

TECHNICAL MANUAL

UNIT MAINTENANCE

FOR

**CONTAINER CRANE, 40-TON,
ROUGH TERRAIN, MODEL RT875CC
NSN 3810-01-205-5716**

This manual shall be used in place of the Unit maintenance portion of the GROVE Manufacturing Company Commercial Maintenance Manual No. 7-187-000004-2 dated 1 Feb 89 and the PAT Equipment Corp. Troubleshooting Manual DS350M dated January 1989v that were originally overpacked with the crane.

Approved for public release; distribution is limited

H E A D Q U A R T E R S , D E P A R T M E N T O F T H E A R M Y

25 FEBRUARY 1993

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 FM21-11.

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.

WARNING**DRY CLEANING SOLVENT P-D-680 IS TOXIC AND FLAMMABLE**

1. Wear protective goggles and gloves and use only in a well ventilated area. Avoid contact with skin, eyes, and clothes and don't breath vapors.
2. Do not use near open flame or excessive heat. Flash point is 100° F 138° F (38° - 59° 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.

CAUTION**COMPRESSED AIR USED FOR CLEANING PURPOSES WILL NOT EXCEED 30 PSI**

1. Use only with effective chip guarding and personal protective equipment (goggles/shield, gloves, etc.).

WARNING

DISCONNECT BATTERIES 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

1. 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

1. Do not work on a hydraulic system while it is in operation or until all pressure is released.

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.

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TECHNICAL MANUAL
HEADQUARTERS
No. 5-3810-306-20

DEPARTMENT OF THE ARMY
Washington D.C., 25 February 1993

UNIT MAINTENANCE MANUAL
FOR
CONTAINER CRANE, 40-TON
ROUGH TERRAIN, MODEL RT875CC
NSN 3810-01-205-2716

REPORTING ERRORS AND RECOMMENDING IMPROVEMENTS

You can help improve this manual. If you find any mistakes or if you know of a way to improve the procedures, please let us know. Mail your letter, DA Form 2028 (Recommended Changes to Publications and Blank Forms), or DA Form 2028-2 located in the back of this manual direct to: US Army Tank-Automotive Command, Attn: AMSTA-MB, Warren, MI 48090-5000. A reply will be furnished to you.

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CHAPTER 1

INTRODUCTION

Section I. GENERAL INFORMATION

SCOPE

Type of Manual: Organizational Maintenance

Model Number and Equipment Name:

RT875CC - Container Crane, Rough Terrain
Wheel Mounted, Hydraulic, Diesel Powered

Purpose of Equipment: Provides for 360 degree boom travel and 80, 000 lbs (40 Tons) lifting capacity in rough terrain conditions.

MAINTENANCE FORMS, RECORDS, AND REPORTS

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

Accidents involving injury to personnel or damage to materiel will be reported on DA Form 285 (Accident Report) in accordance with AR385-40.

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.

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 is warranted by Grove Manufacturing Company for 18 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 Rough Terrain Container Crane

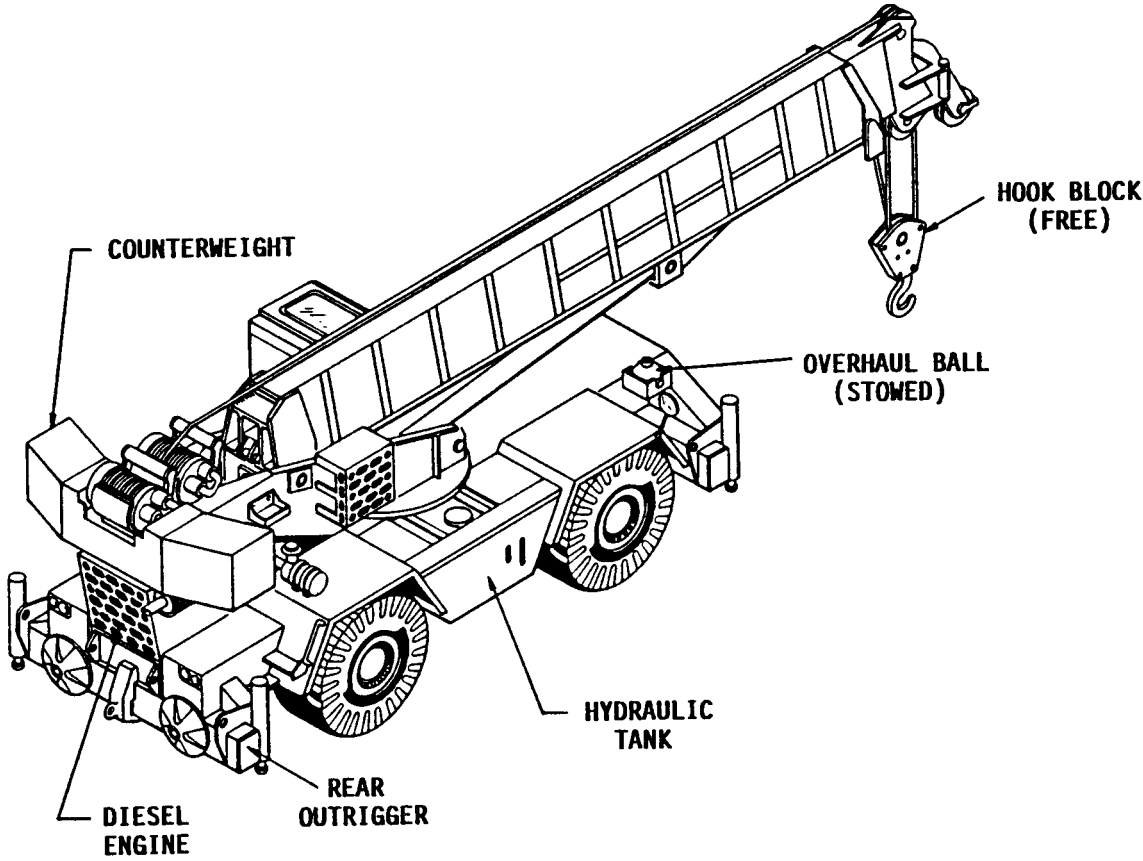
- Axle steering accomplished by utilizing hydraulic steer cylinders
- Welded steel frame
- Engine mounted at rear of crane
- Superstructure
- Sliding beam outriggers are integral with carrier frame
- Remote mounted six speed transmission
- Four-wheel drive

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

LOCATION AND DESCRIPTION OF MAJOR COMPONENTS

- Counterweight. Bolted onto turntable to be part of turntable assembly. Weighs 12, 500 pounds.
- Hookblock. Provides lifting capability while boom is retracted. Capable of lifting 40 tons and utilizes one-piece pivot block with a safety latch.
- Overball 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.



LOCATION AND DESCRIPTION OF MAJOR COMPONENTS

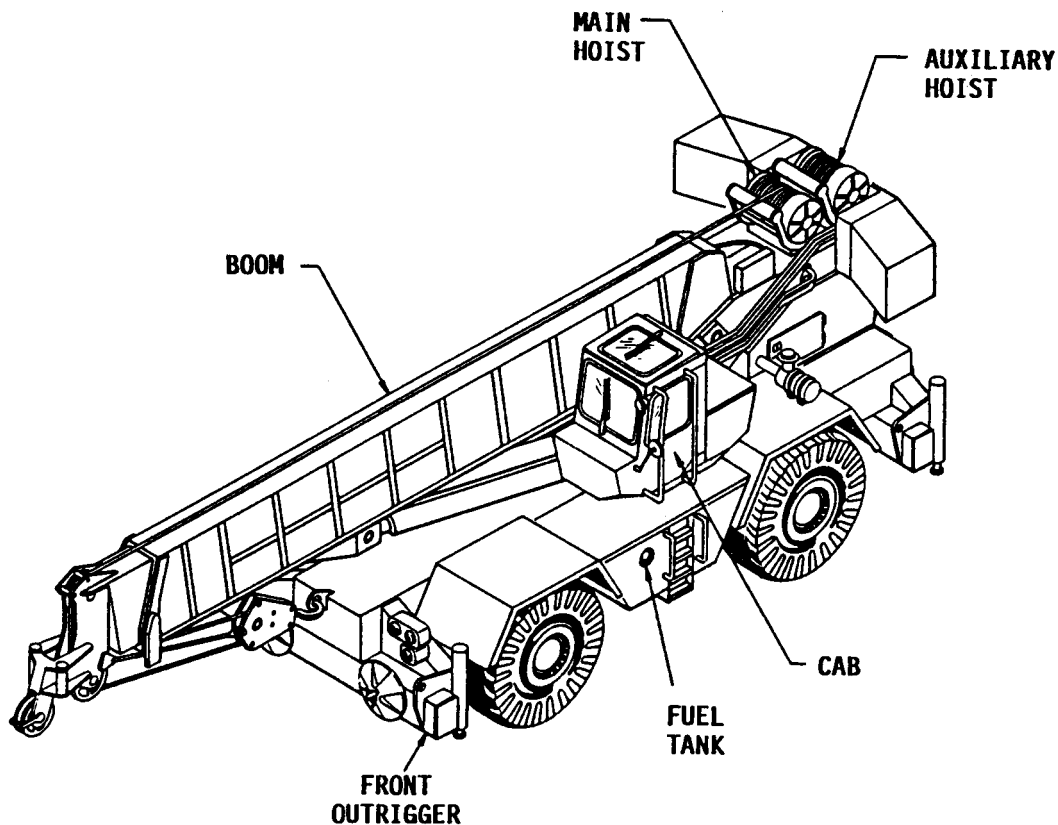
Boom. Extends from 34 to 60 feet with one full powered telescoping section. Trapezoidal in design and uses one 6.50-inch telescope cylinder to extend and retract boom. Boom elevation is from -4° degrees (below horizontal) to $+80^{\circ}$ degrees. Supports main and auxiliary boom nose.

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 roading 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.



EQUIPMENT DATA

General

Grove Manufacturing Co. Model No..... RT875CC
 Drive 4 x 4
 Gross Weight 94, 500 lbs. (42, 865 kg)

NOTE

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

Dimensions

Wheel Base 170 inches (431.8 cm)
 Overall Crane Length 46.3 feet (14.1 cm)
 Overall Crane Width 144 inches (365.76 cm)
 Overall Crane Height..... 156.75 inches (398.15 cm)
 Tail-swing 171 inches (434.43 cm)
 Curb Clearance Circle (4W Steer Mode) 50.2 feet (15.3 m)

Capacities

Fuel Tank 100 gallons (378.50 liters)
 Hydraulic Tank 165 gallons (624.52 liters)
 Coolant System 44 quarts (41.6 liters)
 Engine Lubrication System 23.7 quarts (22.42 liters)
 Hoists (each) 10 quarts (9.46 liters)
 Swing Gearbox..... 15 quarts (14.2 liters)
 Axle Planetary Ends 58 pints (27.45 liters)
 Axle Drive Unit 30 pints (14.2 liters)
 Transmission 8.6 gallons (32.6 liters)

Fire Extinguisher

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

Engine

Manufacturer Cummins
 Model 6CTA8.3
 Type 6 cyl. OHV, diesel
 Combustion 4 cycle, turbo-charged, after-cooled
 Bore and Stroke 4.49 in. x 5.32 in. (114 mm x 135 mm)
 Displacement 504.5 cu. in. (8.27 liters)
 Horsepower (Gross) 250
 Torque (Gross) 650 ft. lb. @ 1800 RPM
 Cooling System 44 quarts (41.6 liters)
 Air Cleaner 2 stage, dry type

Air Compressor

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

Hydraulic Pumps

Manufacturer Commercial Shearing
Model - 3-section 313-9632-002
2-section 313-9320-536
Type Gear
Sections 1- two section and 1 - three section
GPM 3 - 50 gpm and 2 - 27 gpm @ 2400 rpm

Swing Motor

Manufacturer Char-Lynn
Model 101-1086
Type Genotor
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 2-187-900028
Length 34.4 - 64.4 feet (10.5 - 18.4 M)
Elevation -4 to +80 degrees

Main and Auxiliary Hoists

Manufacturer Grove
Model HO 30E-16
Drum Dimensions
Diameter 16 inch (40.64 cm)
Length 16 inch (40.64 cm)
Cable Capacity With Cable Dia. of 0.75 inch (19mm)
16 inch (40.64 cm) Drum 525 feet (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 kgm)

Outriggers

Manufacturer Grove
Model2-187-100108
Type Double box beam and jack
Extended Length 288 inches (731.52 cm)
Retracted Length..... 133 inches (337.82 cm)

Hydraulic Swivel

Manufacturer Grove
Model6-364-001428
Ports 11 with dual ports on 11

Air/Hydraulic 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
Batteries
Number(4)
Rating 610 CCA @ 0°F
Alternator 65 AMP, 24 Volt

Emergency Steer Pump

Manufacturer John S. Barnes
Model..... 1380004
Type Gear
Capacity 5.3 gpm (20.1 lpm)
RPM 400
Voltage24 volts

Cab Heater

ManufacturerWebasto
Model 468-657
Type Internal Combustion
Voltage 24 Volts
Fuel Diesel
Heat Output15, 000 Btu/hr

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 manufacturers 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

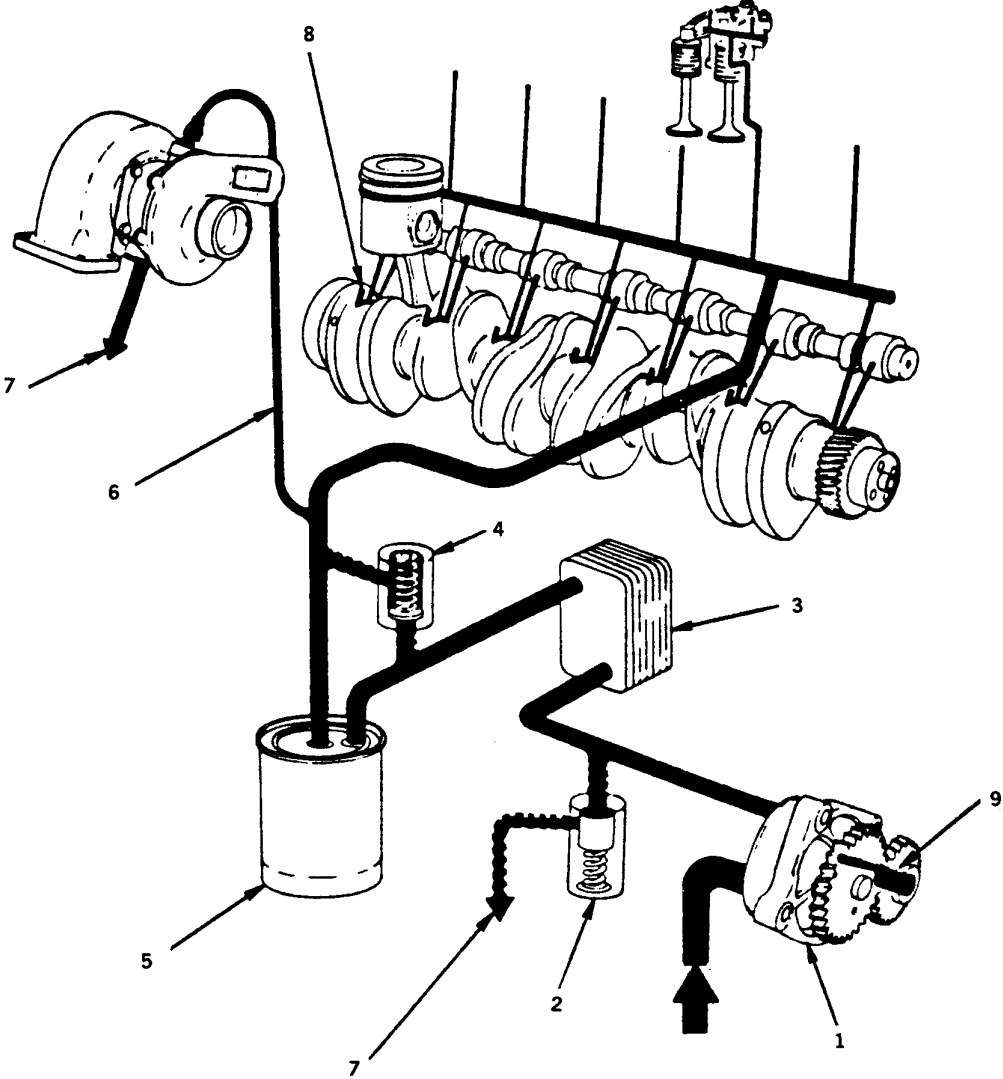
The oil cooler cover contains a bypass valve that will let the oil flow bypass a plugged oil filter. If the pressure drop across the oil filter exceeds 138 kPa (20 PSI), the bypass valve will open, allowing the oil to continue through the engine.

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 locktype 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)

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 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

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.

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.

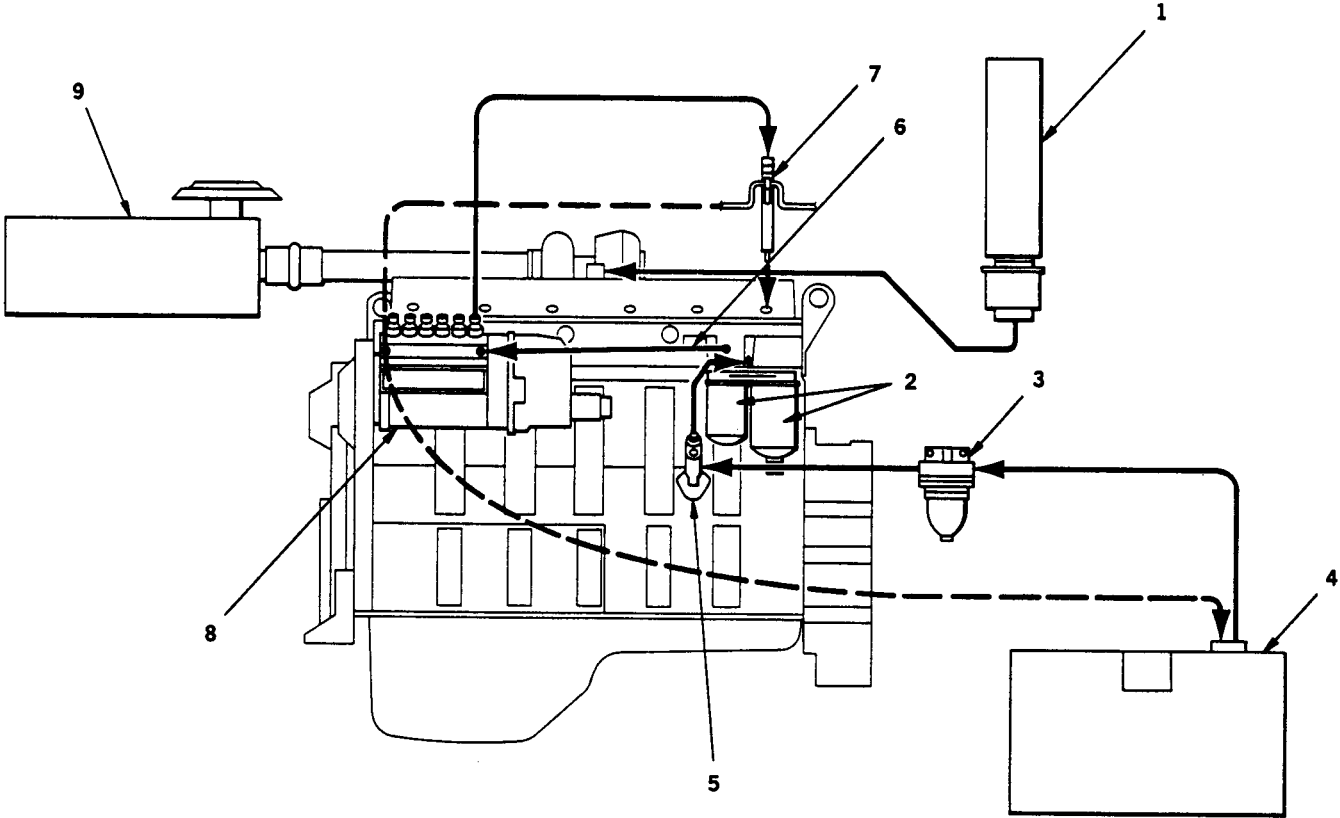
Quick Starting Kit

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 degree F (82 degrees 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 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.

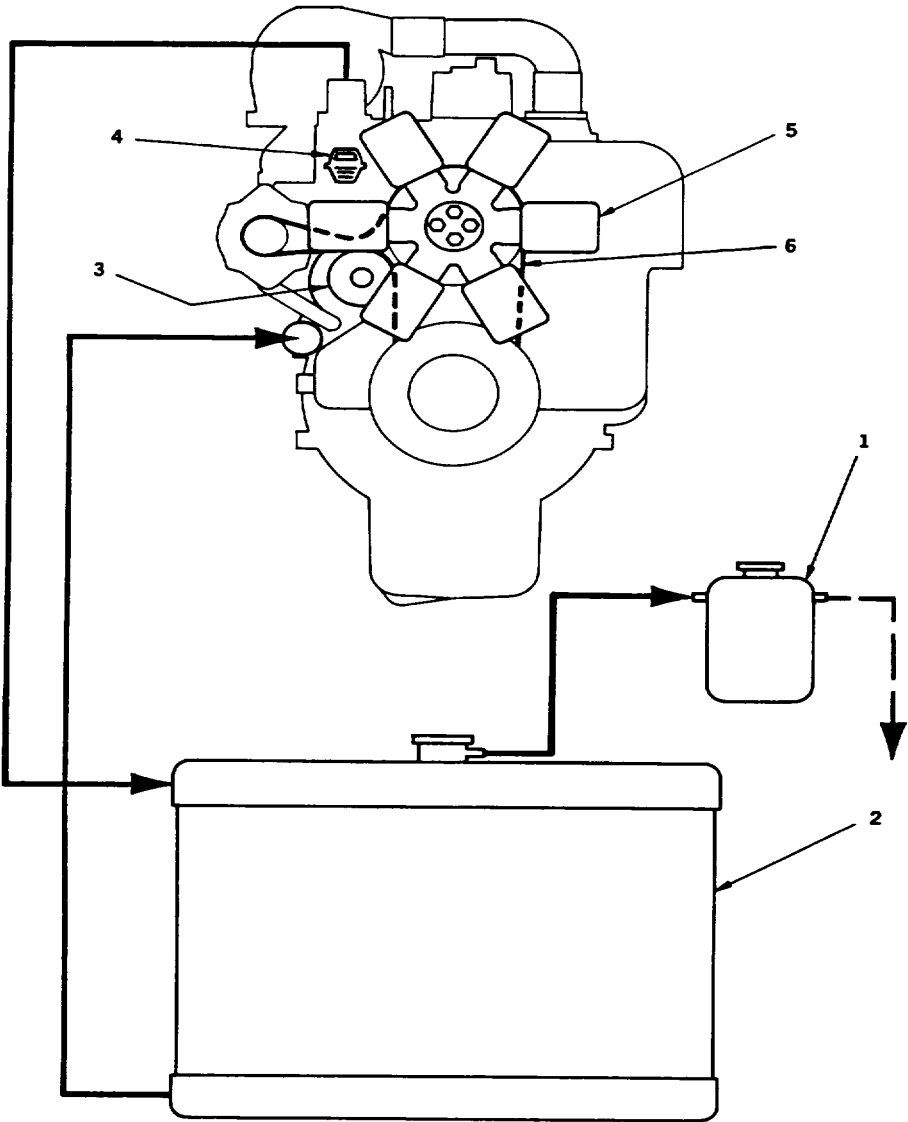
Fan Drive Belt

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. WATERPUMP
- 4. THERMOSTATS
- 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.

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 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.

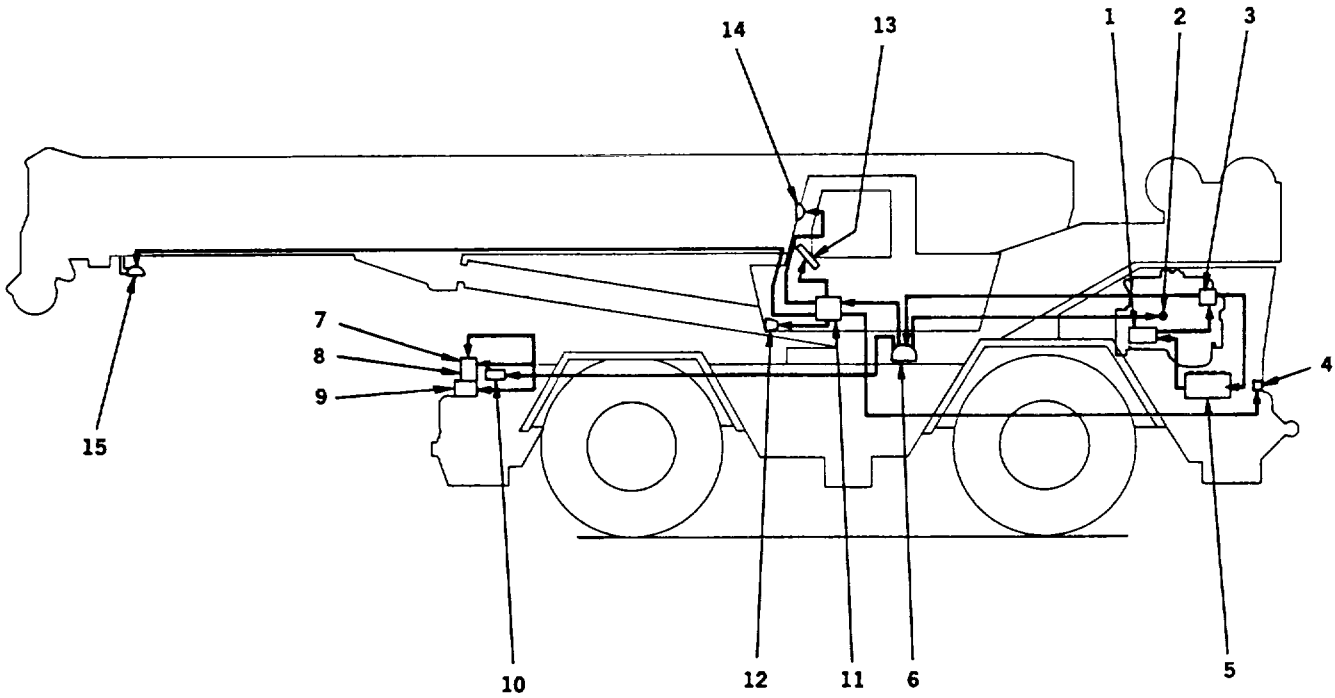
CARRIER FRAME

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 include; 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 FLOODLIGHT

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 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.

Safety Valve

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

The primary reservoir provides the supply for the dual brake valve, the parking brake valve, the transmission shift valve, and the R12 relay valve for the spring or parking brake release.

Pressure Protection Valves

Three pressure protection valves are used in this air system. Two of the pressure protection valves are set at 85 psi (586 kPa/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

The secondary reservoir provides the supply for the R12 relay valve for the service brakes application and the supply for the dual brake valve (pedal) in the cab.

R-12 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 actuators in response to the signals received from the parking brake valve or the dual brake valve.

The rapid reaction of the relay valve to changes in control pressures is in part due to the relatively small volume of air required between the valve cover and the relay piston. The area of the relay piston and the pressure of the quick release also contribute greatly to the fast application and release of the actuators.

When the dual brake valve is actuated, air pressure is delivered to the service port of the relay valve. Air pressure delivered to the service port enters the small cavity above the piston and moves the piston down. The exhaust seat moves down with the piston and seats on the inner or exhaust portion of the inlet and exhaust valve, sealing off the exhaust passage. At the same time, the outer or inlet portion of the inlet and exhaust valve moves off its seat, permitting supply air to flow from the reservoir, past the open inlet valve and into the actuator.

The air pressure being delivered by the open inlet valve also is effective on the bottom area of the relay piston. When this air pressure beneath the piston reaches that being delivered above, the piston moves up slightly and the inlet spring returns the inlet valve to its seat. The exhaust remains closed as the service line pressure balances the relay valve delivery pressure.

When air pressure is released from the service port and air pressure in the cavity above the relay piston is exhausted, air pressure beneath the piston lifts the relay piston and the exhaust seat moves away from the exhaust valve, opening the exhaust passage. With the exhaust passage open, the air pressure in the air actuators exhausts out the exhaust port to the atmosphere.

Foot Brake Valve

The foot 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 driver with a graduated control for applying and releasing the vehicle brakes.

The circuits in the foot brake valve are identified as follows. The No. 1 circuit portion is that portion of the valve between the spring seat which contacts the plunger and the relay piston. The No. 2 circuit portion is that portion between the relay-piston and the exhaust cavity.

The No. 1 circuit portion of the valve is similar in operation to standard single-circuit air brake valve and under normal operating conditions the No.

2 circuit portion is similar in operation to a relay valve.

Both the No. 1 and No. 2 circuit portions of the dual brake valve use a common exhaust protected by an exhaust diaphragm.

For explaining the operation of the foot brake valve, the valve is divided into a No. 1 circuit portion and a No. 2 circuit portion.

Applying Normal Operation of No. 2 Circuit Portion

When the brake treadle is depressed, the plunger exerts force on the spring seat, rubber graduating spring, and No. 1 piston. The No. 1 piston which contains the exhaust valve seat, closes the No. 1 exhaust valve. As the exhaust valve closes, the No. 1 inlet valve is moved off its seat allowing No. 1 air to flow out the No. 1 delivery port.

Applying - Normal Operation of No. 1 Circuit Portion

When the No. 1 inlet valve is moved off its seat, air is permitted to pass through the bleed passage and enters the relay piston cavity. The air pressure moves the relay piston, which contains the exhaust seat and closes the No. 2 exhaust valve. As the No. 2 exhaust valve closes, the No. 2 inlet valve is moved off its seat allowing the No. 2 air to flow out the No. 2 delivery port. Because of the small volume of air required to move the relay piston, action of the No. 2 circuit portion of the valve is almost simultaneous with the No. 1 circuit portion.

Applying Loss of Air in the No. 2 Circuit

Should air be lost in the No. 2 circuit, the No. 1 circuit portion will continue to function as described under Normal Operation of No. 1 Circuit Portion.

Applying Loss of Air in the No. 1 Circuit

Should air be lost in the No. 1 circuit, the function will be as follows. As the brake treadle is depressed and no air is present in the No. 1 circuit supply and delivery ports, the No. 1 piston will mechanically move the No. 2 exhaust valve open the No. 2 inlet valve and allow air to flow out the No. 2 delivery port.

Balanced No. 1 Circuit Portion

When the No. 1 delivery pressure acting on the piston equals the mechanical force of the brake pedal application, the No. 1 piston will move and the No. 1 inlet valve will close, stopping the further flow of air from the No. 1 supply line through the valve. The exhaust valve remains closed preventing any escape of air through the exhaust port.

Balanced No. 2 Circuit Portion

When the air pressure on the No. 2 side of the relay piston approached that being delivered on the No. 1 side of the relay piston, the relay piston moves closing the No. 2 inlet valve and stopping further flow of air from the supply line through the valve. The exhaust remains closed as the No. 2 delivery pressure balances the No. 1 delivery pressure.

When applications in the graduating range are made, a balanced position in the No. 1 portion is reached as the air pressure on the delivery side of the No. 1 piston equals the effort exerted by the operator's foot on the treadle. A balanced position in the No. 2 position is reached when air pressure on the No. 2 side of the relay piston closely approaches the air pressure on the No. 1 side of the relay piston.

When the brake treadle is fully depressed, both the No. 1 and No. 2 inlet valves remain open and full reservoir pressure is delivered to the actuators.

Releasing - No. 1 Circuit Portion

With the brake treadle released, mechanical force is removed from the spring seat, rubber graduating spring, and No. 1 piston. Air pressure and spring load moves the No. 1 piston, opening the No. 1 exhaust valve allowing air pressure in the No. 1 delivery line to exhaust out the exhaust port.

Releasing No. 2 Circuit Portion

With the treadle released, air is exhausted from the No. 1 circuit side of the relay piston. Air pressure and spring load move the relay piston, opening the No. 2 exhaust valve allowing air pressure in the No. 2 delivery line to exhaust out the exhaust port.

Low Pressure Indicating Switch

The low pressure indicating switch is designed to provide a warning to the operator that one or both air systems are at a low pressure. The switch is electrically connected to a buzzer and a 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 Switch

A stop light switch is installed in the No. 1 circuit of the dual brake valve. The switch senses the pressure 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. Each wheel has two spring brake chambers and two service brake chambers. The spring brake is spring actuated and must be released by pressurized air. The spring brakes on all four wheels are released by the parking brake push-pull knob on the right hand console in the cab. Pushing down on the parking brake causes air pressure to enter the spring brake chamber on each wheel and compress the spring, releasing the brakes. At least 40 psi (275.8 kPa/2.75 bar) is required to keep the parking 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 air 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 service brakes, the spring brake valve will allow the operator to release or bleed off the air pressure in the spring brake chamber by depressing the foot brake pedal to apply the brakes.

Dual Brake Valve

The dual brake valve is used in the air system when a single function or component must be controlled by either of two sources of pressure. The dual brake valve transmits the higher of the two pressure sources to the outlet port.

As air pressure enters either end of the dual brake valve (inlet port), the movable shuttle responds to the air pressure and seals the line on the opposite inlet port, but permits air pressure to flow out the outlet port. The same action will take place if the air pressure on one side of the shuttle is higher than the air pressure on the other side. It is not necessary for the cavity, one side of the disc or shuttle, to be exhausted for the valve to operate.

Dual brake valves are designed so that it is impossible for the shuttle to block off the outlet port.

Spring Brake Valve

The function of the spring brake valve is to supply a specific, limited holdoff pressure to the spring brakes, and in the event of loss of service pressure, to modulate the spring brakes through the use of the dual brake 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.

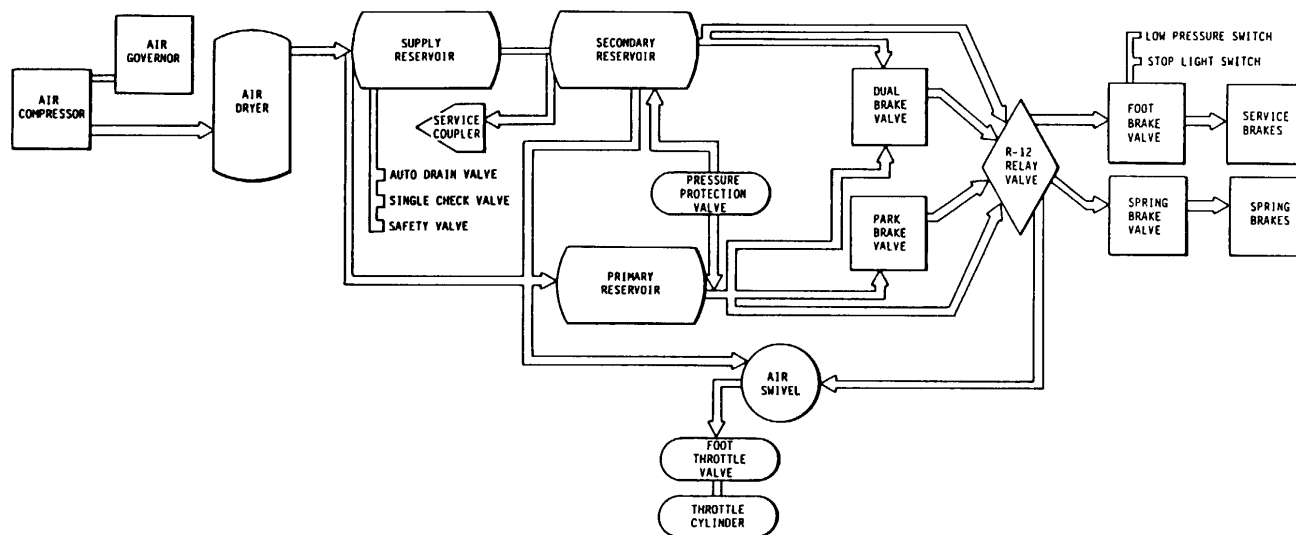
Initial charge air, from primary and secondary reservoirs flow through the park control valve and enters the spring brake valve supply port. Air entering the supply port flows past inlet and exhaust valve B to the under side of piston B and out the delivery port of the spring brake valve to the emergency air connection at the spring brake actuator. Air flowing from the primary reservoir only enters the reservoir port of the spring brake valve.

This air remains under piston A as system pressure builds. With primary reservoir 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 reservoirs, 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 application is made by actuating the dual brake valve, air from the No. 2 delivery circuit is delivered from the brake valve to the control port, and is stopped at the closed inlet of valve A. No movement of the internal components of the spring brake valve takes place. Air from the No. 1 delivery circuit of the dual brake valve actuates the service section of the spring brake actuators.

With both system No. 1 and No. 2 intact when the park control valve is placed in the park or exhaust position, the spring brake valve supply of air pressure and the air pressure in the spring brake actuator cavities is exhausted. The single check valve in the spring brake valve assists this exhaust of air pressure from the spring brake by allowing the air below piston B to flow back out the open exhaust of the park 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 valve from the spring brakes.



AIR BRAKE SYSTEM

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 circuits 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 degrees F (44 degrees 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 overpressurization. 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 evidence 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/172.38 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 weepage 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-overfront, 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 relief the pressure in the power steering system when the pressure reaches 2500 psi (17,238/172.3). 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.

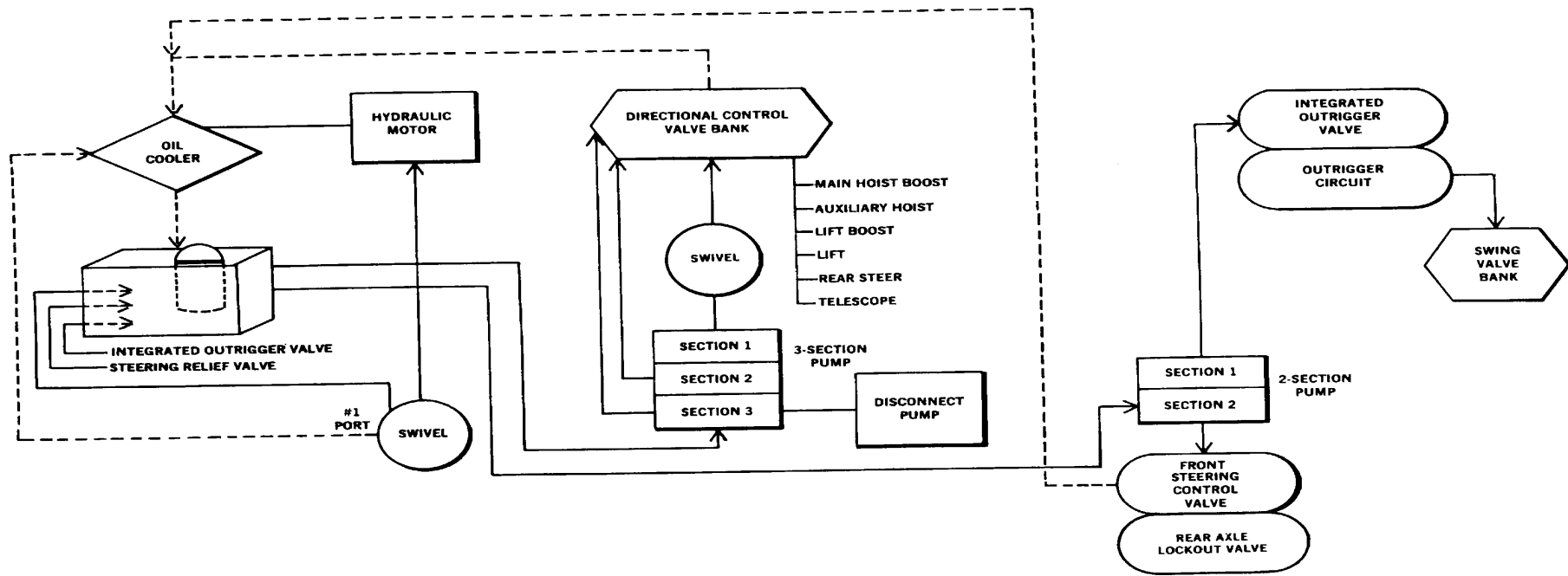
Bypass Valve Assembly

The bypass valve assembly consists of a single selector valve, air cylinder, and a three 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 it's 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

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, test 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 organizational maintenance for this equipment.

Section II. SERVICE UPON RECEIPT

SUMMARY

The Container Crane is shipped in an "operation-ready" condition requiring no maintenance or operator actions. However, it is recommended that a visual inspection of each system be made to ensure air, hydraulic, fuel, and coolant lines or fittings have not loosened or been damaged during transit from the manufacturer.

UNPACKING

The following should be used as a check list while unpacking the container Crane;

1. Remove the restraining strap on the cab door.
2. The fire extinguisher must be removed from the tool box and placed in the mounting bracket located in the cab.

CHECKING UNPACKED EQUIPMENT

- a. Inspect the equipment for damage incurred during shipment. If the equipment has been damaged, report the damage on Form DD Form 6, Packaging Improvement Report.
- b. Check the equipment against the packing slip to see if the shipment is complete. Report all discrepancies in accordance with the instructions of DA PAM 738-750.
- c. Check to see whether the equipment has been modified.

DEPROCESSING UNPACKED EQUIPMENT

The container crane should be clean and free of excess grease. However, if during inspection, any excess grease or lubricant is found on the carrier frame or superstructure it should be cleaned immediately.

PRELIMINARY SERVICING AND ADJUSTMENT

The container crane is shipped completely serviced except for diesel fuel.

A complete walk-around visual inspection of the crane should always be made before operation. Special attention should be given to structural damage, loose equipment, leaks, or other conditions that would require immediate correction for safe operation. The following checklist items are suggested specifically for the operator's benefit to make certain the crane is prepared for starting the days work.

Fuel Supply/Fuel-Water Separator

Ensure the fuel tank is full and the cap is on tight. Open valve (no more than one turn) on the bottom of fuel-water separator. Carefully close valve when clean fuel is visible. Do not overtighten plastic valve.

Engine Oil

Check oil level in the crankcase; fill the FULL mark on the dipstick. Do not overfill.

Engine Coolant

Check coolant level in the radiator by inspecting the coolant expansion tank level located in the engine hood, upper-left rear; fill to proper level. Do not overfill. Check cap for security.

Batteries

Ensure the cables and clamps are tight and not corroded.

Horns, Signals, and Lights Check all signal and running lights for proper operation. Replace burned out lamps with those of the same number, or equivalent. Ensure backup alarm and steering wheel horn are operable.

Foot and Parking Brake

Check for proper operation.

Fan Belt and Fan Inspect fan belt for cracks or fraying.

Inspect fan for cracks.

Transmission

Check transmission oil level; fill if required.

Daily Lubrication

Make certain that all components requiring daily lubrication have been serviced. (Refer to LO 5-3810-306-12.)

Hydraulic Reservoir and Filter

Check hydraulic fluid quantity level gauge and check filter condition indicator. Check breather for cleanliness and security.

Tires

Check for severe cuts, foreign objects inbedded in treads, and for correct inflation pressures.

Wire Rope

Inspect wire rope in accordance with PMCS. Sheaves, guards, guides, drums, flanges, and any other surfaces that come in contact with the rope should be inspected for any condition that could cause possible damage to the rope.

Hook Block

Visually inspect for nicks, gouges, cracks, and evidence of any other damage. Replace a hook containing cracks or showing evidence of excessive deformation of the hook opening (including twist). Be sure the safety latch is free and aligned.

Air Cleaners

Check the air restriction indicator. Check filters and tubing for security.

Muffler and Pipes

Inspect all exhaust system components from the turbocharger exhaust to the tailpipe for corrosion, damage, and loose parts.

Fire Extinguisher

Check the charge indicator dial to ensure that pointer is in the green zone.

Cab Heater

Check cab heater fuel tank is full. The tank is located on the left side of turntable.

Windshield Washer Fluid

Check the windshield washer fluid bottle located in the valve compartment behind the operator's cab.

Tool Box

Check to ensure Emergency Load Lowering hoses (3) and pump handle are stowed. Also ensure that the hoist drain pan is stowed.

Swing/Boom Warning System

Check the elevation warning switch at the bottom of the boom for free operation.

Section III. ORGANIZATIONAL PREVENTIVE MAINTENANCE CHECKS AND SERVICES

GENERAL

To make sure that your vehicle is ready for operation at all times, inspect it systematically so you can discover any defects and have them corrected before they result in serious damage or failure. The charts on the next few pages contain your organizational PMCS. The item numbers indicate the sequence of minimum inspection requirements. If you're operating the vehicle and notice something wrong which could damage the equipment if you continue operation, stop operation immediately.

Record all deficiencies and shortcomings, along with the corrective action taken on a DA Form 2404. The Item Number column is the source for the numbers used on the TM Number column on DA Form 2404.

ORGANIZATIONAL PREVENTIVE MAINTENANCE CHECKS AND SERVICES

1. The item numbers of the table indicate the sequence of the PMCS. Perform at the intervals shown below:
 - a. Do your (Q) PREVENTIVE MAINTENANCE quarterly (every three months).
 - b. Do your (S) PREVENTIVE MAINTENANCE semiannually (every six months).
 - c. Do your (A) PREVENTIVE MAINTENANCE annually (once every year).
 - d. Do your (B) PREVENTIVE MAINTENANCE biannually (one every two years).
 - e. Do your (H) PREVENTIVE MAINTENANCE at the hour interval listed.
 - f. Do your (M) PREVENTIVE MAINTENANCE monthly (once a month).
2. If something doesn't work, troubleshoot it according to the instructions in this manual.
3. Always do your preventive maintenance in the same order so it gets to be a habit. Once you've had some practice, you'll spot anything wrong in a hurry.
4. If anything looks wrong and you can't fix it, write it down on your DA Form 2404. If you find something seriously wrong, report it to direct support as soon as possible.

WARNING

Dry cleaning solvent P-D-680 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 100° F 1380 F (380 C 590 C). If you become dizzy while using 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 personnel protective equipment (goggles/shield/gloves, etc.).

a. Keep it clean: dirt, grease, oil, and debris only get in the way and may cover up a serious problem. Clean as you work and as needed. Use dry cleaning solvent (P-D-680) to clean metal surfaces. Use soap and water when you clean rubber or plastic material.

b. Bolts, nuts and screws: check that they are not loose, missing, bent, or broken. You can't try them all with a tool, of course, but look for chipped paint, bare metal or rust around bolt heads. Tighten any bolt, nut, or screw that you find loose.

c. Welds: look for loose or chipped paint, rust or gaps where parts are welded together. If you find a bad weld, report it to intermediate direct support.

d. Electric wires and connectors: look for cracked or broken insulation, bare wires and loose or broken connectors. Tighten loose connections and make sure the wires are in good condition.

e. Hoses and fluid lines: look for wear, damage and leaks. make sure clamps and fittings are tight. Wet spots show leaks, but a stain around a fitting or connector can also mean a leak. If leakage comes from a loose fitting or connector, tighten the fitting or connector. If something is broken or worn out, either correct it or report it to intermediate direct support (refer to the Maintenance Allocation Chart).

WARNING

The cooling system is pressurized. Personal injury may result when removing the radiator cap after operating temperature is reached. Do not remove radiator cap when radiator is hot to touch.

WARNING

Do not smoke or allow flame or spark in the vicinity while checking or filling the batteries. The batteries generate hydrogen a highly explosive gas. Wear safety goggles when adding distilled water.

CAUTION

Turntable bearing bolts cannot be retorqued more than one time. Stretching takes place everytime they are torqued.

CAUTION

In cold operation, charge batteries immediately after water has been added to prevent freezing and damage to batteries; run crane engine for one hour at 1500 rpms.

5. It is necessary for you to know how fluid leaks affect the status of your equipment. The following are definitions of the types/classes of leakage you need to know to be able to determine the status of your equipment. Learn and be familiar with them and REMEMBER when in doubt, notify your supervisor.

LEAKAGE DEFINITIONS FOR ORGANIZATIONAL PMCS

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

CAUTION

Equipment operation is allowable with minor leakage (Class I or II). Of course consideration must be given to the fluid capacity in the item/system being checked/inspected. When operating with Class I or II leaks, continue to check fluid levels as required on your PMCS. Class II leaks should be reported to your supervisor.

TABLE 2-1. ORGANIZATIONAL PREVENTIVE MAINTENANCE CHECKS AND SERVICES

ITEM NO	INTERVAL						ITEM TO BE INSPECTED PROCEDURE: CHECK FOR AND HAVE REPAIRED, FILLED, OR ADJUSTED AS NEEDED PERFORM ALL OPERATOR PMCS FIRST	
	M	Q	S	A	B	H		
1			•			1000	<p>ENGINE LUBRICATING SYSTEM</p> <p>NOTE</p> <p>Some intervals are expressed in time and operating hours. Perform the PMCS procedure at whichever interval occurs first.</p> <p>Adjust rocker lever, rocker lever shaft, and valves. (Refer to page 4-2.)-I</p>	
2	•						<p>FUEL SYSTEM</p> <p>Clean air cleaner filter element if dirty. Replace if damaged.</p>	
3						500	<p>Replace fuel water separator filter. (Refer to page 5-15.)</p>	
4						500	<p>Replace in-line fuel filter (Refer to page 5-13.)</p>	
5				•			<p>COOLING SYSTEM</p> <p><u>WARNING</u></p> <p>The cooling system is pressurized. Personal injury may result when removing the radiator cap after operating temperature is reached. Do not remove radiator cap when radiator is hot to touch.</p> <p>Drain radiator old coolant, backflush with fresh water and refill with anti-freeze coolant mixture (50/50 mixture of MIL-A-46153 and water). Replace coolant filter. (Refer to page)</p>	
						<p>M - MONTHLY Q - QUARTERLY</p>	<p>S - SEMI-ANNUALLY A - ANNUALLY</p>	<p>B - BIENNIALY H - HOURS</p>

TABLE 2-1. ORGANIZATIONAL PREVENTIVE MAINTENANCE CHECKS AND SERVICES

ITEM NO	INTERVAL						ITEM TO BE INSPECTED PROCEDURE: CHECK FOR AND HAVE REPAIRED, FILLED, OR ADJUSTED AS NEEDED PERFORM ALL OPERATOR PMCS FIRST
	M	Q	S	A	B	H	
6				•		1000	<p>COOLING SYSTEM (CONTINUED)</p> <p>Check condition of radiator cap using pressure tester. Test pressure is 10 psi.</p> <p>ELECTRICAL SYSTEM</p> <p style="text-align: center;">WARNING</p> <p>Do not smoke or allow flame or spark in the vicinity while checking or filling the batteries. The batteries generate hydrogen - a highly explosive gas. Wear safety goggles when adding distilled water.</p> <p style="text-align: center;">CAUTION</p> <p>In cold operation, charge batteries immediately after water has been added to prevent freezing and damage to batteries; run crane engine for one hour at 1500 rpms.</p>
7							Check battery cables and connections for corrosion. Clean batteries and connections. Replace cables if necessary (Refer to page 8-107.)
8							Check battery box for damage and corrosion. Replace if necessary (Refer to page 8-101.)
9			•			250	Perform STE/ICE System Self-Diagnostic Test. (Refer to page 3-59.)
10			•			250	Perform STE/ICE individual battery test. (Refer to page 3-59.)
						<p>M - MONTHLY S - SEMI-ANNUALLY B - BIENNIALY</p> <p>Q - QUARTERLY A - ANNUALLY H - HOURS</p>	

TABLE 2-1. ORGANIZATIONAL PREVENTIVE MAINTENANCE CHECKS AND SERVICES

ITEM NO	INTERVAL						ITEM TO BE INSPECTED PROCEDURE: CHECK FOR AND HAVE REPAIRED, FILLED, OR ADJUSTED AS NEEDED PERFORM ALL OPERATOR PMCS FIRST	
	M	Q	S	A	B	H		
							<p>AIR SYSTEM</p> <p style="text-align: center;">WARNING</p> <p>Compressed air used for cleaning purposes will not exceed 30 psi. Always use goggles and gloves.</p>	
11						250	Remove and inspect air dryer filter. Clean if dirty. Replace if damaged., (Refer to page 11-14.)	
12						250	Notify Direct Support Maintenance to check brake linings for wear/contamination.	
13						250	<p>MISCELLANEOUS</p> <p>Check main and auxiliary final drives.</p>	
14							Notify Direct Support Maintenance to check boom wear pads for wear.	
15							Notify Direct Support Maintenance to check outrigger wear pads for wear.	
					<p>M - MONTHLY Q - QUARTERLY</p>		<p>S - SEMI-ANNUALLY A - ANNUALLY</p>	
							<p>B - BIENNIALY H - HOURS</p>	

TABLE 2-1. ORGANIZATIONAL PREVENTIVE MAINTENANCE CHECKS AND SERVICES

ITEM NO	INTERVAL						ITEM TO BE INSPECTED PROCEDURE: CHECK FOR AND HAVE REPAIRED, FILLED, OR ADJUSTED AS NEEDED PERFORM ALL OPERATOR PMCS FIRST
	M	Q	S	A	B	H	
16					I	300	<p>CAUTION Turntable bearing bolts cannot be retorqued more than one time. Stretching takes place everytime they are torqued.</p> <p>Notify Direct Support Maintenance to recheck torque of turntable bearing bolts after 300 hours of operation.</p> <p>Notify Direct Support Maintenance to replace turntable bearing nuts and bolts.</p>
17						500	
					M - MONTHLY	S - SEMI-ANNUALLY	B - BIENNIALY
					Q - QUARTERLY	A - ANNUALLY	H - HOURS

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.

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TABLE 3-1. ORGANIZATIONAL TROUBLESHOOTING

MALFUNCTION	TEST OR INSPECTION	CORRECTIVE ACTION
1. <u>ENGINE WILL NOT CRANK.</u>		
	Step 1.	Battery charge low. a. Using STE/ICE, check charge state of batteries. If OK, do Step 2. Refer to VTM test no. 67.) b. Service or replace batteries. (Refer to page 8-96.)
	Step 2.	No voltage to starter solenoid. a. Using STE/ICE, check voltage at solenoid switch. If OK, do Step 3. (Refer to VTM test no. 70.) b. Troubleshoot engine starting system from switch, through harness and relay.
	Step 3.	Solenoid malfunction. a. Listen for audible sound at starting motor. If no audible sound, check wiring. If OK, do Step 4. b. Replace starting motor. (Refer to page 8-5.)
	Step 4.	Starting motor operating but not cranking the engine. a. Remove starting motor and check for broken teeth on flywheel. b. Replace starting motor (Refer to page 8-5.) or contact General Support Maintenance to replace flywheel.

TABLE 3-1. ORGANIZATIONAL TROUBLESHOOTING (CONTD)

MALFUNCTION	TEST OR INSPECTION	CORRECTIVE ACTION
2.	<u>ENGINE HARD TO START OR WILL NOT START - EXHAUST SMOKE PRESENT</u>	
	Step 1.	Engine cranking speed too slow. a. Using STE/ICE, check engine cranking RPM. If OK, do Step 2. (Refer to VTM test no. 10.) b. Refer to ENGINE WILL NOT CRANK.
	Step 2.	Starting aid needed for cold weather not working properly. a. Remove starting aid bottle and ensure bottle is not empty. If OK, do Step C. b. Replace starting aid bottle. (Refer to page 5-16.) c. Check solenoid valve for proper operation. If OK, do Step 3. d. Replace solenoid valve. (Refer to page 5-17.)
	Step 3.	Air in fuel system. a. Bleed the fuel system and check for suction leaks. If OK, do Step 4.
	Step 4.	Fuel supply restricted. a. Replace fuel filter and check fuel lines for restrictions. If OK, do Step 5. b. Replace restricted fuel line(s).
	Step 5.	Air intake system restricted. a. Inspect air cleaner elements and check air intake tubes for blockage. If OK, do Step 6. b. Replace air cleaner elements. (Refer to page 5-4.)
	Step 6.	Valves incorrectly adjusted. a. Check and adjust valves. If OK, do Step 7. (Refer to page 4-2.)

TABLE 3-1. ORGANIZATIONAL TROUBLESHOOTING (CONTD)

MALFUNCTION	TEST OR INSPECTION	CORRECTIVE ACTION
Step 7.	Engine compression low.	<ul style="list-style-type: none"> a. Using STE/ICE, perform compression check to identify problem. (Refer to VTM test no. 14.) b. Contact General Support Maintenance.
3. ENGINE CRANKS, BUT WILL NOT START - NO SMOKE FROM EXHAUST		
Step 1.	No fuel in tank.	<ul style="list-style-type: none"> a. Check fuel level. If OK, do Step 2. b. Fill fuel tank. (Refer to TM 5-3810-306-10.)
Step 2.	Air in fuel lines.	<ul style="list-style-type: none"> a. Bleed the fuel system. If no air detected, do Step 2.
Step 3.	Fuel injection pump not getting fuel.	<ul style="list-style-type: none"> a. Loosen bleed screw at filter head end. Operate hand primer on lift pump to check for fuel. If OK, do Step 3. b. Replace fuel lift pump. (Refer to page 5-18.)
Step 4.	Fuel filter plugged with water or other contamination.	<ul style="list-style-type: none"> a. Remove and inspect fuel filter. If OK, do Step 5. b. Replace fuel filter. (Refer to page 5-15.)
Step 5.	Defective fuel shutoff solenoid.	<ul style="list-style-type: none"> a. Check for loose wires and verify that solenoid is operating. b. Replace fuel shutoff solenoid. (Refer to page 8-58.)

TABLE 3-1. ORGANIZATIONAL TROUBLESHOOTING (CONTD)

MALFUNCTION	TEST OR INSPECTION	CORRECTIVE ACTION
4. <u>ENGINE STARTS BUT WILL NOT KEEP RUNNING</u>		
Step 1.	Idle speed too low.	<ul style="list-style-type: none"> a. Check idle speed (500-600 RPM). If OK, do Step 2. b. Adjust idle speed. (Refer to page 5-20.)
Step 2.	Air in fuel system.	<ul style="list-style-type: none"> a. Bleed the fuel system and check for suction leaks. If OK, do Step 3.
Step 3.	Fuel filter plugged.	<ul style="list-style-type: none"> a. Remove and inspect fuel filter. If OK, do Step 4. b. Replace fuel filter. (Refer to page 5-15.)
Step 4.	Fuel supply restricted.	<ul style="list-style-type: none"> a. Using STE/ICE, check fuel supply pressure (VTM test no. 24) and fuel filter pressure drop (VTM test no. 26.) b. Check for fuel line restrictions. If OK, do Step 5. c. Replace restricted fuel line. (Refer to page 5-9.)
Step 5.	Defective fuel shutoff solenoid.	<ul style="list-style-type: none"> a. Ensure fuel shutoff solenoid is operating properly. b. Replace fuel shutoff solenoid. (Refer to page 8-58.)
5. <u>ENGINE WILL NOT SHUT OFF</u>		
Step 1.	Defective fuel shutoff solenoid.	<ul style="list-style-type: none"> a. Ensure solenoid is not being energized by short circuit in wiring. b. Check fuel shutoff linkage for binding. c. Ensure fuel shutoff solenoid can pull fuel injection pump lever to shutoff position.

TABLE 3-1. ORGANIZATIONAL TROUBLESHOOTING (CONTD)

MALFUNCTION	TEST OR INSPECTION	CORRECTIVE ACTION
		d. If OK, do Step 2.
	Step 2. Engine running on fumes drawn into air intake.	a. Inspect air intake system for source of fumes. If none are found, do Step 3. b. Correct source of fumes.
	Step 3. Fuel leaking to intake manifold.	a. Inspect fuel filter mounting at air intake for evidence of fuel leak. b. Remove fuel filter and filter mounting. Correct source of leak.
6. <u>ROUGH IDLE, WARM ENGINE</u>		
	Step 1. Idle speed set too low.	a. Check low idle screw setting (500-600 RPM). If OK, do Step 2. b. Adjust low idle screw setting. (Refer to page 5-20.)
	Step 2. Air in fuel system.	a. Bleed fuel system and check for suction leaks. If no air is detected, do Step 3. (Refer to page 5-12.)
	Step 3. Incorrect valve adjustment.	a. Check intake and exhaust valve clearances. If OK, do Step 4. b. Adjust intake and exhaust valve clearances. (Refer to page 4-2.)
	Step 4. One or more cylinders losing compression.	a. Using STE/ICE, perform compression check to identify problem. (Refer to VTM test no. 14.) If OK, do Step 5.

TABLE 3-1. ORGANIZATIONAL TROUBLESHOOTING (CONTD)

MALFUNCTION	TEST OR INSPECTION	CORRECTIVE ACTION
		b. Contact General Support Maintenance to repair engine.
Step 5.	Fuel system malfunction.	a. Contact Direct Support Maintenance.
7. <u>ENGINE SURGES AT IDLE</u>		
Step 1.	Idle speed set too low (500-600 RPM).	a. Check idle speed. If OK, do Step 2. b. Adjust low idle speed. (Refer to page 5-20.)
Step 2.	Air in the fuel system.	a. Bleed fuel system and check for suction leaks. (Refer to page 5-12.) If no air is detected, do Step 3.
Step 3.	Restricted fuel supply.	a. Remove and inspect filters and screens and check fuel lines for restrictions. If OK, do Step 4. b. Replace fuel filter and restricted fuel lines. (Refer to pages 5-15 and 5-9.)
Step 4.	Fuel system malfunction.	a. Contact Direct Support Maintenance.
8. <u>LOW LUBRICATING OIL PRESSURE</u>		
Step 1.	Defective oil pressure sending unit.	a. Using STE/ICE, perform VTM test for engine oil pressure. If OK, do Step 2. b. Check engine oil pressure by using direct reading gauge. If no pressure, do Step 5. c. Replace engine oil pressure sending unit. (Refer to page 8-46.)

TABLE 3-1. ORGANIZATIONAL TROUBLESHOOTING (CONTD)

MALFUNCTION	TEST OR INSPECTION	CORRECTIVE ACTION
Step 2.	Defective oil pressure gauge. I	<ul style="list-style-type: none"> a. Remove and test oil pressure gauge. If OK, do Step 3. b. Replace oil pressure gauge. (Refer to page 8-17.)
Step 3.	Oil filter plugged.	<ul style="list-style-type: none"> a. Remove and inspect oil filter. If OK, do Step 4. b. Replace oil filter and engine oil. (Refer to LO 5- 3810-306-12.)
Step 4.	Oil diluted with fuel but engine normal.	<ul style="list-style-type: none"> a. Remove and inspect fuel transfer pump seal. If OK, do Step 5. b. Replace fuel transfer pump. (Refer to page 5-18.)
Step 5.	Oil diluted with coolant.	<ul style="list-style-type: none"> a. Check oil cooler and aftercooler for coolant leaks. If OK, do Step 6. b. Contact Direct Support Maintenance to replace oil cooler or after cooler.
Step 6.	Engine lubrication system malfunction.	<ul style="list-style-type: none"> a. Contact Direct Support Maintenance.
9. <u>LUBRICATING OIL PRESSURE TOO HIGH</u>		
Step 1.	Defective oil pressure sending unit.	<ul style="list-style-type: none"> a. Using STE/ICE, perform VTM test for Engine Oil Pressure. If OK, do Step 2. b. Check engine oil pressure by using direct reading gauge. If OK, do Step 2. If pressure is high, contact Direct Support Maintenance. c. Replace oil pressure sending unit. (Refer to page 8-46.)

TABLE 3-1. ORGANIZATIONAL TROUBLESHOOTING (CONTD)

MALFUNCTION	TEST OR INSPECTION	CORRECTIVE ACTION
Step 2.	Defective oil pressure gauge.	<ul style="list-style-type: none"> a. Remove and test oil pressure gauge. If OK, do Step 3. b. Replace oil pressure gauge. (Refer to page 8-17.)
Step 3.	Engine running too cold.	<ul style="list-style-type: none"> a. Refer to troubleshooting logic for COOLANT TEMPERATURE BELOW NORMAL.
10. <u>ENGINE OIL LOSS</u>		
Step 1.	Oil cooler leak.	<ul style="list-style-type: none"> a. Inspect coolant for oil. If OK, do Step 2. b. Contact Direct Support Maintenance to replace oil cooler and gasket.
Step 2.	High blowby forcing oil out breather.	<ul style="list-style-type: none"> a. Inspect breather tube area for signs of oil loss. b. Contact Direct Support Maintenance.
11. <u>CONTAMINATED ENGINE OIL</u>		
Step 1.	Fuel transfer pump seal leaking.	<ul style="list-style-type: none"> a. Remove and inspect fuel transfer pump. If OK, do Step 2. b. Replace fuel transfer pump. (Refer to page 5-18.)
Step 2.	Engine lubrication system malfunction.	<ul style="list-style-type: none"> a. Refer to Direct Support Maintenance.

TABLE 3-1. ORGANIZATIONAL TROUBLESHOOTING (CONTD)

MALFUNCTION	TEST OR INSPECTION	CORRECTIVE ACTION
12. EXHAUST SMOKE EXCESSIVE UNDER LOAD		
Step 1.	Air in fuel system.	a. Bleed fuel system (Refer to page 5-12.) and check for suction leaks. If no air detected, do Step 2.
Step 2.	Air fuel control line leak.	a. Inspect all fittings for leaks. If OK, do Step 3. b. Tighten fittings as required.
Step 3.	Engine running too cold.	a. Remove and test thermostat. b. Inspect cooling system. If OK, do Step 4. c. Replace thermostat. (Refer to page 7-16.)
Step 4.	Fuel system malfunction.	a. Contact Direct Support Maintenance.
13. ENGINE WILL NOT REACH RATED SPEED WHEN LOADED		
Step 1.	Defective tachometer.	a. Using STE/ICE, perform VTM test no. 10 to check accuracy of tachometer. If OK, do Step 2. b. Replace tachometer. (Refer to page 8-32.)
Step 2.	Air fuel control line leaks and/or restricted.	a. Inspect all fittings for leaks. If OK, do Step 3. b. Tighten fittings or replace line(s) as required.
Step 3.	Fuel supply restricted.	a. Replace fuel filter (Refer to page 5-15.) and check fuel lines for restrictions. If OK, do Step 4.

TABLE 3-1. ORGANIZATIONAL TROUBLESHOOTING (CONTD)

MALFUNCTION	TEST OR INSPECTION	CORRECTIVE ACTION
		b. Replace restricted fuel line(s). (Refer to pages 5-9 and 5-10.)
Step 4.	Partially engaged fuel shutdown lever.	a. Inspect travel of fuel shutdown lever. If OK, do Step 5. b. Adjust linkage/fuel shutdown lever travel. (Refer to page 8-58.)
Step 5.	Fuel system malfunction.	a. Contact Direct Support Maintenance.
14. <u>LOW POWER</u>		
Step 1.	Poor fuel quality.	a. Check fuel sample to ensure correct fuel is being used. (Refer to TM 5-3810-306-10.) If OK, do Step 2. b. Drain fuel tank and fuel lines. Refill with correct fuel. (Refer to TM 5-3810-306-10.)
Step 2.	Throttle linkage out of adjustment.	a. Check throttle linkage for full travel of the fuel control lever. If OK, do Step 3. b. Adjust throttle linkage. (Refer to page 11-35.)
Step 3.	Intake or exhaust system restricted.	a. Inspect intake and exhaust systems for restrictions. If OK, do Step 4. b. Remove and clean air intake tubes and exhaust pipes. (Refer to pages 5-2 and 6-2.)
Step 4.	Air/fuel control line leaks and/or restricted.	a. Inspect all fittings for leaks. If OK, do Step 5. b. Tighten fittings and replace line(s) as required.

TABLE 3-1. ORGANIZATIONAL TROUBLESHOOTING (CONTD)

MALFUNCTION	TEST OR INSPECTION	CORRECTIVE ACTION
Step 5.	Air in the fuel system.	a. Bleed the fuel system (Refer to page 5-12.) and check for suction leaks. If no air detected, do Step 6.
Step 6.	Defective fuel transfer pump.	a. Using STE/ICE, check fuel supply pressure. If OK, do Step 7. (Refer to VTM test no. 24.) b. Replace fuel transfer pump. (Refer to page 5-18.)
Step 7.	Fuel supply restricted.	a. Using STE/ICE, check fuel filter pressure drop. (VTM test no. 26). If OK, do Step 8. b. Replace fuel filter (Refer to page 5-15.) and check fuel lines for restrictions. If OK, do Step 8. c. Replace restricted fuel line(s). (Refer to page 5-9.)
Step 8.	Fuel system malfunction.	a. Contact Direct Support Maintenance.
15. <u>ENGINE MISFIRING</u>		
Step 1.	Air in fuel system.	a. Bleed fuel system (Refer to page 5-12.) and check for suction leaks. If no air detected, do Step 2.
Step 2.	Fuel injection lines leaking.	a. Inspect fuel injector lines for leaks. If OK, do Step 3. b. Tighten fuel line fittings.
Step 3.	Incorrect valve adjustment.	a. Check valve adjustment. If OK, do Step 4. (Refer to page 4-2.) b. Adjust valve clearances.

TABLE 3-1. ORGANIZATIONAL TROUBLESHOOTING (CONTD)

MALFUNCTION	TEST OR INSPECTION	CORRECTIVE ACTION
Step 4.	Fuel system malfunction.	a. Contact Direct Support Maintenance.
16. <u>FUEL KNOCK</u>		
Step 1.	Air in fuel system.	a. Bleed fuel system and check for suction leaks. If no air is detected, do Step 2. (Refer to page 5-12.)
Step 2.	Fuel system malfunction.	a. Contact Direct Support Maintenance.
17. <u>EXCESSIVE FUEL CONSUMPTION</u>		
Step 1.	Inadequate intake air or exhaust restriction.	a. Refer to troubleshooting logic for Exhaust Smoke Excessive Under Load. If OK, do Step 2.
Step 2.	Incorrect valve adjustment.	a. Check valve adjustment. b. Adjust valve clearances. (Refer to page 4-2.)

TABLE 3-1. ORGANIZATIONAL TROUBLESHOOTING (CONTD)

MALFUNCTION	TEST OR INSPECTION	CORRECTIVE ACTION
18. EXCESSIVE VIBRATION		
Step 1.	Engine not running smoothly.	a. Refer to troubleshooting logic for Rough IDLE, Warm Engine or Misfiring. If OK, do Step 2.
Step 2.	Loose or broken engine mounts.	a. Inspect engine mounts for damage. If OK, do Step 3. b. Tighten loose attaching hardware. c. Contact Direct Support Maintenance level to replace engine mounts if necessary.
Step 3.	Damaged engine cooling fan.	a. Inspect engine cooling fan for damage and loose attaching hardware. If OK, do Step 4. b. Tighten loose attaching hardware. c. Replace damage engine cooling fan. (Refer to page 7-4.)
Step 4.	Defective alternator bearing.	a. Inspect operation of alternator. If OK, do Step 5. b. Replace alternator. (Refer to page 8-3.)
Step 5.	Defective engine drive line components.	a. Inspect drive line components. b. Contact Direct Support Maintenance.

TABLE 3-1. ORGANIZATIONAL TROUBLESHOOTING (CONTD)

MALFUNCTION	TEST OR INSPECTION	CORRECTIVE ACTION
19. <u>EXCESSIVE ENGINE NOISES</u>		
Step 1.	Drive belt squeal, insufficient tension or abnormally high loading.	<ul style="list-style-type: none"> a. Check belt tensioner and inspect drive belt. b. Make sure water pump, tensioner pulley, fan hub and alternator turn freely. If OK, do Step 2. c. Replace drive belt and/or belt tensioner. (Refer to pages 7-22 and 7-23.)
Step 2.	Intake air or exhaust leaks.	a. Refer to troubleshooting logic for excessive exhaust smoke. If OK, do Step 3.
Step 3.	Valves incorrectly adjusted.	<ul style="list-style-type: none"> a. Check and adjust valves. (Refer to page 4-2.) b. Contact Direct Support Maintenance.
Step 4.	Defective engine.	a. Contact Direct Support Maintenance.

TABLE 3-1. ORGANIZATIONAL TROUBLESHOOTING (CONTD)

MALFUNCTION	TEST OR INSPECTION	CORRECTIVE ACTION
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20. FUEL OR OIL LEAKING FROM EXHAUST MANIFOLD

Step 1. Obstructed turbocharger oil drain line.

- a. Inspect turbocharger drain line for damage or loose fitting. If OK do Step 2.
- b. Replace turbocharger oil drain line and tighten fittings. (Refer to page 4-6.)

Step 2. Defective engine.

- a. Contact Direct Support Maintenance.

TABLE 3-1. ORGANIZATIONAL TROUBLESHOOTING (CONTD)

MALFUNCTION	TEST OR INSPECTION	CORRECTIVE ACTION
21. <u>COOLANT TEMPERATURE ABOVE NORMAL</u>		
Step 1.	Radiator damaged.	<ul style="list-style-type: none"> a. Inspect radiator for corrosion and damaged fins and tubes. If OK, do Step 2. b. Replace radiator. (Refer to page 7-9.)
Step 2.	Collapsed radiator hose.	<ul style="list-style-type: none"> a. Inspect upper and lower radiator hoses. If OK, do Step 3. b. Replace radiator hose(s). (Refer to page 7-6.)
Step 3.	Fan shroud damaged or missing.	<ul style="list-style-type: none"> a. Inspect fan shroud for damage or loose attaching hardware. If OK, do Step 4. b. Replace shroud and tighten attaching hardware. (Refer to page 7-9.)
Step 4.	Loose fan drive belt.	<ul style="list-style-type: none"> a. Inspect fan drive belt and tensioner. If OK, do Step 5. b. Replace fan drive belt and tensioner. (Refer to pages 7-22 and 7-23.)
Step 5.	Defective temperature gauge.	<ul style="list-style-type: none"> a. Remove and test temperature gauge. If OK, do Step 6. b. Replace temperature gauge. (Refer to page 8-17.)
Step 6.	Defective thermostat.	<ul style="list-style-type: none"> a. Remove and test thermostat. If OK, do Step 7. b. Replace thermostat. (Refer to page 7-16.)

TABLE 3-1. ORGANIZATIONAL TROUBLESHOOTING (CONT'D)

MALFUNCTION	TEST OR INSPECTION	CORRECTIVE ACTION
Step 7.	Air in cooling system.	<ul style="list-style-type: none"> a. Inspect hose clamps for leaks on suction side of the water pump. If OK, do Step 8. b. Tighten clamps and/or replace hoses as required.
Step 8.	Clogged radiator, cylinder head cooling passages, cylinder block.	<ul style="list-style-type: none"> a. Flush engine coolant system. b. Refill with correct coolant. (Refer to TM 5-3810-306-10.)
Step 9.	Defective water pump.	<ul style="list-style-type: none"> a. Remove and inspect water pump. b. Replace water pump. (Refer to page 7-21.)
22. COOLANT LOSS		
Step 1.	Defective water pump.	<ul style="list-style-type: none"> a. Remove and inspect water pump. If OK, do Step 2. b. Replace water pump. (Refer to page 7-21.)
Step 2.	Engine oil cooler leak.	<ul style="list-style-type: none"> a. Inspect engine oil cooler for leaking coolant. If OK, do Step 3. b. Contract Direct Support Maintenance to replace oil cooler.
Step 3.	Cylinder head gasket leak.	<ul style="list-style-type: none"> a. Check head gasket for leaks. If OK, do Step 4. b. Contact next higher maintenance level to replace cylinder head gasket.

TABLE 3-1. ORGANIZATIONAL TROUBLESHOOTING (CONT'D)

MALFUNCTION	TEST OR INSPECTION	CORRECTIVE ACTION
Step 4.	Cracked or porous cylinder head.	<ul style="list-style-type: none"> a. Check cylinder head for leaks. b. Refer to Direct Support Maintenance.
23. <u>COOLANT TEMPERATURE BELOW NORMAL</u>		
Step 1.	Defective temperature sensor.	<ul style="list-style-type: none"> a. Remove and test temperature sensor. If OK, do Step 2. b. Replace temperature sensor. (Refer to page 8-53.)
Step 2.	Defective temperature gauge.	<ul style="list-style-type: none"> a. Using STE/ICE, perform VTM test to engine coolant temp-dash gauge. If OK, do Step 3. b. If necessary, remove and test temperature gauge. If OK, do Step 3. c. Replace temperature gauge. (Refer to page 8-17.)
Step 3.	Defective thermostat.	<ul style="list-style-type: none"> a. Remove and test thermostat. b. Replace thermostat. (Refer to page 7-16.)
24. <u>CONTAMINATED COOLANT</u>		
Step 1.	Rusty coolant, operation without correct mixture of antifreeze and water.	<ul style="list-style-type: none"> a. Drain and flush cooling system. b. Fill with correct mixture of antifreeze and water. (Refer to TM 5-3810-306-10.) c. Review coolant change interval.

TABLE 3-1. ORGANIZATIONAL TROUBLESHOOTING (CONT'D)

MALFUNCTION	TEST OR INSPECTION	CORRECTIVE ACTION
Step 2.	Oil leaks from engine oil cooler, head gasket, head and E IL cylinder block.	<ul style="list-style-type: none"> a. Refer to troubleshooting logic for ENGINE OIL LOSS. b. Contact Direct Support Maintenance to repair coolant system.
25. ALTERNATOR NOT CHARGING OR INSUFFICIENT CHARGING		
Step 1.	Loose or corroded connections.	<ul style="list-style-type: none"> a. Inspect terminals for loose or corroded connections. If OK, do Step 2. b. Tighten and/or clean connections.
Step 2.	Low charging voltage.	<ul style="list-style-type: none"> a. Using STE/ICE, check alternator output voltage. (Refer to VTM test no. 82.) If OK, do Step 3. b. Replace alternator. (Refer to page 8-3.)
Step 3.	Fan drive belt slipping.	<ul style="list-style-type: none"> a. Inspect fan drive belt and tensioner. If OK, do Step 2. b. Replace fan drive belt and/or tensioner. (Refer to pages 7-23 and 7-22.)
Step 4.	Defective battery charge gauge.	<ul style="list-style-type: none"> a. Remove and test battery charge gauge. If OK, do Step 3. b. Replace battery charge gauge. (Refer to page 8-17.)
Step 5.	Alternator pulley loose on shaft.	<ul style="list-style-type: none"> a. Inspect alternator pulley. If OK, do Step 4. b. Tighten alternator pulley.

TABLE 3-1. ORGANIZATIONAL TROUBLESHOOTING (CONTD)

MALFUNCTION	TEST OR INSPECTION	CORRECTIVE ACTION
Step 6.	Defective alternator.	a. Replace alternator. (Refer to page 8-3.)
26. CRANE WILL NOT MOVE OR MOVES ERRATICALLY - TRANSMISSION FAILURE		
Step 1.	Hydraulic lines leaking.	a. Inspect hydraulic lines for leaks. If OK, do Step 2. b. Repair as needed.
Step 2.	Air system failure causing transmission shift valve failure.	a. Check air pressure and inspect shift lines. If OK, do Step 3.
Step 3.	Transmission control valve failure.	a. Check transmission control valve for proper operation. Ensure valve actuates transmission shaft rail. If OK, do Step 4. b. Replace transmission control valve. (Refer to page 9-8.)
Step 4.	Defective transmission.	a. Contact Direct Support Maintenance.

TABLE 3-1. ORGANIZATIONAL TROUBLESHOOTING (CONTD)

MALFUNCTION	TEST OR INSPECTION	CORRECTIVE ACTION
27. BRAKES ARE POOR OR DO NOT APPLY		
Step 1.	Insufficient air pressure.	a. Check for correct pressure reading on gauge in cab (105-120 psi). If OK, do Step 2.
Step 2.	Restriction or leak in lines, valves, etc.	a. Check all lines, valves, etc., for leaks or restrictions. If OK, do Step 3.
		b. Replace defective lines, valves, etc. (Refer to Chapter 11.)
Step 3.	Brakes are out of adjustment.	a. Contact Direct Support Maintenance to adjust brakes.
Step 4.	Defective brake chamber.	a. Remove and repair brake chamber. (Refer to pages 11-4 and 11-8.)

TABLE 3-1. ORGANIZATIONAL TROUBLESHOOTING (CONTD)

MALFUNCTION	TEST OR INSPECTION	CORRECTIVE ACTION
28. <u>UNEVEN BRAKING OR LINING WEAR</u>		
Step 1.	Brakes are out of adjustment.	a. Contact Direct Support Maintenance to adjust brakes.
Step 2.	Defective brake chamber.	a. Remove and repair brake chamber. (Refer to pages 11-4 and 11-8.)
Step 3.	Brake wedge rod is out of the push rod socket.	a. Inspect brake wedge rod. b. Remove brake chamber and realign wedge. (Refer to page 11-4.)
Step 4.	Rollers and cage are out of plunger socket.	a. Inspect rollers and cage. b. Remove brake chamber and realign wedge. (Refer to page 11-4.)
29. <u>HARD TO STEER LEFT AND RIGHT</u>		
Step 1.	Clogged or loose hydraulic lines or fittings.	a. Inspect hydraulic lines. If OK, do Step 2.
Step 2.	Defective pressure relief valve.	a. Remove and test relief valve to ensure it opens at 2500 psi. If OK, do Step 3. b. Replace relief valve. (Refer to page 13-4.)
Step 3.	Defective steering control valve or pump.	a. Contact Direct Support Maintenance.

TABLE 3-1. ORGANIZATIONAL TROUBLESHOOTING (CONTD)

MALFUNCTION	TEST OR INSPECTION	CORRECTIVE ACTION
30. <u>HARD TO STEER EITHER LEFT OR RIGHT</u>		
Step 1.	Clogged or loose hydraulic lines or fittings.	<ul style="list-style-type: none"> a. Inspect hydraulic lines. If OK, do Step 2. b. Clean or tighten lines and fittings as needed. (Refer to pages 16-20 and 16-22.)
Step 2.	Insufficient lubricant on steer cylinder.	<ul style="list-style-type: none"> a. Lubricate cylinder. (Refer to LO 5-3810-306-12.)
Step 3.	Defective steer cylinder.	<ul style="list-style-type: none"> a. Replace steer cylinder. (Refer to page 13-2.)
31. <u>REAR STEERING INOPERATIVE</u>		
Step 1.	Clogged, broken, or loose hydraulic lines or fittings.	<ul style="list-style-type: none"> a. Inspect hydraulic lines. If OK, do Step 2. b. Clean, tighten, or replace lines or fittings. (Refer to pages 16-20 and 16-22.)
Step 2.	Steer cylinder(s) locked.	<ul style="list-style-type: none"> a. Inspect steer cylinder(s). If OK, do Step 3. b. Replace steer cylinder(s). (Refer to page 13-2.)
Step 3.	Defective steering control valve.	<ul style="list-style-type: none"> a. Contact Direct Support Maintenance.

TABLE 3-1. ORGANIZATIONAL TROUBLESHOOTING (CONTD)

MALFUNCTION	TEST OR INSPECTION	CORRECTIVE ACTION
32. <u>NOISY EMERGENCY STEER PUMP</u>	Step 1. Suction line plugged or broken.	a. Clean or replace line. (Refer to page 16-38.)
33. <u>EMERGENCY STEER PUMP DOES NOT OPERATE</u>	Step 1. Electrical leads to pump are loose or corroded.	a. Check for input power to emergency steer pump. If OK, do Step 2. b. Clean and/or tighten input leads to emergency steer pump.
	Step 2. Emergency steer pump failure.	a. Replace emergency steer pump. (Refer to page 13-5.)
34. <u>FOAMING HYDRAULIC OIL</u>	Step 1. Air leaking into pump suction line.	a. Inspect hydraulic lines and fittings. Tighten fittings as required. If OK, do Step 2.

TABLE 3-1. ORGANIZATIONAL TROUBLESHOOTING (CONTD)

MALFUNCTION	TEST OR INSPECTION	CORRECTIVE ACTION
35. SLOW OR ERRATIC OPERATION OF OUTRIGGER EXTENSION CYLINDERS		
Step 1.	Damaged main hydraulic relief valve.	<ul style="list-style-type: none"> a. Check relief valve adjustment. (Refer to page 16-54.) If OK, do Step 2. b. Contact Direct Support Maintenance to replace relief valve.
Step 2.	Defective outrigger control valve.	<ul style="list-style-type: none"> a. Remove and test valve. If OK, do Step 3. b. Replace outrigger control valve. (Refer to page 16-4.)
Step 3.	Improper ground to base of outrigger control valve.	<ul style="list-style-type: none"> a. Check ground for loose or corroded connection. If OK, do Step 4. b. Clean and/or tighten ground connection.
Step 4.	Defective directional selector switch.	<ul style="list-style-type: none"> a. Remove and test switch for continuity. If OK, do Step 5. b. Replace switch. (Refer to page 8-34.)
Step 5.	Loose, corroded or damaged wiring to solenoid switch.	<ul style="list-style-type: none"> a. Inspect wiring to outrigger control valve. If OK, do Step 6. b. Clean, tighten or replace wiring as needed.
Step 6.	Outrigger beams dirty or corroded.	<ul style="list-style-type: none"> a. Inspect outrigger beams and outrigger wear pads. If OK, do Step 7. b. Clean outrigger beams and lubricate. Refer to LO 5-3810-306-12.)

TABLE 3-1. ORGANIZATIONAL TROUBLESHOOTING (CONTD)

MALFUNCTION	TEST OR INSPECTION	CORRECTIVE ACTION
Step 7.	Defective outrigger control valve.	a. Remove and test outrigger control valve. If OK, do Step 8. b. Replace outrigger control valve. (Refer to page 16-4.)
Step 8.	Main hydraulic pump cavitation.	a. Inspect pump inlet hoses and fittings. If OK, do Step 9. b. Replace or tighten hose or fittings. (Refer to page 16-38.)
Step 9.	Hydraulic or electrical system malfunction.	a. Contact Direct Support Maintenance.

TABLE 3-1. ORGANIZATIONAL TROUBLESHOOTING (CONTD)

MALFUNCTION	TEST OR INSPECTION	CORRECTIVE ACTION
36. <u>OUTRIGGER VERTICAL JACK CYLINDER SLOW OR ERRATIC</u>		
Step 1.	Damaged main hydraulic relief valve.	<ul style="list-style-type: none"> a. Check relief valve adjustment. (Refer to page 16-54.) If OK, do Step 2. b. Contact Direct Support Maintenance to replace relief valve.
Step 2.	Damaged holding valve.	<ul style="list-style-type: none"> a. Contact Direct Support Maintenance to replace holding valve.
Step 3.	Defective outrigger control valve.	<ul style="list-style-type: none"> a. Remove and test outrigger control valve. If OK, do Step 4. b. Replace outrigger control valve. (Refer to page 16-4.)
Step 4.	Loose, corroded or damaged wiring to solenoid switch.	<ul style="list-style-type: none"> a. Inspect wiring to outrigger control valve. If OK, do Step 5. b. Clean, tighten or replace wiring as needed.
Step 5.	Main hydraulic pump cavitation.	<ul style="list-style-type: none"> a. Inspect pump inlet hoses and fittings. If OK, do Step 6. b. Replace or tighten hose and fittings. (Refer to page 16-38.)
Step 6.	Hydraulic or electrical system malfunction.	<ul style="list-style-type: none"> a. Contact Direct Support Maintenance.

TABLE 3-1. ORGANIZATIONAL TROUBLESHOOTING (CONTD)

MALFUNCTION	TEST OR INSPECTION	CORRECTIVE ACTION
37. <u>OUTRIGGER JACK CYLINDER RETRACTS UNDER LOAD.</u>		
Step 1.	Damaged holding valve.	a. Contact Direct Support Maintenance to replace holding valve.
Step 2.	Defective jack cylinder.	a. Contact Direct Support Maintenance.
38. <u>JACK CYLINDER EXTENDS WITHOUT BEING ACTIVATED</u>		
Step 1.	Defective jack cylinder.	a. Contact Direct Support Maintenance.
39. <u>OUTRIGGERS WILL NOT OPERATE</u>		
Step 1.	Loose or corroded connection on toggle switch.	a. Inspect wiring at toggle switch. If OK, do Step 2. b. Clean, tighten or replace wiring as needed.
Step 2.	Clogged, broken, or loose hydraulic outrigger lines or fittings.	a. Inspect lines and fittings. If OK, do Step 3. b. Replace lines and tighten fittings as needed.
Step 3.	Damaged main hydraulic relief valve.	a. Check relief valve adjustment. (Refer to page 16-54.) b. Contact Direct Support Maintenance to replace relief valve.

TABLE 3-1. ORGANIZATIONAL TROUBLESHOOTING (CONTD)

MALFUNCTION	TEST OR INSPECTION	CORRECTIVE ACTION
Step 4.	Defective outrigger control valve.	<ul style="list-style-type: none"> a. Remove and test outrigger control valve. If OK, do Step 5. b. Replace outrigger control valve. (Refer to page 16-4.)
Step 5.	Other outrigger system failure.	<ul style="list-style-type: none"> a. Contact Direct Support Maintenance.
40. <u>OUTRIGGERS OPERATE, BUT SELECTED OUTRIGGER WILL NOT RETRACT OR EXTEND</u>		
Step 1.	Clogged, broken, or loose hydraulic outrigger lines or fittings.	<ul style="list-style-type: none"> a. Inspect hydraulic lines and fittings. If OK, do Step 2. b. Clean, tighten, or replace lines or fittings; as needed.
Step 2.	Loose, corroded or damaged wire on control switch or outrigger control.	<ul style="list-style-type: none"> a. Inspect wiring and connectors. If OK, do Step 3. b. Clean, tighten or replace wire and connectors as needed.
Step 3.	Defective outrigger control valve.	<ul style="list-style-type: none"> a. Remove and test outrigger control valve. If OK, do Step 4. b. Replace outrigger control valve. (Refer to page 16-4.)
Step 4.	Defective toggle switch.	<ul style="list-style-type: none"> a. Remove and test toggle switch. If OK, do Step 5. b. Replace toggle switch. (Refer to page 8-34.)

TABLE 3-1. ORGANIZATIONAL TROUBLESHOOTING (CONTD)

MALFUNCTION	TEST OR INSPECTION	CORRECTIVE ACTION
Step 5.	Defective hydraulic outrigger cylinder.	a. Contact Direct Support Maintenance.
41. <u>TWO OUTRIGGERS ACTIVATE FROM SINGLE CONTROL SWITCH</u>		
Step 1.	Damaged outrigger control valves.	a. Replace control valve. (Refer to page 16-4.)
42. <u>BOOM RAISES ERRATICALLY</u>		
Step 1.	Defective main hydraulic relief valve.	a. Check main hydraulic relief valve adjustment. (Refer to page 16-54.) If OK, do Step 2. b. Contact Direct Support Maintenance to replace relief valve.
Step 2.	Air in hydraulic cylinders.	a. Bleed air from hydraulic system. (Refer to page 16-52.)
Step 3.	Control valve linkage out of adjustment.	a. Check control valve linkage adjustment. If OK, do Step 4. b. Adjust linkage to obtain full control valve spool travel. (Refer to page 16-2.)
Step 4.	Defective lift cylinder(s).	a. Contact Direct Support Maintenance.

TABLE 3-1. ORGANIZATIONAL TROUBLESHOOTING (CONTD)

MALFUNCTION	TEST OR INSPECTION	CORRECTIVE ACTION
43. <u>BOOM LOWERS ERRATICALLY</u>		
Step 1.	Defective main hydraulic relief valve.	<ul style="list-style-type: none"> a. Check main hydraulic relief valve adjustment. (Refer to page 16-54.) If OK, do Step 2. b. Contact Direct Support Maintenance to replace hydraulic relief valve.
Step 2.	Air in hydraulic cylinders.	<ul style="list-style-type: none"> a. Bleed air from hydraulic system. (Refer to page 16-52.)
Step 3.	Control valve linkage out of adjustment.	<ul style="list-style-type: none"> a. Check valve linkage adjustment. If OK, do Step 4. b. Adjust linkage to obtain full control valve spool travel. (Refer to page 16-2.)
Step 4.	Defective hydraulic pump.	<ul style="list-style-type: none"> a. Contact Direct Support Maintenance.
44. <u>BOOM RAISES SLOWLY</u>		
Step 1.	Defective main hydraulic relief valve.	<ul style="list-style-type: none"> a. Check main hydraulic relief valve adjustment. (Refer to page 16-54.) If OK, do Step 2. b. Contact Direct Support Maintenance to replace hydraulic relief valve.
Step 2.	Control valve linkage out of adjustment.	<ul style="list-style-type: none"> a. Check valve linkage adjustment. If OK, do Step 3. b. Adjust linkage to obtain full control valve spool travel. (Refer to page 16-2.)

TABLE 3-1. ORGANIZATIONAL TROUBLESHOOTING (CONTD)

MALFUNCTION	TEST OR INSPECTION	CORRECTIVE ACTION
Step 3.	Restriction in hydraulic return hose.	<ul style="list-style-type: none"> a. Remove and check hose for obstruction. If OK, do Step 4. b. Replace hydraulic return hose. (Refer to pages 16-38 and 16-40.)
Step 4.	Defective hydraulic cylinder or hydraulic pump.	<ul style="list-style-type: none"> a. Contact Direct Support Maintenance.
45. <u>BOOM LOWERS SLOWLY</u>		
Step 1.	Defective main hydraulic relief valve.	<ul style="list-style-type: none"> a. Check main hydraulic relief valve adjustment. (Refer to page 16-54.) If OK, do Step 2. b. Contact Direct Support Maintenance to replace main hydraulic relief valve.
Step 2.	Control valve linkage out of adjustment.	<ul style="list-style-type: none"> a. Check valve linkage adjustment. If OK, do Step 3. b. Adjust linkage to obtain full control valve spool travel. (Refer to page 16-2.)
Step 3.	Restriction in hydraulic return hose.	<ul style="list-style-type: none"> a. Remove and check hose for obstruction. If OK, do Step 4. b. Replace hydraulic return hose. (Refer to pages 16-38 and 16-40.)
Step 4.	Defective hydraulic cylinder or hydraulic pump.	<ul style="list-style-type: none"> a. Contact Direct Support Maintenance.

TABLE 3-1. ORGANIZATIONAL TROUBLESHOOTING (CONTD)

MALFUNCTION	TEST OR INSPECTION	CORRECTIVE ACTION
46. <u>BOOM WILL NOT RAISE</u>		
	Step 1.	Defective main hydraulic relief valve.
		<ul style="list-style-type: none"> a. Check main hydraulic relief valve adjustment. (Refer to page 16-54.) If OK, do Step 2. b. Contact Direct Support Maintenance to replace main relief valve.
	Step 2.	Control valve linkage out of adjustment.
		<ul style="list-style-type: none"> a. Check valve linkage adjustment. If OK, do Step 3. b. Adjust linkage to obtain full control valve spool travel. (Refer to page 16-2.)
	Step 3.	Defective hydraulic control valve.
		<ul style="list-style-type: none"> a. Remove and inspect hydraulic control valve. If OK, do Step 4. b. Replace hydraulic control valve. (Refer to page 16-2.)
	Step 4.	Defective hydraulic pump.
		<ul style="list-style-type: none"> a. Contact Direct Support Maintenance.

TABLE 3-1. ORGANIZATIONAL TROUBLESHOOTING (CONTD)

MALFUNCTION	TEST OR INSPECTION	CORRECTIVE ACTION
47. <u>BOOM WILL NOT LOWER</u>		
Step 1.	Defective main hydraulic relief valve.	<ul style="list-style-type: none"> a. Check main hydraulic relief valve adjustment. (Refer to page 16-54.) If OK, do Step 2. b. Contact Direct Support Maintenance to replace main relief valve.
Step 2.	Control valve linkage out of adjustment.	<ul style="list-style-type: none"> a. Check valve linkage adjustment. If OK, do Step 3. b. Adjust linkage to obtain full control valve spool travel. (Refer to page 16-2.)
Step 3.	Defective hydraulic control valve.	<ul style="list-style-type: none"> a. Remove and inspect hydraulic control valve section. If OK, do Step 4. b. Replace hydraulic control valve section. (Refer to page 16-2.)
Step 4.	Defective hydraulic pump.	<ul style="list-style-type: none"> a. Contract Direct Support Maintenance.

TABLE 3-1. ORGANIZATIONAL TROUBLESHOOTING (CONTD)

MALFUNCTION	TEST OR INSPECTION	CORRECTIVE ACTION
48. ERRATIC OPERATION OF EXTENDING TELESCOPING CYLINDER		
Step 1.	Defective hydraulic relief valve.	<ul style="list-style-type: none"> a. Check relief valve adjustment. (Refer to page 16-54.) If OK, do step 2. b. Contact Direct Support Maintenance to replace relief valve.
Step 2.	Air in telescope cylinder.	<ul style="list-style-type: none"> a. Bleed air from hydraulic system. (Refer to page 16-52.)
Step 3.	Boom out of alignment.	<ul style="list-style-type: none"> a. Align boom. (Refer to page 17-9.) If OK, do Step 4. b. If boom cannot be aligned, contact Direct Support Maintenance.
Step 4.	Clogged, broken, or loose hydraulic lines or fittings.	<ul style="list-style-type: none"> a. Remove and inspect hydraulic lines. If OK, do Step 5. b. Clean, tighten, or replace lines or fittings, as needed. (Refer to page 16-44.)
Step 5.	Defective hydraulic control valve.	<ul style="list-style-type: none"> a. Remove and inspect hydraulic control valve section. If OK, do Step 6. b. Replace hydraulic control valve. (Refer to page 16-2.)
Step 6.	Defective telescope cylinder or bent boom.	<ul style="list-style-type: none"> a. Contact Direct Support Maintenance.

TABLE 3-1. ORGANIZATIONAL TROUBLESHOOTING (CONTD)

MALFUNCTION	TEST OR INSPECTION	CORRECTIVE ACTION
49. <u>ERRATIC OPERATION OF RETRACTING TELESCOPING CYLINDER</u>		
Step 1.	Defective hydraulic relief valve.	<ul style="list-style-type: none"> a. Check relief valve adjustment. (Refer to page 16-54.) If OK, do step 2.) b. Contact Direct Support Maintenance to replace relief valve.
Step 2.	Air in telescope cylinder.	<ul style="list-style-type: none"> a. Bleed air from hydraulic system. (Refer to page 16-52.)
Step 3.	Defective check valve within holding valve.	<ul style="list-style-type: none"> a. Contact Direct Support Maintenance.
Step 4.	Worn boom wear pads.	<ul style="list-style-type: none"> a. Contact Direct Support Maintenance to replace boom wear pads. b. Lubricate boom. (Refer to LO 5-3810-306-14.)
Step 5.	Defective telescope cylinder or bent boom.	<ul style="list-style-type: none"> a. Contact Direct Support Maintenance.

TABLE 3-1. ORGANIZATIONAL TROUBLESHOOTING (CONTD)

MALFUNCTION	TEST OR INSPECTION	CORRECTIVE ACTION
50. <u>TELESCOPE CYLINDER WILL NOT EXTEND</u>		
Step 1.	Defective hydraulic relief valve.	<ul style="list-style-type: none"> a. Check relief valve adjustment. (Refer to page 16-54.) If OK, do Step 2. b. Contact Direct Support Maintenance to replace relief valve.
Step 2.	Clogged hydraulic hose and fittings.	<ul style="list-style-type: none"> a. Remove and inspect hydraulic hoses and fittings. If OK, do Step 3. b. Replace hose or fittings. (Refer to page 16-44.)
Step 3.	Control valve linkage out of adjustment.	<ul style="list-style-type: none"> a. Check control valve linkage adjustment. If OK, do Step 4. b. Adjust linkage to obtain full control valve spool travel. (Refer to page 16-2.)
Step 4.	Defective hydraulic control valve.	<ul style="list-style-type: none"> a. Remove and inspect hydraulic control valve. If OK, do Step 5. b. Replace control valve. (Refer to page 16-2.)
Step 5.	Defective telescope cylinder or hydraulic pump.	<ul style="list-style-type: none"> a. Contact Direct Support Maintenance.

TABLE 3-1. ORGANIZATIONAL TROUBLESHOOTING (CONTD)

MALFUNCTION	TEST OR INSPECTION	CORRECTIVE ACTION
51. <u>TELESCOPE CYLINDER WILL NOT RETRACT</u>		
Step 1.	Defective hydraulic relief valve.	<ul style="list-style-type: none"> a. Check relief valve adjustment. (Refer to page 16-54.) If OK, do Step 2. b. Contact Direct Support Maintenance to replace relief valve.
Step 2.	Defective holding valve.	<ul style="list-style-type: none"> a. Contact Direct Support Maintenance.
Step 3.	Clogged hydraulic hose and fittings.	<ul style="list-style-type: none"> a. Remove and inspect hydraulic hoses and fittings. If OK, do Step 4. b. Replace hydraulic hose or fittings. (Refer to page 16-44.)
Step 4.	Control valve linkage out of adjustment.	<ul style="list-style-type: none"> a. Check control valve linkage adjustment. If OK, do Step 5. b. Adjust linkage to obtain full control valve spool travel. (Refer to page 16-2.)
Step 5.	Defective telescope cylinder or bent boom.	<ul style="list-style-type: none"> a. Contact Direct Support Maintenance.

TABLE 3-1. ORGANIZATIONAL TROUBLESHOOTING (CONTD)

MALFUNCTION	TEST OR INSPECTION	CORRECTIVE ACTION
52. <u>HOIST WILL NOT RAISE LOAD</u>		
Step 1.	Broken hydraulic lines or fittings.	<ul style="list-style-type: none"> a. Inspect hydraulic hose and fittings. If OK, do Step 2. b. Replace hydraulic lines or fittings. (Refer to page 16-26.)
Step 2.	Defective main hydraulic relief valve.	<ul style="list-style-type: none"> a. Check relief valve adjustment. (Refer to page 16-54.) If OK, do Step 3. b. Contact Direct Support Maintenance to replace relief valve.
Step 3.	Defective hoist.	<ul style="list-style-type: none"> a. Contact Direct Support Maintenance.

TABLE 3-1. ORGANIZATIONAL TROUBLESHOOTING (CONTD)

MALFUNCTION	TEST OR INSPECTION	CORRECTIVE ACTION
53. <u>HOIST WILL NOT LOWER LOAD</u>		
Step 1.	Broken hydraulic lines or fittings.	<ul style="list-style-type: none"> a. Inspect hydraulic lines and fittings. If OK, do Step 2. b. Replace hydraulic lines or fittings. (Refer to page 16-26.)
Step 2.	Defective main hydraulic relief valve.	<ul style="list-style-type: none"> a. Check relief valve adjustment. (Refer to page 16-54.) If OK, do Step 3. b. Contact Direction Support Maintenance to replace hydraulic relief valve.
Step 3.	Defective hoist motor control valve.	<ul style="list-style-type: none"> a. Contact Direct Support Maintenance.
54. <u>SLOW HOIST OPERATION DOWN</u>		
Step 1.	Defective main hydraulic relief valve.	<ul style="list-style-type: none"> a. Check relief valve adjustment. (Refer to page 16-54.) If OK, do Step 2. b. Contact Direct Support Maintenance to replace hydraulic relief valve.
Step 2.	Defective hydraulic pump.	<ul style="list-style-type: none"> a. Contact Direct Support Maintenance.

TABLE 3-1. ORGANIZATIONAL TROUBLESHOOTING (CONTD)

MALFUNCTION	TEST OR INSPECTION	CORRECTIVE ACTION
55. SLOW HOIST OPERATION UP		
Step 1.	Defective main hydraulic relief valve.	<ul style="list-style-type: none"> a. Check relief valve adjustment. (Refer to page 16-54.) If OK, do Step 2. b. Contact Direct Support Maintenance to replace hydraulic relief valve.
Step 2.	Defective hydraulic pump.	<ul style="list-style-type: none"> a. Contact Direct Support Maintenance.
56. ERRATIC HOIST OPERATION DOWN		
Step 1.	Air in brake release line.	<ul style="list-style-type: none"> a. Bleed pilot pressure line going into hoist brake housing.
Step 2.	Defective main hydraulic relief valve.	<ul style="list-style-type: none"> a. Check relief valve adjustment. (Refer to page 16-54.) If OK, do Step 3. b. Contact Direct Support Maintenance to replace relief valve.
Step 3.	Defective hoist.	<ul style="list-style-type: none"> a. Contact Direct Support Maintenance.
57. STICKING SPOOL IN HOIST CONTROL VALVE		
Step 1.	Hoist control valve warped from mounting.	<ul style="list-style-type: none"> a. Remove and inspect hoist control valve. If OK, do Step 2. b. Replace hoist control valve. (Refer to page 16-2.)

TABLE 3-1. ORGANIZATIONAL TROUBLESHOOTING (CONTD)

MALFUNCTION	TEST OR INSPECTION	CORRECTIVE ACTION
Step 2.	Defective main hydraulic relief valve.	<ul style="list-style-type: none"> a. Check relief valve adjustment. (Refer to page 16-54.) If OK, do Step 3. b. Contact Direct Support Maintenance to replace relief valve.
Step 3.	Control valve linkage binding or out of adjustment.	<ul style="list-style-type: none"> a. Check valve linkage adjustment. If OK, do Step 4. b. Adjust linkage to obtain full travel of control valve spool. (Refer to page 16-2.)
Step 4.	Defective hoist control valve.	<ul style="list-style-type: none"> a. Replace hoist control valve. (Refer to page 16-2.)

TABLE 3-1. ORGANIZATIONAL TROUBLESHOOTING (CONTD)

MALFUNCTION	TEST OR INSPECTION	CORRECTIVE ACTION
58. BOOM SWING OPERATION ERRATIC IN EITHER DIRECTION		
Step 1.	Defective main hydraulic relief valve.	<ul style="list-style-type: none"> a. Check relief valve adjustment. (Refer to page 16-54.) If OK, do Step 2. b. Contact Direct Support Maintenance to replace relief valve.
Step 2.	Insufficient lubricant on swing bearing.	<ul style="list-style-type: none"> a. Lubricate bearing. (Refer to LO 5-3810-306-12).
Step 3.	Restricted or partly clogged hydraulic hose or fitting.	<ul style="list-style-type: none"> a. Remove and inspect hydraulic hoses and fittings. If OK, do Step 4. b. Replace hose or fittings. (Refer to page 16-18.)
Step 4.	Pump cavitation in swing section.	<ul style="list-style-type: none"> a. Retighten suction hose or replace any damaged fitting.
<u>WARNING</u>		
Do not torque turntable bolt two times without replacing the bolts. Failure to follow this procedure could result in a serious accident.		
Step 5.	Improperly torqued turntable bolts.	<ul style="list-style-type: none"> a. Contact Direct Support Maintenance to check torque on turntable bolts. If OK, do Step 6.
Step 6.	Defective swing system.	<ul style="list-style-type: none"> a. Contact Direct Support Maintenance.

TABLE 3-1. ORGANIZATIONAL TROUBLESHOOTING (CONTD)

MALFUNCTION	TEST OR INSPECTION	CORRECTIVE ACTION
59. <u>BOOM SWING OPERATION ERRATIC IN ONE DIRECTION ONLY</u>		
Step 1.	Defective main hydraulic relief valve.	<ul style="list-style-type: none"> a. Check relief valve adjustment. (Refer to page 16-54.) If OK, do Step 2. b. Contact Direct Support Maintenance to replace relief valve.
Step 2.	Turntable bearing binding due to continuous limited swing. (Example: concrete pourer.)	<ul style="list-style-type: none"> a. Rotate crane 360 degrees in both directions several times and lubricate turntable bearing. (Refer to TM 5-3810-306-10 and LO 5-3810-306-12.)
Step 3.	Restricted hydraulic hose or fitting.	<ul style="list-style-type: none"> a. Remove and inspect hydraulic hoses and fittings. If OK, do Step 4. b. Replace hydraulic hose or fitting. (Refer to page 16-18.)
Step 4.	Defective swing system.	<ul style="list-style-type: none"> a. Contact Direct Support Maintenance.
60. <u>BOOM WILL NOT SWING IN EITHER DIRECTION</u>		
Step 1.	Defective main hydraulic relief valve.	<ul style="list-style-type: none"> a. Check relief valve adjustment. (Refer to page 16-54.) If OK, do Step 2. b. Contact Direct Support Maintenance to replace relief valve.
Step 2.	Defective swing system.	<ul style="list-style-type: none"> a. Contact Direct Support Maintenance.

TABLE 3-1. ORGANIZATIONAL TROUBLESHOOTING (CONTD)

MALFUNCTION	TEST OR INSPECTION	CORRECTIVE ACTION
<u>61. SWING OPERATION SLOW IN EITHER DIRECTION</u>		
Step 1.	Improperly lubricated swing bearing.	a. Lubricate swing bearing (Refer to LO 5-3810-306-12.)
Step 2.	Restricted hydraulic hoses and fittings.	a. Remove and inspect hydraulic hoses and fittings. If OK, do Step 3. b. Replace hydraulic hose or fitting. (Refer to page 16-18.)
Step 3.	Defective swing system.	a. Contact Direct Support Maintenance.
<u>62. SWING OPERATION SLOW IN ONE DIRECTION ONLY</u>		
Step 1.	Defective main hydraulic relief valve.	a. Check relief valve adjustment. (Refer to page 16-54.) If OK, do Step 2. b. Contact Direct Support Maintenance to replace relief valve.
Step 2.	Restricted hydraulic hoses and fittings.	a. Remove and inspect hydraulic hoses and fittings. If OK, do Step 3. b. Replace hydraulic hoses and fittings. (Refer to page 16-18.)
<u>WARNING</u>		
Do not torque turntable bolts two times without replacing the bolts. Failure to follow this procedure could result in a serious accident.		

TABLE 3-1. ORGANIZATIONAL TROUBLESHOOTING (CONTD)

MALFUNCTION	TEST OR INSPECTION	CORRECTIVE ACTION
Step 3.	Improperly torqued turntable bearing.	a. Contact Direct Support Maintenance to check torque on turntable bolts.
63. <u>SWING BRAKE SYSTEM WILL NOT OPERATE</u>		
Step 1.	Air in swing brake system.	a. Bleed hydraulic system. (Refer to page 16-52.)
Step 2.	Defective hydraulic swing brake valve.	a. Remove and test hydraulic swing brake valve. If OK, do Step 3. b. Replace brake valve. (Refer to page 16-8.)
Step 3.	Defective swing system.	a. Contact Direct Support Maintenance.
64. <u>SWING BRAKE DRAGS</u>		
Step 1.	Defective hydraulic swing brake valve.	a. Remove and test hydraulic swing brake valve. b. Replace hydraulic swing brake valve. (Refer to page 16-8.)
Step 2.	Hydraulic fluid contamination.	a. Drain and flush hydraulic system. (Refer to page 16-50.)

TABLE 3-1. ORGANIZATIONAL TROUBLESHOOTING (CONTD)

MALFUNCTION	TEST OR INSPECTION	CORRECTIVE ACTION
65. BOOM SWINGS SLOWLY	Step 1. Insufficient hydraulic volume.	a. Check delivery of two-section hydraulic pump. Ensure sufficient oil is available to pump. If OK, do Step 2.
	Step 2. Defective swing system.	a. Contact Direct Support Maintenance.
66. <u>SWING MOTOR CONTINUES TO OPERATE WHEN SWING CONTROL IS IN NEUTRAL POSITION</u>	Step 1. Hydraulic control valve spool sticking or valve otherwise damaged.	a. Replace hydraulic control valve. (Refer to page 16-2.)
67. SWING MOTOR TURNING IN WRONG DIRECTION	Step 1. Port connections reversed.	a. Reverse port connections. (Refer to figure FO-1.)
68. <u>SWING MOTOR NOISY</u>	Step 1. Air in hydraulic system.	a. Bleed air from hydraulic system. (Refer to page 16-52.)
	Step 2. Defective swing motor.	a. Contact Direct Support Maintenance.

TABLE 3-1. ORGANIZATIONAL TROUBLESHOOTING (CONTD)

MALFUNCTION	TEST OR INSPECTION	CORRECTIVE ACTION
69. NO OIL FLOWS IN HYDRAULIC SYSTEMS		
Step 1.	Reservoir-to-pump supply line broken or restricted. Air entering at suction lines. Pump not priming.	<ul style="list-style-type: none"> a. Inspect all hydraulic lines for leaks. If OK, do Step 2. b. Clean, repair, or replace hydraulic lines as necessary. Check all lines for security, suction lines for cracks, and proper attachment. Tighten, repair or replace components as necessary. (Refer to pages 16-38 and 16-40.)
Step 2.	Hydraulic pump failure.	<ul style="list-style-type: none"> a. Contact Direct Support Maintenance.
70. EXCESSIVE HYDRAULIC PRESSURE BUILDUP		
Step 1.	System hydraulic relief valve set too high.	<ul style="list-style-type: none"> a. Use adequate pressure gauge and adjust system hydraulic relief valve as necessary. If OK, do Step 2. (Refer to page 16-54.)
Step 2.	Restricted pump-to-control valve hydraulic supply line.	<ul style="list-style-type: none"> a. Remove and inspect hydraulic line. b. Clean or replace hydraulic line. (Refer to pages 16-38 and 16-40.)
71. PUMP NOISE. ACCOMPANIED BY OIL FOAMING IN RESERVOIR		
Step 1.	Air entering at suction lines. Low oil level.	<ul style="list-style-type: none"> a. Check all hydraulic lines for security and proper attachment. b. Tighten, repair or replace components as necessary. c. Ensure that oil level in reservoir is adequate. Fill to HIGH mark on sight gauge. (Refer to LO 5-3810-306-12.)

TABLE 3-1. ORGANIZATIONAL TROUBLESHOOTING (CONTD)

MALFUNCTION	TEST OR INSPECTION	CORRECTIVE ACTION
72. CAB HEATER DOES NOT WORK WHEN SWITCH IS ON		
Step 1.	Corroded or loose electrical connections at heater control.	a. Check wiring to heater. Clean and/or tighten electrical connections.
Step 2.	Switch failure.	a. Remove and test ON/OFF switch. If OK, do Step 3. b. Replace ON/OFF switch. (Refer to page 8-34.)
Step 3.	Operation indicator light blown.	a. Replace lamp.
73. CAB HEATER STARTS AFTER SWITCHING ON SEVERAL TIMES		
Step 1.	Fuel tank empty, fuel lines plugged.	a. Fill fuel tank. (Refer to TM 5-3810-306-10.) b. Inspect in-line fuel filter. If clogged, replace. (Refer to page 15-32.) c. Check fuel lines for blockage or damage. d. If OK, do Step 2.
Step 2.	Defective heater or fuel (dosing) pump.	a. Contact Direct Support Maintenance.

TABLE 3-1. ORGANIZATIONAL TROUBLESHOOTING (CONT)

MALFUNCTION	TEST OR INSPECTION	CORRECTIVE ACTION
74. <u>NO CAB HEATER IGNITION VOLTAGE</u>		
Step 1.	Corroded or loose electrical connections at heater control.	a. Check wiring to heater. Clean and/or tighten electrical connections.
Step 2.	Electrical connections (wiring) mixed.	a. Check wiring connections. If installed properly, do Step 3. b. Remove and properly install electrical connections.
Step 3.	Switch failure.	a. Remove and test ON/OFF switch. If OK, do Step 4. (Refer to page 8-34.) b. Replace ON/OFF switch.
Step 4.	Defective heater.	a. Contact Direct Support Maintenance.
75. <u>CAB HEATER MOTOR DOES NOT START</u>		
Step 1.	Corroded or loose electrical connections to heater control.	a. Check wiring to heater. Clean and/or tighten electrical connections.
Step 2.	Heater switch failure.	a. Remove and test ON/OFF switch. If OK, do Step 3. b. Replace ON/OFF switch. (Refer to page 8-34.)
Step 3.	Defective heater.	a. Contact Direct Support Maintenance.

TABLE 3-1. ORGANIZATIONAL TROUBLESHOOTING (CONT)

MALFUNCTION	TEST OR INSPECTION	CORRECTIVE ACTION
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76. CAB HEATER DOSING PUMP TICKING NOT AUDIBLE

- Step 1. Corroded or loose electrical connections to heater control.
 - a. Check wiring to heater. Clean and/or tighten electrical connections.

- Step 2. Defective heater or fuel (dosing) pump.
 - a. Contact Direct Support Maintenance.

STE/ICE

1. INTRODUCTION.

This section provides guidelines for the Simplified Test Equipment for Internal Combustion Engine (STE/ICE) cards developed for the RT875CC Container Crane. As developed, the cards and the design equipment effort represented thereon provide a powerful troubleshooting tool in both preventive and corrective maintenance capacities.

NOTE

Refer to Vehicle Test Meter (VTM) Operation and Maintenance Manual for the use and repair of the VTM.

2. RT875CC VEHICLE TEST CARD (VTC).

Pre-Test Inspection. Inspect the following crane components prior to beginning the test(s).

- a. Fan drive belt.
- b. Engine, transmission, and torque converter oil levels.
- c. Engine coolant level.
- d. Fuel level.
- e. Batteries, cables, and terminals.

Procedure (DCA Mode)

- a. Open the engine left-side access door and remove the dust cap on the DCA connector box located on the frame adjacent to the engine.
- b. Connect the VTM to cable W1. Connect cable W1 to the DCA connector on the crane. See figure 1 on the RT875CC Vehicle Test Card (VTC)(Sheet 1). (Refer to page 3-57.)
- c. Enter the Vehicle Identification (VID) code using STE/ICE test 60.
- d. Perform the STE/ICE Confidence Test using test 66 (second entry 99).

NOTE

Refer to TM 5-3810-306-10 as required for information or operator prompts (e.g., disengage pumps).

- e. Conduct the Vehicle Readiness Tests shown on the VTC, sheet 1.
- f. Perform the Optional Vehicle Test.

Procedures (TK Mode)

- a. Connect VTM to the W5 cable.

- b. Open the battery box cover and make the cable connections shown on figure 2 of the VTC, sheet 2. (Refer to page 3-58.)
- c. Enter VID using STE/ICE test 60.
- d. Perform STE/ICE Confidence Test using test 66 (second entry 99).
- e. Perform Optional Vehicle Tests shown on VTC sheet 2. Connect the TK Cable W4 to the pressure transducer TK22 as required to take transmission oil pressure (figure 4) and fuel return pressure (figure 3).

3. STE/ICE INDIVIDUAL BATTERY TEST CARD.

Procedure.

- a. Perform the STE/ICE Hookup procedure shown on sheet 1. (Refer to page 3-59.)
 - b. Perform the Test Procedure shown on sheet 1 using the test results, limits, and conditions shown on sheet 2. (Refer to page 3-60.)
4. STE/ICE BATTERY SERIES PAIR TEST CARD.

Procedure.

- a. Perform the STE/ICE Hookup procedure shown on sheet 1. (Refer to page 3-61.)
- b. Perform the Test Procedure shown on sheet 1 using the test results, limits, and conditions shown on sheet 2. (Refer to page 3-62.)

5. STE/ICE BATTERY PACK TEST CARD.

- a. Perform the STE/ICE Hookup procedure shown on sheet 1. (Refer to page 3-63.)
- b. Perform the Test Procedure shown on sheet 1 using the test results, limits, and conditions shown on sheet 2. (Refer to page 3-64.)

RT875CC VEHICLE TEST CARD - DCA MODE - VID XX

PRE-TEST INSPECTION

1 FAN BELTS	4 FUEL LEVEL
2 OIL LEVEL	5 BATTERIES
3 COOLANT LEVEL	

INITIAL ENTRY

TEST 66 -- CONFIDENCE TEST (SECOND ENTRY 99)
 TEST 60 -- VID ENTRY XX
 TEST 61 -- DISPLAY VID
 TEST 62 -- DISPLAY DCA ID
 TEST 63 -- DISPLAY J2 TK XDCR ID
 TEST 64 -- DISPLAY J3 TK XDCR ID

CONTROL OF NEXT TEST

01 -- INTERLEAVE WITH SPEED
 02 -- DISPLAY MIN VALUE
 03 -- DISPLAY MAX VALUE
 04 -- DISPLAY PEAK-TO-PEAK VALUE

ERROR MESSAGES

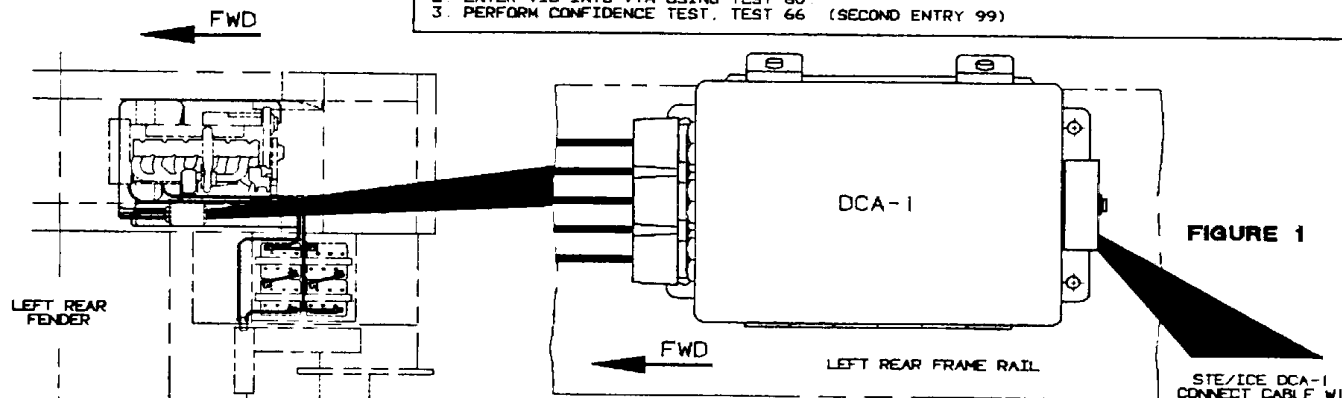
E000 INFORMATION NOT AVAILABLE
 E001 TEST NON-EXISTENT
 E002 TRANSDUCER NOT CONNECTED
 E003 INVALID TEST NUMBER
 E004 VID-NO OF CYL NOT ENTERED
 E005 OFFSET NOT PERFORMED
 E007 NO OF CYL CONFLICTS W/VID
 E008 TEST PROBE NOT CONNECTED
 E009 ENGINE NOT RUNNING
 E010 BAD VID NO ENTERED
 E011 ACCEL/DECEL TIME TOO LONG
 E012 TACH PROBE MISSING
 E013 BAD DATA RECEIVED
 E014 WRONG NO OF CYL S ENTERED
 E015 NO OF CYL CONFLICTS W/DCA
 E017 NO IGNITION SIGNAL
 E018 TEST STOPPED, NO-SIGNAL
 9.9.9.9 OVERLOAD OR NUMBER EXCEEDS DISPLAY CAPABILITY

OPERATOR MESSAGES

PASS TEST SUCCESSFULLY COMPLETED
 CAL OFFSET TEST IN PROGRESS
 CIP RELEASE TEST BUTTON
 CYP INITIATE CI POWER SIMULATION
 CYL ENTER NUMBER OF CYLINDERS OR CYLINDER PARTS
 FAIL TEST FAILED
 GO CRANK ENGINE
 OFF IF CRANKING STOP
 UEH IF CI POWER, DECELERATE
 ENTER VEHICLE IDENTIFICATION NUMBER
 ALE DISPLAY IS AVERAGE VALUE
 66 DIAL 99 PUSH TEST BUTTON
 ---- VTM ACCEPTING DATA OR INITIAL TURN-ON
 .8.8.8.8 CHECK DISPLAY
 -1-1-1-1 VTM IS BUSY

POWERING UP VTM - DCA MODE

1. CONNECT VTM TO W1 CABLE. W1 CABLE ATTACHES TO VEHICLE DCA CONNECTOR (SEE FIGURE 1)
2. ENTER VID INTO VTM USING TEST 60.
3. PERFORM CONFIDENCE TEST, TEST 66 (SECOND ENTRY 99)



	TEST NAME	VTM TEST	OFFSET LIMITS	OPERATING CONDITION	LIMITS			UNITS
					MIN	NORM	MAX	
VEHICLE READINESS TESTS	BATTERY SOURCE VOLTAGE	- 67	-----	ENGINE OFF	22	24	---	VOLTS
	BATTERY CHARGING VOLTAGE	01.67	-----	ENGINE RUN @ 1000-1200RPM,LTS ON	24	27-28	29.5	VOLTS
	STARTER CURRENT FIRST PEAK	- 72	* ±150	ENGINE CRANK ON GO	---	---	1800	AMPS
	ENGINE CRANKING RPM	- 10	-----	ENGINE CRANK ON GO	100	200	---	RPM
	ENGINE IDLE RPM	- 10	-----	ENGINE RUN & WARM	750	800	850	RPM
	ENGINE MAX RPM GOVERNOR	- 10	-----	ENGINE RUN & WARM	2300	2500	2700	RPM
	ENGINE OIL PRESSURE-DASH GAUGE	---	-----	ENGINE RUN @ 800 RPM, IDLE	10	30	---	PSI
	AIR FILTER PRESSURE DROP-POPUP	---	-----	ENGINE RUN @ 2500 RPM, NO LOAD	---	PASS	---	P/FAIL
	FUEL SUPPLY PRESSURE	- 24	* ±150	ENGINE RUN @ 800 RPM, IDLE	---	---	25	PSI
	FUEL FILTER PRESSURE DROP	- 26	-----	ENGINE RUN @ 2500 RPM, NO LOAD	---	PASS	---	P/FAIL
	FUEL SOLENOID VOLTAGE	- 27	-----	ENGINE RUN @ 800 RPM, IDLE	25	28	29	VOLTS
	ALTERNATOR OUTPUT VOLTAGE	- 62	-----	ENGINE RUN @ 1000-1200RPM,LTS ON	26.5	---	29.5	VOLTS
	ENGINE POWER	- 13	-----	ENGINE RUN & WARM	75	---	---	%
	COMPRESSION UNBALANCE	- 14	-----	ENGINE WARM - CRANK ON GO	---	---	8	%
	TRANSMISSION OIL PRESSURE-TK22	01.49	±4 0	TRANSMISSION WARM,ENG IDLE	10	---	25	PSI
OPTIONAL VEHICLE TESTS	ENGINE COOLANT TEMP-DASH GAUGE	-----	-----	ENGINE WARM	170	180	200	*F
	TRANSMISSION OIL TEMP-DASH GAUGE	-----	-----	TRANSMISSION WARM	180	---	250	*F
	STARTER MOTOR VOLTAGE	02.68	-----	ENGINE CRANK	17	---	---	VOLTS
	STARTER NEG CABLE VOLT DROP	03.69	-----	ENGINE CRANK	---	---	1.2	VOLTS
	STARTER SOLENOID VOLTAGE	- 70	-----	ENGINE CRANK	18	---	---	VOLTS
	STARTER CURRENT (AVERAGE)	- 71	* ±150	ENGINE CRANK	---	---	850	AMPS
	BATTERY PACK INTERNAL RESISTANCE	- 73	* ±150	ENGINE CRANK ON GO	---	---	13	MΩ
	STARTER CIRCUIT RESISTANCE	- 74	* ±150	ENGINE CRANK ON GO	---	3-22	25	MΩ
	BATTERY PACK RESISTANCE CHANGE	- 75	* ±150	ENGINE CRANK ON GO	---	---	25	MΩ/SEC
	BATTERY PACK CURRENT	- 80	* ±150	ALL	(-)65	---	1000	AMPS
ALTERNATOR FIELD VOLTAGE	- 83	-----	ENGINE RUN @ 1000-1200RPM,LTS ON	26.5	---	29.5	VOLTS	
ALTERNATOR NEG CABLE VOLT DROP	- 84	-----	ENGINE RUN @ 1000-1200RPM,LTS ON	---	---	0.5	VOLTS	
FUEL RETURN PRESSURE -TK22	- 49	±4 0	ENGINE RUN @ IDLE	---	---	2.5	PSI	

* USE TK-MODE TESTS 76,77,78,79, & 90 WHEN BATTERIES OF THE VEHICLE UNDER TEST ARE TOO WEAK TO PROPERLY POWER THE VTM
 ** PUMPS DISENGAGED

RT875CC VEHICLE TEST CARD - TK MODE - VID XX

PRE-TEST INSPECTION

1. FAN BELTS
2. OIL LEVEL
3. COOLANT LEVEL
4. FUEL LEVEL
5. BATTERIES

INITIAL ENTRY

- TEST 66 -- CONFIDENCE TEST (SECOND ENTRY 99)
 TEST 60 -- VID ENTRY XX
 TEST 61 -- DISPLAY VID
 TEST 62 -- DISPLAY DCA ID
 TEST 63 -- DISPLAY J2 TK XDCR ID
 TEST 64 -- DISPLAY J3 TK XDCR ID

CONTROL OF NEXT TEST

- 01 -- INTERLEAVE WITH SPEED
 02 -- DISPLAY MIN VALUE
 03 -- DISPLAY MAX VALUE
 04 -- DISPLAY PEAK-TO-PEAK VALUE

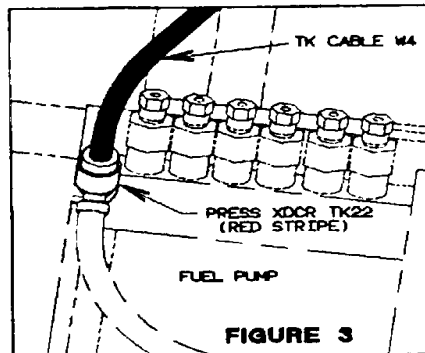


FIGURE 3

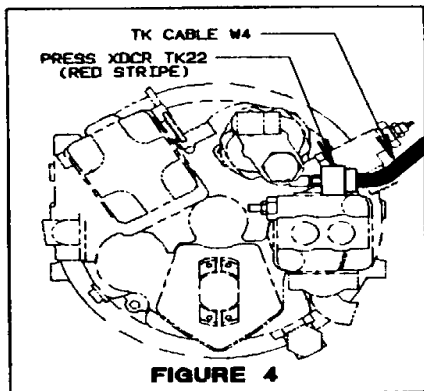


FIGURE 4

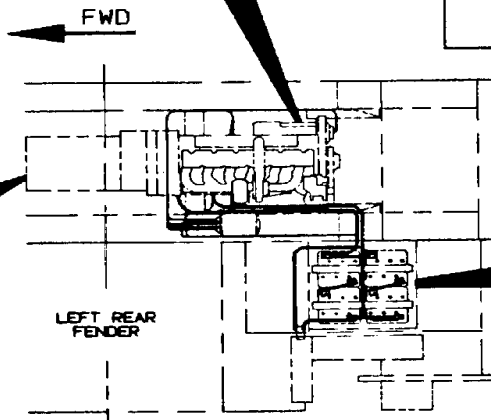
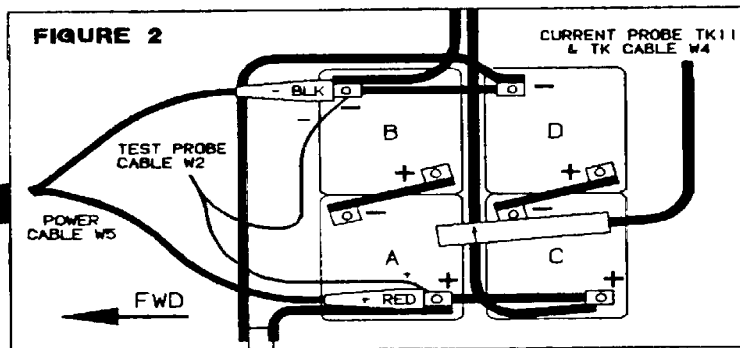
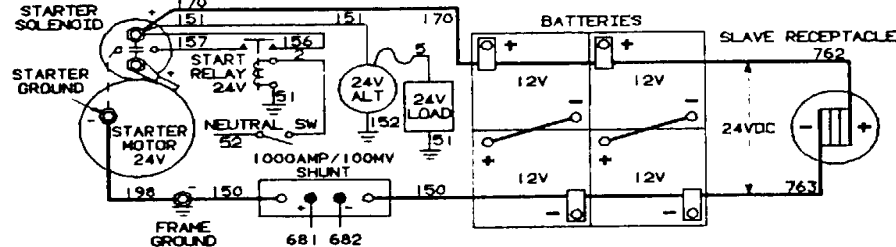


FIGURE 2

POWERING UP VTM - TK MODE

1. CONNECT VTM TO W5 CABLE. W5 CABLE ATTACHES TO BATTERIES AS SHOWN IN FIGURE 2.
2. ENTER VID INTO VTM USING TEST 60
3. PERFORM CONFIDENCE TEST, TEST 66 (SECOND ENTRY 99)

STARTING / CHARGING CIRCUIT DIAGRAM



OPTIONAL VEHICLE TESTS

TEST NAME	VTM TEST	OFFSET LIMITS	OPERATING CONDITION	SPECIAL CONNECTIONS REQUIRED	LIMITS			UNITS
					MIN	NORM	MAX	
TRANSMISSION OIL PRESSURE	49	±4.0	TRANSMISSION WARM, ENG • IDLE	PRESSURE XDCR - FIGURE 4	10	---	25	PSI
FUEL RETURN PRESSURE	49	±4.0	ENGINE RUN • IDLE	PRESSURE XDCR - FIGURE 3	---	---	2.5	PSI
STARTER CURRENT FIRST PEAK	76	±225	ENGINE CRANK ON GO	CURRENT & TEST PROBE - FIGURE 2	---	---	1800	AMPS
BATTERY INTERNAL RESISTANCE	77	±225	ENGINE CRANK ON GO	CURRENT & TEST PROBE, TK CARDS	---	---	13	MΩ
STARTER CIRCUIT RESISTANCE	78	±225	ENGINE CRANK ON GO	CURRENT & TEST PROBE - FIGURE 2	---	3-22	25	MΩ
BATTERY RESISTANCE CHANGE	79	±225	ENGINE CRANK ON GO	CURRENT & TEST PROBE, TK CARDS	---	---	25	MΩ/SEC
STARTER CURRENT AVERAGE	90	±225	ENGINE CRANK ON GO	CURRENT PROBE - FIGURE 2	425	---	650	AMPS

* TESTS 49 CAN BE PERFORMED IN EITHER DCA OR TK MODES WITH THE ADDITION OF TK22(RED STRIPE) & TK CABLE W4.

STE/ICE INDIVIDUAL BATTERY TEST CARD

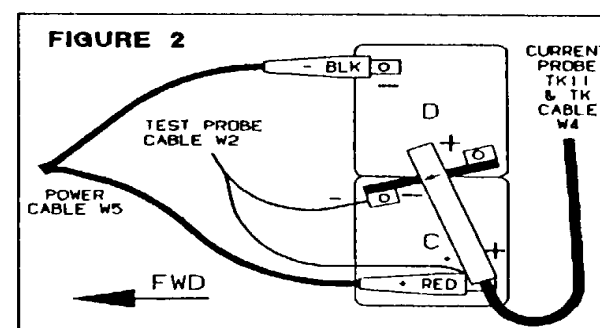
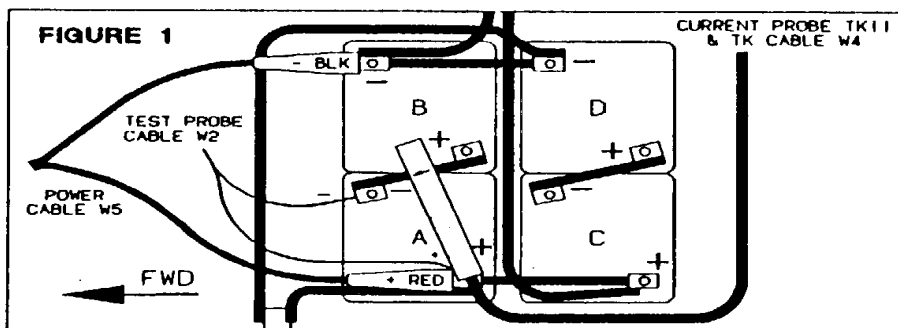
THE BATTERY INTERNAL RESISTANCE TEST (73 OR 77) EVALUATES THE STATE OF CHARGE OF AN INDIVIDUAL BATTERY. THE BATTERY RESISTANCE CHANGE TEST (75 OR 79) EVALUATES WHETHER THE BATTERY IS GOOD OR BAD, EVEN IF IT IS DISCHARGED. A GOOD BATTERY THAT IS DISCHARGED MAY BE RECHARGED. A BAD BATTERY MAY HOLD A CHARGE FOR A SHORT TIME.

STE/ICE HOOKUP

1. THE POWER TO OPERATE THE STE/ICE VTM, MAY BE TAKEN FROM THE BATTERIES BEING TESTED AS SHOWN IN THE APPROPRIATE FIGURE BELOW OR FROM AN ALTERNATE POWER SOURCE (SUCH AS ANOTHER VEHICLE'S BATTERIES).
2. PERFORM VTM GENERAL SETUP, RUN CONFIDENCE TEST, AND ENTER VEHICLE ID.
3. IF THERE IS MORE THAN ONE BATTERY IN THE VEHICLE/EQUIPMENT, THEN FIND THE BATTERY SERIES PAIR THAT INCLUDES THE BATTERY UNDER TEST. A BATTERY SERIES PAIR HAS THE NEGATIVE TERMINAL OF ONE BATTERY CONNECTED TO THE POSITIVE TERMINAL OF ANOTHER BATTERY BY A CABLE. FOR EXAMPLE, IN FIGURES 1 AND 2 BELOW, BATTERIES A AND B ARE A SERIES PAIR, AND BATTERIES C AND D ARE A SERIES PAIR.
4. A. IF THE VEHICLE/EQUIPMENT UNDER TEST HAS MORE THAN ONE BATTERY OR IF THE VTM IS POWERED FROM AN ALTERNATE POWER SOURCE, THEN USE TESTS 77 AND 79. CONNECT TEST PROBE CABLE W2 TO THE BATTERIES UNDER TEST. CONNECT THE RED CLIP TO THE POSITIVE TERMINAL CLOSEST TO THE STARTER AND THE BLACK CLIP LEAD TO THE NEGATIVE TERMINAL CLOSEST TO THE GROUND.
B. IF THE VEHICLE/EQUIPMENT UNDER TEST HAS ONLY ONE BATTERY WHICH IS ALSO SUPPLYING POWER TO THE VTM, USE TESTS 73 AND 75.
5. IF THE VEHICLE/EQUIPMENT UNDER TEST HAS MORE THAN ONE BATTERY, THEN THE BATTERY UNDER TEST IS PART OF A SERIES PAIR OF BATTERIES. CLAMP THE CURRENT PROBE AROUND THE CABLE CONNECTING THE SERIES PAIR. POINT THE ARROW ON THE CURRENT PROBE ALONG THE CABLE LEADING TOWARDS THE NEGATIVE TERMINAL AS SHOWN IN FIGURES 1 AND 2.

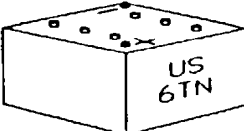
TEST PROCEDURE

1. CONDITION THE CURRENT PROBE BEFORE RUNNING THESE TESTS.
2. MEASURE THE BATTERY RESISTANCE CHANGE BY ENTERING TEST NUMBER 75 OR 79 (AS DESCRIBED IN THE HOOKUP PROCEDURE). THEN ENGAGE THE STARTER FOR ABOUT 5 SECONDS.
3. MEASURE THE BATTERY INTERNAL RESISTANCE BY ENTERING TEST NUMBER 73 OR 77 (AS DESCRIBED IN THE HOOKUP PROCEDURE). THEN ENGAGE THE STARTER FOR ABOUT 5 SECONDS.
4. COMPARE THE RESULTS OF BOTH MEASUREMENTS TO LIMITS IN THE VEHICLE/EQUIPMENT TM OR TO LIMITS ON THE REVERSE SIDE OF THIS CARD.
5. IF EITHER MEASUREMENT IS OUTSIDE OF NORMAL LIMITS, CHECK BATTERY TERMINALS AND CONNECTIONS, AND CHECK BATTERY ELECTROLYTE LEVEL. THEN PERFORM BOTH MEASUREMENTS A SECOND TIME.
6. IF THE BATTERY RESISTANCE CHANGE TEST (75 OR 79) FAILS AFTER THE SECOND MEASUREMENT, THEN THE BATTERY IS IN BAD CONDITION. THE BATTERY MAY BE ABLE TO ACCEPT AND HOLD A CHARGE, BUT IT WILL QUICKLY BECOME DISCHARGED DURING USE. THE BATTERY SHOULD BE REPLACED.
7. IF THE BATTERY INTERNAL RESISTANCE TEST (73 OR 77) FAILS AFTER THE SECOND MEASUREMENT, THEN THE BATTERY SHOULD BE RECHARGED.



STE/ICE INDIVIDUAL BATTERY TEST CARD

BATTERY TEST RESULTS	
STE/ICE DISPLAY AFTER TEST	WHAT IT MEANS
GO -----	1. THE BATTERY IN SERIES WITH THE BATTERY UNDER TEST MAY BE BAD. CHECK THAT BATTERY NEXT. 2. THERE IS A BAD CONNECTION IN THE STARTER CIRCUIT SOMEWHERE. CHECK THE BATTERY NEGATIVE CABLES, AND CABLES TO THE STARTER FOR CORRODED OR LOOSE CONNECTIONS. IF ALL OF THE CABLES AND CONNECTIONS ARE O.K., THEN THE STARTER IS POSSIBLY FAULTY.
.9.9.9.9 -----	1. THERE IS A BAD CONNECTION ON THE BATTERY BEING TESTED. CLEAN AND TIGHTEN THE POSTS AND CLAMPS, AND CHECK THE CABLE BETWEEN THE BATTERIES. 2. THE BATTERY UNDER TEST IS IN EXTREMELY POOR CONDITION.
14.2 -----	IF ANY NUMBER IS DISPLAYED, THEN THE NUMBER IS A STE/ICE TEST RESULT. COMPARE THE TEST RESULT TO THE VALUES SHOWN ALONG THE RIGHT EDGE OF THIS CARD TO DETERMINE A PASS OR A FAIL. SEE TABLE BELOW TO DETERMINE THE CONDITION OF THE BATTERY.
E013 -----	1. THE BATTERY BEING TESTED MAY BE IN A DISCHARGED STATE. CHECK BATTERY ELECTROLYTE LEVEL, CHARGE BATTERY, AND THEN RETEST. 2. IF DISPLAY SHOWS E013 AFTER BATTERY HAS BEEN CHARGED, THEN THE BATTERY IS IN POOR CONDITION.
E002 -----	THE CURRENT PROBE IS NOT CONNECTED. CONNECT CURRENT PROBE.
E004 -----	VEHICLE ID HAS NOT BEEN ENTERED PROPERLY. ENTER VID.
E005 -----	OFFSET TEST FOR CURRENT PROBE HAS NOT BEEN PERFORMED. PERFORM CURRENT PROBE OFFSET TEST.
E008 -----	TEST LEADS ARE IMPROPERLY CONNECTED. CHECK TEST LEADS.

TEST LIMITS	INDIVIDUAL BATTERY TEST LIMITS
<u>FOR TYPE 6TN BATTERIES</u>	
	
STE/ICE TEST NO.	MAXIMUM ACCEPTABLE VALUE TO PASS TEST
BATTERY INTERNAL RESISTANCE TEST 77	13 MILLOHMS MAX.
BATTERY RESISTANCE CHANGE TEST 79	25 MILLOHMS/SEC. MAX.
<u>FOR TYPE 2HN BATTERIES</u>	
<u>FOR COMMERCIAL 12VOLT BATTERIES IN M880 VEHICLES</u>	

BATTERY CONDITION		
TEST 77 BATTERY INTERNAL RESISTANCE RESULT	TEST 79 BATTERY RESISTANCE CHANGE RESULT	BATTERY CONDITION
PASS	PASS	THE BATTERY TESTED IS O.K. AND IN A GOOD STATE OF CHARGE.
PASS	FAIL	THE BATTERY TESTED IS IN POOR CONDITION, BUT HAS A FRESH CHARGE
FAIL	PASS	THE BATTERY TESTED IS O.K. BUT NEEDS TO BE RECHARGED
FAIL	FAIL	THE BATTERY TESTED IS IN POOR CONDITION, AND IN A STATE OF DISCHARGE.

STE/ICE BATTERY SERIES PAIR TEST CARD

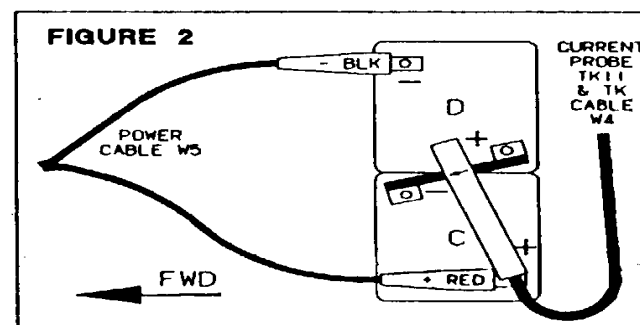
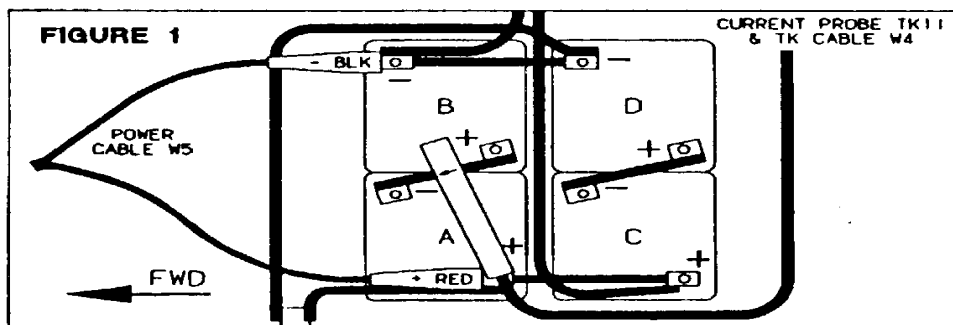
THE BATTERY INTERNAL RESISTANCE TEST (73 OR 77) EVALUATES THE STATE OF CHARGE OF THE BATTERY SERIES PAIR. THE BATTERY RESISTANCE CHANGE TEST (75 OR 79) EVALUATES WHETHER THE BATTERY IS GOOD OR BAD, EVEN IF IT IS DISCHARGED. A GOOD BATTERY THAT IS DISCHARGED MAY BE RECHARGED. A BAD BATTERY MAY HOLD A CHARGE FOR A SHORT TIME.

STE/ICE HOOKUP

1. THE POWER TO OPERATE THE STE/ICE VTM, MAY BE TAKEN FROM THE BATTERIES BEING TESTED AS SHOWN IN THE APPROPRIATE FIGURE BELOW OR FROM AN ALTERNATE POWER SOURCE (SUCH AS ANOTHER VEHICLE'S BATTERIES).
2. PERFORM VTM GENERAL SETUP, RUN CONFIDENCE TEST, AND ENTER VEHICLE ID.
3. FIND A SERIES PAIR OF BATTERIES. A BATTERY SERIES PAIR HAS THE NEGATIVE TERMINAL OF ONE BATTERY CONNECTED TO THE POSITIVE TERMINAL OF ANOTHER BATTERY BY A CABLE. FOR EXAMPLE, IN FIGURES 1 AND 2 BELOW, BATTERIES A AND B ARE A SERIES PAIR, AND IN FIGURE 1 BELOW BATTERIES C AND D ARE A SERIES PAIR.
4. A. IF POWER TO THE VTM COMES FROM A DIFFERENT SET OF BATTERIES THAN THE BATTERIES UNDER TEST, USE TESTS 77 AND 79 INSTEAD OF TESTS 73 AND 75. CONNECT TEST PROBE CABLE W2 TO THE BATTERIES UNDER TEST. CONNECT THE RED CLIP TO THE POSITIVE TERMINAL CLOSEST TO THE STARTER AND THE BLACK CLIP LEAD TO THE NEGATIVE TERMINAL CLOSEST TO THE GROUND.
B. IF POWER TO THE VTM COMES FROM THE SAME SET OF BATTERIES AS THE BATTERIES UNDER TEST, USE TESTS 73 AND 75. THE TEST PROBE CABLE W2 IS NOT USED.
5. CLAMP THE CURRENT PROBE AROUND THE CABLE CONNECTING THE TWO BATTERIES. POINT THE ARROW ON THE CURRENT PROBE ALONG THE CABLE LEADING TOWARDS THE NEGATIVE BATTERY TERMINAL AS SHOWN BELOW IN FIGURES 1 AND 2 FOR BATTERIES A AND B, AND BATTERIES C AND D.

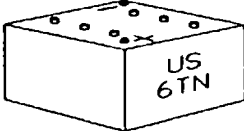
TEST PROCEDURE

1. CONDITION THE CURRENT PROBE BEFORE RUNNING THESE TESTS.
2. MEASURE THE BATTERY RESISTANCE CHANGE BY ENTERING TEST NUMBER 75 OR 79 (AS DESCRIBED IN THE HOOKUP PROCEDURE). THEN ENGAGE THE STARTER FOR ABOUT 5 SECONDS.
3. MEASURE THE BATTERY INTERNAL RESISTANCE BY ENTERING TEST NUMBER 73 OR 77 (AS DESCRIBED IN THE HOOKUP PROCEDURE). THEN ENGAGE THE STARTER FOR ABOUT 5 SECONDS.
4. COMPARE THE RESULTS OF BOTH MEASUREMENTS TO LIMITS IN THE VEHICLE/EQUIPMENT TM OR TO LIMITS ON THE REVERSE SIDE OF THIS CARD.
5. IF EITHER MEASUREMENT IS OUTSIDE OF NORMAL LIMITS, CHECK BATTERY TERMINALS AND CONNECTIONS, AND CHECK BATTERY ELECTROLYTE LEVEL, THEN PERFORM BOTH MEASUREMENTS A SECOND TIME.
6. IF THE BATTERY RESISTANCE CHANGE TEST (75 OR 79) FAILS AFTER THE SECOND MEASUREMENT, THEN THE BATTERY SERIES PAIR IS IN BAD CONDITION. TEST EACH BATTERY INDIVIDUALLY TO DETERMINE WHICH IS GOOD AND WHICH IS BAD OR REPLACE THE BATTERY SERIES PAIR.
7. IF THE BATTERY INTERNAL RESISTANCE TEST (73 OR 77) FAILS AFTER THE SECOND MEASUREMENT, THEN THE BATTERIES SHOULD BE RECHARGED.



STE/ICE BATTERY SERIES PAIR TEST CARD

BATTERY TEST RESULTS	
STE/ICE DISPLAY AFTER TEST	WHAT IT MEANS
GO -----	1. THE BATTERY IN SERIES WITH THE BATTERY UNDER TEST MAY BE BAD. CHECK THAT BATTERY NEXT. 2. THERE IS A BAD CONNECTION IN THE STARTER CIRCUIT SOMEWHERE. CHECK THE BATTERY NEGATIVE CABLES, AND CABLES TO THE STARTER FOR CORRODED OR LOOSE CONNECTIONS. IF ALL OF THE CABLES AND CONNECTIONS ARE O.K., THEN THE STARTER IS POSSIBLY FAULTY.
.9.9.9.9 ----	1. THERE IS A BAD CONNECTION ON THE BATTERY BEING TESTED. CLEAN AND TIGHTEN THE POSTS AND CLAMPS, AND CHECK THE CABLE BETWEEN THE BATTERIES. 2. THE BATTERY UNDER TEST IS IN EXTREMELY POOR CONDITION.
14.2 -----	IF ANY NUMBER IS DISPLAYED, THEN THE NUMBER IS A STE/ICE TEST RESULT. COMPARE THE TEST RESULT TO THE VALUES SHOWN ALONG THE RIGHT EDGE OF THIS CARD TO DETERMINE A PASS OR A FAIL. SEE TABLE BELOW TO DETERMINE THE CONDITION OF THE BATTERY.
E013 -----	1. THE BATTERY BEING TESTED MAY BE IN A DISCHARGED STATE. CHECK BATTERY ELECTROLYTE LEVEL, CHARGE BATTERY, AND THEN RETEST. 2. IF DISPLAY SHOWS E013 AFTER BATTERY HAS BEEN CHARGED, THEN THE BATTERY IS IN POOR CONDITION.
E002 -----	THE CURRENT PROBE IS NOT CONNECTED. CONNECT CURRENT PROBE.
E004 -----	VEHICLE ID HAS NOT BEEN ENTERED PROPERLY. ENTER VID.
E005 -----	OFFSET TEST FOR CURRENT PROBE HAS NOT BEEN PERFORMED. PERFORM CURRENT PROBE OFFSET TEST.
E008 -----	TEST LEADS ARE IMPROPERLY CONNECTED. CHECK TEST LEADS.

TEST LIMITS	BATTERY TEST LIMITS FOR A SERIES PAIR	
<u>FOR TYPE 6TN BATTERIES</u>		
		
STE/ICE TEST NO.	<u>MAXIMUM ACCEPTABLE VALUE TO PASS TEST</u>	
BATTERY INTERNAL RESISTANCE TEST 77	25 MILLOHMS MAX.	
BATTERY RESISTANCE CHANGE TEST 79	50 MILLOHMS/SEC. MAX.	
 <u>FOR TYPE 2HN BATTERIES</u>		
 <u>FOR COMMERCIAL 12VOLT BATTERIES IN M880 VEHICLES</u>		

BATTERY CONDITION		
TEST 77 BATTERY INTERNAL RESISTANCE RESULT	TEST 79 BATTERY RESISTANCE CHANGE RESULT	BATTERY CONDITION
PASS	PASS	THE BATTERY TESTED IS O.K. AND IN A GOOD STATE OF CHARGE.
PASS	FAIL	THE BATTERY TESTED IS IN POOR CONDITION, BUT HAS A FRESH CHARGE
FAIL	PASS	THE BATTERY TESTED IS O.K. BUT NEEDS TO BE RECHARGED
FAIL	FAIL	THE BATTERY TESTED IS IN POOR CONDITION, AND IN A STATE OF DISCHARGE.

STE/ICE BATTERY PACK TEST CARD

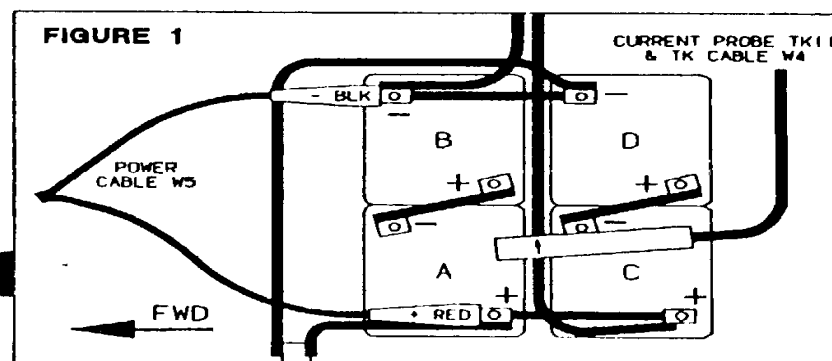
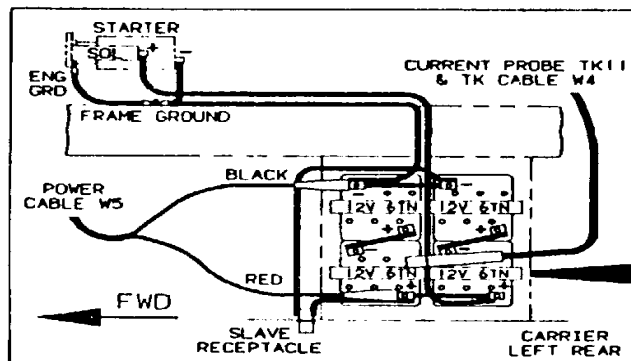
THE BATTERY INTERNAL RESISTANCE TEST (73 OR 77) EVALUATES THE STATE OF CHARGE OF AN INDIVIDUAL BATTERY. THE BATTERY RESISTANCE CHANGE TEST (75 OR 79) EVALUATES WHETHER THE BATTERY IS GOOD OR BAD, EVEN IF IT IS DISCHARGED. A GOOD BATTERY THAT IS DISCHARGED MAY BE RECHARGED. A BAD BATTERY MAY HOLD A CHARGE FOR A SHORT TIME.

STE/ICE HOOKUP

1. THE POWER TO OPERATE THE STE/ICE VTM, MAY BE TAKEN FROM THE BATTERIES BEING TESTED AS SHOWN IN THE APPROPRIATE FIGURE BELOW OR FROM AN ALTERNATE POWER SOURCE (SUCH AS ANOTHER VEHICLE'S BATTERIES).
2. PERFORM VTM GENERAL SETUP, RUN CONFIDENCE TEST, AND ENTER VEHICLE ID.
3. A. IF POWER TO THE VTM COMES FROM A DIFFERENT SET OF BATTERIES THAN THE BATTERY PACK UNDER TEST, USE TESTS 77 AND 79. CONNECT TEST PROBE CABLE W2 TO THE BATTERY PACK UNDER TEST. CONNECT THE RED CLIP TO THE POSITIVE TERMINAL CLOSEST TO THE STARTER. CONNECT THE BLACK CLIP TO THE NEGATIVE TERMINAL CLOSEST TO VEHICLE/EQUIPMENT GROUND.
- B. IF POWER TO THE VTM COMES FROM THE BATTERY PACK UNDER TEST, USE TESTS 73 AND 75. THE TEST PROBE CABLE W2 IS NOT USED.
4. CLAMP THE CURRENT PROBE AROUND THE POSITIVE CABLE CONNECTED TO THE STARTER. POINT THE ARROW ON THE CURRENT PROBE ALONG THE CABLE LEADING TOWARDS THE STARTER AS SHOWN IN FIGURE 1.

TEST PROCEDURE

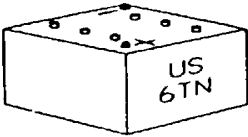
1. CONDITION THE CURRENT PROBE BEFORE RUNNING THESE TESTS.
2. MEASURE THE BATTERY RESISTANCE CHANGE BY ENTERING TEST NUMBER 75 OR 79 (AS DESCRIBED IN THE HOOKUP PROCEDURE). THEN ENGAGE THE STARTER FOR ABOUT 5 SECONDS.
3. MEASURE THE BATTERY INTERNAL RESISTANCE BY ENTERING TEST NUMBER 73 OR 77 (AS DESCRIBED IN THE HOOKUP PROCEDURE). THEN ENGAGE THE STARTER FOR ABOUT 5 SECONDS.
4. COMPARE THE RESULTS OF BOTH MEASUREMENTS TO LIMITS IN THE VEHICLE/EQUIPMENT TM OR TO LIMITS ON THE REVERSE SIDE OF THIS CARD.
5. IF EITHER MEASUREMENT IS OUTSIDE OF NORMAL LIMITS, CHECK BATTERY TERMINALS AND CONNECTIONS, AND CHECK BATTERY ELECTROLYTE LEVEL. THEN PERFORM BOTH MEASUREMENTS A SECOND TIME.
6. IF THE BATTERY RESISTANCE CHANGE TEST (75 OR 79) FAILS AFTER THE SECOND MEASUREMENT, THEN THE BATTERY PACK IS IN BAD CONDITION. TEST EACH SERIES PAIR TO DETERMINE WHICH IS GOOD AND WHICH IS BAD.
7. IF THE BATTERY INTERNAL RESISTANCE TEST (73 OR 77) FAILS AFTER THE SECOND MEASUREMENT, THEN THE BATTERY SHOULD BE RECHARGED.



STE/ICE BATTERY PACK TEST CARD

BATTERY TEST RESULTS	
STE/ICE DISPLAY AFTER TEST	WHAT IT MEANS
GO -----	<ol style="list-style-type: none"> 1. THE BATTERY IN SERIES WITH THE BATTERY UNDER TEST MAY BE BAD. CHECK THAT BATTERY NEXT. 2. THERE IS A BAD CONNECTION IN THE STARTER CIRCUIT SOMEWHERE. CHECK THE BATTERY NEGATIVE CABLES, AND CABLES TO THE STARTER FOR CORRODED OR LOOSE CONNECTIONS. IF ALL OF THE CABLES AND CONNECTIONS ARE O.K., THEN THE STARTER IS POSSIBLY FAULTY.
.9.9.9.9 ----	<ol style="list-style-type: none"> 1. THERE IS A BAD CONNECTION ON THE BATTERY BEING TESTED. CLEAN AND TIGHTEN THE POSTS AND CLAMPS, AND CHECK THE CABLE BETWEEN THE BATTERIES. 2. THE BATTERY UNDER TEST IS IN EXTREMELY POOR CONDITION.
14.2 -----	IF ANY NUMBER IS DISPLAYED, THEN THE NUMBER IS A STE/ICE TEST RESULT. COMPARE THE TEST RESULT TO THE VALUES SHOWN ALONG THE RIGHT EDGE OF THIS CARD TO DETERMINE A PASS OR A FAIL. SEE TABLE BELOW TO DETERMINE THE CONDITION OF THE BATTERY.
E013 -----	<ol style="list-style-type: none"> 1. THE BATTERY BEING TESTED MAY BE IN A DISCHARGED STATE. CHECK BATTERY ELECTROLYTE LEVEL, CHARGE BATTERY, AND THEN RETEST. 2. IF DISPLAY SHOWS E013 AFTER BATTERY HAS BEEN CHARGED, THEN THE BATTERY IS IN POOR CONDITION.
E002 -----	THE CURRENT PROBE IS NOT CONNECTED. CONNECT CURRENT PROBE.
E004 -----	VEHICLE ID HAS NOT BEEN ENTERED PROPERLY. ENTER VID.
E005 -----	OFFSET TEST FOR CURRENT PROBE HAS NOT BEEN PERFORMED. PERFORM CURRENT PROBE OFFSET TEST.
E008 -----	TEST LEADS ARE IMPROPERLY CONNECTED. CHECK TEST LEADS.

BATTERY CONDITION		
TEST 77 BATTERY INTERNAL RESISTANCE RESULT	TEST 79 BATTERY RESISTANCE CHANGE RESULT	BATTERY CONDITION
PASS	PASS	THE BATTERY TESTED IS O.K. AND IN A GOOD STATE OF CHARGE.
PASS	FAIL	THE BATTERY TESTED IS IN POOR CONDITION, BUT HAS A FRESH CHARGE
FAIL	PASS	THE BATTERY TESTED IS O.K. BUT NEEDS TO BE RECHARGED
FAIL	FAIL	THE BATTERY TESTED IS IN POOR CONDITION, AND IN A STATE OF DISCHARGE.

TEST LIMITS	BATTERY TEST LIMITS FOR A FOUR BATTERY PACK *
<u>FOR TYPE 6TN BATTERIES</u>	
	
STE/ICE TEST NO.	MAXIMUM ACCEPTABLE VALUE TO PASS TEST
BATTERY INTERNAL RESISTANCE TEST 77	13 MILLOHMS MAX.
BATTERY RESISTANCE CHANGE TEST 79	25 MILLOHMS/SEC. MAX.
<u>FOR TYPE 2HN BATTERIES</u>	
<u>FOR COMMERCIAL 12VOLT BATTERIES IN M880 VEHICLES</u>	
<p>* WHEN A VEHICLE HAS MORE THAN FOUR BATTERIES IN A PACK, IT IS USUALLY EASIER TO TEST EACH SERIES PAIR SEPARATELY.</p>	

CHAPTER 4

ENGINE MAINTENANCE

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	Valve Adjustment	4-2
	Valve Cover Replacement.....	4-4
Section II	Engine Lubrication System Maintenance.....	4-5
	Engine Oil Filter Replacement.....	4-5
	Turbocharger Oil Return Line Replacement	4-6

Section I. ROCKER ARM MAINTENANCE

VALVE ADJUSTMENT

TOOLS: General mechanic's tool kit: automotive (5180-00-177-7033)

SUPPLIES: None

EQUIPMENT CONDITIONS: Disconnect ground cable at shunt. (Refer to page 8-109.)
Valve cover removed. (Refer to page 4-4.)

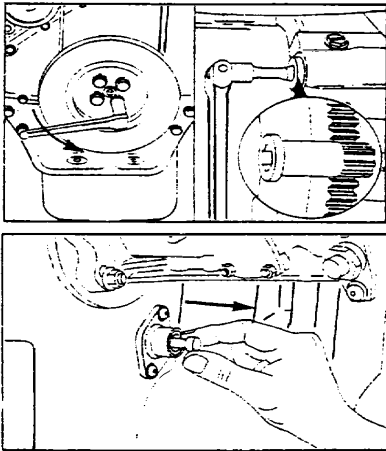
ADJUSTMENT:

NOTE

Check or set valves while engine is cold or cool enough to touch.

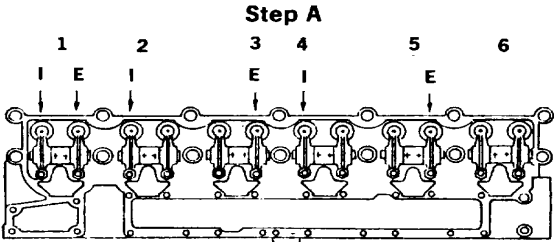
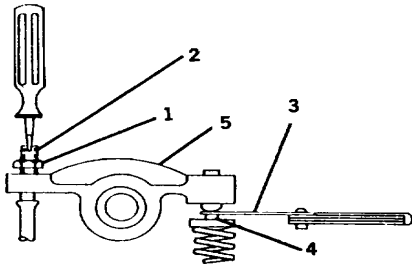
1. LOCATE TOP DEAD CENTER (TDC) FOR CYLINDER NUMBER 1.

- a. Bar engine with 1/2 inch breaker bar, until Number 1 cylinder is at top dead center.
- b. Ensure top dead center pin engages in camshaft gear housing.
- c. Disconnect pin when top dead center is located.

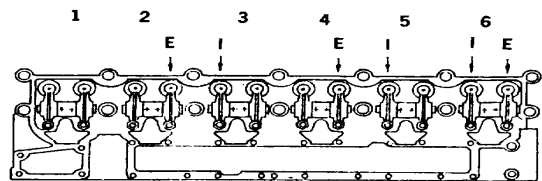
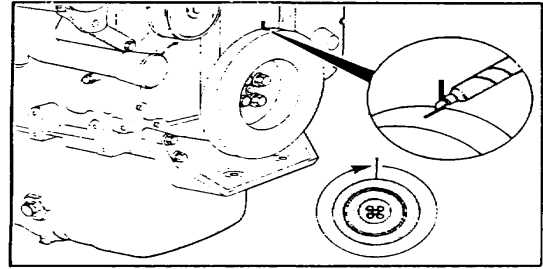


2. ADJUST VALVES INDICATED FOR STEP A (I = INTAKE; E = EXHAUST).

- a. Loosen locknut (1). Loosen or tighten adjustment screw (2) until a slight resistance is felt when feeler gauge (3) is slipped between valve stem (4) and rocker lever (5). Tighten locknut to 18 ft-lbs (24 Nm) then recheck clearance.
- b. Adjust intake valve clearance to .012 inch (.30 mm).
- c. Adjust exhaust valve clearance to .024 inch (.61 mm).



3. MARK VIBRATION DAMPER AND ROTATE CRANKSHAFT 360 DEGREES.
4. ADJUST VALVES INDICATED FOR STEP B (I = INTAKE; E = EXHAUST), AS DESCRIBED IN STEP 2.
5. INSTALL VALVE COVER. (REFER TO PAGE 4-4.)
6. CONNECT GROUND CABLE AT SHUNT. (REFER TO PAGE 8-109.)



Step B

END OF TASK

VALVE COVER REPLACEMENT

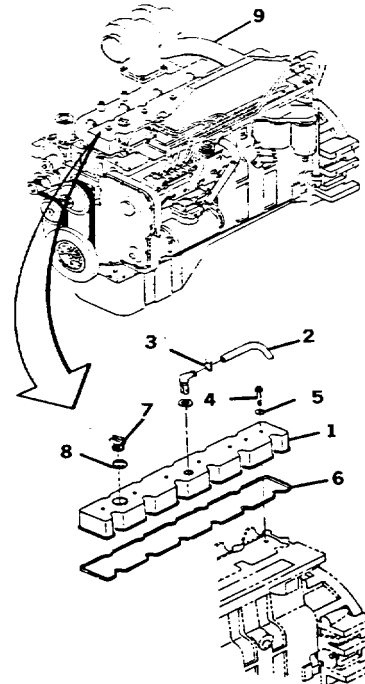
TOOLS: General mechanic's tool kit: automotive (5180-00-177-7033)

SUPPLIES: Preformed packing (Item 20, Appendix C)
 Gasket (Item 21, Appendix C)
 Cap seal (Item 22, Appendix C)

EQUIPMENT CONDITIONS: Disconnect ground cable at shunt. (Refer to page 8-109.)
 Engine access door open.
 Engine cool to touch.

REMOVAL:

1. REMOVE VALVE COVER (1).
 - a. Remove crossover hose (9) from turbocharger aftercooler. (Refer to page 7-19.)
 - b. Remove vent tube (2) by loosening clamp (3).
 - c. Remove capscrews (4) and preformed packing (5). Discard preformed packings (5).
 - d. Remove valve cover (1) and gasket (6). Discard gasket (6).
 - e. Remove cap (7) and cap seal (8). Discard cap seal (8).



INSTALLATION:

1. INSTALL VALVE COVER (1).
 - a. Ensure sealing surfaces are
 - b. Position new gasket (6) in groove of valve cover (1). Set valve cover in place.
 - c. Secure valve cover with capscrews (4) and new preformed packings (5). Torque capscrews to 18 ft-lbs (24 Nm).
 - d. Install vent tube (2) and secure with clamp (3).
 - e. Install crossover hose (9) to aftercooler and secure with clamps. (Refer to page 7-20.) clean of debris.
 - f. Install new cap seal (8) onto cap (7). Install cap (7).
2. CONNECT GROUND CABLE AT SHUNT. (REFER TO PAGE 8-109.)
3. START ENGINE AND OBSERVE FOR LEAKS. (REFER TO TM 5-3810-306-10.)

END OF TASK

Section II. ENGINE LUBRICATION SYSTEM MAINTENANCE**ENGINE OIL FILTER REPLACEMENT**

TOOLS: General mechanic's tool kit: Automotive (5180-00-177-7033)

SUPPLIES: Filter, Engine Oil (Item 56, Appendix C)

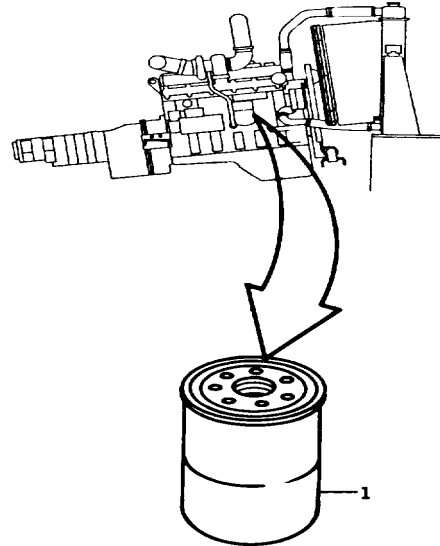
EQUIPMENT CONDITIONS: Disconnect ground cable at shunt. (Refer to page 8-109.)
Engine cool to touch.

REMOVAL:

1. REMOVE AND DISCARD OIL FILTER (1) FROM OIL COOLER HEAD.

INSTALLATION:

1. INSTALL NEW OIL FILTER (1) INTO OIL COOLER HEAD.
 - a. Ensure mounting surface on oil cooler is clean.
 - b. Apply light coat of clean engine oil to filter gasket.
 - c. Install new oil filter hand tight making sure gasket is seated against oil cooler.
2. CONNECT GROUND CABLE AT SHUNT. (REFER TO PAGE 8-109.)
3. START ENGINE AND CHECK FOR LEAKS. (REFER TO TM 5-3810-306-10.)



END OF TASK

TURBOCHARGER OIL RETURN LINE REPLACEMENT

TOOLS: General mechanic's tool kit: Automotive (5180-00-177-7033)

SUPPLIES: Gasket (Item 8, Appendix C)

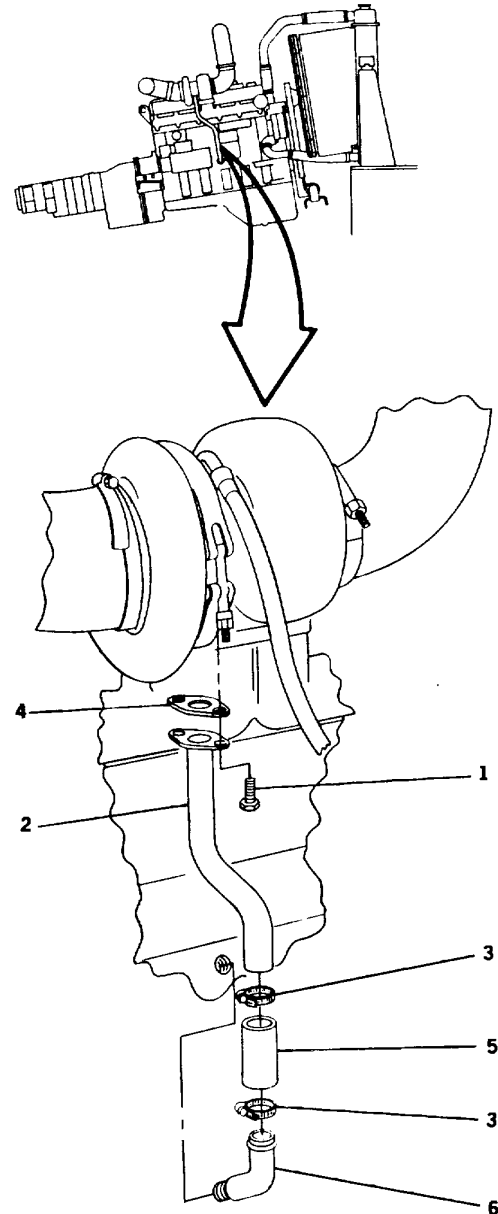
EQUIPMENT CONDITIONS: Disconnect ground cable at shunt. (Refer to page 8-109.)

REMOVAL:

1. REMOVE TURBOCHARGER OIL RETURN LINE.
 - a. Remove capscrews (1) from oil tube connection (2) at turbocharger.
 - b. Remove two clamps (3) and remove tube (2), gasket (4) and hose (5). Discard gasket (4).
 - c. Remove tube (6) from engine block.

INSTALLATION:

1. INSTALL TURBOCHARGER OIL RETURN LINE.
 - a. Install tube (2) and new gasket (4) to turbocharger with capscrews (1). Torque capscrews (1) to 18 ft-lbs (24Nm).
 - b. Install tube (6) in engine block.
 - c. Connect tubes (2) and (6) with hose (5) using clamps (3).
2. CONNECT GROUND CABLE AT SHUNT. (REFER TO PAGE 8-109.)



CHAPTER 5
FUEL SYSTEM MAINTENANCE

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Section I. AIR CLEANER MAINTENANCE

AIR CLEANER AND PIPING

TOOLS: General mechanic's tool kit: automotive (5180-00-177-7033)

SUPPLIES: Lockwashers (Item 67, Appendix C) (2 Required)
(Item 5, Appendix C) (8 Required)

EQUIPMENT CONDITION: Disconnect ground cable at shunt. (Refer to page 8-109).
Engine access doors open.

REMOVAL:

NOTE

The following procedures apply to air cleaner piping on either side of engine.

1. REMOVE AIR CLEANER PIPING.
 - a. Remove two nuts (18) and screws (19) securing air cleaner assembly in mounting bands (4).
 - b. Loosen eight clamps (2). Remove two rubber connectors (3) and tube (10) (or 12) from air inlet tee (13).
 - c. Remove air cleaner assembly from rubber connectors (3). flatwashers (20).
 - d. Remove rubber connectors from pipe inside of engine compartment in order to slide pipes out through hole in engine hood.
 - e. Remove opposite side air cleaner (9).
 - f. Remove two capscrews (16), lockwashers (17) and flatwashers (20) securing air inlet tee (13) to exhaust manifold. Discard lockwashers (17).
 - g. Loosen four clamps (14) and remove air inlet tee (13) and elbow (15) from turbocharger.

h. Remove air restriction indicator (11) from air inlet tee (13).

i. If necessary, remove capscrews (5), flatwashers (6), lockwashers (7) and nuts (8) securing mounting bands (4) to fender brackets. Discard lockwashers (7).

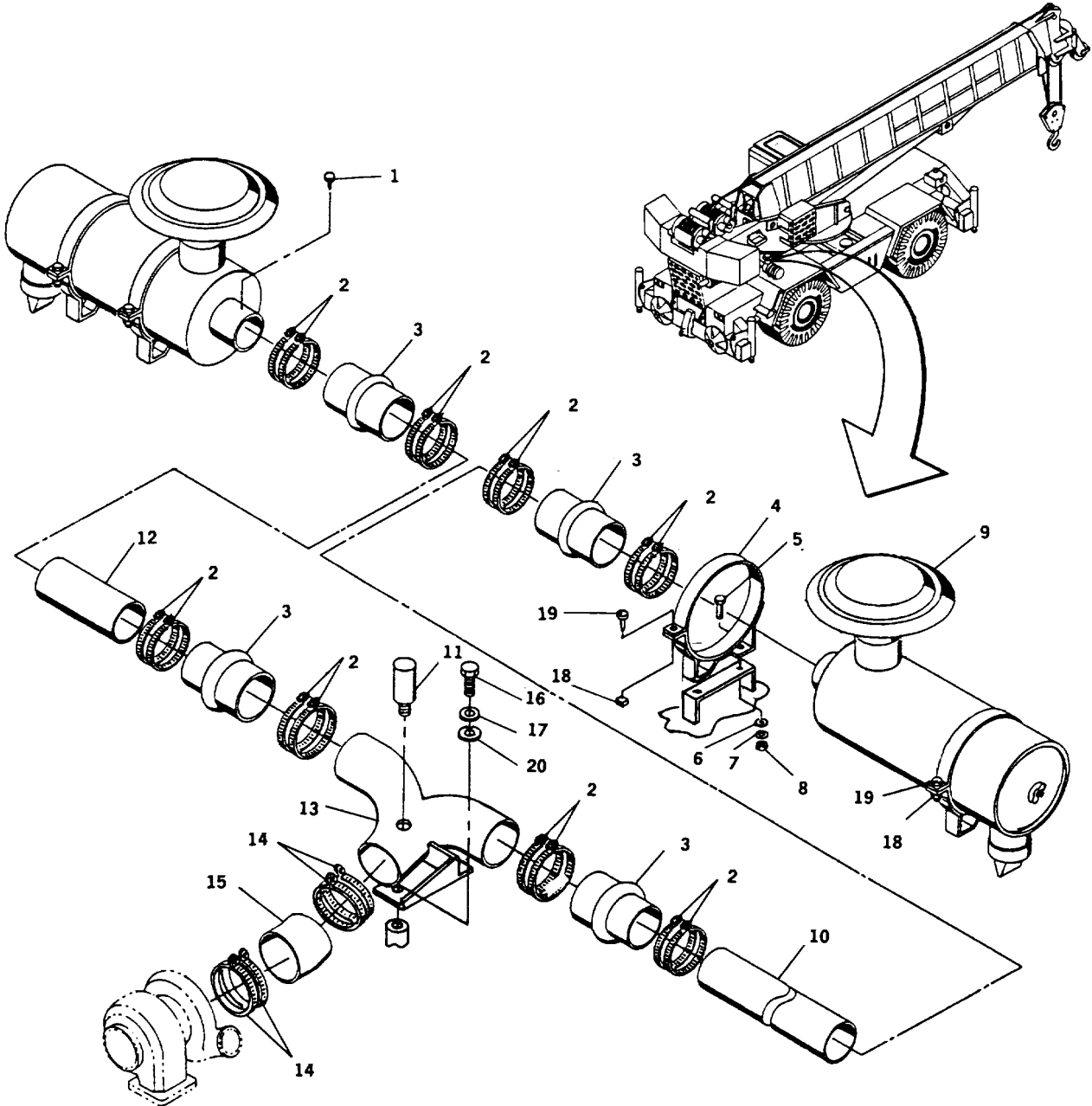
INSTALLATION:

1. INSTALL AIR CLEANER PIPING.
 - a. Install air restriction indicator (11) in air inlet tee (13).
 - b. Install elbow (15), four clamps (14) and air inlet tee (13) on turbocharger. Secure air inlet tee (13) with two capscrews (16), new lockwashers (17) and Tighten four clamps (14).
 - c. Install eight clamps (2) on two rubber connectors. Position on either side of air inlet tee (13) and tighten inner most clamps only.
 - d. Slide tubes (10) and (12) through holes in engine hood and engage in rubber connectors (3). Do not tighten clamps.
 - e. If removed, install mounting bands (4) on fender brackets and secure with capscrews (5), flatwashers (6), new lockwashers (7) and nuts (8).

- f. Install clamps (2), rubber connectors (3) and air cleaner assemblies onto tube ends.
- g. Position air cleaner assemblies in mounting bands and install screws (19) and nuts (18).

- h. Align all air cleaner piping and tighten all clamps (2) and mounting bands (4).
2. CONNECT GROUND CABLE AT SFUNT. (REFER TO PAGE 8-109.)

END OF TASK



AIR CLEANER ASSEMBLY

TOOLS: General mechanic's tool kit: automotive (5180-00-177-7033)

SUPPLIES: None

EQUIPMENT CONDITION: Disconnect ground cable at shunt.
(Refer to page 8-109).

DISASSEMBLY:

- 1. REMOVE ELEMENTS (5) AND (7). REMOVE VACUATOR VALVE (8).

- d. Remove vacuator valve (8).
- e. Loosen clamp (9) and remove air inlet hood (10).

CLEANING:

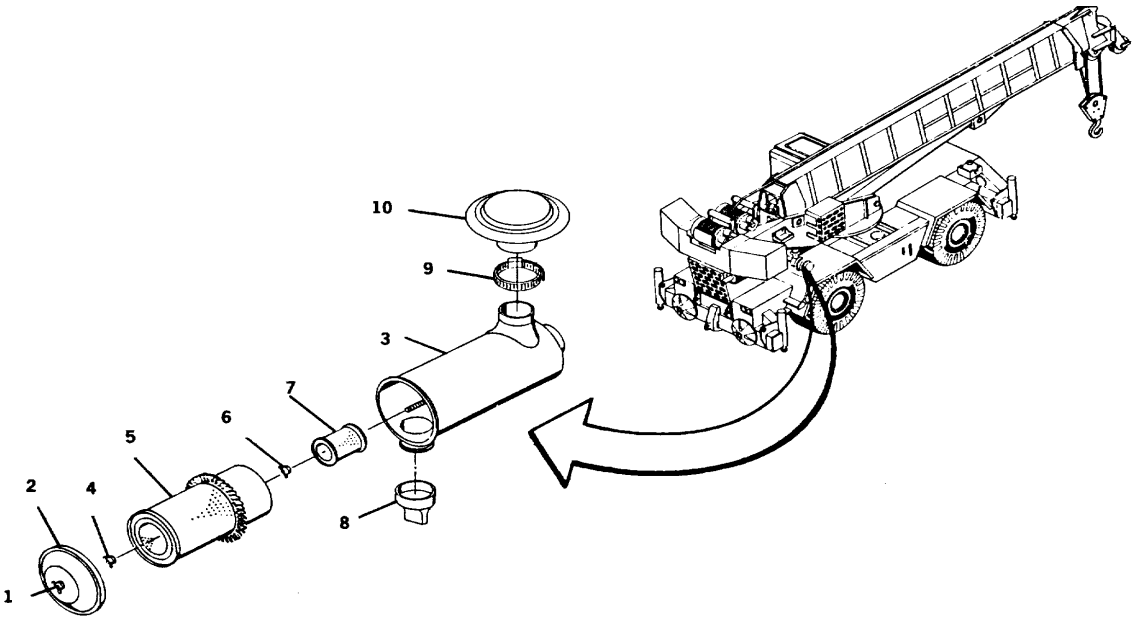
NOTE

Both air cleaners on either side of engine should be serviced at the same time.

- a. Remove end cover assembly (2) from air cleaner body (3) by unscrewing wing nut (1).
- b. Remove outer wing nut (4) and pull primary element (5) from air cleaner body (3).
- c. Remove inner wing nut (6) and remove safety element (7).

WARNING

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



CAUTION

Water pressure from a hose or tap should not exceed 40 psi (276 kPa/2.76 Bar).

CAUTION

Never use gasoline or solvents to clean the elements.

NOTE

Never clean the safety element. Replace the safety element after cleaning the primary element three times.

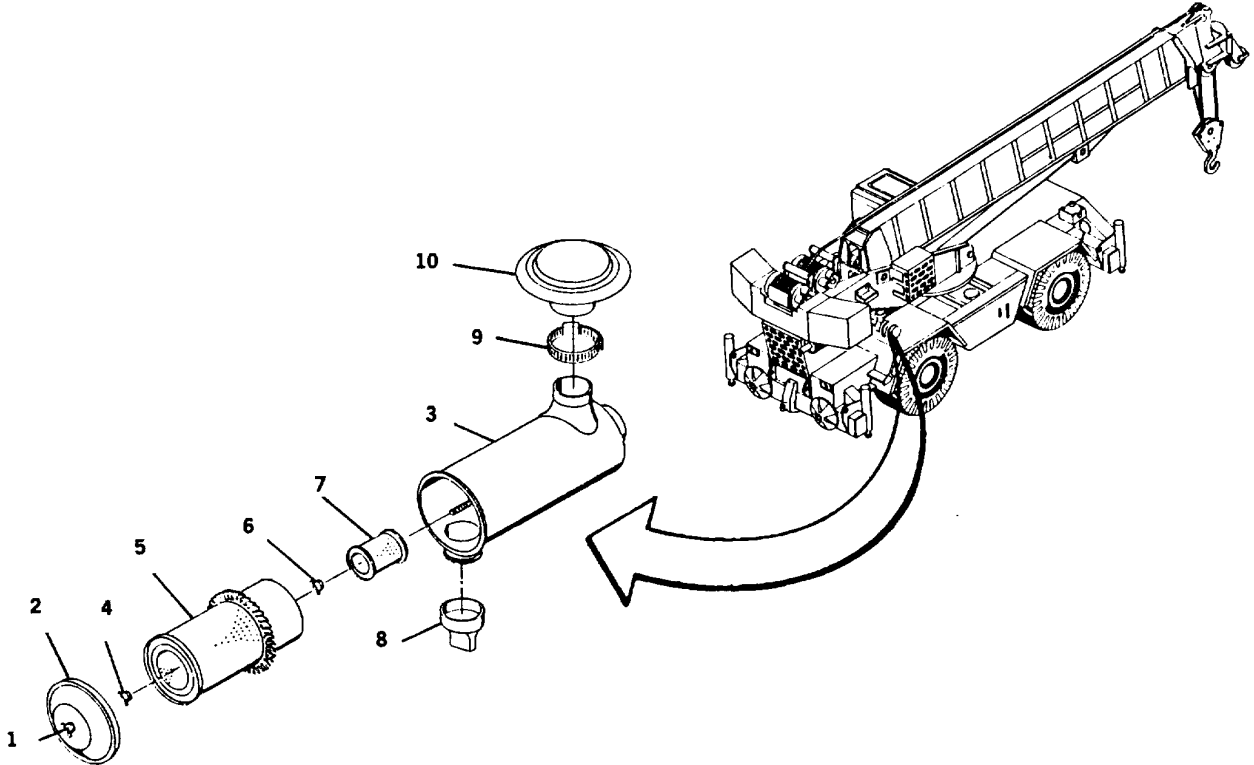
- 1. CLEAN PRIMARY ELEMENT (5) IN WATERDETERGENT SOLUTION OR BLOW OUT WITH COMPRESSED AIR.

NOTE

If primary element is cleaned with compressed air, element can be put back into service immediately; however, if cleaned by washing, element must be dried before returning it to service.

NOTE

Primary elements are partially covered by a plastic sleeve with fins. The covered portion can be cleaned with water or air without removing the sleeve. Use a stiff fiber (not wire) brush to remove oil and grease deposits from the sleeve and fins. Never remove the sleeve and fins from the element.



2. CLEAN ANY MUD, DIRT OR DEBRIS FROM VACUATOR VALVE (8).

INSPECTION:

1. INSPECT ALL PARTS FOR DAMAGE, REPLACE IF NECESSARY.

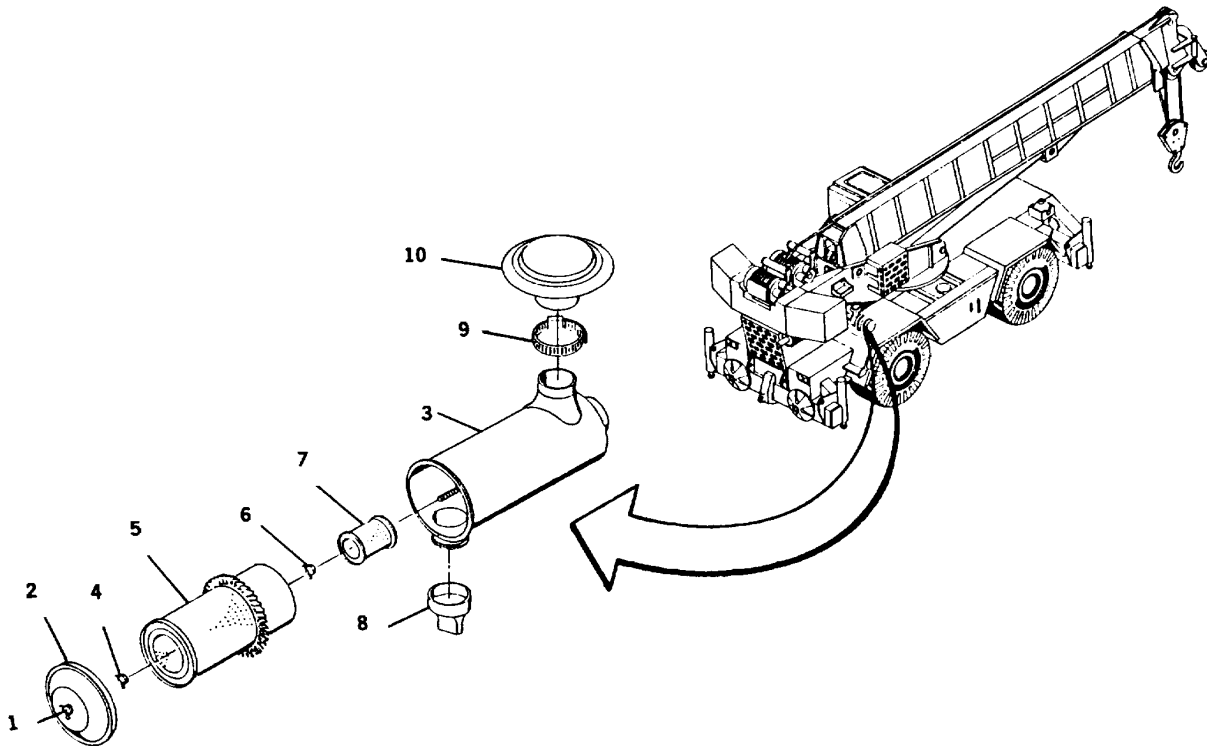
REASSEMBLY:

1. INSTALL AIR CLEANER ELEMENTS (5 AND 7).
 - a. Install safety element (7) into air cleaner body (3). Secure with wing nut (6).
 - b. Install primary element (5) into air cleaner body (3). Secure with wing nut (4).

- c. Install end cover (2) on air cleaner body and secure by tightening wing nut (1).

2. INSTALL INLET HOOD (10) AND CLAMP (9).
3. INSTALL VACUATOR VALVE (8).
4. CONNECT GROUND CABLE AT SHUT. (REFER TO PAGE 8-109.)
5. START ENGINE AND CHECK FOR PROPER OPERATION. (REFER TO TM 5-3810-30610.)

END OF TASK



Section II. FUEL TANKS, LINES AND FITTINGS MAINTENANCE

FUEL TANK INSTALLATION

TOOLS: General mechanic's tool kit: automotive (5180-00-177-7033)

SUPPLIES: Clean rags (Item 1, Appendix C)
Gauge ring (Item 14, Appendix C)
Gasket (Item 17, Appendix C)
Diesel fuel (Item 73, Appendix C)

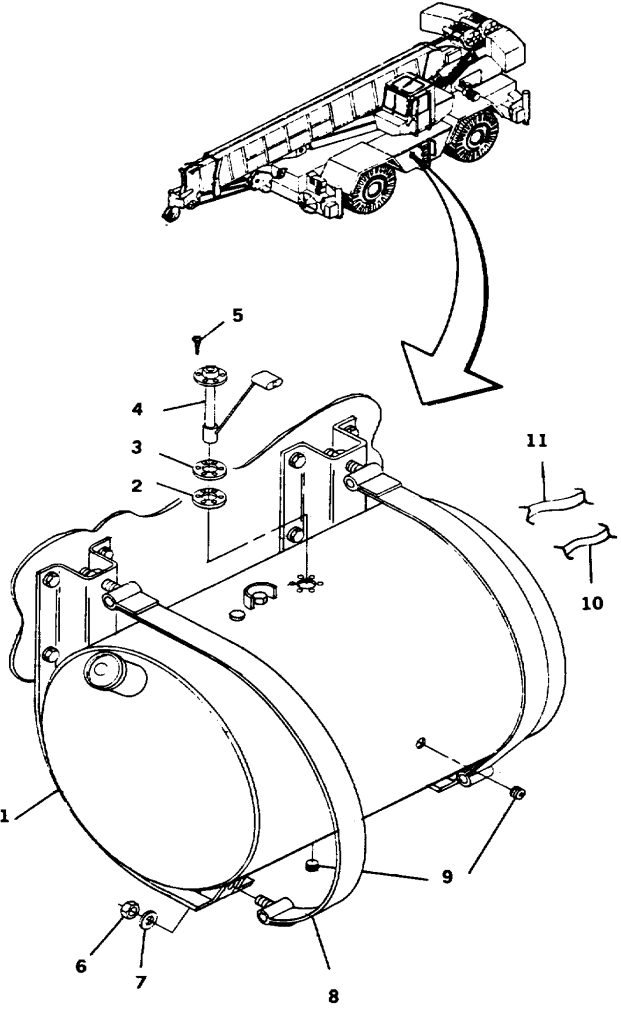
EQUIPMENT CONDITIONS: Disconnect ground cable at shunt. (Refer to page 8-109.)
Fuel tank cover and ladder assembly removed.
(Refer to page 15-19.)
Fuel tank is empty.

REMOVAL:

WARNING

Fuel is flammable. Keep fuel away from heat and open flame.

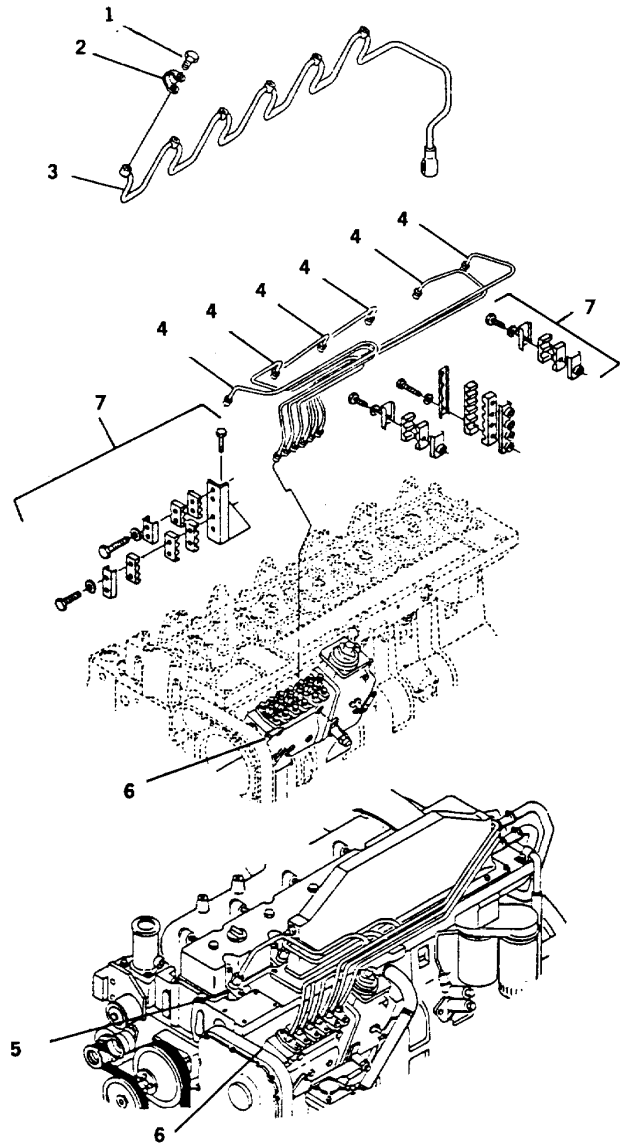
1. TAG AND DISCONNECT ELECTRICAL LEAD TO FUEL LEVEL SENDER (4).
2. TAG AND DISCONNECT FUEL LINE INLET (10) AND OUTLET (11) HOSES. PLUG ENDS.
3. REMOVE FUEL TANK (1) AND FUEL QUANTITY SENDER (4).
 - a. Support fuel tank (1) weight. Remove two nuts (6) and washers (7) from two mounting strap brackets (8).
 - b. Remove and keep fittings (9) from bottom of fuel tank (1).
 - c. Remove five screws (5) and remove fuel quantity sender (4). Discard gauge ring (2) and gasket (3).



INSTALLATION:

1. INSTALL FUEL TANK (1).
 - a. Install fuel quantity sender (4), new gasket (3) and new gauge ring (2) and secure with five screws (5).
 - b. Support fuel tank (1) to proper height. Install two nuts (6) and washers (7) to mounting strap bracket (8).
 - c. Remove tag then connect electrical lead to fuel quantity sender (4).
 - d. Install two fittings (9) in fuel tank (1).
 - e. Remove plugs and tags then connect fuel line inlet (10) and outlet (11) hoses.
2. FILL TANK WITH CLEAN DIESEL FUEL AND ENSURE NO LEAKS ARE PRESENT. (REFER TO TM 5-3810-306-10.)
3. INSTALL FUEL TANK COVER AND LADDER ASSEMBLY. (REFER TO PAGE 15-19.)
4. CONNECT GROUND CABLE AT SHUNT. (REFER TO PAGE 8-109.)
5. BLEED FUEL SYSTEM. (REFER TO PAGE 5-12.)

END OF TASK



FUEL LINE REPLACEMENT

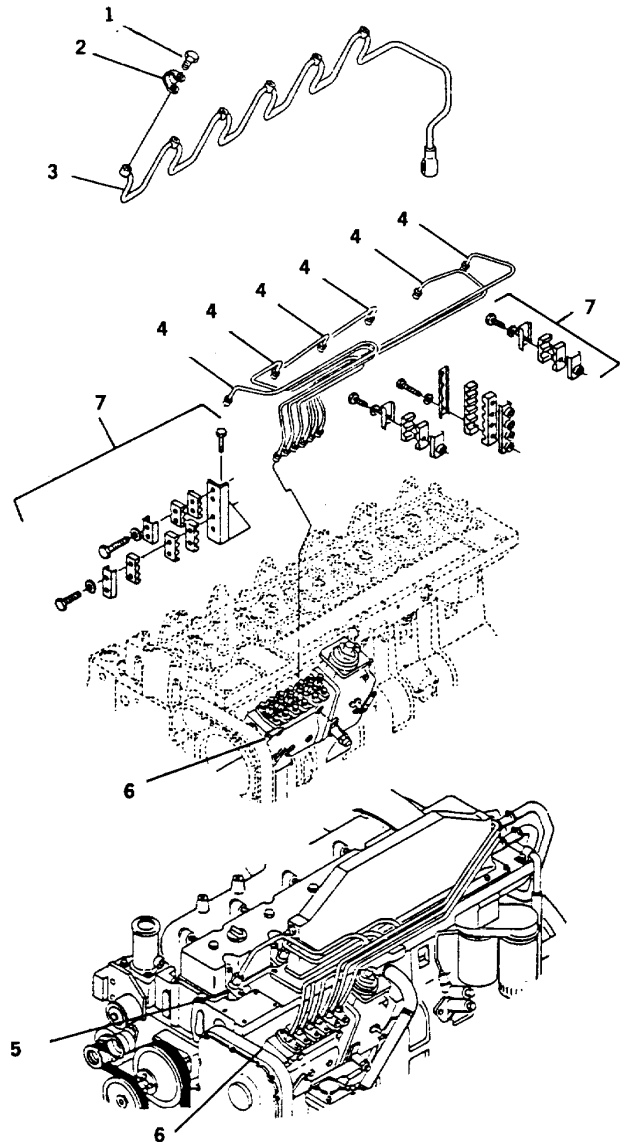
TOOLS: General mechanic's tool kit: automotive (5180-00-177-7033)

SUPPLIES: Banjo seals (Item 66, Appendix C) (6 Required)

EQUIPMENT CONDITION: Disconnect ground cable at shunt. (Refer to page 8-109.)
Engine access doors open.

REMOVAL:

1. DISCONNECT AND REMOVE HIGH PRESSURE FUEL LINES.
 - a. Remove six screws (1) and banjo seals (2) to disassemble fuel manifold (3). Discard banjo seals (2).
 - b. Disconnect six fuel lines (4) from injectors (5).
 - c. Disconnect six fuel lines (4) at fuel pump (6).
2. DISASSEMBLE VIBRATION ISOLATORS (7) AND REMOVE FUEL LINES.
3. INSPECT PARTS FOR DAMAGE. REPLACE AS REQUIRED.



INSTALLATION:

1. INSTALL FUEL LINES.
 - a. Connect fuel lines (4) to fuel pump (6) and to injectors (5).
 - b. Mount fuel manifold (3) on injectors (5), attach with new banjo seals (2) and screws (1).
2. ASSEMBLE VIBRATION ISOLATORS (7) AND SECURE FUEL LINES.
3. CONNECT GROUND CABLE AT SHUNT. (REFER TO PAGE 8-109.) 4. START ENGINE. (REFER TO TM 5-3810306-10.) CHECK FOR LEAKS.

END OF TASK

FUEL SUPPLY AND RETURN LINES REPLACEMENT

TOOLS: General mechanic's tool kit: automotive (5180-00-177-7033)

SUPPLIES: Clean rags (Item 1, Appendix C)
Preformed packing (Item 72, Appendix C)

EQUIPMENT CONDITION: Disconnect ground cable at shunt. (Refer to page 8-109.)
Engine access doors open.

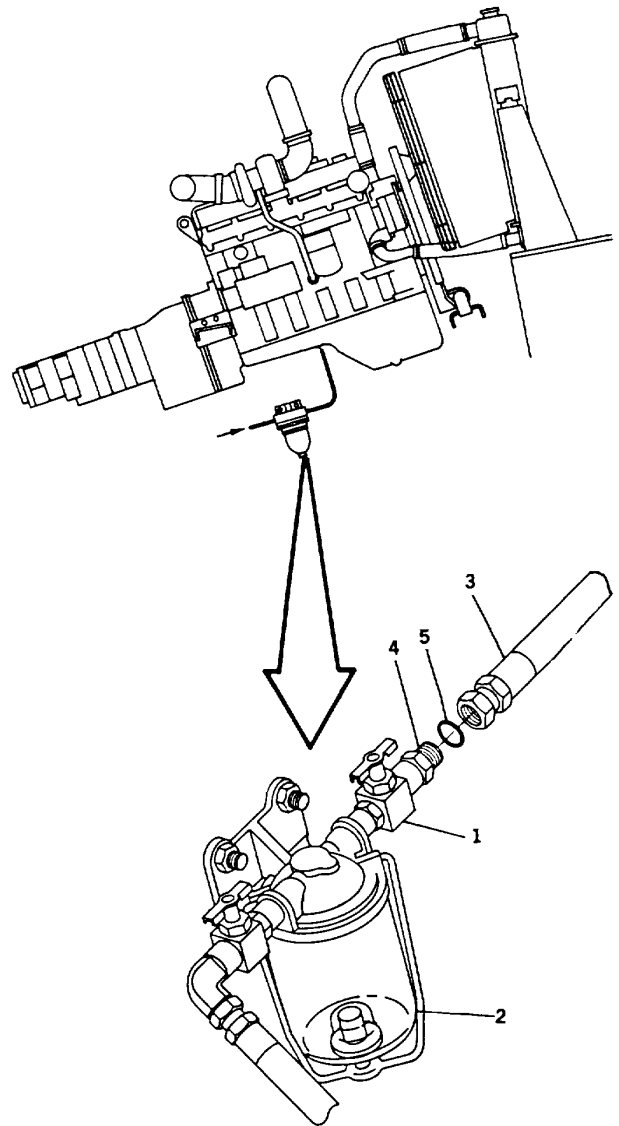
REMOVAL:**WARNING**

Fuel is flammable. Keep fuel away from heat and open flame.

NOTE

Get set to catch fuel in drain pan.

1. REMOVE FUEL SUPPLY LINE (3).
 - a. Close valve (1) at in-line fuel filter (2).
 - b. Disconnect fuel supply line (3) at adapter (4). Remove and discard preformed packing (5).
 - c. Disconnect fuel supply line (3) at tank.
 - d. Remove fuel supply line (3).
2. REMOVE FUEL RETURN LINE (6).
 - a. Loosen clamp (7) at fuel injection pump.
 - b. Disconnect fuel return line (6).
 - c. Loosen clamp (8) at fuel tank.
 - d. Disconnect and remove fuel return line (6).



3. INSPECT ALL PARTS FOR DAMAGE.

INSTALLATION:

1. INSTALL FUEL RETURN LINE (6).

a. Connect fuel return line (6) at tank and secure with clamp (8).

b. Connect fuel return line (6) at fuel injection pump and secure with clamp (7).

2. INSTALL FUEL SUPPLY LINE (3).

a. Connect fuel supply line (3) at fuel tank.

b. Connect fuel supply line (3) at adapter (4) with new preformed packing (5).

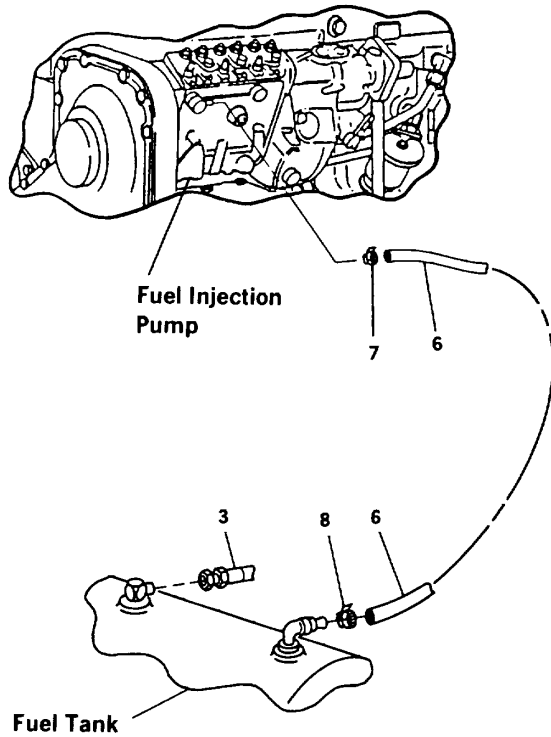
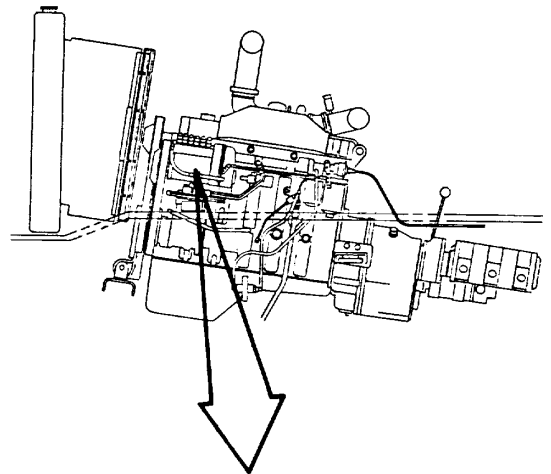
c. Open valve (1) at in-line fuel filter (2).

3. BLEED FUEL SYSTEM. (REFER TO PAGE 5-12.)

4. CONNECT GROUND CABLE AT SHUNT. (REFER TO PAGE 8-109.)

5. START ENGINE. (REFER TO TM 5-3810306-10.)
CHECK FOR LEAKS.

END OF TASK



BLEEDING FUEL SYSTEM

TOOLS: General mechanic's tool kit: automotive (5180-00-177-7033)

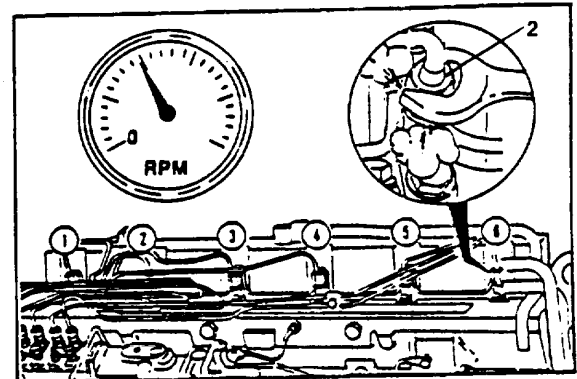
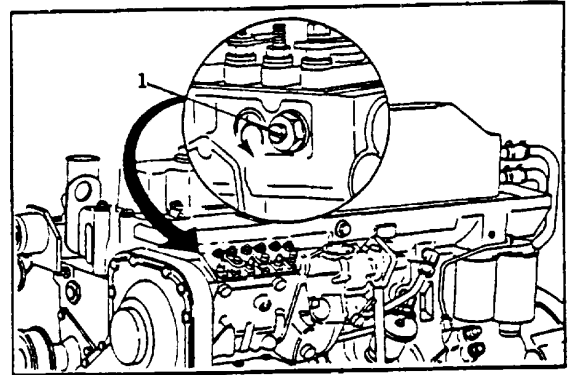
SUPPLIES: None

EQUIPMENT CONDITION: Engine access doors opened.

NOTE

This procedure should be performed after completing maintenance on the fuel system, particularly when a fuel line was opened.

1. BLEED AIR FROM FUEL SYSTEM.
 - a. Loosen vent screw (1) on fuel injection pump.
 - b. Place fuel control in run position.
 - c. Crank engine and allow air to bleed from pump.
 - d. Close vent screw (1).
 - 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.



END OF TASK

Section III. FUEL FILTER MAINTENANCE

IN-LINE FUEL FILTER/STRAINER INSTALLATION

TOOLS: General mechanic's tool kit: automotive (5180-00-177-7033)

SUPPLIES: Clean rags (Item 1, Appendix C)
 Preformed packing (Item 71, Appendix C)
 Lockwashers (Item 2, Appendix C)
 Preformed packing (Item 72, Appendix C)

EQUIPMENT CONDITIONS: Disconnect ground cable at shunt.
 (Refer to page 8-109.)

REMOVAL:

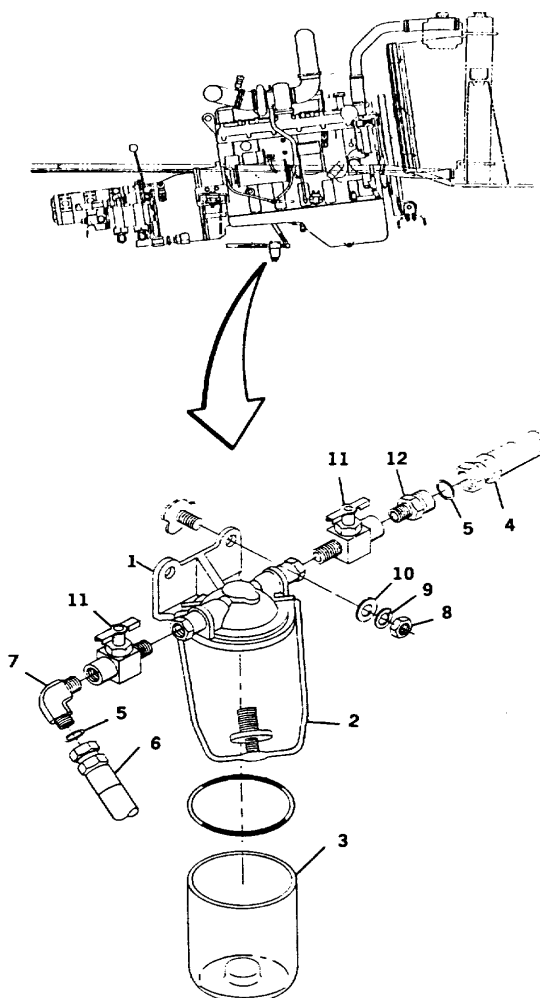
WARNING

Fuel is flammable. Keep fuel away from heat and open flame.

NOTE

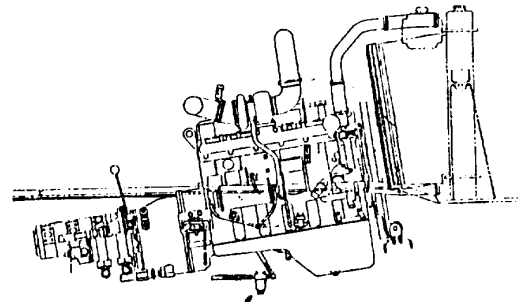
Get set to catch fuel in drain pan.

1. DRAIN FUEL FILTER (1).
 - a. Close valves (11).
 - b. Put drain pan under fuel filter (1).
 - c. Release wire (2).
 - d. Remove bowl (3) to drain fuel.
 - e. Wipe area clean with rag.
2. TAG AND DISCONNECT TWO FUEL LINES FROM FUEL FILTER.
 - a. Remove "IN" fuel line (4) and packing (5).
 - b. Remove "OUT" fuel line (6) and packing (5) from elbow fitting (7).
 - c. Discard packings (5).



3. REMOVE FUEL FILTER ASSEMBLY.

- a. Remove two nuts (8), lockwashers (9) and flatwashers (10) securing fuel filter housing to frame. Discard lockwashers (9).
- b. Remove fuel filter (1) from studs.
- c. Remove elbow (7) and valves (11) from fuel filter assembly.
- d. Remove adapter (12) from valve (11).

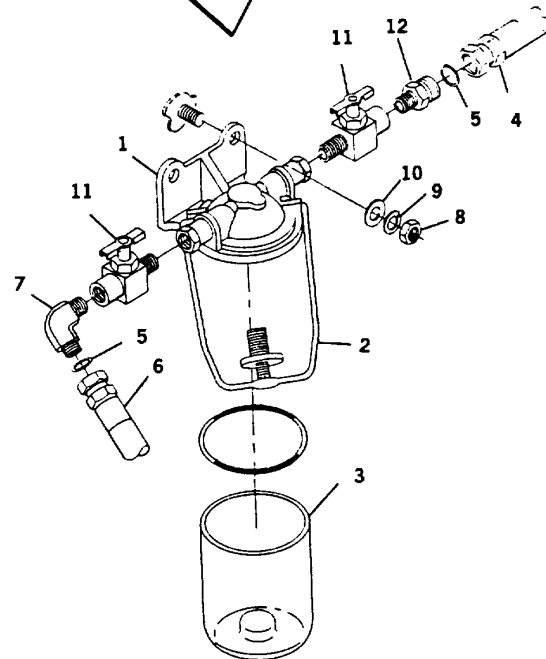


4. INSPECT PARTS FOR DAMAGE. REPLACE IF DAMAGED.

INSTALLATION:

1. INSTALL FUEL FILTER (1).

- a. Install valves (11), adapter (12) and elbow (7) on fuel filter.
- b. Put fuel filter (1) on studs.
- c. Install two flatwashers (10), new lockwashers (9) and nuts (8) to secure fuel filter.



2. CONNECT TWO FUEL LINES TO FUEL FILTER.

- a. Connect "OUT" fuel line (6) and new packing (5) to elbow fitting.
- b. Connect "IN" fuel line (4) and new packing (5) to IN port.
- c. Ensure fuel filter bowl (3) is secure and open valves (11).

3. CONNECT GROUND CABLE AT SHUNT. (REFER TO PAGE 8-109.)

4. START ENGINE. (REFER TO TM 5-3810-306-10.)

5. MAKE SURE SEDIMENT BOWL FILLS WITH FUEL. ENSURE THERE IS NO LEAKAGE.

**END OF TASK
5-14**

FUEL WATER SEPARATOR/FILTER REPLACEMENT

TOOLS: General mechanic's tool kit: automotive (5180-00-177-7033)

SUPPLIES: Clean rags (Item 1, Appendix C)
 Light duty grease (MIL-G-10924)) (Item 9, Appendix C)
 Diesel fuel (Item 73, Appendix C)
 Filter, fuel (Item 74, Appendix C)
 Element, filter (Item 75, Appendix C)

EQUIPMENT CONDITIONS: Disconnect ground cable at shunt. (Refer to page 8-109.)
 Fuel supply to engine is shutoff at valves on in-line filter.
 Surrounding area near filter area is clean and free of debris.

REMOVAL:

1. REMOVE FUEL FILTER (1) AND WATER SEPARATOR (2).

WARNING

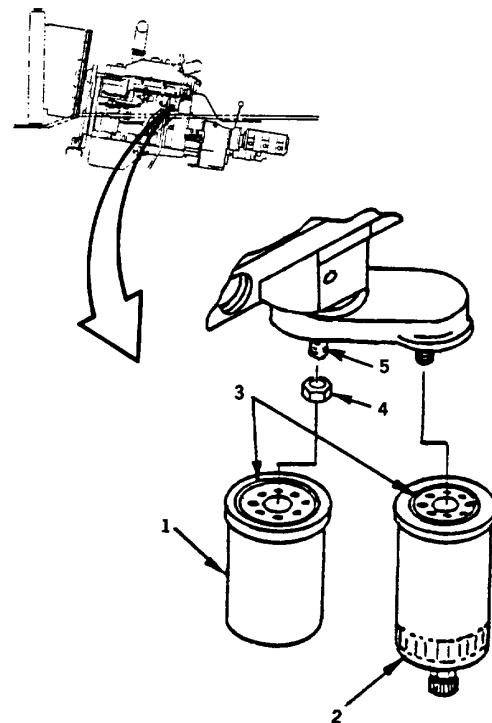
Fuel is flammable. Keep fuel away from heat and open flame.

- a. Place a waste fuel receptacle under filters (1) and (2) to catch fuel spillage.
- b. Remove fuel filter (1) and water separator (2) by turning element counter-clockwise. Dispose of filters.
- c. If necessary remove nut (4) and stud (5).

INSTALLATION:

1. INSTALL FUEL FILTER (1) AND WATER SEPARATOR (2).

- a. If removed, install stud (5) and nut (4).
- b. Coat gaskets (3) with a light film of grease.
- c. Fill filters (1) and (2) with diesel fuel and tighten hand-tight.



d. Turn on fuel supply to engine and prime fuel system

2. CONNECT GROUND CABLE AT SHUNT. (REFER TO PAGE 8-109.)
3. TEST FOR PROPER OPERATION. (REFER TO TM 5-3810-306-10.)

END OF TASK
5-15

Section IV. ENGINE STARTING AID MAINTENANCE

QUICK START STARTING FLUID CYLINDER SERVICE 47

TOOLS: General mechanic's tool kit: automotive (5180-00-177-7033)

SUPPLIES: Clean rags (Item 1, Appendix C)
Starting fluid cylinder (Item 44, Appendix C)

EQUIPMENT CONDITION: Disconnect ground cable at shunt. (Refer to page 8-109.)

REMOVAL:

2. CONNECT GROUND CABLE AT SHUNT. (REFER TO PAGE 8-109.)

CAUTION

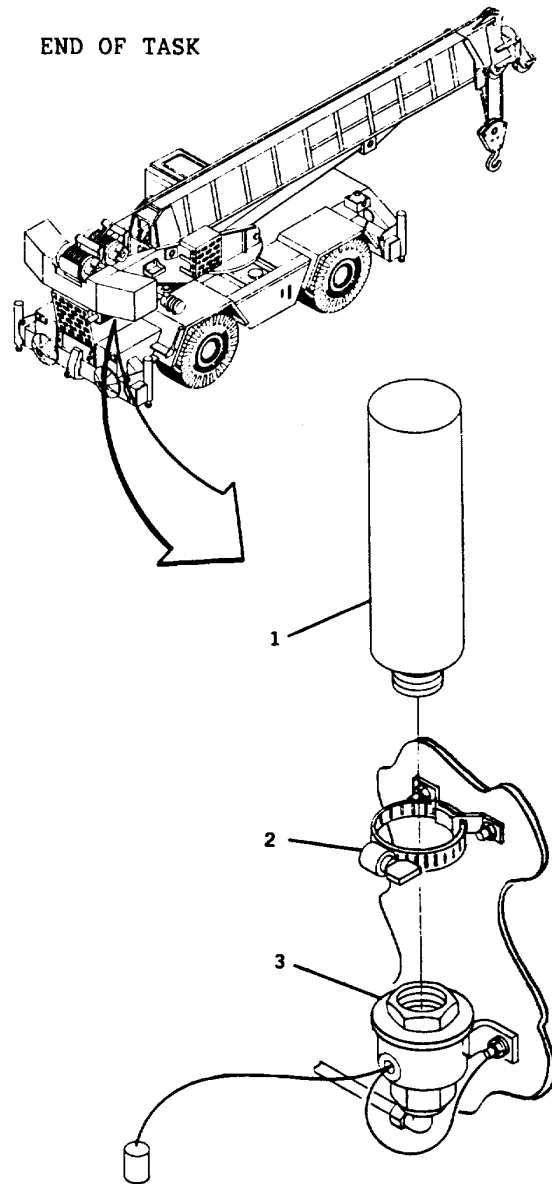
**Do not allow dirt to fall in valve (3).
Dirt in valve (3) could prevent starting
fluid cylinder (1) from sealing
properly.**

1. REMOVE QUICK START STARTING FLUID CYLINDER (1).
 - a. Unscrew clamp (2).
 - b. Unscrew starting fluid cylinder bottle (1) from valve (3). Pull starting fluid cylinder bottle (1) from clamp (2). Cover valve with rag.
 - c. Properly dispose of starting fluid cylinder.
2. INSPECT PARTS FOR DAMAGE. REPLACE AS REQUIRED.

INSTALLATION:

1. INSTALL QUICK START STARTING FLUID CYLINDER (1).
 - a. Remove rag.
 - b. Put starting fluid cylinder bottle (1) through clamp (2).
 - c. Screw starting fluid cylinder bottle (1) in valve (3).
 - d. Tighten clamp (2).

END OF TASK



QUICK START ETHER VALVE AND TUBING REPLACEMENT

TOOLS: General mechanic's tool kit: automotive (5180-00-177-7033)

SUPPLIES: Lockwashers (Item 2, Appendix C) (4 Required)

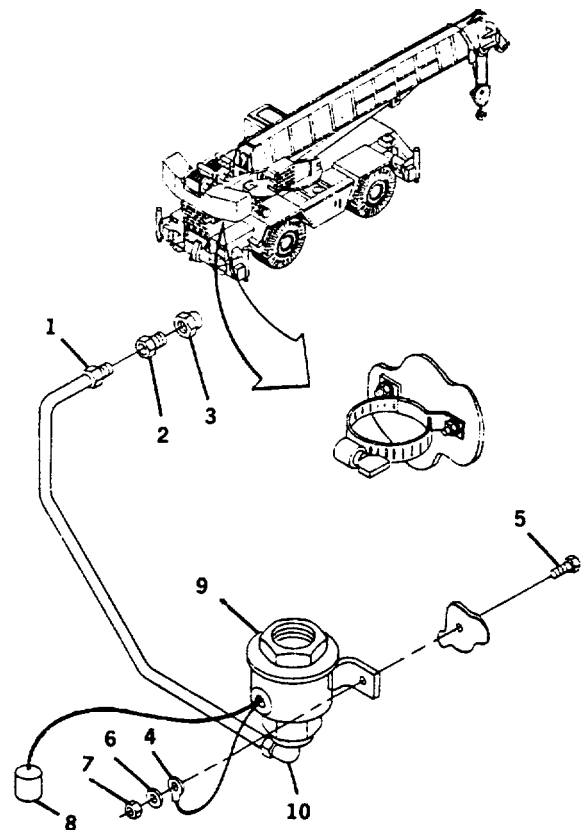
EQUIPMENT CONDITIONS: Disconnect ground cable at shunt. (Refer to page 8-109.)
Quick start starting fluid cylinder removed. (Refer to page 5-16.)

REMOVAL:

1. DISCONNECT ELECTRICAL WIRE (8), AND ETHER VALVE (9) AND TUBING (1).
 - a. Tag and disconnect electrical wire (8) to temperature sender.
 - b. Unscrew plug (3), atomizer (2), and tube (1) from side of engine cylinder head.
 - c. Disconnect tubing (1) and elbow (10) from ether valve (9).
 - d. Remove two capscrews (5), nuts (7), lockwashers (6) and grounding wire (4). Discard lockwashers (6).
 - e. Remove ether valve (9).
2. INSPECT PARTS FOR DAMAGE. REPLACE AS REQUIRED.

INSTALLATION:

1. INSTALL ETHER VALVE (9) head.
 - a. Install elbow (10) and tubing (1) to ether valve (9)
 - b. Hold ether valve (9) against hood. Install two capscrews (5), grounding wire (4), nuts (7) and new lockwashers (6) Remove tag
 - c. Connect electrical wire (8) to temperature sender. Remove tags



2. INSTALL TUBING (1) TO SIDE OF ENGINE CYLINDER HEAD.
 - a. Install plug (3) and atomizer (2) on side of engine cylinder head.
 - b. Connect tubing (1) to atomizer.
3. CONNECT GROUND CABLE AT SHUNT. (REFER TO PAGE 8-109.)
- 4.. INSTALL QUICK START STARTING FLUID. (REFER TO PAGE 5-16.)

END OF TASK
5-17

Section V. FUEL PUMP MAINTENANCE

FUEL PUMP INSTALLATION

TOOLS: General mechanic's tool kit: automotive (5180-00-177-7033)

SUPPLIES: Clean rags (Item 1, Appendix C)
Gasket (Item 64, Appendix C)
Seal, banjo (Item 66, Appendix C)
Washers (Item 65, Appendix C) (2 Required)

EQUIPMENT CONDITION: Disconnect ground cable at shunt. (Refer to page 8-109.)

REMOVAL:

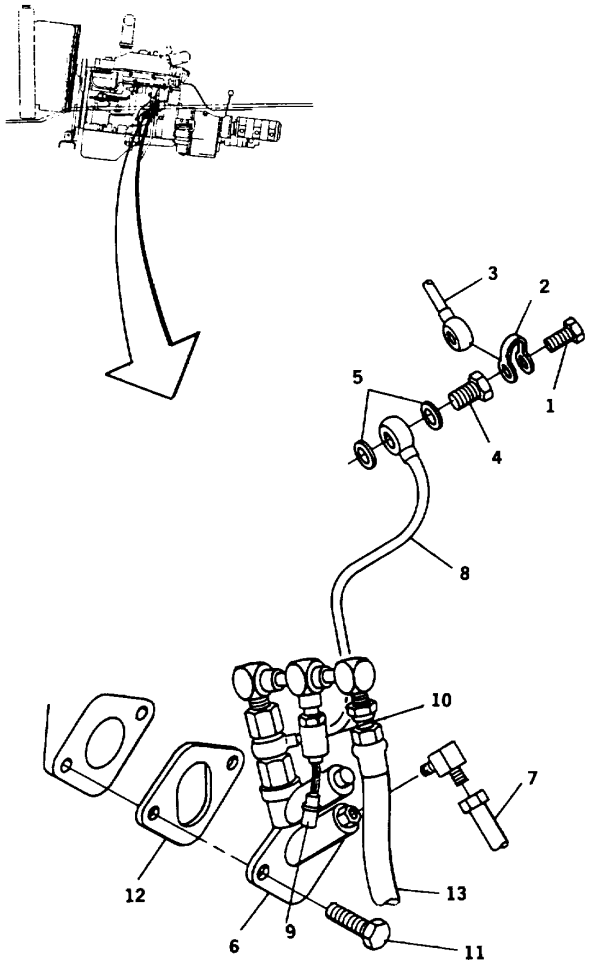
1. DISCONNECT FUEL SUPPLY TUBES.
 - a. Remove fuel supply line (7) to fuel pump (6).

2. DISCONNECT FUEL MANIFOLD LINE (3) AND FUEL SUPPLY TUBE (8).
 - a. Remove connector screw (1), seal (2) and fuel manifold line (3) end. Discard seal (2).
 - b. Remove connector screw (4), washers (5) and fuel supply tube (8). Discard washers (5).

3. TAG AND DISCONNECT ELECTRICAL CONNECTOR (9) TO FUEL SUPPLY PRESSURE TRANSDUCER (10).

4. DISCONNECT FUEL LINE (13).

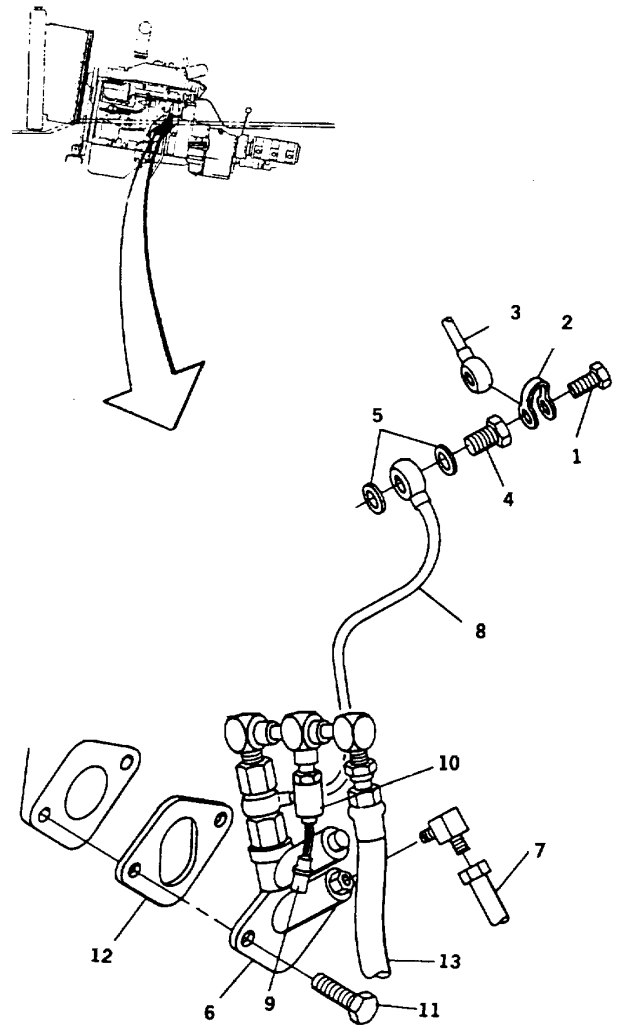
5. REMOVE FUEL PUMP (6).
 - a. Remove two capscrews (11) and fuel pump (6).
 - b. Remove and discard gasket (12).



6. REMOVE FUEL SUPPLY PRESSURE TRANSDUCER (10), FUEL SUPPLY TUBE (8) AND FITTINGS FROM FUEL PUMP (6). RETAIN FOR INSTALLATION.
7. INSPECT PARTS FOR DAMAGE. REPLACE AS REQUIRED.

INSTALLATION:

1. INSTALL FUEL SUPPLY TUBE (8), FITTINGS AND FUEL SUPPLY PRESSURE TRANSDUCER (10) TO FUEL PUMP (6).
2. INSTALL FUEL PUMP (6).
 - a. Clean fuel pump mounting surface until free of gasket material.
 - b. With new gasket (12), mount fuel pump (6) with two capscrews (11).
3. INSTALL FUEL SUPPLY TUBES.
 - a. Attach fuel supply line (7) to fuel pump (6).
 - b. Using two new washers (5) attach fuel supply tube (8) to engine block with connector screw (4).
 - c. Install fuel manifold line (3) with new seal (2) and secure with connector screw (1).
4. CONNECT FUEL LINE (13).
5. CONNECT ELECTRICAL CONNECTOR (9) TO FUEL SUPPLY PRESSURE TRANSDUCER (10).
6. CONNECT GROUND CABLE AT SHUNT. (REFER TO PAGE 8-109.)



7. START ENGINE. (REFER TO TM 5-3810-306-10.) CHECK FOR FUEL LEAKS.

END OF TASK

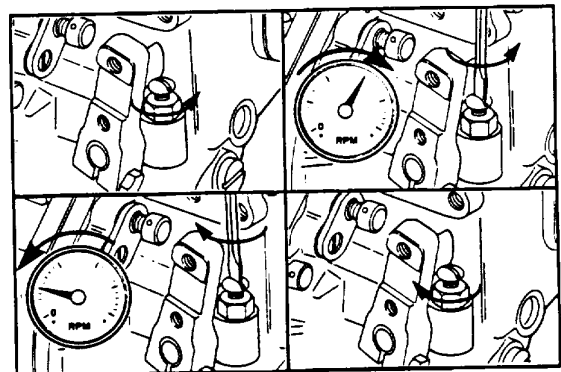
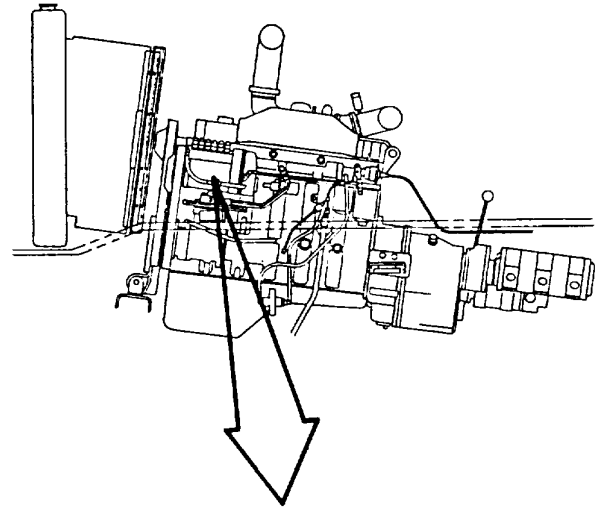
IDLE SPEED ADJUSTMENT

TOOLS: General mechanic's tool kit: automotive (5180-00-177-7033)

SUPPLIES: None

EQUIPMENT CONDITION: Engine access doors opened.

1. START ENGINE. (REFER TO TM 5-3810306-10.)
2. ADJUST ENGINE IDLE SPEED.
 - a. Loosen locknut.
 - b. Turn adjusting screw counterclockwise to increase rpm or clockwise to decrease rpm.
 - c. When desired rpm is obtained, tighten locknut.



END OF TASK

CHAPTER 6
EXHAUST SYSTEM MAINTENANCE

CHAPTER INDEX

Procedure	Page
Muffler and Pipe Replacement	6-2

MUFFLER AND PIPE REPLACEMENT

TOOLS: General mechanic's tool kit: automotive (5180-00-177-7033)

SUPPLIES: Clean rags (Item 1, Appendix C)
Lockwashers (Item 15, Appendix C) (4 Required)

EQUIPMENT CONDITIONS: Muffler is cool to touch.
Radiator grill removed. (Refer to page 15-14.)
Disconnect ground cable at shunt. (Refer to page 8-109.)

REMOVAL:

1. REMOVE MUFFLER AND PIPE ASSEMBLY.

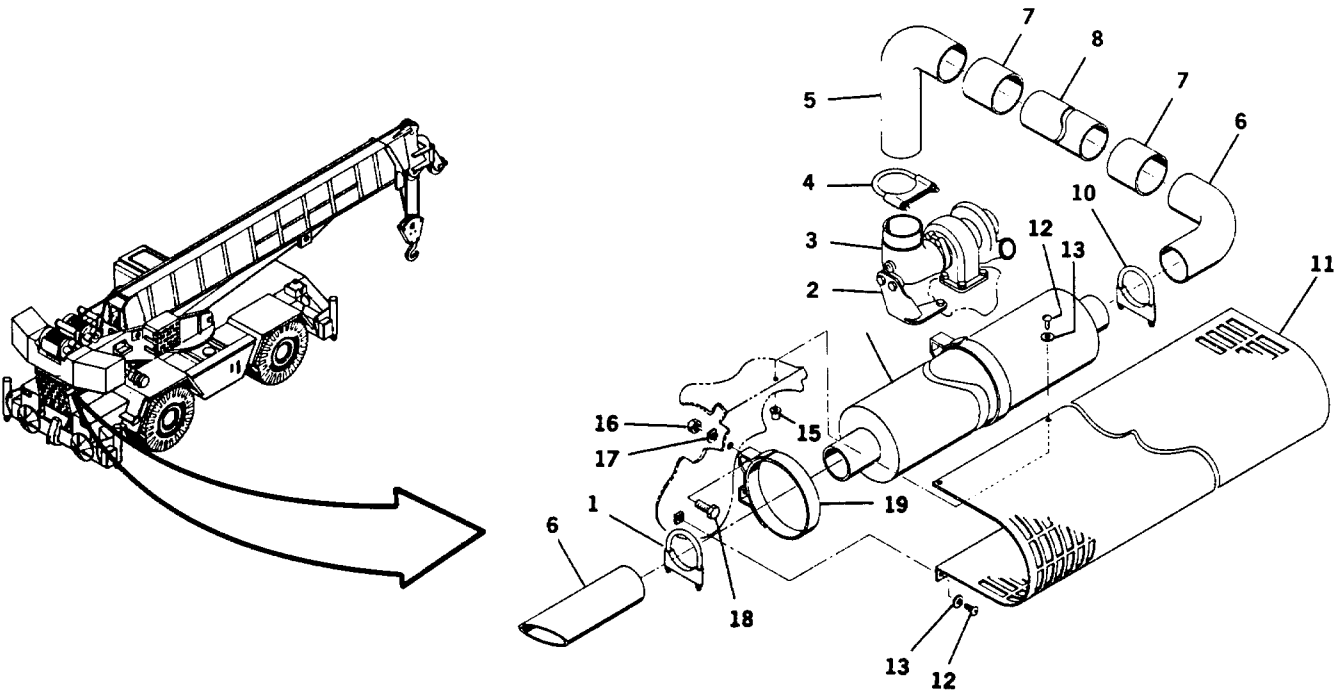
- a. Remove six screws (12) and washers (13) securing muffler guard to engine hood.
- b. Loosen five bolts, securing hood and top of muffler guard, remove guard (11).
- c. Remove pipe assembly (8) from muffler exhaust elbow (9) by loosening bands (7).
- d. Remove clamp (4) and exhaust elbow (5) from turbocharger exhaust connection (3). Cover turbocharger opening.
- e. Loosen clamp (1) and remove tail pipe (6).

- f. Support muffler (14) and remove four capscrews (18), lockwashers (17) and nuts (16) securing muffler mounting band (19) to engine hood. Discard muffler (14) and lockwashers (17).

INSTALLATION:

INSTALL MUFFLER AND PIPE ASSEMBLY.

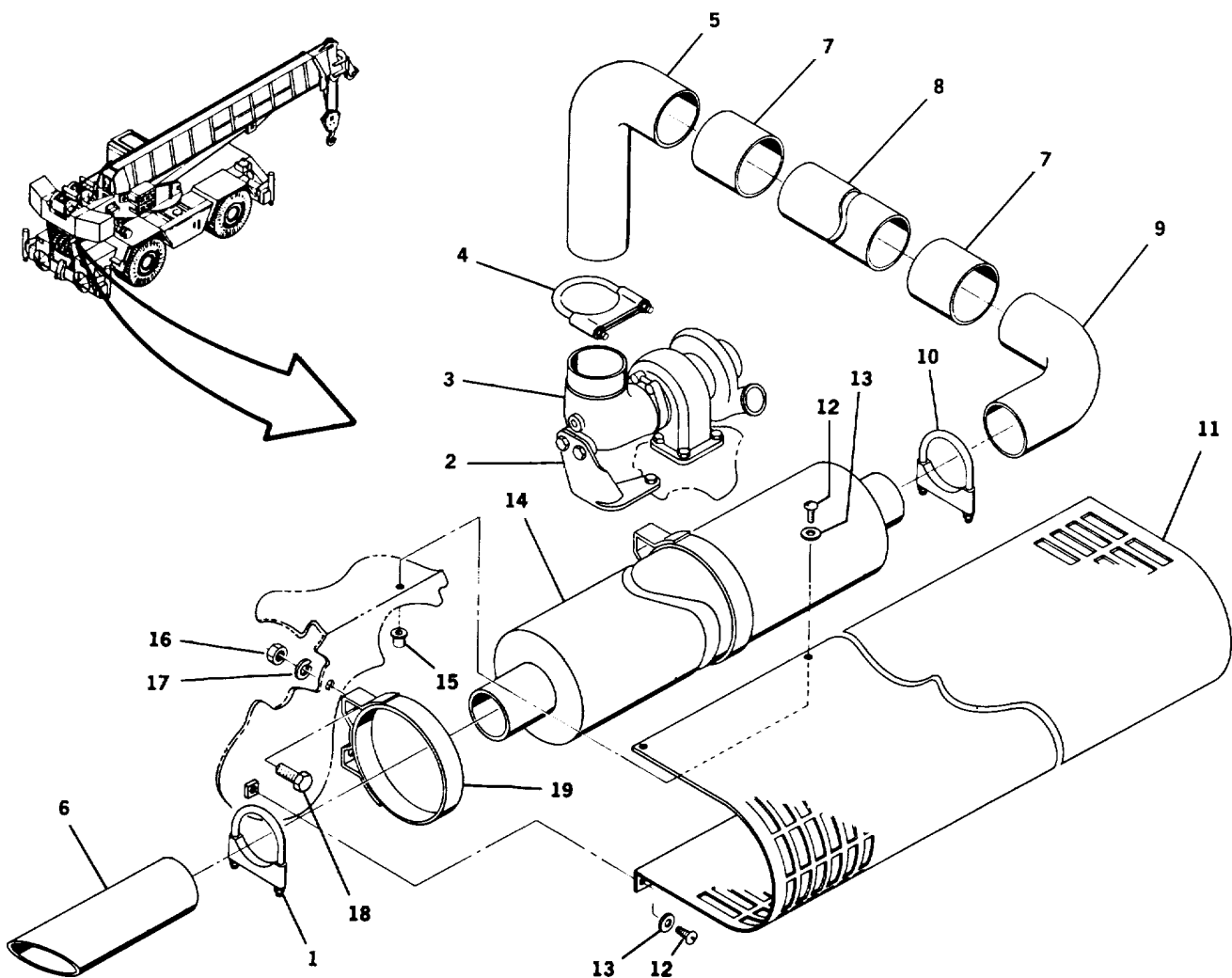
- a. Install tail pipe (6) and exhaust elbow (9) with clamps (10 and 1) to new muffler (14).
- b. Install mounting bands (19) on muffler (14). Ensure proper alignment with engine hood. Tighten bands (19).



- c. Position muffler exhaust elbow (9) through engine hood and secure mounting bands (19) to engine hood with four capscrews (18), new lockwashers (17) and nuts (16).
- d. Install muffler guard (11) under top of hood and on side of engine hood. Secure sides with six screws (12) and washers (13). Tighten five bolts to secure top of hood and muffler guard.
- e. Remove rag and install exhaust elbow (5) and clamp (4) on exhaust connection (3).

- f. Install exhaust hose (8) and sealing clamps (7) between both exhaust elbows (9 and 5). Tighten all clamps.
2. INSTALL RADIATOR GRILL. (REFER TO PAGE 15-14.)
 3. CONNECT GROUND CABLE AT SHUNT. (REFER TO PAGE 8-109.)
 4. START ENGINE AND TEST FOR PROPER OPERATION. (REFER TO TM 5-3810-30610.)

END OF TASK



CHAPTER 7

COOLANT SYSTEM MAINTENANCE

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Section I. RADIATOR MAINTENANCE

COOLANT OVERFLOW TANK

TOOLS: General mechanic's tool kit: automotive (5180-00-177-7033)
Drain pan

SUPPLIES: Lockwashers (Item 2, Appendix C) (4 Required)

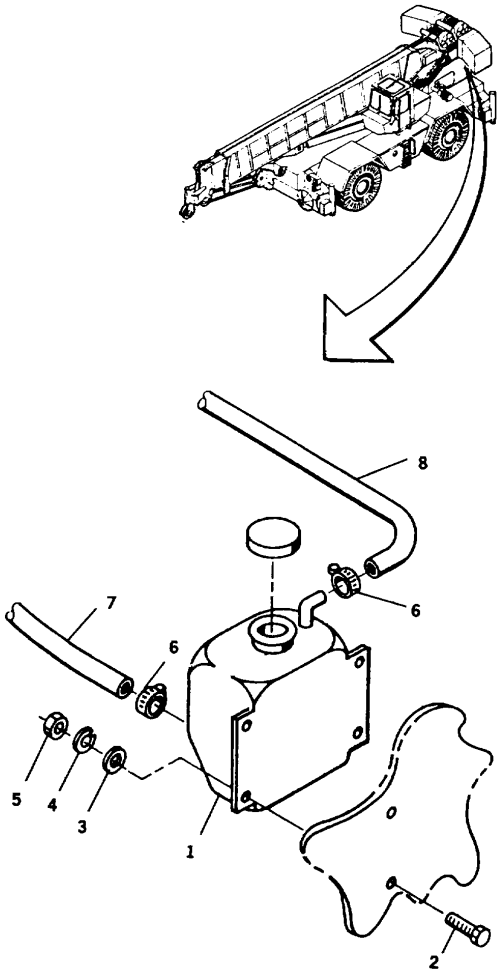
EQUIPMENT CONDITION: Disconnect ground cable at shunt. (Refer to page 8-109.)
Left engine access door opened.
Engine cool.

REMOVAL:

WARNING

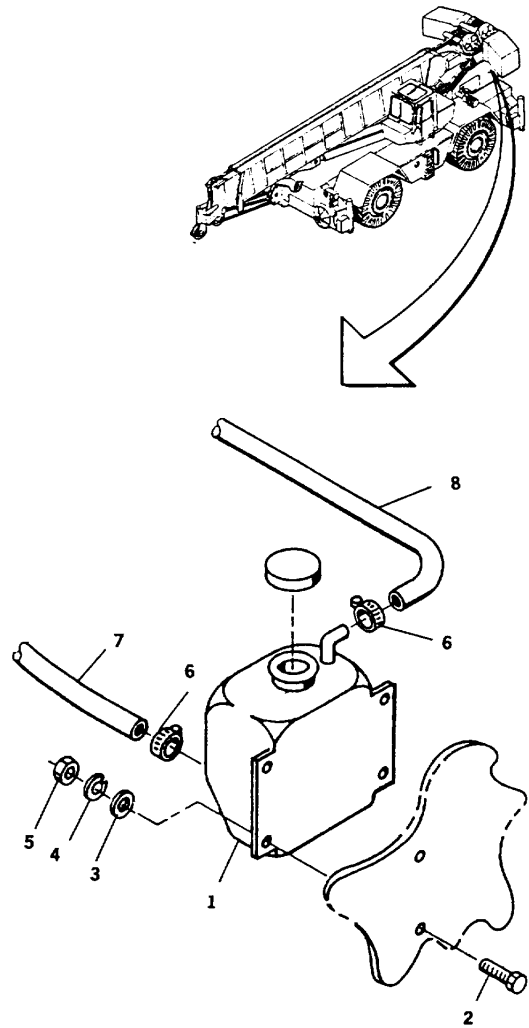
Be sure engine coolant has cooled before draining coolant from overflow tank. Engine coolant can cause burns when hot.

1. REMOVE COOLANT OVERFLOW TANK (1).
 - a. Remove four capscrews (2), flatwashers (3), lockwashers (4) and nuts (5) securing overflow tank to engine hood. Discard lockwashers (4).
 - b. Turn overflow tank over and drain coolant into a suitable container.
 - c. Loosen clamp (6) and remove overflow tube (7) from bottom of overflow tank (1).
 - d. Loosen hose clamp (6) and remove overflow tube (8) from top of overflow tank (1).
 - e. Remove overflow tank (1) through access opening.



INSTALLATION:

1. INSTALL COOLANT OVERFLOW TANK (6).
 - a. Install overflow tubes (7) and (8) to top and bottom of overflow tank and secure with hose clamps (6).
 - b. Position overflow tank with holes in engine hood. Install capscrews (2), flatwashers (3), new lockwashers (4) and nuts (5). Secure overflow tank.
2. SERVICE COOLING SYSTEM. (REFER TO TM 5-3810-306-10.)
3. CONNECT GROUND CABLE AT SHUNT. (REFER TO PAGE 8-109.)



END OF TASK
7-3

RADIATOR FAN AND FAN GUARD REPLACEKENT

TOOLS: General mechanic's tool kit: automotive (5180-00-177-7033)

SUPPLIES: Lockwashers (Item 2, Appendix C) (Quantity 4)

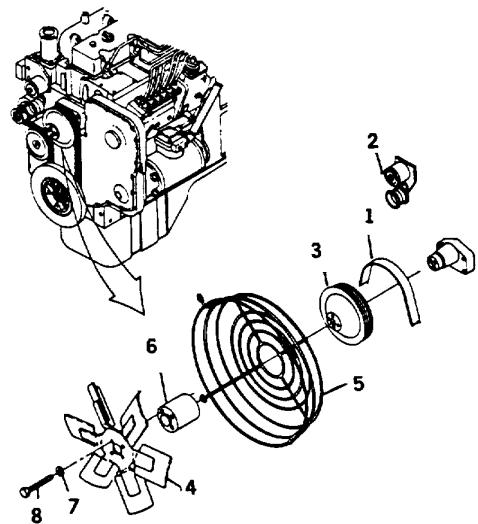
EQUIPMENT CONDITIONS: Disconnect ground cable at shunt. (Refer to page 8-109.)
 Engine hood assembly removed. (Refer to page 15-14.)
 Radiator, mooring brackets, and shroud removed. (Refer to page 7-9.)

REMOVAL:

1. LOOSEN TENSION ON DRIVE BELT (1).
 - a. Insert 1/2-inch square drive into belt tensioner (2) slot.
 - b. Turn clockwise.
 - c. Push drive belt (1) over fan pulley (3) towards engine.
2. REMOVE RADIATOR FAN (4) AND GUARD (5).
 - a. Hold fan guard (5) and spacer (6) in place.
 - b. Remove four long capscrews (8) and lockwashers (7). Pull fan (4) off spacer (6). Discard lockwashers (7).
 - c. Lift fan spacer (6), fan guard (5), and fan pulley (3) from engine compartment.
3. INSPECT PARTS FOR DAMAGE. REPLACE AS REQUIRED.

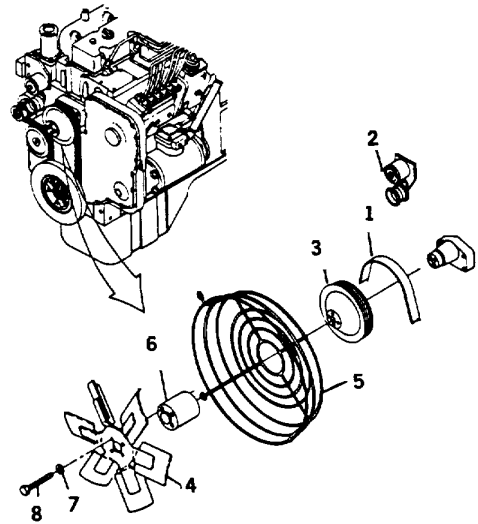
INSTALLATION:

1. ASSEMBLE RADIATOR FAN (4), FAN SPACER (6), FAN GUARD (5) AND FAN PULLEY (3).
 - a. Push radiator fan (4) on pulley spacer (6) detent. Align holes.



- b. Insert four long capscrews (8) and new lockwashers (7).
- c. Align fan guard (5) center hole with fan spacer (6).
- d. Put fan pulley (3) on opposite side of fan guard (5).
- e. Push fan pulley (3) on exposed capscrews (8).
2. POSITION DRIVE BELT (1) ON FRONT OF ENGINE.
3. INSTALL RADIATOR FAN ASSEMBLY ON FAN HUB.
 - a. Secure fan assembly with four capscrews (8) and new lockwashers (7).

- b. Release tension on belt tensioner (2) and put drive belt (1) in fan pulley (3) groove.
4. INSTALL RADIATOR, MOORING BRACKETS, AND SHROUD. (REFER TO PAGE 7-9.)
5. INSTALL ENGINE HOOD ASSEMBLY. (REFER TO PAGE 15-14.)
6. CONNECT GROUND CABLE AT SHUNT. (REFER TO PAGE 8-109.)
7. START ENGINE. (REFER TO 5-3810-306110.)
8. CHECK FOR PROPER OPERATION. (REFER TO TM 5-3810-306-10.)



END OF TASK

RADIATOR HOSE AND TUBE REPLACEMENT

TOOLS: General mechanic's tool kit: automotive (5180-00-177-7033)
Drain Pan

SUPPLIES: Lockwashers (Item 63, Appendix C)
Anti-freeze (Item 10, Appendix C)
Clean rags (Item 1, Appendix C)
Sealant (Item 79, Appendix C)

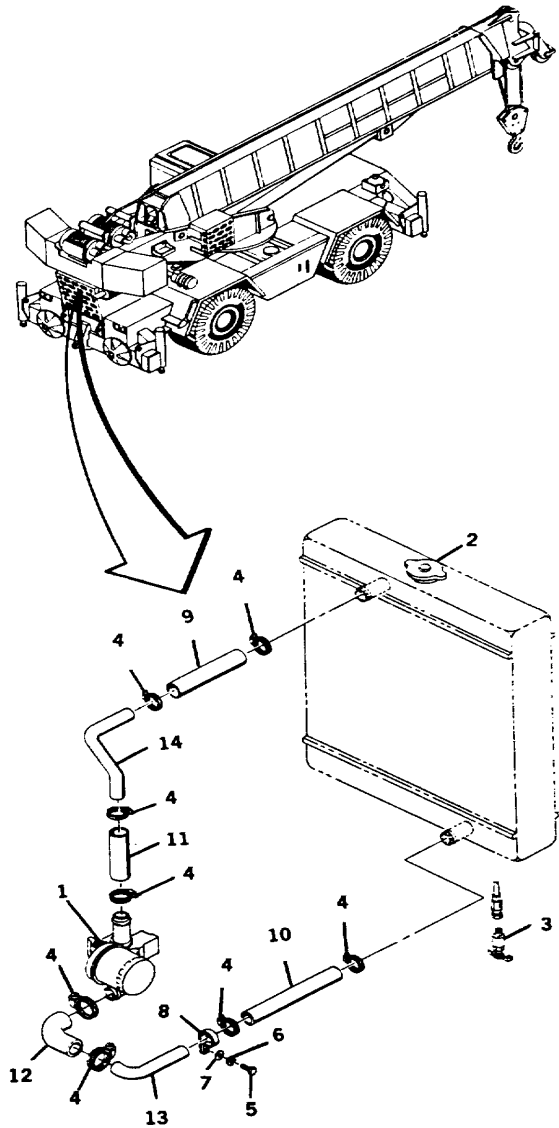
EQUIPMENT CONDITIONS: Engine cool to touch.
Disconnect ground cable at shunt. (Refer to page 8-109.)

REMOVAL:

WARNING

Pressurized cooling system. Remove radiator cap slowly and only when engine is cool, or burns could result.

1. CLOSE SHUTOFF VALVE (1) AND DRAIN RADIATOR.
 - a. Turn shutoff (1) clockwise to close.
 - b. Remove radiator cap (2).
 - c. Put drain pan under radiator. Open petcock (3).
 - d. Close petcock (3) when radiator has completely drained.
2. DISCONNECT TOP AND BOTTOM RADIATOR HOSES (9, 10, 11 AND 12), TUBES (13 AND 14), AND CLAMPS (4).
 - a. Loosen eight clamps (4). Remove capscrew (5), lockwasher (6), flatwasher (7), and tubing clamp (8). Discard lockwasher (6).
 - b. Pull top hose (9) and bottom hose (10) from radiator adapters. Allow coolant to drain from hoses.



- c. Wipe adapters clean of sealant with rag.
- d. Pull two hoses (11 and 12) from water outlet and water inlet connectors.

3. INSPECT PARTS FOR DAMAGE. REPLACE AS REQUIRED.

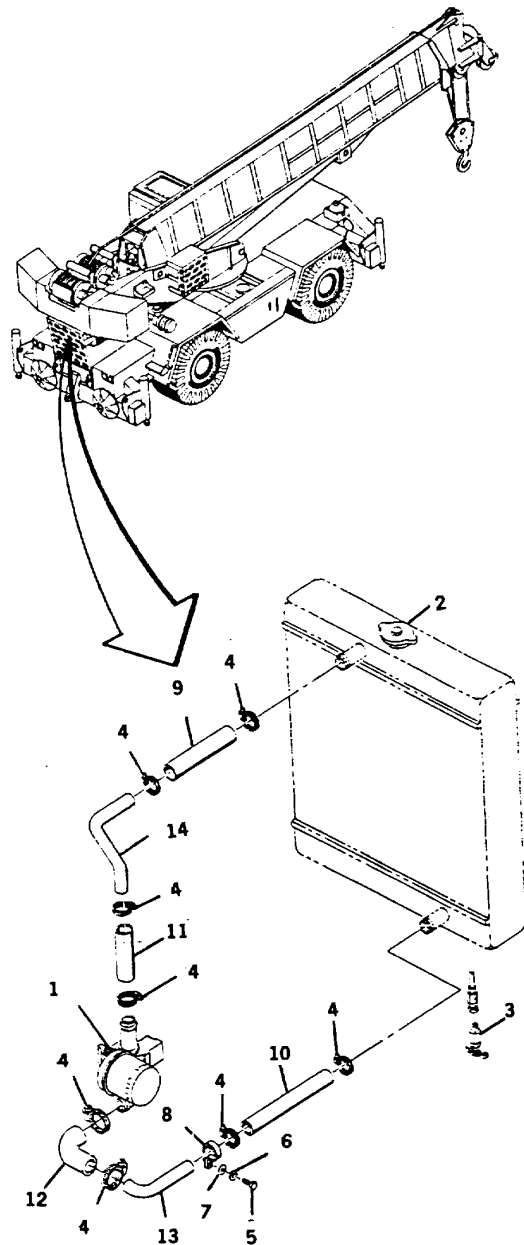
INSTALLATION:

1. ASSEMBLE TOP AND BOTTOM RADIATOR HOSES AND TUBES.
 - a. Connect four hoses and two tubes.
 - b. Loosely install eight clamps (4) around ends of top and bottom radiator hoses.
 - c. Loosely install capscrew (5), new lockwasher (6), flatwasher (7), and tube clamp (8) to bottom tube (13).
2. JOIN HOSES (11 AND 12) TO WATER INLET AND OUTLET CONNECTORS. TIGHTEN CLAMPS (4).

CAUTION

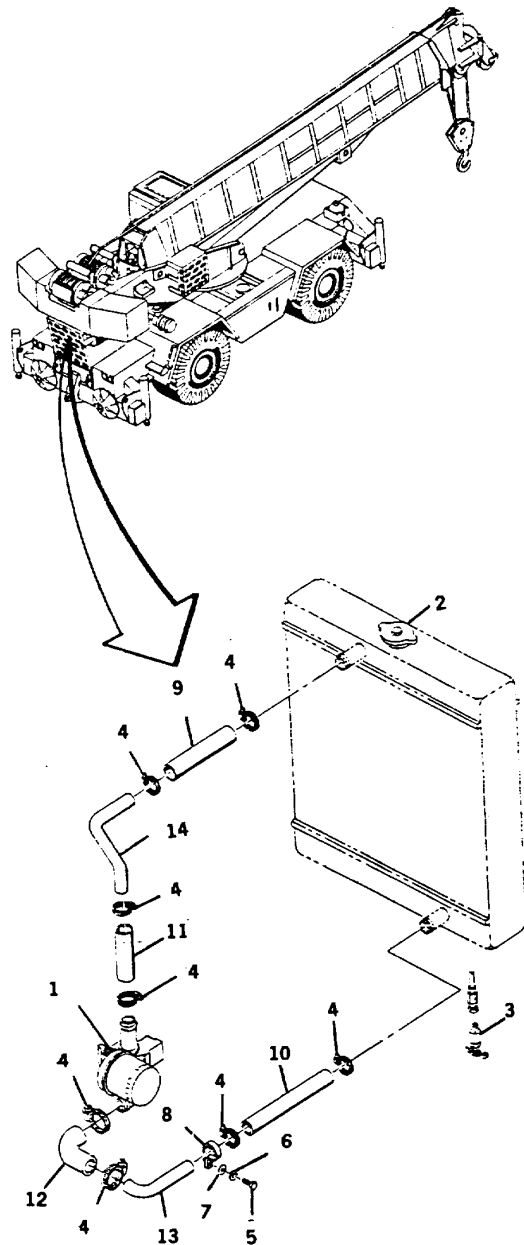
Do not apply sealant to inside of hose. This results in clogged coolant passages and premature engine failure.

3. JOIN HOSES (9 AND 10) TO RADIATOR ADAPTERS.
 - a. Apply a moderate amount of permatex No. 2 to mate ends of radiator adapters.
 - b. Push hoses (9 and 10) on adapters. Wipe excess sealant with rag.
 - c. Tighten two hose clamps (4) on radiator adapters.



- d. Adjust tubes (13 and 14) as necessary. Tighten remaining clamps (4).
 - e. Tighten capscrew (5) on clamp (8).
 - f. Open shutoff valve (1).
4. CONNECT GROUND CABLE AT SHUNT. (REFER TO PAGE 8-109.)
 5. SERVICE RADIATOR. (REFER TO TM 53810-306-10.)

END OF TASK



RADIATOR, MOORING BRACKET AND SHROUD REPLACEMENT

TOOLS: General mechanic's tool kit: automotive (5180-00-177-7033)
Lifting device (2-ton capacity)

SUPPLIES: Lockwashers (Item 2, Appendix C) (20 Required)
Clean rags (Item 1, Appendix C)
Permatex No. 2 (Item 79, Appendix C)
Anti-freeze (MIL-A-46153) (Item 10, Appendix C)

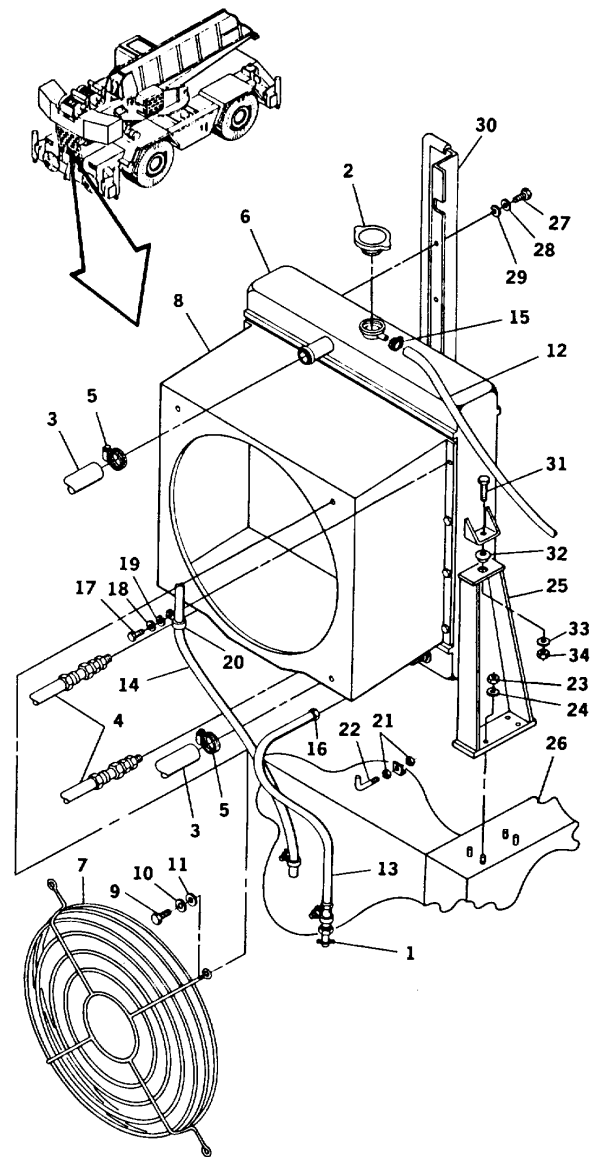
EQUIPMENT CONDITION: Disconnect ground cable at shunt. (Refer to page 8-109.)
Engine hood assembly removed. (Refer to page 15-14.)

REMOVAL:

WARNING

Be sure engine coolant has cooled before draining coolant from radiator. Engine coolant can cause burns when hot.

1. DRAIN RADIATOR COOLANT.
 - a. Place drain pan under petcock (1). Remove radiator cap (2).
 - b. Open petcock (1).
 - c. Wipe up spillage with rags.
2. DISCONNECT TWO RADIATOR HOSES (3).
 - a. Loosen hose clamps (5) on top and bottom radiator hoses (3).
 - b. Disconnect two hoses from radiator (6). Save hose clamps (5).
3. DISCONNECT FAN GUARD (7) FROM FAN SHROUD (8).
 - a. Remove four screws (9), lockwashers (10), and flatwashers (11). Discard lockwashers (10).
 - b. Push fan guard (7) against fan pulley.

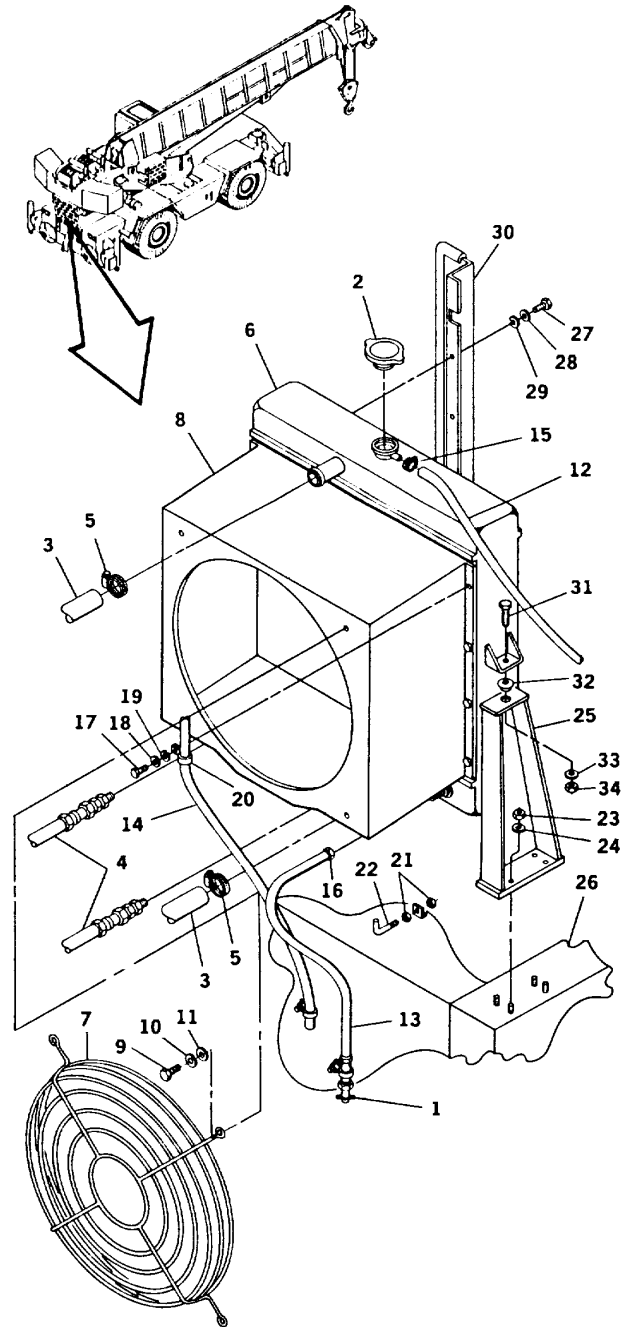


4. DISCONNECT COOLANT RECOVERY TANK HOSE (12), AND OVERFLOW HOSE (14).

- a. Loosen hose clamp (15) and disconnect coolant recovery tank hose (12). Save hose clamp (15).
- b. Remove capscrews (17), lockwashers (18), flatwashers (19), and tubing clamps (20) holding overflow hose (14) to radiator (6). Discard lockwashers (18).

5. REMOVE RADIATOR (6).

- a. Remove nut (21) securing adjusting rod (22) to frame.
- b. Remove eight locknuts (23) and washers (24) securing mounting bracket (25) to frame (26).
- c. Move radiator rearward.
- d. Remove six capscrews (17), lockwashers (18) and flatwashers (19) securing shroud (8).
- e. Unscrew fitting (16). Disconnect drain hose (13) at bottom of radiator (6).
- f. Disconnect two torque converter oil cooler lines (4). Cap open lines.
- g. Using a suitable lifting device, remove radiator.
- h. Set radiator assembly in clean work area and remove lifting equipment.



6. REMOVE BAFFLES (30) AND MOUNTING BRACKETS (25).

- a. Remove eight capscrews (27), lockwashers (28), and flatwashers (29) securing baffles (30). Discard lockwashers (28).
- b. Remove two capscrews (31), bonded mountings (32), flatwashers (33), and locknuts (34) from mounting brackets (25).

7. INSPECT PARTS FOR DAMAGE. REPLACE AS REQUIRED.

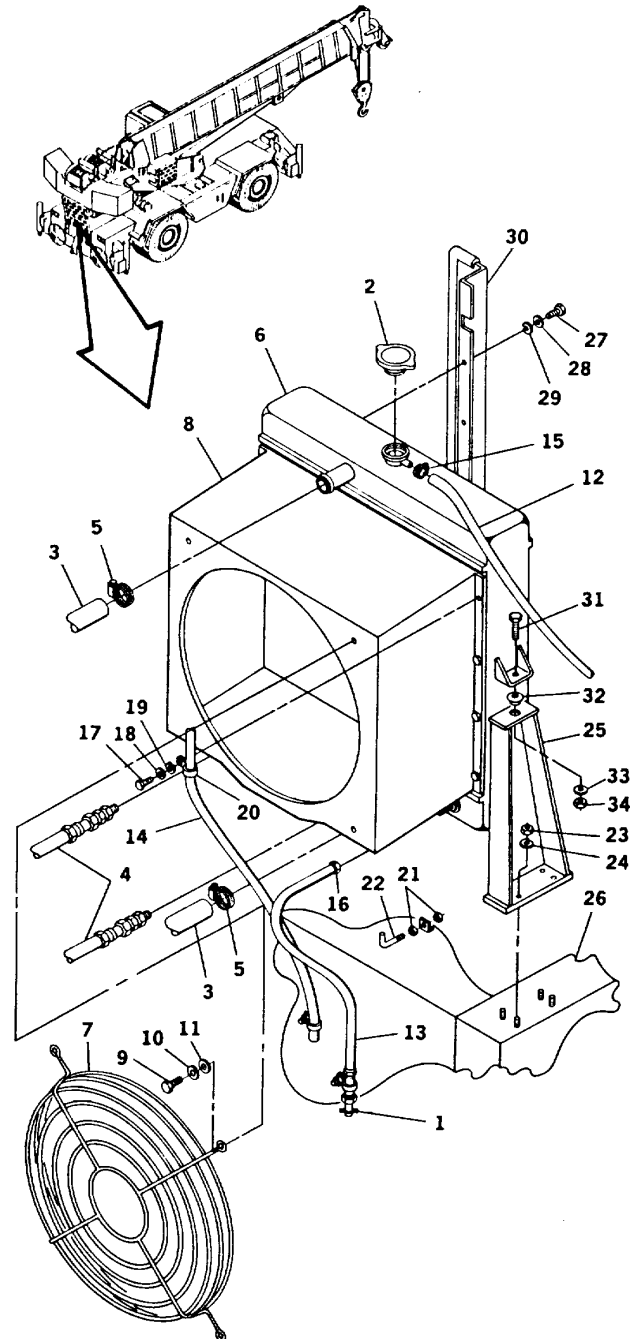
INSTALLATION:

1. ASSEMBLE MOUNTING BRACKETS (25) AND BAFFLES (30) ON RADIATOR (6).

- a. Put bonded mountings (32) in top hole of mounting bracket (25).
- b. Install two capscrews (31) through radiator flange and top hole of mounting brackets (25).
- c. Install two flatwashers (33) and locknuts (34).
- d. Install eight capscrews (27), new lockwashers (28), and flatwashers (29) holding baffles (30) to radiator (6).

2. SET AND SECURE RADIATOR (6) IN ENGINE COMPARTMENT.

- a. Using a suitable lifting device, lift radiator and lower in engine compartment.
- b. Remove caps and connect two torque converter oil cooler lines (4).



- c. Connect drain hose (13) to bottom of radiator (6) tighten fittings (16).
- d. Continue to lower in engine compartment while guiding mounting brackets (25) on frame studs.
- e. Install eight locknuts (23) and flatwashers (24).
- f. Install shroud (8) and secure with six flatwashers (19), new lockwashers (18) and capscrews (17).
- g. Install adjusting rod (22) through guide hole and install nut (21).

3. LEVEL RADIATOR.

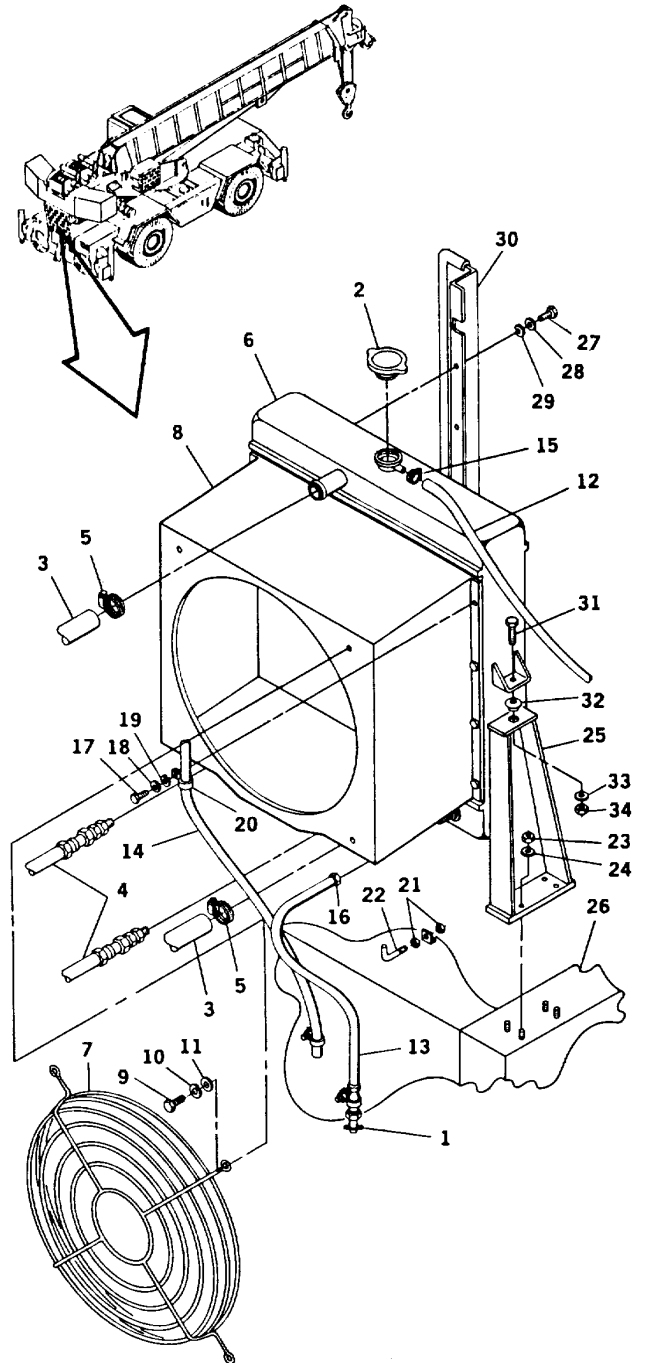
- a. Place a level on front face of radiator (6).
- b. Adjust nuts (21) on adjusting rod until radiator is plumb.
- c. Tighten nut (21).

4. CONNECT OVERFLOW HOSE (14).

- a. Install overflow hose (14) to shroud (8) with capscrews (17), new lockwashers (18), flatwashers (19), and tubing clamps (20).

5. CONNECT FAN GUARD (7) TO SHROUD (8).

- a. Align fan guard (7) with shroud (8). Hold in place.



NOTE

Ensure fan spacer is centered in hole in fan guard or fan may hit guard.

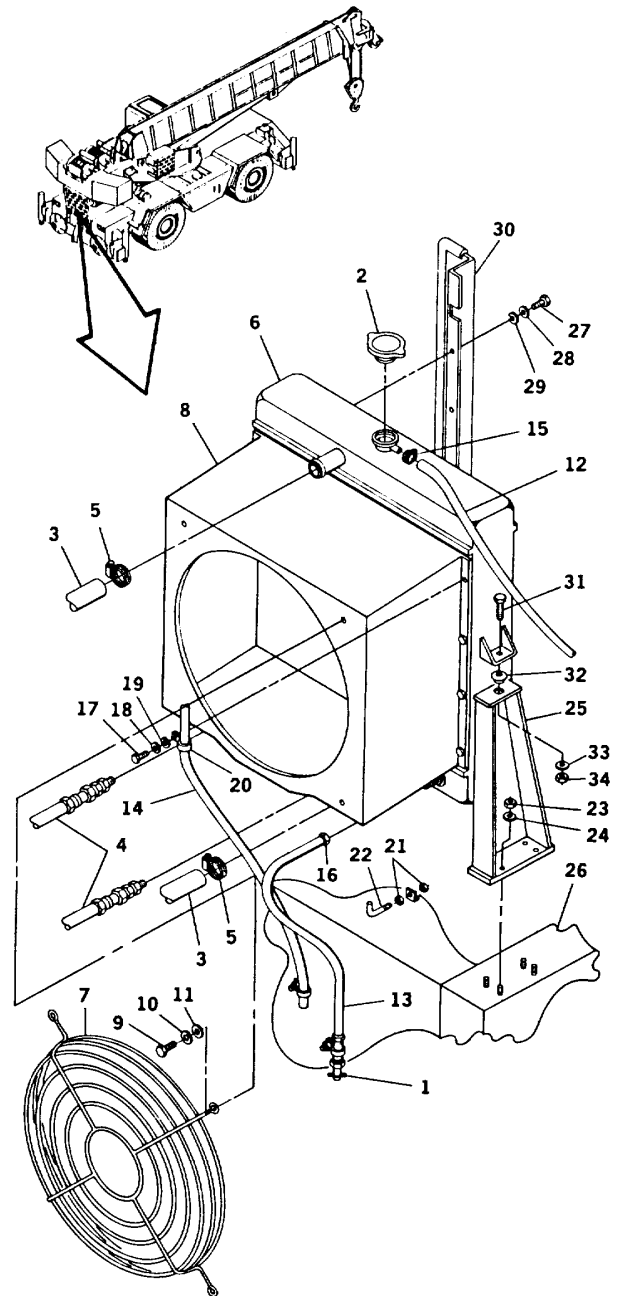
- b. Install four capscrews (9), new lockwashers (10), and flatwashers (11).
6. CONNECT TWO RADIATOR HOSES (3) AND COOLANT RECOVERY TANK HOSE (12).

CAUTION

Do not apply sealant to inside of radiator hose. This results in clogged coolant passages causing premature engine and radiator failure.

- a. Apply a moderate amount of permatex No. 2 to mate ends of radiator hose adapters.
 - b. Put hose clamps (5) on two hoses (3). Push hose (3) on hose adapters. Wipe excess sealant with rag.
 - c. Tighten two hose clamps (5).
 - d. Connect coolant recovery tank hose (12) to radiator (6). Tighten hose clamp (15).
6. SERVICE RADIATOR. (REFER TO TM 53810-306-10.)
7. INSPECT FOR LEAKS.
8. INSTALL ENGINE HOOD ASSEMBLY. (REFER TO PAGE 15-14.) 9. CONNECT GROUND CABLE AT SHUNT. (REFER TO PAGE 8-109.)

END OF TASK



Section II. WATER MANIFOLD, HEADERS, THERMOSTAT AND GASKET MAINTENANCE

COOLANT FILTER REPLACEMENT

TOOLS: General mechanic's tool kit: automotive (5180-00-177-7033)
Drain pan

SUPPLIES: Lubricating oil (Item 46, Appendix C)
Clean rags (Item 1, Appendix C)
Coolant filter (Item 23, Appendix C)
Anti-freeze (Item 10, Appendix C)

EQUIPMENT CONDITIONS: Engine is cool to touch
Disconnect ground cable at shunt. (Refer to page 8-109.)

REMOVAL:

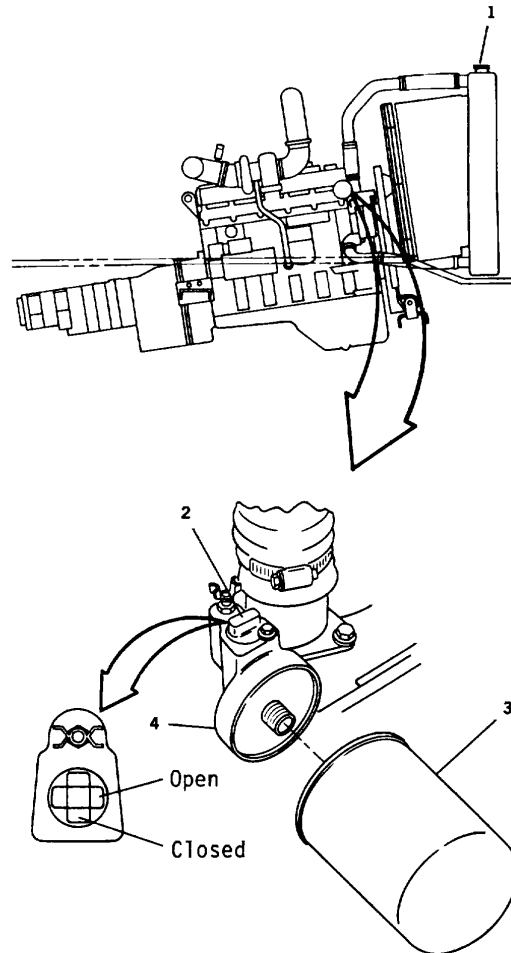
WARNING

Pressurized cooling system. Remove cap slowly and only when engine is cool, or burns could result.

NOTE

Get set to catch coolant in pan.

1. UNSCREW COOLANT FILTER (3) FROM THERMOSTAT HOUSING (4).
 - a. Remove radiator cap (1). Close shut off valve (2).
 - b. Unscrew coolant filter (3) and discard.
 - c. Clean gasket surface on thermostat housing (4) with rag.



INSTALLATION:

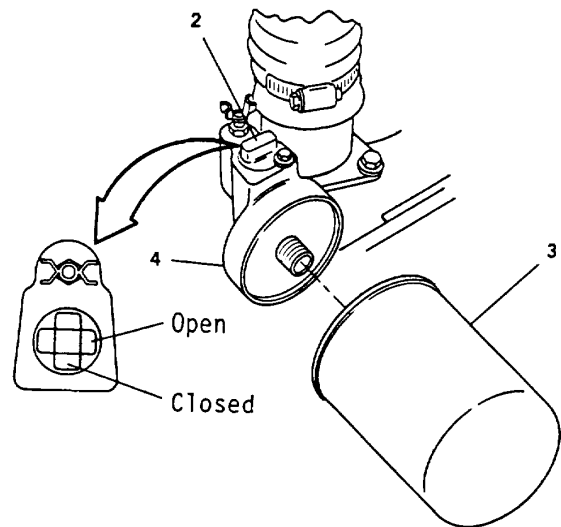
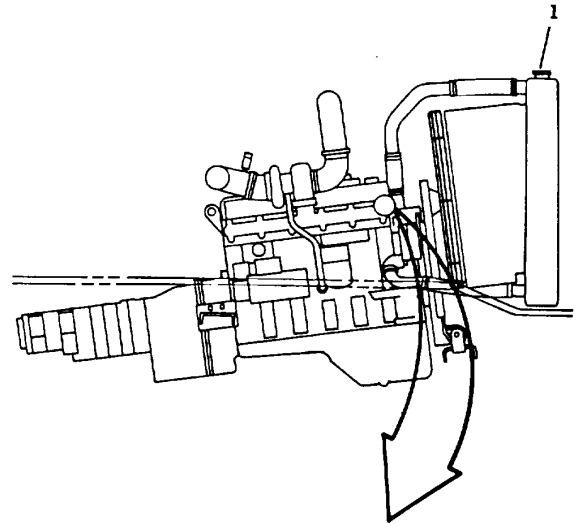
1. INSTALL COOLANT FILTER (3).
 - a. Apply a light coat of clean lubricating oil to gasket.

CAUTION

**Do not overtighten coolant filter (3).
Damage to threads may result.**

- b. Install new coolant filter (3). Hand tighten until gasket contacts mating surface. Tighten an additional 1/4-turn.
2. CHECK RADIATOR COOLANT LEVEL. (REFER TO TM 5-3810-306-10.)
 - a. Open shutoff valve (2). Install radiator cap (1).
3. CONNECT GROUND CABLE AT SHUNT. (REFER TO PAGE 8-109.)
4. START ENGINE. (REFER TO TM 5-3810306-10.)
5. CHECK FOR LEAKS AROUND SEALING SURFACES.
6. SHUT DOWN ENGINE. (REFER TO TM 53810-306-10.)

END OF TASK



THERMOSTAT REPLACEMENT

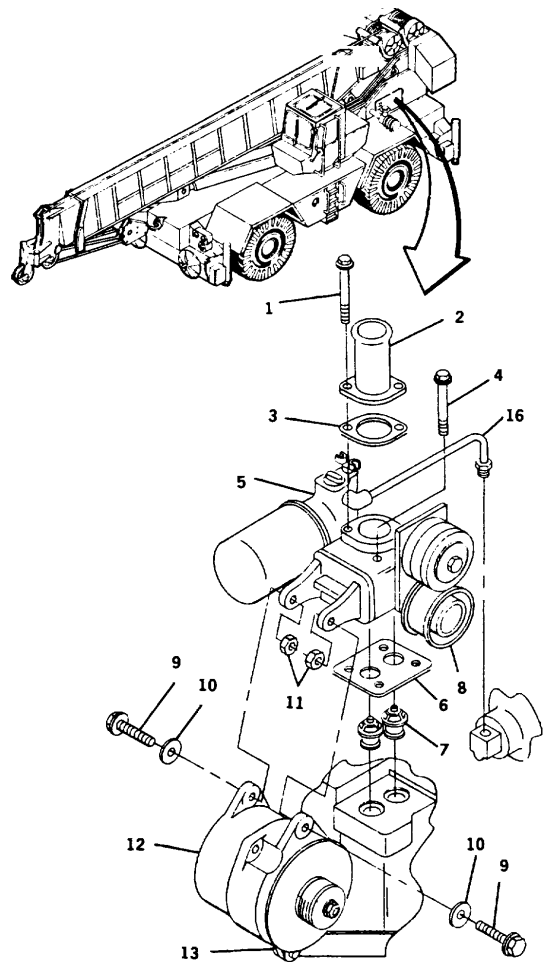
TOOLS: General mechanic's tool kit: automotive (5180-00-177-7033)
 Drain pan
 Thermometer
 Heater

SUPPLIES: Clean rags (Item 1, Appendix C)
 Anti-freeze (Item 10, Appendix C)
 Gasket (Item 24, Appendix C)
 Casket (Item 25, Appendix C)

EQUIPMENT CONDITIONS: Disconnect ground cable at shunt. (Refer to page 8-109.)
 Anti-freeze drained from radiator.
 Radiator hose removed from outlet connection.
 (Refer to page 7-6.)

REMOVAL:

1. RELIEVE PRESSURE ON BELT TENSIONER (8) AND REMOVE BELT FROM ALTERNATOR AND BELT TENSIONER. (REFER TO PAGE 7-23).
2. LOOSEN ALTERNATOR (12).
 - a. Remove nuts (11), washers (10) and capscrews (9) from alternator top bracket.
 - b. Loosen capscrew (13).
 - c. Allow alternator to drop out of way of thermostat housing.
3. REMOVE THERMOSTATS (7).
 - a. Remove capscrews (1) and (4) from thermostat housing (5). Remove water outlet connection (2). Discard connection gasket (3).
 - b. Remove tubing from elbow in block.
 - c. Remove thermostat housing (5) and belt tensioner assembly (8) from cylinder block.
 - d. Remove thermostats (7) and thermostat gasket (6). Cover opening with clean rag. Discard gasket.



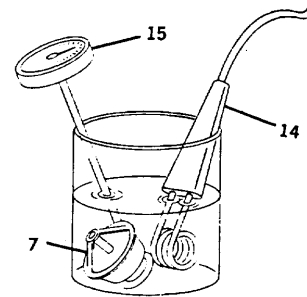
CAUTION

Do not let any gasket material/debris fall into thermostat cavity.

- e. Clean all sealing surfaces on engine block and thermostat housing.

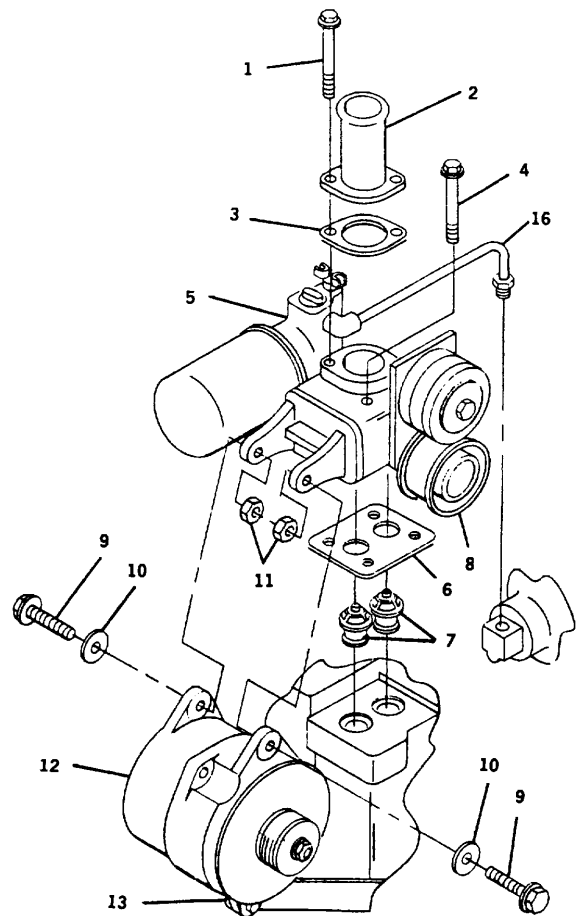
INSPECTION:

1. TEST THERMOSTATS.
 - a. Place thermostats (7) and thermometer (15) in water.
 - b. Place water heater (14) in water.
 - c. Watch thermostats (7) and thermometer (15) as water temperature rises.
 - d. Note temperature when thermostats (7) open. Thermostats (7) must open at 180°F. If not, replace with new thermostats (7).

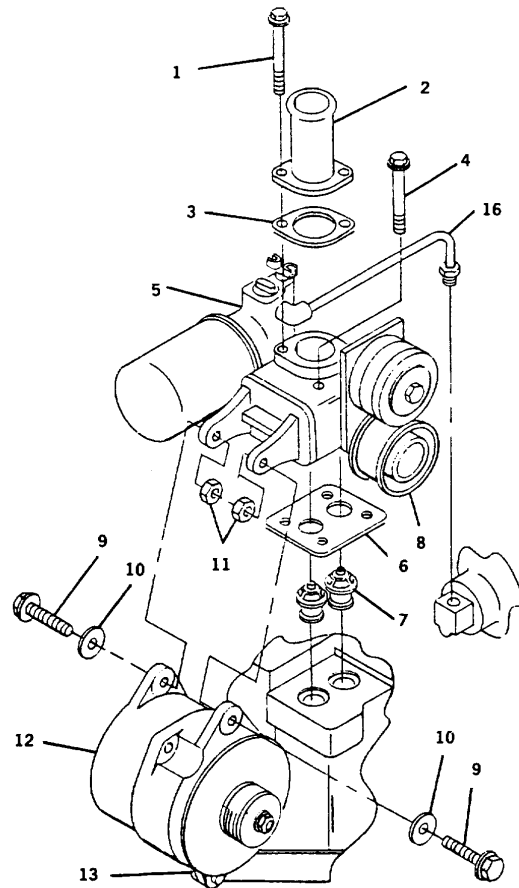


INSTALLATION:

1. INSTALL THERMOSTATS (7).
 - a. Install thermostats (7) in cylinder block.
 - b. Align new thermostat gasket (6) and thermostat housing (5) with cylinder block mounting holes and secure with outer capscrews (4).
 - c. Align water outlet connection (2) and new connection gasket (3) with thermostat housing holes and secure with two capscrews (1). Torque capscrews (1) and (4) to 18 ft-lbs (24 Nm).



- d. Install tubing (16) to elbow on engine.
- 2. INSTALL RADIATOR HOSE TO OUTLET CONNECTION. (REFER TO PAGE 7-6.)
- 3. INSTALL ALTERNATOR ASSEMBLY.
 - a. align mounting holes in alternator (12) with thermostat housing.
 - b. Install two capscrews (9), washers (10) and nuts (11).
 - c. Tighten capscrew (13).
- 4. INSTALL FAN DRIVE BELT. (REFER TO PAGE 7-23.)
- 5. FILL RADIATOR WITH ANTI-FREEZE TO NORMAL LEVEL. (REFER TO TM 5-3810306-10.)
- 6. CONNECT GROUND CABLE AT SHUNT. (REFER TO PAGE 8-109.)
- 7. START ENGINE AND CHECK FOR PROPER OPERATION. (REFER TO TM 5-3810-30610.) INSPECT FOR LEAKS.



END OF TASK

TURBOCHARGER AFTERCOOLER AND PIPING REPLACEMENT

TOOLS: General mechanic's tool kit: automotive (5180-00-177-7033)
 Drain pan

SUPPLIES: Clean rags (Item 1, Appendix C)
 Anti-freeze (Item 10, Appendix C)
 Gasket (Item 11, Appendix C)
 Preformed packings (Item 26, Appendix C) (2 Required)

EQUIPMENT CONDITIONS: Engine access doors open.
 Engine is cool to touch.
 Anti-freeze drained from radiator.
 Disconnect ground cable at shunt. (Refer to page 8-109.)

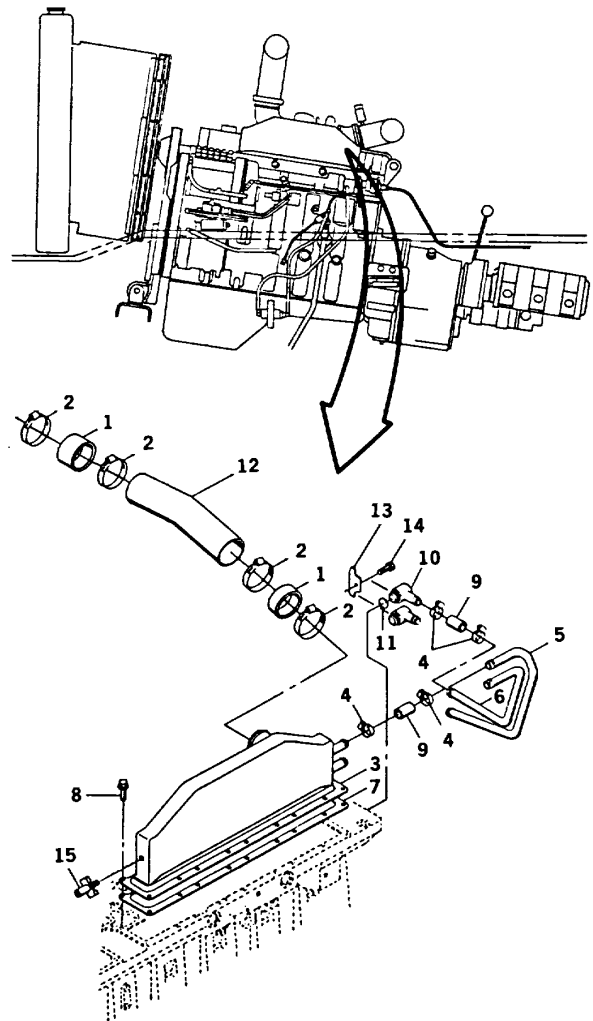
REMOVAL:

1. REMOVE TURBOCHARGER AFTERCOOLER.

WARNING

Use extreme care when removing radiator cap or draining engine coolant system when coolant is hot.

- a. Loosen two clamps (4) from aftercooler coolant supply (5) and return lines (6).
 - b. Loosen clamps (2) from hoses (1) and (12). Disconnect hose (12) and cover opening with clean rag.
 - c. Remove eighteen capscrews (8) to free aftercooler (3) and gasket (7) from engine. Discard gasket (7).
 - d. Remove poppet drain cock (15) from aftercooler housing (3).
2. REMOVE TURBOCHARGER AFTERCOOLER PIPING.
 - a. Loosen clamps (4) and separate lines (5 and 6) and hoses (9).



- b. Remove elbows (10). Discard preformed packings (11).
- c. Remove capscrew (14) and plate (13).

f. Close petcocks.

- 3. START ENGINE AND CHECK FOR NORMAL OPERATION. (REFER TO TM 5-3810-30610.) CHECK FOR COOLANT LEAKS.
- 4. CONNECT GROUND CABLE AT SHUNT. (REFER TO PAGE 8-109.) END OF TASK

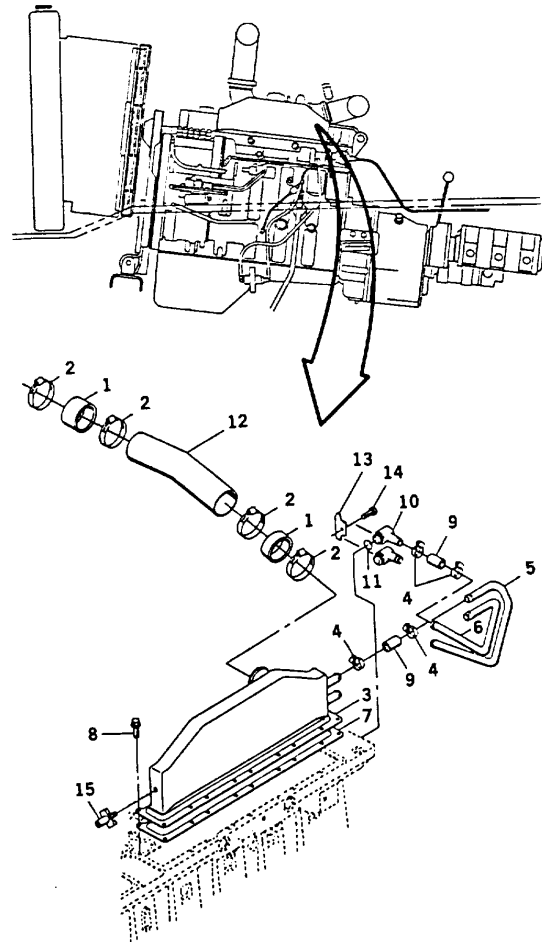
INSTALLATION:

- 1. INSTALL TURBOCHARGER AFTERCOOLER.
 - a. Install poppet drain cock (15) in aftercooler housing (3).
 - b. Align aftercooler (3) and new gasket (7) with cylinder block mounting holes and secure with eighteen capscrews (8). Torque to 18 ft-lbs (24 Nm).
- 2. INSTALL TURBOCHARGER AFTERCOOLER PIPING.
 - a. If removed, install plate (13) with capscrew (14).
 - b. Install elbows (10) with new preformed packings (11) at rear of cylinder block.
 - c. Install hoses (9), lines (5) and (6), and clamps (4) at aftercooler (3) and elbows (10).
 - d. Remove cover from aftercooler (3) opening and install hoses (1) and (12), and clamps (2) to aftercooler (3) and turbocharger.

CAUTION

Open petcocks to vent engine and aftercooler to prevent entrapment of air as the system is filled.

- e. Service radiator. (Refer to TM 5-3810-306-10.)



WATER PUMP INSTALLATION

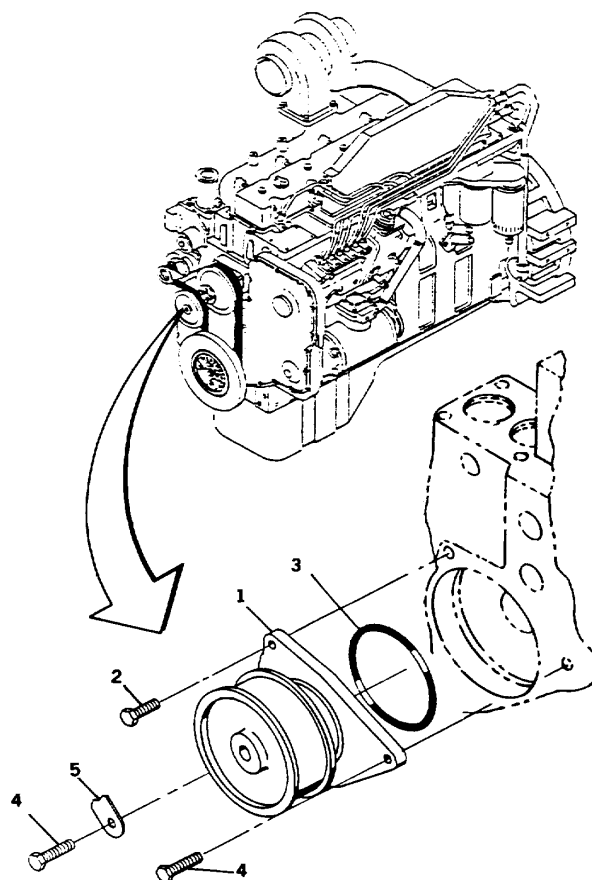
TOOLS: General mechanic's tool kit: automotive (5180-00-177-7033)

SUPPLIES: Pump seal (Item 33, Appendix C)

EQUIPMENT CONDITIONS: Disconnect ground cable at shunt. (Refer to page 8-109.)
 Fan drive belt removed. (Refer to page 7-23.)
 Radiator coolant drained.

REMOVAL:

1. REMOVE WATER PUMP (1).
 - a. Loosen capscrew at bottom of alternator securing link (5).
 - b. Remove three capscrews (2 and 4)securing water pump (1) and alternator link (5). Allow link to fall out of way of water pump.
 - c. Remove water pump (1) and seal (3). Discard seal (3).
 - d. Clean mounting surfaces.



INSTALLATION:

1. INSTALL WATER PUMP (1).
 - a. Install new pump seal (3) on pump (1).
 - b. Position water pump (1) on engine and install two capscrews (2 and 4) hand tight.
 - c. Position alternator link (5) and water pump (1) mounting hole and install capscrew (4).
 - d. Torque alternator link capscrew to 32 ft-lbs (43 Nm) and water. pump capscrews to 18 ft-lbs (24 Nm).
2. INSTALL FAN DRIVE BELT. (REFER TO PAGE 7-23.)
3. SERVICE RADIATOR. (REFER TO TM 5-3810-306-10.)
4. CONNECT GROUND CABLE AT SHUNT (REFER TO PAGE 8-109.)
5. START ENGINE AND CHECK FOR PROPER OPERATION. (REFER TO TM 5-3810-306-10.) CHECK FOR COOLANT LEAKS.

END OF TASK

Section III. FAN ASSEMBLY MAINTENANCE

BELT TENSIONER REPLACEMENT

TOOLS: General mechanic's tool kit: automotive (5180-00-177-7033)

SUPPLIES: None

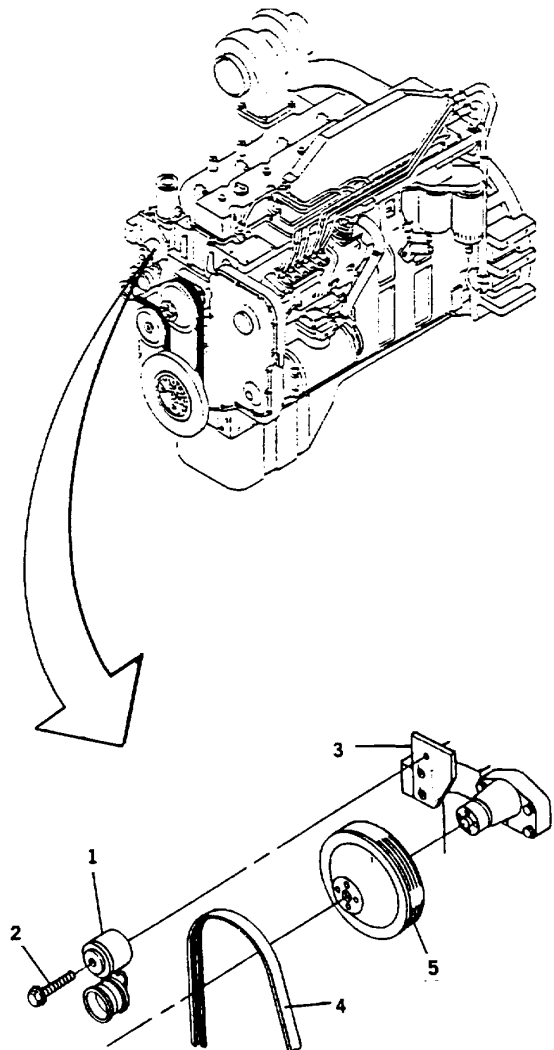
EQUIPMENT CONDITIONS: Left side access door opened.
Disconnect ground cable at shunt. (Refer to page 8-109.)

REMOVAL:

1. REMOVE BELT TENSIONER (1).
 - a. Insert 1/2-inch square drive into belt tensioner (1) slot. Release tension to fan belt (4).
 - b. Pull fan belt (4) over fan pulley (5).
 - c. Remove capscrew (2). Pull belt tensioner (1) from bracket (3).
2. INSPECT PARTS FOR DAMAGE. REPLACE AS REQUIRED.

INSTALLATION:

1. INSTALL BELT TENSIONER (1).
 - a. Loosely install capscrew (2) in belt tensioner (1).
 - b. Align belt tensioner (1) with mounting bracket. Tighten capscrew (2).
 - c. Insert 1/2-inch square drive into belt tensioner (1). Rotate clockwise.
 - d. Put fan belt (4) in fan pulley (5). Release belt tensioner (1).
2. CONNECT GROUND CABLE AT SHUNT. (REFER TO PAGE 8-109.)



END OF TASK

FAN DRIVE BELT REPLACEMENT

TOOLS: General mechanic's tool kit: automotive (5180-00-177-7033)

SUPPLIES: None

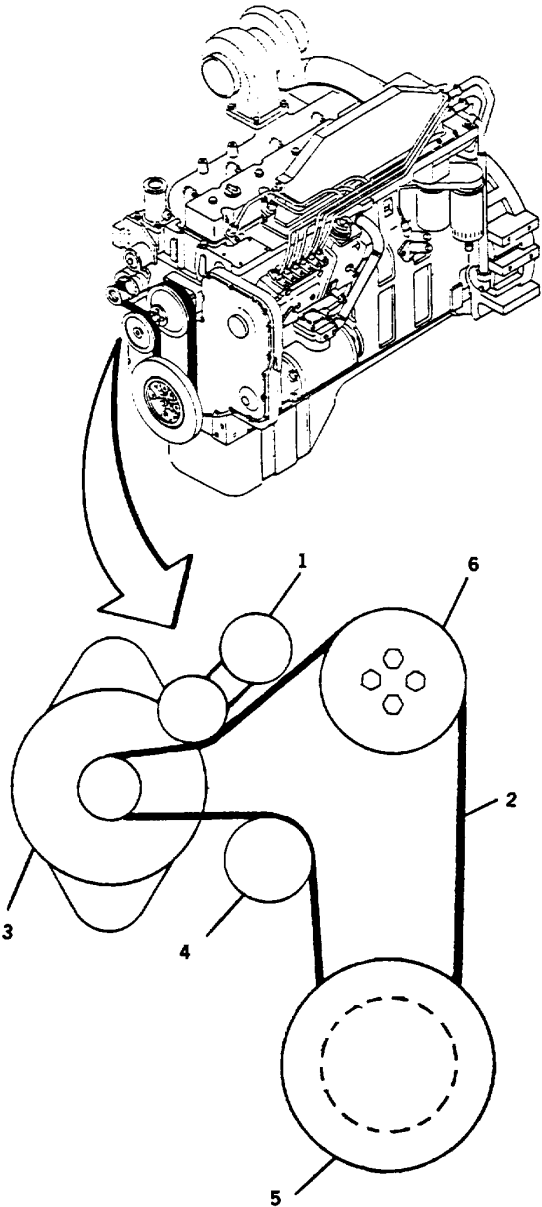
EQUIPMENT CONDITION Left side access door opened
Disconnect ground cable at shunt. (Refer to page 8-109.)

REMOVAL:

1. LOOSEN TENSIONER (1) AND UNWIND FAN BELT (2) FROM ALTERNATOR (3), WATER PUMP (4), CRANK SHAFT (5), AND FAN (6) PULLEYS.
 - a. Place square drive in belt tensioner (1) slot and turn clockwise until fan belt (2) is loose.
 - b. Unwind fan belt (2) from alternator (3), water pump (4), fan drive (6) and crankshaft (5) pulleys.
 - c. Lay fan belt (2) on fan spacer.
2. REMOVE HARDWARE SECURING FAN GUARD TO SHROUD. (REFER TO PAGE 7-9.)
 - a. Separate fan guard and shroud and lift belt (2) through hole in shroud and over fan blades to remove.
3. INSPECT PARTS FOR DAMAGE. REPLACE IF DAMAGED.

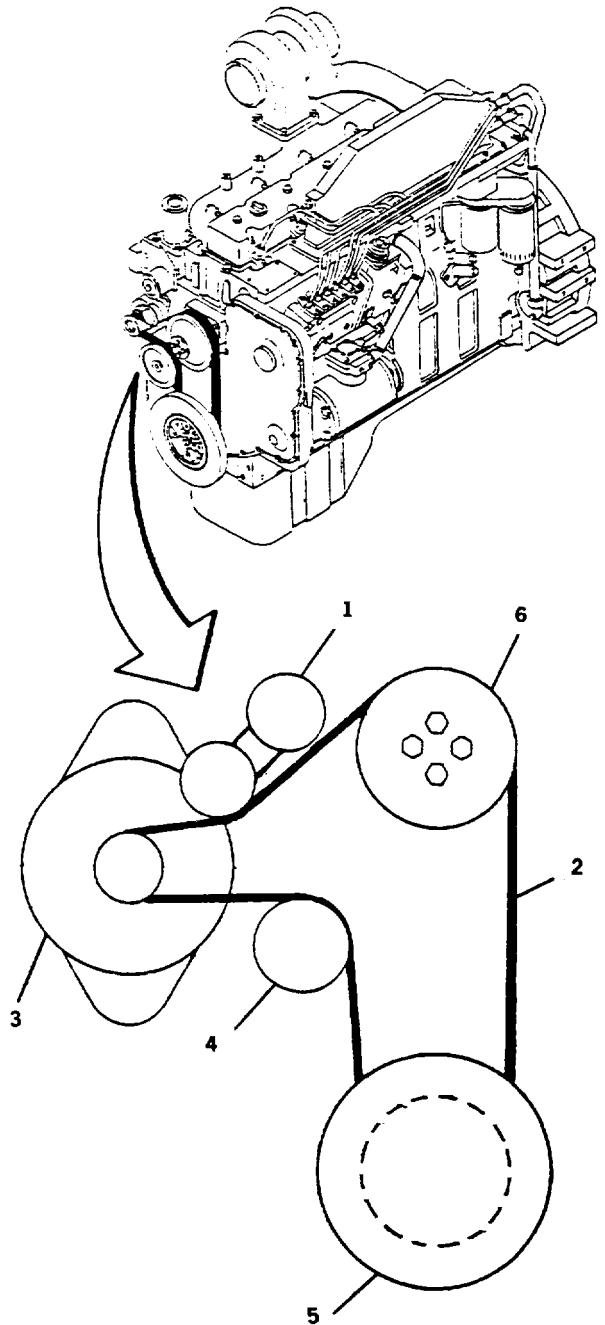
INSTALLATION:

1. INSTALL FAN BELT (2) AND WIND AROUND CRANKSHAFT (5), WATER PUMP (4), ALTERNATOR (3), AND TENSIONER (1) PULLEYS.
 - a. Put fan belt (2) over fan blades.



- b. Reach around fan guard and pull fan belt (2) through fan guard opening.
 - c. Wind fan belt (2) around crank shaft (5), water pump (4), alternator (3) and fan pulley (6).
 - d. Put tension on fan belt (2) using tensioner.
2. INSTALL FAN GUARD. (REFER TO PAGE 7-9.)
 3. CONNECT GROUND CABLE AT SHUNT. (REFER TO PAGE 8-109.)
 4. START ENGINE (REFER TO TM 5-3810306-10.) MAKE SURE FAN BELT DOES NOT SLIP OR SQUEAL.

END OF TASK



CHAPTER 8
ELECTRICAL SYSTEM MAINTENANCE

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Section I. ALTERNATOR MAINTENANCE

ALTERNATOR INSTALLATION

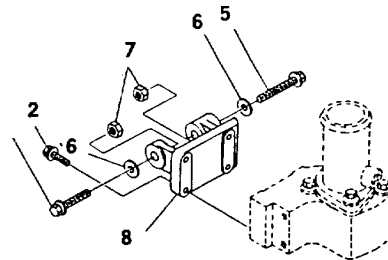
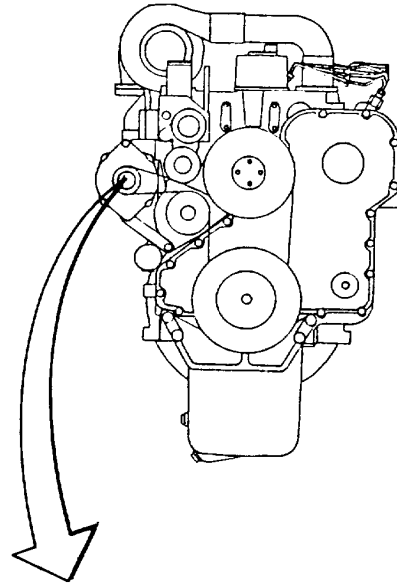
TOOLS: General mechanic's tool kit: automotive (5180-00-177-7033)

SUPPLIES None

EQUIPMENT CONDITIONS: Disconnect ground cable at shunt. (Refer to page 8-109.)

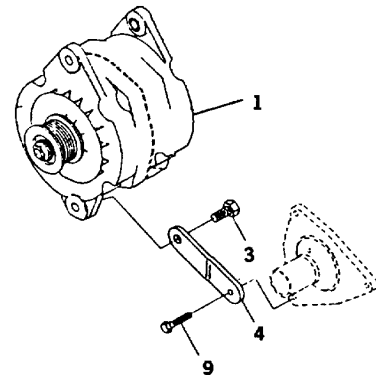
REMOVAL:

1. RELIEVE BELT TENSIONER. (REFER TO PAGE 7-23.)
2. REMOVE FAN DRIVE BELT ON ALTERNATOR PULLEY. (REFER TO PAGE 7-23.)
3. REMOVE ALTERNATOR ASSEMBLY (1).
 - a. Tag and disconnect electrical leads from alternator terminals.
 - b. Remove capscrew (3) from alternator brace (4).
 - c. Support weight of alternator (1).
 - d. Remove two hex bolts (5), washers (6) and hex nuts (7) from alternator bracket (8).
 - e. Remove alternator (1).
 - f. Remove four capscrews (2) and alternator bracket (8) if necessary.
 - g. Remove capscrew (9), and brace (4) if necessary.



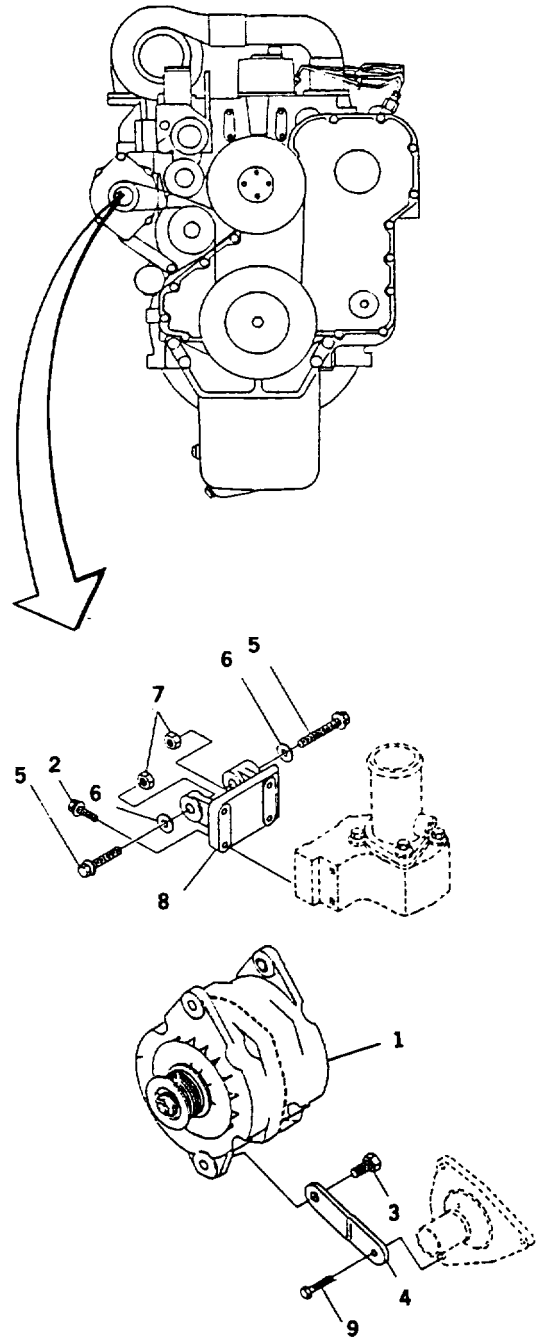
INSTALLATION:

1. INSTALL ALTERNATOR ASSEMBLY (1).
 - a. If removed, install alternator bracket (8) and secure with four capscrews (2).



- b. If removed install brace (4) and install capscrew (9) handtight.
 - c. Align alternator (1) top mounting holes with alternator bracket (8) and secure with two capscrews (5), washers (6) and hex nuts (7).
 - d. Secure alternator (1) to alternator brace (4) with capscrew (3).
 - e. Torque hex bolts (5), to 32 ft-lbs (43 Nm) and capscrew (3) to 18 ft-lbs (24 Nm).
 - f. Tighten capscrew (9).
 - g. Connect tagged electrical leads.
 - h. Install drive belt on alternator pulley. (Refer to page 7-23.)
2. CONNECT GROUND CABLE AT SHUNT. (REFER TO PAGE 8-109.)
 3. START ENGINE. CHECK FOR PROPER OPERATION. (REFER TO TM 5-3810-30610.)

END OF TASK



Section II. STARTER MOTOR MAINTENANCE

STARTER MOTOR INSTALLATION

TOOLS: General mechanic's tool kit: automotive (5180-00-177-7033)

SUPPLIES: Clean rags (Item 1, Appendix C)
Lockwashers (Item 7, Appendix C) (3 Required)
Lockwashers (Item 16, Appendix C) (2 Required)

EQUIPMENT CONDITIONS: Disconnect ground cable at shunt. (Refer to page 8-109.)
Engine oil filter removed. (Refer to page 4-5.)
Turbocharger oil return line removed. (Refer to page 4-6.)

REMOVAL:

1. REMOVE STARTER MOTOR ASSEMBLY (1).
 - a. Tag and disconnect electrical leads on starter motor (1) and solenoid. Discard all lockwashers.
 - b. Support starter motor (1) and remove three capscrews (2), washers (3) and grounding cable (4).

CAUTION

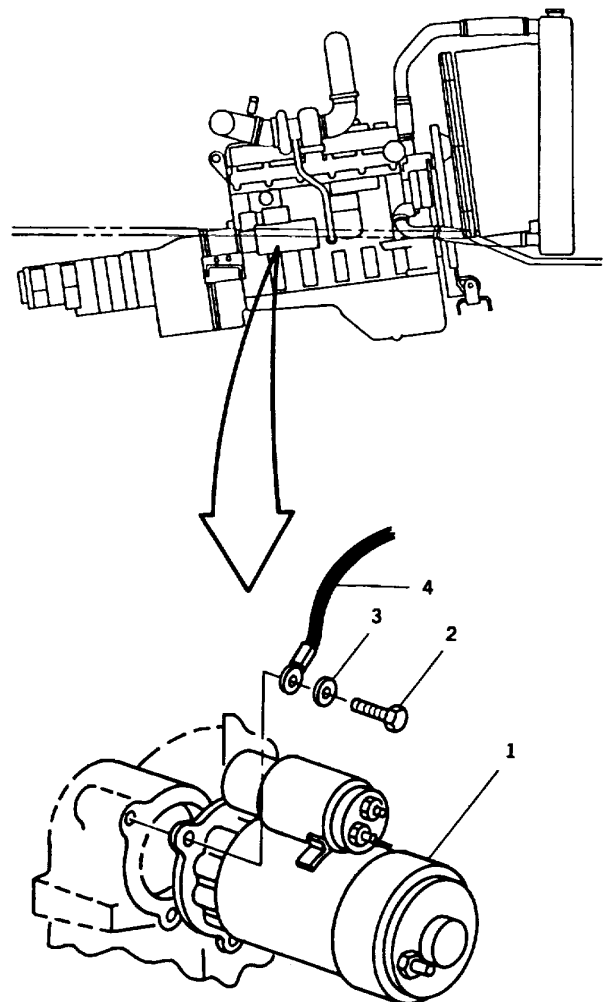
Do not force starter motor out if starter drive is jammed in flywheel.

- c. Carefully remove starter motor (1).

NOTE

If necessary, bar engine slightly to free starter motor (1).

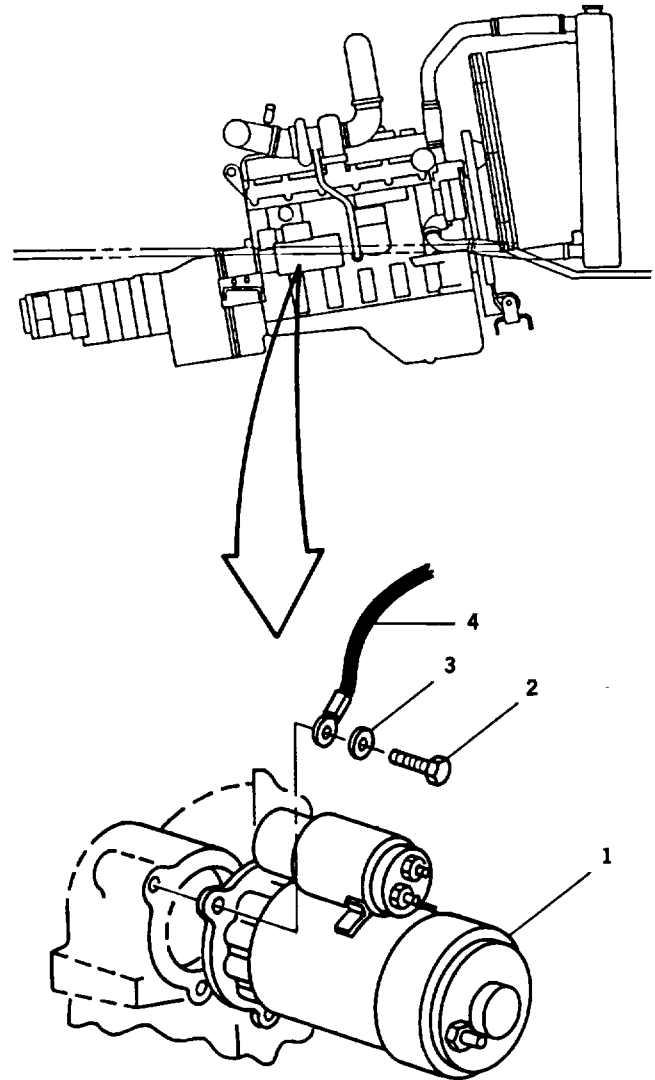
- d. Cover hole in flywheel housing with clean rags.



INSTALLATION:

1. INSTALL STARTER MOTOR ASSEMBLY (1).
 - a. Remove rags from flywheel housing.
 - b. Position starter motor (1) and grounding cable (4) on flywheel housing. Secure with three capscrews (2) and new washers (3). Torque capscrews 72 to 78 ft-lbs (96 to 104 Nm).
 - c. Remove tags and connect electrical leads to starter motor (1). Use new lockwashers where required.
2. INSTALL ENGINE OIL FILTER. (REFER TO PAGE 4-5.)
3. INSTALL TURBOCHARGER OIL RETURN LINE. (REFER TO PAGE 4-6.)
4. CONNECT GROUND CABLE AT SHUNT.
(REFER TO PAGE 8-109.)
5. START ENGINE. CHECK FOR PROPER OPERATION OF STARTER MOTOR. (REFER TO TM 5-3810-306-10.)

END OF TASK



Section III. INSTRUMENT PANEL MAINTENANCE

BLACKOUT LIGHT (MILITARY) SWITCH REPLACEMENT

TOOLS: General mechanic's tool kit: automotive (5180-00-177-7033)

SUPPLIES: None

EQUIPMENT CONDITIONS: Disconnect ground cable at shunt. (Refer to page 8-109.)
Left front control panel removed. (Refer to page 8-11.)

REMOVAL:

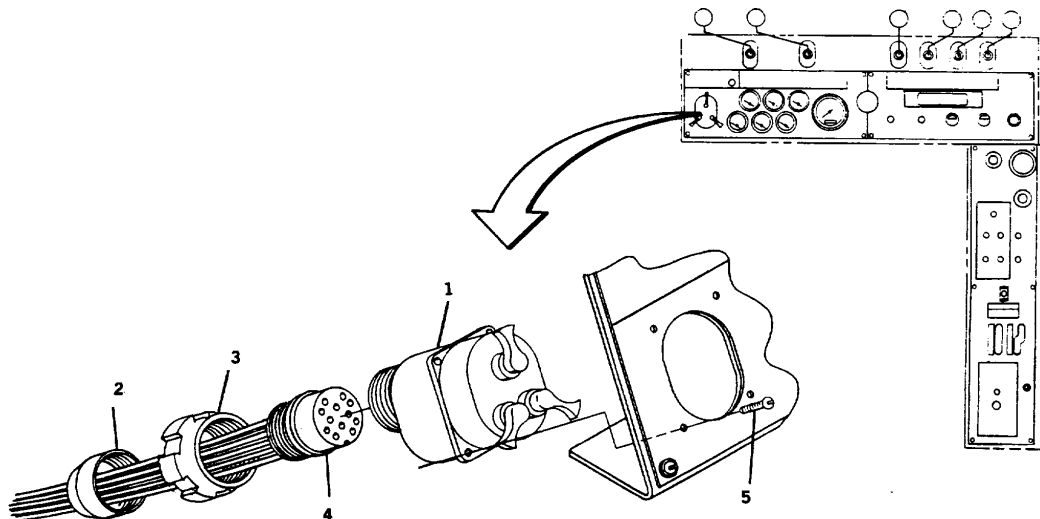
1. DISCONNECT ELECTRICAL CONNECTOR (4).
 - a. Tag electrical connector. Loosen locknut (2) and connector nut (3). Slowly pull off electrical connector (4).
 - b. Remove four screws (5) from b. Remove four screws (5) from control panel securing switch. Pull switch (1) through panel.
2. INSPECT PARTS FOR DAMAGE. REPLACE AS REQUIRED.

- b. Install four screws (5) and secure switch (1) in control panel.
 - c. Push electrical connector (4) on back of switch (1).
 - d. Tighten connector nut (3) and secure with locknut (2).
2. INSTALL LEFT FRONT CONTROL PANEL. (REFER TO PAGE 8-11.)
 3. CONNECT GROUND CABLE AT SHUNT. (REFER TO PAGE 8-109.)
 4. TURN SWITCH LEVER(S) TO TEST LIGHT OPERATION. (REFER TO TM 5-3810-306-10.)

INSTALLATION:

1. INSTALL SWITCH (1) AND CONNECT ELECTRICAL CONNECTOR (4).
 - a. Put switch (1) through panel.

END OF TASK



DUAL AIR PRESSURE GAUGE REPLACEMENT

TOOLS: General mechanic's tool kit: automotive (5180-00-177-7033)

SUPPLIES: None

EQUIPMENT CONDITIONS: Disconnect ground cable at shunt. (Refer to page 8-109.)
 Left front control panel removed. (Refer to page 8-11.)
 Air system purged. (Refer to page 11-2.)

REMOVAL:

1. DISCONNECT TWO AIR LINES (1), AND LIGHT SOCKET (5).

- a. Pull socket (5) from gauge (3).
- b. Remove filter cap (4) and discard if damaged.
- c. Tag and disconnect two air lines (1). Remove fittings (2).

2. INSPECT BULB (6) FOR DAMAGE. IF BULB (6) IS DAMAGED, REPLACE BULB (6).

3. REMOVE GAUGE (3).

- a. Remove two nuts (7) and tooth washers (8). Pull off mounting clamp (9).

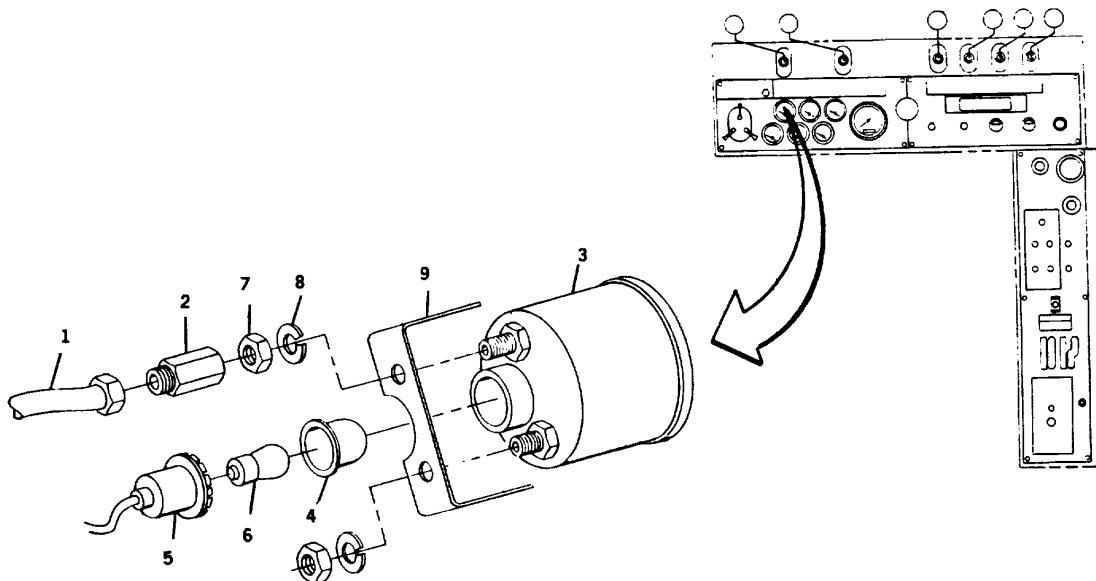
b. Push gauge (3) through panel.

4. INSPECT ALL OTHER PARTS FOR DAMAGE. REPLACE AS REQUIRED.

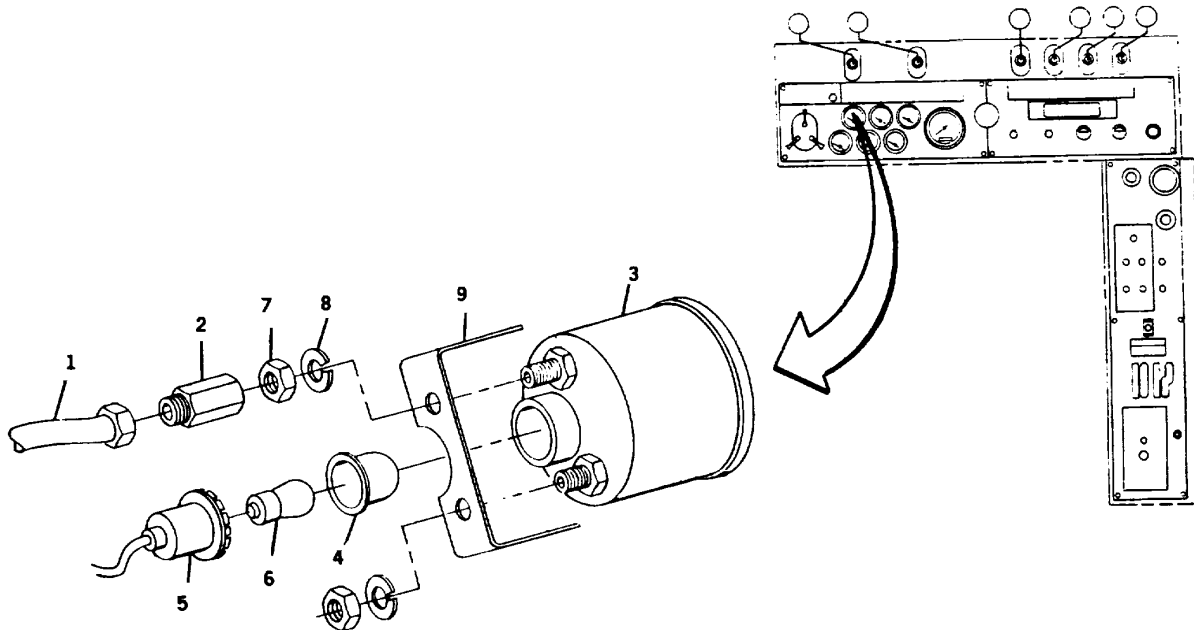
INSTALLATION:

1. INSTALL GAUGE (3)

- a. Put gauge (3) through panel.
- b. Install mounting clamp (9), two nuts (7) and tooth washers (8). Tighten nuts (7).



2. INSTALL FITTINGS (2).
 3. CONNECT TWO AIR LINES (1).
 - a. Connect tagged air lines (1) to gauge (3) as marked.
 - b. Tighten fittings.
 4. INSTALL BULB (6).
 - a. Put bulb (6) in socket (5). Slide filter cap (4) over bulb (6).
 - b. Install socket (5) in back of gauge (3).
 5. INSTALL LEFT FRONT CONTROL PANEL. (REFER TO PAGE 8-11.)
 6. CONNECT GROUND CABLE AT SHUNT. (REFER TO PAGE 8-109.)
 7. START ENGINE (REFER TO TM 5-3810306-10.)
 8. MAKE SURE ARROWS ON GAUGE (3) RISE UNTIL A PRESSURE READING OF 110 PSI IS REACHED.
- END OF TASK



LED ALERT MODULE REPLACEMENT

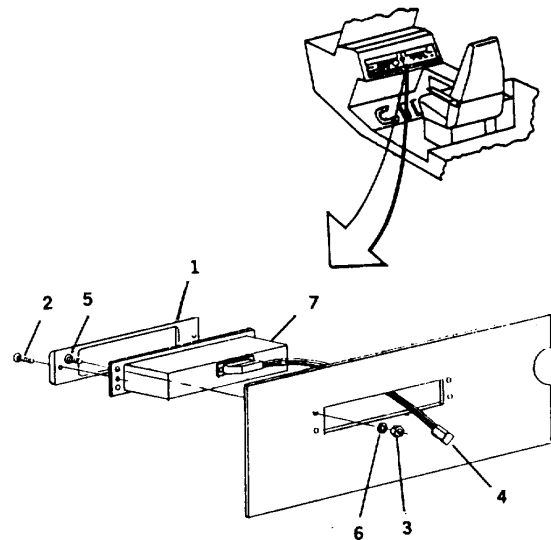
TOOLS: General mechanic's tool kit: automotive (5180-00-177-7033)

SUPPLIES: Lockwashers (Item 7, Appendix C)(4 required)

EQUIPMENT CONDITION: Disconnect ground cable at shunt. (Refer to page 8-98.)
Right front control panel removed. (Refer to page 8-11.)

REMOVAL:

1. REMOVE COVER (1) AND DISCONNECT ELECTRICAL CONNECTOR (4).
 - a. Remove two screws (2) on module cover (1).
 - b. Disconnect harness connector (4).
2. REMOVE LED ALERT MODULE (7).
 - a. Remove four screws (5), lockwashers (6), and nuts (3). Discard lockwashers (6).
 - b. Lift out module (7).
3. INSPECT WIRING FOR DAMAGED INSULATION OR TERMINALS. REPLACE IF DAMAGED.



INSTALLATION:

1. INSTALL LED ALERT MODULE (7).
 - a. Align LED alert module (7) with control panel slot.
 - b. Install four screws (5), new lockwashers (6), and nuts (3).
 - c. Install module cover (1) with two screws (2).

2. CONNECT ELECTRICAL CONNECTOR (4).
3. INSTALL RIGHT FRONT CONTROL PANEL. (REFER TO PAGE 8-11.)
4. CONNECT GROUND CABLE AT SHUNT. (REFER TO PAGE 8-109.)
5. START ENGINE (REFER TO TM 5-3810306-10.)
6. MAKE SURE LED ALERT MODULE (7) INDICATORS LIGHT FOR SEVERAL SECONDS WHEN ENGINE STARTS

END OF TASK

FRONT CONTROL PANEL

TOOLS: General mechanic's tool kit: automotive (5180-00-177-7033)

SUPPLIES: None

EQUIPMENT CONDITION: Disconnect ground cable at shunt. (Refer to page 8-109.)

REMOVAL:

NOTE

Use this task to remove and install left or right front control panel (1). Right front console panel (1) is shown.

1. REMOVE RIGHT FRONT CONSOLE PANEL (1).
 - a. Remove four screws (2) and grommets (3).
 - b. Tag and disconnect electrical plugs to control panel (4).

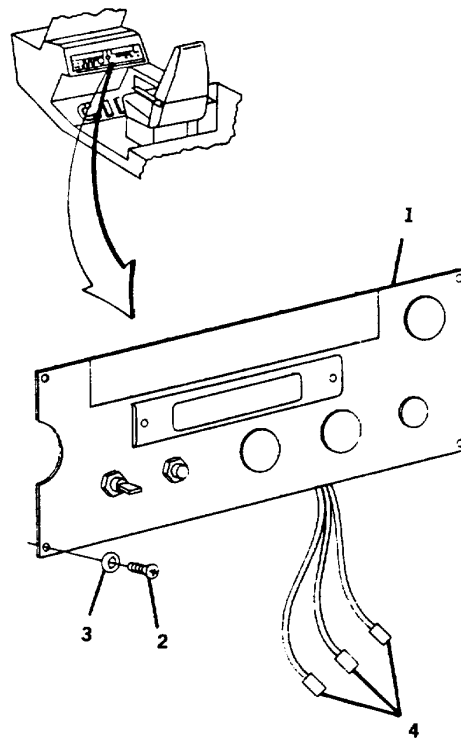
NOTE

On left control panel it will be necessary to remove two air lines to air pressure gauge.

- c. Lift out control panel (1).
2. INSPECT PARTS FOR DAMAGE. REPLACE AS REQUIRED.

INSTALLATION:

1. INSTALL RIGHT FRONT CONSOLE PANEL (1).
 - a. Connect tagged electrical plugs END OF TASK (4).



- b. Align control panel (1) with right front cab console.
 - c. Install four screws (2) and grommets (3).

2. CONNECT GROUND CABLE AT SHUNT. REFER TO PAGE 8-109.)

END OF TASK

LEFT CONSOLE HARNESS INSTALLATION

TOOLS: General mechanic's tool kit: automotive (5180-00-177-7033)

SUPPLIES: None

EQUIPMENT CONDITIONS Disconnect ground cable at shunt. (Refer to page 8-109.)
 Left front control panel removed. (Refer to page 8-11.)
 Front side access panel removed. (Refer to page 8-21.)

REMOVAL:

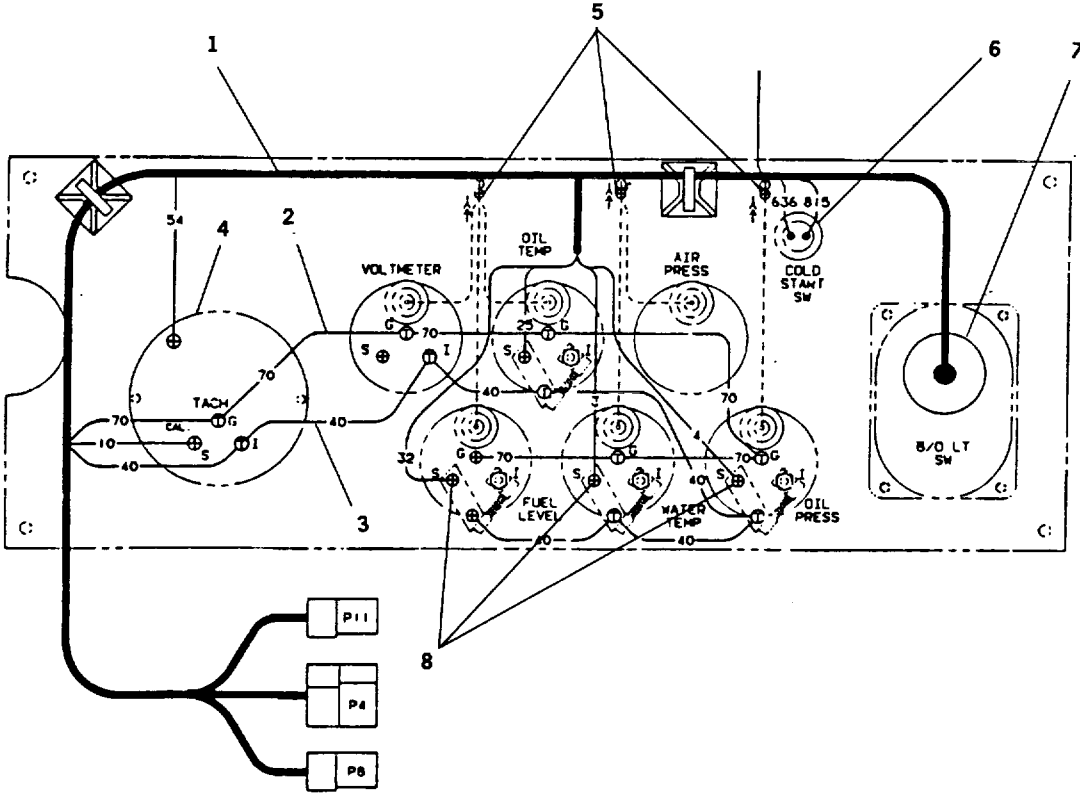
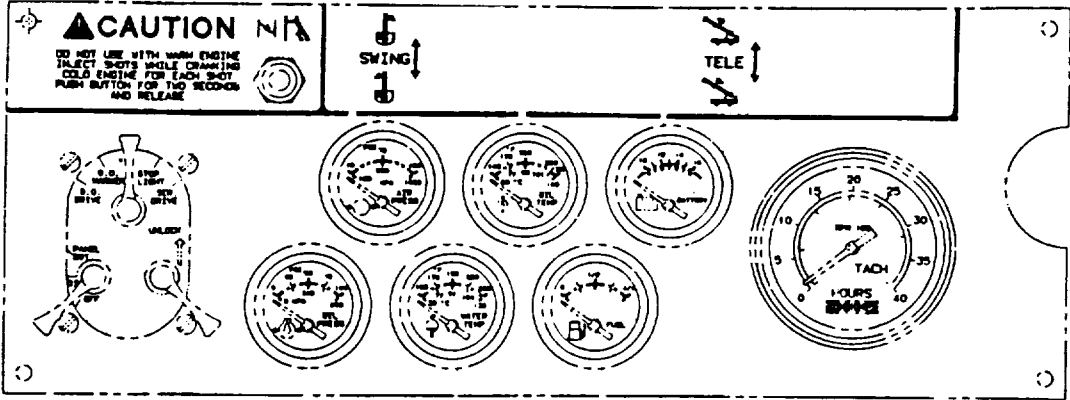
1. REMOVE LEFT CONSOLE HARNESS (1).
 - a. Tag and disconnect ground wire 70 (2) from each gauge.
 - b. Tag and disconnect wire 40 (3) from each gauge.
 - c. Tag and disconnect two electrical connectors from tachometer (4).
 - d. Tag and disconnect three pin/receptacles (5) carrying wires to gauge lights.
 - e. Tag and disconnect two electrical connectors to cold start switch (6).
 - f. Unscrew locknut and remove electrical connector to blackout light switch (7).
 - g. Tag and disconnect wires 32, 25, 3 and 4 to gauges (8).
2. REMOVE LEFT CONSOLE HARNESS (1).

INSTALLATION

1. INSTALL LEFT CONSOLE HARNESS (1).
 - a. Connect tagged wires 32, 25, 3 and 4 to gauges (8).

- b. Connect electrical connector to blackout light switch (7) and secure with locknut.
- c. Connect tagged wires to cold start switch (6).
- d. Connect three tagged electrical connectors (5) to gauge lights.
- e. Connect tagged "T-Tags" on wire 70 (2) to each gauge.
- f. Connect tagged "T-Tags" on wire 40 (3) to each gauge.
- g. Connect two tagged electrical connectors on wires 54 and 10 to tachometer (4).
2. INSTALL LEFT FRONT CONTROL PANEL.REFER TO PAGE 8-11.)
3. INSTALL FRONT SIDE ACCESS PANEL. (REFER TO PAGE 8-21.)
4. CONNECT GROUND CABLE AT SHUNT. (REFER TO PAGE 8-109.)
5. START ENGINE. CHECK LEFT CONSOLE COMPONENTS FOR PROPER OPERATION. (REFER TO TM 5-3810-306-10.)

END OF TASK



RIGHT CONSOLE HARNESS INSTALLATION

TOOLS: General mechanic's tool kit: automotive (5180-00-177-7033)

SUPPLIES: None

EQUIPMENT CONDITIONS: Disconnect ground cable at shunt. (Refer to page 8-109.)
 Front right control panel removed. (Refer to page 8-11.)
 Front side access panel removed. (Refer to page 8-21.)

REMOVAL:

1. REMOVE RIGHT CONSOLE HARNESS (2).

- a. Tag and disconnect two electrical connectors to warning buzzer (3).
- b. Tag and disconnect three electrical connectors to skylight wiper switch (4).
- c. Tag and disconnect four electrical connectors to front wiper switch (5).
- d. Tag and disconnect two electrical connectors to engine start button (6).
- e. Tag and disconnect two electrical connectors to ignition switch (7).
- f. Disconnect terminal plug to AV warning harness (1).

2. REMOVE RIGHT CONSOLE HARNESS (2).

INSTALLATION:

1. INSTALL RIGHT CONSOLE HARNESS (2).

- a. Connect plug to AV warning harness (1).

- b. Connect tagged electrical connectors to ignition switch (7).
- c. Connect tagged electrical connectors to engine start button (6).
- d. Connect tagged electrical connector to front wiper switch (5).
- e. Connect tagged electrical connectors to skylight wiper switch (4).
- f. Connect tagged electrical connectors to warning buzzer.

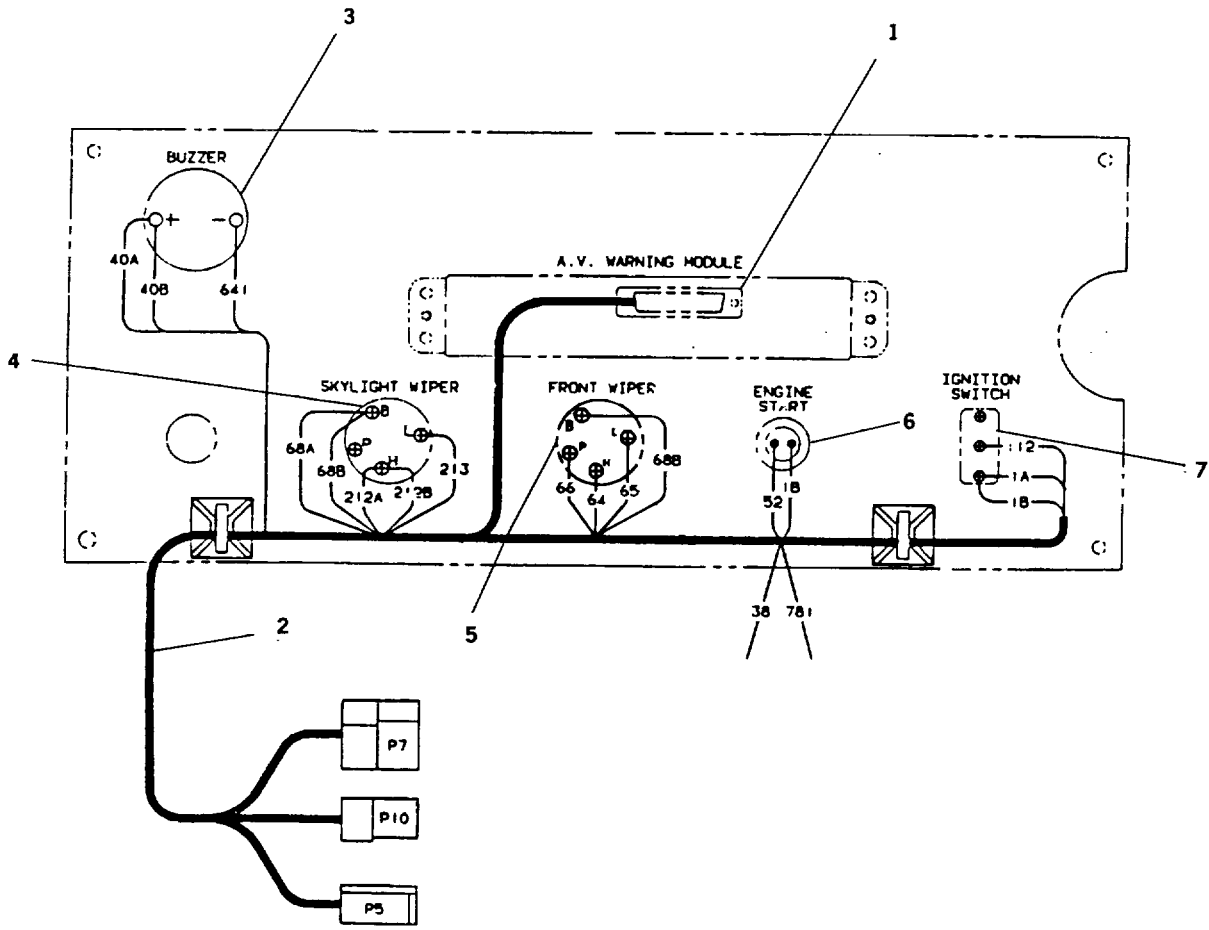
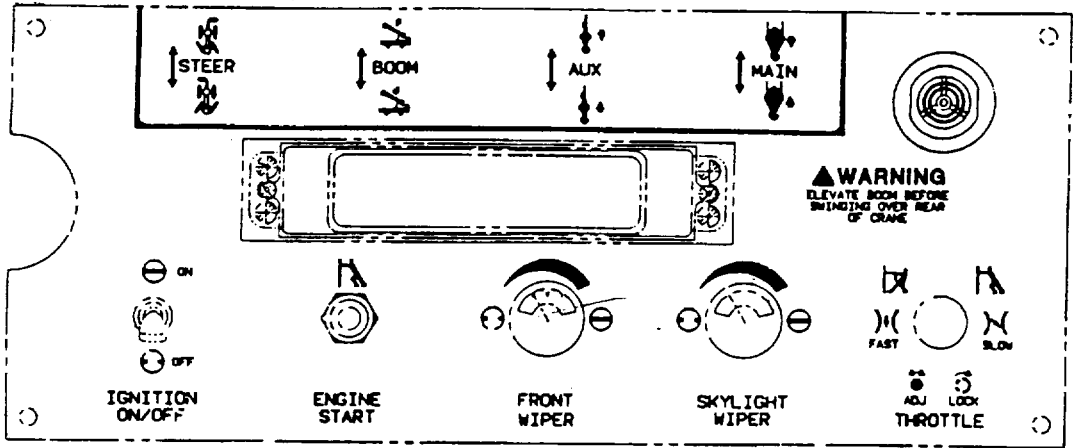
2. INSTALL RIGHT FRONT CONTROL PANEL. (REFER TO PAGE 8-11.)

3. INSTALL FRONT SIDE ACCESS PANEL. (REFER TO PAGE 8-21.)

4. CONNECT GROUND CABLE AT SHUNT. (REFER TO PAGE 8-109.)

5. START ENGINE. CHECK RIGHT CONSOLE COMPONENTS FOR PROPER OPERATION. (REFER TO TM 5-3810-306-10.)

END OF TASK



AV HARNESS INSTALLATION

TOOLS: General mechanic's tool kit: automotive (5180-00-177-7033)

SUPPLIES None

EQUIPMENT CONDITIONS: Disconnect ground cable at shunt. (Refer to page 8-109.)
Right front control panel removed. (Refer to page 8-11.)

REMOVAL:

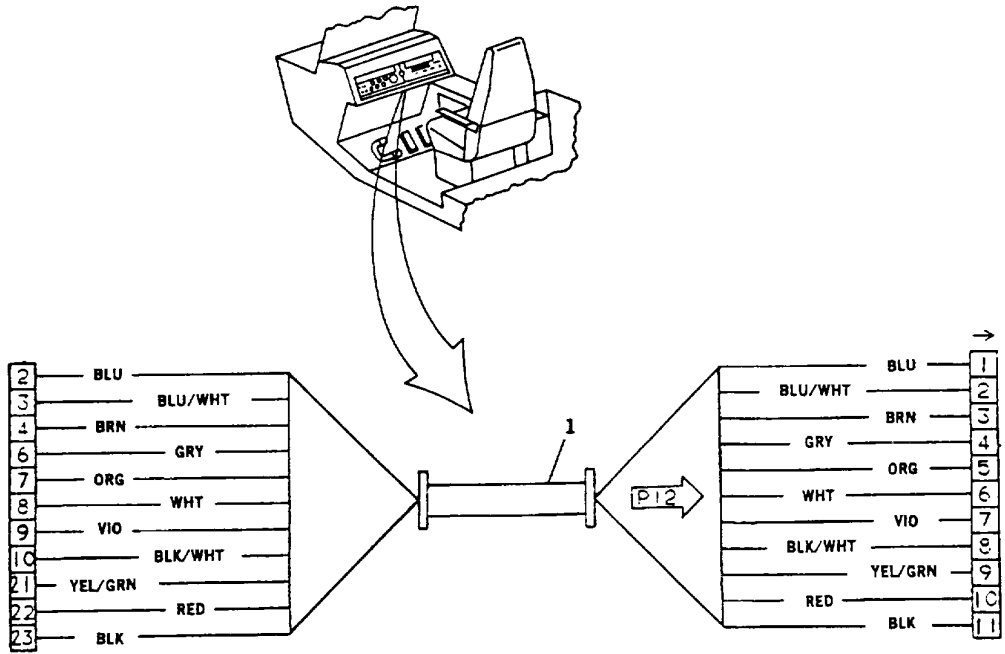
1. REMOVE AV HARNESS (1).
 - a. Tag and disconnect AV harness (1) at LED alert module.
 - b. Tag and disconnect AV harness at right console harness.
 - c. Remove AV harness (1).
2. INSPECT AV HARNESS (1) FOR DAMAGED WIRE AND CONNECTORS. REPAIR OR REPLACE AS NEEDED

- a. Connect AV harness (1) at right console harness.
 - b. Connect AV harness (1) to LED alert module.
2. INSTALL RIGHT FRONT CONSOLE. (REFER TO PAGE 8-11.)
 3. CONNECT GROUND CABLE AT SHUNT. (REFER TO PAGE 8-109.)
 4. START ENGINE AND CHECK OPERATION OF LED ALERT MODULE. (REFER TO TM 5-3810-306-10.)

INSTALLATION:

1. INSTALL AV HARNESS (1).

END OF TASK



GAUGE REPLACEMENT

TOOLS: General mechanic's tool kit: automotive (5180-00-177-7033)

SUPPLIES: None

EQUIPMENT CONDITION: Disconnect ground cable at shunt. (Refer to page 8-109.)
Left front control panel removed. (Refer to page 8-11.)

REMOVAL:

NOTE

Use this task to remove and install control panel gauges. Water temperature gauge (1) with 24 V adapter (2) is shown.

NOTE

24 V adapter is not used on voltmeter.

1. DISCONNECT ELECTRICAL WIRES (3) AND REMOVE 24 V ADAPTER (2).

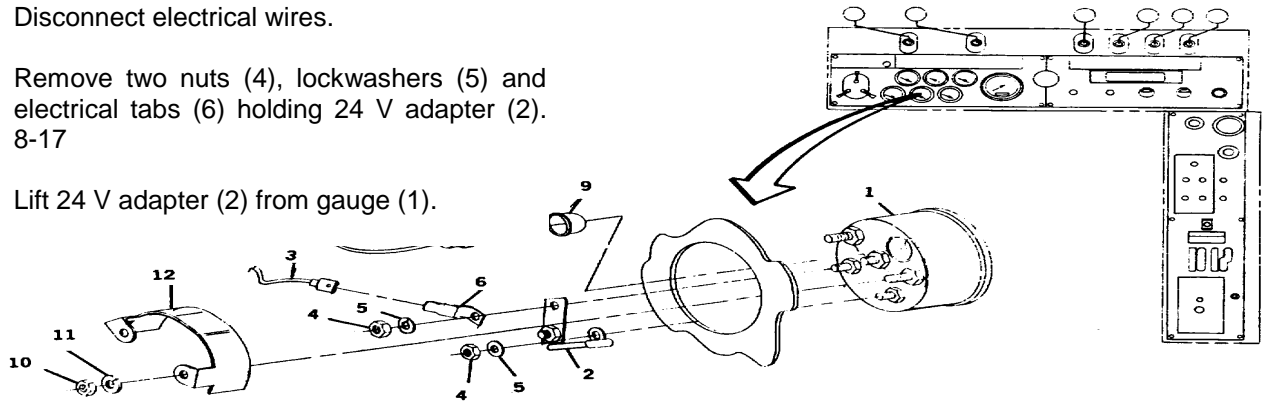
- a. Tag electrical wires.
- b. Disconnect electrical wires.
- c. Remove two nuts (4), lockwashers (5) and electrical tabs (6) holding 24 V adapter (2). 8-17
- d. Lift 24 V adapter (2) from gauge (1).

2. DISCONNECT BULB (7) FROM SOCKET (8).

- a. Pull socket (8) from gauge (1).
- b. Remove filter cap (9) and discard if damaged.
- c. Inspect bulb (7) for damage. If damaged, replace bulb (7).

3. REMOVE GAUGE (1).

- a. Remove two nuts (10) and lockwashers (11) securing mounting clamp 12)



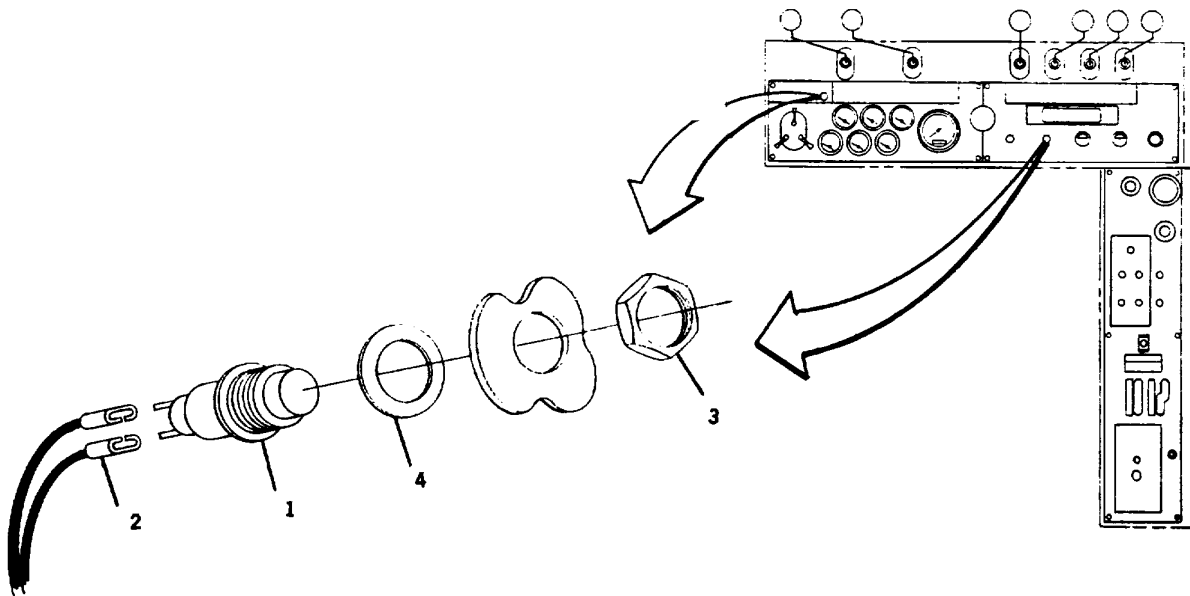
- b. Hold gauge (1) in place. Lift off mounting clamp (12).
 - . Push gauge (1) through panel.
4. INSPECT PARTS FOR DAMAGE. REPLACE PARTS AS REQUIRED.

INSTALLATION:

1. INSTALL GAUGE (1) AND CONNECT SOCKET (8)
- a. Put gauge (1) through panel.
 - b. Install mounting clamp (12) and secure with two lockwashers (11) and nuts (10).
 - c. Put bulb (7) in socket (8). Slide filter cap (9) over bulb (7)..
 - d. Install socket (8) in back of gauge (1).

2. INSTALL 24 V ADAPTER (2) AND CONNECT ELECTRICAL WIRES (3).
- a. Install 24 V adapter (2), electrical tabs (6), lockwashers (5) and nuts (4). Tighten nuts (4).
 - b. Remove tags and connect electrical wires.
3. INSTALL LEFT FRONT CONTROL PANEL. (REFER TO PAGE 8-11.)
4. CONNECT GROUND CABLE AT SHUNT. (REFER TO PAGE 8-109.)
5. START ENGINE. MAKE SURE GAUGE (1) SHOWS PROPER READINGS. (REFER TO TM 5-3810-306-10)

END OF TASK



PUSH BUTTON SWITCH REPLACEMENT

TOOLS: General mechanic's tool kit: automotive (5180-00-177-7033)

SUPPLIES: None

EQUIPMENT CONDITIONS: Disconnect ground cable at shunt. (Refer to page 8-109.)
Front control panel removed. (Refer to page 8-11.)

REMOVAL:

1. REMOVE PUSH BUTTON SWITCH (1).
 - a. Tag and disconnect electrical wires (2).
 - b. Unscrew nut (3). Remove switch (1) and washer (4).
2. INSPECT PARTS FOR DAMAGE. REPLACE AS REQUIRED

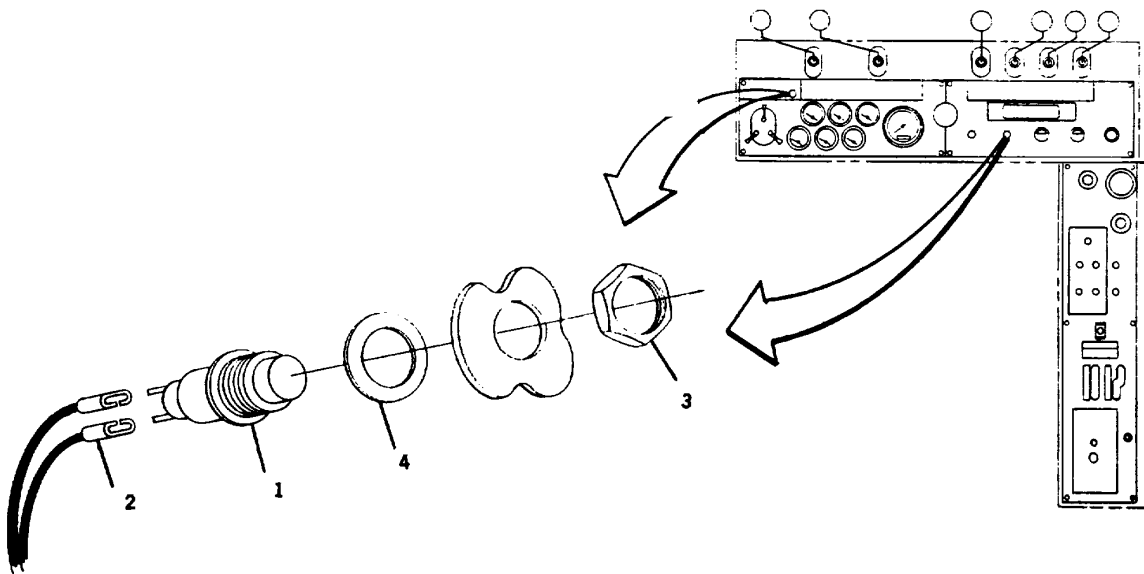
b. Remove tags. Connect electrical wires (2).

2. INSTALL FRONT CONTROL PANEL. (REFER TO PAGE 8-11.)
3. CONNECT GROUND CABLE AT SHUNT. (REFER TO PAGE 8-109.)
4. PRESS PUSH BUTTON (1) TO TEST. REFER TO TM 5-3810-306-10.)

END OF TASK

INSTALLATION:

1. INSTALL PUSH BUTTON SWITCH (1).
 - a. Insert push button switch (1) with washer (4) through panel. TM 5-3810-306-20 Secure with nut (3).



ROTARY SWITCH REPLACEMENT

TOOLS: General mechanic's tool kit: automotive (5180-00-177-7033)

SUPPLIES: None

EQUIPMENT CONDITIONS: Disconnect ground cable at shunt. (Refer to page 8-109.)
Right front control panel removed. (Refer to page 8-11.)

REMOVAL:**NOTE**

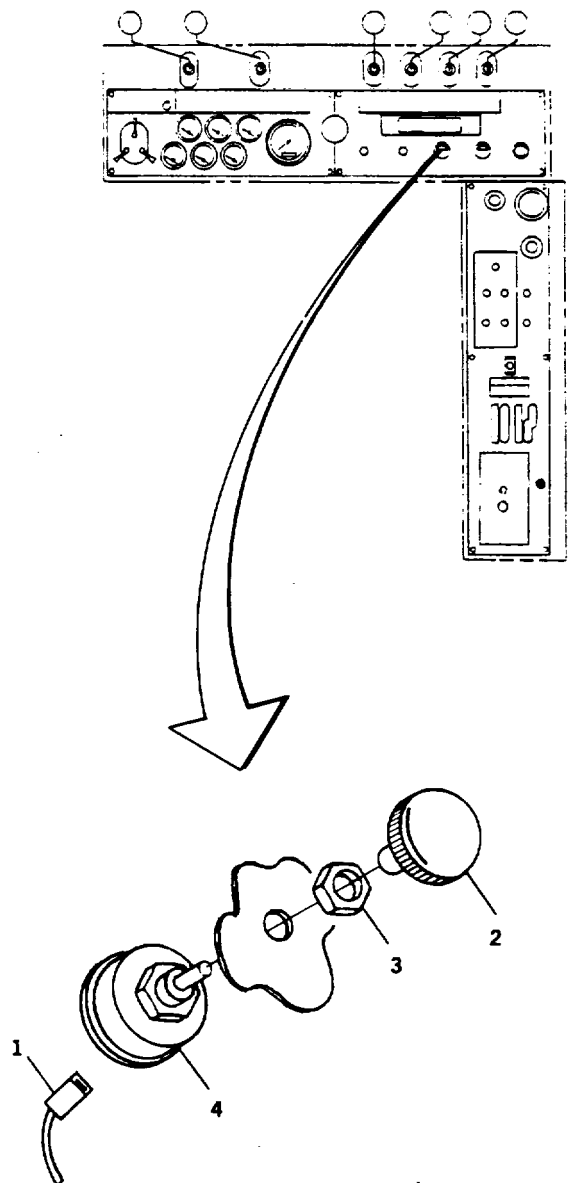
Use this task to remove and install skylight wiper and front wiper switches (4). Front wiper rotary switch (4) is shown.

1. REMOVE ROTARY SWITCH (4).
 - a. Tag and disconnect electrical wires (1).
 - b. Pull off knob (2).
 - c. Remove nut (3). Remove switch from panel.

INSTALLATION:

1. INSTALL ROTARY SWITCH (4).
 - a. Put switch (4) through panel.
 - b. Install nut (3) and knob (2).
 - c. Remove tags. Connect electrical wires (1) to switch (4).
2. INSTALL RIGHT FRONT CONTROL PANEL. (REFER TO PAGE 8-11.)
3. CONNECT GROUND CABLE AT SHUNT. (REFER TO PAGE 8-109.)
4. TURN KNOB (2) TO TEST SWITCH (4). (REFER TO TM 5-3810-306-10.)

END OF TASK



SIDE CONSOLE AND ACCESS PANEL REPLACEMENT

TOOLS: General mechanic's tool kit: automotive (5180-00-177-7033)

SUPPLIES: Lockwashers (Item 2, Appendix C) (5 required)

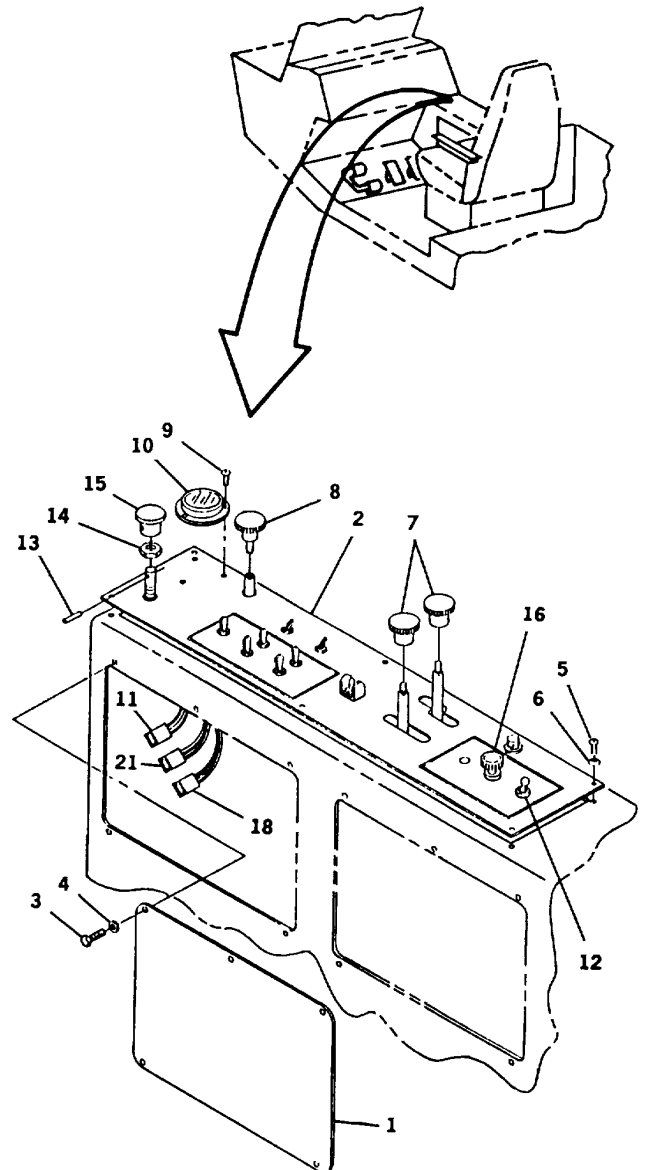
EQUIPMENT CONDITIONS: Disconnect ground cable at shunt. (Refer to page 8-109.)
Operator's seat and pedestal removed. (Refer to page 15-27.)

REMOVAL:

NOTE

Use this task to remove and install side console (2); front and rear side console access panels. Side console (2) and front access panel (1) is shown.

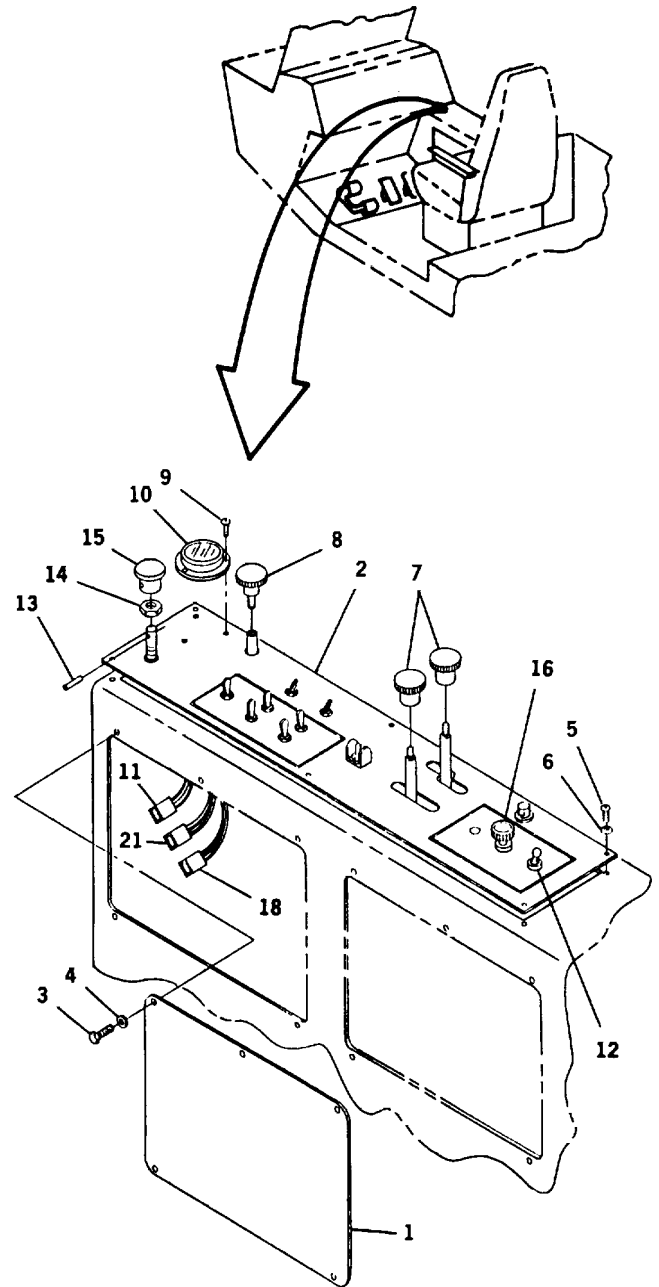
1. REMOVE ACCESS PANEL (1).
 - a. Hold access panel (1) in place.
 - b. Remove five capscrews (3) and lockwashers (4). Discard lockwashers (4).
 - c. Remove access panel (1).
2. REMOVE SIDE CONSOLE PANEL (2).
 - a. Remove six screws (5) and grommets (6).
 - b. Unscrew two shifter knobs (7) and one swing brake knob (8).
 - c. Remove three screws (9) and bubble level (10).
 - d. Remove roll pin (13) from park brake control knob (15). Remove nut (14) and park brake control valve from panel.
 - e. Disconnect electrical connectors to heater temperature control switch (16)



- f. Remove control switch knob and nut (16).
 - g. Remove fan high/low switch (12).
 - h. Tag and disconnect two electrical connectors, P3 (18), P6 (11) and wire no. 21 (21).
 - i. Lift out side console panel (2).
3. INSPECT PARTS FOR DAMAGE. REPLACE AS REQUIRED.

INSTALLATION:

1. INSTALL SIDE CONSOLE PANEL (2).
- a. Place panel over shifter arms.
 - b. Install park brake control valve in panel and secure with nut (14). Install and secure knob (15) with roll pin (13).
 - c. Install fan high/low switch (12).
 - d. Install six screws (5) and grommets (6), to secure console panel.
 - e. Install swing brake knob (8) and two shifter knobs (7).
 - f. Position bubble level (10) and secure with three screws (9).
 - g. Connect electrical connectors, P3 and P6 and wire no. 21.
 - h. Connect heater temperature control switch (16).
2. INSTALL ACCESS PANEL (1).
- a. Hold access panel (1) in place
 - b. Align access panel (1) with side of cab console.
 - c. Install five capscrews (3) and new lockwashers (4).



3. INSTALL OPERATOR'S SEAT AND PEDESTAL. (REFER TO PAGE 15-27.)
4. CONNECT GROUND CABLE AT SHUNT. (REFER TO PAGE 8-109.)

END OF TASK

SIDE CONSOLE PANEL LIGHT (BULB) REPLACEMENT

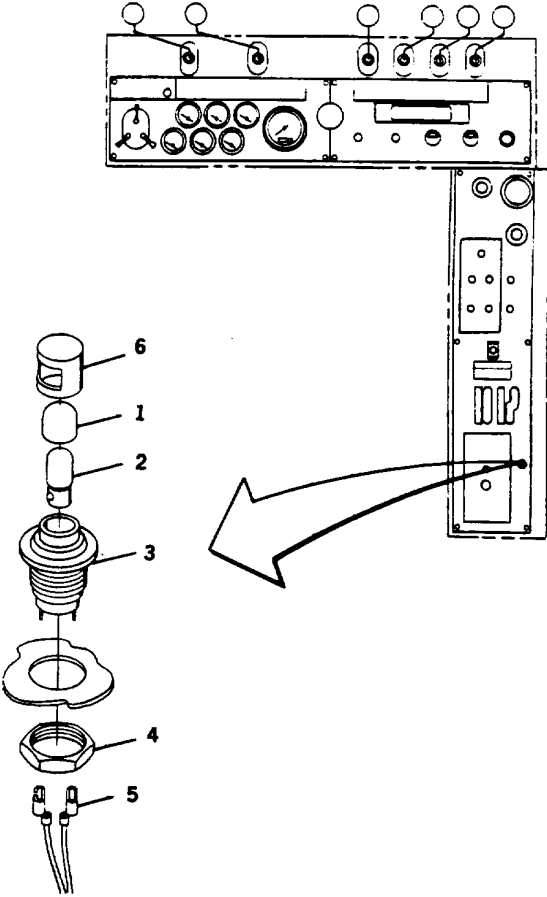
TOOLS: General mechanic's tool kit: automotive (5180-00-177-7033)

SUPPLIES: None

EQUIPMENT CONDITIONS: Disconnect ground cable at shunt. (Refer to page 8-109.)
Rear access panel removed. (Refer to page 8-21.)

REMOVAL:

1. REMOVE PANEL LIGHT (3).
 - a. Tag and disconnect electrical wires (5).
 - b. Remove nut (4).
 - c. Lift light (3) from panel.
 - d. Unscrew and remove cap (6).
 - e. Remove filter cap (1) from bulb.
2. INSPECT PARTS FOR DAMAGE. REPLACE AS REQUIRED. IF BULB (2) IS BLOWN, PUSH DOWN AND TURN BULB (2). LIFT BULB (2) FROM SOCKET AND DISCARD.



INSTALLATION:

1. INSTALL PANEL LIGHT (3).
 - a. Put bulb (2) in socket. Push in and turn.
 - b. Slide filter cap (1) over bulb (2).
 - c. Put light (3) through panel. d. Install nut (4).
 - d. Remove tags. Connect electrical wires (5).
2. INSTALL REAR ACCESS PANEL. REFER TO PAGE 8-21.)

3. CONNECT GROUND CABLE AT SHUNT. (REFER TO PAGE 8-109.)
4. TURN ON FLOOD LIGHTS TO TEST OPERATION. (REFER TO TM 5-3810-306-10.)

END OF TASK

SIDE CONSOLE HARNESS INSTALLATION

TOOLS: General mechanic's tool kit: automotive (5180-00-177-7033)

SUPPLIES: None

EQUIPMENT CONDITIONS: Disconnect ground cable at shunt. (Refer to page 8-109.)
Side console panel and access covers removed. (Refer to page 8-21.)

REMOVAL:

1. REMOVE SIDE CONSOLE HARNESS (1).

- a. Tag and disconnect electrical connectors to panel light (2).
- b. Tag and disconnect electrical connectors to drive axle toggle switch (3).
- c. Tag and disconnect electrical connectors to flood lamp toggle switch (4).
- d. Tag and disconnect electrical connectors to rear head lamp toggle switch (5).
- e. Tag and disconnect electrical connectors on wire 46 to outrigger control switches (6).
- f. Tag and remove two remaining electrical connectors from each outrigger control switch (6).

2. REMOVE SIDE CONSOLE HARNESS (1).

INSTALLATION:

1. INSTALL SIDE CONSOLE HARNESS (1).

- a. Connect tagged electrical connectors to outrigger control switches (6).
- b. Connect two tagged electrical connectors to rear head lamp toggle switch (5).

c. Connect tagged electrical connectors to flood lamp toggle switch (4).

d. Connect tagged electrical connectors to drive axle toggle switch (3).

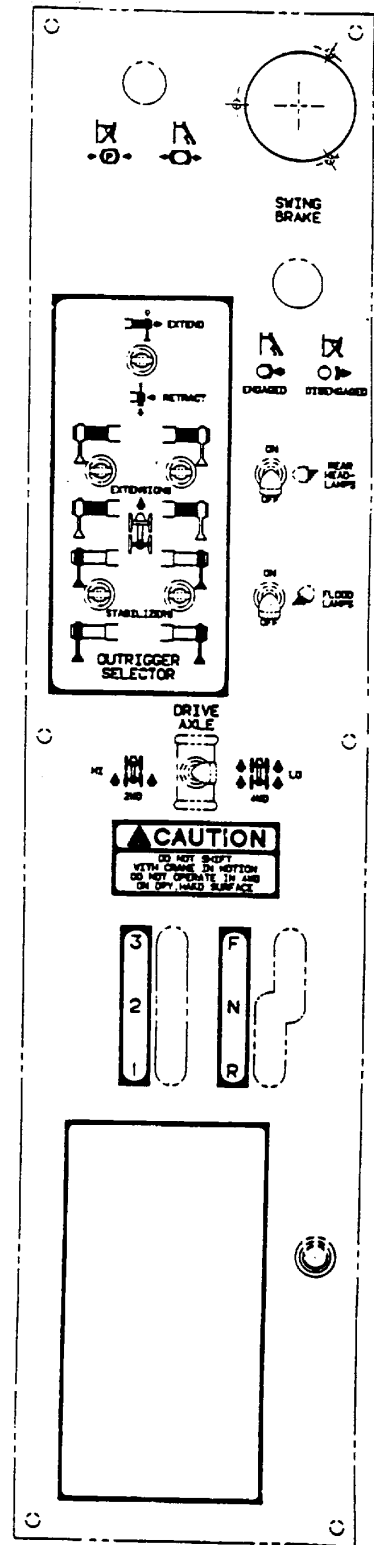
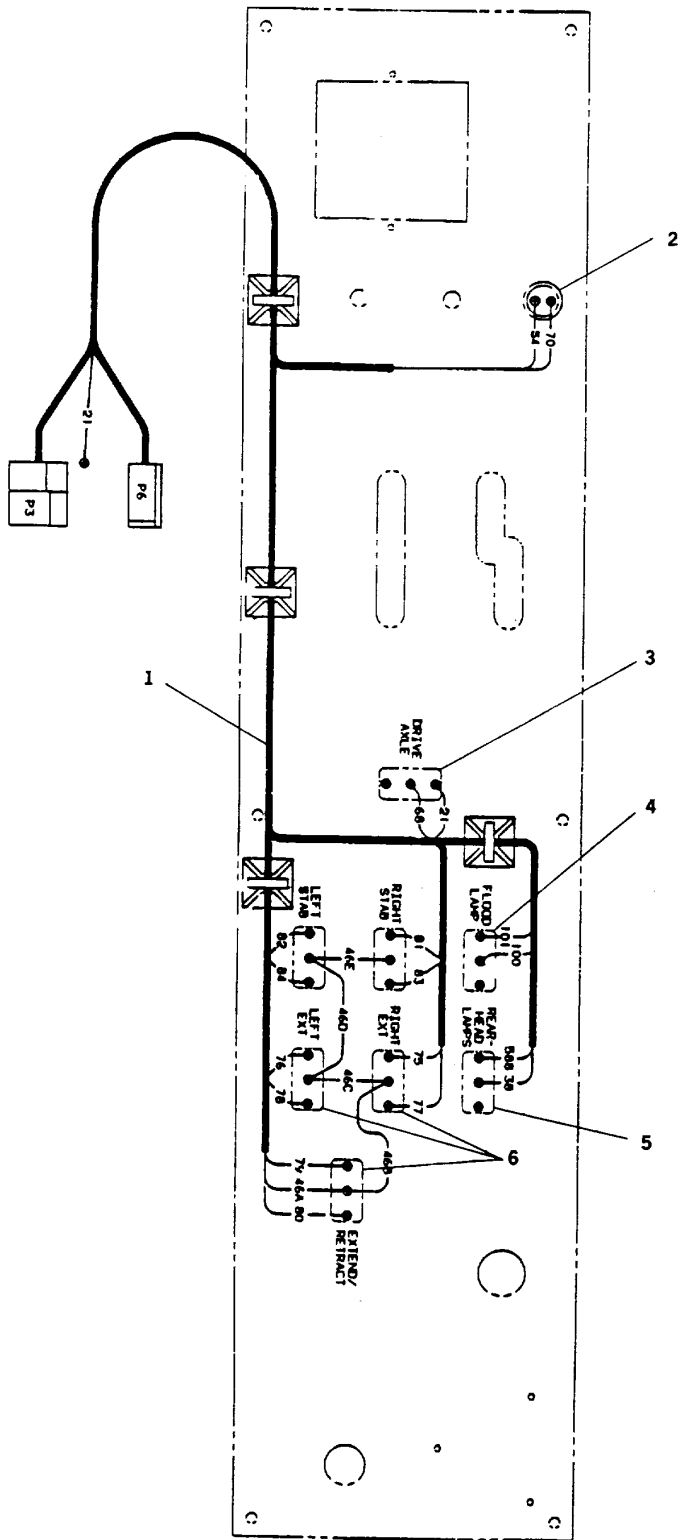
e. Connect tagged electrical connectors to panel Light (2).

2. INSTALL SIDE CONSOLE PANEL AND ACCESS PANELS. (REFER TO PAGE 8-21.)

3. CONNECT GROUND CABLE AT SHUNT. (REFER TO PAGE 8-109.)

4. TEST FOR PROPER OPERATION. (REFER TO TM 5-3810-306-10.)

END OF TASK



DISTRIBUTION PANEL WIRE HARNESS INSTALLATION

TOOLS: General mechanic's tool kit: automotive (5180-00-177-7033)

SUPPLIES: None

EQUIPMENT CONDITION: Disconnect ground cable at shunt. (Refer to page 8-109.)
 Front side access panel removed. (Refer to page 8-21.)
 Distribution panel removed. (Refer to page 8-30.)

REMOVAL:

1. REMOVE DISTRIBUTION WIRING HARNESS.

- a. Remove five electrical connectors on distribution panel wiring harness (1).
- b. Remove electrical connectors to flasher (2).
- c. Remove wires 5A, 5B and 5C from stud (16). buss bar on circuit breakers (3).
- d. Remove wires 112, 30 and 781 from circuit breakers (4).
- e. Remove grounding wires 51F, 51G, 51H and four electrical connectors from relay K5 (5).
- f. Remove wires 212 and 213 from resistor (6).
- g. Remove six relays (7) and using suitable pin removal tool remove four pins from each relay plug
- h. Loosen twelve screws and remove wires, diode silicon wires, diode silicon rectifier (9) and capacitor (10) from terminal block (11).
- i. Remove grounding wires 51A, 51B and 51D from circuit breaker bracket mounting stud (12).
- J. Remove wire 180 from buss bar on circuit breakers (13).
- k. Remove electrical connectors to five circuit breakers (14).
- l. Remove three electrical connectors to two 30A circuit breakers (15).
- m. Remove grounding wires on circuit breaker bracket mounting stud (16).
- n. Remove distribution panel wiring harness (1).

INSTALLATION:

1. INSTALL DISTRIBUTION PANEL WIRING HARNESS (1).

- a. Install grounding wires to circuit breaker bracket mounting STUD (16).
- b. Install three electrical connectors to two 30A circuit breakers (15).
- c. Install electrical connectors to five circuit breakers (14).
- d. Install wire 180 to buss bar on circuit breakers (13).
- e. Install grounding wires 51A, 51B and 51D to circuit breaker bracket mounting stud (12).

- f. Install capacitor (10), diode silicon rectifier (9) and wires to terminal block (11). Secure by tightening screws.
 - g. Install four wire pins in each relay plug (8) according to diagram shown. Install relays (7).
 - h. Install two wires 212 and 213 to resistor (6).
 - i. Install wires and electrical connectors to relay K5 (5).
 - j. Install wires 112, 30 and 781 to circuit breakers (4).
 - k. Install wires 5A, 5B and 5C to buss bar on circuit breakers (3).
 - l. Install electrical connectors on flasher (2).
 - m. Connect five electrical connectors on distribution panel wiring harness (1).
2. INSTALL DISTRIBUTION PANEL. (REFER TO PAGE 8-30.)
 3. INSTALL FRONT SIDE ACCESS PANEL (REFER TO PAGE 8-21.)
 4. CONNECT GROUND CABLE AT SHUNT. (REFER TO PAGE 8-109.)
 5. CHECK FOR PROPER OPERATION OF ALL ELECTRICAL COMPONENTS. (REFER TO TM 5-3810-306-10.)

END OF TASK

DISTRIBUTION PANEL INSTALLATION

TOOLS: General mechanic's tool kit: automotive (5180-00-177-7033)

SUPPLIES: Lockwashers (Item 7, Appendix C) (4 Required)

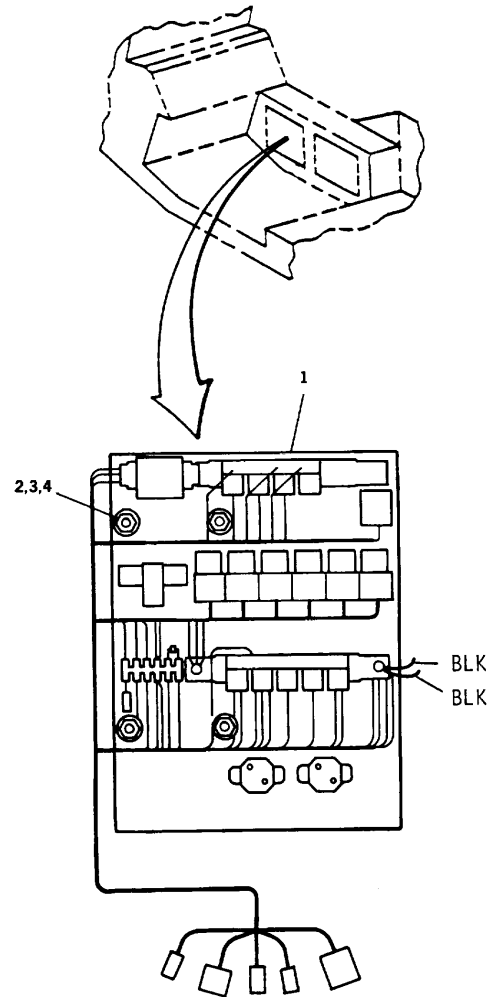
EQUIPMENT CONDITION: Disconnect ground cable at shunt. (Refer to page 8-109.)
 Front side access panel removed. (Refer to page 8-21.)

REMOVAL:

1. REMOVE DISTRIBUTION PANEL (1).
 - a. Tag and disconnect electrical connectors on distribution panel wiring harness.
 - b. Tag and disconnect black wires.
 - c. Remove four nuts (3), lockwashers (4) and flatwashers (2) securing distribution panel (1) on mounting studs. Discard lockwashers (4).
 - d. Remove panel (1).

INSTALLATION:

1. INSTALL DISTRIBUTION PANEL (1).
 - a. Position distribution panel holes on mounting studs and secure with flatwashers (2), lockwashers (4) and nuts (3).
 - b. Connect tagged black wires.
 - c. Connect five tagged electrical connectors to distribution panel.
2. INSTALL FRONT SIDE ACCESS PANEL. (REFER TO PAGE 8-21.)
3. CONNECT GROUND CABLE AT SHUNT. (REFER TO PAGE 8-109.)



END OF TASK

STOP LIGHT SWITCH REPLACEMENT

TOOLS: General mechanic's tool kit: automotive (5180-00-177-7033)

SUPPLIES: Loctite #545 (Item 13, Appendix C)

EQUIPMENT CONDITIONS: Cab bottom panel removed. (Refer to page 15-11.)
Disconnect ground cable at shunt. (Refer to page 8-109.)

REMOVAL:

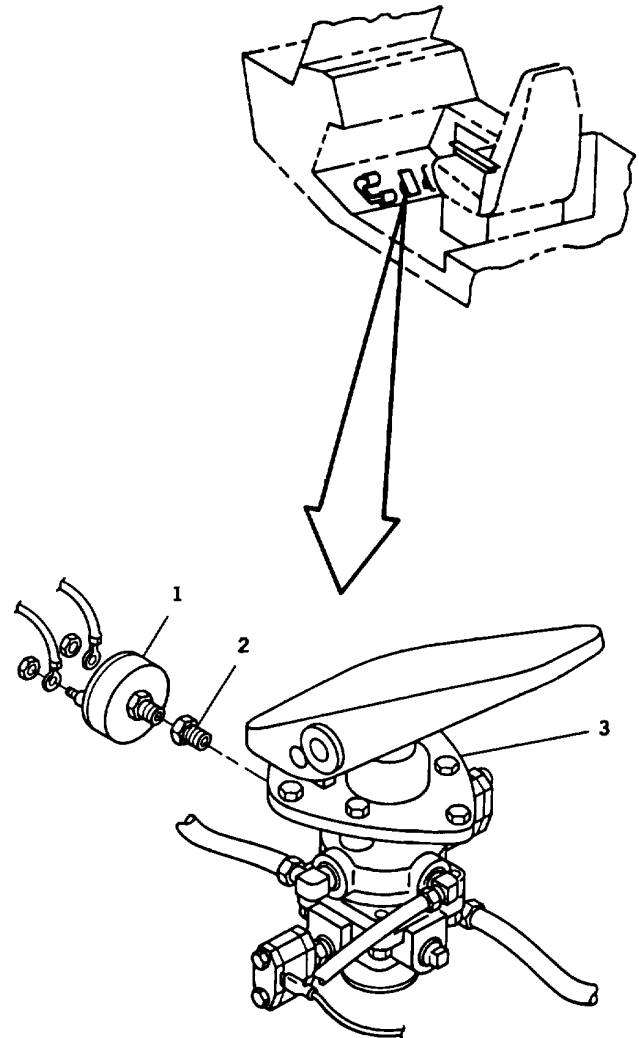
1. REMOVE STOP LIGHT SWITCH (1).
 - a. Tag and remove electrical leads to stop light switch (1).
 - b. Unscrew stop light switch (1) from reducer (2).
 - c. Remove reducer (2) and inspect for damage. Replace if necessary.

INSTALLATION:**NOTE**

Prior to installing switch and reducer, coat threads with Loctite #545.

1. INSTALL STOP LIGHT SWITCH (1).
 - a. Install reducer (2) on brake control valve (3).
 - b. Install stop light switch (1) on reducer (2). Tighten securely.
 - c. Remove tags and connect electrical leads to stop light switch (1).
2. CONNECT GROUND CABLE AT SHUNT. (REFER TO PAGE 8-109.)
3. TEST FOR PROPER OPERATION OF STOP LIGHTS. (REFER TO TM 5-3810-30610.)
4. INSTALL CAB BOTTOM PANEL. (REFER TO PAGE 15-11.)

END OF TASK



TACHOMETER REPLACEMENT

TOOLS: General mechanic's tool kit: automotive (5180-00-177-7033)

SUPPLIES: None

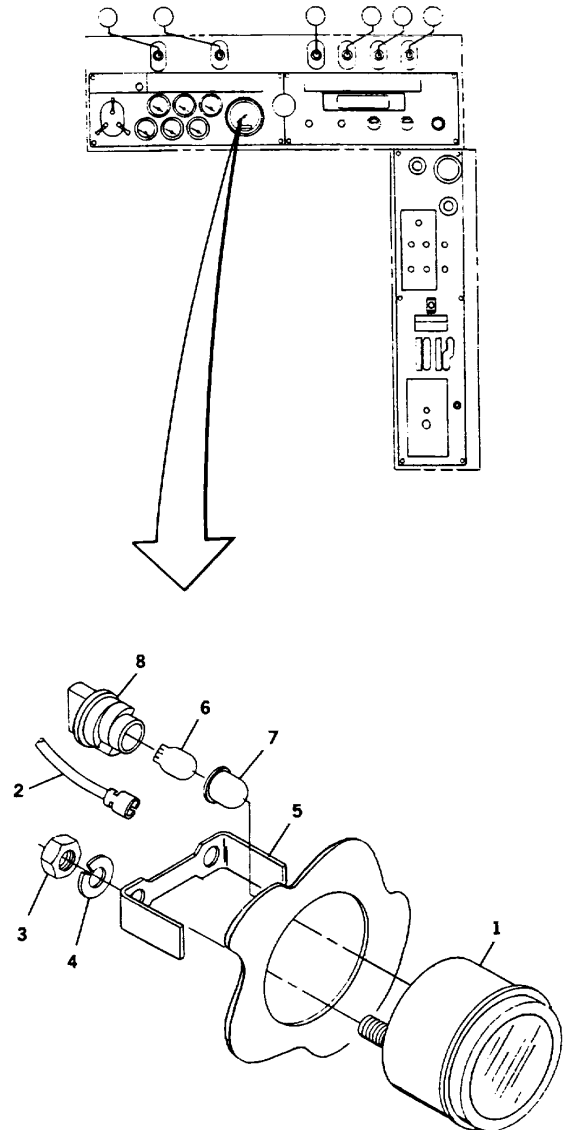
EQUIPMENT CONDITIONS: Disconnect ground cable at shunt. (Refer to page 8-109.)
Left front control panel removed. (Refer to page 8-11.)

REMOVAL:

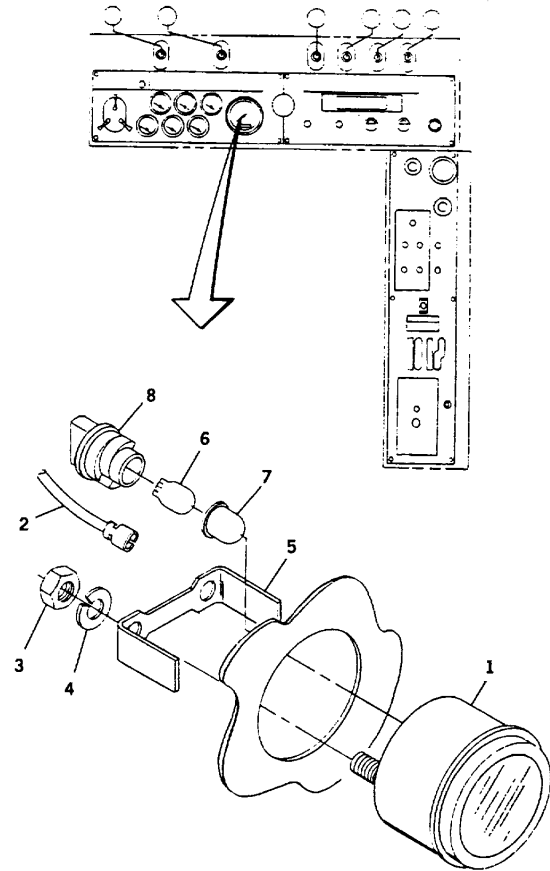
1. REMOVE TACHOMETER (1).
 - a. Tag and disconnect electrical wires (2) to tachometer (1).
 - b. Remove two nuts (3) and lockwashers (4). Lift mounting bracket (5) from tachometer (1).
 - c. Push tachometer (1) through panel.
2. REMOVE BULB (6).
 - a. Push in and turn tab on bulb socket (8) to remove.
 - b. Remove filter cap (7) and discard if damaged.
 - c. Inspect bulb (6) for damage. If bulb (6) is burned out, do step d.
 - d. Pull bulb (6) from socket (8) and discard if damaged.
3. INSPECT ALL OTHER PARTS FOR DAMAGE. REPLACE AS REQUIRED.

INSTALLATION:

1. INSTALL BULBS (6).
 - a. Put bulb (6) in socket (8). Install filter cap (7).
 - b. Install socket (8) in back of tachometer (1). Turn socket to lock in place.



2. INSTALL TACHOMETER (1) AND CONNECT ELECTRICAL WIRES (2).
 - a. Put tachometer (1) through panel.
 - b. Install mounting bracket (5) and secure with two nuts (3) and lockwashers (4).
 - c. Remove tags and connect electrical wires (2).
3. CONNECT GROUND CABLE AT SHUNT. (REFER TO PAGE 8-109.)
4. INSTALL LEFT FRONT CONTROL PANEL. (REFER TO PAGE 8-11.)
5. START ENGINE. (REFER TO TM 5-3810306-10.)
6. MAKE SURE TACHOMETER (1) POINTER MOVES AS ENGINE RPM IS INCREASED.



END OF TASK

TOGGLE SWITCH REPLACEMENT

TOOLS: General mechanic's tool kit: automotive (5180-00-177-7033)

SUPPLIES: None

EQUIPMENT CONDITION: Disconnect ground cable at shunt. (Refer to page 8-109.)
Right front control panel or side access panels removed as required. (Refer to page 8-11 or 8-21.)

REMOVAL:

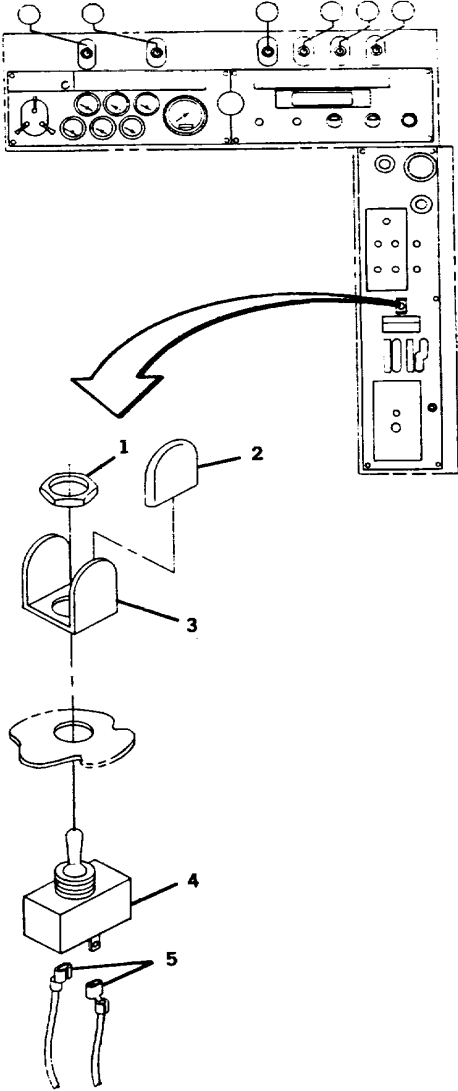
NOTE

Use this task to remove or install toggle switches (4) on front control panel or side console. Drive axle toggle switch (4) is shown.

- 1. REMOVE TOGGLE SWITCH (4).
 - a. Tag and disconnect electrical wires (5).
 - b. Remove nut (1). Pull off switch guard (3) if applicable.
 - c. If applicable inspect vinyl sleeve (2). If damaged, do step d.
 - d. Slide vinyl sleeve (2) off switch guard (3).
 - e. Pull out toggle switch (4).
- 2. INSPECT PARTS FOR DAMAGE. REPLACE AS REQUIRED.

INSTALLATION:

- 1. INSTALL TOGGLE SWITCH (4).
 - a. Put toggle switch (4) through panel. Hold in place.
 - b. Install switch guard (3) if necessary and secure with nut (1).

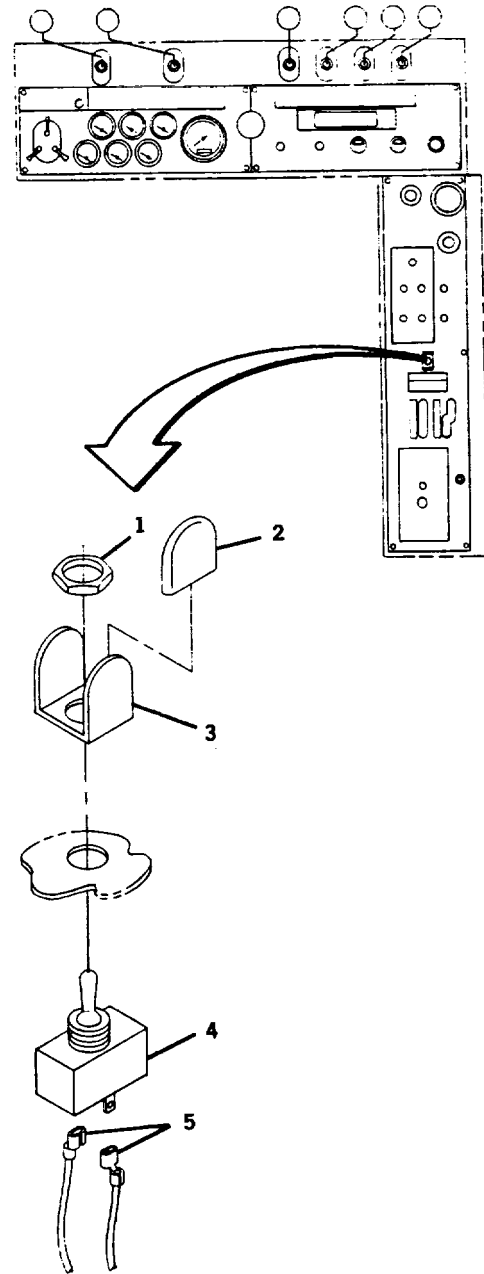


NOTE

If vinyl sleeve (2) was removed, do step c.

- c. Slide vinyl sleeve (2) on switch guard (3).
 - d. Remove tags. Connect electrical wires (5).
2. INSTALL CONTROL PANEL OR SIDE ACCESS PANELS. (REFER TO PAGE 8-11 OR 8-21.)
 3. CONNECT GROUND CABLE AT SHUNT. (REFER TO PAGE 8-109.)
 4. TEST TOGGLE SWITCH (4). (REFER TO TM 5-3810-306-10.)

END OF TASK



WARNING BUZZER REPLACEMENT

TOOLS: General mechanic's tool kit: automotive (5180-00-177-7033)

SUPPLIES: None

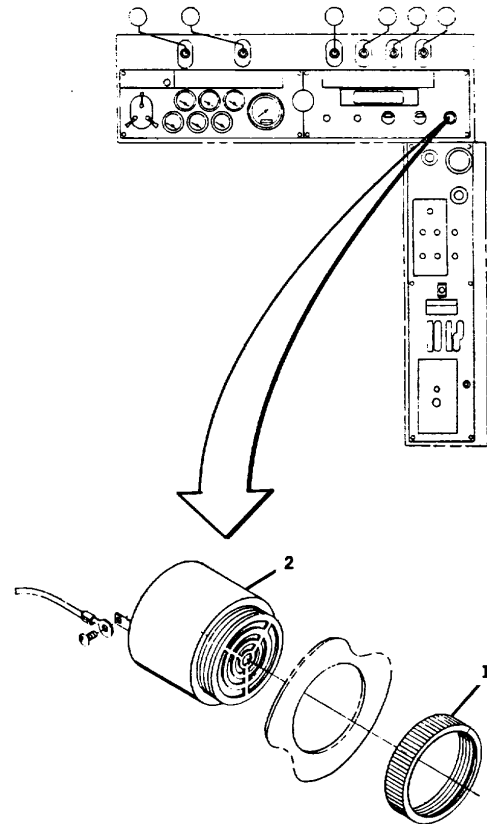
EQUIPMENT CONDITIONS: Disconnect ground cable at shunt. (Refer to page 8-109.)
Right front control panel removed. (Refer to page 8-11.)

REMOVAL:

1. REMOVE WARNING BUZZER (2).
 - a. Tag and disconnect electrical wires.
 - b. Hold back of warning buzzer (2). Unscrew front cap (1). Pull warning buzzer (2) from panel.
2. INSPECT PARTS FOR DAMAGE. REPLACE AS REQUIRED.

INSTALLATION:

1. INSTALL WARNING BUZZER (2).
 - a. Put warning buzzer (2) through panel.
 - b. Install front cap (1).
 - c. Remove tags. Connect electrical wires. Tighten screws securing wires.
2. INSTALL RIGHT FRONT CONTROL PANEL. (REFER TO PAGE 8-11.)
3. CONNECT GROUND CABLE AT SHUNT. (REFER TO PAGE 8-109.)



END OF TASK

TURN SIGNAL CONTROL REPLACEMENT

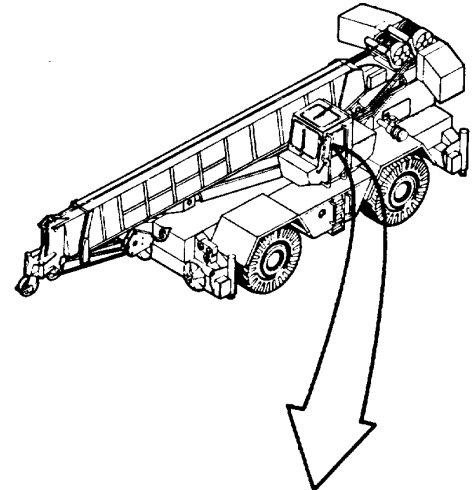
TOOLS: General mechanic's tool kit: automotive (5180-00-177-7033)

SUPPLIES: None

EQUIPMENT CONDITION: Disconnect ground cable at shunt. (Refer to page 8-109.)
Left front control panel removed. (Refer to page 8-11.)

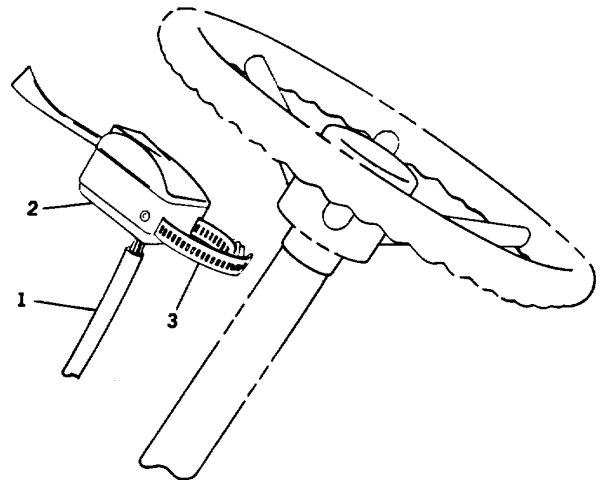
REMOVAL:

1. REMOVE TURN SIGNAL CONTROL (2).
 - a. Tag and disconnect wires of cable (1) inside front console.
 - b. Loosen mounting strap (3) around steering column.
 - c. Remove turn signal control (2).



INSTALLATION:

1. INSTALL TURN SIGNAL CONTROL (2).
 - A. Connect wires of cable (1) inside front console as tagged.
 - b. Install turn signal control (2) by tightening mounting strap (3) around steering column.
2. INSTALL LEFT FRONT CONTROL PANEL. (REFER TO PAGE 8-11.)
3. CONNECT GROUND CABLE AT SHUNT. (REFER TO PAGE 8-109.)
4. CHECK TURN SIGNAL CONTROL FOR PROPER OPERATION. (REFER TO TM 5-3810-30610.)



END OF TASK

Section IV. VEHICLE LIGHTS MAINTENANCE

BEACON LIGHT ASSEMBLY REPLACEMENT

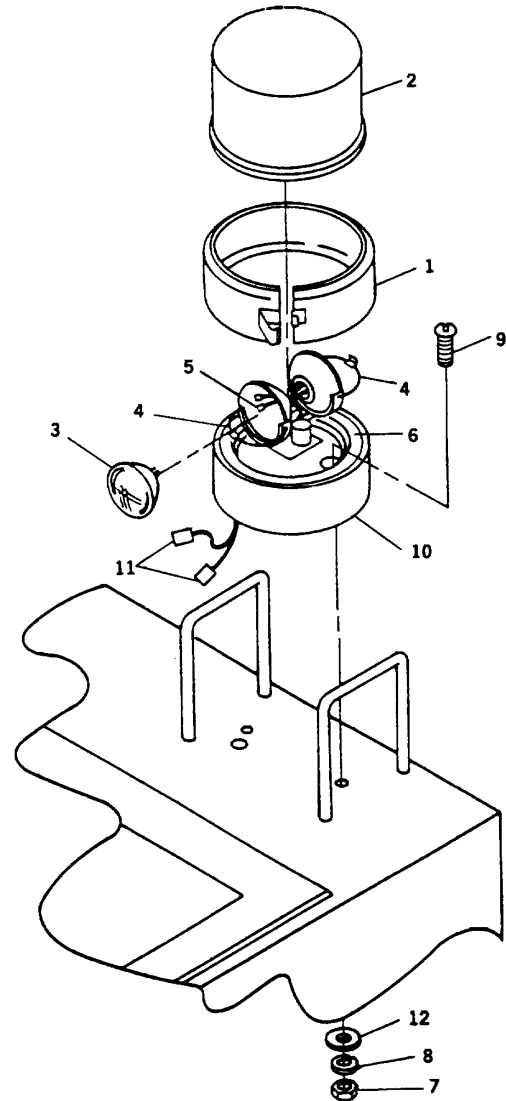
TOOLS: General mechanic's tool kit: automotive (5180-00-177-7033)

SUPPLIES: Lockwashers (Item 2, Appendix C) (2 Required)
Petroleum jelly (Item 42, Appendix C)

EQUIPMENT CONDITION: Disconnect ground cable at shunt. (Refer to page 8-109.)
Cab acoustical foam removed in top rear of cab. (Refer to page 15-2.)

REMOVAL:

1. REMOVE LENS (2).
 - a. Pry open clip on retaining ring. Remove retaining band (1).
 - B. Lift off lens (2).
2. INSPECT LENS (2) FOR DAMAGE. REPLACE AS REQUIRED.
3. INSPECT TWO BULBS (3). REPLACE AS REQUIRED.
 - a. Inspect two bulbs (3) for damage. If damaged, do step b.
 - b. Pry up two retaining bands (4). Tag and disconnect two wires (5) to bulb (3). Discard bulb (3).
4. REMOVE BASE ASSEMBLY (10).
 - a. Tag and disconnect electrical wires (11).
 - b. Remove two nuts (7), lockwashers (8), flatwashers (12) and screws (9) securing base assembly (10) to cab. Discard lockwashers (8).
 - c. Lift base assembly (10) from cab roof. Pull wires (11) thru access hole.
5. INSPECT PARTS FOR DAMAGE. REPLACE AS REQUIRED.



INSTALLATION:

- 1. INSTALL BASE ASSEMBLY (10).
 - a. Push wires (11) thru access hole. Make sure wires (11) are not under edge of base assembly (10) or electrical short may result.

NOTE

Make sure base assembly (10) label faces towards front of crane.

- b. Align holes in base assembly (10) with holes in cab roof. Install two screws (9), new lockwashers (8), flatwashers (12) and nuts (7). Tighten two nuts (7).

- 2. INSTALL BULB (3) AS NEEDED.

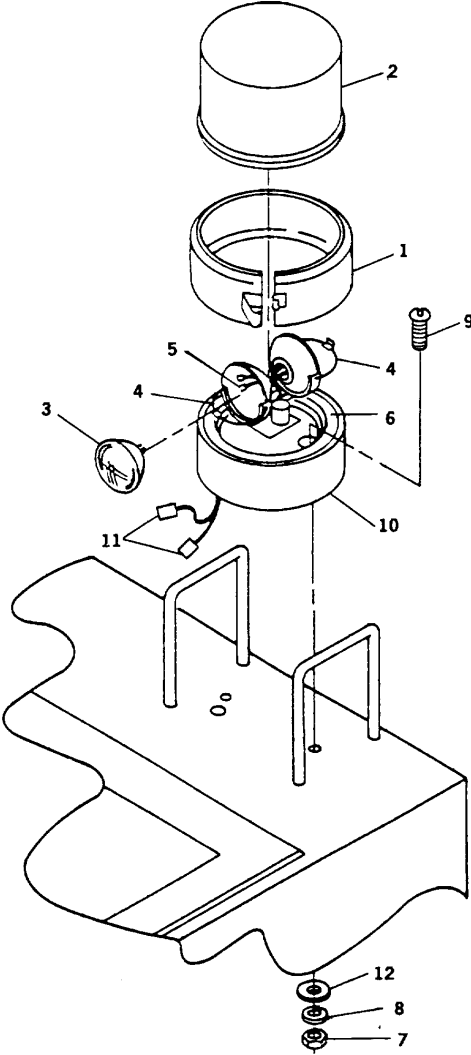
NOTE

Do steps a thru c only if bulb (3) was removed, a. Connect wires (5) to bulb (3).

- b. Put bulb (3) in place.
 - c. Position retaining band (4) over bulbs (3).

- 3. INSTALL LENS (2).

- a. Apply a light coating of petroleum jelly to seal (6).
 - b. Put lens (2) on base assembly (10).
 - c. Wrap retaining ring (1) around lens (2) and base assembly (10). Connect retaining ring ends together with clip.
 - d. Remove tags and connect electrical wires (11).



- 4. CONNECT GROUND CABLE AT SHUNT. (REFER TO PAGE 8-109.)
- 5. INSTALL ACOUSTICAL FOAM IN TOP OF CAB. (REFER TO PAGE 15-2.)
- 6. TEST BEACON LIGHT FOR PROPER OPERATION. (REFER TO TM 5-3810- 306-10.)

END OF TASK

BLACKOUT LIGHT REPLACEMENT

TOOLS: General mechanic's tool kit: automotive (5180-00-177-7033)

SUPPLIES: Lockwasher (Supplied with light)

EQUIPMENT CONDITION: Disconnect ground cable at shunt. (Refer to page 8-109.)

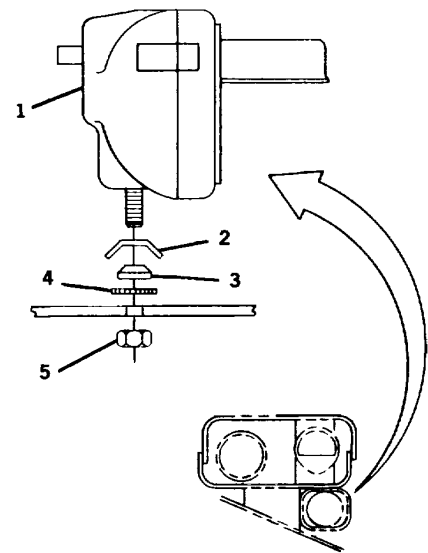
REMOVAL:

1. REMOVE BLACKOUT LIGHT (1).
 - a. Tag and disconnect one electrical lead to blackout light (1).
 - b. Remove nut (5) and light (1).
 - c. Remove conewasher (2), beveled bushing (3) and lockwasher (4). Discard lockwasher.

INSTALLATION:

1. INSTALL BLACKOUT LIGHT (1).
 - a. Install conewasher (2), beveled bushing (3) and new lockwasher (4).
 - b. Align blackout light (1) with mounting assembly hole.
 - c. Install nut (5).
 - d. Remove tags and connect one electrical lead to blackout light (1).
2. CONNECT GROUND CABLE AT SHUNT. (REFER TO PAGE 8-109.)
3. TEST BLACKOUT LIGHT FOR PROPER OPERATION. (REFER TO TM 5-3810-30610.)

END OF TASK



BOOM FLOODLIGHT REPLACEMENT

TOOLS: General mechanic's tool kit: automotive (5180-00-177-7033)

SUPPLIES: Lockwasher (Supplied with light)

EQUIPMENT CONDITIONS: Disconnect ground cable at shunt. (Refer to page 8-109.)
 Boom lowered. (Refer to TM 5-3810-306-10.)

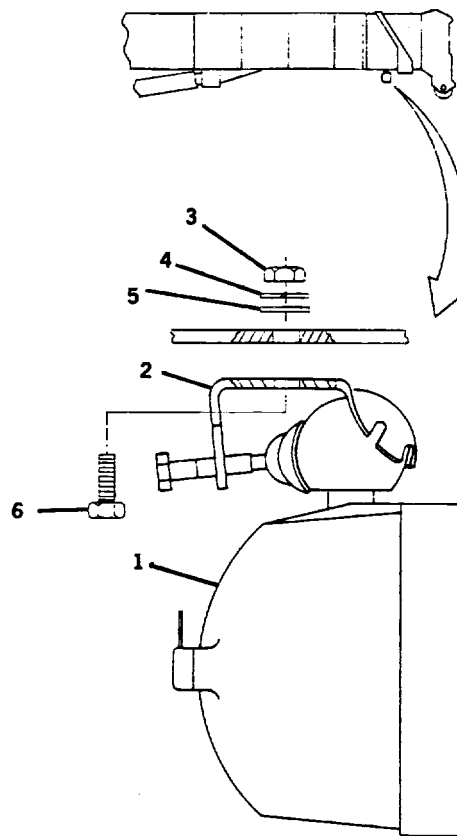
REMOVAL:

1. REMOVE BOOM FLOODLIGHT (1).
 - a. Tag and disconnect electrical leads to boom floodlight (1).
 - b. Support light (1) and remove two nuts (3), lockwashers (4), washers (5) and capscrews (6) securing light bracket (2). Discard lockwashers.
 - c. Remove boom floodlight (1) and bracket (2).

INSTALLATION:

1. INSTALL BOOM FLOODLIGHT (1).
 - a. Align boom floodlight bracket (2) with mounting holes on boom and secure with two capscrews (6) washers (5), new lockwashers (4) and nuts (3).
 - b. Remove tags and connect electrical leads.
 - c. Adjust floodlight (1).
2. CONNECT GROUND CABLE AT SHUNT. (REFER TO PAGE 8-109.)
3. TEST FLOODLIGHT FOR PROPER OPERATION. (REFER TO TM 5-3810306-10.)

END OF TASK



CAB FLOODLIGHT REPLACEMENT

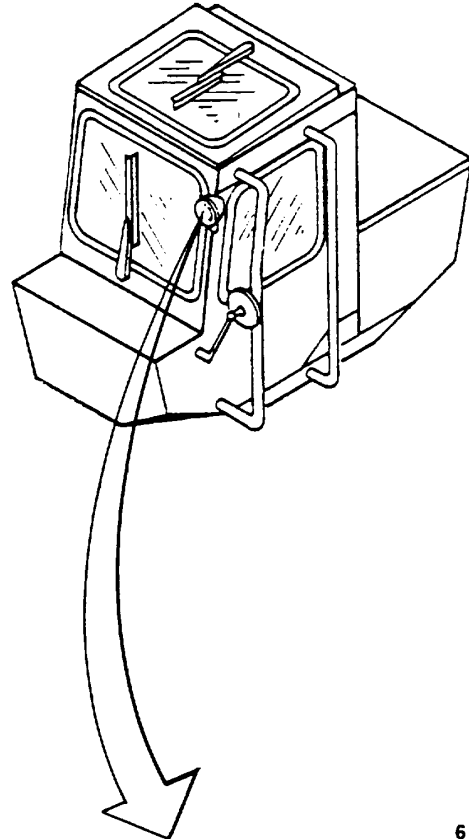
TOOLS: General mechanic's tool kit: automotive (5180-00-177-7033)

SUPPLIES: None

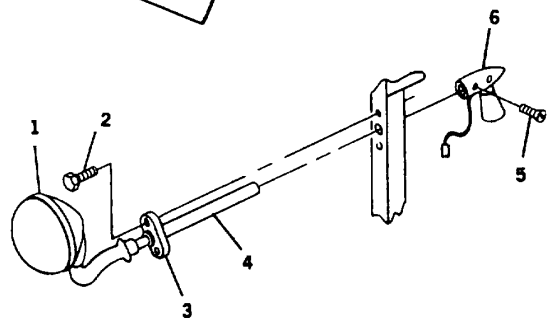
EQUIPMENT CONDITION: Disconnect ground cable at shunt. (Refer to page 8-109.)

REMOVAL:

1. REMOVE CAB FLOODLIGHT (1).
 - a. Tag and disconnect electrical lead to floodlight (1).
 - b. Remove two capscrews (2) from mounting bracket (3) to free shaft assembly (4).
 - c. Remove adjustment screw (5) and separate control handle (6) from shaft assembly (4).
 - d. Remove shaft assembly (4) from cab mounting surface.

**INSTALLATION:**

1. INSTALL CAB FLOODLIGHT (1).
 - a. Insert shaft assembly (4) through cab mounting surface and install mounting bracket (3) with two capscrews (2).
 - b. Attach control handle (6) to shaft assembly (4) using adjustment screw (5).
 - c. Remove tag and connect electrical lead.
2. CONNECT GROUND CABLE AT SHUNT. (REFER TO PAGE 8-109.)
3. TEST CAB FLOODLIGHT FOR PROPER OPERATION. (REFER TO TM 5-3810-306-10.)



END OF TASK

CLEARANCE LIGHT REPLACEMENT

TOOLS: General mechanic's tool kit: automotive (5180-00-177-7033)

SUPPLIES: Lockwashers (Item 51, Appendix C)

EQUIPMENT CONDITION: Disconnect ground cable at shunt. (Refer to page 8-109.)

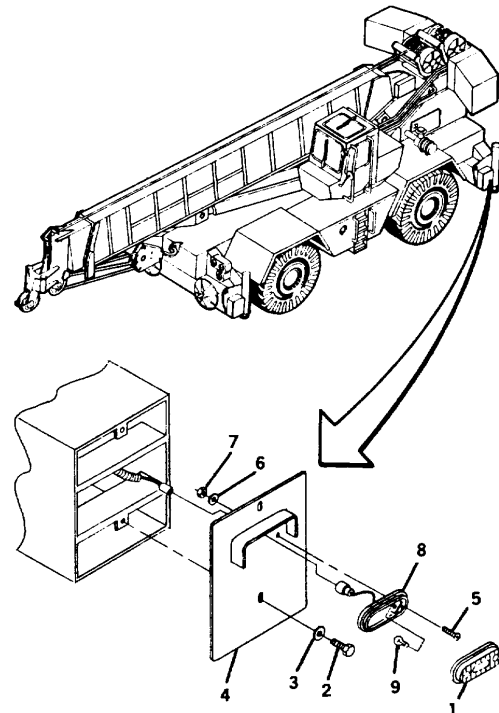
REMOVAL:

1. REMOVE CLEARANCE LIGHT.
 - a. Pry off reflective lens (1).
 - b. Remove two screws (2), flatwashers (3) and outrigger cover (4).

NOTE

Ensure covers (4) stay with same outrigger.

- c. Tag and remove wire from clearance light (8).
- b. Remove two screws (5), lockwashers (6) and nuts (7). Discard lockwashers (6).
- c. Remove clearance light back plate (8) from cover (4).
- d. Replace bulb (9) if damaged.



INSTALLATION:

1. INSTALL CLEARANCE LIGHT.
 - a. Align clearance light back plate (8) with mounting holes and secure with two screws (5), new lockwashers (6) and nuts (7).

NOTE

Amber lenses are used on front clearance lights and red lenses on rear clearance lights.

- b. Install reflective lens (1).

- c. Remove tag. Connect electrical wire to clearance light.
- d. Align outrigger cover holes on end of outrigger and secure with two flatwashers (3) and screws (2).

2. CONNECT GROUND CABLE AT SHUNT. (REFER TO PAGE 8-109.)
3. TEST CLEARANCE LIGHTS FOR PROPER OPERATION. (REFER TO TM 5-3810-306-10.)

END OF TASK

HEADLIGHT REPLACEMENT

TOOLS: General mechanic's tool kit: automotive (5180-00-177-7033)

SUPPLIES: Lockwasher (Item 57, Appendix C)

EQUIPMENT CONDITION: Disconnect ground cable at shunt. (Refer to page 8-109.)

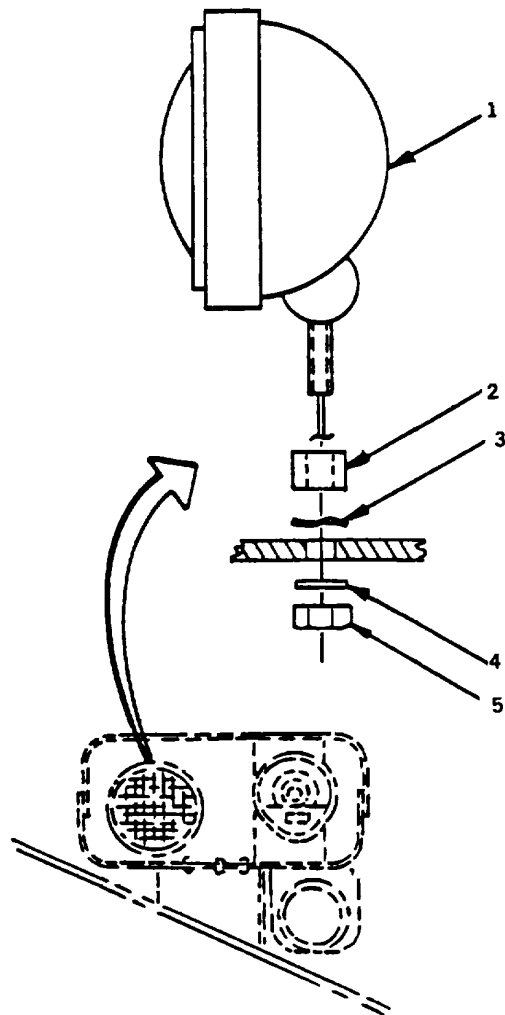
REMOVAL:

1. REMOVE HEADLIGHT (1).
 - a. Tag and disconnect electrical lead to headlight (1).
 - b. Remove nut (5), lockwasher (4), washer (3) and plastic bushing (2) to release headlight (1) from mounting assembly. Discard lockwasher (4).

INSTALLATION:

1. INSTALL HEADLIGHT (1).
 - a. Align headlight (1) with mounting assembly hole and secure with plastic bushing (2), washer (3), new lockwasher (4) and nut (5).
 - b. Remove tag and connect electrical lead to headlight (1).
2. CONNECT GROUND CABLE AT SHUNT. (REFER TO PAGE 8-109.)
3. TEST HEADLIGHT FOR PROPER OPERATION. (REFER TO TM 5-3810-306-10.)

END OF TASK



TURN SIGNAL LIGHT REPLACEMENT

TOOLS: General mechanic’s tool kit: automotive (5180-00-177-7033)

SUPPLIES: Lockwashers (Item 15, Appendix C) (2 Required)

EQUIPMENT CONDITION: Disconnect ground cable at shunt. (Refer to page 8-109.)

REMOVAL:

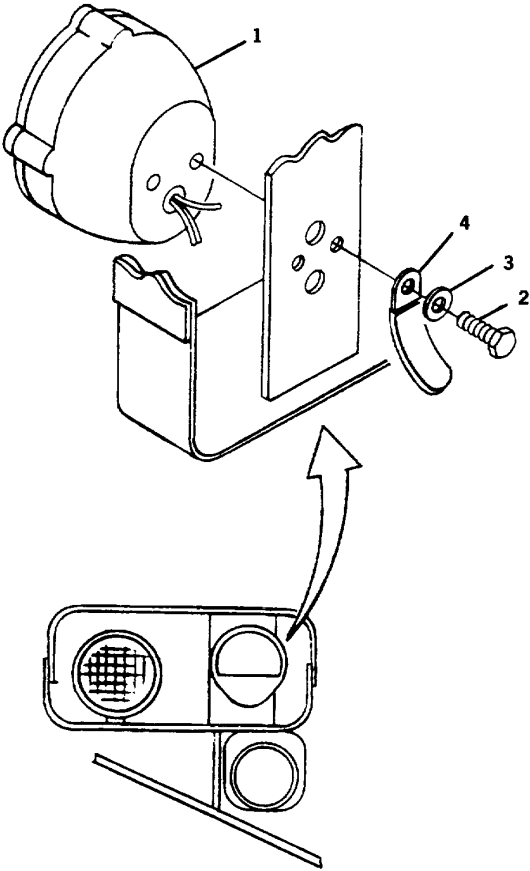
NOTE

Front turn signal shown. Use this for replacing front and rear turn signal assemblies.

- 1. REMOVE TURN SIGNAL LIGHT (1).
 - a. Tag and disconnect electrical leads to turn signal (1). Remove from wire clip (4).
 - b. Remove two capscrews (2), lockwashers (3) and wire clip (4) from mounting bracket. Discard lockwashers (3).

INSTALLATION:

- 1. INSTALL TURN SIGNAL LIGHT (1).
 - a. Align turn signal (1) holes with mounting bracket. Align wire clip (4) and secure turn signal with two new lockwashers (3) and capscrews (2).
 - b. Remove tags and connect electrical leads to turn signal (1).
 - c. Route wires through wire clip (4).
- 2. CONNECT GROUND CABLE AT SHUNT. (REFER TO PAGE 8-109.)



- 3. TEST TURN SIGNALS FOR PROPER OPERATION. (REFER TO TM 5-3810-306-10.)

END OF TASK

Section V. SENDING UNITS AND SWITCHES MAINTENANCE

OIL PRESSURE SENDER REPLACEMENT

TOOLS: General mechanic's tool kit: automotive (5180-00-177-7033)

SUPPLIES: None

EQUIPMENT CONDITIONS: Right engine access door open.
Engine cool to touch.
Disconnect ground cable at shunt. (Refer to page 8-109.)

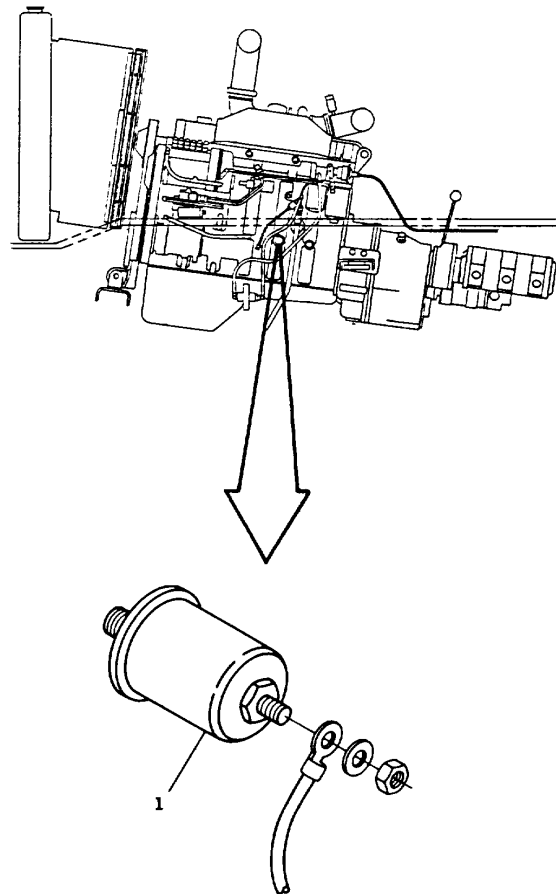
REMOVAL:

1. REMOVE OIL PRESSURE SENDER (1).
 - a. Tag and disconnect electrical connector(s) to pressure sender (1).
 - b. Turn pressure sender (1) counter-clockwise and remove from engine. Plug hole in engine.

INSTALLATION:

1. INSTALL OIL PRESSURE SENDER (1)
 - a. Remove plug and screw pressure sender (1) into engine.
 - b. Remove tag and connect electrical connector(s) to pressure sender (1).
2. CONNECT GROUND CABLE AT SHUNT. (REFER TO PAGE 8-109.)
3. START ENGINE. CHECK FOR PROPER OPERATION OF AFFECTED COMPONENT. (REFER TO TM 5-3810-306-10.)

END OF TASK



LOW OIL PRESSURE SWITCH REPLACEMENT

TOOLS: General mechanic's tool kit: automotive (5180-00-177-7033)

SUPPLIES: None

EQUIPMENT CONDITIONS: Right engine access door open.
 Engine cool to touch.
 Disconnect ground cable at shunt. (Refer to page 8-109.)

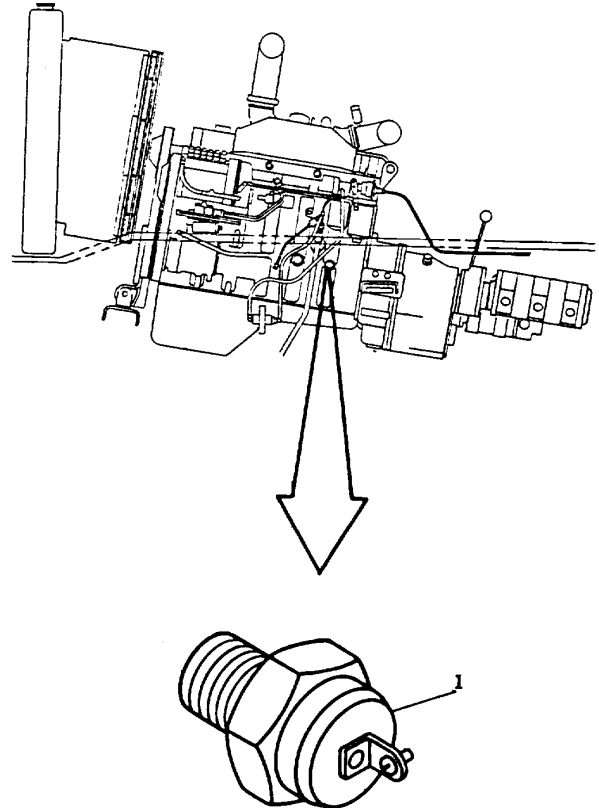
REMOVAL:

1. REMOVE LOW OIL PRESSURE SENDER (1).
 - a. Tag and disconnect electrical connector(s) to pressure sender (1).
 - b. Turn pressure sender (1) counter-clockwise and remove from engine. Plug hole in engine.

INSTALLATION:

1. INSTALL LOW OIL PRESSURE SENDER (1).
 - a. Remove plug and screw pressure sender (1) into engine.
 - b. Remove tag and connect electrical connector(s) to pressure sender (1).
2. CONNECT GROUND CABLE AT SHUNT. (REFER TO PAGE 8-109.)
3. START ENGINE. CHECK FOR PROPER OPERATION OF AFFECTED COMPONENT. (REFER TO TM 5-3810-306-10.)

END OF TASK



TACHOMETER MAGNETIC SENSOR REPLACEMENT

TOOLS: General mechanic's tool kit: automotive (5180-00-177-7033)

SUPPLIES: None

EQUIPMENT CONDITIONS: Right engine access door open.
 Engine cool to touch.
 Disconnect ground cable at shunt. (Refer to page 8-109.)

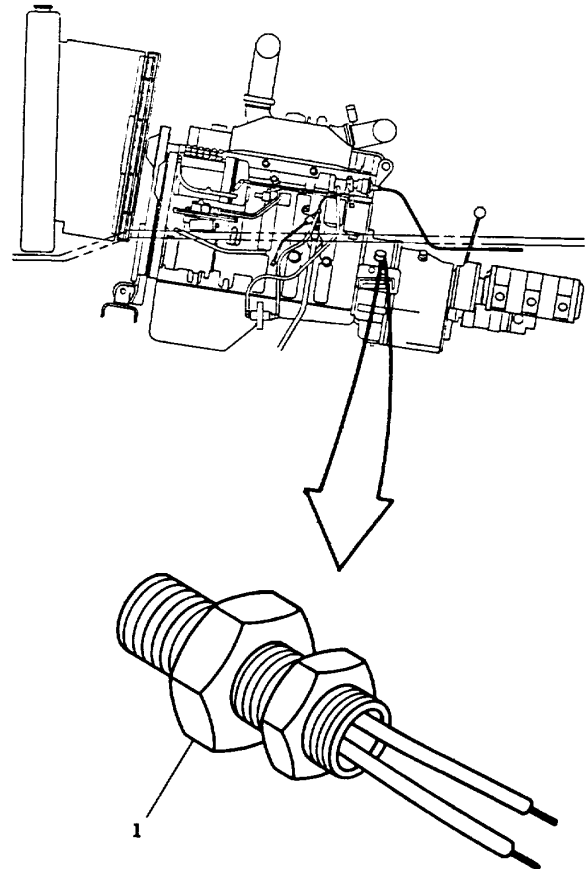
REMOVAL:

1. REMOVE MAGNETIC SENSOR (1).
 - a. Tag and disconnect electrical connector(s) to magnetic sensor (1).
 - b. Turn magnetic sensor (1) counter-clockwise and remove from engine. Plug hole in engine.

INSTALLATION:

1. INSTALL MAGNETIC SENSOR (1).
 - a. Remove plug and screw magnetic sensor (1) into engine.
 - b. Remove tag and connect electrical connector(s) to magnetic sensor (1).
2. CONNECT GROUND CABLE AT SHUNT. (REFER TO PAGE 8-109.)
3. START ENGINE. CHECK FOR PROPER OPERATION OF AFFECTED COMPONENT. (REFER TO TM 5-3810-306-10.)

END OF TASK



TRANSMISSION OIL TEMPERATURE SENDER REPLACEMENT

TOOLS: General mechanic's tool kit: automotive (5180-00-177-7033)

SUPPLIES: None

EQUIPMENT CONDITIONS: Rear decking removed. (Refer to page 15-16.)
 Engine cool to touch.
 Disconnect ground cable at shunt. (Refer to page 8-109.)

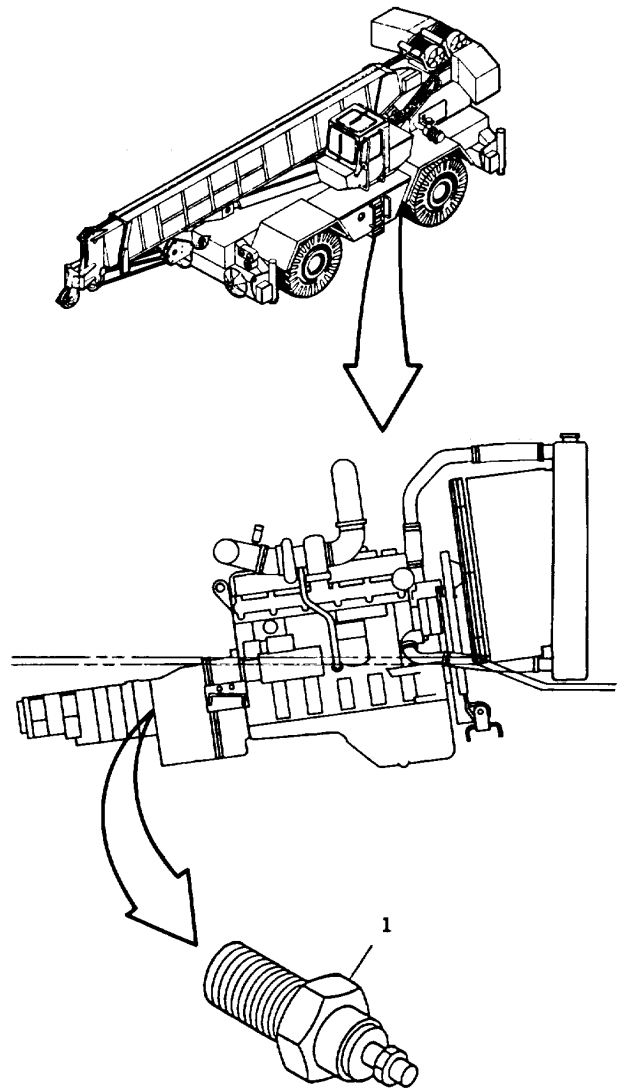
REMOVAL:

1. REMOVE TEMPERATURE SENDER (1).
 - a. Tag and disconnect electrical connector(s) to temperature sender (1).
 - b. Turn temperature sender (1) counter-clockwise and remove from torque converter. Plug hole in torque converter.

INSTALLATION:

1. INSTALL TEMPERATURE SENDER (1).
 - a. Remove plug and screw temperature sender (1) into torque converter.
 - b. Remove tag and connect electrical connector(s) to temperature switch (1).
2. CONNECT GROUND CABLE AT SHUNT. (REFER TO PAGE 8-109.)
3. INSTALL REAR DECKING. (REFER TO PAGE 15-16.)
4. START ENGINE. CHECK FOR PROPER OPERATION OF AFFECTED COMPONENT. (REFER TO TM 5-3810-306-10.)

END OF TASK



TRANSMISSION OIL TEMPERATURE SWITCH REPLACEMENT

TOOLS: General mechanic's tool kit: automotive (5180-00-177-7033)

SUPPLIES: None

EQUIPMENT CONDITIONS: Rear decking removed. (Refer to page 15-16.)
 Engine cool to touch.
 Disconnect ground cable at shunt. (Refer to page 8-109.)

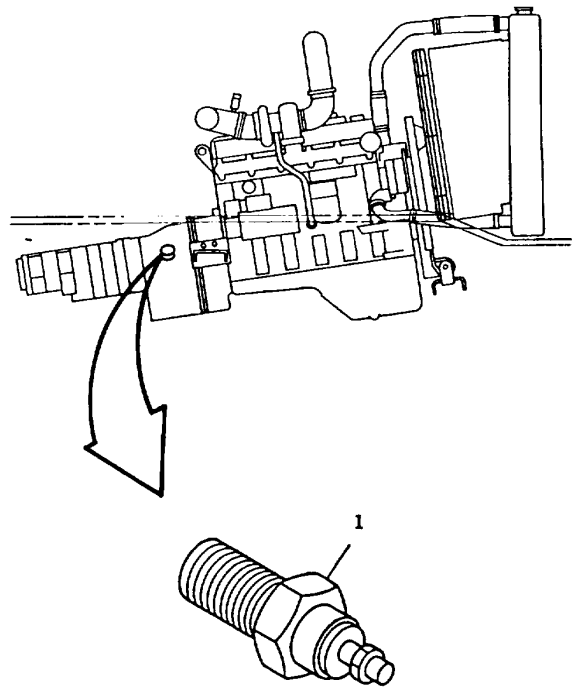
REMOVAL:

1. REMOVE TEMPERATURE SWITCH (1).
 - a. Tag and disconnect electrical connector(s) to temperature switch (1).
 - b. Turn temperature switch (1) counter-clockwise and remove from torque converter. Plug hole in torque converter.

INSTALLATION:

1. INSTALL TEMPERATURE SWITCH (1).
 - a. Remove plug and screw temperature switch (1) into torque converter.
 - b. Remove tag and connect electrical connector(s) to temperature switch (1).
2. CONNECT GROUND CABLE AT SHUNT. (REFER TO PAGE 8-109.)
3. INSTALL REAR DECKING. (REFER TO PAGE 15-16.)
4. START ENGINE. CHECK FOR PROPER OPERATION OF AFFECTED COMPONENT. (REFER TO TM 5-3810-306-10.)

END OF TASK



DCA FUEL PRESSURE TRANSDUCER REPLACEMENT

TOOLS: General mechanic's tool kit: automotive (5180-00-177-7033)

SUPPLIES: None

EQUIPMENT CONDITIONS: Right engine access door open.
 Engine cool to touch.
 Disconnect ground cable at shunt. (Refer to page 8-109.)

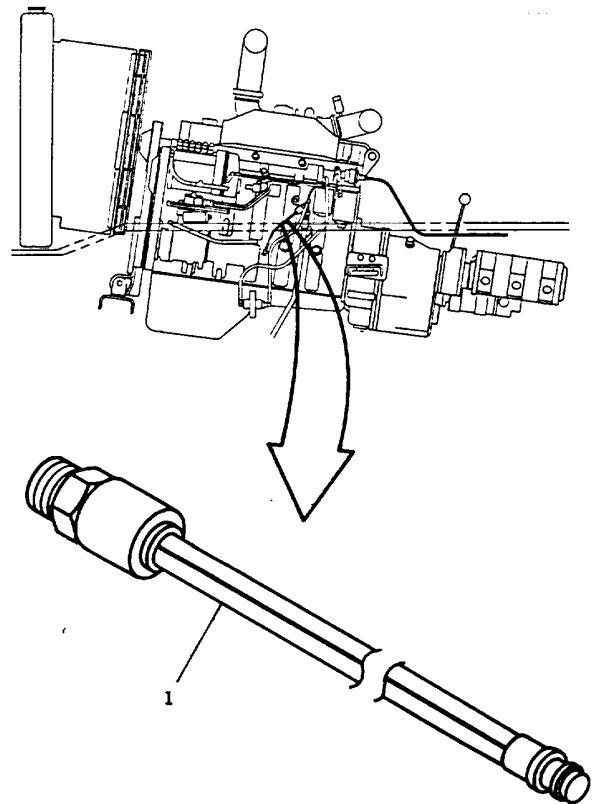
REMOVAL:

1. REMOVE PRESSURE TRANSDUCER (1).
 - a. Tag and disconnect electrical connector(s) to pressure transducer (1).
 - b. Turn pressure transducer (1) counter-clockwise and remove from engine. Plug hole in engine.

INSTALLATION:

1. INSTALL PRESSURE TRANSDUCER (1).
 - a. Remove plug and screw pressure transducer (1) into engine.
 - b. Remove tag and connect electrical connector(s) to pressure transducer (1).
2. CONNECT GROUND CABLE AT SHUNT. (REFER TO PAGE 8-109.)
3. START ENGINE. CHECK FOR PROPER OPERATION OF AFFECTED COMPONENT. (REFER TO TM 5-3810-306-10.)

END OF TASK



HIGH COOLANT TEMPERATURE SWITCH REPLACEMENT

TOOLS: General mechanic's tool kit: automotive (5810-00-177-7033)

SUPPLIES: None

EQUIPMENT CONDITIONS: Left engine access door open.
 Engine cool to touch.
 Disconnect ground cable at shunt. (Refer to page 8-109.)

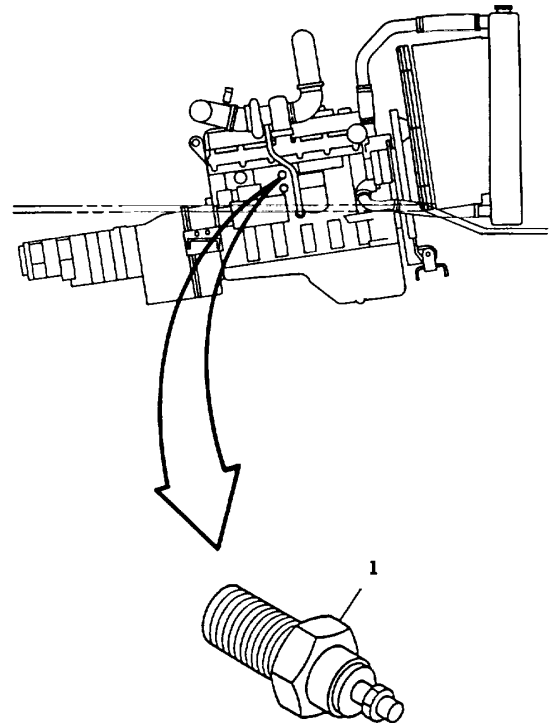
REMOVAL:

1. REMOVE TEMPERATURE SWITCH (1).
 - a. Tag and disconnect electrical connector(s) to temperature switch (1).
 - b. Turn temperature switch (1) counter-clockwise and remove from engine. Plug hole in engine.

INSTALLATION:

1. INSTALL TEMPERATURE SWITCH (1).
 - a. Remove plug and screw temperature sender (1) into engine.
 - b. Remove tag and connect electrical connector(s) to temperature switch (1).
2. CONNECT GROUND CABLE AT SHUNT. (REFER TO PAGE 8-109.)
3. START ENGINE. CHECK FOR PROPER OPERATION OF AFFECTED COMPONENT. (REFER TO TM 5-3810-306-10.)

END OF TASK



COOLANT TEMPERATURE SENDER REPLACEMENT

TOOLS: General mechanic's tool kit: automotive (5180-00-177-7033)

SUPPLIES: None

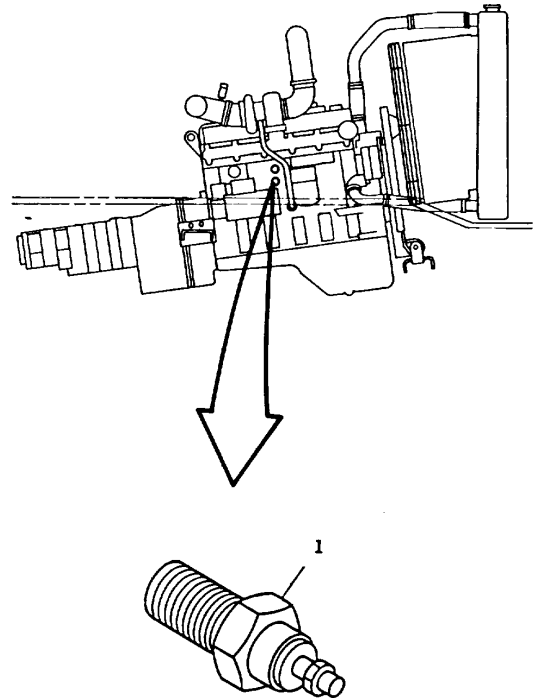
EQUIPMENT CONDITIONS: Left engine access door open.
 Engine cool to touch.
 Disconnect ground cable at shunt. (Refer to page 8-109.)

REMOVAL:

1. REMOVE TEMPERATURE SENDER (1).
 - a. Tag and disconnect electrical connector(s) to temperature sender (1).
 - b. Turn temperature sender (1) counter-clockwise and remove from engine. Plug hole in engine.

INSTALLATION:

1. INSTALL TEMPERATURE SENDER (1).
 - a. Remove plug and screw temperature sender (1) into engine.
 - b. Remove tag and connect electrical connector(s) to temperature sender (1).
2. CONNECT GROUND CABLE AT SHUNT. (REFER TO PAGE 8-109.)
3. START ENGINE. CHECK FOR PROPER OPERATION OF AFFECTED COMPONENT. (REFER TO TM 5-3810-306-10.)



END OF TASK

DCA PULSE TACH SENDER REPLACEMENT

TOOLS: General mechanic's tool kit: automotive (5180-00-177-7033)

SUPPLIES: None

EQUIPMENT CONDITIONS: Right engine access door open.
 Engine cool to touch.
 Disconnect ground cable at shunt. (Refer to page 8-109.)

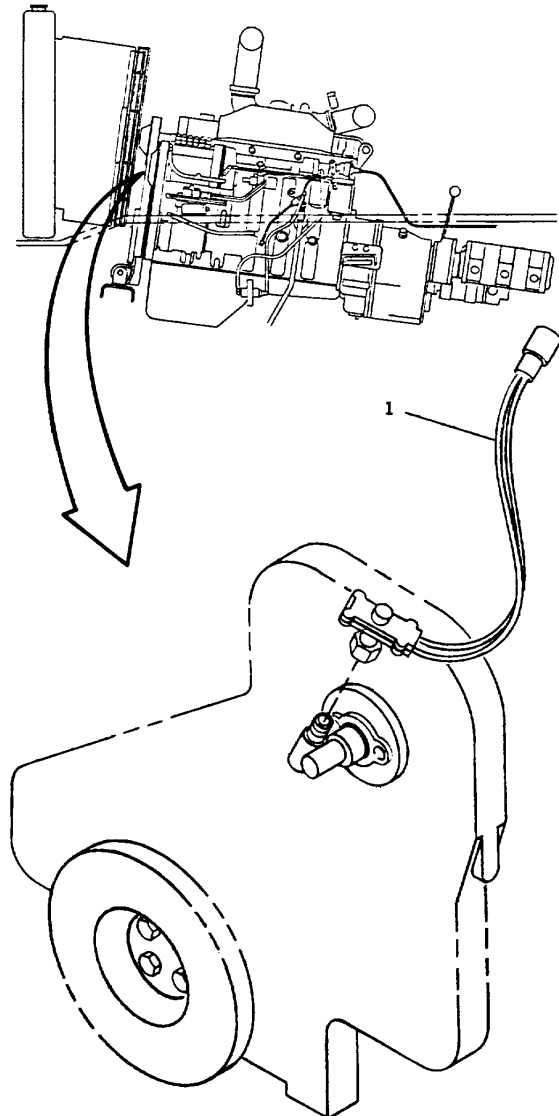
REMOVAL:

1. REMOVE PULSE TACH SENDER (1).
 - a. Tag and disconnect electrical connector(s) to pulse tach sender (1).
 - b. Turn pulse tach sender (1) counter-clockwise and remove from engine. Plug hole in engine.

INSTALLATION:

1. INSTALL PULSE TACH SENDER (1).
 - a. Remove plug and screw pulse tach sender (1) into engine.
 - b. Remove tag and connect electrical connector(s) to pulse tach sender (1).
2. CONNECT GROUND CABLE AT SHUNT. (REFER TO PAGE 8-109.)
3. START ENGINE. CHECK FOR PROPER OPERATION OF AFFECTED COMPONENT. (REFER TO TM 5-3810-306-10.)

END OF TASK



COLD START TEMPERATURE SWITCH REPLACEMENT

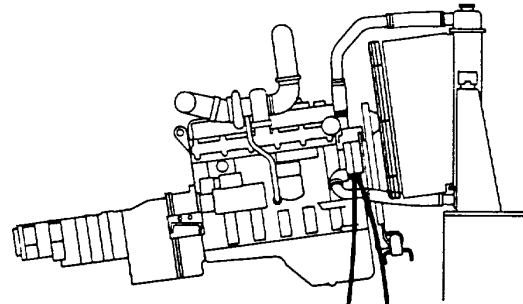
TOOLS: General mechanic's tool kit: automotive (5180-00-177-7033)

SUPPLIES: None

EQUIPMENT CONDITIONS: Left engine access door open.
 Engine cool to touch.
 Disconnect ground cable at shunt. (Refer to page 8-109.)

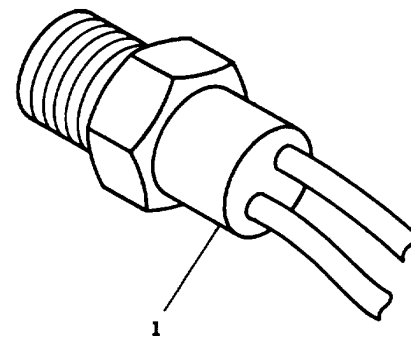
REMOVAL:

1. REMOVE TEMPERATURE SWITCH (1).
 - a. Tag and disconnect electrical connector(s) to temperature switch (1).
 - b. Turn temperature switch (1) counter-clockwise and remove from engine. Plug hole in engine.



INSTALLATION:

1. INSTALL TEMPERATURE SWITCH (1).
 - a. Remove plug and screw temperature switch (1) into engine.
 - b. Remove tag and connect electrical connector(s) to temperature switch (1).
2. CONNECT GROUND CABLE AT SHUNT. (REFER TO PAGE 8-109.)
3. START ENGINE. CHECK FOR PROPER OPERATION OF AFFECTED COMPONENT. (REFER TO TM 5-3810-306-10.)



END OF TASK

DC POWER RELAY REPLACEMENT

TOOLS: General mechanic's tool kit: automotive (5180-00-177-7033)

SUPPLIES: Lockwashers (Item 2, Appendix C) (2 Required)

EQUIPMENT CONDITIONS: Left engine access door open.
 Engine cool to touch.
 Disconnect ground cable at shunt. (Refer to page 8-109.)

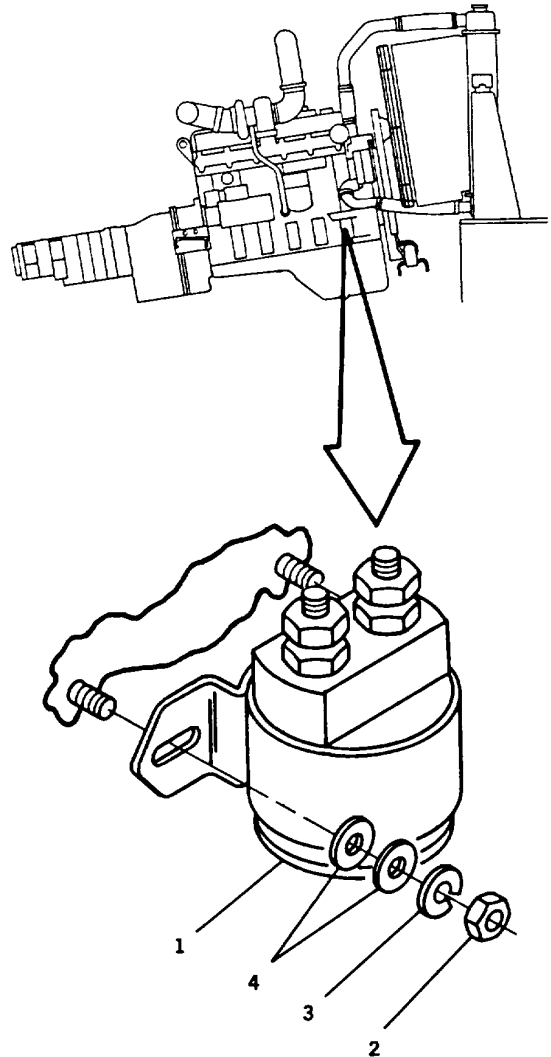
REMOVAL:

1. REMOVE DC POWER RELAY (1).
 - a. Tag and disconnect electrical connector(s) to DC power relay (1).
 - b. Remove two nuts (2), lockwashers (3), flatwashers (4) and DC power relay (1). Discard lockwashers (3).

INSTALLATION:

1. INSTALL DC POWER RELAY (1).
 - a. Install DC power relay (1) and secure with two flatwashers (4) new lockwashers (3) and nuts (2).
 - b. Remove tag and connect electrical connector(s) to DC power relay (1).
2. CONNECT GROUND CABLE AT SHUNT. (REFER TO PAGE 8-109.)
3. START ENGINE. CHECK FOR PROPER OPERATION OF AFFECTED COMPONENT. (REFER TO TM 5-3810-306-10.)

END OF TASK



DCA PRESSURE DIFFERENTIAL TRANSDUCER

TOOLS: General mechanic's tool kit: automotive (5180-00-177-7033)

SUPPLIES: Lockwashers (Item 2, Appendix C) (2 Required)

EQUIPMENT CONDITIONS: Right engine access door open.
 Engine cool to touch.
 Disconnect ground cable at shunt. (Refer to page 8-109.)

REMOVAL:

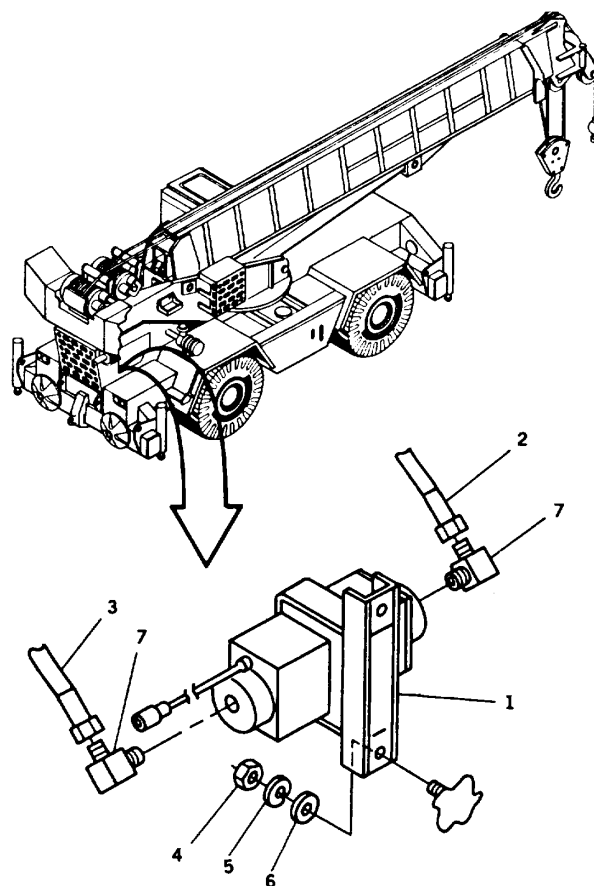
1. REMOVE PRESSURE TRANSDUCER (1).
 - a. Tag and disconnect electrical connector(s) to pressure transducer (1).
 - b. Remove hoses (2) and (3) connected to pressure transducer (1). Cap hoses.
 - c. Remove two nuts (4), lockwashers (5), flatwashers (6) and pressure transducer (1). Discard lockwashers (5).
 - d. Remove elbows (7).

2. CONNECT GROUND CABLE AT SHUNT. (REFER TO PAGE 8-109.)
3. START ENGINE. CHECK FOR PROPER OPERATION OF AFFECTED COMPONENT. (REFER TO TM 5-3810-306-10.)

END OF TASK

INSTALLATION:

1. INSTALL PRESSURE TRANSDUCER (1).
 - a. Install elbows (7) in pressure transducer (1).
 - b. Install pressure transducer and secure with two flatwashers (6), new lockwashers (5) and nuts (4).
 - c. Remove caps and install hoses (2) and (3) to pressure transducer (1).
 - d. Remove tag and connect electrical connector(s) to pressure transducer (1).



FUEL SHUTOFF SOLENOID INSTALLATION

TOOLS: General mechanic's tool kit: automotive (5180-00-177-7033)

SUPPLIES: None

EQUIPMENT CONDITIONS: Disconnect ground cable at shunt. (Refer to page 8-109.)

REMOVAL:

1. REMOVE FUEL SHUTOFF SOLENOID (1).
 - a. Tag and disconnect electrical connector(s) to fuel shutoff solenoid (1).
 - b. Remove two capscrews (2) securing solenoid (1) to mounting bracket (3).

INSTALLATION:

1. INSTALL FUEL SHUTOFF SOLENOID (1).
 - a. Position solenoid (1) on mounting bracket (3) and secure with two capscrews (2).
 - b. Connect tagged electrical connectors (4).
2. CONNECT GROUND CABLE AT SHUNT. (REFER TO PAGE 8-109.)
3. START ENGINE. CHECK FOR PROPER OPERATION OF AFFECTED COMPONENT. (REFER TO TM 5-3810-306-10.)

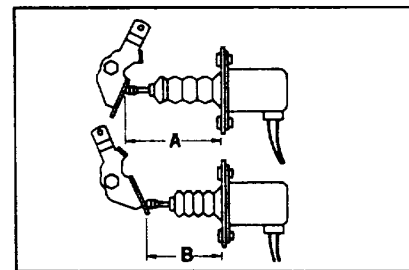
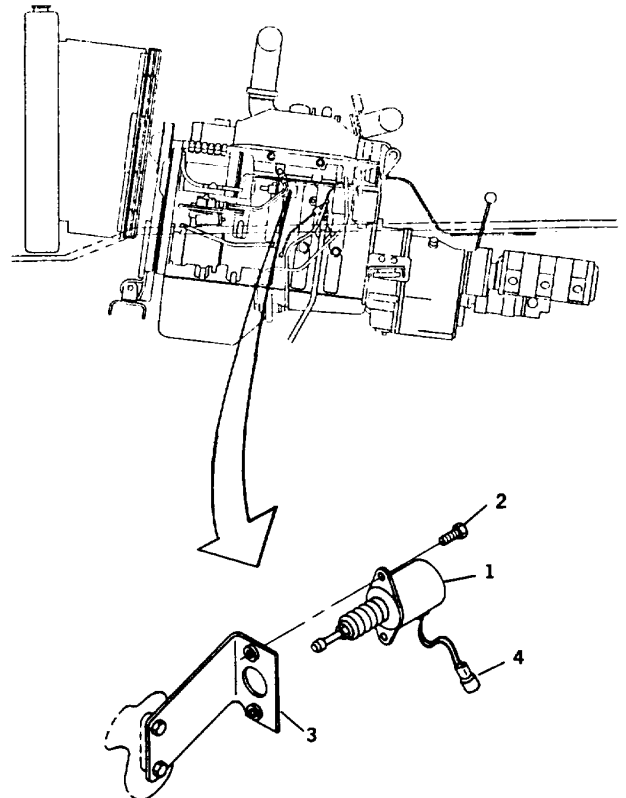
ADJUSTMENT:

1. ACTIVATE SWITCH AND CHECK PLUNGER TRAVEL.

A = 3.4 inch (86.6 mm)

B = 2.4 inch (60.2 mm)
2. ADJUST AS NECESSARY.

END OF TASK



REAR WHEELS NOT CENTERED SWITCH

TOOLS: General mechanic's tool kit: automotive (5180-00-177-7033)

SUPPLIES: Lockwashers (Item 15, Appendix C) (2 Required)

EQUIPMENT CONDITIONS: Disconnect ground cable at shunt. (Refer to page 8-109.)

REMOVAL:

- 1. REMOVE REAR WHEELS NOT CENTERED SWITCH (1).
 - a. Tag and disconnect electrical wires to switch (1)

NOTE

Note number of threads exposed below nut (2) for initial setting of switch (1) on installation

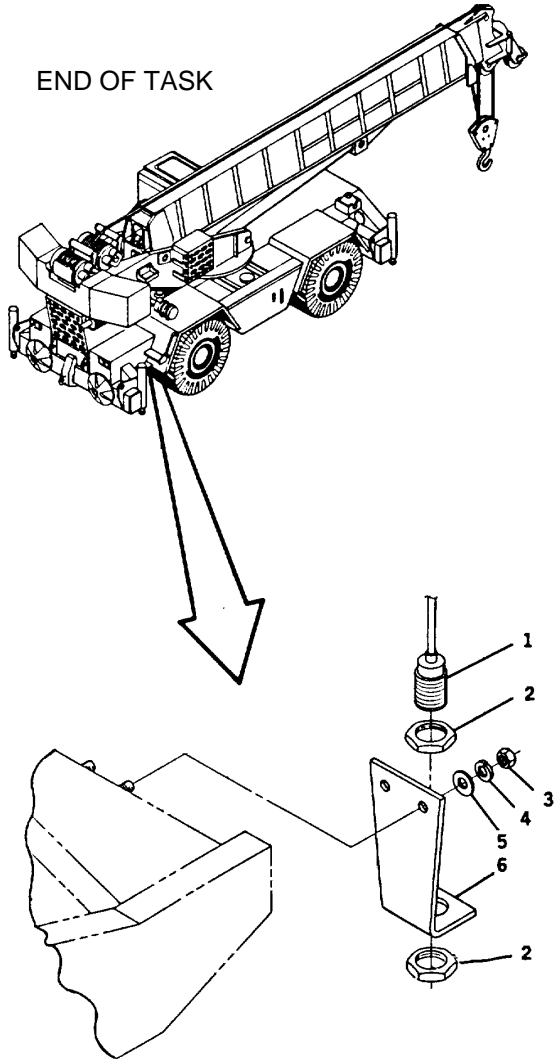
- b. Remove bottom nut (2) and switch (1) from mounting bracket (6).
- c. If necessary, remove nuts (3), lockwashers (4), flat washers (5) and mounting bracket (6). Discard lockwashers (4).

INSTALLATION:

- 1. INSTALL REAR WHEELS NOT CENTERED SWITCH (!).
 - a. If removed, install mounting bracket (6) with flatwashers (5), new lockwashers (4) and nuts (3).
 - b. Install switch (1) in mounting bracket (6) with nuts (2). Adjust nuts (2) to expose same number of threads noted on removal.
- 2. CONNECT GROUND CABLE AT SHUNT. (REFER TO PAGE 8-109.)

- 3. START ENGINE AND CHECK FOR PROPER OPERATION OF SWITCH (1). (REFER TO TM 5-3810-306-10.)
- 4. ADJUST AND TIGHTEN NUTS (2) AS NECESSARY

END OF TASK



ELEVATION SWING WARNING SWITCH INSTALLATION

TOOLS: General mechanic's tool kit: automotive (5180-00-177-7033)

SUPPLIES: Lockwasher (Item 7, Appendix C)

EQUIPMENT CONDITIONS: Boom fully elevated.
Disconnect ground cable at shunt. (Refer to page 8-109.)

REMOVAL:

1. REMOVE ELEVATION SWING WARNING SWITCH (1).

- a. Remove screws (2) and cover (3) from switch (1).
- b. Tag and disconnect electrical wires inside switch (1).
- c. Loosen outer nut on strain relief (4) and pull electrical wires out of switch (1).
- d. Remove screws (5), lockwashers (6) and switch (1) from boom pivot box. Discard lockwashers (6)

2. LOOSEN HEX HEAD SCREW (7) AND REMOVE 306-10.) ARM (8) FROM SWITCH (1). RETAIN ARM (8) FOR INSTALLATION.

3. REMOVE STRAIN RELIEF (4) FROM SWITCH (1) AND RETAIN FOR INSTALLATION.

INSTALLATION:

1. INSTALL STRAIN RELIEF (4) IN SWITCH (1).

2. INSTALL ARM (8) ON SWITCH (1). DO NOT TIGHTEN HEX SCREW (7) AT THIS TIME.

3. INSTALL ELEVATION SWING WARNING SWITCH (1).

- a. Install switch (1) on boom pivot box with screws (5) and new lockwashers (6).

b. Loosen outer nut on strain relief (4) and insert electrical wires through strain relief (4) into switch (1).

- c. Connect electrical wire insides switch (1).as tagged.

- d. Install cover (3) on switch (1) with screws (2).

4. CONNECT GROUND CABLE AT SHUNT. (REFER TO PAGE 8-109.)

5. ADJUST SWITCH (1).

ADJUSTMENT:

1. ADJUST ELEVATION SWING WARNING SWITCH (1).

- a. Start crane and lower boom to 10 degrees. (Refer to TM 5-3810-306-10)

- b. Rotate arm (8) on switch (1) until roller on arm contacts turntable support plate. Tighten hex screw (7).

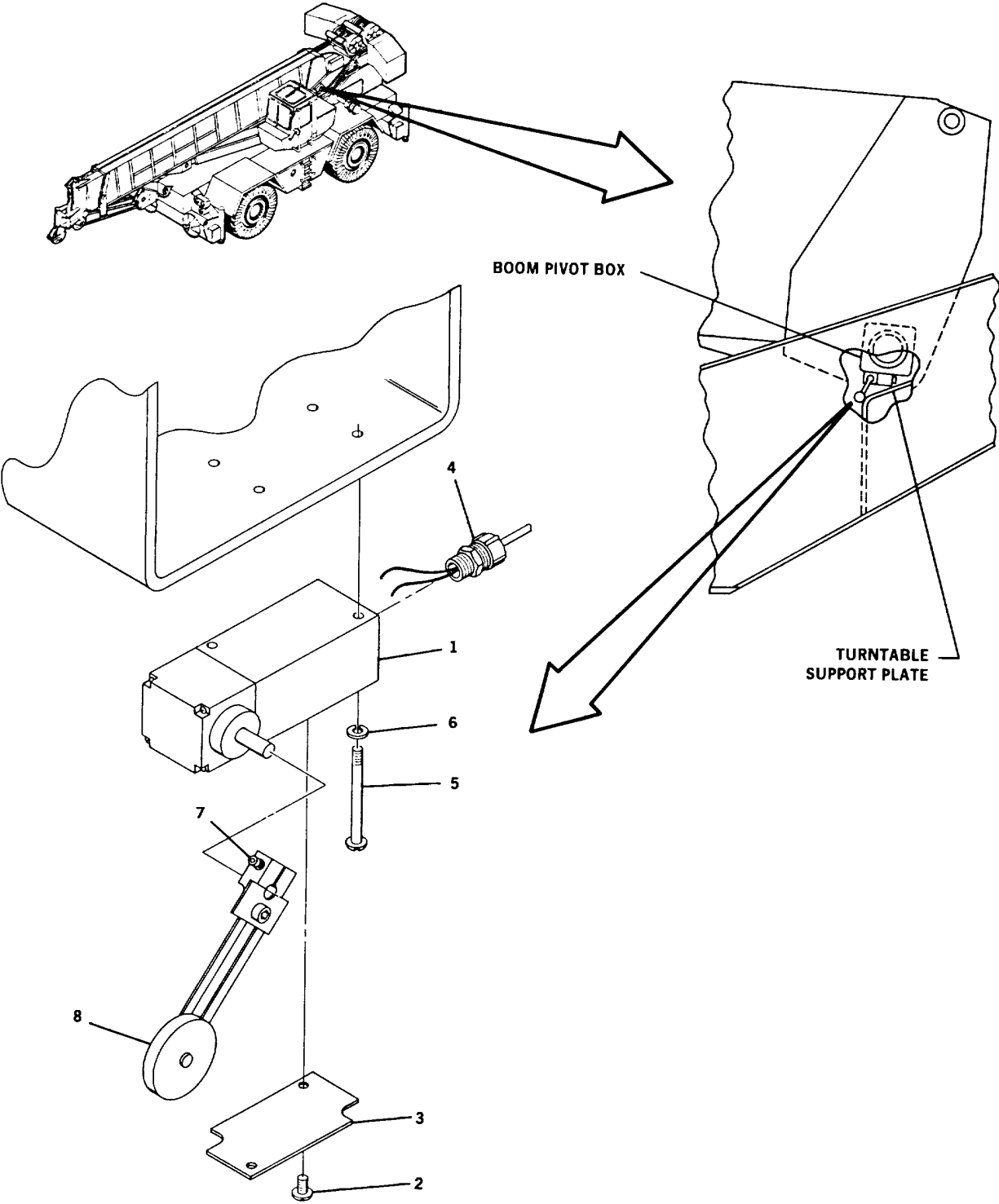
- c. Elevate boom to 20 degrees and rotate boom over rear of crane.

- d. Lower boom slowly, boom elevation swing warning light in cab should illuminate when boom is approximately 7.5 degrees above horizontal.

- e. With warning light activated and boom at approximately 7.5 degrees, check that clearance between lift cylinder and engine hood is a minimum of 3 in. (7.62 cm)

- f. Adjust arm (8) on switch (1) to obtain requirements.

END OF TASK



AREA DEFINITION SWITCH

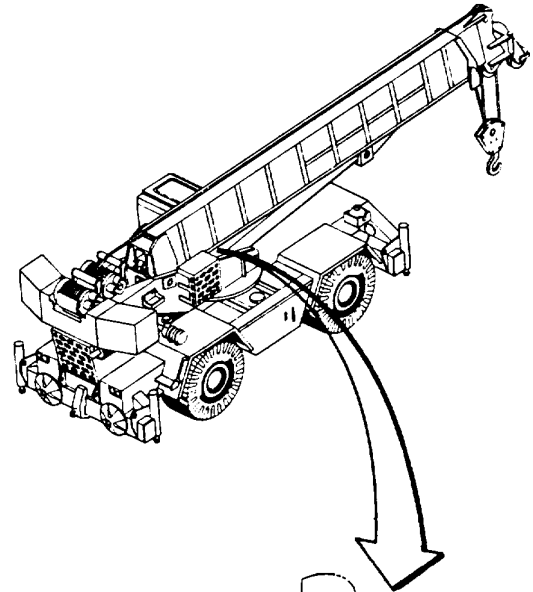
TOOLS: General mechanic's tool kit: automotive (5180-00-177-7033)

SUPPLIES: Lockwashers (Item 7, Appendix C) (2 Required)
Lockwashers (Item 2, Appendix C) (2 Required)

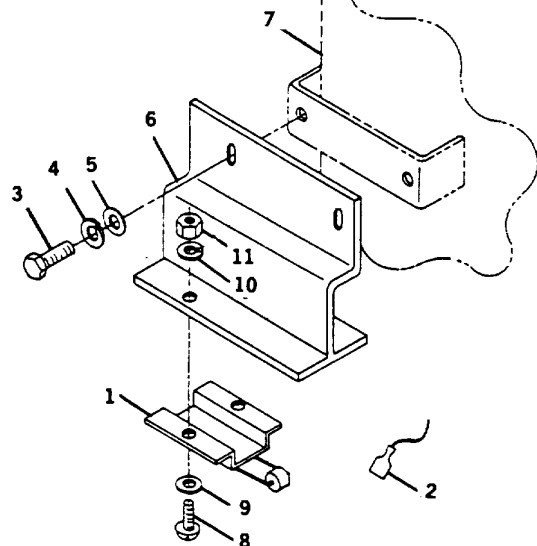
EQUIPMENT CONDITIONS: Boom raised allowing access to area definition switch. (Refer to TM 5-3810-306-10.)
Disconnect ground cable at shunt. (Refer to page 8-109.)

REMOVAL:

1. REMOVE AREA DEFINITION SWITCH (1) AND BRACKET (6).
 - a. Tag and disconnect electrical connectors (2) to area definition switch (1).
 - b. Remove capscrews (3), lockwashers (4) and flatwashers (5) securing bracket (6) to air/transmission swivel (7). Discard lockwashers (4).
 - c. Remove capscrews (8), flatwashers (9), lockwashers (10) and nuts (11) securing area definition switch (1) to bracket (6). Discard lockwashers (10).
 - d. Remove area switch definition (1).

**INSTALLATION:**

1. INSTALL AREA DEFINITION SWITCH (1) AND BRACKET (6).
 - a. Align area definition switch (1) with bracket (6) holes and secure with capscrews (8), flatwashers (9), new lockwashers (10) and nuts (11).



- b. Align switch bracket (6) to air/transmission swivel (7) and secure with capscrews (3), new lockwashers (4) and flatwashers (5) hand tight.
- c. Remove tags and connect electrical connectors (2) to area definition switch (1).

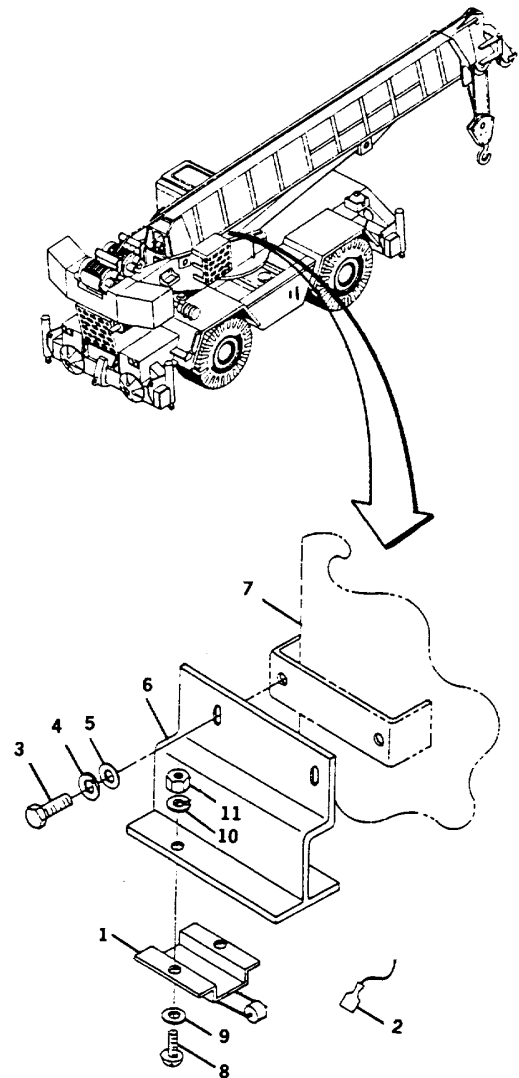
2. CONNECT GROUND CABLE AT SHUNT. (REFER TO PAGE 8-109.)

ADJUSTMENT:

- 1. ADJUST AREA DEFINITION SWITCH.
 - a. Position boom over either side of crane. (Refer to TM 5-3810306-10.)
 - b. Lower boom to 7.5 degrees.
 - c. Shutdown crane.
 - d. Position ignition switch to ON.
 - e. Move area definition switch (1) and bracket down until switch contacts cam as indicated by sounding and illumination of warning in cab.
 - f. Tighten capscrews.

2. START ENGINE AND CHECK SWITCH OPERATION. (REFER TO TM 5-3810-30610.)

END OF TASK



EMERGENCY STEER OIL PRESSURE SWITCH REPLACEMENT

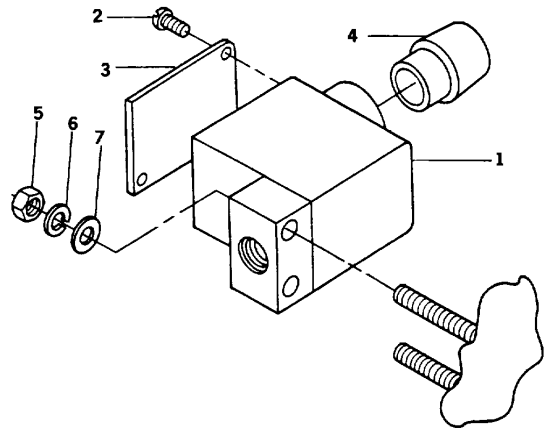
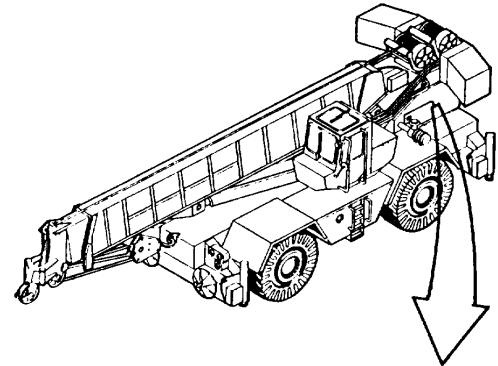
TOOLS: General mechanic's tool kit: automotive (5180-00-177-7033)

SUPPLIES: Lockwashers (Item 2, Appendix C) (2 Required)

EQUIPMENT CONDITIONS: Left engine access door open.
Disconnect ground cable at shunt. (Refer to page 8-109.)

REMOVAL:

1. REMOVE OIL PRESSURE SWITCH (1).
 - a. Remove screws (2) and cover (3) from switch (1).
 - b. Tag and disconnect electrical wire inside switch (1).
 - c. Loosen outer nut on strain relief (4) and pull electrical wires out of switch (1).
 - d. Remove two nuts (5), lockwashers (6), washers (7) and switch from frame mounting. Discard lockwashers (6).
 - e. Unscrew switch (1) from elbow. Plug elbow.



INSTALLATION:

1. INSTALL OIL PRESSURE SWITCH (1).
 - a. Screw switch (1) onto elbow.
 - b. Install switch (1) on mounting studs with two washers (7), new lockwashers (6) and nuts (5).
 - c. Loosen outer nut on strain relief (4) and insert electrical wire through strain relief (4) into switch (1). Tighten outer nut.
 - d. Connect electrical wires inside switch (1) as tagged.

- e. Install cover (3) on switch (1) with screws (2).

2. CONNECT GROUND CABLE AT SHUT. (REFER TO PAGE 8-109.)

END OF TASK

HYDRAULIC OIL COOLER TEMPERATURE CONTROL SWITCH REPLACEMENT

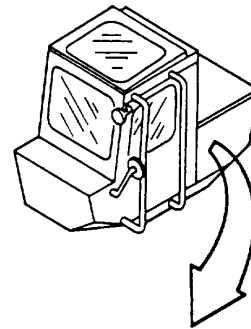
TOOLS: General mechanic's tool kit: automotive (5180-00-177-7033)

SUPPLIES: None

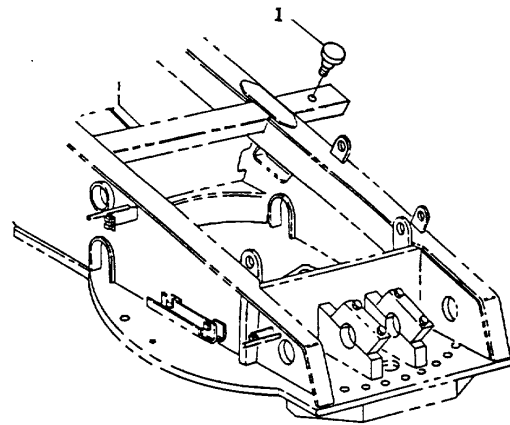
EQUIPMENT CONDITIONS: Disconnect ground cable at shunt. (Refer to page 8-109.)

REMOVAL:

1. REMOVE OIL COOLER TEMPERATURE CONTROL SWITCH (1).
 - a. Tag and disconnect electrical connector(s) to temperature switch (1).
 - b. Turn temperature switch (1) counter-clockwise and remove from return manifold. Plug hole in return manifold.

**INSTALLATION:**

1. INSTALL OIL COOLER TEMPERATURE CONTROL SWITCH (1).
 - a. Remove plug and screw temperature switch (1) into return manifold.
 - b. Remove tag and connect electrical connector(s) to temperature switch (1).
2. CONNECT GROUND CABLE AT SHUNT. (REFER TO PAGE 8-109.)



END OF TASK

BACK-UP LIGHT OIL PRESSURE SWITCH REPLACEMENT

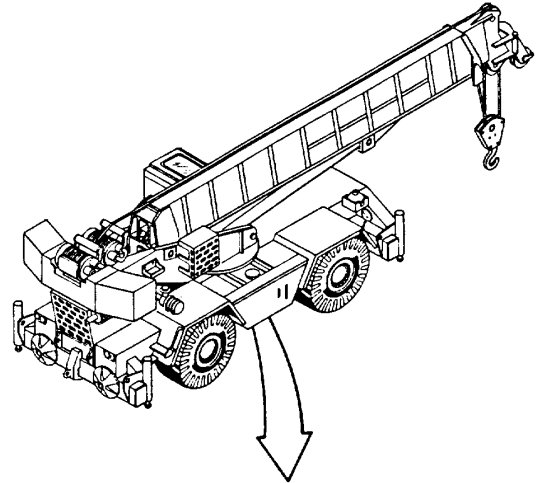
TOOLS: General mechanic's tool kit: automotive (5180-00-177-7033)

SUPPLIES: None

EQUIPMENT CONDITIONS: Disconnect ground cable at shunt. (Refer to page 8-109.)

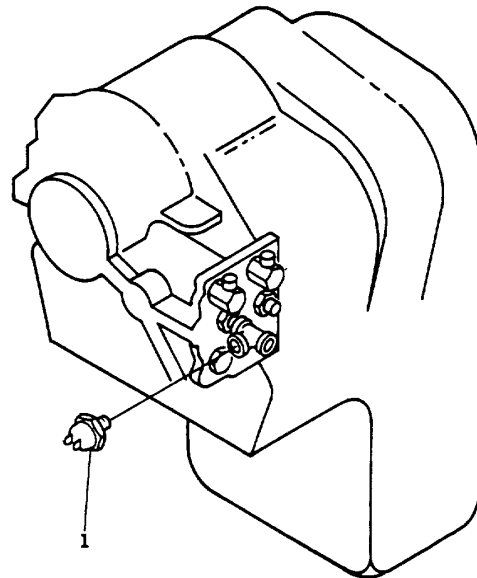
REMOVAL:

1. REMOVE OIL PRESSURE SWITCH (1).
 - a. Tag and disconnect electrical connector(s) to oil pressure switch (1).
 - b. Turn oil pressure switch (1) counter-clockwise and remove from elbow on transmission shifter connection plate. Plug elbow.



INSTALLATION:

1. INSTALL OIL PRESSURE SWITCH (1).
 - a. Remove plug and screw oil pressure switch into elbow on transmission shifter connection plate.
 - b. Remove tag and connect electrical connector(s) to oil pressure switch (1).
2. CONNECT GROUND CABLE AT SHUNT. (REFER TO PAGE 8-109.).



END OF TASK

FUEL FILTER CABLE ASSEMBLY

TOOLS: General mechanic's tool kit: automotive (5180-00-177-7033)

SUPPLIES: None

EQUIPMENT CONDITIONS: Disconnect ground cable at shunt. (Refer to page 8-109.)

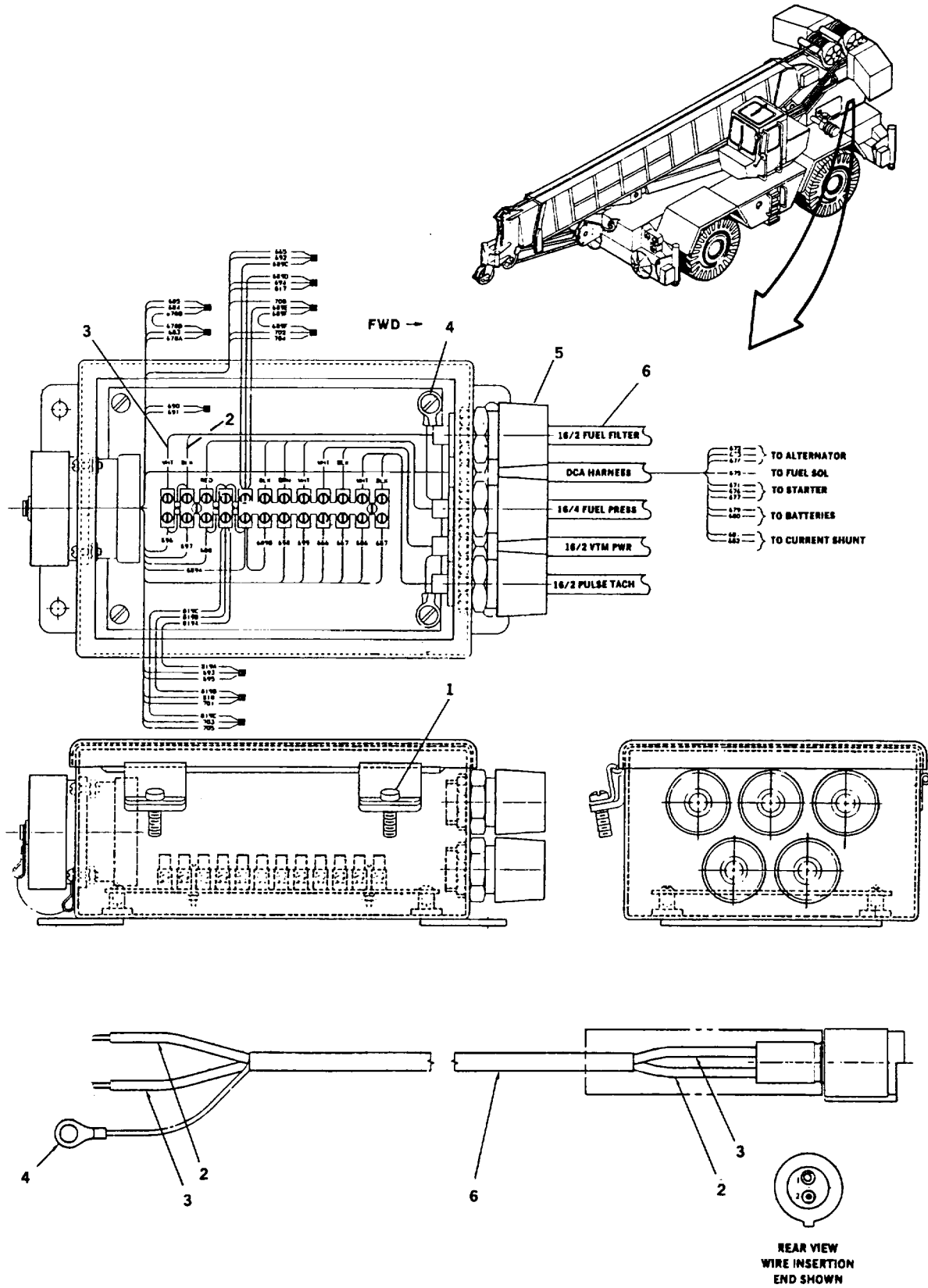
REMOVAL:

1. REMOVE FUEL FILTER CABLE (6).
 - a. Open DCA box cover by loosening retaining screws (1).
 - b. Tag and disconnect black (2) and white (3) wires from terminal strip.
 - c. Remove grounding wire (4).
 - d. Loosen strain relief fitting (5), removing cable (6) from DCA box.
 - e. Remove opposite end cable from fuel filter pressure switch.
 - e. Connect ground wire (4).
 - f. Secure DCA box cover.
2. CONNECT GROUND CABLE AT SHUNT (REFER TO PAGE 8-109.)
3. PERFORM STE/ICE TEST TO CHECK FOR PROPER OPERATION. (REFER TO PAGE 3-57.).

END OF TASK

INSTALLATION:

1. INSTALL FUEL FILTER CABLE (6).
 - a. Connect socket end of cable (6) onto fuel filter pressure switch.
 - b. Route cable through cable clamps.
 - c. Route cable (6) through strain relief fitting (5) on DCA box and connect tagged wires (2) and (3).
 - d. Tighten strain relief fitting (5).



FUEL PRESSURE CABLE ASSEMBLY

TOOLS: General mechanic's tool kit: automotive (5180-00-177-7033)

SUPPLIES: None

EQUIPMENT CONDITIONS: Disconnect ground cable at shunt. (Refer to page 8-109.)

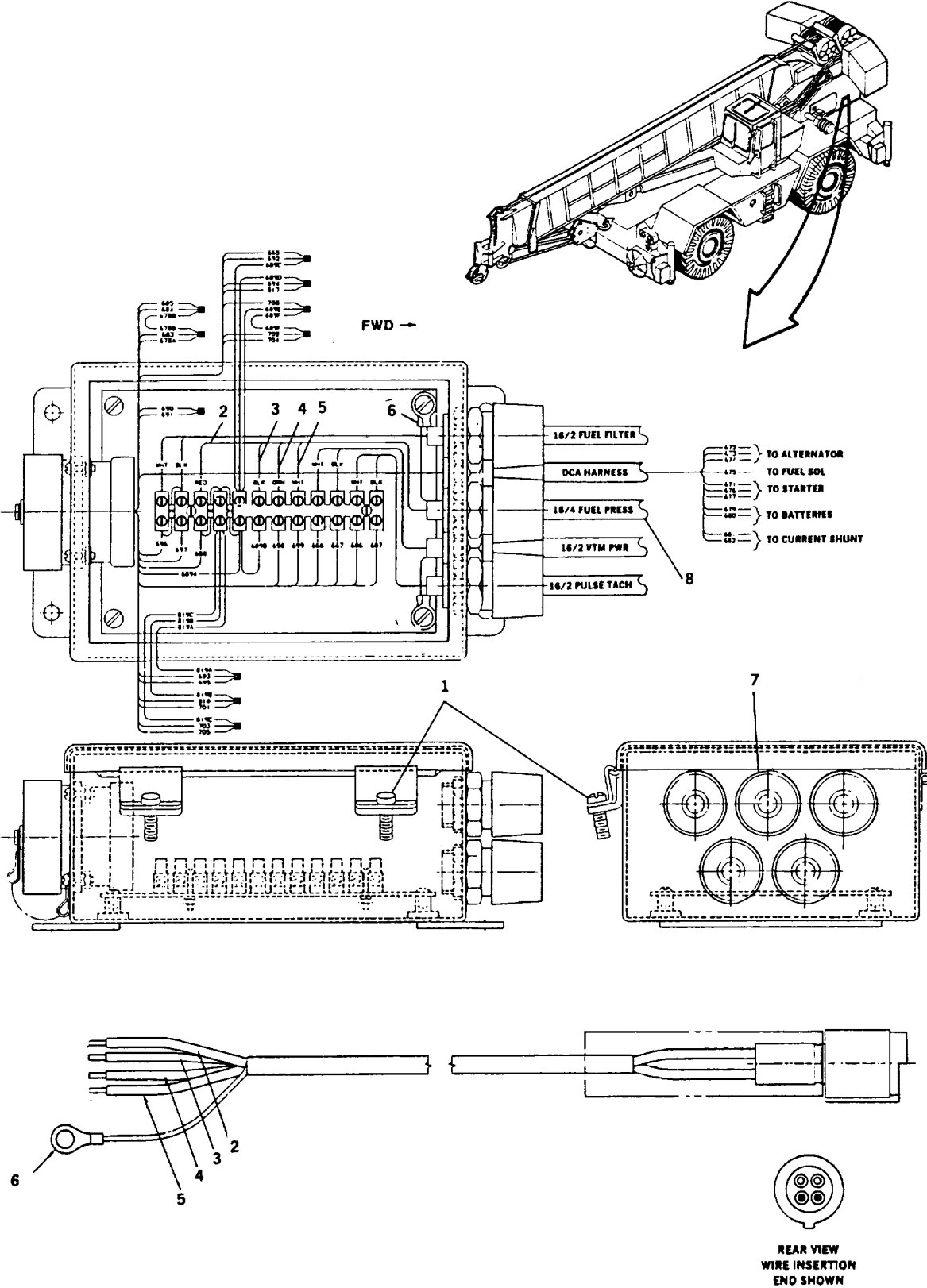
REMOVAL:

1. REMOVE FUEL PRESSURE CABLE (8).
 - a. Open DCA box cover by loosening retaining screws (1)
 - b. Tag and disconnect red (2), black (3), green (4) and white (5) from terminal strip.
 - c. Remove grounding wire (6).
 - d. Loosen strain relief fitting (7), remove cable from box.
 - e. Remove opposite end of cable (8) from fuel supply pressure transducer.
2. CONNECT GROUND CABLE AT SHUNT. (REFER TO PAGE 8-109.)
3. PERFORM STE/ICE TEST TO CHECK FOR PROPER OPERATION. (REFER TO PAGE 3-57).

END OF TASK

INSTALLATION:

1. INSTALL FUEL PRESSURE CABLE (8).
 - a. Connect socket end of cable (8) onto fuel supply pressure transducer cable.
 - b. Route cable through cable clamps.
 - c. Route cable through strain relief fitting (7) on DCA box and connect tagged wires (2), (3), (4) and 5).
 - d. Tighten strain relief fitting (7).
 - e. Connect ground wire (6).
 - f. Secure DCA box cover.



PULSE TACH CABLE ASSEMBLY

TOOLS: General mechanic's tool kit: automotive (5180-00-177-7033)

SUPPLIES: None

EQUIPMENT CONDITIONS: Disconnect ground cable at shunt. (Refer to page 8-109.)

REMOVAL:

1. REMOVE PULSE TACHOMETER CABLE (6).
 - a. Open DCA box cover by loosening retaining screws (1).
 - b. Tag and disconnect black (2) and 3-57.) white (3) wires from terminal strip.
 - c. Remove grounding wire (4).
 - d. Loosen strain relief fitting (5), remove cable (6) from DCA box.
 - e. Remove opposite end of cable from pulse tachometer.
2. CONNECT GROUND CABLE AT SHUNT. (REFER TO PAGE 8-109.)
3. PERFORM STE/ICE TEST TO CHECK FOR PROPER OPERATION. (REFER TO PAGE 3-57).

END OF TASK

INSTALLATION:

1. INSTALL PULSE TACHOMETER CABLE (6).
 - a. Connect socket end of cable (6) onto pulse tachometer.
 - b. Route cable through cable clamps.
 - c. Route cable through strain relief fitting on DCA box and connect tagged wires (2) and (3).
 - d. Tighten strain relief fitting (5).
 - e. Connect ground wire (4).
 - f. Secure DCA box cover.

VTM POWER CABLE HARNESS

TOOLS: General mechanic's tool kit: automotive (5180-00-177-7033)

SUPPLIES: None

EQUIPMENT CONDITIONS: Disconnect ground cable at shunt. (REFER TO PAGE 8-109.)

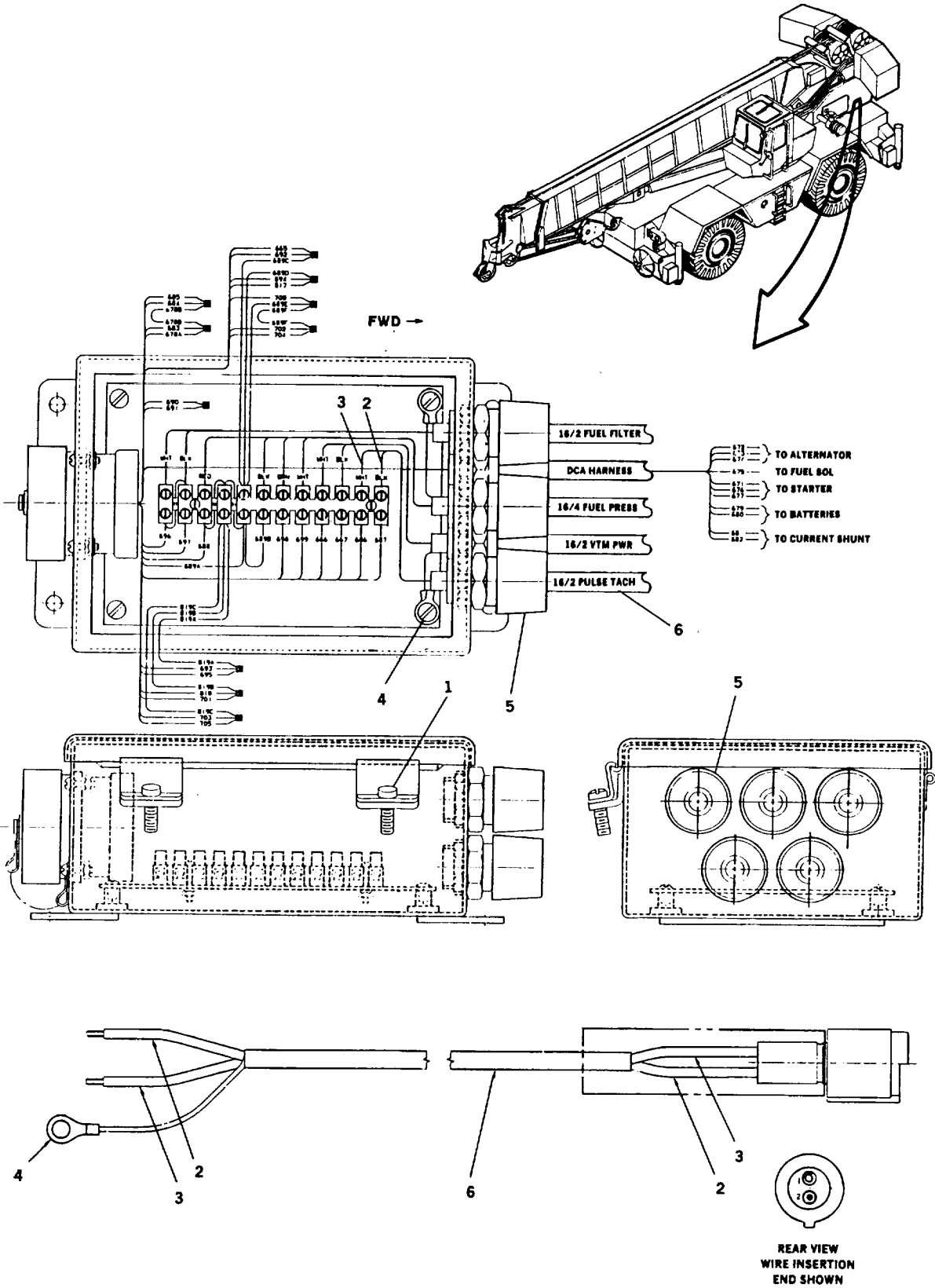
REMOVAL:

1. REMOVE VTM POWER CABLE ARNESS (6).
 - a. Tag and disconnect black (1) and white (2) wires located in battery box.
 - b. Open DCA box cover by loosening retaining screws (3).
 - c. Tag and disconnect black (1) and white (2) wires from terminal strip.
 - d. Remove grounding wire (4).
 - e. Loosen strain relief fitting (5) and remove cable from DCA box.
2. CONNECT GROUND CABLE AT SHUNT. (REFER TO PAGE 8-109.)
3. PERFORM STE/ICE TEST TO CHECK FOR PROPER OPERATION. (REFER TO PAGE 3-57).

END OF TASK

INSTALLATION:

1. INSTALL VTM POWER CABLE HARNESS (6).
 - a. Route cable through cable clamps.
 - b. Route cable through strain relief fitting (5) in DCA box and connect tagged wires (1) and (2).
 - c. Tighten strain relief fitting (5).
 - d. Connect grounding wire (4).
 - e. Connect opposite ends of tagged wires in battery box.
 - f. Secure DCA box cover.



CARRIER HARNESS

TOOLS: General mechanic's tool kit: automotive (5180-00-177-7033)

SUPPLIES: None

EQUIPMENT CONDITIONS: Disconnect ground cable at shunt. (Refer to page 8-109.)

REMOVAL:

1. REMOVE CARRIER HARNESS.

- a. Tag and disconnect wires at left and right tail lights.
- b. Tag and disconnect wires at left and right rear marker lights.
- c. Tag and disconnect wires at back-up alarm.
- d. Tag and disconnect wires at rear outrigger solenoids.
- e. Tag and disconnect wires at rear axle not centered switch.
- f. Tag and disconnect two engine harness connector plugs.
- g. Tag and disconnect black out lights harness connector plug.
- h. Tag and disconnect wires at transmission selector solenoid.
- i. Tag and disconnect wires at back-up light switch.
- j. Tag and disconnect three superstructure harness connector plugs at swivel.
- k. Tag and disconnect wires at fuel gauge sender.
- l. Tag and disconnect wires at air dryer.
- m. Tag and disconnect wires at rear axle oscillation lockout solenoid.

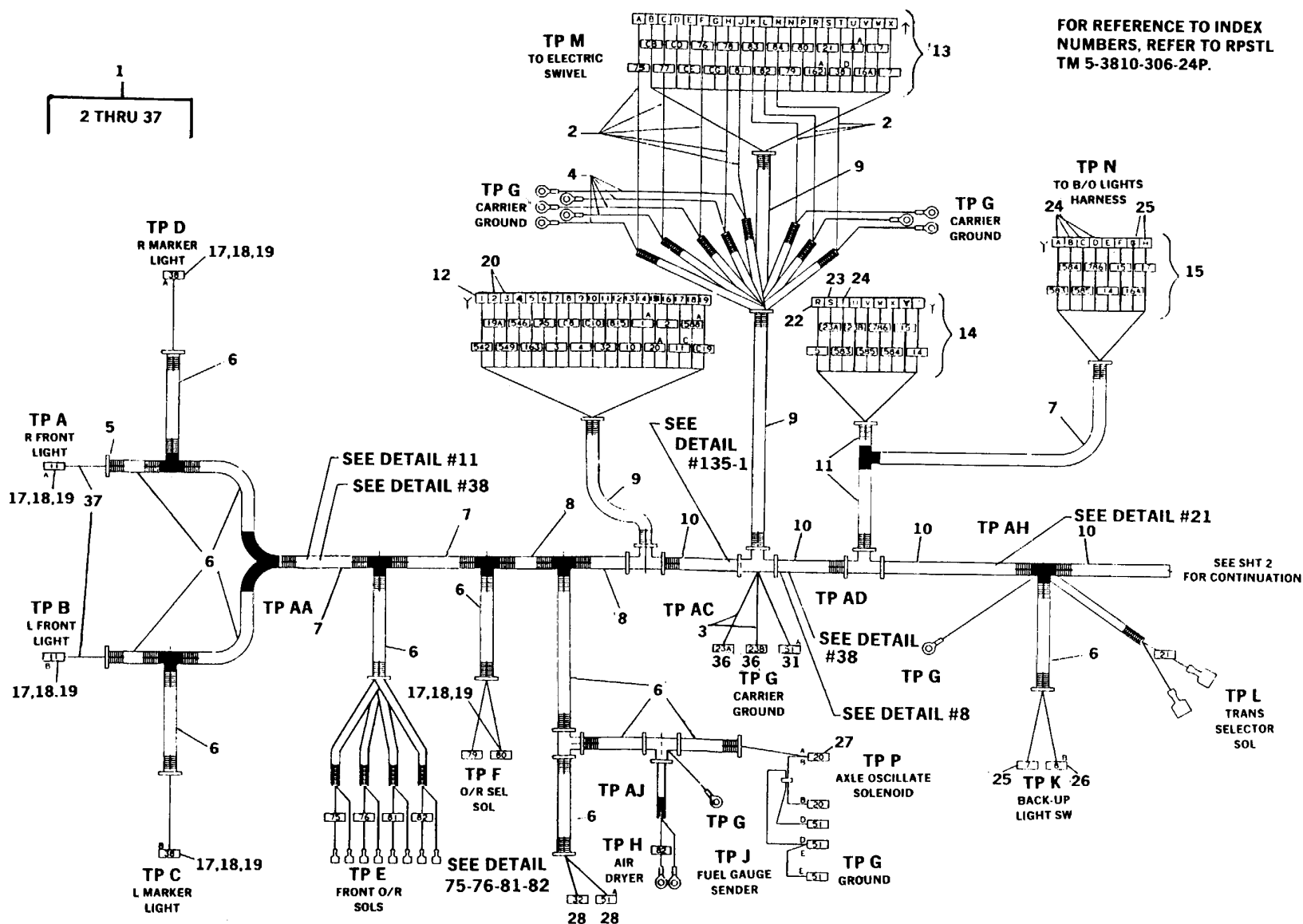
- n. Tag and disconnect wires at outrigger selector solenoid.
- o. Tag and disconnect wires at front outrigger solenoids.
- p. Tag and disconnect wires at left and right front marker lights.
- q. Tag and disconnect wires at left and right front headlights.
- r. Tag and disconnect all ground wires on carrier frame.
- s. Remove any tie straps and/or clamps securing harness to frame and remove carrier harness.

2. INSPECT CARRIER HARNESS FOR DAMAGE, AND REPLACE PARTS OR HARNESS AS REQUIRED.

INSTALLATION:

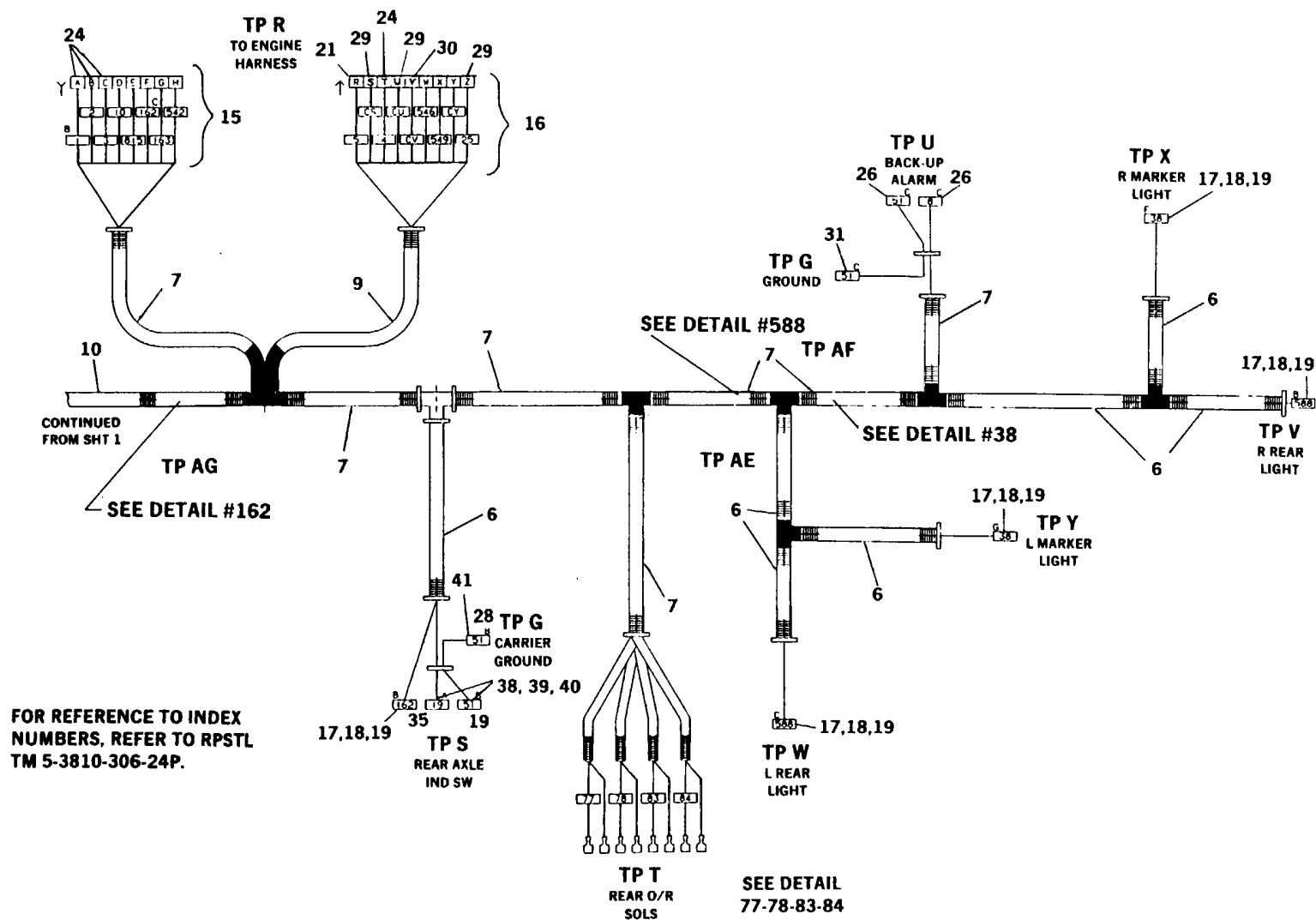
1. INSTALL CARRIER HARNESS.

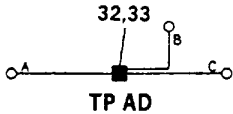
- a. Position carrier harness on frame and support by installing tie straps and/or clamps as required.
- b. Connect all ground wires to carrier frame as tagged.
- c. Connect wires to left and right front headlights as tagged.
- d. Connect wires to left and right front marker lights as tagged.



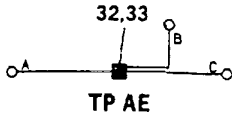
- e. Connect wires to front outrigger solenoids as tagged.
 - f. Connect wires to outrigger selector solenoid as tagged.
 - g. Connect wires to rear axle oscillation lockout solenoid as tagged.
 - h. Connect wires to air dryer as tagged.
 - i. Connect wires to fuel gauge sender as tagged.
 - j. Connect three superstructure harness connector plugs at swivel mount as tagged.
 - k. Connect wires to back-up light switch as tagged.
 - l. Connect wires to transmission selector solenoid as tagged.
 - m. Connect blackout lights harness connector plug as tagged.
 - n. Connect two engine harness connector plugs as tagged.
 - o. Connect wires to rear axle not centered switch as tagged.
 - p. Connect wires to rear outrigger solenoids as tagged.
 - q. Connect wires to back-up alarm as tagged.
 - r. Connect wires to left and right rear marker lights as tagged.
 - s. Connect wires to left and right rear tail lights as tagged.
 - t. Install more tie straps as may be necessary to support harness and prevent chafing.
2. CONNECT GROUND CABLE AT SHUNT. (REFER TO PAGE 8-109.)
 3. CHECK ELECTRICAL SYSTEM FOR PROPER OPERATION. (REFER TO TM 5-3810-30610.).

END OF TASK

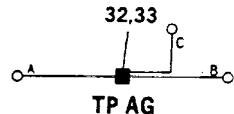




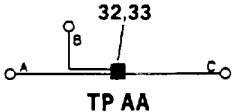
DETAIL #8



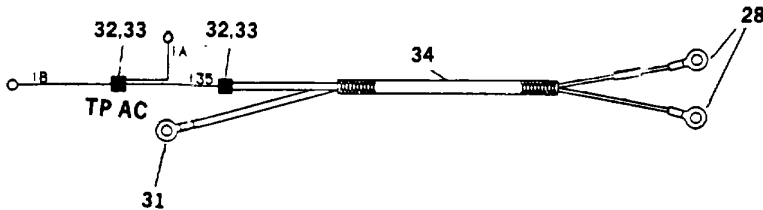
DETAIL #588



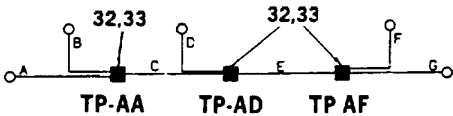
DETAIL #162



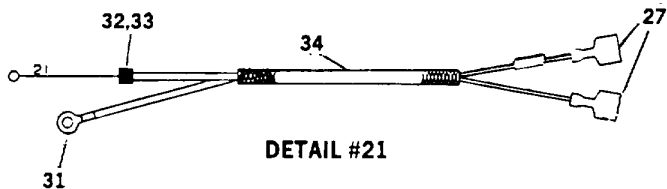
DETAIL #11



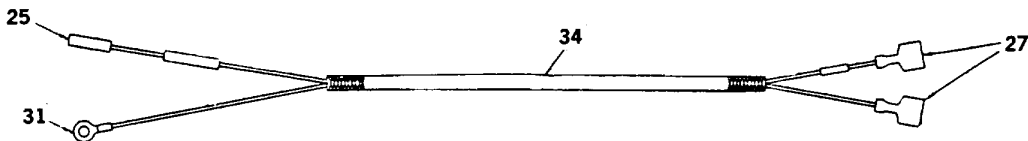
DETAIL #135-1



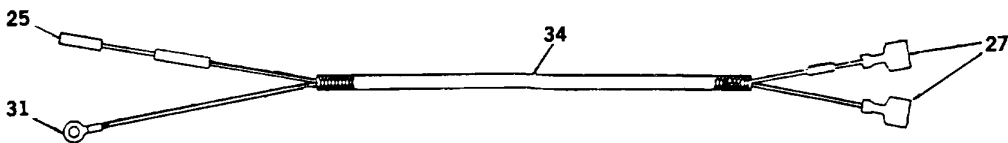
DETAIL #38



DETAIL #21



DETAIL #75-76-81-82



DETAIL #77-78-83-84

FOR REFERENCE TO INDEX
NUMBERS, REFER TO RPSTL
TM 5-3810-306-24P.

SUPERSTRUCTURE HARNESS

TOOLS: General mechanic's tool kit: automotive (5180-00-177-7033)

SUPPLIES: None

EQUIPMENT CONDITIONS: Disconnect ground cable at shunt. (Refer to page 8-109.)

REMOVAL

1. REMOVE SUPERSTRUCTURE HARNESS.

- a. Tag and disconnect connector plug at distribution panel harness connector.
- b. Tag and disconnect black ground wire and wire #5 from distribution panel.
- c. Tag and disconnect connector plug at cab interior harness connector.
- d. Tag and disconnect connector plug at side console harness connector.
- e. Tag and disconnect wire #21 from side console harness f. Tag and disconnect connector plug at left front console harness connector.
- g. Tag and disconnect connect plug at right front console harness connector.
- h. Tag and disconnect wires at neutral safety switch.
- i. Tag and disconnect wires at hydraulic oil cooler temperature switch.
- j. Tag and disconnect wires at hydraulic oil cooler by-pass solenoid.

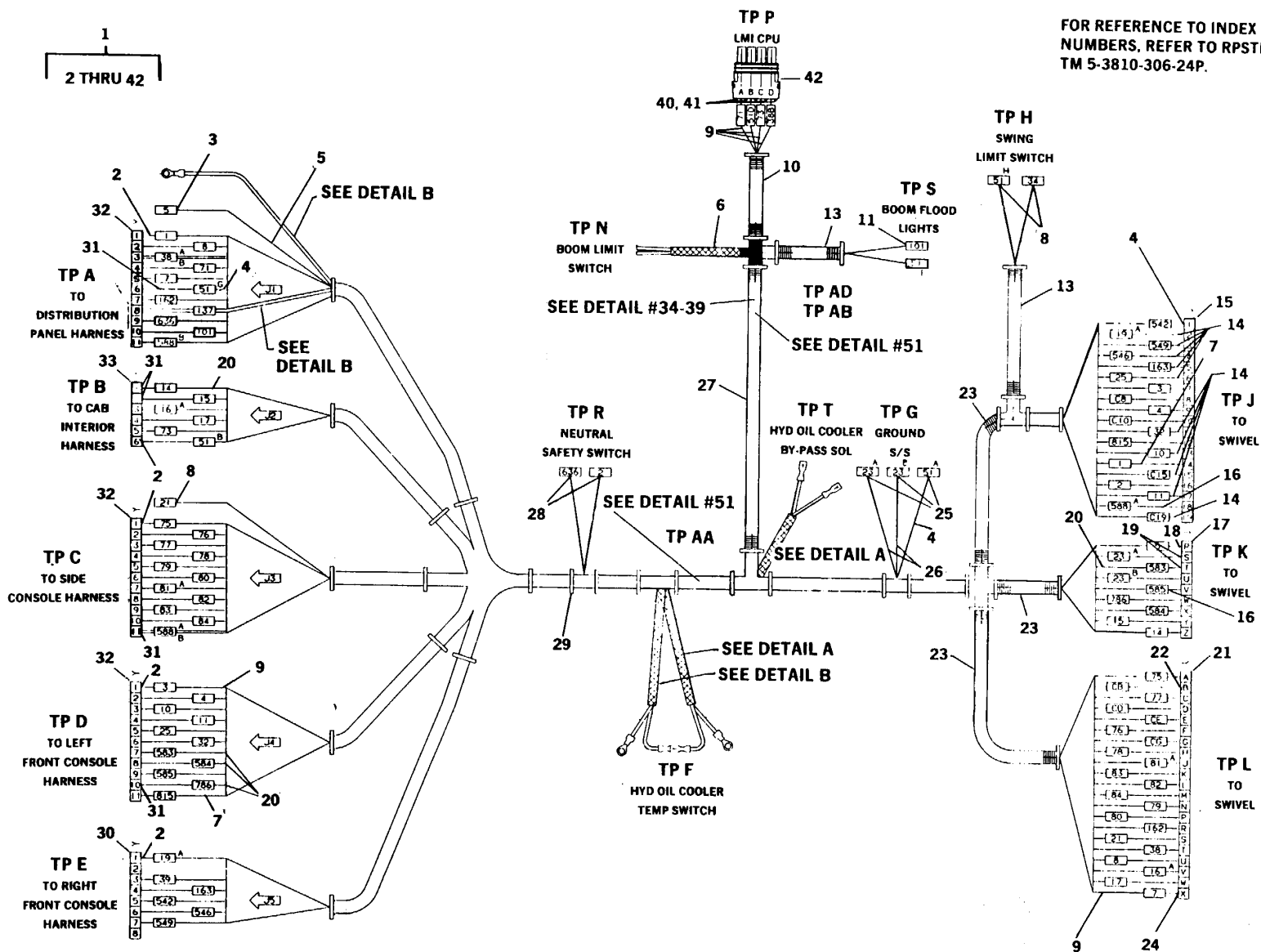
- k. Tag and disconnect wires at boom elevation limit switch.
- l. Tag and disconnect connector plug at load moment indicator central processing unit.
- m. Tag and disconnect wires at boom flood light harness.
- n. Tag and disconnect three connector plugs at swivel mount.
- o. Tag and disconnect wires at swing limit switch.
- p. Tag and disconnect all ground wires on superstructure frame.
- q. Remove tie straps and/or clamps securing harness to superstructure and remove superstructure harness.

2. INSPECT SUPERSTRUCTURE HARNESS FOR DAMAGE AND REPLACE PARTS OR HARNESS AS REQUIRED.

INSTALLATION:

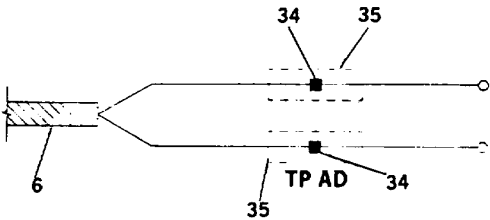
1. INSTALL SUPERSTRUCTURE HARNESS.

- a. Position superstructure harness and maintain in place with tiestraps and/or clamps as required.
- b. Connect all ground wires to superstructure frame as tagged.
- c. Connect wires to swing limit switch as tagged.

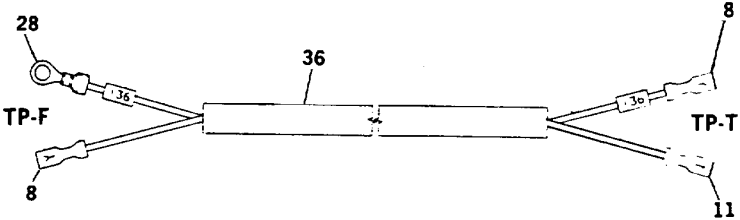


- d. Connect three connector plugs to swivel mount as tagged.
 - e. Connect wires to boom flood light harness as tagged.
 - f. Connect connector plug to load moment indicator central processing unit as tagged.
 - g. Connect wires to boom elevation limit switch as tagged.
 - h. Connect wires to hydraulic oil cooler by-pass solenoid as tagged.
 - i. Connect wires to hydraulic oil cooler temperature switch as tagged.
 - j. Connect wires to neutral safety switch as tagged.
 - k. Connect connector plug to right front console harness as tagged.
 - l. Connect connector plug to left front console harness as tagged.
 - m. Connect connector plug to side console harness as tagged.
 - n. Connect wire #21 to side console harness as tagged.
 - o. Connect connector plug to cab interior harness as tagged.
 - p. Connect connector plug to distribution panel harness as tagged.
 - q. Connect black ground wire and wire #5 to distribution panel as tagged.
 - r. Install more tie straps as needed to support superstructure harness and prevent chafing.
2. CONNECT GROUND CABLE AT SHUNT. (REFER TO PAGE 8-109.)
 3. CHECK ELECTRICAL SYSTEM FOR PROPER OPERATION. (REFER TO TM 5-3810-306-10.).

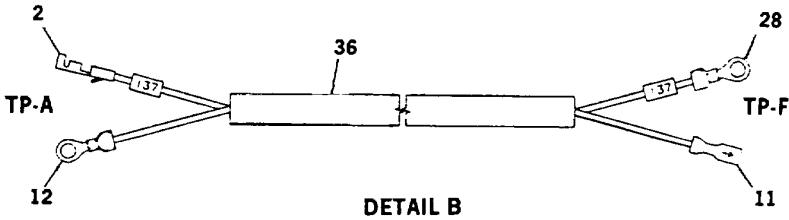
END OF TASK



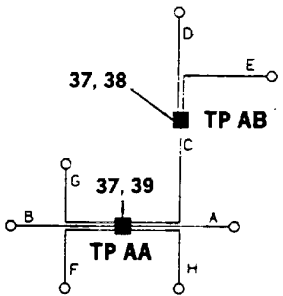
DETAIL #34-39



DETAIL A



DETAIL B



DETAIL #51

FOR REFERENCE TO INDEX
NUMBERS, REFER TO RPSTL
TM 5-3810-306-24P.

BLACKOUT LIGHTS HARNESS

TOOLS: General mechanic's tool kit: automotive (5180-00-177-7033)

SUPPLIES: None

EQUIPMENT CONDITIONS: Disconnect ground cable at shunt. (Refer to page 8-109.)

REMOVAL:

1. REMOVE BLACKOUT LIGHTS HARNESS.
 - a. Tag and disconnect wires at left and right rear blackout lights.
 - b. Tag and disconnect wires at left and right front blackout lights.
 - c. Tag and disconnect wire at blackout headlight.
 - d. Disconnect connector plug at carrier harness.
 - e. Remove tie straps and/or clamps securing harness to crane and remove blackout lights harness.
2. INSPECT BLACKOUT LIGHTS HARNESS FOR DAMAGE AND REPLACE PARTS OR HARNESS AS REQUIRED.

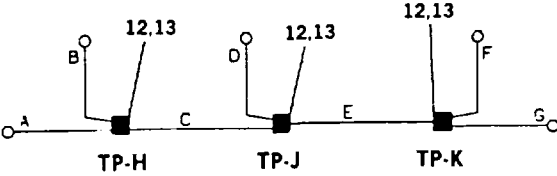
- b. Connect connector plug to carrier harness.
- c. Connect wire to blackout headlight as tagged.
- d. Connect wires to left and right front blackout lights as tagged.
- e. Connect wires to left and right rear blackout lights as tagged.
- f. Install more tie straps as required to support blackout lights harness in crane and prevent chafing.
2. CONNECT GROUND CABLE AT SHUNT. (REFER TO PAGE 8-109.)
3. CHECK BLACKOUT LIGHTS FOR PROPER OPERATION. (REFER TO TM 5-3810-306-10.)

INSTALLATION:

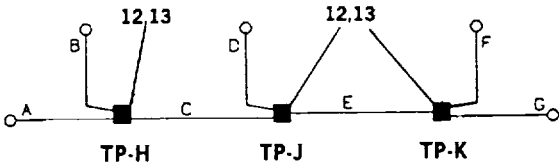
1. INSTALL BLACKOUT LIGHTS HARNESS.
 - a. Position blackout lights harness in crane and maintain in position with tie straps and/or clamps as needed.

END OF TASK

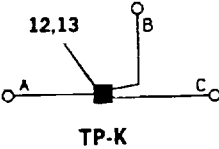
FOR REFERENCE TO INDEX
NUMBERS, REFER TO RPSTL
TM 5-3810-306-24P.



DETAIL #583



DETAIL #786



DETAIL #584

FLOODLIGHT HARNESS

TOOLS: General mechanic's tool kit: automotive (5180-00-177-7033)

SUPPLIES: None

EQUIPMENT CONDITION: Disconnect ground cable at shunt. (Refer to page 8-109.)

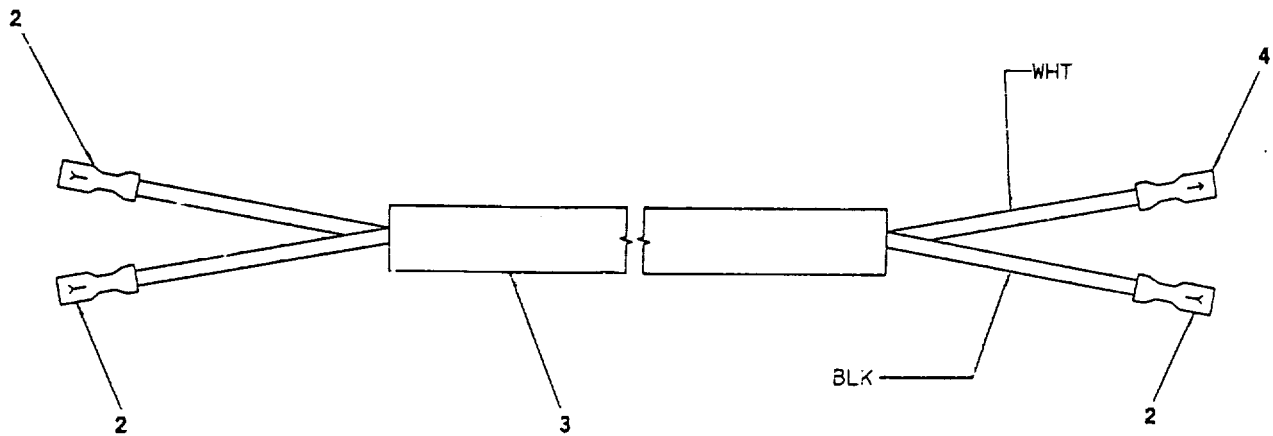
REMOVAL:

1. REMOVE FLOODLIGHT HARNESS.
 - a. Tag and disconnect leads to superstructure harness.
 - b. Tag and disconnect leads to boom-mounted floodlight.
 - c. Remove wire clamps securing harness to boom.
2. INSPECT HARNESS FOR DAMAGED WIRE AND CONNECTORS. REPAIR OR REPLACE AS NEEDED.

INSTALLATION:

1. INSTALL FLOODLIGHT HARNESS.
 - a. Secure harness to boom with wire clamps.
 - b. Connect leads at boom-mounted floodlight.
 - c. Connect leads at super structure harness.
2. CONNECT GROUND CABLE AT SHUNT. (REFER TO PAGE 8-109.)
3. CHECK OPERATION OF BOOM FLOODLIGHT. (REFER TO TM 5-3810-306-10.)

END OF TASK



CAB INTERIOR HARNESS

TOOLS: General mechanic's tool kit: automotive (5180-00-177-7033)

SUPPLIES: None

EQUIPMENT CONDITIONS: Ground cable disconnected at shunt. (Refer to page 8-109.)
 Right front control panel removed. (Refer to page 8-11.)
 Left front control panel removed. (Refer to page 8-11.)
 Side console and access panels removed (Refer to page 8-21.)

REMOVAL

1. REMOVE CAB INTERIOR HARNESS.

- a. Tag and disconnect leads to turnsignal switch.
- b. Tag and disconnect wire no. 31 at park brake pressure switch.
- c. Tag and disconnect wire no. 68 at front circulating fan.
- d. Tag and disconnect wire no. 45 at dome light.
- e. Tag and disconnect leads to skylight wiper.
- f. Tag and disconnect leads at rear circulating fan.
- g. Tag and disconnect plug to left front console harness.
- h. Tag and disconnect plug at distribution panel harness. Tag and disconnect four wire leads to distribution panel.
- i. Tag and disconnect plug at superstructure harness.
- j. Tag and disconnect plug to right front console harness.
- k. Tag and disconnect wire nos. 99 and 51 at horn.

- l. Tag and disconnect wire nos. 42, 582 and 41 to stop light switch and low air pressure switches.

- m. Tag and disconnect leads to wiper motor.

- n. Tag and disconnect wire no. 26 to cab spotlight.

- o. Remove all clamp and cable ties.

- p. Remove cab interior harness.

2. INSPECT HARNESS FOR DAMAGED WIRE AND CONNECTORS. REPAIR OR REPLACE AS NEEDED.

INSTALLATION:

1. INSTALL CAB INTERIOR HARNESS.

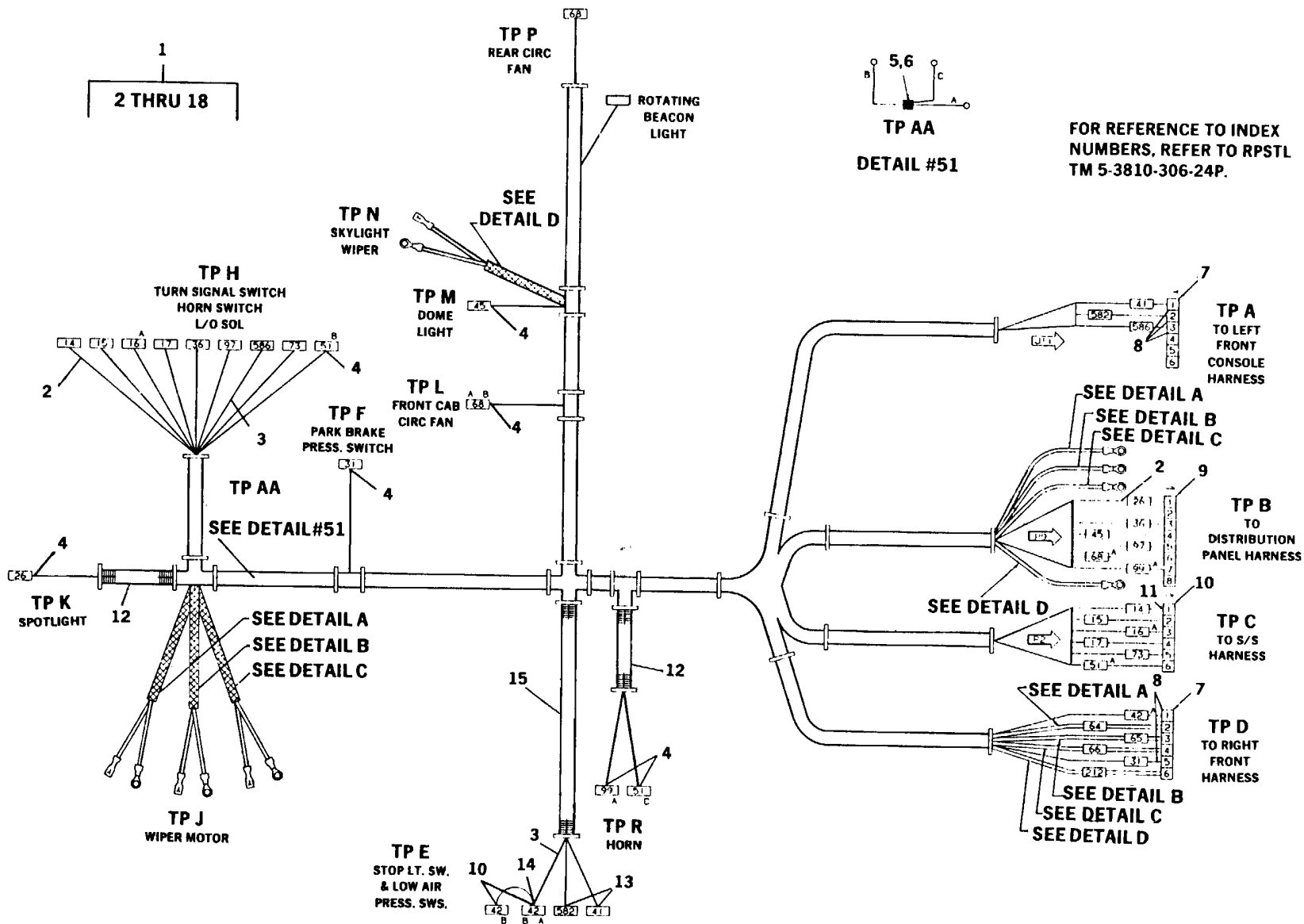
- a. Connect leads to turnsignal switch.

- b. Connect wire no. 1 at park brake pressure switch.

- c. Connect wire no. 68 at front circulating fan.

- d. Connect wire no. 45 at dome light

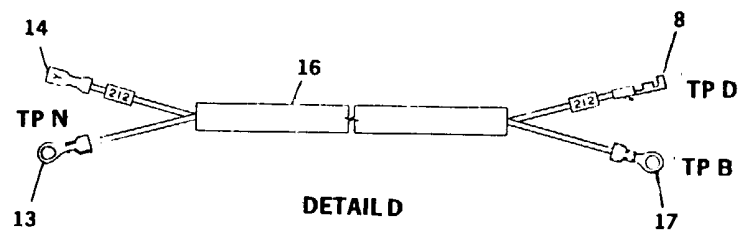
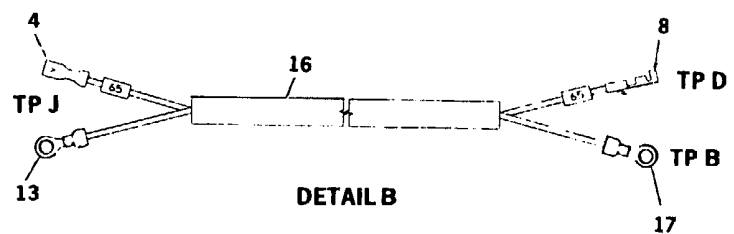
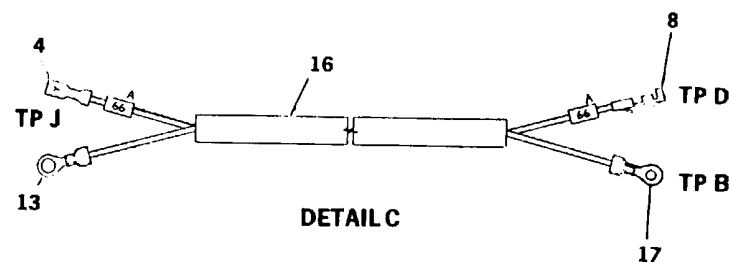
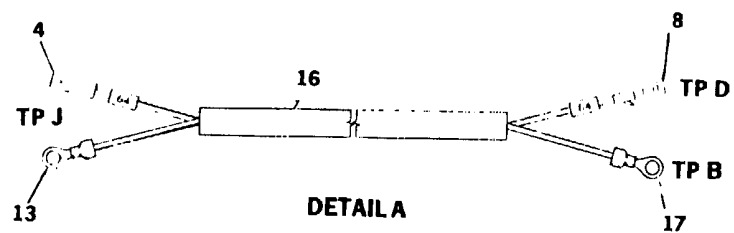
- e. Connect leads at skylight wiper.



- f. Connect leads to rear circulating fan.
 - g. Connect plug at left front console harness.
 - h. Connect plug at distribution panel harness.
Connect four leads at distribution panel.
 - i. Connect plug at superstructure harness.
 - j. Connect plug at right front console harness.
 - k. Connect wire nos. 99 and 51 at horn.
 - L. Connect wire nos. 42, 582 and 41 to stop light
switch and low air pressure switches.
 - m. Connect leads at wiper motor.
 - n. Connect wire no. 26 to cab spotlight.
 - o. Install all clamps and cable ties.
2. INSTALL SIDE CONSOLE AND ACCESS PANELS.
(REFER TO PAGE 8-21.)
 3. INSTALL LEFT FRONT CONSOLE. (REFER TO
PAGE 8-11.)
 4. INSTALL RIGHT FRONT CONSOLE. (REFER TO
PAGE 8-11.)
 5. CONNECT GROUND CABLE AT SHUNT. (REFER
TO PAGE 8-109.) 6. CHECK OPERATION OF
ALL CONTROLS AND INDICATORS. (REFER TO
TM 5-3810-306-10.)

END OF TASK

FOR REFERENCE TO INDEX
 NUMBERS, REFER TO RPSTL
 TM 5-3810-306-24P.



Section VI. HORN AND ALARMS MAINTENANCE

BACKUP ALARM REPLACEMENT

TOOLS: General mechanic's tool kit: automotive (5180-00-177-7033)

SUPPLIES: Lockwashers (Item 28, Appendix C)

EQUIPMENT CONDITION: Disconnect ground cable at shunt. (Refer to page 8-109.)

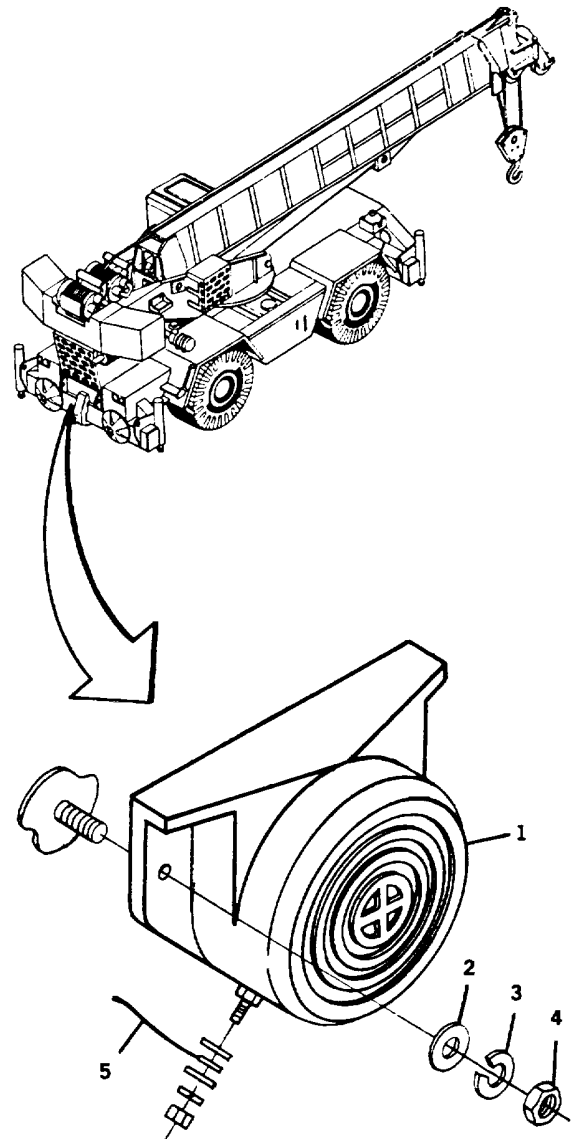
REMOVAL:

1. REMOVE BACKUP ALARM (1).
 - a. Tag and disconnect two electrical leads (5) to backup alarm (1).
 - b. Remove two nuts (4), lockwashers (3) and flatwashers (2) to free backup alarm (1) from frame studs. Discard lockwashers (3).

INSTALLATION:

1. INSTALL BACKUP ALARM (1).
 - a. Align backup alarm (1) holes with frame studs and secure with new lockwashers (3), flatwashers (2) and nuts (4).
 - b. Remove tags and connect two electrical leads (5) to backup alarm (1).
2. CONNECT GROUND CABLE AT SHUNT. (REFER TO PAGE 8-109.)
3. TEST FOR PROPER OPERATION. (REFER TO TM 5-3810-306-10.)

END OF TASK



HORN INSTALLATION

TOOLS: General mechanic's tool kit: automotive (5180-00-177-7033)

SUPPLIES: Lockwashers (Item 70, Appendix C).

EQUIPMENT CONDITION: Disconnect ground cable at shunt. (Refer to page 8-109.)

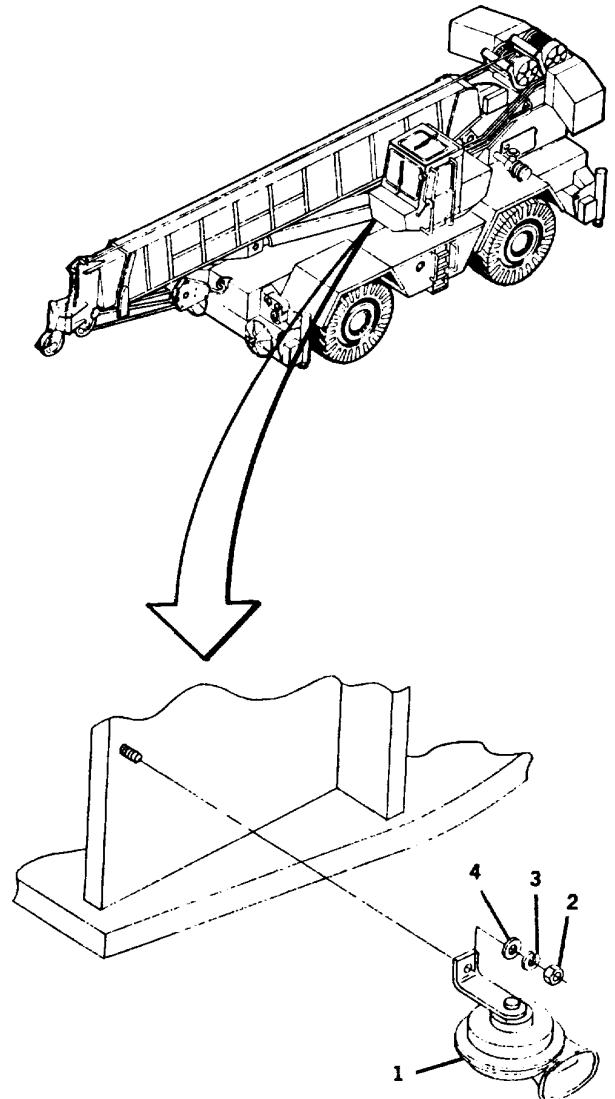
REMOVAL:

1. REMOVE HORN (1).
 - a. Tag and disconnect two electrical leads to horn (1) terminals.
 - b. Remove hex nut (2), lockwasher (3) and flatwasher (4) securing horn (1) on turntable stud (5). Discard lockwasher (3).

INSTALLATION:

1. INSTALL HORN (1).
 - a. Align horn (1) on turntable stud (5) and secure with flatwasher (4), new lockwasher (3) and nut (2).
 - b. Remove tags and connect two electrical leads to horn (1) terminals.
2. CONNECT GROUND CABLE AT SHUNT. (REFER TO PAGE 8-109.)
3. CHECK FOR PROPER OPERATION. (REFER TO TM 5-3810-306-10.)

END OF TASK



Section VII. BATTERY MAINTENANCE

BATTERY REPLACEMENT

TOOLS: General mechanic's tool kit: automotive (5180-00-177-7033)

SUPPLIES: Sodium bicarbonate (Item 19, Appendix C)
Grease (Item 9, Appendix C)

EQUIPMENT CONDITION: Access door to battery box opened.

REMOVAL:

1. REMOVE BATTERIES (1).

WARNING

Batteries generate explosive gases. Keep sparks, flames or other ignition sources away at all times. Always shield eyes when working near batteries.

- a. Tag and disconnect negative then positive battery cables from battery terminal posts (2).
- b. Remove four hex nuts (3), lockwashers (4) and flatwashers (5) from tiedown rods (6).
- c. Remove two channels (7) and tiedown rods (6).

CAUTION

Battery weight is approximately 68.3 lbs. Use care when lifting.

- e. Remove batteries (1) from battery box (8) using rope handles.
- f. Clean battery cable terminals (9) before installing new batteries.

INSTALLATION:

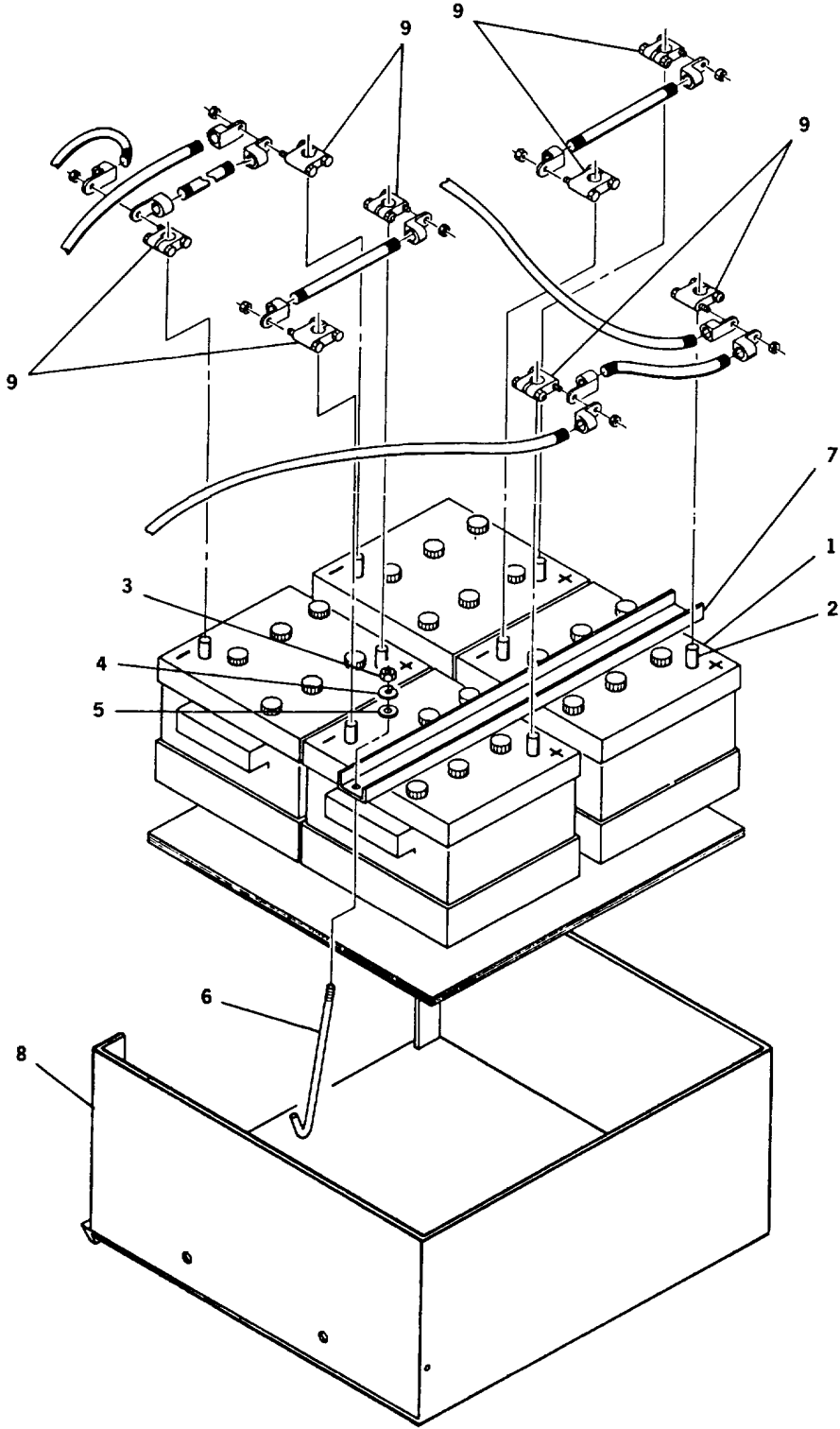
1. INSTALL BATTERIES (1).

CAUTION

When installing batteries, make sure polarity marks (+) and (-) are in correct position as shown in illustration.

- a. Install batteries (1) in battery box (8). Do not tilt while lowering into place.
 - b. Install two channels (7) and four tiedown rods (6) secure with four hex nuts (3), lockwashers (4) and flatwashers (5).
 - c. Remove tags and connect leads to terminal posts (2) starting with positive terminals.
 - d. Coat battery terminals (9) and connections with light duty grease.
 - e. Close battery cover.
2. CHECK FOR PROPER OPERATION. (REFER TO TM 5-3810-306-10.)

END OF TASK



BATTERY BOX COVER AND SLAVE RECEPTACLE REPLACEMENT

TOOLS: General mechanic's tool kit: automotive (5180-00-177-7033)
Lifting device (2-ton capacity)

SUPPLIES: Lockwashers (Item 28, Appendix C) (4 Required)
Lockwashers (Item 15, Appendix C) (5 Required)
Acid resistant paint (Item 36, Appendix C)
Lockwashers (Item 2, Appendix C) (2 Required)

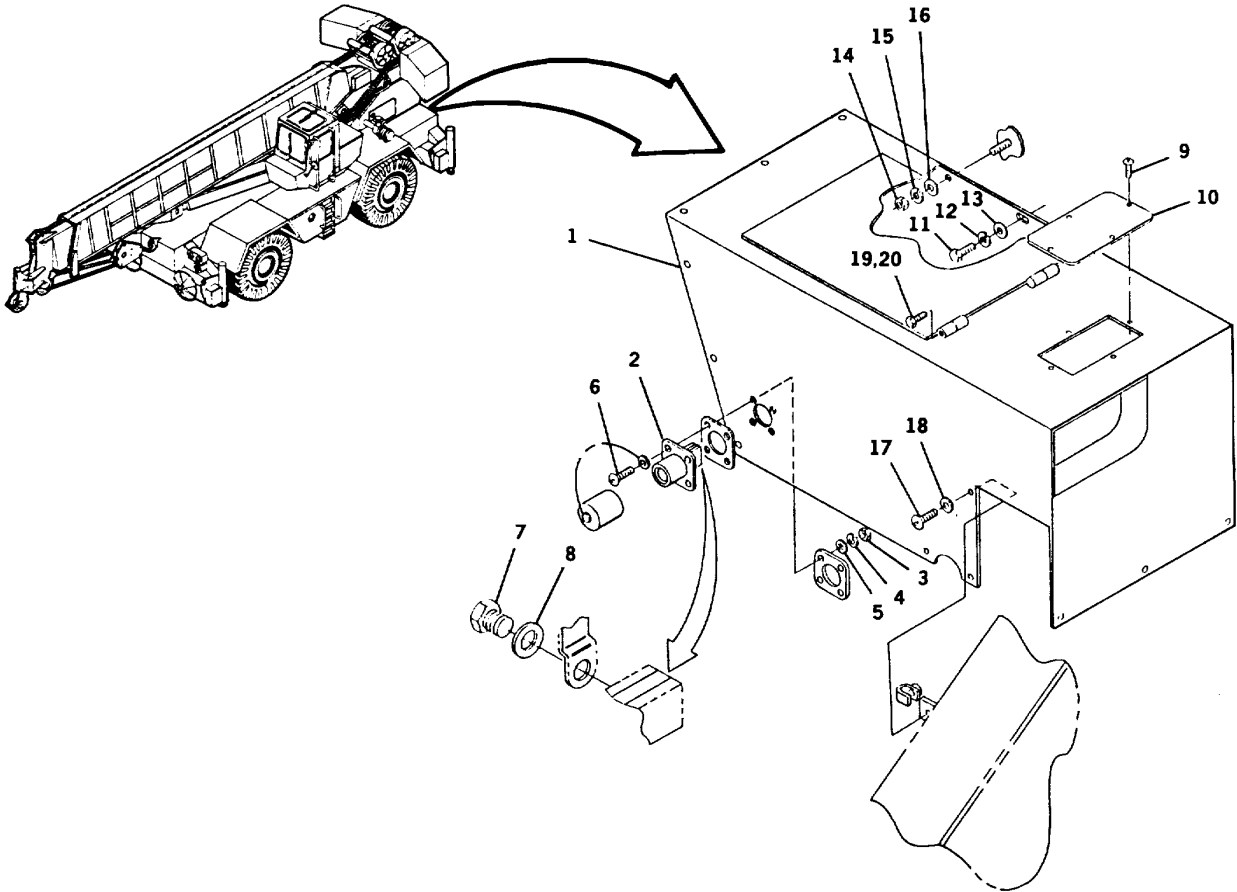
EQUIPMENT CONDITIONS: Disconnect ground cable at shunt. (Refer to page 8-109.)

REMOVAL:

1. REMOVE SLAVE RECEPTACLE (2).

- a. Remove two capscrews (7) and washers (8) securing battery cables to slave receptacle (2). Tag wires.

- b. Remove four nuts (3), lockwashers (4), flatwashers (5) and screws (6) securing slave receptacle to battery box cover (1). Remove receptacle, gasket and plate. Discard lockwashers (4).

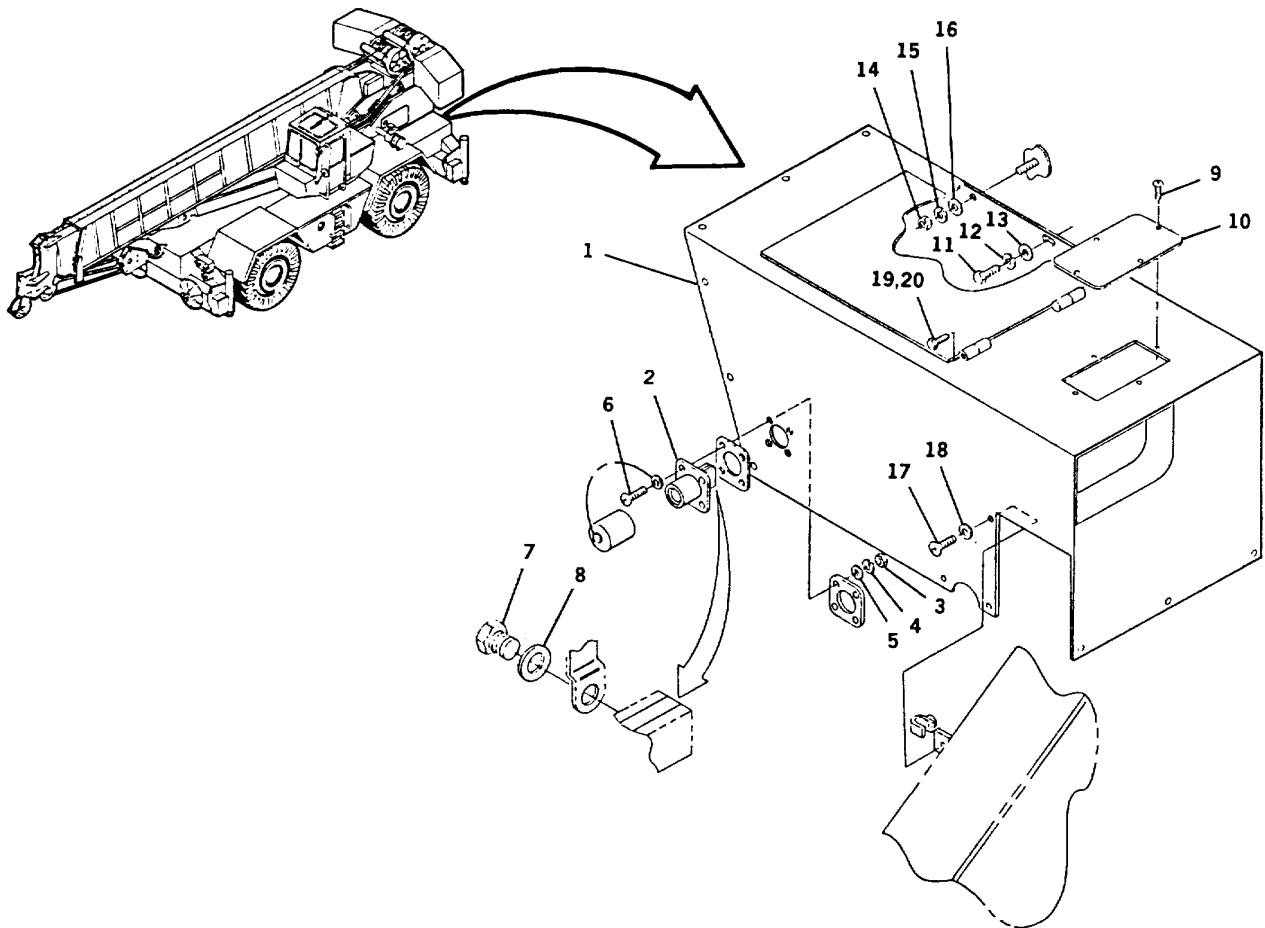


2. REMOVE BATTERY BOX COVER (1).
 - a. Remove four screws (9) securing access panel (10) to battery box cover (1).
 - b. Locate and remove three capscrews (11), lockwashers (12) and flatwashers (13) securing cover to engine hood. Discard lockwashers (12).
 - c. Remove two nuts (14), lockwashers (15) and flatwashers (16) securing cover to frame. Discard lockwashers (15)
 - d. Tag and disconnect five electrical leads to two lights.
 - e. Using a suitable lifting device support battery box cover.

- f. Remove twelve screws (17) and flatwashers (18). Remove battery box cover (1).
- g. Remove attaching hardware and lights from battery box cover if necessary.

NOTE

If door is to be removed, unscrew two self-tapping screws (19) and lockwashers (20) and slide door from hinges. If a new door is to be installed the inside must be coated prior to installation with Bituminous Acid Resistant Coating, Military Specification TTC 494A.



INSTALLATION:

1. INSTALL BATTERY BOX COVER.

- a. If removed, install lights in battery box cover.
- b. Using suitable lifting device, position battery box cover in place and secure with twelve screws (17) and flatwashers (18).
- c. Remove tags and connect five electrical connectors to two lights.
- d. Install three capscrews (11), new lockwashers (12) and flatwashers (13) to secure battery box cover to engine hood.
- e. Install two nuts (14), new lockwashers (15) and flatwashers (16) securing battery box cover to frame studs.

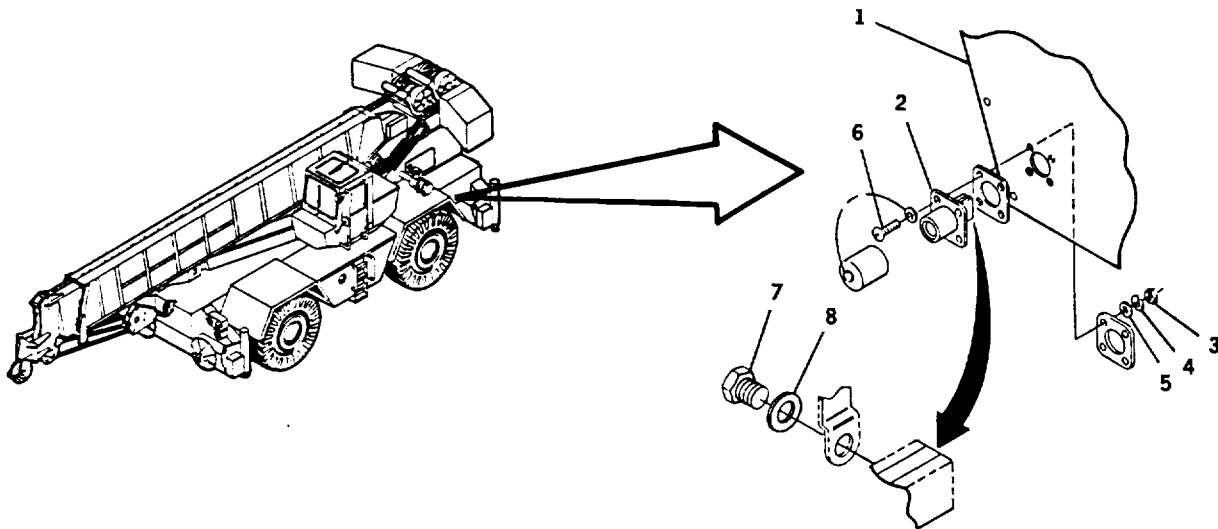
- f. Position access cover (10) and secure with four screws (9).
- g. Install battery box cover door, if removed, using two self-tapping screws (19) and lockwashers (20).

2. INSTALL SLAVE RECEPTACLE (2).

- a. Position slave receptacle (2) components on battery box cover and secure with four screws (6), flatwashers (5), new lockwashers (4) and nuts (3).
- b. Remove tags and fasten battery cables to slave receptacle using capscrews (7) and washers (8).

3. CONNECT GROUND CABLE AT SHUNT. (REFER TO PAGE 8-109.).

END OF TASK



BATTERY BOX REPLACEMENT

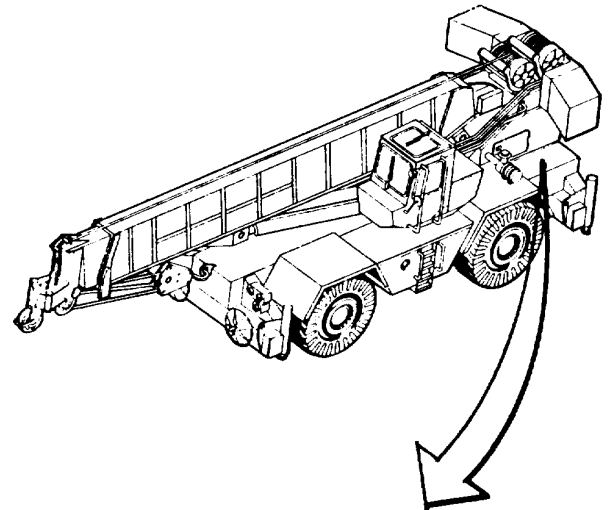
TOOLS: General mechanic's tool kit: automotive (5180-00-177-7033)

SUPPLIES: Lockwashers (Item 15, Appendix C) (7 Required)
 Acid resistant coating (Item 36, Appendix C)

EQUIPMENT CONDITIONS: Batteries removed from battery box. (Refer to page 8-96.)
 Battery box cover removed. (Refer to page 8-98.)

REMOVAL:

1. REMOVE BATTERY BOX (1).
 - a. Tag and remove all cables passing through grommets in battery box (1).
 - b. Remove seven hex nuts (5), lockwashers (3), flatwashers (4) and three spacers (2) from mounting studs. Note position of spacers for reassembly. Discard lockwashers (3).
 - c. Remove two plywood spacers (6).

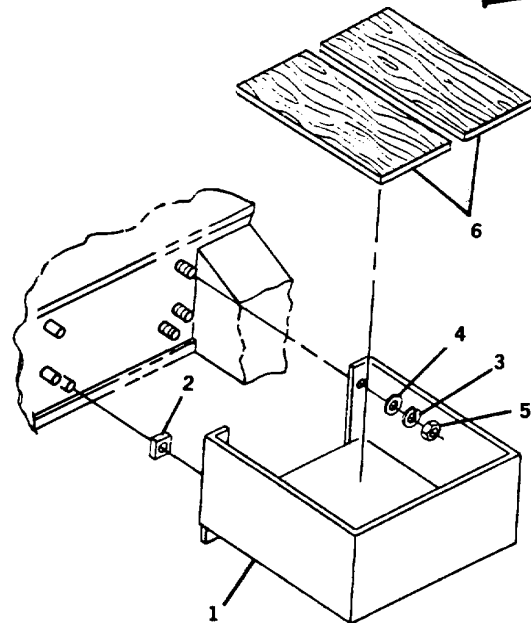


INSTALLATION:

NOTE

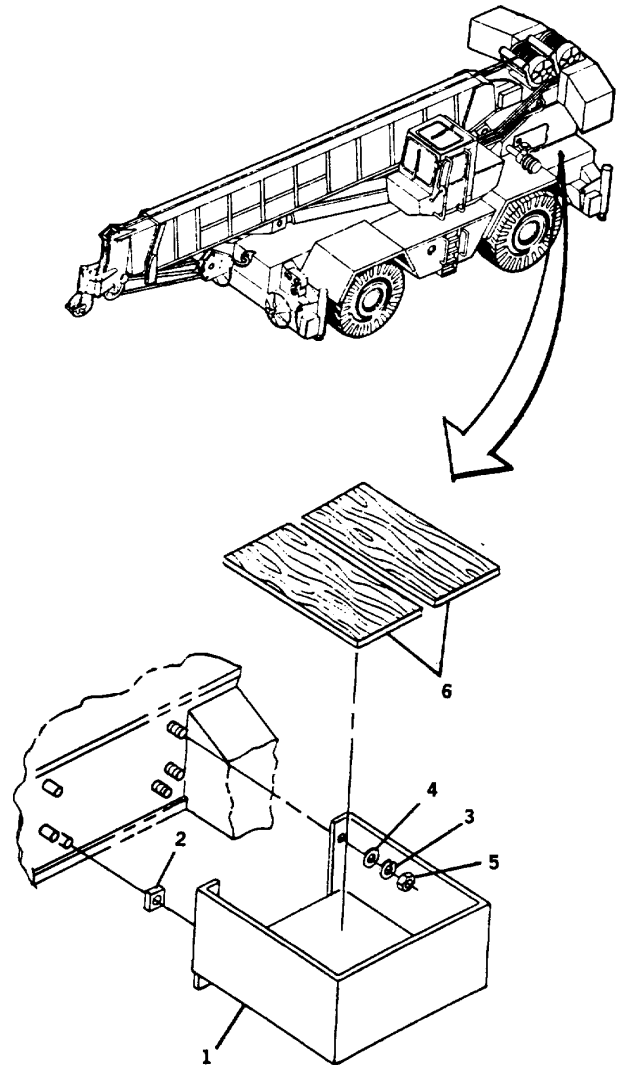
If battery box is to be replaced. New battery box must be coated with Bituminous Acid Resistant Coating, Military Specification TTC 494A.

1. INSTALL BATTERY BOX (1).
 - a. Align battery box (1) holes with mounting studs and secure with three spacers (2), flatwashers (4), new lockwashers (3) and hex nuts (5).
 - b. Install two plywood spacers (6).
 - c. Reinstall battery cables through battery box (1) grommets.



2. REMOVE TAGS AND INSTALL BATTERIES. (REFER TO PAGE 8-96.)
3. INSTALL BATTERY BOX COVER. (REFER TO PAGE 8-98.)
4. TEST FOR PROPER OPERATION. (REFER TO TM 5-3810-306-10.)

END OF TASK



EMERGENCY STEER PUMP BOX REPLACEMENT

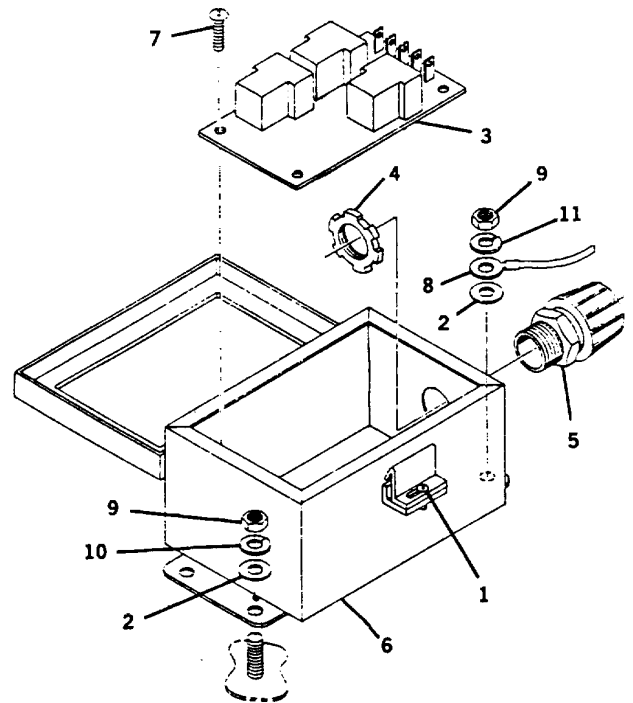
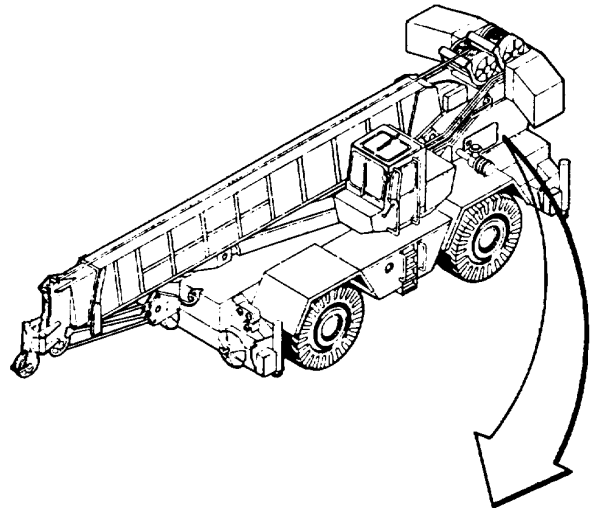
TOOLS: General mechanic's tool kit: automotive (5180-00-177-7033)

SUPPLIES: Lockwashers (Item 2, Appendix C) (3 Required)
 Lockwasher (Item 70, Appendix C)

EQUIPMENT CONDITIONS: Disconnect ground cable at shunt. (Refer to page 8-109.)

REMOVAL:

1. REMOVE EMERGENCY STEER PUMP BOX (6).
 - a. Loosen screw (1) to open box lid.
 - b. Tag and remove five electrical connectors from circuit board (3).
 - c. Remove nut (4) from strain relief fitting (5) and remove wiring harness from box.
 - d. Remove four screws (7) and circuit board (3) from box.
 - e. Remove four nuts (9), lockwashers (10) and (11) and flatwashers (2) from frame studs. Discard lockwashers (10) and (11).
 - f. Remove steer pump box (6) and grounding wire (8) from frame studs.

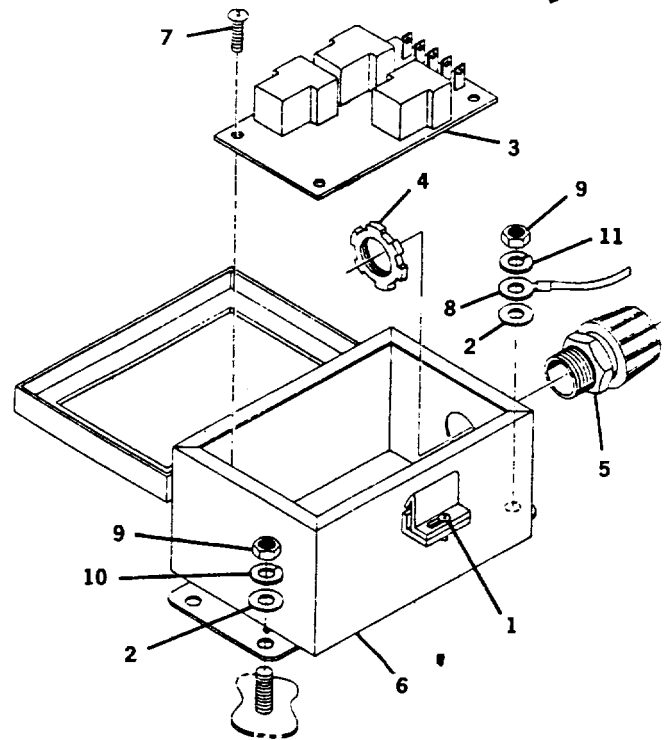
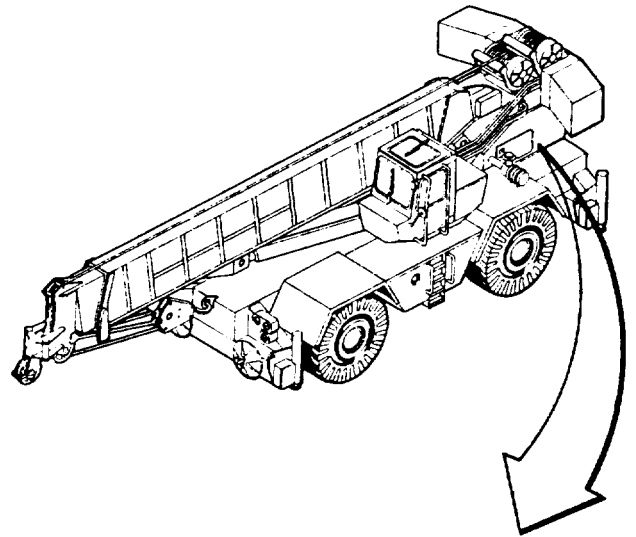


INSTALLATION:

1. INSTALL EMERGENCY STEER PUMP BOX (6).
 - a. Position steer pump box on frame studs, install grounding wire (8) and secure with flatwashers (2), new lockwashers (10) and (11) and nuts (9).
 - b. Mount circuit board on supports in box and secure with four screws (7).

- c. Insert wiring harness and strain relief fitting through box and secure with nut (4).
 - d. Connect five tagged electrical connectors to circuit board.
 - e. Close box lid and hook clamp, tighten screw (1) to secure lid.
2. CONNECT GROUND CABLE AT SHUNT. (REFER TO PAGE 8-109.)
 3. START ENGINE AND CHECK FOR PROPER OPERATION. (REFER TO TM 5-3810-306-10.)

END OF TASK



EMERGENCY STEER PUMP CABLE(S) REPLACEMENT

TOOLS: General mechanic's tool kit: automotive (5180-00-177-7033)

SUPPLIES: Lockwashers (Item 2, Appendix C) (2 Required)
Lockwasher (Item 57, Appendix C)

EQUIPMENT CONDITIONS: Disconnect ground cable at shunt. (Refer to page 8-109.)
Battery cover removed. (Refer to page 8-98.)

REMOVAL:

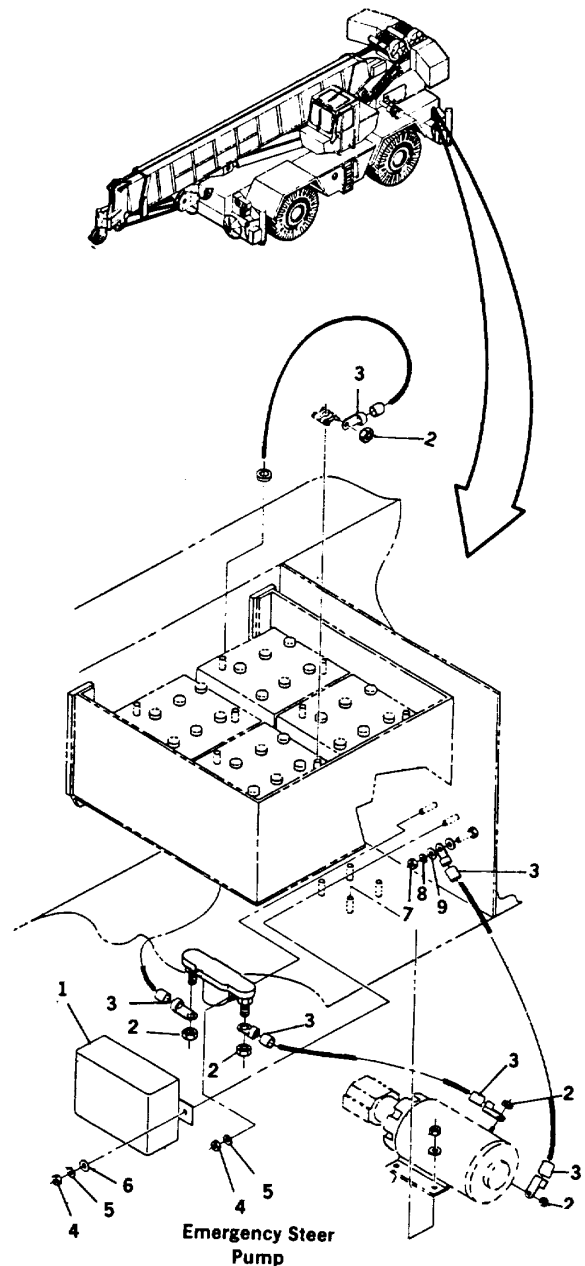
WARNING

Batteries generate explosive gases. Keep sparks, flames or other ignition sources away at all times. Always shield eyes when working near batteries.

WARNING

Electrolyte splashed into eyes is extremely dangerous. If this should happen, force eye open and flood with cool, clean water for approximately five minutes. Call for immediate medical attention.

1. REMOVE RELAY COVER (1) IF REQUIRED.
 - a. Remove nuts (4), lockwashers (5) and washers (6). Discard lockwashers (5).
 - b. Remove relay cover (1).
2. REMOVE EMERGENCY STEER PUMP CABLE(S).
 - a. As required, remove hex nuts (2) (hex nut (7), lockwasher (8) and flat washer (9) for ground cable) on cable terminals (3) for each cable. Discard lockwasher (8) if removed.
 - b. Remove and inspect cable(s). Replace parts as required.

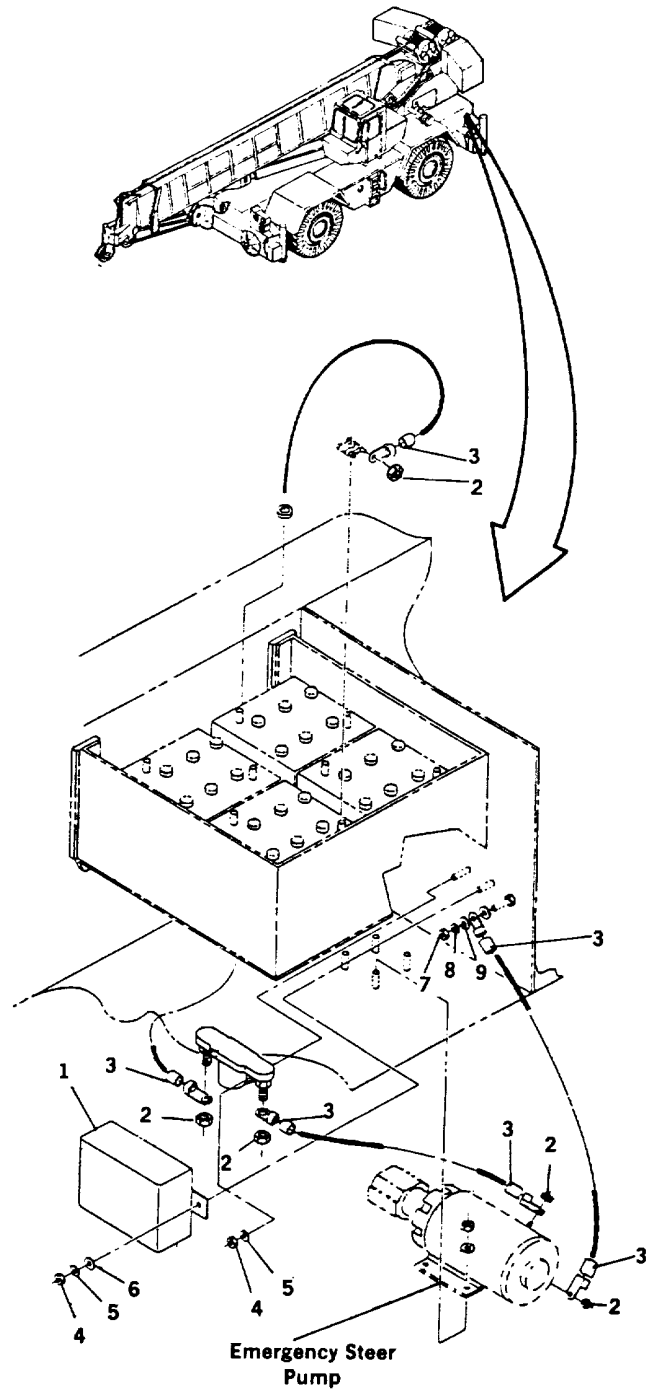


8-105

INSTALLATION:

1. INSTALL NEW EMERGENCY STEER PUMP CABLE(S).
 - a. As required, install hex nuts (2) (hex nut (7), new lockwasher (8) and flatwasher (9) for ground cable) to cable terminals (3) for each new cable.
 - b. Coat terminals and connectors with anti-corrosion compound or grease.
2. SECURE RELAY COVER (1) USING WASHERS (6), NEW LOCKWASHERS (5) AND NUTS (4).
3. CONNECT GROUND CABLE AT SHUNT. (REFER TO PAGE 8-109.)
4. INSTALL BATTERY COVER. (REFER TO PAGE 8-98.)

END OF TASK



BATTERY CABLE(S) REMOVAL

TOOLS: General mechanic's tool kit: automotive (5180-00-177-7033)

SUPPLIES: None

EQUIPMENT CONDITION: None

REMOVAL:

1. OPEN BATTERY BOX COMPARTMENT DOOR (REFER TO TM 5-3810-306-10).

WARNING

Batteries generate explosive gases. Keep sparks, flames or other ignition sources away at all times. Always shield eyes when working near batteries.

2. REMOVE GROUND CABLE (3) GOING TO CURRENT SHUNT (4).
 - a. Remove capscrew (1). Disconnect battery cable connector (2) at shunt (4) (inside left-rear carrier frame).
 - b. Remove nut (6) at battery terminal and remove ground cable (3).

WARNING

Always remove negative battery cables at battery first. Positive battery cables coming in contact with any part of vehicle while negative cable is connected to battery will cause sparking and possible explosion of battery gases.

3. REMOVE BATTERY CABLES, AS REQUIRED.

- a. Remove nuts (6) on each end of battery cable to be removed and remove battery cable.
- b. Remove cables (7), (8) and (9) by removing capscrew (10), nuts (11), lockwasher (12) and flat washer (13). Discard lockwasher (12).

INSTALLATION:

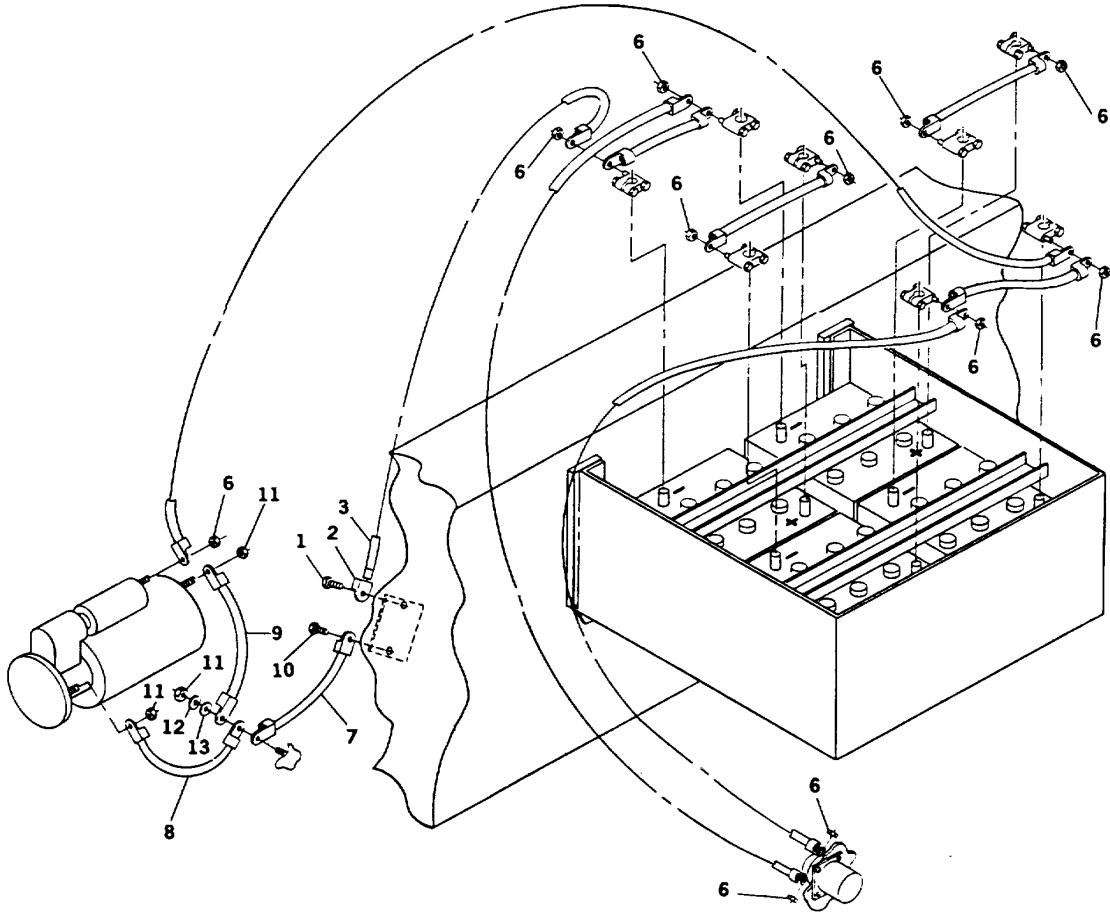
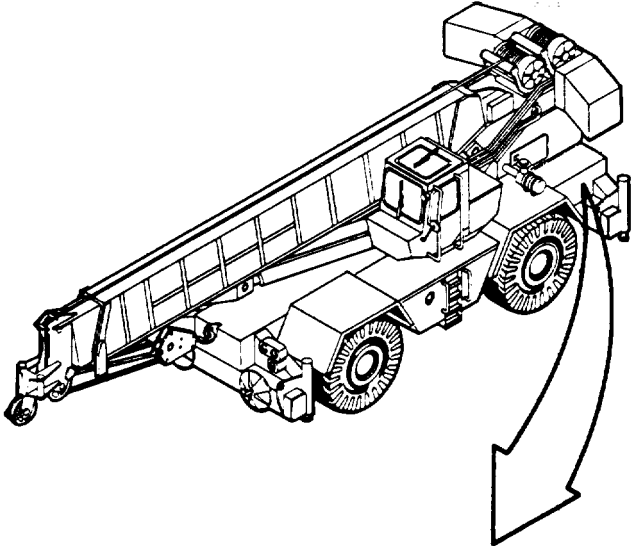
WARNING

Always install positive battery cables at component first. Positive battery cables coming in contact with any part of vehicle while negative cable is connected to battery will cause sparking and possible explosion of battery gases.

1. INSTALL BATTERY CABLES, AS REQUIRED.
 - a. Position battery cables as shown and connect to components and/or battery terminals with nuts (6).
 - b. Install cables (7), (8) and (9) with capscrew (10), nuts (11) new lockwasher (12) and flatwasher (13).

- 2. INSTALL GROUND CABLE (3) GOING TO SHUNT (4).
 - a. Install ground cable (3) at battery terminal with nut (6).
 - b. Place ground cable connector (2) on shunt (4). Install and tighten capscrew (1).
- 3. CLOSE BATTERY BOX COMPARTMENT DOOR (REFER TO TM 5-3810-306-10.).

END OF TASK



GROUND CABLE AT SHUNT REMOVAL

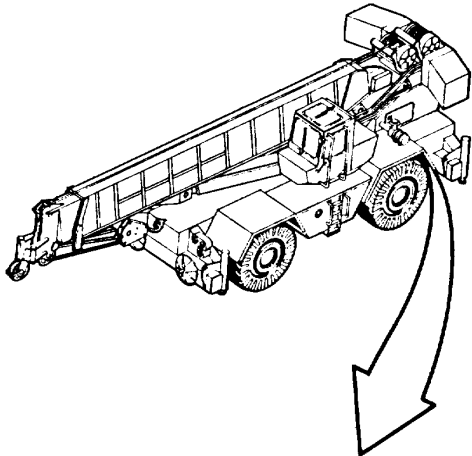
TOOLS: General mechanic's tool kit: automotive (5180-00-177-7033)

SUPPLIES: None

EQUIPMENT CONDITIONS: None

REMOVAL:

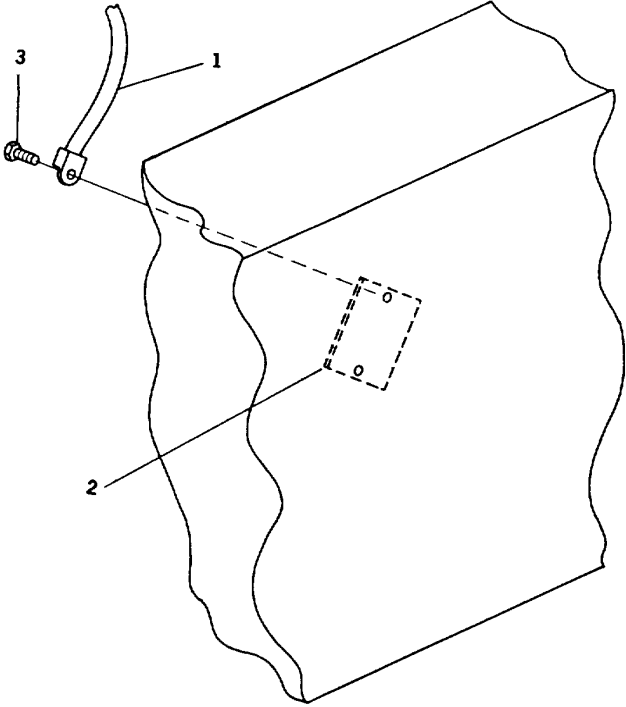
- 1. DISCONNECT GROUND CABLE (1) AT SHUNT (2).
 - a. Remove capscrew (3).
 - b. Remove ground cable (1).
 - c. Tag ground cable (1).



INSTALLATION:

- 1. INSTALL GROUND CABLE (1) AT SHUNT (2).
 - a. Remove tag and install ground cable (1) at shunt (2).
 - b. Secure ground cable with capscrew (3).

END OF TASK



SHUNT REPLACEMENT

TOOLS: General mechanic's tool kit: automotive (5180-00-177-7033)

SUPPLIES: Lockwashers (Item 2, Appendix C) (4 Required)

EQUIPMENT CONDITIONS: None

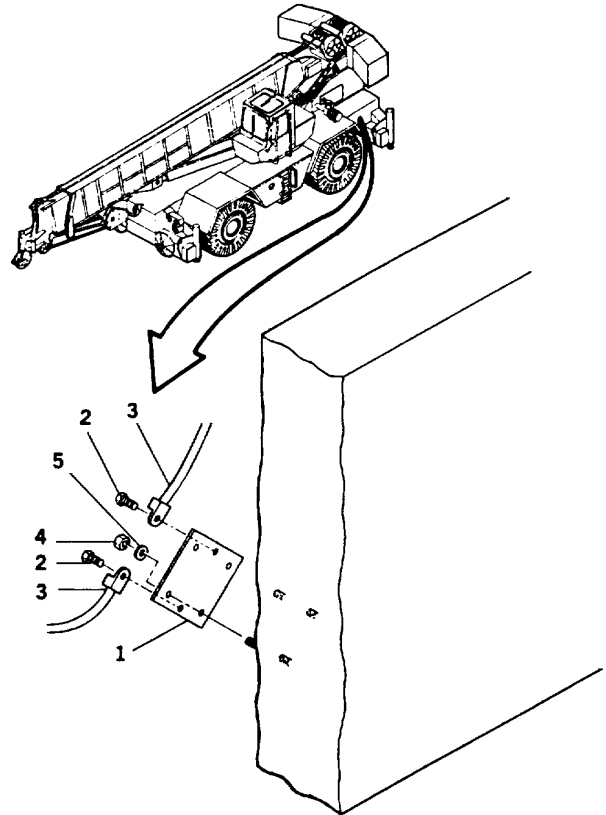
REMOVAL:

1. REMOVE SHUNT (1).
 - a. Remove capscrews (2) at shunt and disconnect cables (3) from shunt.
 - b. Tag and disconnect two meter wires from shunt (1).
 - c. Remove four nuts (4) and lockwashers (5); remove shunt from mounting studs. Discard lockwashers (5).

INSTALLATION:

- I. INSTALL SHUNT (1).
 - a. Position shunt (1) on mounting studs and secure with four new lockwashers (5) and nuts (4).
 - b. Connect cables (3) to shunt (1) with capscrews (2).
 - c. Connect two meter wires to shunt (1) as tagged.

END OF TASK



CHAPTER 9
TRANSMISSION MAINTENANCE

CHAPTER INDEX

Procedure

Page

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	Torque Converter Oil Filter Assembly Installation	9-12
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Section I. TRANSMISSION SHIFT MAINTENANCE

TRANSMISSION SHIFTER REPLACEMENT

TOOLS: General mechanic's tool kit: automotive (5180-00-177-7033)

SUPPLIES: None

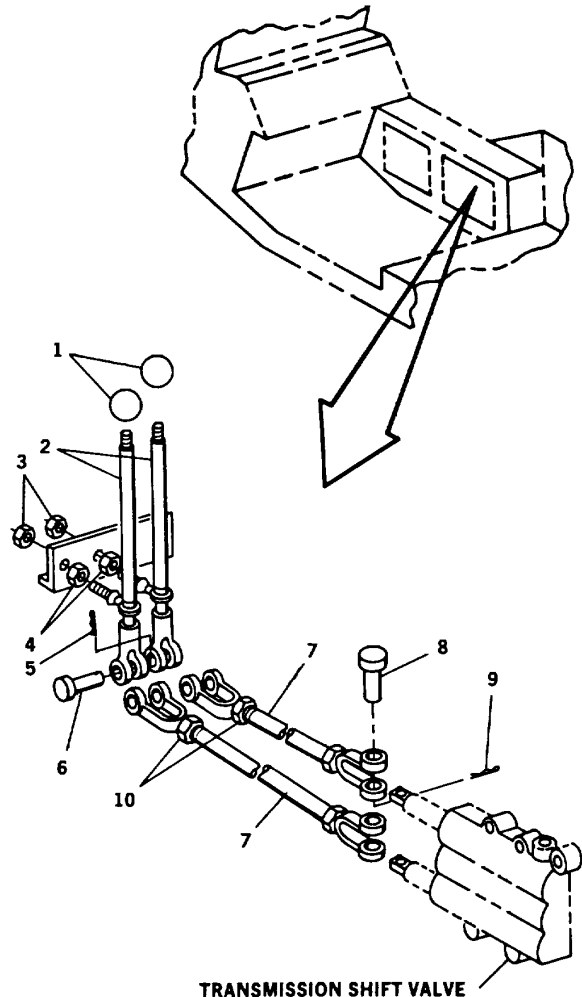
EQUIPMENT CONDITIONS: Disconnect ground cable at shunt. (Refer to page 8-109.)
Operator's seat removed. (Refer to page 15-27.)
Rear access panel removed. (Refer to page 8-21.)

REMOVAL:

1. REMOVE TRANSMISSION SHIFTER.
 - a. Remove clip pin (9) and clevis pin (8) from transmission shift valve and shift lever linkage (7).
 - b. Remove clip pin (5) and clevis pin (6) from shift lever linkage (7).
 - c. Support shift lever (2) and remove hex nut (3) from mounting bracket.
 - d. Remove knob (1) and withdraw shift linkage (2) from side console.

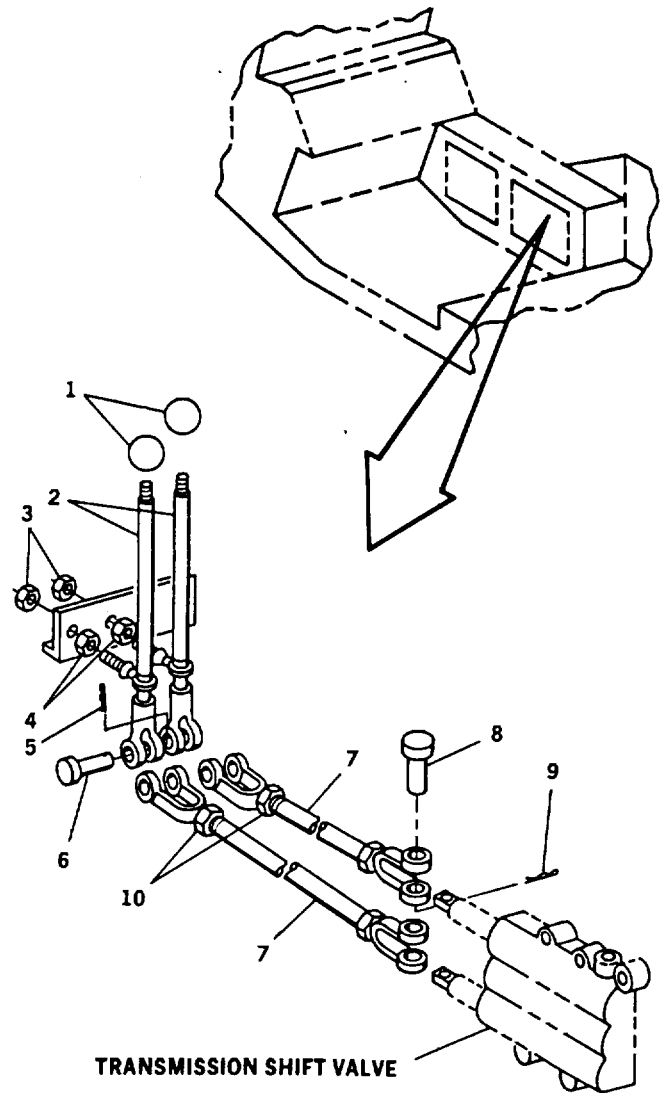
INSTALLATION:

- I. INSTALL TRANSMISSION SHIFTER.
 - a. Install shift lever linkage (7) to transmission shift valve with clevis pin (8) and clip pin (9).
 - b. Insert shift lever (2) through side console shift pattern hole and secure to mounting bracket with nut (3).
 - c. Connect shift lever (2) to shift lever linkage (7) with clevis pin (6) and clip pin (5).



- d. Install knob (1) on shift lever (2).
2. ADJUST LINKAGE AS NECESSARY.
 - a. To obtain full travel of transmission shift valve spools, remove clip pin (9) and clevis pin (8).
 - b. Loosen locknut (10) and turn clevis on linkage (7) to increase or decrease valve spool travel.
 - c. Tighten locknut (10) and install clevis pin (8) and clip pin (9).
3. CONNECT GROUND CABLE AT SHUNT. (REFER TO PAGE 8-109.)
4. INSTALL ACCESS PANEL TO SIDE CONSOLE. (REFER TO PAGE 8-21.)
5. INSTALL OPERATOR SEAT. (REFER TO PAGE 15-27)
6. TEST FOR PROPER OPERATION. (REFER TO TM 5-3810-306-10.).

END OF TASK



TRANSMISSION SHIFT HYDRAULIC LINES, SUPERSTRUCTURE

TOOLS: General mechanic's tool kit: automotive (5180-00-177-7033)

SUPPLIES: Loctite 545 (Item 13, Appendix C)
Preformed packings as required

EQUIPMENT CONDITIONS: Disconnect ground cable at shunt. (Refer to page 8-109.)

REMOVAL:**NOTE**

Use the following procedure to replace all hydraulic lines.

1. REMOVE HYDRAULIC LINE.
 - a. Tag and disconnect both ends of hydraulic line. Remove line and preformed packing. Note routing for ease in installation.
 - b. Remove fittings and preformed packing as necessary. Discard preformed packing.
 - c. Inspect all parts for damage and replace as required.

INSTALLATION:

1. INSTALL HYDRAULIC LINE.
 - a. Coat threads with Loctite 545 and preformed packings with clean hydraulic fluid prior to installation.
 - b. Install fittings and new preformed packing. Tighten securely.
 - c. Route hydraulic line and connect both ends with new preformed packing. Tighten securely.
2. CONNECT GROUND CABLE AT SHUNT. (REFER TO PAGE 8-109.)
3. START ENGINE AND CHECK TRANSMISSION SHIFT FUNCTIONS. CHECK FOR LEAKS. (REFER TO TM 5-3810-306-10.).

END OF TASK

TRANSMISSION SHIFT HYDRAULIC LINES, CARRIER

TOOLS: General mechanic's tool kit: automotive (5180-00-177-7033)

SUPPLIES: Loctite 545 (Item 13, Appendix C)
Preformed packings as required

EQUIPMENT CONDITIONS: Disconnect ground cable at shunt. (Refer to page 8-109.)

REMOVAL:**NOTE**

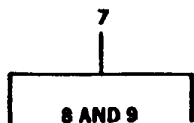
Use the following procedure to replace all hydraulic lines.

1. REMOVE HYDRAULIC LINE.
 - a. Tag and disconnect both ends of hydraulic line. Remove line and preformed packing. Note routing for ease in installation.
 - b. Remove fittings and preformed packing as necessary. Discard preformed packing.
 - c. Inspect all parts for damage and replace as required.

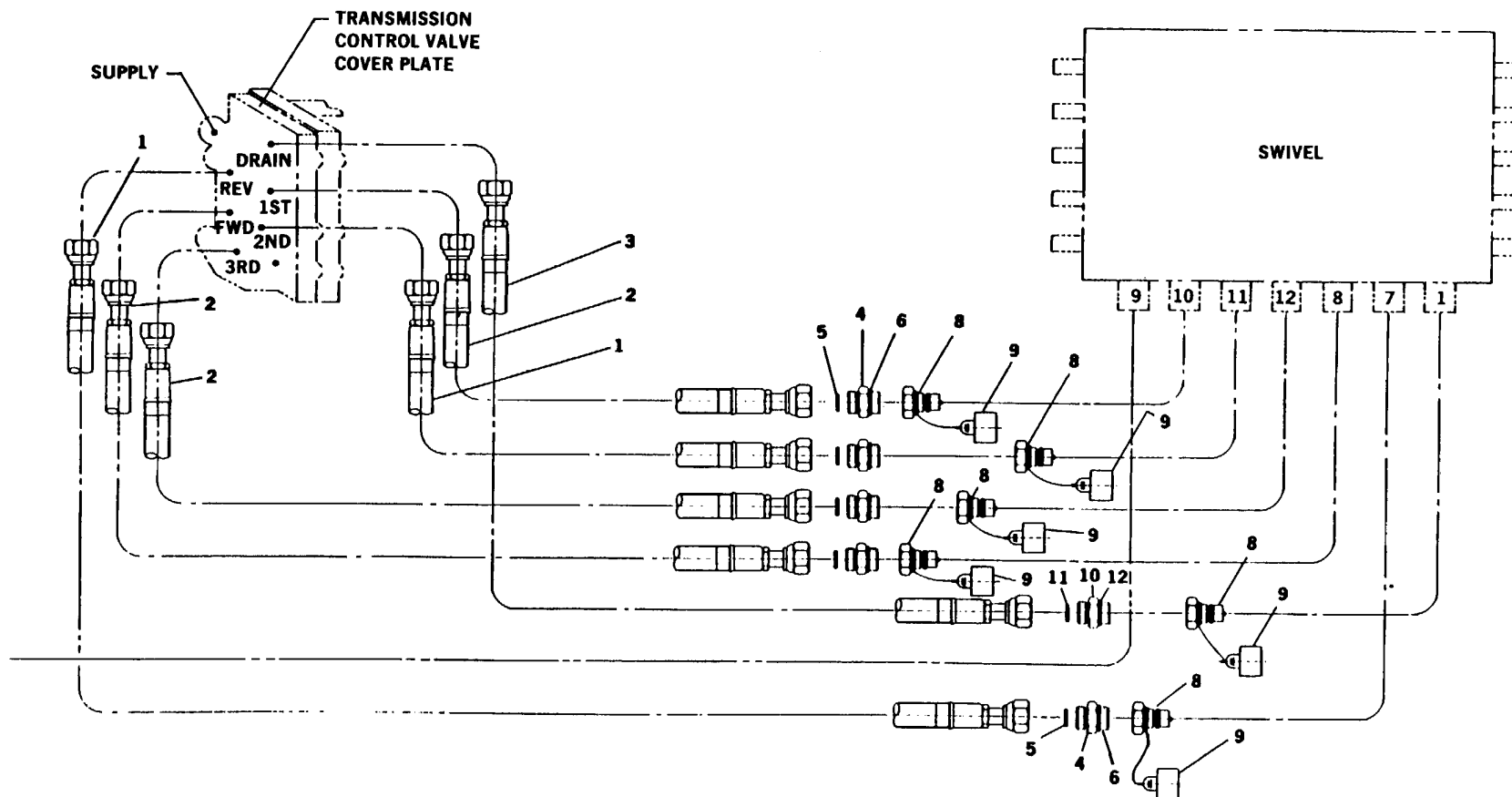
INSTALLATION:

- I. INSTALL HYDRAULIC LINE.
 - a. Coat threads with Loctite 545 and preformed packing with clean hydraulic fluid prior to installation.
 - b. Install fittings and new preformed packing. Tighten securely
 - c. Route hydraulic line and connect both ends with new preformed packing. Tighten securely.
2. CONNECT GROUND CABLE AT SHUNT. (REFER TO PAGE 8-109.)
3. START ENGINE AND CHECK TRANSMISSION SHIFT FUNCTIONS. CHECK FOR LEAKS. (REFER TO TM 5-3810-306-10.)

END OF TASK



FOR REFERENCE TO INDEX
NUMBERS, REFER TO RPSTL
TM 5-3810-306-24P.



TRANSMISSION CONTROL VALVE REPLACEMENT

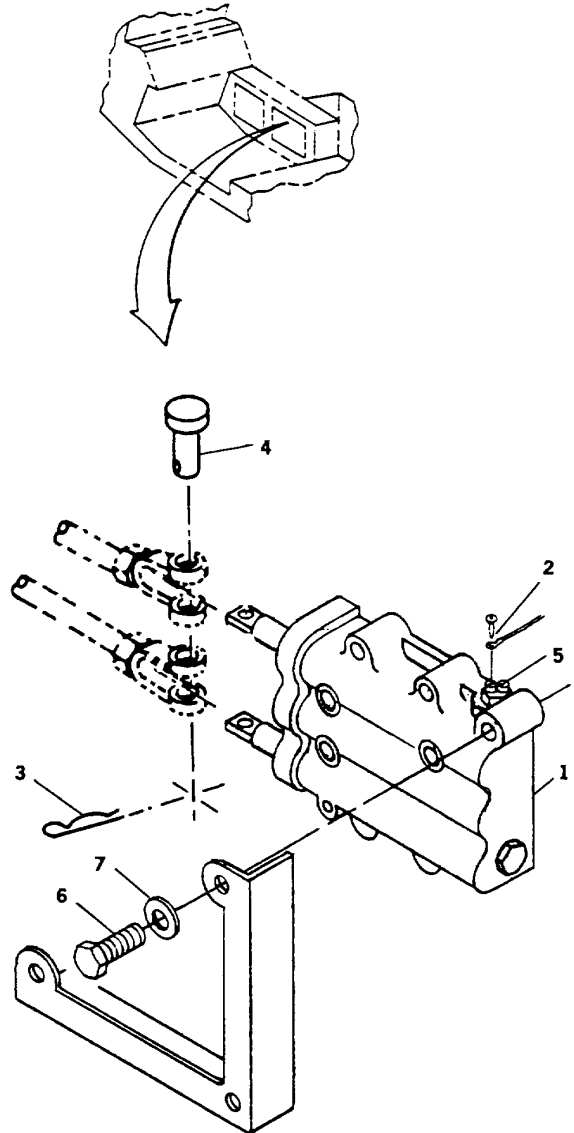
TOOLS: General mechanic's tool kit: automotive (5180-00-177-7033)

SUPPLIES: Lockwashers (Item 15, Appendix C)
 Loctite 545 (Item 13, Appendix C)
 Hydraulic oil (Item 6, Appendix C)

EQUIPMENT CONDITIONS: Disconnect ground cable at shunt. (Refer to page 8-109.)
 Operator seat and pedestal removed.
 (Refer to page 15-27.)
 Rear side access panel removed. (Refer to page 8-21.)

REMOVAL:

1. REMOVE ELECTRICAL WIRES AT NEUTRAL SAFETY SWITCH (5).
 - a. Tag electrical wires to neutral safety switch (5).
 - b. Remove two screws and electrical connectors (2).
2. REMOVE HYDRAULIC LINES.
 - a. Tag and remove hydraulic lines to control valve (1).
3. REMOVE SHIFTER LINKAGES.
 - a. Remove two hitch pin clips (3) and clevis pins (4). Remove two linkages to valve (1).
4. REMOVE TRANSMISSION CONTROL VALVE (1).
 - a. Remove three capscrews (6) and lockwashers (7) securing valve to frame mounting bracket. Remove valve (1).
 - b. Discard lockwashers (7).



INSTALLATION:

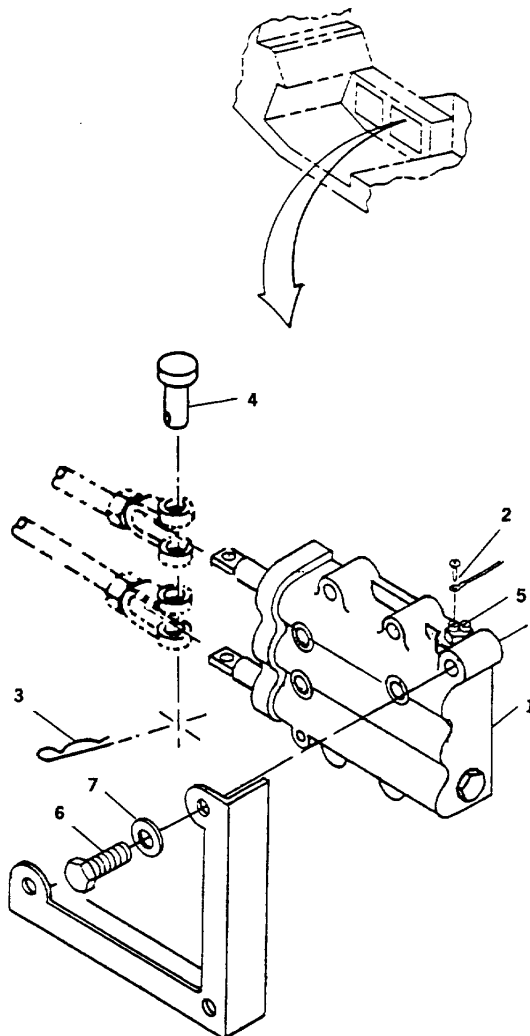
1. INSTALL TRANSMISSION CONTROL VALVE.
 - a. Position valve (1) on mounting bracket and secure with three capscrews (6) and new lockwashers (7).
2. REMOVE TAGS AND CONNECT ELECTRICAL CONNECTORS TO NEUTRAL SAFETY SWITCH. SECURE WITH SCREWS.
3. INSTALL TWO SHIFTER LINKAGES.
 - a. Position linkages on valve spools, insert clevis pin (4) and secure hitch pin clip (3).

NOTE

Prior to installing hydraulic lines, coat preformed packings with clean hydraulic oil and threads with Loctite 545.

4. INSTALL TAGGED HYDRAULIC LINES TO VALVE (1).
5. CONNECT GROUND CABLE AT SHUNT. (REFER TO PAGE 8-109.)
6. TEST FOR PROPER OPERATION AND INSPECT FOR LEAKS. (REFER TO TM 53810-306-10.)
7. INSTALL REAR SIDE ACCESS PANEL. (REFER TO PAGE 8-21.)
8. INSTALL OPERATORS SEAT AND PEDESTAL. (REFER TO PAGE 15-27.)

END OF TASK



TRANSMISSION TO TORQUE CONVERTER HYDRAULIC LINES

TOOLS: General mechanic's tool kit: automotive (5180-00-177-7033)

SUPPLIES: Loctite 545 (Item 13, Appendix C)
Preformed packings as required

EQUIPMENT CONDITIONS: Disconnect ground cable at shunt. (Refer to page 8-109.)

REMOVAL:**NOTE**

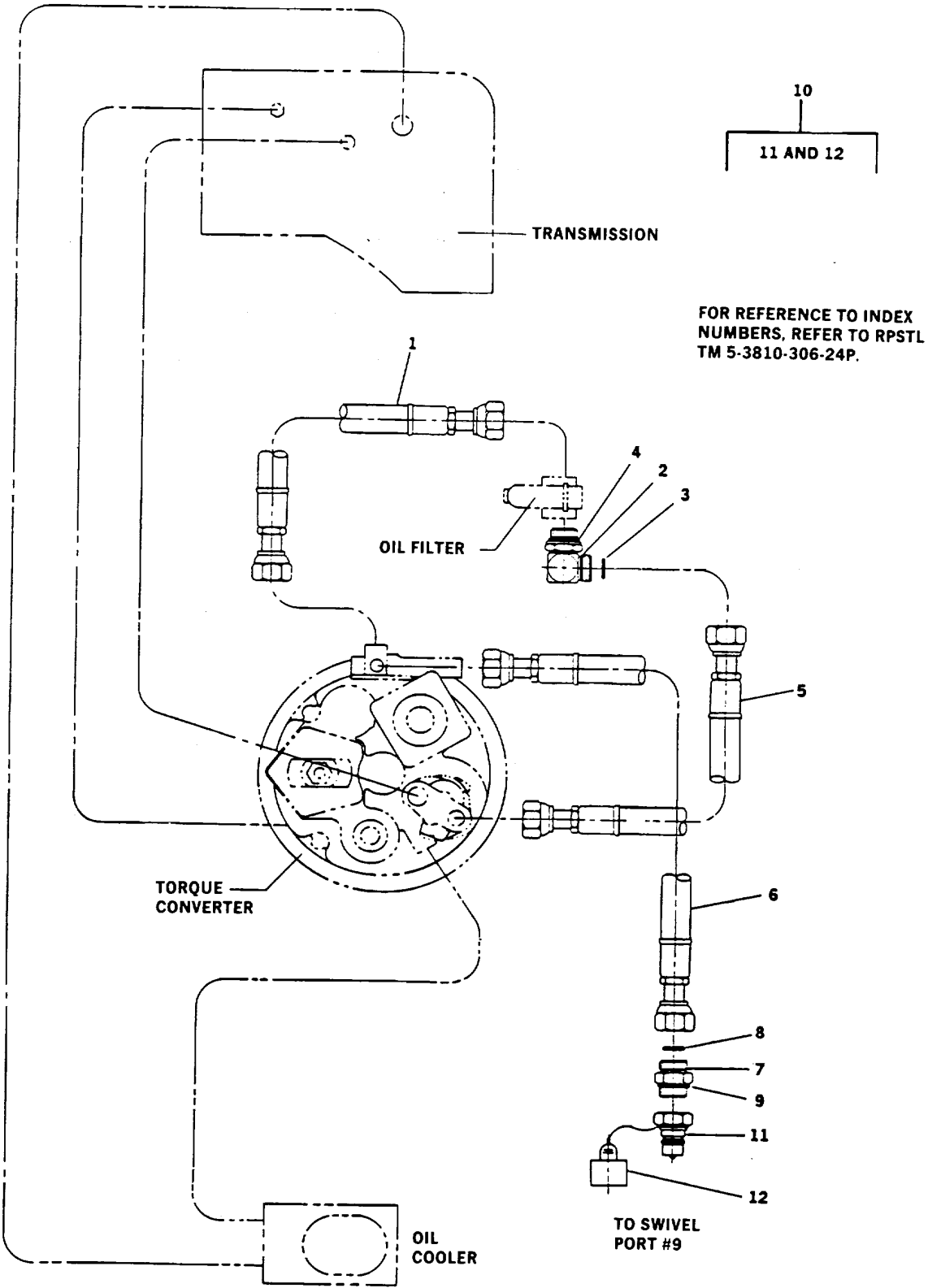
Use the following procedure to replace all hydraulic lines.

1. REMOVE HYDRAULIC LINE.
 - a. Tag and disconnect both ends of hydraulic line. Remove line and preformed packing. Note routing for ease in installation.
 - b. Remove fittings and preformed packing as necessary. Discard preformed packing.
 - c. Inspect all parts for damage and replace as required.

INSTALLATION:

1. INSTALL HYDRAULIC LINE.
 - a. Coat threads with Loctite 545 and preformed packing with clean hydraulic fluid prior to installation.
 - b. Install fittings and new preformed packing. Tighten securely.
 - c. Route hydraulic line and connect both ends with new preformed packing. Tighten securely.
2. CONNECT GROUND CABLE AT SHUNT. (REFER TO PAGE 8-109.)
3. START ENGINE AND CHECK TRANSMISSION SHIFT FUNCTIONS. CHECK FOR LEAKS. (REFER TO TM 5-3810-306-10.)

END OF TASK



FOR REFERENCE TO INDEX
NUMBERS, REFER TO RPSTL
TM 5-3810-306-24P.

TORQUE CONVERTER OIL FILTER ASSEMBLY INSTALLATION

TOOLS: General mechanic's tool kit: automotive (5180-00-177-7033)
 Drain pan

SUPPLIES: Clean rags (Item 1, Appendix C)
 Lockwashers (Item 5, Appendix C)
 Preformed packings Item 84, Appendix C) (2 Required)
 Preformed packings Item 27, Appendix C) (3 Required)

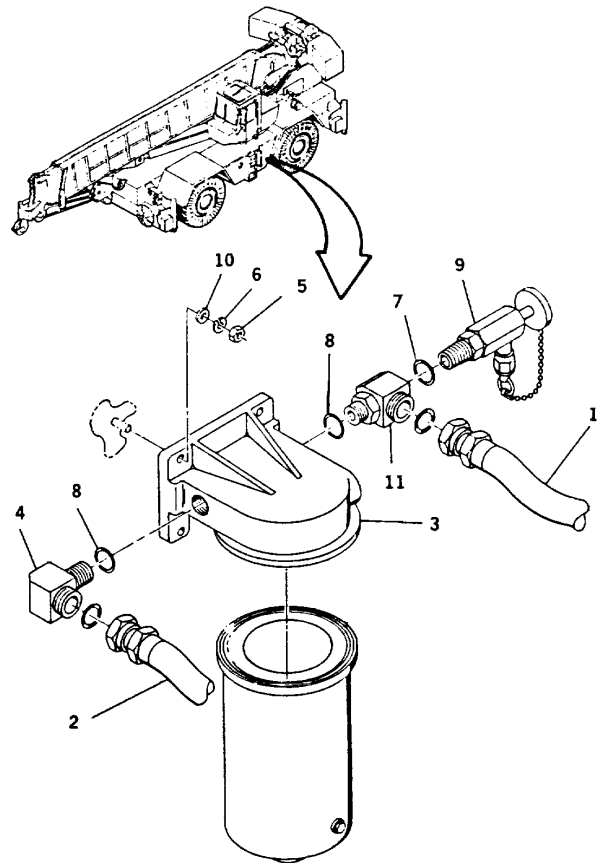
EQUIPMENT CONDITION: Transmission is drained. (Refer to LO 5-3810-306-10.)
 Disconnect ground cable at shunt. (Refer to page 8-109.)

REMOVAL:

NOTE

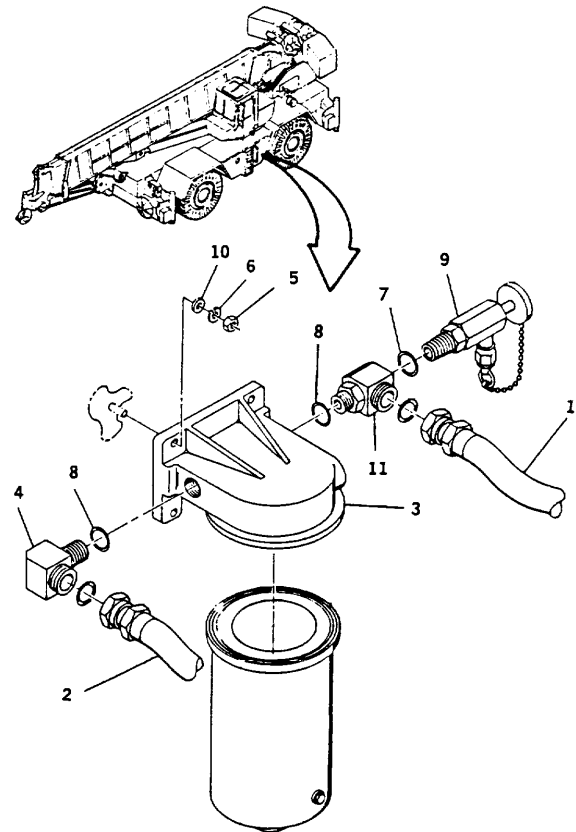
Get set to catch oil in pan.

1. DISCONNECT TWO TRANSMISSION OIL LINES (1, 2).
 - a. Disconnect flow "IN" oil line (1) from elbow (11). Cap line (1).
 - b. Disconnect flow "OUT" oil line (2) from elbow fitting (4). Cap line (2).
2. DISCONNECT HEAD ASSEMBLY (3) AND SAMPLE VALVE (9).
 - a. Remove four nuts (5), flatwashers (10) and lockwashers (6). Discard lockwashers (6).
 - b. Remove elbow fittings (4 and 11) from head assembly (3). Discard preformed packings (8).
 - c. Remove sampling valve (9) from elbow fitting (11). Discard preformed packings (7).
3. INSPECT PARTS FOR DAMAGE. REPLACE AS REQUIRED.



INSTALLATION:

1. INSTALL ELBOW FITTINGS (4 AND 11) AND SAMPLING VALVE (9) ON HEAD ASSEMBLY (3).
 - a. Put new preformed packings (8) on fittings (4 and 11). Install fittings (4 and 11).
 - b. Put new preformed packings (7) on sampling valve (9). Install on elbow fitting (11).
2. INSTALL HEAD ASSEMBLY (3) ON FRAME MOUNTING STUDS.
 - a. Hold head assembly (3) in place on mounting studs. Install four nuts (5), new lockwashers (6) and flatwashers (10).
3. CONNECT TWO TRANSMISSION OIL LINES (1 and 2).
 - a. Remove caps.
 - b. Connect flow "IN" oil line (1) to elbow (11).
 - c. Connect flow "OUT" oil line (2) to elbow (4).
4. IF NECESSARY, FLUSH TRANSMISSION OIL SYSTEM (REFER TO TM 5-3810-306-34.)
5. SERVICE TRANSMISSION/TORQUE CONVERTER OIL (REFER TO LO 5-3810306-12).
6. CONNECT GROUND CABLE AT SHUNT. (REFER TO PAGE 8-109.) END OF TASK



TORQUE CONVERTER OIL FILTER INSTALLATION

TOOLS: General mechanic's tool kit: automotive (5180-00-177-7033)
 Drain pan

SUPPLIES: Clean rags (Item 1, Appendix C)
 Hydraulic oil (Item 6, Appendix C)
 Oil filter element (Item 4, Appendix C)

EQUIPMENT CONDITION: Disconnect ground cable at shunt. (Refer to page 8-109.)

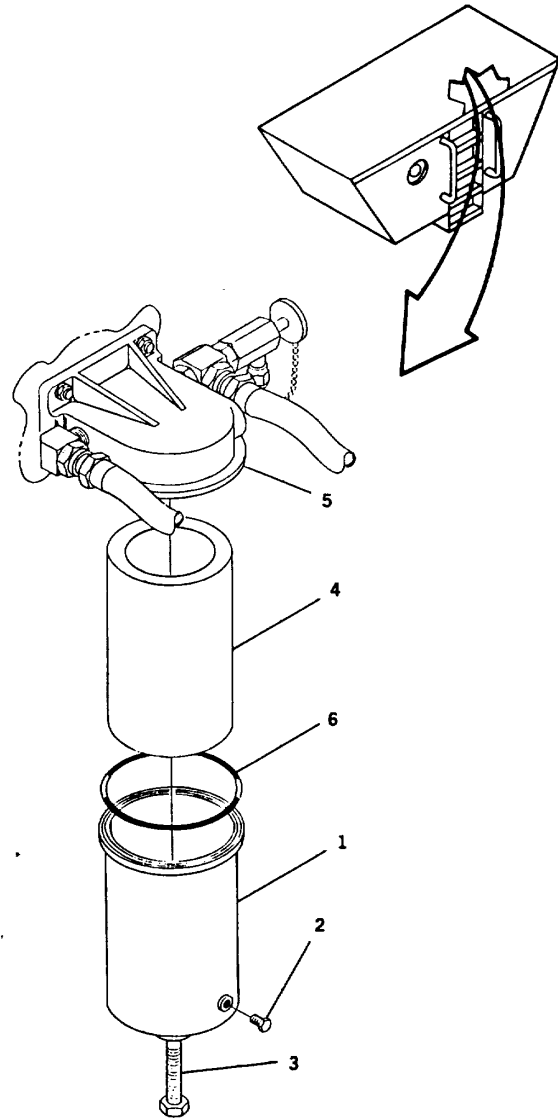
REMOVAL:

1. DRAIN FILTER HOUSING (1).
 - a. Wipe area around oil filter housing (1) with rag.
 - b. Put drain pan under filter housing (1).
 - c. Remove drain bolt (2). When completely drained, do step d.
 - d. Install drain bolt (2) in filter housing (1).
2. REMOVE FILTER ELEMENT (4) AND GASKET (6).

CAUTION

Bolt (3) should not be removed from filter housing (1).

- a. Hold filter housing (1) in place.
- b. Unscrew bolt (3) until filter housing (1) is removed from head assembly (5).
- c. Lower filter housing (1).
- d. Pull filter element (4) from filter housing (1). Remove gasket (6) and discard.

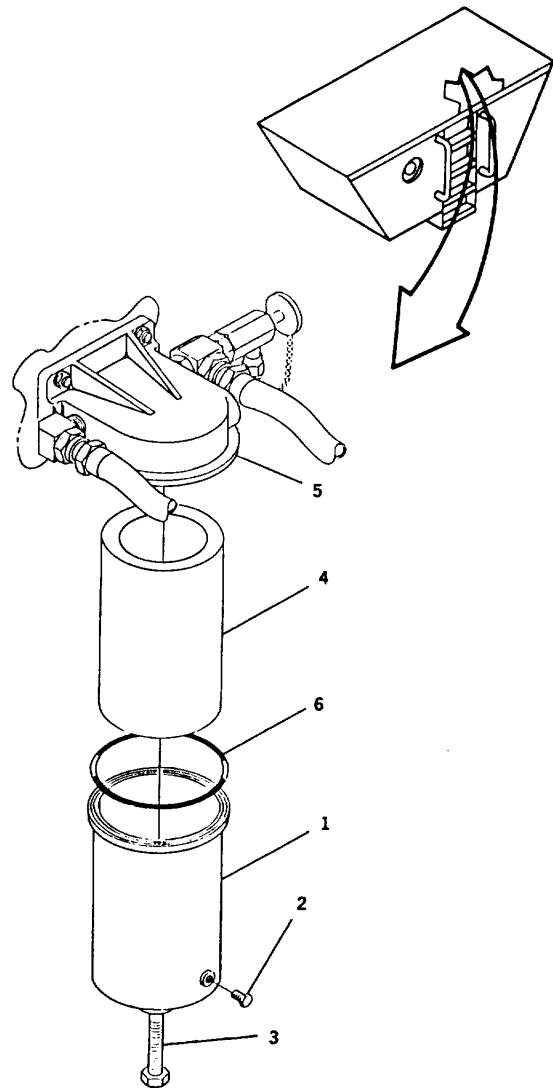


3. INSPECT PARTS FOR DAMAGE. REPLACE AS REQUIRED.
 - a. Inspect filter element (4) for metal chips or flakes. If found, retain filter element (4) and contact Direct Support maintenance regarding possible torque converter/transmission problems. If none are found, discard filter element (4).

INSTALLATION:

1. INSTALL FILTER ELEMENT (4), GASKET (6) AND FILTER HOUSING (1).
 - a. Apply oil on gasket (6). Put gasket (6) in groove on filter housing (1).
 - b. Put filter element (4) in filter housing (1).
 - c. Hold filter housing (1) into place against head assembly (5).
 - d. Screw in bolt (3). Torque bolt (3) between 25-35 lb-ft (34-47 Nm).
2. SERVICE TRANSMISSION/TORQUE CONVERTER OIL (REFER TO LO 5-3810306-12).
3. CONNECT GROUND CABLE AT SHUNT. (REFER TO PAGE 8-109.)

END OF TASK



CHAPTER 10
PROPELLER SHAFT MAINTENANCE

CHAPTER INDEX

Procedure	Page
Propeller Shaft Replacement	10-2
Propeller Shaft Repair	10-4

PROPELLER SHAFT REPLACEMENT

TOOLS: General mechanic's tool kit: automotive (5180-00-177-7033)

SUPPLIES: Cleaning solvent P-D-680 (Item 80, Appendix C)
 Clean rags (Item 1, Appendix C)
 Grease (MIL-G-10924) (Item 9, Appendix C)
 Lockwashers (Item 16, Appendix C)

EQUIPMENT CONDITIONS: Disconnect ground cable at shunt. (Refer to page 8-109.)

REMOVAL:

1. REMOVE PROPELLER SHAFT(S).

NOTE

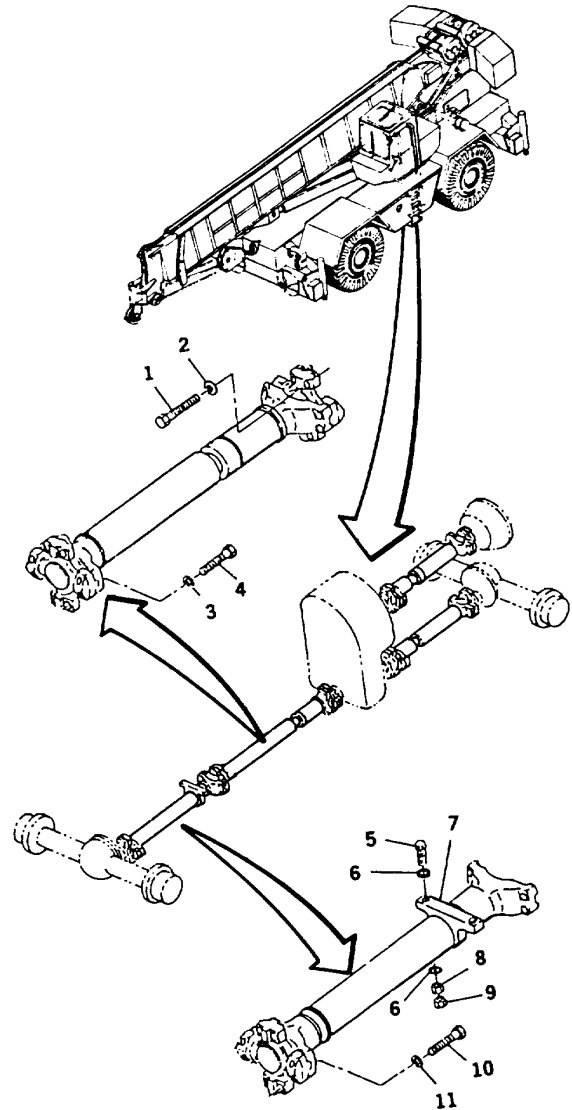
Propeller shaft from transmission to center bearing is shown. Use following steps to remove and replace all other propeller shafts.

- a. Scribe a mark across yoke flanges on both ends of propeller shaft to be removed.
- b. Support propeller shaft and remove four capscrews (1 and 4) and lockwashers (2 and 3). Discard lockwashers (2 and 3). Lower propeller shaft to ground.

NOTE

Propeller shafts from transmission to front axle incorporates a center bearing (7). Use following procedure to remove bearing.

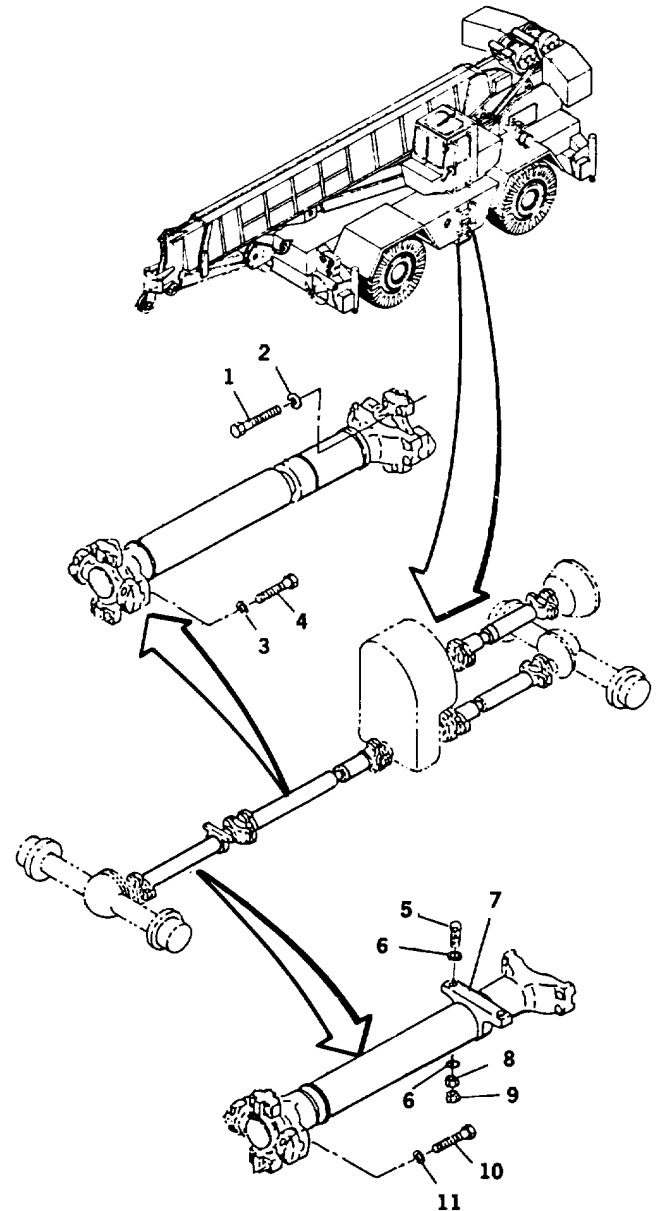
- c. Support drive line and remove two capscrews (5), washers (6), nuts (8) and jam nuts (9) to free center bearing (7) from chassis frame.
- d. Remove four capscrews (10) and lockwashers (11). Discard lockwashers (11). Remove propeller shaft from front axle.



INSTALLATION:

1. LUBRICATE SPLINES ON PROPELLER SHAFTS. (REFER TO LO 5-3810-30612.)
2. INSTALL PROPELLER SHAFT(S).
 - a. Position and align marked flanges at front propeller shaft and front axle yoke. Secure with four capscrews (10) and new lockwashers (11).
 - b. Align center bearing (7) with holes in frame and secure center bearing (7) with two capscrews (5), washers (6), nuts (8) and jam nuts (9).
 - c. Align marked flanges on center bearing yoke and transmission yoke with flanges on propeller shaft and secure with four capscrews (1 and 4) and new lockwashers (2 and 3) on each end of propeller shaft.
 - d. Torque transmission to torque converter propeller shaft mounting bolts to 45 ft-lbs (60 Nm).
 - e. Torque mounting bolts on transmission to axle propeller shafts to 90-110 ft-lbs (120-147 Nm).
3. CONNECT GROUND CABLE AT SHUNT. (REFER TO PAGE 8-109.)
4. TEST FOR PROPER OPERATION. (REFER TO TM 5-3810-306-10.)

END OF TASK



PROPELLER SHAFT REPAIR

TOOLS: General mechanic's tool kit: automotive (5180-00-177-7033)

SUPPLIES: Cleaning solvent P-D-680 (Item 80, Appendix C)
 Clean rags (Item 1, Appendix C)
 Grease (MIL-G-10924) (Item 9, Appendix C)
 Lockwashers (Item 15, Appendix C) (8 Required)
 Lockwashers (Item 16, Appendix C) (8 Required)

EQUIPMENT CONDITIONS: Propeller shafts removed. (Refer to page 10-2.)

DISASSEMBLY:

1. DISASSEMBLE PROPELLER SHAFT(S).

NOTE

Propeller shaft from torque converter to transmission shown in Figure A. Use steps a through c to repair rear axle to transmission and center bearing yoke assembly to transmission propeller shaft.

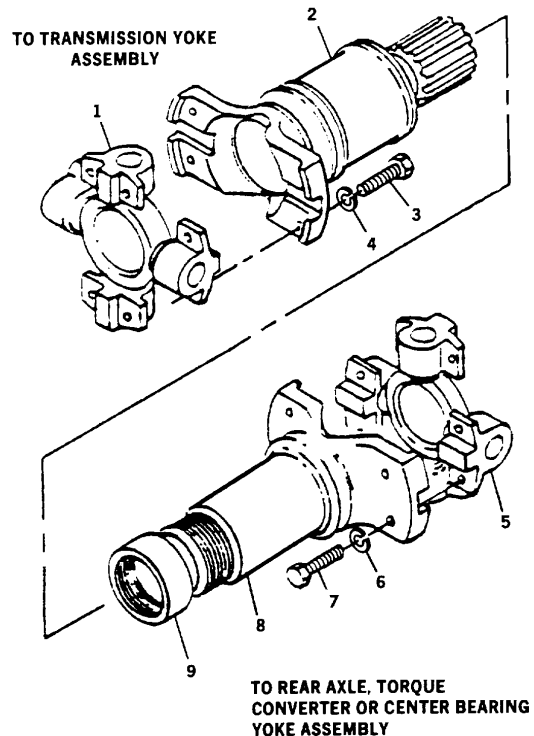
- a. Scribe a mark across yoke spline (2) to yoke assembly (8).
- b. Disassemble propeller shafts by removing four capscrews (3 and 7) and lockwashers (4 and 6) to remove cross and bearings (1 and 5) from yoke spline (2) and yoke assembly (8). Discard lockwashers (4 and 6).
- c. Separate yoke spline (2) from yoke assembly (8) and remove seal (9).

2. DISASSEMBLE PROPELLER SHAFT BETWEEN TRANSMISSION YOKE AND CENTER BEARING YOKE.

NOTE

Propeller shaft from front axle yoke assembly to transmission propeller shaft yoke assembly shown in Figure B.

FIGURE A



- a. Scribe a mark across yoke spline (11) and center bearing yoke assembly (15).
- b. Disassemble yoke assembly (15) from spline (11) by removing nut (14).

- c. Remove center bearing (16) from yoke assembly (15).
- d. Remove four capscrews (12) and lockwashers (13) from yoke spline flange to free cross and bearings (10). Discard lockwashers (13).

CLEANING:

WARNING

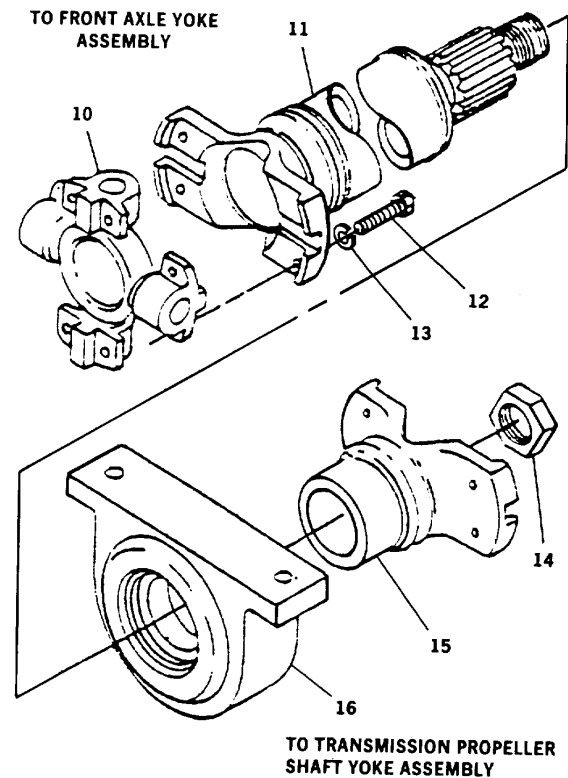
Dry cleaning solvent P-D-680 is toxic and flammable. Wear protective goggles and gloves and use only in a well ventilated area. Avoid contact with skin, eyes, and clothes and don't breathe vapors. Do not use near open flame or excessive heat. Flash point is 100°F-138°F (38°-59°C). If you become dizzy 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 METAL PARTS WITH P-D-680. DRY WITH COMPRESSED AIR.

FIGURE B



2. INSPECT ALL PARTS FOR DAMAGE. REPLACE PARTS AS REQUIRED. CROSS AND BEARINGS MUST BE REPLACED AS A SET.

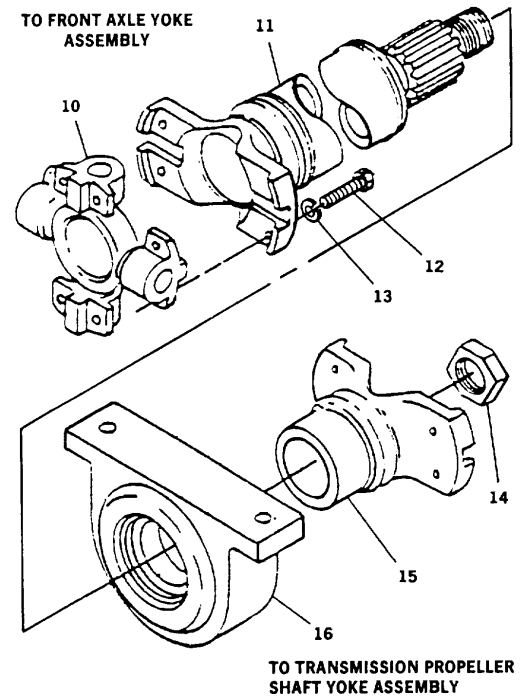
REASSEMBLY:

1. LUBRICATE YOKE SPLINES ON PROPELLER SHAFTS. (REFER TO LO 5-3810-30612).
2. REASSEMBLE PROPELLER SHAFT(S).
 - a. Install seal (9) on yoke assembly (8).
 - b. Align marks and insert yoke spline (2) into yoke assembly (8).
 - c. Install cross and bearings (1 and 5) on yoke spline (2) and yoke assembly (8) using four

capscrews (3 and 7) and new lockwashers (4 and 6).

3. INSTALL PROPELLER SHAFT BETWEEN TRANSMISSION YOKE AND CENTER BEARING YOKE.
 - a. Install center bearing (16) on yoke assembly (15).
 - b. Align timing marks and insert yoke assembly (15) onto yoke spline (11). Tap gently until yoke seats properly.
 - c. Install nut (14) on spline (11) to secure yoke assembly (15). Torque to 750 ft-lbs (997 Nm).
 - d. Install cross and bearing (10) on yoke spline flange using four capscrews (12) and new lockwashers (13).
4. INSTALL PROPELLER SHAFT BETWEEN FRONT AXLE YOKE AND TRANSMISSION YOKE. (REFER TO PAGE 10-2.)
5. TEST FOR PROPER OPERATION. (REFER TO TM 5-3810-306-10.) END OF TASK

FIGURE B



CHAPTER 11

BRAKE AND AIR SYSTEM MAINTENANCE

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	Brake Chamber Assembly	11-8
Section II	Air System Maintenance	11-12
	Air Dryer Replacement	11-12
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Section I. SERVICE BRAKES MAINTENANCE

AIR SYSTEM PURGE

TOOLS: General mechanic's tool kit: automotive (5180-00-177-7033)

SUPPLIES: None

EQUIPMENT CONDITION: Crane wheels are chocked.

PURGE:

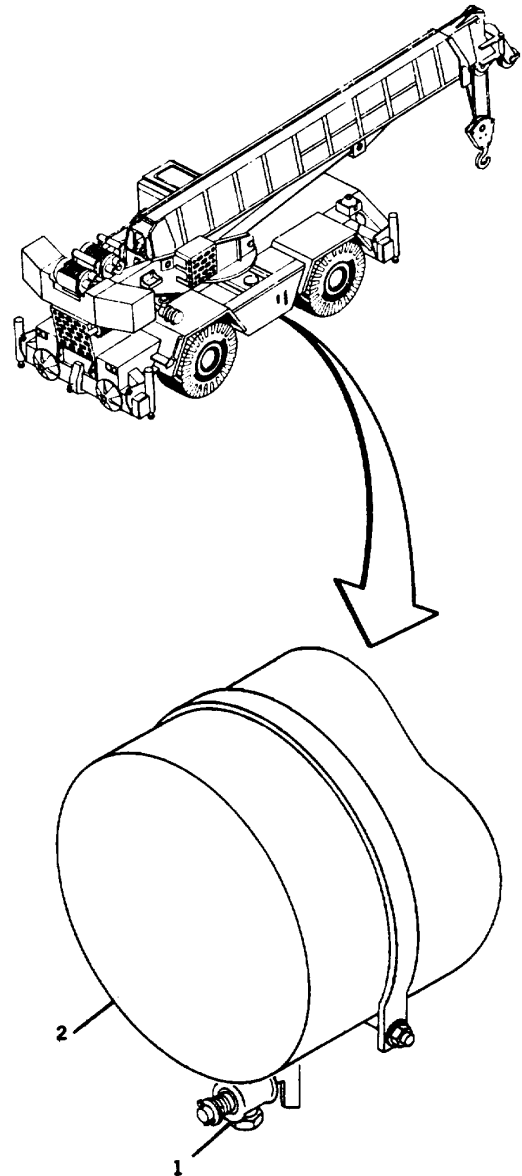
WARNING

High pressure air discharge. Do not open petcocks (1) in a dirty environment. Make sure area is clear of loose dirt, stones, etc. Wear safety goggles when purging air reservoirs (2).

NOTE

Use this task to purge primary, secondary and supply reservoirs. Primary reservoir (2) is shown.

1. PURGE PRIMARY RESERVOIR (2).
 - a. Slowly turn petcock (1) counterclockwise.
 - b. Let air escape from reservoir (2) a small amount at a time.
 - c. Turn petcock (1) clockwise to close when reservoir (2) is empty.
2. REPEAT STEP 1 FOR SECONDARY RESERVOIR.
3. PURGE SUPPLY RESERVOIR.



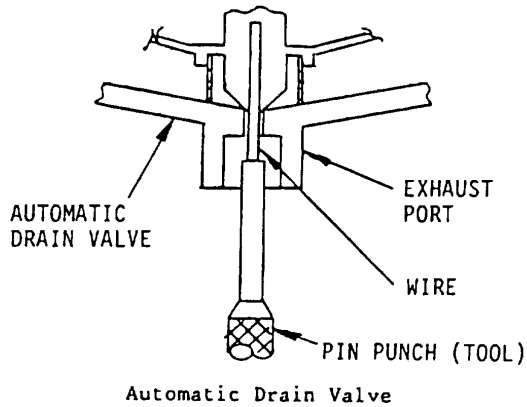
- a. Move wire in exhaust port up, holding it until draining is complete.

NOTE

In areas where more than a 30 degree temperature range is common, small amounts of water can condense in air system. Small amounts of water are normal and are not an indication that the dryer is not working.

1. START-UP ENGINE (REFER TO TM 5-3810-306-10).
 - a. Watch front console dual air gauge as air compressor builds pressure.
 - b. Make sure air pressure is within specified limits.

END OF TASK



BRAKE CHAMBER INSTALLATION

TOOLS: General mechanic's tool kit: automotive (5180-00-177-7033)

SUPPLIES: None

EQUIPMENT CONDITIONS: Disconnect ground cable at shunt. (Refer to page 8-109.)
Tire and wheel assembly removed. (Refer to page 12-2.)

REMOVAL:

WARNING

Never attempt to remove spring brake chamber clamp (8) without first caging spring brake (1). The spring is powerful enough to cause parts to fly apart with explosive force causing personnel injury and equipment damage.

1. MANUALLY CAGE SPRING BRAKE CHAMBER (1).
 - a. Locate and remove caging bolt (2) nut (3) and washer (4) on side of brake chamber.
 - b. Remove rubber cap (5) from rear of brake chamber.
 - c. Install caging bolt into hole in brake chamber and rotate one quarter turn to lock it in chamber.
 - d. Thread nut (3) with washer (4) on bolt (2) and tighten 18-21 turns.

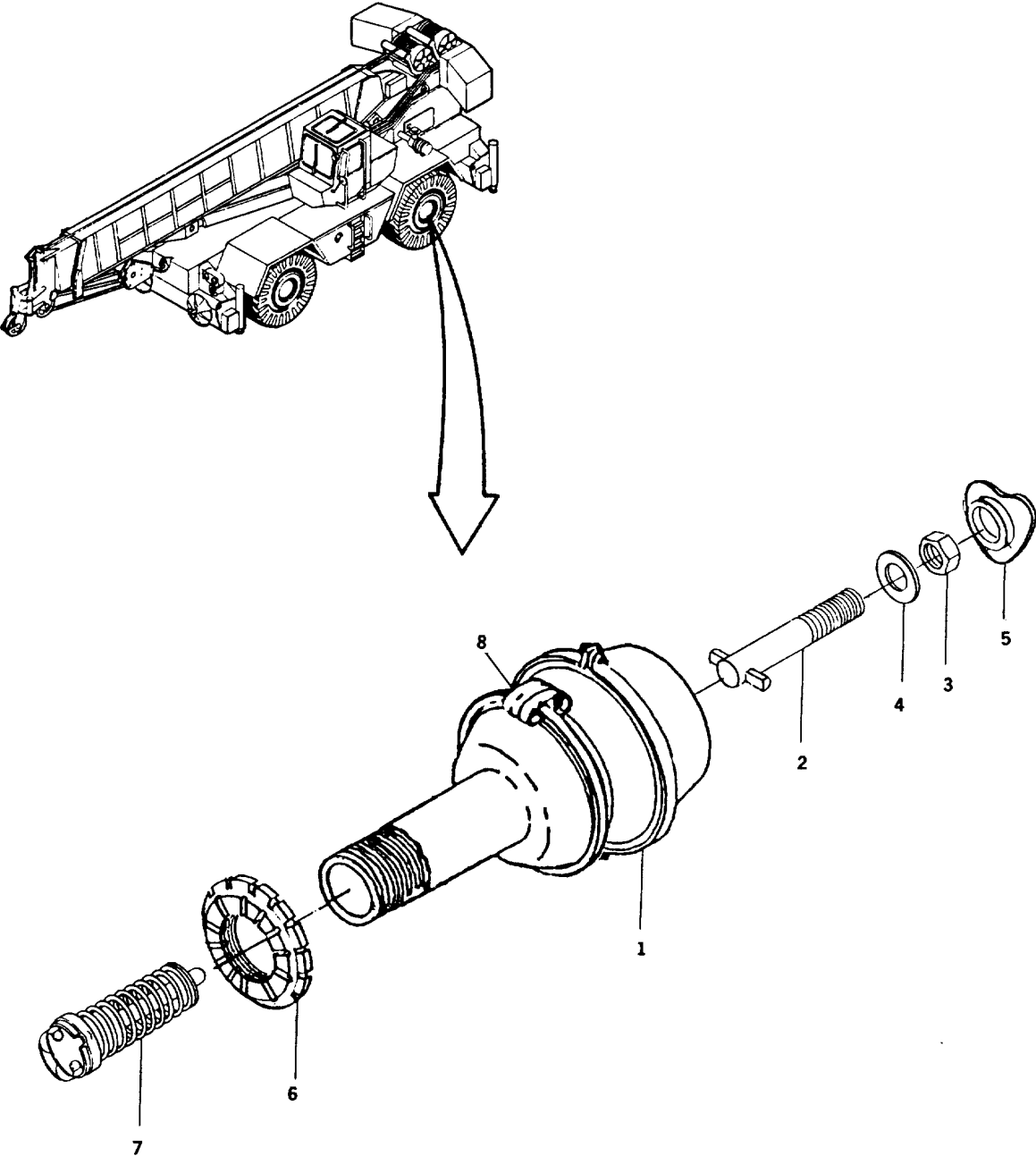
NOTE

Do not force nut beyond its normal stop. Thirty (30) pounds-foot torque is maximum that should be required. Uncaging spring is accomplished by reversing procedure.

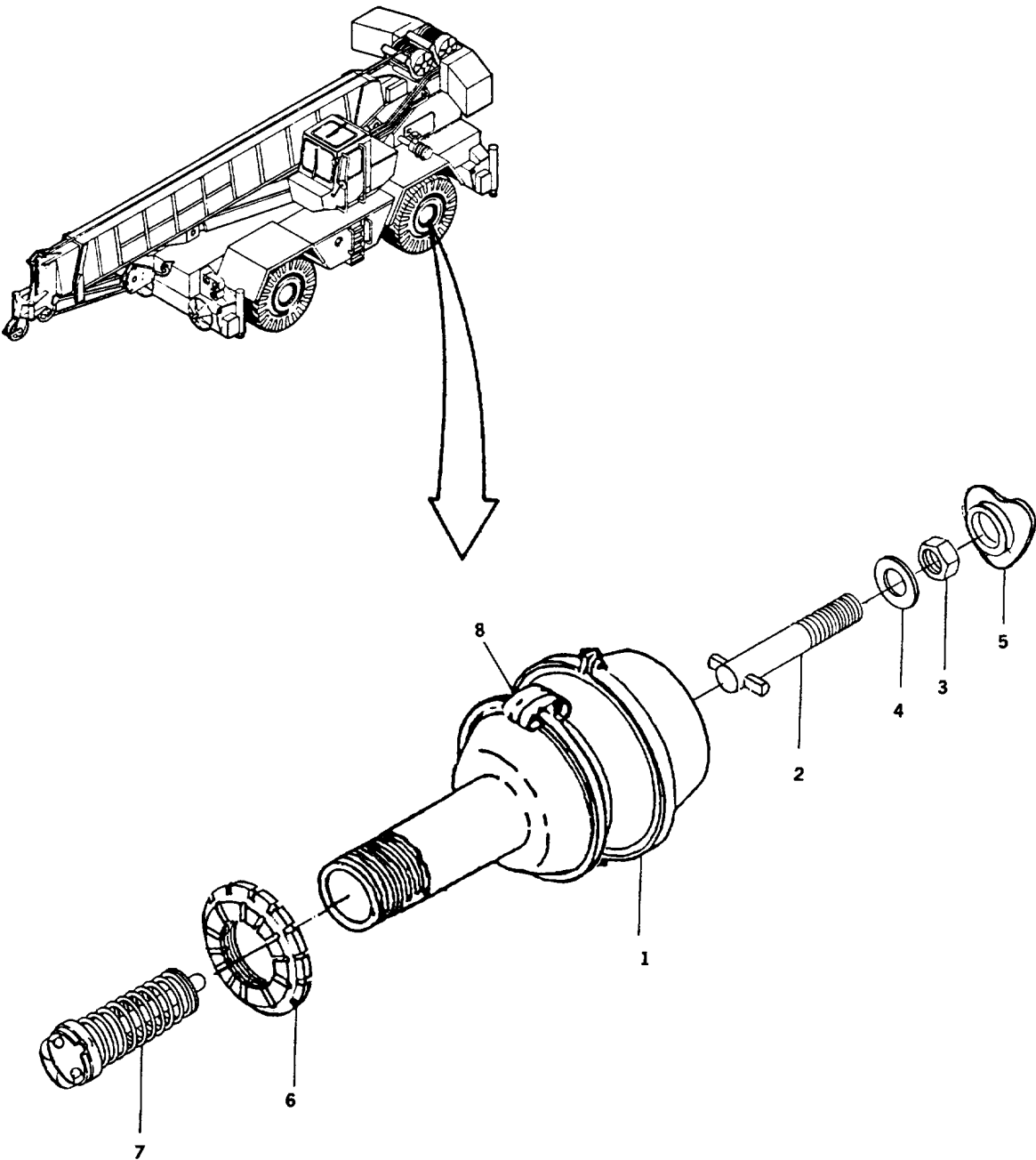
2. TAG AND DISCONNECT AIR LINES TO SPRING BRAKE CHAMBER.
3. REMOVE SPRING BRAKE CHAMBER.
 - a. Loosen collet nut (6) on stem of brake chamber with a drift punch and hammer. Remove entire brake chamber by threading it out of plunger housing.
 - b. Pull wedge assembly (7) out of plunger housing.

INSTALLATION:

1. INSTALL WEDGE ASSEMBLY.
 - a. Install wedge assembly (7) into the plunger housing. Check for the correct roller-plunger engagement by pushing on wedge rod by hand while checking for plunger and shoe lift, or measure standout of wedge rod from end of threaded housing bore. When properly assembled, wedge standout is 2.25 inches (57.2 mm).
2. INSTALL BRAKE CHAMBER ASSEMBLY.
 - a. Install collet nut (6) on stem of brake chamber housing (1).
 - b. Install air brake chamber by threading it into plunger housing.
 - c. Tighten collet nut (6) on stem of air brake chamber housing (1) using a drift and hammer.



- d. Install air hoses to brake chamber as tagged during removal.
3. UNCAGE SPRING IN BRAKE CHAMBER.
- a. Loosen nut (3) on caging bolt (2) to uncage spring in brake chamber.
 - b. Remove nut (3) and washer (4) from caging bolt (2). Turn caging bolt (2) one quarter turn to remove from brake chamber.
 - c. Install caging bolt (2), washer (4) and nut (3) in holding hole on side of brake chamber. Install rubber cap (5) in hole in brake chamber.
4. CONNECT GROUND CABLE AT SHUNT. (REFER TO PAGE 8-109.)
5. CHECK FOR PROPER OPERATION. (REFER TO TM 5-3810-306-10.) INSPECT FOR LEAKS.
- END OF TASK



BRAKE CHAMBER ASSEMBLY

TOOLS: General mechanic's tool kit: automotive (5180-00-177-7033)

SUPPLIES: None

EQUIPMENT CONDITIONS: Brake chamber assembly removed. (Refer to page 11-4.)

DISASSEMBLY:

1. DISASSEMBLE WEDGE ASSEMBLY.

WARNING

Wedge assembly is under pressure. Quick release of spring pressure can cause injury.

CAUTION

Use a vise with soft metal covers on jaws to compress and hold spring (5).

- a. Compress and hold retaining spring (5) and remove snap ring (7) from wedge shaft. Carefully release spring (5).
- b. Remove retaining washer (6) wedge spring (5) and spring retainer (4) from cage (2).

CAUTION

Do not attempt to drive wedge (1) through rollers (3) and cage (2) or force rollers (3) through slightly closed slots of cage. This will permanently damage cage (2).

- c. Insert a thin bladed screwdriver between one flat of wedge head and the roller retainer cage (2). Spread cage (2) open just far enough to remove rollers(3).

- d. Remove roller retainer cage (2) by sliding it off wedge shaft (1).

2. DISASSEMBLE BRAKE CHAMBER.

WARNING

Ensure spring brake chamber (18) is caged before continuing.

- a. Remove clamp ring nuts (10) and bolts (11). Clamp ring (9) is nearest threaded tube.
- b. Spread clamp ring (9) and remove spring brake chamber (18) from non-pressure housing (12).

NOTE

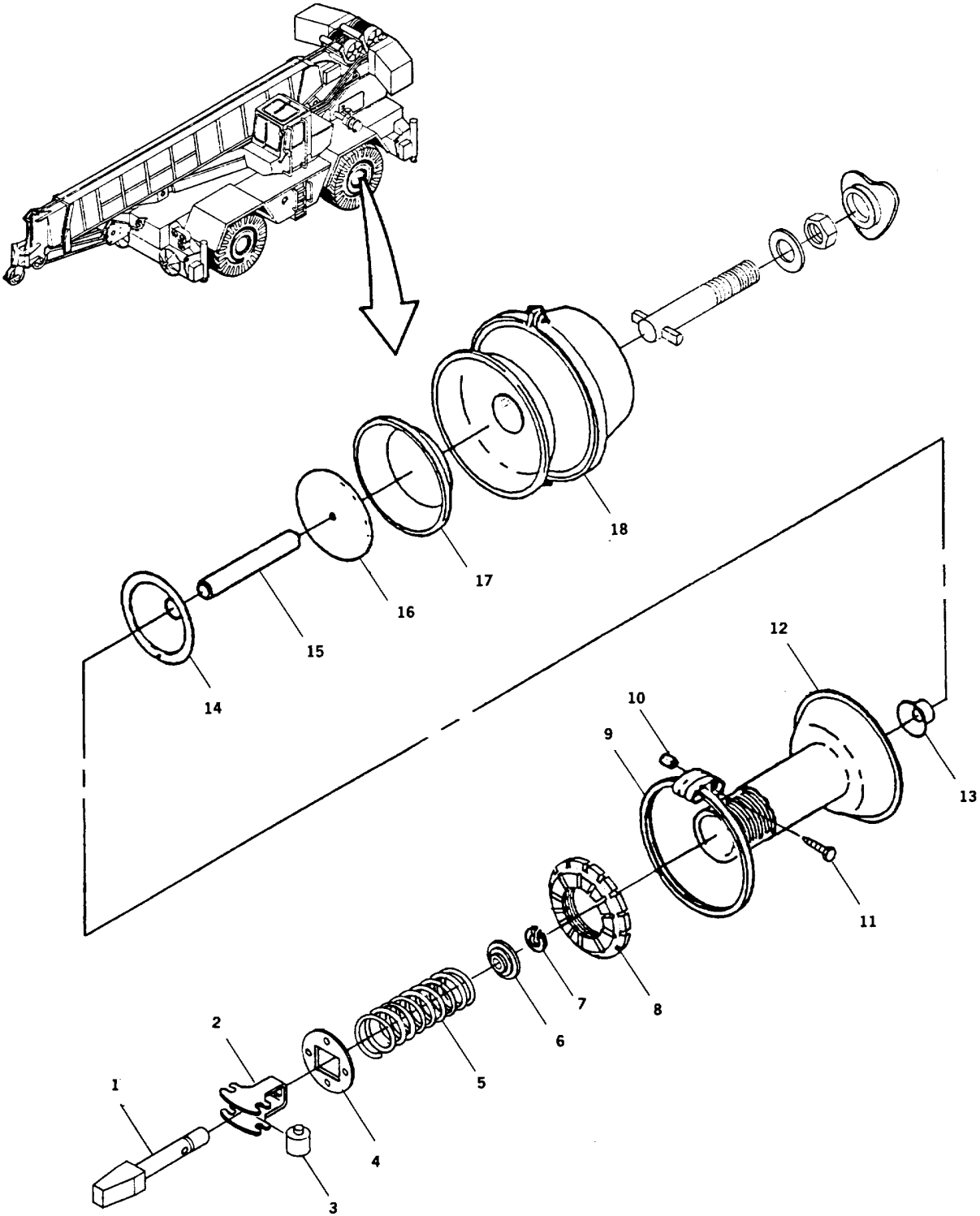
Spring brake chamber (18) containing large spring can be removed to service remainder of the assembly, after spring is caged, but is not serviceable itself.

- c. Remove diaphragm (17), diaphragm plate (16), push rod (15), boot (14) and wedge guide (13) from non pressure housing (12).

INSPECTION:

1. INSPECT WEDGE ASSEMBLY.

- a. Inspect wedge rollers (3) for grooves or nicks and replace if necessary.



- b. Inspect wedge (1) for cracks or wear and replace if necessary.
 - c. Inspect roller retainer cage (2) for damage and wear. Replace as necessary.
 - d. Ensure groove for snap ring on wedge shaft (1) is clean and sharp.
2. INSPECT BRAKE CHAMBER COMPONENTS.
- a. Inspect diaphragm (17) for splits or cracking and replace if necessary.
 - b. Inspect housings (12 and 18) for cracks and damage. Replace as required.

REASSEMBLY:

1. ASSEMBLE WEDGE ASSEMBLY.
- a. Insert wedge shaft (1) into roller retainer cage (2).
 - b. Install two rollers (3) into cage (2). Bend tabs slightly inward to secure rollers without limiting roller action.
 - c. Install spring retainer (4) over wedge shaft (1) and position it centrally over cage (2) and roller assembly.

NOTE

Current production and service replacements use a spring retainer (4) that has two tabs or protrusions on the OD. These tabs serve to align wedge assembly as it is installed into plunger housing by engaging grooves in wedge bore. If the plunger housing is not equipped with such

NOTE (CONT)

grooves, remove tabs at breakoff marks and file OD of retainer smooth.

- d. Install wedge spring (5) over wedge shaft (1), large coil diameter first. Add spring retainer washer (6) and compress spring (5) by hand far enough to expose cotter pin hole and install snap ring (7).

2. ASSEMBLE BRAKE CHAMBER.

- a. Install wedge guide (13), boot (14), push rod (15), diaphragm plate (16) and diaphragm (17).

WARNING

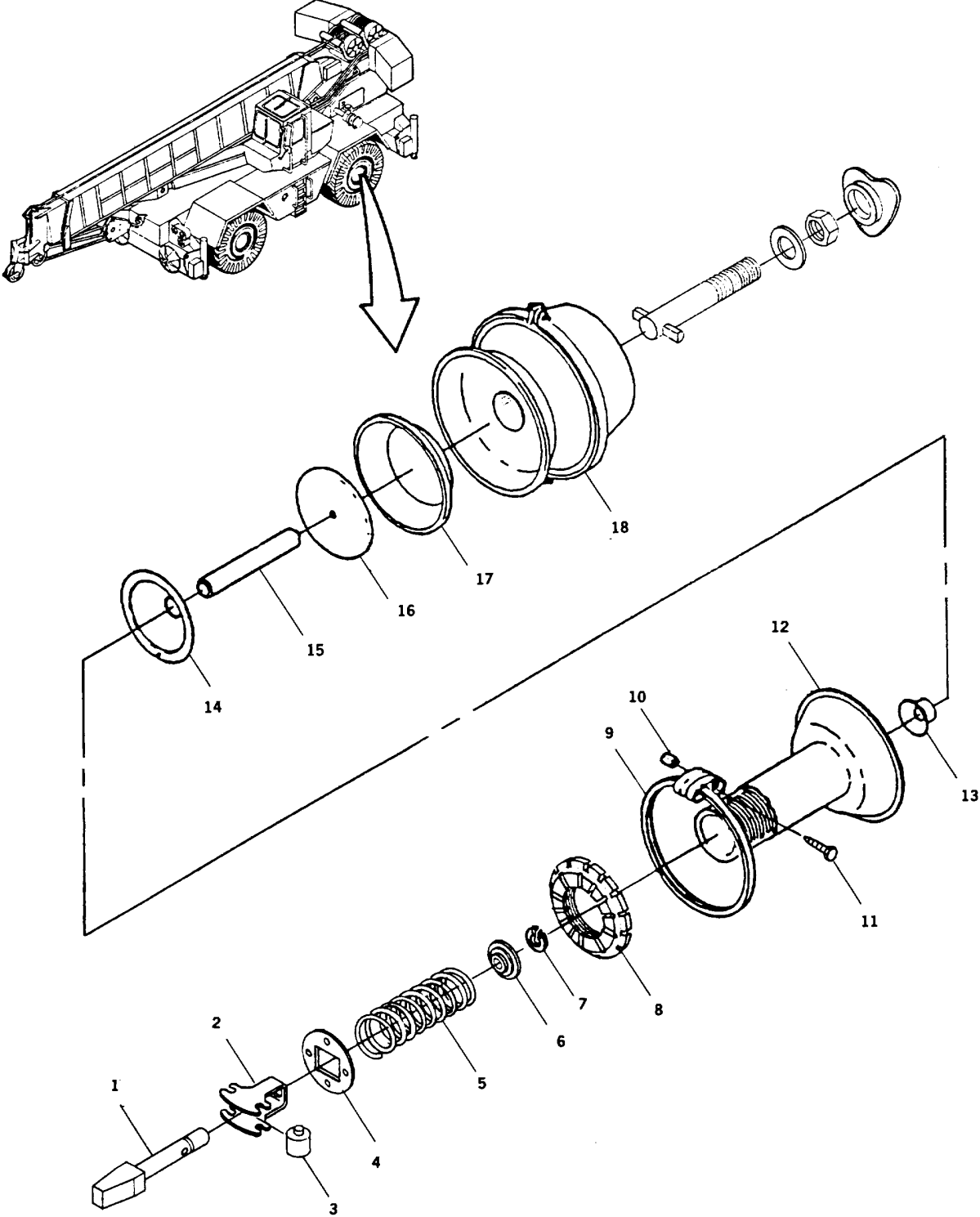
Prior to installing spring brake chamber (18), ensure spring (5) is caged.

- b. Install spring brake chamber (18) on the non-pressure housing (12).
- c. Spread clamp ring (9) and install bolts (11) and nuts (10) that secure spring brake chamber (18) to non-pressure housing (12).

3. INSTALL BRAKE CHAMBER. (REFER TO PAGE 11-4.)

4. TEST FOR PROPER OPERATION. (REFER TO TM 5-3810-306-10.)

END OF TASK



Section II. AIR SYSTEM MAINTENANCE

AIR DRYER REPLACEMENT

TOOLS: General mechanic's tool kit: automotive (5180-00-177-7033)

SUPPLIES: Lockwashers (Item 15, Appendix C) (6 Required)

EQUIPMENT CONDITIONS: Crane wheels are chocked.
Air system is purged. (Refer to page 11-2.)
Disconnect ground cable at shunt. (Refer to page 8-109.)

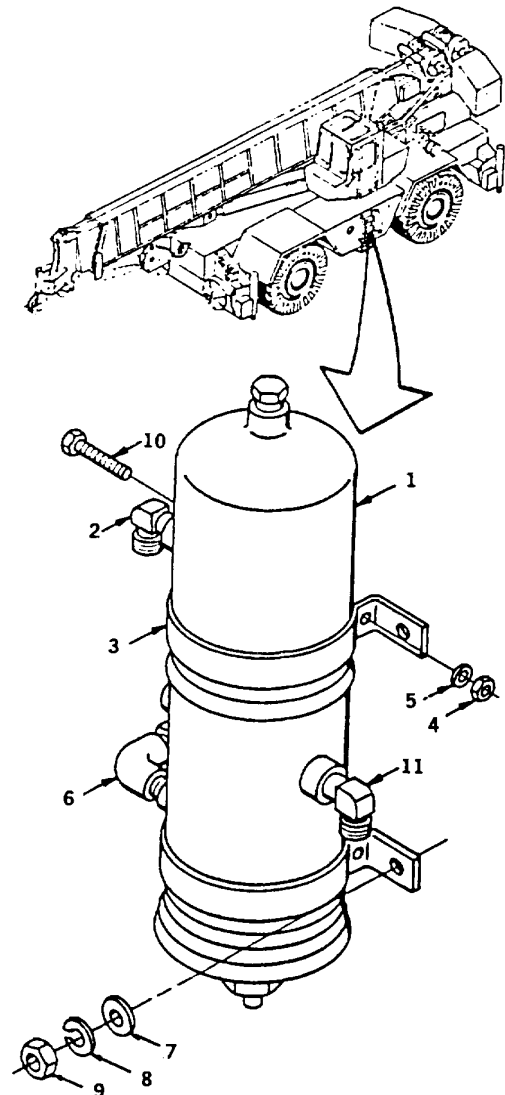
REMOVAL:

1. REMOVE AIR DRYER (1).
 - a. Tag and disconnect air lines on air dryer (1). Plug air lines.
 - b. Tag and disconnect two electrical leads from bottom of air dryer (1).

NOTE

It may be necessary to back off bolt (10) prior to removing nuts (9).

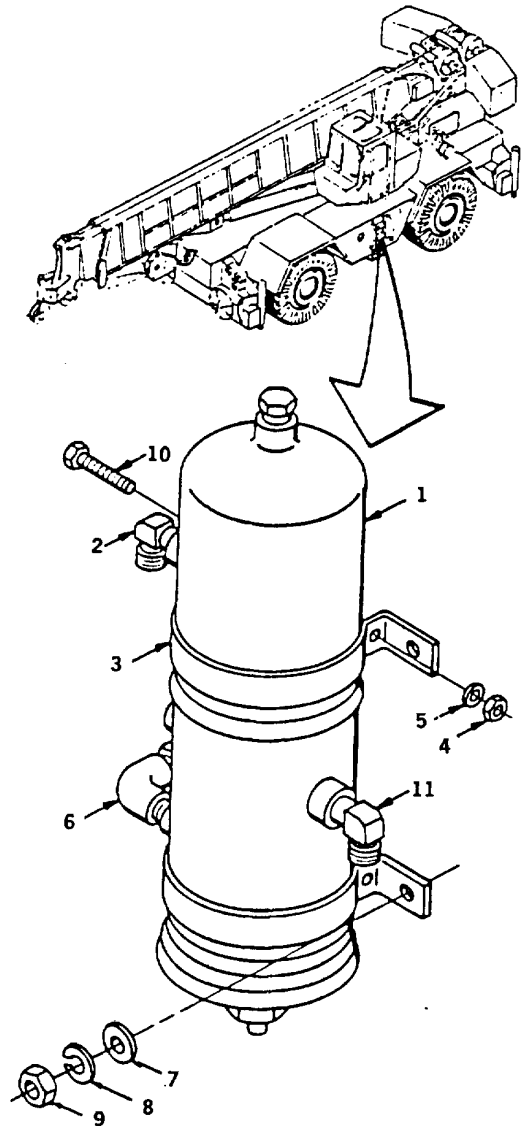
- c. Remove four nuts (9), lockwashers (8) and flatwashers (7) to free air dryer (1) from chassis frame mounting studs. Discard lockwashers (8).
- d. Remove two long capscrews (10), lockwashers (5) and nuts (4) from two mounting brackets (3). Discard lockwashers (5).
- e. Remove inlet (11), outlet (2) port fittings and pressure relief fitting (6). Retain for installation or replace if damaged.



INSTALLATION:

1. INSTALL AIR DRYER (1).
 - a. Install mounting bracket (3) on air dryer (1). Secure with two long capscrews (10), new lockwashers (5) and nuts (4).
 - b. Install inlet (11), outlet (2) port fittings and pressure relief valve (6).
 - c. Support air dryer (1) and align mounting bracket (3) on chassis frame mounting studs. Secure with four flatwashers (7), new lockwashers (8) and nuts (9).
 - d. Remove tags, plugs and connect air lines to air dryer (1).
 - e. Remove tags and connect electrical leads to air dryer (1).
2. CONNECT GROUND CABLE AT SHUNT. (REFER TO PAGE 8-109.)
3. START-UP ENGINE AND ALLOW AIR PRESSURE TO BUILD UP. (REFER TO TM 5-3810-306-10.)
4. CHECK ALL AIR OPERATED FUNCTIONS. (REFER TO TM 5-3810-306-10.)

END OF TASK



AIR DRYER DESICCANT CARTRIDGE REPLACEMENT

TOOLS: General mechanic's tool kit: automotive (5180-00-177-7033)

SUPPLIES: Desiccant Cartridge (Item 26, Appendix C)

EQUIPMENT CONDITIONS: Crane wheels are chocked.
 Air system is purged. (Refer to page 11-2.)
 Disconnect ground cable at shunt. (Refer to page 8-109.)

REMOVAL:

1. REMOVE DESICCANT CARTRIDGE ASSEMBLY (9) AND DESICCANT PLATE ASSEMBLY (6).

- a. Disconnect the heater lead.
- b. Disconnect air control line from purge valve on end cover.
- c. Loosen three capscrews (1) on end cover (2) and turn retaining clamps (3) aside (capscrews may be left finger tight.)
- d. Locate notch in dryer shell (4). While pushing end cover (2) up into dryer, insert blade of screwdriver in notch and slowly pry out retainer ring (5). Remove end cover assembly and set it aside temporarily.

NOTE

Be certain desiccant plate assembly (6) comes out with cartridge assembly (9).

- e. Loosen bolt (16) and remove cartridge assembly (9) and desiccant plate assembly (6).
2. DISASSEMBLE DESICCANT PLATE ASSEMBLY (6) AND DESICCANT CARTRIDGE ASSEMBLY (9).

NOTE

It is recommended that all non-metallic parts be replaced when the sealing plate is removed.

NOTE

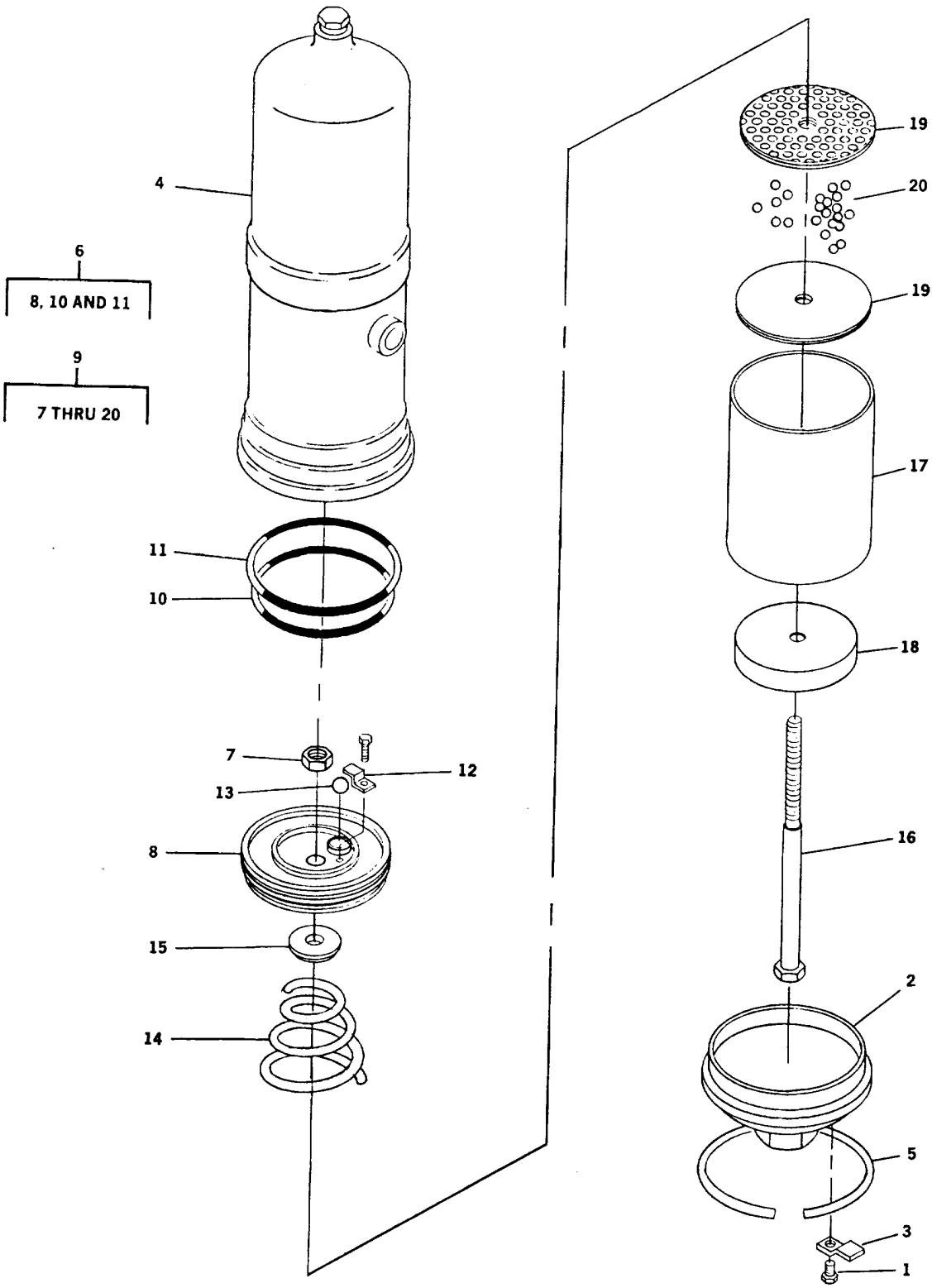
The plate is spring loaded; however, the spring load is completely relieved when the lock nut (7) is removed.

- a. Carefully remove locknut (7) on top of desiccant plate assembly (6).

NOTE

If the desiccant cartridge assembly is to be replaced as an assembly rather than be rebuilt, the cartridge assembly may be discarded after the desiccant plate assembly is removed.

- b. Separate desiccant plate assembly (6) from desiccant cartridge assembly (9).
- c. Remove two preformed packings (10 and 11) from desiccant plate (8) and discard them.



- d. Remove ball check valve retaining clip (12) and remove and discard rubber ball valve (13).
- e. Remove and retain spring (14), spring seat (15), bolt (16), and cartridge shell (17). Discard oil separator filter (18), two perforated plates (19) and desiccant material (20).

WARNING

Dry cleaning solvent P-D680 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 100°-138°F (38°-59°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.).

- 3. CLEAN DESICCANT PLATE (8) THOROUGHLY USING SOLVENT, ENSURING PURGE ORIFICE AND CHECK VALVE SEAT ARE CLEAN.

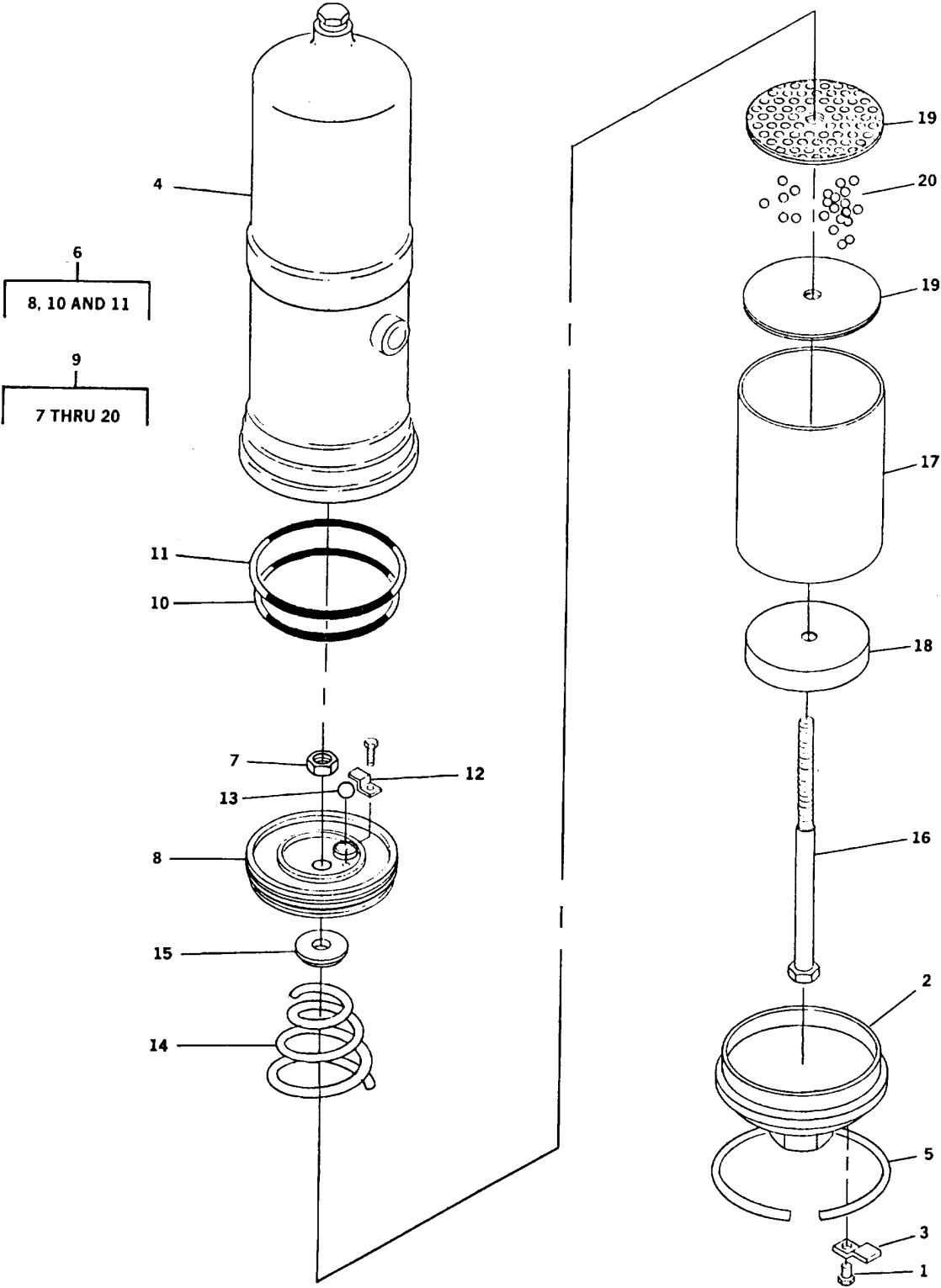
INSTALLATION:

- 1. ASSEMBLE DESICCANT PLATE ASSEMBLY (6) AND DESICCANT CARTRIDGE ASSEMBLY (9).
 - a. Insert one of perforated plates (19) into shell (17), felt cloth up, and tap it firmly to bottom. (Felt always faces desiccant material).
 - b. Slide oil separator filter (18) over cartridge bolt (16) with gasket surface next to shell (17).
 - c. Install bolt (16) with oil separator (18) into bottom of shell and through center hole of perforated plate (19) in bottom of shell (17).
 - d. Pour entire package of desiccant material into shell (17), ensuring none is lost. Handle it carefully so bolt does not fall out.

NOTE

If the shoulder of the bolt does not extend above the perforated plate, tap the side of the desiccant container.

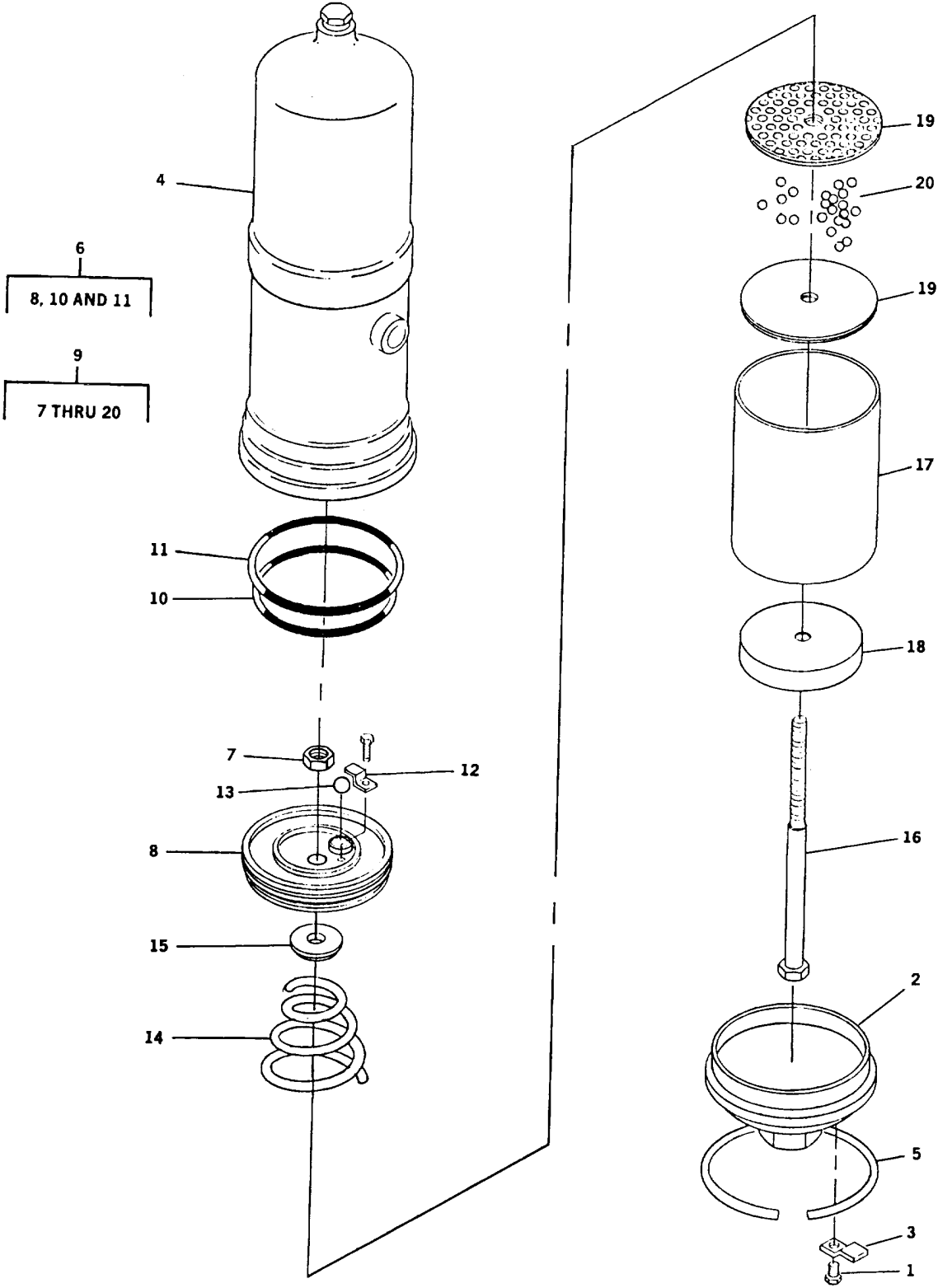
- e. Level desiccant material and install second perforated plate (19), felt cloth down. Ensure shoulder of bolt (16) is centered and extends slightly above top of perforated plate.
- f. Set conical spring (14) on top of perforated plate. (Large diameter down small diameter up).
- g. Place spring seat (15) on top of spring (14).



- h. Install new ball valve (13) in desiccant plate (8) and replace retaining clip (12) and screw.
 - i. Thoroughly lubricate two new preformed packings (10 and 11) and install them in their respective grooves in desiccant plate (8).
 - j. Install desiccant plate assembly (6) on cartridge bolt so ball valve (13) retaining clip is in view.
 - k. Using locknut (7), draw assembly together to approximately half of spring's free height. While slowly turning cartridge, tap side of shell with a plastic mallet. This allows desiccant material to settle properly into place.
 - l. Using an 11/16-inch socket and box wrench, continue to tighten locknut (7) ensuring all items are properly aligned.
 - m. Tighten locknut (7) and draw desiccant plate assembly (6) down into desiccant cartridge until shoulder of desiccant plate is against cartridge shell (17).
2. INSTALL DESICCANT CARTRIDGE ASSEMBLY (9) AND DESICCANT PLATE ASSEMBLY (6).
- a. Wipe inside of air dryer clean.
- If solvent is used, be certain that no residue is left in shell (4).
- b. Check to be certain a film of barium base grease is present on preformed packings, then install cartridge and desiccant plate assembly into body. Engage bolt (16) and tighten to 32 pounds foot (4.42 kgm) torque.
 - c. Check end cover (2) preformed packing to be certain it is clean and lubricated with a barium base lubricant. Install preformed packing (21) on end cover and install end cover in dryer body.
 - d. Position end cover (2) as marked during removal and install retainer ring (5) so that gap in ring is within an inch of notch in body.
 - e. Grease threads on three capscrews (1) and reinstall them with their retaining clamps (3) in end cover.
 - f. Connect air control line to purge valve port in end cover.
 - g. Connect heater lead.
3. CONNECT GROUND CABLE AT SHUNT. (REFER TO PAGE 8-109.)
4. START-UP ENGINE AND ALLOW AIR PRESSURE TO BUILD UP. (REFER TO TM 5-3810-306-10.)
5. CHECK ALL AIR OPERATED FUNCTIONS. (REFER TO TM 5-3810-306-10.) END OF TASK

NOTE

Barium base lubricant (Bendix 246671) is supplied with repair kit.



AIR GOVERNOR REPLACEMENT

TOOLS: General mechanic's tool kit: automotive (5180-00-177-7033)

SUPPLIES Lockwashers (Item 5, Appendix C)

EQUIPMENT CONDITIONS: Crane wheels are chocked.
 Disconnect ground cable at shunt. (Refer to page 8-109.)
 Air system is purged. (Refer to page 11-2.)

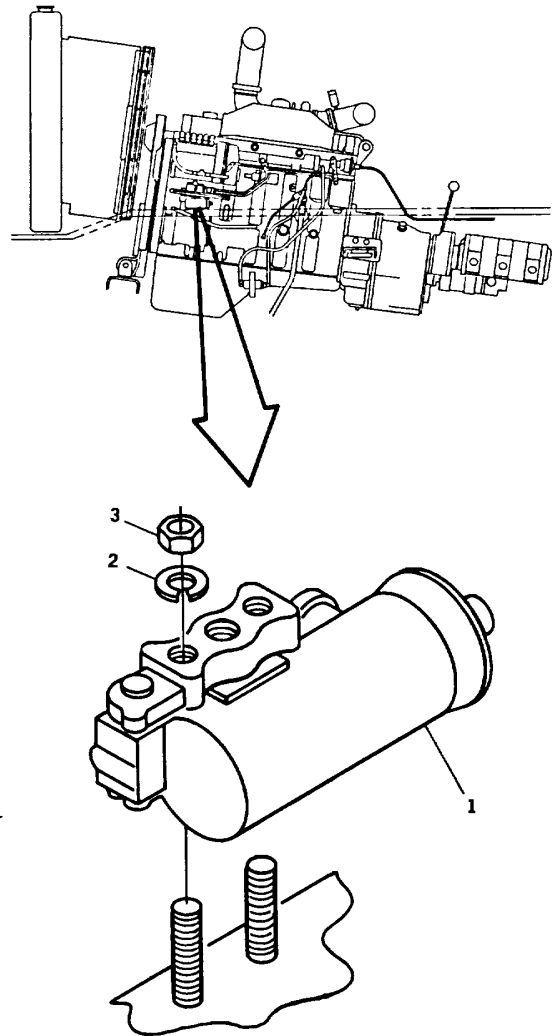
REMOVAL:

1. REMOVE AIR GOVERNOR (1).
 - a. Tag and disconnect three air lines on air governor (1). Plug air lines.
 - b. Remove two nuts (3) and lockwashers (2) to free air governor (1) from carrier frame. Discard lockwashers.
 - c. Remove three fittings. Retain for installation or replace if damaged.

INSTALLATION:

1. INSTALL AIR GOVERNOR (1).
 - a. Install three fittings.
 - b. Align air governor (1) with studs on carrier frame and secure with two nuts (3) and new lockwashers (2).
 - c. Remove tags, plugs and connect air lines to air governor (1).
2. CONNECT GROUND CABLE AT SHUNT. (REFER TO PAGE 8-109.)
3. START-UP ENGINE AND ALLOW AIR PRESSURE TO BUILD UP. (REFER TO TM 5-3810-306-10.)
4. CHECK ALL AIR OPERATED FUNCTIONS. (REFER TO TM 5-3810-306-10.)

END OF TASK



AIR RESERVOIR REPLACEMENT

TOOLS: General mechanic's tool kit: automotive (5180-00-177-7033)

SUPPLIES: Lockwashers (Item 15, Appendix C)
Lockwashers (Supplied with bracket)

EQUIPMENT CONDITIONS: Crane wheels are chocked.
Air system is purged. (Refer to page 11-2.)
Disconnect ground cable at shunt. (Refer to page 8-109.)

REMOVAL

NOTE

Primary and secondary air reservoirs are replaced in the same manner.

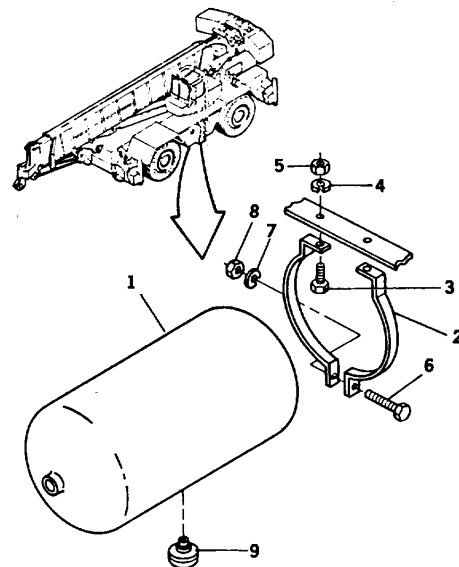
1. REMOVE AIR RESERVOIR (1).
 - a. Tag and disconnect air lines on air reservoir (1). Plug air lines.
 - b. Remove two capscrews (3), lockwashers (4) and nuts (5) to free air reservoir (1) from chassis frame. Discard lockwashers.
 - c. Remove two long capscrews (6), lockwashers (7) and nuts (8) from mounting bracket (2). Discard lockwashers.
 - d. Remove inlet, outlet port fittings and automatic drain valve (9) or petcock drain. Retain for installation or replace if damaged.

INSTALLATION:

1. INSTALL AIR RESERVOIR (1).
 - a. Install mounting bracket (2) on air reservoir (1). Secure with two long capscrews (3), new lockwashers (7) and nuts (8).
 - b. Install inlet, and outlet port fittings and automatic drain valve (9) or petcock drain.

- c. Support air reservoir (1) and align mounting bracket (2) on chassis frame. Secure with two capscrews (3), new lockwashers (4) and nuts (5).
 - d. Remove tags, plugs and connect air lines to air reservoir (1).
2. CONNECT GROUND CABLE AT SHUNT. (REFER TO PAGE 8-109.)
 3. START-UP ENGINE AND ALLOW AIR PRESSURE TO BUILD UP. (REFER TO TM 5-3810-306-10.)
 4. CHECK ALL AIR OPERATED FUNCTIONS. (REFER TO TM 5-3810-306-10.)

END OF TASK



AIR VALVE MUFFLER REPLACEMENT

TOOLS: General mechanic's tool kit: automotive (5180-00-177-7033)

SUPPLIES: None

EQUIPMENT CONDITION: Disconnect ground cable at shunt. (Refer to page 8-109.)

REMOVAL:**CAUTION**

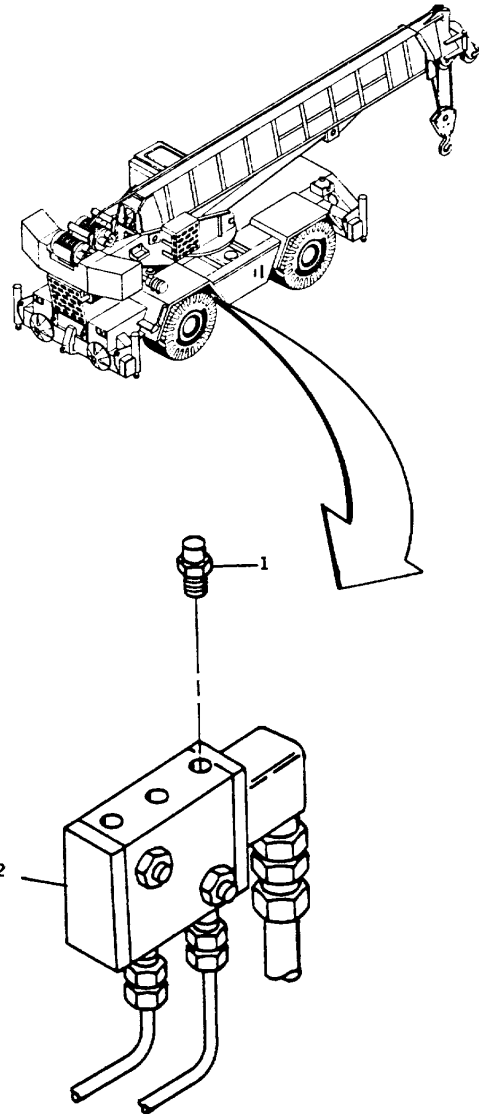
Make sure dirt does not get into 4-way air valve (2). Air system failure may result.

1. REMOVE AIR VALVE MUFFLER (1)
 - a. Unscrew air valve muffler (1) from 4-way air valve (2).
 - b. Cover 4-way air valve (2) with rag.
2. INSPECT PART FOR DAMAGE. REPLACE AS REQUIRED.

INSTALLATION:

1. INSTALL AIR VALVE MUFFLER (1) ON 4-WAY AIR VALVE (2).
 - a. Remove rag.
 - b. Install air valve muffler (1).
2. CONNECT GROUND CABLE AT SHUNT. (REFER TO PAGE 8-109.)
3. START-UP ENGINE AND ALLOW AIR PRESSURE TO BUILD UP. (REFER TO TM 5-3810-306-10.)
4. CHECK ALL AIR OPERATED FUNCTIONS. (REFER TO TM 5-3810-306-10.).

END OF TASK



AUTOMATIC DRAIN VALVE REPLACEMENT

TOOLS: General mechanic's tool kit: automotive (5180-00-177-7033)

SUPPLIES: Clean rags (Item 1, Appendix C)

EQUIPMENT CONDITIONS: Wheels are chocked.
 Disconnect ground cable at shunt. (Refer to page 8-109.)
 Air system is purged. (Refer to page 11-2.)

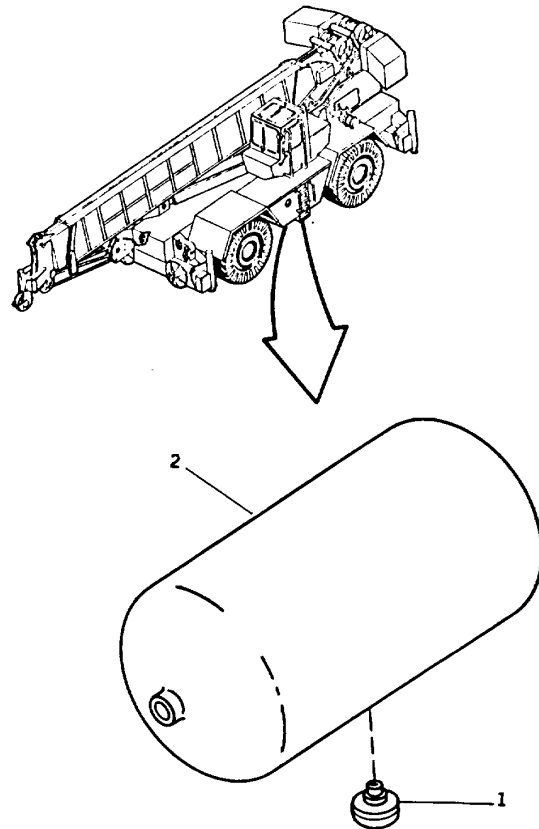
REMOVAL:

1. REMOVE AUTOMATIC DRAIN VALVE (1).
 - a. Turn automatic drain valve (1) counter clockwise on bottom of air reservoir (2).

INSTALLATION:

1. INSTALL AUTOMATIC DRAIN VALVE (1).
 - a. Install automatic drain valve (1) in bottom portion of air reservoir (2) and tighten clockwise.
2. CONNECT GROUND CABLE AT SHUNT. (REFER TO PAGE 8-109.)
3. START-UP ENGINE AND ALLOW AIR PRESSURE TO BUILD UP. (REFER TO TM 5-3810-306-10.)
4. CHECK ALL AIR OPERATED FUNCTIONS. (REFER TO TM 5-3810-306-10.).

END OF TASK



DOUBLE CHECK VALVE AND PRESSURE PROTECTION VALVE REPLACEMENT

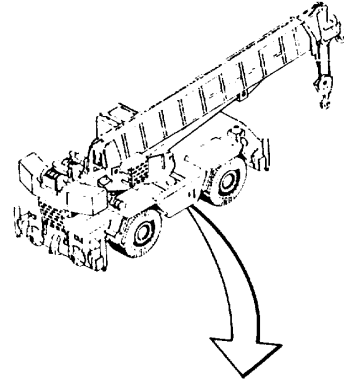
TOOLS: General mechanic's tool kit: automotive (5180-00-177-7033)

SUPPLIES: None

EQUIPMENT CONDITIONS: Wheels are chocked.
 Disconnect ground cable at shunt. (Refer to page 8-109.)
 Air system is purged. (Refer to page 11-2.)

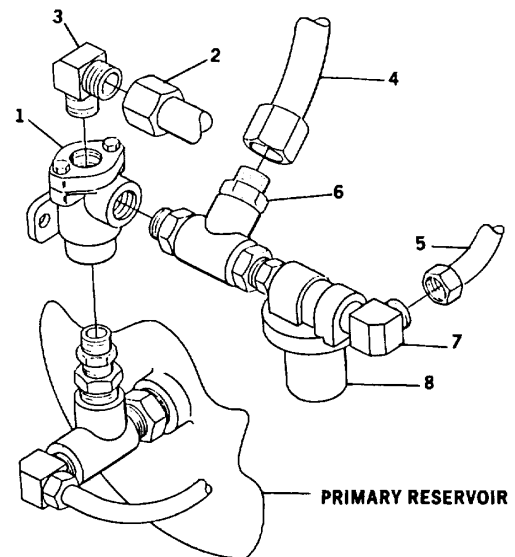
REMOVAL:

1. REMOVE DOUBLE CHECK VALVE (1) AND PRESSURE PROTECTION VALVE (8).
 - a. Tag and remove air line (2) from elbow (3) on double check valve (1).
 - b. Tag and remove two air lines (4 and 5) from tee (6) and elbow (7) attached to double check valve (1).
 - c. Remove tee (6), pressure protection valve (8) and elbow (7).
 - d. Remove double check valve (1).



INSTALLATION:

1. INSTALL DOUBLE CHECK VALVE (1) AND PRESSURE PROTECTION VALVE (8).
 - a. Install double check valve (1).
 - b. Install tee (6), pressure protection valve (8) and elbow (7) on double check valve (1).
 - c. Remove tags, plugs and connect air lines (2, 4 and 5).
2. CONNECT GROUND CABLE AT SHUNT. (REFER TO PAGE 8-109.)
3. START-UP ENGINE AND ALLOW AIR PRESSURE TO BUILD UP. (REFER TO TM 5-3810-306-10.)
4. CHECK ALL AIR OPERATED FUNCTIONS. (REFER TO TM 5-3810-306-10.)



END OF TASK

FOOT BRAKE CONTROL VALVE REPLACEMENT

TOOLS: General mechanic's tool kit: automotive (5180-00-177-7033)

SUPPLIES: Lockwashers (Item 15, Appendix C) (3 Required)
 Loctite #545 (Item 13, Appendix C)

EQUIPMENT CONDITIONS: Wheels are chocked.
 Air system is purged. (Refer to page 11-2.)
 Disconnect ground cable at shunt. (Refer to page 8-109.)
 Cab front panel removed. (Refer to page 15-10.)
 Cab bottom panel removed. (Refer to page 15-11.)

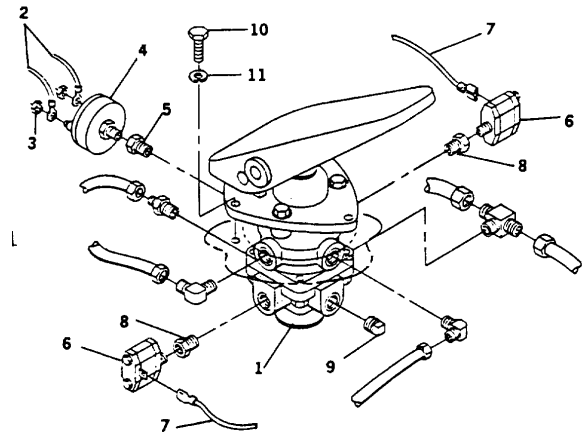
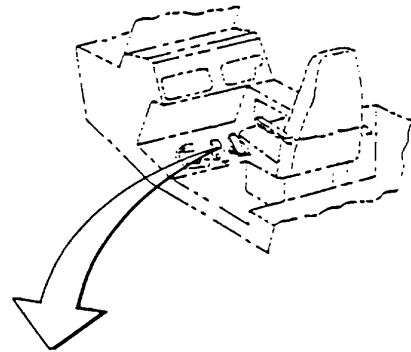
REMOVAL:

1. REMOVE STOP LIGHT SWITCH (4).
 - a. Tag electrical wires (2) to stop light switch (4).
 - b. Remove nuts (3) and wires.
 - c. Remove stop light switch (4) and fitting (5). Retain fittings for installation.

2. REMOVE LOW PRESSURE INDICATOR SWITCHES (6).
 - a. Tag electrical wires (7) to low pressure indicator switches.
 - b. Remove switches (6) and fittings (8). Retain fittings for installation.

3. REMOVE PLUG (9).

4. REMOVE FOOT BRAKE CONTROL VALVE (1).
 - a. Tag and disconnect four air lines from foot brake control valve (1). Plug air lines. Remove fittings from valve. Retain fittings for installation.
 - b. Remove three capscrews (10) and lockwashers (11) securing control valve to cab floor. Remove valve. Discard lockwashers (11).



INSTALLATION:

1. INSTALL FOOT BRAKE CONTROL VALVE (1).
 - a. Align foot brake control valve (1) with cab floor mounting holes and securing with three capscrews (10) and new lockwashers (11).

NOTE

Prior to installing fittings, hoses and switches, coat threads with Loctite #545.

- b. Install fittings on brake control valve.
 - c. Remove tags, plugs and connect four air lines to foot brake control valve.

2. INSTALL STOP LIGHT SWITCH (4).
 - a. Install fitting (5) and install stop light switch (4).
 - b. Secure tagged electrical wires (2) with nuts (3).

3. INSTALL LOW PRESSURE INDICATOR SWITCHES (6).
 - a. Install fittings (8) and low pressure indicator switches (6).

- b. Connect tagged electrical wires (7).

4. CONNECT GROUND CABLE AT SHUNT. (REFER TO PAGE 8-109.)

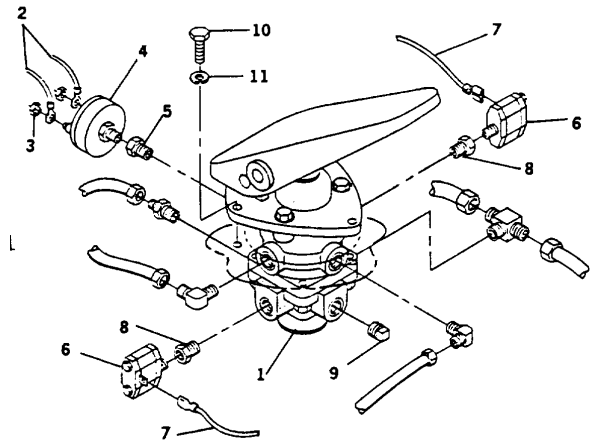
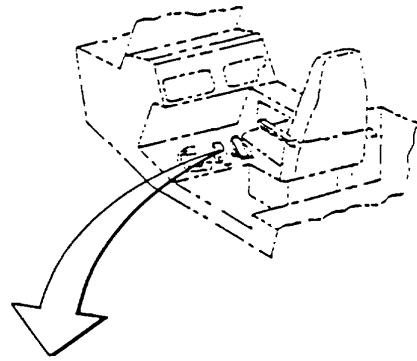
5. START-UP ENGINE AND ALLOW AIR PRESSURE TO BUILD UP. (REFER TO TM 5-3810-306-10.)

6. CHECK ALL AIR OPERATED FUNCTIONS. (REFER TO TM 5-3810-306-10.)

7. INSTALL CAB BOTTOM PANEL. (REFER TO PAGE 15-11.)

8. INSTALL CAB FRONT PANEL. (REFER TO PAGE 15-10.)

END OF TASK



LOW PRESSURE INDICATOR SWITCH REPLACEMENT

TOOLS: General mechanic's tool kit: automotive (5180-00-177-7033)

SUPPLIES: Loctite #545 (Item 13, Appendix C)

EQUIPMENT CONDITIONS: Wheels are chocked.
 Air system is purged. (Refer to page 11-2.)
 Disconnect ground cable at shunt. (Refer to page 8-109.)
 Cab front panel removed. (Refer to page 15-10.)

REMOVAL:

1. REMOVE LOW PRESSURE INDICATOR SWITCH (1).
 - a. Tag and remove electrical leads to low pressure indicator switch (1).
 - b. Unscrew low pressure indicator switch (1) from reducer (2).
 - c. Remove reducer (2) and inspect for damage. Replace if necessary.

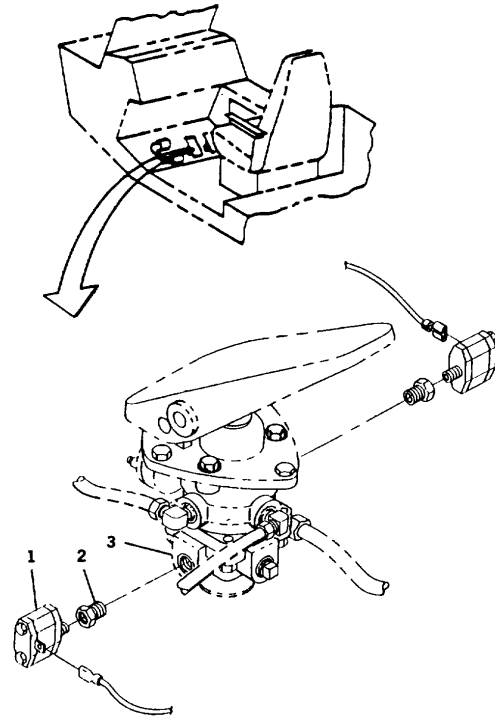
INSTALLATION:

1. INSTALL LOW PRESSURE INDICATOR SWITCH (1).

NOTE

Prior to installing reducer and switch, coat threads with Loctite #545.

- a. Install reducer (2) on brake control valve (3).
 - b. Install low pressure indicator switch (1) on reducer (2). Tighten securely.
 - c. Connect electrical leads to low pressure indicator switch (1).
2. CONNECT GROUND CABLE AT SHUNT. (REFER TO PAGE 8-109.)



3. START-UP ENGINE AND ALLOW AIR PRESSURE TO BUILD UP. (REFER TO TM 5-3810-306-10.)
4. CHECK ALL AIR OPERATED FUNCTIONS. (REFER TO TM 5-3810-306-10.)
5. INSTALL CAB FRONT PANEL. (REFER TO PAGE 15-10.)

END OF TASK

PARK BRAKE CONTROL VALVE AND PRESSURE INDICATOR SWITCH REPLACEMENT

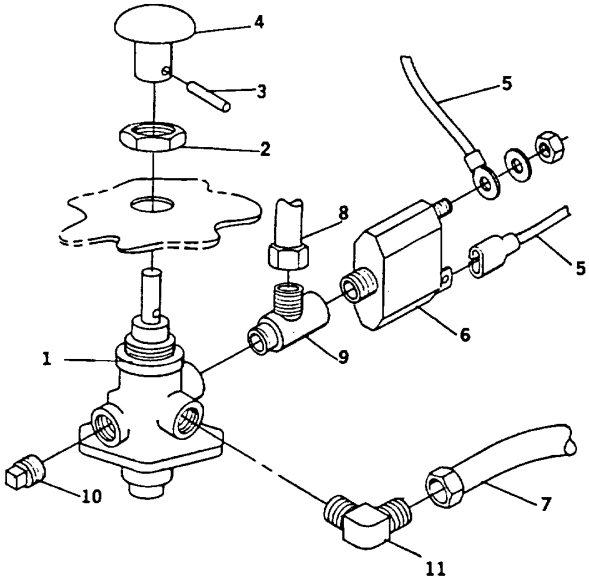
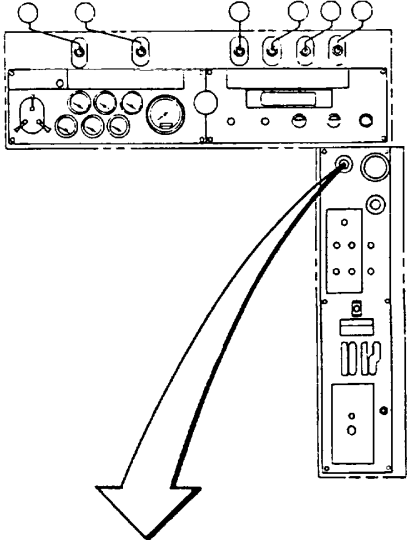
TOOLS: General mechanic’s tool kit: automotive (5180-00-177-7033)

SUPPLIES: None

EQUIPMENT CONDITIONS: Wheels are chocked
Air system is purged. (Refer to page 11-2.)
Disconnect ground cable at shunt. (Refer to page 8-109.)
Side console front access panel removed. (Refer to page 8-21.)

REMOVAL:

- 1. REMOVE PARK BRAKE CONTROL VALVE (1) AND PRESSURE INDICATOR SWITCH (6).
 - a. Tap out roll pin (3) securing knob (4) to valve stem. Discard pin.
 - b. Remove mounting nut (2) and free park brake control valve (1) from side console.
 - c. Tag and disconnect air line (7) from park brake control valve (1). Tag and remove electrical wires (5) from pressure indicator switch (6). Remove air line (8) from tee (9). Plug air lines.
 - d. Remove pressure indicator switch (6) from fitting (9).
 - e. Remove fittings (9, 10 and 11). Retain for installation or replace if damaged.

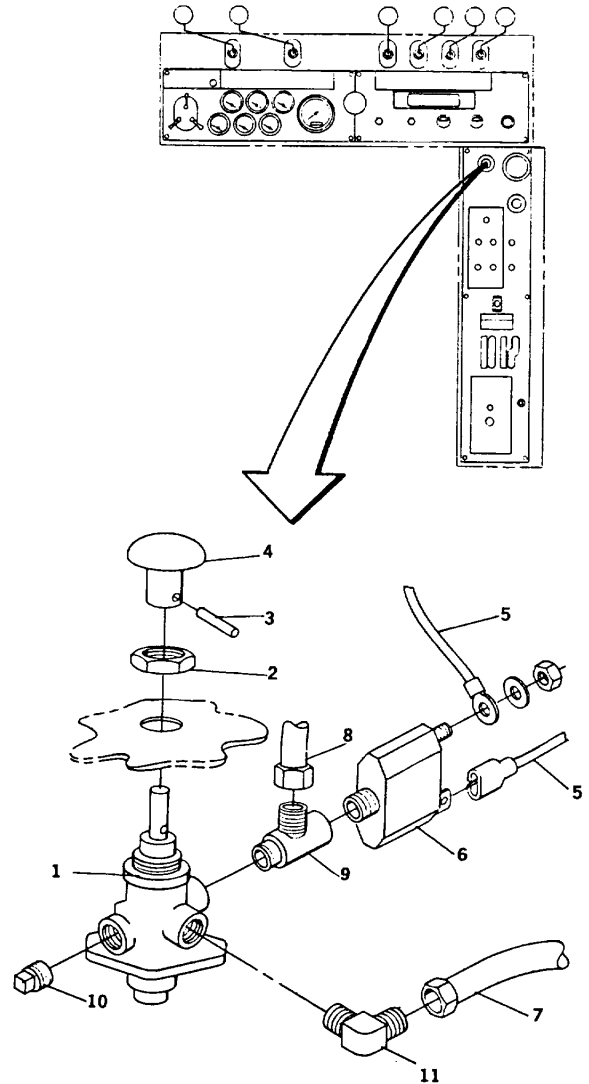


INSTALLATION:

- 1. INSTALL PARK BRAKE CONTROL VALVE (1) AND PRESSURE INDICATOR SWITCH (6).
 - a. Install fittings (9, 10 and 11) on new control valve (1).
 - b. Install pressure indicator switch (6).

- c. Remove tags, plugs and connect air lines (7 and 8) to park brake control valve (1).
 - d. Install electrical wires (5) to pressure indicator switch (6).
 - e. Position park brake control valve (1) through hole in side console and secure to console with mounting nut (2).
 - f. Install knob (4) on valve stem and secure with drive pin (3).
2. INSTALL SIDE CONSOLE FRONT ACCESS PANELS (REFER TO PAGE 8-21.)
 3. CONNECT GROUND CABLE AT SHUNT. (REFER TO PAGE 8-109.)
 4. START-UP ENGINE AND ALLOW AIR PRESSURE TO BUILD UP. (REFER TO TM 5-3810-306-10.)
 5. CHECK ALL AIR OPERATED FUNCTIONS. (REFER TO TM 5-3810-306-10.)

END OF TASK



PRESSURE PROTECTION VALVE REPLACEMENT

TOOLS: General mechanic's tool kit: automotive (5180-00-177-7033)

SUPPLIES: None

EQUIPMENT CONDITIONS: Wheels are chocked.
 Disconnect ground cable at shunt. (Refer to page 8-109.)
 Air system is purged. (Refer to page 11-2.)

REMOVAL:

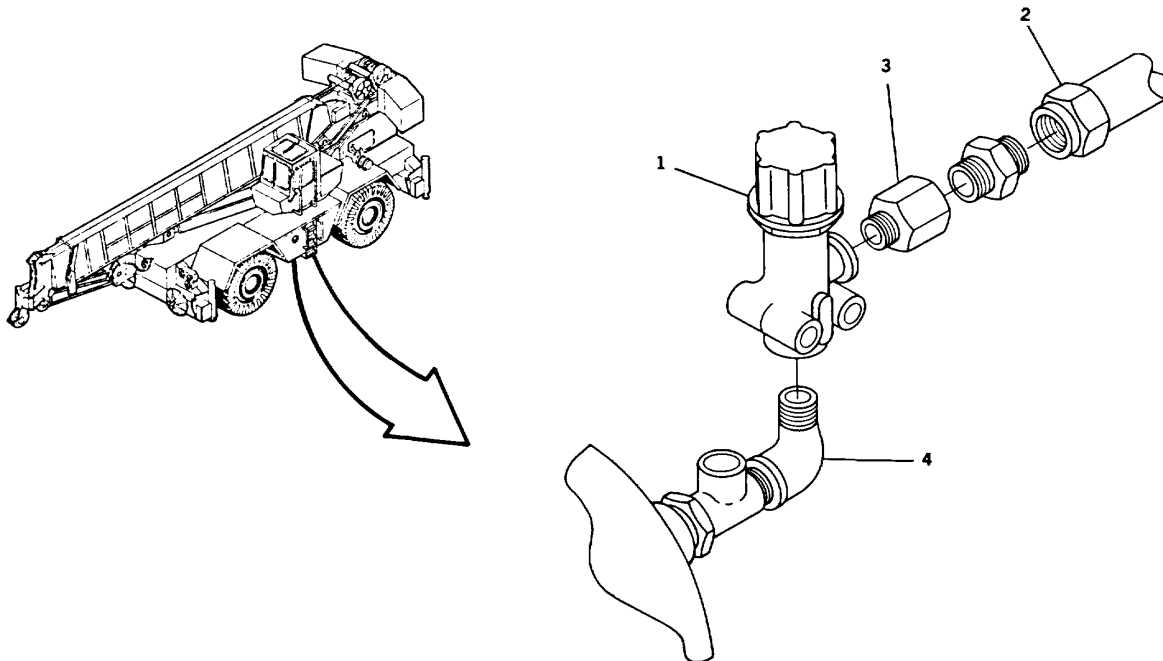
1. REMOVE PRESSURE PROTECTION VALVE (1).
 - a. Tag and disconnect air line (2) from pressure protection valve
 - b. Remove adapter (3) from pressure protection valve. 2.
 - c. Remove pressure protection valve (1) from elbow (4).

- b. Install adapter (3) on pressure protection valve (1)
- c. Remove tags, plugs and connect protection valve (1).
3. CONNECT GROUND CABLE AT SHUNT. (REFER TO PAGE 8-109.)
3. START-UP ENGINE AND ALLOW AIR PRESSURE TO BUILD UP. (REFER TO TM 5-3810-306-10.)
4. CHECK ALL AIR OPERATED FUNCTIONS. (REFER TO TM 5-3810-306-10.)

INSTALLATION:

1. INSTALL PRESSURE PROTECTION VALVE (1).
 - a. Install pressure protection valve (1) on elbow (4).

END OF TASK



R-12 RELAY VALVE REPLACEMENT

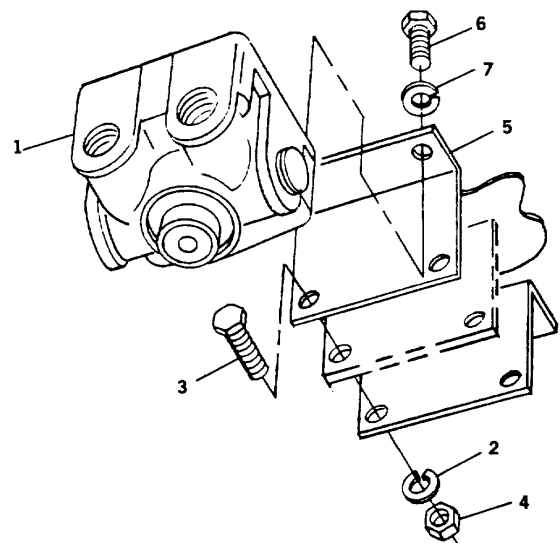
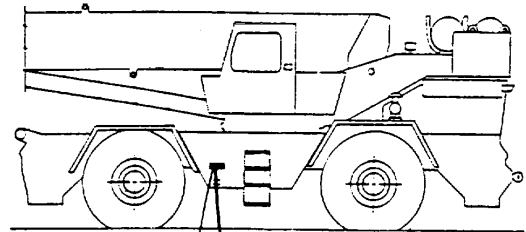
TOOLS: General mechanic's tool kit: automotive (5180-00-177-7033)

SUPPLIES: Lockwashers (Item 15, Appendix C) (4 Required)

EQUIPMENT CONDITIONS: Wheels are chocked.
 Disconnect ground cable at shunt. (Refer to page 8-109.)
 Air system is purged. (Refer to page 11-2.)

REMOVAL:

1. REMOVE R-12 RELAY VALVE (1).
 - a. Tag and disconnect four air lines on R-12 relay valve (1). Plug air lines.
 - b. Remove two capscrews (3), lockwashers (2) and nuts (4) securing relay valve assembly and bracket (5) to chassis frame. Discard lockwashers (2).
 - c. Remove two capscrews (6) and lockwashers (7) securing R-12 relay valve (1) to bracket (5). Discard lockwashers (11).
 - d. Remove relay valve and fittings from relay valve.



INSTALLATION:

1. INSTALL R-12 RELAY VALVE (1).
 - a. Install fittings on relay valve and relay valve onto bracket (5). Secure with two capscrews (6) and new lockwashers (7).
 - b. Align relay valve mounting bracket with mounting holes on chassis and secure with two capscrews (3), new lockwashers (2) and nuts (4).
 - c. Remove tags, plugs and connect air lines to R-12 valve (1).
2. CONNECT GROUND CABLE AT SHUNT. (REFER TO PAGE 8-109.)

3. START-UP ENGINE AND ALLOW AIR PRESSURE TO BUILD UP. (REFER TO TM 5-3810-306-10.)

4. CHECK ALL AIR OPERATED FUNCTIONS. (REFER TO TM 5-3810-306-10.)

END OF TASK

SINGLE CHECK VALVE REPLACEMENT

TOOLS: General mechanic's tool kit: automotive (5180-00-177-7033)

SUPPLIES: None

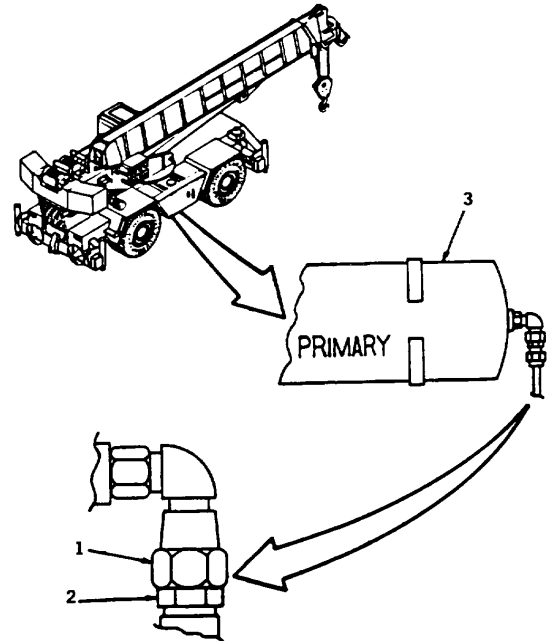
EQUIPMENT CONDITIONS: Wheels are chocked.
 Disconnect ground cable at shunt. (Refer to page 8-109.)
 Air system is purged. (Refer to page 11-2.)

REMOVAL:

NOTE

Single check valve removed from primary air reservoir. Use this replacement procedure for other single check valves.

1. REMOVE SINGLE CHECK VALVE (1).
 - a. Tag and disconnect air lines from single check valve (1). Plug air lines.
 - b. Remove single check valve (1) from reducer fitting (2) in primary reservoir (3).
 - c. Remove reducer fitting (2). Retain for installation or replace if damaged.



INSTALLATION:

1. INSTALL SINGLE CHECK VALVE (1).
 - a. Install reducer fitting (2) on primary reservoir (3). Install single check valve (1) in single check valve (1) in reducer fitting (2).
 - b. Remove tags, plugs and connect air lines to single check valve (1).
2. CONNECT GROUND CABLE AT SHUNT. (REFER TO PAGE 8-109.)

3. START-UP ENGINE AND ALLOW AIR PRESSURE TO BUILD UP. (REFER TO TM 5-3810-306-10.)
4. CHECK ALL AIR OPERATED FUNCTIONS. (REFER TO TM 5-3810-306-10.)

END OF TASK

SPRING BRAKE CONTROL VALVE REPLACEMENT

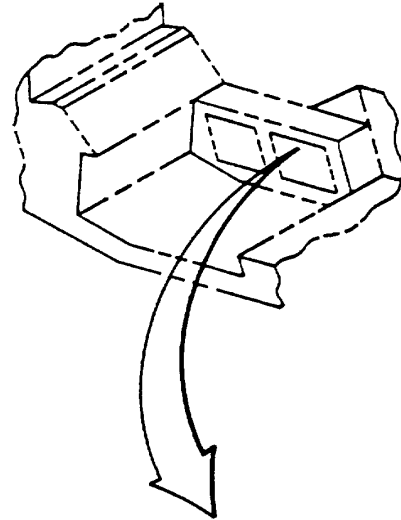
TOOLS: General mechanic's tool kit: automotive (5180-00-177-7033)

SUPPLIES: None

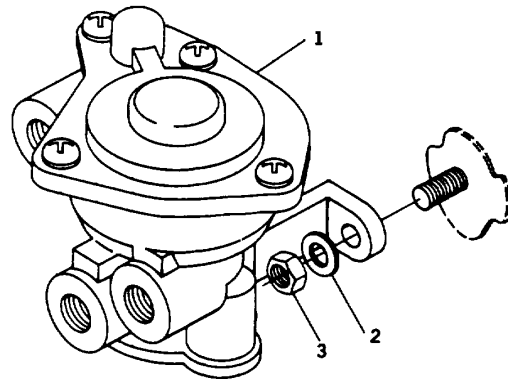
EQUIPMENT CONDITIONS: Wheels are chocked.
 Disconnect ground cable at shunt. (Refer to page 8-109.)
 Air system is purged. (Refer to page 11-2.)
 Operator's seat and pedestal removed. (Refer to page 15-27.)
 Side console rear access panel removed. (Refer to page 8-21.)

REMOVAL:

1. REMOVE SPRING BRAKE CONTROL VALVE (1).
 - a. Tag and disconnect four air lines on spring brake control valve (1). Plug air lines.
 - b. Remove two nuts (3) and washers (2) to free spring brake control valve (1) from cab mounting studs.
 - c. Remove fittings. Retain for installation or replace if damaged.

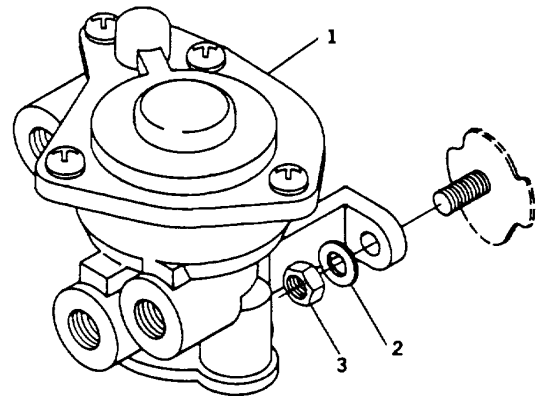
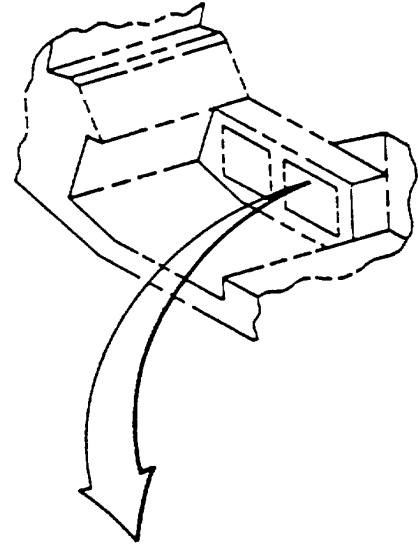
**INSTALLATION:**

1. INSTALL SPRING BRAKE CONTROL VALVE (1).
 - a. Install fittings.
 - b. Align spring brake control valve (1) on cab mounting studs. Secure with nuts (3) and washers (2).
 - c. Remove tags, plugs and connect air lines to spring brake control valve (1).
2. INSTALL SIDE CONSOLE REAR ACCESS PANEL. (REFER TO PAGE 8-21.)



3. INSTALL OPERATOR'S SEAT AND PEDESTAL.
(REFER TO PAGE 15-25.)
4. CONNECT GROUND CABLE AT SHUNT. (REFER
TO PAGE 8-109.)
5. START-UP ENGINE AND ALLOW AIR PRESSURE
TO BUILD UP. (REFER TO TM 5-3810-306-10.)
6. CHECK ALL AIR OPERATED FUNCTIONS.
(REFER TO TM 5-3810-306-10.)

END OF TASK



THROTTLE CYLINDER AND CONTROL ROD REPLACEMENT

TOOLS: General mechanic's tool kit: automotive (5180-00-177-7033)

SUPPLIES: Lockwashers (Item 2, Appendix C) (2 Required)

EQUIPMENT CONDITIONS: Wheels are chocked.
 Disconnect ground cable at shunt. (Refer to page 8-109.)
 Air system is purged. (Refer to page 11-2.)

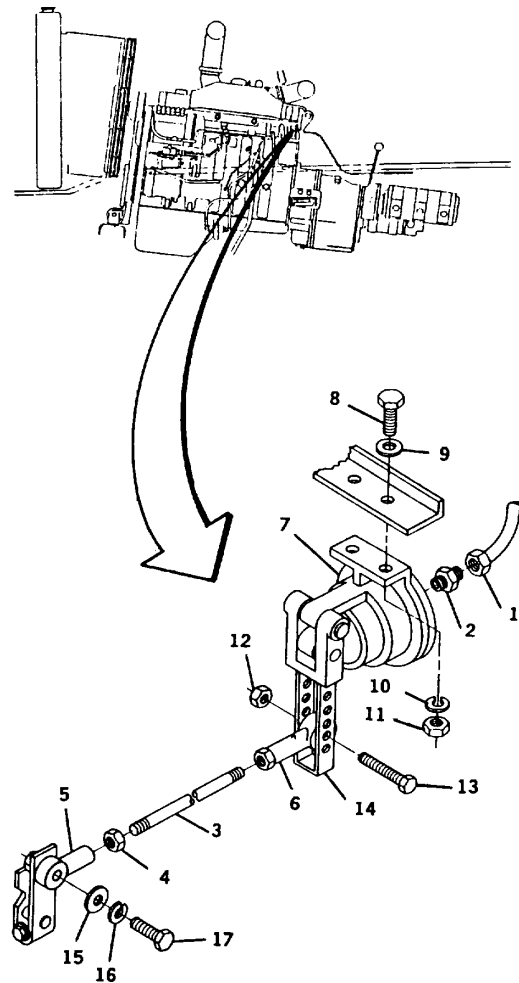
REMOVAL:

1. DISCONNECT AIR LINE (1), FITTING (2), AND REMOVE CONTROL ROD (3).
 - a. Tag and remove air line (1) on throttle cylinder (7). Remove fitting (2). Set aside for installation.
 - b. Inspect fitting (2) for damage, replace as required.
 - c. Remove capscrew (17), lockwasher (16) and flat washer (15) securing control rod ball joint at fuel injection pump lever.

NOTE

Note which hole control rod is mounted for reassembly.

- d. Remove capscrew (13) and locknut (12) securing control rod (3) at throttle cylinder. Remove rod.
2. REMOVE THROTTLE CYLINDER (7).
 - a. Hold throttle cylinder (7) in place.
 - b. Remove two capscrews (8), flatwashers (9), lockwashers (10), and nuts (11). Discard lockwashers (10).
 - c. Lower throttle cylinder (7) from bracket.



3. INSPECT PARTS FOR DAMAGE. REPLACE AS REQUIRED.

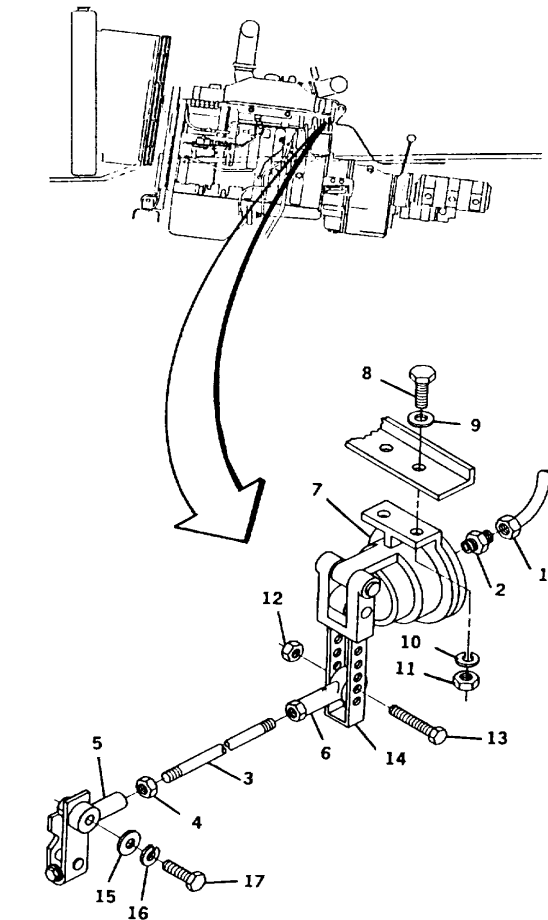
INSTALLATION:

1. INSTALL FITTING (2), THROTTLE CYLINDER (7), AND CONNECT AIR LINE (1).

- a. Screw fitting (2) into throttle cylinder (7).
- b. Hold throttle cylinder (7) in place on bracket and secure with two capscrews (8), flatwashers (9), lockwashers (10), and nuts (11).
- c. Connect air line (1).
- d. Make sure ball joint (6) on new throttle cylinder (7) is installed in same position as other (removed) throttle cylinder (7). If not, do steps e and f.
- e. Remove nut (12). Pull screw (13) from throttle lever (14). Remove ball joint (6)
- f. Put ball joint (6) in same place as other ball joint (6). Install screw (13) and nut (12).

2. INSTALL CONTROL ROD (3) AND ADJUST NUT (4).

- a. Screw control rod (3) in throttle cylinder ball joint (6).
- b. Press and hold throttle lever (14) against throttle cylinder (7).
- c. Screw fuel injector ball joint (5) onto other end of control rod and secure to fuel injection pump lever using flatwasher (15), lockwasher (16) and capscrew (17).



- d. Tighten nut (4) against fuel injector ball joint (5).
3. CONNECT GROUND CABLE AT SHUNT. (REFER TO PAGE 8-109.)
4. START-UP ENGINE AND ALLOW AIR SYSTEM TO BUILD UP TO PROPER PRESSURE. (REFER TO TM 5-3810-306-10.)
5. PRESS ACCELERATOR PEDAL SLOWLY. ENGINE RPM SHOULD INCREASE AS ACCELERATOR PEDAL PRESSED TO FLOOR. IF NOT, ADJUST NUT (4) ON CONTROL ROD (3) AS REQUIRED.

END OF TASK

TIRE INFLATION ASSEMBLY

TOOLS: General mechanic's tool kit: automotive (5180-00-177-7033)

SUPPLIES: None

EQUIPMENT CONDITIONS: Wheels are chocked.
 Disconnect ground cable at shunt. (Refer to page 8-109.)
 Air system is purged. (Refer to page 11-2.)

REMOVAL:

NOTE

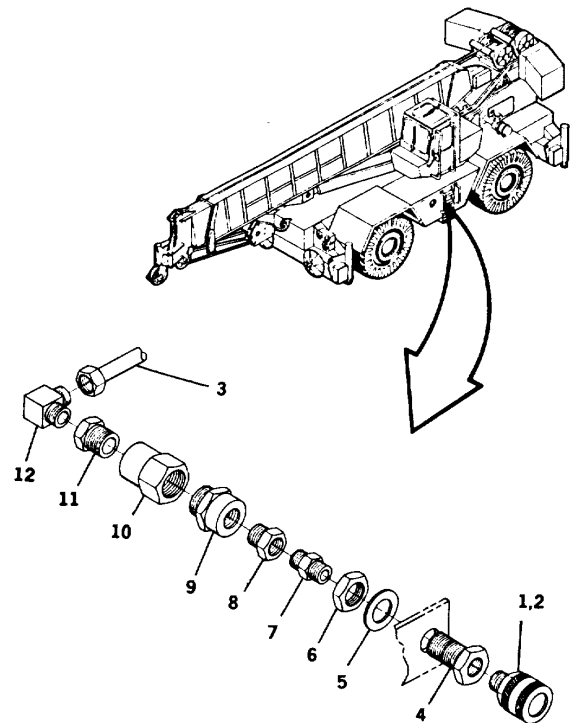
Tire inflation outlet fittings are located on both left and right sides of crane. Procedures are same with only fitting (12) being different. Use this procedure for both.

1. REMOVE TIRE INFLATION ASSEMBLY.
 - a. Remove nipple (1) and body (2).
 - b. Tag and remove air line (3) from elbow.
 - c. Remove pipe nipple (7) from coupling anchor (4).
 - d. Remove coupling anchor (4), locknut (6) and washer (5). Remove coupling anchor (4) from mounting plate.
 - e. Remove other fittings (8, 9, 11 and 12) and check valve (10) as required.

INSTALLATION:

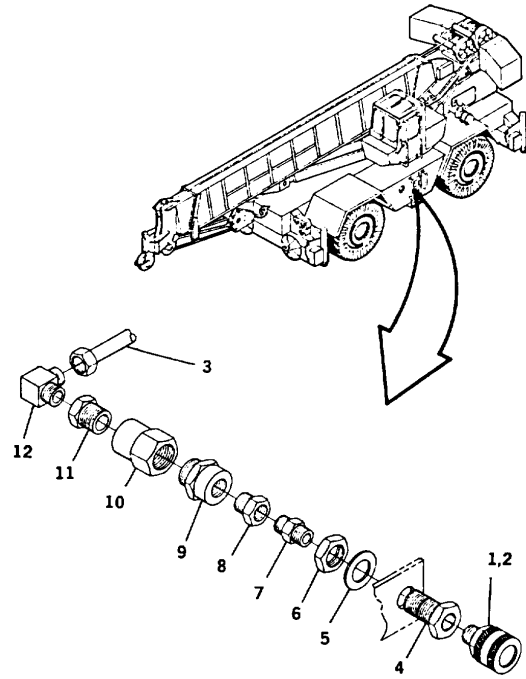
1. INSTALL TIRE INFLATION ASSEMBLY.
 - a. Install coupling anchor (4) through mounting bracket hole and secure with washer (5) and locknut (6).

- b. Install body (2) and nipple (1) into anchor, tighten to secure.
- c. Install pipe nipple (7) into coupling anchor (4).
- d. Install check valve (10) and fittings (8, 9, 11 and 12) onto coupling anchor (4).
- e. Install air line (3) to elbow (12).



2. CONNECT GROUND CABLE AT SHUNT. (REFER TO PAGE 8-109.)
3. START-UP ENGINE AND ALLOW AIR PRESSURE TO BUILD UP. (REFER TO TM 5-3810-306-10.)
4. CHECK ALL AIR OPERATED FUNCTIONS. (REFER TO TM 5-3810-306-10.)

END OF TASK



WINDSHIELD WASHER VALVE INSTALLATION

TOOLS: General mechanic's tool kit: automotive (5180-00-177-7033)

SUPPLIES: None

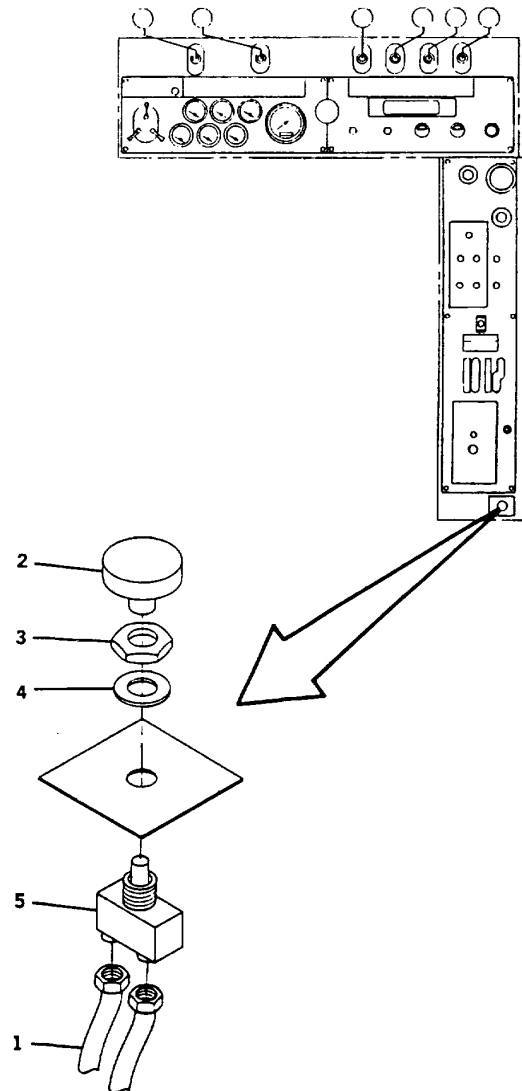
EQUIPMENT CONDITIONS: Wheels are chocked.
 Disconnect ground cable at shunt. (Refer to page 8-109.)
 Air system is purged. (Refer to page 11-2.)
 Side console rear access panel removed. (Refer to page 8-21.)

REMOVAL:

1. REMOVE WINDSHIELD WASHER VALVE (5).
 - a. Tag and disconnect two air lines (1) from bottom of valve (5).
 - b. Pull knob (2) off valve (5).
 - c. Remove nut (3) and washer (4), and pull windshield washer valve (5) out bottom of side console.

INSTALLATION:

1. INSTALL WINDSHIELD WASHER VALVE (5).
 - a. Install windshield washer valve (5) in side console and secure with nut (3) and washer (4).
 - b. Push knob (2) onto valve (5).
 - c. Connect two air lines (1) to bottom of valve (5) as tagged.
2. INSTALL SIDE CONSOLE REAR ACCESS PANEL. (REFER TO PAGE 8-21.)
3. CONNECT GROUND CABLE AT SHUNT. (REFER TO PAGE 8-109.)
4. START-UP ENGINE AND ALLOW AIR PRESSURE TO BUILD UP. CHECK WINDSHIELD WASHER VALVE FOR PROPER OPERATION. (REFER TO TM 5-3810-30610.)



END OF TASK.

FOOT THROTTLE CONTROL VALVE REPLACEMENT

TOOLS: General mechanic’s tool kit: automotive (5180-00-177-7033)

SUPPLIES: Lockwashers (Item 2, Appendix C) (2 Required)
Lockwashers (Item 15, Appendix C) (3 Required)
Loctite #545 (Item 13, Appendix C)

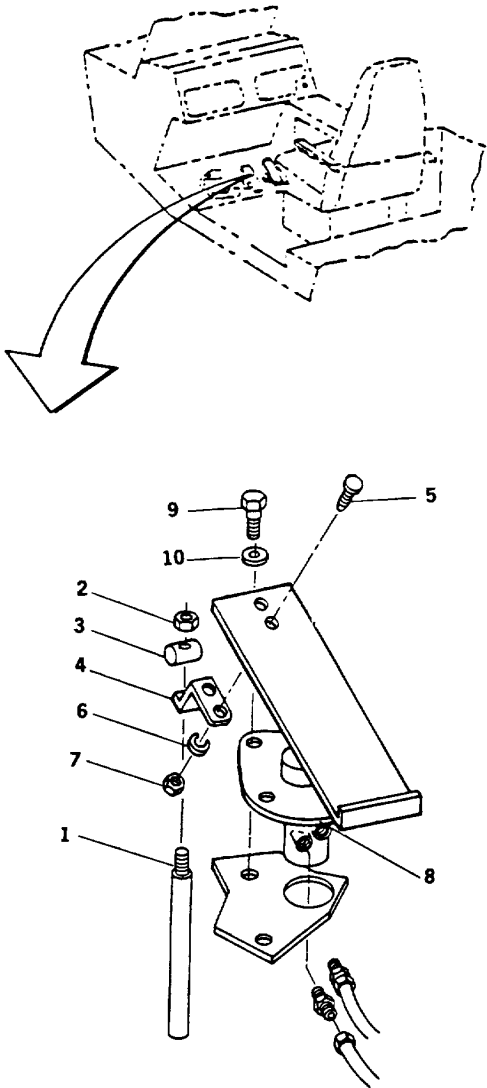
EQUIPMENT CONDITIONS: Wheels are chocked.
Air system is purged. (Refer to page 11-2.)
Disconnect ground cable at shunt. (Refer to page 8-109.)
Cab front panel removed. (Refer to page 15-10.)
Cab bottom panel removed. (Refer to page 15-11.)

REMOVAL:

NOTE

Count number of threads exposed above barrel nut (3) prior to removing it. This will aid in installation.

- 1. DISCONNECT THROTTLE CONTROL CABLE (1) FROM FOOT PEDAL.
 - a. Remove nut (2) and barrel nut (3) from end of throttle control cable (1). Remove cable from bracket (4).
 - b. Remove two screws (5), lockwashers (6) and nuts (7) securing bracket (4) to pedal. Remove bracket. Discard lockwashers.
- 2. REMOVE FOOT THROTTLE CONTROL VALVE (8).
 - a. Tag and disconnect two air lines from foot throttle control valve (8). Plug air lines. Remove fittings from valve. Retain fittings for installation.
 - b. Remove three capscrews (9) and lockwashers (10) securing control valve to cab floor. Remove valve. Discard lockwashers (10).



INSTALLATION:

1. INSTALL FOOT THROTTLE CONTROL VALVE (8).
 - a. Align foot throttle control valve (8) with cab floor mounting holes and secure with three capscrews (9) and new lockwashers (10).

NOTE

Prior to installing fittings and hoses, coat threads with Loctite #545.

- b. Install fittings on throttle control valve.
 - c. Remove tags, plugs and connect two air lines to foot throttle control valve.

2. CONNECT THROTTLE CONTROL CABLE (1) TO FOOT PEDAL.

- a. Position bracket (4) on pedal and secure with two screws (5), new lockwashers (6) and nuts (7).
 - b. Position end of cable (1) in bracket (4) and install barrel nut (3) exposing same amount of threads as noted during removal. Install nut (2).

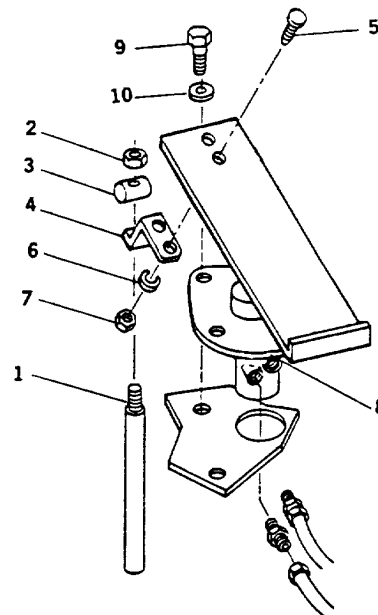
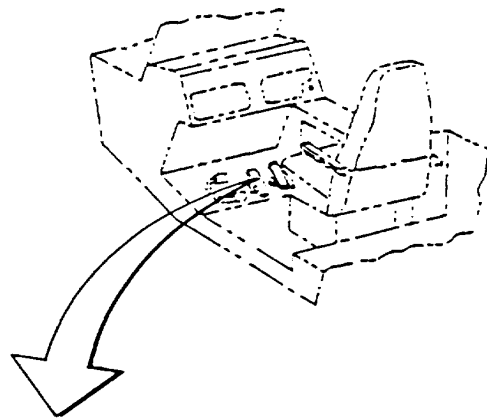
3. CONNECT GROUND CABLE AT SHUNT. (REFER TO PAGE 8-109.)

4. START-UP ENGINE AND ALLOW AIR PRESSURE TO BUILD UP. (REFER TO TM 5-3810-306-10.)

5. CHECK ALL AIR OPERATED FUNCTIONS. (REFER TO TM 5-3810-306-10.)

6. INSTALL CAB BOTTOM PANEL. (REFER TO PAGE 15-11.).

7. INSTALL CAB FRONT PANEL. (REFER TO PAGE 15-10.).



END OF TASK

AIR LINES REPLACEMENT, SUPERSTRUCTURE AND CARRIER

TOOLS: General mechanic's tool kit: automotive (5180-00-177-7033)

SUPPLIES: Loctite #545 (Item 13, Appendix C)

EQUIPMENT CONDITIONS: Disconnect ground cable at shunt. (Refer to page 8-109.)

REMOVAL:**NOTE**

Use the following procedure to replace all air lines.

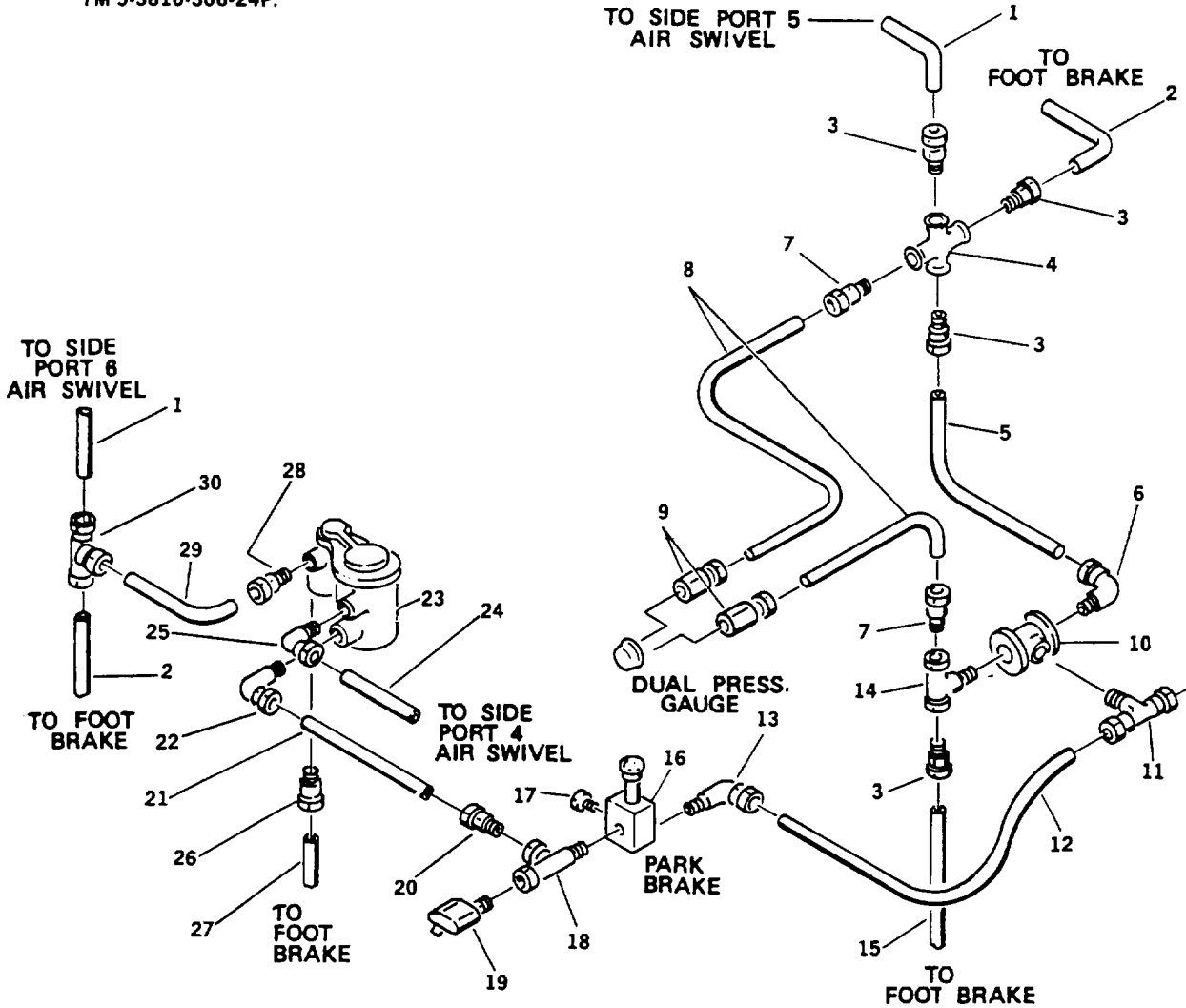
1. REMOVE AIR LINE.
 - a. Tag and disconnect both ends of air line. Remove line and note routing for ease in installation.
 - b. Remove fittings as necessary.
 - c. Inspect all parts for damage and replace as required.

INSTALLATION:

1. INSTALL AIR LINE.
 - a. Coat threads with Loctite 545 prior to installation.
 - b. Install fittings and tighten securely.
 - c. Route air line and connect both ends. Tighten securely.
2. CONNECT GROUND CABLE AT SHUNT. (REFER TO PAGE 8-109.)
3. START ENGINE AND CHECK ALL AIR SYSTEM FUNCTIONS. CHECK FOR LEAKS. (REFER TO TM 5-3810-306-10.)

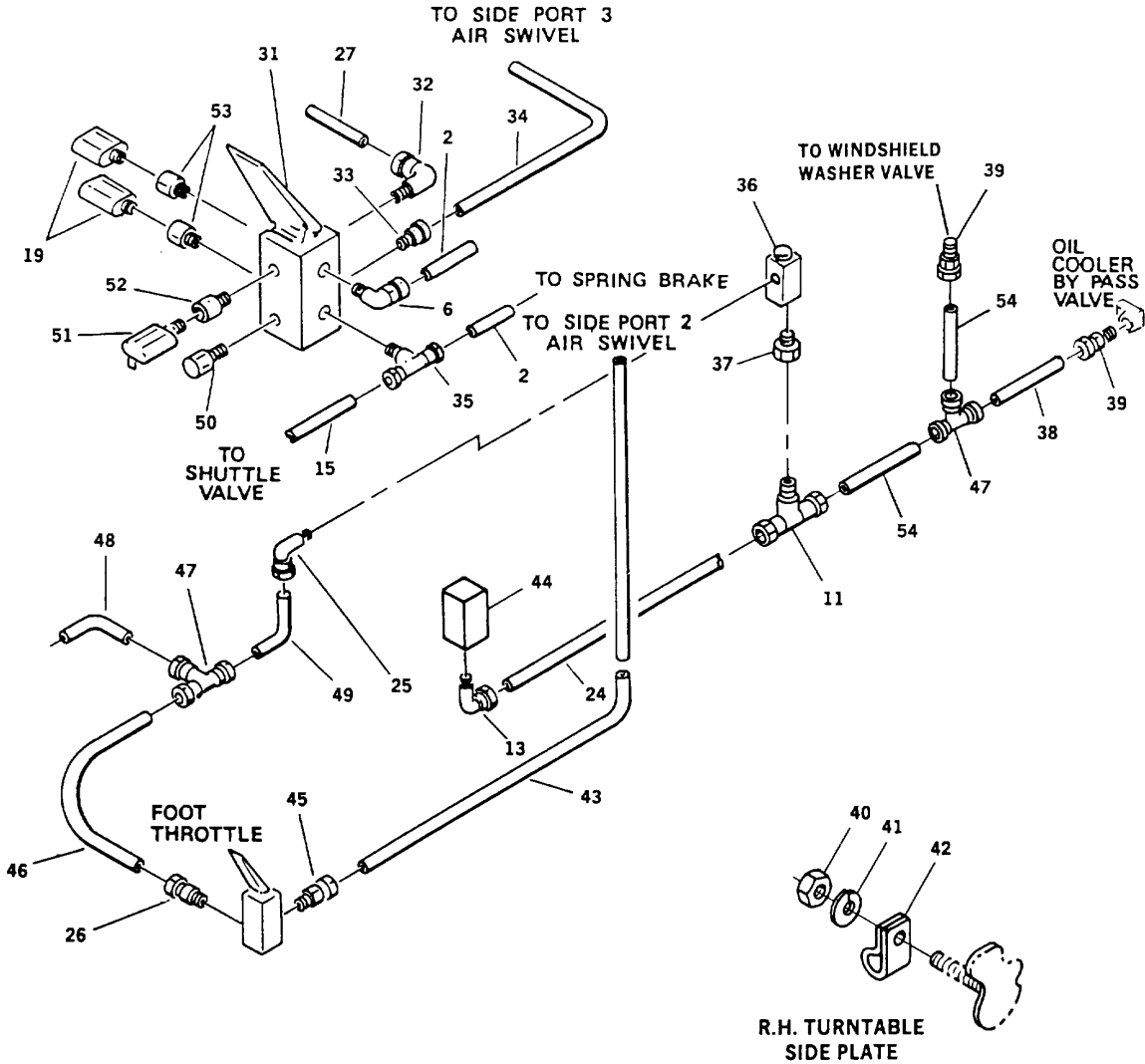
END OF TASK

FOR REFERENCE TO INDEX
NUMBERS, REFER TO RPSTL
TM 5-3810-306-24P.

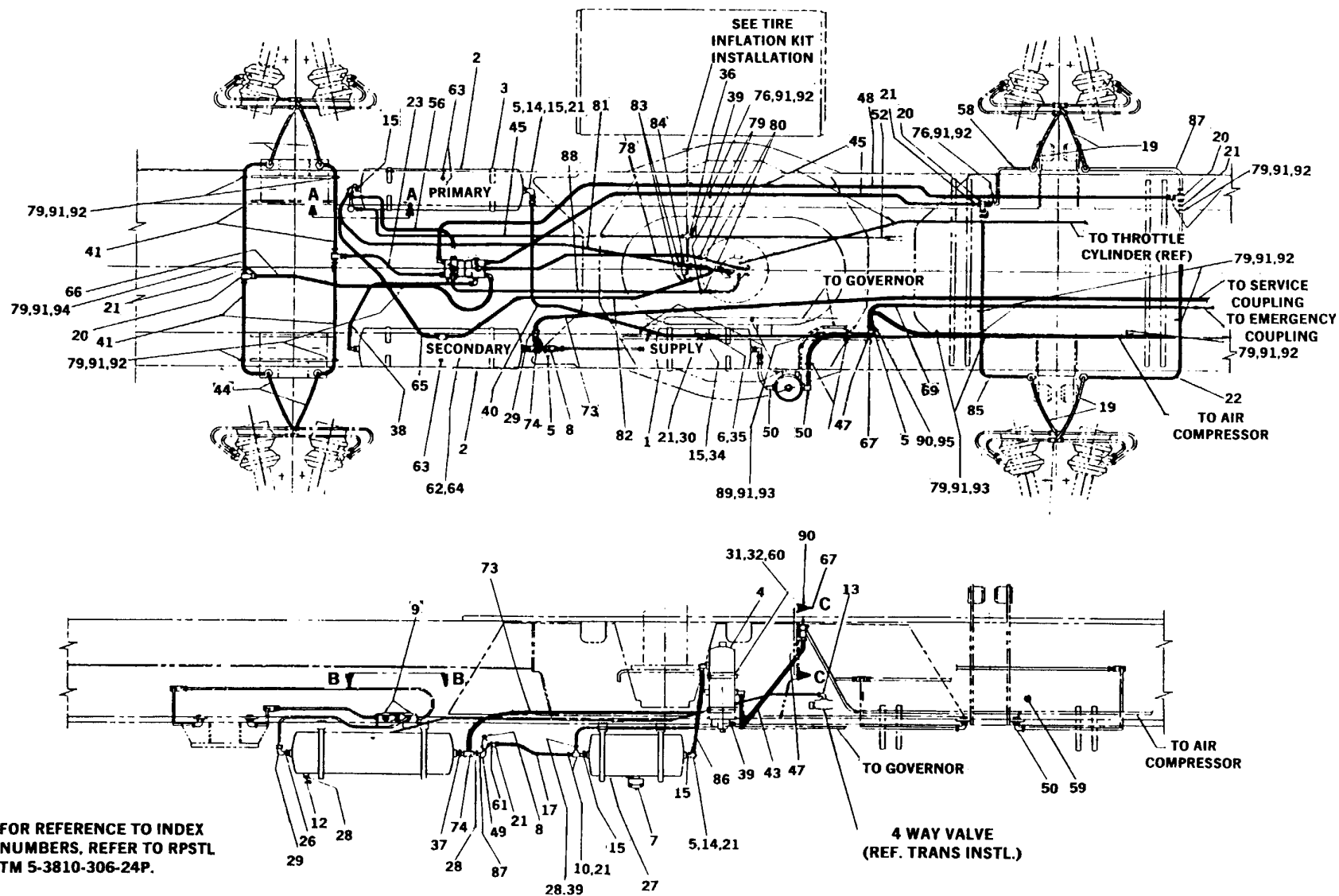


Superstructure Air System (Sheet 1 of 2)

FOR REFERENCE TO INDEX
NUMBERS, REFER TO
RPSTL TM 5-3810-306-24P.



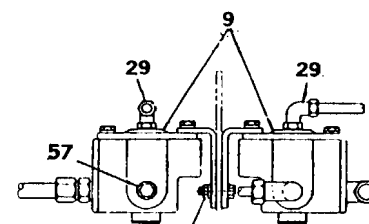
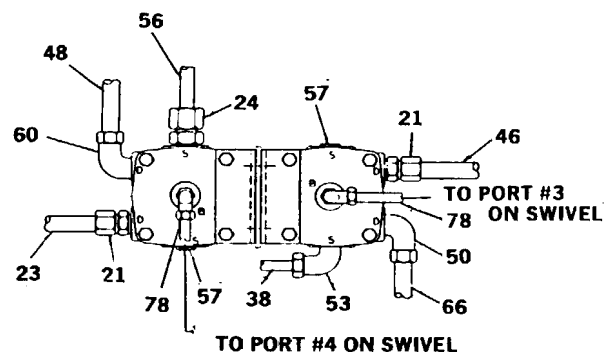
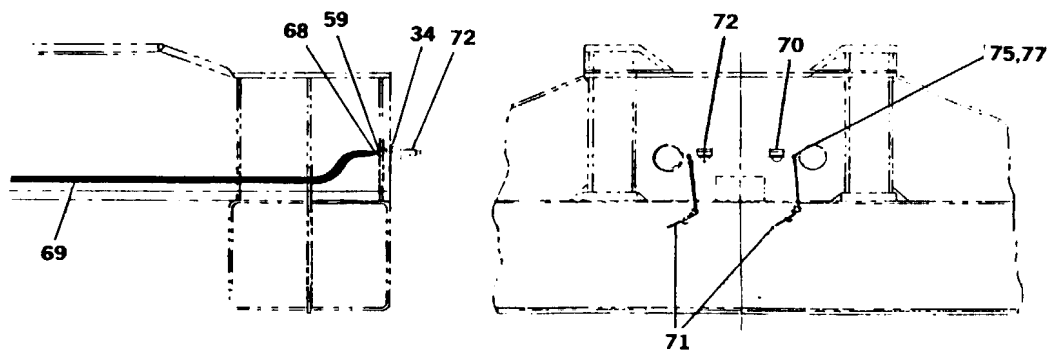
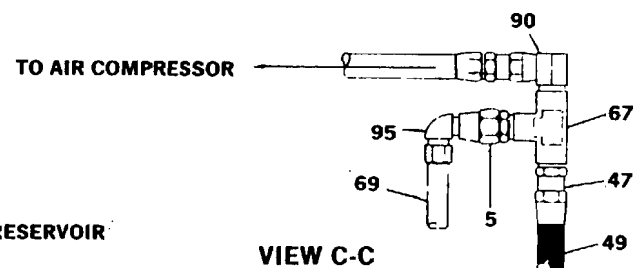
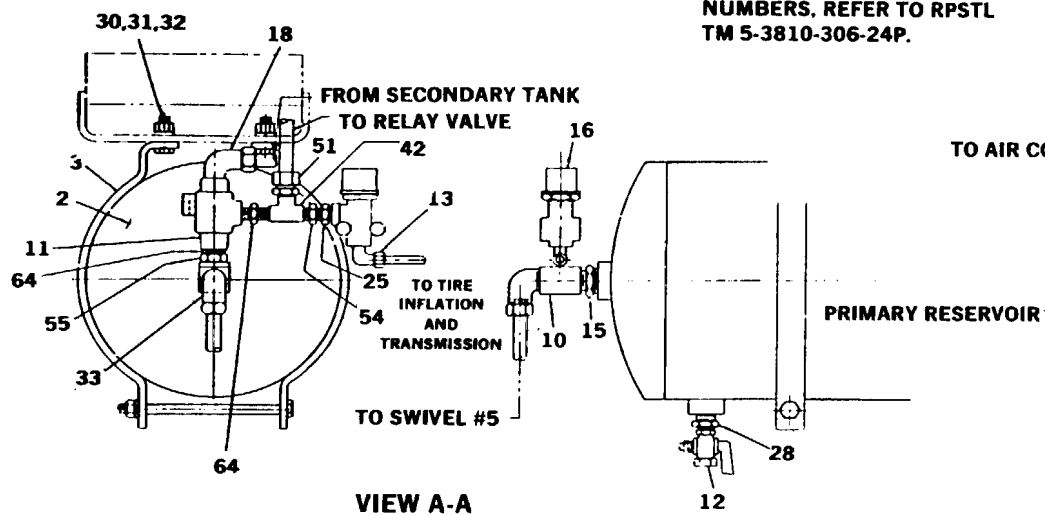
Superstructure Air System (Sheet 2 of 2)



FOR REFERENCE TO INDEX NUMBERS, REFER TO RPSTL TM 5-3810-306-24P.

Carrier Air System (Sheet 1 of 2)

FOR REFERENCE TO INDEX
 NUMBERS, REFER TO RPSTL
 TM 5-3810-306-24P.



CHAPTER 12
WHEELS AND TRACKS MAINTENANCE

CHAPTER INDEX

Procedure	Page
Tire and Wheel Installation.....	12-2
Tire and Wheel Assembly.	12-3

TIRE AND WHEEL INSTALLATION

TOOLS: General mechanic’s tool kit: automotive (5180-00-177-7033)
Lifting device (2-ton (1812 kg) capacity)

SUPPLIES: NONE

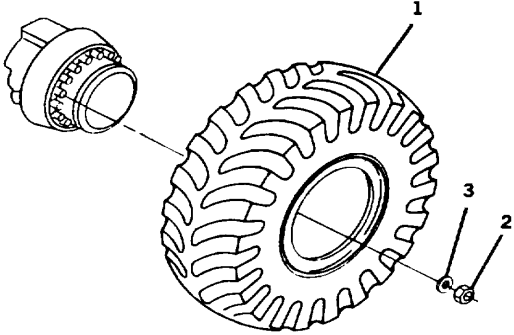
EQUIPMENT CONDITIONS: Outriggers fully extended and lowered. (Refer to TM 5-3810-306-10.)

REMOVAL:

NOTE

Each wheel assembly (tire and rim) weighs approximately 1631 pounds (740 kg) and is mounted on planetary hub with 24, 3/4-16 UNF, grade 8 lug nuts and washers.

- 1. REMOVE TIRE AND WHEEL.
 - a. Remove twenty-four nuts (2) and washers (3).
 - b. Using suitable lifting device, remove tire and wheel assembly (1).



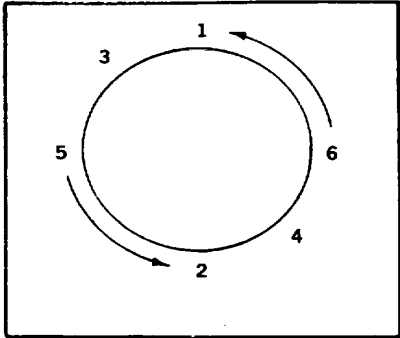
INSTALLATION:

- 1. INSTALL TIRE AND WHEEL (1).
 - a. Position tire and wheel assembly on axle.

NOTE

Do not lubricate the wheel studs or lug nuts.

- b. Install twenty four washers (3) and nuts (2).
 - c. Tighten nuts until they are snug, rotating wheel so nut being tightened is in top position.
 - d. Torque nuts to 300-330 ft-lbs (41.5 45.6 kgm) in sequence shown.
- 2. RAISE AND RETRACT OUTRIGGERS. (REFER TO TM 5-3810-306-10.)



END OF TASK

TIRE AND WHEEL ASSEMBLY

TOOLS: General mechanic's tool kit: automotive (5180-00-177-7033)
 Shop equipment auto-maintenance and repair (4910-00-754-0654)
 Shop equipment auto-maintenance and repair (4910-00-754-0653)
 Clip-on inflator
 Lifting device (2-ton (1812 kg) capacity)
 Tire bead separator
 Air hose
 Safety cage

SUPPLIES: Rubber lubricant (Item 78, Appendix C)
 Rust prohibitive paint (Item 68, Appendix C)
 Prefomed packing (Item 77, Appendix C)

EQUIPMENT CONDITIONS: Tire and wheel assembly removed. (Refer to page 12-2.)

DISASSEMBLY:

1. DISASSEMBLE TIRE AND WHEEL ASSEMBLY.

WARNING

Do not attempt to demount or mount tires without proper training. The tire and wheel assembly shall be placed in a tire cage. The high pressures 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.

- a. Lay tire and wheel assembly on blocks with lock ring side up.
- b. Remove valve stem core (1) and completely deflate tire.
- c. Standing inside rim area, work carefully to remove lock ring (2). Start at lock ring split and work tools around lock ring.

- d. Remove and discard prefomed packing (3) by inserting screwdriver under packing and prying up. Do not use fingers. Discard prefomed packing.

WARNING

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.

CAUTION

Avoid using tire bead separator within one foot (0.3 m) of butt weld on flange.

- e. Starting at flange butt weld, use tire bead separate tire and flange. Use

enough pressure to depress flange 3/4-1 inch.

- f. Release tire bead separator and move machine 2-3 feet around flange for second bite.
- g. Continue depressing flange and separating tire bead until 3/4 of tire bead is free.
- h. Depress flange one final time to completely unseal bead and flange.
- i. Lift out bead seat (4) and flange (5).
- j. Turn tire over and repeat tire bead separation procedure on back flange.
- k. Lift wheel (6) clear of tire. Remove back flange (5).

INSPECTION:

1. INSPECT TIRE AND WHEEL COMPONENTS.
 - a. Clean all dirt and rusty scale from tire and wheel parts.
 - b. Inspect all parts for corrosion and fatigue.
 - c. Inspect tire for damage. If damaged, replace. REPAIR OF THE TIRE IS NOT AUTHORIZED.
 - d. Discard all worn or damaged parts.
 - e. Apply rust prohibitive touchup paint to all parts as necessary to prevent corrosion. (Refer to TM 43-0139.)

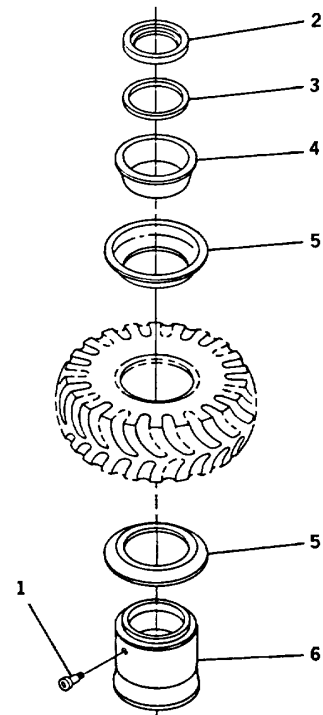
REASSEMBLY:

1. REASSEMBLE TIRE AND WHEEL ASSEMBLY.

CAUTION

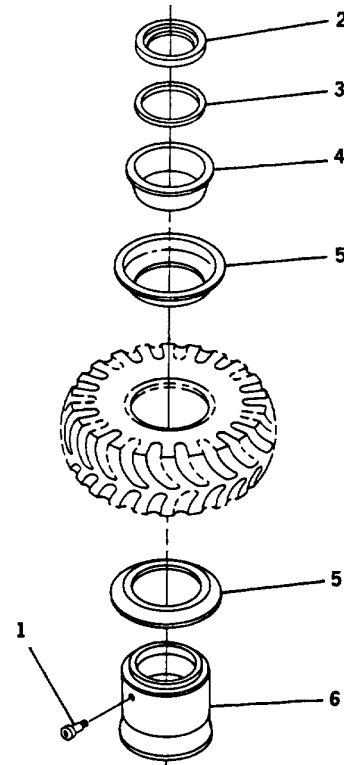
Do not use a steel hammer to assemble rim components. Use rubber, lead, plastic, or brass faced mallet if necessary to tap uninflated components together. However, properly matched components should seat without tapping during inflation.

- a. Install new valve stem (1) in wheel.
- b. Stand wheel (6) on ground with wide end down. Install one flange (5) on rim assembly.
- c. Lift tire and slip it down over rim ensuring that it is seated against flange.



- d Place other flange (5) on wheel and install bead seat (4). suitable hammer, force bead seat down as far as possible.
 - e . Install new preformed packing (3) in second groove.
 - f. Place lock ring (2) in top groove with split opposite the valve stem. Standing on tire pry lock ring into groove by snapping it into place.
 - g. Lubricate the preformed packing (3) and bead seat (4) with vegetable-based lubricant.
 - h. Inspect all rim parts to ensure that they are seated properly. Lock ring (2) should be fully seated.
 - i. Place tire and rim in safety cage.
 - j. Using clip-on inflator, inflate tire to approximately 3 psi. Check all parts for proper alignment.
 - k. If parts appear okay, continue to inflate tire to 75 psi. If parts appear unseated, stop, deflate tire and reassemble rim parts.
2. INSTALL TIRE AND WHEEL ASSEMBLY. (REFER TO PAGE 12-2.)

END OF TASK



CHAPTER 13
STEERING SYSTEM MAINTENANCE

CHAPTER INDEX

	Procedure	Page
Section I	Steer Cylinder Maintenance.....	13-2
	Steer Cylinder Installation	13-2
Section II	Front Steer Relief Valve Maintenance	13-3
	Front Steering Relief Valve Replacement.....	13-3

Section I. STEER CYLINDER MAINTENANCE

STEER CYLINDER INSTALLATION

TOOLS: General mechanic's tool kit: automotive (5180-00-177-7033)

SUPPLIES: Lockwashers (Item 16, Appendix C) (2 Required)

EQUIPMENT CONDITIONS: Disconnect ground cable at shunt. (Refer to page 8-109.)

REMOVAL:

NOTE

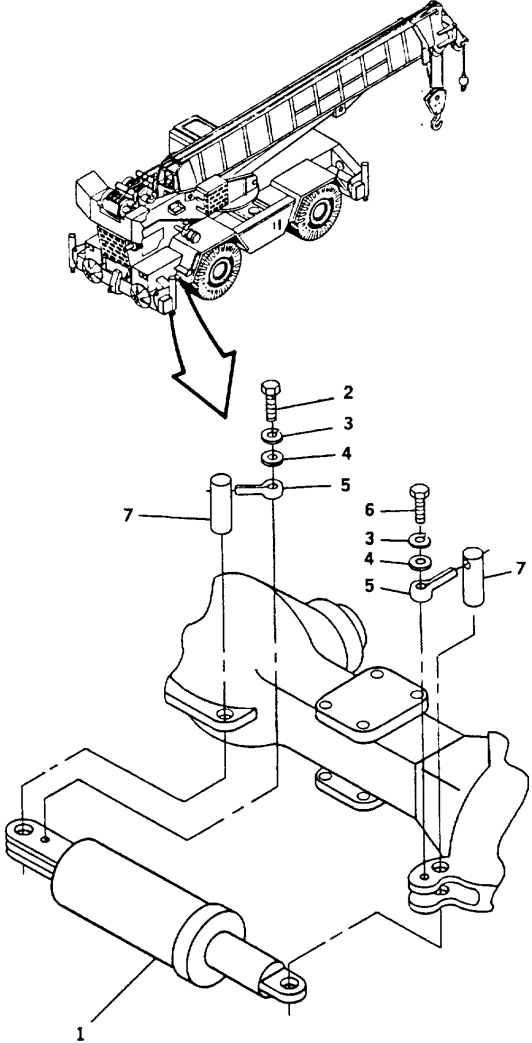
Front and rear steer cylinders are identical. Use this procedure for both.

- 1. REMOVE STEER CYLINDER (1).
 - a. Tag and disconnect two hydraulic lines to steer cylinder (1).
 - b. Remove capscrew (2), lockwasher (3), flatwasher (4) and cotter pin (5) from base end of steer cylinder (1). Remove pivot shaft (7). Discard lockwasher (3).
 - c. Remove capscrew (6), lockwasher (3), flatwasher (4) and cotter pin (5) from rod side of steer cylinder. Remove pivot shaft (7). Discard lockwasher (3).

NOTE

Ensure capscrews (2 and 6) are reinstalled in their correct locations. The rod end capscrew has coarse threads and base end capscrew has fine threads.

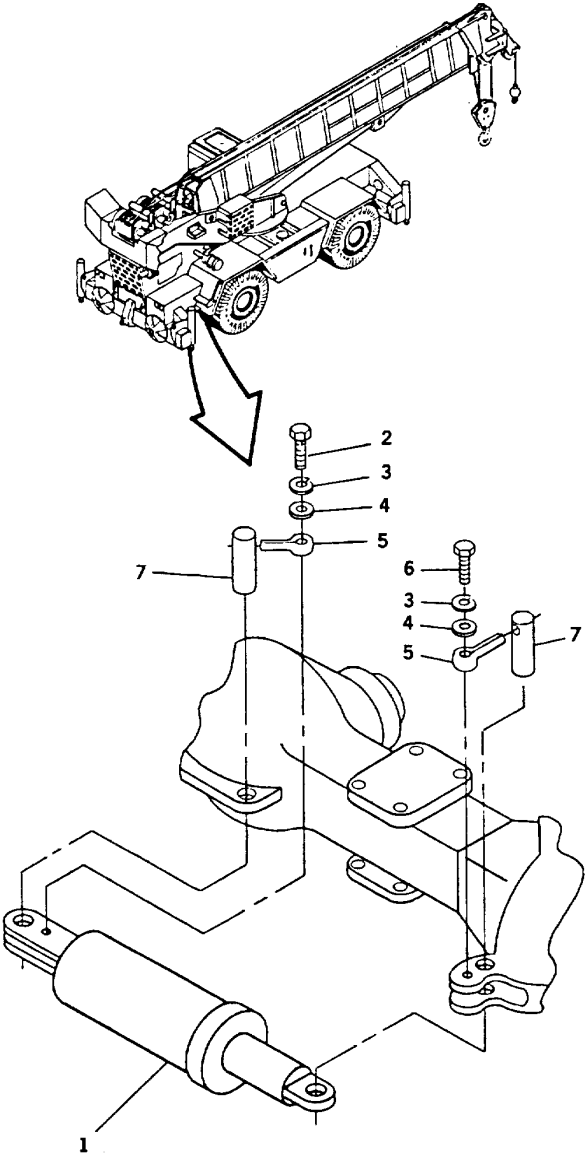
- d. Remove steer cylinder (1).



INSTALLATION:

- 1. INSTALL STEER CYLINDER (1).
 - a. Position steer cylinder (1) on axle and install pivot shafts (7), ensuring cotter pin holes are on top.
 - b. Secure each pivot shaft (7) with cotter pins (3), flatwashers (4), new lockwashers (3) and capscrews (2 and 6).
 - c. Remove tags and connect two hydraulic lines to steer cylinder (1).
- 2. CONNECT GROUND CABLE AT SHUNT. (REFER TO PAGE 8-109.)
- 3. START ENGINE AND CHECK FRONT AND REAR STEERING OPERATION. (REFER TO TM 5-3810-306-10.)

END OF TASK



Section II. FRONT STEER RELIEF VALVE MAINTENANCE

FRONT STEERING RELIEF VALVE REPLACEMENT

TOOLS: General mechanic's tool kit: automotive (5180-00-177-7033)

SUPPLIES: Clean rags (Item 1, Appendix C)
Lockwashers (Item 15, Appendix C)

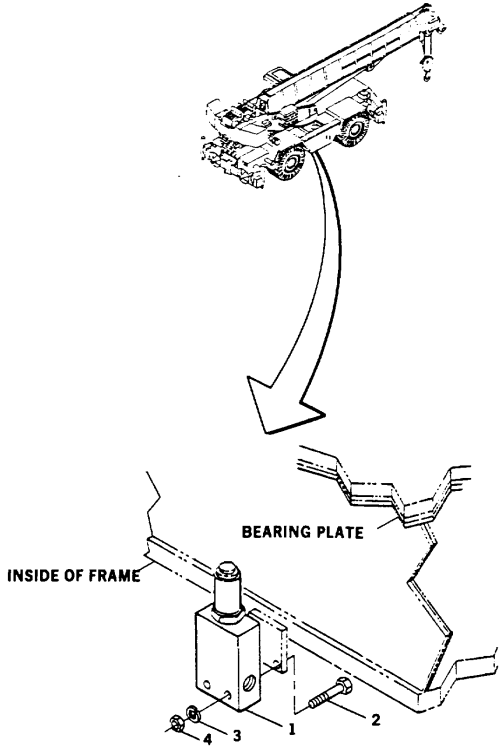
EQUIPMENT CONDITION: Disconnect ground cable at shunt. (Refer to page 8-109.)

REMOVAL:

- 1. REMOVE STEERING RELIEF VALVE (1).
 - a. Tag and remove three hydraulic hoses to steering relief valve (1). Plug hoses.
 - b. Remove two capscrews (2), lockwashers (3) and nuts (4) securing valve to frame. Discard lockwashers (3).
 - c. Remove fittings. Retain for installation or replace if damaged.
 - d. Inspect hydraulic hose seals for damage. Replace if necessary.

INSTALLATION:

- 1. INSTALL STEERING RELIEF VALVE (1).
 - a. Install fittings on new valve.
 - b. Align steering relief valve (1) with frame mounting holes and secure with two capscrews (2), new lockwashers (3) and nuts (4).
 - c. Remove tags, plugs and install hydraulic hoses.
- 2. CONNECT GROUND CABLE AT SHUNT. (REFER TO PAGE 8-109.)



- 3. START ENGINE AND CHECK FRONT STEERING OPERATION. (REFER TO TM 53810-306-10.)

END OF TASK

Section III. EMERGENCY STEERING PUMP MAINTENANCE

EMERGENCY STEERING PUMP REPLACEMENT

TOOLS: General mechanic's tool kit: automotive (5180-00-177-7033)

SUPPLIES: Preformed packing (Item 82, Appendix C)
 Preformed packing (Item 83, Appendix C)
 Preformed packing (Item 85, Appendix C)
 Preformed packing (Item 84, Appendix C)
 Lockwasher (Item 15, Appendix C)
 Loctite #545 (Item 13, Appendix C)
 Hydraulic oil (Item 6, Appendix C)

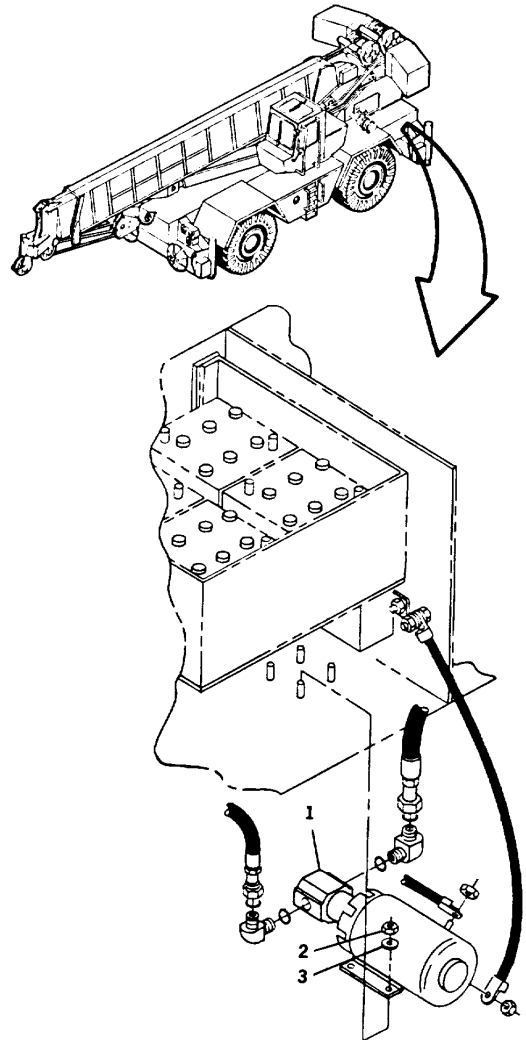
EQUIPMENT CONDITIONS: Discount ground cable at shunt. (Refer to page 8-109)

REMOVAL:

1. REMOVE EMERGENCY STEERING PUMP (1).
 - a. Tag and disconnect electrical connectors from pump (1).
 - b. Tag and disconnect 2 hydraulic lines and preformed packing from pump. Cap hoses.
 - c. Remove fittings and preformed packings from pump ports. Replace as necessary.
 - d. Remove four nuts and (2) and lockwashers (3) securing pump and drive motor.
 - e. Remove pump and drive motor (1).

INSTALLATION:

1. INSTALL EMERGENCY STEERING PUMP (1).
 - a. Position pump and drive motor over studs and secure with lockwashers (3) and nuts (2).

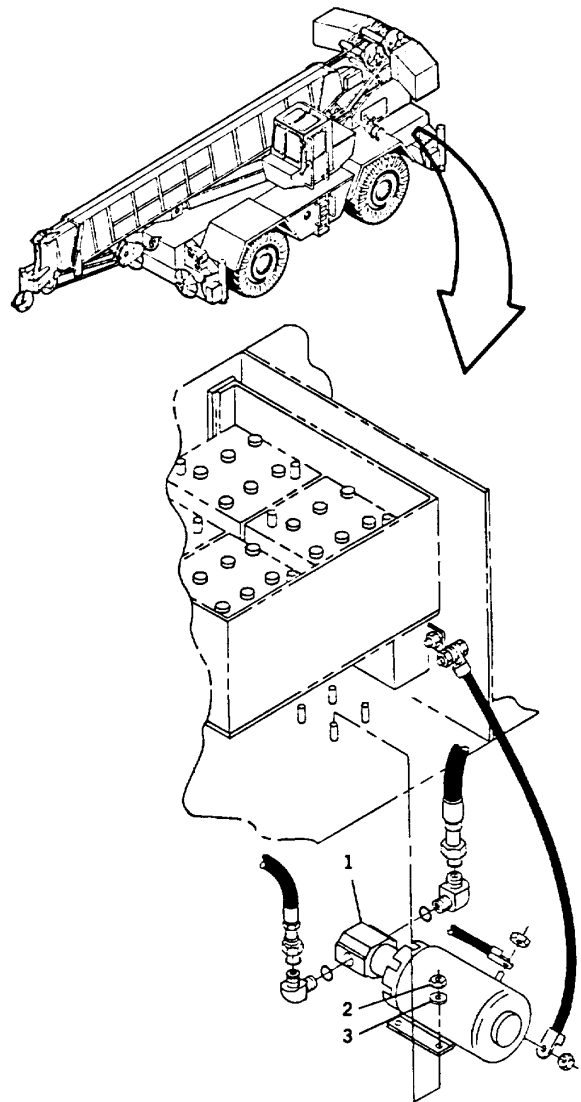


NOTE

Prior to connecting hydraulic lines, coat new preformed packings with clean hydraulic oil and fitting threads with Loctite #545.

- b. Connect hydraulic lines to pump.
 - c. Connect electrical lines to drive motor.
2. CONNECT GROUND CABLE AT SHUNT. (REFER TO PAGE 8-109.)
 3. TEST FOR PROPER OPERATION. (REFER TO TM 5-3810-306-10.)
 4. ENSURE HYDRAULIC CONNECTIONS ARE SECURE AND FREE OF LEAKS.

END OF TASK



CHAPTER 14
FRAME MAINTENANCE

CHAPTER INDEX

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	Pintle Hook Installation	14-2
	Pintle Hook Assembly.....	14-3
Section II	Outrigger Float Maintenance.....	14-5
	Outrigger Float Assembly.....	14-5

Section I. PINTLE HOOK MAINTENANCE

PINTLE HOOK INSTALLATION

TOOLS: General mechanic's tool kit: automotive (5180-00-177-7033)

SUPPLIES: Cotter pin (Item 49, Appendix C)

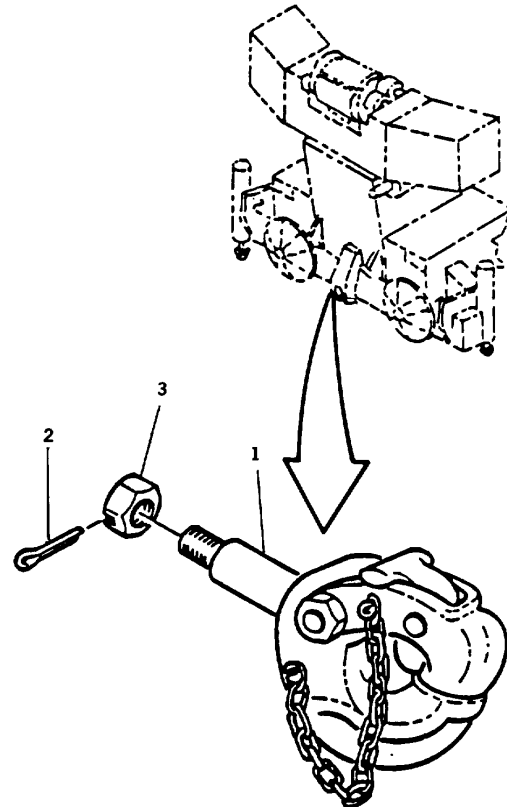
EQUIPMENT CONDITIONS: None

REMOVAL:

1. REMOVE PINTLE HOOK (1) FROM OUTRIGGER WELDMENT.
 - a. Remove and discard cotter pin (2).
 - b. Remove slotted hex nut (3).
 - c. Remove pintle hook assembly (1).

INSTALLATION:

1. INSTALL PINTLE HOOK (2).
 - a. Install pintle hook (2) through outrigger weldment and secure with slotted hex nut (3).
 - b. Install new cotter pin (2) to retain slotted hex nut (3).
2. LUBRICATE PINTLE HOOK (REFER TO LO 5-3810-306-12.)



END OF TASK

PINTLE HOOK ASSEMBLY

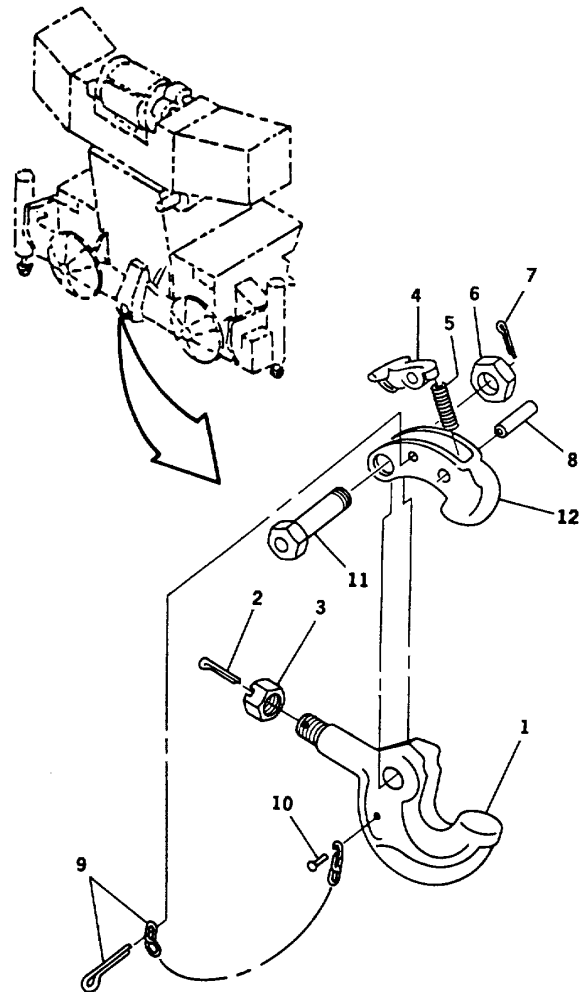
TOOLS: General mechanic's tool kit: automotive (5180-00-177-7033)

SUPPLIES: Cotter pin (Item 49, Appendix C)
Clean rags (Item 1, Appendix C)

EQUIPMENT CONDITIONS: Pintle hook removed. (Refer to page 14-2)

DISASSEMBLY:

1. DISASSEMBLE PINTLE HOOK (1).
 - a. Remove upper cotter pin (7), hex nut (6) and latch bolt (11) securing arm (12) to pintle hook (1). Discard cotter pin (7).
 - b. Remove arm (12) from pintle hook (1).
 - c. Remove pin (8), latch (4) and spring (5).
 - d. Remove drive screw (10) and chain (9) if required.

**CLEANING:****WARNING**

Dry cleaning solvent P-D-680 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. Flash point is 1000F/138°F (38°C-590C). If you become dizzy while using cleaning solvent, get fresh air immediately and get medical aid. If contact with eyes is made, wash your

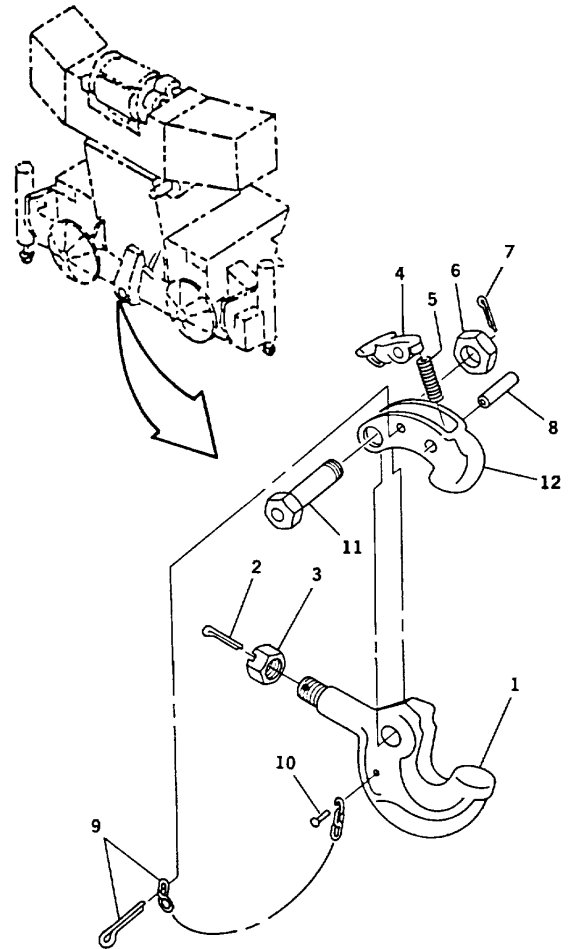
eyes with water and get medical aid immediately.

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

2. CLEAN ALL PARTS WITH P-D-680. DRY PARTS WITH LOW PRESSURE AIR.
3. INSPECT ALL PARTS FOR DAMAGE. REPLACE PARTS AS REQUIRED.

REASSEMBLY:

1. REASSEMBLE PINTLE HOOK (1).
 - a. Install latch (4) with spring (5) and secure with pin (8).
 - b. Install arm (12) on pintle hook (1).
 - c. Install latch bolt (11), hex nut (6) and new cotter pin (7).
 - d. Install new chain (9) and drive screw (10) if required.
2. INSTALL PINTLE HOOK (REFER TO PAGE 14-2.)
3. LUBRICATE PINTLE HOOK. (REFER TO LO 5-3810-306-12.)



END OF TASK

Section II. OUTRICCER FLOAT MAINTENANCE

OUTRIGGER FLOAT ASSEMBLY

TOOLS: General mechanic's tool kit: automotive (5180-00-177-7033)
Lifting device

SUPPLIES: None

EQUIPMENT CONDITIONS: Outrigger float removed. (Refer to TM 5-3810-306-10.)

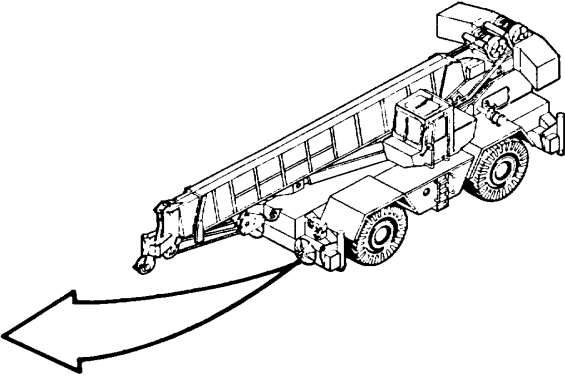
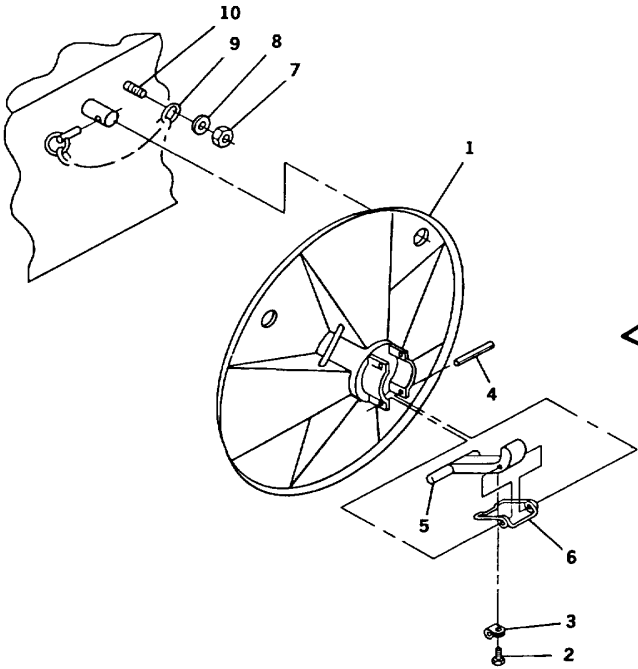
DISASSEMBLY:

1. DISASSEMBLE OUTRIGGER FLOAT(S) (1).
 - a. Remove two self-tapping screws (2) securing clamps (3).
 - b. Drive out two spring pins (4) and remove levers (5) and springs (6).
 - c. Remove two hex locknuts (7), flatwashers (8) and quick release pin chains (9) secured to studs (10).
2. INSPECT ALL PARTS FOR DAMAGE. REPLACE PARTS AS REQUIRED.

REASSEMBLY:

1. REASSEMBLE OUTRIGGER FLOAT(S) (1).
 - a. Assemble two levers (5), springs (6) and secure to outrigger float (1) with spring pins (4).
 - b. Install clamps (3) and secure with two self-tapping screws (2).
 - c. Attach two quick release pin chains (9) to studs (10) and secure with hex locknuts (7) and flatwashers (8).

END OF TASK



CHAPTER 15

BODY, CAB, HOOD, HULL AND ACCESSORY ITEMS MAINTENANCE

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	Cab Protective Grill Replacement	15-5
	Door Assembly Replacement	15-6
	Door Latch Assembly Replacement	15-7
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Section I. CAB MAINTENANCE

CAB ACOUSTICAL FOAM INSTALLATION

TOOLS: General mechanic's tool kit: automotive (5180-00-177-7033)

SUPPLIES: Spray adhesive (Item 59, Appendix C)
Weatherstrip adhesive (Item 60, Appendix C)

EQUIPMENT CONDITIONS: Operator's seat and pedestal removed if required. (Refer to page 15-27.)

REMOVAL:

1. REMOVE ACOUSTICAL PANELS FROM CAB BY REMOVING NEOPRENE NUTS (1), WHERE APPLICABLE, AND SLIDING OUT OF CHANNELS OR CLIPS.
2. REMOVE ACOUSTICAL PANELS FROM VALVE COMPARTMENT BY REMOVING NUTS (2) AND WASHERS (3 AND 4).

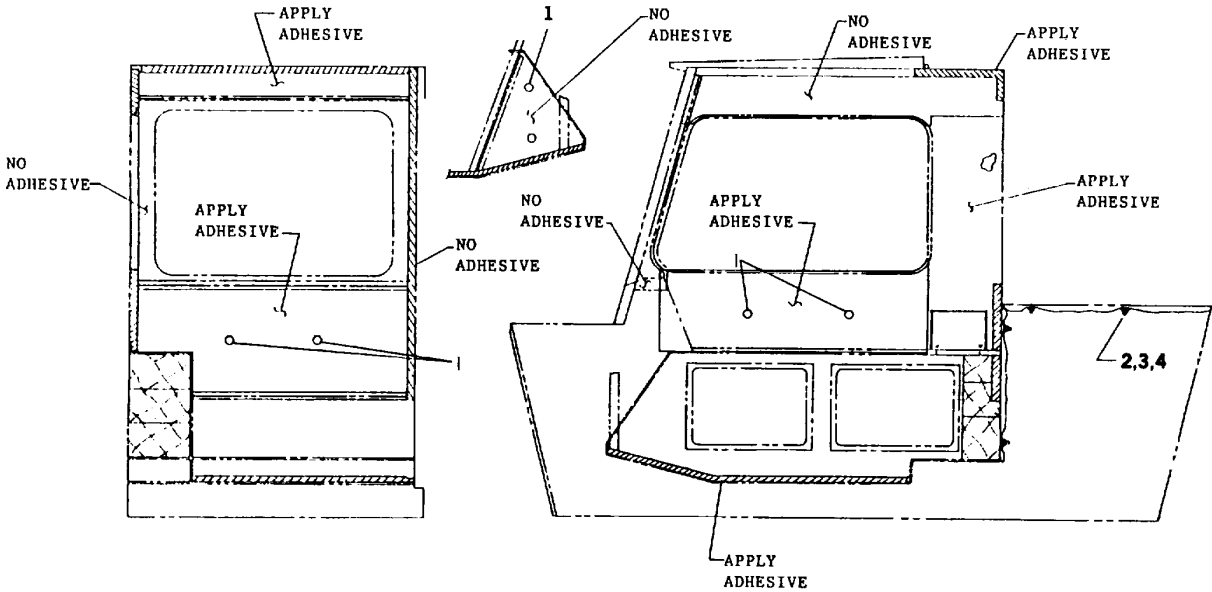
(1) ONTO STUDS WITH A HAMMER TO SECURE.

2. APPLY WEATHER STRIP ADHESIVE TO CHANNEL WHERE FRONT OF DOOR RECESSES AND AROUND SKYLIGHT WINDOW. INSTALL ACOUSTICAL FOAM. TAP NEOPRENE NUTS WITH A HAMMER TO SECURE.
3. POSITION ACOUSTICAL FOAM IN VALVE COMPARTMENT AND SECURE WITH NUTS (2) AND WASHERS (3 AND 4).

INSTALLATION:

1. APPLY 3M SPRAY ADHESIVE TO APPLICABLE AREAS SHOWN AND INSTALL ACOUSTIC FOAM. TAP NEOPRENE NUTS

END OF TASK



WINDOW GLASS REPLACEMENT

TOOLS: General mechanic's tool kit: automotive (5180-00-177-7033)

SUPPLIES: Silicone sealant (Item 38, Appendix C)
Glass molding (Item 61, Appendix C)

EQUIPMENT CONDITIONS: None

REMOVAL:

1. REMOVE WINDOW GLASS (1).

WARNING

Use care when removing cracked or broken glass. Wear eye protection and gloves.

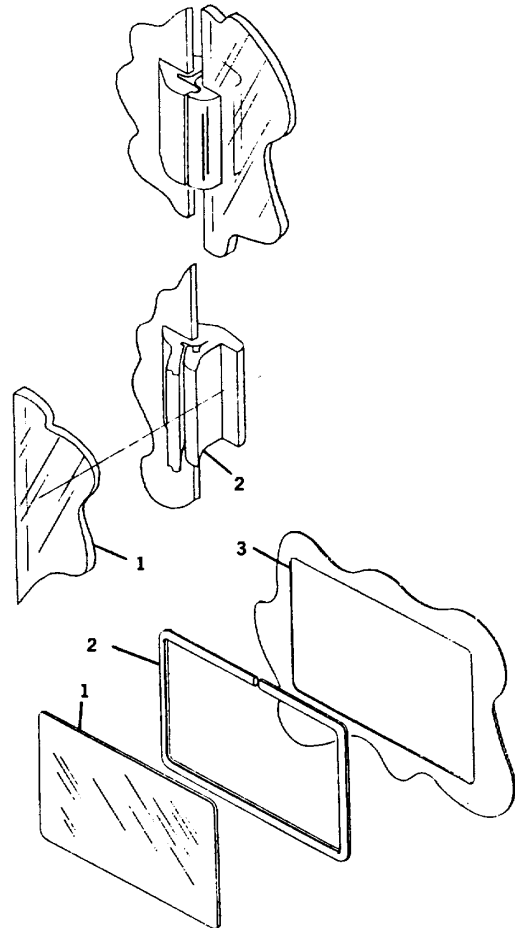
NOTE

Skylight glass in cab roof shown. Use this replacement procedure for front, rear and cab window glass.

NOTE

On front and skylight window installation wiper arm removal will allow easier access to window. (Refer to page 15-40 or 15-36.) Protective grill will have to be removed (Refer to page 15-5.) from cab right side window for removal and installation.

- a. Pry locking strip open on molding (2) around glass (1).
- b. Remove glass (1) and discard.
- c. Remove molding (2) from channel (3) and discard.



INSTALLATION:

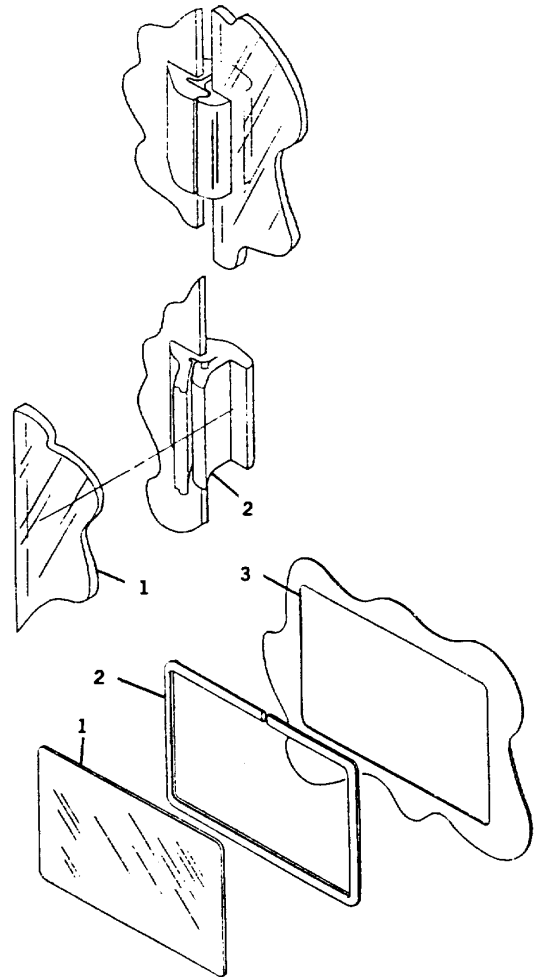
1. INSTALL WINDOW GLASS (1).

WARNING

Eye contact with silicone RTV materials may cause irritation. If eye contact takes place, flush eyes with water for fifteen minutes and have eyes examined by a doctor.

- a. Cut molding (2) to size.
- b. Install molding (2) on channel (3) of window opening.
- c. Fit glass (1) in glass channel of molding (2) and work glass (1) around molding (2) until seated.
- d. Seat locking strip on molding (2) to secure glass from outside of cab.
- e. Apply silicone sealant at joint where molding ends meet. Allow to dry and test for leaks.

END OF TASK



CAB PROTECTIVE GRILL REPLACEMENT

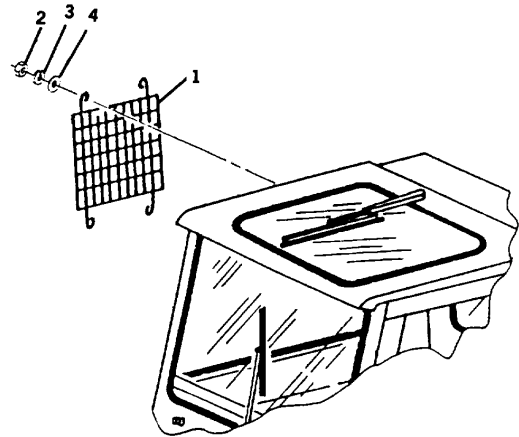
TOOLS: General mechanic's tool kit: automotive (5180-00-177-7033)

SUPPLIES: Lockwashers (Item 2, Appendix C) (4 required)

EQUIPMENT CONDITIONS Boom raised to allow access to grill. (Refer to TM 5-3810-306-10.)
Disconnect ground cable at shunt. (Refer to page 8-109.)

REMOVAL:

1. REMOVE GRILL (1).
 - a. Hold grill (1) in place.
 - b. Remove four nuts (2), lockwashers (3) and flatwashers (4). Discard lockwashers (3).
 - c. Pull grill (1) from mounting studs.
2. INSPECT PARTS FOR DAMAGE. REPLACE AS REQUIRED.

**INSTALLATION:**

1. INSTALL GRILL (1) ON MOUNTING STUDS.
 - a. Align grill (1) on mounting studs. Hold in place.
 - b. Put four flatwashers (4) on mounting studs.
 - c. Install four new lockwashers (3) and nuts (2) on mounting studs. Tighten nuts (2).

END OF TASK

DOOR ASSEMBLY REPLACEMENT

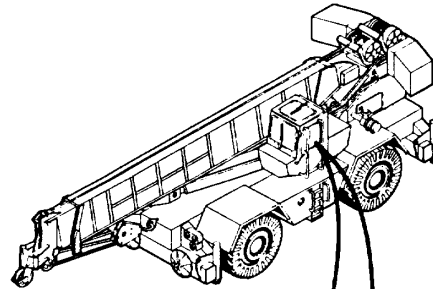
TOOLS: General mechanic's tool kit: automotive (5180-00-177-7033)

SUPPLIES: Lockwashers (Item 7, Appendix C) (6 Required)

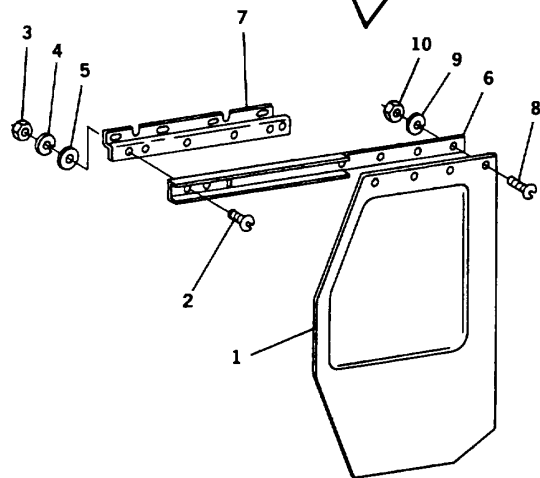
EQUIPMENT CONDITIONS: None

REMOVAL:

1. REMOVE DOOR ASSEMBLY.
 - a. Support weight of door (1) and remove six capscrews (2), hex nuts (3), lockwashers (4) and flatwashers (5) securing door side (6) to door (1). Discard lockwashers (4).
 - b. Remove door (1) and door slide (6) from door hanger (7).
 - c. Remove capscrews (8), lockwashers (9) and nuts (10). Separate slide (6) and door (1). Discard lockwashers (9).

**INSTALLATION:**

1. INSTALL DOOR ASSEMBLY.
 - a. Install slide (6) to door (1) and secure with capscrews (8), new lockwashers (9) and nuts (10).
 - b. Support door assembly and align mounting holes in door (1) with door slide (6). Secure with six capscrews (2), hex nuts (3), new lockwashers (4) and flatwashers (5).
 - c. Adjust door (1), door hanger (7) and door slide (6) as required.
2. ENSURE DOOR SLIDES FREELY WITHOUT BINDING.



END OF TASK

DOOR LATCH ASSEMBLY REPLACEMENT

TOOLS: General mechanic's tool kit: automotive (5180-00-177-7033)
Wire brush

SUPPLIES: Rust prohibitive paint (Item 68, Appendix C)
Lockwashers (Item 2, Appendix C) (4 Required)
Lockwashers (Item 7, Appendix C) (2 Required)

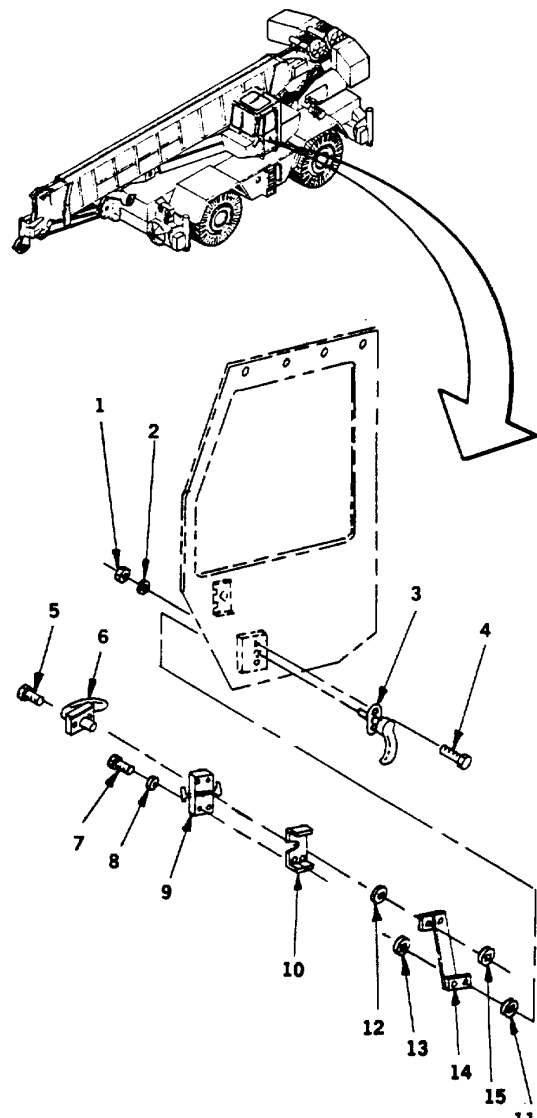
EQUIPMENT CONDITIONS: None

DISASSEMBLY:

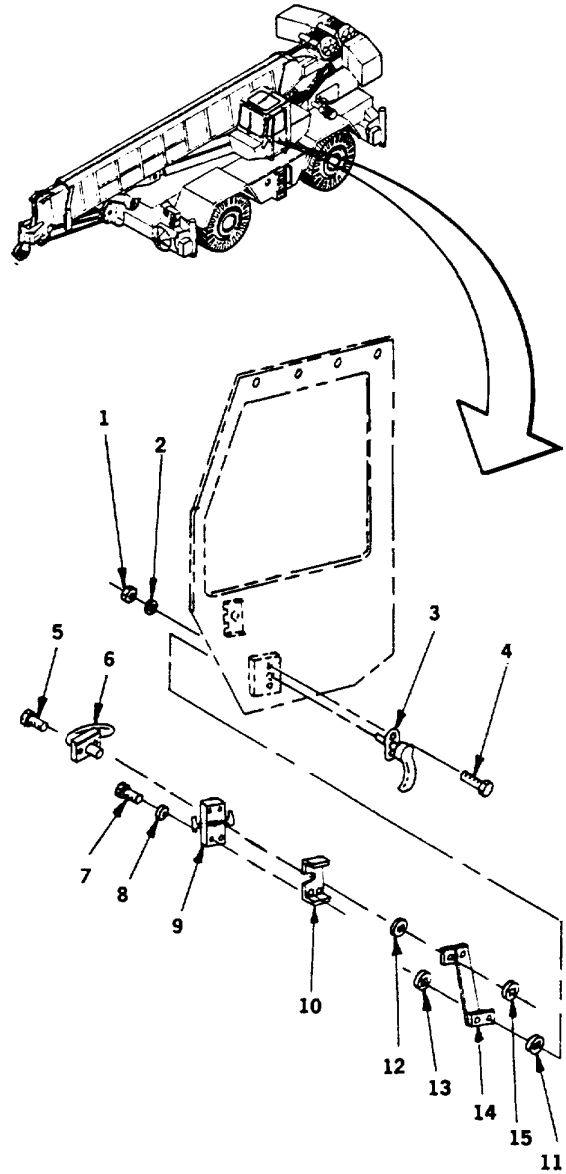
1. DISASSEMBLE DOOR LATCH ASSEMBLY.
 - a. Remove two washers (13 and 11) securing extension rod (14) to handle (3).
 - b. Remove two hex nuts (1), lockwashers (2) and capscrews (4) and remove handle (3) from door. Discard lockwashers (2).
 - c. Remove four screws (7) and lockwashers (8) securing latch (9) to door mounting bracket (10). Discard lockwashers (8).
 - d. Remove two washers (12 and 15) securing extension rod (14) to handle (6).
 - e. Remove inside handle (6) from latch (9) by removing two machine screws (5).
2. INSPECT ALL PARTS FOR DAMAGE. REPLACE IF NECESSARY.
3. REMOVE ANY RUST AND REPAINT AS REQUIRED. (REFER TO TM 43-0139.)

REASSEMBLY:

1. REASSEMBLE DOOR LATCH ASSEMBLY.
 - a. Install inside handle (6) to latch (9) and secure with two machine screws (5).



- b. Secure latch (9) to mounting bracket (10) and secure with four capscrews (7) and new lockwashers (8).
- c. Install outside handle (3) and secure with two capscrews (4), new lockwashers (2) and nuts (1).
- d. Install extension rod (14) to outside handle (3) with two washers (13 and 11).
- e. Install extension rod (14) to inside handle (6) with two washers (12 and 15).



2. CHECK FOR PROPER OPERATION.

END OF TASK

GRABRAILS

TOOLS: General mechanic's tool kit: automotive (5180-00-177-7033)

SUPPLIES: Lockwashers (Item 16, Appendix C) (4 Required)

EQUIPMENT CONDITIONS: None

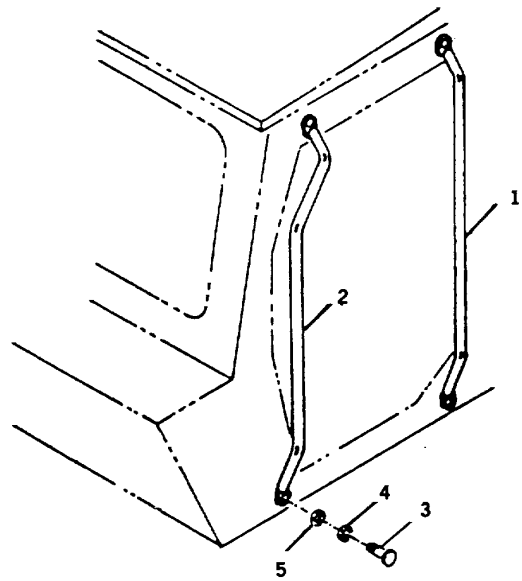
REMOVAL:

1. REMOVE GRABRAIL (1 AND 2).
 - a. Remove two capscrews (3), lockwashers (4) and flatwashers (5) securing grabrail to cab exterior. Discard lockwashers.

INSTALLATION:

1. INSTALL GRABRAIL (1 AND 2).
 - a. Position grabrail on cab exterior and secure with two flatwashers (5), new lockwashers (4) and capscrews (3).

END OF TASK



CAB FRONT PANEL REPLACEMENT

TOOLS: General mechanic's tool kit: automotive (5180-00-177-7033)

SUPPLIES Lockwashers (Item 2, Appendix C)

EQUIPMENT CONDITIONS NONE

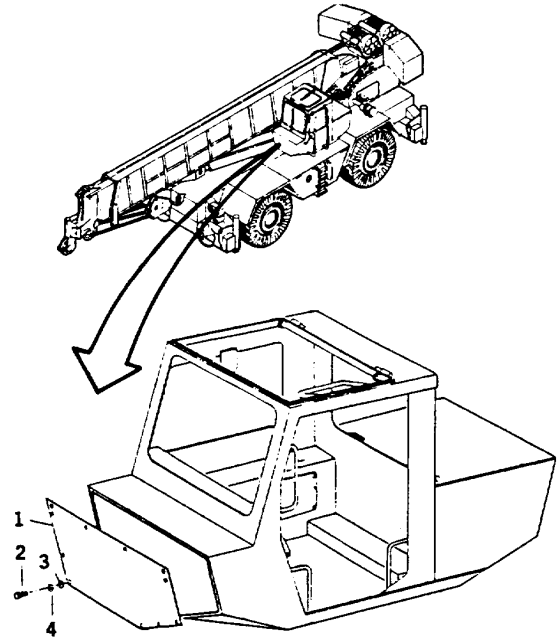
REMOVAL:

1. REMOVE CAB FRONT PANEL (1).
 - a. Remove cap screws (2) flat washers (3) and lockwashers (4); remove cab front panel (1). Discard lockwashers (4).

INSTALLATION:

1. INSTALL CAB FRONT PANEL (1).
 - a. Position cab front panel (1) on front of cab and secure with new lockwashers (4), flat washers (3), and capscrews (2).

END OF TASK



CAB BOTTOM PANEL REPLACEMENT

TOOLS: General mechanic's tool kit: automotive (5180-00-177-7033)

SUPPLIES: NONE

EQUIPMENT CONDITIONS: NONE

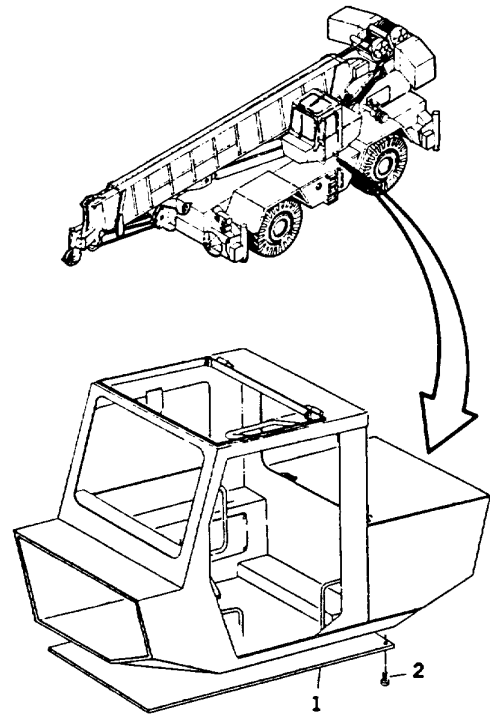
REMOVAL:

- 1 REMOVE CAB BOTTOM PANEL (1).
 - a. Remove self tapping screws (2) and remove cab bottom panel (1).

INSTALLATION:

1. INSTALL CAB BOTTOM PANEL (1).
 - a. Install cab bottom panel (1) under cab and secure with self tapping screws (2).

END OF TASK



Section II. ENGINE HOOD MAINTENANCE

ENGINE ACCESS DOORS REPLACEMENT

TOOLS: General mechanic's tool kit: automotive (5180-00-177-7033)

SUPPLIES: Pop rivets (Item 34, Appendix C) (4 Required)
 Pop rivets (Item 35, Appendix C) (4 Required)
 Pop rivets (Item 39, Appendix C) (4 Required)

EQUIPMENT CONDITIONS: None

REMOVAL:

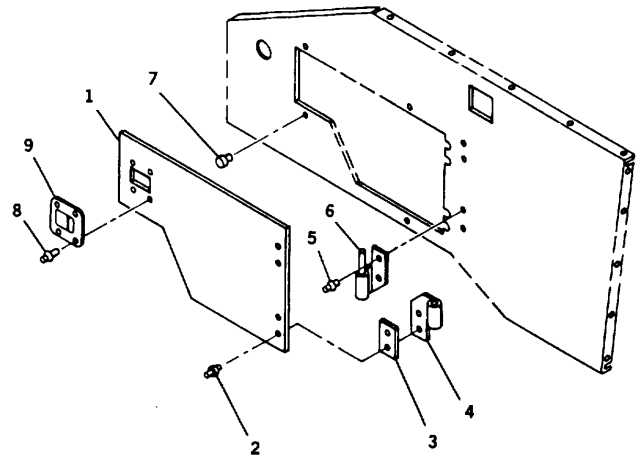
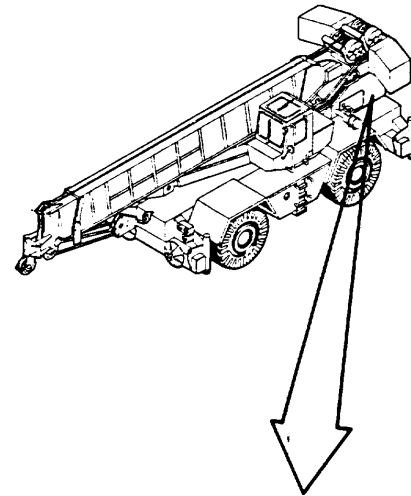
NOTE

The left and right side engine access doors are identical. Use this procedure for both doors.

1. REMOVE ENGINE ACCESS DOOR (1)
 - a. Drill out pop rivets (2) and remove access door (1) and spacer (3).
 - b. Drill out rivets (5) and remove latch half (6) with latch half (4).
 - c. Remove plug (7) if necessary.
2. REMOVE DOOR LATCH (9).
 - a. Drill out pop rivets (8).
 - b. Remove door latch (9).
3. INSPECT ALL COMPONENTS FOR WEAR AND DAMAGE. REPLACE DAMAGED COMPONENTS.

INSTALLATION:

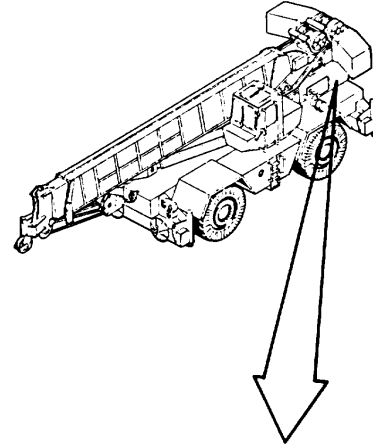
1. INSTALL DOOR LATCH (9).
 - a. Insert door latch (9) through cutout in engine access door.



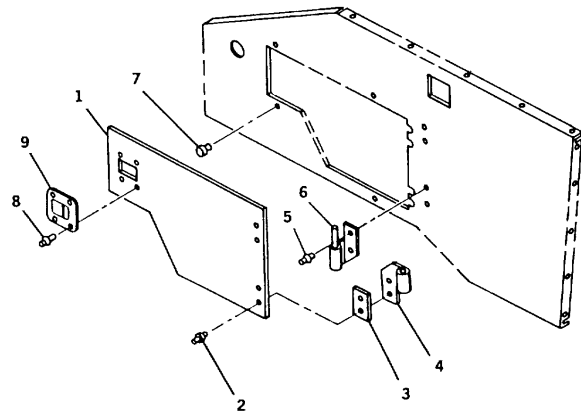
- b. Using pop rivet tool, install four new pop rivets (8) securing door latch (9) to engine access door (1).

2. INSTALL ENGINE ACCESS DOOR (1)

- a. Install latch half (4) with spacer (3) and latch half (6) to engine access door (1) with two new pop rivets (2) for each latch half.
- b. Align engine access door (1) with cutout engine hood.
- c. Secure engine access door (1) with two new pop rivets (5) at each latch half (6).
- d. Install plug (7) if removed.



END OF TASK



ENGINE HOOD REPLACEMENT

TOOLS: General mechanic's tool kit: automotive (5180-00-177-7033)
Lifting device (2 ton (1812 kg) capacity)

SUPPLIES: Lockwashers (Item 15, Appendix C) (46 Required)

EQUIPMENT CONDITIONS: Disconnect ground cable at shunt. (Refer to page 8-109.)
Air cleaner piping removed. (Refer to page 5-2.)
Quick start assembly removed. (Refer to page 5-17.)
Coolant recovery tank removed. (Refer to page 7-2.)
Muffler and pipes attached to hood removed. (Refer to page 6-2.)
Battery cover door open.
Access panels behind battery compartment and tool box removed. (Refer to page 8-98.)

REMOVAL:

1. REMOVE ENGINE HOOD.

- a. Remove six locknuts (1), flatwashers (3) and nylon washers (2) securing engine hood to frame side rails (4).
- b. Remove ten capscrews (14), lockwashers (15) and flatwashers (16) securing side plates (9 and 17) under fenders.
- c. Through access hole in battery compartment, remove three capscrews (14), lockwashers (15) and flatwashers (16) securing side plate (9).
- d. Through access hole near tool box, remove three capscrews (14), lockwashers (15) and flatwashers (16) securing side plate (17).
- e. Lift off engine hood with a suitable lifting device.
- f. Remove twelve capscrews (10), lockwashers (11) and flatwashers (12) securing rear grill (13) to side plates (9 and 17). Remove rear grill (13).
- g. Remove eighteen capscrews (5), lockwashers (6) and flatwashers (7) securing top plate (8) to side plates (9 and 17). Remove top plate (8).
- h. Remove hood side access doors if necessary. (Refer to page 5-11.)
- i. Discard all lockwashers.

INSTALLATION:

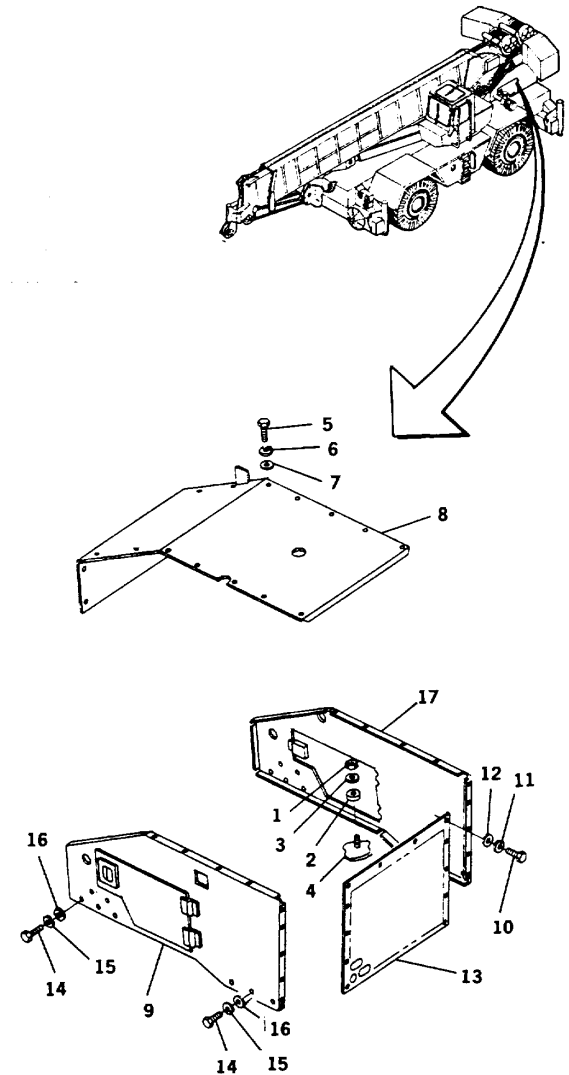
1. INSTALL ENGINE HOOD.

- a. Install top plate (8) to side plates (9 and 17) and secure with eighteen capscrews (5), new lockwashers (6) and flatwashers (7).
- b. Position rear grill (13) on top and side plates and secure using twelve capscrews (10), new lockwashers (11) and flatwashers (12).
- c. Lift assembled hood with a suitable lifting device into position on side frame rails (4). Align studs on frame with mounting holes in hood.

- d. Install six nuts (1), nylon washers (2) and flatwashers (3) securing hood to frame (4).
- e. Install sixteen capscrews (14), new lockwashers (15) and flat washers (16) through battery, tool and access compartments securing side plates (9 and 17) to frame.

2. INSTALL EXHAUST SYSTEM COMPONENTS. (REFER TO PAGE 6-2.)
3. INSTALL QUICK START ASSEMBLY. (REFER TO PAGE 5-17.)
4. INSTALL COOLANT RECOVERY TANK. (REFER TO PAGE 7-2.)
5. INSTALL AIR CLEANER PIPING. (REFER TO PAGE 5-2.)
6. CONNECT GROUND CABLE AT SHUNT. (REFER TO PAGE 8-109.)

END OF TASK



Section III. FENDER AND REAR DECKING MAINTENANCE

FENDERS AND REAR DECKING REPLACEMENT

TOOLS: General mechanic's tool kit: automotive (5180-00-177-7033)
Lifting device (2 ton (1812 Kg) capacity)

SUPPLIES: Lockwashers (Item 2, Appendix C) (8 Required)
Lockwashers (Item 15, Appendix C) (32 Required)

EQUIPMENT CONDITIONS: For rear fender removal only:
Clamps loosened on rubber connector at air inlet tube of air cleaner. (Refer to page 5-2.)
Air cleaner removed. (Refer to page 5-2.)
Battery/tool box cover removed. (Refer to page 8-98.)

REMOVAL:

WARNING

When removing fender, be aware of pinch points. Use care to avoid injury.

NOTE

Note locations of all spacers (18) during removal.

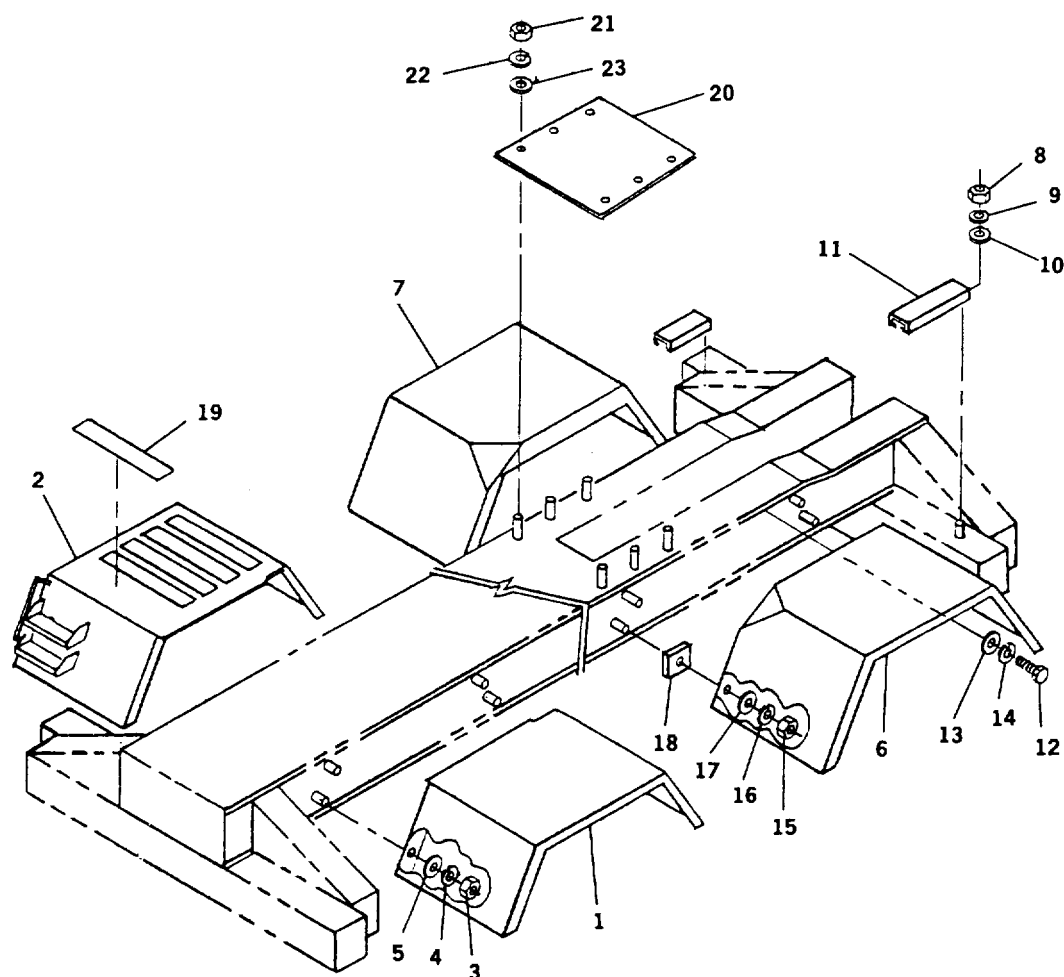
1. REMOVE FRONT FENDER(S) (1) AND (2).
 - a. Support weight of applicable fender(s) with lifting device and remove eight hex nuts (3), lockwashers (4), flatwashers (5) securing fender(s) to frame side rails. Discard lockwashers (4).
 - b. . Remove screws and washers securing fender to hydraulic tank cover. (Right front fender only).
 - c. . Remove fender.
2. REMOVE REAR FENDER(S) (6 AND 7).
 - a. Remove four hex nuts (8), lockwashers (9) and flatwashers (10) from tread (11). Discard lockwashers (9).

- b. Support weight of fender with lifting device and remove capscrews (12), flatwashers (13) and lockwashers (14) securing fender to frame, side rail and hood. Discard lockwashers (14).
- c. Remove four hex nuts (15), lockwashers (16) and flatwashers (17) securing fender to studs on frame side rail. Discard lockwashers (16). Retain spacer plates (18). Mark spacer plates for reassembly.
- d. Remove capscrews and washers securing fender to hydraulic tank cover. (Right rear fender only).

WARNING

Ensure weight of fender is supported and all personnel are clear.

- e. Pull sharply on fender near hydraulic tank cover until fender is free. (Right rear fender only).
3. REMOVE REAR DECKING (20).
 - a. Remove six nuts (21), lockwashers (22) and flatwashers (23) securing deck to frame. Discard lockwashers (22).



b. Remove decking (20) being careful not to damage pump disconnect knob.

a. Align fender (1 or 2) with mounting studs using lifting device.

INSTALLATION:

1. INSTALL FRONT FENDER(S) (1 AND 2).

b. Install washers (5), new lockwashers (4) and nuts (3) to secure fender.

c. Install non-slip strips (19) as required.

WARNING

When installing fender, be aware of pinch points. Use care to avoid injury.

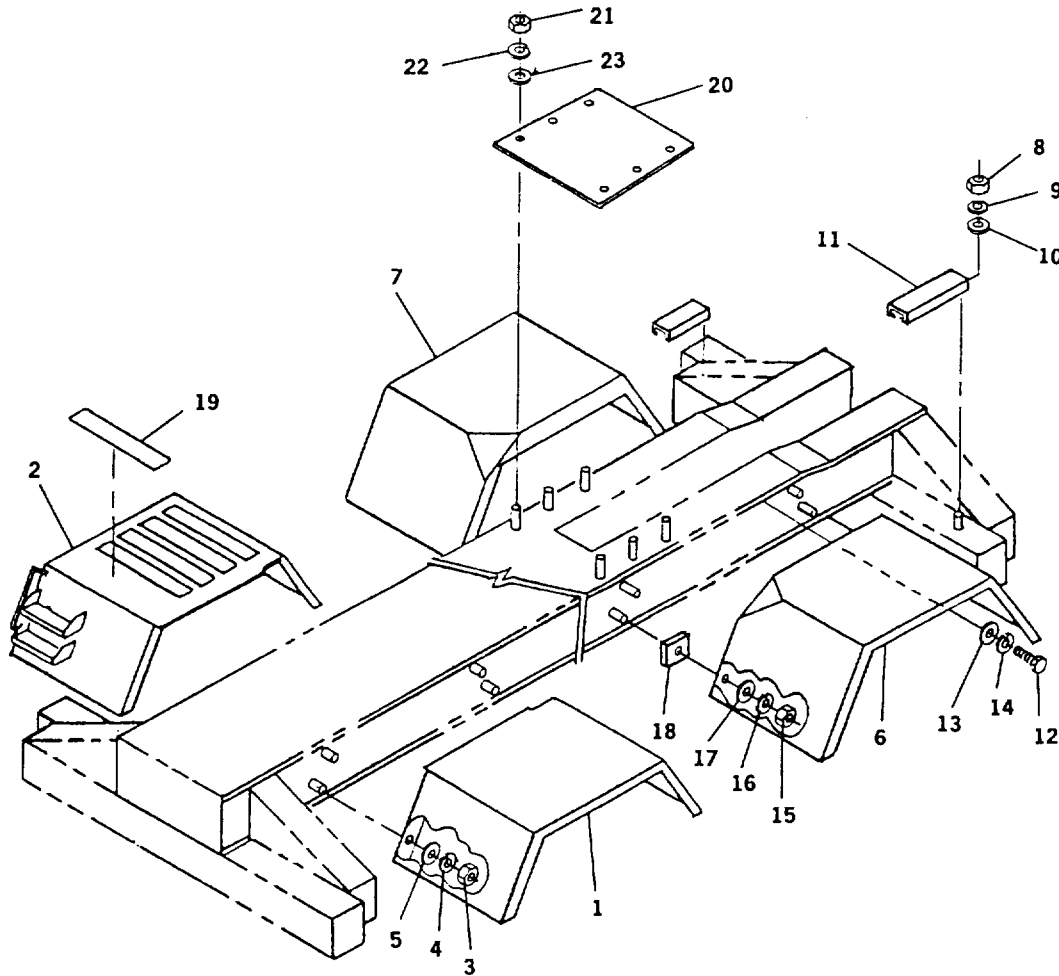
2. INSTALL REAR FENDER(S) (6 AND 7).

a. Align fender with mounting studs using lifting device.

b. Install fender to hydraulic tank cover with capscrews and washers. (Right rear fender only).

NOTE

Ensure spacer plates (18) are installed in correct locations.



- c. Secure fender to frame side rail and hood with capscrews (12), flatwashers (13) and new lockwashers (14). Install spacer plates (18) on studs and secure on frame side rail with four hex nuts (15), new lockwashers (16) and flatwashers (17).
 - d. Install non-skid strips (19) to fender surface.
3. INSTALL DECK COVER AND TREAD.
- a. Install tread (11) and secure with flatwashers (10), new lockwashers (9) and hex nuts (8).

- b. Install rear decking (20) and secure with flatwashers (23), new lockwashers (22) and nuts (21).

4. INSTALL BATTERY/TOOL BOX COVER. (REFER TO PAGE 8-98.)

5. SECURE AIR CLEANER TO FENDER. CONNECT AIR INLET TUBE TO AIR CLEANER. (REFER TO PAGE 5-2.)

6. CONNECT GROUND CABLE AT SHUNT. (REFER TO PAGE 8-109.)

END OF TASK

FUEL TANK COVER AND LADDER REPLACEMENT

TOOLS: General mechanic's tool kit: automotive (5180-00-177-7033)
Lifting device (2 ton (1812 Kg) capacity)

SUPPLIES: Lockwasher (Item 15, Appendix C)
Lockwasher (Item 16, Appendix C)
Lockwasher (Item 5, Appendix C)

EQUIPMENT CONDITIONS: Disconnect ground cable at shunt. (Refer to page 8-109.)

REMOVAL:

- 1. REMOVE FUEL TANK COVER AND LADDER. (4).

WARNING

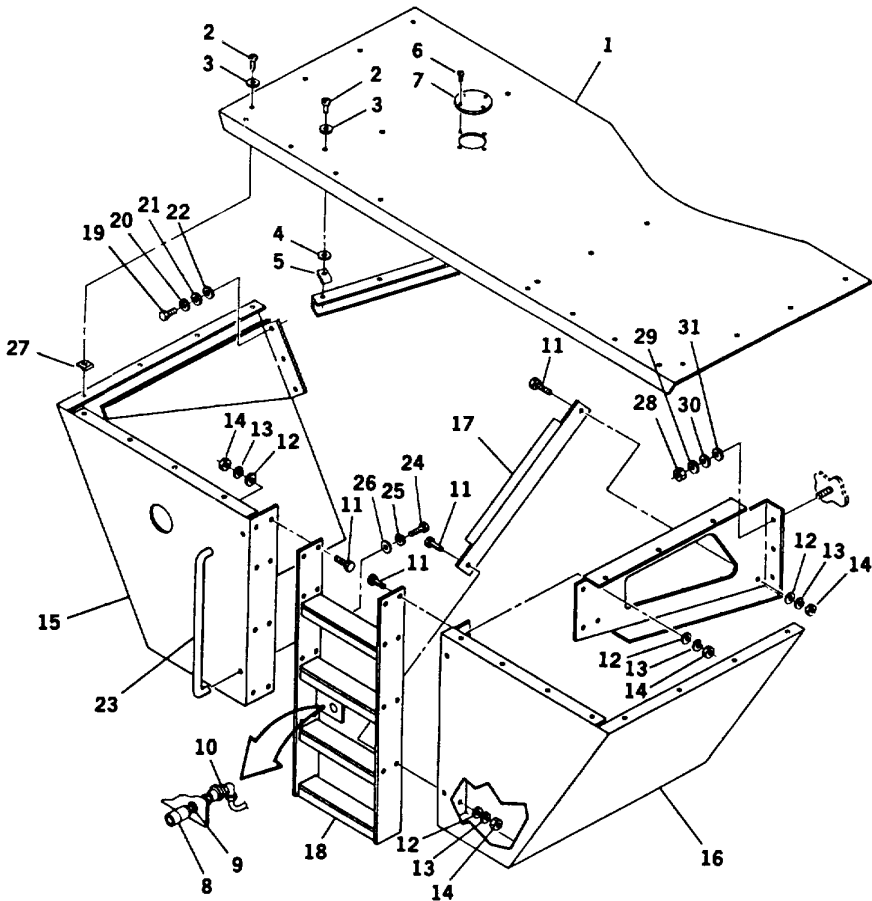
Fuel is flammable. Keep fuel away from heat and open flame.

- a. Remove twenty-three machine screws (2) and flatwashers (3).

- b. Remove eighteen lockwashers (4) and nuts (5) to free top cover (1). Discard lockwashers

- c. Remove four self-rapping screws (6) and remove plate (?).

- d. Disconnect body (8) and coupling nut (9) from tire inflator fittings (10). Coil line and secure on frame.



- e. Remove sixteen capscrews (11), flatwashers (12), lockwashers (13) and hex nuts (14) from front side cover (15) and rear side cover (16). Discard lockwashers (13).
- f. Support weight of side covers (15 and 16) and remove ladder support (17) and ladder (18).

NOTE

Prior to removing leveling lockwashers, mark location, position and quantity. Replace in same order, add or relocate as required.

- g. Remove three capscrews (19), lockwashers (20), flatwashers (21) and leveling lockwashers (22) securing front side cover (15) to frame weld nuts. Discard lockwashers (20) and (22).
- h. Remove grab handrails (23) by removing capscrews (24), lockwashers (25) and flatwashers (26). Discard lockwashers (25).

CAUTION

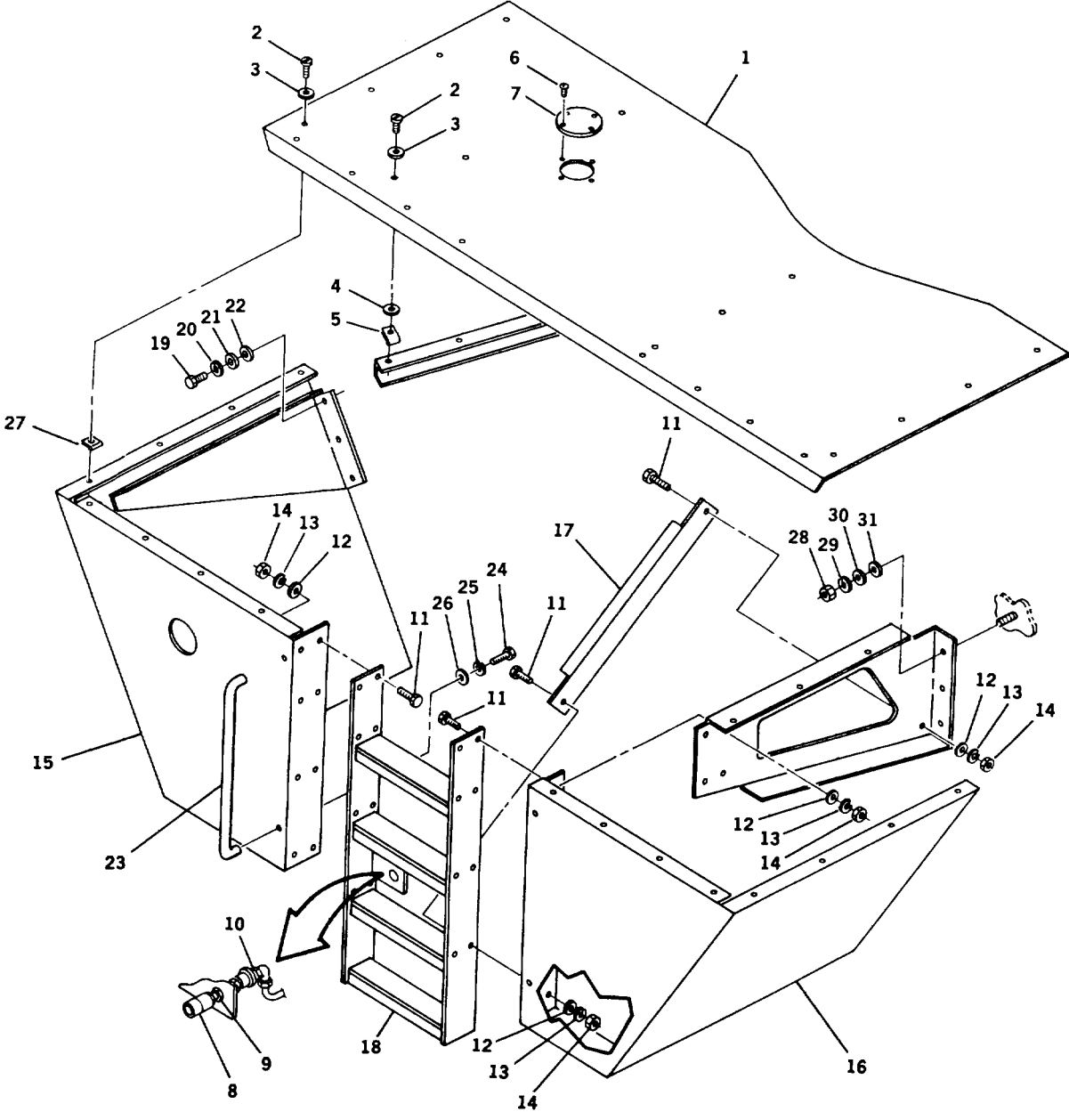
Use care when removing front side cover to prevent damaging fuel tank filler neck.

- i. Using a suitable lifting device remove front side cover (15).
- j. Remove nuts (28), lockwashers (29), flatwashers (30) and leveling lockwashers (31) securing rear side cover (16). Discard lockwashers (29).
- k. Using a suitable lifting device, remove rear side cover (16).

INSTALLATION:

1. INSTALL FUEL TANK COVER AND LADDER.
 - a. Position rear side cover (16) and secure with leveling lockwashers (31), flatwashers (30), new lockwashers (29) and nuts (28).
 - b. Position front side cover (15) at frame weld nuts and secure with three capscrews (19), new lockwashers (20), flatwashers (21) and new leveling lockwashers (22).
 - c. Position ladder (18) between covers. Align ladder support (17) and secure with sixteen capscrews (11), flatwashers (12), new lockwashers (13) and hex nuts (14).
 - d. Connect tire inflator fittings (10) to ladder (18). Secure with coupling nut (9) and install body (8).
 - e. Install grab handrails (23) and secure with capscrews (24), new lockwashers (25) and flatwashers (26).
 - f. Install twenty-three machine screws (2) and flatwashers (3). Install retaining nuts (27) where applicable.
 - g. Install eighteen new lockwashers (4) and nuts (5).
 - h. Install four self-tapping screws (6) to secure plate (7).
2. CONNECT GROUND CABLE AT SHUNT. (REFER TO PAGE 8-109.)

END OF TASK



HYDRAULIC TANK COVER

TOOLS: General mechanic's tool kit: automotive (5180-00-177-7033)

SUPPLIES: Lockwashers (Item 15, Appendix C) (2 Required)
Lockwashers (Item 5, Appendix C) (35 Required)

EQUIPMENT CONDITIONS: Tire inflation coupling to hydraulic tank cover removed.
(Refer to page 11-37.)
Disconnect ground cable at shunt. (Refer to page 8-109.)

REMOVAL:

1. REMOVE HYDRAULIC TANK COVERS.

NOTE

In areas which are difficult to access, speed nuts were used instead of washers and nuts.

- a. Remove twenty-seven screws (1), flatwashers (2), lockwashers (7) and nuts (8) securing top cover (5). Remove cover. Discard lockwashers (7).
- b. Support hydraulic tank cover (6) and remove six screws (1), flatwashers (2), lockwashers (7) and nuts (8) securing cover (6) to mounting brackets (10) and (11). Discard lockwashers (7).
- c. Remove twenty-two screws (1), flatwashers (2), lockwashers (7) and nuts (8) securing rear (3) and front covers (4). Discard lockwashers (7).
- d. Remove six screws (12), flatwashers (13), lockwashers (14) and nuts (15) securing (14) and nuts (15) securing mounting brackets (10 and 11). Remove brackets. Discard lockwashers (14).

INSTALLATION:

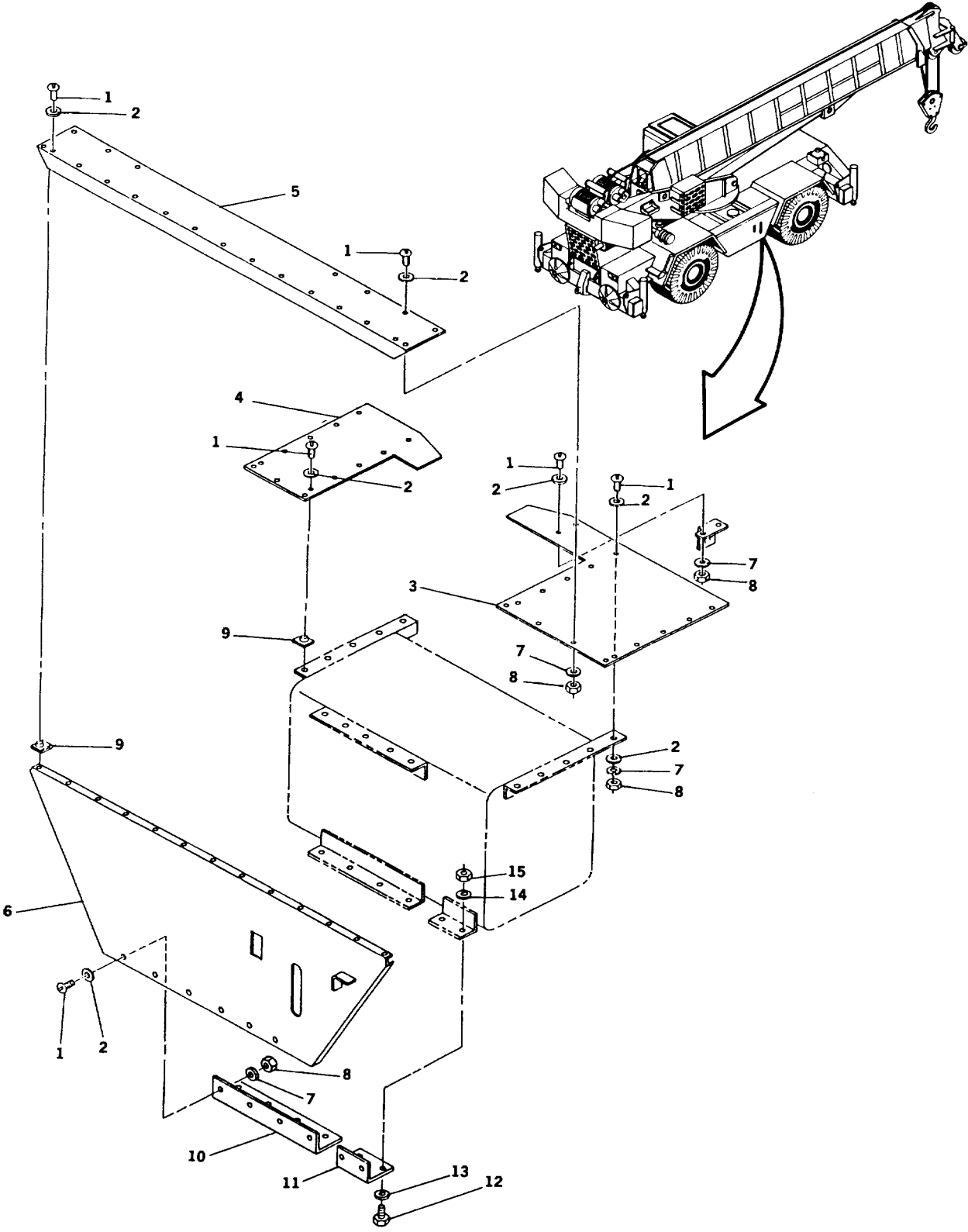
1. INSTALL HYDRAULIC TANK COVERS.

- a. Position mounting brackets (10 and 11) and secure with six screws (12), flatwashers (13), new lockwashers (14) and nuts (15).
- b. Position rear (3) and front covers (4), securing with screws (1), flatwashers (2), new lockwashers (7) and nuts (8).
- c. Using suitable lifting device, position bottom holes in hydraulic tank cover (6) with holes in mounting brackets (10) and (11). Secure with screws (1), flatwashers (2), new lockwashers (7) and nuts (8).
- d. Position top cover and secure 15-22 with screws (1), flatwashers (2), new lockwashers (7) and nuts (8).

2. INSTALL TIRE INFLATION ASSEMBLY. TM 5-3810-306-20 (REFER TO PAGE 11-37.)

3. CONNECT GROUND CABLE AT SHUNT. (REFER TO PAGE 8-109.) TM 5-3810-306-20

END OF TASK



TOOL BOX COVER

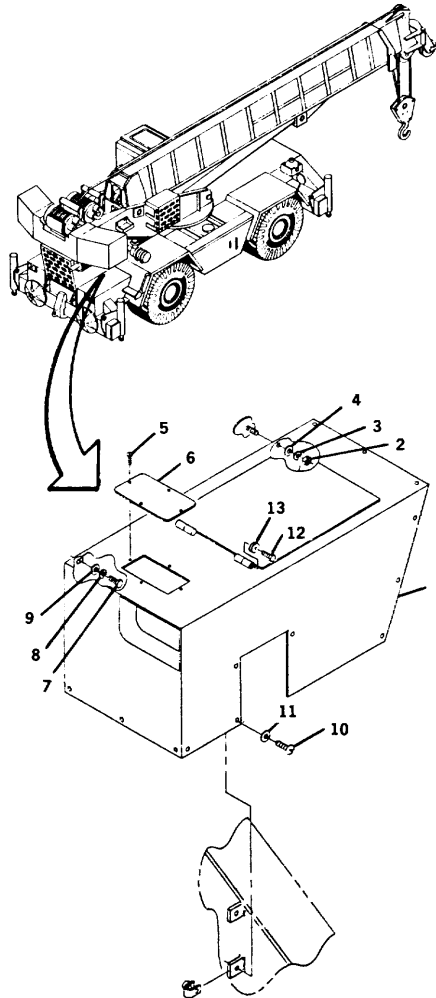
TOOLS: General mechanic's tool kit: automotive (5180-00-177-7033)
Lifting device (2 ton (1812 Kg) capacity)

SUPPLIES: Lockwashers (Item 15, Appendix C) (5 Required)
Lockwashers (Item 2, Appendix C) (2 Required)

EQUIPMENT CONDITIONS: Disconnect ground cable at shunt. (Refer to page 8-109.)

REMOVAL:

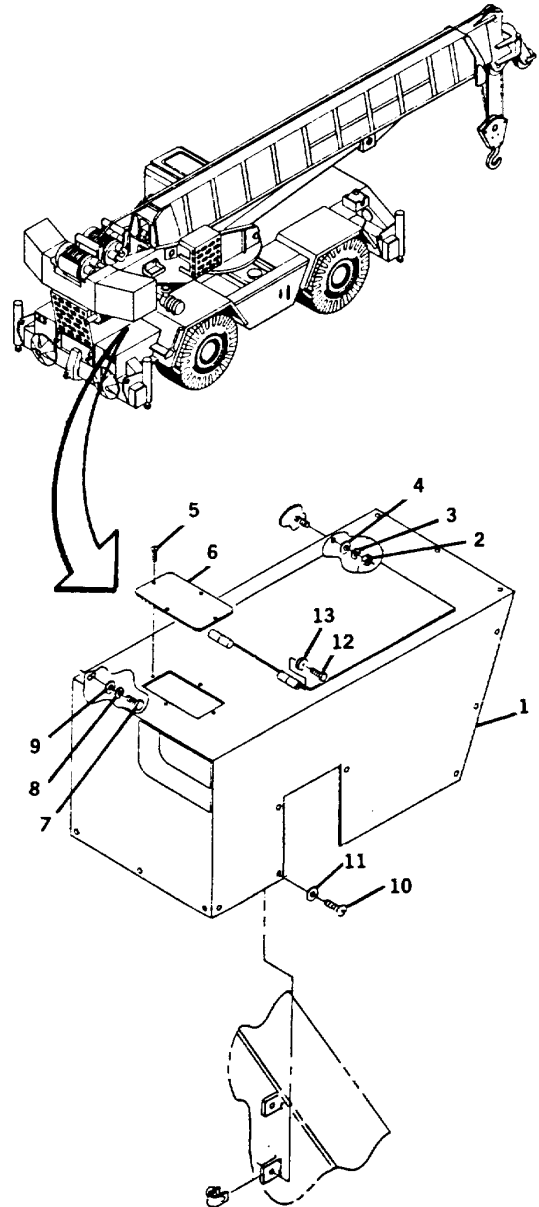
1. REMOVE TOOL BOX COVER (1).
 - a. Remove four screws (5) and access cover (6) from tool box cover (1).
 - b. Locate and remove two nuts (2), lockwashers (3) and flatwashers (4), securing tool box cover (1) to frame studs. Discard lockwashers (3).
 - c. Locate and remove three capscrews (7), lockwashers (8) and flatwashers (9) securing cover to engine hood. Discard lockwashers (8).
 - d. Tag and disconnect five electrical connectors to two lights.
 - e. Using a suitable lifting device support tool box cover.
 - f. Remove thirteen screws (10) and flatwashers (11). Remove tool box cover (1).
 - g. Remove attaching hardware and lights from tool box cover (1) if necessary.
 - h. If door needs replacement, unscrew two self-tapping screws (12) and lockwashers (13) and slide door from hinges. Discard lockwashers (13).



INSTALLATION:

1. INSTALL TOOL BOX COVER (1).
 - a. If removed, install lights in tool box cover.
 - b. Using suitable lifting device, position tool box cover in place and secure using thirteen screws (10) and flatwashers (11).
 - c. Remove tags and connect five electrical connectors to two lights (9).
 - d. Install three capscrews (7), new lockwashers (8) and flatwashers (9) securing tool box cover (1) to engine hood.
 - e. Install two nuts (2), new lockwashers (3) and flatwashers (4) securing tool box cover (1) to frame studs.
 - f. Position access cover (6) over hole and secure with four screws (5).
 - g. Install tool box cover door, if removed, using two self-tapping screws (12) and new lockwashers (13).
2. CONNECT GROUND CABLE AT SHUNT. (REFER TO PAGE 8-109.)

END OF TASK



DECONTAMINATION BRACKET

TOOLS: General mechanic's tool kit: automotive (5180-00-177-7033)

SUPPLIES: None

EQUIPMENT CONDITIONS: None

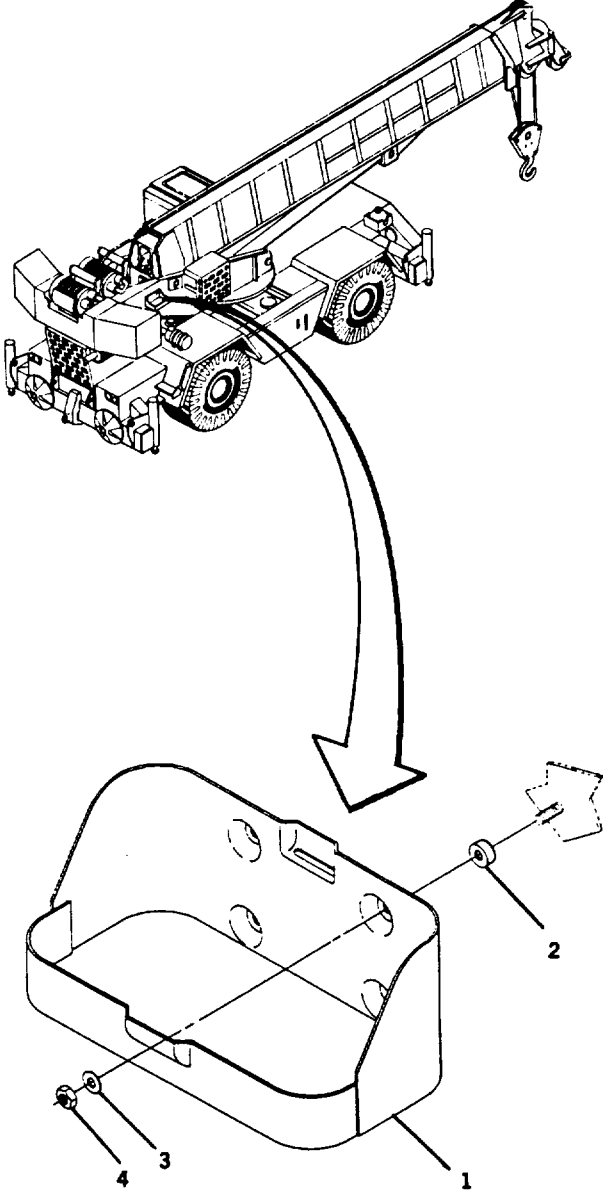
REMOVAL:

- 1. REMOVE DECONTAMINATION BRACKET (1).
 - a. Remove four nuts (4) and washers (3) securing bracket to studs.
 - b. Remove decontamination bracket.
 - c. Remove four bushings (2) from studs.

INSTALLATION:

- 1. INSTALL DECONTAMINATION BRACKET (1).
 - a. Place four bushings (2) on four cab studs.
 - b. Position decontamination bracket on studs and secure with four washers (3) and nuts (4).

END OF TASK



Section IV. SEAT ASSEMBLY MAINTENANCE

OPERATOR SEAT AND PEDESTAL ASSEMBLY REMOVAL

TOOLS: General mechanic's tool kit: automotive (5180-00-177-7033)

SUPPLIES: Lockwashers (Item 43, Appendix C) (4 Required)

EQUIPMENT CONDITIONS: Cab bottom panel removed only to replace seat Belt.
(Refer to page 15-11.)

REMOVAL:

1. REMOVE OPERATOR SEAT.

a. Remove nuts (11), lockwashers (12) and capscrews (13) securing seat belt to seat suspension. Discard lockwashers (12).

b. Loosen pedestal tightening knob (14).

CAUTION

Support seat before removing seat height adjusting pin if seat is in an elevated position.

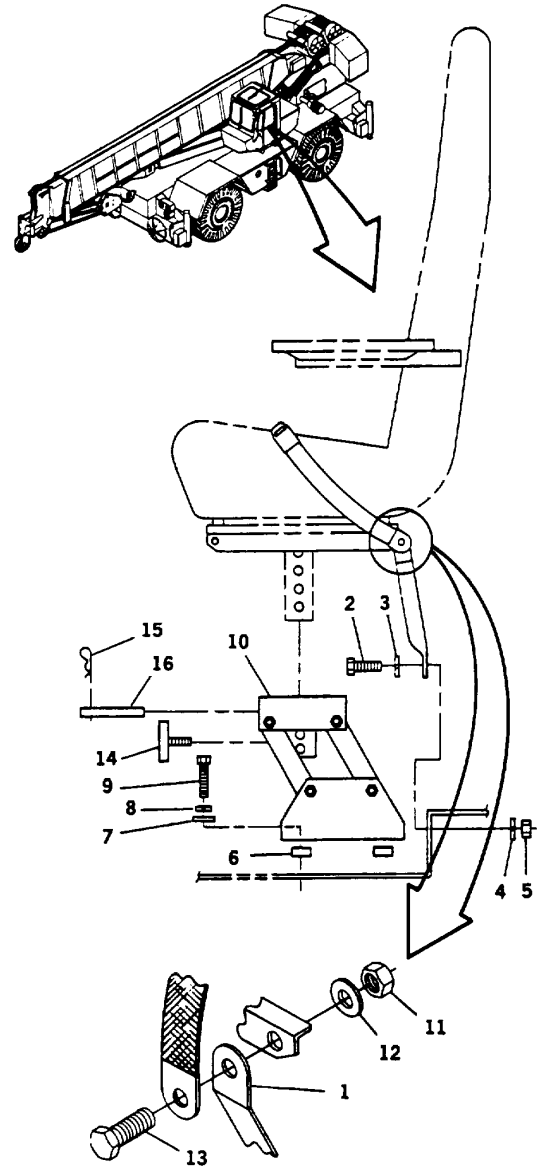
c. Remove clip pin (15) and seat height adjusting pin (16) from pedestal.

d. Lift seat out of pedestal and remove from cab.

2. REMOVE PEDESTAL ASSEMBLY AND SEAT BELT.

a. Remove capscrew (2), flatwasher (3), lockwasher (4) and hex nut (5) securing seat belt (1) to cab. Discard lockwasher (4).

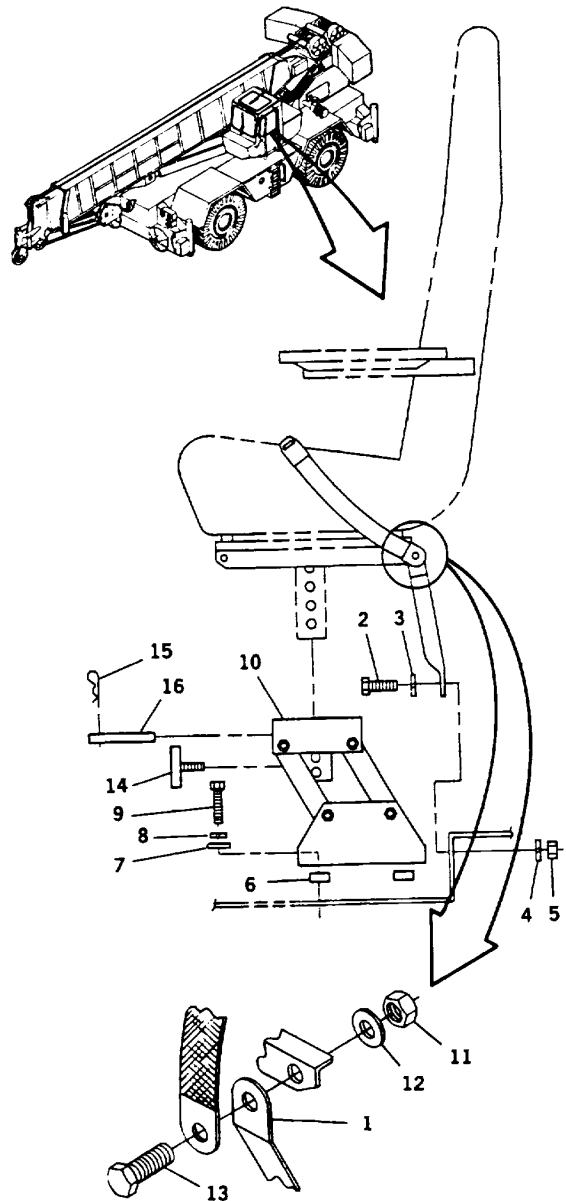
b. Remove four capscrews (9), lockwashers (8), flatwashers (7) and bushings (6) securing seat pedestal (10) to cab floor. Discard lockwashers (8).



- c. Remove seat pedestal.
- 3. INSPECT SEAT BELT BUCKLE AND BELT FABRIC FOR WEAR OR DETERIORATION. REPLACE IF REQUIRED.
- 4. INSPECT ALL PARTS FOR DAMAGE. REPLACE PARTS AS REQUIRED.

INSTALLATION:

- 1. INSTALL PEDESTAL ASSEMBLY AND SEAT BELT.
 - a. Align seat pedestal (10) with cab floor holes and install bushings (6). Secure with four capscrews (9), flatwashers (7) and new lockwashers (8).
 - b. Install seat belt (1) to cab floor with capscrew (2), new lockwasher (4), flatwasher (3) and hex nut (5).
- 2. INSTALL OPERATOR SEAT.
 - a. Install shaft on bottom of seat in socket on pedestal.
 - b. Adjust seat for desired height and install height adjusting pin (16) and clip pin (15).
 - c. Tighten adjusting knob (14) to eliminate play on seat shaft.
 - d. Install seat belt (1) to seat suspension with capscrews (13), new lockwashers (12) and nuts (11).
- 3. CHECK SECURITY OF ALL COMPONENTS.
- 4. INSTALL CAB BOTTOM PANEL. (REFER TO PAGE 15-11.)



END OF TASK

OPERATOR SEAT ASSEMBLY

TOOLS: General mechanic's tool kit: automotive (5180-00-177-7033)

SUPPLIES: Lockwashers (Item 40, Appendix C) (4 Required)

EQUIPMENT CONDITIONS: Operator seat removed. (Refer to page 15-27.)

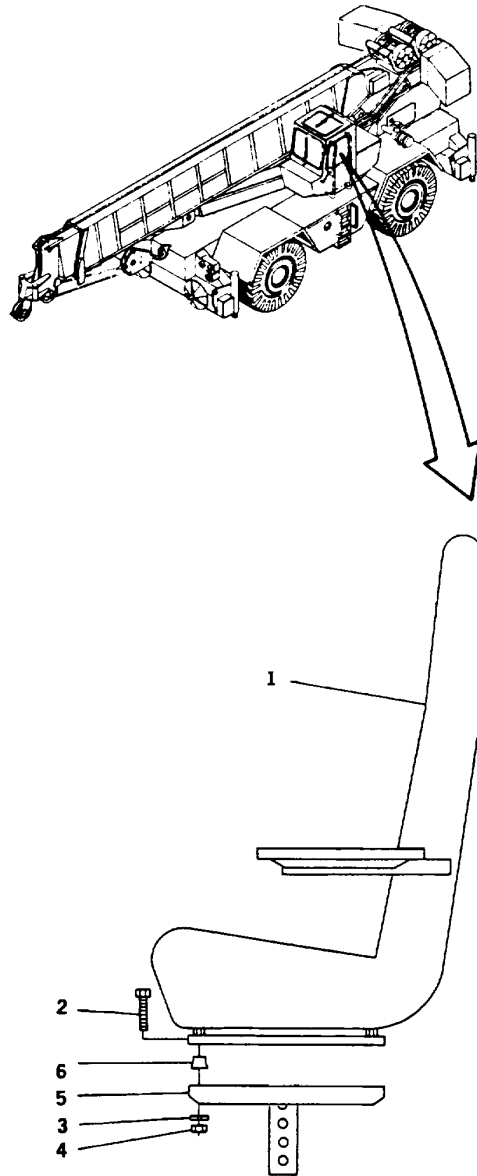
REMOVAL:

1. REMOVE OPERATOR SEAT (1).
 - a. Loosen four capscrews (2), hex nuts (4), lockwashers (3) and bell washers (6) to remove operator seat (1) from seat pedestal plate (5). Discard lockwashers (3).
 - b. Lift operator seat (1) from seat pedestal plate (5).

INSTALLATION:

1. INSTALL OPERATOR SEAT (1).
 - a. Install operator seat (1) over bell washers (6) on seat pedestal plate (5). Align holes and secure with four capscrews (2), new lockwashers (3) and hex nuts (4).
2. INSTALL SEAT. (REFER TO PAGE 15-27.)

END OF TASK



Section V. ACCESSORY MAINTENANCE

CIRCULATING FAN REPLACEMENT

TOOLS: General mechanic's tool kit: automotive (5180-00-177-7033)

SUPPLIES: Lockwasher (Item 7, Appendix C)

EQUIPMENT CONDITION: Disconnect ground cable at shunt. (Refer to page 8-109.)

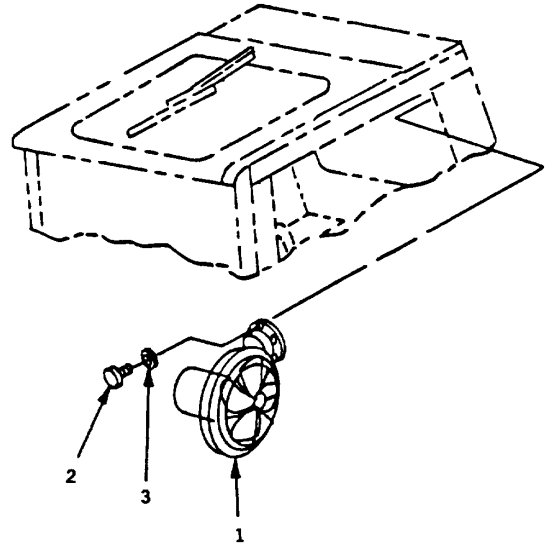
REMOVAL:

1. REMOVE CIRCULATING FAN (1).

NOTE

Rear fan shown. Use this procedure for replacing front fan.

- a. Tag and disconnect electrical lead.
- b. Support fan (1) and remove three machine screws (2) and lockwashers (3). Remove fan (1). Discard lockwashers (3).

**INSTALLATION:**

1. INSTALL CIRCULATING FAN (1).
 - a. Align fan (1) with mounting holes and secure with three machine screws (2) and new lockwashers (3).
 - b. Remove tag and connect electrical lead.
2. CONNECT GROUND CABLE AT SHUNT. (REFER TO PAGE 8-109.)
3. CHECK FAN OPERATION. (REFER TO TM 5-3810-306-10.)

END OF TASK

CAB SKYLIGHT COUNTER BALANCE CYLINDER REPLACEMENT

TOOLS: General mechanic's tool kit: automotive (5180-00-177-7033)

SUPPLIES: Lockwashers (Item 2, Appendix C) (2 Required)

EQUIPMENT CONDITIONS: Skylight window closed.

REMOVAL:

1. REMOVE COUNTER BALANCE CYLINDER (1).
 - a. Hold counter balance cylinder (1) in place.
 - b. Remove two nuts (2) and lockwashers (3). Discard lockwashers (3).
 - c. Pull counter balance cylinder (1) from skylight window and cab frame mounts.
 - d. Remove lock assembly (4) by unscrewing balljoint (5).
2. INSPECT PARTS FOR DAMAGE. REPLACE AS REQUIRED.

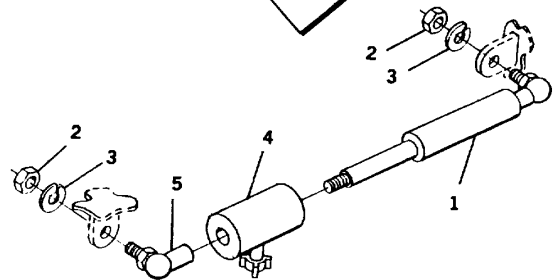
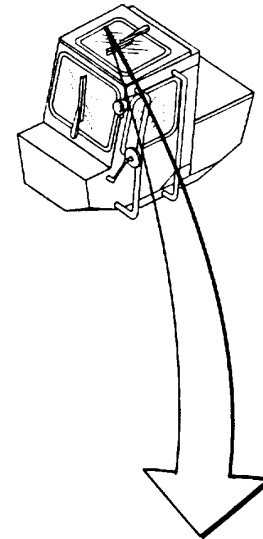
INSTALLATION:

1. INSTALL COUNTER BALANCE CYLINDER (1).
 - a. Install lock assembly (4) on cylinder and secure with balljoint (5).

NOTE

Knob on lock assembly (4) must point down.

- b. Install counter balance cylinder (1) to skylight window and cab frame mounts.
- c. Install two new lockwashers (3) and nuts (2).



2. OPEN SKYLIGHT WINDOW.

3. MAKE SURE SKYLIGHT WINDOW OPENS SMOOTHLY. IF NOT, ADJUST KNOB (4) UNTIL NO FRICTION IS FELT.

END OF TASK

CAB HEATER FUEL TANK REPLACEMENT

TOOLS: General mechanic's tool kit: automotive (5180-00-177-7033)
Drain pan

SUPPLIES: Clean rags (Item 1, Appendix C)
Lockwashers (Item 2, Appendix C) (6 Required)
Diesel fuel (Item 73, Appendix C)

EQUIPMENT CONDITIONS: Disconnect ground cable at shunt. (Refer to page 8-109.)

REMOVAL:**NOTE**

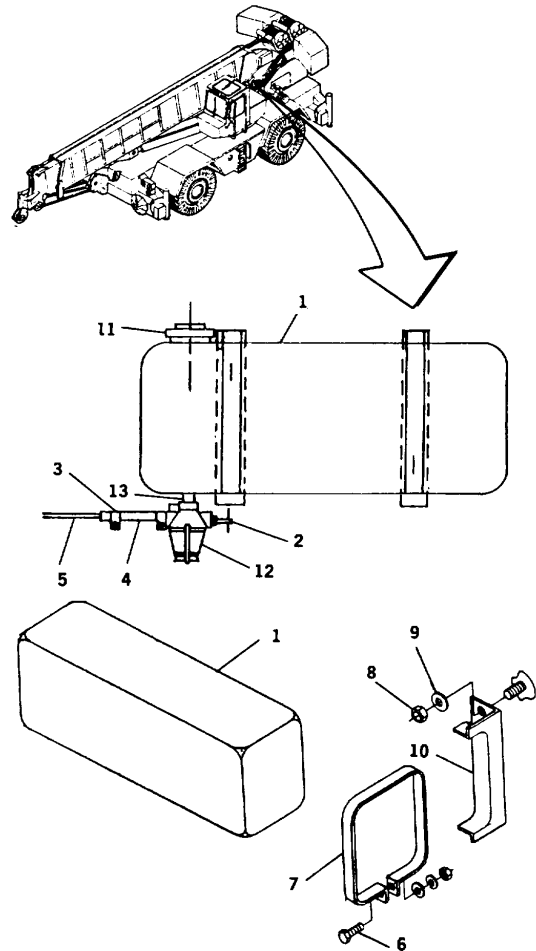
Cab heater fuel tank is located on boom pedestal behind cab valve compartment.

1. REMOVE CAB HEATER FUEL TANK (1).

WARNING

Fuel is flammable. Keep fuel away from heat and open flame.

- a. Shut off fuel at petcock (2).
- b. Remove hose clamp (3) and plug end of fuel hose (4) and fuel supply line (5) to prevent spillage.
- c. Support cab heater fuel tank (1) and loosen two capscrews (6) to release tank straps from mounting assembly. Remove tank (1) and straps (7).
- d. Remove four nuts (8), lockwashers (9) and mounting brackets (10). Discard lockwashers (9).
- e. Open fuel cap (11) and dispose of fuel in a suitable container.

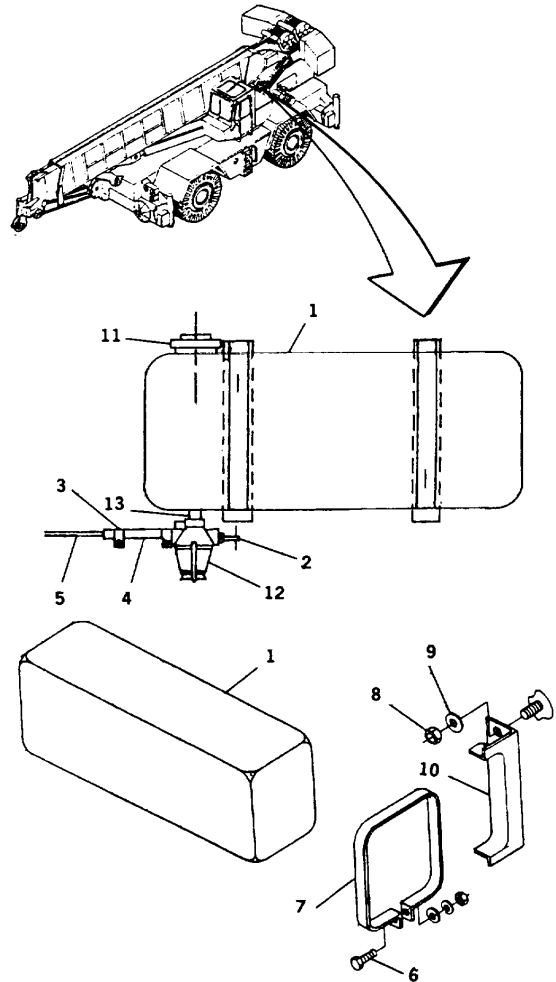


- f. Remove fuel filter (12) and pipe nipple (13) from fuel tank. Retain pipe nipple (13) for installation on new fuel tank (1).

INSTALLATION:

1. INSTALL CAB HEATER FUEL TANK (1).
 - a. Install fuel nipple (13) and fuel filter (12) on fuel tank (1).
 - b. Align mounting bracket holes with mounting studs on frame and secure with nuts (8) and new lockwashers (9).
 - c. Assemble fuel tank (1) with two straps (7) and position on mounting brackets (10).
 - d. Remove fuel plug on fuel supply line (5) and install to fuel hose and fuel filter (12). Secure with two hose clamps (3).
 - e. Fill fuel tank (1) with fuel, open petcock and ensure no leaks are present. Install fuel cap (11).
2. CONNECT GROUND CABLE AT SHUNT. (REFER TO PAGE 8-109.)
3. CHECK CAB HEATER OPERATION. (REFER TO TM 5-3810-306-10.)

END OF TASK



CAB HEATER/DEFROSTER ASSEMBLY REPLACEMENT

TOOLS: General mechanic's tool kit: automotive (5180-00-177-7033)

SUPPLIES: Clean rags (Item 1, Appendix C)

EQUIPMENT CONDITIONS: Disconnect ground cable at shunt. (Refer to page 8-109.)
Seat and pedestal removed. (Refer to page 15-27.)

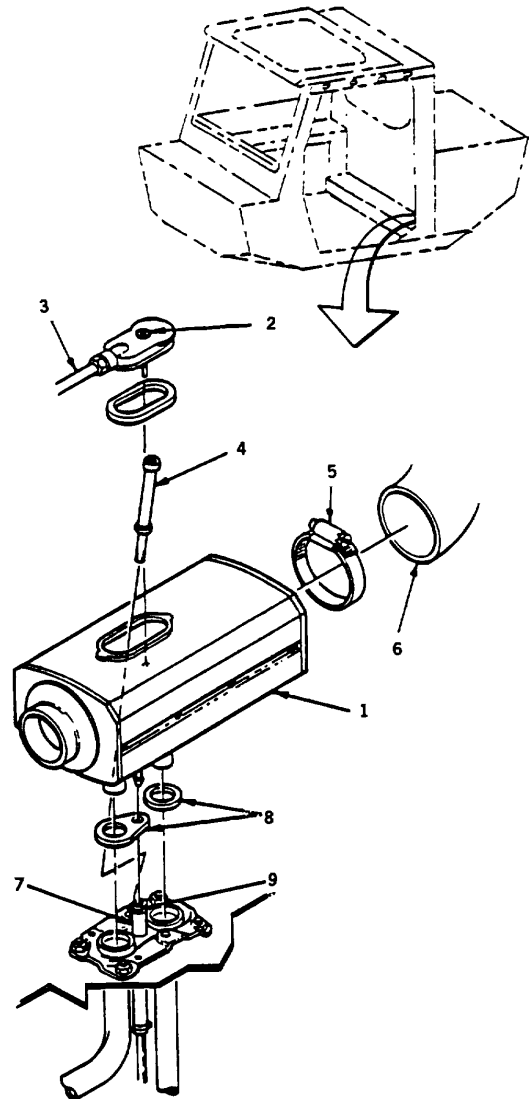
REMOVAL:

1. REMOVE CAB HEATER/DEFROSTER ASSEMBLY (1).

WARNING

Disconnect electrical power from heater before removing covers. Do not run heater with covers removed except for troubleshooting or adjustment. Ignition pack generates a voltage that is high enough to cause severe injury.

- a. Turn off petcock at heater fuel tank located behind cab on boom pedestal.
- b. Loosen screw (2) and disconnect controller wiring harness (3) from heater (1).
- c. Disconnect multi-pin connectors on bottom of controller wiring harness (3).
- d. Loosen two setscrews (4) securing heater to cab floor. Access these screws through controller wiring harness opening.
- e. Loosen clamp (5) and disconnect air flow tubing (6).
- f. Lift heater (1) to disconnect clamp (9) on fuel line hose (7). Plug fuel line.

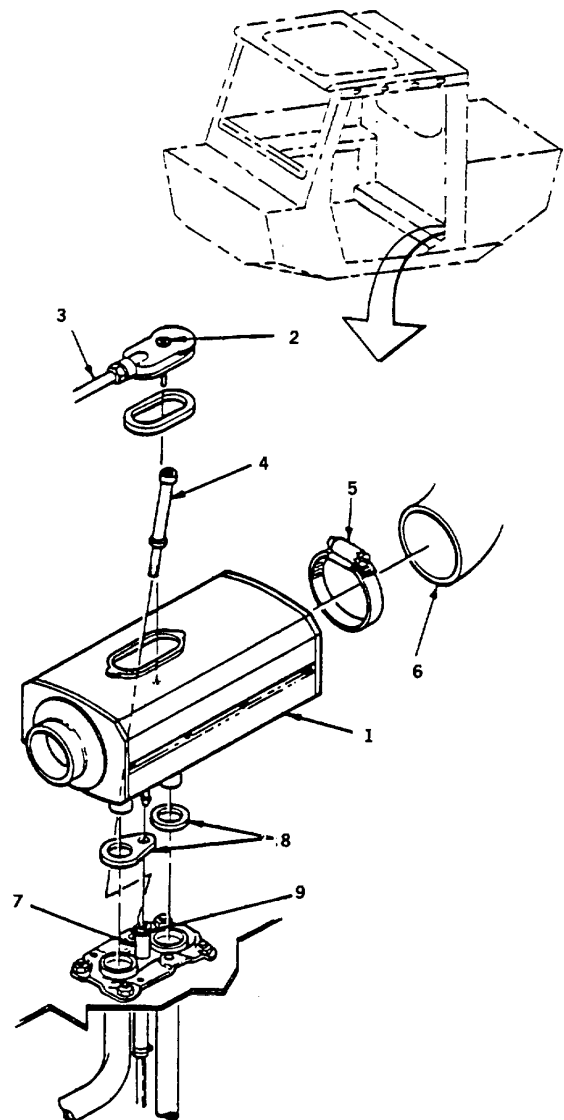


- g. Remove heater (1).
- h. Remove gaskets (8) and replace as required.

INSTALLATION:

1. INSTALL CAB HEATER/DEFROSTER ASSEMBLY.
 - a. Install gaskets (8) on heater.
 - b. Remove plug and align heater (1) over holes in cab floor mounting plate. Install fuel line (7) and tighten clamp (9).
 - c. Tighten two screws (4) to secure heater (1) to cab floor.
 - d. Connect air flow tubing (6) to heater (1) and tighten clamp (5).
 - e. Insert four multi-pin connectors from heater (1) to controller wiring harness (3).
 - f. Connect controller wiring harness (3) to the heater (1). Tighten screw (2).
 - g. Turn fuel on at petcock.
2. CONNECT GROUND CABLE AT SHUNT. (REFER TO PAGE 8-109.)
3. CHECK CAB HEATER FOR PROPER OPERATION. (REFER TO TM 5-3810-30610.)
4. INSTALL SEAT AND PEDESTAL. (REFER TO PAGE 15-27.)

END OF TASK



DOMELIGHT REPLACEMENT

TOOLS: General mechanic's tool kit: automotive (5180-00-177-7033)

SUPPLIES: Lockwashers (Item 70, Appendix C) (3 Required)
 Bulb (Item 69, Appendix C)

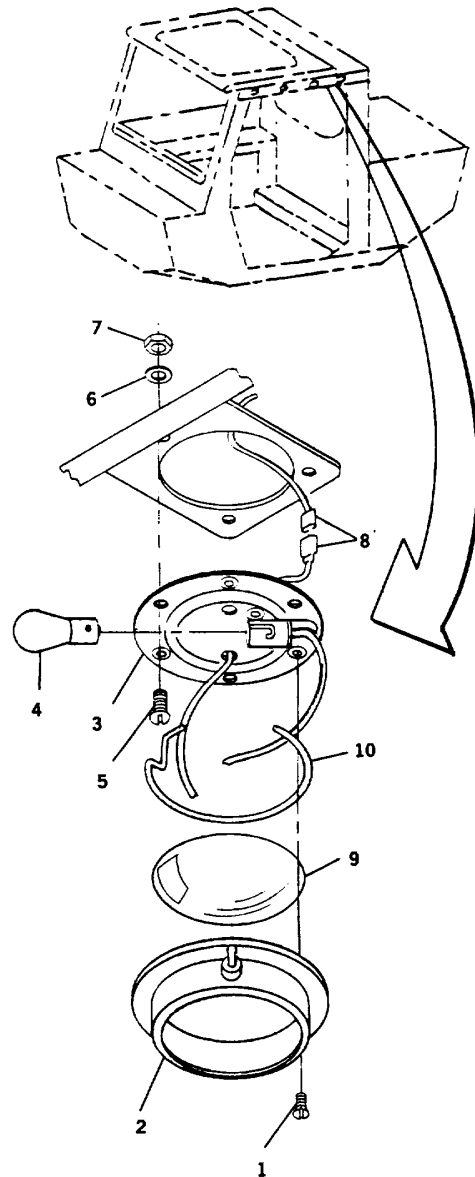
EQUIPMENT CONDITIONS: Disconnect ground cable at shunt. (Refer to page 8-109.)
 Acoustical foam removed in top rear of cab. (Refer to page 15-2.)

REMOVAL:

1. REMOVE DOME LIGHT ASSEMBLY (1).
 - a. Remove three screws (1) securing lens cap (2) to mounting plate (3).
 - b. Remove bulb (4). Discard and replace if damaged.
 - c. Remove three screws (5), lockwashers (6) and nuts (7) securing mounting plate (3) to cab frame. Discard lockwashers (6).
 - d. Tag and disconnect electrical connector (8).
 - e. Remove dome light assembly.
 - f. If lens (9) needs replacement, remove retaining clip (10) and remove lens (9).

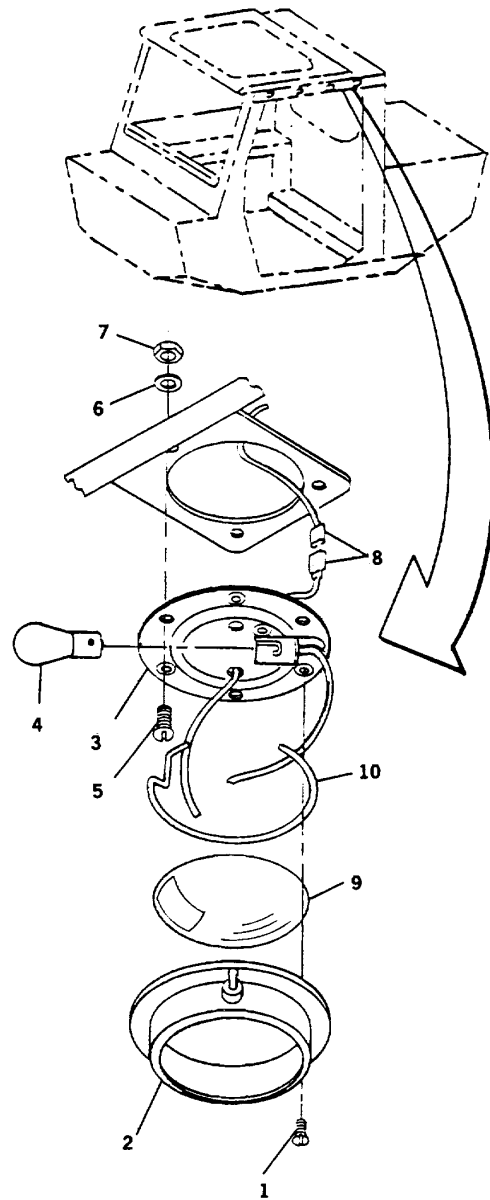
INSTALLATION:

1. INSTALL DOME LIGHT ASSEMBLY (1).
 - a. Remove tag and connect electrical lead to light (8).
 - b. Align mounting plate (3) with mounting holes and secure with three machine screws (5), new lockwashers (6) and nuts (7).
 - c. Install new bulb (4), if required.



- d. Install lens (9) and secure with retaining clip (10) if required.
 - e. Position lens cap (2) on mounting plate and secure with three screws (1).
2. INSTALL ACOUSTICAL FOAM IN TOP REAR OF CAB. (REFER TO PAGE 15-2.)
 3. CONNECT GROUND CABLE AT SHUNT. (REFER TO PAGE 8-109.) 4. CHECK DOME LIGHT OPERATION. (REFER TO TM 5-3810-306-10.)

END OF TASK



FIRE EXTINGUISHER INSTALLATION

TOOLS: General mechanic's tool kit: automotive (5180-00-177-7033)

SUPPLIES: Lockwashers (Item 2, Appendix C)

EQUIPMENT CONDITIONS: None

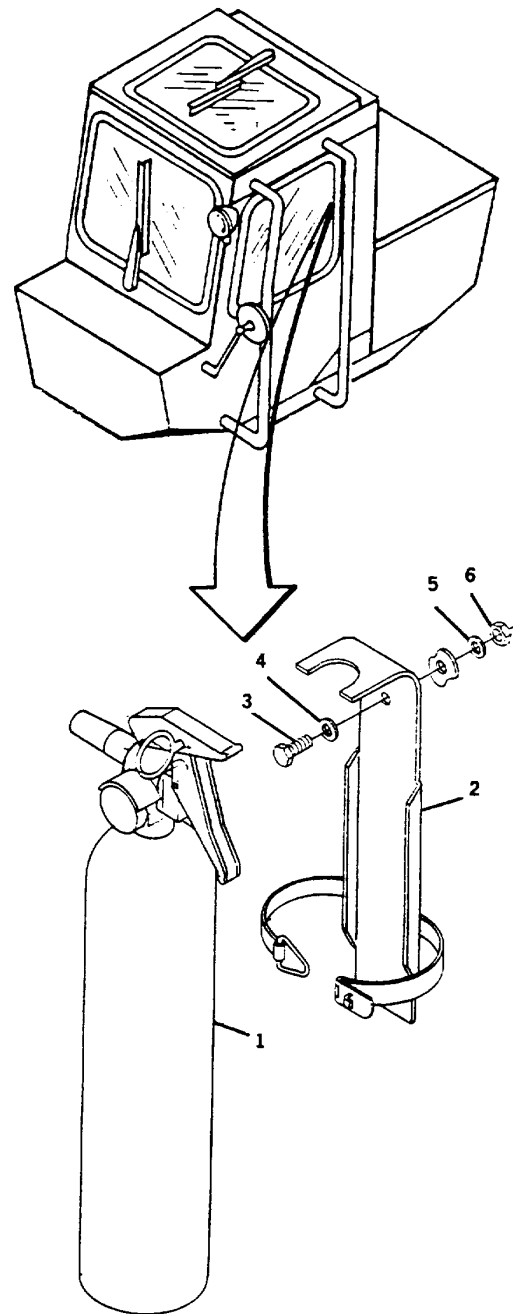
REMOVAL:

1. REMOVE FIRE EXTINGUISHER ASSEMBLY.
 - a. Unhook clip and remove fire extinguisher (1) from mounting bracket (2).
 - b. Remove two capscrews (3), flatwashers (4), lockwashers (5) and nuts (6). Discard lockwashers (5).
 - c. Remove mounting bracket (2).

INSTALLATION:

1. INSTALL FIRE EXTINGUISHER ASSEMBLY.
 - a. Position mounting bracket (2) and secure with two capscrews (3), flatwashers (4), new lockwashers (5) and nuts (6).
 - b. Install fire extinguisher (1) onto bracket and secure with strap.

END OF TASK



SKYLIGHT WIPER MOTOR REPLACEMENT

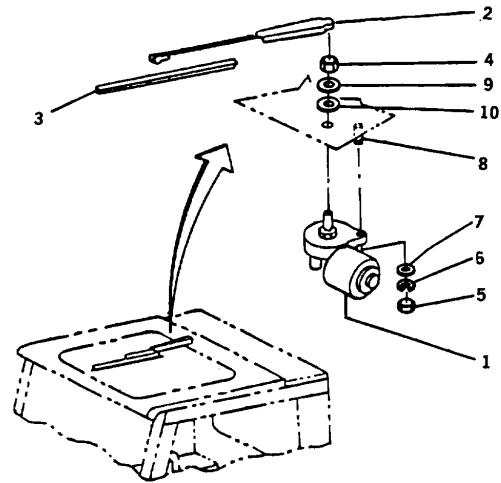
TOOLS: General mechanic's tool kit: automotive (5180-00-177-7033)

SUPPLIES: Lockwasher (Item 18, Appendix C)

EQUIPMENT CONDITIONS: Disconnect ground cable at shunt. (Refer to page 8-109.)

REMOVAL:

1. REMOVE SKYLIGHT WIPER MOTOR ASSEMBLY (1).
 - a. Tag and disconnect two electrical leads to skylight wiper motor (1).
 - b. Remove wiper arm (2), blade (3) and nut (4), bushing (9) and washer (10).
 - c. Support motor (1) and remove nut (5), lockwasher (6) and flatwasher (7) from cab stud (8). Discard lockwasher (6).



INSTALLATION:

1. INSTALL SKYLIGHT WIPER MOTOR ASSEMBLY (1).
 - a. Align wiper motor (1) with cab stud (8) and secure with flatwasher (7), new lockwasher (6) and nut (5).
 - b. Install washer (10), bushing (9), nut (4), wiper arm (2) and blade (3).
 - c. Remove tags and connect two electrical leads to motor (1).
2. CONNECT GROUND CABLE AT SHUNT. (REFER TO PAGE 8-109.)
3. CHECK SKYLIGHT WIPER OPERATION. (REFER TO TM 5-3810-306-10.)

END OF TASK

STEERING WHEEL REMOVAL

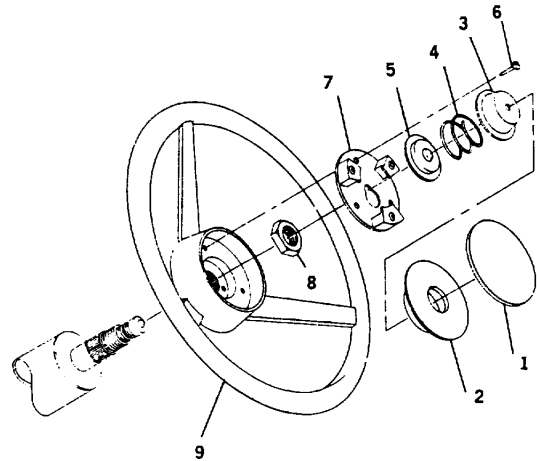
TOOLS: General mechanic's tool kit: automotive (5180-00-177-7033)

SUPPLIES: None

EQUIPMENT CONDITIONS: Disconnect ground cable at shunt. (Refer to page 8-109.)

REMOVAL:

1. REMOVE STEERING WHEEL.
 - a. Remove rubber horn cover (1) from center of steering wheel.
 - b. Disconnect horn plate (2) by applying pressure downward, turning at same time.
 - c. Remove metal cup (3), spring (4) and horn contactor (5).
 - d. Remove three screws (6) and remove horn contactor plate (7) by sliding horn contact wire through hole in contactor plate (7).



WARNING

Do not attempt to pull off steering wheel (5) without using steering wheel puller. Excessive pulling may result in sudden loosening and cause personal injury.

NOTE

Note position of steering wheel for reassembly.

- e. Remove nut (8) and use puller to remove wheel (9) from shaft.

INSTALLATION:

1. INSTALL STEERING WHEEL.
 - a. Install steering wheel (9) on shaft and secure with nut (8).

- b. Install contactor plate (7) in steering wheel and secure with screws (6). Install horn contactor (5), spring (4) and metal cup (3).
- d. Install horn plate (2) by applying slight pressure and turning to engage tab into contactor plate.
- e. Press on rubber horn cover (1).

2. CONNECT GROUND CABLE AT SHUNT. (REFER TO PAGE 8-109.)
3. CHECK HORN OPERATION. (REFER TO TM 5-3810-306-10.)

END OF TASK

REAR VIEW MIRROR REPLACEMENT

TOOLS: General mechanic's tool kit: automotive (5180-00-177-7033)

SUPPLIES: Lockwasher (Item 15, Appendix C)

EQUIPMENT CONDITIONS: None

REMOVAL:**NOTE**

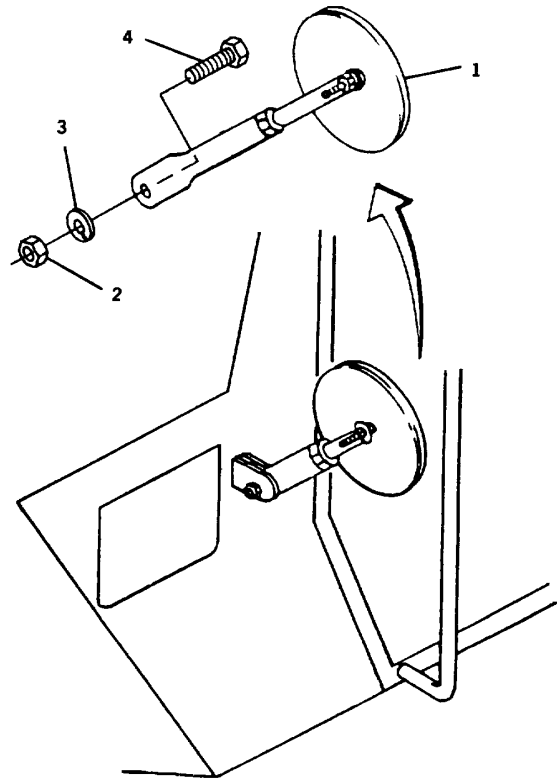
Left side of cab shown. Use this replacement procedure for mirror on right front fender.

1. REMOVE REAR VIEW MIRROR (1).
 - a. Support mirror arm assembly (1) and remove nut (2), lockwasher (3) and capscrew (4). Discard lockwasher (3).

INSTALLATION:

1. INSTALL REAR VIEW MIRROR (1).
 - a. Install nut (2), new lockwasher (3), and capscrew (4) to secure mirror arm assembly.
 - b. Adjust mirror (1) as necessary.

END OF TASK



WINDSHIELD WIPER MOTOR REPLACEMENT

TOOLS: General mechanic's tool kit: automotive (5180-00-177-7033)

SUPPLIES: None

EQUIPMENT CONDITIONS: Disconnect ground cable at shunt. (Refer to page 8-109.)
Cab front panel removed. (Refer to page 15-10.)

REMOVAL:

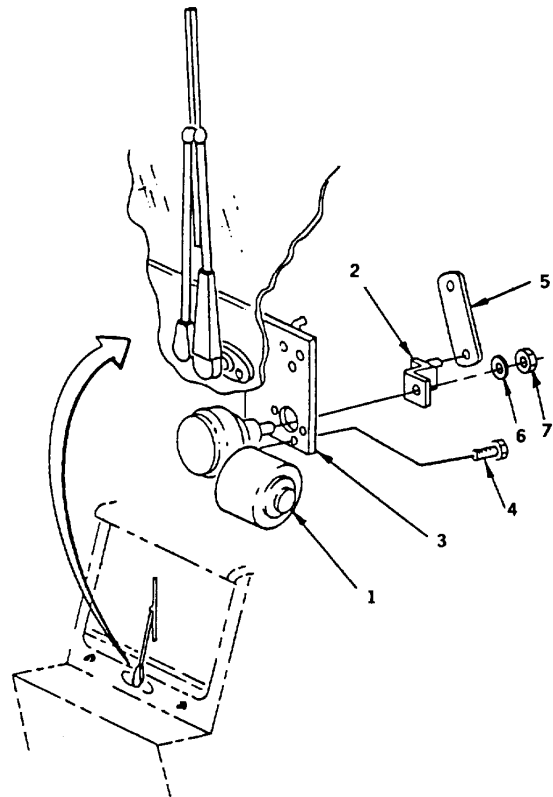
1. REMOVE WIPER MOTOR (1).
 - a. Tag and disconnect three electrical leads to wiper motor (1).
 - b. Remove clip securing crank arm (2) to wiper motor (1) and pivot adapter (5).
 - c. Remove nut (7) and washer (6).
 - d. Remove three capscrews (4) securing wiper motor (1) to mounting bracket (3).

INSTALLATION:

NOTE

Apply loctite to capscrew (4) threads before installing wiper motor (1).

1. INSTALL WIPER MOTOR (1).
 - a. Install wiper motor (1) using three capscrews (4).
 - b. Attach crank arm (2) to wiper motor (1) with washer (6) and nut (7). Secure adapter (5) with clip.
 - c. Remove tags and connect three electrical leads to wiper motor (1).



2. CONNECT GROUND CABLE AT SHUNT. (REFER TO PAGE 8-109.)
3. TEST FOR PROPER OPERATION. (REFER TO TM 5-3810-306-10.)
4. INSTALL CAB FRONT PANEL ON CAB. (REFER TO PAGE 15-10.)

END OF TASK

WIPER ARM REPLACEMENT

TOOLS: General mechanic's tool kit: automotive (5180-00-177-7033)

SUPPLIES: Lockwashers (Item 2, Appendix C)
Lockwashers (Item 41, Appendix C)

EQUIPMENT CONDITIONS: Disconnect ground cable at shunt. (Refer to page 8-109.)
Cab front panel removed. (Refer to page 15-10.)

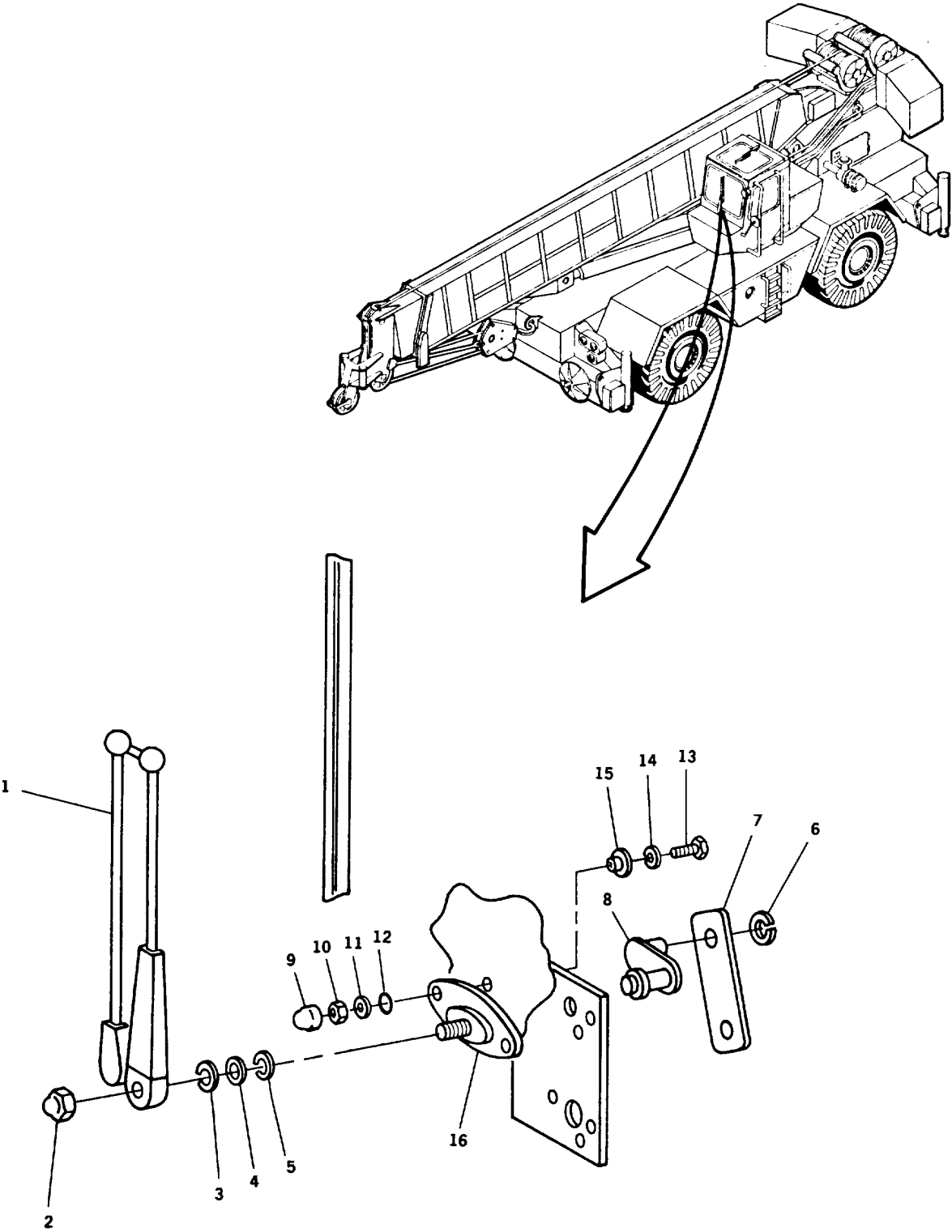
REMOVAL:

1. REMOVE WIPER ARM (1).
 - a. Remove nut (2).
 - b. Carefully remove wiper arm (1).
2. REMOVE WIPER ARM DRIVE (16).
 - a. Remove clip (3), washer (4) and lockwasher (5). Discard lockwasher (5).
 - b. Remove clips (6) and pivot adapter (7)
 - c. Remove adapter (8).
 - d. Remove boots (9), nuts (10), washers (11), seals (12), screws (13) and lockwashers (14). Discard lockwashers (14). 3.
 - e. Remove bushing (15) and wiper arm drive (16).
3. INSPECT ALL PARTS FOR DAMAGE.

INSTALLATION:

1. INSTALL WIPER ARM DRIVE (16).
 - a. Align wiper arm drive (16) and bushing (15).
 - b. Install two screws (13), new lockwashers (14), seals (12), washers (11), nuts (10) and boots (9).
 - c. Install adapter (8) and secure with clip (3), washer (4) and new lockwasher (5).15-43
 - d. Install pivot adapter (7) and secure with clips (6).
2. INSTALL WIPER ARM (1) AND SECURE. WITH NUT (2).
3. CONNECT GROUND CABLE AT SHUNT. REFER TO PAGE 8-109.)
4. CHECK WIPER FOR PROPER OPERATION.TM 5-3810-306-20 (REFER TO TM 5-3810-306-10.)
5. INSTALL CAB FRONT PANEL. (REFER TO PAGE 15-10.)DECAL REPLACEMENT

END OF TASK



DECAL REPLACEMENT

TOOLS: General mechanic's tool kit: automotive (5180-00-177-7033)

SUPPLIES: None

EQUIPMENT CONDITIONS: None

REMOVAL:

1. REMOVE DECAL.

NOTE

Some decals are metal and rivetted, others are plastic self-adhesive. Refer to RPSTL for decal and location (TM 5-3810306-24P).

- a. Remove damaged decal by drilling out rivets or by carefully scraping decal with razor blade.
2. CLEAN DECAL MOUNTING SURFACE.
 - a. Wipe off decal mounting surface to remove residue.
 - b. Touch up painted surfaces as needed.

INSTALLATION:

1. INSTALL NEW DECAL.
 - a. Peel off paper backing of self adhesive decals.
 - b. Place new decal in original location. Press out air bubbles under decal.
 - c. If installing metal decal(s), use pop rivet gun to install new decal in original location.

END OF TASK

CHAPTER 16

HYDRAULIC SYSTEM MAINTENANCE

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Procedure

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Section I. HYDRAULIC CONTROL VALVE MAINTENANCE

HYDRAULIC CONTROL VALVE INSTALLATION

TOOLS: General mechanic's tool kit: automotive (5180-00-177-7033)

SUPPLIES: Clean rags (Item 1, Appendix C)
 Cotter pin (Item 37, Appendix C)
 Loctite 545 (Item 13, Appendix C)
 Hydraulic oil (Item 6, Appendix C)
 Preformed packings as required

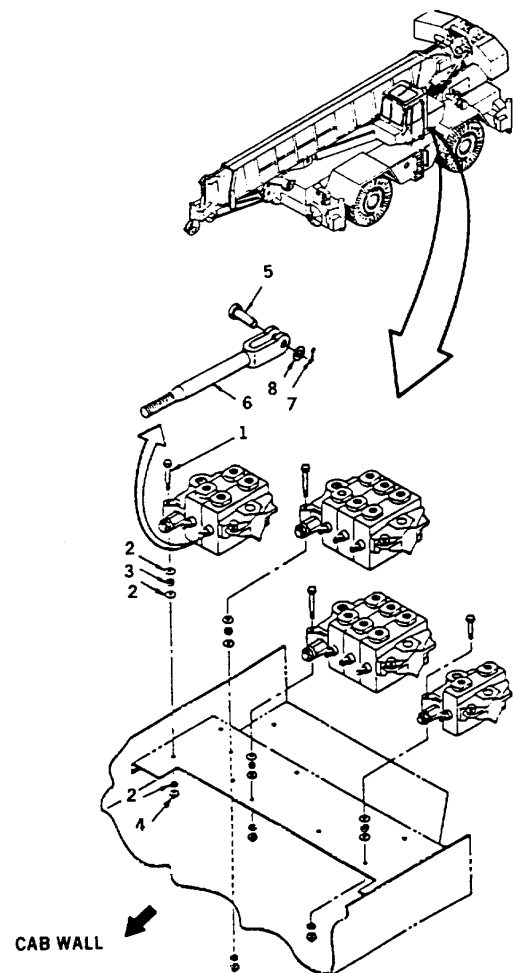
EQUIPMENT CONDITIONS: Area near control valves is clean and free of debris.
 Boom lowered. (Refer to TM 5-3810-306-10.)
 Disconnect ground cable at shunt. (Refer to page 8-109.)

REMOVAL:

NOTE

Main hoist and aux hoist boost control valve shown. Use this procedure to replace remaining valves.

1. REMOVE VALVE COMPARTMENT COVER TO ALLOW EASY ACCESS TO CONTROL VALVES.
2. REMOVE HYDRAULIC CONTROL VALVES.
 - a. Remove cotter pin (7), washer (8) and clevis pin (5) attaching mechanical linkage (6) to control valve. Discard cotter pin (7). Replace hardware in linkage to prevent loss.
 - b. Tag and disconnect hydraulic lines from valves. Plug all lines and openings. Discard preformed packings.
 - c. Remove capscrews (1), washers (2 and 3) and locknuts (4) securing each valve bank to mounting plate. Remove valve bank.
 - d. Remove fittings. Retain for installation or replace if damaged.



INSTALLATION:

1. INSTALL HYDRAULIC CONTROL VALVES.

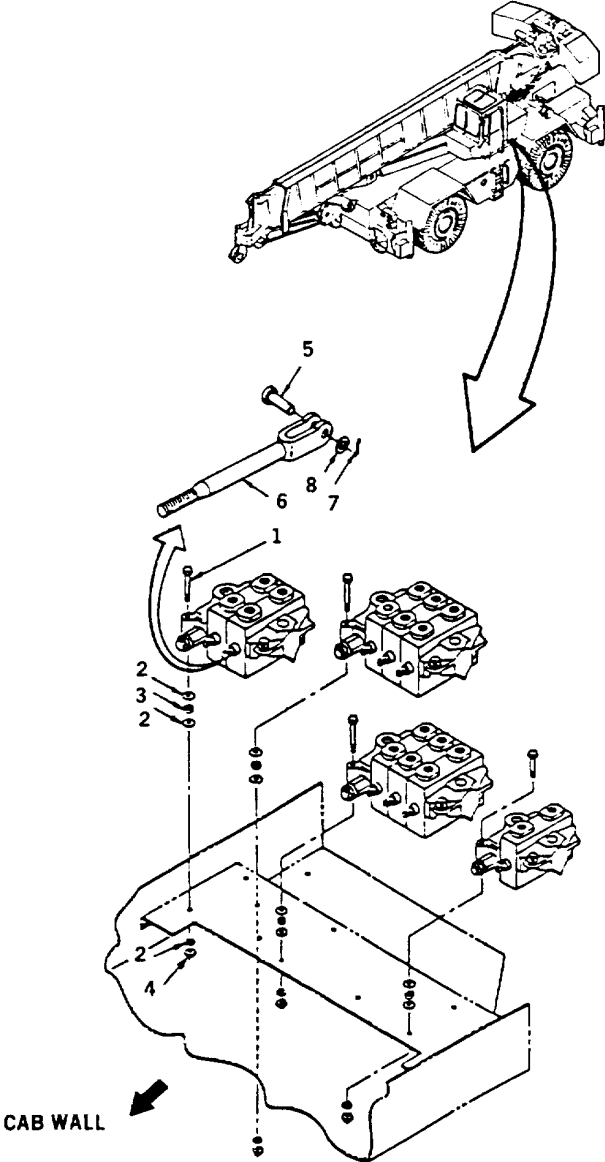
NOTE

Prior to installing fittings and hydraulic hoses, coat external threads with Loctite 545 and preformed packings with clean hydraulic oil.

- a. Install fittings on new control valve using new preformed packing.
- b. . Position valve bank on the mounting plate and secure with capscrews (1), washers (2 and 3) and nuts (4).
- c. . Connect hydraulic lines to each valve as tagged prior to removal. Use new preformed packings.
- d. . Connect mechanical linkage (6) to valve bank and secure with clevis pin (5), washer (8) and new cotter pin (7).

- 2. CONNECT NEGATIVE CABLE AT SHUNT. (REFER TO PAGE 8-109.)
- 3. START ENGINE AND OPERATE ALL HYDRAULIC FUNCTIONS. INSPECT VALVE COMPARTMENT FOR LEAKS. (REFER TO TM 5-3810-306-10.)
- 4. INSTALL VALVE COMPARTMENT COVER.

END OF TASK



INTEGRATED OUTRIGGER CONTROL VALVE INSTALLATION

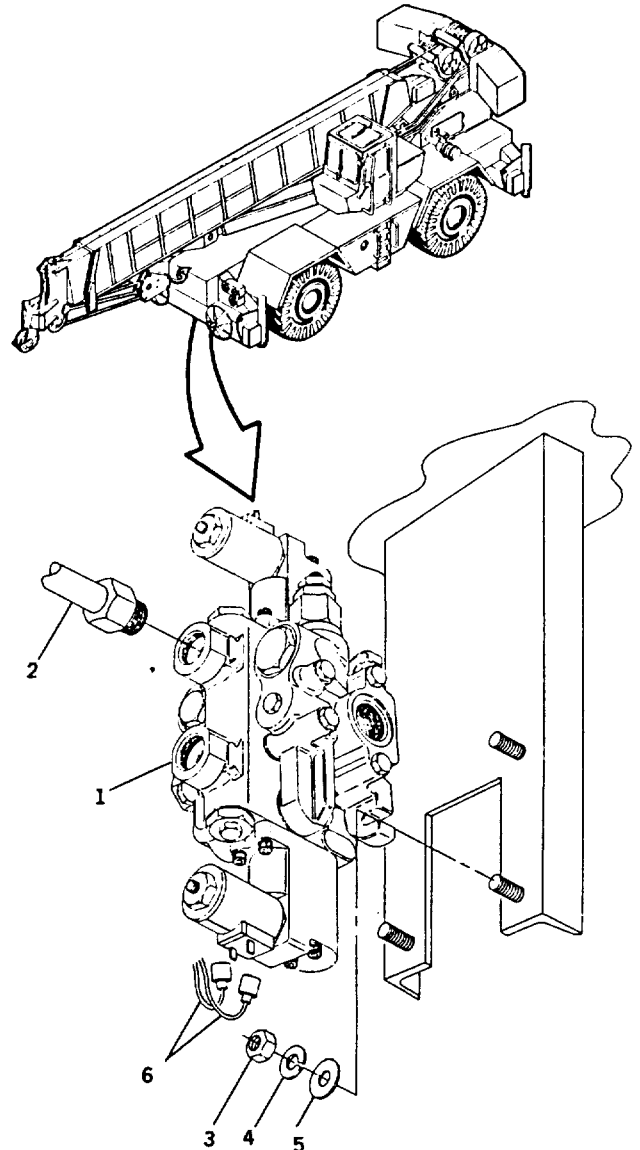
TOOLS: General mechanic's tool kit: automotive (5180-00-177-7033)

SUPPLIES: Loctite 545 (Item 13, Appendix C)
 Hydraulic fluid (Item 6, Appendix C)
 Preformed packings as required
 Lockwashers (Item 57, Appendix C)

EQUIPMENT CONDITION: Disconnect ground cable of shunt. (Refer to page 8-109.)

REMOVAL:

1. REMOVE INTEGRATED OUTRIGGER CONTROL VALVE (1).
 - a. Tag and disconnect electrical leads (6) to outrigger valve.
 - b. Tag and disconnect six hydraulic lines (2) to outrigger valve; cap all lines and openings.
 - c. Remove three nuts (3), lockwashers (4) and flatwashers (5) securing control valve (1), remove valve. Discard lockwashers (4).
 - d. Remove fittings and preformed packings from valve as required. Save fittings for installation or replace as necessary. Discard preformed packings.

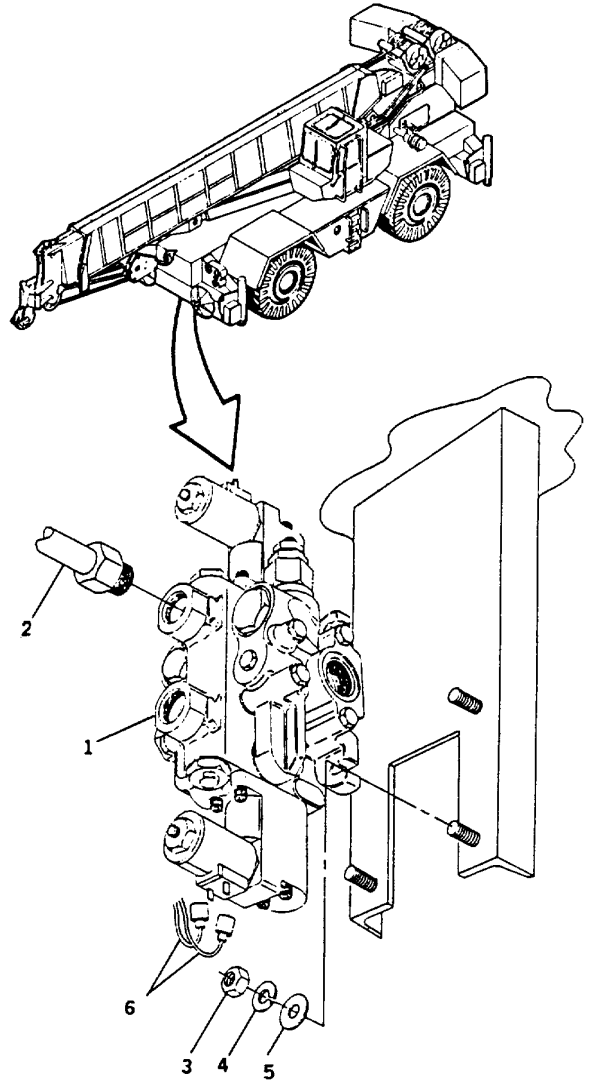


INSTALLATION:

1. INSTALL INTEGRATED OUTRIGGER CONTROL VALVE (1).
 - a. Install fittings.
 - b. Position valve (1) on mounting studs, secure with washers (5), new lockwashers (4) and nuts (3).

- c. Coat threads of fittings and lines (2) with loctite 545. Install tagged lines on valve using new preformed packings.
 - d. Connect tagged electrical connectors (6) to valve.
2. CONNECT GROUND CABLE AT SHUNT. (REFER TO PAGE 8-109.)
 3. START ENGINE AND CHECK OUTRIGGER OPERATION. (REFER TO TM 5-3810-306-10.)

END OF TASK



FRONT AND REAR OUTRIGGER CONTROL VALVE INSTALLATION

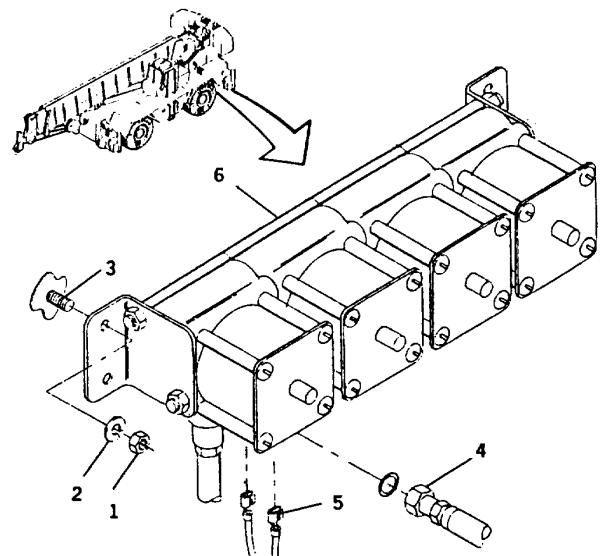
TOOLS: General mechanic's tool kit: automotive (5180-00-177-7033)
 Lubrication Service, Unit Trailer Mounted (4930-00-017-9167)
 Shop Equipment Auto-Maintenance and Repair, FM Basic (4910-00-754-0705)
 Shop Equipment Auto-Maintenance and Repair, FM Suppl No. 1 (4910-00-754-0706)
 Tool Outfit Hyd System; Test and Repair, 3/4 Ton Trailer Mtd (4940-01-036-5784)

SUPPLIES: Hydraulic oil (Item 6, Appendix C)
 Loctite 545 (Item 13, Appendix C)
 Preformed packing (Item 3, Appendix C) (4 Required)
 Preformed packing (Item 58, Appendix C)
 Lockwashers (Item 50, Appendix C)

EQUIPMENT CONDITION: Disconnect ground cable at shunt. (Refer to page 8-109.)

REMOVAL:

1. REMOVE OUTRIGGER CONTROL VALVE ASSEMBLY (6).
 - a. Tag and disconnect five hydraulic lines (4) to outrigger control valve bank.
 - b. Tag and disconnect electrical connectors (5) to outrigger control valve bank.
 - c. Remove four nuts (1) and lockwashers (2) securing valve bank to frame studs (3). Discard lockwashers (2).
 - d. Remove outrigger control valve bank (6).
 - e. Remove fittings and preformed packings. Save fittings for installation as necessary. Discard preformed packings.



INSTALLATION:

1. INSTALL OUTRIGGER CONTROL VALVE.
 - a. Install fittings and new preformed packings.

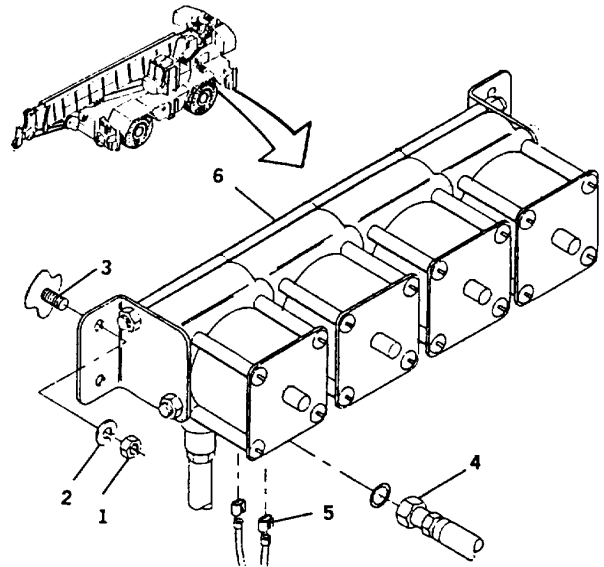
- b. Position outrigger control valve (6) on frame studs (3) and secure with new lockwashers (2) and nuts (1).

NOTE

Coat threads on all lines with Loctite 545 prior to installation.

- c. Remove tags and install five hydraulic lines (4), with new preformed packings, to outrigger control valve.
 - d. Remove tags and connect electrical connectors (5).
2. CONNECT GROUND CABLE AT SHUNT. (REFER TO PAGE 8-109.)
 3. START ENGINE AND CHECK OUTRIGGER OPERATION. (REFER TO TM 5-3810-30610.)

END OF TASK



SWING BRAKE VALVE AND PEDAL INSTALLATION

TOOLS: General mechanic's tool kit: automotive (5180-00-177-7033)

SUPPLIES: Lockwashers (Item 15, Appendix C)
Cotter pin (Item 86, Appendix C)

EQUIPMENT CONDITIONS: Disconnect ground cable at shunt. (Refer to page 8-109.)
Cab front panel removed. (Refer to page 15-10.)

REMOVAL:

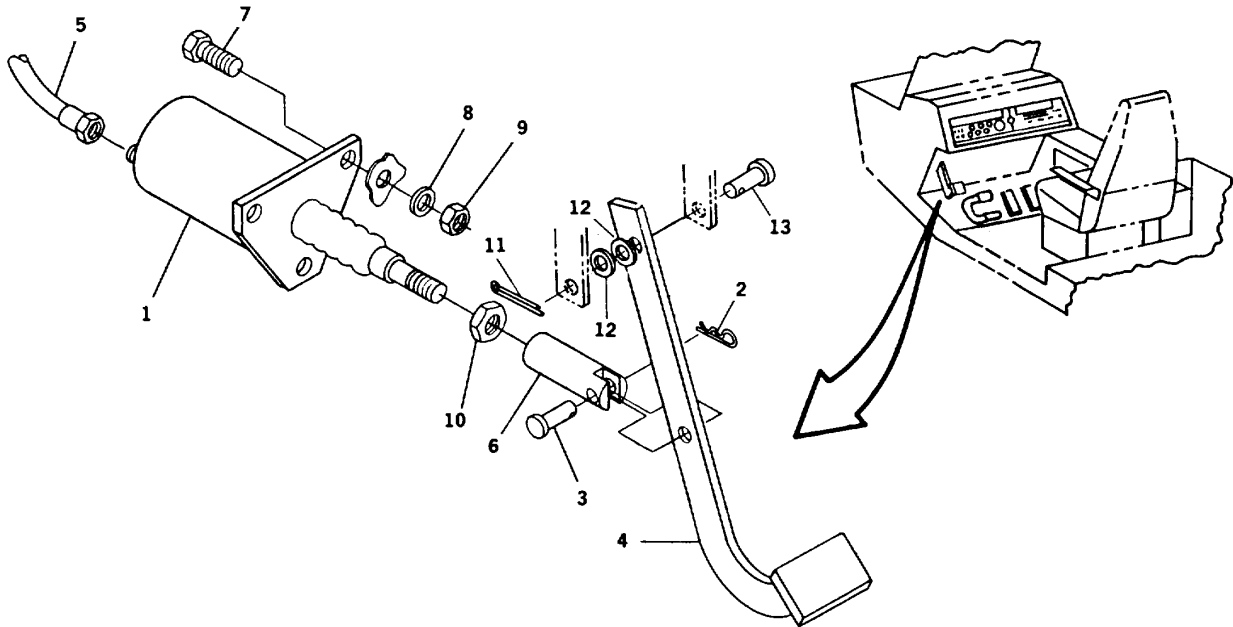
- 1. REMOVE SWING BRAKE VALVE.
 - a. Remove hitch pin (2) from clevis pin (3), securing clevis (6) to brake pedal (4).
 - b. Tag and disconnect three hydraulic hoses (5) to brake valve (1). Remove fittings and retain for reassembly.
 - c. Remove three capscrews (7), lockwashers (8) and nuts (9) securing swing brake valve (1) to mounting plate. Remove valve (1) and discard lockwashers (8).

2. REMOVE PEDAL (4).

- a. Remove cotter pin (11), pin (13) and two washers (12) securing pedal (4) to bracket. Discard cotter pin (11).
- b. Remove pedal (4).

INSTALLATION:

- 1. INSTALL PEDAL (4).
 - a. Position pedal (4) in mounting bracket and secure with pin (13), two washers (12) and new cotter pin (11).



2. INSTALL SWING BRAKE VALVE.

- a. Position swing brake valve (1) to mounting plate, align holes and secure with capscrews (7), new lockwashers (8) and nuts (9).
- b. Remove tags and install hydraulic hoses to swing brake valve (1).

NOTE

It may be necessary to adjust clevis (6). See adjustment procedure.

- c. Align clevis (6) with brake pedal (4) and secure with clevis pin (3) and hitch pin (2).

3. CONNECT GROUND CABLE AT SHUNT. (REFER TO PAGE 8-109.)

4. INSTALL CAB FRONT PANEL. (REFER TO PAGE 15-10.)

ADJUSTMENT:

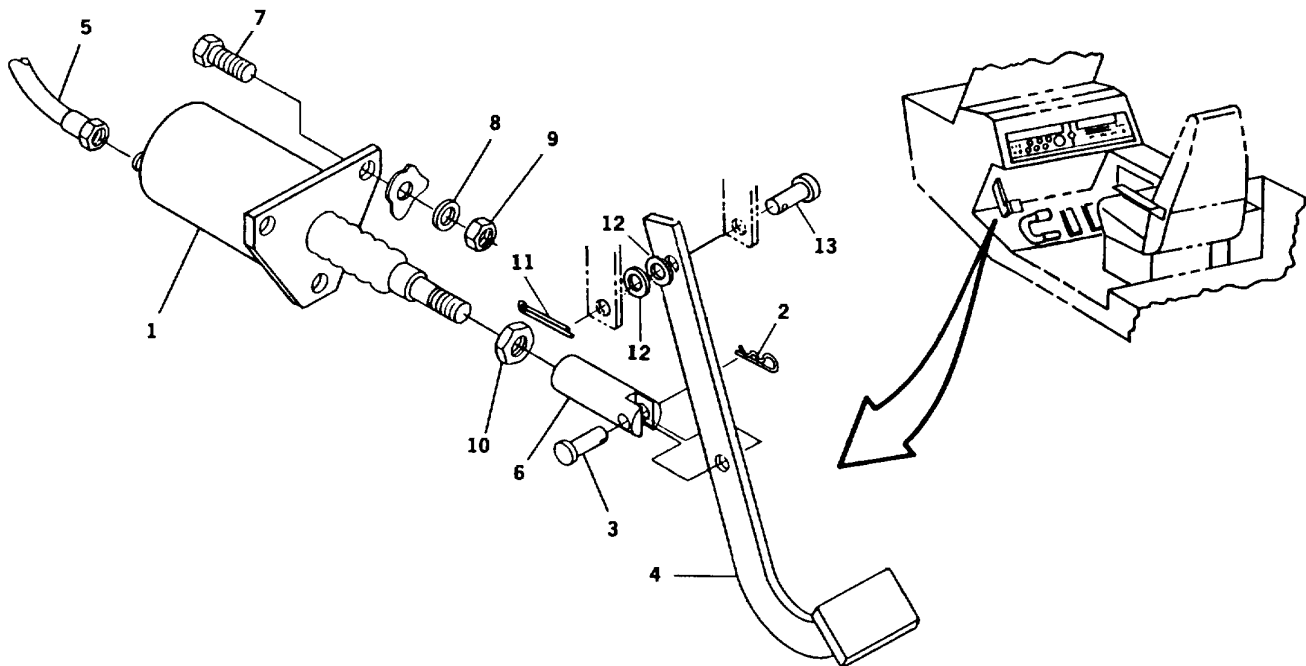
1. ADJUST SWING BRAKE VALVE.

WARNING

Engage swing lock prior to starting engine.

- a. Start engine and set throttle to idle. (Refer to TM 5-3810-30610.)
- b. Use slight pressure to depress valve shaft toward brake valve until it stops.
- c. Remove hitch pin (2) and clevis pin (3).
- d. Pull up on brake pedal into non-braking position.
- e. Loosen clevis locknut (10) and adjust clevis (6) until hole in clevis aligns with hole in brake pedal. Tighten locknut (10).
- f. Insert clevis pin (3) and secure with hitch pin (2).

END OF TASK



REAR AXLE LOCKOUT VALVE

TOOLS: General mechanic's tool kit: automotive (5180-00-177-7033)

SUPPLIES: Lockwashers (Item 2, Appendix C) (2 Required)
 Preformed packing (Item 3, Appendix C) (6 Required)
 Preformed packing (Item 62, Appendix C) (2 Required)
 Loctite 545 (Item 13, Appendix C)
 Hydraulic oil (Item 6, Appendix C)

EQUIPMENT CONDITIONS: Disconnect around cable at shunt. (Refer to page 8-109.)
 Rear deck removed. (Refer to page 15-16.)

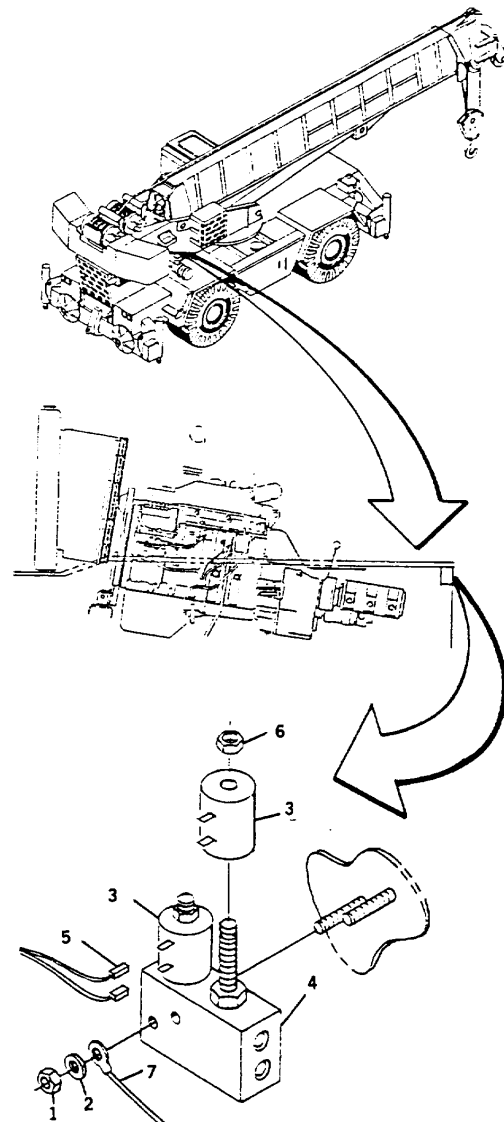
REMOVAL:

1. REMOVE REAR AXLE LOCKOUT VALVE (4).
 - a. Tag and disconnect five hydraulic lines to lockout valve.
 - b. Tag and disconnect electrical connectors (5).
 - Remove two nuts (1) and lockwashers (2) from frame studs. Discard lockwashers (2).
 - c. Remove grounding wire (7) from frame stud.
 - d. Remove rear axle lockout valve.
 - e. Remove fittings and preformed packings from lockout valve (4) and retain fittings for reassembly. Discard preformed packings.

NOTE

The solenoid coils (3) mounted on lockout valve may be removed without removing hoses. Use the following procedure:

2. REMOVE SOLENOID COILS (3).
 - a. Loosen valve mounting hardware enough for removal of solenoid coils.



- b. Remove two solenoid coils (3) by removing retaining nuts (6) and sliding coils up from valve (4).

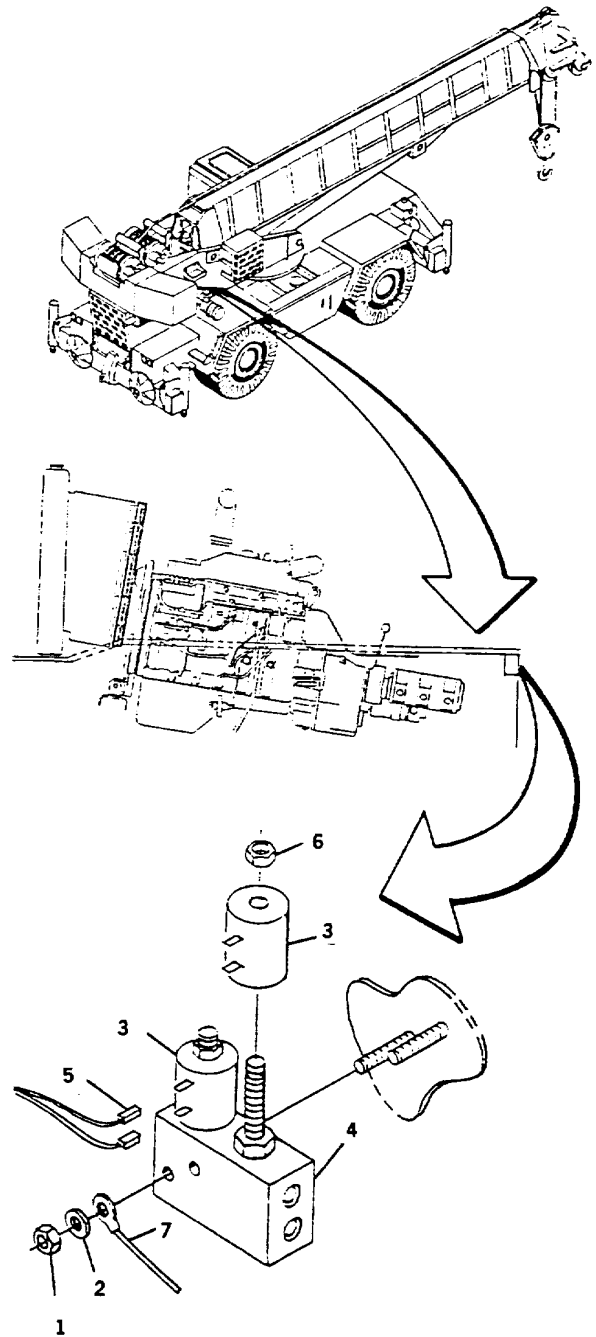
INSTALLATION

NOTE

Prior to installation, coat all preformed packings with clean hydraulic oil and fitting threads with Loctite 545.

1. INSTALL SOLENOID COILS.
 - a. Slide solenoid coils (3) over shaft on valve (4) and secure with nuts (6).
2. INSTALL REAR AXLE LOCKOUT VALVE.
 - a. Install fittings and new preformed packings on lockout valve.
 - b. Position rear axle lockout valve on frame studs.
 - c. Place grounding wire (7) on frame stud and secure wire and lockout valve (4) with new lockwashers (2) and nuts (1).
 - d. Remove tags and install hydraulic lines to lockout valve.
 - e. Remove tags and connect electrical connectors (5).
2. CONNECT GROUND CABLE AT SHUNT. (REFER TO PAGE 8-109.)
3. INSTALL REAR DECK. (REFER TO PAGE 15-16.)
4. TEST FOR PROPER OPERATION AND INSPECT FOR LEAKS. (REFER TO TM 53810-306-10.)

END OF TASK



TWO-POSITION SELECTOR VALVE

TOOLS: General mechanic's tool kit: automotive (5180-00-177-7033)

SUPPLIES: Lockwashers (Item 5, Appendix C)
 Hydraulic oil (Item 6, Appendix C)
 Loctite #545 (Item 13, Appendix C)
 Preformed packing (Item 52, Appendix C)

EQUIPMENT CONDITIONS: Disconnect ground cable at shunt. (Refer to page 8-109.)
 Operator's seat and pedestal removed. (Refer to page 15-27.)
 Front access panel removed. (Refer to page 8-21.)

REMOVAL:

1. REMOVE TWO-POSITION SELECTOR VALVE.
 - a. Unscrew knob (2) from top of two-position selector valve (1).
 - b. Remove nuts and lockwashers securing distribution panel (covering two position selector valve). Discard lockwashers.
 - c. Move distribution panel to allow access to valve (1) and hydraulic lines (3).
 - d. Tag and remove hydraulic lines (3) from valve (1).
 - e. Remove fittings (9) and preformed packings (8). Discard preformed packings (8).
 - f. Remove two nuts (4), lockwashers (5) and capscrews (6) securing valve (1) to mounting plate (7). Remove valve.

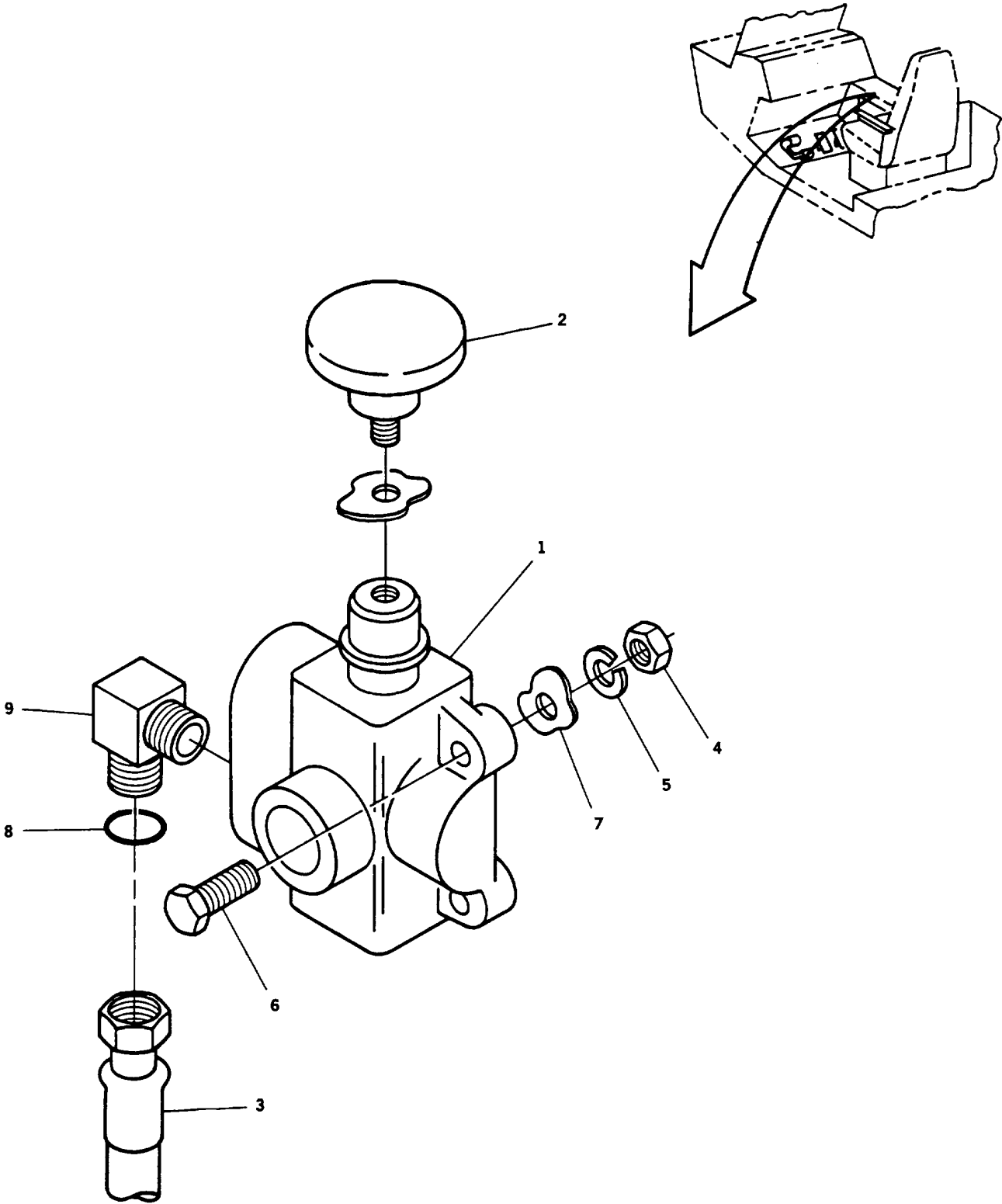
1. INSTALL TWO-POSITION SELECTOR VALVE.
 - a. Align holes in valve (1) with holes in mounting plate (7). Install two capscrews (6), new lockwashers (5) and nuts. Secure valve (1).
 - b. Install fittings (9) with new preformed packings (8).
 - c. Remove tags and connect hydraulic lines (3) to valve (1).
 - d. Place distribution panel on studs and secure with lockwashers and nuts.
 - e. Screw knob (2) onto valve stem.
2. INSTALL FRONT ACCESS PANEL. (REFER TO PAGE 8-21.).
3. INSTALL OPERATOR'S SEAT AND PEDESTAL. (REFER TO PAGE 15-27.)
4. CONNECT GROUND CABLE AT SHUNT. (REFER TO PAGE 8-109.)
5. TEST PARKING BRAKE FOR PROPER OPERATION. (REFER TO TM 5-3810306-10.)

INSTALLATION:

NOTE

Prior to installation, coat hydraulic line and fitting threads with Loctite 545 and coat preformed packing with hydraulic oil.

END OF TASK



LIFT CYLINDER OVER CENTER VALVE INSTALLATION

TOOLS: General mechanic's tool kit: automotive (5180-00-177-7033)

SUPPLIES: Lockwasher (Item 15, Appendix C)

EQUIPMENT CONDITIONS: Disconnect ground cable at shunt. (Refer to page 8-109.)

REMOVAL:

1. REMOVE LIFT CYLINDER OVER CENTER VALVE ASSEMBLY (1).

- a. Tag and remove three hydraulic lines to valve assembly (1). Remove and discard packings (6)
- b. Remove bolts (2), washers (3), lockwashers (4) and nuts (5) securing valve assembly (1) to mount. Discard lockwashers (4).
- c. Remove over center valve assembly (1).

- a. Position over center valve assembly (1) on mount.
- b. Install bolts (2), washers (3), new lockwashers (4) and nuts (5).
- c. Connect three hydraulic lines with new packings (6) to valve assembly (1) as tagged on removal.

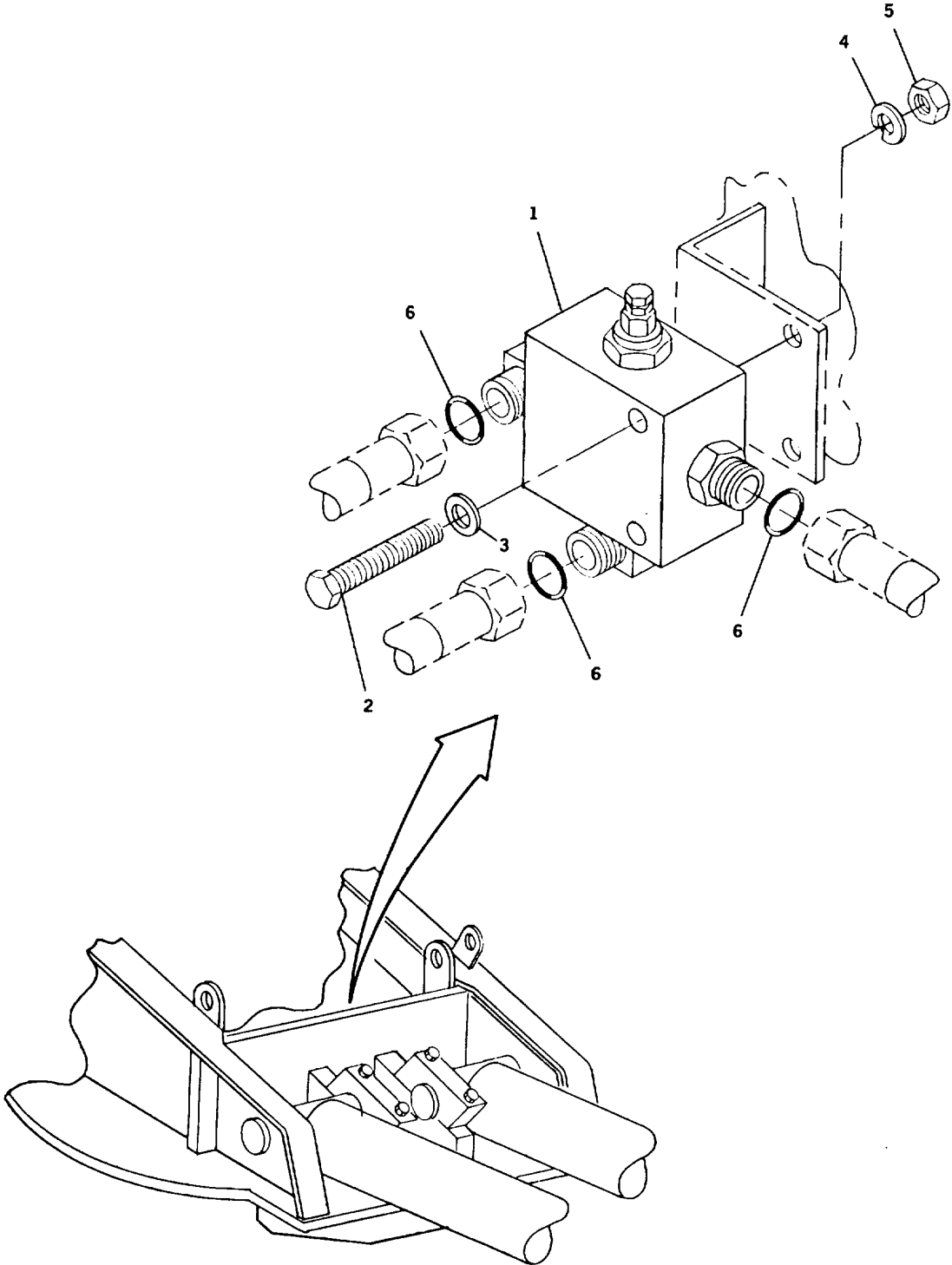
2. CONNECT GROUND CABLE AT SHUNT. (REFER TO PAGE 8-109.)

3. START CRANE AND CHECK FOR LEAKS AND PROPER OPERATION.

INSTALLATION:

1. INSTALL LIFT CYLINDER OVER CENTER VALVE ASSEMBLY (1).

END OF TASK



Section II. FILTER AND LINES MAINTENANCE

AXLE LOCKOUT HYDRAULIC LINES

TOOLS: General mechanic's tool kit: automotive (5180-00-177-7033)

SUPPLIES: Loctite 545 (Item 13, Appendix C)
Preformed packings as required

EQUIPMENT CONDITIONS: Disconnect ground cable at shunt. (Refer to page 8-109.)

REMOVAL:

NOTE

Use the following procedure to replace all hydraulic lines.

1. REMOVE HYDRAULIC LINE.

- a. Tag and disconnect both ends of hydraulic line. Remove line and preformed packing. Note routing for ease in installation.
- b. Remove fittings and preformed packings as necessary. Discard preformed packings.
- c. Inspect all parts for damage and replace as required.

- a. Coat threads with Loctite 545 and preformed packings with clean hydraulic oil prior to installation.
- b. Install fittings and new preformed packings. Tighten securely.
- c. Route hydraulic line and connect both ends with new preformed packing. Tighten securely.

2. CONNECT GROUND CABLE AT SHUNT. (REFER TO PAGE 8-109.)

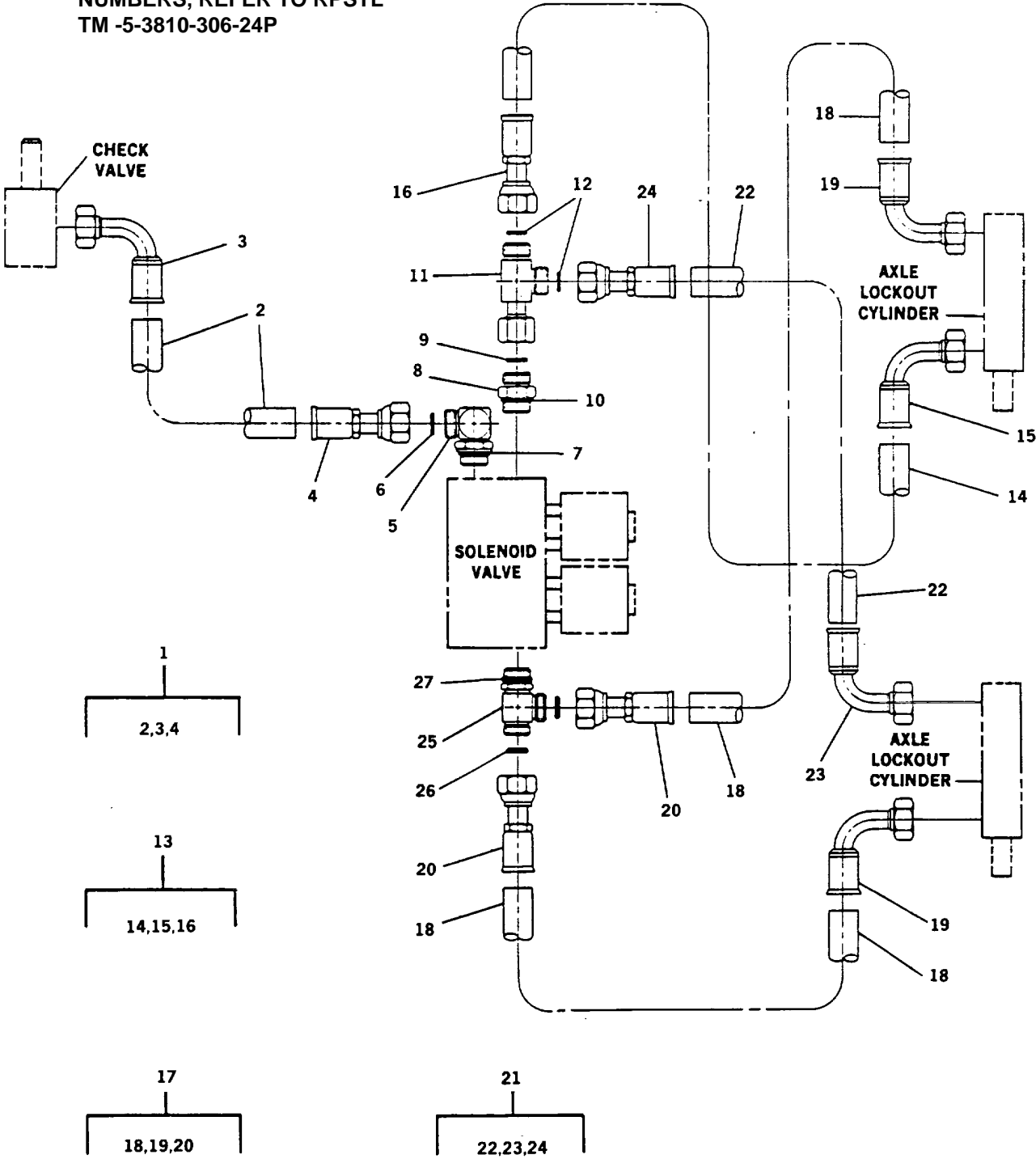
3. START ENGINE AND CHECK REAR AXLE LOCKOUT FUNCTION. INSPECT FOR LEAKS. (REFER TO TM 9-3810-306-10.)

INSTALLATION:

1. INSTALL HYDRAULIC LINE.

END OF TASK

FOR REFERENCE TO INDEX
NUMBERS, REFER TO RPSTL
TM -5-3810-306-24P



FREE SWING HYDRAULIC LINES

TOOLS: General mechanic's tool kit: automotive (5180-00-177-7033)

SUPPLIES: Loctite 545 (Item 13, Appendix C)
Preformed packings as required

EQUIPMENT CONDITIONS: Disconnect ground cable at shunt. (Refer to page 8-109.)

REMOVAL:

NOTE

Use the following procedure to replace all hydraulic lines.

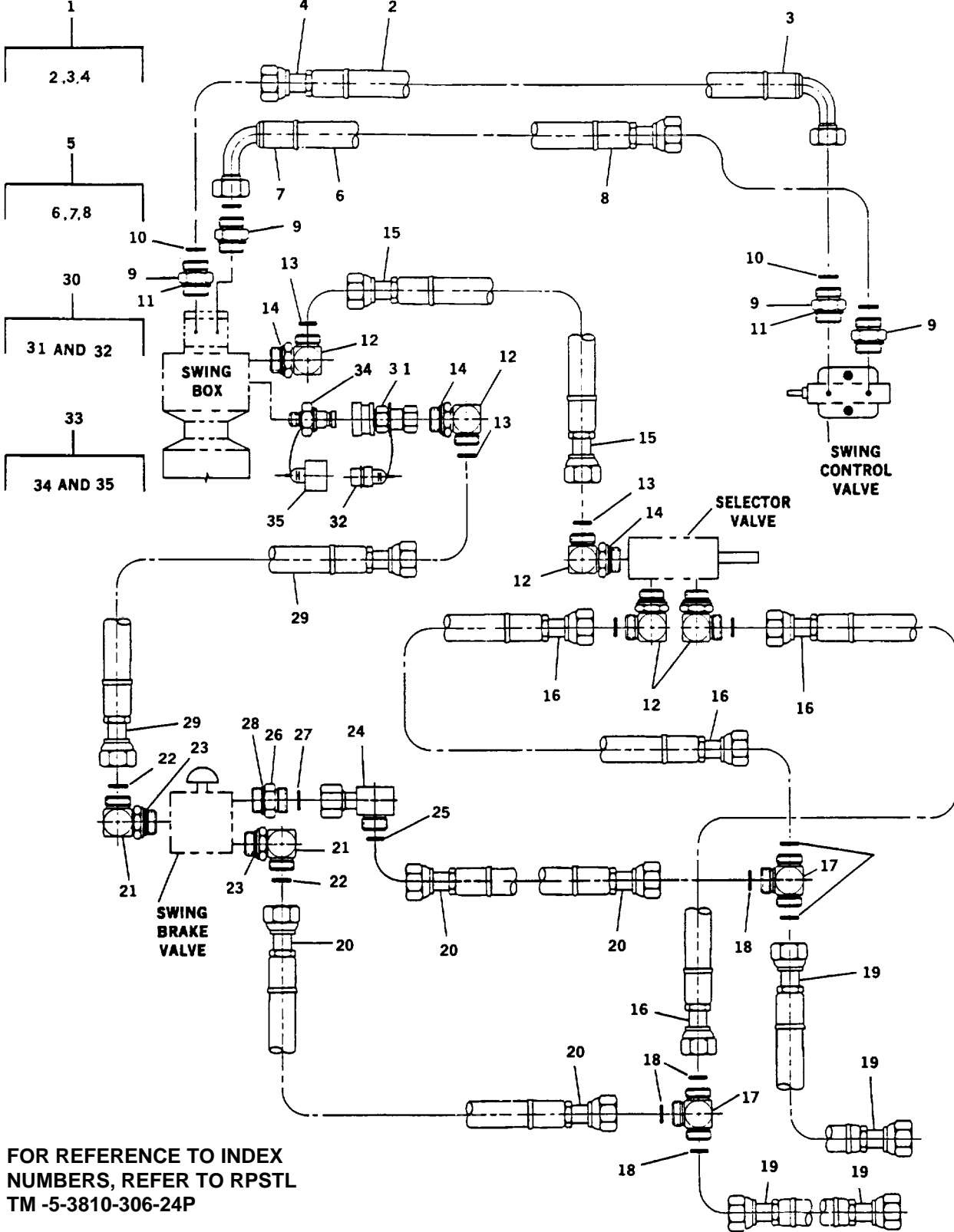
1. REMOVE HYDRAULIC LINE.
 - a. Tag and disconnect both ends of hydraulic line. Remove line and preformed packing. Note routing for ease in installation.
 - b. Remove fittings and preformed packings as necessary. Discard preformed packings.
 - c. Inspect all parts for damage and replace as required.

- a. Coat threads with Loctite 545 and preformed packings with clean hydraulic fluid prior to installation.
 - b. Install fittings and new preformed packings. Tighten securely.
 - c. Route hydraulic line and connect both ends with new preformed packing. Tighten securely.
2. CONNECT GROUND CABLE AT SHUNT. (REFER TO PAGE 8-109.)
 3. START ENGINE AND CHECK FREE SWING FUNCTION. CHECK FOR LEAKS. (REFER TO TM 5-3810-306-10.)

INSTALLATION:

END OF TASK

1. INSTALL HYDRAULIC LINE.



FOR REFERENCE TO INDEX
NUMBERS, REFER TO RPSTL
TM -5-3810-306-24P

FRONT STEERING HYDRAULIC LINES, CAB

TOOLS: General mechanic's tool kit: automotive (5180-00-177-7033)

SUPPLIES: Loctite 545 (Item 13, Appendix C)
Preformed packings as required

EQUIPMENT CONDITIONS: Disconnect ground cable at shunt. (Refer to page 8-109.)

REMOVAL:

NOTE

Use the following procedure to replace all hydraulic lines.

1. REMOVE HYDRAULIC LINE.

- a. Tag and disconnect both ends of hydraulic line. Remove line and preformed packing. Note routing for ease in installation.
- b. Remove fittings and preformed packings as necessary. Discard preformed packings.
- c., Inspect all parts for damage and replace as required.

- a. Coat threads with Loctite 545 and preformed packings with clean hydraulic oil prior to installation.
- b. Install fittings and new preformed packings. Tighten securely.
- c. Route hydraulic line and connect both ends with new preformed packing. Tighten securely.

2. CONNECT GROUND CABLE AT SHUNT. (REFER TO PAGE 8-109.)

3. START ENGINE AND CHECK FRONT STEERING FUNCTION. CHECK FOR LEAKS. (REFER TO TM 5-3810-306-10.)

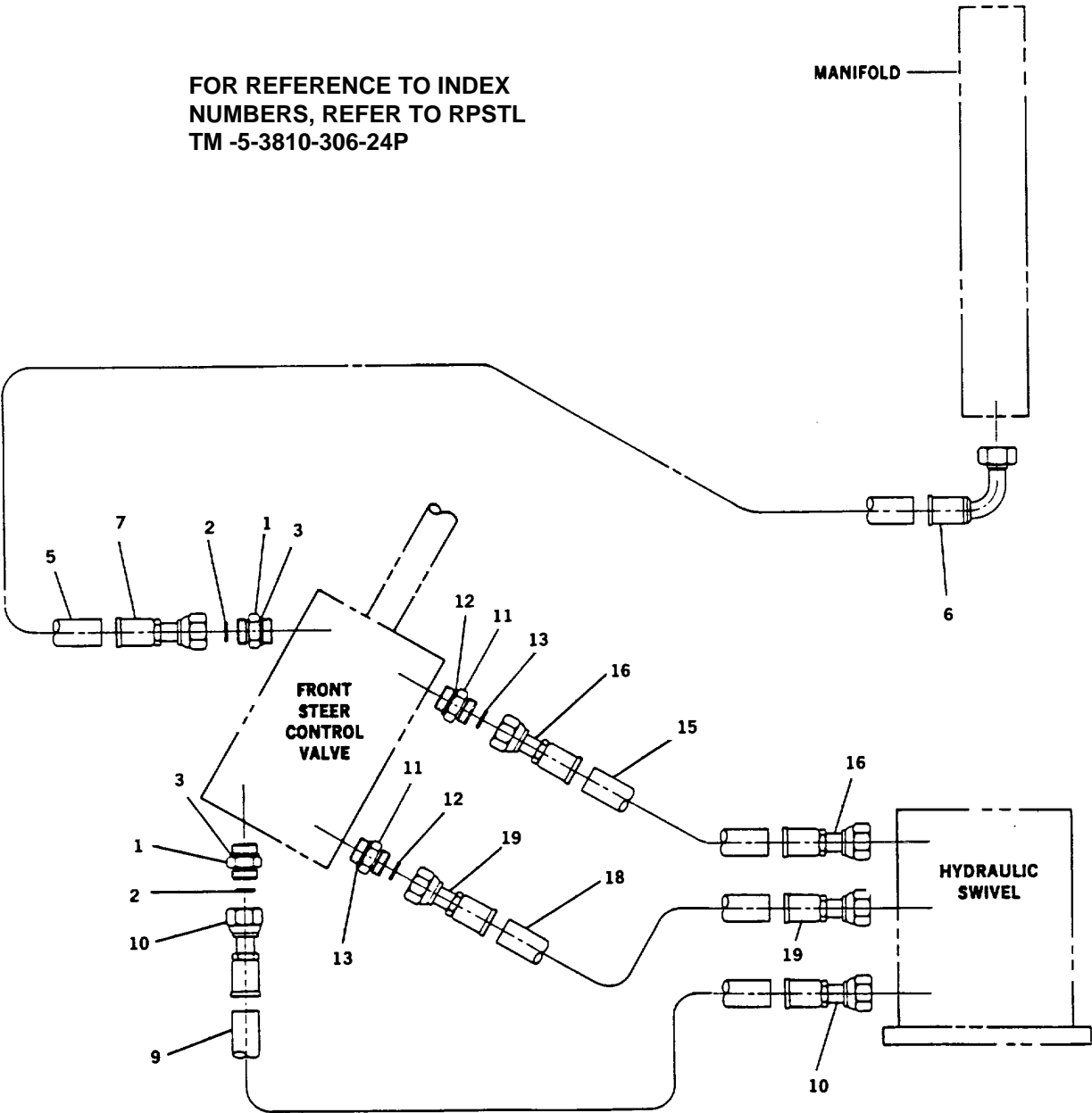
INSTALLATION:

1. INSTALL HYDRAULIC LINE.

END OF TASK



FOR REFERENCE TO INDEX
NUMBERS, REFER TO RPSTL
TM -5-3810-306-24P



FRONT STEERING HYDRAULIC LINES, CARRIER

TOOLS: General mechanic's tool kit: automotive (5180-00-177-7033)

SUPPLIES: Loctite 545 (Item 13, Appendix C)
Preformed packings as required

EQUIPMENT CONDITIONS: Disconnect ground cable at shunt. (Refer to page 8-109.)

REMOVAL:

NOTE

Use the following procedure to replace all hydraulic lines.

1. REMOVE HYDRAULIC LINE.

- a. Tag and disconnect both ends of hydraulic line. Remove line and preformed packing. Note routing for ease in installation.
- b. Remove fittings and preformed packings as necessary. Discard preformed packings.
- c. Inspect all parts for damage and replace as required.

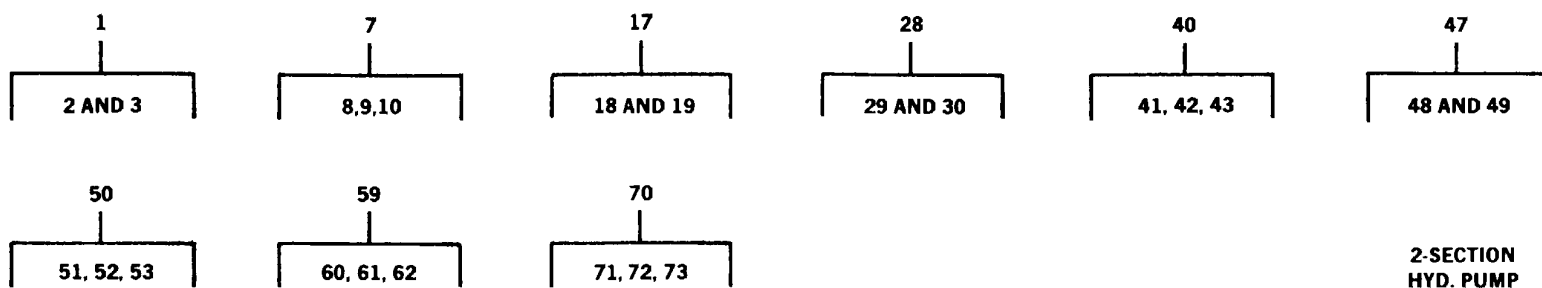
- a. Coat threads with Loctite 545 and preformed packings with clean hydraulic oil prior to installation.
- b. Install fittings and new preformed packings. Tighten securely.
- c. Route hydraulic line and connect both ends with new preformed packing. Tighten securely.

- 2. CONNECT GROUND CABLE AT SHUNT. (REFER TO PAGE 8-109.)
- 3. START ENGINE AND CHECK FRONT STEERING FUNCTION. CHECK FOR LEAKS. (REFER TO TM 5-3810-306-10.)

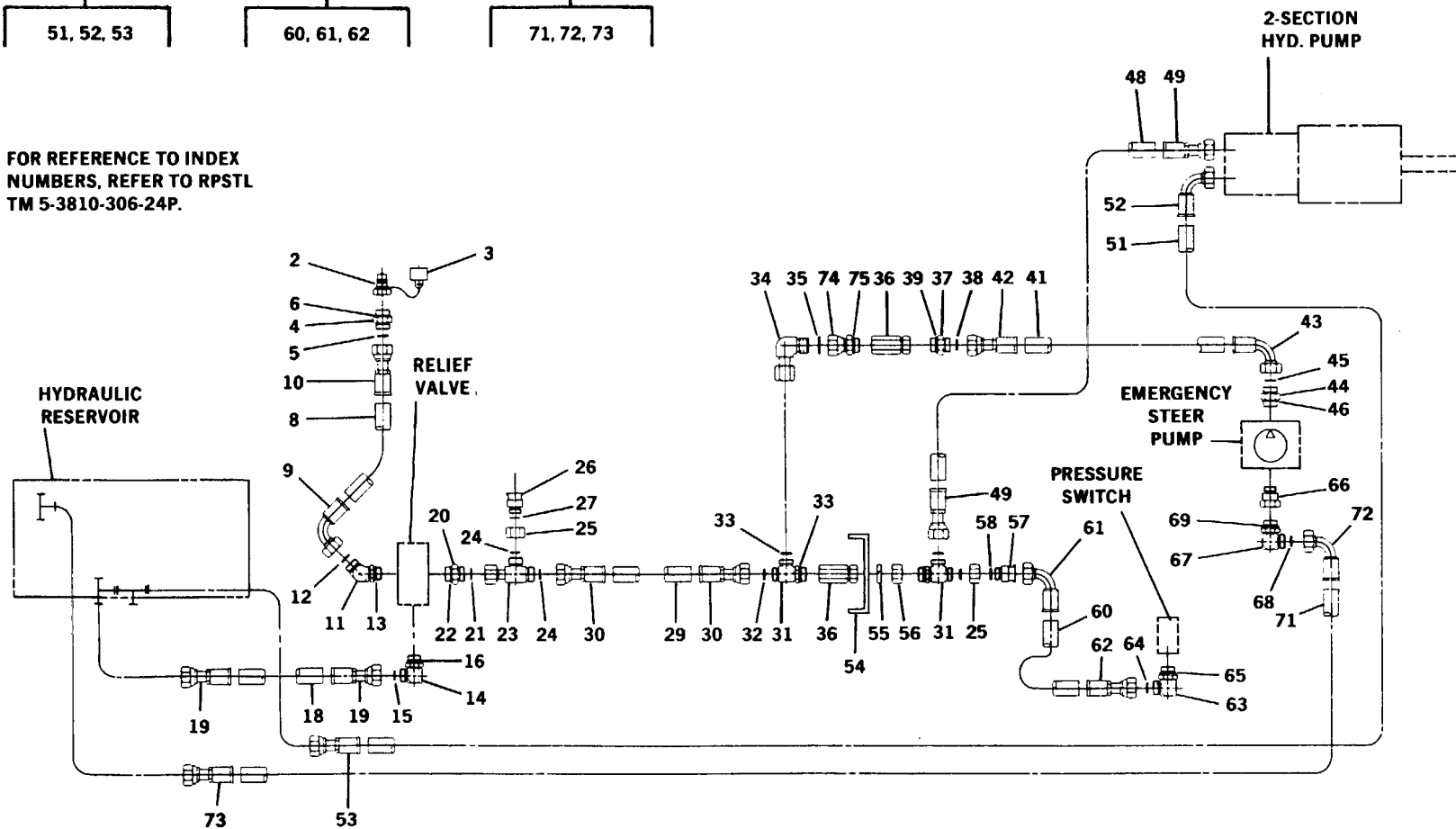
INSTALLATION:

- 1. INSTALL HYDRAULIC LINE.

END OF OTASK



FOR REFERENCE TO INDEX NUMBERS, REFER TO RPSTL TM 5-3810-306-24P.



REAR STEER HYDRAULIC LINES

TOOLS: General mechanic's tool kit: automotive (5180-00-177-7033)

SUPPLIES: Loctite 545 (Item 13, Appendix C)
Preformed packings as required

EQUIPMENT CONDITIONS: Disconnect ground cable at shunt. (Refer to page 8-109.)

REMOVAL: NOTE

Use the following procedure to replace all hydraulic lines.

1. REMOVE HYDRAULIC LINE.

a. Tag and disconnect both ends of hydraulic line. Remove line and preformed packing. Note routing for ease in installation.

b. Remove fittings and preformed packings as necessary. Discard preformed packings.

c. Inspect all parts for damage and replace as required.

INSTALLATION: 1. INSTALL HYDRAULIC LINE.

a. Coat threads with Loctite 545 and preformed packings with clean hydraulic oil prior to installation.

b. Install fittings and new preformed packings. Tighten securely.

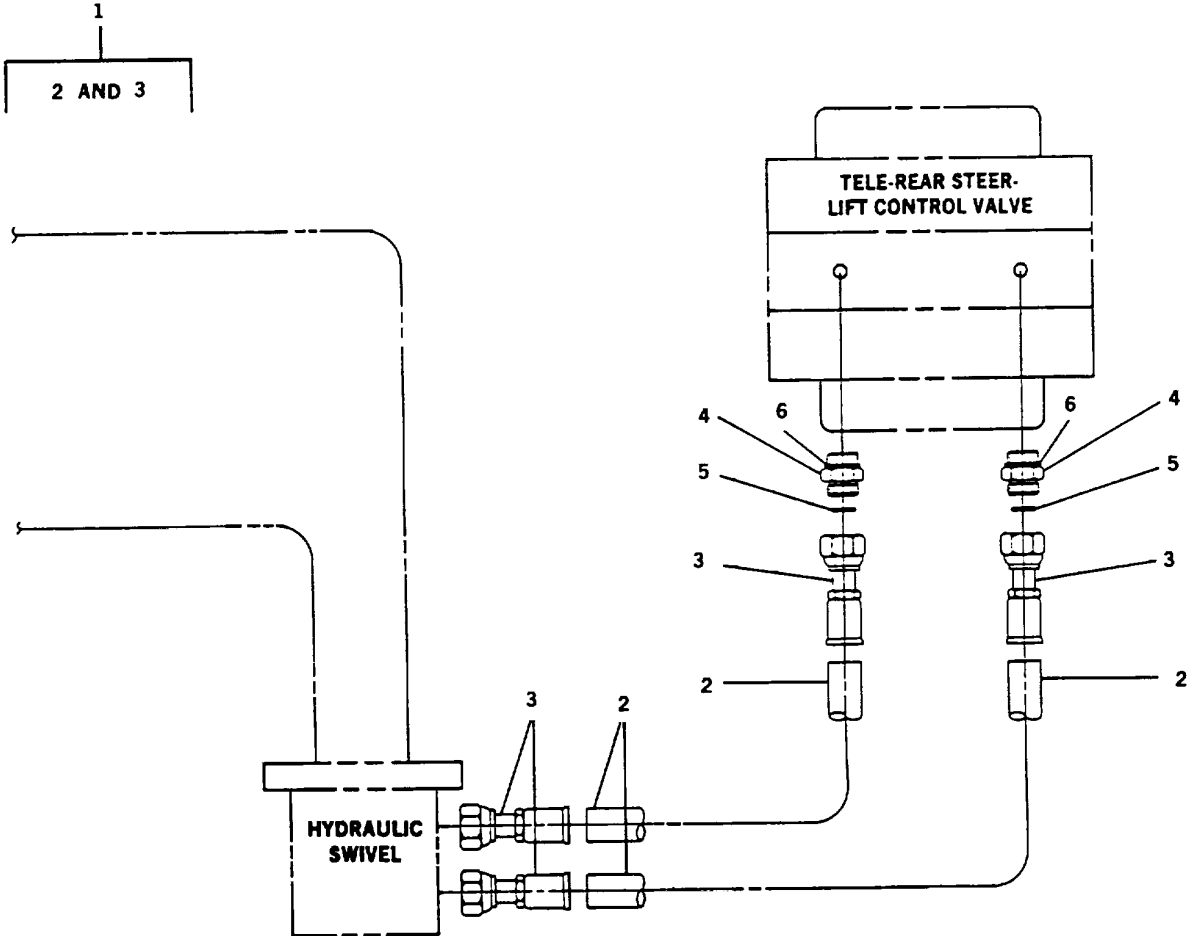
c. Route hydraulic line and connect both ends with new preformed packing. Tighten securely.

2. CONNECT GROUND CABLE AT SHUNT. (REFER TO PAGE 8-109.)

3. START ENGINE AND CHECK REAR FUNCTION. CHECK FOR LEAKS. (REFER TO TM 5-3810-306-10.)

END OF TASK

FOR REFERENCE TO INDEX
NUMBERS, REFER TO
RPSTLTM 5-3810-306-24P.



HOIST HYDRAULIC LINES

TOOLS: General mechanic's tool kit: automotive (5180-00-177-7033)

SUPPLIES: Loctite 545 (Item 13, Appendix C)
Preformed packings as required

EQUIPMENT CONDITIONS: Disconnect ground cable at shunt. (Refer to page 8-109.)

REMOVAL:

NOTE

Use the following procedure to replace all hydraulic lines.

1. REMOVE HYDRAULIC LINE.
 - a. Tag and disconnect both ends of hydraulic line. Remove line and preformed packing. Note routing for ease in installation.
 - .. Remove fittings and preformed packings as necessary. Discard preformed packings.
 - b. Inspect all parts for damage and replace as required.

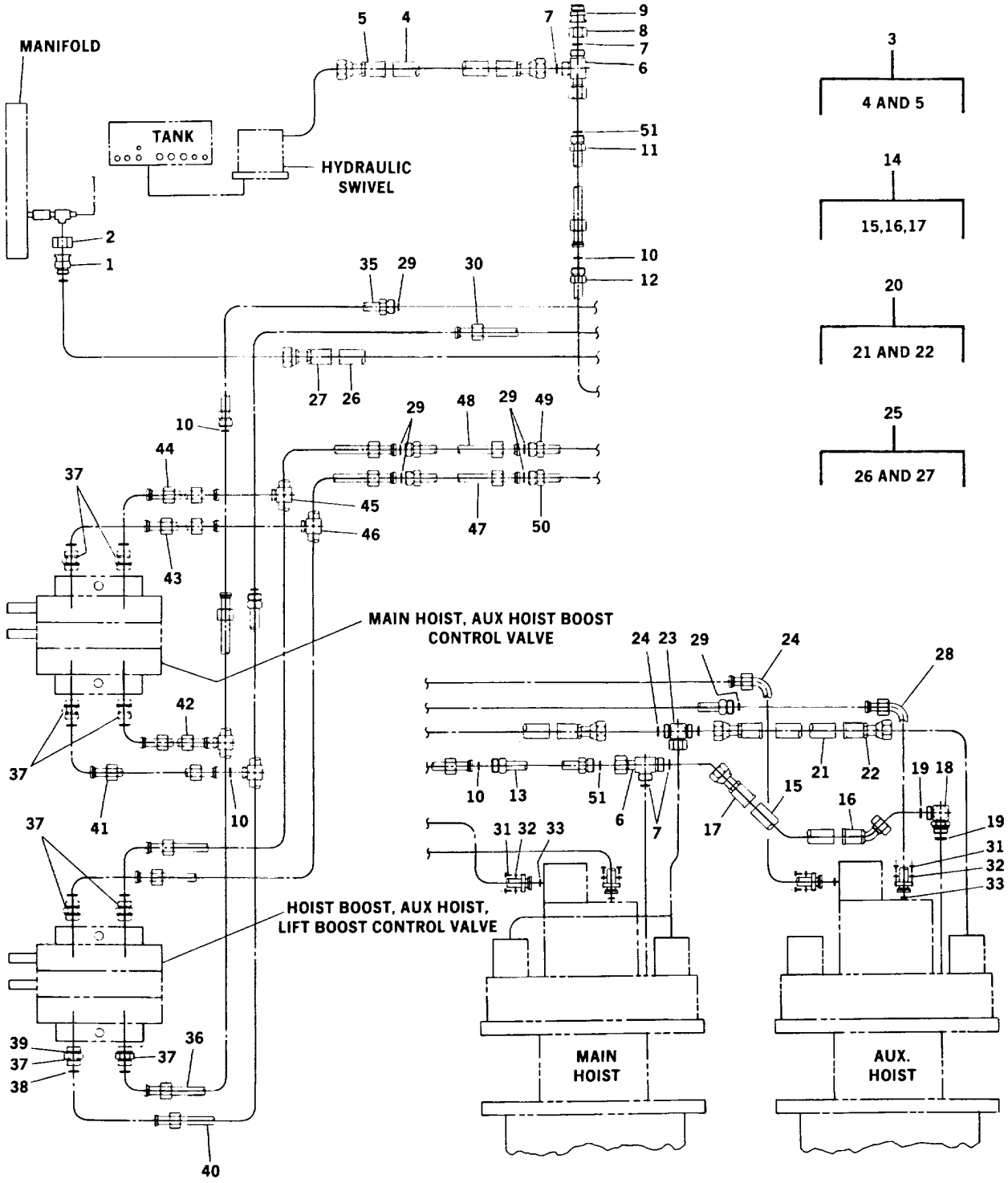
- a. Coat threads with Loctite 545 and preformed packings with clean hydraulic oil prior to installation.
 - b. Install fittings and new preformed packings. Tighten securely.
 - c. Route hydraulic line and connect both ends with new preformed packing. Tighten securely.
2. CONNECT GROUND CABLE AT SHUNT. (REFER TO PAGE 8-109.)
 3. START ENGINE AND CHECK HOIST FUNCTION. CHECK FOR LEAKS. (REFER TO TM 5-3810-306-10.)

INSTALLATION:

END OF TASK

1. INSTALL HYDRAULIC LINE.

FOR REFERENCE TO INDEX
NUMBERS, REFER TO RPSTL
TM -5-3810-306-24P



HYDRAULIC FILTER REPLACEMENT

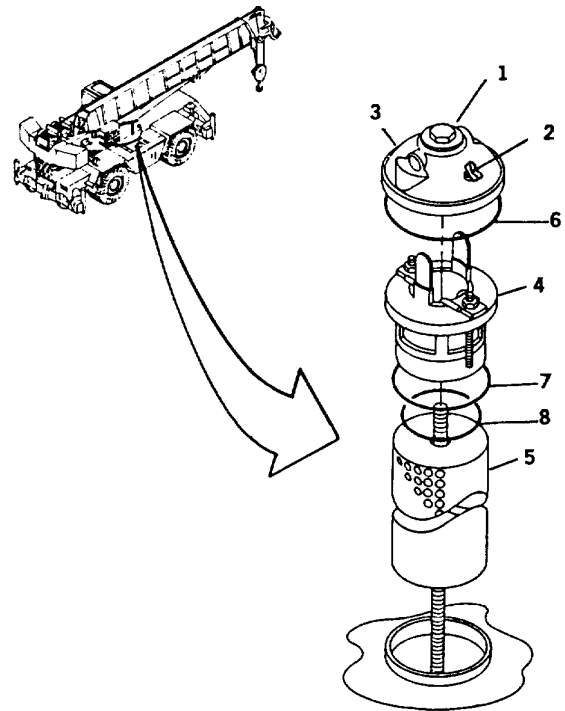
TOOLS: General mechanic's tool kit: automotive (5180-00-177-7033)

SUPPLIES: Clean rags (Item 1, Appendix C)
 Filter element (Item 31, Appendix C)
 Preformed packing (Item 30, Appendix C)
 Preformed packing (Item 53, Appendix C)
 Preformed packing (Item 54, Appendix C)

EQUIPMENT CONDITIONS: All hydraulic systems shutdown and pressure relieved from lines.
 Filter head area is clean and free of debris.
 Disconnect ground cable at shunt. (Refer to page 8-109.)

REMOVAL:

1. REMOVE HYDRAULIC FILTER (5).
 - a. Open bleed valve (2) on filter head (3) to relieve tank pressure.
 - b. Remove nut (1) on filter head (3) to free head from tank. Discard preformed packing (6).
 - c. Remove bypass valve (4) and filter element (5) from tube. Discard filter element (5) and preformed packings (7 and 8).



INSTALLATION:

1. INSTALL HYDRAULIC FILTER (5).
 - a. Install new filter element (5) with new preformed packing (8) and bypass valve assembly (4) with new preformed packing (7) in tube.
 - b. Ensure preformed packings (7 and 8) on bypass valve are not damaged.
 - c. Install filter head (3) with new preformed packing (6) over indicator bars on bypass valve (4). Align head with window

d. Close bleed valve (2).

2. CONNECT GROUND CABLE AT SHUNT. (REFER TO PAGE 8-109.)
3. START ENGINE AND CHECK HYDRAULIC FUNCTIONS. CHECK FOR LEAKS. (REFER TO TM 5-3810-306-10.)

END OF TASK

LIFT CYLINDER HYDRAULIC LINES, CYLINDERS

TOOLS: General mechanic's tool kit: automotive (5180-00-177-7033)

SUPPLIES: Loctite 545 (Item 13, Appendix C)
 Preformed packings as required

EQUIPMENT CONDITIONS Disconnect ground cable at shunt. (Refer to page 8-109.)

REMOVAL:

NOTE

Use the following procedure to replace all hydraulic lines.

1. REMOVE HYDRAULIC LINE.

- a. Tag and disconnect both ends of hydraulic line. Remove line and preformed packing. Note routing for ease in installation.
- b. Remove fittings and preformed packings as necessary. Discard preformed packings.
- c. Inspect all parts for damage and replace as required.

- a. Coat threads with Loctite 545 and preformed packings with clean hydraulic oil prior to installation.
- b. Install fittings and new preformed packing. Tighten securely.
- c. Route hydraulic line and connect both ends with new preformed packings. Tighten securely.

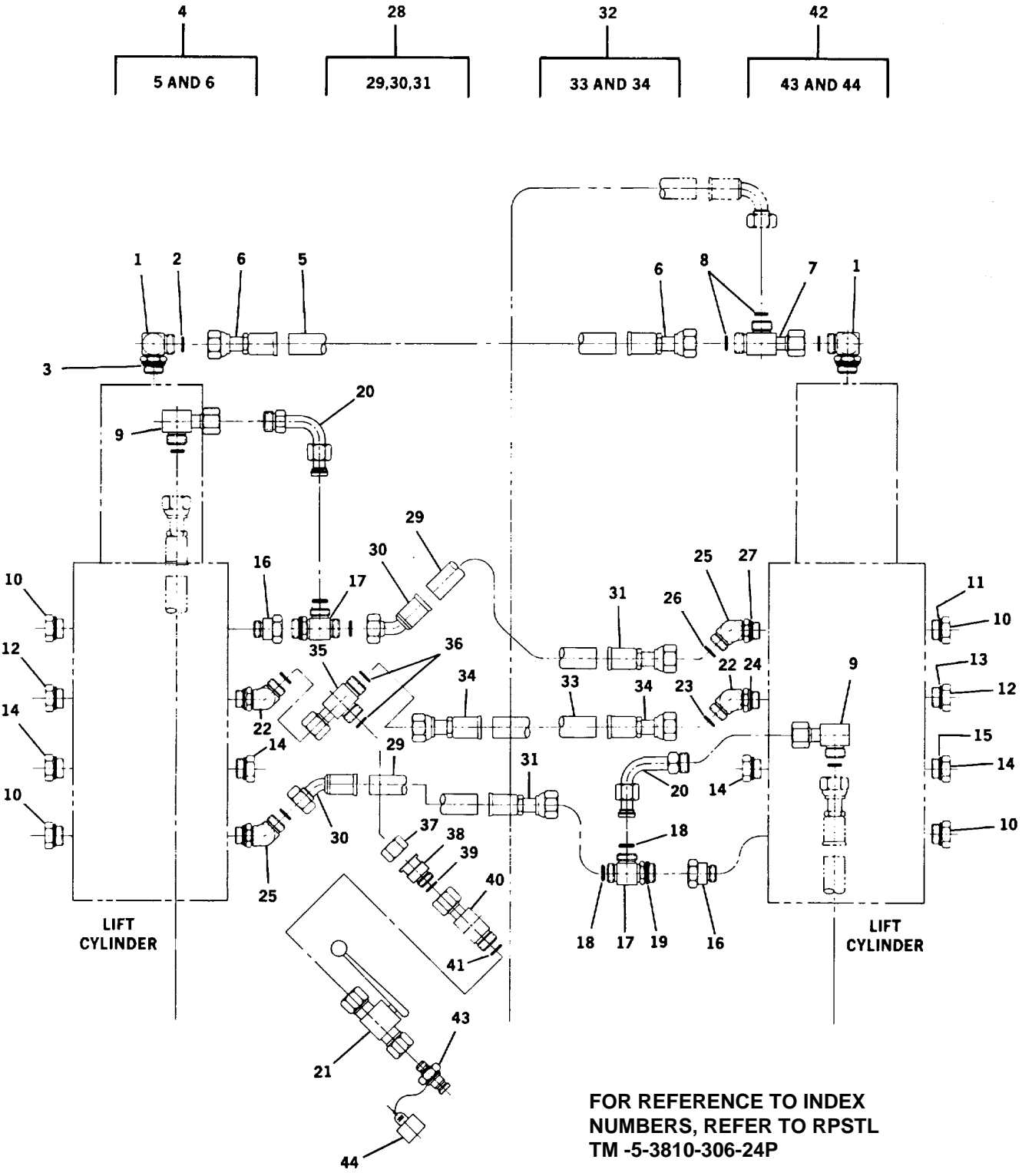
2. CONNECT GROUND CABLE AT SHUNT. (REFER TO PAGE 8-109.)

3. START ENGINE AND CHECK LIFT CYLINDER FUNCTION. CHECK FOR LEAKS. (REFER TO TM 5-3810-306-10.)

INSTALLATION:

1. INSTALL HYDRAULIC LINE.

END OF TASK



LIFT CYLINDER HYDRAULIC LINES, VALVES

TOOLS: General mechanic's tool kit: automotive (5180-00-177-7033)

SUPPLIES: Loctite 545 (Item 13, Appendix C)
 Preformed packings as required

EQUIPMENT CONDITIONS: Disconnect ground cable at shunt. (Refer to page 8-109.)

REMOVAL:

NOTE

Use the following procedure to replace all hydraulic lines.

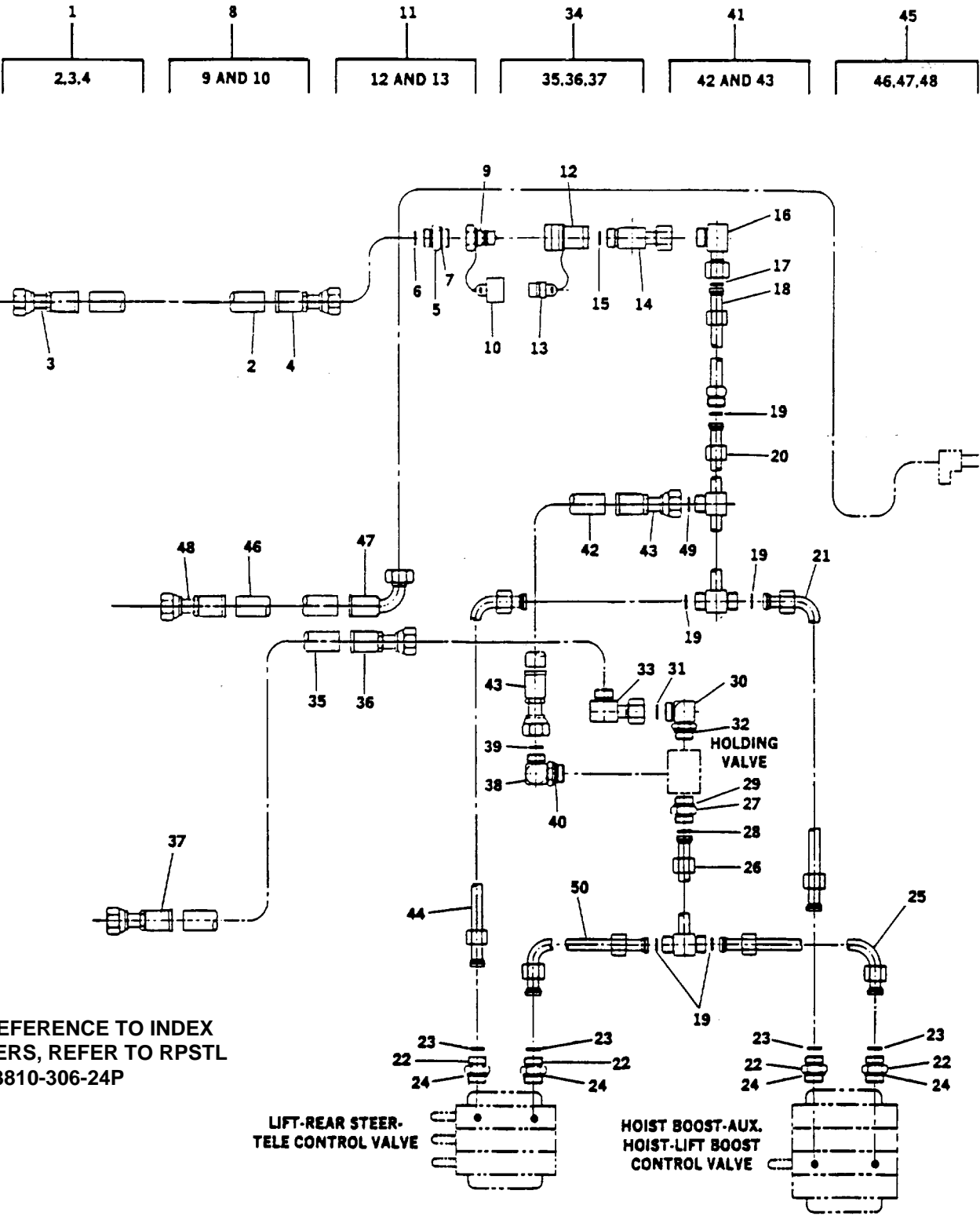
1. REMOVE HYDRAULIC LINE.
 - a. Tag and disconnect both ends of hydraulic line. Remove line and preformed packings. Note routing for ease in installation.
 - b. Remove fittings and preformed packing as necessary. Discard preformed packings.
 - c. Inspect all parts for damage and replace as required.

- a. Coat threads with Loctite 545 and preformed packings with clean hydraulic fluid prior to installation.
 - b. Install fittings and new preformed packing. Tighten securely.
 - c. Route hydraulic line and connect both ends with new preformed packings. Tighten securely.
2. CONNECT GROUND CABLE AT SHUNT. (REFER TO PAGE 8-109.)
 3. START ENGINE AND CHECK LIFT CYLINDER FUNCTION. CHECK FOR LEAKS. (REFER TO TM 5-3810-306-10.)

END OF TASK

INSTALLATION:

1. INSTALL HYDRAULIC LINE.



FOR REFERENCE TO INDEX
NUMBERS, REFER TO RPSTL
TM -5-3810-306-24P

OUTRIGGER LINES

TOOLS: General mechanic's tool kit: automotive (5180-00-177-7033)

SUPPLIES: Loctite 545 (Item 13, Appendix C)
Preformed packings as required

EQUIPMENT CONDITIONS: Disconnect ground cable at shunt. (Refer to page 8-109.)

REMOVAL:

NOTE

Use the following procedure to replace all hydraulic lines.

1. REMOVE HYDRAULIC LINE.
 - a. Tag and disconnect both ends of hydraulic line. Remove line and preformed packing. Note routing for ease in installation.
 - b. Remove fittings and preformed packings as necessary. Discard preformed packings.
 - c. Inspect all parts for damage and replace as required.

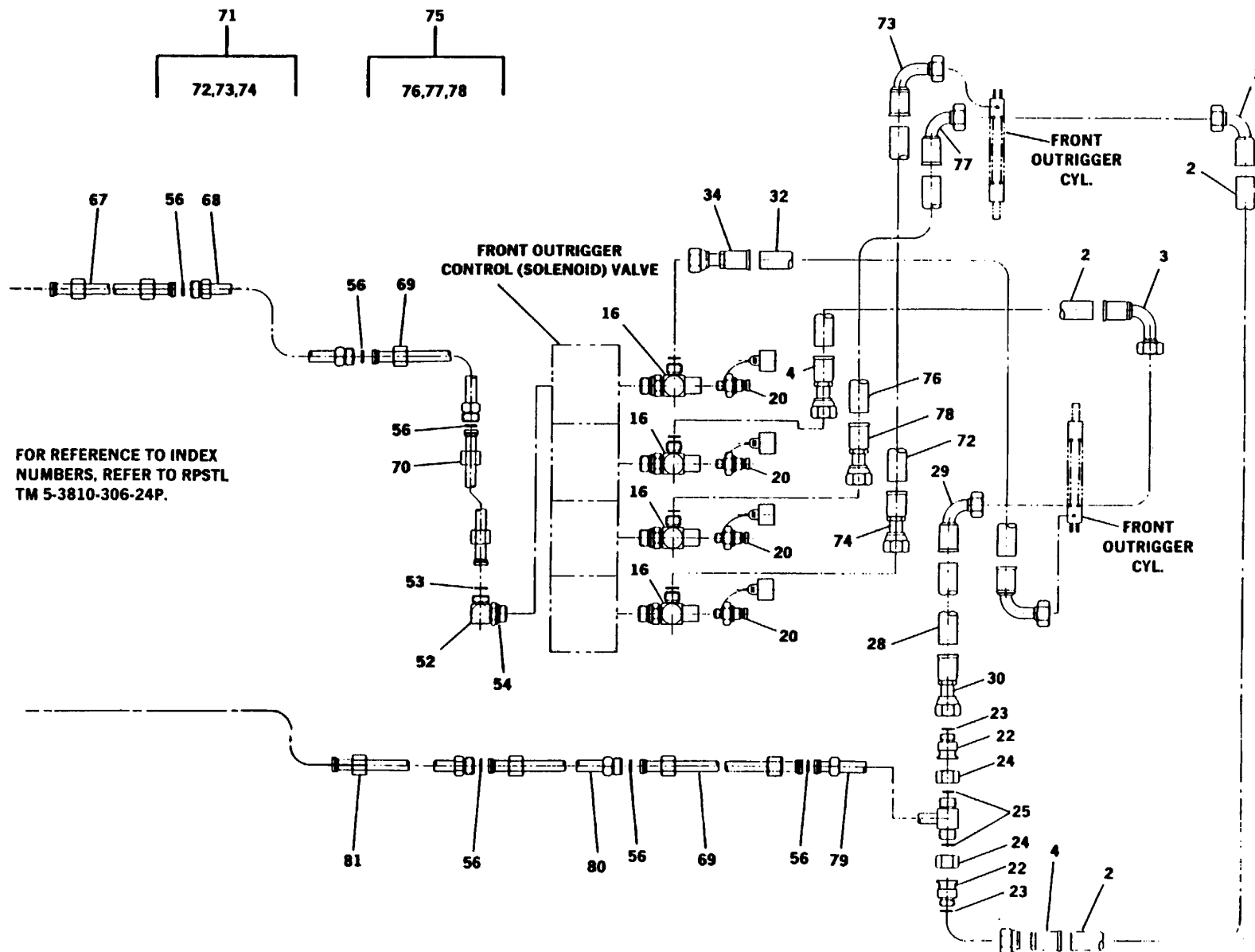
- a. Coat threads with Loctite 545 and preformed packings with clean hydraulic oil prior to installation.
- b. Install fittings and new preformed packing. Tighten securely.
- c. Route hydraulic line and connect both ends with new preformed packings. Tighten securely.

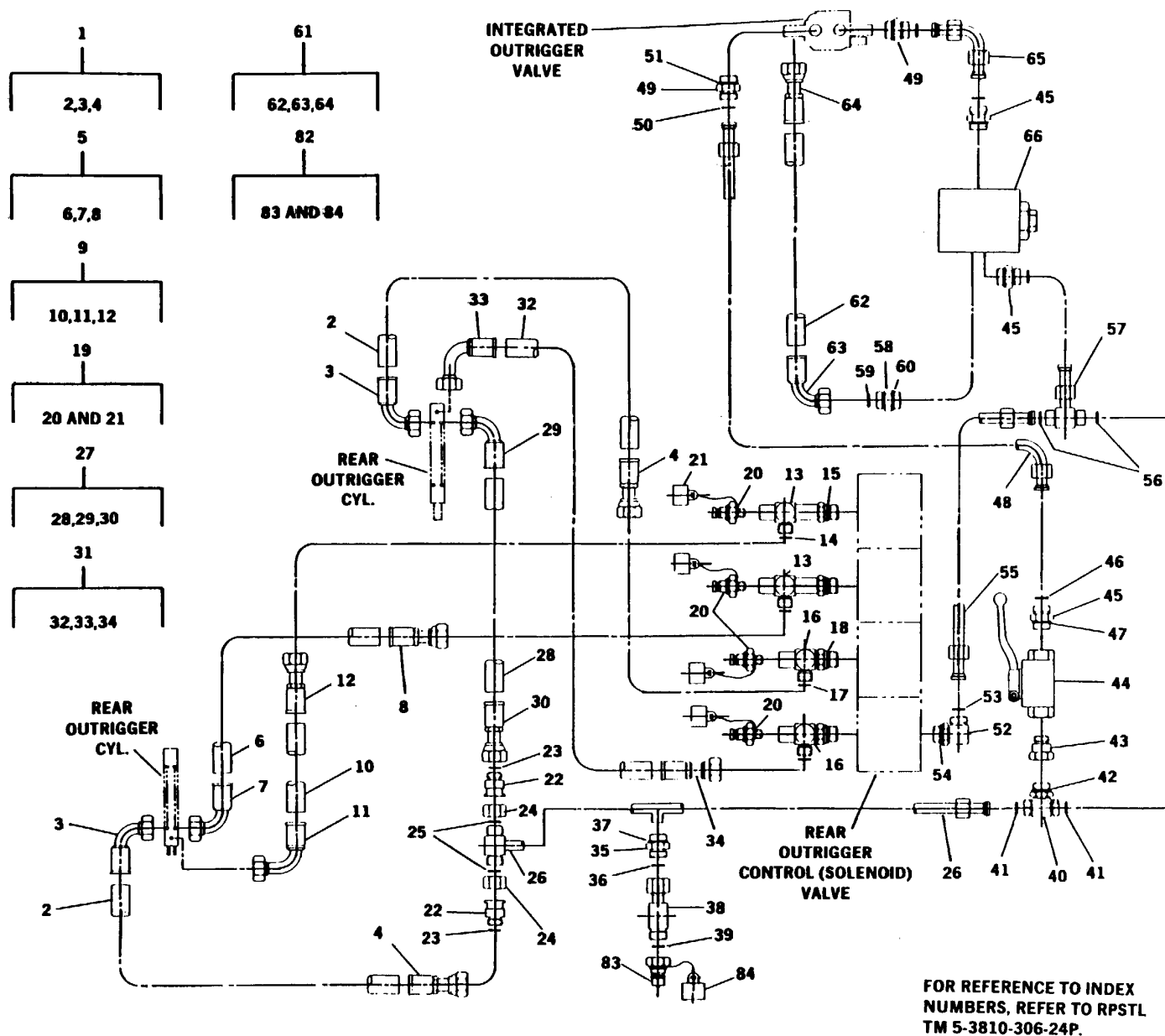
2. CONNECT GROUND CABLE AT SHUNT. (REFER TO PAGE 8-109.)
3. START ENGINE AND CHECK OUTRIGGER FUNCTIONS. CHECK FOR LEAKS. (REFER TO TM 5-3810-306-10.)

END OF TASK

INSTALLATION:

1. INSTALL HYDRAULIC LINE.





SUPPLY, PRESSURE, AND RETURN LINES, CARRIER

TOOLS: General mechanic's tool kit: automotive (5180-00-177-7033)

SUPPLIES: Loctite 545 (Item 13, Appendix C)
Preformed packings as required

EQUIPMENT CONDITIONS: Disconnect ground cable at shunt. (Refer to page 8-109.)

REMOVAL:

NOTE

Use the following procedure to replace all hydraulic lines.

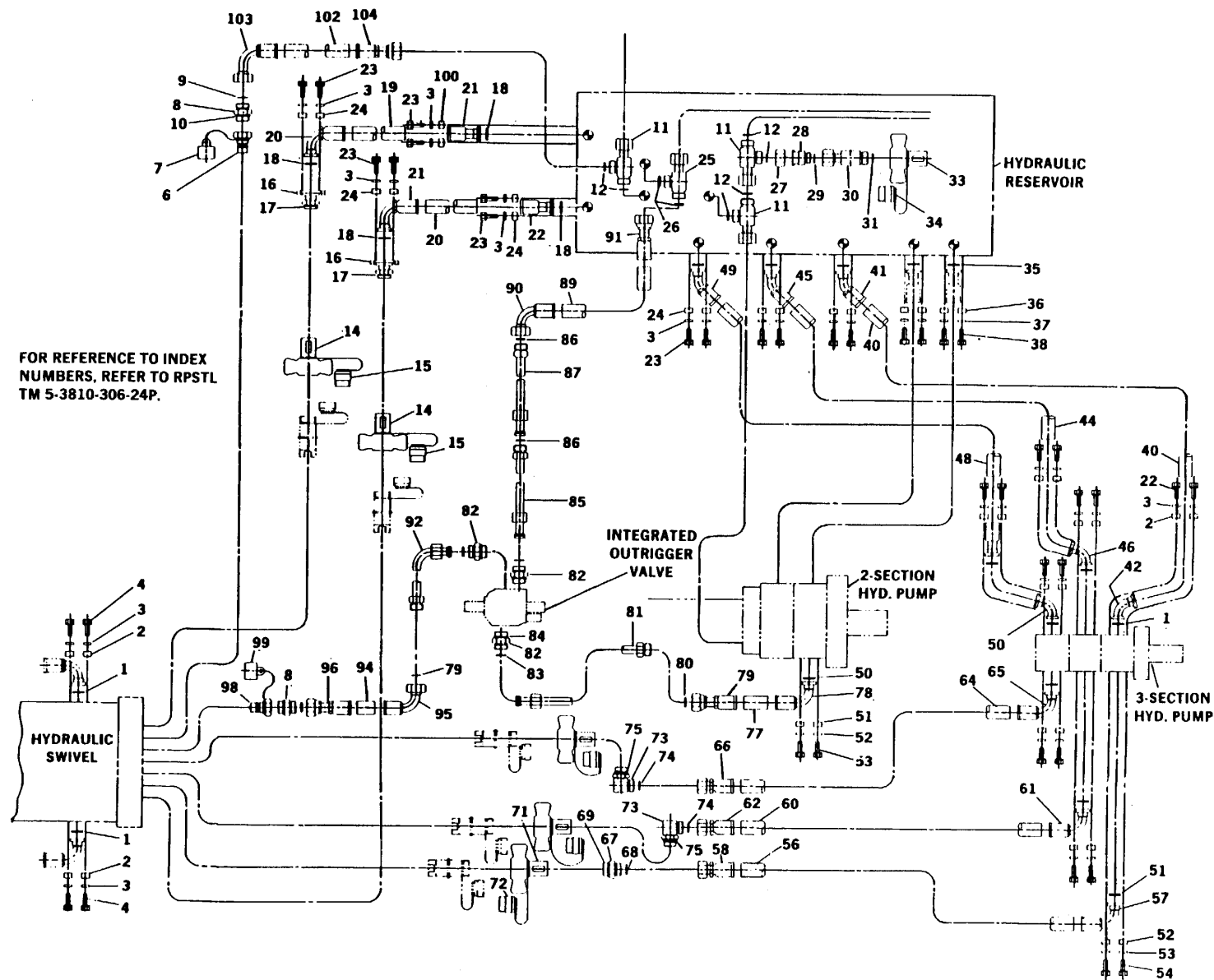
1. REMOVE HYDRAULIC LINE.
 - a. Tag and disconnect both ends of hydraulic line. Remove line and preformed packing. Note routing for ease in installation.
 - b. Remove fittings and preformed packings as necessary. Discard preformed packings.
 - c. Inspect all parts for damage and replace as required.

- a. Coat threads with Loctite 545 and preformed packings with clean hydraulic oil prior to installation.
 - b. Install fittings and new preformed packing. Tighten securely.
 - c. Route hydraulic line and connect both ends with new preformed packings. Tighten securely.
2. CONNECT GROUND CABLE AT SHUNT. (REFER TO PAGE 8-109.)
 3. START ENGINE AND CHECK ALL HYDRAULIC FUNCTIONS. INSPECT FOR LEAKS. (REFER TO TM 3810-306-10.)16-38

END OF TASK

INSTALLATION:

1. INSTALL HYDRAULIC LINE.



SUPPLY, PRESSURE, AND RETURN LINES, SUPERSTRUCTURE

TOOLS: General mechanic's tool kit: automotive (5180-00-177-7033)

SUPPLIES: Loctite 545 (Item 13, Appendix C)
Preformed packings as required

EQUIPMENT CONDITIONS: Disconnect ground cable at shunt. (Refer to page 8-109.)

REMOVAL:

NOTE

Use the following procedure to replace all hydraulic lines.

1. REMOVE HYDRAULIC LINE.

a. Tag and disconnect both ends of hydraulic line. Remove line and preformed packing. Note routing for ease in installation.

b. Remove fittings and preformed packings as necessary. Discard preformed packings.

c. Inspect all parts for damage and replace as required.

a. Coat threads with Loctite 545 and performed packings with clean hydraulic oil prior to installation.

b. Install fittings and new preformed packing. Tighten securely.

c. Route hydraulic line and connect both ends with new preformed packings. Tighten securely.

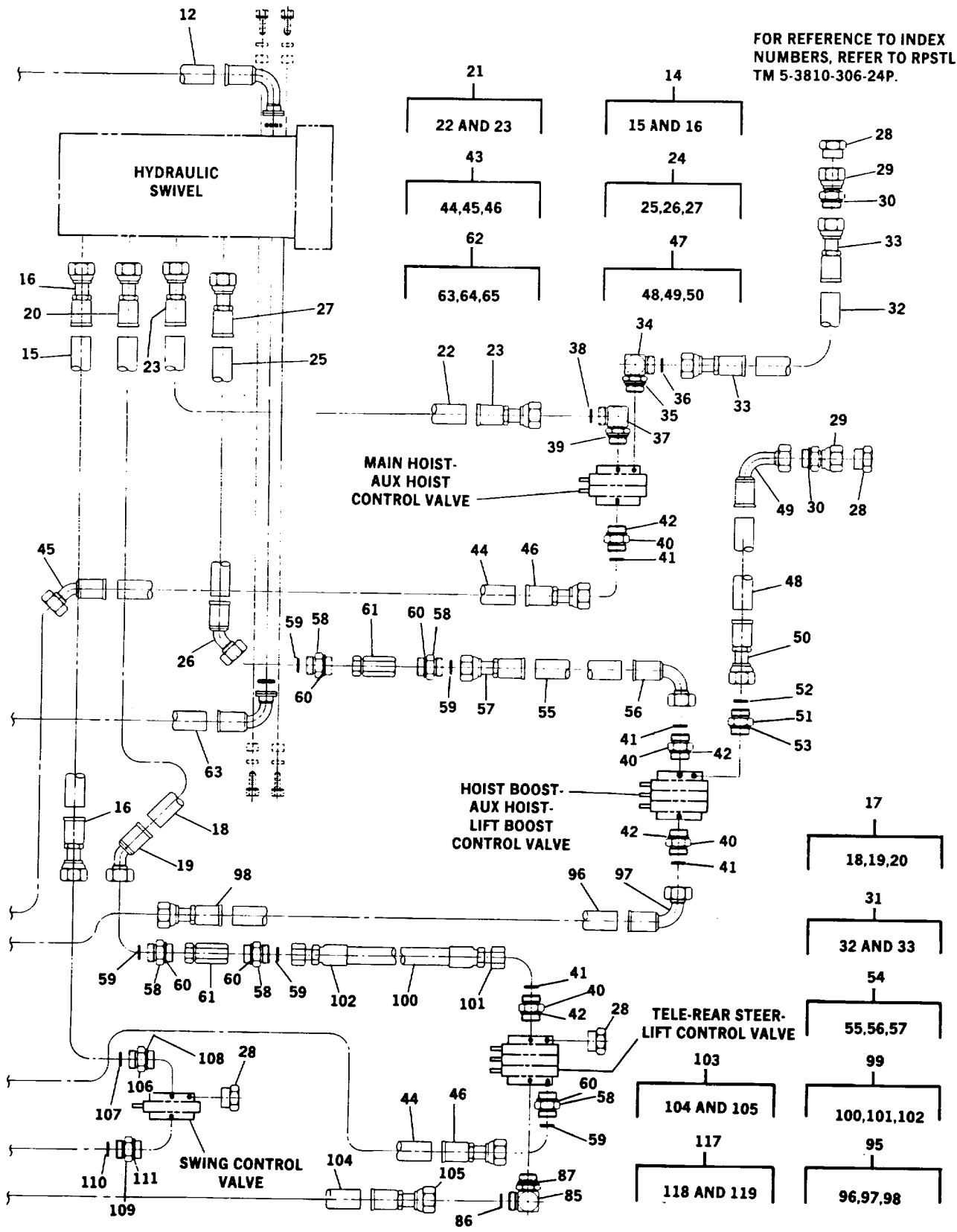
2. CONNECT GROUND CABLE AT SHUNT. REFER TO PAGE 8-109.)

3. START ENGINE AND CHECK HYDRAULIC FUNCTIONS. CHECK FOR LEAKS. (REFER TO TM 5-3810-306-10.)

END OF TASK

INSTALLATION:

1. INSTALL HYDRAULIC LINE.



TELESCOPE HYDRAULIC LINES

TOOLS: General mechanic's tool kit: automotive (5180-00-177-7033)

SUPPLIES: Loctite 545 (Item 13, Appendix C)
Preformed packings as required

EQUIPMENT CONDITIONS: Disconnect ground cable at shunt. (Refer to page 8-109.)

REMOVAL:

NOTE

Use the following procedure to replace all hydraulic lines.

1. REMOVE HYDRAULIC LINE.

- a. Tag and disconnect both ends of hydraulic line. Remove line and preformed packing. Note routing for ease in installation.
- b. Remove fittings and preformed packings as necessary. Discard preformed packings.
- c. Inspect all parts for damage and replace as required.

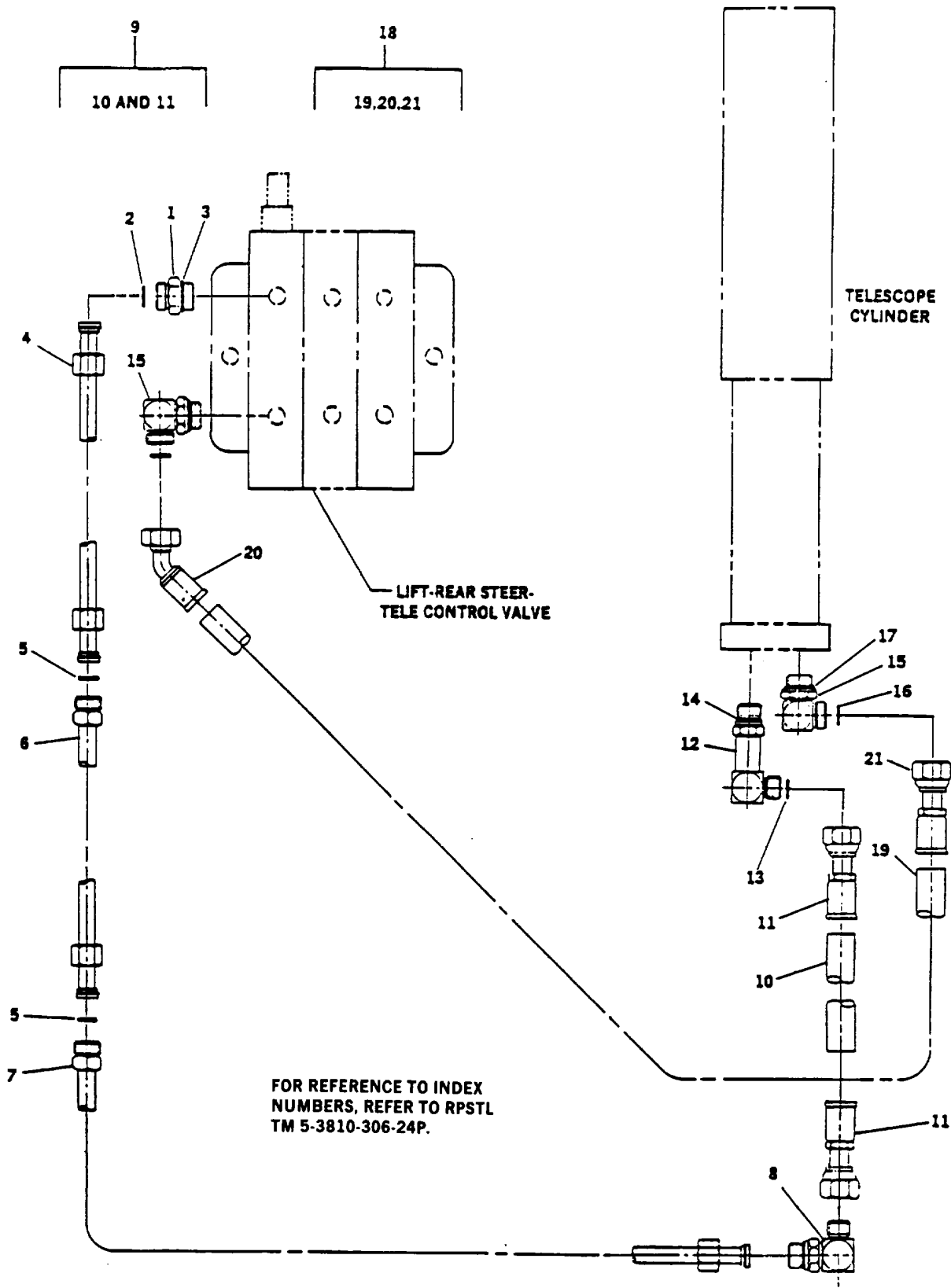
- a. Coat threads with Loctite 545 and preformed packings with clean hydraulic oil prior to installation.
- b. Install fittings and new preformed packing. Tighten securely.
- c. Route hydraulic line and connect both ends with new preformed packings. Tighten securely.

- 2. CONNECT GROUND CABLE AT SHUNT. (REFER TO PAGE 8-109.)
- 3. START ENGINE AND CHECK BOOM TELESCOPE FUNCTION. CHECK FOR LEAKS. (REFER TO TM 5-3810-306-10.)

INSTALLATION:

1. INSTALL HYDRAULIC LINE.

END OF TASK



Section III. HYDRAULIC RESERVOIR MAINTENANCE

EMERGENCY HAND PUMP INSTALLATION

TOOLS: General mechanic's tool kit: automotive (5180-00-177-7033)

SUPPLIES: Lockwashers (Item 15, Appendix C)
Preformed packing (Item 12, Appendix C)
Hydraulic oil (Item 6, Appendix C)
Loctite #545 (Item 13, Appendix C)

EQUIPMENT CONDITIONS: Disconnect ground cable at shunt. (Refer to page 8-109.)

REMOVAL:

- 1. REMOVE EMERGENCY HAND PUMP (2).
a. Tag and disconnect one hydraulic hose (1) to emergency hand pump (2). Discard preformed packing (8).
b. Remove four capscrews (4), lockwashers (5) and flatwashers (6) securing hand pump (2) on mounting bracket (7). Discard lockwashers (5).
c. Remove emergency hand pump (2).
d. Place pump in vice and remove fittings (3) and retain for reassembly.

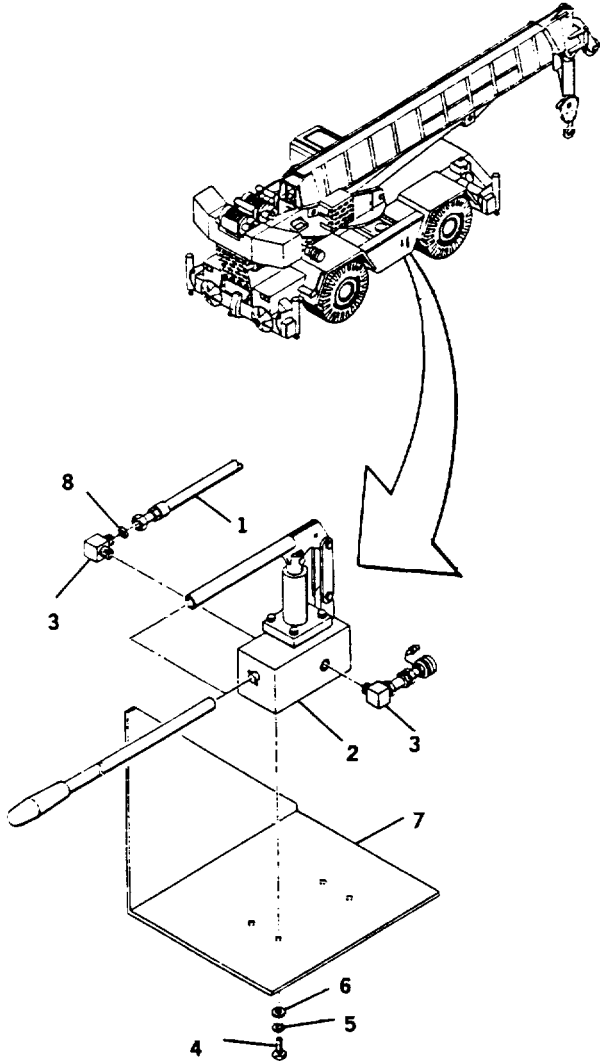
INSTALLATION:

- 1. INSTALL EMERGENCY HAND PUMP (2).

NOTE

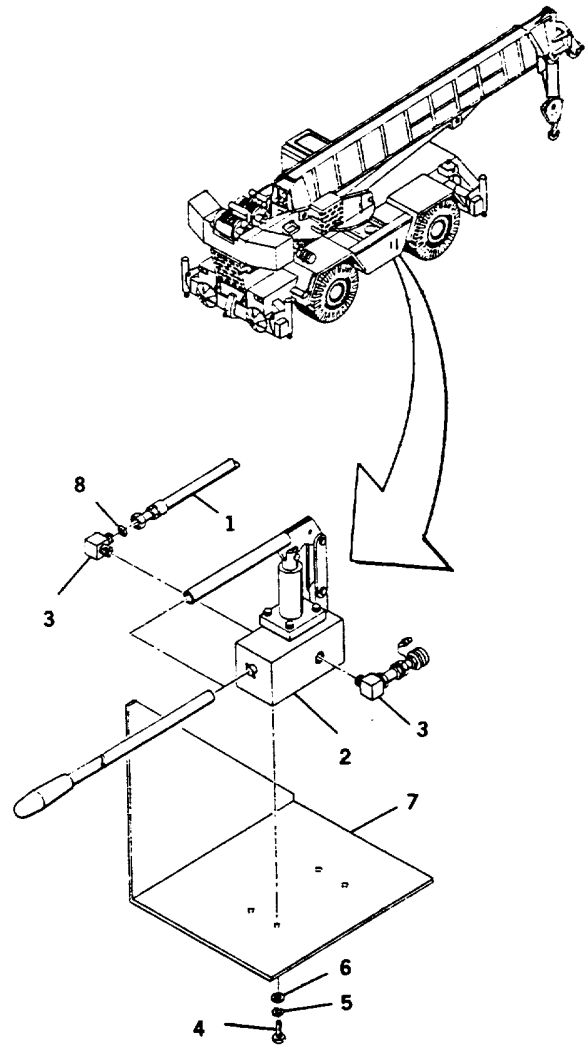
Coat threads on fittings and hoses with Loctite 545. Coat preformed packing with clean hydraulic oil.

- a. Install fittings (3) on hand pump (2).



- b. Position emergency hand pump onto mounting bracket (7), align holes and secure with four capscrews (4), new lockwashers (5) and flatwashers (6).
 - c. Remove tags and install hydraulic hose (1) with new preformed packing (8) to emergency hand pump (2).
2. CONNECT GROUND CABLE AT SHUNT. (REFER TO PAGE 8-109.)
 3. CHECK FOR PROPER OPERATION WHILE PERFORMING EMERGENCY LOAD LOWER PROCEDURES (REFER TO TM 5-3810-30610.)

END OF TASK



HYDRAULIC RESERVOIR REPLACEMENT

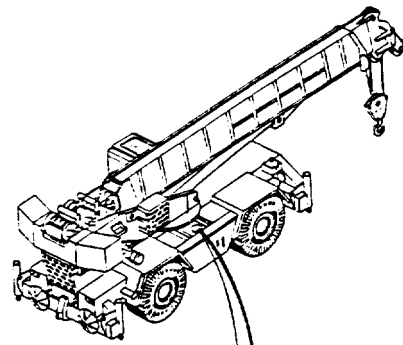
TOOLS: General mechanic's tool kit: automotive (5180-00-177-7033)
 Drain pan
 Lifting device (2 ton (1812 Kg) capacity)

SUPPLIES: Clean rags (Item 1, Appendix C)
 Preformed Packings (As Required)

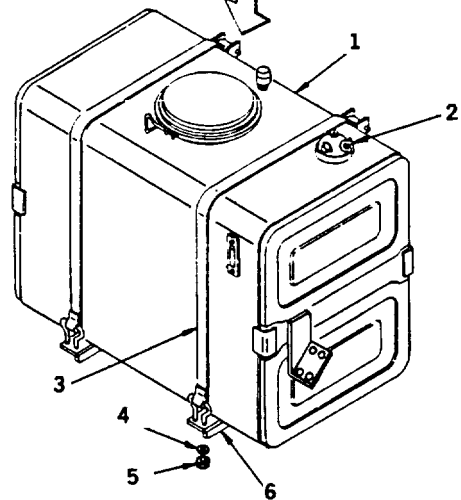
EQUIPMENT CONDITIONS: Disconnect ground cable at shunt. (Refer to page 8-109.)
 All hydraulic systems are shut down.
 Hydraulic reservoir is empty.
 Area near hydraulic hoses is clean and free of debris.
 Hydraulic tank cover assembly removed. (Refer to page 15-22.)
 Emergency hand pump removed. (Refer to page 16-46.)

REMOVAL:

1. REMOVE HYDRAULIC RESERVOIR (1).
 - a. Tag and disconnect all hydraulic lines from back of reservoir. Plug lines and openings.
 - b. Remove four locknuts (5) and flatwashers (4) to free strap (3) on reservoir (1).
 - c. Lift tank from support bracket (6) with lifting device.

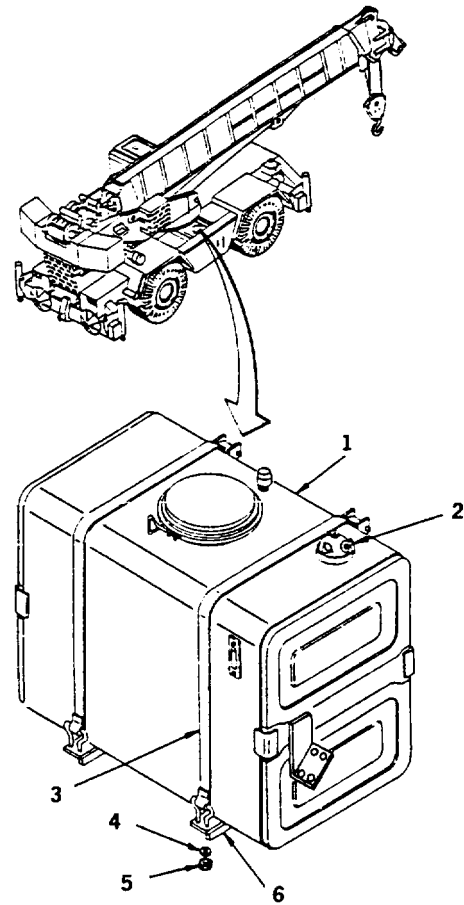
**INSTALLATION:**

1. INSTALL HYDRAULIC RESERVOIR (1).
 - a. Lift and place reservoir (1) on support bracket (6). Secure straps (3) with locknuts (5) and flatwashers (4).
 - b. Remove plugs and ensure preformed packings in hydraulic lines are not damaged. Replace if necessary.
 - c. Remove tags and install hydraulic hoses to reservoir.



2. REMOVE FILTER HEAD (2) AND FILL RESERVOIR TO NORMAL LEVEL. (REFER TO PAGE 16-46.)
3. CONNECT GROUND CABLE AT SHUNT. (REFER TO PAGE 8-109.)
4. START ENGINE AND CHECK ALL HYDRAULIC FUNCTIONS. CHECK FOR LEAKS. (REFER TO TM 5-3810-306-10.)

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.

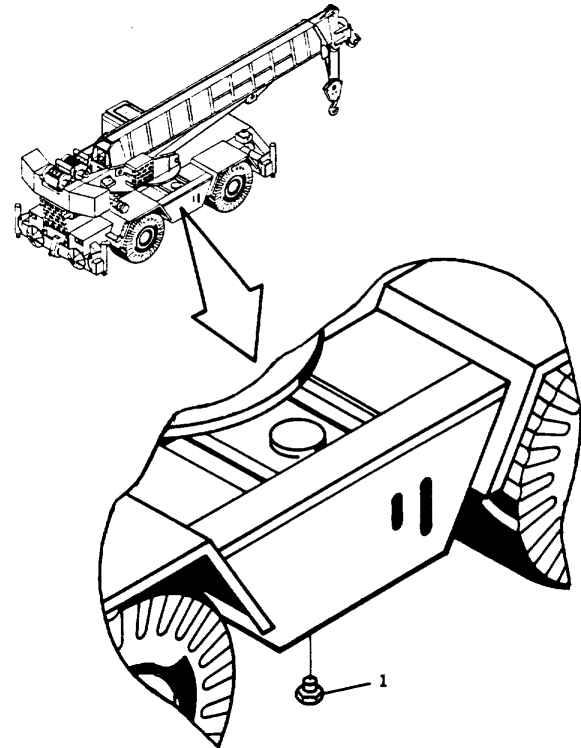
1. DRAIN HYDRAULIC RESERVOIR.

- 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 53810-306-10.)



- 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 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

HYDRAULIC CONTROL VALVE RELIEF SETTING CHECKS AND ADJUSTMENT

TOOLS: Pressure gauge (0 to 5000 psi)
General mechanic's tool kit: automotive (5180-00-177-7033)

SUPPLIES: None

EQUIPMENT CONDITIONS: None

GENERAL:

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 made using the correct equipment, after the need for adjustment has been 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.

CAUTION

Do not hold relief valve open for more than one minute at a time.

NOTE

Release control lever after taking each reading and while making adjustments.

NOTE

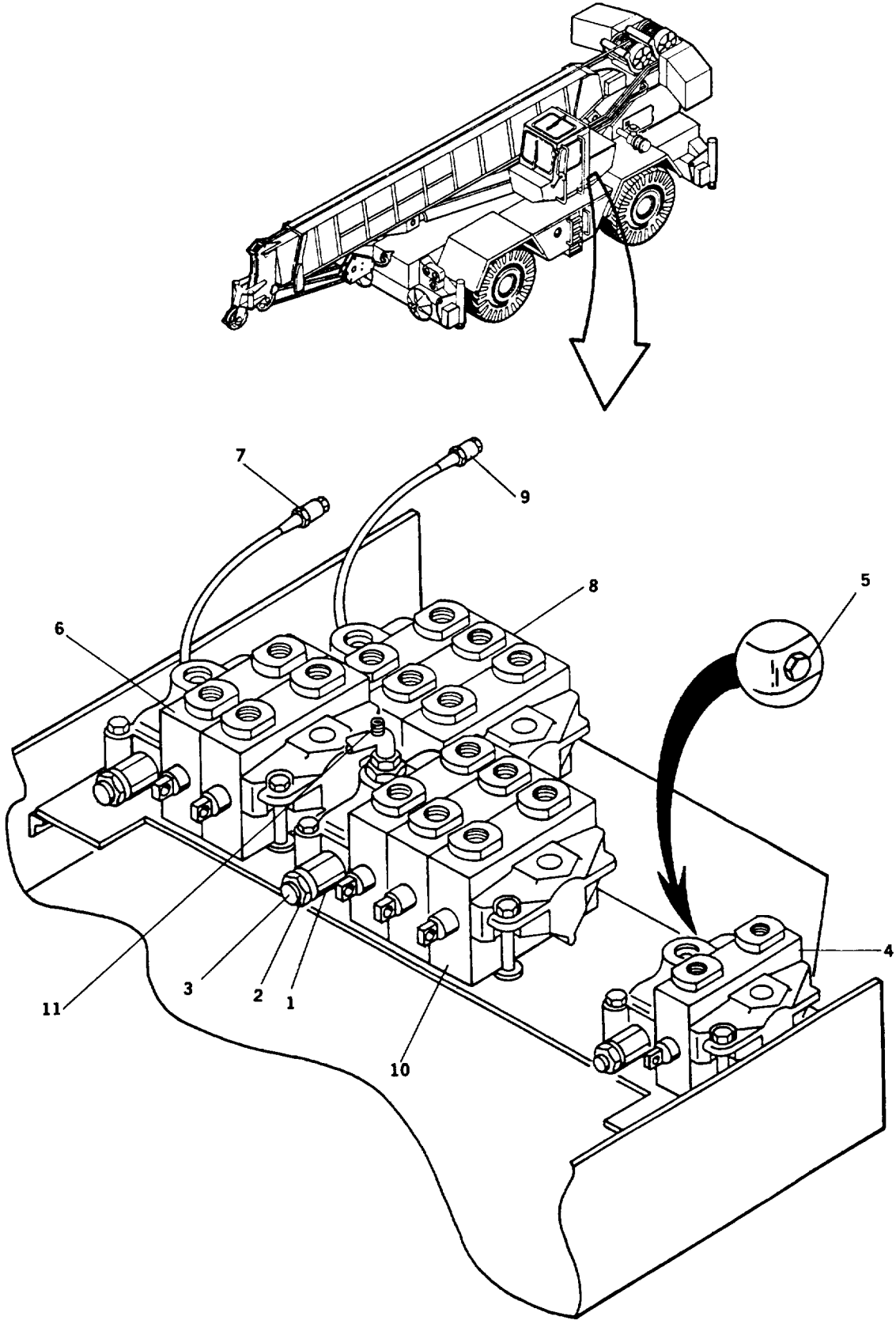
An accurate 0 to 5000 psi (0 to 34,475 kPa/345 bar) pressure gauge should be used when adjusting relief valves.

1. ADJUST RELIEF VALVE (1).
 - a. Loosen locknut (2).
 - b. Turn adjusting screw (3) in to increase pressure or out to decrease pressure to obtain desired relief pressure as indicated on pressure gauge.

CAUTION

Do not overtighten the adjusting screw (3) or locknut (2).

- c. Hold adjusting screw (3) and tighten locknut (2).
- d. Recheck pressure setting.



2. PREPARE FOR RELIEF PRESSURE CHECKS.

- a. Start and warm up the engine until the hydraulic oil temperature reaches a minimum of 70 degrees F (21.1 degrees C). (Refer to TM 5-3810-306-10.)

WARNING

Do not attempt to loosen the fittings in pressurized lines or while hydraulic pumps are in operation.

- b. Shut down the engine.

NOTE

The pressure reading recorded may be + 100 psi (689 kPa/6.89 bar) of that listed.

3. CHECK SINGLE SECTION VALVE BANK (SWING) (4) RELIEF VALVE SETTING.

- a. Remove plug (5) from pressure test port and connect flexible hose and pressure gauge.
- b. Start engine and run at maximum rpm. (Refer to TM 5-3810-30610.)
- c. Ensure swing brake is engaged and positive swing lock is engaged. (Refer to TM 5-3810306-10.)
- d. Activate the swing control lever fully to either LEFT or RIGHT and hold momentarily.
- e. Note the maximum reading on pressure gauge. If reading is not 1500 psi (10,342.5 kPa/ 103.42 bar), adjust relief valve.
- f. Shut down engine.

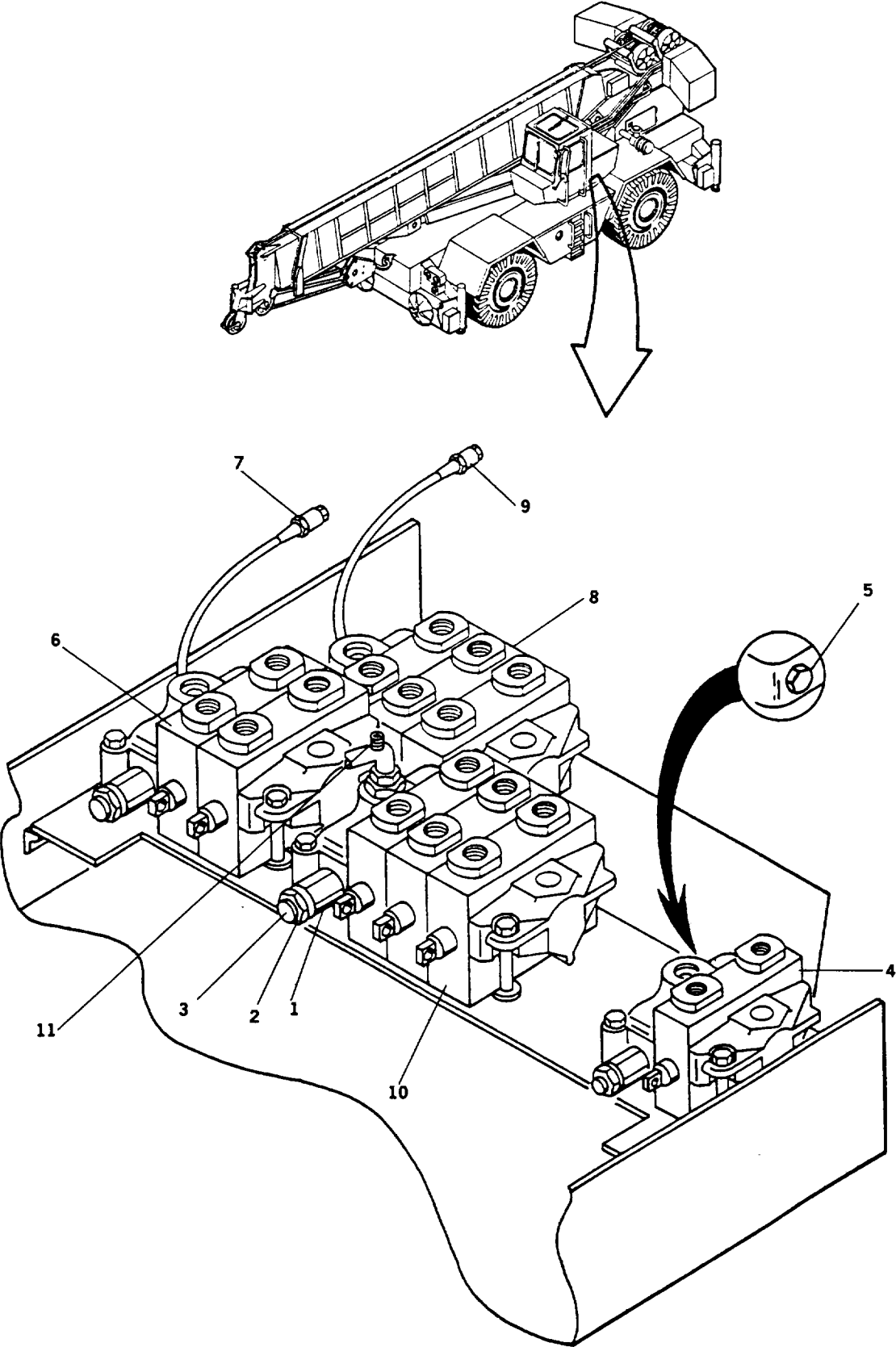
- g. Remove pressure gauge and install plug in pressure test port.

4. CHECK TWO SECTION VALVE BANK (MAIN HOIST/AUX HOIST BOOST) (6) RELIEF VALVE SETTING.

- a. Remove plug (7) from pressure test port and connect flexible hose and pressure gauge.
- b. Disconnect main hoist brake release line using the quick disconnect (outer line entering the brake housing). This will prevent release of the brake.
- c. Start engine and run at maximum rpm. (Refer to TM 5-3810-30610.)
- d. Activate MAIN HOIST control lever fully to DOWN and hold momentarily.
- e. Note the maximum reading on pressure gauge. If reading is not 2700 psi (18,617/186.1 bar), adjust relief valve.
- f. Shut down engine.
- g. Remove pressure gauge and install plug in pressure test port.
- h. Reconnect main hoist brake release line quick disconnect.

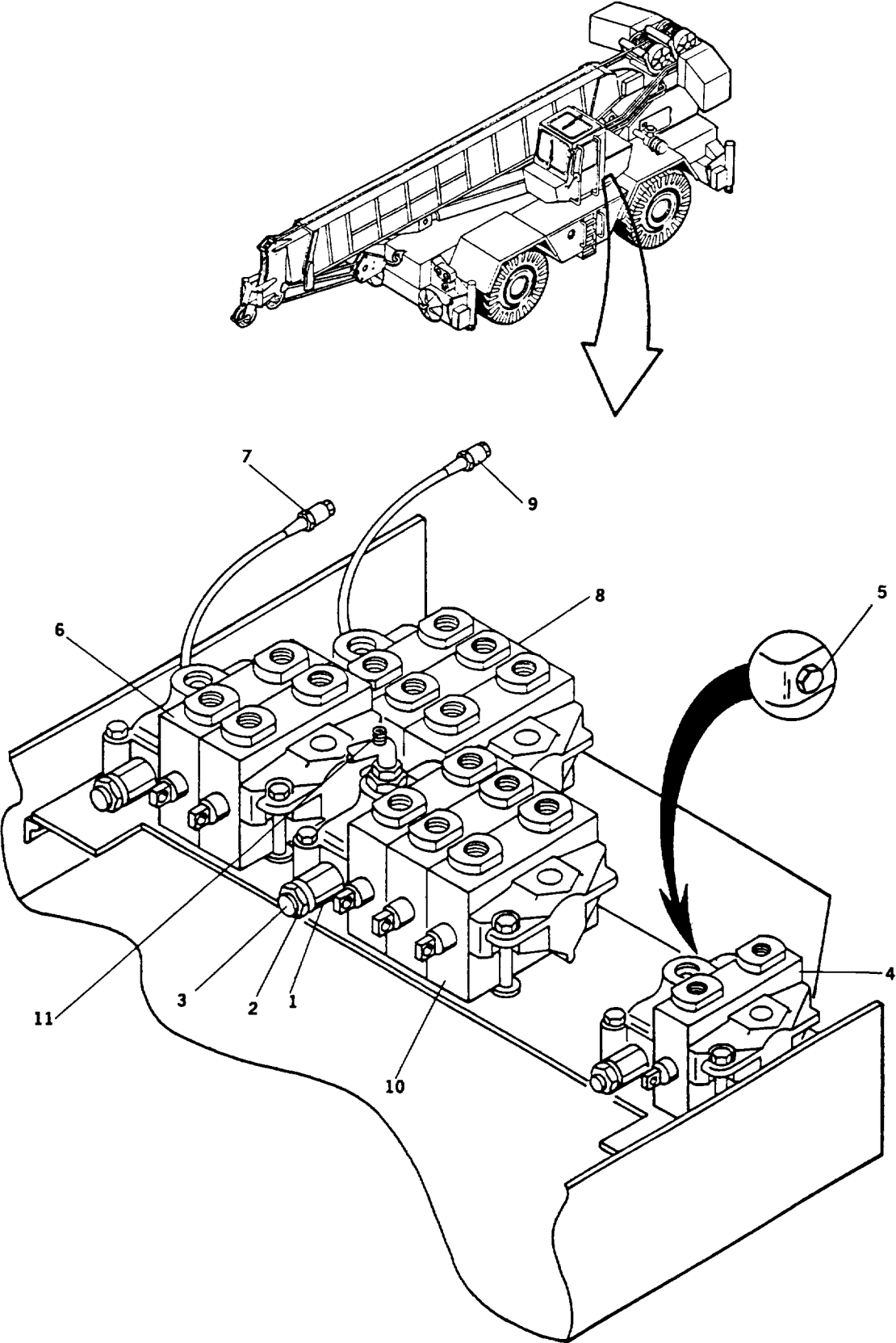
5. CHECK THREE SECTION VALVE BANK (LIFT/REAR STEER/TELESCOPE) (8) RELIEF VALVE SETTING.

- a. Remove plug (9) from pressure test port and connect flexible hose and pressure gauge.
- b. Start engine and run at maximum rpm. (Refer to TM 5-3810-30610.)



- c. Extend and set the outriggers raising the wheels off the ground. (Refer to TM 5-3810306-10.)
 - d. Activate the REAR STEER control lever to either LEFT or RIGHT and hold momentarily with the wheels fully turned.
 - e. Note the maximum reading on pressure gauge. If reading is not 2500 psi (17,238 kPa/172.3 bar), adjust relief valve.
 - f. Center rear wheels, retract and stow the outriggers. (Refer to TM 5-3810-306-10.)
 - g. Shut down engine.
 - h. Remove pressure gauge and install plug in pressure test port.
6. CHECK THREE SECTION VALVE BANK (MAIN HOIST BOOST/AUX HOIST/LIFT BOOST) (10) RELIEF VALVE SETTING.
- a. Remove plug (11) from pressure test port and connect flexible hose and pressure gauge.
 - b. Disconnect aux hoist brake release line using the quick disconnect (outer line entering the brake housing). This will prevent release of the brake.
 - c. Start engine and run at maximum rpm. (Refer to TM 5-3810-30610.)
 - d. Activate AUX HOIST control lever fully to DOWN and hold momentarily.
 - e. Note the maximum reading on pressure gauge. If reading is not 2700 psi (18,617 kPa/186.1 bar), adjust relief valve.
 - f. Shut down engine.
 - g. Remove pressure gauge and install plug in pressure test port.
 - h. Reconnect aux hoist brake release line quick disconnect.
7. INTEGRATED OUTRIGGER CONTROL VALVE (12) RELIEF VALVE SETTING.
- a. Disconnect retract line from any one of the jack cylinders and install pressure gauge in this line.
 - b. Start engine and run at maximum rpm. (Refer to TM 5-3810-30610.)
 - c. On outrigger control panel, position the toggle switch to RETRACT and hold momentarily.
 - d. Note the maximum reading on pressure gauge. If reading is not 2500 psi (17,238 kPa/ 172.3 bar), adjust relief valve.
 - e. Shut down engine.
 - f. Remove pressure gauge and connect retract line to jack cylinder.

END OF TASK



CHAPTER 17
BOOM MAINTENANCE

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Section I. BOOM ASSEMBLY MAINTENANCE

AUXILIARY BOOM NOSE INSTALLATION

TOOLS: General mechanic's tool kit: automotive (5180-00-177-7033)
Lifting device (2 ton (1812 Kg) capacity)

SUPPLIES: Pin clip (Item 47, Appendix C)
Pin clip (Item 48, Appendix C) (2 Required)

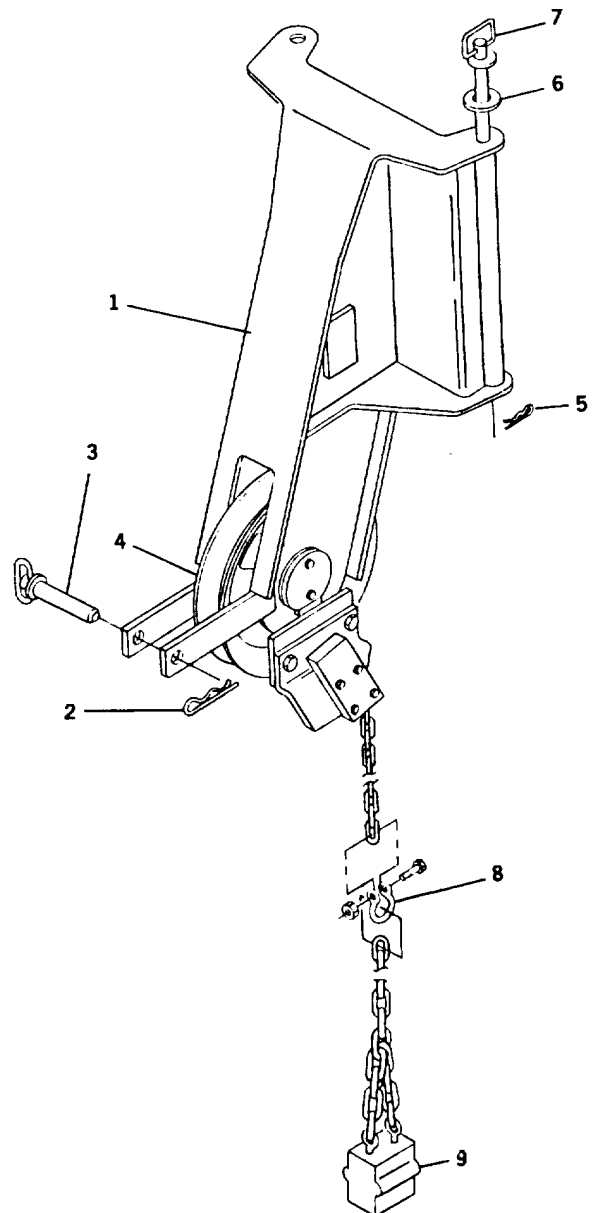
EQUIPMENT CONDITIONS: Overhaul ball removed if required or lowered to ground.
(Refer to page 17-4.)
Boom lowered. (Refer to TM 5-3810-306-10.)
Unplug Anti-Two Block (A2B) cable.

REMOVAL:

1. REMOVE AUXILIARY BOOM NOSE (1).
 - a. Remove pin clip (2) and lock pin (3). Discard pin clip (2).
 - b. Remove hoist cable from auxiliary boom nose sheave (4).
 - c. Disconnect weight (9) at clevis (8) on support chain.
 - d. Support auxiliary boom nose and remove two pin clips (5), lock pins (7) and washers (6). Discard pin clips (5).
 - e. Remove auxiliary boom nose (1).

INSTALLATION:

1. INSTALL AUXILIARY BOOM NOSE (1).
 - a. Using suitable lifting device, position auxiliary boom nose (1).
 - b. Install two lock pins (7), washers (6) and secure with new pin clips (5).



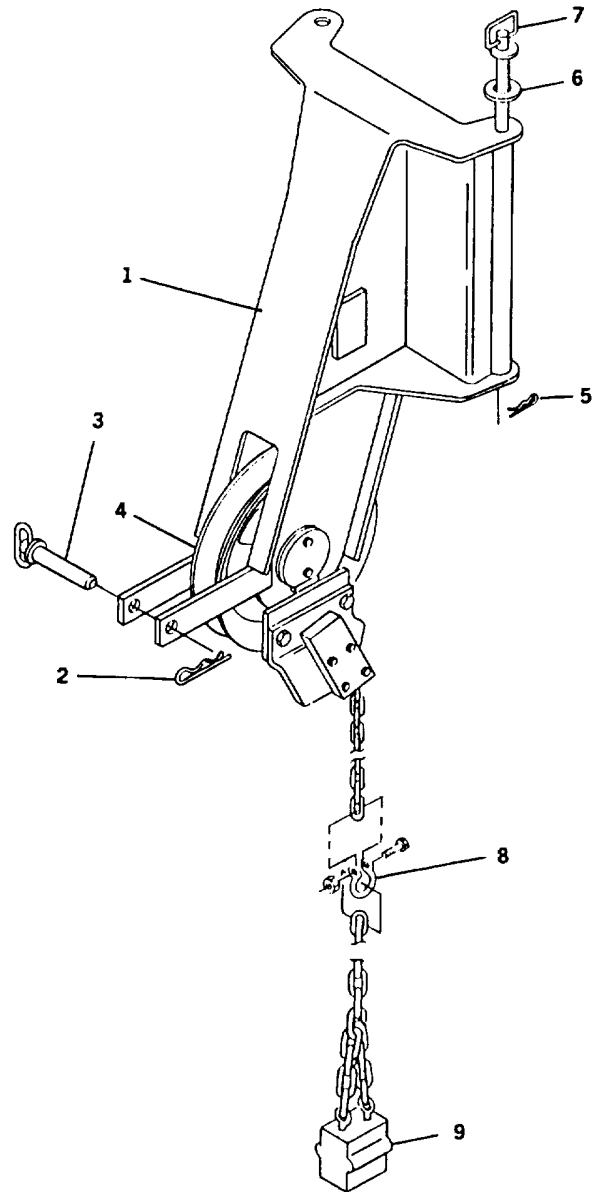
- c. Route cable from hoist over sheave (4).
 - d. Install lock pin (3) and secure with new pin clip (2).
 - e. Connect weight (9) to clevis (8) on support chain.
2. INSTALL OVERHAUL BALL, IF REMOVED.

NOTE

Lifting capacity of auxiliary hoist with a single part line over auxiliary boom nose is limited to 4.5 tons.

- 3. CHECK AUXILIARY BOOM NOSE FOR PROPER OPERATION. (REFER TO TM 5-3810-306-10.)

END OF TASK



OVERHAUL BALL INSTALLATION

TOOLS: General mechanic's tool kit: automotive (5180-00-177-7033).

SUPPLIES: Cotter pin (Item 45, Appendix C)
Never-Seeze (Item 55, Appendix C)

EQUIPMENT CONDITIONS: Overhaul ball lowered to ground. (Refer to TM 5-3810-306-10.)

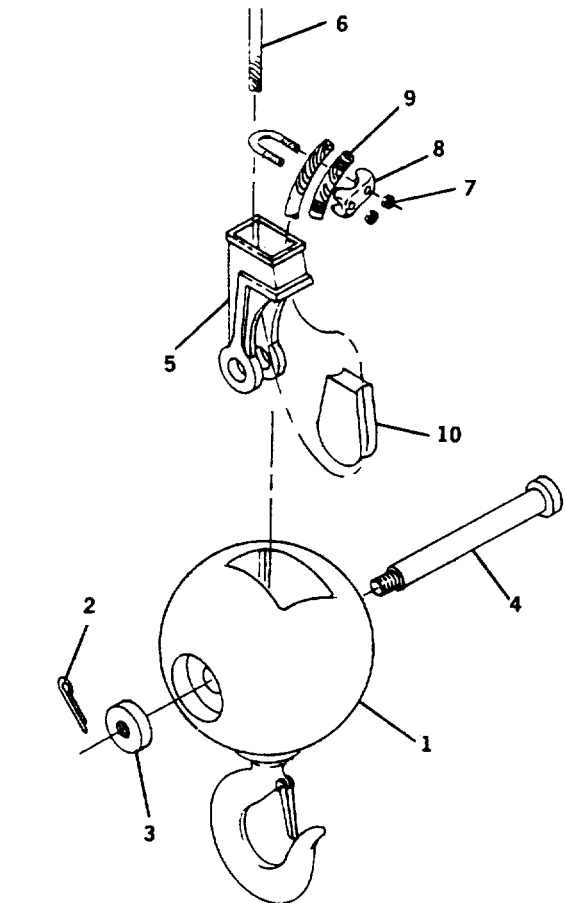
REMOVAL:

1. REMOVE OVERHAUL BALL (1).

WARNING

The hook assembly is secured by pin (4) and will drop out of ball (1) when pin (4) is removed.

- a. Remove and discard cotter pin (2).
 - b. Remove nut (3) and pin (4) securing wedge socket (5) to overhaul ball (1).
2. REMOVE WIRE ROPE (6) FROM WEDGE SOCKET (5).
 - a. Remove nuts (7) and clamp (8) securing wire rope clip (9) to wire rope (6).
 - b. Strike dead end of wire rope to loosen and remove wedge (10). Remove wedge socket (5).



INSTALLATION:

1. INSTALL WEDGE SOCKET (5) ON WIRE ROPE (6).
 - a. Loop wire rope (6) through wedge socket (5) and around wedge (10) as shown. Allow approximately nine inches (22.9 cm) of wire rope to extend out from wedge socket (5).
 - b. Install wire rope clip (9) and secure with clamp (8) and nuts (7).
 - c. Install wedge socket (5) into overhaul ball (1) and secure with pin (4). Apply NEVER-SEEZE to pin threads.
 - d. Secure pin (4) with nut (3) and new cotter pin (2).
2. LUBRICATE OVERHAUL BALL ASSEMBLY. (REFER TO LO 5-3810-306-12.)

END OF TASK

OVERHAUL BALL ASSEMBLY

TOOLS: General mechanic's tool kit: automotive (5180-00-177-7033).

SUPPLIES: None

EQUIPMENT CONDITIONS: Overhaul ball removed. (Refer to page 17-4.)

DISASSEMBLY:

NOTE

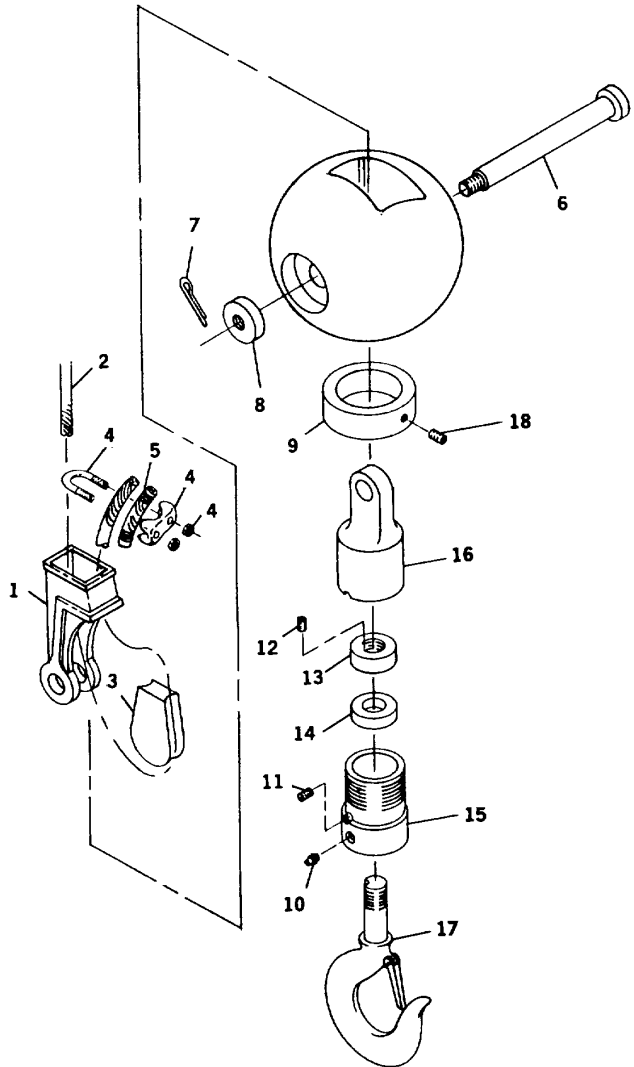
Wedge socket (1), wedge (3), pin (6), nut (8) and cotter pin (7) are already removed during overhaul ball removal.

1. DISASSEMBLE OVERHAUL BALL.
 - a. Remove swivel hook and top housing assembly (9) thru (18).
 - b. Remove setscrew (18) and centering ring (9).
 - c. Remove setscrew (11) and unscrew bottom housing (15) from top housing (16).
 - d. Remove setscrew (12) and unscrew hook (17) from nut (13) in bottom housing (15). Remove hook (17), nut (13) and thrust bearing (14).
 - e. Remove grease fitting (10) if necessary.

CLEANING:

WARNING

Dry cleaning solvent P-D-680 is toxic and flammable. Wear protective goggles and gloves and use only in a well ventilated area.



WARNING (CONT'D)

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 100°F/138°F (380-590C). 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 purpose will not exceed 30 psi. Use only with effective chip guarding and personal protective equipment (goggles/shield, gloves, etc.).

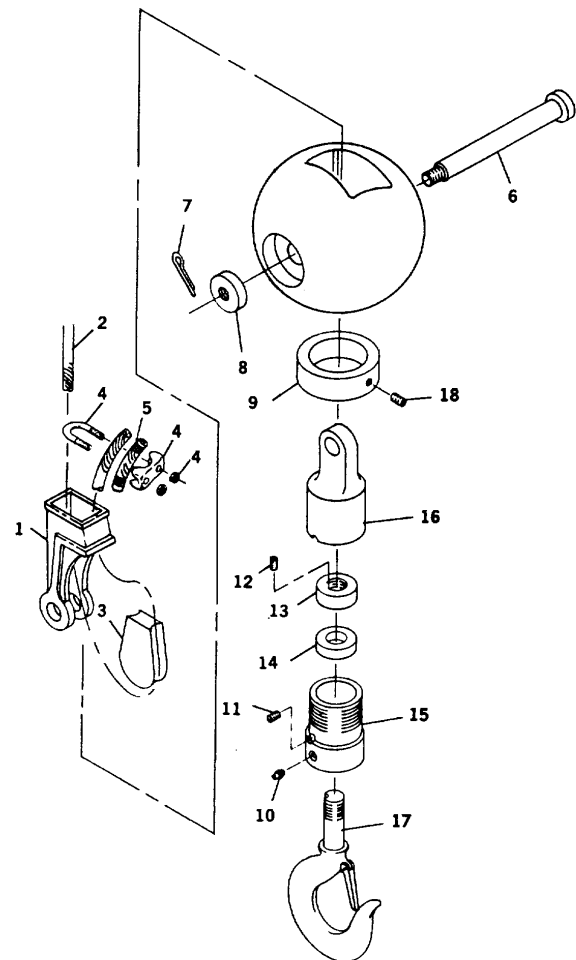
1. CLEAN ALL PARTS WITH P-D-680. DRY PARTS WITH LOW PRESSURE COMPRESSED AIR.

INSPECTION:

1. INSPECT ALL PARTS FOR DAMAGE AND REPLACE AS NECESSARY.

REASSEMBLY:

1. REASSEMBLE OVERHAUL BALL.
 - a. Install hook (17) through bottom housing (15) and secure with thrust bearing (14) and nut (13). Install setscrew (12).
 - b. Install grease fitting (10), if removed.
 - c. Screw bottom housing (15) with hook (17) into top housing (16). Install setscrew (11).



- d. Install centering ring (9) and secure with setscrew (18).
- e. Position swivel hook and top housing (9) thru (10) into overhaul ball.

2. INSTALL OVERHAUL BALL. (REFER TO PAGE 17-4.)

END OF TASK

HOOK BLOCK INSTALLATION

TOOLS: General mechanic's tool kit: automotive (5180-00-177-7033)

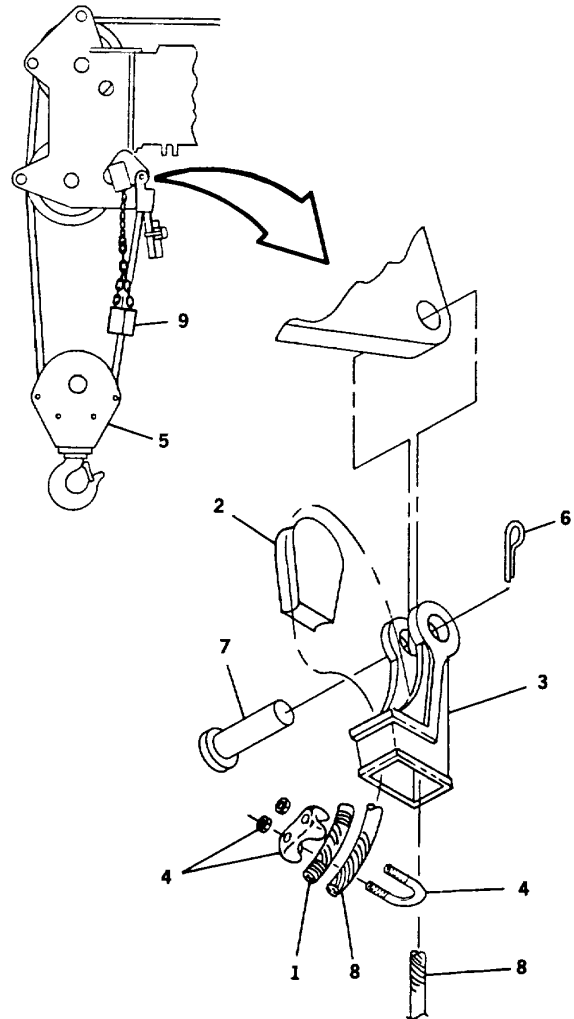
SUPPLIES: None

EQUIPMENT CONDITIONS: Boom lowered for maintenance. (Refer to TM 5-3810-306-10.)
 Hook block lowered to ground. (Refer to TM 5-3810-306-10.)

REMOVAL:

1. REMOVE HOOK BLOCK (5).
 - a. Remove cotter pin (6) and pin (7) securing wedge socket (3) to boom nose.
 - b. Remove two nuts on cable clamp (4) and remove six inch (15.3 cm) piece of cable (1).
 - c. Hit dead end of wire rope (8) with mallet to loosen cable and anchor wedge (2) from wedge socket (3).
 - d. Unplug auxiliary boom nose anti-two block connection and position auxiliary boom nose towards left side of boom.
 - e. Unreeve wire rope (8) from anti-two-block weight (9) and hook block (5). Coil slack cable (8).

six inch (15.3 cm) piece of cable (1) flush with dead end and secure with cable clamp (4).



INSTALLATION:

1. INSTALL HOOK BLOCK (5).
 - a. Reeve wire rope (8) through boom nose, hook block sheaves and anti-two-block weight (9).

- b. Insert wire rope (8) end through wedge socket (3) and loop around anchor wedge (2) as shown. Allow dead end of cable to extend nine inches (22.86 cm) from wedge socket. Position a six inch (15.3 cm) piece of cable (1) flush with dead end and secure with cable clamp (4).

NOTE

Both ends of six inch (15.3 cm) cable must be bound with wire seizing.

- c. Insert anchor wedge (2) in wedge socket (3). Pull firmly on free end of wire rope (8) to secure anchor wedge (2).

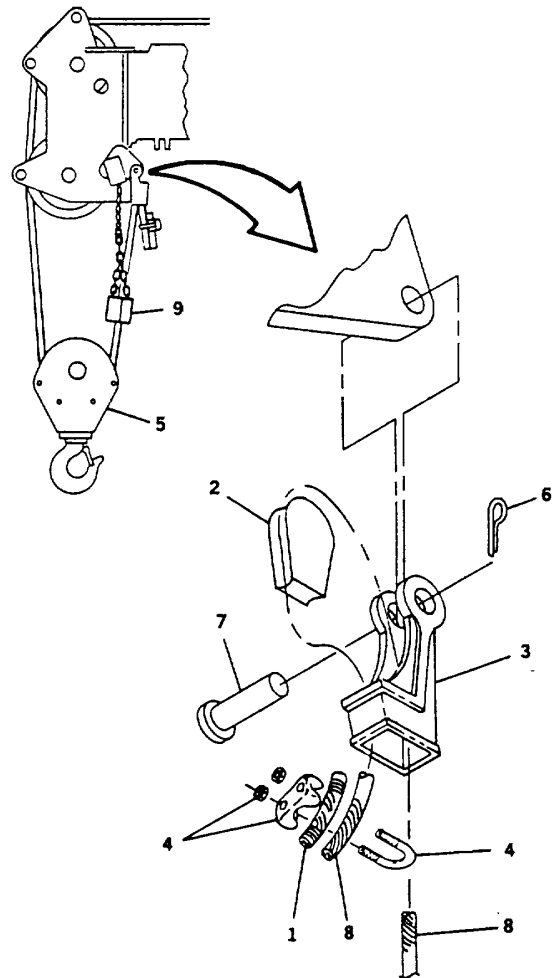
NOTE

If wedge does not seat securely carefully tap top of wedge with a mallet.

- d. Position wedge socket on boom nose and secure with pin (7) and cotter pin (6).

2. LUBRICATE WIRE ROPE (8). (REFER TO LO 5-3810-306-12.)
3. REPOSITION AUXILIARY BOOM NOSE AND CONNECT ANTI-TWO BLOCK CONNECTION.
4. RAISE AND LOWER HOOK BLOCK TO CHECK FOR PROPER OPERATION. (REFER TO TM 5-3810-306-10.)

END OF TASK



BOOM ALIGNMENT:

TOOLS: General mechanic’s tool kit: automotive (5180-00-177-7033)

SUPPLIED: NONE

EQUIPMENT CONDITIONS NONE

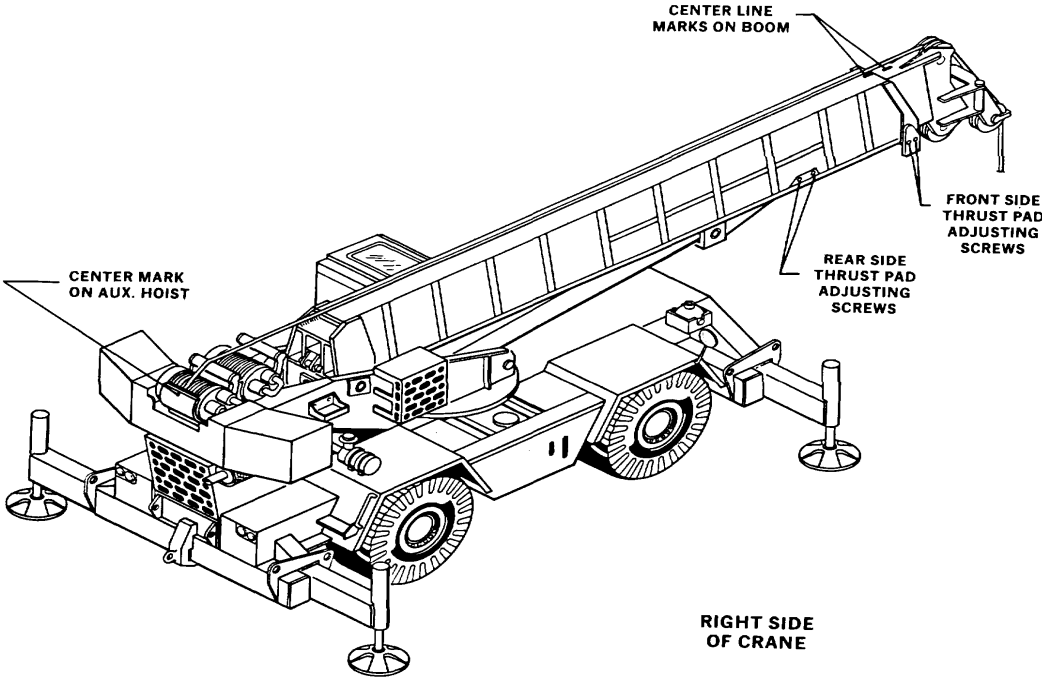
CAUTION

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.

- 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.

1. CHECK AND ADJUST SIDE THRUST PADS.

- a. Extend and lower outriggers. (Refer to TM 5-3810-306-10)



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. 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.

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.

- h. If necessary, adjust telescope and base section alignment by adjusting side thrust pads. If, for example, telescope section mark is to 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

Section II. HOIST MAINTENANCE

HOIST CABLE IDLER INSTALLATION

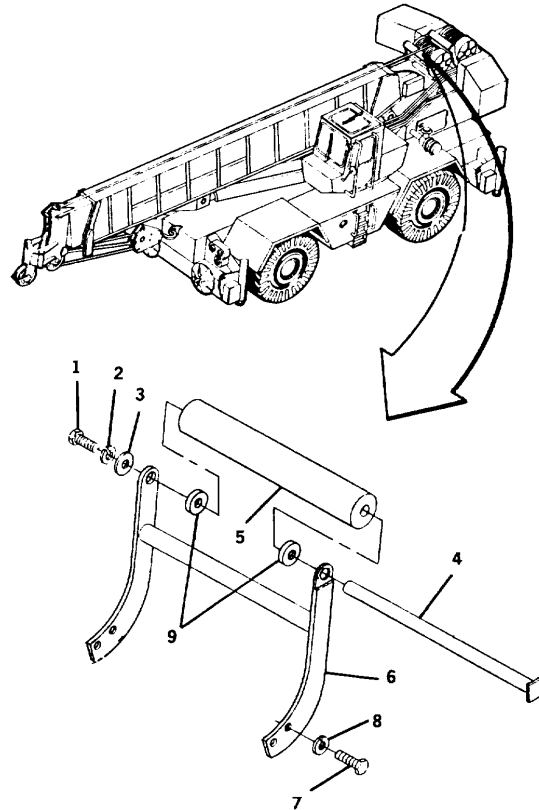
TOOLS: General mechanic's tool kit: automotive (5180-00-177-7033)

SUPPLIES: Lockwasher (Item 16, Appendix C)
Lockwasher (Item 87, Appendix C)

EQUIPMENT CONDITIONS: Disconnect ground cable at shunt. (Refer to page 8-109.)

REMOVAL:

1. REMOVE CABLE IDLER FROM HOIST.
 - a. Remove bolt (1), lockwasher (2), and end cap (3) from idler drums shaft (4). Discard lockwasher (2).
 - b. Remove shaft (4) from drum (5). Remove drum (5) and spacers (9).
 - c. Remove four bolts (7) and lockwashers (8) securing cable idler frame (6) to hoist. Discard lockwashers (8).



INSTALLATION:

1. INSTALL CABLE IDLER.
 - a. Install cable idler frame (6) and secure with new lockwashers (8) and bolts (7).
 - b. Install shaft (4) through hole in cable idler frame.
 - c. Install the drum (5) and spacers (9) on shaft (4).
 - e. Install end cap (3), washer (2) and bolt (1) on end of shaft (4).

2. CONNECT GROUND CABLE AT SHUNT. (REFER TO PAGE 8-109.)

END OF TASK

MAIN AND AUXILIARY WIRE ROPE INSTALLATION

TOOLS: General mechanic's tool kit: automotive (5180-00-177-7033)

SUPPLIES: None

EQUIPMENT CONDITIONS: Hook block removed. (Refer to page 17-7.)
 Overhaul ball removed. (Refer to page 17-4.)

REMOVAL:

1. REMOVE WIRE ROPE FROM MAIN AND/OR AUXILIARY HOISTS.
 - a. Attach end of wire rope to empty cable storage reel.

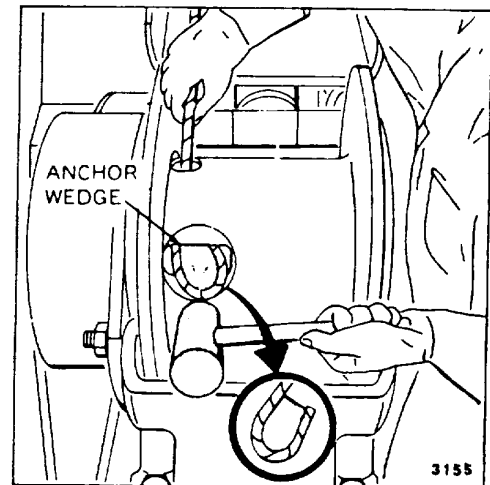
CAUTION

Always maintain tension on wire rope with storage drum to prevent bird caging wire rope on hoist drum.

- b. Slowly run hoist in lowering direction and take up wire rope on storage reel. Turn storage reel in same direction that hoist drum is turning.
- c. When hoist drum is empty, remove cable anchor wedge from socket in hoist drum and wind wire rope on storage drum.

INSTALLATION:

1. INSTALL WIRE ROPE ON MAIN AND/OR AUXILIARY HOISTS.
 - a. Position wire rope over upper boom nose sheave and route to hoist drum by passing wire rope under roller of cable idler.
 - b. Rotate hoist drum so wire rope anchor slot is on top.
 - c. Insert wire rope through anchor slot and position around anchor wedge as shown.



NOTE

The end of wire rope should be even with bottom of anchor wedge.

- d. Position anchor wedge in drum slot; pull firmly on free end of wire rope to secure wedge in slot.

NOTE

If the wedge does not seat securely in the slot, carefully tap the top of the wedge with a mallet.

CAUTION

When wire rope is wound from storage reel, reel should rotate in same direction as hoist drum.

- e. Slowly rotate hoist drum in raise direction, ensuring first layer of wire rope is evenly wound onto drum and all wraps are tight.

NOTE

Use of a rubber mallet may be needed to tap on wraps to ensure they are tight together.

- f. Continue to wind remainder of wire rope on hoist drum slowly, maintaining an even tension on wire rope.

2. CABLE REEVING FOR HOOK BLOCK (MAIN WIRE ROPE):

NOTE

To reeve the hook block, the auxiliary boom nose anti-two block connection must be unplugged and the auxiliary boom nose unpinned on the right side (facing forward) and swung to the left.

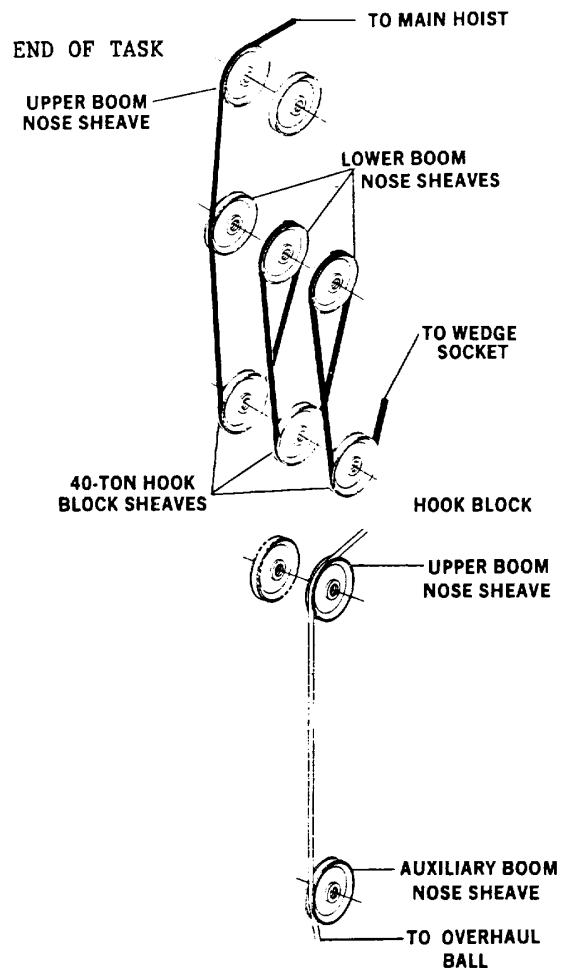
- a. Allow a sufficient length of cable to be removed from main hoist.
- b. Position cable over upper boom nose sheave and then route through remaining sheaves as shown.
- c. Install hook block. (Refer to page 17-7.)
- d. Swing auxiliary boom nose in place and secure with pin and clip.
- d. Connect anti-two block jumper cable.

3. CABLE REEVING FOR OVERHAUL BALL (AUXILIARY WIRE ROPE):

NOTE

Lifting capacity of auxiliary hoist with a single part line over auxiliary boom nose is limited to 4.5 tons (4082 kg).

- a. Allow a sufficient length of cable to be removed from auxiliary hoist.
- b. Position cable over upper boom nose sheave and then route over auxiliary boom nose sheave as shown.
- c. Install overhaul ball. (Refer to page 17-4.)



Section III. TURNTABLE MAINTENANCE

POSITIVE SWING LOCK CONTROL CABLE INSTALLATION

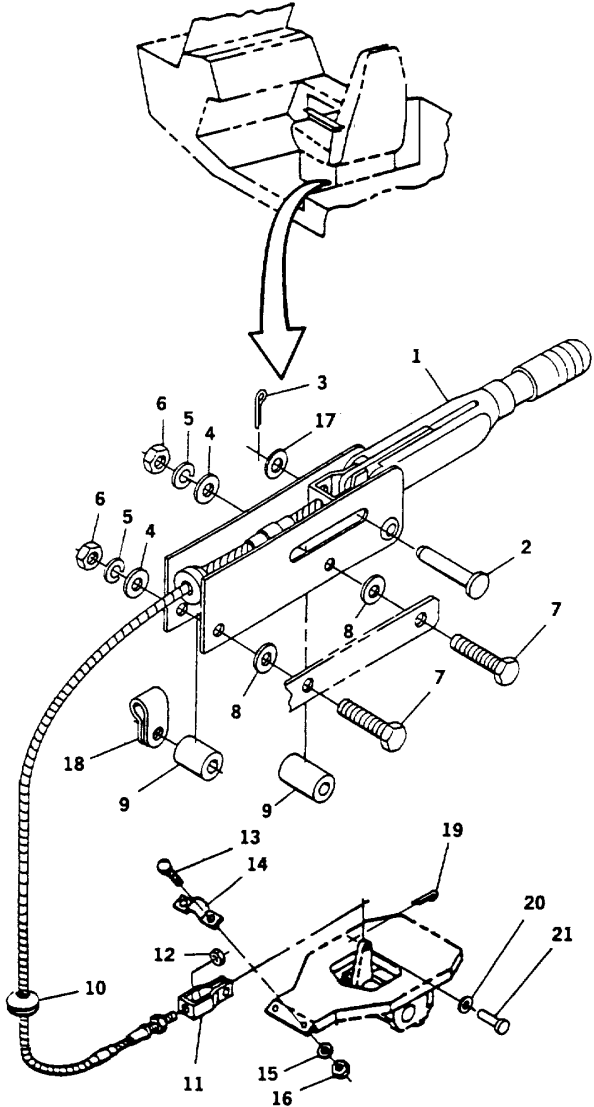
TOOLS: General mechanic's tool kit: automotive (5180-00-177-7033)

SUPPLIES: Cotter pin (Item 32, Appendix C)
Lockwashers (Item 5, Appendix C) (2 Required)
Lockwashers (Item 15, Appendix C) (2 Required)

EQUIPMENT CONDITIONS: Boom raised enough to allow access to swing lock.
Disconnect ground cable at shunt. (Refer to page 8-109.)

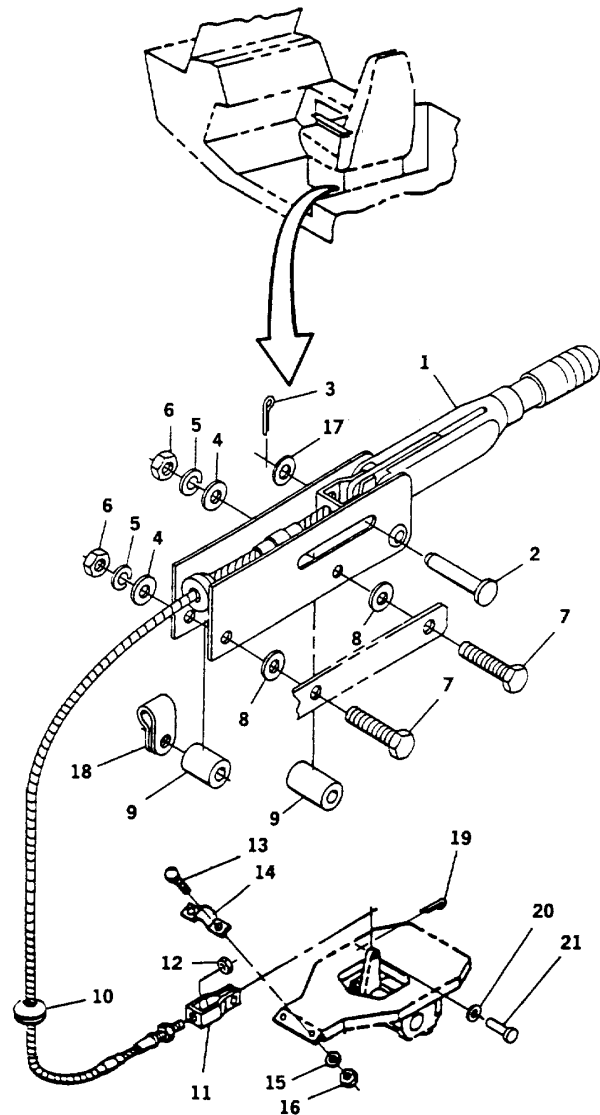
DISASSEMBLY:

- 1. DISASSEMBLE POSITIVE SWING LOCK CONTROL LEVER.
a. Remove cotter pin (19), washer (20), and clevis pin (21) to free control cable clevis (11). Discard cotter pin (19).
b. Remove end nut (12) securing clevis (11) to control cable.
c. Remove two capscrews (13), lockwashers (15) and nuts (16) to free cable clamp (14) from mounting bracket. Discard lockwashers.
d. Remove brake lever (1) by removing two capscrews (7), spacers (9), clamp (18), washers (8), lockwashers (5), washers (4) and nuts (6) from cab mounting bracket. Discard lockwashers.
e. Remove clevis pin (2), washer (17) and cotter pin (3) to free control cable from control lever (1). Discard cotter pin (3).
f. Pull control cable through cab wall. Discard grommet (10) if damaged.
2. INSPECT PARTS FOR DAMAGE. REPAIR IF NECESSARY.



REASSEMBLY:

1. REASSEMBLE POSITIVE SWING LOCK CONTROL LEVER.
 - a. Install grommet (10) on control cable and mount in cab wall.
 - b. Push control cable (10) through cab wall.
 - c. Assemble control lever (1) to control cable with clevis pin (2), washer (17) and new cotter pin (3).
 - d. Install control lever (1) with two capscrews (7), spacers (9), clamp (18), washers (8), new lockwashers (5), washers (4) and nuts (6). Secure to cab mounting bracket.
 - e. Secure cable (10) to mounting bracket with cable clamp (14), two capscrews (13), new lockwashers (15) and nuts (16).
 - f. Position control lever up (UNLOCK).
 - g. Install clevis (11) and nuts (12) on control cable.
 - h. Adjust clevis (11) and nuts (12) until clevis (11) can be attached to swing lock block. Tighten nuts (12).
 - i. Secure control cable clevis (11) to swing lock block with clevis pin (21), washer (20) and new cotter pin (19).
2. CONNECT GROUND CABLE AT SHUNT. (REFER TO PAGE 8-109.)
3. CHECK POSITIVE SWING LOCK FOR PROPER OPERATION. (REFER TO TM 5-3810-30610.)



END OF TASK

SWING MOTOR INSTALLATION

TOOLS: General mechanic's tool kit: automotive (5180-00-177-7033)

SUPPLIES: Silicone sealant (Item 38, Appendix C)
 Clean rags (Item 1, Appendix C)
 Lockwashers (Item 16, Appendix C) (2 Required)
 Preformed packing (Item 81, Appendix C)
 Loctite 242 (Item 76, Appendix C)

EQUIPMENT CONDITIONS: Positive swing lock is engaged. (Refer to TM 5-3810-306-10.)
 Area near swing brake is clean and free of debris.
 Raise boom.
 Disconnect ground cable at shunt. (Refer to page 8-109.)

REMOVAL:

1. REMOVE SWING MOTOR (1).
 - a. Tag and disconnect two hydraulic lines to swing motor (1). Plug lines (5).

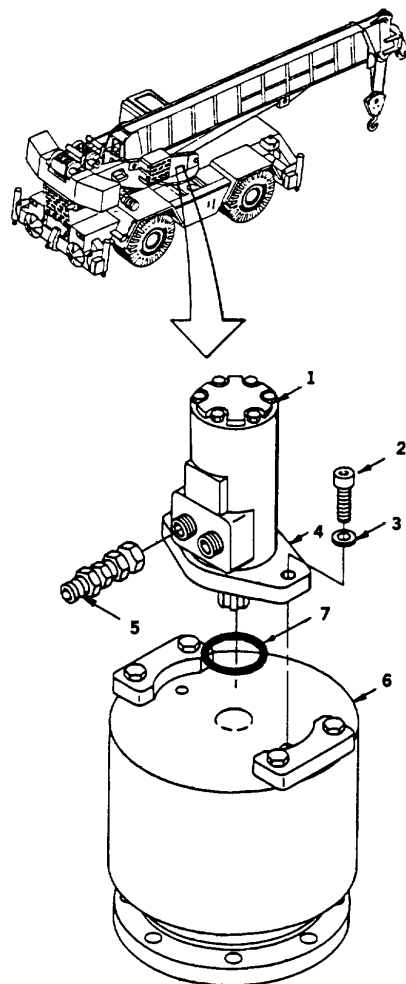
CAUTION

Pull straight up on swing motor assembly to avoid damaging splined shaft.

- b. Remove two socket head capscrews (2) and lockwashers (3) on flange (4). Lift swing motor (1) from swing brake (6).
 - c. Remove and discard preformed packing (7).

NOTE

Remove any gasket material on swing brake (6) and motor (1) that may be present.



INSTALLATION:

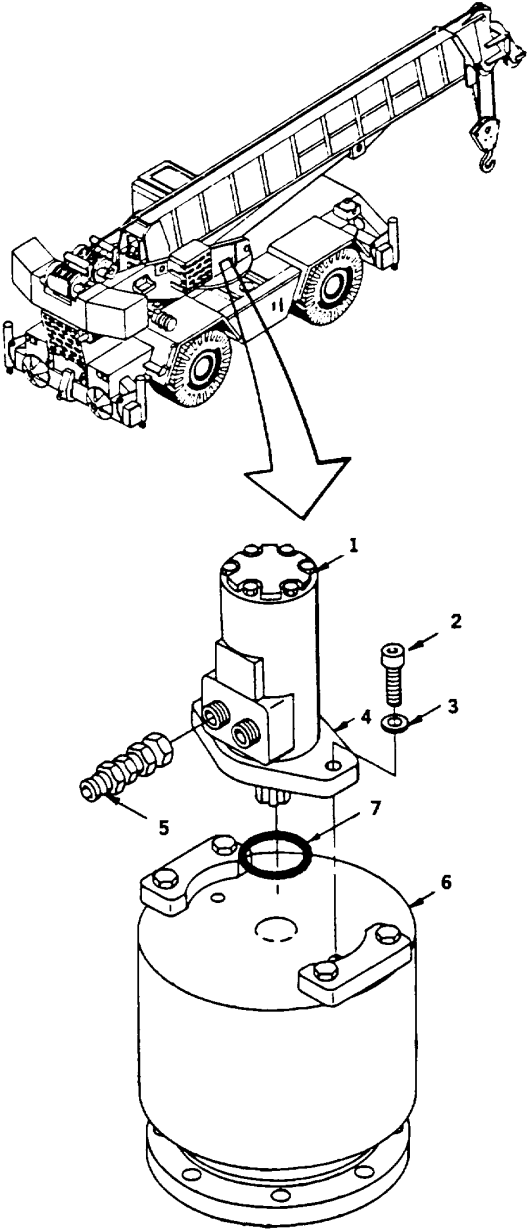
- 1. INSTALL SWING MOTOR (1).
 - a. Apply silicone sealant on swing motor flange (4) mating surface. Do not allow to dry.

CAUTION

Do not force swing motor drive gear in swing brake.

- b. Install swing motor (1) and new preformed packing (7) on swing brake (6).
 - c. Apply Loctite 242 to threads and install two socket head capscrews (2) and lockwashers (3). Torque to 45 ft-lbs.
 - d. Remove tags, plugs and connect hydraulic lines to swing motor (1).
- 2. CONNECT GROUND CABLE AT SHUNT. (REFER TO PAGE 8-109.)
- 3. START ENGINE AND CHECK SWING FUNCTION. CHECK FOR HYDRAULIC LEAKS. (REFER TO TM 5-3810-306-10.)

END OF TASK



CHAPTER 18

PREPARATION FOR STORAGE OR SHIPMENT

CHAPTER INDEX

Procedure	Page
Preparation for Storage or Shipment.....	18-2

CHAPTER 18**PREPARATION FOR STORAGE OR SHIPMENT**

INTRODUCTION

Before storing the container crane for long periods or shipping it to a distant location, certain preparations must be made to ensure operational readiness when the crane is placed in service again.

PRESERVATION, PACKAGING, PACKING, MARKING AND SHIPPING REQUIREMENTS.**General**

These instructions provide minimum preservation and interim storage requirements for the container crane. Components not to be painted will be coated with a preservative, whose application, removal or use will not damage the mechanism, structure or function of the component or end item.

SHORT TERM STORAGE

The crane should be stored in an "operation-ready" status wherein all fluid levels and lubrication points are maintained in an operational status.

Fuel Tank

Draining of fuel tanks is not required. If fuel tank is empty, no preservation is required.

Sealing of Openings.

Openings that will permit direct entry of water will be sealed with pressure-sensitive tape conforming to PPP-T-60, Type IV. Large openings will be bridged with waterproof barrier material conforming to PPP-B-1055, and the edges of the barrier material secured to adjacent surfaces with tape.

Lubricating System

Lubricate equipment in accordance with LO 5-3810-306-12. Check lubricant for level and condition. Operate the engine until it reaches normal operating temperature to ensure complete lubrication of bearings, gears, etc. The oil will remain in the crankcase.

NOTE

Once the container crane is stored, periodically cycle the crane through all of its crane functions.

LONG TERM STORAGE

In long term storage where periodic cycling of crane functions is not feasible, preserve the crane in accordance with the procedures contained in MIL-STD-162E, Preparation for Shipment, Storage, Cycle Maintenance (of) Material Handling Equipment (Level A).

Batteries and Cables

Batteries filled and fully charged will be secured in the battery compartment. The cable terminals will be disconnected and secured to the battery support with tape to prevent grounding.

Packaging

Loose components on the container crane should be secured with rope or tape to prevent damage. The cab door should be secured in the closed position with strapping.

Marking

Waterproof shipping tags will be affixed to the container crane. The tags may be white or manila colored cloth or paper. The information required should be printed in waterproof ink or type; and the tag waterproofed with shellac, spar varnish, laminated plastic or other suitable transparent waterproofing compound.

Shipping

When the container crane must be shipped over long distances, special precautions must be adhered to. Use the procedure below to prepare the container crane for shipment.

- a. Demount the superstructure. (Reference TM 5-3810-306-34.)
- b. Secure the crane to the railway car or towing trailer by blocking each tire and using approved chain tiedowns.
- c. Disconnect the battery grounding cable in the battery box.
- d. Drain the fuel tank.
- e. Preserve the crane in accordance with MIL-STD-162, Preparation for Shipment, Storage Cyclic Maintenance (of) Material Handling Equipment (Level A).

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 organizational maintenance of the RT875CC 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 738-750

A-3. FORMS

Recommended Changes to Publications and Blank Forms.....DA Form 2028

Recommended Changes to Equipment Technical Publications DA Form 2028-2

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 369

A-4. FIELD MANUALS.

NEC Contamination Avoidance.....FM 3-3

NEC ProtectionFM 3-4

NEC Decontamination.....FM 3-5

Camouflage a FM 5-20

Operation and Maintenance of Ordnance Materiel in Cold Weather
(0 Deg to Minus 65 Deg F)FM 9-207

First Aid for SoldiersFM 21-11

Manual for the Wheeled Vehicle Driver.....FM 21-305

Basic Cold Weather Manual.....FM 31-70

Northern Operations..... FM 31-71

Army Motor Transport Units and Operations..... FM 55-30

Desert Operations FM 90-3

Mountain Operations (How to Fight)..... FM 90-6

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

Description, Use, Bonding Techniques, and Properties
of Adhesives TB ORD 1032

A-6. TECHNICAL MANUALS.

Inspection, Care, and Maintenance of Antifriction Bearings..... TM 9-214

Operator's Manual for Welding Theory and Application..... TM 9-237

Deepwater Fording of Ordnance Materiel TM 9-238

Materials Used for Cleaning, Preserving, Abrading, and
Cementing Ordnance Materiel and Related Materials,
Including Chemicals TM 9-247

Organization, Direct Support, and General Support
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,
Model RT875CC, NSN 3810-01-205-2716 TM 5-3810-306-10

Repair Parts and Special Tools List for Container Crane,
40 Ton, Rough Terrain, Model RT875CC,
NSN 3810-01-205-2716 TM 5-3810-306-24P

Lubrication Order for Container Crane, 40 Ton,
Rough Terrain, Model RT8755CC, NSN 3810-01-205-2716LO 5-3810-306-12

A-7. SPECIFICATIONS AND STANDARDS.

Dry Cleaning Solvent..... Fed Spec F-D-680

Methyl Ethyl Ketone, Technical TT-M-261

Inspection, Liquid Penetrant MethodsMIL-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 ItemsCTA 8-100

Expendable/Durable Items (Except Medical,
Class V, Repair Parts, and Heraldic Items).....CTA 5-970

APPENDIX B**MAINTENANCE ALLOCATION CHART****Section I. INTRODUCTION****GENERAL**

This section provides a general explanation of all maintenance and repair functions authorized at various maintenance categories.

Section II designates overall responsibility for the performance of maintenance functions on the identified end item or component. The implementation of the maintenance functions upon the end item or component will be consistent with the assigned maintenance categories.

Section III lists the special tools and test equipment required for each maintenance function as referenced from Section II.

Section IV contains supplemental instructions, explanatory notes and/or illustrations required for a particular maintenance function.

MAINTENANCE FUNCTIONS

The maintenance functions are defined as follows:

Inspect. To determine serviceability of an item by comparing its physical, mechanical, and electrical characteristics with established standards.

Test. To verify serviceability and to detect electrical or mechanical failure by use of test equipment.

Service. To clean, to preserve, to charge, and to add fuel, lubricants, cooling agents, and air. If it is desired that elements, such as painting and lubricating, be defined separately, they may be so listed.

Adjust. To rectify to the extent necessary to bring into proper operating range.

Align. To adjust specified variable elements of an item to bring optimum performance.

Calibrate. To determine the corrections to be made in the readings of instruments or test equipment used in precise measurement. Consists of the comparison of two instruments, one of which is a certified standard of known accuracy, to detect and adjust any discrepancy in the accuracy of this instrument being compared with the certified standard.

Install. To setup for use in an operational environment such as an replacement, site, or vehicle.

Replace. To replace unserviceable items with serviceable like items.

Repair. Those maintenance operations necessary to restore an item to serviceable condition through correction of material damage or a specific failure. Repair may be accomplished at each category of maintenance.

Overhaul. Normally, the highest degree of maintenance performed by the Army in order to minimize time work in process is consistent with quality and economy of operation. It consists of that maintenance necessary to restore an item to completely serviceable condition as prescribed by maintenance standards in technical publications for each item of equipment. Overhaul normally does not return an item to like new, zero mileage, or zero hour condition.

Rebuild. The highest degree of material maintenance. It consists of restoring equipment as nearly as possible to new condition in accordance with original manufacturing standards. Rebuild is performed only when required by operational considerations or other paramount factors and then only at the depot maintenance category. Rebuild reduces to zero the hours or miles the equipment, or component thereof, has been in use.

EXPLANATION OF COLUMNS IN SECTION II

Group Number, Column 1. The assembly group is a numerical group assigned to each assembly in a top down breakdown sequence. The applicable assembly groups are listed on the MAC in disassembly sequence beginning with the first assembly removed in a top down disassembly sequence.

Component/Assembly, Column 2. This column contains the names of components, assemblies and subassemblies.

Maintenance Function, Column 3. This column lists the various maintenance functions to be performed on items listed in column 2.

Maintenance Category, Column 4. Column 4 specifies, by the listing of a "work time": figure in the appropriate subcolumn(s), the lowest level of maintenance authorized to perform the function listed in Column 3. This figure represents the active time required to perform the maintenance function at the indicated category of maintenance. If the number or complexity of the tasks within the listed maintenance function vary at different maintenance categories, appropriate "work time" figures will be shown for each category. The number of man-hours specified by the "work time" figure represents the average time required to restore an item (assembly, subassembly, component, module, end item, or system) to a serviceable condition under typical field operating conditions. This time includes preparation time, troubleshooting time, and quality assurance/quality control time in addition to the time required to perform the specific tasks identified for the maintenance functions authorized in the MAC.

The symbol designations for the various maintenance categories are as follows:

- C - Operator or Crew
- O - Organizational Maintenance
- F - Direct Support Maintenance
- H - General Support Maintenance
- D - Depot Maintenance

Tools and Equipment, Column 5. This column is provided for referencing by code, the special tools and test equipment (Section III), required to perform the maintenance functions (Section II).

Remarks, Column 6. This column is provided for referencing, by code, the remarks (Section IV) pertinent to the maintenance functions.

EXPLANATION OF COLUMNS IN SECTION III

Reference Code. This column consists of a number and a letter separated by a dash. The number references the T&TE requirements column on the MAC. The letter represents the specific maintenance function the item is to be used with. The letter is representative of columns A thru K on the MAC.

Maintenance Category. This column shows the lowest level of maintenance authorized to use the special tool or test equipment.

Nomenclature. This column lists the name or identification of the tool or test equipment.

National Stock Number. This column is provided for the NSN of common tools sets, special tools, and test equipment listed in the nomenclature column.

Tool Number. This column lists the manufacturer's code and part number, or Federal stock number of tools and test equipment.

EXPLANATION OF COLUMNS IN SECTION IV

Reference Code. This column consists of two letters separated by a dash, both of which are references to Section II. The first letter references column 5 and the second letter references a maintenance function in column 3.

Remarks. This column lists information pertinent to the maintenance function being performed, as indicated on the MAC, Section II.

B-3/B-4 Blank

SECTION II. MAINTENANCE ALLOCATION CHART

(1) GROUP NUMBER	(2) COMPONENT ASSEMBLY	(3) MAINTENANCE FUNCTION	(4) MAINTENANCE LEVEL					(5) TOOLS AND EQUIPMENT	(6) REMARKS
			UNIT C	O	INTERMEDIATE F	DEPOT H	D		
01	ENGINE	Inspect	0.1					1, 2, 6, 12, 13, 14, 16, 18, 19, 20, 22, 24, 37, 38, 39, 40	
	Engine Assembly:	Test		0.5					
		Service		1.5					
		Replace			16.0				
		Repair			20.0				
		Overhaul				45.0			
0101	Crankcase, Block Cylinder Head:								
	Cylinder Head	Replace			10.0			6, 8, 9, 10 11, 12, 13, 24, 37, 38 39, 40	
		Repair				8.0			
	Block	Replace				20.0			
		Repair				8.0			
0102	Crankshaft:								
	Crankshaft	Replace				4.0		6, 8, 9, 12, 13, 24	
		Repair					16.0		
0103	Flywheel Assembly:								
	Flywheel	Replace			2.0			10, 11, 15, 16, 24	
		Repair				2.0			
	Flywheel Housing	Replace			18.0				
		Repair				4.0			(B)
0104	Pistons, Connecting Rods:								
	Pistons	Replace				8.0		6, 8, 9, 12, 13, 24	
		Repair				6.0			

*MAINTENANCE LEVELS:

C - OPERATOR/CREW =UNIT
O - ORGANIZATIONAL

F - INTERMEDIATE DIRECT SUPPORT
H - INTERMEDIATE GENERAL SUPPORT

D - DEPOT

SECTION II. MAINTENANCE ALLOCATION CHART									
(1) GROUP NUMBER	(2) COMPONENT ASSEMBLY	(3) MAINTENANCE FUNCTION	(4) MAINTENANCE LEVEL					(5) TOOLS AND EQUIPMENT	(6) REMARKS
			UNIT C	O	INTERMEDIATE F	H	DEPOT D		
0105	Valves, Camshafts & Timing System: Rocker Arm Assembly	Adjust Replace Repair		1.5	4.0 3.0			9, 12, 22, 24	
0106	Engine Lubrication System: Oil Cooler	Replace Repair		4.0 2.0				10, 11, 15, 16, 24	
	Oil Pan	Replace Repair			4.0 4.0				(B)
03	FUEL SYSTEM								
0301	Fuel Injector:	Replace			1.0			21, 23, 24, 20	
0302	Fuel Pumps: Fuel Injection	Replace Repair Overhaul			6.0		10.0 16.0		
0304	Air Cleaner: Air Cleaner Assembly	Inspect Service Replace Repair	0.1	0.5 0.2 1.0				24	
0306	Tank, Lines, Fittings, Headers: Tank, Fuel Assembly	Replace Repair		2.0	1.5			24, 12, 16	(B)
<p>*MAINTENANCE LEVELS: C - OPERATOR/CREW =UNIT O - ORGANIZATIONAL F - INTERMEDIATE DIRECT SUPPORT H - INTERMEDIATE GENERAL SUPPORT D - DEPOT</p>									

SECTION II. MAINTENANCE ALLOCATION CHART

(1) GROUP NUMBER	(2) COMPONENT ASSEMBLY	(3) MAINTENANCE FUNCTION	(4) MAINTENANCE LEVEL					(5) TOOLS AND EQUIPMENT	(6) REMARKS	
			UNIT C	O	INTERMEDIATE F	H	DEPOT D			
0308	Engine Speed Governor & Controls:	Replace Repair Overhaul			2.0			8.0 10.0	14, 22	
0309	Fuel Filters:									
	Fuel Water Separator/ Filter	Service Replace	0.4		1.0				21, 23, 24 20	
0311	Engine Starting Aids:									
	Quick Starting Kit	Service Replace			0.5 1.0				21, 23, 24	
0312	Accelerator, Throttle or Choke Control:									
	Accelerator Control	Replace Repair			2.5 1.5				24	
04	EXHAUST SYSTEM , Muffler & Pipes	Inspect Replace	0.1		2.0				24	
05	COOLING SYSTEM									
0501	Radiator:	Test Service Replace Repair	1.5		2.0 3.5				11, 30, 32	(B)
0503	Water Manifold, Headers, Thermostats & Housing Gasket:									
	Turbo Charger After-cooler	Replace Repair			2.0				24	(B)

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=UNIT

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D - DEPOT

SECTION II. MAINTENANCE ALLOCATION CHART

(1) GROUP NUMBER	(2) COMPONENT ASSEMBLY	(3) MAINTENANCE FUNCTION	(4) MAINTENANCE LEVEL					(5) TOOLS AND EQUIPMENT	(6) REMARKS
			UNIT C	O	INTERMEDIATE F	DIAGNOSTIC H	DEPOT D		
0505	Thermostat	Test Replace		1.5 1.0					
	Fan Assembly:								
06	Belts, Drive Assembly	Inspect Replace	0.1	0.5			24		
0601	ELECTRICAL SYSTM								
0603	Alternator:	Test Replace Repair		0.2 0.5	3.0			1, 4, 5, 16 19, 20	
	Starting Motor:								
0606	Starter & Solenoid Assembly	Test Replace Repair		1.0 0.5	3.0			1, 4, 5, 16, 19, 20	
	Engine Safety Controls:								
0607	Low Oil/Overheating and Over RPM Gauges	Test Replace		0.2 1.0			24		
	Instrument or Engine Control Panel:								
0608	Switches/Circuit Breakers, Light Panel Electrical Gauges	Test Replace		0.5 3.0			4, 16		
	Miscellaneous Items:								
	Light Switches	Test Replace		0.5 1.0			21, 23, 24		

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SECTION II. MAINTENANCE ALLOCATION CHART									
(1) GROUP NUMBER	(2) COMPONENT ASSEMBLY	(3) MAINTENANCE FUNCTION	(4) MAINTENANCE LEVEL					(5) TOOLS AND EQUIPMENT	(6) REMARKS
			UNIT C	O	INTERMEDIATE F	DIAGNOSTIC H	DEPOT D		
0609	Lights: Vehicle Headlights, Tail, Stop, Clearance and Floodlights	Test		0.3				21, 23, 24	
		Replace		0.5					
0610	Sending Units & Warning Switches:	Inspect	0.1					21, 23	
		Replace		0.5					
0611	Horn, Alarm, Siren:	Inspect	0.1					21, 23	
		Replace		1.0					
0612	Batteries, Storage Wet or Dry:	Test		0.5				3, 4, 5	
		Service		1.5					
		Replace		1.5					
	Battery Box and Tie Down	Replace		2.0					
		Repair		1.0					
	Battery Cables	Service		0.5					
Replace			0.5						
Repair				1.0					
0613	Hull or Chassis Wiring Harness:	Test		1.0				21, 23, 5	
		Replace			13.0				
		Repair			2.0				
	Wire Harness Superstructure	Test		1.0				21, 23, 5	
		Replace			12.0				
		Repair			2.0				

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SECTION II. MAINTENANCE ALLOCATION CHART									
(1) GROUP NUMBER	(2) COMPONENT ASSEMBLY	(3) MAINTENANCE FUNCTION	(4) MAINTENANCE LEVEL					(5) TOOLS AND EQUIPMENT	(6) REMARKS
			UNIT C	O	INTERMEDIATE F	H	DEPOT D		
07	TRANSMISSION								
0705	Gear Shift, Vacuum Booster and Controls:	Adjust Replace		0.5 1.0					
0708	Torque Converter:	Service Replace Repair	0.5	0.5		20.0	24.0	2, 4, 5, 8, 9 10, 12, 13 1, 15, 24	
0710	Transmission Assembly:	Service Replace Repair Overhaul	2.0			12.0	18.0 30.0	2, 4, 6, 8, 9 10, 12, 13, 14, 15, 24	
	Rear Axle & Range Shifter	Replace Repair		1.0 2.0					
0721	Coolers, Pumps, Motors Transmission:								
	Cooler	Repair		3.0				21, 23, 24, 2	(B)
09	PROPELLER & PROPELLER SHAFTS								
	Propeller Shaft Assembly:	Replace Repair		1.5 2.5				24, 21	
10	FRONT AXLE								
1000	Front Axle Assembly:	Service Replace Repair Overhaul		1.0		16.0	8.0 16.0	2, 4, 12, 13, 17, 24, 6	
1002	Differential, Front-spin or No-spin:	Service Replace Repair		0.5		12.0 8.0		13, 14, 2	
<p>*MAINTENANCE LEVELS: C - OPERATOR/CREW =UNIT O - ORGANIZATIONAL F - INTERMEDIATE DIRECT SUPPORT H - INTERMEDIATE GENERAL SUPPORT D - DEPOT</p>									

SECTION II. MAINTENANCE ALLOCATION CHART

(1) GROUP NUMBER	(2) COMPONENT ASSEMBLY	(3) MAINTENANCE FUNCTION	(4) MAINTENANCE LEVEL					(5) TOOLS AND EQUIPMENT	(6) REMARKS
			UNIT C	O	INTERMEDIATE F	H	DEPOT D		
1007	Planetary Drive:	Service Replace Repair		1.0	8.0 8.0			2, 13, 14, 24	
11	REAR AXLE								
1100	Rear Axle Assembly:	Service Replace Repair Overhaul		1.0	16.0	8.0	16.0	2, 4, 6, 12, 13, 17, 24	
1102	Differential Rear Spin or No-Spin	Service Replace Repair		0.5	12.0 8.0			13, 14, 24,	
1103	Planetary Drive:	Service Replace Repair		1.0	8.0 8.0			2, 13, 14, 24	
12	BRAKES								
1202	Service Brakes: Brakeshoes and Related Parts	Adjust Replace		1.5 8.0				24, 29	
1208	Air Brake System: Air Dryer	Service Replace Repair		1.0 1.0 2.5				24	

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SECTION II. MAINTENANCE ALLOCATION CHART

(1) GROUP NUMBER	(2) COMPONENT ASSEMBLY	(3) MAINTENANCE FUNCTION	(4) MAINTENANCE LEVEL					(5) TOOLS AND EQUIPMENT	(6) REMARKS
			UNIT C	O	INTERMEDIATE F	DIAGNOSTIC H	DEPOT D		
1209	Air Reservoir	Service Replace Repair	0.1	1.0	2.0			24	(B)
	Air Compressor	Replace Repair Overhaul			2.0 4.0		10.0	4, 6, 10, 21, 23, 24	
13	WHEELS AND TRACKS								
1313	Tires	Inspect Service Replace	0.1 0.2	3.0				21, 23, 24	
14	STEERING								
1401	Steering Control Valve Assembly with Steering Wheel:	Replace Repair			8.0 4.0			2, 12, 13, 22, 23, 24	
1411	Hoses, Lines and Fittings:	Inspect Replace	0.1	1.0				2, 15, 24, 27	
1412	Hydraulic Cylinders (Steering):	Replace Repair		1.5	4.0			2, 15, 24, 27	
1414	Front Steer Relief Valve:	Inspect Replace	0.1	2.0				2, 12, 13, 15, 24	

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SECTION II. MAINTENANCE ALLOCATION CHART									
(1) GROUP NUMBER	(2) COMPONENT ASSEMBLY	(3) MAINTENANCE FUNCTION	(4) MAINTENANCE LEVEL					(5) TOOLS AND EQUIPMENT	(6) REMARKS
			UNIT C	O	INTERMEDIATE F	H	DEPOT D		
15	FRAME, TOWING ATTACHMENTS AND CRAWBAR								
1503	Pintle Hook:	Service Replace Repair		0.1 0.5 0.2				24	
1507	Landing Gear, Leveling Jack:								
	Outrigger Assembly:	Inspect Replace Repair	0.1		2.0 4.0			21, 23, 24	
	Outrigger Pads	Replace Repair		0.1 0.5				21, 23, 24	
	Cylinder, Extension	Replace Repair			1.0 3.8			15, 21, 23, 24	
	Cylinder, Jack	Replace Repair			1.0 3.8				
18	BODY, CAB, HOOD AND HULL								
1801	Door Assembly with Latch/Handle:	Inspect Replace Repair	0.1	1.5 1.0				21, 23, 24	
	Hood Assembly	Inspect Replace Repair	0.1	2.0	2.0				
1802	Fender and Rear Decking Installation:	Replace Repair		2.0	1.5			21, 23, 24	
1806	Upholstery Seat:								
	Seat Assembly	Inspect Replace Repair	0.1	2.0 1.0				21, 23, 24	
<p>*MAINTENANCE LEVELS: C - OPERATOR/CREW =UNIT O - ORGANIZATIONAL F - INTERMEDIATE DIRECT SUPPORT H - INTERMEDIATE GENERAL SUPPORT D - DEPOT</p>									

SECTION II. MAINTENANCE ALLOCATION CHART									
(1) GROUP NUMBER	(2) COMPONENT ASSEMBLY	(3) MAINTENANCE FUNCTION	(4) MAINTENANCE LEVEL					(5) TOOLS AND EQUIPMENT	(6) REMARKS
			UNIT C	O	INTERMEDIATE F	DIAGNOSTIC H	DEPOT D		
22	BODY CHASSIS CR-HULL AND ACCESSORY ITEMS								
	Accessory Items:	Inspect Replace Repair	0.	1.0 0.5				1 24	
2207	Cab Heater and Defroster Assembly:	Inspect Replace Repair	0.1	4.0	16.0				12, 13, 24, 20
24	HYDRAULIC AND FLUID SYSTEM								
2401	Hydraulic Pump:	Test Replace Repair			1.0 2.0 12.0				12, 13, 15
2402	Hydraulic Control Valve:								
	Hydraulic Control Valves	Inspect Replace Repair	0.2	2.0	8.0				2, 12, 13, 15, 24
2406	Strainers, Filters, - Lines and Fittings:	Inspect Replace	0.1	1.5					2, 21, 23, 24
2407	Hydraulic Cylinders:								
	Lift Cylinder	Replace Repair			2.0 5.0				12, 13, 15, 24
	Tele Cylinder	Replace Repair			2.0 12.0				12, 13, 15, 24
	Axle Lockout Cylinder	Replace Repair			2.0 5.0				12, 13, 15, 24
<p>*MAINTENANCE LEVELS: C - OPERATOR/CREW =UNIT O - ORGANIZATIONAL F - INTERMEDIATE DIRECT SUPPORT H - INTERMEDIATE GENERAL SUPPORT D - DEPOT</p>									

SECTION II. MAINTENANCE ALLOCATION CHART									
(1) GROUP NUMBER	(2) COMPONENT ASSEMBLY	(3) MAINTENANCE FUNCTION	(4) MAINTENANCE LEVEL					(5) TOOLS AND EQUIPMENT	(6) REMARKS
			UNIT	INTERMEDIATE	DEPOT	F	H		
			C	O	F	H	D		
2408	Hydraulic Reservoir: Service	Inspect	0.1	0.2				2, 12, 13, 24, 21, 23	(B)
68	WARNING, SCANNING AND SIGNALING DEVICES AND NAVIGATIONAL INSTRUMENTS	Replace Repair		2.0	2.0				
6801	Load Moment Indicator:	Test	0.1					5, 12, 13 24	(A)
74	CRAFES, SHOVELS AND EARTH MDVING EQUIPMENT AND COMPONENTS:	Replace				16.0			
7411	Crane Attachments:								
	Boom Assembly	Inspect Service Replace Repair	0.1	0.2	10.0 20.0			4, 6, 8, 9, 10, 11, 12 13, 24, 25, 26, 32, 33, 20, 31	
	Sheave Assembly, Boom Nose	Inspect Service Replace Repair	0.1	0.1 1.5	2.0			29, 31	
	Cable, Wire Rope	Inspect Service Replace	0.2	2.0 2.0				29, 31	
	Hook Block	Inspect Service Replace Repair	0.1	0.2 1.0	4.0			29, 31	
	Overhaul Ball	Inspect Service Replace Repair	0.1	0.1 1.0 1.0				29, 31	

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SECTION II. MAINTENANCE ALLOCATION CHART

(1) GROUP NUMBER	(2) COMPONENT ASSEMBLY	(3) MAINTENANCE FUNCTION	(4) MAINTENANCE LEVEL					(5) TOOLS AND EQUIPMENT	(6) REMARKS
			UNIT C	O	INTERMEDIATE F	H	DEPOT D		
7417	Hoists:								
	Main Hoist Assembly	Service		0.3				2, 4, 5, 10, 12, 13, 15, 22, 24	
		Replace			8.0				
		Repair			8.0				
	Auxiliary Hoist Assembly	Service		0.3					
		Replace			8.0				
		Repair			8.0				
	Hydraulic Motors, Hoist	Replace			3.0				
		Repair			2.0				
	Idler Roller, Hoist	Replace		1.0					
		Repair			2.5				
7419	Turntable:								
	Swing Brake	Replace			7.0	15		24, 12, 13,	
		Repair			3.0				
	Swing Gearbox	Service		0.3					
		Replace			4.0				
		Repair			4.0				
	Positive Swing Lock	Adjust		0.5					
	1.0	Replace		4.0					
	Swing Motor	Replace		3.0					
		Repair		2.0					
	Hydraulic Swivel	Replace			6.0				
		Repair			2.0				
	Air/Transmission Swivel	Replace			6.0				
		Repair			2.0				
	Electrical Swivel	Replace			3.0				
		Repair			2.0				

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**MAINTENANCE ALLOCATION CHART
FOR
ROUGH TERRAIN CONTAINER CRANE (RTCC)**

SECTION III. TOOL AND TEST EQUIPMENT REQUIREMENTS

TOOL OR TEST EQUIPMENT REF CODE	MAINTENANCE LEVEL	NOMENCLATURE	NATIONAL STOCK NUMBER	TOOL NUMBER	FSCM
1	O,F,H	Analyzer, Set	4910-00-124-2554	2389409	49671
2	F	Lubrication Service, Unit Trailer Mounted	4930-00-017-9157	901765-1	56190
3	F,H	Shop Equipment Battery Servicing Shelter Mtd	4940-00-209-6234	SC4940-95- CL-A58	19204
4	F	Shop Equipment Contact Mainten- ance Truck Mtd SC4940-95-CL-B04	4930-00-294-9518	SECM-1975	98255
5	F,H	Shop Equipment Electrical Repair Semitrailer Mtd SC4940-95-CL-B05	4940-01 150-3113	85236	16004
6	H	Shop Equipment General Purpose Repair, Semi- trailer Mtd SC4940-95-CL-B02	4930-00-006-3229	13221E9020	

**MAINTENANCE ALLOCATION CHART
FOR
ROUGH TERRAIN CONTAINER CRANE (RTCC)**

SECTION III. TOOL AND TEST EQUIPMENT REQUIREMENTS

TOOL OR TEST EQUIPMENT REF CODE	MAINTENANCE LEVEL	NOMENCLATURE	NATIONAL STOCK NUMBER	TOOL NUMBER	FSCM
7	F	Shop Equipment Organizational Repair Light Truck Mtd SC4940-95-CL-B03	4940-01-028-2672	SEORLT-S-12- 050-118	98255
8	H	Shop Equipment Machine Shop FM Heavy Less Power	3470-00-754-0738	SC3470-95- CL-A15	19204
9	H	Shop Equipment Machine Shop; FM Heavy Supply No. 1	3470-00-754-0739	SC3470-95-	19204
10	F	Shop Equipment Machine Shop; FM Basic	3470-00-754-0708	SC3470-95-	19204
11	F	Shop Equipment Welding, Field Maintenance	4940-00-357-7268	SC3470-95-	19204
12	F,M	Shop Equipment Auto-Maintenance and Repair, FM Basic	4910-00-754-0705	SC4910-95-	19204

**MAINTENANCE ALLOCATION CHART
FOR
ROUGH TERRAIN CONTAINER CRANE (RTCC)**

SECTION III. TOOL AND TEST EQUIPMENT REQUIREMENTS

TOOL OR TEST EQUIPMENT REF CODE	MAINTENANCE LEVEL	NOMENCLATURE	NATIONAL STOCK NUMBER	TOOL NUMBER	FSCM
13	F,H	Shop Equipment Auto-Maintenance and Repair, FM Suppl No. 1	4910-00-754-0706	SC4910-95-CL-A62	19204
14	H	Shop Equipment Auto-Maintenance and Repair, FM Suppl No. 2	4910-00-754-0707	SC4910-95-	19204
15	F,H	Tool Outfit Hyd System; Test and Repair, 3/4 Ton Trailer Mtd Sc4940-95-CL-B07	4940-01-036-5784	13221E6850	97403
16	F,H	Shop Equipment Fuel and Electric System Engine FM Basic	4940-00-754-0714	SC4910-95-CL-A01	19204
17	H	Stand Maintenance Auto-Axle, Wheel Mtd. Front and Rear Axle Unit	4910-00-241-3329	150-AX	32625
18	H	Test Set Diesel Injector	4910-00-317-8265	5910359	19204

**MAINTENANCE ALLOCATION CHART
FOR
ROUGH TERRAIN CONTAINER CRANE (RTCC)**

SECTION III. TOOL AND TEST EQUIPMENT REQUIREMENTS

TOOL OR TEST EQUIPMENT REF CODE	MAINTENANCE LEVEL	NOMENCLATURE	NATIONAL STOCK NUMBER	TOOL NUMBER	FSCM
19	F	Test Stand Auto-Generator and Starter, Floor Mtd. 500 AMP	4910-00-767-0218	MIL T4544	81349
20	F,H	Tool Kit Auto-Fuel and Electric System Repair	5180-00-754-0655	SC5180-95-CL-B08	19204
21	O,F,H	Shop Equipment Auto-Maintenance and Repair Common No 1	4910-00-754-0654	SC4910-95--CL-A74	19204
22	F	Shop Equipment Auto-Maintenance and Repair; Common No 2	4910-00-754-0650	SC4910-95-CL-A72	19204
23	O,F,H	Shop Equipment Auto-Maintenance and Repair; Org Suppl No 1	4910-00-754-0653	SC4910-95-	19204
24	O,F,H	Tool Kit, General Mechanic-Auto	5180-00-177-7033	SC5180-90-	19204

**MAINTENANCE ALLOCATION CHART
FOR
ROUGH TERRAIN CONTAINER CRANE (RTCC)**

SECTION III. TOOL AND TEST EQUIPMENT REQUIREMENTS

TOOL OR TEST EQUIPMENT REF CODE	MAINTENANCE LEVEL	NOMENCLATURE	NATIONAL STOCK NUMBER	TOOL NUMBER	FSCM
25	H	Tool Kit Body and Fender Repair	5180-00-357-7731	SC5180-90- CL-N62	5098
26	F,H	Tool Kit; Metalworkers	5180-00-754-0643	SC5180-90- CL-N34	5098
27	F	Tool Kit, Hyd Repair; Army Aircraft	5180-00-323-4891	SC5180-99- CL-AC3	8199
28	F,H	Tool Kit; Machinist, Post-Camp- Station	5280-00-511-1950	SC5280-95- CL-A02	1920
29	O	Tool Kit, General Mechanic; Equip Maintenance and Repair	5180-00-699-5273	SC5130-90-	5098
30	O,F	Welding Shop Trailer Mtd. Oxy-Acet/Elec- Arc	3431-01-090-1231	11022000	59678

**MAINTENANCE ALLOCATION CHART
FOR
ROUGH TERRAIN CONTAINER CRANE (RTCC)**

SECTION III. TOOL AND TEST EQUIPMENT REQUIREMENTS

TOOL OR TEST EQUIPMENT REF CODE	MAINTENANCE LEVEL	NOMENCLATURE	NATIONAL STOCK NUMBER	TOOL NUMBER	FSCM
31	F	Tool Kit Rigging Wire Rope	5180-00-596-1513	SC5180-90- CL-N17	50980
32	F,H	Tool Kit Welders	5180-00-754-0661	SC5180-90- CL-N39	50980
33	F, H	Torch Arc Weld Gas Shield 400 AMP	3431-00-165-4112	MIL W80105	81349
34	F,H	Welding Machine Arc; Transformer 300 AMP AC/DC	3431-00-620-5999	425ACDCG	99787
35	H	Welding Set Arc Inert Gas Shield Water Cool General Purpose Aluminum SC3431-95-CL-A02	3431-00-731-4163	EDTS004-61	81996
36	H	Shop Equipment Canvas and Glass Shop, Shelter Mtd.	4940-00-209-6239	SC4940-95- CL-A63	19204
37	H	Liner Puller	5120-01-143-2032	3376015	15434

**MAINTENANCE ALLOCATION CHART
FOR
ROUGH TERRAIN CONTAINER CRANE (RTCC)**

SECTION III. TOOL AND TEST EQUIPMENT REQUIREMENTS

TOOL OR TEST EQUIPMENT REF CODE	MAINTENANCE LEVEL	NOMENCLATURE	NATIONAL STOCK NUMBER	TOOL NUMBER	FSCM
38	H	Liner Driver		ST-1229	
39	F	Intake Valve Seat Extractor		3377396	
40	F	Exhaust Valve Seat Extractor		ST-1276-1	

APPENDIX A-1 SECTION IV. MAINTENANCE ALLOCATION CHART	
REFERENCE CODE	REMARKS
(A)	No heating, welding, cutting or drilling unless authorized by the manufacturer.
(B)	Reference FM 43-2, Metal body repair and related operations.

APPENDIX C**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 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. C").

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 C

EXPENDABLE MATERIAL LIST

(1) ITEM NUMBER	(2) LEVEL	(3) NATIONAL STOCK NUMBER	(4) DESCRIPTION	(5) U/M
1	0	9Q7920002929204	Clean rags	ea
2	0	5310005825965	Washer, lock	ea
3	0	5330011158226	Packing, preformed	ea
4	0	2940005806283	Element, oil filter	ea
5	0	5310004079566	Washer, lock	ea
6	0	9C9150001116254	Hydraulic oil, MIL-H-46170	pt
7	0	5310000453296	Washer, lock	ea
8	0	5330011901905	Gasket	ea
9	0	9G9150001900906	Multipurpose Grease, MIL-G-10924	pt
10	0		Anti-freeze coolant, MIL-A-46153	
11	0	5330012721138	Gasket	ea
12	0	5330012144857	Packing, preformed	ea
13	0		Loctite # 545	
14	0		Ring, gauge	ea
15	0	5310006379541	Washer, lock	ea
16	0	5310005845272	Washer, lock	ea
17	0		Gasket	ea
18	0	5310005967691	Washer, lock	ea
19	0	9G6810002646618	Sodium Bicarbonate	ea
20	0	5330012818997	Packing, preformed	ea
21	0	5330012718307	Gasket	ea
22	0	5330012721246	Seal, cap	ea
23	0		Filter, Coolant	ea
24	0	5330012721142	Gasket	ea
25	0	5330012714309	Gasket	ea
26	0	5330012013623	Packing, preformed	ea
27	0	5330012694323	Packing, preformed	ea
28	0	5310000453296	Washer, lock	ea
29	0		Cartridge, Air Desiccant	ea
30	0		Packing, preformed	ea
31	0	4330012819406	Filter element	ea
32	0	5315008395820	Pin, cotter	ea
33	0	5330012721123	Packing, preformed	ea
34	0	5320012714361	Pop rivet	ea
35	0	5320012715973	Pop rivet	ea
36	0		Bituminous acid resistant coating, MIL-SPEC-TTC494A	
37	0	5315011847607	Pin, lock	ea
38	0		Sealant, silicone, MIL-A-46146, Type 1	
39	0	5320011716252	Pop rivet	ea
40	0		Washer, lock	ea
41	0		Washer, lock	ea
42	0		Petroleum jelly	
43	0	5310002090965	Washer, lock	ea

APPENDIX C

EXPENDABLE MATERIAL LIST

(1) ITEM NUMBER	(2) LEVEL	(3) NATIONAL STOCK NUMBER	(4) DESCRIPTION	(5) U/M
44	0	2910006469727	Cartridge, engine starting	ea
45	0	5315000137258	Pin, cotter	ea
46	0	9G9150002732389	Lubricating oil, VV-L-800	ea
47	0	5315012209567	Pin, lock	ea
48	0	5315001780488	Pin, lock	ea
49	0	5315000137214	Pin, cotter	ea
50	0	5310000045033	Washer, lock	ea
51	0		Washer, lock	ea
52	0	5330011554277	Packing, preformed	ea
53	0		Packing, preformed	ea
54	0		Packing, preformed	ea
55	0		Never-seeze	ea
56	0	2940011576309	Element, oil filter	ea
57	0	5310006276128	Washer, tooth	ea
58	0	5330011158225	Packing, preformed	ea
59	0		Adhesive, 3M, 90 high strength, 62-4441-4930-6	ea
60	0		Adhesive, dual weatherstrip, light 4061 NAPA	ea
61	0	2510012696686	Molding	ea
62	0	5330011988439	Packing, preformed	ea
63	0	5310010715433	Washer, lock	ea
64	0	5330011909555	Gasket	ea
65	0	5310011951441	Washer	ea
66	0	5330011955268	Seal, banjo	ea
67	0	5310011912514	Washer, lock	ea
68	0		Paint, rust prohibitive	
69	0	21CP/1203	Bulb	ea
70	0	5310002090786	Washer, lock	ea
71	0	5330011326533	Packing, preformed	ea
72	0	5330004698290	Packing, preformed	ea
73	0		Fuel, diesel	ea
74	0	2910011964247	Filter, fuel	ea
75	0	2910011924622	Element, fuel filter	ea
76	0		Loctite 242	
77	0	5330008608023	Packing, preformed	ea
78			Lubricant, rubber	
79			Permatex No. 2	
80			Solvent, dry cleaning, P-D-680 Type II	
81	0	5330001448220	Packing, preformed	ea
82	0	5330012442273	Packing, preformed	ea
83	0	5330012698580	Packing, preformed	ea
84	0	5330012694323	Packing, preformed	ea

APPENDIX C

EXPENDABLE MATERIAL LIST

(1) ITEM NUMBER	(2) LEVEL	(3) NATIONAL STOCK NUMBER	(4) DESCRIPTION	(5) U/M
85	0	5330002287196	Packing, preformed	ea
86	0	5315008395822	Pin, cotter	ea
87	0	5310008206653	Washer, lock	ea

APPENDIX D

ILLUSTRATED LIST OF MANUFACTURED ITEMS.

D-1. SCOPE

This appendix includes complete instructions for making items authorized to be manufactured or fabricated at organizational maintenance.

NONE REQUIRED.

D-1/D-2 Blank

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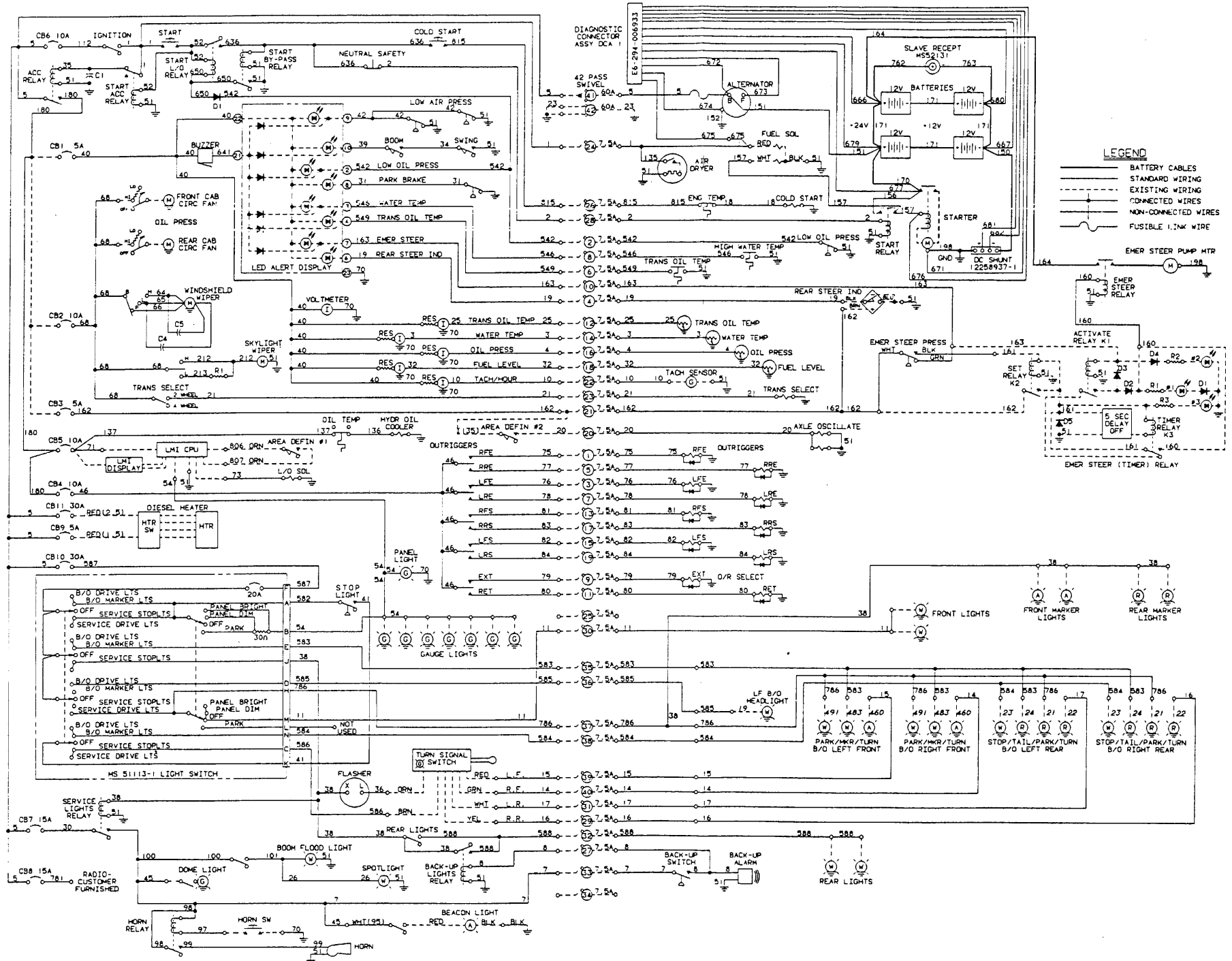
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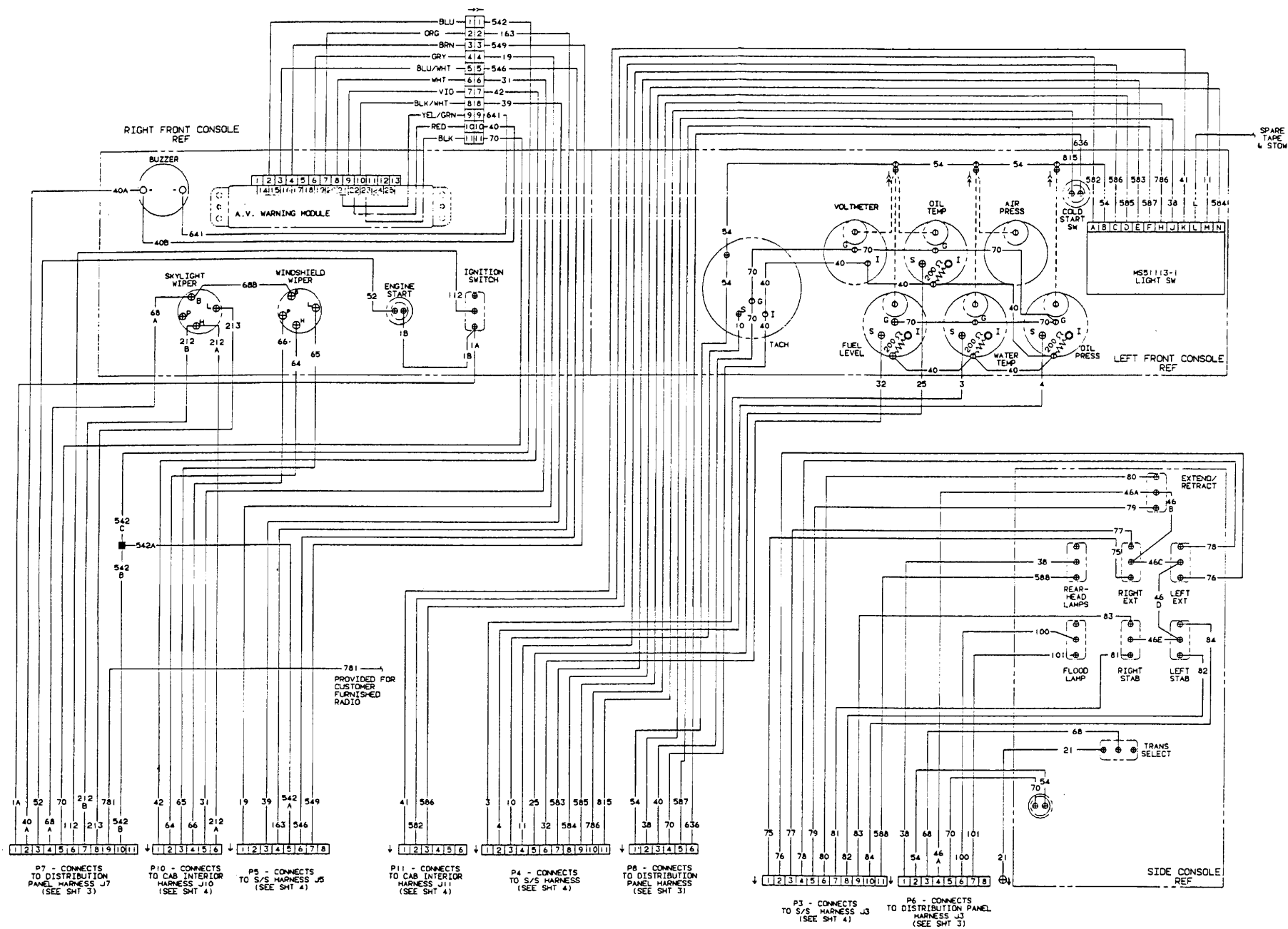
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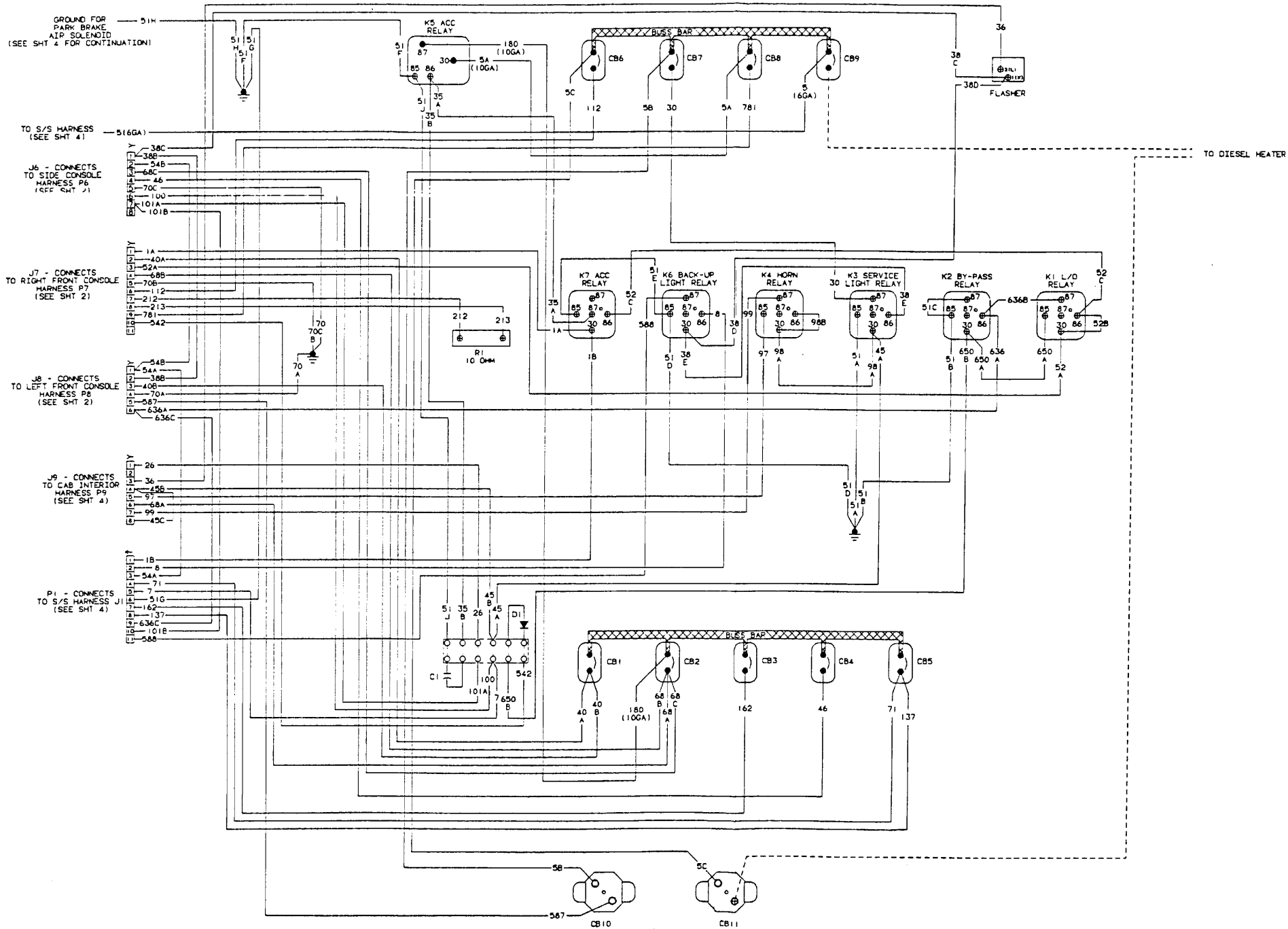
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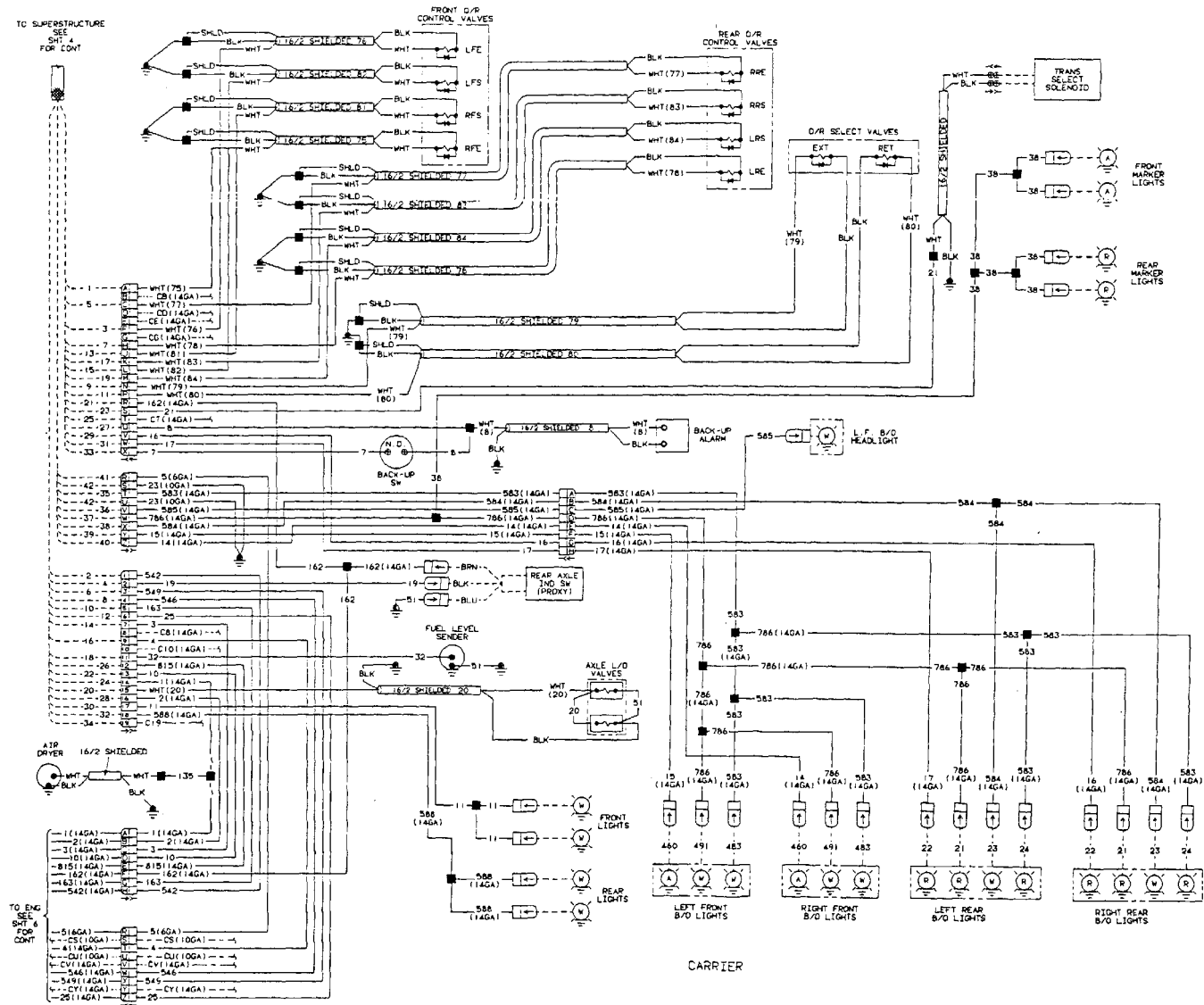
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By Order of the Secretary of the Army:

GORDON R. SULLIVAN
General, United States Army
Chief of Staff

Official:


MILTON H. HAMILTON
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03471

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THE METRIC SYSTEM AND EQUIVALENTS

WEIGHT MEASURE

1 Centimeter = 10 Millimeters = 0.01 Meters = 0.3937 Inches
 1 Meter = 100 Centimeters = 1000 Millimeters = 39.37 Inches
 1 Kilometer = 1000 Meters = 0.621 Miles

WEIGHTS

1 Gram = 0.001 Kilograms = 1000 Milligrams = 0.035 Ounces
 1 Kilogram = 1000 Grams = 2.2 lb.
 1 Metric Ton = 1000 Kilograms = 1 Megagram = 1.1 Short Tons

LIQUID MEASURE

1 Milliliter = 0.001 Liters = 0.0338 Fluid Ounces
 1 Liter = 1000 Milliliters = 33.82 Fluid Ounces

SQUARE MEASURE

1 Sq. Centimeter = 100 Sq. Millimeters = 0.155 Sq. Inches
 1 Sq. Meter = 10,000 Sq. Centimeters = 10.76 Sq. Feet
 1 Sq. Kilometer = 1,000,000 Sq. Meters = 0.386 Sq. Miles

CUBIC MEASURE

1 Cu. Centimeter = 1000 Cu. Millimeters = 0.06 Cu. Inches
 1 Cu. Meter = 1,000,000 Cu. Centimeters = 35.31 Cu. Feet

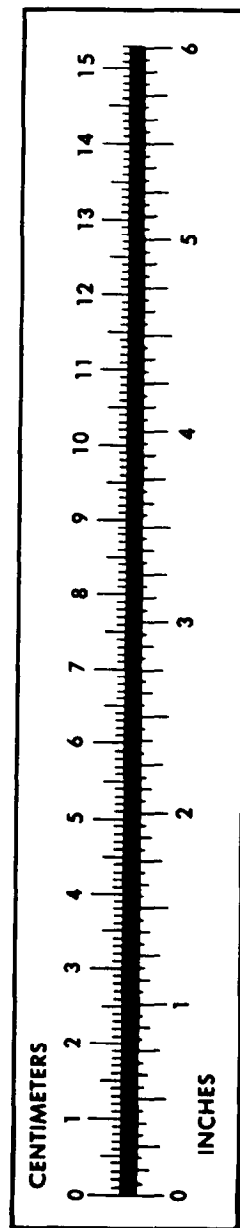
TEMPERATURE

$5/9(^{\circ}\text{F} - 32) = ^{\circ}\text{C}$
 212° Fahrenheit is equivalent to 100° Celsius
 90° Fahrenheit is equivalent to 32.2° Celsius
 32° Fahrenheit is equivalent to 0° Celsius
 $9/5^{\circ}\text{C} + 32 = ^{\circ}\text{F}$

APPROXIMATE CONVERSION FACTORS

TO CHANGE	TO	MULTIPLY BY
Inches	Centimeters	2.540
Feet	Meters	0.305
Yards	Meters	0.914
Miles	Kilometers	1.609
Square Inches	Square Centimeters	6.451
Square Feet	Square Meters	0.093
Square Yards	Square Meters	0.836
Square Miles	Square Kilometers	2.590
Acres	Square Hectometers	0.405
Cubic Feet	Cubic Meters	0.028
Cubic Yards	Cubic Meters	0.765
Fluid Ounces	Milliliters	29.573
its	Liters	0.473
arts	Liters	0.946
allons	Liters	3.785
Ounces	Grams	28.349
Pounds	Kilograms	0.454
Short Tons	Metric Tons	0.907
Pound-Feet	Newton-Meters	1.356
Pounds per Square Inch	Kilopascals	6.895
Miles per Gallon	Kilometers per Liter	0.425
Miles per Hour	Kilometers per Hour	1.609

TO CHANGE	TO	MULTIPLY BY
Centimeters	Inches	0.394
Meters	Feet	3.280
Meters	Yards	1.094
Kilometers	Miles	0.621
Square Centimeters	Square Inches	0.155
Square Meters	Square Feet	10.764
Square Meters	Square Yards	1.196
Square Kilometers	Square Miles	0.386
Square Hectometers	Acres	2.471
Cubic Meters	Cubic Feet	35.315
Cubic Meters	Cubic Yards	1.308
Milliliters	Fluid Ounces	0.034
Liters	Pints	2.113
Liters	Quarts	1.057
ers	Gallons	0.264
ms	Ounces	0.035
ograms	Pounds	2.205
Metric Tons	Short Tons	1.102
Newton-Meters	Pounds-Feet	0.738
Kilopascals	Pounds per Square Inch	0.145
ometers per Liter	Miles per Gallon	2.354
ometers per Hour	Miles per Hour	0.621



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