to enter the IN port and exit through the B port.

Selector Valve

The valve is held in the normally closed position by a spring. When the solenoid is energized, the plunger assembly forces the spool to shift which opens the valve. De-energizing the solenoid causes the spring pressure to shift the spool to its normally closed position.

The selector valve is located at the center of the carrier frame just forward of the rear axle. At crane start-up in travel mode, with boom-over-front, the valve solenoids are energized, allowing rear axle oscillation, by an electrical circuit controlled by a cam actuated roller switch mounted on the swivel. As the superstructure is rotated more than five degrees either direction from boom-over-front-position, the switch roller rides off a cam, opening the circuit, de-energizing the solenoids, and allowing cartridge springs to close the valve, blocking through flow and locking out rear axle oscillation.

The system is designed so that with the loss of power rear axle oscillation lockout is automatic.

Steering Relief Valve

A pressure relief valve is provided on the discharge of the steering pump to relieve the pressure in the power steering system when the pressure reaches 2500 psi (17, 238 kPa/172.3 bar). The relief valve is mounted on the front face of the frame cross-member to rear of centerline of rotation. When the pressure in the power steering system exceeds the setpoint, the relief valve opens to relieve hydraulic oil to the hydraulic return system.

The relief valve protects the system if pressure exceeds the designated setting. The relief valve can be pressure adjusted. The poppet assembly is constructed with the spool area being larger than the poppet area. When pressure against the spool reaches the pre-determined setting, the poppet assembly shifts against the springs. This opens the relief port to the reservoir and oil flows to the reservoir. When pressure decreases, the spring forces the poppet assembly to the neutral position. This closes the relief port to the reservoir. A passage in the relief valve prevents a vacuum buildup within the relief valve.

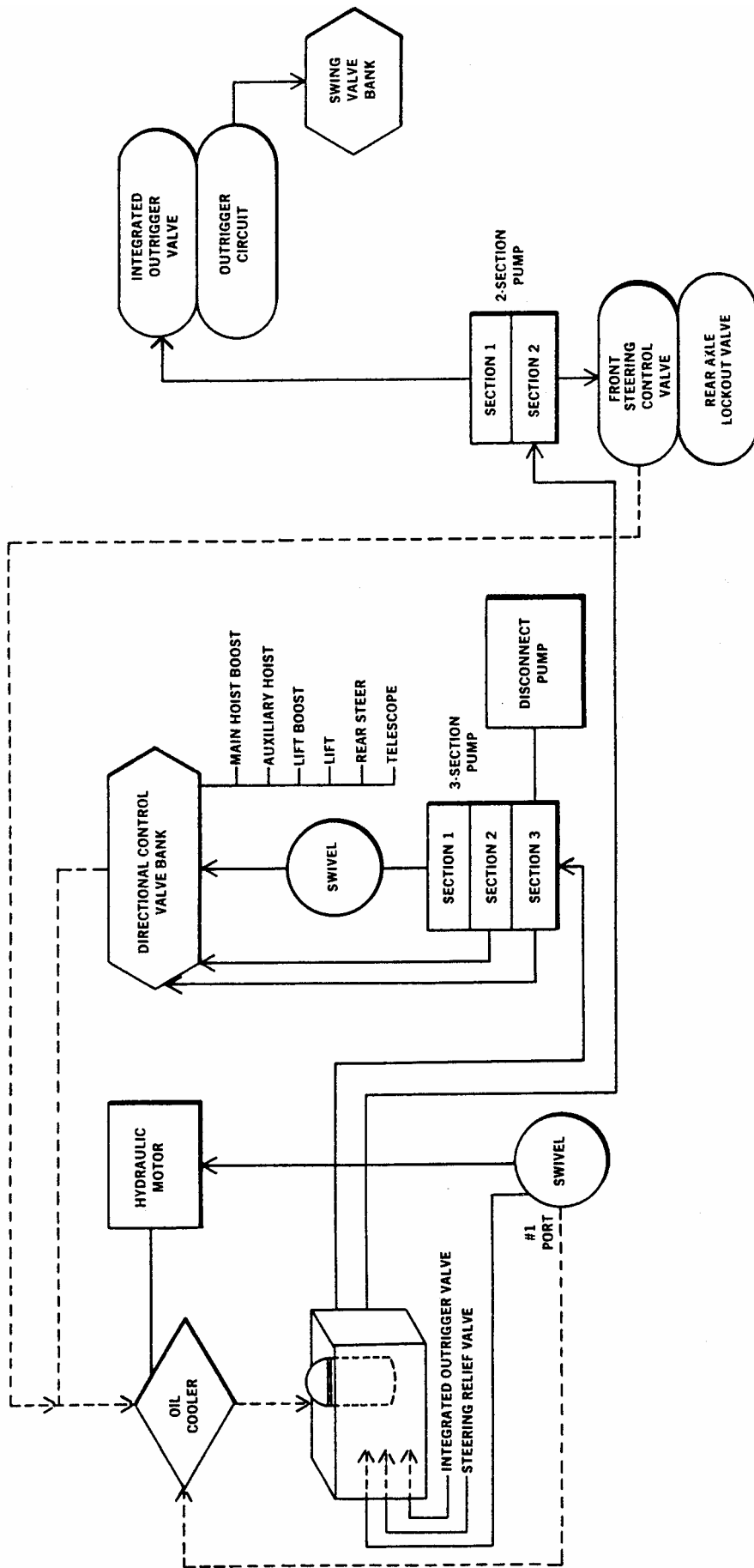
Bypass Valve Assembly

The bypass valve assembly consists of a single selector valve, air cylinder and a 3-way air solenoid valve. This assembly, controlled by a temperature switch mounted in the return manifold, allows hydraulic oil to bypass the superstructure oil cooler fan motor when the hydraulic oil temperature is less than 111 degrees F (44 degrees C).

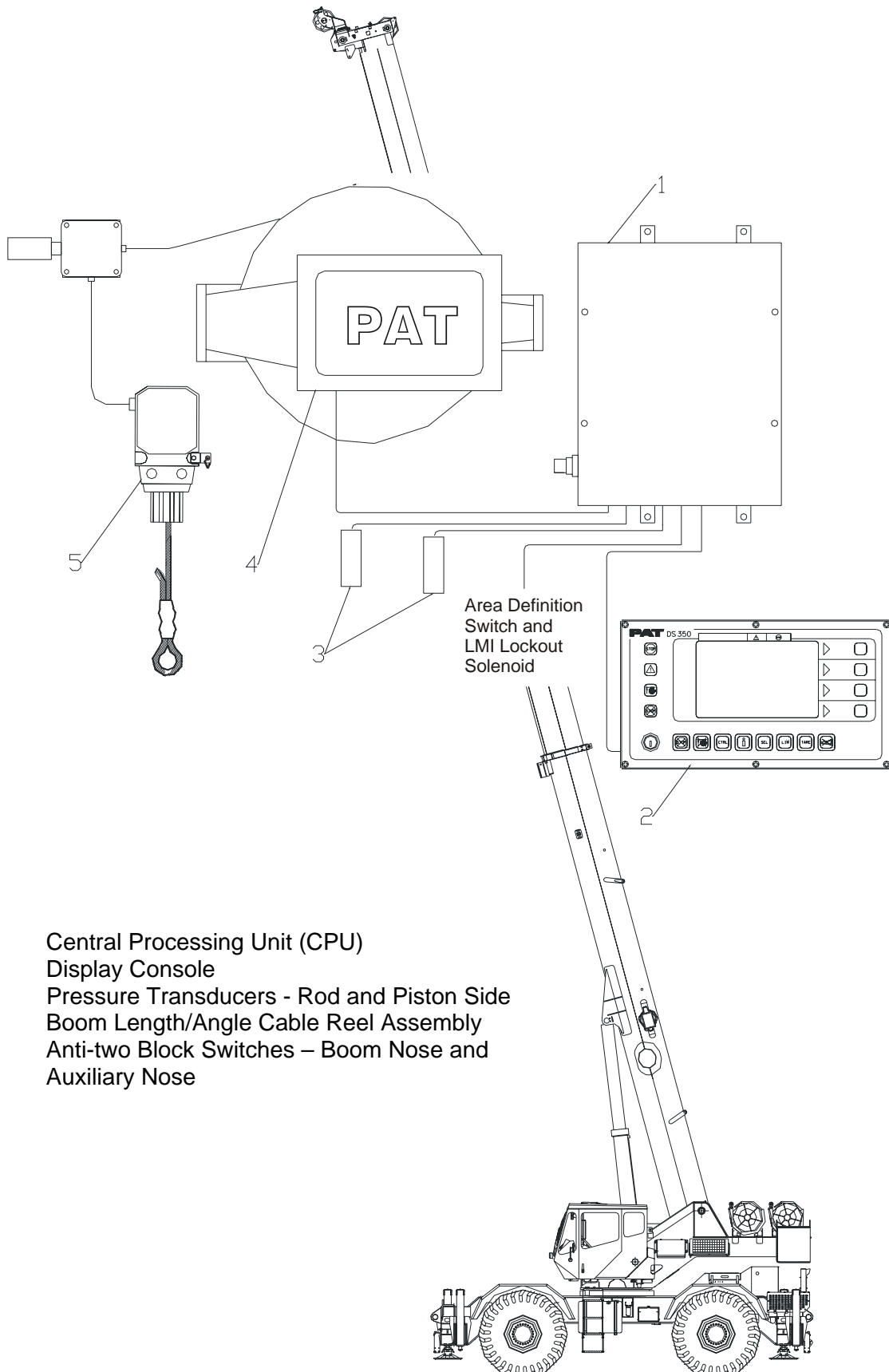
When the oil temperature is 120 degrees F (49 degrees C), the bypass valve is closed and the oil flows through the oil cooler fan motor. When the temperature drops to 111 degrees F (44 degrees C), sensed by the temperature switch, the 3-way air solenoid valve is energized to move the valve spool to allow air pressure on the cylinder moves its piston rod against the single selector valve to open the valve, bypassing the oil cooler fan motor.

Hydraulic Swivel

The spool portion of the hydraulic swivel is attached to lugs inside the corner frame rails by means of a spool mounting plate bolted to a swivel mount channel. The barrel portion is attached by two rotation links to the turntable base plates. This allows the barrel portion of the swivel to rotate around the stationary spool as the superstructure rotates.



HYDRAULIC SYSTEM



Load Moment Indicator (LMI) System (RT875CCS)

LOAD MOMENT INDICATOR (LMI) SYSTEM (RT875CCS)

General

The PAT Load Moment Indicator (LMI) DS 350GM provides the crane operator with essential information required to operate the crane within designed parameters. Using various sensing modules, the LMI system monitors crane functions and provides the operator with continuous crane status information. Status information includes: length and angle of the boom, boom tip height, working radius, rated load, and net load being lifted by the crane. When non-permitted conditions are approached, the LMI will warn the operator with both audio and visual alarms prior to locking out those functions that may aggravate the crane's condition.

The system operates on the principle of reference/real comparison by continuously monitoring loading conditions vs. acceptable limits programmed into the central processing unit (CPU). This data is displayed on a display console mounted above the instrument panel in the cab. When limits are reached, an audible and visual overload warning signal is generated at the operator's display console and the aggravating crane movements, such as hoist up, telescope out, and boom down will be locked out.

The PAT Load Moment Indicator (LMI) DS 350 consists of the following:

- (1) an embedded microprocessor contained in the central processing unit (CPU)
- (2) an operating display console
- (3) boom length/angle sensor
- (4) area definition switch
- (5) two pressure transducers
- (6) two anti-two block switches
- (7) LMI lockout solenoid

Display Console

The display console, mounted on the top right side of the cab dash panel, provides interactive graphical user interface for the operator to provide configuration and limit setting information for the central processing unit (CPU). Displays continuous crane status information received from the CPU including: length and angle of the boom, boom tip height, working radius, rated load, and net load being lifted by the crane. When non-permitted conditions are approached, the display console provides both audio and visual alarms.

The display console is a low temperature system that uses internal heaters for stable system operation in a subzero climate. The main electronics are automatically warmed (by a heater board) before the system boards and components are energized by the heater control board. The display console is a repairable unit that consists of a housing that contains the front console face/display assembly, pushbutton (keyboard) board, processor board, console connection board, heater control board, heater board, light bar terminal interface board, an alarm buzzer, and bypass key switch.

The console connection board provides the interface between the connections from the CPU and the other boards. The processor board contains the display microprocessor and provides the connections from the console connection board to the pushbutton (keyboard) board and front console face/display assembly. The LC display is secured to the display console face to make up the front console face/display assembly. A foil heater, provided with power from the heater board, is also provided on the front of the LC display. The front console face/display assembly, console connection board, and processor board are connected together and secured using stackable stand-

off pins to create a stack of boards. The pushbutton (keyboard) board is two separate boards, secured to the front face of the display console, that provide the connections to the various pushbuttons and indicators on the display console. The heater control board controls the operation of the heater board, provides the supply voltage and ground to the console connection board when the display console has been warmed, and contains a fan to provide internal air flow. The heater board contains the heater elements used to heat the interior of the display console.

Central Processing Unit (CPU)

The central processing unit (CPU), mounted on the top right side of the cab, is the heart of the system. The CPU consists of a housing that contains the main circuit board, analog input module, CPU module, and EPROM module.

The system operates on the principle of reference/real comparison. The real value, resulting from the pressure measurement, boom length measurement, boom angle measurement, and position of the area definition switch is compared with the reference data, which is stored in the CPU memory (EPROMs) and evaluated in the microprocessor. Fixed data regarding the crane, such as capacity charts, boom weights, centers of gravity and dimensions are stored in memory chips (EPROMs) in the CPU. This data is the reference information used to calculate the operating conditions.

When limits are reached, an overload warning signal is generated at the operator's display console. At the same time, the aggravating crane movements, such as hoist up, telescope out and boom down, will be stopped by the CPU activating the LMI lockout solenoid.

The CPU is also a low temperature system that utilizes internal heaters to warm the system electronics for stable system operation in a subzero climate. The heater system in the CPU is independent of the heater system in the display console.

The main board provides the interface between the connections from the various harnesses and the CPU module and analog input module. The CPU module is connected to the main board and contains the microprocessor and the SYSTEM EPROM. The analog input module is connected to the main board and converts the sensor signals on channels 1-7 to signals that will be processed by the microprocessor. The EPROM Module is connected to the CPU module and contains the DATA and TLK (Load Chart) EPROMS.

Boom Length/Angle Cable Reel Assembly

The boom length/angle cable reel assembly, mounted mid-span on the left hand side of the boom base section, consists of a cable reel that rotates and holds the boom length cable with a housing that contains the slip ring, boom length potentiometer, and boom angle sensor.

Boom Length Cable

With one end wrapped around a tube and connected at the boom nose junction box and the other end connected to the slip ring in the cable reel assembly, the boom length cable measures boom length during operation.

The core and shield of the boom length cable also serve as an electrical conductor for the anti-two block switches.

Slip Ring

The slip ring, mounted in the housing on the boom length/angle cable reel assembly, transfers the electrical connection (for the anti-two block switches) from the boom length cable rotating on the cable reel to the terminal board in the cable reel housing.

Boom Length Potentiometer

The boom length potentiometer, mounted in the housing on the boom length/angle cable reel assembly, rotates with the cable reel and measures the boom length.

The boom length potentiometer is a potentiometer supplied with voltage and ground that supplies an input signal to the analog input module in the CPU. The input signal/sensor output can be measured using a voltmeter in parallel or ammeter in series.

Theoretically, the working range of the input signal/sensor output measurement of the boom length potentiometer can be between 1.1V/4mA (boom fully retracted) and 5.5V/20mA (boom fully extended). If the voltage/current measurement is above or below the theoretical input signal/sensor output range, error code E21 or E11 will be displayed respectively. Because the cable reel is never fully unwound, the maximum value for the actual working range of the input signal/sensor output falls below the 5.5Vdc/20mA maximum value. The actual working range measurement of the input signal/sensor output should be between 1.1Vdc/4mA (boom fully retracted) and 2.1 Vdc/7.64mA (boom fully extended).

Boom Angle Sensor

The boom angle sensor, mounted in the housing on the boom length/angle cable reel assembly, measures the boom angle.

The boom angle sensor is a potentiometer supplied with voltage and ground that supplies an input signal to the analog input module in the CPU. The input signal/sensor output can be measured using a voltmeter in parallel or ammeter in series.

The working range of the input signal/sensor output measurement should be between 1.1V/4mA (boom at 90 degrees) and 5.5V/20mA (boom at 0 degrees). If the voltage/current measurement is above or below the input signal/sensor output range, error code E25 or E15 will be displayed respectively.

Pressure Transducer – Piston and Rod Side

The piston and rod side pressure transducers, mounted on the frame rail right of the cab and attached to the piston and rod side of the hoist cylinders, measures the lift cylinder pressure to enable the CPU to calculate the load.

The piston side pressure transducer is a potentiometer supplied with voltage and ground that supplies an input signal to the analog input module in the CPU. The input signal/sensor output can be measured using a voltmeter in parallel or ammeter in series.

Theoretically, the working range of the piston side pressure transducer input signal/sensor output measurement should be between 1.1Vdc/4mA (0 psi) and 5.5Vdc/20mA (4,410 psi). If the voltage/current measurement is above or below the theoretical input signal/sensor output range, error code E22 or E12 will be displayed on the display console respectively.

The rod side pressure transducer is also a potentiometer supplied with voltage and ground that supplies an input signal to the analog input module in the CPU. The input signal/sensor output can be measured using a voltmeter in parallel or ammeter in series.

Theoretically, the working range of the rod side pressure transducer input signal/sensor output measurement should be between 1.1Vdc/4mA (0 psi) and 5.5Vdc/20mA (4,410 psi). If the voltage/current measurement is above or below the theoretical input signal/sensor output range, error code E23 or E13 will be displayed on the display console respectively.

Boom Nose Junction Box

The boom nose junction box is a weather-proof enclosure mounted on the main boom nose that provides the electrical connection between the boom length cable, fastened to the tube on the boom nose, and the two anti-two block switches. A terminal strip in the boom nose junction box provides the terminal connections. The boom length cable and wiring from the main boom nose anti-two block switch are connected directly to the terminal strip in the boom nose junction box.

A connector on the bottom of the boom nose junction box, wired to the terminal strip, provides the connection to the auxiliary boom nose anti-two block switch. When wire rope is reeved and a load-handling hook is present on both the main and auxiliary hoists, the connector for the auxiliary boom nose anti-two block switch is connected to the connector on the boom nose junction box. Both anti-two block switches provide anti-two block protection.

If the auxiliary boom nose has been removed (only wire rope is reeved and a load-handling hook present on the main hoist), a jumper/dummy plug, attached to the boom nose junction box by a lanyard, must be installed in the connector on the boom nose junction box. Only the main boom nose anti-two block switch provides anti-two block protection. The jumper/dummy plug consists of a 4700 ohm resistor (± 500 ohms) connected to the plug terminals.

Anti-two Block Switch – Main Boom Nose and Auxiliary Boom Nose

The main boom nose and auxiliary boom nose anti-two block switches are mounted on brackets on the main and auxiliary boom noses respectively. Each switch consists of a weight, hanging down with the respective wire rope routed inside, attached to a switch assembly by a chain. The switch assembly consists of a single pole switch and 4700 ohm resistor (± 500 ohms). Wiring from the switch assembly enables the switch to be wired with or without the resistor in series with the switch contacts. When the weight is hanging freely, the switch is closed. If the weight were to be raised (i.e. the hook block being raised and coming into contact with the weight) the switch opens.

The main boom nose anti-two block switch is wired such that the 4700 ohm resistor is not in series with the switch contacts and the auxiliary boom nose anti-two block switch is wired such that the 4700 ohm resistor is in series with the switch contacts.

If there is no wire rope reeved, no load-handling hook present, and the anti-two block switch weight has been removed for either the auxiliary or main hoist, the red by-pass flag must be installed in the nose of the respective anti-two block switch, securing the chain. Without the red by-pass flag installed in the anti-two block switch, the switch will be activated (open) and crane functions will be locked out.

WARNING

The red by-pass flag or jumper/dummy plug should never be used to disable an anti-two block switch if there is wire rope reeved and a load-handling hook present.

Area Definition Switch

The area definition switch, mounted on a bracket on the side of the swivel assembly, determines when the boom has rotated more than 6 degrees from center.

LMI Lock-out Solenoid

The LMI lock-out solenoid is mounted behind the cab dash panel and connected to the hydraulic control levers via linkage. When activated by the CPU, the electrically-controlled, pneumatically-operated, LMI lock-out solenoid physically locks out the aggravating crane movements by stopping the following levers from being moved:

- (1) MAIN control lever – lever is stopped from being pulled back to raise main hoist.
- (2) AUX control lever – lever is stopped from being pulled back to raise auxiliary hoist.
- (3) TELE control lever – lever is stopped from being pushed forward to extend the boom.
- (4) BOOM control lever – lever is stopped from being pushed forward to lower boom elevation.

Harness Connections

The CPU is provided with 24 Vdc power supply and ground from the crane electrical system via a double-shielded cable connected to the harness via a 4 pin connector. This cable also provides the LMI lockout solenoid signal from the CPU.

The terminal boards in the boom length/angle cable reel assembly, which provide the electrical connections to the boom length potentiometer, angle sensor, and two anti-two block switches, are connected to the connector on the main board in the CPU via two double-shielded cables connected together by a 7 pin connector. The 7-pin connector is located in the valve compartment behind the operator's cab, near the hydraulic manifold.

All shielded harnesses routed to the CPU and display console are protected by strain relief connectors with the outer shields of the cable connected to the strain relief insert.

CHAPTER 2

CRANE MAINTENANCE INSTRUCTIONS

SECTION I. REPAIR PARTS, SPECIAL TOOLS, TMDE, AND SUPPORT EQUIPMENT

COMMON TOOLS AND EQUIPMENT

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

SPECIAL TOOLS, REPAIR PARTS, TMDE AND SUPPORT EQUIPMENT

Reference Section III in the Maintenance Allocation Chart (MAC) for a list of all special tools, tests and equipment needed to maintain the container crane. Repair parts and special tools are listed and illustrated in the Repair Parts and Special Tools List (TM 5-3810-306-24P) covering direct and general support maintenance for this equipment.

CHAPTER 3 TROUBLESHOOTING

INTRODUCTION

This section provides information useful in diagnosing and correcting unsatisfactory operation or failure of the container crane and its components. Malfunctions which may occur are listed in Table 3-1. Each malfunction is followed by a listing of probable causes. The corresponding corrective actions suggest applicable maintenance actions for correcting the malfunction.

WARNING

Before starting any troubleshooting procedures please wear the proper eye protection in order to insure personal safety.

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TABLE 3-1. DIRECT AND GENERAL SUPPORT TROUBLESHOOTING

MALFUNCTION

TEST OR INSPECTION

CORRECTIVE ACTION

1. ENGINE WILL NOT CRANK OR CRANKS SLOWLY

Step 1. Crankshaft rotation restricted.

- a. Bar engine to check for rotational resistance. (Refer to page 4-30.) If OK, repair starter. (Refer to page 6-8.)
-

2. ENGINE HARD TO START OR WILL NOT START - EXHAUST SMOKE PRESENT

Step 1. Injection pump timing not correct.

- a. Check injection pump timing. (Refer to page 5-4.) If OK, do Step 2.
- b. Time fuel injection pump.

Step 2. One or more injectors worn or malfunctioning.

- a. Remove and test injectors. (Refer to page 5-2.)
 - b. Replace defective injector(s).
-

3. ENGINE CRANKS, BUT WILL NOT START - NO SMOKE FROM EXHAUST

Step 1. Worn or malfunctioning fuel injection pump.

- a. Loosen high pressure line at two injectors and visually check fuel delivery while cranking engine. If OK, do Step 2.
- b. Replace fuel injection pump. (Refer to page 5-4.)

Step 2. Fuel injection pump timing incorrect.

- a. Check fuel injection pump timing. (Refer to page 5-4.) If OK, do Step 3.
- b. Time fuel injection pump.

Step 3. Camshaft timing incorrect.

- a. Check gear train timing alignment. (Refer to page 4-39.)
 - b. Correct gear train timing alignment
-

4. ENGINE STARTS BUT WILL NOT KEEP RUNNING

Step 1. Fuel injection pump timing incorrect.

- a. Check fuel injection pump timing. (Refer to page 5-4.) If OK, do Step 2.
- b. Time fuel injection pump.

Step 2. Camshaft out of time.

- a. Check/correct gear train timing. (Refer to page 4-39.)
-

TABLE 3-1. DIRECT AND GENERAL SUPPORT TROUBLESHOOTING (Continued)**MALFUNCTION****TEST OR INSPECTION****CORRECTIVE ACTION****WARNING**

Be sure to wear protective eye covering to avoid personal injury.

5. ROUGH IDLE, WARM ENGINE

- Step 1. Fuel injection pump timing incorrect.
- Check fuel injection pump timing. (Refer to page 5-4.) If OK, do Step 2.
 - Correct fuel injection pump timing.
- Step 2. Injector nozzles plugged or inoperative.
- Remove and test/inspect fuel injectors. (Refer to page 5-2.) If OK, do Step 3.
 - Replace injectors.
- Step 3. Broken engine mounts.
- Inspect engine mounts. If OK, do Step 4.
 - Replace engine mounts. (Refer to page 4 -2.)
- Step 4. Wrong high pressure fuel lines.
- Inspect high pressure fuel lines. If OK, do Step 5.
 - Replace high pressure fuel lines. (Refer to TM 5-3810-306-20.)
- Step 5. Defective fuel injection pump.
- Remove and test fuel injection pump. (Refer to page 5-4.)
 - Replace fuel injection pump.

6. ENGINE SURGES AT IDLE

- Step 1. Defective fuel injection pump.
- Remove and test fuel injection pump. (Refer to page 5-4.) If OK, do Step 2.
 - Replace fuel injection pump.
- Step 2. One or more injectors malfunctioning.
- Remove and test fuel injectors. (Refer to page 5-2.)
 - Replace defective fuel injector(s).

7. LOW LUBRICATING OIL PRESSURE

- Step 1. Oil diluted with fuel accompanied by rough engine operation or low power.
- Remove and check for stuck fuel injector nozzle. (Refer to page 5-2.) If OK, replace fuel injection pump. (Refer to page 5-4.)
 - Replace defective fuel injector.
- Step 2. Oil diluted with coolant.
- Check core plugs, cylinder liner, head gasket, and cracked passages in block and head for leaks. If OK, do Step 3.
 - Replace defective engine component. Change engine lubrication oil.

TABLE 3-1. DIRECT AND GENERAL SUPPORT TROUBLESHOOTING (Continued)

MALFUNCTION

TEST OR INSPECTION

CORRECTIVE ACTION

7. LOW LUBRICATING OIL PRESSURE (Continued)

- Step 3. Oil pressure regulating valve stuck open or broken spring.
 - a. Remove and inspect oil pressure regulating valve. (Refer to page 4-58.) If OK, do Step 4.
 - b. Clean or replace oil pressure regulating valve.

- Step 4. Internal leak from oil rifle cup plug.
 - a. Check oil rifle cup plugs, cup plug in front and rear face of block. If OK, do Step 5.
 - b. Replace oil rifle cup plugs.

- Step 5. Oil pump suction tube loose or seal leaking.
 - a. Inspect oil pump suction tube. If OK, do Step 6.
 - b. Replace seal and tighten oil pump suction tube. (Refer to page 4-53.)

- Step 6. Defective lube oil pump.
 - a. Remove and inspect lube oil pump. (Refer to page 4-55.) If OK, do Step 7.
 - b. Replace lube oil pump.

- Step 7. Loose main bearing cap.
 - a. Check main bearings and caps. If OK, do Step 8.
 - b. Install new main bearings and tighten caps. (Refer to page 4-22.)

- Step 8. Worn crankshaft bearings.
 - a. Check crankshaft bearings for wear.
 - b. Replace crankshaft bearings. (Refer to page 4-22.) Check and replace piston cooling nozzles if damaged. (Refer to page 4-22.)

8. LUBRICATING OIL PRESSURE TOO HIGH

- Step 1. Oil pressure relief valve stuck closed.
 - a. Remove and inspect oil pressure relief valve. (Refer to page 4-58.)
 - b. Clean or replace valve.
-

9. ENGINE OIL LOSS

- Step 1. Air compressor pumping oil.
 - a. Inspect air compressor output for engine oil. If OK, do Step 2.
 - b. Replace air compressor. (Refer to page 9-2.)

TABLE 3-1. DIRECT AND GENERAL SUPPORT TROUBLESHOOTING (Continued)**MALFUNCTION****TEST OR INSPECTION****CORRECTIVE ACTION****WARNING**

Be sure to wear protective eye covering to avoid personal injury.

9. ENGINE OIL LOSS (Continued)

Step 2. High blowby forcing oil out breather.

- a. Inspect breather tube area for signs of oil loss. If OK, do Step 3.
- b. Measure blowby. Connect open straight port of engine blowby tool (3375788) to crank case breather tube. Connect water manometer to 90° port of engine blowby tool and measure blowby with engine running at rated speed. Maximum blowby 18 inches of water (226 liters/minute).
- c. Perform required repairs.

Step 3. Turbocharger leaking oil to the air intake or exhaust.

- a. Inspect turbocharger inlet and outlet for evidence of oil transfer. If OK, do Step 4.
- b. Replace turbocharger. (Refer to page 5-10.)

Step 4. Worn valve seals.

- a. Inspect valve seals for wear.
- b. Replace worn valve seals. (Refer to page 4-8.)

10. CONTAMINATED ENGINE OIL

Step 1. Fuel injector needle valves not sealing.

- a. Remove and test fuel injectors. (Refer to page 5-2.) If OK, do Step 2.
- b. Replace fuel injector(s).

Step 2. Coolant in the oil, internal engine component leaks.

- a. Refer to troubleshooting logic for COOLANT LOSS.

Step 3. Fuel in the oil, engine operating too cold.

- a. Review operation for excessive idling resulting in the engine running below normal temperature.

Step 4. Defective fuel injection pump.

- a. Replace fuel injection pump. (Refer to page 5-4.)

11. EXHAUST SMOKE EXCESSIVE UNDER LOAD

Step 1. Fuel injection pump timing incorrect.

- a. Check fuel injection pump timing. (Refer to page 5-4.) If OK, do Step 2.
- b. Correct fuel injection pump timing.

Step 2. Air leak between turbocharger and intake or exhaust manifold.

- a. Inspect housing and gaskets for leaks and damage. If OK, do Step 3.
- b. Replace and tighten components.

TABLE 3-1. DIRECT AND GENERAL SUPPORT TROUBLESHOOTING (Continued)

MALFUNCTION

TEST OR INSPECTION

CORRECTIVE ACTION

WARNING

Be sure to wear protective eye covering to avoid personal injury.

11. EXHAUST SMOKE EXCESSIVE UNDER LOAD (Continued)

Step 3. Defective fuel injector nozzle.

- a. Remove and test fuel injectors. (Refer to page 5-2.) If OK, do Step 4.
- b. Replace fuel injector(s).

Step 4. Defective turbocharger.

- a. Remove and inspect turbocharger. (Refer to page 5-10.) If OK, do Step 5.
- b. Replace turbocharger.

Step 5. Piston rings not sealing.

- a. Perform a compression check using STE/ICE,VTM test No. 14. If OK, do Step 6.
- b. Repair engine as required.

Step 6. Defective fuel injection pump.

- a. Replace fuel injection pump. (Refer to page 5-4.)
-

12. ENGINE WILL NOT REACH RATED SPEED WHEN LOADED

Step 1. Defective fuel injection pump.

- a. Replace fuel injection pump. (Refer to page 5-4.)
-

13. LOW POWER

Step 1. Air leak between turbocharger and intake manifold.

- a. Inspect turbocharger, air inlet manifold and connections. If OK, do Step 2.
- b. Replace components and tighten attaching hardware. (Refer to page 5-10.)

Step 2. Exhaust leak between turbocharger and exhaust manifold.

- a. Inspect turbocharger exhaust manifold and connections. If OK, do Step 3.
- b. Replace gasket and tighten attaching hardware. (Refer to page 5-10.)

Step 3. Fuel injection pump timing incorrect.

- a. Check fuel injection pump timing. (Refer to page 5-4.) If OK, do Step 4.
- b. Correct fuel injection pump timing.

Step 4. Defective turbocharger.

- a. Remove and inspect turbocharger. If OK, do Step 5.
- b. Replace turbocharger. (Refer to page 5-10.)

Step 5. Valves out of adjustment.

- a. Check valve adjustment. (Refer to TM 5-3810-306-20.) If OK, do Step 6.
- b. Adjust valves.

TABLE 3-1. DIRECT AND GENERAL SUPPORT TROUBLESHOOTING (Continued)**MALFUNCTION****TEST OR INSPECTION****CORRECTIVE ACTION****13. LOW POWER (Continued)**

Step 6. Defective fuel injector nozzles.

- a. Remove and test fuel injectors. (Refer to page 5-2.) If OK, do Step 7.
- b. Replace fuel injector(s).

Step 7. Low engine compression.

- a. Perform compression check to identify malfunction. (Refer to TM 5-3810-306-20.) If OK, do Step 8.
- b. Repair engine as required.

Step 8. Defective fuel injection pump.

- a. Replace fuel injection pump. (Refer to page 5-4.)

14. ENGINE MISFIRING

Step 1. Fuel injector nozzles plugged or inoperative.

- a. Remove and test fuel injectors. (Refer to page 5-2.) If OK, do Step 2.
- b. Replace fuel injector(s).

Step 2. Fuel injection pump timing incorrect.

- a. Check fuel injection pump timing. (Refer to page 5-4.) If OK, do Step 3.
- b. Correct fuel injection pump timing.

Step 3. Low compression on one or more cylinders.

- a. Perform compression check to identify cause (piston rings, head gasket or valves). (Use STE/ICE, VTM test No. 14.) If OK, do Step 4.
- b. Repair engine as required.

Step 4. Camshaft timing incorrect.

- a. Check gear train timing. (Refer to page 4-39.) If OK, do Step 5.
- b. Correct gear train timing.

Step 5. Damaged camshaft, tappets or push rods.

- a. Inspect camshaft, tappets and push rods.
- b. Replace camshaft, tappets and push rods. (Refer to page 4-39.)

15. FUEL KNOCK

Step 1. Incorrect fuel injection pump timing.

- a. Check fuel injection pump timing. (Refer to page 5-4.) If OK, do Step 2.
- b. Correct fuel injection pump timing.

TABLE 3-1. DIRECT AND GENERAL SUPPORT TROUBLESHOOTING (Continued)

MALFUNCTION

TEST OR INSPECTION

CORRECTIVE ACTION

15. FUEL KNOCK (Continued)

- Step 2. Defective fuel injector nozzles.
- a. Remove and test fuel injectors. (Refer to page 5-2.)
 - b. Replace fuel injector(s).
-

16. EXCESSIVE FUEL CONSUMPTION

- Step 1. Fuel injection pump timing incorrect.
- a. Check fuel injection pump timing. (Refer to page 5-4.) If OK, do Step 2.
 - b. Correct fuel injection pump timing.
- Step 2. Defective fuel injectors.
- a. Remove and test fuel injectors. (Refer to page 5-2.) If OK, do Step 3.
 - b. Replace fuel injector(s).
- Step 3. Malfunctioning base engine components.
- a. Inspect engine base components.
 - b. Repair engine as required.
-

17. EXCESSIVE VIBRATION

- Step 1. Defective vibration bearing.
- a. Inspect vibration damper. If OK, do Step 2.
 - b. Replace defective vibration damper. (Refer to page 4-43.)
- Step 2. Flywheel misaligned.
- a. Disassemble engine and using a dial indicator, check concentricity of flywheel housing to crankshaft. If OK, do Step 3.
 - b. Replace flywheel. (Refer to page 4-30.)
- Step 3. Loose or broken power component.
- a. Disassemble engine and inspect crankshaft and rods for damage that cause unbalance.
 - b. Replace defective engine components.
-

18. EXCESSIVE ENGINE NOISES

- Step 1. Defective vibration damper.
- a. Inspect vibration damper. If OK, do Step 2.
 - b. Replace vibration damper. (Refer to page 4-43.)

TABLE 3-1. DIRECT AND GENERAL SUPPORT TROUBLESHOOTING (Continued)**MALFUNCTION****TEST OR INSPECTION****CORRECTIVE ACTION****18. EXCESSIVE ENGINE NOISES (Continued)**

Step 2. Excessive valve noise.

- a. Inspect push rods and rocker levers for damage and wear. If OK, do Step 3.
- b. Replace push rods and/or rocker levers.

Step 3. Defective turbocharger.

- a. Remove and inspect turbocharger impeller and wheel for housing contact. (Refer to page 5-10.) If OK, do Step 4.
- b. Replace turbocharger.

Step 4. Gear train noise.

- a. Inspect and measure gear backlash. (Refer to page 4-39.) If OK, do Step 5.
- b. Replace damaged gears as required.

Step 5. Defective connecting rods and bearings.

- a. Disassemble engine and inspect connecting rods and bearings. (Refer to page 4-22.)
- b. Replace connecting rods and bearings as required.

19. FUEL OR OIL LEAKING FROM EXHAUST MANIFOLD

Step 1. Defective fuel injector nozzles.

- a. Remove and test fuel injectors. (Refer to page 5-2.) If OK, do Step 2.
- b. Replace fuel injector(s).

Step 2. Defective turbocharger seals leaking oil.

- a. Remove and inspect turbocharger oil seals. (Refer to page 5-10.)
- b. Replace turbocharger seals.

20. COOLANT TEMPERATURE ABOVE NORMAL

Step 1. Defective fuel injection pump.

- a. Remove and test fuel injection pump. (Refer to page 5-2.) If OK, do Step 2.
- b. Replace fuel injection pump.

Step 2. Compression leak through cylinder head gasket.

- a. Check for compression leak through cylinder head gasket. (Use STE/ICE, VTM test No. 14.)
- b. If necessary, remove cylinder head and replace cylinder head gasket. (Refer to page 4-8.)

TABLE 3-1. DIRECT AND GENERAL SUPPORT TROUBLESHOOTING (Continued)

MALFUNCTION

TEST OR INSPECTION

CORRECTIVE ACTION

21. COOLANT LOSS

Step 1. Expansion plugs leaking.

- a. Inspect expansion plugs for leaks. If OK, do Step 2.
- b. Replace expansion plugs.

Step 2. Leak in cylinder block coolant passages.

- a. Disassemble engine and check cylinder block coolant passages.
 - b. Replace cylinder block.
-

22. CONTAMINATED COOLANT

Step 1. Oil leaks from engine oil cooler, head gasket, head and cylinder block.

- a. Disassemble engine and check engine oil cooler, cylinder head and cylinder block for damage.
 - b. Repair or replace components as required.
-

23. ALTERNATOR NOT CHARGING OR INSUFFICIENT CHARGING

Step 1. Defective/malfunctioning alternator.

- a. Remove and test alternator. (Refer to page 6-2.)
 - b. Repair alternator as required.
-

24. LOW TRANSMISSION CLUTCH PRESSURE

Step 1. Clutch pressure regulating valve spool stuck open.

- a. Remove and inspect valve spool housing. (Refer to page 7-5.) If OK, do Step 2.
- b. Clean and repair pressure regulating valve.

Step 2. Faulty charging pump.

- a. Install pressure gauge in pump outlet and check for pressure of 300 psi. If OK, do Step 3.
- b. Replace pump. (Refer to page 7-5.)

Step 3. Broken or worn clutch shaft or piston sealing rings.

- a. Disassemble transmission and inspect sealing rings. (Refer to page 7-21.) If OK, do Step 4.
- b. Replace sealing rings.

Step 4. Clutch piston bleed valve stuck open.

- a. Disassemble transmission and clean bleed valves. (Refer to page 7-21.) If OK, do Step 5.

TABLE 3-1. DIRECT AND GENERAL SUPPORT TROUBLESHOOTING (Continued)**MALFUNCTION****TEST OR INSPECTION****CORRECTIVE ACTION****24. LOW TRANSMISSION CLUTCH PRESSURE (Continued)**

Step 5. Transmission malfunctioning.

- a. Close pressure line to transmission control valve. If clutch pressure returns to normal, transmission is faulty.
- b. Repair or replace transmission. (Refer to page 7-21.)

25. LOW TORQUE CONVERTER CHARGING PUMP OUTPUT

Step 1. Suction screen plugged.

- a. Remove and clean suction screen. (Refer to page 7-21.)

Step 2. Air leaks at pump intake hose and connections or collapsed hose.

- a. Inspect hoses and connections. If OK, do Step 3.
- b. Tighten all connections or replace hose if necessary.

Step 3. Defective charging pump.

- a. Replace pump. (Refer to page 7-5.)

26. TORQUE CONVERTER OVERHEATING

Step 1. Pump suction line taking in air.

- a. Check oil line connections. If OK, do Step 2.
- b. Tighten oil line connections.

Step 2. Worn charging pump.

- a. Remove and test charging pump. (Refer to page 7-5.) If OK, do Step 3.
- b. Replace pump.

Step 3. Restricted oil cooler.

- a. Check oil cooler for restriction.
- b. Clean oil cooler. (Refer to page 7-54.)

27. NOISY TORQUE CONVERTER

Step 1. Worn coupling gears.

- a. Disassemble torque converter and inspect gears. If OK, do Step 2.
- b. Replace gears. (Refer to page 7-5.)

Step 2. Worn charging pump.

- a. Remove and test pump. (Refer to page 7-5.) If OK, do Step 3.
- b. Replace pump.

TABLE 3-1. DIRECT AND GENERAL SUPPORT TROUBLESHOOTING (Continued)

MALFUNCTION

TEST OR INSPECTION

CORRECTIVE ACTION

27. NOISY TORQUE CONVERTER (Continued)

Step 3. Worn or damaged bearings.

- a. Disassemble torque converter and inspect bearings. If OK, do Step 4.
- b. Replace bearings. (Refer to page 7-5.)

Step 4. Worn drive gears.

- a. Replace drive gears. (Refer to page 7-5.)
-

28. TORQUE CONVERTER SUCTION LINE IS TAKING AIR

Step 1. The suction line connections are taking air.

- a. Check oil line connections. If OK, do Step 2.
- b. Tighten oil line connections.

Step 2. Defective charging pump.

- a. Replace pump. (Refer to page 7-5.)
-

29. HIGH TORQUE CONVERTER PRESSURE.

Step 1. The oil cooler or oil lines are restricted.

- a. Check oil cooler lines and oil cooler for restrictions. If OK, do Step 2.
- b. Clean or replace oil cooler and lines. (Refer to TM 5-3810-306-20.)

Step 2. Transmission oil is cold.

- a. Converter pressure in cold weather will-vary. As soon as converter gets hot, pressure should drop.
-

30. HIGH CLUTCH PRESSURE

Step 1. Pressure regulator valve is stuck closed.

- a. Clean and check valve for worn or dirty parts and replace if necessary. (Refer to page 7-5.)
-

31. OIL IN ENGINE FLYWHEEL HOUSING

Step 1. Preformed packing between impeller cover and impeller is damaged.

- a. Remove and inspect preformed packing. (Refer to page 7-5.) If OK, do Step 2.
- b. Replace preformed packing.

Step 2. Oil baffle preformed packing is damaged.

- a. Remove and inspect preformed packing. (Refer to page 7-5.) If OK, do Step 3.
- b. Replace preformed packing.

TABLE 3-1. DIRECT AND GENERAL SUPPORT TROUBLESHOOTING (Continued)**MALFUNCTION****TEST OR INSPECTION****CORRECTIVE ACTION****31. OIL IN ENGINE FLYWHEEL HOUSING (Continued)**

Step 3. Oil baffle oil seal is damaged.

- a. Replace the oil seal. (Refer to page 7-5.)

32. LACK OF POWER

Step 1. Low engine rpm at converter stall.

- a. Refer to troubleshooting logic, engine LOW POWER.

33. UNEVEN BRAKING OR LINING WEAR

Step 1. Grease on brake shoes.

- a. Inspect brake linings. If OK, do Step 2.
- b. Replace the brake lining. (Refer to page 9-16.)

Step 2. Glazed brake lining.

- a. Inspect brake linings. If OK do Step 3.
- b. Replace brake lining. (Refer to page 9-16.)

Step 3. Corroded or frozen plungers.

- a. Remove, clean and free-up plungers. (Refer to page 9-16.)

34. HARD TO STEER LEFT AND RIGHT

Step 1. Defective two-section pump.

- a. Connect flow meter to output of pump and do a flow check (16 gpm). If OK, do Step 2.
- b. Replace pump. (Refer to page 13-24.)

Step 2. Defective steering control valve.

- a. Replace steering control valve. (Refer to page 10-2.)

35. SLOW OR ERRATIC OPERATION OF OUTRIGGER EXTENSION CYLINDERS

Step 1. Electrical collector ring dirty or glazed.

- a. Remove electrical collector ring and clean and deglaze collector ring. (Refer to page 15-86.)

Step 2. Weak brush springs on electrical collector ring.

- a. Replace brush springs. (Refer to page 15-90.)

TABLE 3-1. DIRECT AND GENERAL SUPPORT TROUBLESHOOTING (Continued)

MALFUNCTION

TEST OR INSPECTION

CORRECTIVE ACTION

35. SLOW OR ERRATIC OPERATION OF OUTRIGGER EXTENSION CYLINDERS (Continued)

Step 3. Defective extension cylinder.

- a. Remove extension cylinder and inspect internal parts for damage. (Refer to page 11-8.) If OK, do Step 4.
- b. Repair extension cylinder.

Step 4. Binding outrigger beam.

- a. Inspect outrigger beam for damage. If OK, do Step 5.
- b. Repair or replace outrigger beam. (Refer to page 11-2.)

Step 5. Partially shifted hydraulic selector spool.

- a. Disassemble, clean, and polish spool and valve housing with very fine emery cloth. (Refer to page 13-48.)

NOTE

Solenoids require a minimum of 19 volts to energize.

Step 6. Insufficient voltage for operation of solenoid valve.

- a. Check outrigger wiring and electrical swivel coupling collector rings.
-

36. STICKING OUTRIGGER CONTROL VALVE

Step 1. Distortion caused by tie bolts being overtorqued.

- a. Check torque on the bolts. (Refer to page 13-70.) If OK, do Step 2.
- b. Retorque tie bolts.

Step 2. Flow in excess of valve rating.

- a. Install flow meter in exhaust line of pump. Under moderate load check for proper output (27 gpm at 2400 rpm).

Step 3. Pressure in excess of valve rating.

- a. Check relief valve setting with that recommended. (Refer to TM 5-3810-306-20.) If OK, do Step 4.

Step 4. Electrical failure.

- a. Check wiring and solenoids.
-

TABLE 3-1. DIRECT AND GENERAL SUPPORT TROUBLESHOOTING (Continued)**MALFUNCTION****TEST OR INSPECTION****CORRECTIVE ACTION****37. EXTERNAL LEAKAGE AT CONTROL VALVE**

Step 1. Damage preformed packings or quad rings.

- a. Inspect for chipped packings and replace. (Refer to page 13-70.) If OK, do Step 2.
- b. Repair valve. (Refer to page 13-70.)

Step 2. Loose tie bolts.

- a. Retorque tie bolts. (Refer to page 13-70.) If OK, do Step 3.

Step 3. Damaged solenoid.

- a. Replace damaged parts. (Refer to page 13-70.)

38. OUTRIGGER CONTROL VALVE SOLENOID FAILURE

Step 1. No current.

- a. Check power source of at least 85% of coil rating. If OK, do Step 2.

Step 2. Damaged solenoid assembly.

- a. Check solenoid for obvious damage. If OK, do Step 3.

Step 3. Short in solenoid.

- a. Check solenoid.
- b. Replace coil. (Refer to page 13-70.)

39. OUTRIGGER VERTICAL JACK CYLINDER SLOW OR ERRATIC

Step 1. Defective jack cylinder.

- a. Remove and disassemble jack cylinder. (Refer to page 11-16.) If OK, do Step 2.
- b. Repair jack cylinder.

Step 2. Bent outrigger housing.

- a. Inspect outrigger housing. If OK, do Step 3.
- b. Repair outrigger housing.

Step 3. Sticking solenoid valve spool.

- a. Repair or replace valve spool. (Refer to page 13-70.)

Step 4. Damaged wiring to solenoid.

- a. Repair or replace wiring.

Step 5. Weak electrical collector brush springs.

- a. Replace brush springs. (Refer to page 15-90.)

Step 6. Electrical collector ring dirty or glazed.

- a. Clean or deglaze collector ring.

TABLE 3-1. DIRECT AND GENERAL SUPPORT TROUBLESHOOTING (Continued)

MALFUNCTION

TEST OR INSPECTION

CORRECTIVE ACTION

39. OUTRIGGER VERTICAL JACK CYLINDER SLOW OR ERRATIC (Continued)

Step 7. Directional selector switch sticking.

- a. Replace switch. (Refer to TM 5-3810-306-20.)

Step 8. Defective two-section hydraulic pump.

- a. Remove and repair hydraulic pump. (Refer to page 13-24.)
-

40. OUTRIGGER JACK CYLINDER RETRACTS UNDER LOAD

Step 1. Defective jack cylinder.

- a. Remove and disassemble jack cylinder. (Refer to page 11-16.) Replace all preformed packings.
 - b. Inspect all parts for damage.
 - c. Repair jack cylinder.
-

41. JACK CYLINDER EXTENDS WITHOUT ANY SYSTEM ACTIVATION

Step 1. Defective jack cylinder.

- a. Remove and disassemble jack cylinder. (Refer to page 11-16.) Replace all preformed packings.
 - b. Inspect all parts for damage.
 - c. Repair jack cylinder.
-

42. OUTRIGGER SYSTEM OPERATES, BUT SELECTED OUTRIGGER WILL NOT RETRACT OR EXTEND

Step 1. Defective cylinder.

- a. Remove and disassemble cylinder. (Refer to pages 11-10 or 11-16.) Replace all preformed packings.
 - b. Inspect all parts for damage.
 - c. Repair cylinder.
-

43. BOOM RAISES ERRATICALLY

Step 1. Defective lift cylinder.

- a. Remove and disassemble lift cylinder. (Refer to page 13-90.)
- b. Inspect all parts for damage.
- c. Repair cylinder.

Step 2. Bent boom pivot shaft.

- a. Replace boom pivot shaft. (Refer to page 15-5.)
-

TABLE 3-1. DIRECT AND GENERAL SUPPORT TROUBLESHOOTING (Continued)**MALFUNCTION****TEST OR INSPECTION****CORRECTIVE ACTION****44. BOOM LOWERS ERRATICALLY**

Step 1. Damaged hydraulic pump section.

- a. Repair or replace hydraulic pump. (Refer to page 13-10.)

45. BOOM RAISES SLOWLY

Step 1. Defective lift cylinder(s).

- a. Remove and disassemble lift cylinders. (Refer to page 13-88.) If OK, do Step 2.
- b. Repair hydraulic cylinder.

Step 2. Defective hydraulic pump section.

- a. Repair or replace hydraulic pump section. (Refer to page 13-10.)

46. BOOM LOWERS SLOWLY

Step 1. Defective lift cylinder(s).

- a. Remove and disassemble lift cylinder(s). (Refer to page 13-88.) If OK, do Step 2.
- b. Repair hydraulic cylinder.

Step 2. Defective hydraulic pump.

- a. Repair or replace hydraulic pump. (Refer to page 13-10.)

47. BOOM WILL NOT RAISE

Step 1. Broken pump shaft.

- a. Inspect pump shaft. If OK, do Step 2.
- b. Replace pump shaft and seals. (Refer to page 13-10.)

Step 2. Broken pump drive coupling.

- a. Inspect drive coupling. If OK, do Step 3.
- b. Replace drive coupling. (Refer to page 13-8.)

Step 3. Defective hydraulic pump section.

- a. Repair or replace pump section. (Refer to page 13-10.)

48. BOOM WILL NOT LOWER

Step 1. Broken pump shaft.

- a. Inspect pump shaft. If OK, do Step 2.
- b. Replace pump shaft and seals. (Refer to page 13-10.)

TABLE 3-1. DIRECT AND GENERAL SUPPORT TROUBLESHOOTING (Continued)

MALFUNCTION

TEST OR INSPECTION

CORRECTIVE ACTION

48. BOOM WILL NOT LOWER (Continued)

Step 2. Broken pump drive coupling.

- a. Inspect pump drive coupling. If OK, do Step 3.
- b. Replace drive coupling. (Refer to page 13-8.)

Step 3. Defective hydraulic pump.

- a. Repair or replace hydraulic pump. (Refer to page 13-10.)
-

49. ERRATIC OPERATION OF EXTENDING TELESCOPING CYLINDER

Step 1. Worn boom wear pads.

- a. Replace wear pads. (Refer to page 15-8.)

Step 2. Distorted boom section.

- a. Inspect boom. If OK, do Step 3.
- b. Replace distorted section. (Refer to page 15-8.)

Step 3. Damaged telescope cylinder.

- a. Repair or replace cylinder. (Refer to page 13-104.)
-

50. ERRATIC OPERATION OF RETRACTING TELESCOPING CYLINDER

Step 1. Worn boom wear pads.

- a. Replace wear pads. (Refer to page 15-8.)

Step 2. Distorted boom section.

- a. Inspect boom. If OK, do Step 3.
- b. Replace distorted section. (Refer to page 15-8.)

Step 3. Defective telescope cylinder.

- a. Repair or replace cylinder. (Refer to page 13-104.)
-

51. TELESCOPE CYLINDER WILL NOT EXTEND

Step 1. Broken hydraulic pump coupling.

- a. Inspect hydraulic pump coupling. If OK, do Step 2.
- b. Replace broken hydraulic pump coupling. (Refer to page 13-8.)

Step 2. Defective hydraulic pump.

- a. Repair or replace pump section. (Refer to page 13-10.)

TABLE 3-1. DIRECT AND GENERAL SUPPORT TROUBLESHOOTING (Continued)**MALFUNCTION****TEST OR INSPECTION****CORRECTIVE ACTION****51. TELESCOPE CYLINDER WILL NOT EXTEND (Continued)**

- Step 3. Bent boom section.
- a. Inspect boom. If OK, do Step 4.
 - b. Replace damaged boom section. (Refer to page 15-8.)
- Step 4. Defective telescope cylinder.
- a. Repair or replace cylinder. (Refer to page 13-104.)

52. TELESCOPE CYLINDER WILL NOT RETRACT

- Step 1. Broken hydraulic pump coupling.
- a. Inspect hydraulic pump coupling. If OK, do Step 2.
 - b. Replace broken hydraulic pump coupling. (Refer to page 13-8.)
- Step 2. Defective hydraulic pump.
- a. Repair or replace pump section. (Refer to page 13-10.)
- Step 3. Bent boom section.
- a. Inspect boom. If OK, do Step 4.
 - b. Replace damaged boom section. (Refer to page 15-8.)
- Step 4. Defective telescope cylinder.
- a. Repair or replace cylinder. (Refer to page 13-104.)

53. HOIST WILL NOT RAISE LOAD

- Step 1. Defective hoist motor control valve.
- a. Remove and inspect valve. (Refer to page 15-56.) If OK, do Step 2.
 - b. Replace valve.
- Step 2. Damaged primary drive assembly.
- a. Repair or replace primary drive assembly. (Refer to page 15-34.)
- Step 3. Damaged overrunning clutch.
- a. Remove brake housing and associated lines from the primary housing. The clutch assembly is keyed and bolted to the brake pinion. The clutch assembly should turn freely in the counterclockwise direction. Repair or replace if damaged. (Refer to page 15-60.)

TABLE 3-1. DIRECT AND GENERAL SUPPORT TROUBLESHOOTING (Continued)

MALFUNCTION

TEST OR INSPECTION

CORRECTIVE ACTION

53. HOIST WILL NOT RAISE LOAD (Continued)

Step 4. Sheared shaft on pump or damaged pump.

- a. Install a 0 to 5000 psi (0 to 34,475 kPa/344.8 bar) gauge in the inlet line of the hoist valve bank then activate the system. No pressure or excessively low pressure indicates a damaged pump or drive shaft. Repair or replace. (Refer to page 13-10.)
-

54. HOIST WILL NOT LOWER LOAD

Step 1. Damaged primary drive assembly.

- a. Repair or replace primary drive assembly. (Refer to page 15-34.)
-

55. SLOW HOIST OPERATION DOWN

Step 1. Defective three-section hydraulic pump.

- a. Install flow meter in exhaust line of the pump. Under moderate load, check for proper output (50 gpm at 2400 rpm).
 - b. Damaged pumps normally build heat. By hand, carefully check the temperature of the pump in relation to the other hydraulic pumps.
 - c. Replace pump. (Refer to page 13-8.)
-

56. SLOW HOIST OPERATION UP

Step 1. Damaged hydraulic pump disconnect.

- a. Check speed of other hydraulic functions under load. If all operations are slow, repair or adjust pump disconnect. (Refer to page 13-40.)

Step 2. Defective three-section hydraulic pump.

- a. Install flow meter in exhaust line of pump. Under moderate load, check for proper output (50 gpm at 2400 rpm).
- b. Damaged pumps normally build heat. By hand, carefully check temperature of pump in relation to other hydraulic pumps.
- c. Replace pump. (Refer to page 13-8.)

Step 3. Damaged O-rings in brake piston.

- a. Install a 0 to 5000 psi (0 to 34,475 kPa/344.8 bar) pressure gauge in pipe plug in line going into center of brake housing. Inability to build or hold pressure at 500 psi (3447.5 kPa/34.48 bar) in this line indicates defective preformed packing. Replace if damaged. (Refer to page 15-60.)

Step 4. Warped brake piston.

- a. Replace piston. (Refer to page 15-60.)
-

TABLE 3-1. DIRECT AND GENERAL SUPPORT TROUBLESHOOTING (Continued)**MALFUNCTION****TEST OR INSPECTION****CORRECTIVE ACTION****57. ERRATIC HOIST OPERATION UP**

Step 1. Defective hoist motor.

- a. Disconnect line to brake release port. Plug and cap line. Disconnect exhaust (for the down circuit) lines from each motor and cap lines. Pressurize line and examine exhaust port for excessive leakage.
- b. Replace defective motor. (Refer to page 15-46.)

58. LEAKING HOIST MOTOR CONTROL VALVE SEALS

Step 1. Paint on or under seal.

- a. Remove and clean, as necessary. (Refer to page 15-56.)

Step 2. Dirt under seal.

- a. Remove and clean, as necessary. (Refer to page 15-56.)

Step 3. Scored spool.

- a. Replace valve. (Refer to page 15-56.)

Step 4. Loose seal plates.

- a. Clean and tighten plates.

Step 5. Cut or scored seal.

- a. Replace faulty parts.

59. UNABLE TO MOVE HOIST MOTOR CONTROL VALVE SPOOL IN OR OUT

Step 1. Dirt in valve.

- a. Clean and flush out valve assembly.

Step 2. Spool cap full of oil.

- a. Replace seals. (Refer to page 15-56.)

Step 3. Bind in linkage.

- a. Free linkage.

60. POOR HYDRAULIC SYSTEM PERFORMANCE OR FAILURE

Step 1. Defective three-section hydraulic pump.

- a. Check pump output (50 gpm at 2400 rpm). If OK, do Step 2.
- b. Repair or replace pump. (Refer to page 13-10.)

Step 2. Worn hoist motor.

- a. Repair or replace damaged components. (Refer to page 15-50.)

TABLE 3-1. DIRECT AND GENERAL SUPPORT TROUBLESHOOTING (Continued)

MALFUNCTION

TEST OR INSPECTION

CORRECTIVE ACTION

61. EXTERNAL HOIST MOTOR LEAKAGE

- Step 1. Seal failure.
 - a. Replace seal. (Refer to page 15-46.)
 - Step 2. Defective casting.
 - a. Replace casting. (Refer to page 15-50.)
-

62. LEAKAGE AT HOIST MOTOR FITTINGS

- Step 1. Cracked casting.
 - a. Replace casting. (Refer to page 15-50.)
 - Step 2. Defective threads.
 - a. Replace fittings or casting. (Refer to page 15-50.)
 - Step 3. Damaged preformed packings.
 - a. Replace packings. (Refer to page 15-50.)
 - Step 4. Burrs on casting or fittings.
 - a. Stone or file to remove burrs.
-

63. LOSS OF HOIST SPEED UNDER LOAD

- Step 1. Low hoist motor inlet pressure.
 - a. Check pressure (2700 + 100 psi at 2400 rpm).
 - b. Adjust hoist relief valve. (Refer to TM 5-3810-306-20.)
 - Step 2. Excessive back-pressure at hoist motor outlet.
 - a. Check pressure (50 + 5 psi) increase line size.
 - Step 3. Scored port plate or end cap.
 - a. Relap to remove scored surfaces.
-

64. POOR HOIST SPEED CONTROL

- Step 1. Worn cam ring assembly.
 - a. Repair hoist motor. (Refer to page 15-50.)
-

TABLE 3-1. DIRECT AND GENERAL SUPPORT TROUBLESHOOTING (Continued)**MALFUNCTION****TEST OR INSPECTION****CORRECTIVE ACTION****65. HOIST MOTOR FAILS TO START TURNING**

Step 1. Excessive motor leakage.

- a. Install flow meter in motor outlet and check flow. If 50 gpm, check shuttle valve in front port plate. Pressure not loading plate causing plate to move away from cam ring.
- b. Repair hoist motor. (Refer to page 15-50.)

Step 2. Worn port plates.

- a. Repair hoist motor. (Refer to page 15-50.)

Step 3. Worn cam ring assembly.

- a. Repair hoist motor. (Refer to page 15-50.)

Step 4. Defective preformed packing on OD of front port plate.

- a. Replace preformed packing. (Refer to page 15-50.)

Step 5. Defective hoist motor.

- a. Replace hoist motor. (Refer to page 15-46.)

66. HOIST MOTOR SHAFT PLAY

Step 1. Worn bearings.

- a. Disassemble hoist motor and replace bearings. (Refer to page 15-50.)

Step 2. Hammering coupling on shaft.

- a. Coupling bore should be slip fit on shaft.

67. EXCESSIVE HOIST MOTOR NOISE

Step 1. Worn or damaged internal parts.

- a. Disassemble to remove rotor, vane, cam ring assembly. (Refer to page 15-50.)
- b. Inspect for excessive wear.
- c. Check condition of faces of port plate and end cap.
- d. Rework (lap) or replace if scuffed.

68. BOOM SWING OPERATION ERRATIC IN EITHER DIRECTION

Step 1. Defective swing motor.

- a. Repair or replace swing motor. (Refer to page 15-121.)

Step 2. Improperly torqued swing motor attachment bolts.

- a. Check torque on bolts. (Refer to TM 5-3810-306-20.) If OK, do Step 3.
- b. Torque swing motor attachment bolts.

TABLE 3-1. DIRECT AND GENERAL SUPPORT TROUBLESHOOTING (Continued)

MALFUNCTION

TEST OR INSPECTION

CORRECTIVE ACTION

68. BOOM SWING OPERATION ERRATIC IN EITHER DIRECTION (Continued)

Step 3. Defective swing box.

- a. Remove swing box and make necessary repairs. (Refer to page 15-106.)

Step 4. Defective two-section hydraulic pump section.

- a. Repair or replace damaged section. (Refer to page 13-22.)
-

69. BOOM SWING OPERATION ERRATIC IN ONE DIRECTION ONLY

Step 1. Damaged swing pinion.

- a. Replace swing pinion. (Refer to page 15-106.)
-

70. BOOM WILL NOT SWING IN EITHER DIRECTION

Step 1. Defective swing motor.

- a. Repair or replace swing motor. (Refer to page 15-121.)

Step 2. Swing brake not releasing properly.

- a. Repair as necessary. (Refer to page 15-114.)

Step 3. Defective swing box.

- a. Remove swing box and repair. (Refer to page 15-106.)

Step 4. Defective two-section hydraulic pump.

- a. Repair or replace pump. (Refer to page 13-22.)
-

71. SWING OPERATION SLOW IN EITHER DIRECTION

Step 1. Worn or damaged output shaft bearings.

- a. Remove and disassemble swing box. (Refer to page 15-106.) Inspect bearings. If OK, do Step 2.
- b. Replace bearings.

Step 2. Defective swing motor.

- a. Remove and repair swing motor. (Refer to page 15- 121.)

Step 3. Defective two-section hydraulic pump.

- a. Repair or replace hydraulic pump. (Refer to page 13-22.)
-

TABLE 3-1. DIRECT AND GENERAL SUPPORT TROUBLESHOOTING (Continued)**MALFUNCTION****TEST OR INSPECTION****CORRECTIVE ACTION****WARNING**

Be sure to wear protective eye covering to avoid personal injury.

72. SWING BRAKE SYSTEM WILL NOT OPERATE

Step 1. Defective swing brake valve.

- a. Replace swing brake valve. (Refer to TM 5-3810-306-20.)

Step 2. Defective swing brake assembly.

- a. Remove and repair swing brake. (Refer to page 15-114.)

73. BOOM SWINGS SLOWLY

Step 1. Defective swing motor.

- a. Repair or replace swing motor. (Refer to page 15-121.)

74. SWING MOTOR NOISY

Step 1. Swing motor binding.

- a. Repair or replace swing motor. (Refer to page 15-121.)

75. CAB HEATER STARTS AFTER SWITCHING ON SEVERAL TIMES (RT875CC)

Step 1. Defective glow plug.

- a. Check glow plug. If OK, do Step 2.
- b. Replace glow plug. (Refer to page 12-2.)

Step 2. Fuel (Dosing) pump failure.

- a. Check fuel (dosing) pump deliver rate. (Refer to page 12-13.)
- b. Replace pump. (Refer to page 12-13.)

76. NO CAB HEATER IGNITION VOLTAGE (RT875CC)

Step 1. Defective glow plug.

- a. Check glow plug.
- b. Replace glow plug. (Refer to page 12-2.)

77. CAB HEATER MOTOR DOES NOT START (RT875CC)

Step 1. Motor drive assembly failure.

- a. Replace motor drive assembly. (Refer to page 12-2.)

78. CAB HEATER COMBUSTION DOES NOT START (RT875CC)

Step 1. Overheat thermostat failure.

- a. Inspect thermostat. If OK, do Step 2.
- b. Replace thermostat. (Refer to page 12-2.)

TABLE 3-1. DIRECT AND GENERAL SUPPORT TROUBLESHOOTING (Continued)

MALFUNCTION

TEST OR INSPECTION

CORRECTIVE ACTION

78. CAB HEATER COMBUSTION DOES NOT START (RT875CC) (Continued)

- Step 2. Defective glow plug.
 - a. Check glow plug. If OK, do Step 3.
 - b. Replace glow plug. (Refer to page 12-2.)
 - Step 3. Fuel (dosing) pump failure.
 - a. Check fuel (dosing) pump delivery rate. (Refer to page 12-13.) If OK, do Step 4.
 - b. Replace dosing pump. (Refer to page 12-13.)
 - Step 4. Switch (safety switch) failure.
 - a. Remove and test safety switch.
 - b. Replace switch. (Refer to page 12-2.)
-

79. CAB HEATER COMBUSTION STOPS (RT875CC)

- Step 1. Overheat thermostat failure.
 - a. Inspect thermostat. If OK, do Step 2.
 - b. Replace thermostat. (Refer to page 12-2.)
 - Step 2. Fuel (dosing) pump failure.
 - a. Check fuel (dosing) pump delivery rate. (Refer to page 12-13.) If OK, do Step 3.
 - b. Replace dosing pump. (Refer to page 12-13.)
 - Step 3. Switch (safety switch) failure.
 - a. Remove and test safety switch.
 - b. Replace safety switch. (Refer to page 12-2.)
-

80. CAB HEATER COMBUSTION PRODUCES BLACK SMOKE (RT875CC)

- Step 1. Motor drive assembly failure.
 - a. Replace motor drive assembly. (Refer to page 12-2.)
-

81. CAB HEATER DOSING PUMP TICKING NOT AUDIBLE (RT875CC)

- Step 1. Overheat thermostat failure.
 - a. Inspect thermostat. If OK, do Step 2.
 - b. Replace thermostat. (Refer to page 12-2.)
- Step 2. Fuel (dosing) pump failure.
 - a. Check fuel (dosing) pump delivery rate. (Refer to page 12-13.) If OK, do Step 3.
 - b. Replace dosing pump. (Refer to page 12-13.)

TABLE 3-1. DIRECT AND GENERAL SUPPORT TROUBLESHOOTING (Continued)**MALFUNCTION****TEST OR INSPECTION****CORRECTIVE ACTION****81. CAB HEATER DOSING PUMP TICKING NOT AUDIBLE (RT875CC) (Continued)**

- Step 3. Switch (safety switch) failure.
- a. Replace safety switch. (Refer to page 12-2.)

NOTE

For Cab Heater/Defroster Troubleshooting (RT875CCS), refer to the schematic on page 3-92.

82. CAB HEATER FAILS TO START - MOTOR DOES NOT RUN (RT875CCS)

- Step 1. Defective cab heater motor.
- a. Replace cab heater motor. (Refer to page 12-6.)

83. CAB HEATER FAILS TO START - MOTOR RUNS (RT875CCS)

- Step 1. Defective igniter.
- a. Remove and examine the igniter. Ensure that electrode is centered and not clogged/shorted with carbon.
 - b. Visually check operation with igniter removed from burner head but connected to high tension lead with body grounded. Shut off fuel and ground igniter on heater case to check for spark.
 - c. If defective or fouled, replace igniter. (Refer to page 12-6.)
- Step 2. Defective tilt switch.
- a. Ensure tilt switch is secure in its bracket and is vertical with electrical leads pointing down.
 - b. Using multimeter, check electrical leads on both sides of switch for power.
 - c. If defective, replace terminal board including tilt switch. (Refer to page 12-6.)
- Step 3. Malfunction in fuel heater/glow plug circuit.
- a. With START/OFF switch in START position, check for power at fuel heater and glow plug. If power is applied but there is no heat from these component(s). Replace defective component(s).
 - b. If there is no power to fuel heater during preheat sequence, check all connections. Ensure that thermostat closes at 70°F (21°C).

84. INADEQUATE CAB HEATER OUTPUT (RT875CCS)

- Step 1. Malfunctioning HI-LO control and microswitch.
- a. Check HI-LO microswitch for proper operation.
 - b. Replace HI-LO microswitch. (Refer to page 12-6.)

TABLE 3-1. DIRECT AND GENERAL SUPPORT TROUBLESHOOTING (Continued)

MALFUNCTION

TEST OR INSPECTION

CORRECTIVE ACTION

85. FAN FAILS TO GO TO HIGH SPEED DURING BURNING CYCLE (RT875CCS)

- Step 1. Defective HI-LO microswitch.
 - a. Check HI-LO microswitch for proper operation.
 - b. Replace HI-LO microswitch. (Refer to page 12-6.)
 - Step 2. Defective cab heater motor.
 - a. Inspect motor and connections.
 - b. With power applied, momentarily touch orange motor lead to red motor lead. Motor speed should increase.
 - c. Replace cab heater motor. (Refer to page 12-6.)
-

86. CAB HEATER REMAINS ON BURNING CYCLE AFTER HEAT DEMANDS ARE MET (RT875CCS)

- Step 1. Defective HI-LO microswitch.
 - a. Check HI-LO microswitch for proper operation.
 - b. Replace HI-LO microswitch. (Refer to page 12-6.)
 - Step 2. Defective bi-metal blade and/or linkage.
 - a. Replace bi-metal blades and/or linkage. (Refer to page 12-6.)
-

87. CAB HEATER EXHAUSTS BLACK SMOKE (RT875CCS)

- Step 1. Mechanical binding in motor.
 - a. Check for binding in motor and blower components.
 - b. Disassemble motor and blower and replace defective components. (Refer to page 12-6.)
 - Step 2. Defective igniter.
 - a. Remove and examine the igniter. Ensure that electrode is centered and not clogged/shorted with carbon.
 - b. Visually check operation with igniter removed from burner head but connected to high tension lead with body grounded. Shut off fuel and ground igniter on heater case to check for spark.
 - c. If defective or fouled, replace igniter. (Refer to page 12-6.)
-

TABLE 3-1. DIRECT AND GENERAL SUPPORT TROUBLESHOOTING (Continued)**MALFUNCTION****TEST OR INSPECTION****CORRECTIVE ACTION****88. LEVER LOCKOUT SYSTEM ACTIVATED. (CRANE NOT IN OVERLOAD OR TWO-BLOCK CONDITION) (RT875CC)**

- Step 1. Hold HORN OFF/CLL-OVERRIDE switch to OVERRIDE position. If OK go to Step 2.
- a. Check crane electric or air system. (Refer to TM 5-3810-306-20.) Repair as needed.
 - b. Check lever lockout system. (Refer to page 12-15.) Repair as needed.
- Step 2. Fault in LMI system, cables, wiring or fuses.
- a. Refer to Malfunction No. 90.
- Step 3. Fault in Anti-two Block System.
- a. Refer to Malfunction No. 92.

89. LEVER LOCKOUT SYSTEM ACTIVATED. (CRANE NOT IN OVERLOAD OR TWO-BLOCK CONDITION) (RT875CCS)

- Step 1. Check if display console is blank. If OK go to Step 2.
- a. Refer to Malfunction No. 91.
- Step 2. Ensure display console does not indicate an "Anti-two block warning." If OK go to Step 3.
- a. Fault in Anti-two-Block System. Refer to Malfunction No. 93.
- Step 3. Turn KEY SWITCH to position "B" and press the "By-pass LMI" button on the display console. If OK go to Step 4.
- a. Check crane electric or hydraulic system. (Refer to TM 5-3810-306-20.) Repair as needed.
 - b. Check lever lockout system. (Refer to page 12-15.) Repair as needed.
- Step 4. Fault in LMI system, cables, wiring or fuses.
- a. Refer to Malfunction Nos. 103 through 165.

90. NO DISPLAY (LEVER LOCKOUT SYSTEM ACTIVATED) (RT875CC)

- Step 1. Check circuit breaker on Central Processor Unit (CPU). If OK go to Step 2.
- a. Reset Circuit breaker.

TABLE 3-1. DIRECT AND GENERAL SUPPORT TROUBLESHOOTING (Continued)

MALFUNCTION	TEST OR INSPECTION	CORRECTIVE ACTION
90. NO DISPLAY (LEVER LOCKOUT SYSTEM ACTIVATED) (RT875CC) (Continued)		
	Step 2. Check voltage between Pin 2 and Pin 4 on CPU terminal board, terminal block X1; (Refer to page 3-59.) voltage should be 24 Vdc. If OK go to Step 3.	a. Check crane electrical system. (Refer to TM 5-3810-306-20.) Repair as necessary.
	Step 3. Check voltage between Pin 2 and Pin 3 (ground) on CPU terminal board, terminal block X4; (Refer to page 3-60.) voltage should be 24 Vdc. If OK go to Step 4.	a. Replace defective CPU. (Refer to page 14-10.)
	Step 4. Check voltage between Pin 1 and Pin 2 on CPU main board, terminal block X1; (Refer to page 3-61.) voltage should be 24 Vdc. If OK go to Step 5.	a. Replace defective CPU. (Refer to page 14-10.)
	Step 5. Disconnect ribbon cables from CPU main board, terminal blocks X2 and X3. Check voltages between following test points on Main board: (Refer to page 3-62.)	MP15 and MP1 = + 5 Vdc MP15 and MP2 = - 5 Vdc MP13 and MP12 = + 5 Vdc MP15 and MP18 = + 5 Vdc MP15 and MP19 = - 5 Vdc
	If OK go to Step 6.	a. Replace defective CPU. (Refer to page 14-10.)
	Step 6. Reconnect ribbon cable to CPU main board, terminal blocks X2 and X3. Check voltages between following test points on main board: (Refer to page 3-62.)	MP15 and MP1 = + 5 Vdc MP15 and MP2 = - 5 Vdc MP13 and MP12 = + 5 Vdc MP15 and MP18 = + 5 Vdc MP15 and MP19 = - 5 Vdc
	If OK go to Step 7.	a. Repair short circuit in external wiring of load moment indicator (LMI) system.
	Step 7. Check voltage at console terminal block between Pin 1 and Pin 2; (Refer to page 3-63.) voltage should be 24 Vdc. If OK go to Step 8.	a. Repair wiring between terminal block X1 in CPU and console terminal block.
	Step 8. Defective console.	a. Replace display console. (Refer to page 14-2.)

TABLE 3-1. DIRECT AND GENERAL SUPPORT TROUBLESHOOTING (Continued)**MALFUNCTION****TEST OR INSPECTION****CORRECTIVE ACTION****91. NO DISPLAY (LEVER LOCKOUT SYSTEM ACTIVATED) (RT875CCS)**

- Step 1. Check fuses on bottom of Central Processor Unit (CPU). (Refer to page 3-85.) If OK go to Step 2.
- a. Replace fuse(s).
- Step 2. Check voltage between Pin X1:2 (ground) and Pin X1:1 (+24 Vdc) on CPU main board, terminal block X1; (Refer to pages 3-85, 3-86, and 3-88.) If OK go to Step 3.
- a. Check crane electrical system. (Refer to TM 5-3810-306-20.) Repair as necessary.
- Step 3. Check voltage (fused output voltage to display console heater control board) between Pin X1:4 (ground) and Pin X1:3 (+24 Vdc) on CPU main board, terminal block X1; (Refer to pages 3-86 and 3-88.) voltage should be +24 Vdc. If OK go to Step 4.
- a. Replace main board in CPU. (Refer to page 14-24.)
- Step 4. Check voltage between Pin X2:2 (ground) and Pin X2:1 (+24 Vdc) on display console heater control board, terminal block X2; (Refer to page 3-86.) Voltage should be +24 Vdc. If OK go to Step 5.
- a. Repair wiring between terminal block X1 in CPU and terminal block X2 on console heater control board.
- Step 5. Check voltage between Pin X1:3 (ground) and Pin X1:1 (+24 Vdc) on display console heater control board, terminal block X1; (Refer to page 3-86.) Voltage should be +24 Vdc. If OK go to Step 6.
- a. Repair wiring between terminal block X1 in CPU and terminal block X1 on console heater control board.
- Step 6. Check voltage (switched input voltage from heater control board to console connection board) between Pin X1:2 (ground) and Pin X1:1 (+24 Vdc) on console connection board, terminal block X1; (Refer to page 3-86.) NOTE: heater control board will only supply voltage when the temperature is above +10° C (+50° F). Voltage should be +24 Vdc. If OK go to Step 7.
- a. Replace heater control board (Refer to page 14-4.)
- Step 7. Defective console.
- a. Replace display console. (Refer to page 14-4.)

92. MALFUNCTION OF ANTI-TWO BLOCK SYSTEM (RT875CC)

- Step 1. Check if jumper/dummy plug in receptacle at boom nose is plugged in. If OK go to Step 2.
- a. Plug in jumper/dummy plug.

TABLE 3-1. DIRECT AND GENERAL SUPPORT TROUBLESHOOTING (Continued)

MALFUNCTION

TEST OR INSPECTION

CORRECTIVE ACTION

92. MALFUNCTION OF ANTI-TWO BLOCK SYSTEM (RT875CC) (Continued)

Step 2. Remove jumper/dummy plug from receptacle at boom nose and check ohm reading between terminals 23 and 24 of Anti-two Block Switch. (Refer to page 3-64.) Readings should be:

- Safe condition = 0 ohm
- Block-to-Block = greater than 1 megaohm

If OK go to Step 3.

Step 3. Disconnect wire from CPU terminal board, terminal block X1, Pin 35. Check ohm reading between Pin 1 and Pin 6 of receptacle at boom nose. (Refer to page 3-65.) Readings should be:

- Anti-two Block Switch Closed = 0 ohm
- Anti-two Block Switch Open = greater than 1 megaohm

If OK go to Step 4.

- a. Fault in wiring cable from Anti-two Block switch to junction box at boom nose. Repair as necessary.
- b. Short circuit in length cable. Repair as necessary.

Step 4. Reconnect jumper/dummy plug in receptacle at boom nose. Disconnect length cable from slip rings terminals 17 and 18 in cable reel. (Refer to page 3-66.) Check ohm reading between center and shield of length cable. Readings should be:

- Anti-two Block Switch Closed = 4700 ohms + 500 ohms
- Anti-two Block Switch Open = greater than 1 megaohm

If OK go to Step 5.

- a. Faulty wiring between receptacle at boom nose and cable reel. Repair as necessary.
- b. Damaged length cable. Replace boom length cable. (Refer to page 14-43)

Step 5. Check ohm reading between wire disconnected from Pin 35 and Pin 34 at CPU terminal board, terminal block X1. (Refer to page 3-67.) Readings should be:

- Anti-two Block Switch Closed = 4700 ohms + 500 ohms
- Anti-two Block Switch Open = greater than 1 megaohm

If OK go to Step 6.

- a. Faulty wire between cable reel and CPU. Repair as necessary.

Step 6. Check CPU main board function by installing a temporary resistor (4700 Ohm) at terminal block X1 between Pin 35 and Pin 34. (Refer to page 3-68.) With resistor connected, alarm should be inactive. If OK go to Step 7.

- a. Defective CPU. Replace CPU. (Refer to page 14-10.)

Step 7. Bad data transfer between CPU and console.

- a. Refer to Malfunction No. 99.
-

TABLE 3-1. DIRECT AND GENERAL SUPPORT TROUBLESHOOTING (Continued)

MALFUNCTION	TEST OR INSPECTION	CORRECTIVE ACTION
93. MALFUNCTION OF ANTI-TWO BLOCK SYSTEM (RT875CCS)		
	Step 1. Ensure crane is not in two-block condition. If OK go to Step 2.	a. Lower hook down into safe position.
	Step 2. Check if red bypass flag is installed in any Anti-two Block Switch not being used. If OK go to Step 3.	a. Install red bypass flag as appropriate.
	Step 3. If auxiliary boom nose Anti-two Block Switch is disconnected from boom nose junction box, check if jumper/dummy plug is plugged into receptacle at boom nose junction box. If OK go to Step 4.	a. Plug in jumper/dummy plug.
	Step 4. Disconnect wire from CPU main board, terminal block X1, Pin X1:31 (A2B signal) and remove jumper/dummy plug (or auxiliary boom nose Anti-two Block Switch connector) from boom nose junction box. Check ohm reading between Pin 2 and Pin 3 (or 4) of terminal strip in boom nose junction box. (Refer to page 3-87.) Readings should be:	Main Boom Nose Anti-two Block Switch Closed (weight installed) = 0 ohm Main Boom Nose Anti-two Block Switch Open (weight removed) = greater than 1 megaohm
	If OK go to Step 5.	a. Fault in wiring connections in boom nose junction box from main boom nose anti-two block switch. Repair as necessary. b. Replace main boom nose Anti-two Block Switch. (Refer to page 14-52.)
	Step 5. Connect auxiliary boom nose Anti-two Block Switch connector in receptacle at boom nose junction box. Check ohm reading between Pin 1 and Pin 3 of terminal strip in boom nose junction box. (Refer to page 3-87.) Readings should be:	Main and Auxiliary Boom Nose Anti-two Block Switches Closed (weights installed) = 4700 ohms \pm 500 ohms Auxiliary Boom Nose Anti-two Block Switch Open (weight removed) = greater than 1 megaohm Main Boom Nose Anti-two Block Switch Open (weight removed) = greater than 1 megaohm
	If OK go to Step 6.	a. Fault in wiring connections in boom nose junction box from auxiliary boom nose Anti-two Block Switch. Repair as necessary. b. Replace auxiliary boom nose Anti-two Block Switch. (Refer to page 14-52.)

TABLE 3-1. DIRECT AND GENERAL SUPPORT TROUBLESHOOTING (Continued)

MALFUNCTION
TEST OR INSPECTION
CORRECTIVE ACTION

93. MALFUNCTION OF ANTI-TWO BLOCK SYSTEM (RT875CCS) (Continued)

Step 6. Reconnect jumper/dummy plug (or auxiliary boom nose Anti-two Block Switch connector) in receptacle at boom nose junction box. Disconnect boom length cable from slip rings terminals 17 (brown) and 18 (red) in boom length/angle cable reel assembly. (Refer to page 3-87.) Check ohm reading between center and shield of boom length cable. Readings should be:

Anti-two Block Switch(es) Closed (weights installed) = 4700 ohms ± 500 ohms
 Anti-two Block Switch(es) Open (weight removed) = greater than 1 megaohm

If OK go to Step 7.

- a. Faulty wiring between boom nose junction box and boom length/angle cable reel assembly. Repair as necessary.
- b. Damaged boom length cable. Replace boom length cable. (Refer to page 14-43.)

Step 7. Reconnect boom length cable to slip rings terminals 17 (brown) and 18 (red) in boom length/angle cable reel assembly. Check ohm reading between Pin X1:8 (ground) and Pin X1:7 (A2B signal) on terminal board in boom length/angle cable reel assembly. (Refer to page 3-87.) Readings should be:

Anti-two Block Switch(es) Closed (weights installed) = 4700 ohms ± 500 ohms
 Anti-two Block Switch(es) Open (weight removed) = greater than 1 megaohm

If OK go to Step 8.

- a. Fault in wiring connections in boom length/angle cable reel assembly from slip ring to terminal board, terminal block X1. Repair as necessary.
- b. Replace slip ring. (Refer to page 14-44.)

Step 8. Check ohm reading between Pin F (ground) and Pin E (A2B signal) on 7 pin bayonet plug, located in valve compartment behind operator's cab. (Refer to page 3-87.) Readings should be:

Anti-two Block Switch(es) Closed (weights installed) = 4700 ohms ± 500 ohms
 Anti-two Block Switch(es) Open (weight removed) = greater than 1 megaohm

If OK go to Step 9.

- a. Faulty wire between boom length/angle cable reel assembly and 7 pin bayonet plug located near base of boom. Repair as necessary.

Step 9. Check ohm reading between Pin X1:32 (ground) and Pin X1:31 (A2B signal) on CPU main board, terminal block X1; (Refer to page 3-87.) Readings should be:

Anti-two Block Switch(es) Closed (weights installed) = 4700 ohms ± 500 ohms
 Anti-two Block Switch(es) Open (weight removed) = greater than 1 megaohm

If OK go to Step 10.

- a. Faulty wire between 7 pin bayonet plug, located in valve compartment behind operator's cab, and CPU. Repair as necessary.

TABLE 3-1. DIRECT AND GENERAL SUPPORT TROUBLESHOOTING (Continued)**MALFUNCTION****TEST OR INSPECTION****CORRECTIVE ACTION****93. MALFUNCTION OF ANTI-TWO BLOCK SYSTEM (RT875CCS) (Continued)**

Step 10. Check CPU main board function by installing a temporary resistor (4700 Ohm) at terminal block X1 between Pins 31 and Pin 32. (Refer to pages 3-87 and 3-88.) With resistor connected, alarm should be inactive. If OK go to Step 11.

- a. Defective main board in CPU. Replace main board in CPU. (Refer to page 14-24.)

Step 11. Reconnect wire from CPU main board, terminal block X1, Pin X1:31 (A2B signal). Bad data transfer between CPU and display console.

- a. Refer to Malfunction No. 100.

94. LENGTH READING INCORRECT (RT875CC)

Step 1. Check that boom length potentiometer in boom length/angle cable reel assembly, with boom fully retracted, is adjusted counterclockwise to a soft stop. (Refer to page 3-69.) If OK go to Step 2.

- a. Adjust boom length potentiometer counterclockwise to a soft stop.
- b. Replace boom length/angle cable reel assembly. (Refer to page 14-30.)

Step 2. Extend and retract boom to ensure clutch in big gear wheel of boom length potentiometer is not slipping on potentiometer axle in slip ring. (Refer to page 3-69.) If OK go to Step 3.

- a. Replace boom length/angle cable reel assembly. (Refer to page 14-30.)

Step 3. Check voltage between Pin 8 and Pin 11 on CPU terminal board, terminal block X1. (Refer to page 3-70.) Reading should be: -5 Vdc. If OK go to Step 4.

- a. Replace CPU. (Refer to page 14-10.)

Step 4. Check voltage between Pin 1 and Pin 3 on terminal block in cable reel. (Refer to page 3-71.) Reading should be: -5 Vdc. If OK go to Step 5.

- a. Faulty wiring between CPU and length transducer. Repair as necessary.

Step 5. Check voltage between Pin 2 and Pin 1 on terminal block in cable reel. (Refer to page 3-72.) Readings should be:

Boom retracted = - 0.5 Vdc
Boom extended = -2.27 Vdc

If OK go to Step 6.

- a. Replace boom length/angle cable reel assembly. (Refer to page 14-30.)

TABLE 3-1. DIRECT AND GENERAL SUPPORT TROUBLESHOOTING (Continued)

MALFUNCTION

TEST OR INSPECTION

CORRECTIVE ACTION

94. LENGTH READING INCORRECT (RT875CC) (Continued)

Step 6. Check voltage between Pin 8 and Pin 10 on CPU terminal board, terminal block X1. (Refer to page 3-73.) Readings should be:

Boom retracted = - 0.5 Vdc
 Boom extended = -2.27 Vdc

If OK go to Step 7.

- a. Faulty wiring between CPU and transducer on boom length potentiometer. Repair as necessary.

Step 7. Check voltage between test points MP15 and MP6 on CPU main board. (Refer to page 3-74.) Reading should be: +0.5 Vdc. If OK go to Step 8.

- a. Replace CPU if reading is not as above. (Refer to page 14-10.)

Step 8. Bad data transfer between CPU and display console.

- a. Refer to Malfunction No. 99.
-

95. LENGTH READING INCORRECT (RT875CCS)

Step 1. Check that boom length potentiometer in boom length/angle cable reel assembly, with boom fully retracted, is adjusted counterclockwise to a soft stop. (Refer to page 14-46.) If OK go to Step 2.

- a. Adjust boom length potentiometer counterclockwise to a soft stop.
- b. Replace boom length potentiometer. (Refer to page 14-46.)

Step 2. Extend and retract boom to ensure clutch in big gear wheel of boom length potentiometer is not slipping on potentiometer axle in slip ring assembly. If OK go to Step 3.

- a. Replace gear wheel and boom length potentiometer. (Refer to page 14-46.)

Step 3. Check voltage (power supply voltage to boom length potentiometer) between Pin X1:28 (ground) and Pin X1:26 (+24Vdc) on CPU main board, terminal block X1. (Refer to pages 3-87 and 3-88.) Reading should be: +24 Vdc. If OK go to Step 4.

- a. Replace main board in CPU. (Refer to page 14-24.)

Step 4. Check voltage (power supply voltage to boom length potentiometer) between Pin X1:3 (ground) and Pin X1:1 (+24Vdc) on terminal block X1 in boom length/angle cable reel assembly. (Refer to page 3-87.) Reading should be: +24 Vdc. If OK go to Step 5.

- a. Faulty wiring between CPU and boom length potentiometer. Repair as necessary.

TABLE 3-1. DIRECT AND GENERAL SUPPORT TROUBLESHOOTING (Continued)**MALFUNCTION****TEST OR INSPECTION****CORRECTIVE ACTION****95. LENGTH READING INCORRECT (RT875CCS) (Continued)**

Step 5. Check voltage (signal voltage from boom length potentiometer) between Pin X1:2 (length signal) and Pin X1:3 (ground) on terminal block X1 in boom length/angle cable reel assembly. (Refer to page 3-87.) Readings should be:

Boom retracted/minimum sensor output = +1.1 Vdc
 Boom extended/actual working range = +2.1 Vdc (± 0.1 Vdc)
 Maximum sensor output = +5.5 Vdc

If OK go to Step 6.

a. Replace boom length potentiometer. (Refer to page 14-46.)

Step 6. Check voltage (signal voltage from boom length potentiometer) between Pin X1:27 (length signal) and Pin X:28 (ground) on CPU main board, terminal block X1. (Refer to pages 3-87 and 3-88.) Readings should be:

Boom retracted/minimum sensor output = +1.1 Vdc
 Boom extended/actual working range = +2.1 Vdc (± 0.1 Vdc)
 Maximum sensor output = +5.5 Vdc

If OK go to Step 7.

a. Faulty wiring between CPU and boom length potentiometer. Repair as necessary.

Step 7. Check voltage (boom length signal of amplified output) between test points MP0 and X1:3 (length signal) on analog input module board. (Refer to page 3-89.) Readings should be:

Boom retracted/minimum sensor output = +0.5 Vdc
 Boom length potentiometer turned clockwise 10 turns to full stop = +4.5 Vdc

If OK go to Step 8.

a. Replace analog input module. (Refer to page 14-24.)

Step 8. Bad data transfer between CPU and display console.

a. Refer to Malfunction No. 100.

96. ANGLE READING INCORRECT (RT875CCS)

Step 1. Check boom length/angle cable reel assembly for damage and ensure that boom angle sensor in boom length/angle cable reel assembly is adjusted properly. (Refer to page 14-46.) If OK go to Step 2.

a. Adjust boom angle sensor.

b. Replace boom length/angle cable reel assembly. (Refer to page 14-36.)

Step 2. Raise boom to 0 degrees. Check voltage (power supply voltage to boom angle sensor) between Pin X1:28 (ground) and Pin X1:26 (+24Vdc) on CPU main board, terminal block X1. (Refer to pages 3-87 and 3-88.) Reading should be: +24 Vdc. If OK go to Step 3.

a. Replace main board in CPU. (Refer to page 14-24.)

TABLE 3-1. DIRECT AND GENERAL SUPPORT TROUBLESHOOTING (Continued)

MALFUNCTION

TEST OR INSPECTION

CORRECTIVE ACTION

WARNING

Be sure to wear protective eye covering to avoid personal injury.

96. ANGLE READING INCORRECT (RT875CCS) (Continued)

Step 3. Check voltage (power supply voltage to boom angle sensor) between Pin X1:3 (ground) and Pin X1:1 (+24Vdc) on terminal block X1 in boom length/angle cable reel assembly. (Refer to page 3-87.) Reading should be: +24 Vdc. If OK go to Step 5.

- a. Faulty wiring between CPU and boom angle sensor. Repair as necessary.

Step 4. Check voltage (signal voltage from boom angle sensor) between Pin X1:4 (angle signal) and Pin X1:3 (ground) on terminal block X1 in boom length/angle cable reel assembly. (Refer to page 3-87.) Readings should be:

Boom at 0 degrees = +5.5 Vdc
 Boom at 90 degrees = +1.1 Vdc

If OK go to Step 5.

- a. Replace boom angle sensor. (Refer to page 14-48.)

Step 5. Check voltage (signal voltage from boom angle sensor) between Pin X1:29 (angle signal) and Pin X:28 (ground) on CPU main board, terminal block X1. (Refer to pages 3-87 and 3-88.) Readings should be:

Boom 0 degrees = +5.5 Vdc
 Boom at 90 degrees = +1.1 Vdc

If OK go to Step 6.

- a. Faulty wiring between CPU and boom angle sensor. Repair as necessary.

Step 6. Check voltage (boom angle signal of amplified output) between test points MP0 and X1:4 (boom angle signal) on analog input module board. (Refer to page 3-89.) Readings should be:

Boom 0 degrees = +4.5 Vdc
 Boom at 90 degrees = +0.5 Vdc

If OK go to Step 7.

- a. Replace analog input module. (Refer to page 14-24.)

Step 7. Bad data transfer between CPU and display console.

- a. Refer to Malfunction No. 100.

97. LOAD READING INCORRECT (RT875CC)

Step 1. Measure boom length and check with reading on display. If OK go to Step 2.

- a. Adjust boom length potentiometer. (Refer to page 14-30.)

Step 2. Measure boom radius and check with console display. If OK go to Step 3.

- a. Adjust boom angle sensor. (Refer to page 14-30.)

TABLE 3-1. DIRECT AND GENERAL SUPPORT TROUBLESHOOTING (Continued)**MALFUNCTION****TEST OR INSPECTION****CORRECTIVE ACTION****WARNING**

Be sure to wear protective eye covering to avoid personal injury.

97. LOAD READING INCORRECT (RT875CC) (Continued)

Step 3. Unplug transducer cables (rod and piston) from transducers and check voltages on CPU terminal board at terminal block X1. (Refer to page 3-75.) Readings should be:

Between Pin 14 and Pin 15 = -5 Vdc
 Between Pin 14 and Pin 13 = +5 Vdc
 Between Pin 19 and Pin 20 = -5 Vdc
 Between Pin 19 and Pin 18 = +5 Vdc

If OK go to Step 4.

a. Replace defective CPU. (Refer to page 14-10.)

Step 4. Check voltage at transducer plugs (rod and piston). (Refer to page 3-76.) Readings should be:

Between receptacles B and A = +5 Vdc
 Between receptacles B and C = -5 Vdc

If OK go to Step 5.

a. Faulty wiring between CPU and pressure transducer. Repair as necessary.

Step 5. Reconnect plugs (rod and piston) to pressure transducers and check voltages on CPU terminal board at terminal block X1. (Refer to page 3-77.) Readings should be:

Boom fully retracted:
 Between Pin 19 and Pin 21 = 0 Vdc + 20 mV
 Between Pin 14 and Pin 16 = 0 Vdc + 20 mV

Boom fully extended:
 Between Pin 19 and Pin 21 = Maximum -1 Vdc
 Between Pin 14 and Pin 16 = Maximum -1 Vdc

If OK go to Step 6.

a. Faulty wiring between CPU and pressure transducer. Repair as necessary.

b. Replace defective pressure transducer. (Refer to page 14-54.)

Step 6. Disconnect hydraulic pipes from pressure transducers (rod and piston) and check voltages on CPU main board. (Refer to pages 3-78 and 3-79.) Readings should be:

Between test points MP15 and MP4 = 500 mV
 Between test points MP15 and MP5 = 500 mV

If OK go to Step 7.

a. Adjust voltage readings as follows:

Adjust reading between MP15 and MP4 by turning adjustment screw at P4.
 Adjust reading between MP15 and MP5 by turning adjustment screw at P5.

b. If unable to adjust, replace defective pressure transducer. (Refer to page 14-54.)

Step 7. Bad data transfer between CPU and console.

a. Refer to Malfunction No. 99.

TABLE 3-1. DIRECT AND GENERAL SUPPORT TROUBLESHOOTING (Continued)

MALFUNCTION	TEST OR INSPECTION	CORRECTIVE ACTION
98. LOAD READING INCORRECT (RT875CCS)		
	Step 1. Measure boom length and check with reading on display. If OK go to Step 2.	<ul style="list-style-type: none"> a. Adjust boom length potentiometer counterclockwise to a soft stop. (Refer to page 14-46.) b. Replace boom length potentiometer. (Refer to page 14-46.)
	Step 2. Measure boom radius and check with reading on display. If OK go to Step 3.	<ul style="list-style-type: none"> a. Adjust boom angle sensor. (Refer to page 14-36.)
	Step 3. Check voltage (power supply voltage to piston pressure transducer) between Pin X1:22 (ground) and X1:20 (+24Vdc) on CPU main board, terminal block X1 for piston pressure transducer. Check voltage (power supply voltage to rod pressure transducer) between and X1:25 (ground) and Pin X1:23 (+24Vdc) on CPU main board, terminal block X1 for rod pressure transducer. (Refer to pages 3-85 and 3-88.) Reading should be: +24 Vdc. If OK go to Step 4.	<ul style="list-style-type: none"> a. Replace main board in CPU. (Refer to page 14-24.)
	Step 4. Unplug electrical cables from transducers (rod and piston) and check voltages (power supply voltage to pressure transducers) between Pin C (ground) and Pin A (+24Vdc) on each pressure transducer connector. (Refer to page 3-85.) Reading should be: +24 Vdc. If OK go to Step 5.	<ul style="list-style-type: none"> a. Faulty wiring between CPU and pressure transducer(s). Repair as necessary.
	Step 5. Tag and disconnect BRN wires (signal inputs from pressure transducers) from Pin X1:21 and X1:24 on CPU main board, terminal block X1. (Refer to pages 3-85 and 3-88.) With electrical cables from transducers (rod and piston) also disconnected, check ohm reading between BRN wires at CPU and Pin B (signal) on each pressure transducer connector. (Refer to page 3-85.) Readings should be: 0 ohms. If OK go to Step 6.	<ul style="list-style-type: none"> a. Faulty wiring between CPU and pressure transducer(s). Repair as necessary.
	Step 6. Reconnect BRN wires to Pin X1:21 and X1:24 on CPU main board, terminal block X1 as tagged and reconnect electrical connectors to pressure transducers (rod and piston). (Refer to pages 3-85 and 3-88.) Check voltages (signal voltage from pressure transducers) between Pin X1:22 (ground) and Pin X1:21 (piston signal) and between Pin X1:25 (ground) and Pin X1:24 (rod signal) on CPU main board, terminal block X1. (Refer to pages 3-85 and 3-88.) Readings should be between the following:	<p>Minimum Sensor Output/No Pressure in Hydraulic Lines (0 psi): Between Pin X1:22 (ground) and Pin X1:21 (piston signal) = +1.1 Vdc Between Pin X1:25 (ground) and Pin X1:24 (rod signal) = +1.1 Vdc</p> <p>Maximum Sensor Output: Between X1:22 (ground) and Pin X1:21 (piston signal) = +5.5 Vdc Between Pin X1:25 (ground) and Pin X1:24 (rod signal) = +5.5 Vdc</p>
	If OK go to Step 7.	<ul style="list-style-type: none"> a. Adjust zero point on pressure transducers. (Refer to page 14-20.) b. Replace defective pressure transducer. (Refer to page 14-56.)

TABLE 3-1. DIRECT AND GENERAL SUPPORT TROUBLESHOOTING (Continued)**MALFUNCTION****TEST OR INSPECTION****CORRECTIVE ACTION****98. LOAD READING INCORRECT (RT875CCS) (Continued)**

Step 7. Check voltage (pressure signal of amplified output) between test points MP0 (ground) and X1:1 (piston signal) and MP0 (ground) and X1:2 (rod signal) on analog input module board. (Refer to page 3-89.) Readings should be:

Minimum Sensor Output/No Pressure in Hydraulic Lines (0 psi) = - 0.5 Vdc
Maximum Sensor Output = -4.5 Vdc

If OK go to Step 8.

- a. Replace analog input module. (Refer to page 14-24.)

Step 8. Bad data transfer between CPU and console.

- a. Refer to Malfunction No. 100.

99. ERROR IN DATA OR NO DATA TRANSFER BETWEEN CENTRAL PROCESSING UNIT AND CONSOLE (ERROR CODES E91, E92, E93 OR E94) (RT875CC)

Step 1. Check that Data EPROM is plugged into CPU main board socket D5 and System EPROM is plugged into CPU main board socket D4. Ensure that notch on EPROMs match notch on sockets. (Refer to page 3-80.) If OK go to Step 2.

- a. Position and insert EPROMs correctly.

Step 2. Check voltage supply for console between Pin 33 and Pin 30 on CPU terminal board, terminal block XI. (Refer to page 3-81.) Reading should be 24 Vdc. If OK go to Step 3.

- a. Check crane electric system. (Refer to TM 5-3810-306-20.) Repair as necessary.

Step 3. Check that CPU external and internal power supply is correct. (Refer to Malfunction No. 90.) If OK go to Step 4.

- a. Replace defective CPU. (Refer to page 14-10.)

Step 4. Check power supply to console between terminal No. 2 and terminal No. 1 on console board. (Refer to page 3-83.) Reading should be: 24 Vdc. If OK go to Step 5.

- a. Replace defective cable between CPU and console.

Step 5. Ensure that wires are properly connected between CPU terminal board, terminal block X1, Pin 31 and Console terminal Pin 4 and between CPU terminal board, terminal block X1, Pin 32 and Console terminal Pin 3. If OK go to Step 6.

- a. Connect wires properly (position, clean, tight, etc.).

Step 6. Defective central processor unit and/or display console.

- a. Replace display console. (Refer to page 14-2.)
- b. Replace CPU. (Refer to page 14-10.)

TABLE 3-1. DIRECT AND GENERAL SUPPORT TROUBLESHOOTING (Continued)

MALFUNCTION	TEST OR INSPECTION	CORRECTIVE ACTION
100. ERROR IN DATA NO DATA TRANSFER BETWEEN CENTRAL PROCESSING UNIT AND CONSOLE (ERROR CODES E91, E92, E93 OR E94) (RT875CCS)		
	Step 1. Check that LED H12 (TxD) on the CPU main board is not illuminated (OFF) (Refer to page 3-88.) If OK go to Step 4.	a. Go to Step 2.
	Step 2. Check that Data and TLK EPROMs are plugged into the appropriate EPROM module sockets and System EPROM is plugged into the appropriate CPU module socket. Ensure that notch on EPROMs are in the correct direction. Ensure that EPROMs on the EPROM module fill the bottom of the socket as shown by the arrows. (Refer to page 3-90.) If OK go to Step 3.	a. Position and insert EPROMs correctly.
	Step 3. Check voltage (process voltage) between test points MP4 (+5Vdc) and MP1 (KGND) on CPU main board. (Refer to page 3-88.) Reading should be +5 Vdc. If OK go to Step 4.	a. Check that CPU external and internal power supply is correct. (Refer to Malfunction No. 91.) If OK go to Step 4.
	Step 4. Disconnect wires from CPU main board, terminal block X1, Pins X1:6 (TxD) and X1:5 (RxD) and console connection board in display console, terminal block X1, Pins X1:3 (TxD) and X1:4 (RxD). Check ohm reading between CPU main board, terminal block X1, Pin X1:6 (TxD) and console connection board, terminal block X1, Pin X1:3 (TxD). Check ohm reading between CPU main board, terminal block X1, Pin X1:5 (RxD) and console connection board, terminal block X1, Pin X1:4 (RxD). (Refer to pages 3-86 and 3-88.) Readings should be:	<p style="margin-left: 40px;">Between CPU main board, terminal block X1, Pin X1:6 (TxD) and console connection board, terminal block X1, Pin X1:3 (TxD). = 0 ohm</p> <p style="margin-left: 40px;">Between CPU main board, terminal block X1, Pin X1:5 (RxD) and console connection board, terminal block X1, Pin X1:4 (RxD). = 0 ohm</p>
	If OK go to Step 5.	a. Fault in wiring connections from CPU to display console. Repair as necessary.
	Step 5. Defective display console and/or central processor unit (CPU).	<p>a. Replace display console. (Refer to page 14-4.)</p> <p>b. Replace main board, EPROM module, and/or CPU module in CPU. (Refer to page 14-24.)</p> <p>c. Replace DATA EPROM. (Refer to page 14-28.)</p>

TABLE 3-1. DIRECT AND GENERAL SUPPORT TROUBLESHOOTING (Continued)

MALFUNCTION	TEST OR INSPECTION	CORRECTIVE ACTION
101. INTERFERENCE PROBLEM (ERROR CODES E91, E92, E93 OR E94 INTERMITTENT) (RT875CC)		
	Step 1. Check data transfer between CPU and Console (Refer to Malfunction No. 99). If OK go to Step 2.	a. Repair or replace defective part(s).
	Step 2. Check that additional ground link between CPU main board terminal X9/1 and CPU mounting bracket is in place. If OK go to Step 3.	a. Install ground link (single cable minimum of AWG14 (2.0 mm)).
	Step 3. Ensure that cable shields are connected properly. (Refer to pages 3-82, 3-83 and 3-84.) If OK go to Step 4.	a. Connect cable shields correctly.
	Step 4. Determine which component of crane electric system is spiking out (e.g. dump valve, outrigger relay).	a. Install diode or varistor across terminals of spiking component. Diode type such as IN4001 can be used (Ensure + and - connections for diode are connected properly).
102. INTERFERENCE PROBLEM (ERROR CODES E91, E92, E93 OR E94 INTERMITTENT) (RT875CCS)		
	Step 1. Check data transfer between CPU and Display Console (Refer to Malfunction No. 100). If OK go to Step 2.	a. Repair or replace defective part(s).
	Step 2. Ensure that additional ground wire is connected properly between CPU main board, MP1 (KGND) and CPU housing mounting bracket. If OK go to Step 3.	a. Connect ground wire properly (single cable minimum of AWG14 (2.0 mm)).
	Step 3. Ensure the outer shields of the external cables are properly connected to the strain relief connectors on the CPU housing. (Refer to pages 4-14, and 4-15.) If OK go to Step 4.	a. Connect shield(s) properly. (position, clean, tight, etc.)
	Step 4. Determine which component of crane electric system is spiking out (e.g. dump valve, outrigger relay).	a. Install diode or varistor across terminals of spiking component. Diode type such as IN4001 can be used (Ensure + and - connections for diode are connected properly).
103. ERROR CODE E01 DISPLAYED ON CONSOLE (RT875CCS)		
	Step 1. Minimum radius or maximum angle range exceeded.	a. Lower boom back to a radius or angle given in the load chart.

TABLE 3-1. DIRECT AND GENERAL SUPPORT TROUBLESHOOTING (Continued)

MALFUNCTION

TEST OR INSPECTION

CORRECTIVE ACTION

104.ERROR CODE E02 DISPLAYED ON CONSOLE (RT875CCS)

- Step 1. Maximum radius or minimum angle range exceeded.
- a. Raise boom back to a radius or angle given in the load chart.
-

105.ERROR CODE E04 DISPLAYED ON CONSOLE (RT875CCS)

- Step 1. Operating mode is not permissible with actual crane configuration.
- a. Set operating mode switch correctly to the code assigned to the operating mode of the crane.
-

106.ERROR CODE E05 DISPLAYED ON CONSOLE (RT875CC) (RT875CCS)

- Step 1. Boom length range exceeded.
- a. Boom Length sensor adjustment changed. (Refer to Malfunction No. 94 – RT875CC and 95 – RT875CCS.)
-

107.ERROR CODE E07 DISPLAYED ON CONSOLE (RT875CC)

- Step 1. No acknowledgment signal from overload relay (K1).
- a. Replace defective CPU. (Refer to page 14-10.)
-

108.ERROR CODE E07 DISPLAYED ON CONSOLE (RT875CCS)

- Step 1. No acknowledgment signal from overload relay (K1).
- a. Replace defective main board in CPU. (Refer to page 14-24.)
-

109.ERROR CODE E08 DISPLAYED ON CONSOLE (RT875CC)

- Step 1. No acknowledgment signal from Anti-two Block switch relay (K2).
- a. Replace defective CPU. (Refer to Page 14-10.)
-

110.ERROR CODE E08 DISPLAYED ON CONSOLE (RT875CCS)

- Step 1. No acknowledgment signal from Anti-two Block switch relay (K2).
- a. Replace defective main board in CPU. (Refer to page 14-24.)
-

TABLE 3-1. DIRECT AND GENERAL SUPPORT TROUBLESHOOTING (Continued)**MALFUNCTION****TEST OR INSPECTION****CORRECTIVE ACTION****111.ERROR CODE E11 DISPLAYED ON CONSOLE (RT875CC)**

Step 1. Fallen below lower limiting value for measuring channel (length).

- a. Check for defective cable from CPU to length sensor. (Refer to Malfunction No. 94.) Replace cable if necessary.
- b. Replace defective boom length/angle cable reel assembly. (Refer to page 14-30.)
- c. Replace defective CPU. (Refer to Page 14-10.)

112.ERROR CODE E11 DISPLAYED ON CONSOLE (RT875CCS)

Step 1. Fallen below lower limiting value for measuring channel (length).

- a. Check for defective cable from CPU to boom length potentiometer. (Refer to Malfunction No. 95.) Replace cable if necessary.
- b. Replace defective boom length potentiometer. (Refer to page 14-46.)
- c. Replace defective main board and analog input module in CPU. (Refer to Page 14-24.)

113.ERROR CODE E12 DISPLAYED ON CONSOLE (RT875CC)

Step 1. Fallen below lower limiting value for measuring channel (pressure transducer - piston side).

- a. Check cable and plug from CPU to piston side pressure transducer. (Refer to Malfunction No. 97.) Replace as necessary.
- b. Replace defective pressure transducer (piston side). (Refer to page 14-54.)
- c. Replace defective CPU. (Refer to page 14-10.)

114.ERROR CODE E12 DISPLAYED ON CONSOLE (RT875CCS)

Step 1. Fallen below lower limiting value for measuring channel (pressure transducer - piston side).

- a. Check cable and plug from CPU to piston side pressure transducer. (Refer to Malfunction No. 98.) Replace as necessary.
- b. Replace defective pressure transducer (piston side). (Refer to page 14-56.)
- c. Replace defective main board and analog input module in CPU. (Refer to Page 14-24.)

TABLE 3-1. DIRECT AND GENERAL SUPPORT TROUBLESHOOTING (Continued)

MALFUNCTION

TEST OR INSPECTION

CORRECTIVE ACTION

115.ERROR CODE E13 DISPLAYED ON CONSOLE (RT875CC)

Step 1. Fallen below lower limiting value for measuring channel (pressure transducer - rod side).

- a. Check cable and plug from CPU to rod side pressure transducer. (Refer to Malfunction No. 97.) Replace as necessary.
 - b. Replace defective pressure transducer (rod side). (Refer to page 14-54.)
 - c. Replace defective CPU. (Refer to page 14-10.)
-

116.ERROR CODE E13 DISPLAYED ON CONSOLE (RT875CCS)

Step 1. Fallen below lower limiting value for measuring channel (pressure - rod side).

- a. Check cable and plug from CPU to rod side pressure transducer. (Refer to Malfunction No. 98.) Replace as necessary.
 - b. Replace defective pressure transducer (rod side). (Refer to page 14-56.)
 - c. Replace defective main board and analog input module in CPU. (Refer to Page 14-24.)
-

117.ERROR CODE E15 DISPLAYED ON CONSOLE (RT875CC)

Step 1. Fallen below lower limiting value for the measuring channel (angle - main boom).

- a. Check cable from CPU to boom length/angle sensor. (Refer to Malfunction No. 94.) Replace as necessary.
 - b. Replace defective boom length/angle cable reel assembly. (Refer to page 14-30.)
 - c. Replace defective CPU. (Refer to page 14-10.)
-

118.ERROR CODE E15 DISPLAYED ON CONSOLE (RT875CCS)

Step 1. Fallen below lower limiting value for the measuring channel (angle - main boom).

- a. Check cable from CPU to boom length/angle sensor. (Refer to Malfunction Nos. 95 and 96.) Replace as necessary.
 - b. Replace defective boom angle sensor. (Refer to page 14-48.)
 - c. Replace defective main board and analog input module in CPU. (Refer to Page 14-24.)
-

119.ERROR CODE E19 DISPLAYED ON CONSOLE (RT875CC)

Step 1. Error in reference voltage.

- a. Replace defective CPU. (Refer to page 14-10.)
 - b. Check external load moment indicator wiring for short circuit. Repair as necessary.
-

TABLE 3-1. DIRECT AND GENERAL SUPPORT TROUBLESHOOTING (Continued)**MALFUNCTION****TEST OR INSPECTION****CORRECTIVE ACTION****120.ERROR CODE E19 DISPLAYED ON CONSOLE (RT875CCS)**

Step 1. Error in reference voltage.

- a. Replace defective main board in CPU. (Refer to Page 14-24.)

121.ERROR CODE E21 DISPLAYED ON CONSOLE (RT875CC)

Step 1. Upper limiting value for the measuring channel (length) exceeded.

- a. Check for defective or loose cable between CPU and boom length sensor. (Refer to Malfunction No. 94.) Repair or replace as necessary.
- b. Replace defective boom length/angle cable reel assembly. (Refer to page 14-30.)
- c. Replace defective CPU. (Refer to page 14-10.)

122.ERROR CODE E21 DISPLAYED ON CONSOLE (RT875CCS)

Step 1. Upper limiting value for the measuring channel (length) exceeded.

- a. Check for defective or loose cable between CPU and boom length potentiometer. (Refer to Malfunction No. 95.) Repair or replace as necessary.
- b. Replace defective boom length potentiometer. (Refer to page 14-46.)
- c. Replace defective main board and analog input module in CPU. (Refer to Page 14-24.)

123.ERROR CODE E22 DISPLAYED ON CONSOLE (RT875CC)

Step 1. Upper limiting value for the measuring channel (pressure transducer - piston side) exceeded.

- a. Check for defective or loose cable between CPU and piston side pressure transducer. (Refer to Malfunction No. 97.) Repair or replace as necessary.
- b. Replace defective pressure transducer (piston side). (Refer to page 14-54.)
- c. Replace defective CPU. (Refer to Page 14-10.)

124.ERROR CODE E22 DISPLAYED ON CONSOLE (RT875CCS)

Step 1. Upper limiting value for the measuring channel (pressure transducer - piston side) exceeded.

- a. Check for defective or loose cable between CPU and piston side pressure transducer. (Refer to Malfunction No. 98.) Repair or replace as necessary.
- b. Replace defective pressure transducer (piston side). (Refer to page 14-56.)
- c. Replace defective main board and analog input module in CPU. (Refer to Page 14-24.)

TABLE 3-1. DIRECT AND GENERAL SUPPORT TROUBLESHOOTING (Continued)

MALFUNCTION

TEST OR INSPECTION

CORRECTIVE ACTION

125.ERROR CODE E23 DISPLAYED ON CONSOLE (RT875CC)

- Step 1. Upper limiting value for the measuring channel (pressure transducer - rod side) exceeded.
- a. Check for defective or loose cable between CPU and rod side pressure transducer. (Refer to Malfunction No. 97.) Repair or replace as necessary.
 - b. Replace defective pressure transducer (rod side). (Refer to page 14-54.)
 - c. Replace defective CPU. (Refer to page 14-10.)
-

126.ERROR CODE E23 DISPLAYED ON CONSOLE (RT875CCS)

- Step 1. Upper limiting value for the measuring channel (pressure transducer - rod side) exceeded.
- a. Check for defective or loose cable between CPU and rod side pressure transducer. (Refer to Malfunction No. 98.) Repair or replace as necessary.
 - b. Replace defective pressure transducer (rod side). (Refer to page 14-56.)
 - c. Replace defective main board and analog input module in CPU. (Refer to Page 14-24.)
-

127.ERROR CODE E25 DISPLAYED ON CONSOLE (RT875CC)

- Step 1. Upper limiting value for the measuring channel (angle - main boom) exceeded.
- a. Check for defective or loose cable between CPU and boom length/angle sensor. (Refer to Malfunction No. 94.) Repair or replace as necessary.
 - b. Replace defective boom length/angle cable reel assembly. (Refer to page 14-30.)
 - c. Replace defective CPU. (Refer to Page 14-10.)
-

128.ERROR CODE E25 DISPLAYED ON CONSOLE (RT875CCS)

- Step 1. Upper limiting value for the measuring channel (angle - main boom) exceeded.
- a. Check for defective or loose cable between CPU and boom angle sensor. (Refer to Malfunction Nos. 95 and 97.) Repair or replace as necessary.
 - b. Replace defective boom angle sensor. (Refer to page 14-48.)
 - c. Replace defective main board and analog input module in CPU. (Refer to Page 14-24.)
-

TABLE 3-1. DIRECT AND GENERAL SUPPORT TROUBLESHOOTING (Continued)

MALFUNCTION	TEST OR INSPECTION	CORRECTIVE ACTION
<u>129.ERROR CODE E27 DISPLAYED ON CONSOLE (RT875CCS)</u>		<p>Step 1. Upper limiting value for the measuring channel (boom length I (+II)) exceeded.</p> <ol style="list-style-type: none"> Check for defective or loose cable between CPU and boom angle sensor. (Refer to Malfunction No. 96.) Repair or replace as necessary. Replace defective boom angle sensor. (Refer to page 14-48.) Replace defective main board and analog input module in CPU. (Refer to Page 14-24.)
<u>130.ERROR CODE E29 DISPLAYED ON CONSOLE (RT875CC)</u>		<p>Step 1. Error in reference voltage.</p> <ol style="list-style-type: none"> Replace defective CPU. (Refer to page 14-10.)
<u>131.ERROR CODE E29 DISPLAYED ON CONSOLE (RT875CCS)</u>		<p>Step 1. Error in supply or reference voltage.</p> <ol style="list-style-type: none"> Check crane supply voltage. Check 5V, 6V, and 9V reference voltages on main board and analog input module in the CPU. (Refer to pages 3-88 and 3-89.) Replace defective main board and analog input module in CPU. (Refer to Page 14-24.)
<u>132.ERROR CODE E31 DISPLAYED ON CONSOLE (RT875CC)</u>		<p>Step 1. Error in system program</p> <ol style="list-style-type: none"> Replace defective CPU. (Refer to page 14-10.)
<u>133.ERROR CODE E31 DISPLAYED ON CONSOLE (RT875CCS)</u>		<p>Step 1. Error in system program</p> <ol style="list-style-type: none"> Replace defective SYSTEM EPROM. (Refer to page 14-28.) Replace defective main board and analog input module in CPU. (Refer to Page 14-24.)
<u>134.ERROR CODE E37 DISPLAYED ON CONSOLE (RT875CCS)</u>		<p>Step 1. Error in program run.</p> <ol style="list-style-type: none"> Replace defective SYSTEM EPROM. (Refer to page 14-28.) Replace defective main board and analog input module in CPU. (Refer to Page 14-24.)

TABLE 3-1. DIRECT AND GENERAL SUPPORT TROUBLESHOOTING (Continued)

MALFUNCTION

TEST OR INSPECTION

CORRECTIVE ACTION

135.ERROR CODE E38 DISPLAYED ON CONSOLE (RT875CC)

- Step 1. Incorrect system program.
- a. Replace defective CPU. (Refer to page 14-10.)
-

136.ERROR CODE E38 DISPLAYED ON CONSOLE (RT875CCS)

- Step 1. Error causing differences between SYSTEM EPROM and DATA EPROM.
- a. Replace defective SYSTEM and/or DATA EPROM(s). (Refer to page 14-28.)
-

137.ERROR CODE E39 DISPLAYED ON CONSOLE (RT875CCS)

- Step 1. Error causing differences between SYSTEM EPROM and TLK EPROM.
- a. Replace defective SYSTEM and/or TLK EPROM(s). (Refer to page 14-28.)
-

138.ERROR CODE E41 DISPLAYED ON CONSOLE (RT875CC)

- Step 1. Error in external RAM.
- a. Replace defective CPU. (Refer to page 14-10.)
-

139.ERROR CODE E41 DISPLAYED ON CONSOLE (RT875CCS)

- Step 1. Error in external RAM.
- a. Replace defective main board and analog input module in CPU. (Refer to Page 14-24.)
-

140.ERROR CODE E42 DISPLAYED ON CONSOLE (RT875CC)

- Step 1. Error in external write/read memory (RAM).
- a. Replace defective CPU. (Refer to page 14-10.)
-

141.ERROR CODE E42 DISPLAYED ON CONSOLE (RT875CCS)

- Step 1. Error in external write/read memory (RAM).
- a. Replace defective main board and/or CPU module in CPU. (Refer to Page 14-24.)
-

142.ERROR CODE E43 DISPLAYED ON CONSOLE (RT875CCS)

- Step 1. Error in external write/read memory (RAM).
- a. Replace defective main board and/or CPU module in CPU. (Refer to Page 14-24.)
-

TABLE 3-1. DIRECT AND GENERAL SUPPORT TROUBLESHOOTING (Continued)**MALFUNCTION****TEST OR INSPECTION****CORRECTIVE ACTION****143.ERROR CODE E45 DISPLAYED ON CONSOLE (RT875CC)**

Step 1. Error in internal communications.

- a. Replace defective CPU. (Refer to page 14-10.)

144.ERROR CODE E45 DISPLAYED ON CONSOLE (RT875CCS)

Step 1. Error in A/D conversion.

- a. Replace defective analog input module in CPU. (Refer to Page 14-24.)

145.ERROR CODE E46 DISPLAYED ON CONSOLE (RT875CCS)

Step 1. Error in A/D conversion.

- a. Replace defective CPU module in CPU. (Refer to Page 14-24.)

146.ERROR CODE E47 DISPLAYED ON CONSOLE (RT875CC)

Step 1. Malfunction in the monitored write/read memory.

- a. Replace defective CPU. (Refer to page 14-10.)

147.ERROR CODE E47 DISPLAYED ON CONSOLE (RT875CCS)

Step 1. Malfunction in the internal write/read memory.

- a. Replace defective CPU module in CPU. (Refer to Page 14-24.)

148.ERROR CODE E48 DISPLAYED ON CONSOLE (RT875CCS)

Step 1. Malfunction in the monitored write/read memory.

- a. Replace defective CPU module in CPU. (Refer to Page 14-24.)

149.ERROR CODE E51 DISPLAYED ON CONSOLE (RT875CC)

Step 1. Error in data memory.

- a. Check that BR3 is installed in CPU main board. Install if missing.
- b. Replace defective CPU. (Refer to page 14-10.)

150.ERROR CODE E51 DISPLAYED ON CONSOLE (RT875CCS)

Step 1. Error in data memory.

- a. Check that BR3 is installed in CPU main board. Install if missing.
- b. Replace defective DATA EPROM. (Refer to Page 14-28.)

TABLE 3-1. DIRECT AND GENERAL SUPPORT TROUBLESHOOTING (Continued)

MALFUNCTION

TEST OR INSPECTION

CORRECTIVE ACTION

151.ERROR CODE E52 DISPLAYED ON CONSOLE (RT875CCS)

Step 1. Error in data memory.

- a. Check that BR3 is installed in CPU main board. Install if missing.
 - b. Replace defective EPROM module. (Refer to Page 14-24.)
 - c. Replace defective DATA EPROM. (Refer to Page 14-28.)
-

152.ERROR CODE E56 DISPLAYED ON CONSOLE (RT875CCS)

Step 1. Error in data memory.

- a. Check that BR3 is installed in CPU main board. Install if missing.
 - b. Replace defective EPROM module. (Refer to Page 14-24.)
 - c. Replace defective DATA EPROM. (Refer to Page 14-28.)
-

153.ERROR CODE E57 DISPLAYED ON CONSOLE (RT875CCS)

Step 1. Error in data memory.

- a. Replace defective DATA EPROM. (Refer to Page 14-28.)
 - b. Replace defective EPROM module. (Refer to Page 14-24.)
-

154.ERROR CODE E58 DISPLAYED ON CONSOLE (RT875CCS)

Step 1. Error in data memory.

- a. Replace defective DATA EPROM. (Refer to Page 14-28.)
 - b. Replace defective main board in CPU. (Refer to Page 14-24.)
-

155.ERROR CODE E60 DISPLAYED ON CONSOLE (RT875CCS)

Step 1. The number of the selected EPROM base and the programmed value are not identical.

- a. Replace defective TLK EPROM. (Refer to Page 14-28.)
 - b. Replace defective EPROM module. (Refer to Page 14-24.)
-

156.ERROR CODE E69 DISPLAYED ON CONSOLE (RT875CCS)

Step 1. Error in load chart EPROM. The number of the selected EPROM base and the programmed value are not identical.

- a. Replace defective TLK EPROM. (Refer to Page 14-28.)
 - b. Replace defective EPROM module. (Refer to Page 14-24.)
-

TABLE 3-1. DIRECT AND GENERAL SUPPORT TROUBLESHOOTING (Continued)**MALFUNCTION****TEST OR INSPECTION****CORRECTIVE ACTION****157. ERROR CODE E71, E72, E73, E74, E75, E76, OR E77 DISPLAYED ON CONSOLE (RT875CCS)**

Step 1. No acknowledgment signal from relay Nos. 1, 2, 3, 4, 5, 6, or 7 on main board in CPU. (Error Codes E71 through E77 represent relay Nos. 1 through 7.)

- a. Replace defective main board in CPU. (Refer to Page 14-24.)

158. ERROR CODE E85 DISPLAYED ON CONSOLE (RT875CCS)

Step 1. Error in radius calculation.

- a. Replace defective DATA EPROM. (Refer to Page 14-28.)

159. ERROR CODE E89 DISPLAYED ON CONSOLE (RT875CCS)

Step 1. Operating mode is not permissible with actual crane configuration.

- a. Set operating mode switch correctly to the code assigned to the operating mode of the crane.

160. ERROR CODE E91, E92, E93, OR E94 DISPLAYED ON CONSOLE (RT875CCS)

Step 1. Error in data, no data transfer between central processing unit (CPU) and console, and/or interference problem.

- a. Repair to malfunction Nos. 100 and 102.

161. ERROR CODE E95 DISPLAYED ON CONSOLE (RT875CCS)

Step 1. Error in data memory.

- a. Check that jumper position. Correct if necessary.
- b. Replace defective DATA EPROM. (Refer to Page 14-28.)
- b. Replace defective CPU module in CPU. (Refer to Page 14-24.)

162. ERROR CODE E96 DISPLAYED ON CONSOLE (RT875CCS)

Step 1. Error in internal RAM of display console.

- a. Replace defective display console. (Refer to Page 14-4.)

163. ERROR CODE E97 DISPLAYED ON CONSOLE (RT875CCS)

Step 1. Error in external RAM of display console.

- a. Replace defective display console. (Refer to Page 14-4.)

TABLE 3-1. DIRECT AND GENERAL SUPPORT TROUBLESHOOTING (Continued)

MALFUNCTION

TEST OR INSPECTION

CORRECTIVE ACTION

164.ERROR CODE E98 DISPLAYED ON CONSOLE (RT875CCS)

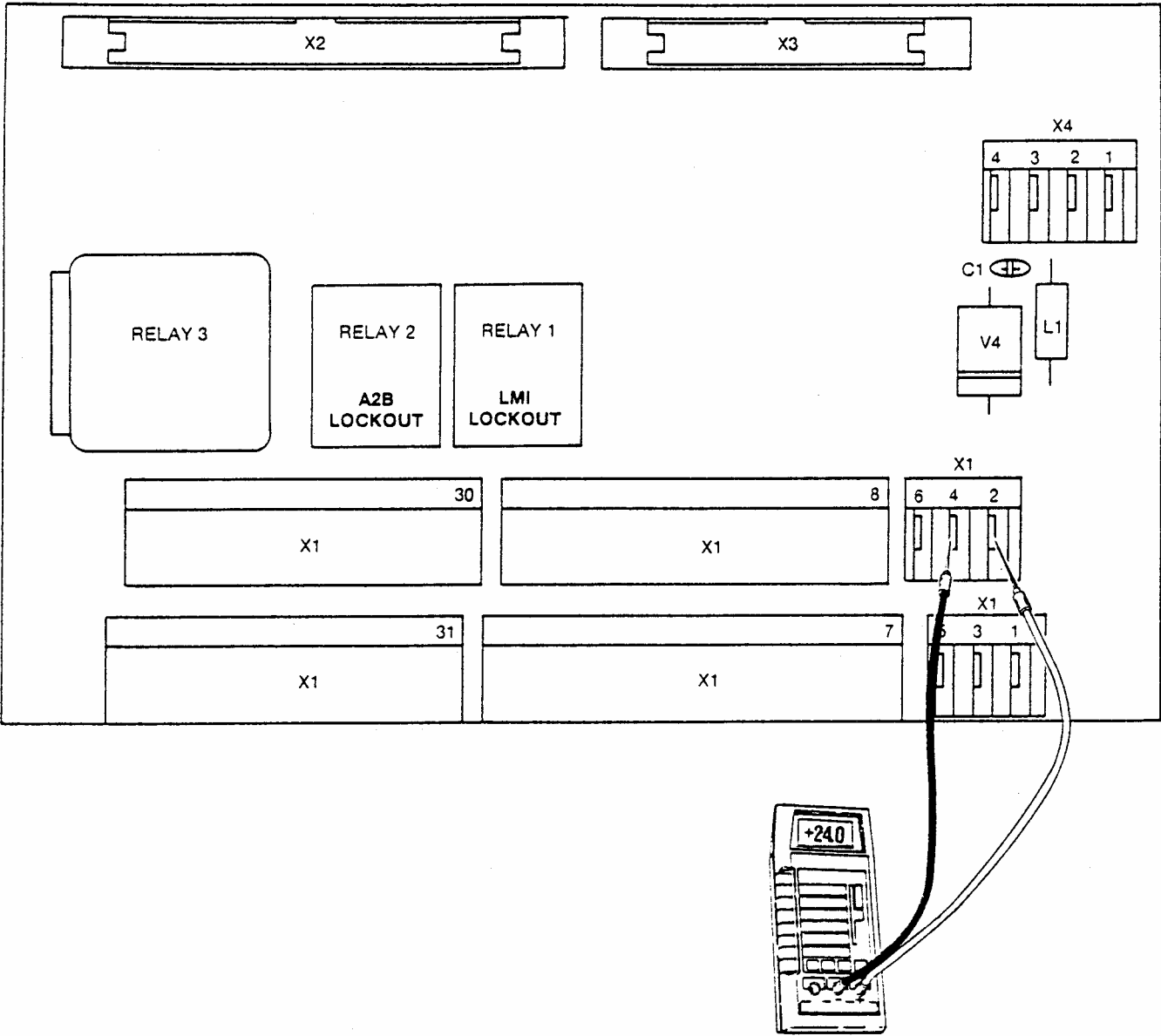
Step 1. Error in jumper position of display console.

- a. Check that BR9/BR10 is installed in CPU main board. Install if missing.
 - b. Replace defective display console. (Refer to Page 14-4.)
-

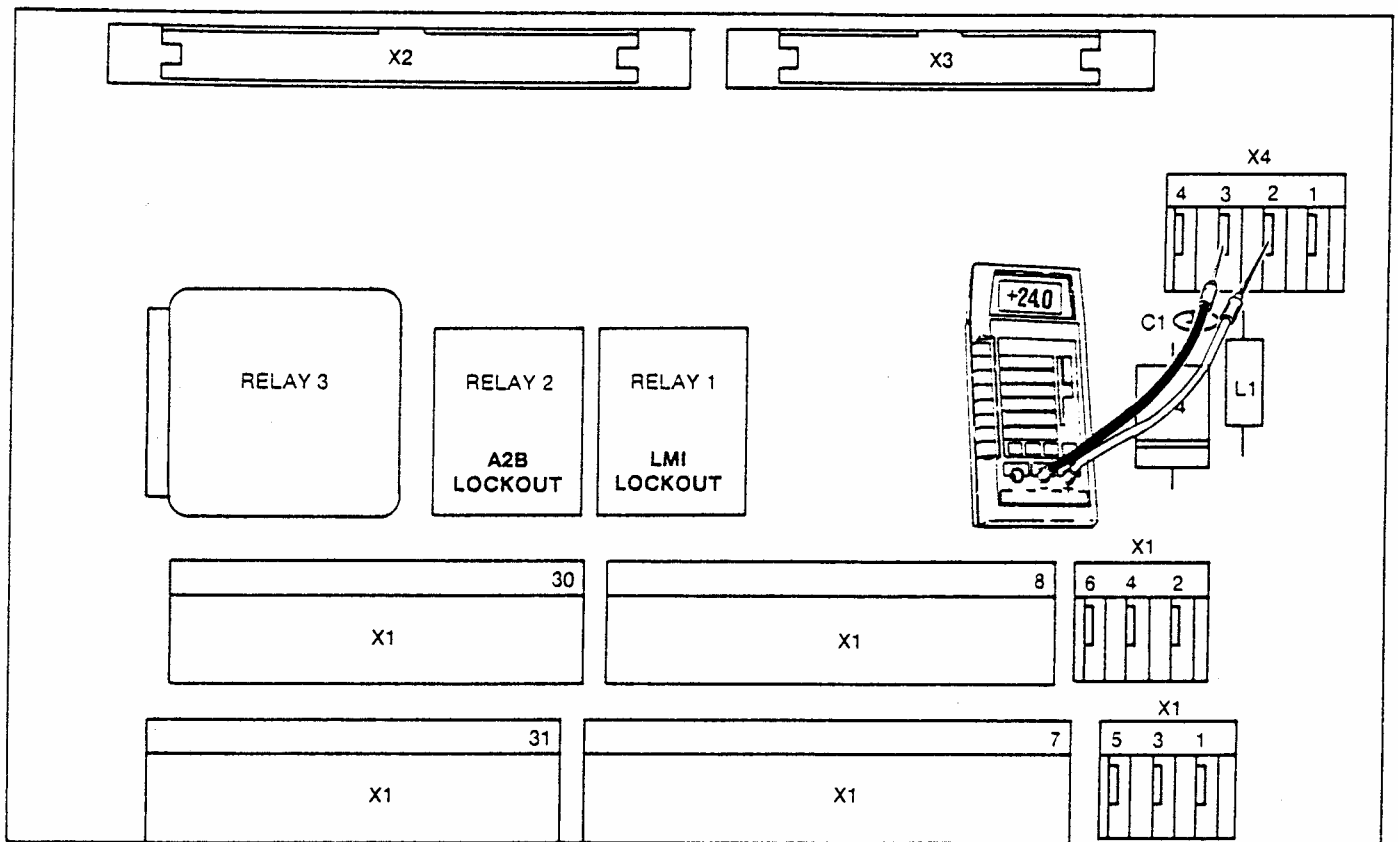
165.ERROR CODE EAB DISPLAYED ON CONSOLE (RT875CCS)

Step 1. Short circuit in Anti-two Block switch circuit.

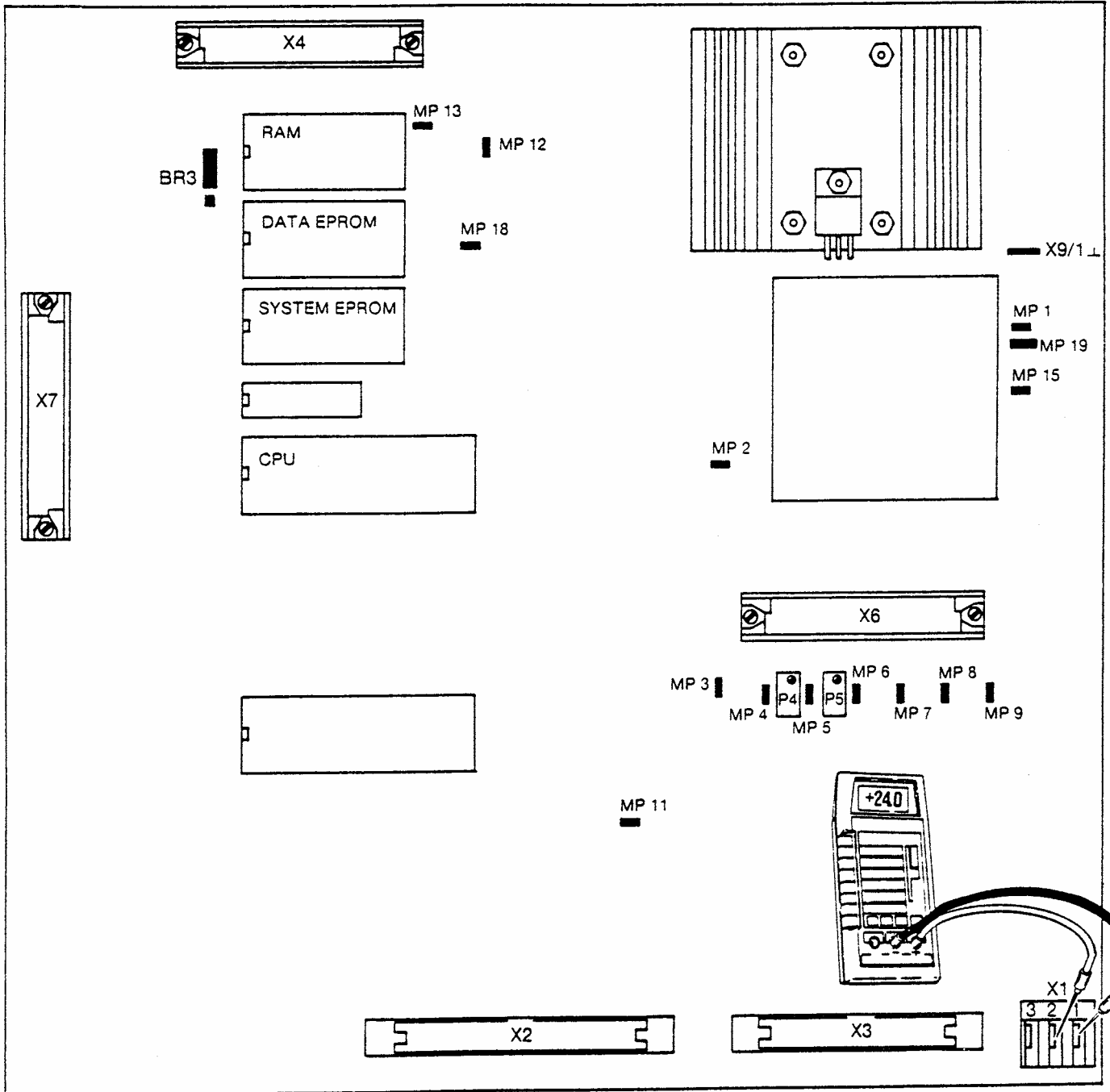
- a. Check for defective cable from CPU to Anti-two Block switches. (Refer to Malfunction No. 93.) Replace cable if necessary.
 - b. Replace defective Anti-two Block switch(es). (Refer to page 14-50.)
 - c. Replace defective main board and analog input module in CPU. (Refer to Page 14-24.)
-



Voltage Check Between Pins 2 and 4 on CPU Terminal Board, Terminal Block X1 (RT875CC)



Voltage Check Between Pins 2 and 3 on CPU Terminal Board, Terminal Block X4 (RT875CC)



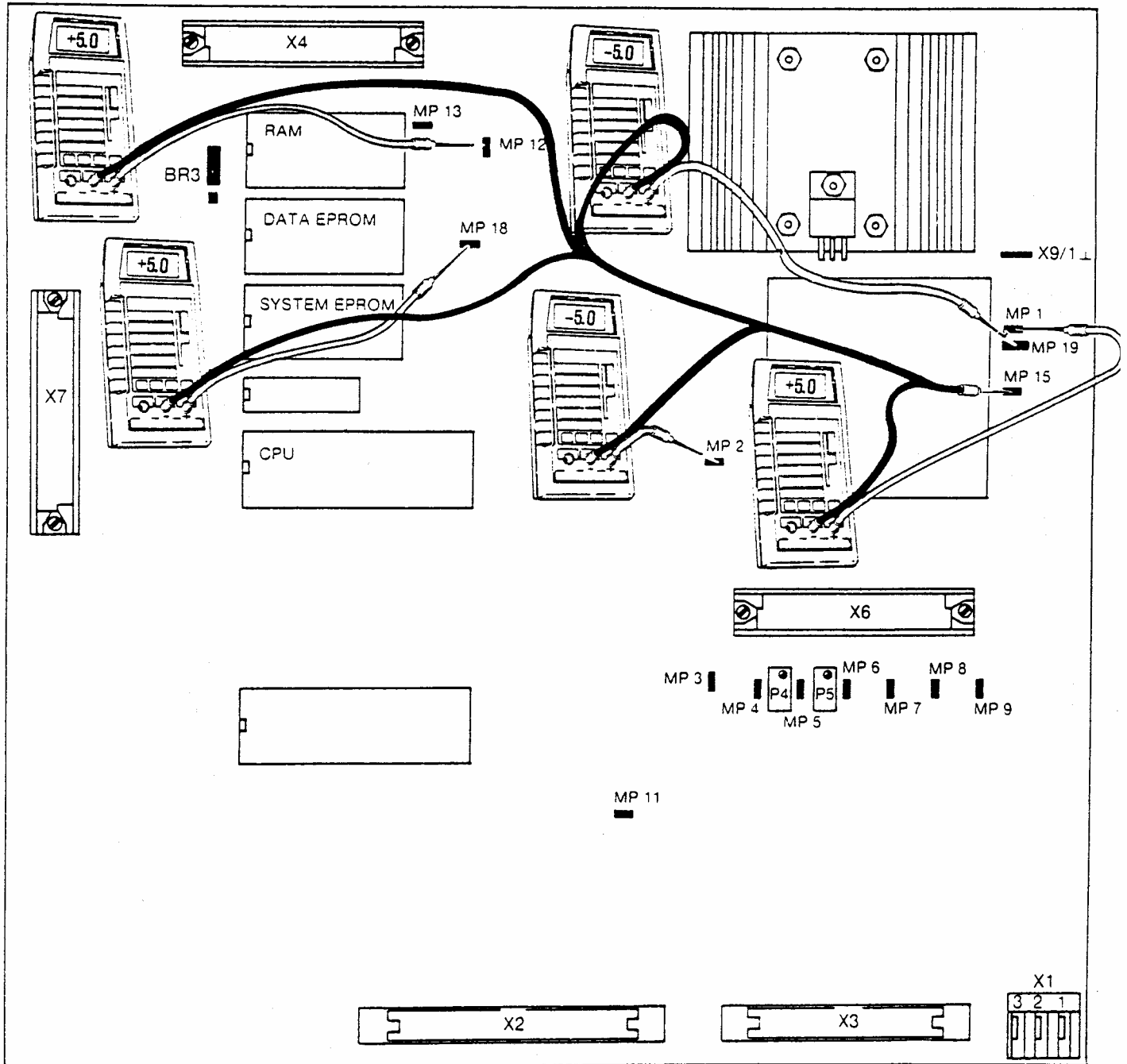
Power Supply Test Points

- MP 1 = + 5V
- MP 2 = - 5V
- MP 11 = Ground
- MP 12 = + 5V
- MP 13 = Digital Ground
- MP 15 = Analog Ground
- MP 19 = - 5V

Analog Measuring Channels/Test Points

- Ch. 1 Boom Length — MP 6/P6 - Do Not Adjust
- Ch. 2 Piston Pressure — MP 4/P4
- Ch. 3 Rod Pressure — MP 5/P5
- Ch. 4 Force Transducer — MP 3/P3 - Do Not Adjust
- Ch. 5 Boom Angle — MP 8/P8 - Do Not Adjust
- Ch. 6 Jib Angle — MP 9/P9 - Do Not Adjust

Voltage Check Between Pins 1 and 2 on CPU Main Board, Terminal Block X1 (RT875CC)



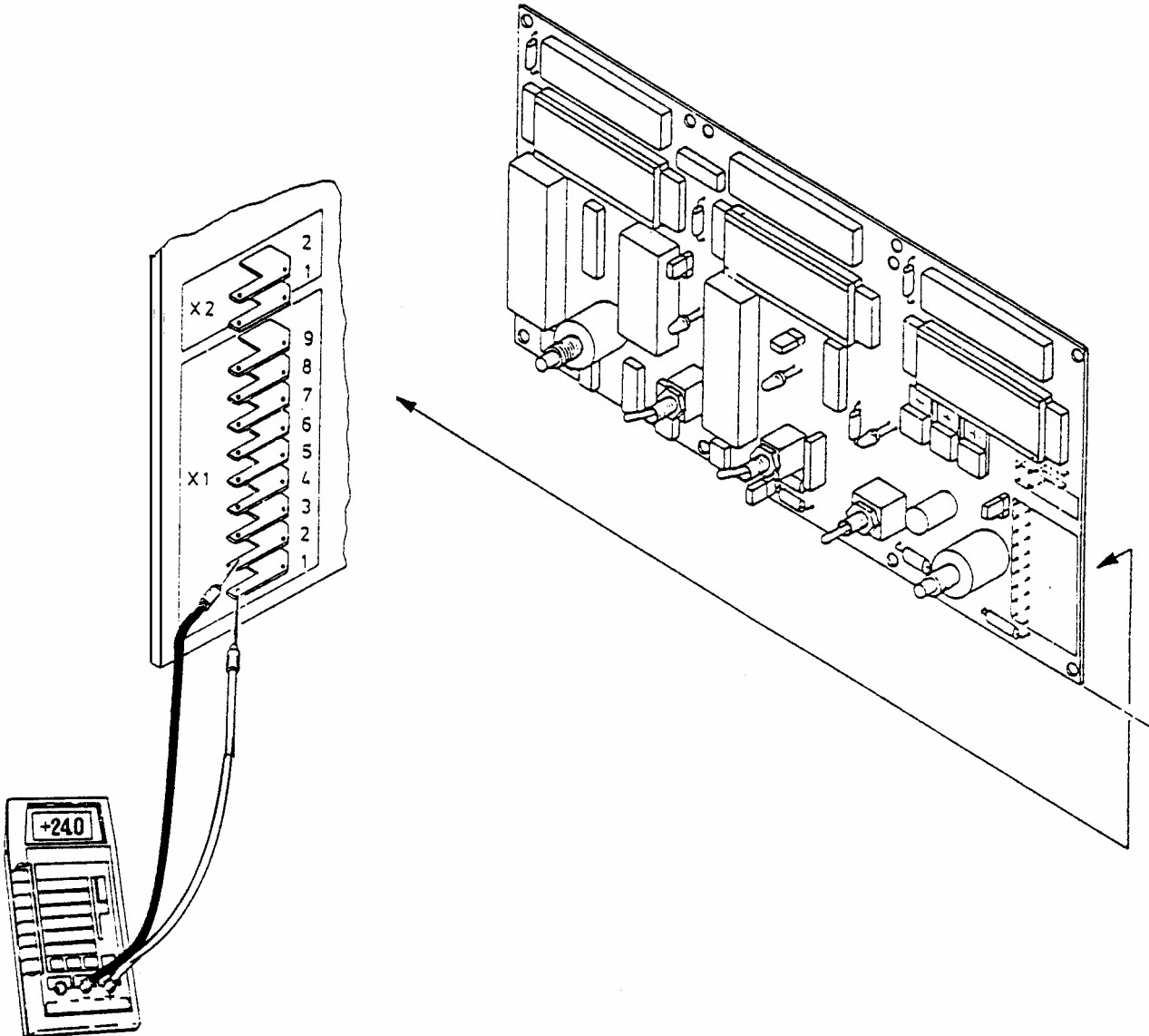
Power Supply Test Points

- MP 1 = + 5V
- MP 2 = - 5V
- MP 11 = Ground
- MP 12 = + 5V
- MP 13 = Digital Ground
- MP 15 = Analog Ground
- MP 19 = - 5V

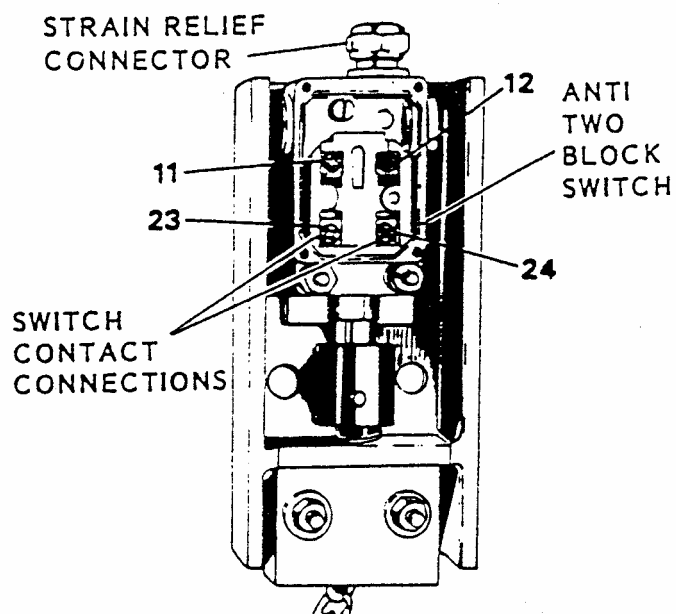
Analog Measuring Channels/Test Points

- Ch. 1 Boom Length — MP 6/P6 - Do Not Adjust
- Ch. 2 Piston Pressure — MP 4/P4
- Ch. 3 Rod Pressure — MP 5/P5
- Ch. 4 Force Transducer — MP 3/P3 - Do Not Adjust
- Ch. 5 Boom Angle — MP 8/P8 - Do Not Adjust
- Ch. 6 Jib Angle — MP 9/P9 - Do Not Adjust

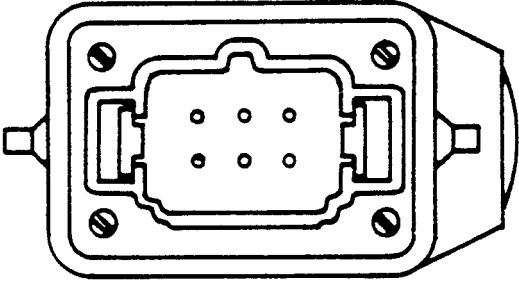
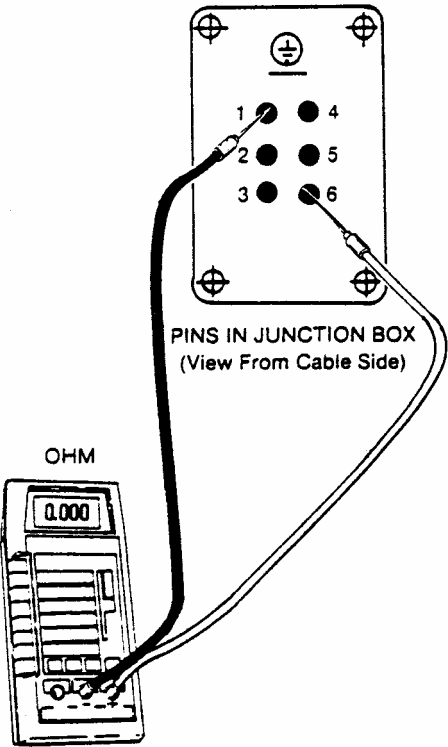
Voltage Check Between Various Measuring Points (MP) on CPU Main Board (RT875CC)



Voltage Check Between Pins 1 and 2 on Display Console Terminal Block X1 (RT875CC)

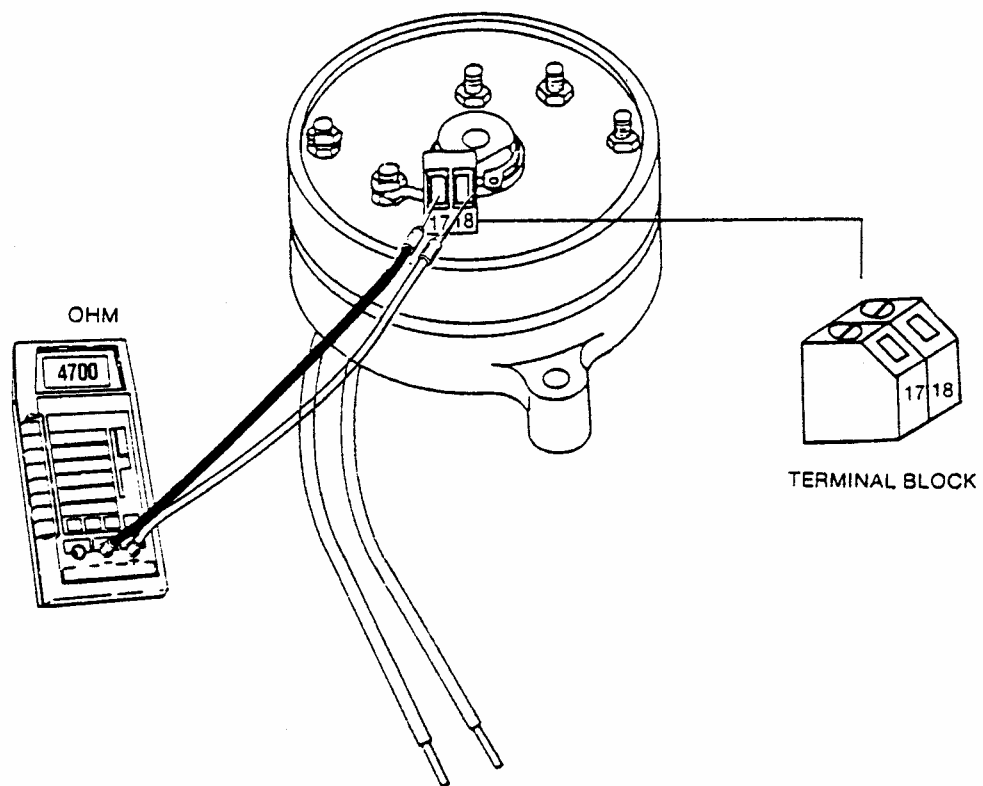


Receptacle at Boom Nose (RT875CC)

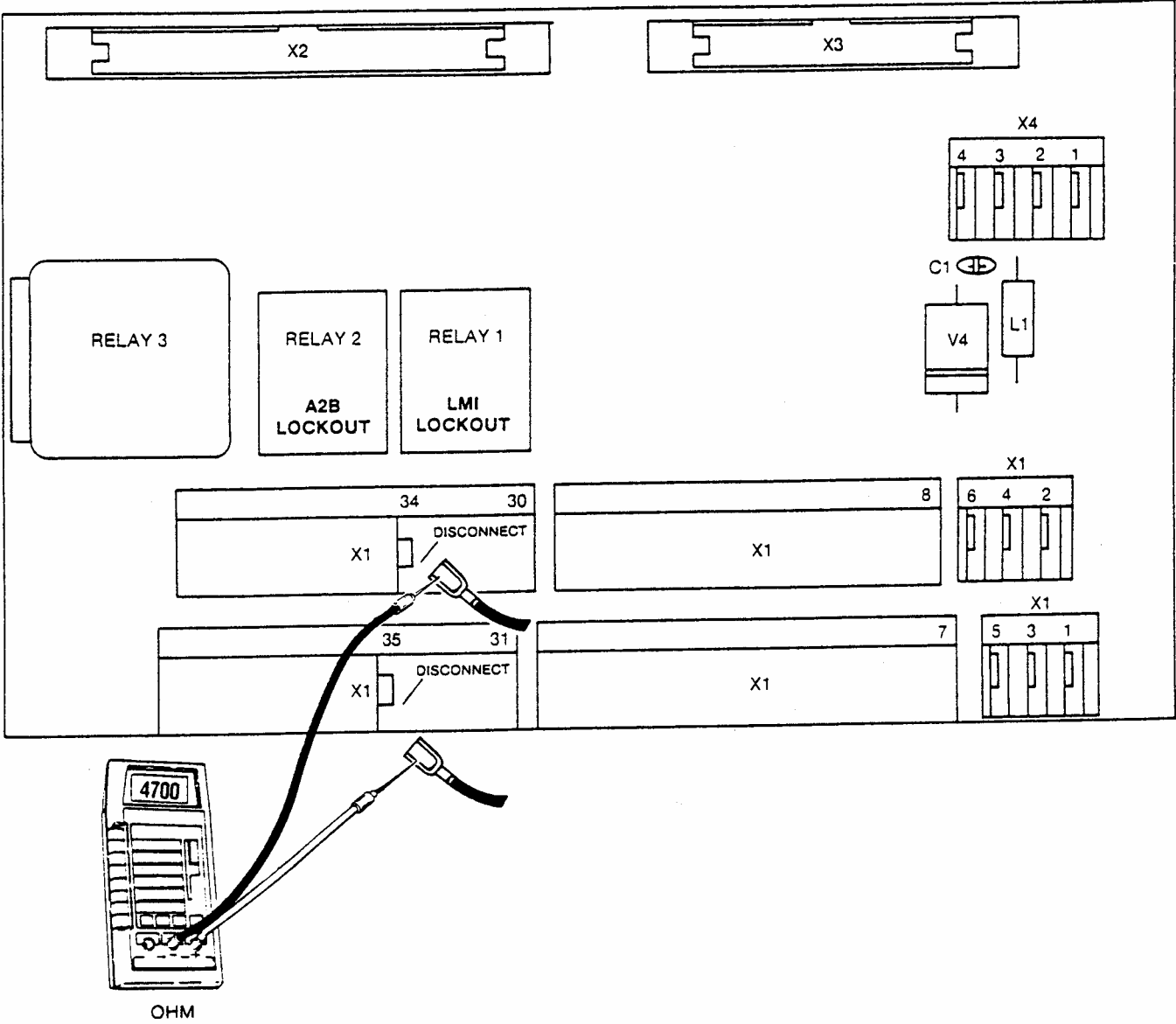


DUMMY PLUG WITH RESISTOR 4700 OHM
BETWEEN PIN 1 AND GROUND PIN

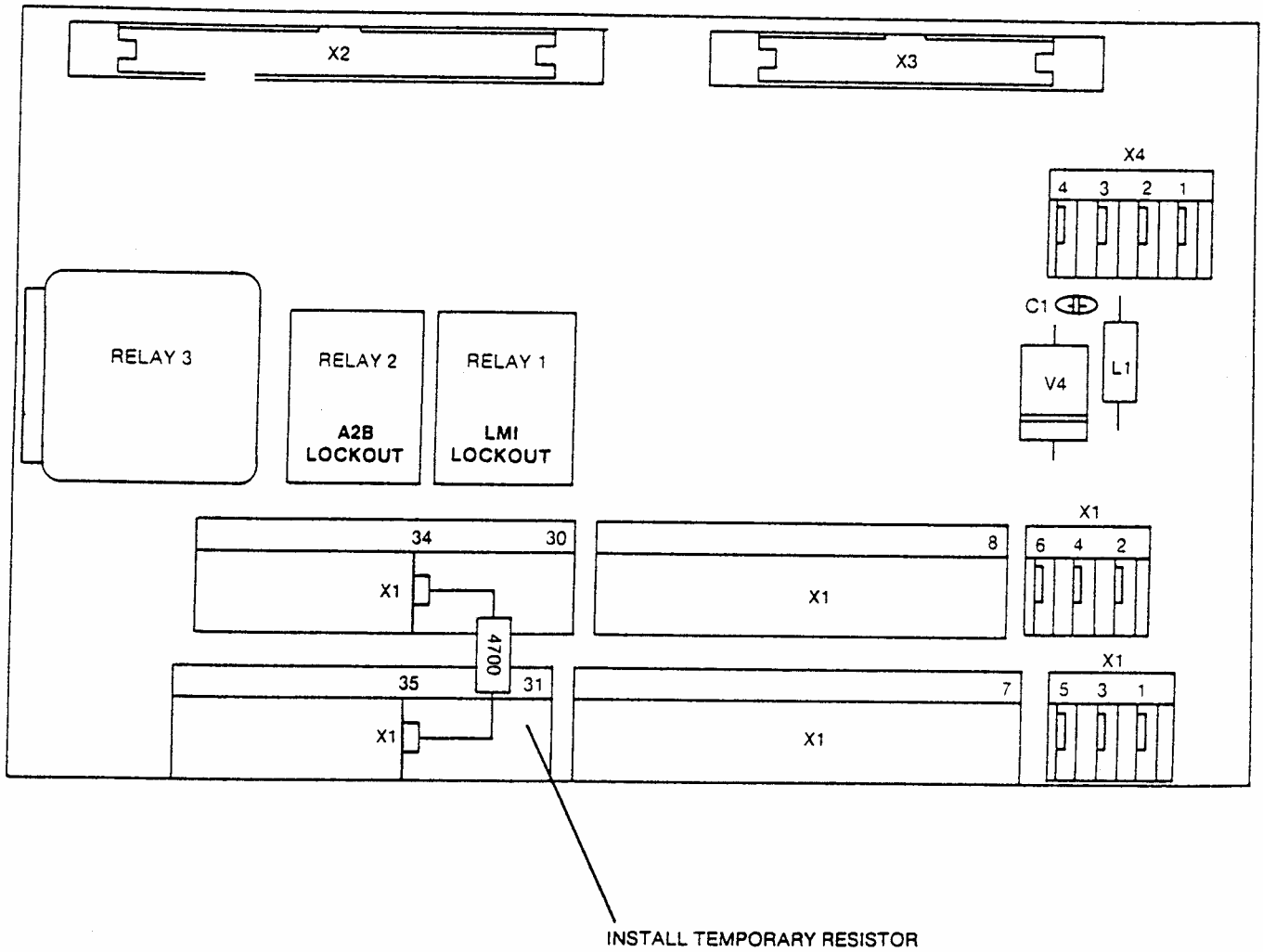
Continuity Check Between Pins 1 and 6 of Receptacle at Boom Nose (RT875CC)



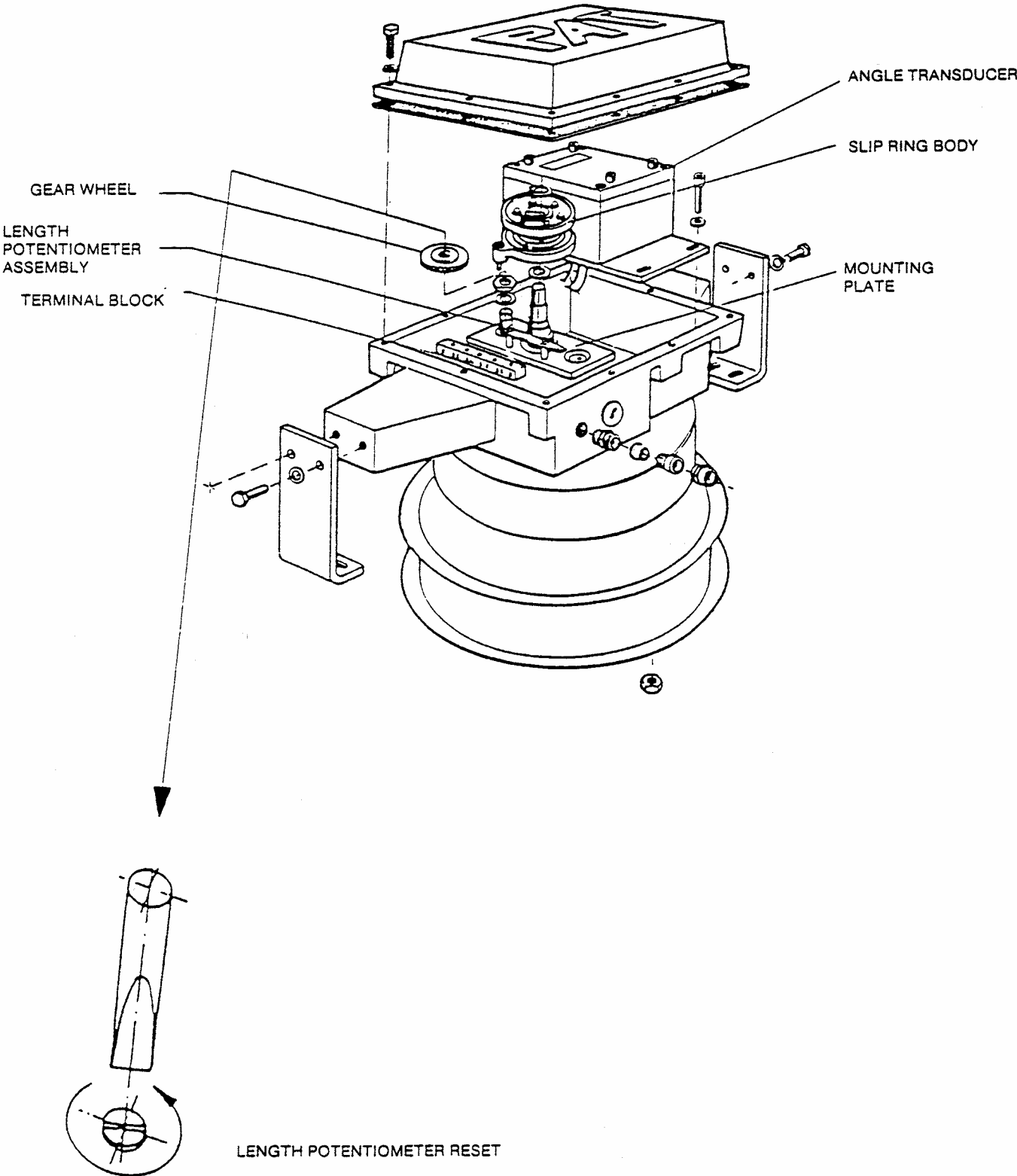
Continuity Check Between Pins 17 and 18 of Slip Ring (RT875CC)



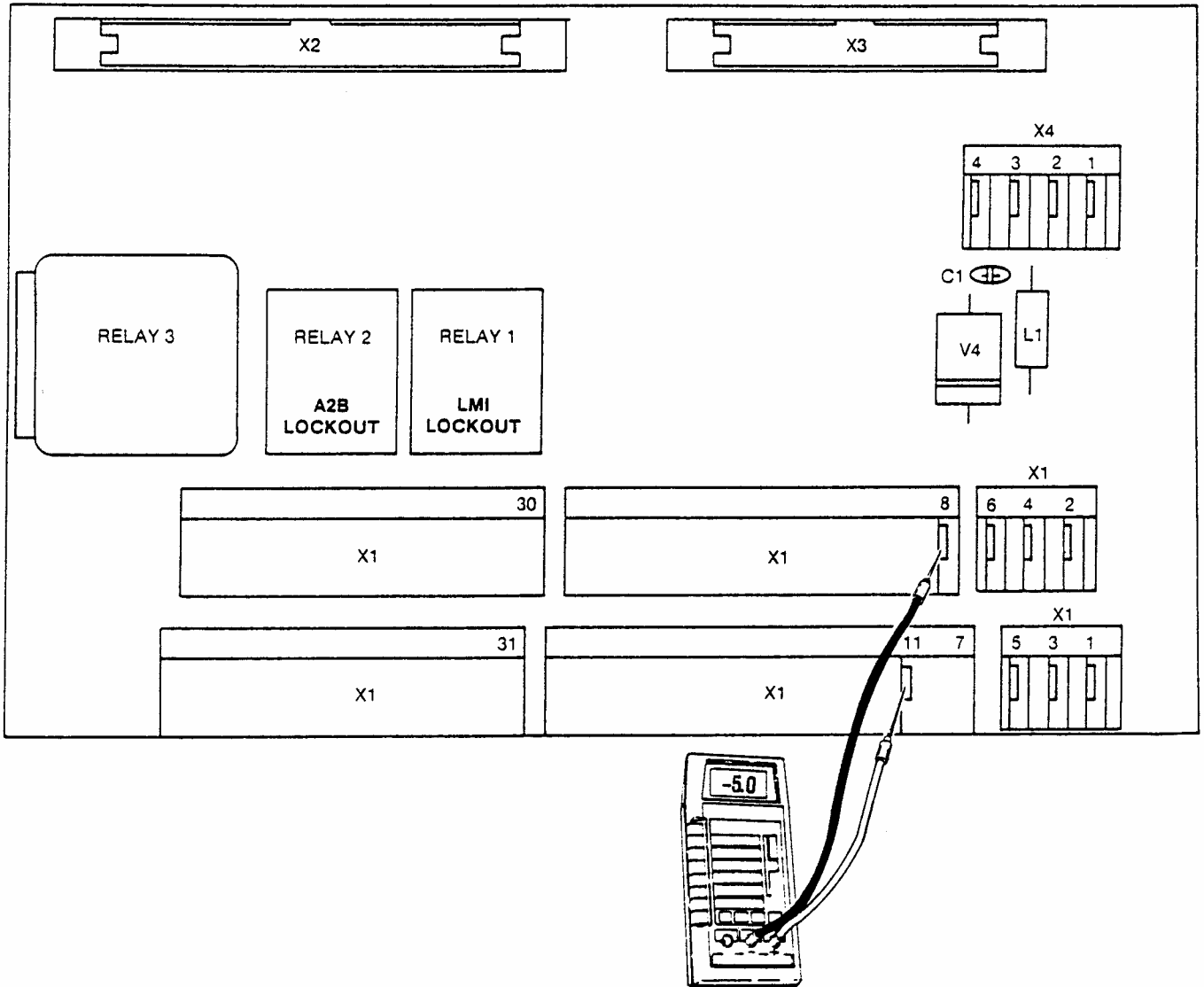
Continuity Check Between Wires Disconnected From Pins 34 and 35 of CPU Terminal Board, Terminal Block X1 (RT875CC)



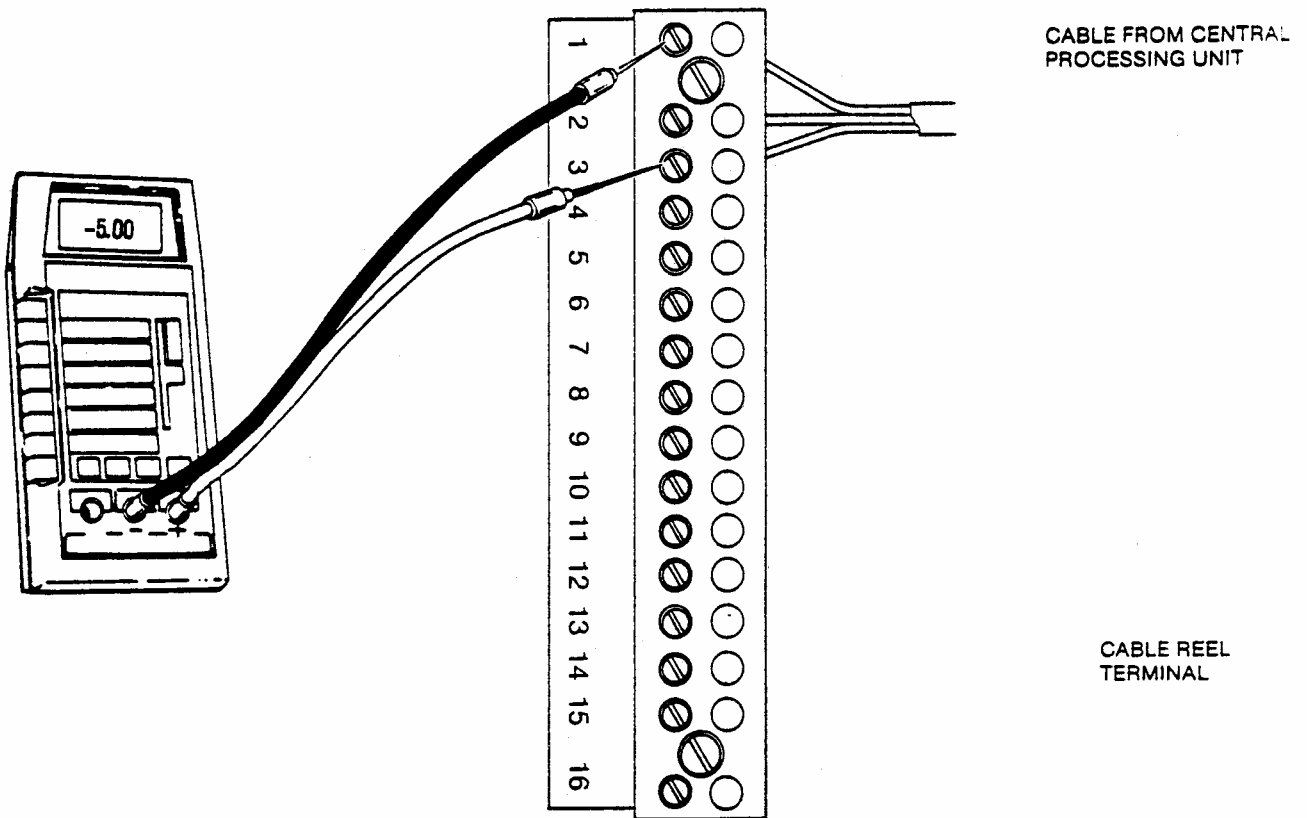
Temporary Resistor Installed Between Pins 34 and 35 of CPU Terminal Board, Terminal Block X1 (RT875CC)



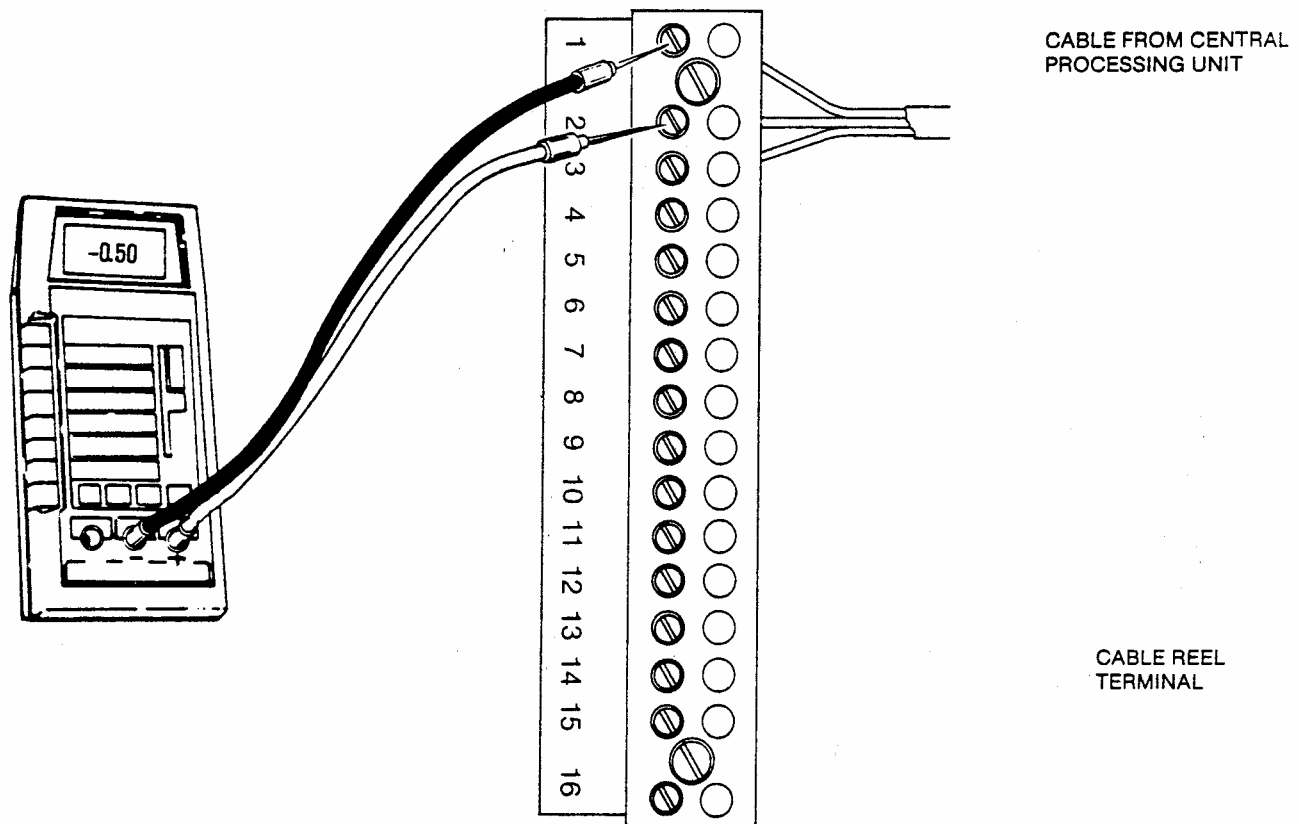
Boom Length/Angle Cable Reel Assembly (RT875CC)



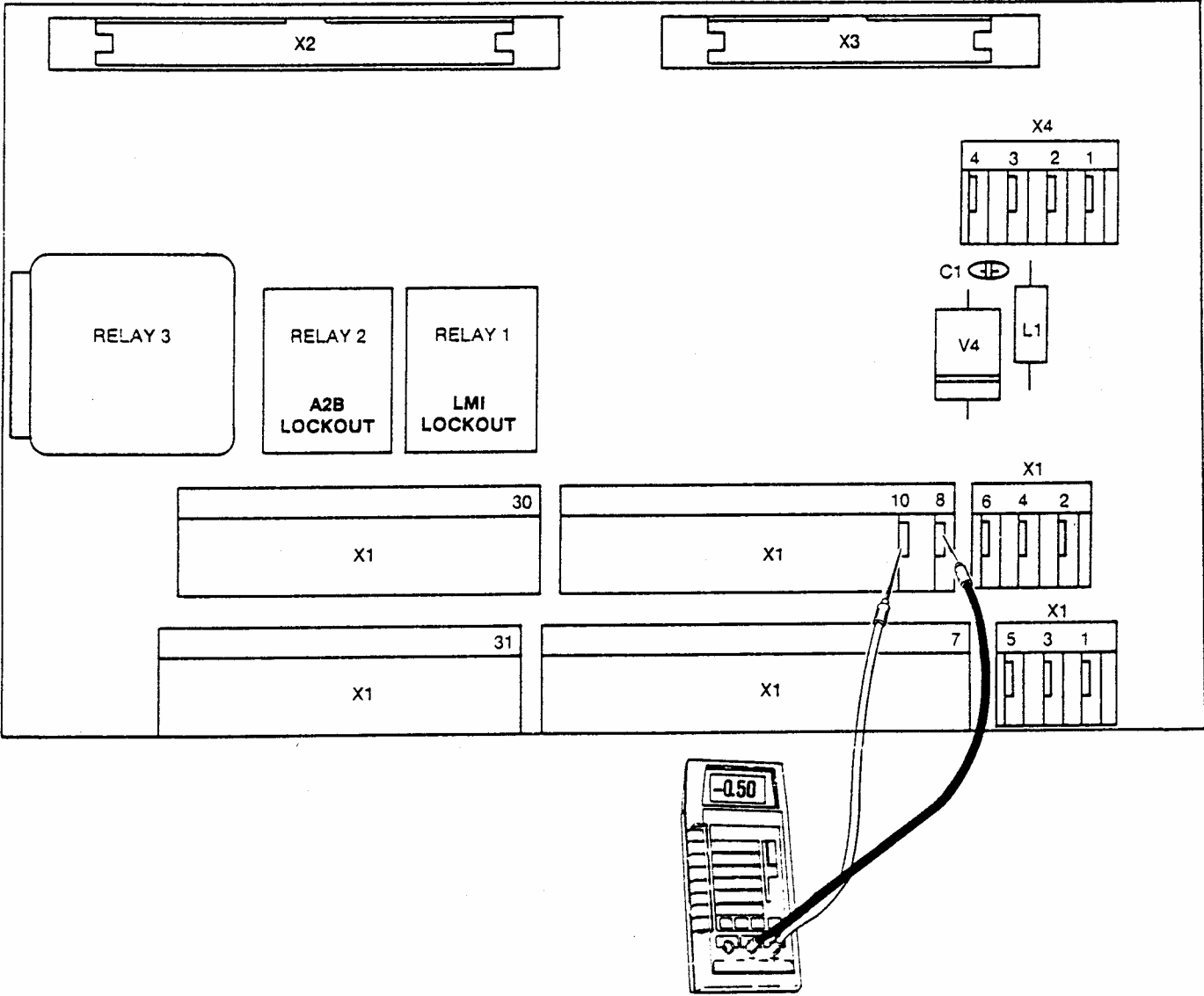
Voltage Check Between Pins 8 and 11 on CPU Terminal Board, Terminal Block X1 (RT875CC)



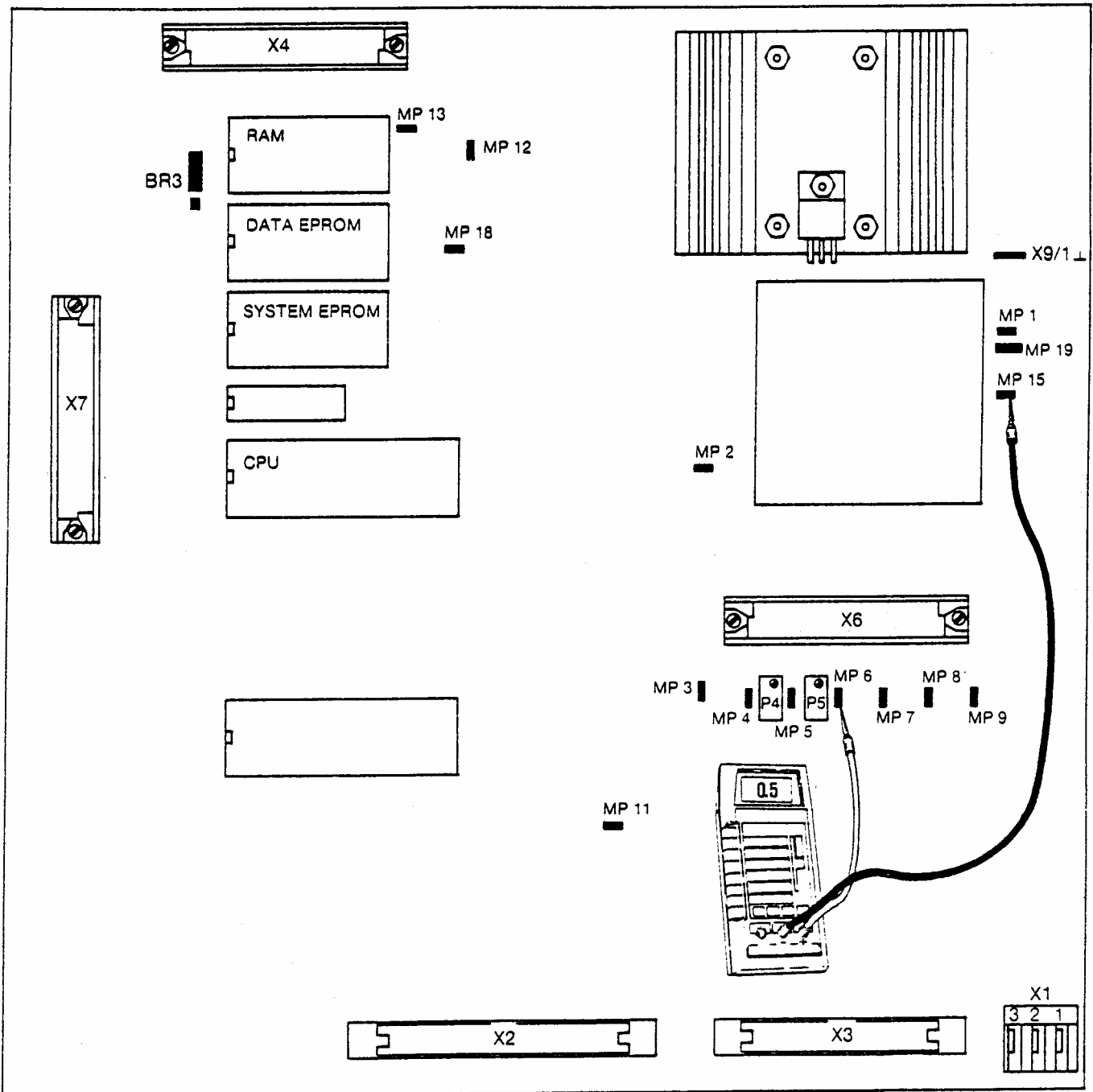
Voltage Check Between Pins 1 and 3 on Terminal Block in Cable Reel (RT875CC)



Voltage Check Between Pins 1 and 2 on Terminal Block in Cable Reel (RT875CC)



Voltage Check Between Pins 8 and 10 on CPU Terminal Board, Terminal Block X1 (RT875CC)



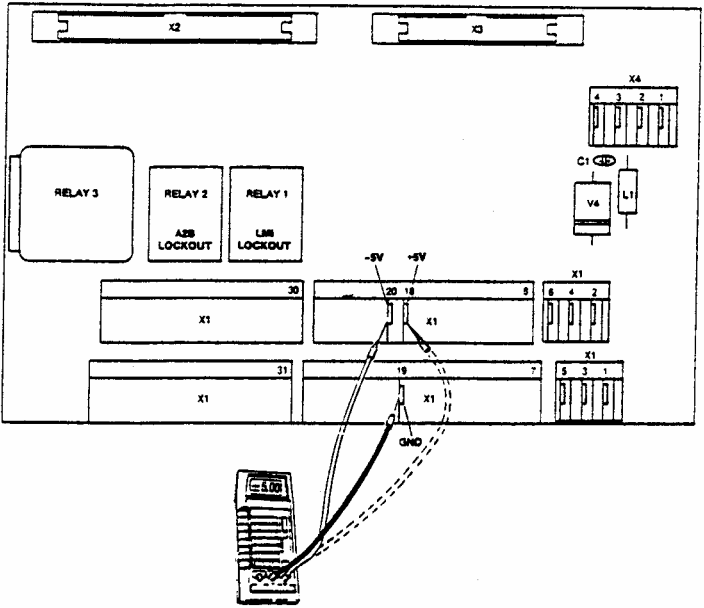
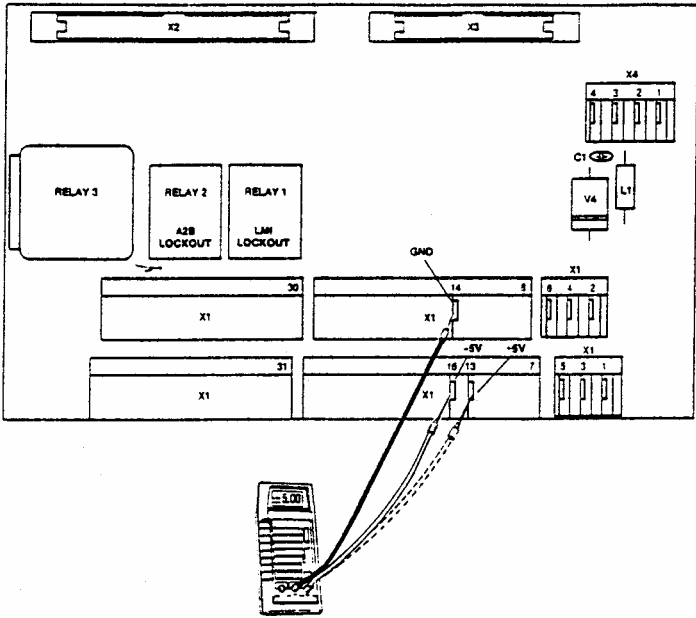
Power Supply Test Points

- MP 1 = + 5V
- MP 2 = - 5V
- MP 11 = Ground
- MP 12 = + 5V
- MP-13 = Digital Ground
- MP 15 = Analog Ground
- MP 19 = - 5V

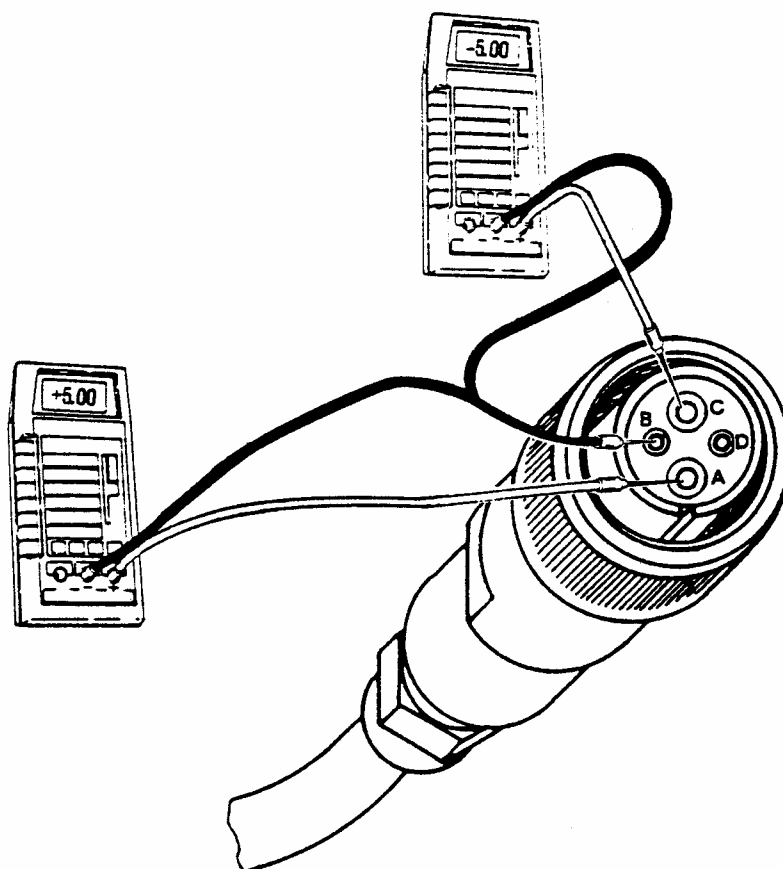
Analog Measuring Channels/Test Points

- Ch. 1 Boom Length — MP 6/P6 - Do Not Adjust
- Ch. 2 Piston Pressure — MP 4/P4
- Ch. 3 Rod Pressure — MP 5/P5
- Ch. 4 Force Transducer — MP 3/P3 - Do Not Adjust
- Ch. 5 Boom Angle — MP 8/P8 - Do Not Adjust
- Ch. 6 Jib Angle — MP 9/P9 - Do Not Adjust

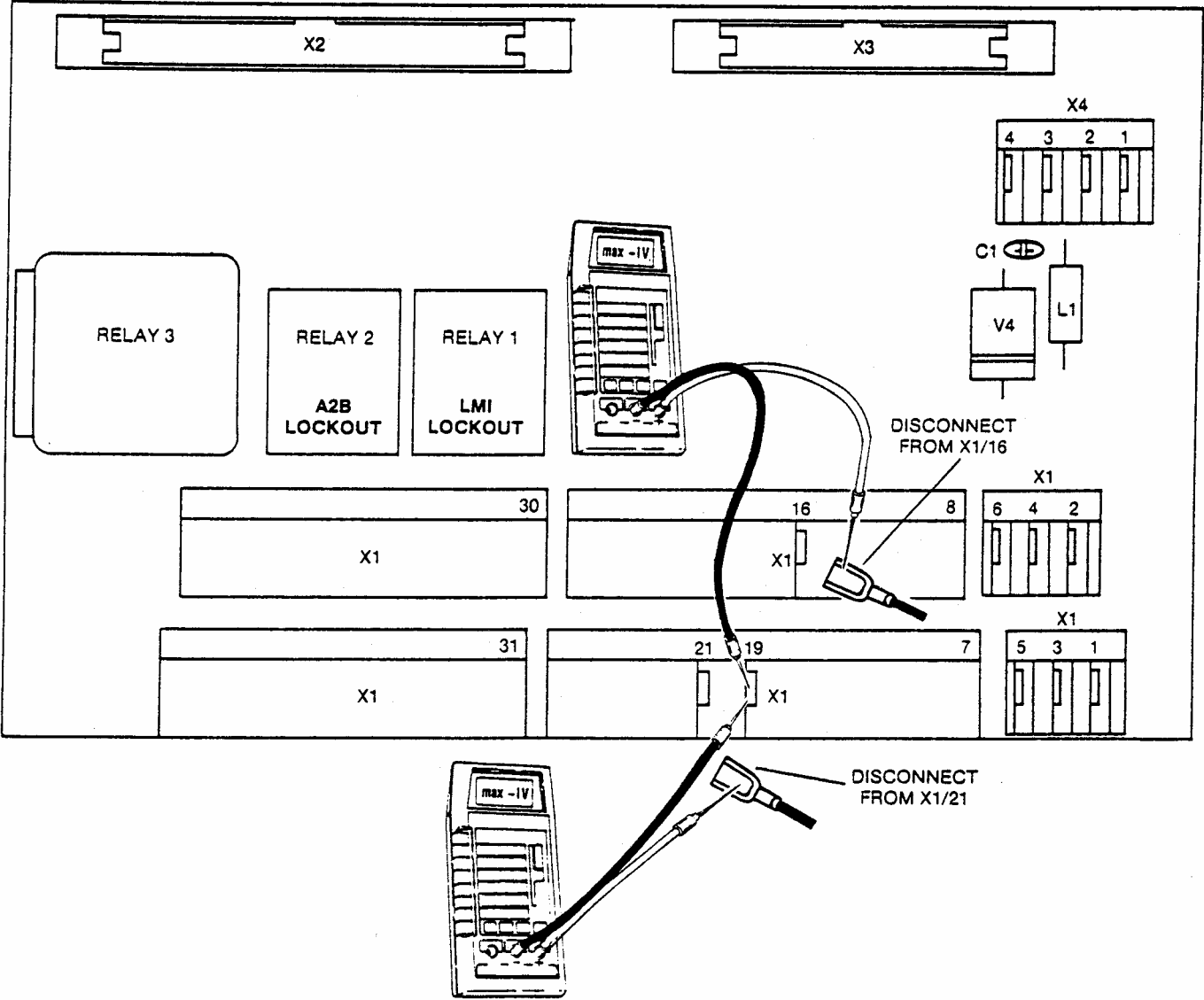
Voltage Check Between Measuring Points (MP) MP15 and MP6 on CPU Main Board (RT875CC)



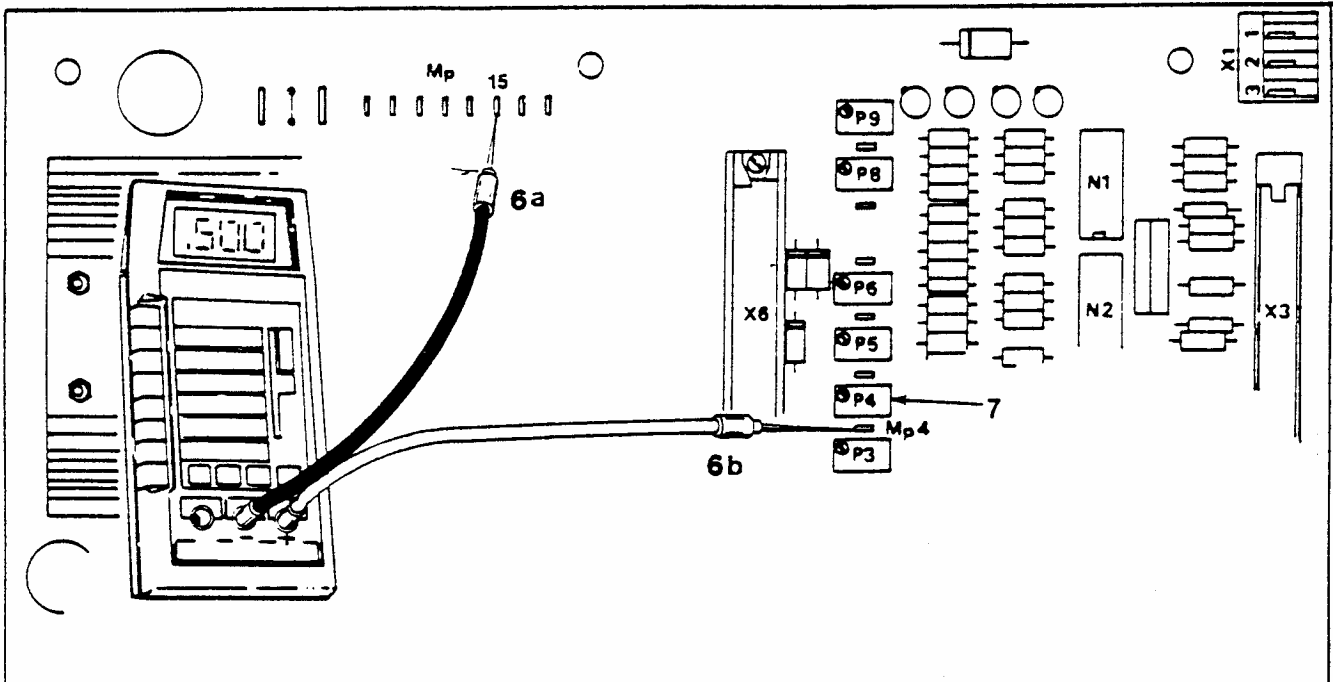
Voltage Check Between Pins 14 and 15/13 and 19 and 20/18 on CPU Terminal Board, Terminal Block X1 (RT875CC)



Voltage Check Between Pins B and A/C of Pressure Transducer Plugs (RT875CC)



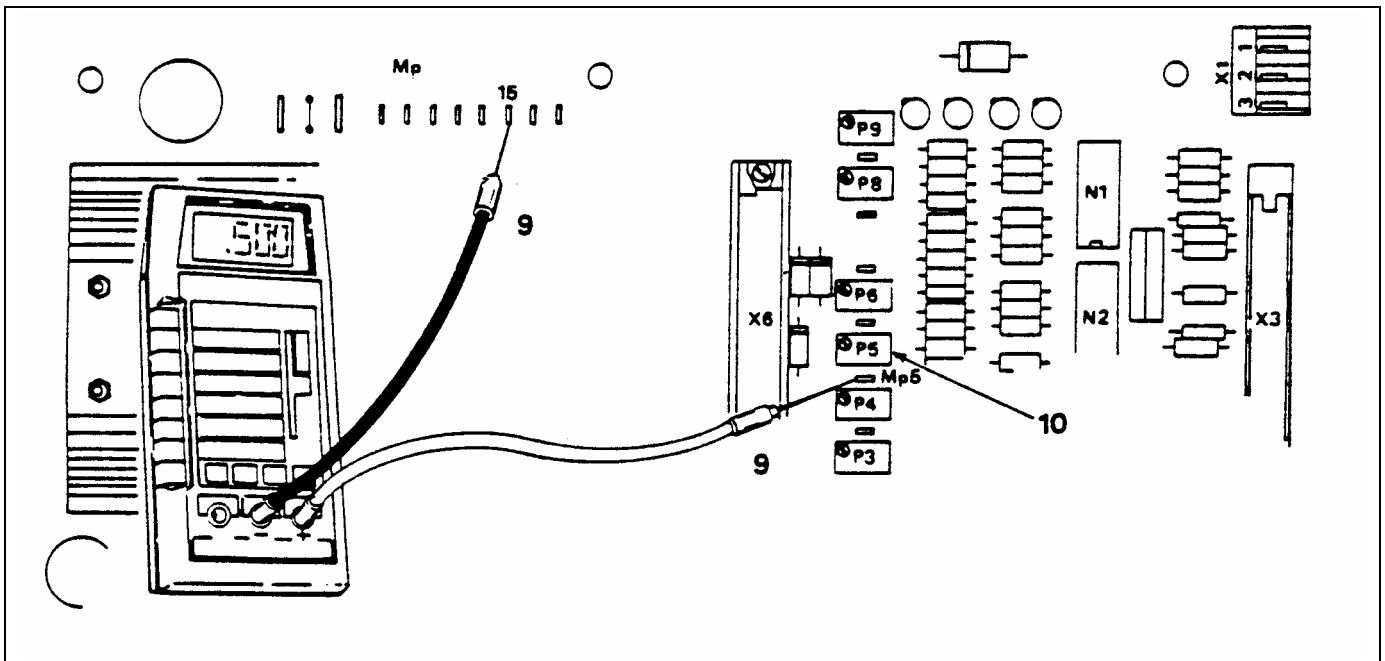
Voltage Check Between Pins 19 and 16/21 on CPU Terminal Board, Terminal Block X1 (RT875CC)



**PISTON PRESSURE CHANNEL
ZERO POINT ADJUSTMENT**

5. LOWER BOOM ALL THE WAY DOWN, SHUT THE ENGINE OFF THEN DISCONNECT HYDRAULIC HOSE FROM THE PISTON SIDE PRESSURE TRANSDUCER.
6. CONNECT A DIGITAL VOLTMETER TO MAIN P.C. BOARD
 - a) BLACK (-) LEAD TO Mp15
 - b) RED (+) LEAD TO Mp 4
7. ADJUST P4 TO OBTAIN A READING OF .500 VOLTS (500mv) ON METER.

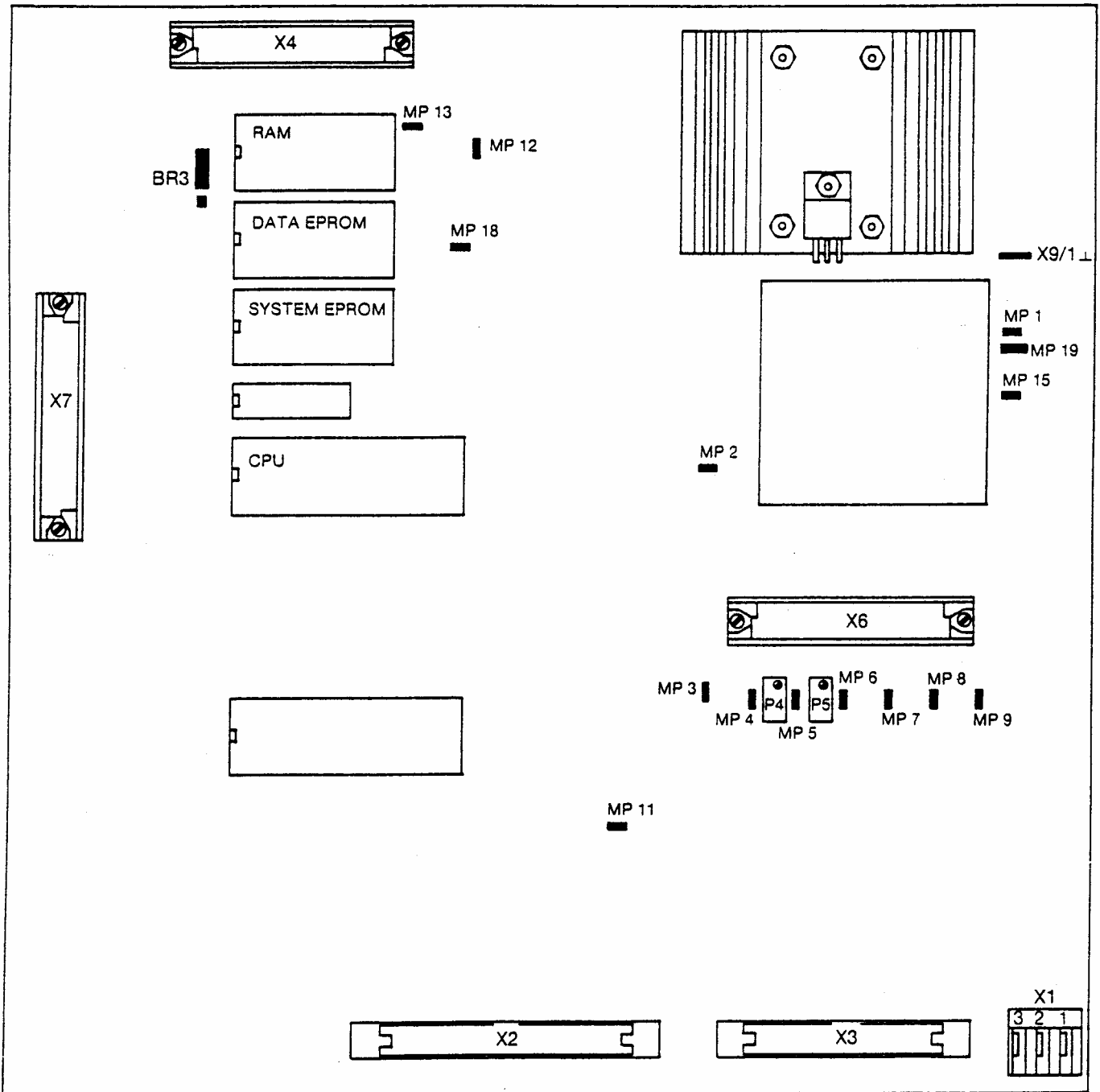
Voltage Check Between Measuring Points (MP) MP15 and MP4 on CPU Main Board (RT875CC)



**ROD PRESSURE CHANNEL
ZERO POINT ADJUSTMENT**

8. **DISCONNECT HYDRAULIC HOSE FROM THE ROD SIDE PRESSURE TRANSDUCER.**
9. **LEAVE BLACK (-) LEAD CONNECTED TO Mp15
MOVE RED (+) LEAD TO Mp5.**
10. **ADJUST P5 TO OBTAIN A READING OF .500
VOLTS (500mv) ON METER.**
11. **RECONNECT HYDRAULIC HOSES TO PRESSURE
TRANSDUCERS, THEN BLEED AIR FROM HYDRAULIC
LINES.**
12. **PUT THE OUTSIDE COVER BACK INTO PLACE, SECURE
WITH THE (8) SCREWS TAKEN OUT DURING THE
DISASSEMBLY PROCEDURE, REPLACE WIRE SEAL.**

Voltage Check Between Measuring Points (MP) MP15 and MP5 on CPU Main Board (RT875CC)



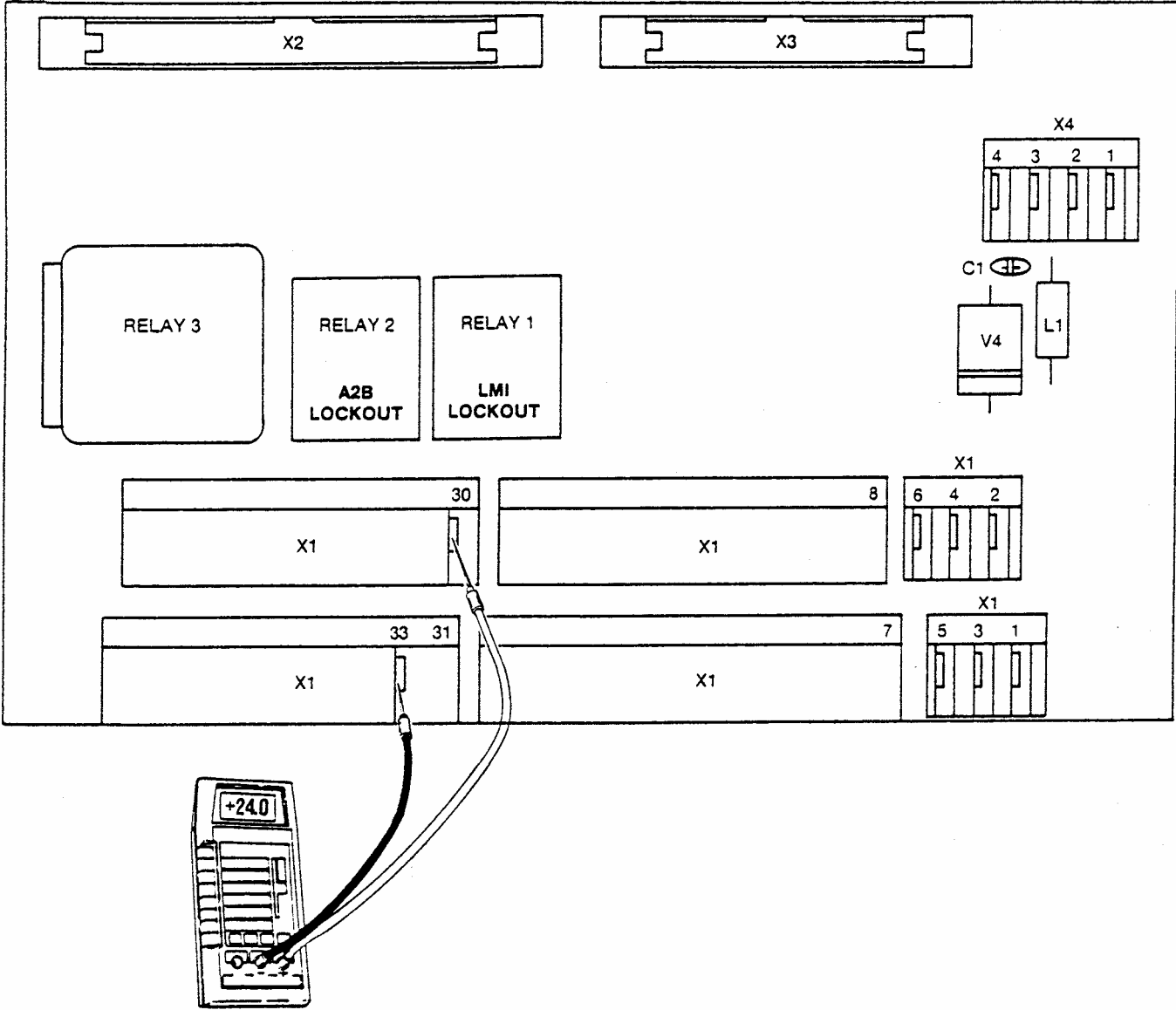
Power Supply Test Points

- MP 1 = + 5V
- MP 2 = - 5V
- MP 11 = Ground
- MP 12 = + 5V
- MP 13 = Digital Ground
- MP 15 = Analog Ground
- MP 19 = - 5V

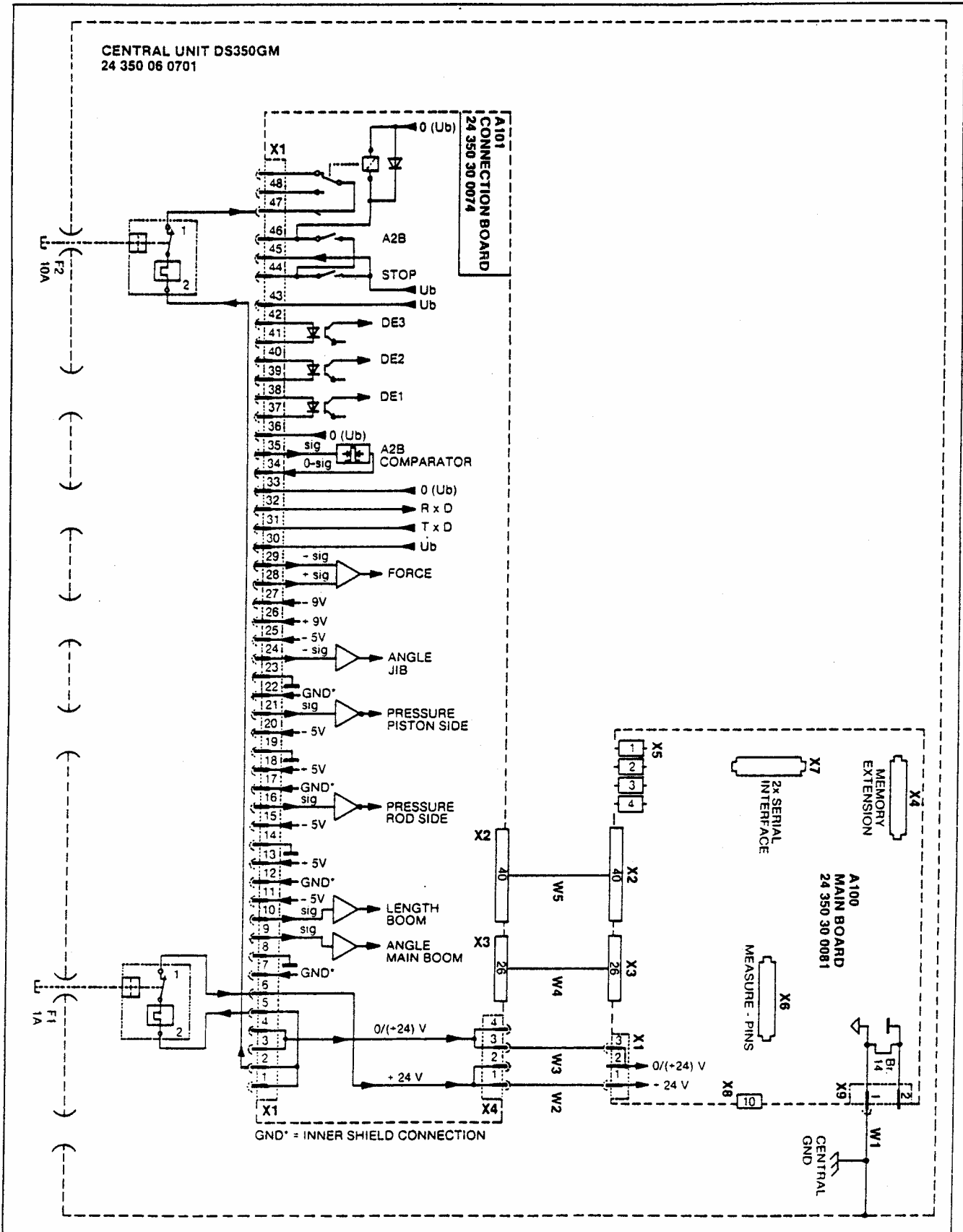
Analog Measuring Channels/Test Points

- Ch. 1 Boom Length — MP 6/P6 - Do Not Adjust
- Ch. 2 Piston Pressure — MP 4/P4
- Ch. 3 Rod Pressure — MP 5/P5
- Ch. 4 Force Transducer — MP 3/P3 - Do Not Adjust
- Ch. 5 Boom Angle — MP 8/P8 - Do Not Adjust
- Ch. 6 Jib Angle — MP 9/P9 - Do Not Adjust

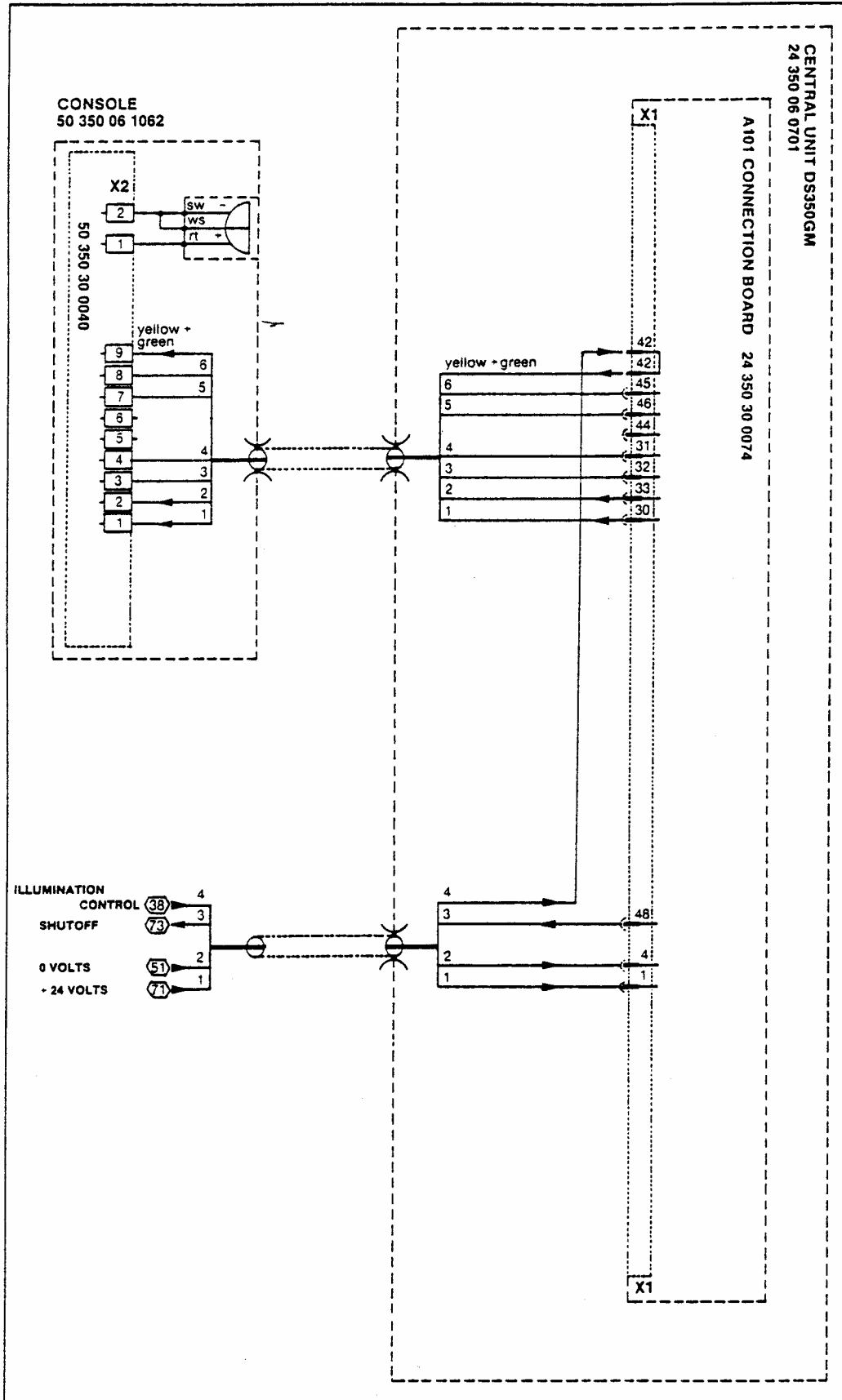
EPROM Locations on CPU Main Board (RT875CC)



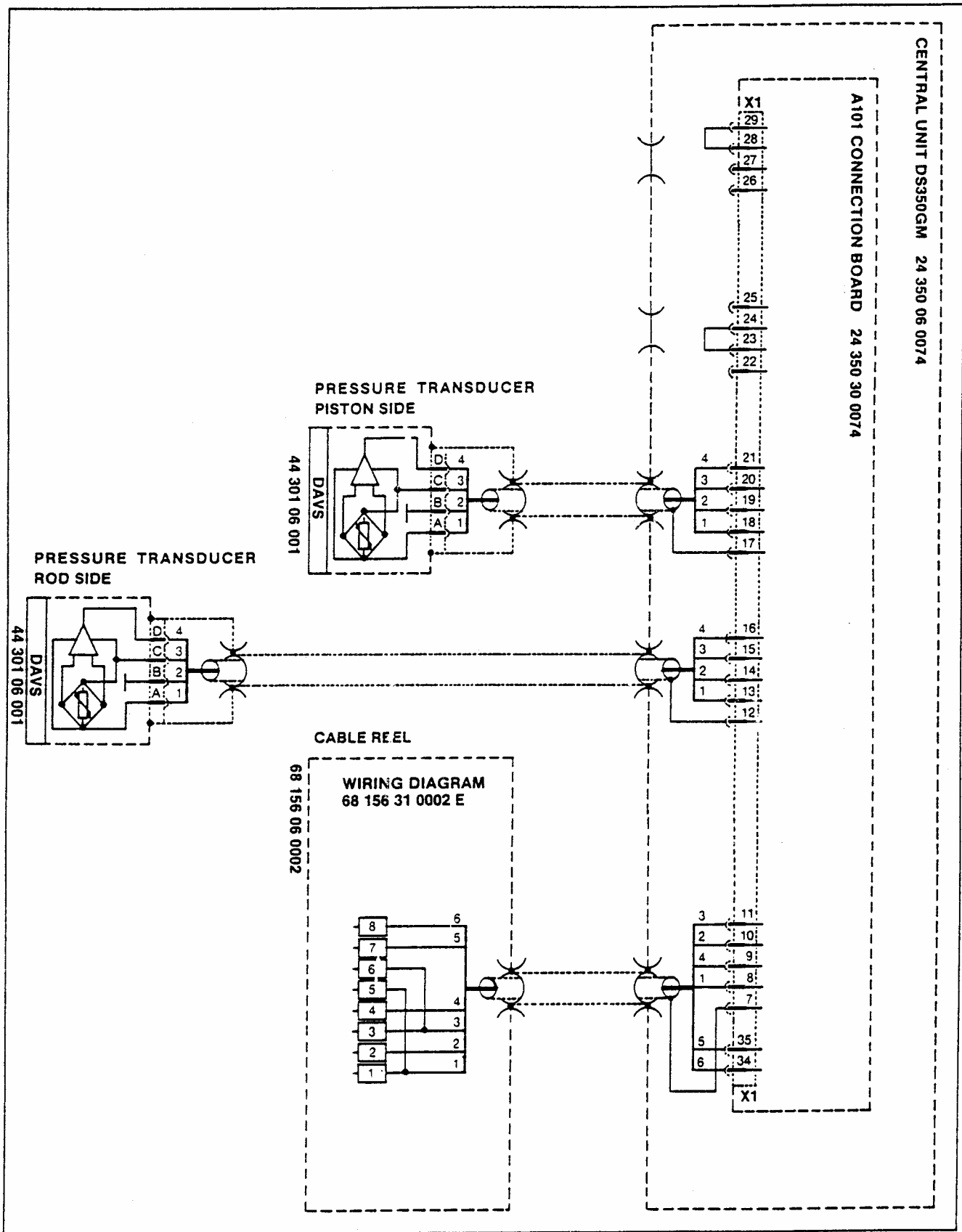
Voltage Check Between Pins 33 and 30 on CPU Terminal Board, Terminal Block X1 (RT875CC)



Load Moment Indicator (LMI) System Electrical Schematic (RT875CC) (Sheet 1 of 3)

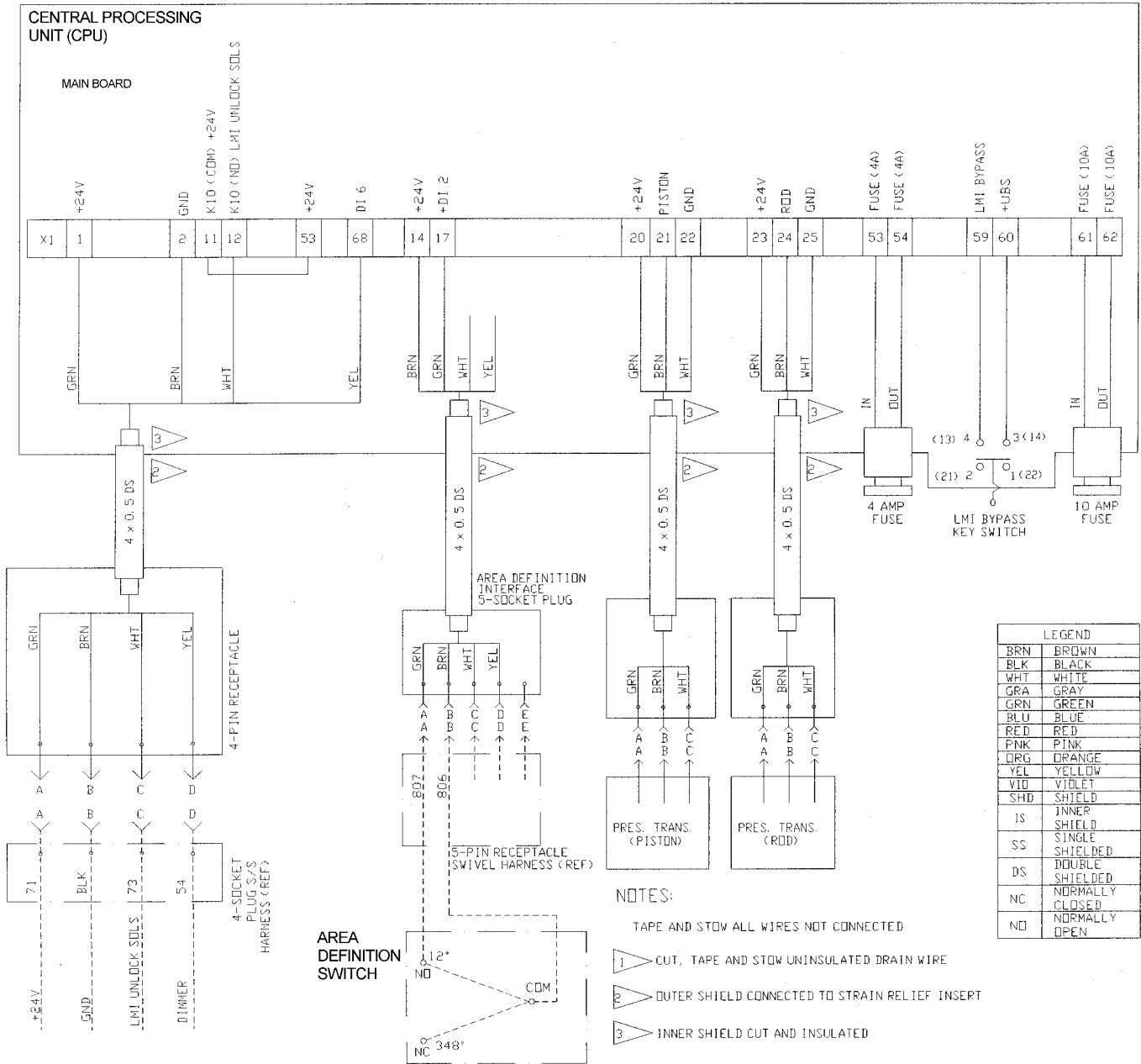


Load Moment Indicator (LMI) System Electrical Schematic (RT875CC) (Sheet 2 of 3)



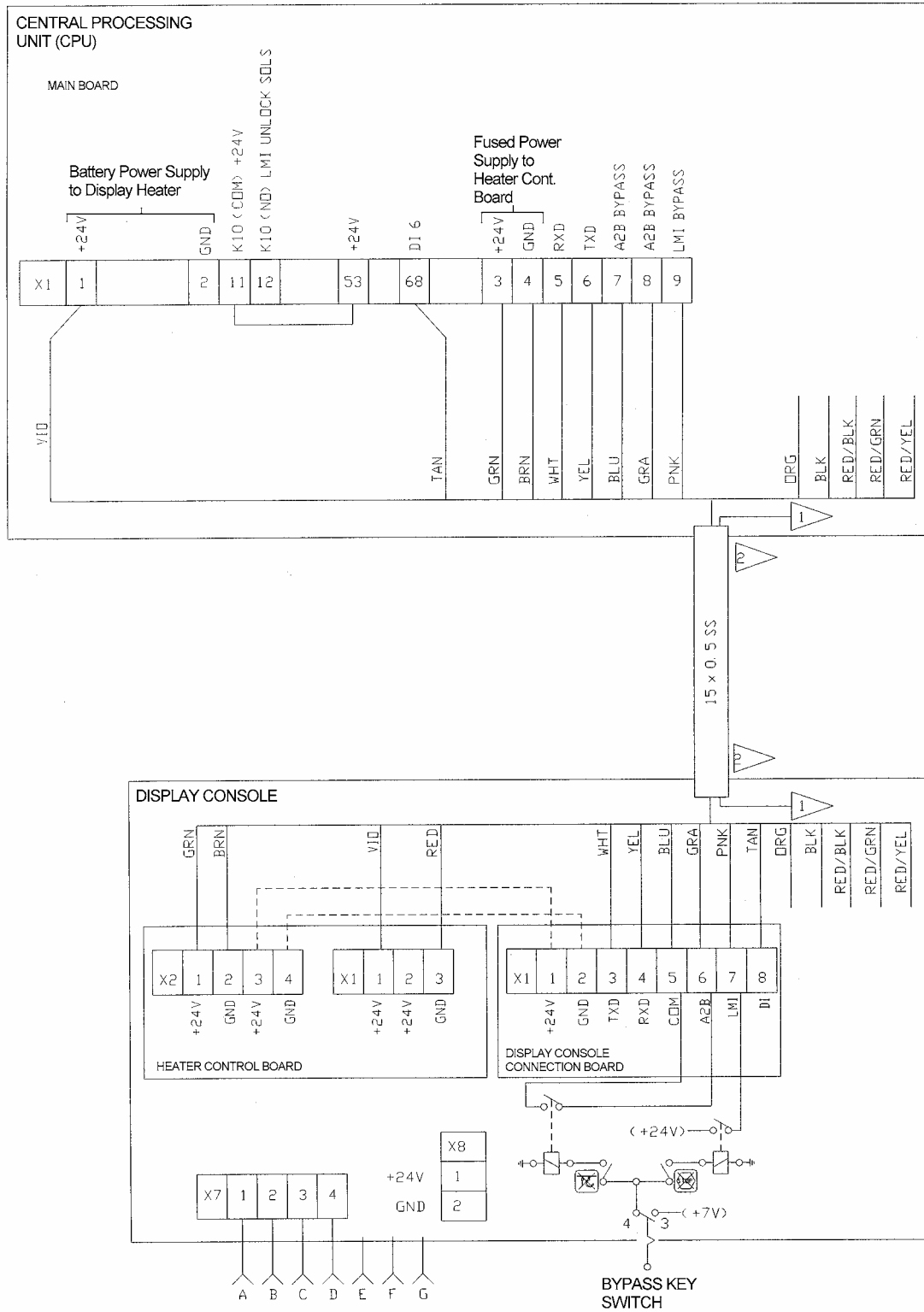
Load Moment Indicator (LMI) System Electrical Schematic (RT875CC) (Sheet 3 of 3)

Central Processing Unit (CPU) to Pressure Transducers and Crane



Load Moment Indicator (LMI) System Electrical Schematic (RT875CCS) (Sheet 1 of 3)

Central Processing Unit (CPU) to Display Console



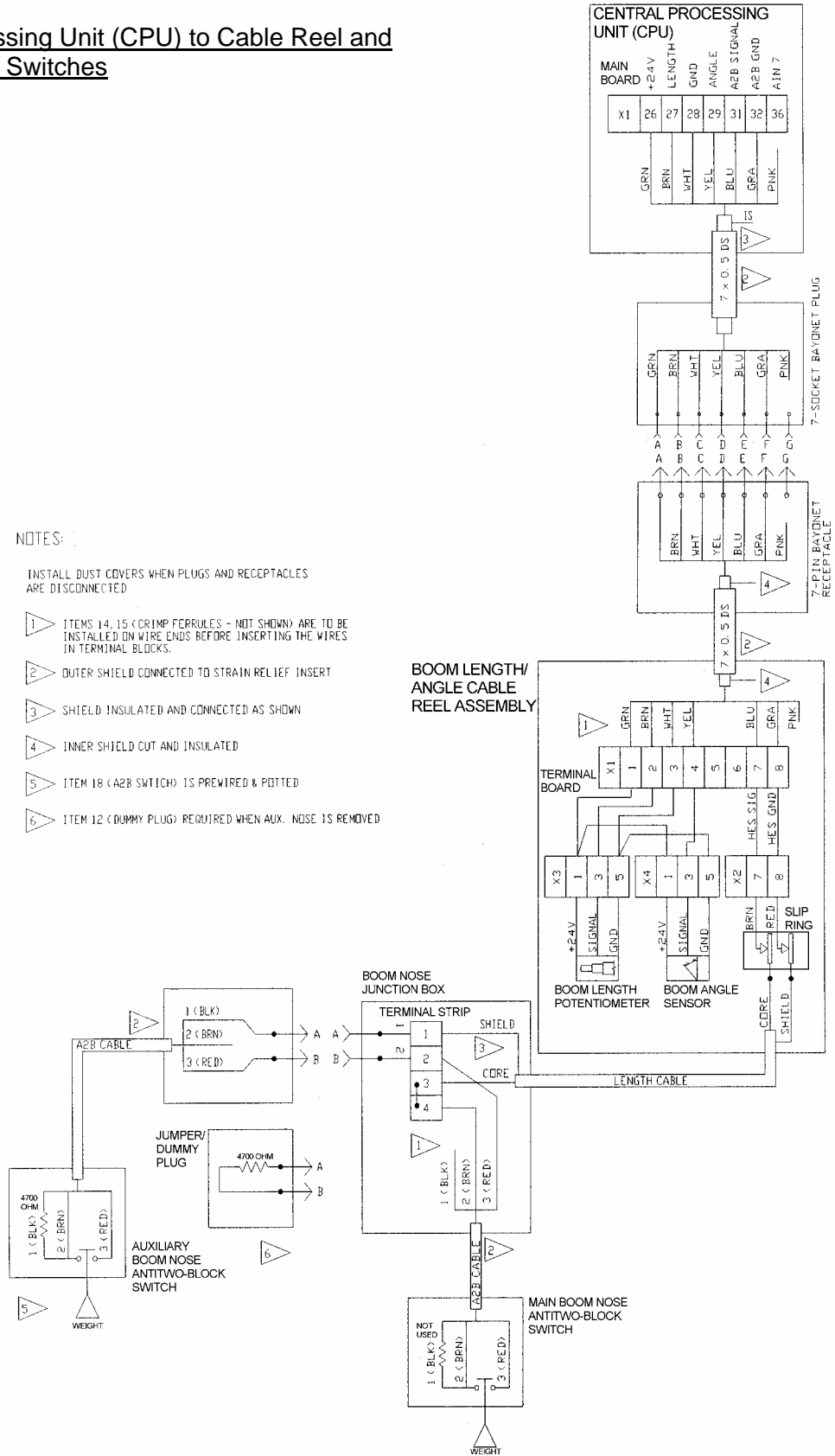
Load Moment Indicator (LMI) System Electrical Schematic (RT875CCS) (Sheet 2 of 3)

Central Processing Unit (CPU) to Cable Reel and Anti-two Block Switches

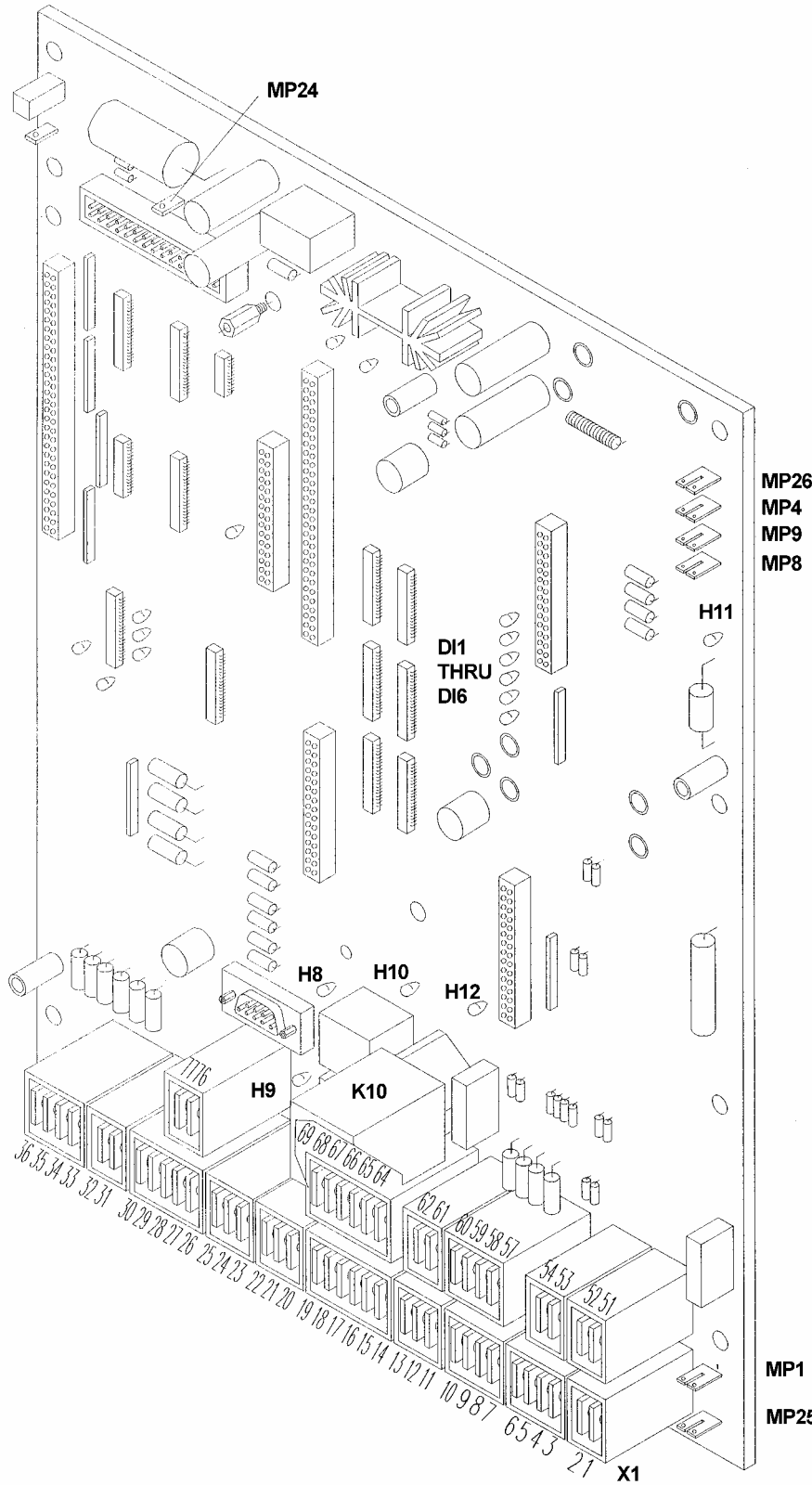
NOTES:

INSTALL DUST COVERS WHEN PLUGS AND RECEPTACLES ARE DISCONNECTED

- 1 ITEMS 14, 15 (CRIMP FERRULES - NOT SHOWN) ARE TO BE INSTALLED ON WIRE ENDS BEFORE INSERTING THE WIRES IN TERMINAL BLOCKS.
- 2 OUTER SHIELD CONNECTED TO STRAIN RELIEF INSERT
- 3 SHIELD INSULATED AND CONNECTED AS SHOWN
- 4 INNER SHIELD CUT AND INSULATED
- 5 ITEM 18 (A2B SWITCH) IS PREWIRED & POTTED
- 6 ITEM 12 (DUMMY PLUG) REQUIRED WHEN AUX. NOISE IS REMOVED



Load Moment Indicator (LMI) System Electrical Schematic (RT875CCS) (Sheet 3 of 3)



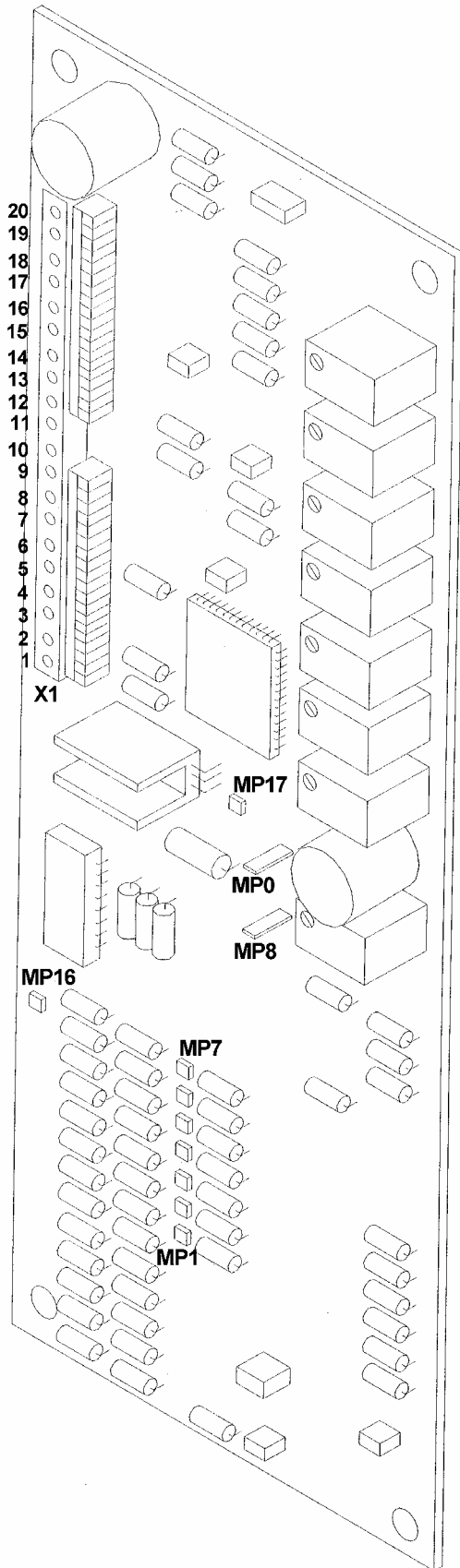
Measuring Points

- MP1 = KGND
- MP4 = +5V
- MP8 = +9V
- MP9 = +6V
- MP24 = +BATT
- MP25 = + UBS console, sensors, DIs
- MP26 = GND
- MP29 = +5V hand terminal

LEDs

- H8 = LOAD
- H9 = A2B
- H10 = MAIN IN/OUT
- H11 = POWER
- H12 = TxD

Central Processing Unit (CPU) Main Board Layout (RT875CCS)



Connector X1

- X1:1-7 = ADC OUTPUT 0.5V...4.5V Note: DO NOT attempt to adjust offset with variable potentiometers.
- X1:8 = TEMP (0.5V + 10mV/°C)
- X1:9 = VREFA = 5.000V reference)
- X1:10 = AGND (reference GND)
- X1:11 = VREF+ = 5.0V power ADC
- X1:12-15 = CH01-04, DIN1-4 / 10
- X1:16 = CH05, +UBS / 10
- X1:17 = CH06, HESIN(A2B) *4
- X1:18 = CH07, +9V *4
- X1:19 = CH08, VREFA / 2 = 2.500V
- X1:20 = UKLEMM, app. VREFA, limits ADC input to 5.0V

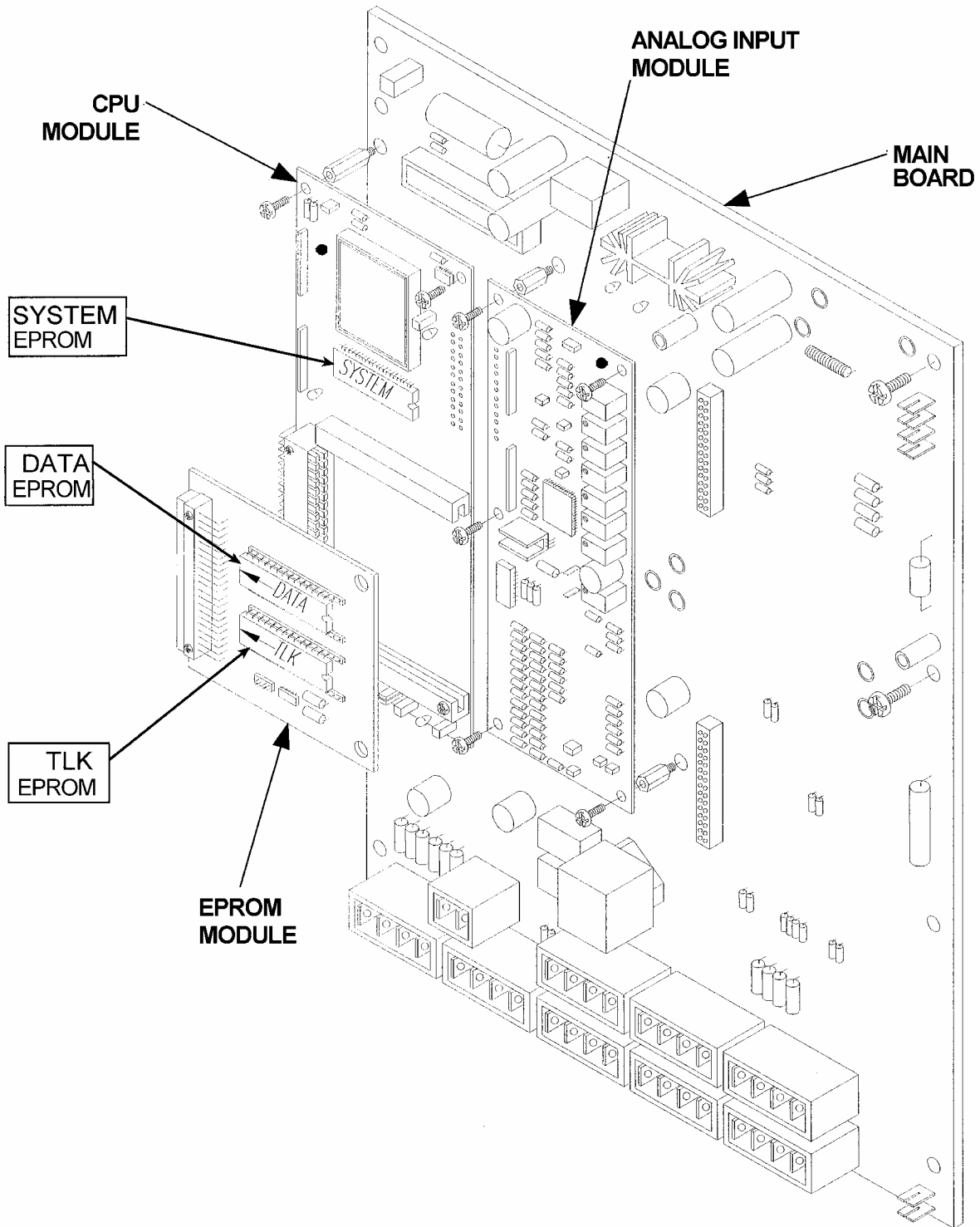
Measuring Points

- MP0 = AGND
- MP8 = +5V
- MP1-7 = Input channels 1-7 0.5V/4mA...2.5V/20mA
- MP16 = HESIN input voltage
- MP17 = app 5.4V clamp for inputs

Board Description

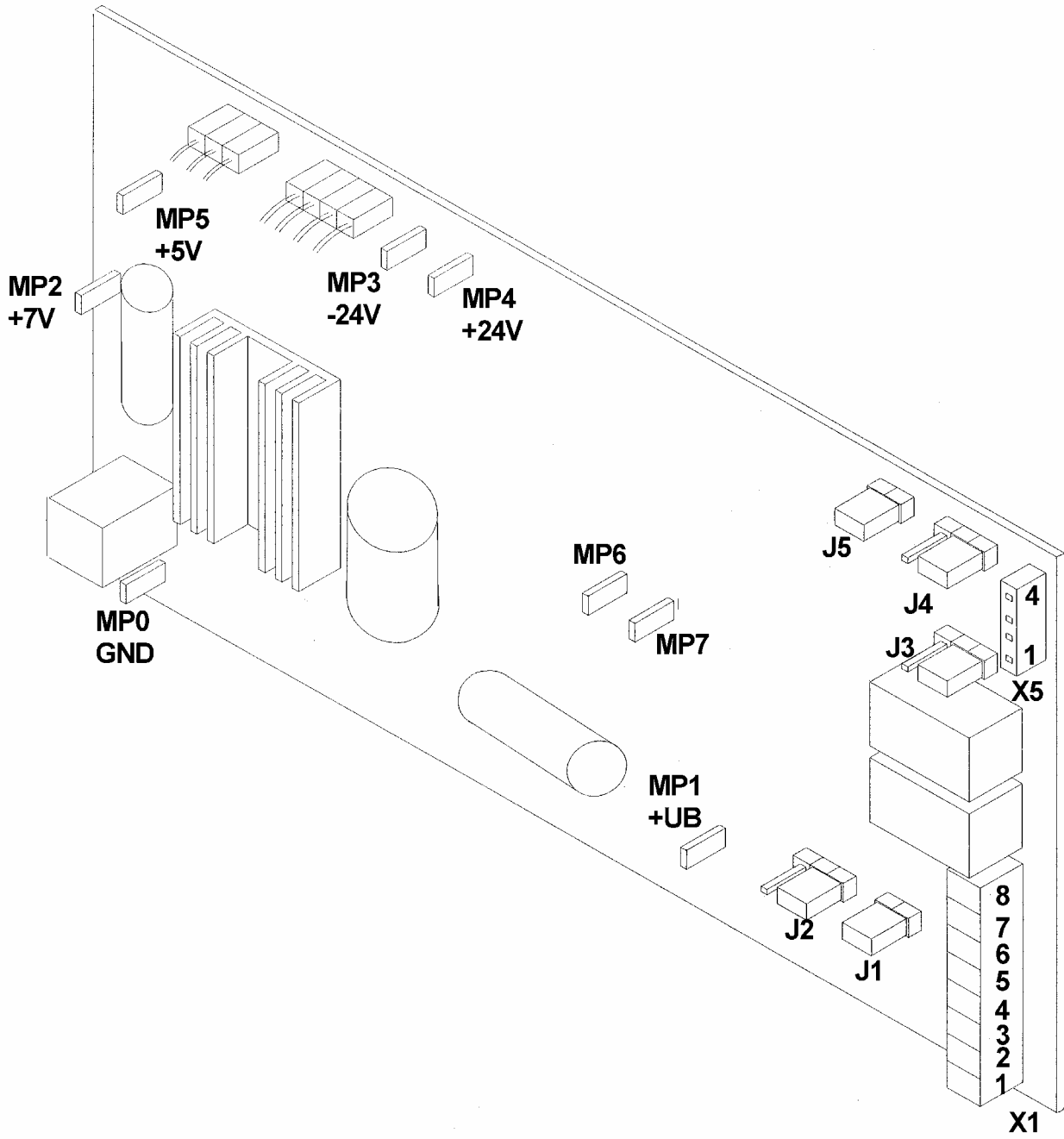
The analog input module converts the sensor signals on channels 1-7 to signals that will be processed by the CPU and software. The incoming signal (to A/D converter) measured at the measuring points (MP) will be 0.5V/4ma...2.5V/20ma. The analog input module then converts the channel signals to 0.5V ... 4.5V, which can be measured on X1:1 through X1:7. The signal voltage can be measured at either point using ground and the signal input.

Central Processing Unit (CPU) Analog Input Module Board Layout (RT875CCS)

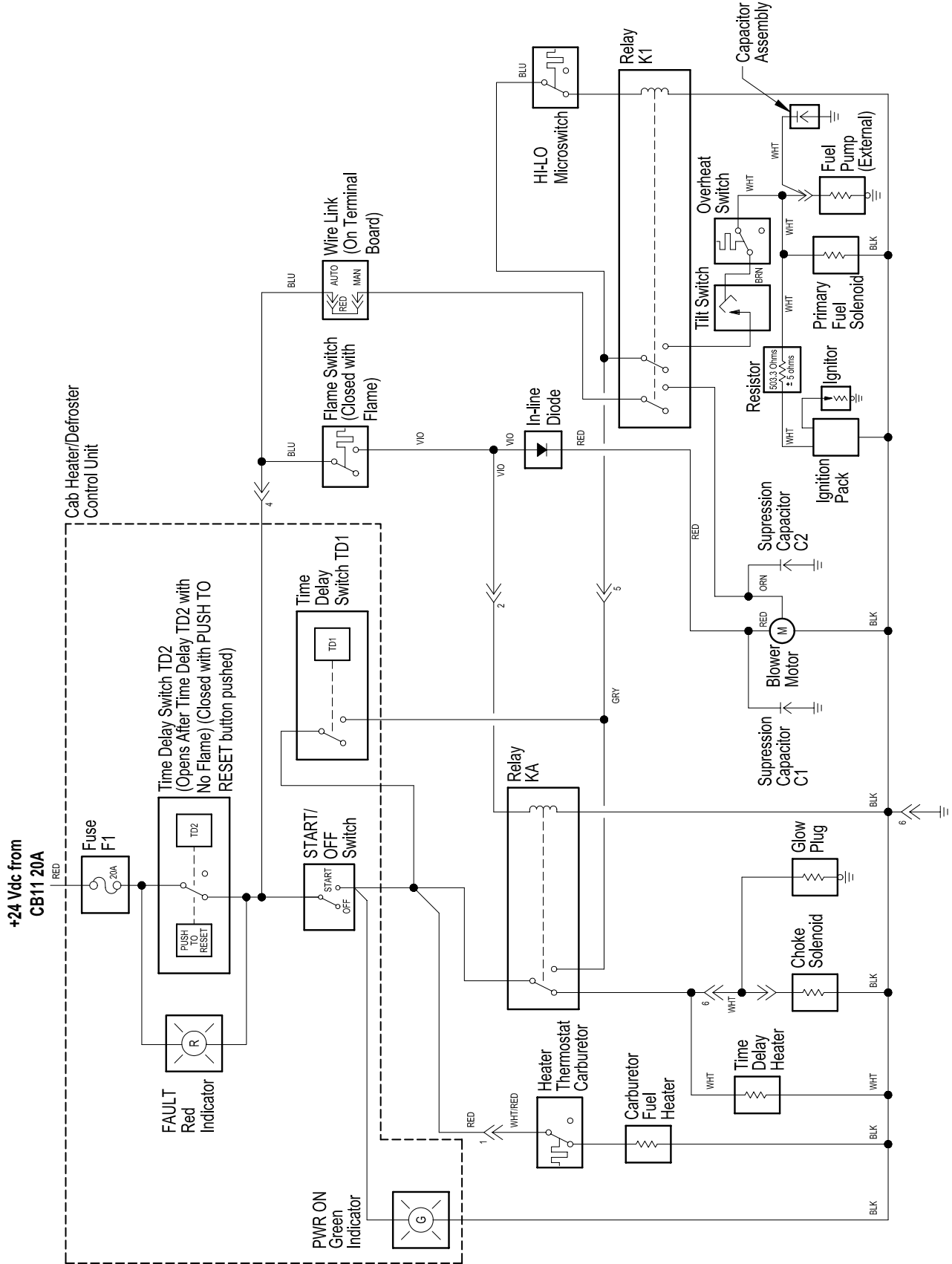


1. Ensure the notch is in the correct direction.
2. The DATA and TLK EPROMs fill the bottom of the socket as shown by the arrows.

Central Processing Unit (CPU) EPROM Location (RT875CCS)



Display Console Connection Board Layout (RT875CCS)



Cab Heater/Defroster Schematic (RT875CCS)

CHAPTER 4

ENGINE MAINTENANCE

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Section I. ENGINE MAINTENANCE

ENGINE INSTALLATION

TOOLS: General mechanic's tool kit: automotive (5180-00-177-7033)
Overhead hoist (1500 lbs. capacity)

SUPPLIES: None

EQUIPMENT CONDITIONS: Outrigger fully extended and lowered.
(Refer to TM 5-3810-306-10.)
Boom positioned over the side. (Refer to TM 5-3810-306-10.)
Battery disconnect switch in off position. (RT875CCS)
Negative battery cable disconnected at shunt. (RT875CC)
(Refer to TM 5-3810-306-20.)
Engine hood removed. (Refer to TM 5-3810-306-20.)
Radiator and shroud removed. (Refer to TM 5-3810-306-20.)
Hydraulic pressure relieved from lines.
(Refer to TM 5-3810-306-20.)
Air system purged. (Refer to TM 5-3810-306-20.)
Rear deck removed. (Refer to TM 5-3810-306-20.)

WARNING

Be sure to wear protective eye covering to avoid personal injury.

REMOVAL:

NOTE

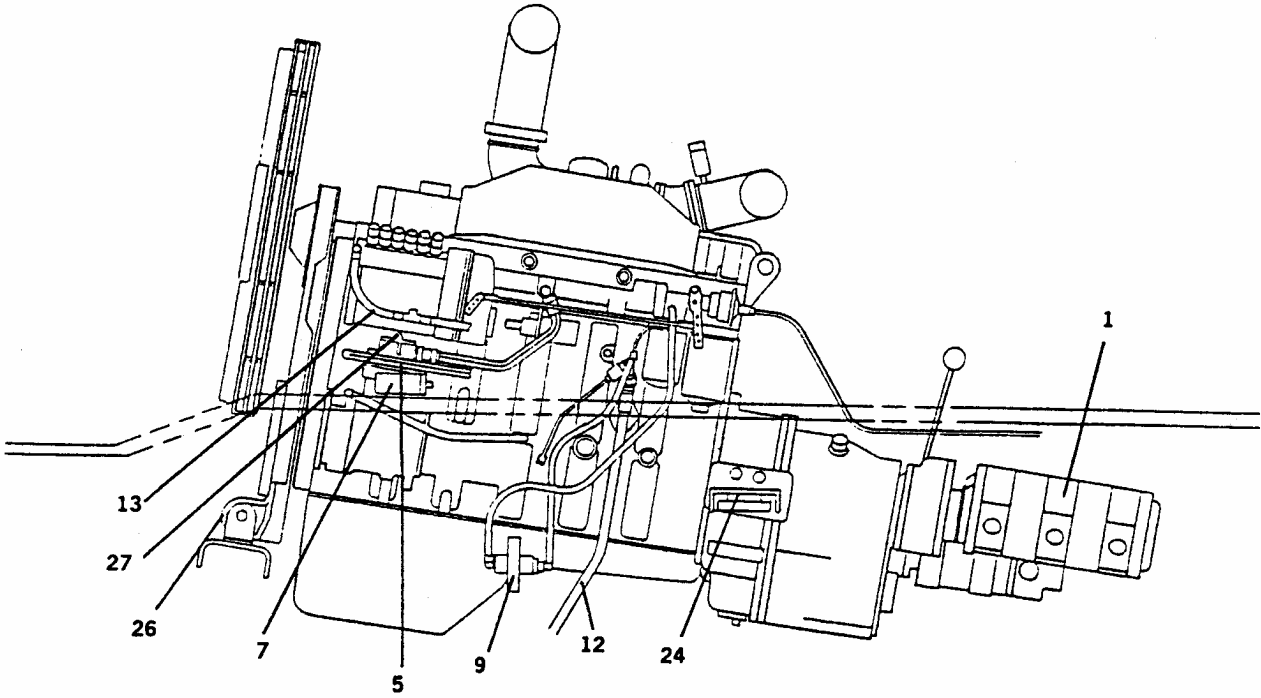
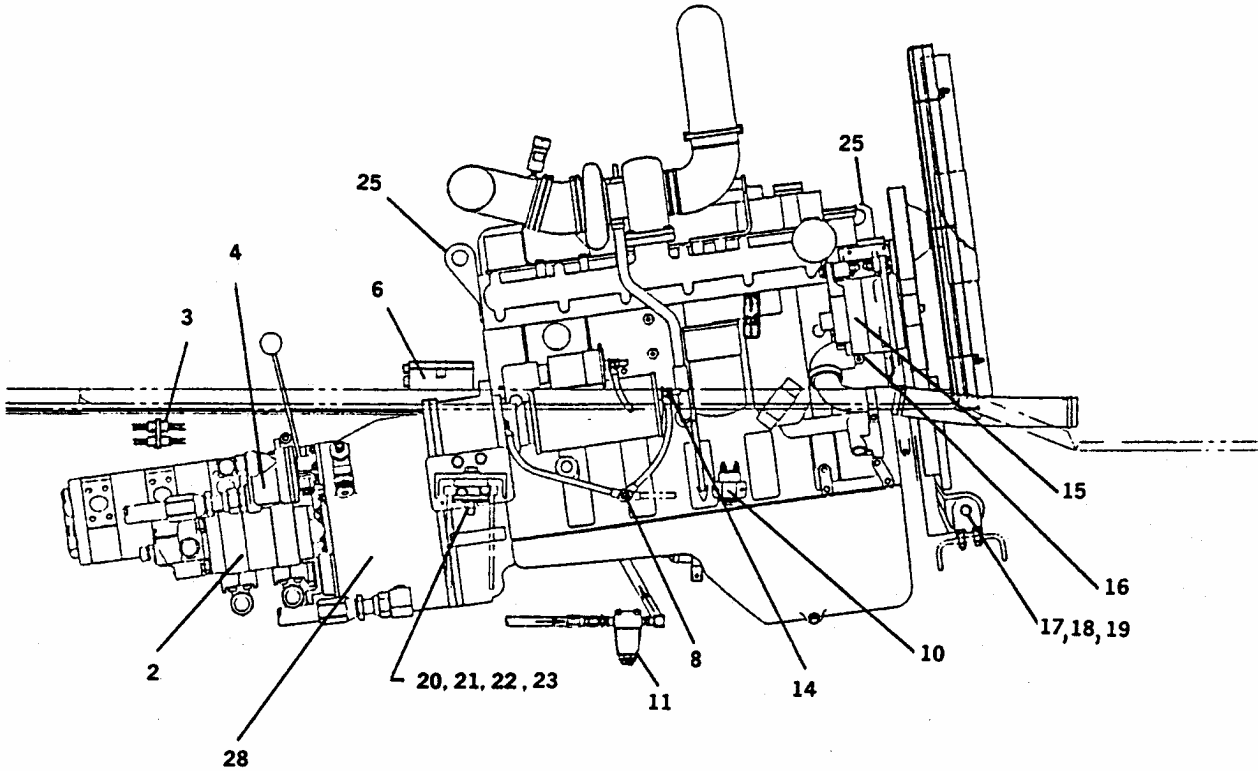
Cover exhaust and intake openings to prevent any parts or debris from entering engine.

1. TAG AND DISCONNECT SIX HYDRAULIC LINES FROM THREE SECTION PUMP (1). PLUG OR CAP ALL OPENINGS.
2. TAG AND DISCONNECT TWO HYDRAULIC LINES TO TORQUE CONVERTER CHARGING PUMP (4). PLUG OR CAP ALL OPENINGS
3. TAG AND DISCONNECT FIVE HYDRAULIC LINES FROM TWO SECTION PUMP (2). PLUG OR CAP ALL OPENINGS.
4. TAG AND DISCONNECT TWO WIRING HARNESS ELECTRICAL CONNECTORS (3) ON RIGHT SIDE WALL IN ENGINE COMPARTMENT.

CAUTION

Mark the universal(s) so they can be assembled as taken apart. Otherwise severe drive line vibration can occur.

5. REMOVE PROPELLER SHAFT BETWEEN TORQUE CONVERTER (28) AND TRANSMISSION.
6. TAG AND DISCONNECT FOUR HYDRAULIC LINES TO TORQUE CONVERTER (28). PLUG OR CAP ALL OPENINGS.
7. REMOVE BRAIDED STEEL LINE (5) FROM AIR COMPRESSOR. POSITION AWAY FROM ENGINE.
8. TAG AND DISCONNECT ALL ELECTRICAL CONNECTORS TO ENGINE COMING FROM DCA BOX (6).
9. REMOVE AIR LINE AT AIR COMPRESSOR (27) FROM AIR GOVERNOR (7).



10. REMOVE TWO NUTS AND LOCKWASHERS FROM AIR GOVERNOR FRAME MOUNTING STUDS. REMOVE AIR GOVERNOR (7) AND RELOCATE OUT OF WAY OF ENGINE.
11. REMOVE GROUNDING CABLE FROM LEFT SIDE WALL TO STARTER (8).
12. REMOVE FUEL PRESSURE DIFFERENTIAL SWITCH (9) FROM FRAME MOUNTING STUDS ON RIGHT SIDE WALL.
13. REMOVE STARTER RELAY (10) FROM FRAME MOUNTING STUDS ON LEFT SIDE WALL.
14. CLOSE PETCOCKS TO SHUT OFF FUEL FLOW AT FUEL FILTER (11). REMOVE FUEL LINE TO FUEL PUMP (12).
15. LOOSEN CLAMP AND REMOVE FUEL RETURN LINE (13) TO FUEL INJECTION PUMP.
16. TAG AND REMOVE BATTERY CABLE TO STARTER (14).
17. TAG AND DISCONNECT THREE WIRES 671, 676 AND 677 TO STARTER (14).
18. TAG AND DISCONNECT THREE WIRES 672, 673 AND 674 TO ALTERNATOR (15).
19. TAG AND DISCONNECT TWO WIRES TO TEMPERATURE SENSOR (16).
20. REMOVE LOCKNUT (17), CAPSCREW (18) AND LOCK WASHER (19) SECURING FRONT ENGINE MOUNT (26) TO MOUNTING BRACKET.
21. REMOVE TWO LOCKNUTS (20), LARGE WASHERS (21), CAPSCREWS (22) AND WASHERS (23) FROM SIDE MOTOR MOUNTS.

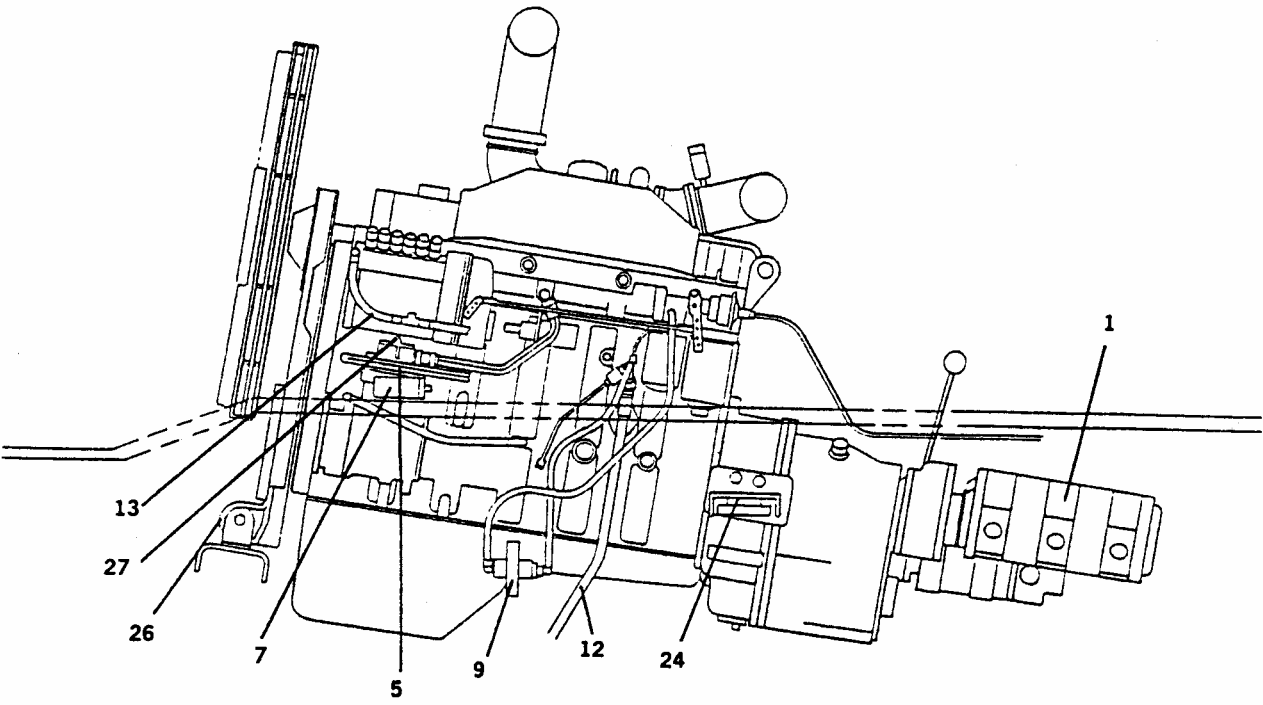
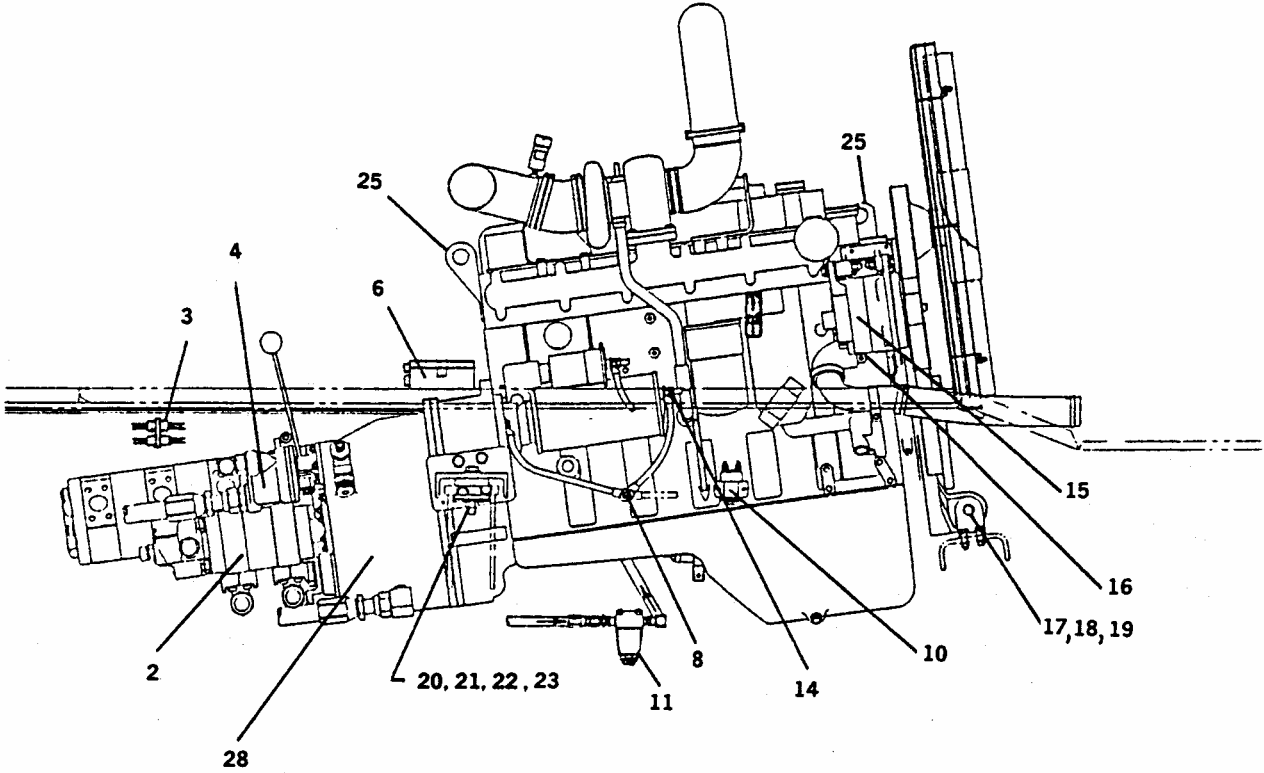
WARNING

The engine/torque converter weighs approximately 1985 pounds (900 kg). Use care when lifting the engine.

22. USING SUITABLE LIFTING DEVICE ATTACHED TO ENGINE LIFTING EYES (25) AND THREE SECTION PUMP (1), REMOVE ENGINE FROM CRANE.
23. REMOVE SHOCK MOUNTS (24) FROM ENGINE SIDE MOUNTS. REPLACE AS NECESSARY.
24. IF A NEW ENGINE IS TO BE INSTALLED, REMOVE ALL COMPONENTS, FITTINGS, ETC., FROM OLD ENGINE AND INSTALL THEM ON NEW ENGINE IN SAME LOCATIONS. ENSURE THAT SAME GRADE HARDWARE, TORQUE VALUES AND LOCTITE AS WERE INSTALLED BY FACTORY ARE USED.

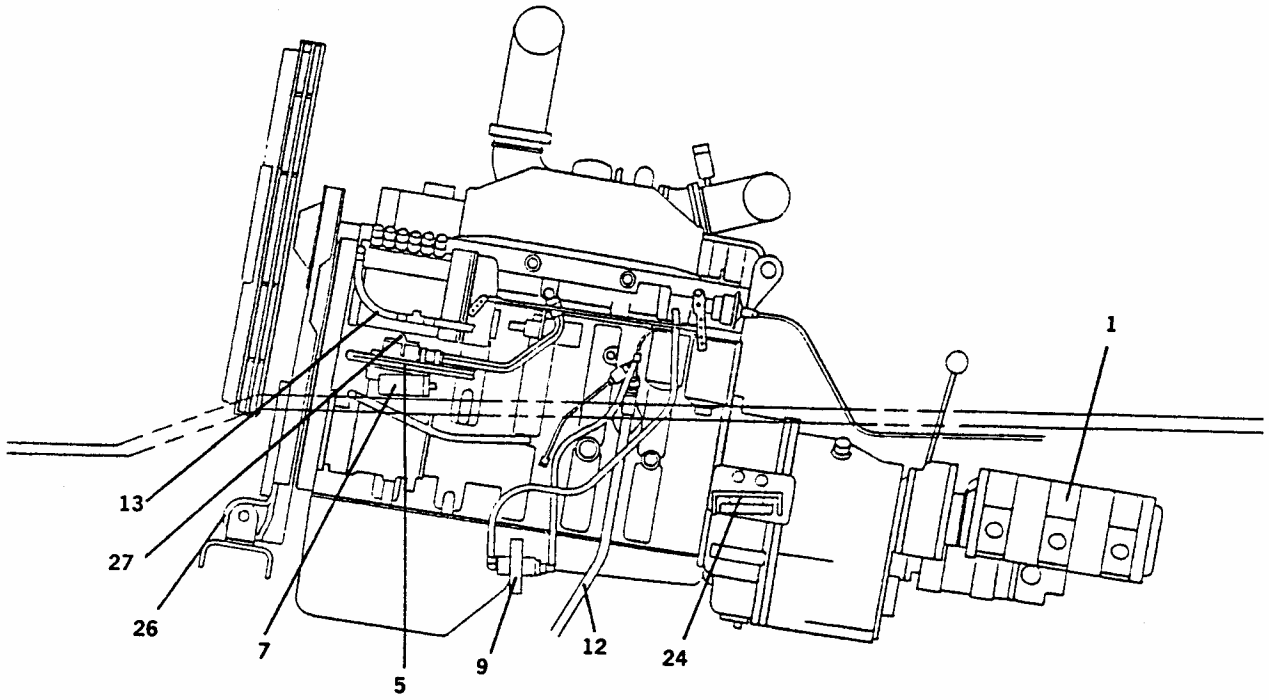
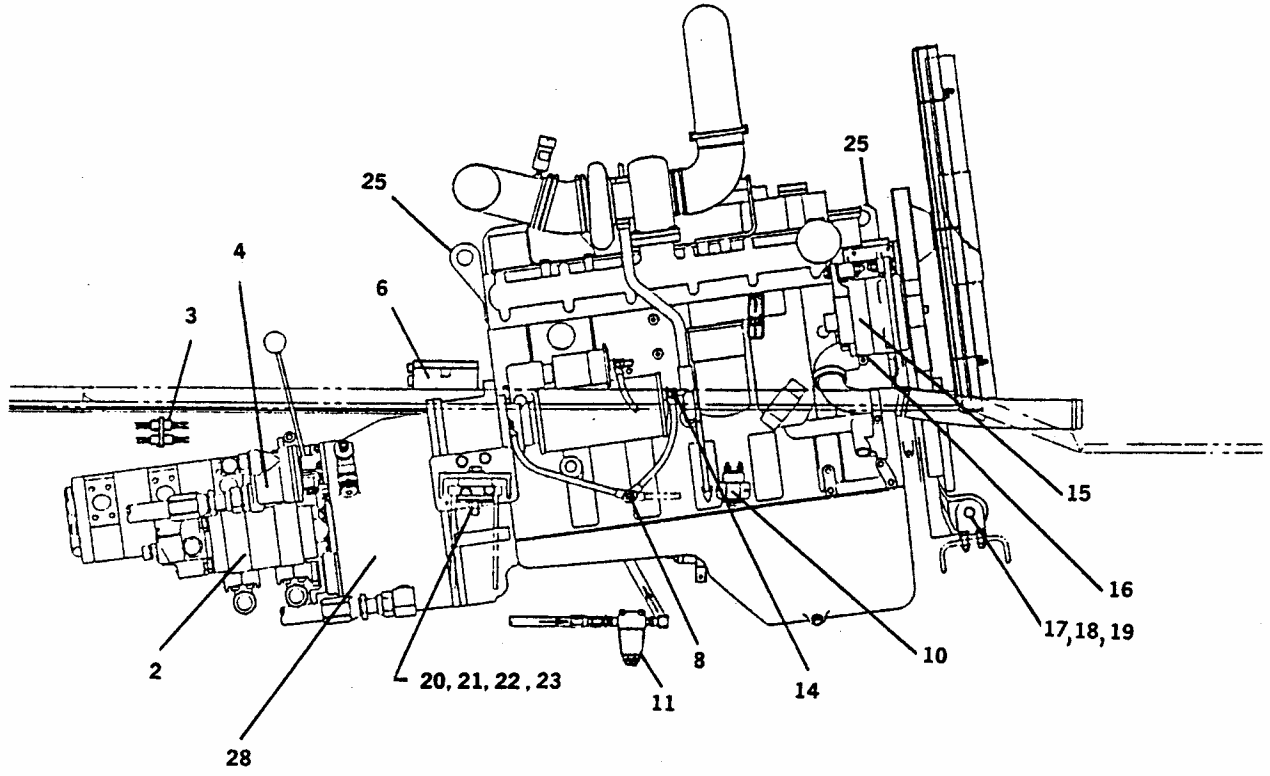
INSTALLATION:

1. INSTALL SHOCK MOUNTS (24) IN HOLES ON ENGINE SIDE MOUNTING BRACKETS.
2. USING SUITABLE LIFTING DEVICE ATTACHED TO ENGINE LIFTING EYES (25) AND THREE SECTION PUMP (1), INSTALL ENGINE.
3. INSTALL TWO CAPSCREWS (22), WASHERS (23), LARGE WASHERS (21) AND LOCKNUTS (20) IN ENGINE SIDE MOUNTS. TORQUE BOLTS TO 150 FT-LBS (200 NM).
4. INSTALL CAPSCREW (18), NUT (17) AND LOCK WASHER (19) SECURING FRONT ENGINE MOUNT (26). TORQUE CAPSCREW (18) TO 250 FT-LBS (333 NM).
5. CONNECT TWO TAGGED WIRES TO TEMPERATURE SENSOR (16).
6. CONNECT THREE TAGGED WIRES 672, 673 AND 674 TO ALTERNATOR (15).
7. CONNECT THREE TAGGED WIRES 671, 676 AND 677 TO STARTER (14).
8. INSTALL BATTERY CABLE TO STARTER (14).
9. INSTALL FUEL RETURN LINE (13) TO FUEL INJECTION PUMP. SECURE WITH CLAMP.



10. INSTALL FUEL LINE TO FUEL PUMP (12).
OPEN PETCOCKS AT FUEL FILTER.
11. MOUNT STARTER RELAY (10) ON
FRAME STUDS AND SECURE WITH
ATTACHING HARDWARE.
12. INSTALL FUEL PRESSURE
DIFFERENTIAL SWITCH (9) ON FRAME
STUDS AND SECURE WITH ATTACHING
HARDWARE.
13. CONNECT GROUNDING CABLE (8)
FROM STARTER TO LEFT SIDE WALL.
14. MOUNT AIR GOVERNOR (7) ON FRAME
STUDS AND SECURE WITH NUTS AND
LOCKWASHERS.
15. CONNECT AIR LINE FROM AIR
GOVERNOR (7) TO AIR COMPRESSOR
(27).
16. CONNECT TAGGED ELECTRICAL
CONNECTORS TO ENGINE FROM DCA
BOX (6).
17. CONNECT BRAIDED STEEL LINE (5) TO
AIR COMPRESSOR (27).
18. CONNECT FOUR TAGGED HYDRAULIC
LINES TO TORQUE CONVERTER.
19. INSTALL PROPELLER SHAFT BETWEEN
TORQUE CONVERTER AND
TRANSMISSION.
20. REMOVE CAPS OR PLUGS AND
CONNECT TWO HYDRAULIC LINES TO
TORQUE CONVERTER CHARGING
PUMP (4).
21. CONNECT TWO WIRING HARNESS
ELECTRICAL CONNECTORS (3) ON
RIGHT SIDE WALL IN ENGINE
COMPARTMENT.
22. CONNECT FIVE HYDRAULIC LINES TO
TWO SECTION PUMP (4).
23. CONNECT SIX HYDRAULIC LINES TO
THREE SECTION PUMP (1).
24. INSTALL RADIATOR AND SHROUD
ASSEMBLY. (REFER TO TM 5-3810-306-
20.)
25. INSTALL ENGINE HOOD. (REFER TO TM
5-3810-306-20.)
26. INSTALL REAR DECK. (REFER TO TM
5-3810-306-20.)
27. CONNECT NEGATIVE BATTERY CABLE
AT SHUNT. (RT875CC) (REFER TO TM
5-3810-306-20.)
28. INSPECT ALL ENGINE/TORQUE
CONVERTER FLUID LEVELS. START
ENGINE AND CHECK FOR LEAKS.
(REFER TO TM 5-3810-306-10.)
29. BLEED HIGH PRESSURE FUEL LINES.
(REFER TO PAGE 5-8.)

END OF TASK



Section II. CYLINDER HEAD AND BLOCK MAINTENANCE

CYLINDER HEAD INSTALLATION AND ASSEMBLY

TOOLS: General mechanic's tool kit: automotive (5180-00-177-7033)
Lifting device (225 lbs. capacity)

SUPPLIES: Clean rags (Item 2, Appendix B)
Gasket (Item 220, Appendix B)
Cleaning pad, non metallic (Item 228, Appendix B)
Solvent P-D-680, Type III (Item 1, Appendix B)

EQUIPMENT CONDITIONS: Outriggers set and boom positioned over-the-side.
(Refer to TM 5-3810-306-10.)
Battery disconnect switch in off position. (RT875CCS)
Negative battery cable disconnected at shunt. (RT875CC)
(Refer to TM 5-3810-306-20.)
Engine hood removed. (Refer to TM 5-3810-306-20.)
Coolant drained from radiator. (Refer to TM 5-3810-306-20.)
Valve cover removed. (Refer to TM 5-3810-306-20.)
Thermostat housing removed. (Refer to TM 5-3810-306-20.)
Aftercooler removed. (Refer to TM 5-3810-306-20.)
Turbocharger removed. (Refer to page 5-10.)
Exhaust manifold removed. (Refer to page 5-10.)
Fuel injection lines removed. (Refer to TM 5-3810-306-20.)
Rocker Lever Assembly removed. (Refer to page 4-50.)
Fuel Injectors removed. (Refer to page 5-2.)

REMOVAL:

1. REMOVE CYLINDER HEAD (1).
 - a. Remove cylinder head capscrews (2) and (3).
- CAUTION**
- Failure to remove cylinder head cleanly from block can result in damage to head.
- b. Attach suitable lifting device to lifting brackets and remove cylinder head (1) in a direct upward motion.
 - c. Remove gasket (4) and discard.

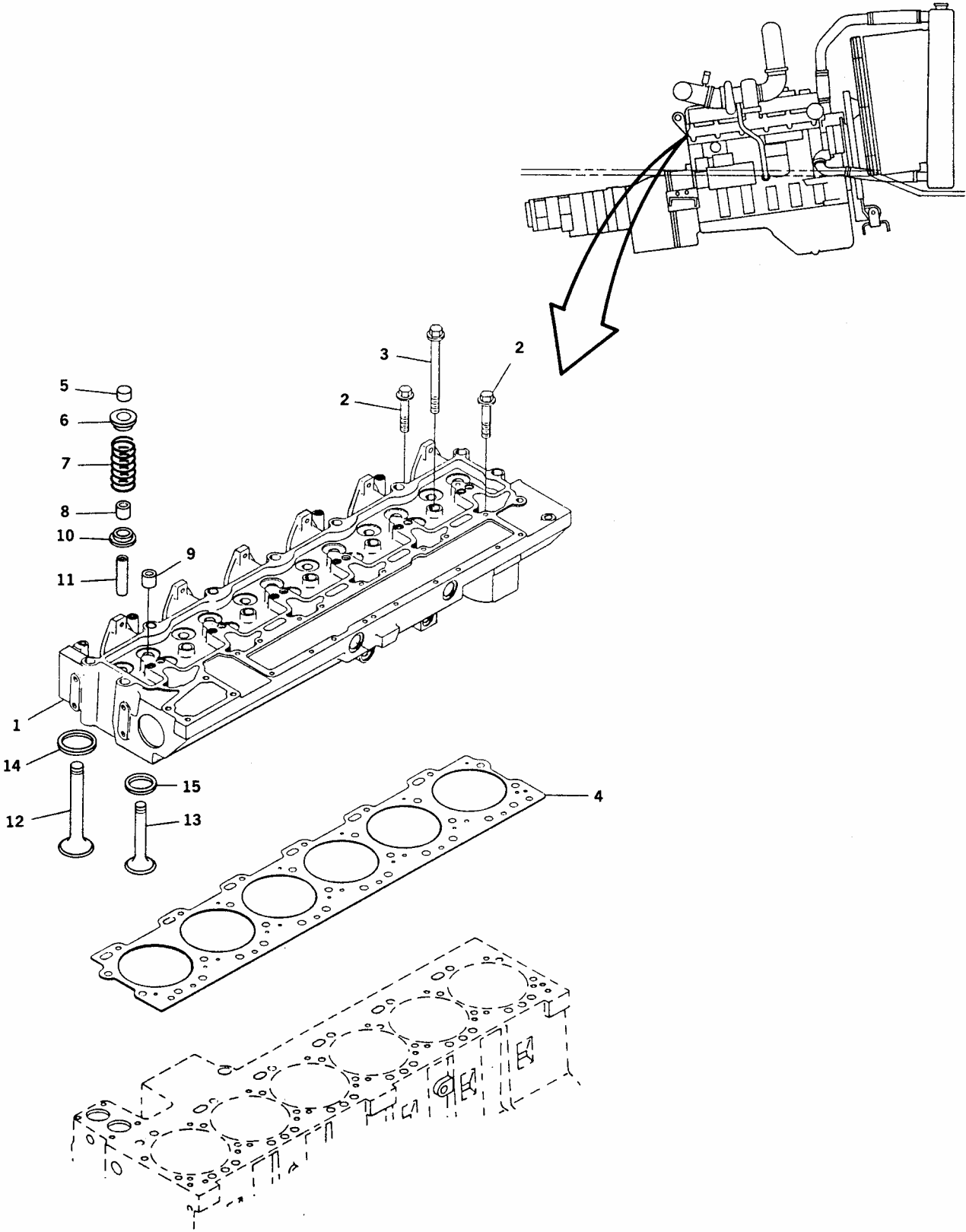
2. IF A NEW CYLINDER HEAD IS TO BE INSTALLED, TRANSFER ANY HARDWARE FROM REPLACED CYLINDER HEAD.

DISASSEMBLY:

1. REMOVE VALVES (12) AND (13).
 - a. Mark valves to identify position in cylinder head.
 - b. For each valve, compress valve spring (7) and remove valve spring lock (5) using a magnet.
 - c. Release valve spring (7) and remove retainer (6), spring (7) and valve (12) or (13) accordingly.
2. REMOVE VALVE STEM SEALS (8) AND (9) AND VALVE SPRING GUIDES (10). DISCARD VALVE STEM SEALS (8) AND (9).

NOTE

The remaining disassembly steps shall be performed only as deemed necessary after inspection.



3. USING AN APPROPRIATE DRIVER, REMOVE VALVE STEM GUIDES (11).
4. REMOVE VALVE SEATS (14) AND (15).

CAUTION

Make sure tool only cuts the valve seats and not the machined valve pockets of the cylinder head.

CAUTION

Shavings or debris between the cutter motor base and the head deck can cause serious damage to cylinder head.

- a. Using Router and Cutter, set the cutter depth 0.03937 to 0.059 in. (1.0 to 1.5 mm) from the bottom of the valve seat pocket.
- b. Cut a groove in valve seats (14) and (15) making sure the cutter motor base remains flat against the cylinder head while rotating the cutter motor in a circular motion. Make sure groove is deep enough for the expanding seat extractor to catch in when expanded.
- c. Using slide hammer and appropriate seat extractor, remove valve seats (14) and (15).

CLEANING:

1. USING INJECTOR BORE BRUSH, CLEAN CARBON FROM INJECTOR NOZZLE SEATS.
2. SCRAPE GASKET MATERIAL AWAY FROM ALL GASKET SURFACES.
3. CLEAN DEPOSITS FROM COOLANT PASSAGES.

WARNING

Dry cleaning solvent P-D-680, Type III is toxic and flammable. Wear protective goggles and gloves and use only in a well ventilated area. Avoid contact with skin, eyes, and clothes and don't breathe vapors. Do not use near open flame or excessive heat. The flash point is 200°F (94°C). If you become dizzy while using cleaning solvent, get fresh air immediately and get medical aid. If contact with eyes is made, wash your eyes with water and get medical aid immediately.

Be sure to wear protective eye covering to avoid personal injury.

4. CLEAN THE COMBUSTION DECK WITH A NONMETALLIC CLEANING PAD AND DIESEL FUEL OR SOLVENT.

CAUTION

Wear eye protective goggles when using rotating tools for cleaning purposes.

5. CLEAN CARBON DEPOSITS FROM THE VALVE POCKETS WITH A HIGH QUALITY STEEL WIRE WHEEL INSTALLED IN A DRILL OR DIE GRINDER.

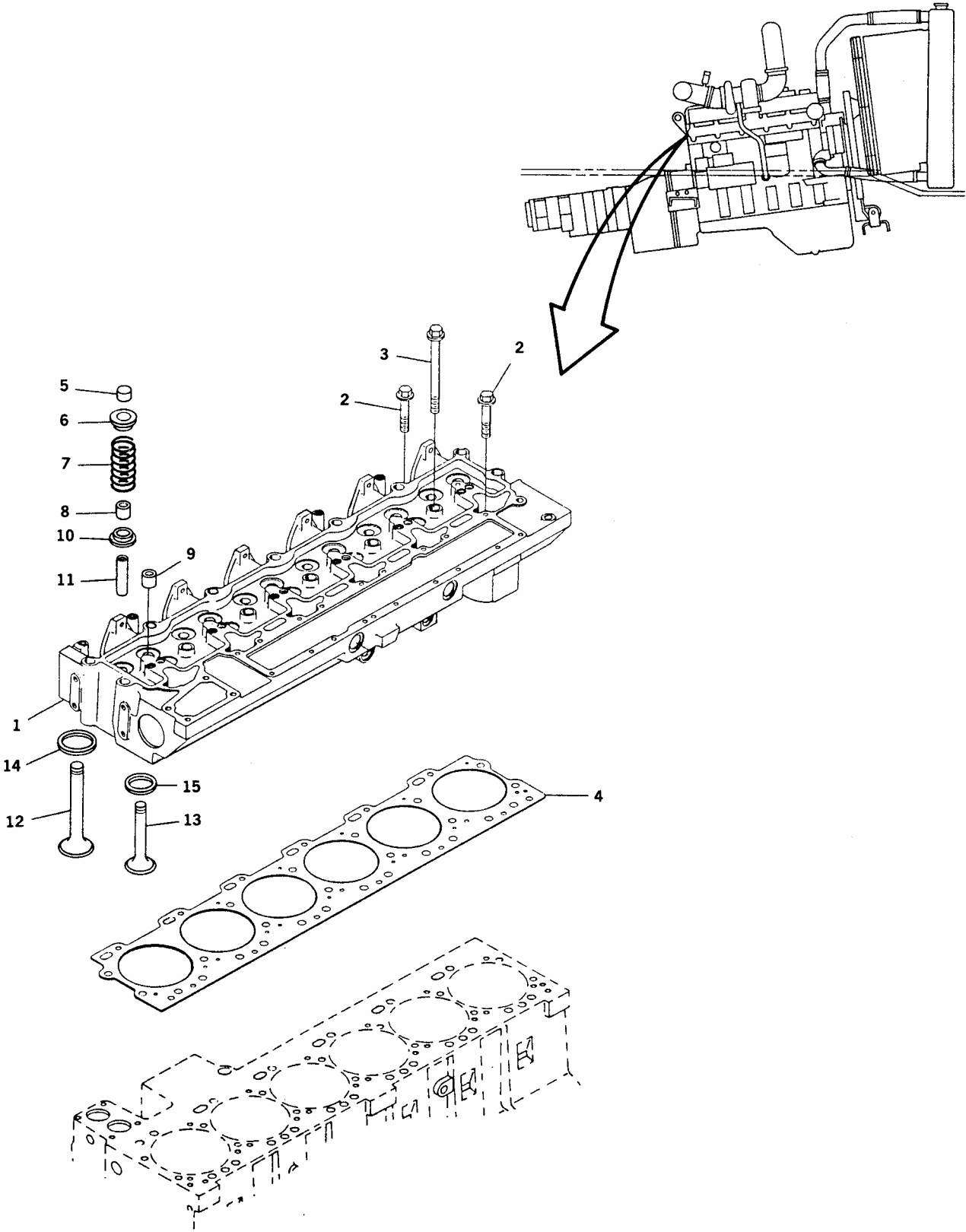
NOTE

An inferior quality wire wheel will lose steel bristles during operation, causing additional contamination.

CAUTION

Use only clean low pressure (30 psi max) compressed air for drying parts. If unavailable, allow parts to air dry or wipe with clean, lint-free cloth.

6. WASH CYLINDER HEAD IN HOT SOAPY WATER SOLUTION 190°F (88°C). AFTER RINSING, USE COMPRESSED AIR TO DRY CYLINDER HEAD.



WARNING

Wear eye protective goggles when using rotating tools for cleaning purposes.

7. CLEAN VALVE HEADS WITH A SOFT WIRE WHEEL INSTALLED IN A DRILL OR BENCH GRINDER.

NOTE

Keep valves in a labeled rack to prevent mixing.

8. POLISH VALVE STEMS WITH CROCUS CLOTH AND DIESEL FUEL.

INSPECTION:

1. INSPECT VALVES.

- a. Inspect for abnormal wear on heads and stems, and bent valves. Replace damaged or worn valves.
- b. Measure diameter of valve stems in at least three equally spaced places. Minimum diameter 0.3724 in. (9.46 mm). Maximum diameter 0.3740 in. (9.50 mm). Replace valves if out of limits.
- c. Check valve stem tips for flatness and measure valve head rim thickness. Minimum thickness of rim 0.0591 in. (1.50 mm). Valve stem tips and valve head rims may be resurfaced if determined suitable.

2. INSPECT VALVE GUIDES.

- a. Inspect valve guides for scuffing or scoring.
- b. Measure valve guide bores. Minimum diameter 0.3756 in. (9.539 mm). Maximum diameter 0.3763 in. (9.559 mm).
- c. Replace damaged valve guides.

3. INSPECT CYLINDER HEAD DECK.

- a. Measure cylinder head deck for distortion. Maximum distortion is 0.003

in. (0.075 mm) overall end to end or side to side.

- b. If distortion exceeds limits, a maximum of 0.040 in. (1.0 mm) can be machined from combustion surface of cylinder head or cylinder head must be replaced.
- c. If cylinder head is machined, place valve in respective bore and check valve depth dimension. Minimum depth is 0.043 in. (1.09 mm), maximum is 0.064 in. (1.62 mm).
- d. If valve depth is less than minimum, machine valve seat. (Refer to page 4-13.)

4. INSPECT VALVE SEATS.

- a. Inspect valve seats for cracks or burnt spots. Replace damaged seats.
- b. Install valves in their respective bores, and using gauge block, measure depth of valve from cylinder head deck. Minimum valve depth 0.035 in. (0.89 mm). Maximum valve depth 0.056 in. (1.42 mm).

NOTE

Make sure seats are clean before measuring valve depth.

- c. If the valve depth is out-of-limits, before replacing the valve seat, try replacing the old valve with a new valve. If the depth is in limits with the new valve, proceed with the seat grinding procedure using the new valve with the old seat. If the valve depth is still out-of-limits, even with the new valve, replace the valve seat. After replacing the seat, recheck the valve depth with the old valve to determine if it can be reused. If not, replace valve.

5. INSPECT VALVE SPRINGS.

- a. Inspect springs for breaks and distortion. Replace damaged springs.

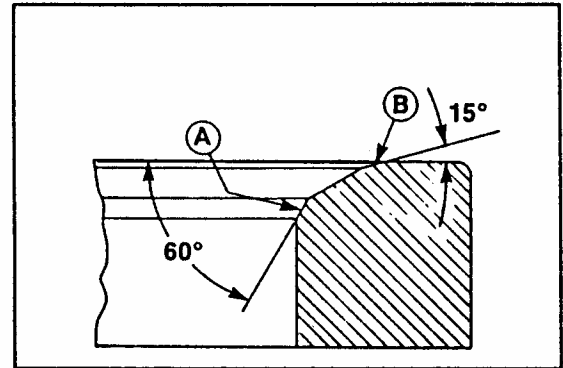
- b. Measure valve springs. Approximate free length 2.585 in. (65.66 mm). Minimum inclination 0.039 in. (1.0 mm). Replace springs out-of-limits.
- c. Check valve spring tension. A load of 101.2 to 115.5 lbs (450 to 513.5 N) is required to compress spring to a height of 2 in. (50.8 mm). Replace springs out-of-limits.

6. INSPECT COMBUSTION FACE FOR CRACKS.

- a. Cracks that extend from the injector bores, away from the valve seats and are not over 0.3937 in. (10 mm) long, are acceptable.
- b. Cracks that extend from the injector bores toward the valve seats or cracks between the valves are unacceptable. Replace cylinder head.

width 0.060 in. (1.5 mm). Maximum seat width 0.080 in. (2.0 mm).

- g. If valve seat width limits are not met or the seat is not centered, grind area (A) with a 60 degree stone and area (B) with a 15 degree stone to center the seat on the valve face and obtain the valve seat width limits.



REPAIR:

1. REFACE ALL REUSED VALVES.

- a. Valve seat angle
Intake: 30 degrees
Exhaust: 45 degrees
- b. Minimum valve head rim thickness
0.0591 in. (1.5 mm)
- c. Valve stem tips as required for flatness

2. GRIND VALVE SEATS.

- a. Grind valve seats to remove all scores, scratches and burns. Seat angle: Intake (30 degrees). Exhaust (45 degrees).
- b. Measure valve depth.
- c. Apply a coat of valve lapping compound to each valve and lap each valve to its corresponding seat.
- d. Remove valves and clean compound from valves and seats.
- e. Reinstall valves in their corresponding bores. The valve seat should seat in the center of the valve face
- f. Measure the valve seat width indicated by the lapped surface. Minimum seat

- h. After reaching limits above, coat each valve face with "Dykem Steel Blue" and allow to dry.
- i. Apply a coat of valve lapping compound to each valve and lap the valve to its corresponding seat.
- j. Remove valves and clean compound from valve faces and seats.

NOTE

Keep valves in a labeled rack to prevent mixing.

ASSEMBLY:

- 1. IF REMOVED, INSTALL NEW VALVE GUIDES (11).
 - a. Fabricate two spacers (Items 12 and 13, Appendix C) for controlling installation depth of new valve guides (11).

NOTE

Valve guide depth is very important and care should be taken to machine spacers to correct dimensions.

- b. Using universal valve guide driver, start guides (11) into head. Make sure guides start straight.
- c. Install the proper spacer over guide. If required, install a flat washer on driver to contact spacer.
- d. Drive guide (11) in, until driver contacts spacer.
- e. Using a 0.3750 in. (9.525 mm) reamer, ream valve guides (11) with no lubricant and in one direction only.

NOTE

Damage to valve guide can result from pulling reamer back through guide.

- f. Lubricate reamer with clean engine oil and run through a second time in one direction only.

WARNING

Dry cleaning solvent P-D-680, Type III is toxic and flammable. Wear protective goggles and gloves and use only in a well ventilated area. Avoid contact with skin, eyes, and clothes and don't breathe vapors. Do not use near open flame or excessive heat. The flash point is 200°F (94°C). If you become dizzy while using cleaning solvent, get fresh air immediately and get medical aid. If contact with eyes is made, wash your eyes with water and get medical aid immediately.

- g. Clean the valve guide bore with cleaning solvent.

2. IF REMOVED, INSTALL NEW VALVE SEATS (14) AND (15).

- a. Freeze new valve seats at 0°F (-18°C) for 30 minutes before attempting to install.
- b. Remove new seats (14) and (15) from freezer one at a time and position in valve pocket. Using a hardwood board and a lead hammer, place hardwood board on valve seat (14) or (15) and drive seat into valve pocket until bottomed.

NOTE

Intake and exhaust valve seats are different. Be sure to use correct seat.

- c. Lap corresponding valve (12) or (13) to each seat (14) or (15) and grind as necessary. (Refer to page 4-13.)

3. INSTALL VALVE SPRING GUIDES (10).

4. INSTALL NEW VALVE STEM SEALS (8) AND (9).

NOTE

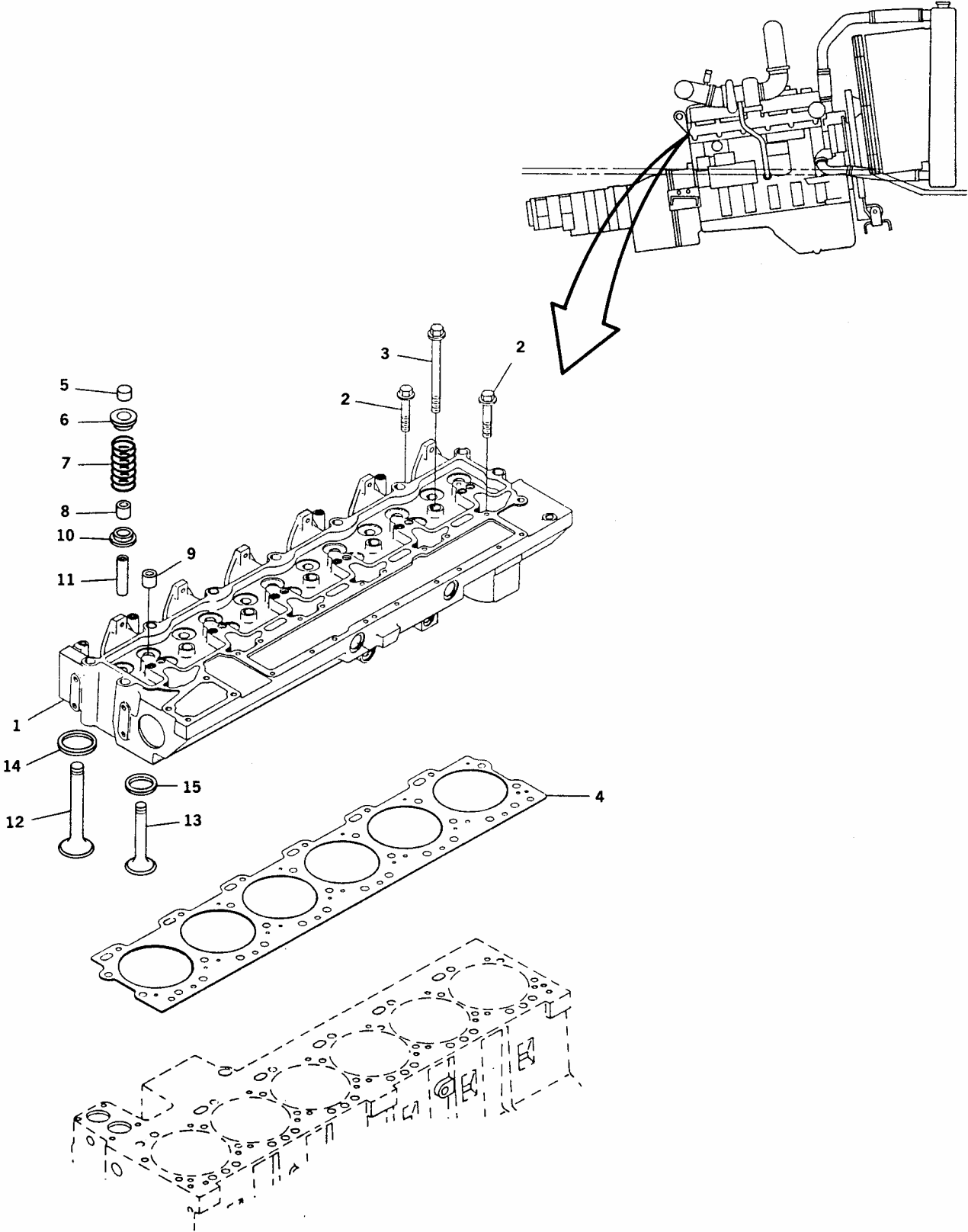
Intake and exhaust seals are different. Be sure to use correct seal.

5. INSTALL VALVES (12) AND (13).

CAUTION

Be sure valves (12) and (13) are installed in corresponding valve bores as removed and/or lapped.

- a. Lubricate valve stems with SAE 90W engine oil and insert valves (12) and (13) in corresponding valve bores.
- b. Position valve springs (7) and valve spring retainers (6) over valve stems.



- c. Compress valve springs (7) and install valve spring locks (5). Release spring tension.

WARNING

Wear eye protective goggles. If valve spring locks (5) are not correctly installed, they can fly out when hit with a hammer.

- d. After assembly, hit valve stems with a plastic hammer to ensure valve spring locks (5) are seated.

INSTALLATION:

1. INSTALL CYLINDER HEAD (1).
 - a. Position new gasket (4) onto cylinder block dowels.

NOTE

Cylinder block and cylinder head must be clean and dry.

- b. Carefully place cylinder head (1) onto gasket (4) on cylinder block. Make sure cylinder head (1) is aligned on dowels.

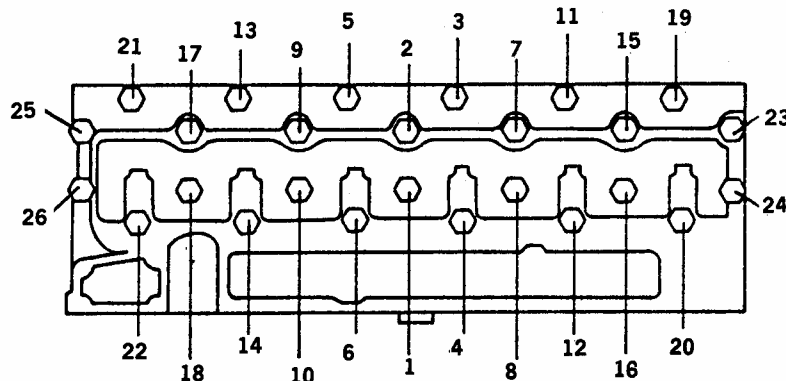
CAUTION

Do not install capscrews with painted heads in the center rows which will be covered by the valve cover.

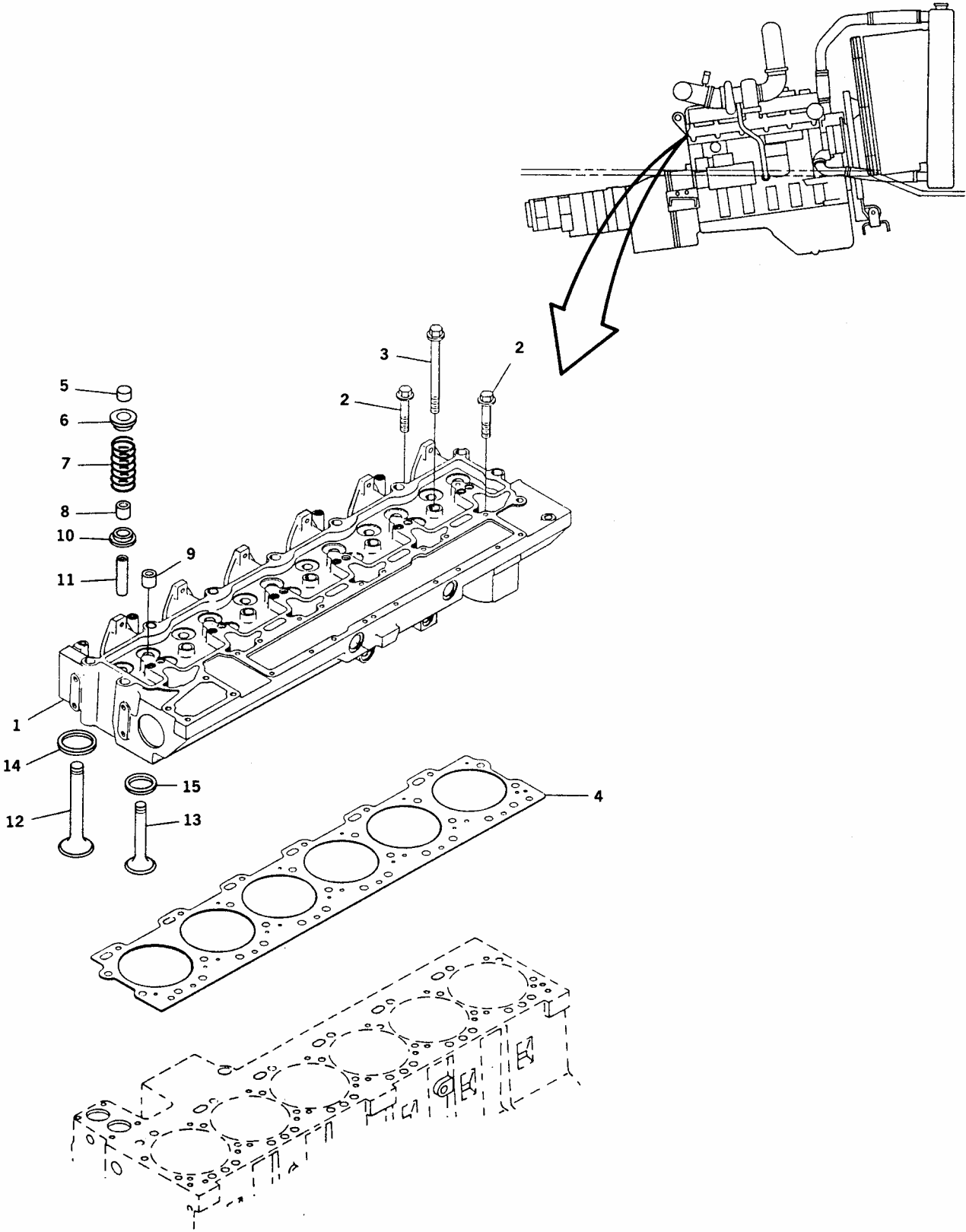
- c. Install lubricated cylinder head capscrews (2) and (3).
- d. Torque capscrews (2) and (3) first time to 27 ft-lbs (36 Nm) in sequence shown. Repeat in same sequence to torque of 110 ft-lbs (146 Nm). Finally torque capscrews in same sequence to 148 ft-lbs (197 Nm).

2. INSTALL ROCKER LEVER ASSEMBLIES. (REFER TO PAGE 4-50.)
3. ADJUST VALVES. (REFER TO TM 5-3810-306-20.)
4. INSTALL VALVE COVER. (REFER TO TM 5-3810-306-20.)
5. INSTALL FUEL INJECTORS AND LINES. (REFER TO PAGE 5-2.)
6. INSTALL THERMOSTAT HOUSING. (REFER TO TM 5-3810-306-20.)
7. INSTALL EXHAUST MANIFOLD. (REFER TO PAGE 5-10.)
8. INSTALL TURBOCHARGER. (REFER TO PAGE 5-10.)
9. INSTALL ENGINE HOOD. (REFER TO TM 5-3810-306-20.)
10. SERVICE RADIATOR. (REFER TO LO 5-3810-306-12.)
11. CONNECT NEGATIVE BATTERY CABLE AT SHUNT. (RT875CC) (REFER TO TM 5-3810-306-20.)

END OF TASK



TORQUE SEQUENCE



CYLINDER LINER INSTALLATION

TOOLS: General mechanic's tool kit: automotive (5180-00-177-7033)
Liner Puller (3376015)
Liner Driver (ST-1299)
Liner protrusion gauge (ST-18547)
Liner clamps (3376944)

SUPPLIES: Ring seals (Item 3, Appendix B)
Clean rags (Item 2, Appendix B)

EQUIPMENT CONDITIONS: Engine removed. (Refer to page 4-2.)
Pistons and connecting rods removed.
(Refer to page 4-32.)

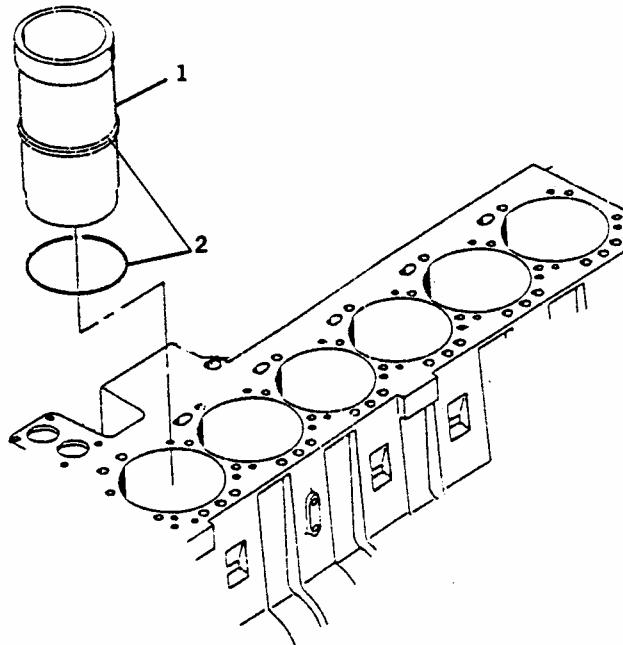
REMOVAL:

1. USE CLEAN RAGS TO COVER HOLE IN BOTTOM OF CYLINDER TO BLOCK DEBRIS FROM FALLING INTO CONNECTING ROD JOURNAL OIL HOLE.

CAUTION

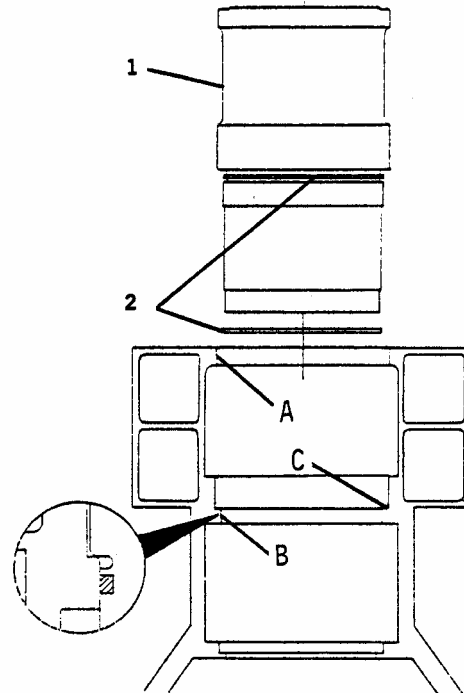
Make sure liner puller does not catch on any of the four liner stops.

2. USING LINER PULLER, PULL LINER (1) AND SEALS (2). MARK LINERS FOR INSTALLATION.



CLEANING AND INSPECTION:**WARNING**

Dry cleaning solvent P-D-680, Type III is toxic and flammable. Wear protective goggles and gloves and use only in a well ventilated area. Avoid contact with skin, eyes and clothes and don't breathe vapors. Do not use near open flame or excessive heat. The flash point is 200°F (94°C). If you become dizzy while using cleaning solvent, get fresh air immediately and get medical aid. If contact with eyes is made, wash your eyes with water and get medical aid immediately. Compressed air used for cleaning purposes will not exceed 30 psi. Use only with effective chip guarding and personal protective equipment (goggles/shield, gloves, etc.).

**1. CLEAN SEALING SURFACES.**

- a. Clean all deposits and debris from sealing surfaces A, B and C.

NOTE

Fine grit sandpaper and cleaning solvent can be used to polish surfaces. However, due to critical machined tolerances, care should be taken not to remove any stock.

2. INSPECT SEALING SURFACES.

- a. If surface C has cracks or signs of extreme wear, engine block must be replaced.

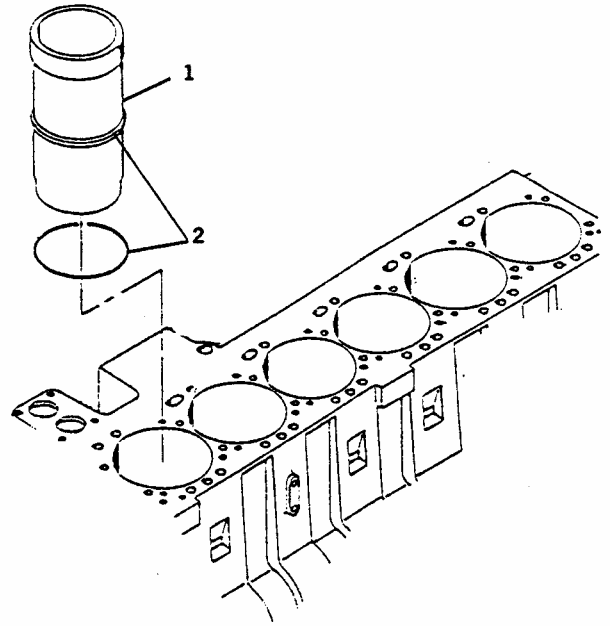
3. CLEAN WATER PASSAGES AND INSPECT FOR DEBRIS IN WATER JACKET.**4. CLEAN CYLINDER BORE.**

- a. Thoroughly flush block with cleaning solvent.
- b. Remove shop rags and clean crankshaft with cleaning solvent.
- c. Blow cylinder bores and crankshaft dry and wipe them clean with a lint free cloth.

TM 5-3810-306-34

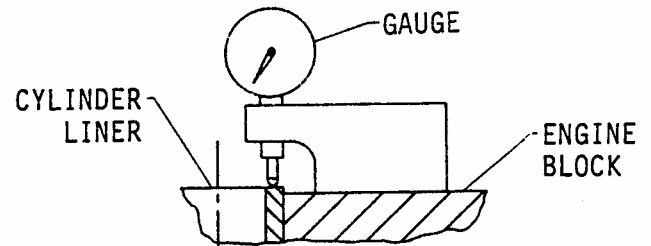
INSTALLATION:

1. INSTALL CYLINDER LINERS (1) AND SEALS (2).
 - a. Lubricate surfaces A and B with clean engine oil.
 - b. Install new seals (2) on liners (1) as illustrated. Lubricate with clean engine oil.
 - c. Position marked liner (1) in proper cylinder bore. Using liner driver, drive liner in until it is fully seated.

**NOTE**

Liner clamps may also be used to install liner. Install liner clamping plate over liner, secure with capscrews and spacers. Torque capscrews to 50 ft-lbs (68 Nm). Repeat for each liner.

2. INSPECT LINER PROTRUSION.
Limits: 0.0005 - 0.0043 in.
(0.013 - 0.109 mm)
3. INSTALL PISTON AND ROD ASSEMBLIES. (REFER TO PAGE 4-32.)
4. INSTALL ENGINE. (REFER TO PAGE 4-2.)
5. TEST FOR PROPER OPERATION. INSPECT FOR LEAKS AND LOOSE PARTS. (REFER TO TM 5-3810-306-10.)

**END OF TASK**

Section III. CRANKSHAFT MAINTENANCE

CRANKSHAFT INSTALLATION

TOOLS: General mechanic's tool kit: automotive (5180-00-177-7033)
Shop equipment general purpose repair, semi-trailer mtd (4930-01-006-3229)
Shop equipment machine shop; fm heavy less power (3470-00-754-0738)
Shop equipment machine shop; fm heavy suppl no. 1 (3470-00-754-0739)
Shop equipment auto-maintenance and repair, fm basic (4910-00-754-0705)
Shop equipment auto-maintenance and repair, fm suppl no. 1 (4910-00-754-0706)
Lifting device (150 lbs capacity)

SUPPLIES: Oil (Item 11, Appendix B)
Lubriplate 105 (Item 4, Appendix C)

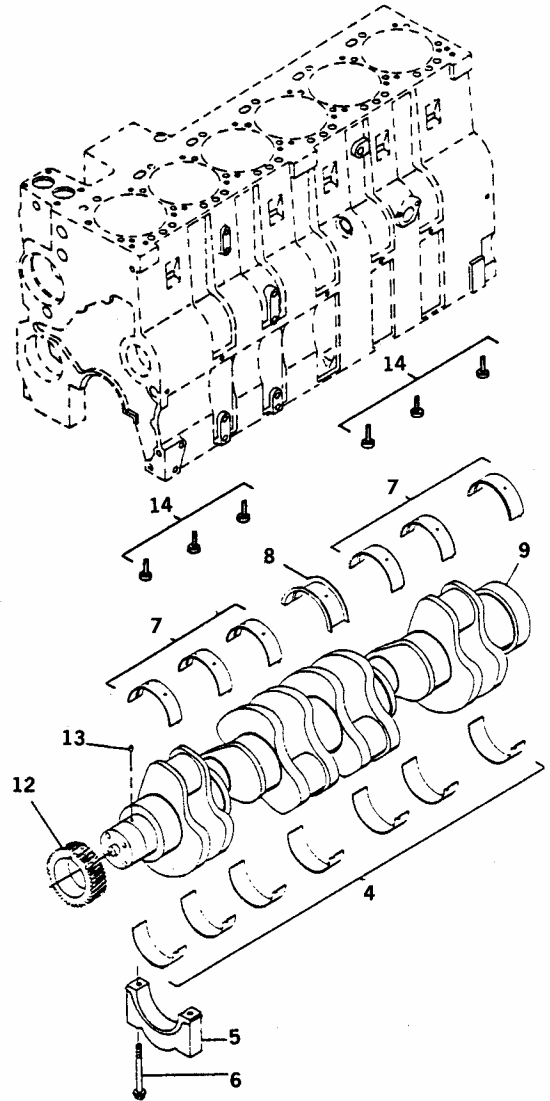
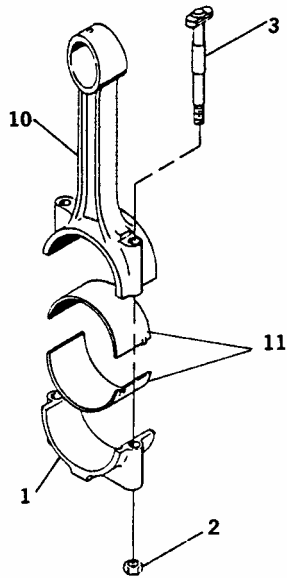
EQUIPMENT CONDITIONS: Engine removed. (Refer to page 4-2.)
Flywheel housing and rear seal cover removed.
(Refer to page 4-27.)
Front gear cover removed. (Refer to page 4-43.)
Oil pan and suction tube removed. (Refer to page 4-53.)

REMOVAL:

1. WITH ENGINE ON MAINTENANCE STAND, ROTATE ENGINE BOTTOM SIDE UP.
2. DISCONNECT CONNECTING RODS (10).
 - a. Mark each rod cap (1) according to cylinder number.
 - b. Remove two nuts (2) from connecting rod bolts (3).
 - c. Tap bolts (3) with plastic hammer to loosen rod cap (1).
 - d. Slide each piston assembly away from crankshaft.
3. REMOVE BEARINGS (4) AND CAPS (5).
 - a. Mark each bearing cap to assure that each is installed in same position at assembly.
 - b. Remove fourteen hex capscrews (6) from seven main bearing caps (5).
 - c. Use two hex capscrews (6) to work main cap loose.
 - d. Remove main bearing caps (5).
4. REMOVE CRANKSHAFT (9) AND BEARINGS (7), (8) AND (11).
 - a. Using suitable lifting device, remove crankshaft (9) from cylinder block in direct upward motion.
 - b. Remove and discard main bearings (4) from seven bearing caps (5).
 - c. Remove and discard main bearings (7) and (8) from cylinder block.
 - d. If necessary, using a 3/16 in. pin punch, drive piston cooling nozzles (14) from bearing saddles in block.
 - e. Remove and discard rod bearings (11) from rods (10) and caps (1).
 - f. Reinstall main bearing caps (5) in their corresponding positions. Note: #1 cap is to front of block.

CAUTION

Do not pry on main bearing caps to free them from cylinder block.



5. REMOVE CRANK SHAFT GEAR (12).

- a. Using a suitable puller, remove crankshaft gear (12) from crankshaft (9).
- b. Remove alignment pin (13) from crankshaft (9).
- c. If crankshaft is to be reused, remove all burrs to make sure gear and bearing surfaces on end of crankshaft are smooth

INSTALLATION

1. INSTALL CRANKSHAFT GEAR (12).

- a. Install alignment pin (13) in crankshaft (9).

CAUTION

Crank case gear (12) will be permanently distorted if overheated.

- b. Heat crankshaft gear (12) for 45 minutes at 250° F (121° C).

CAUTION

Wear protective gloves to prevent personal injury from hot gear.

- c. Install hot crankshaft gear (12), with timing mark out, up to shoulder on crankshaft (9) aligning slot in gear with alignment pin (13).

2. INSTALL BEARINGS (7), (8) AND (11),

- a. If removed, using a 1/2 in. center punch, install piston cooling nozzles even with or below bearing saddle surfaces in block.

NOTE

Upper bearings (7) and (8) contain an oil hole. Lower bearings (4) do not.

NOTE

All bearings are marked on back to indicate either standard (STD) or oversize (OS). Use only appropriate size required.

- b. Install new bearings (7) in bearing saddles. Make sure tang of bearings are in slot of bearing saddle.
- c. Install new combination thrust/main bearing (8) in center journal saddle.

CAUTION

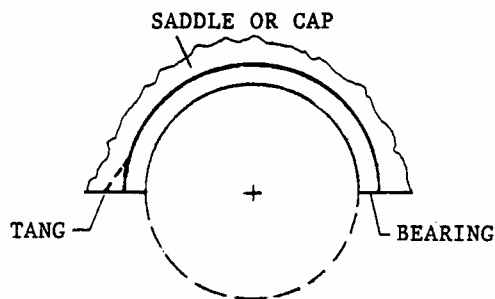
Prevent dirt from mixing with lubricant. (Dirty lubricant will accelerate bearing wear.)

- d. Lubricate bearings (7) and (8) with Lubriplate 105. Do not lubricate back of bearings.
- e. Clean crankshaft (9) bearing surfaces using a lint free cloth.
- f. Install bearings (11) in rods (10) and caps (1). Apply light film of Lubriplate 105 to bearing surfaces.

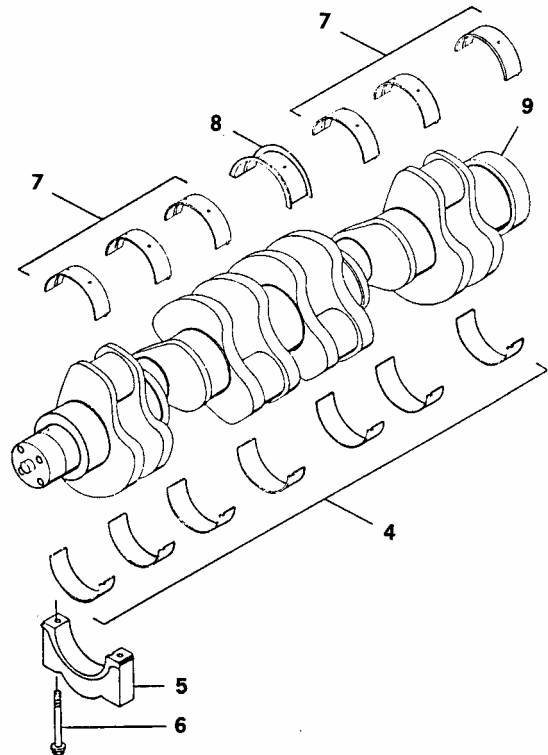
3. INSTALL CRANKSHAFT (9)

- a. Using lifting strap that will not damage crankshaft (9), lower into position and do not drop crankshaft on bearing.
- b. Install crankshaft (9) taking care not to damage thrust/main bearing (8).

4. INSTALL LOWER BEARINGS (4) AND (8) AND CAPS (5).



- a. Install new lower main bearings (4) and (8) into caps (5). Make sure tang of bearing shell is in slot of cap.
- b. Lubricate bearings (4) and (8) with Lubriplate 105. Do not lubricate back of bearings.



NOTE

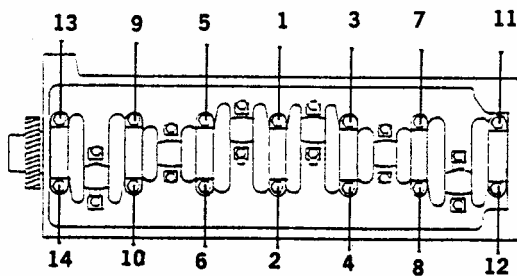
The main bearing caps (5) are numbered for location. Number one starts at front of block, and numbers face the camshaft side of engine. When installed the tangs should both be on the same side.

- c. Install bearing caps (5).

NOTE

Thrust journal bearing (8) does not have tang or slot. Ensure the number stamped on main bearing cap (5) is positioned to the camshaft side of engine.

- d. Lubricate main bearing hex capscrew threads and underside of head with clean engine oil.
- e. Using plastic rubber mallet, tap main bearing caps (5) gently into position. When in place, hex capscrews (6) can be threaded in by hand (6).
- f. Torque hex capscrews (6) evenly in three steps in order shown.
 First step to 37 ft-lbs (49 Nm)
 Second step to 70 ft-lbs (93 Nm)
 Third step to 110 ft-lbs (146 Nm)

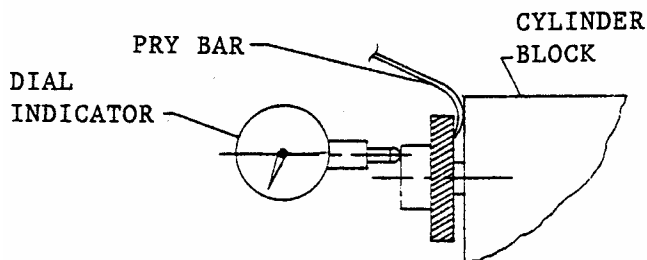


NOTE

Crankshaft should rotate freely. If crankshaft does not rotate freely check bearing installations and sizes.

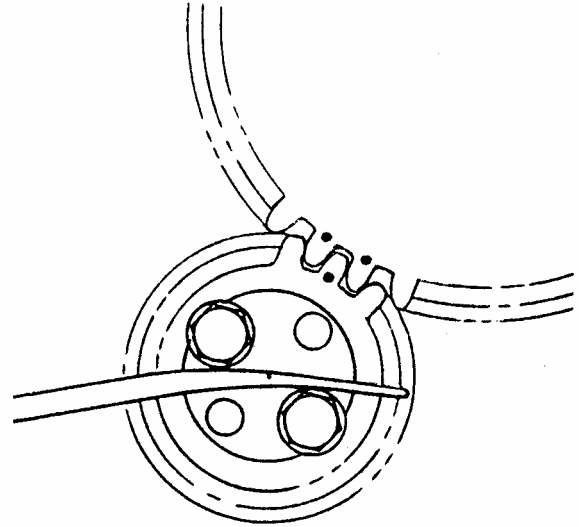
5. CHECK CRANKSHAFT END PLAY.

- a. Position dial indicator as shown and measure crankshaft (9) end play.
 Tolerance: min 0.006 (0.15 mm)
 max 0.013 (0.33 mm)



6. CONNECT PISTON RODS (10).

- a. Bar crankshaft (9) so rod journal for piston to be installed is at bottom dead center.



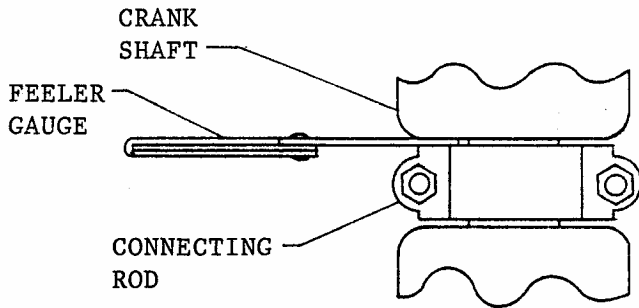
- b. Pull connecting rod (10) onto crankshaft (9) journal.
- c. Apply clean engine oil to lubricate threads of bolts (3) of connecting rod (10).

NOTE

The number stamped on rod (10) and cap (1) at parting line must match and be installed on camshaft side of engine.

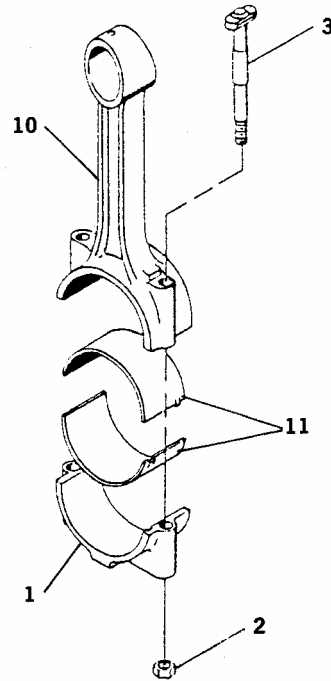
- d. Install rod cap (1) and start connecting rod nuts (2).
- e. Lubricate under connecting rod nuts (2) with clean engine oil.
- f. Alternately tighten rod nuts (2) to pull rod cap (1) into position.
- g. Torque rod nuts (2) evenly in three steps.
 First to 30 ft-lbs (40 Nm)
 Second to 60 ft-lbs (80 Nm)
 Final torque to 88 ft-lbs (117 Nm)

- h. Shake connecting rod (10) and cap (1) to verify side clearance.
- i. Measure total side clearance with a feeler gauge between crankshaft and connecting rod.
 - min 0.004 (0.1 mm)
 - max 0.012 (0.3 mm)



- j. Check crankshaft for freedom of rotation as caps (1) are installed one at a time. If crankshaft does not rotate freely check bearing installation and size.
 - k. Install all six caps (1).
7. INSTALL OIL PAN AND SUCTION TUBE. (REFER TO PAGE 4-53.)
 8. INSTALL FRONT COVER. (REFER TO PAGE 4-43.)
 9. INSTALL FLYWHEEL HOUSING AND REAR SEAL. (REFER TO PAGE 4-27.)
 10. INSTALL ENGINE. (REFER TO PAGE 4-2.)

11. INSTALL ENGINE HOOD. (REFER TO TM 5-3810-306-20.)



12. CONNECT NEGATIVE BATTERY CABLE AT SHUNT. (RT875CC) (REFER TO TM 5-3810-306-20.)

END OF TASK

Section IV. FLYWHEEL MAINTENANCE

FLYWHEEL HOUSING AND REAR SEAL INSTALLATION

TOOLS: General mechanic's tool kit: automotive (5180-00-177-7033)
 Pneumatic or electric drill
 1/8 in. drill bit

SUPPLIES: Preformed packing (Item 221, Appendix B)
 Seal (Item 222, Appendix B)
 Clean rags (Item 2, Appendix B)
 Lubriplate 105 (Item 102, Appendix B)

EQUIPMENT CONDITIONS: Battery disconnect switch in off position. (RT875CCS)
 Negative battery cable disconnected at shunt. (RT875CC)
 (Refer to TM 5-3810-306-20.)
 Engine removed. (Refer to page 4-2.)
 Torque Converter removed. (Refer to page 7-2.)
 Starter removed. (Refer to TM 5-3810-306-20.)
 Flywheel removed. (Refer to page 4-30.)

WARNING

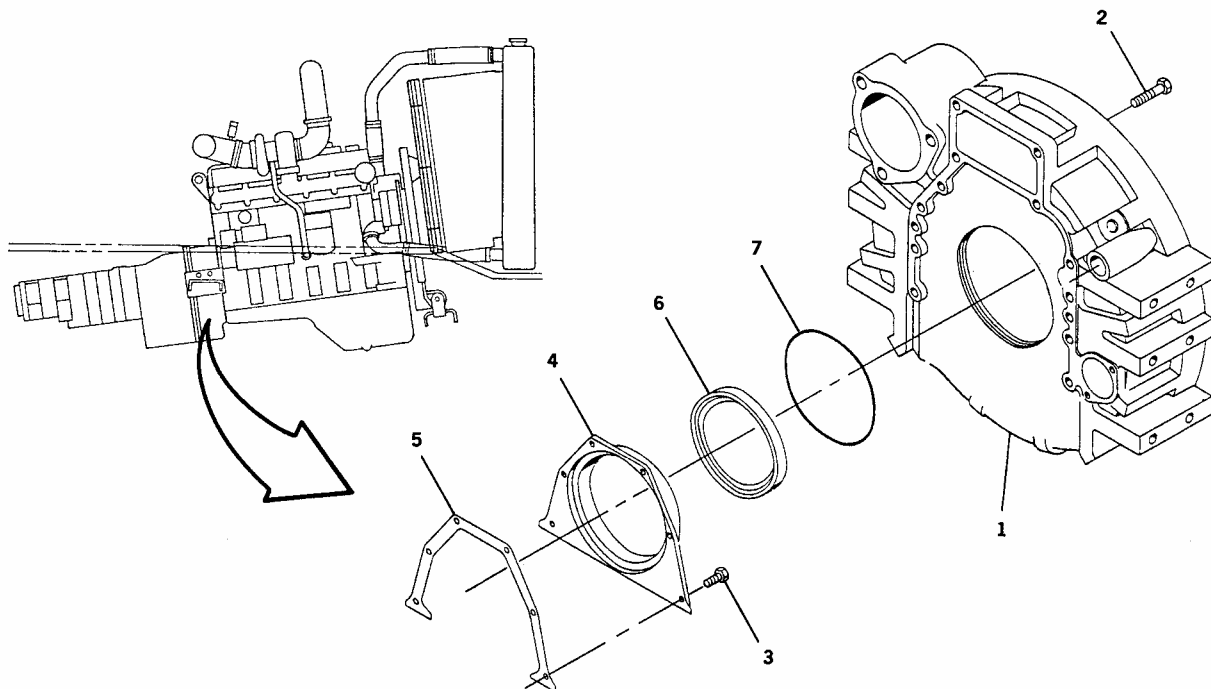
Be sure to wear protective eye covering to avoid personal injury.

REMOVAL:

NOTE

If only rear seal needs replacement.
 Step 2 outlines procedure for removal
 without removing flywheel housing or
 seal cover.

1. REMOVE FLYWHEEL HOUSING (1) AND REAR SEAL (6).
 - a. Remove twelve capscrews (2) from flywheel housing (1). Remove housing (1).
 - b. Remove and discard packing seal (7).



- c. If oil pan has not been removed, remove four capscrews attaching oil pan to rear seal cover (4).
- d. Remove six capscrews (3) from rear seal cover (4) and remove with gasket (5).
- e. Drive out and discard seal (6) from rear seal cover (4).

2. REMOVE REAR SEAL (6) FROM SEAL COVER (4).

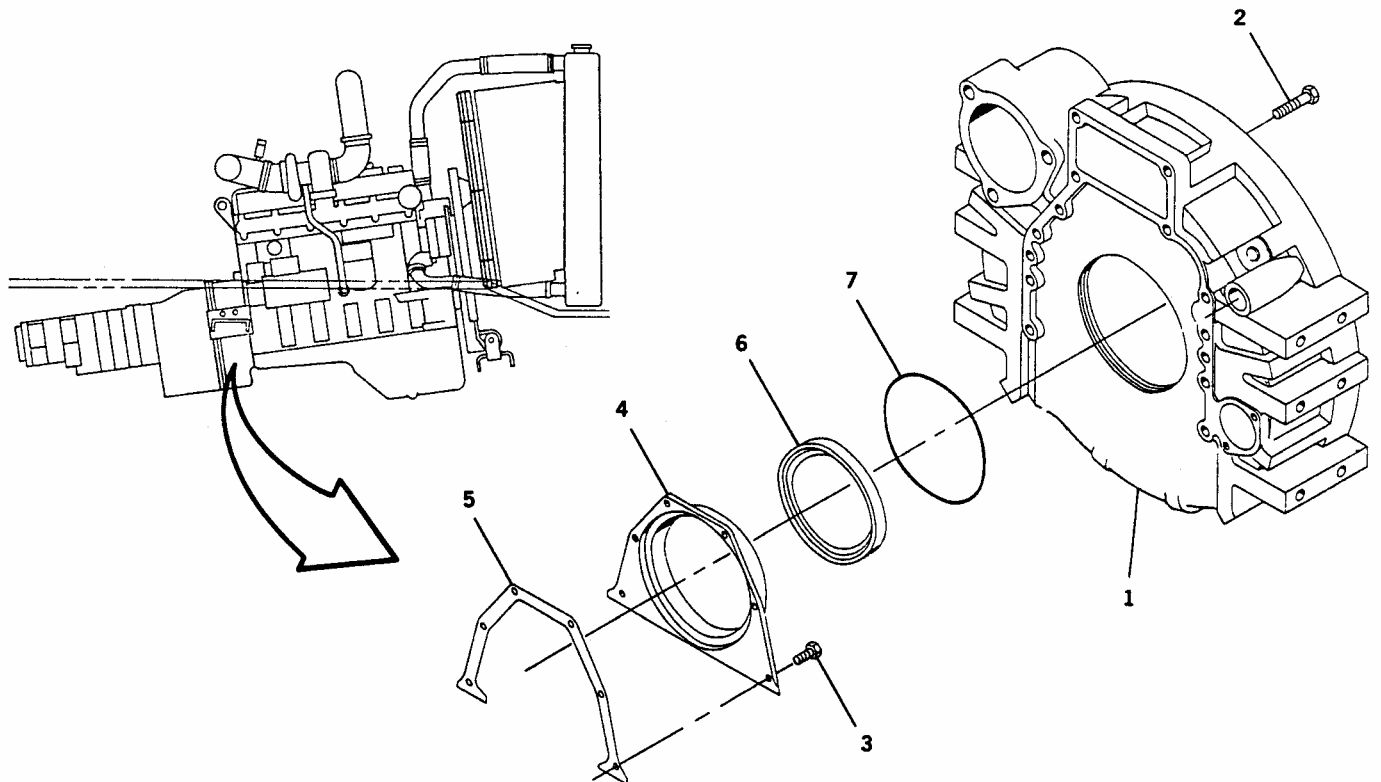
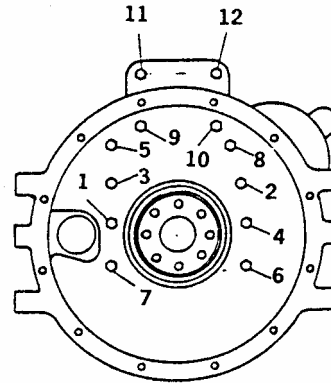
- a. Drill two 1/8 in. holes 180 degrees apart in seal (6).
- b. Install slide hammer with No. 10 sheet metal screw into holes and remove seal (6).

INSTALLATION:

1. INSTALL REAR SEAL (6) (COVER REMOVED)

- a. Install new seal (6) into rear seal cover (4).
- b. Mount rear seal cover (4) and new gasket (5) with six capscrews (3).

- c. Position new packing seal (7) on seal cover (4) and lubricate with Lubriplate 105.
2. INSTALL REAR SEAL (6) (COVER INSTALLED).
- a. Clean and dry crankshaft sealing surface.
 - b. Install seal pilot from seal kit, over crankshaft. Push new seal (6) over pilot into position. Remove pilot.
 - c. Tap seal with alignment tool until tool stops against housing



3. INSTALL FLYWHEEL HOUSING (1).

CAUTION

Make sure flywheel housing is positioned onto the alignment dowels and packing seal (7) is not cut or damaged.

- a. Mount flywheel housing (1) with twelve capscrews (2). Torque capscrews (2) to 45 ft-lbs (60 Nm) in sequence shown.

4. INSTALL FLYWHEEL. (REFER TO PAGE 4-30.)

5. INSTALL STARTER. (REFER TO TM 5-3810-306-20.)

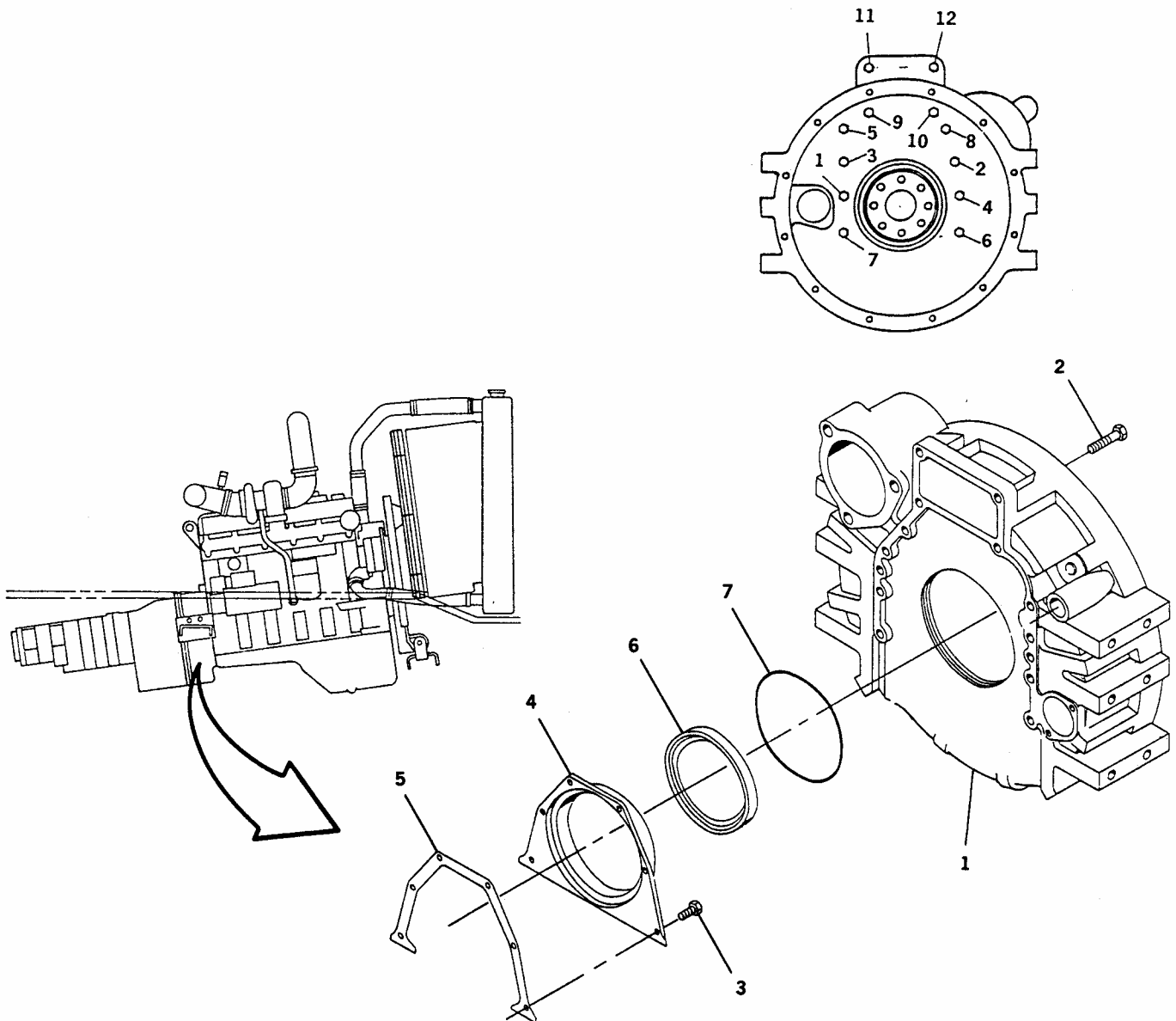
6. INSTALL TORQUE CONVERTER. (REFER TO PAGE 7-2.)

7. INSTALL ENGINE. (REFER TO PAGE 4-2.)

8. INSTALL ENGINE HOOD. (REFER TO TM 5-3810-306-20.)

9. CONNECT NEGATIVE BATTERY CABLE AT SHUNT. (RT875CC) (REFER TO TM 5-3810-306-20.)

END OF TASK



FLYWHEEL INSTALLATION

TOOLS: General mechanic's tool kit: automotive (5180-00-177-7033)
Shop Equipment Machine Shop; FM Basic (3470-00-754-0708)
Shop Equipment Welding, Field Maintenance (4940-00-357-7268)
Tool Outfit Hyd System; Test and Repair, 3/4 Ton Trailer Mtd (4940-01-036-5784)
Shop Equipment Fuel and Electric System Engine FM Basic (4940-00-754-0714)
Engine barring tool (3377371)

SUPPLIES: None

EQUIPMENT CONDITIONS: Battery disconnect switch in off position. (RT875CCS)
Negative battery cable disconnected at shunt. (RT875CC)
(Refer to TM 5-3810-306-20.)
Torque converter removed. (Refer to page 7-2.)

REMOVAL:

1. REMOVE FLYWHEEL (1).
 - a. Remove eight capscrews (3) and washers (2) from crankshaft.
 - b. Remove flywheel (1) from flywheel housing (4).

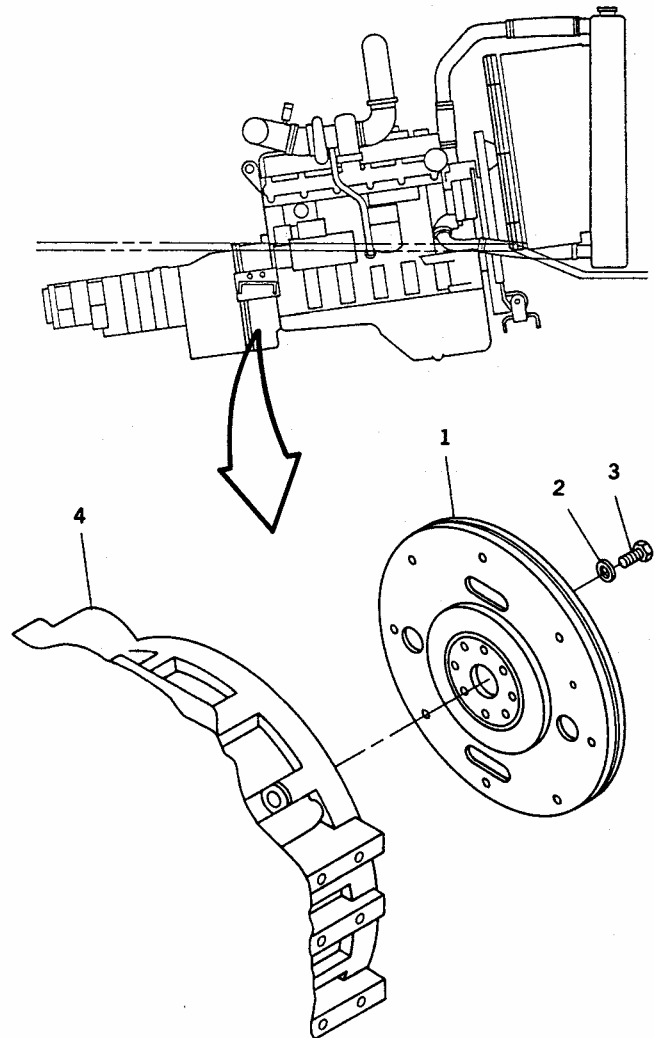
INSTALLATION:

1. INSTALL FLYWHEEL (1).
 - a. Lubricate capscrews (3) and washers (2) with clean engine oil.
 - b. Install flywheel (1) into flywheel housing (4) onto crankshaft with eight capscrews (3) and washers (2).

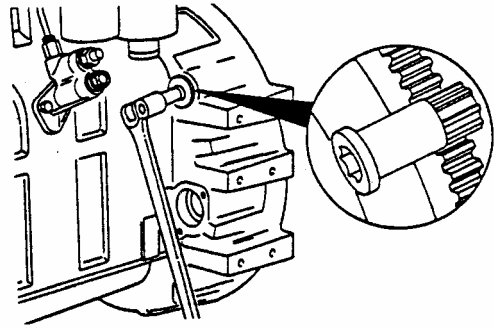
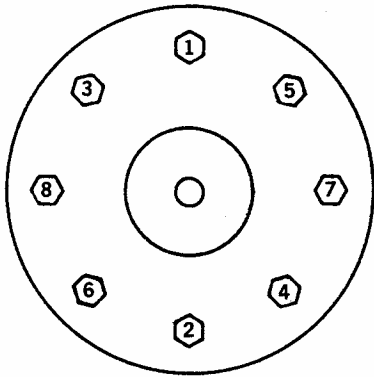
CAUTION

Do not use timing pin to lock engine.

- c. Install engine barring tool through flywheel housing (4) and into flywheel (1).

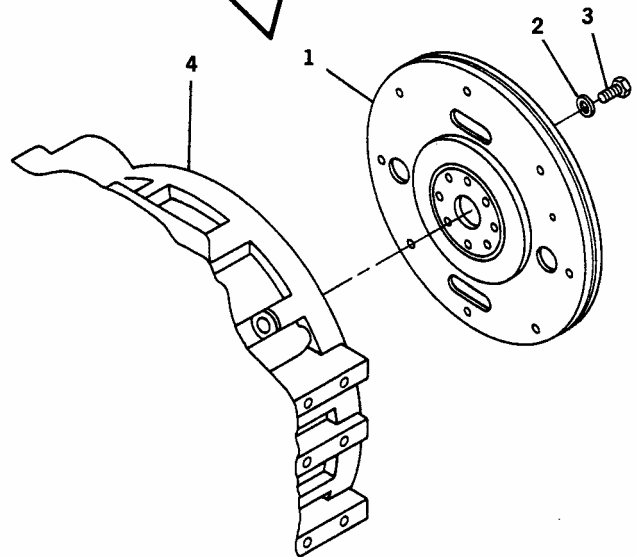
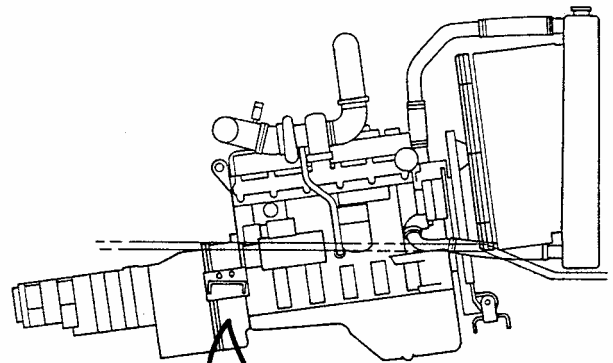


- d. Hold flywheel (1) from turning with engine barring tool and torque capscrews (3) in sequence shown (on next page) to 101 ft-lbs (134 Nm).



- e. Remove engine barring tool from flywheel housing (4).

2. INSTALL TORQUE CONVERTER. (REFER TO PAGE 7-2.)
3. INSTALL REAR DECKING. (REFER TO TM 5-3810-306-20.)
4. INSTALL ENGINE HOOD. (REFER TO TM 5-3810-306-20.)
5. CONNECT NEGATIVE BATTERY CABLE AT SHUNT. (RT875CC) (REFER TO TM 5-3810-306-20.)



END OF TASK

Section V. PISTONS AND CONNECTING RODS MAINTENANCE

PISTON AND CONNECTING ROD ASSEMBLY

TOOLS: General mechanic's tool kit: automotive (5180-00-177-7033)
 Ring compressor
 Engine barring tool (3377371)

SUPPLIES: Piston ring set (Item 5, Appendix B)
 Lubriplate 105 (Item 4, Appendix B)

EQUIPMENT CONDITIONS: Negative battery cable disconnected at shunt. (RT875CC)
 Battery disconnect switch in off position. (RT875CCS)
 Engine removed. (Refer to page 4-2.)
 Cylinder head removed. (Refer to page 4-8.)
 Oil pan and suction tube removed. (Refer to page 4-53.)

REMOVAL:

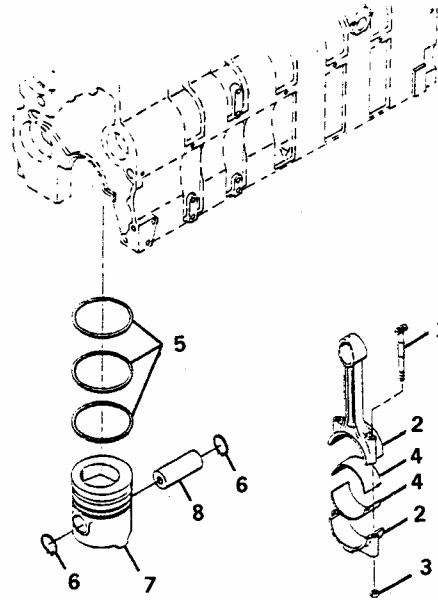
WARNING

Dry cleaning solvent P-D-680, Type III is toxic and flammable. Wear protective goggles and gloves. Use only in a well ventilated area. Avoid contact with skin, eyes and clothes and don't breathe vapors. Do not use near open flame or excessive heat. The flash point is 200°F (94°C). If you become dizzy while using cleaning solvent, get fresh air immediately and get medical aid. If contact with eyes is made, wash your eyes with water and get medical aid immediately.

1. USE SCRAPER OR 240 GRIT EMERY CLOTH AND SOLVENT TO REMOVE CARBON BUILD UP AT TOP OF CYLINDERS.

NOTE

Only scrape or sand above piston travel area.



2. USING NUMBER STAMPS, MARK EACH CYLINDER NUMBER ON EACH CONNECTING ROD CAP AND PISTON.
3. REMOVE TWELVE CONNECTING ROD NUTS (3).
4. REMOVE ROD CAPS (2) AND SLEEVE BEARINGS (4).
 - a. Tap rod bolts (1) to loosen rod caps (2).
5. PUSH PISTONS (7) AND CONNECTING RODS (2) UP THROUGH CYLINDER BORE. SET ASSEMBLIES IN RACK.

CAUTION

Take care not to damage cylinder bore or connecting rod.

DISASSEMBLY:

1. DISASSEMBLE PISTON (7).
 - a. Remove retaining rings (6).
 - b. Remove piston pin (8) and separate connecting rod (2) from piston (7).
 - c. Remove piston rings (5) from piston (7).

CLEANING:

WARNING

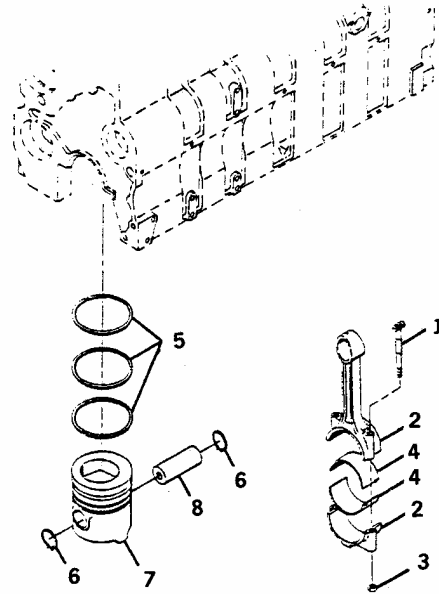
Dry cleaning solvent P-D-680, Type III is toxic and flammable. Wear protective goggles and gloves and use only in a well ventilated area. Avoid contact with skin, eyes and clothes and don't breathe vapors. Do not use near open flame or excessive heat. The flash point is 200°F (94°C). If you become dizzy while using cleaning solvent, get fresh air immediately and get medical aid. If contact with eyes is made, wash your eyes with water and get medical aid immediately. Compressed air used for cleaning purposes will not exceed 30 psi. Use only with effective chip guarding and personal protective equipment (goggles/shield, gloves, etc.).

1. SOAK PISTONS OVERNIGHT TO LOOSEN CARBON DEPOSITS.

CAUTION

Do not use bead blast to clean pistons.

2. WASH PISTONS (7) AND RODS (2) IN STRONG SOLUTION OF LAUNDRY DETERGENT.



CAUTION

Do not clean components in an acid bath.

3. CLEAN REMAINING DEPOSITS FROM RING GROOVES WITH SQUARE END OF A BROKEN RING.

CAUTION

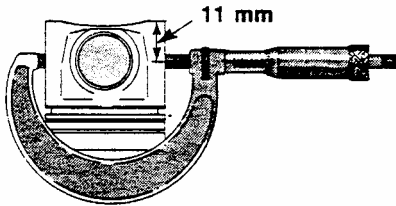
Do not use a ring groove cleaner. Ensure sealing surface in piston groove does not get scratched.

4. WASH PISTONS AGAIN IN DETERGENT SOLUTION AND BLOW DRY WITH COMPRESSED AIR.

INSPECTION:

1. INSPECT PISTON, PISTON PIN AND CONNECTING ROD FOR DAMAGE AND EXCESSIVE WEAR. CHECK PISTON TOP, RING GROOVES, SKIRT AND PIN BORE.

2. MEASURE PISTON SKIRT DIAMETER AND RECORD.



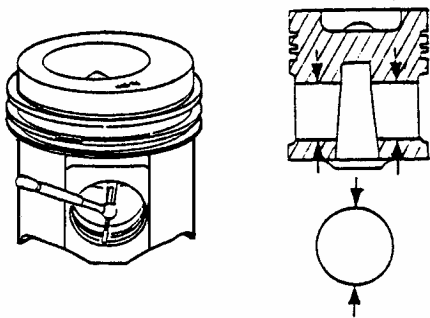
Diameter = 4.4794 in. (113.776 mm)

3. MEASURE RING TO GROOVE CLEARANCE.

- a. Use a new piston ring inserted in appropriate groove to measure clearance.

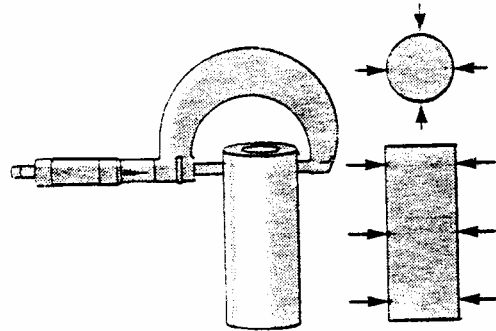
Top = Use keystone gauge
Intermediate = 0.006 in.
(0.150 mm)
Oil control = 0.005 in. (0.130 mm)

4. MEASURE PISTON BORE.



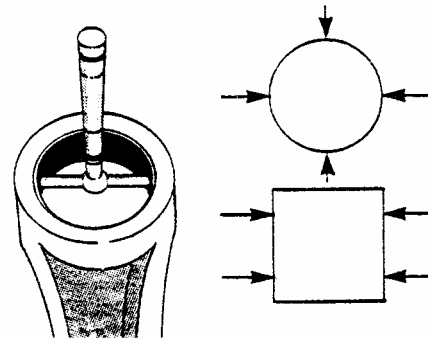
Max. dia. = 1.7726 in. (45.025 mm)

5. MEASURE PISTON PIN.



Min. dia. = 1.7712 in. (44.989 mm)

6. MEASURE CONNECTING ROD PIN BORE.



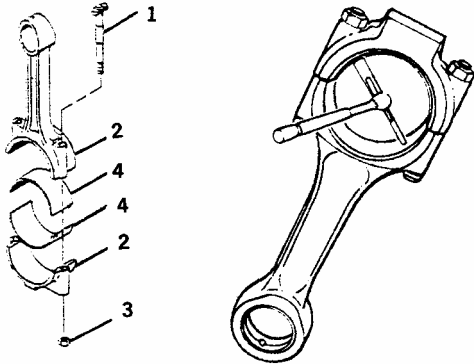
Max. dia. = 1.773 in. (45.035 mm)

7. DETERMINE ROD BEARING CLEARANCE.

NOTE

Bearing clearance can also be determined using Plastigage during engine assembly.

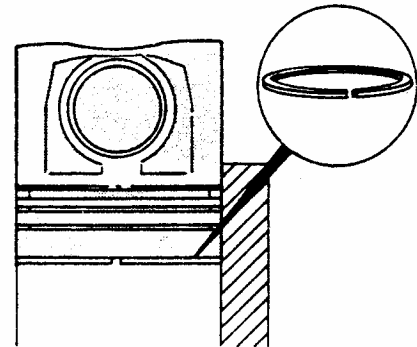
- a. Install bearings (4) and rod caps (2). Install nuts (3) and tighten to 73 ft-lbs (99 Nm). Measure and record smallest diameter.



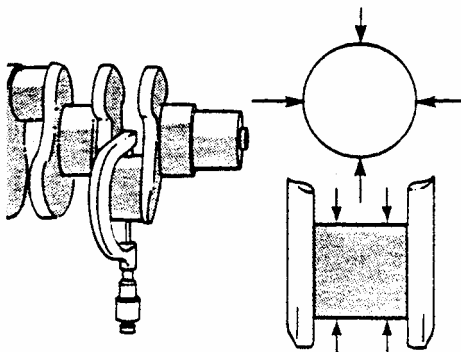
NOTE

Rings for a turbocharged engine are same as rings for a naturally aspirated engine.

- b. Position each ring in cylinder and use a piston to square it in bore 3.5 in. (89 mm) from top of block. Use feeler gauge to measure ring gap.



- b. Measure and record maximum diameter of appropriate rod journal on crankshaft.

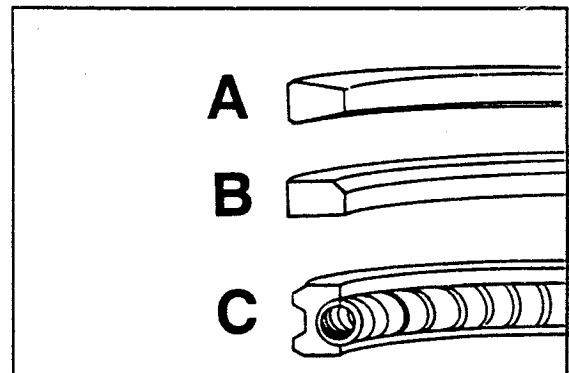


Min. dia. = 2.9906 in. (75.962)
 Max. dia. = 2.9921 in. (76.000)
 Out-of-roundness = 0.002 in.
 (0.050 mm)
 Tapers = 0.0005 in. (0.013 mm)

- c. Bearing clearance = Rod inside diameter minus crankshaft journal diameter.
 Clearance = 0.0035 in. (0.009 mm)

8. CHECK PISTON RING GAP.

- a. Determine proper ring set according to piston diameter measurement taken in step 2.



Top (A)

Max. = 0.0275 in. (0.70 mm)
 Min. = 0.0157 in. (0.40 mm)

Intermediate (B)

Max. = 0.0275 in. (0.70 mm)
 Min. = 0.0157 in. (0.40 mm)

Oil Control (C)

Max. = 0.0236 in. (0.60 mm)
 Min. = 0.0118 in. (0.30 mm)

NOTE

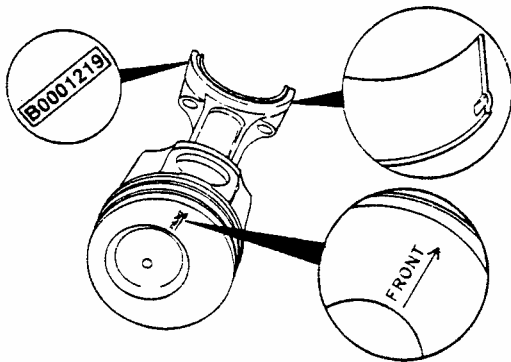
If ring gap exceeds maximum limit, cylinder liner is worn and must be replaced.

REASSEMBLY:

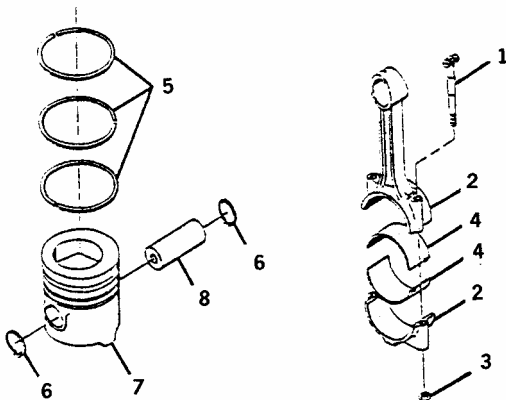
1. INSTALL PISTON (7) ON CONNECTING ROD (2).

CAUTION

Ensure "front" marking on piston and numbers on rod and cap are oriented as shown.



- a. Install retaining ring (6) in pin groove on "front" side of piston.
- b. Lubricate piston pin (8) and pin bores with clean engine oil. Position connecting rod (2) and install pin (8).
- c. Install second retaining ring (6).

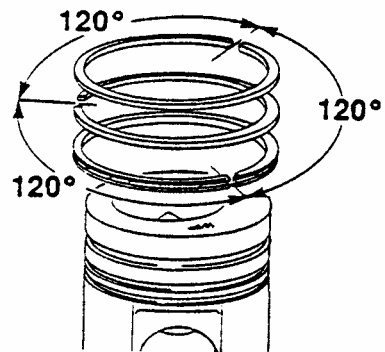
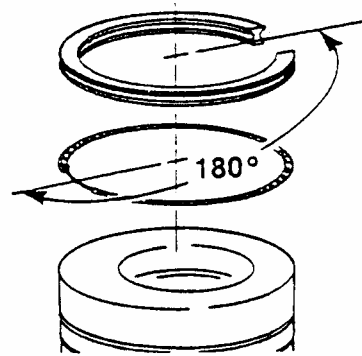


2. INSTALL PISTON RINGS (5).

NOTE

The top surfaces of all rings are identified. Assemble with the word "Top" or the supplier mark up.

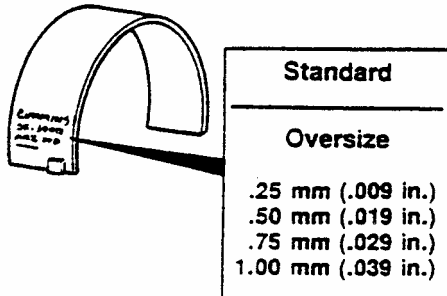
- a. Install oil ring expander in oil control ring groove.



- b. Install oil control ring with end gap opposite end gap on oil ring expander.
 - c. Install intermediate ring.
 - d. Install top ring.
 - e. Position rings.
3. IF REMOVED, TAP CONNECTION ROD BOLTS (1) IN CONNECTING ROD (2) UNTIL HEAD IS SEATED ON FLAT OF ROD.

4. INSTALL ROD BEARINGS (4).

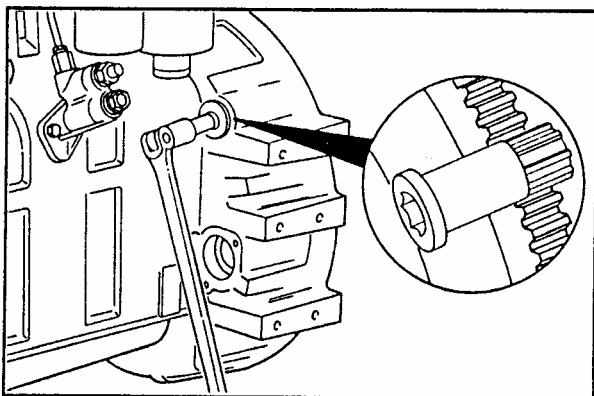
- a. Obtain a set of rod bearings same size as bearings removed which were measured and recorded previously.



- b. Install new bearings (4) in rods and caps (2) and lubricate with Lubriplate 105.

5. INSTALL PISTON AND ROD ASSEMBLIES.

- a. Lubricate cylinder bore, rings and piston skirt with clean engine oil.
- b. Compress rings with a suitable ring compressor taking care not to damage rings.
- c. Using engine barring tool, bar crankshaft so rod journal for piston to be installed is at bottom dead center (BDC).

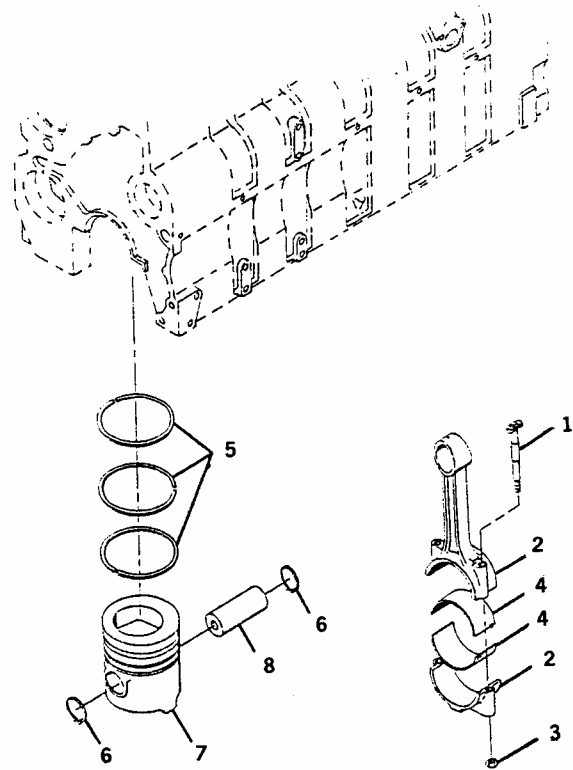


- d. Install piston and rod assembly into appropriate cylinder bore taking care not to damage cylinder bore.

CAUTION

The word "front" on top of piston must face front of engine.

- e. Push piston into bore approximately 2 in. (50 mm), then pull connecting rod onto crankshaft journal.
- f. Lubricate connecting rod capscrews with clean engine oil.
- g. Install rod caps (2) and start connecting rod nuts (3).



CAUTION

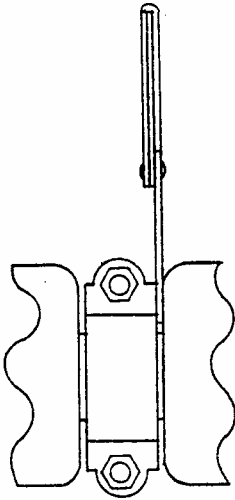
Number stamped on rod and cap at parting line must match and be installed towards camshaft side of engine.

- h. Alternately tighten rod nuts (3) to pull rod cap (2) into position.

- i. Torque rod nuts using the following steps:

- Step 1 = 30 ft-lbs (40 Nm)
- Step 2 = 60 ft-lbs (80 Nm)
- Step 3 = 88 ft-lbs (120 Nm)

- 6. DETERMINE SIDE CLEARANCE BETWEEN CONNECTING ROD AND CRANKSHAFT.



Limit 0.004 - 0.012 in. (0.1 to 0.3 mm)

NOTE

Throughout piston and connecting rod reassembly check for freedom of rotation of the crankshaft. If crankshaft does not move freely recheck bearing size and installation.

- 7. INSTALL SUCTION TUBE AND OIL PAN. (REFER TO PAGE 4-53.)
- 8. INSTALL CYLINDER HEAD. (REFER TO PAGE 4-8.)
- 9. INSTALL ENGINE. (REFER TO PAGE 4-2.)
- 10. CONNECT NEGATIVE BATTERY CABLE AT SHUNT. (RT875CC) (REFER TO TM 5-3810-306-20.)

END OF TASK

Section VI. VALVES AND CAMSHAFT MAINTENANCE

CAMSHAFT AND TAPPET INSTALLATION

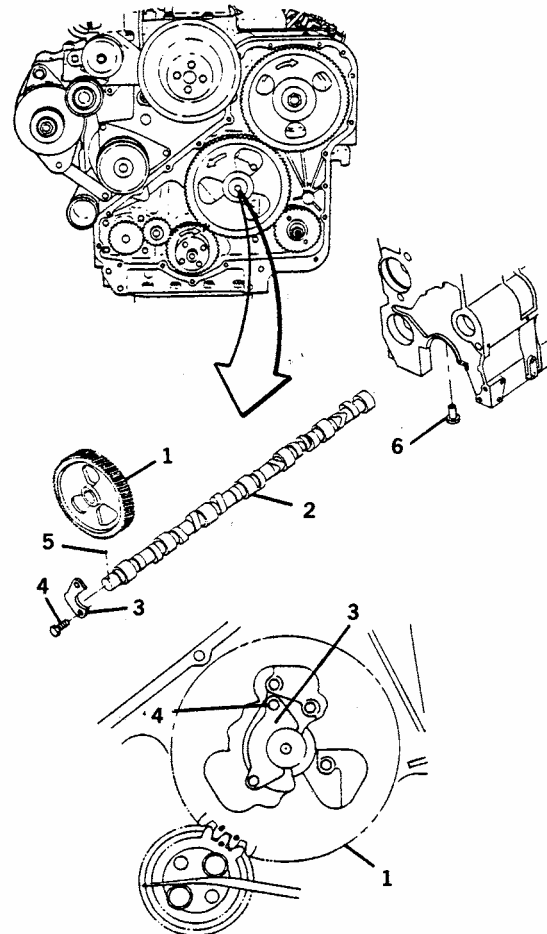
TOOLS: General mechanic's tool kit: automotive (5180-00-177-7033)

SUPPLIES: 1/2 in. x 18 in. Wooden dowel rods (Item 104, Appendix C) (12 Required)
Lubriplate 105 (Item 102, Appendix C)
Rubber bands (Item 103, Appendix C)

EQUIPMENT CONDITIONS: Negative battery cable disconnected at shunt. (RT875CC)
Battery disconnect switch in off position. (RT875CCS)
Engine removed. (Refer to page 4-2.)
Valve cover removed. (Refer to TM 5-3810-306-20.)
Rocker levers and push rods removed. (Refer to page 4-50.)
Oil pan removed. (Refer to page 4-53.)
Fuel Injection pump removed. (Refer to page 5-4.)
Front gear cover removed. (Refer to page 4-43.)

REMOVAL:

1. POSITION TAPPETS (6) AWAY FROM CAMSHAFT (2).
 - a. Cut a slot in each dowel rod 0.75 in. (19 mm) deep using a hacksaw.
 - b. Insert dowels through push rod holes and into top of each tappet securely. When properly installed, dowels can be used to pull tappets up and should not be able to be pulled out without considerable effort.
 - c. Pull tappets (6) up and wrap a rubber band around top of dowel rods. This will prevent tappets from dropping down.
2. REMOVE CAMSHAFT (2).
 - a. Rotate engine to align crankshaft to camshaft timing marks.
 - b. Remove capscrews (4) securing thrust plate (3). Remove thrust plate (3).
 - c. Carefully remove camshaft (2) from engine.
 - d. Remove gear (1) and pin (5) from camshaft using suitable puller.
3. REMOVE TAPPETS (6).
 - a. Rotate crankshaft to allow access to tappets (6).



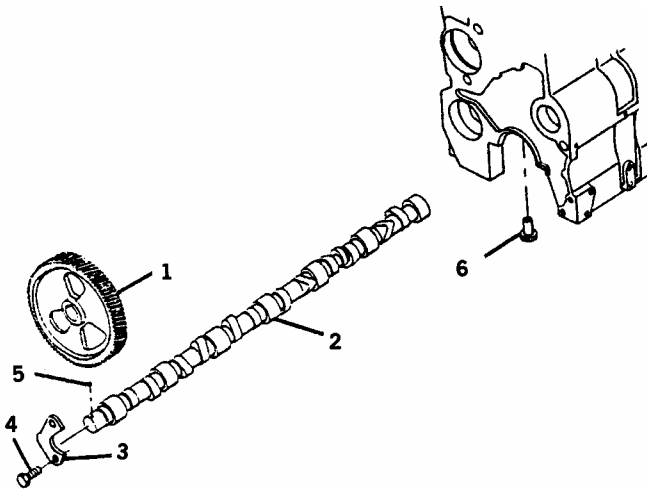
NOTE

Only four tappets will be accessible at one time. Crankshaft must be rotated three times to access all tappets.

- b. Remove rubber bands from dowels securing only accessible tappets. Remove tappets (6) from block and dowel from tappet.

CAUTION

When reusing camshaft (2) and tappets (6), tappets must be matched to their companion lobe on camshaft to prevent accelerated camshaft wear.



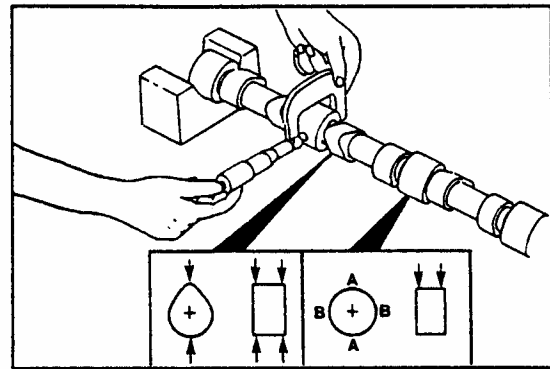
- c. Repeat steps a and b for remaining tappets.

INSPECTION:

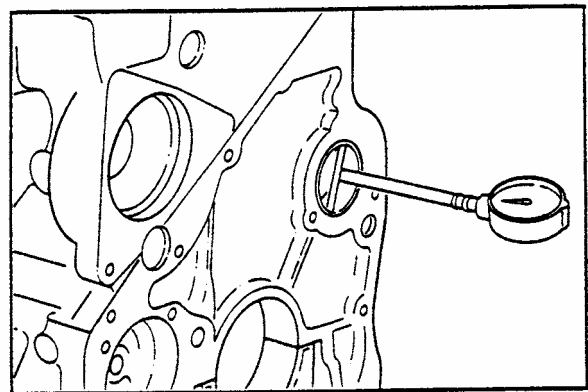
1. INSPECT THE FUEL PUMP LOBE, VALVE LOBES AND BEARING JOURNALS FOR WEAR, CRACKING, PITTING AND OTHER DAMAGE.
2. INSPECT GEAR (1) TEETH FOR WEAR AND DAMAGE. LOOK FOR CRACKS AT ROOT OF TEETH.

3. MEASURE BEARING JOURNALS AND VALVE LOBES.

- a. Bearing journal
Min. dia. = 2.3607 in.
(59.962 mm)
- b. Valve lobes
(Min. dia. at peak of lobe)
Intake min. height = 2.0383 in.
(51.774 mm)
Exhaust min. height = 2.0313 in.
(51.596 mm)
- c. Fuel pump lobe
Min. dia. = 1.626 in. (41.31 mm)



4. INSPECT CAMSHAFT BORES FOR DAMAGE OR EXCESSIVE WEAR.



5. MEASURE CAMSHAFT BUSHING BORE.
Max. dia. = 2.367 in. (60.122 mm)

NOTE

If bushings are worn beyond the specified limit, replacement is necessary.

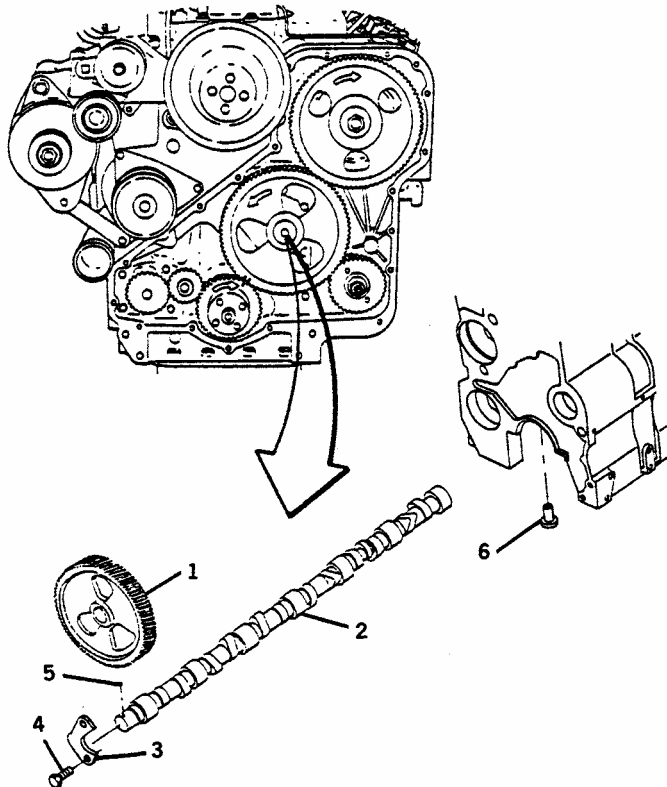
6. INSPECT TAPPET SOCKET, STEM AND FACE FOR EXCESSIVE WEAR, CRACKS AND OTHER DAMAGE.
7. MEASURE TAPPET STEM.
min. dia. = 0.628 in. (15.9 mm)

INSTALLATION:

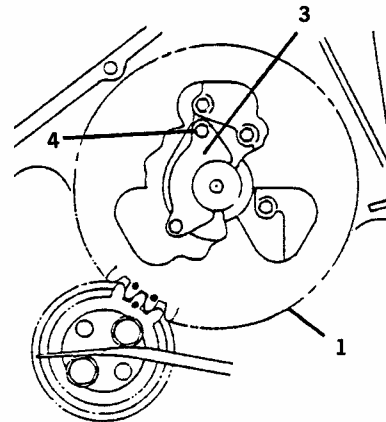
1. INSTALL TAPPETS (6).
 - a. Insert wooden dowels used during removal into tappets.
 - b. Lubricate tappets with Lubriplate 105.
 - c. Insert dowel and tappet into push rod hole until tappet is seated. Secure wooden dowel with rubber bands.

NOTE

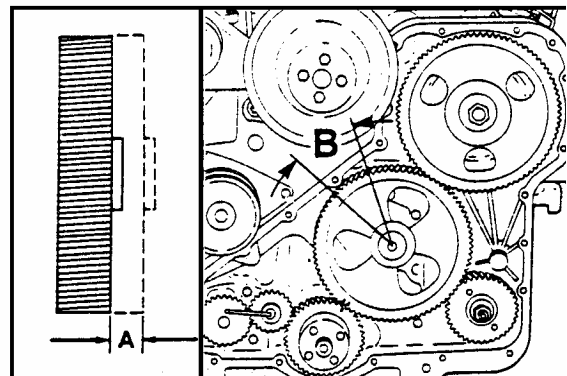
Only four tappets will be accessible at one time. Crankshaft must be rotated three times to access all tappets.



2. INSTALL CAMSHAFT (2).
 - a. Install dowel pin (5) and gear (1) on camshaft (2).
 - b. Lubricate camshaft lobes, journals and thrust washer with Lubriplate 105.
 - c. Install camshaft (2) and thrust washer (3). Align timing marks.



- d. Install thrust washer cap screws (4) and tighten to 18 ft-lbs (24 Nm)
3. CHECK CAMSHAFT BACK LASH AND END PLAY.



- a. End play (A) = 0.006 - 0.010 in. (0.152 - 0.254 mm)
 - b. Backlash (B) = 0.005 - 0.013 in. (0.12 - 0.33 mm)
4. REMOVE DOWELS FROM TAPPETS (6).
5. INSTALL PUSH RODS AND ROCKER LEVERS. (REFER TO PAGE 4-50.)

6. INSTALL OIL PAN. (REFER TO PAGE 4-53.)
7. INSTALL FRONT COVER. (REFER TO PAGE 4-43.)
8. INSTALL FUEL INJECTION PUMP. (REFER TO PAGE 5-4.)
9. INSTALL ENGINE. (REFER TO PAGE 4-2.)
10. INSTALL RADIATOR. (REFER TO TM 5-3810-306-20.)
11. INSTALL ENGINE HOOD. (REFER TO TM 5-3810-306-20.)
12. SERVICE ENGINE FLUID LEVELS. (REFER TO LO 5-3810-306-12.)
13. CONNECT NEGATIVE BATTERY CABLE AT SHUNT. (RT875CC) (REFER TO TM 5-3810-306-20.)
14. TEST FOR PROPER OPERATIONS. INSPECT FOR LEAKS AND LOOSE PARTS. (REFER TO TM 5-3810-306-10.)

END OF TASK

FRONT GEAR COVER INSTALLATION

TOOLS: General mechanic's tool kit: automotive (5180-00-177-7033)

SUPPLIES: Loctite 277 (Item 164, Appendix B)
 Gasket (Item 165, Appendix B)
 Copper coat gasket sealer (Item 32, Appendix B)

EQUIPMENT CONDITIONS: Negative battery cable disconnected at shunt. (RT875CC)
 Battery disconnect switch in off position. (RT875CCS)
 Radiator fan and fan guard removed.
 (Refer to TM 5-3810-306-20.)
 Radiator shroud removed. (Refer to TM 5-3810-306-20.)
 Tachometer angle drive removed. (Refer to page 4-52.)

REMOVAL:

1. REMOVE VIBRATION DAMPER (1).
 - a. Remove four capscrews (2) securing damper to crankshaft. Do not allow crankshaft to turn.
 - b. Remove vibration damper (1).
2. REMOVE FRONT GEAR COVER.

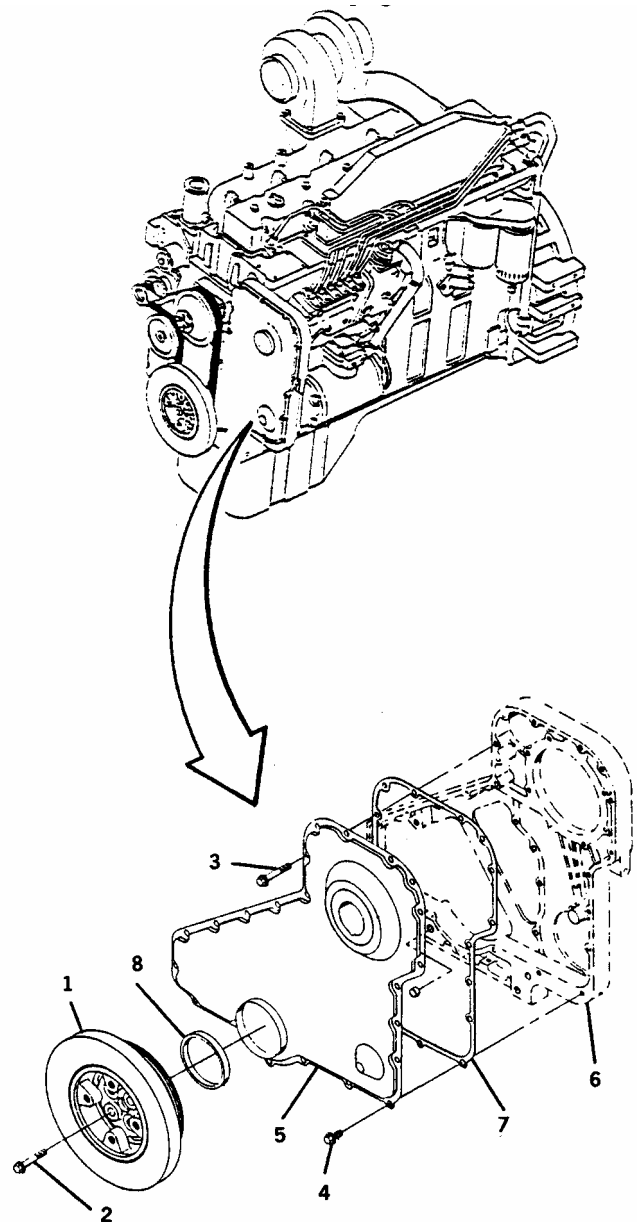
NOTE

Front cover does not have to be removed in order to change front seal. Proceed to Step C to remove front seal (8) only.

- a. Remove capscrews (3) and (4) securing cover (5) to gear cover housing (6).
- b. Remove cover (5) and gasket (7). Discard gasket (7).
- c. Remove front crankshaft seal (8) from front cover, if necessary.

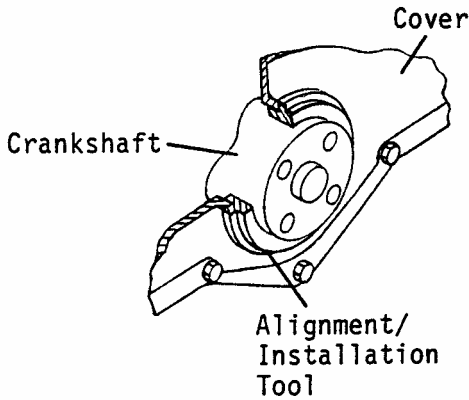
INSTALLATION:

1. CLEAN ANY GASKET MATERIAL OFF OF COVER (5) AND HOUSING (6) MATING SURFACES.
2. APPLY COPPER COAT TO BOTH SIDES OF GASKET (7).



3. INSTALL FRONT GEAR COVER (5).

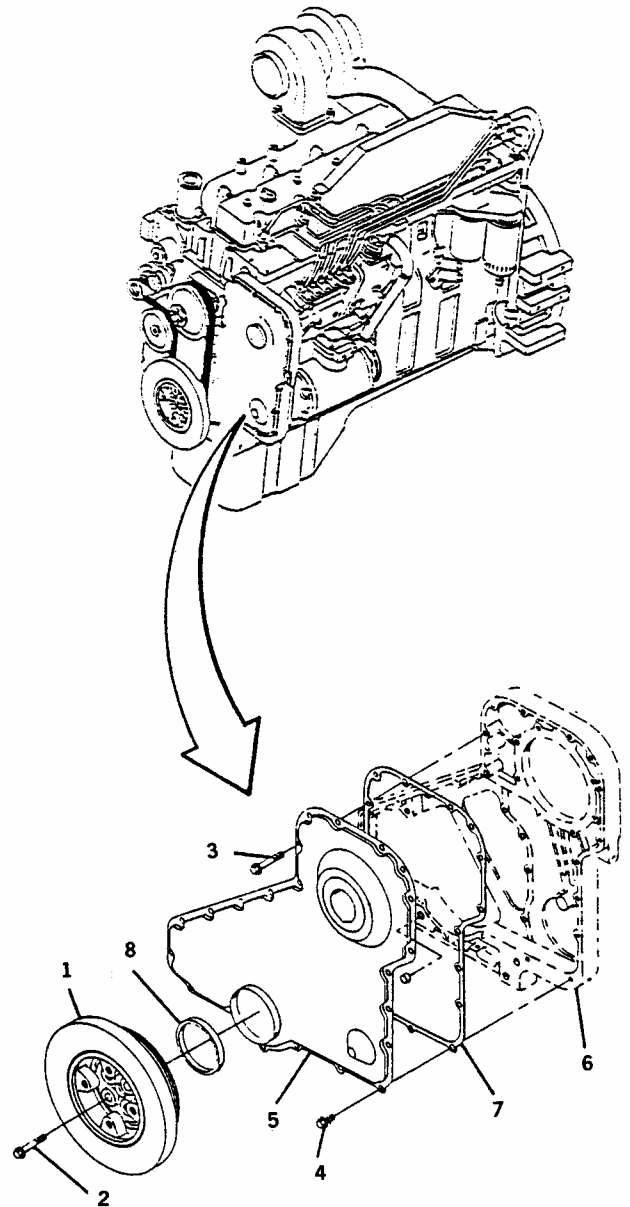
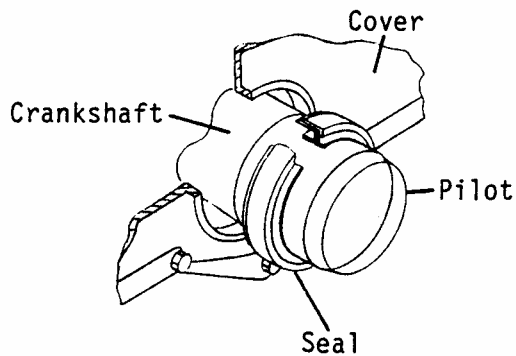
- a. Install new gasket (7) and cover (5). Secure loosely with capscrews (3) and (4).
- b. Clean crankshaft sealing surface and install alignment/installation tool from seal kit to align front cover (5) to crankshaft.



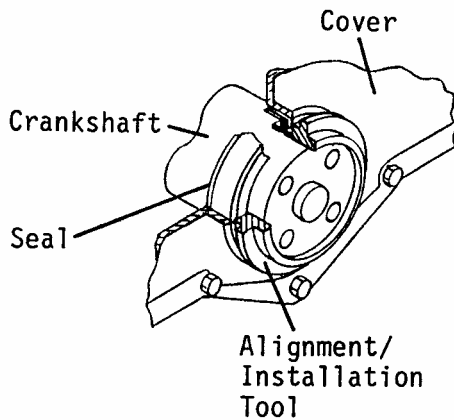
- c. Torque capscrews (3) and (4) to 18 ft-lbs (24 Nm).
- d. Remove alignment/installation tool.

4. IF REMOVED, INSTALL FRONT CRANKSHAFT SEAL (8).

- a. Apply a coat of Loctite 277 to outside diameter of crankshaft seal.
- b. Install pilot from seal kit over crankshaft and slide on crankshaft seal over pilot. Remove pilot.



- c. Using alignment/installation tool, tap seal until outer edge is even with cover. Remove alignment/installation tool.



- d. Connect tagged electrical connector to pulse tachometer.
5. INSTALL VIBRATION DAMPER (1) AND SECURE WITH FOUR CAPSCREWS (2).

6. INSTALL TACHOMETER ANGLE DRIVE. (REFER TO PAGE 4-52.)
7. INSTALL DRIVE BELT, RADIATOR FAN AND FAN GUARD. (REFER TO TM 5-3810-306-20.)
8. INSTALL RADIATOR SHROUD. (REFER TO TM 5-3810-306-20.)
9. INSTALL ENGINE HOOD ASSEMBLY. (REFER TO TM 5-3810-306-20.)
10. CONNECT NEGATIVE BATTERY CABLE AT SHUNT. (RT875CC) (REFER TO TM 5-3810-306-20.)
11. TEST FOR PROPER OPERATION AND INSPECT FOR LEAKS. (REFER TO TM 5-3810-306-10.)

END OF TASK

FRONT GEAR HOUSING INSTALLATION

TOOLS: General mechanic's tool kit: automotive (5180-00-177-7033)

SUPPLIES: Gasket (Item 225, Appendix B)

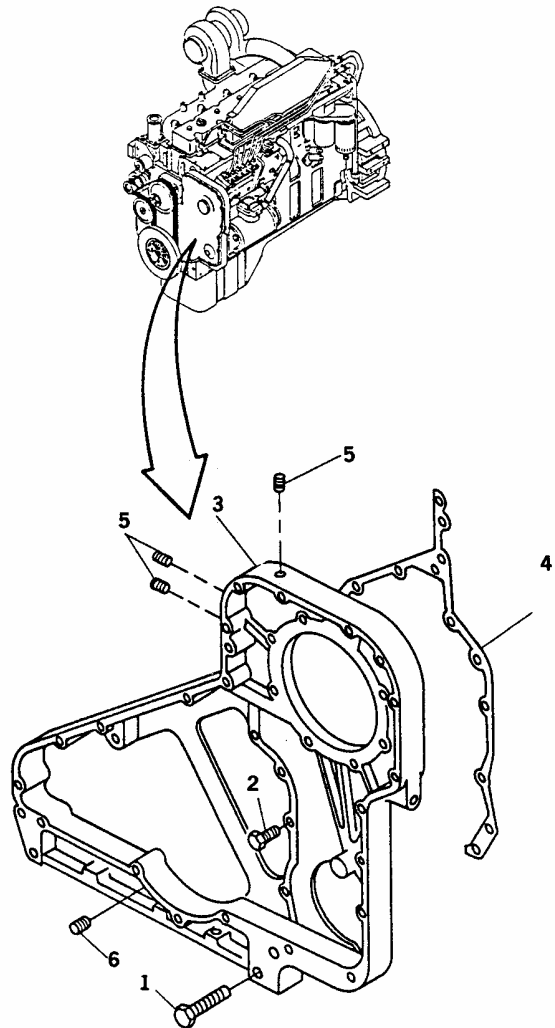
EQUIPMENT CONDITIONS: Negative battery cable disconnected at shunt. (RT875CC)
Battery disconnect switch in off position. (RT875CCS)
Engine removed. (Refer to page 4-2.)
Front gear cover removed. (Refer to page 4-43.)
Fuel Injector pump removed. (Refer to page 5-4.)
Cam shaft removed. (Refer to page 4-39.)
Oil pump removed. (Refer to page 4-55.)
Oil pan removed. (Refer to page 4-53.)

REMOVAL:

1. REMOVE FRONT GEAR HOUSING (3).
 - a. Remove capscrews (1) and (2).
 - b. Remove front gear housing (3) from cylinder block.
2. REMOVE AND DISCARD GASKET (4) FROM CYLINDER BLOCK.
3. IF NECESSARY, REMOVE PLUGS (5) AND (6) FROM GEAR HOUSING (3).
4. IF FRONT GEAR HOUSING IS BEING REPLACED, REMOVE TIMING PIN ASSEMBLY (13). (REFER TO PAGE 4-48.)

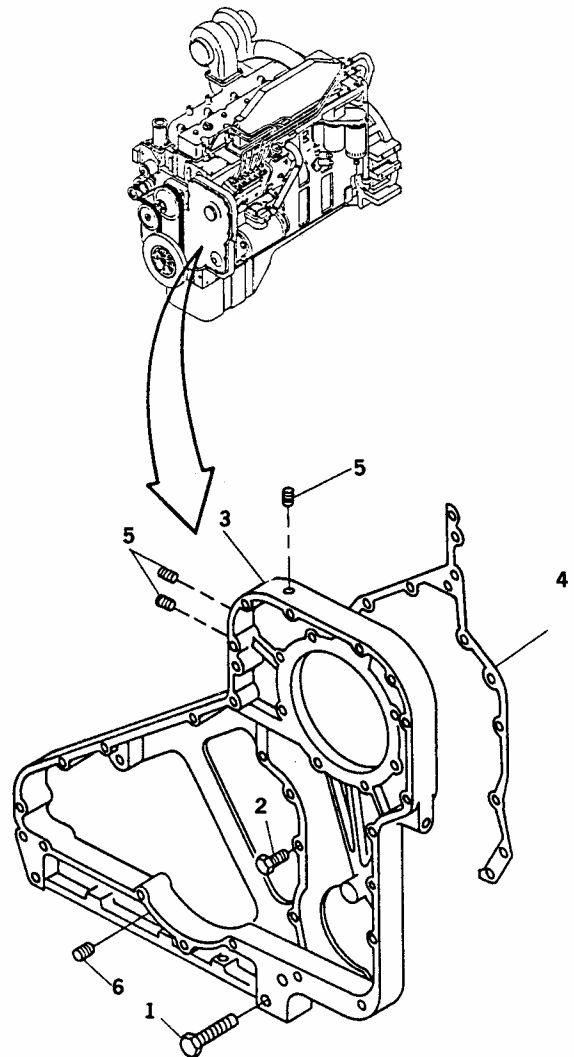
INSTALLATION:

1. IF REMOVED, INSTALL PLUGS (5) AND (6) IN GEAR HOUSING (3).
2. INSTALL FRONT GEAR HOUSING (3).
 - a. Install new gasket (4), front gear housing (3) and capscrews (1) and (2). Torque capscrews (1) and (2) to 18 ft-lbs (24 Nm).
 - b. Trim gasket (4) flush with oil pan rail.
3. INSTALL OIL PUMP. (REFER TO PAGE 4-55.)
4. INSTALL OIL PAN. (REFER TO PAGE 4-53.)
5. INSTALL CAMSHAFT. (REFER TO PAGE 4-39.)



6. IF REMOVED, INSTALL TIMING PIN ASSEMBLY (13). (REFER TO PAGE 4-48.)
7. INSTALL FUEL INJECTOR PUMP. (REFER TO PAGE 5-4.)
8. INSTALL FRONT GEAR COVER. (REFER TO PAGE 4-43.)
9. INSTALL ENGINE. (REFER TO PAGE 4-2.)
10. INSTALL RADIATOR. (REFER TO TM 5-3810-306-20.)
11. INSTALL ENGINE HOOD. (REFER TO TM 5-3810-306-20.)
12. SERVICE ENGINE FLUID LEVELS. (REFER TO LO 5-3810-306-12.)
13. CONNECT NEGATIVE BATTERY CABLE AT SHUNT. (RT875CC) (REFER TO TM 5-3810-306-20.)
14. TEST FOR PROPER OPERATION. INSPECT FOR LEAKS AND LOOSE PARTS. (REFER TO TM 5-3810-306-10.)

END OF TASK



TIMING PIN ASSEMBLY INSTALLATION

TOOLS: General mechanic's tool kit: automotive (5180-00-177-7033)
Cylinder liner clamp (3376944) 2 required

SUPPLIES: Gasket (Item 223, Appendix B)
Preformed packing (Item 224, Appendix B)

EQUIPMENT CONDITIONS: Negative battery cable disconnected at shunt. (RT875CC)
(Refer to TM 5-3810-306-20.)
Battery disconnect switch in off position. (RT875CCS)

REMOVAL:

1. REMOVE TORX SCREWS (1) AND TIMING PIN ASSEMBLY (2) FROM FRONT GEAR HOUSING.
2. REMOVE AND DISCARD GASKET (3).

DISASSEMBLY:

1. REMOVE RETAINING RING (4) FROM TIMING PIN ASSEMBLY (2).
2. REMOVE TIMING PIN (5) AND PREFORMED PACKING (6) FROM HOUSING (7). DISCARD PACKING (6).

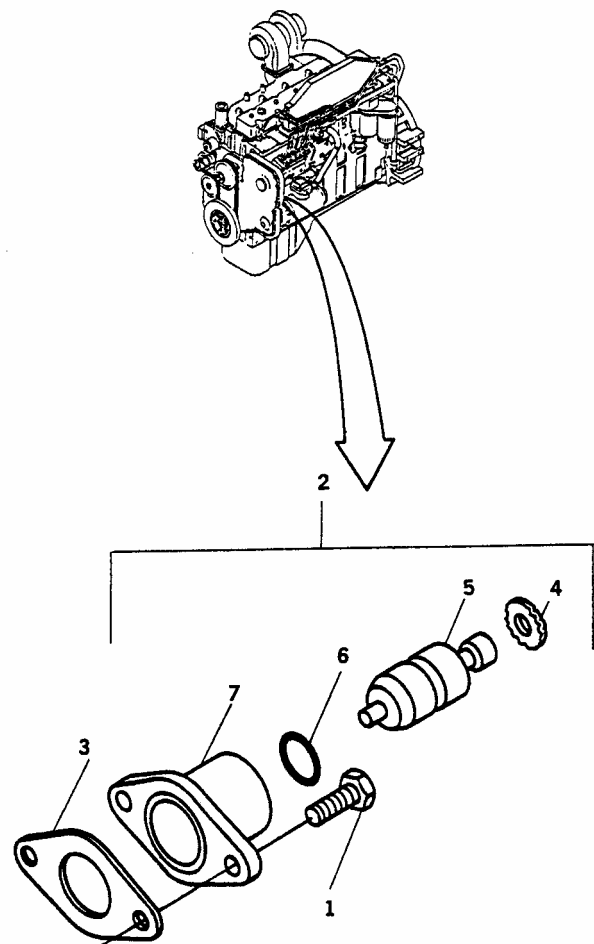
ASSEMBLY:

1. INSTALL NEW PREFORMED PACKING (6) ON TIMING PIN (5).
2. INSERT TIMING PIN (5) AND PREFORMED PACKING (6) INTO HOUSING (7).
3. INSTALL RETAINING RING (4) SECURING TIMING PIN ASSEMBLY (2) TOGETHER.

INSTALLATION:

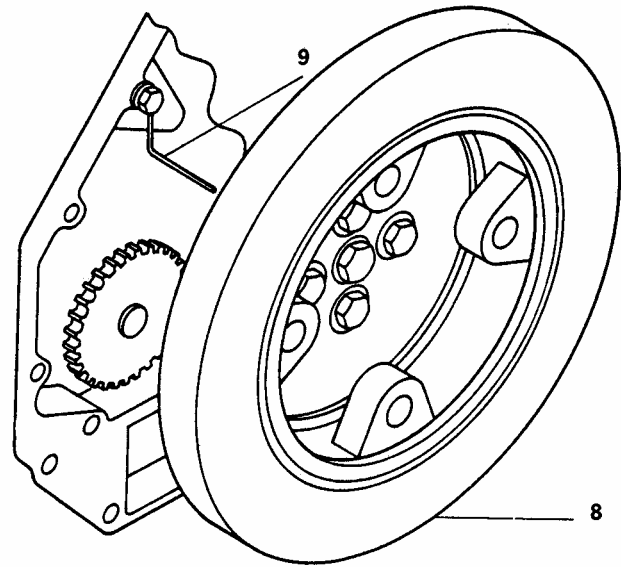
NOTE

The timing pin assembly (2) must be relocated if front gear housing has been replaced. Perform Step 1 before cylinder head and front gear cover are installed. Otherwise proceed to Step 2.



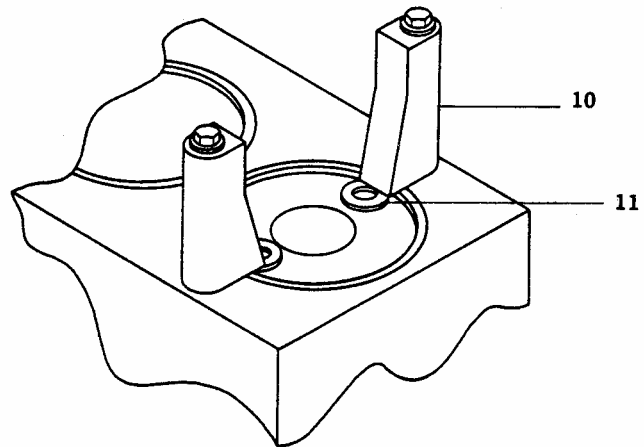
1. RELOCATE TIMING PIN ASSEMBLY (2).

- a. Temporarily install vibration damper (8) on end of crankshaft, and a fabricated wire pointer (9) on front gear housing. Put a flat washer between wire and gear housing to prevent damage to gear housing.
- b. Assemble two liner clamps (10) or equivalent over No. 1 cylinder bore. Torque clamps to 50 ft-lbs (68 Nm).
- c. Position two flat washers (11) on the piston so they will contact the liner clamps (10).
- d. Rotate crankshaft until washers (11) on piston contact liner clamps (10). Mark vibration damper (8) as indicated by pointer (9).
- e. Rotate crankshaft in opposite direction until washers (11) contact liner clamps (10) again. Mark vibration damper (8) as indicated by pointer (9).
- f. Using a steel rule, measure and mark vibration damper (8) one-half the distance between the first two marks. This mark indicates TDC of the No. 1 cylinder.
- g. Remove clamps (10) and washers (11) and rotate crankshaft until the pointer aligns with the TDC mark.
- h. Look for timing pin hole in camshaft gear by looking through timing pin assembly hole in front gear cover. If it is not visible, rotate the crankshaft one complete turn.
- i. Remove wire pointer (9) and vibration damper (8).



2. INSTALL TIMING PIN ASSEMBLY (2).

- a. Install new gasket (3), timing pin assembly (2) and torx screws (1). Do not tighten screws.
- b. Push pin (5) into hole in cam gear to align housing (7).
- c. Hold pin (5) in and torque torx screws (1) to 4 ft-lbs (5 Nm).



3. CONNECT NEGATIVE BATTERY CABLE AT SHUNT. (RT875CC) (REFER TO TM 5-3810-306-20.)

END OF TASK

ROCKER LEVER INSTALLATION

TOOLS: General mechanic's tool kit: automotive (5180-00-177-7033)

SUPPLIES: Clean motor oil (Item 11, Appendix B)
Loctite 601 (Item 12, Appendix B)

EQUIPMENT CONDITIONS: Negative battery cable disconnected at shunt. (RT875CC)
(Refer to TM 5-3810-306-20.)
Battery disconnect in off position. (RT875CCS)
Engine hood assembly removed. (Refer to TM 5-3810-306-20.)
Engine cool to touch.
Valve cover removed. (Refer to TM 5-3810-306-20.)

REMOVAL:

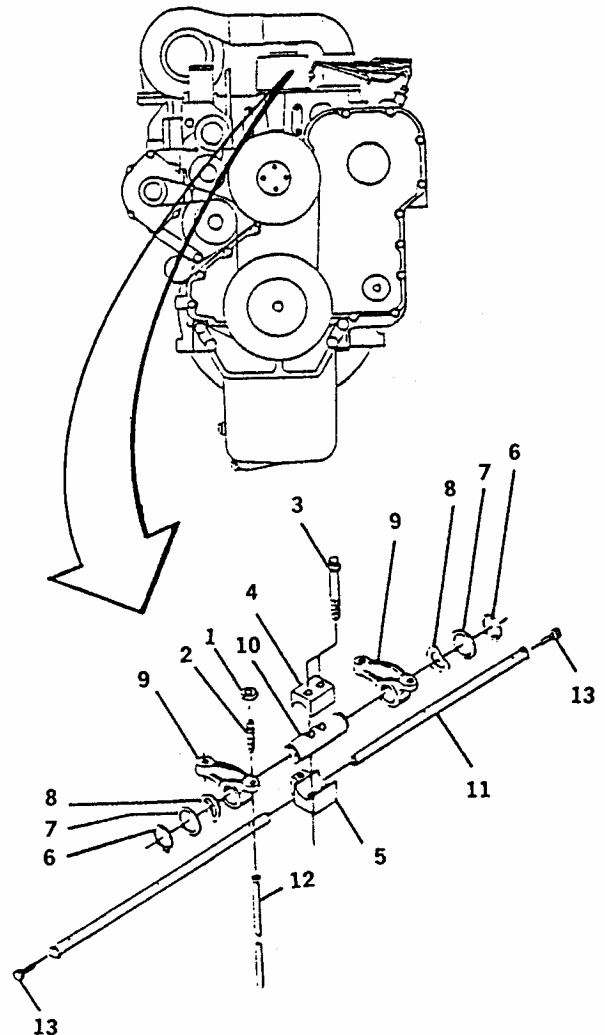
1. REMOVE ROCKER LEVER ASSEMBLY.
 - a. Loosen locknuts (1) and loosen adjusting screws (2) until they stop.
 - b. Remove twelve capscrews (3) rocker lever clamps (4), rocker lever assemblies and rocker lever support (5).
 - c. Remove oil transfer tube (11).
 - d. Remove push rods (12).

DISASSEMBLY:

1. DISASSEMBLE ROCKER LEVER ASSEMBLY.
 - a. Remove retaining rings (6), thrust washers (7), wave washers (8) and rocker levers (9) from rocker shaft (10).
 - b. Remove locknut (1) and adjusting screw (2) from rocker levers (9).
2. REMOVE SCREWS (13) FROM OIL TRANSFER TUBE (11) ENDS.

NOTE

The two self tapping screws (13) in each end of oil transfer tube (11) are not interchangeable. Note which end they are removed from for reassembly.



CLEANING:

1. CLEAN ROCKER COMPONENTS
 - a. Clean all parts in a strong solution of laundry detergent in hot water.

WARNING

Use only clean low pressure compressed air. If available, allow parts to air dry or wipe with clean lint-free cloth.

- b. Use compressed air to dry the parts after rinsing in clean hot water.

INSPECTION:

1. INSPECT ROCKER LEVER COMPONENTS.
 - a. Inspect rocker lever for cracks and excessive wear in bore and contact surfaces.
 - b. Measure rocker lever bore.
Max. dia. 0.878 in. (22.301 mm)
 - c. Measure rocker lever shaft diameter.
Min. dia. 0.874 in. (22.199 mm)
 - d. Inspect pushrod ball and socket for signs of scoring. Inspect for cracks where the ball and socket are pressed into the tube.
 - e. Inspect oil transfer tube for cracks and debris.

REASSEMBLY:

1. ASSEMBLE ROCKER LEVER ASSEMBLY.
 - a. Screw adjusting screw (2) into rocker lever and locknut (1) onto adjusting screw.
 - b. Place retaining ring (6), thrust washer (7) and wave washer (8) on one side of rocker shaft (10).
 - c. Lubricate shaft with motor oil.
 - d. Position levers on rocker shaft.
 - e. Install remaining washers and retaining clips on rocker shaft.
 - f. Compress wave washers and thrust washers and install rocker lever support (5).
2. INSTALL SCREWS (13) IN OIL TRANSFER TUBE (11).

- a. Apply Loctite 601 to threads of screws (13).
- b. Install screws (13) in proper ends of oil transfer tube (11) and tighten until flats of screws align with bottom of oil transfer tube.

INSTALLATION:

1. INSTALL OIL TRANSFER TUBE (11).
2. INSTALL PUSH RODS (12).
3. INSTALL ROCKER LEVER ASSEMBLY.
 - a. Ensure adjusting screws (2) are completely backed out.
 - b. Install rocker lever assembly over oil transfer tube.

NOTE

Make sure dowel rings in rocker lever support (5) are installed into the dowel bores.

- c. Lubricate capscrew (3) threads with clean motor oil.
- d. Install rocker lever clamps (4) and secure with capscrews (3).

NOTE

To prevent damage to rocker lever or push rod, make sure adjusting screw ball is positioned in the socket of push rod when tightening.

- e. Torque capscrews to 32 ft-lbs (43 Nm).
4. ADJUST VALVES. (REFER TO TM 5-3810-306-20.)
5. INSTALL VALVE COVER. (REFER TO TM 5-3810-306-20.)
6. INSTALL ENGINE HOOD. (REFER TO TM 5-3810-306-20.)
7. CONNECT NEGATIVE BATTERY CABLE AT SHUNT. (RT875CC) (REFER TO TM 5-3810-306-20.)

END OF TASK

TACHOMETER ANGLE DRIVE ADAPTER

TOOLS: General mechanic's tool kit: automotive (5180-00-177-7033)

SUPPLIES: Gasket (Item 213, Appendix B)
Gasket (Item 214, Appendix B)

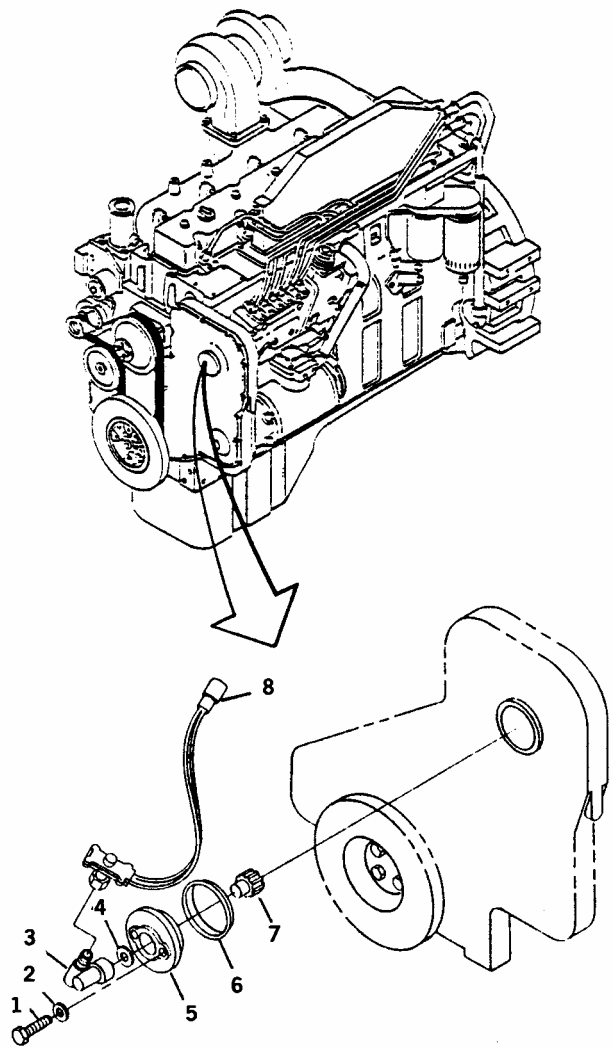
EQUIPMENT CONDITIONS: Negative battery cable disconnected at shunt. (RT875CC)
(Refer to TM 5-3810-306-20.)
Battery disconnect switch in off position. (RT875CCS)

REMOVAL:

1. REMOVE FRONT GEAR TRAIN.
 - a. Note or mark position of angle drive adapter (3).
 - b. Tag and disconnect electrical lead (8).
 - c. Remove two capscrews (1) and washers (2).
 - d. Remove angle drive adapter (3) and gasket (4). Discard gasket (4).
 - e. Remove cover (5) and gasket (6). Discard gasket (6).
 - f. Remove coupling hub (7).
2. INSPECT ALL PARTS FOR DAMAGE. REPLACE PARTS AS REQUIRED.

INSTALLATION:

1. INSTALL FRONT GEAR TRAIN.
 - a. Attach coupling hub (7) to engine.
 - b. Install cover (5) and new gasket (6).
 - c. Install angle drive adapter (3) and new gasket (4).
 - d. Clamp angle drive adapter (3) in position noted or marked and secure with capscrews (1) and washers (2).
2. CONNECT NEGATIVE BATTERY CABLE AT SHUNT. (RT875CC) (REFER TO TM 5-3810-306-20.)



END OF TASK

Section VII. ENGINE LUBRICATION SYSTEM MAINTENANCE

OIL PAN AND SUCTION TUBE INSTALLATION

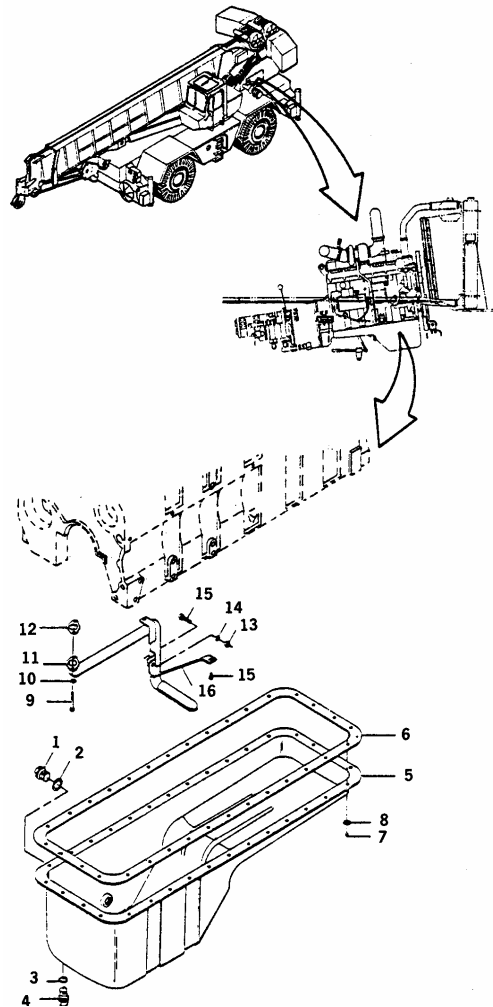
TOOLS: General mechanic's tool kit: automotive (5180-00-177-7033)

SUPPLIES: Clean rags (Item 2, Appendix B)
 Copper coat (Item 32, Appendix B)
 No. 2 Permatex (Item 31, Appendix B)
 Washer, flat sealing (Item 29, Appendix B)
 Washer, flat sealing (Item 30, Appendix B)
 Gasket (Item 226, Appendix B)
 Gasket (Item 227, Appendix B)

EQUIPMENT CONDITIONS: Negative battery cable disconnected at shunt. (RT875CC)
 (Refer to TM 5-3810-306-20.)
 Battery disconnect in off position. (RT875CCS)
 Outriggers set and boom positioned over-the-side.
 (Refer to TM 5-3810-306-10.)
 Lube oil drained from engine. (Refer to LO 5-3810-306-12.)
 Engine removed. (Refer to page 4-2.)

REMOVAL:

1. REMOVE OIL PAN (5).
 - a. Support oil pan (5) and remove bolts (7) and washers (8).
 - b. Remove oil pan (5) and gasket (6). Discard gasket (6).
2. REMOVE PLUGS (1) AND (4) AND SEALS (2) AND (3). DISCARD SEALS (2) AND (3).
3. REMOVE SUCTION TUBE (11) AND GASKET (12).
 - a. Remove two capscrews (9) and washers (10) securing suction tube (11).
 - b. Remove nut (13), washer (14) and capscrew (15) securing suction tube (11) to brace (16).
 - c. Remove suction tube (11) and gasket (12). Discard gasket (12).
4. INSPECT ALL PARTS FOR DAMAGE. REPLACE PARTS AS REQUIRED.



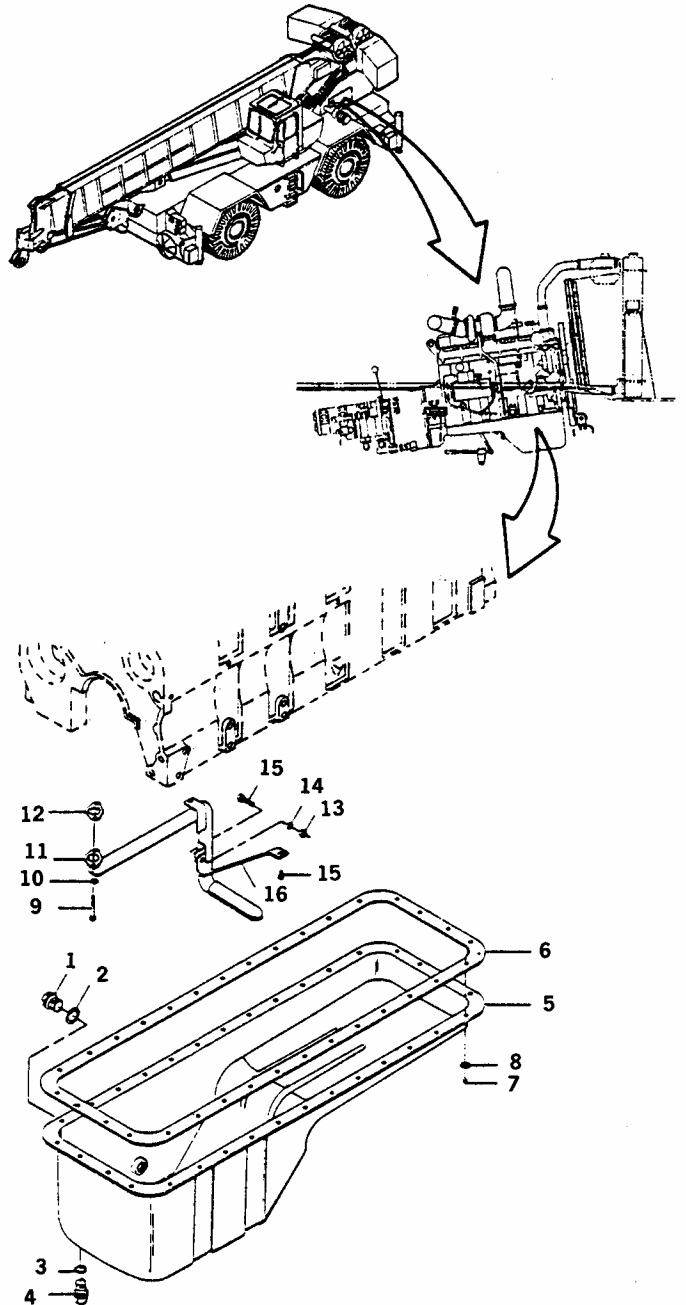
INSTALLATION:

1. CLEAN GASKET MOUNTING SURFACE ON OIL PAN (5) AND BLOCK.
2. INSTALL SUCTION TUBE (11) AND GASKET (12).
 - a. Position suction tube (11) and new gasket (12). Secure with two capscrews (9) and washers (10).
 - b. Secure suction tube (11) to brace (16) with capscrew (15), washer (14) and nut (13).
3. COAT BOTH SIDES OF NEW GASKET (6) WITH COPPER COAT AND APPLY TO OIL PAN. APPLY NUMBER 2 PERMATEX TO JOINTS BETWEEN PAN RAIL, GEAR HOUSING AND REAR COVER.

NOTE

Ensure raised bead on gasket faces pan.

4. INSTALL OIL PAN (5).
 - a. Install oil pan (5) to engine block with bolts (7) and washers (8). Torque bolts to 18 ft-lbs (24 Nm).
5. INSTALL PLUGS (1) AND (4) WITH NEW SEALS (2) AND (3). TORQUE PLUGS TO 60 FT-LBS (80 NM).
6. INSTALL ENGINE. (REFER TO PAGE 4-2.)
7. FILL CRANKCASE WITH NEW OIL TO CAPACITY. (REFER TO LO 5-3810-306-12.)
8. INSTALL ENGINE HOOD. (REFER TO TM 5-3810-306-20.)
9. CONNECT NEGATIVE BATTERY CABLE AT SHUNT. (RT875CC) (REFER TO TM 5-3810-306-20.)



END OF TASK

OIL PUMP INSTALLATION

TOOLS: General mechanic's tool kit: automotive (5180-00-177-7033)

SUPPLIES: Clean rags (Item 2, Appendix B)
Motor oil (Item 11, Appendix B)
Solvent P-D-680, Type III (Item 1, Appendix B)

EQUIPMENT CONDITIONS: Negative battery cable disconnected at shunt. (RT875CC)
(Refer to TM 5-3810-306-20.)
Battery disconnect switch in off position. (RT875CCS)
Front gear cover removed. (Refer to page 4-43.)

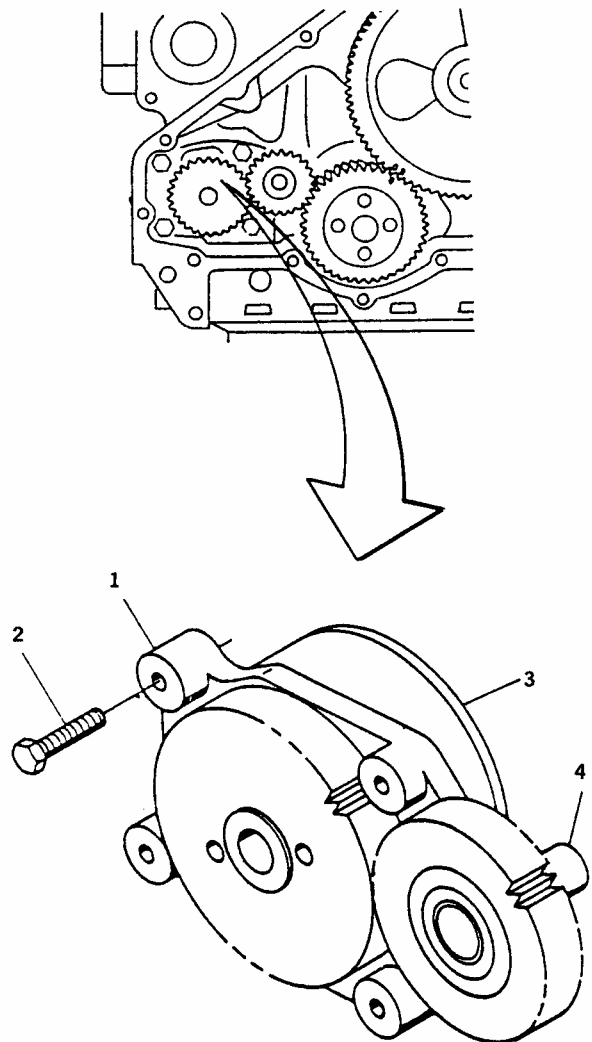
REMOVAL:

1. REMOVE LUBE OIL PUMP.
 - a. Remove four capscrews (2).
 - b. Remove lube oil pump (1).
2. REMOVE BACK PLATE (3).
3. MARK "TOP" ON GEROTOR PLANETARY (5) AND REMOVE.

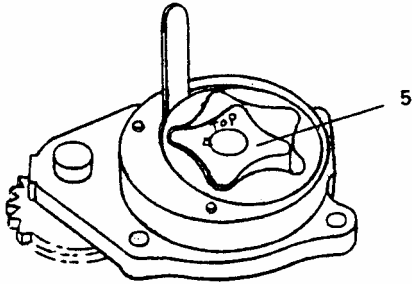
CLEANING AND INSPECTION:**WARNING**

Dry cleaning solvent P-D-680, Type III is toxic and flammable. Wear protective goggles and gloves and use only in a well ventilated area. Avoid contact with skin, eyes, and clothes and don't breathe vapors. Do not use near open flame or excessive heat. The flash point is 200°F (94°C). If you become dizzy while using cleaning solvent, get fresh air immediately and get medical aid. If contact with eyes is made, wash your eyes with water and get medical aid immediately. Compressed air used for cleaning purposes will not exceed 30 psi. Use only with effective chip guarding and personal protective equipment (goggles/ shield, gloves, etc.).

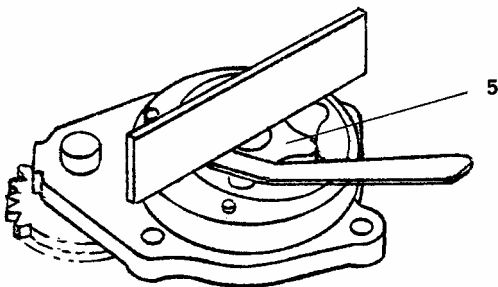
1. CLEAN ALL PARTS WITH SOLVENT P-D-680, TYPE III AND BLOW DRY WITH COMPRESSED AIR.



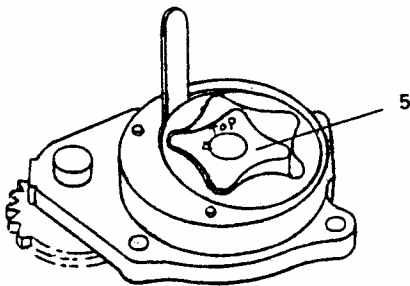
2. VISUALLY INSPECT PUMP GEARS, GEROTOR DRIVE AND HOUSING FOR DAMAGE, CHIPS, CRACKS OR EXCESSIVE WEAR.
3. INSTALL GEROTOR PLANETARY IN ORIGINAL POSITION.



4. MEASURE TIP CLEARANCE.
Max. clearance = 0.007 in.
(0.1778 mm).
5. MEASURE CLEARANCE OF GEROTOR DRIVE/ GEROTOR PLANETARY TO PORT PLATE.



Max. clearance = 0.005 in. (0.127 mm).

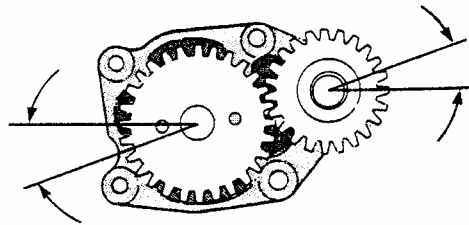


6. MEASURE CLEARANCE OF GEROTOR PLANETARY TO BODY BORE.
Max. clearance = 0.015 in. (0.381 mm).

7. MEASURE GEAR BACKLASH.
LIMIT (USED PUMP) 0.003 TO 0.015 IN.
(0.08 TO 0.38 MM).
LIMIT (NEW PUMP) 0.003 TO 0.013 IN.
(0.08 TO 0.33 MM).

NOTE

If clearances exceed limits, oil pump replacement is necessary.



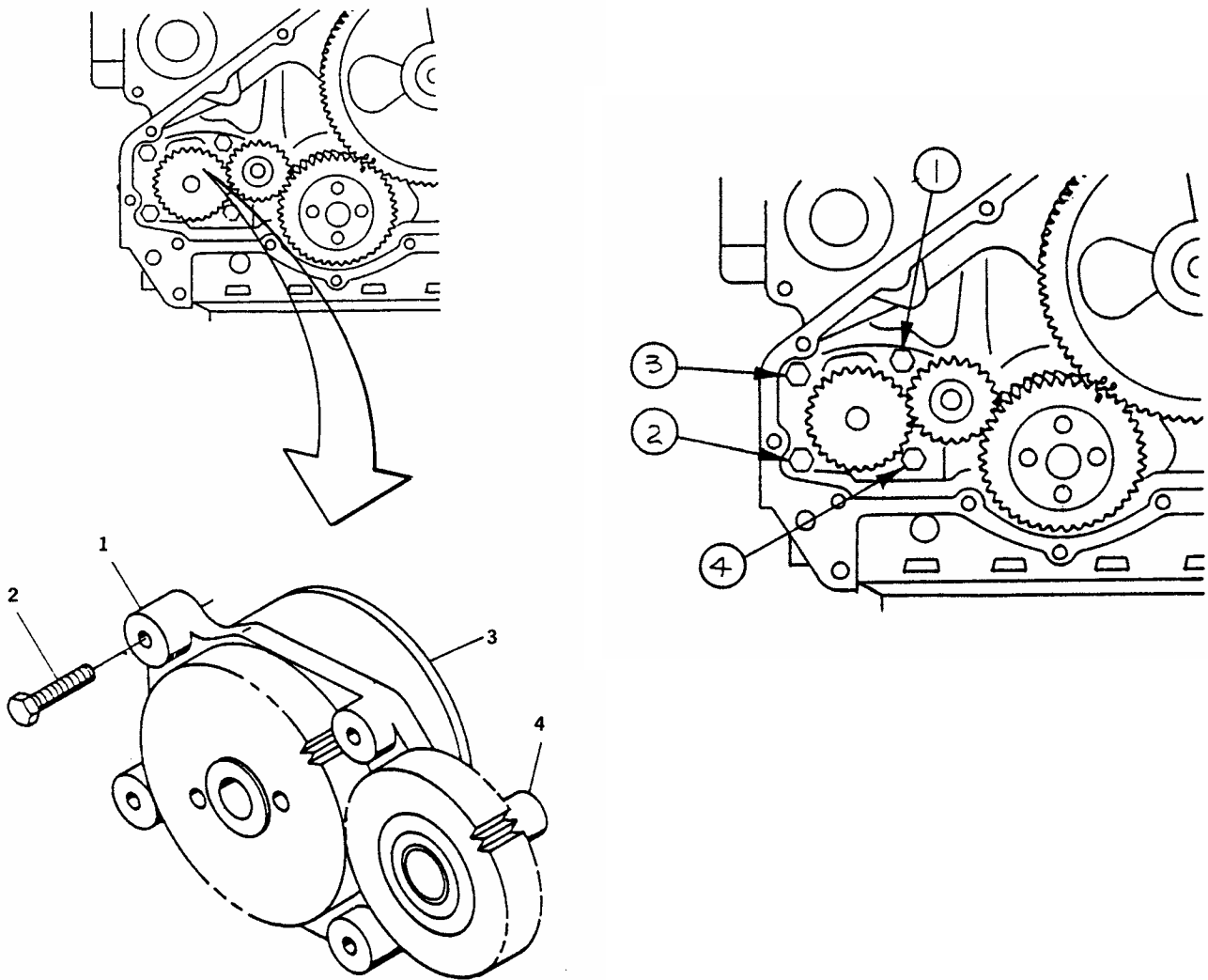
INSTALLATION:

1. INSTALL BACK PLATE (3) AND TAP LIGHTLY WITH HAMMER UNTIL SEATED.
2. LUBRICATE LUBE PUMP (1) WITH CLEAN ENGINE OIL.
3. INSTALL LUBE OIL PUMP (1).
 - a. Install lube pump (1) locating idler gear pin (4) into locating bore in cylinder block.

NOTE

Sealing plate on back of lube pump (1) will seat on cylinder block, but capscrews (2) will not draw flange up tight to the block.

- b. Install capscrews (2) and torque first time to 4 ft-lbs (5 Nm) in sequence shown.
- c. Repeat torquing capscrews (2) in same sequence to 18 ft-lbs (24 Nm).
- d. Lubricate geartrain with clean engine oil.



4. INSTALL FRONT GEAR COVER. (REFER TO PAGE 4-43.)
5. INSTALL DRIVEBELT, RADIATOR FAN AND FAN GUARD. (REFER TO TM 5-3810-306-20.)
6. INSTALL RADIATOR, MOORING BRACKETS AND SHROUD. (REFER TO TM 5-3810-306-20.)

7. INSTALL ENGINE HOOD (REFER TO TM 5-3810-306-20.)
8. CONNECT NEGATIVE BATTERY CABLE AT SHUNT. (RT875CC) (REFER TO TM 5-3810-306-20.)

END OF TASK

OIL COOLER INSTALLATION

TOOLS: General mechanic's tool kit: automotive (5180-00-177-7033)

SUPPLIES: Clean rags (Item 1, Appendix C)
Copper washer (Item 53, Appendix C)
Gasket (Item 55, Appendix C)
Gasket (Item 54, Appendix C)
Oil filter element (Item 56, Appendix C)

EQUIPMENT CONDITIONS: Negative battery cable disconnected at shunt. (RT875CC)
(Refer to TM 5-3810-306-20.)
Battery disconnect in off position. (RT875CCS)
Radiator coolant drained. (Refer to LO 5-3810-306-12.)
Engine cool to touch.
All debris cleaned from oil cooler area.

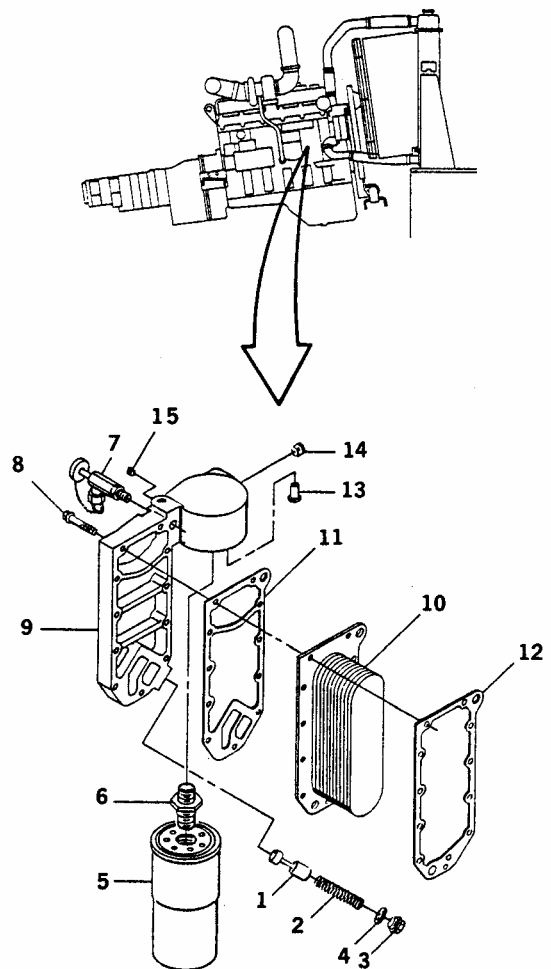
REMOVAL:

1. REMOVE OIL COOLER ASSEMBLY.

- a. Remove retainer plug (3), copper washer (4), retaining spring (2) and regulating valve (1). Remove spring and valve. Discard copper washer (4).
- b. Remove oil filter element (5) and discard. Keep adapter (6) for installation.
- c. Remove oil sampling valve (7). Keep for installation. (RT875CC)
- d. Remove turbocharger oil supply line from oil cooler head. (Refer to TM 5-3810-306-20.)
- e. Remove eleven capscrews (8), cover (9), core (10) and gaskets (11) and (12). Discard gaskets (11) and (12).
- f. Remove bypass valve (13) from cover and replace as necessary.
- g. If necessary, remove plugs (14) and (15).

2. INSPECT ALL PARTS FOR DAMAGE AND REPLACE AS NECESSARY.

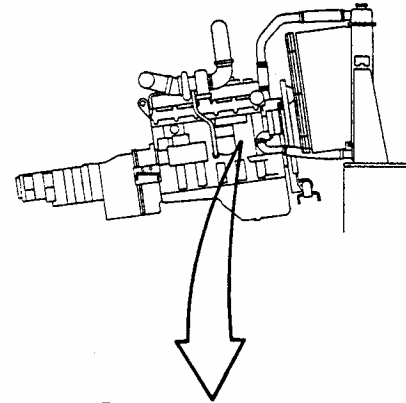
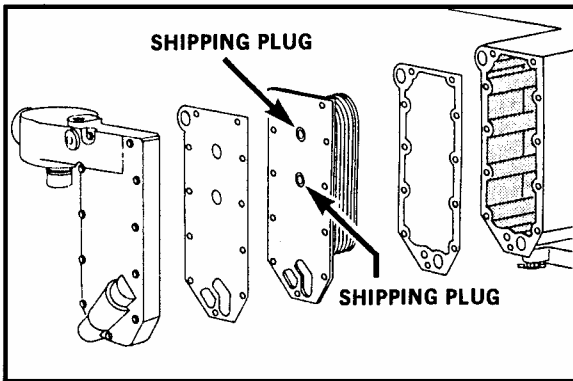
- a. Apply 70 lbs psi (483 kPa) air pressure to core (10) and check for leaks with element in water tank.



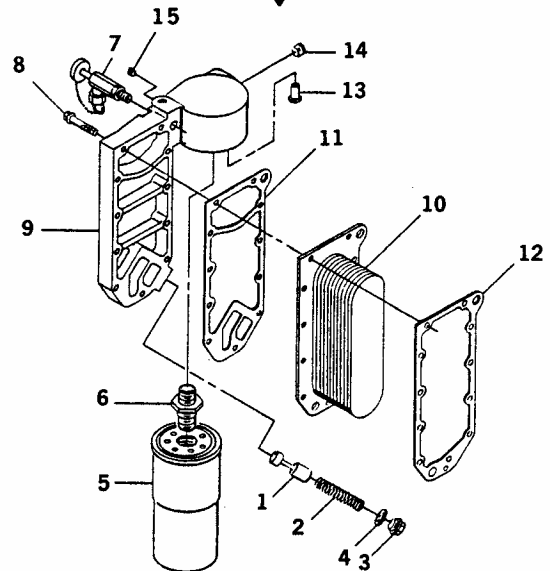
INSTALLATION:

NOTE

If a new oil cooler core is to be installed, be sure to remove shipping plugs from new core.



1. CLEAN ALL SEALING SURFACES.
2. INSTALL OIL COOLER ASSEMBLY.
 - a. If removed, install plugs (14) and (15).
 - b. Install new gaskets (11) and (12), core (10) and cover (9). Secure with eleven capscrews (8).
 - c. Install bypass valve (13).



CAUTION

Mechanical over-tightening may distort the threads or damage the filter element (5) seal.

- d. Install new oil filter element (5). Follow manufacturer's instruction for tightening.
- e. Install oil sampling valve (7).
- f. Install turbocharger oil supply line.
- g. Install regulator valve (1) into bore and ensure it moves freely.
- h. Install spring (2) and secure with new copper washer (4) and retainer plug (3).

3. SERVICE RADIATOR. (REFER TO LO 5-3810-306-12.)
4. CONNECT NEGATIVE BATTERY CABLE AT SHUNT. (RT875CC) (REFER TO TM 5-3810-306-20.)
5. START ENGINE AND INSPECT FOR LEAKS. (REFER TO TM 5-3810-306-10.)

END OF TASK

CHAPTER 5
FUEL SYSTEM MAINTENANCE

CHAPTER INDEX

	Procedure	Page
Section I	Fuel Injector Maintenance	5-2
	Fuel Injector Replacement.....	5-2
Section II	Fuel Injection Pump Maintenance	5-4
	Fuel Injection Pump Installation.....	5-6
Section III	Turbocharger Maintenance	5-10
	Turbocharger and Exhaust Manifold Replacement	5-10

Section I. FUEL INJECTOR MAINTENANCE

FUEL INJECTOR REPLACEMENT

TOOLS: General mechanic's tool kit: automotive (5180-00-177-7033)
Fuel injector tester (3376946)

SUPPLIES: Clean rags (Item 2, Appendix B)
Injector sleeve (Item 229, Appendix B)
Injector washer (Item 20, Appendix B)

EQUIPMENT CONDITIONS: Negative battery cable disconnected at shunt. (RT875CC)
Battery disconnect switch in off position. (RT875CCS)
Fuel injector lines and fuel manifold removed.
(Refer to TM 5-3810-306-20.)
Turbocharger aftercooler removed. (Refer to TM 5-3810-306-20.)

WARNING

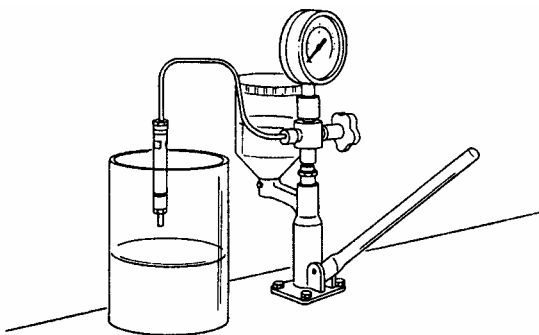
Be sure to wear protective eye covering to avoid personal injury.

REMOVAL:

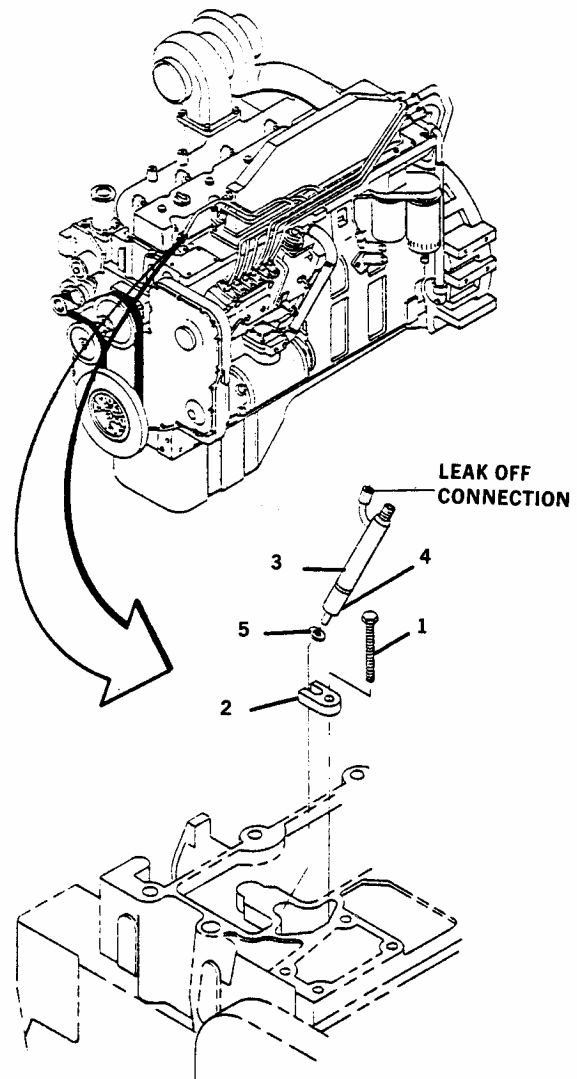
1. REMOVE FUEL INJECTOR(S).
 - a. Remove capscrew (1) and clamp (2) from injector (3).
 - b. Remove injectors (3) with sealing sleeves (4). Discard sleeves (4).
2. REMOVE AND DISCARD SEALING WASHERS (5).
3. INSPECT PARTS FOR DAMAGE. REPLACE AS REQUIRED.

TESTING:

1. ATTACH FUEL INJECTOR TO FUEL INJECTOR TESTER. POINT FUEL INJECTOR INTO A CLEAR CONTAINER.



2. FUEL INJECTOR OPENING PRESSURE TEST.



WARNING

Keep body clear of test spray. Fluid can be injected into bloodstream causing blood poisoning and possible death.

- a. Open valve on fuel injector tester and operate lever at one stroke per second.
 - b. Spray should start at 2973 psi (205 bar).
 - c. Check for well atomized spray pattern.
3. FUEL INJECTOR LEAKAGE TEST.
- a. Open valve on fuel injector tester and operate lever to hold pressure 290 psi (20 bar) below opening pressure.
 - b. No drops should fall from fuel injector tip within 10 seconds.

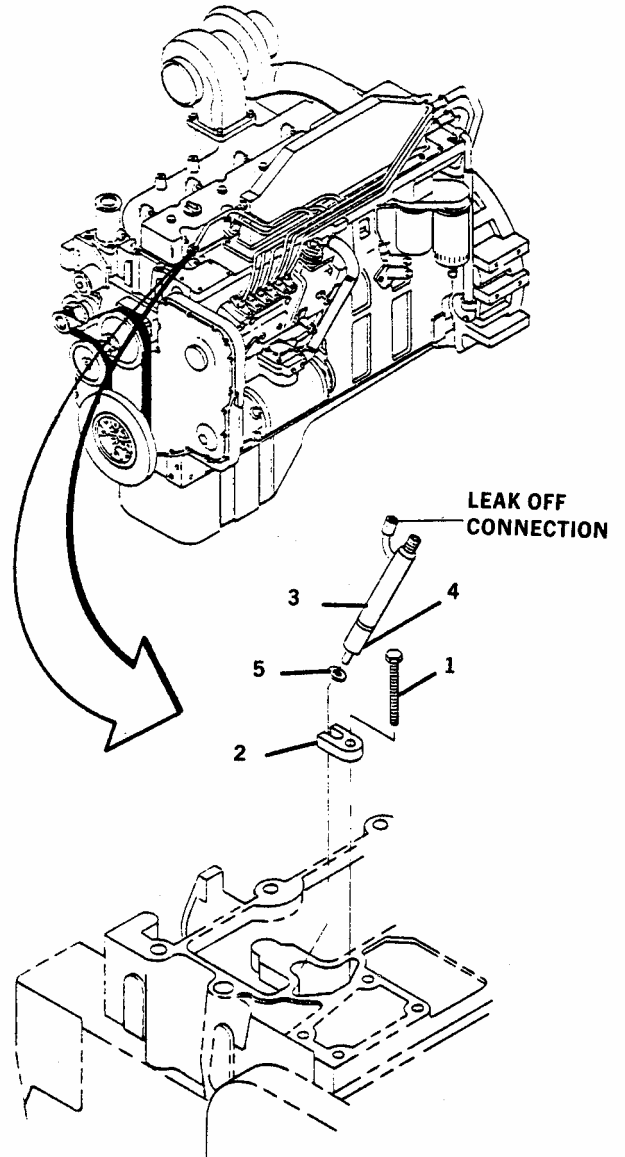
INSTALLATION:

1. INSTALL FUEL INJECTOR(S).
 - a. Lubricate injectors with clean engine oil and install new sealing sleeves (4) on injectors (3).
 - b. Lubricate sealing lips of sleeve (4) with anti-seize compound.

NOTE

A light coat of clean 15W40 engine oil between the washer (5) and injector (3) can help to keep the washer from falling during installation.

- c. Assemble injector (3), sealing sleeve (4), new copper sealing washer (5) and holddown clamp (2). Use only one washer (5).
- d. Install injector assembly into injector bore. Injector leak-off connection must be toward valve cover.
- e. Tighten holddown capscrew (1). Torque to 18 ft-lbs (24 Nm).



2. INSTALL FUEL INJECTION LINES. (REFER TO TM 5-3810-306-20.)
3. INSTALL TURBOCHARGER AFTERCOOLER. (REFER TO TM 5-3810-306-20.)
4. CONNECT NEGATIVE BATTERY CABLE AT SHUNT. (REFER TO TM 5-3810-306-20.) (RT875CC)

END OF TASK

Section II. FUEL INJECTION PUMP MAINTENANCE

TOOLS: General mechanic's tool kit: automotive (5180-00-177-7033)
Tool Kit Auto-Fuel and Electric System Repair (5180-00-754-0655)
Shop Equipment Auto-Maintenance and Repair; Common No. 1 (4910-00-754-0654)
Shop Equipment Auto-Maintenance and Repair; Org Suppl No. 1 (4910-00-754-0653)

SUPPLIES: Clean rags (Item 2, Appendix B)
Preformed packing (Item 190, Appendix B)
Preformed packing (Item 191, Appendix B)
Flat washer (Item 192, Appendix B)

EQUIPMENT CONDITIONS: Outriggers set and boom positioned over-the-side.
(Refer to TM 5-3810-306-10.)
Negative battery cable disconnected at shunt. (RT875CC)
Battery disconnect switch in off position. (RT875CCS)
Radiator fan and fan guard removed.
(Refer to TM 5-3810-306-20.)
Front gear cover removed. (Refer to page 4-43.)
Fuel shutoff solenoid removed. (Refer to TM 5-3810-306-20.)
Throttle linkage removed. (Refer to TM 5-3810-306-20.)
Fuel petcocks closed at filter/strainer.

REMOVAL:

1. CHECK BACKLASH OF DRIVE GEAR (1).

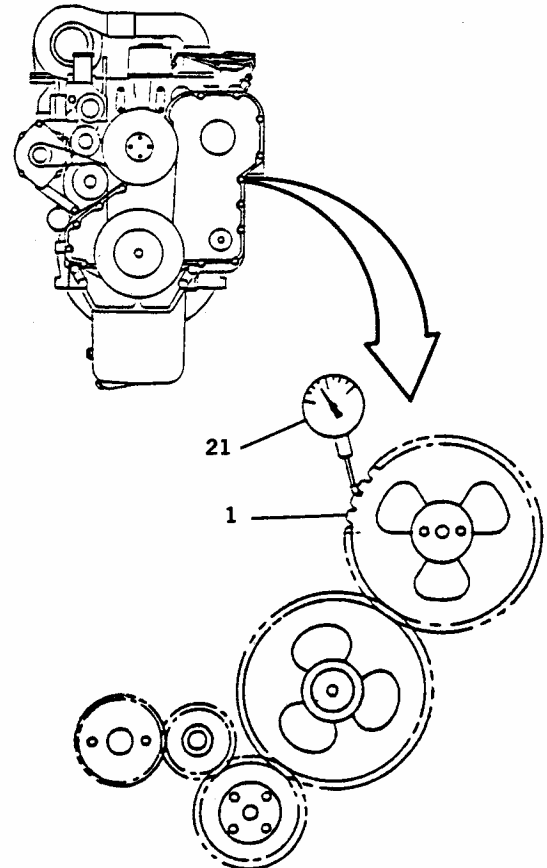
NOTE

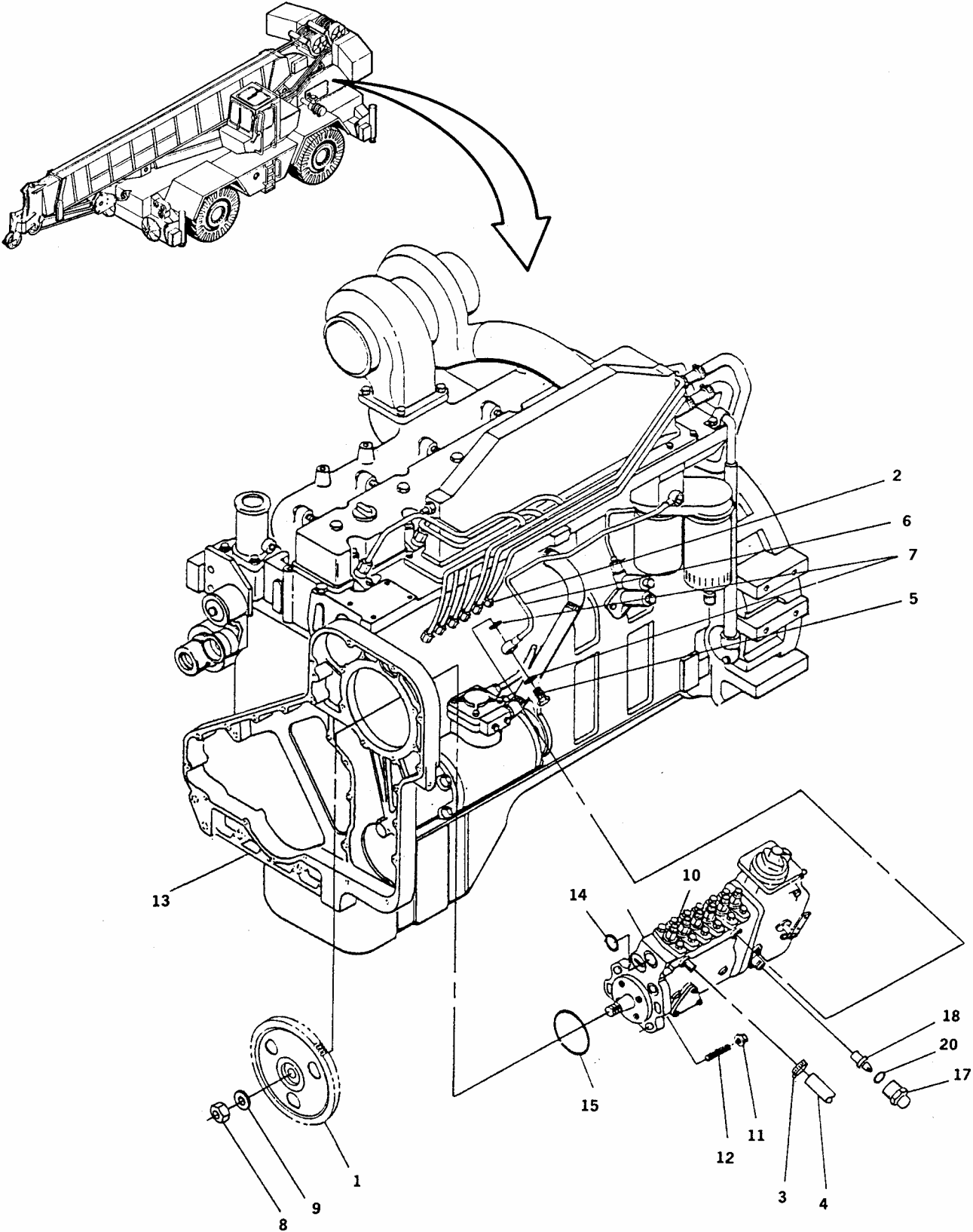
Hold adjoining gear from moving when checking backlash, or readings will be for the total of both gears.

- a. Position dial indicator (21) on a tooth of injector pump drive gear (1).
- b. Note total indicator travel.
Backlash limits
MIN 0.006 - MAX 0.010

2. TAG AND DISCONNECT ALL FUEL LINES.

- a. Disconnect six fuel lines (2).
- b. Cover high pressure outlets on fuel injection pump to avoid contamination.
- c. Remove clamp (3) and fuel hose (4).
- d. Loosen screw (5) and disconnect fuel supply tube (6). Discard washers (7).

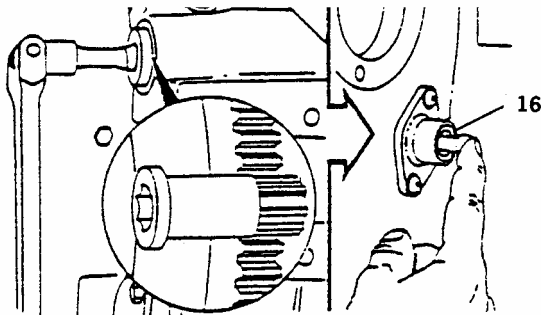




3. REMOVE DRIVE GEAR (1).
 - a. Remove nut (8) and washer (9) from fuel pump shaft and remove gear (1) using a suitable puller.
4. REMOVE FUEL INJECTION PUMP (10).
 - a. Remove four nuts (11) from studs (12) in front gear housing (13).
 - b. Remove fuel pump (10).
 - c. Discard preformed packings (14) and (15).
5. INSPECT ALL PARTS FOR DAMAGE. REPLACE PARTS AS REQUIRED.

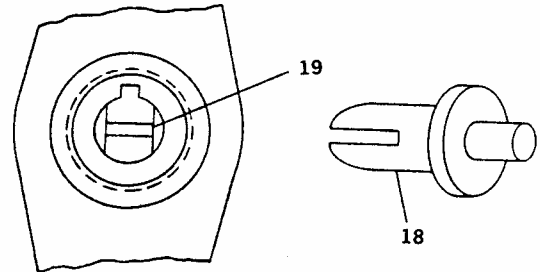
INSTALLATION:

1. ENGINE NO. 1 CYLINDER AT TDC.
 - a. Bar engine at flywheel housing until engine timing pin (16) at rear of front gear housing engages camshaft gear.

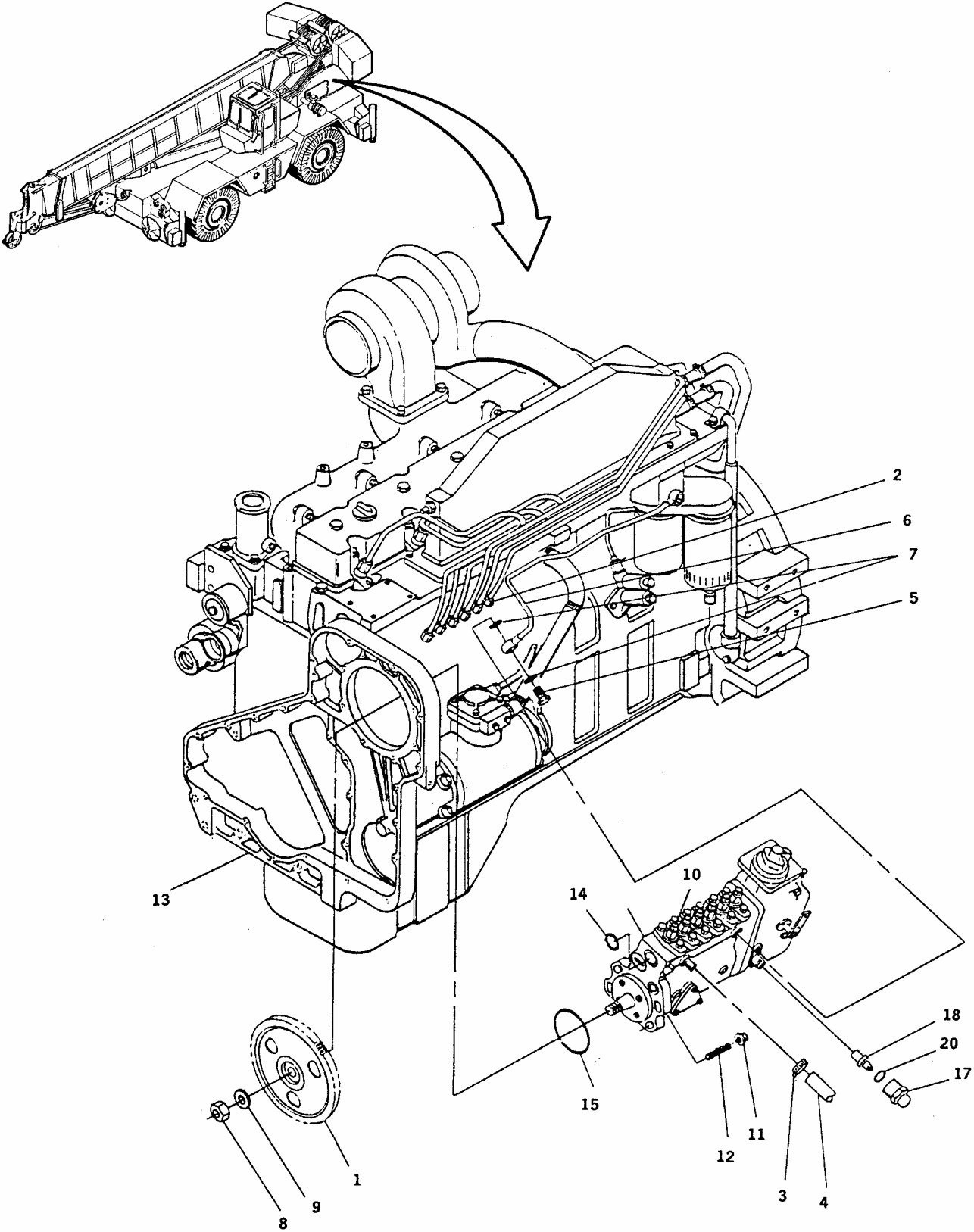


2. INSTALL FUEL INJECTION PUMP.
 - a. Remove access plug (17) and timing pin (18).
 - b. Rotate fuel injection pump shaft until timing tooth (19) is aligned with timing pin hole.

- c. Reverse position of pin (18) so slot of pin (18) will fit over timing tooth (19) in pump.



- d. Install and secure pin (18) with access plug (17).
 - e. Make sure new preformed packings (14) and (15) are correctly installed and not damaged.
 - f. Lubricate mounting flange with clean engine oil.
 - g. Position fuel injection pump (10) flange onto mounting studs.
 - h. Install four nuts (11). Torque to 32 ft-lbs (43 Nm).
3. INSTALL FUEL INJECTION PUMP DRIVE GEAR (1).
 - a. Install fuel injection pump drive gear (1) washer (9) and nut (8). Torque nut (8) to 7-11 ft-lbs (9-15 •m).
 - b. Disengage engine timing pin (16).
 - c. Remove fuel pump timing pin plug (17). Reverse position of pin (18) and install pin (18), plug (17) and sealing washer (20).
 - d. Final torque drive gear retaining nut (8) to 77 ft-lbs (102 Nm).
 4. INSTALL FUEL SHUTOFF SOLENOID. (REFER TO TM 5-3810-306-20.)



5. CONNECT FUEL LINES.

- a. Connect fuel drain manifold hose (4) and secure with clamp (3).
- b. Connect fuel supply tube (6) with two new washers (7) and screw (5).
- c. Connect six fuel lines (2) to fuel injection pump (10).

6. INSTALL THROTTLE LINKAGE. (REFER TO TM 5-3810-306-20.)

7. INSTALL FRONT GEAR COVER. (REFER TO PAGE 4-43.)

8. INSTALL RADIATOR FAN AND FAN GUARD. (REFER TO TM 5-3810-306-20.)

9. INSTALL RADIATOR, MOORING BRACKET AND SHROUD. (REFER TO TM 5-3810-306-20.)

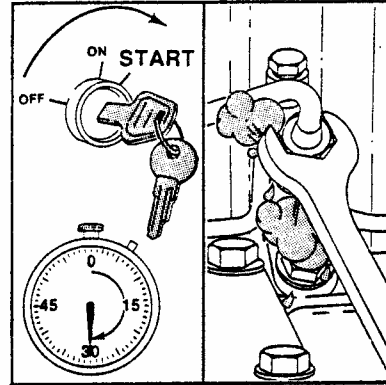
10. INSTALL ENGINE HOOD. (REFER TO TM 5-3810-306-20.)

11. CONNECT NEGATIVE BATTERY CABLE AT SHUNT. (REFER TO TM 5-3810-306-20.) (RT875CC)

12. VENT FUEL INJECTION PUMP AND FUEL LINES.

- a. Loosen vent screw.
- b. Place fuel control in run position.
- c. Crank engine and allow air to bleed from pump.
- d. Close vent screw.

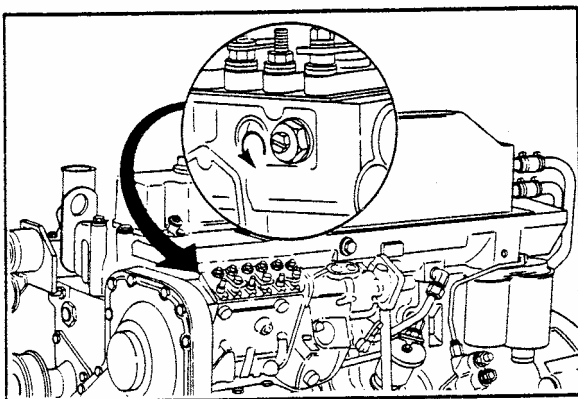
- e. Loosen each high pressure line one at a time starting at number 1 injector. Crank engine to allow air to bleed from lines then tighten lines.

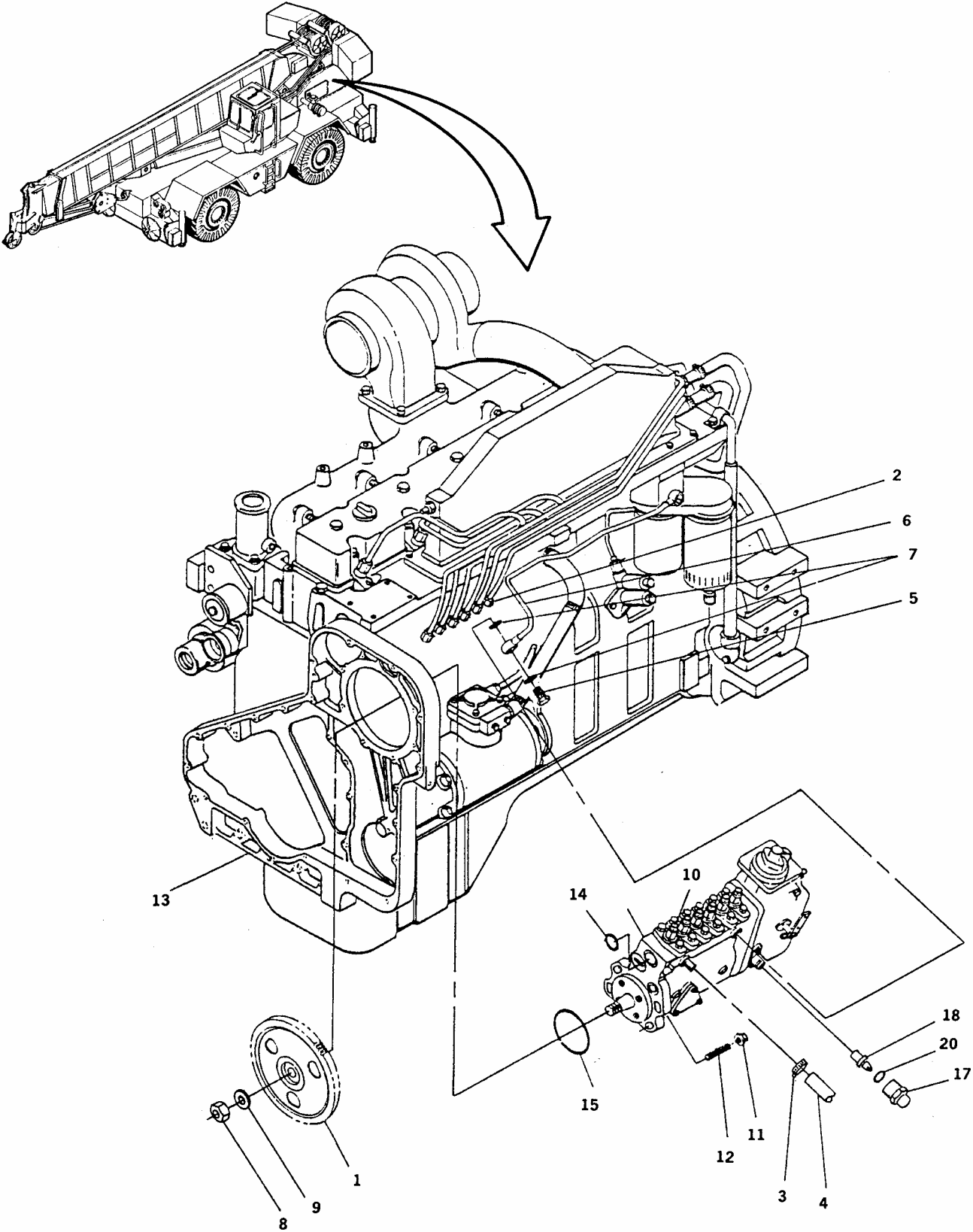


- f. Continue until engine runs smoothly.

13. ADJUST IDLE AS NECESSARY AT THROTTLE LINKAGE. (REFER TO TM 5-3810-306-20.)

END OF TASK





Section III. TURBOCHARGER MAINTENANCE

TURBOCHARGER AND EXHAUST MANIFOLD REPLACEMENT

TOOLS: General mechanic's tool kit: automotive (5180-00-177-7033)

SUPPLIES: Oil (Item 11, Appendix B)
Gasket (Item 111, Appendix B)
Gasket (Item 112, Appendix B)
Gasket (Item 113, Appendix B)
NEVER-SEEZ (Item 24, Appendix B)
Lockwasher (Item 273, Appendix B)

EQUIPMENT CONDITIONS: Negative battery cable disconnected at shunt. (RT875CC)
Battery disconnect switch in off position. (RT875CCS)
Engine oil filter removed. (Refer to TM 5-3810-306-20.)

REMOVAL:

1. REMOVE HOSES AND CLAMPS TO TURBOCHARGER.
 - a. Disconnect clamps (1) and remove hose (2) from turbocharger (3).
 - b. Remove turbocharger oil supply line hose (4).
 - c. Remove two capscrews (5) from oil tube connection (6) to turbocharger (3).
 - d. Remove two clamps (7) and remove tube (6) and gasket (8) and hose (9). Discard gasket (8).
 - e. Remove tube (10) from block.
 - f. Loosen clamp (18) on exhaust connection (17).
 - g. Remove two capscrews (19) from bracket (20) and move exhaust connection (17) and bracket (20) away from turbocharger (3).
 - h. Loosen clamps (21) and hose (22).
2. REMOVE TURBOCHARGER (3).
 - a. Remove four nuts (11) from studs (12).
 - b. Lift turbocharger (3) and gasket (13) away from exhaust manifold (15) while separating it from hose (22). Discard gasket (13).

3. REMOVE EXHAUST MANIFOLD (15).
 - a. Remove two capscrews (19), exhaust connection (17) and brace (20).
 - b. Remove two cap screws (23), lockwashers (24) and flat washers (25) securing air inlet "T" (26) to exhaust manifold (15). Discard lockwashers.
 - c. Remove twelve capscrews (14) from exhaust manifold (15).
 - d. Remove exhaust manifold (15) and gaskets (16). Discard gaskets (16).
 - e. Clean gasket surfaces.
4. INSPECT PARTS FOR DAMAGE. REPLACE AS REQUIRED.

INSTALLATION:

1. INSTALL EXHAUST MANIFOLD (15).
 - a. Assemble exhaust manifold (15) capscrews (14) and new gaskets (16).
 - b. Apply NEVER-SEEZ compound to the capscrews (14). The bead on gaskets (16) can be installed either direction.
 - c. Install manifold (15) and gaskets (16) to block.
 - d. Torque capscrews (14) to 32 ft-lbs (43 Nm) in sequence shown. After tightening, follow same sequence and retighten to same value.

- e. Install air inlet "T" (26) on exhaust manifold (15) with two capscrews (23), new lockwashers (24) and flat washers (25).

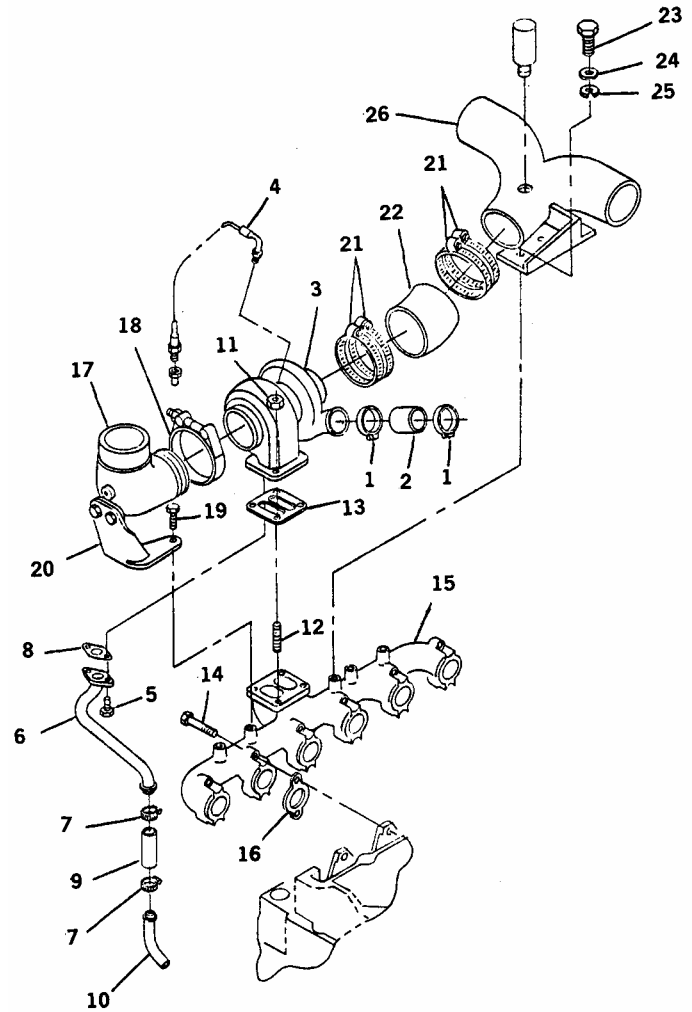
2. INSTALL TURBOCHARGER (3).

- a. Install new turbocharger gasket (13) and apply NEVER-SEEZ compound to studs (12).
- b. Position turbocharger (3) on exhaust manifold (15) and into hose (22). Secure turbocharger (3) using nuts (11). Torque nuts (11) to 24 ft-lbs (32 Nm).

- c. Tighten clamps (21) on hose (22)

3. INSTALL HOSES AND CLAMPS TO TURBOCHARGER.

- a. Install exhaust connection (17) and mount (20) on exhaust manifold (15) using capscrews (19).
- b. Connect exhaust connection (17) to turbocharger (3) with clamp (18).



NOTE

If required, bend lockplates back and loosen the turbine housing capscrews to better position bearing housing to install the turbocharger drain tube.

- c. Install drain tube (6) and new gasket (8) with two bolts (5) torque to 18 ft-lbs (24 Nm).

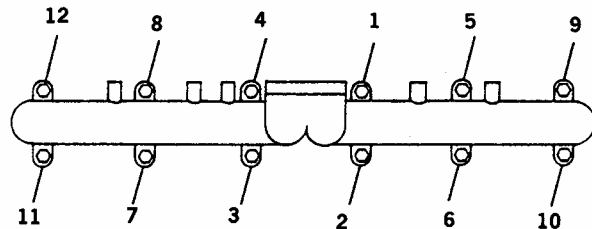
NOTE

If Note above was used, reposition turbine housing and torque nuts to 100 in-lbs (11 Nm).

- d. Install tube (10) in cylinder block.
- e. Connect tubes (6) and (10) with hose (9) using clamps (7).

CAUTION

Failure to pre-lubricate the turbocharger could result in damage to the turbocharger upon engine startup.



- f. Pour 2 to 3 oz of clean engine oil into oil inlet fitting on the top of turbocharger (3) while spinning turbocharger impeller to distribute oil in bearing.
- g. Install oil supply line (4). Tighten fittings securely. Torque to 18 ft-lbs (24 Nm).
- h. Install hose (2) to turbocharger (3) using clamps (1).

4. INSTALL ENGINE OIL FILTER. (REFER TO TM 5-3810-306-20.)

TM 5-3810-306-34

5. CONNECT NEGATIVE BATTERY CABLE AT SHUNT. (REFER TO TM 5-3810-306-20.) (RT875CC)

6. TEST FOR PROPER OPERATION AND INSPECT FOR LEAKS. (REFER TO TM 5-3810-306-10.)

END OF TASK

CHAPTER 6
ELECTRICAL SYSTEM MAINTENANCE

CHAPTER INDEX

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	Alternator Assembly	6-2
Section II	Starting Motor Maintenance	6-8
	Engine Starter Assembly	6-8

Section I. ALTERNATOR MAINTENANCE

ALTERNATOR ASSEMBLY

TOOLS: Ohmmeter
 Battery
 Carbon pile
 Ammeter
 Analyzer, Set Engine; STE/ICE (4910-00-124-2554)
 Shop Equipment Contact Maintenance Truck Mtd (4930-00-294-9518)
 Shop Equipment Electrical Repair Semitrailer Mtd (4940-01-150-3113)
 Shop Equipment Fuel and Electric System Engine FM Basic (4940-00-754-0714)
 Test Standard Auto-Generator and Starter, Floor Mtd 500 AMP (4910-00-767-0218)
 Tool Kit Auto-Fuel and Electric System Repair (5180-00-754-0655)

SUPPLIES: Clean rags (Item 2, Appendix B)

EQUIPMENT CONDITIONS: Alternator removed from engine. (Refer to TM 5-3810-306-20.)

DISASSEMBLY:

1. DISASSEMBLE ALTERNATOR.

- c. Remove three nuts (7) securing stator leads (8) to rectifier assembly (9). Remove stator (10).

NOTE

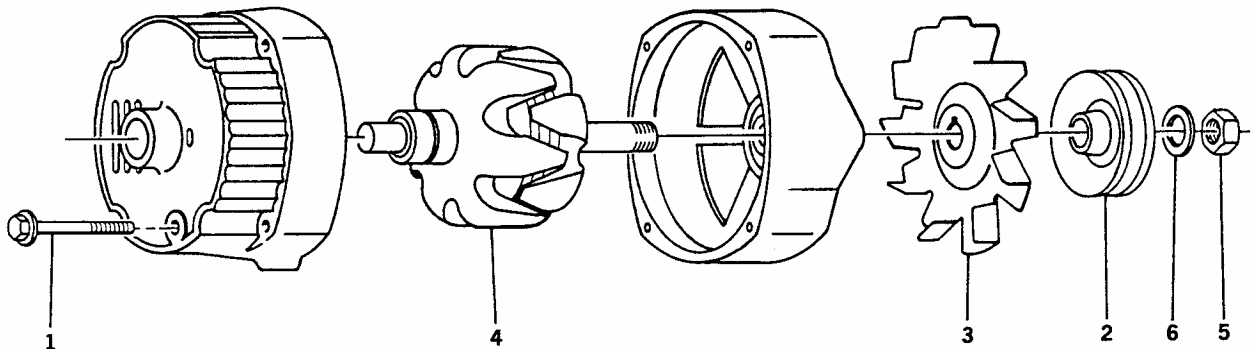
Scribe a locating mark on frames to aid positioning during assembly.

- a. Remove thru-bolts (1) and separate the drive end frame with rotor assembly from the slip ring end frame with stator assembly by prying apart with a screwdriver at the stator slot.
- b. If necessary, remove pulley (2) fan (3) and rotor (4) by removing nut (5) and washer (6).

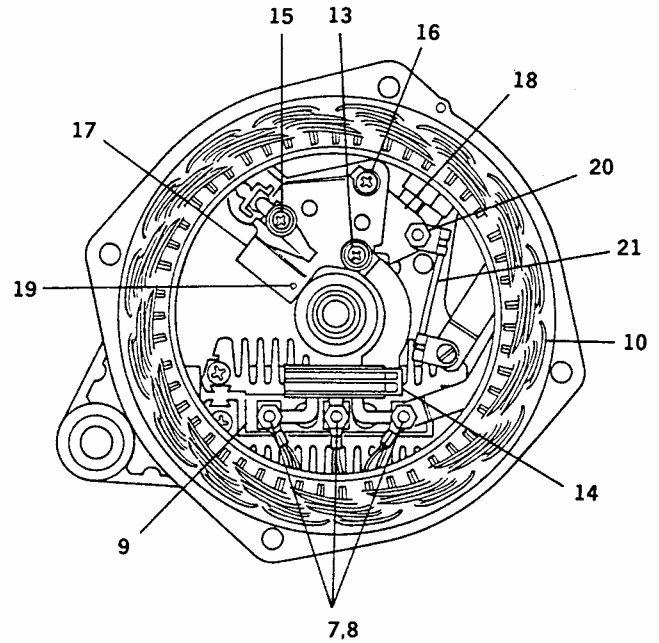
NOTE

Perform rectifier check and stator check as described under INSPECTION prior to further disassembly.

- d. Remove nut (12) securing strap (11) to housing. Remove strap (11). Retain nut (12) and connecting hardware for assembly.
- e. Remove insulated screw (13) securing diode (14). Remove diode (14).



- f. Remove insulated screw (15) and ground screw (16) securing brush holder (17) and regulator (18). Remove brush holder (17). Remove brushes (19) from brush holder.
- g. Remove nut (20) securing wire (21) to regulator (18). Remove regulator (18).
- h. Remove four screws (22) securing rectifier assembly (9) and capacitor (23). Remove rectifier assembly (9), capacitor (23) and wire (21).
- i. Remove nut (24) securing battery terminal strap (25). Remove strap (25). Retain nut (24) and connecting hardware for assembly.

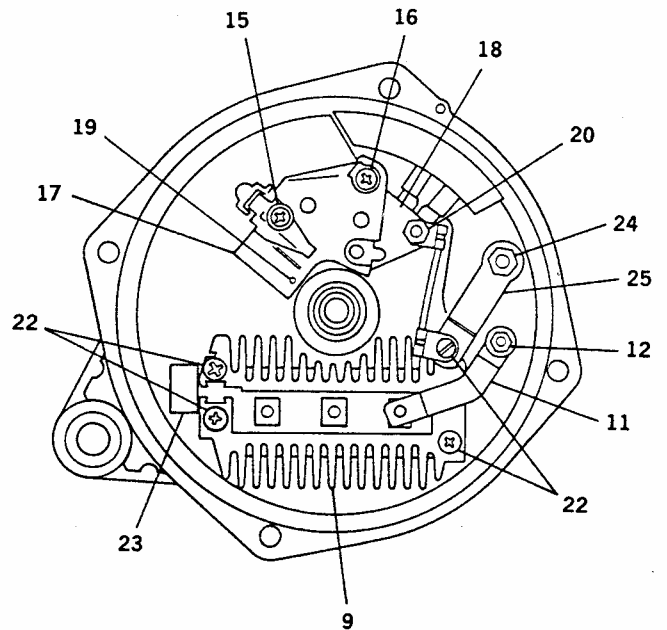


CLEANING:

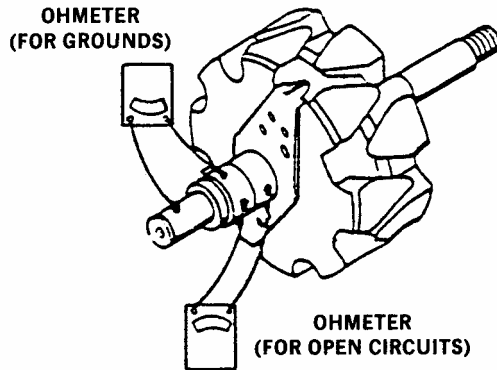
- 1. WIPE OFF ALL PARTS WITH CLEAN LINT-FREE CLOTHS.

INSPECTION:

- 1. INSPECT ALTERNATOR COMPONENTS.
 - a. Inspect pulley for cracks and wear.
 - b. Inspect fan for wear and damaged vanes.
 - c. Inspect rotor for corrosion and wear.
 - d. Inspect brushes for wear.
 - e. Check rotor assembly as follows:
 - (1) Connect ohmmeter to each slip ring.
 - (2) If ohmmeter reading is high (infinite), then rotor winding is open.
 - (3) Connect ohmmeter from one slip ring to shaft.



- (4) If ohmmeter is low, then rotor winding is grounded.



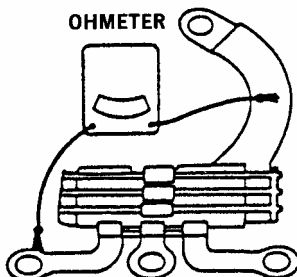
- (5) Check rotor winding for short-circuit by connecting ohmmeter to each slip ring.
- (6) If ohmmeter reading is above 3.0, rotor winding has excessive resistance.
- (7) If ohmmeter reading is below 2.4, rotor winding is shorted.

NOTE

If the rotor assembly is not defective but the generator fails to supply rated output, then defect is in diode, rectifier, stator, or voltage regulator.

- f. Check diodes as follows:

- (1) Connect ohmmeter (having a 1-1/2 volt cell) to single side connector and one of three connectors.
- (2) Observe and record reading on lowest range scale and reverse leads to same two connectors.



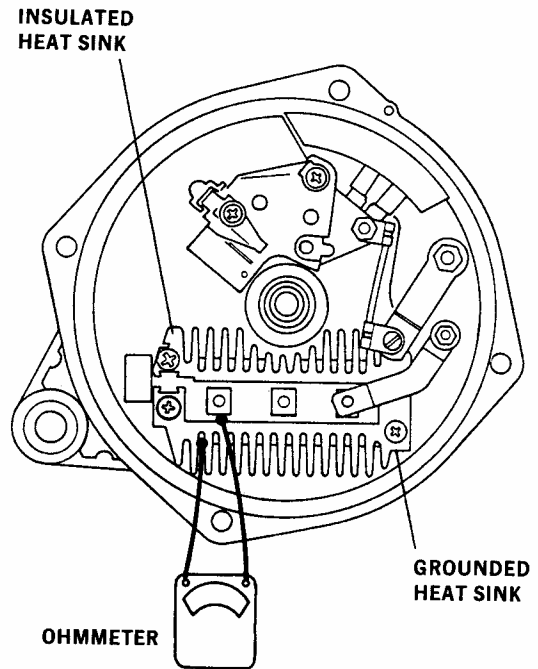
- (3) Observe ohmmeter reading.
- (4) If readings are the same, replace diode. A good diode will give one high and one low reading.
- (5) Repeat steps (1) thru (4) for the other two short connectors.
- (6) Connect ohmmeter to each pair of three connectors.
- (7) If any reading is zero, replace diode.

- g. Check rectifier as follows:

CAUTION

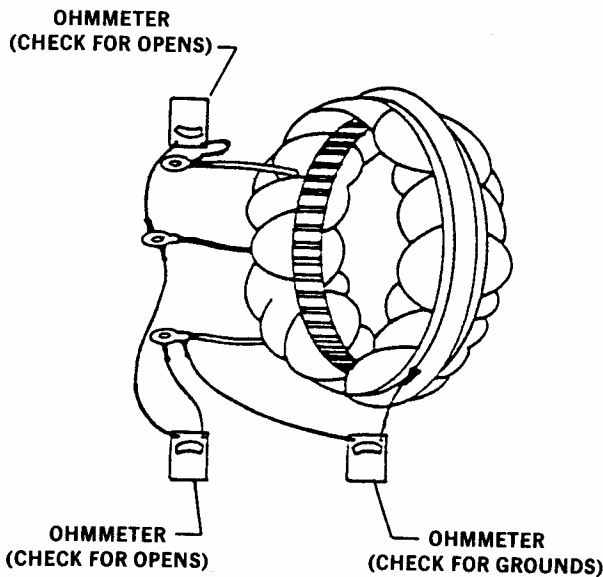
Do not use high voltage such as 110 volt test lamp to check rectifier.

- (1) Connect ohmmeter to grounded heat sink and one of three terminals on rectifier.
- (2) Press down firmly on flat metal connector of rectifier then reverse leads to heat sink and same terminal.

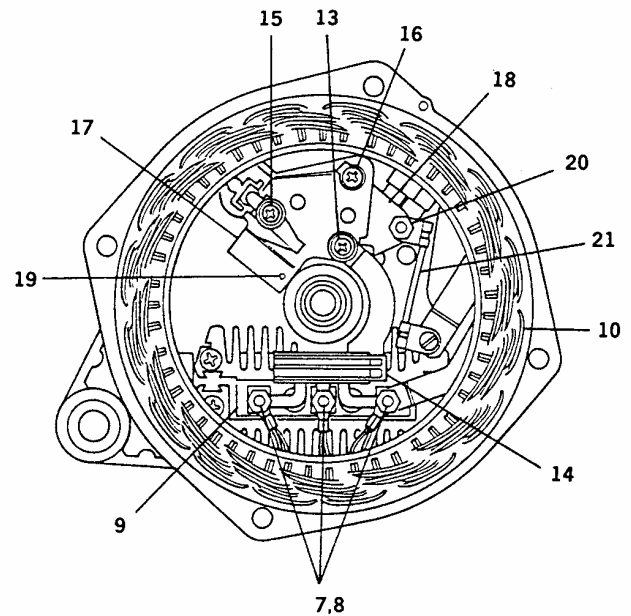


- (3) If both readings are same, replace rectifier.

- (4) Repeat steps (1) thru (3) for the other two terminals on rectifier.
- h. Check stator as follows:
 - (1) Connect ohmmeter from any stator lead to frame.
 - (2) If ohmmeter reading is low, then windings are grounded. Replace alternator.
 - (3) Connect ohmmeter leads from each set of stator leads.
 - (4) If ohmmeter readings are high, then windings are open. Replace alternator.



- b. Install capacitor (23), rectifier assembly (9) (Under end of battery terminal strap (25)) and one end of wire (21). Secure all four items using four screws (22).
- c. Install regulator (18) and other end of wire (21) and secure both with nut (20).
- d. Install brushes (19) in brush holder (17).
- e. Install brush holder (17), insulated screw (15) and ground screw (16).
- f. Install diode (14) and insulated screw (13).



- i. Inspect battery terminal insulator for cracks. Replace if damaged.

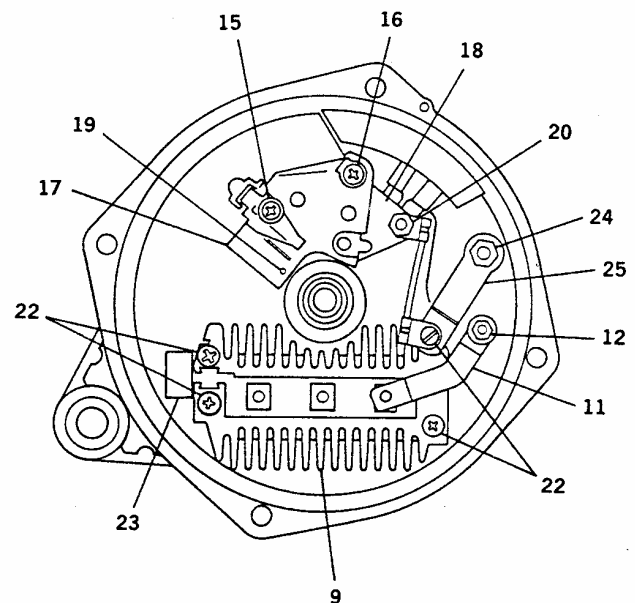
ASSEMBLY:

1. ASSEMBLE ALTERNATOR.

CAUTION

Be certain slip ring end frame is clean prior to assembly.

- a. Install battery terminal strap (25) and secure one end with nut (24) and attaching hardware.



- g. Install strap (11) and secure one end to housing using nut (12) and attaching hardware.
- h. Install stator (10), stator leads (8) and nuts (7).
- i. If removed, install rotor (4), fan (3), pulley (2), washer (6) and nut (5). Torque nut (5) to 70-80 ft-lbs (95-108 Nm).

NOTE

Make sure rotor (4) shaft is clean. Insert pin through hole in end frame to hold brushes and springs up in brush holder during assembly. Remove pin after thru bolts (1) are tightened to allow brushes to contact slip rings.

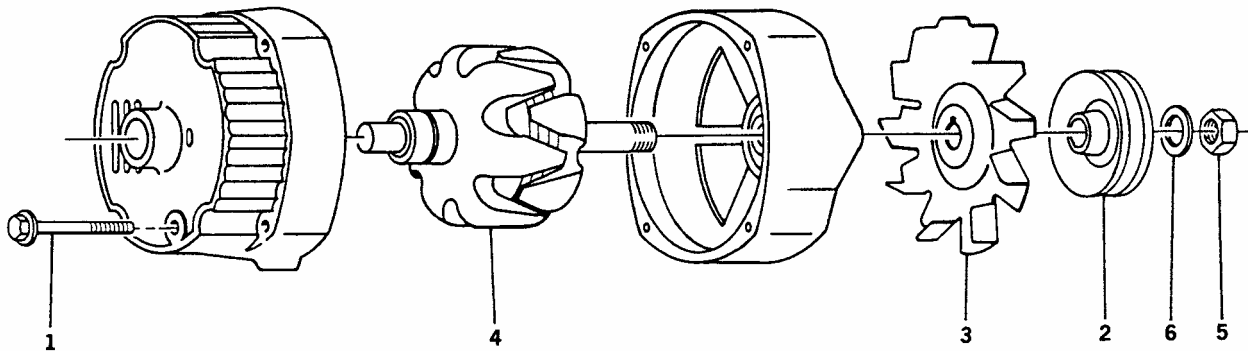
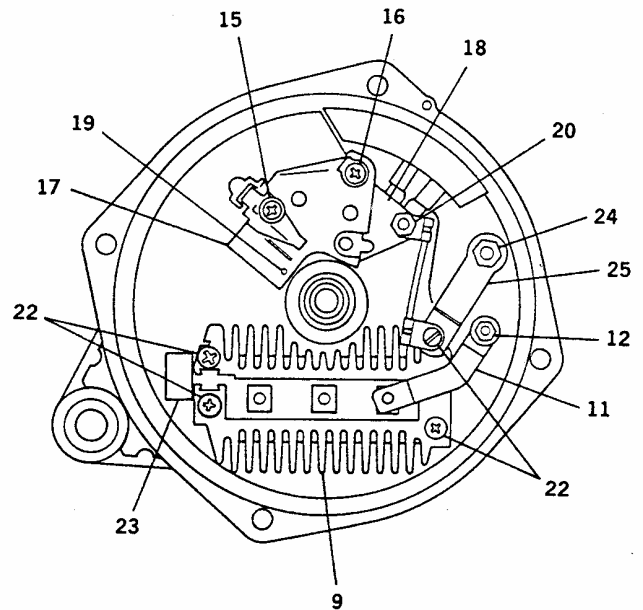
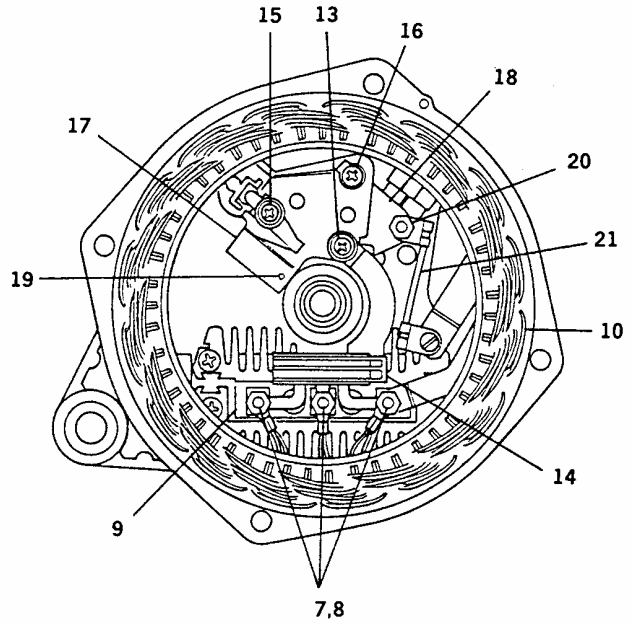
- j. Assemble slip ring end frame to drive end frame. Align scribe mark on frames and install thru bolts (1).

TESTING:

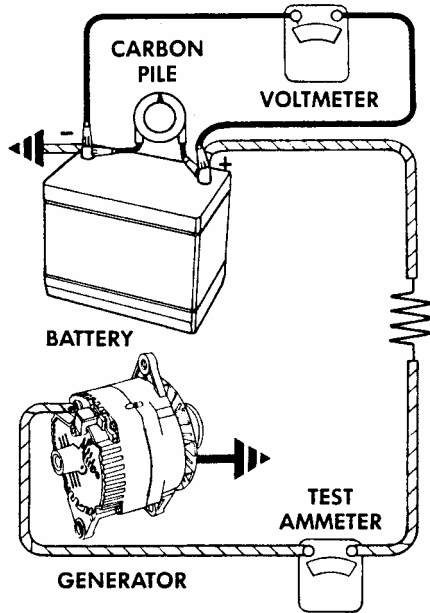
1. BENCH TEST ALTERNATOR.

NOTE

Battery used for bench check must be fully charged.



- a. Connect ammeter, voltmeter, resistor (10 ohms at 6 watts), alternator and fully charged battery as shown. Do not connect carbon pile at this time.



- b. Slowly increase alternator speed and observe voltage.
- c. If voltage is uncontrolled with speed and increases above 31.0 volts, test voltage regulator and recheck field winding.
- d. If voltage is below 31.0 volts, connect carbon pile as shown.

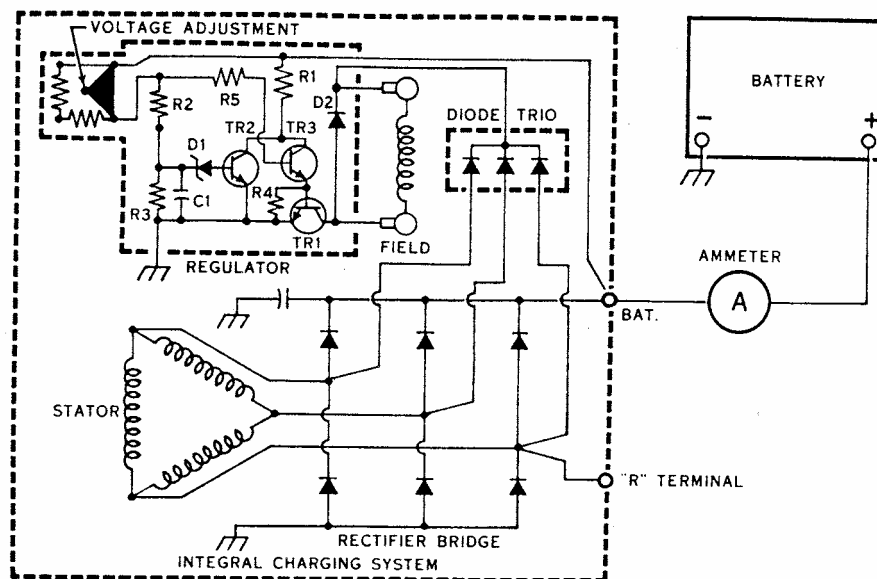
- e. Operate alternator at moderate speed and adjust carbon pile as required to obtain maximum current output.
- f. If output is within 10 amperes of 65 amperes, then alternator is good.
- g. If output is not within 10 amperes of 65 amperes keep battery loaded with carbon pile and insert screwdriver into end frame hole to ground tab to end frame. Note that tab is within 3/4-inch of casting surface, therefore, do not force the screwdriver deeper than 1-inch into end frame.
- h. Operate the alternator at a moderate speed and adjust carbon pile to obtain maximum current output.
- i. If output is within 10 amperes of 65, disassemble the alternator and replace the regulator.

Recheck alternator after repair.

- j. If output is not within 10 amperes of 65, disassemble the alternator and check winding, diode, rectifier and stator. Recheck alternator after repair.
- k. Remove ammeter and turn accessories off.

2. MOUNT ALTERNATOR ON ENGINE.
(REFER TO TM 5-3810-306-20.)

END OF TASK



Section II. STARTING MOTOR MAINTENANCE

ENGINE STARTER ASSEMBLY

TOOLS: General mechanic's tool kit: automotive (5180-00-177-7033)
Multimeter

SUPPLIES: Emery cloth (Item 95, Appendix B) (1 Required)
Preformed packing (Item 92, Appendix B) (2 Required)
Preformed packing (Item 93, Appendix B)
Solvent P-D-680, Type III (Item 1, Appendix B)
Oil, lubricating SAE 10 (Item 94, Appendix B)
Loctite #2114 (Item 100, Appendix B)

EQUIPMENT CONDITIONS: Starting motor removed. (Refer to TM 5-3810-306-20.)

DISASSEMBLY:

1. REMOVE SOLENOID SWITCH (4).

- a. Remove ground jumper wire from terminal #4 on switch (4).

NOTE

If terminal is not heated, the plastic base may be damaged during disassembly.

- b. Using soldering iron or gun, pre-heat terminal #3 on switch (4) enough to soften Loctite. Remove terminal nut.

CAUTION

Use an open wrench to hold the bottom nut while removing the top nut. Failure to do this may damage the field coil.

- c. Remove nut (1) and jumper strap (2) from field coil stud on field ring (49).
- d. Remove two hex head screws (3) from switch bracket.
- e. Lift switch (4) up, turn 180° and pull out of shift lever (40), removing switch from shift housing (29).

CAUTION

Push back on boot (5) to expose plunger on switch (4). Wrap strip of emery cloth twice around plunger to avoid nicks.

- f. Grip plunger on switch (4) with channel lock pliers and unscrew link spool (6) with wrench.
- g. Inspect boot (5) for cracks or damage. Replace if damaged.

2. REMOVE BRUSHES (7).

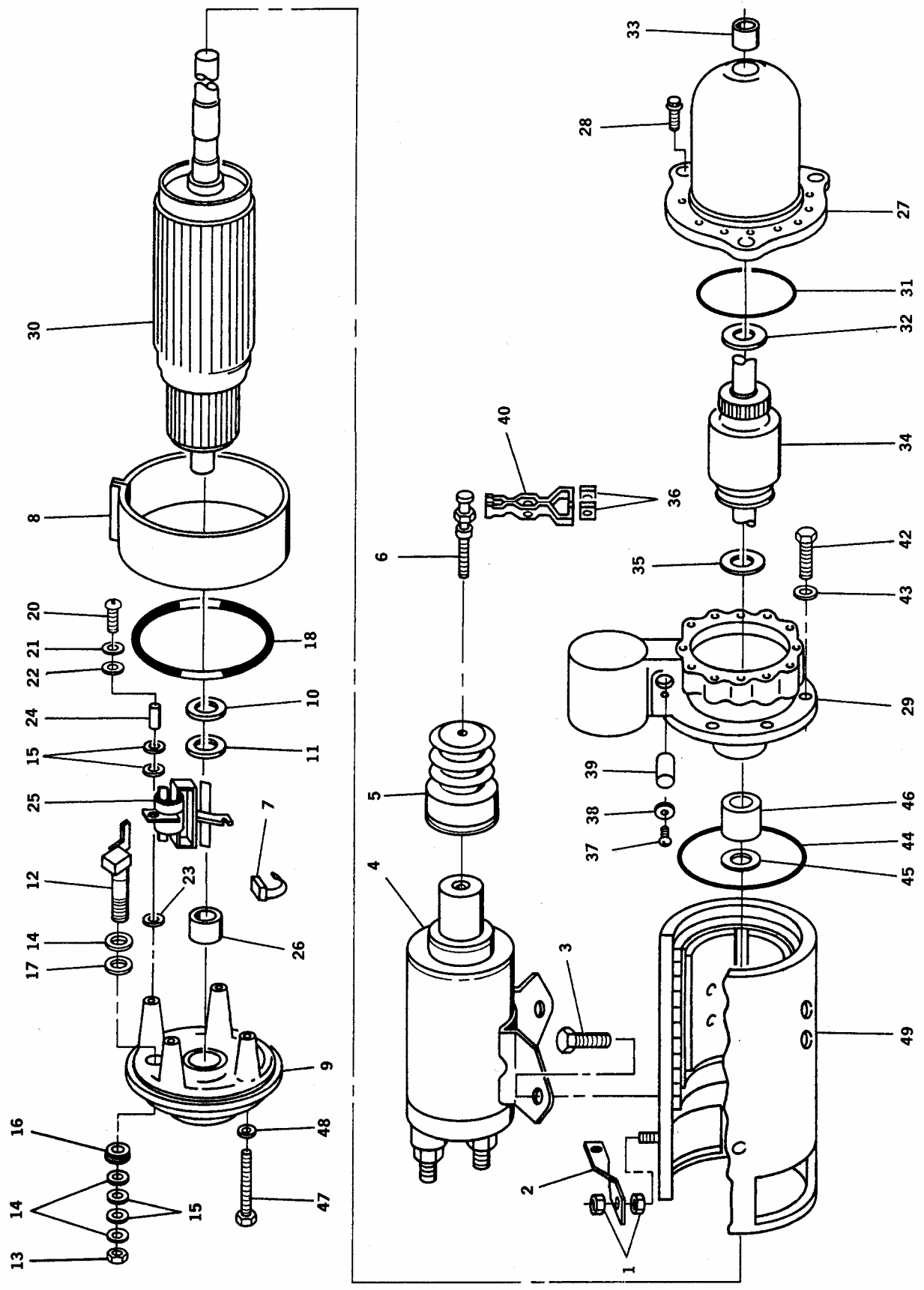
CAUTION

Do not pull brush leads while springs exert pressure on the brushes.

- a. Remove access cover (8) and brushes (7).
- b. Inspect brushes (7) for wear. Brushes less than 5/8" in length must be replaced.

3. REMOVE HOUSING (9).

- a. Remove ground jumper wire from housing (9).
- b. Mark housing (9) in relation to the field ring (49) with a punch.

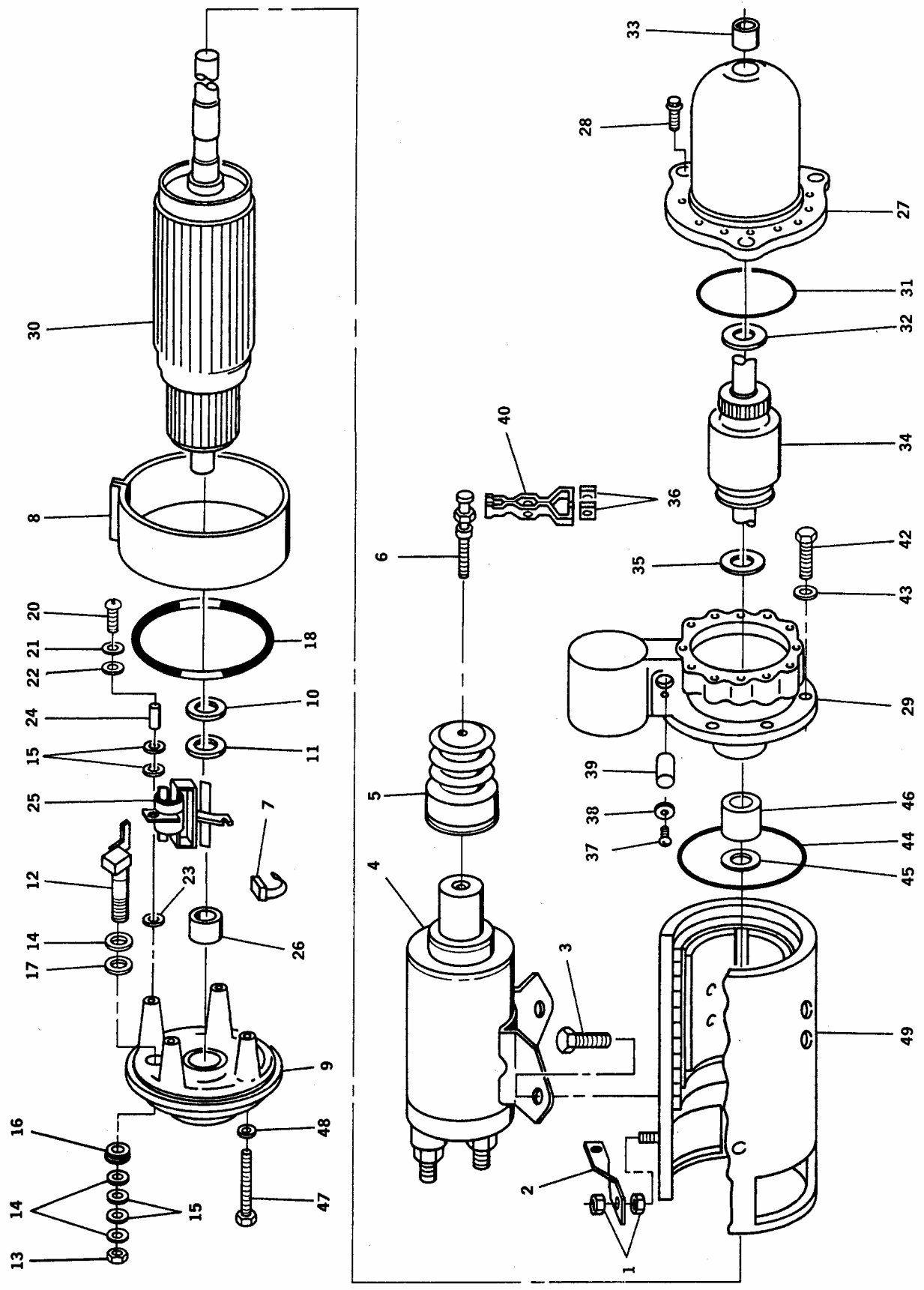


- c. Remove four hex head screws (47), lockwashers (48) and housing (9). Remove and discard preformed packing (18) and lockwashers.
 - d. Remove fiber washer (10) and steel washer (11) from armature (30).
 - e. Match mark jumper and screw assembly (12) to housing (9). Remove nut (13), washer guards (14), Belleville washers (15), insulator (16), insulator washer (17) and jumper and screw assembly (12). Note position of hardware and retain for assembly.
 - f. Remove screws (20), lockwashers (21), washer guards (22), insulation washers (23), insulation bushings (24) and brush holders (25). Discard lockwashers.
 - g. If necessary, using a suitable puller, remove bushing (26) from housing (9).
4. REMOVE ARMATURE (30).
5. REMOVE ENGINE DRIVE HOUSING (27).
- a. Match mark shift housing (29) engine drive housing (27) and field ring (49).
 - b. Remove six socket head capscrews (28).
 - c. Tap flange of engine drive housing (27) and separate housing (27) from shift housing (29).
 - d. Remove packing (31) and steel washer (32). Discard packing (31).
 - e. If necessary, remove bushing (33) from housing (27) using a suitable driver.
6. REMOVE ENGINE DRIVE (34).
- a. Remove engine drive (34) and washer (35).
 - b. Remove cams (36).
 - c. Remove socket head screw (37) and washer (38) from shift housing (29). Remove shift lever shaft (39) and shift lever (40).
7. REMOVE SHIFT HOUSING (29).
- a. Remove socket head screws (42), lockwashers (43) and shift housing (29). Discard lockwashers (43).

- b. Remove and discard packing (44) and seal (45).
- c. If necessary, using a suitable driver, remove bushing (46) from housing (29).

INSPECTION:

1. INSPECT BRUSH HOLDERS (25) FOR DAMAGE.
 - a. Insert new brush (7) in each brush slot in each of the four brush holders (25). If brush does not move freely in one of slots, then that brush holder (25) must be replaced.
 - b. Inspect each of four brush holders (25). Discoloration, burns or signals of high temperatures indicates defective or improperly assembled insulators.
2. TEST BRUSH HOLDER (25) INSULATION.
 - a. Connect multimeter test leads to two brush holders that share a common mounting post.
 - b. A LOW resistance reading indicates that an insulator bushing (24) or washer (23) is defective and must be replaced. Repeat this test at each of four mounting posts.
3. TEST BRUSH HOLDER (25) GROUND.
 - a. Connect one multimeter test lead to a bare metal surface on housing (9) and second test lead to each of four brush holders (25).
 - b. LOW resistance indicates a grounded brush holder caused by defective insulator(s).
4. INSPECT INSULATOR BUSHINGS (24) FOR DAMAGE.
 - a. Inspect each insulator bushing (24) for breaks, cracks or burns.
 - b. Remove damaged insulator bushings (24).
5. TEST JUMPER AND SCREW ASSEMBLY (12).
 - a. Connect multimeter test leads to a bare metal surface on housing and jumper and screw assembly (12).



- b. LOW resistance indicates defective insulation bushing(s) or washer(s).
6. INSPECT BUSHINGS (26) AND (33) FOR WEAR.
- a. Measure inside diameter of each bushing (26) and (33).
 - b. Remove bushings (26) and (33) if measurement is greater than 0.753 inch (19.1 mm).
7. INSPECT ENGINE DRIVE (34) FOR DAMAGE.
- a. Rotate engine drive (34) in both directions. If drive does not move freely (in and out) replace drive.
 - b. Inspect engine drive (34) splines for damage and wear. Replace drive if worn or damaged.
8. INSPECT ARMATURE (30) FOR DAMAGE.
- a. Inspect armature (30) shaft splines for damage and wear.
 - b. Replace engine starter if armature is worn or damaged.
9. PERFORM ARMATURE (30) GROUND TEST.
- a. Connect one multimeter test lead to armature (30) shaft (on spline end) and run second test lead across all commutator contacts.
 - b. LOW resistance indicates a ground and engine starter must be replaced.
10. PERFORM ARMATURE GROWLER TEST.
- a. If armature (30) is grounded, replace entire engine starter.
11. INSPECT COMMUTATOR END OF ARMATURE (30) FOR DAMAGE.
- a. Inspect commutator end for pits, scoring, excessive carbon and oil.
 - b. Turn armature (30) (commutator end) if necessary in a lathe to remove surface pits, scoring and contamination. Minimum diameter after turning must be 2-1/16 inch (52.38 mm). Maximum run-

out should be 0.003 inch (0.076 mm) TIR.

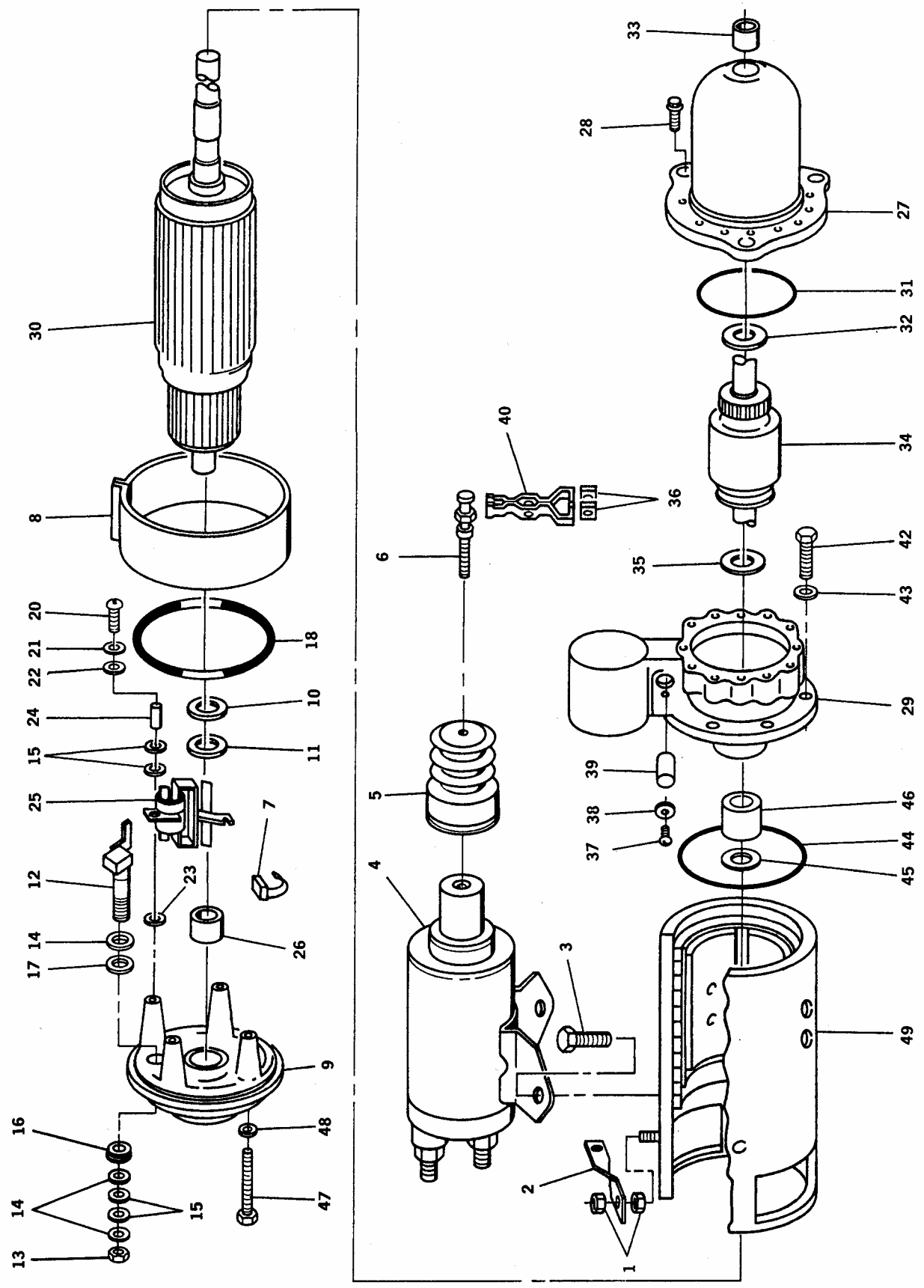
12. TEST FIELD COIL FOR GROUND.
- a. Connect one multimeter test lead to a bare metal surface on the field ring (49) and the second test lead to each of the two field coil jumpers.
 - b. LOW resistance indicates a ground. If grounded, engine starter must be replaced.
13. INSPECT FIELD RING (49) FOR DAMAGE.
- a. Inspect field ring (49) for burn marks.
 - b. Inspect pole pieces for wear. If other field pieces and armature show wear, replace bushings (26) and (33).

CLEANING:

WARNING

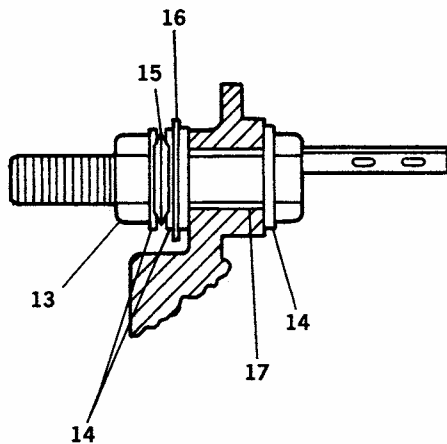
Dry cleaning solvent P-D-680, Type III is toxic and flammable. Wear protective goggles and gloves and use only in a well ventilated area. Avoid contact with skin, eyes, and clothes and don't breathe vapors. Do not use near open flame or excessive heat. The flash point is 200°F (94°C). If you become dizzy while using cleaning solvent, get fresh air immediately and get medical aid. If contact with eyes is made, wash your eyes with water and get medical aid immediately. Compressed air used for cleaning purposes will not exceed 30 psi. Use only with effective chip guarding and personal protective equipment (goggles/ shield, gloves, etc.).

- 1. CLEAN ALL METAL PARTS IN SOLVENT P-D-680, TYPE III.
- 2. USE LOW-PRESSURE COMPRESSED AIR TO DRY PARTS.



REASSEMBLY:

1. IF REMOVED, INSTALL BUSHING (26) IN HOUSING (9).
 - a. Ream bushing (26) ID to .754-inch.
 - b. Press bushing (26) into housing (9).
2. INSTALL JUMPER AND SCREW ASSEMBLY (12).
 - a. Slide washer guard (14) and insulation washer (17) on assembly and insert into housing (9).
 - b. Align jumper and screw assembly with markings made at disassembly.
 - c. Install insulation washer (16), guard washer (14), two Belleville washers (15) (face-to-face) and guard washer (14).
 - d. Install hex nut (13) and torque to 33-37 ft-lbs (44-49 Nm).



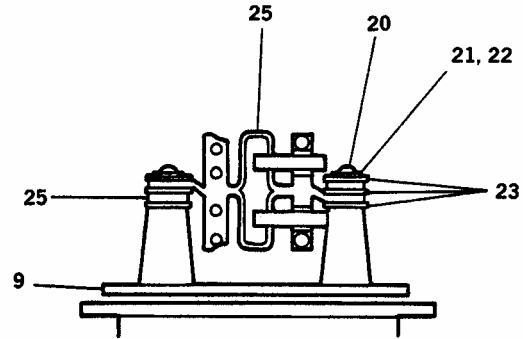
3. INSTALL BRUSH HOLDERS (25).

NOTE

Insulation bushings (24) must be installed so they pass through washers (23) and fit flush against the mounting posts.

- a. Insert four guide pins in each of four housing mounting posts and slide an insulation bushing (24) and an insulation washer (23) on each of the four guide pins.

- b. Match one of four brush holders (25) to jumper and screw assembly (12) tab so two holes in tab are aligned with two tapped holes in brush holder contact plate.



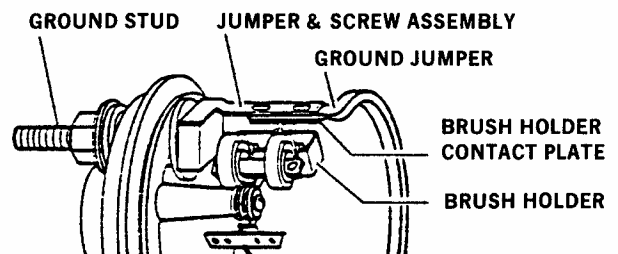
- c. Mount brush holders (25) on the mounting posts with insulation washers (23), washer guards (22), new lockwashers (21) and screws (20).

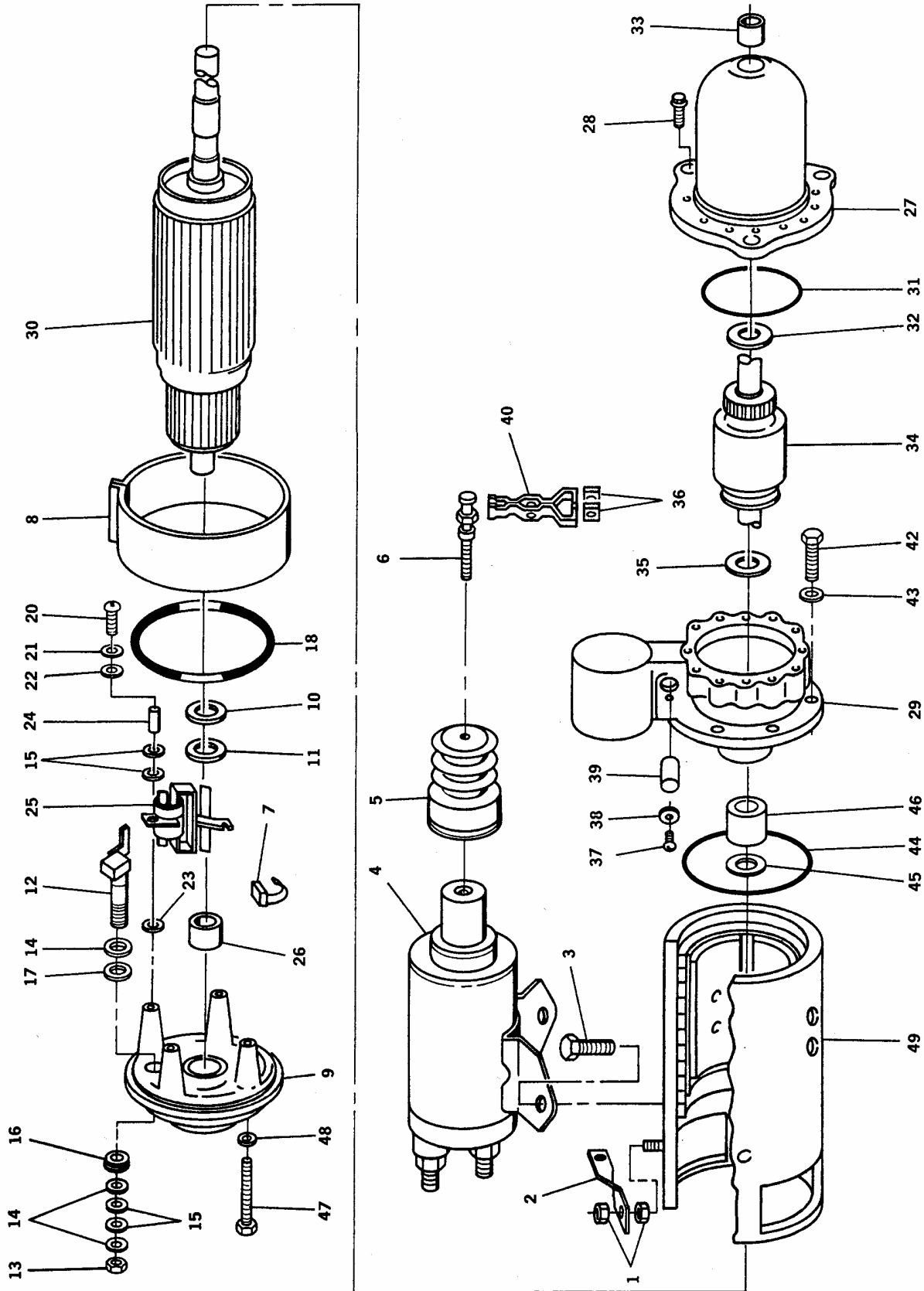
4. TEST BRUSH HOLDER (25) INSULATION.

- a. Connect multimeter test leads to two brush holders (25) that share a common mounting post.
- b. A LOW resistance reading indicates an insulator bushing (24) or washer (23) is defective or misaligned.
- c. If necessary, remove and reinstall insulator bushings (24) and washers (23).

5. TEST BRUSH HOLDER GROUND.

- a. Connect one multimeter lead to bare surface on housing (9) and second test lead to each of four brush holders (25).
- b. A LOW resistance reading at any brush holder indicates a grounded brush holder.
- c. If necessary, remove and reinstall insulator bushings (24) and washers (23).





6. ASSEMBLE HOUSING (9) AND FIELD RING (49).

- a. Install new preformed packing (18).
- b. Match housing (9) to field ring (49) according to marks made at disassembly and align jumper and screw assembly (12) with ground jumper tab.
- c. Press housing (9) flush with field ring (49). Insure that ground jumper tab meshes with jumper and screw assembly (12) and brush holder (25) contact plate.
- d. Apply 1-2 drops of Loctite #2114 on four hex head screws (47). Use these screws plus new lock-washers (48) to secure housing (9) to field ring (49). Torque capscrews (48) to 62-66 in-lbs (7-8 Nm).
- e. Install ground jumper wire.

7. INSTALL ARMATURE (30).

- a. Install fiber washer (10) and steel washer (11) on armature (30).
- b. Apply film of SAE-10 grade oil on armature (30) shaft.
- c. Slide armature (30) into field ring (49) and housing (9).

8. INSTALL BUSHING (46) AND SEAL (45).

- a. Using a suitable driver, install bushing (46) in shift housing (29).
- b. Install seal (45) in shift housing (29).

9. INSTALL SHIFT LEVER (40).

- a. Position shift lever (40) in shift housing (29).
- b. Secure shift lever (40) with lever shaft (39), socket head screw (37) and washer (38).

10. INSTALL ENGINE DRIVE (34).

- a. Apply film of SAE-10 grade oil on armature shaft (30) and splines.
- b. Clamp field ring (49) with armature (30) installed in a vise.

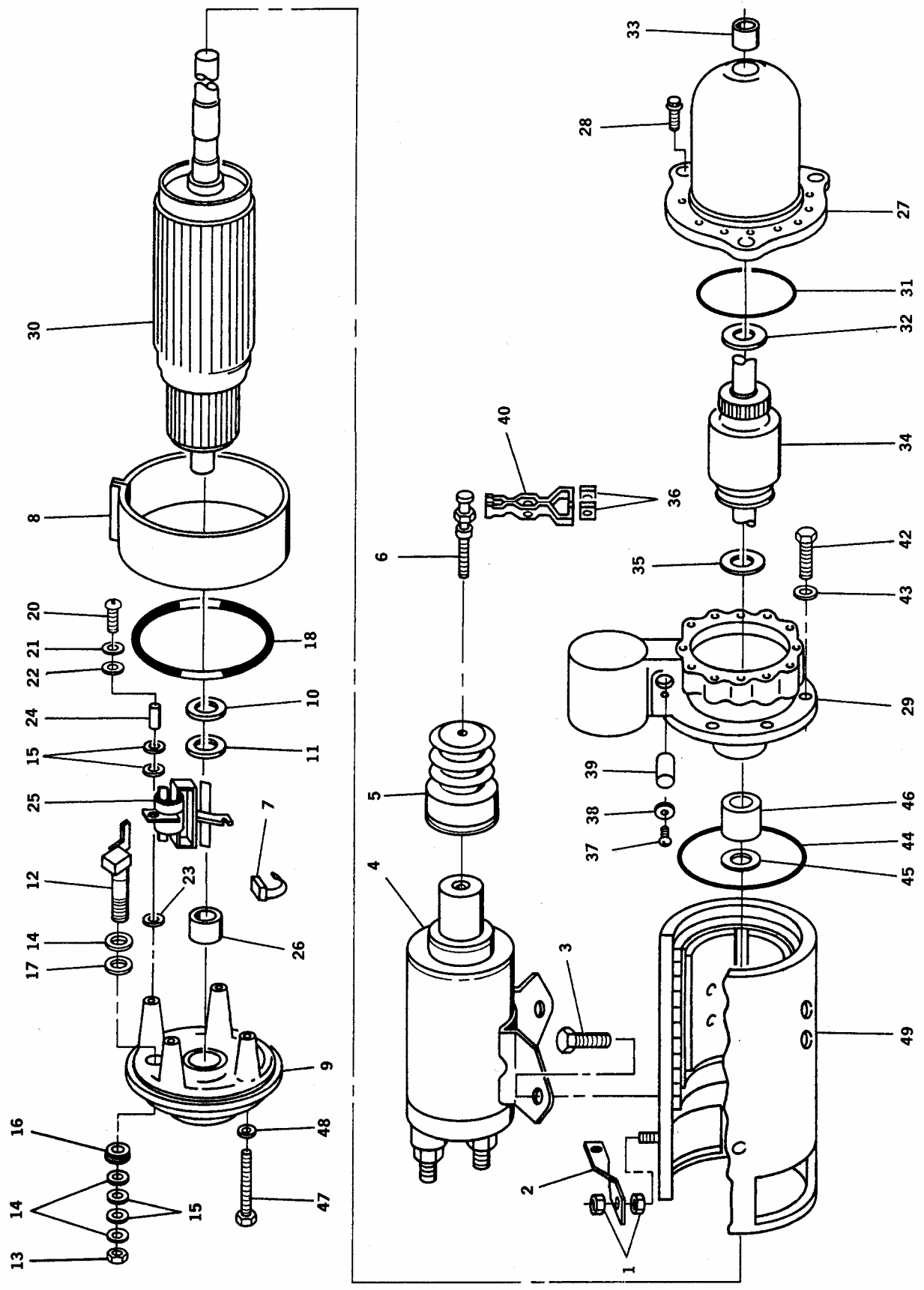
- c. Install new packing (44) on shift housing (29).
- d. Slide shift housing (29) on armature shaft (30) so that shaft sticks out one inch on shift lever side of housing (29).
- e. Install fiber washer (35) on armature (30). Washer (35) should be against shift housing (29).
- f. Apply small amount of bearing grease to holes in shift lever cams (36) and to long sides of cams. Install cams (36) on shift lever (40).
- g. Insert a finger in shift housing (29) and pull top of the shift lever (40) to swivel cams out of housing (29).
- h. Adjust the angle of cams (36) so both point in same direction. Slide engine drive (34) on cams (36) so cams are riding in engine drive (34) channel. Slide engine drive (34) on armature (30) shaft and push shift housing (29) and engine drive (34) toward field ring (49) so that armature (30) shaft passes through drive assembly (34).

11. ASSEMBLE SHIFT HOUSING (29) AND FIELD RING (49).

- a. Press shift housing (29) against field ring (49). Insure that housing and field ring are aligned according to the marks made at disassembly.
- b. Apply 1-2 drops of Loctite #2114 to threads of five socket head capscrews (42).
- c. Install capscrews (42) and washers (43). Torque capscrews (42) to 108-132 in-lbs (12-15 Nm).

12. INSTALL ENGINE DRIVE HOUSING (27).

- a. If removed, install bushing (33) in engine drive housing (27) using a suitable driver.
- b. Install new packing (31) on engine drive housing (27).
- c. Slide bearing washer (32) on armature (30) shaft and place it against engine drive (34).



- d. Press engine drive housing (27) on armature (30) shaft and match alignment markings made at disassembly.
- e. Apply 1-2 drops of Loctite #2114 to threads of six socket head screws (28) and fasten engine drive housing to shift housing. Torque socket head screws to 13-17 ft-lbs (17-23 Nm).
- f. Install rubber plugs in six engine drive housing holes not used.

13. INSTALL BRUSHES (7).

- a. Pass two screws through a lockplate and slide a brush terminal on each of two screws.
- b. Fasten brushes (7) to brush holder contact plate.
- c. Pull inside brush holder spring up and insert brush (7) in slot. Repeat this step to install outer brush.
- d. Install remaining brushes.

NOTE

Before installing band (8) insure that dirt, oil, or any other foreign matter is removed from the brush opening areas to insure proper sealing.

- e. Wrap access band (8) around four brush openings according to paint outline. Secure band with two screws and nuts.

14. INSTALL SOLENOID SWITCH (4).

- a. Slide closed end of boot (5) on link spool (6) up to hex shoulder.
- b. Wrap a strip of emery cloth around plunger of switch (4) twice to avoid nicks.
- c. Grip plunger with channel lock pliers and turn link spool (6) into switch (4) plunger. Torque link spool (6) to 27-33 in-lbs. (3-4 Nm).

- d. Install boot (5) into channel on switch (4).
- e. Turn solenoid switch (4) such that two mounting legs face away from field ring (49) and insert link spool (6) in shift housing (29).
- f. Hook link spool (6) in fork of shift lever (40).
- g. Turn solenoid switch (4) so that mounting legs rest on field ring and press switch flush in shift housing.
- h. Apply 1-2 drops of Loctite #2114 to threads of two hex head screws (3) and secure solenoid switch (4) to field ring (49).

NOTE

Use an open wrench to support the bottom nut while tightening the top nut.

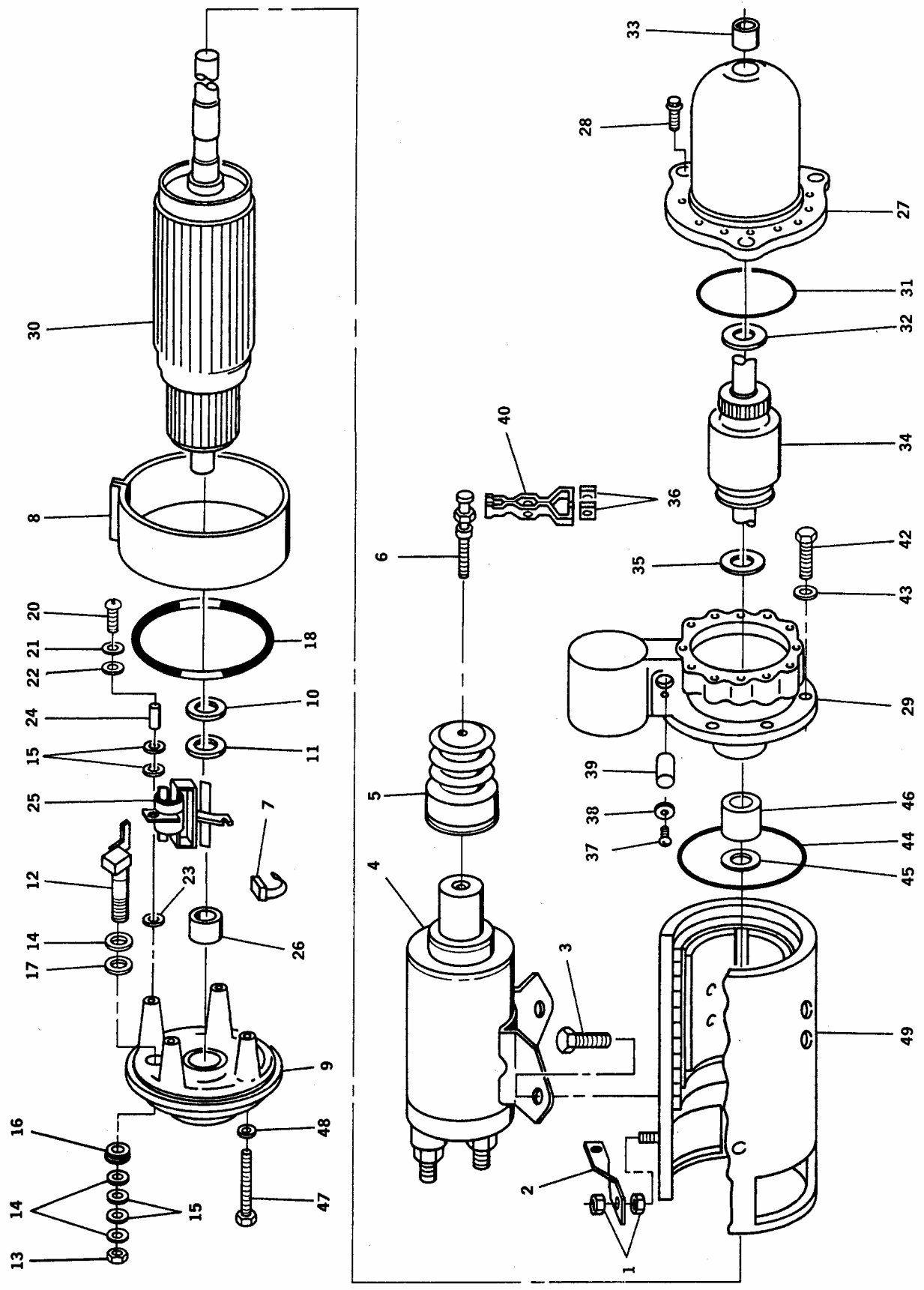
- i. Apply two drops of Loctite #2114 to the last 1/4" of switch (4), #3 terminal and field coil stud on field ring (49).
- j. Secure jumper strap (2) with nuts (1). Torque #3 terminal nut to 33-37 ft. lbs. (44-49 Nm) and field coil nut to 18-22 ft. lbs (24-29 Nm).
- k. Install ground wire to switch (4) terminal #4 and to ground stud on housing (9). Torque terminal #4 connection to 43-47 in lbs (5-6 Nm).

NOTE

Ground stud connection is made finger-tight only.

- l. Install rubber plug in plastic end base access hole.

END OF TASK



CHAPTER 7
TRANSMISSION MAINTENANCE

CHAPTER INDEX

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Section I. TORQUE CONVERTER MAINTENANCE

TORQUE CONVERTER INSTALLATION

TOOLS: General mechanic's tool kit: automotive (5180-00-177-7033)
Lifting device (275 lbs. capacity)

SUPPLIES: Loctite #242 (Item 6, Appendix B)
Loctite #545 (Item 18, Appendix B)
Screw, self-locking (Item 231, Appendix B)

EQUIPMENT CONDITIONS: Outriggers fully extended and lowered.
(Refer to TM 5-3810-306-10.)
Boom positioned over side. (Refer to TM 5-3810-306-10.)
Battery disconnect switch in off position. (RT875CCS)
Negative battery cable disconnected at shunt. (RT875CC)
(Refer to TM 5-3810-306-20.)
Engine top hood and rear decking removed.
(Refer to TM 5-3810-306-20.)
Transmission oil drained. (Refer to LO 5-3810-306-12.)
Propeller shaft to torque converter removed.
(Refer to TM 5-3810-306-20).

REMOVAL:

1. TAG AND DISCONNECT ELECTRICAL WIRES FROM TORQUE CONVERTER (1).
2. TAG AND REMOVE HYDRAULIC LINES FROM TWO HYDRAULIC PUMPS (7) AND (8) AND CONVERTER CHARGING PUMP (11). PLUG OR CAP OPENINGS.

NOTE

Tie lines up to prevent leakage.

3. REMOVE TORQUE CONVERTER (1).

NOTE

Torque converter weighs approximately 267.50 pounds (121.34 kg) dry.

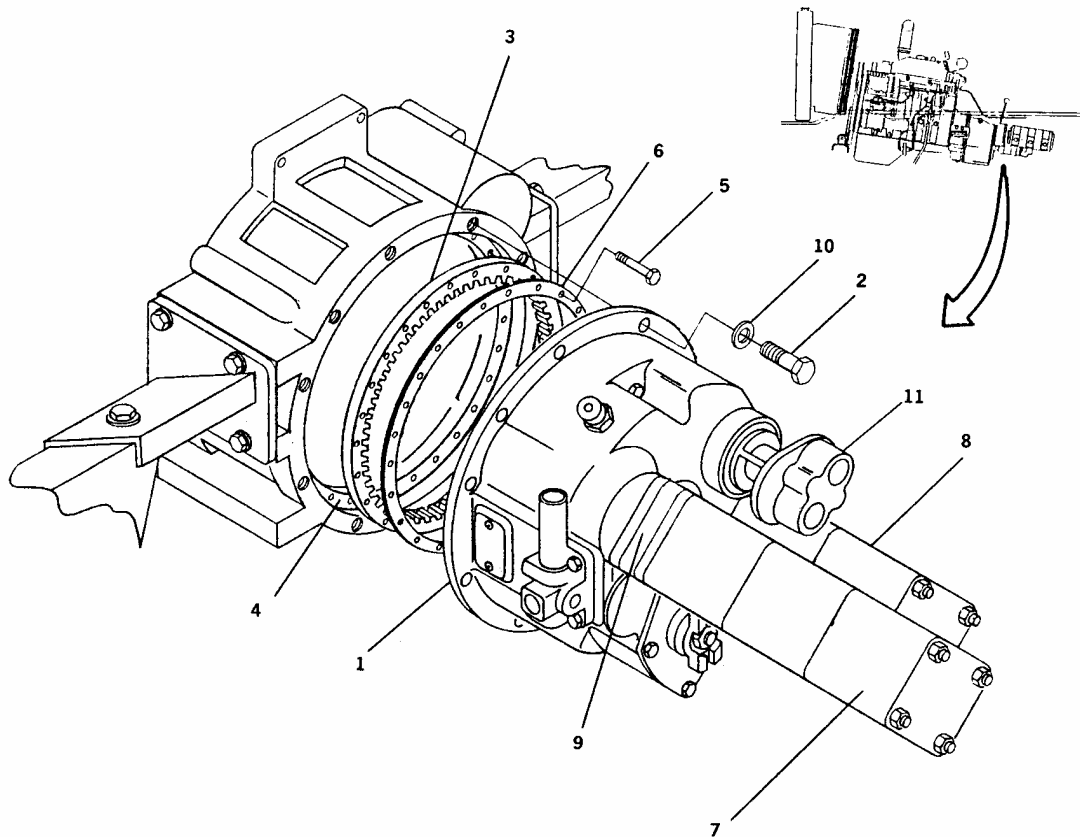
- a. Attach an adequate lifting strap around torque converter and take up any slack.
- b. Remove twelve bolts (2) and washers (10) securing torque converter housing to engine flywheel housing.

- c. Remove torque converter from crane and move it to a clean work area.
4. REMOVE RING GEAR (3) FROM FLYWHEEL (4) IF NECESSARY.
 - a. Remove thirty two bolts (5) securing ring gear (3) to flywheel (4). Discard bolts (5).
 - b. Remove ring gear (3) and back-up ring (6).
5. REMOVE TWO HYDRAULIC PUMPS (7) AND (8) AND PUMP DISCONNECT (9), IF NECESSARY. (REFER TO CHAPTER 13.)
6. IF NEW TORQUE CONVERTER IS TO BE INSTALLED, REMOVE ALL COMPONENTS AND INSTALL THEM ON NEW TORQUE CONVERTER IN SAME LOCATION.

INSTALLATION

NOTE

The torque converter weighs approximately 267.50 pounds (121.34 kg) dry.



1. IF NEW CONVERTER IS TO BE INSTALLED, ENSURE ALL COMPONENTS FROM OLD ONE ARE INSTALLED ON NEW ONE.
2. INSTALL PUMP DISCONNECT (9), IF REMOVED, AND BOTH HYDRAULIC PUMPS (7) AND (8). (REFER TO CHAPTER 13.)
3. IF REMOVED, INSTALL RING GEAR (3) ON FLYWHEEL (4).
 - a. Remove all burrs from flywheel mounting face and pilot bores. Clean torque converter ring gear flywheel mounting surface and ring gear screw tapped holes with solvent. Dry thoroughly, being certain ring gear screw holes are dry and clean.
 - b. Install torque converter ring gear (3) as shown.

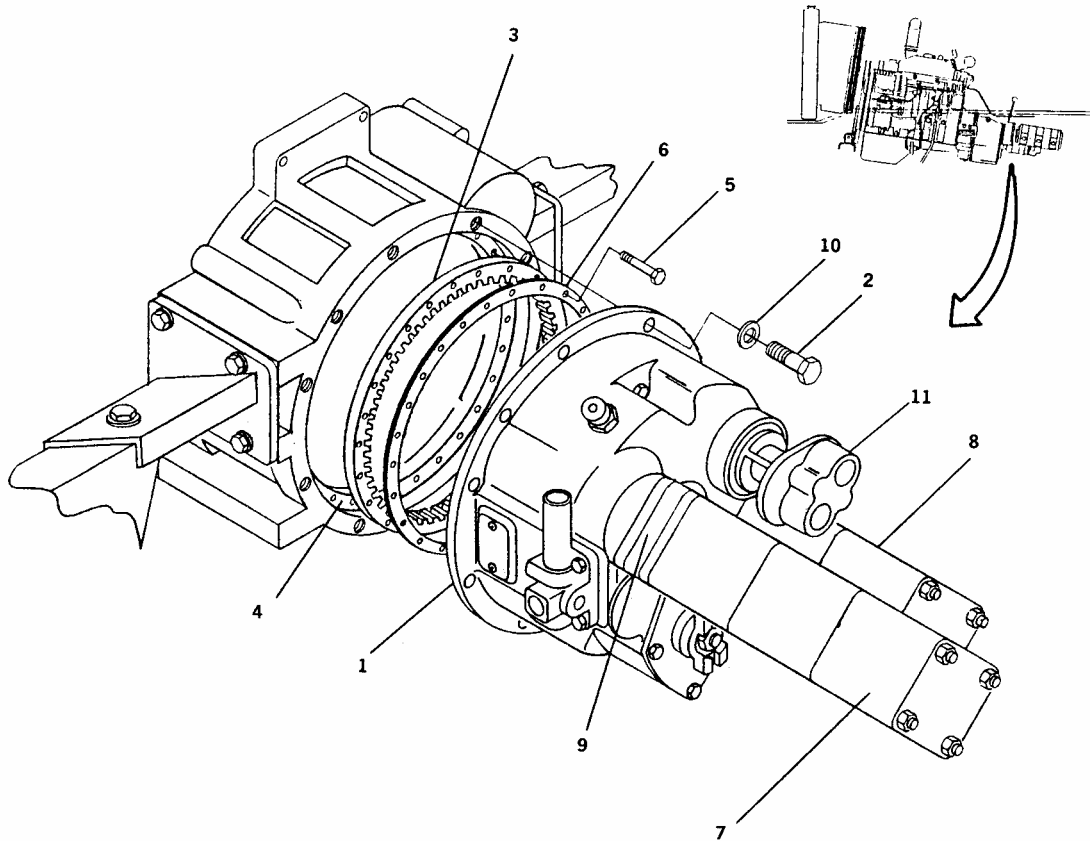
NOTE

Assembly of ring gear must be completed within a fifteen minute period from start of screw installation.

- c. Install backing ring (6) and thirty-two special screws (5). Tighten screws to 23-25 ft-lbs (30- 33 Nm). The special screws are to be used for ONE installation only. If screws are removed for any reason, they **MUST BE REPLACED**. Remove epoxy left in flywheel hole with the proper tap and clean with solvent. Dry hole thoroughly and use a **NEW** screw for reinstallation.
4. USING AN ADEQUATE LIFTING STRAP AROUND TORQUE CONVERTER. LIFT AND MOUNT TORQUE CONVERTER TO FLYWHEEL HOUSING. SECURE WITH TWELVE BOLTS (2) AND WASHERS (10).

NOTE

Apply Loctite #242 to mounting bolts (5).



- a. Measure and record engine crankshaft end play at flywheel.
 - b. Assemble torque converter to engine flywheel by sliding converter into position by hand before fastening housing attachment screws. This may require more than one trial to match drive gear teeth. Pulling converter into position with housing attachment bolts is not recommended.
 - c. Install twelve bolts (2) and washers (10) securing torque converter to flywheel housing.
 - d. Measure engine crankshaft end play after assembly of torque converter. This value must be within one thousandth (.001) of an inch of end play recorded (Step a) before assembly of torque converter.
5. CONNECT TAGGED ELECTRICAL WIRES TO TORQUE CONVERTER.
 6. REMOVE CAPS AND PLUGS AND INSTALL HYDRAULIC LINES TO TWO HYDRAULIC PUMPS (7) AND (8) AND CONVERTER CHARGING PUMP (11).
 7. INSTALL PROPELLER SHAFT. (REFER TO TM 5-3810-306-20.)
 8. INSTALL REAR DECKING AND HOOD. (REFER TO TM 5-3810-306-20.)
 9. CONNECT NEGATIVE BATTERY CABLE AT SHUNT. (REFER TO TM 5-3810-306-20.) (RT875CC)
 10. SERVICE THE TRANSMISSION HYDRAULIC SYSTEM. (REFER TO PAGE 7-54.)
 11. SERVICE CRANE HYDRAULIC SYSTEM. (REFER TO LO 5-3810-306-12.)
 12. TEST FOR PROPER OPERATION AND INSPECT FOR LEAKS.
- END OF TASK**

TORQUE CONVERTER ASSEMBLY

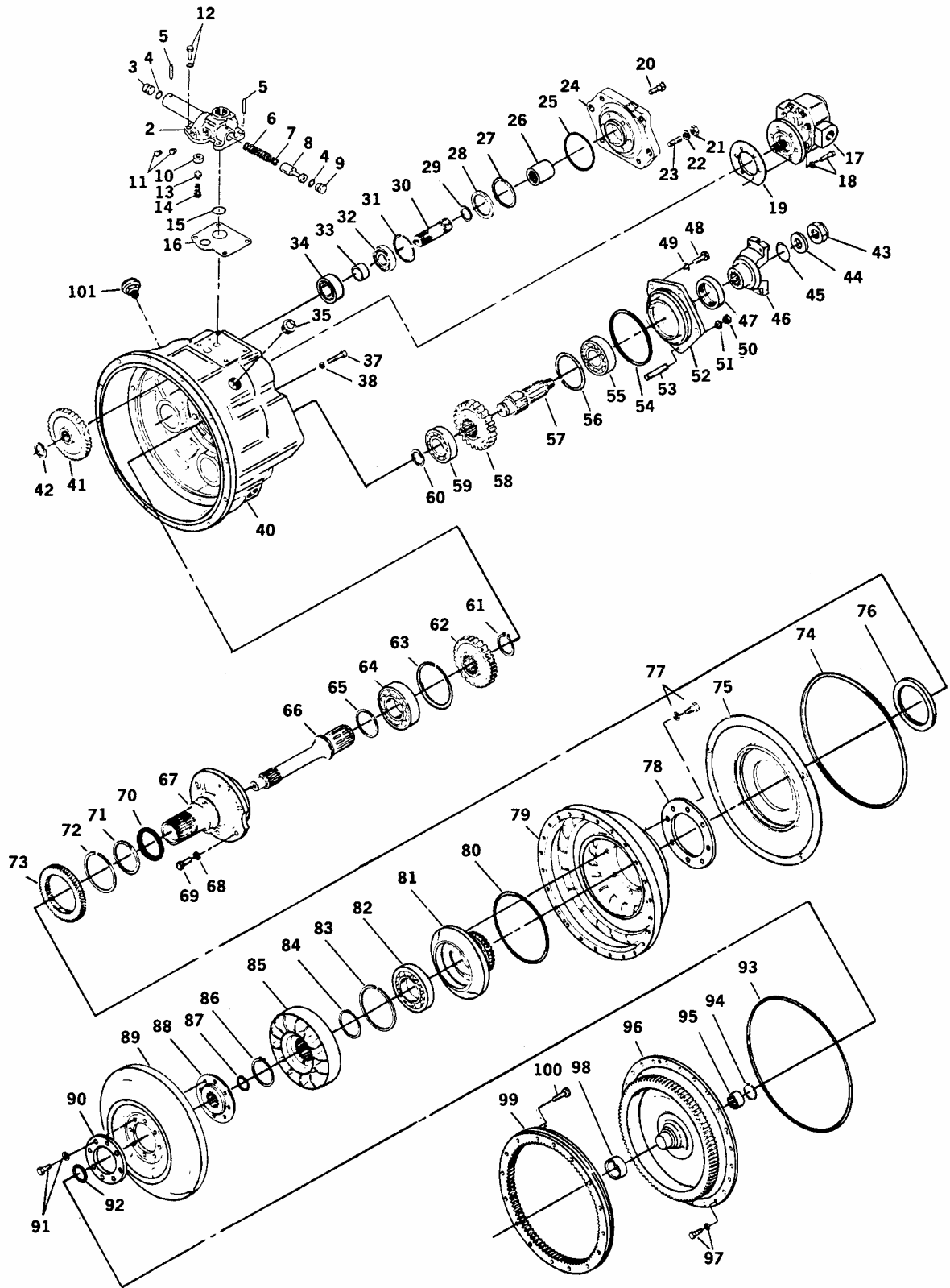
TOOLS: General mechanic's tool kit: automotive (5180-00-177-7033)
 Lubrication Service, Unit Trailer Mtd (4930-00-107-9167)
 Shop Equipment Contact Maintenance Truck Mtd (4930-00-294-9518)
 Shop Equipment Electrical Repair Semi-trailer Mtd (4940-01-150-3113)
 Shop Equipment Machine Shop, FM Heavy Less Power (3470-00-754-0738)
 Shop Equipment Machine Shop; FM Heavy Suppl No. 1 (3470-00-754-0739)
 Shop Equipment Machine Shop; FM Basic (3470-00-754-0708)
 Shop Equipment Auto-Maintenance and Repair, FM Basic (4910-00-754-0705)
 Shop Equipment Auto-Maintenance and Repair, FM Suppl No. 1 (4910-00-754-0706)
 Shop Equipment Auto-Maintenance and Repair, FM Suppl No. 2 (4910-00-754-0707)
 Tool Outfit Hyd System; Test and Repair, 3/4 Ton Trailer Mtd. (4940-01-036-5784)

SUPPLIES: Oil MIL-L-2104 SAE 10 (Item 94, Appendix B)
 Solvent, P-D-680 Type III (Item 1, Appendix B)
 Permatex No. 2 (Item 31, Appendix B)
 Preformed packing (Item 166, Appendix B) (2 Required)
 Safety valve seat (Item 167, Appendix B)
 Preformed packing (Item 168, Appendix B)
 Gasket (Item 169, Appendix B)
 Gasket (Item 170, Appendix B)
 Lockwasher (Item 171, Appendix B) (4 Required)
 Preformed packing (Item 172, Appendix B)
 Retaining ring (Item 173, Appendix B)
 Retaining ring (Item 174, Appendix B)
 Retaining ring (Item 175, Appendix B)
 Retaining ring (Item 176, Appendix B)
 Preformed packing (Item 177, Appendix B)
 Lockwasher (Item 25, Appendix B) (5 Required)
 Preformed packing (Item 178, Appendix B)
 Retaining ring (Item 153, Appendix B)
 Retaining ring (Item 122, Appendix B)
 Retaining ring (Item 179, Appendix B)
 Lockwasher (Item 180, Appendix B) (6 Required)
 Retaining ring (Item 181, Appendix B)
 Preformed packing (Item 182, Appendix B)
 Plain encased seal (Item 183, Appendix B)
 Preformed packing (Item 184, Appendix B)
 Retaining ring (Item 185, Appendix B)
 Retaining ring (Item 186, Appendix B)
 Retaining ring (Item 187, Appendix B) (2 Required)
 Preformed packing (Item 188, Appendix B)
 Retaining ring (Item 189, Appendix B)

EQUIPMENT CONDITION: Torque converter removed. (Refer to page 7-2)

DISASSEMBLY:

1. REMOVE PUMP (17).
 - a. Remove capscrews (18) and pump (17).
 - b. Remove and discard gasket (19).
2. REMOVE IMPELLER COVER (96).
 - a. Remove twenty-four capscrews (97).
 - b. Locate slots in impeller (79) and using two pry bars, remove impeller cover (96).
 - c. If necessary, use puller to remove sleeve (98).
 - d. Using snap ring pliers, remove retaining ring (94).
 - e. Using small inside bearing puller, remove bearing (95).
3. REMOVE TURBINE (89).
 - a. Remove retaining ring (92).
 - b. Remove turbine (89) with hub (88).
 - c. If necessary, remove capscrews (91), spacer (90) and separate hub (88) and turbine (89).
4. REMOVE REACTION MEMBER (85).
 - a. Remove retaining ring (86).
 - b. Remove retaining ring (87).
 - c. Remove reaction member (85).
 - d. Remove spacer (84).
5. REMOVE OIL BAFFLE (75).
 - a. Remove three screws (37) and lockwashers (38) part way.
 - b. Lightly tap each screw to unseat oil baffle (75).
 - c. Remove screws (37) and lockwashers (38). Discard lockwashers (38).
 - d. Remove oil baffle (75) with impeller (79) from housing (40).
 - e. Separate oil baffle (75) from impeller (79).
 - f. Remove retaining ring (72) and gear (73) from hub (81).
 - g. Remove and discard seal (76) and packing (74) from oil baffle (75).
6. REMOVE HUB (81).
 - a. Remove twelve bolts (77) and spacer plate (78).
 - b. Separate impeller (79) and hub (81).
 - c. Remove and discard preformed packing (80).
7. REMOVE BEARING (82).
 - a. Remove retaining ring (83).
 - b. Press bearing (82) from hub (81).
8. REMOVE THREE SPUR GEARS (41).
 - a. Remove retaining rings (42).
 - b. Remove spur gears (41).
9. REMOVE STATOR SUPPORT (67).
 - a. Remove six capscrews (69) and lockwashers (68). Discard lock-washers (68).
 - b. Remove stator support (67).
10. REMOVE SPUR GEAR (62).
 - a. Remove retaining ring (61).
 - b. Remove spur gear (62).
11. REMOVE SHAFT (66).
 - a. Remove retaining ring (63).
 - b. Press shaft (66) from stator support (67).
 - c. Remove bearing (64).
 - d. Remove and discard ring seal (65) and piston rings (70) and (71).
12. REMOVE RETAINER (52).
 - a. Remove three machine bolts (48) and lockwashers (49).
 - b. Remove two nuts (50) and lockwashers (51).
 - c. Remove retainer (52) and preformed packing (54). Discard packing (54).
 - d. Remove seal (47).



13. REMOVE YOKE (46).

- a. Secure shaft (57) in vise with protected jaws.
- b. Remove nut (43), washer (44) and preformed packing (45). Discard packing (45).
- c. Remove yoke (46).

14. REMOVE SHAFT (57).

- a. Expand special ring (56) and remove shaft (57) with bearings (55) and (59).
- b. Remove retaining ring (60), bearing (59), spur gear (58) and bearing (55).

NOTE

Special ring (56) remains in housing (52).

15. REMOVE RETAINING PLATE (24).

- a. Remove six screws (20), nut (21) and lockwasher (22).
- b. Remove retaining plate (24) and packing (25). Discard packing (25).

16. REMOVE THREE COUPLINGS (26).

NOTE

Remove couplings (26) if not removed with pump.

17. REMOVE THREE GEARSHAFTS (30).

- a. Remove retaining rings (27) and spacer rings (28).

NOTE

Mark location of longer gearshaft for reassembly.

- b. Remove gearshafts (30).
- c. Remove retaining rings (29) and (31).
- d. Press bearings (32) and (34) and spacers (33) from gearshafts (30).

18. REMOVE VALVE (2).

NOTE

Use care to avoid losing seat (10), plunger (13) and spring (14) when removing valve (2).

- a. Remove four capscrews with washers (12) and valve (2).
- b. Remove and discard preformed packing (15) and gasket (16).
- c. Depress stop (9) and remove pin (5).
- d. Remove piston (8) and springs (6) and (7).
- e. Remove opposite side pin (5) and stop (3).
- f. Remove and discard two preformed packings (4).

19. IF NECESSARY, REMOVE VACUUM VALVE (101).

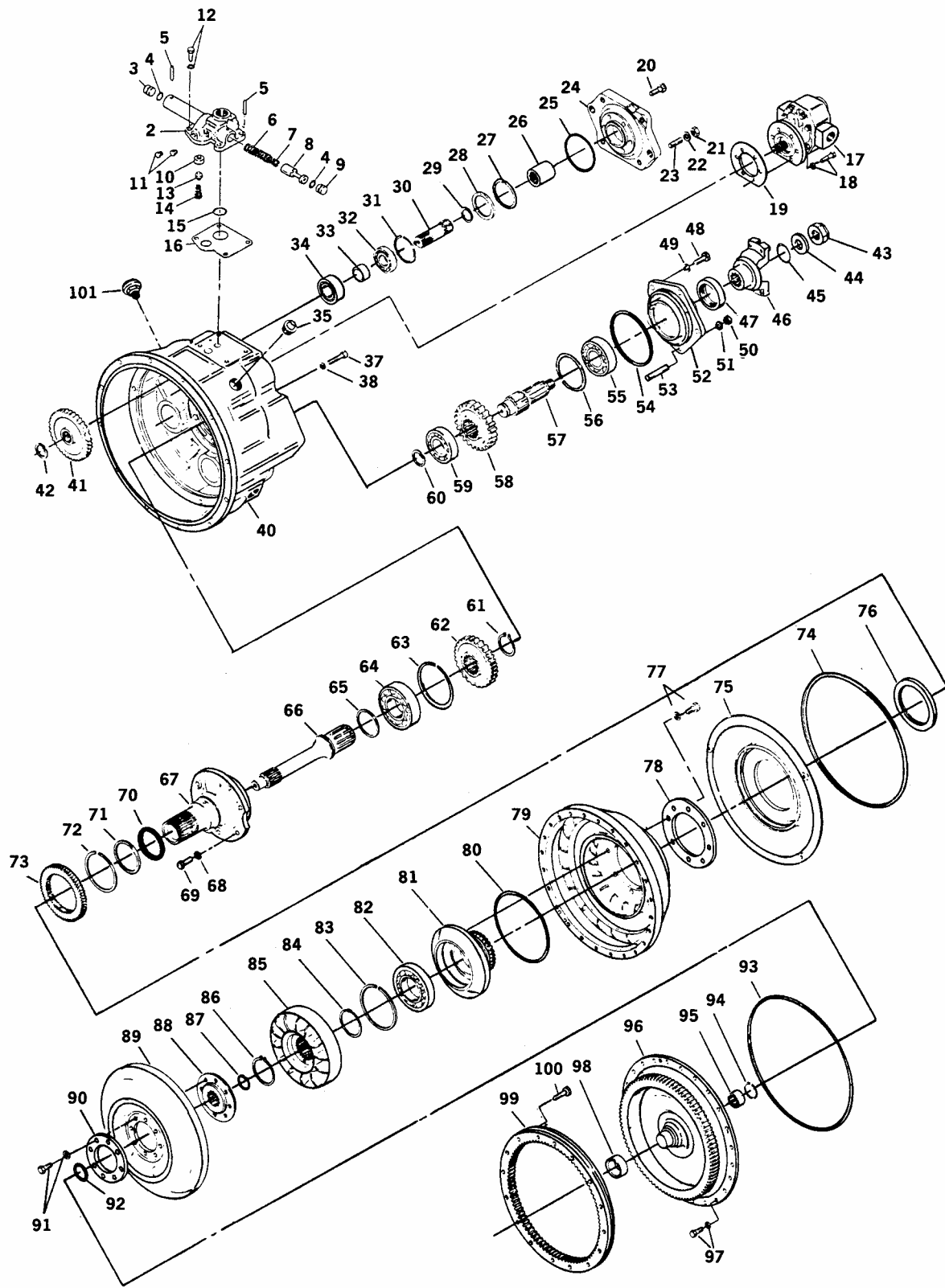
CLEANING:

WARNING

Dry cleaning solvent P-D-680, Type III is toxic and flammable. Wear protective goggles and gloves and use only in a well ventilated area. Avoid contact with skin, eyes, and clothes and do not breathe vapors. Do not use near open flame or excessive heat. The flash point is 200°F (94°C). If you become dizzy while using cleaning solvent, get fresh air immediately and get medical aid. If contact with eyes is made, wash your eyes with water and get medical aid immediately. Compressed air used for cleaning purposes will not exceed 30 psi. Use only with effective chip guarding and personal protective equipment (goggles/ shield, gloves, etc.).

1. CLEAN ALL PARTS THOROUGHLY.

- a. Immerse all parts in dry cleaning fluid P-D-680 Type III.



- b. Agitate parts up and down to remove all old lubricant and foreign material.
2. CLEAN BEARINGS.
- a. Remove bearings from dry cleaning fluid.
 - b. Gently strike bearings against a block of wood to remove solid lubricant particles.
 - c. Immerse bearings in dry cleaning fluid.
 - d. Repeat steps a. thru c. until bearings are clean.
 - e. Dry bearings using dry compressed air.

CAUTION

Do not direct air stream across bearing surfaces causing bearings to spin. Otherwise bearing damage could result.

- f. Rotate bearings slowly by hand to aid in drying.
3. CLEAN HOUSINGS.

WARNING

Care should be exercised to avoid skin rashes and the inhalation of vapors when using alkali cleaners.

- a. Clean interior and exterior housings, bearing caps, etc.
- b. Cast parts (without polished or ground surfaces) can be cleaned in hot solution tank with mild alkali solution.
- c. Ensure parts are thoroughly cleaned and heated.
- d. Rinse parts thoroughly with clean water to remove all traces of alkali.
- e. Thoroughly dry all parts with dry, compressed air and dry, lint-free cloths.

INSPECTION:

1. BEARINGS.
- a. Inspect rollers, cages and cups for wear, nicks and chips.

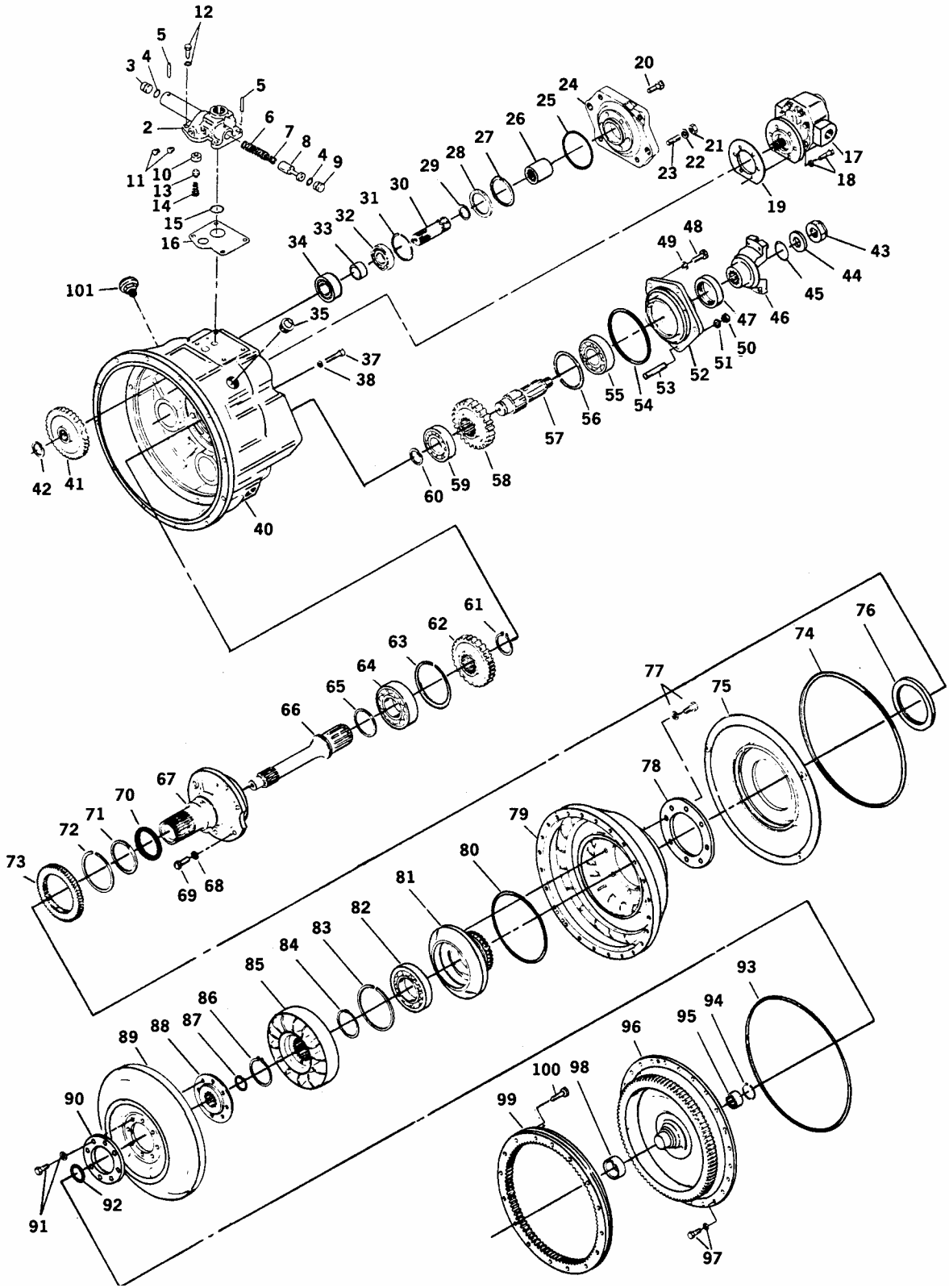
NOTE

Replace bearing cones and cups in matched sets.

- b. Dip bearings in oil MIL-L-2104 SAE 10 and wrap each in clean lint-free cloth.
2. GEARS AND SHAFTS.
- a. Using Magna-flux process, check all gears and shafts for cracks and damage.
 - b. Examine teeth on all gears for wear, pitting, chipping, nicks, cracks or scores.
 - c. Replace gears if case hardening is worn through.
 - d. Remove small nicks with suitable hone.
 - e. Inspect shafts and quills to ensure that they are not sprung, bent or twisted.
3. HOUSINGS AND COVERS.
- a. Inspect housings, covers and bearing caps for damage.
 - b. Inspect mating surfaces for nicks or burrs.

ASSEMBLY:

1. PREPARE SEALS AND PACKINGS.
- a. Coat all preformed packings with oil MIL-L-2104 SAE 10.
 - b. Coat all seals with oil MIL-L-2104 SAE 10.
 - c. Apply thin coat of Permatex No. 2 on outside diameter of oil seal (47).

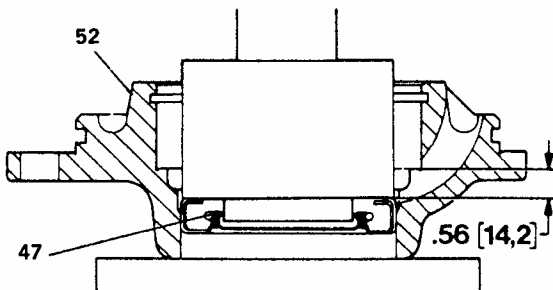


2. ASSEMBLE VALVE (2).
 - a. Install springs (6) and (7) and piston (8) in housing (2).
 - b. Install new preformed packings (4) in valve stops (3) and (9).
 - c. Install new preformed packing (15) in housing (2).
 - d. Install valve stop (9) and pin (5).
 - e. Install valve stop (3).
 - f. Depress valve stop (3) and install pin (5).
3. INSTALL THREE GEARSHAFTS (30).

NOTE

Install longer shaft in location noted during disassembly.

- a. Install retaining rings (29) toward rear of gearshafts (30).
 - b. Press bearings (32) with retaining rings (31) on gearshafts (30).
 - c. Install spacers (33) and press bearings (34) on gearshafts (30) until they shoulder against spacers (33).
 - d. Install gearshafts (30) in housing (40).
 - e. Tap gearshafts (30) until retaining rings (29) shoulder against bearing bore.
 - f. Install spacer ring (28) and retaining ring (27).
4. INSTALL SHAFT (57).
 - a. Press oil seal (47) into retainer (52). Press seal from inside of retainer to dimension shown.



- b. Press bearing (55) on shaft (57) and special ring (56).

CAUTION

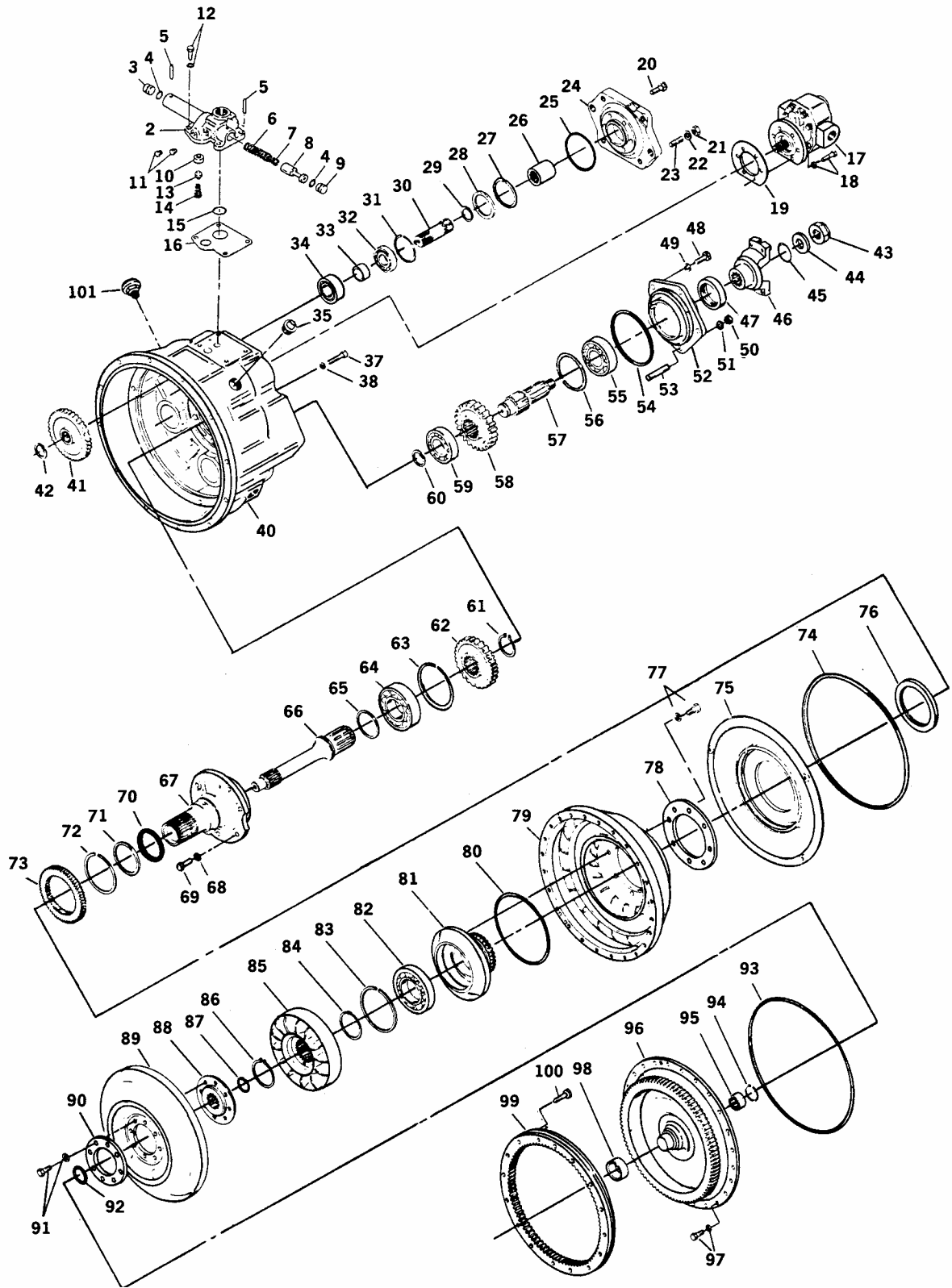
Use care to avoid damage to oil seal (47).

- c. Press shaft (57) into retainer (52).
 - d. Install spur gear (58) on shaft (57).
 - e. Press bearing (59) on shaft (57) and install retaining ring (60).
5. INSTALL RETAINER (52).
 - a. Secure shaft (57) in vise equipped with soft jaws.
 - b. Install yoke (46), new preformed packing (45), washer (44) and nut (43).
 - c. Torque nut (43) to 200-250 ft-lbs (271-338 Nm).
 - d. Install new preformed packing (54) in retainer (52).
 - e. Install retainer assembly (52) in converter housing (40).
 - f. Install three machine bolts (48) with new lockwashers (49).
 - g. Install two nuts (50) with new lockwashers (51).
 - h. Torque machine bolts (48) and nuts (50) to 37- 41 ft-lbs. (49-55 Nm).
 6. INSTALL SHAFT (66).
 - a. Press bearing (64) on shaft (66).

CAUTION

Use care to avoid damage to seal ring (65).

- b. Install new seal ring (65).
- c. Press shaft (66) into stator support (67).
- d. Install retaining ring (63).



7. INSTALL SPUR GEAR (62).
 - a. Install spur gear (62) on shaft (66) with large shoulder toward bearing.
 - b. Install retaining ring (61).
8. INSTALL STATOR SUPPORT (67).

CAUTION

Spring gap on piston rings (70) and (71) should be 180° from piston ring hook joint.

- a. Install piston rings (70) and (71) on stator support (67).
 - b. Install stator support (67) in housing (40).
 - c. Install six capscrews (69) with lockwashers (68).
 - d. Torque capscrews to 57-63 ft-lbs. (76-84 Nm).
9. INSTALL THREE SPUR GEARS (41).
 - a. Install spur gears (41) with P/N facing away from inner housing (40).
 - b. Install retaining rings (42).
 10. ASSEMBLE OIL BAFFLE (75) AND IMPELLER (79).
 - a. Press seal (76) in oil baffle (75) with lip of seal away from impeller (79).
 - b. Press bearing (82) in hub (81).
 - c. Install retaining ring (83).
 - d. Install new preformed packing (80) on hub (81).
 - e. Apply Loctite to twelve bolts (77). Position hub (81) in impeller (79), position spacer plate (78) and secure with twelve bolts (77). Torque bolts (77) to 40 in-lbs. (4 Nm).
 - f. Install oil baffle (75) on impeller (79).
 - g. Install gear (73) and retaining ring (72).
 - h. Set impeller (79) and oil baffle (75) in housing (40), aligning three bolt holes in baffle with holes in housing.

- i. Start three bolts (37) with new lockwashers (38) thru housing (40) into oil baffle (75).

NOTE

Do not tighten bolts (37).

- j. Rotate long gear shaft (30) to align gears (41) and (73).
- k. Tighten bolts (37) in alternate pattern using care to evenly seat oil baffle (75). Torque bolts (37) to 23-25 ft-lbs. (30-33 Nm).

11. INSTALL REACTION MEMBER (85).

- a. Install spacer (84).
- b. Install reaction member (85) on impeller (79).
- c. Install retaining ring (86).
- d. Install retaining ring (87).

12. INSTALL TURBINE (89).

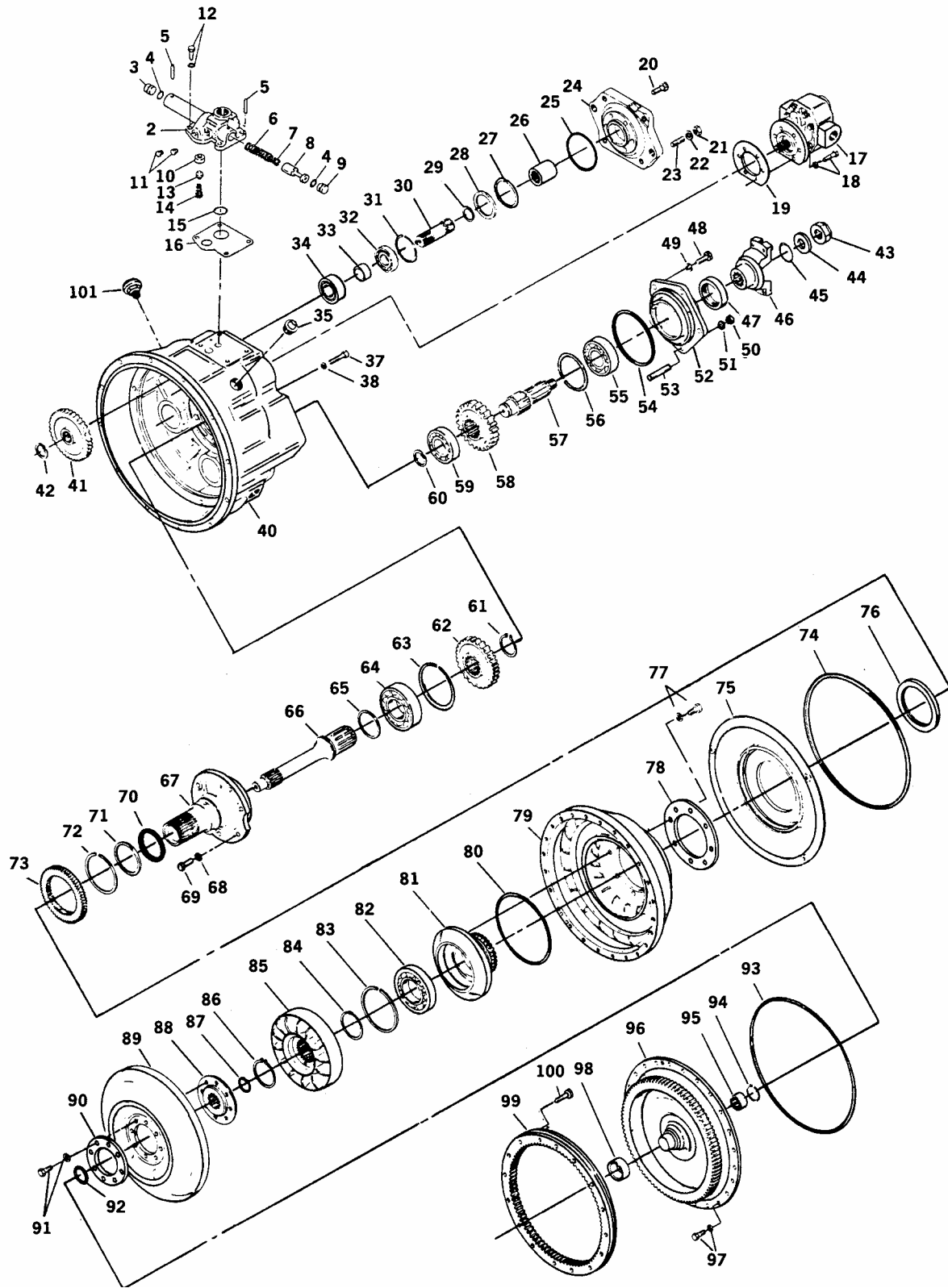
- a. Apply Loctite to capscrews (91). Assemble turbine (89) and hub (88). Position spacer plate (90) and secure with capscrews (91). Torque capscrews (91) to 40 in-lbs. (4 Nm). Lock wire capscrews (91) in pairs.
- b. Install turbine (89) with hub (88).
- c. Install retaining ring (92).

13. ASSEMBLE IMPELLER COVER (96).

- a. Press bearing (95) into impeller cover (96).
- b. Install retaining ring (94).
- c. Heat sleeve (98) to 200°F (93°C) and press on impeller cover (96).

14. INSTALL IMPELLER COVER (96).

- a. Install new preformed packing (93) on impeller cover (96).
- b. Align holes in impeller cover (96) with holes in impeller (79).
- c. Install impeller cover (96).



- d. Install twenty-four capscrews and lockwashers (97). Torque capscrews (97) to 23-25 ft-lbs (30-33 Nm).

15. INSTALL VALVE (2).

- a. Install spring (14), plunger (13) and seat (10).
- b. Install new gasket (16), packing (15) and valve (2).
- c. Secure valve (2) with capscrews (12). Torque capscrews (12) to 23-25 ft-lbs (30-33 Nm).

16. INSTALL COUPLING (26).

17. INSTALL RETAINING PLATE (24).

- a. Install new preformed packing (25) on retaining plate (24).

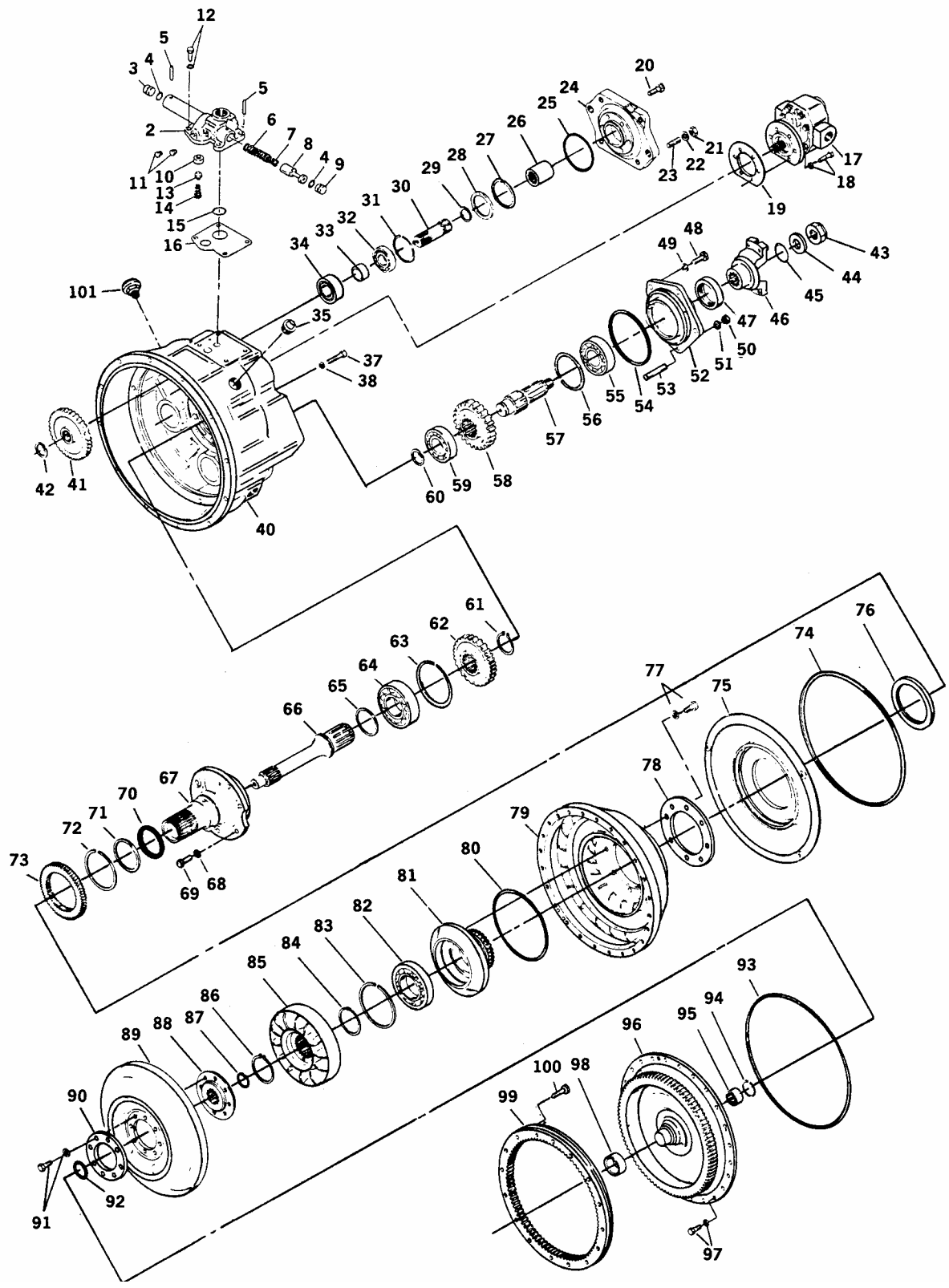
- b. Install retaining plate (24) on housing (40) and secure with six capscrews (20), nut (21) and lockwashers (22). Torque capscrews (20) to 23-25 ft-lbs (30-33 Nm) and nut (21) to 37-41 ft-lbs (50-55 Nm).

18. INSTALL PUMP (17).

- a. Install pump (17) and new gasket (19).
- b. Install capscrews (18). Torque capscrews (18) to 23-25 ft-lbs (30-33 Nm).

19. IF REMOVED, INSTALL VACUUM VALVE (101).

END OF TASK



Section II. TRANSMISSION MAINTENANCE

TRANSMISSION AND RANGE SHIFTER ASSEMBLY INSTALLATION

TOOLS: General mechanic's tool kit: automotive (5180-00-177-7033)
Transmission Jack (800 lbs. capacity)

SUPPLIES:
Hydraulic oil (Item 8, Appendix B)
Cotter pin (Item 105, Appendix B) (2 Required)
Preformed packing (Item 106, Appendix B) (4 Required)
Preformed packing (Item 107, Appendix B)
Preformed packing (Item 189, Appendix B) (3 Required)

EQUIPMENT CONDITIONS: Negative battery cable disconnected at shunt. (RT875CC)
Battery disconnect switch in off position. (RT875CCS)
Propeller shafts with top universal removed.
(Refer to TM 5-3810-306-20.)
Transmission oil drained. (Refer to LO 5-3810-306-12).
Air system purged. (Refer to TM 5-3810-306-20.)

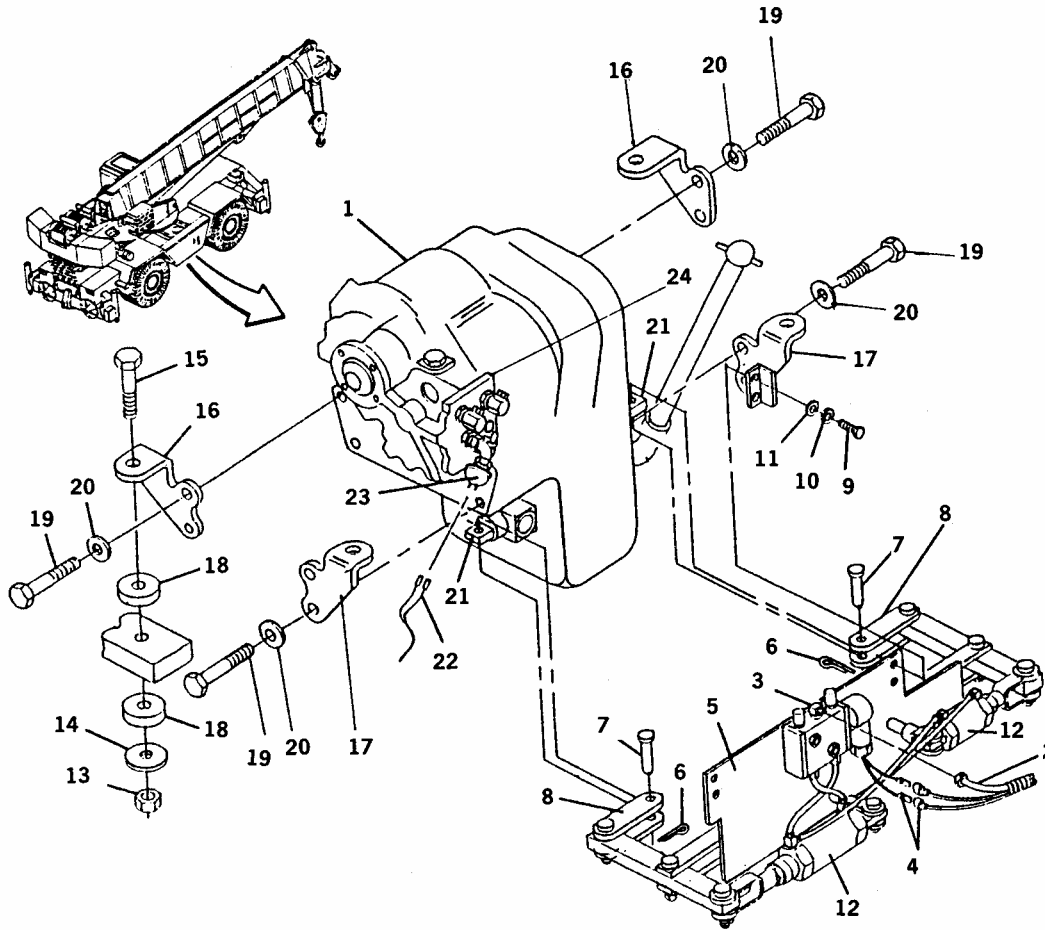
REMOVAL:

1. TAG AND DISCONNECT AIR LINE (2) FROM 4-WAY AIR VALVE (3).
2. TAG AND DISCONNECT TWO ELECTRICAL CONNECTORS (4).
3. TAG AND DISCONNECT ELECTRICAL CONNECTORS (22) FROM BACK-UP SWITCH (23).
4. DISCONNECT RANGE SHIFT ACTUATOR RODS (21).
 - a. Remove cotter pins (6) and clevis pin (7) securing linkage bars (8) to rear axle disconnect and range shift actuator rods (21) in transmission (1). Discard cotter pins (6).
 - b. Remove the four bolts (9), lockwashers (10) and washers (11) securing shifter assembly mounting plate (5). Remove mounting plate with air cylinders (12) and linkage (8) attached. Discard lockwashers (10).
5. TAG AND DISCONNECT ALL TRANSMISSION OIL LINES FROM TRANSMISSION (1).

NOTE

Tag and remove fittings, as necessary from adapter plate (24) to gain access to upper transmission lines.

6. REMOVE TRANSMISSION MOUNTS (16) AND (17) AND TRANSMISSION (1).
 - a. Remove four locknuts (13), washers (14), and bolts (15) that secure front and rear mounts (16) and (17) to frame attachments. Remove four lower bonded mounting centers (18).
 - b. Position a transmission jack or some other means of support, capable of supporting weight of transmission (780 pounds - 354 Kg), under transmission.
 - c. With weight of transmission on supporting device, remove eight bolts (19) and washers (20) securing front and rear mounts (16) and (17) to transmission (1).
 - d. Remove front and rear mounts (16) and (17) and upper bonded mounting centers (18) as required.



NOTE

It may be necessary to remove upper left elbow to lower transmission.

7. USING SUPPORTING DEVICE, LOWER AND REMOVE TRANSMISSION.

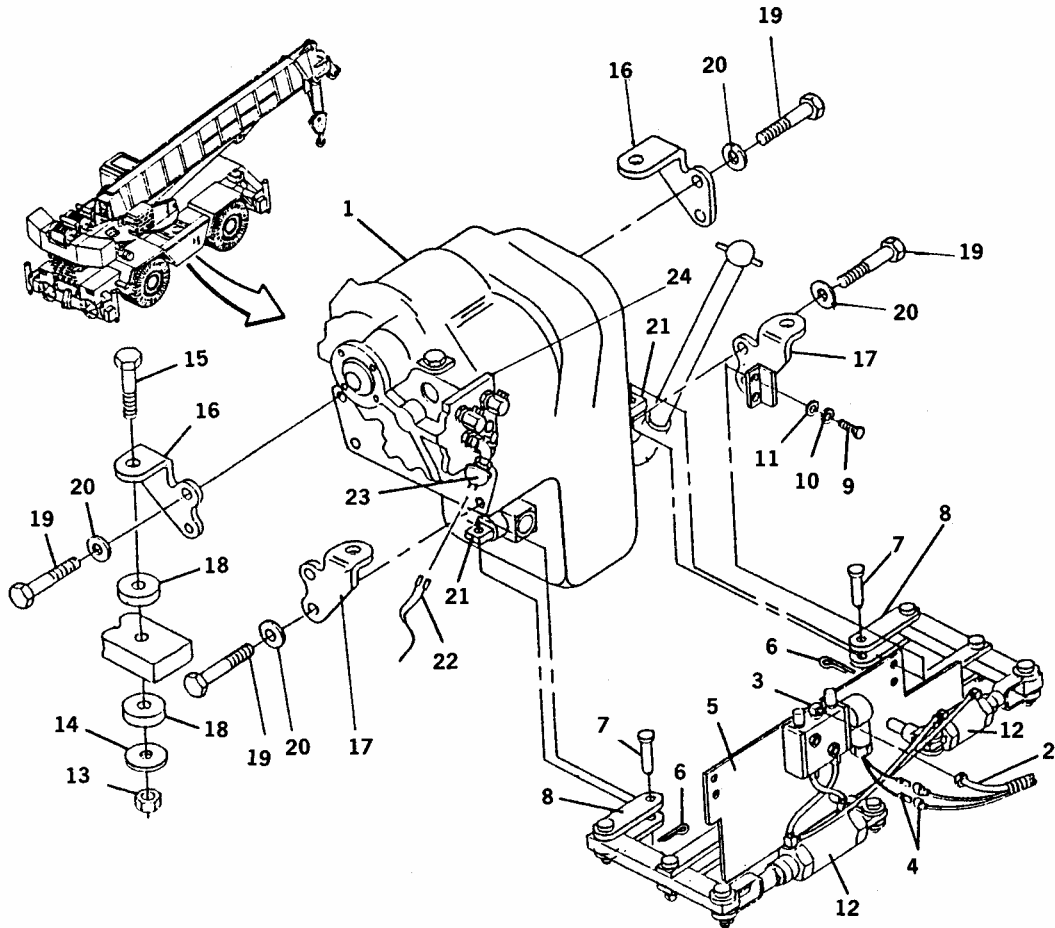
INSTALLATION:

1. IF A NEW TRANSMISSION IS TO BE INSTALLED, REMOVE ALL FITTINGS FROM OLD ONE AND INSTALL THEM IN SAME LOCATIONS ON NEW TRANSMISSION.

NOTE

Prior to connecting hydraulic lines, ensure that fitting threads are clean and free of contaminants. Do not remove any orange thread sealant if previously applied to the fitting(s). Then coat new preformed packings with clean hydraulic oil.

2. USING A TRANSMISSION JACK OR SUITABLE DEVICE CAPABLE OF SUPPORTING TRANSMISSION WEIGHT (780 POUNDS - 354 KG), POSITION TRANSMISSION (1) UNDER FRAME AND RAISE IT INTO POSITION.
3. INSTALL FRONT AND REAR TRANSMISSION MOUNTS
 - a. Secure front and rear mounts (16 and 17) to transmission using eight bolts (19) and washers (20). Torque bolts to 250 ft-lbs (333 Nm).
 - b. Place four upper bonded mounting centers (18) in place between mounts and frame brackets and install four bolts (15).
 - c. Lower supporting device until transmission is supported. Remove supporting device.



- d. Install four lower bonded mounting centers (18), washers (14) and locknuts (13). Torque bolts to 150 ft-lbs (200 Nm).
4. CONNECT ALL TRANSMISSION OIL LINES TO APPROPRIATE FITTINGS ON TRANSMISSION IN ACCORDANCE WITH IDENTIFICATION MARKS MADE DURING REMOVAL.
5. INSTALL SHIFTER ASSEMBLY MOUNTING PLATE (5).
 - a. Position shifter assembly mounting plate (5) with air cylinders and linkage attached on side of transmission mounts and secure with four bolts (9), new lockwashers (10), and washers (11).
 - b. Align linkage bars (8) with actuator rods (21) on transmission and secure with clevis pins (7) and new cotter pins (6).
6. INSTALL TAGGED ELECTRICAL CONNECTORS (4).
7. CONNECT TAGGED AIR LINE (2) TO 4-WAY AIR VALVE (3).
8. SERVICE TRANSMISSION OIL. (REFER TO PAGE 7-54.)
9. INSTALL PROPELLER SHAFTS. (REFER TO TM 5-3810-306-20.)
10. CONNECT NEGATIVE BATTERY CABLE AT SHUNT. (REFER TO TM 5-3810-306-20.) (RT875CC)

END OF TASK

TRANSMISSION ASSEMBLY

TOOLS: General mechanic's tool kit: automotive (5180-00-177-7033)
 Overhead hoist (1-ton capacity)
 Clutch spring tool (Item 9, Appendix C)
 Lubrication Service, Unit Trailer Mtd (4930-00-107-9167)
 Shop Equipment Contact Maintenance Truck Mtd (4930-00-294-9518)
 Shop Equipment General Purpose Repair, Semi-trailer Mtd (4930-01-006-3229)
 Shop Equipment Machine Shop; FM Heavy Less Power (3470-00-754-0738)
 Shop Equipment Machine Shop; FM Heavy Suppl No. 1 (3470-00-754-0739)
 Shop Equipment Machine Shop; FM Basic (3470-00-754-0708)
 Shop Equipment Auto-Maintenance and Repair, FM Basic (4910-00-754-0705)
 Shop Equipment Auto-Maintenance and Repair, FM Suppl No. 1 (4910-00-754-0706)
 Shop Equipment Auto-Maintenance and Repair, FM Suppl No. 2 (4910-00-754-0707)
 Tool Outfit Hyd System; Test and Repair, 3/4 Ton Trailer Mtd. (4940-01-036-5784)

SUPPLIES: Oil (MIL-L-2104; SAE10) (Item 94, Appendix B)
 Grease (MIL-L-10924) (Item 37, Appendix B)
 Solvent P-D-680 Type III (Item 1, Appendix B)
 Retaining ring (Item 119, Appendix B) (2 Required)
 Preformed packing (Item 120, Appendix B) (2 Required)
 Lockwasher (Item 121, Appendix B) (4 Required)
 Retaining ring (Item 122, Appendix B)
 Lockwasher (Item 25, Appendix B) (33 Required)
 Preformed packing (Item 123, Appendix B)
 Preformed packing (Item 124, Appendix B) (2 Required)
 Gasket (Item 125, Appendix B)
 Gasket (Item 126, Appendix B)
 Retaining ring (Item 127, Appendix B) (5 Required)
 Locating ring (Item 128, Appendix B)
 Retaining ring (Item 129, Appendix B)
 Gasket (Item 130, Appendix B)
 Lockwasher (Item 131, Appendix B) (12 Required)
 Inner ring bearing (Item 132, Appendix B) (2 Required)
 Preformed packing (Item 133, Appendix B)
 Preformed packing (Item 134, Appendix B)
 Preformed packing (Item 135, Appendix B)
 Retaining ring (Item 136, Appendix B) (2 Required)
 Preformed packing (Item 137, Appendix B) (2 Required)
 Nut (Item 138, Appendix B)
 Flat washer (Item 139, Appendix B)
 Self-locking nut (Item 140, Appendix B) (2 Required)
 Flat washer (Item 141, Appendix B) (2 Required)
 Preformed packing (Item 142, Appendix B) (2 Required)
 Piston ring (Item 143, Appendix B) (6 Required)
 Special ring (Item 144, Appendix B) (4 Required)
 Retaining ring (Item 145, Appendix B) (5 Required)
 Retaining ring (Item 146, Appendix B) (5 Required)
 Piston ring (Item 147, Appendix B) (5 Required)
 Preformed packing (Item 148, Appendix B) (5 Required)
 Retaining ring (Item 149, Appendix B) (4 Required)
 Retaining ring (Item 150, Appendix B) (6 Required)

- Retaining ring (Item 151, Appendix B) (2 Required)
- Retaining ring (Item 152, Appendix B)
- Special ring (Item 153, Appendix B)
- Retaining ring (Item 154, Appendix B)
- Gasket (Item 155, Appendix B)
- Retaining ring (Item 156, Appendix B)
- Retaining ring (Item 157, Appendix B)

EQUIPMENT CONDITIONS: Transmission removed. (Refer to page 7-18.)

DISASSEMBLY:

WARNING

Dry cleaning solvent P-D- 680, Type III is toxic and flammable. Wear protective goggles and gloves and use only in a well ventilated area. Avoid contact with skin, eyes, and clothes and don't breathe vapors. Do not use near open flame or excessive heat. The flash point is 200°F (94°C). If you become dizzy while using cleaning solvent, get fresh air immediately and get medical aid. If contact with eyes is made, wash your eyes with water and get medical aid immediately. Compressed air used for cleaning purposes will not exceed 30 psi. Use only with effective chip guarding and personal protective equipment goggles/ shield, gloves, etc.).

CAUTION

The entire transmission exterior should be cleaned prior to disassembly in order to reduce the amount of dirt and contaminants entering the interior.

1. CLEAN TRANSMISSION EXTERIOR SURFACES.
2. REMOVE TRANSMISSION COVER (5).
 - a. Remove nut (30), washer (31), preformed packing (32) and flange (33). Discard packing (32).
 - b. Remove pipe plug (28) and gasket (27). Discard gasket (27).

- c. Remove eighteen capscrews (22), (26) and (29) and lockwashers (23). Discard lockwashers (23).
- d. Support transmission cover (5) with overhead hoist.
- e. Using spreading-type snap ring pliers, hold special ring (34) open while prying transmission cover (5) free.

NOTE

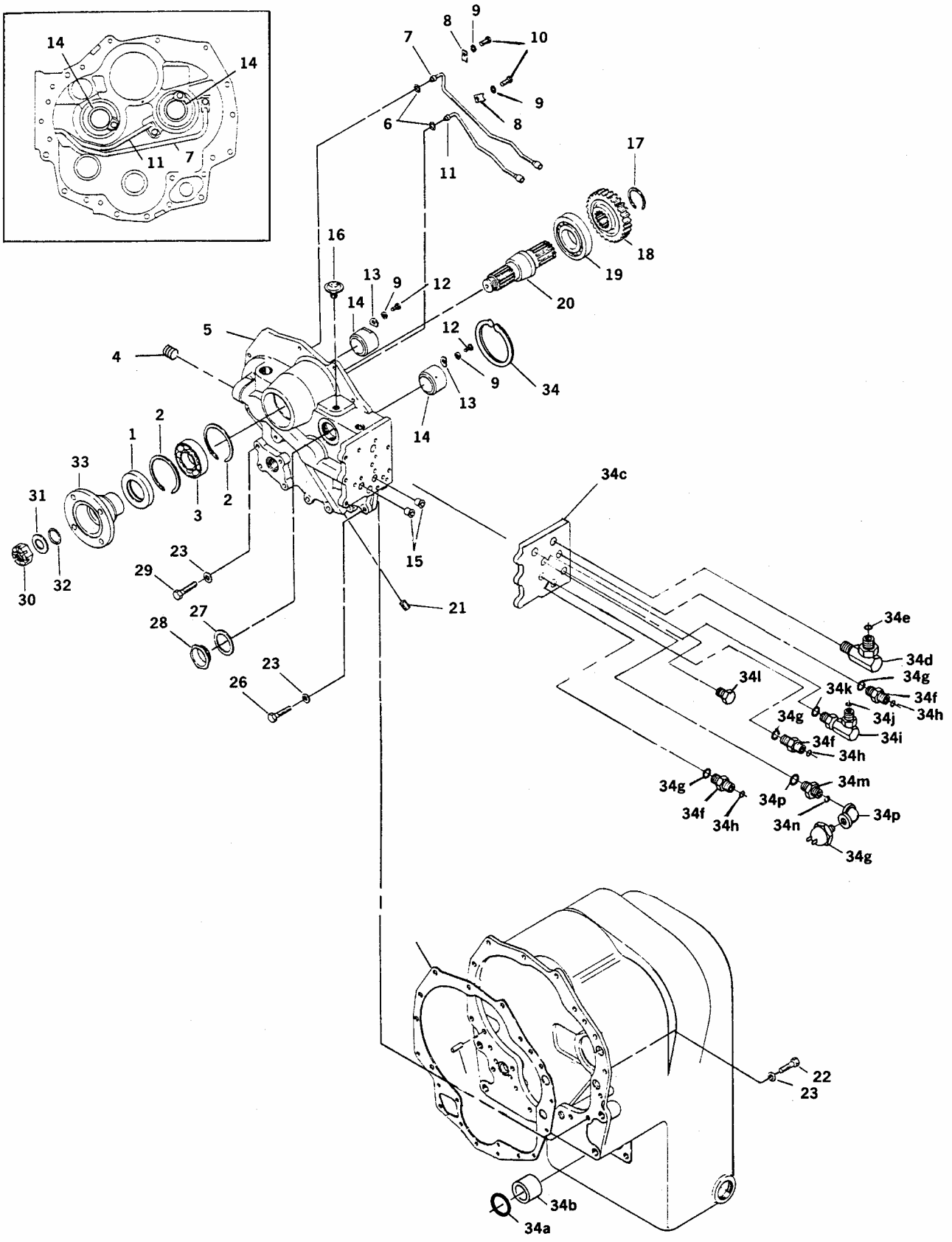
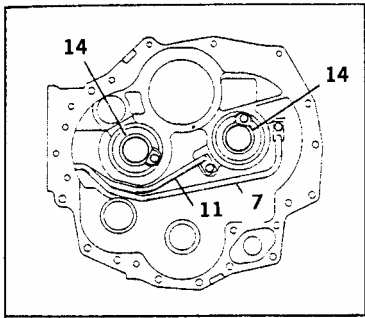
If forward and second clutch comes out with the transmission cover, spread ears on front bearing special ring (34) and separate clutch and cover.

- f. Remove sleeve (34a) and packing (34b). Discard packing (34b).
3. REMOVE GEARSHAFT (20).
 - a. Tap on threaded end of gearshaft (20) with soft mallet.
 - b. Remove gearshaft (20).
4. REMOVE BEARING (3).
 - a. Remove and discard seal (1).
 - b. Remove retaining rings (2) and bearing (3).
5. REMOVE ADAPTER PLATE (34C).

NOTE

Refer to TM 5-3810-306-24P for preformed packing part numbers.

- a. Remove fitting (34d) and preformed packing (34e). Discard packing (34e).



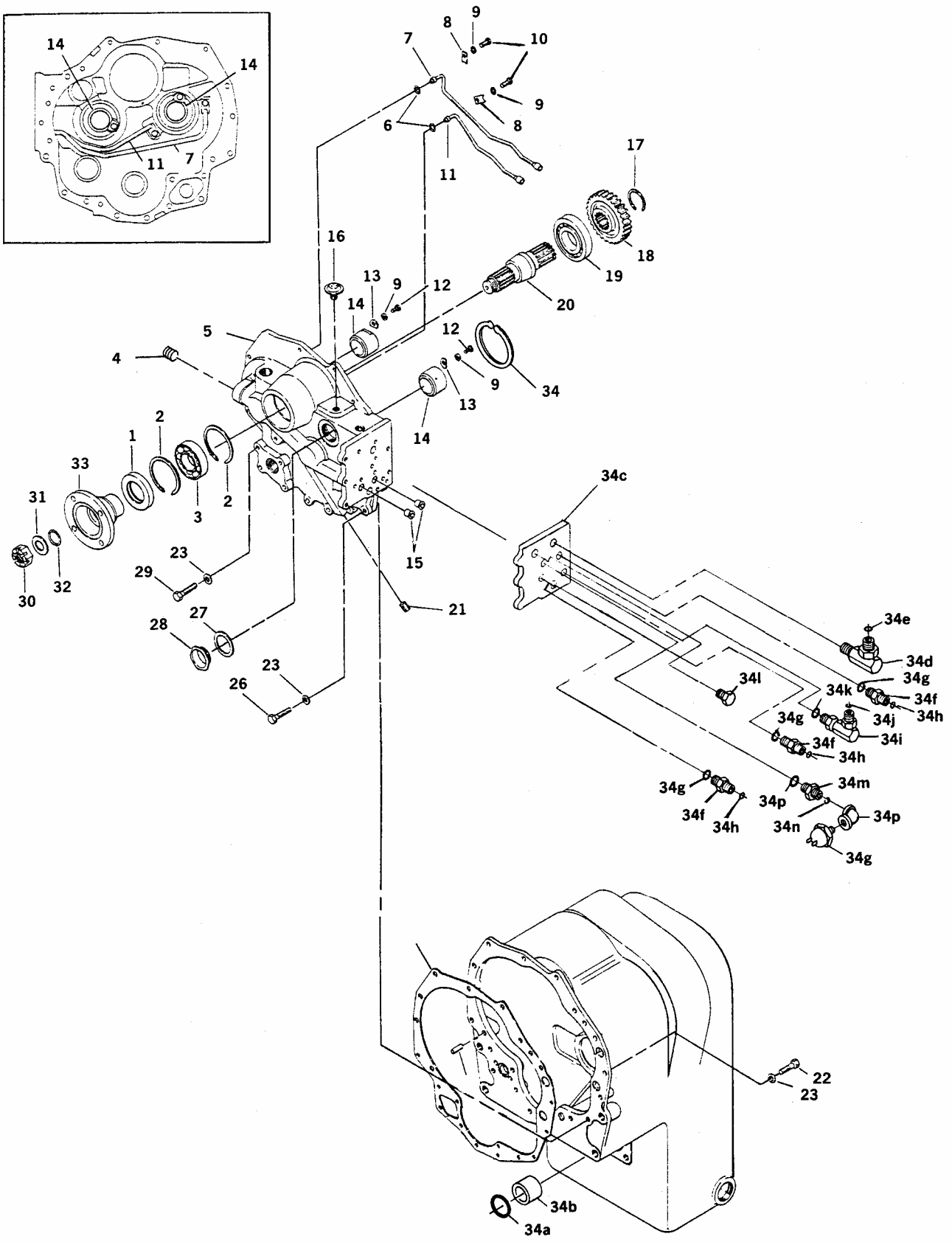
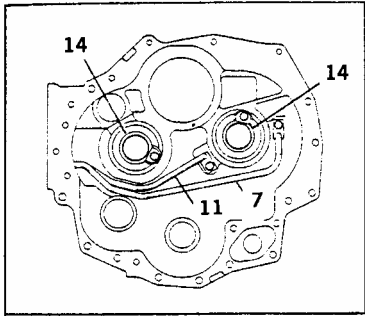
- b. Remove fittings (34f) and preformed packings (34g) and (34h). Discard packings (34g) and (34h).
 - c. Remove fitting (34i) and preformed packings (34j) and (34k). Discard packings (34j) and (34k).
 - d. Remove plug (34l).
 - e. Remove fitting (34m) and preformed packing (34p) with switch (34q) and elbow (34r). Discard packing (34p).
 - f. Remove adapter plate (34c) from cover (5).
 - g. If necessary, remove switch (34q), elbow (34r) and packing (34n) from fitting (34m). Discard packing (34n).
6. REMOVE TUBES (7) AND (11).

- a. Remove two bolts (10), lockwashers (9) and clips (8). Discard lockwashers (9).

CAUTION

Sleeves (15) must be removed while removing tubes (7) and (11) to prevent tubes from bending.

- b. Remove tubes (7) and (11), sleeves (15) and preformed packings (6). Discard preformed packings (6).
7. REMOVE BUSHINGS (14).
- a. Remove two bolts (12), lockwashers (9) and sleeves (13). Discard lockwashers (9).
 - b. Press bushings (14) out of transmission cover (5).



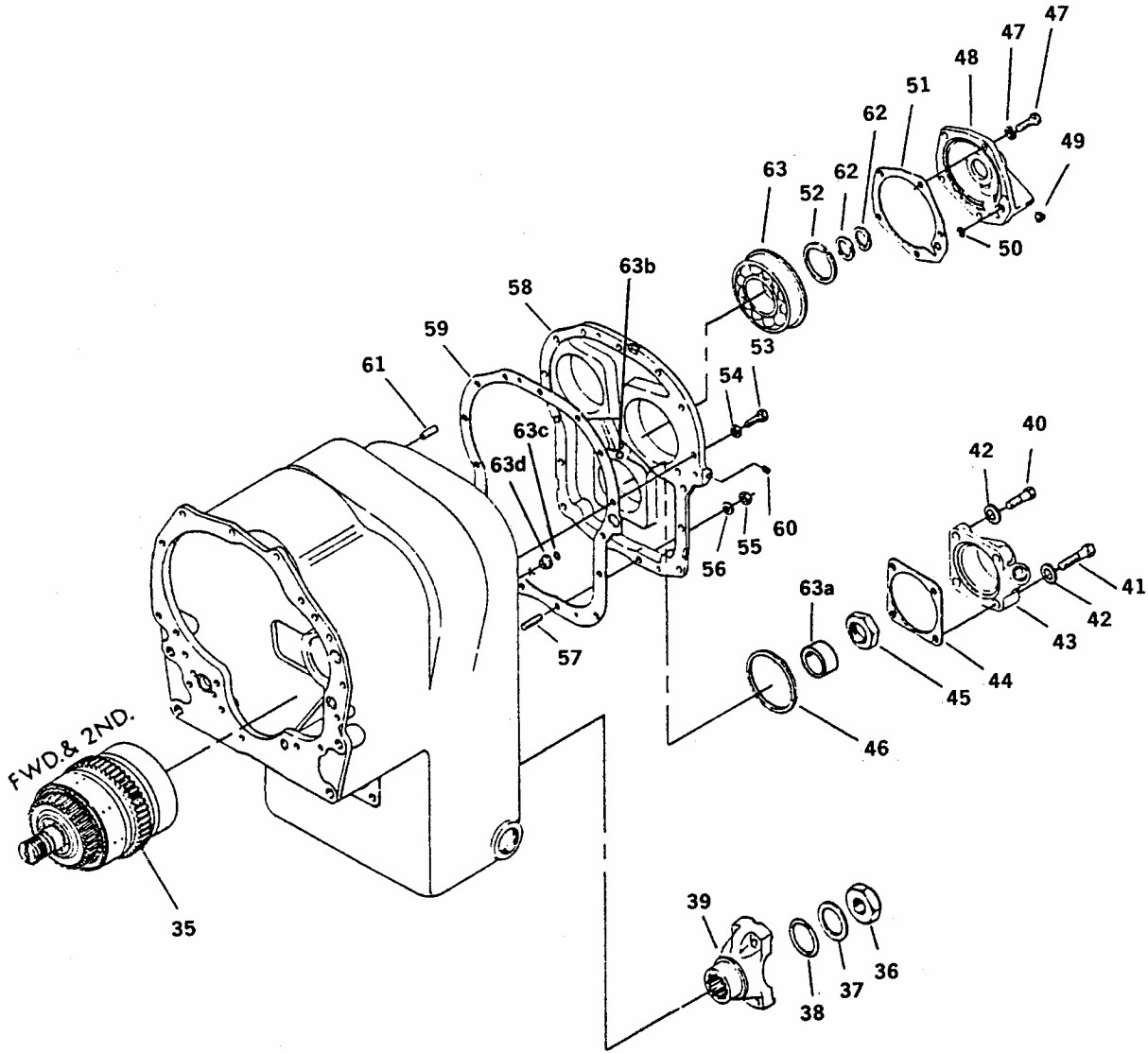
8. REMOVE FORWARD AND SECOND CLUTCH (35).
9. REMOVE FLANGE (39).
 - a. Remove nut (36), washer (37) and preformed packing (38). Discard packing (38).
 - b. Remove flange (39).
10. REMOVE BEARING HOUSING (43).
 - a. Remove four capscrews (40) and (41) and lockwashers (42). Discard lockwashers (42).
 - b. Remove bearing housing (43) and gasket (44). Discard gasket (44).
11. REMOVE NUT (45), SPACER (63A) AND RETAINING RING (46).
12. REMOVE GREASE CAP (48).
 - a. Remove five bolts and washers (47).
 - b. Remove grease cap (48) and gasket (51). Discard gasket (51).
13. REMOVE RETAINING RING (52).
14. REMOVE TRANSMISSION COVER (58).
 - a. Remove thirteen capscrews (53) and lockwashers (54). Discard lockwashers (54).

- b. Remove two nuts (55) and lockwashers (56). Discard lockwashers (56).
- c. Using pry slots provided, pry transmission cover (58) while tapping low clutch/idler shaft (71).

NOTE

Do not lose rear bearing lock ball (63b).

- d. Remove transmission cover (58) and gasket (59). Discard gasket (59).
 - e. Inspect studs (57) for damage. If damaged, remove stud(s).
 - f. Remove packing (63c) and sleeve (63d). Discard packing (63c).
15. REMOVE BEARING (63).
 - a. Remove piston rings (62).
 - b. Using bearing puller, remove bearing (63).

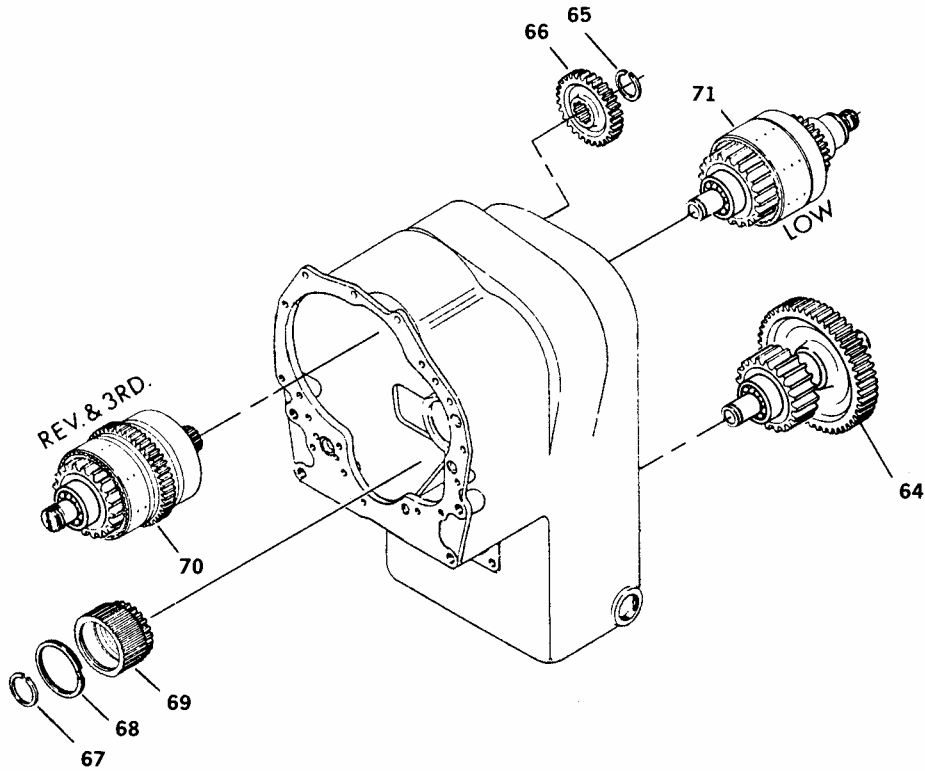


16. REMOVE SIX SPEED IDLER SHAFT AND GEAR (64).

17. REMOVE CLUTCH ASSEMBLIES (70) AND (71).

- a. Remove retaining ring (65).
- b. Remove spur gear (66).

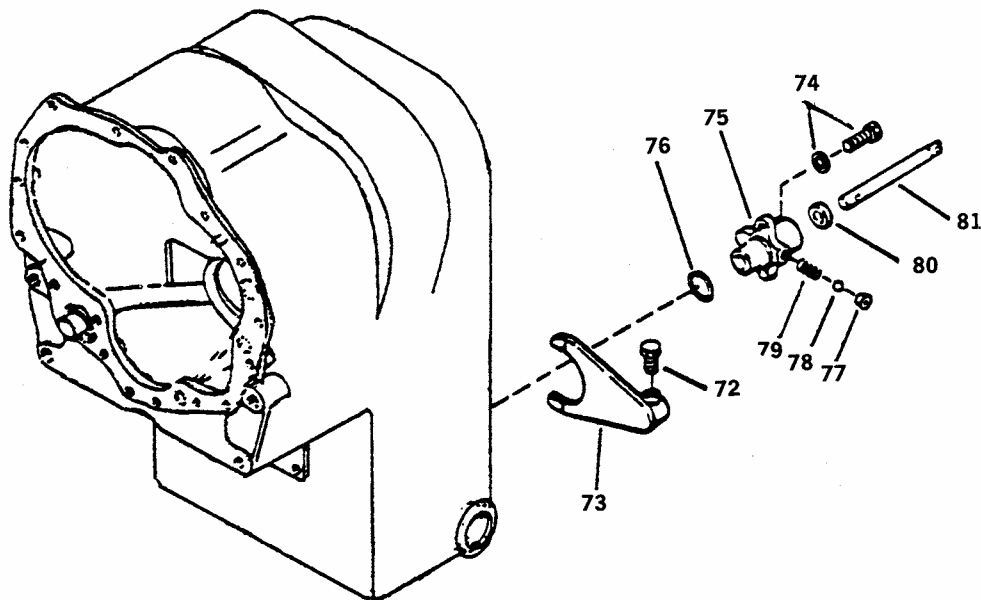
- c. Remove retaining ring (67).
- d. Remove retaining ring (68), if required.
- e. Remove second gear (69).
- f. Remove clutch (70).
- g. Remove clutch (71).



18. REMOVE SHIFT COUPLING (75).

- a. Cut lockwire on setscrew (72).
- b. Remove setscrew (72) and shifter fork (73).

- c. Remove two bolts (74), shift coupling (75) and preformed packing (76). Discard packing (76).
- d. If necessary, remove pipe plug (77), ball (78), spring (79), seal (80) and shaft (81).



19. REMOVE FLANGE (85).

- a. Remove nut (82), lockwasher (83) and preformed packing (84). Discard packing (84) and lockwasher (83).
- b. Remove flange (85).

20. REMOVE BEARING HOUSING (88).

- a. Remove four capscrews (86) and lockwashers (87). Discard lockwashers (87).
- b. Remove bearing housing (88).
- c. Remove cup (110) and preformed packings (89) and (90). Discard packings (89) and (90).
- d. If necessary, remove seal (91).

21. REMOVE REAR AXLE DISCONNECT HOUSING (94).

- a. Remove four capscrews (92) and lockwashers (93). Discard lockwashers (93).
- b. Remove housing (94) pulling it straight out.
- c. Remove shims (95). Note number and size of shims (95).
- d. Remove and discard preformed packing (96).

22. REMOVE OUTPUT SHAFT (114).

- a. Support gears (117) and (120).

- b. Using press, push straight shaft (114) from front through gears (117) and (120).
- c. Remove cup (120a), taper bearing (120b) and washer (120c).
- d. Using press, remove taper bearing (111) and washer (112).

23. REMOVE OUTPUT GEARS (117) AND (120).

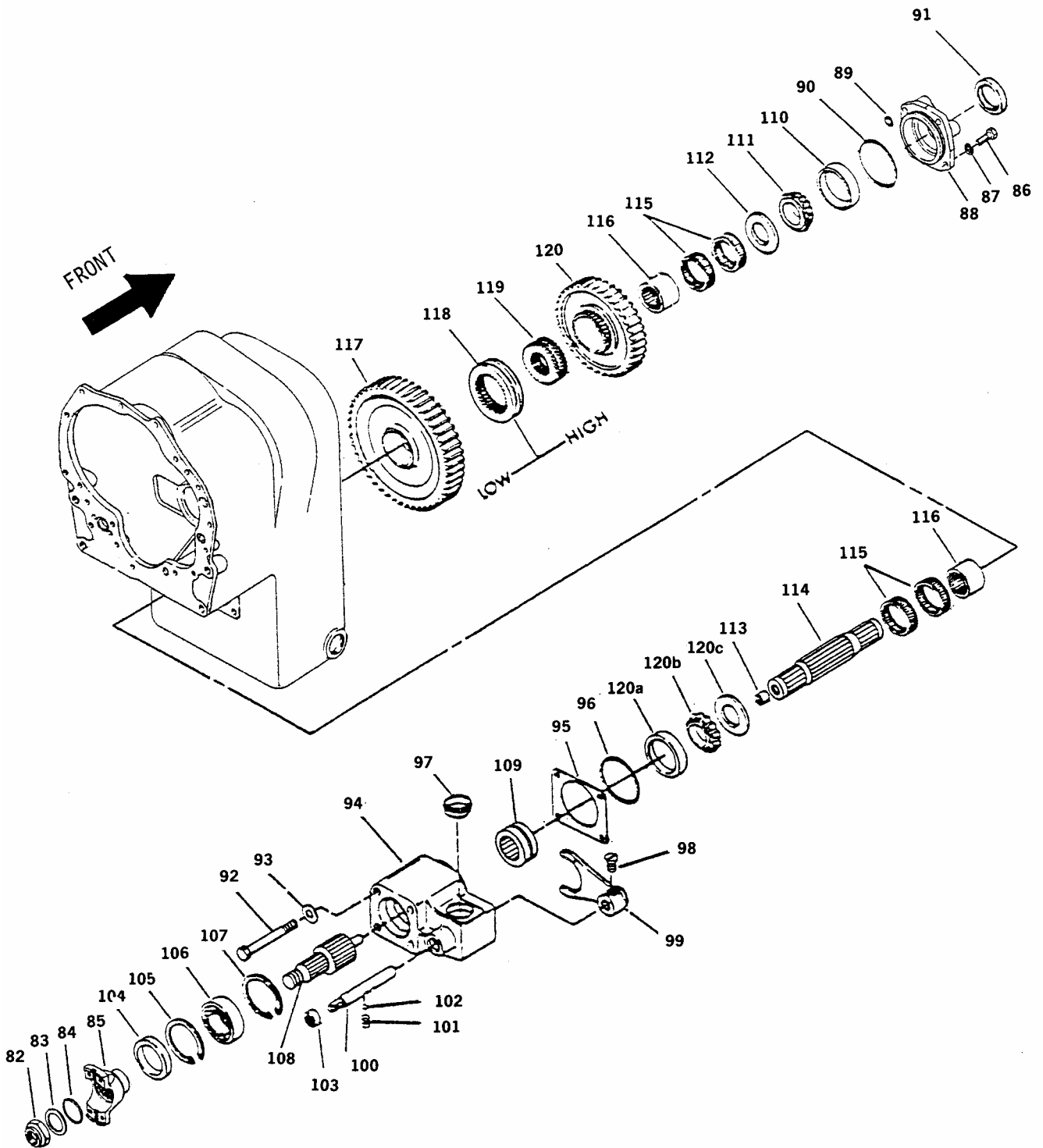
- a. Remove sleeve bushing (113), four retainers and rollers (115), two rings (116) and gears (117) and (120).
- b. Remove gear hub (118) and sleeve bearing (119).

24. DISASSEMBLE REAR AXLE DISCONNECT (94).

- a. Remove plug (97) and setscrew (98).
- b. Remove shift rail (100) with spring (101) and ball bearing (102).
- c. Remove seals (103) and (104). Discard seals (103) and (104).
- d. Remove retaining ring (105) and gearshaft (108) with bearing (106).
- e. Remove bearing (106), hub shaft (109) and fork shift (99).

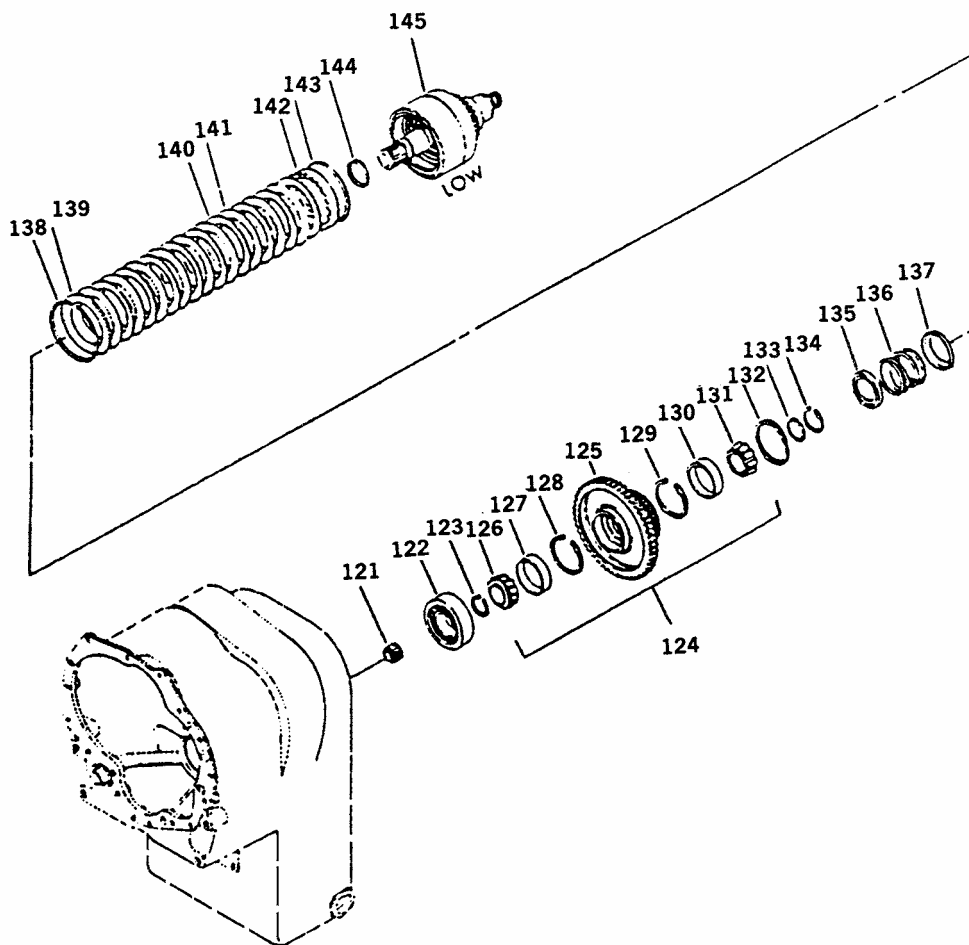
NOTE

Do not mix clutch discs among the clutch packs.



25. DISASSEMBLE LOW CLUTCH (71).

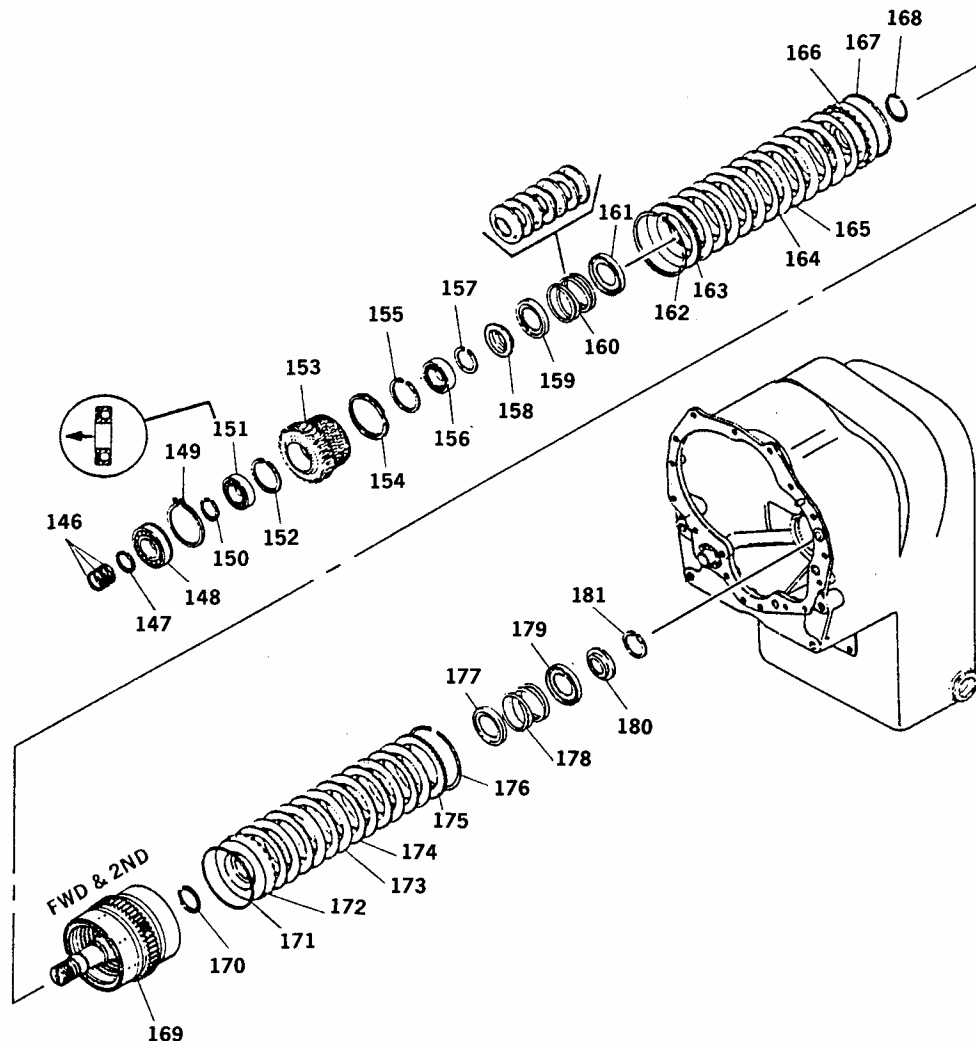
- a. Remove roller (121).
- b. Using puller, remove bearing (122).
- c. Remove retaining ring (123).
- d. Using puller, remove gear (124) with bearing (126).
- e. Remove retaining rings (132) and (138).
- f. Remove clutch plate (139) and clutch discs (140) and (141).
- g. Using puller, remove bearing (131) and retaining ring (133).
- h. Using clutch spring tool (Item 9, Appendix C), compress retainer (135).
- i. Accessing retaining ring (134) through opening in tool, remove retaining ring (134).
- j. Release tension on retainer (135). Remove clutch spring tool, retainers (135) and (137) and spring (136).
- k. Turn over housing (145) resting it on a block of wood. Remove piston (142), piston ring (143) and preformed packing (144). Discard packing (144).



26. DISASSEMBLE FORWARD AND 2ND CLUTCH (169).

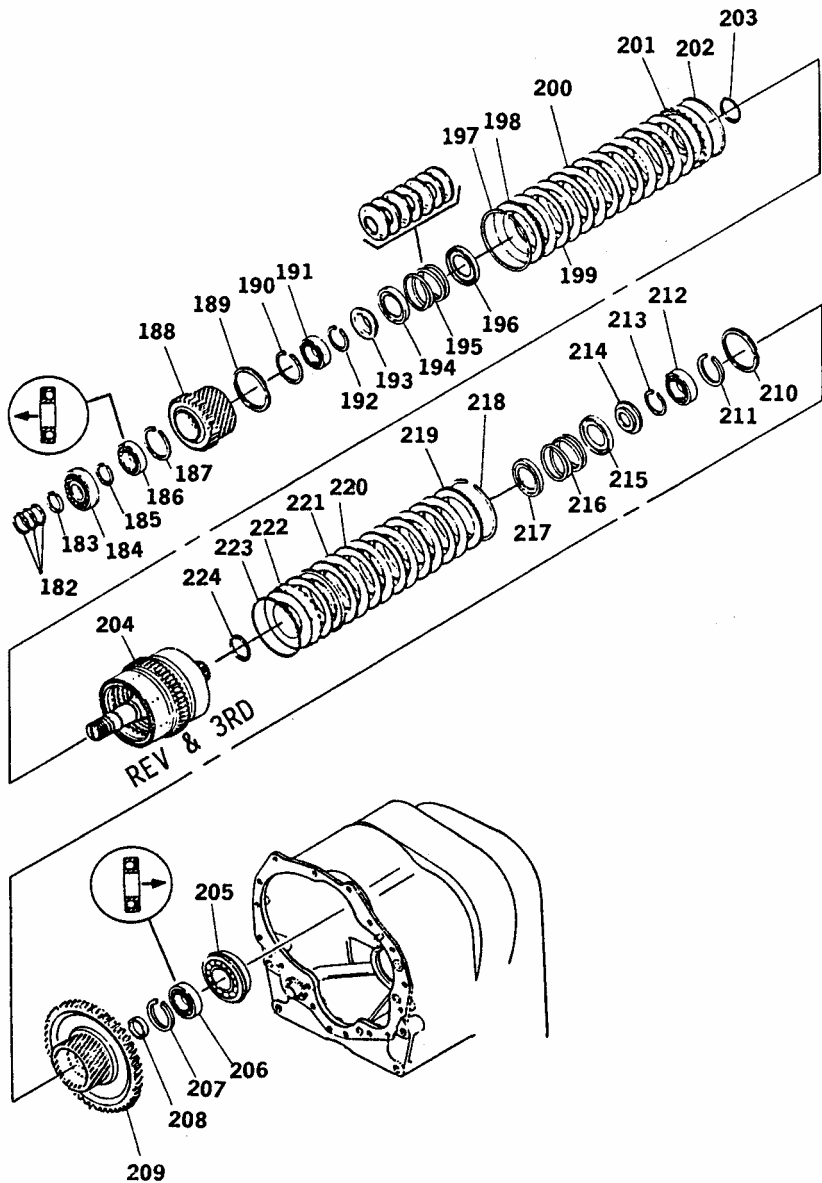
- a. Remove three piston rings (146).
- b. Remove retaining ring (147).
- c. Using puller, remove bearing (148).
- d. Remove special ring (149).

- e. Using puller, remove gear (153) with bearing (151).
- f. Using puller, remove bearing (156).
- g. Remove retaining ring (162).
- h. Remove clutch plate (163).
- i. Using clutch spring tool (Item 9, Appendix C), compress retaining ring (158) and remove retaining ring (157).
- j. Relieve pressure on retaining ring (158) and remove retaining ring (158), spring retainer (159), spring (160) and spring retainer (161).
- k. Remove clutch discs (164 and 165).
- l. Turn over housing (169), resting it on a block of wood. Remove piston (166), piston ring (167) and preformed packing (168). Discard packing (168).
- m. Remove retaining ring (176) and clutch plate (175).
- n. Using clutch spring tool (Item 9, Appendix C), compress retaining ring (180) and remove retaining ring (181).
- o. Relieve pressure on retaining ring (180) and remove retaining ring (180), spring retainer (179), spring (178) and spring retainer (177).
- p. Remove clutch disks (173 and 174).
- q. Turn over housing (169) resting it on a wood block. Remove piston (172), piston ring (171) and preformed packing (170). Discard packing (170).



27. DISASSEMBLE REVERSE AND 3RD CLUTCH (204).

- a. Remove three piston rings (182).
- b. Remove retaining ring (183).
- c. Using puller, remove bearing (183).
- d. Using puller, remove gear (188) with bearing (186).
- e. Using puller, remove bearing (191).
- f. Remove retaining ring (197) and clutch plate (198).
- g. Using clutch spring tool (Item 9, Appendix C), compress retaining ring (193) and remove retaining ring (192).
- h. Relieve pressure on retaining ring (193) and remove retaining ring (193), spring retainer (194), spring (195) and spring retainer (196).
- i. Remove clutch discs (199 and 200).
- j. Turn housing (204) over on a block of wood and remove piston (201), piston ring (202) and preformed packing (203). Discard packing (203).
- k. Using puller, remove bearing (205).
- l. Using puller, remove gear (209) with bearing (206).
- m. Remove retaining ring (207) and spacer (208).
- n. Remove retaining rings (210) and (218).
- o. Remove clutch plate (219) and clutch discs (220) and (221).
- p. Using puller, remove bearing (212).
- q. Using clutch spring tool (Item 9, Appendix C), compress retaining ring (214) and remove retaining ring (213).
- r. Relieve pressure on retaining ring (214) and remove retaining ring (214), spring retainer (215), spring (216) and spring retainer (217).
- s. Turn housing (204) over on a block of wood and remove piston (222), piston ring (223) and preformed packing (224). Discard packing (224).



28. DISASSEMBLE SIX SPEED IDLER SHAFT ASSEMBLY (64).

CAUTION

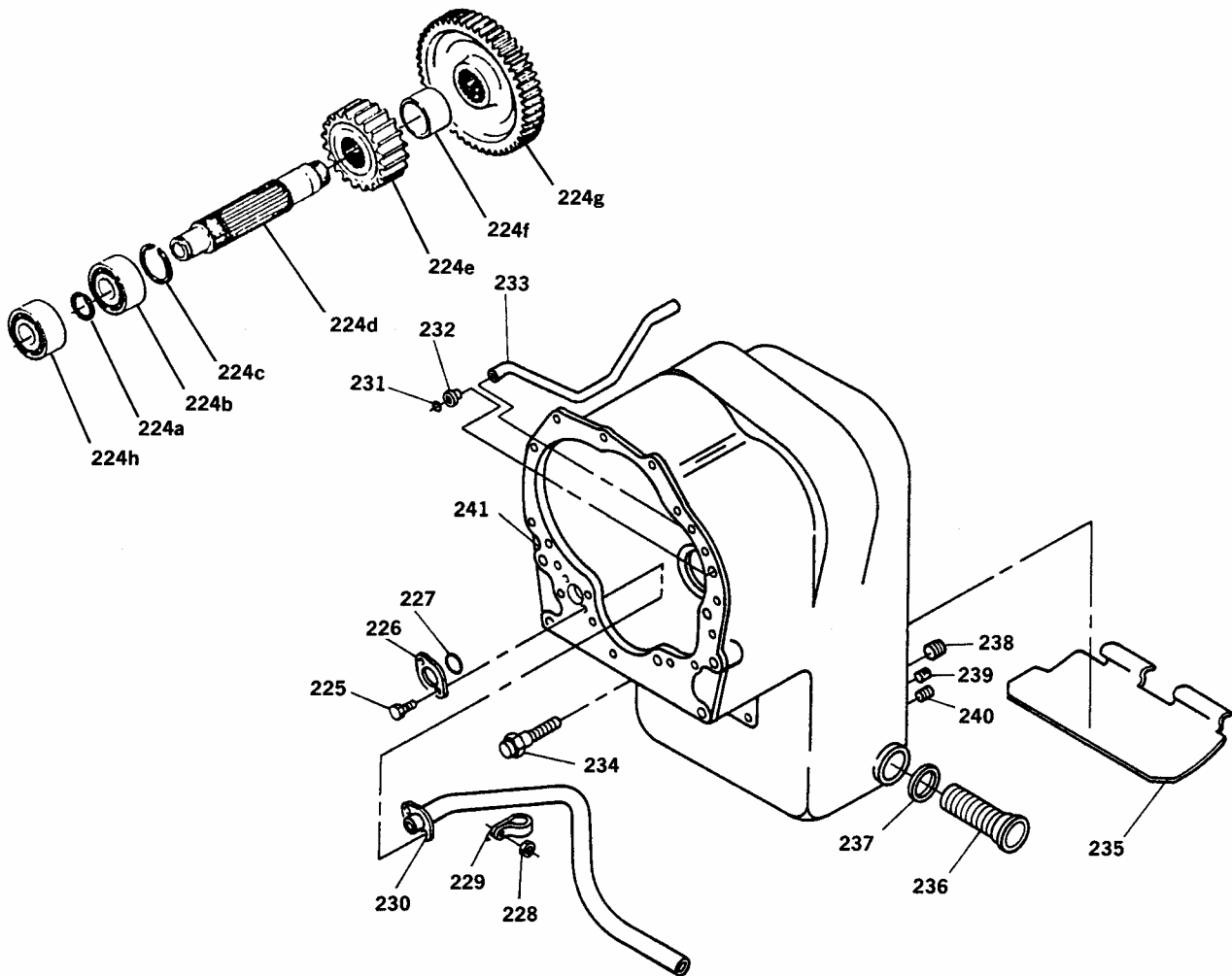
Use care to prevent damage to bearing cage (224h).

- a. Using a suitable bearing puller, remove bearing (224h).
- b. Remove gear (224g).
- c. Remove spacer (224f).
- d. Remove retaining ring (224a).
- e. Using a suitable bearing puller, remove bearing (224b).

- f. Remove locating ring (224c).
- g. Using a suitable press, remove gear (224e).

29. REMOVE OIL TUBES (230) AND (233).

- a. Remove two capscrews (225), spacer (226) and preformed packing (227). Discard packing (227).
- b. Remove nut (228), clamp (229) and tube (230).
- c. Remove two sleeves (232), preformed packings (231) and tube (233). Discard packing (231).
- d. Remove strainer (236) and gasket (237). Discard gasket (237).
- e. Remove oil baffle (235).



CLEANING:**WARNING**

Dry cleaning solvent P-D- 680, Type III is toxic and flammable. Wear protective goggles and gloves and use only in a well ventilated area. Avoid contact with skin, eyes, and clothes and don't breathe vapors. Do not use near open flame or excessive heat. The flash point is 200°F (94°C). If you become dizzy while using cleaning solvent, get fresh air immediately and get medical aid. If contact with eyes is made, wash your eyes with water and get medical aid immediately. Compressed air used for cleaning purposes will not exceed 30 psi. Use only with effective chip guarding and personal protective equipment goggles/ shield, gloves, etc.).

1. CLEAN ALL PARTS WITH CLEANING FLUID P-D-680 TYPE III.
 - a. Immerse parts in cleaning fluid tank.
 - b. Agitate parts up and down to remove old lubricant and foreign material.
2. CLEAN ALL BEARINGS.
 - a. Remove bearings from cleaning fluid and gently strike bearings against block of wood to dislodge lubricant particles.
 - b. Immerse in cleaning fluid again.
 - c. Repeat steps a. and b. until bearings are thoroughly clean.

CAUTION

Do not direct air stream across bearing surfaces causing bearings to spin. Spinning unlubricated bearings could cause premature wear.

- d. Dry bearings using low pressure compressed air. Spin bearings slowly by hand to aid in drying.
3. CLEAN TRANSMISSION HOUSINGS AND CAPS.

WARNING

Use care when cleaning parts with alkali cleaners. Avoid breathing in vapors or contact with bare skin. Otherwise skin rash and dizziness could result.

CAUTION

Do not clean parts which have machined or polished surfaces in alkali solution.

- a. Clean all housings and bearing caps, etc. in hot, mild alkali solution. Allow parts to be thoroughly heated and cleaned.
- b. Rinse parts thoroughly to remove all traces of alkali.
- c. Dry parts immediately with low pressure compressed air.
- d. Wipe all parts dry with clean, lint-free cloths.

INSPECTION:

1. INSPECT BEARINGS.

- a. Inspect all bearings, cages and cups for wear, nicks and chips.

NOTE

Bearing cones and cups are matched sets. Replace both if one is bad.

- b. Dip cleaned bearings in clean oil MIL-L-2104 SAE 10.
- c. Wrap each clean and lubed bearing in a clean, lint-free cloth until installed.

2. INSPECT ALL GEARS AND SHAFTS.

- a. Using a Magna-flux process, inspect all gears and shafts for damage and cracks.

- b. Inspect gear teeth for wear, pits, nicks, cracks and scores. Replace gear(s) if hardening is worn or cracked. Remove minor damage with suitable hone.
- c. Inspect all shafts, insuring each is true, not sprung or bent.

3. INSPECT HOUSINGS AND COVERS.

- a. Inspect all mating surfaces for nicks and burrs.
- b. Inspect all parts for cracks and damage.
- c. Ensure all parts are clean.

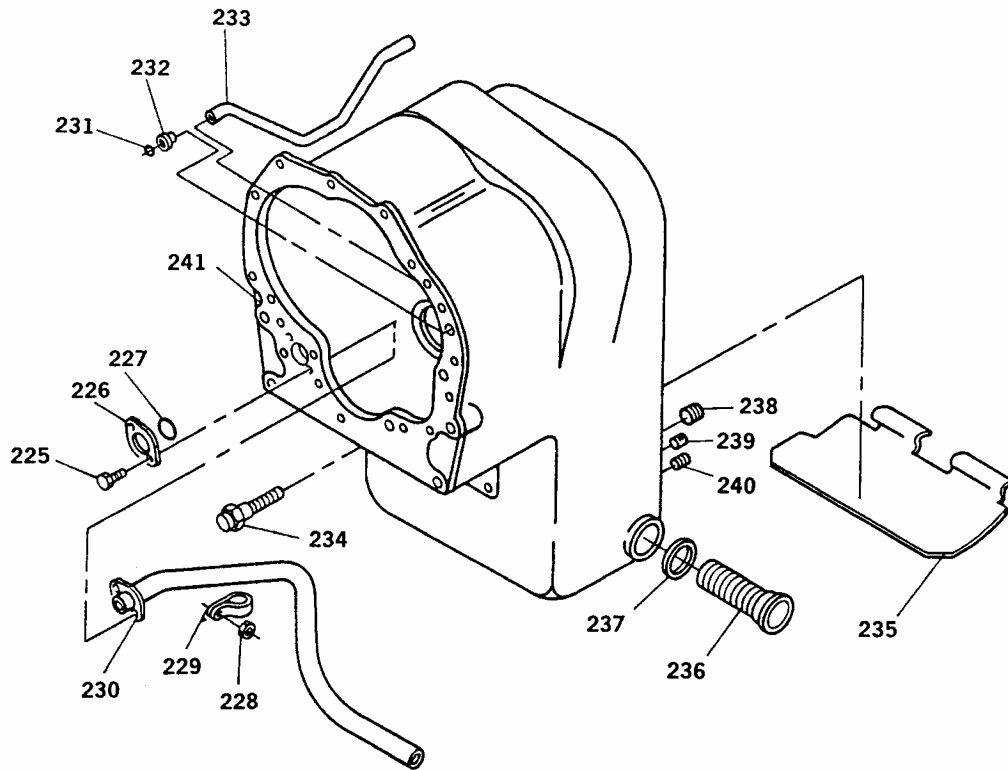
ASSEMBLY:

NOTE

Lubricate all preformed packings and seals with clean oil MIL-L-2104 SAE 10 prior to installation. Apply thin coat of Permatex No. 2 on outer diameter of oil seals to assure tight fit.

Coat metal-type sealing rings with a light coat of grease MIL-G-10924.

1. INSTALL OIL TUBES (230) AND (233).
 - a. Install oil baffle (235).
 - b. Install strainer (236) and new gasket (237).
 - c. Install tube (233) with sleeves (232) and new preformed packings (231).
 - d. Install tube (230) and secure with clamp (229) and nut (228).
 - e. Install new preformed packing (227), spacer (226) and two capscrews (225).



2. ASSEMBLE REVERSE AND 3RD CLUTCH (204).

- a. Install new preformed packing (224) and new piston ring (223) in piston (222).

CAUTION

Do not damage preformed packing (224) and piston ring (223).

- b. Install piston (222) in housing (204).
- c. Install spring retainer (217), spring (216), spring retainer (215), and retaining ring (214). Using clutch spring tool (Item 9, Appendix C), install retaining ring (213).
- d. Install one steel clutch disc (220).
- e. Install one friction clutch disc (221). Alternate one steel clutch disc (220) and one friction clutch disc (221) until all have been installed.
- f. Install clutch plate (219) and retaining ring (218).
- g. Install retaining ring (210).
- h. Press bearing (212) onto housing shaft (204).
- i. Install gear (209) into housing shaft (204). Align gear splines with internal teeth of friction discs and tap gear into position.

NOTE

Gear (209) splines must be aligned with internal teeth of all friction discs.

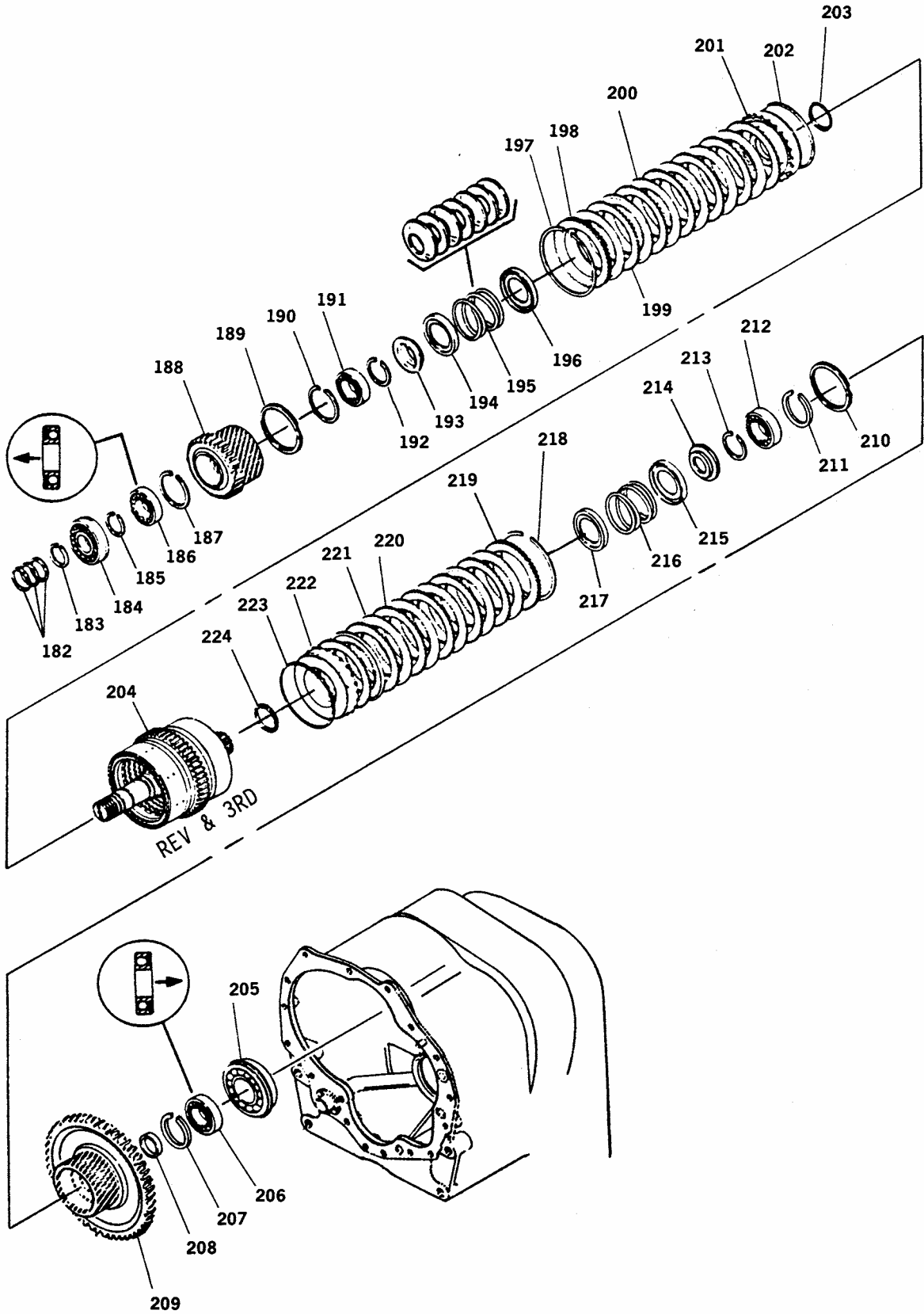
- j. Install spacer (208) and retaining ring (207).

- k. Press bearing (206) into position.
- l. Press bearing (205) into position.
- m. Install new preformed packing (203) and piston ring (202) on piston (201).

CAUTION

Do not damage preformed packing (203) and piston ring (202).

- n. Install piston (201) in housing (204).
- o. Install spring retainer (196), spring (195), spring retainer (194), and retaining ring (193). Using clutch spring tool (Item 9, Appendix C), install retaining ring (192).
- p. Install one steel clutch disc (199).
- q. Install one friction clutch disc (200). Alternate one steel clutch disc (199) and one friction disc (200) until all have been installed.
- r. Install clutch plate (198) and retaining ring (197).
- s. Install retaining ring (189).
- t. Press bearing (191) into position.
- u. Install gear (188) onto housing shaft (204). Align gear splines with internal teeth of friction discs and tap gear into position.
- v. Press bearing (186) into position and install retaining ring (185).
- w. Press bearing (184) into position and install retaining ring (183).
- x. Apply grease MIL-G-10924 to piston rings (182). Install piston rings (182).



3. ASSEMBLE FORWARD AND 2ND CLUTCH (169).

- a. Install new preformed packing (170) and new piston ring (171) in piston (172).

CAUTION

Do not damage preformed packing (170) and piston ring (171).

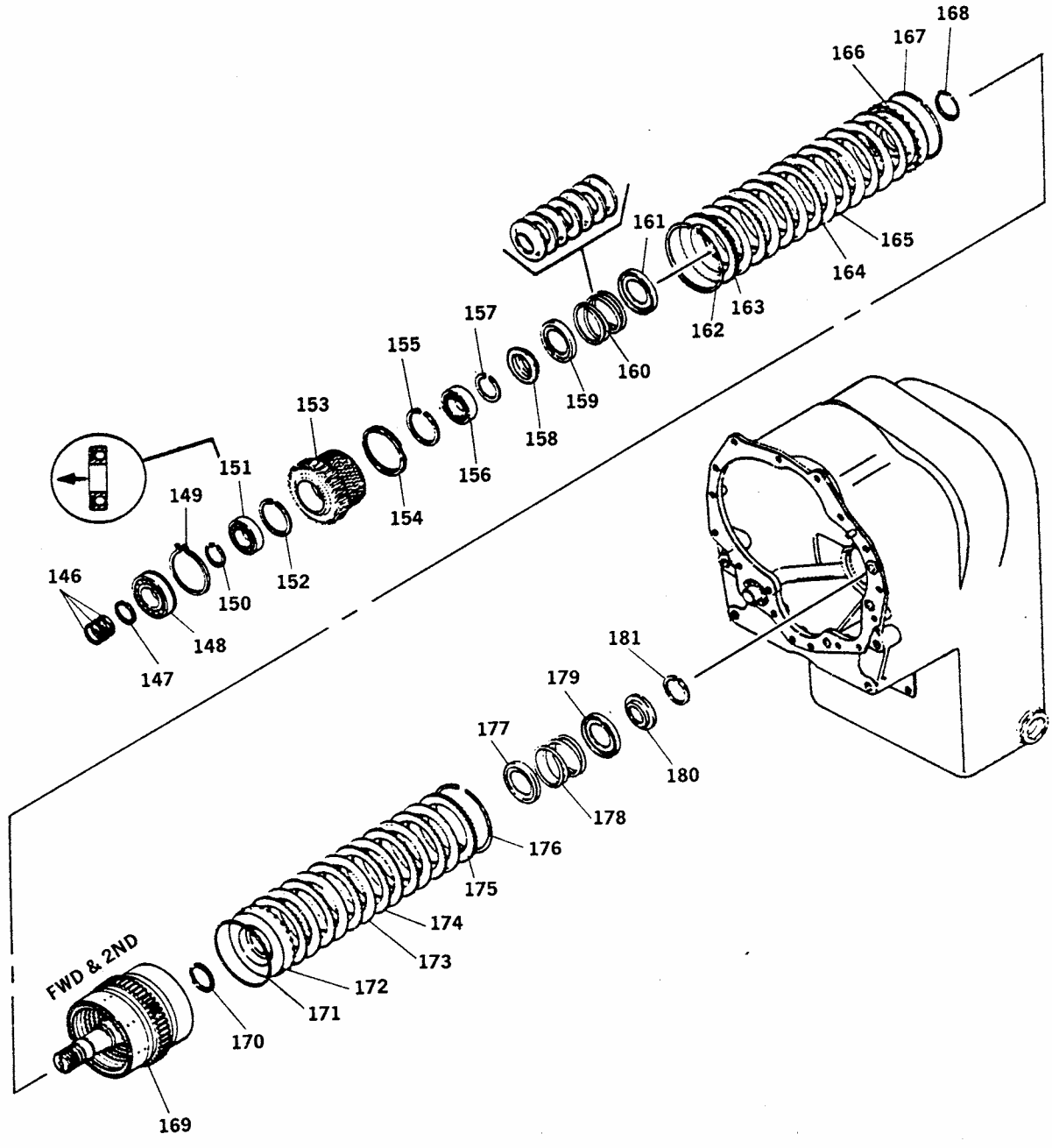
- b. Install piston (172) in housing (169).
- c. Install spring retainer (177), spring (178), spring retainer (179) and retaining spring (180). Using clutch spring tool (Item 9, Appendix C), install retaining ring (181).
- d. Install one steel clutch disc (173).
- e. Install one friction clutch disc (221). Alternate one steel clutch disc (220) and one friction clutch disc (221) until all have been installed.
- f. Install clutch plate (175) and retaining ring (176).
- g. Install new preformed packing (168) and new piston ring (167) in piston (166).
- h. Install piston (166) in housing (169).
- i. Install spring retainer (161), spring (160), spring retainer (159) and retaining spring (158). Using clutch spring tool (Item 9, Appendix C), install retainer ring (157).

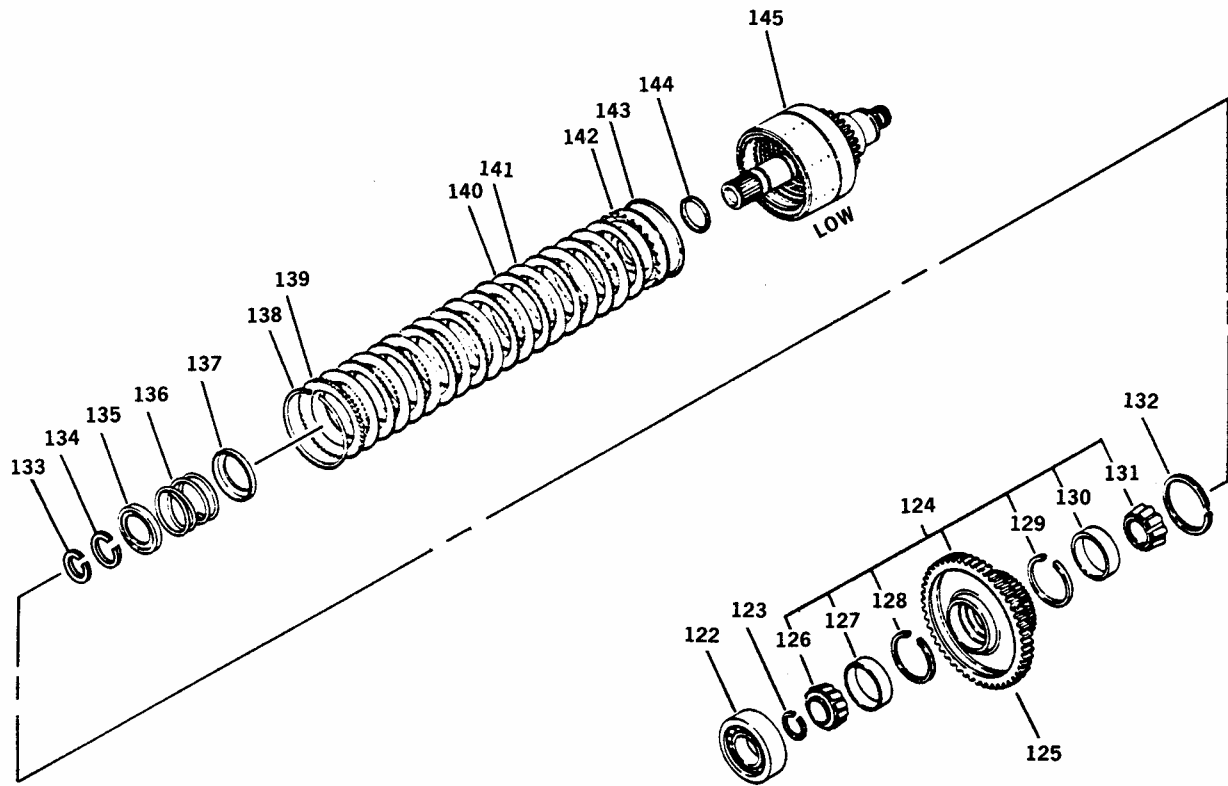
- j. Install one steel clutch disc (164).
- k. Install one friction clutch disc (165). Alternate one steel clutch disc (164) and one friction clutch disc (165) until all have been installed.
- l. Install clutch plate (163) and retaining ring (162).
- m. Install retaining ring (154)
- n. Press bearing (156) into position.

NOTE

Gear (153) must be in full position. Do not force this operation.

- o. Install gear (153) onto housing shaft (169). Align gear splines with external teeth of friction discs and tap gear into position.
- p. Press bearing (151) into position and install retaining ring (150).
- q. Install special ring (149).
- r. Press bearing (148) into position and install retaining ring (147).
- s. Apply grease MIL-G-10924 to piston rings (146). Install piston rings (146).





4. ASSEMBLE LOW CLUTCH (71).

- a. Install new preformed packing (144) and new piston ring (143) in piston (142).

CAUTION

Do not damage preformed packing (144) and piston ring (143).

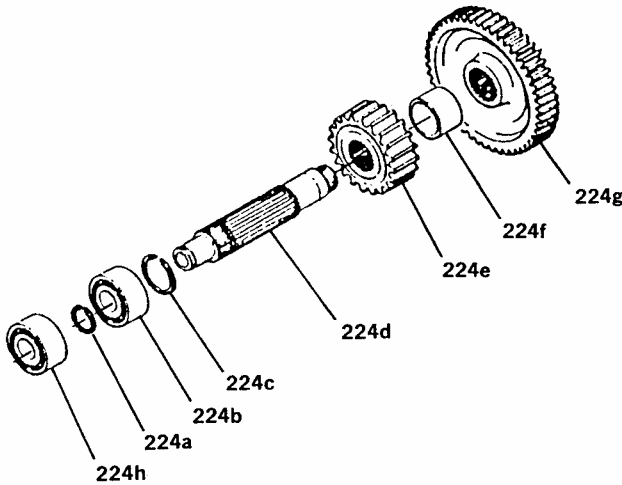
- b. Install piston (142) in housing (145).
- c. Install spring retainer (137), spring (136) and spring retainer (135). Using clutch spring tool (Item 9, Appendix C), install retaining ring (134).

NOTE

The friction discs in the low clutch have a higher coefficient rating than the friction discs in the other clutches; therefore the discs must not be mixed.

The low clutch inner disc can be identified by an X stamped on one side of the inner teeth. The low clutch inner disc also has a strip of non-soluble yellow paint sprayed on the outer edge of the disc.

- d. Install one steel clutch disc (140).
- e. Install one friction clutch disc (141). Alternate one steel clutch disc (140) and one friction clutch disc (141) until all have been installed.
- f. Install clutch plate (139) and retaining ring (138).
- g. Install retaining rings (133 and 132).
- h. Press bearing (131) into position. Install cup (130).
- i. Install gear (125) onto housing shaft (145). Align splines on gear with internal teeth of friction discs and top gear into position.
- j. Install retaining ring (123).
- k. Press bearing (122) into position.



5. ASSEMBLE SIX SPEED IDLER SHAFT ASSEMBLY (64).

- a. Using a suitable press, install gear (224e).
- b. Install locating ring (224c).
- c. Using a suitable press, install bearing (224b).
- d. Install retaining ring (224a).
- e. Install spacer (224f).
- f. Install gear (224g).

NOTE

Retaining ring groove on bearing (224h) must face away from gear (224g).

- g. Using a suitable press, install bearing (224h).

6. ASSEMBLE REAR AXLE DISCONNECT (94).

- a. Install fork shift (99), hub shaft (109) and retaining ring (107) if removed.
- b. Press bearing (106) onto gearshaft (108).
- c. Install gearshaft (108) and retaining ring (105).
- d. Press new seal (104) into disconnect (94).

- e. Install shift rail (100) with spring (101) and ball bearing (102). Press in new seal (103).
- f. Install setscrew (99) and plug (97).

7. INSTALL OUTPUT GEARS (117) AND (120).

- a. Assemble and install two retainer rollers (115), ring (116), gear (120), gear hub (118) and sleeve bearing (119) in housing.
- b. Assemble and install two retainer rollers (115), ring (116) and gear (117) in housing.

8. INSTALL OUTPUT SHAFT (114).

- a. Using press, install front bearing (111) and washer (112) on output shaft (114).
- b. Insert output shaft (114) through output gears from front of transmission housing.
- c. Install front bearing cup (110) and bearing housing (88) with new preformed packings (89 and 90). Ensure lube opening in bearing housing (88) is aligned with lube opening in transmission housing.
- d. Install four capscrews (86) and new lockwashers (87). Torque capscrews to 82-90 ft-lbs (109-120 Nm).
- e. Install rear cup (120a).
- f. Position rear washer (120c) and bearing (120d) on output shaft (114).
- g. Press rear bearing (120b) into place.
- h. Install seal (91) if required.

9. INSTALL REAR AXLE DISCONNECT (94).

- a. Install sleeve bushing (113) and cup (110).
- b. Install new preformed packing (96), shims (95) and rear axle disconnect housing (94). Install capscrews (92) and new lockwashers (93). Torque capscrews (92) 115-127 ft-lbs (153-169 Nm).
- c. Tap output shaft (114) front and rear to seat bearings (111).

10. CHECK ROLLING TORQUE.

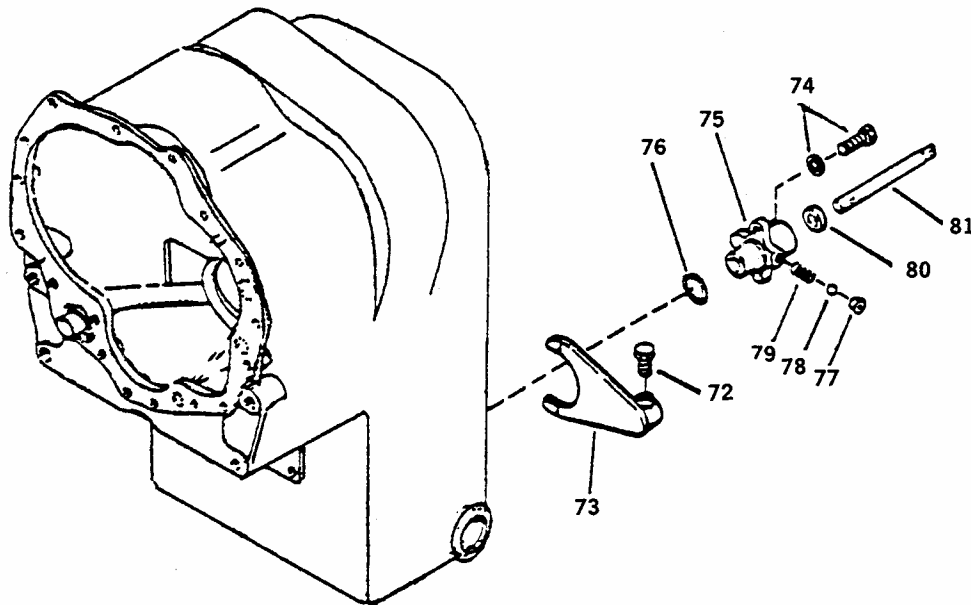
- a. Loosen capscrews (92).
- b. Using pound-inch torque wrench, determine and record rolling torque of output shaft.
- c. Tighten capscrews (92) to 115-127 ft-lbs (153-169 Nm).
- d. Determine and record rolling torque of output shaft.
- e. Compare recorded torque from step b. and step d. If value recorded in step d. is between 6 and 8 pound-inches (8-11 Nm) greater than that recorded in step b, bearing preload is correct. Otherwise add or subtract shims (95) as required to achieve proper bearing preload.

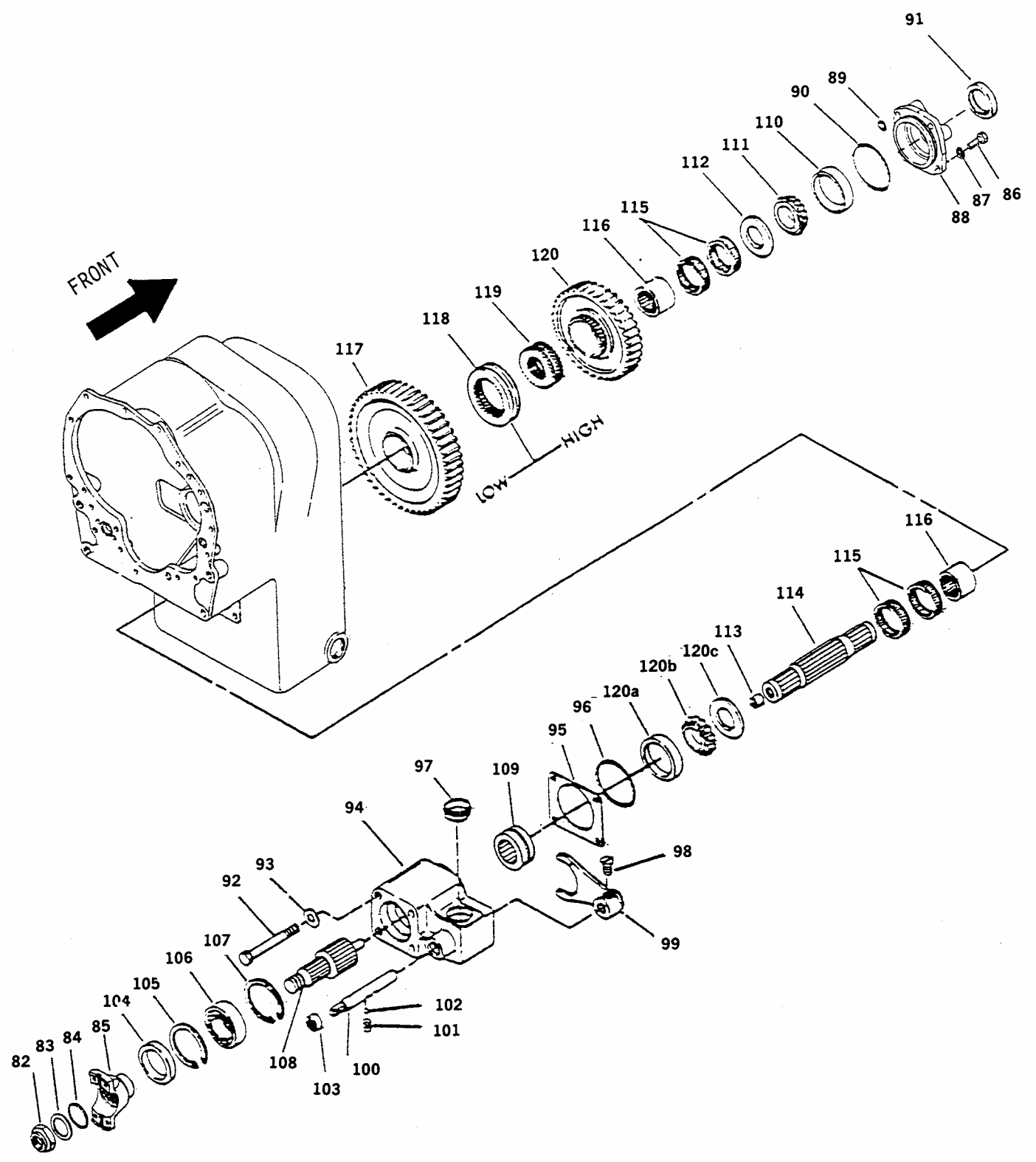
11. INSTALL SHIFT COUPLING (75).

- a. Locate shifter fork (73) in gear hub (118) with offset of fork toward front of transmission.
- b. Assemble shaft (81), seal (80), spring (79), ball (78), and pipe plug (77).
- c. Install shaft coupling (75) with new preformed packing (76).
- d. Install and torque two bolts (74) to 23-25 ft-lbs (31-33 Nm).
- e. Locate setscrew hole in shaft (81) and shift fork (73). Install setscrew (72) and lockwire to prevent loosening.

12. INSTALL FLANGE (85).

- a. Install flange (85).
- b. Install new preformed packing (84), new lockwasher (83) and nut (82).
- c. Torque nut (82) 200-250 ft-lbs (266-333 Nm).





13. INSTALL CLUTCH ASSEMBLIES (70) AND (71).

- a. Install clutch (71) into front of transmission housing.
- b. Install clutch (70) into rear of transmission housing.
- c. Install second gear (69).
- d. If removed, install retaining ring (68).
- e. Install retaining ring (67).
- f. Install spur gear (66) and retaining ring (65).

14. INSTALL SIX SPEED IDLER SHAFT AND GEAR (64).

15. INSTALL BEARING (63).

- a. Press bearing (63) onto clutch (71) with ring groove to front.
- b. Install retaining ring (52).

16. INSTALL TRANSMISSION COVER (58).

- a. Position new gasket (59) on front of transmission housing.
- b. Install new preformed packing (63c) and sleeve (63d).
- c. Align lock ball (63b) in idler shaft (64) bearing with notch in transmission cover (58).
- d. Tap transmission cover (58) into place and secure with thirteen capscrew (53) and new lockwashers (54).
- e. Install two nuts (55) and new lockwashers (56).
- f. Torque capscrews (53) to 52-57 ft-lbs (69-76 Nm).
- g. From rear of transmission, tap low clutch (71) and six speed idler shaft (64). This will allow clearance for installing retaining ring (46).

- h. Install piston rings (62).

17. INSTALL GREASE CAP (48).

- a. Install new gasket (51) on grease cap (48).
- b. Install grease caps (48) and secure with five bolts and washers (47).
- c. Torque bolts and washers (47) to 23-25 ft-lbs (31-33 Nm).

18. INSTALL RETAINING RING (46) AND SPACER (63a).

19. INSTALL NUT (45).

- a. Install nut (45) on six speed idler shaft and gear (64).
- b. Block idler gear and torque nut 400-450 ft-lbs (532-600 Nm).

20. INSTALL BEARING HOUSING (43).

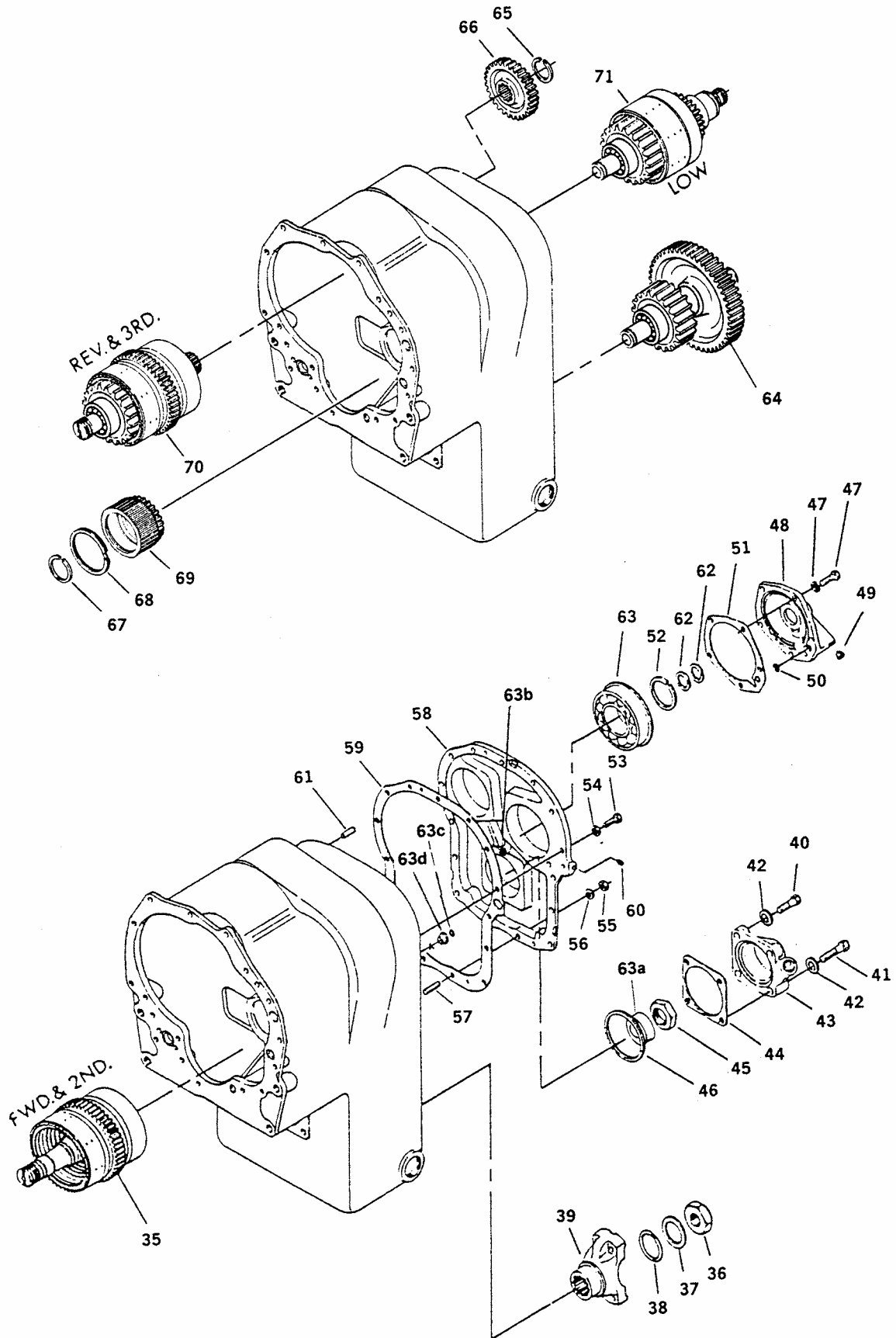
- a. Position new gasket (44) on bearing housing (43).
- b. Install bearing housing (43) and secure with four capscrews (40) and (41) and new lockwashers (42).
- c. Torque capscrews (40) and (41) to 82-90 ft-lbs (109-120 Nm).

21. INSTALL FLANGE (39).

- a. Install flange (39) with new preformed packing (38).
- b. Secure with washer (37) and nut (36).
- c. Block output shaft.
- d. Torque nut (36) 200-250 lbs-ft (266-333 Nm).

22. INSTALL FORWARD AND SECOND CLUTCH ROLLER (71A).

- a. Install roller (71a) in rear of forward and second clutch shaft (35).



23. INSTALL BUSHINGS (14).

- a. Press bushings (14) into transmission cover (5).
- b. Install sleeve (13), two bolts (12) and new lockwashers (9).

24. INSTALL TUBES (7) AND (11).

CAUTION

Sleeves (15) and tubes (7) and (11) must be installed together, lightly tapping sleeves (15) to seat.

- a. Install new preformed packings (6), sleeves (15) and tubes (7) and (11).
- b. Install two clips (8), new lockwashers (9) and bolts (10).

25. INSTALL BEARING (3).

- a. Install bearing (3) and retaining rings (2).
- b. Press new seal (1) into transmission cover (5).

26. INSTALL GEARSHAFT (20) INTO TRANSMISSION COVER (5).

27. INSTALL TRANSMISSION COVER (5).

- a. Install front bearing special ring (33).
- b. Support transmission cover (5) with overhead hoist.
- c. Using snap ring pliers, hold special ring (34) open.
- d. Position transmission cover (5) to transmission housing.

CAUTION

Do not damage piston rings.

- e. Install eight capscrews (22), (26) and (29).
- f. Tighten capscrews 37-41 ft-lbs (49-55 Nm).
- g. Install pipe plug (28).

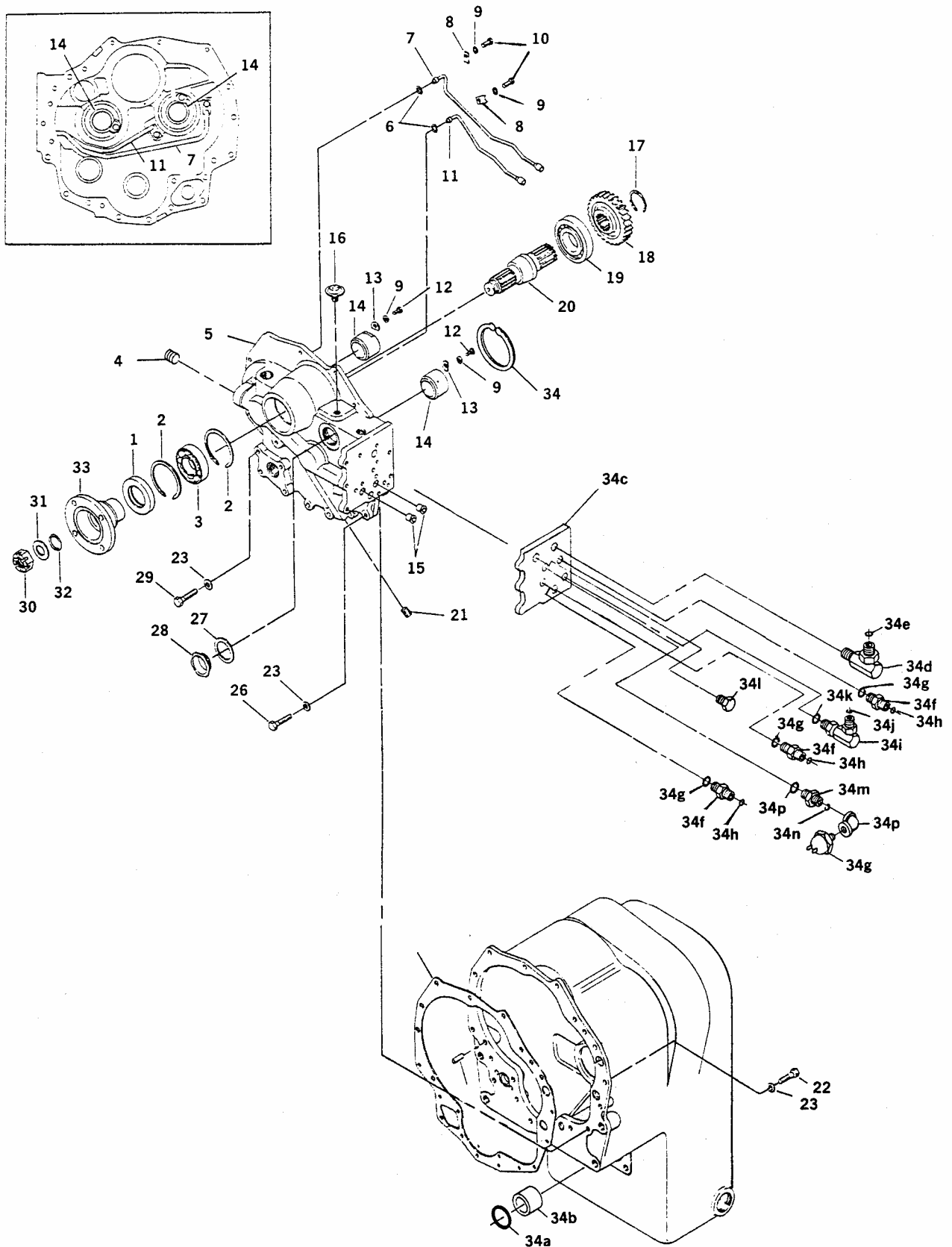
28. INSTALL FLANGE (33).

- a. Install flange (33) with new preformed packing (32), washer (31) and nut (30).
- b. Torque nut (30) to 150-200 ft-lbs (200-265 Nm).

29. INSTALL ADAPTER PLATE (34c).

- a. If removed, install new packing (34n), elbow (34r) and switch (34g) in fitting (34m).
- b. Position adapter plate (34c) on cover (5).
- c. Install new packing (34p) and fitting (34m).
- d. Install plug (341).
- e. Install new packings (34k) and (34j), and fitting (34i).
- f. Install new packings (34h) and (34g), and fittings (34g).
- g. Install new packing (34e) and fitting (34d).

END OF TASK



RANGE SHIFTER ASSEMBLY

TOOLS: General mechanic's tool kit: automotive (5180-00-177-7033)

SUPPLIES: Cotter pin (Item 105, Appendix B) (6 Required)
Cotter pin (Item 232, Appendix B) (2 Required)
Lockwasher (Item 233, Appendix B) (2 Required)

EQUIPMENT CONDITIONS: Range shifter assembly removed. (Refer to page 7-18.)

DISASSEMBLY:

1. REMOVE 4-WAY AIR VALVE (1).
 - a. Disconnect and remove air lines (2) and (3) from air valve (1) and air cylinder (4).
 - b. Remove nuts (5) and lockwashers (6). Discard lockwashers (6).
 - c. Remove air valve (1) from mounting plate (7).
 - d. If necessary, remove air mufflers (13), elbow (14) and unions (15) from air valve (1).
2. REMOVE AIR CYLINDERS (4).
 - a. Disconnect and remove air lines (8) and (9) from air cylinders (4).
 - b. Remove cotter pins (10) and (11), and clevis pins (12) from air cylinders (4). Discard cotter pins (10) and (11).
 - c. Remove air cylinder (4).

NOTE

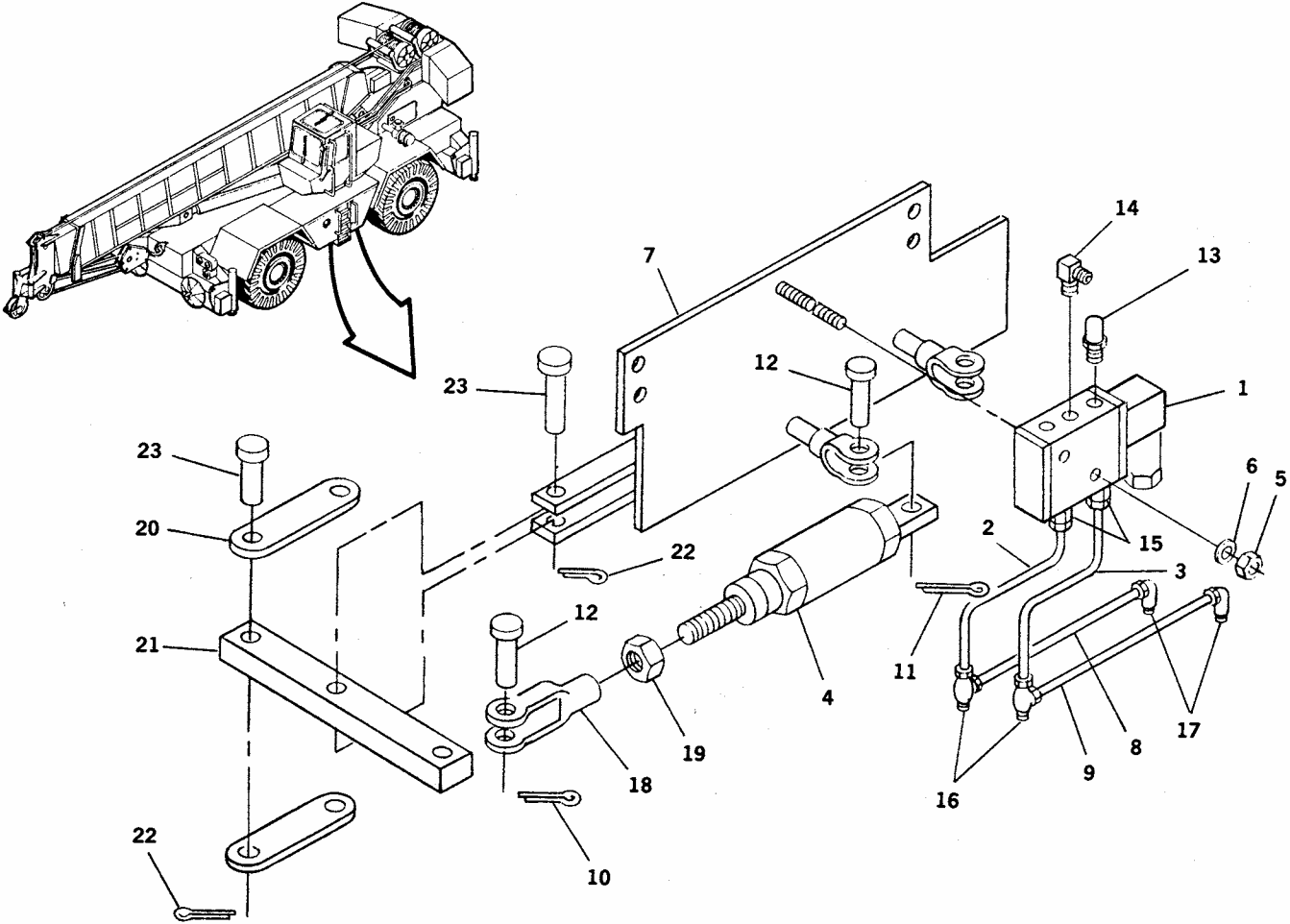
Count number of turns when removing clevis rod ends (18) from air cylinders (4) for reassembly.

- d. If necessary remove tee fittings (16), elbows (17), clevis rod ends (18) and nuts (19) from air cylinders (4).
3. REMOVE LINKAGE BARS (20) AND (21).
 - a. Remove cotter pins (22) and clevis pins (23). Discard cotter pins (22).
 - b. Remove linkage bars (20) and (21) from mounting plate (7) linkage bars.

ASSEMBLY:

1. INSTALL LINKAGE BARS (20) AND (21).
 - a. Position linkage bars (21) in mounting plate (7) linkage bars, and linkage bars (20) on linkage bars (21).
 - b. Secure linkage bars (20) and (21) with clevis pins (23) and new cotter pins (22).
2. INSTALL AIR CYLINDERS (4).
 - a. If removed, install nuts (19), clevis rod ends (18) (same number of turns noted on disassembly), elbows (17) and tee fittings (16).
 - b. Position air cylinders (4) in mounting plate (7) clevis ends and on linkage bars (21).
 - c. Secure air cylinders (4) with clevis pins (12) and new cotter pins (10) and (11).
 - d. Position and connect air lines (8) and (9) to air cylinders (4).
3. INSTALL 4-WAY AIR VALVE (1).
 - a. If removed, install unions (15), elbow (14) and air mufflers (13).
 - b. Secure air valve (1) to mounting plate (7) studs with new lockwashers (6) and nuts (5).
 - c. Position and connect air lines (3) and (2) to air valve (1) and air cylinder (4).
4. INSTALL RANGE SHIFTER ASSEMBLY. (REFER TO PAGE 7-18.)

END OF TASK



Section III. HYDRAULIC SYSTEM SERVICE

HYDRAULIC SYSTEM SERVICE

TOOLS: General mechanic's tool kit: automotive (5180-00-177-7033)

SUPPLIES: Oil as recommended (Refer to LO 5-3810-306-12)

EQUIPMENT CONDITIONS: None

1. SERVICE HYDRAULIC SYSTEM.

NOTE

The transmission, torque converter, and its allied hydraulic system are important links in drive line between engine and wheels. The proper operation of either unit depends greatly on condition and operation of other; therefore, whenever repair or overhaul of one unit is performed, the balance of system must be considered before job can be considered completed.

- a. Replace oil filter elements, cleaning out filter cases thoroughly.
- b. The oil cooler must be thoroughly cleaned. The cooler should be back flushed with oil and compressed air until all foreign material has been removed. Flushing in direction of normal oil flow will not adequately clean cooler. If necessary, cooler assembly should be removed for cleaning, using oil, compressed air and a steam cleaner for that purpose.

CAUTION

Do not use flushing compounds for cleaning purposes.

- c. Drain transmission/converter lubricant from transmission drain plug. If presence of considerable foreign material is noted, it will be necessary that transmission be removed, disassembled and cleaned thoroughly.
- d. Assemble all components and use only type oil recommended. Fill converter/transmission through the fill pipe until fluid is at the top of the fill pipe. Run the engine two minutes at 500 to 600 rpm to prime the torque converter and hydraulic lines. Recheck the level of oil in the transmission with the engine running at idle (500 to 600 rpm). Add oil as necessary to bring the level above the ADD mark on the dipstick. After the oil temperature reaches 180 to 200 degrees F (82.2 to 93.3 degrees C), add oil to bring the level to the FULL mark on the dipstick.

END OF TASK

CHAPTER 8
AXLE MAINTENANCE

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Section I. AXLE ASSEMBLY MAINTENANCE

AXLE, PROPELLER SHAFT, SPINDLE AND TIE ROD ASSEMBLY

TOOLS: General mechanic's tool kit: automotive (5180-00-177-7033)

SUPPLIES: Grease MIL-G-10924 (Item 37, Appendix B)
Sleeve bushing (Item 212, Appendix B) (2 Required)
Sleeve bushing (Item 213, Appendix B) (2 Required)
Cotter pin (Item 214, Appendix B)

EQUIPMENT CONDITIONS: Planetary ends removed. (Refer to page 8-44.)
Steering cylinders disconnected. (Refer to TM 5-3810-306-20.)

DISASSEMBLY

CAUTION

Use care when removing propeller shaft (4) to avoid damage to bushing (3).

1. REMOVE PROPELLER SHAFT (4).
2. REMOVE TIE ROD (8).
 - a. Remove pin (6).
 - b. Remove two cotter pins (14), nuts (5) and bolts (13).
 - c. Remove tie rod (8).
 - d. Mark position of tie rod ends (9) in relation to tie rod (8).
 - e. Remove nuts (11), lockwashers (10), capscrews (7) and tie rod ends (9).
 - f. Remove bushing (12).
 - g. Repeat steps a thru e for opposite side.
3. REMOVE DUST SHIELDS.
4. REMOVE WHEEL SPINDLE (17).
 - a. Remove eight capscrews (1) and washers (2).

CAUTION

Do not mix upper and lower shims (16).

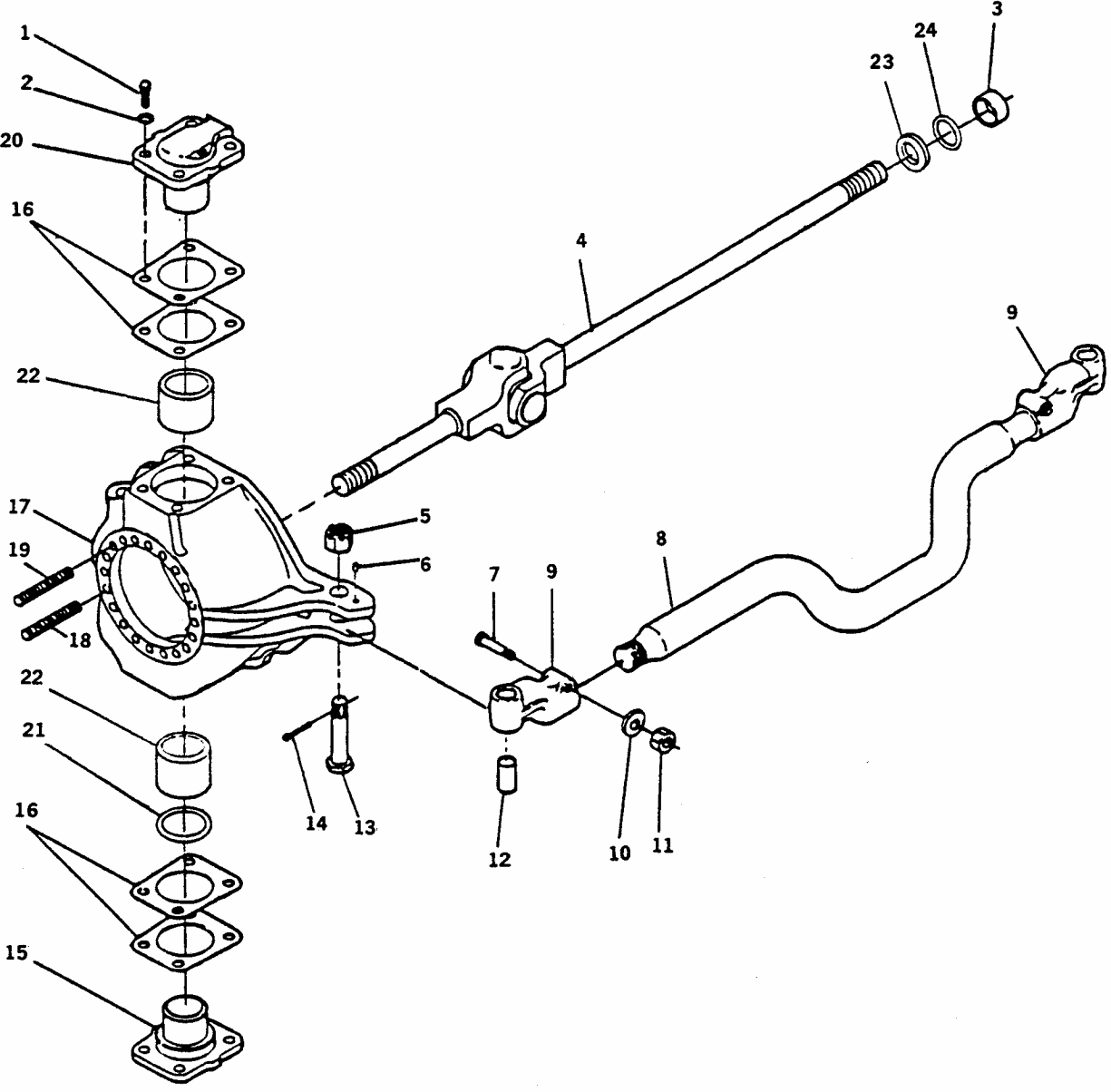
- b. Remove retaining plate (15), shims (16) and thrust washer (21).
- c. Remove retaining plate (20) and shims (16).
- d. Remove wheel spindle (17). Tip wheel spindle (17) to clear axle knuckle.
- e. Repeat steps a thru d for opposite side wheel spindle.

5. REMOVE BUSHINGS (22) AS REQUIRED.
6. REMOVE OIL SEAL (23), RETAINER (24) AND BUSHING (3) FROM END OF AXLE HOUSING.

INSPECTION

WARNING

Dry cleaning solvent P-D-680, Type III is toxic and flammable. Wear protective goggles and gloves and use only in a well ventilated area. Avoid contact with skin, eyes, and clothes and do not breathe vapors. Do not use near open flame or excessive heat. The flash point is 200°F (94°C). If you become dizzy while using cleaning solvent, get fresh air immediately and get medical aid. If contact with eyes is made, wash your eyes with water and get medical aid immediately.



WARNING

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

1. CLEAN ALL PARTS WITH CLEANING FLUID P-D-680 TYPE II.
2. INSPECT ALL PARTS FOR WEAR AND DAMAGE.
 - a. Inspect propeller shaft universal joints for looseness or wear.
 - b. Inspect splines on yoke for cracks or broken teeth.
 - c. Replace driveshaft if previous conditions exist.
 - d. Inspect all bushings and replace as necessary.

ASSEMBLY

1. INSTALL BUSHINGS (12) AND (22).

WARNING

Do not strike hardened steel parts directly with a hammer. Personal injury from chips or splinters may result.

NOTE

Ream bushings as necessary.

- a. If used, install axle shaft guide plate with mallet.
 - b. Using suitable driver, install bushing (12).
 - c. Using suitable driver, install bushings (22).
2. INSTALL BUSHING (3), RETAINER (24) AND OIL SEAL (23) IN END OF AXLE HOUSING. REAM BUSHING AS NECESSARY.

3. INSTALL WHEEL SPINDLES (17).
 - a. Lubricate retaining plate bores (two places) in wheel spindle (17).
 - b. Install wheel spindle (17) on axle socket.
 - c. Install retaining plate (20) with original shims (16).

CAUTION

Insure retaining plate (20) is square with spindle bore while tightening capscrews (1).

- d. Install four capscrews (1) and washers (2). Tighten each capscrew (1) alternately in small increments.
- e. Apply grease MIL-G-10924 to grooved face on thrust washer (21).
- f. Install retaining plate (15) and thrust washer (21) with original shims (16).
- g. Insure tangs of thrust washer engage slots in wheel spindle (17).

CAUTION

Insure retaining plate (15) is square with spindle bore while tightening capscrews (1).

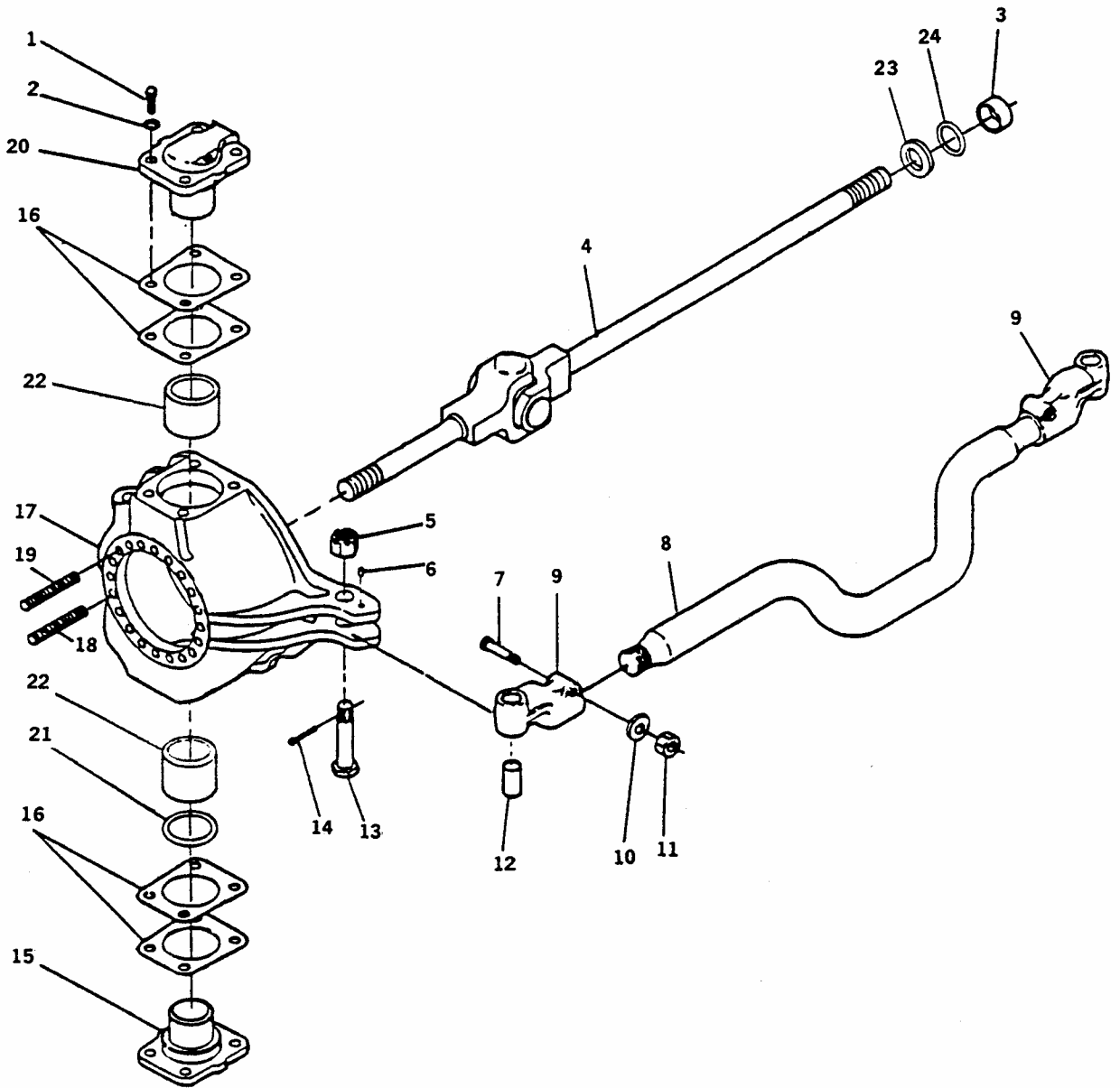
- h. Install four capscrews (1) and washers (2). Tighten each capscrew (1) alternately in small increments.
- i. Repeat steps a thru h for opposite side wheel spindle.

4. ADJUST WHEEL SPINDLE.

NOTE

Wheel spindle adjustment is accomplished by the shims (16). Vertical end play should be 0.005 to 0.013 in. (0.127 to 0.330 mm).

- a. Using hydraulic jack or pry bar, force wheel spindle upward.



- b. Measure and record vertical end play of wheel spindle (17) by using a feeler gauge inserted between plate retainer (20) and wheel spindle (17).

NOTE

If recorded end play is 0.013 in. (0.330 mm) or less, no adjustment is required. If end play exceeds 0.013 in. (0.330 mm) continue with steps c thru h.

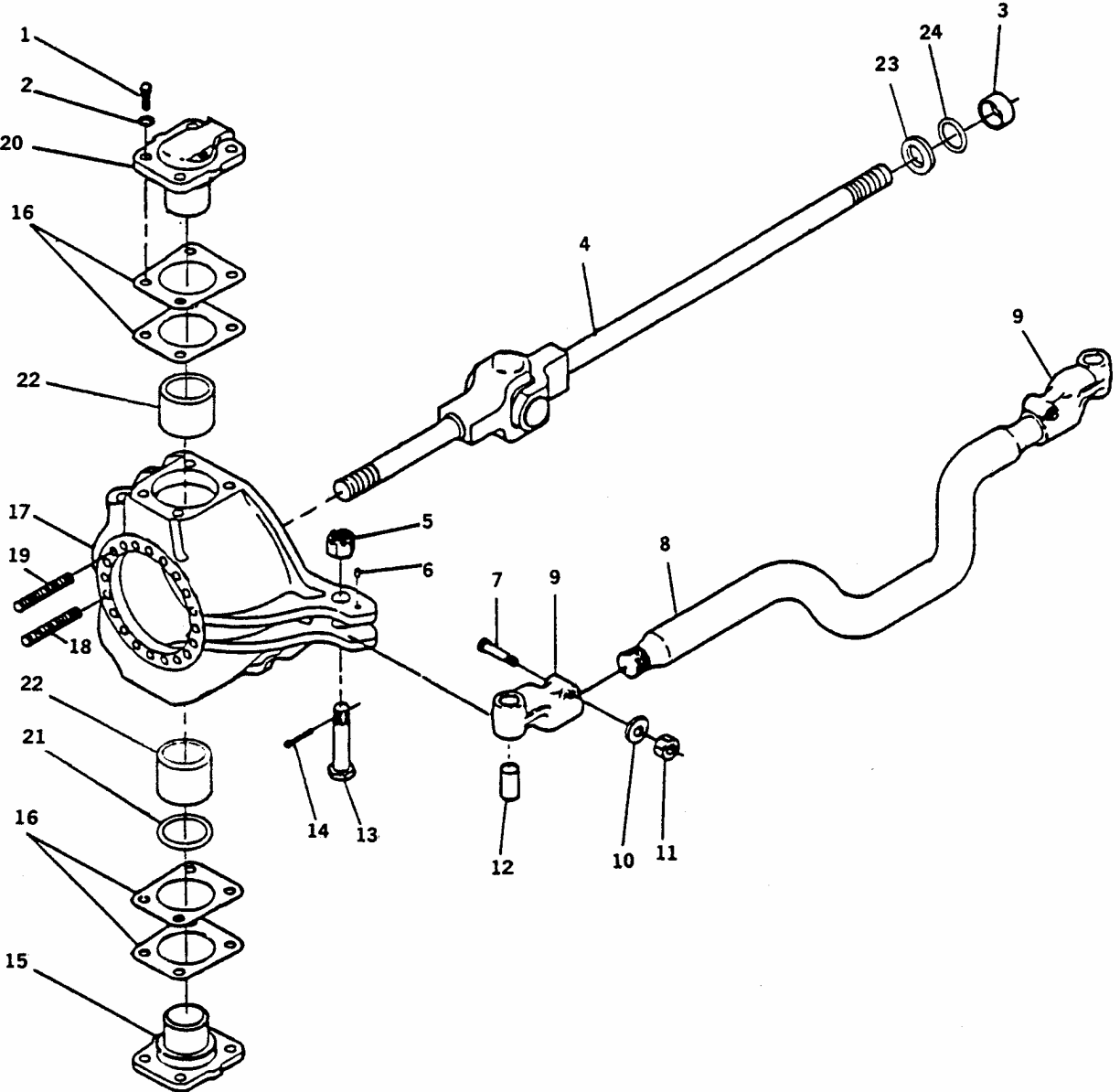
- c. Remove retaining plates (15) and (20).
 - d. Measure total shim pack (16) thickness (i.e., upper pack plus lower pack).
 - e. Subtract actual end play recorded in step b. Divide the result by two.
 - f. Assemble new lower shim pack (16) thickness using same value calculated in step e. If shim pack thickness cannot be met exactly, choose nearest shim pack thickness.
 - g. Assemble new upper shim pack (16) thickness using same value calculated in step e plus 0.005 in. (0.127 mm). If shim pack thickness cannot meet exactly, choose nearest shim pack thickness.
 - h. Install retaining plates (15) and (20) with new shim pack (16).
5. INSTALL PROPELLER SHAFT (4).
- a. Apply film of grease MIL-G-10924 to bushing lips (3), housing oil seal lips and oil seal journal on propeller shaft (4).

CAUTION

Use care to avoid damaging bushing (3) and oil seal (23) when installing propeller shaft (4).

- b. Insert propeller shaft (4) through housing and into side gear of planetary carrier.
6. INSTALL TIE ROD (8).
- a. Press two bushings (12) into tie rod ends (9).
 - b. Install two tie rod ends (9) to original position and secure with nuts (11), washers (10) and capscrews (7).
 - c. Install tie rod (8) and secure with bolts (13) and nuts (5). Install cotter pin (14).
 - d. Install two pins (6).
7. INSTALL PLANETARY ENDS. (REFER TO PAGE 8-44.)
8. CONNECT STEERING CYLINDERS. (REFER TO TM 5-3810-306-20.)
9. INSTALL TIRE AND WHEEL ASSEMBLIES. (REFER TO TM 5-3810-306-20.)

END OF TASK



REAR AXLE REMOVAL

TOOLS: General mechanic's tool kit: automotive (5180-00-177-7033)

SUPPLIES: None

EQUIPMENT CONDITIONS:

- Negative battery cable disconnected at shunt. (RT875CC)
- Battery disconnect switch in off position. (RT875CCS)
- Outrigger fully extended and lowered.
(Refer to TM 5-3810-306-10.)
- Drive lines removed. (Refer to TM 5-3810-306-20.)
- Hydraulic systems shut down. (Refer to TM 5-3810-306-10.)
- Air systems purged. (Refer to TM 5-3810-306-20.)
- Brake chamber lines disconnected and capped.
(Refer to TM 5-3810-306-20.)
- Steer cylinders removed. (Refer to TM 5-3810-306-20.)
- Wheels removed. (Refer to TM 5-3810-306-20.)

REMOVAL:

1. REMOVE REAR AXLE.

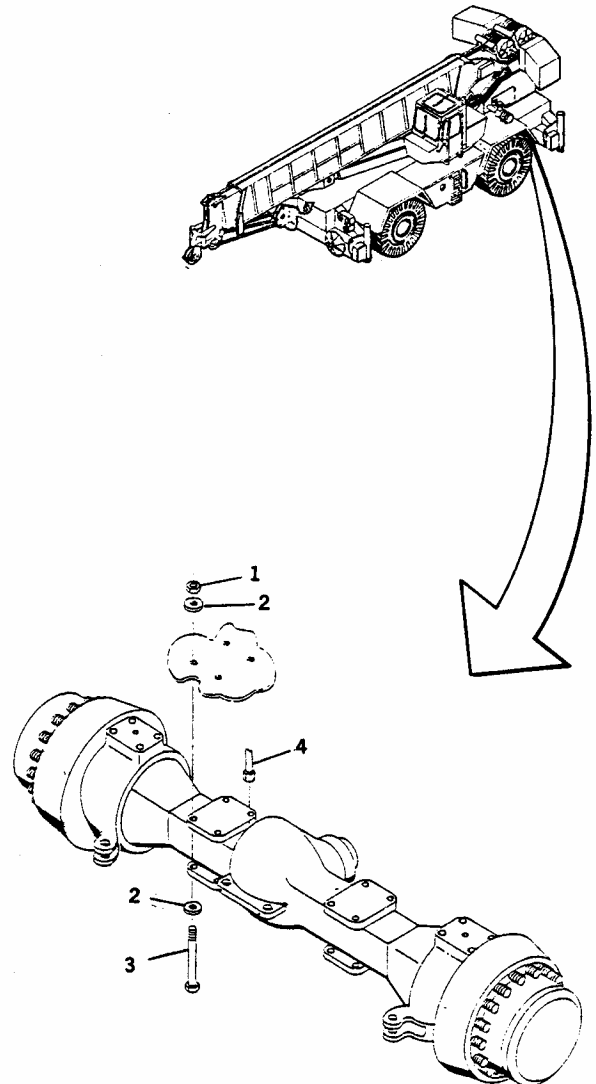
NOTE

Axle weighs approximately 4085 lbs
(1985 kg).

- a. Position jacks which are capable of handling weight of axle, under axle and support axle.
- b. Remove breather line (4) from axle housing.
- c. Remove eight nuts (1), washers (2) and bolts (3) securing axle.
- d. Lower axle to ground.

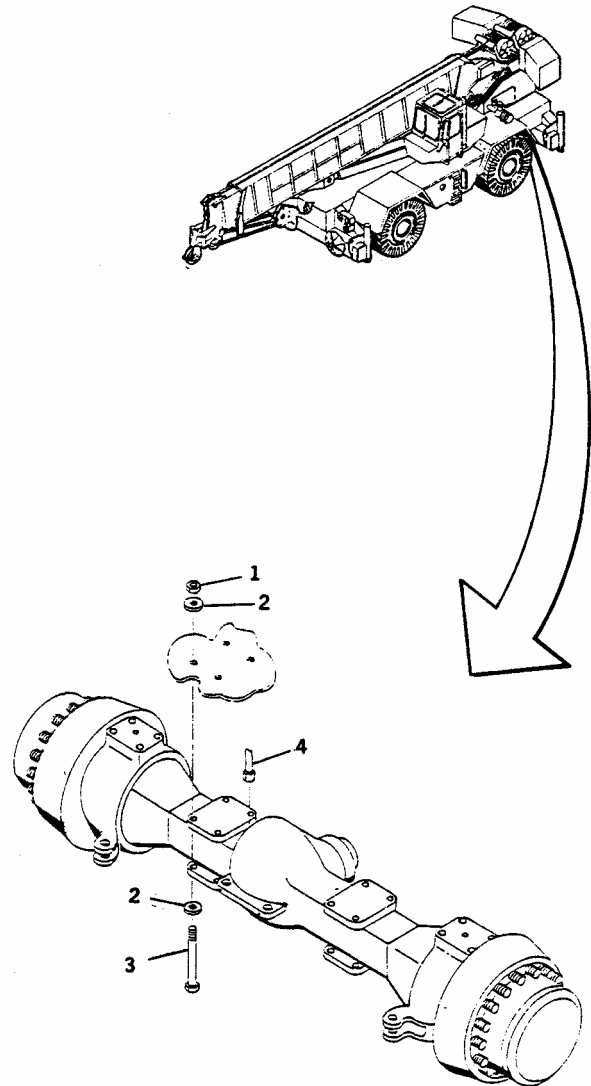
INSTALLATION:

1. INSTALL REAR AXLE.
 - a. Position jacks which are capable of handling weight of axle under axle and support axle.
 - b. Raise axle into place and secure with bolts (3), washers (2) and nuts (1).
 - c. Install breather line (4) at axle housing.
2. INSTALL STEER CYLINDERS. (REFER TO TM 5-3810-306-20.)



3. CONNECT BRAKE CHAMBERS. (REFER TO TM 5-3810-306-20.)
4. INSTALL DRIVE LINES. (REFER TO TM 5-3810-306-20.)
5. INSTALL WHEELS. (REFER TO TM 5-3810-306-20.)
6. CONNECT NEGATIVE BATTERY CABLE AT SHUNT. (REFER TO TM 5-3810-306-20.) (RT875CC)
7. RETRACT AND RAISE OUTRIGGERS TO LOWER THE WHEELS TO THE GROUND. (REFER TO TM 5-3810-306-10.)
8. ALIGN WHEELS STRAIGHT WITH NO TOE IN OR OUT.
9. TEST FOR PROPER OPERATION.

END OF TASK



FRONT AXLE REMOVAL

TOOLS: General mechanic's tool kit: automotive (5180-00-177-7033)

SUPPLIES: None

EQUIPMENT CONDITIONS:

- Negative battery cable disconnected at shunt. (RT875CC)
- Battery disconnect switch in off position. (RT875CCS)
- Outrigger fully extended and lowered.
(Refer to TM 5-3810-306-10.)
- Drive lines removed. (Refer to TM 5-3810-306-20.)
- Hydraulic systems shut down. (Refer to TM 5-3810-306-10.)
- Air systems purged. (Refer to TM 5-3810-306-20.)
- Brake chamber lines disconnected and capped.
(Refer to TM 5-3810-306-20.)
- Steer cylinders removed. (Refer to TM 5-3810-306-20.)
- Wheels removed. (Refer to TM 5-3810-306-20.)

REMOVAL:

1. REMOVE FRONT AXLE.

NOTE

Axle weighs approximately 4085 lbs
(1985 kg).

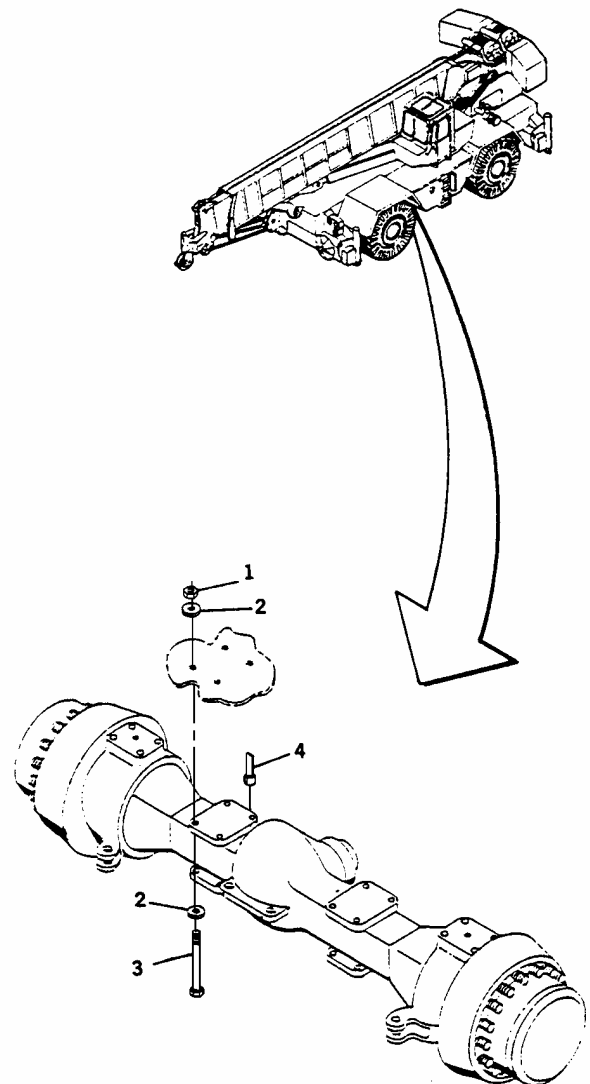
- a. Position jacks which are capable of handling weight of axle, under axle and support axle.
- b. Remove breather line (4) from axle housing.
- c. Remove eight nuts (1), washers (2) and bolts (3) securing axle.
- d. Lower axle to ground.

INSTALLATION:

1. INSTALL FRONT AXLE.

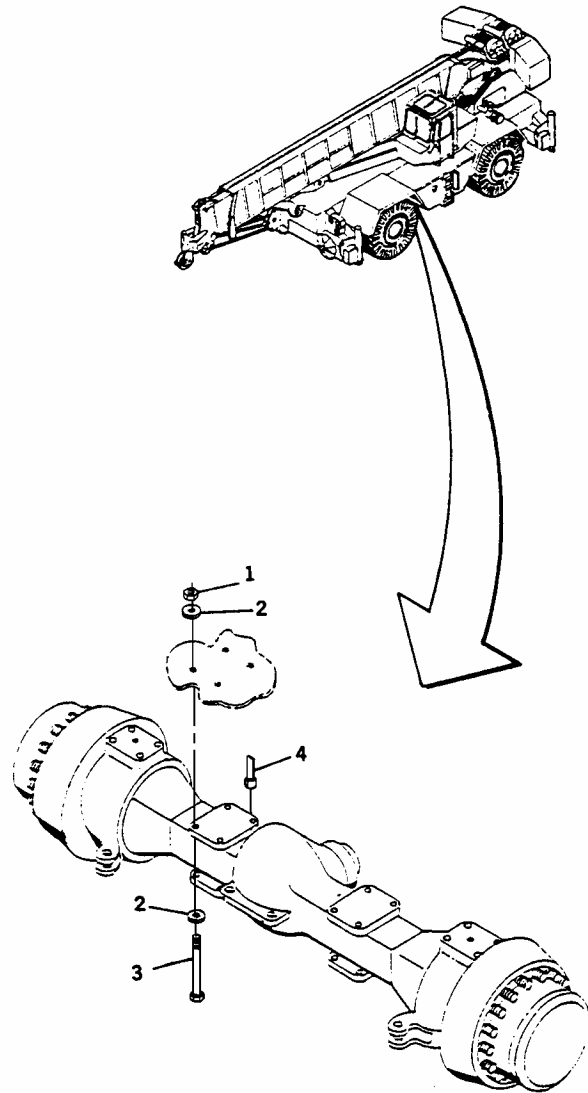
- a. Position jacks which are capable of handling weight of axle under axle and support axle.
- b. Raise axle into place and secure with bolts (3), washers (2) and nuts (1).
- c. Install breather line (4) at axle housing.

2. INSTALL STEER CYLINDERS. (REFER TO TM 5-3810-306-20.)



3. CONNECT BRAKE CHAMBERS. (REFER TO TM 5-3810-306-20.)
4. INSTALL DRIVE LINES. (REFER TO TM 5-3810-306-20.)
5. INSTALL WHEELS. (REFER TO TM 5-3810-306-20.)
6. CONNECT NEGATIVE BATTERY CABLE AT SHUNT. (REFER TO TM 5-3810-306-20.) (RT875CC)
7. RETRACT AND RAISE OUTRIGGERS TO LOWER THE WHEELS TO THE GROUND. (REFER TO TM 5-3810-306-10.)
8. ALIGN WHEELS STRAIGHT WITH NO TOE IN OR OUT.
9. TEST FOR PROPER OPERATION.

END OF TASK



Section II. DIFFERENTIAL MAINTENANCE

DIFFERENTIAL CARRIER

TOOLS: General mechanic's tool kit: automotive (5180-00-177-7033)
Holding fixture
Checking tool (Item 11, Appendix C)
Roller jack
Yoke three-piece installation tool (Item 10, Appendix C)
T-bar (Item 15, Appendix C)
Dial indicator

SUPPLIES: Lint-free cloths (Item 91, Appendix B)
Gear oil MIL-L-2105 (Item 195, Appendix B)
Grease, automotive MIL-G-10924 (Item 37, Appendix B)
Cleaning fluid P-D-680 Type II (Item 1, Appendix B)
Lubriplate (Item 102, Appendix B)
Rockwell adhesive (Item 215, Appendix B)
Gear marking compound (Item 216, Appendix B)
Retaining ring (Item 217, Appendix B)
Gasket (Item 218, Appendix B)
Cotter pin (Item 219, Appendix B) (2 Required)

EQUIPMENT CONDITIONS: Planetary ends removed. (Refer to page 8-44.)
Axle propeller shafts removed. (Refer to TM 5-3810-306-20.)
Propeller (drive) shaft disconnected.
(Refer to TM 5-3810-306-20.)
Tie rods removed. (Refer to page 8-2.)

DISASSEMBLY

1. DRAIN GEAR OIL.

- a. Place suitable container under axle drain plug (40).
- b. Remove drain plug (40).

2. REMOVE DIFFERENTIAL CARRIER.

CAUTION

Loosen two top nuts (41) but do not remove them. Otherwise differential carrier could fall.

- a. Remove nuts (41) and washers (42).
- b. Break differential carrier loose from axle housing using rawhide mallet.
- c. Place roller jack under differential carrier housing (31).

- d. Remove remaining two nuts (41) and washers (42).

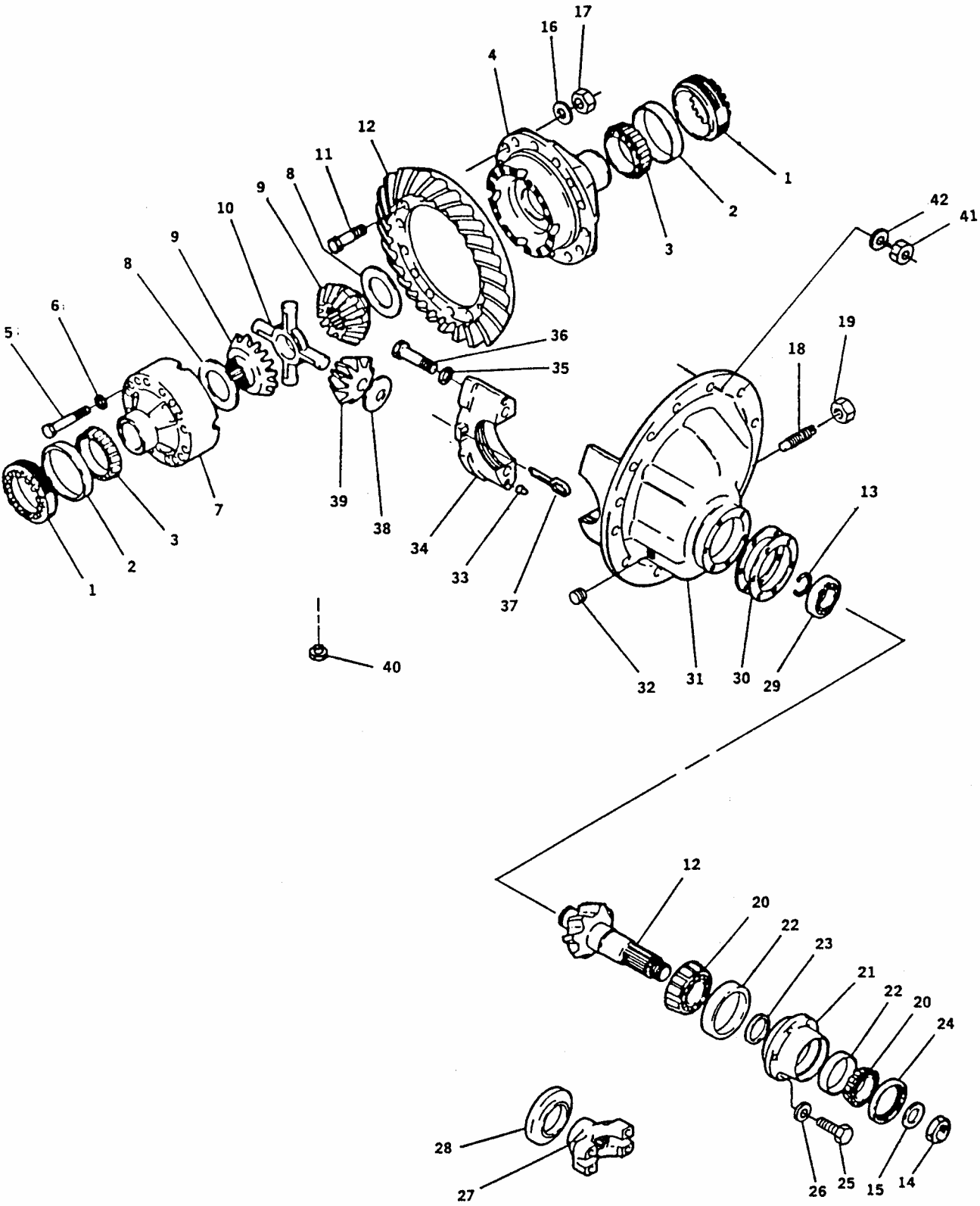
CAUTION

Use rounded pry bar to prevent damage to housing (31).

- e. Work differential carrier free. A small pry bar can be used to straighten housing (31) in axle housing bore.

3. INSPECT BEVEL GEAR (12).

- a. Inspect bevel gear (12), drive and pinion for worn, cracked and chipped teeth.
- b. If bevel gear (12) will not be replaced, measure and record existing backlash to be used at assembly.



4. REMOVE RETAINING RINGS (1) AND CAPS (34).
 - a. Center punch one bearing cap (34) and carrier leg to identify each at assembly.
 - b. Remove and discard two cotter pins (37).
 - c. Remove four capscrews (36) and washers (35).
 - d. Remove two retaining rings (1) and caps (34).
5. REMOVE DIFFERENTIAL AND GEAR ASSEMBLY.
 - a. Loosen jam nut (19) on screw (18). Remove screw (18) and jam nut (19).
 - b. Lift out pinion and retainer assembly.
6. DISASSEMBLE DIFFERENTIAL AND GEAR.
 - a. Match mark differential case (7) and housing (4) for correct alignment at assembly.
 - b. Remove sixteen capscrews (5) and washers (6).

WARNING

Wear safety goggles to prevent eye injury. Do not hit steel parts with a steel hammer. Parts can break or splinter causing injury.

- c. Separate housing (4) and case (7).
- d. Remove spider (10) with four pinion gears (39) and thrust washers (38). Remove two bevel gears (9) and lugs (8).
- e. If necessary, separate bevel gear (12) and housing (4) by removing twelve capscrews (11), nuts (17) and washers (16). Use blocks of wood to support bevel gear (12) and press housing (4) through bevel gear (12).
- f. If necessary, use puller to remove cups (2) and bearings (3).

7. REMOVE PINION (12) AND RETAINER (21).
 - a. Holding yoke (27), remove nut (14) and washer (15).

CAUTION

Do not use a hammer or mallet to remove yoke (27). Otherwise parts will be damaged.

- b. Remove yoke (27) and deflector (28). If necessary, use puller.
- c. Remove eight capscrews (25) and washers (26).

CAUTION

Do not use a pry bar to remove the retainer (21). Otherwise damage to the retainer could result.

NOTE

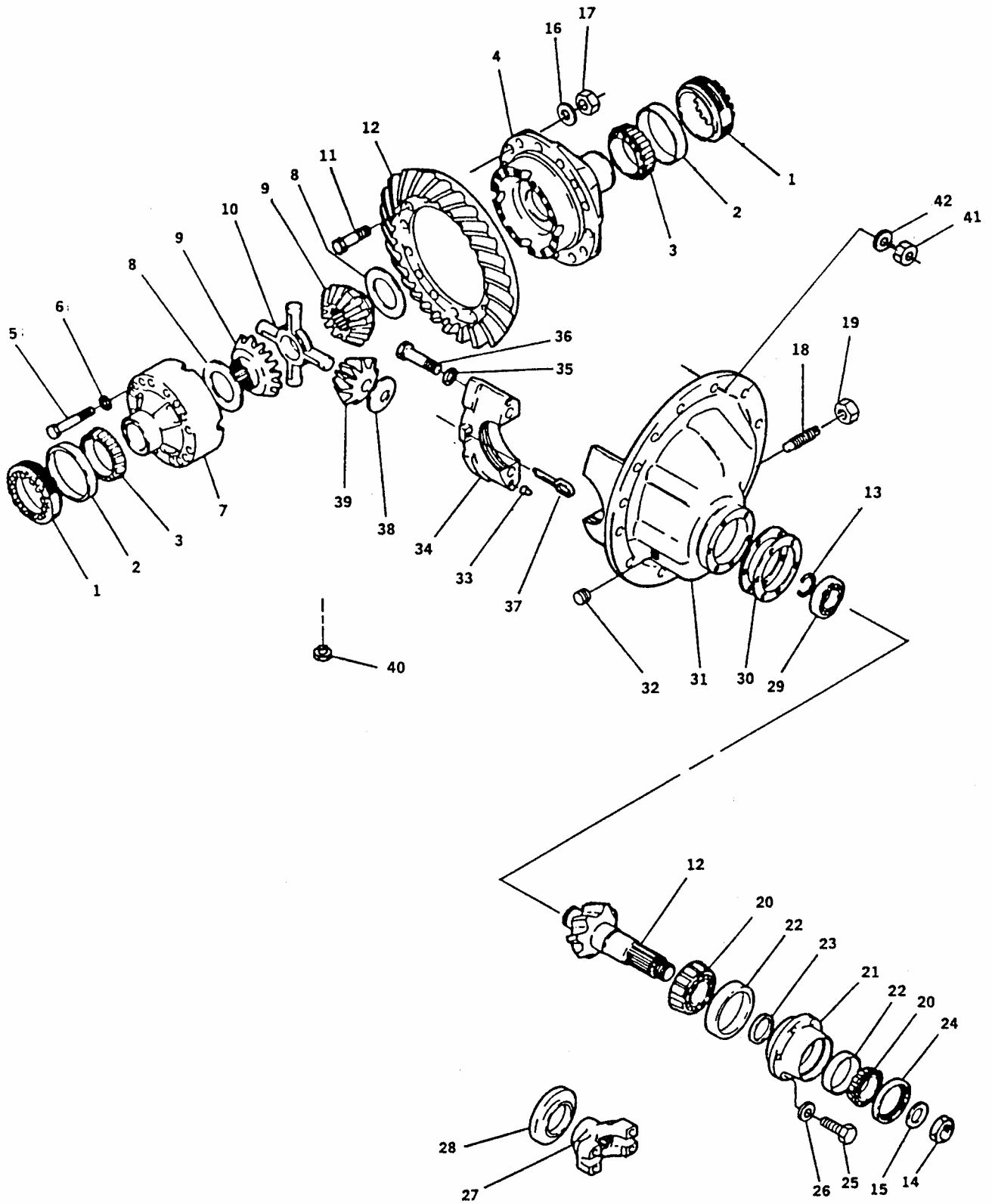
The pinion gasket (24) is mounted in the outer bore of the retainer (21). Remove the gasket (24) after the pinion (12) has been removed.

- d. Remove retainer (21), drive pinion (12) and shims (30) from housing (31). If retainer (21) will not loosen, tap retainer with leather, plastic or rubber mallet.

NOTE

If shims (30) are in good condition, retain shims for later use in assembly. If shims are damaged, first measure and record thickness of shims (30). This dimension will be used to calculate depth of drive pinion.

8. DISASSEMBLE PINION (12) AND RETAINER (21).
 - a. Place pinion (12) and retainer (21) in press. Pinion shaft should be pointed up.



- b. Support retainer (21) under flange area with wood blocks.
- c. Press pinion through retainer (21).

NOTE

The inner bearing (20) will stay on the pinion shaft.

CAUTION

Be careful when using pry bar or screwdriver to remove gasket (24). Otherwise damage to the bore wall could result.

- d. Remove gasket (24).

NOTE

If gasket (24) is a one-piece design, discard gasket. If gasket has a triple lip (with flange), inspect gasket for wear or damage. If OK, reuse the gasket, otherwise discard the gasket.

- 9. REMOVE BEARINGS (20) AND (29).
 - a. Remove cups (22).
 - b. Using press, remove bearing (20) in retainer (21) by supporting retainer flange with wood blocks and driving bearing (20) out of retainer (21).
 - c. Place pinion (12) in soft-faced vise.

CAUTION

The bearing puller must fit under the inner race of the bearing (20). Otherwise damage to the bearing could result.

- d. Remove spacer (23) and, using puller, remove bearing (20) on pinion (12).
- e. Remove snap ring (13).
- f. Using puller remove bearing (29)

CLEANING AND INSPECTION

WARNING

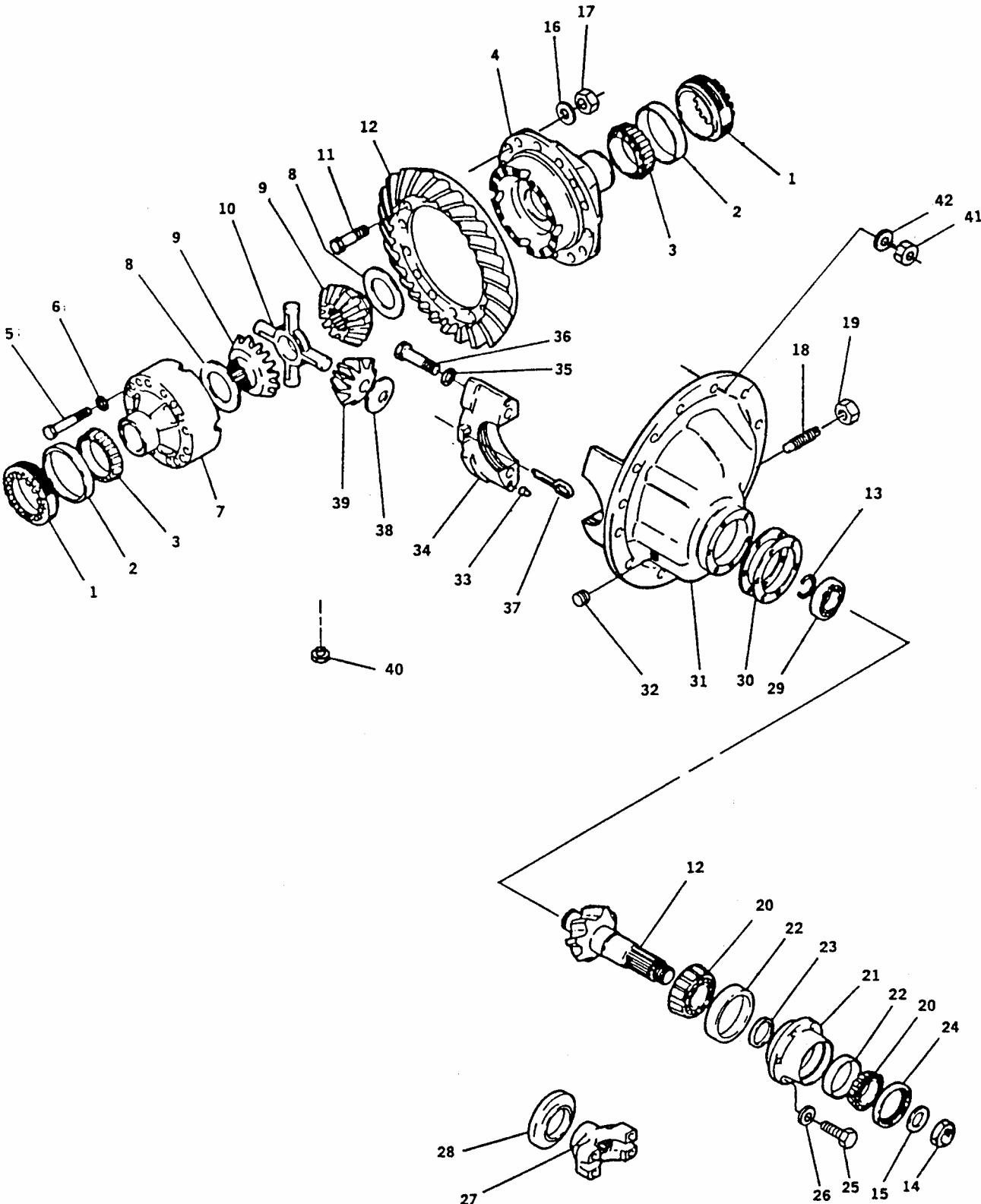
Dry cleaning solvent P-D-680, Type III is toxic and flammable. Wear protective goggles and gloves and use only in a well ventilated area. Avoid contact with skin, eyes, and clothes and do not breathe vapors. Do not use near open flame or excessive heat. The flash point is 200°F (94°C). If you become dizzy while using cleaning solvent, get fresh air immediately and get medical aid. If contact with eyes is made, wash your eyes with water and get medical aid immediately. Compressed air used for cleaning purposes will not exceed 30 psi. Use only with effective chip guarding and personal protective equipment (goggles/shield, gloves, etc.).

- 1. CLEAN ALL PARTS.
 - a. Clean all parts with cleaning solvent P-D-680 Type III.
 - b. Clean bearings in both of solvent moving bearings up and down to dissolve hardened lubricant.

CAUTION

Direct compressed air across bearing face to avoid roller spinning. Otherwise bearing wear could result from high speed spinning without lubrication.

- c. Dry all parts with clean, low pressure air.
- d. Repeat steps b and c until bearings are thoroughly clean.
- e. Wipe all parts with clean, lint-free cloth.
- f. Wrap bearings in clean lint-free cloth until ready for assembly.
- g. Inspect all parts for wear and damage.



ASSEMBLY

1. ASSEMBLE RETAINER (21) AND PINION (12).
 - a. Place retainer (21) in press.
 - b. Support flange of retainer (21) with wood blocks.
 - c. Press two bearing cups (22) into retainer (21) using sleeve of correct size.
 - d. Place pinion (12) in press with gear head down.
 - e. Press inner bearing (20) on pinion (12) until core is flat against gear head of pinion (12). Use sleeve of correct size against bearing inner race.
 - f. Place pinion (12) in press with gear head up.
 - g. Press bearing (29) in pinion (12) until bearing is flat against gear head of pinion (12). Use correct size against bearing inner race.
 - h. Install snap ring (13).
 - i. Apply lubricant MIL-L-2105 on bearing cups (22) and bearings (20) and (29).
 - j. Install pinion (12) in retainer (21)
 - k. Install spacer (23) on pinion (12) against inner bearing (20).

NOTE

Spacer (23) controls preload adjustment of pinion bearings (20).

- l. Install outer bearing (20) on pinion shaft (12) until bearing is flat against spacer (23).

NOTE

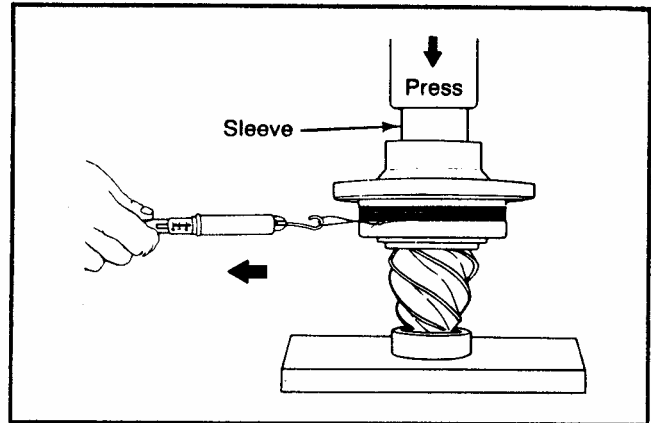
Do not install gasket (24) until bearing preload is set.

2. ADJUST BEARING PRELOAD.

NOTE

New bearings should have a rolling torque of 5 to 45 in-lbs (5.76 to 51.8 kg-cm). Used pinion bearings in good condition should have a rolling torque of 10 to 30 in-lbs (11.5 to 34.6 kg-cm).

PRESS METHOD.

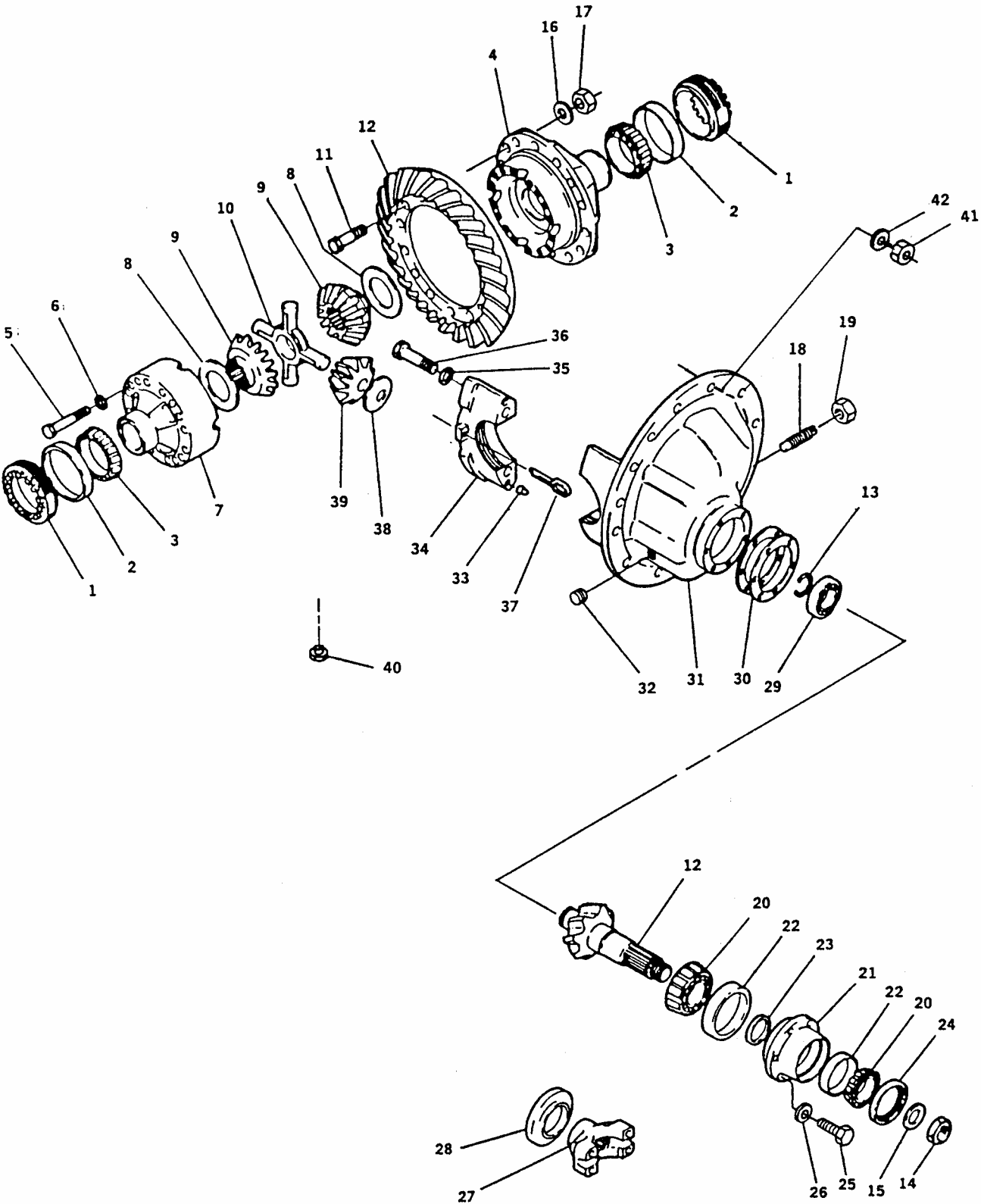


NOTE

If press is not available, or if press does not have a pressure gauge, use yoke or flange method to adjust preload.

- a. Place pinion (12) and retainer (21) in press, gear head down.
- b. Install sleeve of correct size against inner race of outer bearing (20).
- c. Apply and hold correct amount of pressure to pinion bearings. See table.

Pinion Shaft Thread Size	Press Load	
	FT-LBS	KGM
7/8 - 20	22,000	10,000
1 - 20	30,000	13,500
1-1/4 - 12	54,000	24,500
1-1/2 - 12	54,000	24,500
1-1/2 - 18	54,000	24,500
1-3/4 - 12	54,000	24,500
2 - 12	50,000	22,700

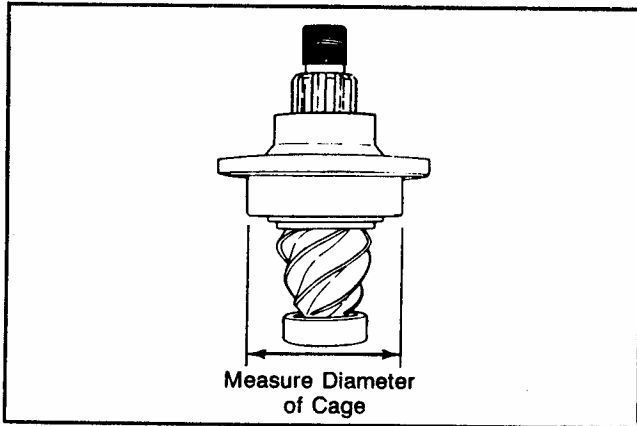


- d. As pressure is applied, rotate retainer (21) several times so that bearings make normal contact.
- e. With pressure being held, wrap a cord around retainer (21) several times.
- f. Attach spring seals to end of cord.

NOTE

Do not record the starting torque. Record only the torque value after retainer starts to rotate. Starting torque gives a false reading.

- g. Pull end with scale on horizontal line. As retainer (21) rotates, read and record value indicated on scale.
- h. Measure and record diameter of retainer where cord was wound. Measurement can be inches or centimeters.



- i. Calculate radius by dividing diameter by 2.
- j. Calculate bearing preload as follows:
Pounds pulled x radius = preload

NOTE

Calculated preload will be in in-lbs if value recorded in step g is in in-lbs. Likewise, preload will be in kg-cm if recorded value is in kg-cm.

- k. If calculated preload is not within 5 to 45 in-lbs (5.76 to 51.8 kg cm) for new bearings or 10 to 30 in-lbs (11.5 to 34.6 kg cm) for used bearings, increase preload by installing thinner bearing spacer (23). Decrease preload by installing thicker bearing spacer (23).
- l. Recheck bearing preload by performing steps a thru j.

YOKE METHOD

CAUTION

Do not install tight fitting yoke on shaft using a hammer or mallet. Otherwise damage to yoke will result.

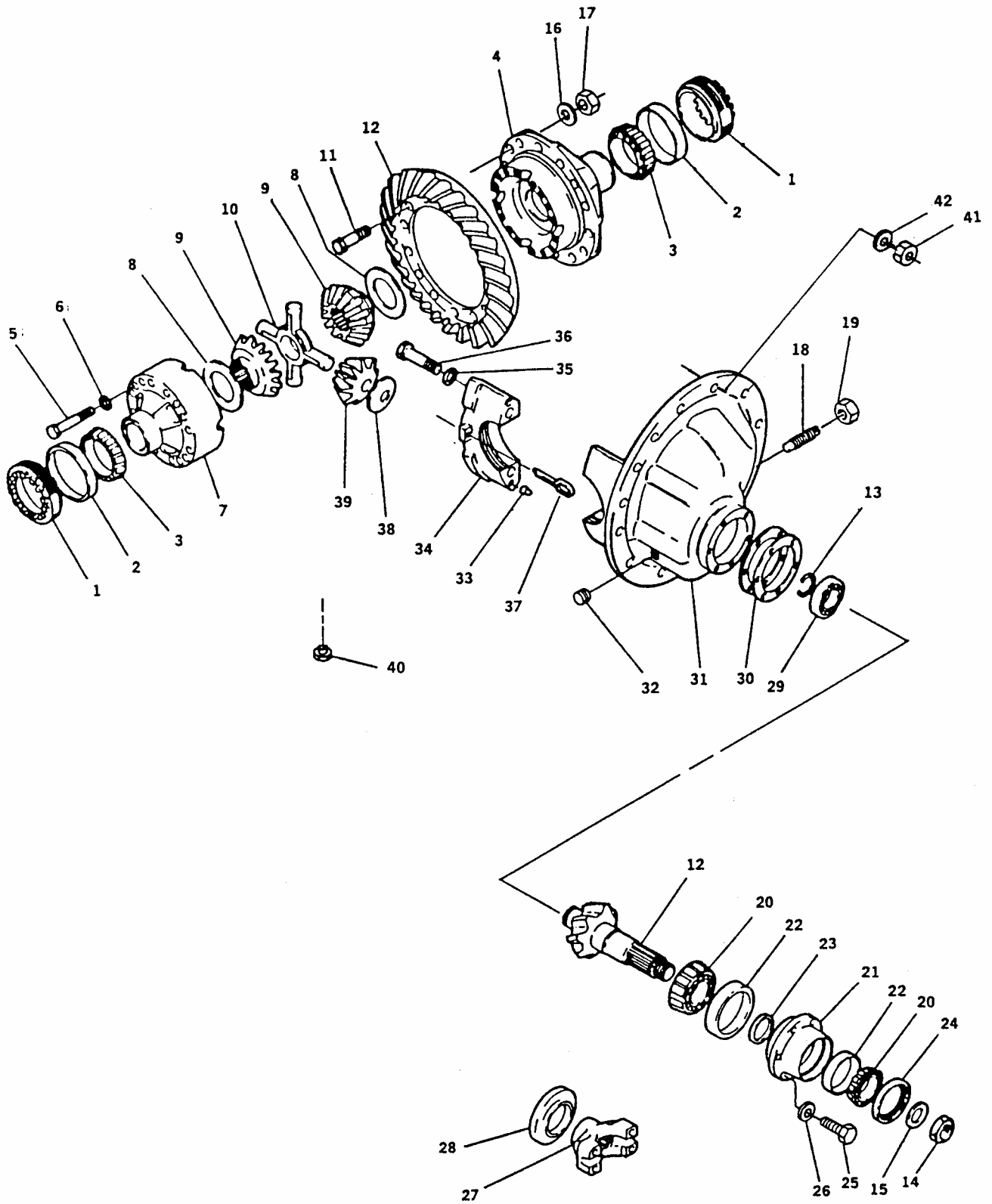
- a. Install yoke (27), washer (15) and nut (14) on pinion (12). Yoke (27) must be against outer bearing (20).

NOTE

If required, use a press to install yoke (27).

- b. Install pinion (12) and retainer (21) in housing (31) without shims (30).
- c. Install eight capscrews (25) without washers (26). Tighten capscrews hand tight.
- d. Attach yoke bar to yoke (27). Bar will hold pinion (12) in position when nut (14) is tightened.
- e. Tighten nut (4) to correct torque value as follows:

Nut Size	Correct Torque	
	LB-FT	KGM
7/8 - 20	200- 275	27.6- 38.0
1 - 20	300- 400	41.4- 55.3
1-1/4 - 20	700- 900	96.8-124.4
1-1/4 - 18	700- 900	96.8-124.4
1-1/2 - 12	800-1100	100.6-152.1
1-1/2 - 18	800-1100	110.6-152.1
1-3/4 - 12	900-1200	124.4-165.9
2 - 12	1200-1500	165.9-207.4



- f. Remove yoke bar.
 - g. Attach torque wrench to nut (14).
 - h. Rotate pinion (12) and read value indicated on torque wrench.
 - i. If preload is not within 5 to 45 in-lbs (5.76 to 51.8 kg cm) for new bearings or 10 to 30 in-lbs (11.5 to 34.6 kg cm) for used bearings, increase preload by installing thinner bearing spacer (23). Decrease preload by installing thicker spacer (23).
 - j. Recheck bearing preload by performing steps a thru i.
 - k. Remove capscrews (25) and pinion (12) with retainer (21).
3. INSTALL GASKET (24).

CAUTION

Insure gasket lips are clean and free of dirt or particles. Otherwise, leaks could occur at gasket.

NOTE

An old three-lipped gasket (24) can be installed if not worn or damaged.

NOTE

On used gaskets, apply Lubriplate or grease MIL-G-10924 to gasket lips.

- a. Apply lubricant MIL-L-2105 to outer surface of gasket (24) and gasket bore in retainer (27).
- b. Place pinion (12) and retainer (21) in a press with gasket bore up.

CAUTION

The diameter of the driver must be larger than the diameter of the gasket (24). Otherwise damage to the gasket (24) could occur.

- c. Using a correct size driver, press gasket (24) into retainer (21) until flange of gasket is against top of retainer (21).

WARNING

Wear eye protection. Do not hit steel parts with a steel hammer. Part or tools can break causing injury.

- d. If press is not available, use mallet and driver to install gasket (24).
- e. Using feeler gauge, check gap at several points around gasket (24). Gap must be from 0.015 to 0.030 in. (0.38 to 0.76 mm). Difference between largest and smallest gap should not exceed 0.010 in. (0.25 mm).

4. ADJUST SHIM PACK THICKNESS.

NOTE

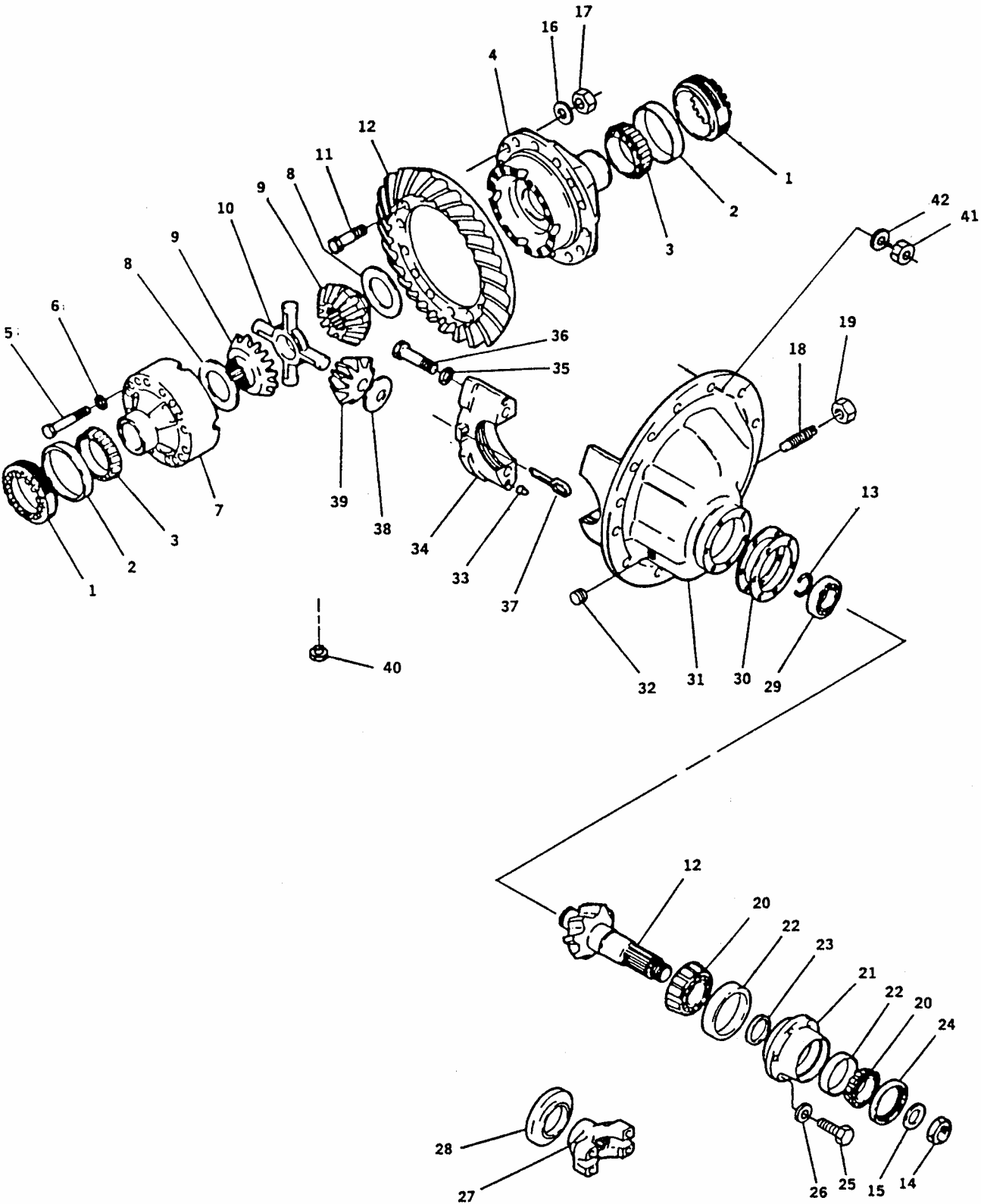
Use this procedure only if new bevel gear (12) and pinion set are being installed.

- a. Measure and record thickness of old shim pack (30).
- b. Check and record pinion core (PC) variation number on old pinion being replaced.

NOTE

The PC variation number can be in 1,000-ths of an inch or 100-ths of a mm. See the following examples:
 PC + 3, PC -3, +3 or -3 = 0.003 in.
 PC +.03, PC -.03, +.03 or -.03 =0.03 mm

- c. If old pinion (12) PC variation number is prefixed with "+", subtract the PC number from old shim pack thickness recorded in step a.
- d. If old pinion (12) PC variation number is prefixed with "-", add the PC number to old shim pack thickness recorded in step a.



NOTE

The value calculated in step c or d is the thickness of a standard shim pack (i.e., without variation).

- e. Check and record PC variation of new pinion (12).
- f. If new pinion (12) PC variation is prefixed with a "+", add the PC number to standard shim pack thickness.
- g. If new pinion (12) PC variation is prefixed with a "-", subtract the PC number from the standard shim pack thickness.

NOTE

The value calculated in steps f or g will be the thickness of the new shim pack (30).

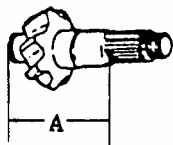
NOTE

The bevel gear (12) and pinion must be replaced as a matched set.

NOTE

If no PC variation number is visible perform the following step.

- h. Measure and record difference between old pinion and new pinion (Dimension A) add or subtract PC number from the standard shim pack thickness.



- 5. INSTALL PINION (12) AND RETAINER (21).

NOTE

Install a minimum of three shims in a pack. If the pack is made up of different thicknesses, install thinnest shims on both sides of pack for maximum sealing.

- a. Install correct shim pack (30). Insure oil slots in shims (30) align with oil slots in retainer (21) and housing (31).

WARNING

Wear eye protection. Do not hit steel parts with a hammer. Parts can break and cause injury.

- b. Install pinion (12) and retainer (21) into housing (31). If required use rubber, plastic or leather mallet.
- c. Install eight capscrews (25) and washers (26). Torque capscrews to 85-115 ft-lbs (113-153 Nm).

- 6. INSTALL YOKE (27).

CAUTION

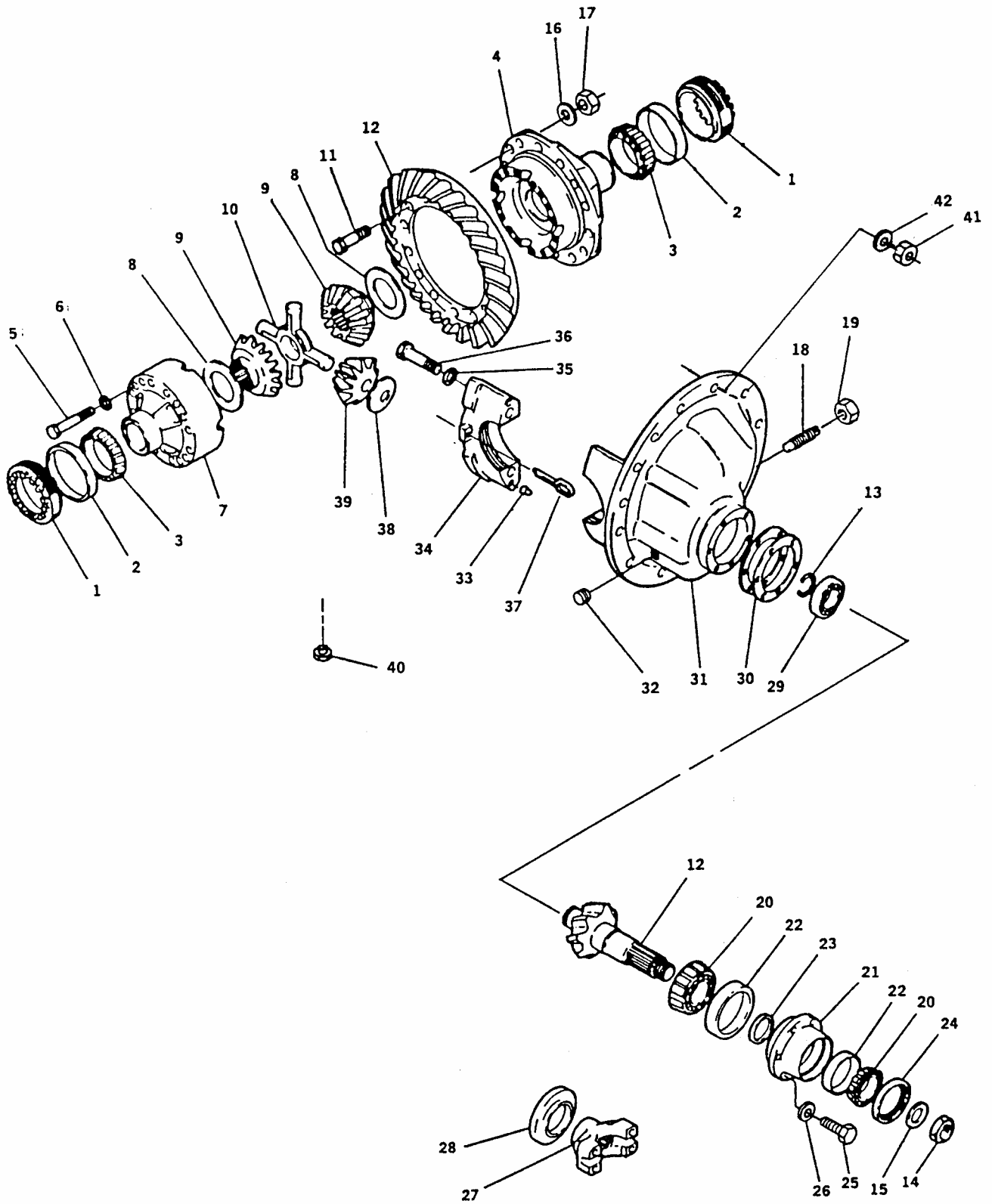
Do not install tight fitting yoke (27) with a hammer or mallet. Otherwise damage to the yoke could result.

- a. Install deflector (28), yoke (27), washer (15) and nut (14). Yoke (27) must be against outer bearing (20).

NOTE

If yoke fit is tight, use three piece yoke installation tool.

- 7. ASSEMBLE BEVEL GEAR (12) TO HOUSING (4).



WARNING

Wear protective clothing and gloves to protect you from hot bevel gear (12).

CAUTION

Do not press cold bevel gear (12) to housing (4). A cold bevel gear will damage the housing due to tight fit. Metal particles trapped between the parts will cause excessive gear run-out.

- a. Place bevel gear (12) in tank of hot water (160° to 180°F (71° to 81°C)) for fifteen minutes.
- b. Safely lift bevel gear (12) from water using lifting tool.
- c. Install bevel gear (12) on housing (4) immediately. If bevel gear does not fit easily on housing, repeat step a.
- d. Align holes in bevel gear (12) with those in housing (4).
- e. Install twelve nuts (17), washers (16) and capscrews (11). Insure screw heads are on gear side of assembly and heads are against gear.
- f. Torque nuts (17) to 180-230 ft-lbs (239-306 Nm).

8. INSTALL BEARINGS (3).

- a. Using press and sleeve, install bearings (3) on housing (4) and case (7).

9. ASSEMBLY HOUSING (4) AND CASE (7).

- a. Apply lubricant MIL-L-2105 to inside surfaces of housing (4) and case (7), lugs (8), spider (10), thrust washers (38) and gears (9) and (39).
- b. Place housing (4) on bench with bevel gear (12) up.

CAUTION

Side gears (9) on some models have hubs of differing lengths.

- c. Install one lug (8) and insert length side gear (9) in housing (4).
- d. Install spider (10) with four pinion gears (39) and thrust washers (38) into housing (4).
- e. Install second side gear (9) and lug (9) over spider (10).
- f. Install case (7) over housing (4) and gears. Rotate case as needed to align match marks.

NOTE

The housing (4) and case (7) are held together with Dri-Loc fasteners.

- g. Install four capscrews (5) and washers (6). Each capscrew should be spaced evenly around case (7). Torque each capscrew (5) in a pattern opposite each other to 85-115 ft-lbs (113-153 Nm).
- h. Install and torque sixteen remaining capscrews (5) and washers (6) to 85-115 ft-lbs (113-153 Nm).

10. CHECK ROLLING RESISTANCE OF DIFFERENTIAL NEST.

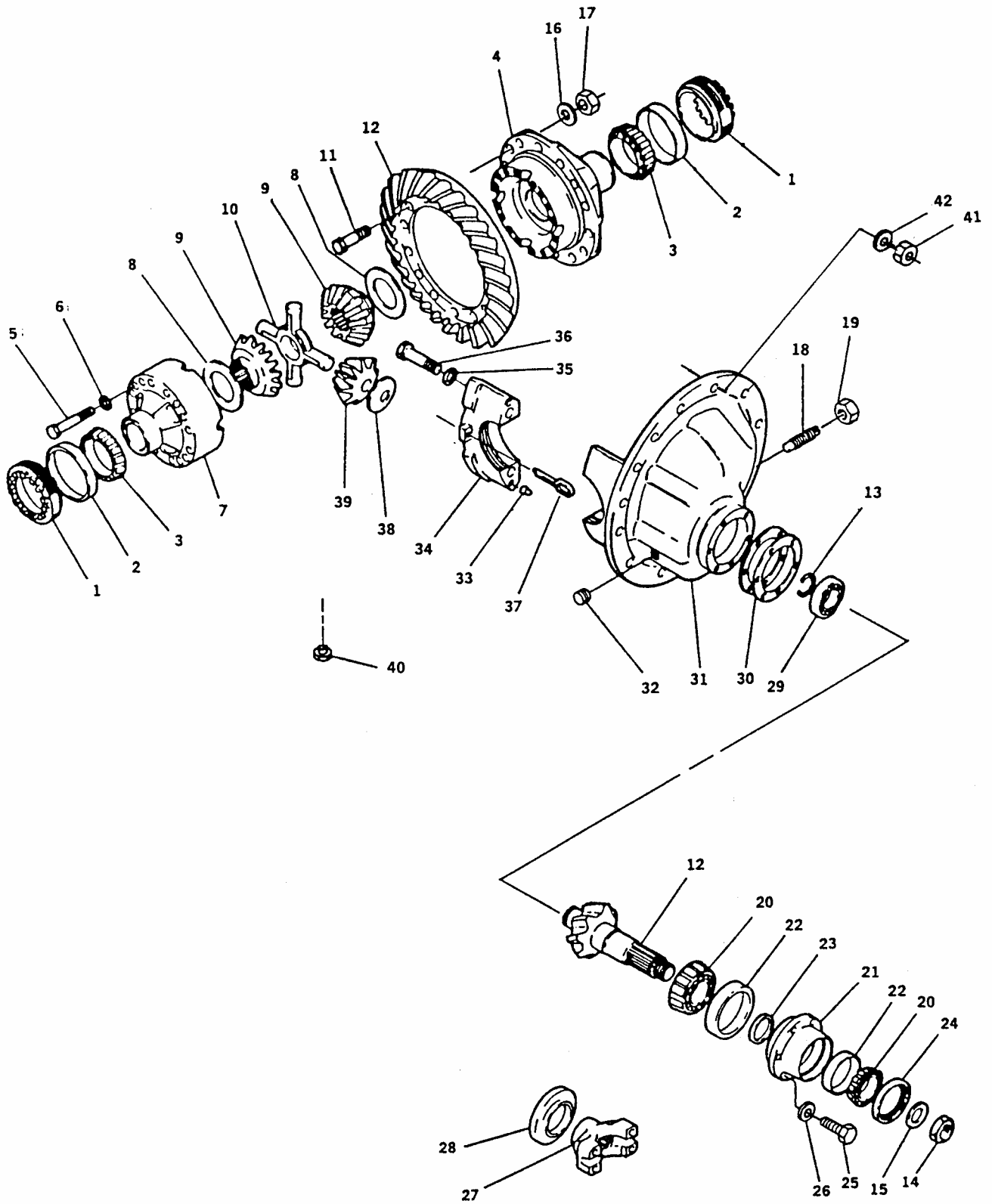
CAUTION

Use soft metal covers over vise jaws to protect bevel gear (12).

- a. Place differential and bevel gear (12) in a vise. Clamp at bevel gear (12).
- b. Insert checking tool into case (7). Checking tool can be made by cutting an axle drive shaft to an appropriate length and welding a nut on end to accept wrench socket.
- c. Using socket and torque wrench, rotate differential nest while observing torque wrench scale. Correct rolling resistance is 50 ft-lbs (67 Nm) torque applied to one side gear.

11. INSTALL CUPS (2).

- a. Clean and dry cups (2) and bores of carrier legs and caps (34).



- b. Apply grease MIL-G-10924 to inner diameter of cups (2) and on bearings (3).
- c. Apply Rockwell adhesive in bearing bores of carrier legs and caps (34).
- d. Install cups (2) over bearings (3).

12. INSTALL DIFFERENTIAL AND BEVEL GEAR (12).

- a. Safely lift differential and bevel gear (12) into housing (31). Bearing cups (2) must be flat against bores between carrier legs.
- b. Install two retaining rings (1). Turn each retaining ring by hand until each is tight against bearing cups (2).
- c. Install caps (34) over bearings and retaining rings as marked during assembly.

WARNING

Wear eye protection. Do not hit steel parts with a steel hammer. Parts can break and cause injury.

NOTE

The caps (34) must fit easily against bearings (3), retaining rings (1) and housing (31). Do not force caps (34) into position.

- d. Strike each cap (34) with a light leather, plastic or rubber mallet.

CAUTION

If caps (34) are not installed in correct locations, the bores and threads will not match the housing (31).

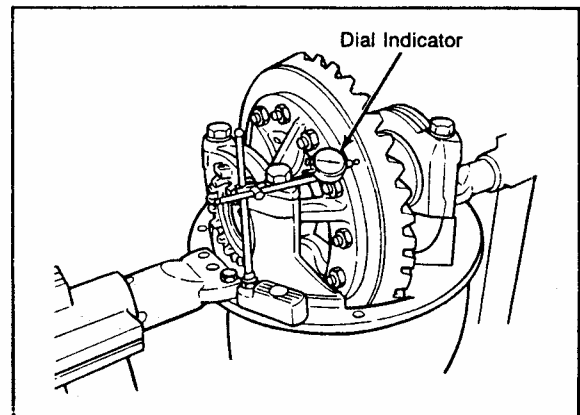
- e. If caps (34) do not fit correctly, recheck alignment marks. Remove caps (34) and repeat steps c and d.
- f. Install two capscrews (36) and washers (35) for each cap (34). Tighten capscrews (36) four to six turns then tighten capscrews (36) to 270-350 ft-lbs (360-465 Nm).

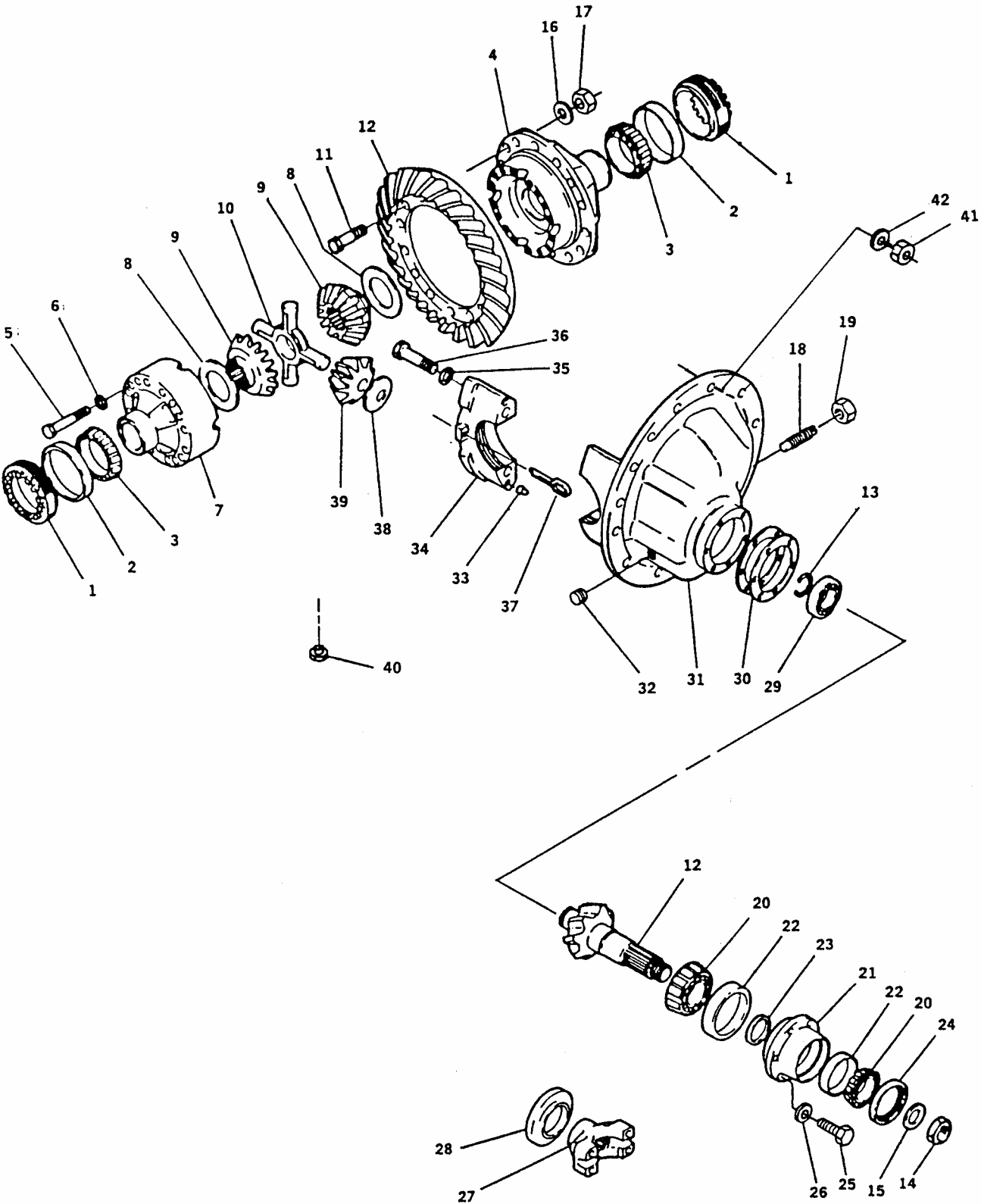
13. ADJUST BEARING PRELOAD.

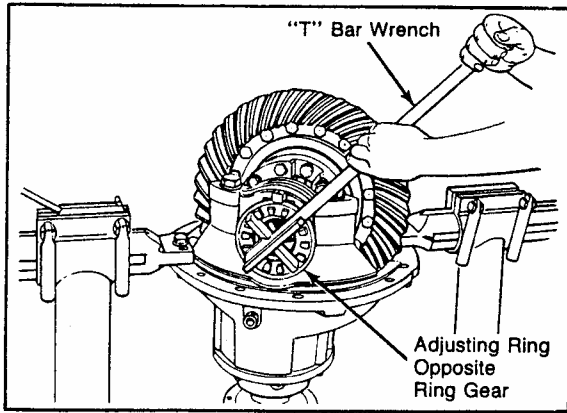
NOTE

The preload of the differential bearing is 15 to 35 in-lbs (17.3 to 40.3 kg cm) torque. The expansion between bearing cups is 0.006 to 0.013 in. (0.15 to 0.33 mm).

- a. Attach dial indicator on mounting flange of housing (31).
- b. Adjust dial indicator so that plunger or pointer is against back surface of bevel gear.







CAUTION

When turning retaining rings (1) always use a tool that engages two or more opposite notches in ring. A "T" bar wrench can be used. If tool does not correctly fit into notches, damage to lugs could occur.

- c. Loosen adjusting ring (1) opposite bevel gear (12) such that a small amount of end play shows on dial indicator.

CAUTION

Pry bars must not touch bearings (3).

- d. Move differential and bevel gear (12) to left and right with pry bars while reading dial indicator. Insert pry bars between retaining rings and housing ends.
- e. Insert pry bars at locations other than those noted in step d and move differential and bevel gear (12) left and right.
- f. Tighten same adjusting ring (1) (loosened in step c) until no end play shows on dial indicator.
- g. Repeat step d and e.
- h. Turn each adjusting ring (1) one notch from zero end play measured in step f to preload differential bearings.

14. CHECK BEVEL GEAR RUNOUT.

- a. Attach dial indicator to mounting flange of housing (31).

- b. Adjust indicator so that plunger or pointer is against back surface bevel gear.
- c. Adjust dial indicator to zero (0).
- d. Rotate differential and bevel gear while reading dial indicator. Runout of bevel gear should not exceed 0.008 in. (0.20 mm).
- e. If bevel gear runout exceeds 0.008 in. (0.20 mm), remove differential and bevel gear (12) and perform steps f thru h.
- f. Inspect all parts for wear. Replace parts as required.
- g. Install differential and bevel gear (12) in housing (31).
- h. Perform steps a thru d.

15. ADJUST BEVEL GEAR BACKLASH.

Specifications:

Bevel gears that have a pitch diameter of less than 17 in. (431.8 mm).

Range of backlash setting - 0.008 to 0.18 in. (0.20 to 0.46 mm).

Backlash setting for new gears - 0.012 in. (0.30 mm).

Bevel gears that have a pitch diameter of 17 in. (431.8 mm) or greater than 17 in.

Range of backlash setting - 0.010 to 0.020 in. (0.25 to 0.51 mm).

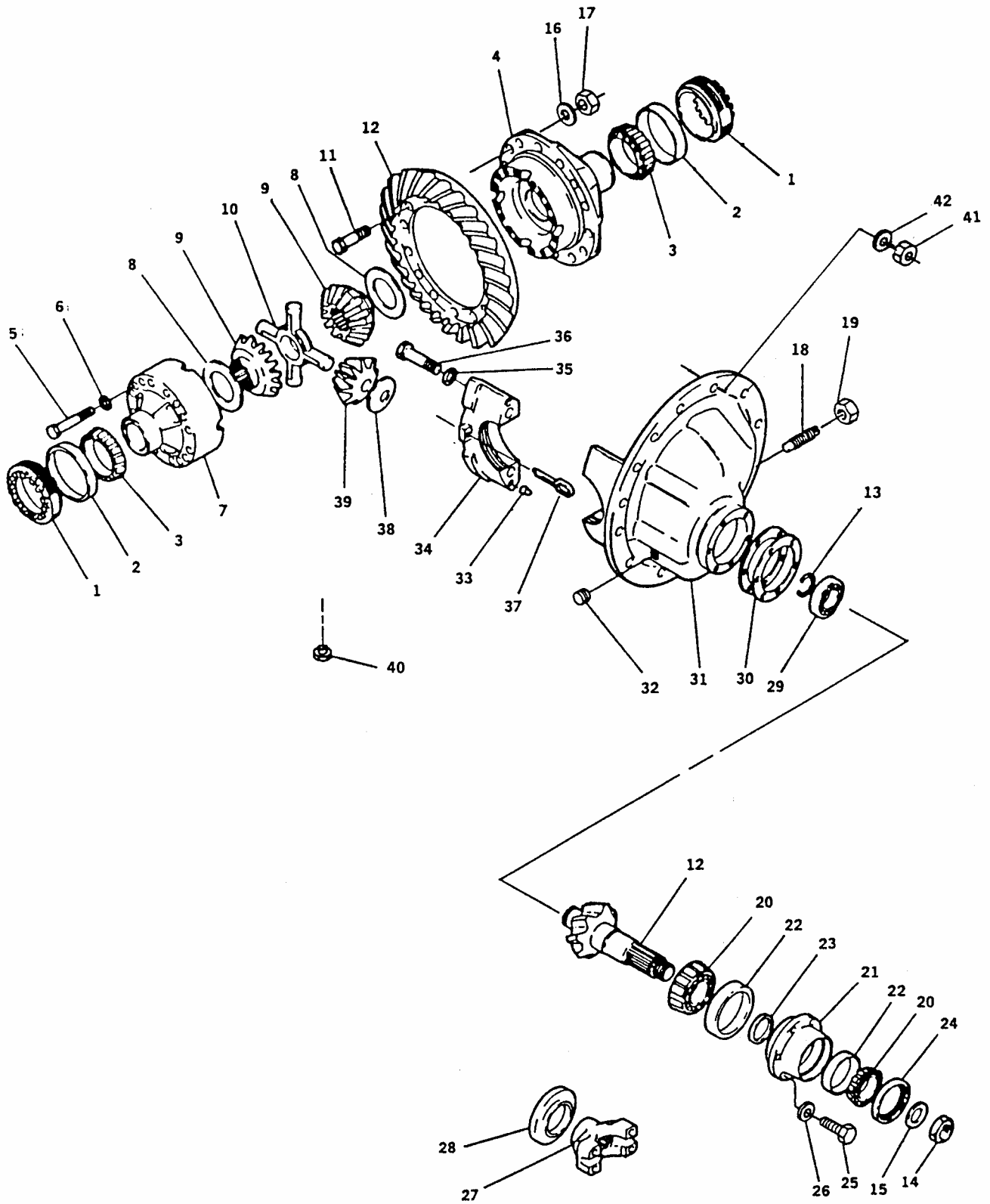
Backlash setting for new gear sets 0.005-0.015 in. (0.13 - 0.38 mm).

NOTE

Measure the outer diameter of bevel gear (12) for approximate pitch diameter.

NOTE

If the old bevel gear set is installed, adjust the backlash to the setting that was measured before the carrier was disassembled.



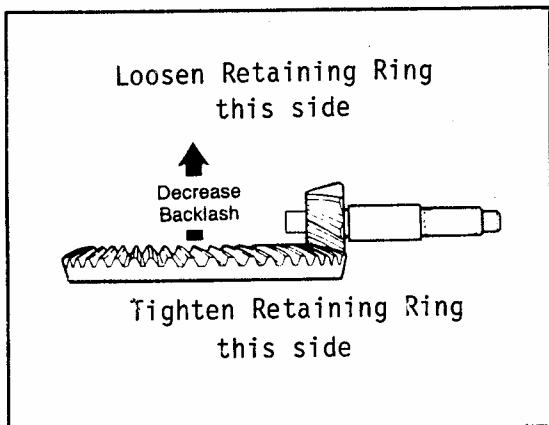
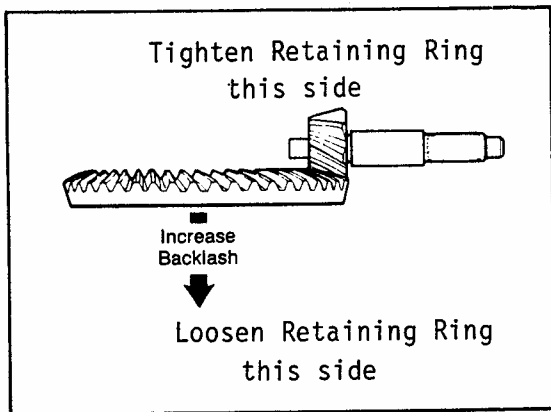
NOTE

If a new bevel gear set is installed, adjust the backlash to the correct specification for new gear sets.

NOTE

During the check of tooth contact patterns, the backlash can be adjusted within specification limits, if needed, to change the location of the pattern.

- a. Attach a dial indicator on mounting flange of housing (31).
- b. Adjust dial indicator so that plunger or pointer is against tooth surface of bevel gear (12).
- c. Adjust dial of indicator to zero (0).
- d. Hold pinion in position.



- e. While reading dial indicator, rotate differential and bevel gear a small amount in both directions, against teeth of drive pinion. If backlash reading is within specification, continue by checking tooth contact patterns. If backlash reading is not within specifications, adjust backlash as needed by following steps f and g.

NOTE

Backlash is increased by moving the bevel gear away from the drive pinion. Backlash is decreased by moving the bevel gear toward the pinion.

- f. Loosen one bearing retaining ring (1) one notch then tighten opposite ring same amount.

NOTE

When you adjust backlash, move the bevel gear ONLY. DO NOT move the drive pinion.

- g. Repeat steps b thru f until backlash is within specifications.

16. CHECK TOOTH CONTACT PATTERNS.

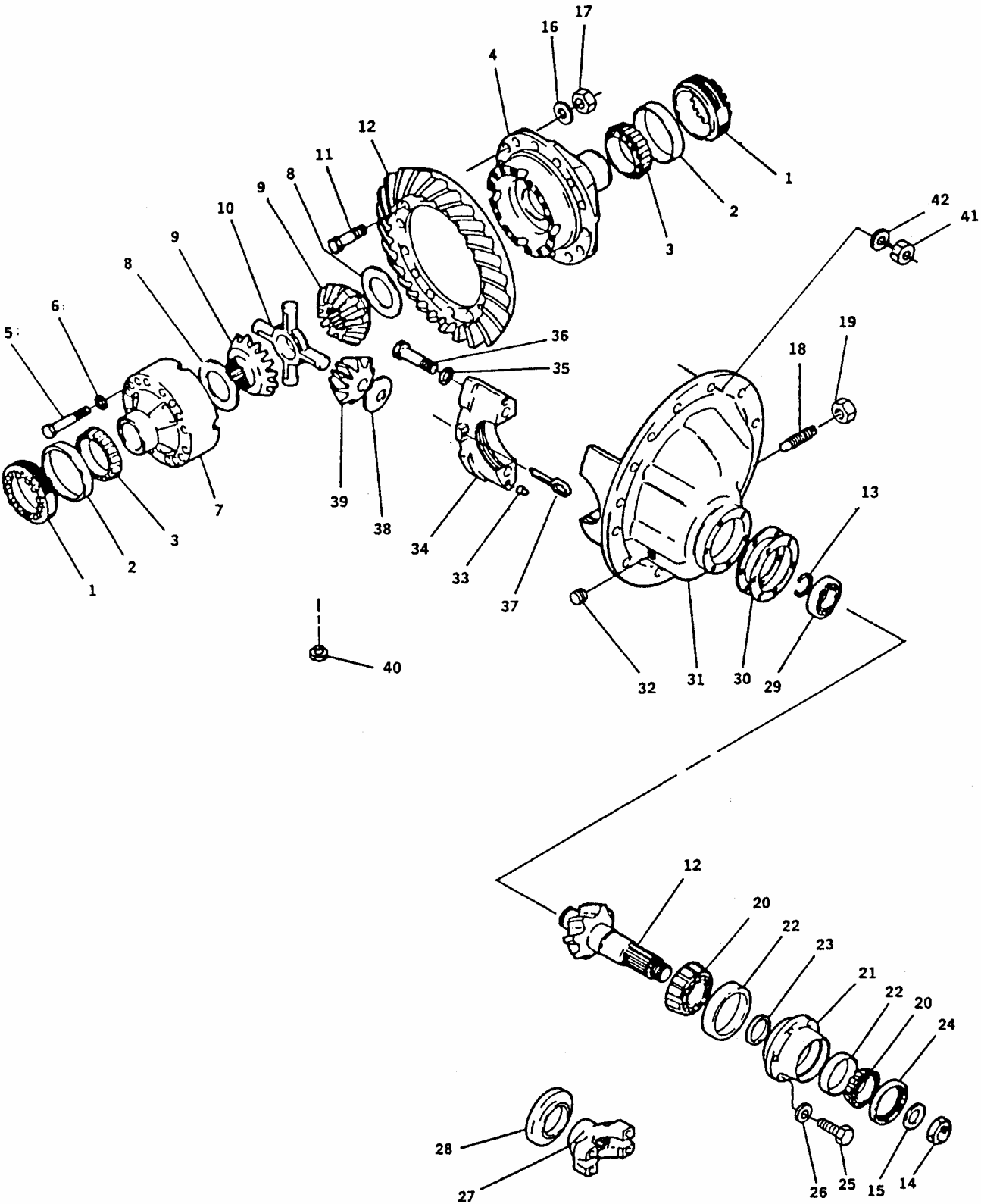
NOTE

In the following procedures movement of the contact pattern in the length of the tooth is indicated as toward the "heel" or "toe" of the bevel gear (12).

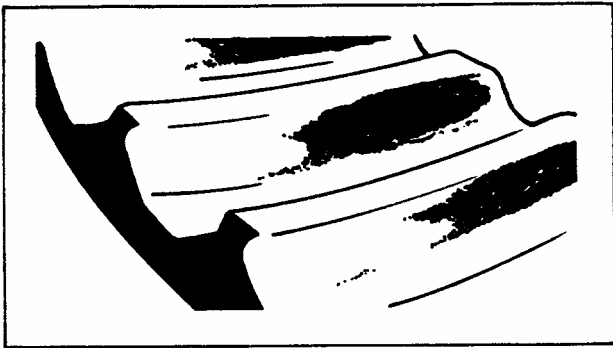
NOTE

Always check tooth contact patterns on the drive side of the gear teeth.

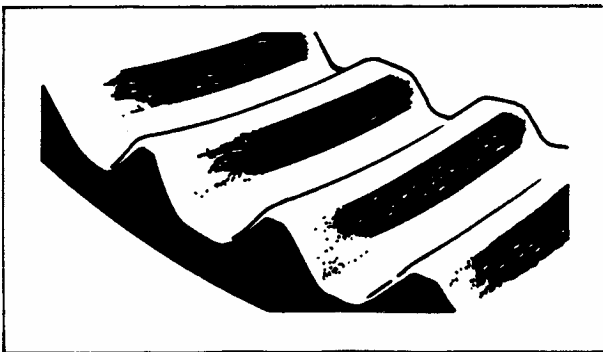
- a. Adjust backlash of a new gear set to either 0.012 in. (0.30 mm) or 0.015 in. (0.38 mm). Adjust backlash of old gear set to setting that was measured before carrier was disassembled.



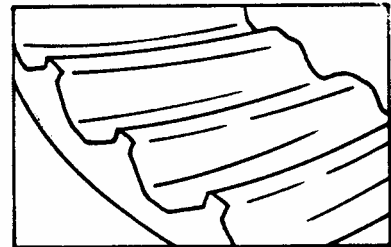
- b. Apply a marking compound to approximately 12 gear teeth of the bevel gear (12). Rotate bevel gear so that 12 gear teeth are next to drive pinion.
- c. Rotate bevel gear (12) forward and backward so that 12 gear teeth go past drive pinion six times to get contact patterns. Repeat if needed to get a clearer pattern.
- d. Look at contact patterns on the ring gear teeth. Compare patterns to the following:



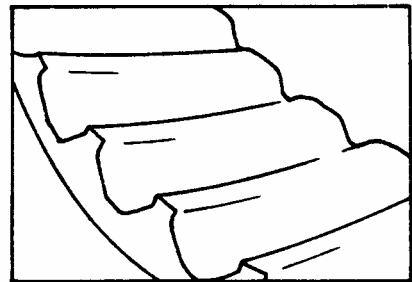
- (1) The location of a good hand rolled contact pattern should be between center and toe of tooth and in center between top and bottom of tooth.
- (2) When carrier is being operated, a good pattern will extend approximately full length of gear tooth. The top of pattern will be near top of gear tooth.



- (3) The location of a good hand rolled contact pattern for an old gear set **MUST** match wear pattern in bevel gear. The contact pattern will be smaller in area than wear pattern.
- (4) If contact patterns require adjustment, continue by following step e to move contact patterns between top and bottom of gear teeth. If contact patterns are in center of gear teeth, continue by following step f.



High Pattern

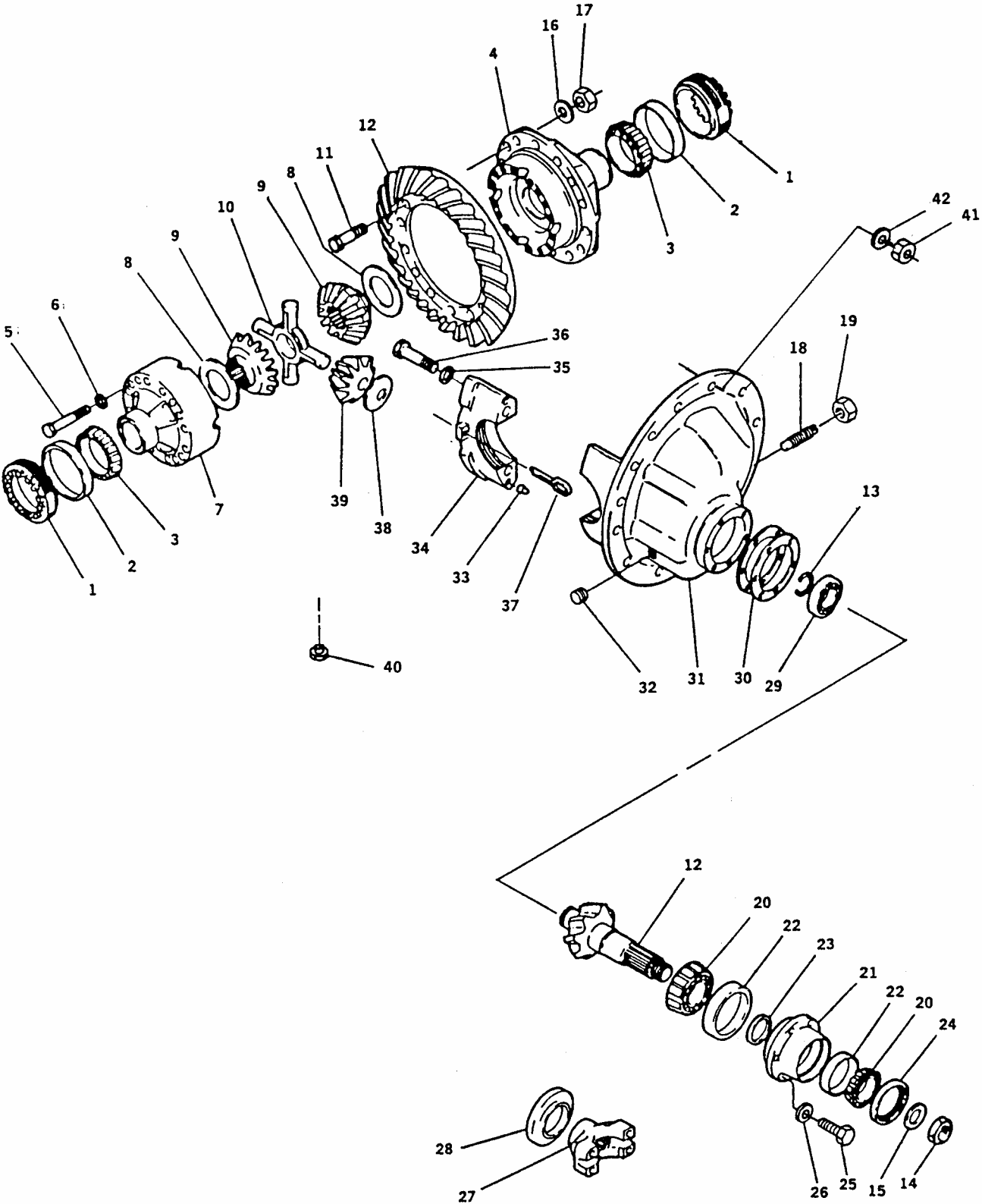


Low Pattern

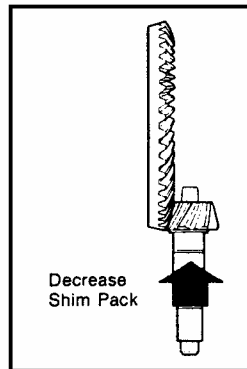
- e. Change thickness of shim pack (30) under retainer (21) to move the contact patterns between top and bottom of gear teeth. Use following procedure.

NOTE

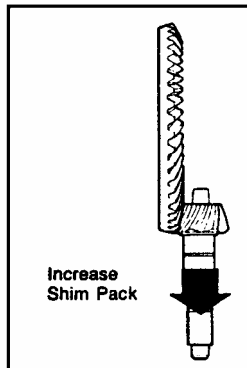
A high contact pattern indicates that the drive pinion was not installed deep enough into the carrier. A low contact pattern indicates that the drive pinion was installed too deep in the carrier.



- (1) Remove drive pinion and retainer (21) from carrier.

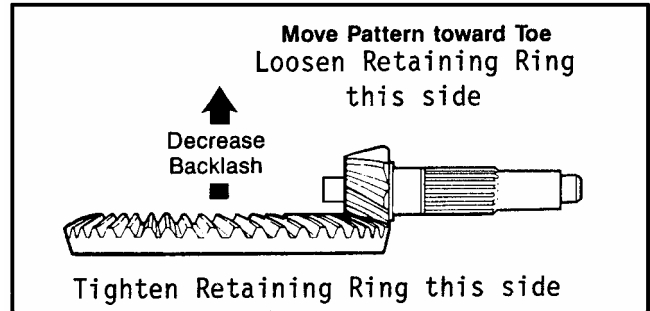


- (2) To correct a high contact pattern, decrease thickness of the shim pack (30) under retainer (21). When you decrease the thickness of the shim pack, the drive pinion will move toward the bevel gear.

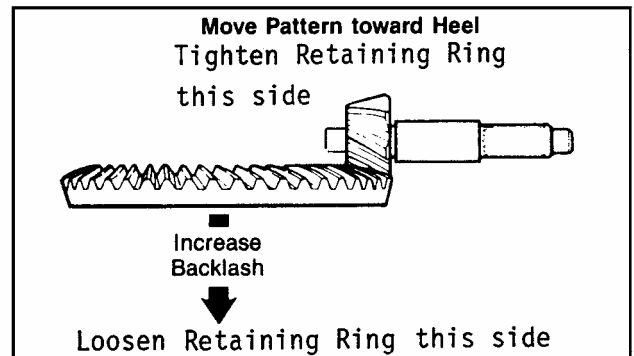


- (3) To correct a low contact pattern increase thickness of shim pack (30) under retainer (21). When you increase the thickness of the shim pack, the drive pinion will move away from the bevel gear.
- (4) Install drive pinion (12), retainer (21) and shims (30) into carrier.
- (5) Repeat steps b, c, and d until the contact patterns are in center between the top and bottom of gear teeth.

- f. Adjust backlash of the bevel gear within specification range to move contact patterns to correct location in length of gear teeth.



- (1) Decrease backlash to move contact patterns toward toe of the bevel gear teeth.

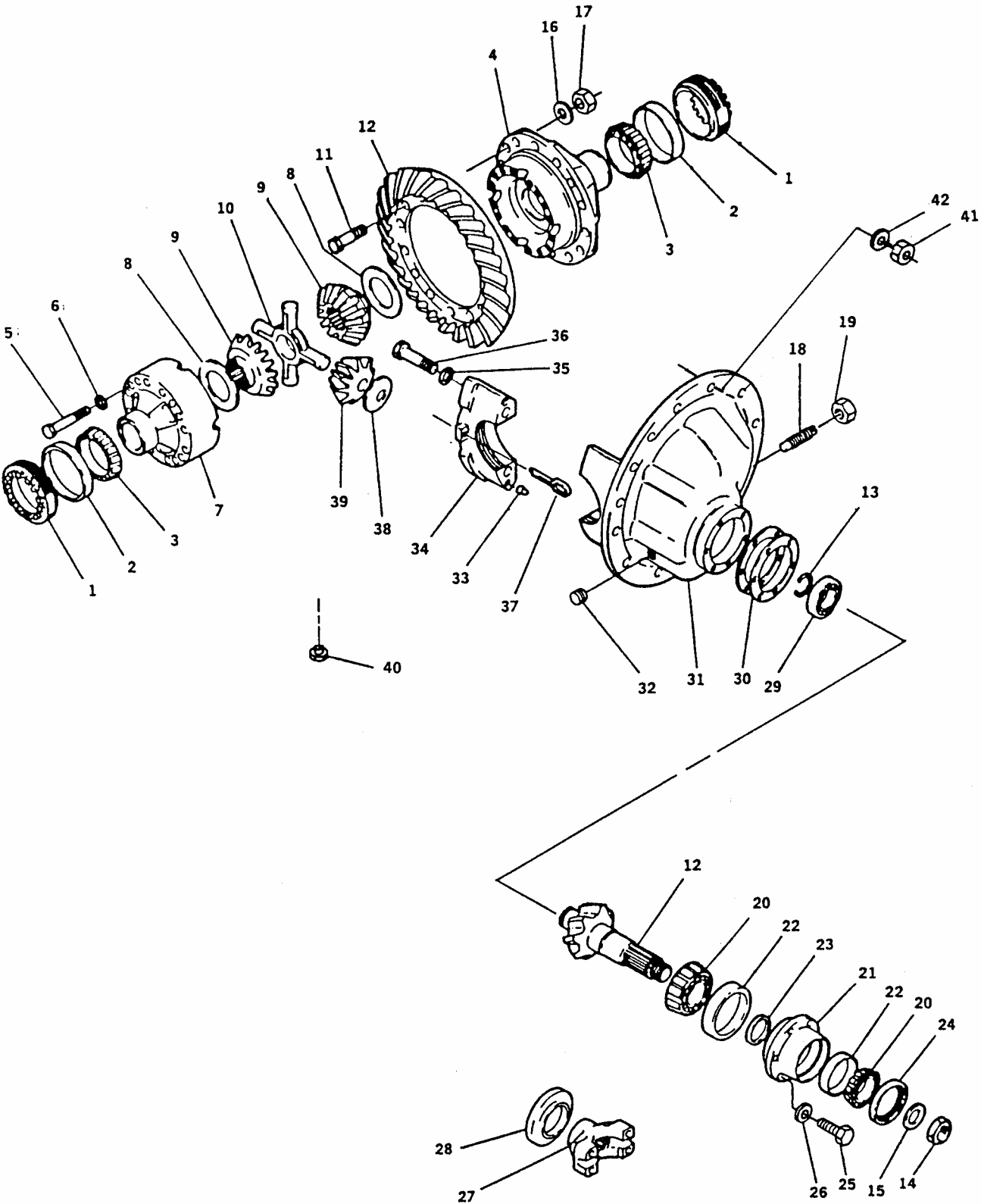


- (2) Increase backlash to move contact patterns toward the heel of the bevel gear teeth.
- (3) Repeat steps b, c, d, and f until contact patterns are at correct location in length of gear teeth.

- g. Install cotter pins (37) between lugs of retaining rings (1) and boss of caps (34). Bend ends of cotter pins around boss.

17. INSTALL THRUST SCREW (18).

- a. Rotate carrier in stand and position it with bevel gear up.
- b. Install jam nut (19) on thrust screw (18) one half distance between both ends.
- c. Install thrust screw (18) and tighten firmly against bevel gear (12).



- d. Loosen thrust screw (18) 1/2 turn to obtain correct adjustment of 0.025 to 0.045 in. (0.635 to 1.143 mm) clearance.
- e. Tighten jam nut (19) to 150-190 ft-lbs (200-253 Nm).

18. INSTALL DIFFERENTIAL CARRIER INTO AXLE HOUSING.

WARNING

Dry cleaning solvent P-D-680, Type III is toxic and flammable. Wear protective goggles and gloves and use only in a well ventilated area. Avoid contact with skin, eyes, and clothes and do not breathe vapors. Do not use near open flame or excessive heat. The flash point is 200°F (94°C). If you become dizzy while using cleaning solvent, get fresh air immediately and get medical aid. If contact with eyes is made, wash your eyes with water and get medical aid immediately. Compressed air used for cleaning purposes will not exceed 30 psi. Use only with effective chip guarding and personal protective equipment (goggles/shield, gloves, etc.).

- a. Clean inside of axle housing and mounting surface where carrier fastens. Use cleaning solvent and clean, lint-free cloths. Dry with low pressure compressed air.
- b. Inspect axle housing for damage. Repair or replace axle housing.
- c. Check for loose or damaged studs (43).

- d. Apply liquid adhesive (Item 215, Appendix B) and install studs (43) if removed.
- e. Apply silicone gasket material to mounting surface of housing where carrier fastens.

CAUTION

Do not use hammer or mallet to install carrier. Otherwise, damage to mounting flange and seals could occur.

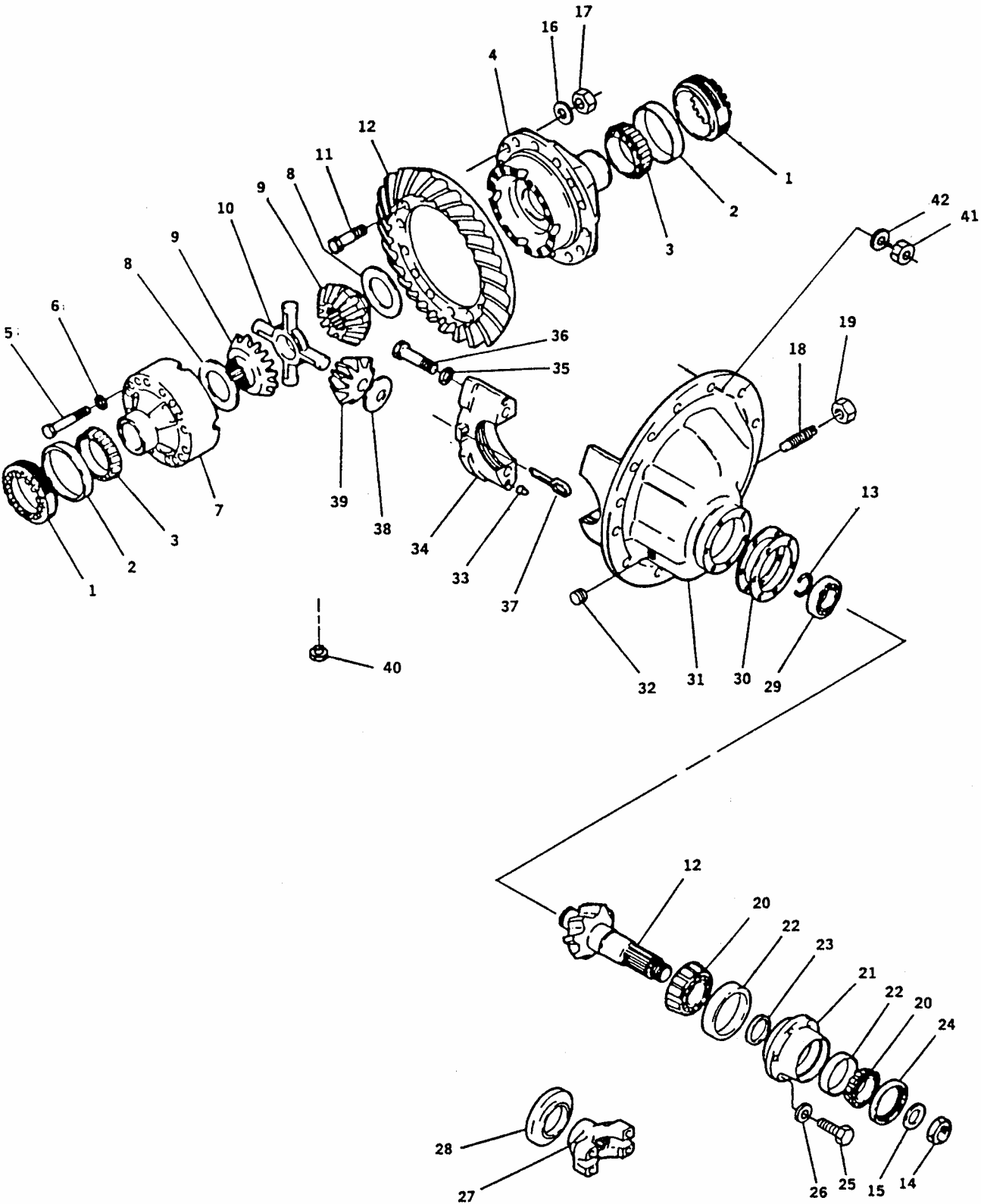
- f. Using roller jack, align and carefully push carrier into axle housing (31).
- g. Install four nuts (41) and washers (42). Tighten nuts hand tight.
- h. Tighten four nuts (41) two or three turns in a pattern opposite each other.
- i. Repeat step h until four nuts (41) are tightened to 150-230 ft-lbs (200-306 Nm).
- j. Install remaining nuts (41) and washers (42). Torque nuts (41) to 150-230 ft-lbs (200-306 Nm).
- k. Install drain plug (40).

19. INSTALL AXLE PROPELLER SHAFTS. (REFER TO TM 5-3810-306-20.)

20. INSTALL PLANETARY ENDS. (REFER TO PAGE 8-44.)

21. INSTALL PROPELLER (DRIVE) SHAFTS. (REFER TO TM 5-3810-306-20.)

22. SERVICE AXLE WITH LUBRICANT. (REFER TO LO 5-3810-306-12.)



DRIVE UNIT TORQUE VALUES

FASTENER	THREAD SIZE	TORQUE VALUE FT-LB (Nm)	
Plug, Oil Drain (40)	.50-14	25 minimum	(34 minimum)
Capscrew, Differential Case (5)	.38-16	35-50	(48-68)
	.44-14	60-75	(81-102)
	.50-13	85-115	(115-156)
	.56-12	130-165	(176-224)
	.62-11	180-120	(244-312)
	Flange Head M12 x 1.75	85-103	(115-140)
	Standard Hex Head M12 x 1.75	75-95	(100-130)
	M16 x 2	203-251	(275-340)
Nut, Bevel Gear Bolt (17)	.50-13	75-100	(102-136)
	.50-20	85-115	(115-156)
	.62-11	150-190	(203-258)
	.62-18	180-230	(244-312)
	M12 x 1.25	66-81	(90-110)
	M12 x 1.75	77-85	(104-115)
	Flange Head M16 x 1.5	192-214	(260-290)
Standard Hex Head M16 x 1.5	190-225	(260-305)	
Capscrew, Bearing Cap (36)	.56-12	110-145	(149-197)
	.62-11	150-190	(203-258)
	.75-10	270-350	(366-475)
	.88-14	360-470	(488-637)
	.88-9	425-550	(576-746)
	M16 x 2	181-221	(245-300)
	M20 x 2.5	347-431	(470-585)
	M22 x 2.5	479-597	(650-810)
Nut, Housing to Carrier Stud (41)	.44-20	50-75	(68-102)
	.50-20	75-115	(102-156)
	.56-18	110-165	(149-224)
	.62-18	150-230	(203-312)
Jam Nut, Thrust Screw (44)	.75-16	150-190	(203-258)
	.88-14	150-300	(203-407)
	1.12-16	150-190	(203-258)
	M22 x 1.5	148-210	(200-285)
	M30 x 1.5	236-295	(320-400)
Nut, Drive Pinion (14)	.88-20	200-275	(271-373)
	1.0-20	300-400	(407-542)
	1.25-12	700-900	(949-1220)
	1.25-18	700-900	(949-1220)
	1.50-12	800-1100	(1085-1491)
	1.50-18	800-1100	(1085-1491)
	1.75-12	900-1200	(1220-1627)
	M32 x 1.5	738-918	(1000-1245)
	M39 x 1.5	922-1132	(1250-1535)
	M45 x 1.5	996-1232	(1350-1670)
Capscrew, Retainer (25)	.38-16	30-50	(41-68)
	.44-14	50-75	(68-102)
	.50-13	75-115	(102-156)
	.56-12	110-165	(149-224)
	.62-11	150-230	(203-312)
	M12 x 1.75	74-96	(100-130)

END OF TASK

UNIVERSAL JOINT ASSEMBLY

TOOLS: General mechanic's tool kit: automotive (5180-00-177-7033)

SUPPLIES: None

EQUIPMENT CONDITIONS: Wheel ends removed. (Refer to page 8-44.)

WARNING

Be sure to wear protective eye covering to avoid personal injury.

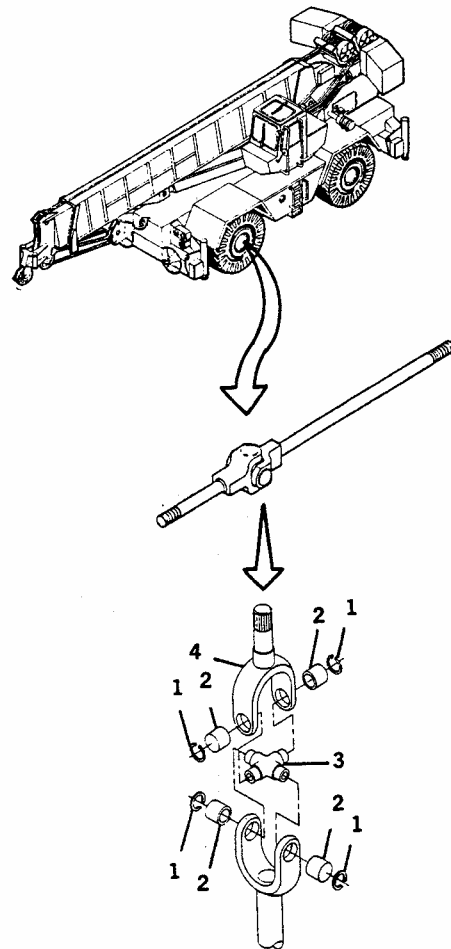
REMOVAL:

1. REMOVE AXLE SHAFT AND UNIVERSAL JOINT FROM HOUSING.

NOTE

Avoid damaging oil seal in housing.

2. REMOVE UNIVERSAL JOINT.
 - a. Remove the snap rings (1) from the two ears in each yoke. Use a suitable tool.
 - b. Position joint assembly in an open vise with one yoke horizontal and resting on top of vise jaws. (Do not tighten vise).
 - c. With a suitable soft hammer, tap upper ear of the vertical yoke several times. This will drive the vertical yoke down and push out upper needle bearing and cap (2). (Bearing cap has a highly polished surface and care should be exercised not to mar or scratch surface during removal operation).
 - d. If metal retainers have worked free from bearing caps, remove them from arms of cross (3), through hole in yokes.
 - e. Turn vertical yoke upside down and remove needle bearing and retainer on opposite side following procedure outlined in Steps c and d.
 - f. Remove vertical yoke by gently working yoke off arms of cross.
 - g. To complete disassembly, hold remaining yoke in a vertical position and rest cross (3) arms on top of open vise. Repeat Steps c, d and e.
 - h. Remove cross from yoke by gently working cross free.

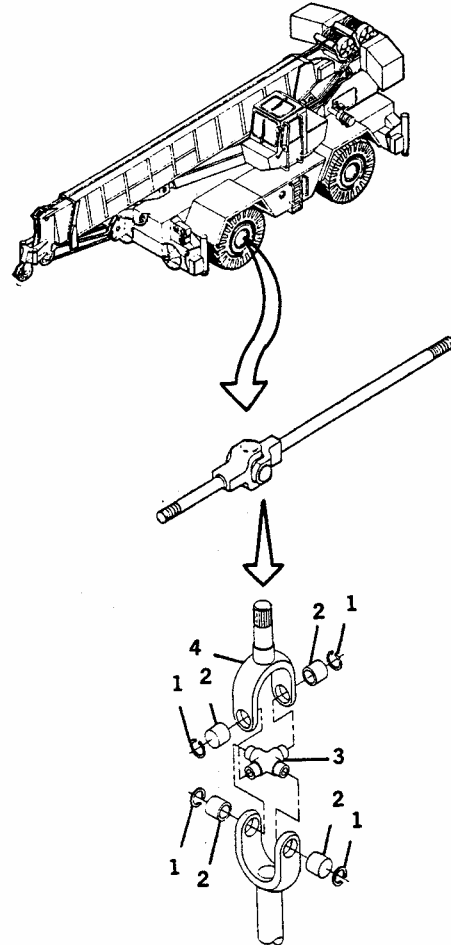
**INSPECTION:**

1. CLEAN AND INSPECT ALL PARTS.
 - a. When inspecting bearings, keep needles, caps, and retainers together.
 - b. Replace parts that show excessive wear or damage. If it is necessary to use a new cross, needle bearings should also be replaced. Do not mix new and used bearings together. Replacement should be made in sets of four.

TM 5-3810-306-34

INSTALLATION:

1. INSTALL UNIVERSAL JOINT.
 - a. Insert needle bearing cap (1) into ear of yoke.
 - b. Place yoke in a vise and press needle bearing cap into proper position. (The bearing cap has a highly polished surface and care should be exercised not to mar or scratch surface during installation operations).
 - c. Remove yoke from vise and gently work one arm of cross (3) into yoke (4) and bearing cap (1).
 - d. Install opposite bearing cap (1) by hand and line up cross (3) arm.
 - e. Place yoke in a vise and press needle bearing cap (2) into yoke (4) and onto arm of cross (3).



CAUTION

The cross must move freely in both caps. If the cross should bind, remove the cap and check for upset needles.

- f. With aid of a short plug, move the bearing caps past snap ring groove, and insert snap rings (1) into grooves. (One with each bearing cap).
 - g. Repeat procedures outlined in Steps a through f for installing remaining caps and yokes.
2. INSTALL AXLE SHAFT AND UNIVERSAL JOINT IN HOUSING.
3. INSTALL WHEEL ENDS. (REFER TO PAGE 8-44.)
4. INSTALL WHEEL AND TIRE ASSEMBLIES. (REFER TO TM 5-3810-306-20.)
5. TEST FOR PROPER OPERATION.

END OF TASK

Section III. PLANETARY DRIVE MAINTENANCE

PLANETARY WHEEL END ASSEMBLY

TOOLS: General mechanic's tool kit: automotive (5180-00-177-7033)
Axle wheel nut wrench (Item 14, Appendix C)

SUPPLIES: Preformed Packing (Item 196, Appendix B)
Gear oil (Item 195, Appendix B)
Grease MIL-G-10924 (Item 37, Appendix B)

EQUIPMENT CONDITIONS: Outriggers fully extended and lowered.
(Refer to TM 5-3810-306-10.)
Wheel assemblies removed. (Refer to TM 5-3810-306-20.)
Spring in air brake chambers caged.
(Refer to TM 5-3810-306-20.)

WARNING

Be sure to wear protective eye covering to avoid personal injury.

REMOVAL:

1. DRAIN LUBRICANT FROM HUB.

- a. Rotate hub assembly so DRAIN/FILL plug (1) is at bottom.
- b. Drain lubricant.
- c. Clean magnetic drain plug.

2. REMOVE PLANETARY ASSEMBLY.

- a. Match mark both spider (2) and wheel hub (21) for identification of correct alignment when reassembling unit.
- b. Remove thirty planetary spider capscrews (18) and lockwashers (34).

- c. Separate and remove planetary spider assembly (2) from wheel hub assembly (21).
- d. Remove setscrews (17).
- e. Support planetary spider (2) in a press, flange side down.

WARNING

Do not strike planet gear shafts (15) directly with a hammer. Personal injury from chips or splinters may result.

CAUTION

Planetary axles employ a floating ring gear. Care should be taken to prevent this gear from accidentally falling out when planetary spider is removed. Two screws (18) should be left slightly threaded to prevent planetary spider assembly from falling out while prying.

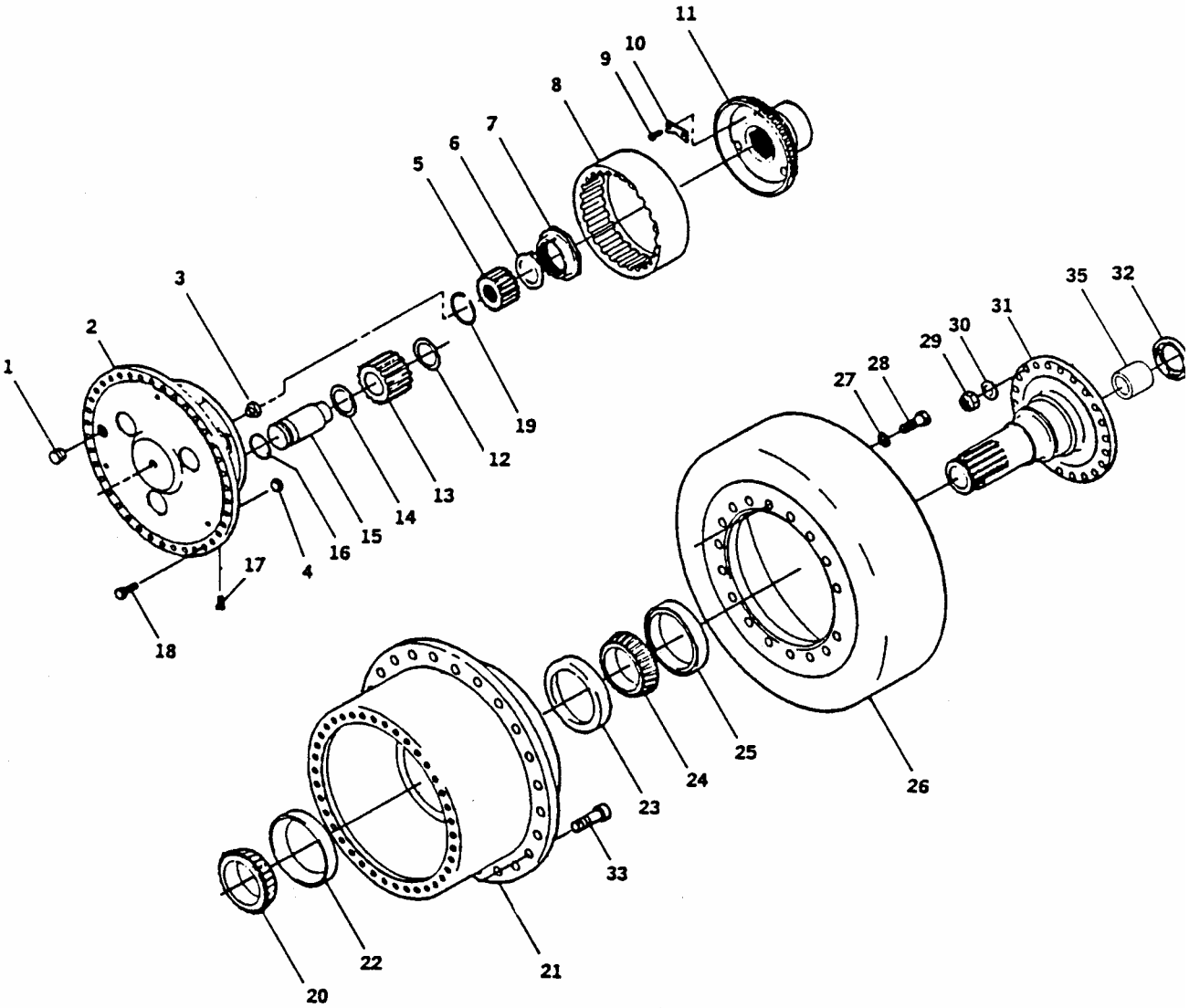
NOTE

The adhesive effect of liquid gasket material may require using the pry bar slots provided.

NOTE

Place block of wood under press to cushion gear shafts as they are pressed out.

- f. Using press, press out planet gear shafts (15) and packing (16). Remove packing (16) and discard.
- g. Remove spur gears (13) and their respective thrust washers (12) and (14).



NOTE

Thrust washers (12) and (14) are designed for opposite sides of the planet shafts and can only be installed in their correct locations.

3. REMOVE FLOATING RING GEAR ASSEMBLY.

- a. Remove retaining ring (19) from end of spindle (31).
- b. Remove axle shaft spur gear (5).
- c. Remove key washer (6).
- d. Remove two capscrews (9) and wheel bearing nut strip (10).
- e. Using axle wheel nut wrench (Item 14, Appendix C) remove wheel bearing nut (7).

CAUTION

Provide support to prevent spur gear (11) from dropping.

- f. Remove spur gear (11) and gear (8).
- g. If necessary, remove bearing (20) using suitable puller.

4. REMOVE WHEEL HUB AND DRUM ASSEMBLY.

- a. Lift hub (21) and drum (26) slightly to relieve hub weight and brake shoe drag. Remove assembly from spindle (31).

NOTE

The oil seal (25) is located in hub against hub rear bearing cup and wipes spindle (31).

- b. Remove oil seal (25) from hub with a suitable puller. Remove bearing (24).
- c. If necessary, remove outer bearing rings (22) and cup (23) from wheel hub with a suitable puller.
- d. Match mark drum (26) and hub (21) and remove eighteen capscrews (28) and

washers (27). Separate drum (26) and hub (21).

5. REMOVE SPINDLE.

- a. Tag and disconnect air lines at both air brake chambers.
- b. Disconnect air line mounting plate on top of wheel spindle and move to side.
- c. Remove air brake chambers.
- d. Remove spindle nuts (29) and washers (30).
- e. Remove brake spider assembly.

CAUTION

Use care when removing spindle (31) to avoid damage to oil seal (32).

- f. Install wheel bearing nut (7) on spindle. Using rubber mallet, tap and remove spindle (31).
- g. Remove inner oil seal (32) and bushing (35). Discard seal (32).

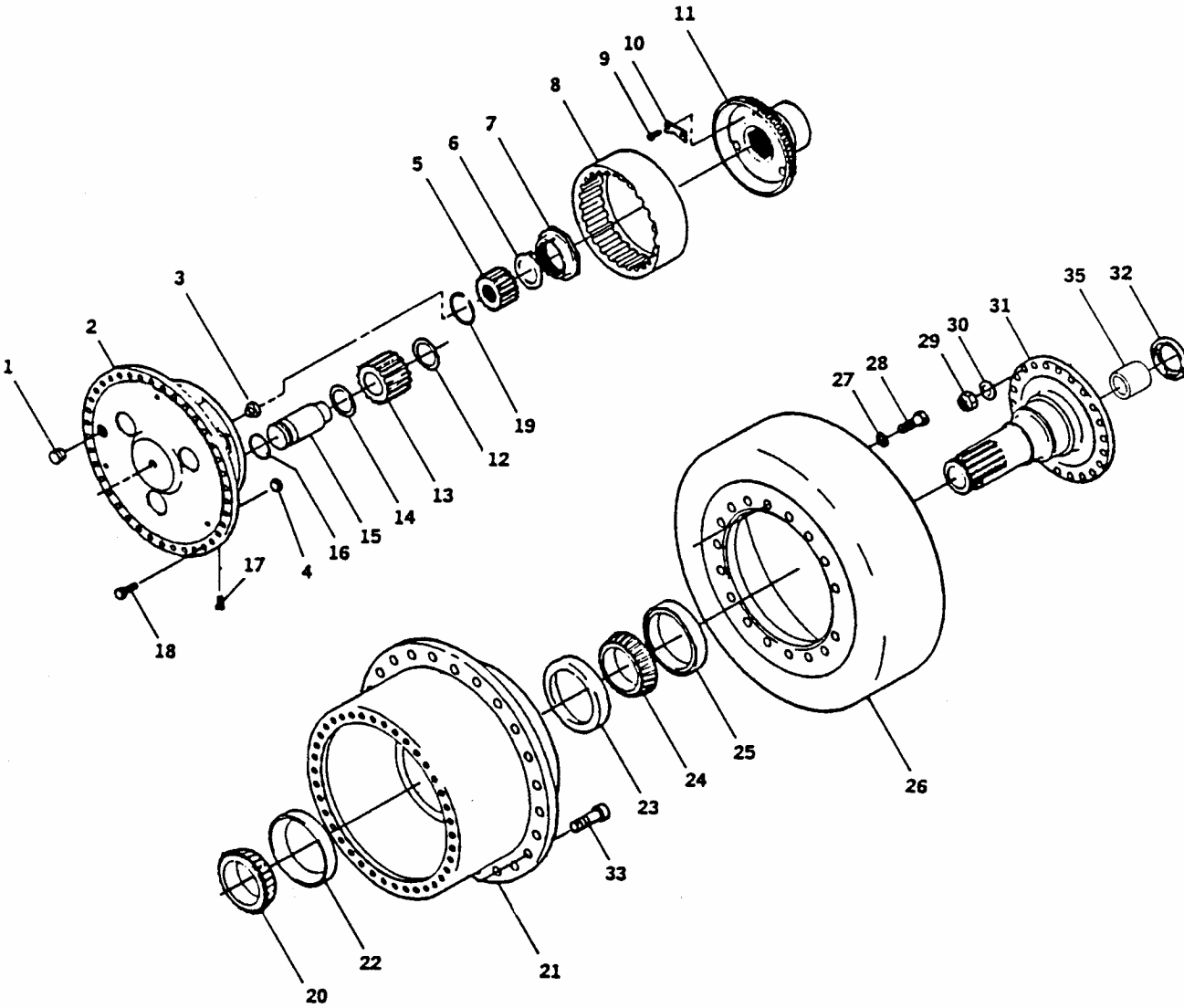
INSPECTION:

1. INSPECT WHEEL END COMPONENTS.

CAUTION

Avoid use of drifts and hammers. They may easily mutilate or distort component parts.

- a. Inspect all bearings, cups and cones, including those not removed from parts of drive unit, and replace if rollers or cups are worn, pitted, or damaged in any way. If necessary, remove parts with a suitable puller or in a press with sleeves.
- b. Inspect planetary reduction, spur gears, and ring gear assembly for wear or damage. Gears which are scored, pitted, ridged, or worn should be replaced.
- c. Inspect for pitted, scored or worn thrust washers.



- d. Inspect for worn or ridged planet shafts.
- e. Remove nicks, marks, and burrs, from machined or ground surfaces. Threads must be clean and free of dirt to obtain accurate adjustment and correct torque. A fine mill file or India stone is suitable for this purpose. Studs must be tight prior to assembling parts.
- f. Burrs caused by lockwashers at spot face of stud holes of knuckle flanges, spider flange or hub cover should be removed to assure easy assembly of these parts.

INSTALLATION:

1. INSTALL SPINDLE.

- a. Apply film of waterproof grease to lips of seal (32), bronze bushing (35) (in spindle 31) and oil seal journal of axle shaft.
- b. Install bushing (35) and a new seal (32) from inner end of spindle (31) with a suitable driver.
- c. Install bearing (24) on spindle (31).

NOTE

Be careful not to damage inner seal (32) as it passes over axle shaft.

- d. Install spindle (31) by carefully sliding it over axle shaft.
- e. Secure spindle with twenty washers (29) and nuts (30).

2. INSTALL BEARING (20).

- a. Install bearing (20) on spur gear journal (11).
- b. Apply grease MIL-G-10924 to bearing (20).

NOTE

Inner race of bearing (20) is slip fit over spindle journal.

3. ASSEMBLE WHEEL HUB AND DRUM ASSEMBLY.

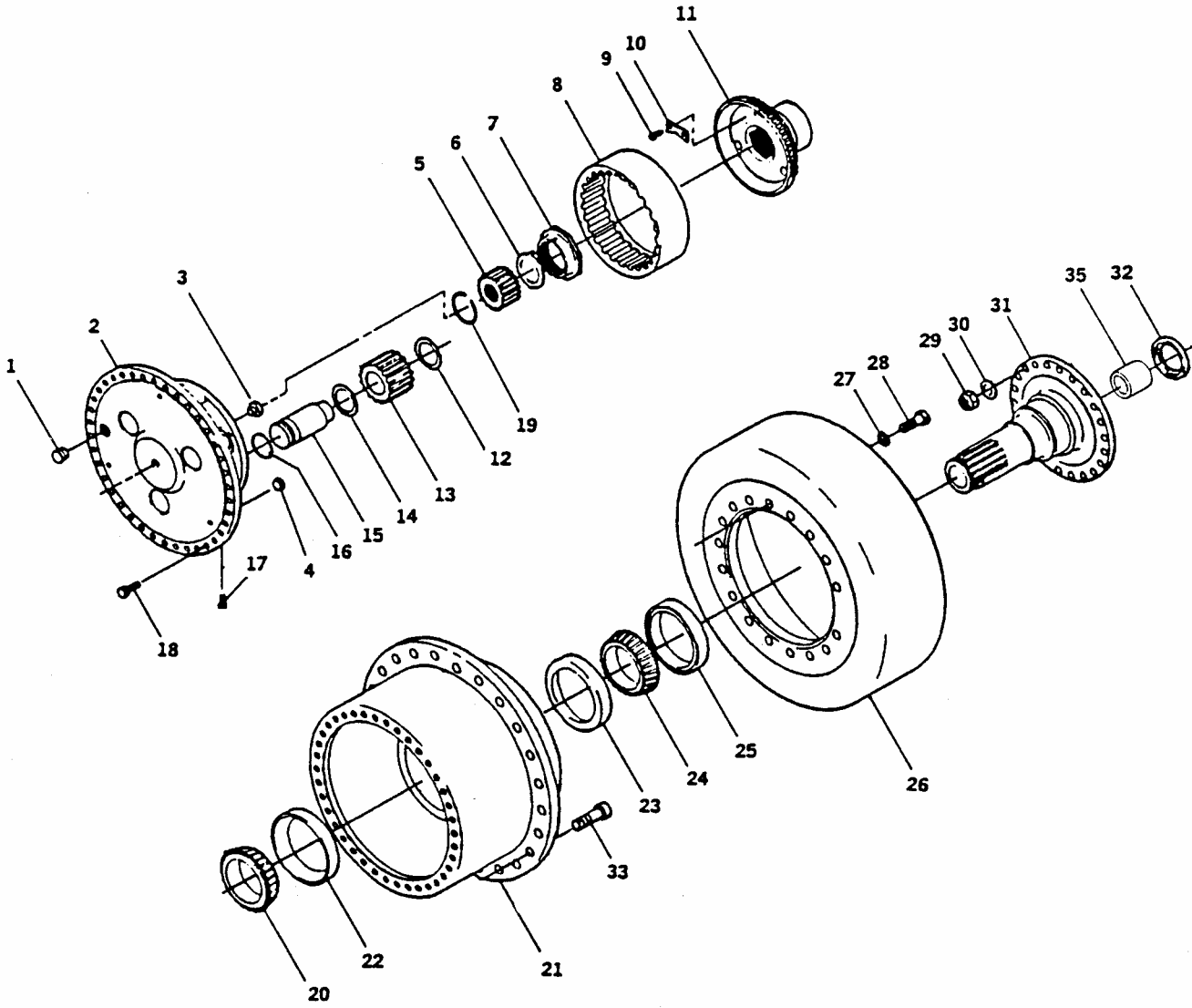
- a. Install cup (23) and outer ring (22) with suitable driver.
- b. Install new oil seal (25) with proper driver. Seal (25) must be driven to its original location.
- c. Lubricate lips of seal (25) and oil seal journal of spindle (31) with grease MIL-G-10924.
- d. Mount brake drum (26) to wheel hub (21) as marked and secure with eighteen capscrews (28) and washers (27). Torque capscrews (28) to 310-400 ft-lbs (412-532 Nm).

4. ASSEMBLE SPUR GEAR (11) AND HUB (21).

- a. Place hub (21) on floor with drum (26) down.
- b. Align puller holes in spur gear (11) with threaded holes in hub (21).
- c. Install temporary capscrews to hold spur gear (11) and hub (21) together.
- d. Using overhead hoist, locate hub (21) on spindle splines.
- e. Install bearing nut (7) and draw assembly into place.
- f. Remove temporary capscrews installed in spur gear (11).

5. ADJUST WHEEL BEARINGS.

- a. Seat bearings and related components by tightening nut (7) to 400 ft-lbs (532 Nm) while hub is rotated in both directions. Rap hub several times with a brass or plastic mallet then re-torque to 400 ft-lbs (532 Nm).
- b. Repeat step a until bearing nut (7) will not advance under application of 400 ft-lbs.
- c. Back off adjusting nut to relieve preload on bearings. Torque on nut should be 0 ft-lbs (0 Nm)



- d. Tighten bearing nut (7) to 350 ft-lbs (466 Nm) while hub (21) is being rotated. Increase torque as required to install nut strip (10).

NOTE

The capscrews (9) are Dri-Loc fasteners. Refer to general maintenance procedures for use of these.

- e. Install nut strip (10) and capscrews (9). Torque capscrews to 60-75 ft-lbs (80-100 Nm).
6. INSTALL PLANETARY RING AND SUN GEARS.
- a. Apply grease MIL-G-10924 to key washers (6).

NOTE

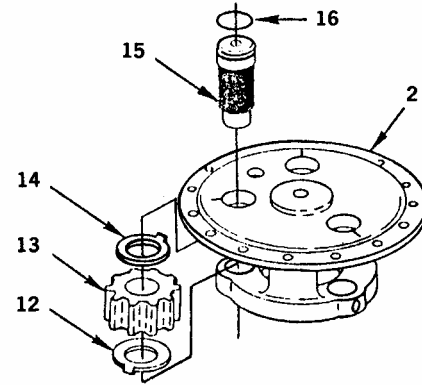
Key washer (6) tangs must engage slots in spindle (31) or bearing nut (7).

- b. Install key washer (6), spur gear (5) and retaining ring (19).
 - c. Install gear (8) onto spur gear.
7. INSTALL SPUR GEARS AND SHAFTS INTO SPIDER ASSEMBLY.
- a. Inspect bores of spur gears (13). Do not reuse spur gears with bore surface roughness. Smooth bore is essential.

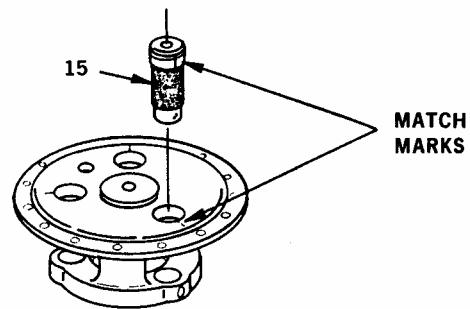
CAUTION

Chamfers on large bores must be smooth. Use emery cloth to remove surface blemishes. Failure to follow this caution could result in damage to shaft (15) and preformed packing (16).

- b. Install new preformed packing (16) on each shaft (15). Ensure preformed packing (16) is not twisted.
- c. Place spider (2) in press with the flange side up. Block up as required.

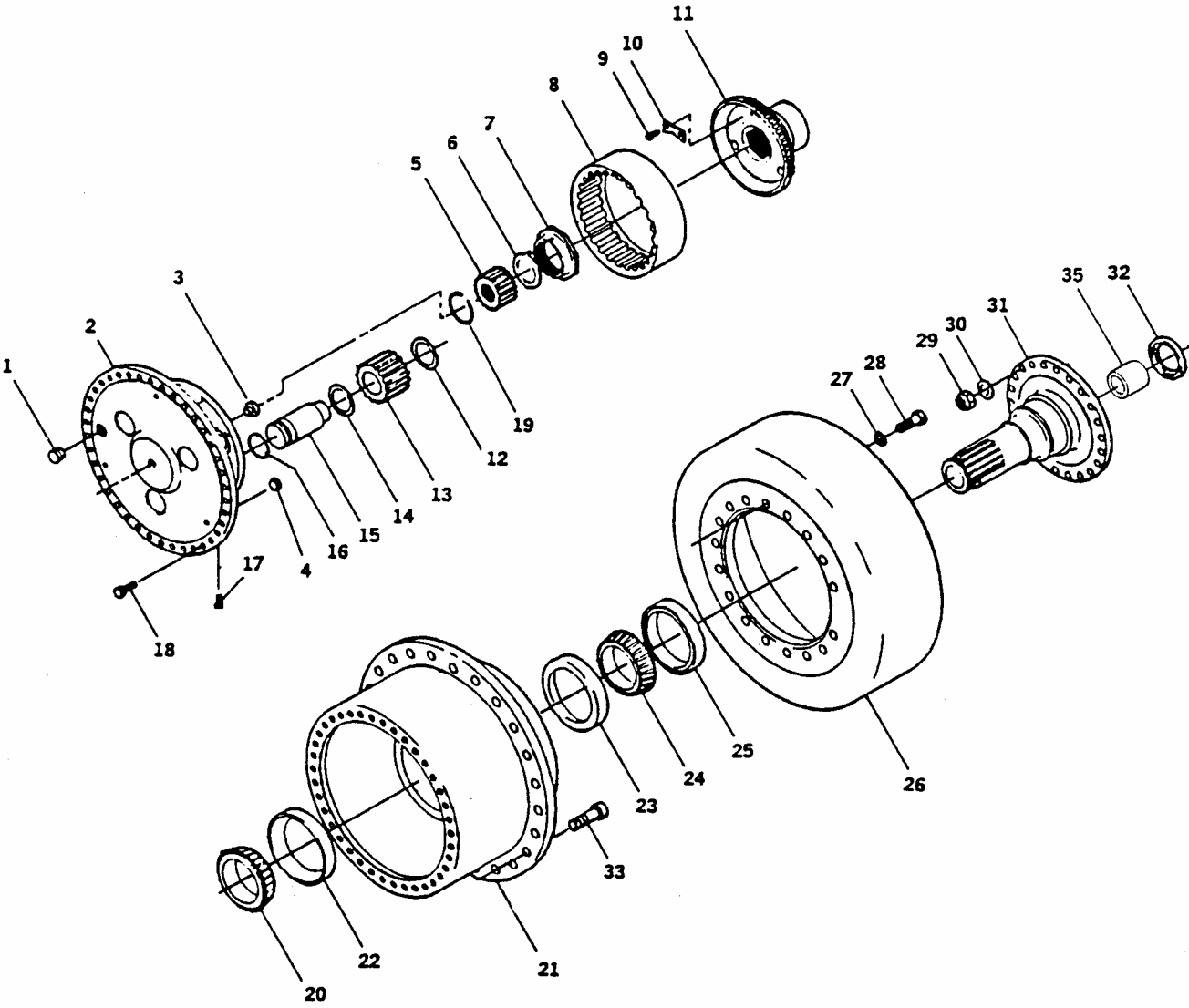


- d. Install inner washer (12) with washer tab engaged in spider indent and washer bore aligned with spider bore.
- e. Coat bore of the spur gear (13) with a film of MIL-L-2105 gear oil. Slide spur gear and outer flat washer (14) into spider. Align bores of parts and engage outer flat washer (14) tab in spider indent.
- f. Install flat shaft (15) into spider and through the spur gear and flat washers by hand. The large end of the shaft will bind in the spider bore due to an interference fit.
- g. On axle models with one-piece integral spider and cover align match-mark on large diameter of shaft with match-mark on spider.



NOTE

These match-marks provide proper alignment of the set screw hole in the small end of the shaft and the tapped set screw hole in the spider boss.



- h. Apply film of non-hardening sealant (Permatex 51 or equivalent) to preformed packing (16) and large end of shaft.

CAUTION

Do not strike shafts (15) directly with a steel hammer. Personal injury from chips or splinters may result.

NOTE

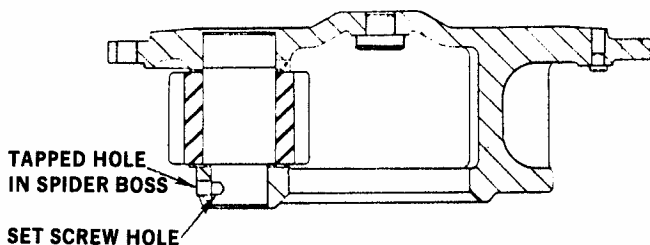
If a press is not available use a brass drift and mallet to tap the shaft (15) through the spider and spur gear.

- i. Being careful to keep shaft (15) aligned, press shaft into spider until shoulder of the shaft bottoms against inner flat washer (12).

NOTE

The set screws are Dri-Loc fasteners. Refer to General Procedures for use of these.

- j. Install set screw (17) into spider and shaft (15). Torque screw 15 to 25 ft-lbs (20-33 Nm).



- k. Repeat steps d thru j for each of two remaining spur gears (13) and shafts (15).

8. INSTALL SPIDER.

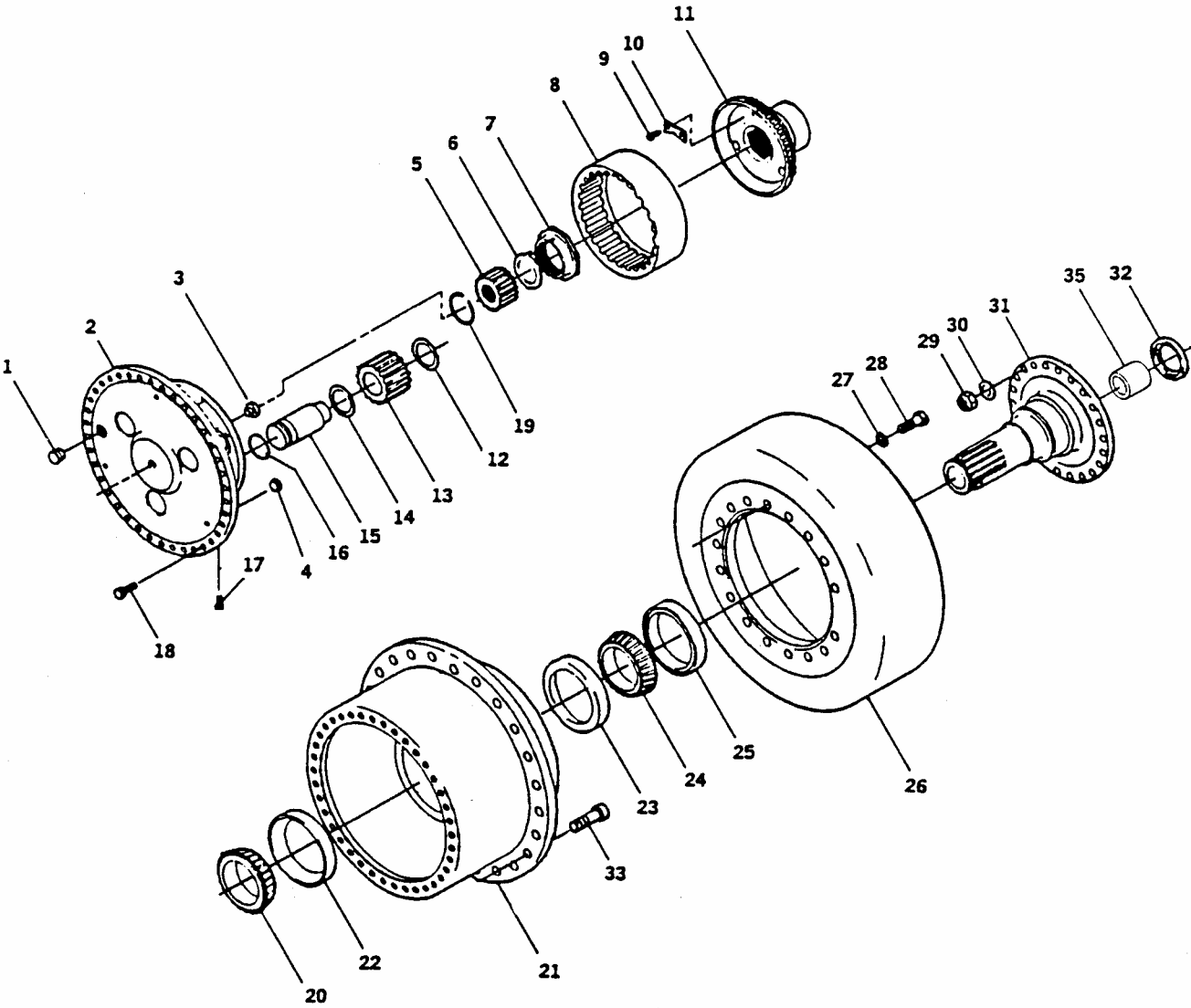
WARNING

Eye contact with these silicone RTV materials may cause irritation. If eye contact takes place, flush the eyes with water for 15 minutes and have the eyes examined by a doctor.

Minor concentrations of acetic acid vapor may be produced during application. Adequate ventilation should be provided when silicone RTV is applied in confined areas.

- a. Apply silicone gasket material (RTV) to cover flange on spider to hub mating surface.
 - b. Start spider and pinion assembly, aligning teeth of spur gear (13) and gear teeth (8). Line up match-marks.
 - c. Align hub holes with spider holes and push spider assembly against hub.
 - d. Install thirty washers (34) and capscrews (18). Torque capscrews (18) to 85-115 ft-lbs (113-153 Nm).
9. FILL WHEEL END ASSEMBLIES WITH MULTIPURPOSE GEAR OIL MIL-L-2105.
- a. Turn hub and drum assembly so the DRAIN/FILL plug (1) 90° from bottom.
 - b. Fill each housing until lubricant appears at drain plug hole. Replace all plugs and tighten them securely.
10. ADJUST BRAKES. (REFER TO TM 5-3810-306-20.)
11. UNCAGE SPRING IN AIR BRAKE CHAMBER. (REFER TO TM 5-3810-306-20.)
12. INSTALL WHEEL AND TIRE ASSEMBLIES. (REFER TO TM 5-3810-306-20.)
13. TEST FOR PROPER OPERATION.

END OF TASK



CHAPTER 9
BRAKE SYSTEM

CHAPTER INDEX

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	Air Compressor Installation	9-2
	Air Compressor Assembly	9-4
Section II	Brake Maintenance	9-16
	Brake Assembly	9-16

Section I. AIR COMPRESSOR MAINTENANCE

AIR COMPRESSOR INSTALLATION

TOOLS: General mechanic's tool kit: automotive (5180-00-177-7033)
Shop Equipment Contact Maintenance Truck Mtd (4930-00-294-9518)
Shop Equipment General Purpose Repair, Semi-trailer Mtd (4930-01-006-3229)
Shop Equipment Machine Shop; FM Basic (3470-00-754-0708)
Shop Equipment Auto-Maintenance and Repair Common No. 1 (4910-00-754-0650)
Shop Equipment Auto-Maintenance and Repair; Org Suppl No. 1 (4910-00-754-0653)

SUPPLIES: Gasket (Item 98, Appendix B)
Gasket (Item 99, Appendix B)

EQUIPMENT CONDITIONS: Negative battery cable disconnected at shunt. (RT875CC)
Battery disconnect switch in off position. (RT875CCS)
Radiator drained. (Refer to TM 5-3810-306-20.)

WARNING

Be sure to wear protective eye covering to avoid personal injury.

REMOVAL:

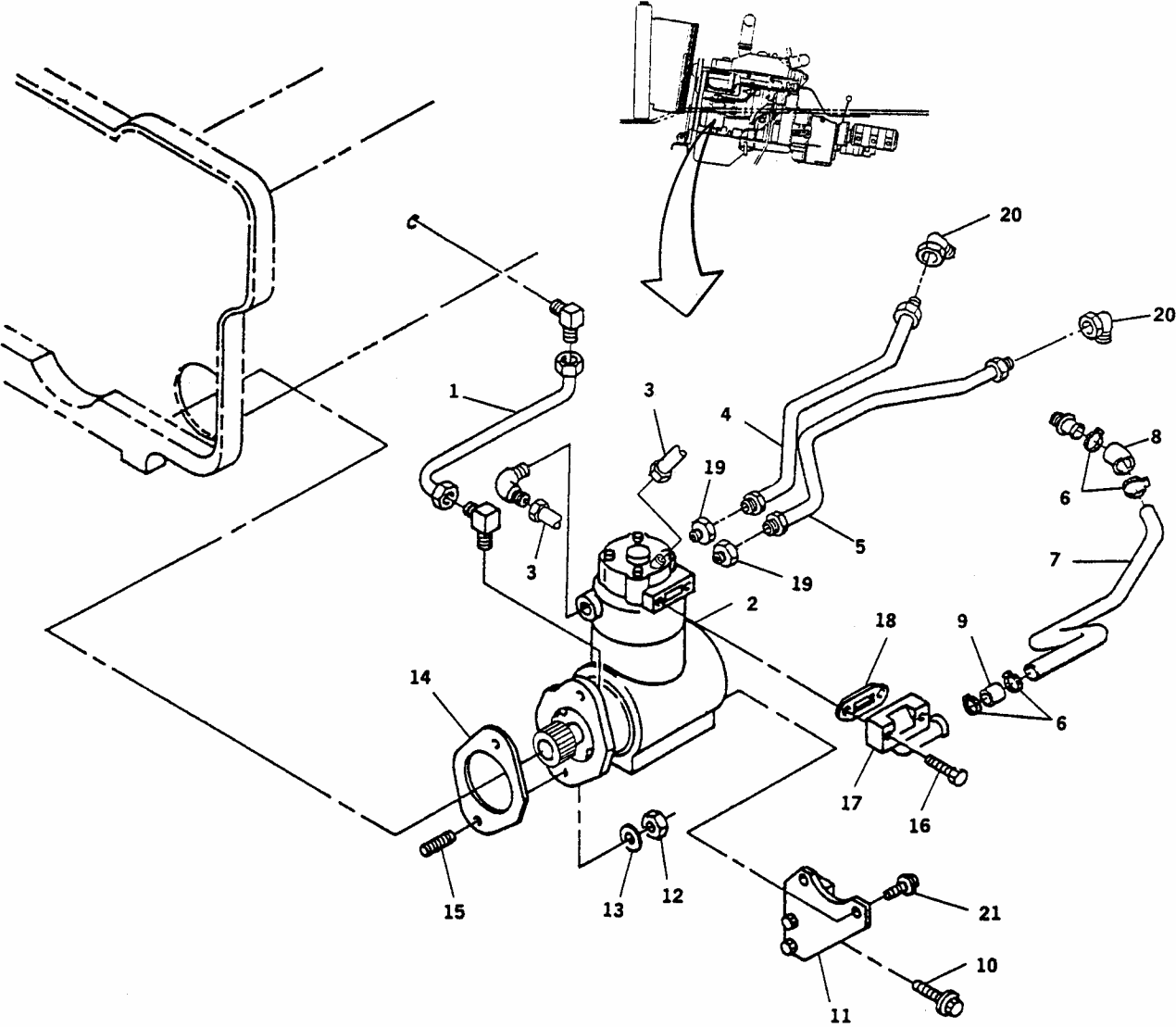
1. REMOVE TUBES AND LINES.
 - a. Loosen clamps (6) and remove compressor inlet tube (7), molded hose (8) and compressor inlet hose (9). Replace as required.
 - b. Tag and remove water inlet (4) and water outlet (5) tubes and fittings (19) and (20) from compressor (2). Replace as required.
 - c. Remove air lines (3).
 - d. Remove lube oil supply tube (1) from compressor (2).
 - e. Remove capscrews (16), inlet connector (17) and gasket (18). Discard gasket (18).
2. REMOVE AIR COMPRESSOR (2).
 - a. Remove capscrews (10) securing compressor mounting brace (11) to engine.
 - b. Remove nuts (12) and washers (13) from mounting studs (15).
 - c. Remove compressor (2).
 - d. Remove gasket (14) and discard.
 - e. Remove capscrews (21) and brace (11).

3. INSPECT PARTS FOR DAMAGE. REPLACE AS REQUIRED.

INSTALLATION:

1. INSTALL AIR COMPRESSOR (2).
 - a. Position new gasket (14) on front gear cover.
 - b. Mount air compressor (2) on studs (9) and retain with washers (8) and lock nuts (7).
2. INSTALL TUBES AND LINES.
 - a. Install fittings (19) and (20), water inlet (4) and water outlet (5) tubes.
 - b. Install inlet connector (17) and new gasket (18). Secure with capscrews (16).
 - c. Install compressor inlet hose (9), molded hose (8) and inlet tube (7). Secure with clamps (6).
 - d. Install oil supply tube (1).
 - e. Install air lines (3).
3. SERVICE RADIATOR. (REFER TO TM 3810-306-20.)
4. CONNECT NEGATIVE BATTERY CABLE AT SHUNT. (REFER TO TM 5-3810-306-20.) (RT875CC)

END OF TASK



AIR COMPRESSOR ASSEMBLY

TOOLS: General mechanic's tool kit: automotive (5180-00-177-7033)
Seat removal tool (NSN)
Air compressor seat installation tool (NSN)

SUPPLIES: Gasket (Item 199, Appendix B)
Fuel pump gasket (Item 200, Appendix B)
Retaining ring (Item 201, Appendix B)
Oil ring (Item 202, Appendix B)
Piston ring (Item 203, Appendix B)
Piston ring (Item 204, Appendix B)
Gasket (Item 205, Appendix B)
Preformed packing (Item 206, Appendix B)
Preformed packing (Item 207, Appendix B)
Preformed packing (Item 208, Appendix B)
Preformed packing (Item 209, Appendix B)
Lockwasher (Item 210, Appendix B)
Gasket (Item 211, Appendix B)
Solvent P-D-680, Type III (Item 1, Appendix B)
NEVER-SEEZ compound (Item 24, Appendix B)
Machinist's bluing

EQUIPMENT CONDITIONS: Air compressor removed from engine. (Refer to page 9-2.)

WARNING

Be sure to wear protective eye covering to avoid personal injury.

DISASSEMBLY:

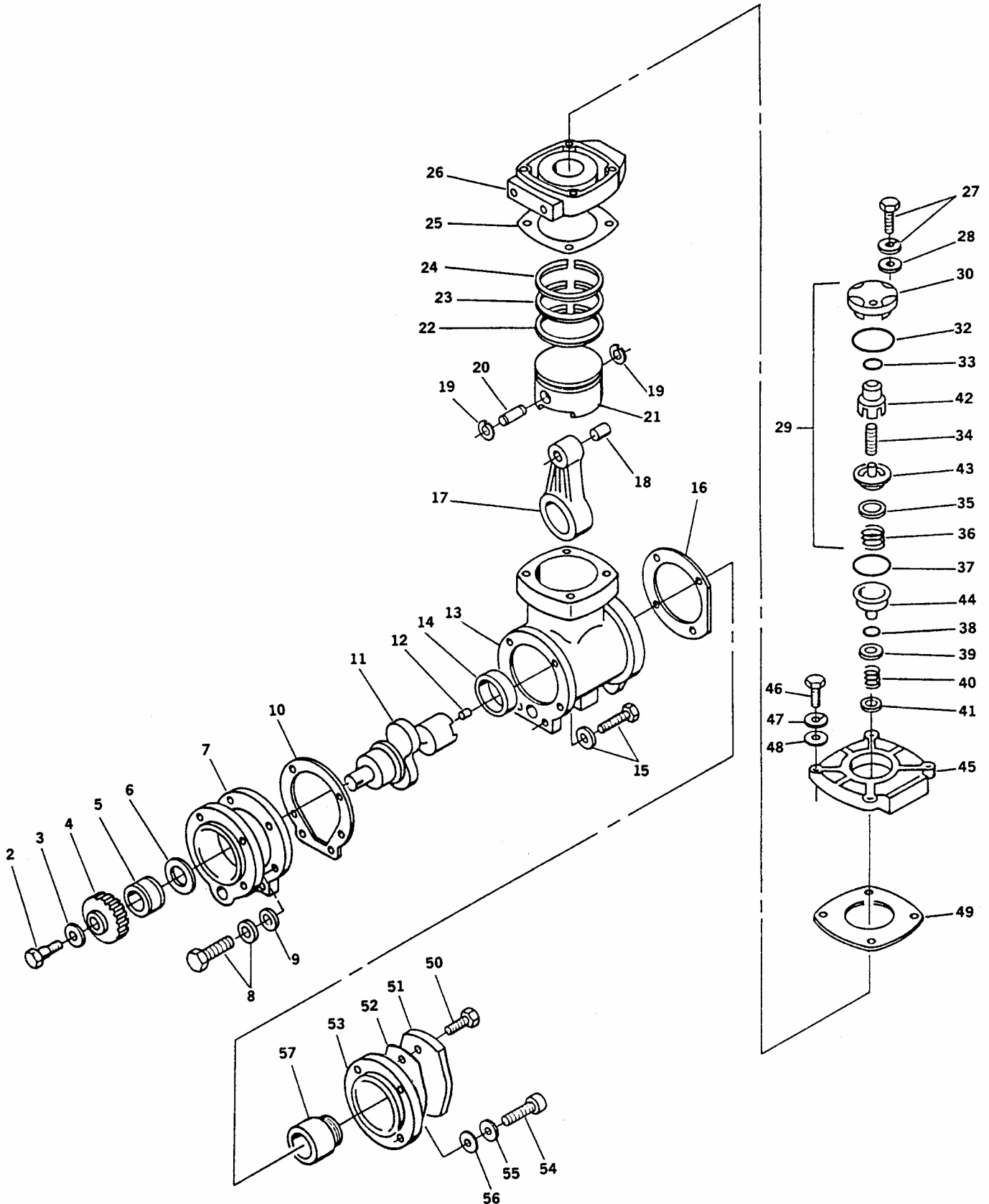
1. DISASSEMBLE UNLOADER VALVE (29).
 - a. Loosen captive washer bolts (27).

WARNING

The unloader valve (29) is spring loaded. Use care when removing valve to avoid personal injury.

- b. Holding down body (30), remove captive washer bolts (27) and washers (28). Remove body (30).
 - c. Remove and discard preformed packings (32) and (33).
 - d. Remove cap (42), spring (34) and cover (43).
 - e. Remove intake valve (35) and valve spring (36).
2. REMOVE COVER (45) AND HEAD (26).
 - a. Remove capscrews (46), lockwashers (47) and washers (48). Remove cover (45) and discard gasket (49).

- b. Remove head (26) and discard gasket (25).
3. REMOVE EXHAUST VALVE (39) AND EXHAUST VALVE SEAT (44).
 - a. Using press and seat removal tools, remove exhaust valve seat (44) and packing (37). Discard packing (37).
 - b. Remove preformed packing (38), exhaust valve (39), compression spring (40) and wear plate (41). Discard packing (38)
4. REMOVE ADAPTER (53).
 - a. Remove two capscrews (50), cover plate (51) and discard gasket (52).
 - b. Remove four socket head screws (54), washers (55), and lockwashers (56) securing adapter (53). Discard gasket (16).
 - c. Using puller, remove splined adapter (57) from crankshaft (11), if required.



5. REMOVE SUPPORT (7).
 - a. Remove capscrew (2), washer (3) and using puller, remove drive gear (4).
 - b. Remove spacer (5) and thrust bearing (6).
 - c. Remove captive washer capscrews (8) and (15), washers (9) and support (7). Discard gasket (10).
6. REMOVE CRANKSHAFT (11).
 - a. Rotate crankshaft (11) until piston (21) is approximately 90° before or after top-dead-center. Remove crankshaft (11)
 - b. Remove pipe plug (12).
7. REMOVE AND DISASSEMBLE PISTON ASSEMBLY.
 - a. Remove piston (21) with connecting rod (17).
 - b. Install connecting rod (17) in a soft-jawed vise.
 - c. Remove piston ring (24), piston ring (23) and oil ring (22).
 - d. Remove retaining rings (19).

CAUTION

Do not drive out piston pin (20). This could damage piston.

- e. Push out piston pin (20) using finger pressure. If necessary, place piston in boiling water for five minutes to expand piston pin bore.
- f. Separate piston (21) and connecting rod (17).

CLEANING:

1. CLEAN AIR COMPRESSOR COMPONENTS.

WARNING

Dry cleaning solvent P-D-680, Type III is toxic and flammable. Wear protective goggles and gloves and use only in a well ventilated area. Avoid contact with skin, eyes, and clothes and do not breathe vapors. Do not use near open flame or excessive heat. The flash point is 200°F (94°C). If you become dizzy while using cleaning solvent, get fresh air immediately and get medical aid. If contact with eyes is made, wash your eyes with water and get medical aid immediately. Compressed air used for cleaning purposes will not exceed 30 psi. Use only with effective chip guarding and personal protective equipment (goggles/shield, gloves, etc.).

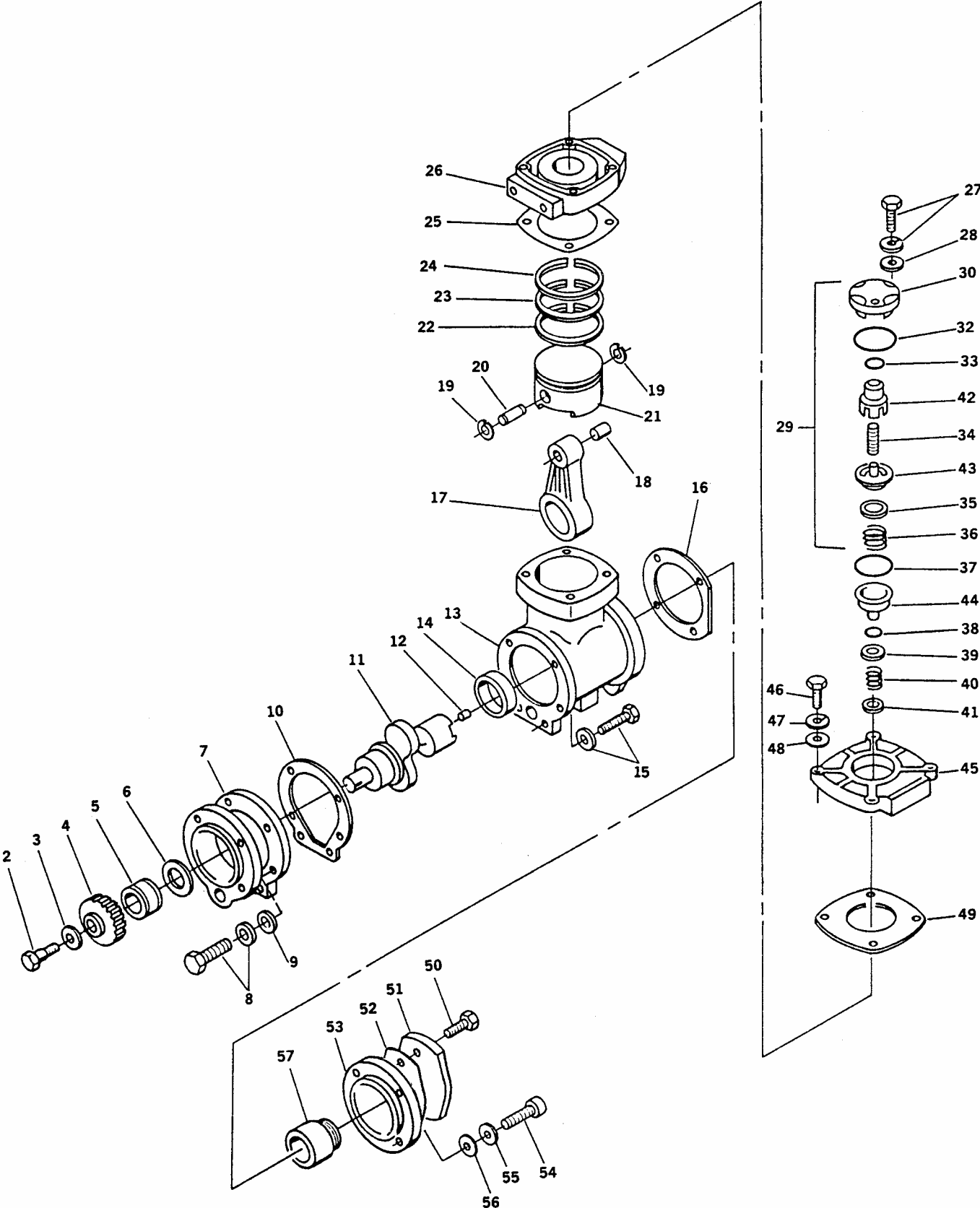
- a. Clean all metal parts with solvent. Use low-pressure compressed air to dry parts.

CAUTION

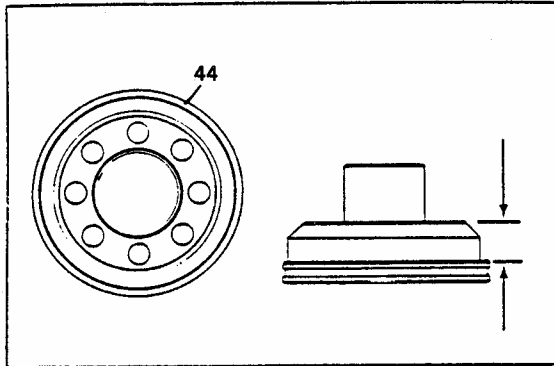
Do not use scraper to remove carbon or scale. Damage to sealing surfaces could result.

INSPECTION:

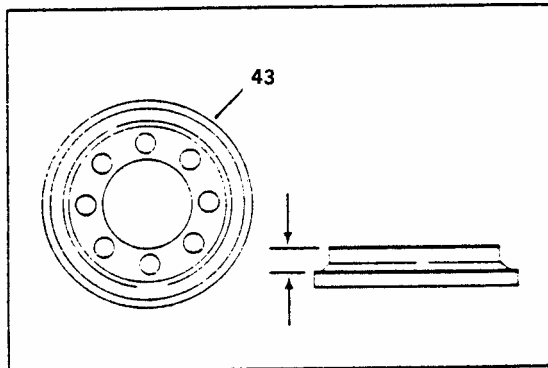
1. INSPECT AIR COMPRESSOR COMPONENTS.
 - a. Inspect exhaust valve seat (44). Use bluing to check seating surface. If not 100% true, replace seat.



- b. Measure exhaust valve seat (44) height as shown. If height is less than 0.485 in. (12.32 mm), replace seat.



- c. Inspect cover (43). Use bluing to check seating surface. If not 100% true, replace seat.
- d. Measure cover (43) height as shown. If height is less than 0.270 in. (6.86 mm), replace cover.

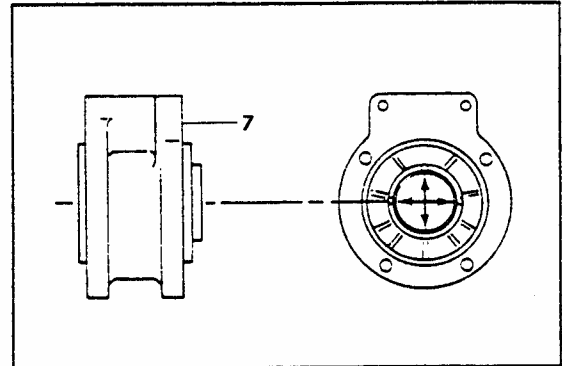


- e. Inspect exhaust valve (39) and intake valve (35) for cracks or damage. Measure valve flatness. Valves must be flat within 0.001 in. (0.03 mm).
- f. Using spring tester, check springs (34), (36) and (40). Use chart shown.

SPRING	FREE LENGTH (IN.)	# COILS	TEST LENGTH (IN.)	SPRING FORCE (LB.)		
				NEW (MIN.)	NEW (MAX.)	WORN
34	1.650	10.8	0.980	13.00	17.00	12.00
36	0.500	2.8	0.280	0.65	1.10	0.55
40	0.670	3.0	0.280	8.50	10.40	8.00

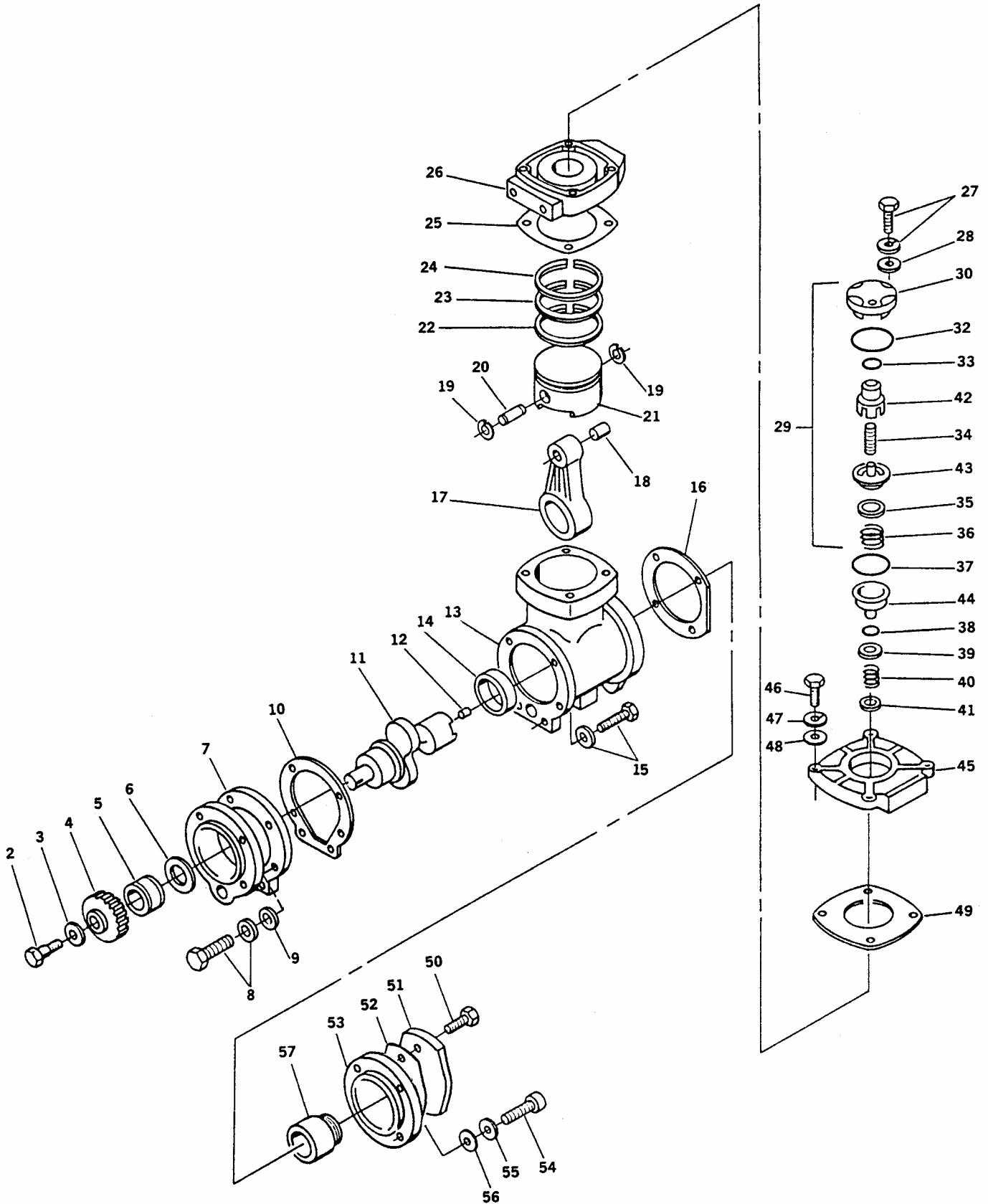
- g. Inspect unloader cap (42) for scoring. Replace if damaged.
- h. Inspect thrust bearing (6). Replace if compressed.
- i. Measure inside diameter of support (7). Use following criteria.

Min = 1.8740 in. (47.600 mm)
 Max = 1.8760 in. (47.650 mm)
 Worn = 1.8775 in. (47.688 mm)



- j. Inspect connecting rod (17) for damaged bushing (18).
- k. Measure inside diameter of crankshaft end of connecting rod (17). Replace if I.D. exceeds 1.9355 in. (49.263 mm).
- l. Measure inside diameter of piston end of connecting rod (17). Replace if I.D. exceeds 0.6895 in. (17.513 mm).
- m. Measure piston pin (20) outside diameter.
- n. Inspect piston (21) for cracks and scoring. Replace if damaged.
- o. Measure outside diameter of piston (21). Measure 0.250 in. (6.35 mm) above bottom piston skirt at right angle to piston pin bore. Measurement should be

Min = 3.619 in. (91.92 mm)
 Max = 3.620 in. (91.95 mm)
 Worn = 3.617 in. (91.87 mm)



- p. Using new piston rings (22), (23) and (24), measure ring to groove clearance. Install piston rings (22), (23) and (24).

Piston rings (23) and (24) to groove clearance should be:

- Min = 0.002 in. (0.05 mm)
- Max = 0.0035 in. (0.089 mm)
- Worn = 0.0045 in. (0.114 mm)

Oil ring (22) to groove clearance should be:

- Min = 0.0015 in. (0.038 mm)
- Max = 0.003 in. (0.08 mm)
- Worn = 0.004 in. (0.10 mm)

- q. Measure piston pin bore on piston (21).

- Min = 0.6880 in. (17.475 mm)
- Max = 0.6885 in. (17.488 mm)
- Worn = 0.6890 in. (17.501 mm)

- r. Inspect crankcase (13) for cracks and scoring.

- s. Measure cylinder bore diameter on crankcase (13). Measure bore diameter at 1.0 in. (25.00 mm) below top of crankcase. Maximum out-of-round is 0.0015 in. (0.038 mm). Cylinder bore should be:

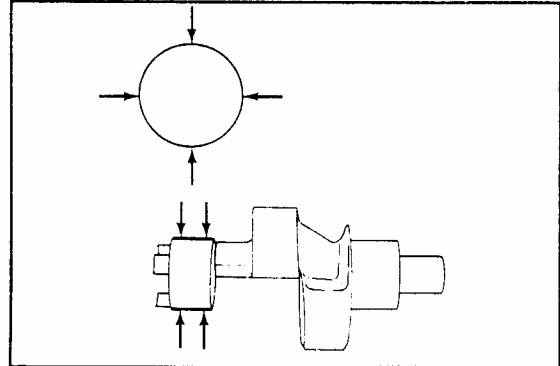
- Min = 3.625 in. (92.08 mm)
- Max = 3.626 in. (92.10 mm)
- Worn = 3.6285 in. (92.164 mm)

- t. Inspect bushing (14) in crankcase (13). If scored, replace bushing.

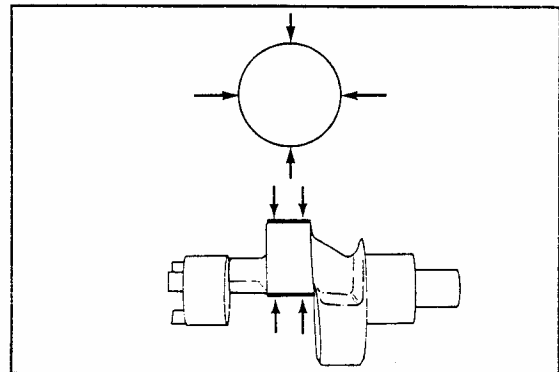
- u. Measure inside diameter of bushing (14). Replace if worn larger than 1.8780 in. (47.701 mm). Support crankcase when removing bushing (14). Using clean oil to lubricate bushing bore, press new bushing until flush with bore surface.

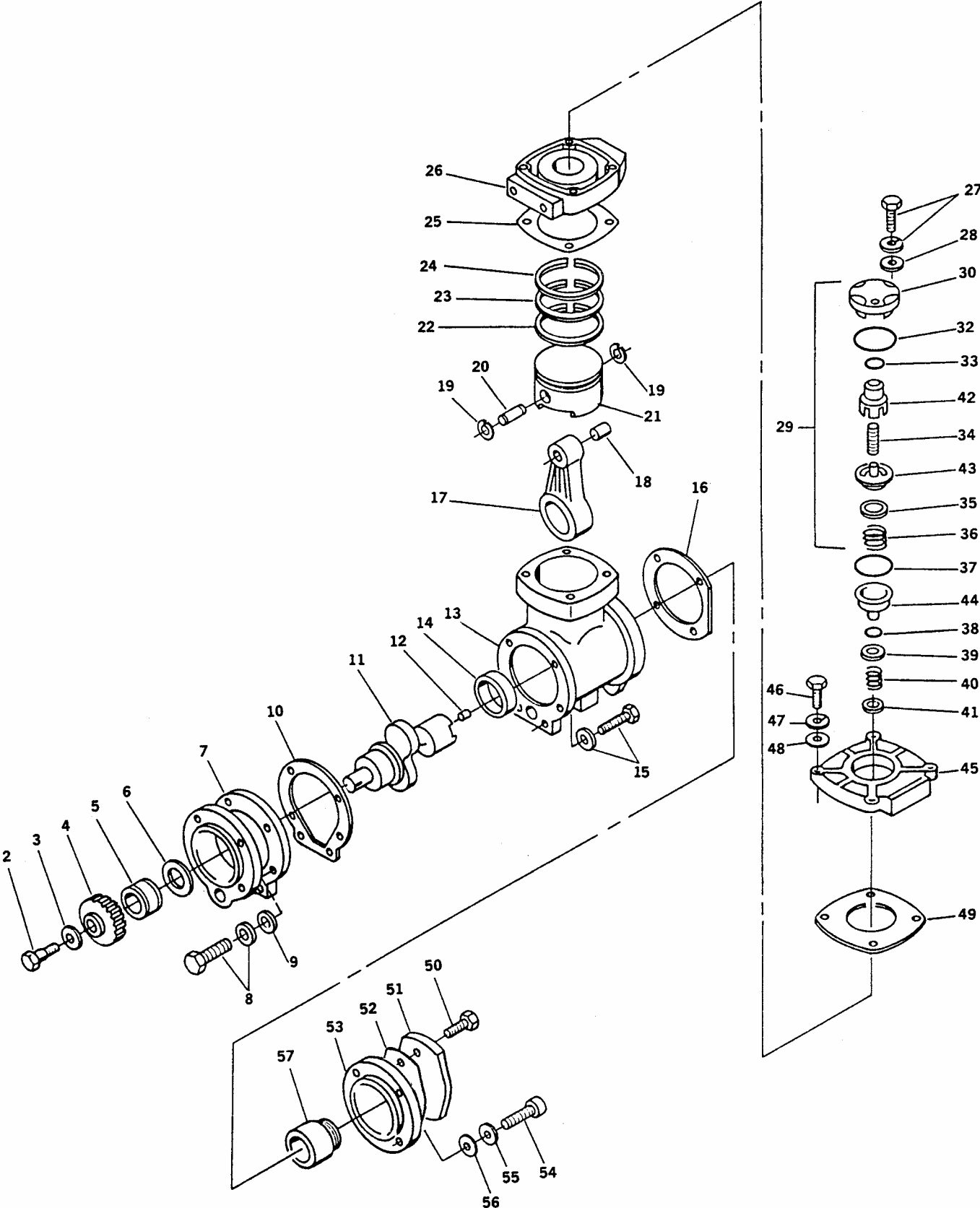
- v. Inspect crankshaft (11) for scoring and scratches.

- w. Measure outside diameter of rear coupling journal on crankshaft (11) as shown. Replace if worn beyond 1.872 in. (47.55 mm).

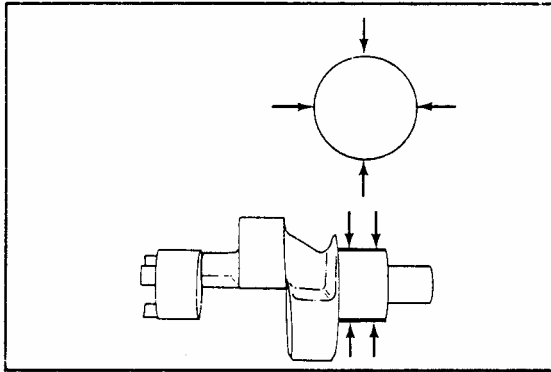


- x. Measure outside diameter of connecting rod journal on crankshaft (11) as shown. Replace if worn beyond 1.9345 in. (49.136 mm).

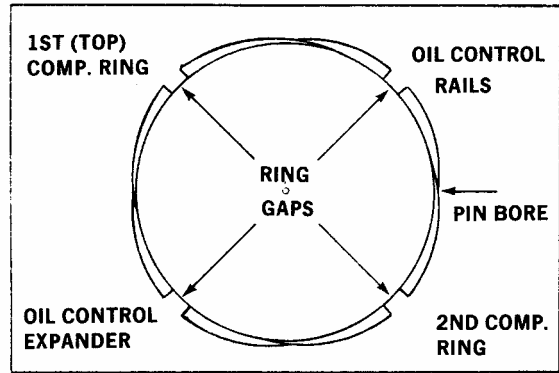




- y. Measure outside diameter of front support journal on crankshaft (11) as shown. Replace if worn beyond 1.872 in. (47.55 mm).



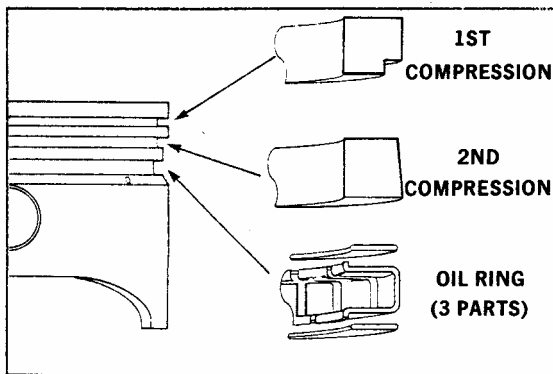
- e. Position piston oil ring and piston ring gaps so that they are not over piston pin bore.



REASSEMBLY:

1. REASSEMBLE PISTON ASSEMBLY.

- a. Install one retaining ring (19) and lubricate piston pin bore with clean engine oil.
- b. With connecting rod (17) in soft-jawed vice, position piston (21) and insert piston pin (20). If piston pin cannot be installed by hand, place piston (21) into boiling water for five minutes.
- c. Install second retaining ring (19).
- d. If not installed, install oil ring (22), piston ring (23) and piston ring (24). Ensure that piston rings are installed with part number or top side pointed up.



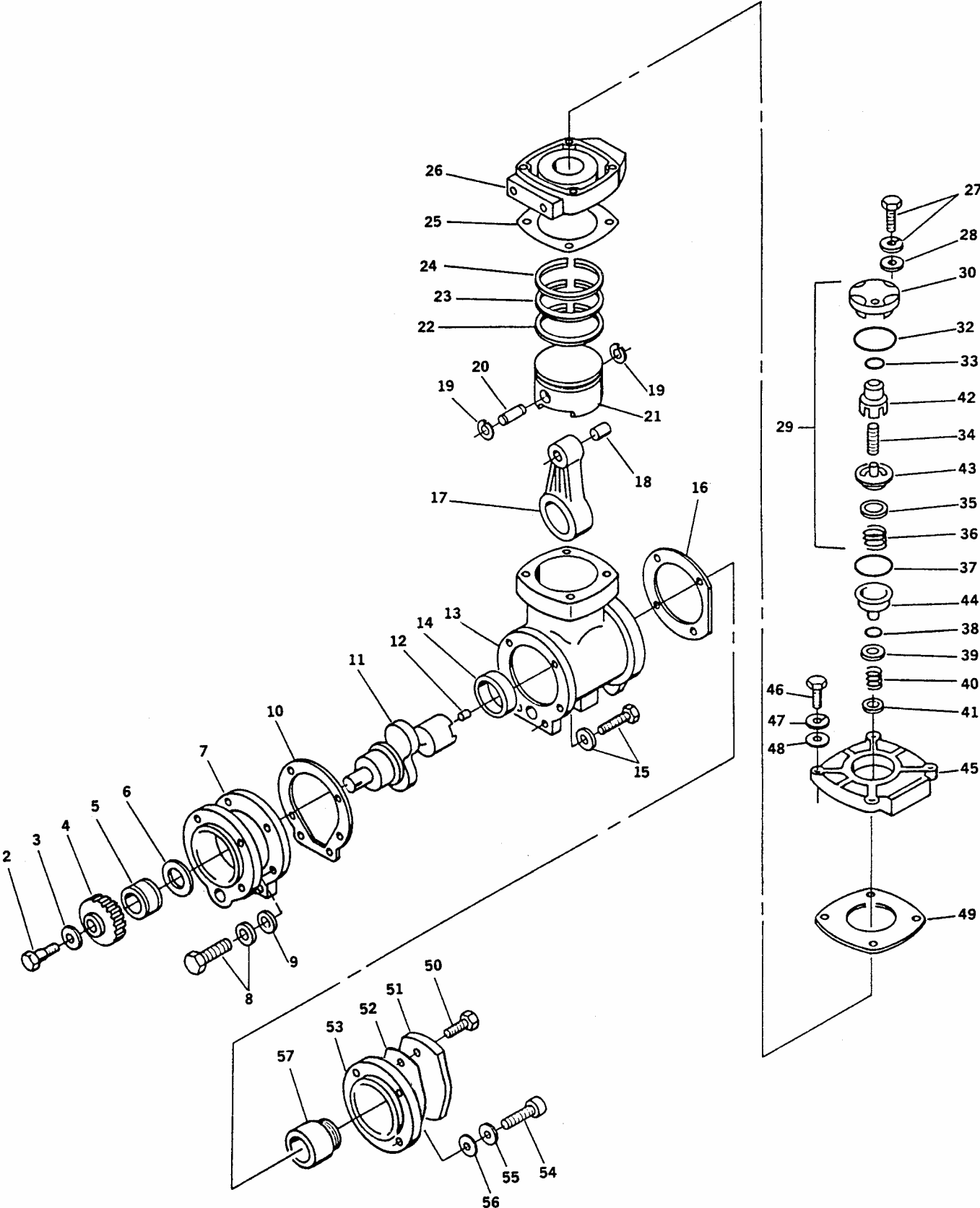
2. INSTALL PISTON (21) AND CONNECTING ROD (17).

- a. Use clean engine oil to lubricate piston rings, compress piston rings and install piston (21) and connecting rod (17).
- b. If removed, install pipe plug (12) and tighten 3-6 ft-lb (4-8 Nm).
- c. If removed, using press, install adapter (57) on crankshaft (11).

3. INSTALL CRANKSHAFT (11) AND SUPPORT (7).

- a. Use clean engine oil to lubricate bore in support (7). Install support (7) over crankshaft.
- b. Use clean engine oil to lubricate thrust bearing (6) and install it with part number side out (or grooved side facing in).
- c. Use clean engine oil to lubricate spacer (5) and gear (4). Install spacer (5) and, using press, install gear (4) until spacer contacts thrust bearing. Install capscrew (2) with washer (3). Torque capscrew (2) to 93 ft-lbs (124 Nm).
- d. Measure distance between support (7) and crankshaft (11) mating surfaces. This measurement should be:

Min = 0.004 in. (0.102 mm)
 Max = 0.009 in. (0.229 mm)
 Worn = 0.012 in. (0.305 mm)



- e. Install new gasket (10) on support (7).
- f. Position piston at 90° before or after top-dead-center and install crankshaft (11) with support (7) into crankcase (13).
- g. Install captive washer capscrews (15).
- h. Install captive washer capscrews (8) and washers (9). Torque capscrews (8) and (15) to 30-35 ft-lbs (41-47 Nm).

4. INSTALL ADAPTER (53).

- a. Install new gasket (16) and adapter (53). Secure with washers (55), lockwashers (56) and socket head screws (54). Torque screws (54) to 45 ft-lbs (60 Nm).
- b. Install new gasket (52) and cover plate (51) using screws (50).

5. INSTALL EXHAUST VALVE (39) AND EXHAUST VALVE SEAT.

- a. Install wear plate (41), valve spring (40), exhaust valve (39) and new preformed packing (38).
- b. Install new packing (37) on exhaust valve seat (44).
- c. Using air compressor seat installation tool, install exhaust valve seat (44).

6. INSTALL HEAD (26) AND COVER (45).

- a. Dip new gasket (25) in clean engine oil and install new gasket (25) and head (26).
- b. Dip new gasket (49) in clean engine oil and install new gasket (49) and cover (45).

- c. Install washers (48), lockwashers (47) and capscrews (46). Torque capscrews to final value of 20 ft-lb (27 Nm) in four steps:

Step 1	5 ft-lb (7 Nm)
Step 2	10 ft-lb (14 Nm)
Step 3	15 ft-lb (20 Nm)
Step 4	20 ft-lb (27 Nm)

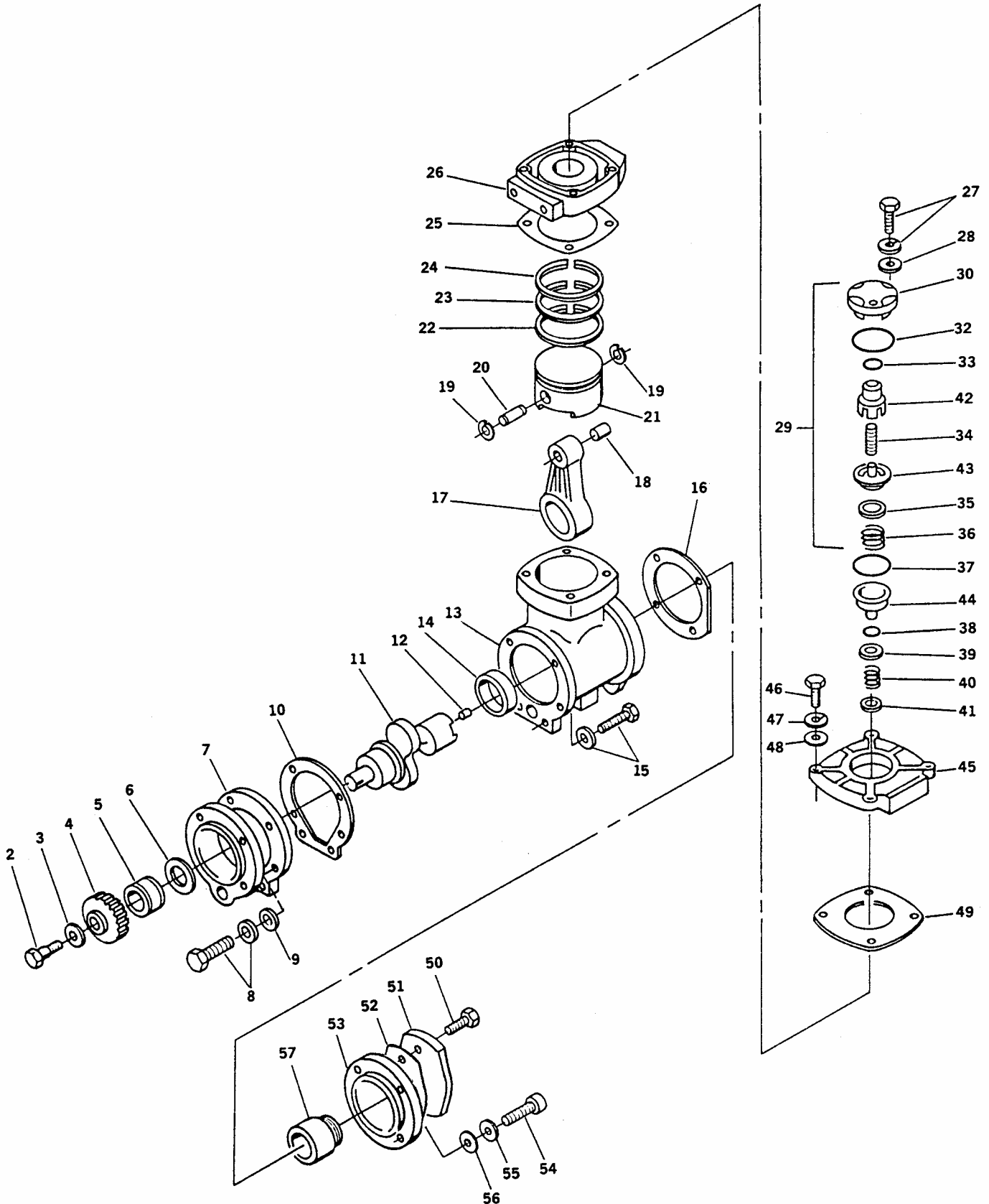
7. INSTALL UNLOADER VALVE.

- a. Install valve spring (36) with tang down, intake valve (35), cover (43) with flange side up, spring (34) and cap (42).
- b. Lubricate outside diameter of cap (42) with NEVER-SEEZ (paste type) compound.
- c. Install new preformed packing (33) with grooved side up. Lubricate preformed packing (32) with clean engine oil.
- d. Install new preformed packing (32).
- e. Install body (30). Press body (30) and ensure that tangs of cap (42) are in three slots of cover (43).
- f. Holding down body (30), install washers (28), capscrews and washers (27). Torque capscrews to 8-11 ft-lbs (11-15 Nm).

8. INSTALL AIR COMPRESSOR. (REFER TO PAGE 9-2.)

9. TEST FOR PROPER OPERATION.

END OF TASK



Section II. BRAKE MAINTENANCE

BRAKE ASSEMBLY

TOOLS: General mechanic's tool kit: automotive (5180-00-177-7033)

SUPPLIES: Grease (Item 37, Appendix B)
Adjusting plunger seal (Item 267, Appendix B)
Anchor plunger seal (Item 268, Appendix B)

EQUIPMENT CONDITIONS: Outriggers fully extended and lowered.
(Refer to TM 5-3810-306-10.)
Negative battery cable disconnected at shunt. (RT875CC)
Battery disconnect switch in off position. (RT875CCS)
Spring brake chambers removed. (Refer to TM 5-3810-306-20.)
Planetary wheel end removed. (Refer to page 8-44.)

WARNING

Be sure to wear protective eye covering to avoid personal injury.

REMOVAL:

WARNING

Parts of the brake assembly may be coated with asbestos dust; breathing this dust can harm you.

- Use filter mask approved for use against asbestos dust.
- Never use compressed air or dry brush to clean these assemblies.
- Use an industrial type vacuum cleaner with a high efficiency filter system to remove dust.
- Use water and a soft bristle brush or cloth to remove dirt or mud.

1. REMOVE BRAKE SHOES.

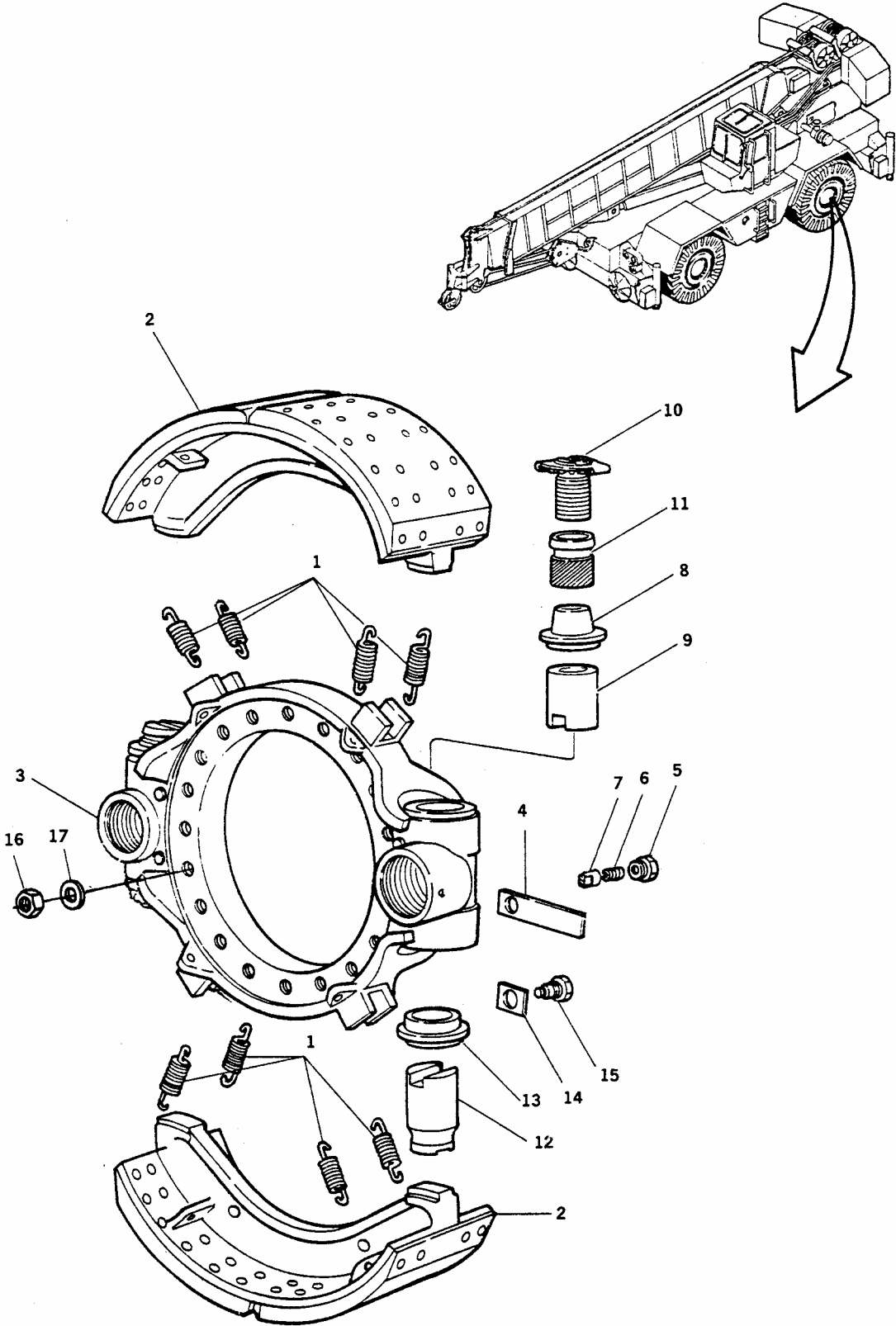
WARNING

Do not use a screwdriver to remove the return springs.

- a. Using brake spring removal tool, remove four springs (1) per shoe (2) from brake spider (3).
- b. Remove brake shoes (2).

DISASSEMBLY:

1. DISASSEMBLE ADJUSTABLE PLUNGER (9).
 - a. Bend tabs on instruction tag (4). Remove cap (5), spring (6) and guide (7) from plunger housing.
 - b. Pry plunger seal (8) loose and remove plunger (9) along with plunger seal (8), adjusting bolt (10) and adjusting actuator (11). Discard adjusting plunger seal (8).
 - c. Remove adjusting actuator (11) and adjusting bolt (10) from plunger (9).
 - d. Unthread adjusting bolt (10) from adjusting actuator (11).
 - e. Remove plunger seal (8) from adjusting bolt (10).
2. DISASSEMBLE ANCHOR PLUNGER (12).
 - a. Pry anchor plunger seal (13) loose and remove from anchor plunger (12). Discard anchor plunger seal (13).
 - b. Bend tabs on lock plate (14) and remove guide screw (15).
 - c. Remove anchor plunger (12) from plunger housing.



NOTE

It is not necessary to remove brake spider to service plunger housing. However, if replacement is required, remove brake chamber assemblies and twenty nuts (16) and washers (17) from mounting studs and remove brake spider. Removing brake spider will also allow access to spindle.

CLEANING:

1. CLEAN ALL PARTS IN SUITABLE SOLVENT AND BLOW DRY WITH COMPRESSED AIR.

WARNING

Dry cleaning solvent P-D-680, Type III is toxic and flammable. Wear protective goggles and gloves and use only in a well ventilated area. Avoid contact with skin, eyes, and clothes and don't breathe vapors. Do not use near open flame or excessive heat. The flash point is 200°F (94°C). If you become dizzy while using cleaning solvent, get fresh air immediately and get medical aid. If contact with eyes is made, wash your eyes with water and get medical aid immediately. Compressed air used for cleaning purposes will not exceed 30 psi. Use only with effective chip guarding and personal protective equipment (goggles/shield, gloves, etc.).

2. WIRE BRUSH PLUNGER PARTS AND ADJUSTING BOLT THREADS TO REMOVE CAKED-ON DIRT AND CORROSION.

INSPECTION:

1. INSPECT ALL PARTS FOR ANY SIGNS OF WEAR OR DAMAGE. REPLACE ANY PART THAT SHOWS WEAR OR DAMAGE.
 - a. Inspect threads in plunger (9) or actuator (11) and on adjusting bolt for

wear or damage. Bolt must move freely in and out of plunger. Clean threads or replace parts.

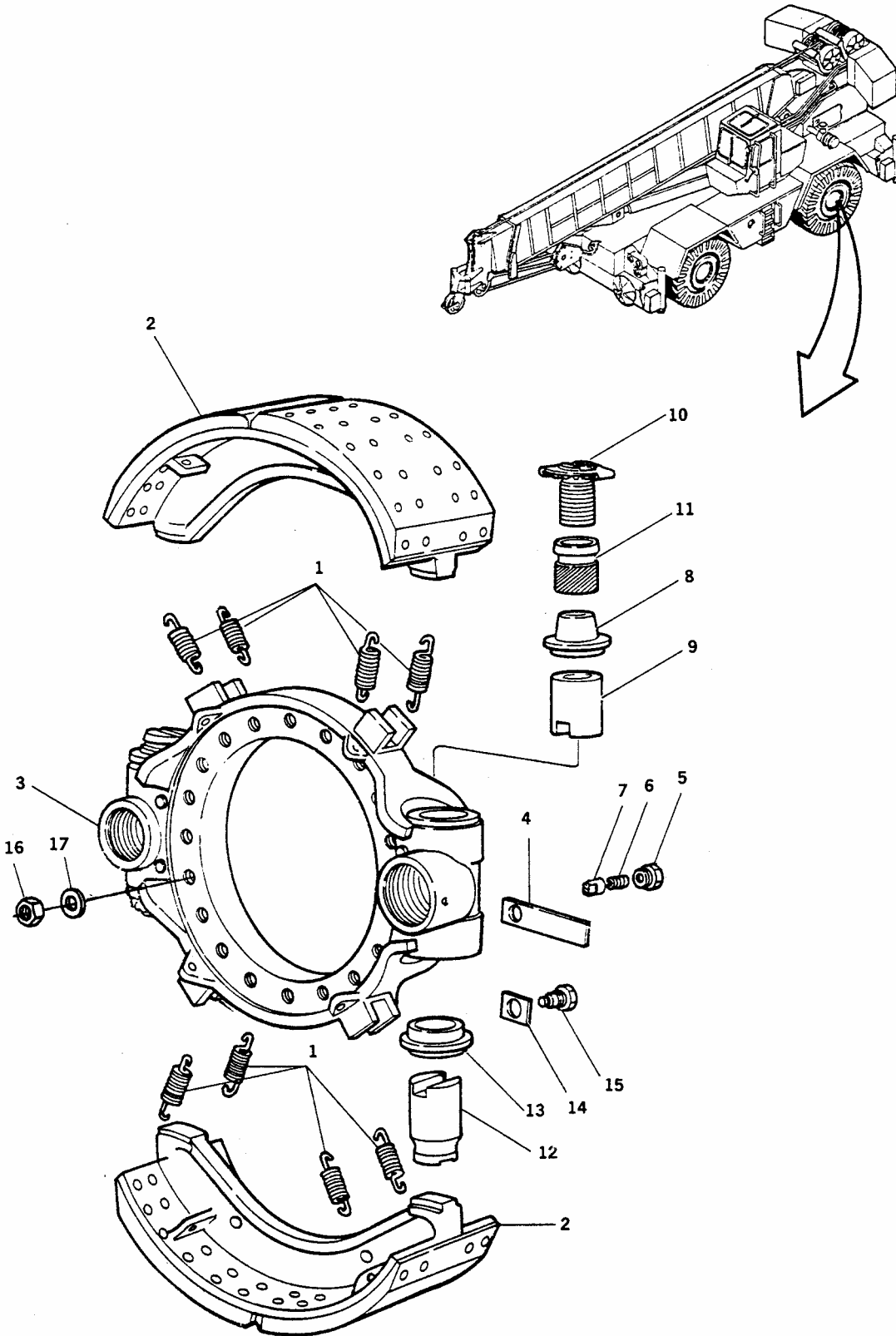
- b. Inspect the teeth on pawl and actuator. Replace the parts that are worn or damaged.
- c. Inspect slot in-plunger (9) and (12) that touches wedge assembly. Be sure area is free of nicks, pits, scratches or corrosion. If damaged, replace plunger.
- d. Inspect brake shoe linings (2) for wear. Each end of brake shoe is chamfered. Brake shoes should be replaced anytime shoes are worn to the point that a chamfer is no longer visible or when thickness of shoe anywhere is less than 0.23 in. (5.84 mm).
- e. Polish bore of plunger housing (3) with crocus cloth. If bore has nicks, scratches or corrosion, replace spider.

INSTALLATION:

1. INSTALL BRAKE SPIDER (3) IF REMOVED. SECURE WITH TWENTY NUTS (16) AND WASHERS (17).
2. INSTALL ANCHOR PLUNGER (12).
 - a. Apply a thin film of grease to a new anchor plunger seal (13).
 - b. Carefully push double lip seal (13) onto anchor plunger (12), stretching outer seal lip over plunger nose end until inner seal lip is completely in second plunger groove and outer seal lip is in first plunger groove.
 - c. Coat entire anchor plunger (12) with grease, packing cavity behind seal.

NOTE

Brake assemblies have one adjusting plunger and one anchor (solid) plunger per plunger housing. Anchor plungers are marked on shoe slot end, R for right hand brakes and L for left hand brakes. DO NOT mix at assembly.



- d. Insert anchor plunger (12) and seal (13) into plunger housing with anchor plunger key-way slot aligned with guide screw hole. Ensure anchor plunger goes all the way into plunger bore and seats at bottom.

NOTE

If a seal driver is not available, a 1-3/4 in. socket can be used.

- e. Seat anchor plunger seal (8) into plunger housing with suitable seal driver tool.
 - f. Install lock plate (14) onto guide screw (15). Install guide screw into plunger housing. Ensure end of guide screw enters the anchor plunger key-way slot so that anchor plunger can slide freely in housing bore. Torque guide screw to 15-20 ft-lbs (20-27 Nm). Bend tabs on lock plate to secure nuts.
3. INSTALL ADJUSTABLE PLUNGER.
- a. Apply a thin coating of grease to inside and outside surfaces of adjusting plunger (9). Place adjusting plunger into bore in plunger housing aligning key-way slot with guide hole.
 - b. Grease a new seal (8) and threads of adjusting bolt (10). Carefully install new seal onto bolt. Grease adjusting actuator (11) and thread it onto bolt.

CAUTION

The adjusting actuator (9) must bottom out on shoulder inside adjusting plunger. If bolt is threaded too far into the adjusting sleeve, bolt will bottom out inside adjusting plunger and the automatic adjuster will not function.

- c. Install actuator (11), adjusting bolt (10), and seal (8) into adjusting plunger (9) already in housing.
- d. Coat guide (7) with grease and install it into plunger housing. Install spring (6),

instruction tag (4) and cap (5) into plunger housing. Torque cap to 15-25 ft-lbs (20-33 Nm). Bend tabs on lock plate to secure cap.

- e. Using suitable seal driver tool, seat adjusting bolt seal (8).

CAUTION

Do not reline shoes with combination linings.

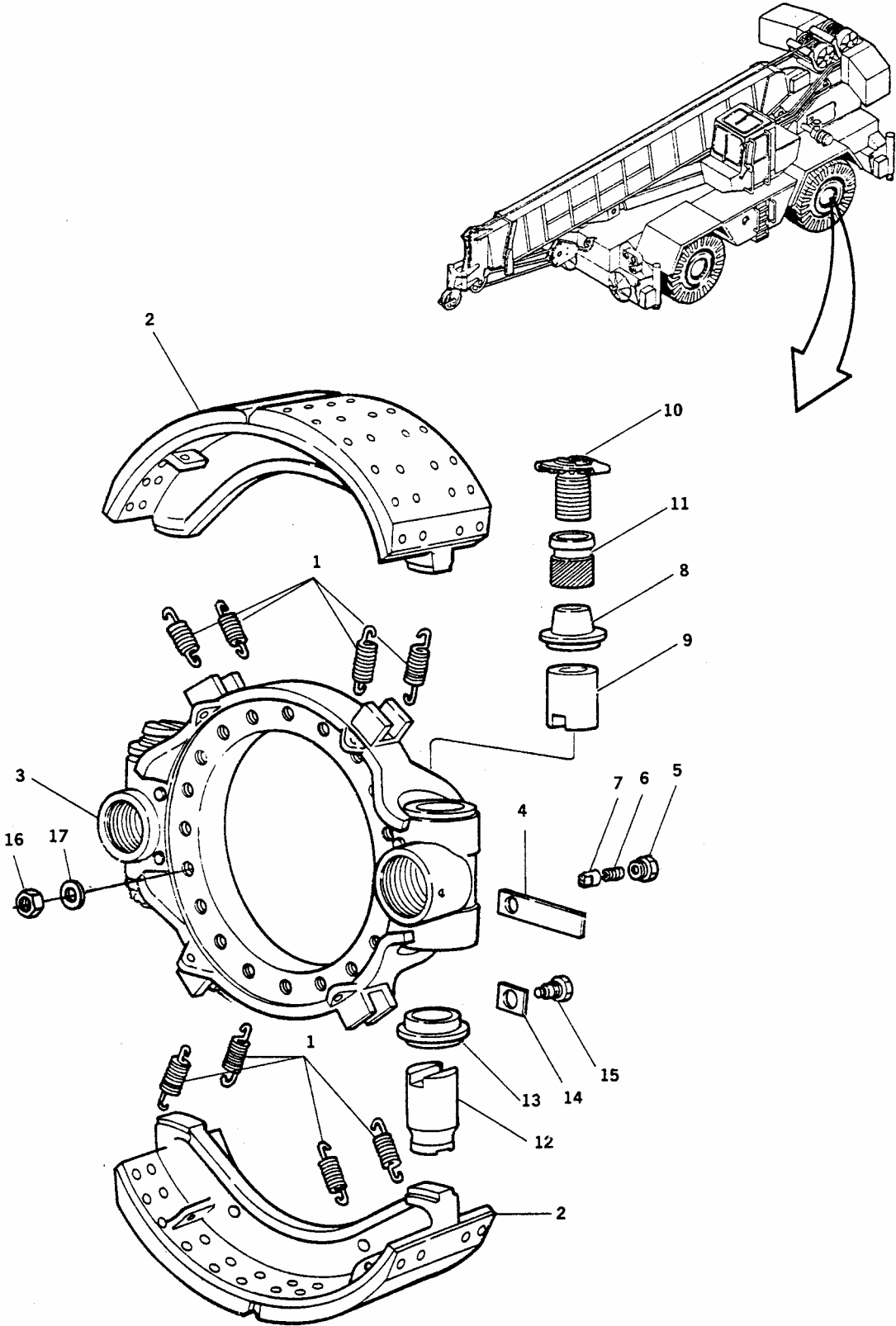
- 4. APPLY GREASE TO SHOE REST PADS AND PLUNGERS.
- 5. INSTALL BRAKE SHOES (2).
 - a. Apply grease to tops of plungers, inside of guide plates and bases of shoes where they contact plungers and guide plates.
 - b. Position brake shoes so long radius of shoe web fits into slots on adjacent bolt retainer and web stamped with an arrow stamp points to anchor plunger in a forward wheel rotation.
 - c. Secure brake shoes (2) with springs (1) installed using brake spring pliers.
- 6. INSTALL PLANETARY WHEEL END ASSEMBLY. (REFER TO PAGE 8-44.)
- 7. INSTALL BRAKE CHAMBERS. (REFER TO TM 5-3810-306-20.)
- 8. ADJUST BRAKES.

NOTE

If brakes shoes (2) were not replaced, do steps a. and b. in addition to the following procedure.

WARNING

Elevate both rear wheels when adjusting brakes. If one wheel remains on the ground, the crane may move when the other wheel is turned.



- a. Cage spring brake manually or build up air pressure and release the parking brake.
- b. Using outriggers, raise wheels off ground. (Refer to TM 5-3810-306-10.)

NOTE

Do not check the clearance at the ends of the linings.

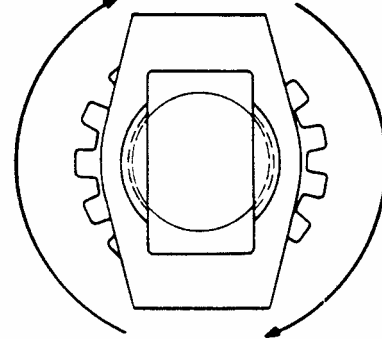
- c. Use feeler gauge to check clearance between center of linings and the drum. The clearance must be 0.020-0.040 in. (0.5-1.0 mm).

CAUTION

Do not damage the seals (8) and (13) when you adjust the brake. If you damage the seals, replace the damaged seal with a new one.

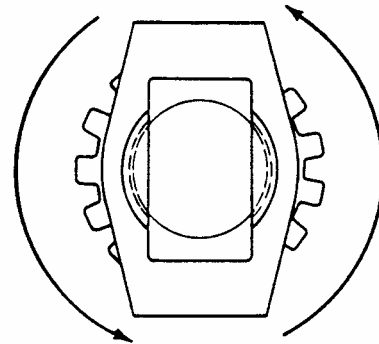
- d. Work on one brake shoe at a time. Use an adjusting spoon or a screwdriver to turn star wheel on the adjuster (10) in direction shown to move the linings against the drum. Turn adjuster (10) until you feel a heavy drag on the drum when you rotate wheel.
- e. Turn the star wheel in direction shown until you feel a very light drag on drum when you turn wheel. Turning the star wheel in this direction moves linings away from the drum.
- f. Use a feeler gauge to check clearance between center of lining and drum. The clearance must be 0.020-0.040 in. (0.5-1.0 mm). Continue to adjust clearance until correct.

TURN STAR WHEEL IN THIS DIRECTION TO MOVE LININGS AWAY FROM DRUM



TOP VIEW OF STAR WHEEL

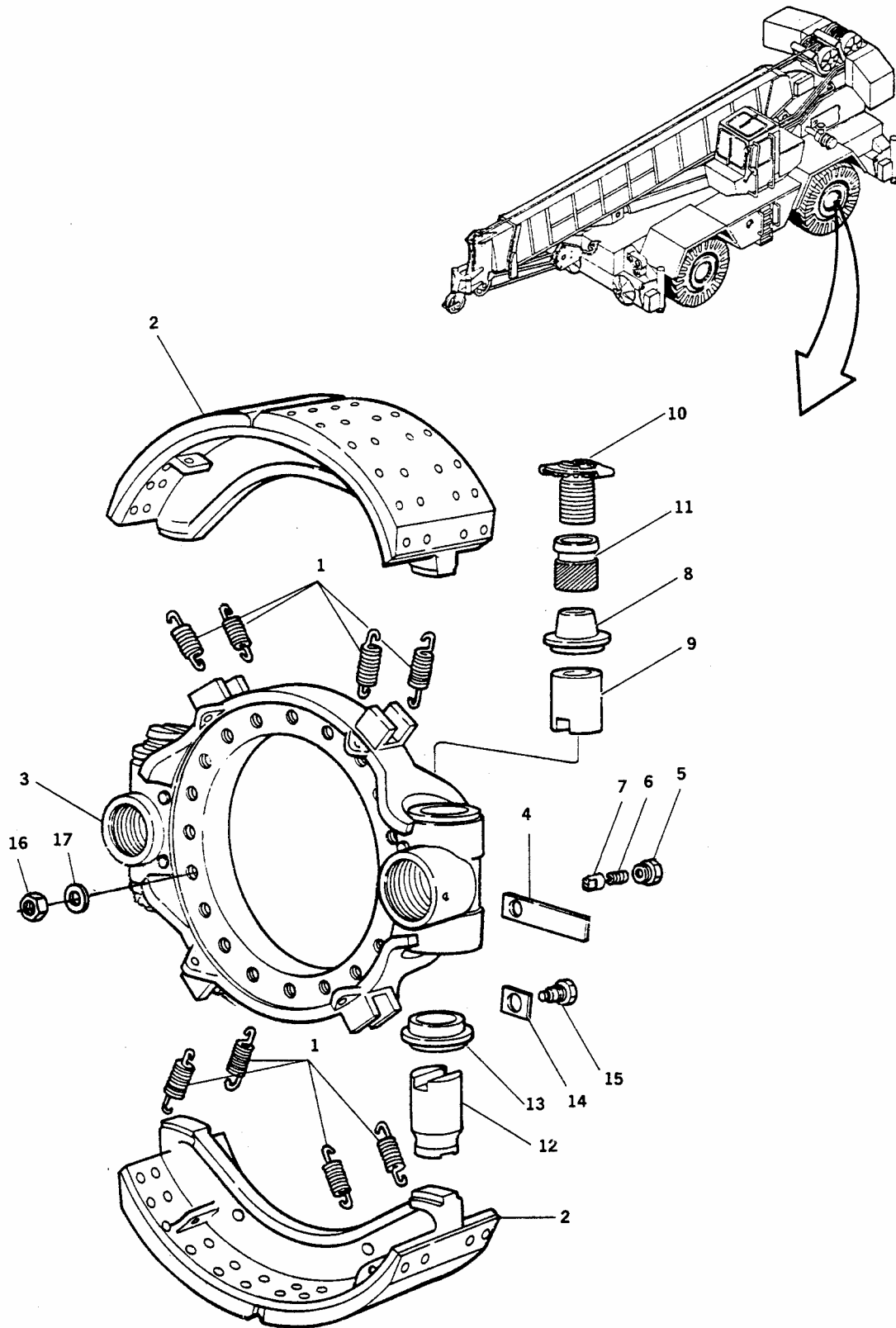
TURN STAR WHEEL IN THIS DIRECTION TO MOVE LININGS AGAINST THE DRUM



TOP VIEW OF STAR WHEEL

- g. Repeat the above procedure for each brake shoe on the brake.
9. UNCAGE BRAKE CHAMBERS. (REFER TO TM 5-3810-306-20.)

END OF TASK



CHAPTER 10
STEERING SYSTEM

CHAPTER INDEX

	Procedure	Page
Section I	Steering Control Valve Assembly Maintenance	10-2
	Steering Control Valve Installation	10-2
	Steering Control Valve Assembly	10-4
Section II	Hydraulic Steering Cylinder Maintenance	10-8
	Steer Cylinder Assembly (Grove PN 6372003089)	10-8
	Steer Cylinder Assembly (Grove PN 7372100118)	10-12

Section I. STEERING CONTROL VALVE ASSEMBLY MAINTENANCE

STEERING CONTROL VALVE INSTALLATION

TOOLS: General mechanic's tool kit: automotive (5180-00-177-7033)

SUPPLIES: Clean rags (Item 2, Appendix B)
Lockwashers (Item 26, Appendix B) (4 required)
Hydraulic oil (Item 8, Appendix B)

Preformed packing (Item 118 (RT875CC) / 275 (RT875CCS), Appendix B) (4 Required)
Preformed packing (Item 107 (RT875CC) / 276 (RT875CCS) Appendix B) (2 Required)
Preformed packing (Item 106 (RT875CC) / 277 (RT875CCS) Appendix B) (2 Required)

EQUIPMENT CONDITIONS: Negative battery cable disconnected at shunt. (RT875CC)
Battery disconnect switch in off position. (RT875CCS)
Cover at front of cab removed. (Refer to TM 5-3810-306-20.)
Right and left front consoles removed.
(Refer to TM 5-3810-306-20.)

WARNING

Be sure to wear protective eye covering to avoid personal injury.

REMOVAL:

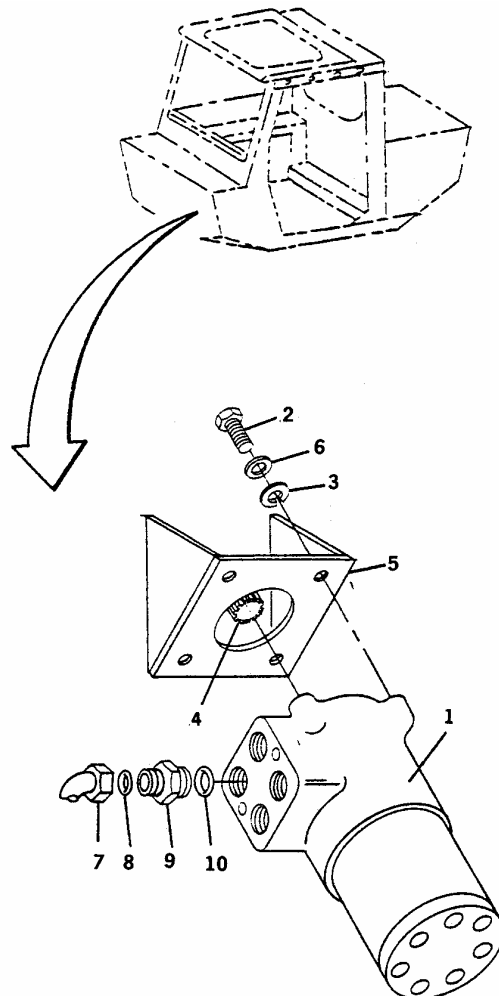
1. TAG AND DISCONNECT HYDRAULIC HOSES.

- a. Thoroughly clean steering control valve and surrounding area of all dirt and contamination before disconnecting hydraulic hoses from valve (1).

NOTE

It may be necessary to disconnect automatic control lever lock out linkage to access all hydraulic hoses.

- b. Tag and disconnect four hydraulic hoses (7) from steering control valve (1). Cap or plug each hose. Remove and discard packings (8).
 - c. Remove fittings (9) and preformed packings (10) from ports and retain for installation. Cap or plug ports. Discard packings (10).
- ##### 2. REMOVE STEERING CONTROL VALVE (1).
- a. Working through front console in cab, remove four bolts (2), washers (6) and



- b. Remove control valve (1) leaving steering column (4) in cab.
- 3. INSPECT ALL PARTS FOR DAMAGE. REPLACE AS REQUIRED.

INSTALLATION:

- 1. INSTALL STEERING CONTROL VALVE (1).
 - a. Position control valve (1) to bracket (5) and steering column and install four lockwashers (3), washers (6) and bolts (2).

NOTE

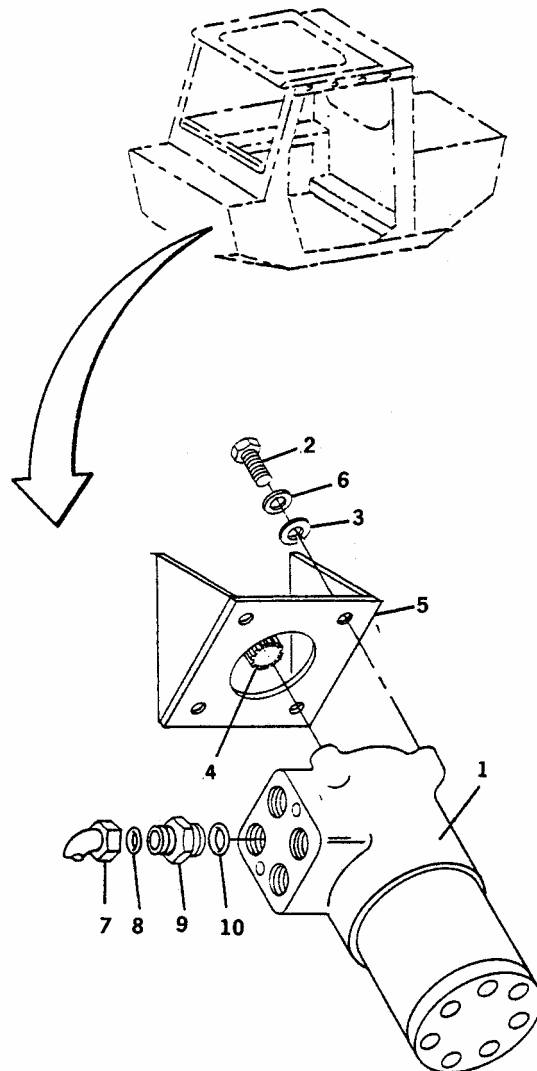
Prior to connecting hydraulic lines, ensure that fitting threads are clean and free of contaminants. Do not remove any orange thread sealant if previously applied to the fitting(s). Then coat new preformed packings with clean hydraulic oil.

- 2. REMOVE TAGS AND INSTALL HYDRAULIC HOSES TO STEERING CONTROL VALVE (1).
 - a. Install fittings in ports.
 - b. Connect four hydraulic hoses to control valve (1) as tagged during removal.

NOTE

Connect lock out control linkage if required.

- 3. CONNECT NEGATIVE BATTERY CABLE AT SHUNT. (REFER TO TM 5-3810-306-20.) (RT875CC)
- 4. TEST STEERING CONTROL VALVE FOR PROPER OPERATION.
 - a. Prior to securing cover to front of crane cab, start engine and check for proper operation and any leaks.



- 5. INSTALL CAB FRONT COVER. (REFER TO TM 5-3810-306-20.)
- 6. INSTALL RIGHT AND LEFT FRONT CONSOLES. (REFER TO TM 5-3810-306-20.)

END OF TASK

STEERING CONTROL VALVE ASSEMBLY

TOOLS: General mechanic's tool kit: automotive (5180-00-177-7033)
Lubrication Service, Unit Trailer Mounted (4930-00-017-9167)
Shop Equipment Auto-Maintenance and Repair, FM Basic (4910-00-754-0705)
Shop Equipment Auto-Maintenance and Repair, FM Suppl No. 1 (4910-00-754-0706)
Shop Equipment Auto-Maintenance and Repair; Common No. 2 (4910-00-754-0653)
Spring installation tool (NSN)

SUPPLIES: Packing Assortment (Item 161, Appendix B)
Retaining Ring (Item 160, Appendix B)
Machine screw, 1/8-24 x 1-1/2 in. (Item 159, Appendix B)
Petroleum Jelly (Item 158, Appendix B)

EQUIPMENT CONDITIONS: Steering control valve assembly removed. (Refer to page 10-2.)

DISASSEMBLY:

CAUTION

1. CLEAN ALL SURFACE CONTAMINATION FROM VALVE ASSEMBLY PRIOR TO DISASSEMBLY.
2. DISASSEMBLE GEROTOR END.
 - a. Remove seven capscrews (27), end cap (26) and packing (21). Discard packing (21).
 - b. Remove gerotor (24) and packing (21). Discard packing (21).
 - c. Remove drive spacer(s) (25).
 - d. Remove drive (23), spacer plate (22) and packing (21). Discard packing (21).
3. DISASSEMBLE CONTROL END.
 - a. Remove retaining ring (4).
 - b. Rotate spool (18) until pin (19) is horizontal. Push spool (18) forward until seal gland bushing (5) is free of housing (16). Remove bushing (5).
 - c. Remove oil seal (3) and quad ring (7) from bushing (5). Discard seal (3).
 - d. Remove needle bearing set (8).
 - e. Remove sleeve (17) and spool (18) from housing (16).

Do not bind the spool and sleeve in the housing. Rotate the spool and sleeve assembly slowly when removing it from the housing.

- f. Remove pin (19) from spool (18) and sleeve (17).
4. REMOVE SIX CENTERING SPRINGS (20) FROM SPOOL (18) AND SLEEVE (17).
 - a. Push spool (18) partially from sleeve (17) and remove six centering springs (20).
 - b. Remove spool (18) from sleeve (17) while rotating slowly.
5. REMOVE AND DISCARD SEAL (6) FROM HOUSING (16).
6. REMOVE CHECK BALL (13) AND SEAT (11).
 - a. Remove setscrew (9) from housing (16).
 - b. Screw 1/8" -24 machine screw into end of check ball seat (11). Pull screw and seat (11) out with pliers.

- c. Remove and discard seals (10) and (12) from seat (11).
- d. Tip housing (16) and remove check ball (13) and check ball retainer (14).

CLEANING:

WARNING

Dry cleaning solvent P-D-680, Type III is toxic and flammable. Wear protective goggles and gloves and use only in a well ventilated area. Avoid contact with skin, eyes, and clothes and do not breathe vapors. Do not use near open flame or excessive heat. The flash point is 200°F (94° C). If you become dizzy while using cleaning solvent, get fresh air immediately and get medical aid. If contact with eyes is made, wash your eyes with water and get medical aid immediately.

Dry parts with compressed air. Do not wipe dry with cloth or paper towel because lint or other matter can get into hydraulic system and cause damage.

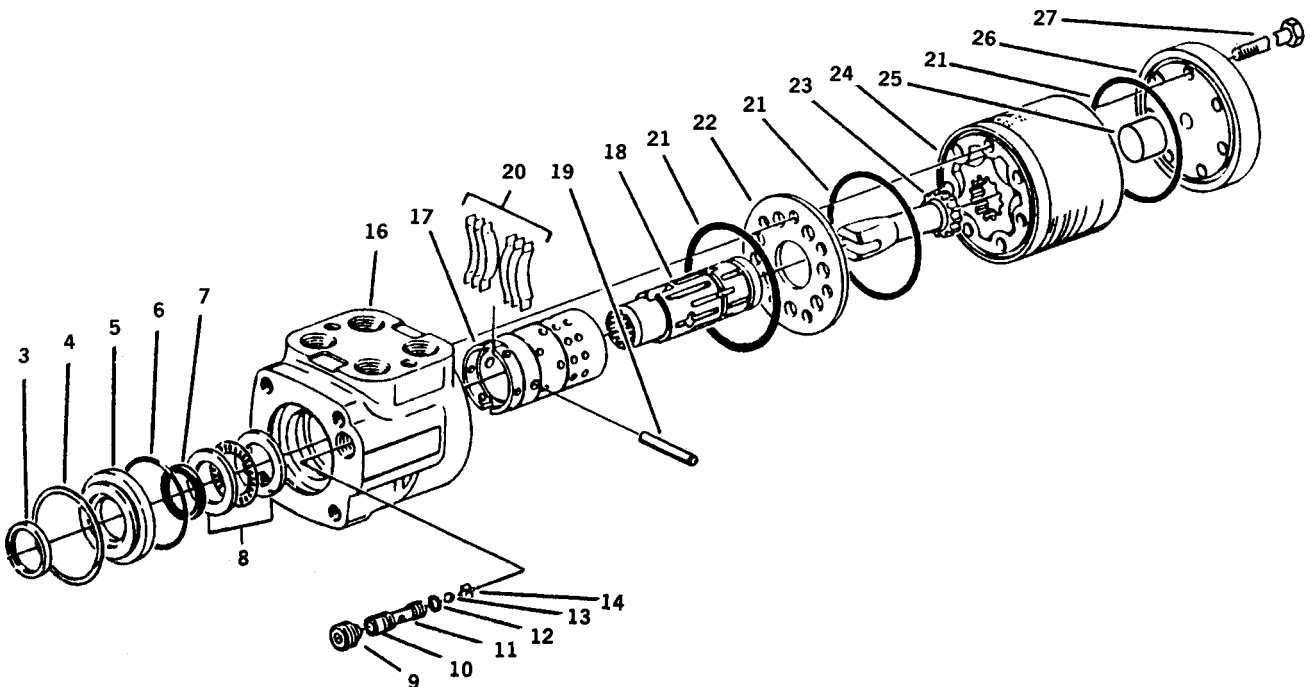
WARNING

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

- 1. CLEAN ALL PARTS WITH SOLVENT P-D-680, TYPE III AND BLOW DRY WITH COMPRESSED AIR.

INSPECTION:

- 1. INSPECT ALL PARTS AND REPLACE AS NECESSARY.
 - a. Inspect parts for scratches and burrs. Minor scratches may be removed with fine crocus cloth. Do not use coarse grit or grind.
 - b. Inspect all mating surfaces.



REASSEMBLY:

NOTE

Lubricate all seals (with the exception of the quad ring seal) with a petroleum jelly, such as Vaseline. Do not use excessive lubricant on the seals for the gerotor section.

1. INSTALL CHECK BALL (13) AND SEAT (11).
 - a. Insert check ball retainer (14) into housing using needle nose pliers. Ensure retainer sits flat.
 - b. Install check ball (13).
 - c. Lubricate and install new seals (10) and (12) onto check ball seat (11). Install check ball seat (11) in housing (16).
 - d. Install setscrew (9). Torque to 100 in.-lbs (11 Nm). Ensure top of setscrew is below mating surface to avoid interference upon installation.
2. ASSEMBLE AND INSTALL SPOOL (18), SLEEVE (17) AND SPRINGS (20).
 - a. Install spool (18) into sleeve (17). Ensure spool (18) moves freely. Rotate spool (18) so spring slots are aligned.

NOTE

Some spool and sleeve sets have identification marks, aligning these marks will line up spring slots.

- b. Bring spring slots of both parts in line and stand parts on end of bench. Insert spring installation tool through spring slots of both parts. Position three pairs of centering springs (20) (two sets of three each) on bench so extended edge is down and arched center section is together. In this position, enter one end of entire spring set into spring installation tool.

- c. Compress the extended end of centering spring set and push it into spool sleeve assembly, withdrawing installation tool at same time.
- d. Center spring set in parts so they push down evenly and are flush with upper surface of the spool and sleeve.
- e. Install pin (19) through spool (18) and sleeve (17) until ends are flush with both sides of sleeve.
- f. Install spool and sleeve assembly into housing (16).

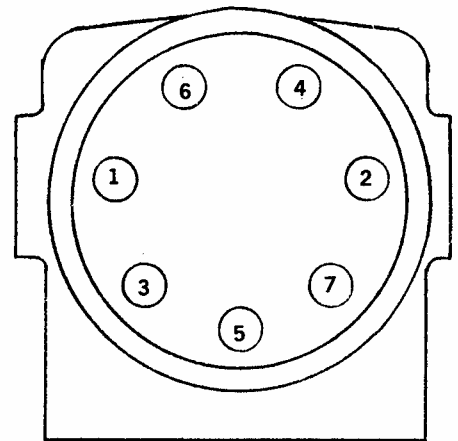
CAUTION

Be extremely careful that parts do not tilt out of position while entering. Push parts gently into place with a slight rotating action. Keep the pin (19) nearly horizontal. Bring spool assembly entirely within housing (16) bore until parts are flush at meter end or fourteen hole end of housing. Do not pull spool assembly beyond this point to prevent the cross pin from dropping into discharge groove of housing. With spool assembly in this flush position, check for free rotation within housing by turning with light fingertip force at splined end.

3. REASSEMBLE CONTROL END.
 - a. Install new seal (6) into housing (16).
 - b. Lubricate and install needle bearing set (8) on spool (18) in housing (16).
 - c. Install new oil seal (3) into bushing (5). Flat or smooth side of oil seal (3) must face in towards bushing (5).
 - d. Install quad ring (7) in bushing (5). Install bushing over spool end until seated on bearing (8).
 - e. Secure assembled part with retaining ring (4).

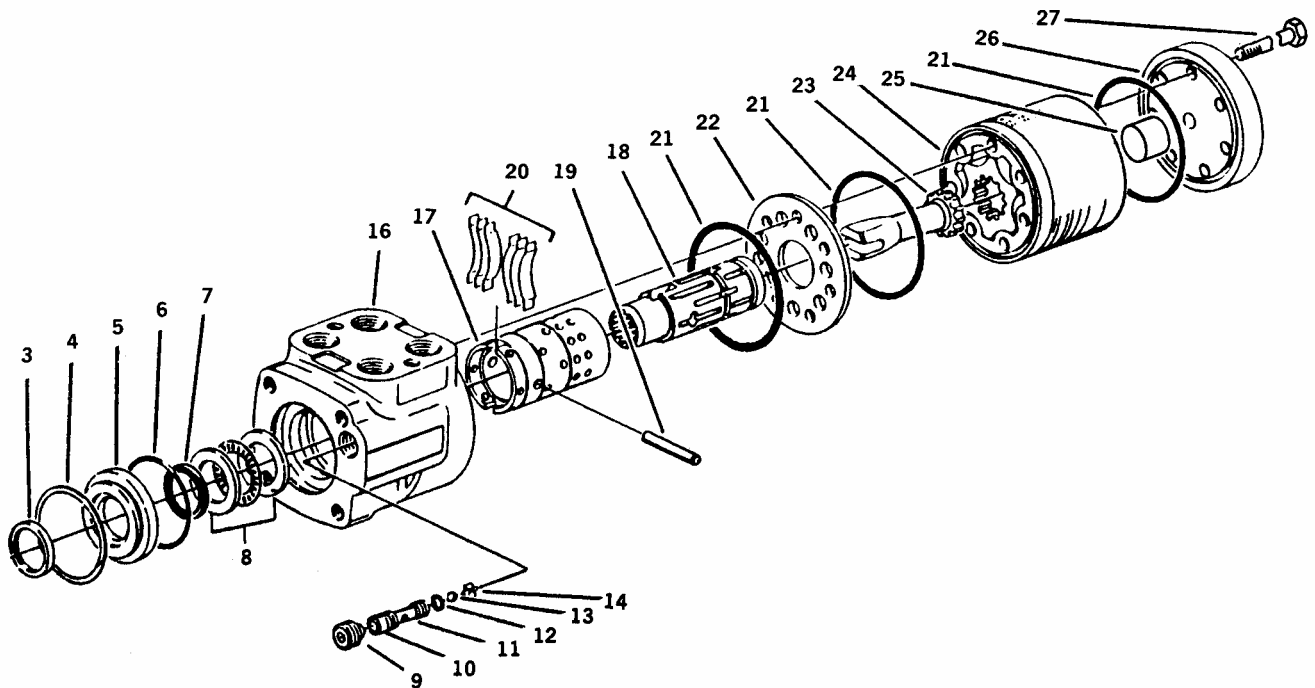
4. REASSEMBLE GEROTOR END.

- a. Install new packing (21) and spacer plate (22). Align holes in spacer plate (22) with those in housing (16).
- b. Ensure pin (19) is parallel with port face and install drive (23) until fully seated against pin (19).
- c. Install new packing (21) and gerotor (24) on housing (16).
- d. Install spacer(s) (25).
- e. Install new packing (21) and end cap (26). Secure with seven capscrews (27).
- f. Pre-tighten capscrews (27) to 150 in.-lbs (17 Nm) then torque screws to 275 in.-lbs (30 Nm) in sequence shown.



5. INSTALL STEERING CONTROL VALVE.
(REFER TO PAGE 10-2.)

END OF TASK



Section II. HYDRAULIC STEERING CYLINDER MAINTENANCE

STEER CYLINDER ASSEMBLY (GROVE PN 6372003089)

TOOLS: General mechanic's tool kit: automotive (5180-00-177-7033)
Shop Equipment Auto-Maintenance and Repair, FM Basic (4910-00-754-0705)
Shop Equipment Auto-Maintenance and Repair, FM Suppl No. 1 (4910-00-754-0706)
Tool Outfit Hyd System, Test and Repair, 3/4 Ton Trailer Mtd (4940-01-036-5784)

SUPPLIES: Parts kit (Item 266, Appendix B)
Loctite # 271 (Item 23, Appendix B)
Hydraulic oil (Item 8, Appendix B)
Solvent, Cleaning P-D-680, Type III (Item 1, Appendix B)
NEVER-SEEZ (Item 24, Appendix B)

EQUIPMENT CONDITIONS: Steer cylinder assembly removed. (Refer to TM 5-3810-306-20.)

WARNING

Be sure to wear protective eye covering to avoid personal injury.

NOTE

Check the steering cylinder for a stamped part number on the barrel at the piston end. If the number "710018" is stamped on the barrel, refer to the repair procedure on page 10-13.

DISASSEMBLY:

NOTE

Any maintenance requiring disassembly of the cylinder should include replacement of all cylinder seals.

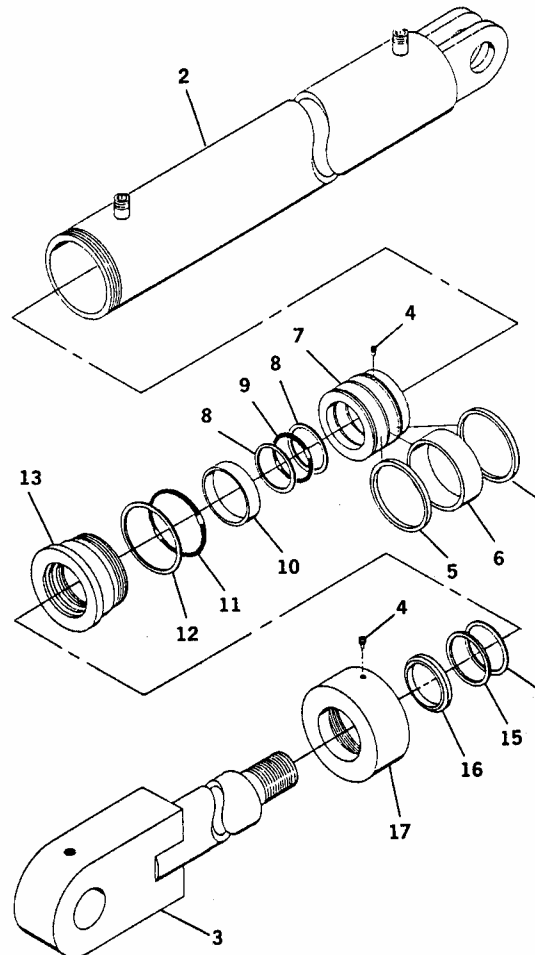
1. REMOVE CYLINDER ROD ASSEMBLY (3), SEALS AND PISTON (7).
 - a. Loosen and remove setscrew (4) that attaches lock ring (17) to rod end of barrel (2).

WARNING

Do not use air pressure to remove cylinder rod assembly. Use only a source of controlled hydraulic oil pressure if rod assembly is hard to remove.

CAUTION

Exercise extreme care when handling or setting down cylinder rod.



CAUTION

When removing seals and rings, avoid scratching grooved and gland surfaces.

- b. Remove rod (3) with components, from barrel (2) and place rod assembly on a clean workbench for disassembly. Cover barrel opening.

NOTE

Aligning discarded seals and rings in order of disassembly will facilitate installation of new items.

- c. Remove and discard seal (6) and rings (5) from outside of piston (7).
 - d. Loosen and remove setscrew (4) from rod (3).
 - e. Unscrew piston (7) from rod (3).
 - f. Remove and discard two backup rings (8) and packing (9) from inside of piston (7).
2. REMOVE HEAD (13) AND SEALS FROM ROD (18).
 - a. Slide head (13) from rod (3).
 - b. Remove and discard wear ring (10), buffer seal (14) and rod seal (15) from inside of head (13).
 - c. Remove and discard packing (11) and back-up ring (12) from outside of head (13).
 3. SIDE LOCK RING (17) FROM ROD (3). REMOVE AND DISCARD WIPER SEAL (16) FROM LOCK RING.

CLEANING AND INSPECTION:**WARNING**

Dry cleaning solvent P-D-680, Type III is toxic and flammable. Wear protective goggles and gloves and use only in a well ventilated area.

WARNING

Avoid contact with skin, eyes, and clothes and do not breathe vapors. Do not use near open flame or excessive heat. The flash point is 200°F (94°C). If you become dizzy while using cleaning solvent, get fresh air immediately and get medical aid. If contact with eyes is made, wash your eyes with water and get medical aid immediately.

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

1. CLEAN ALL PARTS WITH SOLVENT AND DRY WITH COMPRESSED AIR. INSPECT ALL PARTS FOR SERVICEABILITY.

CAUTION

Before installing new seals and rings, clean all surfaces and carefully remove burrs and nicks. Parts displaying excessive wear or damage should be replaced.

2. STONE OUT MINOR BLEMISHES AND POLISH WITH A FINE CROCUS CLOTH.
3. CLEAN WITH SOLVENT AND DRY WITH COMPRESSED AIR ANY PARTS THAT HAVE BEEN STONED AND POLISHED.
4. INSPECT BARREL CAREFULLY FOR SCORING.

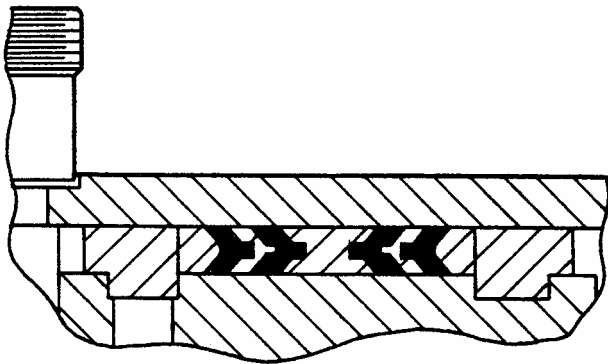
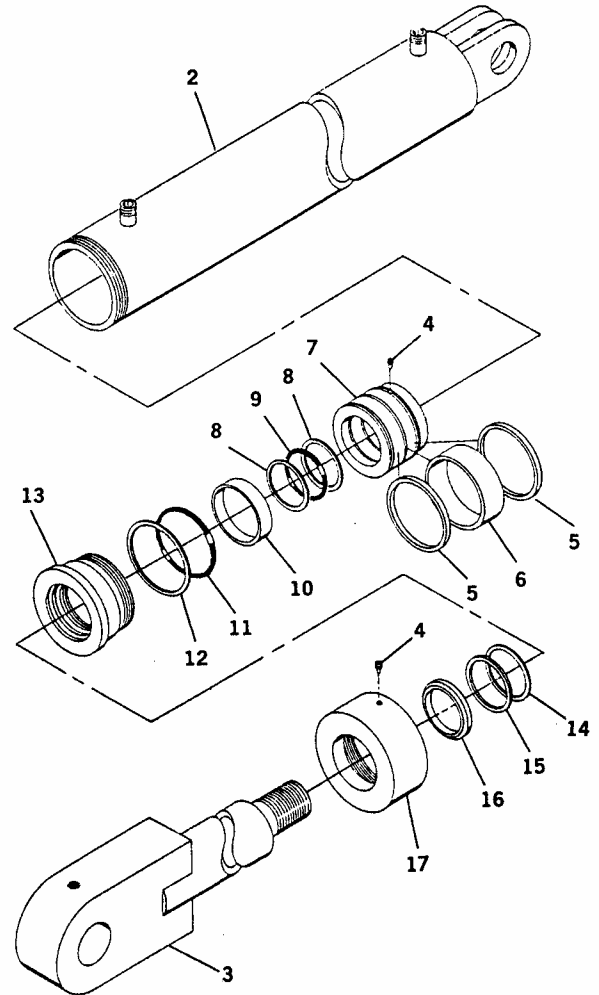
REASSEMBLY:**WARNING**

When installing new seals and rings, avoid stretching seals or scratching grooved or gland surfaces.

NOTE

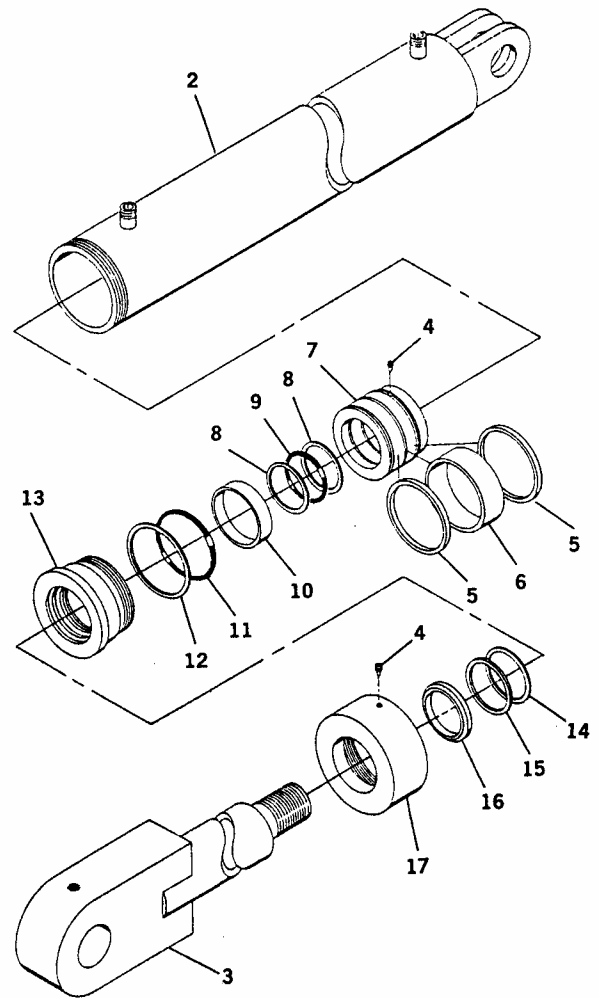
Lubricate new seals and rings with clean hydraulic oil.

1. LUBRICATE AND INSTALL A NEW WIPER SEAL (16) INTO INSIDE OF LOCK RING (17) AND SLIDE LOCK RING ONTO ROD (3).
2. INSTALL HEAD (13) AND NEW SEALS ON ROD (3).
 - a. Lubricate and install a new packing (11) and backup ring (12) onto outside of head (13).
 - b. Lubricate and install a new wear ring (10) on inside of head.
 - c. Lubricate and install a new rod seal (15), grooved end first, into inside of head (13). Lubricate and install a new buffer seal (14).
 - d. Slide head onto rod (3).
3. INSTALL NEW SEALS AND BACKUP RINGS ON PISTON (7).
 - a. Lubricate and install new ring (6) and seals (5) onto outside of piston (7). Ensure the seal assembly is installed as shown.



- b. Lubricate and install two new back-up rings (8) and new packing (9) on inside of piston (7).
4. IF EXISTING PISTON (7) AND ROD (3) ARE TO BE USED, PROCEED AS FOLLOWS:
 - a. Install piston (7) onto rod (3).
 - b. Using strap wrench, tighten piston securely.
 - c. If necessary, drill 0.265-inch diameter hole 3/16- inch (minimum) deep in rod (3).
 - d. Clean drilled hole of chips and debris.
 - e. Apply Loctite # 271 to setscrew (4) and install setscrew.
5. IF NEW PISTON (7) OR ROD (3) ARE TO BE USED, PROCEED AS FOLLOWS:
 - a. Install piston (7) onto rod (3).
 - b. Using strap wrench, tighten piston securely until setscrew holes align.
 - c. Apply Loctite # 271 to setscrew (4) and install setscrew.

6. SLIDE CYLINDER ROD (3) WITH HEAD (13) AND PISTON (7) INTO CYLINDER BARREL WITH A TWISTING MOTION.
7. CLEAN OIL FROM THREADS OF LOCK RING (17). COAT THREAD WITH NEVER-SEEZ (PASTE-TYPE) LUBRICANT.
8. IF EXISTING LOCK RING (17) AND BARREL (2) ARE TO BE USED, PROCEED AS FOLLOWS:
 - a. Screw lock ring (17) onto barrel (2).
 - b. Using strap wrench, tighten lock ring (17) securely until setscrew holes align.
 - c. Apply Loctite # 271 to setscrew (4) and install setscrew.
9. IF NEW LOCK RING (17) OR BARREL (2) IS TO BE USED, PROCEED AS FOLLOWS:
 - a. Screw lock ring (17) onto barrel (2).
 - b. Using strap wrench, tighten lock ring (17) securely.
 - c. If necessary, drill 0.265-inch diameter hole 3/16- inch (maximum) deep in barrel (2).



NOTE

Setscrew (4) when installed should be flush with lock ring (17).

- d. Clean drilled hole of chips and debris.
- e. Apply Loctite # 271 to setscrew (4) and install setscrew.

WARNING

Do not use air pressure to cycle or pressurize the cylinder.

10. PRESSURIZE AND CYCLE TEST CYLINDER. CHECK FOR PROPER OPERATION AND ANY LEAKAGE.

END OF TASK

STEER CYLINDER ASSEMBLY (GROVE PN 7372100118)

TOOLS: General mechanic's tool kit: automotive (5180-00-177-7033)
 Shop Equipment Auto-Maintenance and Repair, FM Basic (4910-00-754-0705)
 Shop Equipment Auto-Maintenance and Repair, FM Suppl No. 1 (4910-00-754-0706)
 Tool Outfit Hyd System, Test and Repair, 3/4 Ton Trailer Mtd (4940-01-036-5784)

SUPPLIES: Parts kit (Item 297, Appendix B)
 Hydraulic oil (Item 8, Appendix B)
 Solvent, Cleaning P-D-680, Type III (Item 1, Appendix B)
 NEVER-SEEZ (Item 24, Appendix B)

EQUIPMENT CONDITIONS: Steer cylinder assembly removed. (Refer to TM 5-3810-306-20.)

NOTE

This procedure is for the steering cylinder which began appearing on container cranes in September 2003. It can be identified by the stamp on the cylinder barrel: "7100118".

DISASSEMBLY:

NOTE

Any maintenance requiring disassembly of the cylinder should include replacement of all cylinder seals.

1. REMOVE CYLINDER ROD ASSEMBLY (15), SEALS AND PISTON (4).

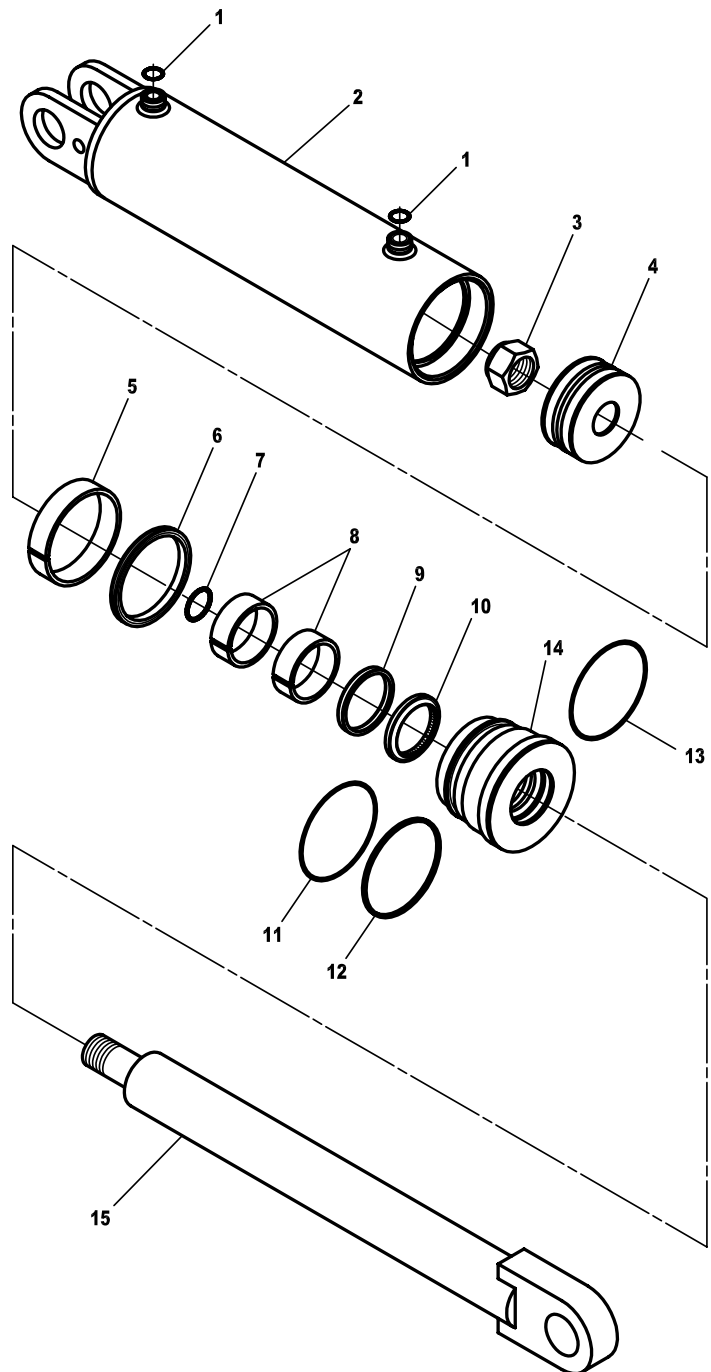
WARNING

Do not use air pressure to remove cylinder rod assembly. Use only a source of controlled hydraulic oil pressure if rod assembly is hard to remove.

CAUTION

Exercise extreme care when handling or setting down cylinder rod.

- a. Use spanner wrench to loosen head (14).



CAUTION

When removing seals and rings, avoid scratching grooved and gland surfaces.

- b. Remove rod (15) with components, from barrel (2) and place rod assembly on a clean workbench for disassembly. Cover barrel opening.

NOTE

Aligning discarded seals and rings in order of disassembly will facilitate installation of new items. Also note how each seal and ring is oriented.

- c. Remove and discard seal (6) and wear ring (5) from outside of piston (4).
 - d. Loosen and remove locknut (3) from rod (15).
 - e. Remove piston (4) from rod (15).
 - f. Remove and discard packing (7) from inside of piston (4).
2. REMOVE HEAD (14) AND SEALS FROM ROD (15).
 - a. Slide head (14) from rod (15).
 - b. Remove and discard wear rings (8), buffer seal (9) and ring wiper (10) from inside of head (14).
 - c. Remove and discard packing (11), back-up ring (12), and packing (13) from outside of head (14).

CLEANING AND INSPECTION:**WARNING**

Dry cleaning solvent P-D-680, Type III is toxic and flammable. Wear protective goggles and gloves and use only in a well ventilated area.

WARNING

Avoid contact with skin, eyes, and clothes and do not breathe vapors. Do not use near open flame or excessive heat. The flash point is 200°F (94°C). If you become dizzy while using cleaning solvent, get fresh air immediately and get medical aid. If contact with eyes is made, wash your eyes with water and get medical aid immediately.

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

1. CLEAN ALL PARTS WITH SOLVENT AND DRY WITH COMPRESSED AIR. INSPECT ALL PARTS FOR SERVICEABILITY.

CAUTION

Before installing new seals and rings, clean all surfaces and carefully remove burrs and nicks. Parts displaying excessive wear or damage should be replaced.

2. STONE OUT MINOR BLEMISHES AND POLISH WITH A FINE CROCUS CLOTH.
3. CLEAN WITH SOLVENT AND DRY WITH COMPRESSED AIR ANY PARTS THAT HAVE BEEN STONED AND POLISHED.
4. INSPECT BARREL CAREFULLY FOR SCORING.

REASSEMBLY:**WARNING**

When installing new seals and rings, avoid stretching seals or scratching grooved or gland surfaces.

NOTE

Lubricate new seals and rings with clean hydraulic oil.

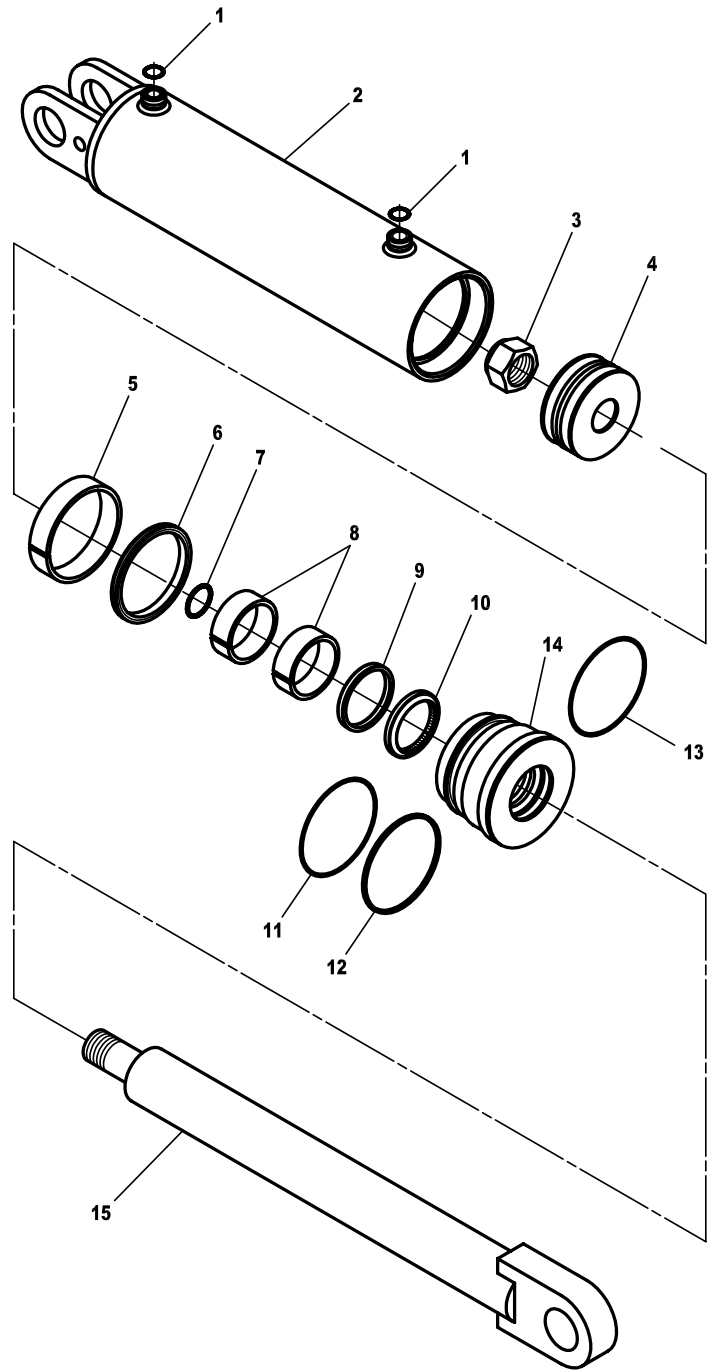
1. INSTALL HEAD (14) AND NEW SEALS ON ROD (15).
 - a. Lubricate and install a new packing (13), backup ring (12), and packing (11) onto outside of head (14).
 - b. Lubricate and install a new ring wiper (10), grooved end first and buffer seal (9) on inside of head.
 - c. Lubricate and install new wear rings (8) inside of head (14).
 - d. Slide head (14) onto rod (15).
2. INSTALL NEW SEALS AND BACKUP RINGS ON PISTON (4).
 - a. Lubricate and install new wear ring (5) and seal (6) onto outside of piston (4). Ensure the seal assembly is installed as noted during disassembly.
 - b. Lubricate and install new packing (7) on inside of piston (4).
3. INSTALL PISTON (4) ON ROD (15) AND SECURE WITH LOCKNUT (3).
4. INSTALL PISTON (4) AND ROD (15) INTO CYLINDER BARREL (2) AND TIGHTEN HEAD (14).

WARNING

Do not use air pressure to cycle or pressurize the cylinder.

5. PRESSURIZE AND CYCLE TEST CYLINDER. CHECK FOR PROPER OPERATION AND ANY LEAKAGE

END OF TASK



CHAPTER 11
OUTRIGGER MAINTENANCE

CHAPTER INDEX

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Section I. OUTRIGGER ASSEMBLY MAINTENANCE

OUTRIGGER BEAM INSTALLATION

TOOLS: General mechanic's tool kit: automotive (5180-00-177-7033)
Shop Equipment Auto-Maintenance and Repair Common No 1 (4910-00-754-0655)
Shop Equipment Auto-Maintenance and Repair; Org Suppl No 1 (4910-00-754-0653)
Lifting device (1 ton capacity)

SUPPLIES: Cotter pins (Item 64, Appendix B)
Hydraulic oil (Item 8, Appendix B)
Preformed packing (Item 67, Appendix B) (2 Required)
Preformed packing (Item 68, Appendix B) (2 Required)
Grease (Item 9, Appendix B)
NEVER-SEEZ (Item 24, Appendix B)

EQUIPMENT CONDITION: None

REMOVAL:

WARNING

Outrigger beam assembly weighs approximately 1520 lbs (690 Kg). Use care when removing outrigger beam assembly.

Be sure to wear protective eye covering to avoid personal injury.

1. EXTEND OUTRIGGER SLIGHTLY TO FACILITATE ATTACHING A LIFTING DEVICE TO OUTRIGGER BEAM.
2. DISCONNECT NEGATIVE BATTERY CABLE AT SHUNT. (REFER TO TM 5-3810-306-20.) (RT875CC) BATTERY DISCONNECT SWITCH IN OFF POSITION (RT875CCS)
3. REMOVE OUTRIGGER HOUSING COVER (1).
 - a. On opposite side of outrigger housing, remove two screws (2) securing cover (1) to housing. Disconnect side marker light electrical connector and remove cover.
4. TAG AND DISCONNECT THREE HYDRAULIC LINES (3) AT CYLINDER END OF EXTENSION CYLINDER. CAP ALL LINES AND FITTINGS.
5. REMOVE EXTENSION CYLINDER MOUNTING SHAFT (4).

NOTE

Do not allow end of outrigger extension cylinder to fall when cylinder mounting shaft is removed. Use an adequate blocking to support cylinder.

- a. Remove cotter pins (5) securing cylinder mounting shaft (4) and remove shaft.
6. REMOVE OUTRIGGER BEAM (6).
- a. Attach a suitable lifting device to outrigger beam.
 - b. Pull outrigger beam out of outrigger box, readjusting lifting attachment to maintain equal balance.

WARNING

Ensure any blocking material used is capable of supporting weight of outrigger beam. Do not allow it to tilt or slide.

- c. Position outrigger beam (6) on blocking material.
7. REMOVE WEAR PAD (7) AND SHIM (8) FROM POCKET AT BOTTOM OF OUTRIGGER BOX.

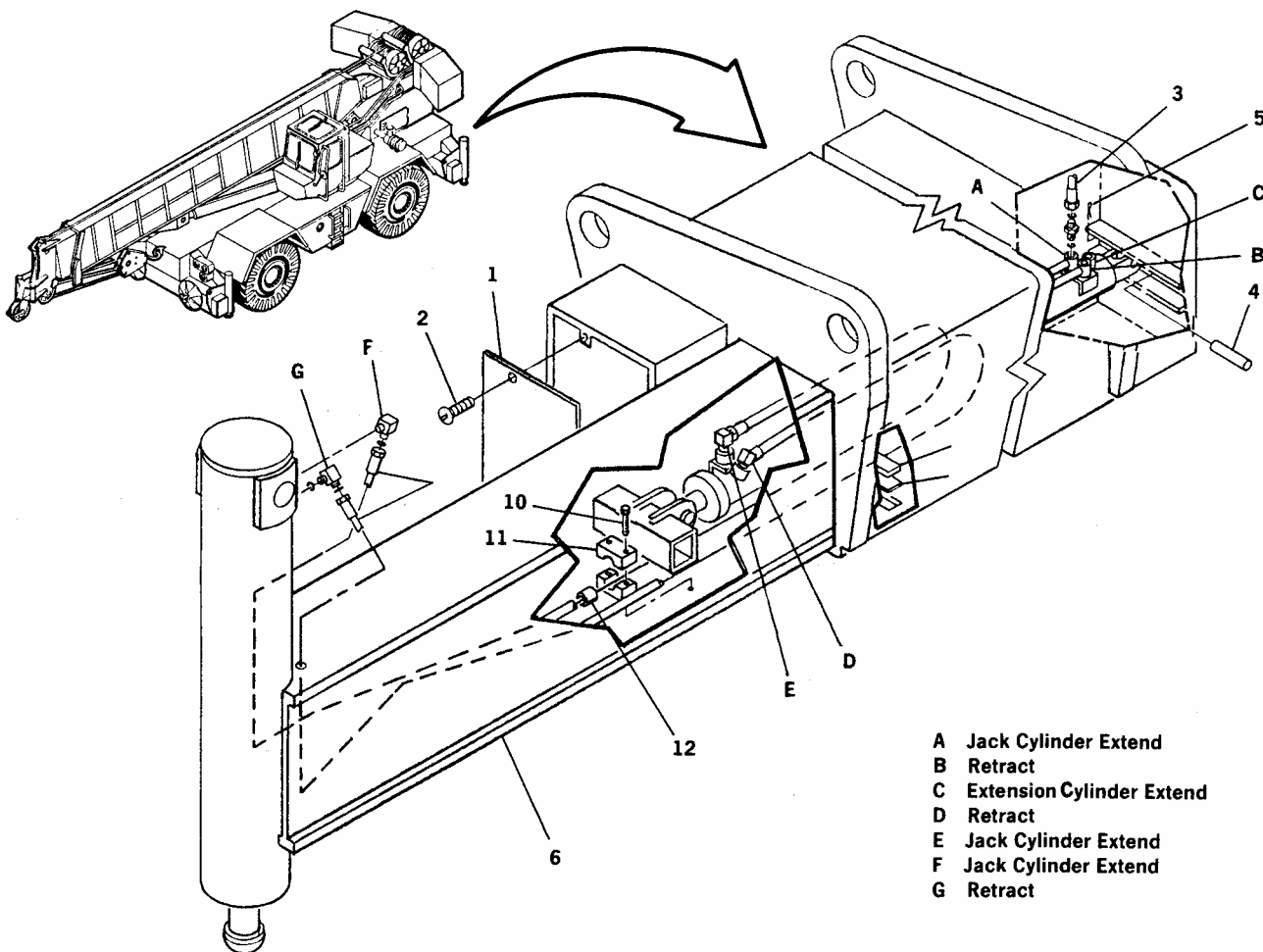
8. IF NECESSARY, REMOVE JACK CYLINDER AND/OR EXTENSION CYLINDER.
9. IF NECESSARY, REMOVE JACK CYLINDER HYDRAULIC HOSES FROM BEAM AS FOLLOWS:
 - a. If not disconnected, tag and disconnect hoses (9) from jack cylinder.
 - b. If not removed, remove extension cylinder.
 - c. Remove two capscrews (10) securing pipe clamps (11), hoses (9) and rubber insert (12). Remove items.
 - d. Pass hoses through holes in top of beam and remove from beam.

1. INSPECT OUTRIGGER BEAMS FOR BENDS, EVIDENCE OF CRACKS, OR OTHER DAMAGE. CHECK OUTRIGGER BEAM INTERNALLY FOR HYDRAULIC FLUID, WHICH MAY INDICATE A LEAKING CYLINDER, LOOSE CONNECTION, OR DAMAGED HYDRAULIC LINE.

INSTALLATION:

1. IF REMOVED, INSTALL JACK CYLINDER HOSES AS FOLLOWS:
 - a. Slide hoses (9) into beam ensuring they pass through hose retainer bracket.
 - b. Feed hose ends through holes in top of beam.

INSPECTION:



NOTE

Extend hose through inward hole, retract hose through outward hole.

- c. Install hose clamps (11) and rubber insert (12) and secure with two capscrews (10).
- 2. IF REMOVED, INSTALL JACK CYLINDER AND/OR EXTENSION CYLINDER.
- 3. APPLY GREASE TO SHIM (8) AND WEAR PAD (7). INSTALL IN POCKET IN BOTTOM OF BOX.
- 4. APPLY GREASE TO TOP AND BOTTOM SIDE RAILS OF BEAM.
- 5. INSTALL OUTRIGGER BEAM (10).
 - a. Attach a suitable lifting device to outrigger beam (6).
 - b. Slide beam (10) into outrigger housing and align cylinder bushing with mounting lug.

NOTE

Coat the cylinder mounting shaft (33) with NEVER-SEEZ.

- c. Secure cylinder barrel to housing with shaft (4) and two new cotter pins (5). Remove blocking under cylinder.

CAUTION

Ensure piston side (extend) of all outrigger cylinders is connected to solenoid valves. Reversal of port connections of rod (retract) and piston (extend) could result in damage to cylinders as very high pressures will occur.

Ensure that only low-temperature preformed packings are used. Refer to TM 5-3810-306-24P. (RT875CCS)

NOTE

Prior to connecting hydraulic lines, ensure that fitting threads are clean

and free of contaminants. Do not remove any orange thread sealant if previously applied to the fitting(s). Then coat new preformed packings with clean hydraulic oil.

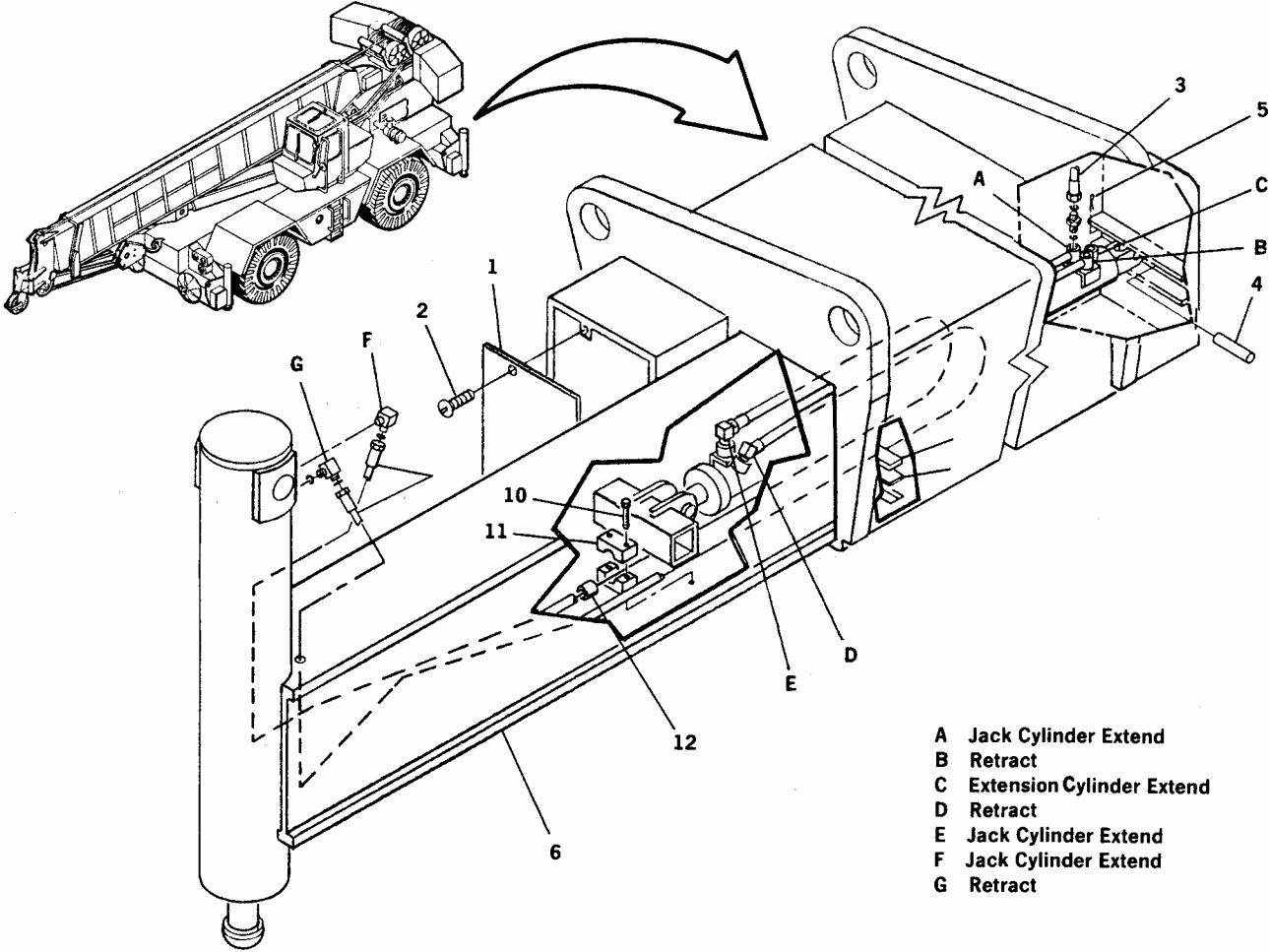
- 6. CONNECT HYDRAULIC LINES AS TAGGED PRIOR TO REMOVAL.
- 7. INSTALL OUTRIGGER HOUSING COVER (1).
 - a. Connect marker light electrical connector and position end cover (1) on housing. Secure cover with two screws (2).
- 8. CONNECT NEGATIVE BATTERY CABLE AT SHUNT. (REFER TO TM 5-3810-306-20.) (RT875CC)
- 9. CHECK FOR PROPER OPERATION OF AFFECTED BEAM AS FOLLOWS:

CAUTION

Be sure to use this sequence of operation. If hydraulic lines are reversed, this will prevent damage to cylinders until the situation can be corrected.

- a. Position applicable extensions switch to proper position.
- b. Position EXTEND/RETRACT switch to EXTEND.
- c. Observe that proper beam extends.
- d. Release both switches.
- e. Position applicable STABILIZERS switch to proper position.
- f. Position EXTEND/RETRACT switch to EXTEND.
- g. Observe that proper jack cylinder extends.
- h. Release both switches.
- i. Retract cylinders in same manner using RETRACT position.

END OF TASK



OUTRIGGER CHECK VALVE INSTALLATION

TOOLS: General mechanic's tool kit: automotive (5180-00-177-7033)

SUPPLIES: Cotter pins (Item 10, Appendix B)

EQUIPMENT CONDITION: Hydraulic pressure relieved from system.
(Refer to TM 5-3810-306-20.)
Negative battery cable disconnected at shunt.
(Refer to TM 5-3810-306-20.) (RT875CC)
Battery disconnect switch in off position. (RT875CCS)

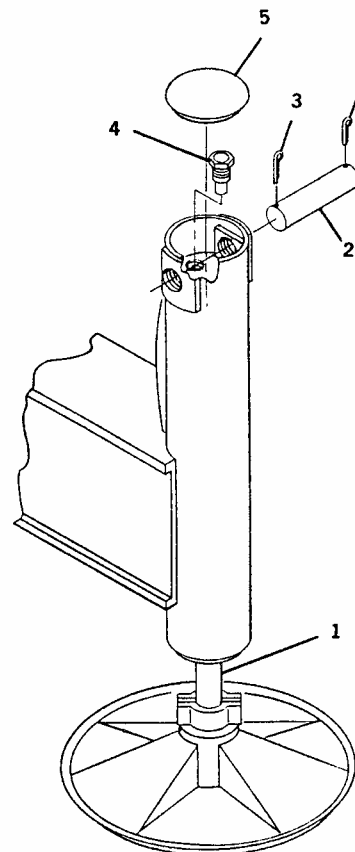
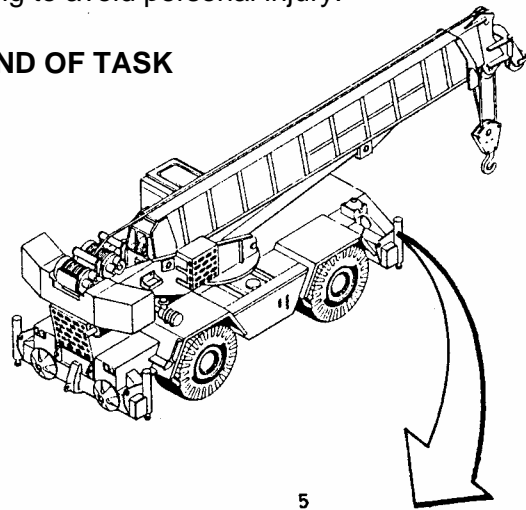
WARNING

Be sure to wear protective eye covering to avoid personal injury.

REMOVAL:

1. REMOVE OUTRIGGER CHECK VALVE (4).
 - a. Position a suitable jack under jack cylinder and raise to relieve pressure from pin (2).
 - b. Remove nut (RT875CCS) and access cap (5).
 - c. Remove two cotter pins (3) and remove pin (2) securing jack cylinder (1). Discard cotter pins (3).
 - d. Loosen outrigger check valve (4) slowly to relieve hydraulic pressure. Remove outrigger check valve (4).

END OF TASK



INSTALLATION:

1. INSTALL OUTRIGGER CHECK VALVE (4).
 - a. Install outrigger check valve (4) in jack cylinder (1).
 - b. Install jack cylinder pin (2) through outrigger body and jack cylinder (4). Secure with two new cotter pins (3).
 - c. Install access cap (5). Secure cap with nut (RT875CCS).
2. CONNECT NEGATIVE BATTERY CABLE AT SHUNT. (REFER TO TM 5-3810-306-20.) (RT875CC)
3. TEST FOR PROPER OPERATION.

OUTRIGGER CHECK VALVE ASSEMBLY

TOOLS: General mechanic's tool kit: automotive (5180-00-177-7033)

SUPPLIES: Parts kit (Item 36, Appendix B)
Hydraulic oil (Item 8, Appendix B)

EQUIPMENT CONDITION: Outrigger check valve removed. (Refer to page 11-6.)

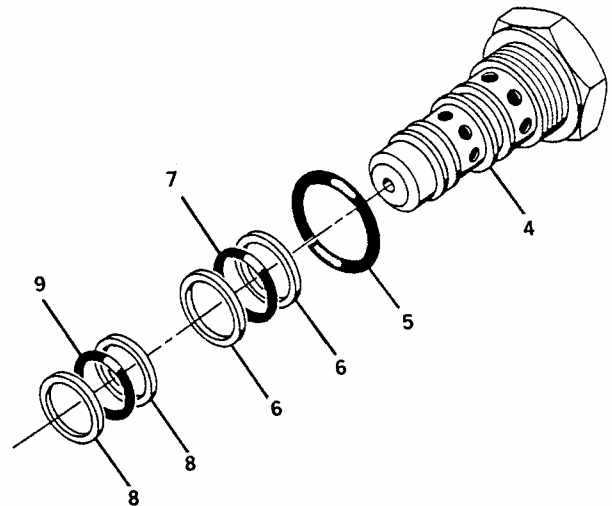
DISASSEMBLY:

1. DISASSEMBLE OUTRIGGER CHECK VALVE (4).

NOTE

Disassembly of outrigger check valve is limited to replacement of packings and backup rings.

- a. Remove packing (5) from check valve (4).
- b. Remove packings (9) and (7) and backup rings (6) and (8).



REASSEMBLY:

1. REPLACE ALL PACKINGS (5), (7) AND (9) AND BACKUP RINGS (6) AND (8). COAT WITH CLEAN HYDRAULIC OIL PRIOR TO INSTALLATION.

END OF TASK

OUTRIGGER EXTENSION CYLINDER INSTALLATION

TOOLS: General mechanic's tool kit: automotive (5180-00-177-7033)

SUPPLIES: Hydraulic oil (Item 8, Appendix B)
Preformed packing (Item 67 (RT875CC) / 278 (RT875CCS) Appendix B) (2 Required)
Preformed packing (Item 68 (RT875CC) / 279 (RT875CCS) Appendix B) (2 Required)
Lockwasher (Item 13, Appendix B)
Cotter pin (Item 71, Appendix B)
NEVER-SEEZ (Item 24, Appendix B)

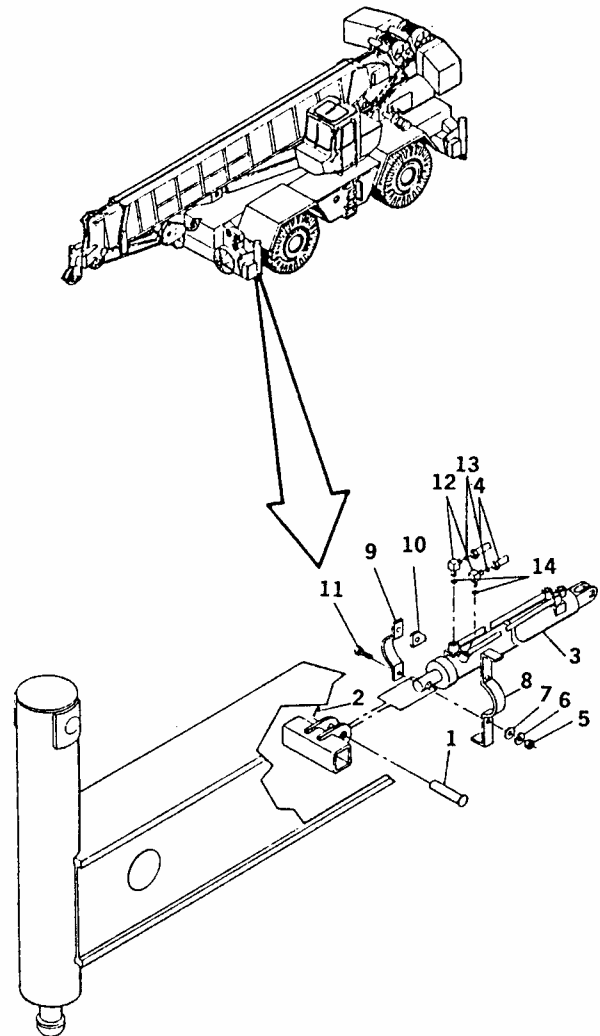
EQUIPMENT CONDITION: Outrigger beam removed. (Refer to page 11-2.)

WARNING

Be sure to wear protective eye covering to avoid personal injury.

REMOVAL:

1. REMOVE CLEVIS PIN (1) AND EXTENSION CYLINDER (3).
 - a. Remove cotter pins (2) and pin (1) securing rod end of extension cylinder (3) to outrigger beam. Discard cotter pins (2).
 - b. Withdraw cylinder until rod end is exposed.
 - c. Tag and disconnect hydraulic lines (4) on rod end of extension cylinder. Remove and discard packings (13). Cap lines.
 - d. Remove extension cylinder (3).
 - e. Remove capscrews (11), lockwashers (6), washers (7), nuts (5), spacer (10) and clamps (8) and (9).
 - f. If necessary, remove fittings (12) from end of cylinder. Remove and discard packings (14). Plug ports.



INSTALLATION:

1. INSTALL FITTINGS (12) AND CLAMPS (8) AND (9) ONTO EXTENSION CYLINDER (3).

NOTE

Prior to connecting hydraulic lines, ensure that fitting threads are clean and free of contaminants. Do not remove any orange thread sealant if previously applied to the fitting(s). Then coat new preformed packings with clean hydraulic oil.

- a. If removed, install hydraulic fittings (12) and new packings (14) on end of cylinder.
- b. Install clamps (8) and (9) and spacer (10) and secure them with two capscrews (11), washers (7), lockwashers (6) and nuts (5).

NOTE

The wedge shape spacer (10) is located between two top halves of clamps and goes between hydraulic port bosses on rod end of cylinder to prevent clamp from rotating.

NOTE

The top leg of longer clamp should face toward outside of the beam (toward hoses).

CAUTION

Ensure piston side (extend) of cylinder is connected to the solenoid valve. Reversal of port connections of rod (retract) and piston (extend) could result in damage to cylinder as very high pressure will occur.

2. INSTALL EXTENSION CYLINDER (3).
 - a. Start cylinder into beam and connect hydraulic hoses (4) with new packings (13) to fittings (12) as marked during removal.
 - b. Push cylinder into beam until rod end aligns with mounting lugs.
 - c. Coat clevis pin (1) with Never-Seez and install pin and new cotter pin (2) securing extension cylinder (3) rod.
3. INSTALL OUTRIGGER BEAM. (REFER TO PAGE 11-2.)
4. EXTEND AND RETRACT EXTENSION CYLINDER AS DESCRIBED UNDER OUTRIGGER BEAM INSTALLATION.

END OF TASK

OUTRIGGER EXTENSION CYLINDER ASSEMBLY

TOOLS: General mechanic's tool kit: automotive (5180-00-177-7033)
Shop Equipment Auto-Maintenance and Repair, FM Basic (4910-00-754-0705)
Shop Equipment Auto-Maintenance and Repair, FM Suppl No. 1 (4910-00-754-0706)
Tool Outfit Hyd System, Test and Repair, 3/4 Ton Trailer Mtd (4940-01-036-5784)

SUPPLIES: Parts kit (Item 58, Appendix B)
Loctite # 271 (Item 23, Appendix B)
NEVER SEEZ (Item 24, Appendix B)
Hydraulic oil (Item 8, Appendix B)
Solvent, Cleaning P-D-680, Type III (Item 1, Appendix B)

EQUIPMENT CONDITION: Outrigger extension cylinder assembly removed.
(Refer to page 11-8.)

WARNING

Be sure to wear protective eye covering to avoid personal injury.

DISASSEMBLY:

- b. Unscrew lock ring (5) and withdraw cylinder rod assembly from barrel.

NOTE

Any maintenance requiring disassembly of cylinders should be accompanied by replacement of all cylinder seals.

1. DRAIN THE OIL FROM THE CYLINDER.
2. REMOVE CYLINDER ROD ASSEMBLY FROM BARREL (14).
 - a. Remove setscrew (3) securing lock ring (5) to barrel (14).

WARNING

Do not use air pressure to remove cylinder rod assembly. Use only a source of controlled hydraulic oil pressure if rod assembly is hard to move.

CAUTION

Exercise extreme care when handling or setting down cylinder rod. Damage to rod surface may cause unnecessary maintenance and expense.

NOTE

Cover cylinder barrel opening to preclude contamination from dust and dirt.

3. DISASSEMBLE ROD ASSEMBLY.

CAUTION

When removing seals (12) and rings, avoid scratching grooved and gland surfaces.

- a. Remove the seals from the piston (2).

NOTE

Aligning discarded seals and rings in order of disassembly will facilitate installation of new seals and rings.

- b. Remove lock ring (5) from rod (2). Remove wiper seal (4) from inside of the lock ring (5).
- c. Remove head (9) from rod. Remove packing (8) and back-up ring (7) from outside of head. Remove wear ring (11), rod seal (6) and buffer seal (10) from inside of head.

immediately and get medical aid. If contact with eyes is made, wash your eyes with water and get medical aid immediately.

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

1. CLEAN ALL PARTS WITH SOLVENT AND DRY WITH COMPRESSED AIR. INSPECT ALL PARTS FOR SERVICEABILITY.

CAUTION

Before installing new seals and rings, clean all surfaces and carefully remove burrs and nicks. Parts displaying excessive wear or damage should be replaced.

2. STONE OUT MINOR BLEMISHES AND POLISH WITH A FINE CROCUS CLOTH.
3. CLEAN WITH SOLVENT AND DRY WITH COMPRESSED AIR ANY PARTS THAT HAVE BEEN STONED AND POLISHED.
4. INSPECT BARREL CAREFULLY FOR SCORING.

REASSEMBLY:

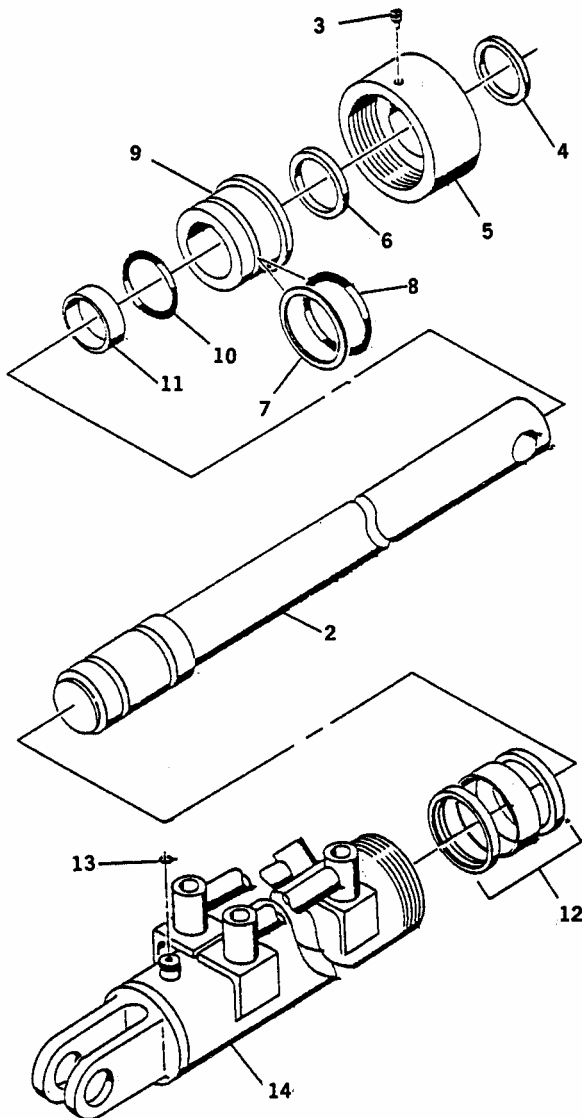
CAUTION

When installing new seals and rings, avoid scratching the grooved and gland surfaces. Scratches cause seal wear resulting in leakage.

NOTE

Before installation, lubricate all parts and surfaces freely with clean hydraulic oil. Ensure packing portion of rod seal is installed forward as head (9) would enter barrel (14).

1. INSTALL NEW SEALS AND BACK-UP RINGS ON HEAD AND INSTALL ON ROD (2).

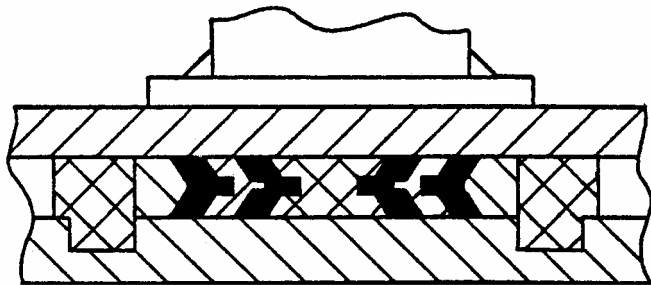


CLEANING AND INSPECTION:

WARNING

Dry cleaning solvent P-D-680, Type III is toxic and flammable. Wear protective goggles and gloves and use only in a well ventilated area. Avoid contact with skin, eyes, and clothes and do not breathe vapors. Do not use near open flame or excessive heat. The flash point is 200°F (94°C). If you become dizzy while using cleaning solvent, get fresh air

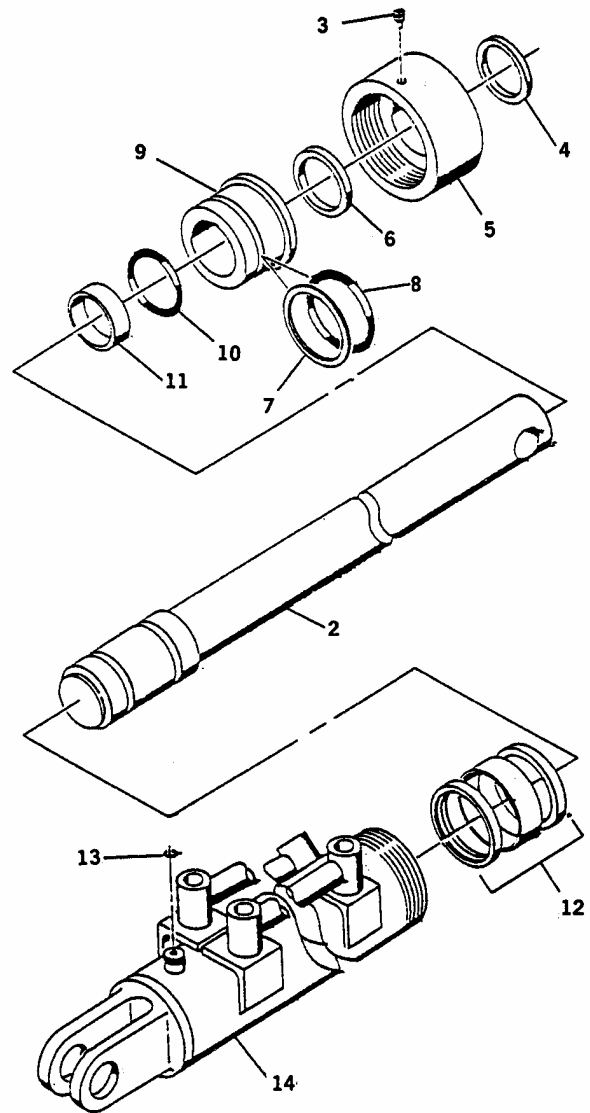
- a. Install wear ring (11), rod seal (6) and buffer seal (10) on inside of head (9). Install packing (8) and back-up ring (7) on outside of head.
 - b. Install head (9) on rod (2).
 - c. Install wiper seal (4) in lock ring (5).
2. INSTALL ROD SEALS. ENSURE SEAL ASSEMBLY (12) IS INSTALLED AS SHOWN.



CAUTION

Exercise extreme care when handling or setting down cylinder rod. Damage to rod surface may cause unnecessary maintenance and expense.

3. INSTALL CYLINDER ROD ASSEMBLY INTO CYLINDER BARREL WITH A TWISTING MOTION. SEAT HEAD IN CYLINDER BARREL.
4. CLEAN OIL FROM THREADS OF LOCK RING (5). COAT THREADS WITH NEVER-SEEZ (PASTE TYPE) LUBRICANT.
5. IF EXISTING LOCK RING (5) AND BARREL (14) ARE TO BE USED, PROCEED AS FOLLOWS:
 - a. Screw lock ring (5) onto barrel (14).
 - b. Using strap wrench, tighten lock ring securely until the setscrew holes align.
 - c. Apply Loctite # 271 to setscrew (3) and install setscrew.



6. IF NEW LOCK-RING (5) OR BARREL (14) IS TO BE USED, PROCEED AS FOLLOWS:
 - a. Screw lock ring onto barrel.
 - b. Using a strap wrench, tighten lock ring securely.
 - c. If necessary, drill 0.265-in. dia. hole 3/16-in. (maximum) deep in barrel.

NOTE

Setscrew when installed should be flush with lock ring.

- d. Clean drilled hole of chips and debris.
- e. Apply Loctite # 271 to setscrew and install setscrew (3).

WARNING

Do not use air pressure to cycle or pressurize cylinder.

- 7. PRESSURIZE AND CYCLE CYLINDER.
CHECK PROPER OPERATION AND ANY LEAKAGE.

END OF TASK

OUTRIGGER JACK CYLINDER INSTALLATION

TOOLS: General mechanic's tool kit: automotive (5180-00-177-7033)
Tool Outfit Hyd System, Test and Repair, 3/4 Ton Trailer Mtd (4940-01-036-5784)
Tool Kit Auto-Fuel and Electric System Repair (5180-00-754-0655)
Shop Equipment Auto-Maintenance and Repair; Org Suppl No 1 (4910-00-754-0653)
Lifting device (500 lbs capacity)

SUPPLIES: Preformed packing (Item 67 (RT875CC) / 278 (RT875CCS) Appendix B) (2 Required)
Preformed packing (Item 68 (RT875CC) / 279 (RT875CCS) Appendix B) (2 Required)
Wear ring (Item 69, Appendix B)
Weatherstrip adhesive (Item 70, Appendix B)
Cotter pin (Item 10, Appendix B) (2 Required)
NEVER-SEEZ (Item 24, Appendix B)

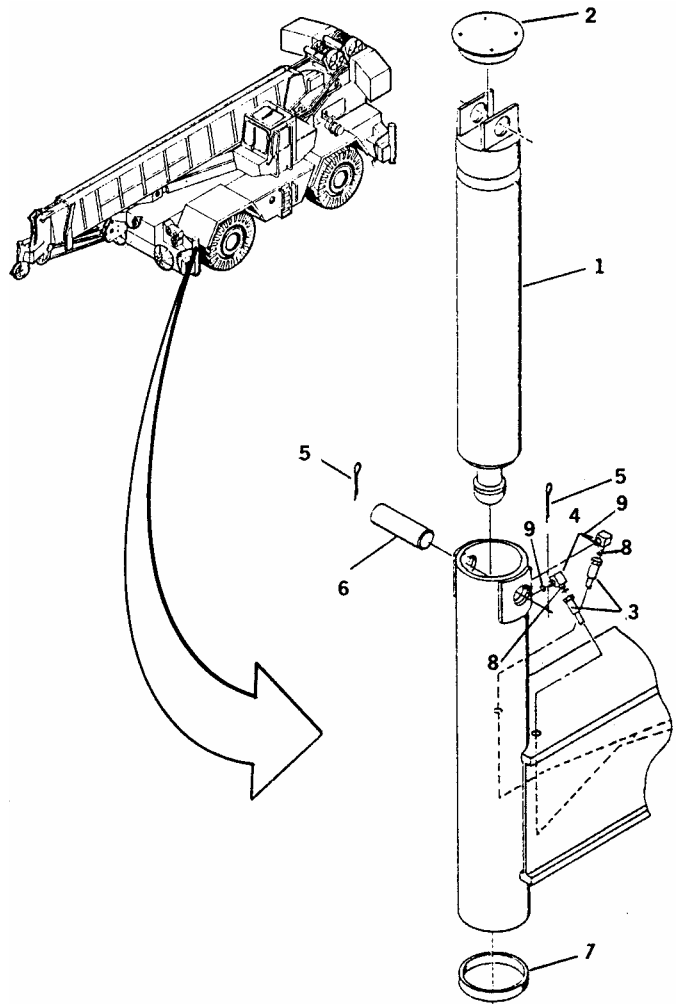
EQUIPMENT CONDITIONS: Negative battery cable disconnected at shunt.
(Refer to TM 5-3810-306-20.) (RT875CC)
Battery disconnect switch in off position. (RT875CCS)

WARNING

Be sure to wear protective eye covering to avoid personal injury.

REMOVAL:

1. REMOVE JACK CYLINDER (1).
 - a. Remove nut (RT875CCS) and access cap (2).
 - b. Tag and disconnect hydraulic lines (3) from jack cylinder. Remove and discard packings (8). Cap or plug lines.
 - c. Remove two fittings (4) from jack cylinder ports. Remove and discard packings (9). Plug cylinder ports.
 - d. Place a hydraulic jack under jack cylinder. Raise jack cylinder to relieve weight from pin (6).
 - e. Remove cotter pins (5) and pin (6) securing jack cylinder (1). Discard cotter pins (5).
 - f. Using hydraulic jack, raise cylinder up until a lifting device can be attached to cylinder (1).
 - g. Using lifting device, remove cylinder from beam.
 - h. In bottom of cylinder tubes remove and discard wear ring (7).



INSTALLATION:

1. INSTALL JACK CYLINDER (1).
 - a. Install new wear ring (7) in groove in bottom of cylinder tube.

- b. Place a hydraulic jack under cylinder tube.
- c. Using a lifting device, lower jack cylinder into tube aligning ports with cut-out in tube.
- d. Raise hydraulic jack to take up weight of cylinder and remove lifting device.
- e. Lower cylinder (1) into tube until pin (6) can be installed. Use care not to damage wear ring (7) or dislodge it.
- f. Coat pin with Never-Seez and install pin (6) and two new cotter pins (5) securing cylinder (1) to tube.
- g. Remove the hydraulic jack.

NOTE

Coat new performed packing with clean hydraulic oil and fittings threads with Loctite #545.

- h. Install hydraulic fittings (4) and new packings (9) in ports of cylinder.

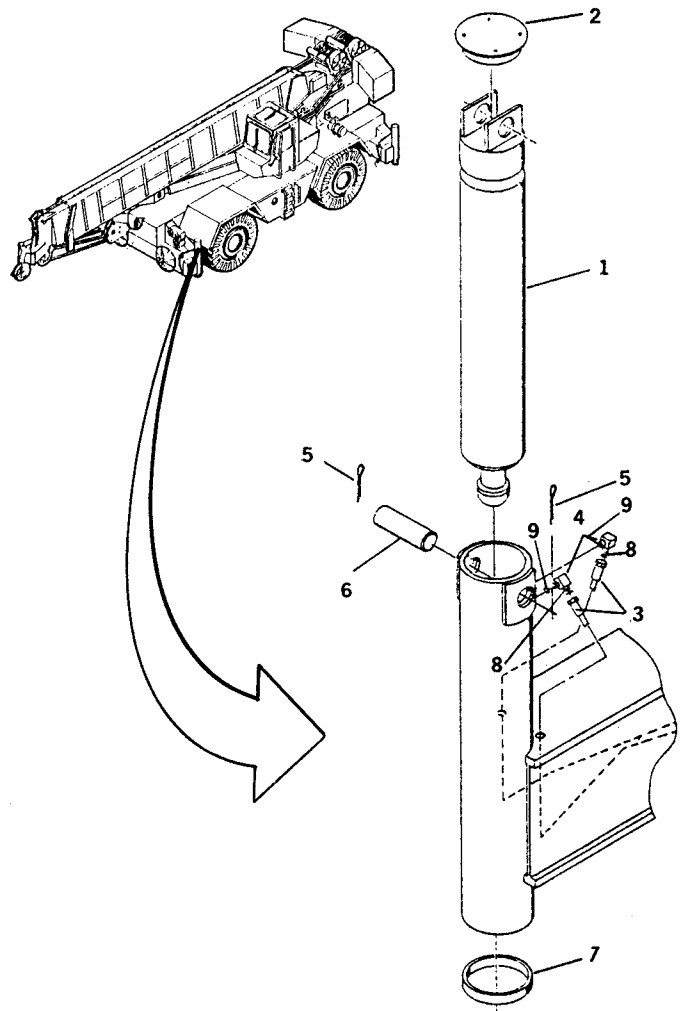
CAUTION

Ensure piston side (extend) of cylinder is connected to solenoid valve. Reversal of port connection of rod (retract) and piston (extend) could result in damage to cylinder as very high pressure will occur.

- i. Connect hydraulic lines (3) and new packings (8) to fittings as tagged during removal.
 - j. Install access cap (2) with weatherstrip cement applied in three beads approximately 120° apart. (RT875CC)
 - k. Install access cap (2) and secure with nut. (RT875CCS)
2. CONNECT NEGATIVE BATTERY CABLE AT SHUNT. (REFER TO TM 5-3810-306-20.) (RT875CC)
 3. ACTIVATE HYDRAULIC SYSTEM. (REFER TO TM 5-3810-306-10.)

4. EXTEND AND RETRACT JACK CYLINDER AS DESCRIBED UNDER OUTRIGGER BEAM INSTALLATION.
5. CHECK FOR SMOOTH OPERATION OF CYLINDER.
6. CHECK ALL HYDRAULIC CONNECTIONS AND HOSES FOR EVIDENCE OF LEAKAGE.

END OF TASK



OUTRIGGER JACK CYLINDER ASSEMBLY

TOOLS: General mechanic's tool kit: automotive (5180-00-177-7033)
 Shop Equipment Auto-Maintenance and Repair, FM Basic (4910-00-754-0705)
 Shop Equipment Auto-Maintenance and Repair, FM Suppl No. 1 (4910-00-754-0706)
 Tool Outfit Hyd System, Test and Repair, 3/4 Ton Trailer Mtd (4940-01-036-5784)

SUPPLIES: Parts kit, seal repl (Item 57, Appendix B)
 Parts kit, check valve (Item 36, Appendix B)
 Solvent, Cleaning P-D-680, Type III (Item 1, Appendix B)
 Loctite #271 (Item 23, Appendix B)
 Hydraulic oil (Item 8, Appendix B)
 NEVER-SEEZ (Item 24, Appendix B)

EQUIPMENT CONDITION: Outrigger jack cylinder assembly removed. (Refer to page 11-14.)

WARNING

Be sure to wear protective eye covering to avoid personal injury.

DISASSEMBLY:

NOTE

Any maintenance requiring disassembly of cylinder should include replacement of all cylinder seals.

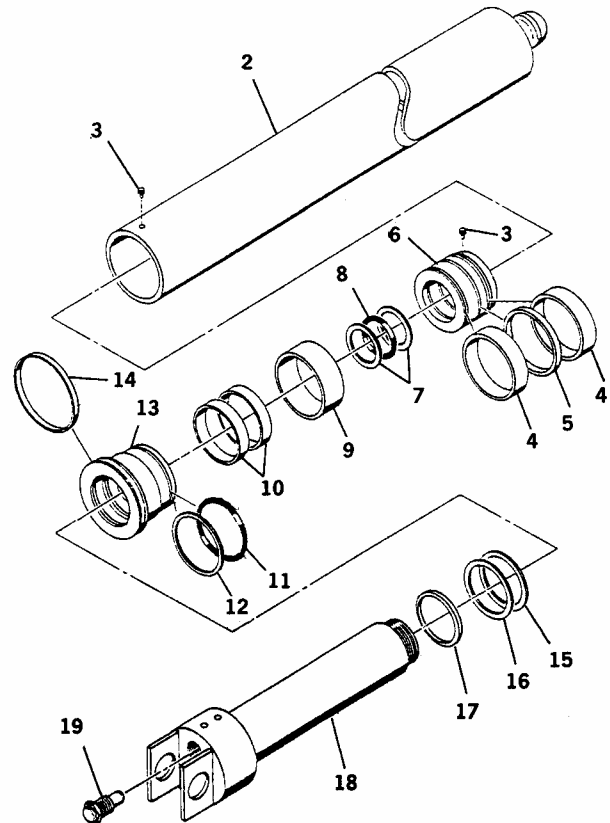
1. REMOVE THE CHECK VALVE (19) FROM PORT BLOCK.
2. DRAIN ALL OIL FROM HYDRAULIC CYLINDER.
3. REMOVE CYLINDER ROD ASSEMBLY.
 - a. Remove ring (14) from outside of hood (13).
 - b. Remove setscrew (3) securing head (13) to barrel (2).

WARNING

Do not use air pressure to remove cylinder rod assembly. Use only a source of controlled hydraulic oil pressure if rod assembly is hard to remove.

CAUTION

Exercise extreme care when handling or setting down cylinder rod. Do not damage rod surface.



- c. Remove cylinder rod assembly from cylinder barrel (2) and set it on a suitable surface. Cover cylinder barrel opening.
4. REMOVE PISTON (6), RINGS AND SEALS.
 - a. Secure cylinder rod from moving.

CAUTION

When removing seals and rings, avoid scratching grooved and gland surfaces.

- b. Remove ring (5) and seals (4) from piston external surface.
- c. Remove the setscrew (3) from piston (6). Unscrew piston and remove it.
- d. Remove two back-up rings (7) and packing (8) from inside of piston (6).

NOTE

Aligning discarded seals and rings in order of disassembly will facilitate installation of new items.

5. REMOVE HEAD (13) FROM ROD (18).
 - a. Remove spacer (9) and head (13) from rod.
 - b. Remove wiper seal from threaded head (13).
 - c. Remove two wear rings (10), rod seal (16) and buffer seal (15) from inside of head (13).
 - d. Remove packing (11) and back-up ring (12) from outside of head.

CLEANING AND INSPECTION:**WARNING**

Dry cleaning solvent P-D-680, Type III is toxic and flammable. Wear protective goggles and gloves and use only in a well ventilated area. Avoid contact with skin, eyes, and clothes and do not breathe vapors. Do not use near open flame or excessive heat. The flash point is 200°F (94°C). If you become dizzy while using cleaning solvent, get fresh air immediately and get medical aid. If contact with eyes is made, wash your eyes with water and get medical aid immediately.

WARNING

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

1. CLEAN ALL PARTS WITH SOLVENT AND DRY WITH COMPRESSED AIR. INSPECT ALL PARTS FOR SERVICEABILITY.

CAUTION

Before installing new seals and rings, clean all surfaces and carefully remove burrs and nicks. Parts displaying excessive wear or damage should be replaced.

2. STONE OUT MINOR BLEMISHES AND POLISH WITH A FINE CROCUS CLOTH.
3. CLEAN WITH SOLVENT AND DRY WITH COMPRESSED AIR ANY PARTS THAT HAVE BEEN STONED AND POLISHED.
4. INSPECT BARREL CAREFULLY FOR SCORING.

REASSEMBLY:**CAUTION**

When installing new seals and rings, avoid stretching seals or scratching grooved and gland surfaces.

NOTE

Lubricate new seals and rings with clean hydraulic oil.

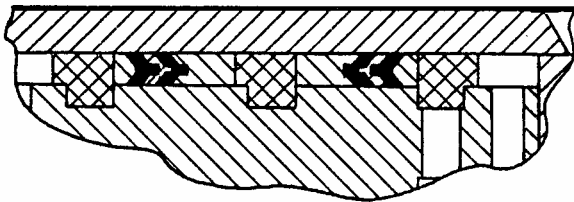
NOTE

Locate the gap of each wear ring 180° apart.

NOTE

The packing must be assembled forward of backup ring of rod seal as head would enter barrel.

1. ASSEMBLE HEAD (13) WITH NEW SEALS AND INSTALL ON ROD (18).
 - a. Install two wear rings (10), rod seal (16), buffer seal (15) and wiper seal (17) on inside of head (13). Install packing (11) and back-up ring (12) on outside of head (13).
2. LUBRICATE ROD (18) WITH CLEAN HYDRAULIC OIL.
3. INSTALL HEAD (13) ONTO ROD (18).
4. INSTALL SPACER (9) ON ROD (18).
5. ASSEMBLE PISTON (6) WITH NEW SEALS AND INSTALL ONTO ROD (18).
 - a. Install seals (4) and ring (5) on outside of piston. Ensure seal assembly is installed as shown.



NOTE

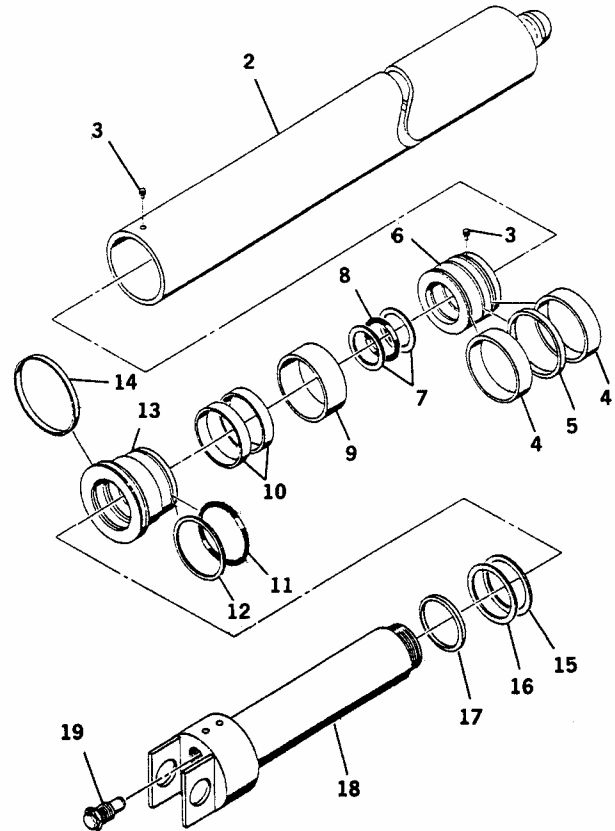
The packing is centered between two backup rings in piston.

- b. Install the two backup rings (7) and the packing (8) into inside of piston (6).

CAUTION

Do not damage back-up rings and packing when installing piston over threaded rod.

6. IF EXISTING PISTON AND ROD ARE TO BE USED, PROCEED AS FOLLOWS:
 - a. Install piston (6) onto rod.



- b. Using strap wrench, tighten piston securely until setscrew holes align.
- c. Apply Loctite #271 to setscrew (3) and install setscrew.
7. IF NEW PISTON OR ROD IS TO BE USED, PROCEED AS FOLLOWS:
 - a. Install piston (6) onto rod.
 - b. Using strap wrench, tighten piston securely.
 - c. If necessary, drill 0.265-in. dia. hole 3/16-in. (min.) deep in rod.
 - d. Clean drilled hole of chips and debris.
 - e. Apply Loctite #271 to setscrew (3) and install setscrew.
8. INSTALL BARREL (2) OVER ROD ASSEMBLY.
 - a. Remove cover from barrel opening.
 - b. Lubricate piston, head, and inside of barrel opening.

CAUTION

Do not damage packing (11) or back-up ring (12) when installing head into threaded barrel.

- c. Install rod assembly into barrel (2) with a slight twisting motion.
 - d. Wipe any oil from threads of barrel and head. Coat threads with NEVER-SEEZ (paste type) lubricant.
9. IF EXISTING HEAD (13) AND BARREL (2) ARE TO BE USED, PROCEED AS FOLLOWS:
- a. Screw head (13) into barrel (2).
 - b. Using strap wrench, tighten head securely until the setscrew holes align.
 - c. Apply Loctite # 271 to setscrew (3) and install setscrew.
10. IF NEW HEAD (13) OR BARREL (2) IS TO BE USED, PROCEED AS FOLLOWS:
- a. Screw head (13) into barrel (2).
 - b. Using strap wrench, tighten head securely.
 - c. If necessary, drill 0.265-in. dia. hole 3/16-in. (max.) deep in head (13).

NOTE

Setscrew when installed should be flush with barrel.

- d. Clean drilled hole of chips and debris.
- e. Apply Loctite #271 to setscrew and install setscrew.

11. INSTALL CHECK VALVE (19).

- a. Check inside of port block for any sharp edges or burrs and remove as necessary with emery cloth.
- b. Install new external packing onto check valve (19).
- c. Lubricate check valve and packings with clean hydraulic oil.

CAUTION

Do not damage packings during installation of check valve. If check valve turns freely then gets hard to turn, then easy to turn; remove check valve and check packings. They have probably been damaged by a sharp edge of a port.

NOTE

Check valve should turn by hand until compression of the packings begins.

- d. Carefully install check valve into port block until fully seated.

WARNING

Do not use air pressure to cycle or pressurize cylinder.

12. PRESSURIZE AND CYCLE CYLINDER. CHECK FOR PROPER OPERATION AND ANY LEAKAGE.

END OF TASK

CHAPTER 12
BODY CHASSIS AND ACCESSORY ITEM MAINTENANCE

CHAPTER INDEX

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Section I. CAB HEATER MAINTENANCE

CAB HEATER ASSEMBLY (RT875CC)

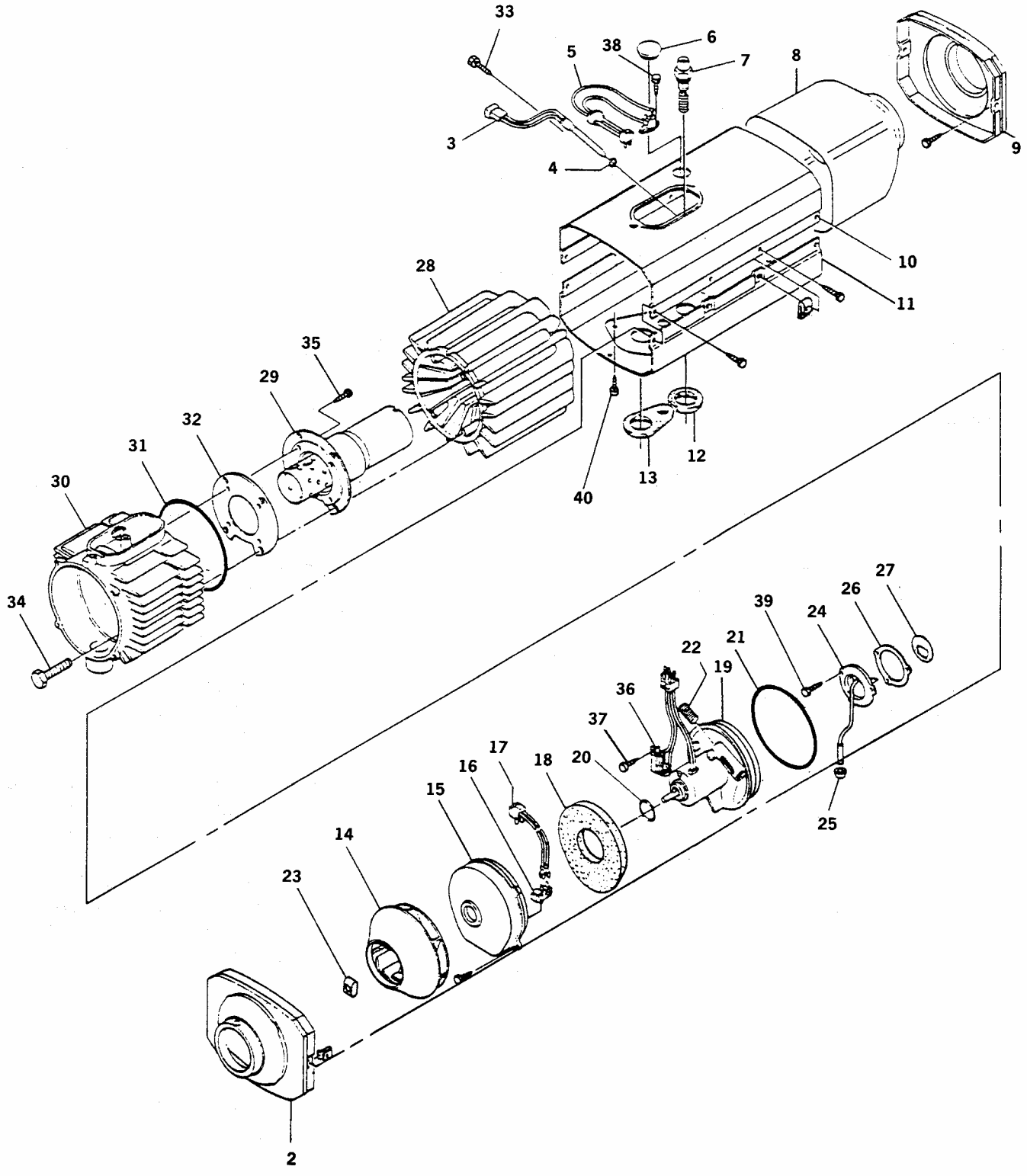
TOOLS: General mechanic's tool kit: automotive (5180-00-177-7033)

SUPPLIES: Packing, preformed (Item 235, Appendix B)
Gasket (Item 236, Appendix B)
Gasket (Item 237, Appendix B)
Packing, preformed (Item 238, Appendix B)
Packing, preformed (Item 239, Appendix B)
Gasket (Item 240, Appendix B)
Matting (Item 241, Appendix B)
Packing, preformed (Item 242, Appendix B)
Gasket (Item 243, Appendix B)

EQUIPMENT CONDITIONS: Cab heater removed. (Refer to TM 5-3810-306-20.)

DISASSEMBLY:

1. REMOVE GLOW PLUG (7).
2. REMOVE FLAME DETECTOR (3).
 - a. Remove Phillips head screw (33) securing flame detector and packing (4) in housing. Discard packing (4).
3. SEPARATE UPPER AND LOWER CASES HALVES (10) AND (11).
 - a. Remove upper case (10) by removing eight Phillips head screws from sides of cover and one screw on top. Remove top cover (10).
 - b. Remove end hoods (2) and (9).
 - c. Remove and discard gaskets (12) and (13).
 - d. Remove screws (40) and lower cover (11) from housing (30).
 - e. Remove foil heat protector (8).
4. REMOVE OVERHEAT SWITCH.
 - a. Remove two Phillips head screws (38) and overheat switch (5) from outside of housing (10).
 - b. Remove rubber grommet (6) and wire harness from housing (10).
5. REMOVE HEATER DRIVE (19).
 - a. Remove retainer (23) securing rotor (14) to motor shaft. Remove rotor (14).
 - b. Remove four Phillips head screws securing motor cap (15) and switch (16) to housing (30).
 - c. Tag and disconnect two electrical wires (17) from switch (16) and remove switch from motor cap (15).
 - d. Remove packing (20) and sound proof mat (18). Discard packing (20).
 - e. Remove heater drive assembly (19) and packing (21). Discard packing (21).
6. REMOVE RESISTOR (36).
 - a. Remove Phillips head screw (37) and resistor (36) from drive assembly.
 - b. Tag and unsolder two electrical wires to resistor.
7. REMOVE FUEL SUPPLY TUBE (24).
 - a. Remove three Phillips head screws (39) securing fuel supply tube (24), gasket (25), gasket (26) and fleece (27) in housing. Remove components. Discard gaskets (25) and (26) and fleece (27).



8. REMOVE HEAT EXCHANGER (28).
 - a. Separate heat exchanger (28) from housing by removing four capscrews (34).
 - b. Remove and discard packing (31) from housing (30).
9. REMOVE BURNER TUBE (29).
 - a. Remove four Phillips head screws (35). Remove burner tube (29) and gasket (32) from housing. Discard gasket (32).

INSPECTION:

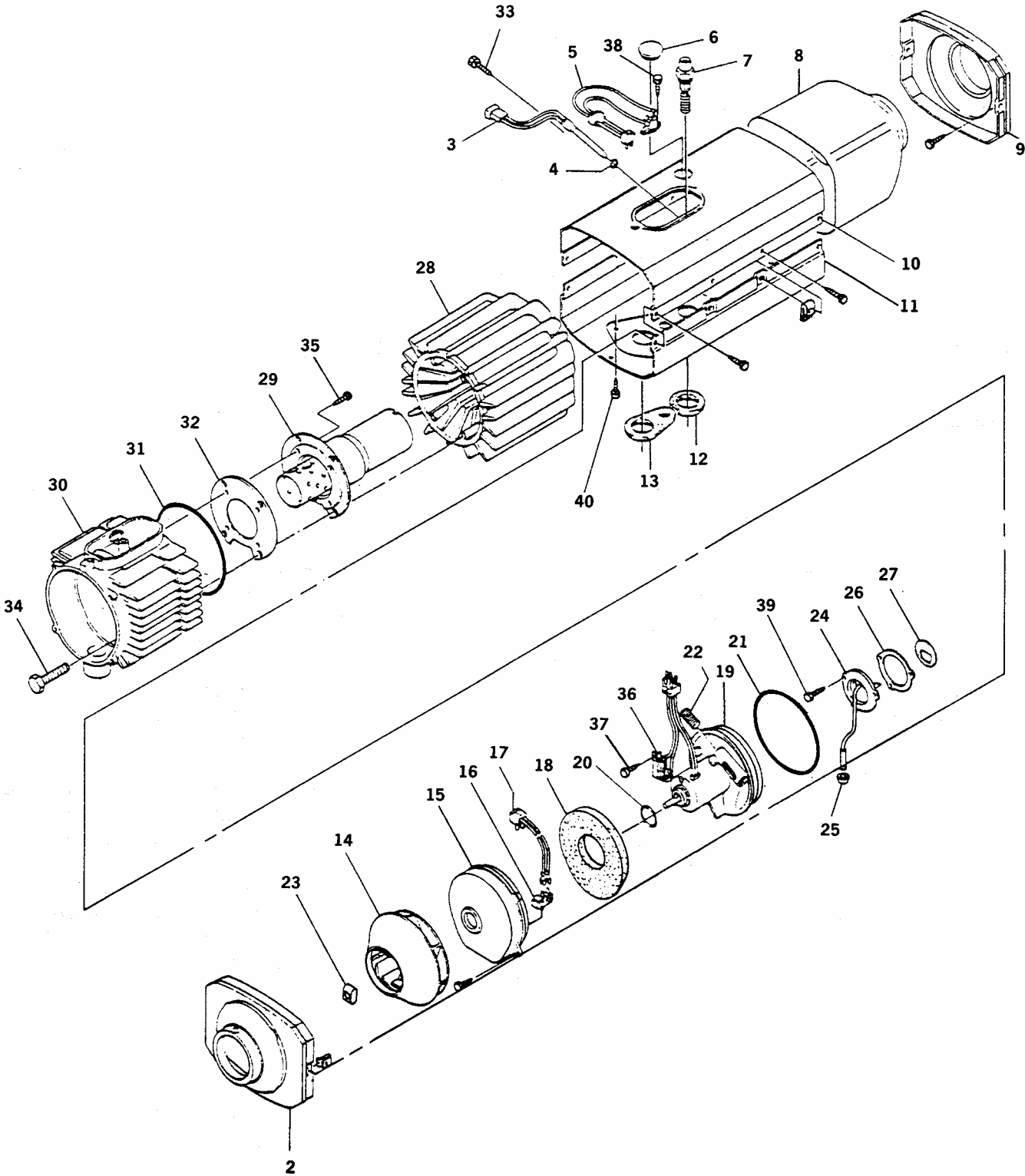
1. INSPECT PARTS AND REPLACE AS NECESSARY.

ASSEMBLY:

1. INSTALL BURNER TUBE (29).
 - a. Position new gasket (32) and burner tube (29) on housing (30) and secure with four Phillips head screws (35).
2. INSTALL HEAT EXCHANGER (28).
 - a. Install new packing (31) in groove on housing (30) and install heat exchanger (28). Secure with four capscrews.
3. INSTALL FUEL SUPPLY TUBE (24).
 - a. Install new fleece (27), gasket (26) and fuel supply tube in housing and secure with three Phillips head screws (39).
 - b. Position new gasket (25) over tube and slide into housing until seated.
4. INSTALL RESISTOR (36).
 - a. Solder tagged electrical wires directly to resistor and mount on heater drive assembly (19) using Phillips head screw.
5. INSTALL HEATER DRIVE (19).
 - a. Place new packing (21) on heater drive assembly (19) and install in housing.

- b. Install sound proof mat (18) over heater drive (19).
 - c. Install new packing (20) on front of heater drive (19).
 - d. Install switch (16) in motor cap (15) and connect tagged wires (17). Secure motor cap to housing with four Phillips head screws.
 - e. Place rotor (14) on motor shaft insuring small pin seats in slot. Secure with retainer (23).
6. INSTALL OVERHEAT SWITCH (5).
 - a. Position overheat switch (5) on housing and secure with two Phillips head screws (38).
 - b. Route overheat switch wiring harness through hole in housing and secure rubber grommet (6) in hole.
 7. PLACE FOIL HEAT PROTECTOR (8) OVER HEAT EXCHANGER.
 8. INSTALL TWO HOODS (2) AND (9), UPPER AND BOTTOM CASE HALVES (10) AND (11).
 - a. Turn heater assembly upside down and install bottom case. Secure with four Phillips head screws (40). Install new gaskets (12) and (13).
 - b. Turn heater right side up and install both hoods (2) and (9) and upper case ensuring wires are routed through hole in top case. Secure with eight Phillips head screws along side and one on top.
 9. INSTALL FLAME DETECTOR (3).
 - a. Place new packing (4) on flame detector (3) and insert in housing. Secure with Phillips head screw.
 10. INSTALL GLOW PLUG (7).
 11. INSTALL HEATER IN CAB. (REFER TO TM 5-3810-306-20.)

END OF TASK



CAB HEATER ASSEMBLY (RT875CCS)

TOOLS: General mechanic's tool kit: automotive (5180-00-177-7033)

SUPPLIES: Gasket, Burner Head (Item 280, Appendix B)
Gasket, Burner Head (Item 281, Appendix B)
Seal Kit, Exhaust Outlet (Item 282, Appendix B)
Lockwasher, No. 8 (Item 283, Appendix B)
Lockwasher, No. 10 (Item 284, Appendix B)

EQUIPMENT CONDITIONS: Cab heater/defroster removed. (Refer to TM 5-3810-306-20.)

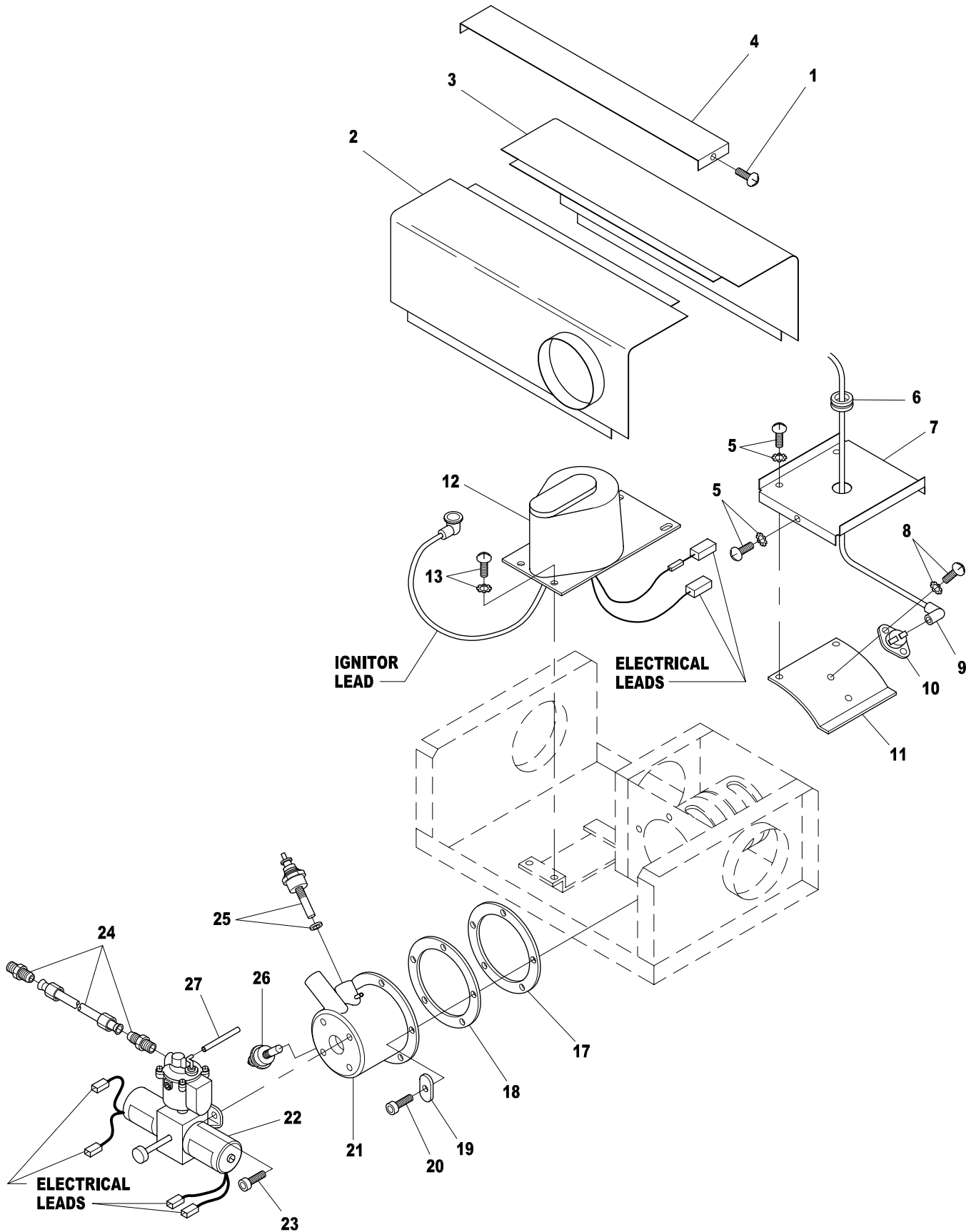
DISASSEMBLY:

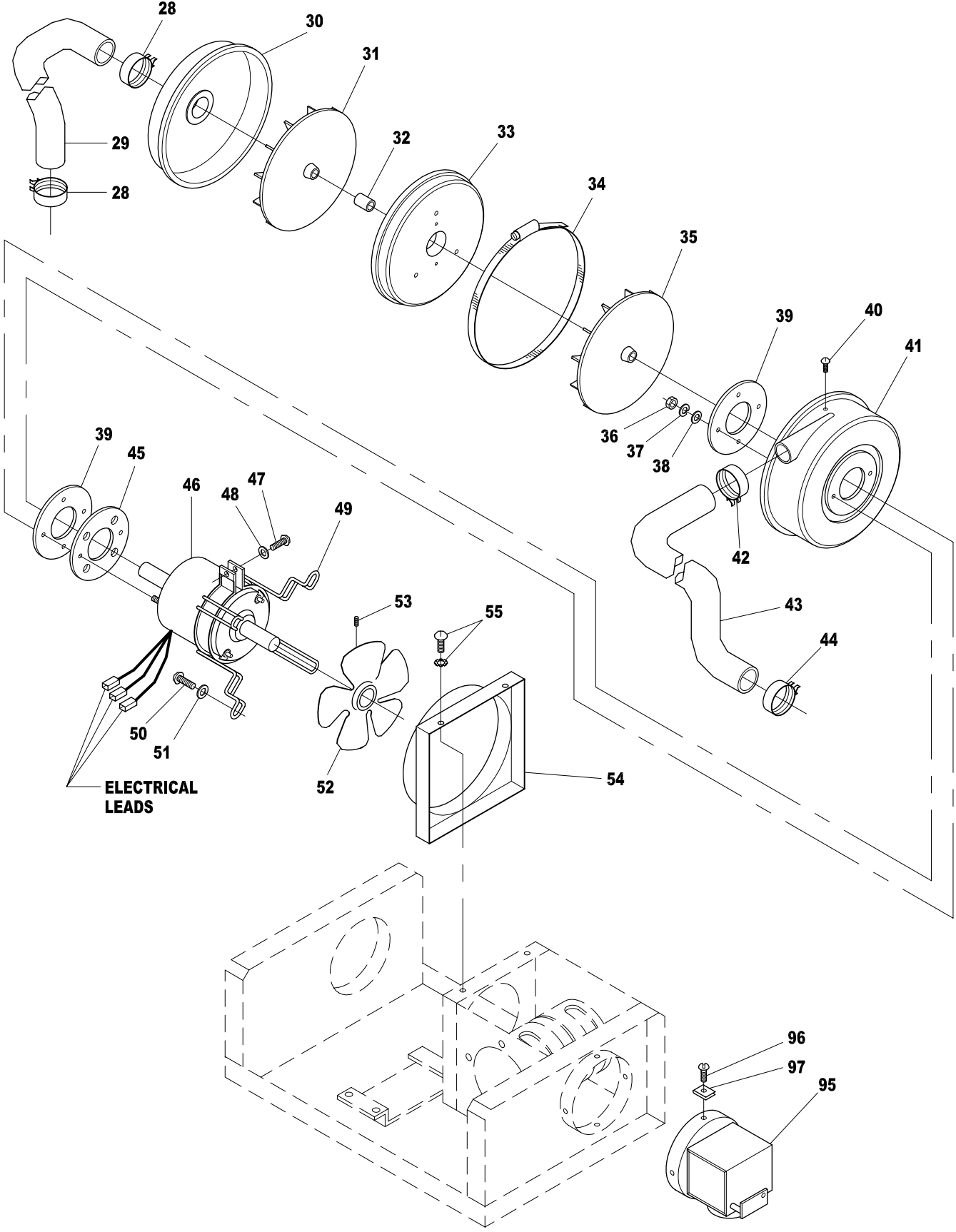
1. REMOVE CARBURETOR (22).
 - a. Remove screws (1), cross bar (4), cover (2), and cover (3) from heater case.
 - b. Remove fuel line and fittings (24) at carburetor assembly (22) and rear wall of heater case.
 - c. Tag and disconnect electrical leads for carburetor assembly (22).
 - d. Remove screws (23) and carburetor assembly (22) from burner head (21).
2. REMOVE IGNITER (25), BURNER HEAD (21) AND GLOW PLUG (26).
 - a. Loosen clamps (42 and 44), and disconnect air hose (43) from burner head (21) and blower housing (41).
 - b. Tag and disconnect electrical leads from igniter (25) and glow plug (26).
 - c. Remove mounting screws (20), pressure pads (19), burner head (21), and gaskets (17 and 18) from heat exchanger bracket (15).
 - d. Remove igniter (25) with gasket, glow plug (26), and hose (27) from burner head (21).
3. REMOVE IGNITION PACK (12)
 - a. Remove screws and star washers (13), and ignition pack (12) with resistor from bracket on bottom of case.
4. REMOVE BLOWER (41) AND MOTOR (46).
 - a. Loosen clamps (28), and disconnect air hose (29) from blower cover (30) and bottom of case.
 - b. Tag and disconnect electrical leads for motor (46).
 - c. Remove screws (50), washers (51), and motor (46) with blower assembly from mounting plate (54).
 - d. Mark position of motor mount (49) on motor (46), and remove screw (47), washer (48), and mount (49) from motor (46).
 - e. Mark position of fan (52) on shaft of motor (46), and remove setscrews (53) and fan (52) from shaft of motor (46).
 - f. Remove screws and star washers (55), and mounting plate (54) from heat exchanger bracket (15).
5. SEPARATE MOTOR (46) AND BLOWER (41).
 - a. Loosen clamp (34), and remove blower cover (30) and clamp (34) from blower housing (41).
 - b. Release tension on captured spring clip (part of fan wheel hub), and remove fan wheel (31) and spacer (32) from shaft of motor (46).
 - c. Remove screws (40) and stationary wheel (33) from blower housing (41).
 - d. Release tension on captured spring clip (part of fan wheel hub), and remove fan wheel (35) from shaft of motor (46).
 - e. Remove nuts (36), lockwashers (37), washers (38), washer (39), blower

- housing (41), washer (39), and gasket (45) from motor (46).
6. REMOVE OVERHEAT SWITCH (10).
 - a. Tag and disconnect electrical lead for overheat switch (10) from terminal board (83)
 - b. Remove screws and star washers (5), and cover (7) with baffle (11) from heat exchanger bracket (15).
 - c. Disconnect electrical lead (9) from overheat switch (10), and remove screws and star washers (5), and cover (7) from baffle (11).
 - d. Remove electrical lead (9) and grommet (6) from cover (7).
 - e. Remove screws and star washers (8), and overheat switch (10) from baffle (11).
 7. REMOVE SCREW AND WASHER (94) AND HEAT EXCHANGER (93) FROM HEAT EXCHANGER BRACKET (15).
 8. REMOVE HI-LO MICROSWITCH (64) AND FLAME SWITCH (66).
 - a. Remove locknut (70) and disconnect lever of bracket assembly (60) from pivot arm (69).
 - b. Tag and disconnect electrical leads for microswitch (64) and flame switch (66) from terminal board (83).
 - c. Remove screws and star washers (14), and heat exchanger bracket (15) from case (73).
 - d. Remove nuts (61), screws (65), microswitch (64), and insulator (63) from bracket assembly (60).
 - e. Remove grommet (16), screws (62), and bracket assembly (60) from heat exchanger bracket (15).
 - f. Mark position of actuator stop (58) on actuating rod (56), loosen setscrews (57), and remove stop (58), rod (56), and bi-metal blade (59) from bracket assembly (60).
 - g. Remove nuts (67), flame switch (66), and spacers (68) from bracket assembly (60).
 - h. Remove nut (77) and collar (76), loosen setscrew (75), and remove control lever (74) and pivot arm (69) from case.
9. REMOVE HARNESS (82) AND TERMINAL BOARD (83).
 - a. Tag and disconnect electrical leads for harness (82) from terminal board (83) and receptacle (71), and remove harness (82) from case.
 - b. Remove screws (84), terminal board (83), spacers (85), and star washers (86) from case.
 - c. Remove capacitor (87).
 10. REMOVE RECEPTACLES AND CONNECTORS.
 - a. Remove screws and star washers (72) and receptacle (71) from case.
 - b. Remove nut (91), fuel line connector (89), cover (90), terminal connector (88), screws and lockwashers (79), exhaust connector (78), gasket (80), and washer (81) from case.
 - c. If necessary, remove cover (95).

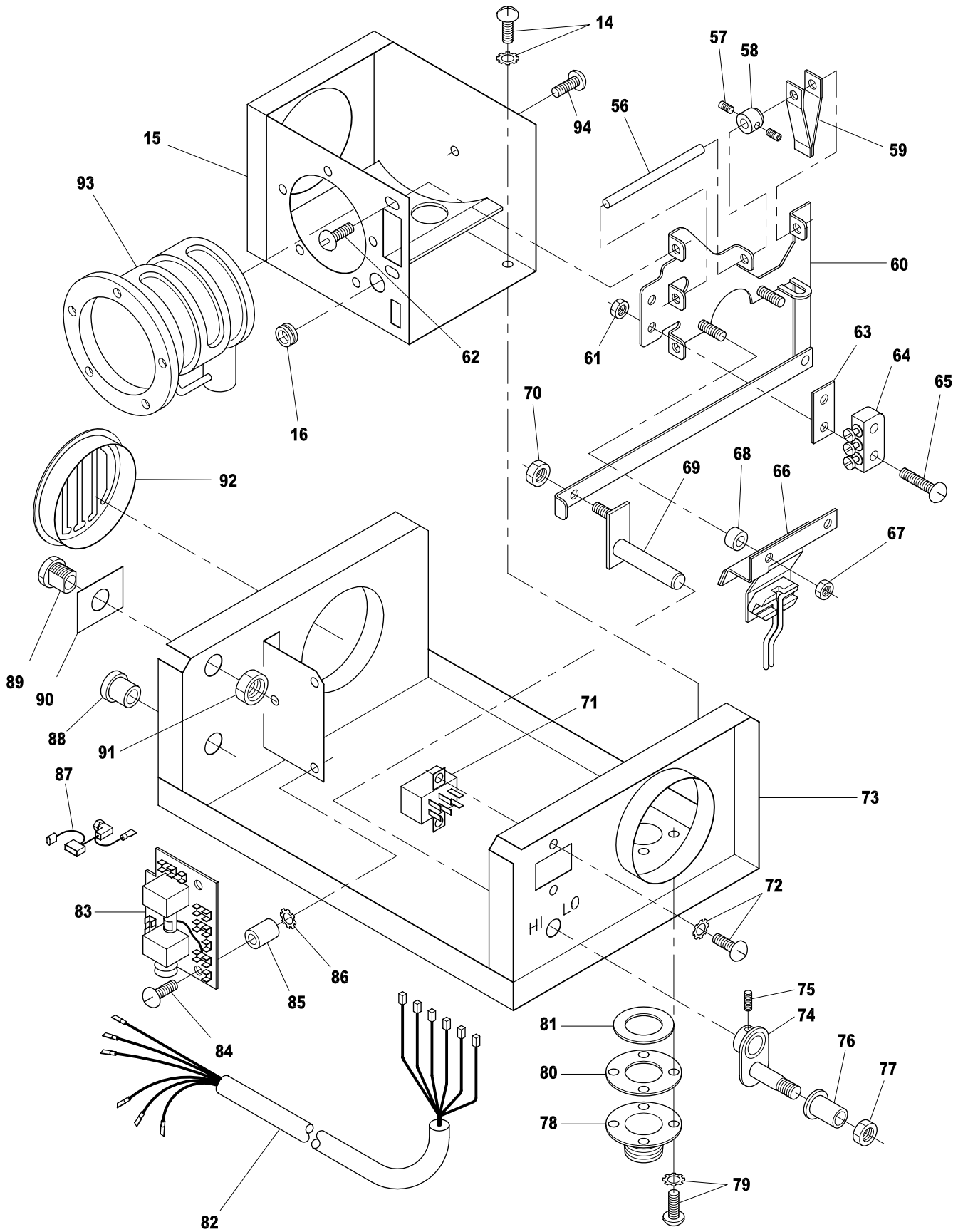
INSPECTION:

1. INSPECT PARTS AND REPLACE AS NECESSARY.





TM 5-3810-306-34



ASSEMBLY:

1. INSTALL RECEPTACLES AND CONNECTORS.
 - a. Install new washer (81), new gasket (80), and exhaust connector (78) on case with screws and lockwashers (79).
 - b. Install terminal connector (88) and fuel line connector (89) and cover (90) with nut (91).
 - c. Install receptacle (71) in case with screws and star washers (72).
 - d. If removed, install cover (95).
2. INSTALL HARNESS (82) AND TERMINAL BOARD (83).
 - a. Install terminal board (83) with star washers (86), spacers (85), and screws (84)
 - b. Position harness (82) in case, connect electrical leads to receptacle (71) and terminal board (83), and remove tags.
 - c. Install capacitor (87).
3. INSTALL HI-LO MICROSWITCH (64) AND FLAME SWITCH (66).
 - a. Position pivot arm (69) and control lever (74) in case, tighten set screw (75), and install collar (76) and nut (77) on control lever (74).
 - b. Install flame switch (66) on bracket assembly (60) with spacers (68) and nuts (67).
 - c. Install actuating rod (56) and bi-metal blade (59) on bracket assembly (60), position actuator stop (58) on rod (56) as marked during removal, and secure stop (58) with setscrews (57).
 - d. Position bracket assembly (60) and heat shield (61) in heat exchanger bracket (15) with lever of bracket assembly (60), mounting area for microswitch (64), and wires for flame switch (66) protruding through appropriate holes in bracket (60). Secure bracket assembly (60) to heat exchanger bracket (15) with screws (62).
 - e. Install insulator (63) and microswitch (64) on bracket assembly (60) with screws (65) and nuts (61).
 - f. Install bracket (15) in case (73) with star washers and screws (14).
 - g. Install grommet (16) over wires for flame switch (66) and into heat exchanger bracket (15). Route and connect wires for flame switch (66) and microswitch (66) to terminal board (83). Remove tags.
4. INSTALL HEAT EXCHANGER (93) IN HEAT EXCHANGER BRACKET (15) WITH SCREW AND WASHER (94) ENSURING FLAME SWITCH (64) CONTACTS HEAT EXCHANGER. REPOSITION FLAME SWITCH (66) AS NECESSARY TO ACHIEVE CONTACT.
5. CONNECT LEVER OF BRACKET ASSEMBLY (60) TO PIVOT ARM (69) WITH LOCK NUT (70).
6. INSTALL OVERHEAT SWITCH (10).
 - a. Install overheat switch (10) in baffle (11) with star washers and screws (8).
 - b. Install electrical lead (9) and grommet (6) in cover (7).
 - c. Position baffle (11) under cover (7), connect electrical lead to overheat switch (10), and secure baffle (11) to cover (7) with star washers and screws (5).
 - d. Install cover (7) on bracket (15) with star washers and screws (5). Route and connect electrical leads for overheat switch (10) to terminal board (83) and remove tags.
 - e. Install mounting plate (54) on bracket (15) with star washers and screws (55).
7. ASSEMBLE MOTOR (46) AND BLOWER (41).
 - a. Install gasket (45), washer (39), and blower housing (41) on motor (46) with washer (39), washers (38), lockwashers (37), and nuts (36).

- b. Install fan wheel (35) on shaft of motor (46) and secure with spring clip (part of fan wheel hub).
 - c. Install stationary wheel (33) on blower housing (41) with screws (40).
 - d. Install spacer (32) and fan wheel (31) on shaft of motor (46). Secure fan wheel (31) with spring clip (part of fan wheel hub).
 - e. Install blower cover (30) on blower housing (41) with clamp (34).
8. INSTALL BLOWER (41) AND MOTOR (46).
- a. Apply thread sealant to threads of setscrews (53). Install fan (52) on shaft of motor (46) as marked during removal and secure with setscrews (53) ensuring setscrews engage flats on motor shaft.
 - b. Install motor mount (49) on motor (46) as marked during removal. Secure with washer (48) and screw (47).
 - c. Install motor (46) with blower assembly on mount plate (54) with washers (51) and screws (50).
 - d. Connect electrical leads for motor (46) and remove tags.
 - e. Install air hose (29) to blower cover (30) and bottom of case with clamps (28).
9. INSTALL IGNITION PACK (12).
- a. Install ignition pack (12) with resistor on bracket at bottom of case with star washers and screws (13).
10. INSTALL IGNITER (25), BURNER HEAD (21) AND GLOW PLUG (26).
- a. Install hose (27), glow plug (26), and igniter (25) with new gasket on burner head (21).
 - b. Install new gaskets (17 and 18) and burner head (21) on heat exchanger (93) with pressure pads (19) and screws (20).
 - c. Connect electrical leads to glow plug (26) and igniter (25). Remove tags.
 - d. Install air hose (43) on burner head (21) and blower housing (41) with clamps (42 and 44).
11. INSTALL CARBURETOR (22).
- a. Install carburetor assembly (22) on burner head (21) with screws (23). Connect electrical leads for carburetor assembly (22) and remove tags.
 - b. Install fuel line and fittings (24) at carburetor assembly (22) and rear wall of case.
 - c. Position covers (2 and 3) on heater assembly and install cross bar (4) on heater assembly with screws (1).

END OF TASK

FUEL (DOSING) PUMP INSTALLATION (RT875CC)

TOOLS: General mechanic's tool kit: automotive (5180-00-177-7033)

SUPPLIES: Lockwasher (Item 274, Appendix B)

EQUIPMENT CONDITIONS: Disconnect ground cable at shunt. (Refer to TM 5-3810-306-20.)
Valve compartment access lid open.

WARNING

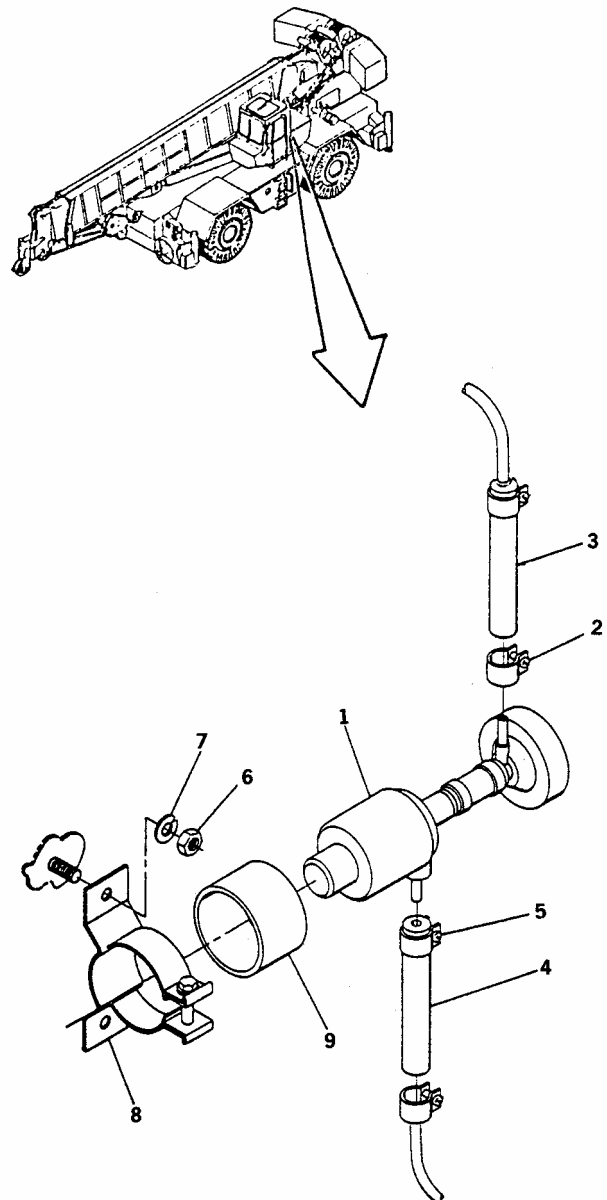
Be sure to wear protective eye covering to avoid personal injury.

REMOVAL:

WARNING

Fuel is flammable. Keep fuel away from heat and open flame. Catch any fuel that may come out of hoses in a suitable container.

1. SHUT OFF FUEL AT PETCOCK ON BOTTOM OF HEATER FUEL TANK.
2. REMOVE FUEL (DOSING) PUMP (1).
 - a. Tag and disconnect electrical leads from fuel pump (1).
 - b. Loosen hose clamp (2) and disconnect hose (3) from fuel pump (1). Plug hose.
 - c. Loosen hose clamp (5) and disconnect hose (4) from fuel pump (1). Plug hose.
 - d. Loosen clamp (8) and remove bumper (9) and fuel pump (1) from clamp.
 - e. In necessary remove two nuts (6) and lockwashers (7) securing clamp (8) and remove clamp. Discard lockwashers (7).



INSTALLATION:

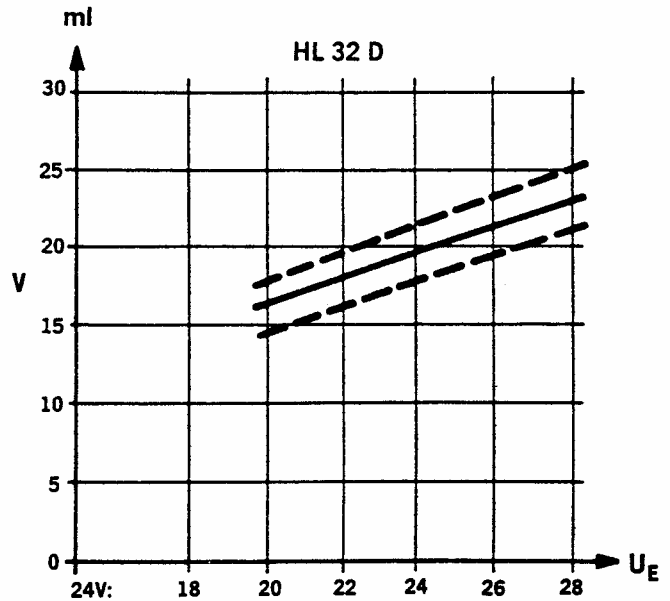
1. INSTALL FUEL (DOSING) PUMP (1).
 - a. If removed, position clamp (8) on mounting studs and secure with two new lockwashers (7) and nuts (6).
 - b. Slide bumper (9) and pump (1) into clamp (8) and tighten.
 - c. Slip hose (4) over fitting on pump and secure with hose clamp (5).
 - d. Slip hose (3) over fitting on pump and secure with hose clamp (2).

- e. Connect electrical leads to pump and marked during removal.
2. OPEN PETCOCK ON BOTTOM OF HEATER FUEL TANK.
3. CONNECT GROUND CABLE AT SHUNT. (REFER TO TM 5-3810-306-20.)
4. CHECK CAB HEATER OPERATION. (REFER TO TM 5-3810-306-10.)

CHECKING PUMP FLOW RATE:

1. CHECK FLOW RATE AS FOLLOWS:
 - a. Remove wiring harness cap from top of heater and disconnect glow plug.
 - b. Detach the fuel line from the heater and place the end of it in a measuring cylinder such as a 100 ml graduated burette.
 - c. Turn on heater. After 90 seconds, the heater automatically goes to fault lock-out with subsequent repeat start. Repeat this procedure until fuel emerges from fuel line.
 - d. To make the measurements, turn on the heater again and measure the increase in fuel volume for two 90 second periods. At the same time, measure the electrical voltage at the control unit terminals B3 (+) and C2 (-).

- e. Take the data recorded in step d and apply it to the following graph. The point of intersection must lie within the shaded area.



Delivery volume V (ml) of the dosing pump after 180 seconds pumping time plotted against the input voltage U (V) at the electronic control unit. Temperature T= +20 ±2 (°C).

END OF TASK

Section II. AUTOMATIC CONTROL LEVER LOCKOUT CYLINDER AND LINKAGE MAINTENANCE

AUTOMATIC CONTROL LEVER LOCKOUT CYLINDER AND LINKAGE INSTALLATION

TOOLS: General mechanic's tool kit: automotive (5180-00-177-7033)

SUPPLIES: Lockwasher (Item 234, Appendix B) (4 Required)

EQUIPMENT CONDITION: Negative battery cable disconnected at shunt. (RT875CC)
Battery disconnect switch in off position. (RT875CCS)
Air system purged. (Refer to TM 5-3810-306-20.)
Cab front cover removed. Refer to TM 5-3810-306-20.)

WARNING

Be sure to wear protective eye covering to avoid personal injury.

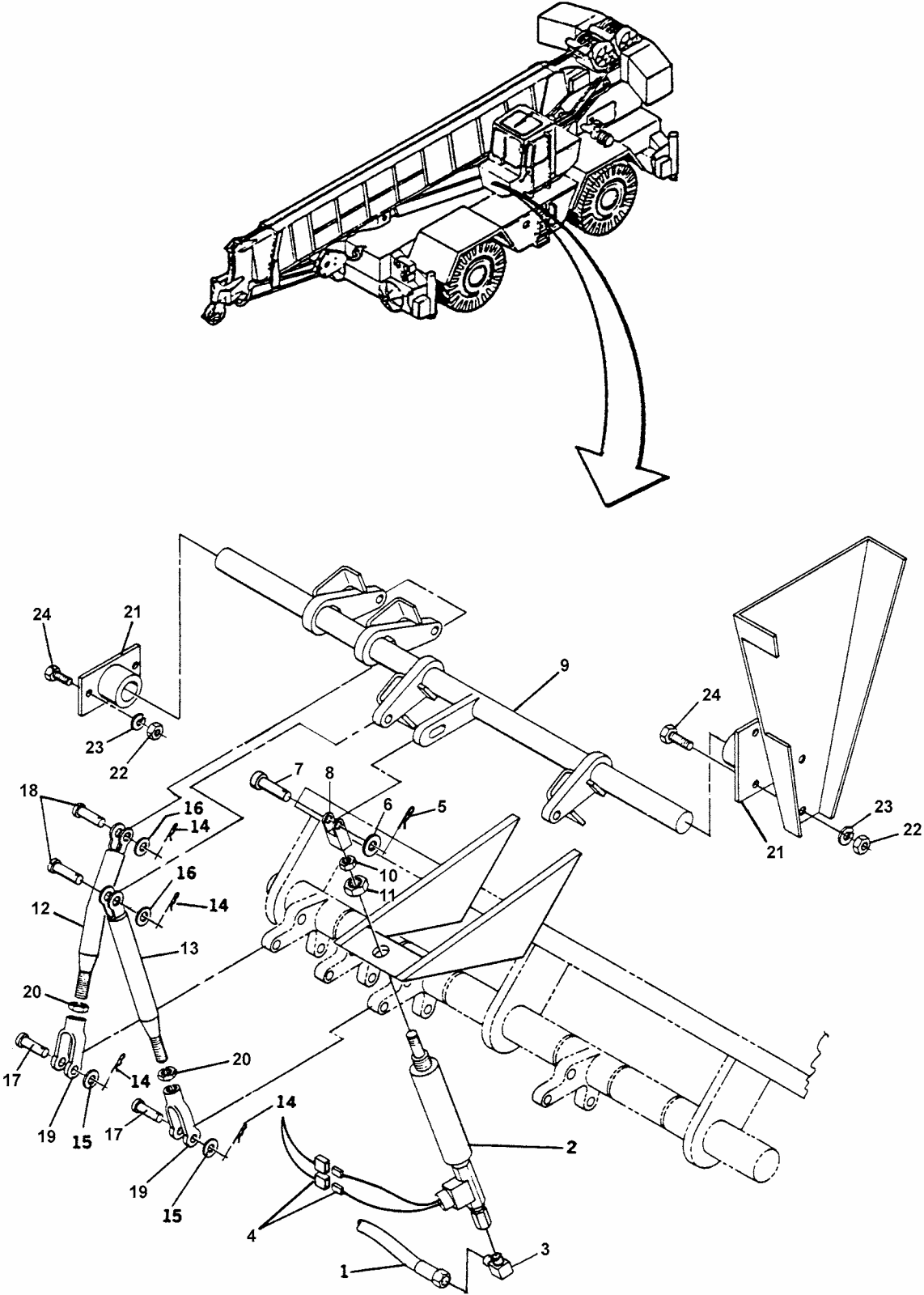
REMOVAL:

1. REMOVE AUTOMATIC CONTROL LEVER LOCKOUT CYLINDER (2).
 - a. Tag and disconnect air line (1) to automatic control lever lockout (2).
 - b. Remove fitting (3) and retain for reassembly.
 - c. Tag and disconnect two electrical connectors (4).
 - d. Remove lock pin (5) and washer (6) from clevis pin (7) securing clevis (8) to lockout shaft (9).
 - e. Loosen clevis lock nut (10) and remove clevis (8) and lock nut (10) from automatic control lever lockout cylinder (2).
 - f. Remove nut (11) and automatic control lever lockout cylinder (2) from mounting bracket.
2. REMOVE CONTROL RODS (12) AND (13).
 - a. Remove lock pins (14) and washers (15) and (16).
 - b. Remove clevis pins (17) and (18) and control rods (12) and (13).
 - c. If necessary, remove clevis rod ends (19) and jam nuts (20) from control rods (12) and (13).

3. REMOVE SHAFT ASSEMBLY (9) AND BEARING UNITS (21).
 - a. Remove nuts (22) and lockwashers (23) from bolts (24). Discard lockwashers (23).
 - b. Remove bolts (24) and lower shaft (9) and bearing units (21) from frame.
 - c. Slide bearing units (21) from ends of shaft (9).

INSTALLATION:

1. INSTALL SHAFT ASSEMBLY (9) AND BEARING UNITS (21).
 - a. Slide bearing units (21) on ends of shaft (9) and position assembly in frame.
 - b. Install bolts (24), new lockwashers (23) and nuts (22).
2. INSTALL CONTROL RODS (12) AND (13).
 - a. If removed, install jam nuts (20) and clevis rod ends (19) on control rods (12) and (13).
 - b. Install control rods (12) and (13) with clevis pins (18) and (17), washers (16) and (15) and lock pins (14).



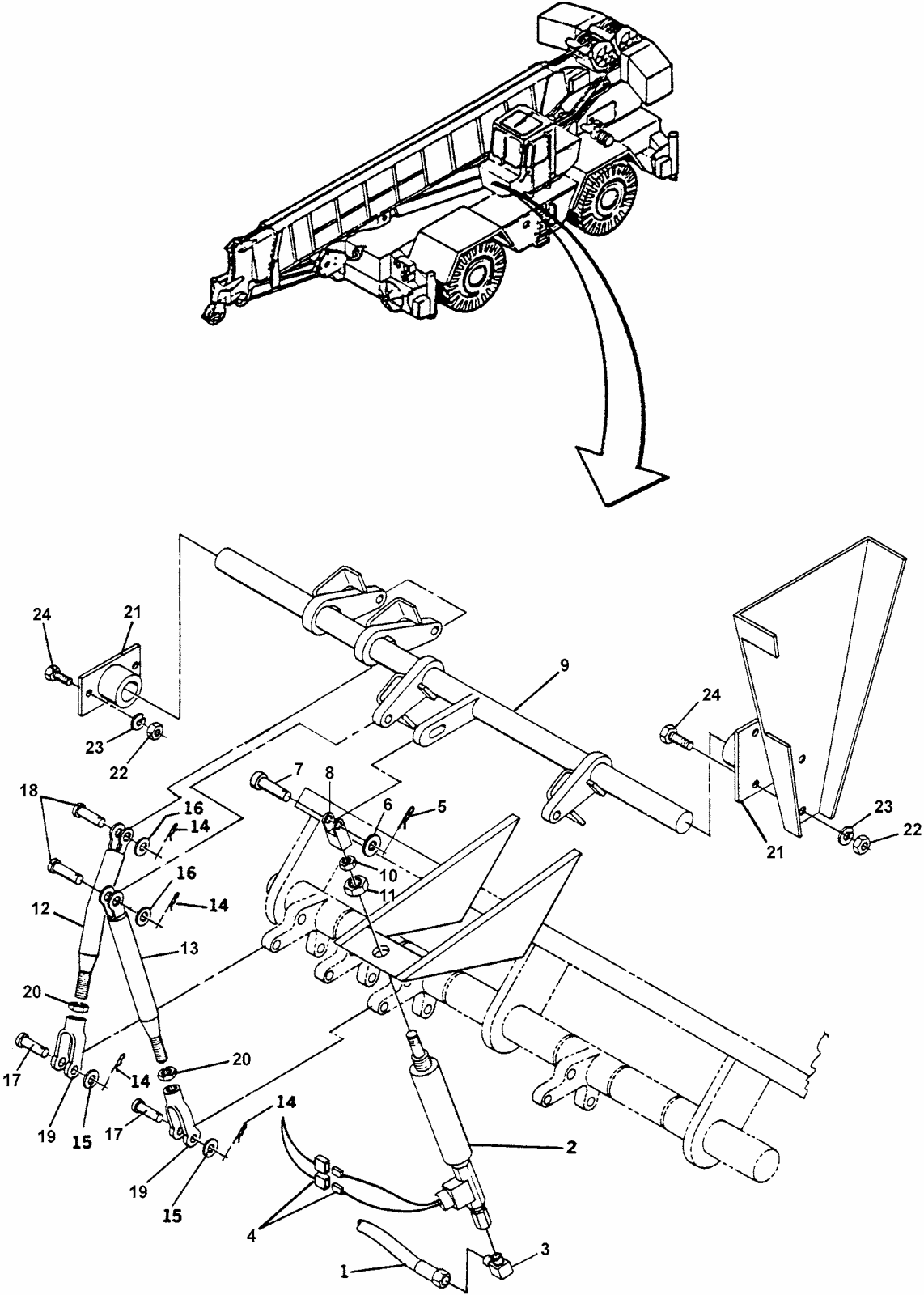
3. INSTALL AUTOMATIC CONTROL LEVER LOCKOUT CYLINDER (2).
 - a. Place lockout cylinder (2) shaft through hole in mounting bracket and secure with nut (11).
 - b. Install locknut (10) and clevis (8) on lockout cylinder (2) shaft.
 - c. Align slotted hole in lockout shaft (9) with hole in clevis (8). Install clevis pin (7) and secure with lock pin (5) and washer (6).
 - d. Tighten clevis locknut (10).
 - e. Remove tags and connect two electrical connectors (4).
 - f. Install fitting (3) and connect air line (1) to automatic control lever lockout (2).

4. CONNECT NEGATIVE BATTERY CABLE AT SHUNT. (REFER TO TM 5-3810-306-20.) (RT875CC)
5. TEST FOR PROPER OPERATION.

ADJUSTMENT:

1. ADJUST AUTOMATIC CONTROL LEVER LOCKOUT CYLINDER (2).
 - a. With control valves centered and lockout cylinder (2) fully extended, adjust clevis (19) until stops on shaft (9) contact free rotating lugs (12) on shaft.
2. INSTALL FRONT COVER ON CAB. (REFER TO TM 5-3810-306-20.)

END OF TASK



Section III. 5TH WHEEL MAINTENANCE

5TH WHEEL INSTALLATION

TOOLS: General mechanic's tool kit: automotive (5180-00-177-7033)

SUPPLIES: Lifting device (1000 pound capacity)

EQUIPMENT CONDITIONS: Rear axle removed. (Refer to page 8-8.)
Rear axle not centered proximity switch removed.
(Refer to TM 5-3810-306-20.)
Lockout cylinders disconnected at 5th wheel.
(Refer to page 13-82.)

REMOVAL:

1. REMOVE 5TH WHEEL (1).
 - a. Using a suitable jack, support 5th wheel (1) in carrier frame.
 - b. Remove nuts (3), bolts (2) and pivot pins (4).
 - c. Lower 5th wheel (1) from carrier frame.

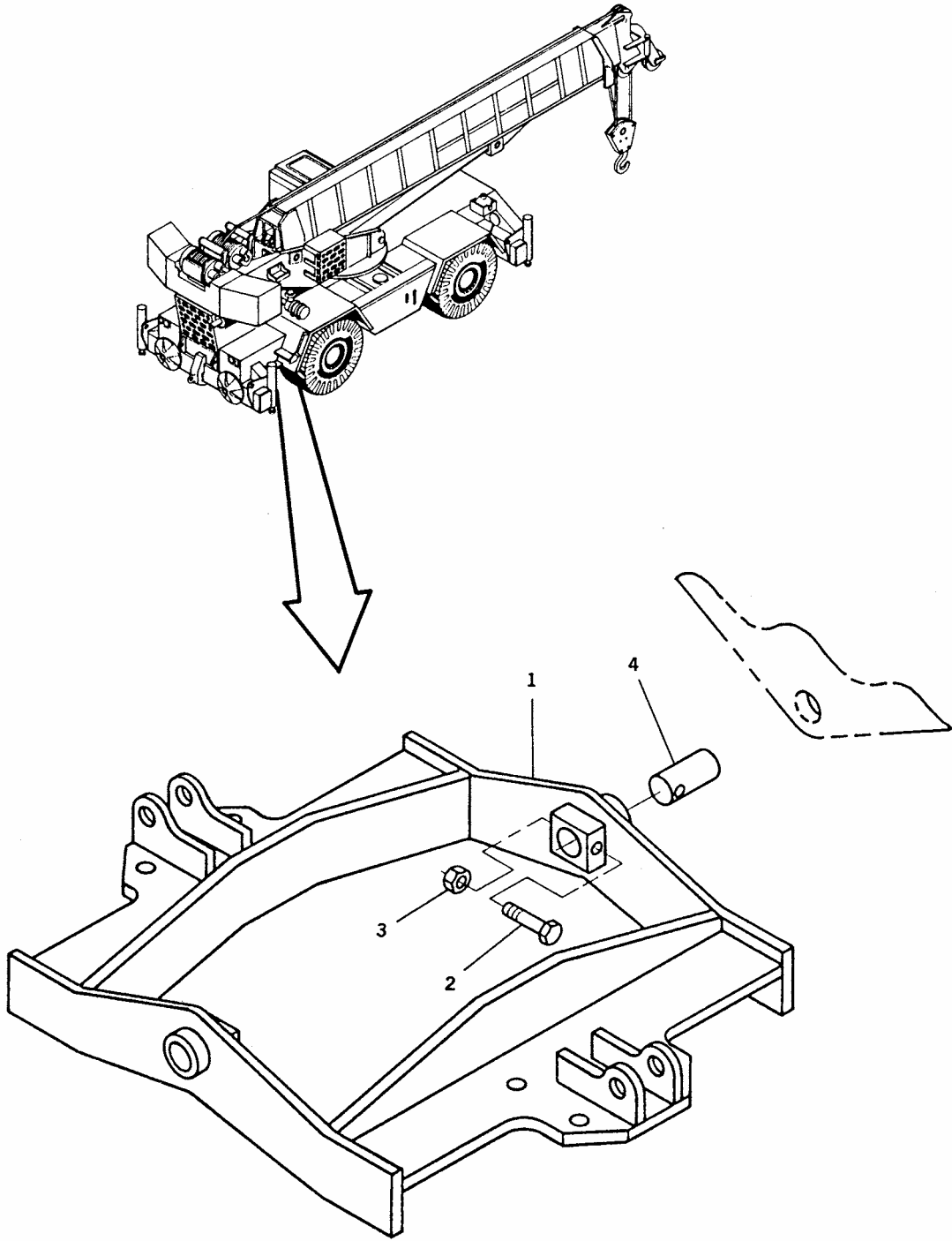
INSPECTION:

1. INSPECT 5TH WHEEL (1) FOR CRACKS AND OBVIOUS DAMAGE. REPLACE IF DAMAGED.

INSTALLATION:

1. INSTALL 5TH WHEEL (1).
 - a. Using a suitable jack, raise and position 5th wheel (1) in carrier frame.
 - b. Install pivot pins (4), bolts (2), and nuts (3).
2. CONNECT LOCKOUT CYLINDERS TO 5TH WHEEL. (REFER TO PAGE 13-82.)
3. INSTALL REAR AXLE. (REFER TO PAGE 8-8.)
4. INSTALL REAR AXLE NOT CENTERED PROXIMITY SWITCH. (REFER TO TM 5-3810-306-20.)

END OF TASK



CHAPTER 13

HYDRAULIC AND FLUID SYSTEM MAINTENANCE

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Section I. HYDRAULIC PUMP MAINTENANCE

OIL COOLER HYDRAULIC MOTOR ASSEMBLY

TOOLS: General mechanic's tool kit: automotive (5180-00-177-7033)
Shop Equipment Auto-Maintenance and Repair, FM Basic (4910-00-754-0705)
Shop Equipment Auto-Maintenance and Repair, FM Suppl No. 1 (4910-00-754-0706)
Tool Outfit Hyd System, Test and Repair, 3/4 Ton Trailer Mtd (4940-01-036-5784)
Check valve tool (Item 4, Appendix C)
Sleeve (Item 5, Appendix C)
Carborundum stone
Seal removal tool (Item 3, Appendix C)
Lip seal installer (Item 7, Appendix C)

SUPPLIES: Grease (Item 9, Appendix B)
Aviation Form-A-Gasket No. 3 (Item 75, Appendix B)
Gasket (Item 72, Appendix B) (2 Required)
Gasket (Item 73, Appendix B) (2 Required)
Seal (Item 74, Appendix B)

EQUIPMENT CONDITIONS: Hydraulic motor removed. (Refer to page 13-44.)

DISASSEMBLY: 4. REMOVE THRUST PLATE (9).

CAUTION

Disassemble in dust-free work area.

1. POSITION MOTOR ASSEMBLY IN SOFT JAWED VISE WITH SHAFT END DOWN.
2. INDEX MARK HOUSINGS.
 - a. Index mark port end housing (4), gear housing (5), and shaft end housing (16) to facilitate reassembly.
3. REMOVE PORT END HOUSING (4).
 - a. Remove the four capscrews (2) and washers (3) from port end housing (4).

CAUTION

If end cover (4) will not lift off, pry it off using care to avoid damaging machined surfaces.

- b. Remove port end housing (4) from gear housing (5).

NOTE

If thrust plate (9) remains in gear housing (5) it will be removed later.

CAUTION

Avoid distorting the thrust plate.

- a. Pry thrust plate (9) from port end housing (4) carefully. Remove and discard six pocket seals (12).

NOTE

To replace ring seal (8) pull integral shaft and gear bearing (6) with suitable bearing puller and remove ring seal (8) from bottom of bearing bore.

- b. Check ring seals (8) for wear and replace if necessary.

5. REMOVE GEAR HOUSING (5).

CAUTION

If gear housing (5) will not lift off, pry it off using care to avoid damaging machined surfaces.

- a. Remove integral shaft and gear (11), gear (10), and gear housing (5) from shaft end housing (16). Keep gears together as they are a matched set.

NOTE

Gears are a matched set, therefore both gears must be replaced even if only one was found damaged.

CAUTION

Avoid distorting thrust plates.

- b. If thrust plates (9) remained in gear housing (5), tap them out with a wooden hammer handle.

- c. Remove and discard packings (14) from grooves in housing (5).

6. REMOVE THRUST PLATE (9).

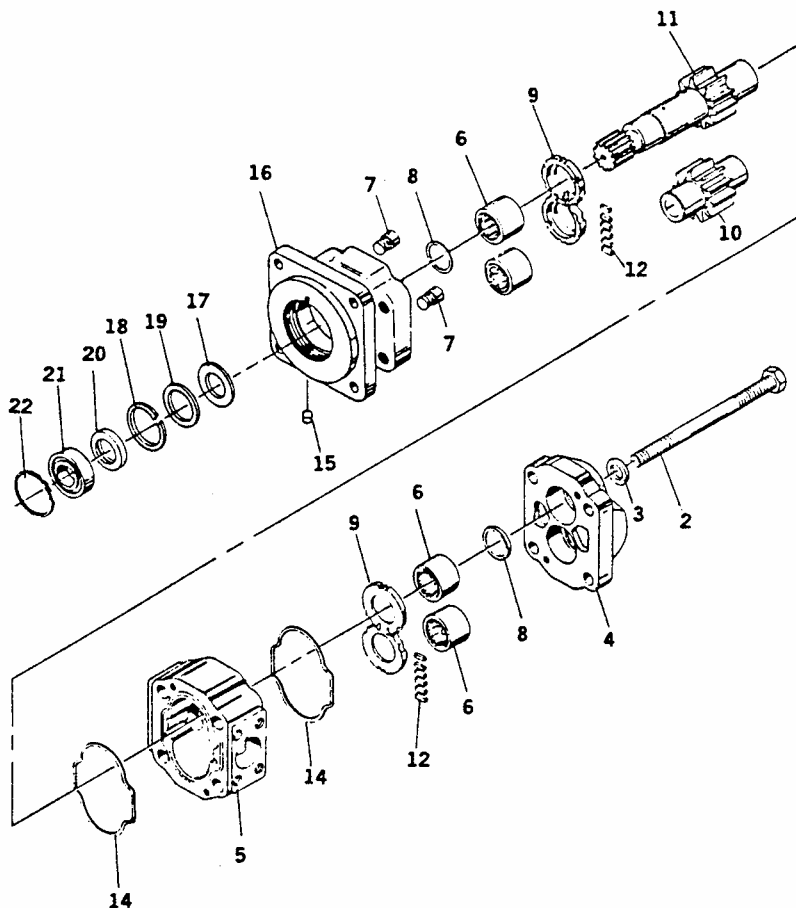
CAUTION

Avoid distorting thrust plate.

- a. Pry thrust plate (9) from shaft end cover (16) with a thin bladed screwdriver. Remove and discard pocket seals (12).

NOTE

To replace ring seal (8) pull integral shaft and gear bearing (6) with suitable bearing puller and remove ring seal (8) from bottom of bearing bore.



- b. Check ring seals (8) for wear and replace if necessary.

7. REMOVE SHAFT END BEARING AND SEALS.

- a. Remove the outboard bearing snap ring (22) with a small screwdriver or awl.
- b. Pull outboard bearing (21) from shaft end cover (16) with a bearing puller.
- c. Remove spacer bearing (20) and retaining ring (18) from shaft end cover (16).
- d. Remove seal retainer (19) and using seal removal tool (Item 3, Appendix C), remove lip seal (17) from shaft end housing (16).
- e. If necessary remove check assemblies (7) from shaft end cover (16) using check valve tool (Item 4, Appendix C).
- f. If necessary, remove plug (15) from shaft end cover (16). Stone off all machined surfaces with a medium grit carborundum stone.

CLEANING:

WARNING

Dry cleaning solvent P-D-680, Type III is toxic and flammable. Wear protective goggles and gloves and use only in a well ventilated area. Avoid contact with skin, eyes, and clothes and do not breathe vapors. Do not use near open flame or excessive heat. The flash point is 200°F (94°C). If you become dizzy while using cleaning solvent, get fresh air immediately and get medical aid. If contact with eyes is made, wash your eyes with water and get medical aid immediately.

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

- 1. CLEAN ALL PARTS IN SOLVENT P-D-680, TYPE III AND DRY WITH COMPRESSED AIR.

INSPECTION:

- 1. INSPECT HOUSINGS.

NOTE

Wear in excess of 0.005 in. (0.127 mm) cutout justifies replacement of housing.

- a. Place a straight edge across housing bore. If a 0.005-in. (0.127 mm) feeler gauge will slip between straight edge and housing, replace housing.
- 2. INSPECT GEAR HUBS AND GEARS.

NOTE

Gears are a matched set, therefore both gears must be replaced even if only one was found damaged.

- a. Any wear on gear hubs that is detectable by touch, or exceeding 0.002-in. (0.051 mm) justifies replacement. Scoring, grooving, or burring of the outside diameter of the gear teeth, as well as nicking, grooving, or fretting of teeth surfaces necessitates replacement.
 - b. Replace the integral shaft and gear if any wear is detectable visibly or by touch in the seal areas or at the drive coupling. A maximum of 0.002-in. (0.051 mm) wear is allowable. Wear or damage to key or keyway justifies replacement. Wear in shaft seal areas indicates oil contamination.
- 3. INSPECT THRUST PLATES.
- a. Thrust plates seal the gear section at sides of gears. Wear in this area will allow internal slippage, resulting in oil bypassing within motor. Maximum allowable wear is 0.002-in. (0.051 mm). Replace thrust plates if they are scored, eroded, or pitted.

- b. Check the center area of thrust plates where the gears mesh. Erosion in this area indicates oil contamination. Pitted thrust plates indicate cavitation or oil aeration. Discoloration of plates would indicate overheating, probably as a result of insufficient oil.

- c. Bearings should fit into bore with a light press fit, however, a neat hand fit is allowable. If the bearings tend to fall from bore, bore is probably oversize.

4. INSPECT BEARINGS.

CAUTION

If the gears are replaced, bearings must be replaced also.

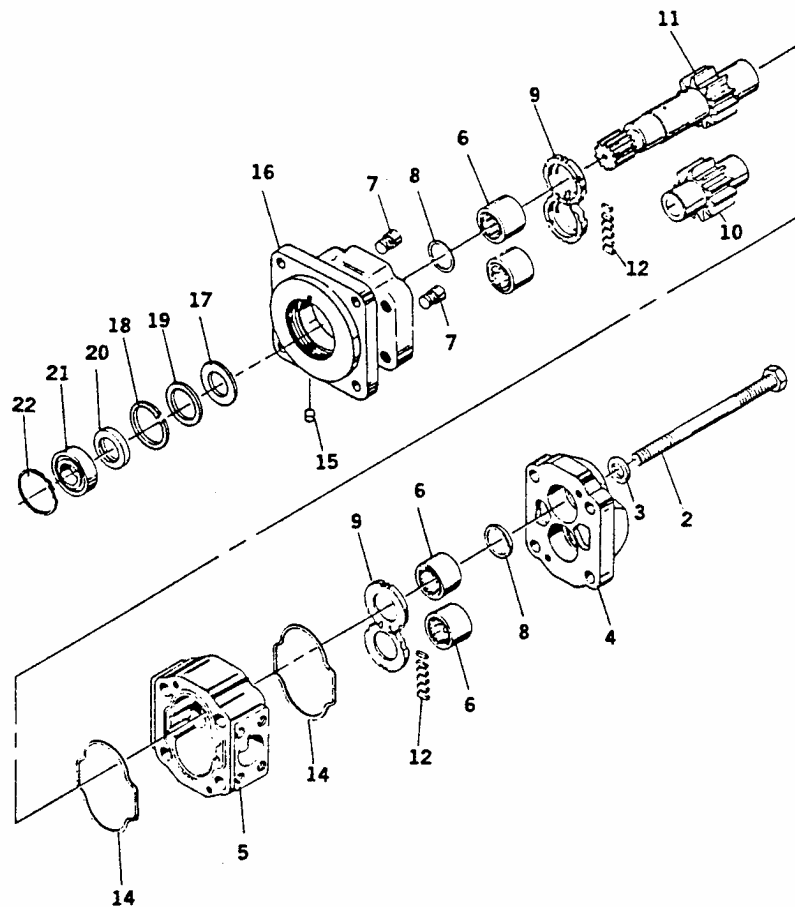
- a. Examine roller bearings (6) for spalling and pitting. If replacement is necessary, pull bearings with a bearing puller.
- b. If bearings have been removed, deburr bearing bores. Clean all parts in a suitable solvent and dry them with compressed air.

REASSEMBLY:

CAUTION

When securing the motor in a vise, do not grip on or near the machined surfaces.

1. IF REMOVED, INSTALL PLUG (15) IN SHAFT END HOUSING (16). TORQUE PLUG TO 240 IN-LBS (27 NM).
2. IF REMOVED, INSTALL CHECK VALVE ASSEMBLIES (7) IN SHAFT END COVER (16) USING CHECK VALVE TOOL (ITEM 4, APPENDIX C).
 - a. Peen edge of check valve holes 1/32 to 1/16 in. using a 1-1/2 in. diameter steel ball.



3. INSTALL SHAFT END BEARING AND SEALS.

NOTE

Coat outer edge of new lip seal (17) with Aviation Form-A-Gasket No. 3 non-hardening sealant or equivalent prior to installation.

- a. With metal side up press new lip seal (17) in shaft end cover (16) using suitable press and lip seal installer (Item 7, Appendix C). Ensure seal is fully seated in bore.
- b. Install seal retainer (19) in shaft end cover (16).
- c. Install spacer bearing (20) and retaining ring (18) in shaft end cover (16).
- d. Using a press install outboard bearing (21) into shaft end cover.
- e. Install snap ring (22) into shaft end cover groove to retain outboard bearing.

4. INSTALL RING SEALS (8) IF REMOVED.

NOTE

The notch in ring seal (8) must be visible to ensure notched side is next to bearing.

- a. Install new ring seals (8) into bottom of integral shaft and gear bearing bore on both shaft end cover (16) and port end cover (4).

5. INSTALL BEARINGS (6).

- a. Replace any bearings that have been removed from shaft end cover (16) and port end cover (4). Install bearings with an arbor press.

6. INSTALL THRUST PLATES (9).

- a. Cut two pocket seals for each thrust plate 0.219 in. (5.56 mm) long from pocket seal strip.
- b. Place a small amount of heavy grease into two middle slots in open face of

thrust plates (9) and insert pocket seals (12).

- c. With pocket seals down, place thrust plates (9) over bearings (6) in shaft end cover (16) and port end cover (4). Tap thrust plates with a soft hammer to about 0.031-in. (0.794 mm) from machined surface.
- d. Cut four pocket seals for each thrust plates (9) approximately 0.25-in. (6.35 mm) long from pocket seal strip. Insert one pocket seal into each slot in thrust plate. Push each pocket seal all the way in so that they touch roller bearings. Tap thrust plates down firmly against machined surface with a soft hammer. Using a sharp razor blade, trim exposed end of pocket seal square and flush with thrust plate.

7. INSTALL GEAR HOUSING (5).

- a. Grease the new packings (14) and install them into grooves in both sides of gear housing (5).
- b. Insert keyed end of integral shaft and gear (11) into special steel sleeve (Item 5, Appendix C). Lightly grease driveshaft and sleeve. Insert shaft with sleeve into shaft end cover with twisting motion. Be careful not to damage shaft seal (17). Push down carefully until gear rests against thrust plate (9). Remove steel sleeve.
- c. Install drive gear (10) into the shaft end cover roller bearing bores.

CAUTION

Avoid pinching the gasket seal (14).

CAUTION

Ensure index marks are properly aligned.

- d. Slide gear housing (5) over gears and tap with a soft hammer until housing rests tightly against the shaft end cover (16).

NOTE

Oil the gears to provide initial lubrication when the motor is started.

8. INSTALL PORT END COVER (4).

CAUTION

Avoid pinching gasket seal (14).

CAUTION

Ensure index marks are properly aligned.

- a. Install port end cover (4) over gear hubs and tap with a soft hammer until cover (4) rests tightly against gear housing (5).

- b. Thread four capscrews (2) with washers (3) into shaft end cover (4). Tighten diagonally opposed capscrews (2).
- c. Using 6-in. wrench, rotate the drive shaft to ensure there is no binding in motor.
- d. Torque diagonally opposed capscrews (2) to 200 ft-lbs (266 Nm).

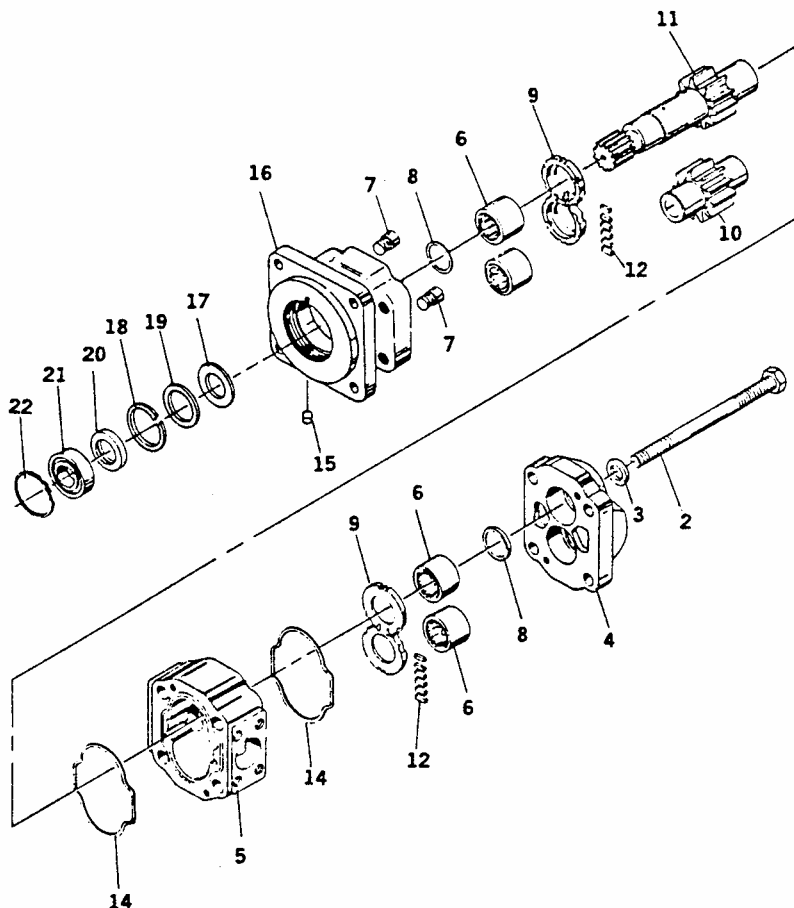
9. INSTALL HYDRAULIC MOTOR. (REFER TO PAGE 13-44.)

10. CONNECT NEGATIVE BATTERY CABLE AT SHUNT. (REFER TO TM 5-3810-306-20.) (RT875CC)

11. DRAIN AND FLUSH HYDRAULIC SYSTEM. (REFER TO PAGE 13-111.)

12. BLEED AIR FROM HYDRAULIC SYSTEM. (REFER TO PAGE 13-113.) OBSERVE FOR LEAKS AND PROPER OPERATION.

END OF TASK



THREE-SECTION HYDRAULIC PUMP INSTALLATION

TOOLS: General mechanic's tool kit: automotive (5180-00-177-7033)
Shop Equipment Auto-Maintenance and Repair, FM Basic (4910-00-754-0705)
Shop Equipment Auto-Maintenance and Repair, FM Suppl No. 1 (4910-00-754-0706)
Tool Outfit Hyd System, Test and Repair, 3/4 Ton Trailer Mtd (4940-01-036-5784)

SUPPLIES: Lockwashers (Item 26, Appendix B) (6 Required)
Gasket (Item 28, Appendix B)
Hydraulic oil (Item 8, Appendix B)
Silicone sealant (Item 27, Appendix B)
Packing, preformed (Item 285, Appendix B) (RT875CCS)
Packing, preformed (Item 286, Appendix B) (RT875CCS)

EQUIPMENT CONDITIONS: Outriggers fully extended and lowered.
(Refer to TM 5-3810-306-10.)
Boom positioned over-the-side.
Engine hood top cover removed. (Refer to TM 5-3810-306-20.)
Rear decking removed. (Refer to TM 5-3810-306-20.)
Negative battery cable disconnected at shunt.
(Refer to TM 5-3810-306-20.) (RT875CC)
Battery disconnect in off position. (RT875CCS)

WARNING

Be sure to wear protective eye covering to avoid personal injury.

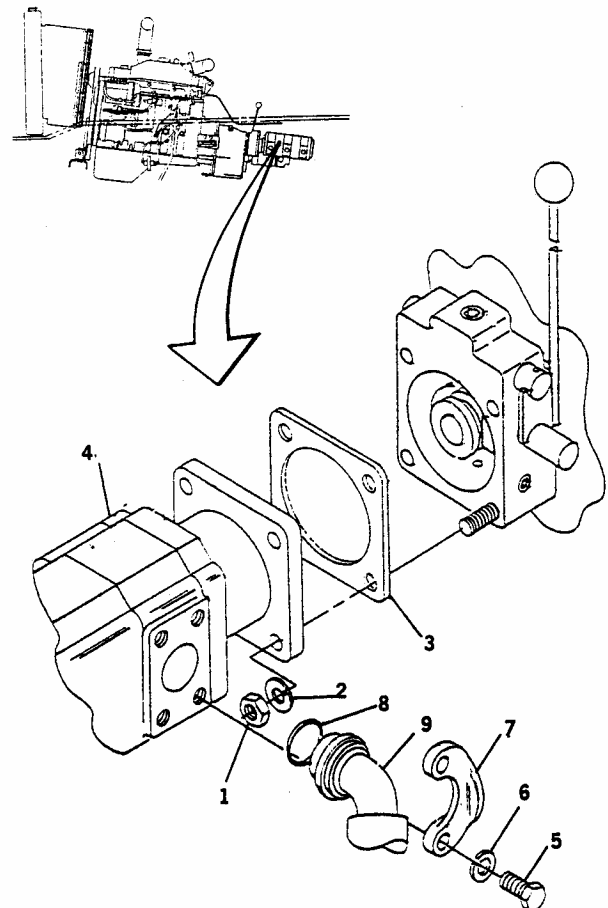
REMOVAL:

1. REMOVE THREE-SECTION HYDRAULIC PUMP (4).
 - a. Tag and disconnect hydraulic hoses (9) from pump (4) by removing capscrews (5), lockwashers (6) and split flanges (7). Remove hoses and discard preformed packing (8). Cap all lines and openings.
 - b. Remove nuts (1) and Lockwashers (2) securing hydraulic pump.

NOTE

Leave pump disconnect on studs unless necessary to remove it. If gasket between pump drive pad and disconnect is broken, it must be replaced.

- c. Remove pump and if necessary, remove drive sleeve.



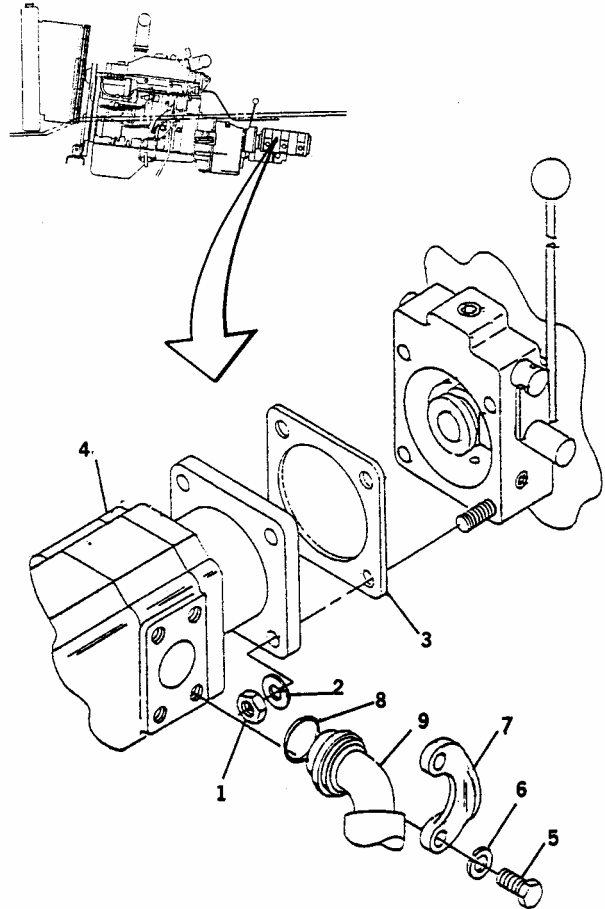
INSTALLATION:

NOTE

If pump is being installed on new torque converter it will be necessary to install new studs in pump drive flanges. Studs must be 4.5 in. (11.4 cm) long as measured from the mounting flange. Using a prick punch,peen studs at mounting flange holes.

1. INSTALL THREE-SECTION HYDRAULIC PUMP (4).

- a. Uncover pump opening.
- b. If pump disconnect was removed install new gasket with silicone sealant and install pump disconnect.
- c. If removed, install pump drive sleeve.
- d. Install a new gasket (3) between pump (4) and pump drive mounting. Apply silicone sealant to gasket.
- e. Install the pump (4) using nuts (1) and lockwashers (2).



NOTE

Prior to connecting hydraulic lines, ensure that fitting threads are clean and free of contaminants. Do not remove any orange thread sealant if previously applied to the fitting(s). Then coat new preformed packings with clean hydraulic oil.

- f. Connect hydraulic hoses (9) with new preformed packing (8) to pump as tagged during removal using split flanges (7), lockwashers (6) and capscrews (5).
- 2. CONNECT NEGATIVE BATTERY CABLE AT SHUNT. (REFER TO TM 5-3810-306-20.) (RT875CC)**

CAUTION

Hot oil must not be fed into a cold pump. It may cause pump to seize.

- 3. DRAIN AND FLUSH HYDRAULIC SYSTEM. (REFER TO PAGE 13-111.)
- 4. BLEED AIR FROM HYDRAULIC SYSTEM. (REFER TO PAGE 13-113.) OBSERVE FOR LEAKS AND PROPER OPERATION.
- 5. INSTALL REAR DECKING. (REFER TO TM 5-3810-306-20.)
- 6. INSTALL ENGINE HOOD TOP COVER. (REFER TO TM 5-3810-306-20.)

END OF TASK

THREE-SECTION HYDRAULIC PUMP ASSEMBLY

TOOLS: General mechanic's tool kit: automotive (5180-00-177-7033)
Shop Equipment Auto-Maintenance and Repair, FM Basic (4910-00-754-0705)
Shop Equipment Auto-Maintenance and Repair, FM Suppl No. 1 (4910-00-754-0706)
Tool Outfit Hyd System, Test and Repair, 3/4 Ton Trailer Mtd (4940-01-036-5784)
Seal removal tool (Item 3, Appendix C)
Carborundum stone
Sleeve (Item 6, Appendix C)
Lip seal Installer (Item 8, Appendix C)

SUPPLIES: Preformed packing (Item 96, Appendix B) (4 Required)
Parts kit, seal repl (Item 97, Appendix B)
Lint free cloth (Item 91, Appendix B)
Solvent, Cleaning, P-D-680, Type III (Item 1, Appendix B)
Form-a-gasket (Item 75, Appendix B)

EQUIPMENT CONDITIONS: Three-Section hydraulic pump assembly removed.
(Refer to page 13-8.)

DISASSEMBLY: 2. REMOVE GEAR HOUSING (12).

CAUTION

When securing pump in a vise, do not grip on or near machined surfaces.

1. REMOVE PORT END COVER (5).
 - a. Place pump in a vise with shaft pointing down. Index mark all sections with a prick punch for proper alignment during assembly.
 - b. Remove nuts (2), washers (4) and studs (3) securing port end cover (5).

NOTE

If thrust plate (10) remains in gear housing (12), tap it out with a wooden hammer handle. Avoid distorting the thrust plate.

NOTE

It will be necessary to pry components off dowel pins (6). Pry from opposite sides.

- c. Remove port end cover (5).

CAUTION

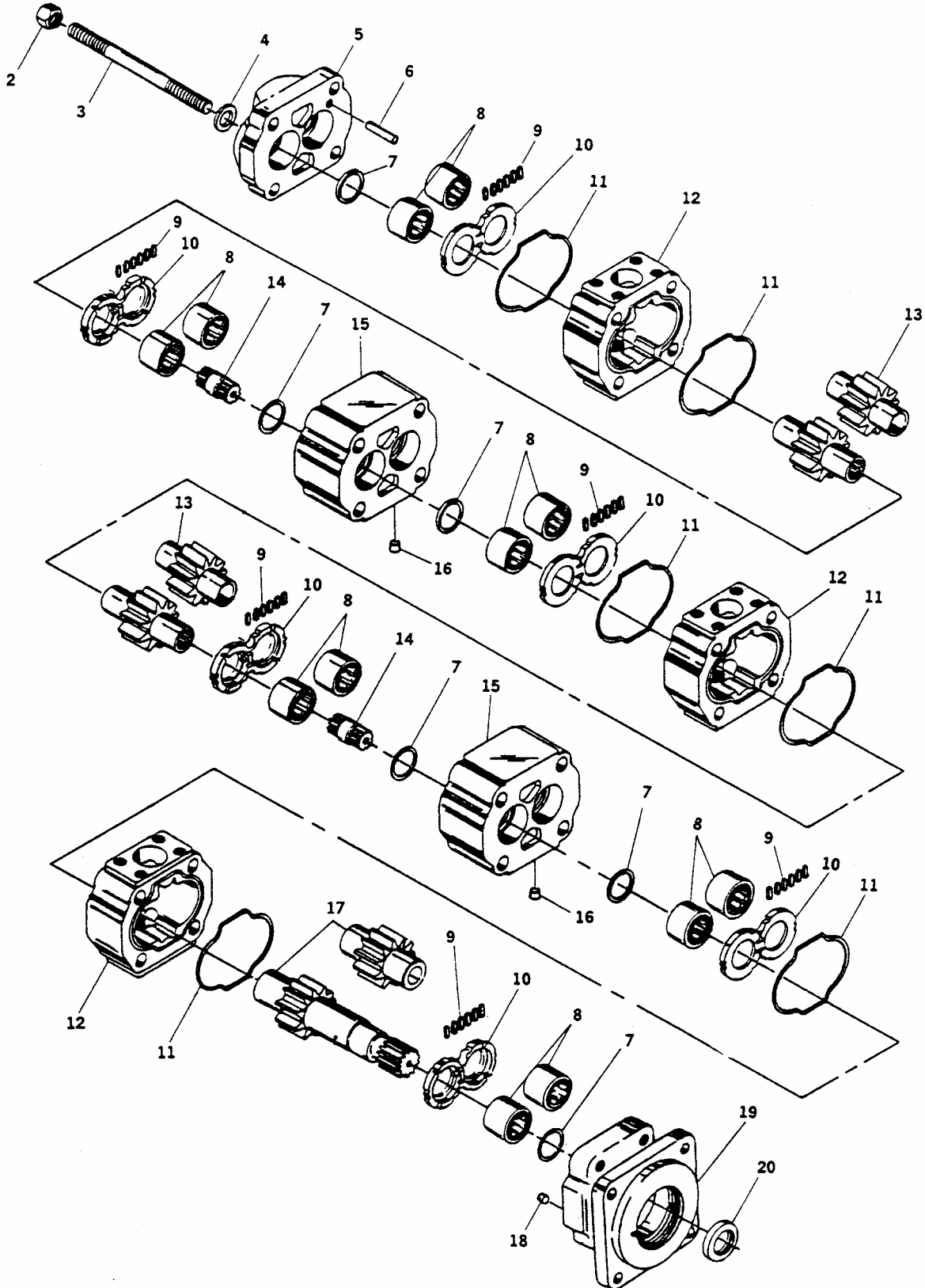
If it is necessary to pry housing loose, use care to avoid damaging machined surfaces.

- a. Remove gear housing (12) from gears (13).
- b. Remove and discard performed packings (11).
3. REMOVE DRIVE AND DRIVEN GEARS (13) AND KEEP THEM TOGETHER AS THEY ARE A MATCHED SET.
4. REMOVE CONNECTING SHAFT (14).

CAUTION

If it is necessary to pry bearing carrier loose, use care to avoid damaging machined surfaces.

5. LIFT OFF BEARING CARRIER (15) AND REMOVE PLUG (16) IF NECESSARY.



CAUTION

If it is necessary to pry gear housing loose, use care to avoid damaging machined surfaces.

NOTE

If thrust plate (10) remains in gear housing, tap it out with a wooden hammer handle. Avoid distorting thrust plate.

6. USING STEPS 2 THROUGH 5, REMOVE ADDITIONAL GEAR HOUSINGS (12) AND BEARING CARRIER (15) FROM SHAFT END COVER.
7. REMOVE DRIVE GEAR WITH SHAFT AND DRIVEN GEAR (17), AND KEEP THEM TOGETHER AS THEY ARE A MATCHED SET.

CAUTION

Avoid distorting thrust plate.

8. REMOVE THRUST PLATES (10) AND SEALS (11) AND (9).
 - a. Pry thrust plate from shaft end cover, port end cover or bearing carrier with a screwdriver or similar tool. Remove and discard all rubber seals (9) and gasket seals (11).
9. INSPECT BEARINGS (8) AND RING SEALS (7) AND REPLACE AS REQUIRED.
 - a. Examine all roller bearings (8) for spalling or pitting. If replacement is necessary, pull bearings (8) with a bearing puller.

NOTE

To replace ring seals (7), pull drive gear bearing with a bearing puller and remove ring seal from bottom of bearing bore.

- b. Check ring seals (7) for wear and replace them if necessary.
10. REMOVE LIP SEAL (20) FROM SHAFT END COVER (19).
 - a. Secure shaft end cover in a vise with mounting face down. Remove double lip seal by inserting special seal removal tool (Item 3, Appendix C) into notch between double lip seal and shaft end cover. Tap double lip seal out from shaft end cover and discard seal.
 - b. Stone off all machined surfaces with a medium grit carborundum stone.

CLEANING:

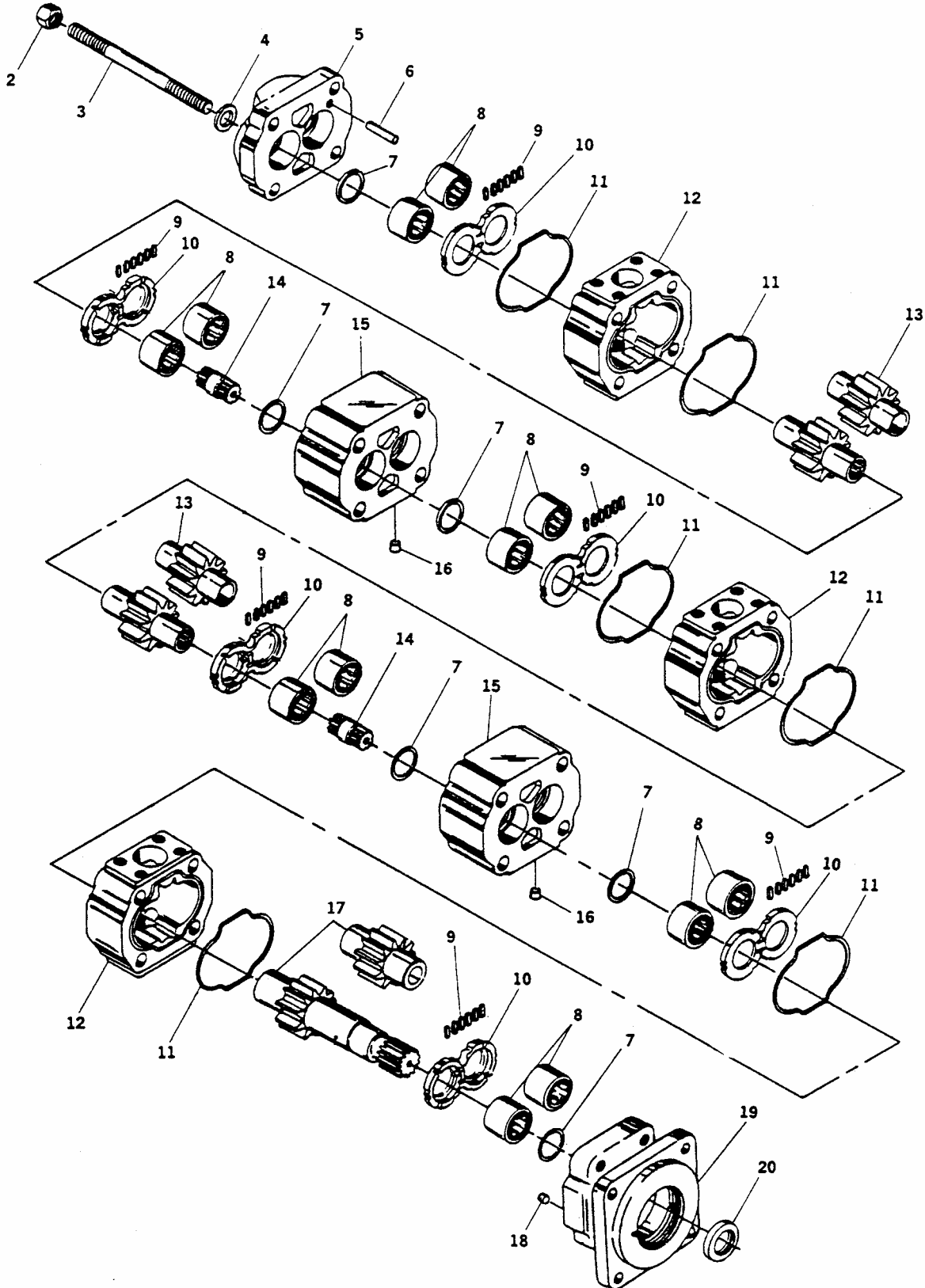
WARNING

Dry cleaning solvent P-D-680, Type III is toxic and flammable. Wear protective goggles and gloves and use only in a well ventilated area. Avoid contact with skin, eyes, and clothes and do not breathe vapors. Do not use near open flame or excessive heat. The flash point is 200°F (94°C). If you become dizzy while using cleaning solvent, get fresh air immediately and get medical aid. If contact with eyes is made, wash your eyes with water and get medical aid immediately. Compressed air used for cleaning purposes will not exceed 30 psi. Use only with effective chip guarding and personal protective equipment (goggles/shield, gloves, etc.).

1. CLEAN ALL PARTS IN SOLVENT P-D-680, TYPE III AND BLOW DRY WITH COMPRESSED AIR.

INSPECTION:

1. INSPECT GEAR HOUSING.



NOTE

Wear in excess of 0.005 in. (0.127 mm) cutout justifies replacement of housing.

- a. Place a straight edge across housing bore. If a 0.005-in. (0.127 mm) feeler gauge will slip between the straight edge and housing, replace housing.

2. INSPECT DRIVE AND DRIVEN GEARS (17).

- a. Any wear on gear hubs that is detectable by touch, or exceeding 0.002 in. (0.051 mm) justifies replacement. Scoring, grooving, or burring of outside diameter of gear teeth, as well as nicking, grooving, or fretting of teeth surfaces necessitates replacement.

NOTE

Gears are a matched set, therefore both gears must be replaced even if only one was found damaged.

3. INSPECT DRIVE SHAFT (14).

- a. Replace drive shaft if any wear is detectable visibly or by touch in seal areas or at drive coupling. A maximum of 0.002-in. (0.051 mm) wear is allowable. Wear or damage to splines justifies replacement. Wear in shaft seal areas indicates oil contamination.

4. INSPECT THRUST PLATES (10).

- a. Thrust plates seal gear section at sides of gears. Wear in this area will allow internal slippage, resulting in oil bypassing within the pump.
- b. Maximum allowable wear is 0.002 in. (0.051 mm). Replace thrust plates if they are scored, eroded, or pitted.

- c. Check center area of thrust plate where gears mesh. Erosion in this area indicates oil contamination. Pitted thrust plates indicate oil contamination, cavitation or oil aeration. Discoloration of plates would indicate overheating, probably as a result of insufficient oil.

5. INSPECT BEARINGS (8).

CAUTION

If gears are replaced, bearings must be replaced also.

- a. Bearings should fit into bore with a light press fit, however, a neat hand fit is allowable. If bearings tend to fall from bore, bore is probably oversize.

REASSEMBLY:

NOTE

If either dowel pin (6) or dowel hole is damaged, pin or machined casting, or both, must be replaced. If more than reasonable force is required to seat dowels, cause may be poorly deburred or dirty parts, cocking of dowel in holes or improper pin-to-hole fit.

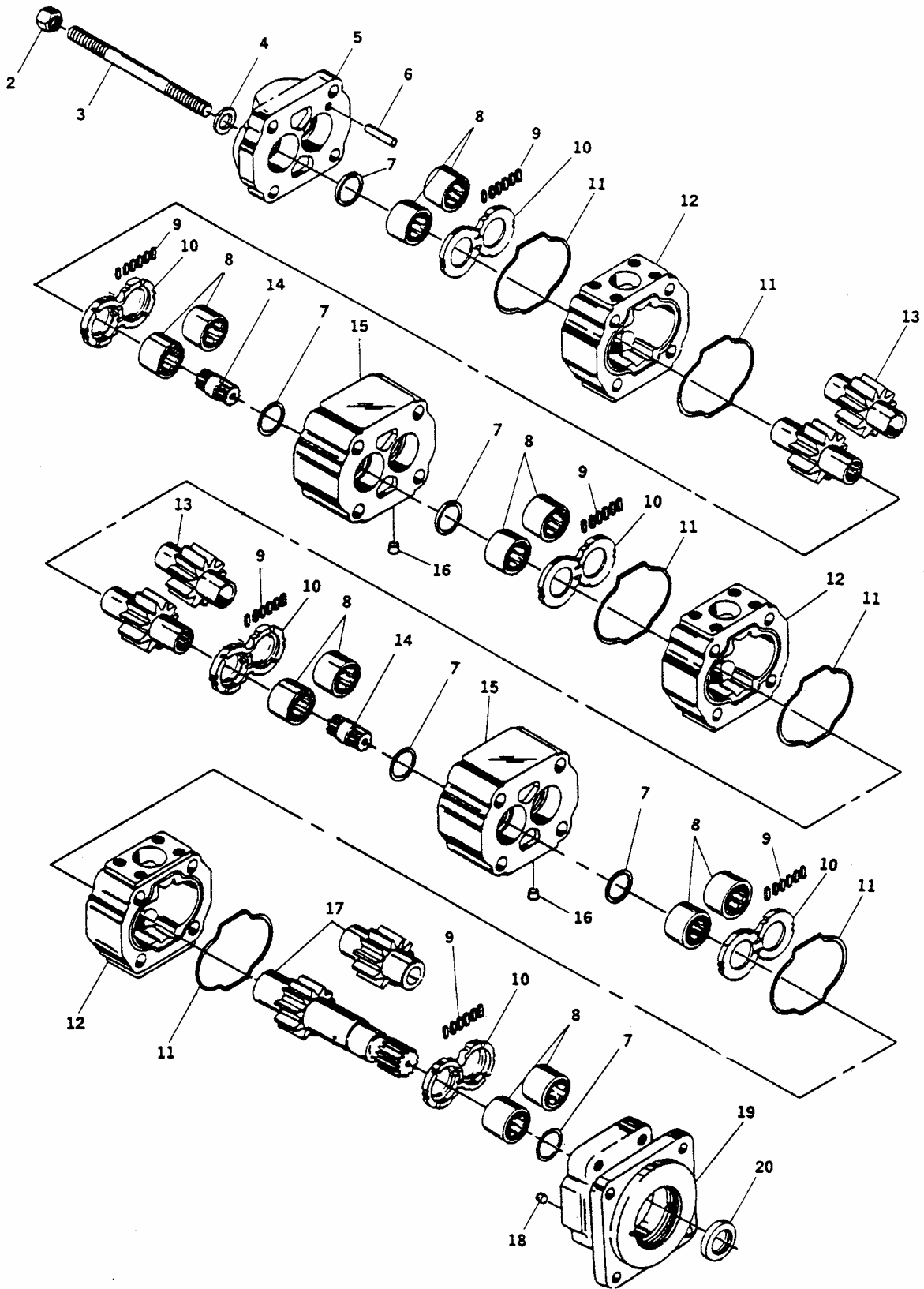
NOTE

Replace all rubber and polymer seals. Include all packings, pocket seals (9) behind thrust plates (10), shaft seal (20) and gasket seals (11).

CAUTION

When securing pump in a vise, do not grip on or near machined surfaces.

- 1. IF BEARINGS HAVE BEEN REMOVED, DEBURR BEARING BORES. CLEAN ALL PARTS IN A SUITABLE SOLVENT AND DRY THEM WITH COMPRESSED AIR. WIPE WITH CLEAN LINT FREE CLOTH.



NOTE

If plug (18) is replaced, strike new plug with a prick punch at both ends of screwdriver slot and around edges.

2. EXAMINE PLUG (18) FOR SECURITY. REPLACE ONLY IF IT IS DAMAGED.

CAUTION

Do not attempt to bottom out double lip seal. Press in until seal is flush with face of recess.

NOTE

Wipe off excess sealant.

3. INSTALL LIP SEAL (20).
 - a. Coat outer edge of lip seal and its recess with Permatex Aviation Form-A-Gasket No. 3 Non-hardening Sealant or equivalent. With metal side of lip seal up, press it into mounting flanges side of the shaft and cover (23) with an arbor press and lip seal installer (Item 8, Appendix C).
4. INSTALL RING SEALS (7) AS APPLICABLE.

NOTE

Notch in ring seal must be visible to ensure notched side of seal (7) is next to bearing (8).

- a. If ring seals are being replaced, insert them into bottom of drive gear bearing bore.

CAUTION

Use an arbor press only to install bearings. Do not hammer bearings into place.

5. INSTALL BEARINGS (8) AS APPLICABLE.

- a. Replace any bearings that have been removed from shaft end cover (19), port end cover (5), or bearing carrier (15). Install bearings with an arbor press.

NOTE

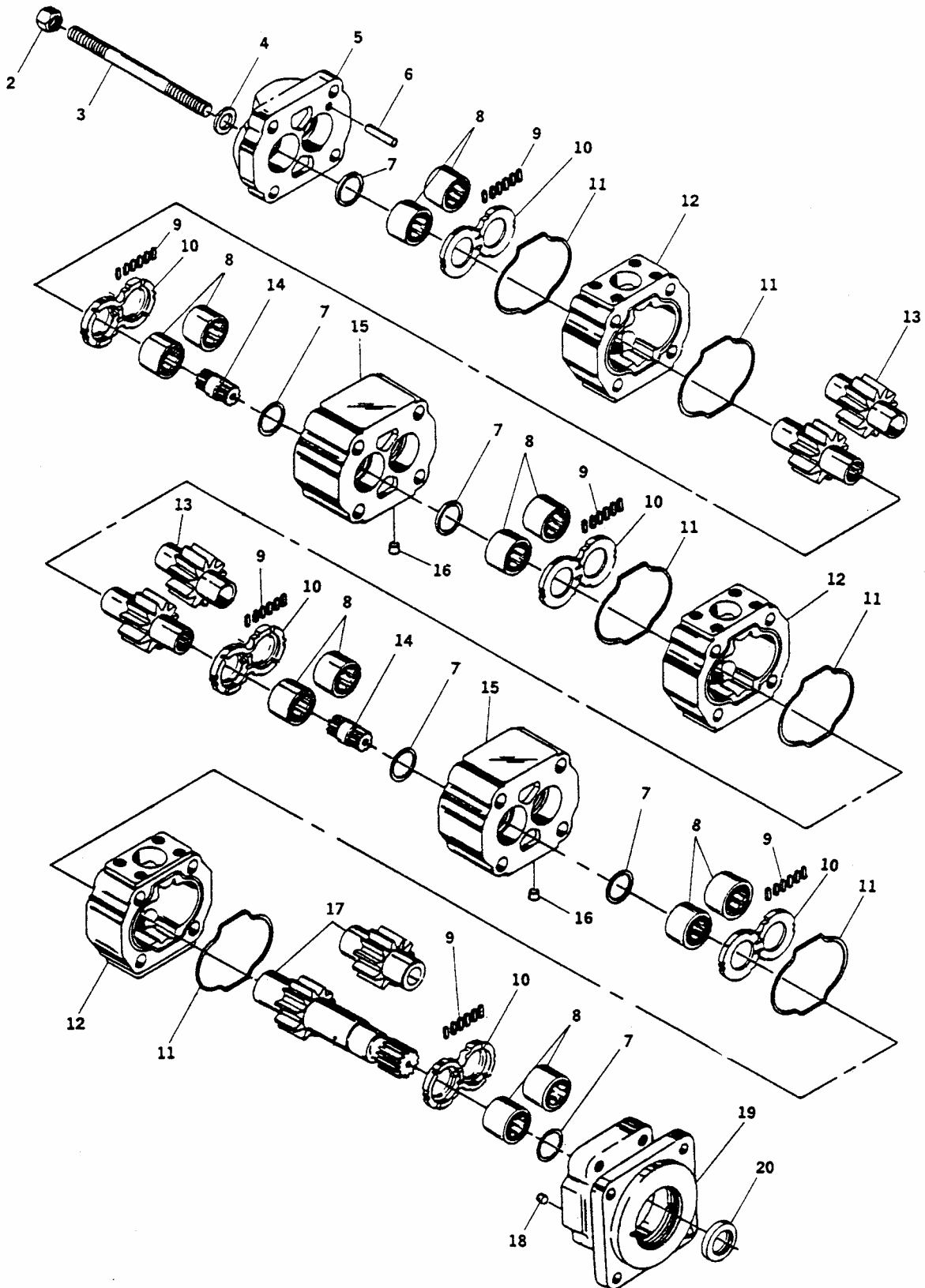
Thrust plates (10) have a single relief pocket and must be installed with this groove on high pressure (outlet) side.

6. REPLACE DAMAGED OR WORN THRUST PLATES (10) AND INSTALL GREASED POCKET SEALS (9).

- a. Cut two pocket seals (9) 0.219 in. (5.556 mm) long from pocket seal strip. Grease seals (9) and insert them into middle slots in thrust plate (10).
- b. With pocket seals down, place thrust plates (10) over bearings (8) in shaft end cover (19). Tap thrust plate with a soft hammer to about 0.031 in. (0.794 mm) from machined surface.
- c. Cut four pocket seals approximately 0.25-in. (6.35 mm) long from pocket seal strip. Insert one pocket seal into each slot in thrust plate. Push each pocket seal all the way in so that they touch roller bearing (8). Tap thrust plate (10) down firmly against machined surface with a soft hammer. Using a sharp razor blade, trim exposed end of pocket seal square and flush with thrust plate (10).
- d. Secure shaft end cover (19) in a vise with mounting face down.

CAUTION

Avoid damaging the double lip seal.



7. INSTALL SHAFTS (17).

- a. Insert splined end of drive shaft (17) into special drive sleeve (Item 6, Appendix C). Lightly grease drive shaft and sleeve. Insert internal gear and drive shaft with sleeve into shaft end cover (19) with a twisting motion. Push down carefully until gear rests against thrust plate (10). Remove steel sleeve. Insert driven gear.

8. INSTALL FIRST SECTION GEAR HOUSING (12) AND GASKETS (11).

- a. Grease new gasket seals (11) and insert them into grooves in both sides of all gear housings (12).
- b. Examine all dowel pins (6). Before inserting a pin, ensure hole is clean and free from burrs. Start pin into hole gently and straight, tapping lightly with a soft hammer.

CAUTION

Avoid pinching gasket seal (11).

NOTE

Oil gears to provide initial lubrication when pump is started.

CAUTION

Do not force parts together.

- c. Line up dowels with matching holes. When parts are parallel, squeeze them together or gently tap alternately over dowels with a plastic hammer until parts become parallel and move smoothly together.

CAUTION

Ensure index marks are properly aligned.

9. INSTALL BEARING CARRIER (15).

NOTE

Tap bearing carrier tight with a soft hammer.

- a. Position bearing carrier (15) (with thrust plates) on gear housing so that roller bearings receive journal of drive gear (17). Ensure drain port in bearing carrier is on suction or inlet side. If removed, torque plug (16) to 140 in-lbs (16 Nm).

10. INSERT CONNECTING SHAFT (14) INTO SPINE OF DRIVE GEAR (17).

11. INSTALL GEARS (13) AND SECOND SECTION GEAR HOUSING (12) AND GASKETS (11).

- a. Insert drive and driven gears (13) of section into proper bearings (8) and push down tightly against thrust plate (10).

CAUTION

Avoid pinching gasket seal (11).

NOTE

Oil gears to provide initial lubrication when pump is started.

CAUTION

Do not force parts together.

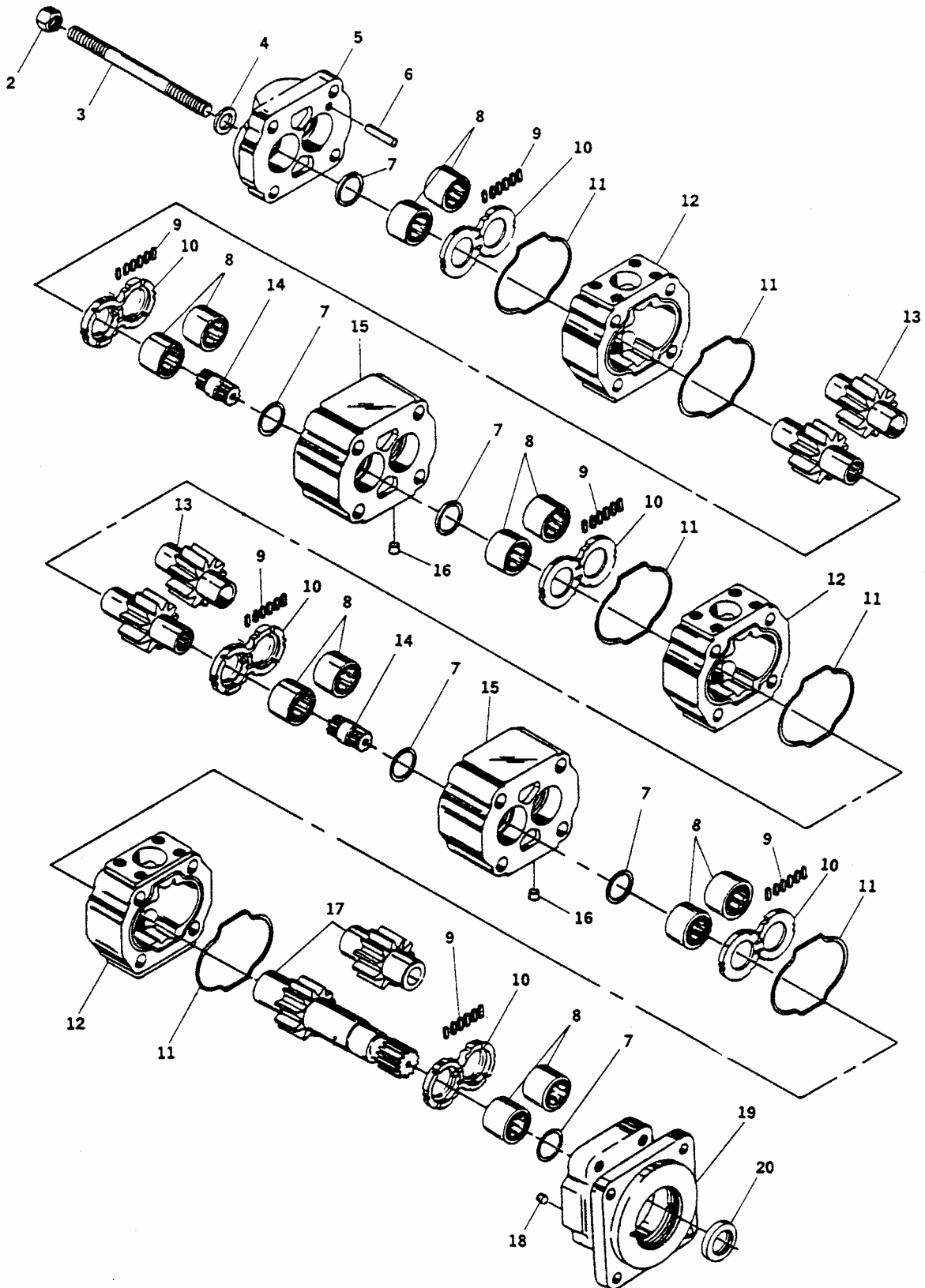
- b. Line up dowel pins (6) with matching holes. When parts are parallel, squeeze them together or gently tap alternately over dowels with a plastic hammer until parts become parallel and move smoothly together. Install dowel pins as stated in step 8b.

12. REPEAT STEPS 6 THROUGH 11 FOR ADDITIONAL HOUSINGS.

13. INSTALL PORT END COVER (5).

CAUTION

Avoid pinching gasket seal (11).



- a. Align dowel pins (6) with holes in port end cover (5). Tap port end cover lightly in center between bearing bores to engage dowels, and to move parts together in final seating.
- b. Thread four studs (3), washers (4) and nuts (2) into shaft end cover and a snug up cross-corner.
- c. Rotate the drive shaft with a six inch wrench to insure there is no binding in the pump.
- d. Torque diagonally opposed nuts to 200 ft-lbs (266 Nm).

14. TEST HYDRAULIC PUMP AFTER REBUILD.

- a. Operate pump at least two minutes at zero pressure and at a moderate speed of not over 1500 rpm.

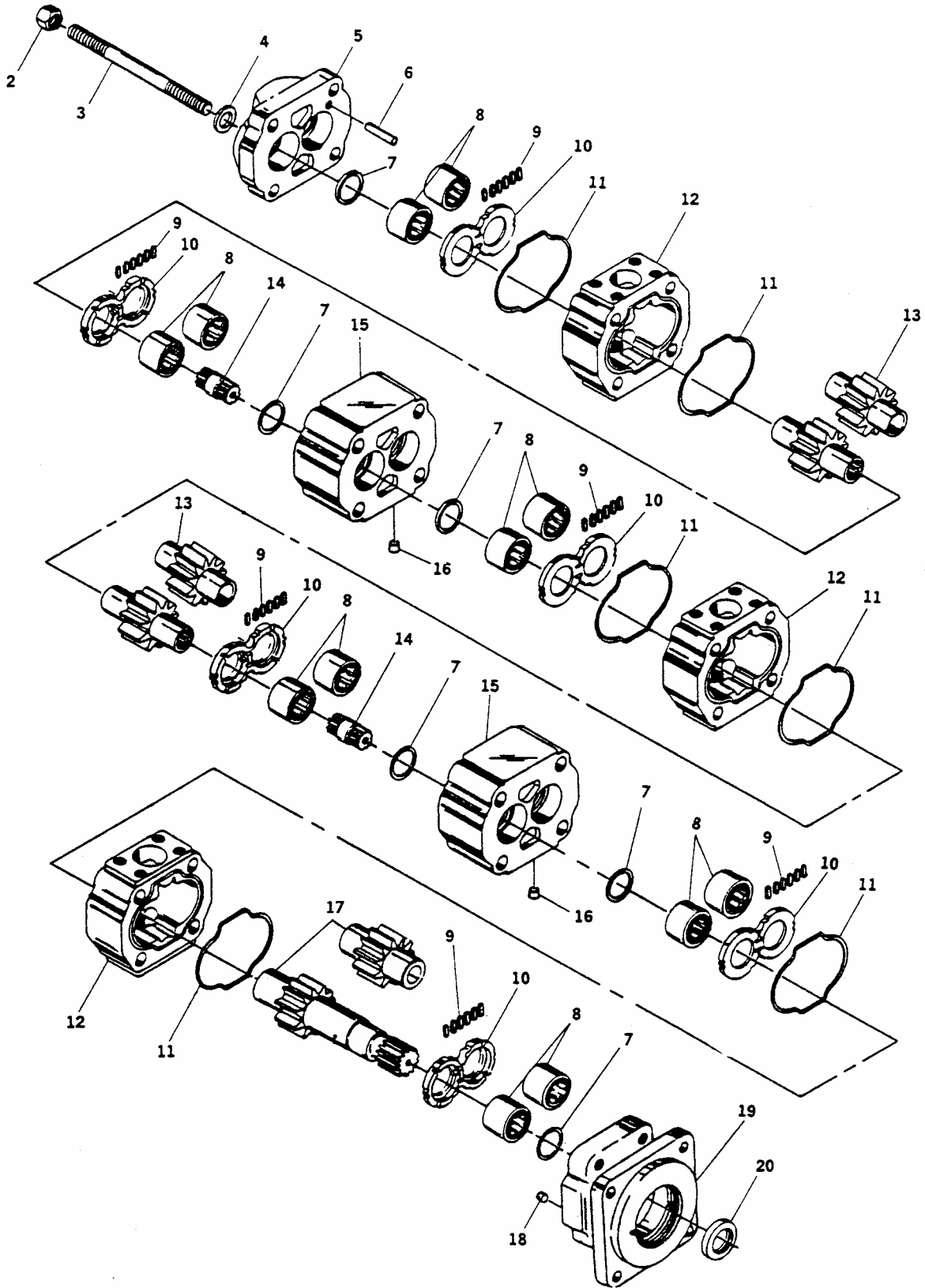
NOTE

If pump becomes hot to touch, it is binding and may seize. Disassemble and ensure freedom from binding.

- b. Gradually increase pressure on pump, intermittently, until desired test pressure is reached. This should take about five minutes.
- c. Inspect for leakage.

15. INSTALL THREE-SECTION HYDRAULIC PUMP. (REFER TO PAGE 13-8.)

END OF TASK



TWO-SECTION HYDRAULIC PUMP INSTALLATION

TOOLS: General mechanic's tool kit: automotive (5180-00-177-7033)
 Shop Equipment Auto-Maintenance and Repair, FM Basic (4910-00-754-0705)
 Shop Equipment Auto-Maintenance and Repair, FM Supply No. 1 (4910-00-754-0706)
 Tool Outfit Hyd System, Test and Repair, 3/4 Ton Trailer Mtd (4940-01-036-5784)

SUPPLIES: Lockwasher (Item 13, Appendix B) (4 Required)
 Lockwashers (Item 26, Appendix B) (6 Required)
 Gasket (Item 170, Appendix B)
 Preformed packing (Item 15 (RT875CC) / 276 (RT875CCS) Appendix B) (3 Required)
 Preformed packing (Item 76 (RT875CC) / 285 (RT875CCS) Appendix B) (3 Required)
 Lockwashers (Item 13, Appendix B)
 Lockwashers (Item 26, Appendix B)
 Hydraulic oil (Item 8, Appendix B)
 Silicone sealant (Item 27, Appendix B)

EQUIPMENT CONDITIONS: Outriggers fully extended and lowered.
 (Refer to TM 5-3810-306-10.)
 Boom positioned over-the-side. (Refer to TM 5-3810-306-10.)
 Engine hood top cover removed. (Refer to TM 5-3810-306-20.)
 Rear decking removed. (Refer to TM 5-3810-306-20.)
 Torque converter charging pump removed. (Refer to page 7-6.)
 Negative battery cable disconnected at shunt.
 (Refer to TM 5-3810-306-20.) (RT875CC)
 Battery disconnect switch in off position. (RT875CCS)

WARNING

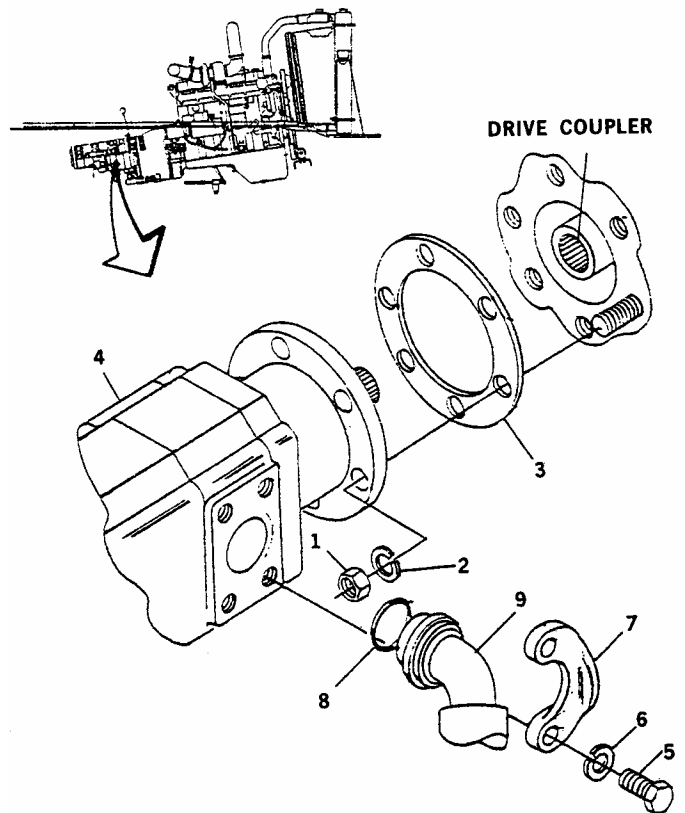
Be sure to wear protective eye covering to avoid personal injury.

REMOVAL:

NOTE

Drive coupler to torque converter should remain with torque converter.

1. REMOVE TWO-SECTION HYDRAULIC PUMP (4).
 - a. Tag and disconnect hydraulic hoses (9 from pump (4) by removing capscrews (5), lockwashers (6) and split flanges (7). Remove hoses and discard preformed packing (8). Cap all lines and openings.
 - b. Remove nuts (1) and lockwashers (2) securing hydraulic pump.
 - c. Remove pump (4) and gasket (3). Discard gasket (3).
 - d. Cover opening to prevent dirt from getting into pump drive opening.



INSTALLATION:

NOTE

If pump is being installed on new torque converter, it will be necessary to install new studs in pump drive flanges. Using a prick punch, peen studs at mounting flange holes.

1. INSTALL TWO-SECTION HYDRAULIC PUMP (4).
 - a. Uncover pump opening.
 - b. If removed, install pump drive sleeve.
 - c. Install a new gasket (3) between pump (4) and pump drive coupling. Apply silicone sealant to gasket.
 - d. Install the pump (4) using nuts (1) and lockwashers (2).

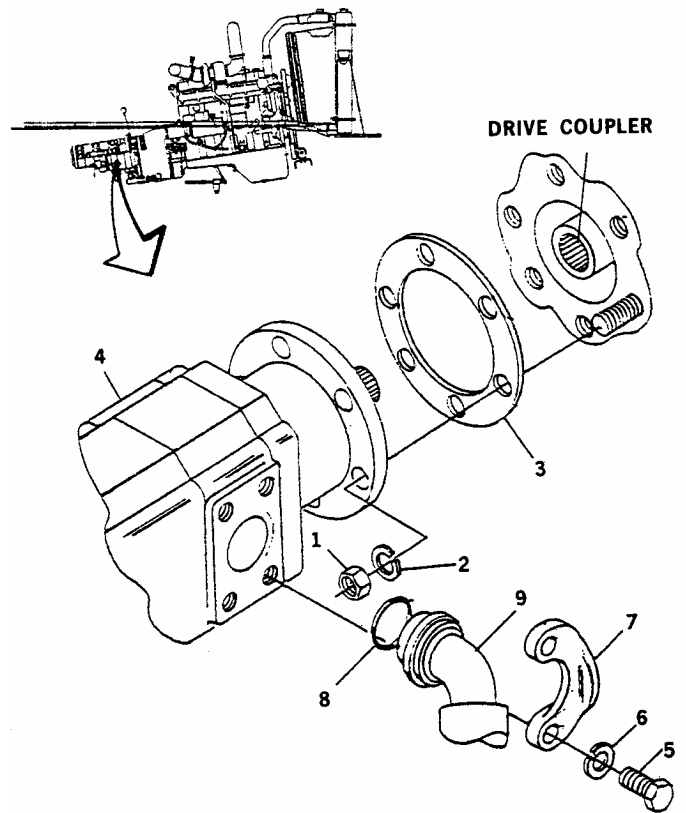
NOTE

Coat new preformed packings with clean hydraulic oil prior to assembly.

- e. Connect hydraulic hoses (9) with new preformed packing (8) to pump as tagged during removal using split flanges (7), lockwashers (6) and capscrews (5).
2. INSTALL TORQUE CONVERTER CHARGING PUMP. (REFER TO PAGE 7-16.)
 3. CONNECT NEGATIVE BATTERY CABLE AT SHUNT. (REFER TO TM 5-3810-306-20.)

CAUTION

Hot oil must not be fed into a cold pump. It may cause pump to seize.



4. DRAIN AND FLUSH HYDRAULIC SYSTEM. (REFER TO PAGE 13-111.)
5. BLEED AIR FROM HYDRAULIC SYSTEM. (REFER TO PAGE 13-113.) OBSERVE FOR LEAKS AND PROPER OPERATION.
6. INSTALL REAR DECKING. (REFER TO TM 5-3810-306-20.)
7. INSTALL ENGINE TOP COVER. (REFER TO TM 5-3810-306-20.)

END OF TASK

TWO-SECTION HYDRAULIC PUMP ASSEMBLY AND PRIORITY VALVE

TOOLS: General mechanic's tool kit: automotive (5180-00-177-7033)
Shop Equipment Auto-Maintenance and Repair, FM Basic (4910-00-754-0705)
Shop Equipment Auto-Maintenance and Repair, FM Supply No. 1 (4910-00-754-0706)
Tool Outfit Hyd System, Test and Repair, 3/4 Ton Trailer Mtd (4940-01-036-5784)
Seal removal tool (Item 3, Appendix C)
Carborundum stone
Lip seal Installer (Item 7, Appendix C)
Sleeve (Item 5, Appendix C)

SUPPLIES: Preformed packing (Item 89, Appendix B)
Preformed packing (Item 9, Appendix B)
Seal (Item 88, Appendix B) (4 Required)
Parts kit (Item 87, Appendix B)
Lint free cloth (Item 91, Appendix B)
Solvent, Cleaning P-D-680, Type III (Item 1, Appendix B)
Form-a-gasket (Item 75, Appendix B)

EQUIPMENT CONDITIONS: Two-Section hydraulic pump assembly removed.
(Refer to page 13-22.)

DISASSEMBLY:

CAUTION

When securing pump in a vise, do not grip on or near machined surfaces.

1. REMOVE PRIORITY VALVE (28) AND PORT END COVER (9).
 - a. Place pump in a vise with shaft pointing down. Index mark all sections with a prick punch for proper alignment during assembly.
 - b. Remove nuts (2) and washers (8) securing priority valve (28) to port end cover (9). Remove priority valve (28).
 - c. Remove nuts (2) and washers (8) from port end cover (9).

CAUTION

If end cover (9) will not lift off, pry it off using care to avoid damaging machined surfaces.

NOTE

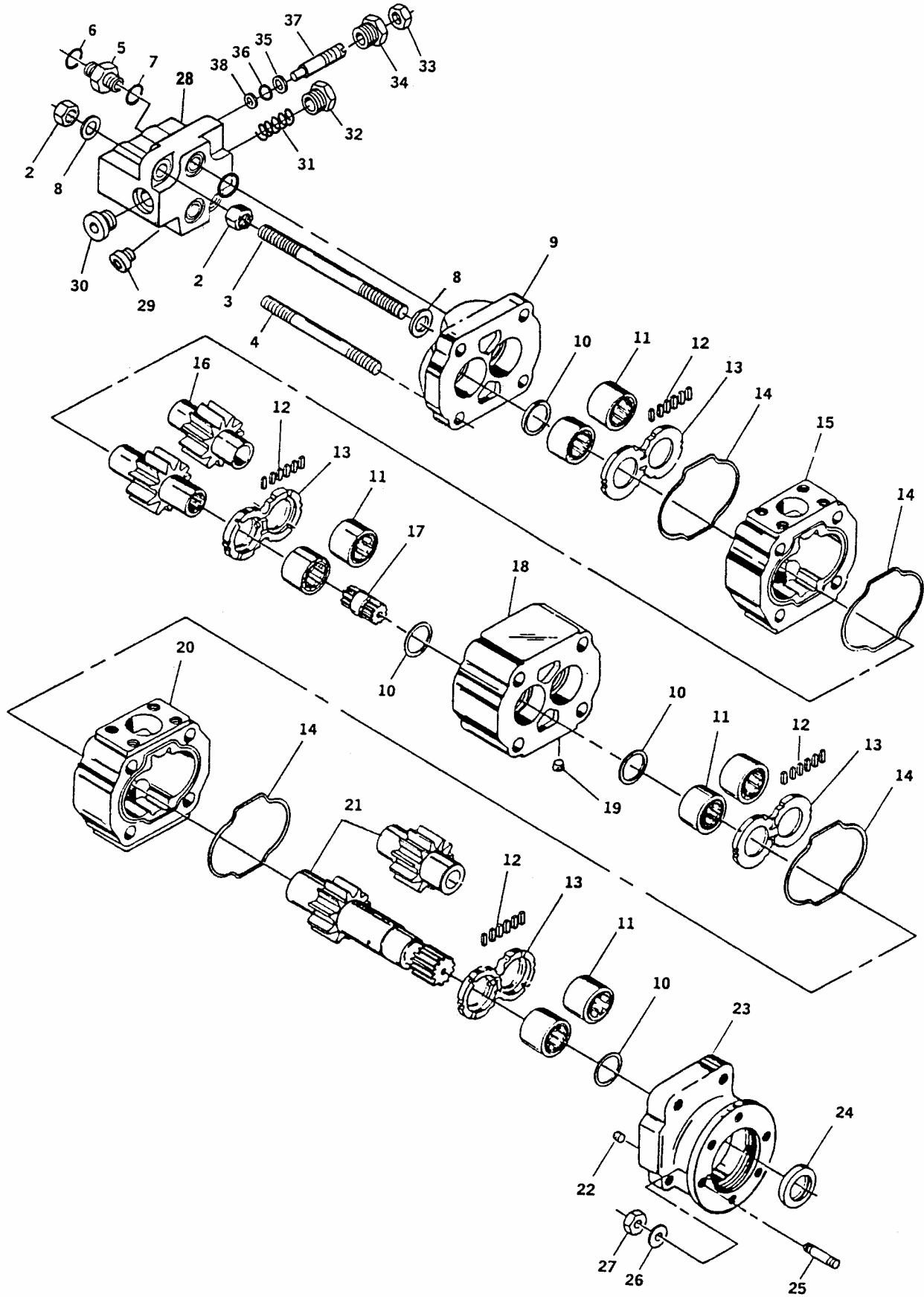
If thrust plate (13) remains in gear housing (15), tap it out with a wooden hammer handle. Avoid distorting the thrust plate.

- d. Remove port end cover.
2. REMOVE GEAR HOUSING (15).

CAUTION

If it is necessary to pry housing loose, use care to avoid damaging machined surfaces.

- a. Remove gear housing (15) from gears (16).
3. REMOVE DRIVE AND DRIVEN GEARS (16) AND KEEP THEM TOGETHER AS THEY ARE A MATCHED SET.
4. REMOVE CONNECTING SHAFT (17).



CAUTION

If it is necessary to pry bearing carrier loose, use care to avoid damaging machined surfaces.

5. LIFT OFF BEARING CARRIER (18) AND REMOVE PLUG (19) IF NECESSARY.

CAUTION

If it is necessary to pry gear housing loose, use care to avoid damaging machined surfaces.

NOTE

If thrust plate remains in gear housing, tap it out with a wooden hammer handle. Avoid distorting thrust plate.

6. LIFT OFF FIRST SECTION GEAR HOUSING.
7. REMOVE DRIVE GEAR WITH SHAFT AND DRIVEN GEAR (21) AND KEEP THEM TOGETHER AS THEY ARE A MATCHED SET.

CAUTION

Avoid distorting thrust plate.

8. REMOVE THRUST PLATES (13) AND SEALS (14) AND (12).
 - a. Pry thrust plate from shaft end cover, port end cover or bearing carrier with a screwdriver or similar tool. Remove and discard all rubber seals (12) and gasket seals (14).
9. INSPECT BEARINGS (11) AND RING SEALS (10) AND REPLACE AS REQUIRED.
 - a. Examine all roller bearings (11) for spalling or pitting. If replacement is necessary, pull bearings (11) with a bearing puller.

NOTE

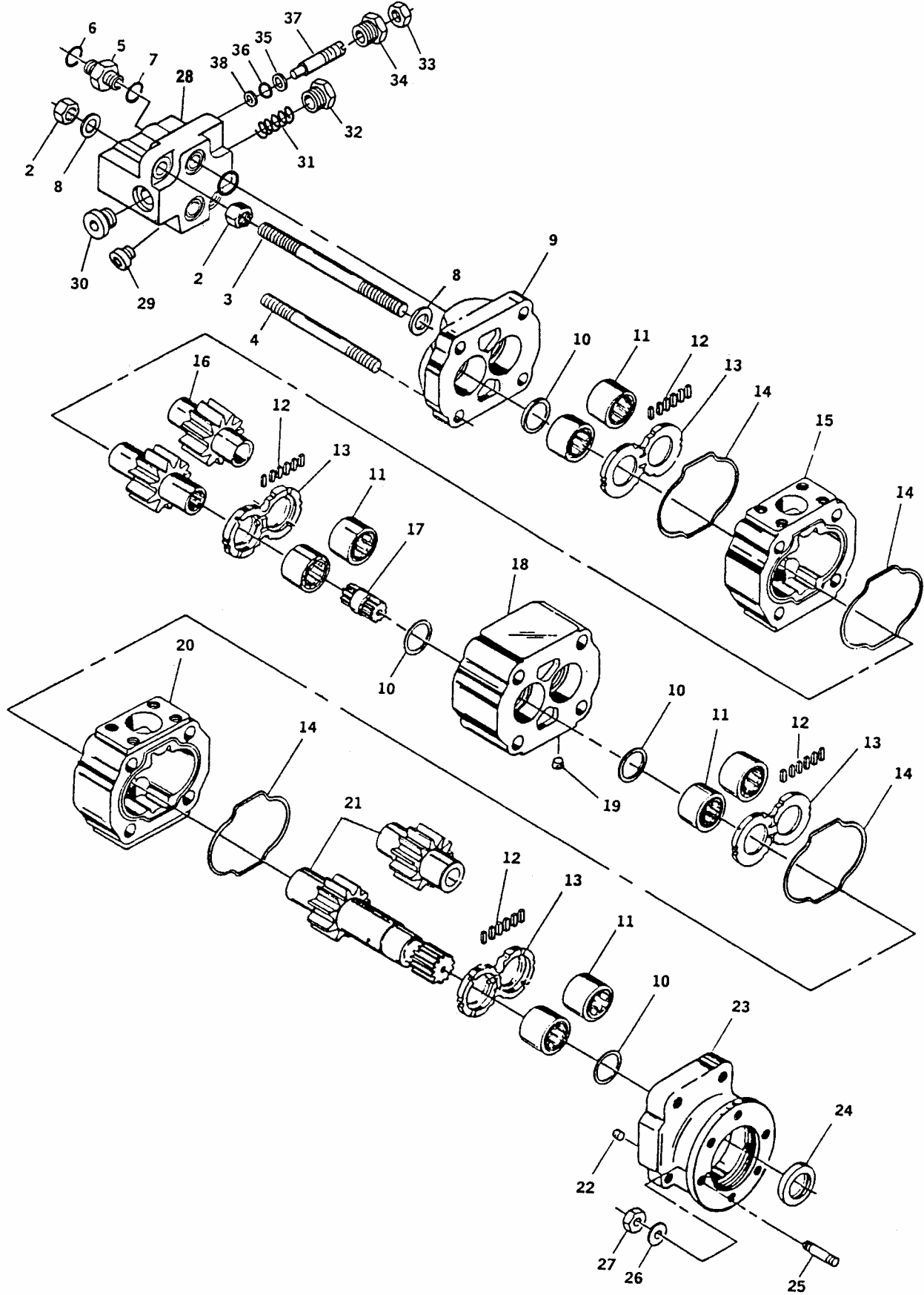
To replace ring seals (10), pull drive gear bearing with a bearing puller and remove ring seal from bottom of bearing bore.

- b. Check ring seals (10) for wear and replace them if necessary.
10. REMOVE LIP SEAL (24) FROM SHAFT END COVER (23).
 - a. Secure shaft end cover in a vise with mounting face down. Remove double lip seal by inserting special seal removal tool (Item 3, Appendix C) into notch between double lip seal and shaft end cover. Tap double lip seal out from shaft end cover and discard seal.
 - b. Stone off all machined surfaces with a medium grit carborundum stone.
11. REMOVE STUDS (3) AND (4) FROM END COVER (23).
12. DISASSEMBLE PRIORITY VALVE (28).
 - a. Remove adapters (5) and packings (6) and (7). Discard packings (6) and (7).
 - b. Remove plugs (29) and (30).
 - c. Remove plug (32) and spring (31).

NOTE

Count turns on adjusting screw (37) for initial setting on reassembly.

- d. Loosen jam nut (33) and unscrew adjusting screw (37) from cap (34).
 - e. Remove jam nut (33), retaining ring (38), packing (36) and back-up ring (35) from adjusting screw (37). Discard back-up ring (35) and packing (36).
 - f. Remove cap (34) from valve (28).



CLEANING:

WARNING

Dry cleaning solvent P-D-680, Type III is toxic and flammable. Wear protective goggles and gloves and use only in a well ventilated area. Avoid contact with skin, eyes, and clothes and do not breathe vapors. Do not use near open flame or excessive heat. The flash point is 200°F (94°C). If you become dizzy while using cleaning solvent, get fresh air immediately and get medical aid. If contact with eyes is made, wash your eyes with water and get medical aid immediately.

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

1. CLEAN ALL PARTS IN SOLVENT P-D-680 AND BLOW DRY WITH COMPRESSED AIR.

INSPECTION:

1. INSPECT GEAR HOUSING.
 - a. Place a straight edge across housing bore. If a 0.005-in. (0.127 mm) feeler gauge will slip between the straight edge and housing replace housing.
2. INSPECT DRIVE AND DRIVEN GEARS (21).
 - a. Any wear on gear hubs that is detectable by touch, or exceeding 0.002 in. (0.051 mm) justifies replacement. Scoring, grooving, or burring of outside diameter of gear teeth, as well as nicking, grooving, or fretting of teeth surfaces necessitates replacement.

NOTE

Gears are a matched set, therefore both gears must be replaced even if only one was found damaged.

3. INSPECT DRIVE SHAFT (17).
 - a. Replace drive shaft if any wear is detectable visibly or by touch in seal areas or at drive coupling. A maximum of 0.002-in. (0.051 mm) wear is allowable. Wear or damage to splines justifies replacement. Wear in shaft seal areas indicates oil contamination.
4. INSPECT THRUST PLATES (13).
 - a. Thrust plates seal gear section at sides of gears. Wear in this area will allow internal slippage, resulting in oil bypassing within the pump.
 - b. Maximum allowable wear is 0.002 in. (0.051 mm). Replace thrust plates if they are scored, eroded, or pitted.
 - c. Check center area of thrust plate where gears mesh. Erosion in this area indicates oil contamination. Pitted thrust plates indicate cavitation or oil aeration. Discoloration of plates would indicate overheating, probably as a result of insufficient oil.
5. INSPECT BEARINGS (11).

CAUTION

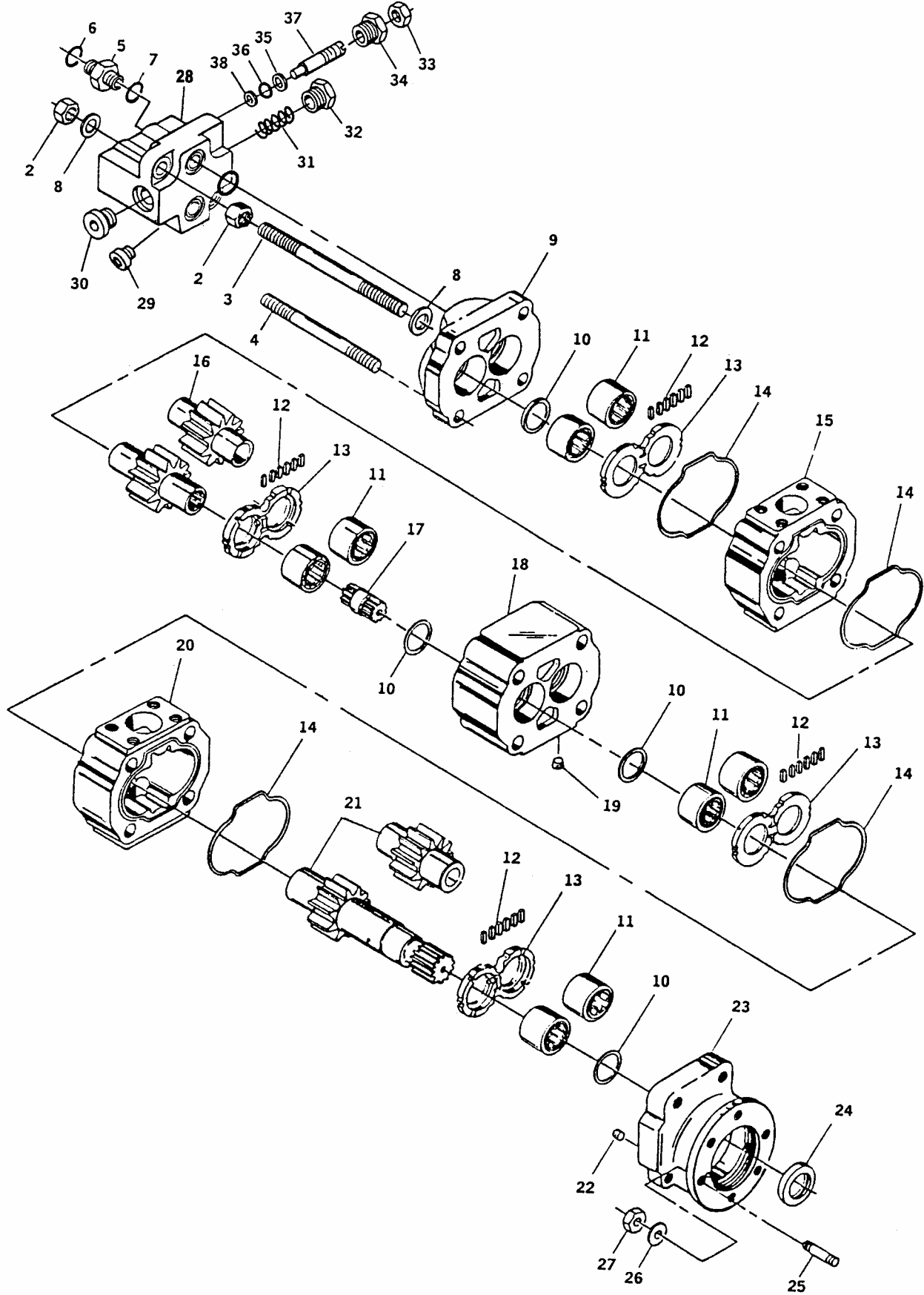
If gears are replaced, bearings must be replaced also.

- a. Bearings should fit into bore with a light press fit, however, a neat hand fit is allowable. If bearings tend to fall from bore, replace housing.

REASSEMBLY:

NOTE

Replace all rubber and polymer seals. Include all packings, pocket seals (12) behind thrust plates (13), lip seal (24), back-up ring (35) and gasket seals (14).



WARNING

Be sure to wear protective eye covering to avoid personal injury.

CAUTION

When securing pump in a vise, do not grip on or near machined surfaces.

1. IF BEARINGS (11) HAVE BEEN REMOVED, DEBURR BEARING BORES. CLEAN ALL PARTS IN A SUITABLE SOLVENT AND DRY THEM WITH COMPRESSED AIR. WIPE WITH CLEAN LINT FREE CLOTH.

NOTE

If plug (22) is replaced, strike new plug with a prick punch at both ends of screwdriver slot and around edges.

2. EXAMINE PLUG (22) FOR SECURITY. REPLACE IT ONLY IF IT IS DAMAGED.

CAUTION

Ensure double lip seal is fully seated in recess.

NOTE

Wipe off excess sealant.

3. INSTALL LIP SEAL (24).
 - a. Coat outer edge of lip seal and its recess with Permatex Aviation Form-A-Gasket No. 3 Non-hardening Sealant or equivalent. With metal side of lip seal up, press it into mounting flanges side of the shaft and cover (23) with an arbor press and lip seal installer (Item 7, Appendix C).
4. INSTALL RING SEALS (10) AS APPLICABLE.

NOTE

Notch in ring seal must be visible to ensure notched side of seal (10) is next to bearing (11).

- a. If ring seals are being replaced, insert them into bottom of drive gear bearing bore.

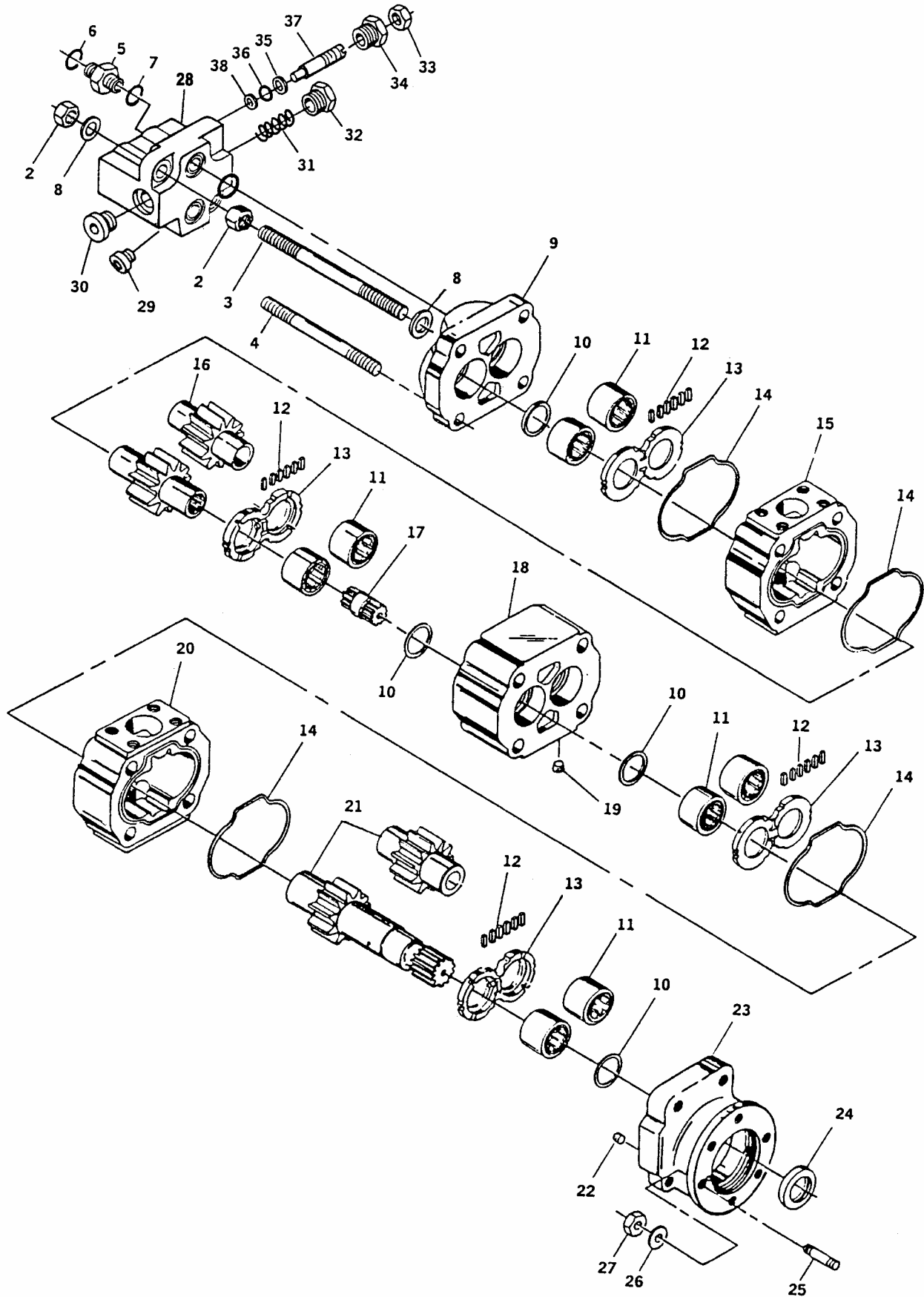
CAUTION

Use an arbor press only to install bearings. Do not hammer bearings into place.

5. INSTALL BEARINGS (11) AS APPLICABLE.
 - a. Replace any bearings that have been removed from shaft end cover (23), port end cover (9), or bearing carrier (18). Install bearings with an arbor press.
6. REPLACE DAMAGED OR WORN THRUST PLATES (13) AND INSTALL GREASED POCKET SEALS (12).
 - a. Cut two pocket seals (12) 0.219 in. (5.556 mm) long from pocket seal strip. Grease seals (12) and insert them into middle slots in thrust plate (13).
 - b. With pocket seals down, place thrust plates (13) over bearings (11) in shaft end cover (23). Tap thrust plate with a soft hammer to about 0.031 in. (0.794 mm) from machined surface.
 - c. Cut four pocket seals approximately 0.25 in. (6.35 mm) long from pocket seal strip. Insert one pocket seal into each slot in thrust plate. Push each pocket seal all the way in so that they touch roller bearing (11). Tap thrust plate (13) down firmly against machined surface with a soft hammer. Using a sharp razor blade, trim exposed end of pocket seal square and flush with thrust plate (13).
 - d. Secure shaft end cover (23) in a vise with mounting face down.

CAUTION

Avoid damaging the double lip seal.



7. INSTALL SHAFTS (21).
 - a. Insert splined end of drive shaft (21) into special drive sleeve (Item 5, Appendix C). Lightly grease drive shaft and sleeve. Insert internal gear and drive shaft with sleeve into shaft end cover (23) with a twisting motion. Push down carefully until gear rests against thrust plate (13). Remove steel sleeve. Insert driven gear.
8. INSTALL FIRST SECTION GEAR HOUSING (20) AND GASKETS (14).
 - a. Grease new gasket seals (14) and insert them into grooves in both sides of all gear housings (15) and (20).

CAUTION

Avoid pinching gasket seal (14).

NOTE

Oil gears to provide initial lubrication when pump is started.

- b. Slide first section gear housing (20) over gears and tap with a soft hammer until housing rests tightly against shaft end cover.

CAUTION

Ensure index marks are properly aligned.

9. INSTALL BEARING CARRIER (18).

NOTE

Tap bearing carrier tight with a soft hammer.

- a. Position bearing carrier (18) (with thrust plates) on gear housing so that roller bearings receive journal of drive gear (21). Ensure drain port in bearing carrier is on suction or inlet side. If removed, torque plug (19) to 140 in-lbs (16 Nm).

10. INSERT CONNECTING SHAFT (17) INTO SPLINE OF DRIVE GEAR (21).
11. INSTALL GEARS (16) AND SECOND SECTION GEAR HOUSING (15) AND GASKETS (14).
 - a. Insert drive and driven gears (16) of second section into proper bearings (11) and push down tightly against thrust plate (13).

CAUTION

Avoid pinching gasket seal (14).

NOTE

Oil gears to provide initial lubrication when pump is started.

- b. Slide second gear housing (15) over gears (16) and tap in tight against bearing carrier with a soft hammer.

12. INSTALL PORT END COVER (9).

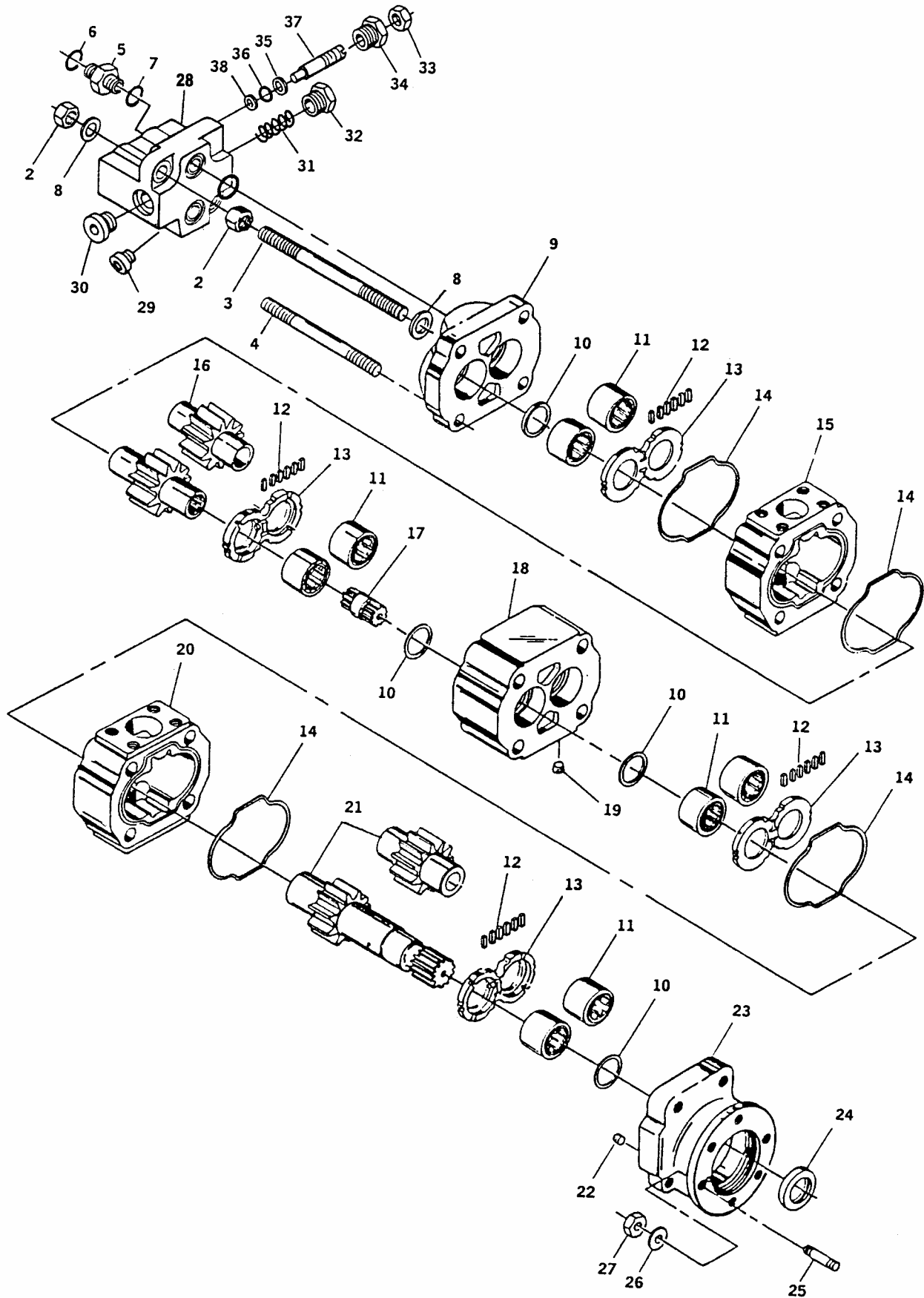
CAUTION

Avoid pinching gasket seal (14).

- a. Place port end cover (9) over gear journals and tap lightly against gear housing (15).
- b. Thread four studs (3) and (4), washers (8) and nuts (2) into shaft end cover and snug up cross-corner.
- c. Rotate the drive shaft with a six inch wrench to insure there is not binding in the pump.
- d. Torque diagonally opposed nuts to 200 ft-lbs (266 Nm).

13. ASSEMBLE PRIORITY VALVE (28).

- a. Install jam nut (33), new backup ring (35), new packing (36) and retaining ring (38) on adjusting screw (37).
- b. Install cap (34) in valve (28).



- c. Screw adjusting screw (37) into cap (34) the number of turns noted on disassembly and tighten jam nut (33).
- d. Install spring (31) and plug (32).
- e. Install new packings (6) and (7) on adapters (5).
- f. Install adapters (5).
- g. Install plugs (30) and (29).

14. INSTALL PRIORITY VALVE (28).

- a. Install priority valve on two longer studs with nuts (2) and washers (8). Torque nuts to 200 ft-lbs (266 Nm).

WARNING

Be sure to wear protective eye covering to avoid personal injury.

15. TEST HYDRAULIC PUMP AND ADJUST PRIORITY VALVE (28) OUTPUT AFTER REBUILD.

- a. Install flow meter (2-30 GPM) between output adapter (5) and output line.

- b. Operate pump at least two minutes at zero pressure and at a moderate speed of not over 1500 rpm.

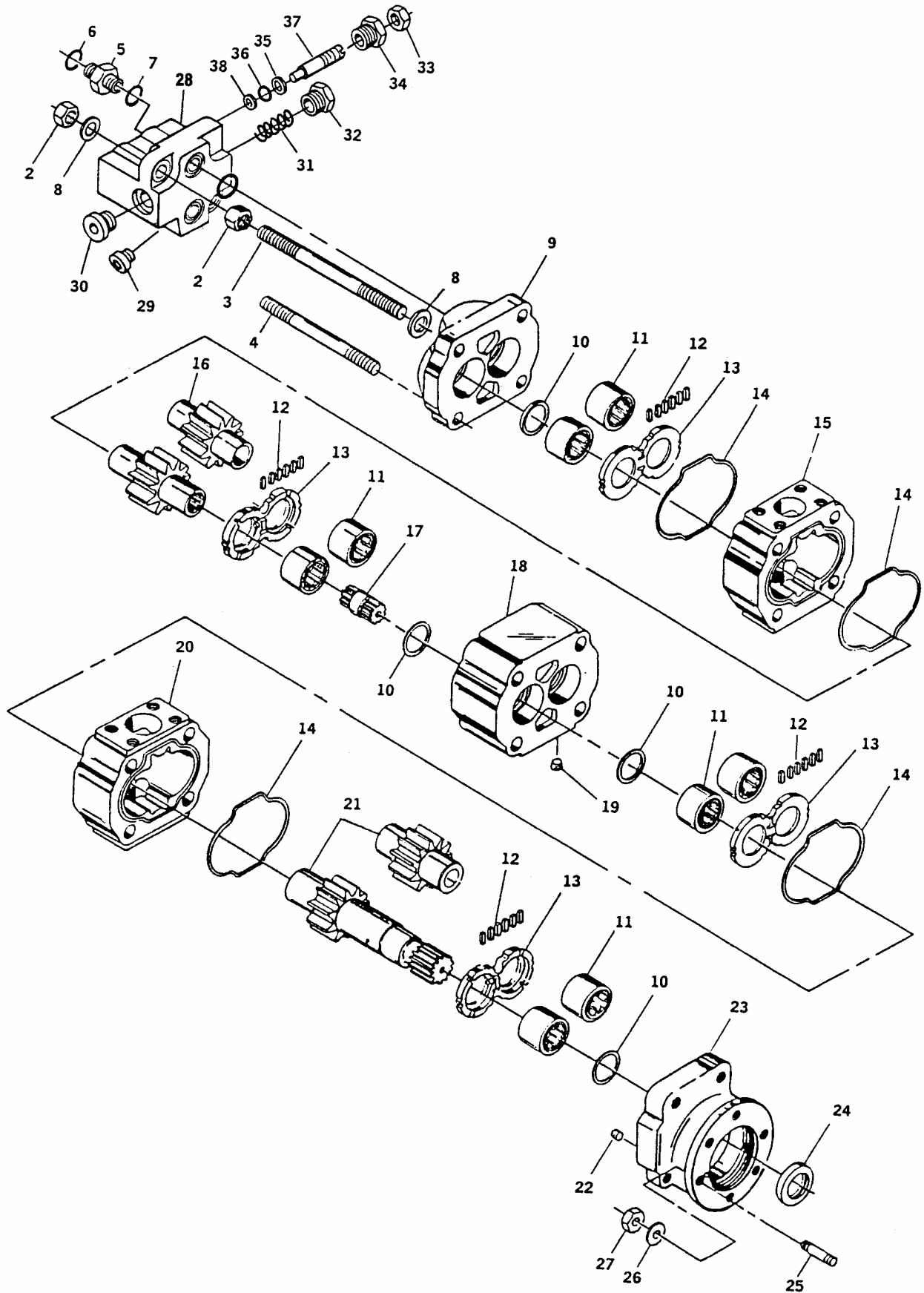
NOTE

If pump becomes hot to touch, it is binding and may seize. Disassemble and ensure freedom from binding.

- c. Gradually increase pressure on pump, intermittently, until desired test pressure is reached. This should take about five minutes.
- d. Inspect for leakage.
- e. Check flow meter at output side of priority valve (28). Loosen jam nut (33) and turn adjusting screw (37) as necessary to obtain 15 GPM flow. Tighten jam nut (33).

16. INSTALL TWO-SECTION PUMP. (REFER TO PAGE 13-22.)

END OF TASK



PUMP DISCONNECT INSTALLATION

TOOLS: General mechanic's tool kit: automotive (5180-00-177-7033)

SUPPLIES: Gasket (Item 28, Appendix B)
Silicone sealant (Item 27, Appendix B)

EQUIPMENT CONDITIONS: Rear decking removed. (Refer to TM 5-3810-306-20.)
Three-Section hydraulic pump removed. (Refer to page 13-8.)
Negative battery cable disconnected at shunt. (RT875CC)
Battery disconnect switch in off position. (RT875CCS)

REMOVAL:

1. REMOVE PUMP DISCONNECT (1).
 - a. Pull pump disconnect (1) off studs.
 - b. Remove and discard gasket (2).
 - c. Cover opening to prevent dirt from entering.

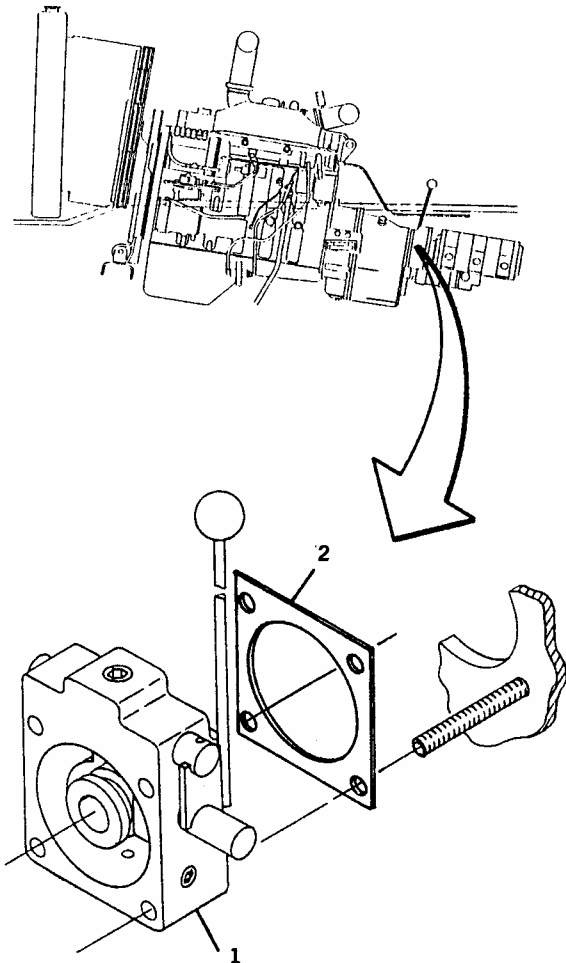
INSTALLATION:

1. CLEAN PUMP DISCONNECT MATING SURFACES OF GASKET MATERIAL.
2. INSTALL PUMP DISCONNECT (1).

WARNING

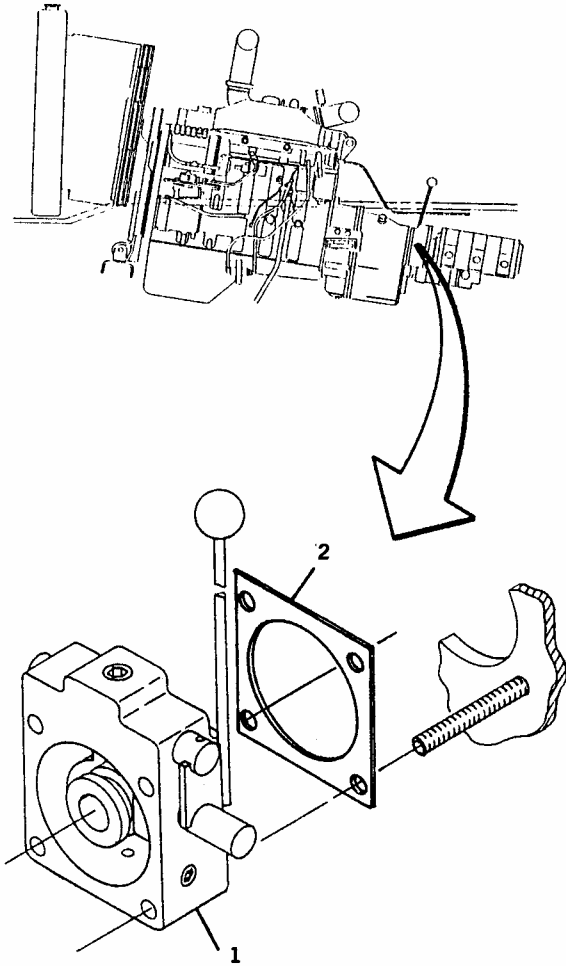
Be sure to wear protective eye covering to avoid personal injury. Eye contact with silicone RTV materials may cause irritation. If eye contact takes place, flush the eyes with water for 15 minutes and have the eyes examined by a doctor.

- a. Apply silicone sealant to gasket (2).
 - b. Position new gasket (2) and pump disconnect (1) on mounting studs.
3. INSTALL THREE-SECTION HYDRAULIC PUMP. (REFER TO PAGE 13-8.)
 4. CONNECT NEGATIVE BATTERY CABLE AT SHUNT. (REFER TO TM 5-3810-306-20.) (RT875CC)
 5. DRAIN AND FLUSH HYDRAULIC SYSTEM. (REFER TO PAGE 13-111.)



6. BLEED AIR FROM HYDRAULIC SYSTEM.
(REFER TO PAGE 13-113.)
7. INSTALL REAR DECKING. (REFER TO
TM 5-3810-306-20.)
8. TEST FOR PROPER OPERATION.

END OF TASK



PUMP DISCONNECT ASSEMBLY

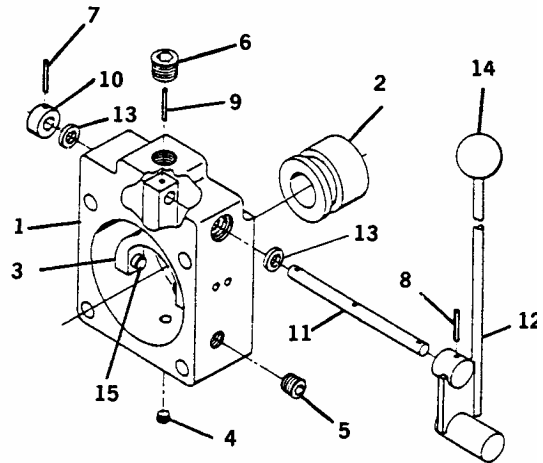
TOOLS: General mechanic's tool kit: automotive (5180-00-177-7033)

SUPPLIES: Oil seals (Item 33, Appendix B)

EQUIPMENT CONDITIONS: Pump disconnect removed. (Refer to page 13-36.)

DISASSEMBLY:

1. DISASSEMBLE PUMP DISCONNECT (1).
 - a. Remove drive sleeve (2) from shifter fork (3).
 - b. Remove fittings (4), (5) and (6) from pump disconnect.
 - c. Remove spring pin (7) securing collar (10) to shaft (11). Remove collar (10).
 - d. Remove spring pin (8) securing handle (12) to shaft (11). Remove handle (12).
 - e. Remove spring pin (9) from shifter fork (3).
 - f. Remove shaft (11) and shifter fork (3).
 - g. Remove and discard two seals (13).
 - h. Remove knob (14) from handle.



WARNING

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

CLEANING:

WARNING

Dry cleaning solvent P-D-680, Type III is toxic and flammable. Wear protective goggles and gloves and use only in a well ventilated area. Avoid contact with skin, eyes, and clothes and do not breathe vapors. Do not use near open flame or excessive heat. The flash point is 200°F (94°C). If you become dizzy while using cleaning solvent, get fresh air immediately and get medical aid. If contact with eyes is made, wash your eyes with water and get medical aid immediately.

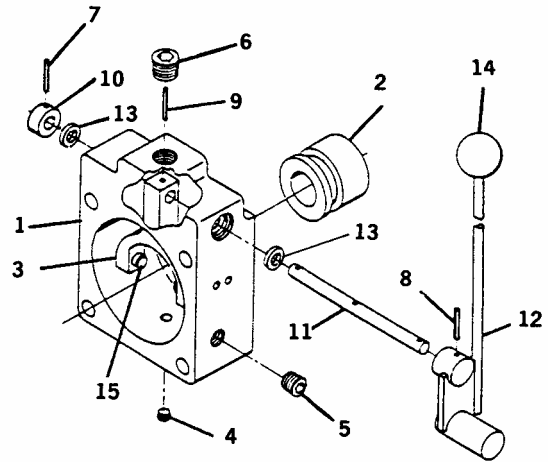
1. CLEAN PARTS WITH CLEANING SOLVENT P-D-680, TYPE III AND DRY WITH COMPRESSED AIR.

INSPECTION:

1. INSPECT SHIFTER FORK (3) FOR WEAR AND DISTORTION.
2. INSPECT SHIFTER BUTTONS (15) FOR WEAR.
3. INSPECT SHAFT FOR EXCESSIVE WEAR.
4. INSPECT DRIVE SLEEVE (2) FOR WEAR AND CRACKS.

REASSEMBLY:

1. REASSEMBLE PUMP DISCONNECT (1).
 - a. Install two new oil seals (13).
 - b. Install shifter fork (3) and position so shaft (11) can be installed through shifter fork (3).
 - c. Install shaft (11) secure to shifter fork (3) with spring pin (9).
 - d. Install fittings (4), (5) and (6) into pump disconnect.
 - e. Position collar (10) on shaft (11) and secure with spring pin (7).
 - f. Position handle (12) on shaft and secure with spring pin (8).
 - g. Install knob (14) on handle (12).
2. INSTALL PUMP DISCONNECT ASSEMBLY. (REFER TO PAGE 13-36.)

**END OF TASK**

Section II. HYDRAULIC CONTROL VALVE MAINTENANCE

MAIN HOIST BOOST, AUXILIARY HOIST, LIFT BOOST CONTROL VALVE ASSEMBLY

TOOLS: General mechanic's tool kit: automotive (5180-00-177-7033)
Lubrication Service, Unit Trailer Mounted (4930-00-017-9167)
Shop Equipment Auto-Maintenance and Repair, FM Basic (4910-00-754-0705)
Shop Equipment Auto-Maintenance and Repair, FM Supply No. 1 (4910-00-754-0706)
Tool Outfit Hyd System; Test and Repair, 3/4 Ton Trailer Mtd (4940-01-036-5784)

SUPPLIES: Packing assortment (Item 50, Appendix B)
Parts kit, seal repl. (Item 51, Appendix B)
Packing assortment (Item 52, Appendix B)
Parts kit, seal repl. (Item 53, Appendix B)
Solvent, Cleaning P-D-680, Type III (Item 1, Appendix B)
Hydraulic oil (Item 8, Appendix B)

EQUIPMENT CONDITION: Control valve removed. (Refer to TM 5-3810-306-20.)

DISASSEMBLY:

NOTE

The following procedure outlines disassembly for one section of the valve bank. All additional valve sections will be identical.

1. REMOVE FITTINGS FROM VALVE BANK AS REQUIRED. SAVE FOR INSTALLATION.
2. REMOVE TIE BOLTS (2) SECURING VALVE SECTIONS TOGETHER. SEPARATE SECTIONS AND REMOVE PREFORMED PACKINGS (21) AND (22).
3. REMOVE RELIEF VALVE (5) FROM INLET SECTION (4).

NOTE

Keeping preformed packings and rings in order during disassembly will aid in reassembly.

4. DISASSEMBLE RELIEF VALVE (5).
 - a. Remove preformed packing (18) and washer (9) from cartridge (8).

- b. Remove locknut (20), adjusting screws (19), preformed packing (18), spring (17) and plunger (16).
 - c. Remove preformed packing (14) and backup ring (15) from plunger (16).
 - d. Remove floating seal (12) and check valve snubber (13) from cartridge.
 - e. Remove poppet (11) and retainer (10) from cartridge.
 - f. Remove preformed packing (6) and back-up ring (7).
5. DISASSEMBLE VALVE SECTION (33).
 - a. Remove two screws (38) and valve cap (37)
 - b. Remove stripper bolt (36), spring guides (34) and spring (35).
 - c. Remove two screws (28) and retainer plates (29).
 - d. Remove preformed packings (31), back-up rings (32) and spool (30) from valve body.
 - e. Remove check cap (24), preformed packing (25), check spring (26) and poppet (27).
 - f. Remove plugs and packings (40) from unused ports.

CLEANING:

WARNING

Dry cleaning solvent P-D-680, Type III is toxic and flammable. Wear protective goggles and gloves and use only in a well ventilated area. Avoid contact with skin, eyes, and clothes and do not breathe vapors. Do not use near open flame or excessive heat. The flash point is 200°F (94°C). If you become dizzy while using cleaning solvent, get fresh air immediately and get medical aid. If contact with eyes is made, wash your eyes with water and get medical aid immediately.

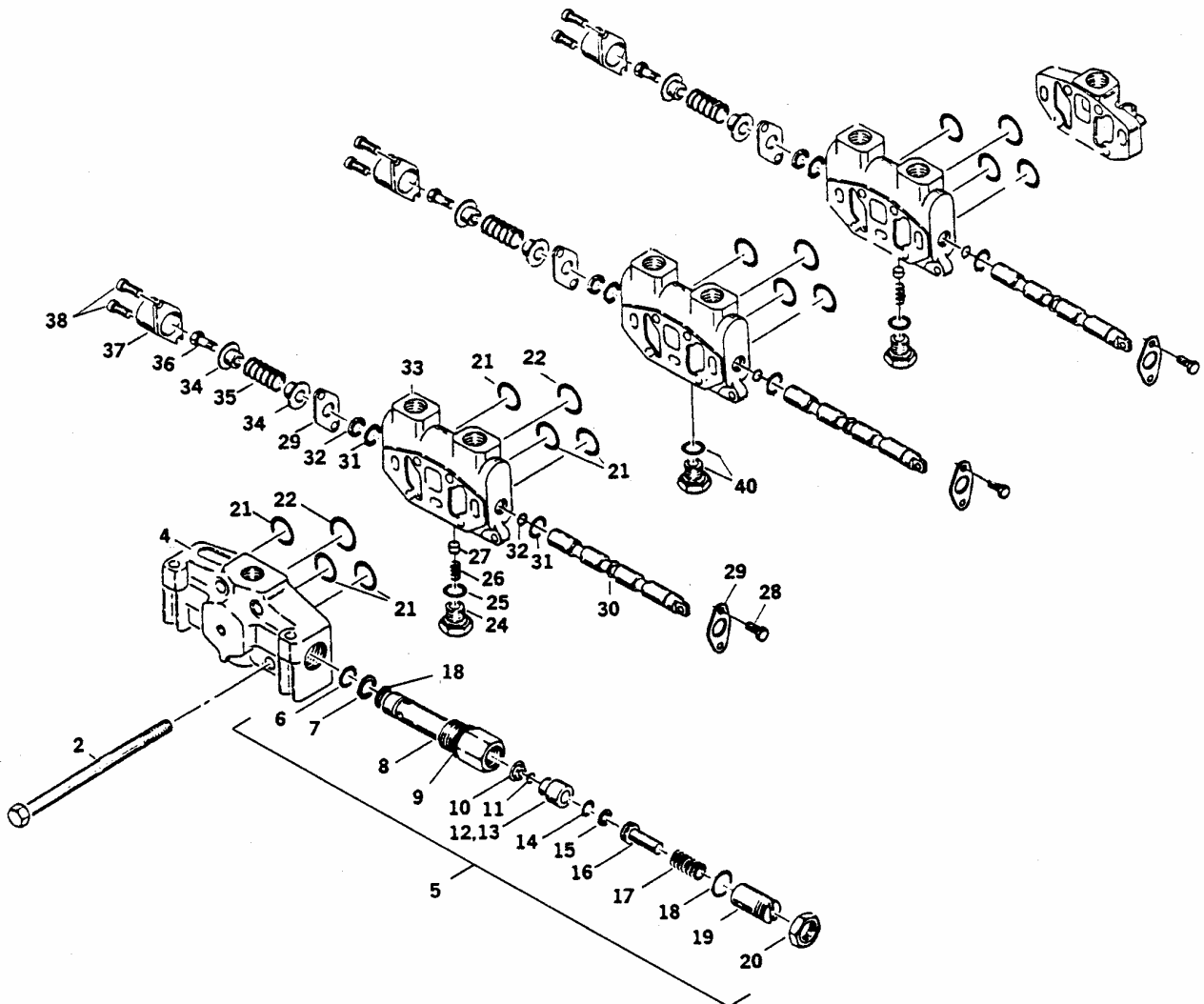
WARNING

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

1. CLEAN PARTS IN CLEANING SOLVENT P-D-680, TYPE III AND BLOW DRY WITH COMPRESSED AIR.

INSPECTION:

1. INSPECT SPOOL BORE FOR CRACKS, PITTING SCORING AND WEAR. REPLACE IF NECESSARY.



2. INSPECT SPOOL FOR SCORING AND WEAR. REPLACE IF NECESSARY.

REASSEMBLY:

CAUTION

Install new packings and seals on or in all component parts. Coat packings and seals with clean hydraulic fluid prior to assembly.

1. REMOVE ANY BURRS FROM FACES OF VALVE SECTIONS AND ENSURE ALL MATING SURFACES ARE CLEAN.
2. REASSEMBLE VALVE SECTION (33).
 - a. Install new packings onto plugs (40).
 - b. Install poppet (27), spring (26), new preformed packing (25) and check cap (24).
 - c. Install spool (30).
 - d. Install new preformed packings (31) and back-up rings (32) on both sides of spool. Retain on clevis end of spool with retainer plate (29) and screws (28).
 - e. Install retainer plate (29), spring guides (34) and spring (35). Secure with stripper bolt (36).
 - f. Install valve cap (37) and screws (38).
3. REASSEMBLE RELIEF VALVE (5).
 - a. Install new preformed packing (6) and back-up ring (7) into cartridge (8).
 - b. Install poppet (11) and retainer (10) into cartridge (8).
 - c. Install new floating seal (12) and check valve snubber (13).
 - d. Install new preformed packing (14) and back-up ring (15) on plunger (16).

- e. Install plunger (16), spring (17), adjusting screw (19) with new preformed packing (18) into cartridge (8). Secure with locknut (20).
- f. Install washer (9) and new preformed packing (18) on relief valve cartridge (8). Install relief valve (5) into inlet section (4).

4. POSITION SECTIONS TOGETHER WITH NEW PREFORMED PACKINGS (21) AND (22). SECURE ASSEMBLY WITH TIE BOLTS (2).

NOTE

Do not torque tie bolts at this time.

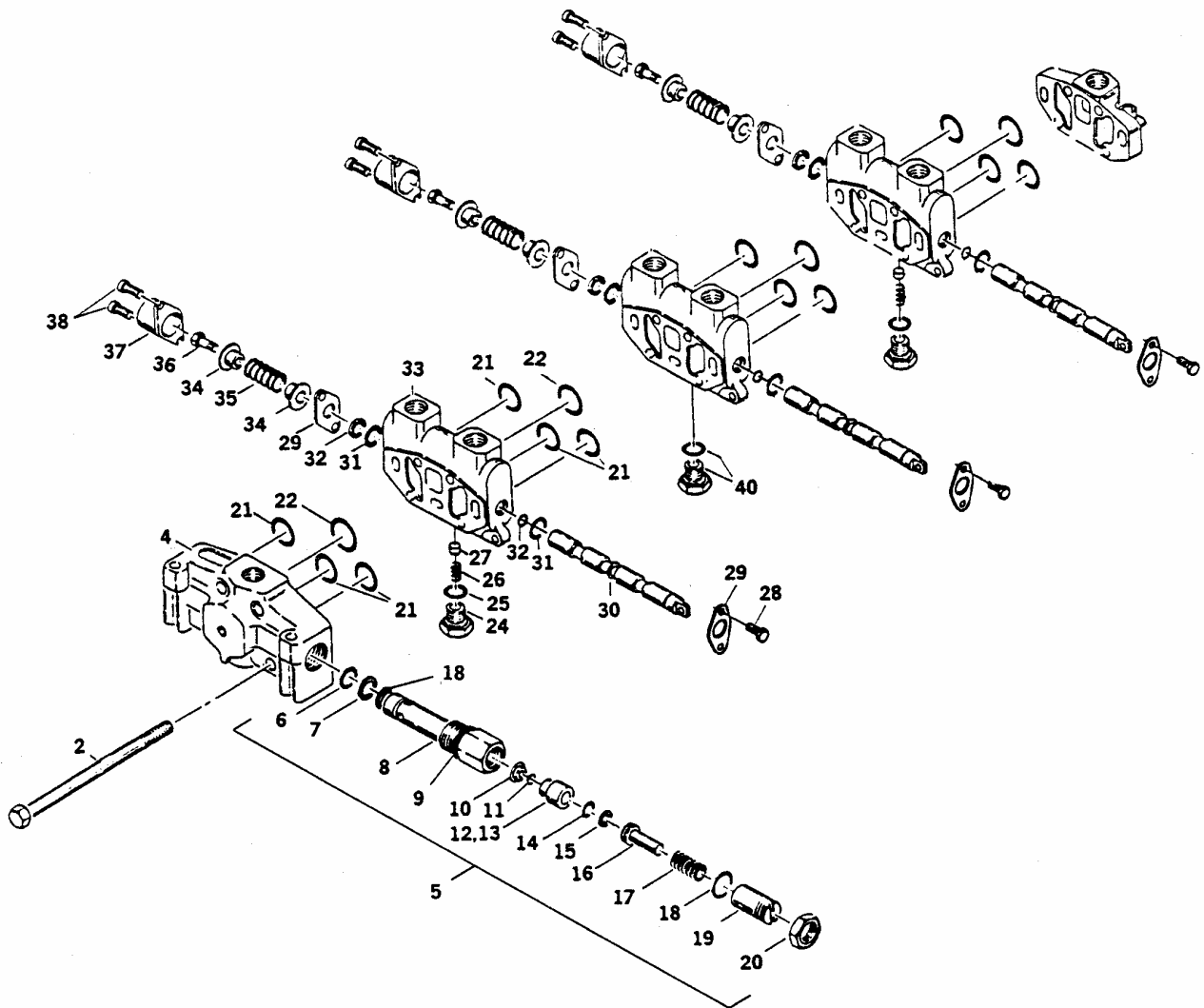
5. INSTALL CIRCUIT RELIEF VALVES IF APPLICABLE IN THEIR HOUSING.

CAUTION

Ensure that all sections (inlet, housing, and outlet) are aligned prior to applying torque.

6. USING PROPER TORQUE WRENCH, TORQUE TIE BOLTS (2) TO 350 IN-LBS (39 NM) (A-20 VALVE) AND 400 IN-LBS (44 NM) (A-35 VALVE).
7. INSTALL PLUGS (40) AND TIGHTEN UNTIL BOTTOMED.
8. ACTUATE SPOOL TO ENSURE FREE MOVEMENT.
9. INSTALL CONTROL VALVE. (REFER TO TM 5-3810-306-20.)

END OF TASK



HYDRAULIC OIL COOLER ASSEMBLY

TOOLS: General mechanic's tool kit: automotive (5180-00-177-7033)
Lifting Device (300 lbs Capacity)

SUPPLIES: Lockwasher (Item 13, Appendix B)
Lockwasher (Item 25, Appendix B)
Lockwasher (Item 26, Appendix B)

EQUIPMENT CONDITIONS: Negative battery cable disconnected at shunt. (RT875CC)
Battery disconnect switch in off position. (RT875CCS)
Hydraulic system shutdown and pressure relieved from lines.

REMOVAL:

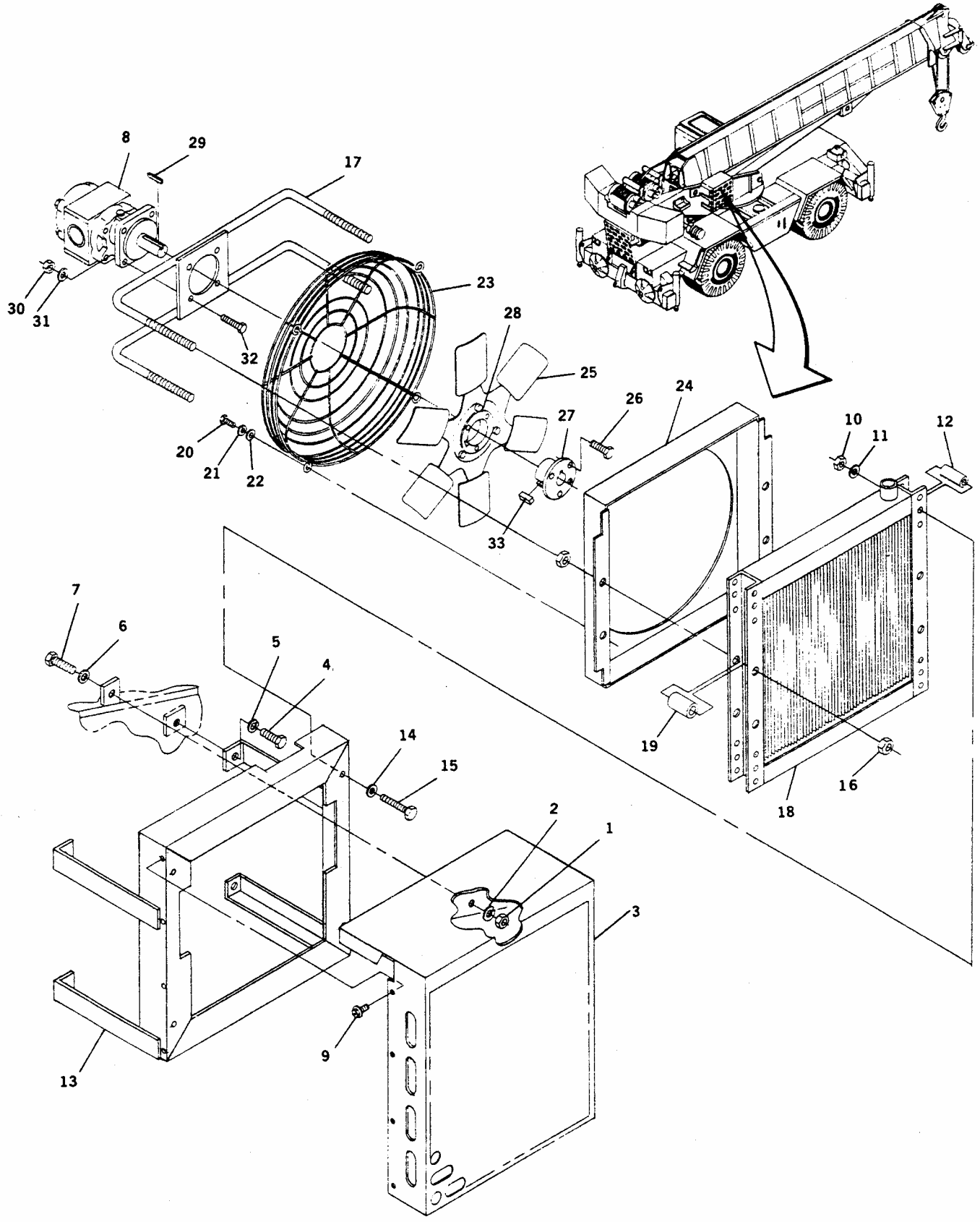
WARNING

Be sure to wear protective eye covering to avoid personal injury.

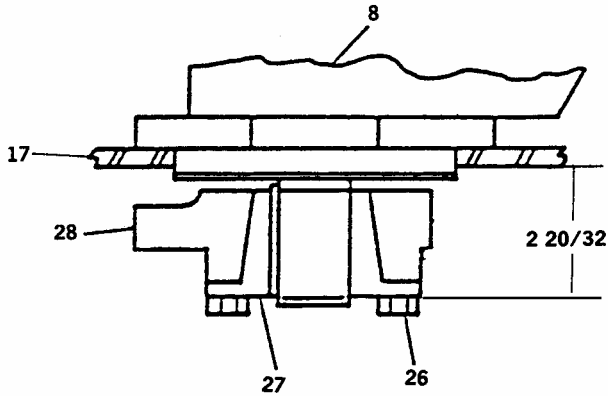
1. REMOVE OIL COOLER COVER (3).
 - a. Remove two nuts (1), lockwashers (2), flatwashers (6) and capscrews (7) securing shroud to superstructure.
 - b. Remove eight capscrews (9) securing cover (3) to frame (13).
 - c. Remove cover (3).
2. REMOVE OIL COOLER ASSEMBLY.
 - a. Tag and disconnect four hydraulic hoses from oil cooler motor and oil cooler.
 - b. Tag and remove one hydraulic hose between oil cooler and oil cooler motor.
 - c. Remove four capscrews (4) and lockwashers (5) and remove oil cooler assembly from superstructure using suitable lifting device.
3. REMOVE OIL COOLER FROM FRAME (13).
 - a. Remove eight nuts (10), lockwashers (11), spacers (12), flatwashers (14) and capscrews (15). Remove oil cooler assembly from frame (13).
4. REMOVE OIL COOLER MOTOR FROM OIL COOLER.
 - a. Remove four nuts (16) securing fan mount (17) to oil cooler (18). Retain spacers (19) for reassembly.
 - b. Remove four capscrews (20), lockwashers (21) and flatwashers (22) securing fan guard (23) to shroud (24).
 - c. Remove fan (25), fan guard (23), fan mount (17) and motor (8).
 - d. Remove three socket head screws securing fan (25) to fan collar (28). Remove fan (25) and fan guard (23).
 - e. Remove three capscrews (26) securing tapered bushing (27) and fan collar (28) to motor shaft. Install capscrew (26) into hole on tapered bushing (27) and tighten to separate bushing and fan collar (28). Remove bushing (27), key (33), and collar (28) from motor shaft.
 - f. Remove square key (29) from motor shaft.
 - g. Remove four nuts (30), lockwashers (31) and capscrews (32). Remove oil cooler motor (8). Note position of fan mount (17) to oil cooler motor (8) for reassembly.

INSTALLATION:

1. INSTALL OIL COOLER MOTOR TO OIL COOLER.
 - a. Position oil cooler motor on fan mount bracket (17). Secure with capscrews (32), lockwashers (31) and nuts (30).
 - b. Position fan guard (23) over motor shaft. Position square key (29) and fan collar (28) on motor shaft.



- c. Position key (33) and tapered bushing (27) on motor shaft. Ensure that measurement from front of mounting plate (17) to front of tapered bushing (27) is 2-20/32 in. (66.7 mm) Install and tighten cap screws (26) alternately to draw tapered bushing (27) and fan collar (28) together evenly. Torque cap screws to 15 ft-lbs (20 Nm)



- d. Install fan (25) on fan collar (28) using three socket head screws.
- e. Position fan shroud (24) on oil cooler, align holes and insert fan mount (17) through holes, ensure spacers (19) are in place.

NOTE

Tee fitting on motor (8) must face boom nose.

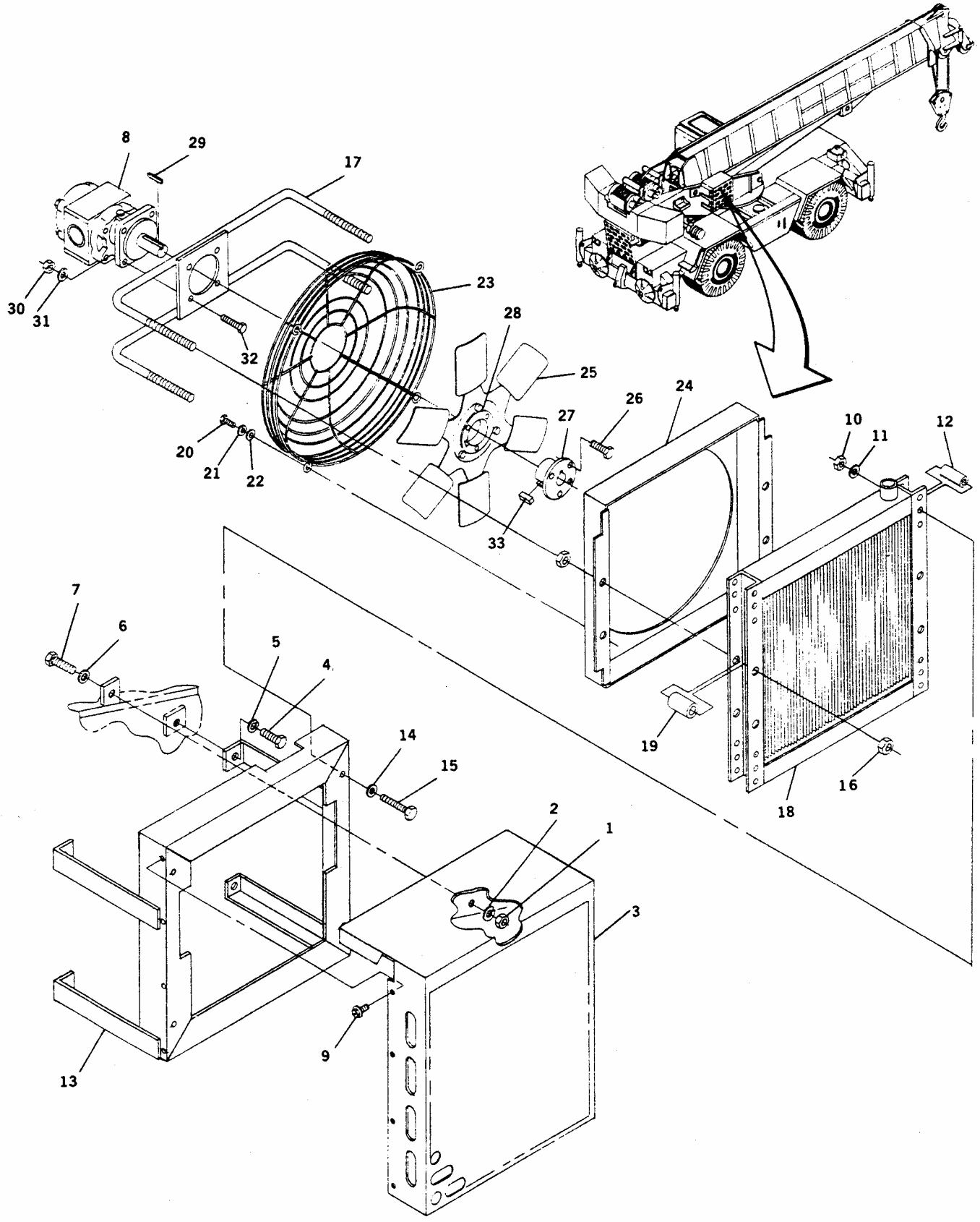
- f. Secure fan mount with nuts (16).
- g. Align holes in fan guard (23) with holes in shroud (24) and secure with flatwashers (22), lockwashers (21) and cap screws (20).

NOTE

Ensure fan spins freely inside and is centered between fan guard (23) and shroud (24) to eliminate any possible oil cooler damage when motor starts. Adjust by loosening and tightening nuts (16) on fan mount (17).

2. INSTALL OIL COOLER ON FRAME (13).
 - a. Position oil cooler assembly on frame and secure with eight capscrews (15), flatwashers (14), lockwashers (11) and nuts (10). Ensure spacers (12) are in place.
3. INSTALL OIL COOLER ASSEMBLY.
 - a. Using a suitable lifting device, position oil cooler assembly on superstructure and secure with four lockwashers (5) and capscrews (4).
 - b. Install tagged hoses on oil cooler and oil cooler motor.
4. INSTALL COVER (3).
 - a. Position cover (3) over oil cooler assembly and secure to superstructure using two capscrews (7), flatwashers (6), lockwashers (2) and nuts (1).
 - b. Secure cover (3) sides to frame (13) with eight capscrews (9).
5. CONNECT NEGATIVE BATTERY CABLE AT SHUNT. (REFER TO TM 5-3810-306-20.) (RT875CC)
6. DRAIN AND FLUSH HYDRAULIC SYSTEM. (REFER TO PAGE 13-111.)
7. BLEED AIR FROM HYDRAULIC SYSTEM. (REFER TO PAGE 13-113.)
8. START UP HYDRAULIC SYSTEM AND CHECK FOR PROPER OPERATION AND LEAKS.

END OF TASK



INTEGRATED OUTRIGGER CONTROL VALVE ASSEMBLY

TOOLS: General Mechanic's Tool Kit: automotive (5180-00-177-7033)

SUPPLIES: Parts Kit (Item 256, Appendix B)
Parts Kit (Item 257, Appendix B)
Packing, preformed (Item 245, Appendix B)
Packing, preformed (Item 246, Appendix B)
Packing, preformed (Item 247, Appendix B)
Packing, preformed (Item 248, Appendix B) (2 Required)
Packing, preformed (Item 249, Appendix B) (4 Required)
Packing, preformed (Item 250, Appendix B)
Packing, preformed (Item 251, Appendix B) (3 Required)
Packing, preformed (Item 252, Appendix B) (2 Required)
Packing, preformed (Item 253, Appendix B)
Packing, preformed (Item 254, Appendix B)
Packing, preformed (Item 255, Appendix B)
Solvent, Cleaning P-D-680, Type III (Item 1, Appendix B)
Hydraulic Oil (Item 8, Appendix B)

EQUIPMENT CONDITIONS: Integrated outrigger control valve removed.
(Refer to TM 5-3810-306-20.)

WARNING

Be sure to wear protective eye covering to avoid personal injury.

DISASSEMBLY:

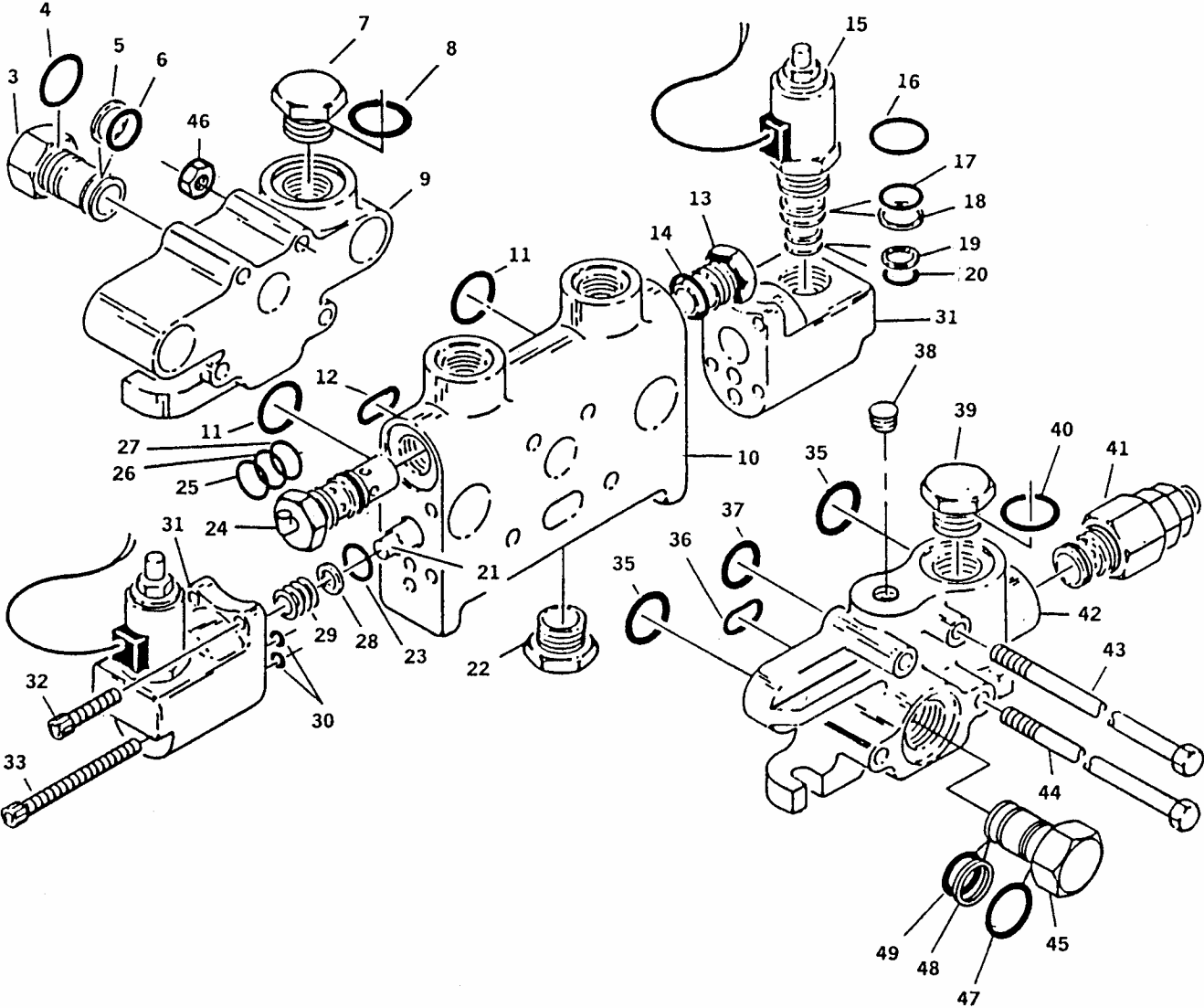
1. REMOVE SOLENOIDS (31).

CAUTION

Remove solenoids (31) slowly.
Springs (29) are under tension and can pop out resulting in personal injury.

- a. Remove socket head screws (32) and (33), and remove solenoids (31) from valve body (10).
 - b. Remove springs (29), washers (28), packings (23) and valve (21) from valve body (10). Discard packings (23).
 - c. Remove and discard packings (30).
 - d. Remove valves (15) from solenoids (31).
 - e. Remove and discard packings (16), packings (17), retainers (18), retainers (19) and packings (20).
- ##### 2. REMOVE SAFETY RELIEF VALVES (13) AND (24).

- a. Remove relief valves (13) and (24) from valve body (10).
 - b. Remove and discard packings (25), (26) and (27) from relief valve (24).
 - c. Remove and discard packing (14) from relief valve (13).
- ##### 3. REMOVE VALVE SECTIONS (9) AND (42).
- a. Remove nuts (46) from cap screws (43) and (44) and remove valve section (9) from valve body (10).
 - b. Remove and discard packings (11) and (12).
 - c. Remove capscrews (43) and (44), and valve section (42) from valve body (10).
 - d. Remove and discard packings (35), (36) and (37).
 - e. Remove plug (7) and packing (8) from valve section (9). Discard packing (8).
 - f. Remove directional sleeve (3) from valve section (9).
 - g. Remove and discard packings (4), (5) and (6).



- h. Remove relief valve (41) from valve section (42).
 - i. Remove directional sleeve (45) from valve section (42).
 - j. Remove and discard packings (47), (48) and (49) from directional sleeve (45).
 - k. Remove plugs (38) and (39), and packing (40) from valve section (42).
4. IF NECESSARY, REMOVE PLUG (22) FROM VALVE BODY (10).

CLEANING:

WARNING

Dry cleaning solvent P-D-680, Type III is toxic and flammable. Wear protective goggles and gloves and use only in a well ventilated area. Avoid contact with skin, eyes, and clothes and do not breathe vapors. Do not use near open flame or excessive heat. The flash point is 200°F (94°C). If you become dizzy while using cleaning solvent, get fresh air immediately and get medical aid. If contact with eyes is made, wash your eyes with water and get medical aid immediately. Compressed air used for cleaning purposes will not exceed 30 psi. Use only with effective chip guarding and personal protective equipment (Goggles/shield, gloves, etc.).

1. CLEAN ALL PARTS IN CLEANING SOLVENT P-D-680, TYPE III AND BLOW DRY WITH COMPRESSED AIR.

INSPECTION:

- 1. INSPECT ALL PARTS FOR WEAR OR OTHER DAMAGE.
- 2. CHECK THAT ALL ORIFICES ARE CLEAR.

ASSEMBLY:

CAUTION

Install new packings on or in all component parts. Coat packings with clean hydraulic oil prior to assembly.

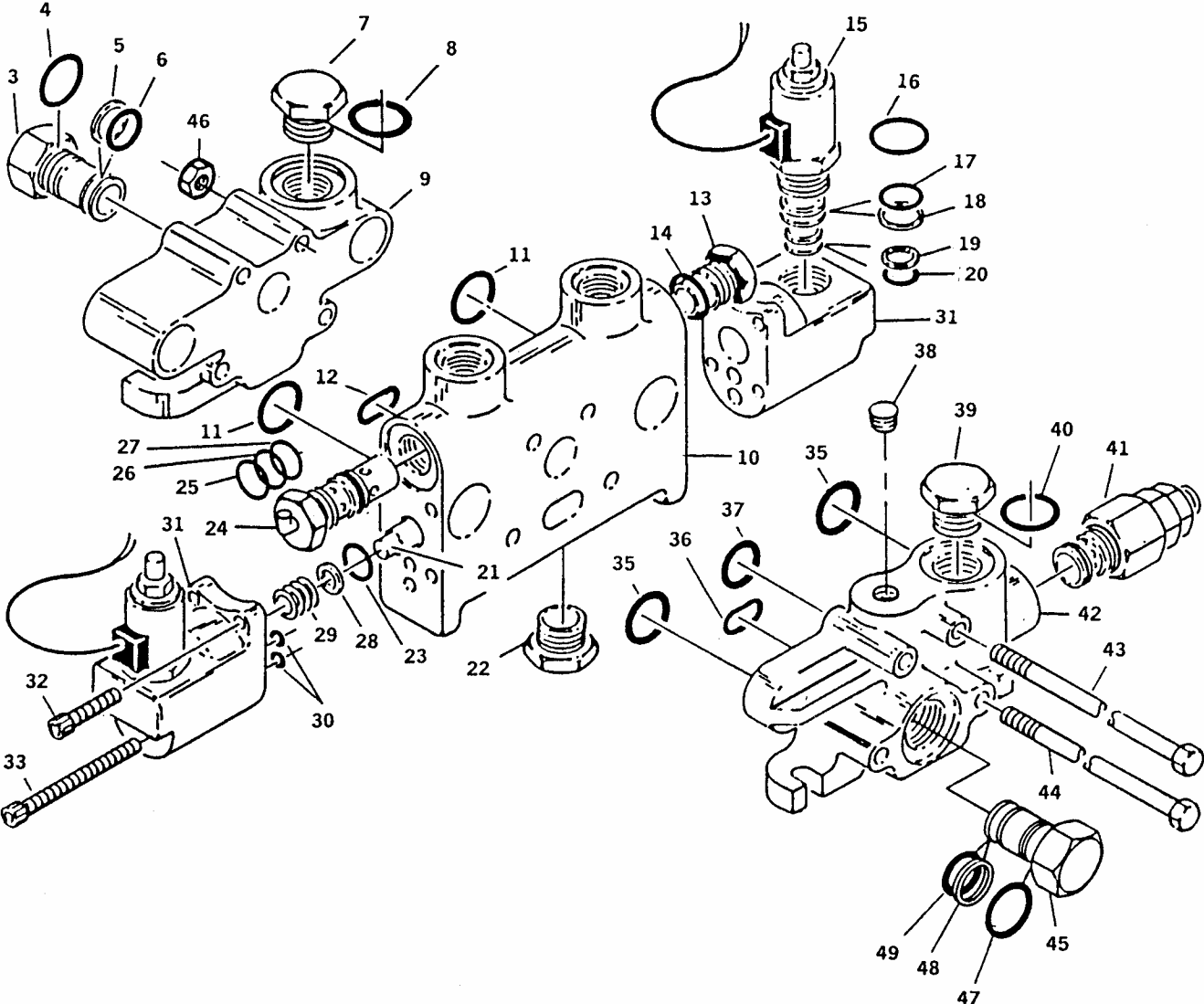
CAUTION

Do not damage the packings during installation of the valve. If the valve turns freely then gets hard to turn, then easy to turn, remove the valve and check the packings. They have probably been damaged by a sharp edge of a port or thread.

NOTE

The valve should turn by hand until compression of the packings begins.

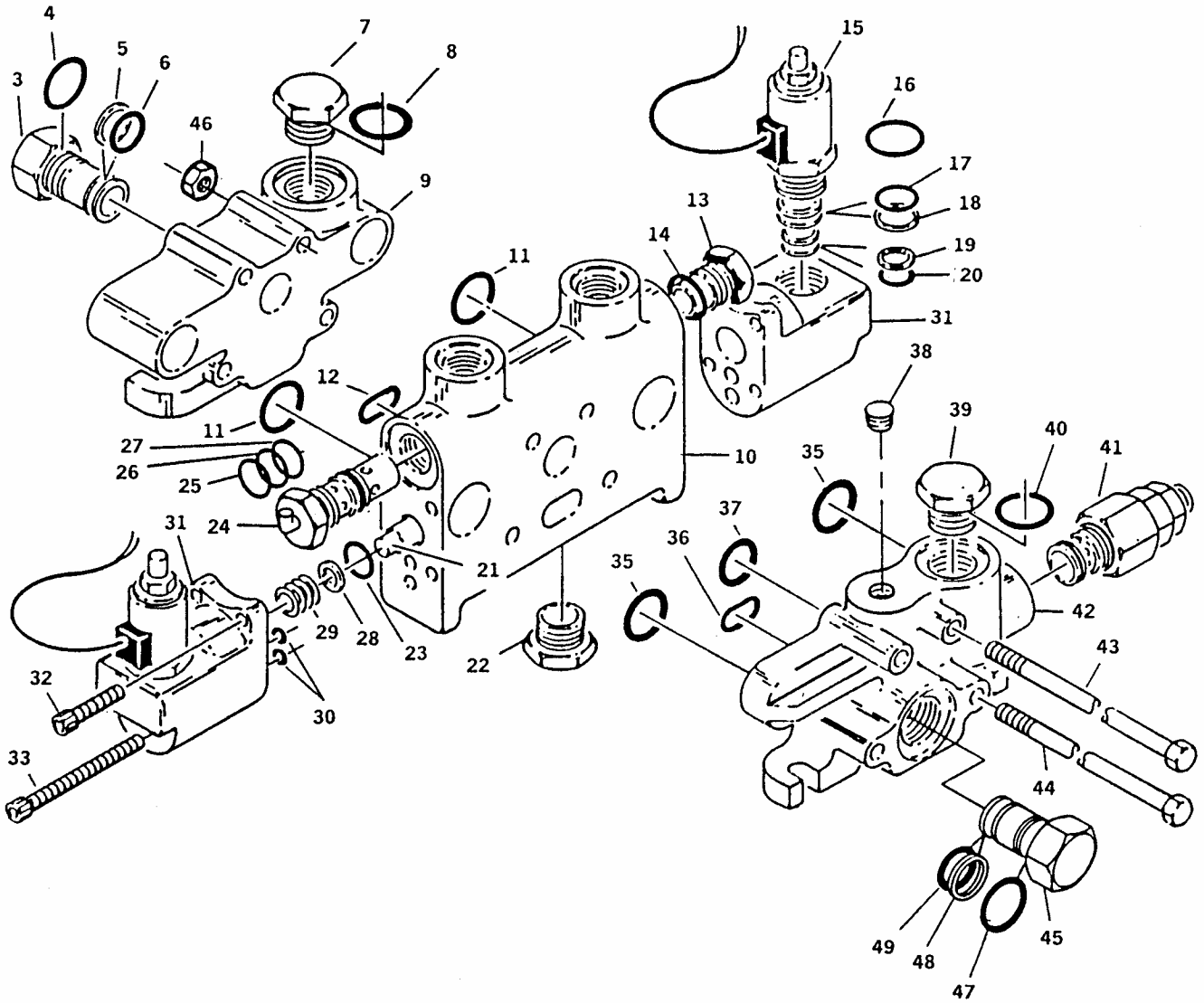
- 1. REMOVE ANY BURRS FROM FACES OF VALVE SECTIONS AND ENSURE ALL MATING SURFACES ARE CLEAN.
- 2. IF REMOVED, INSTALL PLUG (22) IN VALVE BODY (10).
- 3. ASSEMBLY VALVE SECTION (42).
 - a. Install plugs (38) and (39), and new packing (40).
 - b. Install new packings (47), (48) and (49) on directional sleeve (45).
 - c. Install directional sleeve (45) in valve section (42).
 - d. Install relief valve (41) in valve section (42).
 - e. Install new packings (35), (36) and (37) in valve section (42).
- 4. ASSEMBLE VALVE SECTION (9).
 - a. Install new packing (8) and plug (7) in valve section (9).
 - b. Install new packings (4), (5) and (6) on directional sleeve (3).
 - c. Install directional sleeve (3) in valve section (9).



- d. Install new packings (11) and (12) in valve section (9).
5. INSTALL VALVE SECTIONS (9) AND (42).
- a. Position valve section (42) on valve body (10) and install capscrews (43) and (44) through valve section (42) and valve body (10).
 - b. Install valve section (9) over cap screws (43) and (44), and install nuts (46).
6. INSTALL SAFETY RELIEF VALVES (13) AND (24).
- a. Install new packings (25), (26) and (27) on relief valve (24).
 - b. Install relief valve (24) in valve body (10).
 - c. Install new packing (14) and relief valve (13) in valve body (10).

7. INSTALL VALVES (15).
- a. Install new packings (16), (17) and (20), and new retaining rings (18) and (19) on valves (15).
 - b. Install valves (15) in solenoids (31).
8. INSTALL SOLENOIDS (31).
- a. Install valve (21), new packings (23), washers (28) and springs (29) in valve body (10).
 - b. Install new packings (30) in solenoids (31).
 - c. Install solenoids (31) on valve body (10) with socket head screws (32) and (33).
9. INSTALL INTEGRATED OUTRIGGER CONTROL VALVE. (REFER TO TM 5-3810-306-20.)

END OF TASK



LIFT, REAR STEER, TELE CONTROL VALVE ASSEMBLY

TOOLS: General mechanic's tool kit: automotive (5180-00-177-7033)
Lubrication Service, Unit Trailer Mounted (4930-00-017-9167)
Shop Equipment Auto-Maintenance and Repair, FM Basic (4910-00-754-0705)
Shop Equipment Auto-Maintenance and Repair, FM Suppl No. 1 (4910-00-754-0706)
Tool Outfit Hyd System; Test and Repair, 3/4 Ton Trailer Mtd (4940-01-036-5784)

SUPPLIES: Packing assortment (Item 50, Appendix B)
Parts kit, seal repl. (Item 51, Appendix B)
Packing assortment (Item 52, Appendix B)
Solvent, Cleaning P-D-680, Type III (Item 1, Appendix B)
Hydraulic oil (Item 8, Appendix B)

EQUIPMENT CONDITION: Control valve-removed. (Refer to TM 5-3810-306-20.)

DISASSEMBLY:

NOTE

The following procedure outlines disassembly for one section of the valve bank. All additional valve sections will be identical.

1. REMOVE FITTINGS FROM VALVE BANK AS REQUIRED. SAVE FOR INSTALLATION.
2. REMOVE TIE BOLTS (2) SECURING VALVE SECTIONS TOGETHER. SEPARATE SECTIONS AND REMOVE PREFORMED PACKINGS (21) AND (22).
3. REMOVE RELIEF VALVE (5) FROM INLET SECTION (4).

NOTE

Keeping preformed packings and rings in order during disassembly will aid in reassembly.

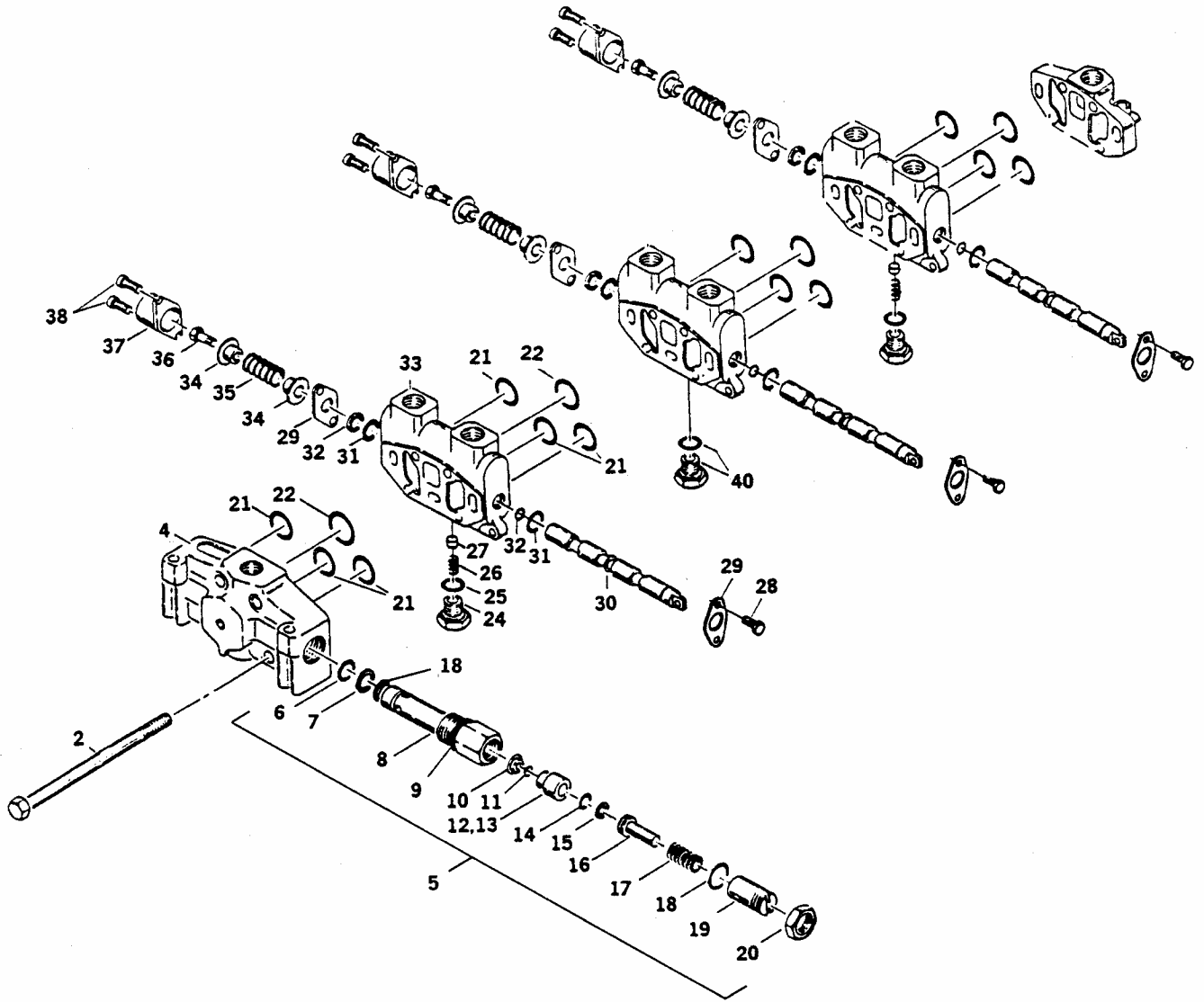
4. DISASSEMBLE RELIEF VALVE (5).
 - a. Remove preformed packing (18) and washer (9) from cartridge (8).
 - b. Remove locknut (20), adjusting screws (19), preformed packing (18), spring (17) and plunger (16).

- c. Remove preformed packing (14) and back-up ring (15) from plunger (16).
 - d. Remove floating seal (12) and check valve snubber (13) from cartridge.
 - e. Remove poppet (11) and retainer (10) from cartridge.
 - f. Remove preformed packing (6) and back-up ring (7).
5. DISASSEMBLE VALVE SECTION (33).
 - a. Remove two screws (38) and valve cap (37).
 - b. Remove stripper bolt (36), spring guides (34) and spring (35)
 - c. Remove two screws (28) and retainer plates (29)
 - d. Remove preformed packings (31), backup rings (32) and spool (30) from valve body.
 - e. Remove check cap (24), preformed packing (25), check spring (26) and poppet (27).

CLEANING:

WARNING

Dry cleaning solvent P-D-680, Type III is toxic and flammable. Wear protective goggles and gloves and use only in a well ventilated area.



WARNING

Avoid contact with skin, eyes, and clothes and do not breathe vapors. Do not use near open flame or excessive heat. The flash point is 200°F (94°C). If you become dizzy while using cleaning solvent, get fresh air immediately and get medical aid. If contact with eyes is made, wash your eyes with water and get medical aid immediately.

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

1. CLEAN PARTS IN CLEANING SOLVENT P-D-680, TYPE III AND BLOW DRY WITH COMPRESSED AIR.

INSPECTION:

1. INSPECT SPOOL BORE FOR CRACKS, PITTING SCORING AND WEAR. REPLACE IF NECESSARY.
2. INSPECT SPOOL FOR SCORING AND WEAR. REPLACE IF NECESSARY.

REASSEMBLY:

CAUTION

Install new packings and seals on or in all component parts. Coat packings and seals with clean hydraulic fluid prior to assembly.

1. REMOVE ANY BURRS FROM FACES OF VALVE SECTIONS AND ENSURE ALL MATING SURFACES ARE CLEAN.
2. REASSEMBLE VALVE SECTION (33).
 - a. If removed, install new packings onto plugs.
 - b. Install poppet (27), spring (26), new preformed packing (25) and check cap (24).

- c. Install spool (30).
- d. Install new preformed packings (31) and back-up rings (32) on both sides of spool. Retain on clevis end of spool with retainer plate (29) and screws (28).
- e. Install retainer plate (29), spring guides (34) and spring (35). Secure with stripper bolt (36).
- f. Install valve cap (37) and screws (38).
3. REASSEMBLE RELIEF VALVE (5).
 - a. Install new preformed packing (6) and back-up ring (7) into cartridge (8).
 - b. Install poppet (11) and retainer (10) into cartridge (8).
 - c. Install new floating seal (12) and check valve snubber (13).
 - d. Install new preformed packing (14) and back-up ring (15) on plunger (16).
 - e. Install plunger (16), spring (17), adjusting screw (19) with new preformed packing (18) into cartridge (8). Secure with locknut (20).
 - f. Install washer (9) and new preformed packing (18) on relief valve cartridge (8). Install relief valve (5) into inlet section (4).
4. POSITION SECTIONS TOGETHER WITH NEW PREFORMED PACKINGS (21) AND (22). SECURE ASSEMBLY WITH TIE BOLTS (2).

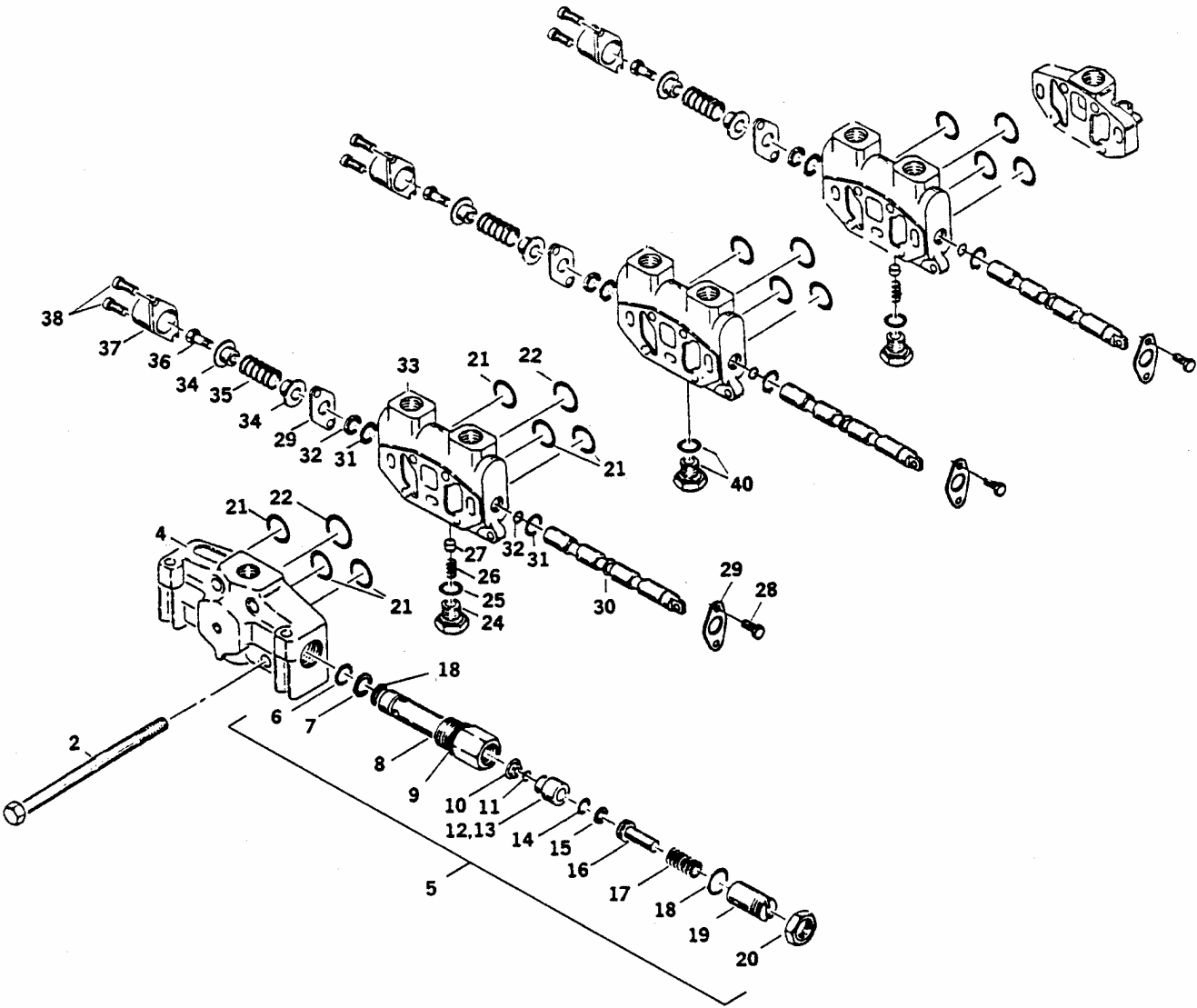
NOTE

Do not torque tie bolts at this time.

5. INSTALL CIRCUIT RELIEF VALVES IF APPLICABLE IN THEIR HOUSING.

CAUTION

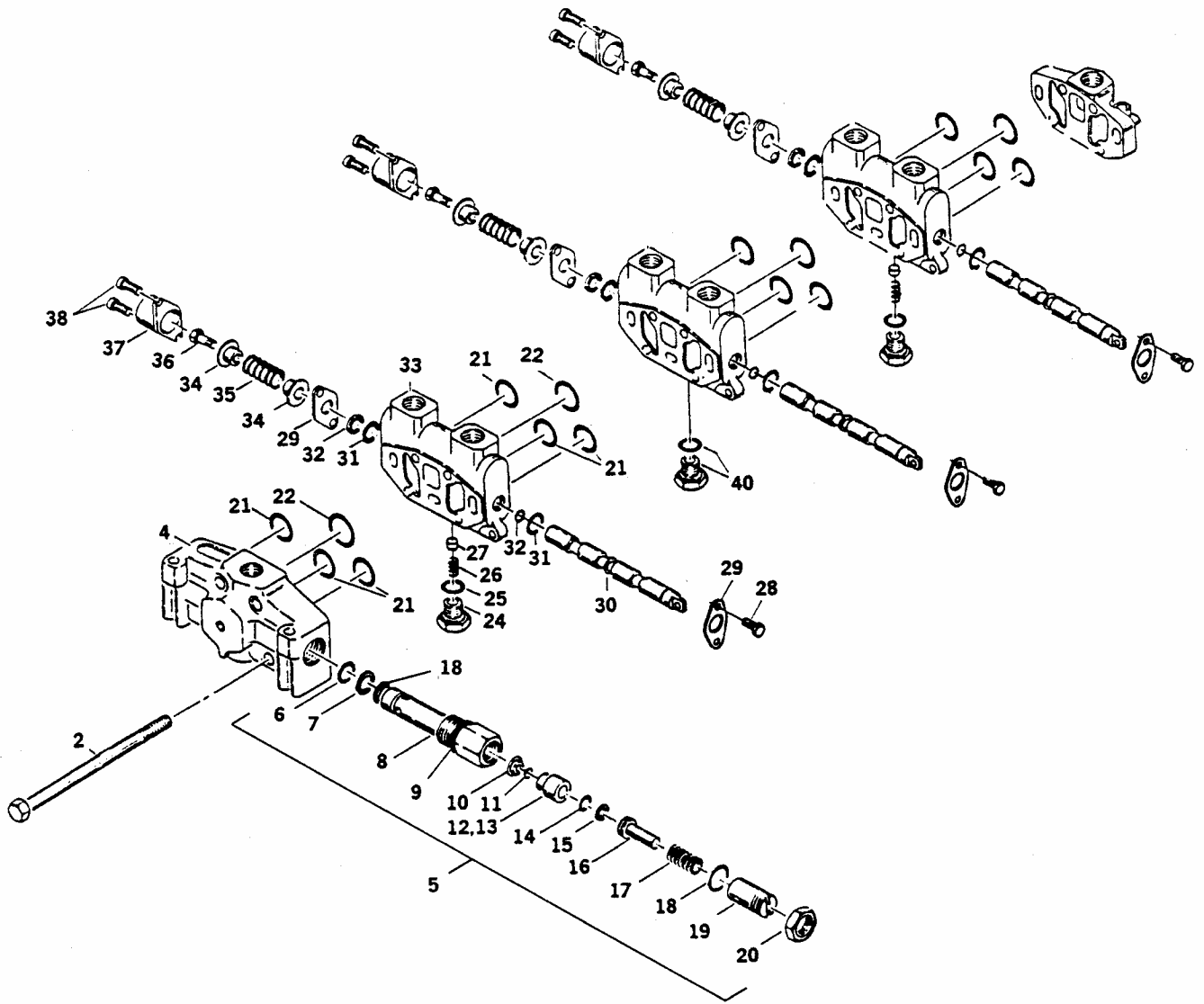
Ensure that all sections (inlet, housing, and outlet) are aligned prior to applying torque.



6. USING PROPER TORQUE WRENCH, TORQUE TIE BOLTS (2) TO 350 IN-LBS (39 NM) (A-20 VALVE) AND 400 IN-LBS (44 NM) (A-35 VALVE).
7. ACTUATE SPOOL TO ENSURE FREE MOVEMENT.

8. INSTALL CONTROL VALVE. (REFER TO TM 5-3810-306-20.)

END OF TASK



MAIN HOIST, AUXILIARY HOIST BOOST CONTROL VALVE ASSEMBLY

TOOLS: General mechanic's tool kit: automotive (5180-00-177-7033)
Lubrication Service, Unit Trailer Mounted (4930-00-017-9167)
Shop Equipment Auto-Maintenance and Repair, FM Basic (4910-00-754-0705)
Shop Equipment Auto-Maintenance and Repair, FM Suppl No. 1 (4910-00-754-0706)
Tool Outfit Hyd System; Test and Repair, 3/4 Ton Trailer Mtd (4940-01-036-5784)

SUPPLIES: Packing assortment (Item 50, Appendix B)
Parts kit, seal repl. (Item 51, Appendix B)
Packing assortment (Item 52, Appendix B)
Parts kit, seal repl. (Item 53, Appendix B)
Solvent, Cleaning P-D-680, Type III (Item 1, Appendix B)
Hydraulic oil (Item 8, Appendix B)

EQUIPMENT CONDITION: Control valve removed. (Refer to TM 5-3810-306-20.)

DISASSEMBLY:

NOTE

The following procedure outlines disassembly for one section of the valve bank. All additional valve sections will be identical.

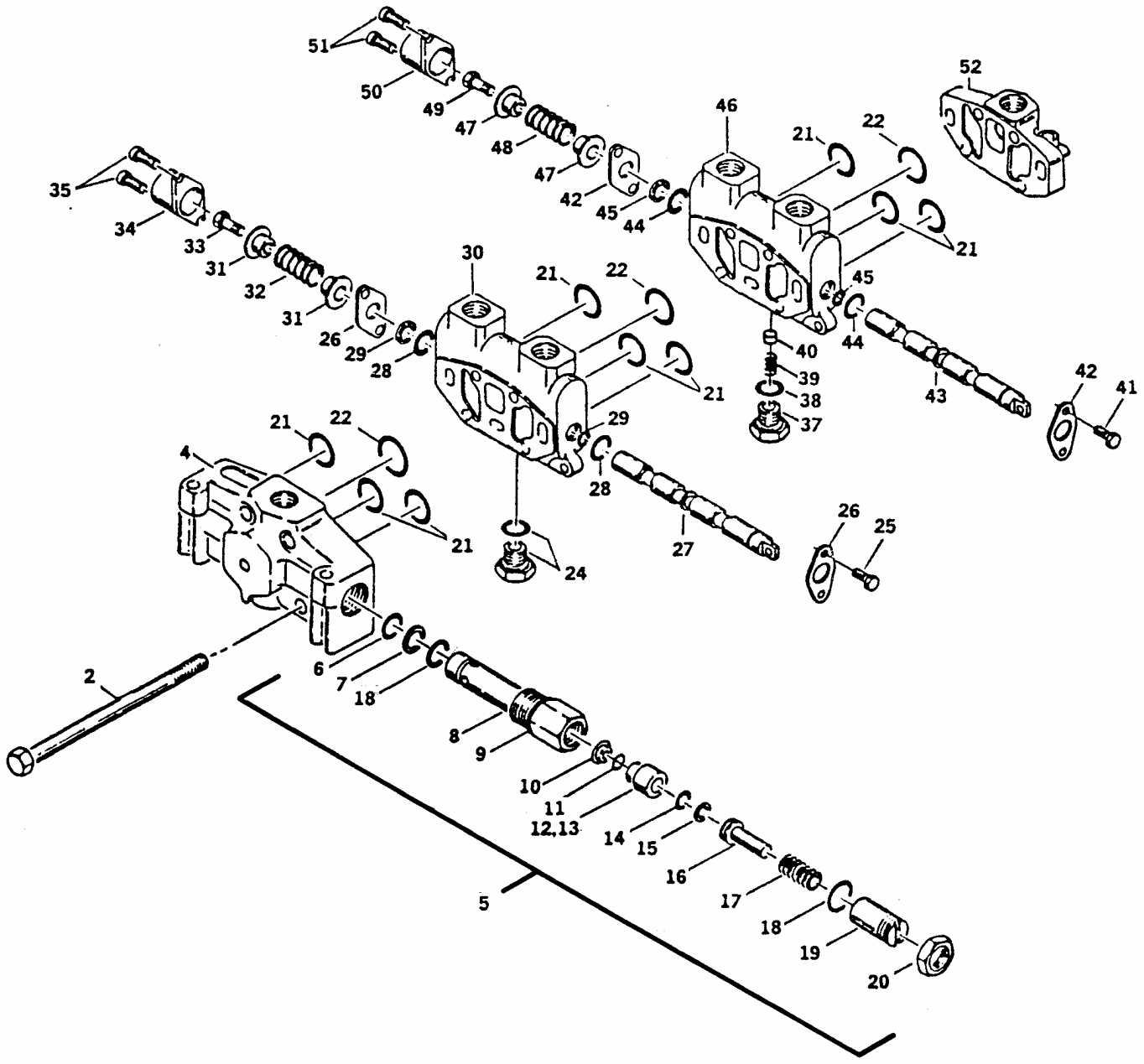
1. REMOVE FITTINGS FROM VALVE BANK AS REQUIRED. SAVE FOR INSTALLATION.
2. REMOVE TIE BOLTS (2) SECURING VALVE SECTIONS TOGETHER. SEPARATE SECTIONS AND REMOVE PREFORMED PACKINGS (21) AND (22).
3. REMOVE RELIEF VALVE (5) FROM INLET SECTION (4).

NOTE

Keeping preformed packings and rings in order during disassembly will aid in reassembly.

4. DISASSEMBLE RELIEF VALVE (5).
 - a. Remove preformed packing (18) and washer (9) from cartridge (8).

- b. Remove locknut (20), adjusting screws (19), preformed packing (18), spring (17) and plunger (16).
 - c. Remove preformed packing (14) and backup ring (15) from plunger (16).
 - d. Remove floating seal (12) and check valve snubber (13) from cartridge.
 - e. Remove poppet (11) and retainer (10) from cartridge.
 - f. Remove preformed packing (6) and back-up ring (7).
5. DISASSEMBLE VALVE SECTION (30).
 - a. Remove two screws (35) and valve cap (34).
 - b. Remove stripper bolt (33), spring guides (31) and spring (32).
 - c. Remove two screws (25) and retainer plates (26).
 - d. Remove preformed packings (28), back-up rings (29) and spool (27) from valve body.
 - e. Remove check cap (37), preformed packing (38), check spring (39) and poppet (40).
 - f. Remove plugs and preformed packings (24) from unused ports.



CLEANING:

WARNING

Dry cleaning solvent P-D-680, Type III is toxic and flammable. Wear protective goggles and gloves and use only in a well ventilated area. Avoid contact with skin, eyes, and clothes and do not breathe vapors. Do not use near open flame or excessive heat. The flash point is 200° F (94° C). If you become dizzy while using cleaning solvent, get fresh air immediately and get medical aid. If contact with eyes is made, wash your eyes with water and get medical aid immediately.

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

1. CLEAN PARTS IN SOLVENT P-D-680, TYPE III AND BLOW DRY WITH COMPRESSED AIR.

INSPECTION:

1. INSPECT SPOOL BORE FOR CRACKS, PITTING SCORING AND WEAR. REPLACE AS NECESSARY.
2. INSPECT SPOOL FOR SCORING AND WEAR. REPLACE AS NECESSARY.

REASSEMBLY:

CAUTION

Install new packings and seals on or in all component parts. Coat packings and seals with clean hydraulic fluid prior to assembly.

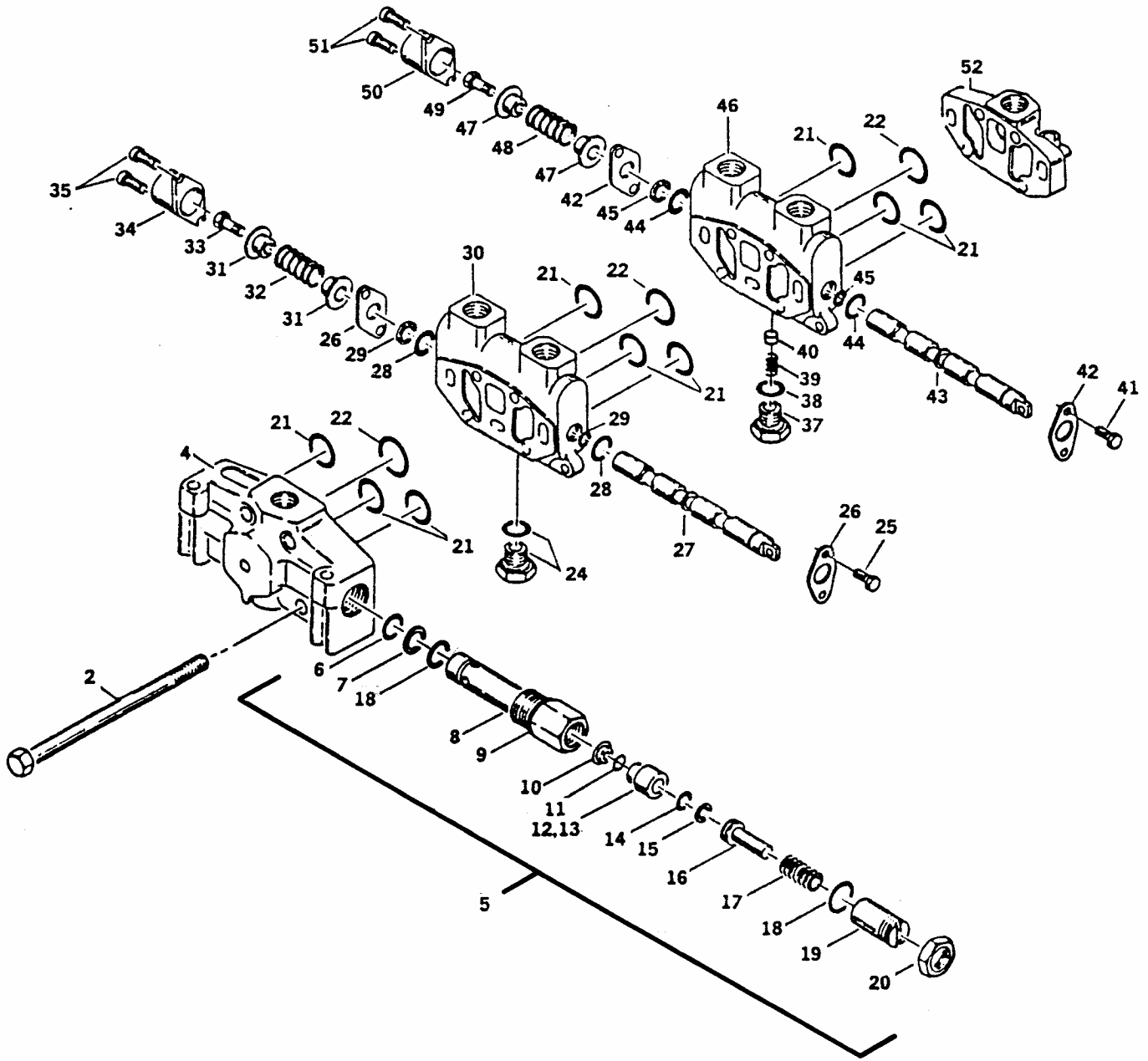
1. REMOVE ANY BURRS FROM FACES OF VALVE SECTIONS AND ENSURE ALL MATING SURFACES ARE CLEAN.

2. REASSEMBLE VALVE SECTION (30).
 - a. Install new packings onto plugs (24).
 - b. Install poppet (40), spring (39), new preformed packing (38) and check cap (37).
 - c. Install spool (27).
 - d. Install new preformed packings (28) and back-up rings (29) on both sides of spool. Retain on clevis end of spool with retainer plate (26) and screws (25).
 - e. Install retainer plate (26), spring guides (31) and spring (32). Secure with stripper bolt (33).
 - f. Install valve cap (34) and screws (35).
3. REASSEMBLE RELIEF VALVE (5).
 - a. Install new preformed packing (6) and back-up ring (7) into cartridge (8).
 - b. Install poppet (11) and retainer (10) into cartridge (8).
 - c. Install new floating seal (12) and check valve snubber (13).
 - d. Install new preformed packing (14) and back-up ring (15) on plunger (16).
 - e. Install plunger (16), spring (17), adjusting screw (19) with new preformed packing (18) into cartridge (8). Secure with locknut (20).
 - f. Install washer (9) and new preformed packing (18) on relief valve cartridge (8). Install relief valve (5) into inlet section (4).
4. POSITION SECTIONS TOGETHER WITH NEW PREFORMED PACKINGS (21) AND (22). SECURE ASSEMBLY WITH TIE BOLTS (2).

NOTE

Do not torque tie bolts at this time.

5. INSTALL CIRCUIT RELIEF VALVES IF APPLICABLE IN THEIR HOUSING.



CAUTION

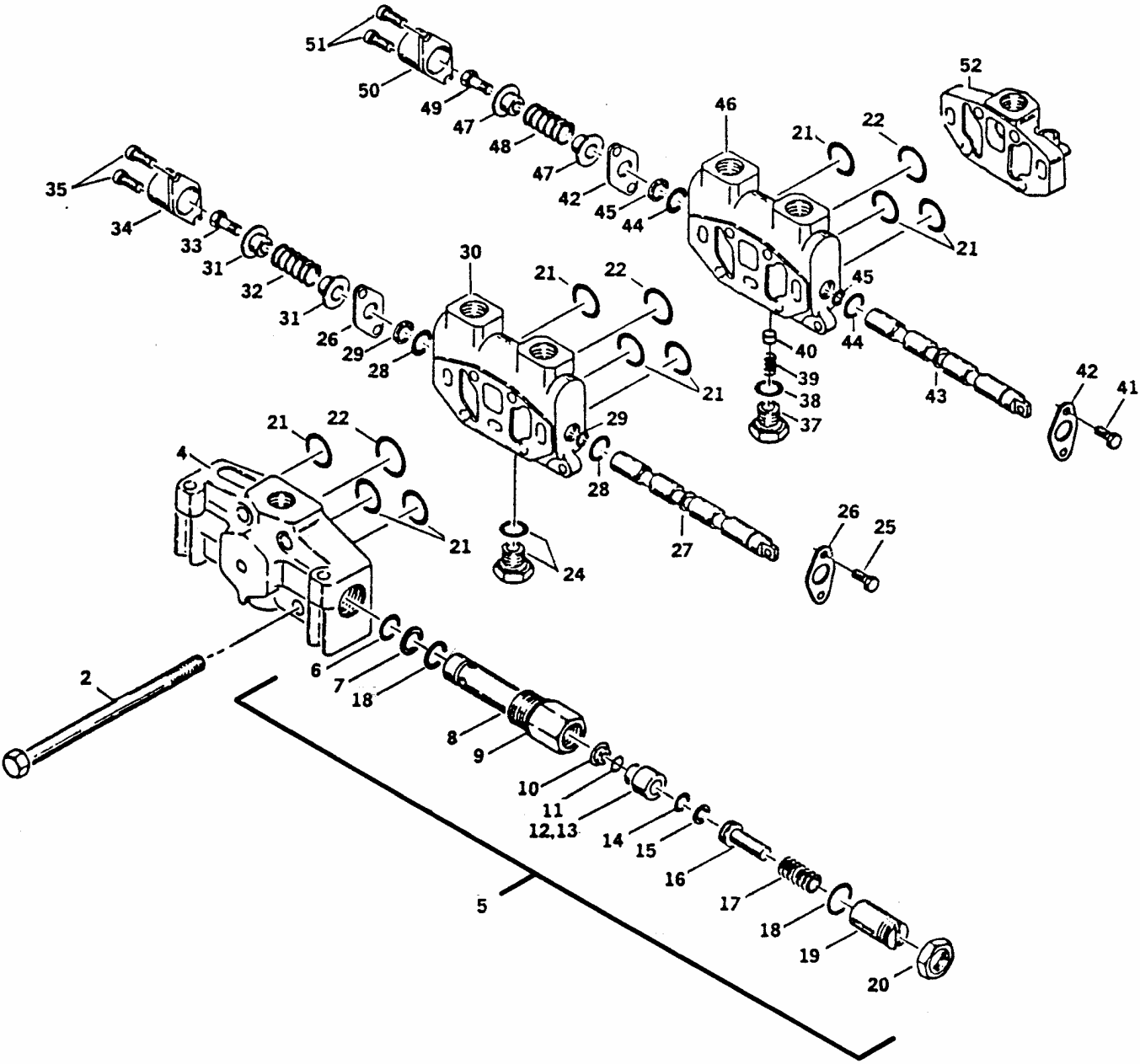
Ensure that all sections (inlet, housing, and outlet) are aligned prior to applying torque.

6. USING PROPER TORQUE WRENCH, TORQUE TIE BOLTS (2) TO 350 IN-LBS (39 NM) (A-20 VALVE) AND 400 IN-LBS (44 NM) (A-35 VALVE).

7. ACTUATE SPOOL TO ENSURE FREE MOVEMENT.

8. INSTALL CONTROL VALVE. (REFER TO TM 5-3810-306-20.)

END OF TASK



OIL COOLER BYPASS VALVE INSTALLATION (RT875CC)

TOOLS: General mechanic's tool kit: automotive (5180-00-177-7033)

SUPPLIES: Preformed packing (Item 198, Appendix B) (3 Required)
Preformed packing (Item 90, Appendix B) (3 Required)
Lockwashers (Item 38, Appendix B) (2 Required)
Lockwashers (Item 26, Appendix B) (2 Required)
Hydraulic oil (Item 8, Appendix B)

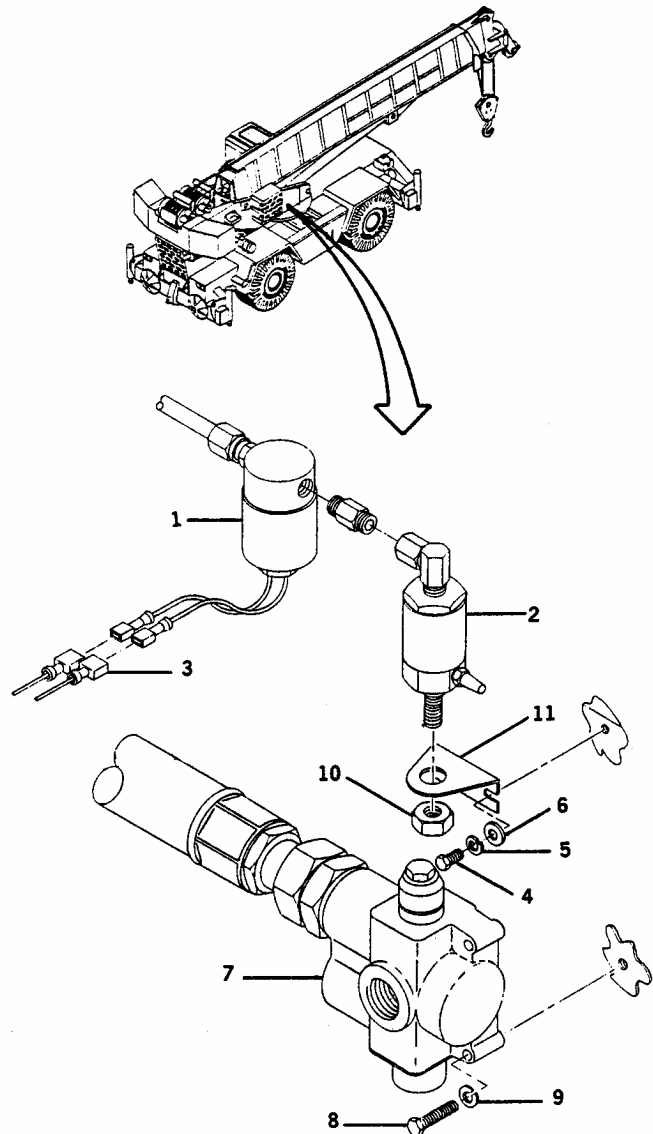
EQUIPMENT CONDITIONS: Hydraulic system shutdown and pressure relieved from lines.
(Refer to TM 5-3810-306-20.)
Negative battery cable disconnected at shunt.
(Refer to TM 5-3810-306-20.)

WARNING

Be sure to wear protective eye covering to avoid personal injury.

REMOVAL:

1. REMOVE SOLENOID VALVE (1) AND AIR CYLINDER (2).
 - a. Tag and disconnect two electrical connectors (3) from solenoid valve (1).
 - b. Tag and disconnect air line from solenoid valve (1).
 - c. Remove two capscrews (4), lockwashers (5) and flatwashers (6) and remove air cylinder (2), solenoid valve (1) and bracket (11).
 - d. Remove nut (10) and bracket (11) from air cylinder (2).
 - e. Remove fittings and separate valve (1) from air cylinder (2). Retain fittings for installation.
2. REMOVE BYPASS VALVE (7).
 - a. Tag and disconnect three hydraulic lines from bypass valve (7). Remove fittings and preformed packing. Discard preformed packing.
 - b. Remove two capscrews (8) and lockwashers (9). Remove bypass valve (7).



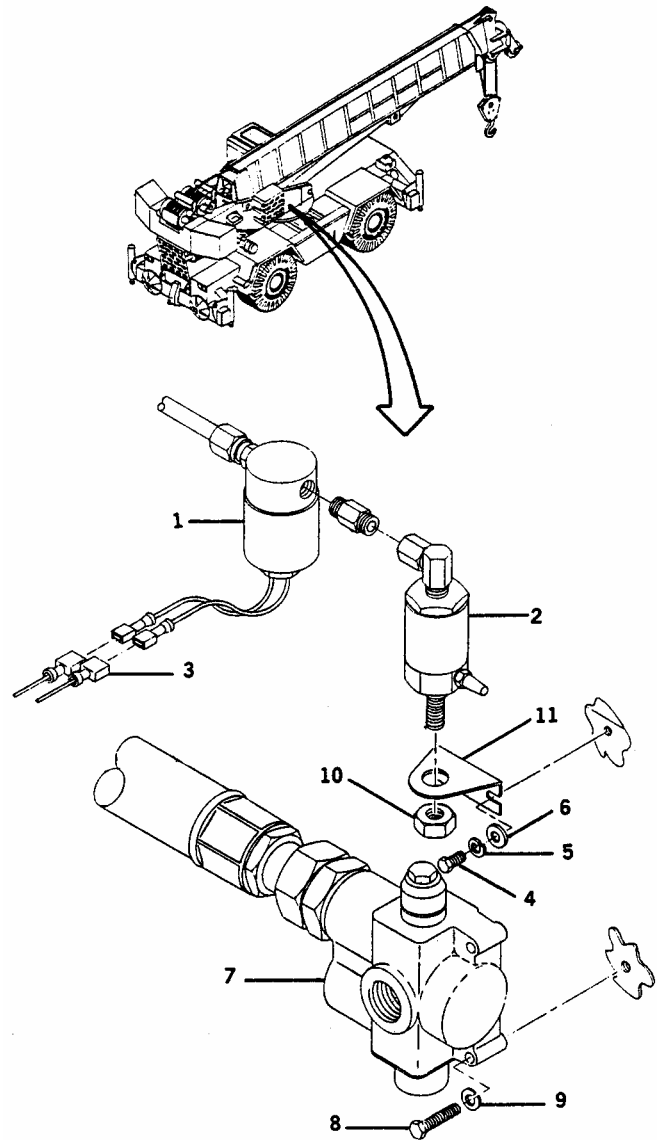
INSTALLATION:

1. INSTALL BYPASS VALVE (7).
 - a. Position bypass valve (7) and secure to superstructure with two capscrews (8) and lockwashers (9).

NOTE

Prior to connecting hydraulic lines, ensure that fitting threads are clean and free of contaminants. Do not remove any orange thread sealant if previously applied to the fitting(s). Then coat new preformed packings with clean hydraulic oil.

- b. Connect three tagged hydraulic lines, fittings and new preformed packing to bypass valve (7).
2. **INSTALL SOLENOID VALVE (1) AND AIR CYLINDER (2).**
 - a. Position air cylinder (2) in bracket (11) and secure with nut (10).
 - b. Connect solenoid valve (1) to air cylinder (2) with fittings.
 - c. Position air cylinder (2) above bypass valve (7) and secure bracket (11) to turntable with two capscrews (4), lockwashers (5) and flatwashers (6).
 - d. Connect tagged air line to solenoid valve (1).
 - e. Connect two tagged electrical connectors (3) to solenoid valve (1).
3. **CONNECT NEGATIVE BATTERY CABLE AT SHUNT. (REFER TO TM 5-3810-306-20.)**
4. **DRAIN AND FLUSH HYDRAULIC SYSTEM. (REFER TO PAGE 13-111.)**
5. **BLEED AIR FROM HYDRAULIC SYSTEM. (REFER TO PAGE 13-113.)**
6. **TEST FOR PROPER OPERATION.**

END OF TASK

OIL COOLER BYPASS VALVE INSTALLATION (RT875CCS)

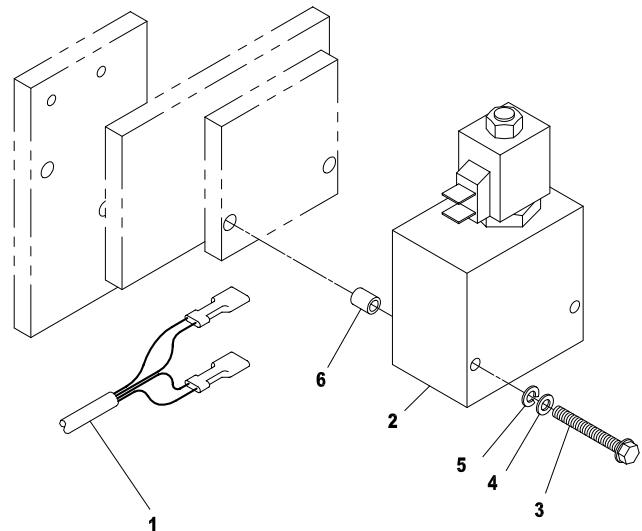
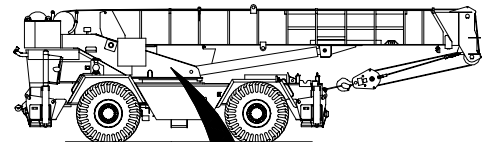
TOOLS: General mechanic's tool kit: automotive (5180-00-177-7033)

SUPPLIES: Preformed packing (Item 287, Appendix B) (2 Required)
Preformed packing (Item 288, Appendix B)
Preformed packing (Item 289, Appendix B)
Lockwashers (Item 290, Appendix B) (2 Required)
Hydraulic oil (Item 8, Appendix B)

EQUIPMENT CONDITIONS: Hydraulic system shutdown and pressure relieved from lines.
(Refer to TM 5-3810-306-20.)
Battery disconnect switch in off position.

REMOVAL:

1. REMOVE OIL COOLER BYPASS VALVE (2).
 - a. Tag and disconnect two electrical connectors (1) from solenoid on oil cooler bypass valve (2).
 - b. Tag and disconnect two hydraulic lines from oil cooler bypass valve (2). Remove fittings and preformed packing. Discard preformed packing.
 - c. Remove two capscrews (3), flatwashers (4), and lockwashers (5). Discard lockwashers (5).
 - d. Remove oil cooler bypass valve (2) and bushings (6). Retain bushings (6)



INSTALLATION:

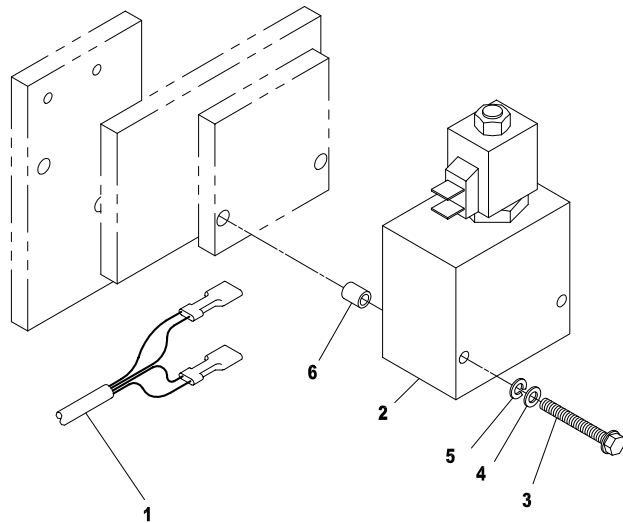
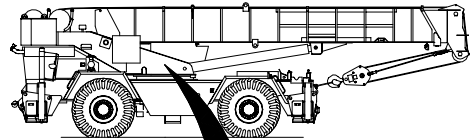
1. INSTALL OIL COOLER BYPASS VALVE (1).
 - a. Position oil cooler bypass valve (2) and bushings (6) and secure to superstructure with two capscrews (3), new lockwashers (5), and bushings (6).

NOTE

Prior to connecting hydraulic lines, ensure that fitting threads are clean and free of contaminants. Do not remove any orange thread sealant if previously applied to the fitting(s). Then coat new preformed packings with clean hydraulic oil.

- b. Connect two tagged hydraulic lines, fittings and new preformed packing to bypass valve (2).
 - c. Connect two tagged electrical connectors (1) to solenoid on oil cooler bypass valve (2).
3. TURN BATTERY DISCONNECT TO THE ON POSITION. (REFER TO TM 5-3810-306-10.)
 4. DRAIN AND FLUSH HYDRAULIC SYSTEM. (REFER TO PAGE 13-111.)
 5. BLEED AIR FROM HYDRAULIC SYSTEM. (REFER TO PAGE 13-113.)
 6. TEST FOR PROPER OPERATION.

END OF TASK



OUTRIGGER CONTROL VALVE ASSEMBLY

TOOLS: General mechanic's tool kit: automotive (5180-00-177-7033)
Lubrication Service, Unit Trailer Mounted (4930-00-017-9167)
Shop Equipment Auto-Maintenance and Repair, FM Basic (4910-00-754-0705)
Shop Equipment Auto-Maintenance and Repair, FM Suppl No. 1 (4910-00-754-0706)
Tool Outfit Hyd System; Test and Repair, 3/4 Ton Trailer Mtd (4940-01-036-5784)

SUPPLIES: Solvent, Cleaning P-D-680, Type III (Item 1, Appendix B)
Retainer, packing (Item 40, Appendix B) (3 Required)
Packing, preformed (Item 41, Appendix B)
Packing, preformed (Item 42, Appendix B)
Packing, preformed (Item 43, Appendix B)
Packing, preformed (Item 44, Appendix B)
Packing, preformed (Item 45, Appendix B)
Packing, preformed (Item 46, Appendix B) (3 Required)
Hydraulic oil (Item 8, Appendix B)

EQUIPMENT CONDITION: Outrigger control valve assembly removed.
(Refer to TM 5-3810-306-20.)

WARNING

Be sure to wear protective eye covering to avoid personal injury.

DISASSEMBLY:

1. DISASSEMBLE OUTRIGGER CONTROL VALVE BANK.

NOTE

The following procedures detail disassembly of one solenoid valve. The outrigger control valve bank consists of four identical solenoid valves. These procedures apply for all valves.

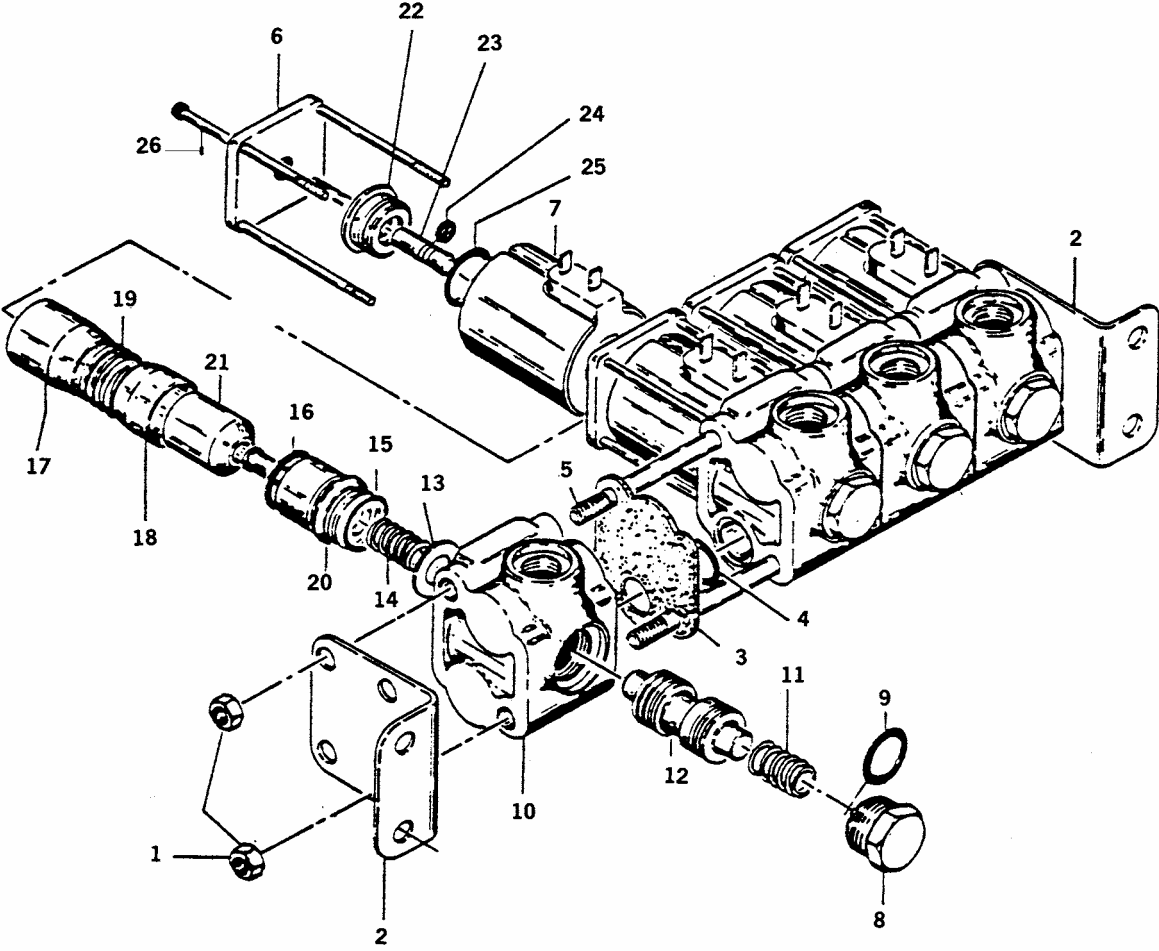
- a. Remove nuts (1) from each end of valve bank securing mounting brackets (2).
- b. Separate valve assemblies and remove three plates (3), three preformed packings (4) and two tie bolts (5). Discard packings (4).
- c. Remove fittings from valve assemblies and retain for reassembly.
- d. Remove four screws (26), plate (6) and solenoid coil (7) from valve assembly.
- e. Remove plug (8) and preformed packing (9) from valve body (10). Discard packing (9).

- f. Remove spring (11), spool (12), washer (13) and spring (14) from valve body (10).
- g. Remove plunger assembly from solenoid coil.
- h. Remove preformed packings (15) and (16), sleeves (17) and (18), spring (19) and cone (20) from plunger (21). Discard packings (15) and (16).
- i. Remove guide (22), pin (23), quad ring (24) and preformed packing (25). Discard packing (25).

CLEANING:

WARNING

Dry cleaning solvent P-D-680, Type III is toxic and flammable. Wear protective goggles and gloves and use only in a well ventilated area. Avoid contact with skin, eyes, and clothes and do not breathe vapors. Do not use near open flame or excessive heat. The flash point is 200°F (94°C). If you become dizzy while using cleaning solvent, get fresh air



WARNING (CONTD)

immediately and get medical aid. If contact with eyes is made, wash your eyes with water and get medical aid immediately.

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

INSPECTION:

1. INSPECT ALL PARTS FOR NICKS AND SCRATCHES, MINOR NICKS AND SCRATCHES MAY BE REMOVED WITH CROCUS CLOTH.

REASSEMBLY:

1. ASSEMBLE OUTRIGGER CONTROL VALVE.

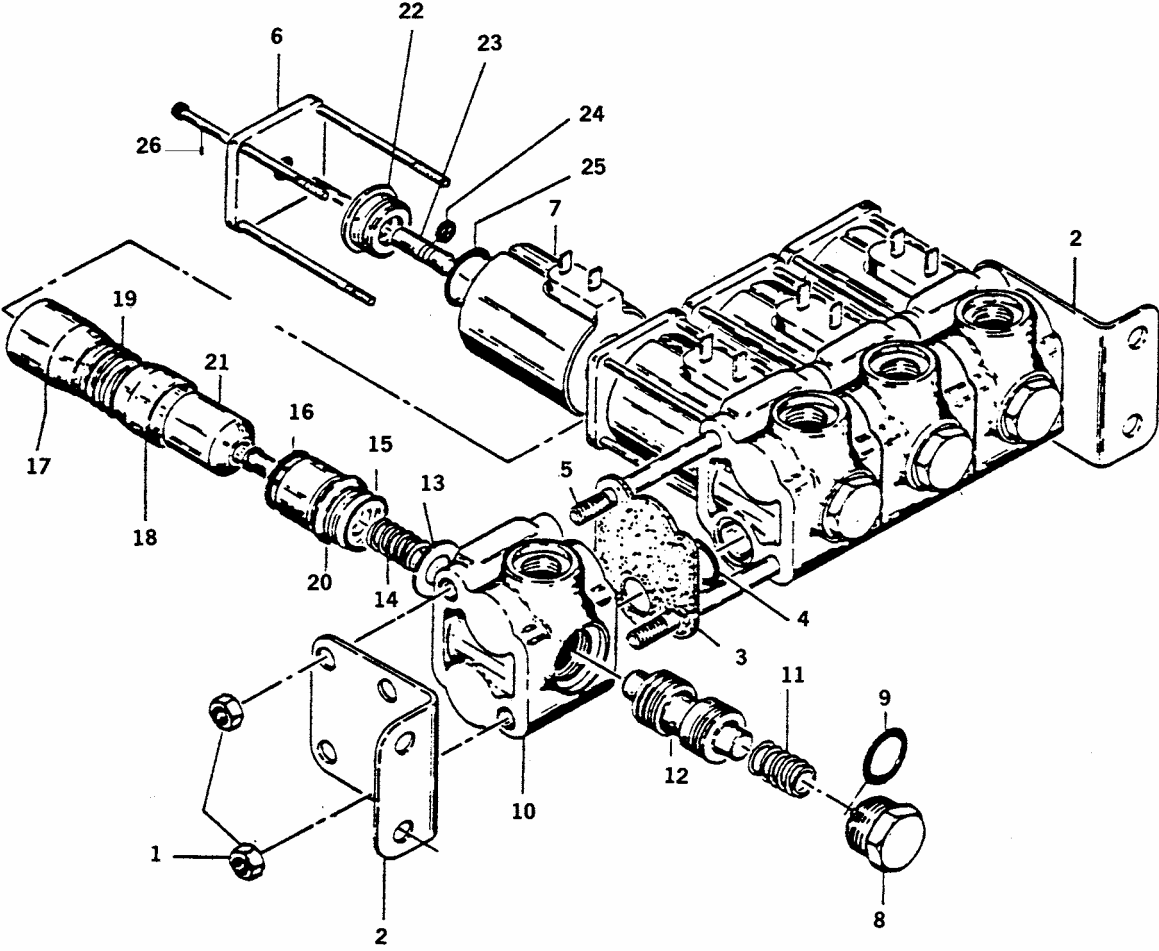
NOTE

Prior to connecting hydraulic lines, ensure that fitting threads are clean and free of contaminants. Do not remove any orange thread sealant if previously applied to the fitting(s).

Then coat new preformed packings with clean hydraulic oil.

- a. Install new preformed packings (15) and (16), sleeves (17) and (18), spring (19) and cone (20) on plunger (21) and insert in solenoid coil.
 - b. Install quad ring (24) on pin (23). Install pin (23), guide (22) and new preformed packing (25).
 - c. Install spring (11), washer (13), spool (12) and spring (14) in valve body.
 - d. Install new preformed packing (9) on plug (8) and tighten in end of valve body.
 - e. Position solenoid coil (7) on valve body and secure with plate (6) and four screws (26). Tighten screws.
 - f. Assemble valve bodies, plates (3) and new preformed packings (4) on tie bolts (5).
 - g. Position two mounting brackets (2) on each end of valve bank and secure with nuts (1). Torque nuts (1) to 125 in-lbs (14 Nm).
 - h. Install fittings on valves.
2. INSTALL CONTROL VALVE. (REFER TO TM 5-3810-306-20.)

END OF TASK



SWING CONTROL VALVE ASSEMBLY

TOOLS: General mechanic's tool kit: automotive (5180-00-177-7033)
Lubrication Service, Unit Trailer Mounted (4930-00-017-9167)
Shop Equipment Auto-Maintenance and Repair, FM Basic (4910-00-754-0705)
Shop Equipment Auto-Maintenance and Repair, FM Suppl No. 1 (4910-00-754-0706)
Tool Outfit Hyd System; Test and Repair, 3/4 Ton Trailer Mtd (4940-01-036-5784)

SUPPLIES: Packing assortment (Item 47, Appendix B)
Quad seal (Item 48, Appendix B) (2 Required)
Back-up ring (Item 49, Appendix B) (2 Required)
Solvent, Cleaning P-D-680 Type III (Item 1, Appendix B)
Hydraulic oil (Item 8, Appendix B)

EQUIPMENT CONDITION: Control valve removed. (Refer to TM 5-3810-306-20.)

WARNING

Be sure to wear protective eye covering to avoid personal injury.

DISASSEMBLY:

1. REMOVE FITTINGS FROM VALVE BANK AS REQUIRED. SAVE FOR INSTALLATION.
 2. REMOVE TIE BOLTS (2) SECURING VALVE SECTIONS TOGETHER. SEPARATE SECTIONS AND REMOVE PREFORMED PACKINGS (16) AND (17).
 3. REMOVE RELIEF VALVE (5) FROM INLET SECTION (4).
- a. Remove two screws (31) and valve cap (30).
 - b. Remove stripper bolt (29), spring guides (27) and spring (28).
 - c. Remove two screws (21) and retainer plates (22).
 - d. Remove quad seals (24), back-up rings (25) and spool (23) from valve body.
 - e. Remove plug and packing (20) from unused port.
 - f. Remove check valves (32).

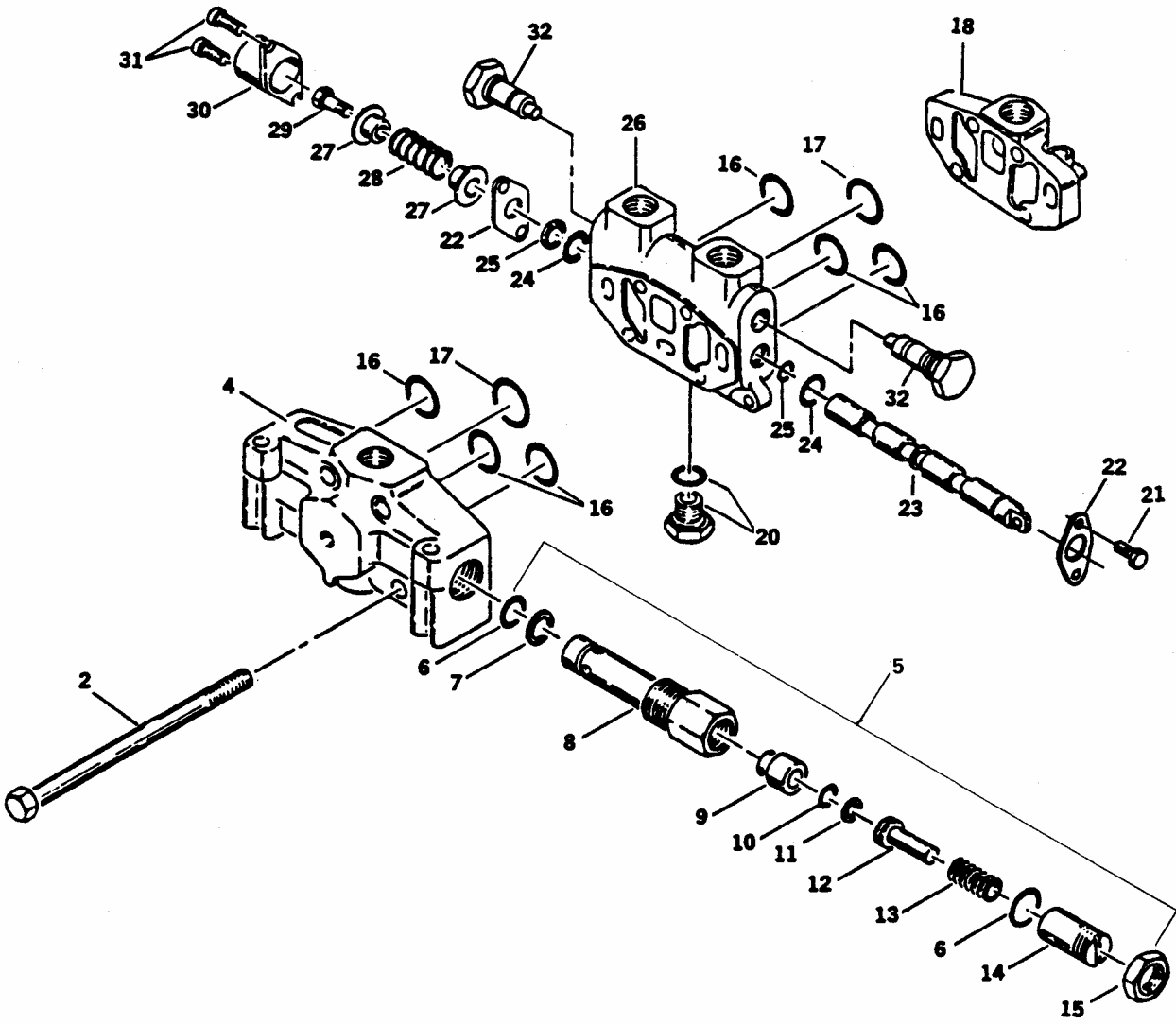
NOTE

Keeping preformed packings and rings in order during disassembly will aid in reassembly.

CLEANING:

WARNING

4. DISASSEMBLE RELIEF VALVE (5).
 - a. Remove preformed packing (6) and washer (7) from cartridge (8).
 - b. Remove lock nut (15), adjusting screw (14), preformed packing (6), spring (13) and plunger (12).
 - c. Remove preformed packing (10) and back-up ring (11) from plunger (16).
 - d. Remove seat (9).
 5. DISASSEMBLE VALVE SECTION (26).
- Dry cleaning solvent P-D-680, Type III is toxic and flammable. Wear protective goggles and gloves and use only in a well ventilated area. Avoid contact with skin, eyes, and clothes and do not breathe vapors. Do not use near open flame or excessive heat. The flash point is 200° F (94° C). If you become dizzy while using cleaning solvent, get fresh air immediately and get medical aid. If contact with eyes is made, wash your eyes with water and get medical aid immediately.



WARNING

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

1. CLEAN PARTS IN SOLVENT P-D-680, TYPE III AND BLOW DRY WITH COMPRESSED AIR.

INSPECTION:

1. INSPECT SPOOL BORE FOR CRACKS, PITTING SCORING AND WEAR. REPLACE AS NECESSARY.
2. INSPECT SPOOL FOR SCORING AND WEAR. REPLACE AS NECESSARY.

REASSEMBLY:

NOTE

Install new packings and seals on or in all component parts.

Prior to connecting hydraulic lines, ensure that fitting threads are clean and free of contaminants. Do not remove any orange thread sealant if previously applied to the fitting(s). Then coat new preformed packings with clean hydraulic oil.

1. REMOVE ANY BURRS FROM FACES OF VALVE SECTIONS AND ENSURE ALL MATING SURFACES ARE CLEAN.
2. REASSEMBLE VALVE SECTION (26).
 - a. Install new packing onto plug (20).
 - b. Install spool (23).
 - c. Install new quad seals (24) and back-up rings (25) on both sides of spool. Retain on clevis end of spool with retainer plate (22) and screws (21).
 - d. Install retainer plate (22), spring guides (27) and spring (28). Secure with stripper bolt (29).

- e. Install valve cap (30) and screws (31).
3. REASSEMBLE RELIEF VALVE (5).
 - a. Install seat (9).
 - b. Install new preformed packing (10) and back-up ring (11) on plunger (12).
 - c. Install plunger (12), spring (13), adjusting screw (14) with new preformed packing (6) into cartridge (8). Secure with locknut (15).
 - d. Install washer (7) and new preformed packing (6) on relief valve cartridge (8). Install relief valve (5) into inlet section (4).
4. POSITION SECTIONS TOGETHER WITH NEW PREFORMED PACKINGS (16) AND (17). SECURE ASSEMBLY WITH TIE BOLTS (2).

NOTE

Do not torque tie bolts at this time.

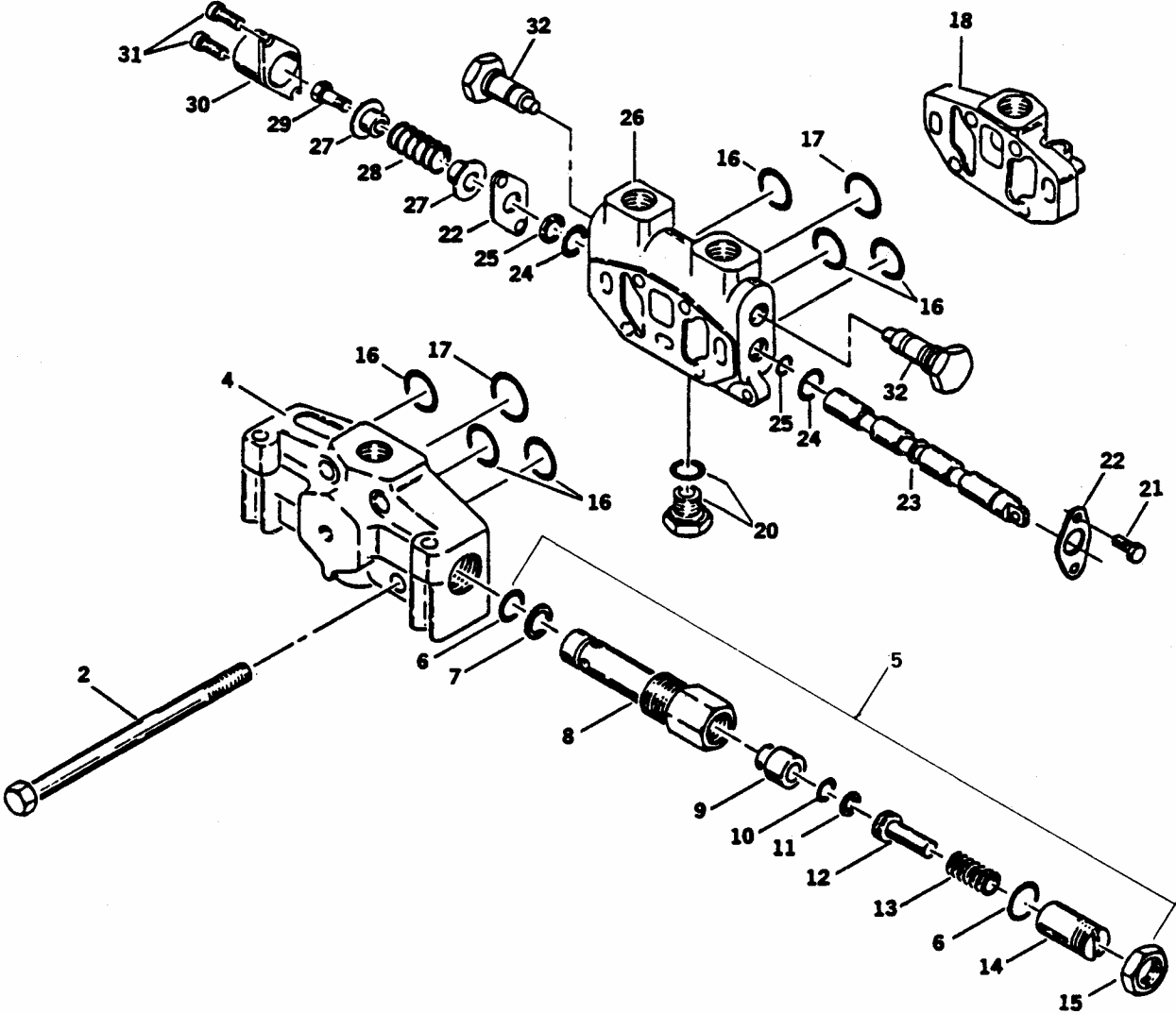
5. INSTALL CHECK VALVES (32).

CAUTION

Ensure that all sections are aligned prior to applying torque.

6. USING PROPER TORQUE WRENCH, TORQUE TIE BOLTS (2) TO 350 IN-LBS (39 NM) (A-20 VALVE) AND 400 IN-LBS (44 NM) (A-35 VALVE).
7. INSTALL FITTINGS AS REQUIRED.
8. INSTALL PLUG (20) AND TIGHTEN UNTIL BOTTOMED.
9. ACTUATE SPOOL TO ENSURE FREE MOVEMENT.
10. INSTALL CONTROL VALVE. (REFER TO TM 5-3810-306-20.)
11. TEST FOR PROPER OPERATION AND INSPECT FOR LEAKS.

END OF TASK



TRANSMISSION CONTROL VALVE ASSEMBLY

TOOLS: General mechanic's tool kit: automotive (5180-00-177-7033)

SUPPLIES: Hydraulic oil (Item 8, Appendix B)
Preformed packing (Item 60, Appendix B) (2 Required)
Seal (Item 59, Appendix B) (2 Required)
Washer (Item 61, Appendix B)
Lockwasher (Item 26, Appendix B)
Gasket (Item 62, Appendix B)

EQUIPMENT CONDITIONS: Transmission control valve removed.
(Refer to TM 5-3810-306-20.)

WARNING

Be sure to wear protective eye covering to avoid personal injury.

DISASSEMBLY:

1. DISASSEMBLE TRANSMISSION CONTROL VALVE.
 - a. Remove fittings from valve and save for installation.
 - b. Remove neutral safety switch (13) and ball (12) from valve body (3).
 - c. Remove plug (22), washer (21), spring (20) and ball (19) from bolt head side of valve.
 - d. Remove nine bolts (23) and lockwashers (24) which secure valve plates (3) together.
 - e. Remove snap ring (5) and washer (6) which secure control spool (7) located near neutral safety switch port. Remove the spool (7).
 - f. Remove snap ring (5), washer (6) and spacer (18) from other spool (8) and remove spool (8) and plug (9).

CLEANING:

1. CLEAN ALL PARTS IN SOLVENT P-D-680, TYPE III AND BLOW DRY WITH AIR.

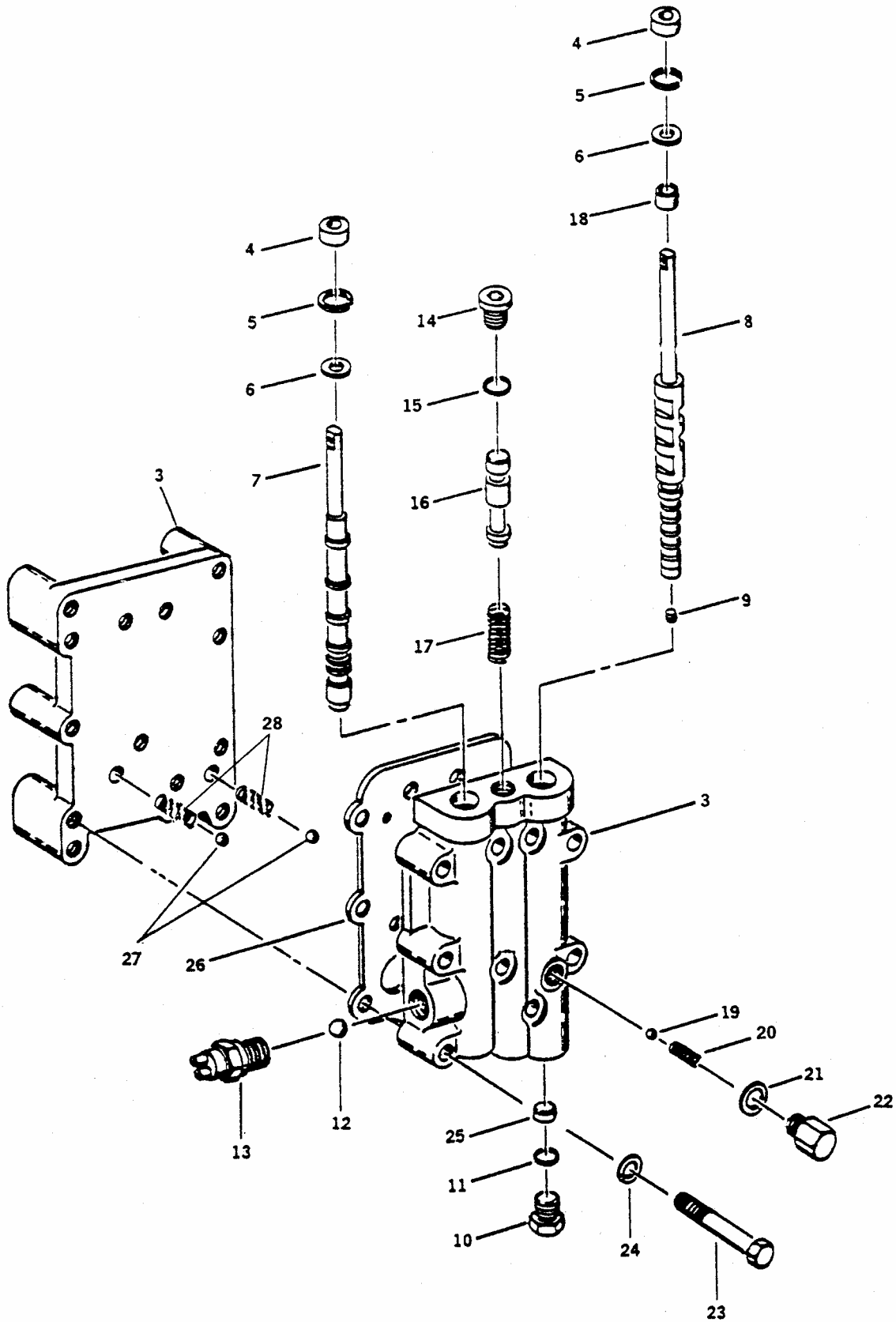
WARNING

Dry cleaning solvent P-D-680, Type III is toxic and flammable. Wear protective goggles and gloves and use only in a well ventilated area. Avoid contact with skin, eyes, and clothes and do not breathe vapors. Do not use near open flame or excessive heat. The flash point is 200°F (94°C). If you become dizzy while using cleaning solvent, get fresh air immediately and get medical aid. If contact with eyes is made, wash your eyes with water and get medical aid immediately. Compressed air used for cleaning purposes will not exceed 30 psi. Use only with effective chip guarding and personal protective equipment (goggles/shield, gloves, etc.).

NOTE

When separating plates, take care not to lose detent balls (27) and springs (28).

- e. Separate plate and remove detent balls (27), springs (28) and gasket (26).
- f. Remove plug (10), packing (11) and spacer (25) from base of valve. Discard packing (11).
- g. Rotate valve body so spools are visible. Remove center plug (14), packing (15), spool (16) and spring (17). Discard packing (15).
- h. Remove and discard oil seals (4) from two spool shafts.



INSPECTION:

1. INSPECT PARTS FOR DAMAGE AND REPLACE AS NECESSARY. MINOR NICKS OR SCRATCHES MAY BE REMOVED WITH CROCUS CLOTH.

REASSEMBLY:

1. REASSEMBLE TRANSMISSION CONTROL VALVE.

NOTE

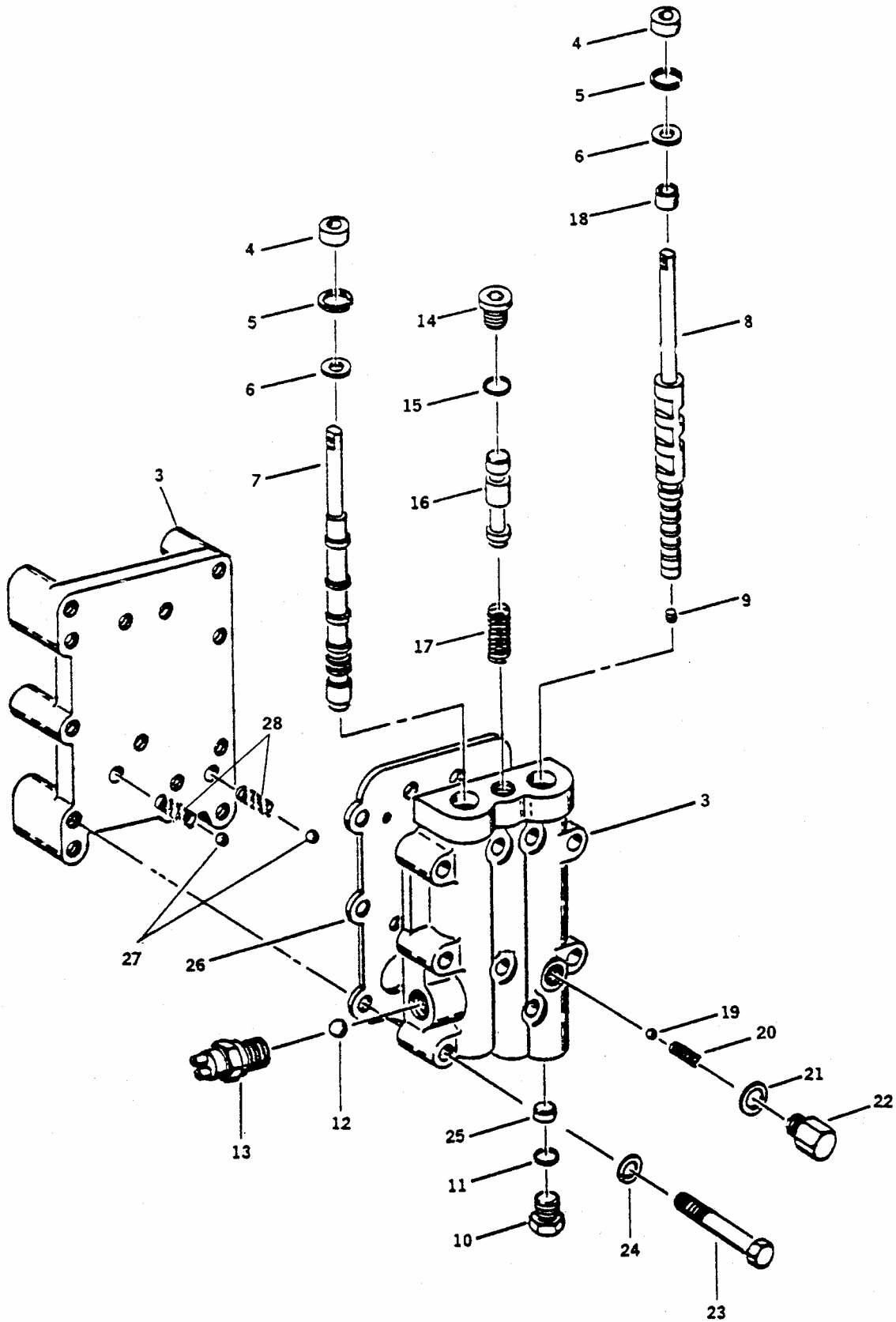
Replace all seals, gaskets, and packings at assembly with new parts.

Prior to connecting hydraulic lines, ensure that fitting threads are clean and free of contaminants. Do not remove any orange thread sealant if previously applied to the fitting(s). Then coat new preformed packings with clean hydraulic oil.

- a. Install bottom plug (10), new packing (11) and spacer (25) into bottom of valve.

- b. Install center spool spring (17), center spool (16), new packing (15) and plug (14).
 - c. Install spool (7) closest to neutral safety switch port. Secure in place using washer (6) and snap ring (5).
 - d. Install other spool (8) by installing plug (9), spool (8), spacer (18), washer (6), and snap ring (5).
 - e. Install new oil seals (4) and seat using an oil seal installer or a deep-well socket of appropriate size.
 - f. Install gasket (26) on valve body plate.
 - g. Install detent balls (27) and springs (28) and place the other plate onto valve body and secure it in place with nine bolts (23) and lockwashers (24).
 - h. Install ball (12) and neutral safety switch (13).
 - i. Install ball (19), spring (20), washer (21) and plug (22) into bolt head side of valve.
 - j. Install fittings in valve.
2. INSTALL TRANSMISSION CONTROL VALVE. (REFER TO TM 5-3810-306-20.)

END OF TASK



Section III. HYDRAULIC CYLINDERS MAINTENANCE

AXLE LOCKOUT CYLINDER INSTALLATION

TOOLS: General mechanic's tool kit: automotive (5180-00-177-7033)

SUPPLIES: Cotter pins (Item 56, Appendix B)

EQUIPMENT CONDITIONS: Negative battery cable disconnected at shunt. (RT875CC)
 (Refer to TM 5-3810-306-20.)
 Battery disconnect switch in off position. (RT875CCS)
 Hydraulic system shut down and pressure relieved from lines.
 (Refer to TM 5-3810-306-20.)

WARNING

Be sure to wear protective eye covering to avoid personal injury.

REMOVAL:

1. REMOVE LOCKOUT CYLINDER (1).
 - a. Tag and disconnect two hydraulic lines from lockout cylinder (1). Cap or plug lines and openings.
 - b. Remove locknut (2), capscrew (3), flatwasher (4) and cotter pin (5) securing retaining shaft (6) at base end of lockout cylinder (1). Discard cotter pin (5).
 - c. Tap out retaining shaft (6). Swing lockout cylinder out of mounting gusset.
 - c. Rotate lockout cylinder up and position base end of lockout cylinder between mounting gussets on frame. Tap in retaining shaft (6).
 - d. Remove tags and caps and connect two hydraulic lines to appropriate ports on lockout cylinder.
2. CONNECT NEGATIVE BATTERY CABLE AT SHUNT. (REFER TO TM 5-3810-306-20.) (RT875CC)
3. DRAIN AND FLUSH HYDRAULIC SYSTEM. (REFER TO PAGE 13-111.)

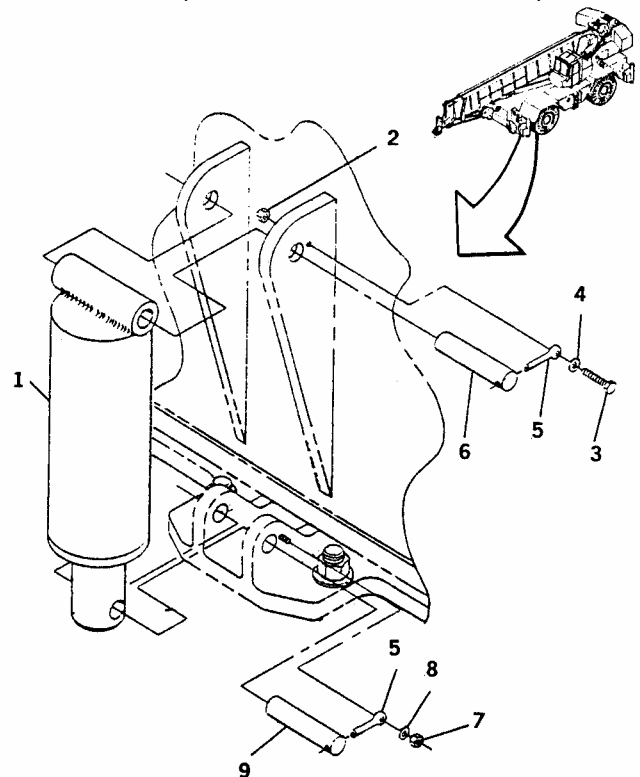
NOTE

Lockout cylinder weighs 87 lbs (39.5 Kg).

- d. Remove locknut (7), flatwasher (8) and cotter pin (5) securing retaining shaft at rod end of lockout cylinder. Discard cotter pin (5).
- e. Tap out retaining shaft (9) and remove lockout cylinder (1).

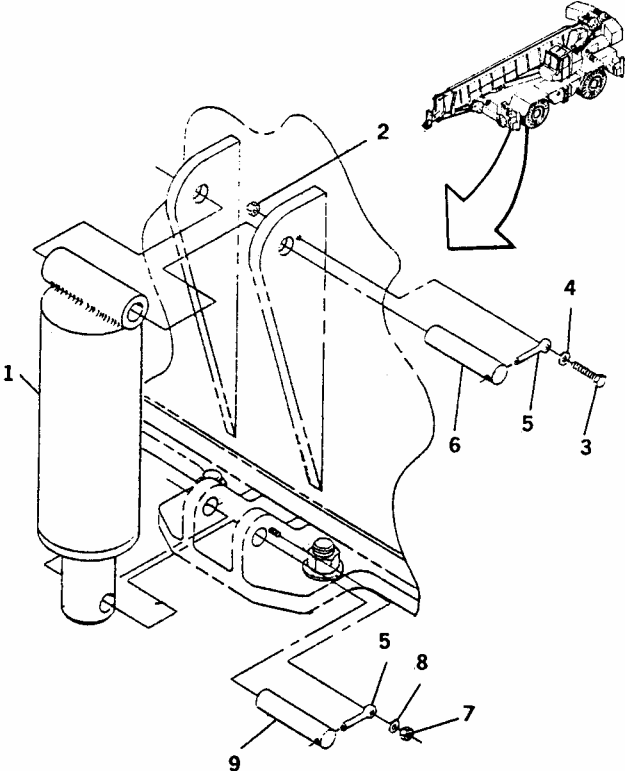
INSTALLATION:

1. INSTALL LOCKOUT CYLINDER (1).
 - a. Align rod end of lockout cylinder (1) between mounting lugs on fifth wheel and tap in retaining shaft (9).
 - b. Install new cotter pin (5) through hole in retaining shaft (6) and secure to the stud with flatwasher (8) and locknut (7).



- 4. BLEED AIR FROM HYDRAULIC SYSTEM.
(REFER TO PAGE 13-113.)
- 5. TEST FOR PROPER OPERATION AND
INSPECT FOR LEAKS.

END OF TASK



AXLE LOCKOUT CYLINDER ASSEMBLY

TOOLS: General mechanic's tool kit: automotive (5180-00-177-7033)
Shop Equipment Auto-Maintenance and Repair, FM Basic (4910-00-754-0705)
Shop Equipment Auto-Maintenance and Repair, FM Suppl No. 1 (4910-00-754-0706)
Tool Outfit Hyd System, Test and Repair, 3/4 Ton Trailer Mtd (4940-01-036-5784)

SUPPLIES: Parts kit (Item 63, Appendix B)
Loctite #271 (Item 23, Appendix B)
Hydraulic oil (Item 8, Appendix B)
Solvent, Cleaning P-D-680, Type III (Item 1, Appendix B)
NEVER-SEEZ (Item 24, Appendix B)

EQUIPMENT CONDITIONS: Axle lockout cylinder assembly removed. (Refer to page 13-82.)

WARNING

Be sure to wear protective eye covering to avoid personal injury.

DISASSEMBLY:

NOTE

Any maintenance requiring disassembly of cylinder should include replacement of all cylinder seals.

1. REMOVE AND DISASSEMBLE PISTON AND ROD ASSEMBLY (14).
 - a. Remove setscrew (2) at rod end of cylinder.

WARNING

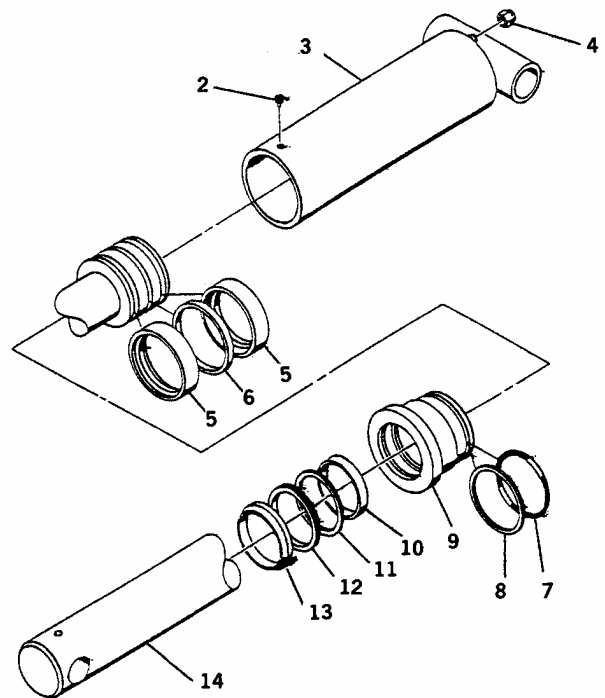
Do not use air pressure to remove cylinder rod assembly. Use only a source of controlled hydraulic oil pressure if rod assembly is hard to remove.

Exercise extreme care when handling or setting down cylinder rod. Do not damage the chrome surface.

- b. Unscrew head (9) and remove cylinder rod assembly from cylinder barrel (3). Cover barrel to avoid contamination.

CAUTION

When removing seals and rings, avoid scratching grooved and gland surfaces.



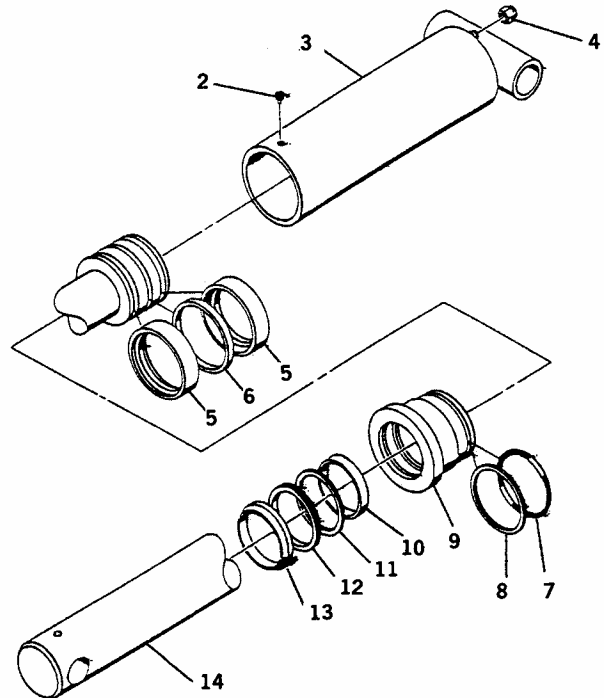
NOTE

Aligning discarded seals and rings in order of disassembly will facilitate installation of new items.

- c. Remove seals (5) and ring (6) from outside of piston.

2. REMOVE HEAD (9) FROM ROD AND PISTON (14). REMOVE SEALS FROM HEAD.
 - a. Remove packing (7) and back-up ring (8) from outside of head.
 - b. Remove wear ring (10), rod seal (12) and buffer seal (11) from inside of head.
 - c. Remove wiper seal (13) from head.
 - d. If necessary, remove cap (4).

3. CLEAN WITH SOLVENT AND DRY WITH COMPRESSED AIR ANY PARTS THAT HAVE BEEN STONED AND POLISHED.



CLEANING AND INSPECTION:

WARNING

Dry cleaning solvent P-D-680, Type III is toxic and flammable. Wear protective goggles and gloves and use only in a well ventilated area. Avoid contact with skin, eyes, and clothes and do not breathe vapors. Do not use near open flame or excessive heat. The flash point is 200°F (94°C). If you become dizzy while using cleaning solvent, get fresh air immediately and get medical aid. If contact with eyes is made, wash your eyes with water and get medical aid immediately.

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

1. CLEAN ALL PARTS WITH SOLVENT AND DRY WITH COMPRESSED AIR. INSPECT ALL PARTS FOR SERVICEABILITY.

CAUTION

Before installing new seals and rings, clean all surfaces and carefully remove burrs and nicks. Parts displaying excessive wear or damage should be replaced.

2. STONE OUT MINOR BLEMISHES AND POLISH WITH A FINE CROCUS CLOTH.

4. INSPECT BARREL CAREFULLY FOR SCORING.

REASSEMBLY:

CAUTION

When installing new seals and rings, avoid stretching seals or scratching the grooved or gland surfaces.

NOTE

Lubricate new seals and rings with clean hydraulic oil.

NOTE

Ensure the packing portion of the rod seal is installed forward as head would enter barrel.

1. INSTALL NEW SEALS ON HEAD (9).
INSTALL HEAD.

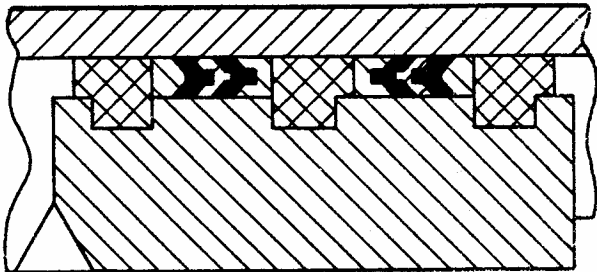
 - a. Install wear ring (10), rod seal (12) and buffer seal (11) into inside of head.
 - b. Fit wiper seal (13) into head.

NOTE

Ensure packing is installed forward of back-up ring as head would enter barrel.

 - c. Install packing (7) and backup ring (8) onto outside of head.
 - d. Lubricate rod (13) with clean hydraulic oil.
 - e. Install head (9) onto rod (14).

2. INSTALL NEW SEALS (5) AND RING (6) ON PISTON. ENSURE SEAL ASSEMBLY IS INSTALLED AS SHOWN.



3. INSTALL ROD (14) INTO BARREL (3).

 - a. Remove cover from cylinder barrel.

CAUTION

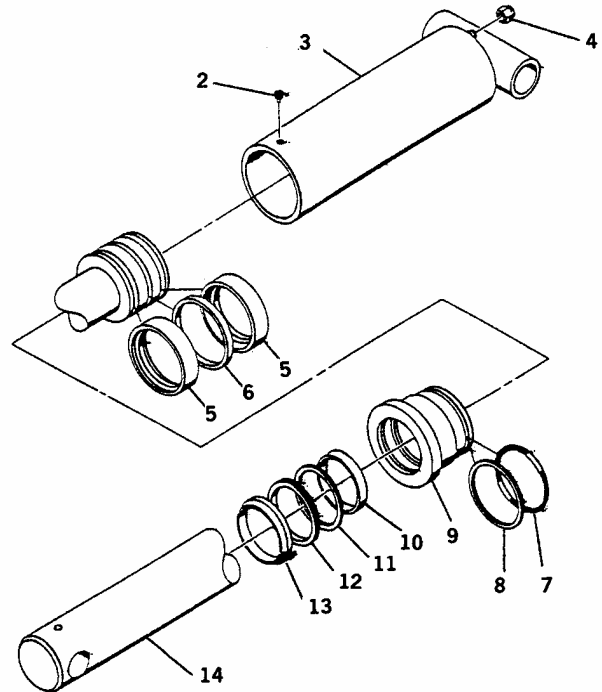
Avoid scratching or damaging grooved or gland surfaces or rings and seals.

 - b. Lubricate cylinder rod assembly with clean hydraulic oil and install rod assembly into cylinder with a light twisting motion.

4. CLEAN OIL FROM THREADS OF HEAD (9). COAT THREADS WITH NEVER-SEEZ (PASTE TYPE) LUBRICANT.

 - a. Screw head (9) into barrel (3).
 - b. Using strap wrench, tighten head securely until the setscrew holes align.

5. IF EXISTING HEAD (9) AND BARREL (3) ARE TO BE USED, PROCEED AS FOLLOWS:



 - c. Apply Loctite #271 to setscrew (2) and install setscrew.

6. IF NEW HEAD (9) OR BARREL (3) IS TO BE USED, PROCEED AS FOLLOWS:

 - a. Screw head (9) into barrel (3).
 - b. Using a strap wrench, tighten head securely.
 - c. If necessary, drill 0.265-in. diameter hole 3/16 in. (max) deep in head.

NOTE

Setscrew (2) when installed should be flush with barrel.

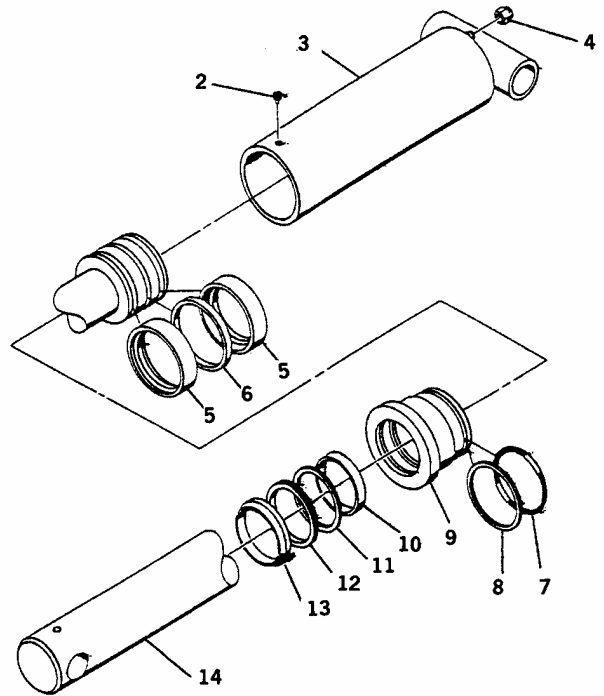
- d. Clean drilled hole of chips and debris.
 - e. Apply Loctite #271 to setscrew (2) and install setscrew.
7. IF REMOVED, INSTALL CAP (4).

WARNING

Do not use air pressure to cycle or pressurize cylinder.

- 8. PRESSURIZE AND CYCLE CYLINDER. CHECK FOR PROPER OPERATION AND ANY LEAKAGE.
- 9. INSTALL AXLE LOCKOUT CYLINDER. (REFER TO PAGE 13-82.)

END OF TASK



LIFT CYLINDER INSTALLATION

TOOLS: General mechanic's tool kit: automotive (5180-00-177-7033)

SUPPLIES: None

EQUIPMENT CONDITIONS: Outriggers fully extended and lowered.
(Refer to TM 5-3810-306-10.)
Swing lock engaged. (Refer to TM 5-3810-306-10.)

WARNING

Be sure to wear protective eye covering to avoid personal injury.

REMOVAL:

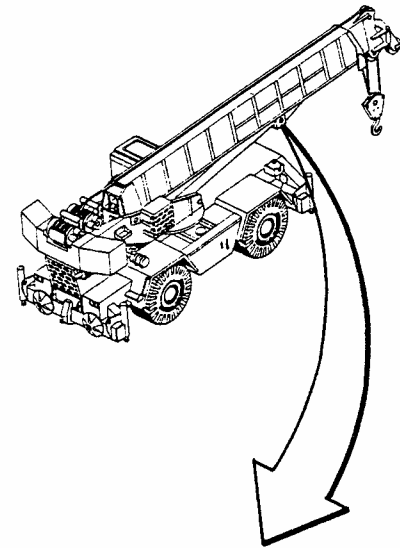
1. RAISE AND SUPPORT BOOM.

- a. Raise boom enough so lift cylinder (1) end will be able to be removed from boom mounting bracket.
- b. Support weight of boom with a suitable lifting device, (i.e., another crane or overhead hoist).

2. REMOVE LIFT CYLINDER.

- a. Remove rod end pivot shaft capscrew (2), hardened washer (3) and retainer block (4).
- b. Block up lift cylinder (1).
- c. Remove shaft (9).
- d. Tag and disconnect small equalizer line from lift cylinder. Plug or cap line and opening.

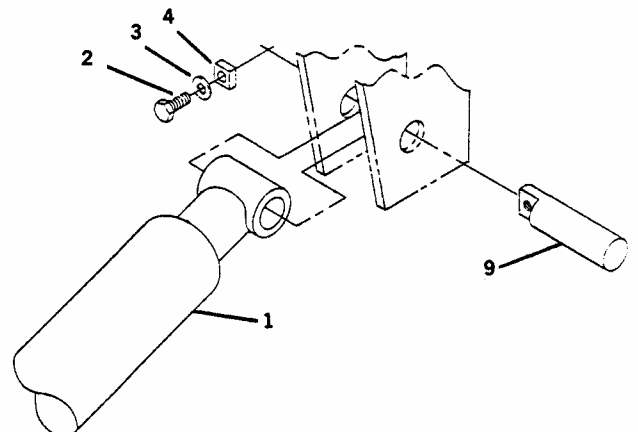
- h. Remove hydraulic lines from lift cylinder. Remove fittings. Cap or plug all lines and openings.
- i. Remove two capscrews (5) and flatwashers (6) from lift cylinder pivot shaft cap (7).



CAUTION

Failure to remove equalizer line from lift cylinder will result in both cylinders retracting. Removing equalizer line will allow only the disconnected lift cylinder to retract.

- e. Start crane and retract lift cylinder from boom mounting.
- f. Disconnect negative battery cable at shunt. (Refer to TM 5-3810-306-20.) (RT875CC) Battery disconnect switch in off position. (RT875CCS)
- g. Attach suitable lifting device to lift cylinder.



- j. Slide pivot shaft (8) towards cap end enough to clear hole in superstructure.
- k. Remove lift cylinder (1) and pivot shaft (8).

INSTALLATION:

1. INSTALL LIFT CYLINDER.

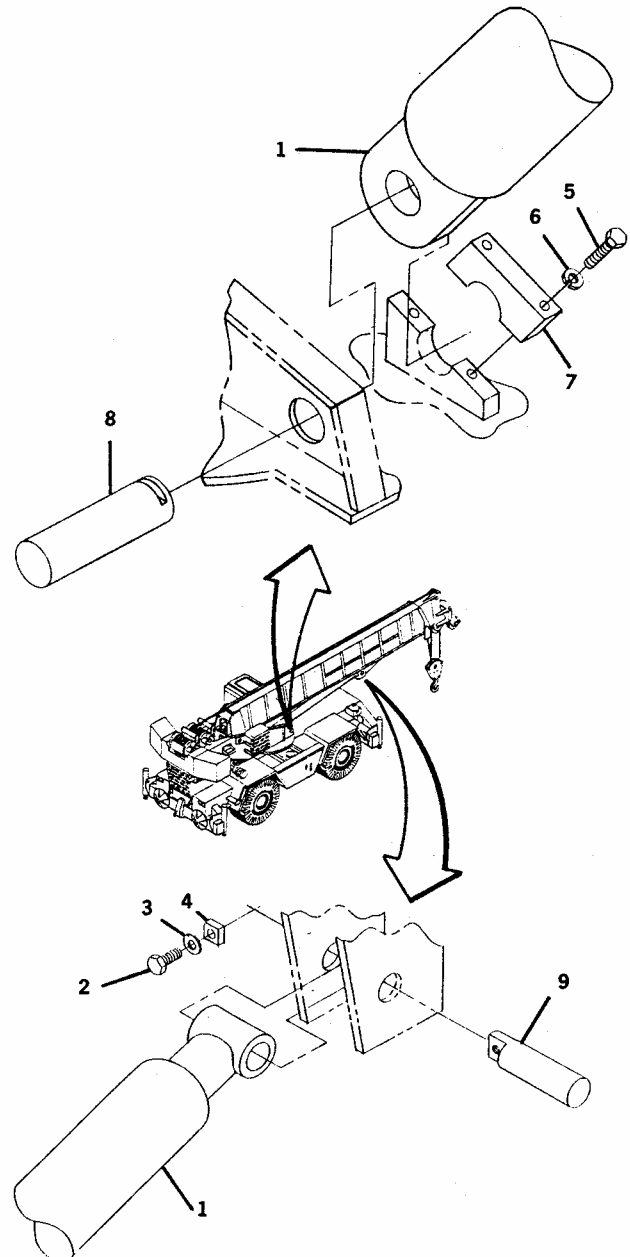
- a. Attach suitable lifting device to lift cylinder.
- b. Insert pivot shaft (8) into base end of lift cylinder (1) and position cylinder and shaft into hole in superstructure.
- c. Install pivot shaft cap (7) and secure with flatwashers (6) and capscrews (5).
- d. Block up lift cylinder.
- e. Connect all tagged hydraulic hoses to lift cylinder with exception of equalizer line.
- f. Connect negative battery cable at shunt. (Refer to TM 5-3810-306-20.) (RT875CC)
- g. Start crane and extend lift cylinder until rod end holes line up with holes in boom mounting. Shut down crane.
- h. Install pivot shaft (9) and secure with retainer block (4), hardened washer (3) and capscrew (2).
- i. Remove caps and connect equalizer line.
- j. Start crane and extend lift cylinders, remove blocking and boom support.

2. DRAIN AND FLUSH HYDRAULIC SYSTEM. (REFER TO PAGE 13-111.)

3. BLEED AIR FROM HYDRAULIC SYSTEM (REFER TO PAGE 13-113.)

4. TEST FOR PROPER OPERATION AND INSPECT FOR LEAKS.

END OF TASK



LIFT CYLINDER ASSEMBLY

TOOLS: General mechanic's tool kit: automotive (5180-00-177-7033)

SUPPLIES: Parts kit (Item 21, Appendix B)
Loctite #271 (Item 23, Appendix B)
Never-Seez (Item 24, Appendix B)
Hydraulic oil (Item 8, Appendix B)
Packing (Item 22, Appendix B)

EQUIPMENT CONDITIONS: Lift cylinder removed. (Refer to page 13-88.)

DISASSEMBLY:

1. REMOVE HOLDING VALVE (1) FROM PORT BLOCK. (REFER TO PAGE 13-96.)
2. REMOVE CYLINDER HEAD (14) AND CYLINDER ROD (18).
 - a. Remove setscrew (2) and unscrew head (14). Slide head clear of barrel. Drain hydraulic oil from cylinder.

WARNING

Be sure to wear protective eye covering to avoid personal injury.

Do not use air pressure to remove cylinder rod assembly. Use only a source of controlled hydraulic oil pressure if rod assembly is hard to remove.

CAUTION

Exercise extreme care when handling or setting down the cylinder rod (18).

- b. Withdraw cylinder rod (18) assembly from barrel, and move it to a clean work area.

NOTE

It is advisable to cover cylinder barrel opening to avoid contamination.

- c. Secure cylinder rod (18) to prevent it from moving. Remove seals (5) and ring (6) from outside of piston (7). Remove setscrew (2) securing piston (7) to rod (18).

- d. Unscrew piston (7) from rod (18) and remove piston (7), spacer (10) and cylinder head (14).

CAUTION

When removing seals and rings, avoid scratching grooved and gland surfaces.

NOTE

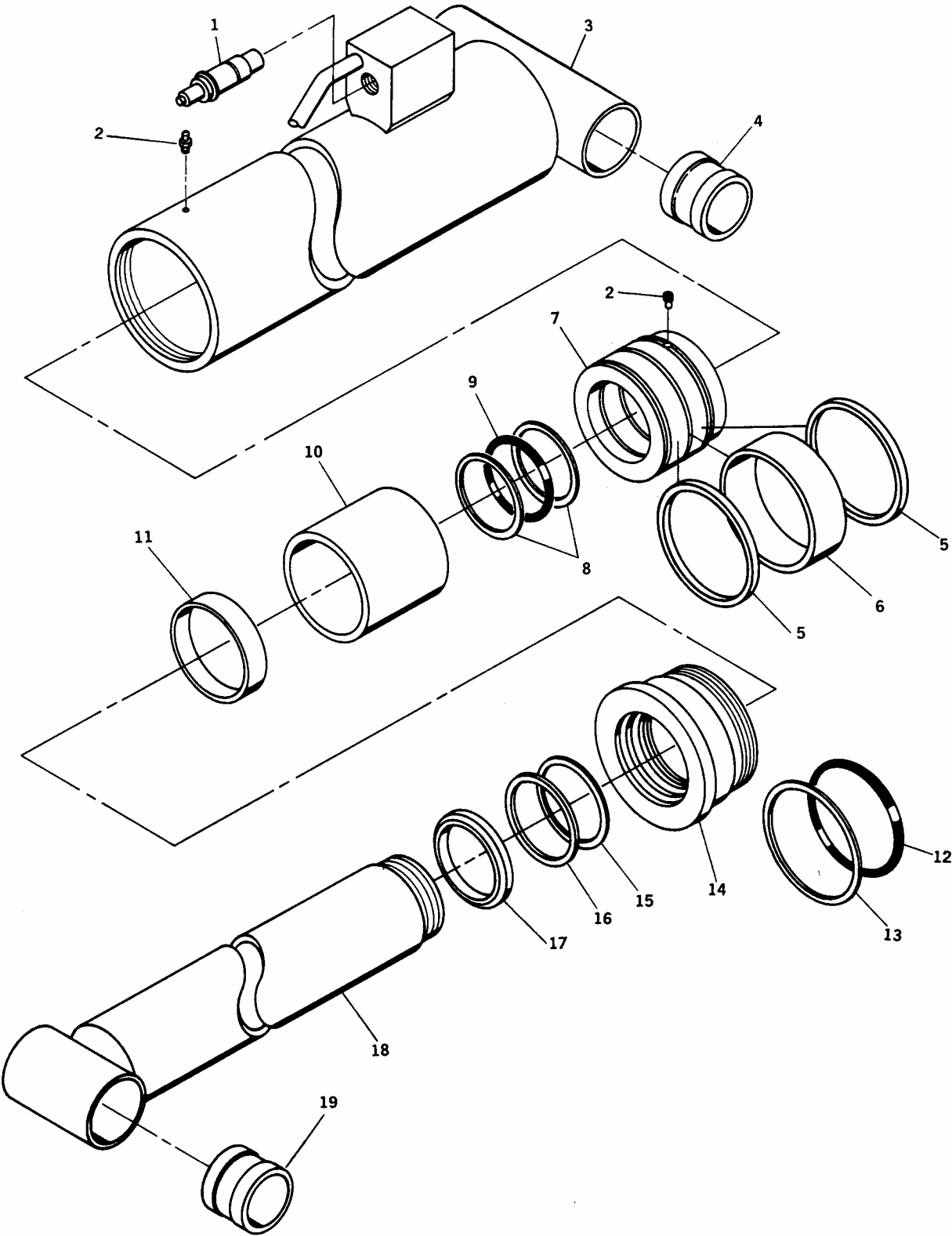
Aligning discarded seals and rings in order of disassembly will facilitate installation of new seals and rings.

- e. Remove and discard packing (9) and backup rings (8) from inside of piston.
- f. Remove and discard packing (12) and backup ring (13) from outside of head (14). Remove and discard wear ring (11), seal (15), rod seal (16), and wiper seal (17) from inside of head (14).

CLEANING:

WARNING

Dry cleaning solvent P-D-680, Type III is toxic and flammable. Wear protective goggles and gloves and use only in a well ventilated area. Avoid contact with skin, eyes, and clothes and do not breathe vapors. Do not use near open flame or excessive heat.



WARNING

The flash point for dry cleaning solvent P-D-680, Type III is 200°F (94°C). If you become dizzy while using cleaning solvent, get fresh air immediately and get medical aid. If contact with eyes is made, wash your eyes with water and get medical aid immediately.

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

1. CLEAN ALL PARTS WITH SOLVENT AND DRY WITH COMPRESSED AIR. INSPECT ALL PARTS FOR SERVICEABILITY.

INSPECTION:

CAUTION

Before installing new seals and rings, clean all surfaces and carefully remove burrs and nicks. Parts displaying excessive wear or damage should be replaced.

1. STONE OUT MINOR BLEMISHES AND POLISH WITH A FINE CROCUS CLOTH.
2. CLEAN WITH SOLVENT AND DRY WITH COMPRESSED AIR ANY PARTS THAT HAVE BEEN STONED AND POLISHED.
3. INSPECT BARREL (3) CAREFULLY FOR SCORING.

REASSEMBLY:

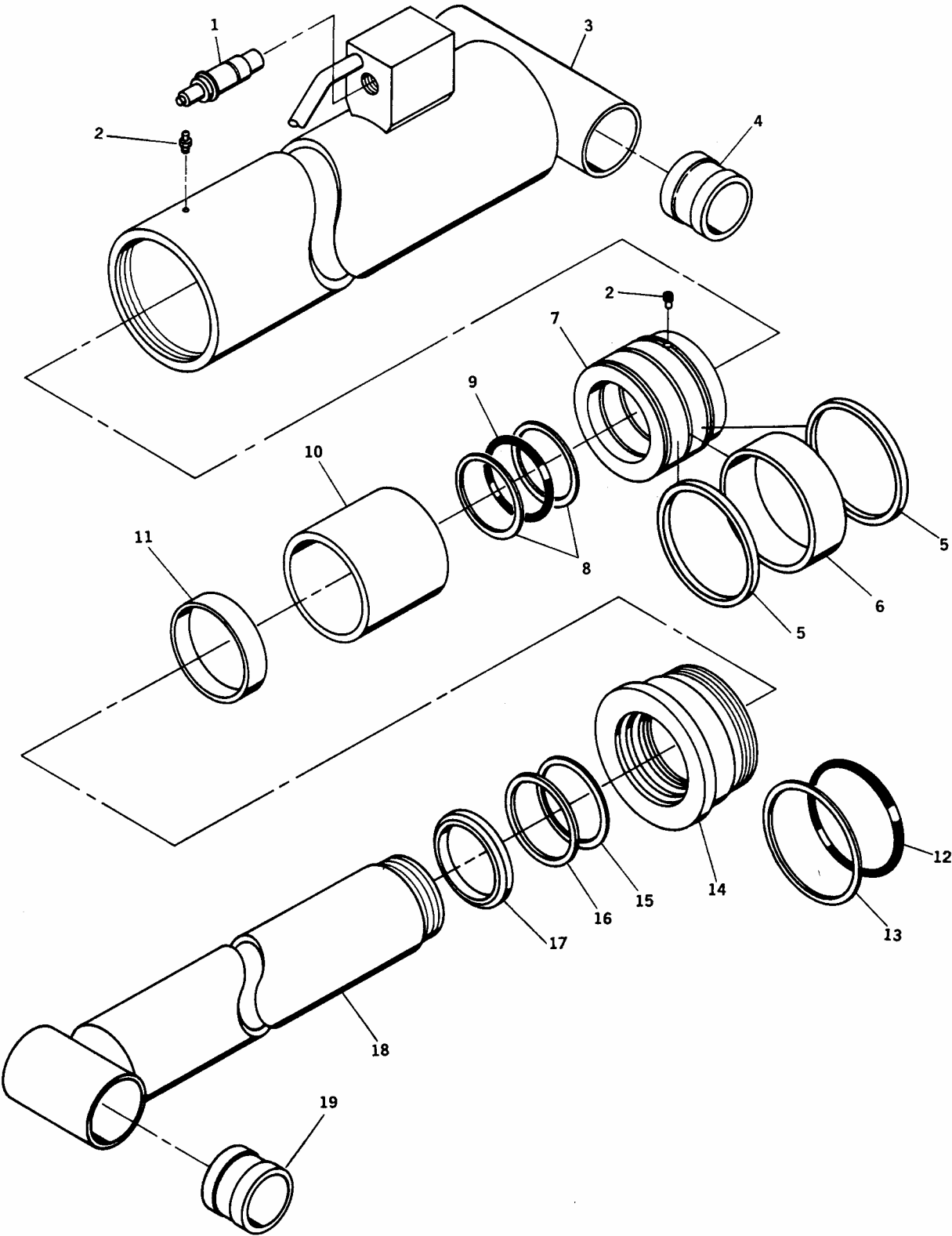
NOTE

Coat all seals and rings with clean hydraulic oil.

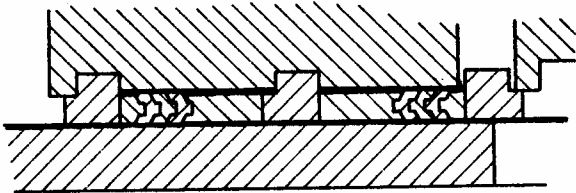
CAUTION

Avoid stretching the seals and rings. Ensure the seals and rings are installed in the proper order. Ensure all components are clean prior to and during assembly.

1. REASSEMBLE CYLINDER ROD (18).
 - a. Install new wiper ring (17) inside of head (14).
 - b. Install new wear ring (11), rod seal (16), and seal (15) into inside of head. Ensure rod seal is installed with packing portion forward of seal portion as head (14) would enter barrel (3).
 - c. Install new packing (12) and backup ring (13) onto outside of head.
 - d. Install new packing (9) and backup rings (8) on inside of piston (7). Ensure round packing (9) is between the backup rings (8).
 - e. Lubricate bore of head (14) heavily with water pump grease in area between wiper ring and rod seal.
 - f. Install head assembly (14) onto rod (18).
 - g. Install spacer (10) onto rod.
2. IF EXISTING PISTON (7) AND ROD (18) ARE TO BE USED, PROCEED AS FOLLOWS:
 - a. Install piston (7) onto rod (18).
 - b. Using strap wrench, tighten piston (7) securely until setscrew holes align.
 - c. Apply Loctite #271 to setscrew (2) and install setscrew (2).
3. IF NEW PISTON (7) OR ROD (18) IS TO BE USED PROCEED AS FOLLOWS:
 - a. Install piston (7) onto rod (18).
 - b. Using strap wrench, tighten pistons securely.



- c. If necessary, drill 0.265 in. diameter hole 3/16-in. (min) deep in the rod (18).
 - d. Clean drilled hole of chips and debris.
 - e. Apply Loctite #271 to setscrew (2) and install setscrew (2).
4. INSTALL PISTON RING (6) AND SEALS (5).
- a. Install new ring (6) and seals (5) on outside of piston (7). Ensure seals (5) are installed as shown.



- b. Lubricate head (14) and piston (7) with clean hydraulic oil and install rod assembly into barrel with a slight twisting motion.
5. IF EXISTING HEAD (14) AND BARREL (3) ARE TO BE USED, PROCEED AS FOLLOWS:
- a. Clean all oil from threads of head (14).
 - b. Coat threads with NEVER-SEEZ (paste type) lubricant and screw head assembly into barrel (3).
 - c. Using strap wrench, tighten head (14) securely until setscrew holes align.

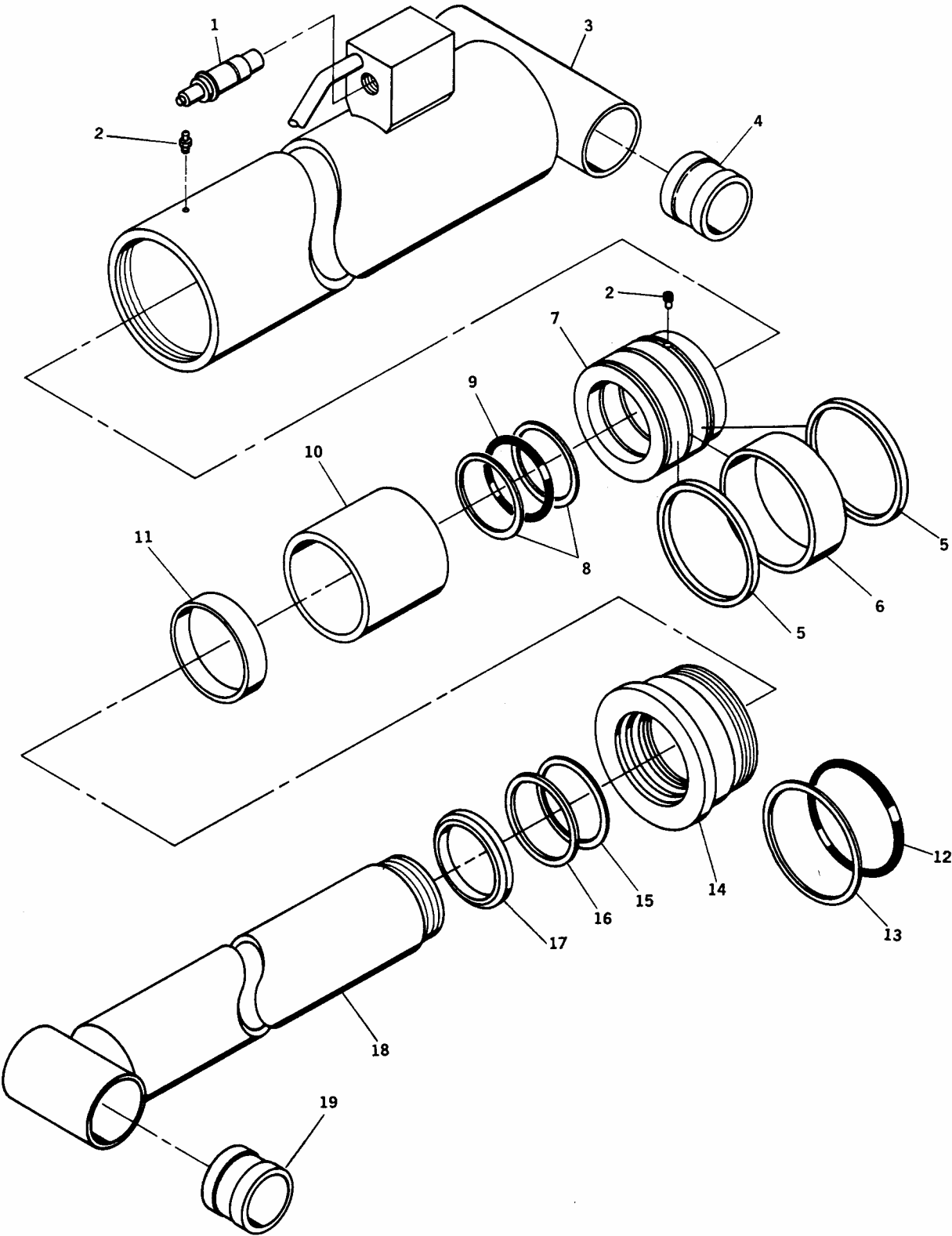
- d. Apply Loctite #271 to setscrew (2) and install setscrew (2).
6. IF NEW HEAD (14) OR BARREL (3) IS TO BE USED, PROCEED AS FOLLOWS:
- a. Clean all oil from thread of head (14).
 - b. Coat threads with NEVER-SEEZ (paste type) lubricant and screw head assembly into barrel (3).
 - c. Using strap wrench, tighten head securely.
 - d. If necessary, drill 0.265-in. diameter hole 3/16-in. (max) deep in head.

NOTE

Setscrew when installed should be flush with barrel.

- e. Clean drilled hole of chips and debris.
 - f. Apply Loctite #271 to setscrew (2) and install setscrew (2).
7. INSTALL HOLDING VALVE (1). (REFER TO PAGE 13-96.)
8. USING A SOURCE OF CONTROLLED HYDRAULIC OIL PRESSURE TEST LIFT CYLINDER FOR PROPER OPERATION AND INSPECT FOR LEAKS.
9. INSTALL LIFT CYLINDER. (REFER TO PAGE 13-88.)

END OF TASK



LIFT CYLINDER HOLDING VALVE INSTALLATION

TOOLS: General mechanic's tool kit: automotive (5180-00-177-7033)

SUPPLIES: Seal kit (Item 101, Appendix B)
Hydraulic oil (Item 8, Appendix B)

EQUIPMENT CONDITIONS: Hydraulic system shutdown and pressure relieved from lines (Refer to TM 5-3810-306-20.)
Boom fully lowered. (Refer to TM 5-3810-306-10.)
Negative battery cable disconnected at shunt. (RT875CC)
Battery disconnect switch in off position. (RT875CCS)

WARNING

Be sure to wear protective eye covering to avoid personal injury.

REMOVAL:

1. REMOVE LIFT CYLINDER HOLDING VALVE (1) FROM LIFT CYLINDER (2).
 - a. Tag and remove hydraulic line (8) from plug (9).
 - b. Remove plug (9) and packing (10) from holding valve (1). Discard packing (10).
 - c. Remove lift cylinder holding valve (1).
 - d. Remove and discard packings (3), (4) and (5) and back-up rings (6) and (7).

NOTE

No repair or replacement of valve components is recommended with the exception of outer seals.

INSTALLATION:

NOTE

Prior to installing packings and back-up ring, coat components with clean hydraulic oil.

1. INSTALL NEW EXTERNAL PACKINGS (3), (4) AND (5) AND BACK-UP RINGS (6) AND (7) ONTO VALVE.

CAUTION

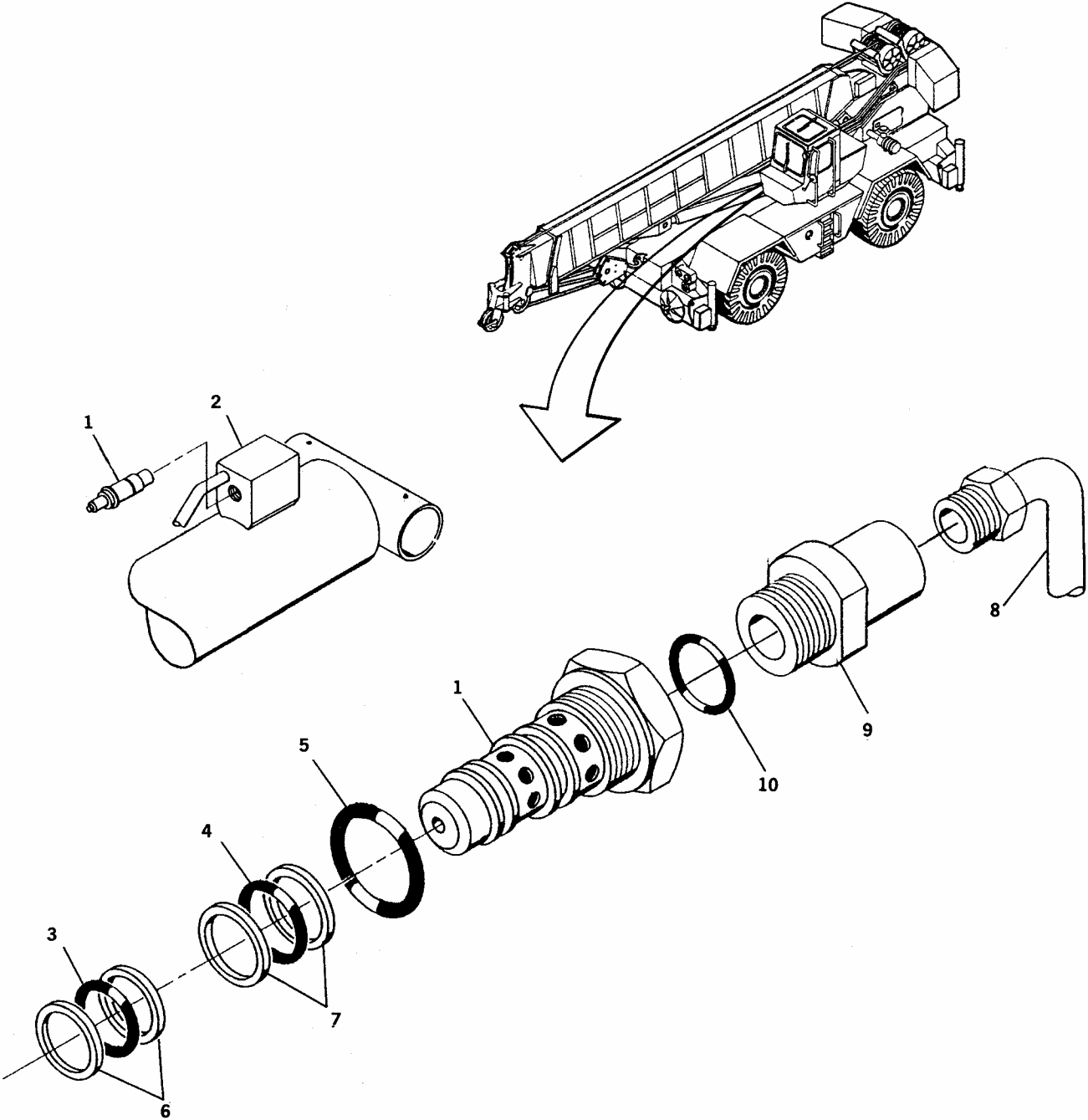
Do not damage the packings during installation of the holding valve. If the holding valve turns freely then gets hard to turn, then easy to turn, remove the holding valve and check the packings. They have probably been damaged by a sharp edge of a port.

NOTE

The holding valve should turn by hand until compression of the packings begins.

2. INSTALL LIFT CYLINDER HOLDING VALVE (1) ON LIFT CYLINDER (2).
 - a. Check inside of lift cylinder (2) port block for any sharp edges or burrs and remove as necessary with emery cloth.
 - b. Install lift cylinder holding valve (1) on lift cylinder.
 - c. Install new packing (10) on plug (9) and install into holding valve (1).
 - d. Install and tighten hydraulic line (8).
3. CONNECT NEGATIVE BATTERY CABLE AT SHUNT. (REFER TO TM 5-3810-306-20.) (RT875CC)
4. START UP HYDRAULIC SYSTEM TO NORMAL PRESSURE. (REFER TO TM 5-3810-306-10.)
5. TEST FOR PROPER OPERATION AND INSPECT FOR LEAKS.

END OF TASK



LIFT CYLINDER OVER CENTER VALVE ASSEMBLY

TOOLS: General mechanic's tool kit: automotive (5180-00-177-7033)

SUPPLIES: Parts kit (Item 258, Appendix B)
Hydraulic oil (Item 8, Appendix B)
Cleaning Solvent P-D-680, Type III (Item 1, Appendix B)

EQUIPMENT CONDITIONS: Lift cylinder over center valve assembly removed.
(Refer to TM 5-3810-306-20.)

DISASSEMBLY:

1. DISASSEMBLE OVER CENTER VALVE ASSEMBLY (1).

- a. Remove regulating valve assembly (3) from valve body (2).
- b. If necessary, remove fittings (31), (32) and (33) from valve body (2).

2. DISASSEMBLE REGULATING VALVE ASSEMBLY (3).

WARNING

Be sure to wear protective eye covering to avoid personal injury.

Internal parts beneath plug (25) are under spring tension. Remove plug (25) carefully to prevent parts from popping out and causing personal injury.

- a. Remove plug (25), from valve (30).
- b. Remove piston (19), packing (18), spring seats (15) and (17), spring (16) and spring holder (14) from valve assembly (3). Discard packing (18).
- c. Remove bolt (29), nuts (27) and (28), and packing (26) from plug (25). Discard packing (26).
- d. Remove plug (8) from valve (30).
- e. Remove disk (13), spring (12) and piston (11) from plug (8).
- f. Remove and discard retainers (10) and packing (9) from piston (11).
- g. Remove and discard retainer (7) and packings (5) and (6) from plug (8).

- h. If necessary, remove vent plug (4) from plug (8).
- i. Remove and discard packings (20), (22) and (24), and retainers (21) and (23) from valve (30).

CLEANING:

WARNING

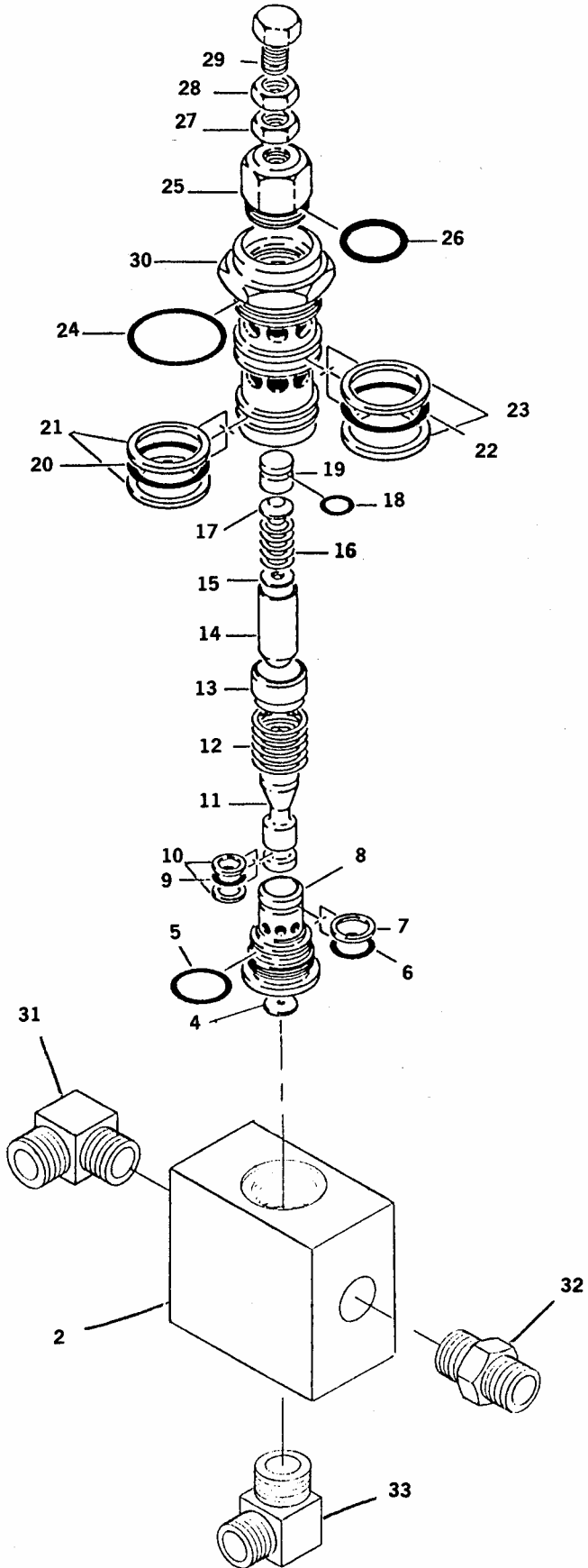
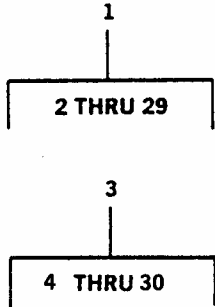
Dry cleaning solvent P-D-680, Type III is toxic and flammable. Wear protective goggles and gloves and use only in a well ventilated area. Avoid contact with skin, eyes, and clothes and do not breathe vapors. Do not use near open flame or excessive heat. The flash point is 200°F (94°C). If you become dizzy while using cleaning solvent, get fresh air immediately and get medical aid. If contact with eyes is made, wash your eyes with water and get medical aid immediately.

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

1. CLEAN ALL PARTS WITH DRY CLEANING SOLVENT P-D-680, TYPE III AND DRY WITH COMPRESSED AIR.

INSPECTION:

1. INSPECT ALL PARTS FOR OBVIOUS DAMAGE AND REPLACE AS NECESSARY.



ASSEMBLY:

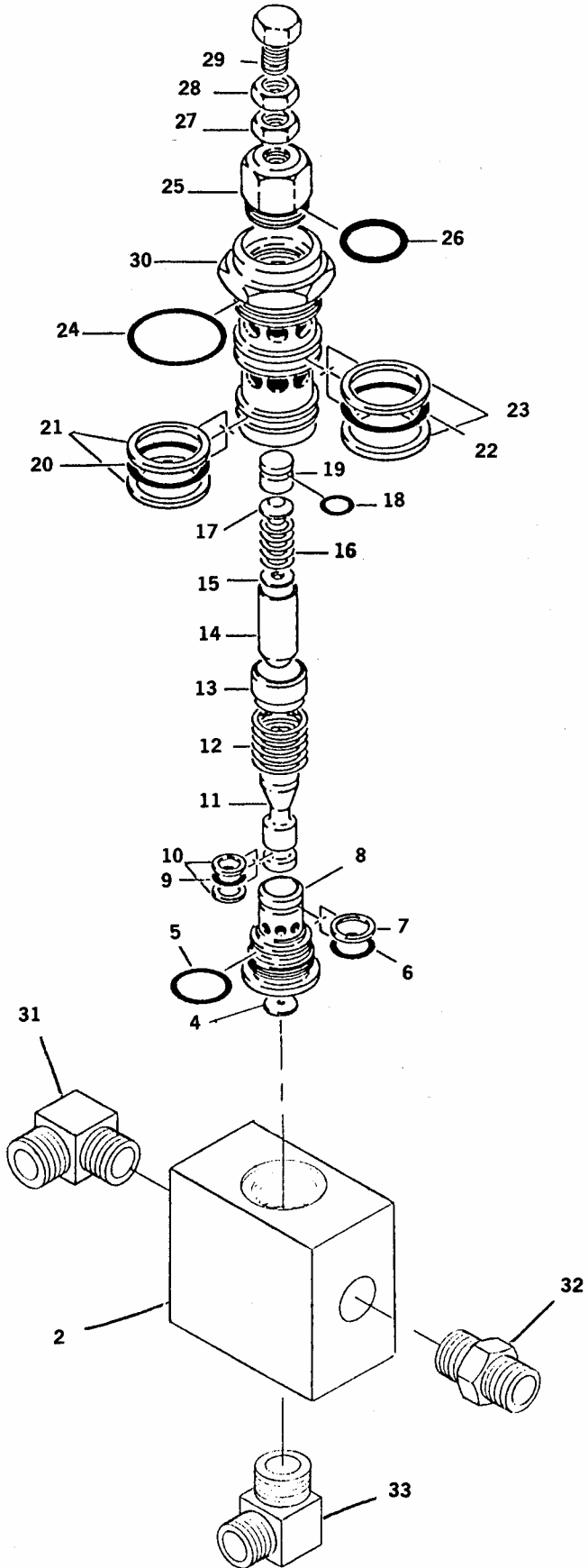
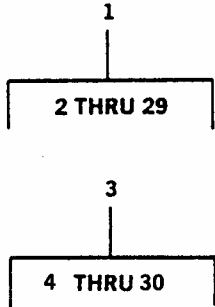
NOTE

Install new packings and retainers on or in all component parts.
Lubricate all new packings and retainers with clean hydraulic oil prior to installation.

1. ASSEMBLE REGULATING VALVE ASSEMBLY (3).

- a. Install new retainers (10) and packing (9) on piston (11).
- b. Install new packings (5) and (6), and retainer (7) on plug (8).
- c. Install piston (11), spring (12) and disk (13) in plug (8).

- d. Install new packings (20), (22) and (24), and new retainers (21) and (23) on valve (30).
 - e. Install plug (8) in valve (30).
 - f. Install new packing (18) on piston (19).
 - g. Install spring holder (14), spring seats (15) and (17), spring (16) and piston (19) in valve assembly (3).
 - h. Install bolt (29), nuts (27) and (28), and new packing (26) on plug (25).
 - i. Install plug (25) in valve assembly (3).
2. ASSEMBLE LIFT CYLINDER OVER CENTER VALVE ASSEMBLY (1).
- a. If removed, install fittings (31), (32) and (33) in valve body (2).
 - b. Install regulating valve (3) in valve body (2).

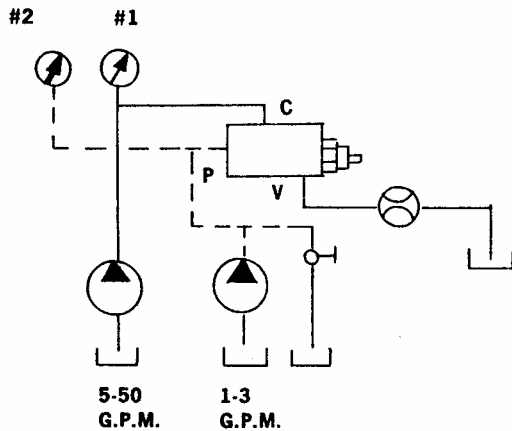


3. BENCH CHECK OVER CENTER VALVE ASSEMBLY (1).

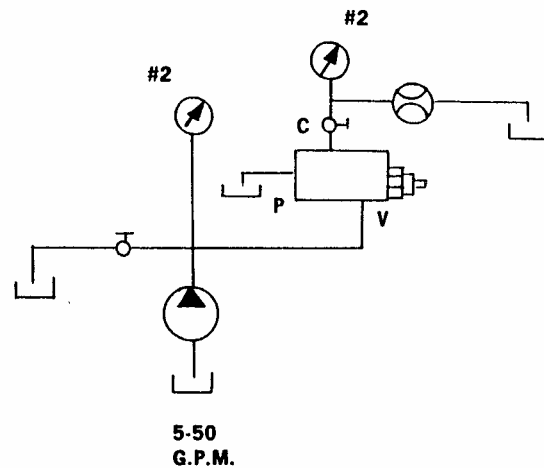
NOTE

Ensure oil temperature is 120°F-130°F (49°C-54°C) and all air is purged from test set up before starting checks.

CHECKS a AND b



CHECK c



GAUGES

- #1 — 0 to 5000 P.S.I.
- #2 — 0 to 600 P.S.I.

BENCH CHECK SET UP

a. Pilot pressure adjustment.

- 1) Induce 2000 psi into "cylinder" port and 375 psi into "pilot pressure" port. Adjust valve with adjusting bolt to allow 1/4 GPM flow \pm 10% out of "valve" port.
- 2) Vary pilot pressure to open and close valve several times. Recheck valve at 375 psi pilot pressure (and 2000 psi induced into "cylinder" port) to verify proper adjustment.

b. Leakage test.

- 1) Induce 2500 psi into "cylinder" port and observe "valve" and "pilot pressure" ports for leakage (5 drops per minute allowed after 2 minutes).

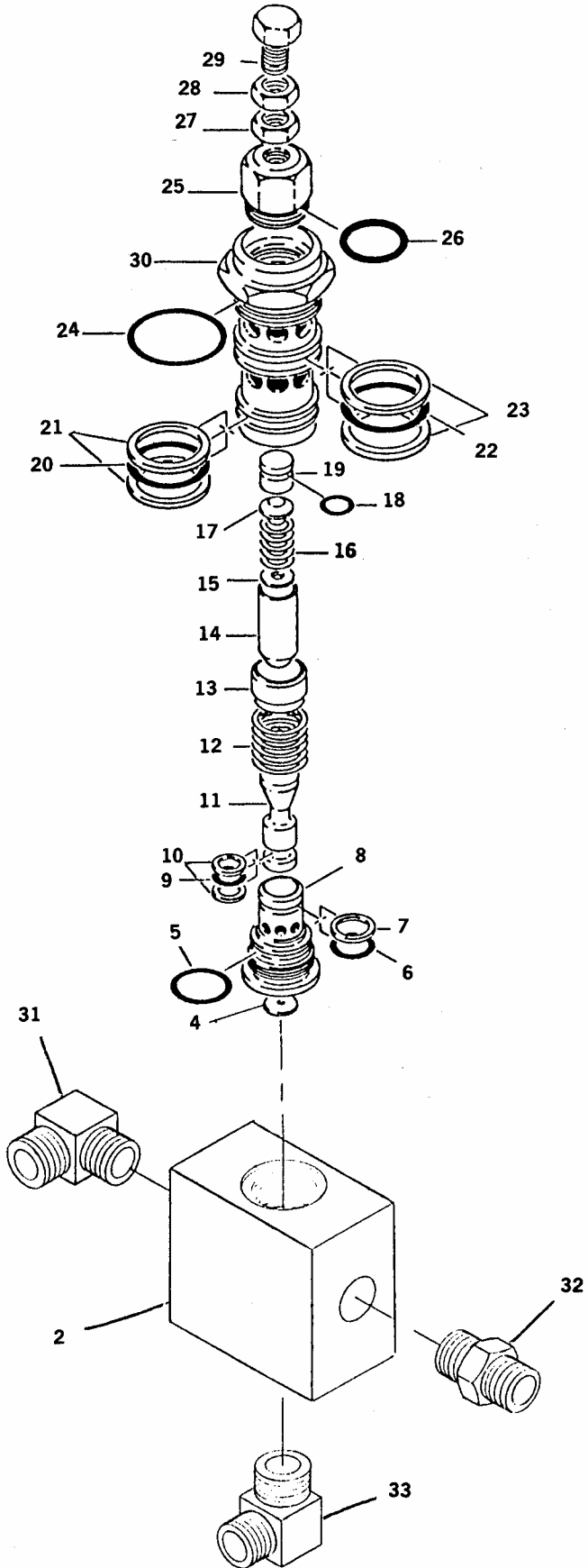
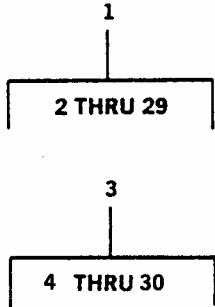
- 2) Apply 20 psi into all ports simultaneously and observe for external leakage. No leakage allowed.

c. Free flow check test.

- 1) Pressurize "valve" port to check function of free flow check. Check valve to crack at 25 psi.
- 2) Induce 25 GPM flow into "valve" port. Pressure drop through valve not to exceed 70 psi.

4. INSTALL LIFT CYLINDER OVER CENTER VALVE ASSEMBLY. (REFER TO TM 5-3810-306-20.)

END OF TASK



TELESCOPE CYLINDER ASSEMBLY

TOOLS: General mechanic's tool kit: automotive (5180-00-177-7033)
Shop Equipment Auto-Maintenance and Repair, FM Basic (4910-00-754-0705)
Shop Equipment Auto-Maintenance and Repair, FM Suppl No. 1 (4910-00-754-0706)
Tool Outfit Hyd System Test and Repair, 3/4 Ton Trailer Mtd (4940-01-036-5784)

SUPPLIES: Cylinder parts kit (Item 54, Appendix B)
Hydraulic oil (Item 8, Appendix B)
Loctite #271 (Item 23, Appendix B)
Never-Seez (Item 24, Appendix B)
Packing (Item 22, Appendix B)

EQUIPMENT CONDITIONS: Telescope cylinder removed. (Refer to page 15-8.)

DISASSEMBLY:

CAUTION

NOTE

Any maintenance requiring disassembly of cylinder should include replacement of all cylinder seals.

When removing seals and rings, avoid scratching grooved and gland surfaces.

NOTE

Aligning discarded seals and rings in order of disassembly will facilitate installation of new items.

1. REMOVE HOLDING VALVE (19) FROM PORT BLOCK.
2. REMOVE CYLINDER ROD (18).
 - a. Remove setscrew (3) and unscrew threading ring (17) from barrel (2).

3. REMOVE PISTON (4) AND HEAD (11).
 - a. Remove seals (5) and rings (6) from outside of piston (4). Remove setscrew (3).
 - b. Remove piston (4) spacer (9) and head (11) from rod (18).
 - c. Remove preformed packing (8) and back-up rings (7) from piston rod (18).
 - d. Remove preformed packing (12) and backup ring (13) from outside of head (11).
 - e. Remove wear ring (10), buffer seal (14) and rod seal (15) from inside of head (11).
 - f. Remove threaded ring (17). Remove wiper seal (16).

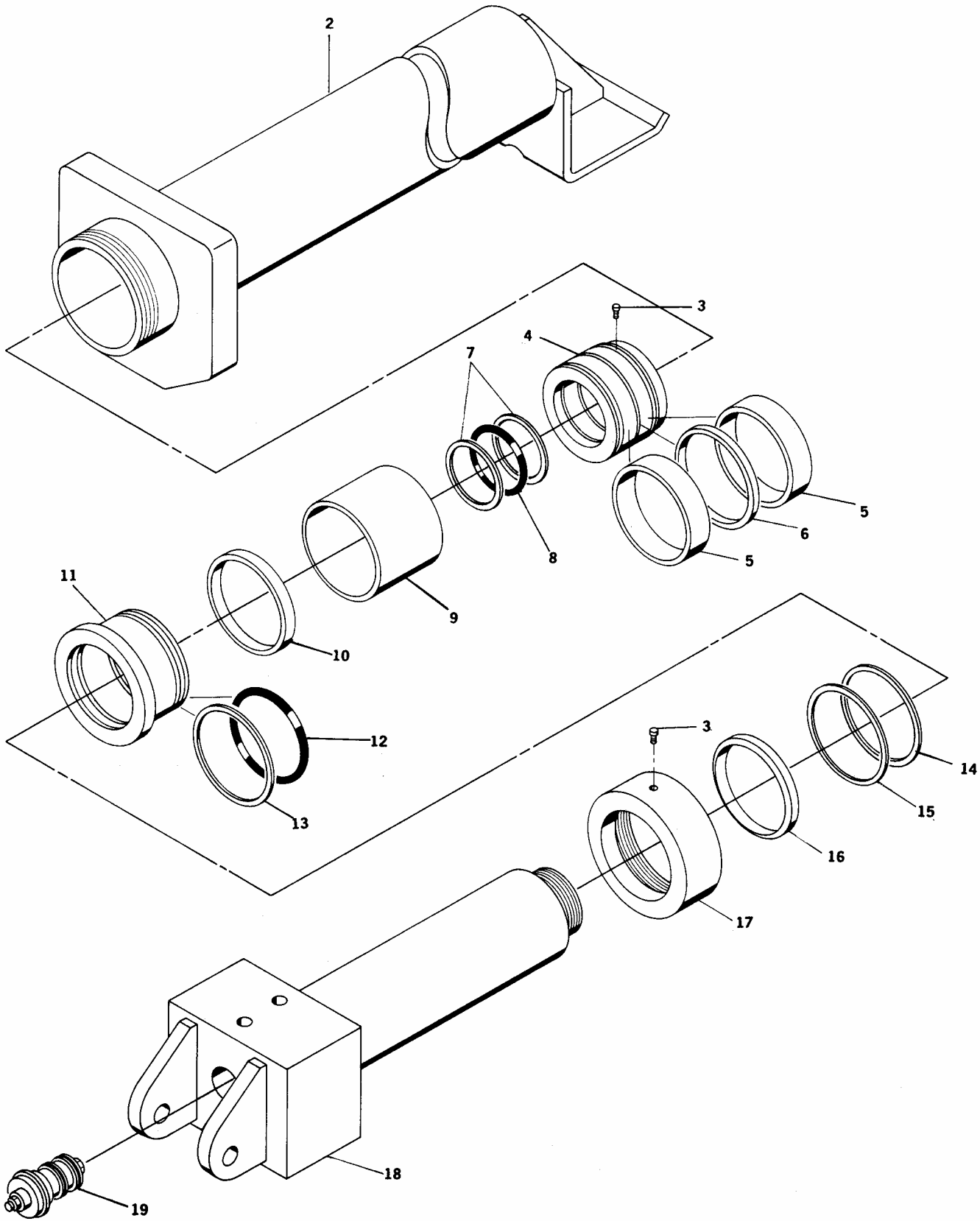
NOTE

It is advisable to cover cylinder barrel opening to prevent contamination.

WARNING

Do not use air pressure to remove cylinder rod assembly. Use only a source of controlled hydraulic oil pressure, if rod is hard to move.

- b. Remove cylinder rod (18), with components, from cylinder barrel (2).



CLEANING AND INSPECTION:

WARNING

Dry cleaning solvent P-D-680, Type III is toxic and flammable. Wear protective goggles and gloves and use only in a well ventilated area. Avoid contact with skin, eyes, and clothes and do not breathe vapors. Do not use near open flame or excessive heat. The flash point is 200°F (94°C). If you become dizzy while using cleaning solvent, get fresh air immediately and get medical aid. If contact with eyes is made, wash your eyes with water and get medical aid immediately.

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

1. CLEAN ALL PARTS WITH SOLVENT AND DRY WITH COMPRESSED AIR. INSPECT ALL PARTS FOR SERVICEABILITY.

CAUTION

Before installing new seals and rings, clean all surfaces and carefully remove burrs and nicks. Parts displaying excessive wear or damage should be replaced.

2. STONE OUT MINOR BLEMISHES AND POLISH WITH A FINE CROCUS CLOTH.
3. CLEAN WITH SOLVENT AND DRY WITH COMPRESSED AIR ANY PARTS THAT HAVE BEEN STONED AND POLISHED.
4. INSPECT THE BARREL CAREFULLY FOR SCORING.

REASSEMBLY:

CAUTION

When installing new seals and rings, avoid stretching seals or scratching the grooved or gland surfaces.

NOTE

Lubricate new seals and rings with clean hydraulic oil.

1. LUBRICATE CYLINDER ROD (18) WITH CLEAN HYDRAULIC OIL.
2. REASSEMBLE HEAD (11), INSTALL ON ROD (18).
 - a. Install new packing (12) and back-up ring (13) onto the outside of head (11).

NOTE

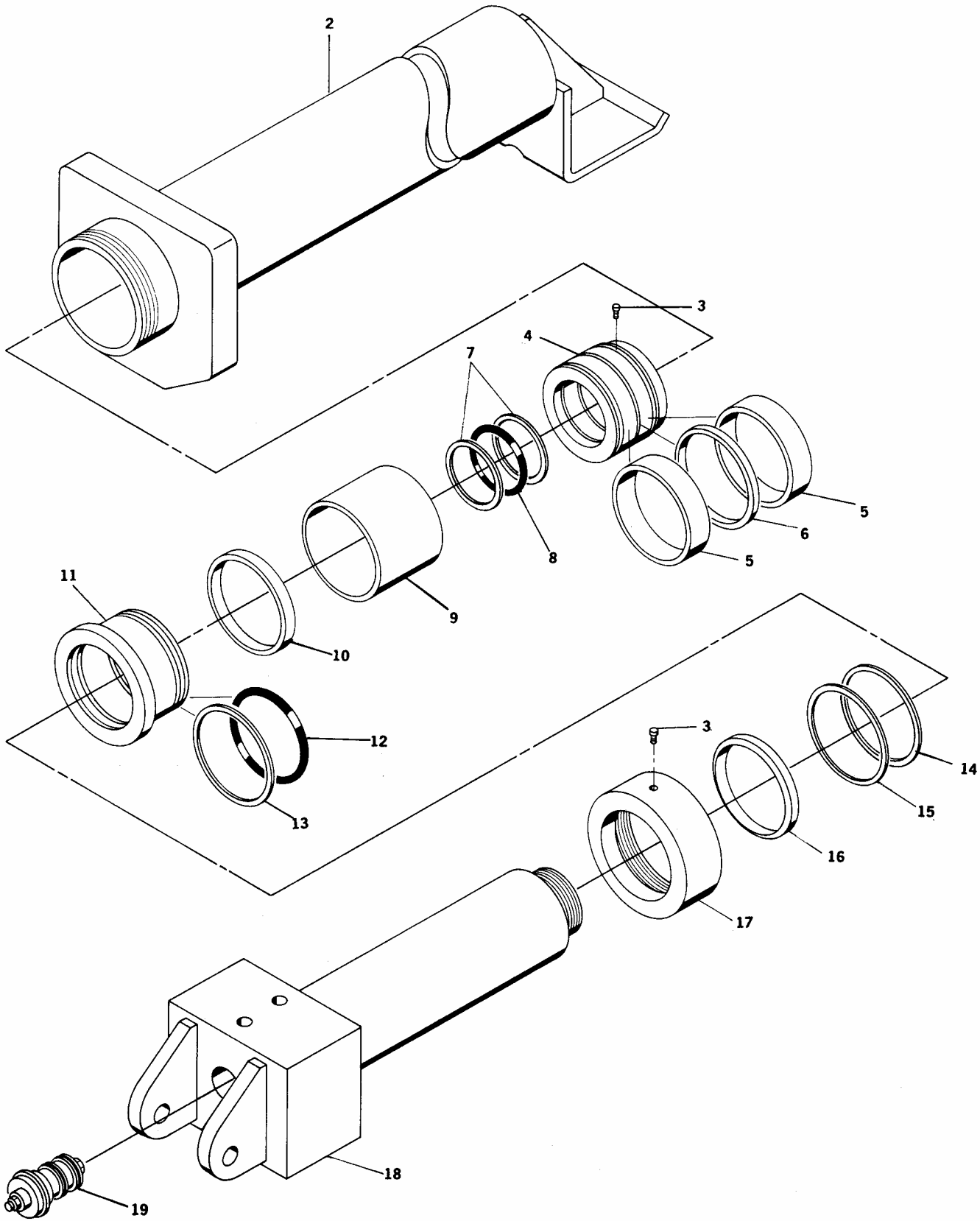
Ensure packing portion of rod seal is installed forward as head would enter barrel.

- b. Install new wear ring (10), buffer seal (14) and rod seal (15) into inside of head (11).
- c. Install new wiper seal (16) into inside of threaded ring (17).

CAUTION

Do not damage rings and seals when installing head (11) and piston (4) onto rod (18).

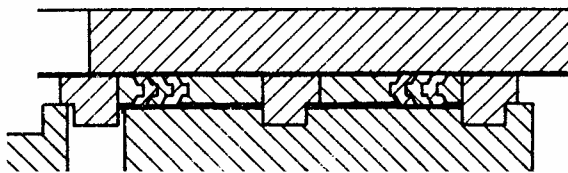
- d. Install threaded ring (17) and head (11) onto rod (18).
- e. Install spacer (9) (tapered end first) onto the rod (18).



NOTE

Install new performed packing (8) between two backup rings (7).

3. INSTALL NEW PREFORMED PACKING (8) AND BACKUP RINGS (7) INTO INSIDE OF PISTON (4).
4. IF EXISTING PISTON (4) AND ROD (18) ARE TO BE USED, PROCEED AS FOLLOWS:
 - a. Install piston (4) onto rod (18).
 - b. Using strap wrench, tighten piston (4) securely until setscrew holes align.
 - c. Apply Loctite #271 to setscrew (3) and install setscrew.
5. IF NEW PISTON (4) OR ROD (18) IS TO BE USED, PROCEED AS FOLLOWS:
 - a. Install piston (4) onto rod (18).
 - b. Using strap wrench, tighten piston (4) securely.
 - c. If necessary, drill 0.265-in. diameter hole 3/16 in. (min) deep in rod (18).
 - d. Clean drilled hole of chips and debris.
 - e. Apply Loctite #271 to setscrew (3) and install setscrew.
6. INSTALL NEW SEALS (5) AND RING (6) ONTO OUTSIDE OF PISTON (4). ENSURE SEAL ASSEMBLY IS INSTALLED AS SHOWN.



7. INSTALL ROD ASSEMBLY INTO CYLINDER BARREL (2).
 - a. Lubricate all parts freely with clean hydraulic oil.
 - b. Remove cover from cylinder barrel opening.

CAUTION

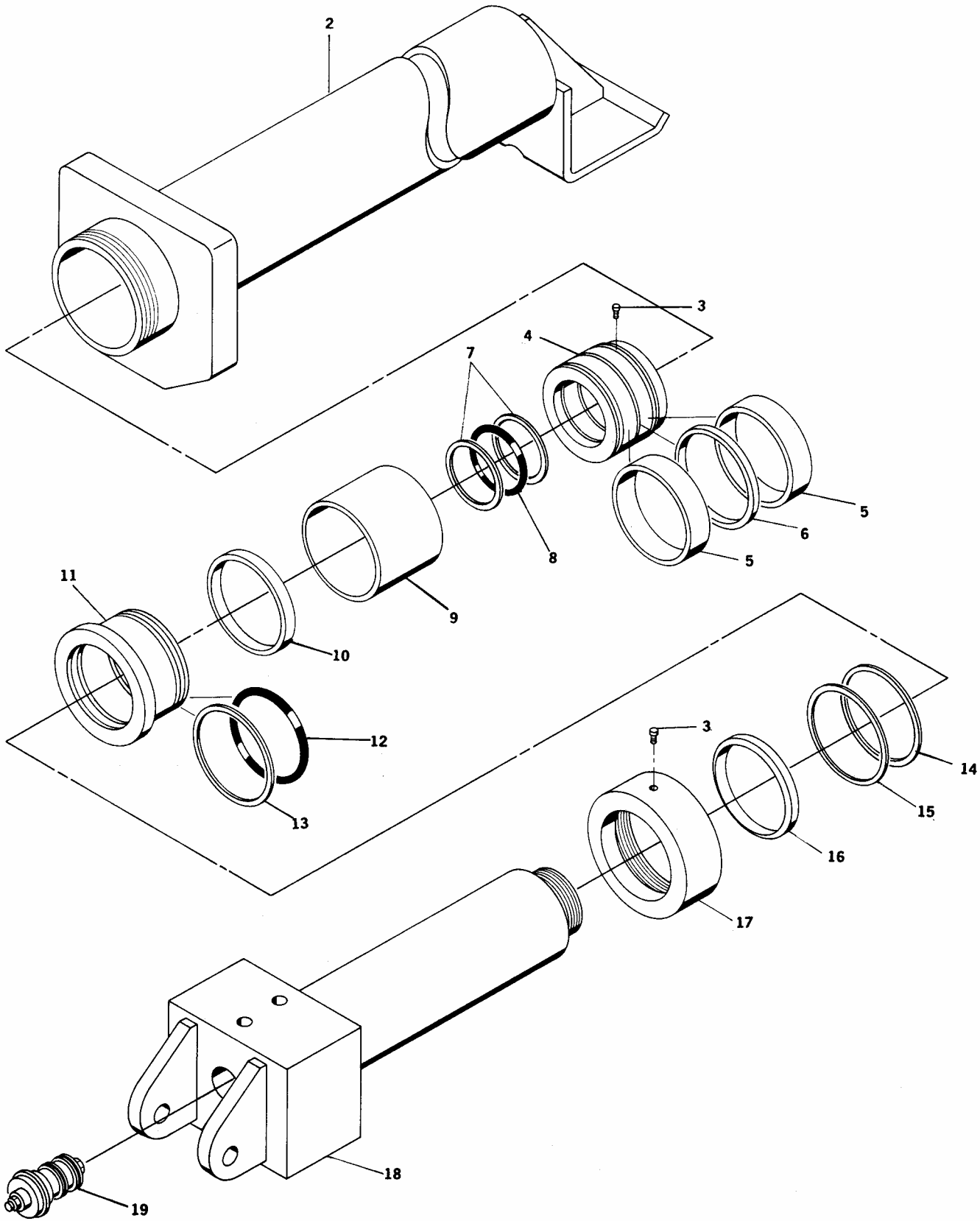
Avoid scratching or damaging grooved or gland surfaces or rings and seals.

- c. Carefully slide cylinder rod, with components, in cylinder barrel with a twisting motion.
- d. Clean all oil from threads of threaded ring (17). Coat threads of threaded ring with NEVER-SEEZ (paste type) lubricant.
8. SEAT HEAD ASSEMBLY INTO BARREL (2).
9. IF EXISTING THREADED RING (17) AND BARREL (2) ARE TO BE USED, PROCEED AS FOLLOWS:
 - a. Screw threaded ring onto barrel.
 - b. Using strap wrench, tighten threaded ring securely until the setscrew holes align.
 - c. Apply Loctite #271 to setscrew (3) and install setscrew.
10. IF NEW THREADED RING OR BARREL IS TO BE USED, PROCEED AS FOLLOWS:
 - a. Screw threaded ring onto barrel.
 - b. Using strap wrench, tighten threaded ring securely.
 - c. If necessary, drill 0.265-in. diameter hole 3/16 in. (max) deep in the barrel.

NOTE

Setscrew (3) when installed should be flush with threaded ring (17).

- d. Clean drilled hole of chips and debris.
- e. Apply Loctite #271 to setscrew (3) and install setscrew.
11. INSTALL HOLDING VALVE (19).
 - a. Check inside of port block for any sharp edges or burrs and remove as necessary with emery cloth.
 - b. Install new external packings onto holding valve.



- c. Lubricate holding valve and the packings with clean hydraulic oil.

CAUTION

Do not damage packings during installation of holding valve. If holding valve turns freely then gets hard to turn, then easy to turn, remove holding valve and check packings. They have probably been damaged by a sharp edge of a port.

NOTE

The holding valve should turn by hand until compression of the packings begins.

- d. Carefully install holding valve (19) into port block.

WARNING

Do not use air pressure to cycle or pressurize cylinder.

12. PRESSURIZE AND CYCLE CYLINDER. CHECK FOR PROPER OPERATION AND ANY LEAKAGE.
13. INSTALL TELESCOPE CYLINDER. (REFER TO PAGE 15-8.)

END OF TASK

Section IV. HYDRAULIC SYSTEM MAINTENANCE

DRAINING AND FLUSHING HYDRAULIC SYSTEM

TOOLS: General mechanic's tool kit: automotive (5180-00-177-7033)
Drain pan

SUPPLIES: Diesel fuel (82 gal (310 L) Required)
Oil, lubricating, MIL-L-2104 Grade 10 (240 gal (934 L) required)

EQUIPMENT CONDITIONS: None

DRAINING AND FLUSHING:

NOTE

If a component has been changed because of a failure that might allow metal or abrasive particles to enter the system, all systems must be thoroughly checked, drained and flushed.

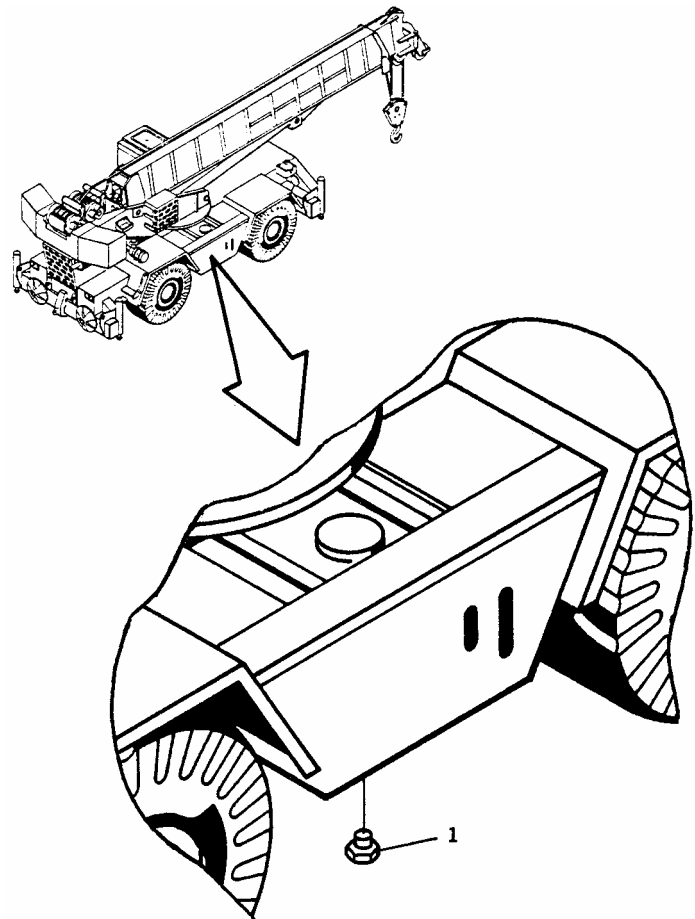
1. DRAIN HYDRAULIC RESERVOIR.

- a. Remove reservoir drain plug (1). Allow approximately three minutes after oil stops flowing from drain port, for side walls to drain.

NOTE

The hydraulic reservoir capacity is 165 gallons (624.5 L)

- b. Clean and install reservoir drain plug and fill reservoir with a 50-50 mixture of diesel fuel and clean hydraulic oil MIL-L-2104, grade 10.
- c. Cycle crane through all functions several times; then return crane to its stowed position and turn front and rear wheels to extreme left. Shut down engine. (Refer to TM 5-3810-306-10.)
- d. Remove reservoir drain plug (1) and drain reservoir. Clean and install drain plug (1) and fill reservoir with clean oil, MIL-L2104, grade 10.



2. FLUSH HYDRAULIC SYSTEM.

CAUTION

Oil supply lines must be connected to the cylinders when flushing the system.

CAUTION

When oils are changed or added, ensure that oils of different manufacturers are equivalent to MIL-L-2104 grade 10.

NOTE

Draining the various components will require connecting a drain line in place of the disconnected return line.

- a. Disconnect return line from lift cylinder and raise boom to maximum elevation.
- b. Connect cylinder return line and lower boom to its stowed position. Refill hydraulic reservoir as required.
- c. Disconnect return line from an outrigger extension cylinder and fully extend outrigger.
- d. Connect outrigger return line and retract outrigger. Refill hydraulic reservoir as required.
- e. Repeat steps c and d for remaining three outriggers.

CAUTION

When draining the jack cylinders, always operate either both front or both rear cylinders together to prevent twisting the crane.

- f. Disconnect return lines from front outrigger jack cylinders and activate cylinders to their maximum down position.

- g. Connect return lines and raise jack cylinders to stowed position. Refill hydraulic reservoir as required.
 - h. Repeat steps f and g for rear outrigger jack cylinders.
 - i. Disconnect return line from telescope cylinder and fully extend boom.
 - j. Connect return line and retract boom. Refill hydraulic reservoir as required.
 - k. Disconnect return lines from both front steer cylinders and turn front wheels to extreme right.
 - l. Connect return lines and turn front wheels to extreme left and then back to center. Refill hydraulic reservoir as required.
 - m. Repeat steps k and l for rear steering cylinders.
 - n. Return crane to travel mode (all cylinders retracted and boom over the front).
3. DRAIN AND REFILL HYDRAULIC RESERVOIR WITH FRESH OIL, MIL-L-2104, GRADE 10.
 4. START ENGINE AND OPERATE ALL CRANE FUNCTIONS. CHECK AND REFILL RESERVOIR AS REQUIRED.

END OF TASK

BLEEDING AIR FROM HYDRAULIC SYSTEM

TOOLS: None

SUPPLIES: None

EQUIPMENT CONDITIONS: None

GENERAL:

By design, air entering the hydraulic oil will normally be removed automatically by passage of the oil over the baffles in the hydraulic reservoir. However, air can enter the system if a component has been replaced, the reservoir level is too low, or a leak develops in the suction lines to the pumps. If air becomes entrapped in the hydraulic oil, it may be detectable in pumps and motor-operated components such as the swing mechanism and hoist(s) causing these units to become noisy during operation. Should noisy operation occur, first check oil level in hydraulic reservoir and fill as necessary. Then inspect for leaks in suction lines leading to pumps.

Small leaks may be difficult to locate. Should you encounter a leak that is not readily detectable, the following method may be used when checking for such leaks.

1. PRESSURIZE HYDRAULIC SYSTEM.

- a. Seal all normal openings (vents, etc.) in hydraulic system and reservoir.
- b. Using a positive means to control pressure (i.e., a regulator), pressurize hydraulic system to 2 to 4 psi (13.79 to 27.6 kPa/0.1379 to 0.276 bar).

NOTE

A soap solution applied to the fittings and joints may also prove helpful in detecting small leaks while the system is pressurized.

- c. Inspect all joints and fittings for evidence of leaks.

- d. Remove pressure, repair any leaks found and reopen any openings (vents, etc.) closed for inspection.
 - e. Refill reservoir after completing any repairs or service.
 - f. Operate all hydraulic circuits several times in both directions. This action should return any entrapped air to the reservoir where it can be removed from oil by the baffle system provided.
- 2. REMOVE ENTRAPPED AIR IN CYLINDERS.**

CAUTION

Locate crane on a firm supporting surface and position boom in most stable position when extending boom at low angles.

NOTE

Rear outriggers may be used to raise crane in order to lower boom nose slightly below horizontal.

- a. If air in telescope cylinder is not readily removed, lower boom to below horizontal, extend telescope cylinder as far as practicable, and allow boom to remain in this position overnight.

WARNING

Extreme care must be used when removing any plugs or restrictions from a hydraulic system suspected to have entrapped air that may be pressurized.

NOTE

This should allow entrapped air to find its way to holding valve so telescoping boom IN next morning should force air back to reservoir.

NOTE

While allowing boom to remain in extended and lowered position overnight is helpful in removing entrapped air from hydraulic cylinder, ensure boom is first telescoped IN (not OUT) in morning. Telescoping OUT can cause air to be forced back into cylinder.

- b. Entrapped air can be removed from any cylinder by cycling cylinder. On certain cylinders, a plugged port is provided on rod end to bleed-off entrapped air.

WARNING

Do not attempt to loosen fittings in pressurized lines or while hydraulic pumps are in operation.

- c. If pumps and motors are noisy after bleeding cylinders, bleed air by loosening various fittings.

END OF TASK

CHAPTER 14

LOAD MOMENT INDICATOR SYSTEM

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SECTION I. LOAD MOMENT INDICATOR SYSTEM MAINTENANCE

DISPLAY CONSOLE INSTALLATION (RT875CC)

TOOLS: General mechanic's tool kit: automotive (5180-00-177-7033)

SUPPLIES: None

EQUIPMENT CONDITIONS: Negative battery cable disconnected at shunt.
(Refer to TM 5-3810-306-20.)

REMOVAL:

1. REMOVE DISPLAY CONSOLE (1).

- a. Unscrew self-retaining screws (2) holding console face (3) and separate console face (3) from console (1).
- b. Tag and disconnect electrical wires of cable (6) from console terminal strip (4) on back of console face (3). Secure console face (3) to console (1) with screws (2).
- c. Loosen connector nut (5) and pull cable (6) through connector nut (5) and out of console (1).
- d. Remove adjusting knobs (7) and remove console (1) from mounting bracket (8).

INSTALLATION:

1. INSTALL DISPLAY CONSOLE (1).

- a. Position console (1) in mounting bracket (8) and secure by installing adjusting knobs (7) through bracket (8) and into sides of console (1).
- b. Unscrew self-retaining screws (2) holding console face (3) and separate console face (3) from console (1).

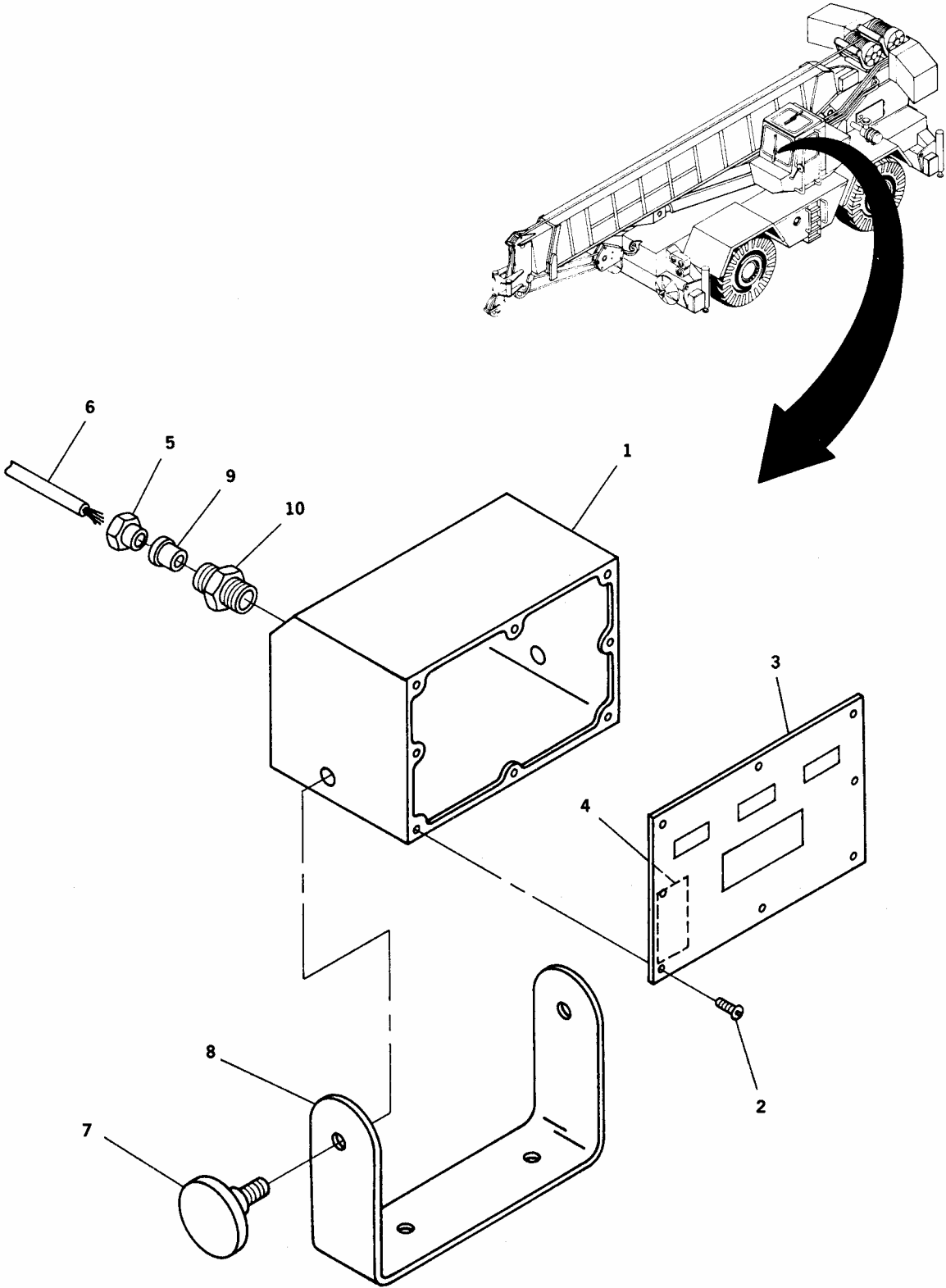
- c. Remove connector nut (5) and rubber insert (9) from metal insert (10) and insert cable (6) through connector nut (5) and rubber insert (9). Push both back over outer insulation of cable.
- d. Insert wires and inner insulation of cable (6) through metal insert (10) and into console (1).

NOTE

Ensure that proper contact is made between outer shield of cable (6) and metal insert (10).

- e. Slide rubber insert (9) and connector nut (5) to metal insert (10) and tighten connector nut (5).
 - f. Reconnect wires of cable (6) to console terminal strip (4) as tagged.
 - g. Secure console face (3) to console (1) by tightening self-retaining screws (2).
- ##### 2. CONNECT NEGATIVE BATTERY CABLE AT SHUNT. (REFER TO TM 5-3810-306-20.)

END OF TASK



DISPLAY CONSOLE INSTALLATION (RT875CCS)

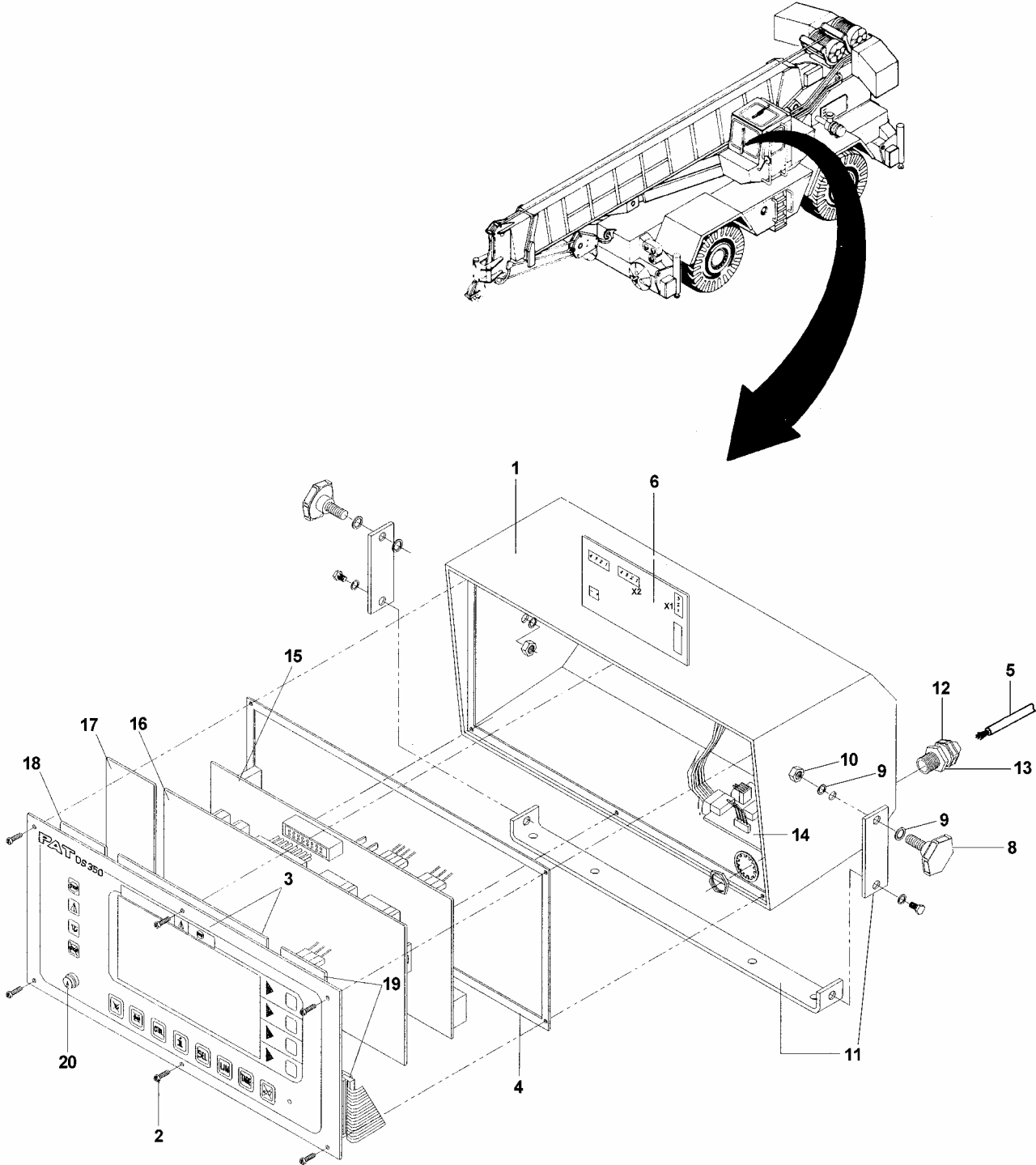
TOOLS: General mechanic's tool kit: automotive (5180-00-177-7033)

SUPPLIES: None

EQUIPMENT CONDITIONS: Battery disconnect switch in the off position.

REMOVAL:

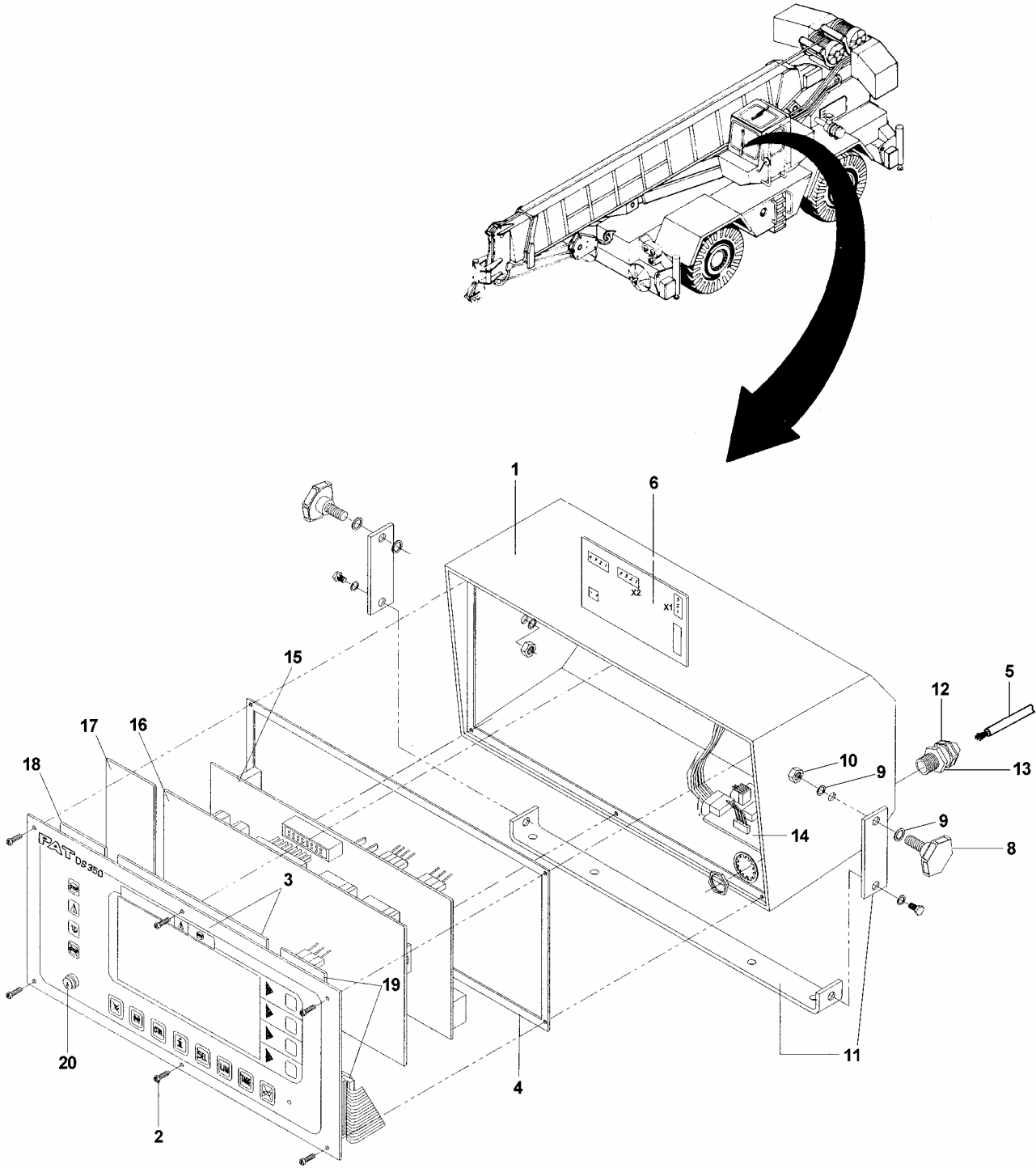
1. REMOVE DISPLAY CONSOLE (1).
 - a. Unscrew self-retaining screws (2) holding front console face/display assembly (3) and separate front console face/display (3) from console (1) and front panel sealing (4).
 - b. Tag and disconnect electrical wires of cable (5) from heater control board (6) and console connection board (15), with stack of board attached, in console (1).
 - c. Remove adjusting knobs (8), washers (9), and nuts (10) and remove console (1) from mounting bracket (11).
 - d. Loosen connector nut (12) on strain relief connector (13) and pull cable (5) through connector nut and strain relief connector (13) and out of console (1).
2. REMOVE HEATER CONTROL BOARD (6)
 - a. Tag and disconnect three electrical connectors from heater control board (6).
 - b. Remove three fan mounting screws and one screw securing heater control board (6) to pins on console (1) and remove heater control board (6) from console (1).
3. REMOVE LIGHT BAR TERMINAL INTERFACE BOARD (14).
 - a. Tag and disconnect three electrical connectors from light bar terminal interface board (14).
 - b. Remove nuts securing light bar terminal interface board (14) to the pins on the console (1) and remove light bar terminal interface board (14) from console (1).
4. REMOVE CONSOLE CONNECTION BOARD (14).
 - a. Tag and disconnect two electrical connectors from light bar terminal interface board (14) and remove front console face/display assembly (3) with the stack of boards attached, from the console (1).
 - b. Tag and disconnect two wires (on X1) and three electrical connectors from console connection board (15).
 - c. Remove four nuts securing console connection board (15) to the stand-off pins on the processor board (16).
 - d. To prevent damage to pins on board connector, carefully pull console connection board (15) away from processor board (16) and remove console connection board (15) from console (1).
5. REMOVE PROCESSOR BOARD (16).
 - a. If necessary, remove console connection board (14).
 - b. Tag and disconnect two ribbon cable electrical connectors from processor board (16).
 - c. Remove four stand-off pins securing processor board (16) to the stand-off pins on the front console face/display assembly (3).
 - d. To prevent damage to pins on board connector, carefully pull processor board (16) away from front console face/display assembly (3) and remove processor board (16) from console (1).



6. REMOVE HEATER BOARD (17).
 - a. Tag and disconnect electrical wires from heater board (17).
 - b. Remove four nuts securing heater board (17) to the stand-off pins on the smaller pushbutton (keyboard) board (18) and remove heater board (17).
7. REMOVE PUSHBUTTON (KEYBOARD) BOARDS (18) AND (19).
 - a. If necessary, remove console connection board (14), processor board (16), and heater board (17).
 - b. Remove one nut and four stand-off pins securing smaller pushbutton (keyboard) board (18) to the pins on the front console face/display assembly (3) and remove smaller pushbutton (keyboard) board (18).
 - c. Tag and disconnect electrical wires for bypass key switch (20) from larger pushbutton (keyboard) board (19). Tag and disconnect electrical connector/wiring and retain.
 - d. Remove nuts securing larger pushbutton (keyboard) board (19) to the pins on the front console face/display assembly (3) and remove larger pushbutton (keyboard) board (19).
8. REMOVE FRONT CONSOLE FACE/DISPLAY ASSEMBLY (3).
 - a. If necessary, remove console connection board (14), processor board (16), heater board (17), and pushbutton (keyboard) boards (18) and (19).
 - b. Remove bypass key switch (20) from front console face/display assembly (3) and remove front console face/display assembly (3).
 - c. If necessary, remove four stand-off pins securing LC display to the pins on the front console face, remove LC display, and tag and disconnect electrical wires from foil heater on front of LC display.

INSTALLATION:

1. INSTALL FRONT CONSOLE FACE/DISPLAY ASSEMBLY (3).
 - a. If necessary, reconnect electrical wires to foil heaters on front of LC display as tagged, position LC display on the pins on the front console face, and secure with four stand-off pins.
 - b. Install bypass key switch (20) to front console face/display assembly (3).
 - c. Install pushbutton (keyboard) boards (18) and (19), heater board (17), processor board (16), and console connection board (15).
2. INSTALL PUSHBUTTON (KEYBOARD) BOARDS (18) AND (19).
 - a. Position larger pushbutton (keyboard) board (19) on pins on the front console face/display assembly (3) and secure with nuts.
 - b. Reconnect electrical wires for bypass key switch (20) and electrical connector/wiring to larger pushbutton (keyboard) board (19) as tagged.
 - c. Position smaller pushbutton (keyboard) board (18) on pins on the front console face/display assembly (3) and secure with one nut and four stand-off pins.
 - d. Install heater board (17), processor board (16), and console connection board (15).
3. INSTALL HEATER BOARD (17).
 - a. Position heater board (17) on stand-off pins on the smaller pushbutton (keyboard) board (18) and secure with four nuts.
 - b. Reconnect electrical wires to heater board (17) as tagged.



4. INSTALL PROCESSOR BOARD (16).
 - a. To prevent damage to pins on board connector, carefully position processor board (16) on board connector and stand-off pins on the front console face/display assembly (3) and connect board connector.
 - b. Secure processor board (16) to stand-off pins on the front console face/display assembly (3) with four stand-off pins.
 - c. Reconnect two ribbon cable electrical connectors (from pushbutton (keyboard) boards) to processor board (16) as tagged.
 - d. Install console connection board (15).
5. INSTALL CONSOLE CONNECTION BOARD (14).
 - a. To prevent damage to pins on board connector, carefully position console connection board (14) on board connector and stand-off pins on the processor board (16) and connect board connector.
 - b. Secure console connection board (14) to stand-off pins on the processor board (16) with four nuts.
 - c. Reconnect two wires (to X1) and three electrical connectors to console connection board (14) as tagged.
6. INSTALL LIGHT BAR TERMINAL INTERFACE BOARD (14).
 - a. Position light bar terminal interface board (14) on pins in console (1) and secure with nuts.
 - b. Reconnect three electrical connectors to light bar terminal interface board (14) as tagged.

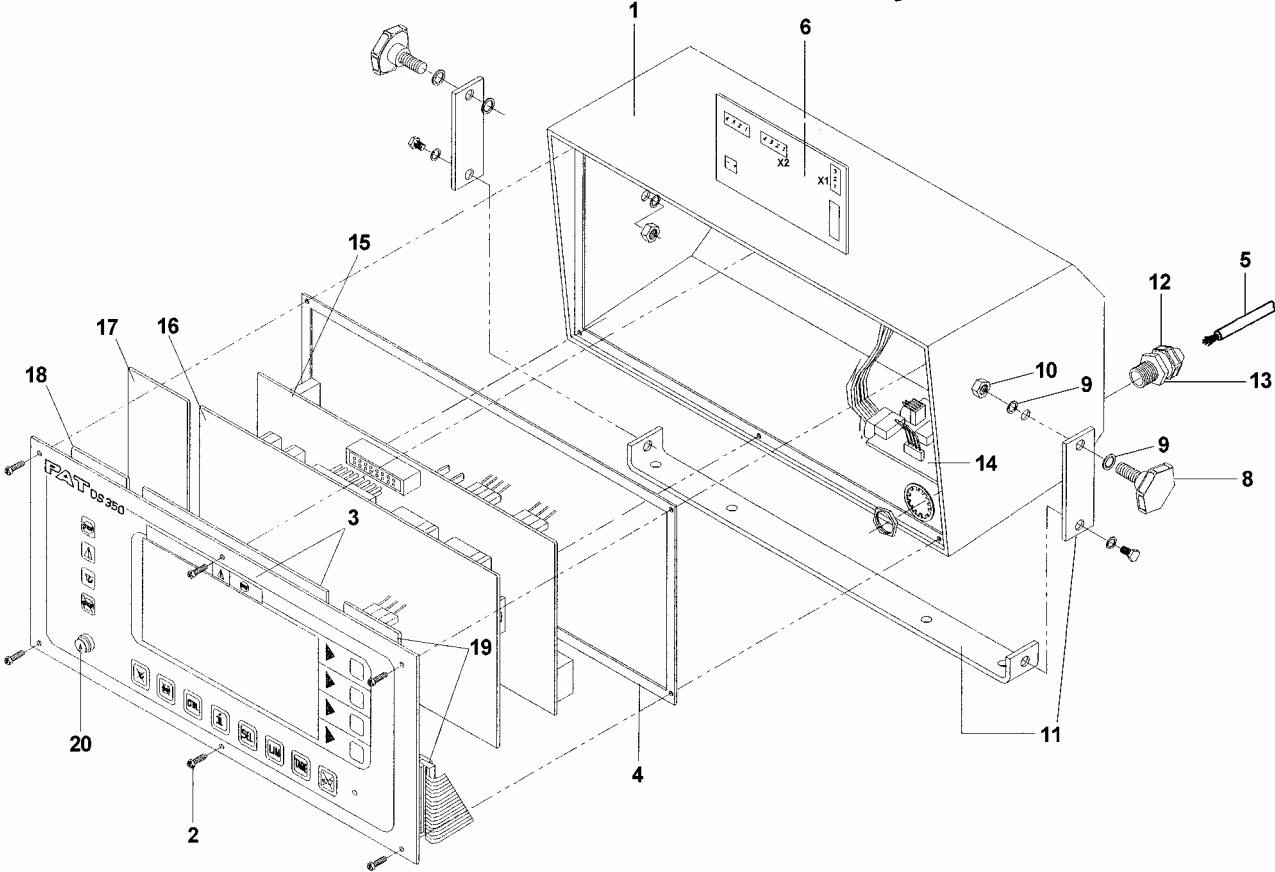
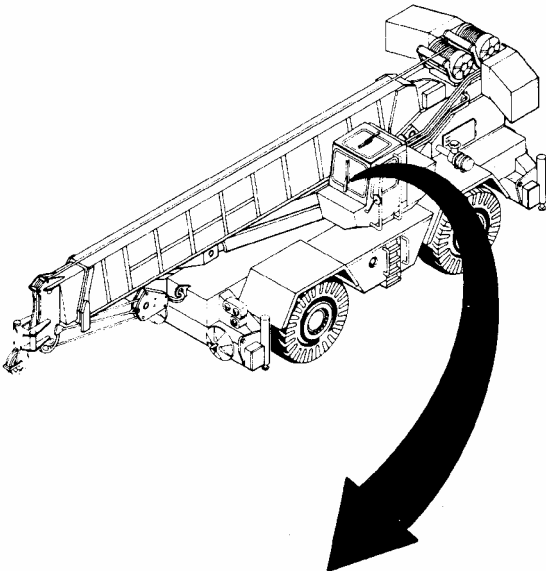
7. INSTALL HEATER CONTROL BOARD (6).
 - a. Position heater control board (6) on pins in the console (1) and secure with four screws.
 - b. Reconnect three electrical connectors to heater control board (6) as tagged.
8. INSTALL DISPLAY CONSOLE (1).
 - a. Remove connector nut (12) and rubber insert from strain relief connector (13).
 - b. Insert cable (5) through connector nut (12) and rubber insert. Push both back over outer insulation of cable (5).
 - c. Insert wires and inner insulation of cable (5) through strain relief connector (13) and into console (1).

NOTE

Ensure that proper contact is made between outer shield of cable (5) and metal insert of strain relief connector (13).

- d. Slide rubber insert and connector nut (12) onto strain relief connector (13) and tighten connector nut (12).
- e. Reconnect wires of cable (5) to heater control board (6) and console connection board (15) as tagged.
- g. Position console (1) in mounting bracket (11) and secure by installing adjusting knobs (8) through washers (9) and bracket (11) and into sides of console (1). Secure with washers (9) and nuts (10).
- h. Secure front console face/display (3), with stack of boards attached, to console (1) and front panel sealing (4) by tightening self-retaining screws (2).

END OF TASK



CENTRAL PROCESSING UNIT INSTALLATION (RT875CC)

TOOLS: General mechanic's tool kit: automotive (5180-00-177-7033)
Digital Voltmeter (6625-00-139-2512)

SUPPLIES: None

EQUIPMENT CONDITIONS: Negative battery cable disconnected at shunt.
(Refer to TM 5-3810-306-20.)
Boom hoist cylinder fully retracted. (Refer to TM 5-3810-306-10.)

REMOVAL:

1. REMOVE CENTRAL PROCESSING UNIT (CPU).
 - a. Remove wire seal, screws (2) and cover (3) from housing (1).
 - b. Tag and remove electrical wires of external cables from terminal board in housing (1).
 - c. Loosen connector nuts (4) securing external cables.
 - d. Mark each cable to its corresponding strain relief connector port on bottom of housing (1) and pull each cable out of housing (1).
 - e. Remove bolts (5) and remove housing (1) from mounting bracket (6).

- b. Remove connecting nuts (4) and rubber inserts (7) from strain relief connectors on bottom of housing (1).
- c. Insert each external cable through a connector nut (4) and rubber insert (7). Push both over outer insulation of cables.
- d. Insert wires and inner insulation of each cable through correct strain relief port and into housing (1) as marked.

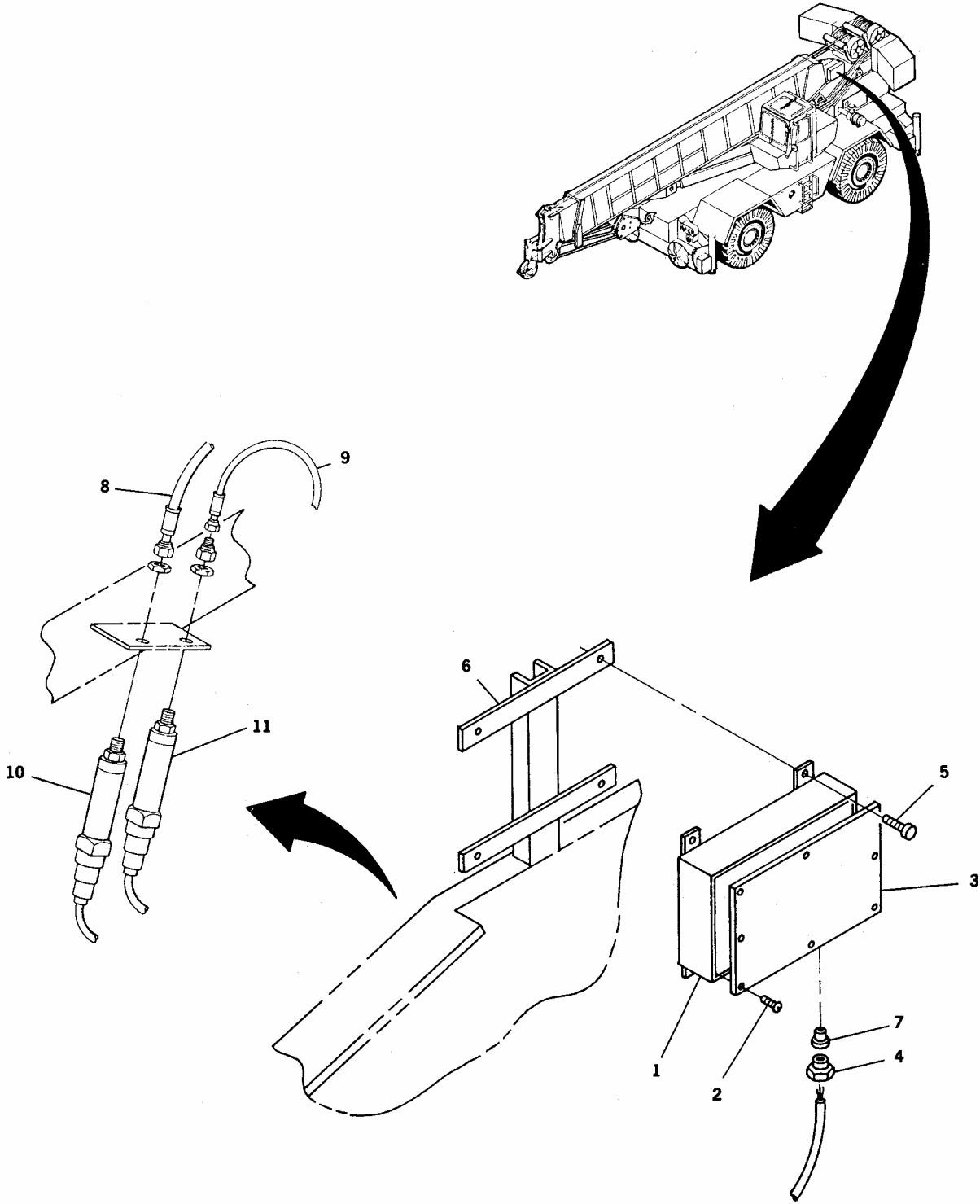
NOTE

Ensure proper contact between outer shield of cable and metal insert of strain relief connector.

INSTALLATION:

1. INSTALL CENTRAL PROCESSING UNIT (CPU).
 - a. Position housing (1) in mounting bracket (6) and secure with bolts (5).

- e. Slide each rubber insert (7) and connector nut (4) back onto strain relief connectors and tighten connector nuts (4).
- f. Reconnect electrical wires to terminal board in housing (1) as tagged.
- g. Adjust central processing unit.



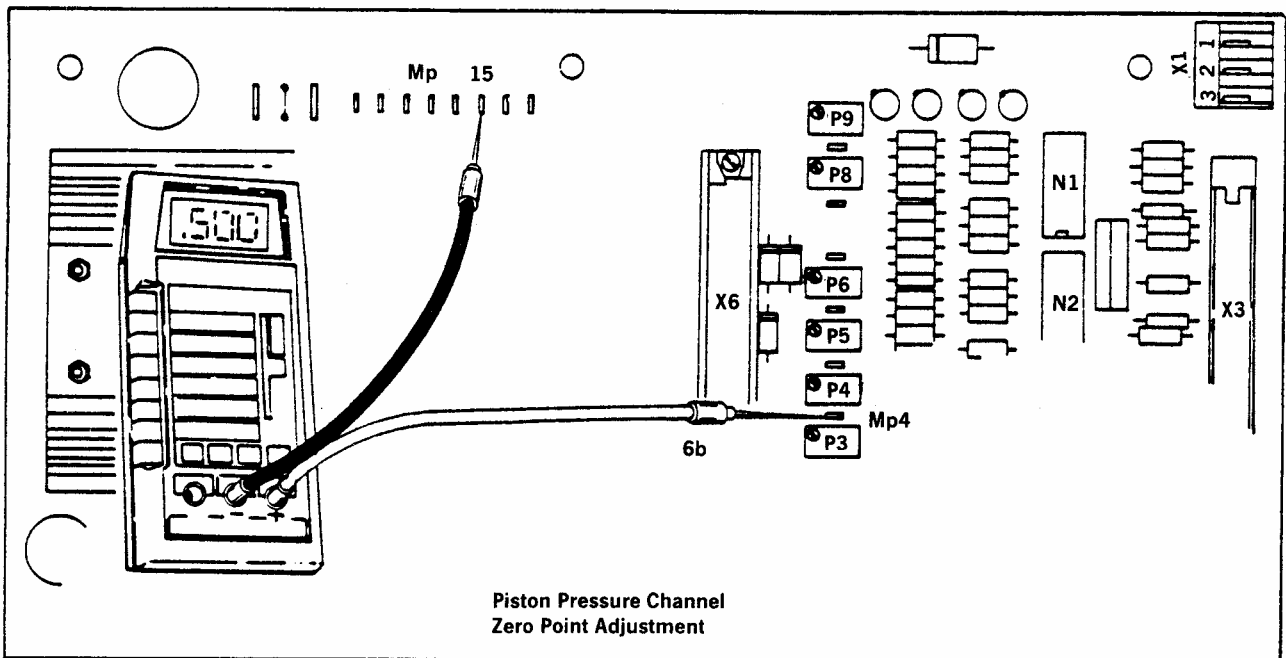
ADJUSTMENT:

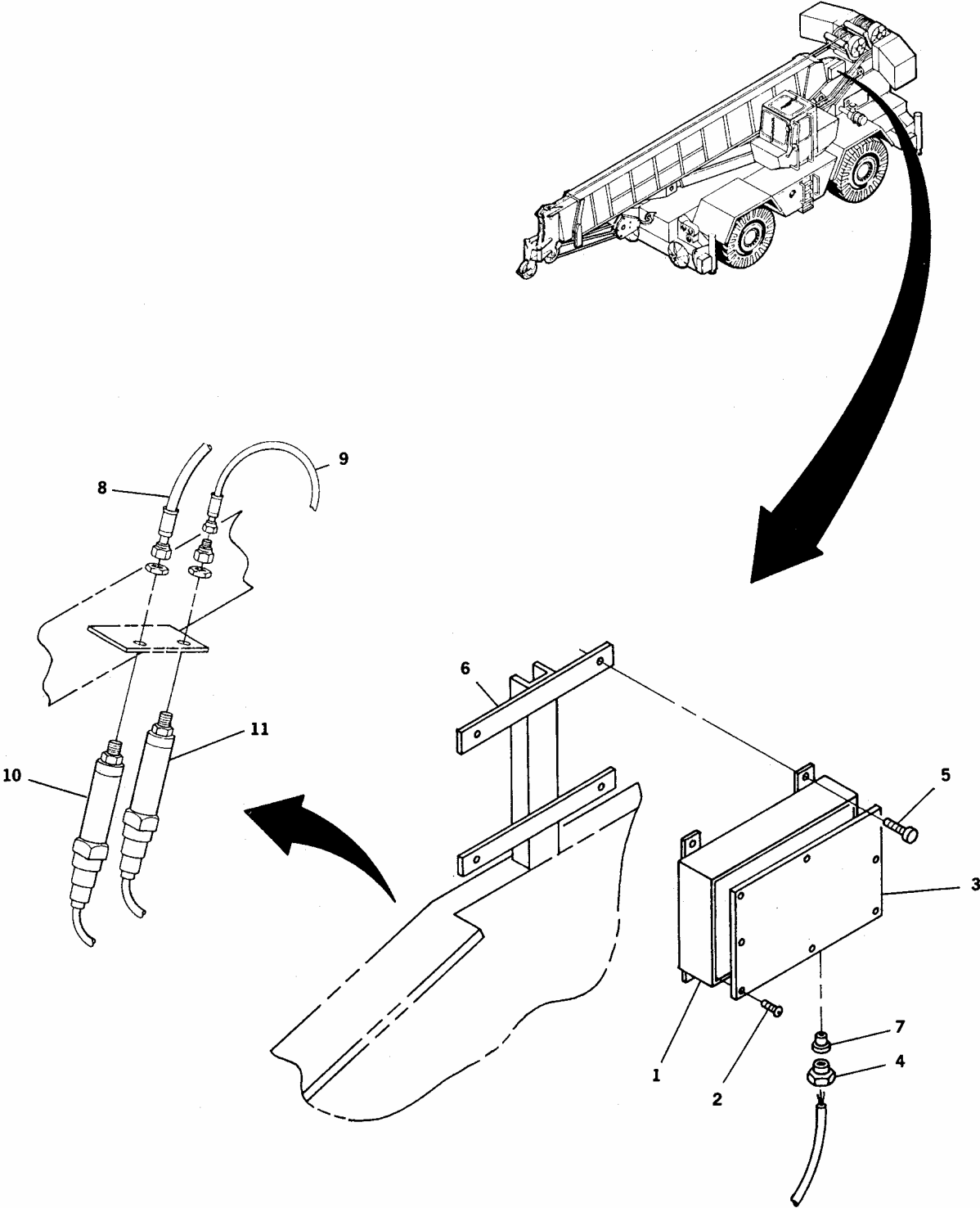
1. ADJUST CENTRAL PROCESSING UNIT (CPU).

CAUTION

Special care must be taken before disconnecting hydraulic lines from transducers. Make sure lift cylinders are FULLY retracted; otherwise injury and damage can occur.

- a. Disconnect pressure lines (8) and (9) from pressure transducers (10) and (11).
2. ADJUST PISTON PRESSURE CHANNEL.
 - a. Connect digital voltmeter to CPU main board.
 - 1) Black (-) lead to test point MP15.
 - 2) Red (+) lead to test point MP4.
 - b. Adjust P4 to obtain a reading of .500 Vdc (500 mV) on voltmeter.





3. ADJUST ROD PRESSURE CHANNEL.

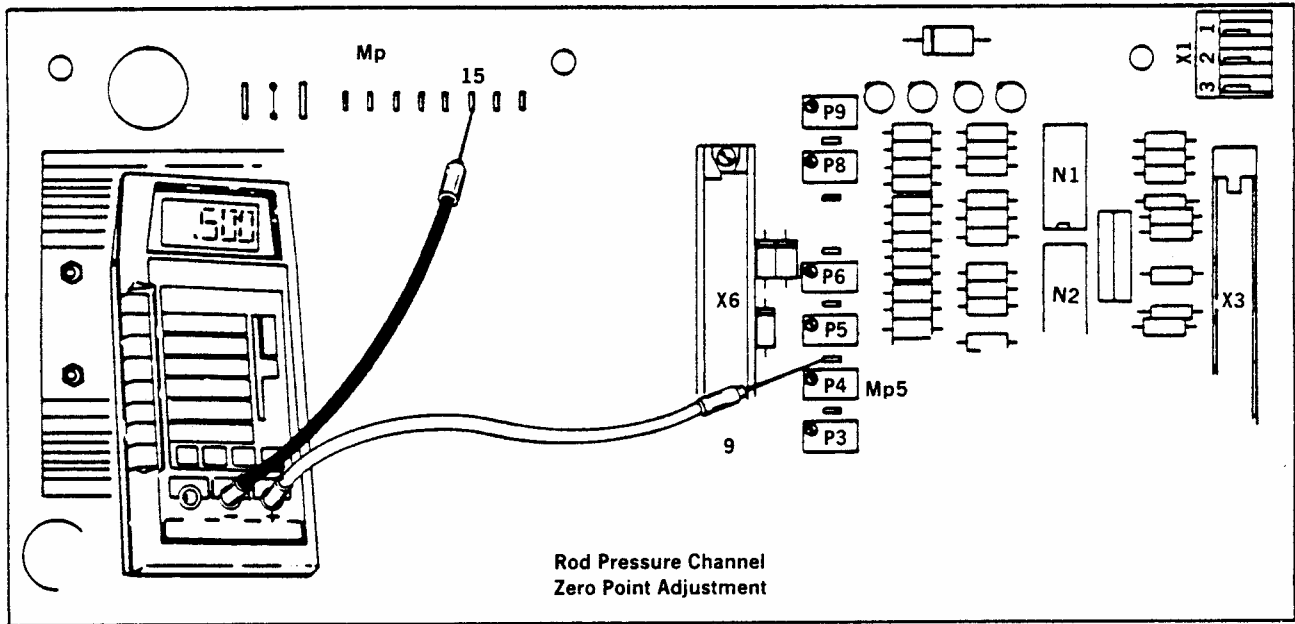
- a. Connect digital voltmeter to CPU main board.
 - 1) Black (-) lead to test point MP15.
 - 2) Red (+) lead to test point MP5.
- b. Adjust P5 to obtain a reading of .500 Vdc (500 mV) on voltmeter.

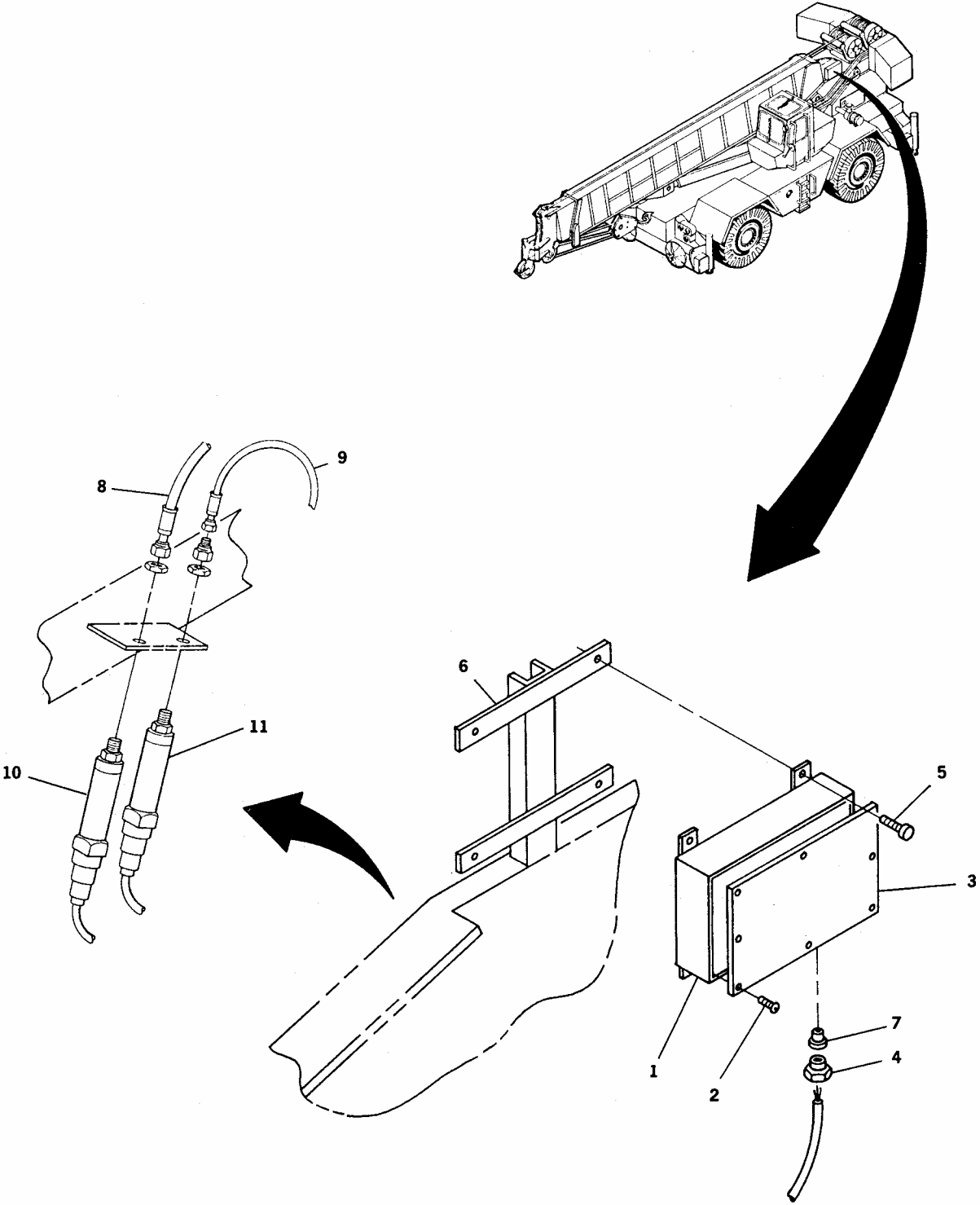
4. INSTALL COVER (3) WITH SCREWS (2) AND WIRE SEAL.

5. RECONNECT PRESSURE LINES (8) AND (9) TO PRESSURE TRANSDUCERS (10) AND (11).

6. CONNECT NEGATIVE BATTERY CABLE AT SHUNT. (REFER TO TM 5-3810-306-20.)

END OF TASK





CENTRAL PROCESSING UNIT INSTALLATION (RT875CCS)

TOOLS: General mechanic's tool kit: automotive (5180-00-177-7033)
Digital Voltmeter (6625-00-139-2512)

SUPPLIES: Heat shrink tubing (as required)

EQUIPMENT CONDITIONS: Battery disconnect switch in off position.
Boom hoist cylinder fully retracted. (Refer to TM 5-3810-306-10.)

REMOVAL:

1. REMOVE CENTRAL PROCESSING UNIT (CPU).

- a. Remove tamper seal, screws (1) and washers (2) and remove seal (4) and cover/load chart (3) from CPU housing (5).

NOTE

Retain cover/load chart (3) from CPU for installation on new CPU.

- b. Tag and remove electrical wires of external cables from connector X1 (6) on main board (7) in CPU housing (5).
- c. Loosen connector nuts (8) securing external cables to strain relief connectors (9) on side of CPU housing (5).
- d. Mark each cable to its corresponding strain relief connector (9) on side of CPU housing (5) and pull each cable out of housing (5).
- e. Remove nuts (10), lockwashers (11), and washers (12) and remove CPU housing (5) from side of cab.

INSTALLATION:

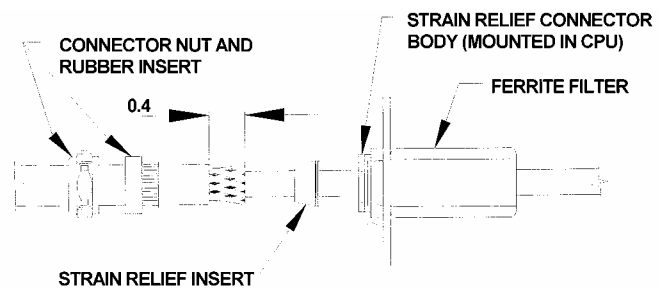
1. INSTALL CENTRAL PROCESSING UNIT (CPU).

- a. Position CPU housing (5) in mounting studs on side of cab and secure with nuts (10), lockwashers (11), and washers (12).

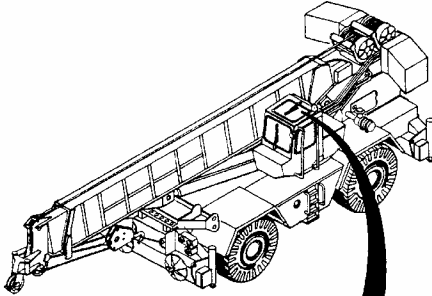
- b. Remove connecting nuts (8), rubber inserts, and strain relief insert from strain relief connectors (9) on bottom of CPU housing (5).
- c. Insert each external cable through a connector nut (8) and rubber insert. Push both over outer insulation of cables.
- d. Insert wires and inner insulation of each cable through a strain relief insert and then through correct strain relief port and ferrite filter and into CPU housing (5) as marked.

NOTE

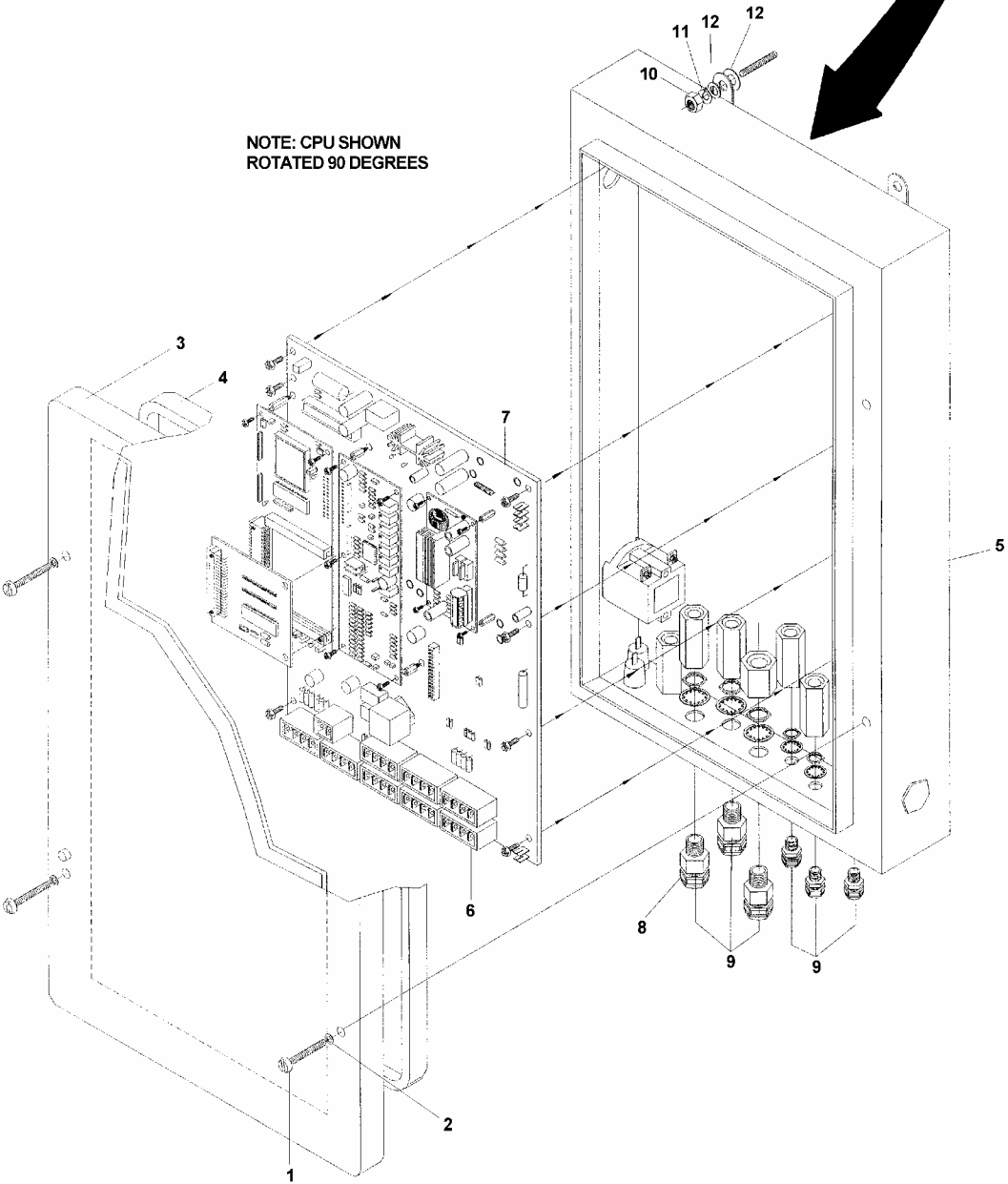
Ensure proper contact between outer shield of cable and metal strain relief insert of strain relief connector.



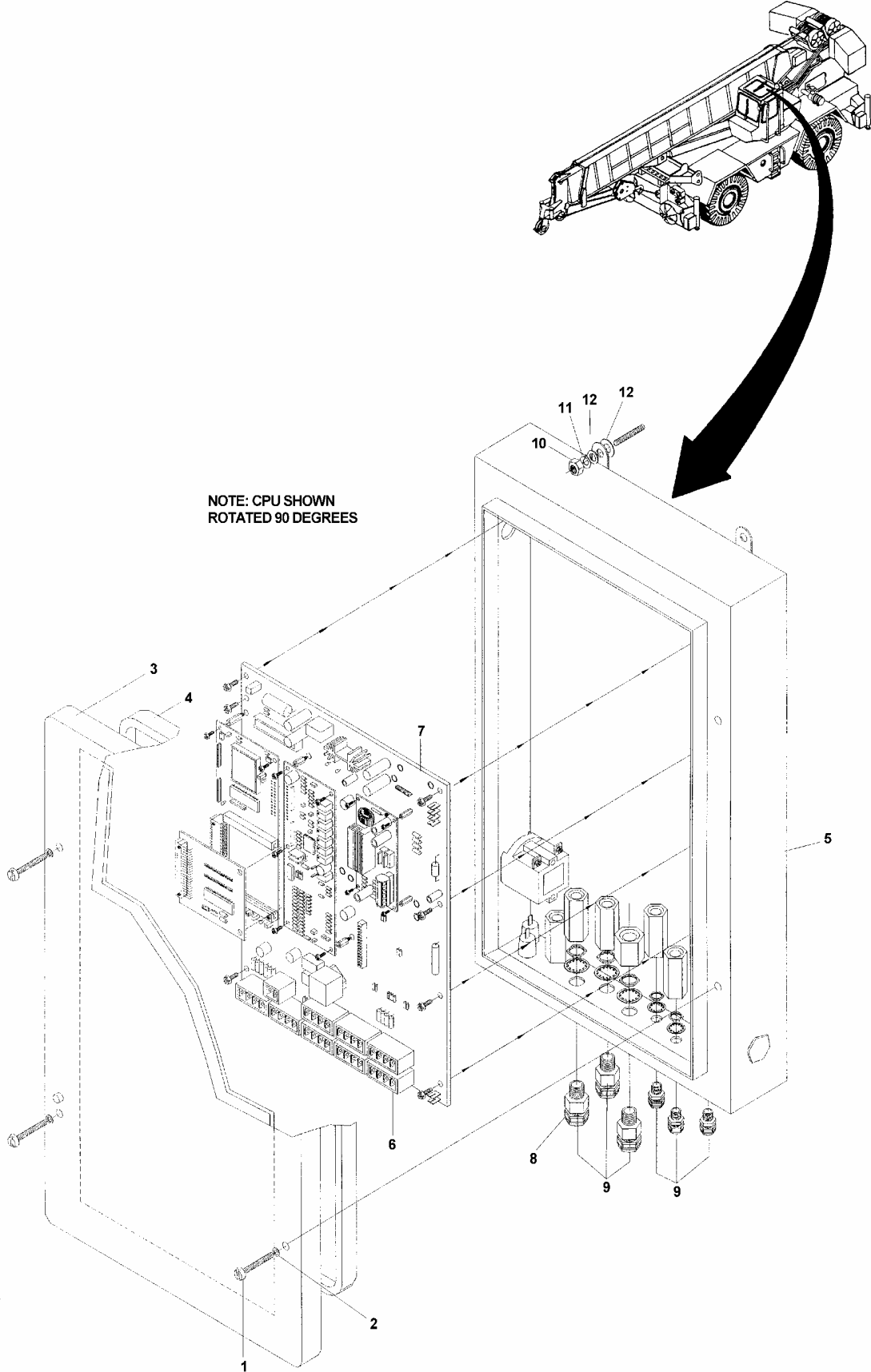
- e. Slide each rubber insert, strain relief insert, and connector nut (8) back onto strain relief connectors and tighten connector nuts (8).



NOTE: CPU SHOWN
ROTATED 90 DEGREES



- f. Reconnect electrical wires to connector X1 (6) on main board (7) in CPU housing (5) as tagged.
- g. Position cover/load chart (3) from old CPU with new seal (4) on front of CPU housing (5) and secure with screws (1), washers (2) and new tamper seal.
- h. Adjust central processing unit. (Refer to Page 14-20).



ADJUSTMENT:

1. ADJUST CENTRAL PROCESSING UNIT (CPU).





WARNING

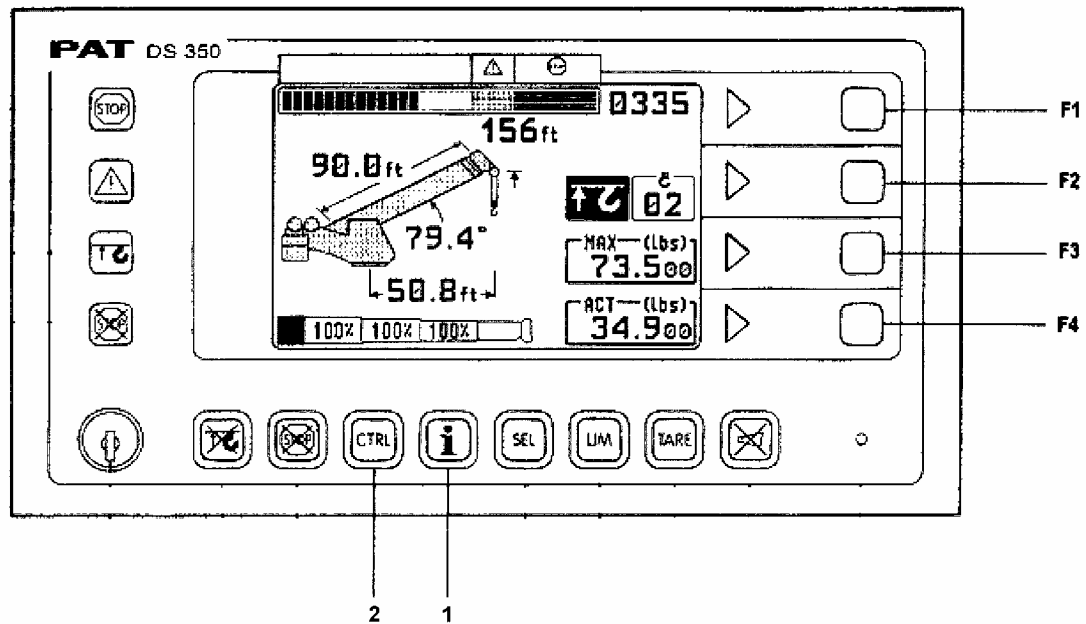
Be sure to wear protective eye covering to avoid personal injury.

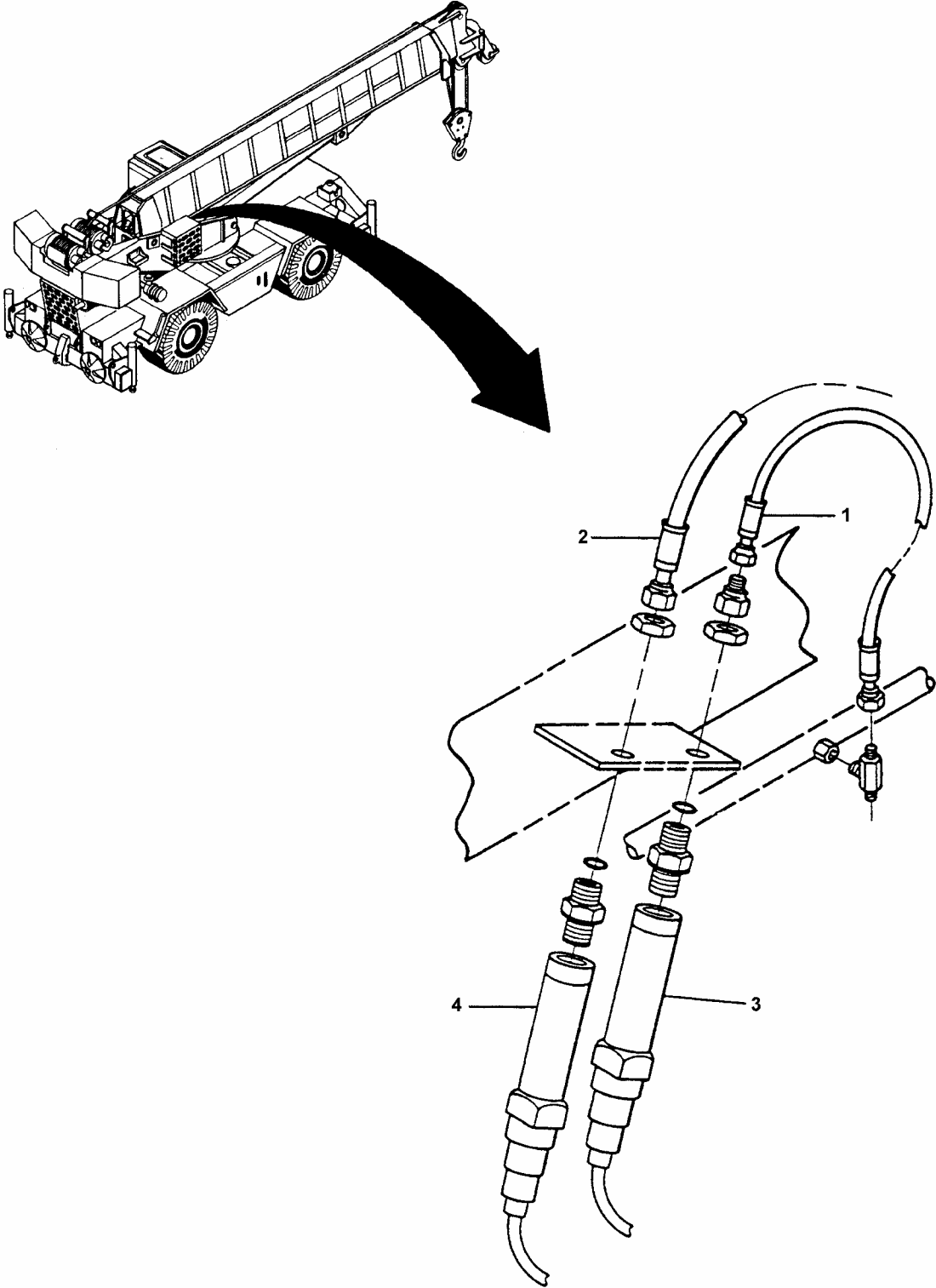
CAUTION

Special care must be taken before disconnecting hydraulic lines from transducers. Make sure lift cylinders are FULLY retracted; otherwise injury and damage can occur.

- a. Disconnect pressure lines (1) and (2) from pressure transducers (3) and (4).


- b. Turn the battery disconnect switch to the on position.
2. ACTIVATE THE ZERO-SETTING FUNCTION
 - a. Press **i** (Information) button (1) on the display console to activate the “crane information configuration” function.
 - b. Press the **CTRL** (Control) button (2) on the display console.
 - c. Use F1 (), F2 () and F3 () buttons to enter appropriate five digit authorization number (64356) to activate the zero-point settings function.
 - d. Press the F4 () button.









3. ADJUST PISTON PRESSURE CHANNEL.


NOTE

The display console should indicate that piston pressure channel is being zeroed. If necessary, press the F4 () button to toggle between the piston pressure, rod pressure, and force channel zero-settings.

- a. Press the F2 () and F3 () buttons simultaneously to automatically set the zero-setting for the piston pressure channel.

NOTE


Manual adjustments may be performed by pressing the F2 () and F3 () buttons to adjust the pressure upwards or downwards respectively.



- b. Press the F4 () button to advance to the rod pressure channel setting.

4. ADJUST ROD PRESSURE CHANNEL.



NOTE


The display console should indicate that rod pressure channel is being zeroed. If necessary, press the F4

() button to toggle between the piston pressure, rod pressure, and force channel zero-settings.

- a. Press the F2 () and F3 () buttons simultaneously to automatically set the zero-setting for the rod pressure channel.

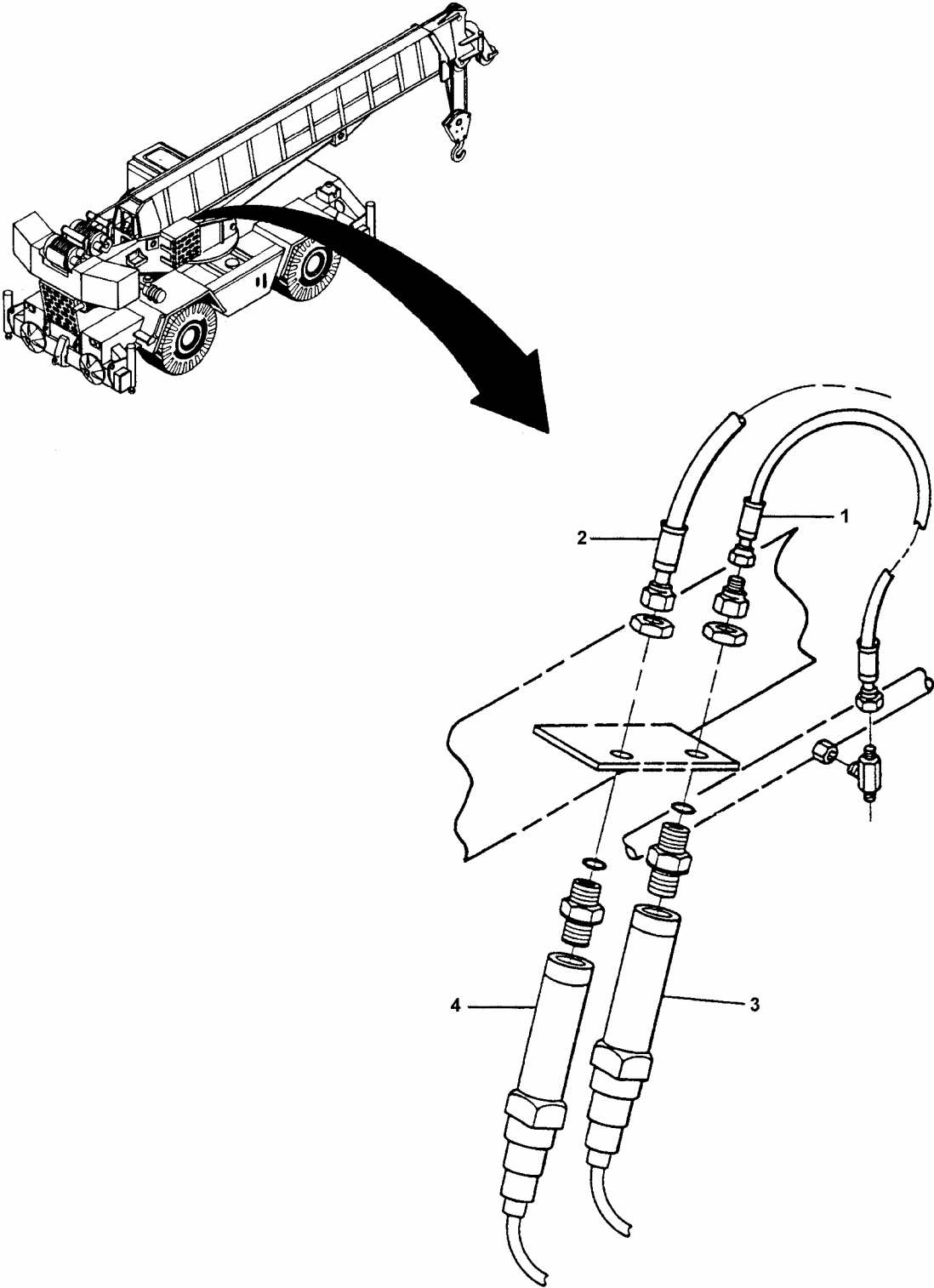
NOTE

Manual adjustments may be performed by pressing the F2 () and F3 () buttons to adjust the pressure upwards or downwards respectively.

- b. Confirm inputs and exit the “crane information configuration” function by pressing F1 ().

5. TURN BATTERY DISCONNECT SWITCH TO THE OFF POSITION.
6. RECONNECT PRESSURE LINES (1) AND (2) TO PRESSURE TRANSDUCERS (3) AND (4) AND BLEED HYDRAULIC LINES.
7. TURN BATTERY DISCONNECT SWITCH TO THE ON POSITION.

END OF TASK



CENTRAL PROCESSING UNIT MAIN BOARD, CPU MODULE, AND ANALOG INPUT MODULE INSTALLATION (RT875CCS)

TOOLS: General mechanic's tool kit: automotive (5180-00-177-7033)
Digital Voltmeter (6625-00-139-2512)

SUPPLIES: None

EQUIPMENT CONDITIONS: Battery disconnect switch in off position.
Boom hoist cylinder fully retracted. (Refer to TM 5-3810-306-10.)

REMOVAL:

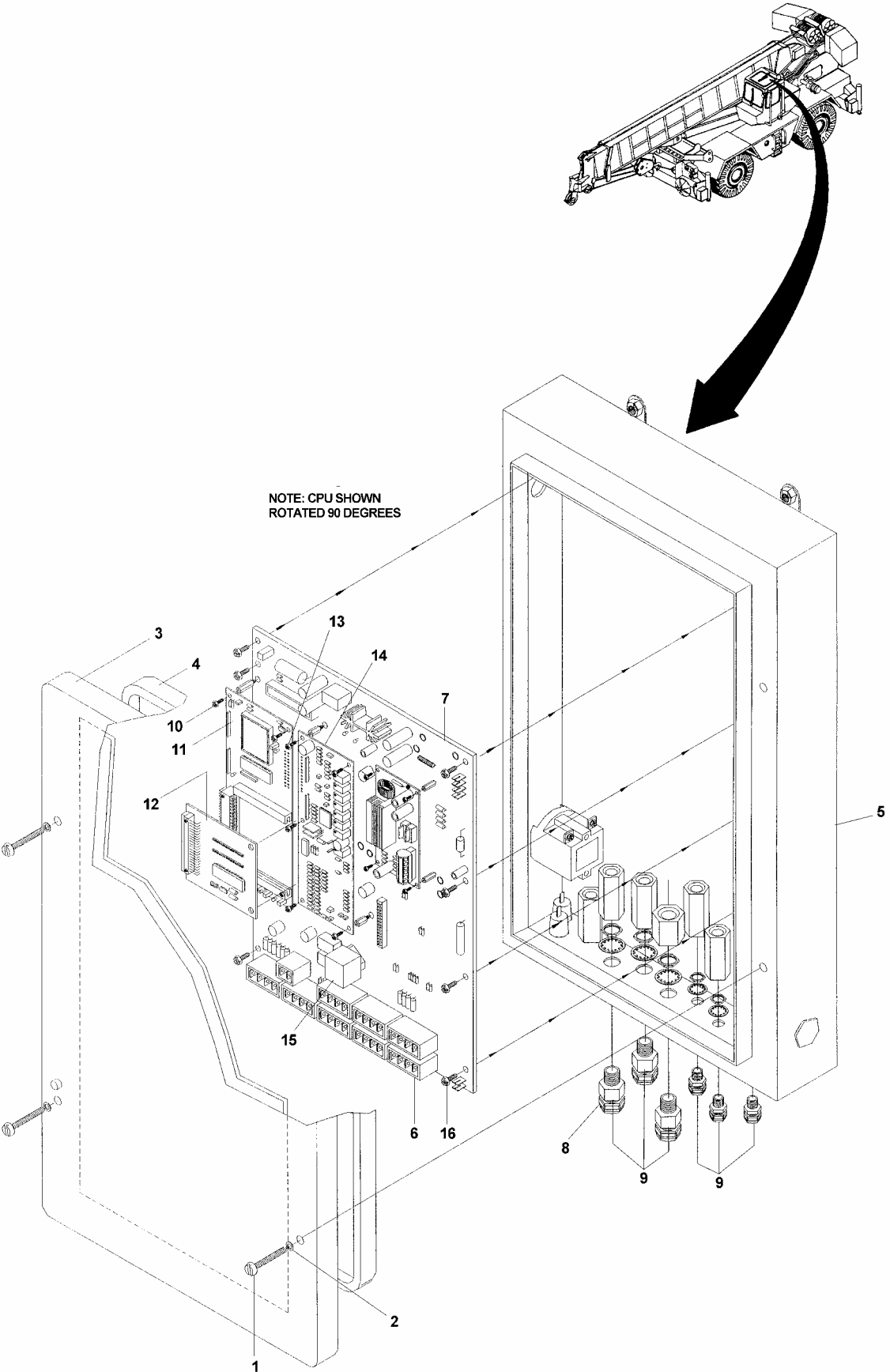
CAUTION

1. REMOVE MAIN BOARD.

- a. Remove screws (1) and washers (2) and remove seal (4) and cover/load chart (3) from CPU housing (5).
- b. Tag and remove electrical wires of external cables from connector X1 (6) on main board (7) in CPU housing (5).
- c. Loosen connector nuts (8) securing external cables to strain relief connectors (9) on side of CPU housing (5).
- d. Mark each cable to its corresponding strain relief connector (9) on side of CPU housing (5) and pull each cable out of housing (5).

To prevent damage to boards, use screwdriver carefully when removing/installing screws and remove CPU module board (11) and analog input module (14) carefully to prevent damage to pins on bottom side of the boards.

- e. Remove screws (10) and remove CPU module (11) from main board (7) with the EPROM module (12) remaining on the CPU module (11).
- f. Remove screws (13) and remove analog input module (14) from main board (7).
- g. Remove relay (15) from main board (7).
- h. Remove screws (16) and remove main board (7) from CPU housing (5).



INSTALLATION:

1. INSTALL MAIN BOARD

- a. Carefully position main board (7) in CPU housing (5) and secure with screws (16).

NOTE

Ensure to attach ground wire to KGND screw in the lower left hand corner of the main board (7).

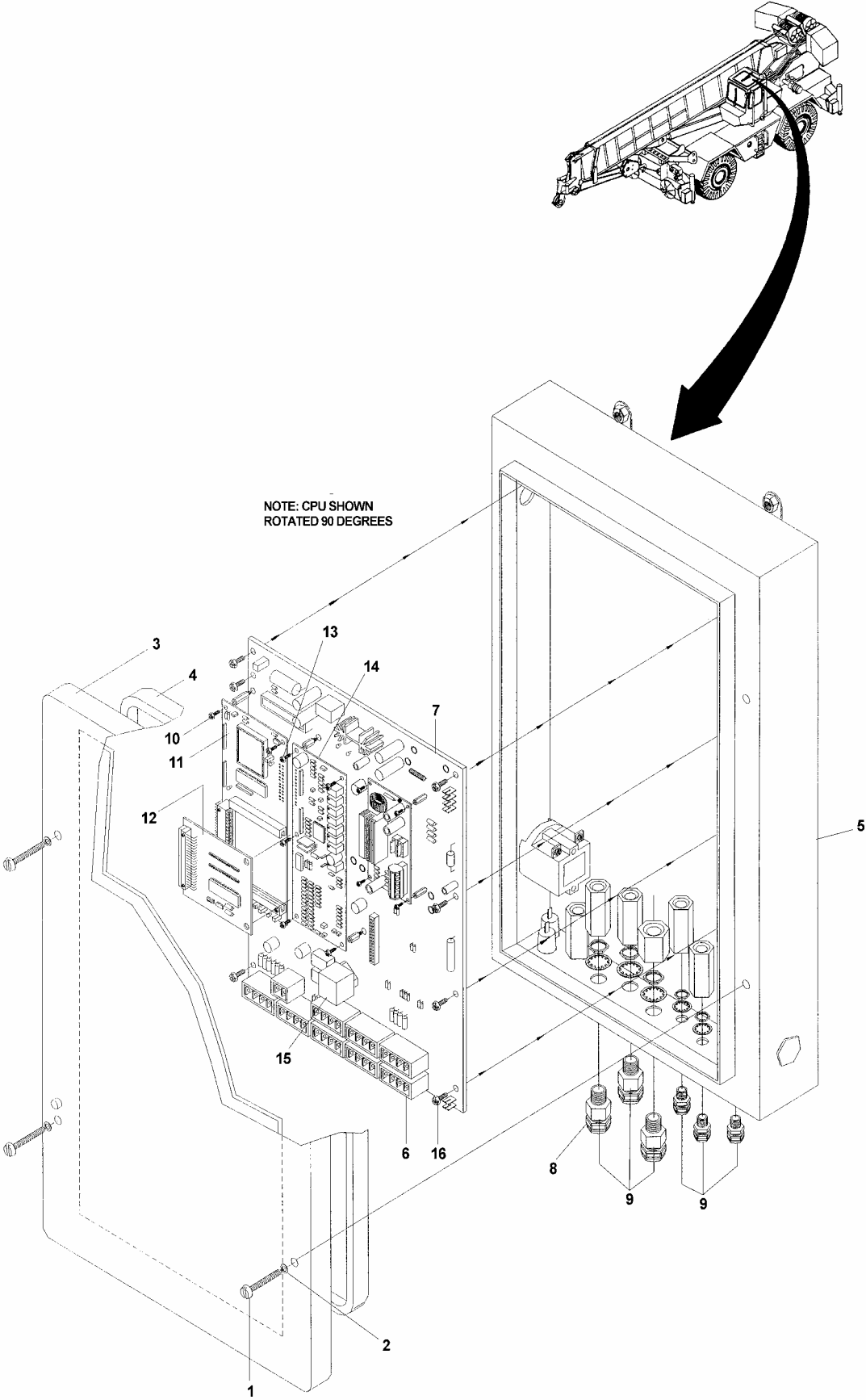
- b. Insert the relay (15) into the connector on the main board (7).
- c. Carefully insert the analog input module (14) into the sockets on the main board (7) and secure with screws (13).
- d. Carefully insert the CPU module (11) into the sockets on the main board (7) and secure with screws (10).
- e. Remove connecting nuts (8) and rubber inserts from strain relief connectors (9) on bottom of CPU housing (5).
- f. Insert each external cable through a connector nut (8) and rubber insert. Push both over outer insulation of cables.

- g. Insert wires and inner insulation of each cable through correct strain relief port and into CPU housing (5) as marked.

NOTE

Ensure proper contact between outer shield of cable and metal insert of strain relief connector.

- h. Slide each rubber insert and connector nut (8) back onto strain relief connectors and tighten connector nuts (8).
- i. Reconnect electrical wires to connector X1 (6) on main board (7) in CPU housing (5) as tagged.
- j. Position cover/load chart (3) from old CPU with seal (4) on front of CPU housing (5) and secure with screws (1) and washers (2).
- k. Adjust central processing unit (refer to Page 14-20).



CENTRAL PROCESSING UNIT EPROM INSTALLATION (RT875CCS)

TOOLS: General mechanic's tool kit: automotive (5180-00-177-7033)
Digital Voltmeter (6625-00-139-2512)
EPROM Puller

SUPPLIES: None

EQUIPMENT CONDITIONS: Battery disconnect switch in off position.
Boom hoist cylinder fully retracted. (Refer to TM 5-3810-306-10.)

REMOVAL:

1. REMOVE EPROM

- a. Remove screws (1) and washers (2) and remove seal (4) and cover/load chart (3) from CPU housing (5).
- b. Carefully remove appropriate EPROM from EPROM socket.

CAUTION

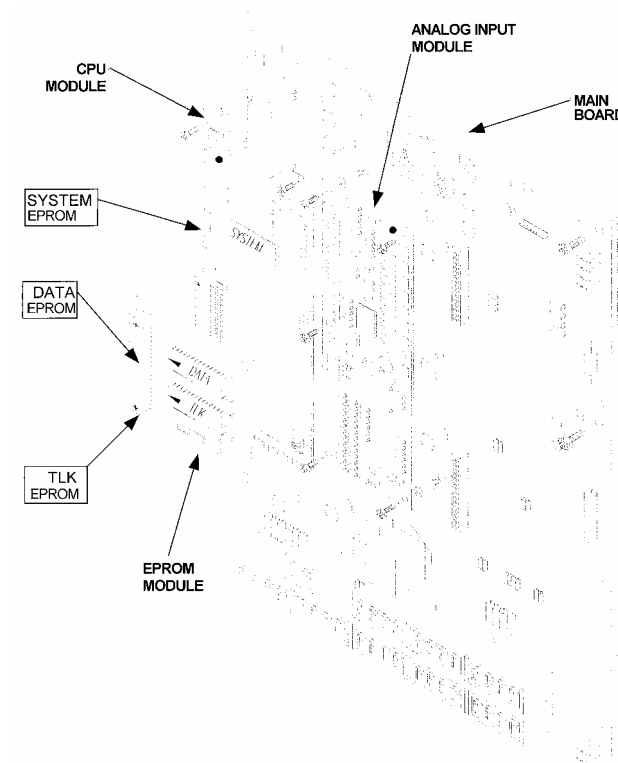
The DATA and TLK EPROMs fill the bottom of the socket as shown by the arrows.

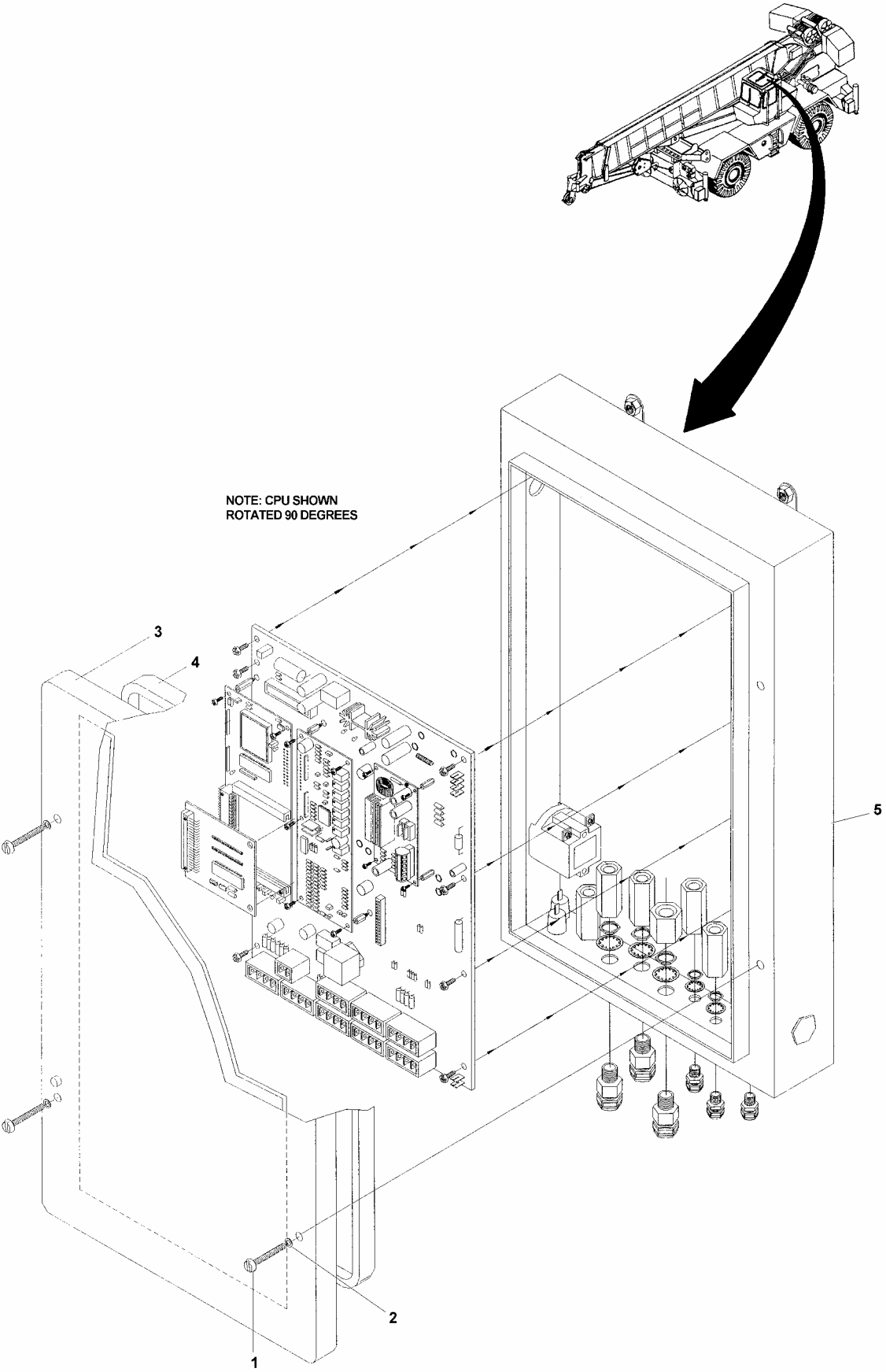
- b. Position cover/load chart (3) with seal (4) on front of CPU housing (5) and secure with screws (1) and washers (2).
- c. Adjust central processing unit (refer to Page 14-20).

INSTALLATION:

1. INSTALL EPROM

- a. Carefully position appropriate EPROM with notch in the correct direction and insert EPROM into appropriate socket on board.





BOOM LENGTH/ANGLE CABLE REEL ASSEMBLY INSTALLATION (RT875CC)

TOOLS: General mechanic's tool kit: automotive (5180-00-177-7033)
Carpenter's level (2 Required)

SUPPLIES: None

EQUIPMENT CONDITIONS: Negative battery cable disconnected at shunt.
(Refer to TM 5-3810-306-20.)
Boom fully retracted and lowered. (Refer to TM 5-3810-306-10.)

WARNING

Be sure to wear protective eye covering and gloves to avoid personal injury.

REMOVAL:

1. CLAMP CABLE REEL DRUM (1) ONTO MOUNTING BRACKET (2) TO PREVENT PREMATURE RETRACTION OF BOOM LENGTH CABLE (6).
2. REMOVE BOOM LENGTH CABLE (6) FROM BOOM NOSE RECEPTACLE (4).
 - a. Unplug jumper/dummy plug (3) from boom nose receptacle (4).
 - b. Loosen set screws (5) and separate insert (18) from boom nose receptacle (4).
 - c. Disconnect the core wire of boom length cable (6) from pin 6 and the shield of boom length cable (6) from ground terminal on insert (18).
3. CAREFULLY RELEASE CLAMP ON CABLE REEL DRUM (1) AND RETRACT BOOM LENGTH CABLE (6) ONTO DRUM. SECURE FREE END OF BOOM LENGTH CABLE (6) TO CABLE REEL DRUM (1) WITH TAPE.

NOTE

Cable reel drum (1) will still be under tension when boom length cable (6) is fully retracted. Carefully turn cable reel drum (1) until tension is gone.

NOTE

Do not remove wire No. 2 (A2B Switch) from pin 6.

- d. Loosen connector nut (7) on strain relief connector and pull boom length cable (6) from boom nose receptacle (4).

NOTE

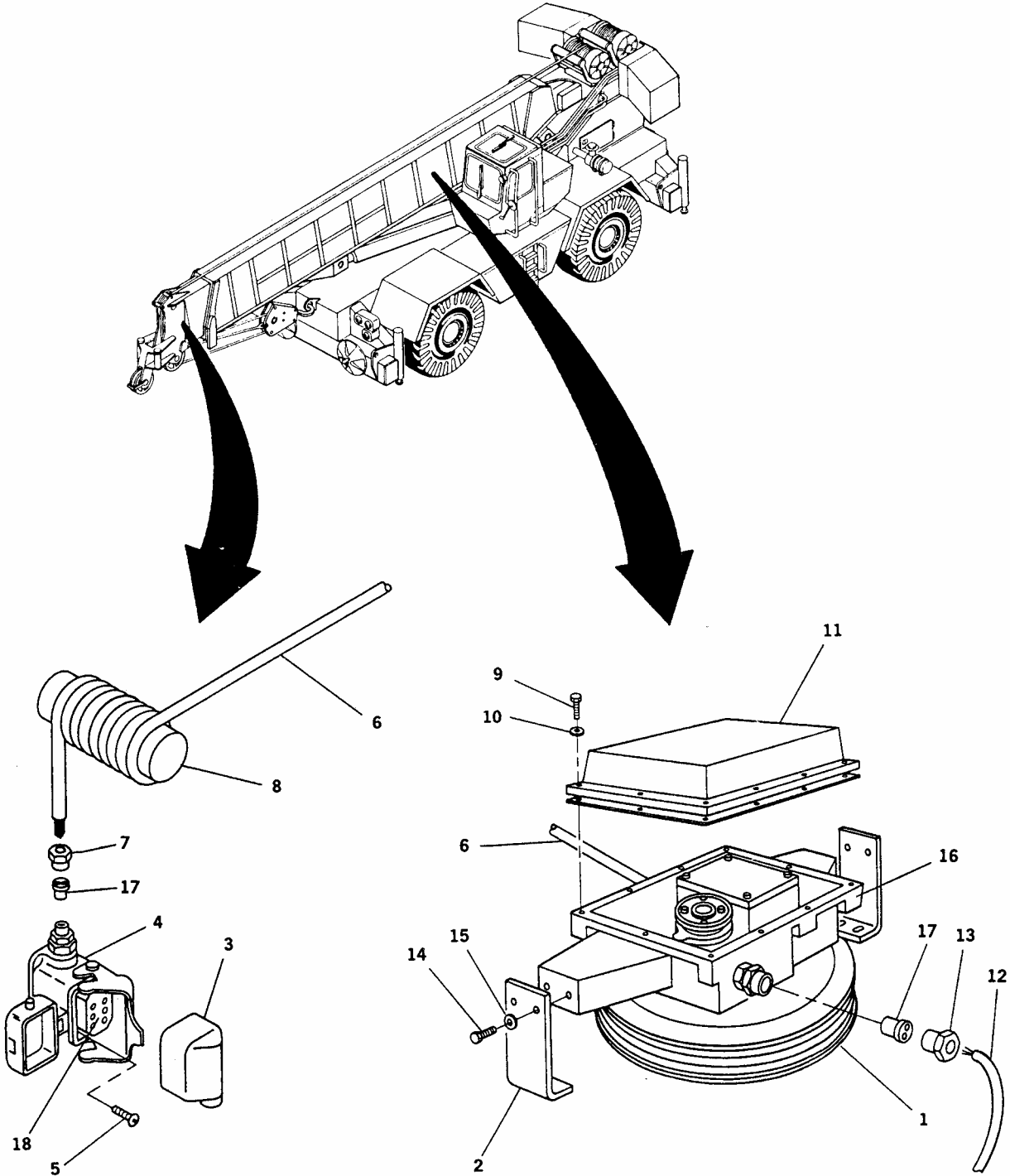
Before cutting tie wraps, make note of how many times boom length cable (6) is wrapped around tube (8).

- e. Cut tie wraps holding boom length cable (6) around tube (8). Remove boom length cable (6).

4. REMOVE BOOM LENGTH/ANGLE CABLE REEL ASSEMBLY (16).
 - a. Remove hex screws (9), washers (10) and cover (11) from cable reel assembly (16).
 - b. Tag and disconnect electrical wires of cable (12) from terminal block in cable reel assembly (16).
 - c. Loosen connector nut (13) on strain relief connector (9) and pull cable (12) through connector nut and strain relief connector (9) and from cable reel assembly (16).
 - d. Remove bolts (14), washers (15) and cable reel assembly (16) from mounting brackets (2).

INSTALLATION:

1. INSTALL BOOM LENGTH/ANGLE CABLE REEL ASSEMBLY (16).
 - a. Position cable reel assembly (16) in mounting brackets (2) and secure with bolts (14) and washers (15).



- b. If necessary, remove hex screws (9), washers (10) and cover (11) from cable reel assembly (16).
- c. Remove connector nut (13) and rubber insert (17) from strain relief connector.
- d. Insert cable (12) through connector nut (13) and rubber insert (17). Push both back over outer insulation of cable (12).
- e. Insert wires and inner insulation of cable (12) through strain relief connector and into cable reel assembly (16).

NOTE

Ensure proper contact between outer shield of cable and metal insert of strain relief connector.

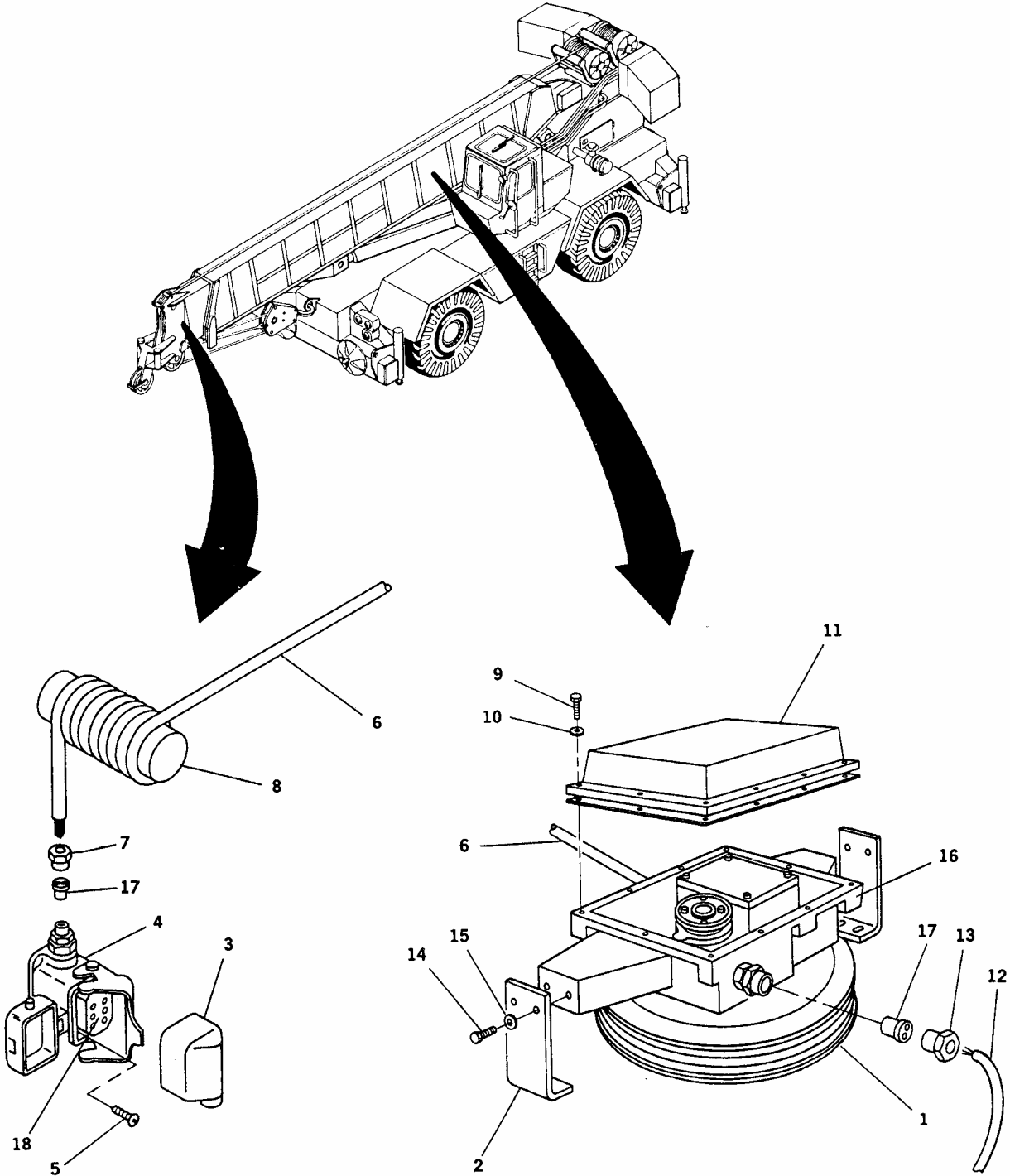
- f. Slide rubber insert (17) and connector nut (13) onto strain relief connector and tighten connector nut (13).
 - g. Connect wires of cable (12) to terminal block in cable reel assembly (16) as tagged.
 - h. Install cover (11) on cable reel assembly (16) with hex screws (9) and washers (10).
 - i. Preload cable reel drum (1) by turning drum 5 to 8 turns counterclockwise. Clamp cable drum (1) to mounting bracket (2) to prevent unwinding.
2. INSTALL LENGTH CABLE (6) TO BOOM NOSE RECEPTACLE (4).
- a. Unreel boom length cable (6) from cable reel drum (1) and thread through the roller and cable guides along the boom.

- b. Wrap boom length cable (6) from the outside and working inward around tube (8) the same number of times as noted on removal and secure with tie wraps. Ensure the boom length cable (6) is aligned with center line of cable reel drum.

CAUTION

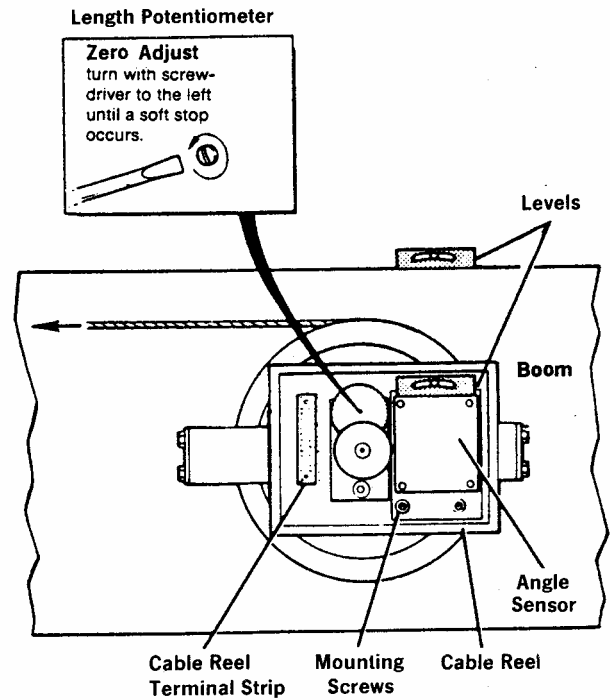
To prevent damage to length cable (6) there should be no slack between tube (8) and cable reel assembly (16).

- c. Remove connector nut (7) and rubber insert (17) from strain relief connector on boom nose receptacle (4).
- d. Insert boom length cable (6) through connector nut (7) and rubber insert (17). Insert length cable (6) into boom nose receptacle (4). Push rubber insert (17) and connector nut (7) onto strain relief connector and tighten connector nut (7).
- e. Connect core wire to pin 6 and shield wire to ground terminal on insert (18) of boom nose receptacle (4).
- f. Install insert (18) in boom nose receptacle (4) and secure with screws (5).
- g. Plug jumper/dummy plug (3) into boom nose receptacle (4).

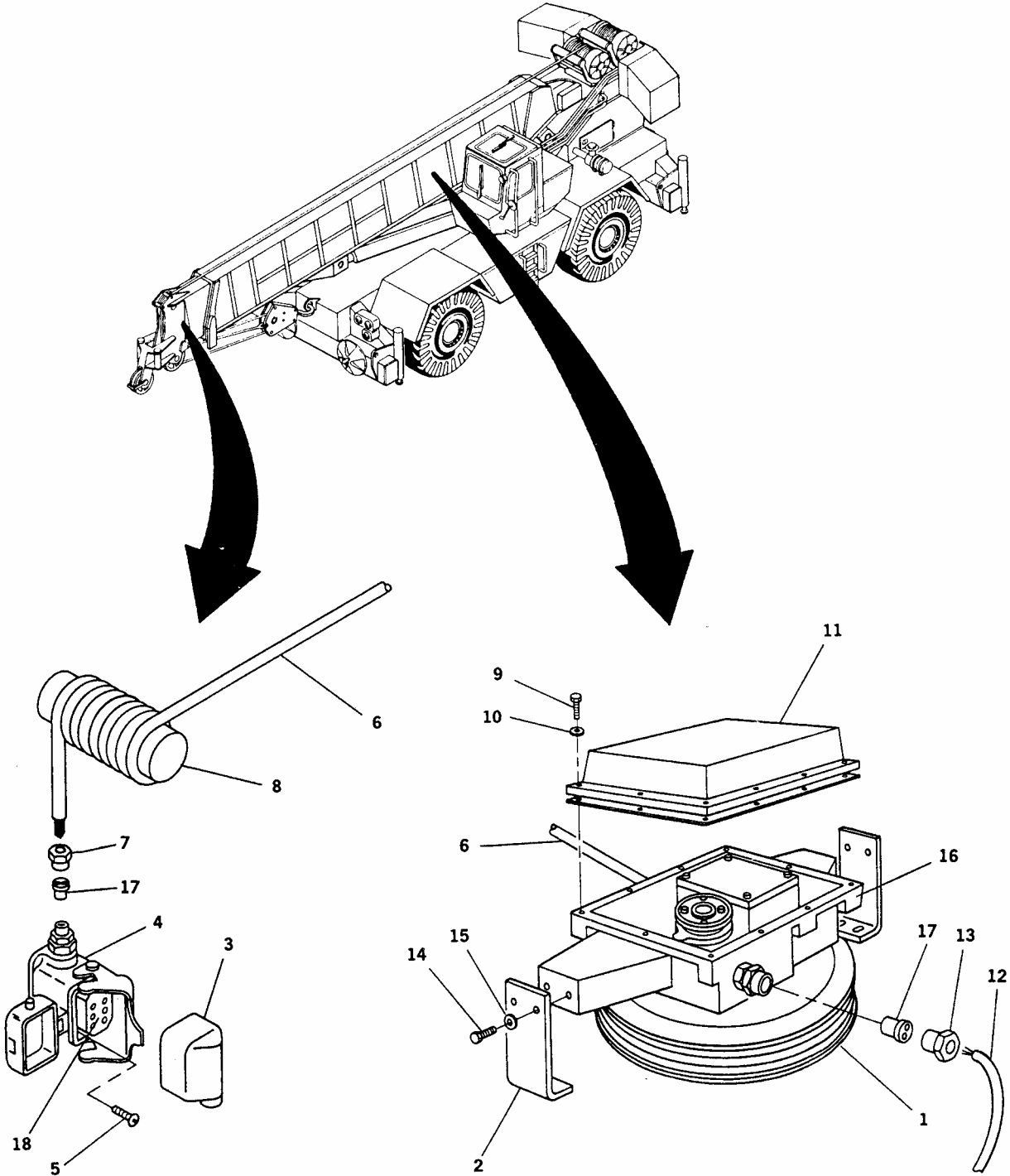


ADJUSTMENT:

1. TURN SCREW (POTENTIOMETER AXLE) IN CENTER OF LARGE NYLON GEAR (INSIDE BOOM LENGTH/ANGLE CABLE REEL ASSEMBLY (16) COUNTERCLOCKWISE UNTIL IT STOPS. **DO NOT FORCE SCREW.**
2. CONNECT NEGATIVE BATTERY CABLE AT SHUNT. (REFER TO PAGE TM 5-3810-306-20.)
3. START CRANE AND RAISE BOOM TO 0 DEGREES. PLACE A LEVEL ON TOP OF BOOM BASE SECTION AND ON ANGLE SENSOR INSIDE LENGTH/ANGLE CABLE REEL ASSEMBLY (16).
4. LOOSEN SOCKET HEAD SCREWS ON ANGLE SENSOR AND ADJUST ANGLE SENSOR TO SAME ANGLE AS BOOM BASE SECTION.
5. LUBRICATE HEX HEAD SCREWS (9) WITH OE/HDO ENGINE OIL.
6. INSTALL COVER (11), WASHERS (10) AND HEX HEAD SCREWS (9).
7. COMPARE LOAD MOMENT INDICATOR (LMI) DISPLAY TO BOOM LENGTH AND ANGLE TO CONFIRM PROPER FUNCTION OF SYSTEM.



END OF TASK



BOOM LENGTH/ANGLE CABLE REEL ASSEMBLY INSTALLATION (RT875CCS)

TOOLS: General mechanic's tool kit: automotive (5180-00-177-7033)
Carpenter's level (2 Required)

SUPPLIES: None

EQUIPMENT CONDITIONS: Battery disconnect switch in off position.
Boom fully retracted and lowered. (Refer to TM 5-3810-306-10.)

WARNING

Be sure to wear protective eye covering and gloves to avoid personal injury.

REMOVAL:

1. CLAMP CABLE REEL DRUM (1) ONTO MOUNTING BRACKET (2) TO PREVENT PREMATURE RETRACTION OF BOOM LENGTH CABLE (6).
2. REMOVE BOOM LENGTH CABLE (6) FROM BOOM NOSE JUNCTION BOX (4).
 - a. Remove capscrews (3) and cover (5) from boom nose junction box (4).
 - b. Disconnect the core wire of boom length cable (6) from terminal 3 and the shield of boom length cable (6) from terminal 1 of terminal strip in boom nose junction box (4).
3. CAREFULLY RELEASE CLAMP ON CABLE REEL DRUM (1) AND RETRACT BOOM LENGTH CABLE (6) ONTO DRUM. SECURE FREE END OF BOOM LENGTH CABLE (6) TO CABLE REEL DRUM (1) WITH TAPE.
4. REMOVE BOOM LENGTH/ANGLE CABLE REEL ASSEMBLY (16).
 - a. Remove hex screws (9), washers (10) and cover (11) from cable reel assembly (16).
 - b. Tag and disconnect electrical wires of cable (12) from terminal block in cable reel assembly (16).
 - c. Loosen connector nut (13) on strain relief connector (9) and pull cable (12) through connector nut and strain relief connector (9) and from cable reel assembly (16).
 - d. Remove bolts (14), washers (15) and cable reel assembly (16) from mounting brackets (2).

NOTE

Cable reel drum (1) will still be under tension when boom length cable (6) is fully retracted. Carefully turn cable reel drum (1) until tension is gone.

NOTE

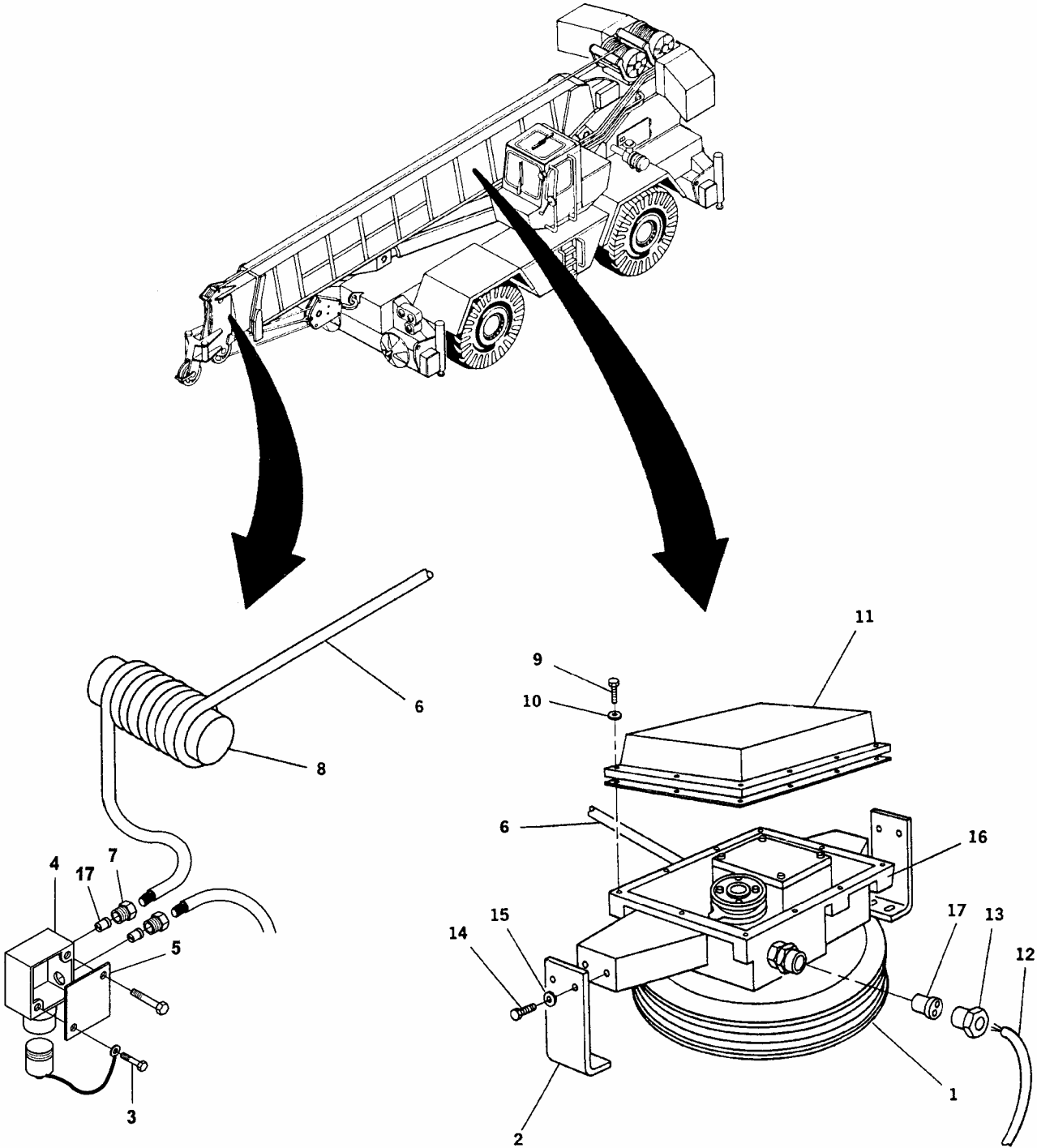
Do not remove wire No. 1 (Auxiliary Hoist A2B Switch) from terminal 1.

- c. Loosen connector nut (7) on strain relief connector and pull boom length cable (6) from boom nose junction box (4).

NOTE

Before cutting tie wraps, make note of how many times boom length cable (6) is wrapped around tube (8).

- d. Cut tie wraps holding boom length cable (6) around tube (8). Remove boom length cable (6).



INSTALLATION:

1. INSTALL BOOM LENGTH/ANGLE CABLE REEL ASSEMBLY (16).
 - a. Position cable reel assembly (16) in mounting brackets (2) and secure with bolts (14) and washers (15).
 - b. If necessary, remove hex screws (9), washers (10) and cover (11) from cable reel assembly (16).
 - c. Remove connector nut (13) and rubber insert (17) from strain relief connector.
 - d. Insert cable (12) through connector nut (13) and rubber insert (17). Push both back over outer insulation of cable (12).
 - e. Insert wires and inner insulation of cable (12) through strain relief connector and into cable reel assembly (16).

NOTE

Ensure proper contact between outer shield of cable and metal insert of strain relief connector.

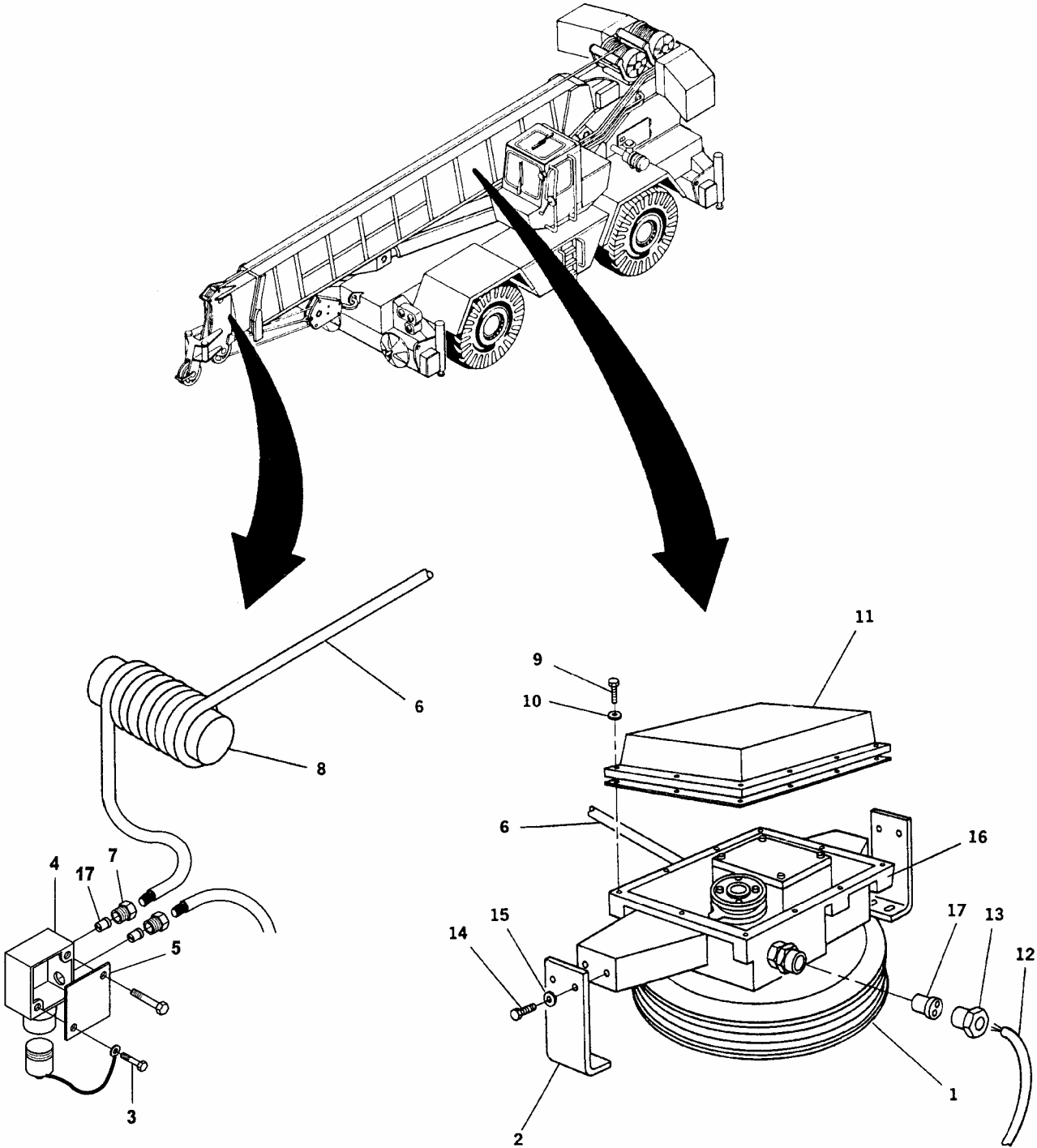
- f. Slide rubber insert (17) and connector nut (13) onto strain relief connector and tighten connector nut (13).
- g. Connect wires of cable (12) to terminal block in cable reel assembly (16) as tagged.
- h. Install cover (11) on cable reel assembly (16) with hex screws (9) and washers (10).
- i. Preload cable reel drum (1) by turning drum 5 to 8 turns counterclockwise. Clamp cable reel drum (1) to mounting bracket (2) to prevent unwinding.

2. INSTALL BOOM LENGTH CABLE (6) TO BOOM NOSE JUNCTION BOX (4).
 - a. Unreel boom length cable (6) from cable reel drum (1) and thread through the roller and cable guides along the boom.
 - b. Wrap boom length cable (6) from the outside and working inward around tube (8) the same number of times as noted on removal and secure with tie wraps. Ensure the boom length cable (6) is aligned with center line of cable reel drum.

CAUTION

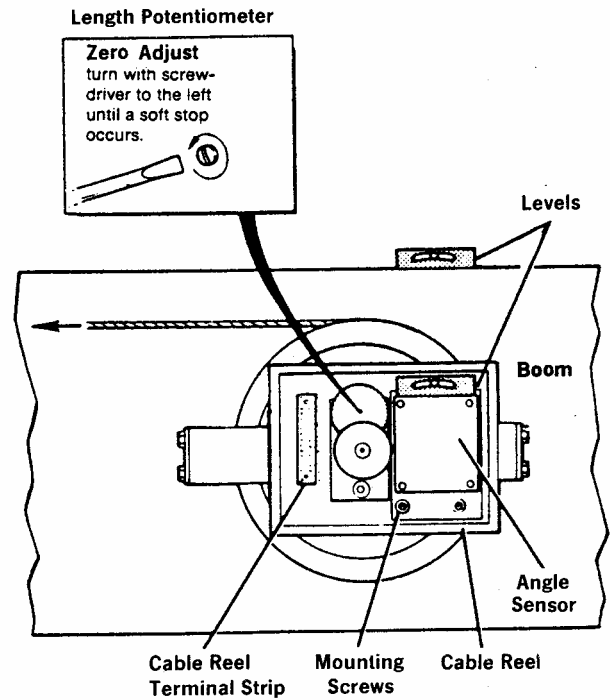
To prevent damage to length cable (6) there should be no slack between tube (8) and cable reel assembly (16).

- c. Remove connector nut (7) and rubber insert (17) from strain relief connector on boom nose junction box (4).
- d. Insert boom length cable (6) through connector nut (7) and rubber insert (17). Insert boom length cable (6) into boom nose junction box (4). Push rubber insert (17) and connector nut (7) onto strain relief connector and tighten connector nut (7).
- e. Connect core wire to terminal 3 and shield wire to terminal 1 on terminal block of boom nose junction box (4).
- f. Install cover (5) on boom nose junction box (4) with capscrews (3).

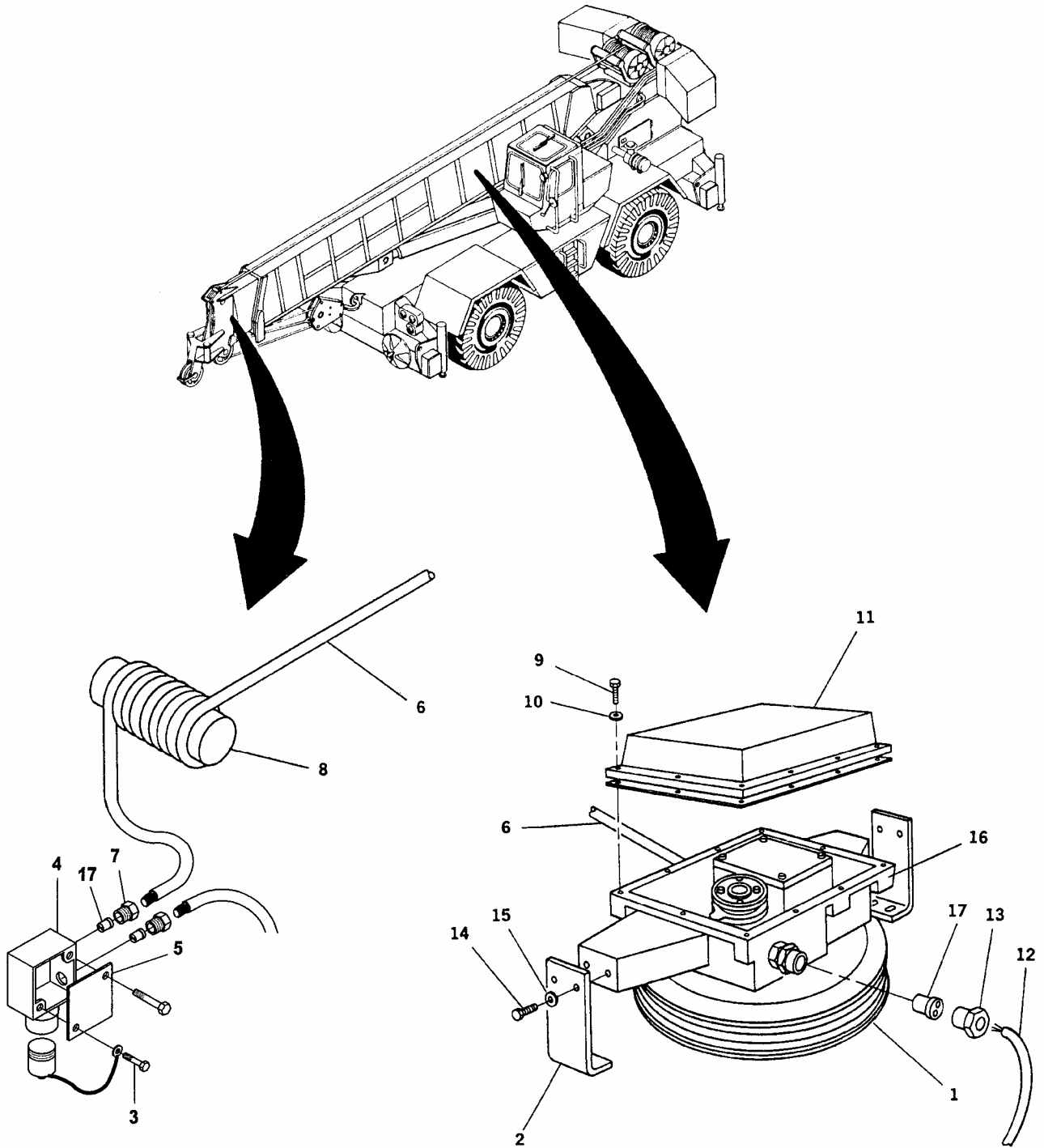


ADJUSTMENT:

1. TURN SCREW (POTENTIOMETER AXLE) IN CENTER OF LARGE NYLON GEAR (INSIDE BOOM LENGTH/ANGLE CABLE REEL ASSEMBLY (16) COUNTERCLOCKWISE UNTIL IT STOPS. **DO NOT FORCE SCREW.**
2. TURN BATTERY DISCONNECT SWITCH TO ON POSITION.
3. START CRANE AND RAISE BOOM TO 0 DEGREES. PLACE A LEVEL ON TOP OF BOOM BASE SECTION AND ON ANGLE SENSOR INSIDE BOOM LENGTH/ANGLE CABLE REEL ASSEMBLY (16).
4. LOOSEN SOCKET HEAD SCREWS ON ANGLE SENSOR AND ADJUST ANGLE SENSOR TO SAME ANGLE AS BOOM BASE SECTION.
5. LUBRICATE HEX HEAD SCREWS (9) WITH OE/HDO ENGINE OIL.
6. INSTALL COVER (11), WASHERS (10) AND HEX HEAD SCREWS (9).
7. COMPARE LOAD MOMENT INDICATOR (LMI) DISPLAY TO BOOM LENGTH AND ANGLE TO CONFIRM PROPER FUNCTION OF SYSTEM.



END OF TASK



TM 5-3810-306-34

BOOM LENGTH CABLE INSTALLATION (RT875CC) (RT875CCS)

TOOLS: General mechanic's tool kit: automotive (5180-00-177-7033)

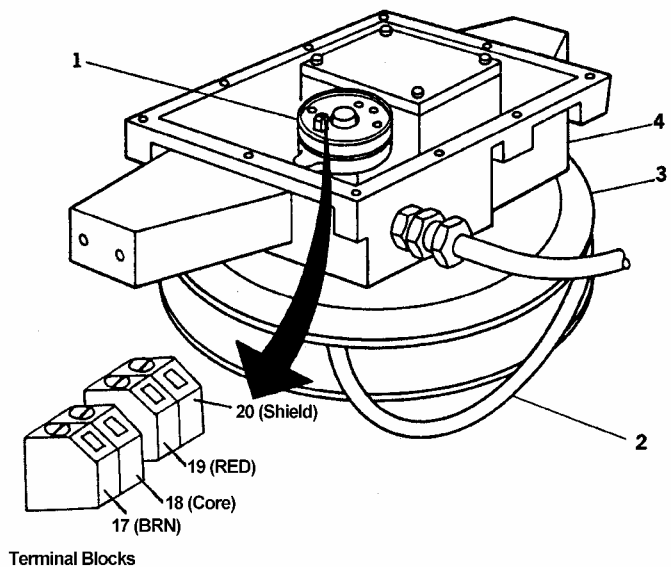
SUPPLIES: None

EQUIPMENT CONDITIONS: Negative battery cable disconnected at shunt. (RT875CC) (Refer to TM 5-3810-306-20.)
 Battery disconnect switch in off position. (RT875CCS)
 Boom length/angle cable reel assembly removed.
 (Refer to pages 14-30 and 14-36.)

REMOVAL:

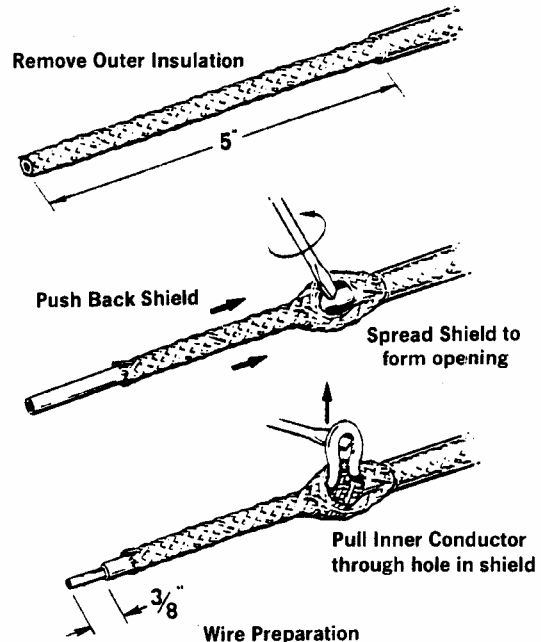
1. DISCONNECT WIRES OF BOOM LENGTH CABLE (2) FROM TERMINALS 18 AND 20 ON SLIP RING (1) IN CABLE REEL ASSEMBLY (3).
2. UNWIND BOOM LENGTH CABLE (2) AND LOOSEN STRAIN RELIEF CONNECTOR NUT ON AXLE IN CENTER OF CABLE DRUM (3). PULL REMAINDER OF BOOM LENGTH CABLE (2) FROM CABLE REEL ASSEMBLY (4).

END OF TASK



INSTALLATION:

1. PUSH NEW BOOM LENGTH CABLE (2) THROUGH STRAIN RELIEF CONNECTOR ON AXLE OF CABLE DRUM (3), AND UP THROUGH CABLE REEL ASSEMBLY (4) AND SLIP RING (1). TIGHTEN STRAIN RELIEF CONNECTOR NUT.
2. PREPARE BOTH ENDS OF BOOM LENGTH CABLE (2) AS SHOWN. TWIST SHIELD INTO A SINGLE CONDUCTOR ONCE SEPARATED.
3. CONNECT BOOM LENGTH CABLE (2) TO SLIP RING (1) (SHIELD TO TERMINAL 20 AND CORE TO TERMINAL 18).
4. TURN CABLE DRUM (3) CLOCKWISE (AS MOUNTED) TO WIND BOOM LENGTH CABLE (2) ONTO DRUM. SECURE FREE END OF BOOM LENGTH CABLE (2) TO CABLE DRUM (3).
5. INSTALL BOOM LENGTH/ANGLE CABLE REEL ASSEMBLY. (REFER TO PAGES 14-30 AND 14-36).



SLIP RING ASSEMBLY INSTALLATION (RT875CCS)

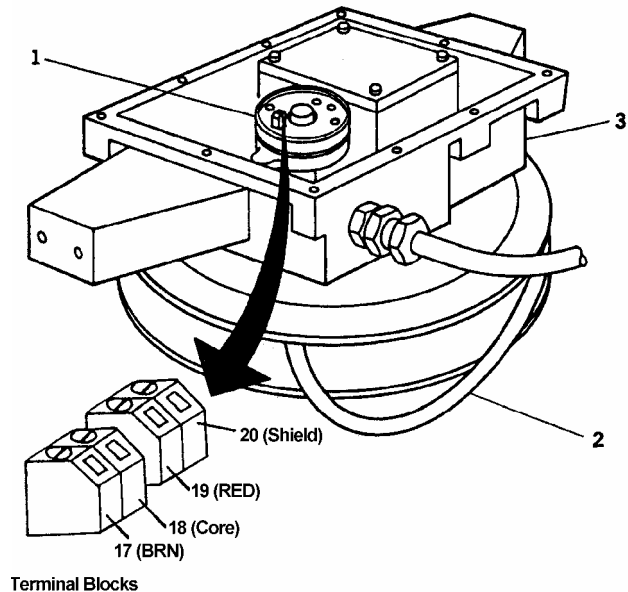
TOOLS: General mechanic's tool kit: automotive (5180-00-177-7033)

SUPPLIES: None

EQUIPMENT CONDITIONS: Battery disconnect switch in off position.
Boom fully retracted and lowered. (Refer to TM 5-3810-306-10.)
Boom length/angle cable reel assembly removed. (Refer to page 14-36.)

REMOVAL:

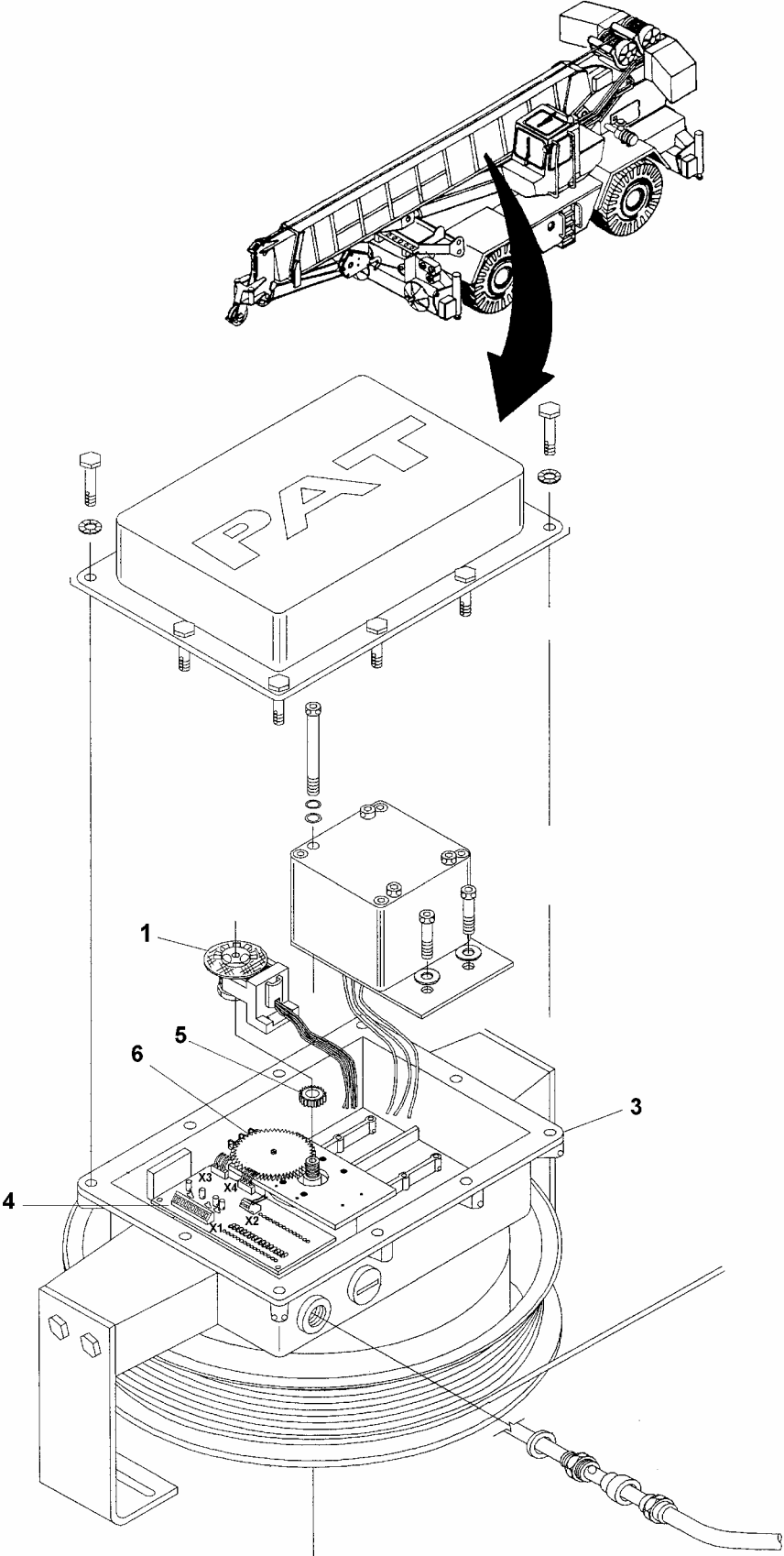
1. REMOVE SLIP RING ASSEMBLY (1).
 - a. Disconnect wires of boom length cable (2) from terminals 18 and 20 on slip ring assembly (1) in cable reel assembly (3).
 - b. Tag and disconnect electrical wires from contact terminals (X2) on terminal block (4) of boom length/angle cable reel assembly (3).
 - c. Remove slip ring assembly (1) and gear wheel (5) from axle shaft of boom length potentiometer (6).



INSTALLATION:

1. INSTALL SLIP RING ASSEMBLY (1).
 - a. Install gear wheel (5) and slip ring assembly (1) on axle shaft of boom length potentiometer (6).
 - b. Connect electrical wires to contact terminals (X2) on terminal block (4) of boom length/angle cable reel assembly (3) as tagged.
 - c. Connect boom length cable (2) to slip ring (1) (shield to terminal 20 and core to terminal 18).
2. INSTALL BOOM LENGTH/ANGLE CABLE REEL ASSEMBLY. (REFER TO PAGE 14-36).

END OF TASK



BOOM LENGTH POTENTIOMETER INSTALLATION (RT875CCS)

TOOLS: General mechanic's tool kit: automotive (5180-00-177-7033)

SUPPLIES: None

EQUIPMENT CONDITIONS: Battery disconnect switch in off position.
Boom fully retracted and lowered. (Refer to TM 5-3810-306-10.)
Boom length/angle cable reel assembly removed. (Refer to page 14-36.)

REMOVAL:

1. REMOVE BOOM LENGTH POTENTIOMETER (3).

- a. Remove slip ring assembly (1) and gear wheel (2) from axle shaft of boom length potentiometer (3).
- b. Remove screws and remove boom length potentiometer (3) from mounting plate (4).
- c. Tag and disconnect electrical connector (X3) on terminal block (5) of boom length/angle cable reel assembly (6).

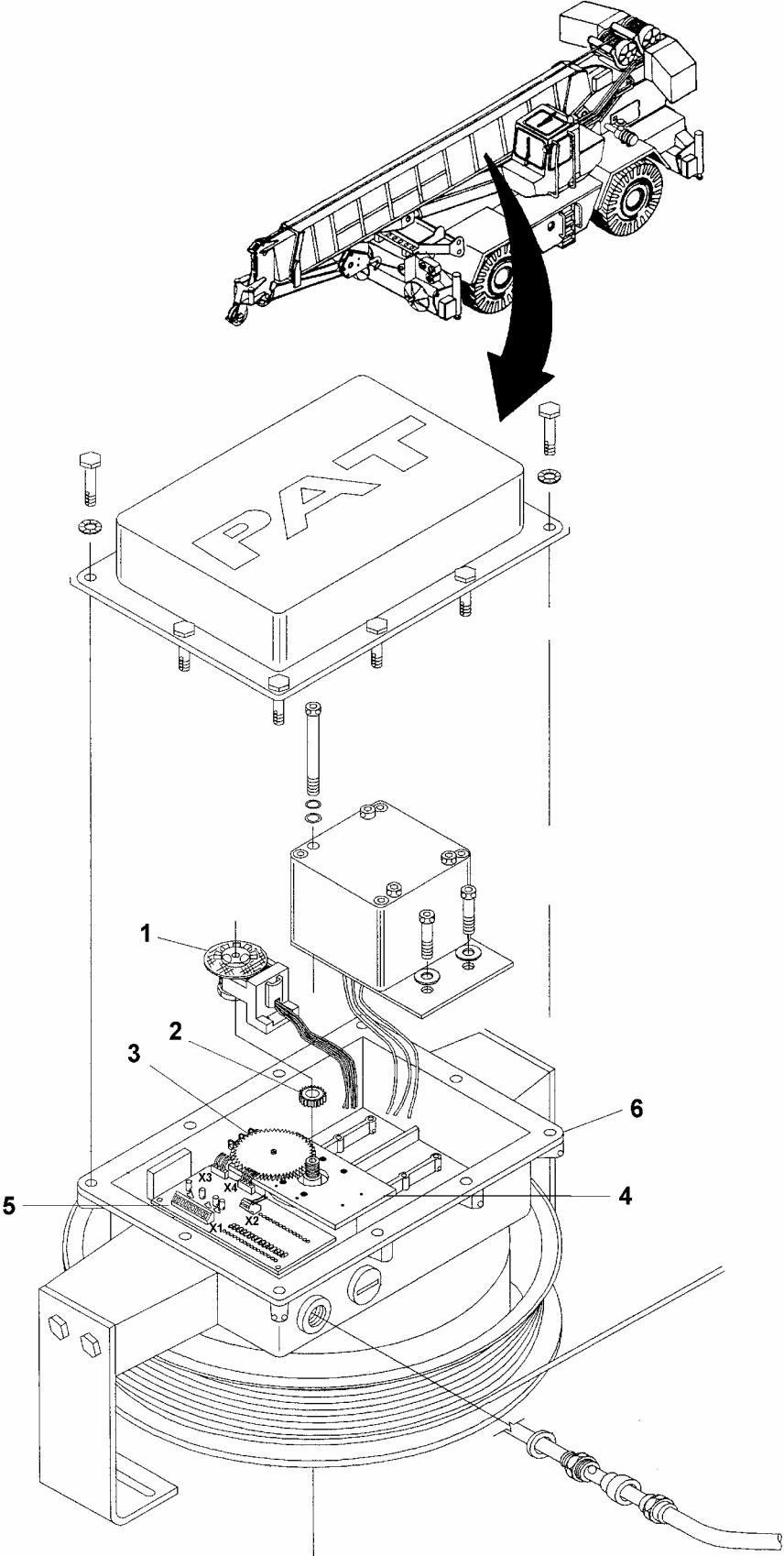
- a. Connect electrical connector (X3) to terminal block (5) of boom length/angle cable reel assembly (6) as tagged.
- b. Install boom length potentiometer (3) in mounting plate (4) and secure with screws.
- c. Install gear wheel (2) and slip ring assembly (1) on axle shaft of boom length potentiometer (3).

2. INSTALL BOOM LENGTH/ANGLE CABLE REEL ASSEMBLY. (REFER TO PAGE 14-36).

END OF TASK

INSTALLATION:

1. INSTALL BOOM LENGTH POTENTIOMETER (3).



BOOM ANGLE SENSOR INSTALLATION (RT875CCS)

TOOLS: General mechanic's tool kit: automotive (5180-00-177-7033)

SUPPLIES: None

EQUIPMENT CONDITIONS: Battery disconnect switch in off position.
Boom fully retracted and lowered. (Refer to TM 5-3810-306-10.)
Boom length/angle cable reel assembly removed. (Refer to page 14-36.)

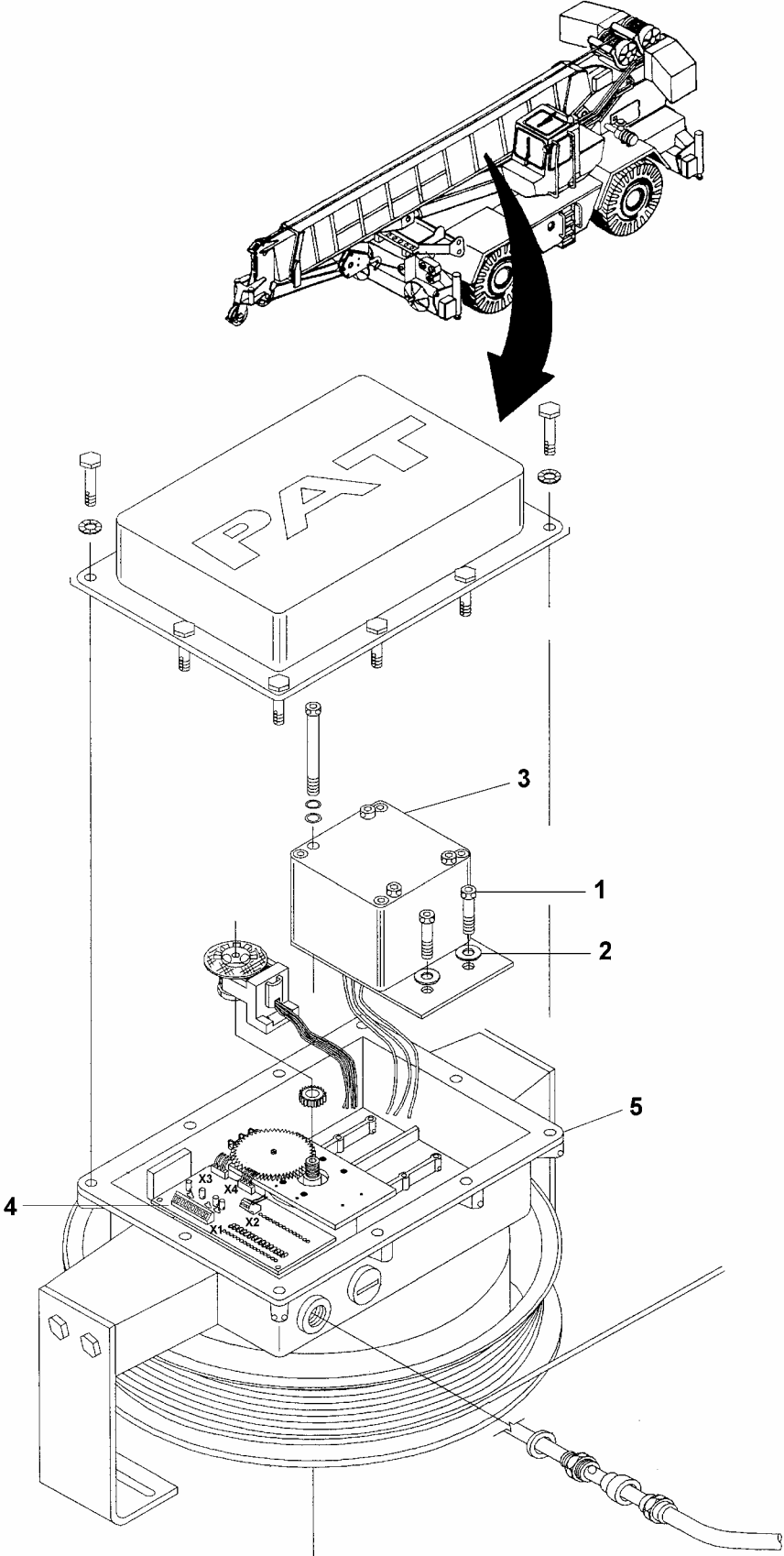
REMOVAL:

1. REMOVE BOOM ANGLE SENSOR (3).
 - a. Remove capscrews (1) and flat washers (2) and remove boom angle sensor (3).
 - b. Tag and disconnect electrical connector (X4) on terminal block (4) of boom length/angle cable reel assembly (5).

INSTALLATION:

1. INSTALL BOOM ANGLE SENSOR (3).
 - a. Connect electrical connector (X4) to terminal block (4) of boom length/angle cable reel assembly (5) as tagged.
 - b. Install boom angle sensor (3) in boom length/angle cable reel assembly (5).and secure with capscrews (1) and flat washers (2).
2. INSTALL BOOM LENGTH/ANGLE CABLE REEL ASSEMBLY. (REFER TO PAGE 14-36).

END OF TASK



MAIN AND AUXILIARY BOOM NOSE ANTI-TWO BLOCK SWITCH INSTALLATION (RT875CC)

TOOLS: General mechanic's tool kit: automotive (5180-00-177-7033)

SUPPLIES: None

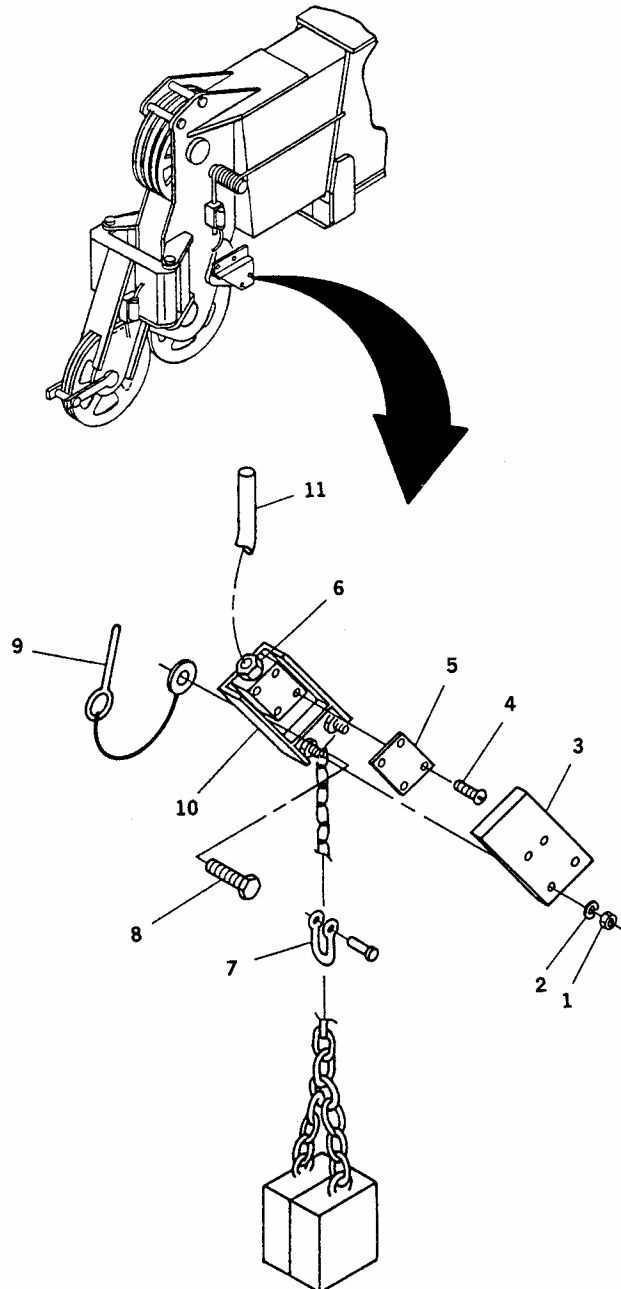
EQUIPMENT CONDITIONS: Negative battery cable disconnected at shunt.
(Refer to TM 5-3810-306-20.)

WARNING

Be sure to wear protective eye covering to avoid personal injury.

REMOVAL:

1. REMOVE ANTI-TWO BLOCK SWITCH (10).
 - a. Remove nuts (1), washers (2) and cover (3) from switch (10).
 - b. Remove screws (4) and switch contact cover (5).
 - c. Tag and disconnect electrical wires from contact terminals.
 - 1) Main Boom: Disconnect wires from terminals 23 and 24.
 - 2) Auxiliary Boom: Disconnect wires from terminals 12 and 23. Remove 4700 ohm resistor from terminals 12 and 24, and retain for installation.
 - d. Loosen connector nut (6) and pull cable (11) out of switch (10).
 - e. Remove link (7) and disconnect chain and weight from switch (10).
 - f. Remove capscrews (8), switch (10) and lock pin (9) from boom.



INSTALLATION:

1. INSTALL ANTI-TWO BLOCK SWITCH (10).
 - a. Install lock pin (9) and switch (10) to boom with capscrews (8).
 - b. Insert cable (11) into switch (10) and tighten connector nut (6).

c. Connect electrical wires to contact terminals.

- 1) Main Boom: Connect wires to terminals 23 and 24 as tagged.
- 2) Auxiliary Boom: Install 4700 ohm resistor between terminals 12 and 24. Connect wires to terminals 12 and 23 as tagged.

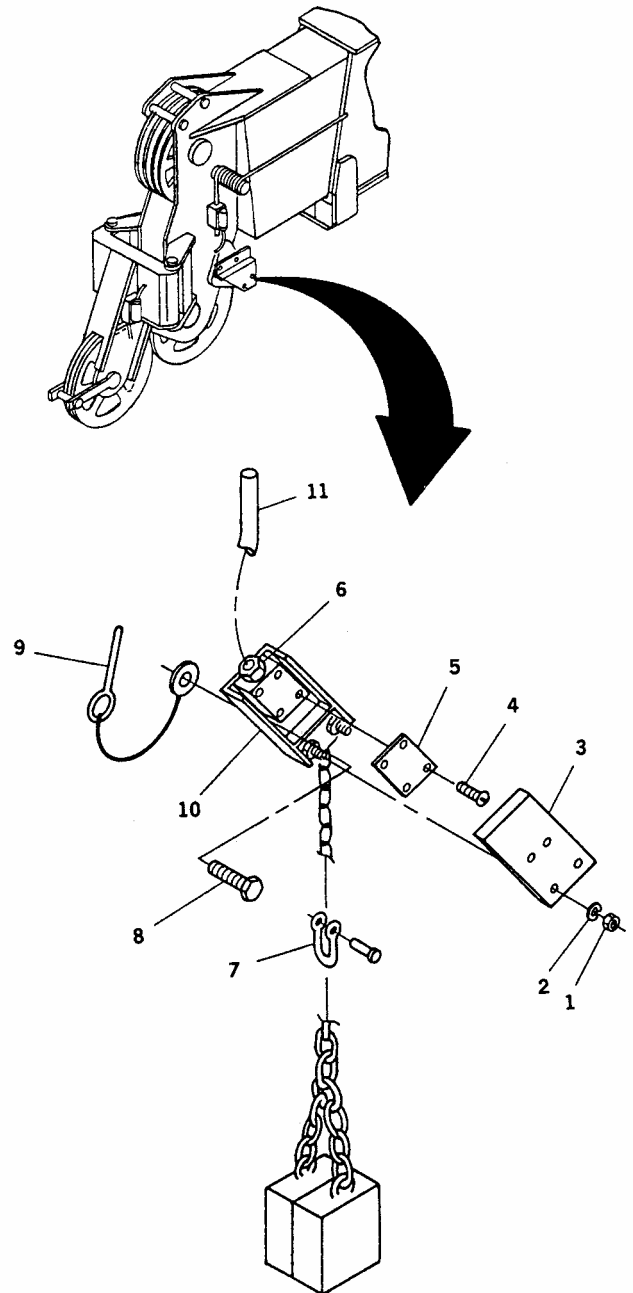
d. Install switch contact cover (5) with screws (4).

e. Install cover (3) with nuts (1) and washers (2).

f. Attach chain and weight to switch (10) by installing link (7).

2. CONNECT NEGATIVE BATTERY CABLE AT SHUNT. (REFER TO TM 5-3810-306-20.)

END OF TASK



MAIN AND AUXILIARY BOOM NOSE ANTI-TWO BLOCK SWITCH INSTALLATION (RT875CCS)

TOOLS: General mechanic's tool kit: automotive (5180-00-177-7033)

SUPPLIES: None

EQUIPMENT CONDITIONS: Battery disconnect switch in the off position.

REMOVAL:

1. REMOVE MAIN BOOM NOSE ANTI-TWO BLOCK SWITCH (11).
 - a. Remove capscrews (1) and cover (2) from boom nose junction box (3).
 - b. Tag and disconnect electrical wires of cable (4) from terminals 2 and 4 of terminal strip in boom nose junction box (3).

NOTE

Do not remove wire No. 2 (Auxiliary boom nose A2B Switch) from terminal 2.

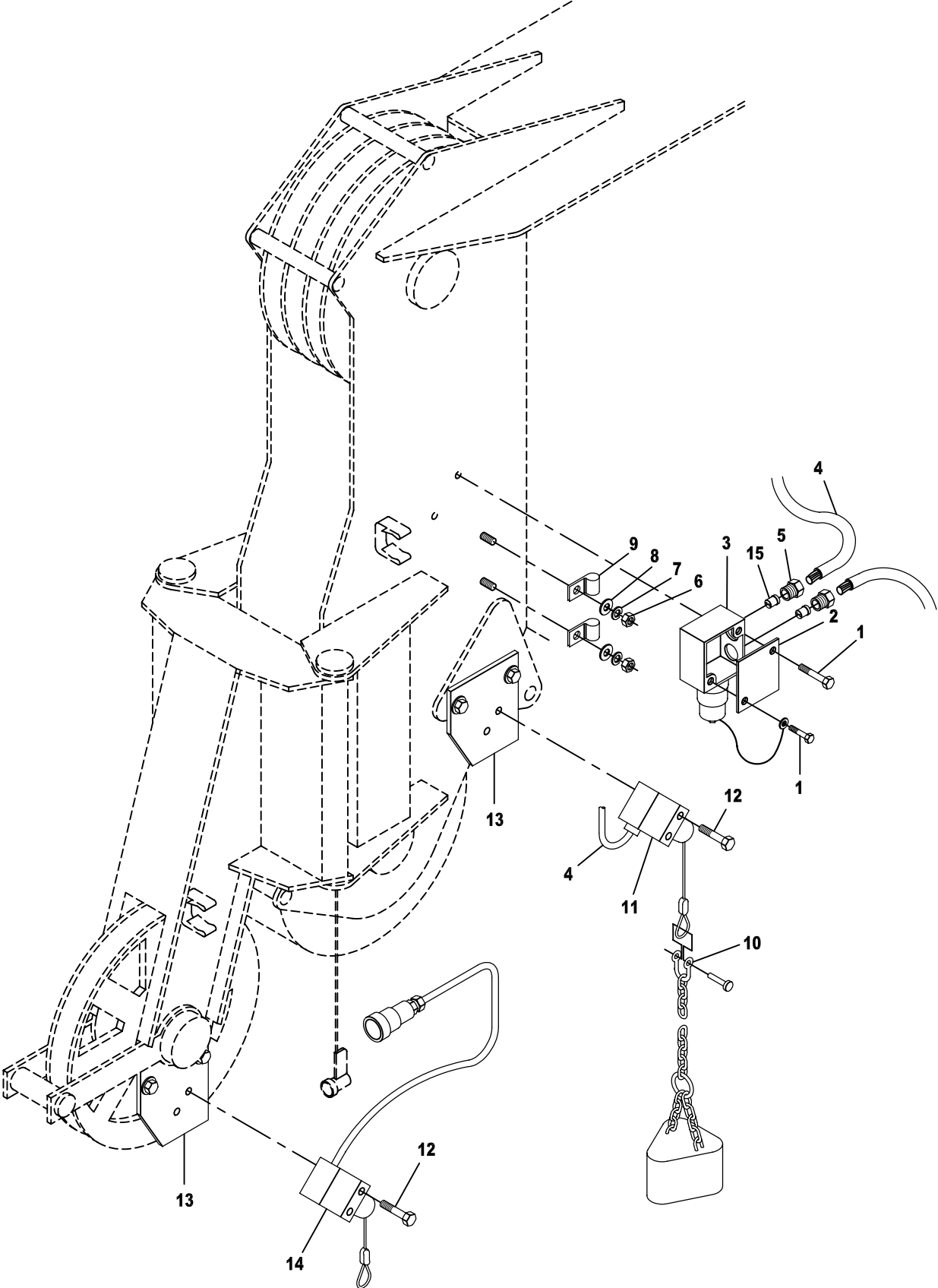
- c. Loosen connector nut (5) on strain relief connector and pull cable (4) from boom nose junction box (3).
 - d. Remove nuts (6), lockwashers (7), and washers (8) from cable clips (9) on side of boom nose. Pull cable (4) from cable clips (9).
 - e. Remove link (10) then disconnect chain and weight from main boom nose anti-two block switch (11).
 - f. Remove capscrews (12) and switch (11) from bracket (13) on boom nose.
2. REMOVE AUXILIARY BOOM NOSE ANTI-TWO BLOCK SWITCH (14).
 - a. Remove link (10) then disconnect chain and weight from auxiliary boom nose anti-two block switch (14).
 - b. Remove capscrews (12) and switch (14) from bracket (13) on boom nose.

- a. Install main boom nose anti-two block switch (11) to bracket (13) on boom nose with capscrews (12).
 - b. Insert cable (4) through cable clips (9), leave enough cable (4) to connect to boom nose junction box (3) and secure cable clips (9) to side of boom nose with washers (8), lockwashers (7), and nuts (6).
 - c. Remove connector nut (5) and rubber insert (15) from strain relief connector on boom nose junction box (3).
 - d. Insert cable (4) through connector nut (5) and rubber insert (15). Insert cable (4) into boom nose junction box (3). Push rubber insert (15) and connector nut (5) onto strain relief connector and tighten connector nut (5).
 - e. Connect wires to terminals 1 and 4 on terminal block of boom nose junction box (4) as tagged.
 - f. Install cover (2) on boom nose junction box (3) with capscrews (1).
 - g. Install chain and weight to main boom nose anti-two block switch (11) with link (10).
2. INSTALL AUXILIARY BOOM NOSE ANTI-TWO BLOCK SWITCH (11).
 - a. Install auxiliary boom nose anti-two block switch (14) to bracket (13) on boom nose with capscrews (12).
 - b. Install chain and weight to auxiliary boom nose anti-two block switch (14) with link (10).

END OF TASK

INSTALLATION:

1. INSTALL MAIN BOOM NOSE ANTI-TWO BLOCK SWITCH (11).



ROD PRESSURE AND PISTON PRESSURE TRANSDUCER INSTALLATION (RT875CC)

TOOLS: General mechanic's tool kit: automotive (5180-00-177-7033)

SUPPLIES: None

EQUIPMENT CONDITIONS: Negative battery cable disconnected at shunt.
(Refer to TM 5-3810-306-20.)
Boom fully lowered. (Refer to TM 5-3810-306-10.)

WARNING

Be sure to wear protective eye covering to avoid personal injury.

REMOVAL:

1. REMOVE PRESSURE TRANSDUCER (2).

- a. Disconnect electrical plug (1) from transducer (2).

WARNING

Special care must be taken before disconnecting hydraulic line (3) from transducer (2). Make sure boom lift cylinder is FULLY retracted; otherwise injury or damage could occur. Even with cylinder fully retracted, some pressure could remain in system. Loosen hydraulic line (3) slowly to bleed any remaining pressure from system.

- b. Disconnect hydraulic line (3) from transducer (2).
- c. Rod pressure transducer only: Remove fitting (4) from transducer (2).

- d. Remove nut (5) and transducer (2) from mounting bracket.

INSTALLATION:

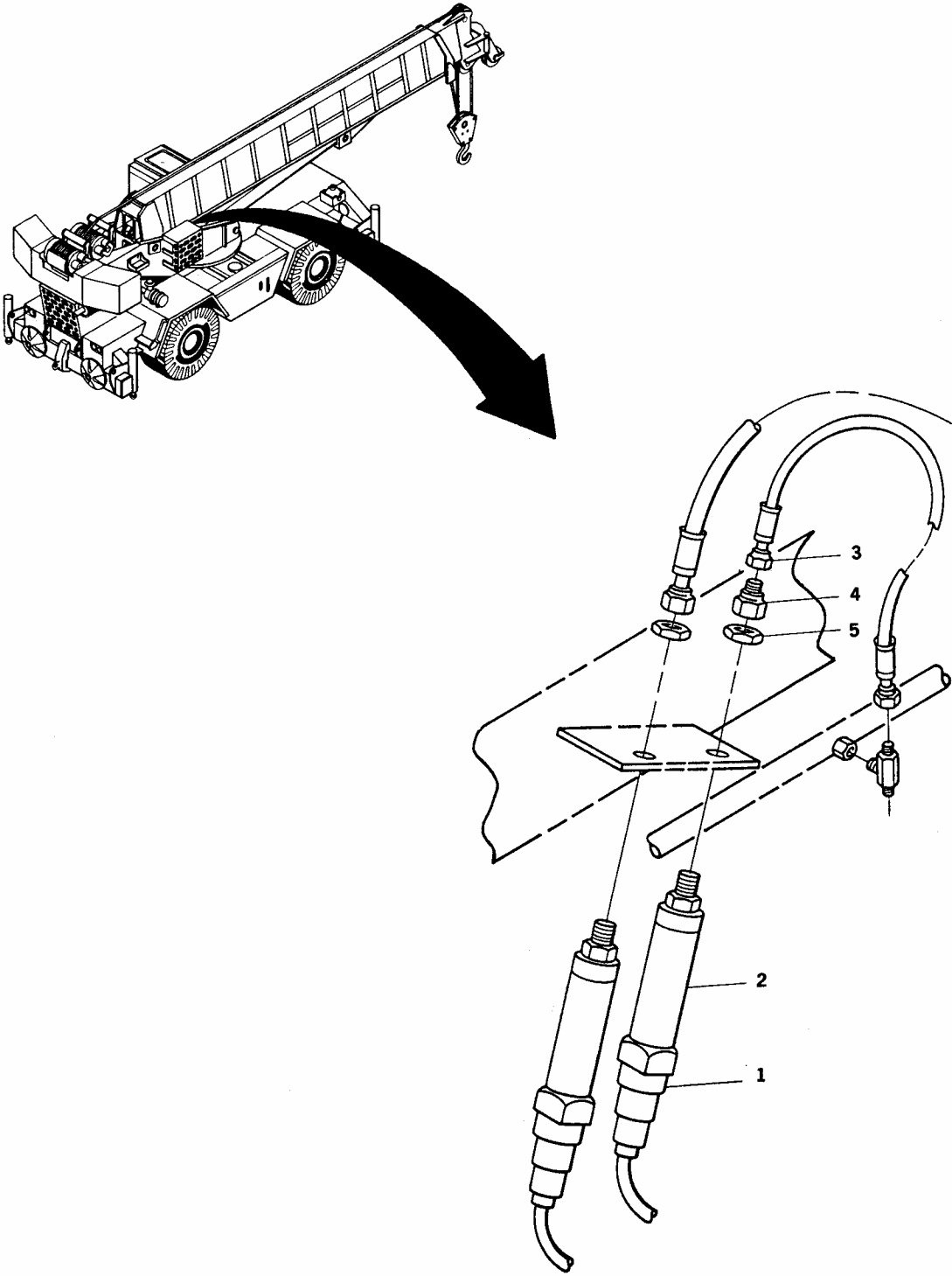
1. INSTALL PRESSURE TRANSDUCER (2).

- a. Install transducer (2) and nut (5) to mounting bracket.
- b. Rod pressure transducer only: Install fitting (4) to transducer (2).
- c. Connect hydraulic line (3) to transducer (2).
- d. Connect electrical plug (1) to transducer (2).

2. ADJUST PRESSURE CHANNELS ON CENTRAL PROCESSING UNIT. (REFER TO PAGE 14-12.)

3. CONNECT NEGATIVE BATTERY CABLE AT SHUNT. (REFER TO TM 5-3810-306-20.)

END OF TASK



ROD PRESSURE AND PISTON PRESSURE TRANSDUCER INSTALLATION (RT875CCS)

TOOLS: General mechanic's tool kit: automotive (5180-00-177-7033)

SUPPLIES: None

EQUIPMENT CONDITIONS: Battery disconnect switch in off position.
Boom fully lowered. (Refer to TM 5-3810-306-10.)

WARNING

Be sure to wear protective eye covering to avoid personal injury.

REMOVAL:

1. REMOVE PRESSURE TRANSDUCER (2).
 - a. Disconnect electrical plug (1) from transducer (2).

WARNING

Special care must be taken before disconnecting hydraulic line (3) from transducer (2). Make sure boom lift cylinder is FULLY retracted; otherwise injury or damage could occur. Even with cylinder fully retracted, some pressure could remain in system. Loosen hydraulic line (3) slowly to bleed any remaining pressure from system.

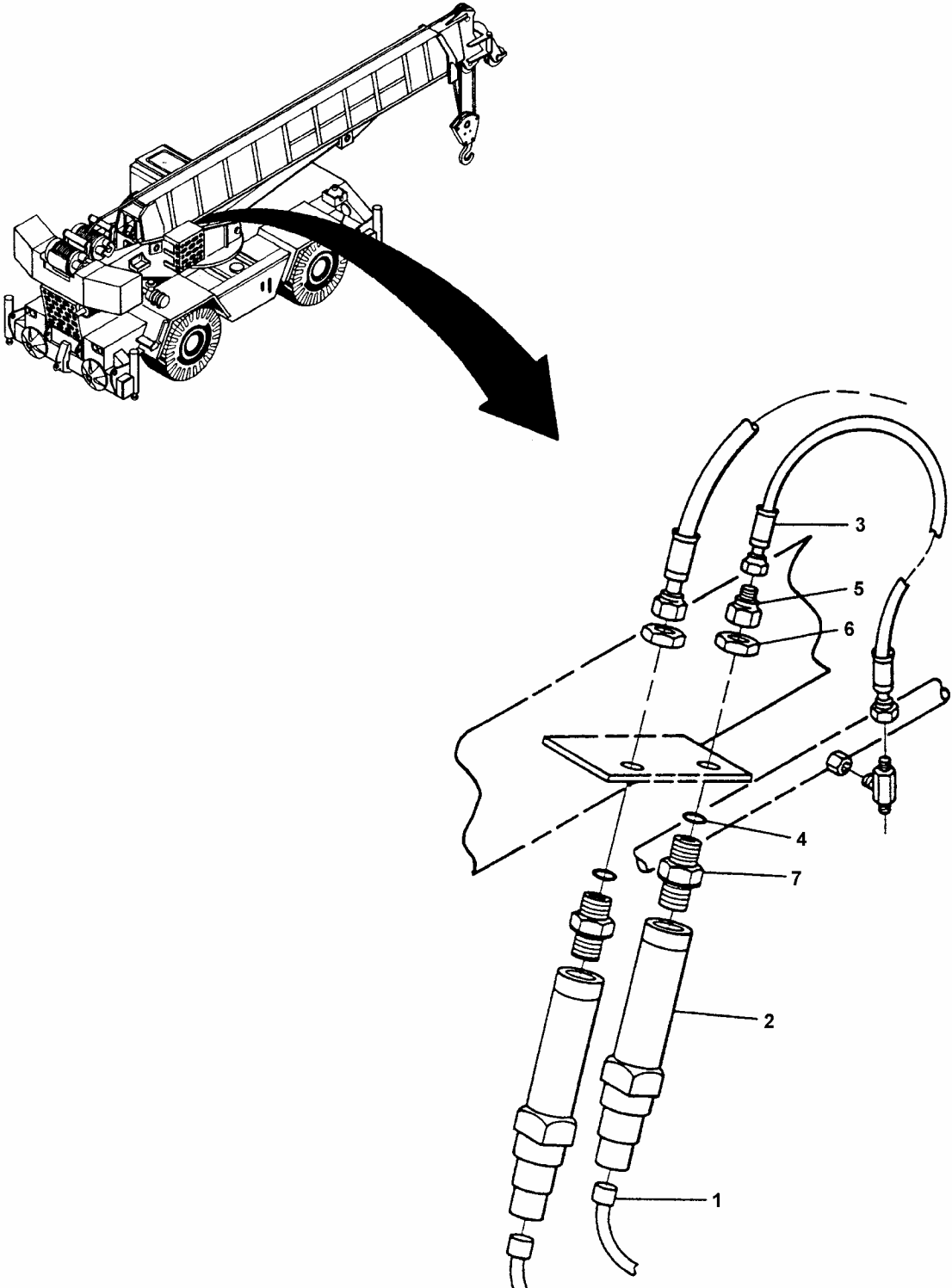
- b. Rod pressure transducer: Disconnect hydraulic line (3) from transducer (2).
Piston pressure transducer: Disconnect hydraulic line (3) and o-ring (4) from transducer (2).
- c. Rod pressure transducer only: Remove fitting (5) and o-ring (4) from transducer (2).

- d. Remove nut (6) and transducer (2) from mounting bracket.
- e. Remove fitting (7) from transducer (2).

INSTALLATION:

1. INSTALL PRESSURE TRANSDUCER (2).
 - a. Install JIC fitting (7) on transducer (2).
 - b. Install transducer (2) and nut (6) to mounting bracket.
 - c. Rod pressure transducer only: Install fitting (5) and new o-ring (4) to transducer (2).
 - d. Rod pressure transducer: Connect hydraulic line (3) to transducer (2).
Piston pressure transducer: Connect hydraulic line (3) and new o-ring (4) to transducer (2).
 - e. Connect electrical plug (1) to transducer (2).
4. ADJUST PRESSURE CHANNEL ON CENTRAL PROCESSING UNIT. (REFER TO PAGE 14-20.)

END OF TASK



ROLLER/CABLE GUIDE INSTALLATION

TOOLS: General mechanic's tool kit: automotive (5180-00-177-7033)

SUPPLIES: None

EQUIPMENT CONDITIONS: Negative battery cable disconnected at shunt (RT875CC). (Refer to TM 5-3810-306-20.)
Battery disconnect switch in off position (RT875CCS).
Boom length cable disconnected at boom nose receptacle and retracted into boom length/angle cable reel. (Refer to pages 14-30 and 14-36.)

REMOVAL:

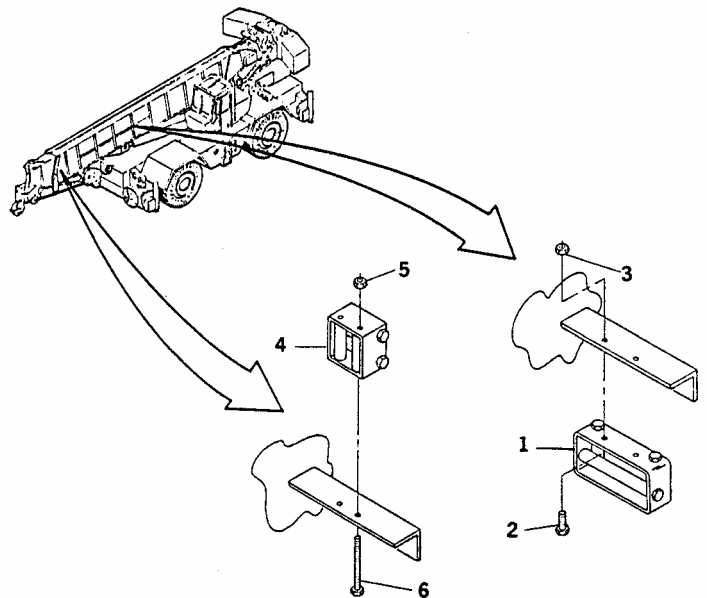
1. REMOVE ROLLER GUIDE (1).
 - a. Remove nuts (3) from capscrews (2).
 - b. Remove capscrews (2) and roller guide (1) from lower boom bracket.
2. REMOVE CABLE GUIDE (4).
 - a. Remove nuts (5) from capscrews (6).
 - b. Remove capscrews (6) and cable guide (4) from upper boom bracket.

5. LOOSEN NUTS (3) AND (5), AND ADJUST ROLLER/CABLE GUIDES (1) AND (4) WITH CENTER OF CABLE REEL DRUM FOR SMOOTH OPERATION OF BOOM LENGTH CABLE. TIGHTEN NUTS (3) AND (5) AFTER ADJUSTMENT.

END OF TASK

INSTALLATION:

1. POSITION CABLE GUIDE (4) ON UPPER BOOM BRACKET AND SECURE WITH BOLTS (6) AND NUTS (5).
2. POSITION ROLLER GUIDE (1) ON LOWER BOOM BRACKET AND SECURE WITH CAPSCREWS (2) AND NUTS (3).
3. REROUTE BOOM LENGTH CABLE AND CONNECT AT BOOM NOSE RECEPTACLE. (REFER TO PAGES 14-30 AND 14-36.)
4. CONNECT NEGATIVE BATTERY CABLE AT SHUNT (RT875CC). (REFER TO TM 5-3810-306-20.) TURN BATTERY DISCONNECT SWITCH TO ON POSITION (RT875CCS).



CHAPTER 15

CRANE COMPONENTS MAINTENANCE

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Section I. BOOM MAINTENANCE

AUXILIARY BOOM NOSE ASSEMBLY

TOOLS: General mechanic's tool-kit: automotive (5180-00-177-7033)

SUPPLIES: Lockwashers (Item 26, Appendix B)

EQUIPMENT CONDITIONS: Overhaul ball removed. (Refer to TM 5-3810-306-20.)
 Cable unreeved from boom nose sheave. (Refer to TM 5-3810-306-20.)
 Auxiliary boom nose removed. (Refer to TM 5-3810-306-20.)

WARNING

Be sure to wear protective eye covering and gloves to avoid personal injury.

NOTE

Auxiliary boom nose does not have to be removed to service or replace boom nose sheave.

DISASSEMBLY:

1. DISASSEMBLE AUXILIARY BOOM NOSE (1).

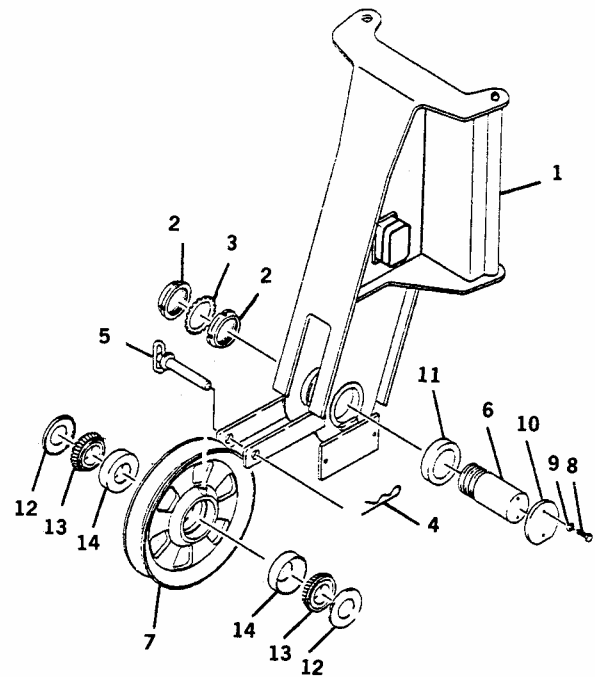
- a. Remove pin clip (4) and pin (5).
- b. Remove locknuts (2) and washers (3).
- c. Remove two capscrews (8), lockwashers (9) and end cap (10) from sheave pin (6). Discard lockwashers (9).
- d. Tap out sheave pin (6) and remove sheave (7).
- e. Remove two spacers (11) from auxiliary boom nose (1).

2. DISASSEMBLE SHEAVE (7).

- a. Remove two bearing closures (12) and two bearing cones (13).

INSPECTION:

1. INSPECT SHEAVE FOR DAMAGE AND DISTORTION.



2. INSPECT BEARING CUP (14) AND CONE (13) FOR WEAR OR SCORING. IF REPLACEMENT IS NECESSARY REMOVE CUP FROM SHEAVE AND REPLACE BEARING ASSEMBLY AS A SET.

3. INSPECT SHEAVE PIN FOR WEAR OR SCORING.

REASSEMBLY:

1. REASSEMBLE AUXILIARY BOOM NOSE (1).

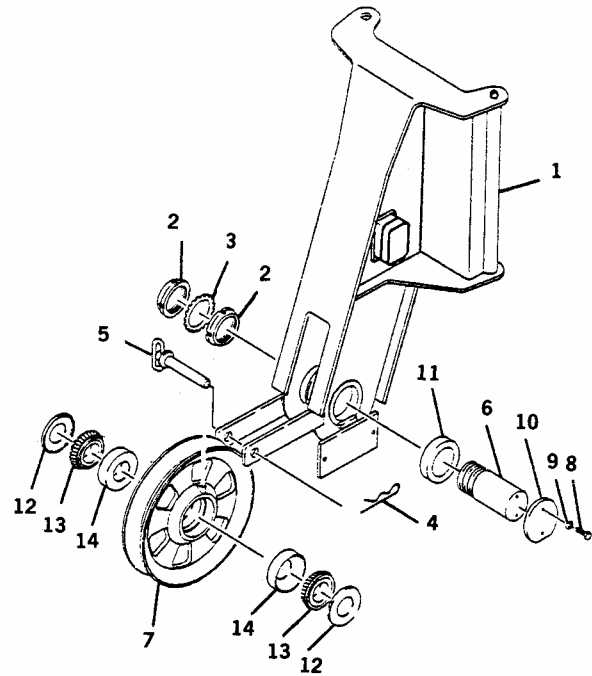
- a. Install two spacers (11) into auxiliary boom nose (1).
- b. Replace or clean and repack bearing assemblies as required and install in sheave (7).
- c. Install two bearing closures (12) and position sheave (7) into auxiliary boom nose (1).
- d. Install sheave pin (6) through sheave (7) and boom nose (1).
- e. Install end cap (10) on sheave pin (6) and secure with new lockwashers (9) and capscrews (8).
- f. Install locknuts (2) and washer (3).

2. INSTALL AUXILIARY BOOM NOSE (1). (REFER TO TM 5-3810-306-20.)

3. REEVE CABLE THROUGH AUXILIARY BOOM NOSE SHEAVE. (REFER TO TM 5-3810-306-20.)

4. INSTALL PIN (5) AND SECURE WITH PIN CLIP (4).

5. INSTALL OVERHAUL BALL OR LIFTING DEVICE TO CABLE. (REFER TO TM 5-3810-306-20.)



END OF TASK

TM 5-3810-306-34

BOOM INSTALLATION

TOOLS: General mechanic's tool kit: automotive (5180-00-177-7033)
Lifting device (10 ton Capacity)

SUPPLIES: Lockwashers (Item 26, Appendix B) (2 Required)
Grease (Item 37, Appendix B)

EQUIPMENT CONDITIONS: Outriggers fully extended and lowered.
(Refer to TM 5-3810-306-10.)
Auxiliary boom nose removed. (Refer to TM 5-3810-306-20.)
PAT/LMI components removed. (Refer to Chapter 14.)
Boom floodlight and harness removed.
(Refer to TM 5-3810-306-20.)

REMOVAL:

WARNING

Boom weighs approximately 13,135 pounds (5,958 Kg). Ensure that blocking and lifting devices are capable of supporting weight of boom.

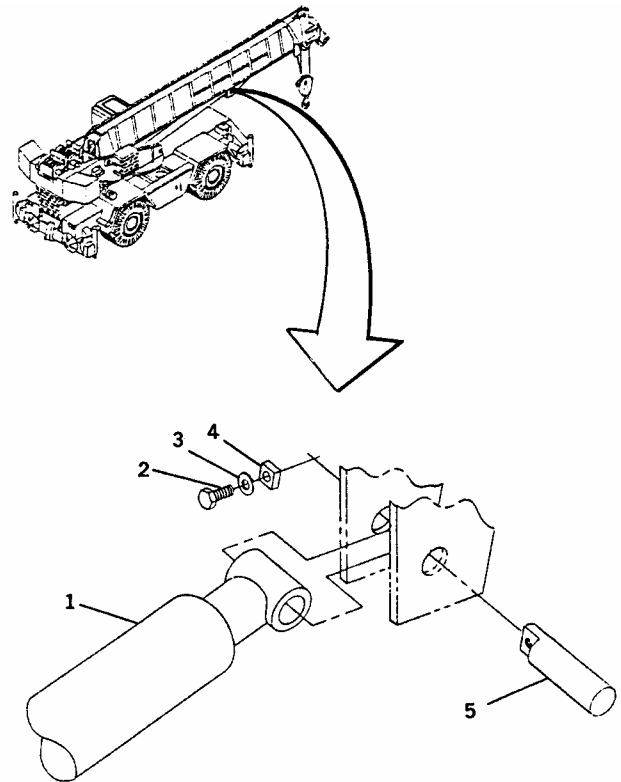
NOTE

Boom can be disassembled without removing boom from crane if base section does not require replacement.

1. ATTACH AN ADEQUATE LIFTING DEVICE BOOM, PROVIDING AN EQUAL WEIGHT DISTRIBUTION.
2. TAG AND DISCONNECT HYDRAULIC LINES TO TELESCOPE CYLINDER, CAP OPEN LINES.
3. ELEVATE BOOM SLIGHTLY TO ALLOW FOR WITHDRAWAL OF LIFT CYLINDER ROD ENDS.

WARNING

Failure to properly support boom lift cylinders could result in injury or death to personnel.



4. REMOVE LIFT CYLINDERS.
 - a. Block lift cylinders.
 - b. Take up any slack in boom lifting device(s).
 - c. Remove cap screw (2), washers (3), and retainer blocks (4) from lift cylinders (1).
 - d. Remove rod end anchor shafts (5)

NOTE

Withdraw lift cylinder rod ends only enough to clear lift cylinder attach fitting.

- e. Retract lift cylinders.

WARNING

Shut down crane before proceeding.

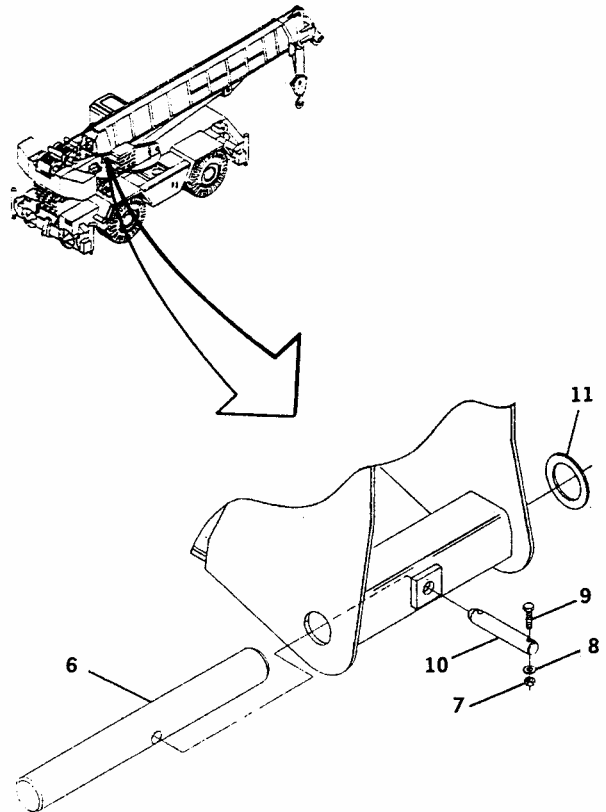
5. DISCONNECT NEGATIVE BATTERY CABLE AT SHUNT. (REFER TO TM 5-3810-306-20.) (RT875CC). BATTERY DISCONNECT SWITCH IN OFF POSITION. (RT875CCS)
6. REMOVE BOOM PIVOT SHAFT (6) AND BOOM ASSEMBLY.
 - a. Remove nuts (7), lockwashers (8) and capscrews (9) securing pivot shaft pin (10) through pivot shaft (6). Discard lockwashers (8).
 - b. Remove pivot shaft pin (10).
 - c. Remove pivot shaft (6) and thrust washer(s) (11).
7. RAISE BOOM CLEAR OF CRANE AND LOWER IT TO GROUND. USE CARE TO AVOID DAMAGING BOOM NOSE.

INSTALLATION:

WARNING

Ensure blocking and lifting devices are capable of supporting the boom assembly.

1. INSTALL BOOM ASSEMBLY.
 - a. Attach boom lifting device to provide equal weight distribution.
 - b. Suspend boom over crane.
 - c. Lower the boom into position and align the boom pivot shaft mounting holes for installation of the pivot shaft.



NOTE

Add thrust washer (11) as necessary to fill in space between boom and turntable.

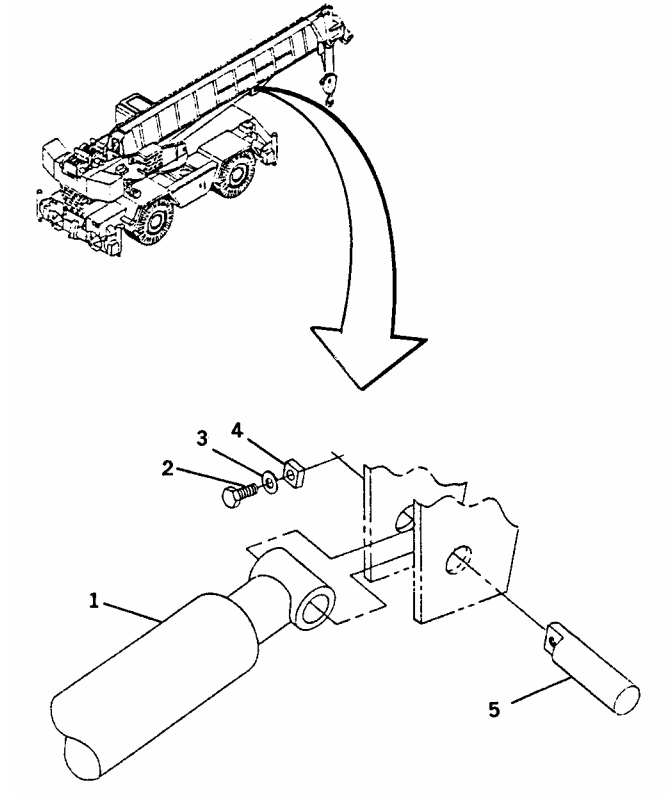
- d. Use extreme pressure multi-purpose grease to lubricate boom pivot shaft (6). Install boom pivot shaft and secure it with the boom pivot shaft retaining pin (10), capscrews (9), new lockwashers (8) and hex nut (7).
2. CONNECT NEGATIVE BATTERY CABLE AT SHUNT. (REFER TO TM 5-3810-306-20.) (RT875CC). BATTERY DISCONNECT SWITCH IN ON POSITION. (RT875CCS)

CAUTION

Extend the cylinder rod ends only enough to align them with the holes in the lift cylinder attach fitting.

3. INSTALL LIFT CYLINDERS.

- a. Extend cylinder rod ends and lower boom until ends align with holes in lift cylinder attach fittings.
- b. Use extreme pressure multipurpose grease to lubricate rod end anchor shafts (5) and install them.
- c. Install the retainer blocks (4), washers (3), and capscrews (2) securing rod end anchor shafts to lift cylinder attach fitting.
- d. Gradually slacken boom lifting device until boom lift cylinders are supporting boom; detach lifting device and rigging from boom.
- e. Remove lift cylinder blocking device.



4. CONNECT THE HYDRAULIC LINES TO THE TELESCOPE CYLINDER AS TAGGED PRIOR TO REMOVAL.

5. INSTALL PAT/LMI COMPONENTS. (REFER TO CHAPTER 14.)

6. INSTALL THE BOOM FLOODLIGHT AND HARNESS. (REFER TO TM 5-3810-306-20.)

7. CONNECT THE ELECTRICAL WIRES AS APPLICABLE.

8. INSTALL THE AUXILIARY BOOM NOSE. (REFER TO TM 5-3810-306-20.)

9. INSTALL HOOK BLOCK AND OVERHAUL BALL. (REFER TO TM 5-3810-306-20.)

10. TEST FOR PROPER OPERATION.

END OF TASK

BOOM ASSEMBLY

TOOLS: General mechanic's tool kit: automotive (5180-00-177-7033)
Four (4) pieces 1 in. dia. x 3 in. long drill rod or equivalent
Two (2) spacers, equal thickness
One (1) four ft. level
Large square (3 ft. x 4 ft.)
Measuring tape/scale
One (1) three ft. straight edge
Chalk line (cord) or equivalent
Spanner wrench

SUPPLIES: Cotter pins (Item 64, Appendix B) (2 Required)
Solvent, Cleaning P-D-680, Type III (Item 1, Appendix B)
Loctite Primer Grade T (Item 65, Appendix B)
Loctite # 242 (Item 6, Appendix B)
NEVER-SEEZ (Item 24, Appendix B)
Lockwashers (Item 26, Appendix B) (12 Required)
Retaining clip (Item 66, Appendix B) (3 Required)
Wear pad (Item 259, Appendix B) (2 Required)
Wear pad (Item 260, Appendix B) (4 Required)
Wear pad (Item 261, Appendix B) (2 Required)
Wear pad (Item 262, Appendix B) (2 Required)

EQUIPMENT CONDITIONS: Boom assembly removed if required. (Refer to page 15-5.)
Outriggers fully extended and lowered.
(Refer to TM 5-3810-306-10.)

DISASSEMBLY:

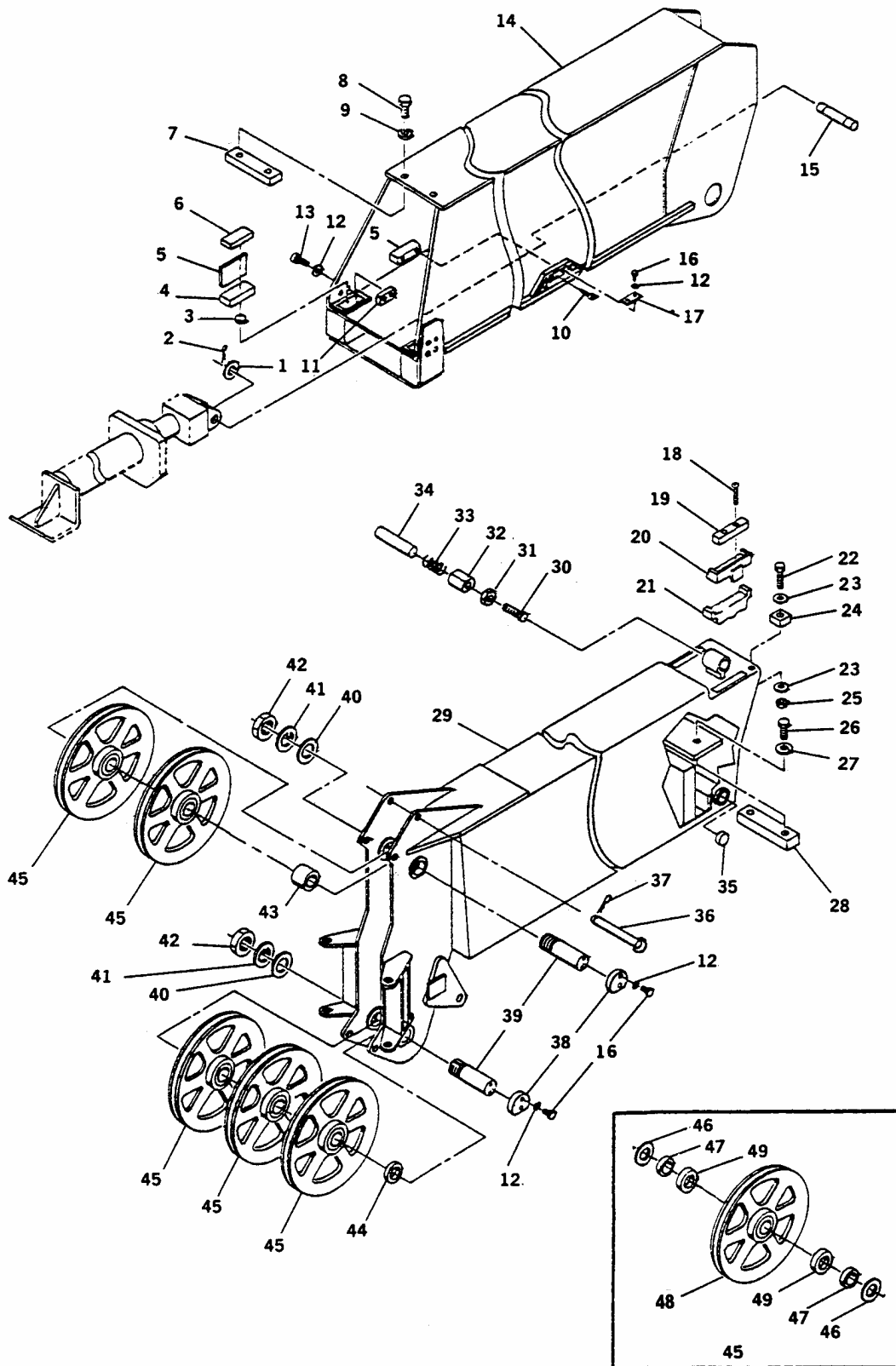
NOTE

Boom can be disassembled without removing boom from crane if base section does not require replacement.

WARNING

If telescope section is being removed while base section is still attached to crane, ensure lifting device is capable of supporting weight of telescope section and telescope cylinder.

1. REMOVE THE CAPSCREWS (8) AND WASHERS (9) SECURING SPACER (7) TO FRONT OF BOOM BASE SECTION.
2. REMOVE THE CAPSCREWS (16) AND LOCKWASHERS (12) SECURING PLATE (17) ON BOTH SIDE ADJUSTABLE WEAR PADS.
3. REMOVE THE CAPSCREWS (13) AND LOCKWASHERS (12) SECURING KEEPER (11) ON BOTH FRONT ADJUSTABLE WEAR PADS.
4. LOOSEN ADJUSTING SCREWS (1) ON ALL FOUR ADJUSTABLE WEAR PADS (5). REMOVE AND DISCARD WEAR PADS (5).
5. LOOSEN THE ADJUSTING NUT (31) ON THE FLY SECTION ADJUSTABLE WEAR PADS.
6. DISCONNECT TELESCOPE CYLINDER AT BASE SECTION.
 - a. Remove two cotter pins (2), washers (1), and pin (15) securing telescope cylinder to base section.
 - b. Attach suitable lifting device to fly section.



- c. Raise the fly section within base section. Remove and discard two bottom wear pads (6).
7. REMOVE FLY SECTION FROM BASE SECTION OF BOOM. (14) DISASSEMBLE FLY SECTION.
- a. Using lifting device, remove fly section from base section. Place fly section on suitable blocking.
 - b. Remove and discard round side wear pads (35) from both sides of fly section.
 - c. Remove adjustable wear pad supports (20) and pad bases (21) from the fly section.
 - d. Remove screws (18) securing wear pads (19). Remove and discard wear pads (19).
 - e. Remove adjusting bolt (30), nut (31), block (32), spring (33) and pin (34) from fly section.
 - f. Remove capscrew (22), two washers (23) and nut (25) securing each retainer (24). Remove retainers.
 - g. Remove base (4) and plate (3) from wear pad pockets on front of base section.
 - h. Remove lockwire, two bolts (26) and washer (27) securing block (28) to fly section, remove block.
 - i. Using lifting device, raise telescope cylinder to clear mounting slot and withdraw telescope cylinder from fly section.
8. DISASSEMBLE BOOM NOSE.
- a. Remove the three clip pins (37) and hitch pins (36) from boom nose.
 - b. Remove the nut (42), slotted washer (41) and washer (40) from lower boom nose shaft.
 - c. Remove the two capscrews (16) and lockwashers (12) securing cap (38) to lower boom nose shaft. Remove cap (38).
 - d. Repeat steps b and c for the upper boom nose shaft.

NOTE

Each sheave assembly consists of a sheave, grease fitting, two cones (47) two bearings (46) and two cups (49). The cups are a press fit in sheave.

- e. Remove each boom nose shaft (39), spacers (44) and (43), and sheave assemblies. Be careful not to drop bearings or cone.

9. BOOM ANGLE INDICATOR

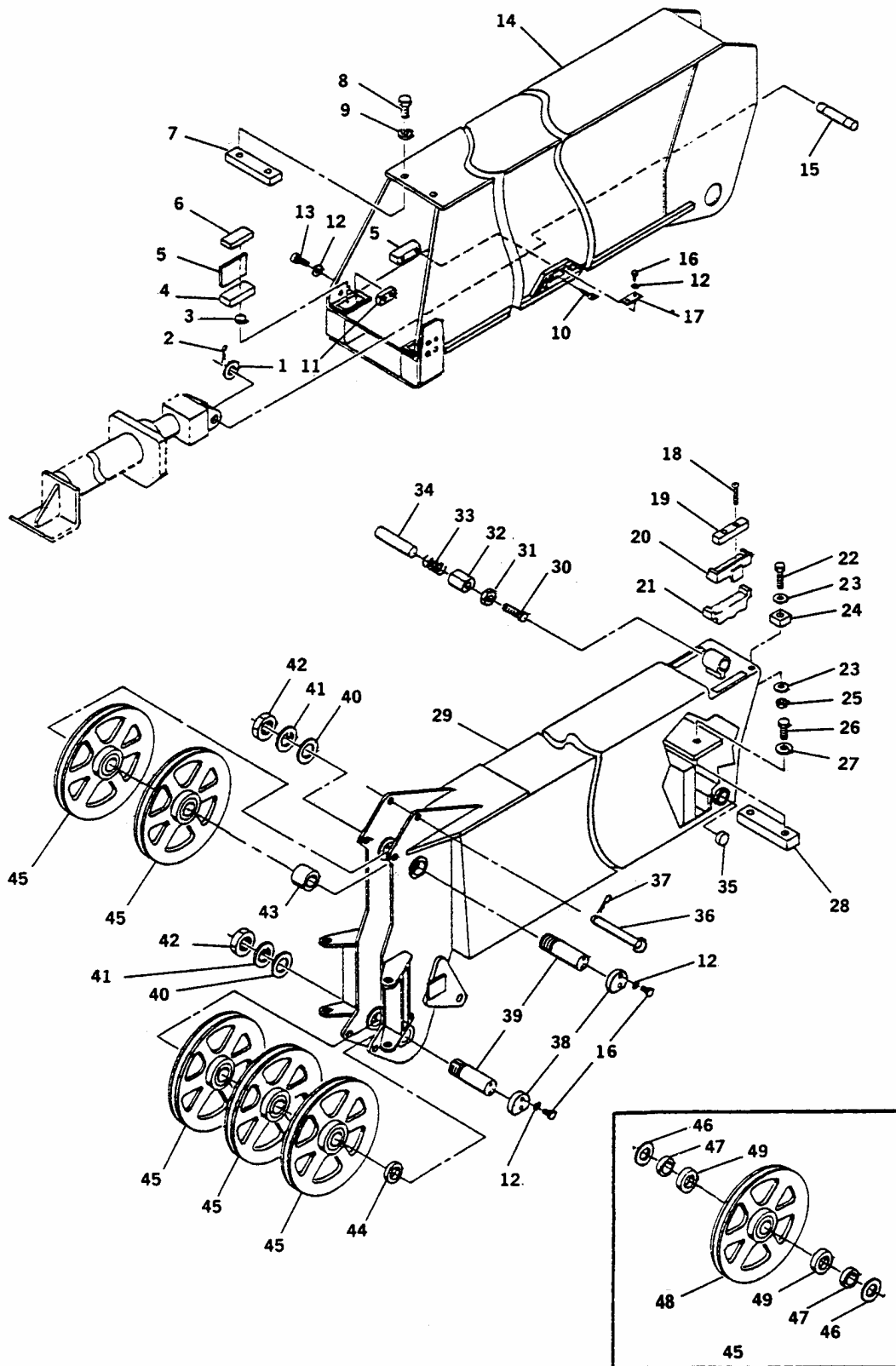
- a. Remove and Repair as necessary.

CLEANING AND INSPECTION:

WARNING

Dry cleaning solvent P-D-680, Type III is toxic and flammable. Wear protective goggles and gloves and use only in a well-ventilated area. Avoid contact with skin, eyes, and clothes and do not breathe vapors. Do not use near open flame or excessive heat. The flash point is 200°F (94°C). If you become dizzy while using cleaning solvent, get fresh air immediately and get medical aid. If contact with eyes is made, wash your eyes with water and get medical aid immediately. Compressed air used for cleaning purposes will not exceed 30 psi. Use only with effective chip guarding and personal protection equipment (goggles/ shield, gloves, etc.).

1. CLEAN ALL METAL PARTS WITH CLEANING SOLVENT P-D-680, TYPE III TO REMOVE GREASE AND DIRT. BLOW DRY WITH COMPRESSED AIR.
2. INSPECT SHEAVE WHEELS FOR DAMAGED AND WORN BEARINGS. REPLACE DAMAGED BEARINGS.
3. INSPECT FLY SECTION AND BASE SECTION FOR CRACKS OR DAMAGE.

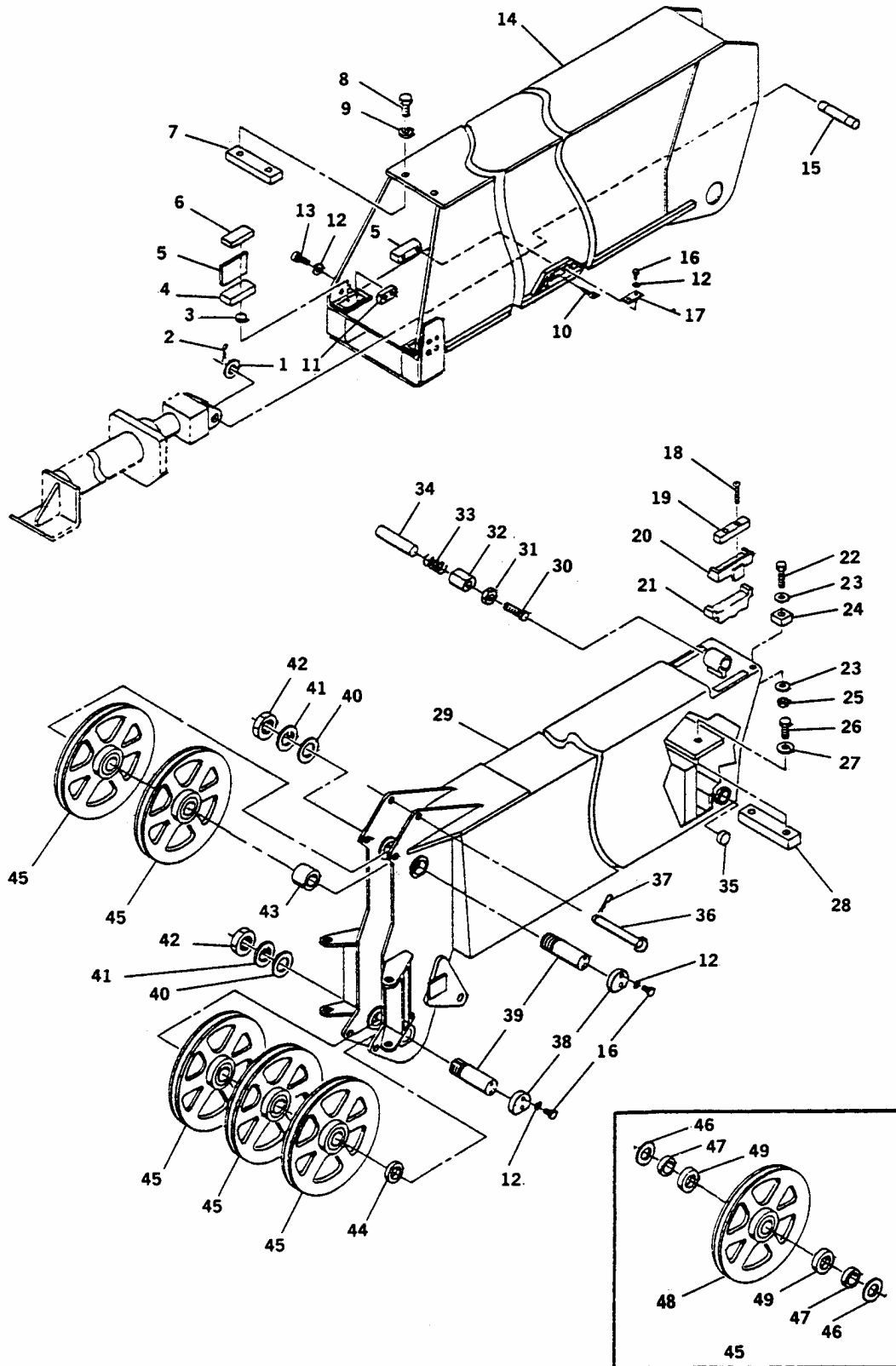


REASSEMBLY:

NOTE

Apply Loctite Primer Grade T and Loctite Adhesive Sealant Grade 242 to all capscrews and bolts.

1. INSTALL TELESCOPE CYLINDER IN FLY SECTION OF BOOM.
 - a. Using a lifting device, slide telescope cylinder in to fly section. Ensure end of barrel aligns in bracket provided. Lower cylinder until collar of barrel rests in slot provided at end of fly section.
 - b. Position block (28) on top of cylinder barrel collar and secure block with two bolts (26) and washers (27). Torque bolts (26) to 370 ft-lbs. (492 Nm) and install lockwire.
2. INSTALL WEAR PAD AND INSERT FLY SECTION INTO BASE SECTION OF BOOM.
 - a. Position plate (3) (concave side up) and base (4) in wear pad pocket on front of base section.
 - b. Install retainers (24) on each side of fly section with a capscrew (22), two washers (23) and nut (25).
 - c. On rear of fly section, assemble adjusting bolt (30), nut (31), block (32), spring (33), and pin (34).
 - d. Install new wear pads (19) on supports (20) with two screws (18).
 - e. Install adjustable wear pad support (20) and pad base (21) on each side of fly section.
 - f. Coat new round wear pads (35) with grease and install them in pockets on each side of fly section.
 - g. Coat bottom rails of fly section and area of base section where fly section will ride with NEVER-SEEZ.
3. SECURE THE TELESCOPE CYLINDER TO THE BASE SECTION WITH PIN (15), TWO WASHERS (1) AND TWO COTTER PINS (2).
4. IF REMOVED, INSTALL ADJUSTING SCREWS (10) IN BOOM BASE SECTION FOUR PLACES.
5. INSTALL FOUR NEW ADJUSTABLE WEAR PADS (5).
6. ON FRONT ADJUSTABLE WEAR PADS, INSTALL KEEPER (11) ON INSIDE OF BOOM AND SECURE FROM OUTSIDE WITH TWO CAPSCREWS (13) AND LOCKWASHERS (12).
7. AT SIDE ADJUSTABLE WEAR PADS, INSTALL PLATE (17) ON WEAR PADS AND SECURE WITH TWO CAPSCREWS (16) AND LOCKWASHERS (12).
8. AT FRONT OF BASE SECTION, INSTALL SPACER (7) AND SECURE WITH TWO CAPSCREWS (8) AND WASHERS (9).
9. REASSEMBLE BOOM NOSE.
 - a. Start upper boom nose shaft (39) from right side of boom nose (end with two tapped holes).
 - b. If necessary, press two cups (49) in each of the five sheaves (48).
 - c. Install small spacer (44), on shaft.
 - d. Install cone (47), bearing (46), sheave (48), bearing (46) and cone (47). Install sheave on shaft (39).
 - e. Repeat step d for second sheave assembly.
 - f. Install large spacer (43).
 - g. Align shaft (39) so flat of cap (38) is down. Install cap and secure with two capscrews (16) and lockwashers (12).
- h. Using an adequate lifting device, slide fly section into base section. Be careful the round side wear pads (35) and upper adjustable wear pads (19) do not fall out.
- i. Raise fly section and install two new bottom wear pads (6). Lower fly section and remove lifting device.



- h. Install washer (40), slotted washer (41), and nut (42) on threaded end of shaft.
- i. Using spanner wrench, tighten nut (42) while rotating sheave and checking for proper bearing alignment.
- j. Lock nut (42) by bending tab from slotted washer (41) into slot on nut.
- k. Repeat steps c thru e for lower boom nose sheaves.
- l. Repeat step d for third sheave assembly.
- m. Install small spacer (44).
- n. Repeat steps a thru j for lower boom nose sheaves.

10. IF REMOVED, INSTALL BOOM. (REFER TO PAGE 15 5.)

11. TEST FOR PROPER OPERATION.

POST-ASSEMBLY INSPECTION:

NOTE

Boom width, height, squareness, sway/sweep, camber, concavity, convexity, and waviness are checked at the factory prior to boom assembly. Boom damage resulting from overloading or other misuse of the crane would be evidenced by binding between the boom sections. Should this occur, the boom should be disassembled and inspected to determine the source of binding and the extent of damage. Contact Grove Manufacturing Company, Service Department, concerning possible repair or replacement of affected parts.

1. MANUALLY INSPECT BOOM OPERATION.

- a. Elevate boom and hold in extended position. Boom should stay in position until retracted by operator.
- b. Extend and retract boom several times at various elevations. Check for smooth operation of telescope cylinder.

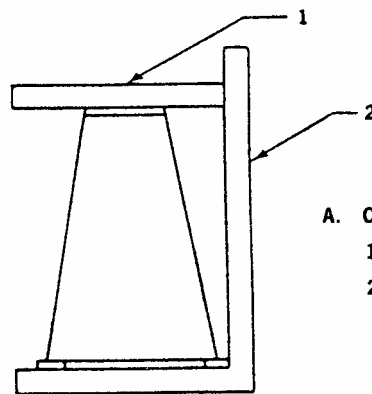
- c. Check operation of all electrical/electronic components affected by boom removal.
- d. Visually inspect telescoping section for adequate lubrication of boom plates. Observe extended section for evidence of cracks, warping, or other damage. Periodically check security of boom wear pads. Check boom nose sheave for security and freedom of movement.

NOTE

The following procedure is used to inspect channel and plate trapezoidal boom sections. The procedure ensures proper component clearance and freedom from physical contact and interference.

2. INSPECT CHANNEL AND PLATE TRAPEZOIDAL BOOM SECTIONS.

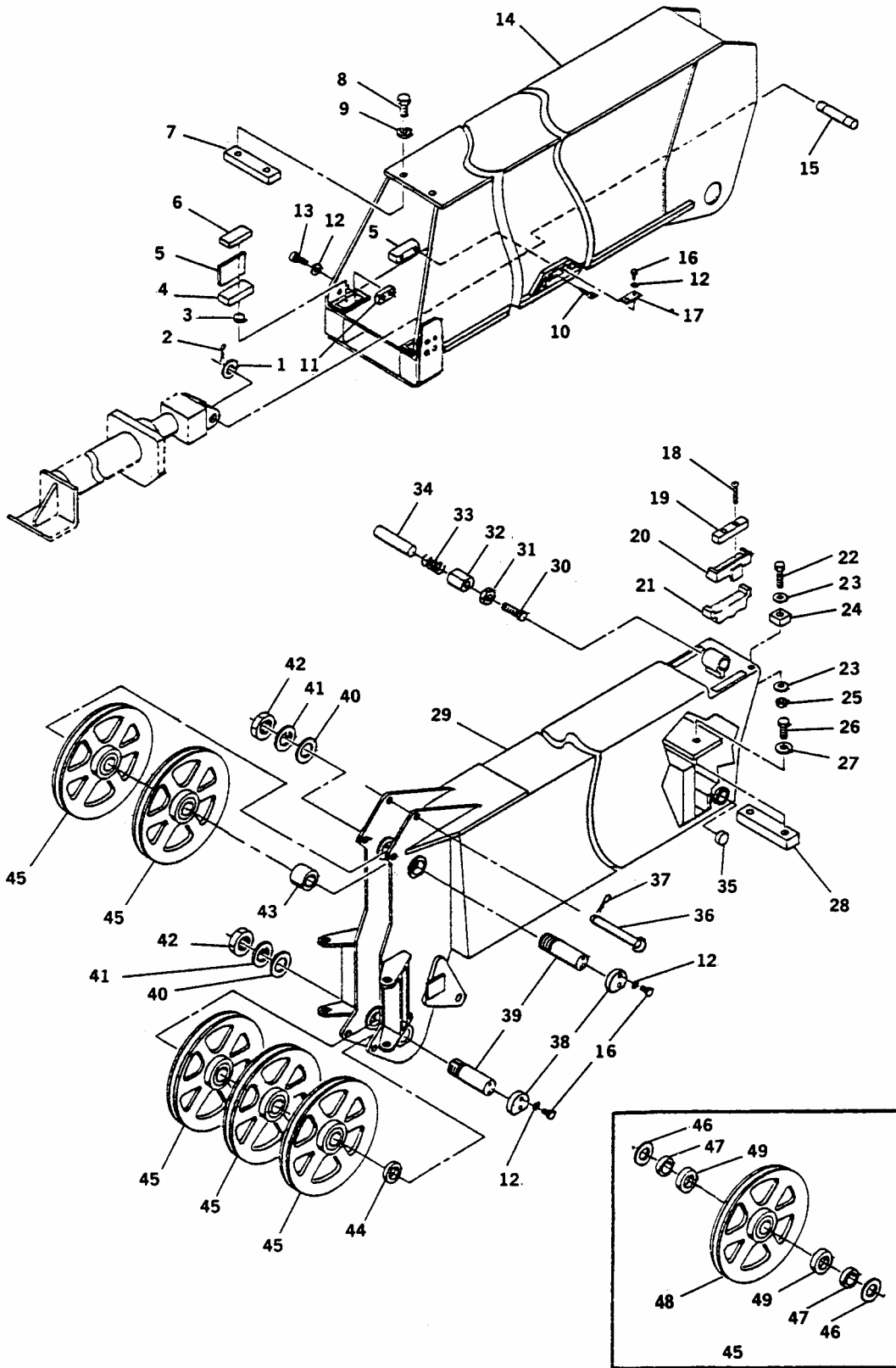
- a. Check width of boom by measuring across boom plate. This check shall be made at front and rear end and several places along boom section length.
- b. Check height of boom by placing straightedge and square as shown in A. Measure between the edge of square and straight edge, both sides, at 4 foot intervals, maximum.



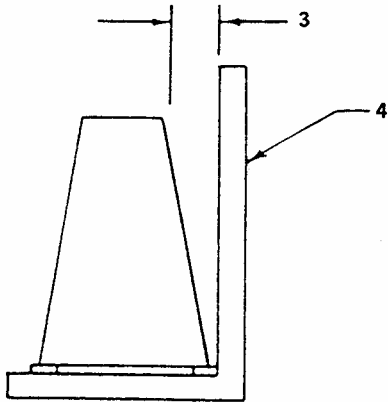
A. CHECKING HEIGHT OF BOOM
1. STRAIGHT EDGE
2. SQUARE

A

- c. Check top width at 4 foot intervals along boom section length.



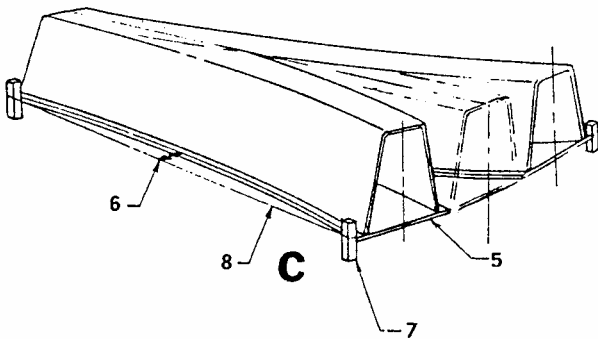
- d. Check squareness of boom section by placing square as shown in B. Measure dimensions for top plate to square on both sides of section at same interval. The amount boom is out of square is 1/2 of difference between left and right check dimensions.



B

- B. CHECKING SQUARENESS OF BOOM SECTION**
 3. CHECK DIMENSION
 4. SQUARE

- e. Check sway/sweep by placing spacers of equal thickness against base plate edge at both ends and draw a cord tightly over them as shown in C. Check distance between cord and top plate at four foot intervals. Record measurements.



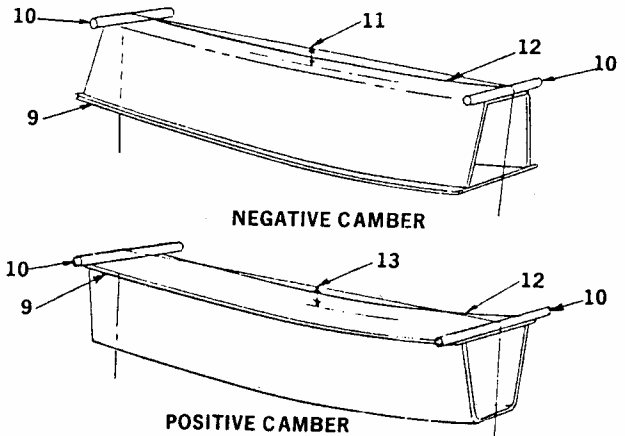
C

- C. CHECKING SWAY/SWEEP OF BOOM SECTION**
 5. BASE PLATE
 6. CHECK DIMENSION
 7. SPACERS
 8. CORD

NOTE

The boom must be in travel position when checked.

- f. Check camber. An upsweep condition is negative camber and a down sweep condition is positive camber. Use drill rods and cord as shown in D. Check at four foot intervals.



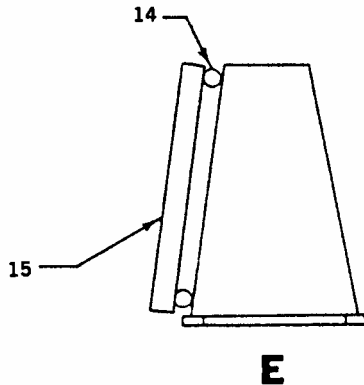
D

- D. CHECKING POSITIVE AND NEGATIVE CAMBER**
 9. BASE
 10. DRILL ROD
 11. CHECK NEGATIVE CAMBER
 12. CORD
 13. CHECK POSITIVE CAMBER

NOTE

The boom must be in the travel position when checked.

- g. Check concavity and convexity by placing straight edge over rods as shown in E. Measure from straight edge to side plate at mid-point, both sides. Record results. Use straight edge and rods to check lacings and top/bottom plates.

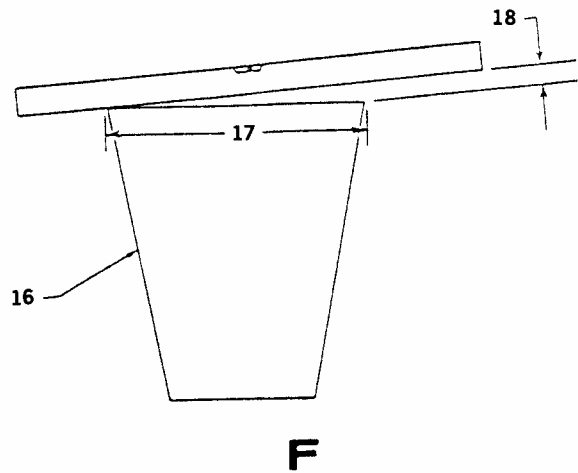


E. CHECKING CONCAVITY AND CONVEXITY
 14. ROD
 15. STRAIGHTEDGE

- h. Position boom section with bottom plate facing up. Level rear end of section with respect to bottom plate. Check front of boom section to determine amount of longitudinal twist in bottom plate as shown in F.

NOTE

When telescope section is not twisted, vertical centerline of boom nose shall be located perpendicular to center of bottom plate of section.



F. CHECKING BOTTOM PLATE LONGITUDINAL TWIST
 16. FRONT OF SECTION
 17. BOTTOM OF PLATE WIDTH
 18. LONGITUDINAL TWIST

- i. Check longitudinal waviness. Waviness shall be smooth with positive/negative arches (no kinks). Peak to peak waviness shall be based upon peak to valley dimensions as shown in G.



G. LONGITUDINAL WAVINESS (PEAK-TO-VALLEY)
 19. EDGE VIEW OF MEMBER
 20. PEAK-TO-VALLEY MAXIMUM
 21. MEAN CENTER LINE

BOOM ALIGNMENT:

CAUTION

The following procedure involves the side thrust pads in checking boom width. Avoid over adjusting the thrust pads to a point where too much binding exists between the pads and the telescope section. Boom damage can occur.

1. CHECK AND ADJUST SIDE THRUST PADS.

- a. Extend and lower outriggers.
- b. Position fully retracted boom over front of crane and elevate boom slightly to permit complete extension of telescoping section while allowing a maintenance technician to access boom from a maintenance platform.
- c. Back out two rear side thrust pad adjusting screws on right side of crane as shown.

NOTE

Ensure that front side thrust pads are in contact with telescope section.

- d. Lower front and rear outrigger jack cylinders on right side of crane until the crane tilts slightly. This will cause the right side of the boom to ride on the retracted rear side thrust pads.
- e. While a crane operator slowly extends telescope section, slowly turn forward adjusting screw of front side thrust pad on left side of the boom. Adjust screw in and out in order to "feel" the changing width of the telescope section. The wide point in telescope section will be indicated when the adjusting screw is backed out furthest.
- f. As the telescope section is extended, mark the locations which "feel" wide.
- g. Upon full section extension, measure the distance across the bottom of the telescope section at each mark to determine the widest point. Clearly mark the widest point.
- h. Retract the telescope section until the mark is lined up with the front side thrust pads.

- i. Turn left front side thrust pad adjusting screws in snug and back out 1/6 of a turn. When cycled if boom is sluggish or binding, continue to back out screws at 1/6 of a turn increments until smooth cycle operating is achieved. The width between front side thrust pads is now set and will not change.
- j. Measure distance between front and rear side thrust pads. Record this distance.
- k. From mark on telescope section measure distance recorded in step j forward. Make another mark on telescope section.
- l. Retract telescope section until new mark is aligned with front side thrust pads. This will position widest point in line with rear side thrust pads.
- m. Turn left rear side thrust pad adjusting screws in until snug. Do not back off on these screws.
- n. Turn right rear side thrust pad adjusting screws in until, snug and then back off 1/6 of a turn. Distance between rear side thrust pads is now set.

2. CHECK AND ADJUST TELESCOPE TO BASE SECTION ALIGNMENT.

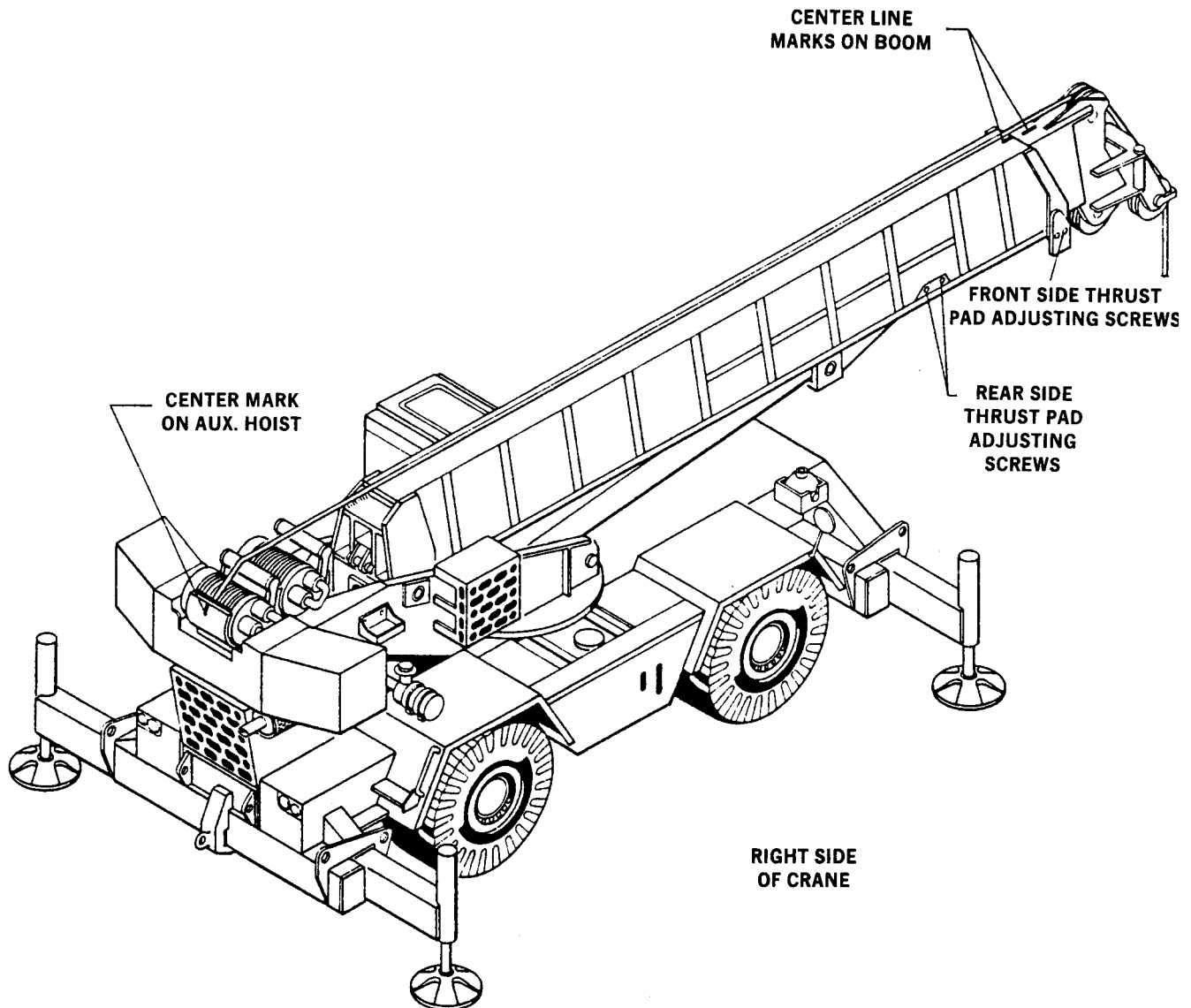
- a. Level crane by raising right front and rear outriggers.
- b. Measure across the top outer end of the boom base section and telescope section. Mark center point of each section.
- c. Route auxiliary hoist cable over center sheave on boom nose. Attach a weight to cable to help keep cable taut.
- d. Elevate boom until cable is suspended (i.e., not resting on top of boom) between boom nose sheave and hoist drum.
- e. Measure distance across back of auxiliary hoist drum and mark center of drum.

- f. Lower auxiliary hoist cable until cable lines up with mark.
- g. Using the auxiliary hoist cable as a point of reference, check telescope and base section alignment. If aligned, auxiliary hoist cable will cover the centerline marks made in step b.
- h. If necessary, adjust telescope and base section alignment by adjusting side thrust pads. If, for example, telescope section mark is to the left of base section mark, back off on right side thrust pad adjusting screws and tighten left side thrust pad adjusting screws.

END OF TASK

CAUTION

When backing off and tightening opposite side thrust pads, be sure to turn screws an equal number of turns in order to maintain previously established optimum width between side thrust pads.



HOOK BLOCK ASSEMBLY

TOOLS: General mechanic's tool kit: automotive (5180-00-177-7033)

SUPPLIES: Fluid, dry cleaning P-D-680 Type II (Item 1, Appendix B)

EQUIPMENT CONDITION: Hook block removed. (Refer to TM 5-3810-306-20.)

WARNING

Be sure to wear protective eye covering and gloves to avoid personal injury.

DISASSEMBLY:

1. DISASSEMBLE HOOK BLOCK.
 - a. Lay hook block on its side and remove nuts (7).
 - b. If necessary remove three grease fittings from center pin (6).
 - c. Remove spirol (10), setscrew (5) and nut (4).
 - d. Remove side plate (9) and spacers (16).
 - e. Remove first sheave (14), thrust washers (12), and plate (15). Remove remaining sheaves (14), spacers (16) and plates (15) in same manner.
 - f. Remove hook (19) and spacers (28).
 - g. Remove tie bolts (8) and center pin (6).
2. REMOVE ROLLER BEARINGS (13) FROM SHEAVE (14).

CAUTION

Use care when driving out roller bearings (13) to avoid damage to sheaves.

3. DISASSEMBLE HOOK.
 - a. Remove setscrew (18), nut (19), thrust bearing (20) and housing (21).
 - b. Remove retaining rings (26), grooved pin (27), latch (23) and spring (24). Remove quick release pin (25).
 - c. If necessary remove grease fitting from nut (19).

CLEANING:

WARNING

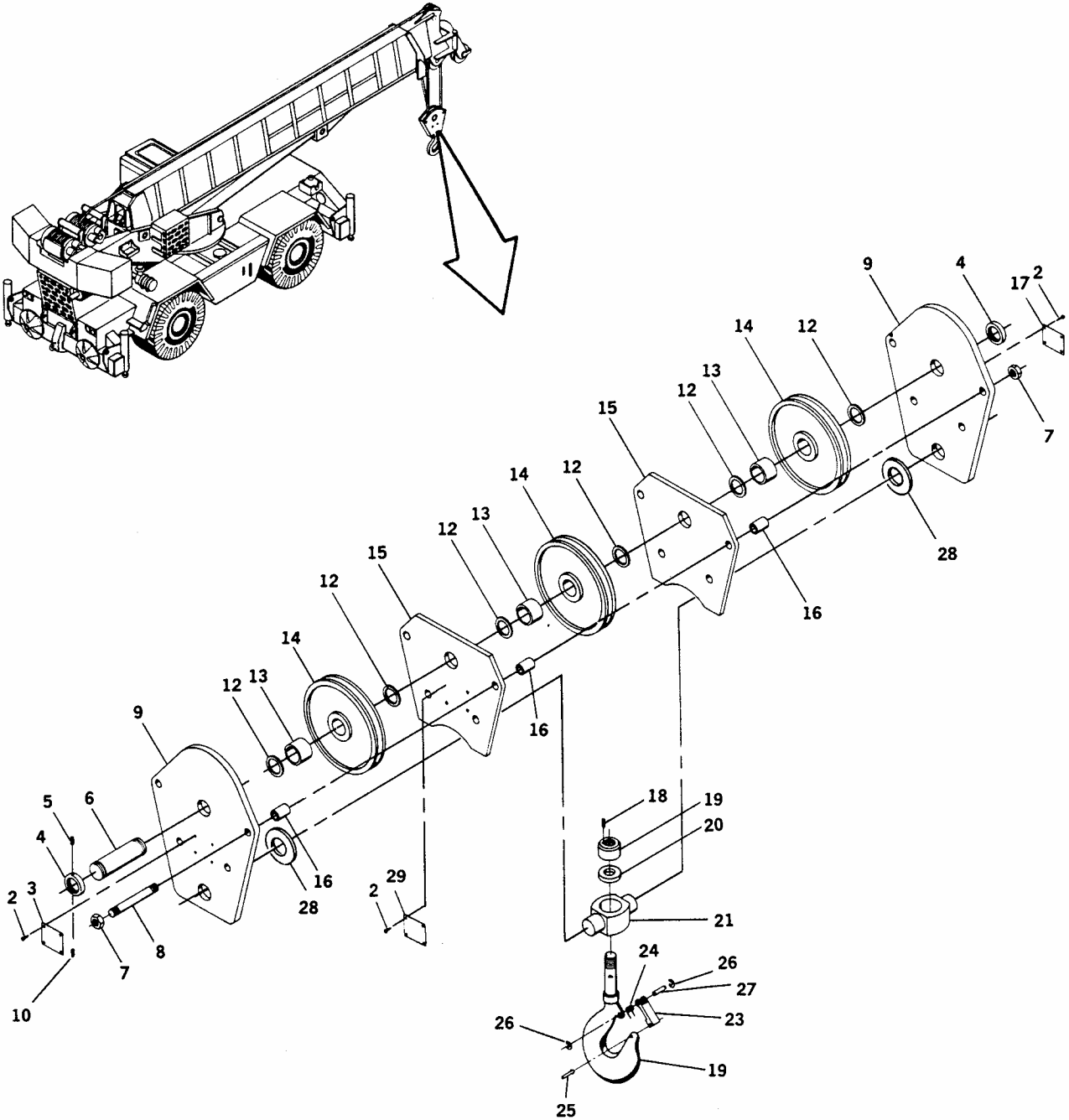
Dry cleaning solvent P-D-680, Type III is toxic and flammable. Wear protective goggles and gloves and use only in a well ventilated area. Avoid contact with skin, eyes, and clothes and do not breathe vapors. Do not use near open flame or excessive heat. The flash point is 200°F (94°C). If you become dizzy while using cleaning solvent, get fresh air immediately and get medical aid. If contact with eyes is made, wash your eyes with water and get medical aid immediately.

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

1. CLEAN ALL PARTS WITH CLEANING SOLVENT P-D-680 TYPE III AND CLEAN LINT-FREE CLOTH.

INSPECTION:

1. INSPECT HOOK BLOCK COMPONENTS.
 - a. Inspect all sheaves for wear and damaged grooves.
 - b. Inspect internal bearing surfaces for scoring.
 - c. Inspect roller bearings for wear. Repack each bearing with grease MIL-G-10924.
 - d. Inspect hook for distortion and cracks. Perform magnetic-particle inspection to uncover possible fatigue damage. Latch opening must measure 3.43 inches (8.7 cm). Any distortion or fatigue is cause for replacement.



REASSEMBLY:

1. ASSEMBLE HOOK.

- a. Install spring (24), latch (23) and grooved pin (27). Secure with retaining rings (26).
- b. Install quick release pin (25).
- c. If removed, install grease fitting in nut (19).
- d. Install housing (21) on hook and secure with thrust bearing (20), nut (19) and setscrew (18).

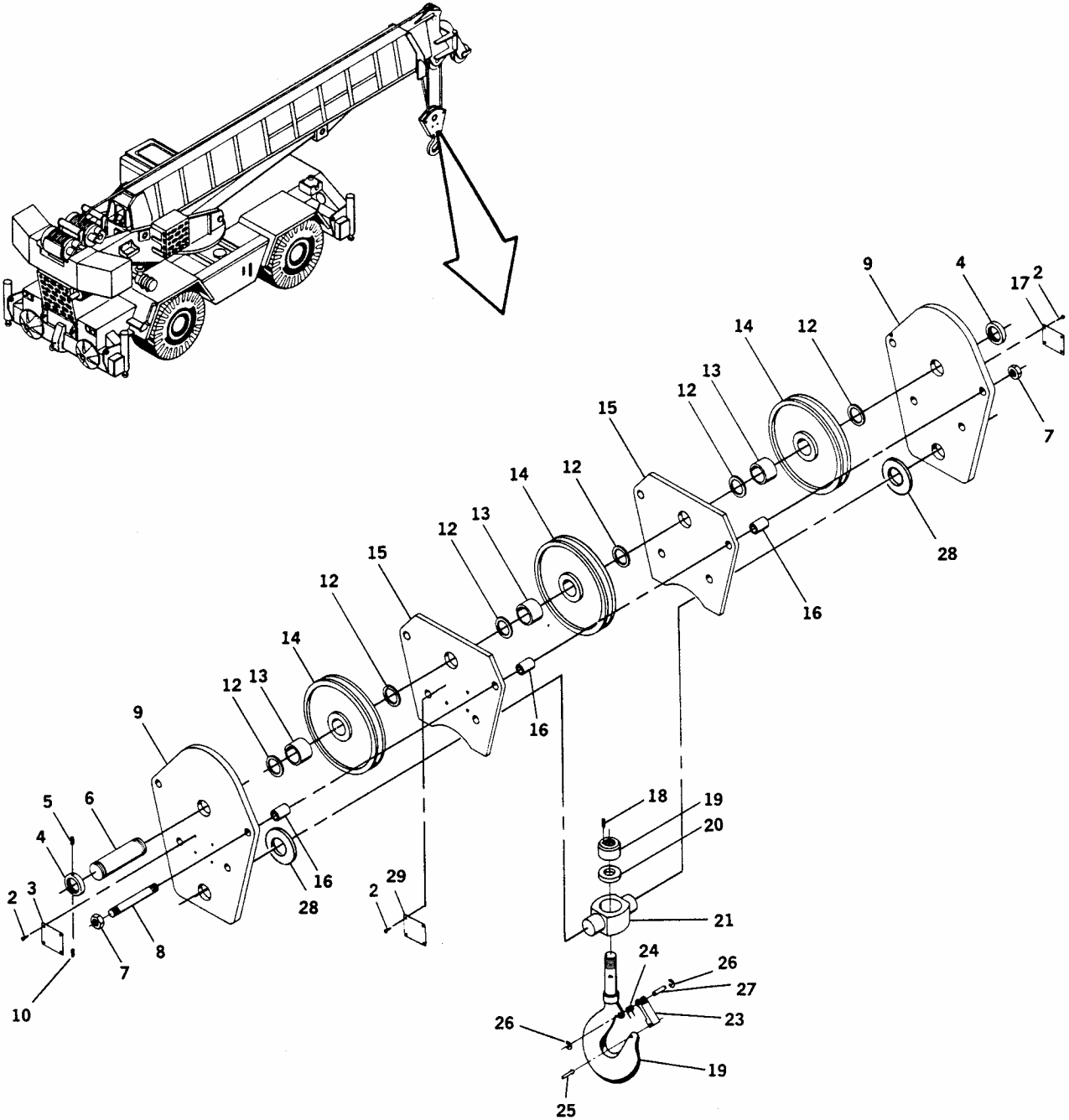
2. ASSEMBLE HOOK BLOCK.

- a. Assemble sheaves (14), roller bearings (13) and thrust washers (12) - 3 places.
- b. Install sheave (14), thrust washers (12) and plates (15) on center pin (6).

- c. Install hook (19) and spacers (28).
- d. Install side plate (9) over center pin. Install tie bolts (8) ensuring spacers (16) are installed between plates.
- e. Secure center pin with nut (4) and setscrew (5). Install spirol (10). Secure tie bolts (8) with nuts (7).
- f. If removed, install three grease fittings in center pin (6).
- g. Grease lubrication fittings. (Refer to LO 5-3810-306-12.)

3. INSTALL HOOK BLOCK. (REFER TO TM 5-3810-306-20.)

END OF TASK



Section II. HOIST MAINTENANCE

AUXILIARY HOIST INSTALLATION

TOOLS: General mechanic's tool kit: automotive (5180-00-177-7033)
Torque wrench tool kit (5180-01-284-8747)
Overhead hoist (15,000 lb.)

SUPPLIES: Preformed packing (Item 89, Appendix B) (RT875CC)
Preformed packing (Item 163, Appendix B) (RT875CC)
Preformed packing (Item 15 (RT875CC) / 291 (RT875CCS) Appendix B) (2 Required)
Preformed packing (Item 276, Appendix B) (3 Required) (RT875CCS)
Lockwasher (Item 13, Appendix B) (4 Required)
Hydraulic oil (Item 8, Appendix B)

EQUIPMENT CONDITION: Outrigger fully extended and lowered. (Refer to TM 5-3810-306-10.)
Hoist mirror removed. (Refer to TM 5-3810-306-20.) (RT875CCS)
Wire rope removed from hoist drum. (Refer to TM 5-3810-306-20.)
Negative battery cable disconnected at shunt. (RT875CC)
Battery disconnect switch in off position. (RT875CCS)

WARNING

Be sure to wear protective eye covering to avoid personal injury.

REMOVAL:

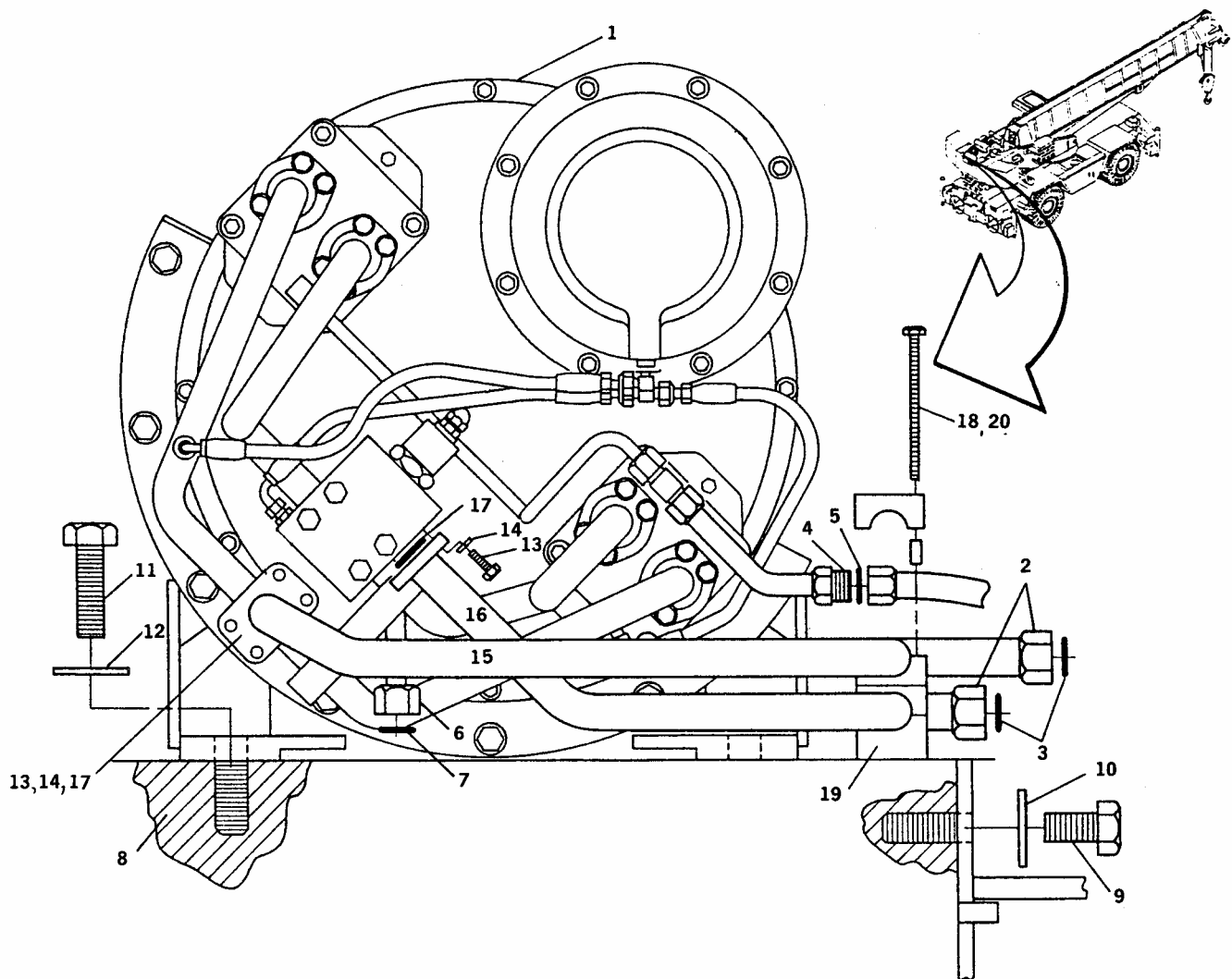
1. TAG AND REMOVE HYDRAULIC LINES TO AUXILIARY HOIST (1).
 - a. Disconnect fittings (2) at steel tubes on left side of auxiliary hoist (1). Discard preformed packing (3).
 - b. Disconnect fitting (4) to motor drain tube. Discard preformed packing (5).
 - c. Disconnect fitting (6) to case drain tube. Discard preformed packing (7).
2. REMOVE COUNTERWEIGHT (8) AND AUXILIARY HOIST (1).
 - a. Attach suitable lifting device, capable of supporting weight of counterweight and hoist to counterweight lifting eyes.
 - b. Take up slack in lifting device.
 - c. Remove four capscrews (9) and washers (10) securing counterweight to superstructure.
 - d. Remove counterweight and auxiliary hoist and lower to ground.
3. REMOVE AUXILIARY HOIST (1).
 - a. Remove eight capscrews (13) and lockwashers (14) securing clamps on hydraulic tubes (15 and 16). Remove tubes and preformed packing (17).
 - b. Remove four capscrews (11) and washers (12) securing auxiliary hoist (1) to counterweight.
 - c. Attach suitable lifting device to hoist drum and remove from counterweight.
 - d. Remove four capscrews (18), four inserts (20) and four pipe clamps (19) securing tubes (15 and 16) to counterweight.

NOTE

To simplify auxiliary hoist removal, counterweight (8) and auxiliary hoist are removed as an assembly and hoist is removed with counterweight on ground.

WARNING

Counterweight (8) and hoist weigh approximately 14,300 pounds (6486.37 kg). Use care when lifting and transporting.



INSTALLATION:

1. INSTALL AUXILIARY HOIST (1) TO COUNTERWEIGHT.
 - a. Use suitable lifting device to lift and mount auxiliary hoist on counterweight.
 - b. Install four capscrews (11) and washers (12) and torque to 1100 ft-lbs (1465 Nm) with a suitable torque wrench.
2. INSTALL HYDRAULIC TUBES (15) AND (16) TO HOIST (1).

NOTE

Prior to connecting hydraulic lines, ensure that fitting threads are clean and free of contaminants. Do not remove any orange thread sealant if previously applied to the fitting(s). Then coat new preformed packings with clean hydraulic oil.

- a. Position hydraulic tubes (15) and (16) in pipe clamps (19) and secure loosely to counterweight using capscrews (18) and inserts (20).

- b. Position two hydraulic tubes (15) and (16) and new preformed packing (17) and secure with eight capscrews (13) and lockwashers (14).
 - c. Tighten pipe clamps (19).
3. INSTALL COUNTERWEIGHT (8) AND AUXILIARY HOIST (1) TO SUPERSTRUCTURE.
- a. Attach suitable lifting device to lifting eyes on counterweight (8).

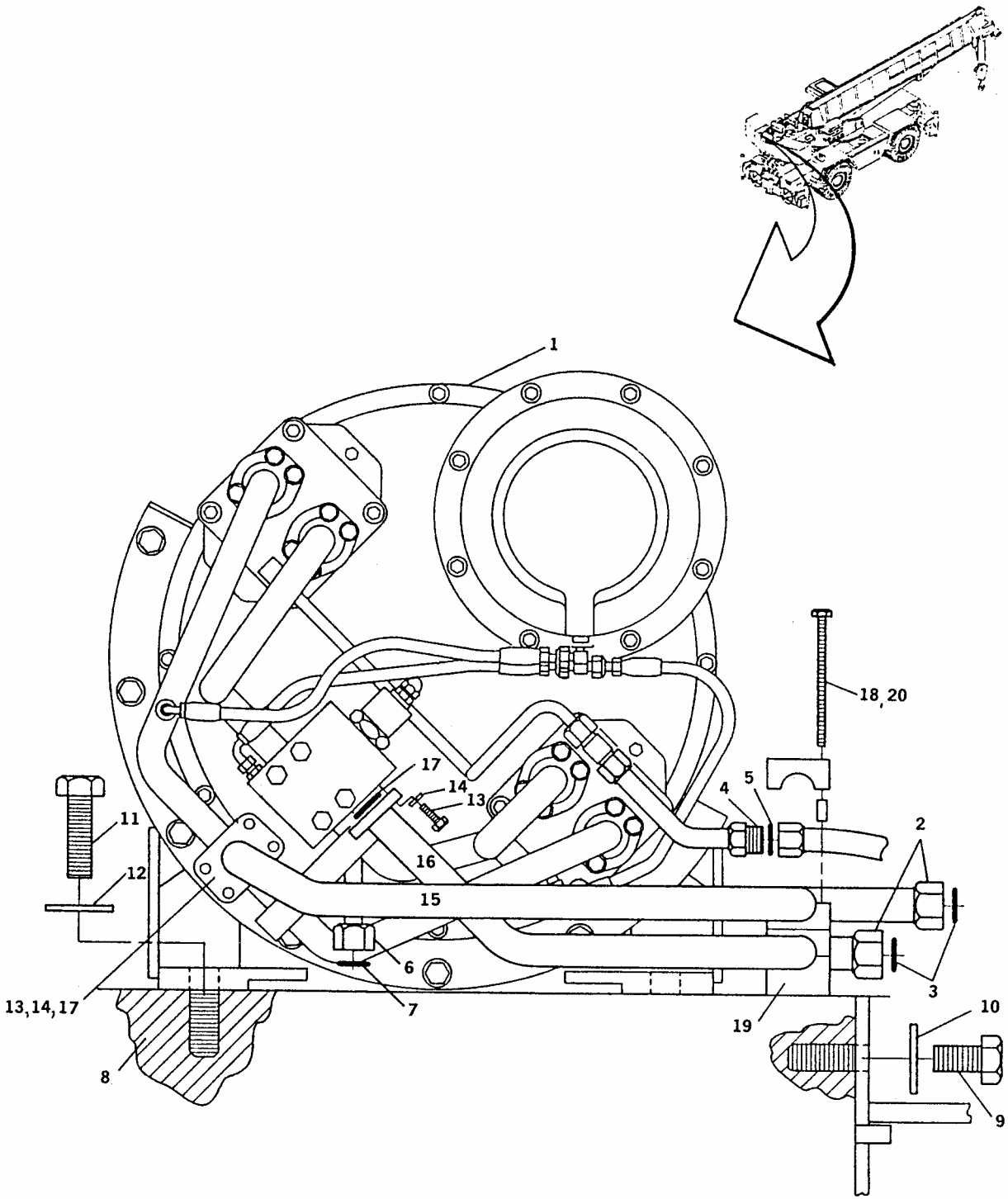
WARNING

Counterweight (8) and hoist weigh approximately 14,300 pounds (6486.37 kg). Use care when lifting and transporting.

- b. Raise and position counterweight on superstructure. Install four capscrews (9) and washers (10).
- c. Using a suitable torque wrench torque capscrews to 3000 ft-lbs (4000 Nm).

4. CONNECT REMAINING HYDRAULIC LINES.
- a. Connect fittings (4) and new preformed packing (5) to motor drain tube and tighten to secure.
 - b. Connect fitting (6) and new preformed packing (7) to case drain tube and tighten to secure.
 - c. Install new preformed packing (3) and connect fitting (2) on steel tubes at left side of auxiliary hoist (1).
5. CONNECT NEGATIVE BATTERY CABLE AT SHUNT. (REFER TO TM 5-3810-306-20.) (RT875CC)
6. INSTALL WIRE ROPE TO HOIST DRUM. (REFER TO TM 5-3810-306-20.)
7. INSTALL HOIST MIRROR. (REFER TO TM 5-3810-306-20.) (RT875CCS)
8. TEST FOR PROPER OPERATION.

END OF TASK



COUNTERWEIGHT INSTALLATION

TOOLS: General mechanic's tool kit: automotive (5180-00-177-7033)
Torque wrench tool kit (5180-01-284-8747)
Overhead hoist (15,000 LB)

SUPPLIES: Preformed packing (Item 89, Appendix B) (RT875CC)
Preformed packing (Item 163, Appendix B) (RT875CC)
Preformed packing (Item 15 (RT875CC) / 291 (RT875CCS) Appendix B) (2 Required)
Preformed packing (Item 276, Appendix B) (3 Required) (RT875CCS)
Hydraulic oil (Item 8, Appendix B)

EQUIPMENT CONDITION: Outrigger fully extended and lowered. (Refer to TM 5-3810-306-10.)
Hoist mirror removed. (Refer to TM 5-3810-306-20.) (RT875CCS)
Wire rope removed from hoist drum. (Refer to TM 5-3810-306-20.)
Negative battery cable disconnected at shunt. (RT875CC)
Battery disconnect switch in off position. (RT875CCS)

NOTE

To simplify counterweight removal, auxiliary hoist and counterweight are removed as an assembly. Auxiliary hoist is removed after counterweight is on ground.

REMOVAL:

1. TAG AND REMOVE HYDRAULIC LINES TO AUXILIARY HOIST (1).
 - a. Disconnect fittings (2) at steel tubes on left side of auxiliary hoist (1). Discard preformed packing (3).
 - b. Disconnect fitting (4) to motor drain tube. Discard preformed packing (5).
 - c. Disconnect fitting (6) to case drain tube. Discard preformed packing (7).

- a. Attach suitable lifting device, capable of supporting weight of counterweight and hoist to counterweight lifting eyes.
- b. Take up slack in lifting device.
- c. Remove four capscrews (9) and washers (10) securing counterweight to superstructure.
- d. Remove counterweight and auxiliary hoist and lower to ground.

3. REMOVE AUXILIARY HOIST (1).
 - a. Remove four capscrews (13), four inserts (14) and four pipe clamps (17) securing tubes (15 and 16) to counterweight.
 - b. Remove four capscrews (11) and washers (12) securing auxiliary hoist (1) to counterweight.
 - c. Attach suitable lifting device to hoist drum and remove from counterweight.

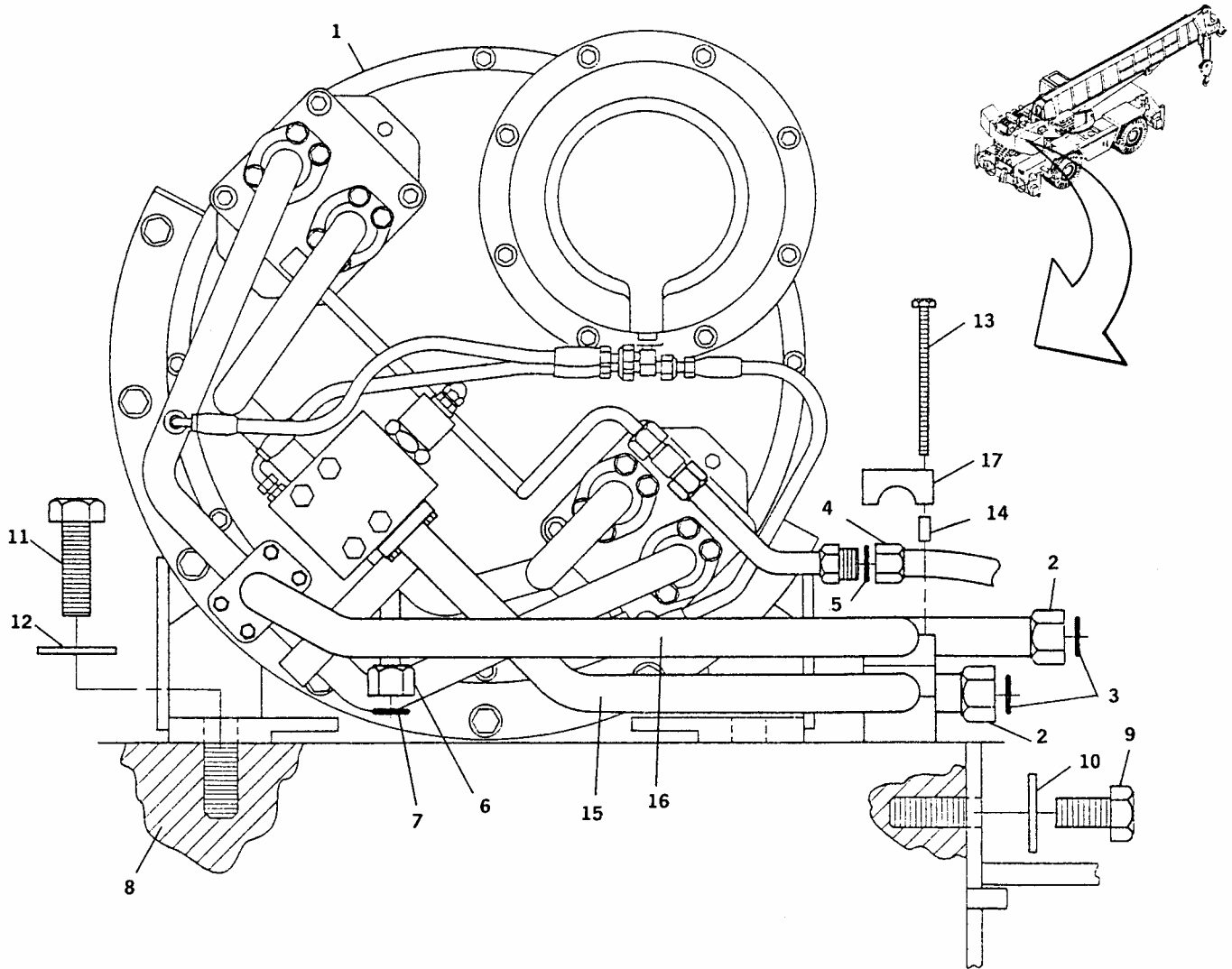
WARNING

Counterweight (8) and hoist weigh approximately 14,300 pounds (6486.37 kg). Use care when lifting and transporting.

2. REMOVE COUNTERWEIGHT (8) AND AUXILIARY HOIST (1).

INSTALLATION:

1. INSTALL AUXILIARY HOIST (1) TO COUNTERWEIGHT.
 - a. Use suitable lifting device to lift and mount auxiliary hoist on counterweight.



- b. Install four capscrews (11) and washers (12) and torque to 1100 ft-lbs (1465 Nm) with a suitable torque wrench.
- c. Position hydraulic tubes (15 and 16) in pipe clamps (17) and secure to counterweight using capscrews (13) and inserts (14). Tighten clamps.

2 INSTALL COUNTERWEIGHT (8) AND AUXILIARY HOIST (1) TO SUPERSTRUCTURE.

- a. Attach suitable lifting device to lifting eyes on counterweight.

WARNING

Counterweight (8) and hoist weigh approximately 14,300 pounds (6486.37 kg). Use care when lifting and transporting.

- b. Raise and position counterweight on superstructure. Install four capscrews (9) and washers (10).
- c. Using a suitable torque wrench, torque capscrews to 3000 ft-lbs (4000 Nm).

3. CONNECT HYDRAULIC LINES.

NOTE

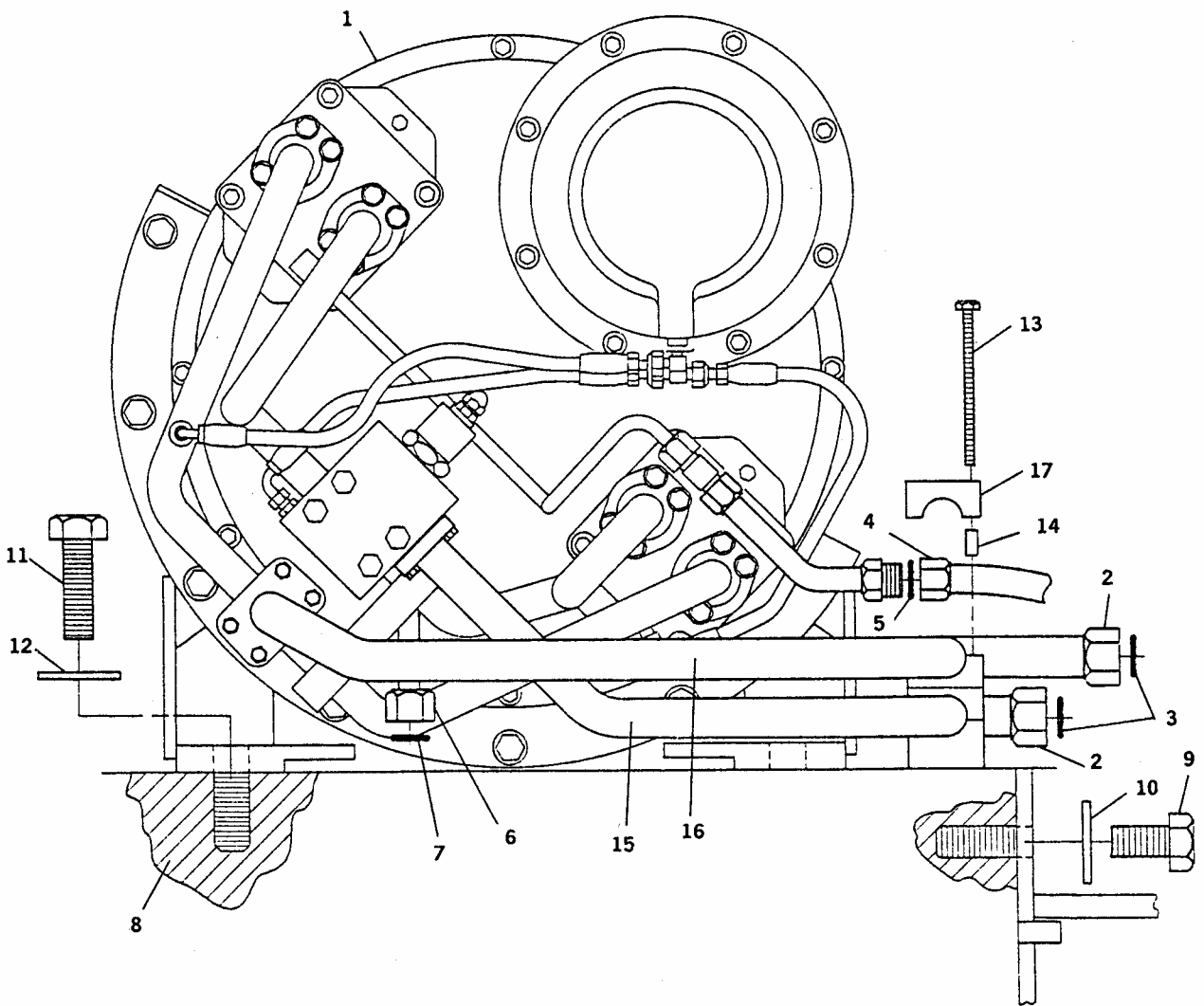
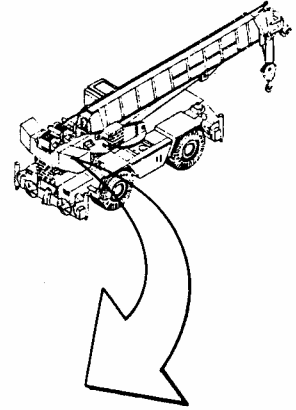
Prior to connecting hydraulic lines, ensure that fitting threads are clean and free of contaminants. Do not remove any orange thread sealant if previously applied to the fitting(s). Then coat new preformed packings with clean hydraulic oil.

- a. Connect fittings (4) and new preformed packing (5) to motor drain tube and tighten to secure.
- b. Connect fitting (6) and new preformed packing (7) to case drain tube and tighten to secure.

- c. Install new preformed packing (3) and connect fittings (2) on steel tubes at left side of auxiliary hoist (1).

4. CONNECT NEGATIVE BATTERY CABLE AT SHUNT. (REFER TO TM 5-3810-306-20.) (RT875CC)
5. INSTALL WIRE ROPE TO HOIST DRUM. (REFER TO TM 5-3810-306-20.)
6. INSTALL HOIST MIRROR. (REFER TO TM 5-3810-306-20.) (RT875CCS)
7. TEST FOR PROPER OPERATION.

END OF TASK



MAIN HOIST INSTALLATION

TOOLS: General mechanic's tool kit: automotive (5180-00-177-7033)
Torque wrench tool kit (5180-01-284-8747)
Overhead hoist (1 ton Capacity)

SUPPLIES: Lockwashers (Item 13, Appendix B)
Preformed packing (Item 89, Appendix B) (RT875CC)
Preformed packing (Item 163, Appendix B) (RT875CC)
Preformed packing (Item 15 (RT875CC) / 291 (RT875CCS) Appendix B) (2 Required)
Preformed packing (Item 276, Appendix B) (3 Required) (RT875CCS)
Hydraulic oil (Item 8, Appendix B)

EQUIPMENT CONDITION: Wire rope removed from hoist drum. (Refer to TM 5-3810-306-20.)
Hydraulic system shutdown and pressure relieved from lines.
(Refer to TM 5-3810-306-20.)
Hoist mirror removed. (Refer to TM 5-3810-306-20) (RT875CCS)
Negative battery cable disconnected at shunt. (RT875CC)
Battery disconnect switch in off position. (RT875CCS)

WARNING

Be sure to wear protective eye covering to avoid personal injury.

REMOVAL:

1. TAG AND REMOVE HYDRAULIC LINES TO HOIST (1).
 - a. Remove eight capscrews (4) and lockwashers (5) securing clamps on hydraulic tubes (2) and (3). Remove two hydraulic tubes and preformed packings (6). Discard packings (6).
 - b. Disconnect fitting (7) at end of case drain tube. Remove tube and preformed packing (8). Discard packing (8).
 - c. Disconnect fitting (9) at motor drain tube. Remove tube and preformed packing (10). Discard packing (10).
2. REMOVE MAIN HOIST (1).
 - a. Remove four capscrews (11), washers (12) and nuts (13) securing hoist assembly (1) to turntable.

INSTALLATION:

1. INSTALL MAIN HOIST (1).
 - a. Using suitable lifting device, position main hoist (1) onto turntable.
 - b. Install four capscrews (11), washers (12) and nuts (13) and secure hoist (1) to turntable.
 - c. Using suitable torque wrench, torque nuts (13) to 1100 ft-lbs (1465 Nm).
2. INSTALL HYDRAULIC LINES TO HOIST (1).

NOTE

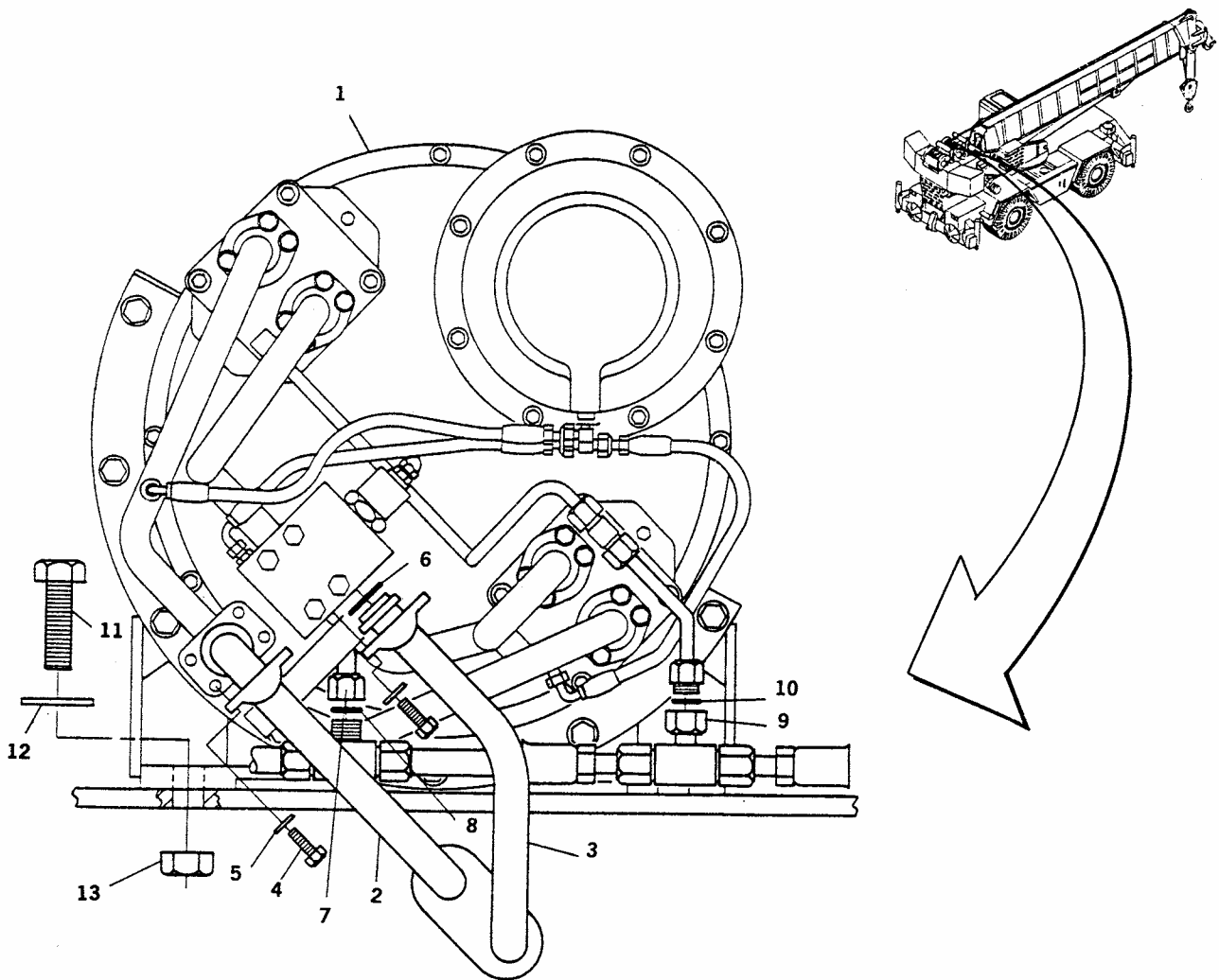
Prior to connecting hydraulic lines, ensure that fitting threads are clean and free of contaminants. Do not remove any orange thread sealant if previously applied to the fitting(s). Then coat new preformed packings with clean hydraulic oil.

- a. Connect fitting (9) and new preformed packing (10) to motor drain tube and tighten.
- b. Connect fitting (7) and new preformed packing (8) to case drain tube and tighten.

WARNING

Hoist weighs approximately 1800 pounds (818 kg). Use care when lifting and transporting.

- b. Using suitable lifting device, remove hoist from crane.



- c. Install hydraulic tube (3) and new preformed packing (6) to motor control valve. Secure clamp with four capscrews (4) and lockwashers (5).
 - d. Install hydraulic tube (2) and new preformed packing (6). Secure with four capscrews (4) and lockwashers (5).
 - 3. CONNECT NEGATIVE BATTERY CABLE AT SHUNT. (REFER TO TM 5-3810-306-20.) (RT875CC)
 - 4. INSTALL WIRE ROPE TO HOIST DRUM. (REFER TO TM 5-3810-306-20.)
 - 5. INSTALL HOIST MIRROR. (REFER TO TM 5-3810-306-20.)
 - 6. TEST FOR PROPER OPERATION.
- END OF TASK**

HOIST ASSEMBLY

TOOLS: General mechanic's tool kit: automotive (5180-00-177-7033)
Lifting device (200 lbs. Capacity)

SUPPLIES: Kit, repair (Item 77, Appendix B)
Bearing (Item 78, Appendix B) (3 required)
Bearing (Item 79, Appendix B)
Bearing (Item 80, Appendix B) (3 required)
Washer, key (Item 81, Appendix B)
Washer, lock (Item 82, Appendix B) (6 required)
Washer, lock (Item 83, Appendix B) (7 required)
Washer, key (Item 84, Appendix B)
Washer, key (Item 85, Appendix B) (2 required)
Washer, lock (Item 26, Appendix B) (8 required)
Rags, clean (Item 2, Appendix B)
Fluid, dry cleaning P-D-680 Type II (Item 1, Appendix B)
Oil, hydraulic (Item 8, Appendix B)
Loctite 242 (Item 6, Appendix B)
Gear oil, EPGL 90 Wt (Item 86, Appendix B)

EQUIPMENT CONDITIONS: Hoist removed. (Refer to pages 15-24 or 15-32.)
Hoist motors removed. (Refer to page 15-46.)
Hoist brake removed. (Refer to page 15-60.)

WARNING

Be sure to wear protective eye covering and gloves to avoid personal injury.

DISASSEMBLY:

NOTE

CAUTION

Any maintenance requiring disassembly of the hoist should be accompanied by replacement of all seals and preformed packings.

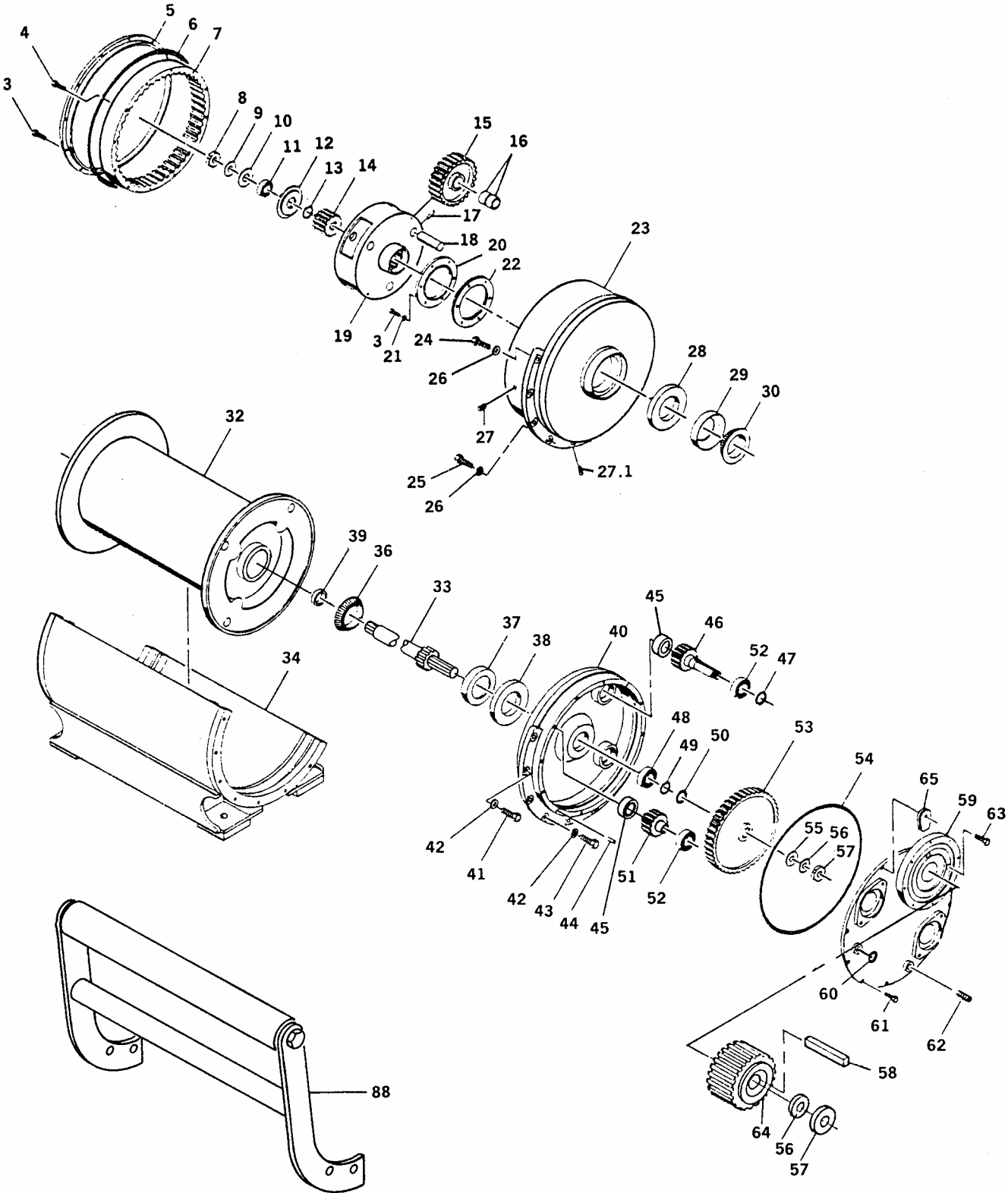
NOTE

If the drum (32) is to be removed or replaced, the right side (primary drive) does not have to be disassembled.

1. DRAIN HOIST.
 - a. Drain hydraulic oil from the right hand side (primary drive).
 - b. Drain gear oil from left hand side (final drive).
2. REMOVE END COVER (5).
 - a. Remove bolts (3) from the end cover (5).

Leave one or two bolts loosely in place. This will help support the weight of the end cover as it is removed.

- b. Using pry bar midway between any two bolt holes, loosen end cover (5) and remove it.
 - c. Remove and discard the preformed packing (6).
3. REMOVE PLANETARY ASSEMBLY (19).
 - a. Knock tab of keywasher (10) from its seat on locknut (8). Remove keywasher (10) and locknut (8).
 - b. Remove retaining nut (9).
 - c. Remove ball thrust bearing (11) and thrust bearing housing (12).
 - d. Remove the snap ring (13) from the main shaft (33).



- e. Install two bolts in threaded holes in planetary assembly (19). Attach lifting device and lift out the entire planetary assembly (19).

4. REMOVE PLANET CAGE HOUSING (23).

- a. Remove pinion gear (14) from planet assembly (19).
- b. Remove bolts (3) and lockwashers (21) securing bearing retainer plate (20) to planet cage housing (23).
- c. Remove bearing retainer plate (20) and shims (22).
- d. Remove bolts (24) and (41) and washers (26) and (42) securing cable reel (88). Remove cable reel (88).
- e. Remove bolts (25) and washers (26) securing planet cage housing (23) to center housing (34).
- f. Using suitable lifting device, remove planet cage housing (23).

5. REMOVE RING GEAR.

- a. Remove bolts (4) securing ring gear (7) to planet cage housing (23).
- b. Remove ring gear (7).

NOTE

Label the bearing (30) and the bearing race (29) to ensure they are mated together.

6. REMOVE DRUM (32).

- a. Pull oil seal (28) and bearing race (29) from planet cage housing (23).

NOTE

The main shaft (33) need not be removed to replace the drum or the drum bearings.

- b. Using suitable lifting device. Remove drum assembly (32).
- c. Pull bearings (30) and (36) from each end of drum (32).

- d. Remove seal (39) from drum (32)

7. DISASSEMBLE PLANET CAGE (19).

NOTE

Ensure each planet gear, planet gear shaft, and roll pin is labeled as to its position upon disassembly. Mark the planet gears for the direction of rotation.

NOTE

Use Steps a thru e to remove each of the three planet gears.

- a. Using punch, drive roll pin (17): completely into planet gear shaft (18).
- b. Using brass drift, drive planet gear shaft (18) out of planet cage (19).
- c. Remove planet gear (15).
- d. Using punch, remove roll pin (17) from planet gear shaft (18).
- e. Press bearings (16) out of planet gear (15).

8. REMOVE OVERRUNNING CLUTCH (64).

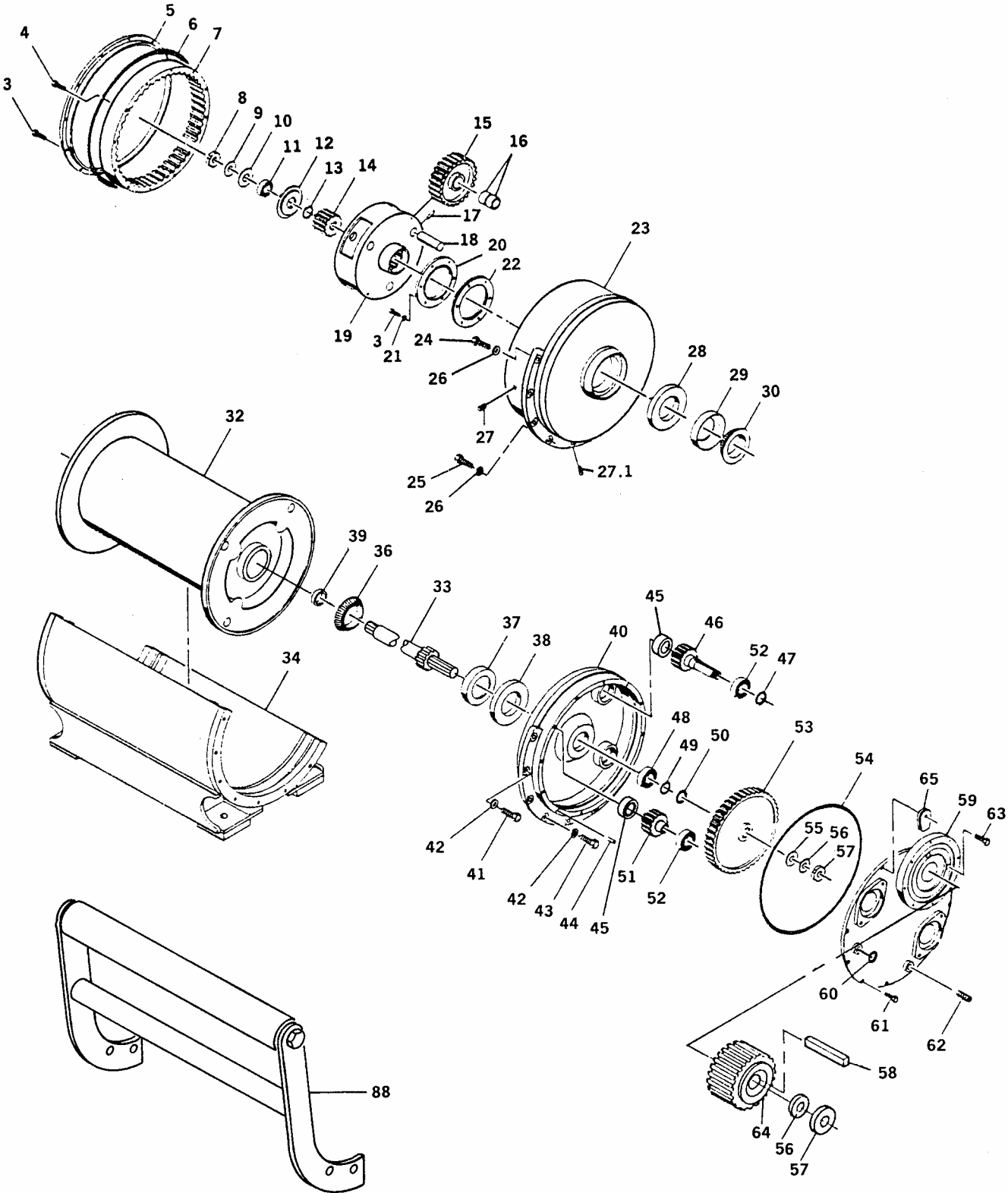
- a. Knock tab of keywasher (56) from its seat on locknut (57).
- b. Using spanner, remove locknut (57). Remove keywasher (56).
- c. Remove overrunning clutch (64) and key (58).
- d. Remove bearing spacer (47) from pinion (46).

9. REMOVE END COVER (59).

NOTE

Leave one or two bolts loosely in place. This will help support the weight of the end cover as it is removed.

- a. Remove bolts (61) and (63) from end cover (59).



- b. Using pry bar midway between any two bolt holes, loosen end cover (59) and remove it.
 - c. Remove and discard preformed packing (54).
10. REMOVE DRIVEN GEAR (53).
- a. Knock tab of keywasher (56) from its seat on locknut (57).
 - b. Using spanner wrench, remove locknut (57).
 - c. Remove keywasher (56) and spacer (55).
 - d. Remove driven gear (53).
 - e. Remove spacer (50).
11. REMOVE DRIVING PINIONS (46) AND (51) AND BEARINGS (45) AND (52).
- a. Using pry bars, remove brake driving pinion (46) and two driving pinions (51).
 - b. Using suitable puller, remove bearings (45) and (52).
12. REMOVE MAIN SHAFT (33).
- a. Remove snap ring (49) from primary drive housing (40).
 - b. Remove main shaft (33). Using suitable puller, pull bearing (48) from main shaft.
13. REMOVE PRIMARY DRIVE HOUSING (40).
- a. Remove bolts (43) and washers (42) securing primary drive housing (40) to the center housing (34).
 - b. Remove the primary drive housing (40).

NOTE

Label bearing (36) and bearing race (37) to ensure they are mated together.

- c. Remove oil seal (38) and bearing race (37).

CLEANING:

WARNING

Dry cleaning solvent P-D-680, Type III is toxic and flammable. Wear protective goggles and gloves and se only in a well ventilated area. Avoid contact with skin, eyes, and clothes and do not breathe vapors. Do not use near open flame or excessive heat. The flash point is 200°F (94° C). If you become dizzy while using cleaning solvent, get fresh air immediately and get medical aid. If contact with eyes is made, wash your eyes with water and get medical aid immediately.

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

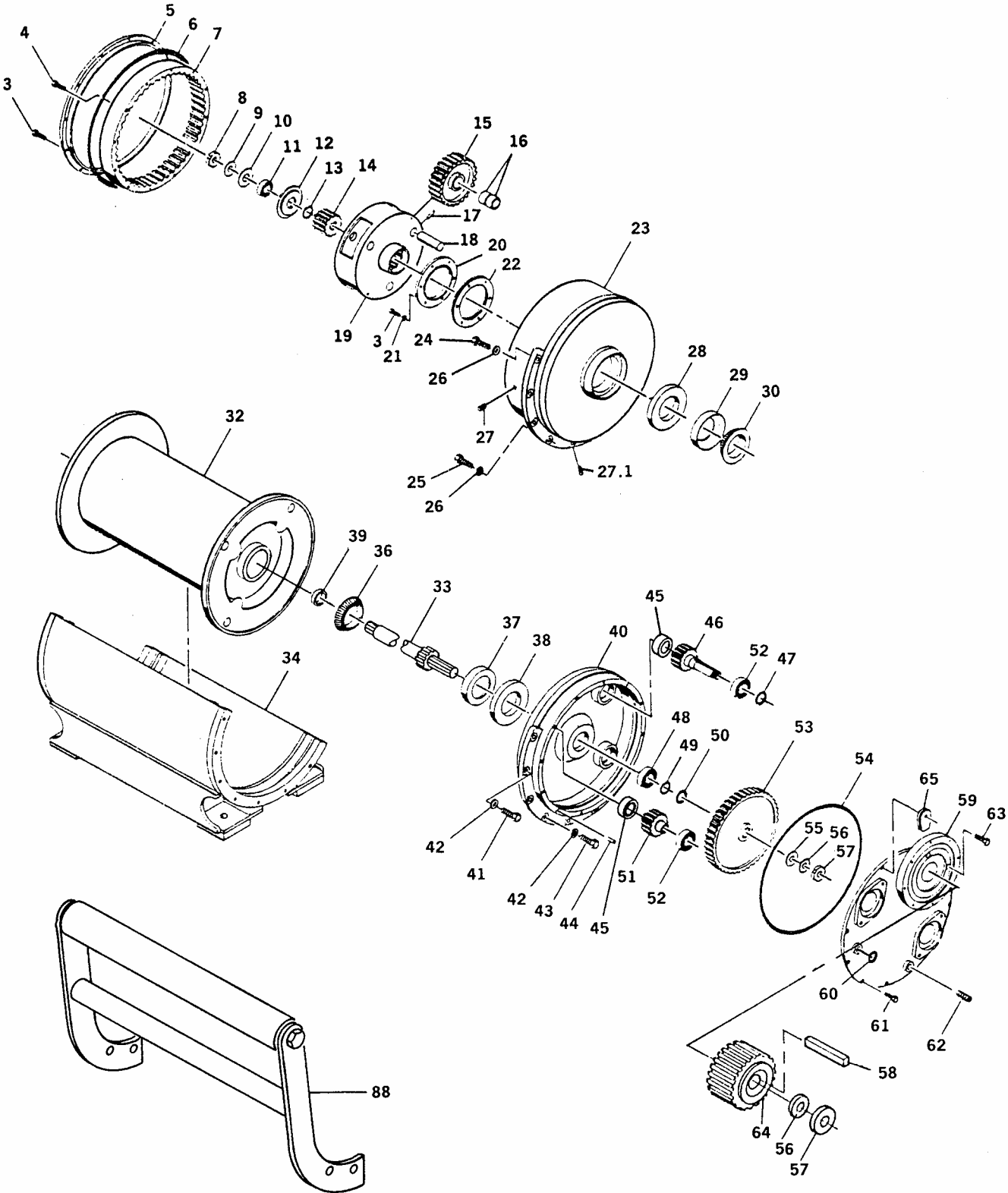
CAUTION

Do not use gasoline as solvent.

- 1. CLEAN ALL PARTS THOROUGHLY IN SOLVENT P-D-680, TYPE III AND DRY WITH COMPRESSED AIR.

INSPECTION:

- 1. INSPECT PARTS FOR WEAR.
 - a. Inspect all bearings and races, including those not removed from parts, and replace if the bearings or cups are worn, pitted or damaged in any way.
 - b. Inspect all gears for worn or damaged teeth.
 - c. Inspect all splines for wear.



ASSEMBLY:

1. INSTALL PLANET GEARS (15).

NOTE

Unless replaced, ensure each planet gear, planet gear shaft, and roll pin is used in its position as labeled upon disassembly. Ensure the planet gears are installed so they rotate in the same direction as before disassembly.

NOTE

Lubricate all preformed packings and seals with clean hydraulic oil prior to installation.

- a. Press bearings (16) into planet gear (15).
- b. Start planet gear shaft (18) in correct hole of planet cage (19). Ensure roll pin hole in planet gear shaft (18) is aligned with hole in planet cage (19).
- c. Align planet gear (15) with planet gear shaft (18).
- d. Using brass drift, drive planet gear shaft (18) through planet gear (15) and planet cage (19). Ensure needle bearings are not driven out by planet gear shaft.
- e. Using punch, install roll pin (17) in hole in planet cage.

2. INSTALL PRIMARY DRIVE HOUSING (40).

- a. Apply Loctite #271 to oil seal (38), and press bearing race (37) and oil seal (38) in drum side of primary drive housing (40).
- b. Install primary drive housing (40) on center housing (34).
- c. Apply Loctite #242 to hex head bolt threads (43) and install hex head bolts (43) and washers (42).

NOTE

Ensure alignment of holes for longer bolts (41) installed later.

- d. Torque hex head bolts (43) to 150 ft-lbs (200 Nm).
- 3. INSTALL BEARINGS (45), (48) AND (52), DRIVING PINIONS (46) AND (51) AND MAIN SHAFT (33).
 - a. Press bearing (48) on main shaft (33) and install main shaft in primary drive housing (40).

NOTE

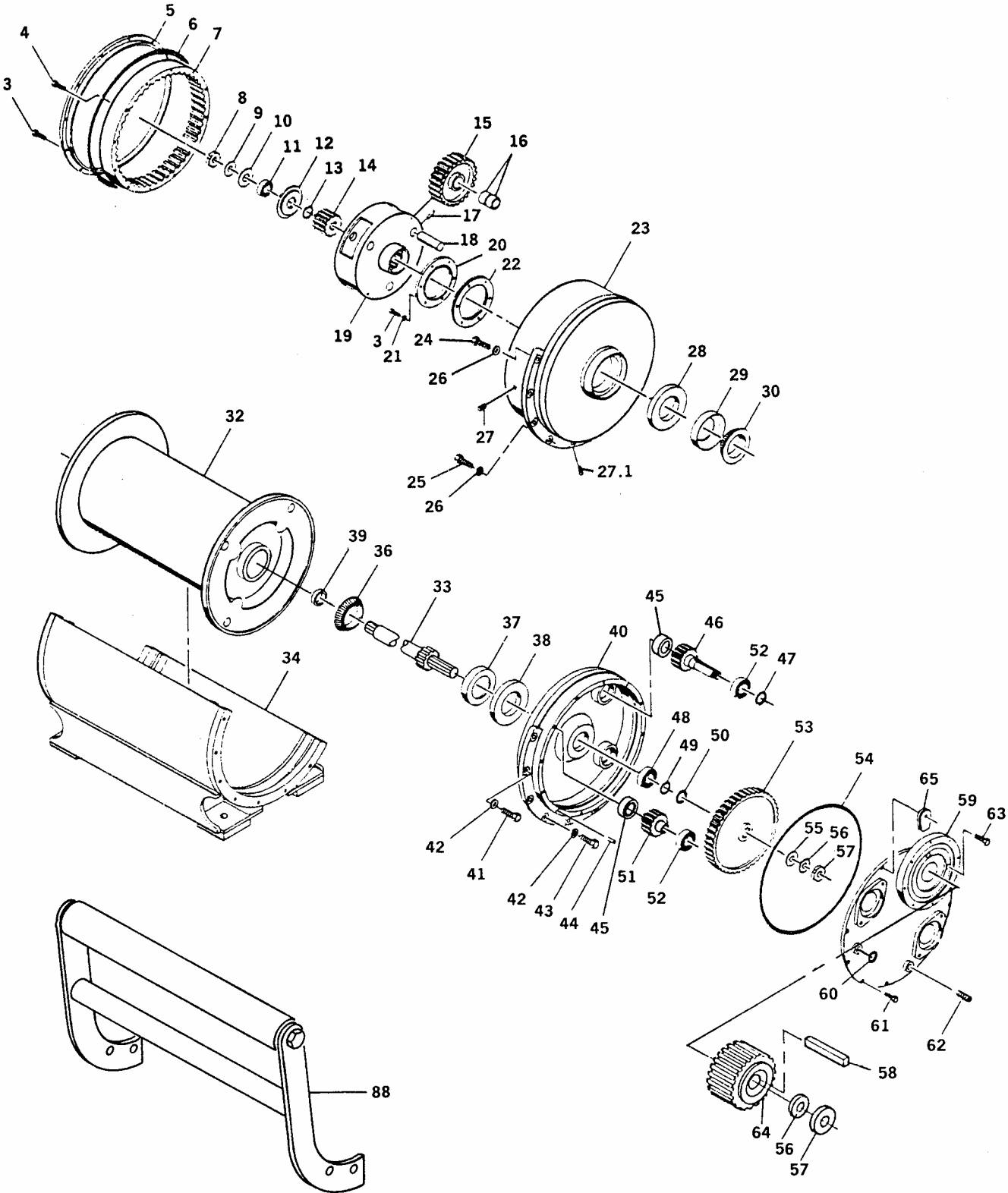
Bearing (48) has a snap ring. The bearing is installed with the snap ring to the gear side.

- b. Using snap ring pliers, secure bearing (48) in housing (40) with snap ring (49).
- c. Press two new bearings (45) and (52) onto two driving pinions (51) and pinion (46).
- d. Install pinions (51) and (46) in face of primary drive housing (40).
- e. Install spacer (50) on main shaft (33) with recess on shaft shoulder.
- 4. INSTALL DRIVEN GEAR (53).

NOTE

The gears do not have to be timed.

- a. Install driven gear (53).
- b. Install spacer (55), keywasher (56), and locknut (57) on main shaft (33). Ensure recess in spacer faces toward driven gear (53).
- c. Torque locknut (57) with spanner wrench to 20 ft-lbs (27 Nm).
- d. Secure locknut (57) by bending a tab of keywasher (56) into a corresponding groove of the locknut.



5. INSTALL END COVER (59).

- a. Install new preformed packing (54) in end cover (59).
- b. Using suitable lifting device, install end cover (59) on primary drive housing. Use soft faced hammer to seat cover.
- c. Apply Loctite #242 to hex head bolt threads (61) and (63). Apply RTV to shanks of bolts (63).

NOTE

The two bolts (63) which fit where the brake assembly is to be mounted are longer than the other bolts.

- d. Secure end cover (59) to the primary drive housing with the hex head bolts (61) and (63).
 - e. Torque bolts (61) and (63) to 31 ft-lbs (41 Nm).
6. INSTALL OVERRUNNING CLUTCH (64).
- a. Install bearing spacer (47) on pinion (46).

NOTE

The direction of free rotation of the over-running clutch (64) should be counter-clockwise.

- b. Install overrunning clutch (64) on pinion shaft (46) and secure with key (58).
 - c. Install keywasher (56) and locknut (57). Torque locknut (57) using a spanner wrench to 20 ft-lbs (27 Nm).
 - d. Lock locknut (57) by bending a tab of keywasher (56) into corresponding groove of the locknut (57).
7. ASSEMBLE PLANET CAGE (19).

NOTE

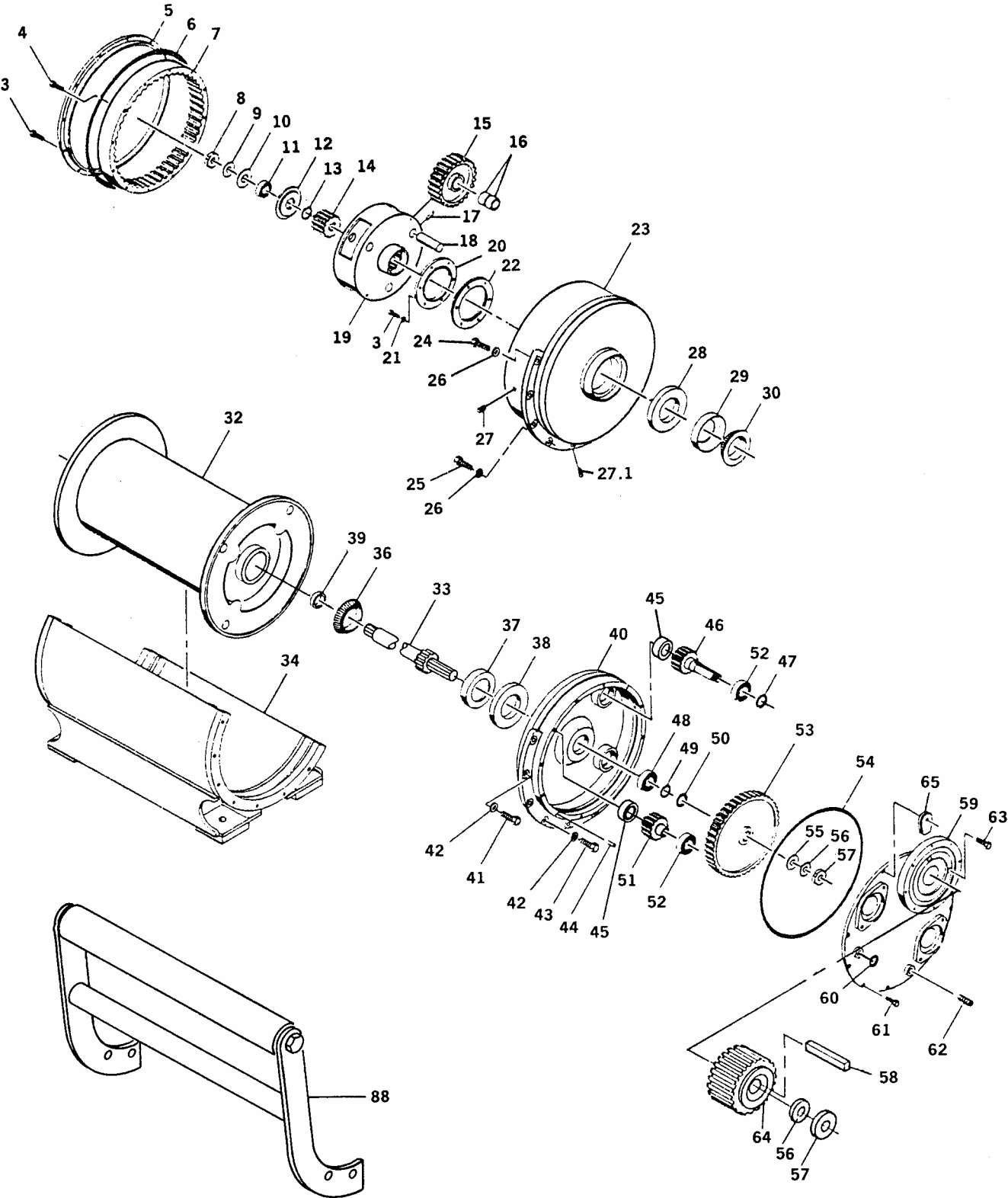
Lubricate the preformed packings, seals and bearings with 90 weight EPGL gear lubricant.

- a. Apply Loctite #271 to oil seal (39) and install in primary drive housing side of drum (32).

NOTE

If the bearings (30) and (36) are being reused, install them on the side from which they were removed.

- b. Press bearings (30) and (36) on both ends of drum (32).
 - c. Press bearing race (29) into planetary side of planet cage housing (23).
 - d. Apply Loctite #271 to oil seal (28) and install in drum side of planet cage housing (23).
8. INSTALL DRUM (32) AND PLANET CAGE HOUSING (23).
- a. Using suitable lifting device install drum (32) over main shaft (33).
 - b. Apply Loctite #242 to bolt threads (4).
 - c. Install ring gear (7) in planet cage housing (23) using bolts (4).
 - d. Torque bolts (4) to 31 ft-lbs (41 Nm).
 - e. Apply Loctite #242 to hex head bolt threads (25).
 - f. Using suitable lifting device mount planet cage housing (23) on center housing (34) using hex head bolts (25) and washers (26). Torque hex head bolts to 150 ft-lbs (200 Nm).
 - g. Apply Loctite #242 to hex head bolt threads (24) and (41). Install cable reel (88) using hex head bolts (24) and (41) and washers (26) and (42). Torque bolts to 150 ft-lbs (200 Nm).



9. INSTALL BEARING RETAINER (20).

CAUTION

Tighten the bolts (3) only enough to remove the free play from the drum support bearings. Over tightening could result in premature bearing failure.

- a. Mount bearing retainer (20) using only three bolts (3) in a staggered sequence.
- b. Tighten bolt (3) until all free play is removed from drum support bearings.
- c. Use pry bar to check drum (32) for free play.
- d. Using feeler gauge, measure clearance between planet cage housing (23) and bearing retainer (20).
- e. From this reading subtract 0.005 in. (0.127 mm) to find amount of shimming needed to ensure proper preload on drum bearings.
- f. Remove bearing retainer (20).
- g. Install shims (22) with measurement equal to that computed in Step e.
- h. Apply Loctite #242 to the hex head bolt threads (3).
- i. Install bearing retainer (20) using lockwashers (21) and hex head bolts (3). Torque to 31 ft-lbs (41 Nm).

10. INSTALL END COVER (5).

- a. Install the planet cage assembly (19).
- b. Install the pinion gear (14).

- c. Install snap ring (13) on main shaft (33).
- d. Install thrust bearing housing (12) and ball thrust bearing (11) so small ID of bearing will face locknut (8).
- e. Install retaining nut (9) and torque to 35 ft-lbs (47 Nm).
- f. Install keywasher (10) and locknut (8). Torque locknut (8) to 20 ft-lbs (27 Nm).
- g. Lock locknut (8) by bending tab of keywasher (10) into corresponding groove of locknut.
- h. Install new preformed packing (6) on left end cover (5).
- i. Apply Loctite #242 to the hex head bolt threads (3).
- j. Install left end cover (5) on planet cage housing (23) using hex head bolts (3). Torque hex head bolts (3) to 31 ft-lbs (41 Nm).

11. SERVICE FINAL DRIVE.

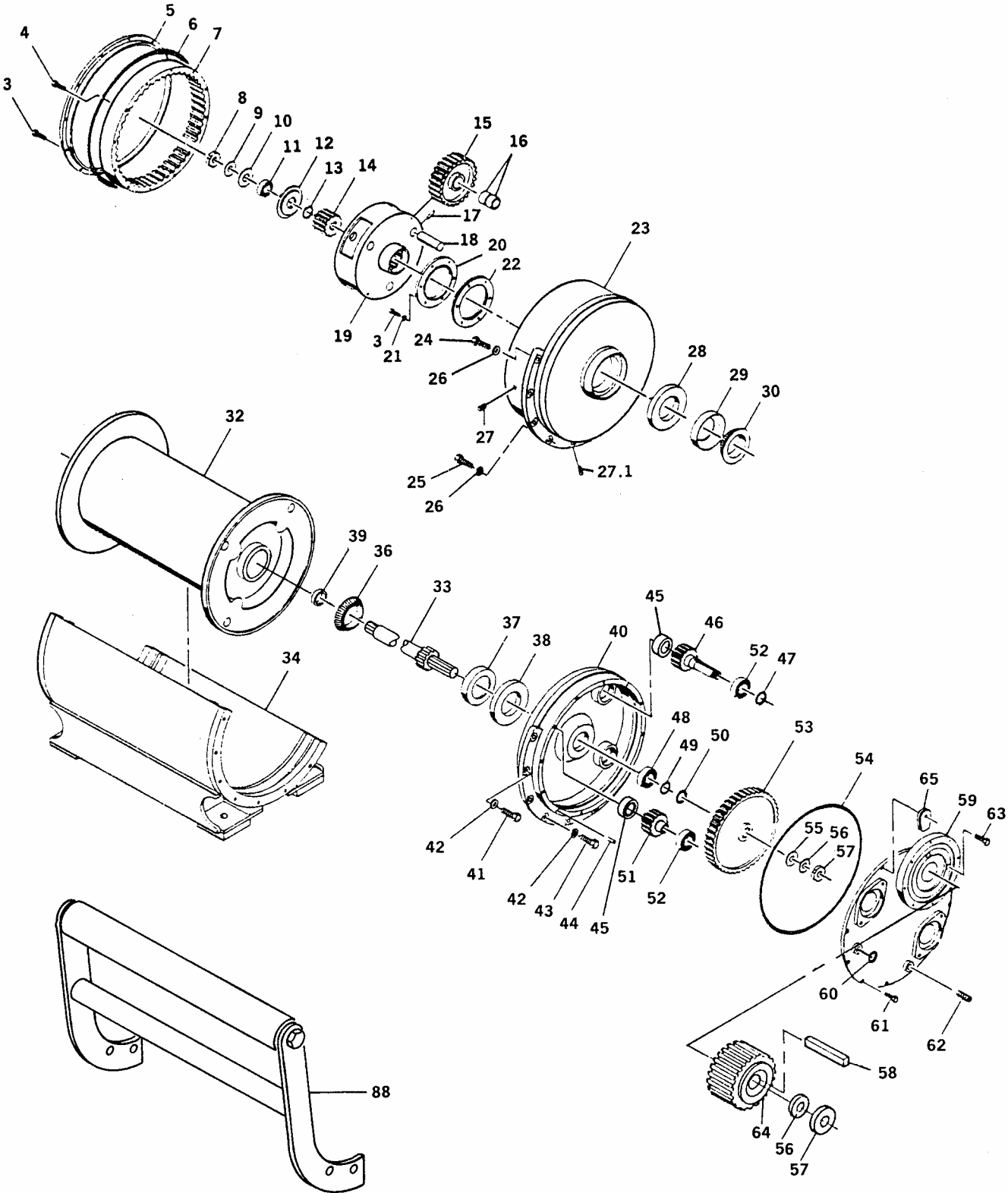
- a. Remove fill/check plug (27) from side of final drive assembly.
- b. Fill with 90 weight EPGL gear lubricant until oil starts to flow out of plug hole.
- c. Install fill/check plug (27).

12. INSTALL HOIST BRAKE ASSEMBLY (REFER TO PAGE 15-60.)

13. INSTALL HOIST MOTORS. (REFER TO PAGE 15-46.)

14. INSTALL HOIST ASSEMBLY. (REFER TO PAGES 15-24 OR 15-32.)

END OF TASK



HOIST MOTOR INSTALLATION

TOOLS: General mechanic's tool kit: automotive (5180-00-177-7033)

SUPPLIES: Lockwasher (Item 82, Appendix B) (24 Required)
Preformed Packing (Item 106, Appendix B) (4 Required) (RT875CC)
Preformed packing (Item 263, Appendix B) (3 Required) (RT875CC)
Preformed packing (Item 264, Appendix B) (4 Required) (RT875CC)
Preformed packing (Item 277, Appendix B) (4 Required) (RT875CCS)
Preformed packing (Item 292, Appendix B) (6 Required) (RT875CCS)
Preformed packing (Item 293, Appendix B) (3 Required) (RT875CCS)
Lockwasher (Item 26, Appendix B)
Parts kit (Item 77, Appendix B)
Loctite #242 (Item 6, Appendix B)
Parts kit (Item 265, Appendix B)

EQUIPMENT CONDITIONS: Pressure relieved from hydraulic system. (Refer to TM 5-3810-306-20.)
Negative battery cable disconnected at shunt. (RT875CC)
Battery disconnect switch in off position. (RT875CCS)

WARNING

Be sure to wear protective eye covering to avoid personal injury.

REMOVAL:

1. TAG AND REMOVE HYDRAULIC LINES AND TUBES.
 - a. Remove eight capscrews (3) and lockwashers (4) securing clamps on tubes (5) and (6). Remove and discard two preformed packings (7).
 - b. Remove line (8) from bottom-right hoist motor (1) to drain tube. Remove and discard preformed packings (9).
 - c. Disconnect lines (10), (11) and (12) at hoist brake (2). Remove and discard packings (29).
 - d. Remove sixteen capscrews (14) and lockwashers (15) securing clamps on tubes (16) and (17). Remove and discard preformed packings (18).
 - e. Remove capscrew (19), lockwasher (20), washer (21) and spacer (22) from bracket assembly. Remove disconnected lines and tubes as an assembly.
 - f. Remove line (24) between hoist motors (1). Remove and discard preformed packings (25).
2. REMOVE HOIST MOTORS (1).
 - a. Label each hoist motor (1) as to its position (top-bottom, left-right).

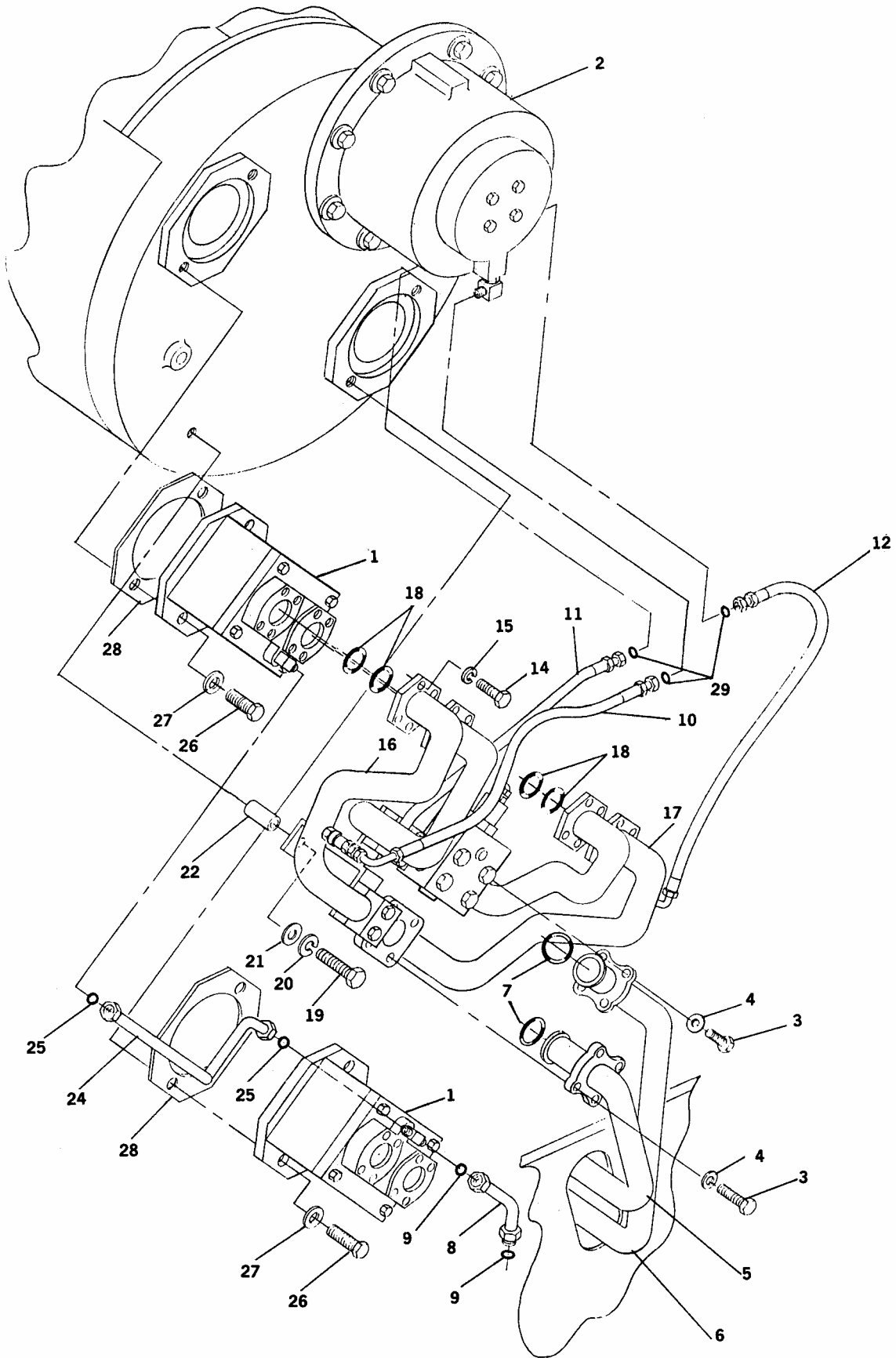
- b. Remove capscrews (26) and lockwashers (27) securing hoist motors (1) to hoist.
- c. Remove hoist motors (1). Remove and discard gaskets (28).

INSTALLATION:

1. INSTALL HOIST MOTORS (1).
 - a. Install new gaskets (28) on hoist motor mounting flanges.
 - b. Install hoist motors (1) on hoist as labeled during removal.
 - c. Apply Loctite #242 to bolt threads (26). Secure hoist motors (1) to hoist with bolts (26) and new lockwashers (27). Torque bolts (26) to 150 ft-lbs (200 Nm).
2. INSTALL HYDRAULIC LINES AND TUBES.

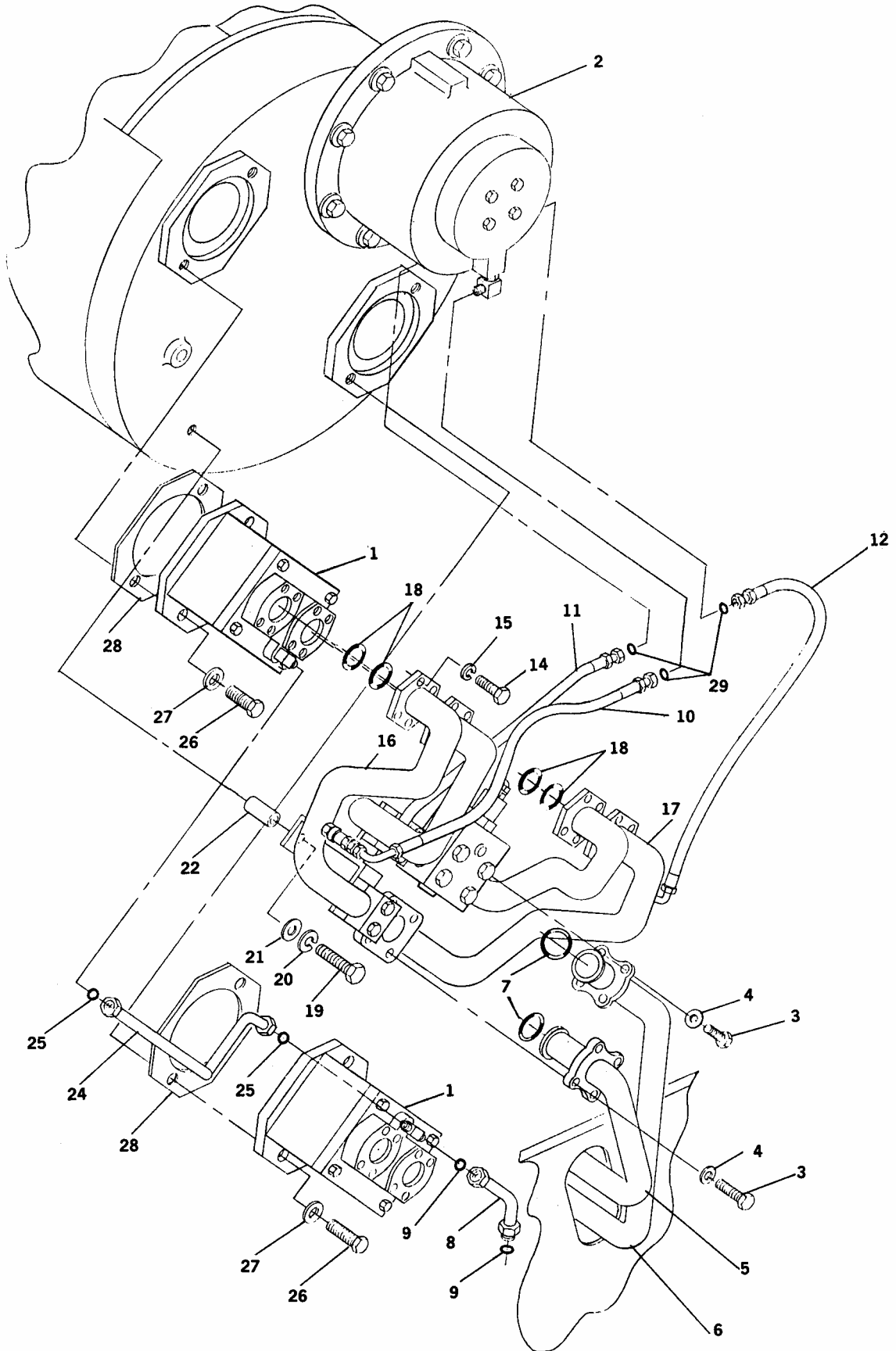
NOTE

Prior to connecting hydraulic lines, ensure that fitting threads are clean and free of contaminants. Do not remove any orange thread sealant if previously applied to the fitting(s). Then coat new preformed packings with clean hydraulic oil.



- a. Install line (24) and new packings (25) between hoist motors (1).
 - b. Position lines and tubes assembly and install spacer (22), new lockwasher (20), washer (21) and capscrew (19) through bracket.
 - c. Install new packings (18), new lockwashers (15), and sixteen capscrews (14) to secure tubes (16) and (17) to hoist motors (1).
 - d. Connect lines (10), (11) and (12) using new packings (29) to hoist brake (2).
 - e. Install line (8) and new packings (9) between bottom-right hoist motor (1) and drain tube.
 - f. Install new packings (7), new lockwashers (4) and eight capscrews (3) to secure tubes (5) and (6) to tube (16) and hoist motor control valve.
3. CONNECT NEGATIVE BATTERY CABLE AT SHUNT. (REFER TO TM 5-3810-306-20.) (RT875CC)
 4. OPERATE HOIST AND CHECK FOR PROPER OPERATION AND LEAKS.

END OF TASK



HOIST MOTOR ASSEMBLY

TOOLS: General mechanic's tool kit: automotive (5180-00-177-7033)
Protective cone (Item 2, Appendix C)
Shaft seal driver (Item 1, Appendix C)

SUPPLIES: Clean rags (Item 2, Appendix B)
Loctite No. 242 (Item 6, Appendix B)
Seal kit (Item 7, Appendix B)
Hydraulic oil (Item 8, Appendix B)
Grease (Item 9, Appendix B)

EQUIPMENT CONDITIONS: Hoist motor removed. (Refer to page 15-46.)

WARNING

Be sure to wear protective eye covering to avoid personal injury.

DISASSEMBLY:

1. PREPARE HOIST MOTOR.
 - a. Match mark end cap (2) and body (21).
 - b. Drain all fluid from the motor and thoroughly clean all exterior surfaces.
 - c. Prepare a clean, lint-free surface on which to lay internal parts of hoist motor.
2. REMOVE END CAP (2).
 - a. Remove screws (1) and end cap (2) from body (21).
 - b. Remove and discard rubber seal ring (3) from end cap (2).
 - c. Check needle bearing (4) in end cap (2). If worn or damaged, replace it.
3. REMOVE CAM RING ASSEMBLY (6).
 - a. Remove dowel pin (5) from cam ring assembly (7).
 - b. Thread two 1/4-20 screws in two tapped holes provided as puller holes in cam ring (7).

NOTE

If resistance is encountered when lifting the cam ring assembly, lightly tap the outside of body while lifting the assembly. This will help in removing the cam ring, rotor, vanes, and springs as a unit.

- c. Remove cam ring assembly (6) as unit (7), (8), (9), and (10).

4. DISASSEMBLE CAM RING ASSEMBLY.

WARNING

The vanes are held against the cam ring by tension from the springs in the rotor. If the rotor is pulled from the cam ring with no protection, tension from the springs will throw the vanes out in all directions. The following procedure must be followed when disassembling the rotor and vanes from the cam ring.

- a. Place cam ring assembly on a clean, flat surface.
 - b. Push rotor and vanes from cam ring far enough to secure a piston ring compressor over vanes (9) and around rotor (8).
 - c. After compressor is in place, push rotor and vanes remainder of way out of cam ring.
 - d. Release tension on compressor and remove vanes (9) and vane springs (10) from rotor (8).
- #### 5. REMOVE PORT PLATE (12).
- a. Remove dowel pin (11) from port plate assembly (12). Note location of dowel pin (11) in relation to body (21) for reassembly.

- b. Thread two 1/4-20 screws into puller holes in port plate assembly (12) and remove it from body (21).
6. REMOVE SETSCREW (25), VALVE ADAPTER (24), PACKING (13) AND RUBBER SEAL (14).

- a. Remove special setscrew (25) in the side of port plate assembly (12).
- b. Remove valve adapter (24) from the drilled passage.

NOTE

The drilled holes in port plate must be clean and free from burrs.

- c. Remove packing (13), rubber seal (14) and Belleville washer (20). Discard packing (13) and seal (14).

7. REMOVE SHAFT (18).

- a. Remove snap ring (15) from body (21).
- b. Press on external end of shaft (18) and remove shaft (18) and bearing (17) from body.

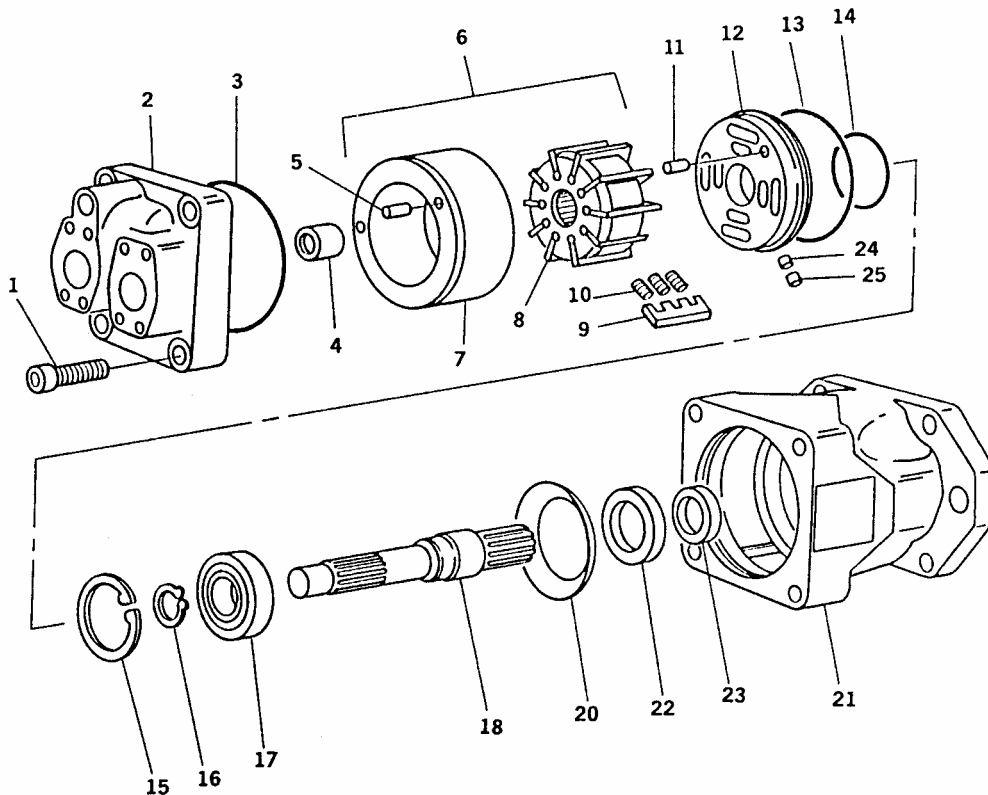
- c. Remove external snap-ring (16) and press bearing (17) from shaft (18).
- d. Remove and discard wiper seal (23) and shaft seal (22) from body (21).

CLEANING:

WARNING

Dry cleaning solvent P-D-680, Type III is toxic and flammable. Wear protective goggles and gloves and use only in a well ventilated area. Avoid contact with skin, eyes, and clothes and do not breathe vapors. Do not use near open flame or excessive heat. The flash point is 200°F (94° C). If you become dizzy while using cleaning solvent, get fresh air immediately and get medical aid. If contact with eyes is made, wash your eyes with water and get medical aid immediately.

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



1. WASH ALL METAL PARTS IN P-D-680, TYPE III AND DRY THOROUGHLY.

INSPECTION:

1. INSPECT PARTS FOR DAMAGE.
 - a. Inspect seals for wear, breaks, cuts, brittleness, scratches and cracks. Discard and replace all defective seals.
 - b. Inspect all springs for wear on OD, for cracks or permanent set. Replace all defective springs.
 - c. Inspect bearings for wear or flat spots. If bearing are rough or loose, they must be replaced.
 - d. Inspect cam ring for excessive wear (ripples or washboard marks on contour). Replace a badly worn or defective cam ring.
 - e. Inspect rotor for scored, marred, or scratched (faces and vane slots) surfaces. Replace defective rotor.
 - f. Inspect vanes for excessive wear marks (burrs, nicks, and scoring). Replace any defective vanes.
 - g. Inspect wear surfaces of port plate and end cap for deep scratches. Replace if defective.
 - h. Inspect body and end cap for cracks or other casting damage. Replace all damaged castings.
 - i. Inspect shaft for excessive wear (internal, spline, bearing surface and drive end). Replace if defective.

CAUTION

Dirt is a major cause of wear and motor failure. Cover all parts after cleaning to prevent dust and dirt from settling on them. All surfaces should be coated with a film of hydraulic lubricating oil after they have been cleaned.

ASSEMBLY:

NOTE

Tools are required to properly install the shaft oil seal. A driver must be used to install the shaft seal. A protective cone must be used over the shaft end to prevent damage to the shaft seal when installing the shaft.

1. SOAK SEALS AND BEARINGS IN CLEAN HYDRAULIC OIL.
 2. INSTALL WIPER SEAL (23).
 - a. Position body (21) on a clean, flat surface with small open end up.
 - b. Press new wiper seal (23) in 2-1/16 inch hole. Wiper seal must be flush with bottom of counterbore.
 3. INSTALL SHAFT SEAL (22) AND BEARING (17).
 - a. Turn body (21) over with large open end facing up.
 - b. Use shaft seal driver (Item 1, Appendix C) and drive shaft seal (22) into body (21) until it seats in counterbore.
- NOTE**
- Ensure open side of seal is toward inside of the body.
- c. Press bearing (17) on shaft (18) to shoulder and install external snap ring (16).
 - d. Ensure ring is seated in snap ring groove.
4. INSTALL SHAFT (18).
 - a. Apply lubricating fluid to inside of shaft seal (22) and wiper seal (23).
 - b. Install protective cone (Item 2, Appendix C) over shaft (18) extension to protect shaft seal.
 - c. Press shaft and bearing assembly (16), (17), and (18) into body (21).

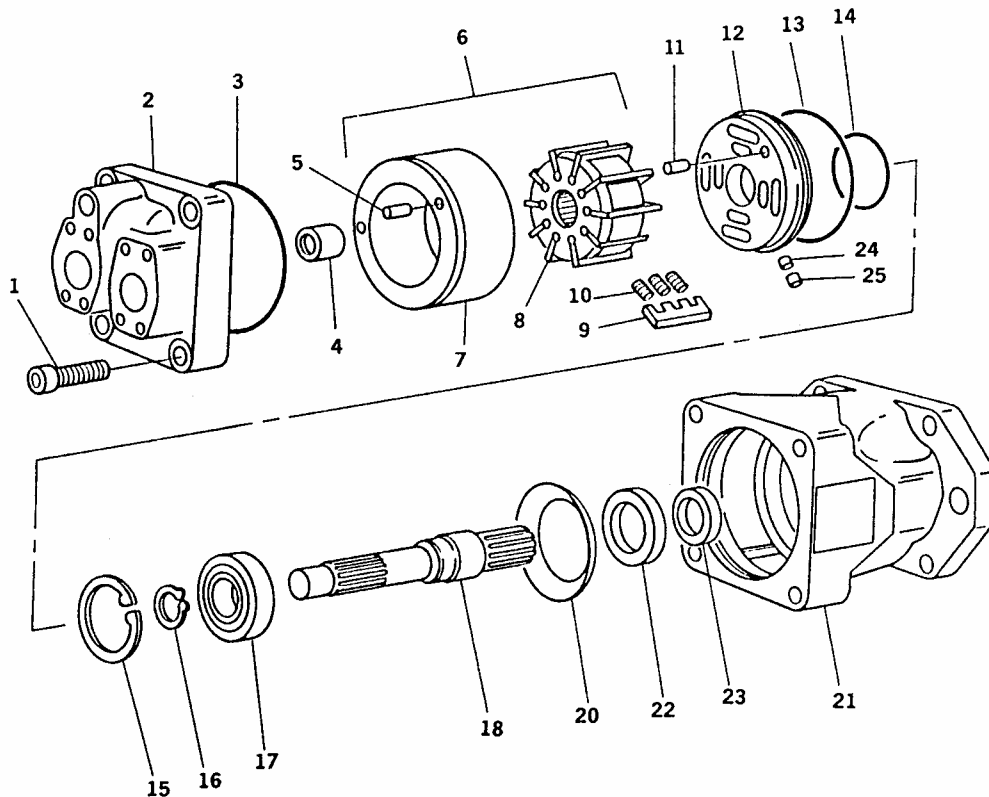
- d. Install snap ring (15) in body (21) and against bearing (17) to hold shaft assembly in place.
 - e. Ensure snap ring (15) is fully seated in groove.
5. INSTALL VALVE ADAPTER (24), SETSCREW (25), PACKING (13) AND RUBBER SEAL (14).

NOTE

The setscrew and the port plate including the internal threads must be degreased. Apply a very small amount of Loctite No. 242 to the setscrew (25) only. An excessive amount of Loctite on the screw would force Loctite into the valve adapter bore when the screws are installed. Allow the Loctite to cure for one hour after installing the screw.

- a. Insert valve adapter (24) into bore and install setscrew (25) and tighten.

- b. Tilt port plate sub-assembly back and forth to be certain that spool travels full length of bore.
 - c. Lubricate new packing (13) and seal (14) with hydraulic oil and then install on back of port plate.
 - d. Place some heavy grease on section seal (14) on back of port plate (12) and on Belleville washer (20).
 - e. Install Belleville washer (20) with the inside diameter on section seal and outside diameter against port plate.
6. INSTALL PORT PLATE (12).
- a. Insert dowel pin (11) in hole in face of port plate assembly.
 - b. Thread two 1/4-20 screws in tapped holes in face of the port plate assembly (12) and position plate (12) in body (21) with dowel pin (11) in approximate position noted in disassembly. DO NOT SEAT.



7. ASSEMBLE CAM RING (6).

CAUTION

Ensure the springs are started in the holes in each rotor slot.

- a. Place cam ring (7), rotor (8), vanes (9) and vane springs (10) on clean flat surface.
- b. Arrange vanes side by side with three spring holes up.
- c. Insert vane springs in vanes.
- d. Install vanes with springs in slots in rotor.

WARNING

Ensure the rotor and vane assembly is inserted far enough in the cam ring to prevent the vanes from flying out of position when the ring compressor is removed.

- e. Place ring compressor around vanes and tighten the compressor gradually until springs and vanes are in position they will occupy while in cam ring.
- f. Place backup plate, slightly smaller than outside diameter of rotor, in ring compressor and push rotor, springs and vanes into cam ring. The backup plate will prevent vanes from sliding end wise in rotor slots and damaging slots and springs.

8. INSTALL CAM RING (6).

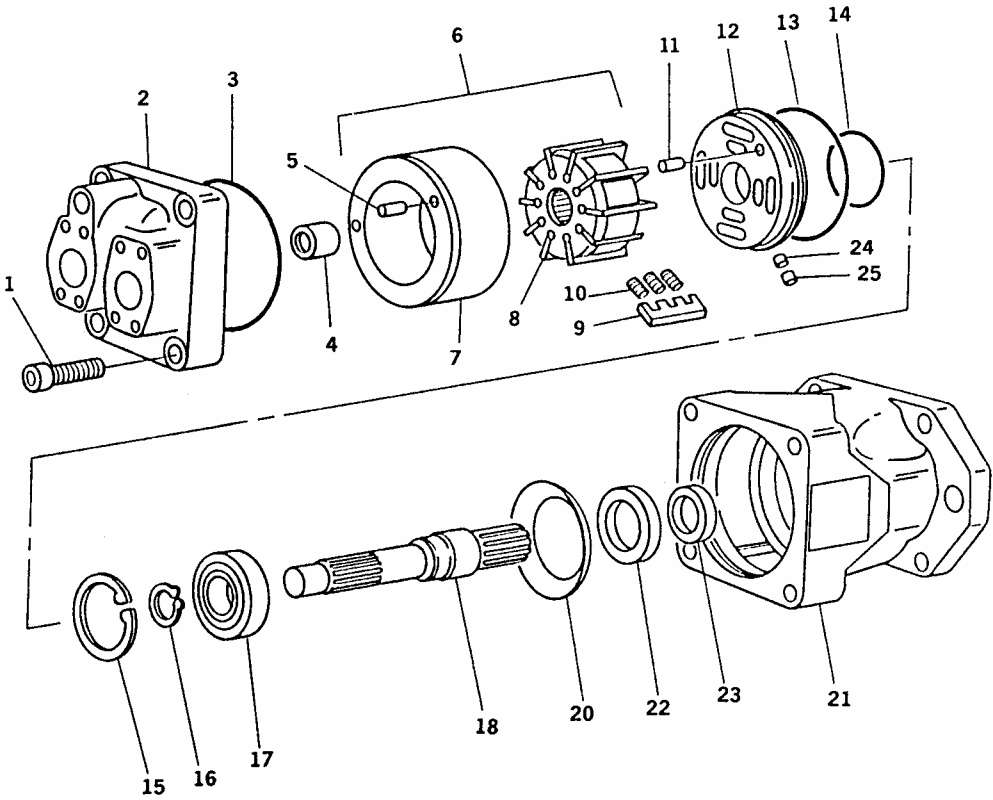
- a. Thread two 1/4-20 screws into cam ring assembly on the same side of the ring that indicates cam size.
- b. Insert dowel pin (5) in cam ring and position complete assembly in body over other dowel pin (11). DO NOT SEAT.
- c. Lubricate new rubber seal (3) and install it on cap (2).

9. INSTALL END CAP (2).

- a. Press needle bearing (4) into end cap (2) with bearing 0.0625-in. (1.58 mm) below face of cap.
- b. Position end cap (2) over dowel pin (5). Hold the end cap firmly against cam ring assembly and rotate to line up bolt holes.
- c. Insert capscrews (1) and tighten evenly to 130 ft-lbs (173 Nm).

10. INSTALL HOIST MOTOR. (REFER TO PAGE 15-46.)

END OF TASK



HOIST MOTOR CONTROL VALVE INSTALLATION

TOOLS: General mechanic's tool kit: automotive (5180-00-177-7033)

SUPPLIES: Clean rags (Item 2, Appendix B)
Lockwashers (Item 13, Appendix B) (8 Required)
Hydraulic oil (Item 8, Appendix B)
Packing assortment (Item 14, Appendix B)
Preformed packing (Item 15, Appendix B) (RT875CC)
Preformed packing (Item 16, Appendix B) (RT875CC)
Preformed packing (Item 17, Appendix B) (RT875CC)
Preformed packing (Item 291, Appendix B) (RT875CCS)
Preformed packing (Item 293, Appendix B) (RT875CCS)
Preformed packing (Item 294, Appendix B) (RT875CCS)
Preformed packing (Item 295, Appendix B) (RT875CCS)

EQUIPMENT CONDITIONS: All hydraulic systems shutdown and pressure relieved from lines (Refer to TM 5-3810-306-20.)
Negative battery cable disconnected at shunt. (RT875CC)
Battery disconnect switch in off position. (RT875CCS)

WARNING

Be sure to wear protective eye covering to avoid personal injury.

REMOVAL:

1. REMOVE HOIST MOTOR CONTROL VALVE (4).
 - a. Tag hydraulic lines to control valve (4).
 - b. Remove four capscrews (1), lockwashers (2) and hydraulic line (3) from control valve (4). Remove and discard packing (9).
 - c. Remove hydraulic hose (10), fitting (12) and preformed packings (11) and (13) from control valve. Discard packings (11) and (13).
 - d. Remove four nuts (5), lockwashers (6) and bolts (7) securing valve (4) to hoist piping. Remove valve (4).
 - e. Remove and discard packing (8) from valve (4).

NOTE

The only repair authorized on hoist motor control valve (4) is the replacement of cap packings.

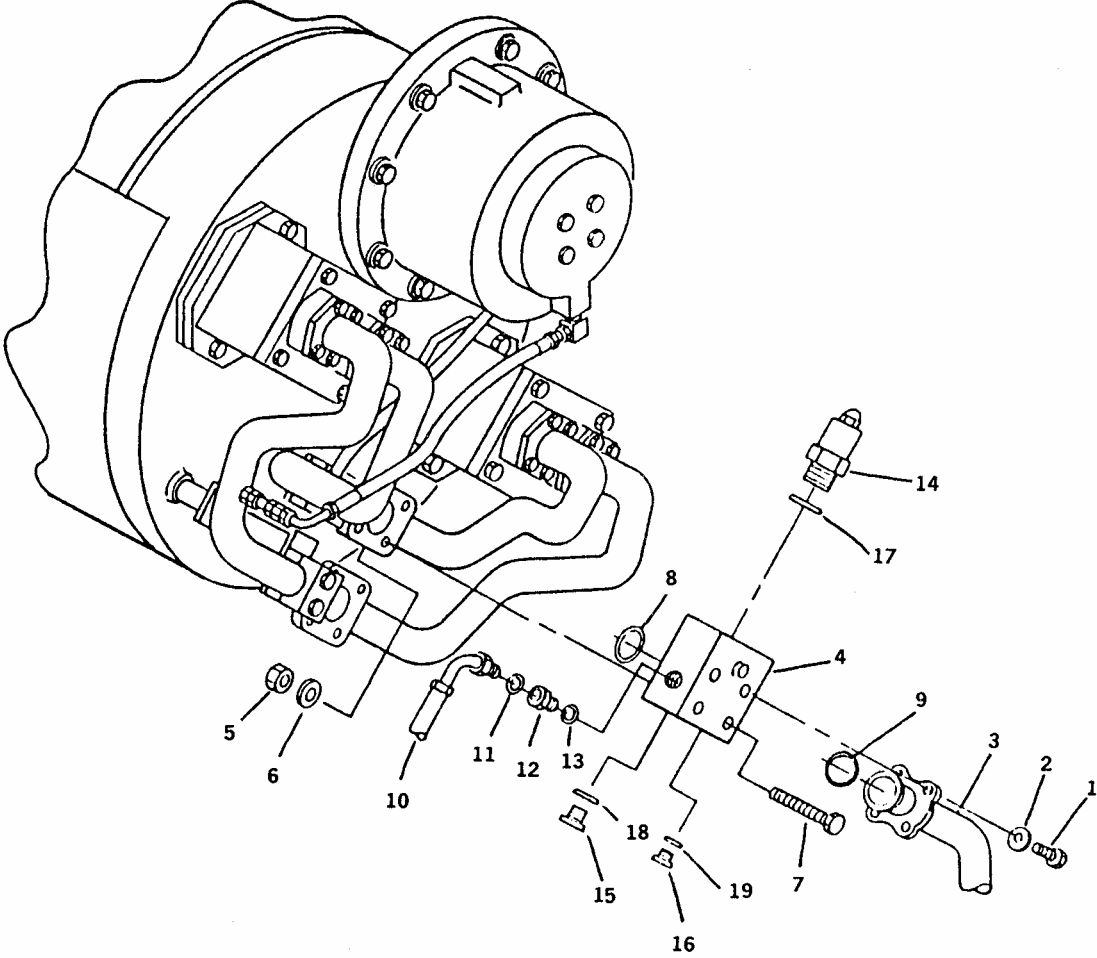
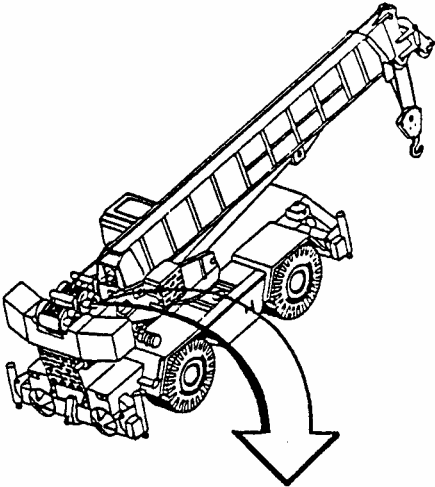
WARNING

Caps (14), (15) and (16) are installed with spring tension. Remove caps carefully to prevent parts from popping out and causing personal injury.

2. REMOVE CAP PACKINGS (17), (18) AND (19).
 - a. Remove caps (14), (15) and (16) from control valve (4).
 - b. Remove and discard packings (17), (18) and (19).

NOTE

If internal parts are removed from valve (4), ensure that positioning is noted and maintained.



INSTALLATION:

NOTE

Prior to connecting hydraulic lines, ensure that fitting threads are clean and free of contaminants. Do not remove any orange thread sealant if previously applied to the fitting(s). Then coat new preformed packings with clean hydraulic oil.

NOTE

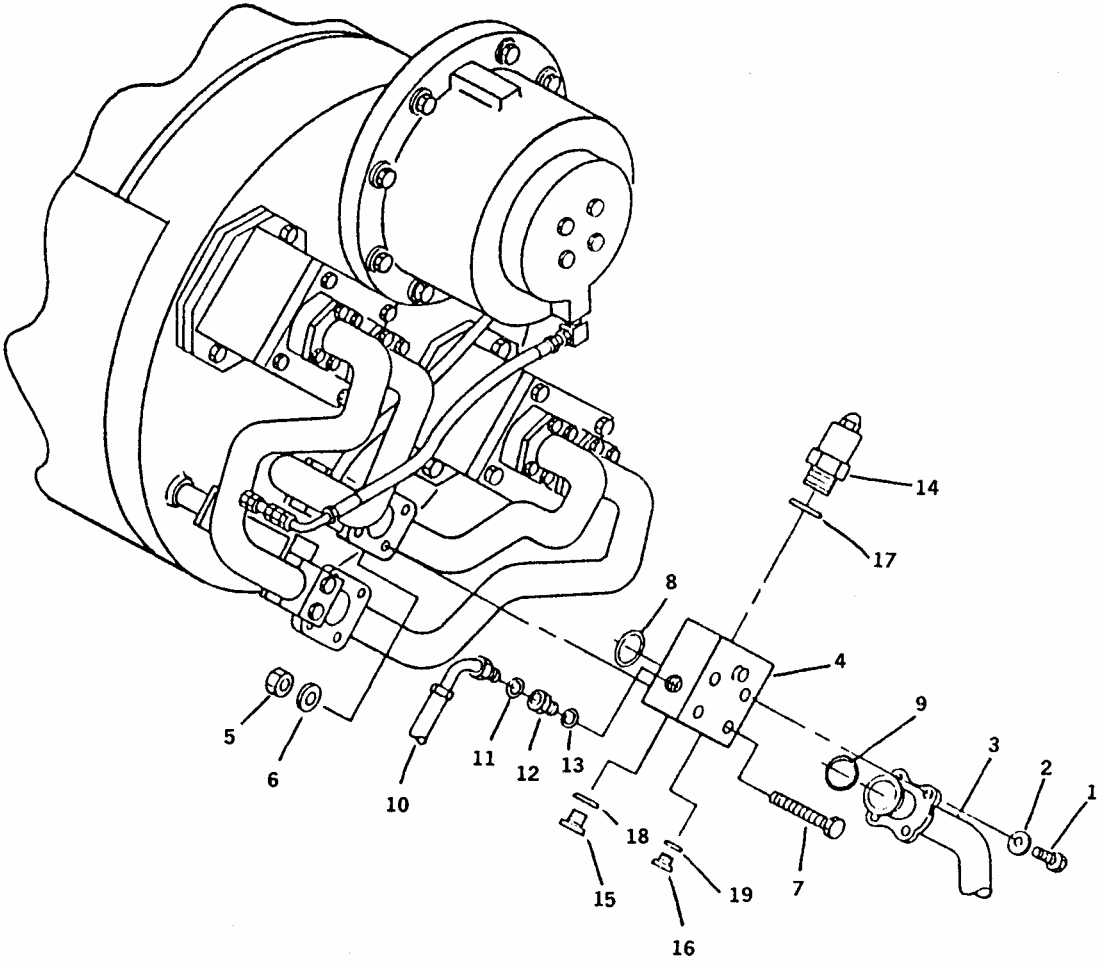
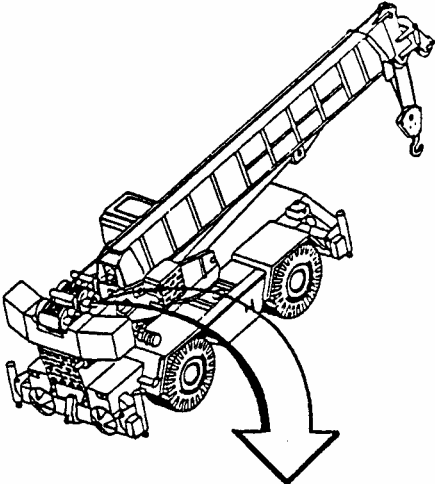
If internal parts were removed from valve (4), make sure they are installed in positions marked on removal.

1. INSTALL NEW PACKINGS (17), (18) AND (19), AND CAPS (14), (15) AND (16) IN CONTROL VALVE (4).
2. INSTALL HOIST MOTOR CONTROL

VALVE (4).

- a. Install new packing (8) onto valve.
 - b. Install valve (4) onto hoist piping and secure with four bolts (7), lockwashers (6) and nuts (5).
 - c. Install new packing (9), four capscrews (1), and lockwashers (2) to secure hydraulic line (3).
 - d. Install fitting (12), new preformed packings (11) and (13) and hydraulic hose (10) to control valve (4).
3. CONNECT NEGATIVE BATTERY CABLE AT SHUNT. (REFER TO TM 5-3810-306-20.) (RT875CC)
 4. START-UP HYDRAULIC SYSTEM AND CHECK FOR LEAKS.
 5. TEST FOR PROPER OPERATION.

END OF TASK



HOIST BRAKE INSTALLATION AND ASSEMBLY

TOOLS: General mechanic's tool kit: automotive (5180-00-177-7033)

SUPPLIES: Preformed packing (Item 263, Appendix B) (3 Required) (RT875CC)
Preformed packing (Item 293, Appendix B) (3 Required) (RT875CCS)
Parts kit (Item 77, Appendix B)
Loctite #242 (Item 6, Appendix B)

EQUIPMENT CONDITIONS: Pressure relieved from hydraulic system.
(Refer to TM 5-3810-306-20.)
Negative battery cable disconnected at shunt. (RT875CC)
Battery disconnect switch in off position. (RT875CCS)
Headache ball or hook block lowered to ground.
(Refer to TM 5-3810-306-10.)

WARNING

Be sure to wear protective eye covering to avoid personal injury.

REMOVAL:

1. REMOVE BRAKE ASSEMBLY (1).
 - a. Disconnect lines (25), (26) and (27) from brake assembly (1). Remove and discard packings (28).
 - b. Remove bolts (2) and washers (3) securing brake assembly (1) to hoist.
 - c. Remove brake assembly (1) from hoist.
 - d. Cover open end of brake assembly (1).

NOTE

If brake discs are to be replaced, perform the following:

2. REMOVE OVERRUNNING CLUTCH (4).
 - a. Knock tab of key washer (5) from its seat on locknut (6).
 - b. Using a spanner wrench, remove locknut (6) and key washer (5).
 - c. Remove overrunning clutch (4) and key (7) from pinion shaft (9).
 - d. Remove bearing spacer (8) from pinion shaft (9).
3. REMOVE BRAKE DISCS (10).
 - a. Place brake assembly in press.

NOTE

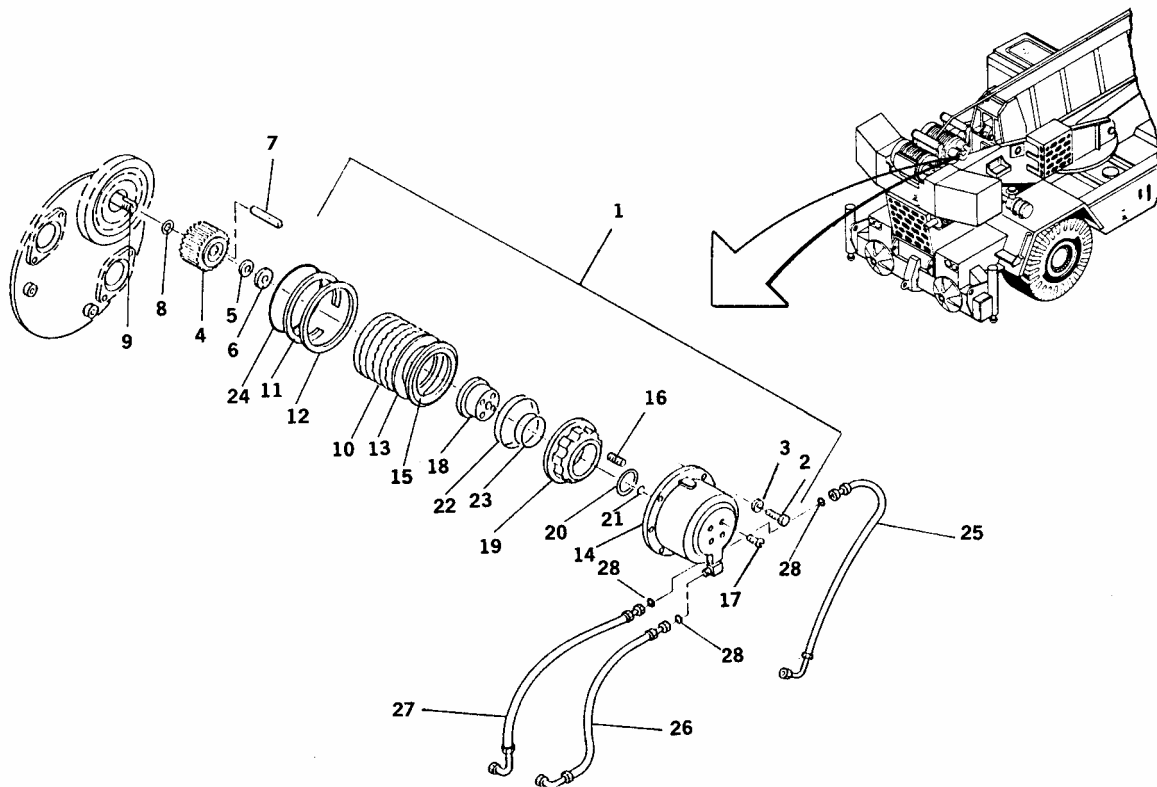
Two large C-clamps can be used to compress the springs for removal of the snap ring.

- b. Using a suitable sleeve, compress brake spring and remove snap ring (11).
- c. Remove backing plate (12).
- d. Remove brake discs (10) and stators (13) and set them aside.

NOTE

There are seven brake stators and six brake discs.

4. REMOVE BRAKE HOUSING (14).
 - a. Remove pressure plate (15).
 - b. Turn brake housing (14) upside down on a wood block about five inches high and with a circumference less than that of the housing.
 - c. Lift housing from piston assembly and remove springs (16).
 - d. Remove four capscrews (17) to free piston assembly still inside. The block will prevent the piston assembly from falling.



- e. Using soft faced hammer, tap brake piston (18) from brake cylinder (19).
- f. Remove and discard preformed packings (20), (21), (22), and (23) from brake piston (18) and brake cylinder (19).
- g. Remove and discard preformed packing (24) from brake housing (14).

WARNING

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

CLEANING:

CAUTION

Do not use gasoline as solvent.

WARNING

Dry cleaning solvent P-D-680, Type III is toxic and flammable. Wear protective goggles and gloves and use only in a well-ventilated area. Avoid contact with skin, eyes, and clothes and do not breathe vapors. Do not use near open flame or excessive heat. The flash point is 200°F (94°C). If you become dizzy while using cleaning solvent, get fresh air immediately and get medical aid. If contact with eyes is made, wash your eyes with water and get medical aid immediately.

1. CLEAN ALL PARTS THOROUGHLY IN SOLVENT P-D-680, TYPE III AND DRY WITH COMPRESSED AIR.

INSPECTION:

1. INSPECT ALL PARTS FOR WEAR AND OBVIOUS DAMAGE.
2. MEASURE SPRINGS (16).
 - a. Springs (16) should measure 2.5 in. (63.5 mm) long (free length).

- b. If any spring measures less than 2.375 in. (60.325 mm) all nine springs should be replaced.

INSTALLATION:

1. INSTALL BRAKE PISTON (18).

- a. Lubricate preformed packings (20), (21), (22), and (23) and brake piston (18) with clean hydraulic oil.

CAUTION

Do not damage the preformed packings.

- b. Install two new preformed packings (22) on side of brake piston (18).
- c. Install two new preformed packings (23) on brake cylinder (19).
- d. Lubricate piston and cylinder mating surfaces with light coating of oil.
- e. Start brake piston (18) into brake cylinder (19). Ensure bolt holes in end of brake piston are aligned so vent hole will face up when installed in brake housing (14) and mounted on hoist.
- f. Use soft faced hammer to tap brake piston (18) into brake cylinder (19).
- g. Install new preformed packings (20) and (21) on end of piston (18).

2. SET NINE BRAKE SPRINGS (16) INTO POSITION ON CAST SPROCKET OF BRAKE CYLINDER (19).

3. INSTALL BRAKE HOUSING (14).

- a. Set piston/cylinder assembly on wood block about five inches high and with a circumference less than that of brake housing (14).

WARNING

Ensure the brake cylinder is installed so the vent hole will be at the top when installed on the hoist.

- b. Set brake housing (14) over piston cylinder assembly aligning the capscrew holes.
- c. Apply Loctite to threads of capscrews (17).
- d. Install capscrews (17) and torque to 75 ft-lbs (100 Nm).

4. ASSEMBLE BRAKE DISCS (10).

- a. Set housing face down.
- b. Place one inch (25.4 mm) block in housing on piston to act as a spacer in aligning brake discs and plates.
- c. Set overrunning clutch (4) in position in housing.

NOTE

The pressure plate (15) is thicker than the backing plate (12).

- d. Install pressure plate (15).

NOTE

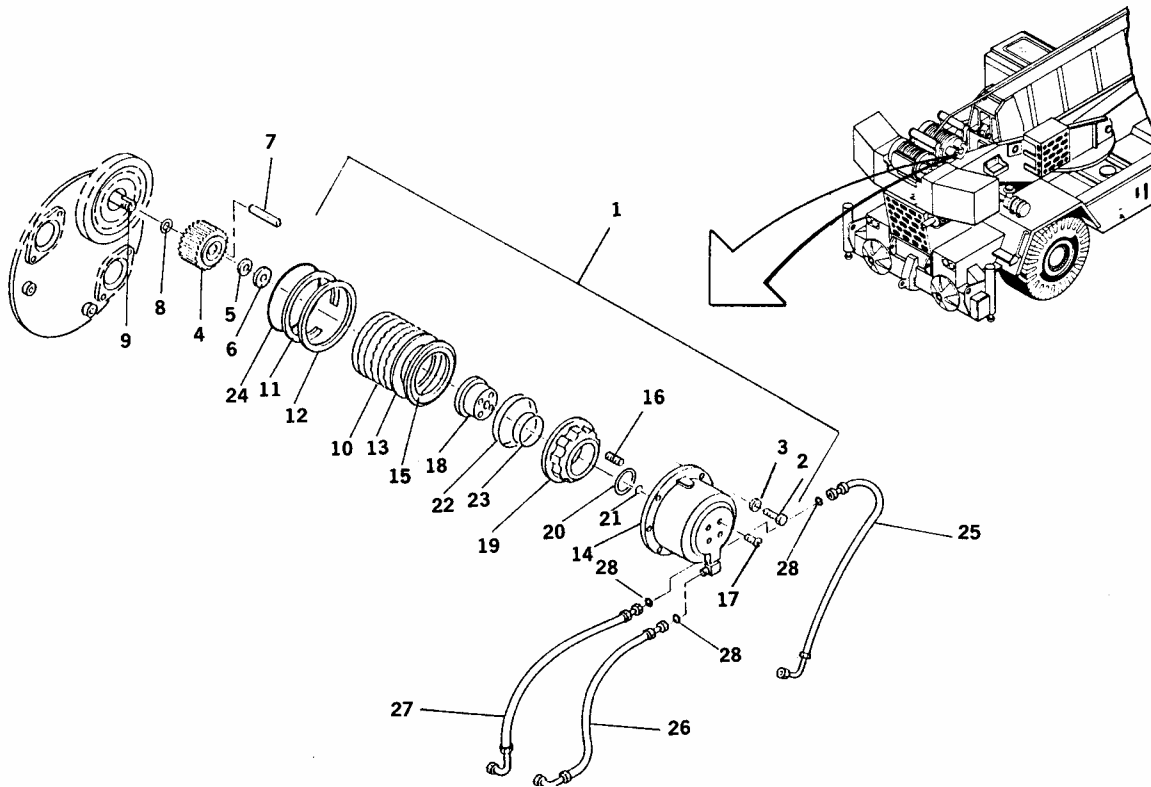
There are seven brake stators (13) and six brake discs (10). Two brake stators (13) are flat and should be installed first and last. The other five brake stators (13) are concave. Each should be installed with the hump side up.

- e. Install brake stator (13) and brake disc (10) alternating until all stators and discs are installed. The last one should be a brake stator.

- f. Install backing plate (12).

5. ASSEMBLE HOIST BRAKE.

- a. Place brake housing (14) in press.
- b. Using sleeve larger than overrunning clutch, push down on backing plate (12) far enough so snap ring (11) can be installed securely.
- c. Remove brake housing from press.
- d. Remove overrunning clutch (4).



e. Place new preformed packing (24) in groove in housing.

6. INSTALL OVERRUNNING CLUTCH (4).

a. Install bearing spacer (8) on pinion shaft (9).

NOTE

The direction of free rotation of the overrunning clutch (4) should be counterclockwise.

- b. Install overrunning clutch (4) on pinion shaft (9) and secure with key (7).
- c. Install keywasher (5) and locknut (6). Torque locknut (6) to 20 ft-lbs (27 Nm).
- d. Lock locknut (6) by bending a tab of keywasher (5) into corresponding groove of the locknut (6).

7. INSTALL BRAKE ASSEMBLY (1).

NOTE

Ensure the plugged hole is at the top when installing the brake assembly (1).

- a. Install brake assembly (1) over overrunning clutch, using a soft faced hammer to tap brake in place.
- b. Apply Loctite to hex head bolt threads (2).
- c. Secure brake assembly with hex head bolts (2) and lockwashers (3). Torque hex head bolts (2) to 31 ft-lbs (41 Nm).
- d. Install new packings (28) and connect lines (25), (26) and (27) to brake assembly (1).

8. CONNECT NEGATIVE BATTERY CABLE AT SHUNT. (REFER TO TM 5-3810-306-20.) (RT875CC)

9. START CRANE AND CHECK HOIST BRAKE FOR PROPER OPERATION AND LEAKS.

END OF TASK

Section III. TURNTABLE MAINTENANCE

SWIVEL INSTALLATION

TOOLS: General mechanic's tool kit: automotive (5180-00-177-7033)
 Shop Equipment Auto-Maintenance and Repair, FM Basic (4910-00-754-0705)
 Shop Equipment Auto-Maintenance and Repair, FM Suppl No. 1 (4910-00-754-0706)
 Tool Outfit Hyd System; Test and Repair, 3/4 Ton Trailer Mtd (4940-01-036-5784)

SUPPLIES: Preformed packing (Item 106, Appendix B) (4 Required) (RT875CC)
 Preformed packing (Item 107, Appendix B) (3 Required) (RT875CC)
 Preformed packing (Item 108, Appendix B) (3 Required) (RT875CC)
 Preformed packing (Item 90, Appendix B) (RT875CC)
 Preformed packing (Item 117, Appendix B) (3 Required) (RT875CC)
 Preformed packing (Item 118, Appendix B) (6 Required) (RT875CC)
 Preformed packing (Item 15, Appendix B) (2 Required) (RT875CC)
 Preformed packing (Item 275, Appendix B) (6 Required) (RT875CCS)
 Preformed packing (Item 289, Appendix B) (RT875CCS)
 Preformed packing (Item 296, Appendix B) (2 Required) (RT875CCS)
 Preformed packing (Item 288, Appendix B) (3 Required) (RT875CCS)
 Preformed packing (Item 294, Appendix B) (5 Required) (RT875CCS)
 Preformed packing (Item 278, Appendix B) (7 Required) (RT875CCS)
 Hydraulic oil (Item 8, Appendix B)
 Cotter pins (Item 110, Appendix B) (2 Required)
 Oak Posts (Item 39, Appendix B) (2 Required)

EQUIPMENT CONDITIONS: Negative battery cable disconnected at shunt. (RT875CC)
 Battery disconnect switch in off position. (RT875CCS)
 Outriggers fully extended and lowered. (Refer to TM 5-3810-306-10.)
 Boom over front and elevated for access to swivel.
 (Refer to TM 5-3810-306-10.)
 Air system purged. (Refer to TM 5-3810-306-20.)
 All hydraulic systems shutdown and pressure relieved in lines.
 (Refer to TM 5-3810-306-20.)

WARNING

Be sure to wear protective eye covering to avoid personal injury.

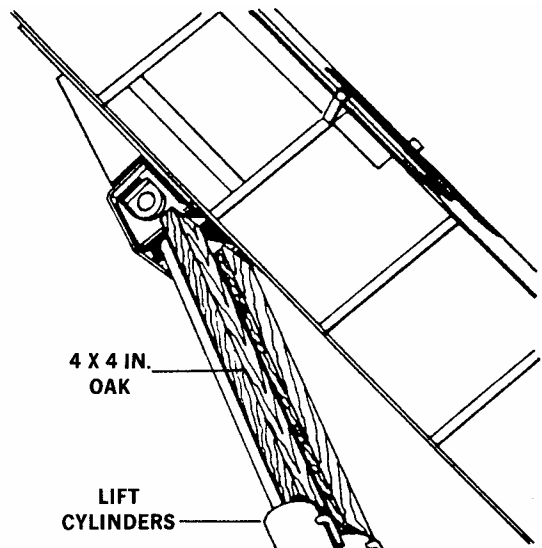
REMOVAL:

1. SUPPORT BOOM.

NOTE

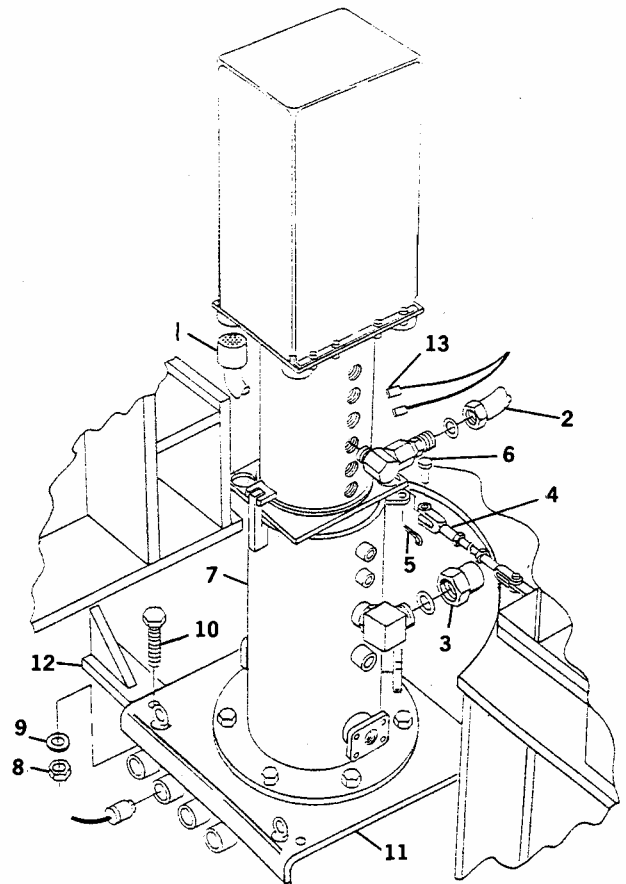
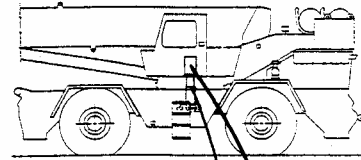
This blocking is to add extra support for the boom. Any seepage or leakage in the holding valve or internally in the cylinder will allow the boom to settle over a period of time.

- a. Measure the distance from the top of the lift cylinders to the base of the boom section where the lift cylinder attaches. Cut a piece of 4 x 4-in. (10.16 x 10.16 cm) oak to fit.



BLOCKING INSTALLATION

- b. Use the oak blocking to block between the barrel of the lift cylinders and the boom base section.
2. TAG AND DISCONNECT TWO WIRES (13) TO AREA DEFINITION SWITCH.
3. TAG AND DISCONNECT FOUR ELECTRICAL CONNECTORS (1) TO ELECTRIC SWIVEL.
4. TAG AND DISCONNECT HYDRAULIC AND AIR LINES TO SWIVEL BARREL.
 - a. Tag and disconnect twelve lines (2) from air/transmission swivel.
 - b. Tag and disconnect twelve lines (3) from hydraulic swivel.
5. DISCONNECT TWO ROD AND LINK ASSEMBLIES (4).
 - a. Remove two cotter pins (5) and hitch clip pins (6) securing rod and link assemblies to swivel. Position rods and links out of way of swivel.
6. UNCOUPLE 22 QUICK DISCONNECT COUPLERS AT BOTTOM OF SWIVEL. CAP OPENINGS WITH ATTACHED CAPS.



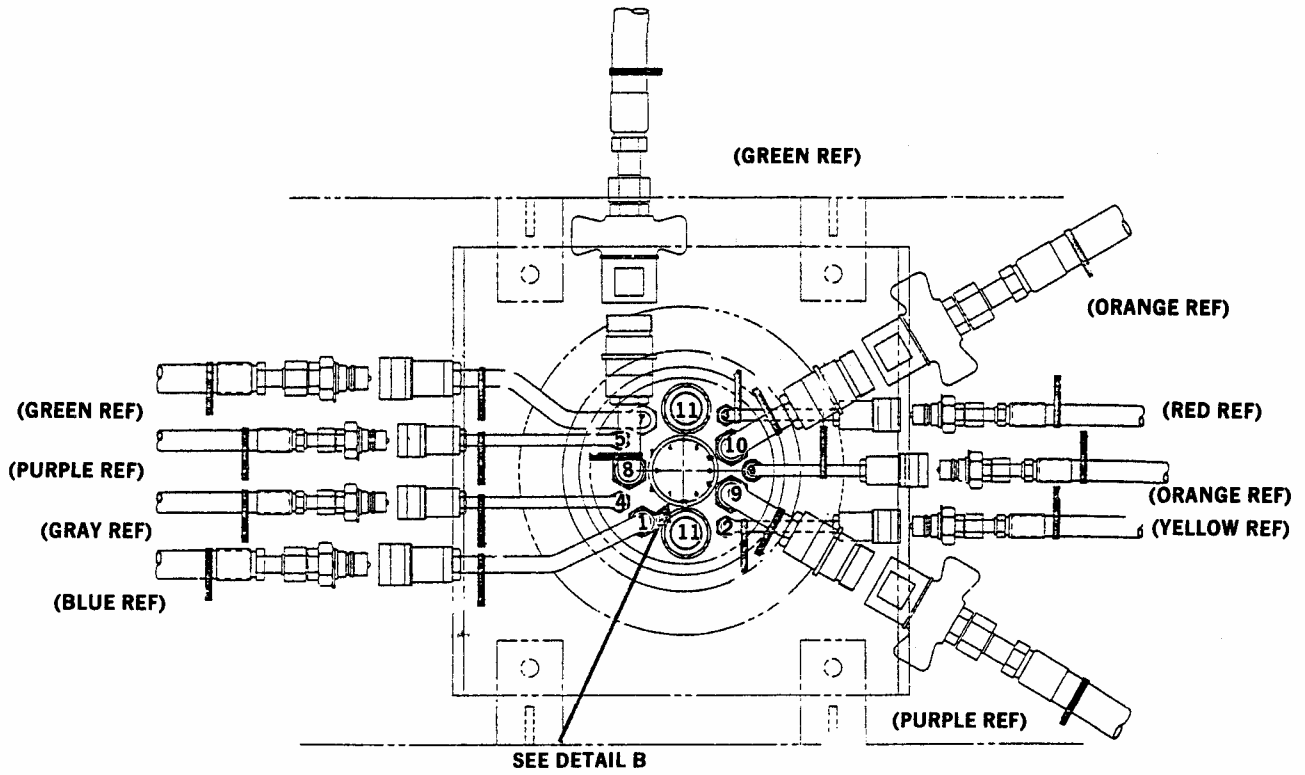
NOTE

Connections are size matched or color coded to ensure correct replacement.

7. TAG AND DISCONNECT THREE ELECTRICAL CONNECTORS TO ELECTRICAL SWIVEL.
8. REMOVE SWIVEL (7).
 - a. Remove four nuts (8) washers (9) and capscrews (10) securing swivel mounting channel (11) to mounting brackets (12).
 - b. Attach an appropriate sling to swivel. Using a suitable lifting device attached to sling, raise swivel slightly. Tilt swivel assembly to side while lowering and allow one side of mounting channel to clear under mounting brackets (12). Continue to lower, favoring the one side in order to allow other side of mounting channel to clear brackets (12).

CAUTION

Ensure steel lines are not damaged during swivel removal.



OUTER SPOOL HOSE ARRANGEMENT
VIEW FROM BOTTOM

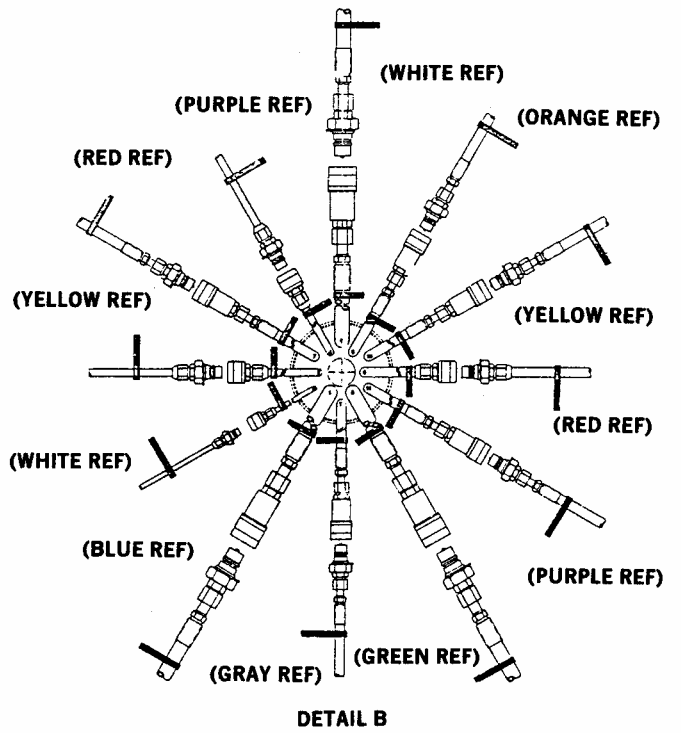
NOTE

For ease in removal, it may be necessary to loosen hydraulic line from swivel to front steer relief valve and position out of way of swivel.

- c. Lower swivel down through hole onto suitable dolly.
- d. Remove lifting device and sling from swivel, roll swivel out from underneath crane.

INSTALLATION:

1. INSTALL SWIVEL (7).
 - a. Position swivel (7) on dolly, attach an appropriate sling and roll under crane.
 - b. Lower suitable lifting device through center hole in turntable and attach to sling.



INNER SPOOL HOSE ARRANGEMENT

- c. Slowly raise swivel (7) through hole favoring one side until mounting channel (11) is past mounting brackets (12).
 - d. Continue to raise swivel (7) favoring one side until other side of mounting plate (11) clears mounting brackets (12).
 - e. Lower swivel (7) and mounting channel (11) onto mounting brackets. Align holes and install four capscrews (10), washers (9) and nuts (8). Torque nuts to 250 ft-lbs (333 Nm).
 - f. Remove sling and lifting device.
2. CONNECT HYDRAULIC AND AIR LINES TO SWIVEL (7).

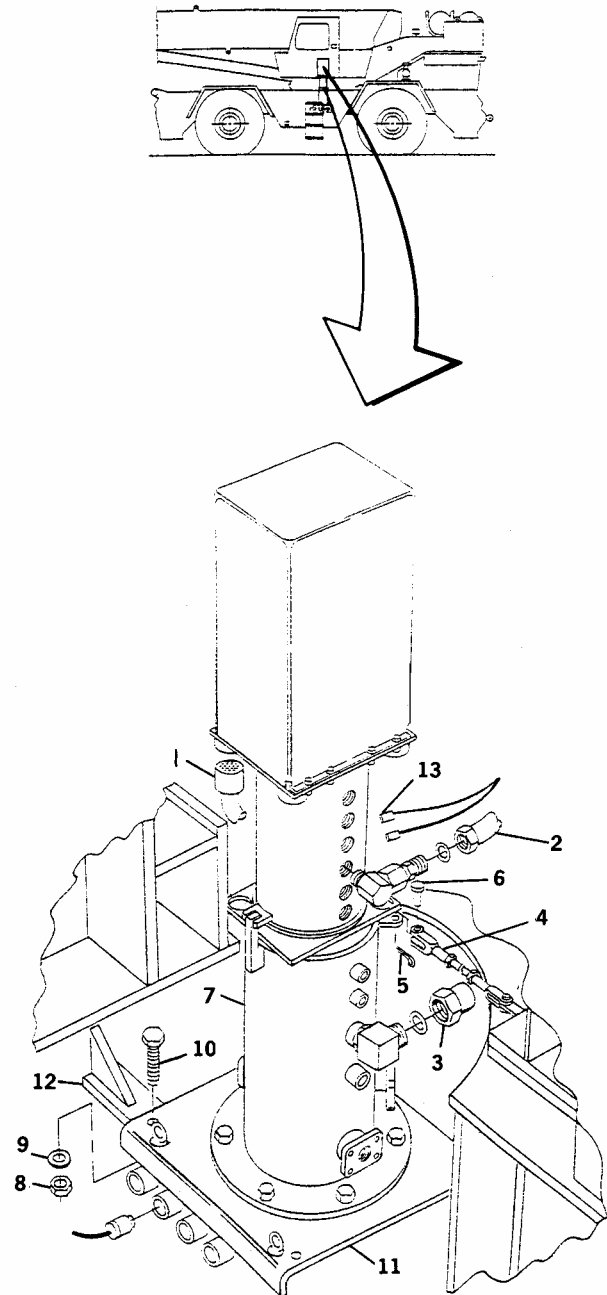
NOTE

Prior to connecting hydraulic lines, ensure that fitting threads are clean and free of contaminants. Do not remove any orange thread sealant if previously applied to the fitting(s). Then coat new preformed packings with clean hydraulic oil.

- a. Join 22 tagged quick disconnect couplers to bottom of swivel. Tighten hose to steer relief valve as necessary.
 - b. Install twelve lines to hydraulic swivel. Use new preformed packings.
 - c. Install twelve lines to air/transmission swivel. Use new preformed packings and coat threads with Loctite 545.
3. CONNECT FOUR TAGGED ELECTRICAL CONNECTORS (1) TO ELECTRICAL SWIVEL.
4. CONNECT THREE TAGGED ELECTRICAL CONNECTORS TO CARRIER HARNESS.
5. CONNECT TWO ROD AND LINK ASSEMBLIES (4).
- a. Align hole in yoke with hole in ear on swivel barrel. Install hitch clip pins (6) and secure with new cotter pins (5).
6. CONNECT TAGGED WIRES (13) TO AREA DEFINITION SWITCH.

- 7. CONNECT NEGATIVE BATTERY CABLE AT SHUNT. (REFER TO TM 5-3810-306-20.) (RT875CC)
- 8. REMOVE BLOCKING FROM LIFT CYLINDER.
- 9. START CRANE. TEST FOR PROPER OPERATION AND INSPECT FOR LEAKS.

END OF TASK



AIR/TRANSMISSION SWIVEL INSTALLATION

TOOLS: General mechanic's tool kit: automotive (5180-00-177-7033)

SUPPLIES: Lockwashers (Item 109, Appendix B)
 Preformed packing (Item 106, Appendix B) (8 Required) (RT875CC)
 Preformed packing (Item 114, Appendix B) (4 Required) (RT875CC)
 Preformed packing (Item 115, Appendix B) (RT875CC)
 Preformed packing (Item 116, Appendix B) (8 Required) (RT875CC)
 Preformed packing (Item 275, Appendix B) (6 Required) (RT875CCS)
 Preformed packing (Item 289, Appendix B) (RT875CCS)
 Preformed packing (Item 296, Appendix B) (2 Required) (RT875CCS)
 Preformed packing (Item 288, Appendix B) (3 Required) (RT875CCS)
 Preformed packing (Item 294, Appendix B) (5 Required) (RT875CCS)
 Preformed packing (Item 278, Appendix B) (7 Required) (RT875CCS)

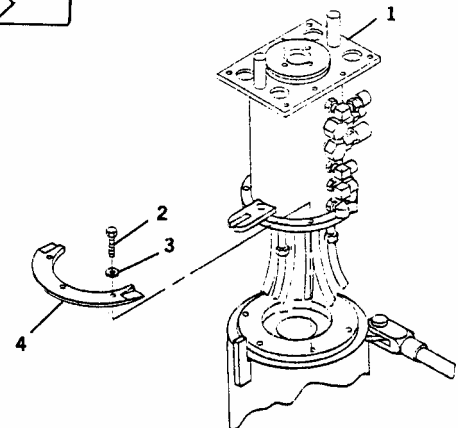
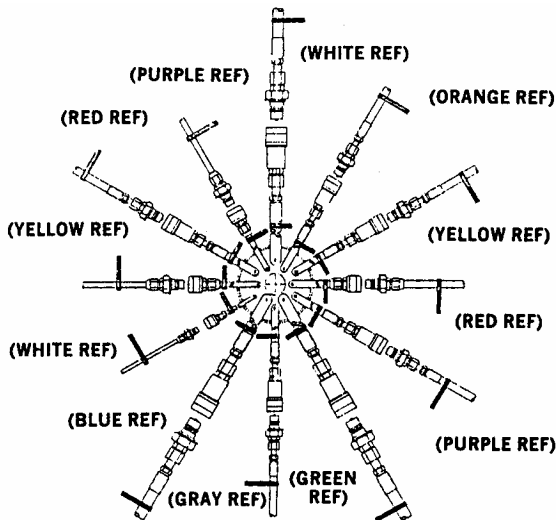
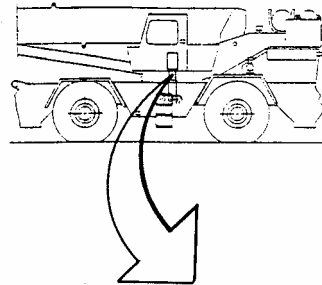
EQUIPMENT CONDITIONS: Air system is purged. (Refer to TM 5-3810-306-20.)
 Hydraulic pressure depleted. (Refer to TM 5-3810-306-20.)
 Negative battery cable disconnected at shunt. (RT875CC)
 Battery disconnect switch in off position. (RT875CCS)
 Electrical swivel ring removed. (Refer to page 15-86.)
 Area definition switch removed. (Refer to TM 5-3810-306-20.)

WARNING

Be sure to wear protective eye covering to avoid personal injury.

REMOVAL:

1. REMOVE AIR/TRANSMISSION SWIVEL (1).
 - a. Tag and disconnect twelve oil and air lines from swivel barrel. Cap lines and openings.
 - b. Remove six socket head capscrews (2) and lockwashers (3) attaching switch actuating cam (4) and swivel casing to hydraulic swivel.



- c. Tag and disconnect lines from quick disconnect couplers below hydraulic swivel.
- d. To allow lines to pass through hydraulic swivel barrel, tag and remove couplers from air and hydraulic lines to air/transmission swivel.

CAUTION

When removing air/ transmission swivel, ensure swivel is lifted vertically until all rigid pipe extensions are out of center of hydraulic swivel.

- e. Using an adequate lifting device, remove air/transmission swivel, extension tubes and hoses from hydraulic swivel.
- f. Remove hoses and extension tubes as required.

INSTALLATION:

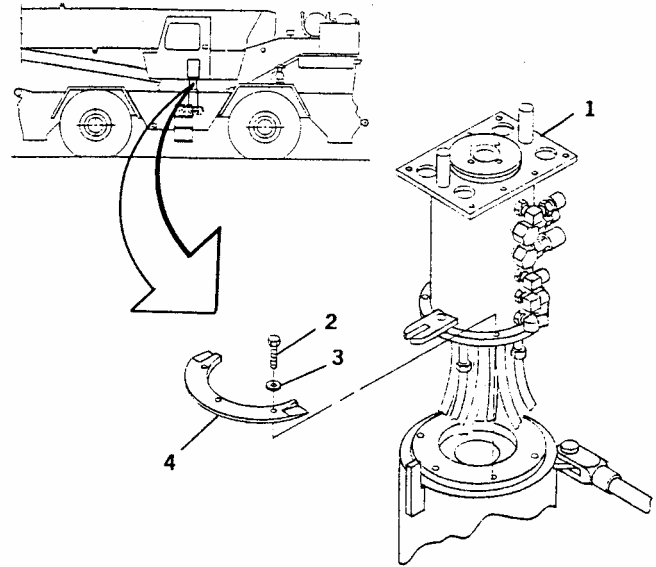
CAUTION

When installing air/ transmission swivel, ensure rigid pipe extensions are not bent or crimped.

NOTE

Prior to connecting hydraulic lines, ensure that fitting threads are clean and free of contaminants. Do not remove any orange thread sealant if previously applied to the fitting(s). Then coat new preformed packings with clean hydraulic oil.

1. INSTALL AIR/TRANSMISSION SWIVEL.
 - a. Position swivel and connect tagged oil and air lines to spool of the swivel.
 - b. Insert swivel, extension tubes and hoses into hydraulic swivel and install slotted arm into keying lug on hydraulic swivel barrel.
 - c. Place switch actuating cam (4) in place on swivel casing and secure casing to hydraulic swivel using six capscrews (2) and lockwashers (3).
 - d. Install tagged couplers onto appropriate hoses. Connect all couplers to tagged lines below hydraulic swivel.
 - e. Install twelve air and oil lines to swivel barrel as tagged.



2. INSTALL AREA DEFINITION SWITCH AND ADJUST. (REFER TO TM 5-3810-306-20.)
3. INSTALL ELECTRICAL SWIVEL. (REFER TO PAGE 15-86.)
4. CONNECT NEGATIVE BATTERY CABLE AT SHUNT. (REFER TO TM 5-3810-306-20.) (RT875CC)
5. START UP AIR SYSTEM. RETURN TO NORMAL PRESSURE. (REFER TO TM 5-3810-306-10.)
6. START UP HYDRAULIC SYSTEM. RETURN TO NORMAL PRESSURE. (REFER TO TM 5-3810-306-10.)
7. REMOVE BLOCKING FROM LIFT CYLINDERS.
8. TEST FOR PROPER OPERATION AND INSPECT FOR LEAKS.

END OF TASK

AIR/TRANSMISSION SWIVEL ASSEMBLY

TOOLS: General mechanic's tool kit: automotive (5180-00-177-7033)
Shop Equipment Auto-Maintenance and Repair, FM Basic (4910-00-754-0705)
Shop Equipment Auto-Maintenance and Repair, FM Suppl No. (4910-00-754-0706)
Tool Outfit Hyd System; Test and Repair, 3/4 Ton Trailer Mtd (4940-01-036-5784)

SUPPLIES: Hydraulic Oil (Item 8, Appendix B)
Parts kit (Item 194, Appendix B)
Solvent, Cleaning P-D-680, Type III (Item 1, Appendix B)
Packings as required

EQUIPMENT CONDITIONS: Air/transmission swivel removed. (Refer to page 15-68.)

DISASSEMBLY:

NOTE

Any maintenance requiring disassembly of swivel should include replacement of all seals and rings.

2. REMOVE THE SEALS (6), (7) AND (8) AND RINGS (9) FROM SPOOL (3).
 - a. Remove and discard four preformed packings (6), four crown seals (7), five bronze filled seals (8) and quad rings (9).

1. REMOVE SPOOL (3).
 - a. Tag and disconnect pipe extensions and fittings from bottom of spool.
 - b. Remove clips (1) and screws (2) that retain spool (3).
 - c. Withdraw spool (3) from swivel case (10).

NOTE

Aligning discarded seals and rings in order of disassembly will assist with installation of new seals and rings.

CLEANING AND INSPECTION:

WARNING

Dry cleaning solvent P-D-680, Type III is toxic and flammable. Wear protective goggles and gloves and use only in a well-ventilated area. Avoid contact with skin, eyes, and clothes and do not breathe vapors. Do not use near open flame or excessive heat. The flash point is 200°F (94°C). If you become dizzy while using cleaning solvent, get fresh air immediately and get medical aid. If contact with eyes is made, wash your eyes with water and get medical aid immediately.

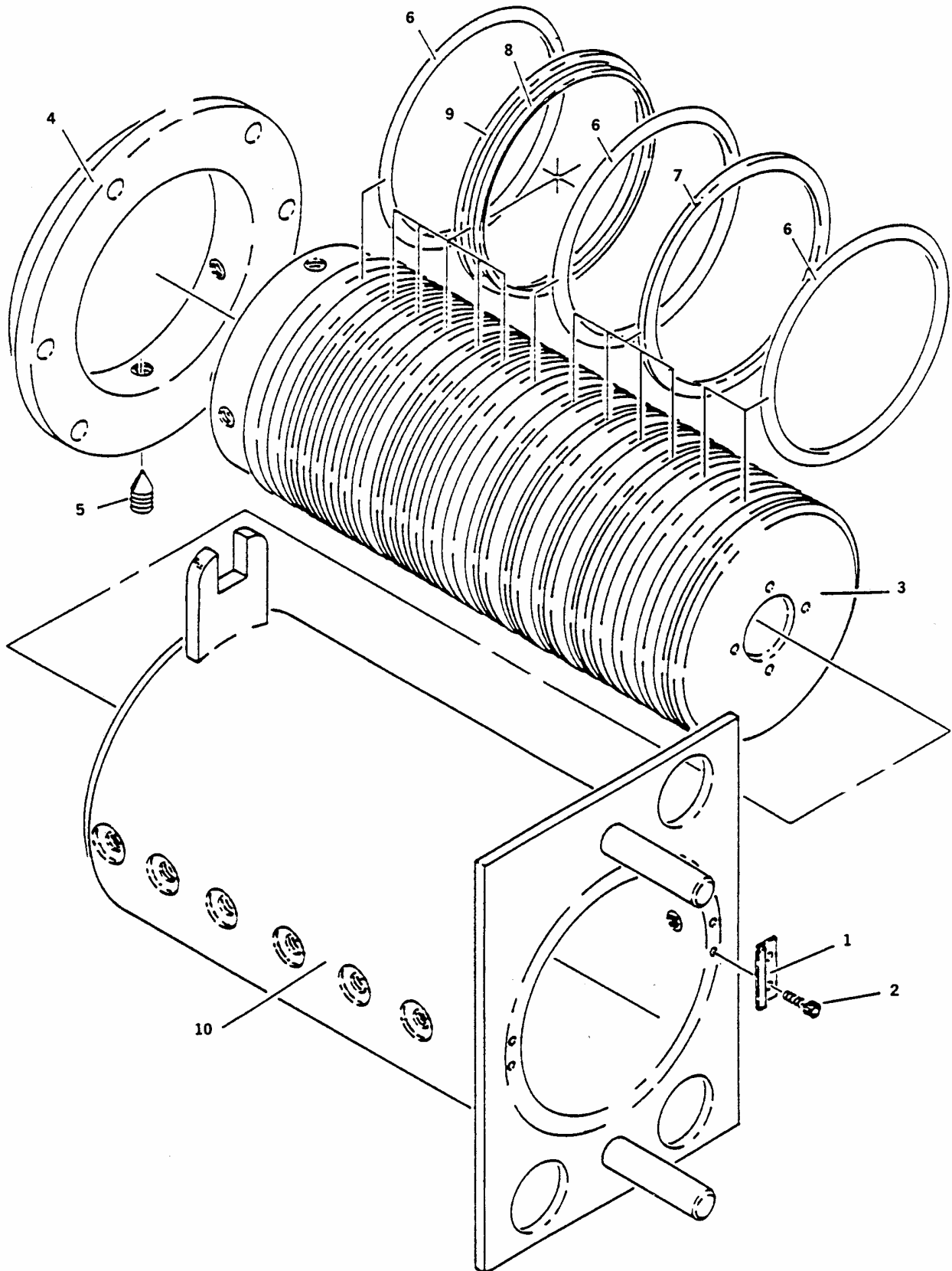
NOTE

During routine maintenance, it is not necessary to remove mounting plate. Use the mounting plate for blocking. However, if mounting plate is damaged and needs replacement, remove four screws (5) and mounting plate (4).

- d. Place spool on a clean work surface in a dust-free area and block spool to prevent movement during disassembly.

CAUTION

When removing seals and rings, avoid scratching the grooved and gland surfaces.



WARNING

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

1. CLEAN SPOOL (3) AND SWIVEL CASE (10) WITH SOLVENT P-D-680, TYPE III AND DRY WITH COMPRESSED AIR.
2. CHECK SPOOL (3) AND THE INSIDE OF THE SWIVEL CASE (10) FOR SCRATCHES, GROOVES, SCORING, ETC. IF ANY GROOVES HAVE DEVELOPED WITH A DEPTH EXCEEDING 0.005 IN. (0.1270 MM), UNIT SHOULD BE REPLACED.
3. CHECK PIPE EXTENSIONS FOR ANY CRACKS, BREAKS, OR CRIMPING.

REASSEMBLY:

1. LUBRICATE SPOOL, SEALS, AND RINGS WITH CLEAN HYDRAULIC OIL.

CAUTION

When installing new seals and rings, avoid stretching seals or scratching grooved or gland surfaces.

2. IF REMOVED, INSTALL MOUNTING PLATE (4) AND SECURE WITH SCREWS (5).
3. INSTALL SEALS (6), (7) AND (8) AND RINGS (9) ON SPOOL (3).
 - a. Install four new crown seals (7), four preformed packings (6), five bronze filled seals (8) and quad rings (9).

CAUTION

Proper alignment when inserting spool is required. Do not force spool into swivel case.

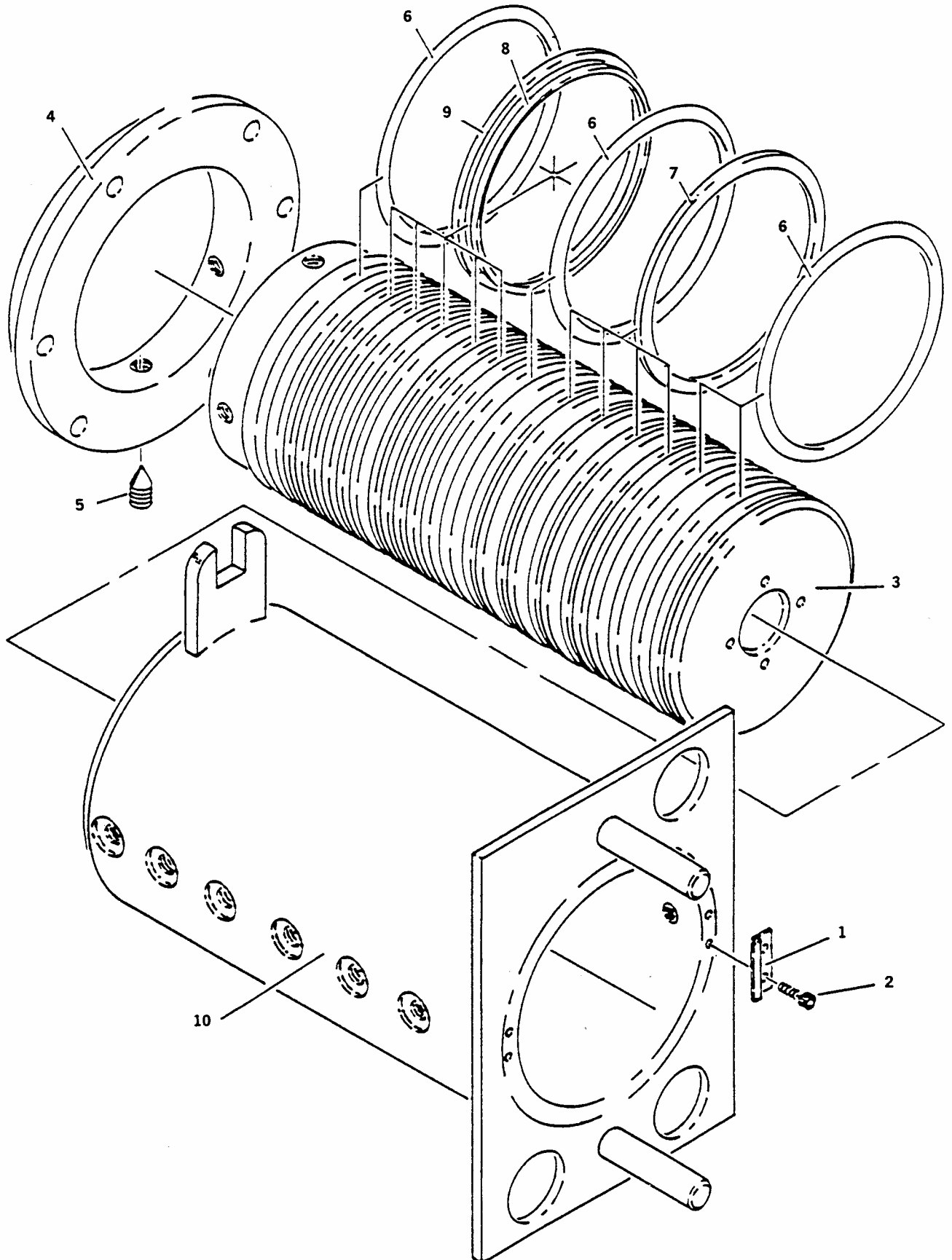
4. INSERT SPOOL (3) INTO SWIVEL CASE (10); SECURE WITH CLIPS (1) AND SCREWS (2).
5. INSTALL TAGGED PIPE EXTENSIONS ON SPOOL (3).

PRESSURE TEST:

NOTE

Use only 10W hydraulic oil for testing hydraulic ports. Air pressure should be used to test the air ports.

1. PRESSURE TEST SWIVEL PORTS.
 - a. Install a pressure gauge into a port on swivel case.
 - b. Install a pressure line in the corresponding port in the swivel spool.
 - c. Allow ports, on each side of port to be tested, to vent in order to detect leakage.
 - d. Pressurize port to be tested while rotating spool or case 360 degrees.
 - e. If leakage is detected disassemble swivel and determine cause.
 - f. Pressure check each port individually until all ports have been tested.
 - g. Test ports with following pressures:



Port Number	Test Pressure	Function	Port Number	Test Pressure	Function
1	500 psi (3447.5 kPa/ 34.5 bar)	(Oil)Transmission Shift Drain	7	500 psi (3447.5 kPa/ 34.5 bar)	(Oil) Reverse
2	150 psi (1034.3 kPa/ 10.34 bar)	(Air) Throttle	8	500 psi (3447.5 kPa/ 34.5 bar)	(Oil) Forward
3	150 psi (1034.3 kPa/ 10.34 bar)	(Air) Service Brake	9	500 psi (3447.5 kPa/ 34.5 bar)	(Oil) Pressure
4	150 psi (1034.3 kPa/ 10.34 bar)	(Air) Park Brake	10	500 psi (3447.5 kPa/ 34.5 bar)	(Oil) First
5	150 psi (1034.3 kPa/ 10.34 bar)	(Air) Service Supply	11	500 psi (3447.5 kPa/ 34.5 bar)	(Oil) Second
6	150 psi (1034.3 kPa/ 10.34 bar)	(Air) Auxilliary Supply	12	500 psi (3447.5 kPa/ 34.5 bar)	(Oil) Third

END OF TASK

DEMOUNTING AND MOUNTING SUPERSTRUCTURE

TOOLS: General mechanic's tool kit: automotive (5180-00-177-7033)
 Torque wrench tool kit (5180-01-284-8747)
 1-7/8 inch socket
 Cribbing, planking, block, tiedown chain cables, straps, etc., must be available to stabilize the removed superstructure on its transport vehicle or in its stowed location.
 Lifting device (26.5 ton capacity)

SUPPLIES: Bolts, 1-1/4 in. x 7 in. (Item 162, Appendix B) (40 Required)
 Nuts (Item 269, Appendix B) (40 required)

EQUIPMENT CONDITIONS: Crane on flat level surface.
 Boom over front retracted and horizontal.
 (Refer to TM 5-3810-306-10.)
 Hook block assembly removed. (Refer to TM 5-3810-306-20.)
 Overhaul ball removed. (Refer to TM 5-3810-306-20.)
 All cable rewound onto hoist drums.
 (Refer to TM 5-3810-306-20.)
 Outriggers retracted and pads stowed.
 (Refer to TM 5-3810-306-10.)

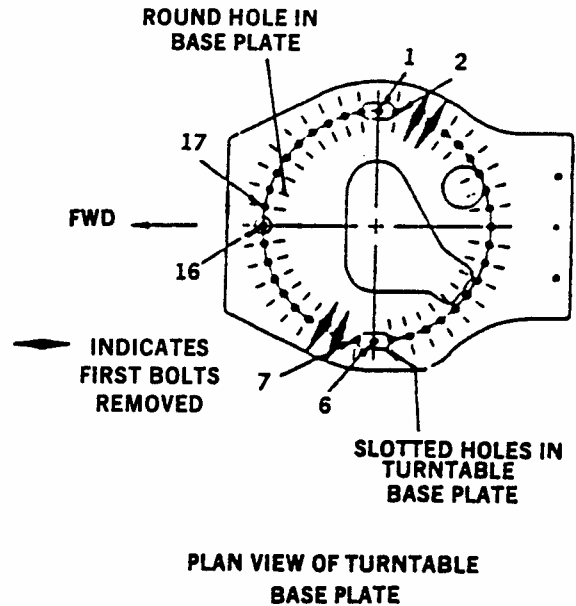
REMOVAL:

1. REMOVE TURNTABLE MOUNTING BOLTS
 1-40 EXCEPT FOR 1, 2, 6 AND 7.

CAUTION

When swinging boom over rear during bearing bolt removal, the boom must be raised enough to clear the carrier structure and so the operator can see the right side of the turntable.

- a. With superstructure rotated 4-1/2 degrees to right, from straight over front, four inner ring bearing bolts 1, 2, 6 and 7 are visible through elongated holes on each side of turntable base plate. Mark these four bolts but do not remove them until all of the following steps are completed.

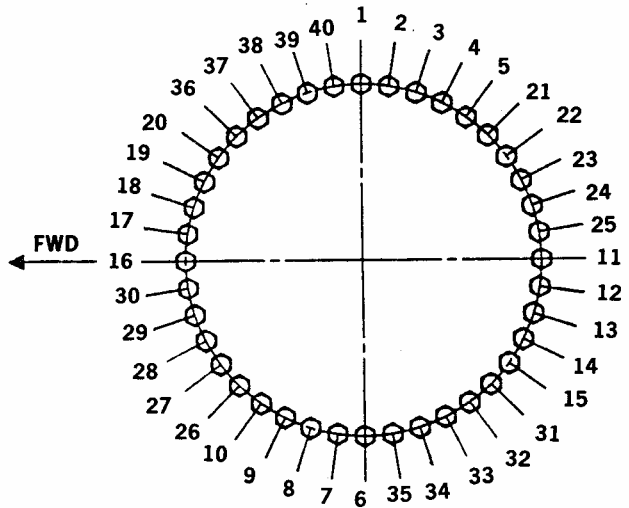


- b. Using crane power, rotate superstructure 18 degrees to right or left of initial position in Step a above, exposing pairs of unmarked bearing bolts in elongated holes on each side of turntable base plate. If the bolts on left side, under cab, can be reached with available tool combination, begin by removing these four (4) bolts (3, 4, 8 and 9 or 34, 35, 39 and 40). Continue rotating the boom in 18-degree increments in same direction and remove all turntable bolts, except 1, 2, 6 and 7 marked previously. If the bolts are tight in holes, after nuts have been removed, tap them out using a hammer.
- c. Alternately, if a multiplier-torque wrench combination, air impact or hydraulic wrench is to be used, and lacks vertical space on left side under the cab, all bolts may be removed through the elongated holes on right side of turntable. Remove all bolts, except 1, 2, 6 and 7, in any sequence.
- d. After all bolts except 1, 2, 6 and 7 have been removed, swing boom back to initial 4-1/2 degrees to the right of boom straight over front position. (Bolts 1, 2, 6 and 7 are again exposed through elongated holes in turntable base plate.) If vertical height of tool combination prohibits removal of bolts 6 and 7 from under the cab on the left side of turntable, break the torque of these two bolts when boom is to right of straight over rear position. Leave bolts 6 and 7 snug until final removal in steps below.

2. SUPPORT SUPERSTRUCTURE WITH SUITABLE HOIST.

NOTE

Suitable material handling equipment as noted above must now be employed to demount the superstructure.



- a. Using a four fall sling with single apex positioned above superstructure longitudinal c.g., approximately 28 inches to rear of center of rotation, connect each fall to a superstructure sling eye.

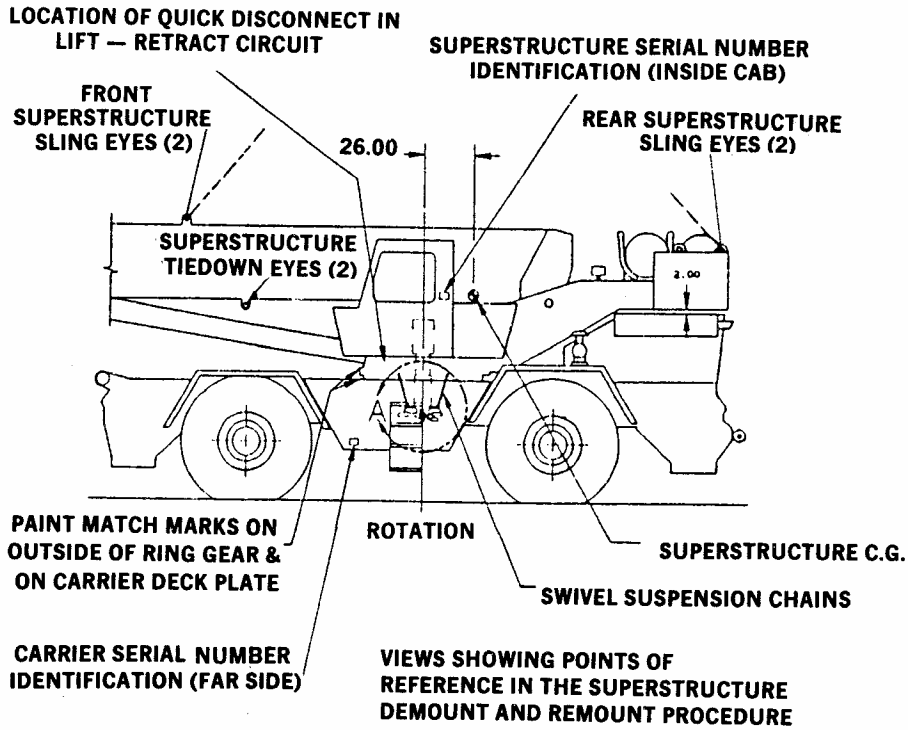
NOTE

For superstructure sling eye locations, refer to Shipping Data Plate or Transportability Data drawing (E6-829-008730).

- b. Hoist up to remove slack from sling falls.
 - c. Remove two bolts 7 and 2.
 - d. Center boom over front, engage swing lock, lower boom to horizontal and turn off engine.
3. DISCONNECT NEGATIVE BATTERY CABLE AT SHUNT. (REFER TO TM 5-3810-306-20.) (RT875CC) PLACE BATTERY DISCONNECT SWITCH IN OFF POSITION.
 4. DISCONNECT QUICK COUPLER AT BASE END OF LIFT CYLINDER.

CAUTION

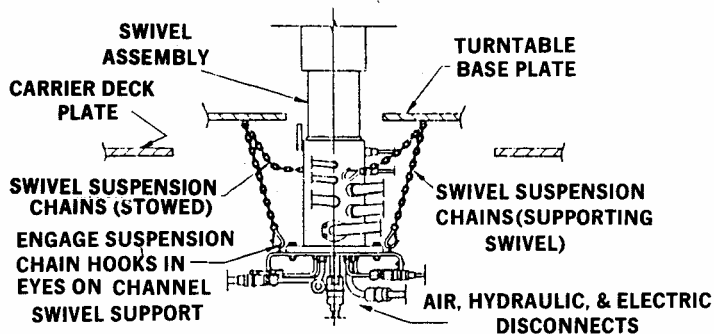
Failure to break this line at disconnect may result in boom raising when superstructure is lifted.



- a. Disconnect quick coupler provided in lift - retract circuit located between turntable side plates at base end of lift cylinders. Breaking this line effectively blocks any possible leakage past lift control valve spool which would allow boom to raise during superstructure demount.
- b. Install dust caps to cover quick coupler ends to avoid entrance of dirt.

5. SUPPORT SWIVEL WITH SUSPENSION CHAINS.

- a. From underneath crane, centerline of rotation, find four (4) swivel assembly suspension chains in their stowed positions wrapped around swivel barrel.
- b. Detach chains from their stowed positions. The upper ends of these chains are secured to underside of superstructure turntable base plate.



- c. Engage hooks on lower ends of chains in four eyes provided on corners of carrier swivel support channel.

6. PURGE AIR TANKS, DISCONNECT AIR AND HYDRAULIC QUICK DISCONNECTS.

- a. Purge air reservoirs (Refer to TM 5-3810-306-20.)
- b. Uncouple five air and nineteen hydraulic quick disconnect fittings and three electrical conduit plugs on underside of swivel.

- c. Remove four 3/4 inch bolts, nuts and washers attaching the swivel support channel to supporting lugs. Save bolts, nuts and washers for use in remounting superstructure.
- d. Install dust covers on all quick disconnects.

7. REMOVE ROTATION LINKS FROM SWIVEL.

- a. Unpin and remove two rotation links between turntable base plate and swivel barrel.

CAUTION

Code mark these links so that they can be replaced in same location when remounting superstructure. Failure to do so will result in rotary misalignment of swivel assembly. These links rotate swivel barrel with turntable and are not designed to accept the weight of suspended swivel assembly.

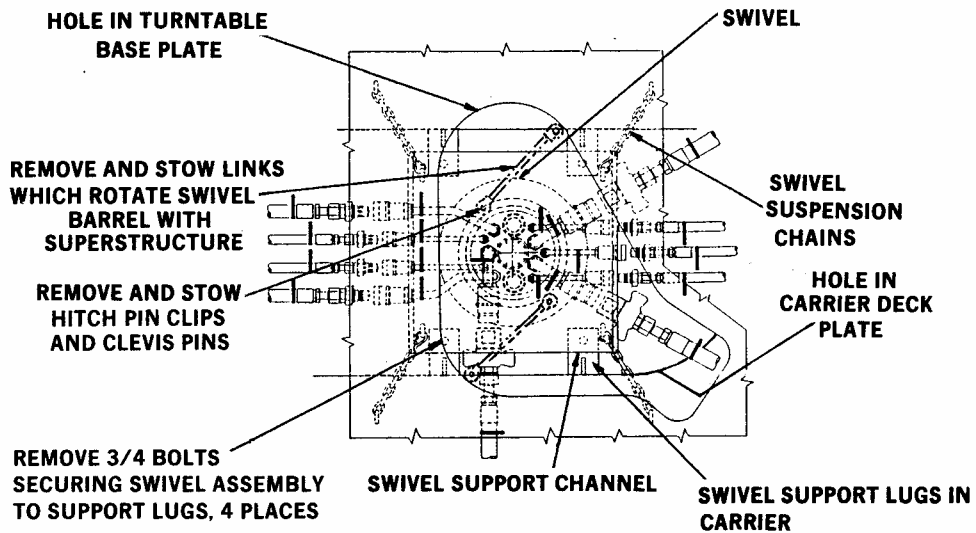
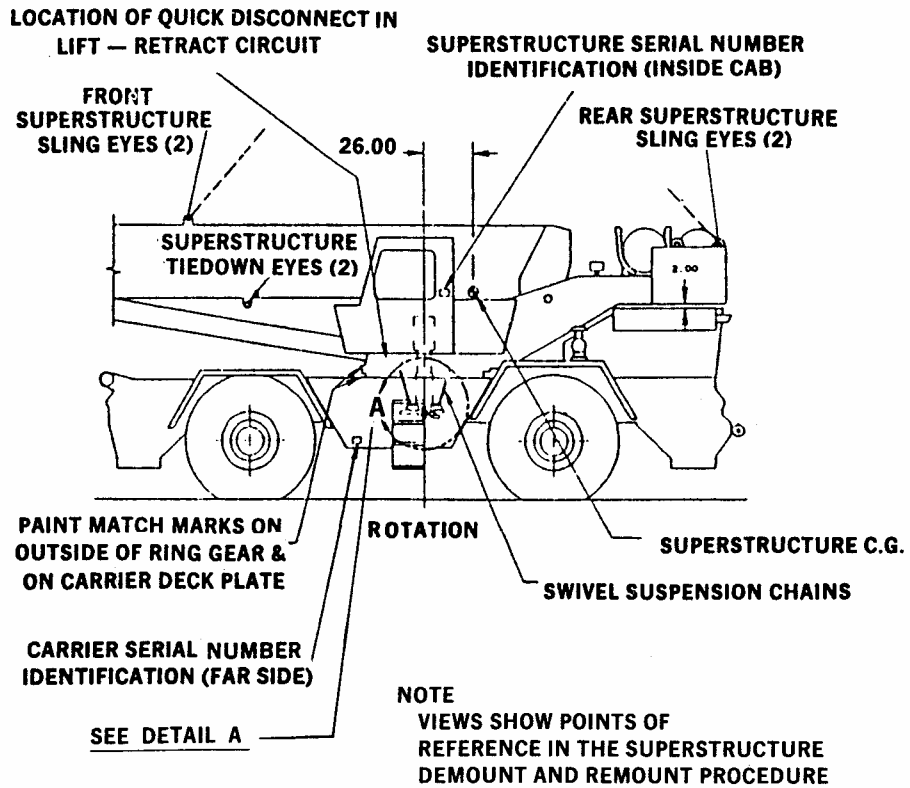
- b. Stow links and attaching hardware in tool box for use in remounting the superstructure.

8. MATCH MARK RING GEAR TO CARRIER BASE PLATE.

- a. Paint indelible match marks on outside of turntable ring gear and carrier base plate. These match marks will aid in mating the swivel assembly support channel with the support lugs in carrier frame and locating swing lock in relation to boom straight over front position.

9. ELIMINATE SLACK FROM HOIST AND REMOVE BOLTS 1 AND 6.

- a. Verify that slack is removed from sling falls and that apex is over load center-of-gravity (see 2a above).
- b. Remove final two bolts 1 and 6 securing swing bearing and ring gear to carrier deck plate.
- c. Discard all forty of swing bearing tie-down bolts and nuts.



DETAIL A

10. REMOVE SUPERSTRUCTURE FROM CRANE.

CAUTION

The crane superstructure, when lowered to a flat supporting surface, must be blocked up approximately 26 inches under turntable bearing ring to protect suspended swivel. The load is unstable when resting on bearing ring without additional supports and tiedowns. See RT875CC transportability data and shipping data plate for locations of tiedowns and supports. For semi-trailer or rail transport of crane superstructure and carrier, see Shipping Data Plate.

- a. Demount superstructure, hoisting carefully to avoid damage to the swivel assembly and surrounding hoses.

NOTE

Protect turntable bearing ring and carrier deck plate machined surfaces against damage and rust while separated.

INSTALLATION:

1. INSTALL SUPERSTRUCTURE ONTO CARRIER.

CAUTION

Forty new 1-1/4 in. 7 N.C. x 7 in. long, grade 8, bolts and nuts are required for mounting superstructure. Use the forty bearing bolt washers saved at demount, unless damaged or deformed.

CAUTION

At reassembly of crane superstructure and carrier, do not mix serial numbered components. The crane superstructure should be replaced on carrier from which it was removed.

CAUTION

Pay strict attention to proximity of counterweight to top of engine hood. Only a 2-inch space exists here, after installation, and minor rocking of superstructure during mounting could damage hood.

NOTE

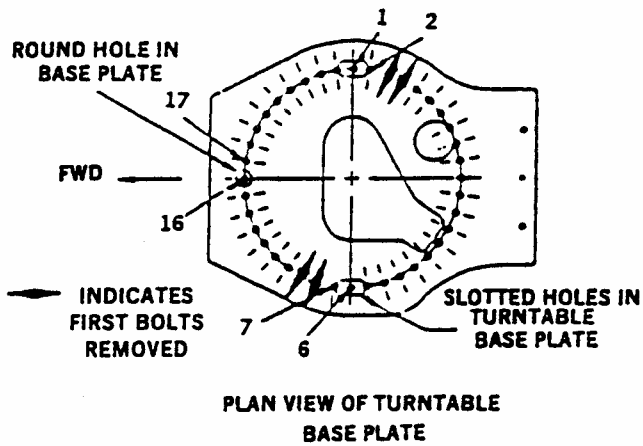
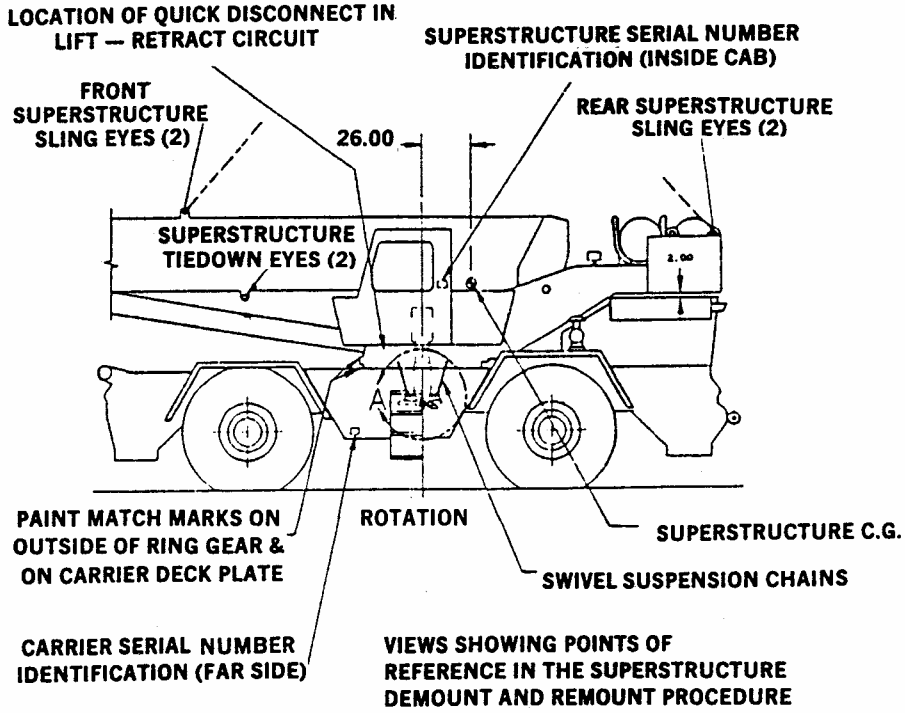
To unload crane carrier and superstructure from transport vehicles, material handling equipment of at least 26.5 ton (24,041 kg) capacity is required.

- a. Ensure crane carrier is on a flat level surface.
- b. Inspect bearing and carrier deck plate mating surfaces. Mating surfaces should be clean and dry for remounting.
- c. Position material handling boom head with suspended sling over superstructure center of gravity and connect four falls of sling to sling eyes located on the boom base section and counterweight.

NOTE

See the Shipping Data Plate (E7-376-002128) and/or the RT875CC Transportability Data (E6-829-008730) for details of superstructure slinging.

- d. Take up slack in sling falls and remove cribbing, planking, supports and superstructure tiedowns. Attach guide ropes at boom nose and/or counterweight (use for rotationally aligning superstructure with carrier during mounting).



- e. Insert three new bearing bolts with washers under heads through exposed holes in turntable bearing ring at 1, 6 and 16. These bolts will serve to align entire superstructure bearing hole pattern with matching holes in carrier deck plate.

CAUTION

Use care to avoid damaging swivel assembly which is suspended from superstructure turntable base plate.

- f. Lift and swing the suspended superstructure over crane carrier. Center boom over front and attempt to align superstructure turntable bearing ring with bearing hole pattern in carrier deck plate.
- g. Station a person on the carrier within view of match marks on front of superstructure bearing ring and carrier deck plate. Also, locate a person under carrier to center swivel assembly support channel onto its supporting lugs in carrier frame, as it is lowered into place.
- h. Lower the superstructure into close contact with the carrier deck plate. The swivel support channel will contact its supporting lugs before turntable bearing contacts carrier deck plate.
- i. Center the channel on the lugs and install four 3/4 inch bolts through the channel and lugs. Install the washers and nuts on the ends of the bolts. Do not tighten.
- j. Unhook swivel assembly suspension chains and secure together around swivel barrel.

NOTE

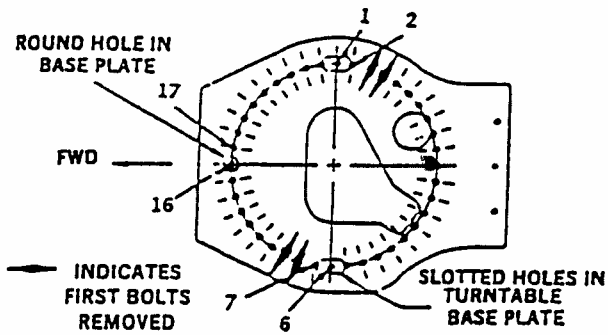
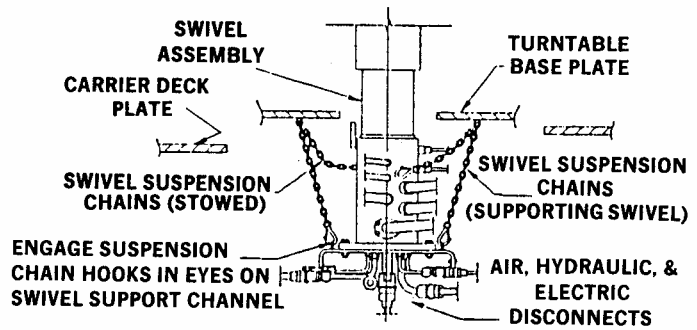
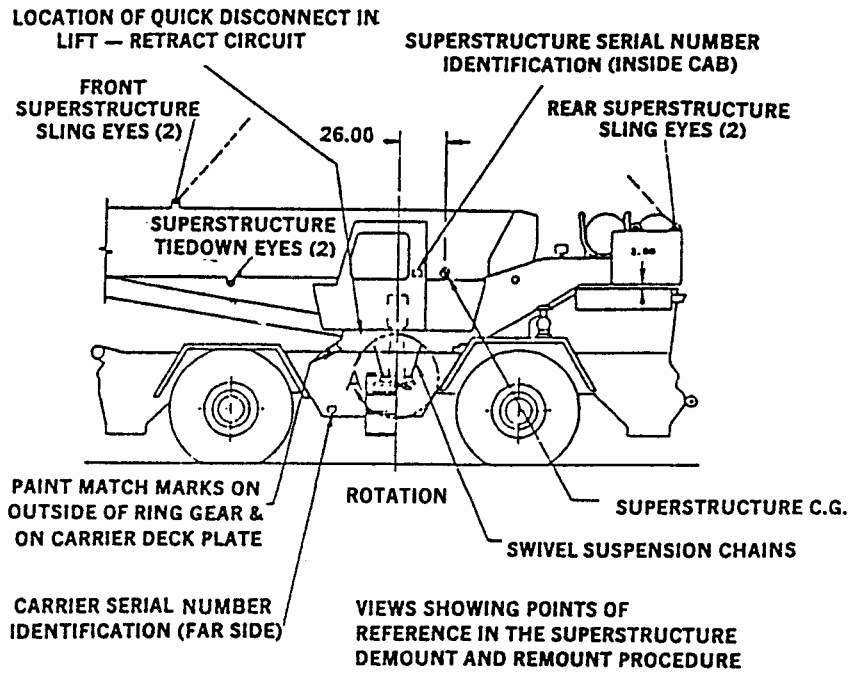
The remaining procedure to bring turntable ring gear into final contact with crane carrier deck plate involves small, precise movements of suspended superstructure.

- k. Rotate load using guide line(s) and inch swing, lift and hoist functions of the supporting equipment. The aim is to align match marks on ring gear and carrier deck plate, and finally hole patterns in two units.

NOTE

Accurate final matching of bearing hole patterns is evidenced by three bolts installed in step 1e above, dropping through carrier deck plate.

- l. Allow superstructure to settle onto crane carrier, but keep sling falls taut.
 - m. Install washers and nuts on three bolts now in place and tighten snug, but do not torque.
 - n. Tighten bolts securing swivel assembly base channel to supporting lugs in carrier frame. Tighten bolts 1/2 turn past snug-tight.
2. INSTALL ROTATION LINKS TO SWIVEL.
 - a. Reinstall drag links according to their coded locations, between turntable base plate and upper end of swivel.
 3. INSTALL AIR AND HYDRAULIC QUICK COUPLERS.
 - a. Reconnect all air and hydraulic quick couplers at base of swivel, being careful to mate aluminum tag coded ends. Uncoded ends and electrical plugs cannot be installed incorrectly and are unmarked.
 - b. Recouple the quick disconnect in the lift retract circuit.
 4. CONNECT NEGATIVE BATTERY AT SHUNT. (RT875CC) (REFER TO TM 5-3810-306-20.)
 5. PERFORM A PREOPERATIONAL CHECK OF CRANE. (REFER TO TM 5-3810-306-10.)
 6. START ENGINE AND ROTATE BOOM TO INSTALL BOLTS 2, 7 AND 17.



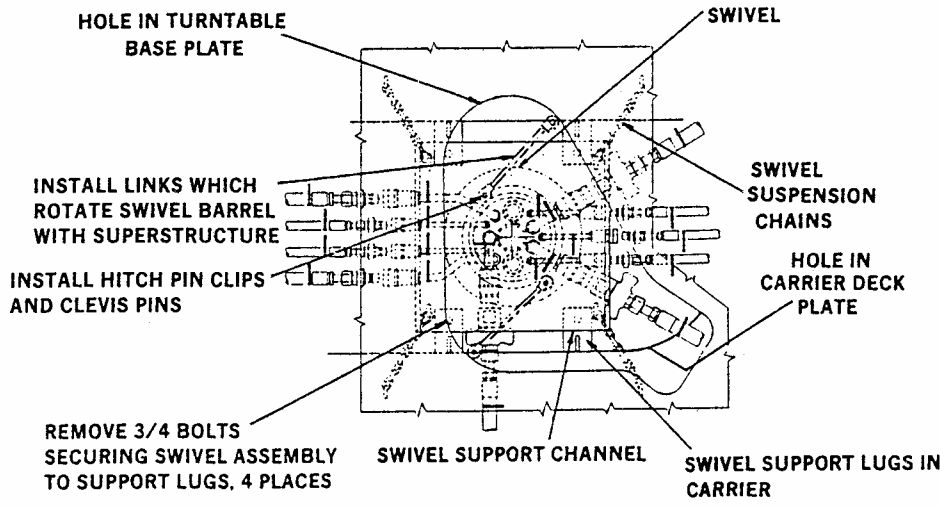
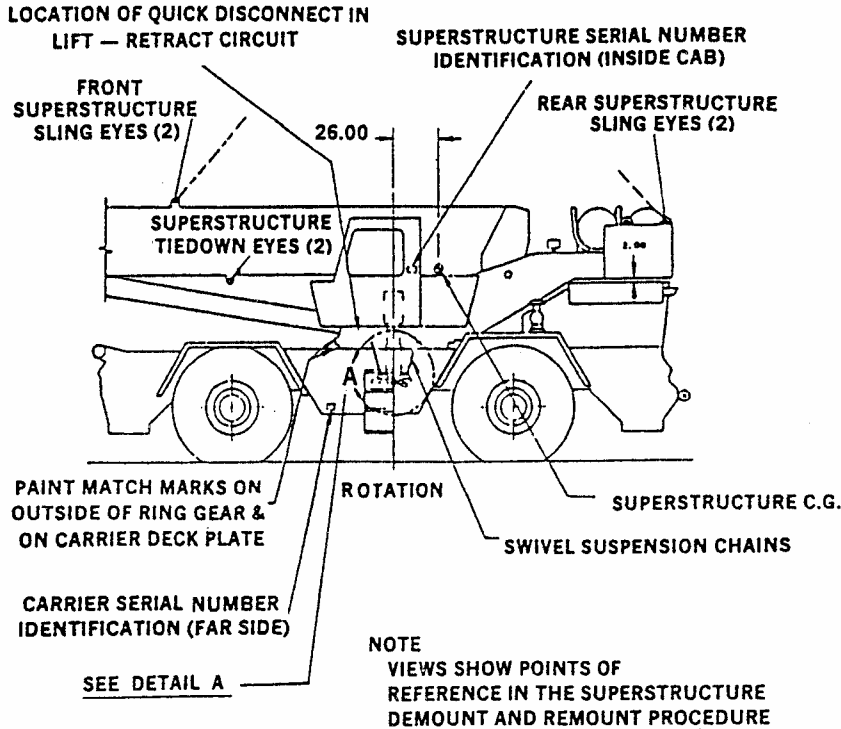
PLAN VIEW OF TURNTABLE BASE PLATE

NOTE

Each installed bearing bolt includes washers under head and nut. After initial tightening, torque all bearing bolts using available torque wrench.

- a. Start engine and swing superstructure (with sling falls still attached) 9 degrees to the right. (Refer to TM 5-3810-306-10).
 - b. Install three more bearing bolts 2, 7 and 17, with washers under heads.
 - c. Install washers and nuts and tighten snug, but do not torque.
 - d. Disconnect the material handling sling falls and remove.
7. INSTALL REMAINING BOLTS, WASHERS, AND NUTS.
 - a. Alternately swing left and right and install all remaining bearing bolts, washers and nuts.
 8. TORQUE TURNTABLE BOLTS, EXPLAINED UNDER TURNTABLE BEARING INSTALLATION. (REFER TO PAGE 15-130.)
 9. REEVE CABLE THROUGH PULLEYS. (REFER TO TM 5-3810-306-20.)
 10. INSTALL HOOK BLOCK ASSEMBLY. (REFER TO TM 5-3810-306-20.)
 11. INSTALL OVERHAUL BALL. (REFER TO TM 5-3810-306-20.)

END OF TASK



DETAIL A

ELECTRICAL SWIVEL RING INSTALLATION

TOOLS: General mechanic's tool kit: automotive (5180-00-177-7033)
Pin removal tool

SUPPLIES: Lockwashers (Item 38, Appendix B)
4" x 4" Oak lumber (Item 39, Appendix B)
Lockwashers (Item 212, Appendix B)

EQUIPMENT CONDITIONS: Outriggers extended and lowered. (Refer to TM 5-3810-306-10.)
Boom over front and elevated for access to swivel. (Refer to TM 5-3810-306-10.)
Air system purged. (Refer to TM 5-3810-306-20.)
Pressure relieved from hydraulic system. (Refer to TM 5-3810-306-20.)
Negative battery cable disconnected at shunt. (RT875CC)
Battery disconnect switch in off position. (RT875CCS)

WARNING

Be sure to wear protective eye covering to avoid personal injury.

REMOVAL:

1. SUPPORT BOOM.

- a. Measure the distance from the top of the lift cylinders to the base of the boom section where the lift cylinder attaches. Cut a piece of 4 x 4-in. (10.16 x 10.16 cm) oak to fit.

NOTE

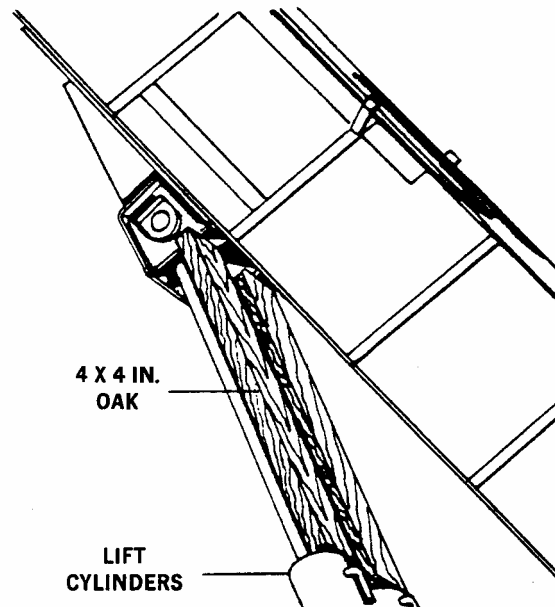
This blocking is to add extra support for the boom. Any seepage or leakage in the holding valve or internally in the cylinder will allow the boom to settle over a period of time.

- b. Use the oak blocking to block between the barrel of the lift cylinders and the boom base section.

2. DISCONNECT WIRE HARNESS CONNECTORS.

- a. Locate, tag and disconnect three connectors (14), (15) and (16) that pass through bottom of swivel.

3. REMOVE WIRE HARNESS CONNECTORS.

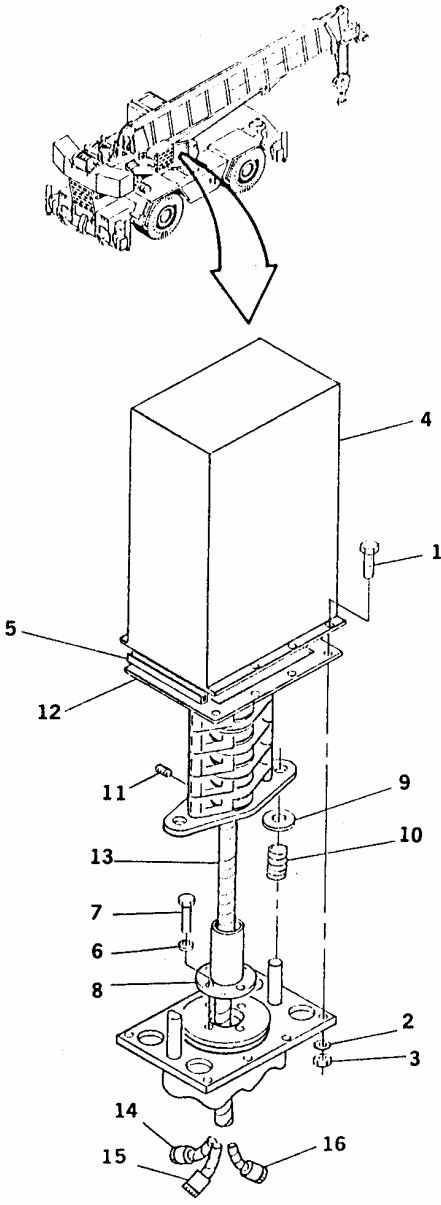
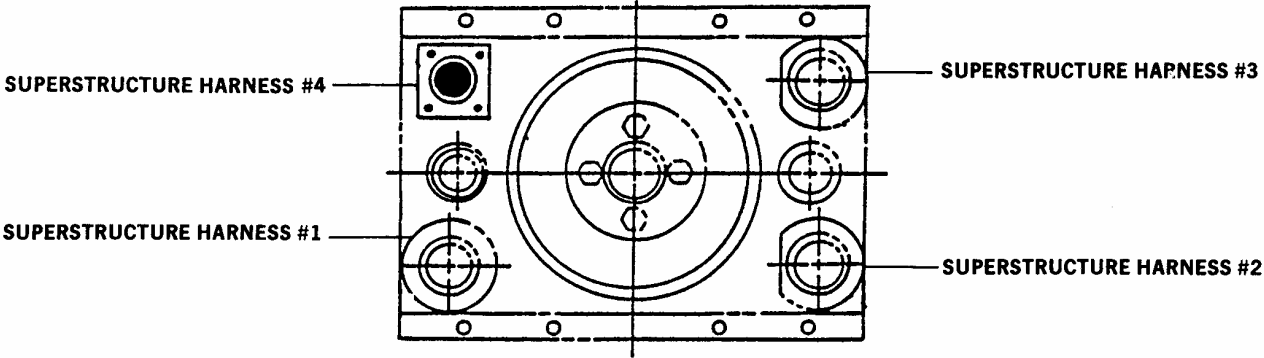


NOTE

The connectors are too large to pass through center of hydraulic and air/transmission swivels. They must be removed.

NOTE

Do not disconnect the collector ring wires crimped at the top of the swivel assembly.



- a. Cut and tag all wires approximately 6 in. away from connector (14). Collect wires and secure in a bundle. Mark bundle with connector number.
- b. Repeat step a. for connectors (15) and (16).

4. REMOVE ELECTRICAL SWIVEL.

- a. Remove eight screws (1), lockwashers (2) and nuts (3) to remove swivel cover (4) and seals (5) and (12).
- b. Tag and disconnect four superstructure harness connectors from bottom of air/transmission swivel mounting plate.
- c. Remove locknuts securing three round superstructure connector receptacles to mounting plate. Note position of each connector.
- d. Remove four screws, lockwashers, washers and nut securing superstructure harness No. 4 connector to mounting plate.
- e. If necessary remove bolts (7) and lockwashers (6) attaching center post (8) to air/transmission swivel spool.
- f. Loosen three setscrews and remove electrical swivel, wiring harness (13), washers (9) and springs (10) from air/transmission swivel.

INSTALLATION:

1. INSTALL WIRING HARNESS.

- a. Attach a guide wire to end of wiring harness (13) and pull wiring harness through center of air/transmission and hydraulic swivels.

2. INSTALL ELECTRIC SWIVEL.

- a. If removed, install bolts (7) and lockwashers (6) securing center post (8) to spool of air/transmission swivel.
- b. Install springs (10) and washers (9) over pins on mounting plate.

- c. Position the swivel mounting bracket over washers (9), springs (10) and pins on mounting plate.
- d. Loosen setscrews (11) securing collector core to center post (8).

NOTE

Prior to tightening setscrews (11) in collector core, rotate swivel ring until area definition switch cam is located in center of detent on ring.

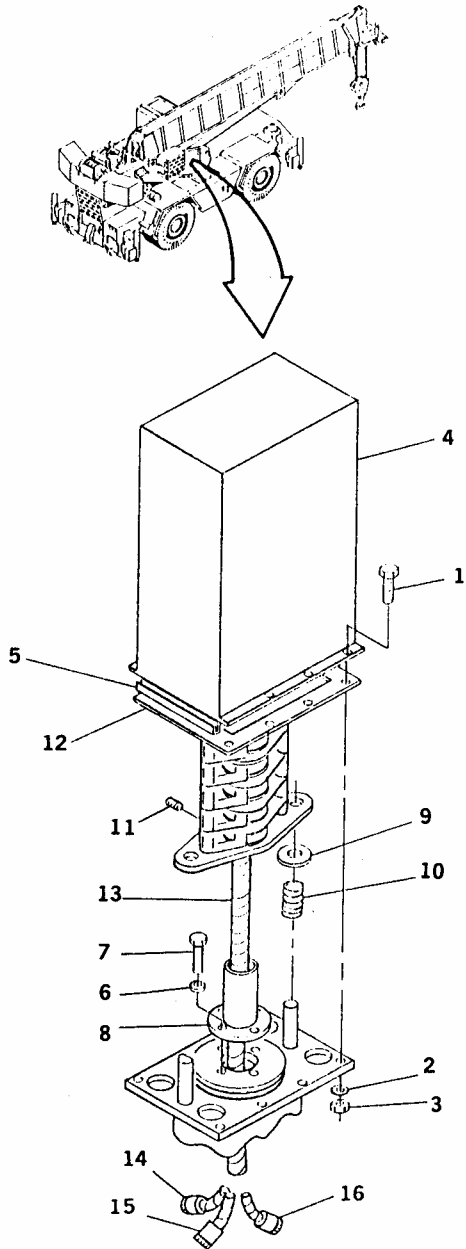
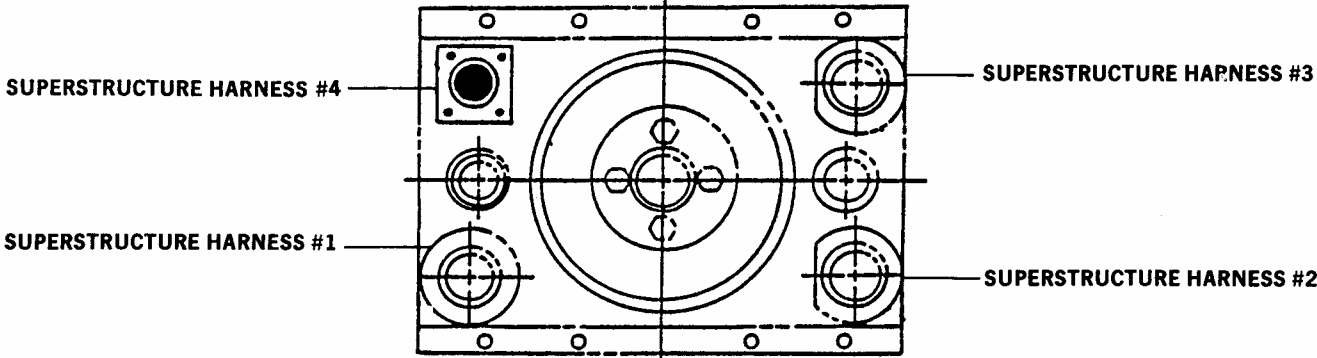
- e. Exert downward pressure on collector core and brush assembly until springs are compressed 0.5 to 0.75 in. (1.27 to 1.91 cm). Tighten three setscrews to secure collector core to center post.
- f. Install three round connector receptacles into mounting plate and secure with locknuts.
- g. Install superstructure harness No. 4 connector into mounting plate and secure with four screws, washers, lockwashers and nuts.
- h. Install swivel cover (4), seals (5) and (12), eight screws (1), lockwashers (2) and nuts (3).
- i. After collector ring harness is routed through hydraulic and air/transmission swivel connect previously tagged wires to connectors (14), (15) and (16).
- j. Connect carrier and superstructure wiring harnesses as tagged.

3. CONNECT NEGATIVE BATTERY CABLE AT SHUNT. (REFER TO TM 5-3810-306-20.) (RT875CC)

4. REMOVE BLOCKING FROM LIFT CYLINDERS.

5. CHECK FOR PROPER OPERATION.

END OF TASK



ELECTRICAL SWIVEL ASSEMBLY

ELECTRICAL TOOLS: General mechanic's tool kit: automotive (5180-00-177-7033)
Ohmmeter

SUPPLIES: None.

EQUIPMENT CONDITIONS: Electrical swivel assembly removed. (Refer to page 15-86.)

REMOVAL:

1. PRIOR TO DISASSEMBLY CHECK ELECTRICAL SWIVEL AS FOLLOWS.

NOTE

See electrical swivel slip ring chart (page 15-97) to pinpoint problem areas, and aid in disassembly and installation.

- a. Check all brushes (26) and (27) for proper contact with collector ring conductors. Note any brush sets which are oil-soaked or worn to one-half of their original length. These must be replaced.
- b. Check spring tension of each brush. Any that are damaged or weak must be replaced. Spring tension should be sufficient to firmly hold brushes against the collector ring.
- c. Inspect collector ring conductors for arcing, pitting, and corrosion. Under some conditions, ring will have a tendency to collect fine silt and in a salt atmosphere, corrosion will occur. If this happens, rotate collector core several times. This should clean the ring. If it does not, it might be necessary to clean core after disassembly.
- d. Using an ohmmeter, check the continuity between each of the collector core rings' surfaces and the electrical leads. If any conductors are defective they must be replaced.

2. TAG AND REMOVE ELECTRICAL HARNESSSES (22) AND (24).

- a. Tag and disconnect sleeves (28) and (29) and knife disconnects on the brush and arm assemblies (26) and (27) and remove harness (22).
- b. Tag and disconnect the collector ring wire connectors (15) and (16) located at the top of the swivel and remove harness (24).

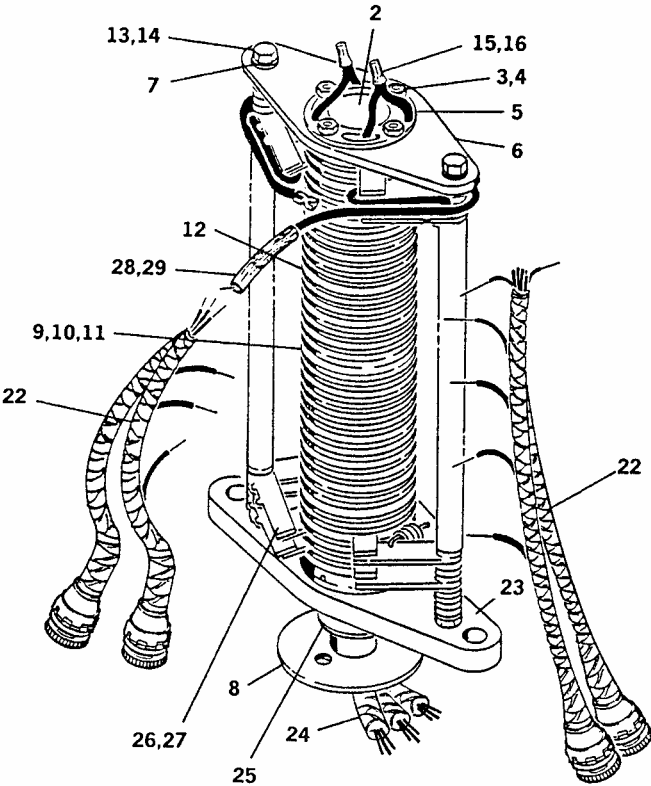
CAUTION

Ensure brush and arm assemblies are properly tagged with the corresponding circuit numbers.

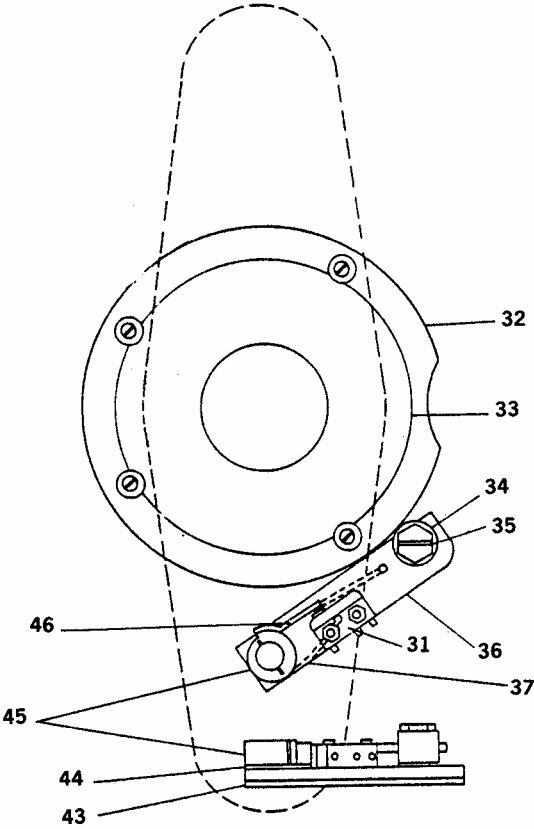
NOTE

When removing brush and arm assemblies, it will help if they are kept in order.

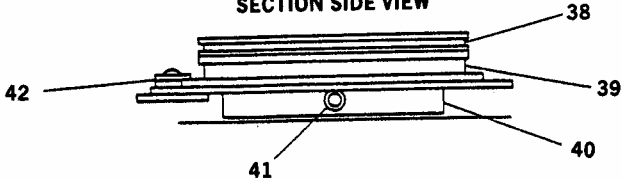
3. REMOVE BRUSH AND ARM ASSEMBLIES (26) AND (27).
 - a. Remove nuts (14) and washers (7) on brush holding studs (13).
 - b. Remove top retainer plate (6).
 - c. Remove the brush and arm assemblies (26) and (27).
4. LOOSEN SET SCREWS AND REMOVE CAM ROLLER ARM (36) AND SWITCH (31).
5. REMOVE COLLECTOR CORE (2).
 - a. Loosen setscrews securing collector core (2) to slip ring center post (8) and remove collector core (2). Retain center post (8) for reinstallation.
 - b. Remove nylon bearing (25) from mounting bracket (23).



SECTION TOP VIEW



SECTION SIDE VIEW



6. DISASSEMBLE COLLECTOR CORE (2)
 - a. Remove nuts (3) from studs (4) and remove bearing (5).
 - b. Remove spacers (9), collector rings (10) and (11), and insulators (12).
 - c. Remove spacer ring (39).
 - d. Remove cam plate (32) and retaining plate (6).
 - e. If necessary, remove retaining plate (6) from cam plate (32) by loosening clamps (42).
 - f. If necessary, remove studs (4) from holder (40).

CLEANING AND INSPECTION

WARNING

Dry cleaning solvent P-D-680, Type III is toxic and flammable. Wear protective goggles and gloves and use only in a well-ventilated area. Avoid contact with skin, eyes, and clothes and do not breathe vapors. Do not use near open flame or excessive heat. The flash point is 200°F (94°C). If you become dizzy while using cleaning solvent, get fresh air immediately and get medical aid. If contact with eyes is made, wash your eyes with water and get medical aid immediately.

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

1. IF COLLECTOR RINGS ARE CORRODED, IT MAY BE NECESSARY TO USE P-D-680, TYPE III TO CLEAN THEM. THEN LIGHTLY SAND BRUSHES WITH DOUBLE-UGHT (2/0) NONABRASIVE MATERIAL. BLOW OUT ANY DUST WITH COMPRESSED AIR.
2. ANY BRUSH SETS THAT ARE OIL SOAKED CANNOT BE CLEANED. THEY MUST BE REPLACED.

3. IF NYLON BEARING (25) IS WORN, REPLACE IT.
4. IF SWITCH CONTACTS, ROLLER (34) OR ROLLER BUSHINGS (35) ARE WORN, REPLACE THEM.

REASSEMBLY

1. ASSEMBLE COLLECTOR CORE (2).
 - a. If removed, install studs (4) in holder (40).
 - b. If removed, install retaining plate (6) on cam plate (32) and tighten clamps (42).
 - c. Install cam plate (32) and retaining plate (6) on collector core (2).
 - d. Install spacer ring (39).
 - e. Install collector rings (10) and (11), insulators (12) and spacers (9).
 - f. Install bearing (5) on studs (4) and secure with nuts (3).
2. INSTALL COLLECTOR CORE (2).
 - a. Install nylon bearing (25) in mounting bracket (23).
 - b. Install collector core (2) in mounting bracket (23) and tighten one setscrew to secure core to center post (8). (This setscrew will be loosened later).

NOTE

When assembling switch (31), ensure switch wiper (46) allows switch to make contact when in detent. Perform a continuity check.

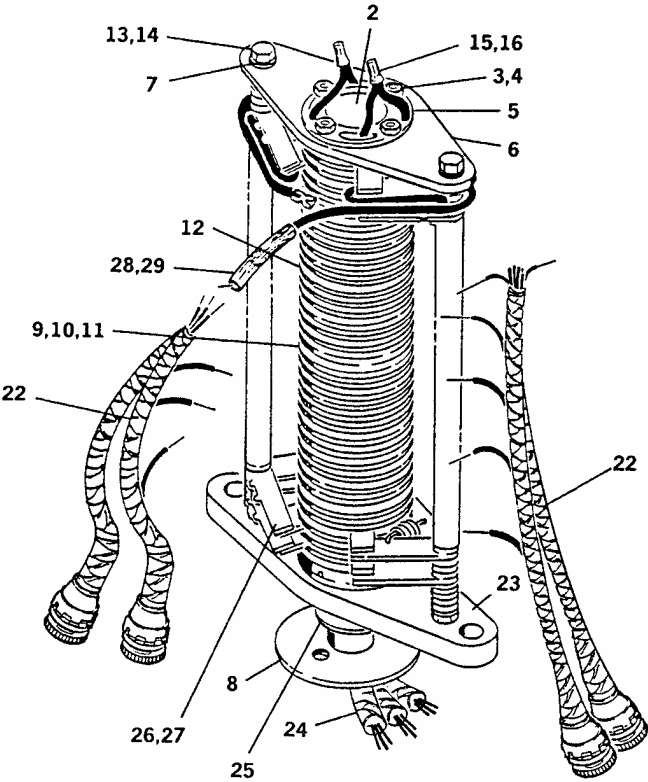
3. INSTALL CAM ROLLER ARM (36) AND SWITCH (31).

CAUTION

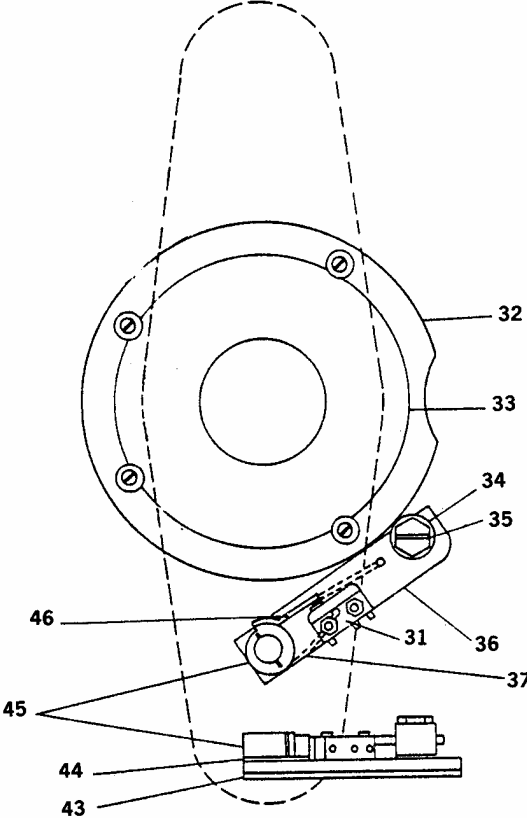
Ensure brush and arms assemblies are installed in proper order.

CAUTION

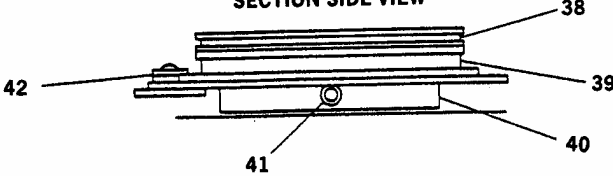
Ensure that any brush and arm assemblies that have been replaced are of proper electrical capacity.



SECTION TOP VIEW



SECTION SIDE VIEW



NOTE

When installing brush and arm assemblies, do not unhook springs. Use your fingers to spread brush arms while sliding brush and arm assemblies onto holding studs.

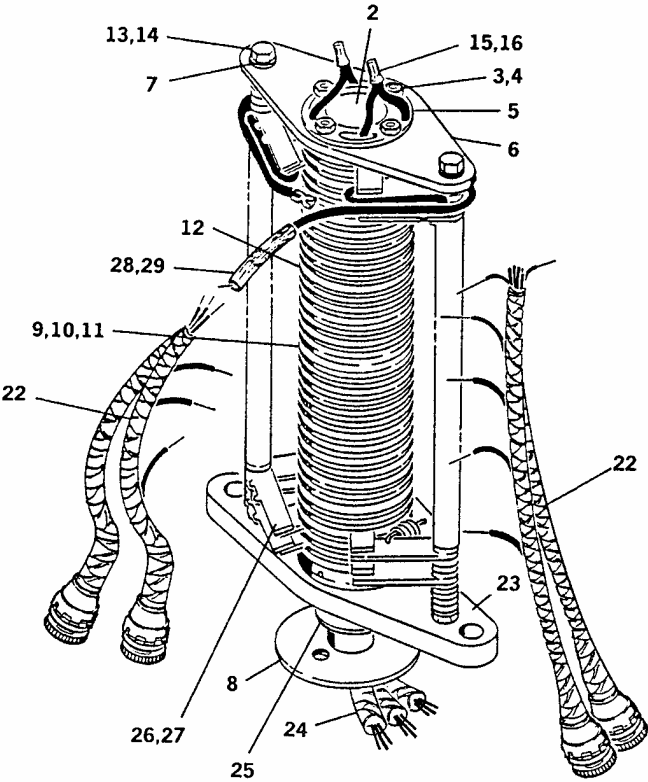
4. INSTALL BRUSH AND ARM ASSEMBLIES (26) AND (27).
5. INSTALL ANY SPACERS THAT WERE TAKEN OFF.
6. INSTALL WASHERS (7) AND NUTS (14) ON STUDS (13).

NOTE

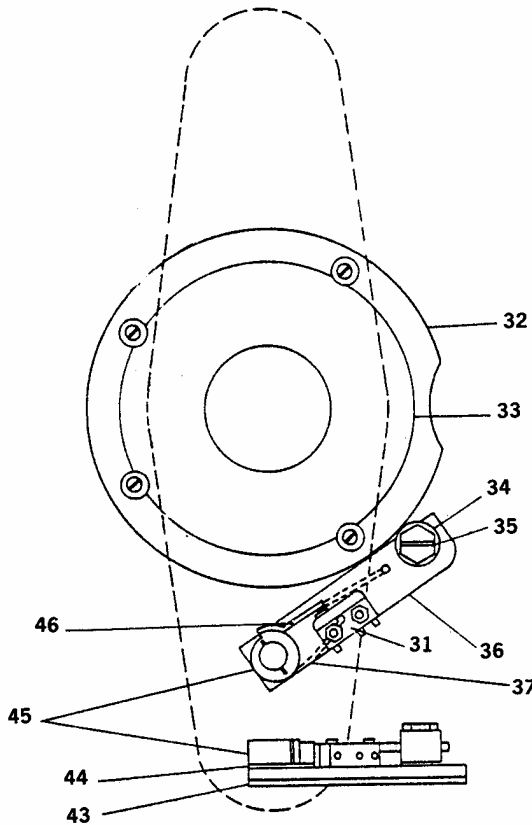
Tighten nuts (14) snugly insuring that brush and arm assemblies move freely.

7. CONNECT KNIFE DISCONNECTS ON BRUSH AND ARMS ASSEMBLIES. SLIDE PLASTIC SLEEVES OVER KNIFE DISCONNECTS.

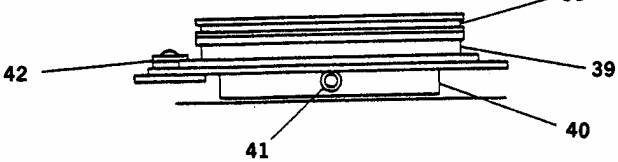
END OF TASK



SECTION TOP VIEW



SECTION SIDE VIEW



TM 5-3810-306-34

Electrical Swivel Slip Rings

Slip Ring	Rated Capacity	Circuit
1	7.5	Right front outrigger
2	7.5	Low oil pressure
3	7.5	Left front outrigger
4	7.5	Rear steer indicator
5	7.5	Right rear outrigger
6	7.5	Trans oil temperature
7	7.5	Left rear outrigger
8	7.5	High water temperature
9	7.5	Outrigger selector extend
10	7.5	Emergency steer indicator
11	7.5	Outrigger selector retract
12	7.5	Trans oil temperature
13	7.5	Right front jack cylinder
14	7.5	Water temperature
15	7.5	Left front jack cylinder
16	7.5	Oil pressure
17	7.5	Right rear jack cylinder
18	7.5	Fuel level
19	7.5	Left rear jack cylinder
20	7.5	Axle lockout
21	7.5	Emergency steer relay
22	7.5	Tachometer
23	7.5	Transmission select
24	7.5	Air dryer, fuel solenoid
25	7.5	Front/rear marker lights
26	7.5	Cold start
27	7.5	Back-up alarm
28	7.5	Starter
29	7.5	Right rear turn signal
30	7.5	Front lights
31	7.5	Left rear turn signal
32	7.5	Rear lights
33	7.5	Back-up alarm switch
34	7.5	Ground
35	7.5	Front marker and rear tail lights
36	7.5	Left front blackout headlight
37	7.5	Front park and rear park lights
38	7.5	Rear stop lights
39	7.5	Left front turn signal
40	7.5	Right front turn signal
41	60	Main power
42	60	Ground

HYDRAULIC SWIVEL ASSEMBLY

TOOLS: General mechanic's tool kit: automotive (5180-00-177-7033)
 Shop Equipment Auto-Maintenance and Repair, FM Basic (4910-00-754-0705)
 Shop Equipment Auto-Maintenance and Repair, FM Suppl No. 1 (4910-00-754-0706)
 Tool Outfit Hyd System; Test and Repair, 3/4 Ton Trailer Mtd. (4940-01-036-5784)

SUPPLIES: Hydraulic oil (Item 8, Appendix B)
 Solvent, Cleaning P-D-680, Type III (Item 1, Appendix B)
 Parts kit (Item 197, Appendix B)

EQUIPMENT CONDITIONS: Swivel removed. (Refer to page 15-64.)
 Air/transmission swivel removed. (Refer to page 15-68.)

WARNING

Be sure to wear protective eye covering to avoid personal injury.

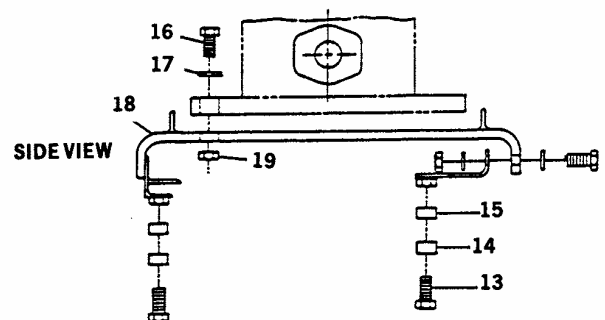
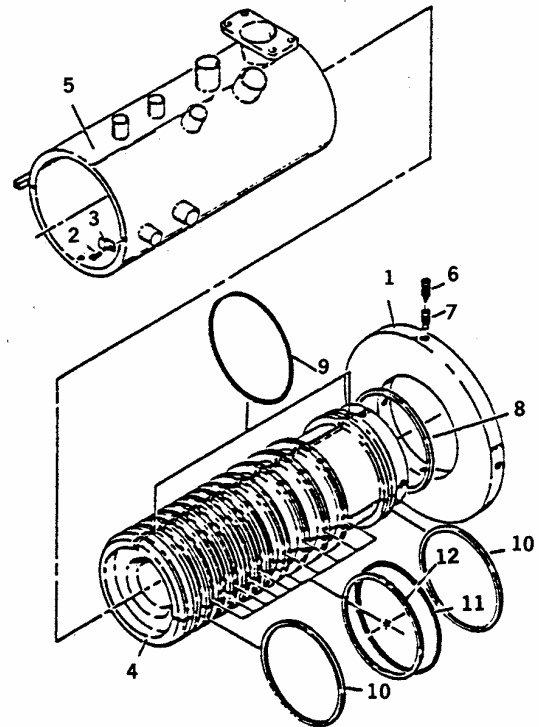
DISASSEMBLY:

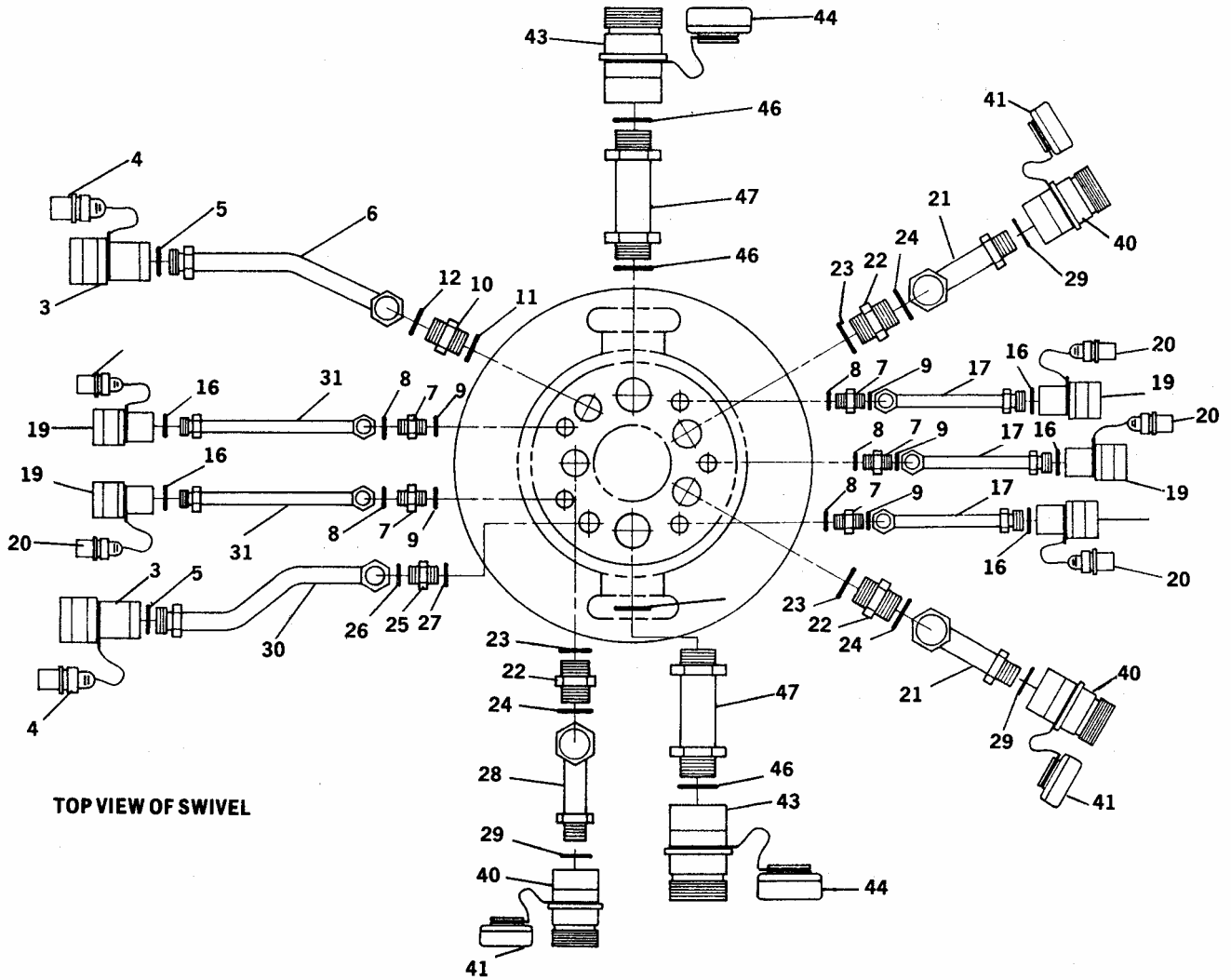
1. REMOVE RIGID PIPING FROM BOTTOM OF SWIVEL.
 - a. Remove capscrews (13), pipe clamps (14) and bolt inserts (15).
 - b. Tag and remove rigid piping from bottom of hydraulic swivel.
2. REMOVE MOUNTING CHANNEL (18) FROM HYDRAULIC SWIVEL.
 - a. Remove six capscrews (16), washers (17) and nuts (19) securing mounting channel (18) to hydraulic swivel mounting plate (1).

NOTE

Any maintenance requiring disassembly of hydraulic swivel should include replacement of all seals and rings.

3. REMOVE SPOOL (4).
 - a. Remove capscrews (2) and retaining clips (3) that secure spool (4) in the swivel case (5).
 - b. Withdraw spool (4) from swivel case (5).





TOP VIEW OF SWIVEL

NOTE

FIND NUMBERS NOT REFERENCED IN TEXT.
 ILLUSTRATION FOR CLARIFICATION OF RIGID
 PIPING INSTALLATION (SEE TM5-3810-306-24P).

NOTE

During routine maintenance it is not necessary to remove mounting plate (1). Use the mounting plate for blocking. If mounting plate is damaged, remove four screws (6) and four setscrews (7) to replace mounting plate and thrust washer (8).

- c. Place spool (4) on a clean work surface in a dust-free area and block spool to prevent movement during disassembly.

CAUTION

When removing seals and rings, avoid scratching grooved and gland surfaces.

NOTE

Aligning the discarded seals and rings in the order of disassembly will assist with installation of new seals and rings.

- 4. REMOVE AND DISCARD TWO PREFORMED PACKINGS (9), TWO SPLIT RING BEARINGS (10), TEN QUAD RINGS (11) AND BRONZE FILLED SEALS (12).

CLEANING AND INSPECTION:

WARNING

Dry cleaning solvent P-D-680, Type III is toxic and flammable. Wear protective goggles and gloves and use only in a well ventilated area. Avoid contact with skin, eyes, and clothes and do not breathe vapors. Do not use near open flame or excessive heat. The flash point is 200°F (94°C). If you become dizzy while using cleaning solvent, get fresh air immediately and get medical aid. If contact with eyes is made, wash your eyes with water and get medical aid immediately.

WARNING

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

- 1. CLEAN ALL PARTS WITH SOLVENT P-D-680, TYPE III.
- 2. CHECK SPOOL AND INSIDE OF SWIVEL CASE FOR SCRATCHES, GROOVES, SCORING, ETC. IF ANY GROOVES HAVE DEVELOPED WITH A DEPTH EXCEEDING 0.005 IN. (0.1270 MM), THE UNIT SHOULD BE REPLACED.
- 3. INSPECT RIGID TUBING FOR DAMAGE.

REASSEMBLY:

- 1. LUBRICATE SPOOL, SEALS, AND RINGS WITH CLEAN HYDRAULIC OIL.
- 2. IF REMOVED, INSTALL THRUST WASHER (8) AND MOUNTING PLATE (1). SECURE WITH SETSCREWS (7) AND SCREWS (6).

CAUTION

When installing new seals and rings, avoid stretching seals or scratching grooved or gland surfaces.

- 3. INSTALL RINGS AND SEALS.
 - a. Install two new preformed packings (9), two split ring bearings (10), ten quad rings (11) and bronze filled seals (12).

CAUTION

Proper alignment when inserting spool is required. Do not force spool into swivel case.

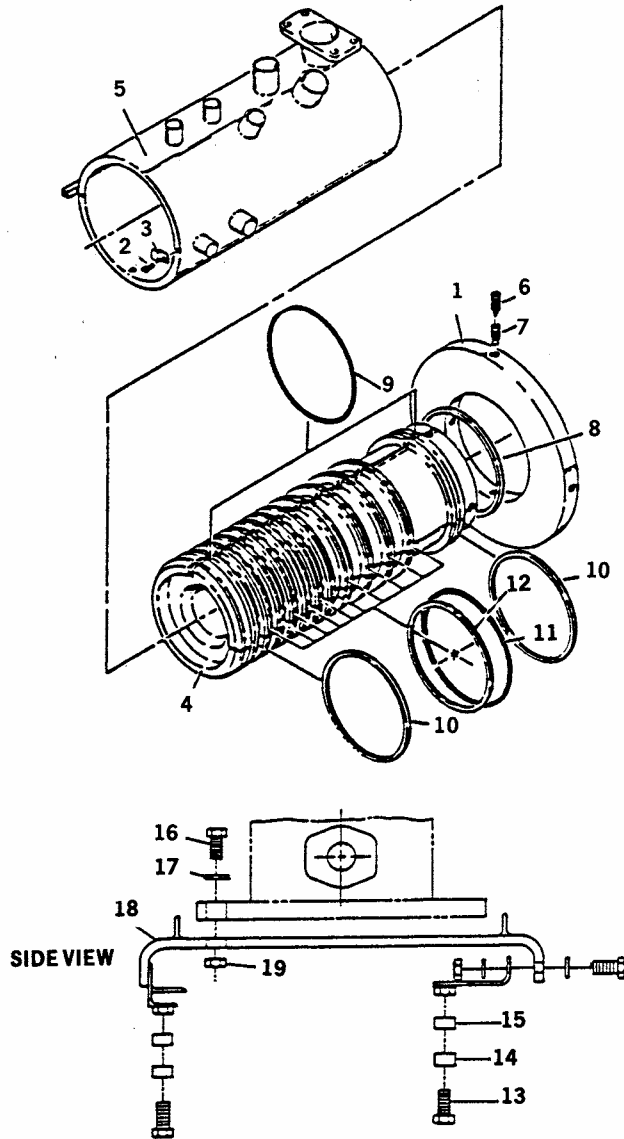
- 4. INSERT SPOOL (4) INTO BARREL (5). SECURE SPOOL TO SWIVEL CASE WITH CAPSCREWS (2) AND RETAINING CLIPS (3).

5. INSTALL MOUNTING CHANNEL (18).

- a. Secure mounting channel (18) to hydraulic swivel mounting plate (1). Secure with six capscrews (16), washers (17) and nuts (19)

6. INSTALL RIGID PIPING AND CLAMPS (14).

- a. Connect tagged piping to bottom of hydraulic swivel.
- b. Secure piping with pipe clamps (14), bolt inserts (15) and capscrews (13).



PRESSURE TEST:

NOTE

Use only 10W hydraulic oil during pressure testing.

1. PRESSURE TEST SWIVEL PORTS.

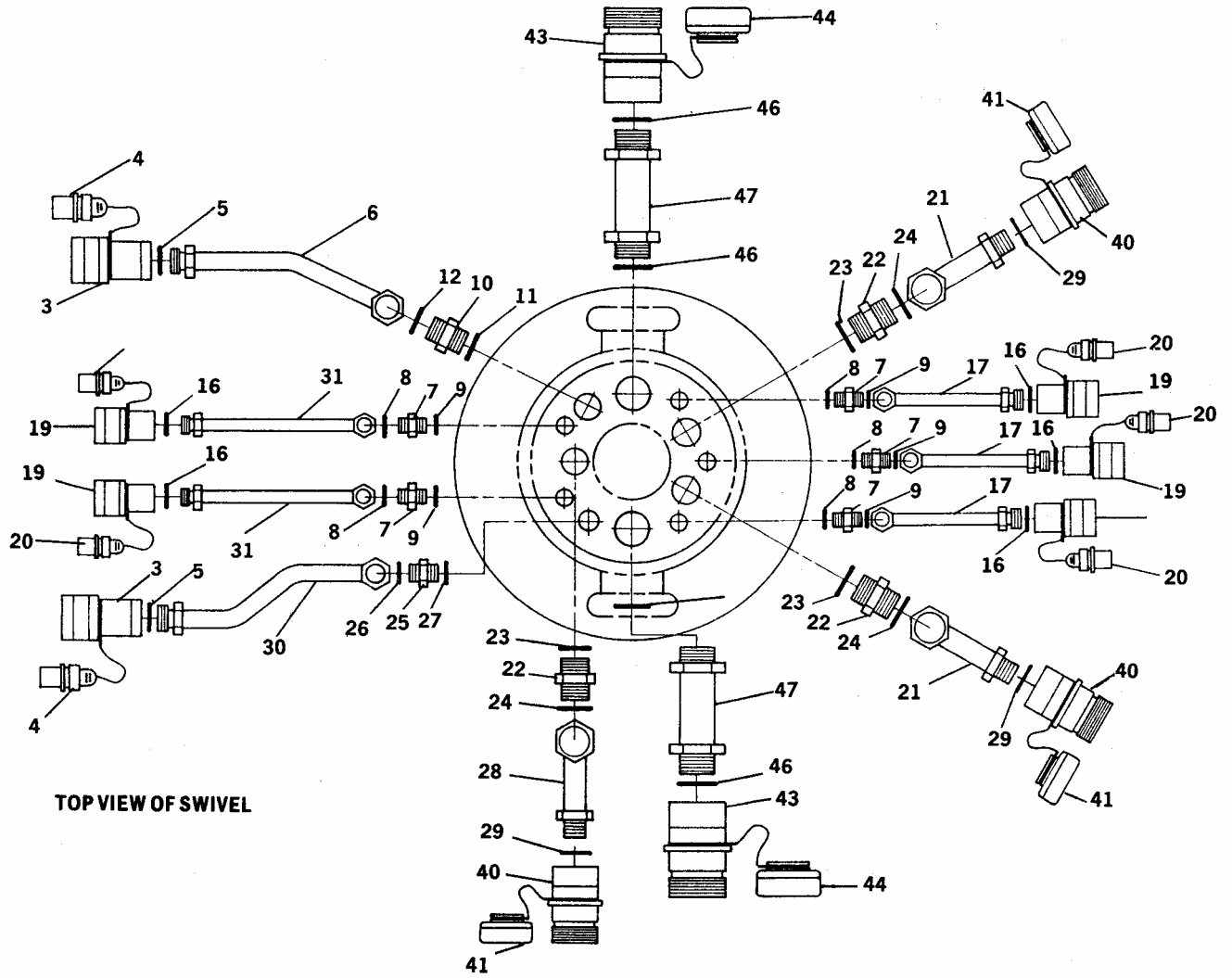
NOTE

Each port on spool (4) and barrel (5) is stamped with port number.

- a. Install a pressure gauge into a port on swivel case.
- b. Install a pressure line in corresponding port in swivel spool.
- c. Allow ports on each side of the port to be tested to vent in order to detect leakage.
- d. Pressurize port to be tested while rotating either spool or case 360 degrees.
- e. If leakage is detected, disassemble swivel and determine cause.
- f. Pressure check each port individually until all parts have been tested.
- g. Test ports with following pressures:

Port Number	Test Pressure	Function
1	500 psi (3, 447.5 kPa/ 34.5 bar)	Drain Line
2	2500 psi (17, 237.5 kPa/ 172.5 bar)	Rear Steer
3	2500 psi (17, 237.5 kPa/ 172.5 bar)	Rear Steer
4	2500 psi (17, 237.5 kPa/ 172.5 bar)	Front Steer
5	2500 psi (17, 237.5 kPa/ 172.5 bar)	Front Steer
6	2500 psi (17, 237.5 kPa/ 172.5 bar)	Front Steer Supply
7	1500 psi (10, 342.5 kPa/ 103.4 bar)	Swing
8	2500 psi (17, 237.5 kPa/ 172.5 bar)	Lift, Rear Steer, Tele
9	2700 psi (18, 616.5 kPa/ 186.2 bar)	Main Hoist and Aux. Hoist Boost
10	2700 psi (18, 616.5 kPa/ 186.2 bar)	Main Hoist Boost, Aux. Hoist and Lift
11	500 psi (3, 447.5 kPa/ 34.5 bar)	Dual Return

END OF TASK



TOP VIEW OF SWIVEL

NOTE

FIND NUMBERS NOT REFERENCED IN TEXT.
 ILLUSTRATION FOR CLARIFICATION OF RIGID
 PIPING INSTALLATION (SEE TM5-3810-306-24P).

SWING GEARBOX INSTALLATION

TOOLS: General mechanic's tool kit: automotive (5180-00-177-7033)
Lifting device (500 lb. Capacity)

SUPPLIES: None

EQUIPMENT CONDITIONS: Negative battery cable disconnected at shunt. (RT875CC)
Battery disconnect switch in off position. (RT875CCS)
Swing lock is engaged. (Refer to TM 5-3810-306-10.)
Boom fully raised and blocked. (Refer to page 15-86.)
Hydraulic system pressure relieved.
(Refer to TM 5-3810-306-20.)

WARNING

Be sure to wear protective eye covering to avoid personal injury.

REMOVAL:

1. REMOVE TWO HYDRAULIC HOSES TO HYDRAULIC MANIFOLD (5) WHICH BLOCK THE REMOVAL OF SWING GEARBOX.
2. REMOVE HYDRAULIC LINE (6) FROM TOP OF OIL COOLER AND PULL HOSE THROUGH HOLE IN SUPERSTRUCTURE OUT OF WAY OF GEARBOX.
3. REMOVE SWING GEARBOX ASSEMBLY.
 - a. Disconnect and cap hydraulic lines from swing motor and swing brake.
 - b. Remove lockwire (1), bolts (2), and washers (3) securing swing gearbox to mounting plate. Attach a suitable sling to lifting eyes on cover.
 - c. Attach an adequate lifting device to sling; remove swing gearbox.

INSTALLATION:

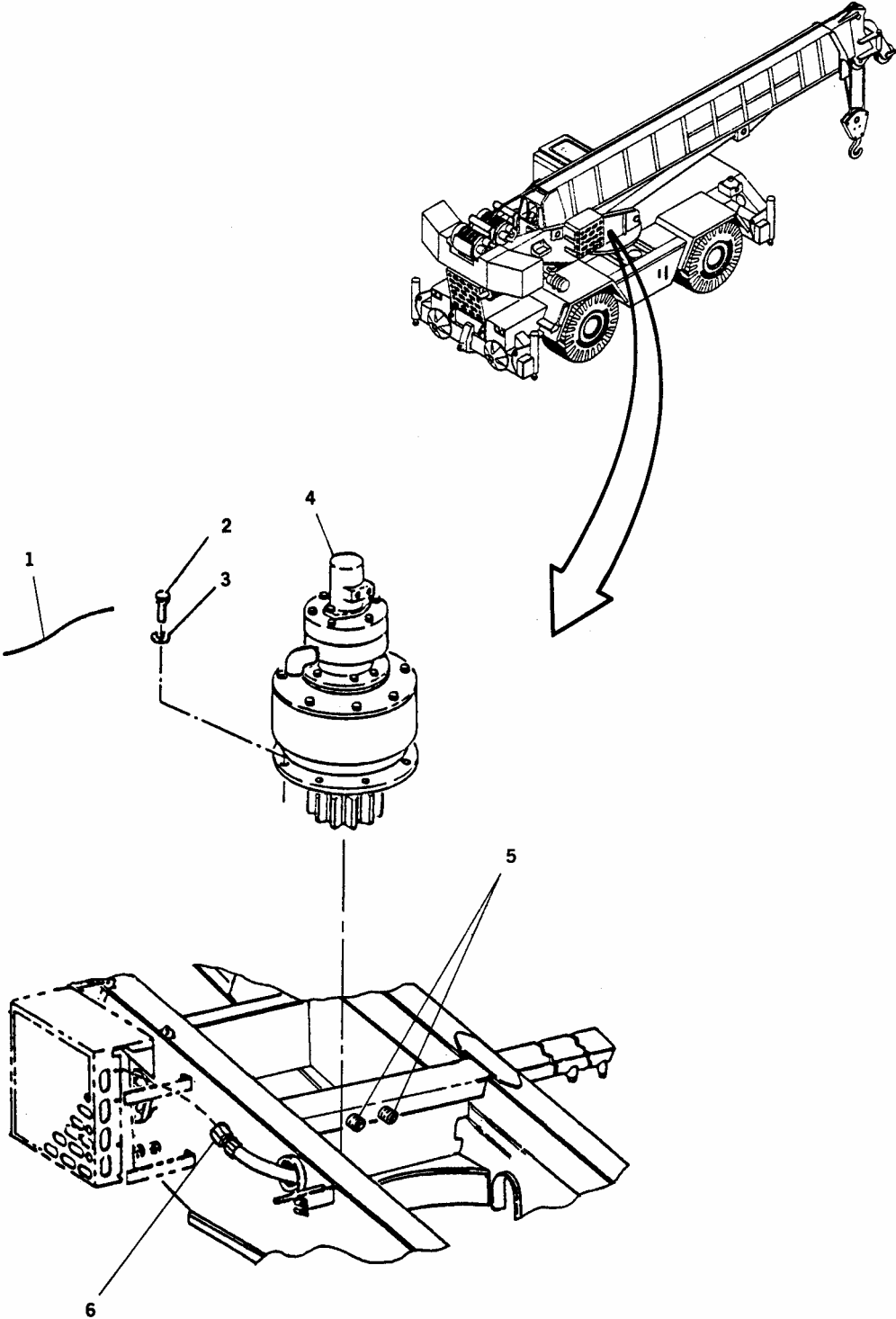
1. INSTALL SWING GEARBOX ASSEMBLY.
 - a. Attach a suitable sling to lifting eyes on swing box cover.
 - b. Using an adequate lifting device, lift and position swing box in place on mounting plate.

NOTE

If a new gearbox is being installed, the key stock welded to deck may not align with grooves in gearbox housing, therefore, some filing may be required.

- c. Install bolts (2) and washers (3). Torque to 250 ft-lbs (333 Nm). Install the lockwire (1) through bolts in direction that resists loosening.
- d. Connect the hydraulic lines to the gearbox, motor, and brake as applicable.
2. POSITION HYDRAULIC LINE (6) THROUGH HOLE IN SUPERSTRUCTURE AND CONNECT TO OIL COOLER.
3. INSTALL TWO HYDRAULIC LINES TO HYDRAULIC MANIFOLD (5).
4. CONNECT NEGATIVE BATTERY CABLE AT SHUNT. (REFER TO TM 5-3810-306-20.) (RT875CC)
5. START CRANE AND CHECK FOR LEAKS AND PROPER OPERATION.

END OF TASK



SWING GEARBOX ASSEMBLY

TOOLS: General mechanic's tool kit: automotive (5180-00-177-7033)

SUPPLIES: Lockwashers (Item 13, Appendix B) (11 Required)
Loctite 242 (Item 6, Appendix B)
Solvent, Cleaning P-D-680, Type III (Item 1, Appendix B)
Silicone sealant (Item 27, Appendix B)
Grease (Item 9, Appendix B)

EQUIPMENT CONDITIONS: Swing gearbox assembly removed. (Refer to page 15-104.)
Swing motor removed. (Refer to TM 5-3810-306-20.)
Swing brake removed. (Refer to page 15-112.)

WARNING

Be sure to wear protective eye covering to avoid personal injury.

DISASSEMBLY:

1. IF NOT ALREADY REMOVED, REMOVE LOCKWIRE, BOLTS (52) AND END CAP (51) FROM BOTTOM OF PINION (50). REMOVE PINION (50) AND SPACER (49) FROM BOTTOM OF PLANET CAGE AND SHAFT (30).

NOTE

For ease of alignment during assembly, scribe or pencil mark a line through housing cover (21) and base (40).

2. REMOVE VENT AND DRAIN PLUGS (20) AND (42). PLACE THE SWING GEARBOX ON ITS SIDE AND DRAIN IT.
3. REMOVE COVER (21).
 - a. Remove hex head bolts (22) and (17), washers (18) and lifting lugs (19) from gear housing cover (21). Remove the cover (21).
4. REMOVE PLANET CAGE AND SHAFT (30) AND BEARINGS (24), (29) AND (37).

NOTE

Ensure planet gears (28) are aligned with cutouts in gear housing (40).

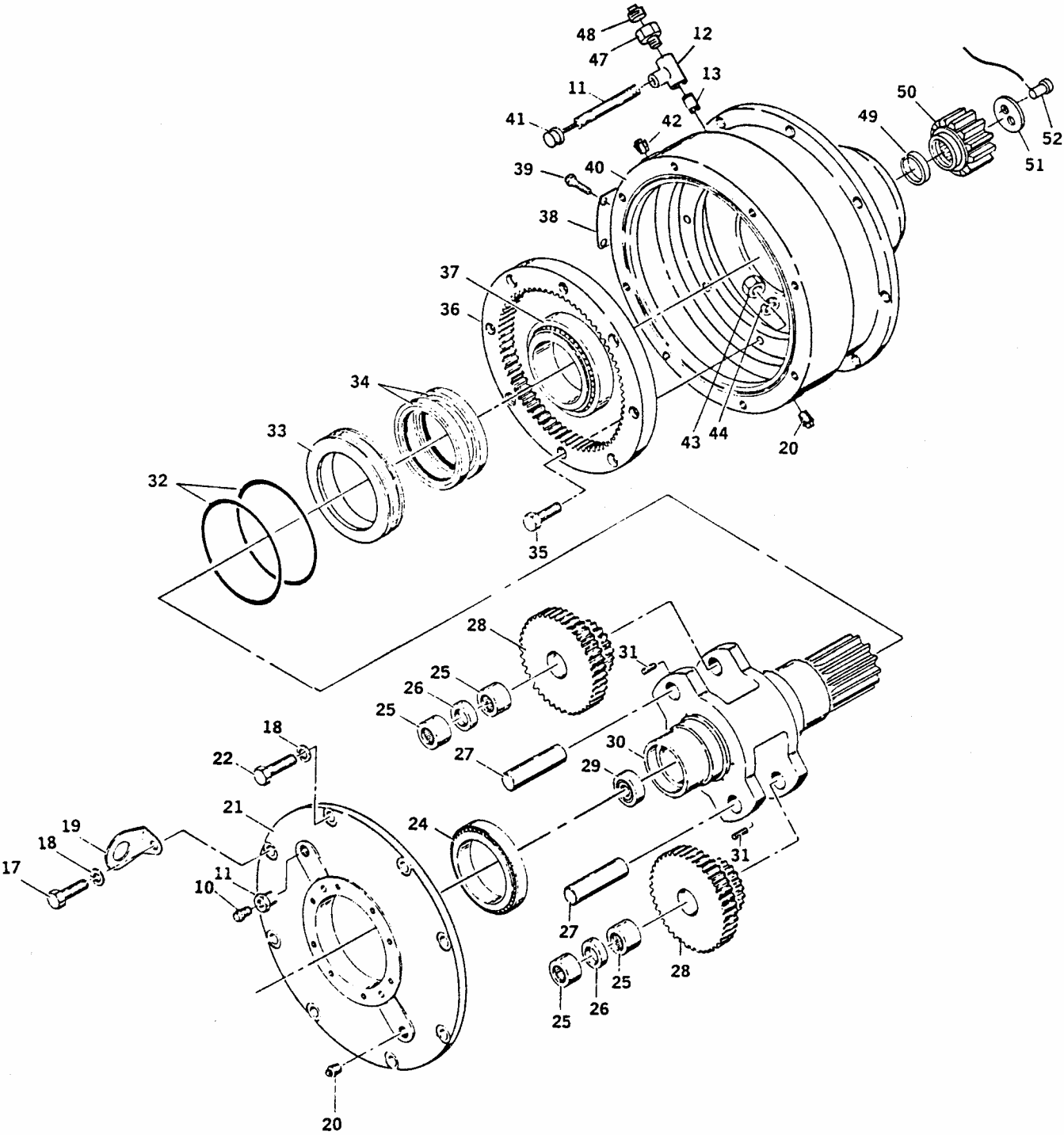
- a. Using a suitable driver, remove planet cage and shaft (30) from gear housing (40).

- b. Use a bearing puller to remove planet cage and shaft bearing (24).
- c. Using puller, remove bearing (29) from planet cage and shaft (30).

NOTE

Bearing (37) and seal retainer (33) may remain in housing (40) instead of coming out with planet shaft (30).

- d. Pull lower bearing (37) from planet shaft assembly.
 - e. Remove seal retainer (33) from planet shaft. Remove packings (32) from seal retainer. Using a press or driver, remove two seals (34) from seal retainer (33).
5. REMOVE PLANET GEARS (28), BEARINGS (25) AND SPACERS (26) FROM PLANET CAGE (30).
 - a. The length of roll pins (31) is slightly less than diameter of planet shafts (27). Use a punch to carefully drive roll pins (31) into planet shafts (27) until planet shafts can be removed. Ensure pins do not engage lip of shafts on inside.
 - b. Tap planet shafts (27) from planet gears (28) and planet cage assembly (30). Remove planet gears (28).



NOTE

After planet gear shafts have been removed, roll pins can be tapped out and re-used if they are serviceable.

- c. Using a press or driver, remove both bearings (25) and spacer (26) from each planet gear.
- d. If the internal gear (36) needs to be serviced, remove capscrews (35), lockwashers (44) and locknuts (43); otherwise just ensure they are properly torqued to 75 ft-lbs (100 Nm).
- e. If the bearing (37) and seal retainer (33) remained in housing (40), use a puller or driver and remove from housing (40).
- f. Turn housing (40) and, using a brass rod and mallet, remove lower shaft bearing outer race.

CLEANING AND INSPECTION:

WARNING

Dry cleaning solvent P-D-680, Type III is toxic and flammable. Wear protective goggles and gloves and use only in a well ventilated area. Avoid contact with skin, eyes, and clothes and do not breathe vapors. Do not use near open flame or excessive heat. The flash point is 200°F (94°C). If you become dizzy while using cleaning solvent, get fresh air immediately and get medical aid. If contact with eyes is made, wash your eyes with water and get medical aid immediately.

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

- 1. CLEAN ALL PARTS IN SOLVENT P-D-680, TYPE III.

- 2. INSPECT GEAR TEETH FOR CRACKS AND DAMAGE.
- 3. INSPECT BEARINGS AND RACES FOR SCORING AND WEAR.
- 4. INSPECT PLANET SHAFTS FOR WEAR.

REASSEMBLY:

NOTE

Prior to assembly, clean all components with a non-residue type solvent.

- 1. IF REMOVED, INSTALL INTERNAL GEAR (36) USING CAPSCREWS (35), LOCKWASHERS (44), AND LOCKNUTS (43). TORQUE TO 75 FT-LBS (100 NM).
- 2. PRESS OUTER BEARING RACE IN GEAR HOUSING (40).
- 3. INSTALL BEARING (37) AND SEAL RETAINER (33).
 - a. Lubricate bearing (37) with MIL-G-10924 and place it in bearing race.

NOTE

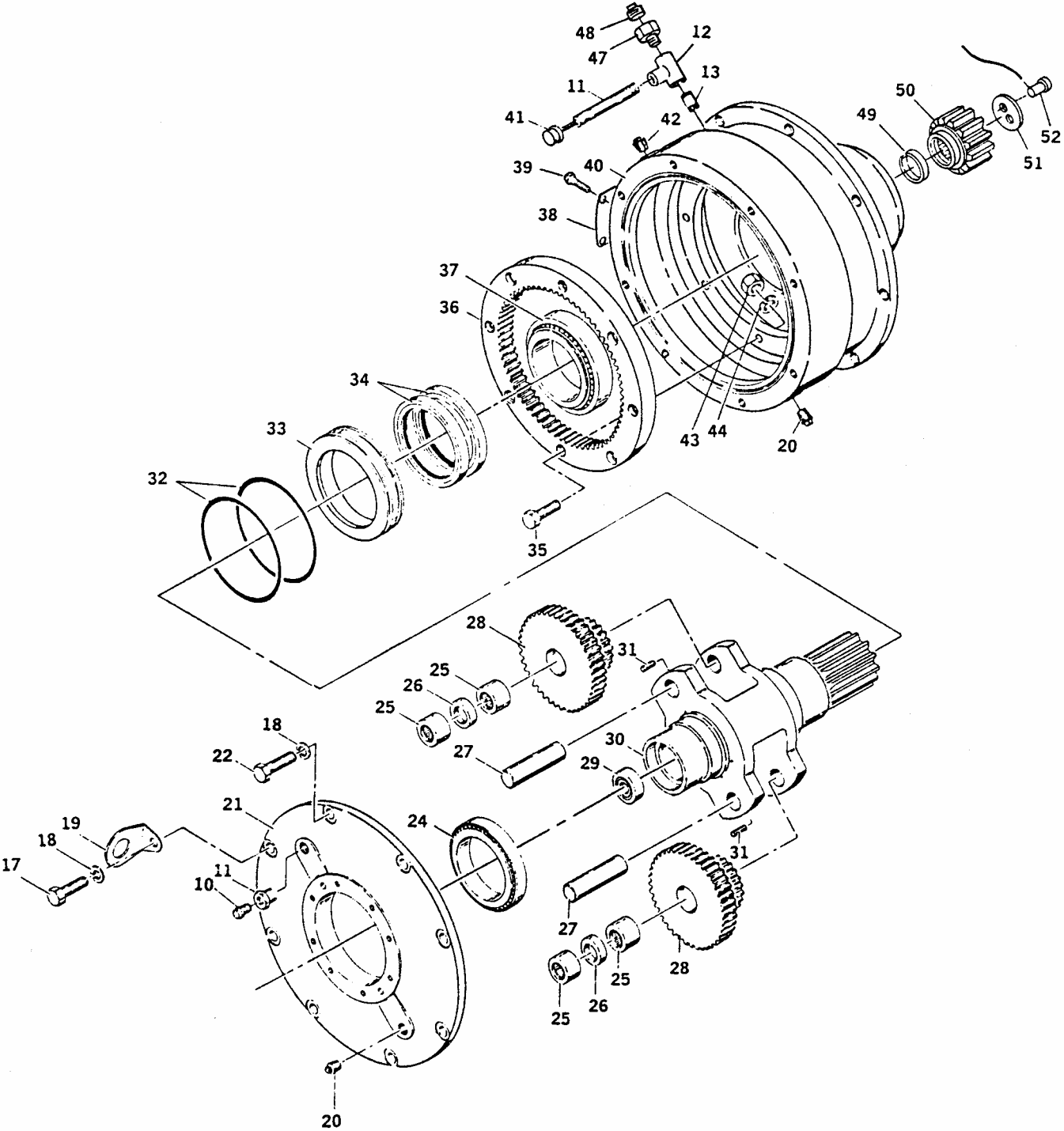
Install seals (34) in retainer (33) with lip of seals facing up.

- b. Use a seal driver to install seals (34) in seal retainer (33). Lubricate packings (32) with clean hydraulic oil; then place them on outside of seal retainer (33).

NOTE

Place seal retainer (33) in housing (40) with lip of seals (34) down.

- c. Lubricate seal retainer (33) with MIL-G-10924 and place it in housing (40). Use a driver to seat it in position.
- 4. INSTALL BEARINGS (29) AND (24).
 - a. Press support pinion and shaft bearing (29) in planet cage and shaft (30).



- b. Pack bearing (24) with grease and press on planet cage and shaft (30).
5. INSTALL PLANET GEARS (28).
- a. Use a press to install planet shaft bearings (25), bearing spacers (26), and the other planet shaft bearings (25) in planet gears (28).
 - b. Each planet gear has a timing mark (punch hole). Locate timing mark and scribe or mark a line on other side of gear that will be visible when looking down through planet cage and shaft.
 - c. Align bores of planet gears (28) with those of planet cage and shaft (30). Carefully tap planet shafts (27) in bores, also aligning bores for roll pins (31).
 - d. Tap in roll pins (31) until they are almost flush with planet cage and shaft (30).
 - e. Using a drift punch, drive roll pins (31) into planet cage and shaft (30).
 - f. Turn the planet gears (28) until the timing marks are directly across from each other.

NOTE

Maintain timing marks aligned while installing planet cage and shaft assembly. This will allow planet gears (28) to mate with internal gear (36).

6. INSTALL PLANET CAGE AND SHAFT (30).
- a. Lubricate planet cage and shaft assembly (30) and install into gear housing. A slight force may be needed to push shaft through seal retainer (33) and bearing (37). It may be necessary to slightly move planet gear (28) to align with internal gear (36).
7. INSTALL COVER (21).

NOTE

Apply Loctite # 242 to bolts (17) and (22) during assembly.

NOTE

Do not tighten any of cover bolts until all bolts are installed.

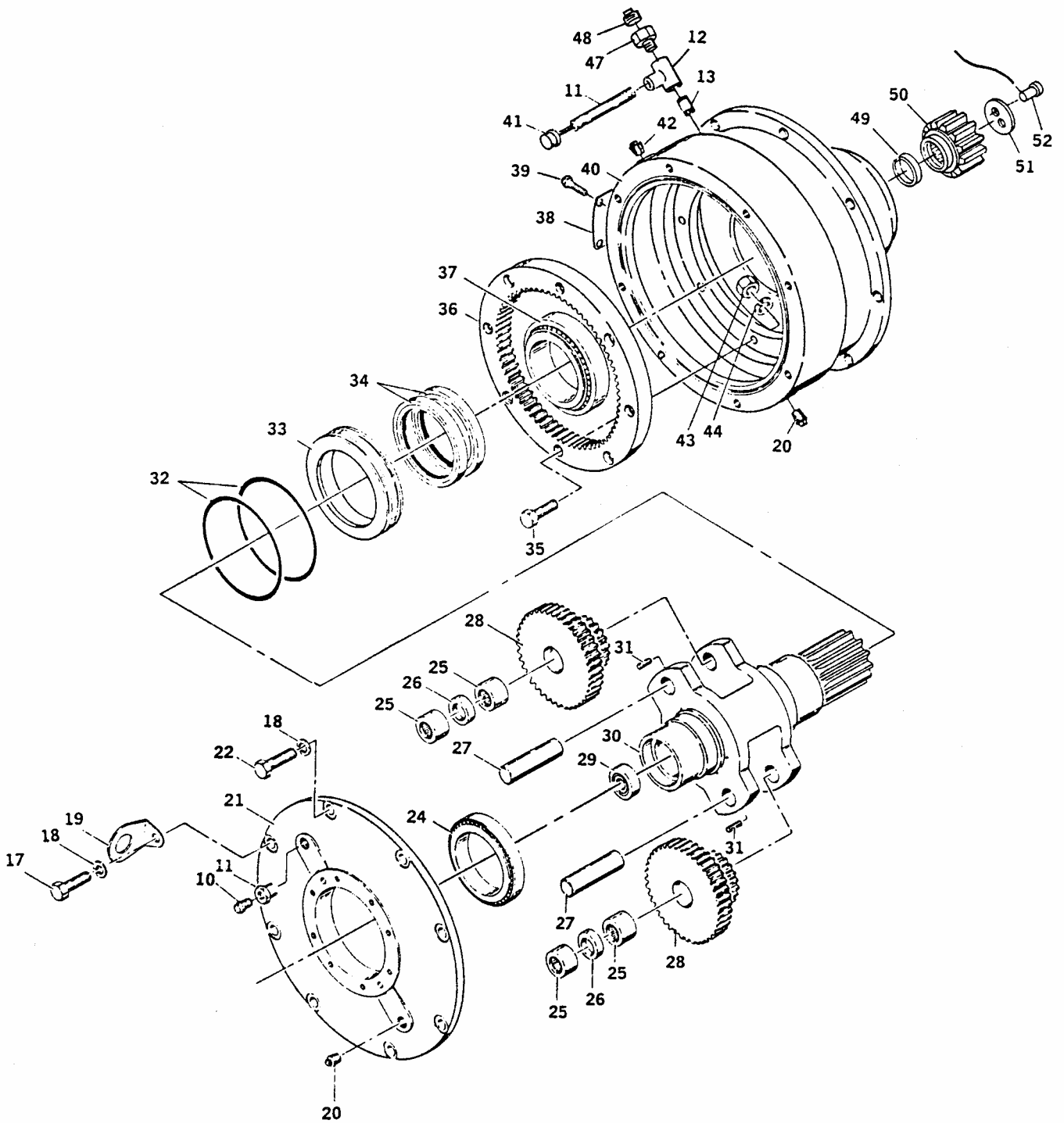
- a. Install cover (21). Install lifting lugs (19), washers (18) and hex head bolts (17) in cover opposite each other (the bolts are longer than other cover bolts). Install remaining hex head bolts (22) and washers (18). Torque to 68 ft-lbs (90 Nm).
8. INSTALL VENT AND PLUG IN TOP COVER.
9. INSTALL FILL AND DRAIN PIPE.
10. INSTALL PLUGS IN REMAINING HOLES IN HOUSING.

NOTE

Steps 11 and 12 are only necessary if the swing brake and motor are to be installed prior to installation.

11. INSTALL SWING BRAKE. (REFER TO PAGE 15-112.)
12. INSTALL SWING MOTOR. (REFER TO TM 5-3810-306-20.)
13. INSTALL SPACER (49), PINION GEAR (50), CAP (51) AND BOLTS (52). TORQUE BOLTS (52) TO 75 IN-LBS (8 NM).
14. FILL GEARBOX WITH LUBRICANT AND GREASE LOWER BEARING. (REFER TO LO 5-3810-306-12.)
15. INSTALL SWING GEAR BOX. (REFER TO PAGE 15-104.)
16. TEST FOR PROPER OPERATION.

END OF TASK



SWING BRAKE INSTALLATION

TOOLS: General mechanic's tool kit: automotive (5180-00-177-7033)

SUPPLIES: None

EQUIPMENT CONDITIONS: Negative battery cable disconnected at shunt. (RT875CC)
Battery disconnect switch in off position. (RT875CCS)
Hydraulic system pressure relieved.
(Refer to TM 5-3810-306-20.)
Swing motor removed. (Refer to TM 5-3810-306-20.)

REMOVAL:

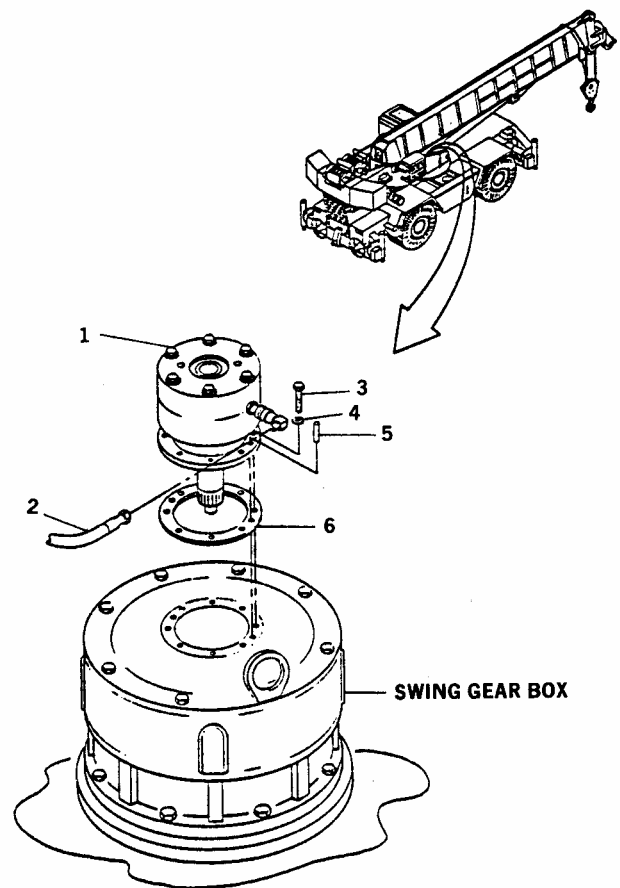
1. REMOVE SWING BRAKE ASSEMBLY (1).
 - a. Tag and disconnect line (2) from swing brake (1).
 - b. Remove bolts (3), washers (4) and carefully lift swing brake (1) from swing gear box.
 - c. Remove laminated shim (6) and dowel pins (5) from swing gearbox.

INSTALLATION:

1. INSTALL SWING BRAKE ASSEMBLY (1).
 - a. Position brake assembly (1) on swing gearbox but do not install laminated shim (6).
 - b. Install bolts (3) and washers (4). Torque bolts (3) to 80 in-lbs (9 Nm) alternating side to side while working in a circle. Release brake and rotate pinion end of main shaft at least two complete revolutions after torquing.

NOTE

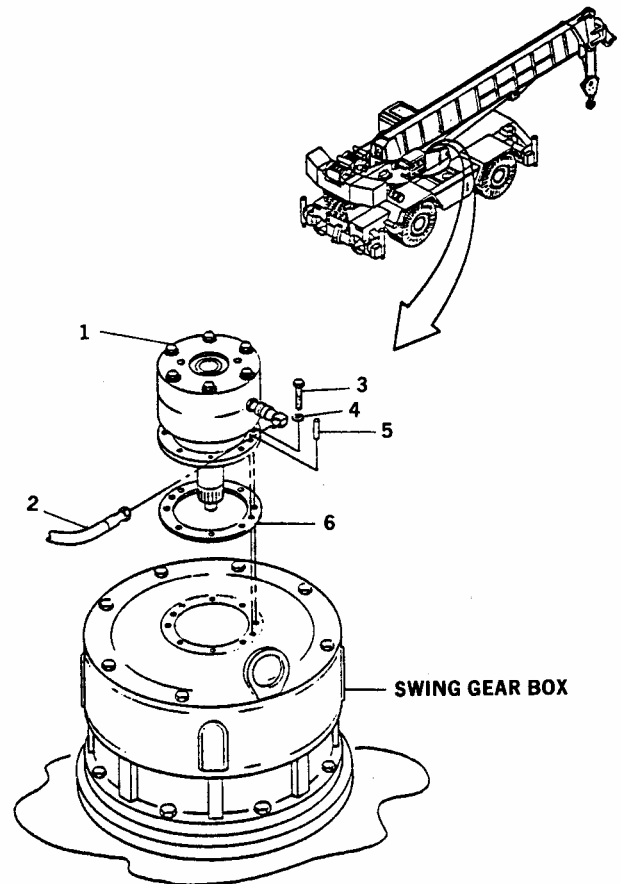
Each lamination of shim (6) is 0.003 in. (0.076 mm) thick. Therefore, thickness of shim installed will be the required thickness +0.000/-0.002 in. (+0.000/-0.051 mm).



- c. Measure gap between brake assembly (1) and swing gearbox at two places, 180° apart, with a feeler gauge. Add two measurements together and divide by 2 to obtain an average gap. Subtract 0.020 in. (0.508 mm) from average gap to determine required thickness of shim (6). If average gap is 0.022 in. (0.559 mm) or less, no shim is required.
- d. Remove brake assembly (1) and install correct shim (6) thickness.
- e. Place dowel pins (5) in position in swing gearbox.
- f. Install brake assembly (1) using hex head bolts (3) and washers (4).
- g. Torque bolts (3) to 200 in-lbs (22 Nm) in the same manner as in Step b. Repeat torquing until all bolts are at 200 in-lbs (22 Nm).

2. INSTALL SWING MOTOR. (REFER TO TM 5-3810-306-20.)
3. CONNECT NEGATIVE BATTERY CABLE AT SHUNT. (REFER TO TM 5-3810-306-20.)
4. START CRANE AND CHECK FOR LEAK AND PROPER OPERATION.

END OF TASK



SWING BRAKE ASSEMBLY

TOOLS: General mechanic's tool kit: automotive (5180-00-177-7033)
Shop Equipment Auto-Maintenance and Repair, FM Basic (4910-00-754-0705)
Shop Equipment Auto-Maintenance and Repair, FM Suppl No. 1 (4910-00-754-0706)
Tool Outfit Hyd System, Test and Repair, 3/4 Ton Trailer Mtd (4940-01-036-5784)

SUPPLIES: Parts kit, seal repl. (Item 55, Appendix B)
Loctite 271 (Item 23, Appendix B)
Hydraulic oil (Item 8, Appendix B)
Loctite 242 (Item 6, Appendix B)

EQUIPMENT CONDITIONS: Swing brake assembly removed. (Refer to page 15-112.)

WARNING

Be sure to wear protective eye covering to avoid personal injury.

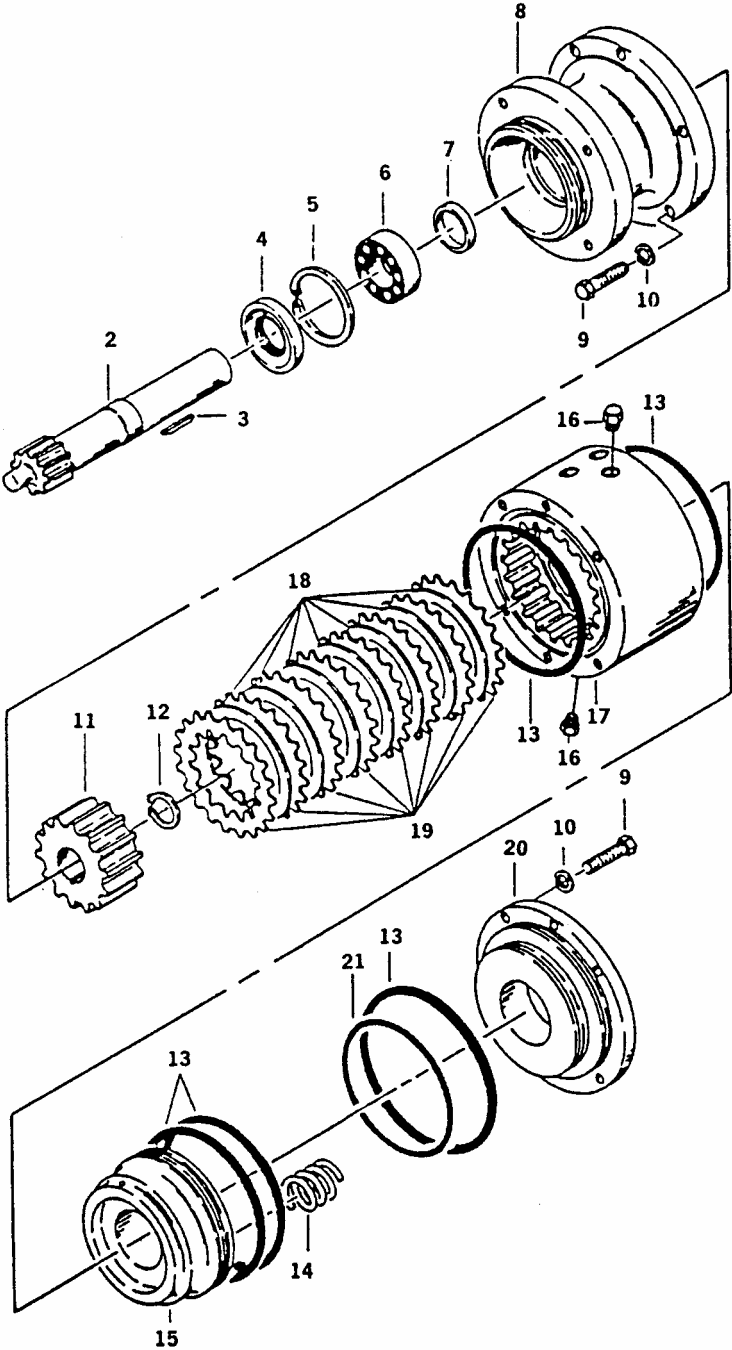
DISASSEMBLY:

1. DRAIN OIL FROM SWING BRAKE ASSEMBLY.
 - a. Remove plug from elbow in check/fill port and drain oil from brake assembly.
 - b. Remove all components from ports on swing brake and retain for reassembly.
2. REMOVE COVER (20) AND PREFORMED PACKINGS (13) AND (21).
 - a. Remove bolts (9) and washers (10) securing cover (20) to brake housing. Remove bolts together, in stages, so as to provide a uniform release of spring pressure.
 - b. Remove cover (20) from the brake housing (17).
 - c. Remove and discard preformed packings (13) and (21) from cover (20).
3. REMOVE PISTON (15) AND PREFORMED PACKING (13).
 - a. Remove six springs (14) from brake piston (15) and remove piston from brake housing (17).
 - b. Remove and discard preformed packings (13) from piston (15).
 - c. Remove and discard preformed packing (13) from inside of brake housing (17).
4. REMOVE MOUNTING FLANGE (8).
 - a. Remove bolts (9) and washers (10) securing mount flange (8) to brake housing (17). Remove mounting flange (8).
 - b. Remove and discard preformed packing (13) from brake housing (17).
5. REMOVE BRAKE DISCS (18) AND STATORS (19).
6. REMOVE SHAFT (2), SEAL (4) AND BEARING (6).
 - a. Remove retaining ring (12) key (3), spacer (7) and gear (11) from shaft (2).
 - b. Remove shaft (2).
 - c. Remove shaft seal (4) from mounting flange (8).
 - d. Remove retainer ring (5) and bearing (6) from mounting flange (8).

CLEANING AND INSPECTION:

WARNING

Dry cleaning solvent P-D-680, Type III is toxic and flammable. Wear protective goggles and gloves and use only in a well ventilated area. Avoid contact with skin, eyes, and clothes and do not breathe vapors. Do not use near open flame or excessive heat. The flash point is 200°F (94°C). If you become dizzy while using cleaning solvent, get fresh air immediately and get medical aid. If contact with eyes is made, wash your eyes with water and get medical aid immediately.



WARNING

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

1. CLEAN ALL PARTS WITH SOLVENT P-D-680, TYPE III AND BLOW DRY WITH COMPRESSED AIR.
2. INSPECT ALL PARTS FOR CRACKS AND EXCESS WEAR, REPLACE AS NECESSARY.

REASSEMBLY:

1. INSTALL BEARING (6), SHAFT (2) AND GEAR (11).
 - a. Position bearing (6) in mounting flange (8) and secure with retaining ring (5).
 - b. Apply Loctite 271 to shaft seal (4) and install in mounting flange (8).
 - c. Install shaft (2).
 - d. Install spacer (7), key (3) and gear (11) onto shaft (2). Secure with retaining ring (12).
2. INSTALL MOUNTING FLANGE (8).
 - a. Install a new preformed packing (13), lubricated with clean hydraulic oil, into brake housing (17).

NOTE

Apply Loctite 242 to all bolts.

- b. Install mounting flange (8) onto brake housing (17) with bolts (9) and washers (10). Torque bolts (9) to 31 ft-lbs (41 Nm).

NOTE

Ensure proper order is maintained (stator with external teeth, then brake disc (18) with internal teeth, etc.).

3. INSTALL THE BRAKE DISCS (18) AND STATORS (19) OVER GEAR.
4. INSTALL PISTON (15) AND PREFORMED PACKING (13).
 - a. Install a new preformed packing (13) lubricated with clean hydraulic oil, into packing groove on inside of brake housing (17).
 - b. Install new preformed packings (13) lubricated with clean hydraulic oil, onto brake piston (15).
 - c. Install brake piston (15) into brake housing (17) with spring bores facing out.
5. INSTALL SPRINGS (14).

NOTE

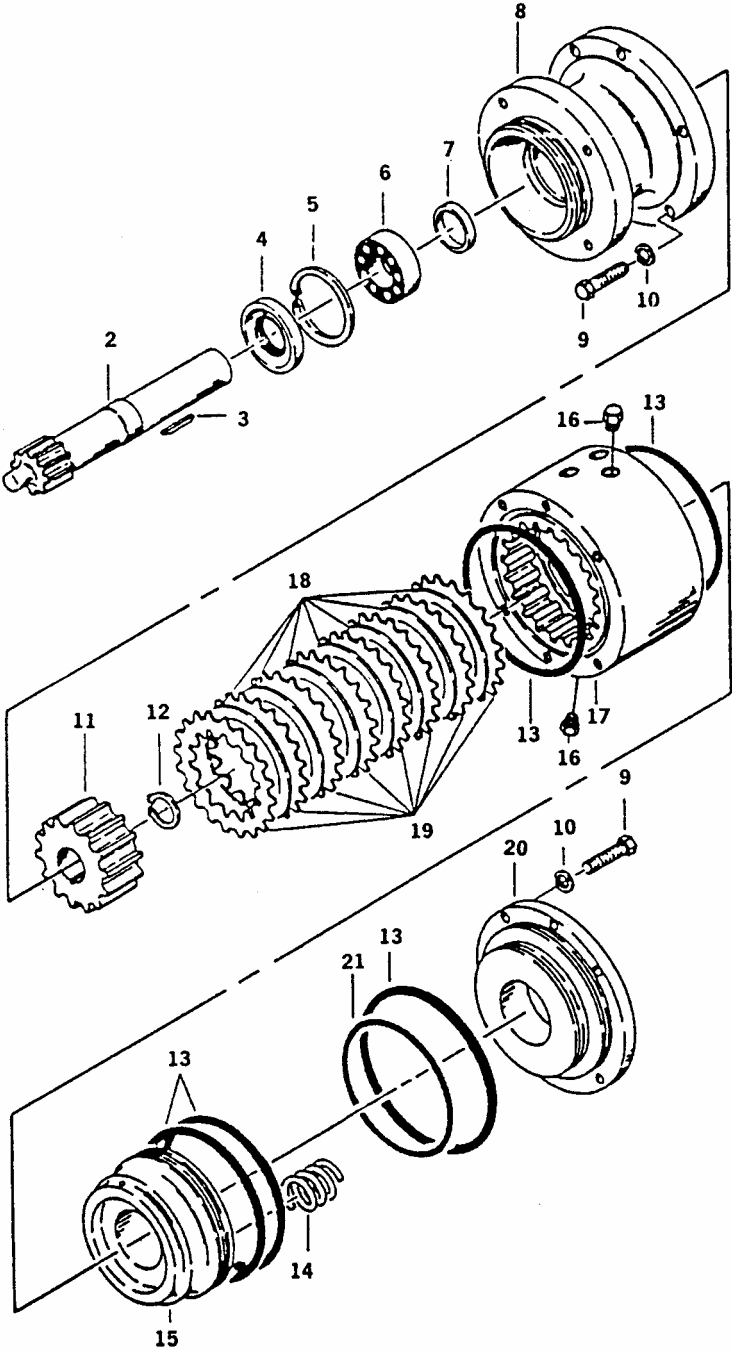
The original length of compression spring (14) is 1.5 in. (3.8 cm). If one or two springs are shorter than others, replace only worn springs.

- a. Install six compression springs (14) into holes provided in piston (15).
6. INSTALL COVER (20) AND PREFORMED PACKINGS (13) AND (21).
 - a. Install new preformed packings (13) and (21) lubricated with clean hydraulic oil, into packing grooves provided on cover (20).

NOTE

Install the bolts in the holes opposite the ones for mounting the motor.

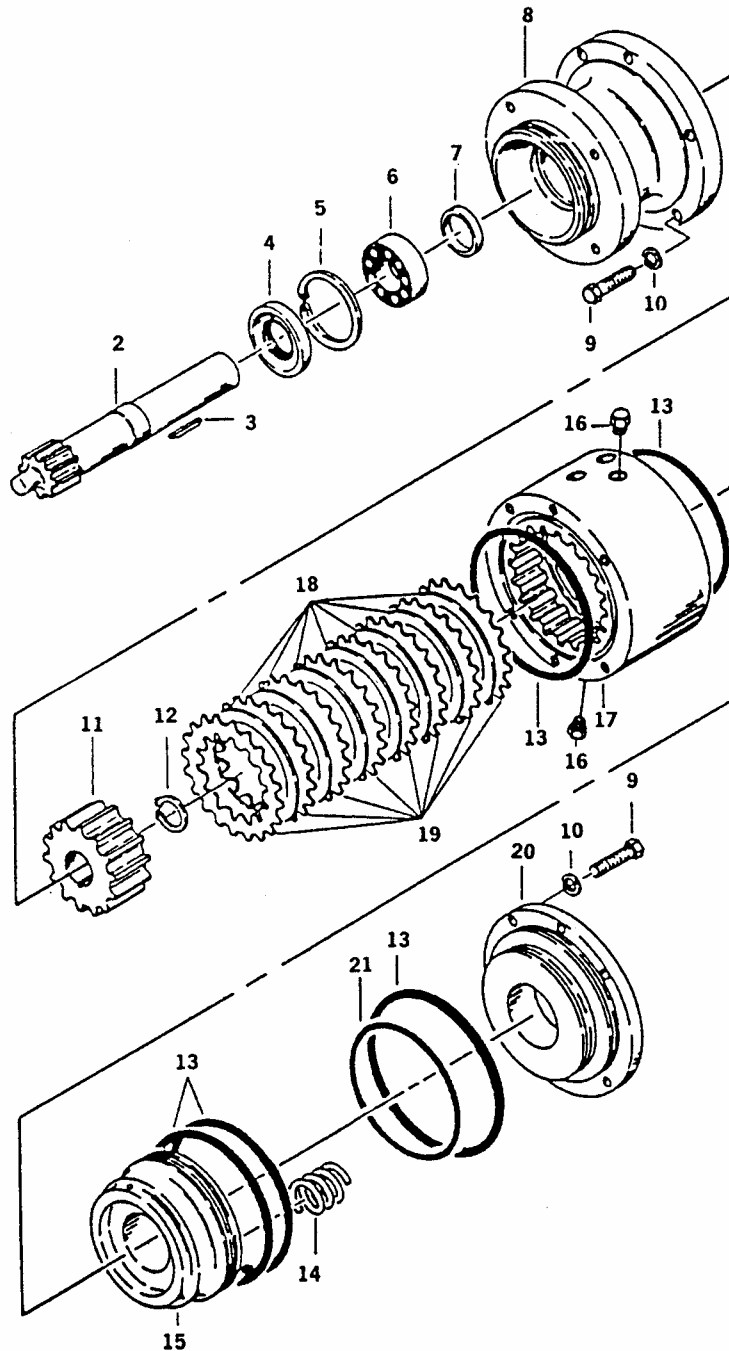
- b. Install cover (20) onto brake housing (17) with bolts (9) and washers (10). Torque bolts (9) to 31 ft-lbs (41 Nm).
7. INSTALL STREET ELBOW IN BOTTOM PART OF HOUSING (17).
8. FILL DISC/STATOR AREA WITH CLEAN HYDRAULIC OIL. CAPACITY OF BRAKE IS APPROXIMATELY 0.50 PINTS (0.24 L). INSTALL FILL PORT PLUG.



- 9. INSTALL PLUG IN STREET ELBOW.
- 10. INSTALL BREATHER IN HOLE ON COVER (20).
- 11. INSTALL BLEEDER FITTINGS IN HOUSING.

- 12. INSTALL SWING BRAKE ASSEMBLY.
(REFER TO PAGE 15-112.)

END OF TASK



POSITIVE SWING LOCK ASSEMBLY

TOOLS: General mechanic's tool kit: automotive (5180-00-177-7033)

SUPPLIES: Clean rags (Item 2, Appendix B)
 Cotter pin (Item 230, Appendix B)
 Lockwashers (Item 234, Appendix B)

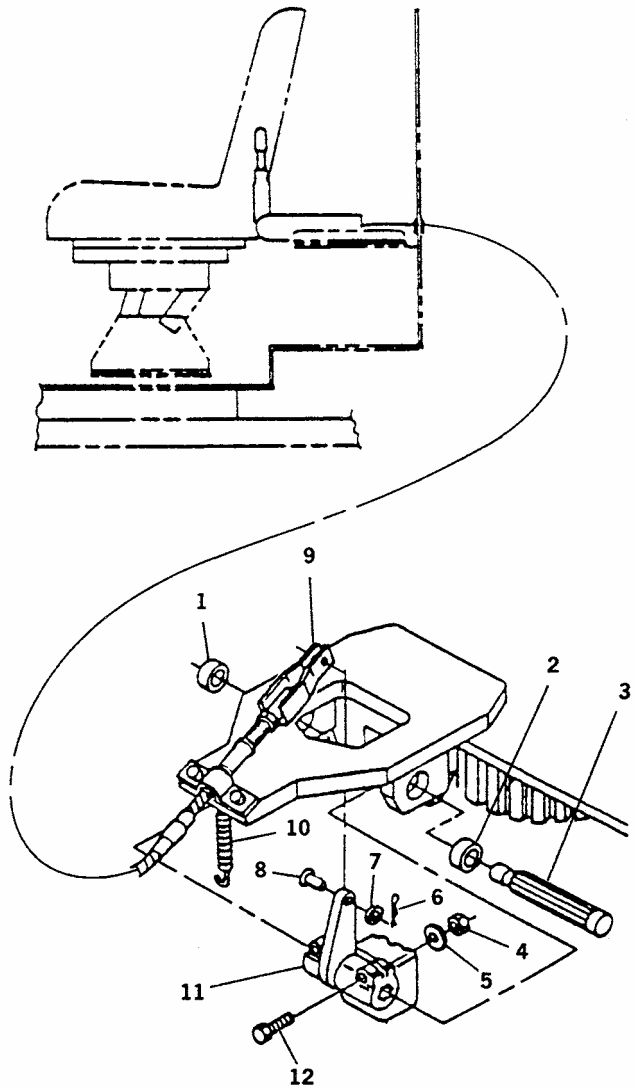
EQUIPMENT CONDITIONS: Positive swing lock is not engaged. (Refer to TM 5-3810-306-10.)
 Negative battery cable disconnected at shunt. (RT875CC)
 Battery disconnect switch in off position. (RT875CCS)
 Boom raised enough to allow access to swing lock.
 (Refer to TM 5-3810-306-10.)
 Swivel removed. (Refer to page 15-64.)

WARNING

Be sure to wear protective eye covering to avoid personal injury.

REMOVAL:

1. REMOVE POSITIVE SWING LOCK.
 - a. Remove spring (10) from mounting bracket and swing lock block (11).
 - b. Remove cotter pin (6), washer (7), and clevis pin (8) to free control cable clevis (9) from swing lock block (11). Discard cotter pin (6).
 - c. Remove two capscrews (12), lockwashers (5) and nuts (4) to loosen turntable lock shaft (3).



NOTE

It may be necessary to cut out chain hook on bottom of turntable if shaft does not clear it upon removal.

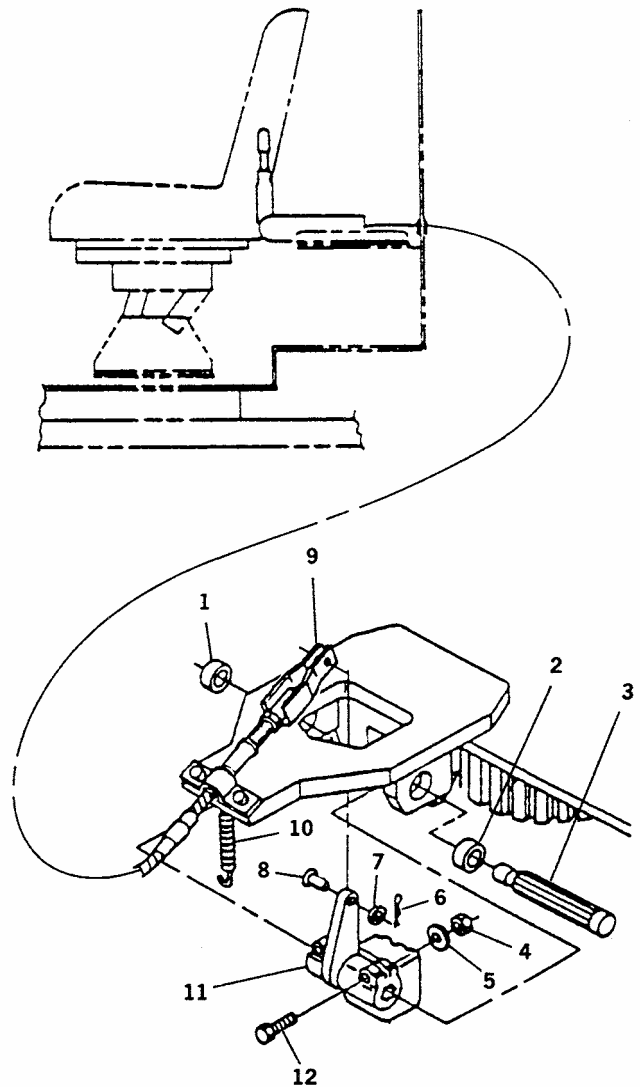
- d. Support swing lock block (11) and drive out turntable lock shaft (3) (small diameter end) from mounting bracket.
- e. Remove two bearings (1) and (2) from mounting bracket.

INSTALLATION:

1. LUBRICATE BEARING. (REFER TO LO 5-3810-306-12.)
2. INSTALL POSITIVE SWING LOCK.
 - a. Install bearings (1) and (2) in mounting bracket.

- b. Align swing lock block (11) with mounting bracket holes and insert turntable lock shaft (3). Install two capscrews (12), lockwashers (5) and nuts (4) to secure turntable lock shaft (3).
 - c. Secure control cable clevis (9) to swing lock block (11) with clevis pin (8), washer (7) and new cotter pin (6).
 - d. Install spring (10) on swing lock block (11) and mounting bracket.
- 3. CHECK POSITIVE SWING LOCK OPERATION. (REFER TO TM 5-3810-306-10.)
 - 4. INSTALL SWIVEL. (REFER TO PAGE 15-64.)
 - 5. CONNECT NEGATIVE BATTERY CABLE AT SHUNT. (REFER TO TM 5-3810-306-20.) (RT875CC)

END OF TASK



SWING MOTOR ASSEMBLY

TOOLS: General mechanic's tool kit: automotive (5180-00-177-7033)
Propane torch

SUPPLIES: Petroleum jelly (Item 158, Appendix B)
Gasket and seal set (Item 271, Appendix B)
Loctite #601 (Item 12, Appendix B)
Loctite Primer NF (Item 272, Appendix B)
Hydraulic oil (Item 8, Appendix B)

EQUIPMENT CONDITIONS: Swing motor assembly removed. (Refer to TM 5-3810-306-20.)

WARNING

Be sure to wear protective eye covering to avoid personal injury.

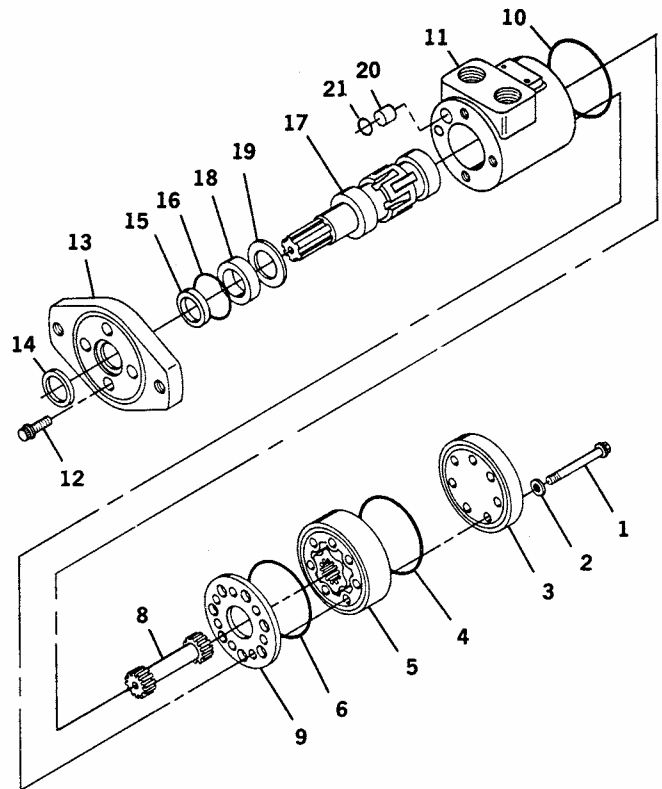
DISASSEMBLY:

NOTE

It is recommended that the motor be kept in a vise during disassembly.

a. Reposition motor in vise, clamping across ports, not on housing. Excessive clamping pressure on housing causes distortion. Position output shaft upward.

1. REMOVE END CAP (3) AND SEAL (4).
 - a. Place motor in a vise and clamp across the edge of flange with output shaft down. When clamping, use a protective device on vise, such as special soft jaws or pieces of hard rubber or board.
 - b. Remove capscrews (1) and seal washers (2).
 - c. Remove end cap (3).
 - d. Remove seal (4) from end cap (3).
2. REMOVE GEROTOR (5) AND SEAL (6).
3. REMOVE THE SPLINED DRIVE (8).
4. REMOVE THE WEAR PLATE (9).
5. REMOVE THE SEAL (10) FROM HOUSING (11).
6. REMOVE OUTPUT SHAFT (17) FROM HOUSING.
7. REMOVE BEARING RACE (18) AND NEEDLE THRUST BEARING (19) FROM SHAFT.
8. REMOVE MOUNTING FLANGE (13) AND SEALS.



- b. Remove four capscrews (12) from mounting flange (13). These motors are assembled using Loctite on screws (12) to hold them in place. Screws (12) will require approximately 300 to 400 in-lbs (33-44 Nm) of torque to break loose and approximately 100 in-lbs (11 Nm) of torque to remove after they are broken loose. Do not use an impact wrench on screws held with Loctite, this may result in rounded heads or broken sockets. If it requires more than 400 in lbs (44 Nm) to remove capscrews (12), proceed to step c otherwise proceed to step d.

CAUTION

Be careful not to overheat and damage the motor.

- c. Use a small flame propane torch to heat a small area of housing (11) where the screw (12) enters. Apply torque to capscrew (12) with a socket wrench gradually as heat is applied for 8 to 10 seconds. As soon as screw breaks loose, remove heat from housing, and continue turning screw until it is completely removed.
- d. Remove motor from vise and place it on a clean flat surface. Carefully remove flange (13) from the housing (11).

CAUTION

Use care not to scratch seal cavity O.D. This could cause leakage.

NOTE

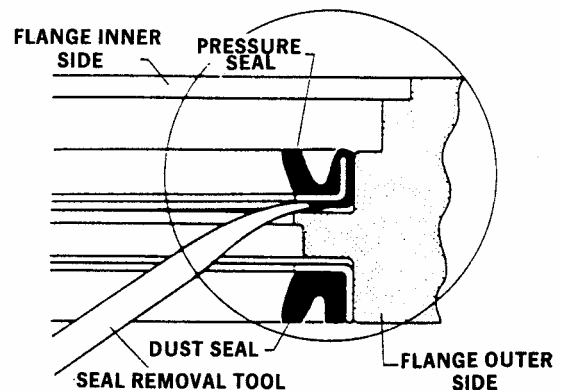
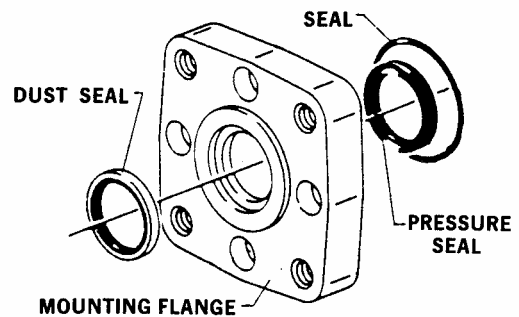
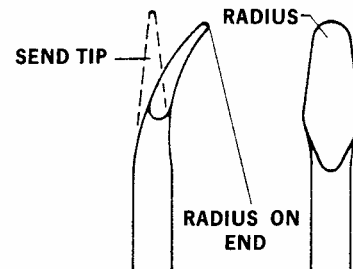
The dust seal (14), pressure seal (15) and seal (16) will come off with flange (11).

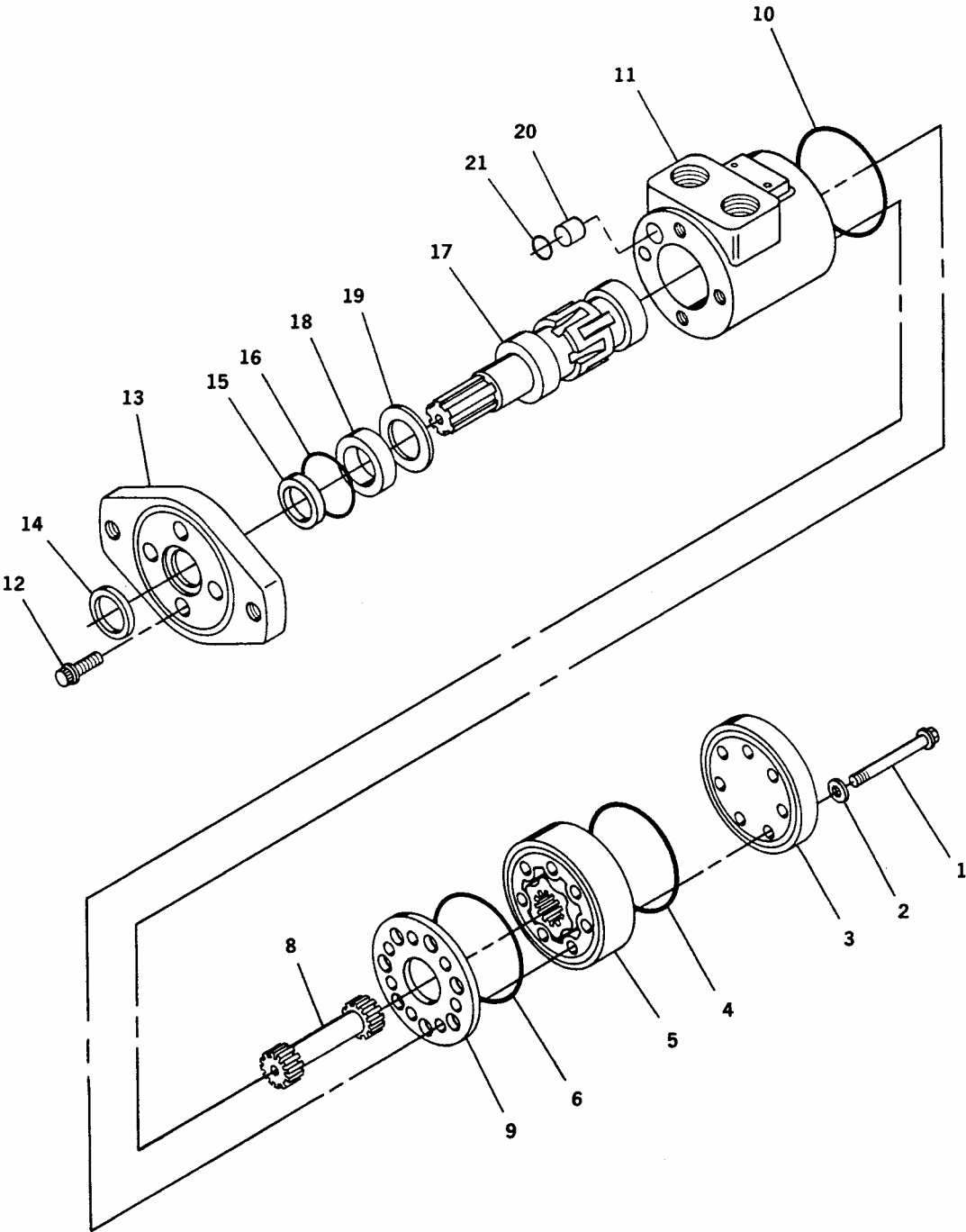
- e. Use a seal remover tool, like the one shown, to remove dust seal (14) and pressure seal (15). Work from outer side to remove each seal. Work nose of tool between pressure seal (15) and the flange (13). Pry seal partway. Remove tool and repeat at a point 180 degrees

away. Push seal (15) completely out of cavity.

9. REMOVE PLUG (20) AND SEAL (21) IF REQUIRED.

- a. A metal plug (20) and seal (21) is used to plug a machining hole in housing (11). It is not necessary to remove plug and replace seal unless leakage is occurring around plug. To remove plug, insert a 3/16 inch Allen wrench through port opening and push it out.





CLEANING:

WARNING

Dry cleaning solvent P-D-680, Type III is toxic and flammable. Wear protective goggles and gloves and use only in a well ventilated area. Avoid contact with skin, eyes, and clothes and do not breathe vapors. Do not use near open flame or excessive heat. The flash point is 200°F (94°C). If you become dizzy while using cleaning solvent, get fresh air immediately and get medical aid. If contact with eyes is made, wash your eyes with water and get medical aid immediately.

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

1. CLEAN ALL METAL PARTS IN CLEAN SOLVENT P-D-680, TYPE III. BLOW DRY WITH AIR.
 - a. Do not wipe parts with a cloth or paper towel because lint or other matter can get into hydraulic system and cause damage.
 - b. Wash housing (11) with non-petroleum base solvent to remove oil, grease and debris. Petroleum base solvents may leave residue detrimental to successful use of Loctite. Pay particular attention to four tapped holes on flange end.

NOTE

Fully cured Loctite resists most solvents, oils, gasoline, kerosene, and is not affected by cleaning operations. It is not necessary to remove cured Loctite that is securely bonded in tapped holes; however, any loose particles of cured Loctite should be removed.

- c. Wire brush screw threads to remove any cured Loctite and other debris. Discard any screws that have damaged threads or a corroded, damaged, or rounded head.
- d. Wash screws with non-petroleum base solvent. Blow dry with compressed air.

INSPECTION:

1. INSPECT MOTOR COMPONENTS.
 - a. Check all mating surfaces, and replace any parts having scratches or burrs that could cause leakage or damage.
 - b. Check around chamfered area of shaft for burrs, nicks, or sharp edges that can damage seals when assembling flange. Nicks or burrs may be removed with a hard, smooth stone (such as an Arkansas stone). Do not try to file or grind this part.

REASSEMBLY:

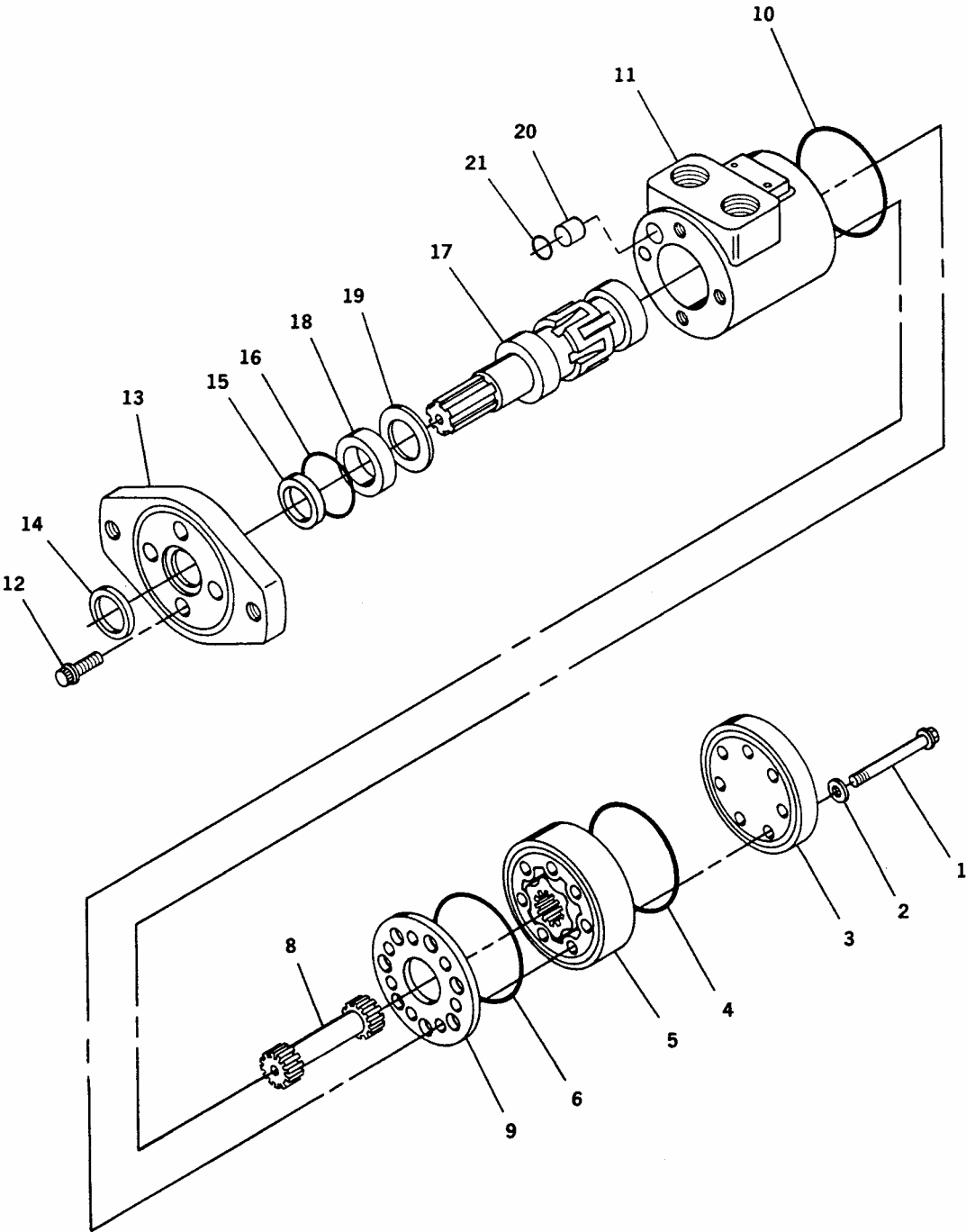
NOTE

Use all new seals when assembling motor. Lubricate the seals with petroleum jelly before assembly. Do not stretch seals before installing.

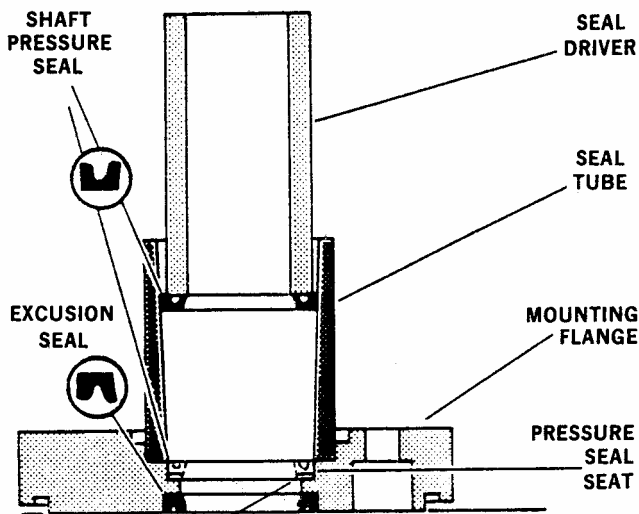
1. INSTALL PLUG (20) AND SEAL (21), IF REMOVED.
 - a. If plug (20) and seal (21) were removed, lubricate seal and install it on plug. Push plug into housing so plug and housing are flush. Be careful not to damage seal (21).

NOTE

Do not allow oil to get into tapped holes.



2. INSTALL OUTPUT SHAFT (17), NEEDLE THRUST BEARING (19) AND BEARING RACE (18).
 - a. Lubricate output shaft (17) with hydraulic oil. Install shaft in housing (11).
 - b. Install needle thrust bearing (19) then bearing race (18) on shaft (17). Pull shaft partially out of housing, then push all three parts in housing together. Bearing race must rotate freely when in piston.
3. INSTALL MOUNTING FLANGE (13) AND SEALS.
 - a. Install dust seal (14) in the flange (13) as shown. Press seal into place carefully, using a tool which will provide proper guiding and positioning to eliminate damage to rubber portion or distortion of the metal container.

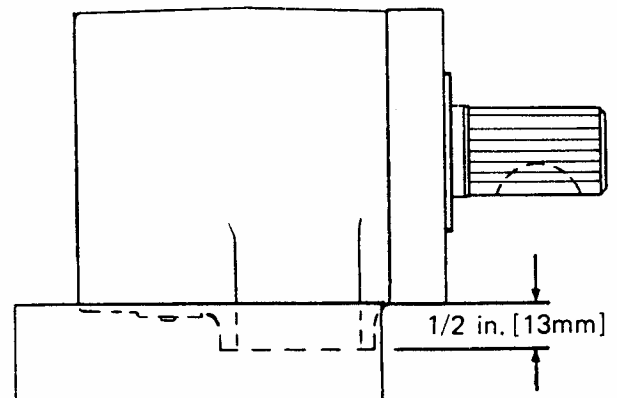


- b. Lubricate I.D. of seal tube and O.D. of shaft pressure seal (15) with light film of clean petroleum jelly. Align small I.D. end of seal tube with seal seat in mounting flange. Install pressure seal (15) in tube with lip of seal face up as shown. Insert seal driver in tube and firmly push seal seat with a rotating action.

CAUTION

After installing seal in flange, examine seal condition. If damaged or improperly installed, you must replace it before continuing with reassembly.

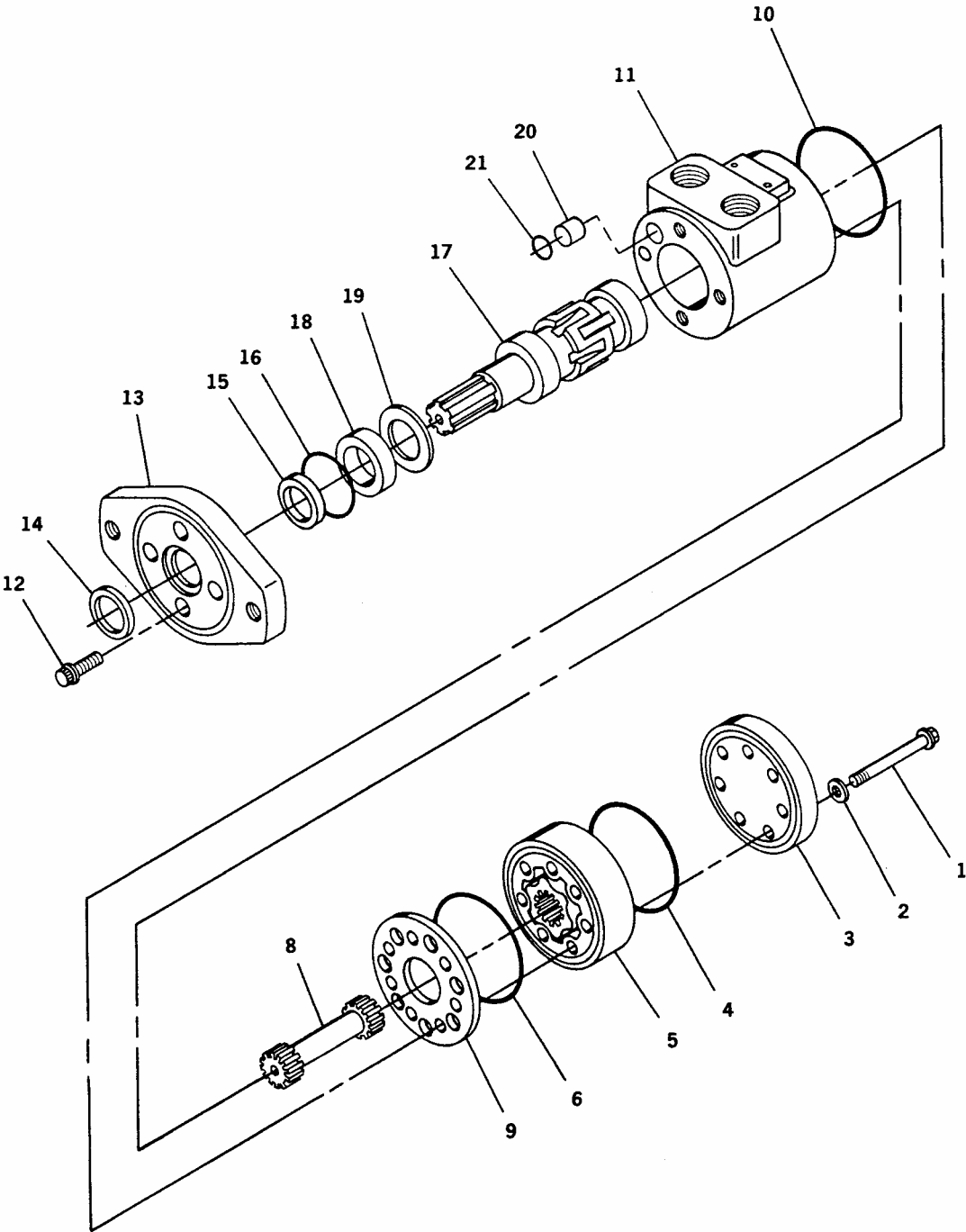
- c. Install 1.9375 in. (4.92 cm) diameter seal (16) in flange (13).
 - d. Apply Loctite to bolts (12).
 - e. Before installing flange (13) with seal assembly over shaft, place protective sleeve or bullet over shaft. Then lubricate space between dust seal (14) and pressure seal (15) as well as lips of both seals.
 - f. Install flange (13). Rotate flange slowly while pushing down over shaft. Be careful not to invert or damage seals.
 - g. After removing bullet, clamp motor in vise as shown. Ensure shaft cannot fall out. Install capscrews (12) and torque immediately 250 in-lbs (28 Nm).



4. INSTALL SPLINED DRIVE (8) AND WEAR PLATE (9).
 - a. Clamp housing in a vise, gerotor end up. Refer to step 1a of disassembly for correct clamping procedure.

CAUTION

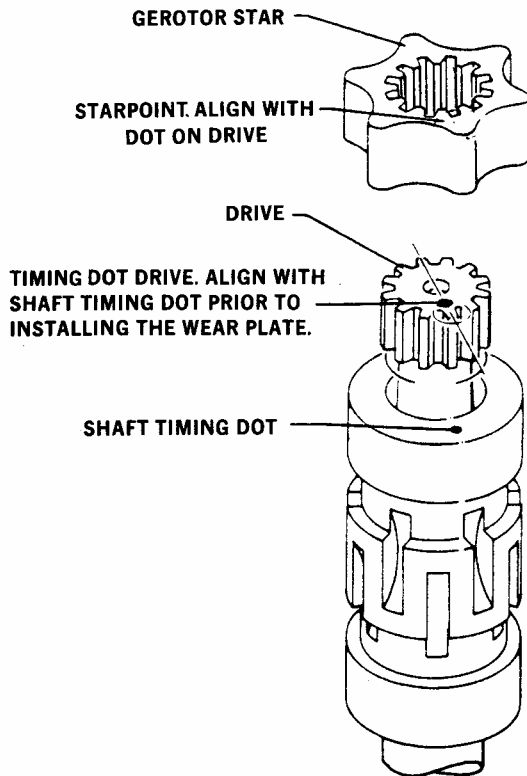
Do not stretch seals before installing them in groove.



NOTE

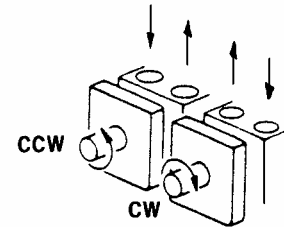
To aid in installation of seals, apply a light coating of clean petroleum to seal before installing.

- b. Pour approximately 35 cc of hydraulic oil in output shaft cavity.
- c. Install 2.875-in. (7.3 cm) diameter seal (10) in housing seal groove and install wear plate (9) on housing (11).
- d. Install splined drive (8). Use felt tip marker to mark one drive tooth. Align this tooth with the timing mark on shaft. Refer to Motor Timing figure below.



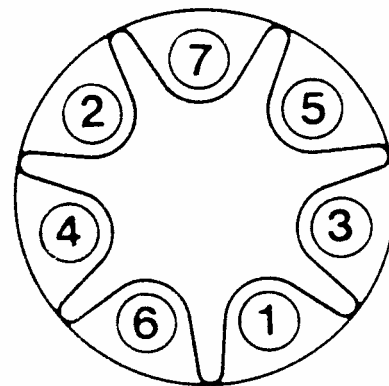
- 5. INSTALL GEROTOR (5).
 - a. Install 2.875-in. (7.3 cm) diameter seal (6) in gerotor seal groove.
 - b. Carefully place gerotor (5) on wear plate (9), seal side toward the wear plate. Install the gerotor with any tooth aligned with timing mark on drive.

- c. Turn gerotor (5) to line up holes for capscrews, be careful not to disengage star from drive.
- d. With orientation shown in Motor Timing figure, output shaft (17) will rotate as shown with the ports pressurized as shown.



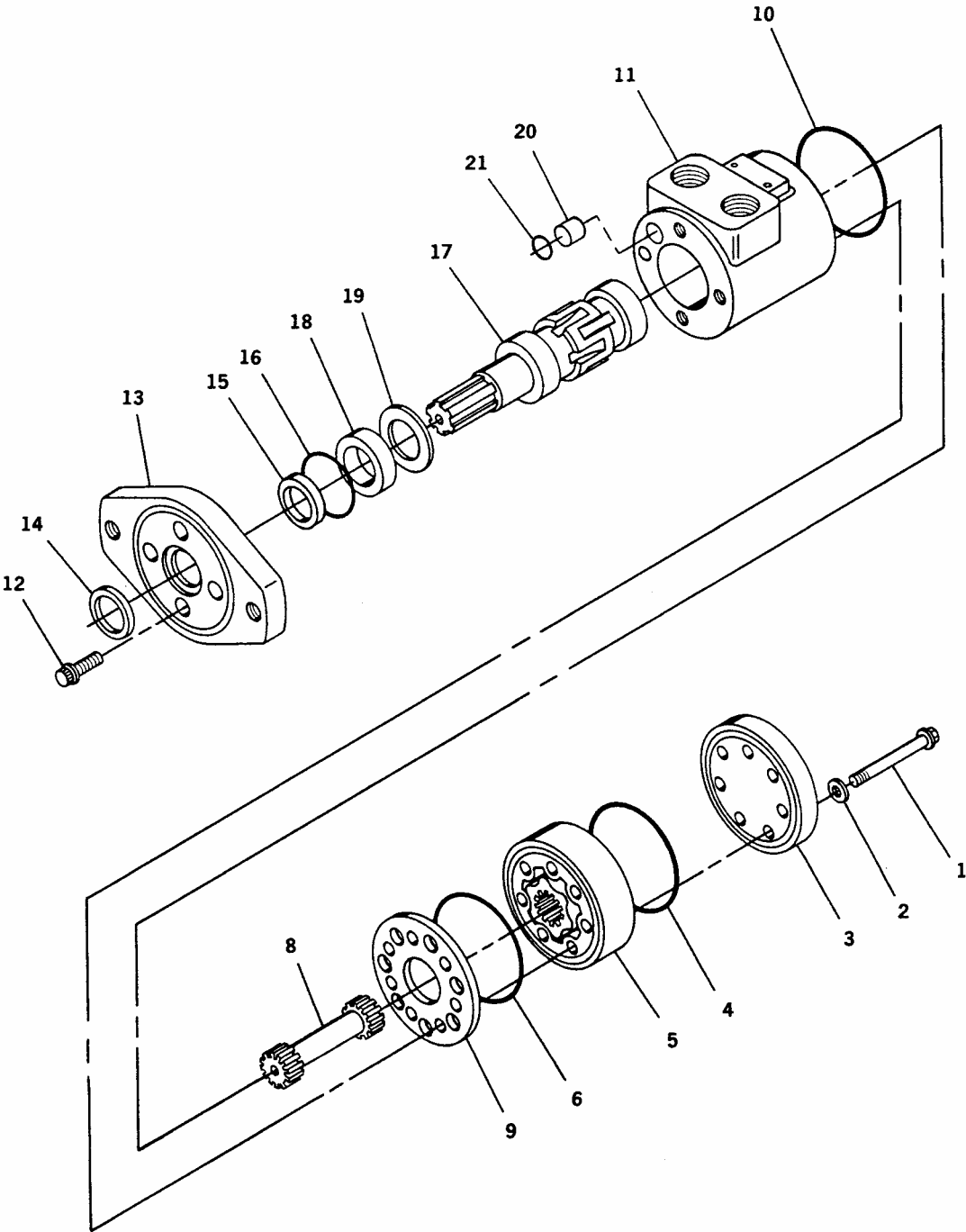
6. INSTALL END CAP (3).

- a. Install 2.875-in. (7.3 cm) diameter seal (4) in end cap (3), then carefully place end cap on gerotor.
- b. Install capscrews (1) and seal washers (2) in end cap. Pre-tighten all screws to 40 in-lbs (4 Nm). Check to ensure seals are seated properly in grooves. Tighten capscrews to final torque of 275 to 300 in-lbs (30-33 Nm) following the sequence shown.



7. INSTALL SWING MOTOR. (REFER TO TM 5-3810-306-20.)

END OF TASK



TURNTABLE BEARING INSTALLATION

TOOLS: General mechanic's tool kit: automotive (5180-00-177-7033)
Torque wrench tool kit (5180-01-284-8747)
Lifting device (2000 lbs. capacity)

SUPPLIES: Bolt (Item 270, Appendix B) (24 Required)

EQUIPMENT CONDITIONS: Superstructure removed. (Refer to page 15-75.)

REMOVAL:

NOTE

The superstructure must be supported, suspended with sling, or blocked, to allow swing bearing removal.

NOTE

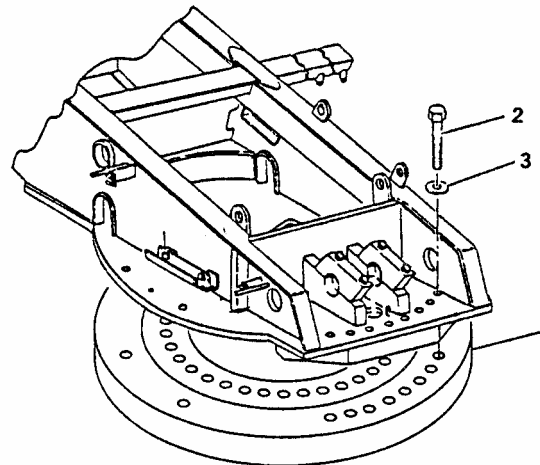
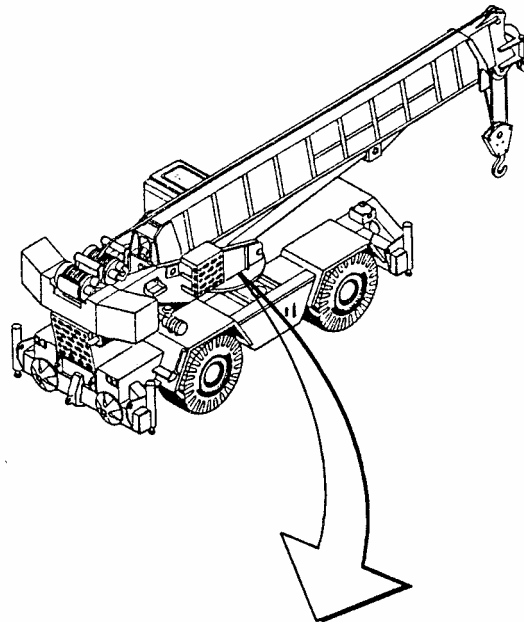
Bearing weight is 1300 lbs (590 kg) and its outer diameter is 66-1/4 inch (168.3 cm). Means must be provided to handle detached component.

1. REMOVE BEARING (1).
 - a. Disengage swing lock.
 - b. Remove twenty-four bolts (2), washers (3) and bearing (1) from superstructure.

INSTALLATION:

1. INSTALL BEARING (1).
 - a. Support superstructure, using slings or blocking so that underside of the turntable is exposed for installation of the bearing (1).
 - b. Clean dirt, debris, and/or any corrosion from bearing mount surface using an approved method. Be sure to follow all recommended warnings and cautions.
 - c. Locate maximum eccentricity point on bearing and lift and install bearing with this point in mesh with drive pinion.

- d. Install twenty-four new grade 8 bolts (2) and washers (3). Removed washers, if undamaged or deformed, may be reused.



2. TORQUE BOLTS (2) ON SWING BEARING OUTER RACE.

a. General.

WARNING

Failure to maintain proper torque of the turntable bearing attaching bolts will result in damage to the crane and possible injury to personnel.

Maintaining proper torque values for bolts is extremely important for structural strength, performance, and reliability of crane. Variations in torque can cause distortion, binding, or complete separation of the superstructure from the carrier.

CAUTION

Turntable bearing bolts cannot be retorqued. If any turntable bolt(s) has lost its pre-load torque, it must be discarded and replaced with a new bolt and torqued.

WARNING

It is mandatory that bearing attaching bolts be inspected for loss of pre-load torque after the first 100 hours of crane operation in accordance with the unit level PMCS chart. The bolts may loosen in service due to vibration, shock-loads, and temperature changes. Therefore, periodic inspection should be accomplished annually or every 500 hours thereafter, ensuring the bolts are properly torqued.

NOTE

Any bearing bolt found to be loose or that has been removed from the bearing for any reason shall be replaced with a new bolt, nut and hardened washers. The new bolt, nut and washer assembly must be properly torqued before putting the

unit back into service. A bearing bolt that continually maintains its proper torque never has to be replaced. With this in mind, it should not be necessary to replace all swing bearing bolts after every 500 hours of operation, but rather, only those that are found to be loose.

WARNING

KNOW YOUR TORQUE WRENCH! Flexible beam type wrenches, even though they might have a pre-set feature must be pulled at right angles and force must be applied at center of handle. Force value readings must be made while tool is in motion. Rigid handle type, with torque limiting devices that can be pre-set to required values, eliminate dial readings and provide more reliable, less variable readings.

NOTE

If multipliers and/or special tools are used to reach hard to get at areas, ensure torque readings are accurate.

NOTE

Torque wrenches are precision instruments and must be handled with care. To ensure accuracy, calibrations must be made on a schedule basis. Whenever there is a possibility that a torque wrench may have been either overstressed or damaged, it should immediately be removed from service until recalibrated. When using a torque wrench, any erratic or jerking motion can result in the application of excessive or improper torque.

NOTE

ALWAYS use a slow, even movement and STOP when the predetermined value has been reached. If it is reported by the crane operator or suspected that the crane has been overloaded beyond the capacities specified above the bold line on the cranes' capacity chart, then all turntable bolts must be checked for loss of pre-load torque. Replace any bolts that have lost their pre-load torque. Turntable bolts should be torqued following preliminary and final tightening sequences in tightening figures in this Section. When using step wrenches, calculated wrench settings are valid only when following conditions are met.

- (1) Torque wrenches must be those specified and forces must be applied at the handle grip. The use of handle extensions will change applied torque to bolt.
- (2) All handles must be parallel to the step wrench during final tightening. Multiplier reaction bars may be misaligned no more than 30 degrees without causing serious error in torque.
- (3) Multiplier reaction bar handles must be propped or supported within outer 1/4 of handle length, or serious under or over tightening will occur.

The inner race of bearing is secured to carrier frame by forty 1.25-in. x 7 in. grade 8 bolts and nuts. The outer race of bearing is secured to superstructure by twenty-four 1.25-in. x 4 in. grade 8 bolts.

b. Torque Values.

Preliminary torque on bolts is 1571 ft-lbs (2090 Nm). With two multipliers, set torque wrench for 128 ft-lbs (170 Nm). With six-in. step wrench, set torque wrench for 94 ft-lbs (125 Nm). With

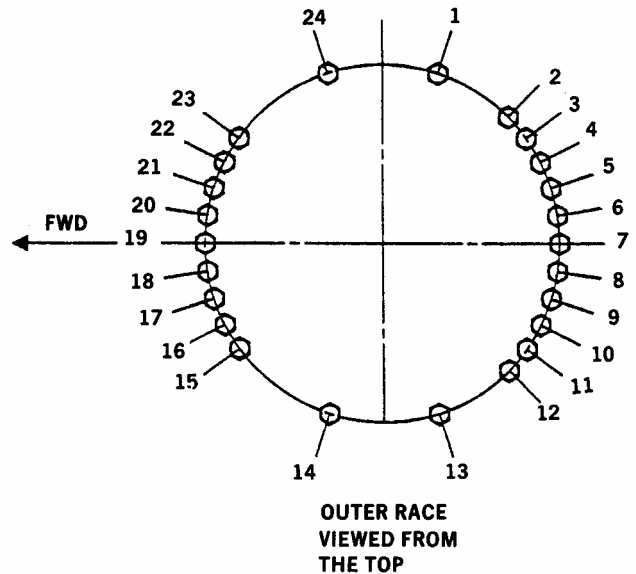
eighteen-in. step wrench, set torque wrench to 62 ft-lbs (82 Nm).

c. Tools Required.

Tools required are listed at the beginning of this procedure.

d. Outer Race Torquing.

- (1) Fully extend and set outriggers. Fully elevate the boom.

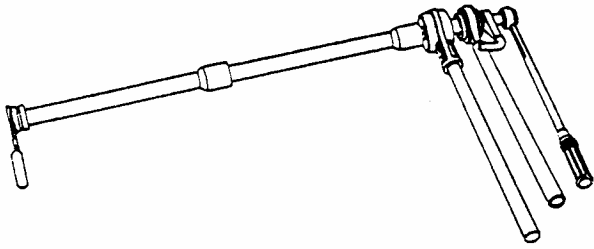


- (2) Torque the bolts using the tools listed in following steps. Apply a preliminary torque of 1571 ft-lbs (2090 Nm) to bolts 1, 14, 7, 19, 2, 15, 12, and 23 in that order. Return to bolt 1 and torque all the bolts sequentially in a clockwise direction to a final torque of 1964 ft-lbs (2090 Nm).

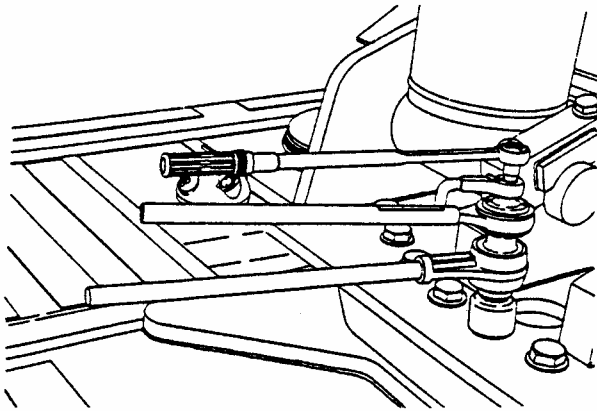
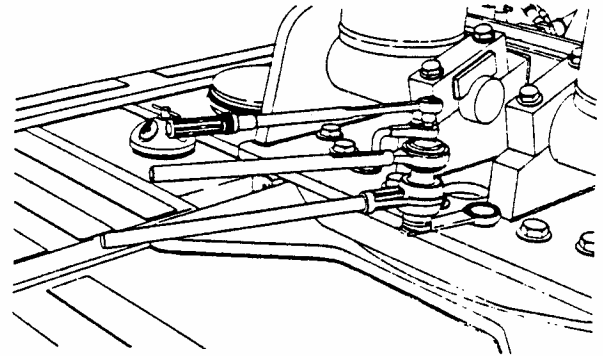
NOTE

The swing gearbox must be removed to gain access to bolts 2, 3, 4, and 5. Refer to SWING GEARBOX for information concerning its removal and installation.

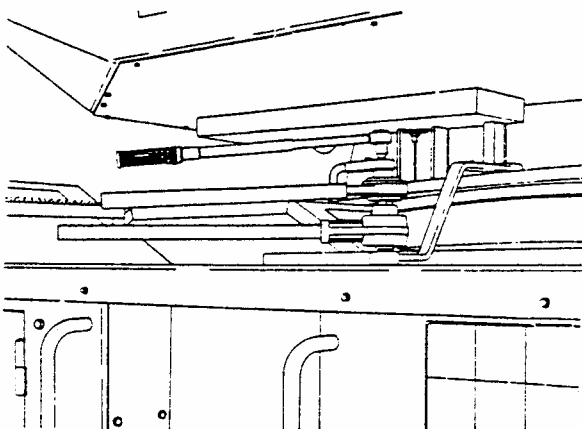
- (3) Use torque wrench, two multipliers, backlash adapter, two extensions, and 6-in. step wrench to torque bolts 7, 12, 11, 10, 9, 8, 6, 5, 4, 3, and 2.



(4) Use torque wrench, two multipliers, backlash adapter, and socket to torque bolts 19, 24, 1, 20, 21, 18, and 17.



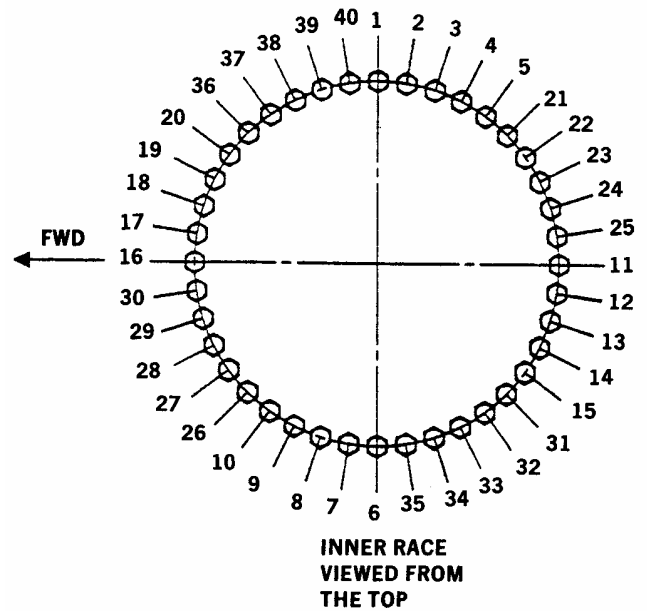
(5) Use torque wrench, two multipliers, backlash adapter, the 18-in. step wrench to torque bolts 13 and 14.



(6) Use torque wrench, two multipliers, backlash adapter and 6-in. step wrench to torque bolts 23, 22, 15, and 16.

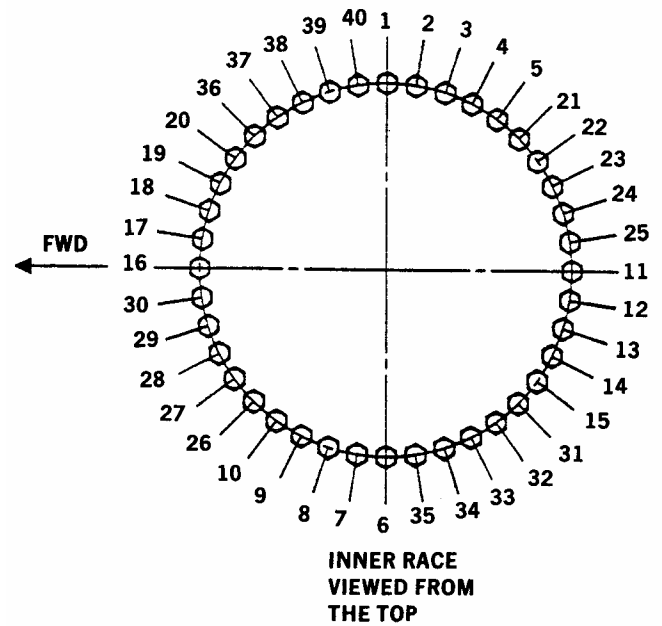
3. INSTALL SUPERSTRUCTURE. (REFER TO PAGE 15-75.)

4. TORQUE FORTY BOLTS ON SWING BEARING INNER RACE.



- a. Fully extend and set outriggers. Elevate boom enough to clear hood.
- b. Rotate the superstructure so access hole is over bolt number 1.
- c. Use a standard 1-7/8 in. open end wrench to hold nut end of bolt from under carrier.

- d. Use torque wrench, two multipliers, backlash adapter and 6-in. step wrench to torque inner race bolts.
 - e. Apply a preliminary torque of 1571 ft-lbs (2090 Nm) to bolts 1, 21, 11, 31, 6, 26, 16, and 36 in that order.
 - f. Return to bolt 1 and torque all bolts sequentially in a clockwise direction to a final torque of 1964 ft-lbs (2090 Nm).
5. REEVE CABLE THROUGH PULLEYS. (REFER TO TM 5-3810-306-20.)
 6. INSTALL HOOK BLOCK ASSEMBLY. (REFER TO TM 5-3810-306-20.)
 7. INSTALL OVERHAUL BALL. (REFER TO TM 5-3810-306-20.)
 8. PERFORM A PREOPERATIONAL CHECK OF CRANE.



APPENDIX A

REFERENCES

A-1. SCOPE

This appendix lists forms, field manuals, technical manuals, and other publications referenced in this manual and which apply to direct and general support maintenance of the RT875CC/RT875CCS Rough Terrain Container Crane.

A-2. DEPARTMENT OF THE ARMY PAMPHLETS.

Consolidated Index of Army Publications and Blank Forms	DA Pam 25-30
Using Unit Supply System (Manual Procedures).....	DA Pam 710-2-1
The Army Maintenance Management System (TAMMS)	DA Pam 750-8

A-3. FORMS.

Recommended Changes to Publications and Blank Forms.....	DA Form 2028
Organizational Control Record for Equipment	DA Form 2401
Equipment Inspection and Maintenance Worksheet.....	DA Form 2404
Maintenance Request.....	DA Form 2407
Preventive Maintenance Schedule and Record.....	DD Form 314
Product Quality Deficiency Report (NSN 7540-00-105-0078)	SF 368

A-4. FIELD MANUALS.

NEC Contamination Avoidance	FM 3-11.3
NEC Protection	FM 3-11.4
NEC Decontamination	FM 3-11.5
Camouflage	FM 20-3
Operation and Maintenance of Ordnance Materiel in Cold Weather (0 Deg to Minus 65 Deg F).....	FM 9-207
First Aid	FM 4-25.11
Manual for the Wheeled Vehicle Driver	FM 21-305
Basic Cold Weather Manual	FM 31-70
Northern Operations	FM 31-71

A-4. FIELD MANUALS (CONTINUED)

Army Motor Transport Units and Operations FM 55-30

Desert Operations..... FM 90-3

Mountain Operations (How to Fight).....FM 3-97.6

Vehicle Recovery OperationFM 4-30.31

A-5. TECHNICAL BULLETINS.

Tactical Wheeled Vehicles: Repair of Frames TB 9-2300-247-30

Equipment Improvement Report and Maintenance Digest (US Army Tank-Automotive Command)
Tank-Automotive Equipment..... TB 43-0001-39 series

Color, Marking, and Camouflage Painting of Military Vehicles, Construction Equipment, and
Materials Handling Equipment TB 43-0209

Maintenance in the Desert..... TB 43-0239

A-6. TECHNICAL MANUALS.

Inspection, Care, and Maintenance of Antifriction Bearings TM 9-214

Materials Used for Cleaning, Preserving, Abrading, and Cementing Ordnance Materiel and
Related Materials, Including Chemicals TM 9-247

Operator's, Unit, Direct Support, and General Support for
Care, Maintenance, and Repair of Pneumatic Tires and Inner Tubes TM 9-2610-200-14

Organization, Direct Support, and General Support for
Care, Maintenance, and Repair of Pneumatic Tires and Inner Tubes TM 9-2610-200-24

Painting Instructions for Field Use TM 43-0139

Procedures for Destruction of Tank-Automotive Equipment to Prevent Enemy Use TM 750-244-6

Operator's Manual for Container Crane, 40 Ton, Rough Terrain,
Models RT875CC and RT875CCS TM 5-3810-306-10

Organizational Maintenance Manual for Container Crane, 40 Ton, Rough Terrain,
Models RT875CC and RT875CCS TM 5-3810-306-20

A-6. TECHNICAL MANUALS. (CONTINUED)

Repair Parts and Special Tools List for Container Crane, 40 Ton, Rough Terrain,
Models RT875CC and RT875CCS TM 5-3810-306-24P

Lubrication Order for Container Crane, 40 Ton, Rough Terrain,
Models RT8755CC and RT875CCS LO 5-3810-306-12

Warranty Technical Bulletin (RT875CC) TM 5-3810-306-14

Transportability TM 55-3810-306

A-7. SPECIFICATIONS AND STANDARDS.

Dry Cleaning Solvent (Type III)..... Fed Spec P-D-680

Methyl Ethyl Ketone, Technical..... TT-M-261

Inspection, Liquid Penetrant Methods..... MIL-I-6866

Inspection Process, Magnetic Particles MIL-I-6868

Human Engineering Design Criteria for Military Systems, Equipment and Facilities MIL-STD-1472

A-8. OTHER PUBLICATIONS.

Army Medical Department Expendable/Durable Items CTA 8-100

Expendable/Durable Items (Except Medical, Class V, Repair Parts, and Heraldic Items) CTA 50-970

APPENDIX B

EXPENDABLE/DURABLE SUPPLIES AND MATERIALS LIST

Section I. INTRODUCTION

SCOPE

Appendix C lists expendable supplies and materials you will need to operate and maintain the RT875CC/RT875CCS Rough Terrain Container Crane. This listing is for informational purposes only and is not authority to requisition the listed items. These items are authorized to you by CTH 50-970, Expendable/Durable Items (Except Medical, Class V, Repair Parts, and Heraldic Items), or CTH 8100, Army Medical Department Expendable/Durable Items.

EXPLANATION OF COLUMNS

Item Number. This number is assigned to the entry in the listing and is referenced in the narrative instructions to identify the material (e.g., "Use cleaning compound, item 5, App. B").

Level. This column identifies the lowest level of maintenance that requires the listed item. The symbol designation for the various maintenance categories are as follows:

- C - Operator or Crew
- O - Organizational Maintenance
- F - Direct Support Maintenance
- H - General Support Maintenance
- D - Depot Maintenance

National Stock Number. This is the National Stock Number assigned to the item; use it to request or requisition the item.

Description. Indicates the federal item name and, if required, a description to identify the item. The last line for each item indicates the Federal Supply Code for Manufacturer (FSCM) in parentheses followed by the part number.

Unit of Measure (U/M). Indicates the measure used in performing the actual maintenance function. 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, requisition the lowest unit of issue that will satisfy your requirements.

APPENDIX B

EXPENDABLE MATERIAL LIST

(1) ITEM NUMBER	(2) LEVEL	(3) NATIONAL STOCK NUMBER	(4) DESCRIPTION	(5) U/M
1		---	Solvent, Dry cleaning P-D-680, Type III	
2		9Q7920002929204	Clean rags	pkg
3	H	5330012721282	Seal, nonmetallic	ea
4		---	Lubriplate 105	
5	H	2815012719792	Ring set, piston	ea
6		---	Loctite No. 242	
7	F	4320012751629	Parts kit, seal repl.	ea
8		9G9150001116254	Hydraulic oil, MIL-H-46170	pt
9		---	Grease, MIL-G-81322	
10	F	5315008460126	Pin, cotter	ea
11		---	Motor oil	
12		---	Loctite # 601	
13	O	5310005845272	Washer, lock	ea
14	F	5330012776290	Packing assortment	ea
15	O	5330004341494	Packing, preformed	ea
16	F	5330011764809	Packing, preformed	ea
17	F	5330008052966	Packing, preformed	ea
18		---	Deleted	
19	O	5330011955268	Seal, banjo connect	ea
20	O	5310012708417	Washer, saddle	ea
21	F	3040012819708	Parts kit, linear AC	ea
22	F	5330011577543	Packing	ea
23		---	Loctite # 271	
24		---	Never-Seize	
25	F	5310002090965	Washer, lock	ea
26	F	5310006379541	Washer, lock	ea
27		---	Sealant, silicone	
28	F	5330012810912	Gasket	ea
29	O	5310012090508	Washer, flat sealing	ea
30	O	5310011880997	Washer, flat sealing	ea
31		---	Permatex No. 2	
32		---	Copper coat	
33	O	5330012894417	Seal, plain	ea
34	F	5310006379541	Washer, lock	ea
35	F	5315008395822	Pin, cotter	ea
36	F	4820011734642	Kit, check valve part	ea
37		9G9150001900907	Grease, MIL-G-10924	qt
38	F	5310005825965	Washer, lock	ea
39		---	Oak post, 4" x 4"	ea
40	F	5330012845735	Retainer, packing	ea
41	F	5330004933881	Packing, preformed	ea
42	F	5330001499150	Packing, preformed	ea
43	F	5330001499150	Packing, preformed	ea
44	F	5330001499152	Packing, preformed	ea
45	F	5330001191921	Packing, preformed	ea
46	F	5330001191931	Packing, preformed	ea

APPENDIX B

EXPENDABLE MATERIAL LIST (CONT'D)

(1) ITEM NUMBER	(2) LEVEL	(3) NATIONAL STOCK NUMBER	(4) DESCRIPTION	(5) U/M
47	F	5330011045122	Packing assortment	ea
48	F	5330012066813	Seal, quad	ea
49	F	5330012896168	Ring, back-up	ea
50	F	5330011020453	Packing, assortment	ea
51	F	5330012882160	Parts kit, seal repl	ea
52	F	5330012869208	Packing assortment	ea
53	F	5330012869852	Parts kit, seal repl	ea
54	F	2590012689893	Parts kit, cylinder	ea
55	F	2530012726694	Parts kit, seal repl	ea
56	O	5315012807030	Pin, cotter	ea
57	F	4320012690409	Parts kit, seal repl	ea
58	F	2590012688448	Parts kit, linear AC	ea
59	F	5330010185360	Seal, plain encased	ea
60	F	5330005506748	Packing, preformed	ea
61	F	5310010713401	Washer, flat	ea
62	F	5330010180780	Gasket	ea
63	F	2590012821741	Parts kit, linear AC	ea
64	F	5315000137308	Pin, cotter	ea
65		---	Loctite primer grade T	
66	O	5340002352785	Clip, retaining	ea
67	O	5330011158226	Packing, preformed	ea
68	O	5330011988439	Packing, preformed	ea
69	F	4320012689877	Ring, wearing	ea
70		---	Adhesive, weather-strip	
71	F	5315000590205	Pin, cotter	ea
72	F	5330012122222	Gasket	ea
73	F	5330012107357	Gasket	ea
74	F	5330012806773	Seal, plain encased	ea
75		---	Form-a-gasket # 3 (aviation)	
76	O	5330000137784	Packing, preformed	ea
77	F	4320012688450	Parts kit, seal repl	ea
78	F	3110005555207	Bearing	ea
79	F	3110005543081	Bearing	ea
80	F	3110005543318	Bearing	ea
81	F	5310010145136	Washer, key	ea
82	F	5310002090965	Washer, lock	ea
83	F	5310008206653	Washer, lock	ea
84	F	5310001515483	Washer, key	ea
85	F	5310010145136	Washer, key	ea
86		---	Oil, gear 90 wt	
87	F	4320012815930	Kit, parts, rotary pump	ea
88	F	5330012346369	Seal, plain	ea
89	O	5330010925503	Packing, preformed	ea
90	O	5330002287196	Packing, preformed	ea
91		9Q7920000449281	Cloth, lint free "miracle wipe"	box
92	F	5330010122722	Packing, preformed	ea
93	F	5330006336827	Packing, preformed	ea

APPENDIX B

EXPENDABLE MATERIAL LIST (CONT'D)

(1) ITEM NUMBER	(2) LEVEL	(3) NATIONAL STOCK NUMBER	(4) DESCRIPTION	(5) U/M
94		---	Oil, SAE 10, MIL-L-2104	
95		---	Emery cloth	
96	F	5330004392539	Packing, preformed	ea
97	F	291001120853	Parts kit, seal repl	ea
98	F	5330011810630	Gasket	ea
99	F	5330012718306	Gasket	ea
100		---	Loctite #2114	
101		533001157543	Packing	ea
102		---	Lubriplate 105	
103		---	Rubber bands	ea
104		---	Rods, wooden dowel 1/2 in. x 18 in.	ea
105	F	5315008395822	Pin, cotter	ea
106	F	5330012698580	Packing, preformed	ea
107	F	5330012696152	Packing, preformed	ea
108	F	5330012819013	Packing, preformed	ea
109	F	5310000045033	Washer, lock	ea
110	O	5315011847607	Pin, cotter	ea
111	F	5330012819013	Gasket	ea
112	O	5330011901905	Gasket	ea
113	F	5330011901905	Gasket	ea
114	O	5330011742917	Packing, preformed	ea
115	F	5330011744595	Packing, preformed	ea
116	F	5330011988439	Packing, preformed	ea
117	F	5330011680885	Packing, preformed	ea
118	F	5330012442273	Packing, preformed	ea
119	H	5340004356124	Ring, retaining	ea
120	H	5330011157910	Packing, preformed	ea
121	H	5310004079566	Washer, lock	ea
122	H	5365001446445	Ring, retaining	ea
123	H	5330007746894	Packing, preformed	ea
124	H	5330005596182	Packing, preformed	ea
125	H	5330001198079	Gasket	ea
126	H	5330002502156	Gasket	ea
127	H	5365008388715	Ring, retaining	ea
128	H	2520009963736	Ring, locating	ea
129	H	5365010185447	Ring, retaining	ea
130	H	5330010262916	Gasket	ea
131	H	5310001670680	Washer, lock	ea
132	H	3110010097012	Ring, bearing, inner	ea
133	H	5330005806588	Packing, preformed	ea
134	H	5330002500222	Packing, preformed	ea
135	H	5330010135820	Packing, preformed	ea
136	H	5365012715247	Ring, retaining	ea
137	H	5330005366835	Packing, preformed	ea
138	H	5310010374069	Nut	ea
139	H	5310008098541	Washer, flat	ea
140	H	5310010180686	Nut, self-locking	ea

APPENDIX B
EXPENDABLE MATERIAL LIST (CONT'D)

(1) ITEM NUMBER	(2) LEVEL	(3) NATIONAL STOCK NUMBER	(4) DESCRIPTION	(5) U/M
141	H	5310010713400	Washer, flat	ea
142	H	5330002917339	Packing, preformed	ea
143	H	2520001425392	Ring, piston	ea
144	H	5365010185253	Ring, special	ea
145	H	5365010176324	Ring, retaining	ea
146	H	5365002496555	Ring, retaining	ea
147	H	2520001425391	Ring, piston	ea
148	H	5330010185222	Packing, preformed	ea
149	H	5365012713334	Ring, retaining	ea
150	H	5365011052983	Ring, retaining	ea
151	H	5365010185223	Ring, retaining	ea
152	H	5365010185449	Ring, retaining	ea
153	H	5365010185220	Ring, special	ea
154	H	5365010185448	Ring, retaining	ea
155	H	5330010180074	Gasket	ea
156	H	5365010607228	Ring, retaining	ea
157	H	5365010562109	Ring, retaining	ea
158		---	Jelly, petroleum	
159			Screw, machine, 1/8-24 x 1-1/2 in.	ea
160		5365010853125	Ring, retaining	ea
161	H	5330010709321	Packing assortment	ea
162		5305012915122	Bolt, 1-1/4 in. x 7 inch	ea
163	O	5330010933503	Packing, preformed	ea
164		---	Loctite #277	
165	F	5330012721140	Gasket	ea
166	H	5330011014773	Packing, preformed	ea
167	H	2520004204420	Seat, safety valve	ea
168	H	5330011812430	Packing, preformed	ea
169	H	5330004044481	Gasket	ea
170	H	5330010693126	Gasket	ea
171	H	5310001800277	Washer, lock	ea
172	H	5330012803625	Packing, preformed	ea
173	H	5365012805593	Ring, retaining	ea
174	H	5340004342005	Ring, retaining	ea
175	H	5340004398143	Ring, retaining	ea
176	H	5365002471032	Ring, retaining	ea
177	H	5330011812434	Packing, preformed	ea
178	H	5330012803624	Packing, preformed	ea
179	H	5340004398139	Ring, retaining	ea
180	H	5310007918733	Washer, lock	ea
181	H	5365008212502	Ring, retaining	ea
182	H	5330007275154	Packing, preformed	ea
183	H	5330012803621	Seal, plain encased	ea
184	H	5330012805579	Packing, preformed	ea
185	H	5365011971631	Ring, retaining	ea
186	H	5365008039971	Ring, retaining	ea
187	H	5365012809483	Ring, retaining	ea

APPENDIX B

EXPENDABLE MATERIAL LIST (CONT'D)

(1) ITEM NUMBER	(2) LEVEL	(3) NATIONAL STOCK NUMBER	(4) DESCRIPTION	(5) U/M
188	H	5330001451509	Packing, preformed	ea
189	H	5365002524746	Ring, retaining	ea
190	F	5330012721122	Packing, preformed	ea
191	F	5330012721121	Packing, preformed	ea
192	O	5310012805611	Washer, flat	ea
193		---	Deleted	
194	F	4820012883938	Kit, parts	ea
195	F	---	Oil, gear, MIL-L-2105, MPL-85W140	
196	F	5330012813406	Packing, preformed	ea
197	F	4820012893618	Kit, parts	ea
198	F	5330012694323	Packing, preformed	ea
199	F	5330001299389	Gasket	ea
200	F	5330013384829	Gasket, fuel pump	ea
201	F	5325009229101	Ring, retaining	ea
202	F	2815010793290	Ring, oil	ea
203	F	4310010795245	Ring, piston	ea
204	F	4310011971882	Ring, piston	ea
205	F	5330008527347	Gasket	ea
206	F	5331012718289	Packing, preformed	ea
207	F	5331009413762	Packing, preformed	ea
208	F	5331004410145	Packing, preformed	ea
209	F	5331009052679	Packing, preformed	ea
210	F	5310000103320	Lockwasher	ea
211	F	5330010715727	Gasket	ea
212	F	5310005432410	Washer, lock	ea
213	F	5330011918047	Gasket	ea
214	F	5330012708144	Gasket	ea
215		---	Rockwell adhesive	
216		---	Gear marking compound	
217	F	5365007157391	Ring, retaining	ea
218	F	5330012694327	Gasket	ea
219	F	5315008806027	Pin, cotter	ea
220	F	5330012714311	Gasket	ea
221	F	5330012719375	Packing, preformed	ea
222	F	5330011922037	Seal	ea
223	F	5330012550176	Gasket	ea
224	F	5330012916537	Packing, preformed	ea
225	F	5330012721141	Gasket	ea
226	F	5330012721143	Gasket	ea
227	F	5330012714310	Gasket	ea
228	F	---	Pad, cleaning, non-metallic	ea
229	F	2910012719826	Sleeve, fuel injector	ea
230	F	5315008395820	Pin, cotter	ea
231	F	5305012805591	Screw, self-locking	ea
232	F	5315000050442	Cotter pin	ea
233	F	5310002090786	Washer, lock	ea
234	F	5310004079566	Washer, lock	ea

APPENDIX B

EXPENDABLE MATERIAL LIST (CONT'D)

(1) ITEM NUMBER	(2) LEVEL	(3) NATIONAL STOCK NUMBER	(4) DESCRIPTION	(5) U/M
235	F	5330012846648	Packing, preformed	ea
236	F	5330012846657	Gasket	ea
237	F	5330012846656	Gasket	ea
238	F	5330012846649	Packing, preformed	ea
239	F	5330012846650	Packing, preformed	ea
240	F	5330012846658	Gasket	ea
241	F	2540012841677	Matting	AR
242	F	5330012846652	Packing, preformed	ea
243	F	5330012846659	Gasket	ea
244	F	5310006276128	Washer, lock	ea
245	F	5330010573127	Packing	ea
246	F	5330012852593	Packing	ea
247	F	5330004816504	Packing	ea
248	F	5330004384106	Packing	ea
249	F	5330009140795	Packing	ea
250	F	5330012852595	Packing	ea
251	F	5330012852594	Packing	ea
252	F	5330012836673	Packing	ea
253	F	5330012849353	Packing	ea
254	F	5330012849354	Packing	ea
255	F	5330012836674	Packing	ea
256	F	5330011045122	Parts kit	ea
257	F	5330012869853	Parts kit	ea
258	F	4320012721907	Parts kit	ea
259	F	2590012689989	Wear pad	ea
260	F	2590012690422	Wear pad	ea
261	F	2590012689988	Wear pad	ea
262	F	2530012689883	Wear pad	ea
263	F	5330012144857	Packing, preformed	ea
264	F	5330005992766	Packing, preformed	ea
265	F	5330012776290	Kit, parts	ea
266	F	2590012817914	Kit, parts	ea
267	F	5330011251856	Seal	ea
268	F	5330009794342	Seal Assembly	ea
269	F	5310012729047	Nut	ea
270	F	5305011651283	Bolt	ea
271	F	5330010397437	Gasket and seal kit	ea
272	F	---	Loctite primer NF	ea
273	F	5310011912514	Washer, lock	ea
274	F	5310000453296	Washer, lock	ea
275	F	5330014767693	Packing, preformed	ea
276	F	5330014767844	Packing, preformed	ea
277	F	5331004722783	Packing, preformed	ea
278	F	5331014316558	Packing, preformed	ea
279	F	5330014772740	Packing, preformed	ea
280	F	5330014775315	Gasket, burner head	eq
281	F	5330014775308	Gasket, burner head	ea

APPENDIX B

EXPENDABLE MATERIAL LIST (CONT'D)

(1) ITEM NUMBER	(2) LEVEL	(3) NATIONAL STOCK NUMBER	(4) DESCRIPTION	(5) U/M
282	F	5330014792123	Seal kit, exhaust	ea
283	F	5310014775188	Lockwasher, No. 8	ea
284	F	5310014775336	Lockwasher, No. 10	ea
285	F	5330014772809	Packing, preformed	ea
286	F	5330014772871	Packing, preformed	ea
287	F	5331015348717	Packing, preformed	ea
288	F	5330014772294	Packing, preformed	ea
289	F	5331014205128	Packing, preformed	ea
290	F	5310014944109	Washer, lock	ea
291	F	5330014772293	Packing, preformed	ea
292	F	7755022003(12361)	Packing, preformed	ea
293	F	5330014768492	Packing, preformed	ea
294	F	5331015348719	Packing, preformed	ea
295	F	9926110749(12361)	Packing, preformed	ea
296	F	5330014773432	Packing, preformed	ea
297	F.	9372103302 (12361)	Kit, steering cylinder seal	ea

APPENDIX C

ILLUSTRATED LIST OF MANUFACTURED ITEMS

C-1. SCOPE

This appendix includes complete instructions for making items authorized to be manufactured or fabricated at organizational maintenance.

APPENDIX C (CONT'D)

ILLUSTRATED LIST OF MANUFACTURED ITEMS

ITEM 1

SEE NOTE NO. 3

2.56

0.75

1.50

0.18

0.03R

15°

1.501
1.499

2.246
2.241

0.09

A

0.005

2 7/64 DRILL X 1.31 DEEP
90° C SINK X 0.53 DIA.
1/2 - 13 UNC - 28 X 1.00 DEEP

NOTES:

1. Remove all burrs and break sharp edges 0.010 / 0.005R.
2. Length \triangle to be heat treated to RC 50-55.
3. Length \triangle to have 10-20 full length, with a smooth intersection between chamfer and DIA. A.
4. Grease OD of length \triangle before installing shaft seal onto tool to prevent damage to the seal.
5. Material 4140 or equivalent.

SEAL DRIVER

ITEM 2

30°

3.25

0.38

1.501
1.499

1.255
1.252

1.00

10-20 FULL LENGTH OF
OD NO TOOL MARKS OR
SCRATCHES PERMISSIBLE.
WITH A SMOOTH INTER-
SECTION BETWEEN 30°
CHAMFER & DIA. A.

NOTES:

1. Remove all burrs and break sharp edges 0.010 / 0.005R.
2. Teflon preferred, alternate 4140 treated after machining to RC 50-55.
3. Install protective cone over shaft extension and grease OD to prevent damage to shaft seal.

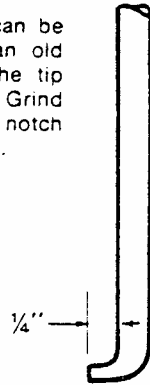
PROTECTIVE CONE

APPENDIX C (CONT'D)

ILLUSTRATED LIST OF MANUFACTURED ITEMS

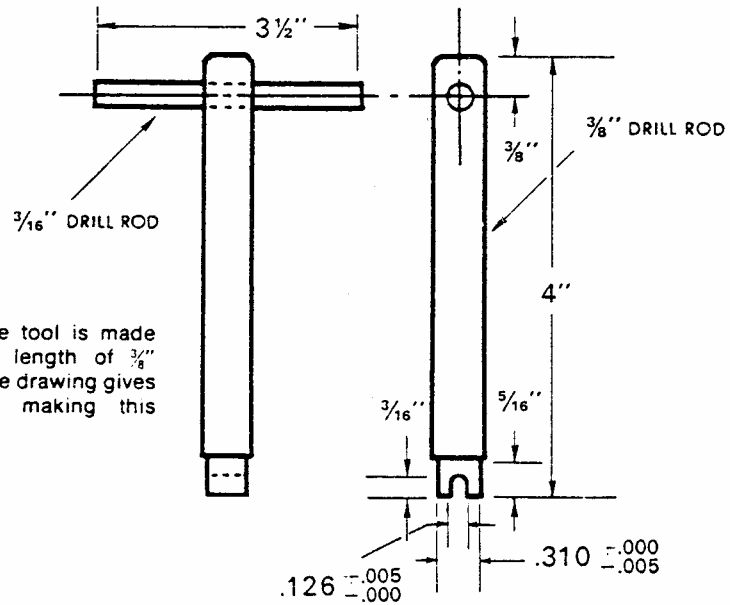
ITEM 3

Seal removal tool can be easily made from an old screwdriver. Heat the tip and bend as shown. Grind off the tip to fit the notch behind the shaft seal.



SEAL REMOVAL TOOL

ITEM 4



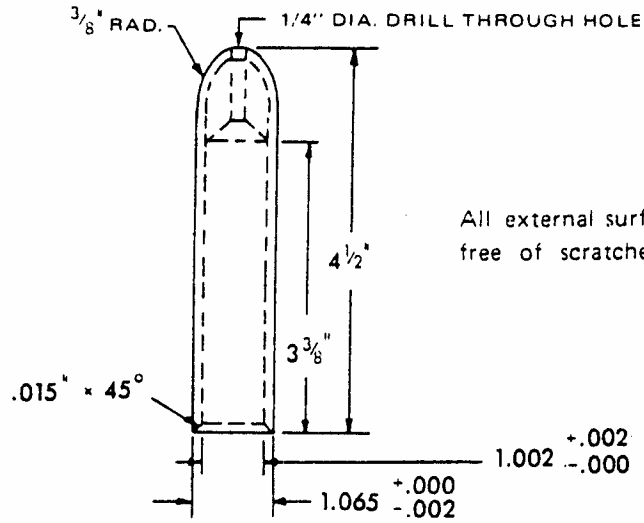
Check valve tool is made from a 4" length of 3/8" drill rod. The drawing gives details for making this handy tool.

CHECK VALVE TOOL

APPENDIX C (CONT'D)

ILLUSTRATED LIST OF MANUFACTURED ITEMS

ITEM 5

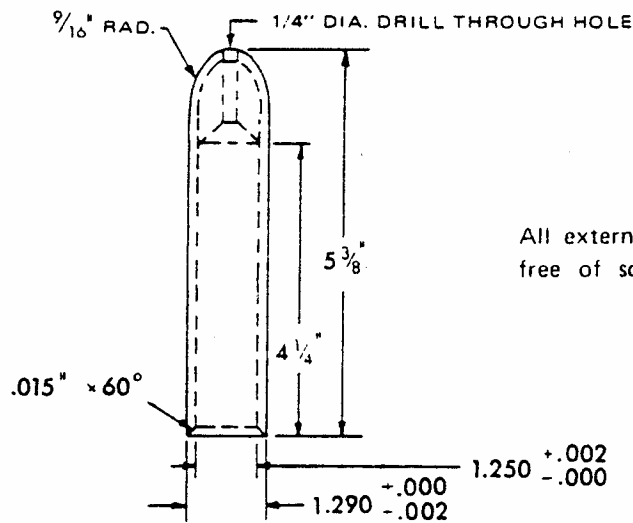


All external surfaces must be free of scratches and burrs.

1 1/4" or 1 1/2" diameter x 4 1/2" bar.

SLEEVE

ITEM 6



All external surfaces must be free of scratches and burrs.

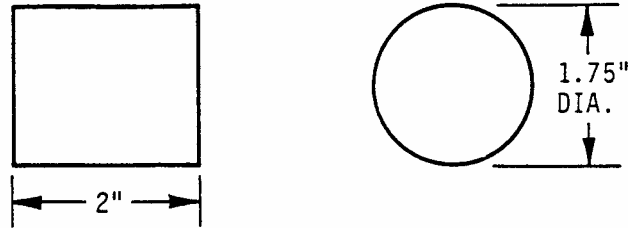
a 1 1/2" diameter x 5 1/2" bar.

SLEEVE

APPENDIX C (CONT'D)

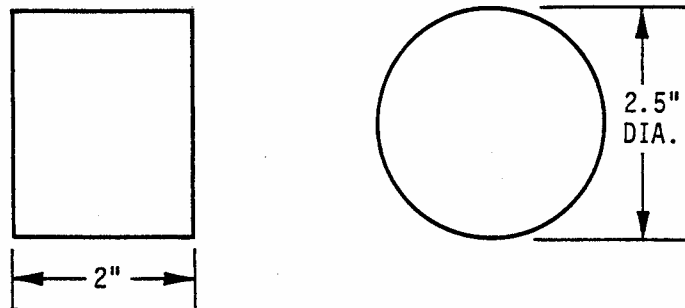
ILLUSTRATED LIST OF MANUFACTURED ITEMS

ITEM 7



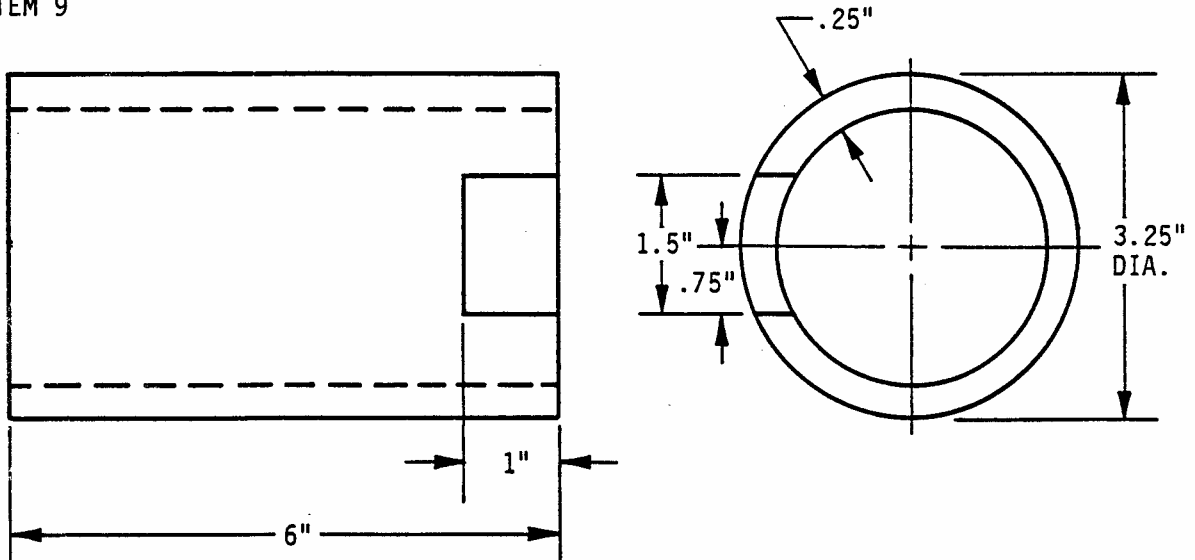
LIP SEAL INSTALLER

ITEM 8



LIP SEAL INSTALLER

ITEM 9

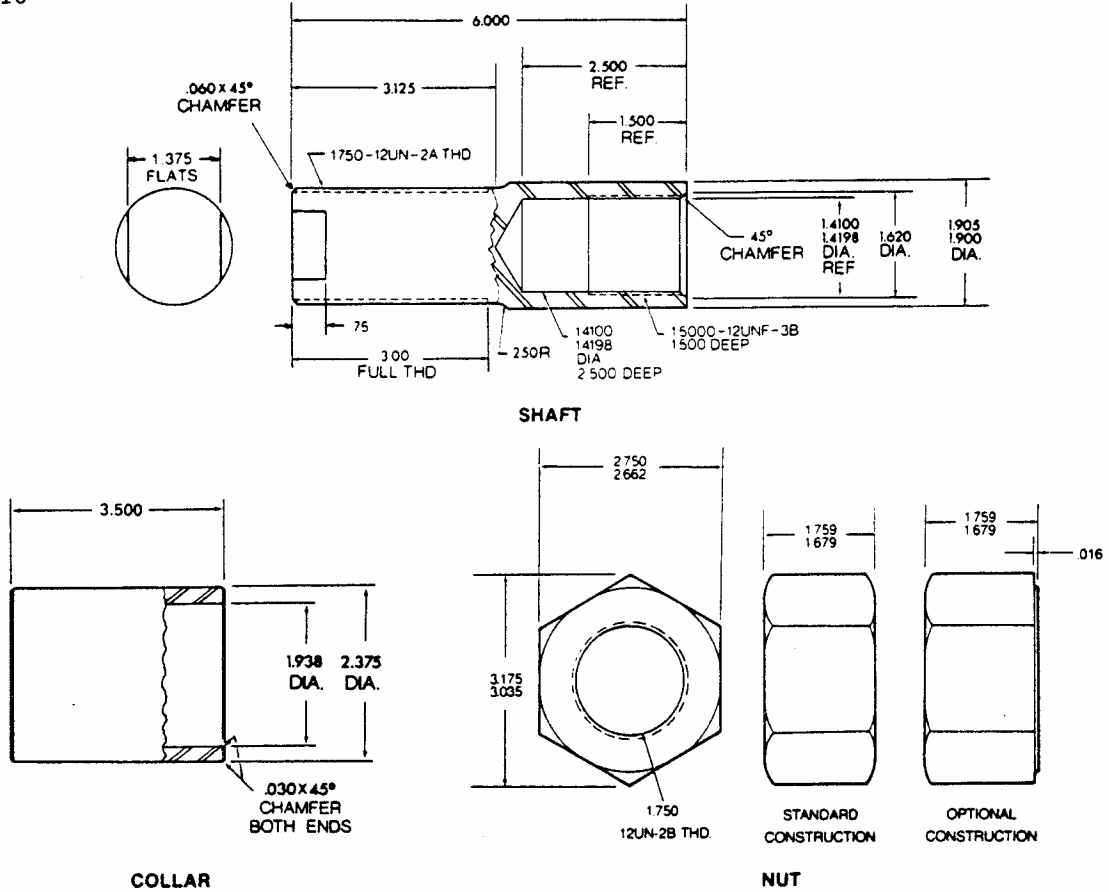


CLUTCH SPRING TOOL

APPENDIX C (CONT'D)

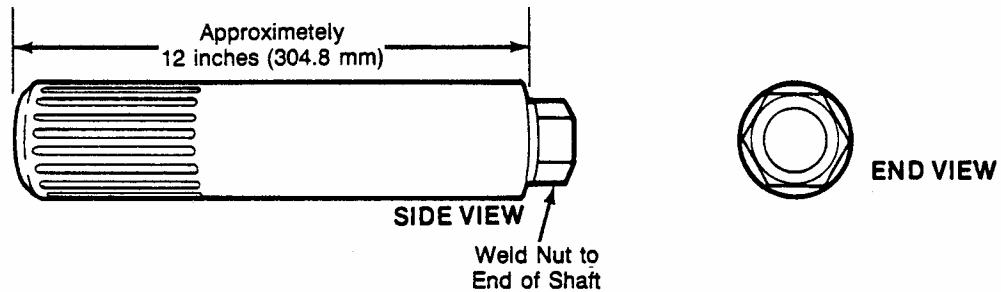
ILLUSTRATED LIST OF MANUFACTURED ITEMS

ITEM 10



YOKE THREE-PIECE INSTALLATION TOOL

ITEM 11



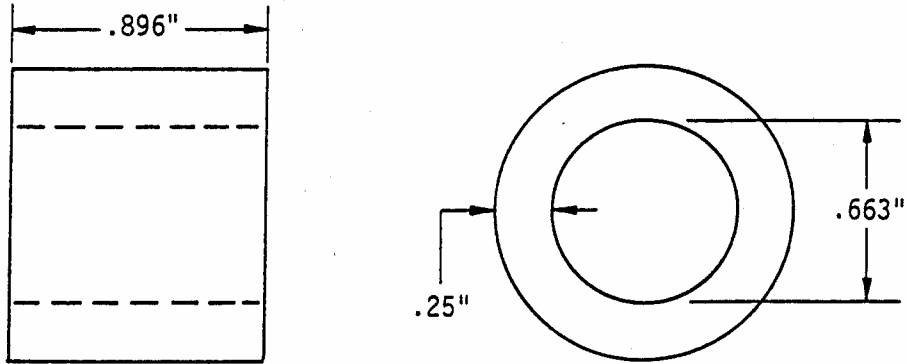
Tool can be made from an axle shaft that matches the spline size of the differential side gear.

CHECKING TOOL

APPENDIX C (CONT'D)

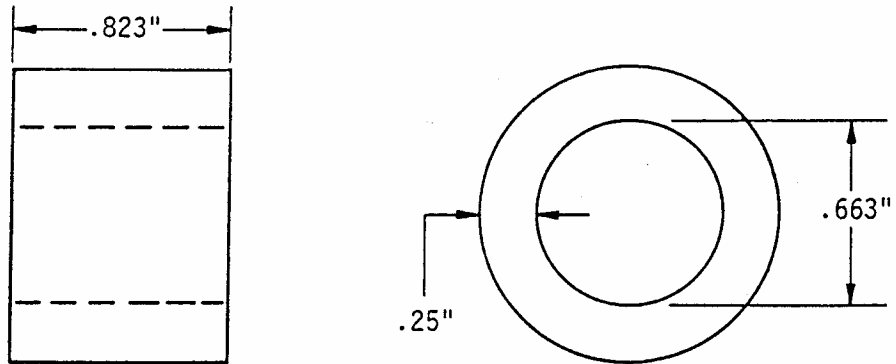
ILLUSTRATED LIST OF MANUFACTURED ITEMS

ITEM 12



EXHAUST VALVE GUIDE INSTALLATION SPACER

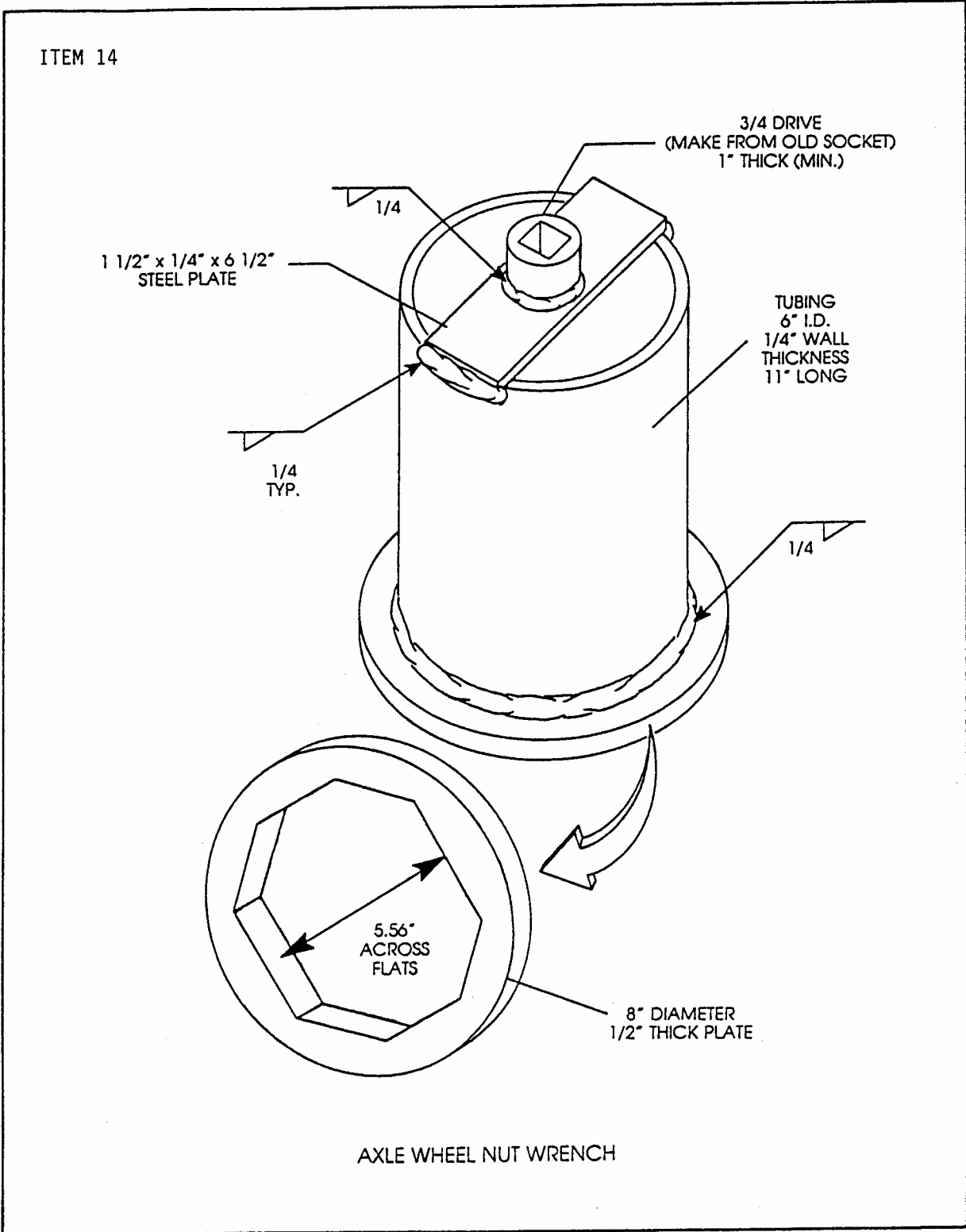
ITEM 13



INTAKE VALVE GUIDE INSTALLATION SPACER

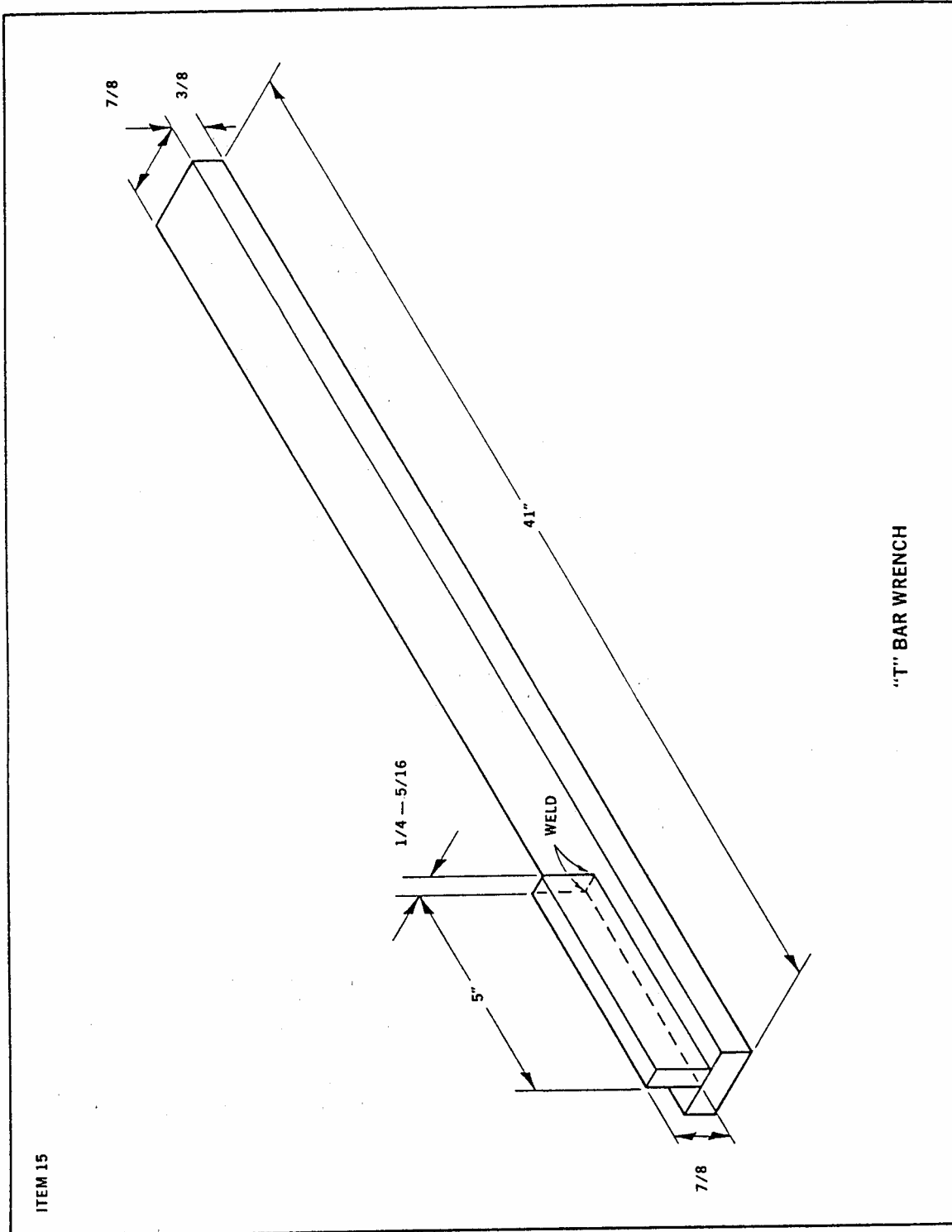
APPENDIX C (CONT'D)

ILLUSTRATED LIST OF MANUFACTURED ITEMS



APPENDIX C (CONT'D)

ILLUSTRATED LIST OF MANUFACTURED ITEMS



APPENDIX D

TORQUE LIMITS

INTRODUCTION

Use of proper torque values is extremely important. Improper torquing can seriously affect performance and reliability.

Identification of fastener grade is always necessary. When marked as a high strength bolt (grade 3, 5, etc.), the mechanic must be aware that he is working with a highly stressed component and the fastener should be torqued accordingly.

NOTE

Some special applications require variation from standard torque values. Reference should always be made to component overhaul procedures for recommendations.

Special attention should be given to the existence of lubricant, plating, or other factors that might require variation from standard torque values.

When maximum recommended torque values have been exceeded, the fastener should be replaced.

When referring to the applicable torque charts, use values as close as possible to the torque values shown to allow for wrench calibration tolerance. An erratic or jerking motion of the wrench can easily result in excessive torque. ALWAYS use a slow wrench movement and STOP when the predetermined value has been reached.

Torque wrenches are precision instruments and are to be handled with care to ensure calibrated accuracy. Calibration checks should be made on a scheduled basis. Whenever the wrench might be either overstressed or damaged, it should immediately be removed from service until recalibrated.

KNOW YOUR TORQUE WRENCH! Flexible beam type wrenches, even though they might have a preset feature, must be pulled at right angles and the force must be applied at the exact center of the handle. Force value readings must be made while the tool is in motion.

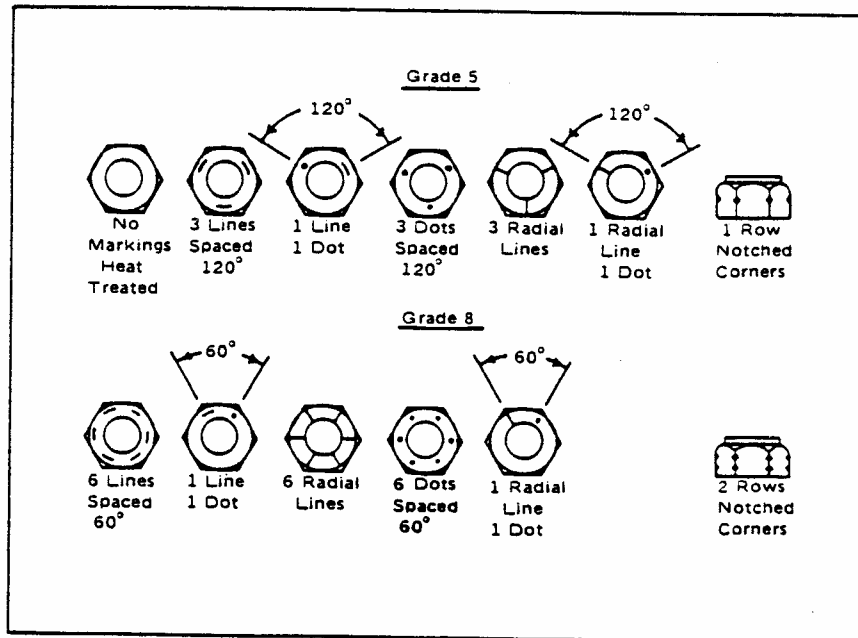
Rigid handle type torque wrenches are available with torque limiting devices that can be preset to required values and which eliminate dial readings.

NOTES













To convert pounds-foot of torque to kilograms meter (kgm), multiply the pounds-foot quantity by 0.138255.

To convert pounds-inch of torque to kilograms centimeter (kgcm), multiply the pounds-inch quantity by 1.152.













When multipliers and/or special tools are used to reach hard to get at spots, ensure torque readings are precisely calculated.



Nut Identification




FINE OR COURSE THREAD FASTENER	GRADE DESIGNATION	TENSILE STRENGTH MINIMUM	MATERIAL	3/8	7/16	1/2	9/16	5/8	3/4	7/8	1	1 1/4	1 3/8	1 1/2
				TORQUE POUNDS/FOOT										
 CAPSCREW	S.A.E. 2 A.S.T.M. A 307 STEEL	64,000 P.S.I.	Low Carbon Steel	19	30	45	66	93	150	202	300	659		1057
 CAPSCREW	S.A.E. 3 STEEL	100,000 P.S.I.	Medium Carbon Steel	30	47	69	103	145	234	372	551	1211		1943
 CAPSCREW	A.S.T.M. A-449 S.A.E. 5 STEEL	105,000 P.S.I.	Medium Carbon Steel or Low Alloy Heat Treated	31	50	75	110	150	250	378	583	1097		1748
 CAPSCREW	A.S.T.M. 35488 STEEL													
 CAPSCREW	A.S.T.M.A. A-325													
 CAPSCREW	A.S.T.M. A-354-BC STEEL	125,000 P.S.I.	Low Alloy or Med. Carb. Quenched Tempered	34	54	81	119	167	269	427	644	1392		2234
 CAPSCREW	S.A.E. 6 STEEL	133,000 P.S.I.	Med. Carbon Steel Quenched Tempered	43	69	106	150	209	350	550	825	1815		2913
 CAPSCREW	S.A.E. 7 STEEL		Med. Carbon Alloy, Quenched Tempered Roll Threaded											
 CAPSCREW	S.A.E. 8 STEEL	150,000 P.S.I.	Med. Carbon Alloy Quenched Tempered	46	75	115	165	225	370	591	893	1964	2633	3150
 SOCKET CAPSCREW	SOCKET HEAD CAPSCREW ALSO N.A.S. AIRCRAFT STD.	160,000 P.S.I.	High Carbon Alloy Quenched Tempered	50	81	121	176	240	395	629	964	2120		3402
 CAPSCREW	N.A.S. 144 AIRCRAFT STD. MS20000 MIL. STD.													
 CAPSCREW	N.A.S. 624 NATIONAL AIRCRAFT STANDARD STEEL	180,000 P.S.I.	High Carbon Alloy Quenched Tempered	56	91	136	198	270	444	708	1085	2385		3827

Torque values as shown are for nut-bolt combinations that have not been plated and have not had special lubrications applied to them and/or for those using flat or split ring types of washers. (Discount the residual lubricant present that was applied at the time of manufacture.)

FINE OR COURSE THREAD FASTENER	GRADE DESIGNATION	TENSILE STRENGTH MINIMUM	MATERIAL	3/8	7/16	1/2	9/16	5/8	3/4	7/8	1	1 1/4	1 3/8	1 1/2		
				TORQUE POUNDS/FOOT												
 CAPSCREW	S.A.E. 2 A.S.T.M. A-307 STEEL	64,000 P.S.I.	Low Carbon Steel	17	27	40	59	84	135	182	270	593		951		
 CAPSCREW	S.A.E. 3 STEEL	100,000 P.S.I.	Medium Carbon Steel	27	42	62	93	131	211	335	496	1090		1748		
 CAPSCREW	A.S.T.M. A-449 S.A.E. 5 STEEL	105,000 P.S.I.	Medium Carbon Steel or Low Alloy Heat Treated	28	45	68	99	135	225	340	524	987		1573		
 CAPSCREW	A.S.T.M. 35488 STEEL															
 CAPSCREW	A.S.T.M.A. A-325							90		180	320	473	711	1346		2340
 CAPSCREW	A.S.T.M. A-354-BC STEEL	125,000 P.S.I.	Low Alloy or Med. Carb. Quenched Tempered	31	49	73	107	150	242	384	580	1253		2010		
 CAPSCREW	S.A.E. 6 STEEL	133,000 P.S.I.	Med. Carbon Steel Quenched Tempered	39	62	95	135	188	315	495	743	1634		2620		
 CAPSCREW	S.A.E. 7 STEEL		Med. Carbon Alloy, Quenched Tempered Roll Threaded													
 CAPSCREW	S.A.E. 8 STEEL	150,000 P.S.I.	Med. Carbon Alloy Quenched Tempered	41	68	104	149	203	333	532	804	1768	2367	2835		
 SOCKET CAPSCREW	SOCKET HEAD CAPSCREW ALSO N.A.S. AIRCRAFT STD.	160,000 P.S.I.	High Carbon Alloy Quenched Tempered	45	73	109	158	216	356	566	868	1908		3062		
 CAPSCREW	N.A.S. 144 AIRCRAFT STD. MS20000 MIL. STD.															
 CAPSCREW	N.A.S. 624 NATIONAL AIRCRAFT STANDARD STEEL	180,000 P.S.I.	High Carbon Alloy Quenched Tempered	50	82	122	178	243	400	637	977	2147		3444		

Torque values as shown are for nut-bolt combinations that have been plated or have had lubrication applied.

Torque Values (Sheet 2 of 2)

FINE OR COURSE THREAD FASTENER	GRADE DESIGNATION	M4	M5	M6	M7	M8	M10	M12	M14	M16	M18	M20	M22	M24	M27	M30
		TORQUE POUNDS/FOOT														
	8.8	2	4	7	11	18	32	58	94	144	190	260	368	470	707	967
	10.9	2.9	6	10	16	25	47	83	133	196	269	366	520	664	996	1357
	12.9	3.6	7	11	20	29	58	100	159	235	323	440	628	794	1205	1630

Torque values as shown are for nut-bolt combinations that have not been plated and have not had special lubrications applied to them and/or for those using flat or split ring types of washers. (discount the residual lubricant present that was applied at the time of manufacture.)

Metric Torque Values

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Official:

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JOYCE E. MORROW
*Administrative Assistant to the
Secretary of the Army*
0703112

PETER J. SCHOOMAKER
*General, United States Army
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