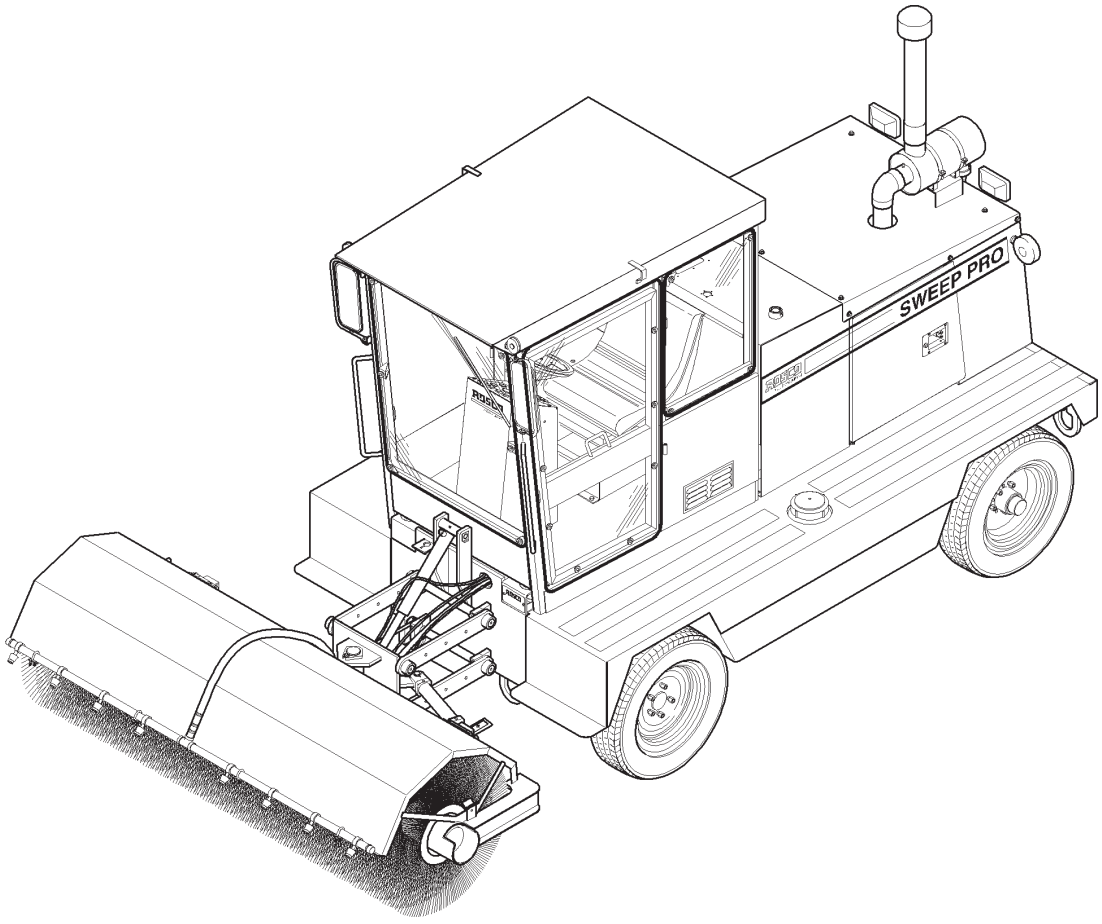
ROSCO

A LeeBoy Company

OPERATIONS, SERVICE AND PARTS MANUAL



SWEEPPRO BROOM

Manual No. 39004-01

For Units With Serial No. 44681 and higher

Revised 06-30-06

A LeeBoy Company

500 Lincoln County Parkway Ext.
Lincolnton, NC 28092
Tel: 704-966-3300
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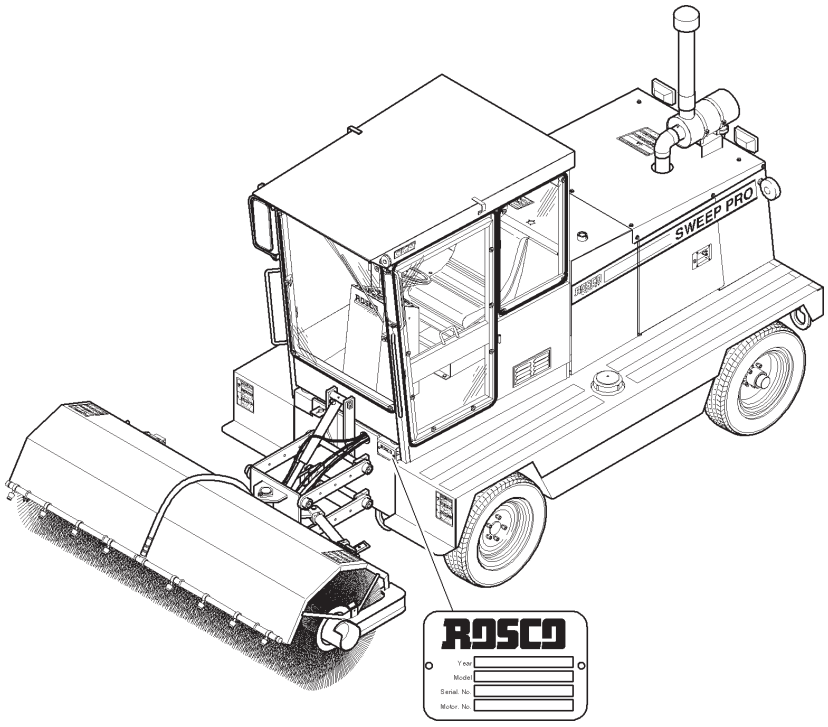
www.LeeBoy.com

USERS' REFERENCE GUIDE



DELIVERY DATE _____

UNIT SERIAL NUMBER _____

ENGINE TYPE _____

ENGINE NUMBER _____

DEALER'S NAME AND ADDRESS

_____

_____

PHONE NUMBER _____

EQUIPMENT HOURS _____

SERVICE MANAGER _____

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LIMITED WARRANTY
POLICY AND PROCEDURES
EFFECTIVE FOR UNITS SHIPPED AFTER DECEMBER 1, 2001

WARRANTY

1. If a defect in material or workmanship is found and the authorized dealer is notified during the warranty period, LeeBoy will repair or replace any part of component of the unit or part that fails to conform to the warranty during the warranty period.
2. The warranty date will begin upon the completion of the warranty form by the initial customer and will expire after twelve (12) months have passed. The Warranty Card should be filled out within ten (10) days of delivery of the unit.
3. Engines are warranted by their manufacturers and may have warranty coverage that differs from that of LeeBoy.
4. Replacement parts furnished by LeeBoy are covered for the remainder of the warranty period applicable to the unit or component in which such parts are installed.
5. LeeBoy has the right to repair any component or part before replacing it with a new part.
6. All new replacement parts purchased by a LeeBoy dealer will carry a six (6) month warranty. Remanufactured parts purchased by a LeeBoy dealer will carry a ninety (90) day warranty.

ITEMS NOT COVERED

LeeBoy is not responsible for the following:

1. Charges for travel time, mileage, or overtime.
2. Charges related to transporting the product to and from the place at which warranty work is performed.
3. Airfreight charges related to transporting repair parts to the place at which warranty work is performed.
4. All used units or used parts of any kind.
5. Repairs due to normal wear and tear, or brought about by abuse or lack of maintenance of the equipment, except for premature failures, conveyor chains, polytrack pads, and track rails.
6. Attachments not manufactured or installed by LeeBoy.
7. Liability for incidental or consequential damages of any type including, but not limited to lost profits or expenses of acquiring replacement equipment.
8. Miscellaneous charges.

LIMITATIONS

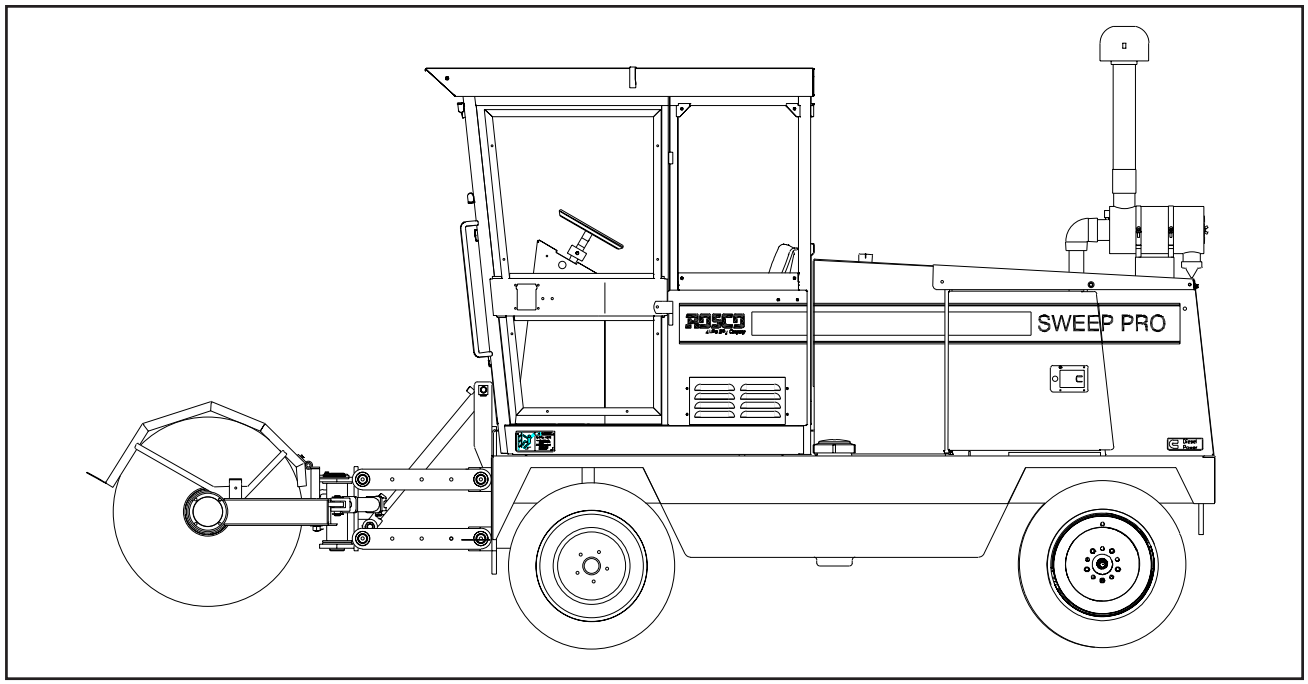
LeeBoy has no obligation under this warranty for:

1. Any defects caused by misuse, misapplication, negligence, accident or failure to maintain or use in accordance with the most current operating instructions.
2. Unauthorized alterations.
3. Defects or failures caused by any replacement parts or attachments not manufactured by or approved by LeeBoy.
4. Failure to conduct normal maintenance and operating service, including without limitation, providing lubricants, coolant, fuel, tune-ups, inspections or adjustments.
5. Unreasonable delay, as established by LeeBoy, in making the applicable units or parts available upon notification of a service notice ordered by LeeBoy.
6. The warranty responsibility on all engines and/or truck chassis rests with the respective manufacturer.
7. LeeBoy may have support agreements with some engine and/or truck chassis manufacturers for warranty and parts support.

OTHER WARRANTIES

THE FOREGOING WARRANTY IS EXCLUSIVE AND IN LIEU OF ALL OTHER EXPRESSED STATUTORY AND IMPLIED WARRANTIES APPLICABLE TO UNITS, ENGINES, OR PARTS WITH LIMITATION, ALL IMPLIED WARRANTIES OF MERCHANTABILITY OR FITNESS FOR ANY PARTICULAR USE OR PURPOSE. IN NO EVENT, WHETHER AS A RESULT OF BREACH OF CONTRACT OR WARRANTY, OR ALLEGED NEGLIGENCE OR LIABILITY WITHOUT FAULT, SHALL LEEBOY BE LIABLE FOR SPECIAL, INCIDENTAL OR CONSEQUENTIAL DAMAGES, INCLUDING WITHOUT LIMITATION, LOSS OF PROFIT OR REVENUE, COST OF CAPITAL, COST OF SUBSTITUTED EQUIPMENT, FACILITIES OR SERVICES, DOWNTIME COSTS, LABOR COSTS OR CLAIMS OF CUSTOMERS, PURCHASERS OR LESSEES FOR SUCH DAMAGES.

SWEEPPRO BROOM
OPERATIONS, SERVICE AND PARTS MANUAL

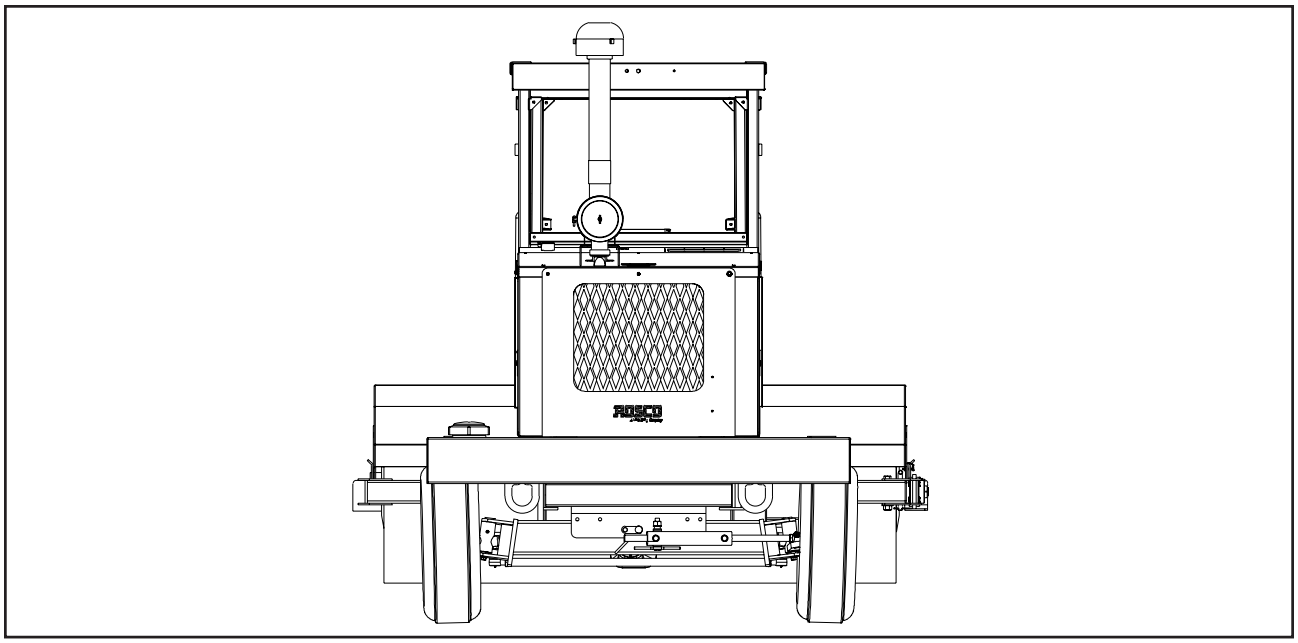


SIDE VIEW

This manual should be used with all related supplemental books, engine and transmission manuals, and parts books. Related Service Bulletins should be reviewed to provide information regarding some of the recent changes.

If any questions arise concerning this publication or others, contact your local ROSCO Distributor for the latest available information.

Contents of this manual are based on information in effect at the time of publication and are subject to change without notice.



REAR VIEW

SWEEPPRO BROOM

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Section 1
INTRODUCTION & SAFETY

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Section 1
INTRODUCTION & SAFETY

FORWARD

LeeBoy's ROSCO brand self-propelled SweepPro Broom is used for cleanup and removal of dirt, debris and other foreign materials from roadways, at landfills, in landscaping, in road building or resurfacing projects and at industrial sites. The SweepPro's front-mounted rotary broom is commonly used in chip seal coating, asphalt milling, light snow removal and general construction site clean-up applications. The 150-gallon brush watering system can be used for dust control during sweeping.

This manual contains the correct operation and routine maintenance procedures needed by the owner/operator for the safe and efficient use of the ROSCO SweepPro Broom. In order to maximize the performance and efficiency of the SweepPro, it is VERY IMPORTANT that the owner/operator and maintenance personnel read this manual thoroughly before operating or servicing the broom.

Always keep this manual in a convenient place for instant reference and NEVER attempt to make repairs or adjustments that you do not fully understand. If you require additional information or service, contact your authorized ROSCO Dealer. Always give your dealer the Serial Number of your machine when ordering parts or when requesting service or other information.

The technical information found in this manual was correct at the time it was approved for publication. However, due to a continuous program of research and development, some procedures, specifications and parts may be altered in a constant effort to update and improve our products.

ROSCO Manufacturing Company reserves the right to make design or specification changes without prior notification and to make improvements without incurring an obligation to add them to any machine in existence. Please contact your local authorized ROSCO Dealer if you require further assistance.

RECEIVING THE SWEEPPRO BROOM

CAUTION: Always set the park brake before leaving the machine. Check park brake before placing machine back in service.

The SweepPro Broom was inspected thoroughly at the factory. However, road hazards or vandalism may occur during transport, and result in damage. Inspect the machine as outlined below and perform necessary repairs before placing the machine in service.

1. Check engine oil level as shown in the manufacturer's manual.
2. Check fuel tank, cooling system, engine oil, and hydraulic reservoir for proper levels and contaminants. If contaminants are suspected, flush and fill the system.
3. Read this manual and understand the contents.
4. Check all hydraulic functions and repair or adjust as necessary. Have any repairs or adjustments performed by a qualified mechanic, or consult your local dealer.
5. Check for missing parts. If parts are missing or the machine is damaged, contact the local dealer.
6. Check the park brake to make sure it is operating properly.
7. Check the seat belt to make sure it is operating properly.

OVERVIEW OF THE MANUAL

GENERAL INFORMATION

This manual contains Safety information, Specifications, Operation procedures, Maintenance and Troubleshooting guidelines, and an Illustrated Parts List for the SweepPro Broom.

INTRODUCTION AND SAFETY

Important Safety precautions related to specific areas of the machine and workplace are included to insure your safety, the safety of those around you, and the correct operation of the broom.

SPECIFICATIONS

Refer to **Specifications**, Section 2 in this manual, for all major system specifications and detailed information on this machine's components and controls.

OPERATION

Refer to **Operation**, Section 3 in this manual, for information needed to operate the broom safely. The operator of this equipment should READ, UNDERSTAND, and FOLLOW all instructions and **ALL** Safety precautions found in Section 1 of this manual, as well as all Cautions and Warnings provided throughout all sections of this manual.

CAUTION: **Do not attempt to operate the SweepPro Broom unless fully trained in the machine's operation. Only authorized personnel should operate this machine. All instructions provided in this manual and on the machine's operation and warning decals must be followed to prevent damage to the equipment and/or injury to operating personnel.**

MAINTENANCE AND TROUBLESHOOTING

Refer to **Maintenance**, Section 4 of this manual, for all maintenance and repair procedures, as well as charts and tables containing important machine-specific information.

CAUTION: **All maintenance instructions provided in this manual should be followed to insure the safety of the personnel performing the maintenance and to prevent damage to the machine.**

PRECAUTIONARY INSTRUCTIONS

This manual provides important information to familiarize you with safe operating and maintenance procedures. Even though you may be familiar with similar equipment, you MUST read and understand this manual before operating this unit.

Safety is everyone's business and is one of your primary concerns. Knowing the guidelines covered in the following paragraphs and throughout Section 1 will help provide for your safety, the safety of those around you, and the machine's proper operation.

LOOK FOR THESE SYMBOLS WHICH POINT OUT ITEMS OF EXTREME IMPORTANCE TO YOU AND YOUR COWORKERS. READ AND UNDERSTAND THE WARNINGS. HEED AND FOLLOW THE INSTRUCTIONS.

Note the use of the words DANGER, WARNING, CAUTION and ATTENTION with the message. The appropriate word for each message has been selected using the following guidelines:

DANGER: **An immediate and specific hazard which WILL result in severe personal injury or death if the proper precautions are not taken.**

WARNING: **A specific hazard or unsafe practice which COULD result in severe personal injury or death if proper precautions are not taken.**

CAUTION: **Unsafe practices which COULD result in personal injury if proper practices are not taken, or as a reminder of good safety practices.**

ATTENTION: **Equipment on the machine could be damaged through improper performance of an operation, maintenance or repair procedure.**

MATERIAL SAFETY DATA SHEETS

In addition, some machines use or contain hazardous chemicals which may require a specific Material Safety Data Sheet (MSDS). If such information is necessary for the safe operation of this machine, those MSDSs are included on the following pages.

SAFETY DECALS

KNOW and UNDERSTAND the content and position of each safety decal.

KEEP the safety decals and signs CLEAN and legible.

REPLACE safety decals and signs that are missing or have become illegible. When replacing or painting machine parts, REPLACE safety decals as necessary. Refer to Decal Installation in Section 4, **Maintenance**.

OBTAIN replacement decals or signs from your dealer. Refer to the **Illustrated Parts List** in this manual for a list of part numbers.

The illustrations on this page will aid you in determining the proper location of decals. If you need more explicit instructions for their placement, contact your dealer.

NOTE: It is the responsibility of the owner and operator to make sure that all decals are readable and located on the machine as designated by the manufacturer.

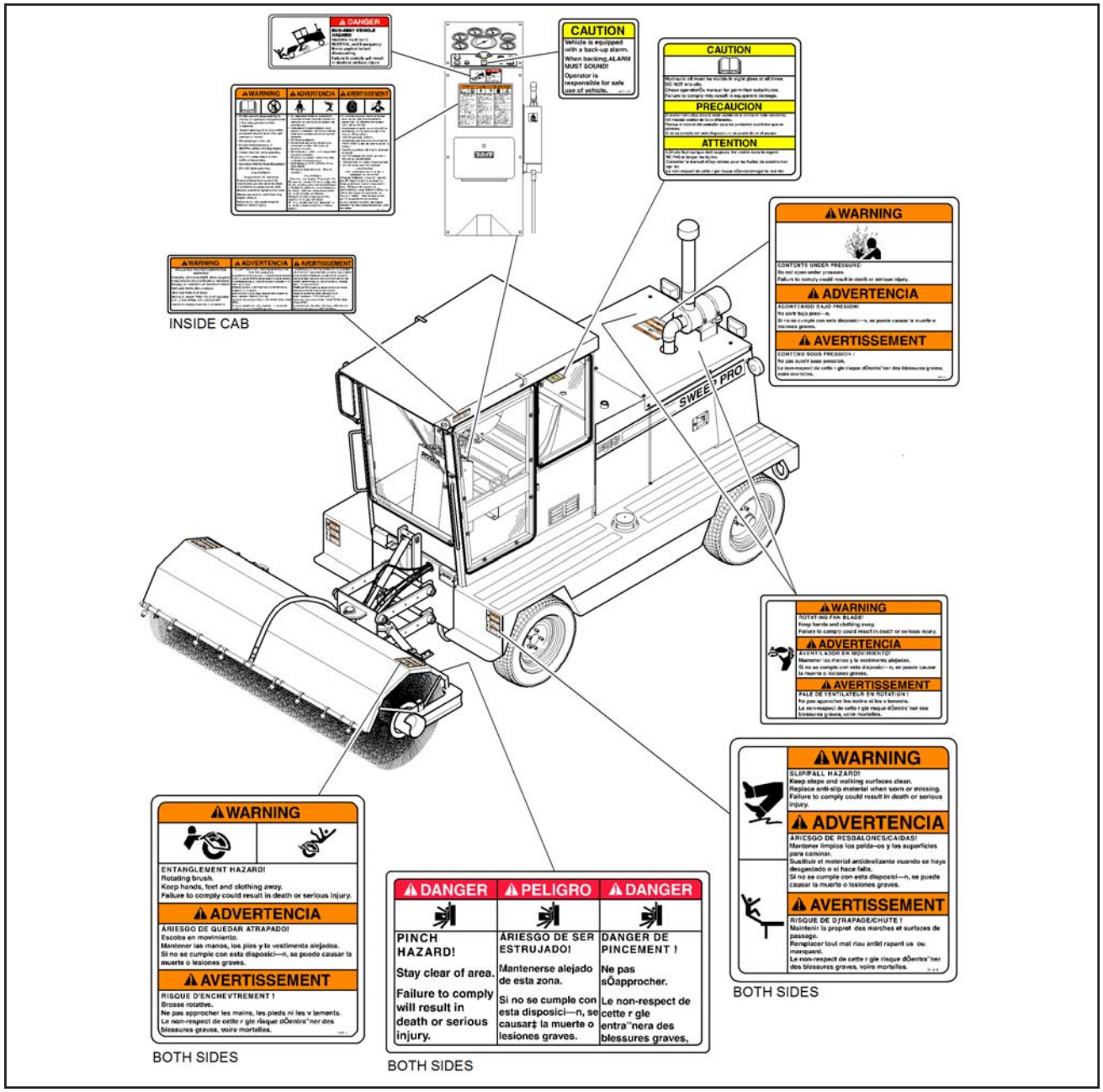

FIGURE 1-1. DECALS and DECAL LOCATIONS

SAFETY

PRE-START INSPECTION

INSPECT machine. Have any malfunctioning, broken or missing parts corrected or replaced before using the machine.

READ and UNDERSTAND the operator's manual as well as all instruction and safety decals.

Have a FIRST AID KIT available. KNOW how to use it.

Have a charged FIRE EXTINGUISHER within reach. Have the correct type for your situation:

TYPE A: Wood, paper, textile, rubbish.

TYPE B: Flammable liquid.

TYPE C: Electrical equipment.

CHECK hydraulic hoses daily for wear and leaks. Replace if damaged.

CHECK engine, transmission, and hydraulic oil levels. Fill to the correct level as necessary.

USE the correct hydraulic fluid grade for the operating season. Refer to the **Hydraulic Fluids Chart** in Section 4.

FILL the fuel tank with the engine off. NEVER fill fuel tank near an open flame, or when smoking.

CHECK for frayed or worn electrical wires and loose or corroded connections.

CHECK tires for wear, cuts, and damage. CHECK air pressure.

INSPECT wheels for loose, damaged, or missing hardware. TIGHTEN as necessary. Refer to the torque specification charts in Section 4.

CHECK pedals and levers for freedom of movement.

MAKE SURE operator's compartment, steps and hand holds are free of grease and debris.

CHECK steps and supports for damage. Repair as necessary.

CHECK protective devices, cab, ROPS, canopy, shields, and seat belt for wear or damage.

MAKE SURE all lights, reflectors and other protective devices are clean and operate correctly.

CHECK that all safety decals and signs are in place and readable. These are as important as any other equipment on the machine.

OPERATING SAFETY

WEAR OSHA required safety equipment when operating the machine.

WEAR appropriate ear protection when exposed to loud noise.

DO NOT wear loose fitting clothing, rings or wrist watches that could catch on moving parts.

ADJUST the seat and FASTEN the seat belt before starting the machine.

ALWAYS make sure no person or object is in your line of travel BEFORE starting.

DO NOT allow riders on the machine unless they are seated in appropriate seats.

KNOW and UNDERSTAND the job site traffic flow patterns. Work SLOWLY in tight areas and when turning.

DRIVE at speeds compatible with road, weather, and job site conditions.

AVOID steep hills, rough terrain, and sharp turns if possible.

ALWAYS look BEFORE changing your direction of travel.

DO NOT run engine in a closed building for long periods of time.

DO NOT start engine by shorting across starter terminals. Machine will start in gear if normal circuitry is bypassed.

NEVER start engine while standing on the ground. Start engine only from operator's seat, with all controls in neutral.

DO NOT leave the engine running without operator present.

USE recommended hand holds and steps with at least three points of support when getting on and off the machine. Face the machine and NEVER jump off or dismount while the machine is moving.

STOPPING SAFETY

ALWAYS park the machine on solid, level ground. If this is not possible, always park at a right angle to the slope.

ALWAYS engage park brake.

USE proper flags, barriers and warning devices especially when parking in areas of traffic.

GENERAL MAINTENANCE SAFETY

NEVER work on the machine with the engine running.

DO NOT change the engine governor settings.

DO NOT work under the machine unless the machine is supported by approved jacks and jack stands.

ALWAYS replace damaged or lost decals.

REINSTALL safety devices, guards or shields after servicing or adjusting the machine.

CLEAN the service area. KEEP tools and parts off the floor. BE SURE electrical outlets and tools are properly grounded. USE adequate light for the job.

BATTERY SAFETY

DISCONNECT battery cables when working on the electrical system or when welding on the unit.

IF battery needs a charge, be sure battery charger is off when making connections.

BE SURE the correct battery polarity is observed [negative (-) to negative (-) and positive (+) to positive (+)], when connecting a battery charger or jumper cable.

DO NOT tip batteries more than 45 degrees. Electrolyte solution is caustic and explosive.

TIRE SAFETY

DO NOT change tires unless the machine is supported by approved jacks and jack stands.

DO NOT inflate tires beyond the maximum recommended pressure.

DO NOT hammer on rims with steel hammers. Use rubber, lead, plastic or brass faced mallets.

DO NOT mount a tire without the proper equipment and experience.

HANDLING FLUIDS SAFELY

NEVER fill the fuel tank with the engine running.

DO NOT smoke while refueling the machine.

DO NOT fill fuel tank to capacity. Allow room for expansion.

DO NOT use hands to find hydraulic leaks. High-pressure fluid can penetrate the skin, causing severe injury.

TRANSPORT

FOLLOW all local regulations regarding transporting equipment on public roads and highways.

KNOW and USE all required signal devices, including tail lights, slow moving vehicle signs, and warning beacons. Provide an escort when necessary.

BE SURE the lights and reflectors are clean, in good repair and can be seen clearly by all overtaking and oncoming traffic.

Refer to Section 3, **Operation**, for more detailed instructions.

STORAGE

STORE the machine in an area away from human activity.

BE SURE the unit is stored in an area that is firm, level and free of debris.

STORE the machine inside a building, or cover it with a weather-proof tarpaulin and support the wheels securely.

Refer to Section 4, **Maintenance**, for more detailed instructions.

NOTES

Section 2
SPECIFICATIONS

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Section 2
SPECIFICATIONS

GENERAL INFORMATION

The descriptions and specifications provided in this section are applicable to the SweepPro Broom. This section contains a description of how the major components operate. It also includes specifications for the major system components. Included in this section are machine weights, dimensions, performance, and major system specifications for the ROSCO SweepPro Broom.

ENGINE

The SweepPro Broom uses a four-cylinder, water cooled diesel engine to drive the hydraulic traction pump and the auxiliary pump for steering and brush control. The engine is mounted to the rear of the operating platform and accessible through doors in the engine cover.

A fuel lift pump mounted on the (Caterpillar only) tank inside the engine compartment draws diesel fuel from the fuel tank. The fuel tank is mounted behind the operator's platform.

An air cleaner mounted on the top of the engine filters intake air before use by the engine. The air cleaner removes fine particles such as dust, sand, chaff, and lint from the air.

A pre-cleaner mounted on top of the air cleaner assembly removes larger particles of dirt and debris before the air enters the air filter elements. The pre-cleaner relieves the load on the air filter elements and allows longer intervals between servicing. The materials trapped by the pre-cleaner are deposited in the pre-cleaner bowl.

As air is taken into the air cleaner assembly, a cyclone type action deposits some of the fine particles in the evacuator mounted on the bottom of the air cleaner housing. The evacuator is held closed during engine operation by suction. When the engine is shut off the weight of the debris helps to open the rubber flaps allowing the debris to fall out. The rubber flaps can also be squeezed together for cleaning.

Primary and secondary fuel filters remove contaminants from the diesel fuel before the fuel flows to the injection pump for injection into the engine combustion chamber.

A radiator mounted at the rear of the broom cools the engine. As coolant flows through the radiator, airflow from the engine-driven fan removes heat from the coolant.

Refer to the engine manufacturer's manual for a complete description of the engine.

ELECTRICAL SYSTEM

The electrical system is powered by a 12-volt battery mounted inside the engine compartment.

The battery produces 12 volts DC and maintains 1000 cold cranking amperes (CCA). An engine-mounted alternator capable of 60 amperes charging capacity keeps the battery charged during normal operation.

The battery charge rate can be monitored using a voltmeter mounted in the instrument panel.

HYDRAULIC SYSTEM

The ROSCO SweepPro Broom is a fully hydrostatic, self-propelled unit. The Hydrostatic Drive System and Hydraulic System, which powers the steering and brush drive, have one common oil reservoir.

Hydrostatic Drive System

This system propels the broom forward and reverse with dynamic braking. The system consists of a variable displacement pump driven off the rear of the diesel engine. This pump provides power to a variable displacement motor. This motor drives a mechanical front axle through a drive shaft and gear transfer case arrangement.

Hydrostatic Drive Control

Control for the Drive System is provided by a manually operated lever at the driver's platform, located on the right side of the seat. A neutral position, which activates a neutral start switch, is included between forward and reverse directions of the control lever. This provides for easy and safe starting of the broom. There is also a toggle switch to engage the transmission Speed Selector.

ATTENTION: Never decelerate or change direction rapidly. Changing direction rapidly may cause excess heat and pressure in the hydrostatic drive system. This can shorten the system component life.

Steering & Brush Hydraulic System

A hydraulic pump, which is directly connected to the Hydrostatic System pump, has a built-in priority flow divider. The divider provides priority flow to the steering system and the brush lift and swing valves at approximately 4 gallons per minute. Excess flow from the pump provides power for the brush drive motor. The steering flow ALWAYS receives the priority flow so it is always powered.

Steering

Steering is performed by a hydraulically powered orbital system and operated by a steering wheel. In the event of a hydraulic power failure, the machine can still be steered.

Brush Control

The brush drive speed is regulated by the engine speed. Brush lift and swing is controlled by push buttons on the travel control lever. The buttons operate solenoid controlled hydraulic valves.

SPECIFICATIONS

Tables 2-1 through 2-7 list major system specifications for the SweepPro Broom. Additional maintenance tables are shown in Section 4, **Maintenance**.

TABLE 2-1. ENGINE SPECIFICATIONS

ITEM	SPECIFICATION
ENGINE - CUMMINS 4B3.3	
Type	4 Cycle Diesel, Water Cooled
Number of Cylinders	Four
Bore & Stroke	3.7 in. (94 mm) x 4.5 in. (114 mm)
Displacement	199 cu. in. (3.3 liters)
Power @2500 RPM	85 HP (63 kw)
Idle Speed	1000 RPM
Engine Oil Type	15W-40
Oil Capacity	8.4 quarts (8 liters)
ENGINE - CATERPILLAR 3044T	
Type	4 Cycle Diesel, Water Cooled
Number of Cylinders	Four
Bore & Stroke	3.7 in. (94 mm) x 4.72 in. (120 mm)
Displacement	203 cu. in. (3.33 liters)
Power @2500 RPM	85 HP (63 kw)
Idle Speed	1000 RPM
Engine Oil Type	15W-40
Oil Capacity	8.4 quarts (8 liters)
ENGINE COOLING SYSTEM	
Type	Radiator
Capacity	4 gallons (15 liters)
ENGINE FUEL	
Type	Diesel
Capacity	30 gallons (114 liters)
FUEL FILTER	
Primary (Cartridge)	P/N 38734-02/Cummins; 38144-03/Caterpillar
In-Line	P/N 33291
OIL FILTER	
Cartridge	P/N 38734-01/Cummins; 38144-02/Caterpillar
AIR FILTER	
Primary (Dry-type)	P/N 36643-01
Safety (Cartridge)	P/N 171150

TABLE 2-2. ELECTRICAL SPECIFICATIONS

ITEM	SPECIFICATION
BATTERY	
Rating	1000 CCA
Voltage	12 Volt
ALTERNATOR	
Rating	60 Amps
Type and Voltage	12 Volt, negative ground

TABLE 2-3. MACHINE DIMENSIONS

ITEM	SPECIFICATION
Weight	5,700 lbs (2,585 kg)
Overall Length	15' 10" (4.83 m)
Overall Height	8' 1" (2.46 m)
Overall Width (Brush at 30°)	8' 6" (2.59 m)
Tread Width (Front & Rear)	5' 6" (1.68 m)
Wheelbase	7' 2" (2.18 m)
Turning Radius (Inside)	5' 2" (1.57 m)
Turning Radius (Outside)	13' 4" (4.17 m)
Ground Clearance	13" (33 cm)

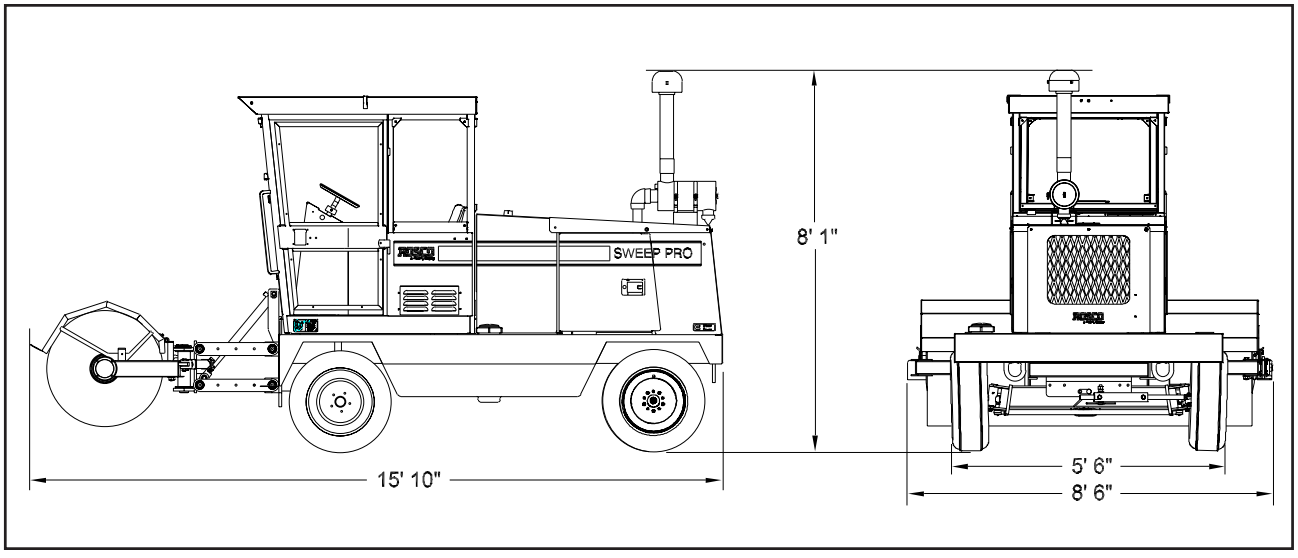

FIGURE 2-1. OUTLINE DIMENSIONAL DRAWING

TABLE 2-4. DRIVE SYSTEM SPECIFICATIONS

ITEM	SPECIFICATION
Transmission	2-Speed Hydrostatic
Steering	Hydraulic, Orbital Motor
	3.7 GPM (14 LPM) priority flow at 1500 psi (10 MPa)
Rear Axle	Heavy Duty, Truck-Type, Oscillating
Tires	ST 225/75-15R
SPEED	
High (Travel)	0-22 mph (0-35 kph)
Low (Working)	0-12 mph (0-19 kph)
HYDROSTATIC DRIVE SYSTEM	
Pump Model and Manufacturer	Sauer/Danfoss M46 Series 40
Pump Displacement	2.8 CIR (46 cc)
Motor Model and Manufacturer	Sauer/Danfoss M46 Series 40
Motor Displacement (2-Speed)	2.8 CIR (46 cc)
Hydraulic Reservoir	25 gallons (95 liters)
Hydraulic Fluid	Refer to Section 4, **Maintenance**
Hydraulic Filters	7-Micron Spin-On Cartridge (P/N 34464)
Hydraulic Strainer	In-Tank (P/N 33148)
Oil Cooler	Flow-Thru
FINAL DRIVE SYSTEM	
Gear Box	4.533:1 Ratio
Front Axle, Differential, Semi-Float	3.55:1 Ratio
Brakes	Drum-Type Hydraulic, Duo-Servo

TABLE 2-5. BRUSH OPERATING SYSTEM

ITEM	SPECIFICATION
Pump (Gear-Type)	19 GPM (72 LPM), 3,000 psi (21 MPa)
Motor (Gerotor-Type)	Direct Drive
Brush Core (Welded Steel)	10 in. x 7 ft. 6 in. (25 cm x 2.3 m)
Brush Filler (Wafer-Type)	10 in. x 32 in. (25 cm x 81 cm)
Brush Filler (Tube-Type)	10 in. x 32 in. (25 cm x 81 cm)
Brush Cover (Steel)	160°, Full Length
Brush Speed	200 RPM maximum, Variable w/Engine RPM
Brush Angle	30°, Left or Right
Down Pressure Control	Hydraulic, Fully Adjustable
Brush Watering System	Poly Tanks, 2@75 gallons (284 liters), Strainer, 12 Volt Diaphragm-Type Pump

TABLE 2-6. CAB SPECIFICATIONS

ITEM	SPECIFICATION
ROPS Cab	OSHA & SAE Certified
Windshield Wiper (Front)	12 Volt, 2-Speed
Defroster Fan (Front)	12 Volt, Variable Speed
Seat	Padded with Seat Belt
Horn	12 Volt, Automotive-Type
Back-up Alarm	97 db +/- 4 db at 4 ft. (122 cm)
Air Conditioning	22,000 Btu/Hr (6,448 Watt) Capacity
Heater	30,000 Btu/Hr (8,793 Watt) Capacity
Lights	Turn Indicators, Tail Lights, Work Lights, Stop Lights
Mirrors	West Coast
Instrumentation	Oil Pressure, Coolant Temperature, Fuel Gauge, Voltmeter, Hourmeter, and Tachometer

TABLE 2-7. OPTIONAL EQUIPMENT

ITEM	SPECIFICATION
Defroster Fan (Rear)	12 Volt, Variable Speed
Windshield Wiper (Rear)	12 Volt, 2-Speed
Windshield Washer (Front or Rear)	12 Volt
Mirrors	Inside Rear View
Ether Start (Cummins only)	12 Volt
Engine Block Heater (Cummins only)	12 Volt, 400 Watt
Engine Pre-Cleaner	Standard or Turbo-Type
Instrumentation	Hydraulic Oil Temperature, Engine Warning Light/Buzzer
Seat	Suspension, Adjustable, with Seat Belt

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NOTES:

Section 3
OPERATION

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Section 3
OPERATION

GENERAL INFORMATION

This section provides the Operating instructions for the SweepPro Broom. Before starting or operating the machine, it is important to READ, UNDERSTAND, and FOLLOW all Operating instructions, Danger, Warning, and Caution messages in this section, as well as all Safety information contained in Section 1 of this manual.

DANGER: **Failure to observe the Operating instructions, Danger, Warning, and Caution messages in this manual can cause serious injury or death. Only authorized personnel, who are fully trained in the machine operation, can operate the SweepPro Broom.**

This machine should be kept in good mechanical condition at all times.

WARNING: **Do not operate a machine needing repair. Put an information tag on the instrument panel that says DO NOT OPERATE. Remove the key from the ignition switch. Repair all damage at once. Minor damage can result in major system failures.**

OPERATING CONTROLS, INDICATORS, AND GAUGES

Operating controls for the SweepPro Broom are shown in Figures 3-1 through 3-6 and listed in Tables 3-1 through 3-6. All controls, indicators and gauges are located in the operator's compartment.

WARNING: **Do not start or operate the SweepPro Broom before reading, understanding and following all information given in this section and shown on the machine. The operator must read and understand the function of all controls, indicators, and gauges before starting the engine. Serious injury or death can result if these procedures are not followed.**

The ignition key-switch, light switches, gauges, and warning indicators are mounted on the steering wheel console in front of the operator. The park brake lever is mounted on the right side of the steering wheel console.

The joystick, brush drive lever, speed selector switch, throttle control, and brush down pressure control are mounted in a panel to the right of the operator's seat.

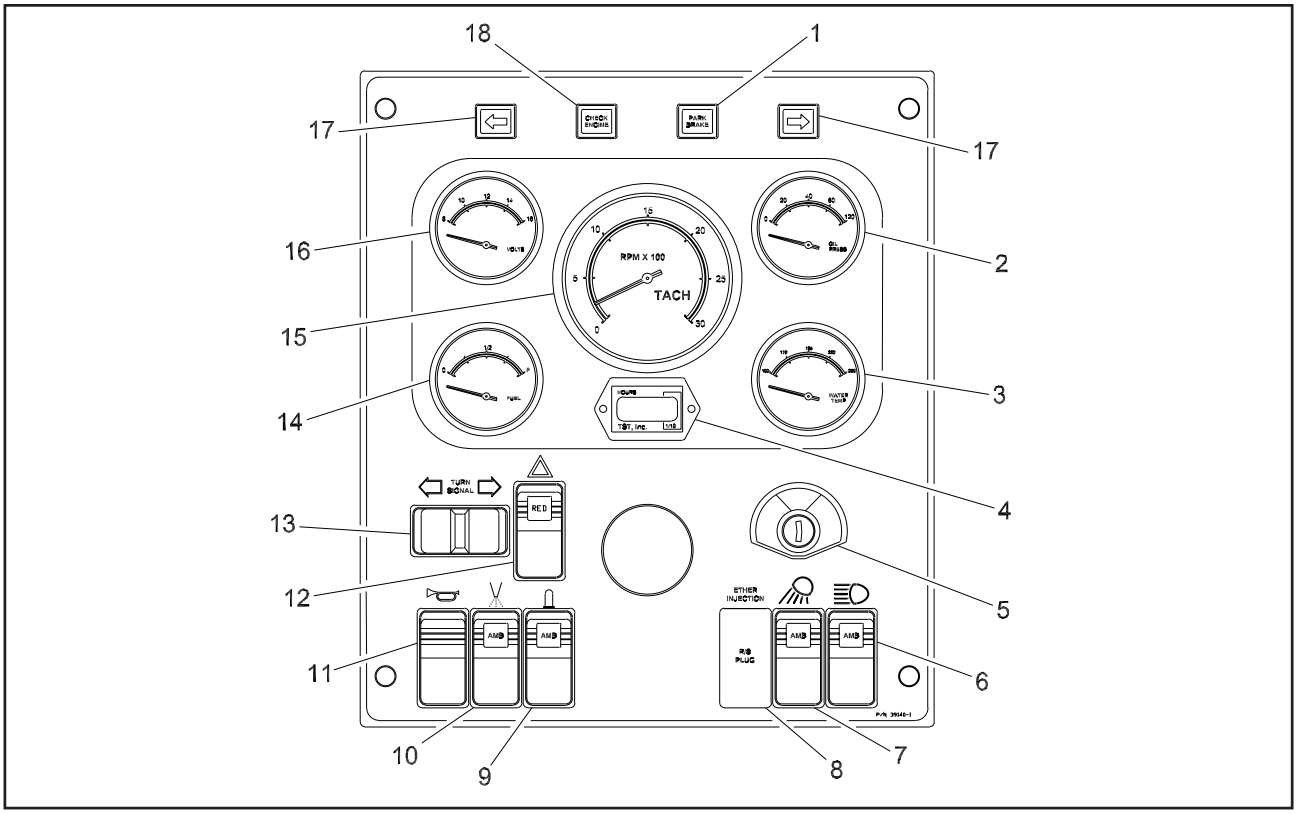


FIGURE 3-1. INSTRUMENT PANEL

TABLE 3-1. INSTRUMENT PANEL

FIGURE	ITEM	CONTROL NAME	TYPE	FUNCTION
3-1	1	Park Brake Light	Red Warning Light	Indicates that park brake is set.
3-1	2	Oil Pressure Gauge		Displays engine oil pressure in pounds per square inch (psi).
3-1	3	Temperature Gauge		Displays engine coolant temperature.
3-1	4	Hour Meter		Displays total machine work hours.
3-1	5	Ignition Switch	Key	Used to start and stop the engine and activate switched power circuits.
3-1	6	Head Lights Switch	ON/OFF (Rocker Switch)	Activates the head lights.
3-1	7	Work Lights	ON/OFF (Rocker Switch)	Activates the work lights. Used to illuminate work area when working at night.
3-1	8	Cold Start	ON/OFF (Rocker Switch)	Optional Ether Injection on Cummins. Standard Glow Plugs on Caterpillar.
3-1	9	Beacon Light Switch	ON/OFF (Rocker Switch) equipment.	Controls cab-mounted strobe beacon light. Warns traffic of slow moving
3-1	10	Brush Watering System Switch	ON/OFF (Rocker Switch)	Activates brush watering system.
3-1	11	Horn Switch	ON/OFF (Rocker Switch)	Sounds the horn when pressed.
3-1	12	Hazard Lights	ON/OFF (Rocker Switch)	Activates the hazard lights.
3-1	13	Turn Signal Switch	ON/OFF/ON (Toggle Switch)	Activates the left/right turn signals.
3-1	14	Fuel Gauge		Displays fuel level in the fuel tank.
3-1	15	Tachometer		Displays engine speed in revolutions per minute (RPM).
3-1	16	Voltmeter		Displays the condition of the battery charging system.
3-1	17	Directional Arrows	Green Flashing Light	Indicates left/right turn as selected with Turn Signal Switch (item 13).
3-1	18	Check Engine Light	Red Warning Light	Indicates engine malfunction. Check major components and fluid levels. Service immediately.

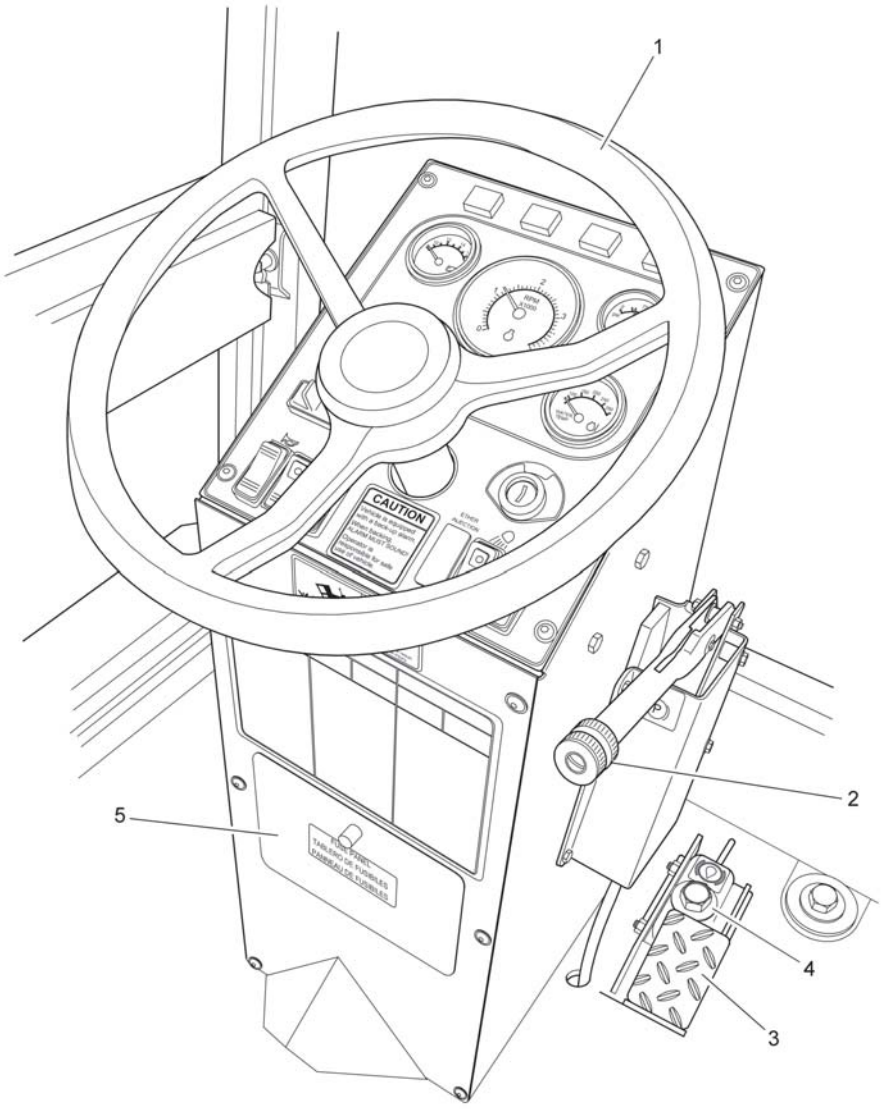


FIGURE 3-2. STEERING CONSOLE

TABLE 3-2. STEERING CONSOLE

FIGURE	ITEM	CONTROL NAME	TYPE	FUNCTION
3-2	1	Steering Wheel		Controls right and left steering function of the front wheels.
3-2	2	Park Brake Lever		Raise to set park/emergency brake. Lower lever to release.
3-2	3	Service Brake Pedal		Used to slow and stop the broom.
3-2	4	Brake Master Cylinder		Pressurizes the brake system.
3-2	5	Main Fuse Panel		Contains fuses for the instrument panel, brush controls, heat, blower fan, air conditioning, and exterior lights.

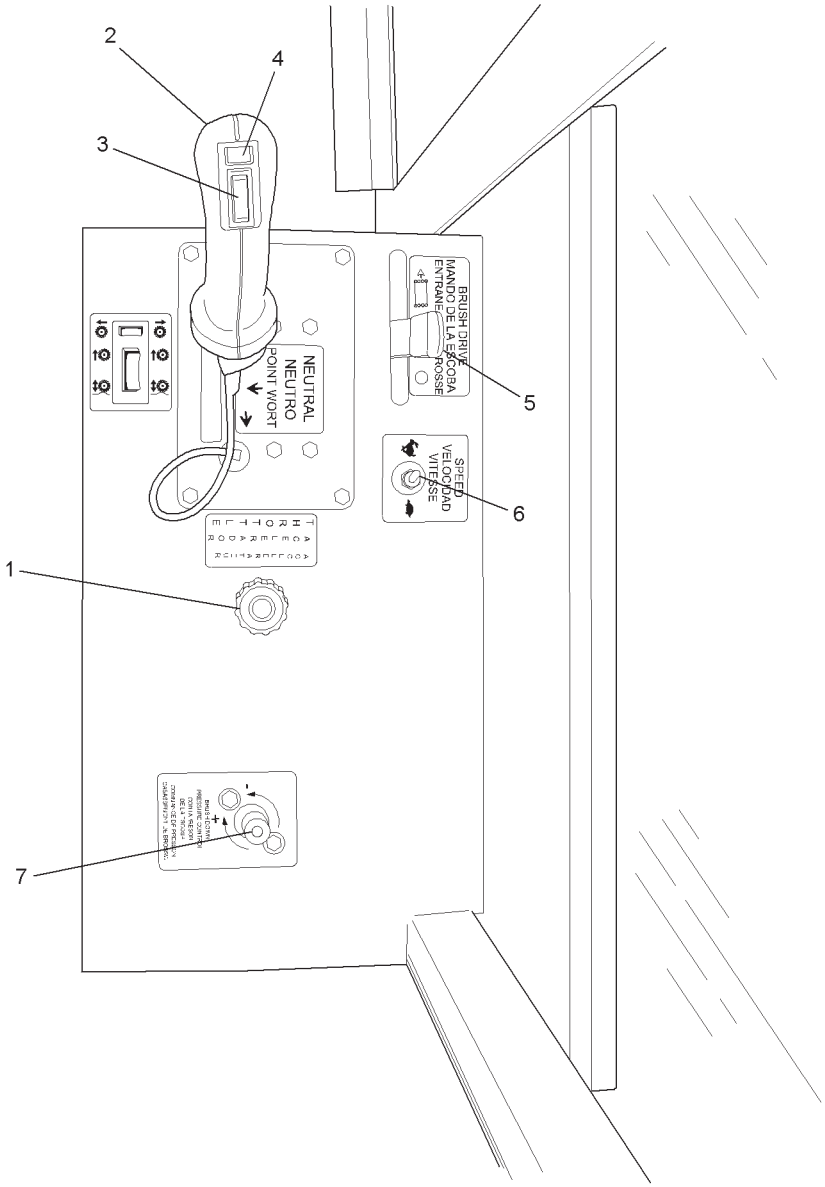


FIGURE 3-3. BRUSH CONTROL CONSOLE

TABLE 3-3. BRUSH CONTROL CONSOLE

FIGURE	ITEM	CONTROL NAME	TYPE	FUNCTION
3-3	1	Engine Throttle	PUSH/PULL and LEFT/RIGHT knob	Controls engine RPM, with center push-button.
3-3	2	Joystick/Transmission Selector Lever	FWD/NEUTRAL/ REVERSE	Controls speed and direction of machine's travel.
3-3	3	Brush Control Switch (Located on Joystick)	FORWARD/BACK (Rocker Switch)	Controls brush lift and float.
3-3	4	Brush Swing Switch (Located on Joystick)	LEFT/RIGHT (Rocker Switch)	Controls left and right brush swing.
3-3	5	Brush Drive Lever	ON/OFF	Turns brush rotation on and off.
3-3	6	Speed Selector Switch	HIGH/LOW (Toggle Switch)	Controls speed of machine.
3-3	7	Brush Down Pressure Control	LEFT/RIGHT knob	Controls hydraulic pressure suspending the brush.

TABLE 3-4. HEAT & AIR CONDITIONING CONTROLS

FIGURE	ITEM	CONTROL NAME	TYPE	FUNCTION
3-4	1	Heater Control Knob	LEFT/RIGHT knob	Clockwise rotation to adjust heat.
3-4	2	Blower Fan Control	4-Position knob	Controls blower fan for heater and air conditioning.
3-4	3	Air Conditioning Control	LEFT/RIGHT knob	Clockwise rotation to control temperature.

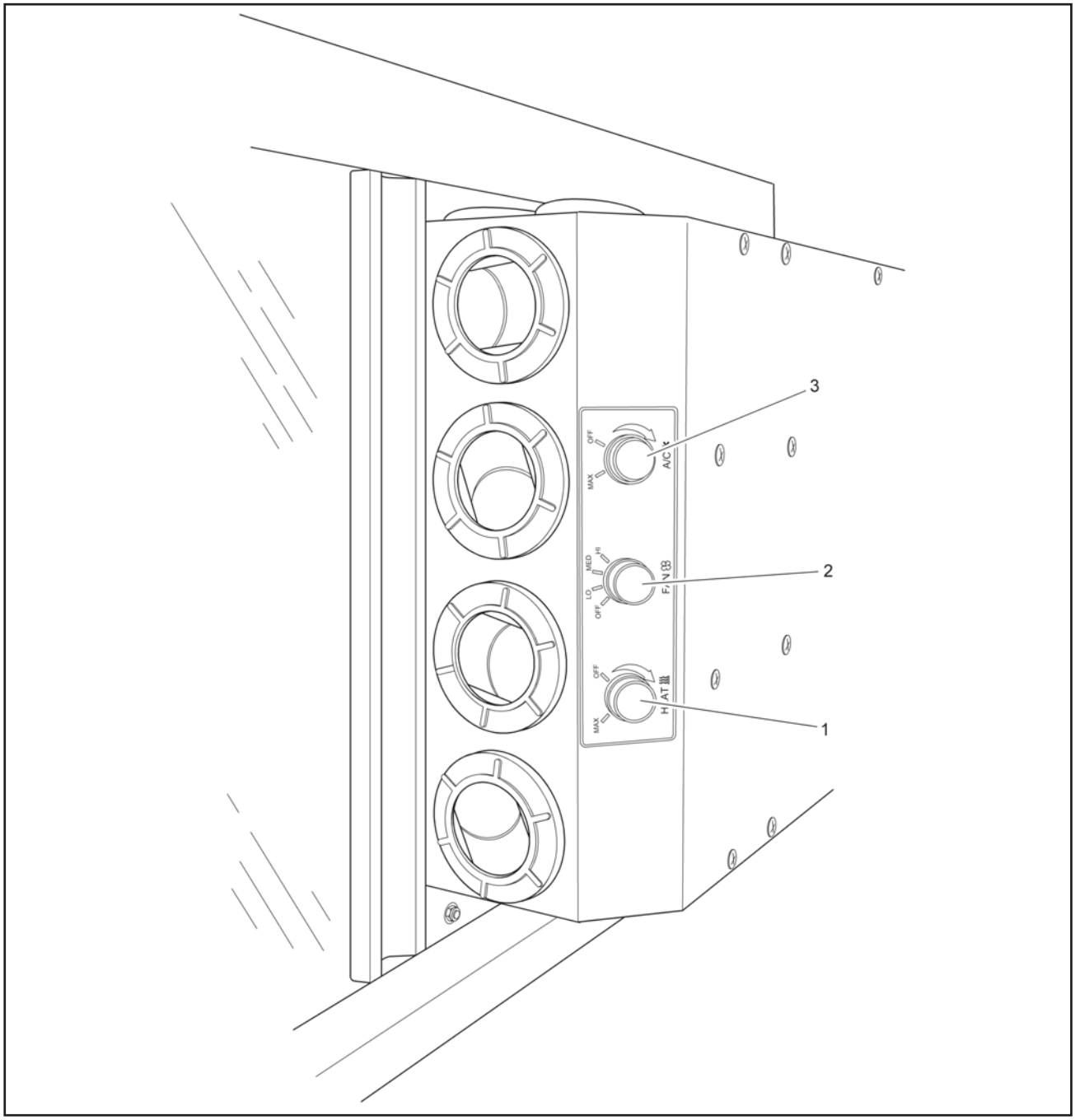


FIGURE 3-4. HEAT & AIR CONDITIONING CONTROLS

TABLE 3-5. WINDSHIELD WIPER, DEFROST & DOME LIGHT CONTROLS

FIGURE	ITEM	CONTROL NAME	TYPE	FUNCTION
3-5	1	Windshield Wiper and Washer Knob	HIGH/LOW wiper with push-to-wash	Controls front windshield wiper and washer.
3-5	2	Option	HIGH/LOW wiper with push-to-wash	Controls rear windshield wiper and washer.
3-5	3	Defroster Fan	HIGH/MED/LOW knob	Controls front cab-mounted windshield defroster fan.
3-5	4	Option	HIGH/MED/LOW knob	Controls rear cab-mounted windshield defroster fan.
3-5	5	Dome Light	ON/OFF (Push Button)	Lights cab interior with push button switch on top.

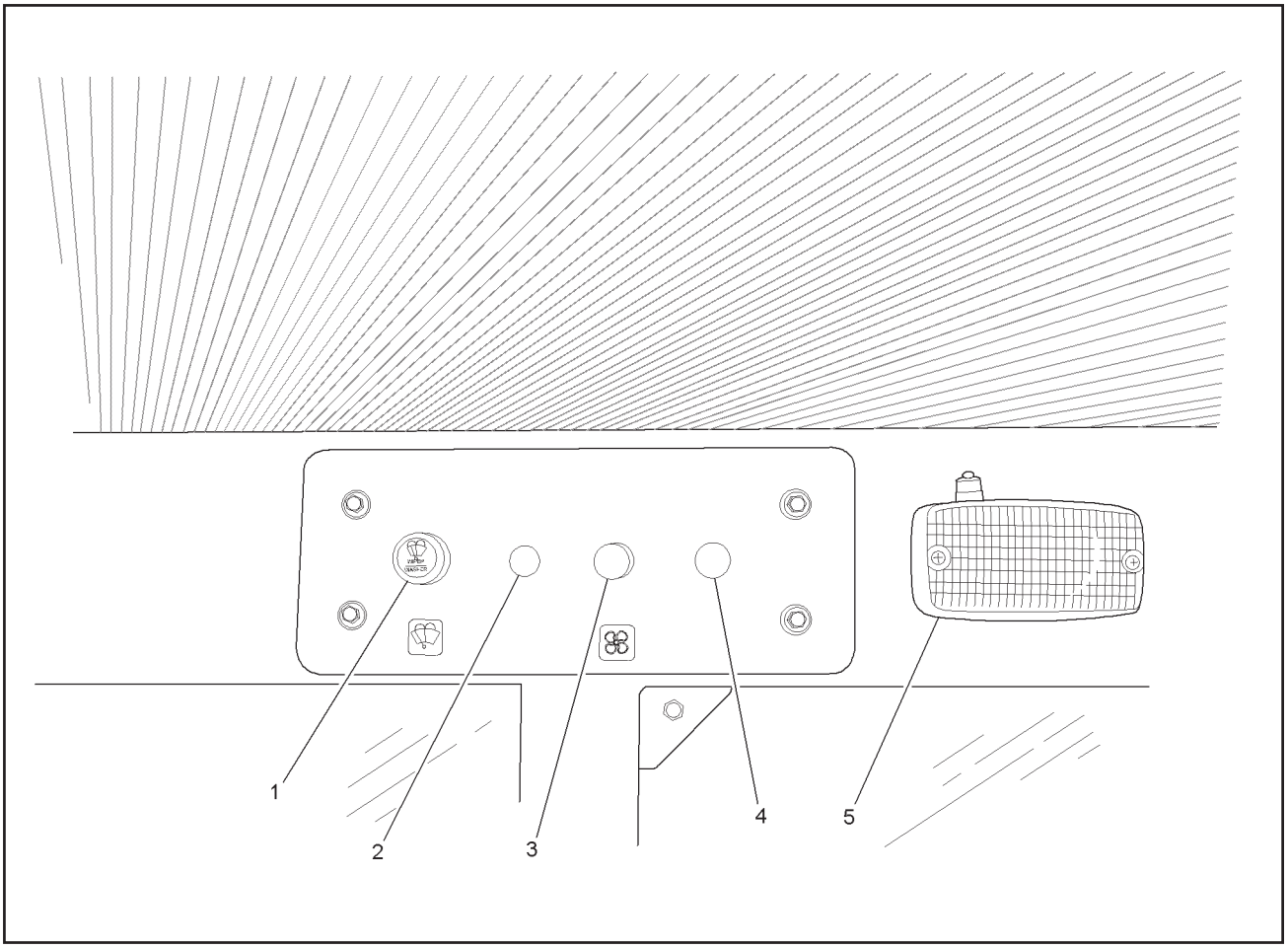


FIGURE 3-5. WINDSHIELD WIPER, DEFROST & DOME LIGHT CONTROLS

TABLE 3-6. DEFROSTER FAN & ACCESSORY FUSE PANEL

FIGURE	ITEM	CONTROL NAME	TYPE	FUNCTION
3-6	1	Front Cab-Mounted Windshield Defroster Fan		Directed toward front window to defrost the windshield.
3-6	2	Accessories Fuse Panel		Contains fuses for dome light, windshield wiper/washer, and defroster fan.

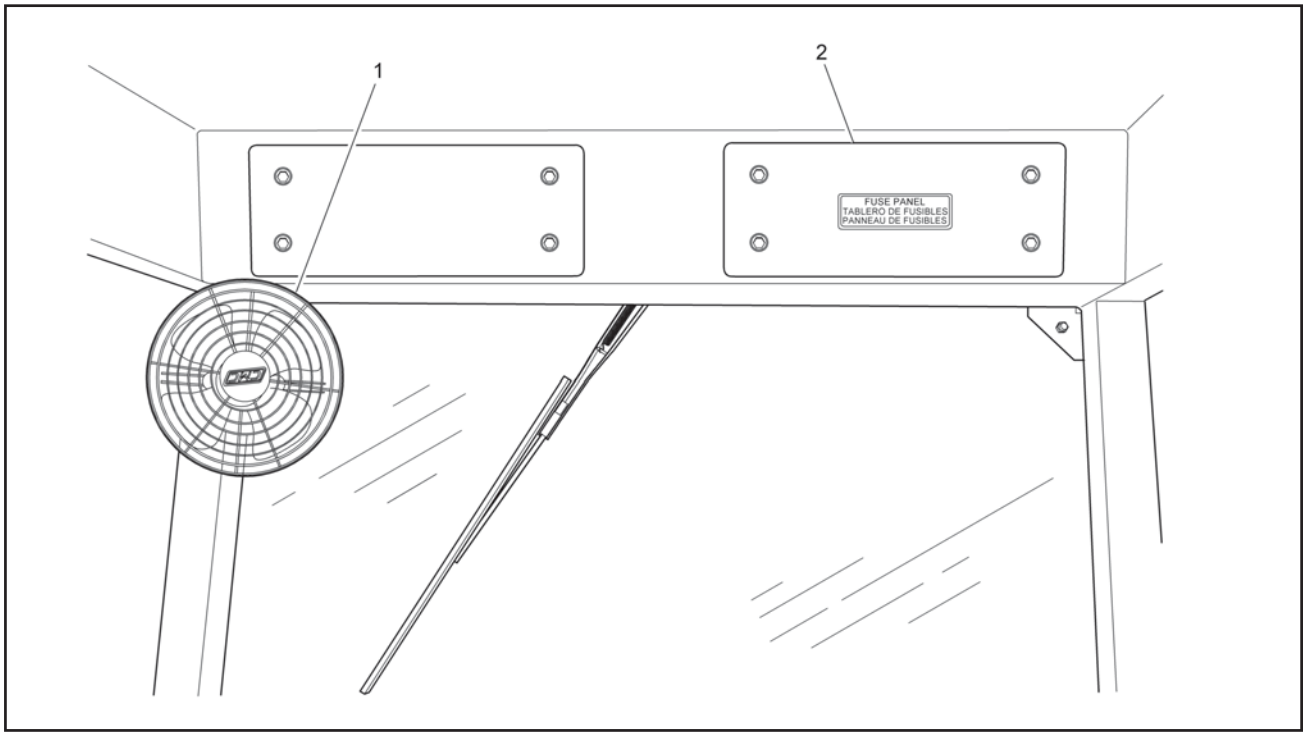


FIGURE 3-6. DEFROSTER FAN & ACCESSORY FUSE PANEL

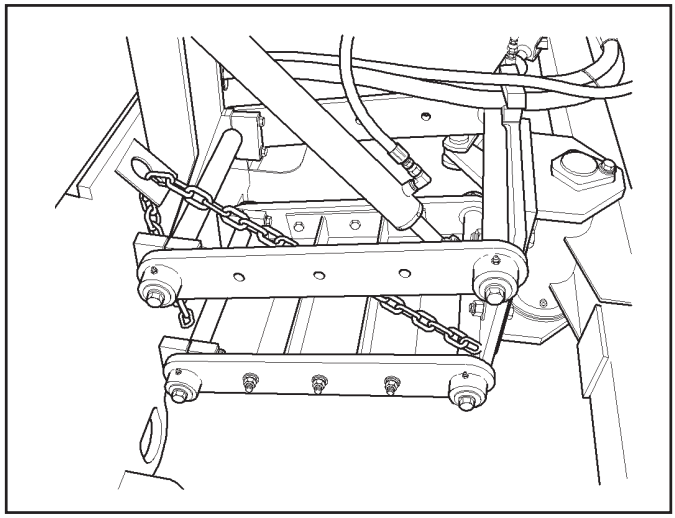


FIGURE 3-7. MECHANICAL BRUSH LIFT CYLINDER LOCK

PRE-OPERATION

Before starting or operating the machine, it is important to READ, UNDERSTAND, and FOLLOW all Operating instructions, Danger, Warning, and Caution messages in this section, as well as all Safety information contained in Section 1 of this manual. A pre-operation checklist is provided to ensure efficient and safe operation of the SweepPro Broom.

Check the following areas before operating the machine and each time thereafter:

1. Recommended fluid types and required quantities are listed in **Specifications**, Section 2 of this manual. Replace fluids as detailed in the Maintenance Interval Chart in **Maintenance**, Section 4 of this manual. Check the following:
   a. Check ENGINE OIL. Add if low. Be careful not to overfill.
   b. Check HYDRAULIC OIL RESERVOIR. Add if low.
   c. Check ENGINE DIESEL FUEL TANK. Fill if low.
   d. Check ENGINE COOLANT LEVEL at radiator. Fill if low.
   e. Check BRAKE FLUID at Brake Master Cylinder. Fill to 1" below the top.
2. Check the Engine Air Filter Indicator. Clean or replace filters if indicator shows red or 20 inches of restriction.
3. Check engine belts and hoses for wear or fraying. Replace any that show signs of wear, cuts or abrasion.
4. Check park/emergency brake adjustment. See **Maintenance**, Section 4 for adjustment instructions.
5. Check the mechanical brush lift cylinder lock. Disengage it if it is in the locked position. (See Figure 3-7.)
6. Check Tire Pressure. Maintain even pressure in all four tires at 50 psi.
7. Make sure cab windows are clean and pressurizer air filters are clean.
8. Check the machine for loose bolts.
9. Check for signs of leaking hoses. Refer to **Maintenance**, Section 4 for hydraulic leak inspection procedures.
10. Check engine manufacturer's manual for pre-operation information.

START-UP & ENGINE OPERATION

WARNING:  **Know the location and function of the controls before starting the engine. Refer to Figures 3-1 through 3-6 and Tables 3-1 through 3-6 for the position of all operating controls and system monitoring gauges.**

1. Place the Transmission Selector Lever (Figure 3-3, item 2) in the neutral position. A Neutral Start Switch has been installed to prevent operation of the engine starter when the transmission is not in neutral.

WARNING:  **Do not bypass the neutral start system. If the neutral start system malfunctions, it must be repaired. Failure to do so can cause the machine to jerk and throw an operator from the machine.**

2. Apply the park/emergency brake (Figure 3-2, item 2).

WARNING:  **Be sure the park brake is applied and the Transmission Selector Lever (Figure 3-3, item 2) is in the neutral position before starting the machine. Sudden movement of the machine can throw an operator from the machine.**

3. Set the Engine Throttle (Figure 3-3, item 1) to one-half speed by holding the center button depressed and pulling on the knob.
4. Turn the Ignition Switch key (Figure 3-1, item 5) to activate the engine starter. As soon as the engine starts, release the switch.

ATTENTION:  **Do not crank engine for more than 30 seconds at a time. Continuous cranking can cause starter failure.**

ATTENTION:  **If the starter does not turn the engine over, shut off the ignition key immediately and make no further attempts to start the engine until the condition is corrected. Refer to Troubleshooting in the Maintenance section of this manual (or the engine manufacturer's manual) for possible solutions. For further analysis, contact your Diesel Engine Service Dealer.**

ATTENTION: **Allow the starter to cool down for 2 minutes between unsuccessful attempts to start the engine. Failure to follow these guidelines can damage the starter motor.**

5. As soon as the engine starts, move the Engine Throttle (Figure 3-3, item 1) to idle by holding the button depressed and pushing the knob fully down.

ATTENTION: **Be sure oil pressure is observed within 15 Seconds after starting the engine. If no oil pressure is shown on the gauge in 15 seconds, shut down the engine and determine the cause.**

6. Check the gauges on the instrument panel (Figure 3-1) for proper readings, and make the necessary corrections.
7. Adjust the position of the seat and mirrors for the operator's convenience.
8. When the engine is warm and running properly, fasten the seat belt and familiarize yourself with the operation of the controls.

WARNING: **Always wear a seat belt when operating the SweepPro Broom. Sudden speed changes or a roll over will throw an unrestrained operator from the machine causing death or serious injury.**

ATTENTION: **Do not idle the engine for more than 10 minutes. Excess idling can damage the engine. During idling, combustion chamber temperature drops and fuel may not burn completely. Unburned fuel will dilute the crankcase oil, reducing its viscosity and its ability to protect the engine.**

ATTENTION: **Before moving the machine, be sure the park/emergency brake is released to prevent premature wear and possible failure of the brake shoes.**

SYSTEM CONTROLS

WARNING: **Know the location and function of the controls before starting the engine. Refer to Figures 3-1 through 3-6 and Tables 3-1 through 3-6 for the position of all operating controls and system monitoring gauges.**

ENGINE THROTTLE

The Engine Throttle (Figure 3-3, item 1) is a knob with a center push-button. It is located on the control panel to the right of the driver's seat.

Hold the button down while pulling or pushing the knob to increase or decrease throttle. Once the button is released the operator can fine-tune the engine RPM by turning the knob clockwise to increase throttle or counterclockwise to decrease throttle.

When first operating this machine, set the throttle to 1/2 or 3/4 open until you are familiar with the functions of the controls.

TRANSMISSION SELECTOR LEVER

The hydrostatic Transmission Selector Lever (Figure 3-3, item 2) is on the control panel on the operator's right side. With some experience, an operator should be able to operate this control along with the throttle to make the forward or reverse movement smooth and fluid-like.

SPEED SELECTOR SWITCH

The hydrostatic transmission system is equipped with a HIGH/LOW Speed Selector Switch (Figure 3-3, item 6) located on the control panel on the operator's right side. Use HIGH speed for road travel and LOW speed for sweeping operations.

ATTENTION: **Do not activate the Speed Selector Switch while the transmission is engaged. Excessive pressures are generated which can cause premature component failure.**

ATTENTION: **Do not use HIGH speed for sweeping operations. The operator cannot control the machine in a safe manner while sweeping in the HIGH range.**

SERVICE BRAKE PEDAL

The foot-operated Service Brake Pedal (Figure 3-2, item 3) is on the right side of the steering wheel console. The service brake may be overpowered by the hydrostatic drive. Always return the Transmission Selector Lever (Figure 3-3, item 2) to neutral as the service brakes are applied.

STEERING WHEEL

The Steering Wheel (Figure 3-2, item 1) is located in front of the operator's seat. Remember that steering takes priority over brush operations (rotation, lift and swing) when both are attempted at the same time.

STOPPING & BRAKING

Most operators seldom use the foot brake. Instead they use the throttle and hydrostatic transmission to slow down, stop and change directions.

The operator must become accustomed to using the hydrostatic transmission to assist in braking. This is best done by moving the Transmission Selector Lever (Figure 3-3, item 2) into the neutral position before applying the service brake.

CAUTION: **The Service Brake alone is not sufficient to stop the machine if it is in forward or reverse drive mode.**

If stopping on a grade, the distance needed to come to a stop will be longer, the steeper the grade. Familiarize yourself with the job site so you can anticipate these variables.

WARNING: **Before dismounting from the machine, place the Transmission Selector Lever (Figure 3-3, item 2) in neutral, turn off all accessories, set the park brake, shut off the engine, and remove the ignition key.**

BRUSH OPERATION

Brush operation controls are located in the control panel on the operator's right side. The SweepPro Broom is equipped with the following brush operating controls:

BRUSH CONTROL SWITCH

The Brush Control Switch (Figure 3-3, item 3) is the forward/back switch on the joystick. It has three positions:

1. Up - Pushing fully forward lifts the brush carrier. When pressure on the switch is released, the switch automatically returns to the HOLD position.
2. Hold - This position holds or “locks” the brush carrier at the height used in the last UP or DOWN operation of the Brush Control Switch.
3. Down - Pushing back on the switch moves the brush carrier down towards the ground. This is a detented position. When the switch is in this position, the brush is in the FLOAT position.

BRUSH SWING SWITCH

The Brush Swing Switch (Figure 3-3, item 4) is the left/right switch on the joystick. Push the switch in gradual momentary adjustments to swing the brush left or right. Hold the switch in place to move the brush to its full swing position.

BRUSH DRIVE LEVER

The Brush Drive Lever (Figure 3-3, item 5) is on the control panel to the right of the operator. It turns the brush drive motor ON and OFF.

BRUSH SPEED

Brush speed is controlled by changing the engine's RPM. This is done by adjusting the Engine Throttle (Figure 3-3, item 1).

BRUSH DOWN PRESSURE CONTROL

The Brush Down Pressure Control (Figure 3-3, item 7) controls the amount of hydraulic pressure needed to keep the brush suspended over the work surface. Turn the valve clockwise to increase "down force" and counterclockwise to decrease "down force".

ATTENTION: **Do not apply excessive down pressure on the brush. Poor sweeping action and excessive brush wear will result. Brush stall can occur when applying excessive force. For best results, operate in the FLOAT position. Use the Brush Down Pressure Control knob to correct excessive down force.**

NOTE: **It is important to understand that by decreasing the hydraulic pressure suspending the brush, you are increasing the down force. Brush "down force" control only works with the Brush Control Switch in the DOWN, or FLOAT position.**

SWEEPING GUIDELINES

For best sweeping results, observe the following guidelines:

1. Sweep only with the tips of the brush bristles. This will provide maximum “flick” sweeping action. Control of sweeping action can be obtained by using the Brush Down Pressure Control knob.
2. Sweep only with the Speed Selector Switch (Figure 3-3, item 6) in LOW position.
3. For most normal sweeping operations, the FLOAT position works best. Practice will help the operator achieve the most effective operation of the broom.
4. For heavy sweeping, slow the ground speed and increase the brush RPM by increasing the engine RPM. The right combination of ground speed and brush speed will correct ineffective sweeping.
5. To get an ideal brush height setting, sprinkle some sand under the brush. Place the transmission in neutral and set the park brake. Engage the brush by moving the Brush Drive Lever (Figure 3-3, item 5) to the ON position.

WARNING: **To avoid entanglement in the brush, disengage the Brush Drive Lever before letting anyone check the sweeping swath.**

6. Move the Brush Drive Lever to the OFF position. When the brush is raised, there should be a 2" to 4" wide clean swath under the entire length of the brush.
7. Keep the rubber brush apron, located in front of the brush, in good working order and in place while sweeping. The brush apron protects the front of the broom as well as oncoming traffic and bystanders from flying debris.

ATTENTION: **If it is necessary to leave the SweepPro Broom for an extended period of time, place Transmission Selector Lever (Figure 3-3, item 2) in neutral and use the mechanical brush lift cylinder lock to secure the brush in the raised position. (See Figure 3-7.) This will prevent a flat spot from forming on the brush bristles.**

BRUSH WATERING SYSTEM

In certain conditions, it may be necessary to sweep using the Brush Watering System to control dust. This system consists of two 75 gallon poly tanks, an electric pump, and a corrosion resistant spraybar and piping system. The pump is turned on by a switch on the instrument panel (Figure 3-1, item 10).

TRANSPORTING THE BROOM

When transporting the machine on a flat bed vehicle, the vehicle must be capable of carrying the machine safely in all driving situations.

1. Clean the machine using a pressure washer. Remove all loose gravel, mud or debris from wheels, frame, and brush.
2. Make sure the combined height of the truck, trailer and loaded broom meet height restrictions for the local area, including bridges, overpasses, and overhead obstructions.
3. Park the transport vehicle on a level surface and set the park brake.
4. Install chocks or blocks against truck and trailer wheels.
5. Use a ramp or loading dock. Make sure the ramp weight capacity will support the machine and has a low angle of rise to the trailer bed.
6. Load the machine on the trailer bed by driving straight on, centered on the trailer. The broom centerline must be over the centerline of the trailer.
7. Set the park brake and block broom wheels in both directions to prevent rolling.
8. Using the Brush Swing Switch, center the brush.
9. Using the Brush Control Switch, raise the brush to its full upright position.
10. Use the mechanical brush lift cylinder lock to secure the brush in the raised position. (See Figure 3-7.)
11. Return the Brush Control Switch to the HOLD (center) position.

CAUTION: **Secure the machine with chains, cables, and binders of sufficient strength to prevent the machine from moving or breaking loose during travel.**

ATTENTION: Fasten chains or cables to machine frame. Do not place chains or cables over or against hydraulic lines, hoses or electrical harnesses.

12. Secure the machine to the trailer using the tie-downs located at two places on the front and rear of the machine frame. (See Figure 3-8.)
13. Idle the engine at 1/2 speed (RPM) for 3 to 5 minutes.
14. Place engine throttle at slow idle.
15. Place ignition switch in the OFF position and remove the key.
16. Cover the exhaust opening with heavy gauge plastic to prevent dust and moisture from entering the engine.

NOTE: Remove the plastic cover from the exhaust before operating the broom.

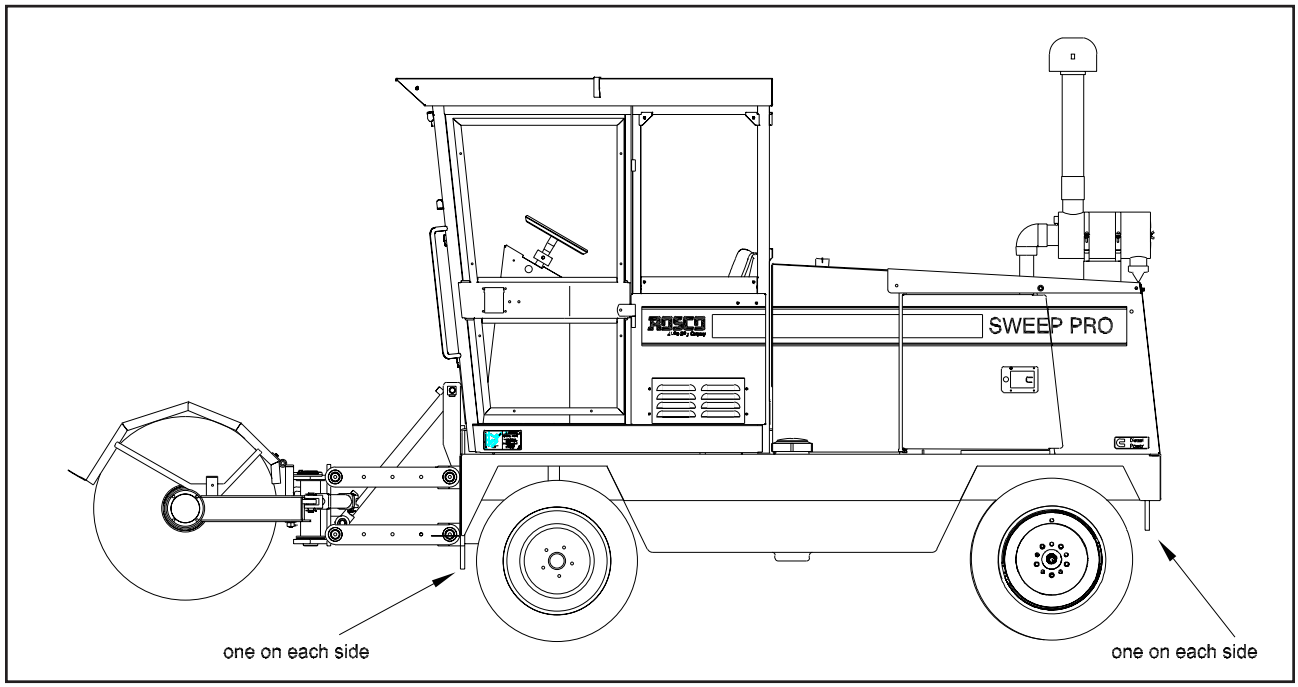


FIGURE 3-8. TIE-DOWN POINTS

NOTES:

TABLE OF CONTENTS

TABLE OF CONTENTS (Continued)

GENERAL INFORMATION

This section gives the necessary procedures for routine and general maintenance on the SweepPro Broom. Before starting any Maintenance program on the machine, it is important to READ, UNDERSTAND, and FOLLOW all Maintenance instructions, Danger, Warning, and Caution messages in this section, as well as all Safety information contained in Section 1 of this manual.

DANGER: **Failure to observe the Maintenance instructions, Danger, Warning, and Caution messages in this manual can cause serious injury or death.**

NOTE: **By following a careful service and maintenance program for your broom, you will insure many years of trouble free operation.**

PROPERLY MAINTAINED EQUIPMENT IS SAFE EQUIPMENT! The user of this product is responsible for inspecting the machine daily, and for having parts replaced or repaired when continued use would cause damage or excessive wear to other parts. General daily inspection of the broom should include inspection for missing guards, loose bolts, fluid leaks, worn or damaged hoses and debris or dirt accumulations which could cause a potential service or safety problem.

ROUTINE MAINTENANCE

GENERAL INFORMATION

Maintenance must be a planned program that includes periodic machine inspection and lubrication procedures.

The maintenance program must be done based on the machine's "Operating Hours" recorded on the hour meter, or on a "Periodic Schedule" which is done at daily, weekly, monthly or yearly intervals.

ATTENTION: **When performing any routine maintenance such as 50, 100, 250, 500, or 1000 hours, always include previous routine maintenance hours to the higher hourly schedule.**

Table 4-1, Maintenance Interval Chart, lists recommended maintenance procedures and time intervals between machine maintenance inspections and lubrication procedures. Tables 4-2 through 4-6 list recommended hydraulic oils and torque values for fittings and fasteners commonly used on this machine.

MACHINE LUBRICATION

Proper lubrication is necessary to maintain the machine at top efficiency. Refer to the lubrication information in Table 4-1, Maintenance Interval Chart. All lubrication points are shown in Figure 4-1.

TABLE 4-1. MAINTENANCE INTERVAL CHART

8 HOURS or DAILY		
Engine Oil Level	Check	SAE 15W40
Engine Coolant	Check	50/50 Antifreeze
Engine Air Filters		
Primary	Check	P/N 36643-01 Dry Type
Safety	Check	P/N 171150 Cartridge
Engine Fuel Filters		
Primary (Cartridge)	Check	P/N 38734-02/Cummins; 38144-03 Caterpillar
In-Line	Check	P/N 33291/Cummins; 38217/Caterpillar
Hydraulic Oil	Check	See Table 4.2
Hydraulic Filters	Check	P/N 34464 7-Micron Spin-On Cartridge
Drive Shaft	Check	Use Multi-Service Grease
Master Cylinder Brake Fluid	Check	P/N 90707 D.O.T. 3 Approved
Brush Shaft Bearing (item 1)	Lubricate	Use Multi-Service Grease
Brush Lift Bushings (item 2)	Lubricate	Use Multi-Service Grease
Brush Watering System	Check	Clean if Necessary
Brush Watering System Strainer	Clean	
Lighting System	Check	Clean and Repair as Necessary
FIRST 50 HOURS and WEEKLY		
Engine Oil	Replace	SAE 15W40
Engine Oil Filter	Replace	P/N 38144-02 Cartridge
Engine Air Filters		
Primary	Check	P/N 36643-01 Dry Type
Safety	Check	P/N 171150 Cartridge
100 HOURS or MONTHLY		
Engine Belts (Aux. V-Rib Belt)	Check	P/N 38842
Engine Air Filters		
Primary	Replace	P/N 36643-01 Dry Type
Safety	Check	P/N 171150 Cartridge
Hydraulic Oil (first 100 hrs, then 500 hrs)	Replace	See Table 4.2
Hydraulic Filters (first 100, then 500 hrs)	Replace	P/N 34464 7-Micron Spin-On Cartridge
Hydraulic Strainer (first 100 hours)	Clean	P/N 33148 In-Tank
Steering Axle		
Axle Pivot (item 3)	Lubricate	Use Multi-Service Grease
King Pins (item 4)	Lubricate	Use Multi-Service Grease
Tie Rods (item 5)	Lubricate	Use Multi-Service Grease
Driveshaft (item 6)	Lubricate	Use Multi-Service Grease
Transfer Case (first 100, then 500 hrs)	Replace	90W Gear Lubricant
Drive Axle (first 100, then 500) (item 9)	Replace	90W Gear Lubricant
250 HOURS or QUARTERLY		
Engine Air Filter (Safety)	Replace	P/N 171150 Cartridge
Engine Oil	Replace	SAE 15W40
Engine Oil Filter	Replace	P/N 38144-02 Cartridge
Engine Belts	Check	P/N 38734-03/Cummins; 984909-06/Caterpillar
Brush Swing Bearings (item 7)	Lubricate	Use Multi-Service Grease

TABLE 4-1. MAINTENANCE INTERVAL CHART (Continued)

500 HOURS or SEMI-ANUALLY		
Engine Fuel Filters		
Primary (Cartridge)	Replace	P/N 38734-02/Cummins; 38144-03/Caterpillar
In-Line	Replace	P/N 33291/Cummins; 38217/Caterpillar
Engine Coolant	Replace	50/50 Antifreeze
Hydraulic Oil	Replace	See Table 4-2
Hydraulic Filters	Replace	P/N 34464 7-Micron Spin-On Cartridge
Hydraulic Strainer	Replace	P/N 33148 In-Tank
Steering Axle Bearings (item 8)	Re-Pack	Wheel Bearing Grease
Brake Linings	Check	P/N 37574-40 Brake Shoe Kit
Drive Axle (item 9)	Replace	90W Gear Lubricant
Transfer Case	Replace	90W Gear Lubricant
Spraybar Line and Nozzles	Clean	Remove End Caps and Flush

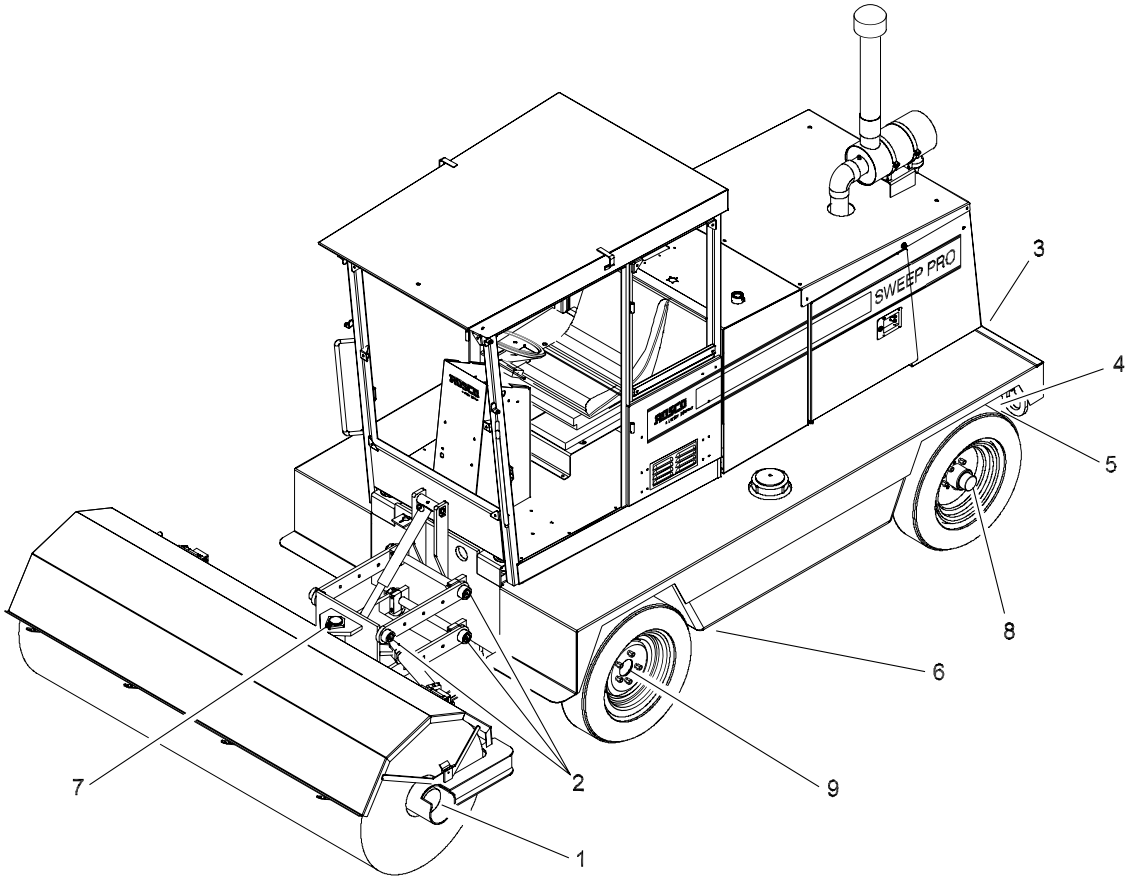


FIGURE 4-1. LUBRICATION POINTS

TABLE 4-2. HYDRAULIC FLUIDS CHART

ISO 46 / SAE 20	ISO 68	ISO 100 / SAE 30
AMBIENT TEMP. -15° F to 80° F (-26° C to 27° C)	AMBIENT TEMP. 0° F to 100° F (-18° C to 38° C)	AMBIENT TEMP. 15° F to 115° F (-9° C to 46° C)
Special Start-up Below 5°F (-15° C) Hyd Res Temp Max 165° F (74° C)	Special Start-up Below 20°F (-7° C) Hyd Res Temp Max 185° F (85° C)	Special Start-up Below 32°F (0° C) Hyd Res Temp Max 200° F (93° C)
MOBIL DTE 25 CITGO AW 46 CONOCO PHILLIPS 46 CHEVRON TEXACO AW 46 SHELL TELLUS 46 EXXON NUTO 46	MOBIL DTE 26 CITGO AW 68 CONOCO PHILLIPS 68 CHEVRON TEXACO AW 68 SHELL TELLUS 68 EXXON NUTO 68	MOBIL DTE AW 100/DTE 18M CITGO AW 100 CONOCO PHILLIPS 100 CHEVRON TEXACO AW 100 SHELL TELLUS 100 EXXON NUTO 100

NOTE: The hydraulic oils listed in Table 4-2 are recommended as replacements. It is best to use the heaviest weight oil that can safely be used for the temperature range of your machine's operation. If your machine will never be used at temperatures below 0° F, use a heavy weight oil.

ATTENTION: 

If you are considering using oil that is not listed, contact the factory to obtain the specifications that hydraulic oil must meet to provide needed lubrication and cooling for the unit's hydraulic components.

TIGHTENING FLARE TYPE TUBE FITTINGS

1. Check the flare and flare seat for defects that might cause leakage.
2. Align tube with fitting before tightening.
3. Lubricate connection and hand tighten swivel nut until snug.
4. To prevent twisting the tube(s), use two wrenches. Place one wrench on the connector body and with the second, tighten the swivel nut to the torque shown in Table 4-3.

TABLE 4-3. TORQUE SPECIFICATIONS FOR HYDRAULIC FITTINGS - FLARE TYPE TUBE

Tube Size OD	Nut Size Across Flats	Torque Value		Recommended Turns to Tighten (After Finger Tightening)	
(in)	(in)	(N.m)	(lb-ft)	(Flats)	(Turns)
3/16	7/16	8	6	1	1/6
1/4	9/16	12	9	1	1/6
5/16	5/8	16	12	1	1/6
3/8	11/16	24	18	1	1/6
1/2	7/8	46	34	1	1/6
5/8	1	62	46	1	1/6
3/4	1 1/4	102	75	3/4	1/8
7/8	1 3/8	122	90	3/4	1/8

TIGHTENING O-RING FITTINGS

1. Inspect O-ring and seat for dirt or obvious defects.
2. On angle fittings, back the lock nut off until washer bottoms out at top of groove.
3. Hand tighten fitting until back-up washer or washer face (if straight fitting) bottoms on face and O-ring is seated.
4. Position angle fittings by unscrewing no more than one turn.
5. Tighten straight fittings to torque shown in Table 4-4.
6. Tighten while holding body of fitting with a wrench.

TABLE 4-4. TORQUE SPECIFICATIONS FOR HYDRAULIC FITTINGS - O-RING TYPE

Tube Size OD	Nut Size Across Flats	Torque Value		Recommended Turns to Tighten (After Finger Tightening)	
(in)	(in)	(N.m)	(lb-ft)	(Flats)	(Turns)
3/8	1/2	8	6	2	1/3
7/16	9/16	12	9	2	1/3
1/2	5/8	16	12	2	1/3
9/16	11/16	24	18	2	1/3
3/4	7/8	46	34	2	1/3
7/8	1	62	46	1 1/2	1/4
1 1/16	1 1/4	102	75	1	1/6
1 3/16	1 3/8	122	90	1	1/6
1 5/16	1 1/2	142	105	3/4	1/8
1 5/8	1 7/8	190	140	3/4	1/8
1 7/8	2 1/8	217	160	1/2	1/12

TABLE 4-5. TORQUE SPECIFICATIONS FOR STANDARD INCH FASTENERS

The following table gives the correct torque values for standard fasteners and is intended as a guide for average applications involving typical stresses and machined surfaces. Values are based on physical limitations of clean, plated and lubricated hardware. Check tightness of bolts periodically, using this table as a guide. When using locking fastener, increase torque values by 5%.

CAUTION: **Aways replace original equipment with hardware of equal grade. When an individual torque value is specified, it should be followed instead of values given in this table.**

		CAPSCREWS: SAE GRADE 5				CAPSCREWS: SAE GRADE 8			
SIZE	THREAD	TORQUE FT. LB.		TORQUE N•m		TORQUE FT. LB.		TORQUE N•m	
		Dry	Lubed	Dry	Lubed	Dry	Lubed	Dry	Lubed
1/4	20 UNC	8	6	11	9	12	9	16	12
	28 UNF	10	7	13	10	14	10	19	14
5/16	18 UNC	17	13	24	18	25	18	33	25
	24 UNF	19	14	26	20	27	20	37	28
3/8	16 UNC	31	23	42	31	44	33	59	44
	24 UNF	35	26	47	36	49	37	67	50
7/16	14 UNC	49	37	67	50	70	52	95	71
	20 UNF	55	41	75	56	78	58	105	79
1/2	13 UNC	75	57	100	77	105	80	145	110
	20 UNF	85	64	115	86	120	90	165	120
9/16	12 UNC	110	82	145	110	155	115	210	155
	18 UNF	120	91	165	125	170	130	230	175
5/8	11 UNC	150	115	205	155	210	160	285	215
	18 UNF	170	130	230	175	240	180	325	245
3/4	10 UNC	265	200	360	270	375	280	510	380
	16 UNF	295	225	405	300	420	315	570	425
7/8	9 UNC	430	320	580	435	605	455	820	615
	14 UNF	475	355	640	480	670	500	905	680
1	8 UNC	645	485	875	655	910	680	1230	925
	14 UNF	720	540	980	735	1020	765	1380	1040
1-1/8	7 UNC	795	595	1080	805	1290	965	1750	1310
	12 UNF	890	670	1210	905	1440	1080	1960	1470
1-1/4	7 UNC	1120	840	1520	1140	1820	1360	2460	1850
	12 UNF	1240	930	1680	1260	2010	1500	2730	2050
1-3/8	6 UNC	1470	1100	1990	1490	2380	1780	3230	2420
	12 UNF	1670	1250	2270	1700	2710	2040	3680	2760
1-1/2	6 UNC	1950	1460	2640	1980	3160	2370	4290	3210
	12 UNF	2190	1650	2970	2230	3560	2670	4820	3620

N•m = Newton meter
FT. LBS = Foot Pound

TABLE 4-6. TORQUE SPECIFICATIONS FOR METRIC FASTENERS

The following table gives the correct torque values for standard fasteners and is intended as a guide for average applications involving typical stresses and machined surfaces. Values are based on physical limitations of clean, plated and lubricated hardware. Check tightness of bolts periodically, using this table as a guide. When using locking fastener, increase torque values by 5%.

CAUTION: **Aways replace original equipment with hardware of equal grade. When an individual torque value is specified, it should be followed instead of values given in this table.**

NOMINAL SIZE & PITCH	CLASS 8.8 (GRADE 5 EQUIVALENT)				CLASS 10.9 (GRADE 8 EQUIVALENT)			
	TORQUE FT. LB.		TORQUE N•m		TORQUE FT. LB.		TORQUE N•m	
	Dry	Lubed	Dry	Lubed	Dry	Lubed	Dry	Lubed
M4 x 0.7	2.27	1.70	3.07	2.30	2.27	2.31	4.17	3.13
M5 x 0.8	4.58	3.43	6.20	4.65	6.22	4.67	8.43	6.33
M6 x 1	7.75	5.83	10.5	7.9	10.60	7.97	14.3	10.8
M8 x 1.25	18.89	14.17	25.6	19.2	18.95	19.26	34.8	26.1
M10 x 1.25	39.11	29.52	53.0	40.1	53.87	40.59	73.0	55.0
M12 x 1.75	64.94	48.71	88.0	66.0	88.56	66.42	120.0	90.0
M14 x 2	103.32	77.49	140.0	105.0	140.22	107.01	190.0	145.0
M16 x 2	162.36	121.77	220.0	165.0	221.40	166.05	300.0	225.0
M20 x 2.5	317.34	236.16	430.0	320.0	428.04	321.03	580.0	435.0
M24 x 3	516.12	409.59	740.0	555.0	754.38	557.19	1010.0	755.0
M27 x 3	797.04	597.78	1080.0	810.0	1084.86	811.80	1470.0	1100.0
M30 x 3.5	1084.86	811.80	1470.0	1100.0	1476.00	1107.00	2000.0	1500.0

N•m = Newton meter
FT. LBS = Foot Pound

Section 4
MAINTENANCE

MAINTENANCE SCHEDULE

GENERAL INFORMATION

Preventive maintenance on the SweepPro Broom will provide years of trouble-free operation. Adjustments can be performed in the field with ordinary hand tools. Engine preventive maintenance, other than oil, air, and fuel filter changes, is not covered in this section. Refer to the engine manufacturer's manual for engine service information.

NOTE: Changing oil and cleaning the broom should only be done in a designated area that can contain the oil and chemicals involved in any maintenance requirement. These by-products should be discarded in accordance with environmental regulations.

CAUTION:

Do not substitute fasteners of any kind unless the fasteners are equal in size and grade to original equipment. See Tables 4-5 and 4-6 for torque specifications.

ATTENTION:

When performing any routine maintenance such as 50, 100, 250, 500, or 1000 hours, always include previous routine maintenance hours to the higher hourly schedule.

PREPARING THE MACHINE FOR MAINTENANCE

When performing maintenance, perform the following steps before leaving the operator's seat, unless the maintenance procedure instructs otherwise.

1. Park the machine on a flat even surface.
2. Lower all attachments to ground level.
3. Place transmission in neutral.
4. Engage park brake.
5. Turn off brush drive.
6. Run engine at 1/2 speed (RPM) for 3 to 5 minutes before checking engine oil level.
7. Reduce engine speed to slow idle.
8. Place ignition key in OFF position.

WARNING:

If maintenance must be performed with engine running, do not leave machine unattended.

CHECKS AND ADJUSTMENTS

1. Check the machine for indications of oil leakage around oil lines, hoses, and fittings.
2. Tighten fittings as necessary. Replace hoses and fittings as needed. Refer to Tables 4-3 and 4-4 for torque specifications.
3. Check and empty the precleaner bowl. Clean the bowl and dry with a lint free cloth.
4. Check air intake hoses from the engine to the air cleaner assembly, and from the air cleaner assembly to the precleaner. Replace worn or damaged hoses and tubes. Tighten or replace loose and damaged clamps.

ENGINE MAINTENANCE

WARNING:

Do not service the SweepPro Broom while it is in motion or while the engine is running. If the engine must be running to service a component, place transmission in neutral, apply park brake, block wheels, and use extreme caution.

In addition to the following maintenance recommendations, consult the diesel engine manufacturer's manual for detailed instructions. A copy of this manual was provided with your SweepPro Broom at the time of its shipment from the factory. If additional copies are needed, they can be obtained from your local dealer.

NEUTRAL START SYSTEM

A Neutral Start Switch has been installed to prevent operation of the engine starter when the transmission is not in neutral. To check this system:

1. Set the park brake.
2. Place transmission in the forward position.
3. Turn ignition key to START. Starter must not crank the engine. If starter cranks engine, release key. Do not operate machine.
4. Repeat test with the transmission in reverse.

CAUTION:

Do not operate machine if starter cranks the engine while transmission is in any gear except neutral. See local dealer for Neutral Start System repair.

5. Place transmission in neutral and turn ignition switch to START. Starter should crank engine.

COLD WEATHER STARTING

Caterpillar Engines

If your unit is equipped with a Caterpillar engine, the Cold Start feature consists of a Glow Plug toggle switch located on the instrument panel. Use the following steps for starting in cold weather.

1. Turn the ignition key to the ACC position.
2. Press and hold the Cold Start button according to Table 4-7.

Preheat Times	
Ambient Temperature	**Preheat Time**
41° F (5° C)	10 seconds
23° F to 40° F (-5°C to 4° C)	20 seconds
Less than 23° F (-5° C)	30 seconds
Continuous Preheat	60 seconds max

TABLE 4-7. GLOW PLUG PREHEAT

3. Release the Cold Start button.
4. Turn the key to start the engine.
5. Allow the engine to idle for 5 to 10 minutes before applying a load to the engine.
6. Be sure the engine oil pressure is indicated on the gauge within 15 seconds after starting.

DANGER: **Do not use aerosol types of starting aids, such as ether, with glow plugs. Such use can result in an explosion, causing death or serious injury.**

Cummins Engines

If your unit is equipped with a Cummins engine, the Cold Start feature consists of an optional ether injection system. Use the following steps for starting in cold weather.

1. Put unit in neutral and set park brake.
2. Set throttle to idle.
3. While cranking the engine, inject a metered amount of ether starting fluid by pushing the Cold Start button.
4. Be sure the engine oil pressure is indicated on the gauge within 15 seconds after starting.
5. Never inject ether for more than two (2) seconds at a time.

If your unit is not equipped with the optional ether injection system, and it is necessary to use ether as a starting aid, do it promptly. Read and follow the steps below and the ether manufacturer's recommendations for safe and effective use.

1. Place transmission in neutral and set park brake.
2. Set throttle to idle.
3. Have another person crank the engine while you spray starting fluid into the air cleaner for no more than two (2) seconds at a time.

WARNING: **Never remove the air filter element and spray ether directly into the air inlet piping or the intake manifold.**

4. Be sure that engine oil pressure is indicated on the gauge within 15 seconds after starting.

DANGER: **Never use ether near open flames or with pre-heater or glow plugs. The combination can cause an explosion.**

WARNING: **Do not inhale ether fumes. They are extremely harmful. Seek medical attention if this occurs.**

ATTENTION: **Do not spray excessive amounts (two seconds per time) of ether starting fluid when starting the engine. Using too much ether will cause engine damage.**

ENGINE BELTS

1. Check the diesel engine belt(s) for excessive wear, fraying and cracking every 250 service hours. Auxiliary V-belt drives should be inspected every 100 hours.
2. Adjust engine belt(s) as required to provide proper tension. Consult the engine manufacturer's manual for correct tensioning instructions and specifications.
3. Your SweepPro Broom may be equipped with an air conditioner with a V-belt drive. For proper operation, it is important to keep this belt tensioned properly.

DANGER: **Always shut down engine before adjusting belts. Severe injury can result if belts are adjusted on a running engine.**

4. When installing new belts, always shorten the distance between pulley centers so the belt can be installed without force. Never roll the belt over a pulley and never pry it with a tool such as a screw driver. This will damage belts and cause early failure.

CAUTION: **Keep belt guards in place at all times. Severe personal injury may result from contact with turning belts and pulleys.**

FUEL AND FLUIDS

Keep the fuel tank full to prevent condensation from forming. Fill the fuel tank at the end of each day.

Fuel Requirements

Use clean, good quality ASTM No. 2-O or No. 2-D climatized diesel fuel. If the broom will be used often in cold weather (below 20° F), blended fuels or No. 1 diesel fuel is recommended to prevent gelling of the fuel filters. Using No. 1 diesel fuel may reduce the engine performance by approximately 10%.

ATTENTION: **Avoid using contaminated fuel. Fuel contaminated by water or dirt can cause severe damage to engine components. Fuel tanks contaminated with water will promote the growth of microbes which form a "slime" that can clog fuel filters and lines.**

Caterpillar Fuel Filter and Water Separator

Caterpillar diesel engine injection systems use fuel for lubrication of close tolerance internal engine parts. Proper maintenance of the fuel filters and the fuel tank are required for continued top performance, and to prevent damage to internal engine components.

The engine fuel filter and water separator are located on the left side of the engine. A drain valve is provided on the bottom of the water separator (Figure 4-2).

1. Before operating the engine, use the valve to drain a small quantity of fuel from the water separator into a clean, clear container.

ATTENTION: **This is a necessary daily routine to prevent damage to internal engine components.**

2. If water or contaminants are found in the fuel you drained, DO NOT attempt to start the engine. Continue to drain fuel into the container until it runs clear.

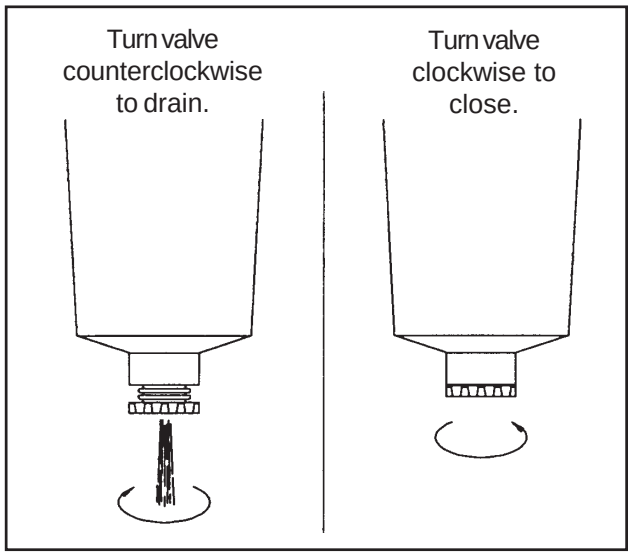


FIGURE 4-2. ENGINE WATER SEPARATOR

3. If large amounts of contamination are found, drain the fuel tank until the lines run clear. Replace the filters. Fill new filters with fresh clean fuel and install.

The engine manufacturer's manual provided with your broom contains more detailed information on fuel system maintenance procedures.

Crankcase Oil

1. Engine crankcase oil level should be checked daily prior to each day's use of the broom. The machine must be parked on a level surface when checking the oil to assure accurate measurements. When checking oil while the engine is warm, wait until the engine has been OFF for at least five minutes. This allows oil to drain back to the crankcase.
2. The oil dipstick is located on the side of the engine. If the oil measures below the "L" mark on the dipstick, add the proper amount of oil specified in the Table 4-1, Maintenance Interval Chart. After adding oil, recheck the level with the dipstick and make sure it doesn't measure above the "H" mark.

ATTENTION: **Never operate the engine with the oil level below the "L" (Low) mark or above the "H" (High) mark.**

3. Engine crankcase oil and oil filter should be changed after the first 50 hours of service and every 250 hours or every 3 months thereafter.
4. Refer to the Table 4-1 and/or engine manufacturer's manual for engine oil recommendations.

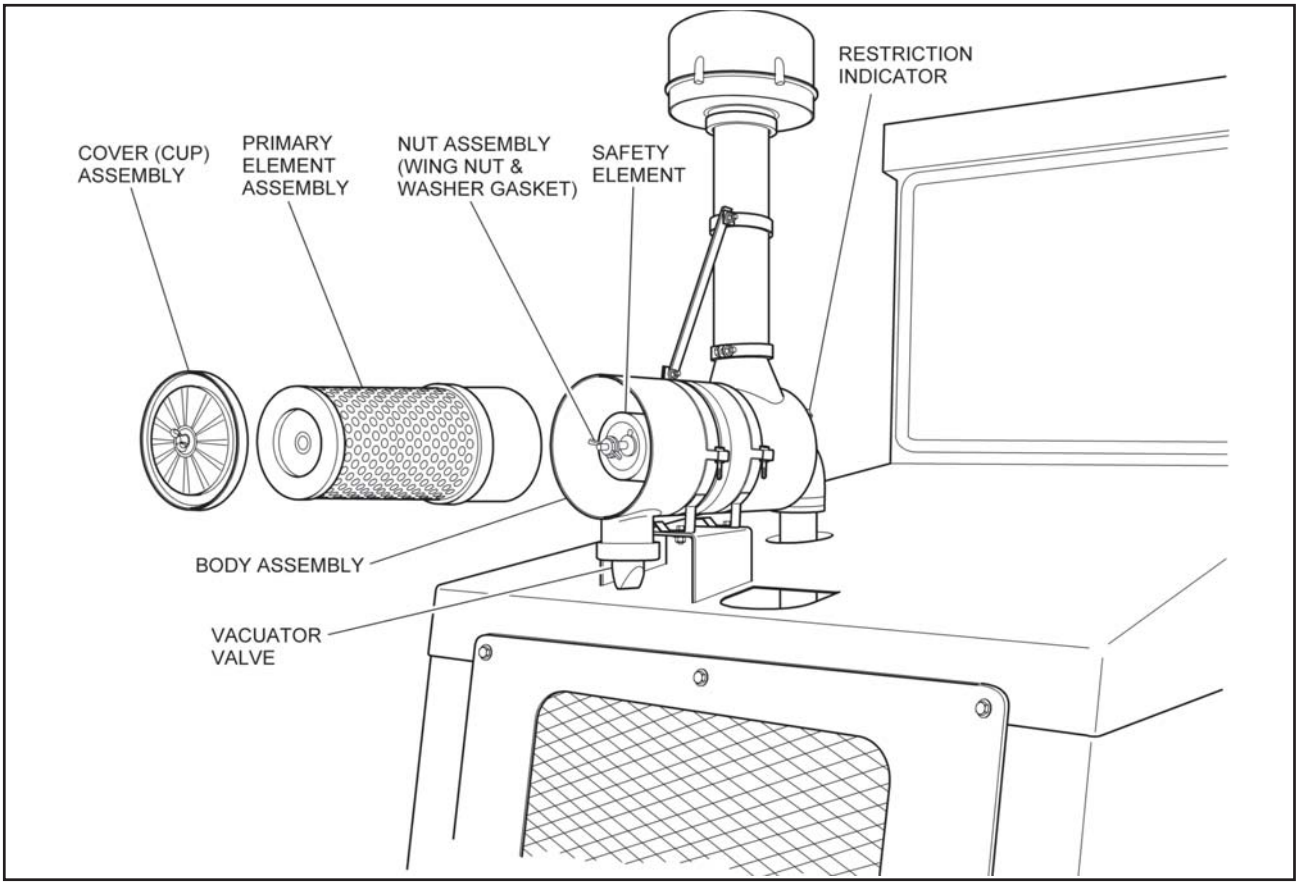


FIGURE 4-3. ENGINE AIR CLEANER ASSEMBLY

Brake Master Cylinder

Check fluid level daily and fill to 1" below top with D.O.T. 3 approved commercial brake fluid. Refer to Table 4-1, Maintenance Interval Chart for the ROSCO/ LeeBoy part number. Check hydraulic system for leaks if the brake cylinder is frequently low.

AIR INTAKE SYSTEM

The heavy-duty engine air cleaner is mounted on top of the hood. A restriction indicator is mounted on the outlet side of the air cleaner assembly housing, near the large inlet tube to the engine (Figure 4-3).

1. Prior to daily operation, inspect all air intake system components for damage, cracked hoses or loose clamps.
2. Inspect the restriction indicator several times daily during operation (Figure 4-3). If the red indicator flag on the restriction indicator is visible, the air cleaner element must be replaced.

ATTENTION: Be sure to clean the inside of the air cleaner body assembly BEFORE removing the safety element to prevent introducing contaminants into the system.

   a. Before replacing any new element to the air filter housing, wipe the inside of the housing with a damp cloth. Reset the restriction indicator. Be sure not to introduce any contaminants into the engine intake tube.
   b. When replacing body assembly or rubber adaptors, torque the T-clamp bolts to 50 inch pounds.
3. DO NOT replace the filter elements until the maintenance interval has been reached or the restriction indicator flag is visible.
4. Replace the primary filter elements monthly or every 100 service hours. Replace the safety element quarterly or every 250 hours. Refer to Table 4-1, Maintenance Interval Chart for the correct part number.
5. The air precleaner should not require maintenance or service unless visible damage is apparent.

ATTENTION: Never operate the engine without an air cleaner. Destruction of internal engine components will occur within minutes.

RADIATOR AND COOLANT

ATTENTION: A partially blocked radiator will reduce the efficiency of the radiator and could cause overheating and premature failure of the engine or its components.

1. Check the engine radiator daily for rocks and debris.

CAUTION: Wear eye protection when using compressed air. Flying debris can cause serious eye injury.

2. Use compressed air to remove rocks or debris from the radiator.

WARNING: Do not remove the radiator cap when engine is hot. Escaping hot coolant can cause serious burns. Add coolant to the radiator only when the engine is stopped and fully cooled.

3. Check radiator coolant level prior to each day's use of the broom. When the engine is cold, the coolant level should cover the radiator core. When the engine is warm, the coolant level should be at the bottom of the filler tube.
4. Refill the cooling system when necessary with 50% water and 50% ethylene-glycol antifreeze.
5. Seasonally, or after every 500 service hours, flush the cooling system. Any good commercial automotive cooling system cleaning solution can be used.

Before replacing the coolant after cleaning, refer to Table 4-1, Maintenance Interval Chart to find the total cooling system capacity for your engine. Prepare the coolant as recommended by the engine manufacturer and refill according to step 3 above.

BATTERY

The SweepPro Broom is factory equipped with a maintenance-free battery that is sized to provide efficient starting for the diesel engine on the machine. With proper care, the battery will provide years of trouble-free service.

ATTENTION: When welding on the machine, always turn the machine off and remove the battery ground (-) cable to prevent damage to the machine's electrical system.

1. Starting an engine depends heavily upon good cranking speed. It is important that the battery is fully charged and that all cables and terminals are clean and properly connected to the battery.
2. Check the level of the battery electrolyte regularly. Add distilled water if necessary. DO NOT overfill. Overfilling can cause poor performance or early failure. A maintenance free battery should rarely require additional electrolyte.
3. Keep the top of the battery clean. When necessary, wash with a baking soda solution (1 part baking soda to 4 parts water) and rinse with fresh water. DO NOT allow the soda solution to enter the battery cells.
4. Inspect the cables, clamps and hold-down bracket regularly. Clean and apply a light coating of grease when needed. Replace corroded or damaged parts.

CAUTION: When servicing the battery, always disconnect the battery ground (-) cable first. Always reconnect the positive (+) battery cable first.

5. If the battery becomes discharged repeatedly, check the electrical charging system. If the engine is difficult to start or the battery seems weak, clean and check the terminal connections. If the problem continues, use a battery tester and check voltage and current draw.
   a. Shut down engine and remove ignition key.
   b. Place the positive (red) multimeter lead on the positive (+) battery terminal, and the negative (black) multimeter lead on the grounded (-) battery terminal.
   c. With the multimeter set at 12 VDC, the battery must show a charge of at least 12 volts. If necessary, charge the battery or perform a load test.
   d. Start the engine.
   e. With an operator in the operator's seat, check the battery charge level. The multimeter should read at least 13.5 volts.
   f. If the multimeter does not indicate minimum charge, check the machine's charging system.

WARNING: **Explosive gas may remain in and around the battery for several hours after charging. Sparks or flame can ignite this gas causing an explosion which could shatter the battery and cause serious personal injury. Always shut off the battery charger before disconnecting cables from the battery terminals.**

CAUTION: **Always wear eye protection when servicing batteries. Caustic solutions can cause serious eye injuries.**

6. If the broom is to be stored for more than 30 days, remove the battery from the broom and store it in a cool, dry place. During storage, keep the battery fully charged and check the level of the electrolyte regularly.

CAUTION: **When removing or replacing the battery, always disconnect the battery ground (-) cable first. Always reconnect the positive (+) battery cable first.**

NOTE: **When replacing the battery, discard the old battery properly.**

The alternator supplies electrical current for charging the battery and electrical power to the electronic controls. The built-in regulator controls the voltage output. If the wires must be disconnected from the alternator, mark them so they can be reconnected properly.

ATTENTION: **Never polarize an alternator. Never ground alternator terminals or circuits.**

ATTENTION: **Always disconnect the battery before disconnecting or connecting the alternator. Never disconnect the alternator with it operating. Be sure wiring is properly connected before connecting the battery.**

ELECTRICAL MAINTENANCE

CAUTION: **When servicing the electrical system, always disconnect the battery ground (-) cable first. Always reconnect the positive (+) battery cable first.**

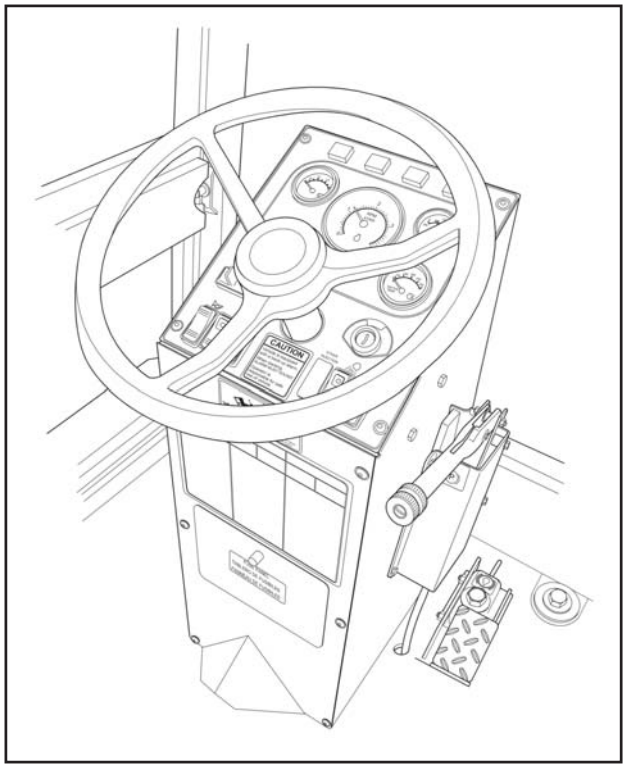


FIGURE 4-4. FUSE PANEL LOCATION

The SweepPro Broom's electrical system is protected from overload damage by fuses. If an electrical component fails to operate, check the fuse panel first to make sure that a fuse is not blown. The fuse panel is located in the front of the instrument panel directly in front of the operator's seat. See Figure 4-4.

Fuses that blow may be replaced but will continue to blow until the cause of the overload is found and corrected. Refer to Figure 4-5 for replacement fuse sizes.

ATTENTION: **Always replace a blown fuse with the same rating as specified. Never replace with a higher amperage rating. Severe wiring damage and possible fire could result.**

LIGHTING

1. Inspect lights daily for proper operation.
2. If a light or group of lights does not function:
   a. Check the fuse panel located in the front of the instrument panel for a blown fuse. See Figure 4-5 for replacement fuse sizes.
   b. Examine all visible wiring connections, making sure that they are securely fastened.

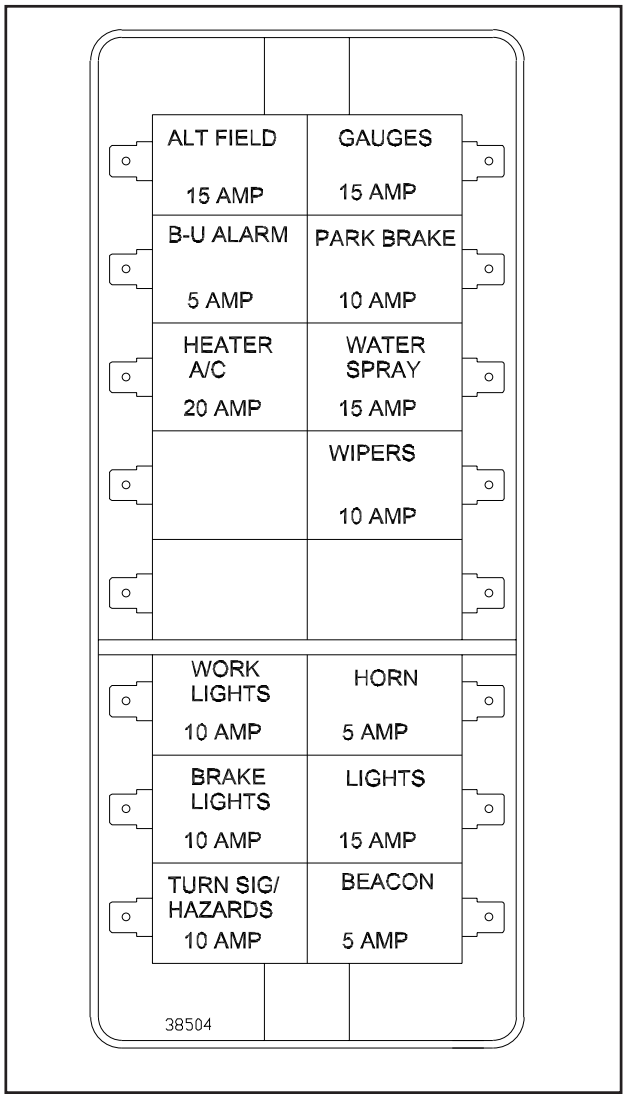


FIGURE 4-5. FUSE REPLACEMENT SIZES

c. If the light(s) still does not work, remove the lens from the light and inspect the bulb(s), replacing any that appear damaged or discolored.

d. Check lighting mounts for proper grounds.

e. If the trouble is not located, inspect the wiring harnesses for damage. Wiring schematics are provided in the **Illustrated Parts List** to assist in troubleshooting the broom's electrical system.

3. If broken wires are found, it is recommended that they be soldered together and covered by a shrink wrap type of plastic covering (preferred) or electrician's tape to prevent contamination of the solder joint by moisture.

4. After making repairs to a wiring harness on the broom, always replace or repair the protective loom which covers the wiring to prevent future damage to the wiring harness. Examine the routing of the harness and make sure it is not subjected to the type of excessive movement which causes broken wiring.

HYDRAULIC SYSTEM MAINTENANCE

WARNING: **Do not service the SweepPro Broom while it is in motion or while the engine is running. If the engine must be running to service a component, place transmission in neutral, apply park brake, block wheels, and use extreme caution.**

Your SweepPro Broom consists of a variable displacement Sauer/Danfoss M46 Series 40 pump and motor which provide drive power for the broom. A gear-type hydraulic pump is directly connected to the Sauer/Danfoss pump, and provides operational pressure for the power steering, brush lift, brush swing and brush drive.

A 25 gallon hydraulic reservoir and filter(s) complete the Hydraulic System (Figure 4-6). This manual contains general system maintenance guidelines. Detailed service and maintenance information is available directly from the hydraulic component manufacturers if necessary.

HYDRAULIC FLUID

The ambient temperatures of your geographic area dictate the factory fill hydraulic fluid in your broom.

When adding or changing hydraulic fluid, refer to Table 4-2, Hydraulic Fluids Chart. The use of hydraulic oils or fluids that are not equal to those listed could result in substandard performance or failure of the broom's hydraulic components. If you are not sure whether a specific hydraulic oil is suitable for use in your broom, consult your authorized dealer.

HYDRAULIC OIL REQUIREMENTS

ATTENTION: **Do not mix manufacturers or grade weights when adding hydraulic oil. Substandard performance or hydraulic component failure can occur.**

1. Be sure hydraulic oil selection is compatible with your hydraulic system.
2. Be sure to use mineral base hydraulic oil.
3. Be sure hydraulic oil selection assistance is from a reputable supplier.

Hydraulic oil must provide anti-wear properties that meet or exceed those found in the API (American Petroleum Institute) classification SD, SE or CC crank case oil.

Hydraulic oil viscosity must not fall below 70 SUS (13 cs) in the reservoir under the most adverse conditions. The best viscosity rating is 80-300 SUS (17 cs to 65 cs). The viscosity rating at the lowest expected start-up temperature should not exceed 10,000 SUS (2158 cs).

Hydraulic oil must have rust and oxidation inhibitors that will maintain chemical stability. When changing the hydraulic oil with oil other than the specific factory fill oil listed in Table 4-2, the hydraulic system must be completely drained. Be sure to purge or drain all hoses, cylinders, valves, motors and pumps of hydraulic oil. All hydraulic oil filters must also be changed at this time.

HYDRAULIC RESERVOIR

The hydraulic reservoir is located in the engine compartment on the right side of the machine. The fill cap is on top of the front engine panel. The hydraulic reservoir has a sight gauge on the right side used to monitor hydraulic oil levels. Refer to Figure 4-6.

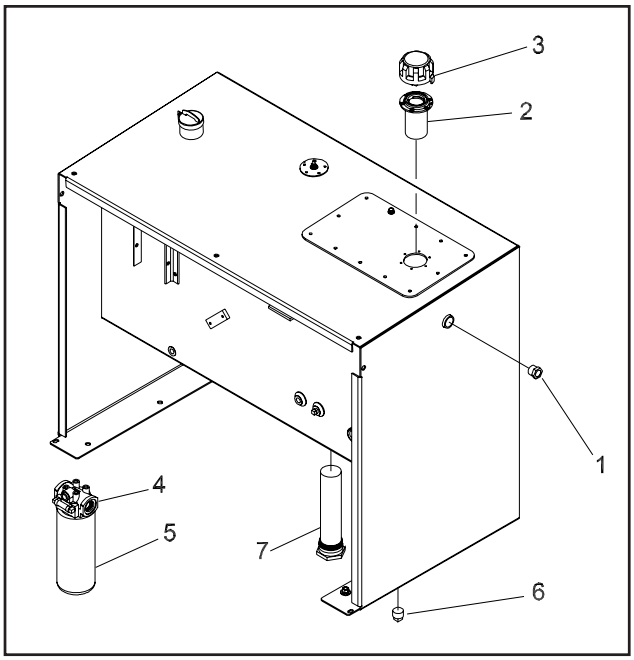


FIGURE 4-6. HYDRAULIC RESERVOIR

1. Check the level of hydraulic oil prior to each day's operation of the broom. Hydraulic oil should be visible in the sight gauge (Figure 4-6, item 1). If not, fill the tank until oil is visible in the sight gauge.
2. The fill cap strainer (item 2) should be cleaned each time hydraulic oil is added or changed.

ATTENTION: Use extreme caution when removing the filler cap to prevent any foreign matter from entering the hydraulic reservoir.

3. The filler cap (item 3) should be padlocked, when possible, to eliminate tampering.
4. Condensation that may build up in the hydraulic system is capable of clogging the filter elements. This can lead to insufficient hydraulic fluid at the pump, which will degrade performance. Clogged filter elements can damage the hydraulic pump and other system components.
5. Warm the hydraulic system to 100° F (38° C) and check filter indicator (item 4). If the filter indicator is in the RED, the filter element (item 5) should be replaced. See Table 4-1, Maintenance Interval Chart for the part number of the filter element.

NOTE: Use only genuine ROSCO/LeeBoy replacement parts. Other parts could be substandard and cause hydraulic system failure. The use of other than approved filter elements will void the warranty on hydraulic components.

6. Drain and replace hydraulic oil and filter after the first 100 hours of service, and after every 500 hours of service or seasonally, whichever comes first. Drain the hydraulic oil by removing the plug (item 6). For convenience, a customer supplied drain hose can be attached to drain fluid into a container.
7. The suction strainer (item 7) should be removed and cleaned at the 500 hour service interval or whenever the hydraulic oil is changed.

HYDRAULIC SYSTEM CHECKS

Before each day's use, inspect the SweepPro Broom for hydraulic leaks. Check weekly to make sure that all hose fittings are secure and tight.

DANGER: **Never use your hand to locate hydraulic leaks. Hydraulic fluid under pressure will pierce the skin and is dangerous. Use a piece of wood or cardboard to locate leaks. If hydraulic oil has pierced the skin, get immediate medical attention.**

DANGER: **Always wear eye protection when inspecting for leaks in the hydraulic system.**

1. If leaking fluid is found, it is probably on the pressure side of the hydraulic system. Find and repair the leaking component before starting the broom.
2. Leaks on the suction side of the hydraulic system are more difficult to find. This condition is serious since air or dirt introduced into the hydraulic system causes rapid component wear and eventual failure. Some symptoms of suction leakage are:
   - Foaming of hydraulic oil
   - Sluggish hydraulic system operation
   - Unusual noise in hydraulic pump or motor

   a. If a suction side leak is suspected, verify that all reservoir connectors and fittings are properly tightened.

   b. If the problem persists, replace the defective hose assembly or fitting.

WARNING: **Never attempt to repair hydraulic hoses with tape, clamps, or cements. The hydraulic system operates under extremely high pressure. Temporary repairs will fail, creating a hazardous condition.**

3. The operator should inspect the broom during operation for hydraulic leaks which may only be noticeable while the unit is running.

PUMPS AND MOTORS

The hydraulic pump and motor generally require no regularly scheduled maintenance. As stated above, frequent inspection for leaks will indicate the need for service of these components.

ADJUSTING PRIORITY RELIEF VALVE

The Priority Circuit on the hydraulic pump supplies the power steering with approximately 4 GPM of hydraulic flow. This flow goes to the steering circuit before any other circuit.

The Priority Relief Valve controls the maximum operating pressure for the power steering and brush lift and swing circuits. The Relief Valve is located in the hydraulic pump attached to the rear of the hydrostatic pump on the engine flywheel housing.

The following are signs that the Priority Relief Valve needs adjusting:

- Total or partial loss of steering functions or hard steering
- Constant noise from hydraulic pump when using steering or brush lift and swing
- Hydraulic oil overheating

If it becomes necessary to readjust the Relief Valve setting, follow these steps:

1. Plumb a 0 to 5000 psi pressure gauge into the Priority Flow Circuit as shown in Figure 4-7. Parts needed for this, including a pressure gauge, can be obtained from your authorized dealer. Part numbers are listed in Figure 4-7.
2. Start the engine and warm the hydraulic oil to at least 100° F.
3. Set the park brake and be sure the transmission is in neutral. Use the foot brake as an extra precaution.

CAUTION: **Use extreme caution when working under the SweepPro Broom while adjusting priority relief pressure. Have another person who is familiar with the machine assist you.**

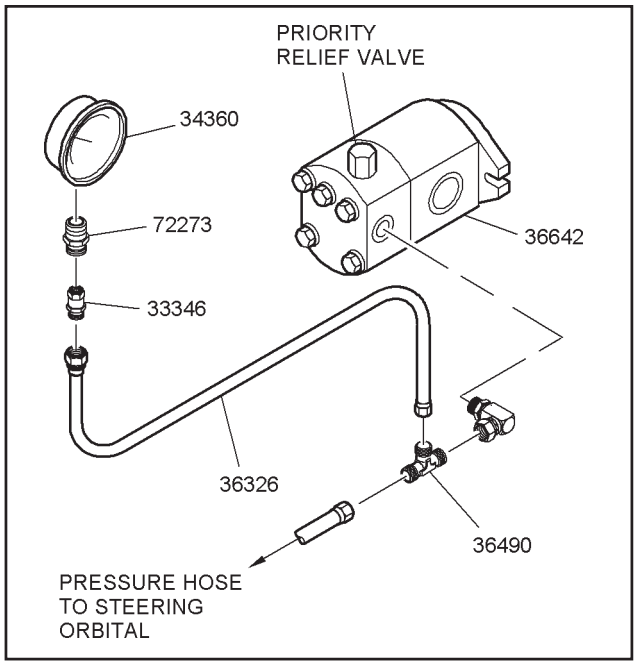


FIGURE 4-7. SETTING PRIORITY RELIEF VALVE

4. Increase engine speed to 2500 RPM.
5. Raise the brush using the lift circuit until it stops. Continue to hold pressure to lift cylinder until a gauge reading can be taken.
6. The pressure gauge should read 1500 +/- 50 psi.
7. Adjust relief pressure by removing the locknut and turning the adjusting screw clockwise to increase pressure and counterclockwise to decrease pressure.

ADJUSTING BRUSH DRIVE RELIEF VALVE

The Brush Drive Circuit gets its hydraulic flow from the excess flow port of the hydraulic pump. This flow has no relief valve at the pump. The relief valve is built into the brush rotation control valve. This valve controls the rotation of the brush drive motor. The valve is located below the operator's platform on the right side of the broom.

Adjust the relief valve if:

- Brush stalls frequently
- Brush lacks sweeping power
- There is a constant noise while sweeping

To adjust the Brush Drive Relief Valve:

1. Plumb a 0 to 5000 psi gauge into the Brush Rotation Flow Circuit as shown in Figure 4-8. Parts needed for this step, including a pressure gauge, can be obtained from your authorized dealer. Part numbers are shown. Pressure port to Brush Motor must be blocked with cap as shown.
2. Turn Brush Float control valve OFF (clockwise until stopped).
3. Start the engine and warm up the hydraulic oil to at least 100° F.
4. Set the park brake and be sure the transmission is in neutral.

CAUTION: **Use extreme caution when working under the SweepPro Broom while adjusting Brush Rotation hydraulic pressure. Have another person who is familiar with the machine assist you.**

5. Engage the Brush Drive control handle to turn the brush in the forward direction.
6. Increase engine speed to 2500 RPM.
7. Take a pressure reading. The pressure gauge should read 2500 +/- 100 psi.
8. Disengage the Brush Drive control lever.
9. Adjust the Relief Valve by removing locknut and turning the adjusting screw clockwise to increase pressure and counterclockwise to decrease pressure. Turn adjusting screw in 1/8 turn increments and repeat steps 5 through 8 until correct pressure is obtained.

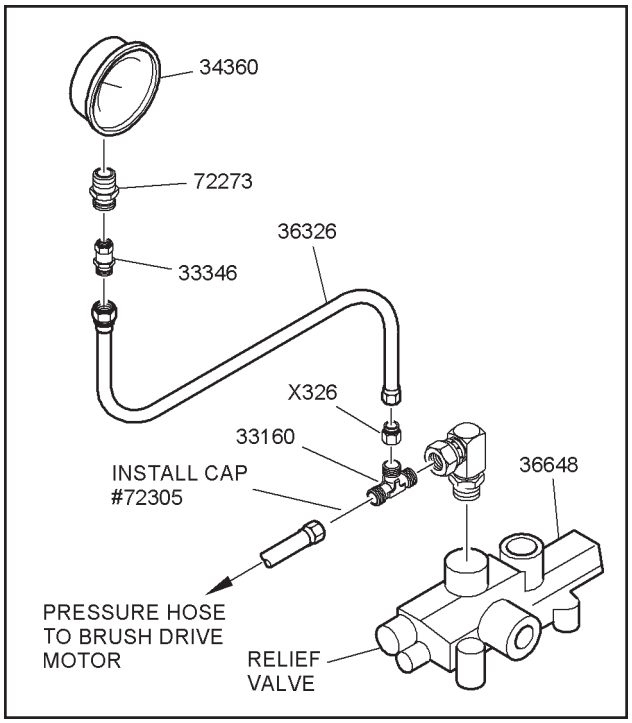


FIGURE 4-8. SETTING BRUSH DRIVE RELIEF VALVE

BRUSH SYSTEM MAINTENANCE

WARNING: **Do not service the SweepPro Broom while it is in motion or while the engine is running. If the engine must be running to service a component, place transmission in neutral, apply park brake, block wheels, and use extreme caution.**

Grease the brush core shaft pillow block bearing and brush lift pivot bushings daily using a multi-purpose grease.

Grease the brush swing bearings with a multi-purpose grease every 250 hours.

CHANGING THE BRUSH CORE

1. Lower the brush completely to the ground but do not put pressure on the brush. Put unit in neutral and set park brake.
2. Remove cotter pin from brush cover pin. Remove the cover latch pin.

3. On the under side of the swing arm, remove hairpin clip from the swing arm pin. Remove pin and pull swing arm away from brush core.
4. Pull the core away from the drive hub and slide it out of the way.
5. Your unit may be equipped with Lube For Life U-Joints. If it is not, check both hubs for any damage and grease the U-joint on the idle hub.
6. Slide new brush onto slotted drive hub making sure that the key stock inside the brush core goes onto the drive hub side.
7. Align the idle hub with the smooth end of the brush core and push the swing arm back into position into the brush core. Carefully guide the hub by hand if necessary to start into the core center. Keep hands away from pinch points.

NOTE: Brush carriage may have to be raised slightly to install a new core if the old brush core was well worn.

8. Once the idle hub is fully engaged, replace the swing arm pin. Be sure pin is fully locked and replace hairpin clip.
9. Replace cotter pin on brush cover pin.

BRUSH WATERING SYSTEM

1. Clean the spraybar water system strainer daily to prevent nozzle clogging.
2. Inspect the spraybar water system daily to confirm operation of all nozzles on the spraybar.
3. If a spraybar nozzle becomes plugged, remove it from the bar, clean the nozzle slots, and replace. You may also pierce the small holes of the spraybar openings with wire. Be careful not to ream the nozzle opening, as spray pattern will be affected.
4. At the end of each operating season (or more often if required), alternately remove the end caps on the spraybar pipe and flush out the line and nozzles.
5. For storage in temperatures below freezing, make sure the water tank, strainer, pump and all lines are completely drained to prevent damage from freezing.

CHASSIS & RUNNING GEAR MAINTENANCE

WARNING: 
Do not service the SweepPro Broom while it is in motion or while the engine is running. If the engine must be running to service a component, place transmission in neutral, apply park brake, block wheels, and use extreme caution.

DRIVE SHAFT AND TRANSFER CASE

1. Check the Drive Shaft daily for wear and loose bolts.
2. Grease the driveshaft universal joints and slip yoke every 100 hours of service using a multi-purpose grease.
3. Check the lube level in the Transfer Case every 100 hours. The lube should be up to the middle plug level. Add if necessary. See Table 4-1, Maintenance Interval Chart, for lubricant information.

TIRES AND WHEELS

1. Check tires with an accurate gauge prior to each day's use. Repair or replace damaged tires to provide safe operation of the broom.

ATTENTION: 
Never operate the SweepPro Broom with less than four wheels and tires installed. Tires should be inflated to 50 psi when tires are cold.

ATTENTION: 
Never exceed tire manufacturer's maximum recommended inflation pressure.

2. Protect tires from contact with petroleum products and chemicals.

ATTENTION: 
The drive shaft must be removed prior to towing, unless equipped with gearbox disconnect. Failure to do this could result in serious damage.

3. Wheel lug nuts should be checked for tightness weekly. Torque to 85 ft-lbs.
4. Visually inspect the wheels for damage prior to each day's use of the broom. Replace bent or cracked wheels.

AXLES AND BRAKES

WARNING: **Securely support chassis when removing the wheels. Do not lie under the machine while it is supported only by a jack. Use jackstands on a solid surface to prevent tipping of the machine when it is raised. Block the remaining wheels to prevent rolling of the machine when it is raised.**

1. Grease king pin bushings, tie rod ends, steering cylinder rod end and steering axle pivot bushings every 100 hours of service with a good quality chassis lube.
2. Steering axle wheel bearings should be removed, inspected, and repacked with a high quality axle bearing grease after every 500 service hours or seasonally.
3. To reinstall bearings and hub, tighten the retaining nut until the wheel drags during hand rotation. Then back off the nut 1/8 of a turn and bend over the locking tab or install the cotter pin, depending on the design configuration.
4. Check the lube level in the drive axle every 500 hours or seasonally. The lube should be at the plug hole. Add if necessary. Refer to Table 4-1, Maintenance Interval Chart for lubricant specifications.
5. Inspect and adjust brake pad linings in brake drums after every 500 hours of operation or seasonally. Remove wheel and hub. Inspect brake pad linings for excessive wear and proper operation. Linings should be replaced if they are 1/16" thick or less in the thinnest spot.

ATTENTION: **Only qualified technicians should perform brake adjustment. Information on proper brake adjustment can be found in the brake manufacturer's manual.**

6. Check brake fluid level daily. When filling the brake fluid reservoir, only fill to 1 inch below the top of the fill neck. To prevent fluid from leaking out of the cap vent hole, locate the hole toward the rear of the machine when replacing the cap.

STORAGE

PREPARING FOR LONG TERM STORAGE

A stored machine requires as much periodic maintenance as a machine at work. Stored units must receive periodic scheduled maintenance.

1. Clean the machine. Paint chipped or rusty areas to prevent rusting.
2. Inspect the machine thoroughly and repair worn or damaged parts.
3. Retract all hydraulic cylinders, as far as possible.
4. Coat with grease or rust inhibitor all exposed cylinder rods, seals, and o-rings to prevent cracking.

ATTENTION: **Some rust inhibitors can destroy painted surfaces. Do not spray rust inhibitor on painted surfaces.**

5. Lubricate all grease points. Make sure all grease cavities are filled with grease. See Table 4-1, Maintenance Interval Chart.
6. Remove alternator belt.
7. Remove the battery and store in a cool, dry place.
8. Check air filter restriction gauge. Clean the air cleaner assembly and precleaner. Replace air filter elements if restricted.
9. Top up all fluid levels to minimize condensation forming inside the tanks.
10. Check engine oil level and fill as necessary.
11. Perform specific gravity test on engine coolant. Drain and replace or fill coolant reservoir as needed to prevent freeze damage.
12. Check hydraulic oil sight gauge and fill as necessary.
13. Inspect all air and hydraulic hoses, couplers, fittings and cylinders. Tighten any loose fittings and replace any hoses that are worn.
14. Check all safety decals. Replace any decals that are damaged or illegible. Refer to **Decal Installation** in this section.
15. Use the mechanical brush lift cylinder lock to secure brush in the raised position. (See Figure 4-9.) This will prevent a flat spot from forming on the brush bristles.
16. Place transmission lever in neutral, idle the engine a few minutes before shutting it down, and set the park/emergency brake.
17. If possible, raise and support machine with tires off the ground, or park machine on a hard surface to prevent tires from freezing to ground.

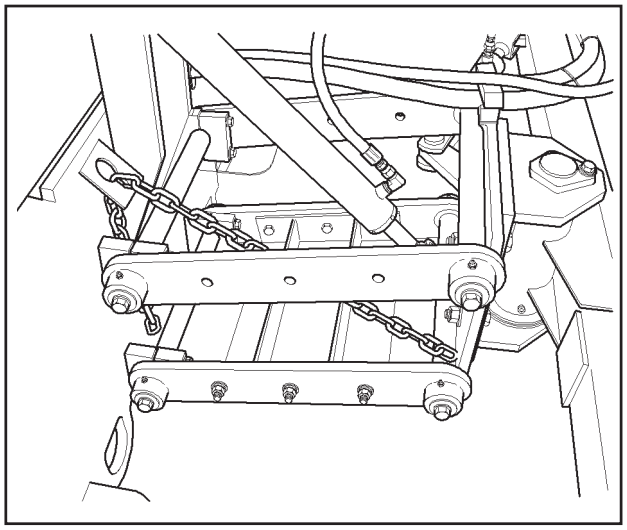


FIGURE 4-9. MECHANICAL BRUSH LIFT CYLINDER LOCK

18. Remove ignition key, lock any optional panels, cab doors, and spare tire. Cover seat with plastic, and place a DO NOT OPERATE tag on the steering wheel.
19. Store machine in a dry, protected area. If stored outside, cover with waterproof material.

PERIODIC MAINTENANCE DURING STORAGE

If a unit will not be used for more than two months, refer to Table 4-1, Maintenance Interval Chart, and follow procedures for 100-Hours interval, as well as these preventive maintenance procedures:

1. Keep battery fully charged and check the level of the electrolyte regularly.
2. Check for water in hydraulic fluid. Any machine that is stored for an extended period in a climate that has a wide range of temperatures and/or humidity, will develop condensation on the inside of the tank walls. Check the hydraulic fluid on a regular basis for possible moisture contamination.

ATTENTION: Hydraulic oil that is contaminated, must be drained, the filter elements replaced and the tank refilled with ROSCO approved fluid. Failure to do this could result in premature failure of the pumps and/or motors.

3. Start and run the engine until it is warm. Cycle all hydraulic and/or hydrostatic functions until all components are warm and the hydraulic fluid is up to operating temperature.
4. After the machine is warmed up, grease all pivot points.

REMOVING THE MACHINE FROM STORAGE

1. Follow steps above in **Periodic Maintenance During Storage**.
2. Refer to Table 4-1, Maintenance Interval Chart. Check all fluid levels, belt tensions, and bolt torques.
3. Replace alternator belt.
4. Replace battery. Refer to Battery maintenance earlier in this section for additional instructions.
5. Clean grease or rust inhibitor from all exposed cylinder rods, seals, and o-rings.
6. Disengage mechanical brush lift cylinder lock.

DECAL INSTALLATION

1. Be sure that the installation area is clean and dry. Use hot soapy water and dry the area thoroughly before installing decals.
2. Determine the exact position by taking measurements and test fitting before you remove the backing paper.
3. For decals with no top protection paper, determine the decal location and remove the smallest portion of the split backing paper.
4. Align the decal over the specified area and carefully press the small portion with the exposed adhesive backing into place.
5. Peel back the remaining paper and carefully smooth the remaining portion of the decal in place.
6. Small air pockets can be pierced with a pin and smoothed out using the piece of decal backing paper.
7. If the decal has a protective top paper, use hot soapy water on the surface to which the decal is being applied. Leave wet. After determining the location, remove the backing paper and soak the decal in clean soapy water before application. This will help prevent air bubbles in the finished decal.
8. Smooth the decal into place with a sponge and check for air bubbles. Small air pockets may be pierced with a pin and smoothed out. When the decal is completely smoothed out, carefully remove the top paper.

NOTES:

TROUBLESHOOTING

GENERAL INFORMATION

The troubleshooting chart below identifies the most common symptoms of failure. Use this chart to help identify the failed component.

For specific engine and hydraulic problems not covered here, see the Engine or Hydraulic Pump and/or Motor Manufacturer's manual.

ATTENTION:  **Do not attempt to service or repair major components such as the engine, hydrostatic pump or motor unless authorized to do so by your ROSCO dealer. ANY UNAUTHORIZED REPAIR WILL VOID THE WARRANTY.**

TROUBLESHOOTING CHARTS

SYMPTOM	CAUSE	REMEDY
Engine doesn't crank.	Battery weak or dead.	Charge or replace battery.
	Neutral start switch not activated.	Put direction control lever in neutral.
	Faulty ignition switch.	Replace.
	Faulty start solenoid.	Replace.
	Faulty starter.	Repair or replace.
Engine cranks but won't start.	No fuel in tank.	Add fuel to tank.
	No voltage to fuel shutoff solenoid.	Voltage should be 9 volts with the ignition switch in the ON or START position.
	No fuel to injector pump.	Check fuel supply system.
	Fuel connections loose on suction side of injector pump.	Tighten all fuel filter fittings and connections from fuel tank to injector pump.
	Fuel filter plugged or restricted.	Replace fuel filter.
	Intake or exhaust system restricted.	Check for and remove restrictions.
Engine difficult to start, or won't start.	Engine cranking speed too low.	Clean battery terminal connections. Charge or replace battery.
	Insufficient fuel supply to injector nozzles.	Check fuel system. Clean or replace fuel filter.
	Fuel solenoid defective.	Check/replace defective fuel solenoid. See engine manufacturer's manual.
	Fuel filter plugged.	Replace fuel filter.
	Air in the fuel system.	Check for air leaks in the low pressure side of the fuel system. Prime fuel system. See engine manufacturer's manual.

TROUBLESHOOTING CHARTS

SYMPTOM	CAUSE	REMEDY
Engine difficult to start, or won't start (continued).	Fuel supply contaminated.	Verify by operating engine with a known fuel quality.
	Intake air system restricted.	Check for and remove restrictions.
Unit doesn't move with engine running, or moves in one direction only.	Park brake engaged.	Release park brake.
	Brush rotation control valve is bypassing oil at low pressure.	Repair or replace relief valve cartridge(s).
	Damaged hydrostatic pump.	Repair or replace hydrostatic pump.
	Damaged hydrostatic motor.	Repair or replace hydrostatic motor.
Unit jerks when operating in Forward or Reverse.	Fast movement of direction control handle.	Move handle slowly when changing speed and/or direction.
	Park brake not disengaged.	Release park brake. Check for binding park brake cable(s).
	Engine speed set too low.	Run engine at higher RPM.
	Low hydraulic fluid level.	Fill reservoir with correct fluid until visible in sight gauge.
	Air leaking into hydraulic system.	Tighten or replace hoses, fittings and/or filter(s).
	Hydrostatic pump is malfunctioning.	Repair or replace pump.
Engine power output is low.	Operating engine at high altitude.	De-rate engine power output for altitudes above 10,000 feet.
	Air intake piping restricted.	Remove restrictions.
	Air cleaner element dirty.	Clean or replace air cleaner elements.
	Fuel suction line or filter restricted.	Check fuel line for restrictions. Replace fuel filter element(s).
	Fuel return system restricted.	Correct restricted fuel return system.
	Fuel quality poor.	Verify by operating with a known fuel quality.
	Fuel transfer pump malfunctioning.	Replace fuel transfer pump. See engine manufacturer's manual.
	Throttle improperly adjusted.	Adjust throttle controls.
	Injector malfunctioning.	Replace injector. See engine manufacturer's manual.

TROUBLESHOOTING CHARTS

SYMPTOM	CAUSE	REMEDY
Engine won't shut off.	Electrical wiring fault supplying power to fuel solenoid when key is in OFF position.	Repair wiring.
	Faulty diode in engine wire harness at alternator.	Check diode wire connection and/or replace diode.
	Injection pump fuel solenoid inoperative.	Check solenoid for defects or foreign material inhibiting proper operations.
	Engine operating on fumes drawn into air intake.	Locate and isolate the source of fumes.
	Low idle set too high.	Set idle to specifications.
Transmission won't shift to HIGH.	Faulty switch.	Replace if necessary.
	Loose wiring or connector to 2-speed solenoid valve.	Repair wiring or connection.
	Faulty solenoid on 2-speed solenoid valve.	Repair or replace solenoid cartridge and/or coil.
Brush stalls or lacks power.	Brush drive relief valve set too low or defective.	Adjust relief valve to 2500 psi. Replace if defective. See Pumps and Motors in this section.
	Sweeping with too much down pressure.	See Brush Down Pressure Control in Section 3, Operation.
	Ground speed too fast.	Pull back on hydrostatic control lever and increase engine RPM to increase brush speed. Always sweep in LOW range.
Steering is difficult.	Low hydraulic fluid level.	Add fluid to proper level. See Hydraulic Maintenance in this section.
	Hydraulic filters contain contamination.	Check filter(s) for contamination and replace if necessary. See Hydraulic Maintenance.
	Hydraulic pump priority relief valve set incorrectly.	Check relief valve setting. It should be 1500 psi. Adjust setting if necessary. See Pumps and Motors in this section.
	Worn hydraulic pump.	Check for worn pump and repair or replace.
	Worn steering orbital motor.	Check for worn steering orbital motor and repair or replace.

TROUBLESHOOTING CHARTS

SYMPTOM	CAUSE	REMEDY
Steering is difficult (continued).	Worn steering cylinder.	Repair or replace steering cylinder.
Hydraulic system overheats (temperature above 200° F).	Low hydraulic fluid level.	Fill with correct fluid until visible in sight gauge.
	Defective temperature gauge or sender giving wrong temperature reading.	Replace gauge or sender.
	Brush drive relief valve set too low or defective.	Adjust relief valve to 2500 psi. Replace if defective. See Pumps and Motors in this section.
	Excessive ambient air temperature and high duty cycle.	Operate unit at slower ground speed and maximum engine RPM during hot weather.
	Plugged fins on fluid cooler.	Clean fins and correct any other problems with cooling air flow.
	Hydrostatic pump bypass valve defective or open.	Repair or replace. If valve is open, turn valve clockwise until seated and torque to 7 to 10 ft-lbs (9.5 to 14 Nm). Overtorquing will damage valve.
	Worn hydrostatic pump.	Repair or replace.
Engine oil pressure is low.	Electrical power not being supplied to gauge.	Check fuse.
	Incorrect oil level. Too high or too low.	Check for leaks. Add or drain engine oil. Check dipstick calibration.
	Oil filter plugged.	Change oil filter.
	Oil diluted with fuel.	Replace fuel injector, fuel transfer pump and/or injection pump.
	Oil diluted with coolant.	See authorized engine repair facility.
	Incorrect oil specifications.	Change oil. Check oil specifications. See Engine Maintenance in this section. See engine manufacturer's manual.
	Oil pressure sender or gauge malfunctioning.	Replace oil pressure sender or gauge.
	Coolant level too low.	Add coolant.
Engine coolant termperature above normal.	Radiator fins damaged or obstructed.	Inspect radiator fins. Clean, repair or replace.

TROUBLESHOOTING CHARTS

SYMPTOM	CAUSE	REMEDY
Engine coolant temperature above normal (continued).	Collapsed or restricted radiator hose.	Inspect hoses. Replace if necessary.
	Loose fan drive belt.	Check belt tension and tighten if necessary.
	Cooling fan shroud damaged or missing.	Inspect shroud. Repair, replace or install as needed.
	Incorrect or malfunctioning radiator cap.	Check the radiator cap. Replace if necessary.
	Temperature gauge or sender malfunctioning.	Repair or replace sender and/or gauge.
	Thermostat stuck in closed position.	Test thermostat. Replace if necessary.
	Dirt, scale or rust in the cooling system.	Clean cooling system.
Alternator not charging.	Loose wiring or faulty connection.	Repair or replace loose wiring or connector.
	Diode at alternator loose or faulty.	Tighten connection or replace diode.
	Alternator belt loose or broken.	Adjust or replace belt.
	Alternator malfunctioning.	Replace alternator.
Instrument gauges don't work.	Faulty gauge or sender.	Replace gauge or sender.
	Alternator not charging.	Repair wiring or replace alternator.
	Faulty wiring.	Replace wiring or connector.

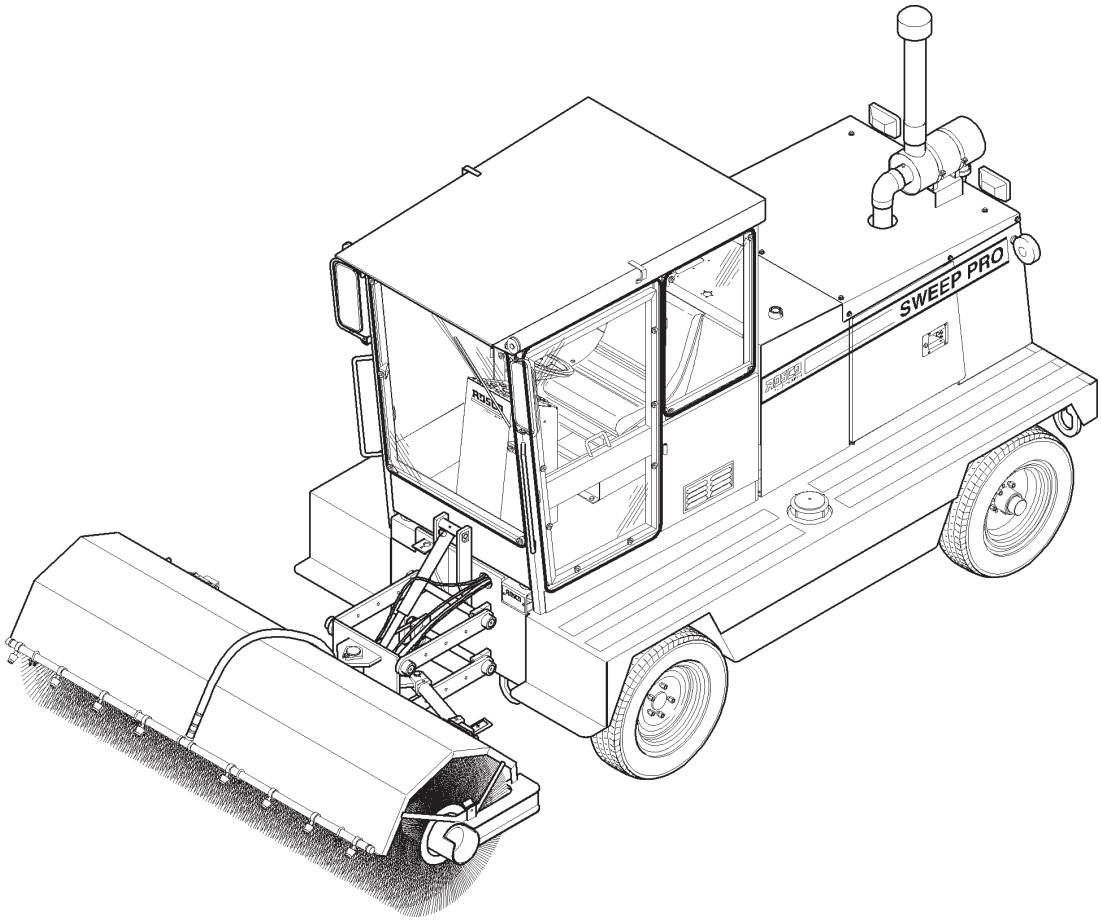
NOTES:

NOTES:

ROSCO

A LeeBoy Company

ILLUSTRATED PARTS LIST



SWEEPPRO BROOM

Manual No. 39004-01

For Units With Serial No. 44681 and higher

Revised 06-30-06

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TABLE OF CONTENTS

TABLE OF CONTENTS

INTRODUCTION

This Illustrated Parts List (IPL) is intended for use in identifying and requisitioning replacement parts.

ILLUSTRATED PARTS LIST

HOW TO USE THE IPL

In column 1, FIG refers to the corresponding illustration, and ITEM refers to the item number for the referenced illustration.

Parts with a dash preceding the ITEM number are not illustrated.

In column 2, PART NUMBER refers to the associated FIG or ITEM in column 1.

In column 3, NOMENCLATURE refers to the description of the associated PART NUMBER. Bullets preceding the description are explained in **General System Of Assembly Order**, in following paragraphs.

In the case of sub-assemblies, parts are captioned ATTACHING PARTS and are listed immediately following the attached part(s). The -----*----- symbol follows the last item of the attached parts group.

In column 4, UNITS PER ASSY refers to the quantity required to assemble the item illustrated in the associated FIG. Unit of measure may be EACH, FT, LBS or other.

In the case of sub-assemblies, the quantities listed for the attaching parts are the quantity required to attach one item.

NHA notations at item descriptions refer to Next Higher Assembly.

On the associated illustrations, numbers in parentheses next to the item number, refer to the quantities used at that assembly location.

EXPLANATION OF PART NUMBERS

If standard parts (those with AN, MS, NAF, NAS prefixes) are used, the standard part number is listed in the PART NUMBER column.

If a company other than LeeBoy is referred to as the original manufacturer, these parts may carry the original manufacturer's part number or a LeeBoy part number. These manufacturers are identified by an appropriate vendor code following the nomenclature. If the part number is a LeeBoy part number, the original manufacturer's part number is given after his vendor code. Vendor codes are in accordance with the current issue of Cataloguing Handbook , "Commercial and Government Entity" (H4-1 and H4-2) and are preceded by the capital letter "V".

When a vendor code cannot be obtained from the H4-1 and H4-2 Cataloguing Handbook, the manufacturer's full name and address are included in the parts list. Government standard parts such as AN, MS, NAF and NAS parts are not identified with a vendor code.

GENERAL SYSTEM OF ASSEMBLY ORDER

The indenture system used in the Illustrated Parts List shows relationship of parts and assemblies to the next higher assembly or installation as follows:

1 2 3 4 5 6 7

Installation

- • Detail parts for installation
- • Assembly
- • Attaching parts for assembly

-----*-----

- •• Detail parts for assembly
- •• Sub-assembly
- •• Attaching parts for sub-assembly

-----*-----

- ••• Detail parts for sub-assembly
- ••• Sub-sub-assembly
- ••• Attaching parts for sub-sub-assembly

-----*-----

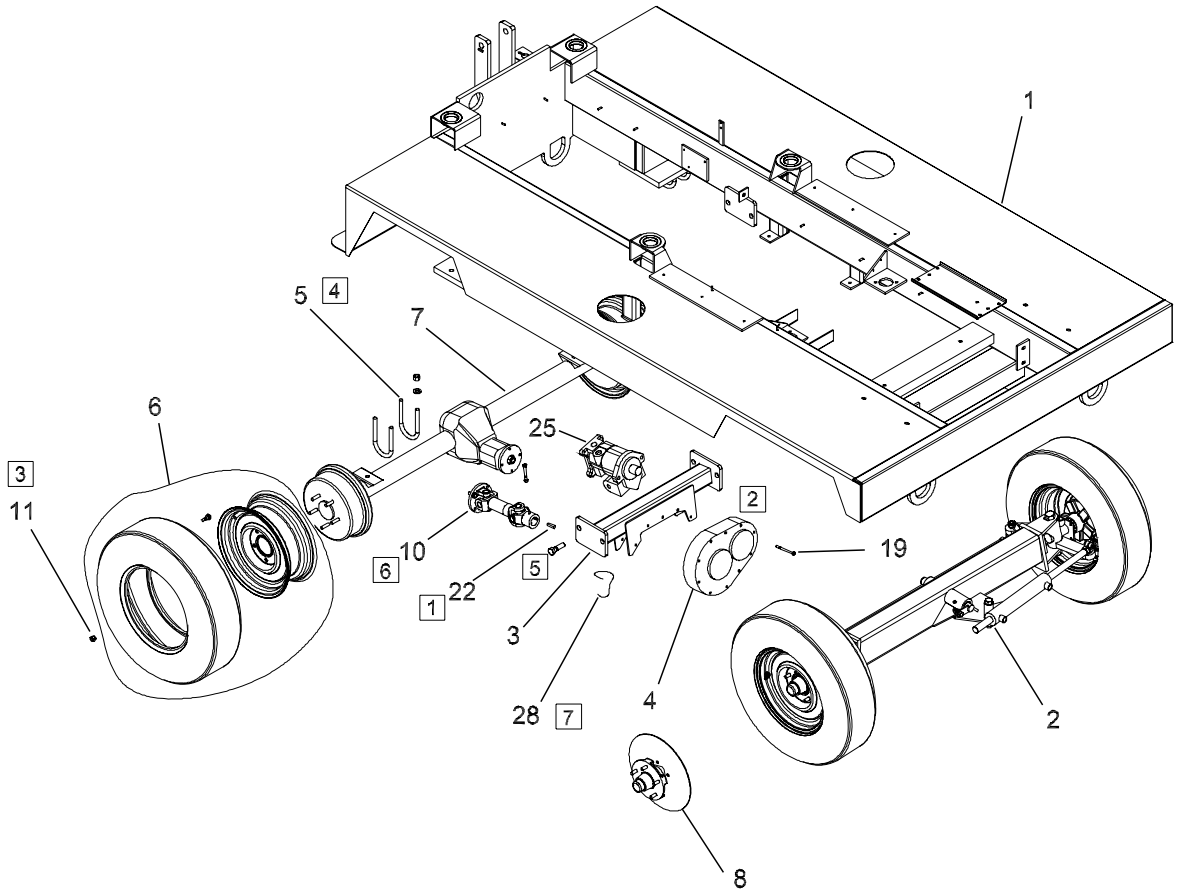
- •••• Detail parts for sub-sub-assembly

ALPHABETICAL INDEX

An Alphabetical Index is provided as a supplement at the end of the Illustrated Parts List.

EQUIPMENT DESIGNATOR INDEX

If equipment designators are used in place of part numbers at any place in the IPL, an Equipment Designator Index is provided, listing all equipment designators listed in the Illustrated Parts List.



NOTES:

1. Torque to 46 FT. LBS.
2. Torque to 75 FT. LBS.
3. Torque to 85 FT. LBS.
4. Torque to 150 FT. LBS.
5. Torque to 250 FT. LBS.
6. Torque to 65 FT. LBS.
7. Route wire thru the set screw, around the shaft and tie.

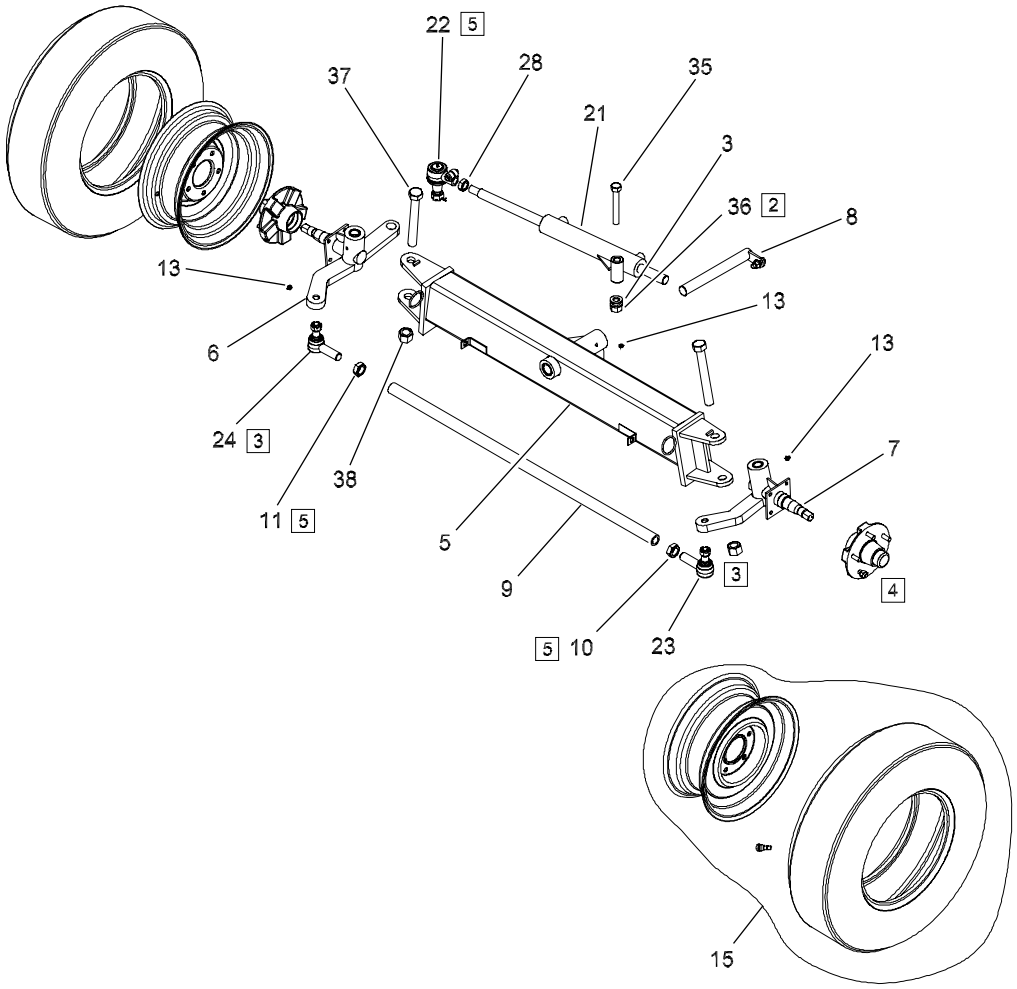
FIGURE 1. FRAME ASSEMBLY

FIGURE 1. FRAME ASSEMBLY

FIG ITEM	PART NUMBER	NOMENCLATURE 1 2 3 4 5 6 7	UNITS PER ASSY
1	**See Note**	**FRAME ASSEMBLY**	**1**
1	29040	•FRAME W/M,CUMMINS	1
1	986182	•FRAME W/M,CATERPILLAR	1
2	29043	•AXLE ASSY,FRONT (SEE FIGURE 2 FOR BREAKDOWN)	1
3	29037	•GEARBOX,MOUNT W/M	1
4	35338	•GEARBOX B PAD 15T 4.533 RATIO (SEE FIGURE 3)	1
5	35339	•U-BOLT,AXLE MOUNT	4
6	981678	•WHEEL,BROOM,ST225/75-R15,C	2
		ATTACHING PARTS	
-601	33799	••TIRE VALVE,TUBELESS,.453,1.25	1
-602	35342	••TIRE,RADIAL,ST225/75-R15,C	1
-603	39027	••WHEEL,15X6.5 HOLE,5.5BC,FORD	1
		-----*-----	
7	984260	•AXLE,RB48,DANA,044AA532-12	1
8	27791	•HUB ASSY,WHEEL,W/DUST SHIELD (SEE FIGURE 4)	1
-9	81201	•WASHER,FLAT,SAE,.625,HARDENED	8
10	984395	•DRIVESHAFT,BROOM,DANA AXLE	1
-11	620520	•NUT,LUG,.500-20	10
-12	80356	•NUT,FLEXLOC,.625-11,FULL,LT	8
-13	81048	•CSHH,.375-16X3.00,GR8	1
-14	81009	•CSHH,M12-1.75X30MM,CL8.8	4
-15	80484	•WASHER,LOCK,M12	4
-16	80147	•WASHER,FLAT,USS,.750	4
-17	80168	•WASHER,LOCK,.750	4
-18	80043	•NUT,HEX,.750-10	1
19	81010	•CSHH,.312-18X4.00,GR8	5
-20	80352	•NUT,FLEXLOC,.375-16,FULL,LT	1
-21	33137	•CSHH,.750-10X2.50,GR5	4
22	010990739	•KEYSTOCK,.375X1.625	1
25	35330	•MOTOR,HYD,M46 VAR,2.8/1.45 CIR	1
28	38620	•WIRE,MECHANICS,16.5 GA	0.8
-29	71631	•CSHH,.500-20X1.75,GR5 NF HT	2
-30	80164	•WASHER,LOCK,.500	2

NOTE: For Cummins engines, frame assembly is #28403.
For Caterpillar engines, frame assembly is #986181.
Except for item 1, all assembly parts are common to both units.

- ITEM NOT ILLUSTRATED



NOTES:

2. Torque to 200 FT. LBS.
3. Torque to 250 FT. LBS.
4. Torque to 85 FT. LBS. for lug nuts.
5. Torque to 400 FT. LBS.

FIGURE 2. FRONT AXLE ASSEMBLY

FIGURE 2. FRONT AXLE ASSEMBLY

FIG ITEM	PART NUMBER	NOMENCLATURE 1 2 3 4 5 6 7	UNITS PER ASSY
2	**29043**	**•FRONT AXLE ASSEMBLY (SEE FIGURE 1 FOR NHA)**	**1**
3	16935	••SLEEVE,STEERING CYL MOUNT	1
5	28451	••FRONT AXLE W/M,RB48	1
6	25282	••SPINDLE W/M,LH	1
7	25283	••SPINDLE W/M,RH	1
8	20724	••SHAFT W/M,PIVOT,FRONT AXLE	1
9	20727	••TUBE,TIE ROD	1
10	21113	••NUT,HEX,JAM,1.00-16,RH	1
11	21114	••NUT,HEX,JAM,1.00-16,LH	1
13	33684	••FITT,LUBE,STR,02MP,SHORT	3
15	981678	••WHEEL,BROOM,ST225/75-R15,C	2
		ATTACHING PARTS	
-1501	33799	•••TIRE VALVE,TUBELESS,.453,1.25	1
-1502	35342	•••TIRE,RADIAL,ST225/75-R15,C	1
-1503	39027	•••WHEEL,15X6.5 HOLE,5.5BC,FORD	1
		-----*-----	
21	36754	••CYL,HYD,2.00X10.75X1.00 ROD	1
-2101	33805-01	•••SEAL KIT,STEERING CYL	A/R
22	36755	••BALL JOINT,STEERING CYL END	1
23	36756	••BALL JOINT,RH	1
24	36757	••BALL JOINT,LH	1
28	80097	••NUT,HEX,JAM,.875-14	1
-30	81154	••WASHER,FLAT,SAE,.750,HARDENED	1
-32	80248	••CSHH,.500-13X1.00,GR5	2
-33	71627	••CSHH,.500-13X1.50,GR5	1
-34	80040	••NUT,HEX,.500-13	1
35	80839	••CSHH,.750-10X5.00,GR5	1
36	80357	••NUT,FLEXLOC,.750-10,FULL,LT	1
37	81184	••CSHH,1.000-8X8.0,GR5	2
38	80359	••NUT,FLEXLOC,1.000-8,FULL,LT	2
-TBD	610250-1	••FLAT WASHER, FRONT SPINDLE	2
-TBD	610260	••NUT,SPINDLE	2

- ITEM NOT ILLUSTRATED

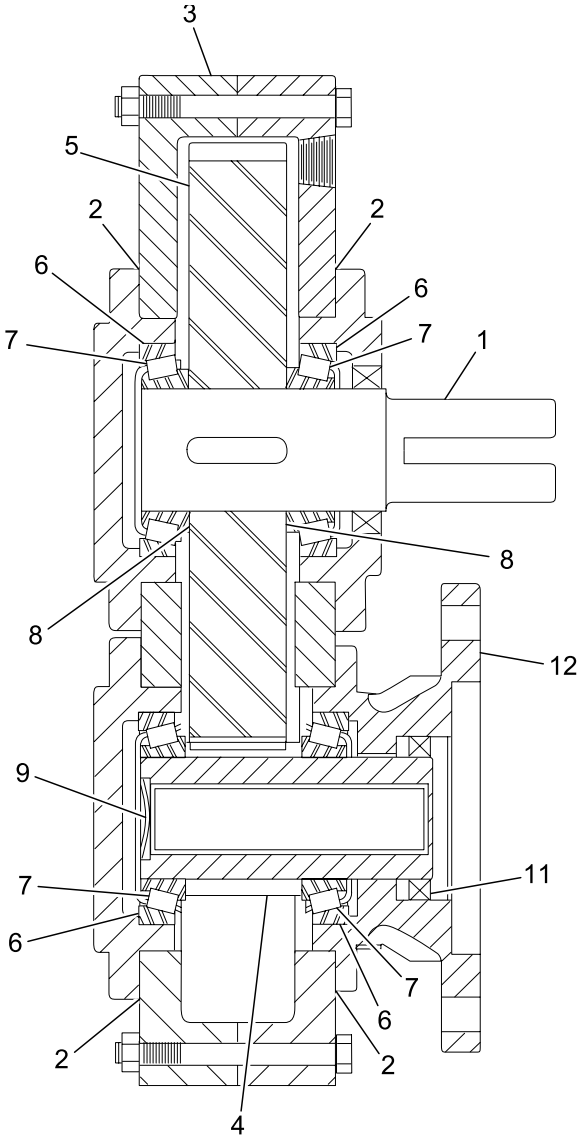
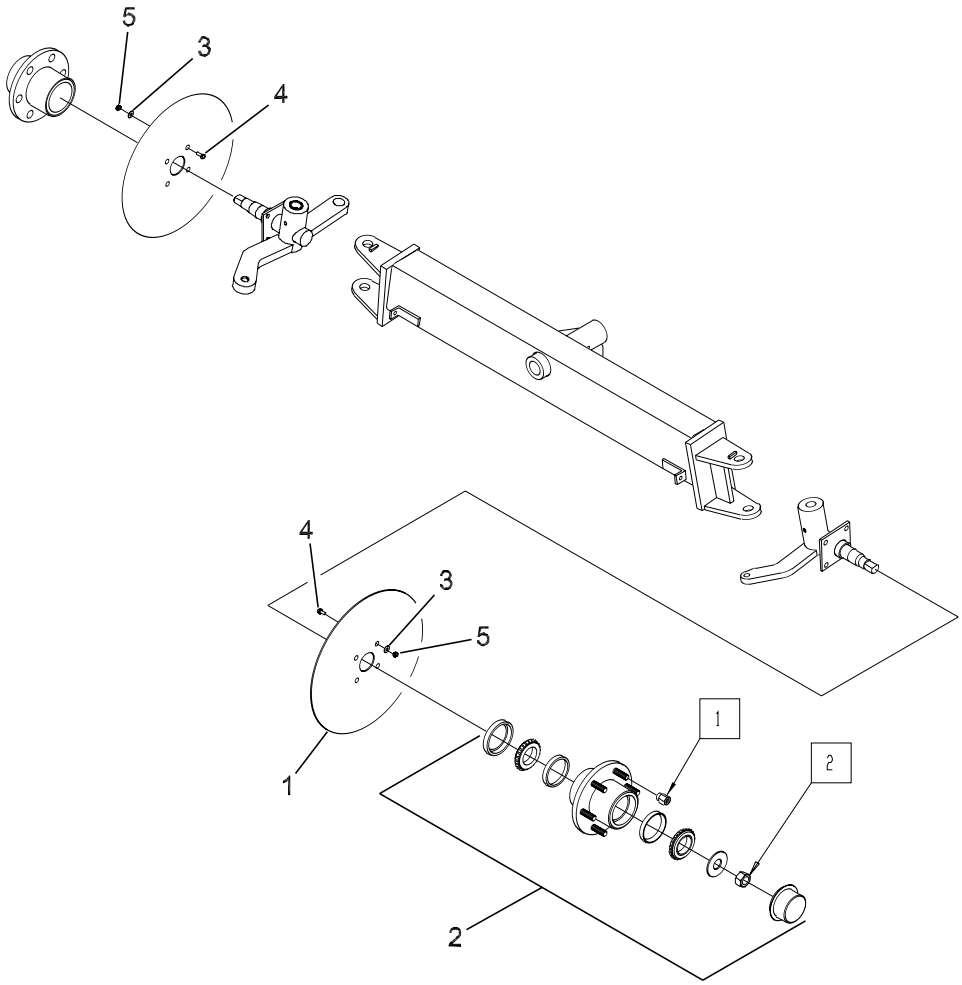


FIGURE 3. GEARBOX B PAD

FIGURE 3. GEARBOX B PAD

FIG ITEM	PART NUMBER	NOMENCLATURE 1 2 3 4 5 6 7	UNITS PER ASSY
3	**35338**	**•GEARBOX B PAD (SEE FIGURE 1 FOR NHA)**	**1**
1	35338-01	••SHAFT	1
2	35338-02	••GASKET,BLUE SHIM	8
3	35338-03	••GASKET	1
4	35338-04	••GEAR,INT HEL LH 15T (NOT SOLD INDIVIDUALLY)	1
5	35338-05	••GEAR,HEL RH 68T (NOT SOLD INDIVIDUALLY)	1
6	35338-06	••CUP,BEARING	4
7	35338-07	••CONE,BEARING	4
8	35338-08	••SPACER,BEARING	2
9	35338-09	••PLUG,EXPANSION DISC (BUY LOCALLY)	1
-10	35338-10	••PLUG,VENTED (BUY LOCALLY)	1
11	35338-11	••SEAL	2
12	35338-12	••FLANGE,SAE B,2-HOLE	1
-13	35338-13	••KEY,OUTPUT SHAFT/GEAR	1
-14	35338-14	••HOUSING HALF,GEAR BOX,BLIND END	1
-15	35338-15	••HOUSING HALF,GEAR BOX,MOTOR END	1
-16	35338-16	••CAP,OPEN	1
-17	35338-17	••CAP,CLOSED	2
-18	35338-18	••GASKET,RED SHIM	8

- ITEM NOT ILLUSTRATED



NOTES:

1. Torque to 85 FT. LBS.
2. Tighten bearings until they drag, then back off to first cotter pin hole.

FIGURE 4. HUB ASSEMBLY

FIGURE 4. HUB ASSEMBLY

FIG ITEM	PART NUMBER	NOMENCLATURE 1 2 3 4 5 6 7	UNITS PER ASSY
4	**27791**	**•HUB ASSEMBLY (SEE FIGURE 1 FOR NHA)**	**1**
1	29021	••SHIELD,DUST,W/OUT BRAKES,E150	2
2	37938	••HUB ASSY,5-BOLT,5.50INBC (SEE FIGURE 5)	2
3	80142	••WASHER,FLAT,USS,.375	8
4	80221	••CSHH,.375-16X1.00,GR5	8
5	80352	••NUT,FLEXLOC,.375-16,FULL,LT	8

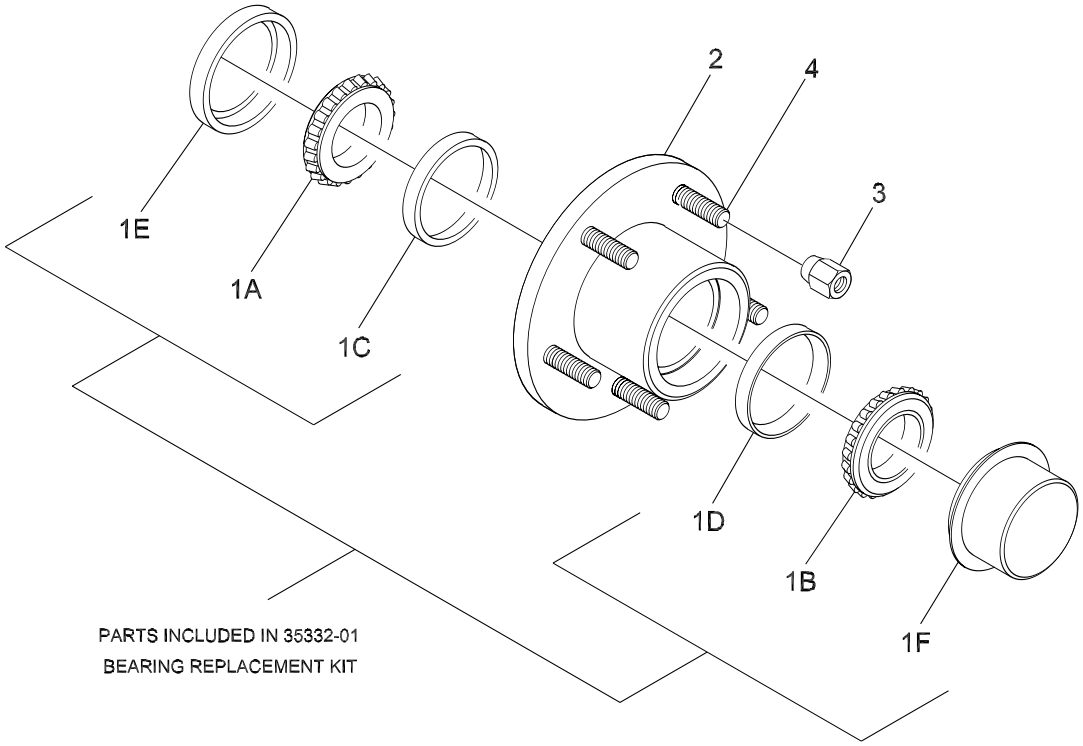


FIGURE 5. HUB ASSEMBLY, 5 BOLT

FIGURE 5. HUB ASSEMBLY, 5 BOLT

FIG ITEM	PART NUMBER	NOMENCLATURE 1 2 3 4 5 6 7	UNITS PER ASSY
5	**37938**	**••HUB ASSEMBLY, 5-BOLT (SEE FIGURE 4 FOR NHA)**	**2**
1	35332-01	•••BEARING REPLACEMENT KIT	1
1A		•••INNER BEARING	1
1B		•••OUTER BEARING	1
1C		•••INNER CUP	1
1D		•••OUTER CUP	1
1E		•••GREASE SEAL	1
1F		•••DUST CAP	1
2	37938-01	•••HUB W/O BRAKES	1
3	620520	•••WHEEL NUT,1/2-20	6
4	37938-02	•••WHEEL STUD,1/2-20	6

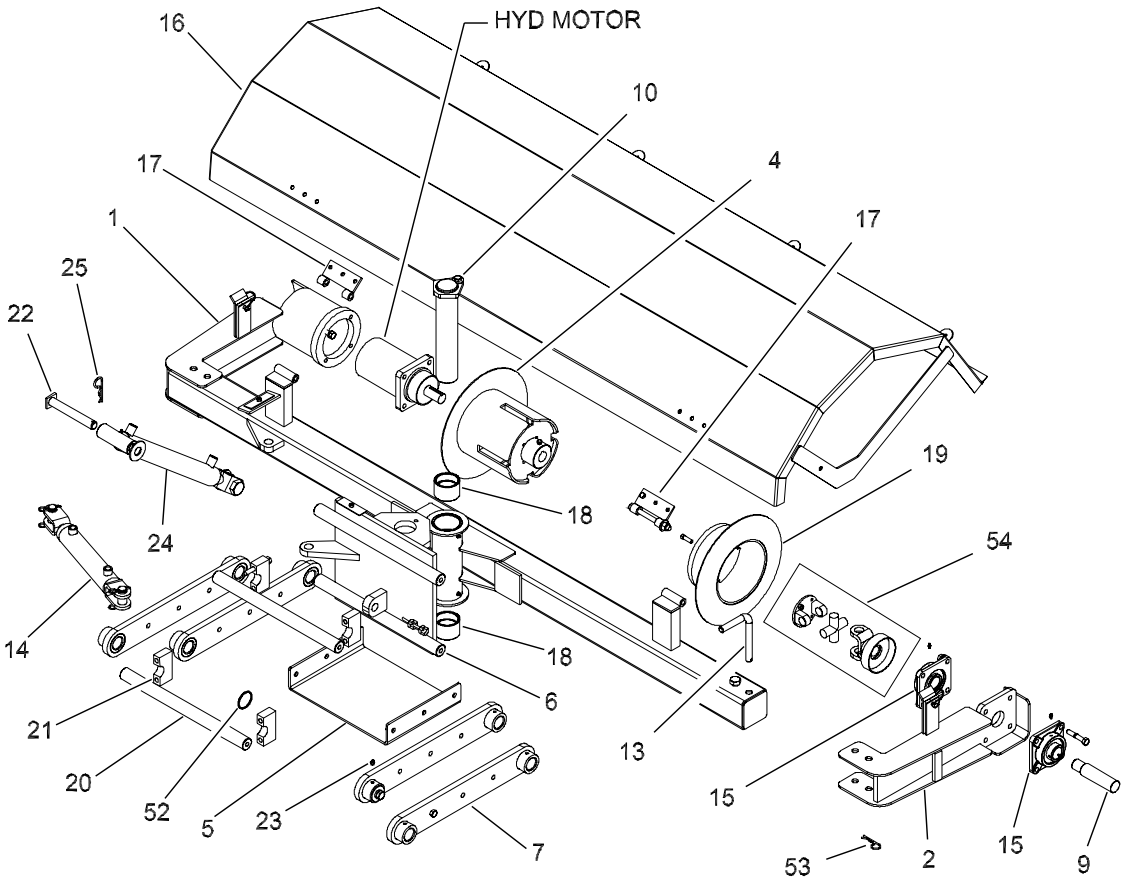


FIGURE 6. BRUSH FRAME GROUP, SWEEPPRO

FIGURE 6. BRUSH FRAME GROUP, SWEEPPRO (PAGE 1 OF 2)

FIG ITEM	PART NUMBER	NOMENCLATURE 1 2 3 4 5 6 7	UNITS PER ASSY
6	**28395**	**BRUSH FRAME GROUP, SWEEPPRO**	**1**
1	28510	•BRUSH FRAME,WMT SWEEP-PRO	1
2	28501	•SWING ARM,W/M	1
4	28570	•DRIVE HUB,W/M	1
5	984859	•PLATE,LIFT,SUPPORT,W/M	1
6	28512	•LIFT PLATE,W/M	1
7	28567	•LIFT ARM,W/M	4
9	28461	•PIN,IDLE SHAFT	1
10	27280	•MAIN PIVOT PIN,W/M	1
13	28747	•PIN,HITCH	1
14	610110	•CYL,HYD,2.00X8.00X1.00 ROD	1
15	312030	•BEARING,FLANGE,4-BOLT,1.50	2
16	28576	•BRUSH COVER,W/M	1
17	26531	•BRUSH HINGE,W/M	2
18	26521	•PIVOT BUSHING,BRUSH FRAME	2
19	28828	•HUB,IDLER,W/M	1
20	28463	•PIN,LIFT	2
21	28582	•MOUNT,BRUSH LIFT PIVOT	4
22	28656	•PIN,W/M,LIFT CYLINDER	1
23	33684	•FITT,LUBE,STR,02MP,SHORT	10
24	38922	•CYL,HYD,2.00X16.O0X1.125 ROD	1
25	36544	•PIN,COTTER,.177,7GA	1
52	37187	•RING,SPLIT,2.02IDX.18,ZINC CTD	1
53	5928	•PIN,COTTER,.148,#9	1
54	39138	•HUB ASSY	1
		ATTACHING PARTS	
-5401	26954	••GUARD,IDLER HUB	1
-5402	38285	••YOKE,FLANGE	1
-5403	39125	••BEARING KIT, U-JOINT CROSS	1
		-----*-----	

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FIGURE 6. BRUSH FRAME GROUP, SWEEPPRO (PAGE 2 OF 2)

FIG ITEM	PART NUMBER	NOMENCLATURE 1 2 3 4 5 6 7	UNITS PER ASSY
6	**28395**	**BRUSHFRAME GROUP, SWEEPPRO**	**1**
-26	38976	•PIN,SAFETY SNAP,.312,1.38 GRIP	2
-27	80224	•CSHH,.375-16X1.25,GR5	10
-28	80142	•WASHER,FLAT,USS,.375	7
-29	80162	•WASHER,LOCK,.375	6
-30	80038	•NUT,HEX,.375-16	10
-32	80147	•WASHER,FLAT,USS,.750	9
-33	80357	•NUT,FLEXLOC,.750-10,FULL,LT	1
-34	80295	•CSHH,.750-10X5.50,GR5	1
-35	80189	•CSHH,.500-13X2.75,GR5	4
-36	80166	•WASHER,LOCK,.625	4
-37	71638	•CSHH,.625-11X1.25,GR5	4
-39	80248	•CSHH,.500-13X1.00,GR5	1
-40	80186	•CSHH,.500-13X1.75,GR5	10
-41	80164	•WASHER,LOCK,.500	1
-42	80040	•NUT,HEX,.500-13	4
-43	80266	•CSHH,.500-13X3.50,GR5	8
-44	80311	•SET SCREW,.312-18X1.00,SQHD	1
-45	80299	•CSHH,1.000-14X3.00,GR5	1
-46	80149	•WASHER,FLAT,USS,1.000	2
-47	80377	•NUT,FLEXLOC,1.000-14,FULL,LT	1
-48	80250	•CSHH,.500-13X1.25,GR5	8
-49	80144	•WASHER,FLAT,USS,.500	10
-50	80467	•CSHH,.500-13X6.00,GR5	2
-51	80354	•NUT,FLEXLOC,.500-13,FULL,LT	2
		ATTACHING PARTS	
	TBD	BRUSH GROUPS	
-100	*28766	•BRUSH CORE GROUP	1
-101	28773	••BRUSH CORE,W/M,QWK CHG	1
-102	28854	••PLATE,BRUSH RING	1
-103	81256	••CSSBH,.312-18X1.0	4
-200	6375P	•WAFER,POLY,10X32,W/SPACERS	27 / box
-201	37638	••SPACERS,BRUSH	A/R
-300	6375S	•WAFER,STL,10X32,W/SPACERS	27 / box
-301	37638	••SPACERS,BRUSH	A/R
-400	38806	•BRUSH,TUBE,32"X90",POLY	1
-500	38831	•BRUSH,TUBE,32"X90",POLY/STEEL	1
		-----*-----	

* Brush Core Group is required with all wafer options except Tube Brushes.

- ITEM NOT ILLUSTRATED

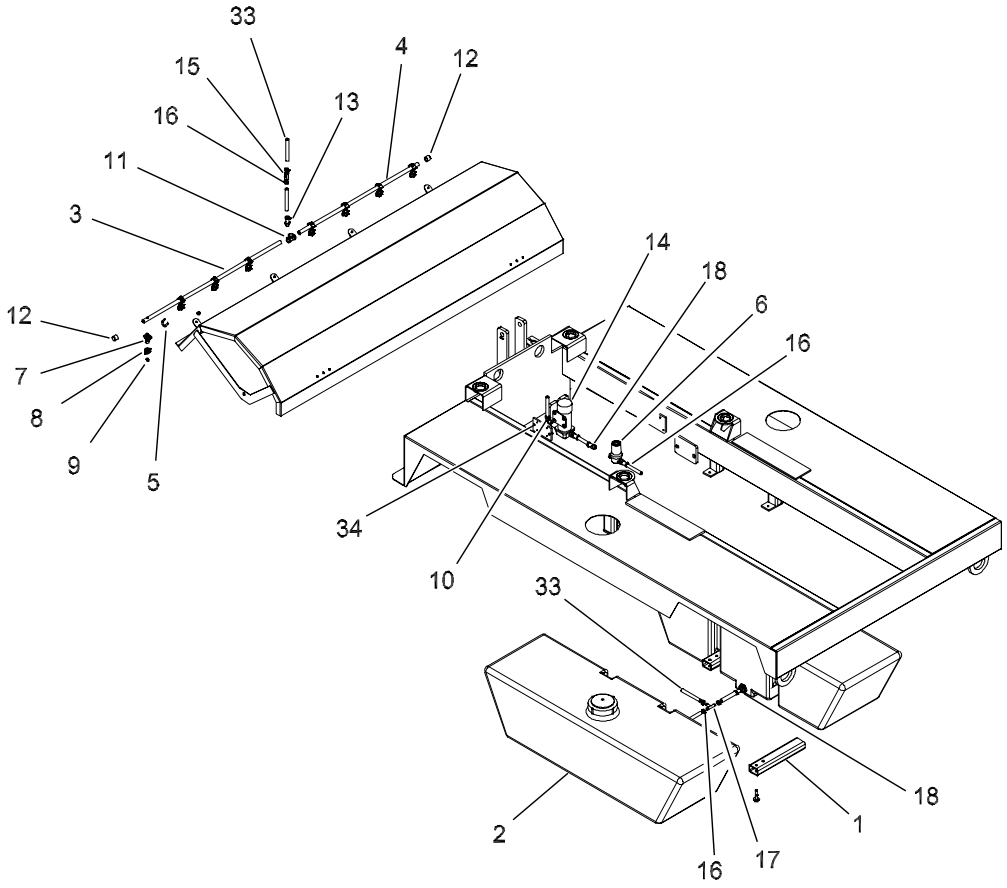

FIGURE 7. WATER SPRAY GROUP

FIGURE 7. WATER SPRAY GROUP (PAGE 1 OF 2)

FIG ITEM	PART NUMBER	NOMENCLATURE 1 2 3 4 5 6 7	UNITS PER ASSY
7	**28396**	**WATER SPRAY GROUP**	**1**
1	28657	•BRACKET,WATER TANK	4
2	38884	•TANK,WATER,75GAL,PLAST,SWEEPPR	2
3	21143	•SPRAY PIPE,RH	1
4	21144	•SPRAY PIPE,LH 39"	1
5	35077	•U-BOLT,.250-20,1.00IW,1.75IL	4
6	36926	•STRAINER ASSY	1
8	986502	•NOZZLE,ASSY,08 PIPE NYL,STR	8
		ATTACHING PARTS	
-801	38655	••NOZZLE,EYELET,08 PIPE,NYLON	1
-802	38656	••CAP,WATER SPRAY NOZZLE W/SEAL	1
-803	38657	••NOZZLE,80 DEG,.094 ORF,NYLON	1
		-----*-----	
10	36809	•PORT KIT,08 BARB X 90,EPDM	1
11	99845	•PIPE,TEE,08FP,GALV	1
12	91152	•PIPE,CAP,.500,GALV	2
13	X427	•FITT,STR 08MP-08HB,CRIMPED	1
14	36730	•PUMP,WATER,DIAPHRAM	1
15	36883	•VALVE,CHECK,.500 HB,5 PSI,POLY	1
16	33163	•CLAMP,HOSE,# 08	12
17	35771	•FITT,TEE 08HB,POLY	1
18	70318	•FITT,STR 08MP-08HB,BLK POLY	5
33	6352	•HOSE,08,PUSH-ON,250	11.5
34	28678	•PLATE,MOUNTING,WATER PUMP	1

- ITEM NOT ILLUSTRATED

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FIGURE 7. WATER SPRAY GROUP (PAGE 2 OF 2)

FIG ITEM	PART NUMBER	NOMENCLATURE 1 2 3 4 5 6 7	UNITS PER ASSY
7	**28396**	**WATER SPRAY GROUP**	**1**
-19	80160	•WASHER,LOCK,.250	8
-20	80140	•WASHER,FLAT,USS,.250	8
-21	71717	•MACH SCR,PH,#10-32X.75	4
-22	80995	•WASHER,FLAT,USS,#10	4
-23	871071601	•WASHER,LOCK,#10	4
-24	80144	•WASHER,FLAT,USS,.500	8
-25	80164	•WASHER,LOCK,.500	8
-26	80189	•CSHH,.500-13X2.75,GR5	8
-27	35465-07	•GROMMET,INSULATION,.750ID	2
-28	35465-09	•GROMMET,INS,.375ID X 1.00GRV	1
-29	33607	•TERM,RING,16-14 GA,.250 STUD	1
-30	33602	•CONN,BUTT,16-14 GA	2
-31	36341	•FUSE,15 AMP,ATC	1
-32	38093	•PORT KIT,.50 STR HOSE BARB	1
-35	80141	•WASHER,FLAT,USS,.313	2
-36	80207	•CSHH,.312-18X.75,GR5	2
-TBD	28369	•WIRE HARNESS,WATER PUMP	1
-TBD	36810	•PIPE,NIPPLE,.500XCLOSE,PVC	1

- ITEM NOT ILLUSTRATED

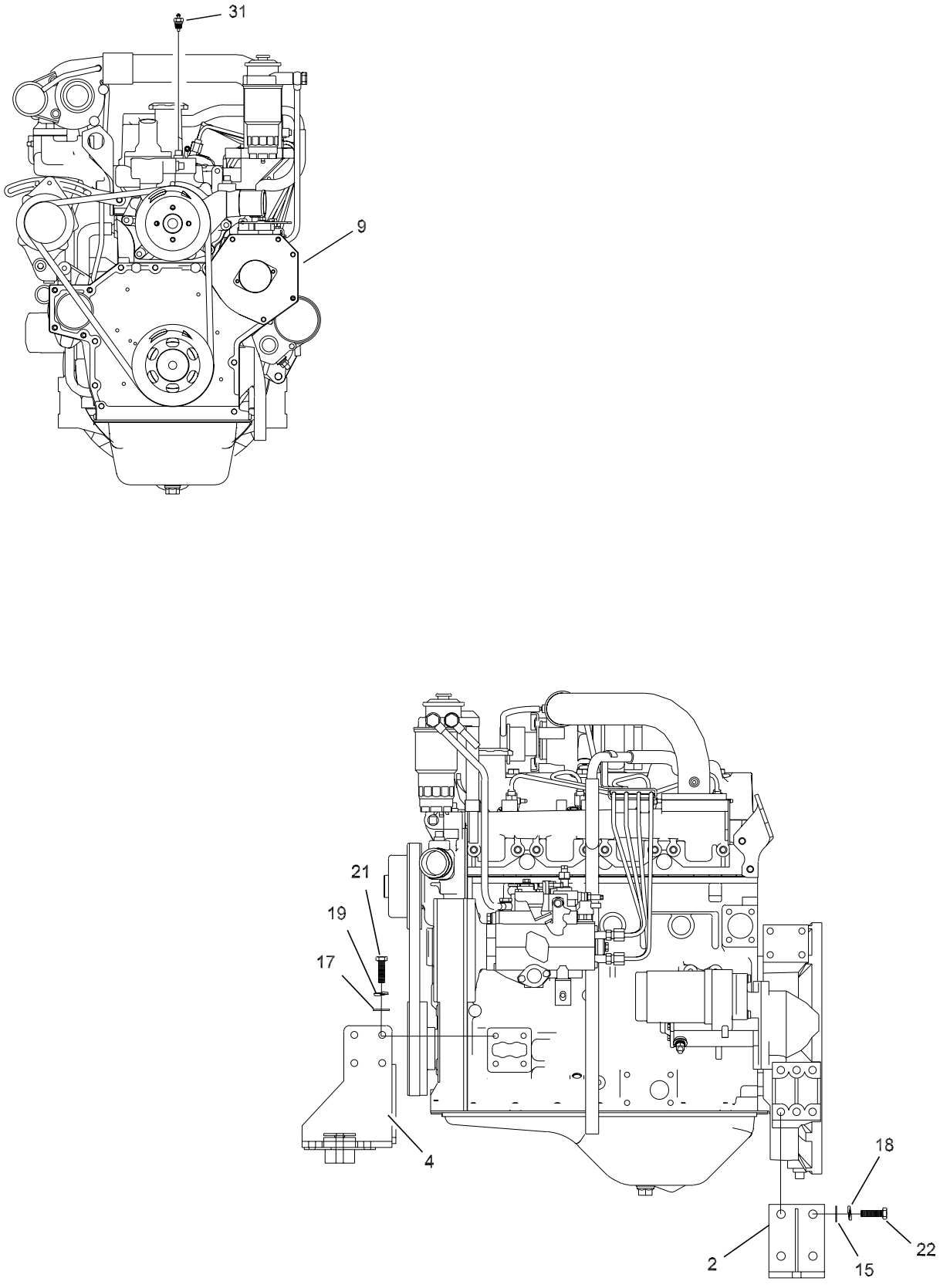

FIGURE 8. ENGINE SUBASSEMBLY, CUMMINS (SHEET 1 OF 2)

FIGURE 8. ENGINE SUBASSEMBLY, CUMMINS (PAGE 1 OF 3)

FIG ITEM	PART NUMBER	NOMENCLATURE 1 2 3 4 5 6 7	UNITS PER ASSY
8	**28401**	**ENGINE SUBASSEMBLY, CUMMINS**	**1**
2	28681	•MOUNT,ENG,CUMMINS,B3.3,FRONT	2
4	27920	•MOUNT,ENGINE,CUMMINS B3.3,RH	1
9	38734	•ENGINE,CUMMINS,4B3.3T	1
15	81155	•WASHER,FLAT,SAE,.375,HARDENED	10
17	81141	•WASHER,FLAT,SAE,.500,HARDENED	8
18	80478	•WASHER,LOCK,M10	8
19	80484	•WASHER,LOCK,M12	8
21	80516	•CSHH,M10-1.50X30MM,CL8.8	8
22	81009	•CSHH,M12-1.75X30MM,CL8.8	8
31	39081	•SENDER,PRESS,OIL,1-150 PSI,HD	1

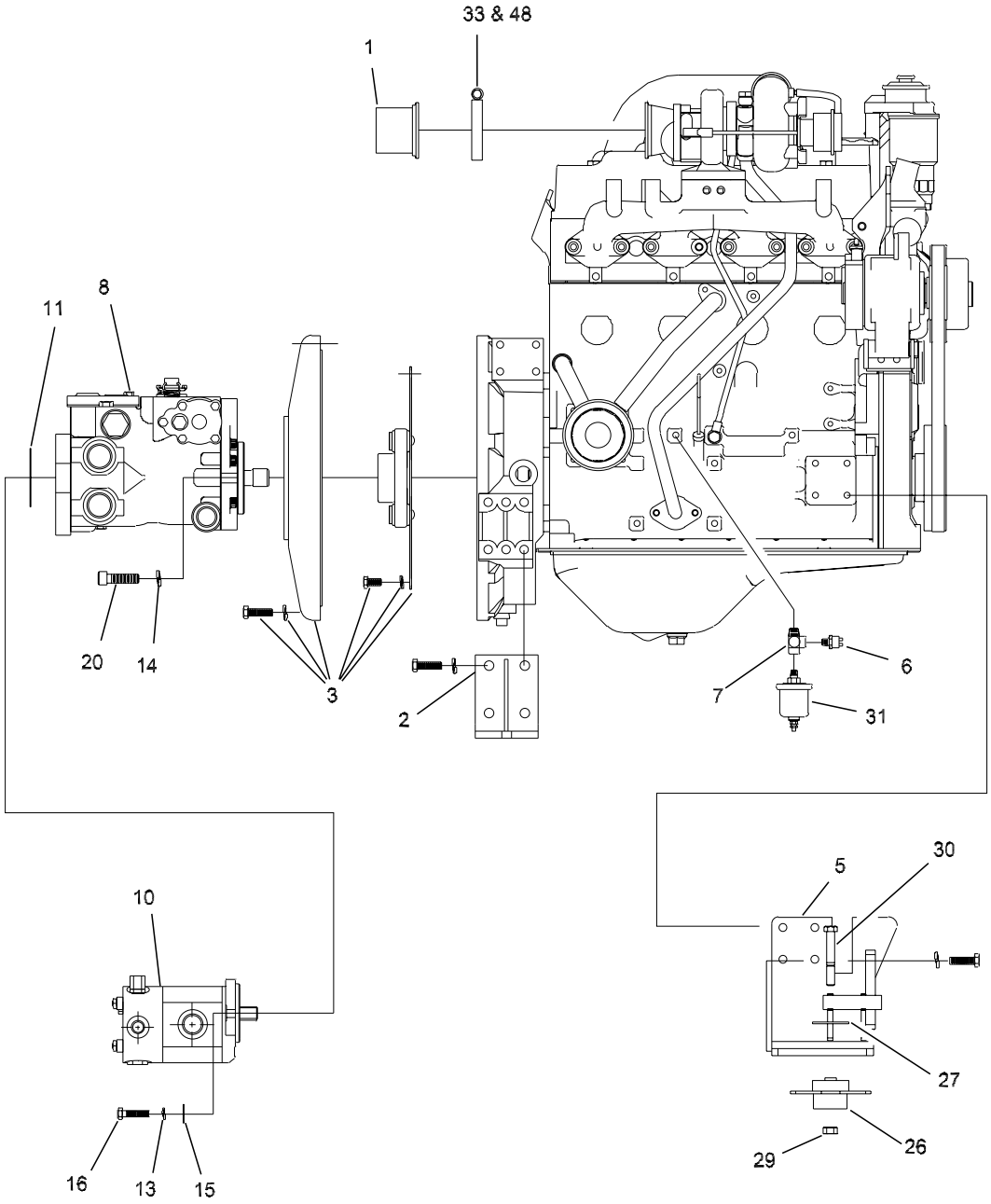

FIGURE 8. ENGINE SUBASSEMBLY, CUMMINS (SHEET 2 OF 2)

FIGURE 8. ENGINE SUBASSEMBLY, CUMMINS (PAGE 2 OF 3)

FIG ITEM	PART NUMBER	NOMENCLATURE 1 2 3 4 5 6 7	UNITS PER ASSY
8	**28401**	**ENGINE SUBASSEMBLY, CUMMINS**	**1**
1	28256	•MOUNT,SOLENOID/THROTTLE,3.3	1
2	28681	•MOUNT,ENG,CUMMINS,B3.3,FRONT	2
3	38732	•DRIVE PLATE ASSY,SAE#4,B MT	1
5	27921	•MOUNT,ENGINE,CUMMINS B3.3,LH	1
6	39083	•SWITCH,PRESS,2-6 PSI,N/O,02MP	1
7	36066	•FITT,TEE 02MP-02FP-02FP,STL	1
8	37833	•PUMP,HYD,PISTON,2.8 CIR	1
9	38734	•ENGINE,CUMMINS,4B3.3T	1
10	36642	•PUMP,HYD,GEAR,1.8 CIR	1
11	36808	•ORING,3.237 ID X .103,SAE 152	1
13	80162	•WASHER,LOCK,.375	2
14	80164	•WASHER,LOCK,.500	2
15	81155	•WASHER,FLAT,SAE,.375,HARDENED	10
16	80224	•CSHH,.375-16X1.25,GR5	2
20	80503	•CSSH,.500-13X1.75	2
26	39082	•MOUNT,ISOLATION,425#	4
27	38827-01	•WASHER,SNUBBING,2.00ODX.450OD	4
29	80353	•NUT,FLEXLOC,.438-14,FULL,LT	4
30	80776	•CSHH,.437-14X3.00,GR5	4
31	39081	•SENDER,PRESS,OIL,1-150 PSI,HD	1
33	986179	•HARNESS,RB48/SWPRO,MAIN	1
48	986305	•HARNESS,ENG,CUMMINS 3.3	1

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FIGURE 8. ENGINE SUBASSEMBLY, CUMMINS (PAGE 3 OF 3)

FIG ITEM	PART NUMBER	NOMENCLATURE 1 2 3 4 5 6 7	UNITS PER ASSY
8	**28401**	**ENGINE SUBASSEMBLY, CUMMINS**	**1**
-12	33291	•FILTER,FUEL,INLINE	1
-23	81007	•NUT,HEX,M05-80	1
-24	81008	•NUT,HEX,M10-1.50	1
-25	81043	•WASHER,LOCK,M05	1
-28	80163	•WASHER,LOCK,.437	4
-32	35367	•SENDER,TEMP GAUGE,08 MP	1
-34	91505	•PIPE,COUPLING,.500,GALV	2
-35	99834	•PIPE,NIPPLE,.500XCLOSE,GALV	2
-37	33146-6	•BATTERY,12V,1000 CRK AMPS	1
-38	400020	•CABLE,BATTERY,NEG,16",EYE/POST	1
-39	800072	•CABLE,BATTERY,POS,16",EYE/POST	1
-40	5804	•CABLE,BATTERY,NEG,13",EYE/EYE	1
-42	72313	•HOLD DOWN,BATTERY	1
-43	38954	•RELAY,STARTER	1
-44	80453	•NUT,HEX,M06-1.00	1
-45	28701	•WIRE,JUMPER,GROUND	1
-46	33595	•CLAMP,LOOP,1.00 OD,REM CUSHION	4
-47	16959	•HARNESS,WIRE,JUMPER,ALTERNATOR	1
-TBD	38734-05	•FAN SPACER, 3.3 ENGINE	1
-TBD	981637	•BAR,.250X3.00X3.25 W/KEY HOLE	1

- ITEM NOT ILLUSTRATED

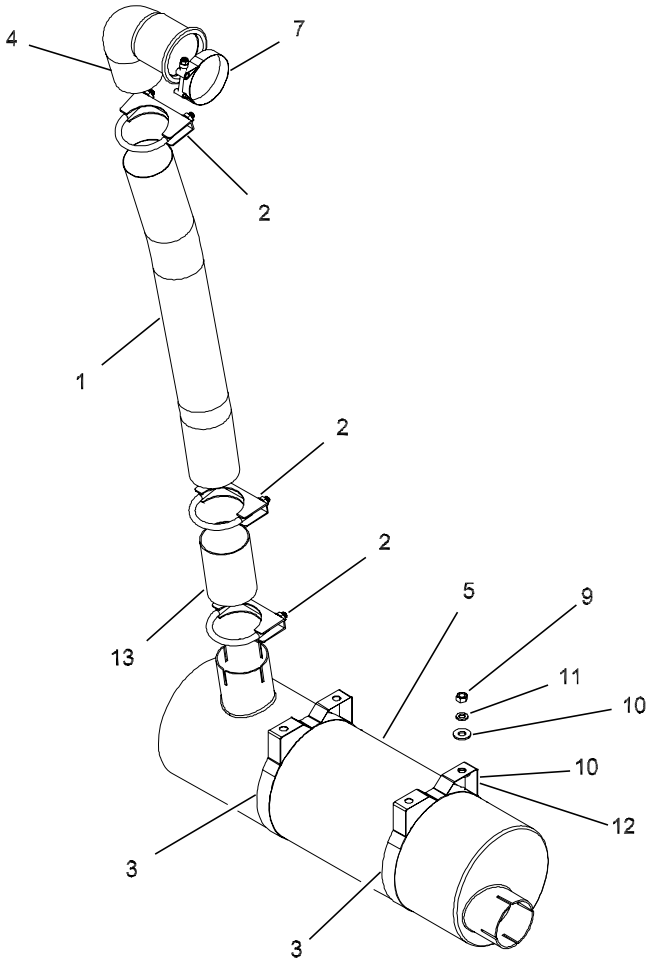

FIGURE 9. EXHAUST ASSEMBLY, CUMMINS

FIGURE 9. EXHAUST ASSEMBLY, CUMMINS

FIG ITEM	PART NUMBER	NOMENCLATURE 1 2 3 4 5 6 7	UNITS PER ASSY
9	**27984**	**EXHAUST ASSEMBLY, CUMMINS**	**1**
1	982979	•TUBE,FLEX,EXHAUST,2.5IDX27.50	1
2	161250	•CLAMP,MUFFLER 3"	3
3	34033	•MOUNTING BAND,6.50 ID	2
4	28178	•EXHAUST,CUM 3.3 ELBOW W/M	1
5	34074	•MUFFLER,EXH 6.50 OD,2.5 IN/OUT	1
7	38737	•CLAMP,V BAND,2.75	1
9	80037	•NUT,HEX,.312-18	4
10	80141	•WASHER,FLAT,USS,.313	8
11	80161	•WASHER,LOCK,.312	4
12	80208	•CSHH,.312-18X1.00,GR5	4
13	15481	•PIPE,EXH,CUMMINS	1

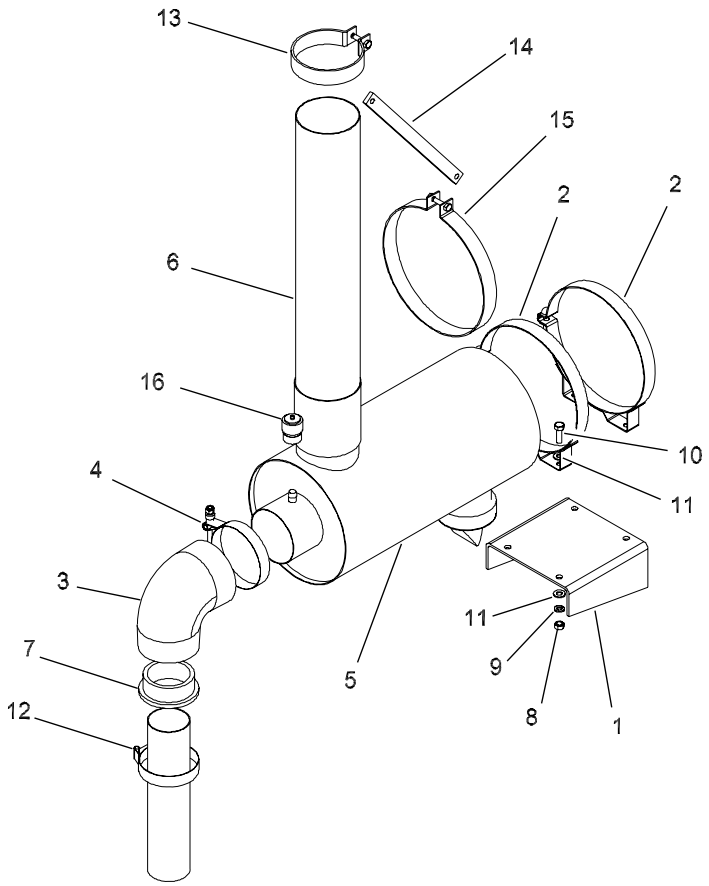

FIGURE 10. AIR INTAKE GROUP, CUMMINS

FIGURE 10. AIR INTAKE GROUP, CUMMINS

FIG ITEM	PART NUMBER	NOMENCLATURE 1 2 3 4 5 6 7	UNITS PER ASSY
10	**27976**	**AIR INTAKE GROUP, CUMMINS**	**1**
1	28298	•MOUNT,AIR CLEANER (Part of Engine Cover Assembly)	REF
2	171100	•CLAMP,AIR CLEANER MOUNT,8"ID	2
3	171170	•ELBOW,RUBBER,90,3.50X3.00 ID	1
4	171090	•CLAMP,T-BOLT,3.00 NOMINAL	1
5	171130	•AIR CLEANER ASSY,685 #140 UP	1
6	28141	•TUBE,AIR INTAKE,MODIFIED	1
7	38830	•ADPTR,RUBBER,INSERT,3.00X2.50	1
8	80037	•NUT,HEX,.312-18	4
9	80161	•WASHER,LOCK,.312	4
10	80208	•CSHH,.312-18X1.00,GR5	4
11	80963	•WASHER,FLAT,SAE,.312	8
12	171190	•CLAMP,T-BOLT,3.50 NOMINAL	1
13	28381	•CLAMP,HOSE,4.00 ID	1
14	28818	•BAR,SUPPORT	1
15	28819	•CLAMP,HOSE,8.00 ID	1
16	171220	•INDICATOR,AIR FILTER SERVICE	1
-17	80185	•CSHH,.250-20X1.00,GR5	2
-18	80350	•NUT,FLEXLOC,.250-20,FULL,LT	2
-19	37587	•PRE-CLEANER,4.00ID	1
-20	37587-2	•INSERT,RUBBER,4.00 TO 3.75	1

- ITEM NOT ILLUSTRATED

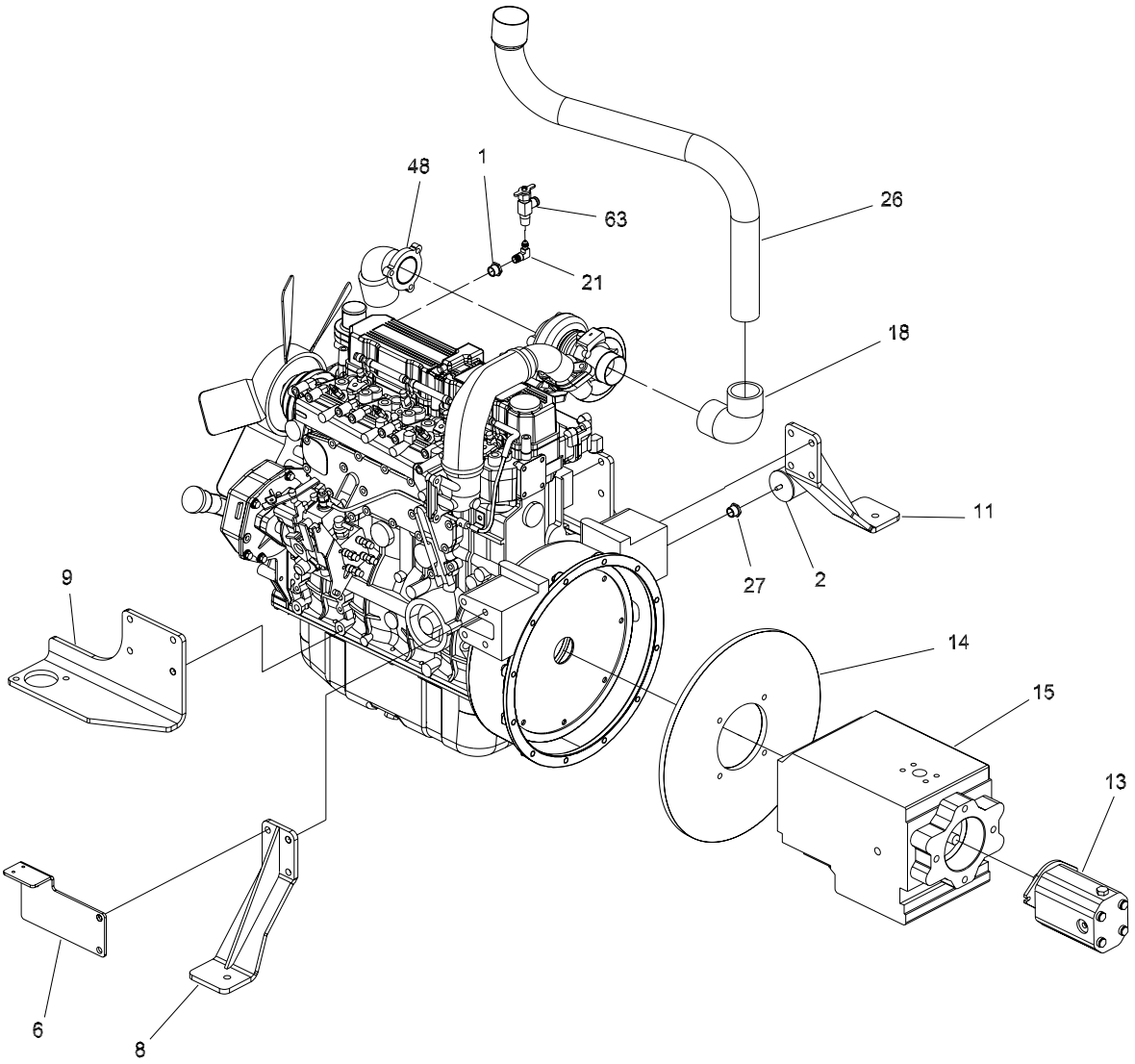

FIGURE 11. ENGINE SUBASSEMBLY, CATERPILLAR (SHEET 1 OF 2)

FIGURE 11. ENGINE SUBASSEMBLY, CATERPILLAR (PAGE 1 OF 3)

FIG ITEM	PART NUMBER	NOMENCLATURE 1 2 3 4 5 6 7	UNITS PER ASSY
11	**986183**	**ENGINE SUBASSEMBLY, CAT**	**1**
1	33356	•PIPE,BUSH,08MP-06FP,BRASS	1
2	39081	•SENDER,PRESS,OIL,1-150 PSI,HD	1
-3	36066	•FITT,TEE 02MP-02FP-02FP,STL	1
-4	986459	•PLATE,CAT,LIFT,PUMP,MNT	1
-5	984909	•ENGINE,CAT,3044T,80 HP	1
6	983185	•BRKT,THROTTLE,CABLE,CAT/PER3.3	1
-7	39146-14	•SWITCH,IGNITION,PERKINS 3.3	1
8	986167	•ASSY,LH,FLYWHEEL,CAT,ENG,MNT	1
9	986170	•ASSY,RT,FLYWHEEL,CAT,ENG,MNT	1
10	986172	•ASSY,RT,REAR,CAT,ENG,MNT	1
-11	986175	•ASSY,LF,REAR,CAT,ENG/COMP,MNT	1
12	39146-01	•WELDMENT,EXHAUST,PERKINS 3.3	1
-1201	983255	••ADAPTER,TURBO,PERKINS 3.3	1
-1202	983256	••ELBOW,EXHAUST,90,2.00 ODX 2.50 OD	1
13	36642	•PUMP,HYD,GEAR,1.8 CIR	1
* 14	983192	•DRIVE PLATE ASSY,SAE#4,B MT	1
15	37833	•PUMP,HYD,PISTON,2.8 CIR	1
-16	34799	•CLAMP,INSULATED BAND,1-5/8"	2
-17	35045	•FITT,45 04MP-04HB,CRIMPED	2
18	38387	•ADPTR,RUBBER 90,2.00ID	1
-19	38954	•RELAY,STARTER	2
-20	39146-05	•FILTER ASSY,FUEL,PERKINS 3.3	1
21	71796	•FITT,90 02MP-04HB,CRIMPED,BRAS	1
-22	852510	•CABLE,BATTERY,POS,44",EYE/POST	1
-24	983281	•HOSE,RADIATOR,UPPER	1
-25	983285	•SHROUD, FLAT REDUCING FAN	1
26	983286	•TUBE, AIR INTAKE PERKINS (Part of Air Intake Assembly)	REF
27	984493	•CPLG,02BSPP X 02FP	1
-28	985757	•HARNESS,ENGINE,CAT 3.3 (Schematic at end of IPL)	1
-29	986179	•HARNESS,RB48/SWPRO,MAIN (Schematic at end of IPL)	1
-30	986461	•ADAPTER,HOSE,1.5IDX1.25ID	1
-31	986462	•HOSE,FLEX,1.5X1.75X15	1
-32	986687	•KIT,FUEL LIFT PUMP,CAT	1
47	35546	•VALVE,HEATER SHUT OFF	1

* Includes plate, adapter, coupling, and mounting hardware.

- ITEM NOT ILLUSTRATED

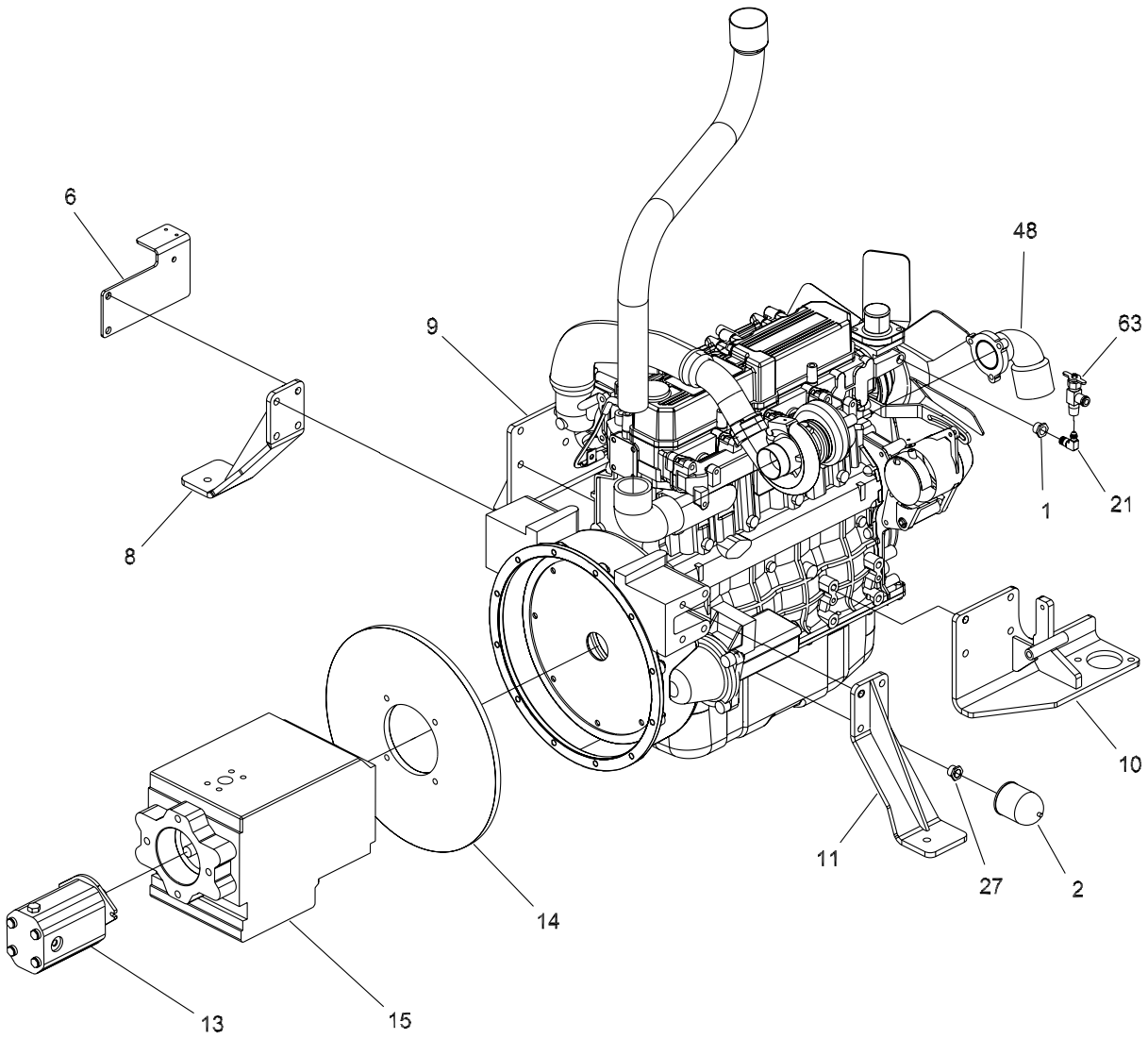

FIGURE 11. ENGINE SUBASSEMBLY, CATERPILLAR (SHEET 2 OF 2)

FIGURE 11. ENGINE SUBASSEMBLY, CATERPILLAR (PAGE 2 OF 3)

FIG ITEM	PART NUMBER	NOMENCLATURE 1 2 3 4 5 6 7	UNITS PER ASSY
11	**986183**	**ENGINE SUBASSEMBLY, CAT**	**1**
1	33356	•PIPE,BUSH,08MP-06FP,BRASS	1
2	39081	•SENDER,PRESS,OIL,1-150 PSI,HD	1
-3	36066	•FITT,TEE 02MP-02FP-02FP,STL	1
-4	986459	•PLATE,CAT,LIFT,PUMP,MNT	1
-5	984909	•ENGINE,CAT,3044T,80 HP	1
6	983185	•BRKT,THROTTLE,CABLE,CAT/PER3.3	1
-7	39146-14	•SWITCH,IGNITION,PERKINS 3.3	1
8	986167	•ASSY,LH,FLYWHEEL,CAT,ENG,MNT	1
9	986170	•ASSY,RT,FLYWHEEL,CAT,ENG,MNT	1
10	986172	•ASSY,RT,REAR,CAT,ENG,MNT	1
11	986175	•ASSY,LF,REAR,CAT,ENG/COMP,MNT	1
12	39146-01	•WELDMENT,EXHAUST,PERKINS 3.3	1
-1201	983255	••ADAPTER,TURBO,PERKINS 3.3	1
-1202	983256	••ELBOW,EXHAUST,90,2.00 ODX 2.50 OD	1
13	36642	•PUMP,HYD,GEAR,1.8 CIR	1
* 14	983192	•DRIVE PLATE ASSY,SAE#4,B MT	1
15	37833	•PUMP,HYD,PISTON,2.8 CIR	1
-16	34799	•CLAMP,INSULATED BAND,1-5/8"	2
-17	35045	•FITT,45 04MP-04HB,CRIMPED	2
-18	38387	•ADPTR,RUBBER 90,2.00ID	1
-19	38954	•RELAY,STARTER	2
-20	39146-05	•FILTER ASSY,FUEL,PERKINS 3.3	1
21	71796	•FITT,90 02MP-04HB,CRIMPED,BRAS	1
-22	852510	•CABLE,BATTERY,POS,44",EYE/POST	1
-24	983281	•HOSE,RADIATOR,UPPER	1
-25	983285	•SHROUD, FLAT REDUCING FAN	1
-26	983286	•TUBE, AIR INTAKE PERKINS (Part of Air Intake Assembly)	REF
27	984493	•CPLG,02BSPP X 02FP	1
-28	985757	•HARNESS,ENGINE,CAT 3.3 (Schematic at end of IPL)	1
-29	986179	•HARNESS,RB48/SWPRO,MAIN (Schematic at end of IPL)	1
-30	986461	•ADAPTER,HOSE,1.5IDX1.25ID	1
-31	986462	•HOSE,FLEX,1.5X1.75X15	1
-32	986687	•KIT,FUEL LIFT PUMP,CAT	1
47	35546	•VALVE,HEATER SHUT OFF	1

* Includes plate, adapter, coupling, and mounting hardware.

- ITEM NOT ILLUSTRATED

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FIGURE 11. ENGINE SUBASSEMBLY, CATERPILLAR (PAGE 3 OF 3)

FIG ITEM	PART NUMBER	NOMENCLATURE 1 2 3 4 5 6 7	UNITS PER ASSY
11	**986183**	**ENGINE SUBASSEMBLY, CAT**	**1**
-33	80164	•WASHER,LOCK,.500	2
-34	81141	•WASHER,FLAT,SAE,.500,HARDENED	8
-35	80478	•WASHER,LOCK,M10	8
-36	80484	•WASHER,LOCK,M12	8
-37	80503	•CSSH,.500-13X1.75	2
-38	80516	•CSHH,M10-1.50X30MM,CL8.8	8
-39	81009	•CSHH,M12-1.75X30MM,CL8.8	8
-40	81007	•NUT,HEX,M05-80	1
-41	81008	•NUT,HEX,M10-1.50	1
-42	81043	•WASHER,LOCK,M05	1
-43	80163	•WASHER,LOCK,.437	4
-44	80353	•NUT,FLEXLOC,.438-14,FULL,LT	4
-45	80776	•CSHH,.437-14X3.00,GR5	4
-46	80453	•NUT,HEX,M06-1.00	1

- ITEM NOT ILLUSTRATED

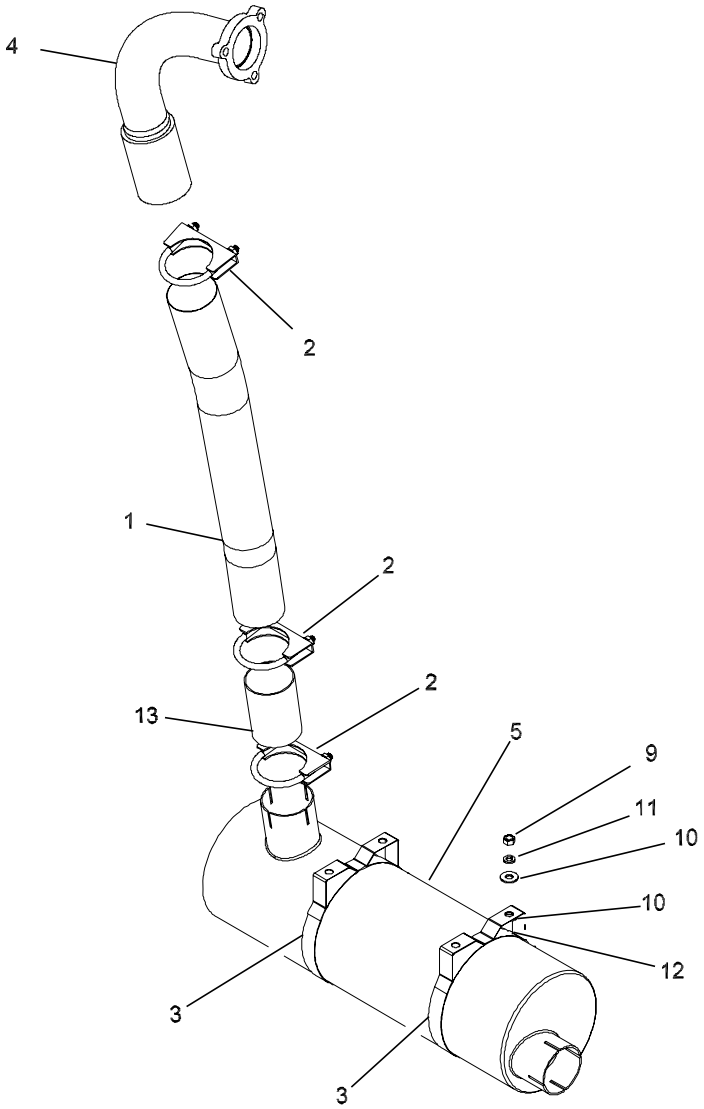


FIGURE 12. EXHAUST GROUP, CATERPILLAR

FIGURE 12. EXHAUST GROUP, CATERPILLAR

FIG ITEM	PART NUMBER	NOMENCLATURE 1 2 3 4 5 6 7	UNITS PER ASSY
12	**986488**	**EXHAUST GROUP, CATERPILLAR**	**1**
1	986487	•TUBE,FLEX,2.50IDX45.00	1
2	161250	•CLAMP,MUFFLER 3"	3
3	34033	•CLAMP,AIR CLEANER MOUNT,6.5"ID	2
4	986387	•ADAPTER,EXHAUST,CAT	1
5	34074	•MUFFLER,2-1/2" ID SIDE INLET	1
9	80037	•NUT,HEX,.312-18	4
10	80141	•WASHER,FLAT,USS,.313	8
11	80161	•WASHER,LOCK,.312	4
12	80208	•CSHH,.312-18X1.00,GR5	4
13	15481	•PIPE,EXH,CUMMINS	1

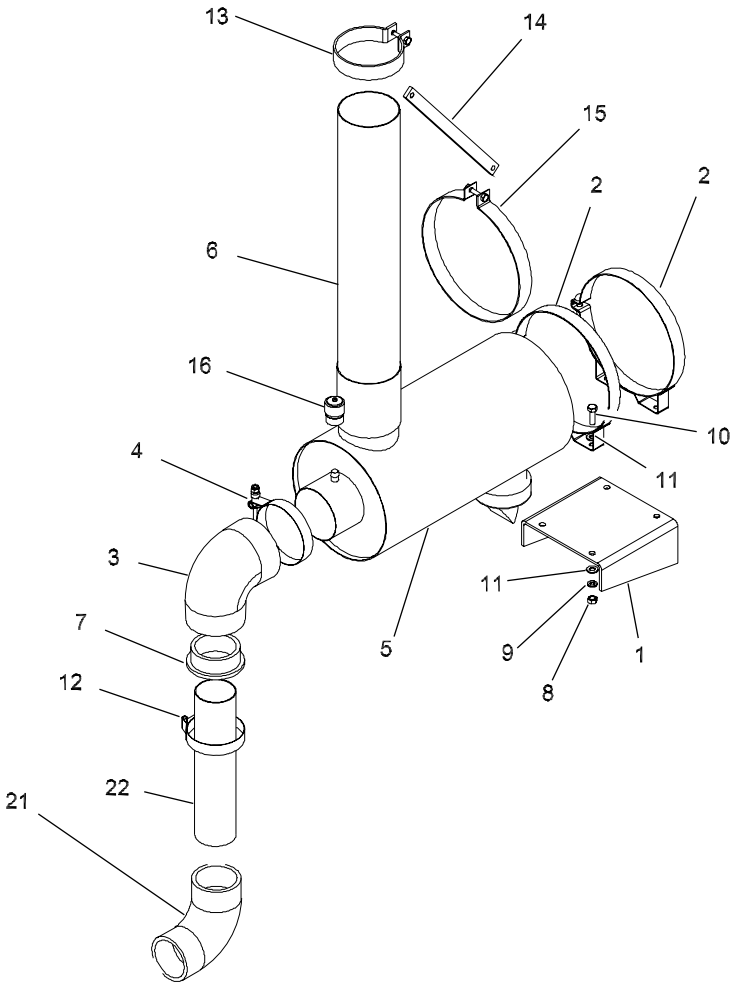


TABLE 13. AIR INTAKE, CATERPILLAR

FIGURE 13. AIR INTAKE, CATERPILLAR

FIG ITEM	PART NUMBER	NOMENCLATURE 1 2 3 4 5 6 7	UNITS PER ASSY
13	**986380**	**AIR INTAKE, CATERPILLAR**	**1**
1	28298	•MOUNT,AIR CLEANER (Part of Engine Cover)	REF
2	171100	•CLAMP,AIR CLEANER MOUNT,8"ID	2
3	171170	•ELBOW,RUBBER,90,3.50X3.00 ID	1
4	171090	•CLAMP,T-BOLT,3.00 NOMINAL	1
5	171130	•AIR CLEANER ASSY,685 #140 UP	1
6	28141	•TUBE,AIR INTAKE,MODIFIED	1
7	38830	•ADPTR,RUBBER,INSERT,3.00X2.50	1
8	80037	•NUT,HEX,.312-18	4
9	80161	•WASHER,LOCK,.312	4
10	80208	•CSHH,.312-18X1.00,GR5	4
11	80963	•WASHER,FLAT,SAE,.312	8
12	171190	•CLAMP,T-BOLT,3.50 NOMINAL	1
13	28381	•CLAMP,HOSE,4.00 ID	1
14	28818	•BAR,SUPPORT	1
15	28819	•CLAMP,HOSE,8.00 ID	1
16	171220	•INDICATOR,AIR FILTER SERVICE	1
-17	80185	•CSHH,.250-20X1.00,GR5	2
-18	80350	•NUT,FLEXLOC,.250-20,FULL,LT	2
-19	37587	•PRE-CLEANER,4.00ID	1
-20	37587-2	•INSERT,RUBBER,4.00 TO 3.75	1
21	38387	•ADPTR,RUBBER 90,2.00ID	1
22	983286	•TUBE, AIR INTAKE PERKINS	1

- ITEM NOT ILLUSTRATED

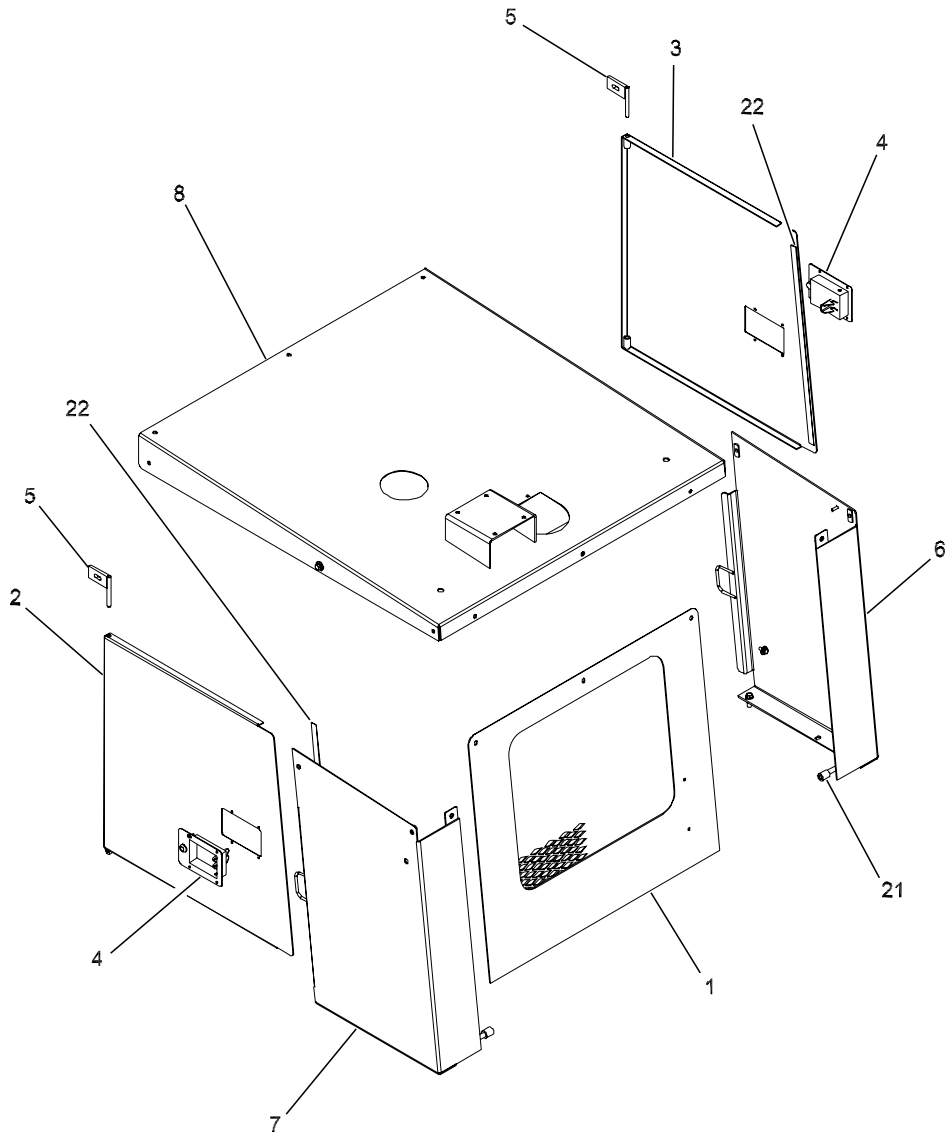


FIGURE 14. ENGINE COVER ASSEMBLY

FIGURE 14. ENGINE COVER ASSEMBLY

FIG ITEM	PART NUMBER	NOMENCLATURE 1 2 3 4 5 6 7	UNITS PER ASSY
14	**28398**	**ENGINE COVER ASSEMBLY**	**1**
1	28318	•GRILL W/M,ENGINE COVER	1
-101	28315	••HOOK,GRILL OPENING	2
-102	28595	••SUPPORT,ENG COVER GRILL	1
2	28320	•DOOR W/M,LEFT	1
3	28321	•DOOR W/M,RIGHT	1
4	160450	•LATCH,ENG ACCESS PANEL	2
5	28495	•TOP HINGE W/M, RB48 ENG DOOR	2
6	28635	•ENGINE COVER,W/M RIGHT REAR	1
7	28634	•ENGINE COVER,W/M LEFT REAR	1
8	28636	•ENGINE COVER,W/M,TOP	1
-801	28722	••MOUNT,AIR CLEANER	1
-9	80207	•CSHH,.312-18X.75,GR5	3
-10	80161	•WASHER,LOCK,.312	7
-11	80141	•WASHER,FLAT,USS,.313	7
-12	80224	•CSHH,.375-16X1.25,GR5	6
-13	80996	•WASHER,FLAT,SAE,.375	10
-14	80162	•WASHER,LOCK,.375	13
-15	80038	•NUT,HEX,.375-16	13
-16	871052400	•MACH SCR,RH,#10-24X.50	8
-17	80824	•NUT,HEX,#10-24	8
-18	80074	•NUT,HEX,JAM,.375-16	2
-19	80221	•CSHH,.375-16X1.00,GR5	9
-20	80142	•WASHER,FLAT,USS,.375	18
21	6352	•HOSE,08,PUSH-ON,250	0.33
22	38043	•RUBBER STRIP,SPONGE,.18X.75	4

- ITEM NOT ILLUSTRATED

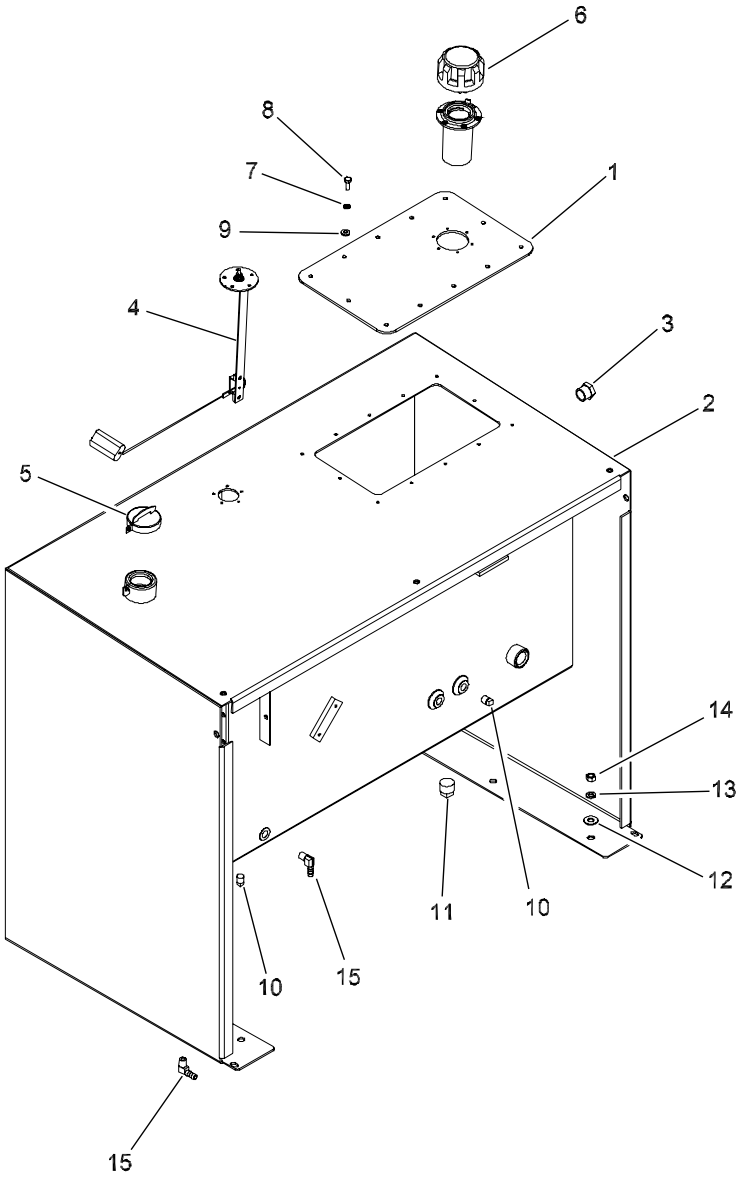


FIGURE 15. FUEL TANK ASSEMBLY

FIGURE 15. FUEL TANK ASSEMBLY

FIG ITEM	PART NUMBER	NOMENCLATURE 1 2 3 4 5 6 7	UNITS PER ASSY
15	**28397**	**FUEL TANK ASSEMBLY**	**1**
1	28559	•COVER,HYD TANK CLEANOUT	1
2	28562	•TANK W/M,FUEL,30GAL/HYD,25GAL	1
3	31886	•GAUGE,SIGHT,12NPT	1
4	35370-3	•SENDER,FUEL LEVEL,19.50 TANK	1
5	36105	•CAP,FUEL,W/LOCK LUG	1
6	37680	•CAP W/STRAINER,HYD FILLER	1
7	80160	•WASHER,LOCK,.250	12
8	80192	•CSHH,.250-20X.75,GR5	12
9	81161	•WASHER,WEATHER SEAL,#10	12
10	99535	•PIPE,PLUG,.250,SQ HEAD,MI	2
11	99538	•PIPE,PLUG,.750,SQ HEAD	1
12	80142	•WASHER,FLAT,USS,.375	6
13	80162	•WASHER,LOCK,.375	6
14	80038	•NUT,HEX,.375-16	6
15	33365	•FITT,90 04MP-06HB,CRIMPED	2
-TBD	280248	•PIPE,PLUG,.750,SQ HEAD	1
-TBD	39072	•PIPE,PLUG,.250,HEX	2

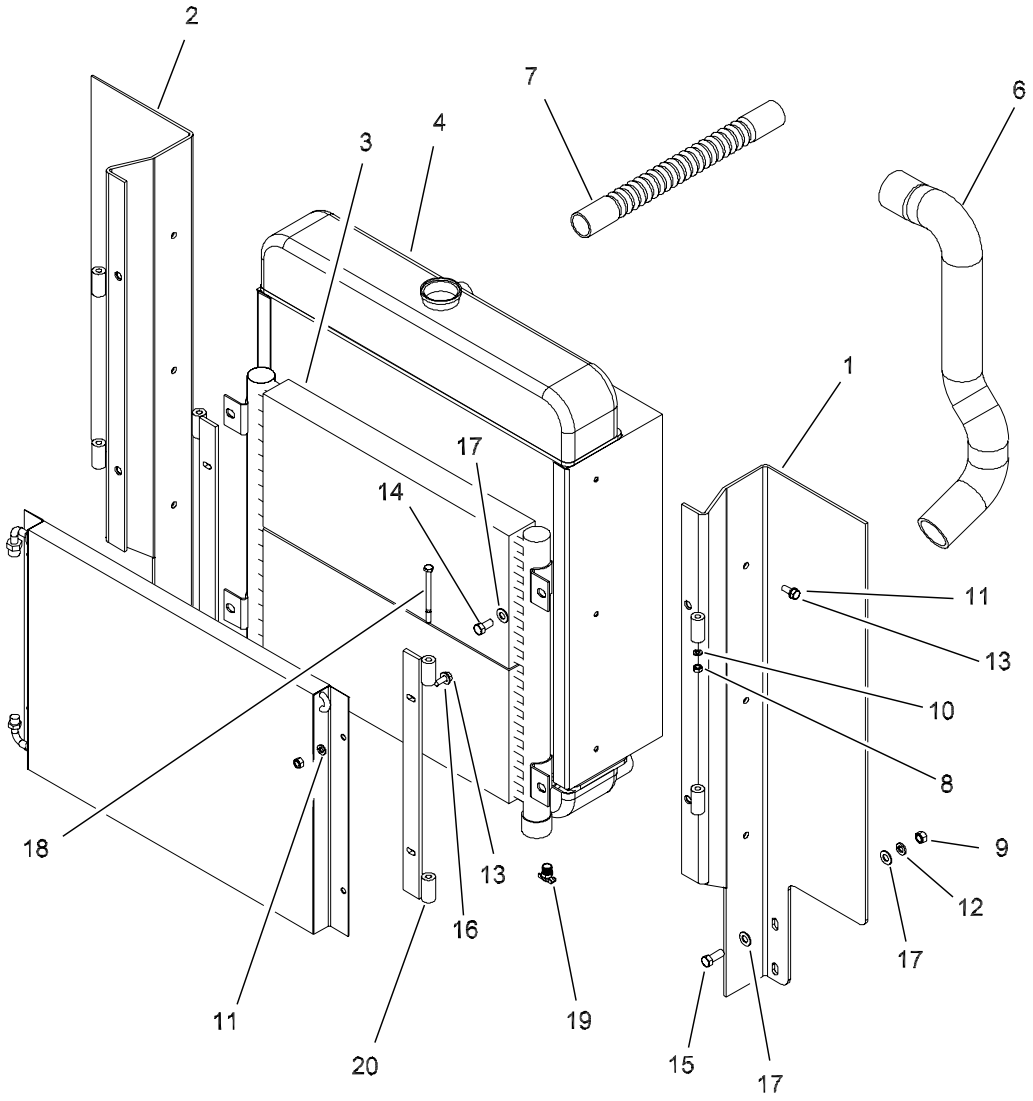


FIGURE 16. RADIATOR/COOLER ASSEMBLY

FIGURE 16. RADIATOR/COOLER ASSEMBLY

FIG ITEM	PART NUMBER	NOMENCLATURE 1 2 3 4 5 6 7	UNITS PER ASSY
16	**28683**	**•RADIATOR/COOLER ASSEMBLY**	**1**
1	28605	•MOUNT,RADIATOR,RH,SWEEP PRO	1
2	28606	•MOUNT,RADIATOR,LH,SWEEP PRO	1
3	35423	•COOLER,HYD OIL	1
4	38784	•RADIATOR,RB48 W/CUMMINS 3.3	1
-401	33770	••RADIATOR CAP	A/R
-5	38785	•FAN,CUMMINS 3.3,20.00 OD X 30°	1
6	38955	•HOSE,RADIATOR,LOWER,3.3 ENG	1
7	38798	•HOSE,RADIATOR,UPPER,1.25 ID	1
8	80036	•NUT,HEX,.250-20	4
9	80038	•NUT,HEX,.375-16	4
10	80160	•WASHER,LOCK,.250	4
11	80161	•WASHER,LOCK,.312	6
12	80162	•WASHER,LOCK,.375	4
13	80207	•CSHH,.312-18X.75,GR5	6
14	80219	•CSHH,.375-16X.75,GR5	4
15	80221	•CSHH,.375-16X1.00,GR5	4
16	80963	•WASHER,FLAT,SAE,.312	4
17	80996	•WASHER,FLAT,SAE,.375	12
18	81072	•CSHH,.250-20X3.50,GR5	4
19	910150	•VALVE,DRAIN COCK,.250 NPT	1
20	28224	•CONDENSER HINGE	2

- ITEM NOT ILLUSTRATED

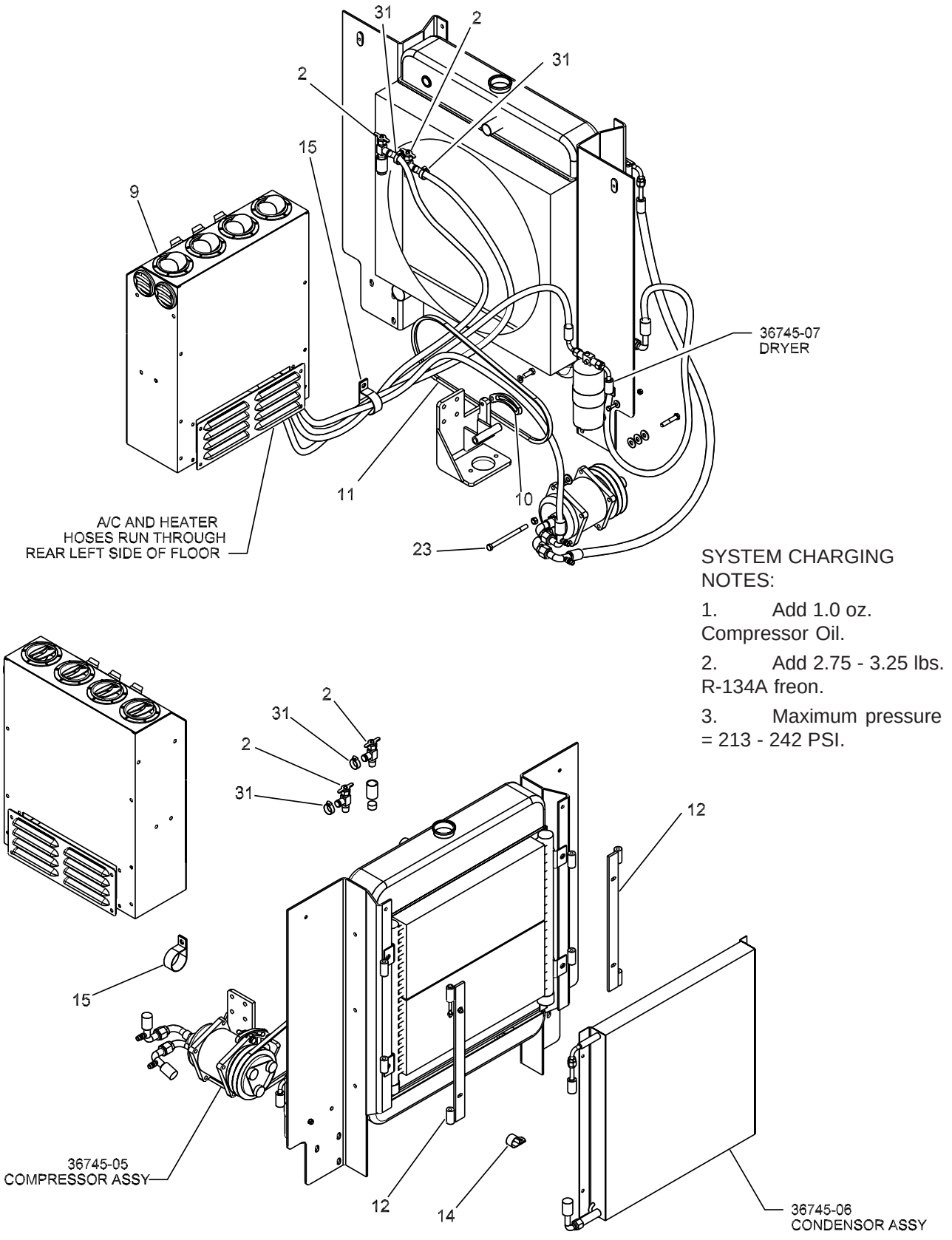


FIGURE 17. AIR CONDITIONING/HEATER GROUP

FIGURE 17. AIR CONDITIONING/HEATER GROUP

FIG ITEM	PART NUMBER	NOMENCLATURE 1 2 3 4 5 6 7	UNITS PER ASSY
17	**28303**	**AIR CONDITIONING/HEATER GROUP**	**1**
-1	35138	•CONNECTOR,SEALED,SHROUD,2-PIN	1
2	35546	•VLV,HEATER SHUTOFF	2
-3	36164	•TERM,SEALED CONN,16-14 GA,MALE	2
-4	36166	•SEAL,CABLE,18-16 GA	1
-5	36342	•FUSE,BLADE,20AMP,ATC-20	1
-6	36623	•SEAL,CABLE,14 GA	1
-7	36712	•HOSE,HEATER,.625 ID	12
-8	38106	•REFRIGERANT,OIL	0.12
9	38653	•CAB AIR COND/HEATER KIT (SEE FIG 18 FOR BREAKDOWN)	1
10	26778	•BRACKET,A/C COMPRESSOR	1
11	38842	•V BELT,4L 39.00X.500	1
12	28224	•CONDENSER HINGE W/M	2
-13	38105	•REFRIGERANT,R134A FREON	0.09
14	33595	•CLAMP,LOOP,1.00 OD,REM CUSHION	1
15	36894	•CLAMP,LOOP,2.00 OD,PLSTC COVER	1
-18	80230	•CSHH,.375-16X2.00,GR5	1
-19	80038	•NUT,HEX,.375-16	1
-20	80162	•WASHER,LOCK,.375	2
-21	80142	•WASHER,FLAT,USS,.375	4
-22	80221	•CSHH,.375-16X1.00,GR5	1
23	71617	•CSHH,.375-16X5.00,GR5	1
-24	80352	•NUT,FLEXLOC,.375-16,FULL,LT	1
-25	80192	•CSHH,.250-20X.75,GR5	16
-26	80140	•WASHER,FLAT,USS,.250	2
-27	80160	•WASHER,LOCK,.250	2
-28	80350	•NUT,FLEXLOC,.250-20,FULL,LT	8
-29	81072	•CSHH,.250-20X3.50,GR5	4
-30	80036	•NUT,HEX,.250-20	2
31	33164	•CLAMP,HOSE,# 10	4
-32	81006	•WASHER,FLAT,USS,.188	10

- ITEM NOT ILLUSTRATED

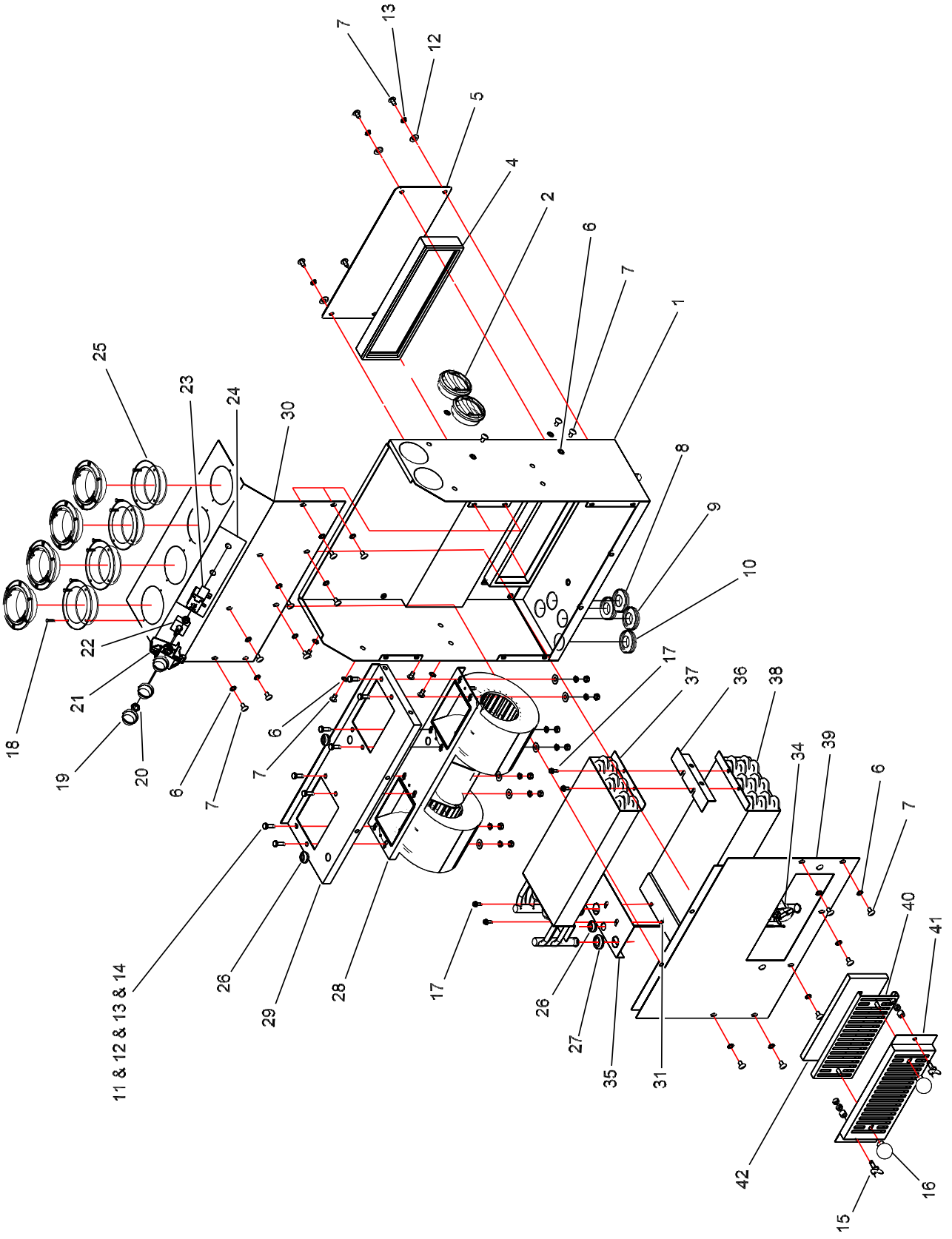


FIGURE 18. CAB AIR CONDITIONING/HEATER KIT (SHEET 1 OF 2)

FIGURE 18. CAB AIR CONDITIONING/HEATER KIT (PAGE 1 OF 2)

FIG ITEM	PART NUMBER	NOMENCLATURE 1 2 3 4 5 6 7	UNITS PER ASSY
18	**38653**	**•CAB AIR CONDITIONING/HEATER KIT (SEE FIG 17 FOR NHA)**	**1**
1	38653-04	••HOUSING	1
2	36745-17	••LOUVERS	2
4	38653-01	••FILTER ELEMENT,CAB AIR	1
5	38653-02	••LOUVER DOOR	1
6	N/A	••WASHER,EXT. TOOTH	22
7	N/A	••SCREW,1/4-20,TRUSS HEAD	26
8	38606-16	••GROMMET	1
9	38606-15	••GROMMET	1
10	38525-34	••GROMMET	2
11	N/A	••BOLT,1/4-20	8
12	N/A	••WASHER,FLAT,1/4-20	12
13	N/A	••WASHER,LOCK,1/4-20	12
14	N/A	••NUT,1/4-20	8
15	36745-36	••FASTENER,TURN,1/4	2
16	37645-20	••KNOBS	2
17	N/A	••SCREW,WHIZLOCK,1/2-24,#10	4
18	N/A	••SCREW,FLAT HEAD,3/4-#6	8
19	36745-21	••KNOBS	3
20	38525-22	••NUT,MOUNTING CONTROL	4
21	36749-03	••CABLE,ROTARY CONTROL	1
22	36745-18	••SWITCH,FAN	1
23	36745-19	••COLD CONTROL	1
24	36745-22	••DECAL	1
25	36745-16	••LOUVERS	4
26	38653-09	••GROMMET	3
27	38653-08	••GROMMET	2
28	36745-13	••BLOWER	1
29	36745-26	••BLOWER PLATE	1
30	36745-24	••COVER,TOP	1
31	36749-04	••CABLE,ROTARY CONTROL	1
34	36749-01	••VALVE,WATER	1
35	38653-07	••BRACKET,RH COIL	1
36	38653-06	••BRACKET,LH COIL	1
37	36749-02	••COIL,HEATER	1
38	38653-05	••COIL,ASSY,EVAP.	1
39	36745-25	••COVER,BOTTOM	1
40	36745-30	••FILTER HOLDER,RECIRC.	1
41	36745-29	••COVER,RECIRC.	1
42	36745-31	••FILTER PAD,CAB AIR	1

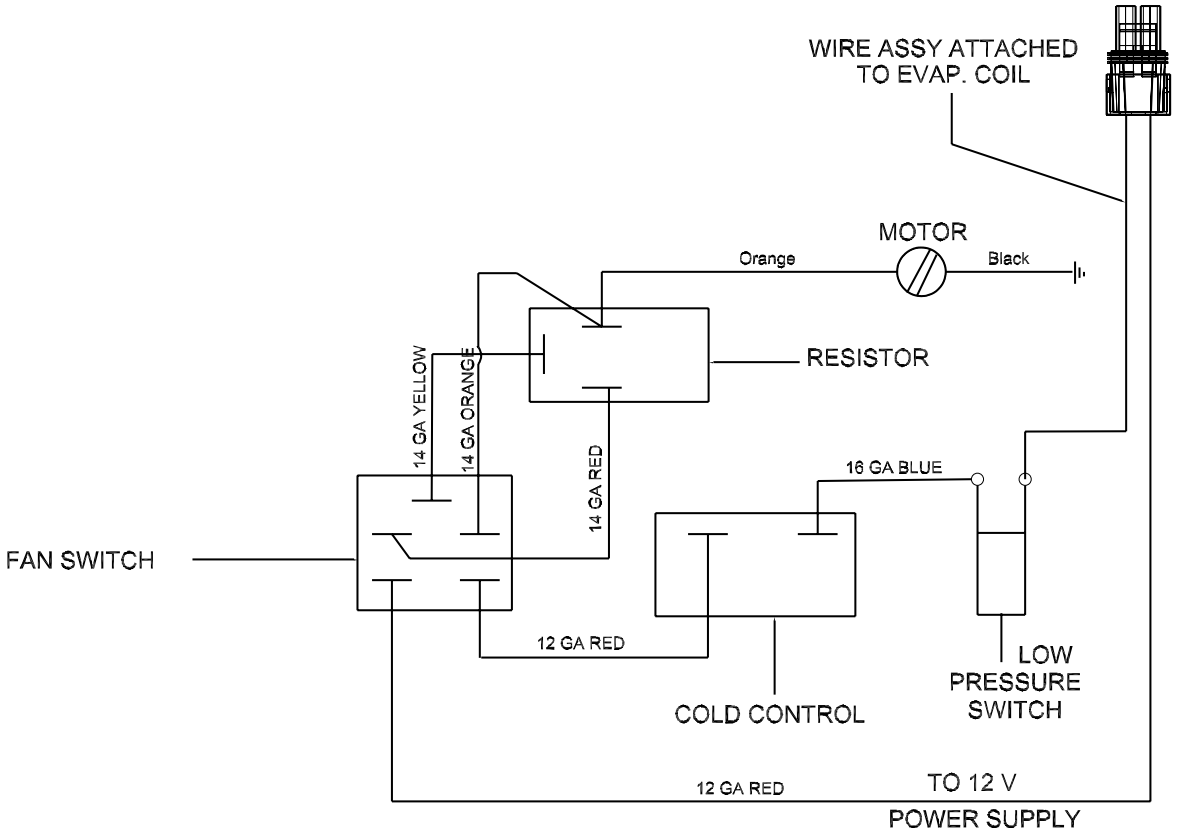
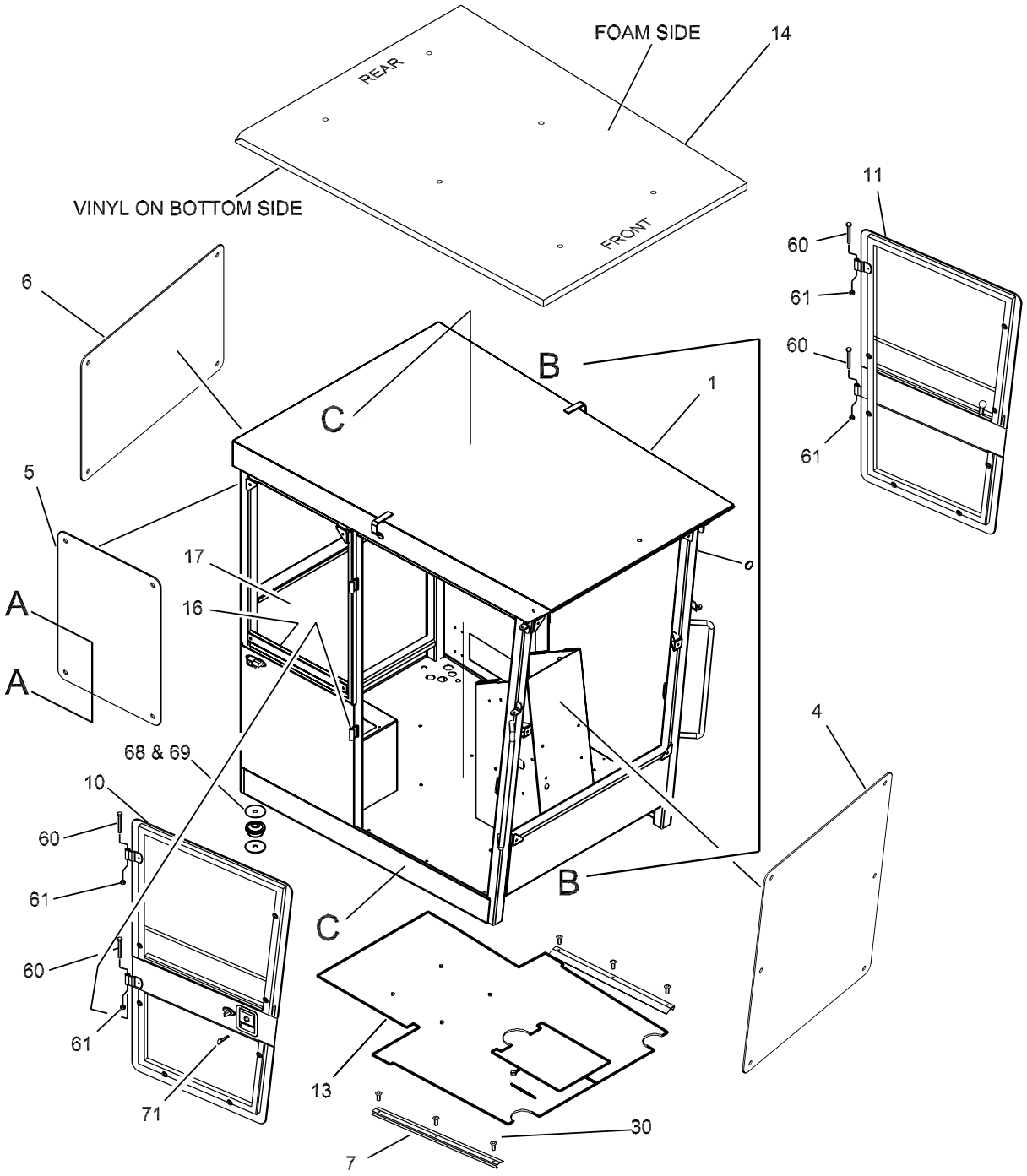


FIGURE 18. CAB AIR CONDITIONING/HEATER KIT (SHEET 2 OF 2)

FIGURE 18. CAB AIR CONDITIONING/HEATER KIT (PAGE 2 OF 2)

FIG ITEM	PART NUMBER	NOMENCLATURE 1 2 3 4 5 6 7	UNITS PER ASSY
18	**38653**	**CAB AIR CONDITIONING/HEATER KIT (SEE FIG 19 FOR NHA)**	**1**
-100	36745-01	••HOSE,COMP-CONDEN,13/32	1
-105	36745-02	••HOSE,COMP-EVAPOR,1/2	1
-110	36745-03	••HOSE,EVAPOR-DRYER,5/16	1
-115	36745-04	••HOSE,DRYER-CONDEN,5/16	1
-120	36745-05	••COMPRESSOR ASSY	1
-125	36745-06	••CONDENSER ASSY	1
-130	36745-07	••RECEIVER DRYER	1
-135	36745-08	••CLAMP,RECEIVER DRYER	1
-140	36745-09	••SWITCH,HIGH PRESSURE	1
-145	36745-10	••O-RING,#10	2
-150	36745-11	••O-RING,#8	2
-155	36745-12	••O-RING,#6	4
-160	38653-03	••HEATER EVAPORATOR ASSY	1
-165	36745-32	••VALVE,THERMAL EXPANSION	1
-170	36745-34	••SWITCH,LOW PRESSURE	1

- ITEM NOT ILLUSTRATED



INSTALL ITEM #59 (SEE SEC DD) BEFORE ITEM #16
ADHERE ITEM #16 & #17 TO CAB WITH ITEM #18

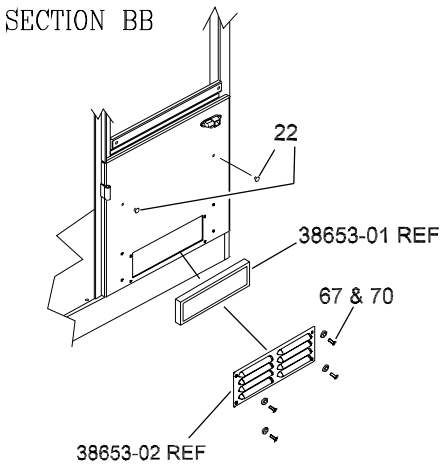
NOTE:
Install item #59 (see section DD) before item #16.
Adhere item #16 & #17 to Cab with item #18.

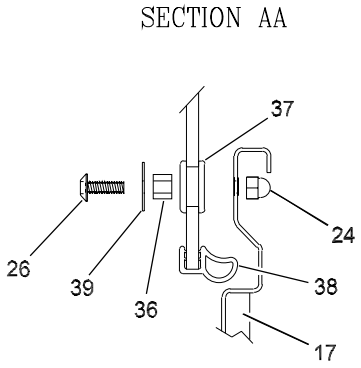
FIGURE 19. CAB ASSEMBLY (SHEET 1 OF 6)

FIGURE 19. CAB ASSEMBLY (PAGE 1 OF 6)

FIG ITEM	PART NUMBER	NOMENCLATURE 1 2 3 4 5 6 7	UNITS PER ASSY
19	**28235**	**CAB ASSEMBLY**	**1**
1	28171	•RB48 CAB,W/M,2 DOOR (SEE FIG 20 FOR BREAKDOWN)	1
4	36688-04P	•GLASS,FRONT WINDOW	1
5	36688-02P	•GLASS,SIDE WINDOW	2
6	36688-05P	•GLASS,REAR WINDOW	1
7	36688-07	•SILL,DOOR	2
10	36688-41	•ASSY,DOOR,RH ENTRANCE (SEE FIG 21 FOR BREAKDOWN)	1
11	36690R	•ASSY,DOOR,LH ENTRANCE	1
-18	38462	•ADHESIVE,AEROSOL SPRAY,CAN	0.17
30	81282	•CSBHS,.250-20X1.25,SS	6
60	80882	•CSHH,.375-16X4.75,GR8	4
61	80352	•NUT,FLEXLOC,.375-16,FULL,LT	4
68	36072	•MOUNT,RUBBER,TUBE FORM	4
69	36073	•WASHER,.80X3.25X.188THICK	12
71	36688-32	•KEY,PADDLE LATCH	1
-TBD	28549	•CONSOLE,SIDE COVER	1
-TBD	985514	•KIT,RB48,CAB,INSULATION	1
		ATTACHING PARTS	
13	28342	••FLOORMAT,RB48	1
14	36688-12	••HEADLINER	1
16	36688-14	••FOAM,RIGHT SIDE	2
17	36688-15	••FOAM,REAR PANEL	1
		-----*-----	

- ITEM NOT ILLUSTRATED





NOTE:
Splice item #38 onto bottom of glass, all locations.

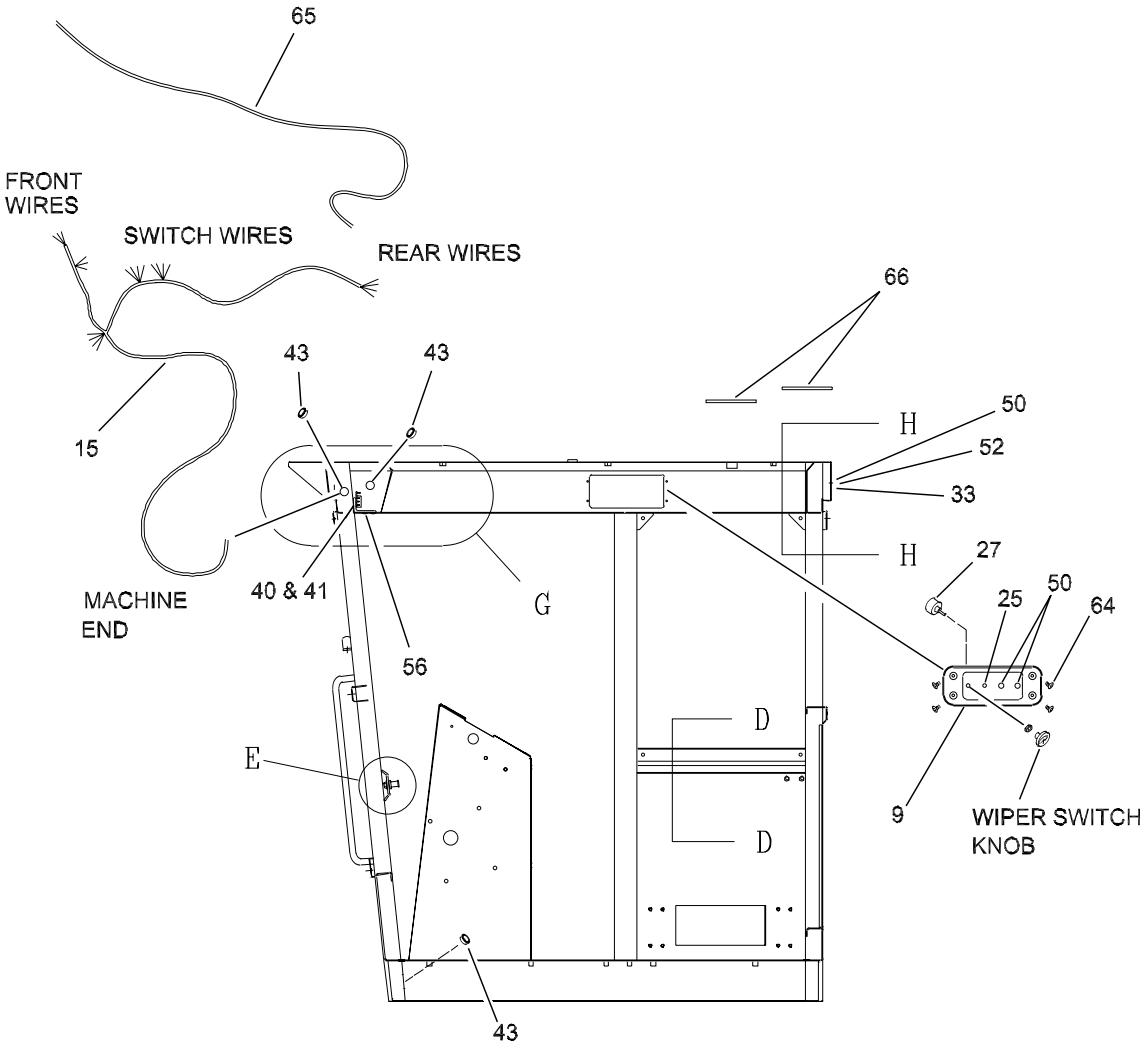
FIGURE 19. CAB ASSEMBLY (SHEET 2 OF 6)

FIGURE 19. CAB ASSEMBLY (PAGE 2 OF 6`)

FIG ITEM	PART NUMBER	NOMENCLATURE 1 2 3 4 5 6 7	UNITS PER ASSY
19	**28235**	**CAB ASSEMBLY**	**1**
22	35136-21	•PLUG,HOLE,.312,FLUSH MT,PLSTC	2
24	81275	•NUT,ACORN,.250-20,SS	18
26	81277	•CSBHS,.250-20X.88,SS	18
36	36688-16	•BUSHING,NYLON	18
37	36688-17	•GROMMET,.250	18
38	36688-18	•SEAL,WINDOW	44
39	81278	•WASHER,FLAT,.250X1.00,SS	20
67	80192	•CSHH,.250-20X.75,GR5	4
70	80140	•WASHER,FLAT,USS,.250	4
-TBD	985514	•KIT,RB48,CAB,INSULATION	1
		ATTACHING PARTS	
-13	28342	••FLOORMAT,RB48	1
-14	36688-12	••HEADLINER	1
-16	36688-14	••FOAM,RIGHT SIDE	2
17	36688-15	••FOAM,REAR PANEL	1
		-----*-----	

- ITEM NOT ILLUSTRATED

SECTION CC



WIRE HARNESS INSTALLATION:

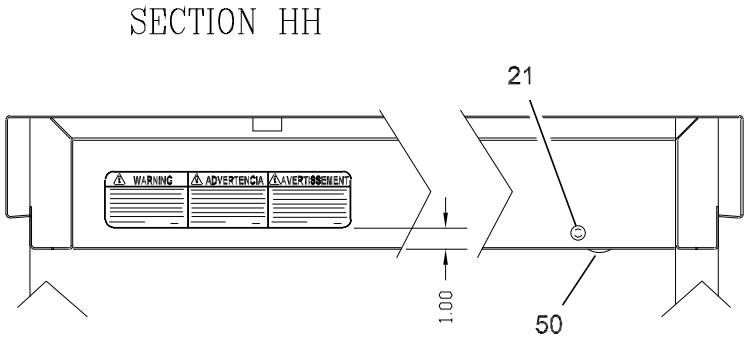
Insert machine end of wire harness through #43, down right front ROPS tube, out through #43 on bottom of ROBS tube under floor. Tie excess harness to grab-handle. Place front wires across front crossmember. Insert rear wire end through #43 in side crossmember. Position such that the switch wires are located in front of the access opening. Wire fuse block, wiper switch, and wiper motor as shown.

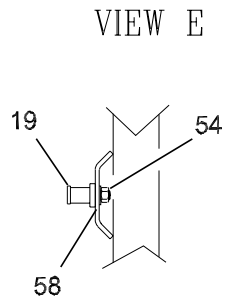
FIGURE 19. CAB ASSEMBLY (SHEET 3 OF 6)

FIGURE 19. CAB ASSEMBLY (PAGE 3 OF 6)

FIG ITEM	PART NUMBER	NOMENCLATURE 1 2 3 4 5 6 7	UNITS PER ASSY
19	**28235**	**CAB ASSEMBLY**	**1**
9	36688-09	•COVER,SIDE ACCESS	1
15	36688-13	•WIRE HARNESS (Schematic at end of IPL)	1
25	35136-19	•PLUG,HOLE,.438,FLUSH MT,PLSTC	1
27	853090	•SWITCH,WIPER/WASHER (3000)	1
33	35136-1	•PLUG,HOLE,.250,FLUSH MT,PLSTC	1
40	151170	•MOTOR,WINDSHIELD WIPER	1
41	29262	•BRACKET,FUSE BLOCK	1
43	36688-54	•GROMMET,.94ID,1.12HOLE,SNAP IN	3
50	35136-5	•PLUG,HOLE,.625,FLUSH MT,PLSTC	7
52	35136-4	•PLUG,HOLE,.500,FLUSH MT,PLSTC	2
56	35136-20	•PLUG,HOLE,.562,FLUSH MT,PLSTC	2
64	80322	•SCR,SLFTPG,HH,.250-20X.50	17
65	35550	•HOSE,WINDSHIELD WASHER .188ID	3
66	33630-1	•STRIPPING,EDGE,.125	0.5

Additional wiring schematic at end of IPL.





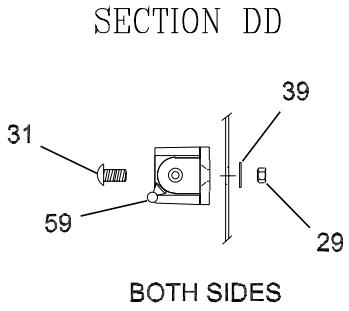
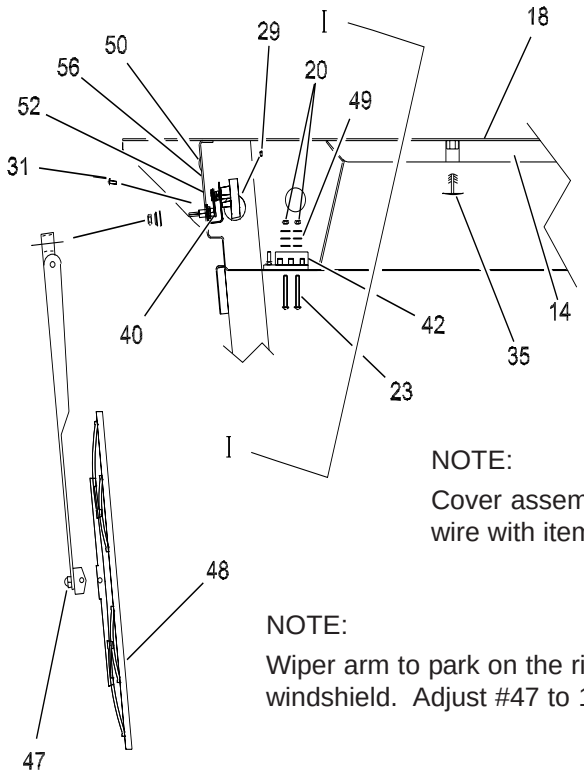


FIGURE 19. CAB ASSEMBLY (SHEET 4 OF 6)

FIGURE 19. CAB ASSEMBLY (PAGE 4 OF 6)

FIG ITEM	PART NUMBER	NOMENCLATURE 1 2 3 4 5 6 7	UNITS PER ASSY
19	**28235**	**CAB ASSEMBLY**	**1**
19	36688-49	•STRIKER,EXTERNAL THREAD	2
21	35136-3	•PLUG,HOLE,.375,FLUSH MT,PLSTC	2
29	80350	•NUT,FLEXLOC,.250-20,FULL,LT	5
31	81106	•CSBHS,.250-20X.75,SS	6
39	81278	•WASHER,FLAT,.250X1.00,SS	20
50	35136-5	•PLUG,HOLE,.625,FLUSH MT,PLSTC	7
54	36688-52	•NUT,CENTERLOCK,.438-14	3
58	80142	•WASHER,FLAT,USS,.375	3
59	36688-34	•DOOR HOLD RB-48	2

VIEW G



NOTE:

Wire #40 & #42 as shown in schematic #28235 before fastening with items #20, 49, 23, 32, 23, as well as washers and nuts included with item #40.

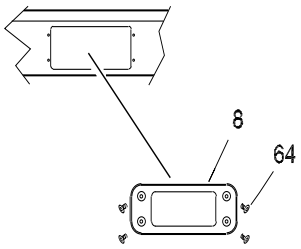
NOTE:

Cover assembled threaded stud, nut, and wire with item 62 (MSD 154).

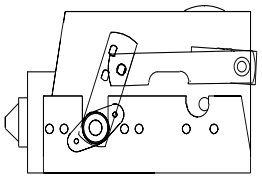
NOTE:

Wiper arm to park on the right side of windshield. Adjust #47 to 16".

SECTION II



WIPER MOTOR DETAIL



NOTE:

Use middle mount hole, 85° wipe.

FIGURE 19. CAB ASSEMBLY (SHEET 5 OF 6)

FIGURE 19. CAB ASSEMBLY (PAGE 5 OF 6)

FIG ITEM	PART NUMBER	NOMENCLATURE 1 2 3 4 5 6 7	UNITS PER ASSY
19	**28235**	**CAB ASSEMBLY**	**1**
8	36688-08	•COVER,PLASTIC	3
18	38462	•ADHESIVE,AEROSOL SPRAY,CAN	0.17
20	80824	•NUT,HEX,#10-24	3
23	81281	•CSBHS,10-24X1.50,SS	2
29	80350	•NUT,FLEXLOC,.250-20,FULL,LT	5
31	81106	•CSBHS,.250-20X.75,SS	6
35	36688-43	•FASTENER,X-MAS TREE,1.00 IN	6
40	151170	•MOTOR,WINDSHIELD WIPER	1
42	36695	•FUSE BLOCK,6 GANG,ATC	1
-46	36340	•FUSE,10 AMP,ATC	1
47	151180	•ARM,WINDSHIELD WIPER	1
48	33744-01	•BLADE,WIPER	1
49	871071601	•WASHER,LOCK,#10	6
50	35136-5	•PLUG,HOLE,.625,FLUSH MT,PLSTC	7
52	35136-4	•PLUG,HOLE,.500,FLUSH MT,PLSTC	2
56	35136-20	•PLUG,HOLE,.562,FLUSH MT,PLSTC	2
-62	33707	•SEALANT,SILICONE,CLEAR	0.0011
64	80322	•SCR,SLFTPG,HH,.250-20X.50	17
-TBD	985514	•KIT,RB48,CAB,INSULATION	1
		ATTACHING PARTS	
-13	28342	••FLOORMAT,RB48	1
14	36688-12	••HEADLINER	1
-16	36688-14	••FOAM,RIGHT SIDE	2
-17	36688-15	••FOAM,REAR PANEL	1
		-----*-----	

- ITEM NOT ILLUSTRATED

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FIGURE 19. CAB ASSEMBLY (PAGE 6 OF 6)

FIG ITEM	PART NUMBER	NOMENCLATURE 1 2 3 4 5 6 7	UNITS PER ASSY
	TBD	OPTIONAL WINDSHIELD WIPER/WASHER GROUPS	
-1	21166	•REAR WINDSHIELD WIPER	
-101	33744	••ARM,WIPER	1
-102	33744-01	••BLADE,WIPER	1
-103	36741	••WIPER MOTOR,2-SPEED	1
-104	853090	••SWITCH,WIPER/WASHER (3000)	1
-105	36747	••FUSE,4 AMP,ATC	1
-106	80140	••WASHER,FLAT,USS,.250	1
-107	80192	••CSHH,.250-20X.75,GR5	1
-108	80350	••NUT,FLEXLOC,.250-20,FULL,LT	1
-2	21167	•WINDSHIELD WASHER, FRONT OR REAR	
-201	33745-1	••WASHER,TANK AND PUMP	1
-202	35465-07	••GROMMET,INSULATION,.750ID	1
-203	36687	••CSBHS,.312-18X.75,BLACK FINISH	4
-204	36753	••WASHER NOZZLE & TEE KIT	1
-205	80037	••NUT,HEX,.312-18	4
-206	80141	••WASHER,FLAT,USS,.313	4
-207	35550	••HOSE,WINDSHIELD WASHER .188ID	11

- ITEM NOT ILLUSTRATED

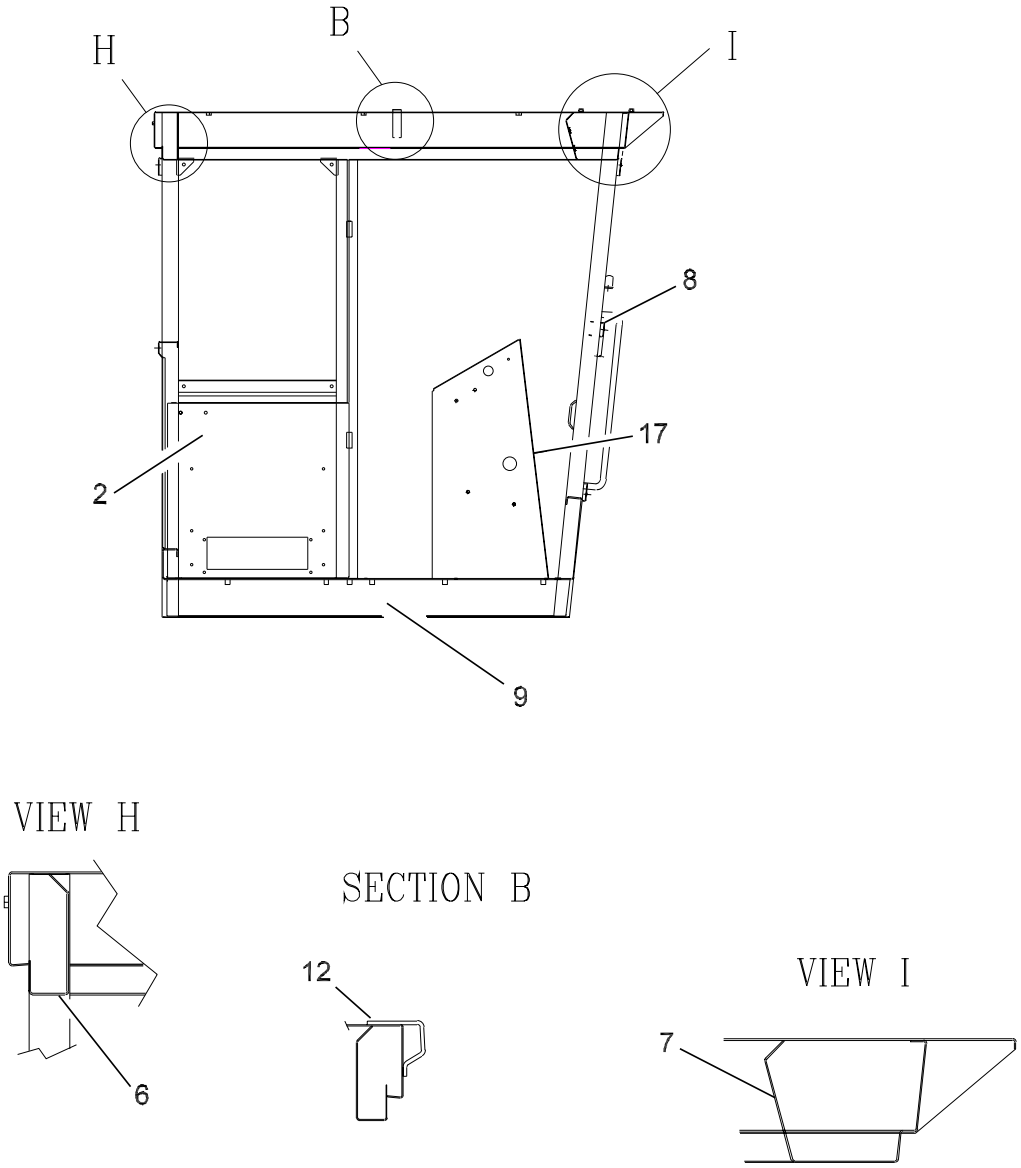


FIGURE 20. CAB, 2 DOOR

FIGURE 20. CAB, 2 DOOR

FIG ITEM	PART NUMBER	NOMENCLATURE 1 2 3 4 5 6 7	UNITS PER ASSY
20	**28171**	**•CAB, 2 DOOR (SEE FIGURE 19 FOR NHA)**	**1**
-1	76003-01	••CAB W/M,RH SIDE,RB48	1
2	27572	••CAB,W/M LH SIDE,RB48	1
-3	76005-01	••PANEL,REAR	1
-4	76008-01	••GUSSET,GLASS SUPPORT	6
-5	78008-01	••ROOF (OPEN ROPS)	1
6	76013-01	••CROSSBRACE,UPPER REAR	1
7	76014-01	••CROSSBRACE,UPPER FRONT	1
8	76017-01	••GUSSET,CENTER	2
9	28259	••FLOOR	1
-11	80959	••NUT,WELD,.312-18	3
12	269905	••EYE,LIFTING,RB48	2
-14	28258	••PLATE,CONSOLE	1
-15	81042	••NUT,WELD,.250-20	14
-16	81268	••NUT,HEX,HEAVY,.375-16 UNFINISH	6
17	28243	••STAND,STEERING CONSOLE	1
-18	21034	••MOUNT,ROTATION CONTROL LEVER	1
-19	81090	••NUT,WELD,.375-16	4

- ITEM NOT ILLUSTRATED

NOTE 1:

Adhere item 26 (1.00”) to center of top horizontal door tube.

NOTE 2:

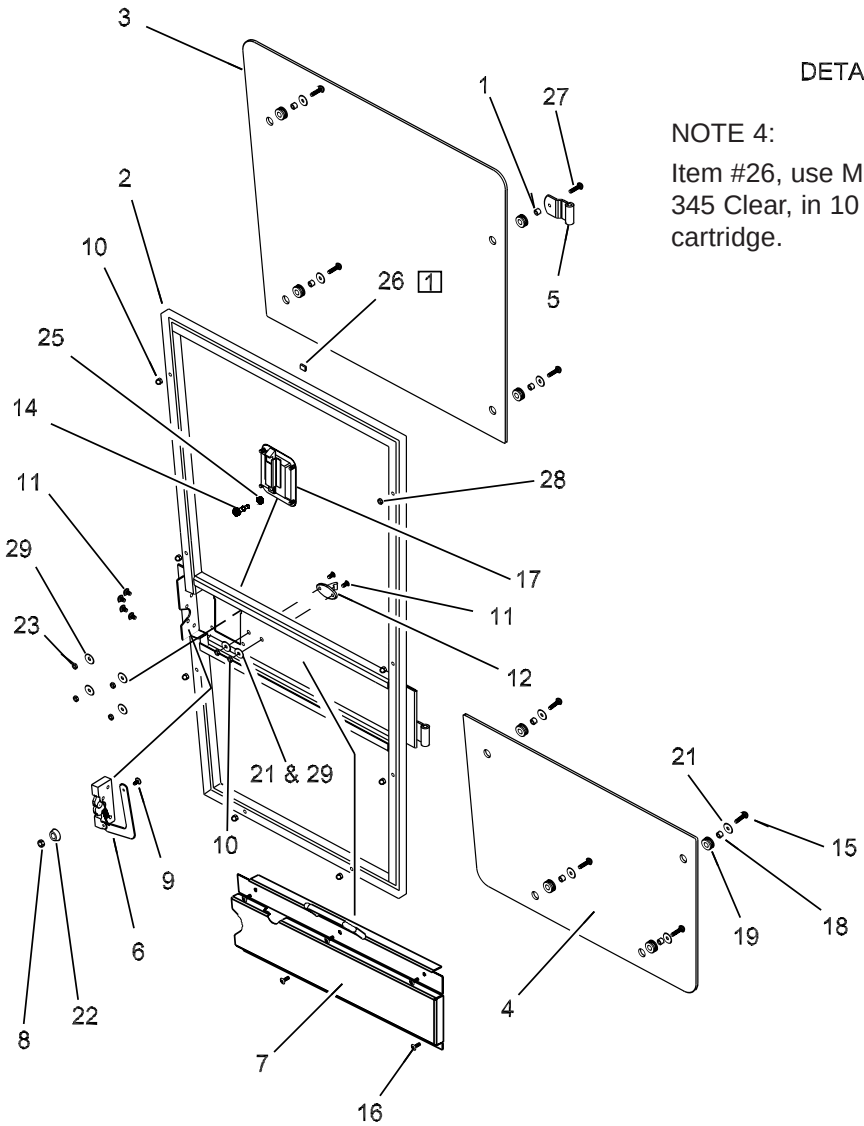
Apply item #26 before installing item #20.

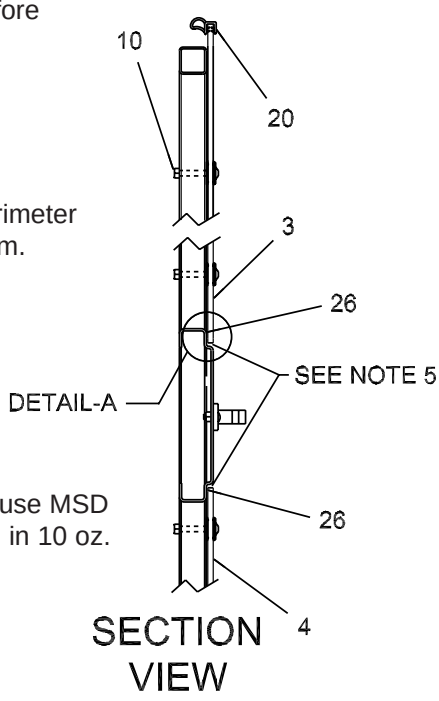
NOTE 3:

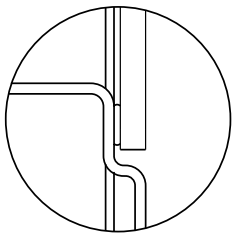
Install item #20 around perimeter of door with splice at bottom.

NOTE 4:

Item #26, use MSD 345 Clear, in 10 oz. cartridge.







DETAIL-A

NOTE 5:

MSD 149 on outside edge of door only, at 4 places.

FIGURE 21. DOOR ASSEMBLY, ENTRANCE, RH

FIGURE 21. DOOR ASSEMBLY, ENTRANCE, RH

FIG ITEM	PART NUMBER	NOMENCLATURE 1 2 3 4 5 6 7	UNITS PER ASSY
21	**36688-41**	**•DOOR ASSEMBLY (SEE FIGURE 19 FOR NHA)**	**1**
1	27481	••BUSHING,.334 IDX.500 OD	1
2	36688-23	••DOOR RH,W/M	1
3	36688-03P	••GLASS,UPPER DOOR	1
4	36688-06P	••GLASS,LOWER DOOR	1
5	36688-39	••HINGE,LEFT,PAINTED	1
6	36688-25	••CAM LATCH,RH	1
7	36688-27	••LATCH COVER W/M,RH	1
8	80824	••NUT,HEX,#10-24	1
9	871052400	••MACH SCR,RH,#10-24X.50	1
10	80350	••NUT,FLEXLOC,.250-20,FULL,LT	10
11	81106	••CSBHS,.250-20X.75,SS	4
12	36688-34	••DOOR HOLD RB-48	1
14	81262	••SHLDR SCR,.500X.625X.375-16	1
15	81279	••CSBHS,.250-20X2.00,SS	7
16	80322	••SCR,SLFTPG,HH,.250-20X.50	5
17	36688-31	••PADDLE LATCH	1
18	36688-16	••BUSHING,NYLON	7
19	36688-17	••GROMMET,.250	8
20	36688-18	••SEAL,WINDOW	14
21	81278	••WASHER,FLAT,.250X1.00,SS	9
22	36688-55	••KNOB,INSIDE RELEASE	1
23	80036	••NUT,HEX,.250-20	6
-24	33707	••SEALANT,SILICONE,CLEAR	0.0011
25	80038	••NUT,HEX,.375-16	1
26	73064	••RUBBER STRIP,SPONGE,.250X.50	5
27	81280	••CSBHS,.312-18X2.25,SS	1
28	80351	••NUT,FLEXLOC,.312-18,FULL,LT	1
29	80160	••WASHER,LOCK,.250	6
-TBD	19871	••SEAL,DOOR	1
-TBD	36688-49	••STRIKER,EXTERNAL THREAD	1

- ITEM NOT ILLUSTRATED

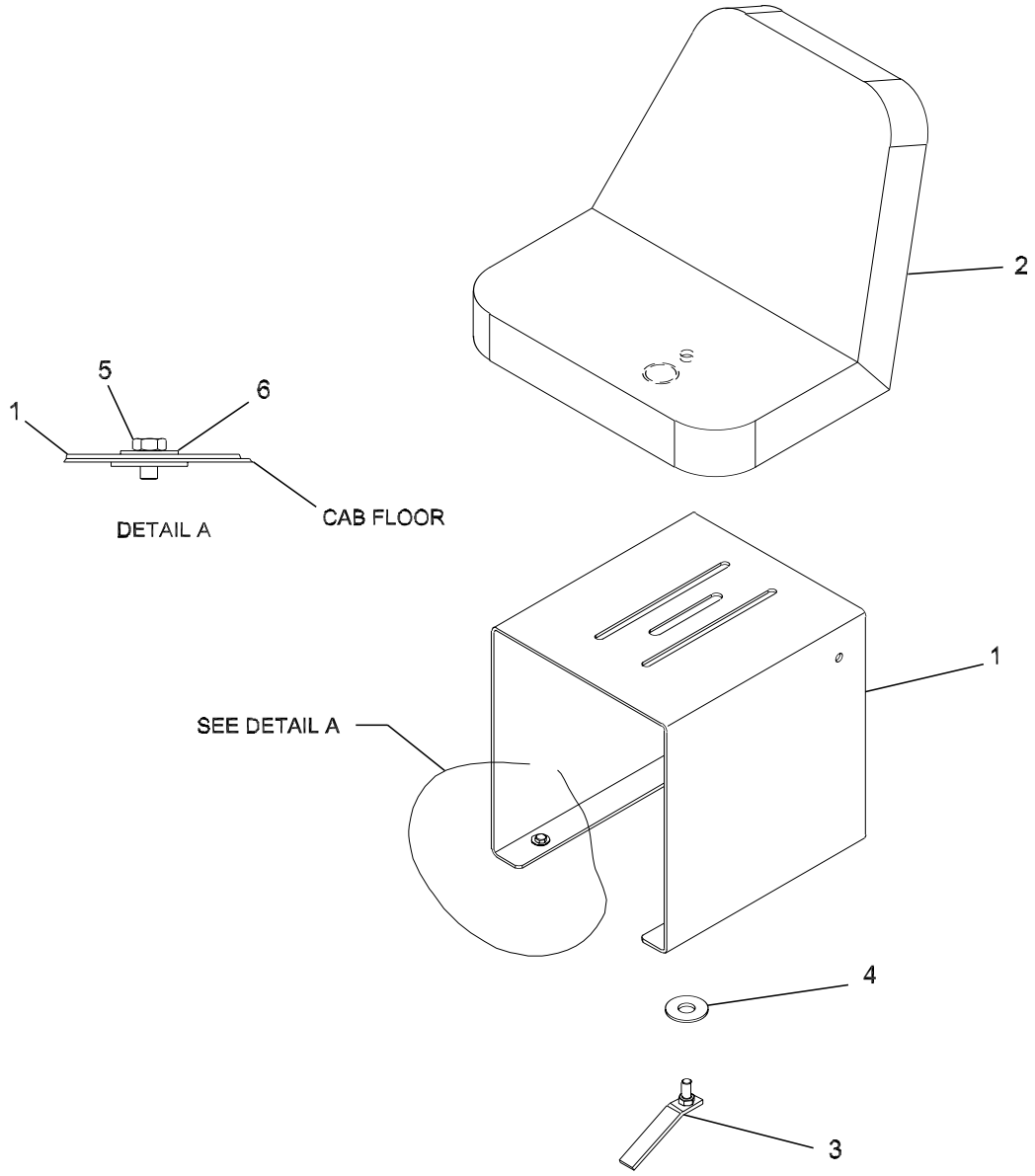


FIGURE 22. STANDARD SEAT

FIGURE 22. STANDARD SEAT

FIG ITEM	PART NUMBER	NOMENCLATURE 1 2 3 4 5 6 7	UNITS PER ASSY
22	**25035**	**STANDARD SEAT**	**1**
1	24511	•PEDESTAL,STD SEAT	1
2	6576	•SEAT,BLACK,PLAIN	1
3	14039	•SEAT ADJUSTMENT LEVER WELDMENT	1
4	80144	•WASHER,FLAT,USS,.500	1
5	80237	•CSHH,.438-14X1.50,GR5	4
6	80143	•WASHER,FLAT,USS,.438	4

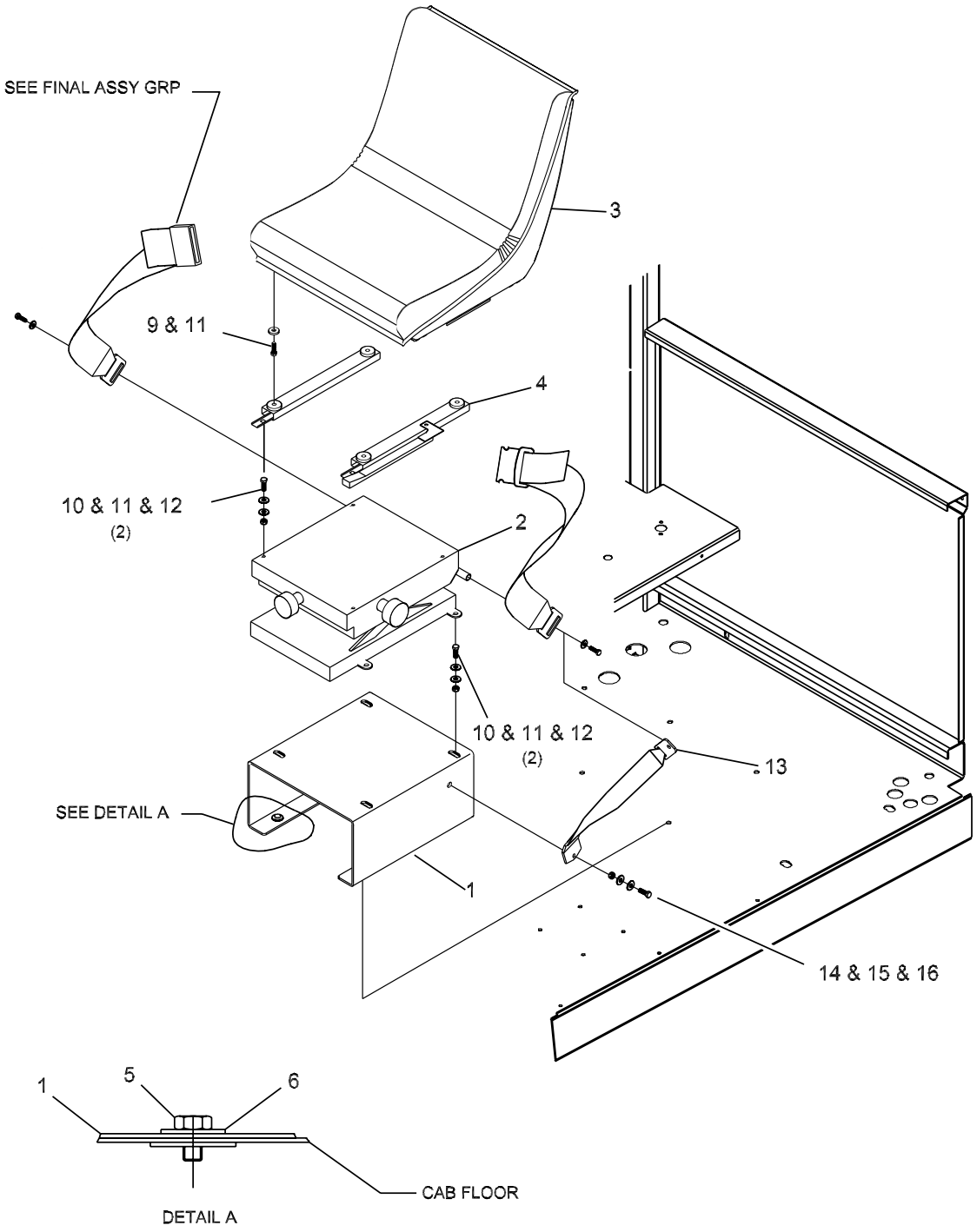


FIGURE 23. OPTIONAL SPRING SEAT

FIGURE 23. OPTIONAL SPRING SEAT

FIG ITEM	PART NUMBER	NOMENCLATURE 1 2 3 4 5 6 7	UNITS PER ASSY
23	**28723**	**SPRING SEAT**	**1**
1	25037	•PEDESTAL,SPRING SEAT	1
2	140600	•SEAT,SUSPENSION,LOW PROFILE	1
3	360010B	•SEAT ASSY,BLACK,W/ARMREST	1
4	72527-01	•SLIDER SET,SEAT BASE	1
5	80237	•CSHH,.438-14X1.50,GR5	4
6	80143	•WASHER,FLAT,USS,.438	4
9	80207	•CSHH,.312-18X.75,GR5	4
10	80208	•CSHH,.312-18X1.00,GR5	8
11	80141	•WASHER,FLAT,USS,.313	20
12	80351	•NUT,FLEXLOC,.312-18,FULL,LT	8
13	37982	•TETHER KIT,12.0	1
14	80233	•CSHH,.438-14X1.00,GR5	2
15	80143	•WASHER,FLAT,USS,.438	4
16	80039	•NUT,HEX,.438-14	2
-TBD	72527-03	•SPACER,SEAT SLIDE,PLASTIC	4

- ITEM NOT ILLUSTRATED

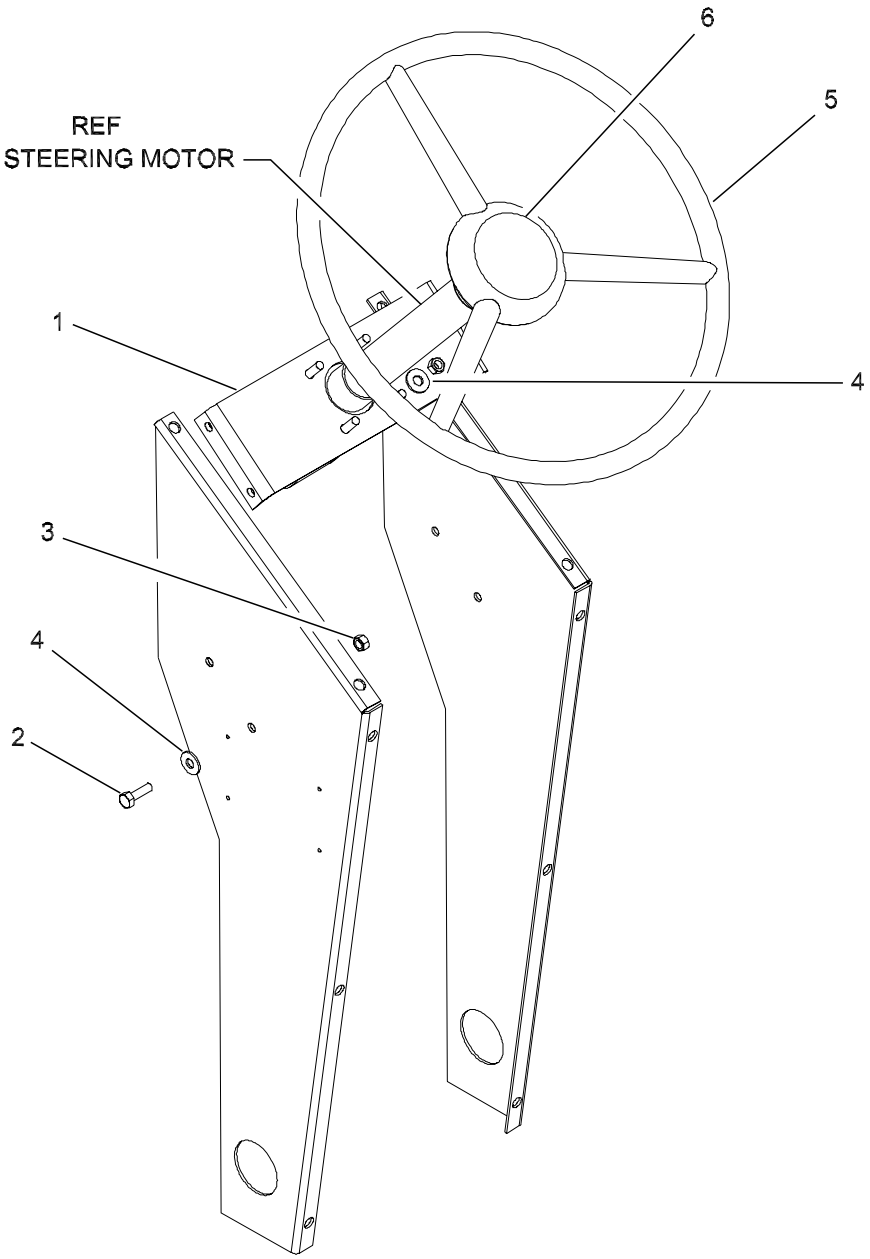


FIGURE 24. STEERING ORBITAL MOUNT ASSEMBLY

FIGURE 24. STEERING ORBITAL MOUNT ASSEMBLY

FIG ITEM	PART NUMBER	NOMENCLATURE 1 2 3 4 5 6 7	UNITS PER ASSY
24	**27525**	**STEERING ORBITAL MOUNT ASSEMBLY**	**1**
1	21075	•MOUNT,STEERING ORBITAL	1
2	80208	•CSHH,.312-18X1.00,GR5	4
3	80037	•NUT,HEX,.312-18	4
4	81130	•WASHER,SAE,HARDENED,.312	8
5	300030	•STEERING WHEEL,17.00,36 SPLINE	1
6	300010	•CAP,STEERING WHEEL	1

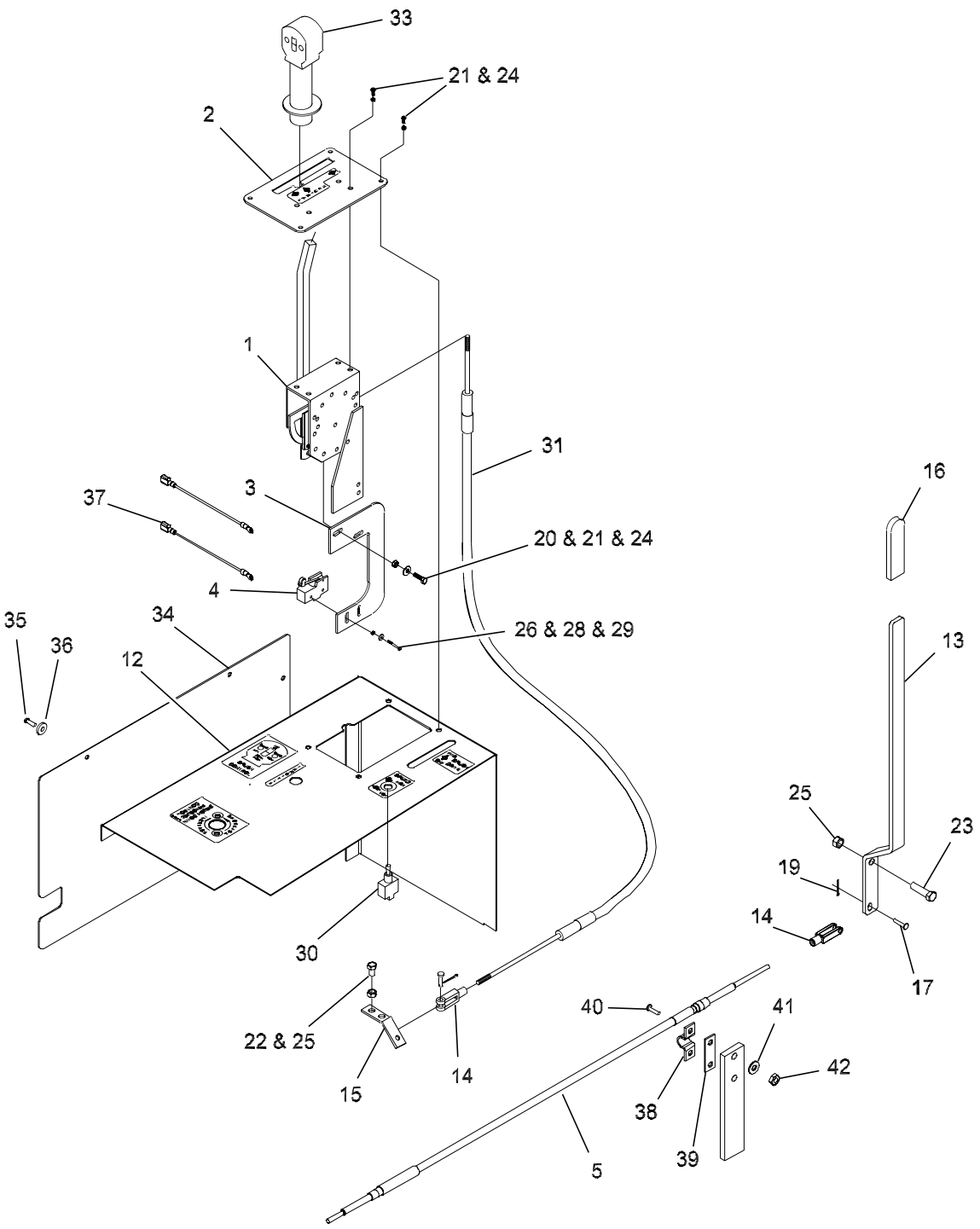


FIGURE 25. CONTROL GROUP

FIGURE 25. CONTROL GROUP

FIG ITEM	PART NUMBER	NOMENCLATURE 1 2 3 4 5 6 7	UNITS PER ASSY
25	**28402**	**CONTROL GROUP**	**1**
1	29157	•REWORK,CONTROL SHIFT LEVER	1
2	986787	•PLATE,TRAVEL,CONTROL,Z-GATE	1
3	25021	•BRACKET,NEUTRAL SAFETY	1
4	37941	•SWITCH,SNAP ACTING,W/ROLLER	1
5	33873	•CABLE,PUSH/PULL,37"X1" STROKE	1
12	38819	•DECAL KIT,RB48 CONTROLS (Part of Decal Kit)	REF
13	28158	•LEVER,BRUSH ROTATION CONTROL	1
14	350050	•CLEVIS,.250-28	2
15	28491	•LEVER,PUMP ACTUATOR	1
16	36735	•GRIP,.250X1.000X4.0	1
17	37595	•PIN,CLEVIS,.188X1.00	1
19	71714	•PIN,COTTER,.094X.75	1
20	80140	•WASHER,FLAT,USS,.250	2
21	80192	•CSHH,.250-20X.75,GR5	10
22	80219	•CSHH,.375-16X.75,GR5	2
23	80226	•CSHH,.375-16X1.50,GR5	1
24	80350	•NUT,FLEXLOC,.250-20,FULL,LT	10
25	80352	•NUT,FLEXLOC,.375-16,FULL,LT	3
26	80493	•NUT,HEX,#6-32	2
28	80927	•MACH SCR,#6-32X1.25	2
29	81188	•WASHER,FLAT,USS,#6	2
30	851391	•SWITCH,TOGGLE,SPST,2-POS	1
31	32939-2	•CABLE,PUSH/PULL,54"X3" STROKE	1
-32	28476	•HARNESS,JOYSTICK TO VLV,RB48 (SEE FIGURE 26)	1
33	28477	•CONTROL HANDLE,WIRING,RB48 (SEE FIGURE 27)	1
34	28549	•CONSOLE,SIDE COVER	1
35	80423	•CSHH,.250-20X.50,GR5	4
36	80140	•WASHER,FLAT,USS,.250	4
37	28763	•WIRE,JUMPER	2
38	38534	•CLAMP,CABLE,40 SERIES	1
39	38535	•SHIM,CABLE CLAMP,40 SERIES	1
40	81200	•MACH SCR,RH,#10-24X.75,GR2	2
41	80995	•WASHER,FLAT,USS,#10	2
42	80824	•NUT,HEX,#10-24	2

- ITEM NOT ILLUSTRATED

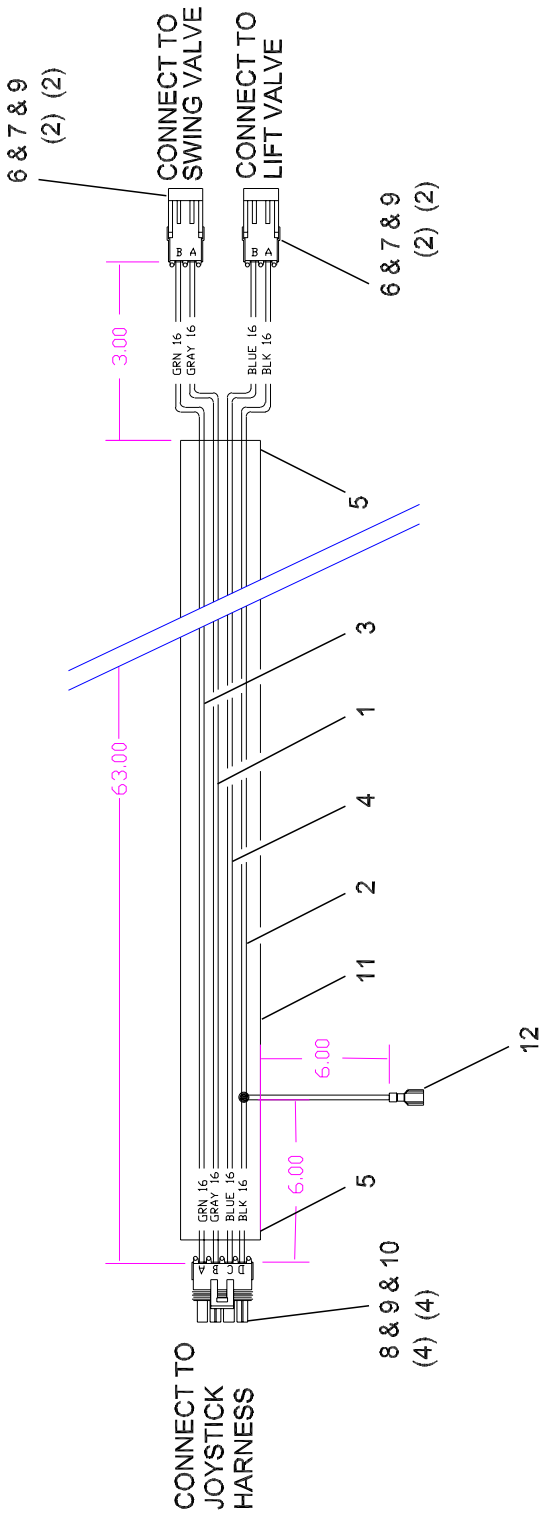
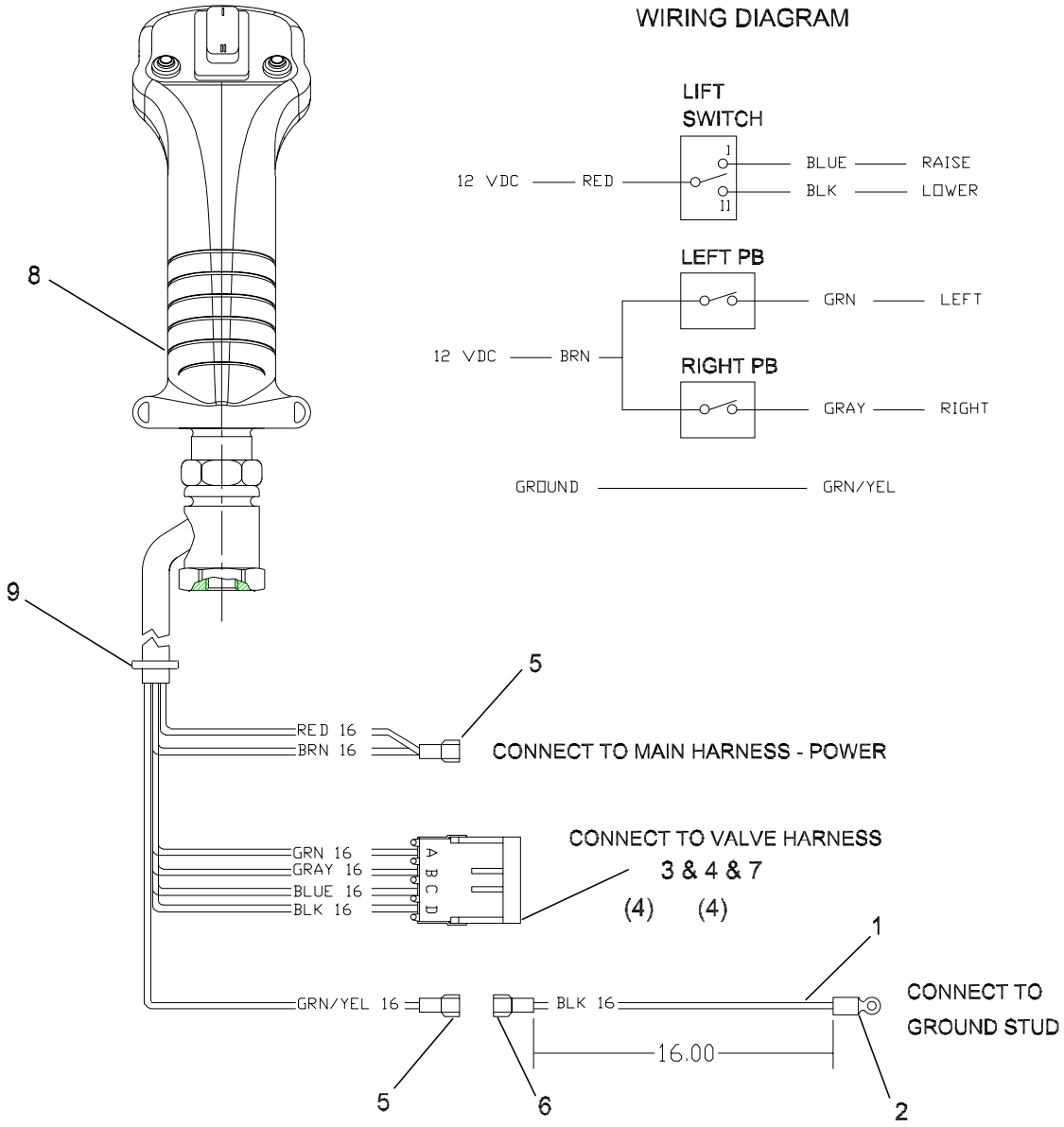


FIGURE 26. HARNESS, JOYSTICK TO VALVE

FIGURE 26. HARNESS, JOYSTICK TO VALVE

FIG ITEM	PART NUMBER	NOMENCLATURE 1 2 3 4 5 6 7	UNITS PER ASSY
26	**28476**	**•HARNESS,JOYSTICK TO VALVE (SEE FIG 25 FOR NHA)**	**1**
1	33271-0	••WIRE,16GA,GRAY	5.5
2	33271-1	••WIRE,16GA,BLACK	6
3	33271-4	••WIRE,16GA,GREEN	5.5
4	33271-11	••WIRE,16GA,BLUE	5.5
5	33596	••TIE WRAP,.188X7.500	2
6	35138	••CONNECTOR,SEALED,SHROUD,2-PIN	2
7	36164	••TERM,SEALED CONN,16-14 GA,MALE	4
8	36165	••TERM,SEALED CONN,16-14 GA,FEM	4
9	36166	••SEAL,CABLE,18-16 GA,GREEN	8
10	36352	••CONNECTOR,SEALED,TOWER,4-PIN	1
11	71060	••LOOM,SPLIT,CONVOLUTED,.250	5.25
12	36348	••TERM,PUSH-ON,.25,M,18-14,SLV	1



NOTE: Do not put pins into 4-pin watertight shroud. Wires to be run through hole in mounting plate, then the pins inserted into shroud.

FIGURE 27. CONTROL HANDLE

FIGURE 27. CONTROL HANDLE

FIG ITEM	PART NUMBER	NOMENCLATURE 1 2 3 4 5 6 7	UNITS PER ASSY
27	**28477**	**•CONTROL HANDLE (SEE FIGURE 25 FOR NHA)**	**1**
1	33271-1	••WIRE,16 GA,BLACK	1.33
2	33607	••TERM,RING,16-14 GA,.250 STUD	1
3	36164	••TERM,SEALED CONN,16-14 GA,MALE	4
4	36166	••SEAL,CABLE,18-16 GA	4
5	36348	••TERM,PUSH-ON,.25,M,18-14,SLV	2
6	36349	••TERM,PUSH-ON,.25,FEM,18-14,SLV	1
7	36351	••CONNECTOR,SEALED,SHROUD,4-PIN	1
8	38820	••CONTROL HANDLE,RB48	1
9	35465-06	••GROMMET,INSULATION,.375ID	1

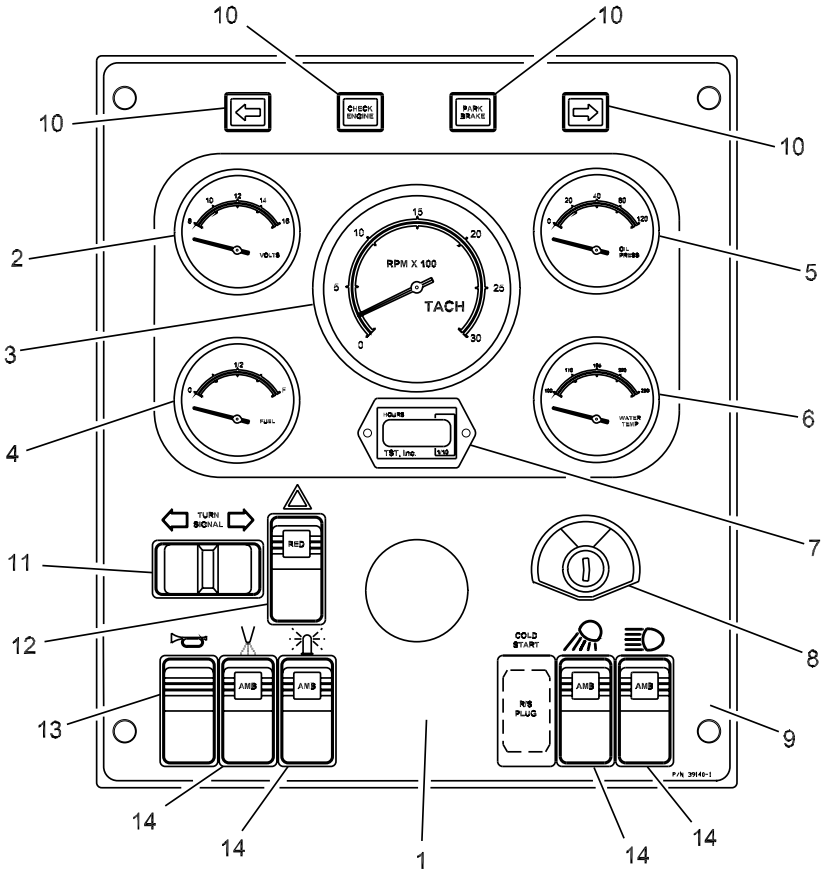


FIGURE 28. INSTRUMENT PANEL

FIGURE 28. INSTRUMENT PANEL

FIG ITEM	PART NUMBER	NOMENCLATURE 1 2 3 4 5 6 7	UNITS PER ASSY
28	**39140**	**INSTRUMENT PANEL**	**1**
1	39140-1	•DECAL,RB48,INSTRUMENT PANEL	1
2	39140-2	•VOLTMETER	1
3	39140-3	•TACHOMETER	1
4	39140-4	•GAUGE,FUEL	1
5	39140-5	•GAUGE,OIL PRESSURE	1
6	39140-6	•GAUGE,WATER TEMP	1
7	39140-7	•HOURMETER,DIGITAL	1
8	39140-8	•SWITCH,KEY,OFF-ON-(ON)	1
9	39140-9	•OVERLAY	1
10	39140-10	•LIGHTS,EURO,SMOKED LENS,GREEN/RED FILTER	4
11	39140-11	•ROCKER,PADDLE,ON-OFF-ON,N.I.,DPDT	1
12	39140-12	•ROCKER,ON-OFF,RED W.I.,SPST	1
13	39140-13	•ROCKER,ON-OFF,N.I.,SPST	1
14	31940-14	•ROCKER,ON-OFF,AMBER W.I.,SPST	4
15	29403	•WIRING SCHEMATIC,RB48/SWEEPPRO (Schem. at end of IPL)	1
-50	**21168**	**DEFROSTER FAN GROUP, SINGLE**	**1**
-501	33271-5	•WIRE,16 GA,WHITE	0.5
-502	35425	•DEFROSTER FAN ASSY 12 VOLT	1
-503	35426	•SWITCH,DEFROSTER FAN	1
-504	35465-06	•GROMMET,INSULATION,.375ID	1
-505	36348	•TERM,PUSH-ON,.25,M,18-14,SLV	1
-506	36739	•CONN,1 WAY,MALE,LOCKING	1
-507	36747	•FUSE,4 AMP,ATC	1
-508	70953	•CONN,MALE TERMINAL	1
-509	851390204	•TERM,RING,16-14 GA,#10 STUD	1

- ITEM NOT ILLUSTRATED

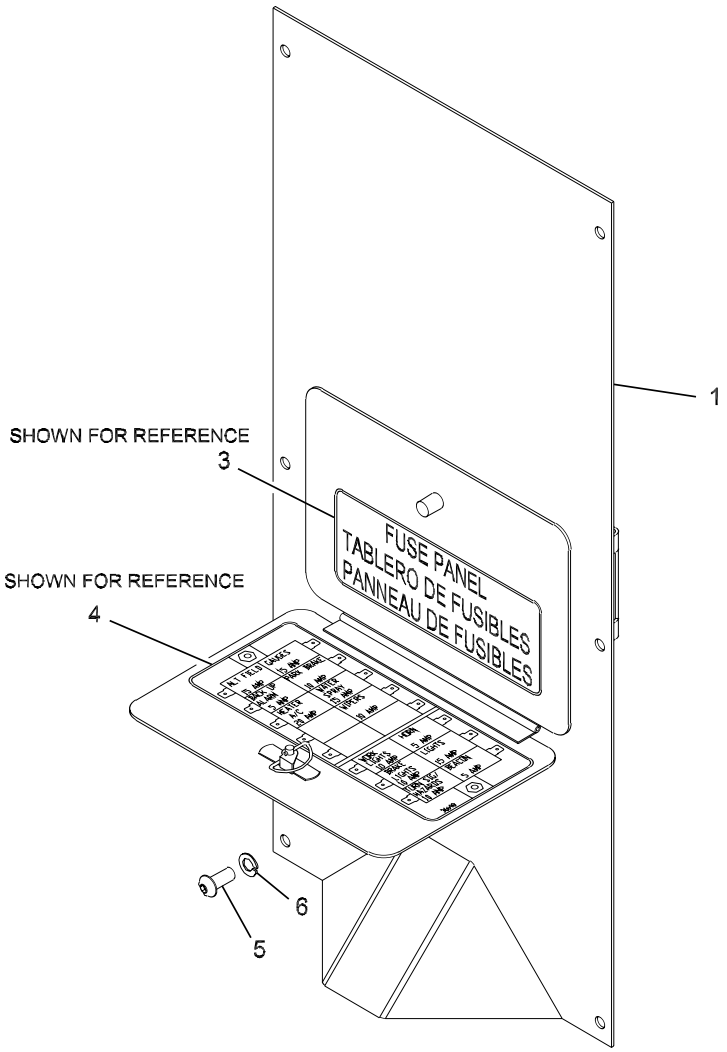


FIGURE 29. INSTRUMENT FUSE PANEL

FIGURE 29. INSTRUMENT FUSE PANEL

FIG ITEM	PART NUMBER	NOMENCLATURE 1 2 3 4 5 6 7	UNITS PER ASSY
29	**28032**	**INSTRUMENT FUSE PANEL**	**1**
1	21078	•INSTRUMENT PANEL W/M,RB48	1
-2	26970	•FUSE PANEL SUB-ASSY (SEE FIGURE 30 FOR BREAKDOWN)	1
3	36696	•DECAL,FUSE PANEL (Part of Decal Group)	REF
4	38504	•DECAL,FUSE PANEL (Part of Decal Group)	REF
5	81106	•CSBHS,.250-20X.75,SS	6
6	80160	•WASHER,LOCK,.250	6

- ITEM NOT ILLUSTRATED

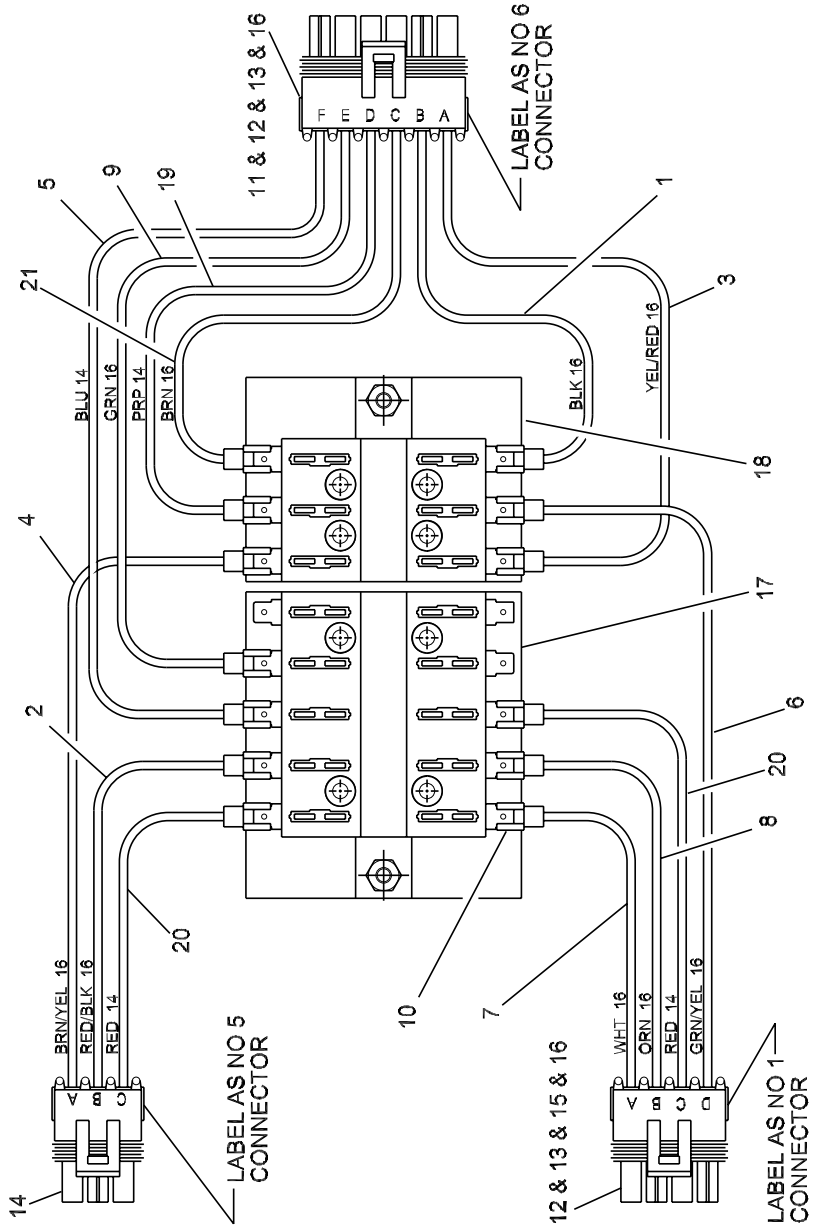


FIGURE 30. FUSE PANEL SUB-ASSEMBLY

FIGURE 30. FUSE PANEL SUB-ASSEMBLY

FIG ITEM	PART NUMBER	NOMENCLATURE 1 2 3 4 5 6 7	UNITS PER ASSY
30	**26970**	**•FUSE PANEL SUB-ASSEMBLY (SEE FIGURE 29 FOR NHA)**	**1**
1	33271-1	••WIRE,16 GA,BLACK	1
2	33271-12	••WIRE,16 GA,RED/BLACK STRIPE	1
3	33271-14	••WIRE,16 GA,YELLOW/RED STRIPE	1
4	33271-15	••WIRE,16 GA,BROWN/YELLOW STRIPE	1.25
5	71062	••WIRE,14 GA,BLUE	1.25
6	33271-19	••WIRE,16 GA,GREEN/YEL STRIPE	1.33
7	33271-5	••WIRE,16 GA,WHITE	1
8	33271-6	••WIRE,16 GA,ORANGE	1
9	33271-4	••WIRE,16 GA,GREEN	1.25
10	33600	••TERM,PUSH-ON,.25,FEM,16-14 GA	13
11	36163	••CONNECTOR,SEALED,TOWER,6-PIN	1
12	36165	••TERM,SEALED CONN,16-14 GA,FEM	13
13	36166	••SEAL,CABLE,18-16 GA	10
14	36300	••CONNECTOR,SEALED,TOWER,3-PIN	1
15	36352	••CONNECTOR,SEALED,TOWER,4-PIN	1
16	36623	••SEAL,CABLE,14 GA	3
17	36694	••FUSE BLOCK,10 GANG,ATC	1
18	36695	••FUSE BLOCK,6 GANG,ATC	1
19	35174	••WIRE,14 GA,PURPLE	1
20	71065	••WIRE,14 GA,RED	2
21	33271-3	••WIRE,16 GA,BROWN	1.25

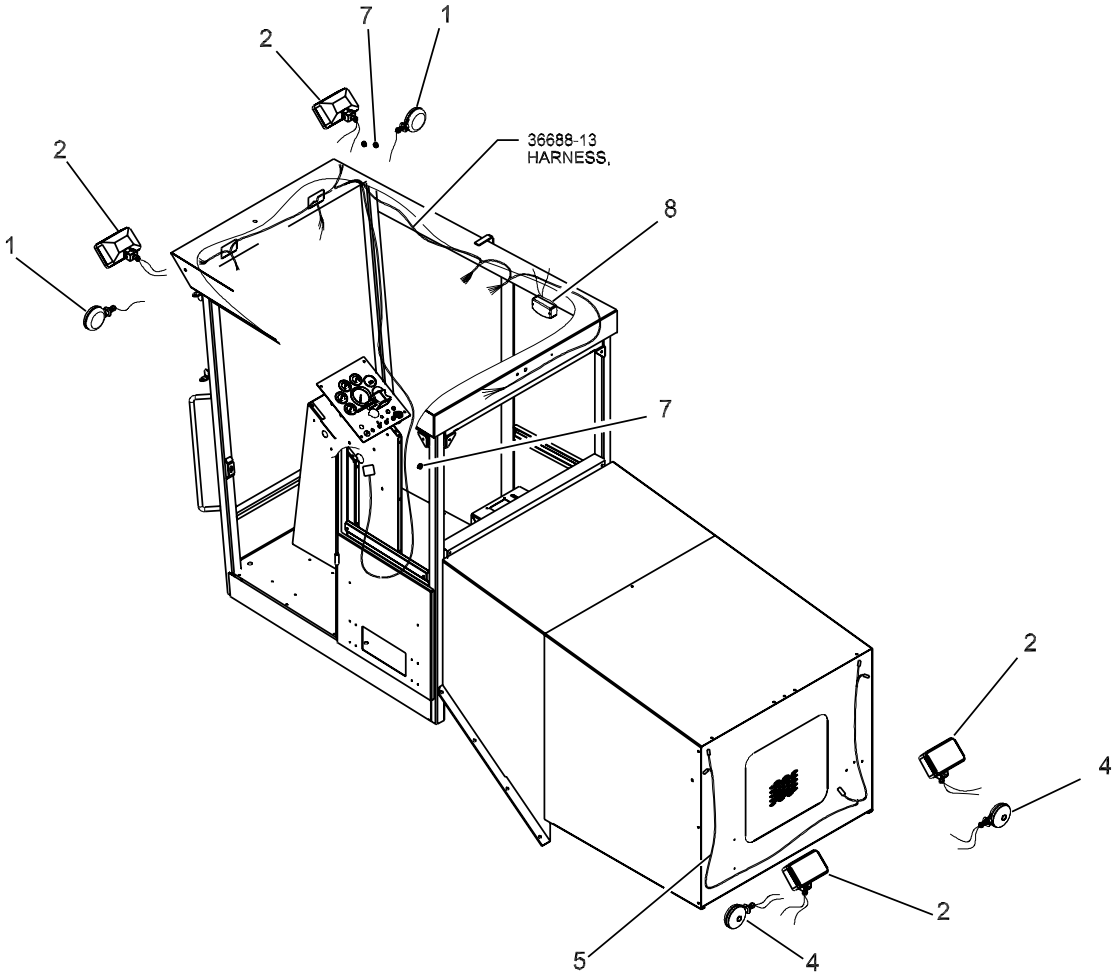


FIGURE 31. LIGHTS AND MIRROR GROUPS

FIGURE 31. LIGHTS AND MIRROR GROUPS

FIG ITEM	PART NUMBER	NOMENCLATURE 1 2 3 4 5 6 7	UNITS PER ASSY
31	**28246**	**LIGHTS AND MIRROR GROUPS**	**1**
1	6161	•LIGHT,TURN SIGNAL,AMBER	2
2	160040A	•WORK LIGHT	4
4	851342007	•LIGHT,TURN/BRAKE,RED	2
5	28353	•WIRE HARNESS,REAR/WORK LIGHTS (Schem at end of IPL)	1
7	35465-06	•GROMMET,INSULATION,.375ID	3
8	38840	•LIGHT,DOME	1
-9	35139	•CONNECTOR,SEALED,TOWER,2-PIN	2
-10	35213	•HOLDER,WIRE TIE,ADHESIVE BACK	1
-11	36165	•TERM,SEALED CONN,16-14 GA,FEM	4
-12	36166	•SEAL,CABLE,18-16 GA	4
-13	36340	•FUSE,10 AMP,ATC	1
-14	36349	•TERM,PUSH-ON,.25,FEM,18-14,SLV	7
-15	36746	•FUSE,5 AMP,ATC	1
-16	70953	•CONN,MALE TERMINAL	6
-17	72135	•TERM,RING,12-10 GA,.500 STUD	2
-19	851390204	•TERM,RING,16-14 GA,#10 STUD	3
-TBD	38687	•LIGHT,STROBE,AMBER,8J,80SFPM	1
-50	**21176**	**MOUNT,WARNING LIGHT GROUP**	**1**
-501	16962	•MOUNT,RISER,STROBE LIGHT	1
-502	35465-06	•GROMMET,INSULATION,.375ID	2
-503	36746	•FUSE,5 AMP,ATC	1
-504	80140	•WASHER,FLAT,USS,.250	4
-505	80141	•WASHER,FLAT,USS,.313	4
-506	80161	•WASHER,LOCK,.312	4
-507	80192	•CSHH,.250-20X.75,GR5	4
-508	80202	•CSHH,.312-18X.50,GR5	4
-509	80350	•NUT,FLEXLOC,.250-20,FULL,LT	4
-60	**25703**	**MIRROR GROUP, 7x16 WEST COAST**	**1**
-601	38057	•MIRROR,WEST COAST,7X16	1
-602	80219	•CSHH,.375-16X.75,GR5	2
-603	80142	•WASHER,FLAT,USS,.375	4
-604	80352	•NUT,FLEXLOC,.375-16,FULL,LT	2

- ITEM NOT ILLUSTRATED

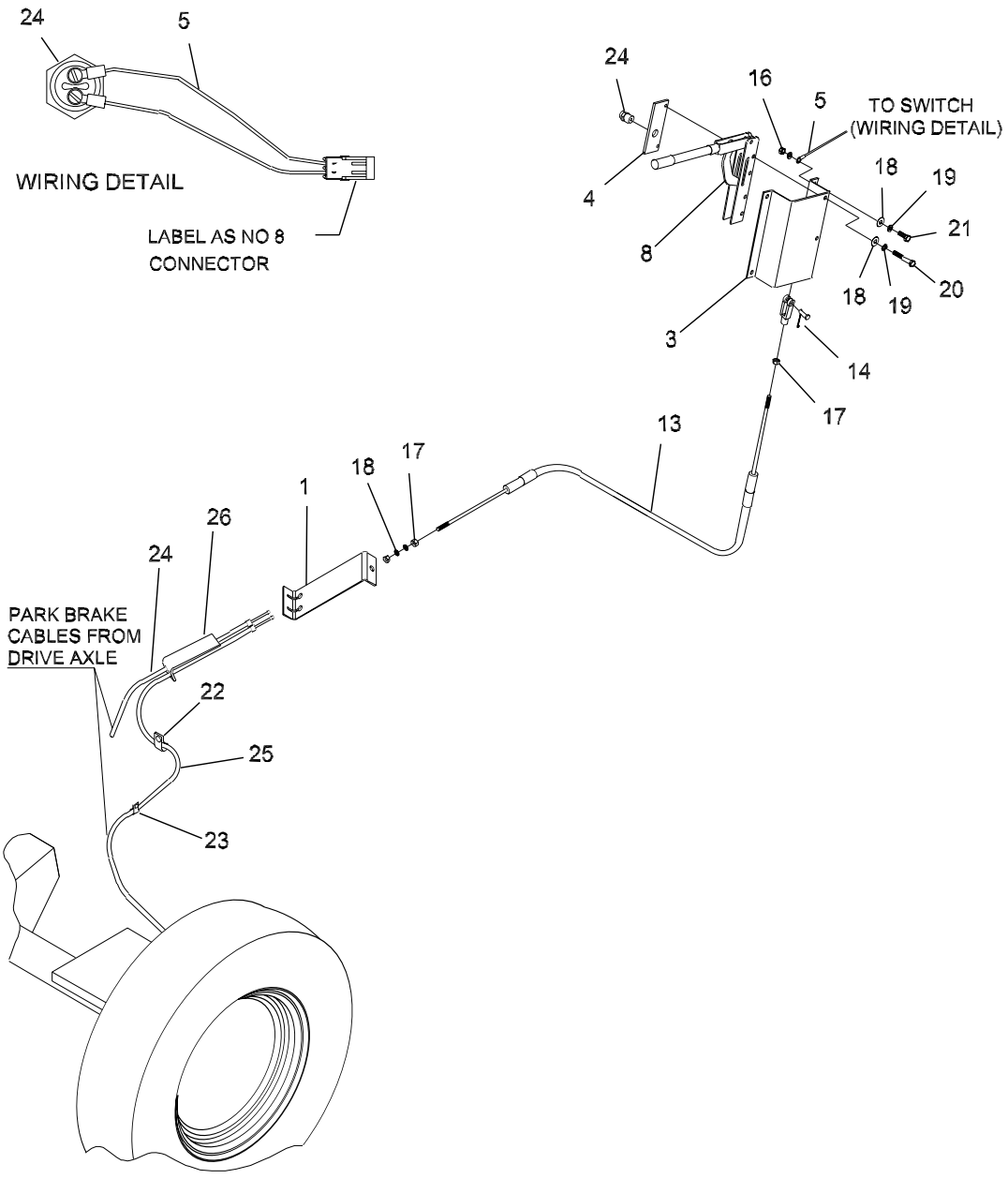


FIGURE 32. PARK BRAKE GROUP

FIGURE 32. PARK BRAKE GROUP

FIG ITEM	PART NUMBER	NOMENCLATURE 1 2 3 4 5 6 7	UNITS PER ASSY
32	**21250**	**PARK BRAKE GROUP**	**1**
1	16837	•PULLEY,PARK BRAKE CABLE	1
3	21217	•BRACKET,BRAKE LEVER	1
4	21218	•MOUNT,BRAKE SWITCH	1
5	33271-1	•WIRE,16 GA,BLACK	0.5
8	34299	•LEVER,BRAKE,12 IN HANDLE	1
13	36797	•CABLE,BRAKE,	1
14	6427	•CLEVIS,.313-24 UNF W/PIN	2
16	80037	•NUT,HEX,.312-18	1
17	80055	•NUT,HEX,.312-24	2
18	80141	•WASHER,FLAT,USS,.313	6
19	80161	•WASHER,LOCK,.312	7
20	80208	•CSHH,.312-18X1.00,GR5	4
21	80214	•CSHH,.312-18X2.25,GR5	2
22	871111602	•CLAMP,INSULATED BAND,3/4”	1
23	871111605	•CLAMP,INSULATED BAND,1/2”	1
24	951091224	•SWITCH,SAFETY START	1
25	983573	•CABLE,PARK BRAKE,LH,BROOMS	1
26	983574	•CABLE,PARK BRAKE,RH,BROOMS	1
-27	984206	•ANGLE,BRAKE CABLE BRKT	1

- ITEM NOT ILLUSTRATED

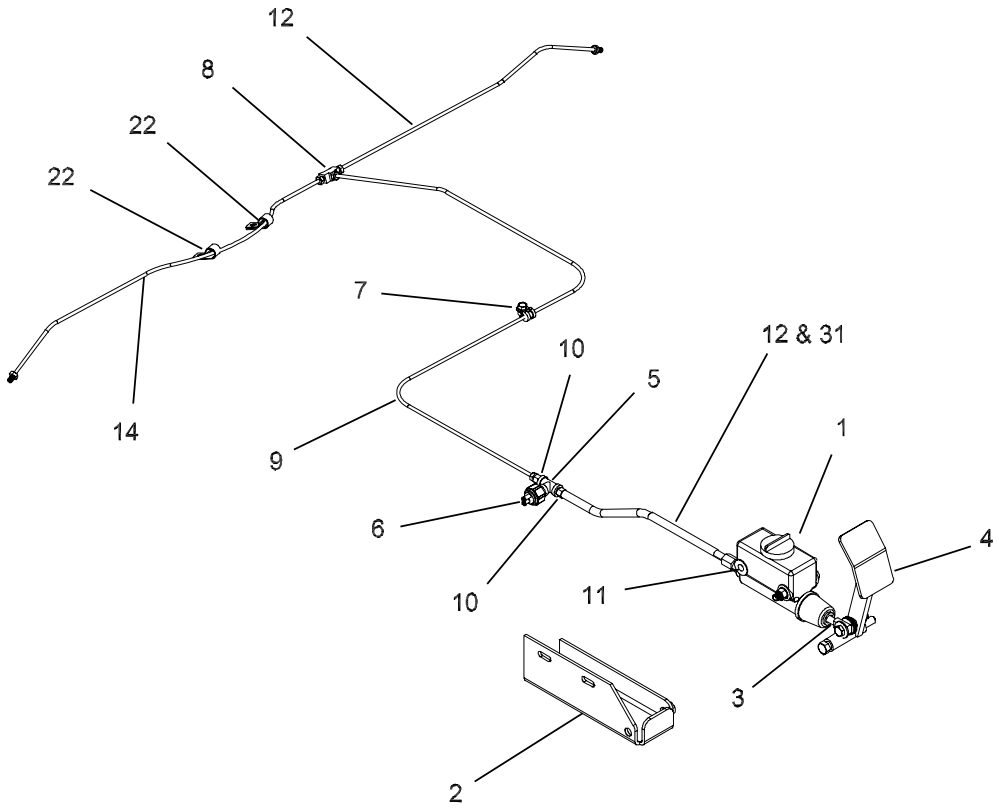


FIGURE 33. BRAKE ASSEMBLY GROUP

FIGURE 33. BRAKE ASSEMBLY GROUP

FIG ITEM	PART NUMBER	NOMENCLATURE 1 2 3 4 5 6 7	UNITS PER ASSY
33	**28399**	**BRAKE ASSEMBLY GROUP**	**1**
1	38314	MASTER CYL,BRAKE	1
2	28649	BRACKET,BRAKE PEDAL/CYLINDER	1
3	28647	PUSHROD,BRAKE	1
4	9378	BRAKE PEDAL ASSY.SHIP-OUT ONLY	1
5	33557	FITT,TEE 02FM,BRASS	1
6	32131	SWITCH,STOP LAMP,HYD TYPE,NO	1
7	33594	CLAMP,LOOP,.25 OD,REM CUSHION	1
8	33949	FITT,TEE 03IFF,BRASS	1
9	33953-20	BRAKE LINE,.188X20	1
10	39059	FITT,STR 02MP-03IFF,BRASS	2
11	38277	FITT,MASTER CYL ADAPTOR	1
12	33953-15	BRAKE LINE,.188X15	2
14	33953-50	BRAKE LINE,.188X50	1
-15	80038	NUT,HEX,.375-16	2
-17	80095	NUT,HEX,JAM,.625-18	1
-18	80160	WASHER,LOCK,.250	3
-19	80162	WASHER,LOCK,.375	2
-20	80192	CSHH,.250-20X.75,GR5	3
-21	871111602	CLAMP,INSULATED BAND,3/4"	1
22	871111605	CLAMP,INSULATED BAND,1/2"	2
-23	80350	NUT,FLEXLOC,.250-20,FULL,LT	1
-24	80142	WASHER,FLAT,USS,.375	4
-25	80230	CSHH,.375-16X2.00,GR5	1
-26	80353	NUT,FLEXLOC,.438-14,FULL,LT	1
-27	80790	CSHH,.437-14X3.75,GR5	1
-28	71620	CSHH,.375-16X3.00,GR5	2
-29	38278	GASKET,MASTER CYL	1
-30	80093	NUT,HEX,JAM,.500-20	1
31	71870	LOOM,SPLIT,CONVOLUTED,.750	1.3
-TBD	P77703	GASKET	2

- ITEM NOT ILLUSTRATED

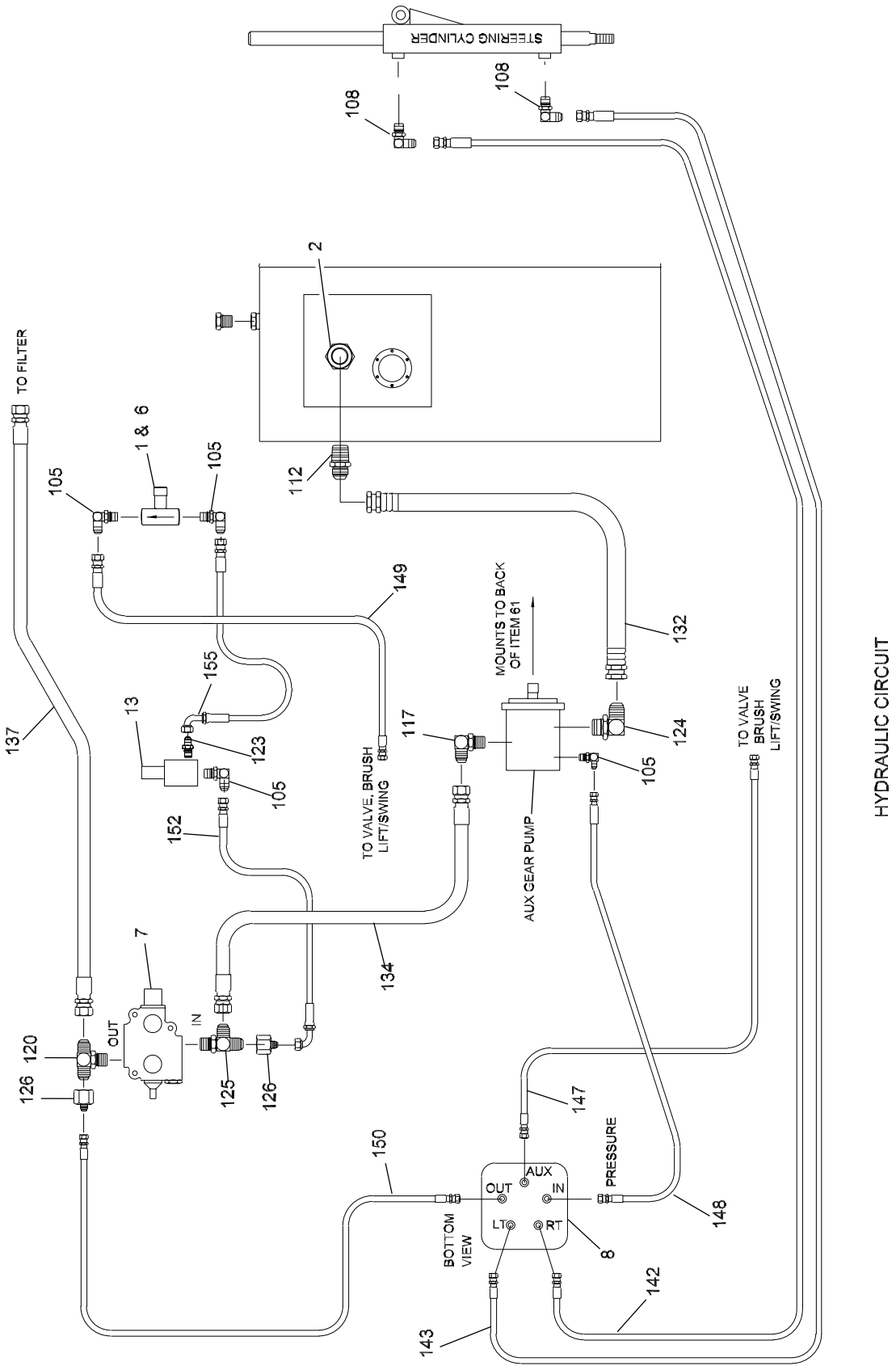


FIGURE 34. HYDRAULICS GROUP (SHEET 1 OF 4)

FIGURE 34. HYDRAULICS GROUP (PAGE 1 OF 4)

FIG ITEM	PART NUMBER	NOMENCLATURE 1 2 3 4 5 6 7	UNITS PER ASSY
34	**28394**	**HYDRAULICS GROUP**	**1**
3	34463	•FILTER ASSY,HYD RETURN	1
-14	38940	•HOSE KIT,SWEEP-PRO	1
		ATTACHING PARTS	
101	31149	••FITT,STR 12MJ-16MB	1
102	33160	••FITT,TEE 12MJ-12FJX-12MJ	1
103	33327	••FITT,45 12MJ-12MB	2
104	33887	••FITT,STR 16MJ-16MB	1
105	33892	••FITT,90 06MJ-06MB	7
111	35562	••FITT,90 04MJ-06MB	2
115	38203	••FITT,45 12MJ-16MB	1
116	71771	••FITT,90 12MJ-16MB	1
117	71775	••FITT,90 12MJ-12MB	2
118	71822	••FITT,90 04MJ-04MP	1
121	853180160	••FITT,STR 12MJ-12MB	1
123	X217	••FITT,STR 06MJ-06MB	7
124	X319	••FITT,90 16MJ-16MB	4
125	X324	••FITT,TEE 12MJ-12MB-12MJ	3
126	X326	••FITT,STR 06MJ-12FJ	3
130	36804-052	••HOSE,16,16FJX-16RJ90,6000	1
131	36804-044	••HOSE,16,16FJX-16RJ90,6000	1
135	72560-068	••HOSE,12,12FJX-12FJX,1250	1
136	72600-062	••HOSE,12,12FJX-12RJ45,1250	1
137	72560-058	••HOSE,12,12FJX-12FJX,1250	1
138	72560-045	••HOSE,12,12FJX-12FJX,1250	1
139	72560-030	••HOSE,12,12FJX-12FJX,1250	1
140	72558-027	••HOSE,12,12FJX-12RJ90,1250	1
151	72549-036	••HOSE,06,06FJX-06RJ90,3000	1
154	37634-014.5	••HOSE,06,06FJX-06JX45,3000	1
157	73181-071	••HOSE,04,04FJ-06FJ,3000	1
158	72416-015	••HOSE,04,04FJ-04FJ,2500	1
159	6463	••FITT,90 16MJ-16FJX	1
		-----*-----	
15	72149	•VLV,HYD,SOL,3 WAY,06 ORB PORTS	1
16	72372	•FITT,PLUG 02PD,DUST	1
17	72689	•FITT,TEST 06MB-02PD	1
18	16919	•HARNESS,WIRE,JUMPER	1

- ITEM NOT ILLUSTRATED

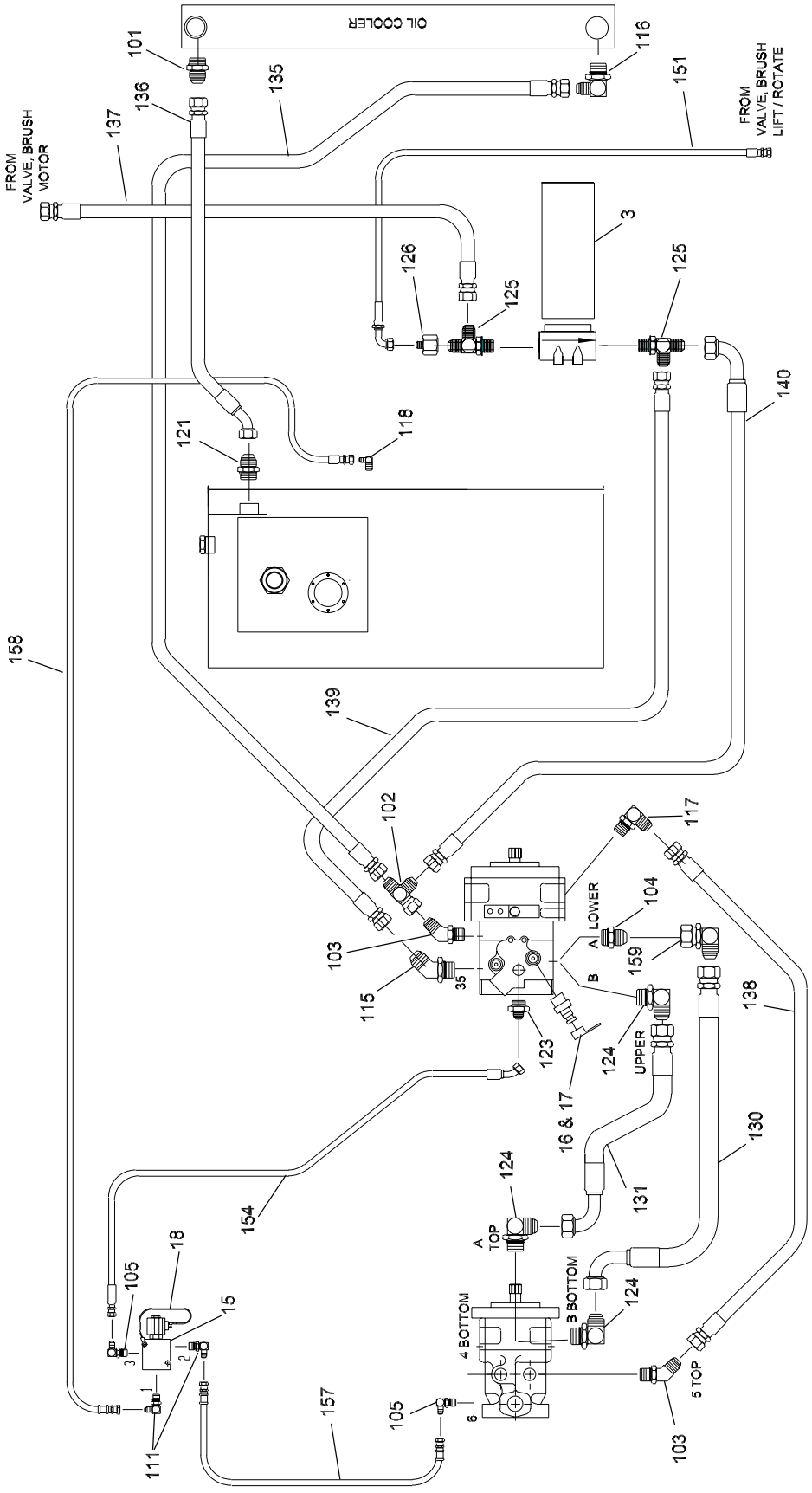


FIGURE 34. HYDRAULICS GROUP (SHEET 2 OF 4)

FIGURE 34. HYDRAULICS GROUP (PAGE 2 OF 4)

FIG ITEM	PART NUMBER	NOMENCLATURE 1 2 3 4 5 6 7	UNITS PER ASSY
34	**28394**	**HYDRAULICS GROUP**	**1**
1	17670	•CLAMP,NEEDLE VALVE	1
2	33148	•STRAINER,SUCT,2NPT,25GPM,100ME	1
6	35552	•VLV,NEEDLE,HYDRAULIC	2
7	36648	•VLV,MOTOR	1
8	39045	•MOTOR,HYD,POWER STEERING	1
13	38937	•VALVE,SOLENOID,HYD,2-WAY	1
-14	38940	•HOSE KIT,SWEEP-PRO	1
		ATTACHING PARTS	
105	33892	••FITT,90 06MJ-06MB	7
108	34535	••FITT,90 06MJ-08MB	2
112	35780	••FITT,STR 16MJ-20MP	1
117	71775	••FITT,90 12MJ-12MB	2
120	72566	••FITT,TEE 12MJ-12MJ-12MB	1
123	X217	••FITT,STR 06MJ-06MB	7
124	X319	••FITT,90 16MJ-16MB	4
125	X324	••FITT,TEE 12MJ-12MB-12MJ	3
126	X326	••FITT,STR 06MJ-12FJ	3
132	38873-032	••HOSE,16,16FJ-16FJ,250	1
134	38871-032	••HOSE,12,12FJ-12FJ,3000	1
137	72560-058	••HOSE,12,12FJX-12FJX,1250	1
142	72550-146	••HOSE,06,06FJX-06FJX,3000	1
143	72550-142	••HOSE,06,06FJX-06FJX,3000	1
147	72550-109	••HOSE,06,06FJX-06FJX,3000	1
148	72550-080	••HOSE,06,06FJX-06FJX,3000	1
149	72549-065.5	••HOSE,06,06FJX-06RJ90,3000	1
150	72550-053	••HOSE,06,06FJX-06FJX,3000	1
152	72549-033	••HOSE,06,06FJX-06RJ90,3000	1
155	72549-011	••HOSE,06,06FJX-06RJ90,3000	1
		-----*-----	

- ITEM NOT ILLUSTRATED

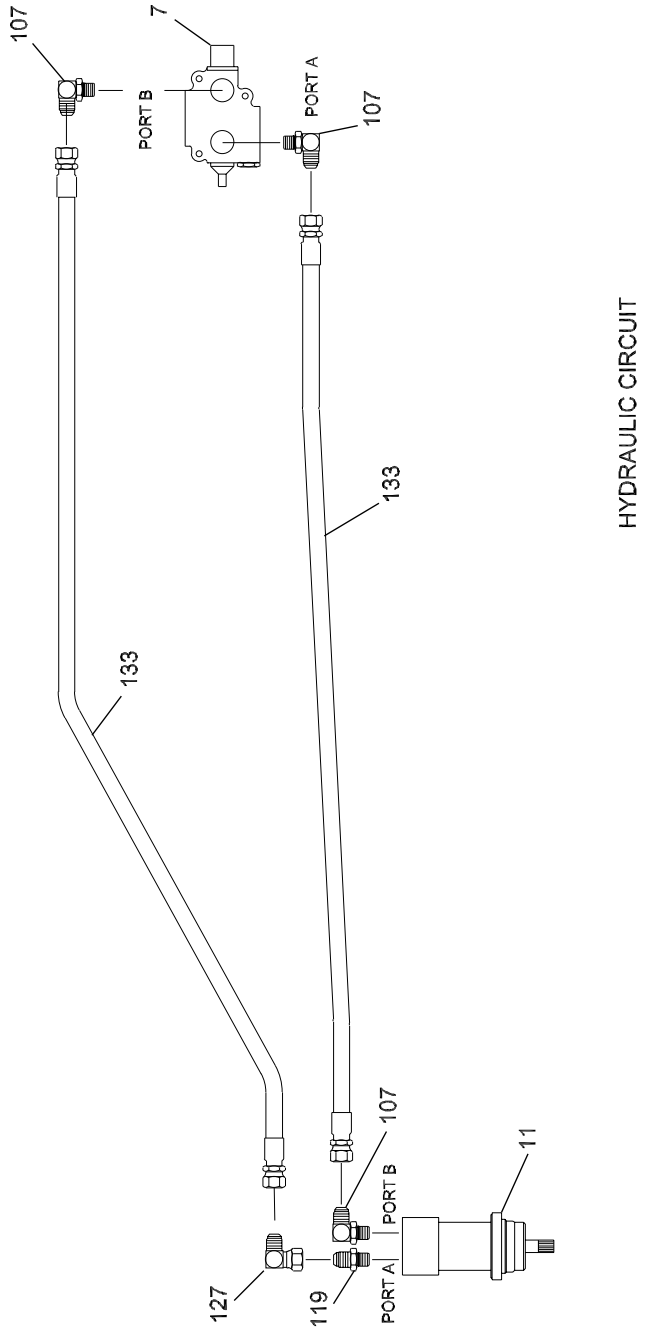


FIGURE 34. HYDRAULICS GROUP (SHEET 3 OF 4)

FIGURE 34. HYDRAULICS GROUP (PAGE 3 OF 4)

FIG ITEM	PART NUMBER	NOMENCLATURE 1 2 3 4 5 6 7	UNITS PER ASSY
34	**28394**	**HYDRAULICS GROUP**	**1**
7	36648	•VLV,MOTOR	1
11	983599	•MOTOR,HYD,BRUSH DRIVE	1
-14	38940	•HOSE KIT,SWEEP-PRO	1
		ATTACHING PARTS	
107	34083	••FITT,90 12MJ-10MB	3
119	71882	••FITT,STR 12MJ-10MB	1
127	X365	••FITT,90 12MJ-12FJX	1
133	38872-132	••HOSE,12,12FJ-12FJ90,3000	2
		-----*-----	

- ITEM NOT ILLUSTRATED

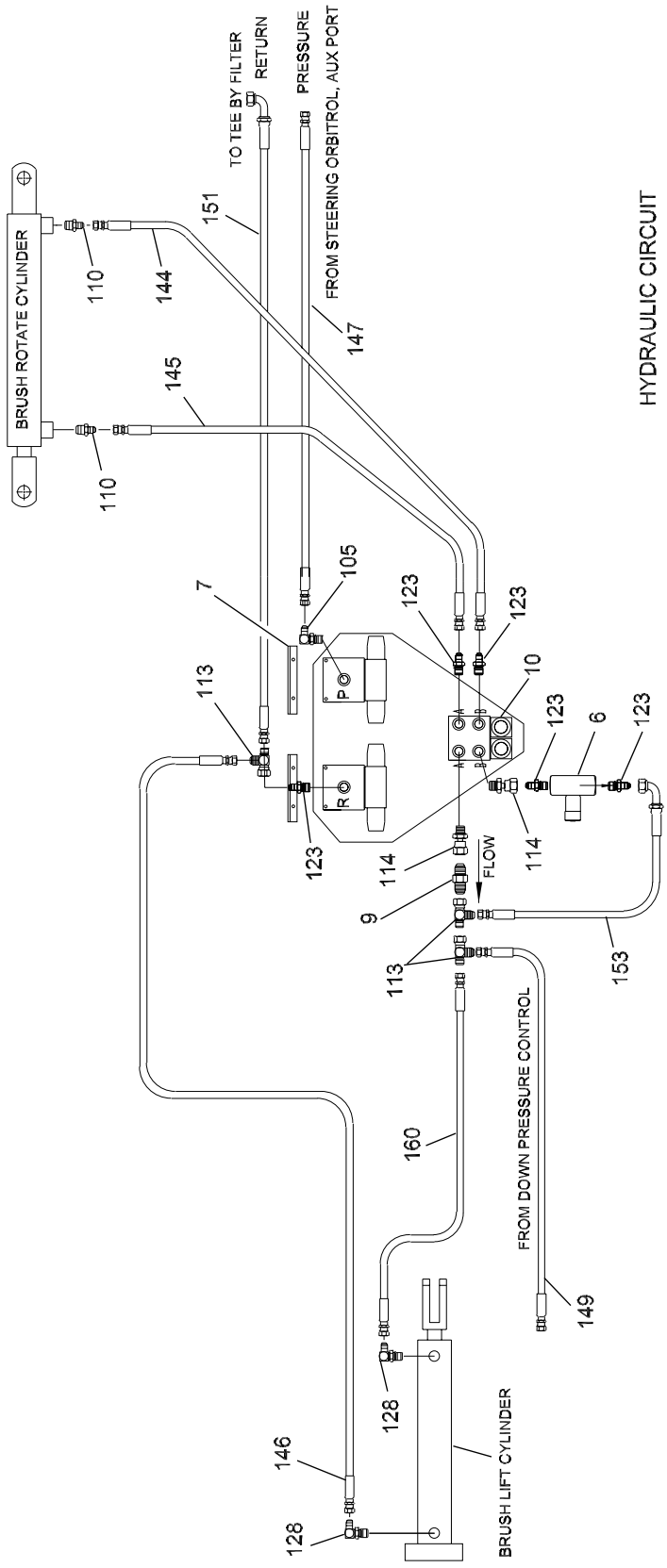


FIGURE 34. HYDRAULICS GROUP (SHEET 4 OF 4)

FIGURE 32. HYDRAULICS GROUP (PAGE 4 OF 4)

FIG ITEM	PART NUMBER	NOMENCLATURE 1 2 3 4 5 6 7	UNITS PER ASSY
32	**28394**	**HYDRAULICS GROUP**	**1**
-TBD	35465-05	•GROMMET,INSULATION,1.00ID	2
-TBD	RES1001	•HYD OIL SPECIFICATIONS	0
-4	34860	•CLAMP,HALF,HOSE,.750	2
-5	34861	•COVER PLATE,HOSE CLAMP	1
6	35552	•VLV,NEEDLE,HYDRAULIC	2
7	36648	•VLV,MOTOR	1
9	38641	•VALVE,CHECK,.375 MJ,20 PSI	1
10	38814	•MANIFOLD,HYD,2 STA,D03	1
11	983599	•MOTOR,HYD,BRUSH DRIVE	1
-14	38940	•HOSE KIT,SWEEP-PRO	1
		ATTACHING PARTS	
105	33892	••FITT,90 06MJ-06MB	7
107	34083	••FITT,90 12MJ-10MB	3
110	37297	••FITT,STR 06MJ-06MP,.078 ORF	2
113	36490	••FITT,TEE 06MJ-06FJX-06MJ	3
114	37536	••FITT,STR 06MB-06FJX	2
119	71882	••FITT,STR 12MJ-10MB	1
123	X217	••FITT,STR 06MJ-06MB	7
127	X365	••FITT,90 12MJ-12FJX	1
128	X383	••FITT,90 06MJ-06MP	2
133	38872-132	••HOSE,12,12FJ-12FJ90,3000	2
144	72550-122	••HOSE,06,06FJX-06FJX,3000	1
145	72550-128	••HOSE,06,06FJX-06FJX,3000	1
146	72550-126	••HOSE,06,06FJX-06FJX,3000	1
147	72550-109	••HOSE,06,06FJX-06FJX,3000	1
149	72549-065.5	••HOSE,06,06FJX-06RJ90,3000	1
151	72549-036	••HOSE,06,06FJX-06RJ90,3000	1
153	72549-020	••HOSE,06,06FJX-06RJ90,3000	1
160	72550-116	••HOSE,06,06FJS-06FJX,3000	1
		-----*-----	

- ITEM NOT ILLUSTRATED

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FIGURE 33. FINAL AND MISCELLANEOUS GROUPS

FIG ITEM	PART NUMBER	NOMENCLATURE 1 2 3 4 5 6 7	UNITS PER ASSY
	28400	**FINAL GROUP**	**1**
-1	33963	•ALARM,BACK UP	1
-2	38257	•DECAL,GREASE DAILY	1
-3	39141	•KIT,DECAL,RB48/SWEEPPRO	1
-4	986426	•KIT,DECAL,DECORATIVE,SEEPPRO	1
-5	730-3050	•SEAT BELT,2.00 W/HARDWARE	1
-6	35355	•PLATE,SERIAL NUMBER,ROSCO	1
-7	72062	•DECAL,DIESEL POWER,CUMMINS	2
-8	80141	•WASHER,FLAT,USS,.313	2
-9	80208	•CSHH,.312-18X1.00,GR5	2
-10	80351	•NUT,FLEXLOC,.312-18,FULL,LT	2
-11	853521158	•INDICATOR,AIR CLEANER	1
-12	81159	•TACK,DIA.146/.104X.04 GRIP LG	4
-13	951250115	•KIT,HORN	1
-14	4684102	•STRIP,ABRASIVE,4"X60'ROLL,BLK	41.5
-50	**984624**	**PAINT GROUP,SWEEPPRO**	**1**
-501	853240	•CATALYST,TOPCOAT	.88 GL
-502	853220	•PAINT,YELLOW,LEEBOY TOPCOAT	4 GL
-503	981666	•PAINT,BLACK,URETHANE,H-SOLID	.5 GL
-504	853230	•PAINT,WHITE,PRIMER	2.25 GL
-60	**28896**	**KIT,FILTER,SWEEPPRO,CUM 3.3**	**1**
-601	33291	•FILTER,FUEL,INLINE	1
-602	34464	•FILTER ELEMENT,HYD	2
-603	36643-01	•FILTER ELEMENT,AIR,PRIMARY	1
-604	38734-01	•FILTER ELEMENT,OIL	1
-605	38734-02	•FILTER ELEMENT,FUEL	1
-606	171150	•FILTER ELEMENT,AIR,SAFETY	1
-70	**28890**	**KIT,FILTER,RB48,CATERPILLAR**	**1**
-701	171150	•FILTER ELEMENT,AIR,SAFETY	1
-702	34464	•FILTER ELEMENT,HYD	2
-703	36643-01	•FILTER ELEMENT,AIR,PRIMARY	1
-704	38144-02	•FILTER ELEMENT,OIL	1
-705	38144-03	•FILTER ELEMENT,FUEL	1
-706	38217	•FILTER,FUEL,INLINE,5/16 HOSE	1
-80	**17898**	**SLOW MOVING VEHICLE SIGN**	**1**

- ITEM NOT ILLUSTRATED

ALPHABETICAL INDEX FOR ALL STANDARD AND OPTIONAL PARTS.

FOR SPECIAL FEATURES, REFER TO SUPPLEMENTS IN THE BACK OF THIS BOOK.

ALPHABETICAL INDEX

ITEM NUMBER	PART NUMBER	NOMENCLATURE	IPL PAGE NUMBER
		A	
4	986387	ADAPTER,EXHAUST,CAT	39
30	986461	ADAPTER,HOSE,1.5IDX1.25ID	33, 35
1201	983255	ADAPTER,TURBO,PERKINS 3.3	33, 35
18	38462	ADHESIVE,AEROSOL SPRAY,CAN	55, 63
18	38387	ADPTR,RUBBER 90,2.00ID	33, 35
21	38387	ADPTR,RUBBER 90,2.00ID	41
7	38830	ADPTR,RUBBER,INSERT,3.00X2.50	31, 41
5	171130	AIR CLEANER ASSY,685 #140 UP	31, 41
1	33963	ALARM,BACK UP	103
27	984206	ANGLE,BRAKE CABLE BRKT	91
47	151180	ARM,WINDSHIELD WIPER	63
101	33744	ARM,WIPER	65
11	36690R	ASSY,DOOR,LH ENTRANCE	55
10	36688-41	ASSY,DOOR,RH ENTRANCE	55
11	986175	ASSY,LF,REAR,CAT,ENG/COMP,MNT	33, 35
8	986167	ASSY,LH,FLYWHEEL,CAT,ENG,MNT	33, 35
9	986170	ASSY,RT,FLYWHEEL,CAT,ENG,MNT	33, 35
10	986172	ASSY,RT,REAR,CAT,ENG,MNT	33, 35
2	29043	AXLE ASSY,FRONT	5
7	984260	AXLE,RB48,DANA,044AA532-12	5
		B	
24	36757	BALL JOINT,LH	7
23	36756	BALL JOINT,RH	7
22	36755	BALL JOINT,STEERING CYL END	7
TBD	981637	BAR,.250X3.00X3.25 W/KEY HOLE	27
14	28818	BAR,SUPPORT	31, 41
37	33146-6	BATTERY,12V,1000 CRK AMPS	27
5403	39125	BEARING KIT, U-JOINT CROSS	15
1	35332-01	BEARING REPLACEMENT KIT	13
15	312030	BEARING,FLANGE,4-BOLT,1.50	15
102	33744-01	BLADE,WIPER	65
48	33744-01	BLADE,WIPER	63
28	36745-13	BLOWER	51
29	36745-26	BLOWER PLATE	51
11	N/A	BOLT,1/4-20	51
10	26778	BRACKET,A/C COMPRESSOR	49
3	21217	BRACKET,BRAKE LEVER	91
2	28649	BRACKET,BRAKE PEDAL/CYLINDER	93
41	29262	BRACKET,FUSE BLOCK	59
36	38653-06	BRACKET,LH COIL	51
3	25021	BRACKET,NEUTRAL SAFETY	77

ITEM NUMBER	PART NUMBER	NOMENCLATURE	IPL PAGE NUMBER
35	38653-07	BRACKET,RH COIL	51
1	28657	BRACKET,WATER TANK	19
12	33953-15	BRAKE LINE,.188X15	93
9	33953-20	BRAKE LINE,.188X20	93
14	33953-50	BRAKE LINE,.188X50	93
4	9378	BRAKE PEDAL ASSY.SHIP-OUT ONLY	93
6	983185	BRKT,THROTTLE,CABLE,CAT/PER3.3	33, 35
100	28766	BRUSH CORE GROUP	17
101	28773	BRUSH CORE,W/M,QWK CHG	17
16	28576	BRUSH COVER,W/M	15
1	28510	BRUSH FRAME,WMT SWEEP-PRO	15
17	26531	BRUSH HINGE,W/M	15
400	38806	BRUSH,TUBE,32"X90",POLY	17
500	38831	BRUSH,TUBE,32"X90",POLY/STEEL	17
1	27481	BUSHING,.334 IDX.500 OD	69
18	36688-16	BUSHING,NYLON	69
36	36688-16	BUSHING,NYLON	57
		C	
9	38653	CAB AIR COND/HEATER KIT	49
1	76003-01	CAB W/M,RH SIDE,RB48	67
2	27572	CAB,W/M LH SIDE,RB48	67
40	5804	CABLE,BATTERY,NEG,13",EYE/EYE	27
38	400020	CABLE,BATTERY,NEG,16",EYE/POST	27
39	800072	CABLE,BATTERY,POS,16",EYE/POST	27
22	852510	CABLE,BATTERY,POS,44",EYE/POST	33, 35
13	36797	CABLE,BRAKE,	91
25	983573	CABLE,PARK BRAKE,LH,BROOMS	91
26	983574	CABLE,PARK BRAKE,RH,BROOMS	91
5	33873	CABLE,PUSH/PULL,37"X1" STROKE	77
31	32939-2	CABLE,PUSH/PULL,54"X3" STROKE	77
21	36749-03	CABLE,ROTARY CONTROL	51
31	36749-04	CABLE,ROTARY CONTROL	51
6	36688-25	CAM LATCH,RH	69
6	37680	CAP W/STRAINER,HYD FILLER	45
17	35338-17	CAP,CLOSED	9
5	36105	CAP,FUEL,W/LOCK LUG	45
16	35338-16	CAP,OPEN	9
6	300010	CAP,STEERING WHEEL	75
802	38656	CAP,WATER SPRAY NOZZLE W/SEAL	19
501	853240	CATALYST,TOPCOAT	103
3	34033	CLAMP,AIR CLEANER MOUNT,6.5"ID	39
2	171100	CLAMP,AIR CLEANER MOUNT,8"ID	31, 41

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38	38534	CLAMP,CABLE,40 SERIES	77
4	34860	CLAMP,HALF,HOSE,.750	101
16	33163	CLAMP,HOSE,# 08	19
31	33164	CLAMP,HOSE,# 10	49
13	28381	CLAMP,HOSE,4.00 ID	31, 41
15	28819	CLAMP,HOSE,8.00 ID	31, 41
22	871111605	CLAMP,INSULATED BAND,1/2"	93
23	871111605	CLAMP,INSULATED BAND,1/2”	91
16	34799	CLAMP,INSULATED BAND,1-5/8"	33, 35
21	871111602	CLAMP,INSULATED BAND,3/4"	93
22	871111602	CLAMP,INSULATED BAND,3/4”	91
7	33594	CLAMP,LOOP,.25 OD,REM CUSHION	93
14	33595	CLAMP,LOOP,1.00 OD,REM CUSHION	49
46	33595	CLAMP,LOOP,1.00 OD,REM CUSHION	27
15	36894	CLAMP,LOOP,2.00 OD,PLSTC COVER	49
2	161250	CLAMP,MUFFLER 3"	29, 39
1	17670	CLAMP,NEEDLE VALVE	97
135	36745-08	CLAMP,RECEIVER DRYER	53
4	171090	CLAMP,T-BOLT,3.00 NOMINAL	31, 41
12	171190	CLAMP,T-BOLT,3.50 NOMINAL	31, 41
7	38737	CLAMP,V BAND,2.75	29
14	350050	CLEVIS,.250-28	77
14	6427	CLEVIS,.313-24 UNF W/PIN	91
38	38653-05	COIL,ASSY,EVAP.	51
37	36749-02	COIL,HEATER	51
23	36745-19	COLD CONTROL	51
120	36745-05	COMPRESSOR ASSY	53
125	36745-06	CONDENSER ASSY	53
20	28224	CONDENSER HINGE	47
12	28224	CONDENSER HINGE W/M	49
7	35338-07	CONE,BEARING	9
506	36739	CONN,1 WAY,MALE,LOCKING	83
30	33602	CONN,BUTT,16-14 GA	21
16	70953	CONN,MALE TERMINAL	89
508	70953	CONN,MALE TERMINAL	83
1	35138	CONNECTOR,SEALED,SHROUD,2-PIN	49
6	35138	CONNECTOR,SEALED,SHROUD,2-PIN	79
7	36351	CONNECTOR,SEALED,SHROUD,4-PIN	81
9	35139	CONNECTOR,SEALED,TOWER,2-PIN	89
14	36300	CONNECTOR,SEALED,TOWER,3-PIN	87
10	36352	CONNECTOR,SEALED,TOWER,4-PIN	79
15	36352	CONNECTOR,SEALED,TOWER,4-PIN	87

ITEM NUMBER	PART NUMBER	NOMENCLATURE	IPL PAGE NUMBER
11	36163	CONNECTOR,SEALED,TOWER,6-PIN	87
34	28549	CONSOLE,SIDE COVER	77
TBD	28549	CONSOLE,SIDE COVER	55
8	38820	CONTROL HANDLE,RB48	81
33	28477	CONTROL HANDLE,WIRING,RB48	77
3	35423	COOLER,HYD OIL	47
5	34861	COVER PLATE,HOSE CLAMP	101
39	36745-25	COVER,BOTTOM	51
1	28559	COVER,HYD TANK CLEANOUT	45
8	36688-08	COVER,PLASTIC	63
41	36745-29	COVER,RECIRC.	51
9	36688-09	COVER,SIDE ACCESS	59
30	36745-24	COVER,TOP	51
27	984493	CPLG,02BSPP X 02FP	33, 35
7	76014-01	CROSSBRACE,UPPER FRONT	67
6	76013-01	CROSSBRACE,UPPER REAR	67
11	81106	CSBHS,.250-20X.75,SS	69
31	81106	CSBHS,.250-20X.75,SS	61, 63
5	81106	CSBHS,.250-20X.75,SS	85
26	81277	CSBHS,.250-20X.88,SS	57
30	81282	CSBHS,.250-20X1.25,SS	55
15	81279	CSBHS,.250-20X2.00,SS	69
203	36687	CSBHS,.312-18X.75,BLACK FINISH	65
27	81280	CSBHS,.312-18X2.25,SS	69
23	81281	CSBHS,10-24X1.50,SS	63
35	80423	CSHH,.250-20X.50,GR5	77
107	80192	CSHH,.250-20X.75,GR5	65
20	80192	CSHH,.250-20X.75,GR5	93
21	80192	CSHH,.250-20X.75,GR5	77
25	80192	CSHH,.250-20X.75,GR5	49
507	80192	CSHH,.250-20X.75,GR5	89
67	80192	CSHH,.250-20X.75,GR5	57
8	80192	CSHH,.250-20X.75,GR5	45
17	80185	CSHH,.250-20X1.00,GR5	31, 41
18	81072	CSHH,.250-20X3.50,GR5	47
29	81072	CSHH,.250-20X3.50,GR5	49
508	80202	CSHH,.312-18X.50,GR5	89
13	80207	CSHH,.312-18X.75,GR5	47
36	80207	CSHH,.312-18X.75,GR5	21
9	80207	CSHH,.312-18X.75,GR5	43, 73
10	80208	CSHH,.312-18X1.00,GR5	31, 41, 73
12	80208	CSHH,.312-18X1.00,GR5	29, 39

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ROSCO
A LeeBoy Company

ITEM NUMBER	PART NUMBER	NOMENCLATURE	IPL PAGE NUMBER
2	80208	CSHH,.312-18X1.00,GR5	75
20	80208	CSHH,.312-18X1.00,GR5	91
9	80208	CSHH,.312-18X1.00,GR5	103
21	80214	CSHH,.312-18X2.25,GR5	91
19	81010	CSHH,.312-18X4.00,GR8	5
14	80219	CSHH,.375-16X.75,GR5	47
22	80219	CSHH,.375-16X.75,GR5	77
602	80219	CSHH,.375-16X.75,GR5	89
15	80221	CSHH,.375-16X1.00,GR5	47
19	80221	CSHH,.375-16X1.00,GR5	43
22	80221	CSHH,.375-16X1.00,GR5	49
4	80221	CSHH,.375-16X1.00,GR5	11
12	80224	CSHH,.375-16X1.25,GR5	43
16	80224	CSHH,.375-16X1.25,GR5	25
27	80224	CSHH,.375-16X1.25,GR5	17
23	80226	CSHH,.375-16X1.50,GR5	77
18	80230	CSHH,.375-16X2.00,GR5	49
25	80230	CSHH,.375-16X2.00,GR5	93
28	71620	CSHH,.375-16X3.00,GR5	93
13	81048	CSHH,.375-16X3.00,GR8	5
60	80882	CSHH,.375-16X4.75,GR8	55
23	71617	CSHH,.375-16X5.00,GR5	49
30	80776	CSHH,.437-14X3.00,GR5	25
45	80776	CSHH,.437-14X3.00,GR5	37
27	80790	CSHH,.437-14X3.75,GR5	93
14	80233	CSHH,.438-14X1.00,GR5	73
5	80237	CSHH,.438-14X1.50,GR5	71, 73
32	80248	CSHH,.500-13X1.00,GR5	7
39	80248	CSHH,.500-13X1.00,GR5	17
48	80250	CSHH,.500-13X1.25,GR5	17
33	71627	CSHH,.500-13X1.50,GR5	7
40	80186	CSHH,.500-13X1.75,GR5	17
26	80189	CSHH,.500-13X2.75,GR5	21
35	80189	CSHH,.500-13X2.75,GR5	17
43	80266	CSHH,.500-13X3.50,GR5	17
50	80467	CSHH,.500-13X6.00,GR5	17
29	71631	CSHH,.500-20X1.75,GR5 NF HT	5
37	71638	CSHH,.625-11X1.25,GR5	17
21	33137	CSHH,.750-10X2.50,GR5	5
35	80839	CSHH,.750-10X5.00,GR5	7
34	80295	CSHH,.750-10X5.50,GR5	17

ITEM NUMBER	PART NUMBER	NOMENCLATURE	IPL PAGE NUMBER
45	80299	CSHH,1.000-14X3.00,GR5	17
37	81184	CSHH,1.000-8X8.0,GR5	7
21	80516	CSHH,M10-1.50X30MM,CL8.8	23
38	80516	CSHH,M10-1.50X30MM,CL8.8	37
14	81009	CSHH,M12-1.75X30MM,CL8.8	5
22	81009	CSHH,M12-1.75X30MM,CL8.8	23
39	81009	CSHH,M12-1.75X30MM,CL8.8	37
103	81256	CSSBH,.312-18X1.0	17
20	80503	CSSH,.500-13X1.75	25
37	80503	CSSH,.500-13X1.75	37
6	35338-06	CUP,BEARING	9
21	36754	CYL,HYD,2.00X10.75X1.00 ROD	7
24	38922	CYL,HYD,2.00X16.O0X1.125 ROD	15
14	610110	CYL,HYD,2.00X8.00X1.00 ROD	15
		D	
24	36745-22	DECAL	51
12	38819	DECAL KIT,RB48 CONTROLS	77
7	72062	DECAL,DIESEL POWER,CUMMINS	103
3	36696	DECAL,FUSE PANEL	85
4	38504	DECAL,FUSE PANEL	85
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702	34464	FILTER ELEMENT,HYD	103
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104	33887	FITT,STR 16MJ-16MB	95
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9	28461	PIN,IDLE SHAFT	15
20	28463	PIN,LIFT	15
26	38976	PIN,SAFETY SNAP,.312,1.38 GRIP	17
22	28656	PIN,W/M,LIFT CYLINDER	15
1	33356	PIPE,BUSH,08MP-06FP,BRASS	33, 35
12	91152	PIPE,CAP,.500,GALV	19
34	91505	PIPE,COUPLING,.500,GALV	27
13	15481	PIPE,EXH,CUMMINS	29, 39
35	99834	PIPE,NIPPLE,.500XCLOSE,GALV	27

ITEM NUMBER	PART NUMBER	NOMENCLATURE	IPL PAGE NUMBER
TBD	36810	PIPE,NIPPLE,.500XCLOSE,PVC	21
TBD	39072	PIPE,PLUG,.250,HEX	45
10	99535	PIPE,PLUG,.250,SQ HEAD,MI	45
11	99538	PIPE,PLUG,.750,SQ HEAD	45
TBD	280248	PIPE,PLUG,.750,SQ HEAD	45
11	99845	PIPE,TEE,08FP,GALV	19
18	26521	PIVOT BUSHING,BRUSH FRAME	15
102	28854	PLATE,BRUSH RING	17
4	986459	PLATE,CAT,LIFT,PUMP,MNT	33, 35
14	28258	PLATE,CONSOLE	67
5	984859	PLATE,LIFT,SUPPORT,W/M	15
34	28678	PLATE,MOUNTING,WATER PUMP	19
6	35355	PLATE,SERIAL NUMBER,ROSCO	103
2	986787	PLATE,TRAVEL,CONTROL,Z-GATE	77
9	35338-09	PLUG,EXPANSION DISC	9
33	35136-1	PLUG,HOLE,.250,FLUSH MT,PLSTC	59
22	35136-21	PLUG,HOLE,.312,FLUSH MT,PLSTC	57
21	35136-3	PLUG,HOLE,.375,FLUSH MT,PLSTC	61
25	35136-19	PLUG,HOLE,.438,FLUSH MT,PLSTC	59
52	35136-4	PLUG,HOLE,.500,FLUSH MT,PLSTC	59, 63
56	35136-20	PLUG,HOLE,.562,FLUSH MT,PLSTC	59, 63
50	35136-5	PLUG,HOLE,.625,FLUSH MT,PLSTC	59, 61, 63
10	35338-10	PLUG,VENTED	9
32	38093	PORT KIT,.50 STR HOSE BARB	21
10	36809	PORT KIT,08 BARB X 90,EPDM	19
19	37587	PRE-CLEANER,4.00ID	31, 41
1	16837	PULLEY,PARK BRAKE CABLE	91
10	36642	PUMP,HYD,GEAR,1.8 CIR	25
13	36642	PUMP,HYD,GEAR,1.8 CIR	33, 35
15	37833	PUMP,HYD,PISTON,2.8 CIR	33, 35
8	37833	PUMP,HYD,PISTON,2.8 CIR	25
14	36730	PUMP,WATER,DIAPHRAM	19
3	28647	PUSHROD,BRAKE	93
		R	
401	33770	RADIATOR CAP	47
4	38784	RADIATOR,RB48 W/CUMMINS 3.3	47
1	28171	RB48 CAB,W/M,2 DOOR	55
1	21166	REAR WINDSHIELD WIPER	65
130	36745-07	RECEIVER DRYER	53
8	38106	REFRIGERANT,OIL	49
13	38105	REFRIGERANT,R134A FREON	49
19	38954	RELAY,STARTER	33, 35

ITEM NUMBER	PART NUMBER	NOMENCLATURE	IPL PAGE NUMBER
39	38535	SHIM,CABLE CLAMP,40 SERIES	77
14	81262	SHLDR SCR,.500X.625X.375-16	69
25	983285	SHROUD, FLAT REDUCING FAN	33, 35
7	36688-07	SILL,DOOR	55
3	16935	SLEEVE,STEERING CYL MOUNT	7
4	72527-01	SLIDER SET,SEAT BASE	73
80	17898	SLOW MOVING VEHICLE SIGN	103
8	35338-08	SPACER,BEARING	9
TBD	72527-03	SPACER,SEAT SLIDE,PLASTIC	73
201	37638	SPACERS,BRUSH	17
301	37638	SPACERS,BRUSH	17
6	25282	SPINDLE W/M,LH	7
7	25283	SPINDLE W/M,RH	7
4	21144	SPRAY PIPE,LH 39"	19
3	21143	SPRAY PIPE,RH	19
17	28243	STAND,STEERING CONSOLE	67
5	300030	STEERING WHEEL,17.00,36 SPLINE	75
6	36926	STRAINER ASSY	19
2	33148	STRAINER,SUCT,2NPT,25GPM,100ME	97
19	36688-49	STRIKER,EXTERNAL THREAD	61
TBD	36688-49	STRIKER,EXTERNAL THREAD	69
14	4684102	STRIP,ABRASIVE,4"X60'ROLL,BLK	103
66	33630-1	STRIPPING,EDGE,.125	59
102	28595	SUPPORT,ENG COVER GRILL	43
2	28501	SWING ARM,W/M	15
503	35426	SWITCH,DEFROSTER FAN	83
22	36745-18	SWITCH,FAN	51
140	36745-09	SWITCH,HIGH PRESSURE	53
7	39146-14	SWITCH,IGNITION,PERKINS 3.3	33, 35
8	39140-8	SWITCH,KEY,OFF-ON-(ON)	83
170	36745-34	SWITCH,LOW PRESSURE	53
6	39083	SWITCH,PRESS,2-6 PSI,N/O,02MP	25
24	951091224	SWITCH,SAFETY START	91
4	37941	SWITCH,SNAP ACTING,W/ROLLER	77
6	32131	SWITCH,STOP LAMP,HYD TYPE,NO	93
30	851391	SWITCH,TOGGLE,SPST,2-POS	77
104	853090	SWITCH,WIPER/WASHER (3000)	65
27	853090	SWITCH,WIPER/WASHER (3000)	59
		T	
3	39140-3	TACHOMETER	83
12	81159	TACK,DIA.146/.104X.04 GRIP LG	103
2	28562	TANK W/M,FUEL,30GAL/HYD,25GAL	45

ALPHABETICAL INDEX

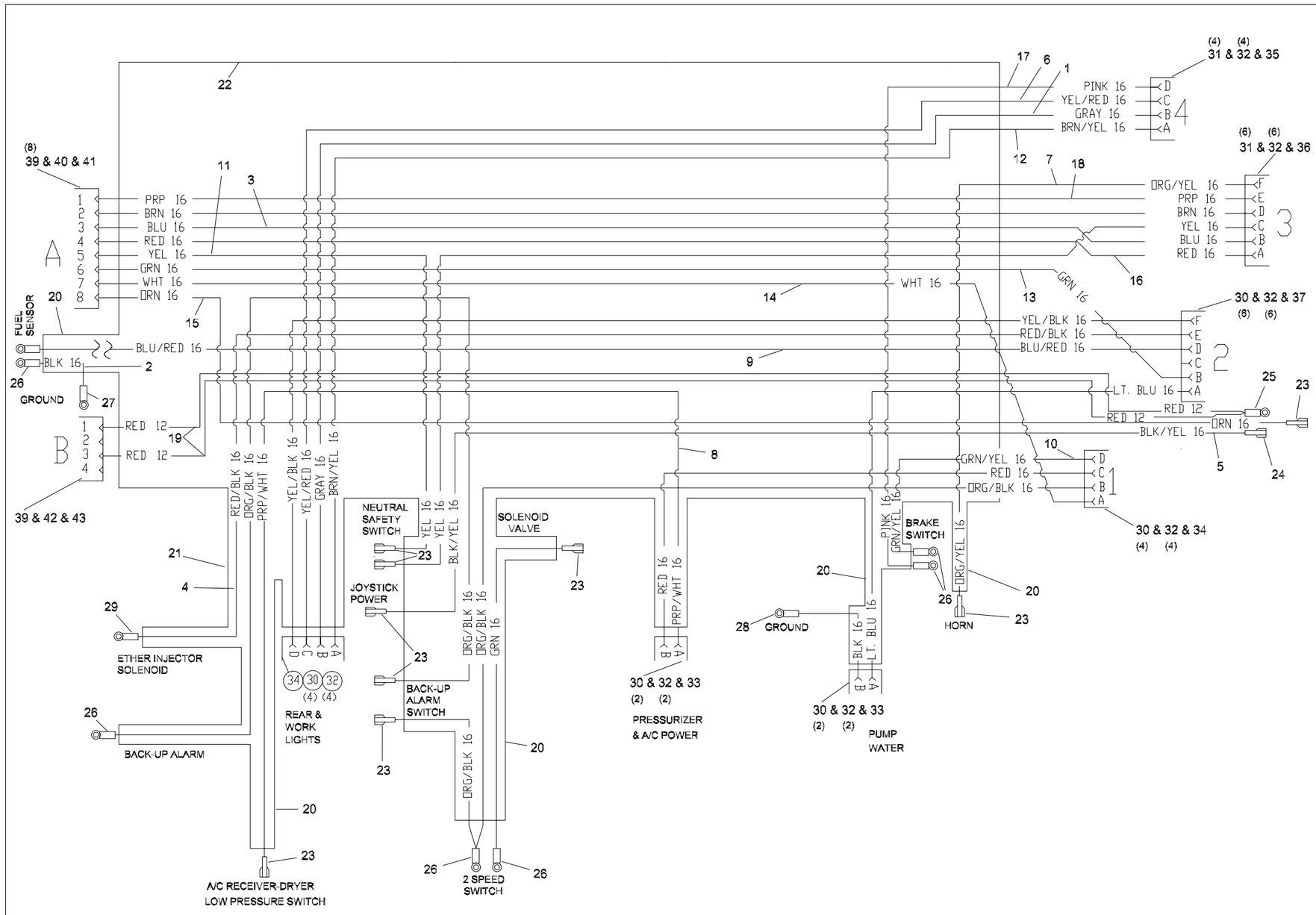
ITEM NUMBER	PART NUMBER	NOMENCLATURE	IPL PAGE NUMBER
2	38884	TANK,WATER,75GAL,PLAST,SWEEPPR	19
10	33600	TERM,PUSH-ON,.25,FEM,16-14 GA	87
14	36349	TERM,PUSH-ON,.25,FEM,18-14,SLV	89
6	36349	TERM,PUSH-ON,.25,FEM,18-14,SLV	81
12	36348	TERM,PUSH-ON,.25,M,18-14,SLV	79
5	36348	TERM,PUSH-ON,.25,M,18-14,SLV	81
505	36348	TERM,PUSH-ON,.25,M,18-14,SLV	83
17	72135	TERM,RING,12-10 GA,.500 STUD	89
19	851390204	TERM,RING,16-14 GA,#10 STUD	89
509	851390204	TERM,RING,16-14 GA,#10 STUD	83
2	33607	TERM,RING,16-14 GA,.250 STUD	81
29	33607	TERM,RING,16-14 GA,.250 STUD	21
11	36165	TERM,SEALED CONN,16-14 GA,FEM	89
12	36165	TERM,SEALED CONN,16-14 GA,FEM	87
8	36165	TERM,SEALED CONN,16-14 GA,FEM	79
3	36164	TERM,SEALED CONN,16-14 GA,MALE	49, 81
7	36164	TERM,SEALED CONN,16-14 GA,MALE	79
13	37982	TETHER KIT,12.0	73
5	33596	TIE WRAP,.188X7.500	79
1501	33799	TIRE VALVE,TUBELESS,.453,1.25	7
601	33799	TIRE VALVE,TUBELESS,.453,1.25	5
1502	35342	TIRE,RADIAL,ST225/75-R15,C	7
602	35342	TIRE,RADIAL,ST225/75-R15,C	5
5	28495	TOP HINGE W/M, RB48 ENG DOOR	43
22	983286	TUBE, AIR INTAKE PERKINS	41
26	983286	TUBE, AIR INTAKE PERKINS	33, 35
6	28141	TUBE,AIR INTAKE,MODIFIED	31, 41
1	986487	TUBE,FLEX,2.50IDX45.00	39
1	982979	TUBE,FLEX,EXHAUST,2.5IDX27.50	29
9	20727	TUBE,TIE ROD	7
		U	
5	35077	U-BOLT,.250-20,1.00IW,1.75IL	19
5	35339	U-BOLT,AXLE MOUNT	5
		V	
11	38842	V BELT,4L 39.00X.500	49
9	38641	VALVE,CHECK,.375 MJ,20 PSI	101
15	36883	VALVE,CHECK,.500 HB,5 PSI,POLY	19
19	910150	VALVE,DRAIN COCK,.250 NPT	47
47	35546	VALVE,HEATER SHUT OFF	33, 35
13	38937	VALVE,SOLENOID,HYD,2-WAY	97
165	36745-32	VALVE,THERMAL EXPANSION	53
34	36749-01	VALVE,WATER	51

ITEM NUMBER	PART NUMBER	NOMENCLATURE	IPL PAGE NUMBER
2	35546	VLV,HEATER SHUTOFF	49
15	72149	VLV,HYD,SOL,3 WAY,06 ORB PORTS	95
7	36648	VLV,MOTOR	97, 99, 101
6	35552	VLV,NEEDLE,HYDRAULIC	97, 101
2	39140-2	VOLTMETER	83
		W	
200	6375P	WAFER,POLY,10X32,W/SPACERS	17
300	6375S	WAFER,STL,10X32,W/SPACERS	17
204	36753	WASHER NOZZLE & TEE KIT	65
69	36073	WASHER,.80X3.25X.188THICK	55
6	N/A	WASHER,EXT. TOOTH	51
21	81278	WASHER,FLAT,.250X1.00,SS	69
39	81278	WASHER,FLAT,.250X1.00,SS	57, 61
12	N/A	WASHER,FLAT,1/4-20	51
11	80963	WASHER,FLAT,SAE,.312	31, 41
16	80963	WASHER,FLAT,SAE,.312	47
13	80996	WASHER,FLAT,SAE,.375	43
17	80996	WASHER,FLAT,SAE,.375	47
15	81155	WASHER,FLAT,SAE,.375,HARDENED	23, 25
17	81141	WASHER,FLAT,SAE,.500,HARDENED	23
34	81141	WASHER,FLAT,SAE,.500,HARDENED	37
9	81201	WASHER,FLAT,SAE,.625,HARDENED	5
30	81154	WASHER,FLAT,SAE,.750,HARDENED	7
22	80995	WASHER,FLAT,USS,#10	21
41	80995	WASHER,FLAT,USS,#10	77
29	81188	WASHER,FLAT,USS,#6	77
32	81006	WASHER,FLAT,USS,.188	49
106	80140	WASHER,FLAT,USS,.250	65
20	80140	WASHER,FLAT,USS,.250	21, 77
26	80140	WASHER,FLAT,USS,.250	49
36	80140	WASHER,FLAT,USS,.250	77
504	80140	WASHER,FLAT,USS,.250	89
70	80140	WASHER,FLAT,USS,.250	57
10	80141	WASHER,FLAT,USS,.313	29, 39
11	80141	WASHER,FLAT,USS,.313	43, 73
18	80141	WASHER,FLAT,USS,.313	91
206	80141	WASHER,FLAT,USS,.313	65
35	80141	WASHER,FLAT,USS,.313	21
505	80141	WASHER,FLAT,USS,.313	89
8	80141	WASHER,FLAT,USS,.313	103
12	80142	WASHER,FLAT,USS,.375	45
20	80142	WASHER,FLAT,USS,.375	43

ITEM NUMBER	PART NUMBER	NOMENCLATURE	IPL PAGE NUMBER
21	80142	WASHER,FLAT,USS,.375	49
24	80142	WASHER,FLAT,USS,.375	93
28	80142	WASHER,FLAT,USS,.375	17
3	80142	WASHER,FLAT,USS,.375	11
58	80142	WASHER,FLAT,USS,.375	61
603	80142	WASHER,FLAT,USS,.375	89
15	80143	WASHER,FLAT,USS,.438	73
6	80143	WASHER,FLAT,USS,.438	71, 73
24	80144	WASHER,FLAT,USS,.500	21
4	80144	WASHER,FLAT,USS,.500	71
49	80144	WASHER,FLAT,USS,.500	17
16	80147	WASHER,FLAT,USS,.750	5
32	80147	WASHER,FLAT,USS,.750	17
46	80149	WASHER,FLAT,USS,1.000	17
23	871071601	WASHER,LOCK,#10	21
49	871071601	WASHER,LOCK,#10	63
10	80160	WASHER,LOCK,.250	47
18	80160	WASHER,LOCK,.250	93
19	80160	WASHER,LOCK,.250	21
27	80160	WASHER,LOCK,.250	49
29	80160	WASHER,LOCK,.250	69
6	80160	WASHER,LOCK,.250	85
7	80160	WASHER,LOCK,.250	45
10	80161	WASHER,LOCK,.312	43
11	80161	WASHER,LOCK,.312	29, 39, 47
19	80161	WASHER,LOCK,.312	91
506	80161	WASHER,LOCK,.312	89
9	80161	WASHER,LOCK,.312	31, 41
12	80162	WASHER,LOCK,.375	47
13	80162	WASHER,LOCK,.375	25, 45
14	80162	WASHER,LOCK,.375	43
19	80162	WASHER,LOCK,.375	93
20	80162	WASHER,LOCK,.375	49
29	80162	WASHER,LOCK,.375	17
28	80163	WASHER,LOCK,.437	27
43	80163	WASHER,LOCK,.437	37
14	80164	WASHER,LOCK,.500	25
25	80164	WASHER,LOCK,.500	21
30	80164	WASHER,LOCK,.500	5
33	80164	WASHER,LOCK,.500	37
41	80164	WASHER,LOCK,.500	17
36	80166	WASHER,LOCK,.625	17

NOTES:

ILLUSTRATED PARTS LIST

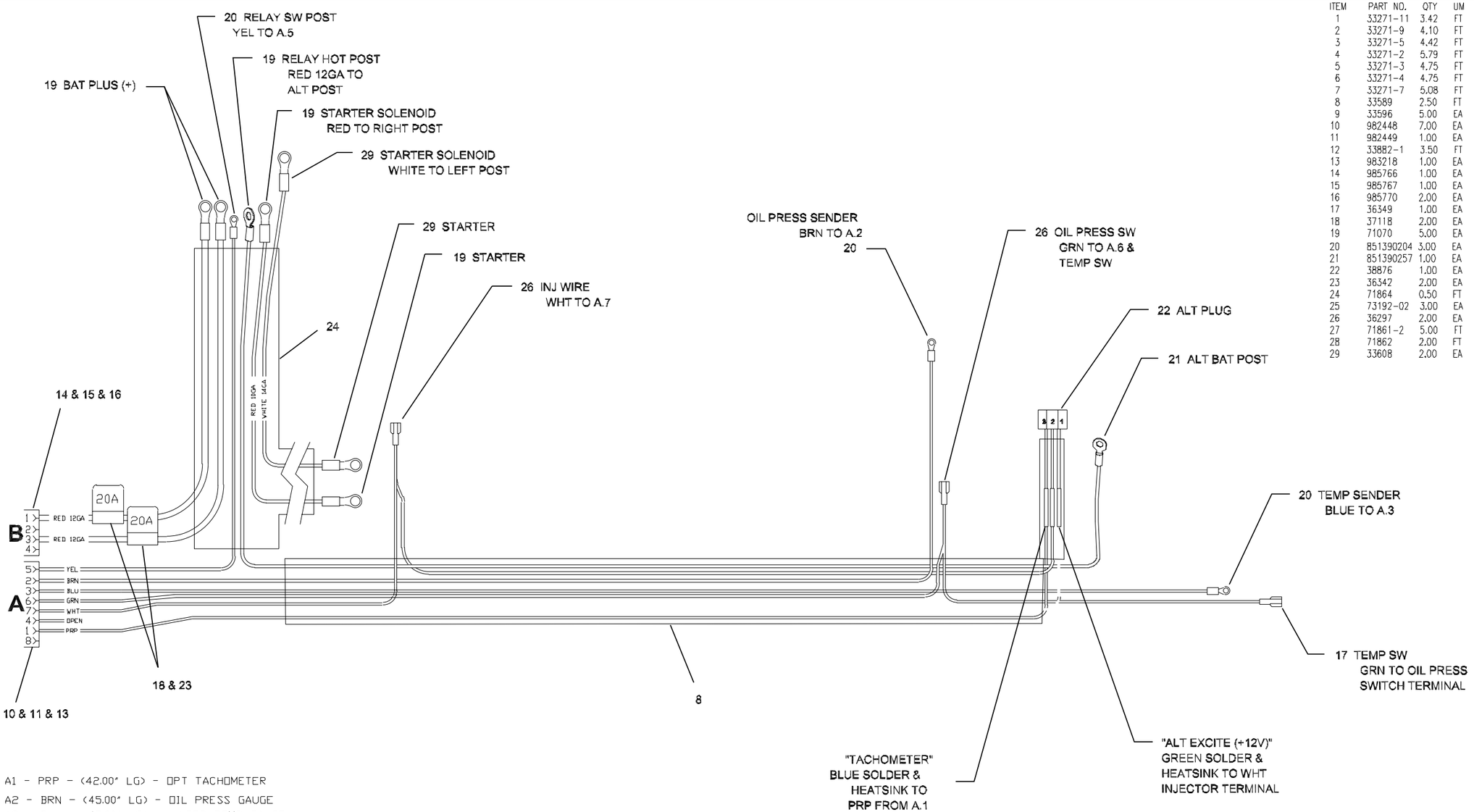


ITEM	PART #	QTY	UM	DESCRIPTION
1	33271-0	11.75	FT	WIRE,16GA,GRAY
2	33271-1	7.25	FT	WIRE,16GA,BLACK
3	33271-11	19.5	FT	WIRE,16GA,BLUE
4	33271-12	13.5	FT	WIRE,16GA,RED,BLACK STRIPE
5	33271-13	11.75	FT	WIRE,16GA,BLK,YELLOW STRIPE
6	33271-14	11.75	FT	WIRE,16GA,YELLOW,RED STRIPE
7	33271-15	4.5	FT	WIRE,16GA,BR,YELLOW STRIPE
8	33271-16	15	FT	WIRE,16GA,PRPL,WHITE STRIPE
9	33271-18	15.75	FT	WIRE,16GA,BLUE,RED STRIPE
10	33271-19	4.25	FT	WIRE,16GA,GRN,YELLOW STRIPE
11	33271-2	26.5	FT	WIRE,16GA,YELLOW
12	33271-3	21	FT	WIRE,16GA,BROWN
13	33271-4	16.75	FT	WIRE,16GA,GREEN
14	33271-5	9	FT	WIRE,16GA,WHITE
15	33271-6	31	FT	WIRE,16GA,ORANGE
16	33271-7	3	FT	WIRE,16GA,RED
17	33271-8	4.5	FT	WIRE,16GA,PINK
18	33271-9	9.25	FT	WIRE,16GA,PURPLE
19	71861-2	10.25	FT	WIRE,10GA,RED
20	71060	38.25	FT	LOOM,SPLIT,CONVOLUTED,.250
21	71864	3	FT	LOOM,SPLIT,CONVOLUTED,.375
22	71870	8.75	FT	LOOM,SPLIT,CONVOLUTED,.750
23	36349	9	EA	TERM,PUSH-ON,.25,FEM,16-14,SLV
24	36297	1	EA	TERM,PUSH-ON,.25,FEM,12-10,SLV
25	33620	1	EA	TERM,RING,12-10 GA,#10 STUD
26	851390204	7	EA	TERM,RING,16-14 GA,#10 STUD
27	33609	1	EA	TERM,RING,16-14 GA,.375 STUD
28	33607	1	EA	TERM,RING,16-14 GA,.250 STUD
29	35123	1	EA	TERM,RING,16-14 GA,#6 STUD
30	36164	18	EA	TERM,SEALED CONN,16-14 GA,MA
31	36165	10	EA	TERM,SEALED CONN,16-14 GA,FEM
32	36166	28	EA	SEAL,CABLE,18-16 GA,GREEN
33	35138	2	EA	CONN,SEALED,SHROUD,2-PIN
34	36351	2	EA	CONN,SEALED,SHROUD,4-PIN
35	36352	1	EA	CONN,SEALED,TOWER,4-PIN
36	36163	1	EA	CONN,SEALED,TOWER,6-PIN
37	36162	1	EA	CONN,SEALED,SHROUD,6-PIN
38	33596	22	EA	TIE WRAP,.188X7.500
39	982456	9	EA	TERM,PIN,DEUTSCH,14-16AWG
40	983216	1	EA	CONN,WEDGE,RECP,8P,DEUTSCH
41	983204	1	EA	CONN,SOC,DT04-6P,DEUTSCH
42	985768	1	EA	CONN,WEDGE,SOC,4P,DTP,DEUT
43	985765	1	EA	CONN,SOC,DTP-4P,DEUTSCH

NOTES:
1. TAPE ALL LOOM ENDS AND TEES WITH BLACK ELECTRICAL TAPE AND TIE WRAPS (ITEM 38).
2. WHEN REDUCING, LAY SMALLER LOOM INSIDE LARGER LOOM FOR A LENGTH OF 2.50".
3. AT TEES, SPLIT BRANCHING LOOM ON SIDE OPPOSITE EXISTING SPLIT FOR 2.50" AND RESULTING STRIPS INSIDE MAIN LOOM BEFORE TAPING AND TIE WRAPPING.
4. USE BRAIDED LOOM IN PLACE OF CONVOLUTED LOOM PROVIDED THERE IS LITTLE OR NO DIFFERENCE IN COST.
5. USE SMALLEST SIZE OF LOOM IN ALL CASES. PRINT MAY BE OVERLY GENEROUS IN LOOM SIZES.

986179 REV. B
MAIN HARNESS

SHEET 1 OF 1



ITEM	PART NO.	QTY	UM	DESCRIPTION
1	33271-11	3.42	FT	WIRE,16GA,BLUE
2	33271-9	4.10	FT	WIRE,16GA,PURPLE
3	33271-5	4.42	FT	WIRE,16GA,WHITE
4	33271-2	5.79	FT	WIRE,16GA,YELLOW
5	33271-3	4.75	FT	WIRE,16GA,BROWN
6	33271-4	4.75	FT	WIRE,16GA,GREEN
7	33271-7	5.08	FT	WIRE,16GA,RED
8	33589	2.50	FT	LOOM,SPLIT,CONVOLUTED,.500
9	33596	5.00	EA	TIE WRAP,.188X7.5
10	982448	7.00	EA	TERM,SOC,DEUTSCH,14-16AWG
11	982449	1.00	EA	CONN,SOC,DEUTSCH,8P,TYPE A
12	33882-1	3.50	FT	WIRE,12GA,RED
13	983218	1.00	EA	CONN,WEDGE,PLUG,8P,DEUTSCH
14	985766	1.00	EA	CONN,PLUG,4P,DTP,DEUTSCH
15	985767	1.00	EA	CONN,WEDGE,PLUG,4P,DTP,DEUTSCH
16	985770	2.00	EA	TERM,SOC,DTP,10 GA
17	36349	1.00	EA	TERM,PUSH-ON,.25,FEM,18-14,SLV
18	37118	2.00	EA	FUSE HOLDER,IN-LINE,BLADE,SEAL
19	71070	5.00	EA	TERM,RING,12-10 GA,.312 STUD
20	851390204	3.00	EA	TERM,RING,16-14 GA,#10 STUD
21	851390257	1.00	EA	TERM,RING,12-10 GA,.250 STUD
22	38876	1.00	EA	HARNESS,ALTERNATOR,3.3CUMMINS
23	36342	2.00	EA	FUSE,BLADE,20AMP,ATC-20
24	71864	0.50	FT	LOOM,SPLIT,CONVOLUTED,.375
25	73192-02	3.00	EA	PLUG,CAVITY,DEUTSCH CONN
26	36297	2.00	EA	TERM,PUSH-ON,.25,FEM,10-12GA
27	71861-2	5.00	FT	WIRE,10GA,RED
28	71862	2.00	FT	WIRE,14GA,WHITE
29	33608	2.00	EA	TERM,RING,16-14GA,.312 STUD

A1 - PRP - (42.00" LG) - OPT TACHOMETER
A2 - BRN - (45.00" LG) - OIL PRESS GAUGE
A3 - BLU - (45.00" LG) - WATER TEMP GAUGE
A4 - OPEN
A5 - YEL - (20.00 " LG) - START RELAY
A6 - GRN - (40.00" & 28.00" LG) - WARNING SYSTEM
A7 - WHT - (18.00" LG) - IGNITION SWITCH
A8 - NOT USED - PLUG

B1 - RED 12GA - (20.00"LG) - BATTERY TERM IGN SW
B2 - NOT USED - PLUG
B3 - RED 12GA - (20.00" LG) - FOR LIGHTS
B4 - NOT USED - PLUG

986305 REV. B
CUMMINS 3.3 ENGINE HARNESS

SHEET 1 OF 1

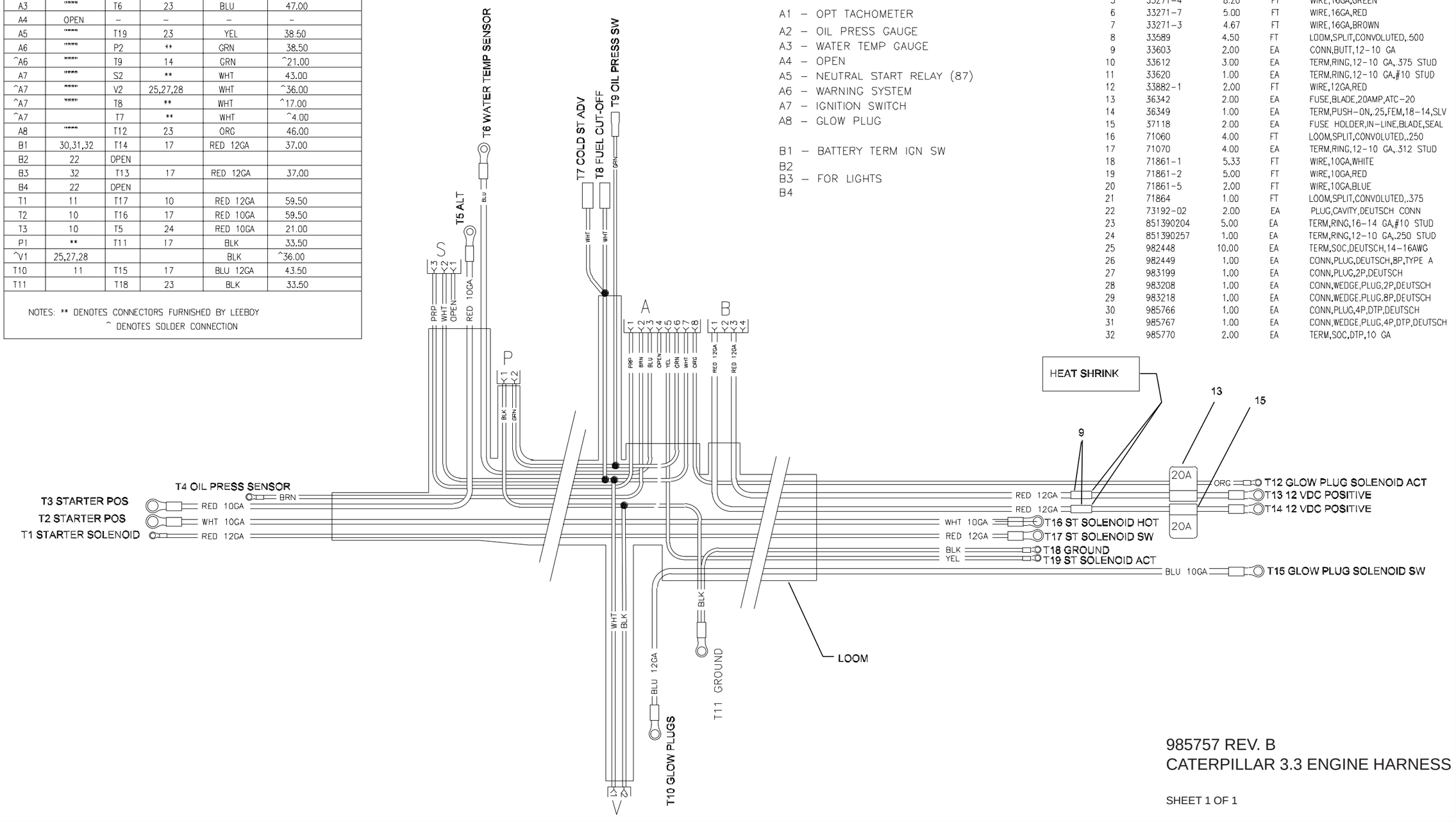
CONN/TERM				COLOR	WIRE
FROM	ITEM NO	TO	ITEM NO	WIRE	LENGTH INCH
A1	25,26,29	S3	**	PRP	43.00
A2	""	T4	23	BRN	41.50
A3	""	T6	23	BLU	47.00
A4	OPEN	–	–	–	–
A5	""	T19	23	YEL	38.50
A6	""	P2	**	GRN	38.50
^A6	""	T9	14	GRN	^21.00
A7	""	S2	**	WHT	43.00
^A7	""	V2	25,27,28	WHT	^36.00
^A7	""	T8	**	WHT	^17.00
^A7		T7	**	WHT	^4.00
A8	""	T12	23	ORG	46.00
B1	30,31,32	T14	17	RED 12GA	37.00
B2	22	OPEN			
B3	32	T13	17	RED 12GA	37.00
B4	22	OPEN			
T1	11	T17	10	RED 12GA	59.50
T2	10	T16	17	RED 10GA	59.50
T3	10	T5	24	RED 10GA	21.00
P1	**	T11	17	BLK	33.50
^V1	25,27,28			BLK	^36.00
T10	11	T15	17	BLU 12GA	43.50
T11		T18	23	BLK	33.50

NOTES: ** DENOTES CONNECTORS FURNISHED BY LEEBOY
^ DENOTES SOLDER CONNECTION

A1 – OPT TACHOMETER
A2 – OIL PRESS GAUGE
A3 – WATER TEMP GAUGE
A4 – OPEN
A5 – NEUTRAL START RELAY (87)
A6 – WARNING SYSTEM
A7 – IGNITION SWITCH
A8 – GLOW PLUG

B1 – BATTERY TERM IGN SW
B2
B3 – FOR LIGHTS
B4

ITEM	PART NO	QTY	UOM	DESCRIPTION
1	33271-11	5.50	FT	WIRE,16GA,BLUE
2	33271-9	5.00	FT	WIRE,16GA,PRUPLE
3	33271-5	4.67	FT	WIRE,16GA,WHITE
4	33271-2	2.00	FT	WIRE,16GA,YELLOW
5	33271-4	8.20	FT	WIRE,16GA,GREEN
6	33271-7	5.00	FT	WIRE,16GA,RED
7	33271-3	4.67	FT	WIRE,16GA,BROWN
8	33589	4.50	FT	LOOM,SPLIT,CONVOLUTED,.500
9	33603	2.00	EA	CONN,BUTT,12-10 GA
10	33612	3.00	EA	TERM,RING,12-10 GA,.375 STUD
11	33620	1.00	EA	TERM,RING,12-10 GA,#10 STUD
12	33882-1	2.00	FT	WIRE,12GA,RED
13	36342	2.00	EA	FUSE,BLADE,20AMP,ATC-20
14	36349	1.00	EA	TERM,PUSH-ON,.25,FEM,18-14,SLV
15	37118	2.00	EA	FUSE HOLDER,IN-LINE,BLADE,SEAL
16	71060	4.00	FT	LOOM,SPLIT,CONVOLUTED,.250
17	71070	4.00	EA	TERM,RING,12-10 GA,.312 STUD
18	71861-1	5.33	FT	WIRE,10GA,WHITE
19	71861-2	5.00	FT	WIRE,10GA,RED
20	71861-5	2.00	FT	WIRE,10GA,BLUE
21	71864	1.00	FT	LOOM,SPLIT,CONVOLUTED,.375
22	73192-02	2.00	EA	PLUG,CAVITY,DEUTSCH CONN
23	851390204	5.00	EA	TERM,RING,16-14 GA,#10 STUD
24	851390257	1.00	EA	TERM,RING,12-10 GA,.250 STUD
25	982448	10.00	EA	TERM,SOC,DEUTSCH,14-16AWG
26	982449	1.00	EA	CONN,PLUG,DEUTSCH,8P,TYPE A
27	983199	1.00	EA	CONN,PLUG,2P,DEUTSCH
28	983208	1.00	EA	CONN,WEDGE,PLUG,2P,DEUTSCH
29	983218	1.00	EA	CONN,WEDGE,PLUG,8P,DEUTSCH
30	985766	1.00	EA	CONN,PLUG,4P,DTP,DEUTSCH
31	985767	1.00	EA	CONN,WEDGE,PLUG,4P,DTP,DEUTSCH
32	985770	2.00	EA	TERM,SOC,DTP,10 GA

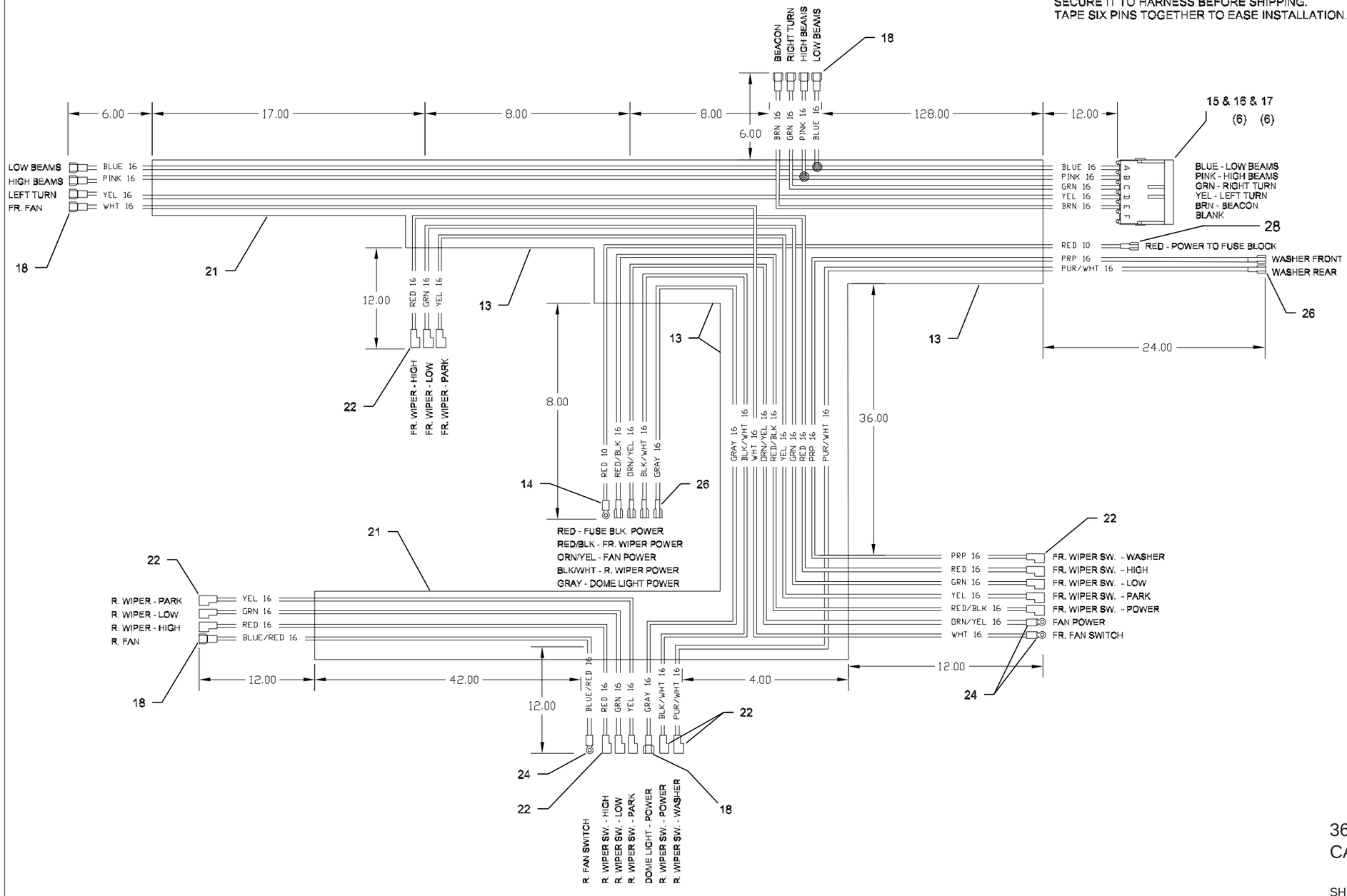


985757 REV. B
CATERPILLAR 3.3 ENGINE HARNESS

SHEET 1 OF 1

NOTE: DO NOT CONNECT SIX PIN SHROUD TO HARNESS.
SECURE IT TO HARNESS BEFORE SHIPPING.
TAPE SIX PINS TOGETHER TO EASE INSTALLATION.

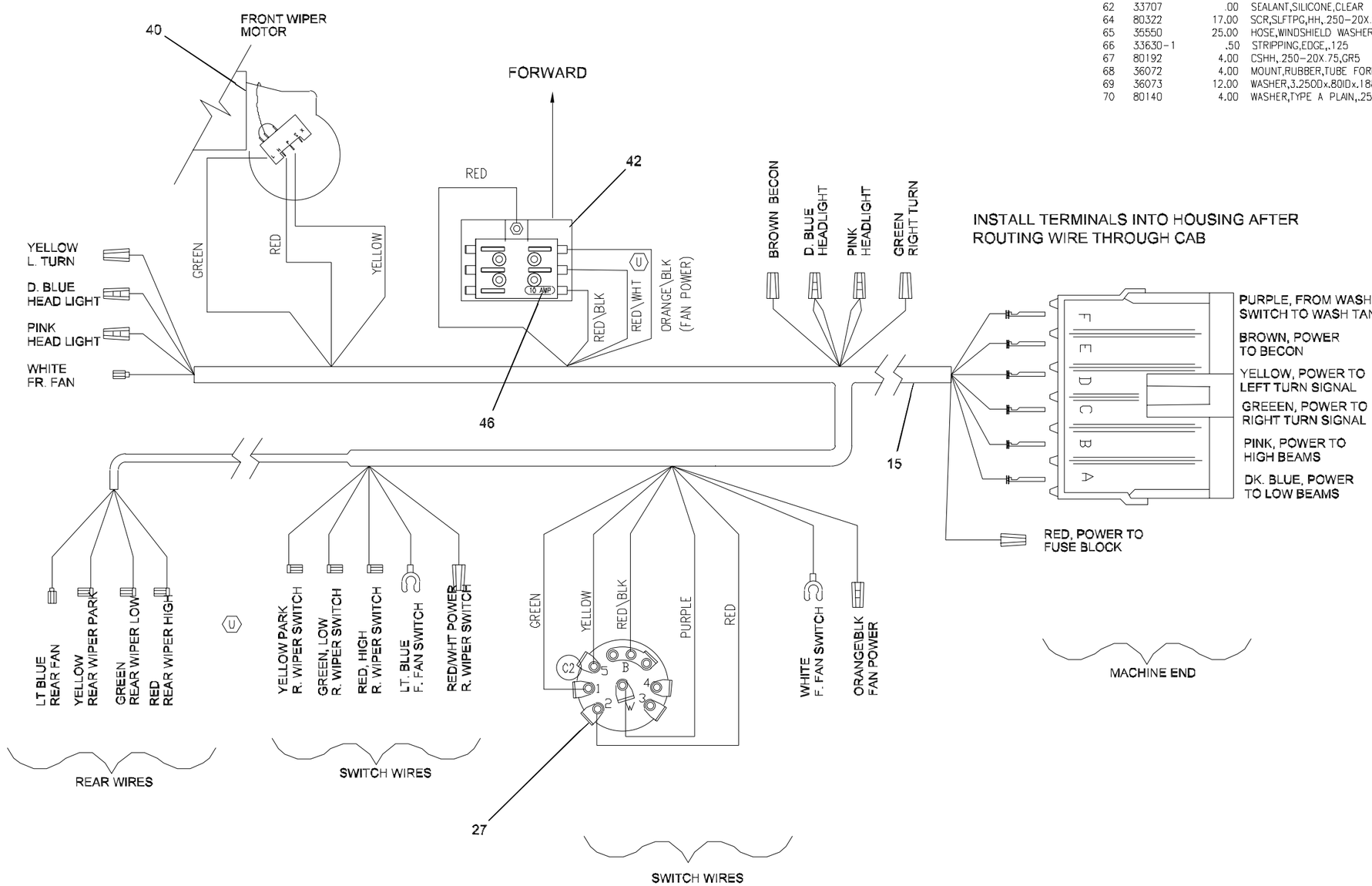
Item	Part No.	Qty	Description
1	33271-2	20.42	WIRE,16 GA,YELLOW
2	33271-3	12.16	WIRE,16 GA,BROWN
3	33271-4	17.66	WIRE,16 GA,GREEN
4	33271-5	7.25	WIRE,16 GA,WHITE
5	33271-7	11.83	WIRE,16 GA,RED
6	33271-8	15.41	WIRE,16 GA,PINK
7	33271-9	15.67	WIRE,16 GA,PURPLE
8	33271-11	15.41	WIRE,16 GA,BLUE
9	33271-12	5.00	WIRE,16 GA,RED/BLACK STRIPE
10	33271-17	5.33	WIRE,16 GA,WHITE/BLACK STRIPE
11	33271-18	5.50	WIRE,16 GA,BLUE/RED STRIPE
12	33271-21	5.33	WIRE,16 GA,ORANGE/YEL STRIPE
13	33589	15.00	LOOM,SPLIT,CONVOLUTED,.500
14	33620	1.00	TERM.RING,12-10 GA,#10 STUD
15	36162	1.00	CONNECTOR,SEALED,SHROUD,6-PIN
16	36164	6.00	TERM,SEALED CONN,16-14 GA,MALE
17	36166	6.00	SEAL,CABLE,18-16 GA
18	36348	10.00	TERM,PUSH-ON,.25,M.18-14,SLV
21	71864	5.25	LOOM,SPLIT,CONVOLUTED,.375
22	72997	16.00	TERM,PUSH-ON,.25,FEM,16-14G,90
23	851201417	15.00	TIE WRAP,.094X4.00
24	851390204	3.00	TERM,RING,16-14 GA,#10 STUD
25	33271-0	5.33	WIRE,16 GA,GRAY
26	36349	6.00	TERM,PUSH-ON,.25,FEM,18-14,SLV
27	33271-16	17.00	WIRE,16 GA,PURPLE/WHITE STRIPE
28	36297	1.00	TERM.PUSH-ON,.25,FEM.12-10,SLV



36688-13 REV. D
CAB HARNESS

SHEET 1 OF 1

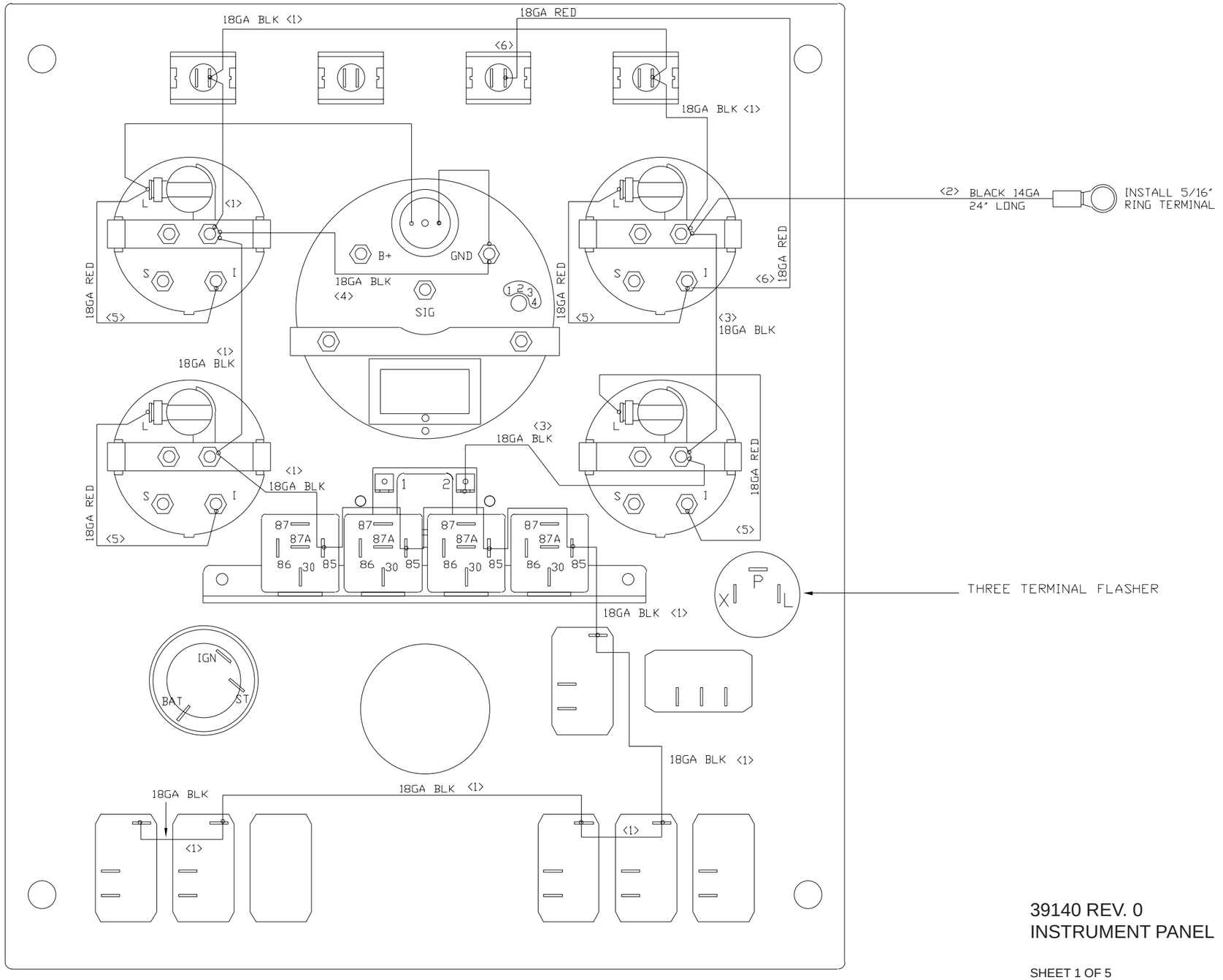
USE 4 AMP FUSE WITH OPTIONAL REAR WIPER MOTOR.
USE 4 AMP FUSE WITH ONE DEFROSTER FAN,
USE 10 AMP FUSE WITH 2 DEFROSTER FANS.
USE 10 AMP FUSE WITH FRONT WIPER MOTOR.



Item	Part No.	Qty	Description
51	38593	1.00	DECAL,WARNING,ROPS
52	35136-4	2.00	PLUG,HOLE,.500,FLUSH MT,PLSTC
54	36688-52	3.00	NUT,CENTERLOCK,.438-14
56	35136-20	2.00	PLUG,HOLE,.562,FLUSH MT,PLSTC
58	80142	3.00	WASHER,TYPE A PLAIN,.375
59	36688-34	2.00	DOOR HOLD
60	80882	4.00	CSHH,.375-16X4.75,GR8
61	80352	4.00	NUT,FLEXLOC,.375-16,FULL,LT
62	33707	.00	SEALANT,SILICONE,CLEAR
64	80322	17.00	SCR,SLFTPG,HH,.250-20X.50
65	35550	25.00	HOSE,WINDSHIELD WASHER .188ID
66	33630-1	.50	STRIPPING,EDGE,.125
67	80192	4.00	CSHH,.250-20X.75,GR5
68	36072	4.00	MOUNT,RUBBER,TUBE FORM
69	36073	12.00	WASHER,3.250Dx.80IDx.188T
70	80140	4.00	WASHER,TYPE A PLAIN,.250
1	28171	1.00	RB48 CAB,W/M,2 DOOR
4	36688-04	1.00	GLASS,FRONT WINDOW
5	36688-02	2.00	GLASS,SIDE WINDOW
6	36688-05	1.00	GLASS,REAR WINDOW
7	36688-07	2.00	SILL,DOOR
8	36688-08	3.00	COVER,PLASTIC
9	36688-09	1.00	COVER,SIDE ACCESS
10	36688-41	1.00	DOOR ASSY,ENTRANCE,RH
11	36690R	1.00	ASSY,LEFT ENTRANCE DOOR
13	28342	1.00	FLOOORMAT,RB48
14	36688-12	1.00	HEADLINER
15	36688-13	1.00	WIRE HARNESS
16	36688-14	2.00	FOAM,RIGHT SIDE
17	36688-15	1.00	FOAM,REAR PANEL
18	38462	.17	ADHESIVE,AEROSOL SPRAY,CAN
19	36688-49	2.00	STRIKER,EXTERNAL THREAD
20	80824	3.00	NUT,HEX,#10-24
21	35136-3	2.00	PLUG,HOLE,.375,FLUSH MT,PLSTC
22	35136-21	2.00	PLUG,HOLE,.312,FLUSH MT,PLSTC
23	81281	2.00	CSBHS,10-24X1.50,SS
24	81275	18.00	NUT,ACORN,.250-20,SS
25	35136-19	1.00	PLUG,HOLE,.438,FLUSH MT,PLSTC
26	81277	18.00	CSBHS,.250-20X.88,SS
27	853090	1.00	SWITCH,WIPER/WASHER
29	80350	5.00	NUT,FLEXLOC,.250-20,FULL,LT
30	81282	6.00	CSBHS,.250-20X1.25,SS
31	81106	6.00	CSBHS,.250-20X.75,SS
33	35136-1	1.00	PLUG,HOLE,.250,FLUSH MT,PLSTC
35	36688-43	6.00	FASTENER,X-MAS TREE,1.00 IN
36	36688-16	18.00	BUSHING,NYLON
37	36688-17	18.00	GROMMET,.250
38	36688-18	44.00	SEAL,WINDOW
39	81278	20.00	WASHER,.250,1.00 OD,SS
40	151170	1.00	WIPER MOTOR
41	29262	1.00	BRACKET,FUSE BLOCK
42	36695	1.00	FUSE BLOCK,BLADE-TYPE,6 POS
43	36688-54	3.00	GROMMET,.94ID,1.12HOLE,SNAP IN
46	36340	1.00	FUSE,BLADE,10AMP,ATC-10
47	151180	1.00	WIPER ARM,BLACK,16 IN.
48	33744-01	1.00	WIPER BLADE,16 IN.
49	871071601	6.00	WASHER,SPLIT LOCK,#10
50	35136-5	7.00	PLUG,HOLE,.625,FLUSH MT,PLSTC

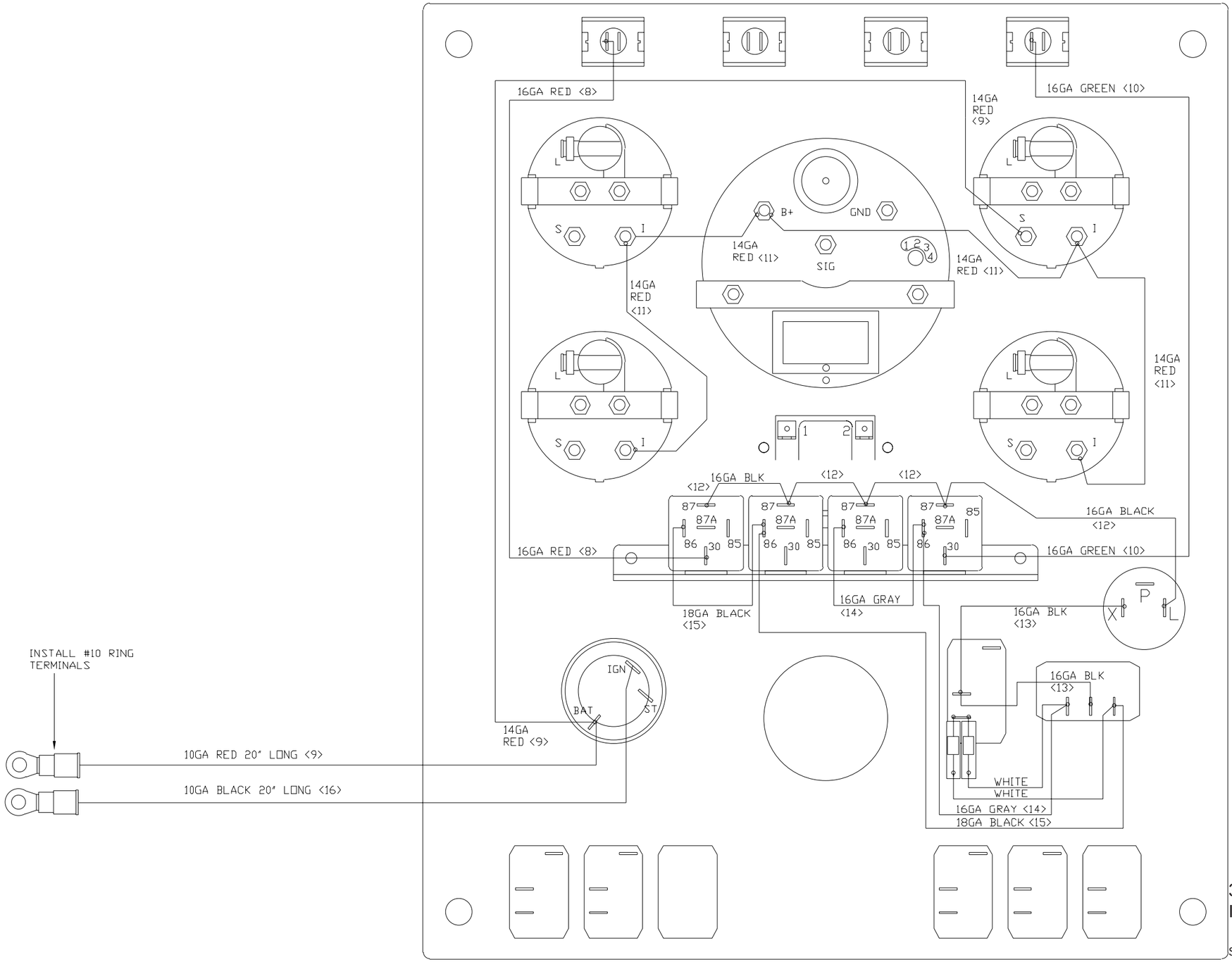
28235 REV. J
CAB ASSEMBLY, 2-DOOR

SHEET 1 OF 1



39140 REV. 0
INSTRUMENT PANEL

SHEET 1 OF 5



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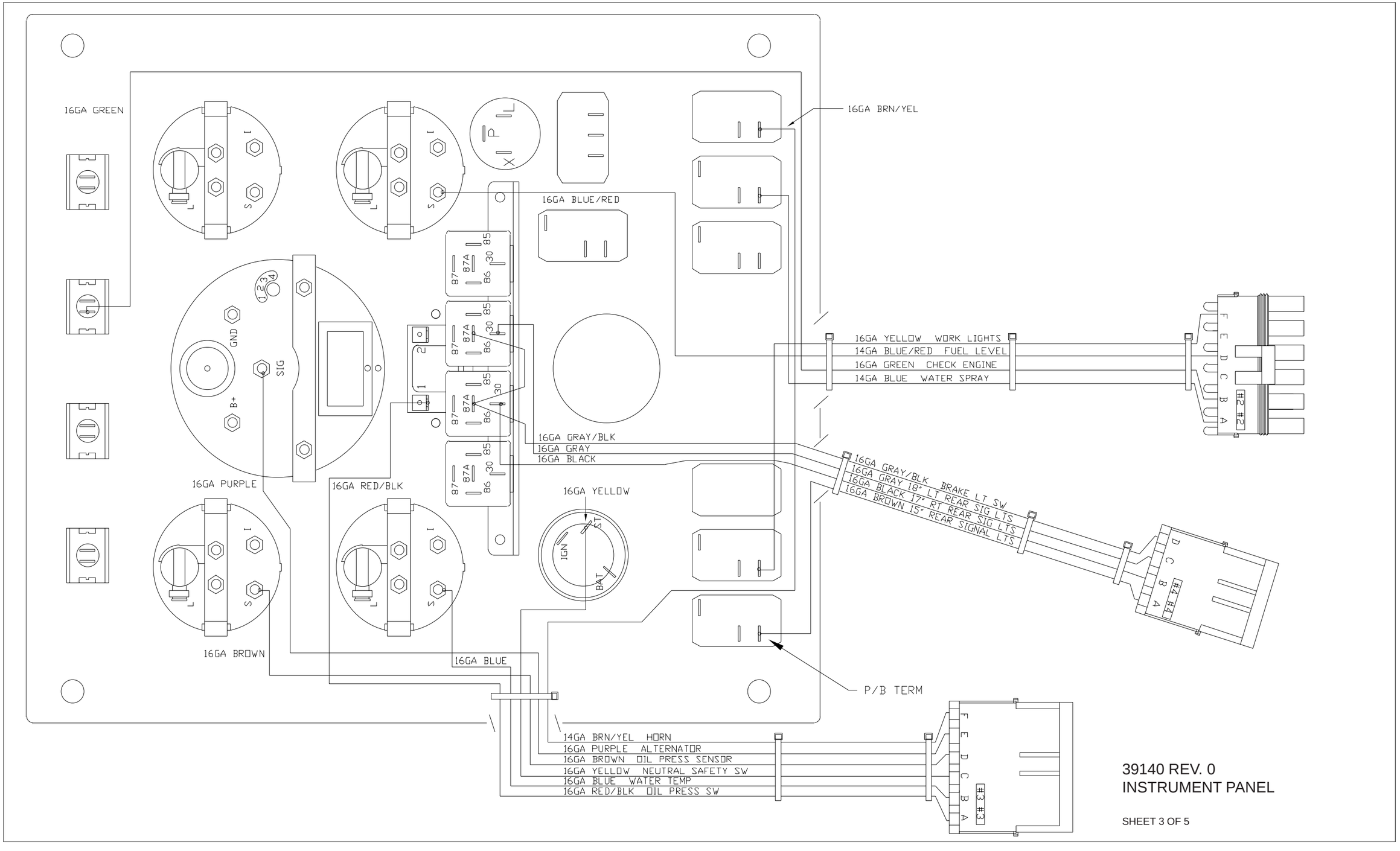
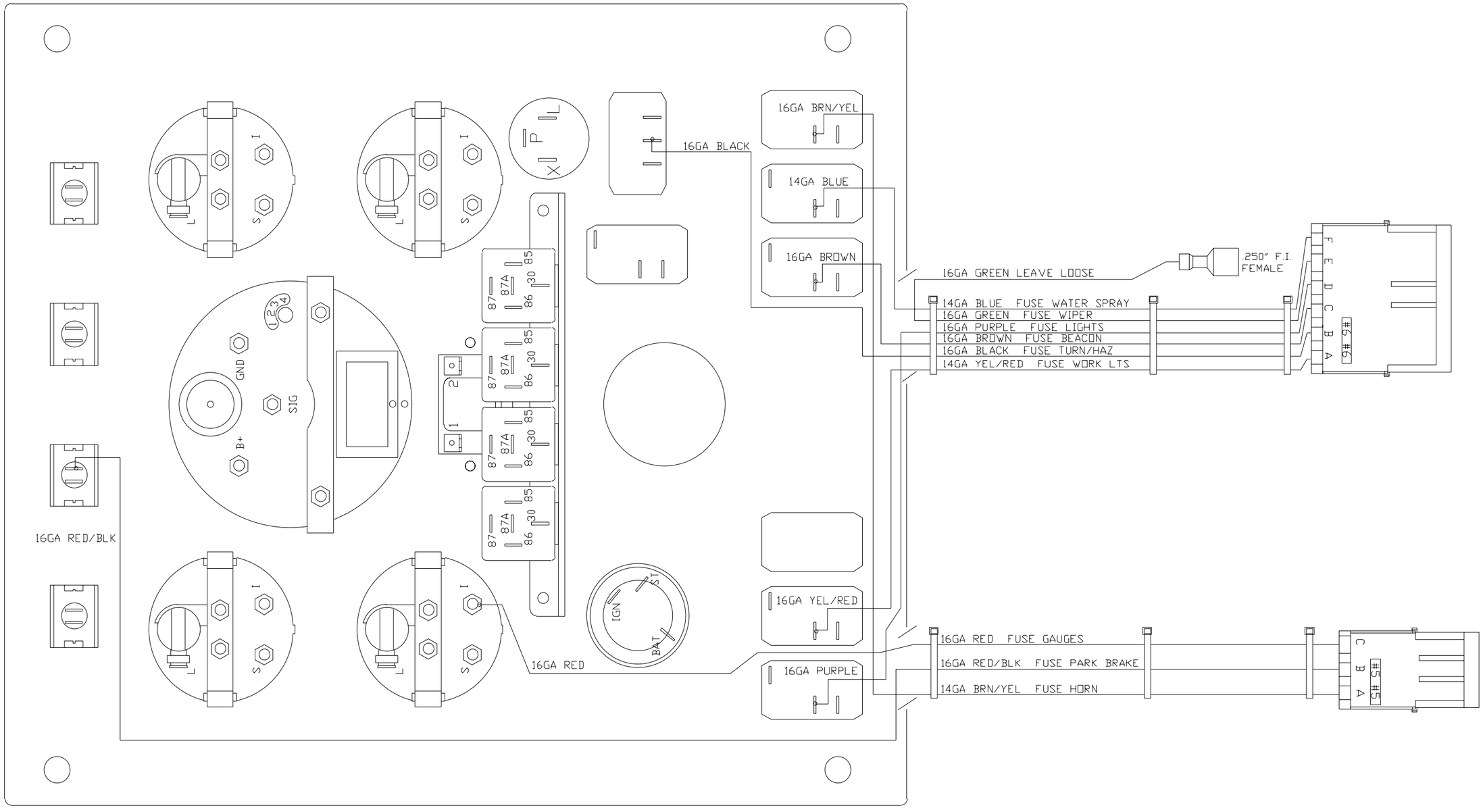
INSTRUMENT PANEL

SHEET 2 OF 5



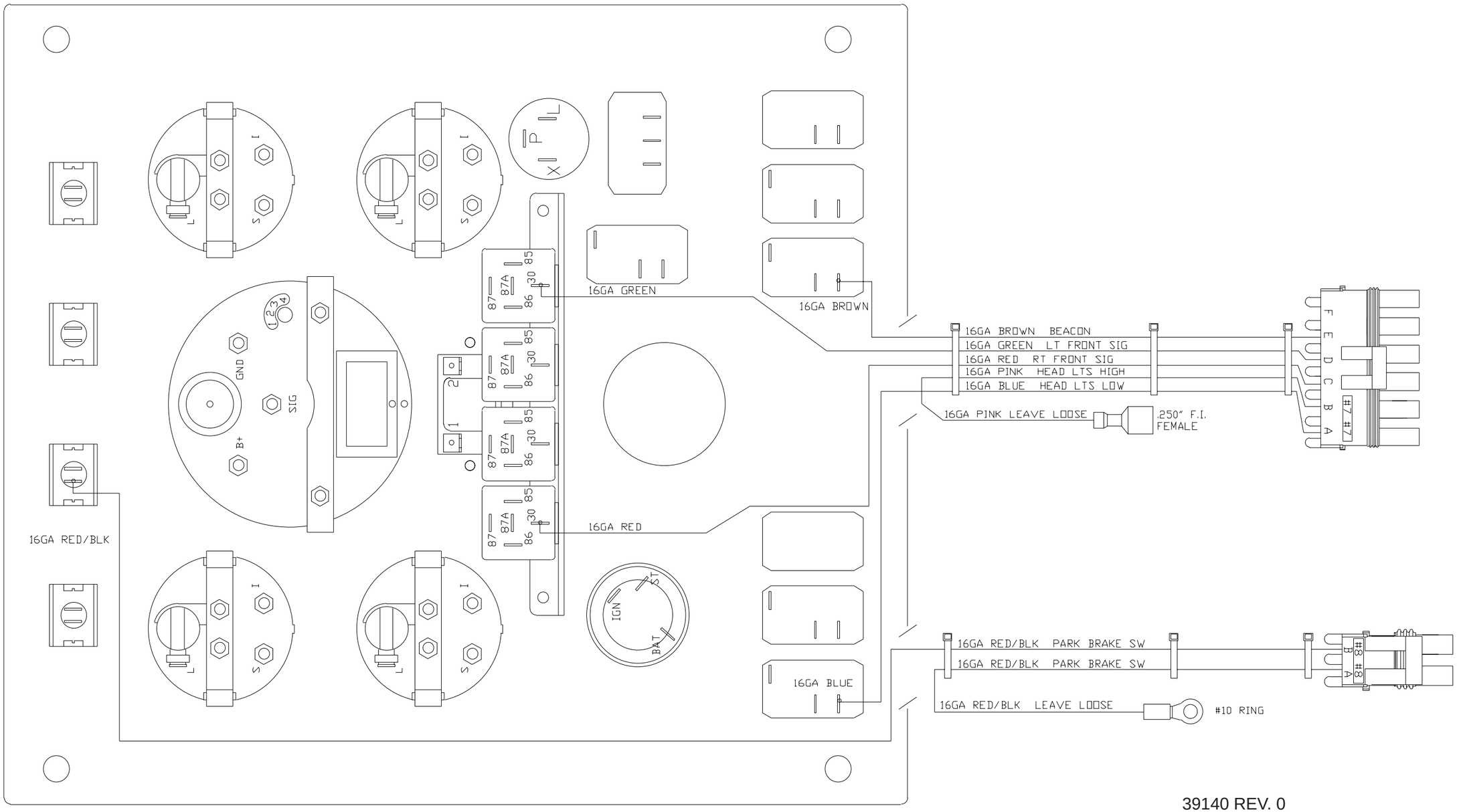
39140 REV. 0
INSTRUMENT PANEL

SHEET 3 OF 5



39140 REV. 0
INSTRUMENT PANEL

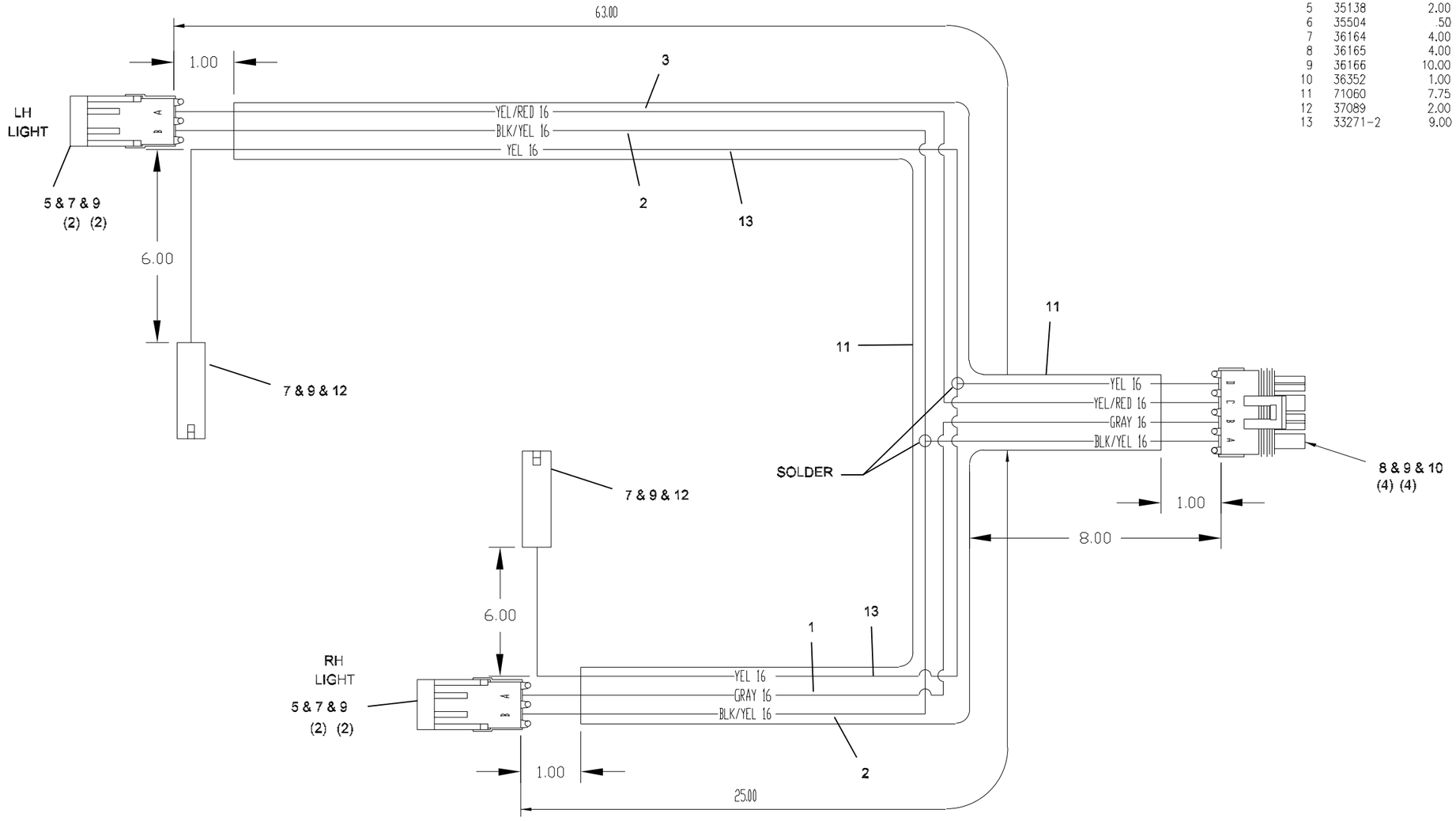
SHEET 4 OF 5



39140 REV. 0
INSTRUMENT PANEL

SHEET 5 OF 5

Item	Part No.	Qty	Description
1	33271-0	3.00	WIRE,16 GA,GRAY
2	33271-13	8.25	WIRE,16 GA,BLACK/YELLOW STRIPE
3	33271-14	6.25	WIRE,16 GA,YELLOW/RED STRIPE
4	33596	2.00	TIE WRAP,.188X7.5
5	35138	2.00	CONNECTOR,SEALED,SHROUD,2-PIN
6	35504	.50	TUBING,HEAT SHRINK,.250
7	36164	4.00	TERM,SEALED CONN,16-14 GA,MALE
8	36165	4.00	TERM,SEALED CONN,16-14 GA,FEM
9	36166	10.00	SEAL,CABLE,18-16 GA
10	36352	1.00	CONNECTOR,SEALED,TOWER,4-PIN
11	71060	7.75	LOOM,SPLIT,CONVOLUTED,.250
12	37089	2.00	CONNECTOR,SEALED,SHROUD,1-PIN
13	33271-2	9.00	WIRE,16 GA,YELLOW



NOTES:
1. TAPE ALL LOOM ENDS AND TEES WITH BLACK ELECTRICAL TAPE AND TIE WRAPS (ITEM 4).
2. AT TEES, SPLIT BRANCHING LOOM ON SIDE OPPOSITE EXISTING SPLIT FOR 2.50" AND RESULTING STRIPS INSIDE MAIN LOOM BEFORE TAPING AND TIE WRAPPING.

28353 REV. 0
REAR/WORK LIGHTS

SHEET 1 OF 1

Introduction

The purpose of this manual is to provide information useful in the normal servicing of the Series 40 - M46 Medium Duty Hydrostatic Pumps and Motors. This manual includes unit and component description, troubleshooting, adjustment, and minor repair procedures. Following the procedures in this manual, the minor repairs may be performed without affecting the unit warranty.

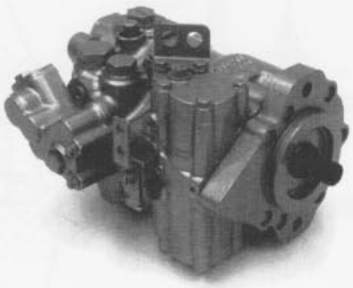
A Series 40 Transmission does occasionally require servicing, and these units have been designed with this in mind. Some repairs and adjustments can be accomplished without removing the unit from its installed location, provided that the unit is accessible and can be thoroughly cleaned before beginning any procedures. Since dirt or contamination is the greatest enemy of any hydraulic equipment, the greatest possible cleanliness is necessary.

For Technical Information on Series 40 products, refer to publication BLN-9989 (pumps) or BLN-9990 (motors).

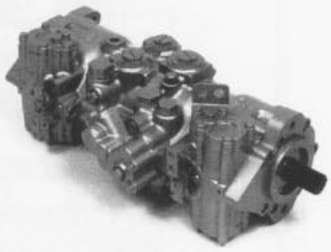
For Fluid Quality Requirements, refer to publication BLN-9887 or 697581.

Sauer-Sundstrand provides a complete repair service for its products. Contact any Sauer-Sundstrand Authorized Service Center for details. Sauer-Sundstrand Authorized Service Center locations are listed in publication BLN-2-40527 or 698266.

The torque values, pressures, and dimensions used throughout this manual are given in English and metric measurements.



Series 40 - M46 Variable Displacement Pump



Series 40 - M46 Variable Displacement Tandem Pump

Series 40 - M46 Fixed Displacement Motor

Series 40 - M46 Variable Displacement Motor

General Description

Series 40 - M46 Medium Duty Hydrostatic Transmission

The Series 40 - M46 Medium Duty pumps and motors can be applied separately or combined in a system to transfer and control power. When combined in such a system, these units provide an infinitely variable speed range between zero and maximum, in both forward and reverse modes of operation.

Series 40 - M46 variable displacement pumps are a compact, state-of-the-art design, using the parallel axial piston / slipper design in conjunction with a tiltable swashplate to vary the pump's displacement. Reversing the direction of tilt of the swashplate reverses the flow of oil from the pump and thus reverses the direction of the motor output rotation.

The Series 40 - M46 variable displacement pump and tandem pump are controlled by a compact responsive hydro-mechanical, closed loop control system. A choice of manual, hydraulic, or electrical displacement controls are available.

A charge relief valve and charge check valves are included in the pump end cap to control the makeup and cooling oil flow for the system. The charge check valves also incorporate the high pressure relief valve function into their design.

The Series 40 - M46 variable displacement pump is available with a 0.85 in3/rev (13.9 cc/rev) integral gerotor type charge pump. The Series 40 - M46 tandem pump is available with a 1.40 in3/rev (22.9 cc/rev) integral gerotor type charge pump.

The fixed and variable displacement motors also incorporate the parallel axial piston / slipper design. Fixed displacement motors utilize a fixed swashplate angle. The variable displacement motors use a variable angle swashplate with a hydraulic control system, designed to provide two positions of the swashplate: a maximum displacement and a minimum displacement.

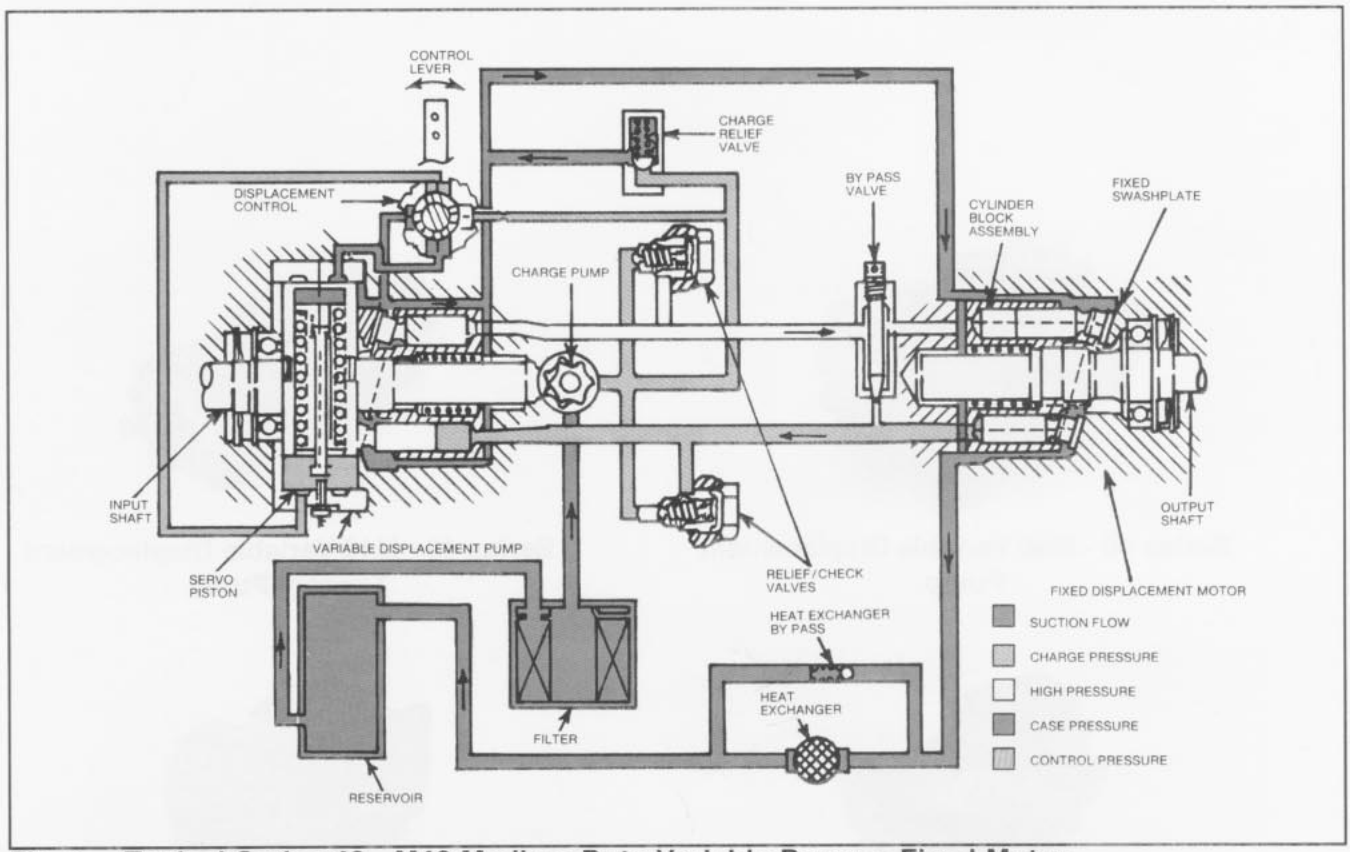


Fig. 1 - Typical Series 40 - M46 Medium Duty Variable Pump -- Fixed Motor Transmission Schematic

Transmission Hydraulic Support System

The Series 40 - M46 Pumps and Motors are easy to install, requiring no adjustments and few auxiliary components. They have their own hydraulic support system which is discussed in this section.

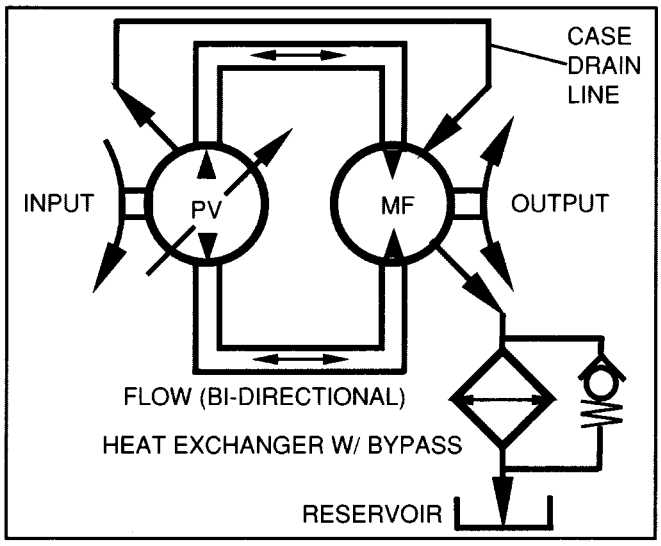


Fig. 2 - Basic Closed Circuit

Basic Closed Circuit

The main ports of the pump are connected by hydraulic lines to the main ports of the motor. Fluid flows, in either direction, from the pump to the motor then back to the pump in this closed circuit. Either of the hydraulic lines can be under high pressure. The direction and speed of fluid flow (and the motor output shaft rotation) depends on the position of the pump swashplate. The system pressure is determined by the machine load.

Case Drain and Heat Exchanger

The pump and motor require case drain lines to remove hot fluid from the system. The pump case should be drained from its upper drain port to insure the case remains full of fluid. The pump case drain is then connected to the lower drain port on the motor housing. The upper motor housing drain port is then connected to the reservoir.

A heat exchanger, with a bypass valve, may be required to cool the case drain fluid before it returns to the reservoir.

NOTE: When operating pump near rated speed, some case flow may have to be diverted around the motor to ensure pump case pressure remains within recommended limits.

CAUTION

Continuous case pressure should not exceed 25 PSI (1.7 BAR).

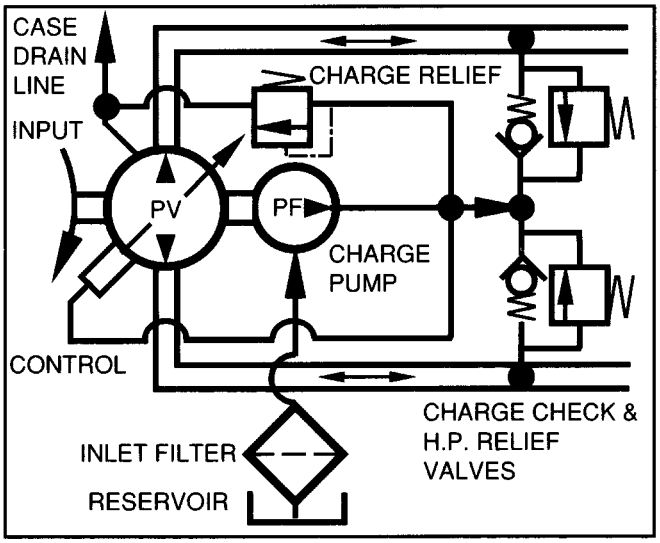


Fig. 3 - Charge System

Charge System and Inlet Filter

The charge pump supplies cool fluid to the system and keeps the closed loop charged to prevent cavitation. The charge pump draws its fluid from the system reservoir.

CAUTION

The inlet vacuum, measured at the charge pump inlet should not exceed 5 in. Hg (.8 BAR abs.), except during cold starts.

Since either of the main hydraulic lines can be high pressure, two (2) charge check valves are used to direct the charge supply into the low pressure line. These check valves are incorporated into the high pressure relief valves in the pump end cap. Any charge flow not being used for the closed circuit is discharged over a direct operating charge relief valve, through the pump and motor housings, and back to the system reservoir. The charge pressure relief valve is factory set for 220-240 ΔPSI (15.2-16.5 BAR) above case pressure under test conditions. Exact charge pressure may vary in various applications.

CAUTION

Charge Pressure must not be less than 220 PSI (15.2 BAR) for satisfactory operation. Pressure less than this may result in premature unit failure or loss of control.

High Pressure Relief Valves

Two (2) optional combination check / high pressure relief valves may be provided in the pump end cap for overload protection. These cartridge type relief valves are factory set, and are not field adjustable. Changing the maximum system pressure can be accomplished by installing different cartridges with the desired setting.

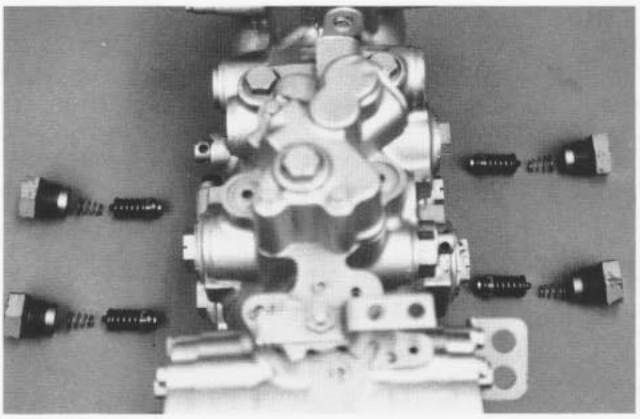


Fig. 4 - Charge Check and High Pressure Relief Valves (Tandem Pump Shown)

Safety Precautions

- **The loss of hydrostatic drive line power in any mode of operation may cause a loss of hydrostatic braking capacity. A braking system, redundant to the hydrostatic transmission must, therefore, be provided which is adequate to stop and/or hold the system should the condition develop.**

- **Certain service procedures may require the vehicle/machine to be disabled (wheels raised off the ground, work function disconnected, etc.) while performing them in order to prevent injury to the technician and bystanders.**

- **Use caution when dealing with hydraulic fluid under pressure. Escaping hydraulic fluid under pressure can have sufficient force to penetrate your skin causing serious injury. This fluid may also be hot enough to burn. Serious infection or reactions can develop if proper medical treatment is not administered immediately.**

- **Some cleaning solvents are flammable. To avoid possible fire, do not use cleaning solvents in an area where a source of ignition may be present.**

Technical Data - Variable Displacement Pump / Tandem Pump

Product Type		M46 Variable Pump	M46 Tandem Pump
Displacement			
In^3/Rev		2.8	2.8 (each section)
cc/Rev		46	46 (each section)
Input Speed			
Max - RPM (Full Angle)		5000	ALL UNITS
Continuous - RPM (Full Angle)		4000	
Input Mounting Flange (per SAE J744)			
		SAE B	SAE B
Input Shaft (Std. Spline)			
Number of Teeth		15	ALL UNITS
Pitch		16/32	
Weight			
LBS		73	131
KG		33	59
Pressure			
Maximum	PSI	5000	ALL UNITS
	BAR	345	
Continuous	PSI	3000	ALL UNITS
	BAR	210	
Case Pressure			
Continuous	PSI	25	ALL UNITS
	BAR	1.7	
Maximum	PSI	75	ALL UNITS
(Cold Start)	BAR	5.2	
Temperature at Hottest Point in Transmission (normally at case drain)			
Maximum	°F	220	ALL UNITS
	°C	104	
Continuous	°F	180	ALL UNITS
	°C	82	
Fluid Viscosity Limits -- SUS (CST)			
Optimum		70 (13)	
Min. Continuous		55 (9.0)	
Min. Intermittent		47 (6.4)	ALL UNITS
Max. Continuous		500 (110)	
Max. Cold Start		7500 (1600)	
Suggested Filtration			
Dedicated Reservoir		Beta 10 = 1.5 to 2.0	ALL UNITS
Common Reservoir		Beta 10 = 10 to 20	
Charge Inlet Vacuum at Sea Level			
Normal	in. Hg	5	
	BAR (abs.)	.8	ALL UNITS
Cold Start	in. Hg	10	
	BAR (abs.)	.7	

Technical Data - Fixed Displacement Motor / Variable Displacement Motor

Product Type		M46 Fixed Motor	M46 Variable Motor
Displacement			
In³/Rev		2.8	2.8 (Maximum)
cc/Rev		46	46 (Maximum)
Output Speed			
Full Angle (17°)	Max - RPM	5000	5000
	Continuous - RPM	4000	4000
Low Angle (< 11°)	Max - RPM	----	6000
	Continuous - RPM	----	5000
Output Mounting Flange (per SAE J744)			
		SAE B	SAE B
Output Shaft (Std. Spline)			
Number of Teeth		15	ALL UNITS ▸
Pitch		16/32	
Weight			
LBS		30	51
KG		14	23
Pressure			
Maximum	PSI	5000	ALL UNITS ▸
	BAR	345	
Continuous	PSI	3000	ALL UNITS ▸
	BAR	210	
Case Pressure			
Continuous	PSI	25	ALL UNITS ▸
	BAR	1.7	
Maximum	PSI	75	ALL UNITS ▸
(Cold Start)	BAR	5.2	
Temperature at Hottest Point in Transmission (normally at case drain)			
Maximum	°F	220	ALL UNITS ▸
	°C	104	
Continuous	°F	180	ALL UNITS ▸
	°C	82	
Fluid Viscosity Limits -- SUS (CST)			
Optimum		70 (13)	
Min. Continuous		55 (9.0)	
Min. Intermittent		47 (6.4)	ALL UNITS ▸
Max. Continuous		500 (110)	
Max. Cold Start		7500 (1600)	
Suggested Filtration			
Dedicated Reservoir		Beta 10 = 1.5 to 2.0	ALL UNITS ▸
Common Reservoir		Beta 10 = 10 to 20	

Controls and Options

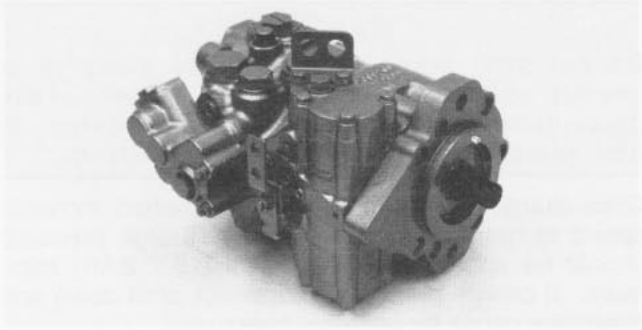


Fig. 5 - Variable Pump with Manual Displacement Control

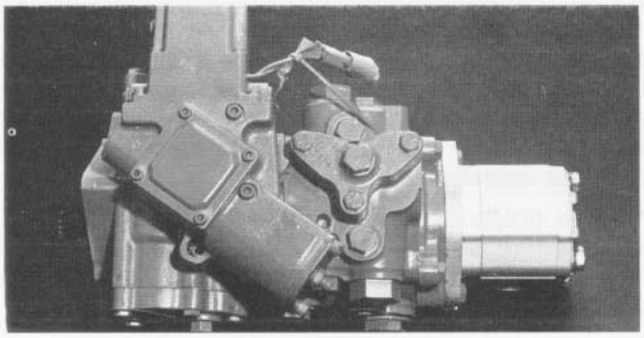


Fig. 6 - Variable Pump with Electric Displacement Control

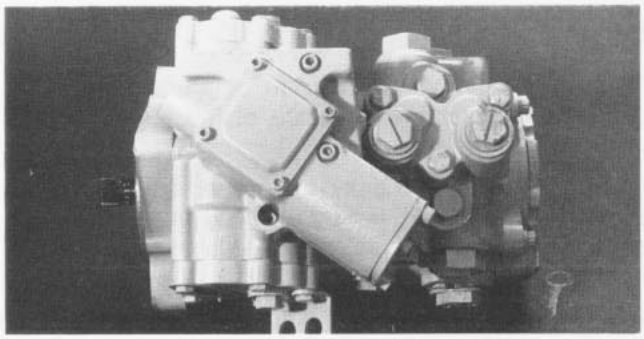


Fig. 7 - Variable Pump with Hydraulic Displacement Control

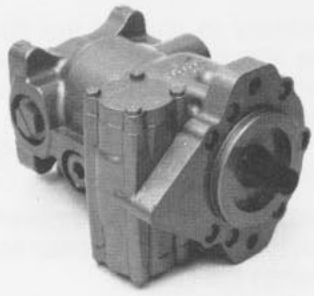


Fig. 8 - Variable Motor with Hydraulic Control

Manual Displacement Control

With the Manual Displacement Control (MDC), the pump displacement and output flow, in either direction, is approximately proportional to the angular movement of the control handle. The control will return to neutral if the pump control handle is released. the control centering mechanism is not sufficient to overcome external control linkage friction.

This control may have various sized orifices installed in the supply and drain passages for controlling maximum acceleration and deceleration (control response).

CAUTION

Torque on the control handle must not exceed 150 in.lbs. (17 Nm). Excessive torque may damage the control shaft.

Electric Displacement Control

With the Electric Displacement Control (EDC), the pump displacement and output flow, in either direction, is approximately proportional to an electrical input signal.

Orifices (various sizes available) are installed in the servo passages to control maximum acceleration and deceleration (control response).

Hydraulic Displacement Control

With the Hydraulic Displacement Control (HDC), the pump displacement and output flow, in either direction, is approximately proportional to a hydraulic pressure input signal.

Orifices (various sizes available) are installed in the servo passages to control maximum acceleration and deceleration (control response).

Bypass Valve

In some applications it is desirable to bypass fluid, allowing, for example, a vehicle to be moved short distances at low speeds without running the prime mover. This is accomplished by a manually operated bypass valve installed in the pump housing. When open (unscrewed 2 turns maximum), this valve connects both sides of the pump/motor closed circuit and allows the motor to turn. This valve must be fully closed for normal operation.

Variable Displacement Motor Hydraulic Control

The M46 Variable Motor Hydraulic Control is designed to provide two different positions of the swashplate: a maximum displacement and a minimum displacement. This control is available in several minimum displacement settings, including an infinitely adjustable stop.

Start-Up & Maintenance

Fluids

Hydraulic fluids used with Sauer-Sundstrand products should be carefully selected with assistance from a reputable supplier, following the guidelines presented in the "Fluid Quality Requirements" bulletin, BLN-9887.

Start-Up Procedure

The following start-up procedure should always be followed when starting-up a new Series 40 - M46 installation or when restarting an installation in which either the pump or motor had been removed from the system.

WARNING

The following procedure may require the vehicle/machine to be disabled (wheels raised off the ground, work function disconnected, etc.) while performing the procedure in order to prevent injury to the technician and bystanders. Take necessary safety precautions before moving the vehicle/machine.

Prior to installing the pump and/or motor, inspect the units for damage incurred during shipping and handling. Make certain all system components (reservoir, hoses, valves, fittings, heat exchanger, etc.) are clean prior to filling with fluid.

Fill the reservoir with recommended hydraulic fluid, which should be passed through a 10 micron (nominal, no bypass) filter prior to entering the reservoir. The use of contaminated fluid will cause damage to the components, which may result in unexpected vehicle/machine movement.

The inlet line leading from the reservoir to the pump should be filled prior to start up. Check inlet line for properly tightened fittings and make sure it is free of restrictions and air leaks.

Be certain to fill the pump and/or motor housing with clean hydraulic fluid prior to start up. Fill the housing by pouring filtered oil into the upper case drain port.

Install a 0 to 500 PSI (35 BAR) pressure gauge in the charge pressure gauge port to monitor the charge pressure during start-up.

It is recommended that the external control input signal (linkage for MDC, hydraulic lines for HDC, or electrical connections for EDC) be disconnected at the pump control until after initial start-up. This will allow the pump to remain in its neutral position.

"Jog" or slowly rotate prime mover until charge pressure starts to rise. Start the prime mover and run at the lowest possible RPM until charge pressure has been established. Excess air may be bled from the high pressure lines through the high pressure gauge ports.

WARNING

Do not start prime mover unless pump is in neutral position (0° swashplate angle). Take precautions to prevent machine movement in case pump is actuated during initial start up.

Once charge pressure has been established, increase speed to normal operating RPM. Charge pressure should be approximately 220 PSI (15.2 BAR) minimum. If charge pressure is incorrect, shut down and determine cause for improper pressure.

WARNING

Inadequate charge pressure will affect the operator's ability to control the vehicle/machine.

Shut down prime mover and connect external control input signal. Start prime mover, checking to be certain pump remains in neutral. With prime mover at normal operating speed, slowly check for forward and reverse machine operation.

Charge pressure should remain at 220 to 240 PSI (15.2 to 16.5 BAR) minimum during forward or reverse operation. Continue to cycle slowly between forward and reverse for at least five (5) minutes.

Shut down prime mover, remove gauges, and plug ports. Check reservoir level and add fluid if necessary.

The transmission is now ready for operation.

Maintenance

To insure optimum service life on Series 40 - M46 products, regular maintenance of the fluid and filter must be performed.

Check the reservoir daily for proper fluid level, the presence of water (noted by a cloudy to milky appearance, or free water in bottom of reservoir), and rancid fluid odor (indicating excessive heat).

It is recommended that the fluid and filter be changed per the vehicle/machine manufacturer's recommendations or at the following intervals:

- System with a sealed type reservoir - 2000 hrs.
- System with a breathing type reservoir - 500 hrs.

It may be necessary to change the fluid more frequently than the above intervals if the fluid becomes contaminated with foreign matter (dirt, water, grease, etc.) or if the fluid has been subjected to temperature levels greater than the maximum recommended. Never reuse fluid.

The filter should be changed whenever the fluid is changed or whenever the filter indicator shows that it is necessary to change the filter.

Troubleshooting

Gauge Installation

Various pressure and vacuum gauge readings can be a great asset in troubleshooting problems with the Series 40 - M46 transmission or support system.

It will be necessary to install a high pressure gauge into the system pressure gauge ports to check the setting of the high pressure relief valves.

Measuring the charge pump inlet vacuum will help locate restrictions in the inlet lines, filter, etc.

Case pressure readings can help locate restrictions in the return lines, oil cooler, and return filter.

Gauge Information		
M1	System Pressure Port "A"	10,000 PSI or 600 BAR Gauge 9/16–18 O-Ring Fitting
M2	System Pressure Port "B"	10,000 PSI or 600 BAR Gauge 9/16–18 O-Ring Fitting
M3	Charge Pressure	1000 PSI or 60 BAR Gauge 9/16–18 O-Ring Fitting or Tee into Charge Pressure Filter Outlet Line
L1 L2	Case Pressure	1000 PSI or 60 BAR Gauge 1-1/16–12 O-Ring Fitting
S	Charge Pump Inlet Vacuum	Vacuum Gauge Tee into Charge Pump Inlet Line
M4	Servo Pressure	1000 PSI or 60 BAR Gauge 9/16–18 O-Ring Fitting - Later Units 7/16–20 O-Ring Fitting - Earlier Units
M5	Servo Pressure	1000 PSI or 60 BAR Gauge 9/16–18 O-Ring Fitting - Later units 7/16–20 O-Ring Fitting - Earlier units

NOTE: Tandem pumps have additional gauge and working ports in the rear section.

Snubbers are recommended to protect pressure gauges. Frequent gauge calibration is necessary to insure accuracy.

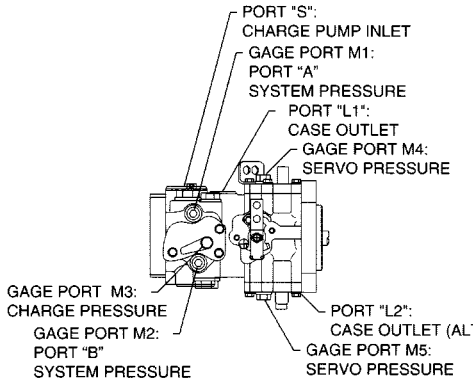


Fig. 9 - Gauge Connections — Variable Pump with Suction Filtration

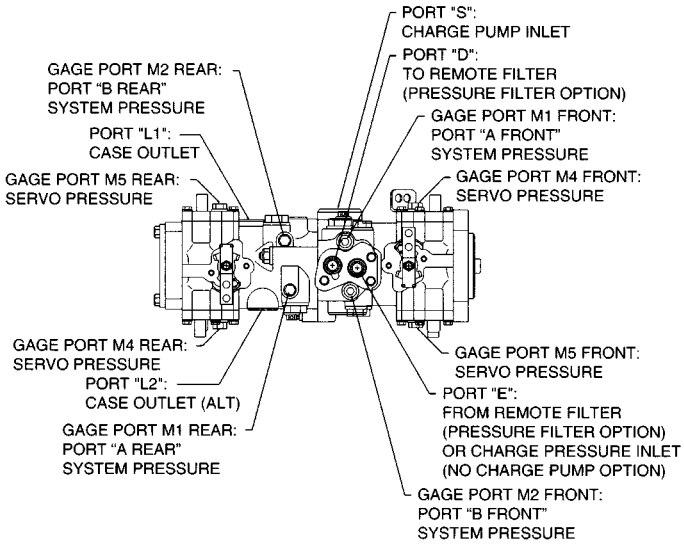
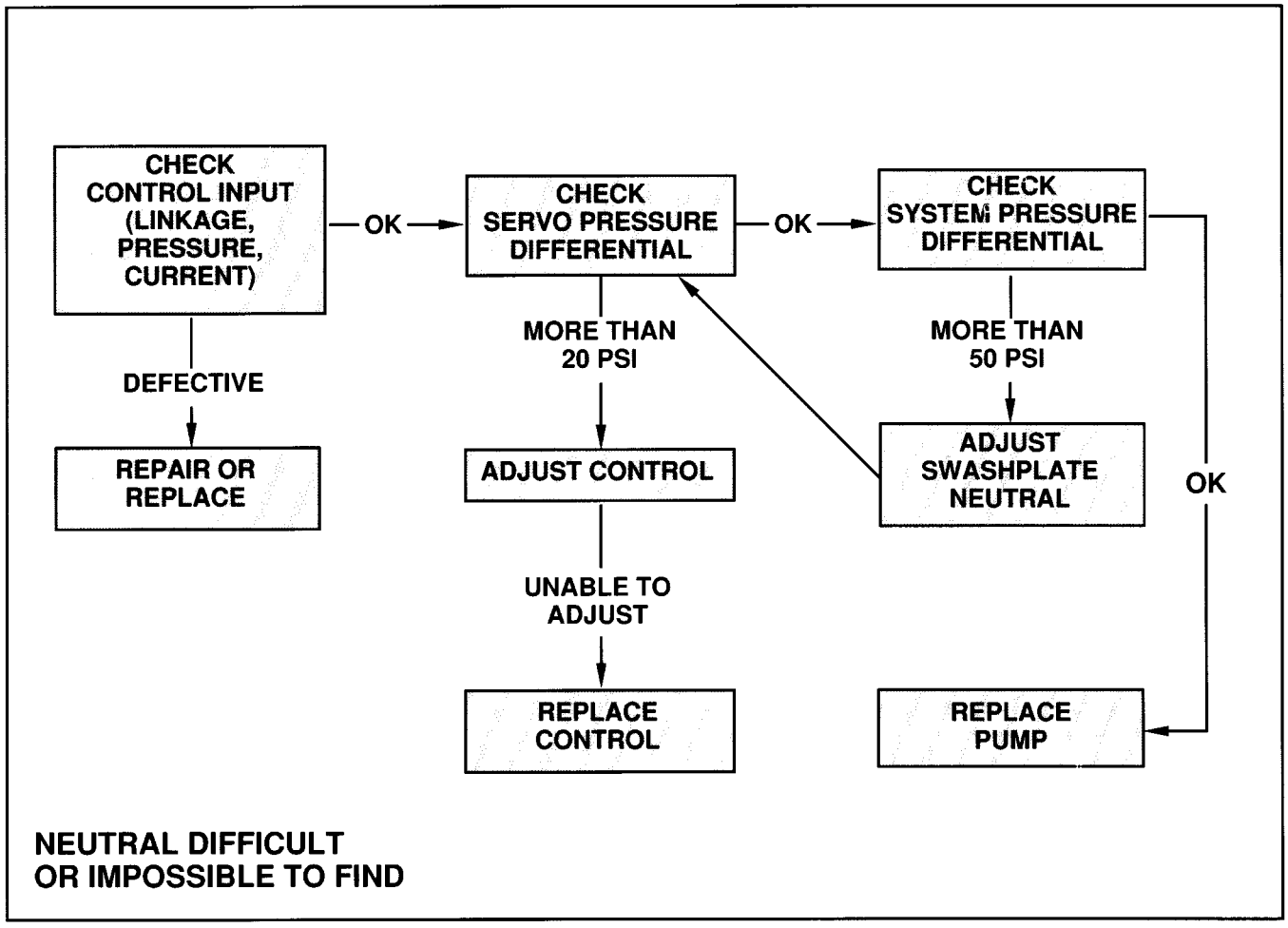
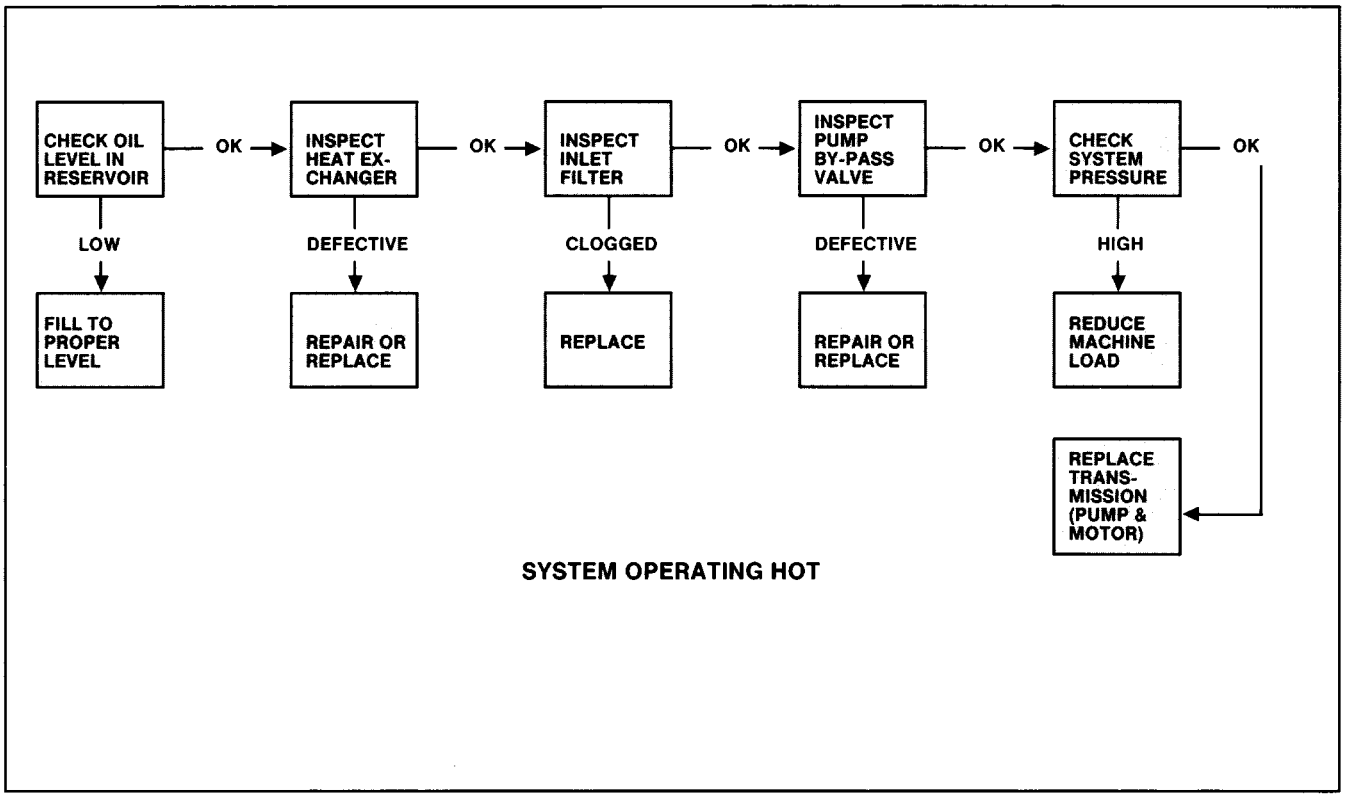


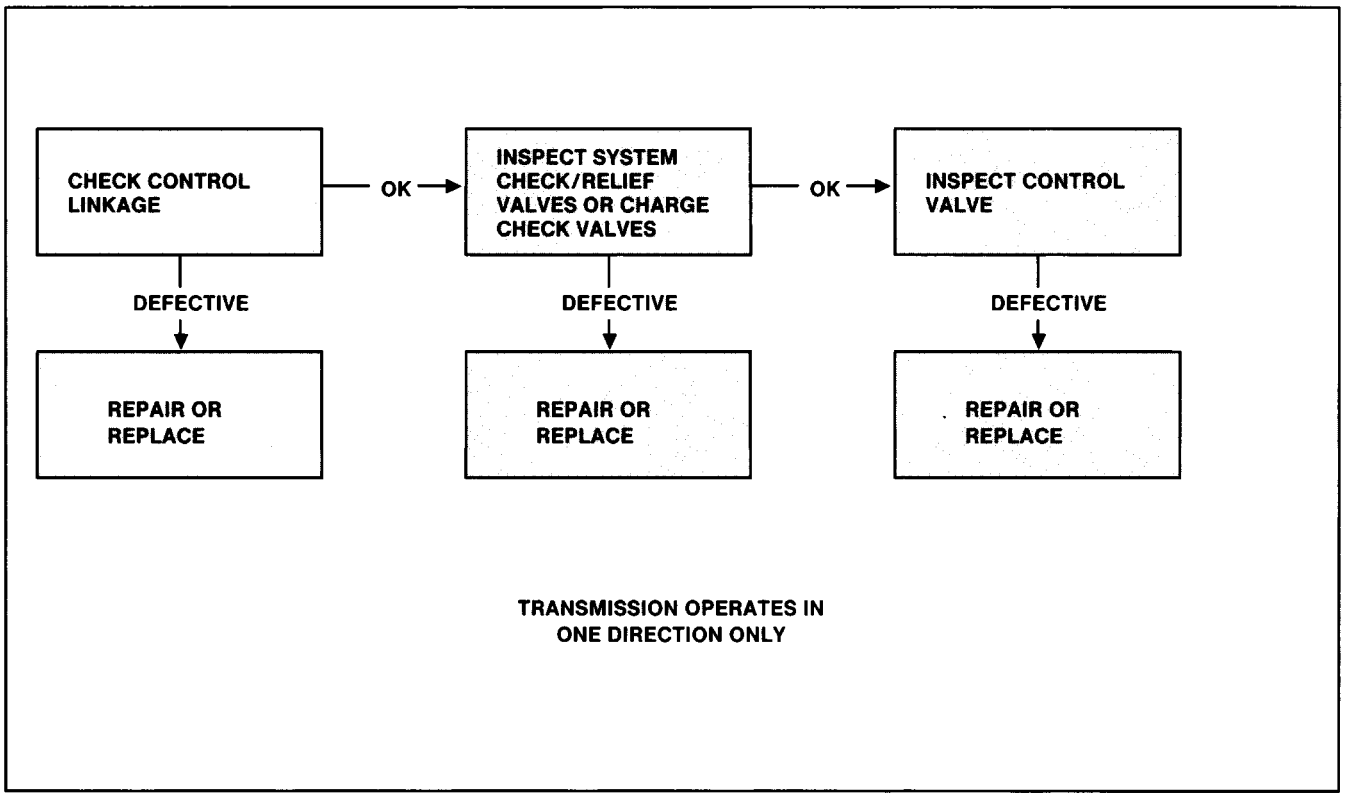
Fig. 10 - Gauge Connections — Tandem Pump with Remote Pressure Filtration

Fault-Logic Diagrams

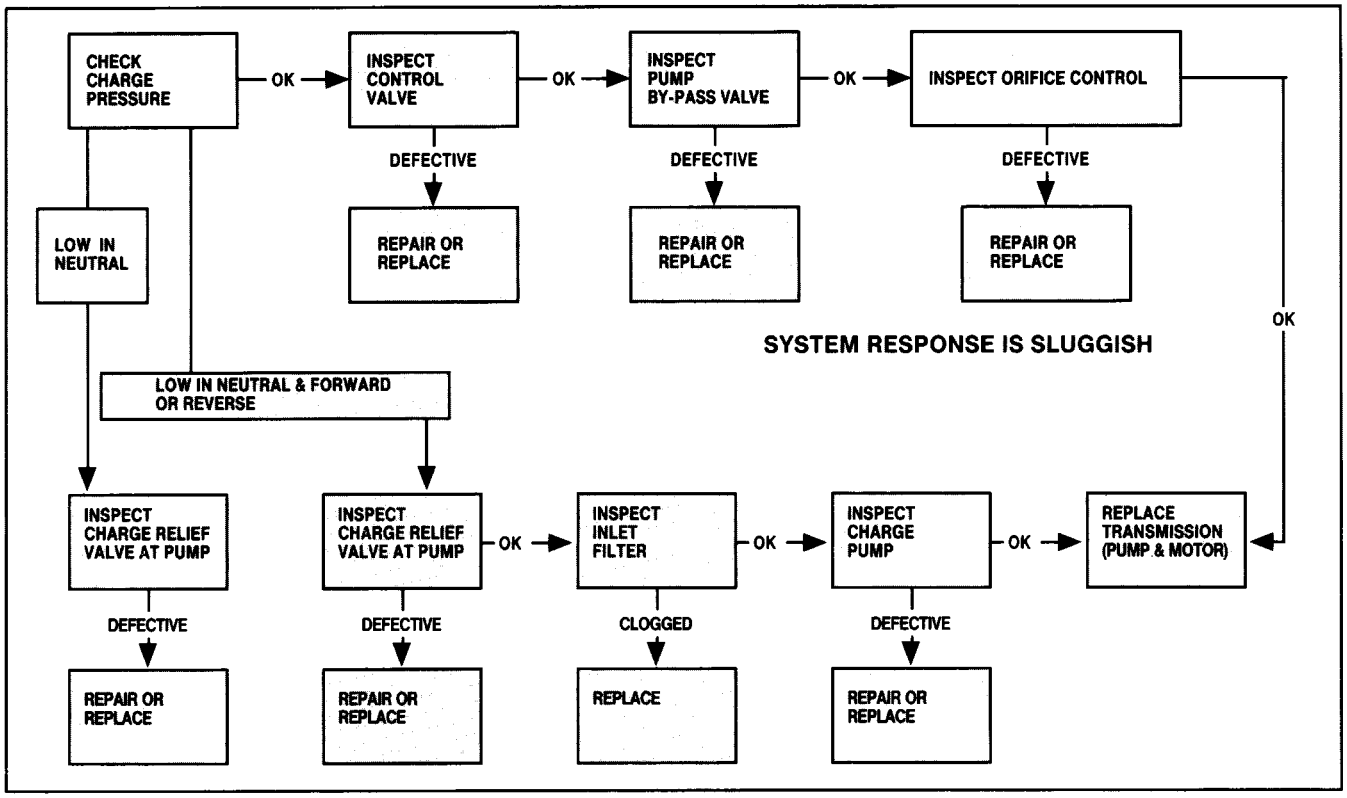


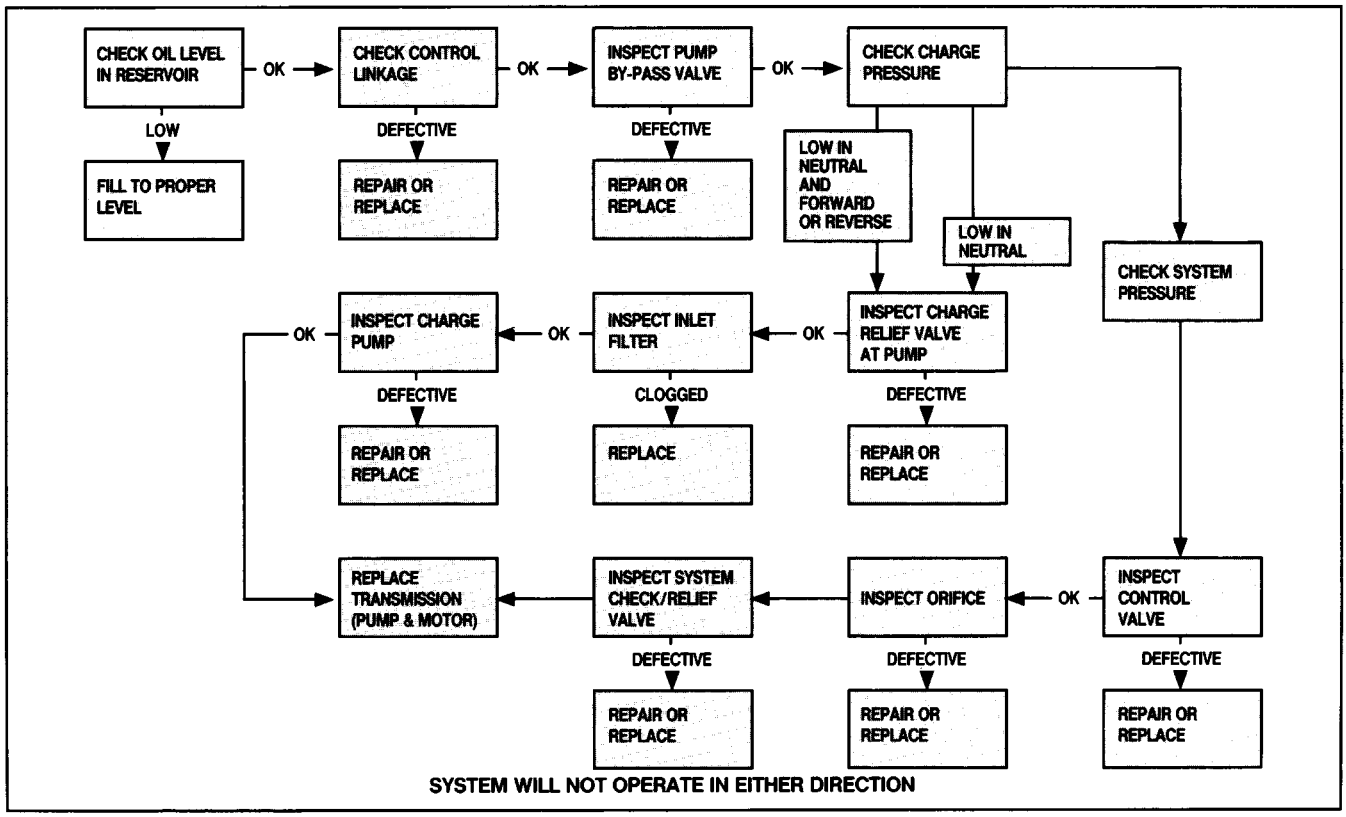


SYSTEM OPERATING HOT



TRANSMISSION OPERATES IN ONE DIRECTION ONLY


CHECK CHARGE PRESSURE
OK
INSPECT CONTROL VALVE
OK
INSPECT PUMP BY-PASS VALVE
OK
INSPECT ORIFICE CONTROL
DEFECTIVE
DEFECTIVE
DEFECTIVE
REPAIR OR REPLACE
REPAIR OR REPLACE
REPAIR OR REPLACE
LOW IN NEUTRAL
OK
SYSTEM RESPONSE IS SLUGGISH
LOW IN NEUTRAL & FORWARD OR REVERSE
INSPECT CHARGE RELIEF VALVE AT PUMP
INSPECT CHARGE RELIEF VALVE AT PUMP
OK
INSPECT INLET FILTER
OK
INSPECT CHARGE PUMP
OK
REPLACE TRANSMISSION (PUMP & MOTOR)
DEFECTIVE
DEFECTIVE
CLOGGED
DEFECTIVE
REPAIR OR REPLACE
REPAIR OR REPLACE
REPLACE
REPAIR OR REPLACE


CHECK OIL LEVEL IN RESERVOIR
OK
CHECK CONTROL LINKAGE
OK
INSPECT PUMP BY-PASS VALVE
OK
CHECK CHARGE PRESSURE
LOW
DEFECTIVE
DEFECTIVE
FILL TO PROPER LEVEL
REPAIR OR REPLACE
REPAIR OR REPLACE
LOW IN NEUTRAL AND FORWARD OR REVERSE
LOW IN NEUTRAL
CHECK SYSTEM PRESSURE
OK
INSPECT CHARGE PUMP
OK
INSPECT INLET FILTER
OK
INSPECT CHARGE RELIEF VALVE AT PUMP
DEFECTIVE
CLOGGED
DEFECTIVE
REPAIR OR REPLACE
REPLACE
REPAIR OR REPLACE
REPLACE TRANSMISSION (PUMP & MOTOR)
INSPECT SYSTEM CHECK/RELIEF VALVE
INSPECT ORIFICE
OK
INSPECT CONTROL VALVE
DEFECTIVE
DEFECTIVE
DEFECTIVE
REPAIR OR REPLACE
REPAIR OR REPLACE
REPAIR OR REPLACE
SYSTEM WILL NOT OPERATE IN EITHER DIRECTION

Inspections and Adjustments

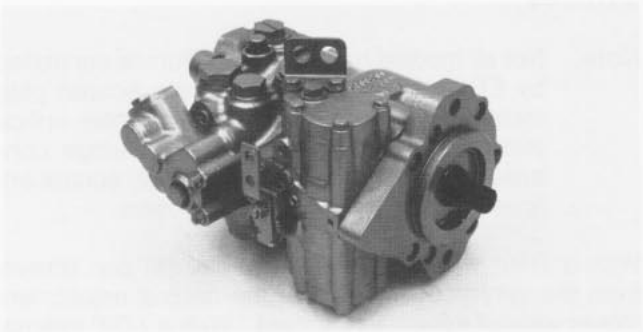


Fig. 11 - Pump with Manual Displacement Control

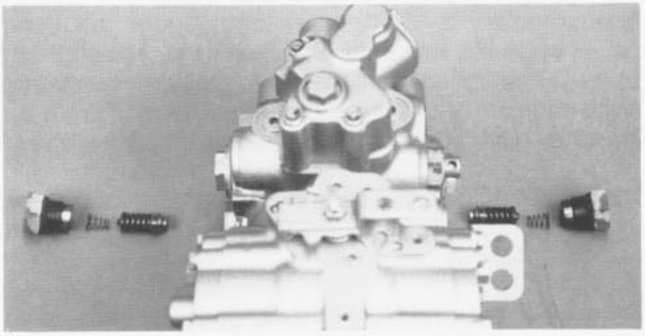


Fig. 12 - Check and High Pressure Relief Valves

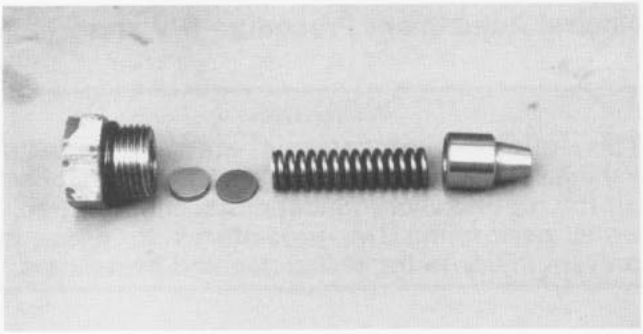


Fig. 13 - Pump Charge Relief Valve

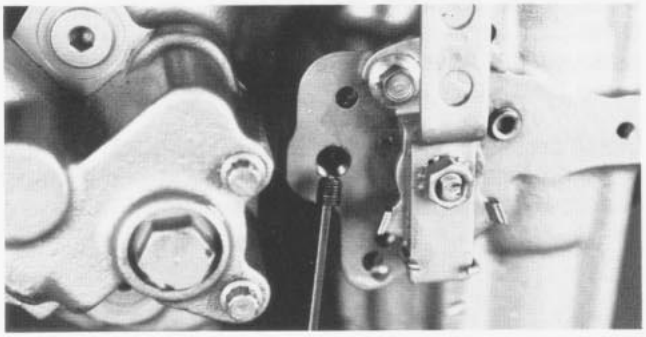


Fig. 14 - Manual Displacement Control Supply Orifice

Manual Displacement Control

Disconnect the external control linkage from the control handle and check for neutral by manually operating the control handle. Releasing the control handle should allow the pump to return to neutral. If operation is satisfactory with the external control linkage disconnected, the problem is not in the hydrostatic transmission.

If operation is not satisfactory with the external control linkage disconnected from the handle, the control may be incorrectly adjusted.

Check / High Pressure Relief Valves

The system check/relief valves have the dual purpose of providing make-up oil during by-directional rotation and providing protection from system over pressure. When the problem occurs in one direction only, interchange the check/relief valves to see if the problem changes to the other direction. If so, one check/relief valve cartridge is either malfunctioning or does not have the proper setting.

CAUTION

The relief valves are factory set and should not be tampered with except for replacing the entire cartridge. Disassembly may change the setting and cause erratic unit operation or premature failure.

Pump Charge Relief Valve

If charge pressure is low (less than 220 psi [15.2 BAR] above case pressure), the charge relief valve should be inspected. Inspect for foreign material holding the poppet open, and for scoring or wear on the poppet and seat in the housing.

Adjustment of the charge pressure is accomplished by changing the shim thickness behind the spring.

Manual Displacement Control (MDC) Supply Orifice

Note: Not all models have an orifice.

If the system is sluggish or will not operate in either direction, inspect the orifice. For pumps with serial number 02-XX-XX-XXXXX or below, remove the hex plug using a 9/16" wrench and remove the orifice with an 1/8" internal hex wrench. For pumps with serial number 03-XX-XX-XXXXX or above, remove the pipe plug with a 3/16" internal hex wrench and the orifice with a 5/32" internal hex wrench.

Fig. 15 - Remove Servo Cover (Opposite Neutral Adjustment)

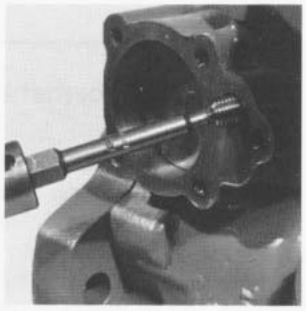


Fig. 16 - Remove Control Orifice

Fig. 17 - Install Spacer and Replace Cover

Fig. 18 - Remove Control Orifice (Neutral Adjustment Side)

Hydraulic Displacement Control (HDC) and Electrical Displacement Control (EDC) Orifices

Note: Not all models have orifices. Pumps controlled by EDC or HDC should have a screen plug installed in place of the control inlet orifice installed in pumps with MDC. Pumps controlled by EDC or HDC have two (2) control orifices located under the servo covers.

With a 7/16" wrench, remove the five (5) cap screws from the servo cover opposite the neutral adjustment (cover without adjustment screw). With a 7/32" internal hex wrench, remove and inspect the orifice.

Remove the (5) cap screws from the servo cover on the neutral adjustment side. Install a spacer or socket, approximately 3/4" (19 mm) long, under the servo cover opposite the neutral adjustment, reinstall cap screws, and tighten until the servo cover on the neutral adjustment side of the pump separates 1/8" from the housing. Turn cover and remove and inspect orifice.

NOTE: On later production pumps, the displacement control may first have to be removed in order to rotate the servo cover.

Remove spacer, reinstall orifices, gaskets, and covers. Torque grade 5 cap screws to 8 to 11 ft.lbs. (10.8 to 14.9 NM) and grade 8 cap screws to 11 to 13 ft.lbs. (14.9 to 17.8 Nm).

Neutral Adjustment Procedure (PV and PT)

WARNING

The following procedures may require the vehicle/machine to be disabled (wheels raised off the ground, work function disconnected, etc.) while performing the procedures in order to prevent injury to the technician and bystanders.

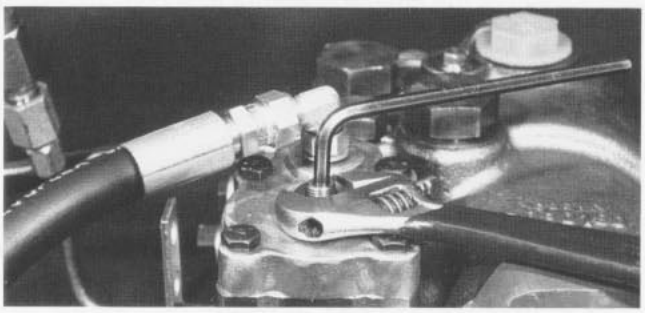


Fig. 19 - Install Servo Cross-Port Line

Swashplate Neutral Adjustment

Using a low pressure line (500 PSI [35 BAR] min.), cross-port servo port "F" to servo port "G". This removes the effects of any control pressure on the servo piston.

Install pressure gauges (10,000 PSI [690 BAR]) in the system pressure gauge ports. Start the prime mover and slowly accelerate to normal operating RPM.

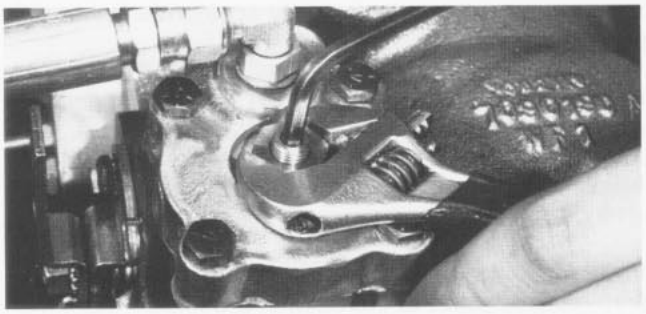


Fig. 20 - Loosen Neutral Adjustment Lock Nut

Remove the protective cap and loosen servo lock nut while holding the servo adjustment screw in position. Turn the servo adjustment screw until the two system pressure gauge readings are equal.

Turn the servo adjustment screw clockwise until one of the system pressures starts to increase. Noting the amount of rotation, turn the servo adjustment screw counter-clockwise until the other system pressure starts to increase.

Turn the servo adjustment screw clockwise half the amount of rotation noted above.

While holding the servo adjustment screw from turning, torque the servo lock nut to 13 to 18 ft.lbs. (17.6 to 24.4 Nm). Stop the prime mover, install a new protective cap, remove the servo cross-port line, and proceed to the appropriate control adjustment.

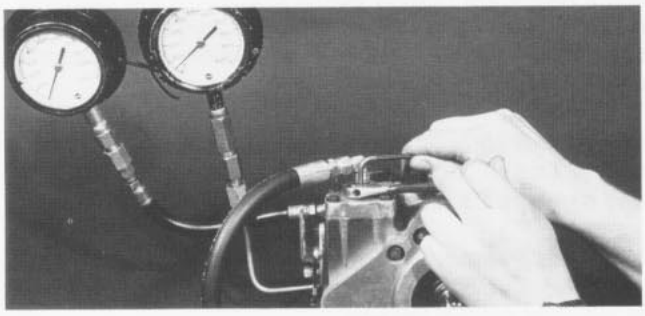


Fig. 21 - Adjusting Swashplate Neutral

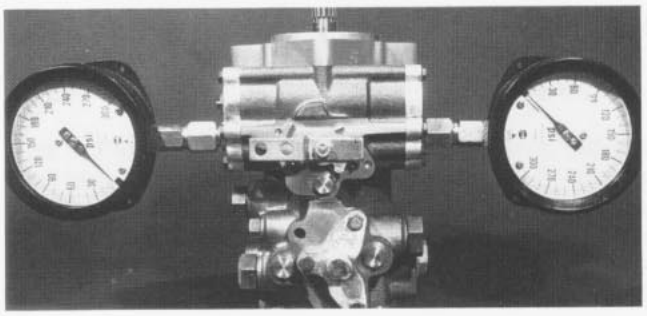


Fig. 22 - Install Servo Pressure Gauges

Manual Displacement Control (MDC) Neutral Bracket Adjustment

Remove the external control linkage from the control handle. Remove the servo cross-port line (installed while making the swashplate neutral adjustment) and install a 0 to 300 PSI (0 to 21 BAR) gauge in each servo gauge port.

Fig. 23 - Loosen Neutral Bracket Retaining Screw

Loosen the washer head screw to allow the neutral bracket to move, but not freely.

WARNING

The following procedure may require the vehicle/machine to be disabled (wheels raised off the ground, work function disconnected, etc.) while performing the procedure in order to prevent injury to the technician and bystanders.

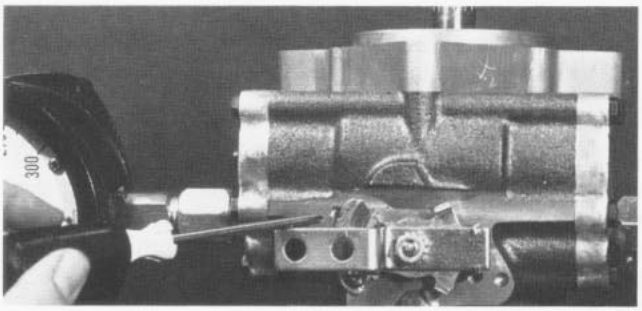


Fig. 24 - Rotate Neutral Bracket

Start the prime mover and slowly accelerate to normal operating RPM.

Insert a Phillips screwdriver into the 1/4" clearance hole and engage the slot of the neutral adjust bracket. Slowly rotate the neutral adjust bracket, using the Phillips screwdriver, until the pressure is equal on both servo gauges.

Slowly rotate the neutral adjust bracket until one of the servo gauges starts to increase in pressure. Mark the position of the neutral adjust bracket.

Slowly rotate the neutral adjust bracket in the opposite direction until the other servo gauge begins to increase in pressure. Mark the position of the neutral adjust bracket.

Rotate the neutral adjust bracket to a position between the two marks, and hold while torquing the washer head screw to 95 to 132 in.lbs. (10.8 to 14.9 Nm).

Stop the prime mover. Remove the gauges and install the gauge port plugs. Install and adjust, if necessary, the external control linkage.

Hydraulic Displacement Control (HDC) and Electrical Displacement Control (EDC) Neutral Adjustment

Remove the electrical connector at the EDC or the signal lines at the HDC. Remove the servo cross port line (installed while making the swashplate neutral adjustment) and install a 0 to 300 PSI (0 to 21 BAR) gauge in each servo port. (Refer to section on mechanical displacement control adjustment.)

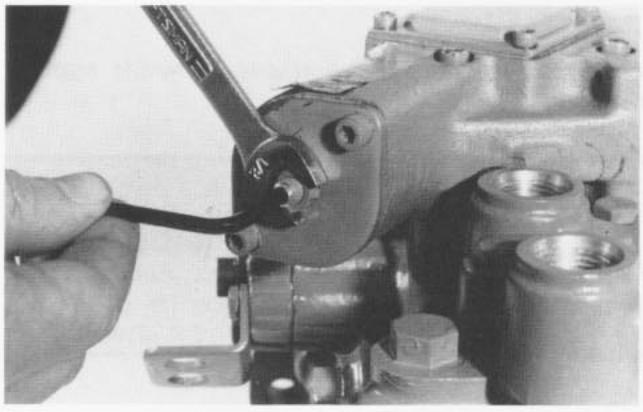


Fig. 25 - Adjusting Neutral for Hydraulic Displacement Control (HDC) or Electric Displacement Control (EDC)

WARNING

The following procedure may require the vehicle/machine to be disabled (wheels raised off the ground, work function disconnected, etc.) while performing the procedure in order to prevent injury to the technician and bystanders.

Start the prime mover and slowly accelerate to normal operating RPM.

Loosen lock nut with 1/2" wrench and slowly rotate the neutral adjustment screw, with 5/32" internal hex wrench, until the pressure is equal on both servo gages.

Slowly rotate the neutral adjust screw until one of the servo gauges starts to increase in pressure.

Noting the amount of rotation, slowly rotate the neutral adjust screw in the opposite direction until the other servo gauge begins to increase in pressure.

Turn the neutral adjust screw back one-half the amount noted above. Hold the neutral adjust screw and torque the lock nut to 25 to 30 in.lbs. (2.8 to 3.4 Nm).

Stop the prime mover. Connect the control input. Remove the servo pressure gages. Return the machine to normal operating condition. Restart prime mover and assure that hydrostatic system is in neutral.

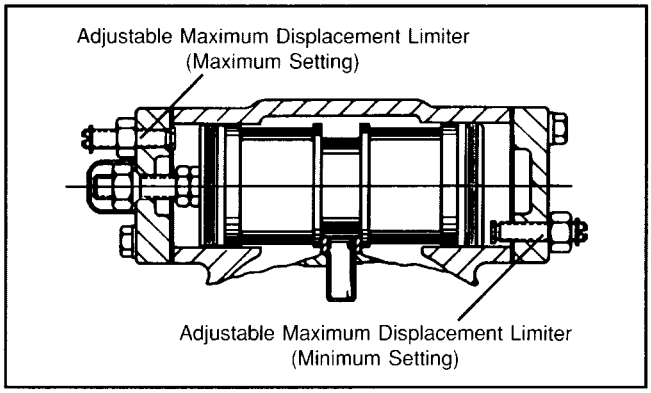


Fig. 26 - Displacement Limiter Adjustment (PV and PT)

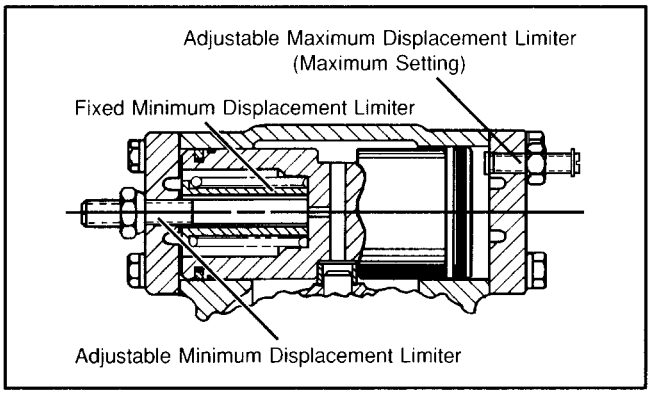


Fig. 27 - Displacement Limiter Adjustment (MV) (From 87-49)

Displacement Limiters

Variable pumps and tandem pumps may have optional maximum displacement (stroke) limiters located in the servo covers. To adjust, remove the protective sleeve and loosen the sealing lock nut (with a 5/16" hex wrench), and adjust the maximum displacement by rotating the stop with a screwdriver. Full pump displacement is attained with the stop at its maximum extension from the servo cover. Lock the adjustment by torquing the sealing lock nut to 4 to 7 lb.ft. (5.4 to 9.5 Nm) while holding the stop stationary. Install a new protective sleeve.

Variable motors may have an adjustable minimum displacement (stroke) limiter located in the bottom servo cover. To adjust, remove the protective sleeve and loosen the sealing lock nut (with an 11/16" hex wrench), and adjust the minimum displacement by rotating the stop with a 3/16" internal hex wrench. Minimum motor displacement is attained with the stop at its maximum extension from the servo cover. Lock the adjustment by torquing the sealing lock nut to 13 to 18 lb.ft. (17.6 to 24.4 Nm) while holding the stop stationary. Install a new protective sleeve.

Variable motors with date code 87-49 and above may also have an optional maximum displacement (stroke) limiter located in the top servo cover. This displacement limiter may be adjusted using the procedure outlined above for variable pumps and tandem pumps.

WARNING

Care should be taken in adjusting displacement limiters to avoid undesirable flow or speed conditions. The sealing lock nut must be retorqued after every adjustment to prevent an unexpected change in operating conditions and to prevent external leakage during unit operation. Use caution when adjusting minimum displacement on variable motors to avoid potential overspeed conditions during operation.

NOTE: One full revolution of the limiter stop produces a change in maximum or minimum displacement of approximately 9% (1.5° swashplate angle).

Minor Repair and Replacement

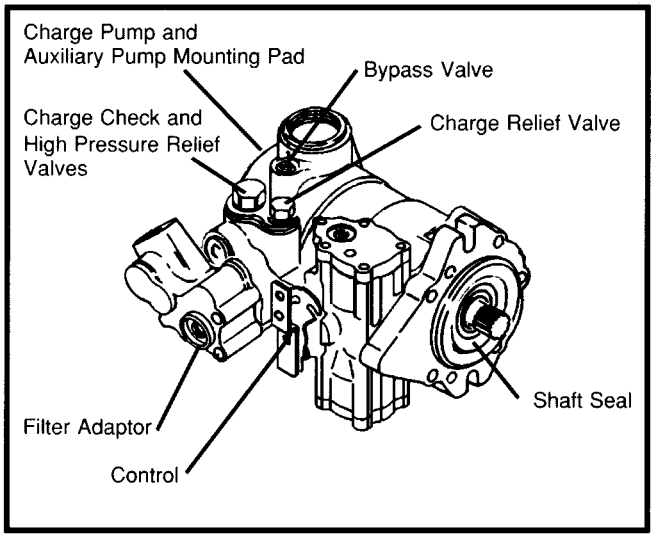
General

Minor Repairs may be performed, following the procedures in this section, without voiding the unit warranty.

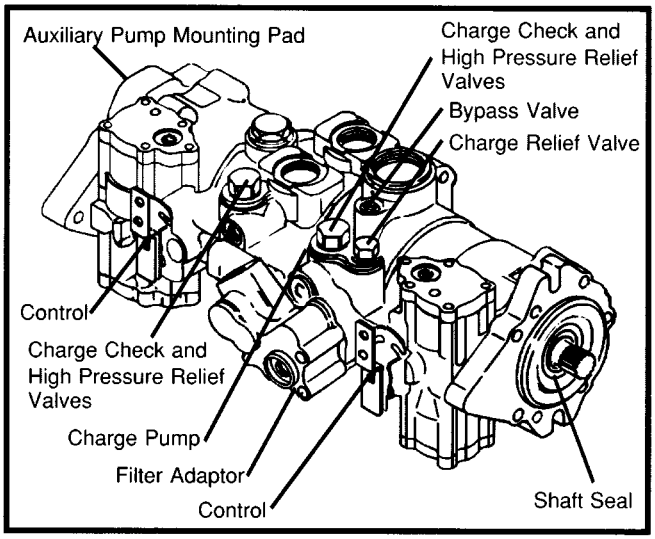
Cleanliness is a primary means of assuring satisfactory transmission life, on either new or repaired units. Cleaning parts by using a clean solvent wash and air drying is usually adequate. As with any precision equipment, all parts must be kept free of foreign materials and chemicals.

Protect all exposed sealing surfaces and open cavities from damage and foreign material.

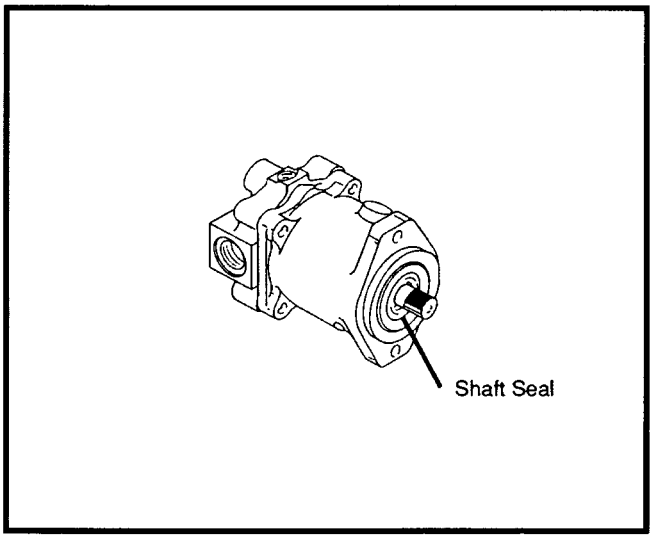
It is recommended that all gaskets and O-rings be replaced. Lightly lubricate all O-rings with clean petroleum jelly prior to assembly. All gasket sealing surfaces must be cleaned prior to installing new gaskets.



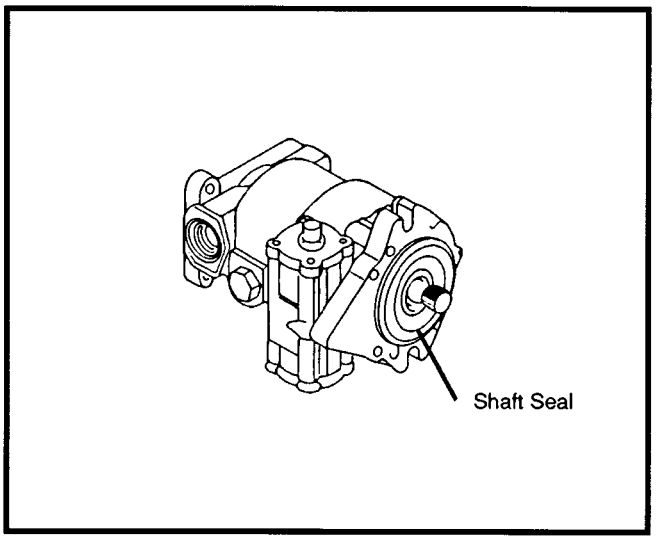
Variable Displacement Pump



Variable Displacement Tandem Pump



Fixed Displacement Motor



Variable Displacement Motor

Fig. 28 - Minor Repairs

Fig. 29 - Removing Shaft Seal

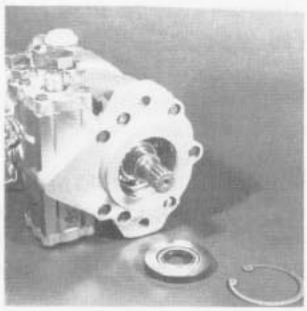


Fig. 30 - Shaft Seal Removed

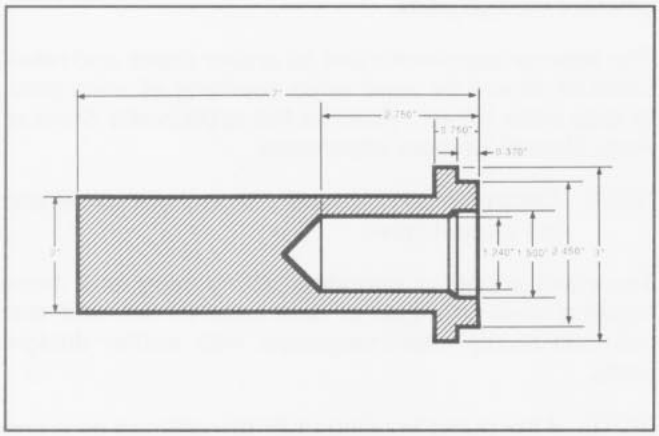


Fig. 31 - Shaft Seal Installation Tool Dimensions

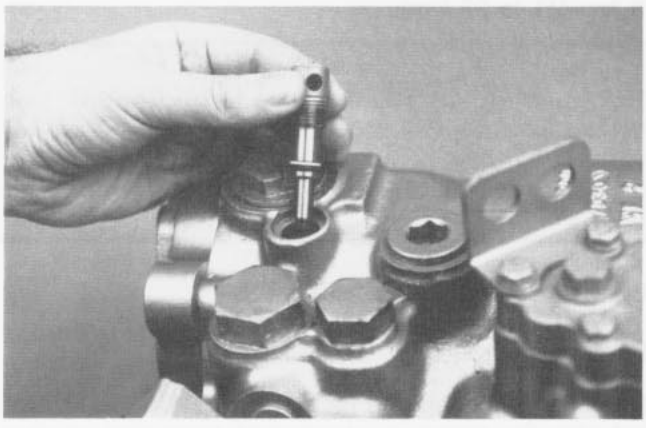


Fig. 32 - Bypass Valve

Shaft Seal

Lip type shaft seals are used on the Series 40 - M46 pumps and motors. These seals can be replaced without major disassembly of the unit. However, replacement of the shaft seal requires removal of the pump or motor from the machine.

Remove the retaining ring from the housing.

Carefully remove the seal from the housing bore. The face of the seal may be punctured with a sharp instrument (such as a screw driver) to aid in prying the seal out, or a slide hammer type puller may be used to remove the seal. Care must be taken so as not to damage the housing bore or shaft. Once removed, the seal is not reusable.

Prior to installing the new seal, inspect the sealing area on the shaft for rust, wear, or contamination. Polish the sealing area on the shaft if necessary.

Wrap the spline or key end of shaft with thin plastic to prevent damage to the seal lip during installation. Lubricate the inside diameter of the new seal with petroleum jelly.

NOTE: The outside diameter of the seal may be lightly coated with a sealant (such as Loctite High Performance Sealant #59231) prior to installation. This will aid in preventing leaks caused by damage to the housing seal bore.

Slide the new seal over the shaft and press it into the housing bore. Be careful not to damage seal. A seal installer tool can be made to aid in installing the seal. Dimensions for this tool are shown in the accompanying drawing.

Reinstall the seal retaining ring.

Bypass Valve (Pump)

Unscrew the bypass valve from the housing. Inspect the valve and mating seat for damage or foreign material. It is recommended that the O-ring and back up ring be replaced.

NOTE: Bypass valves are available with integral bypass orifices for specific applications. Refer to the appropriate Service Parts Manual for more information.

Reinstall the bypass valve into the housing. Torque to 7 to 10 ft.lbsf. (9.5 to 13.6 Nm).

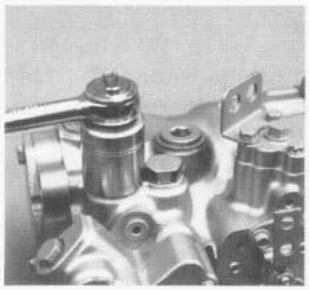


Fig. 33 - Removing Check and Relief Valve Plug

Fig. 34 - Remove Check and Relief Valves (PV Shown)

Fig. 35 - Charge Check Valve Components (Through 87-39)

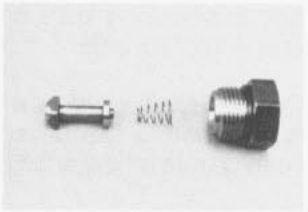
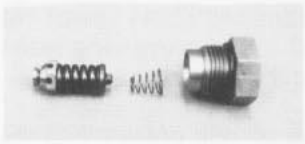


Fig. 36 - Charge Check Valve Components (From 87-40)



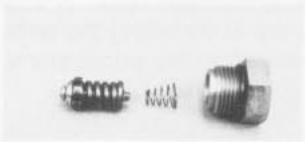


Fig. 37 - Charge Check and Relief Valve Components (Through 87-39)

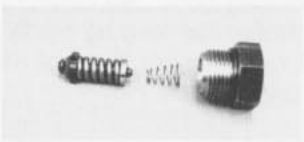


Fig. 38 - Charge Check and Relief Valve Components (From 87-40)

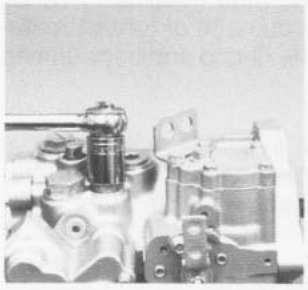


Fig. 39 - Removing Charge Relief Valve

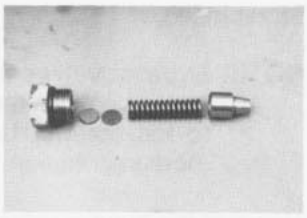


Fig. 40 - Charge Relief Valve Components

Charge Check and High Pressure Relief Valves

Remove the charge check and high pressure relief valve hex plug.

Remove the spring and check poppet or valve cartridge from the housing. Inspect the valve and mating seat in the housing for damage or foreign material. It will be necessary to replace the housing if the seat is damaged.

Several designs of charge check and high pressure relief valves have been used. Do not attempt to mix different vintage parts.

The appropriate check valve kit and/or check and relief valve kit should be used when servicing all units prior to date code 87-40. Refer to the appropriate Service Parts Manual for more information.

NOTE: Always replace ball type charge check valves with the poppet type.

The valve poppet or cartridge, spring, plug, and main housing were changed at date code 87-40, and are not individually interchangeable with earlier design parts.

NOTE: If the pump housing must be replaced on a unit with date code 86-14 through 87-39, the latest design charge check and high pressure relief valves must also be installed. Refer to the appropriate Service Parts Manual for more information.

Reinstall the valve cartridge, spring, and plug (with O-ring) into the housing. Torque the plug to 30 to 70 ft.lbs. (41 to 95 Nm).

CAUTION

The relief valves are factory set and should not be tampered with except for replacing the entire cartridge. Disassembly may change the setting and cause erratic unit operation or premature failure.

Charge Pressure Relief Valve

Remove charge relief valve hex plug.

Remove the spring and poppet from the housing. Do not alter the shims or interchange parts with another valve. Inspect the poppet and mating seat in the end cap for damage or foreign material.

Reinstall the poppet, spring, and plug (with shims and O-ring) into the housing. Torque the plug to 30 to 70 ft.lbs. (41 to 95 Nm).

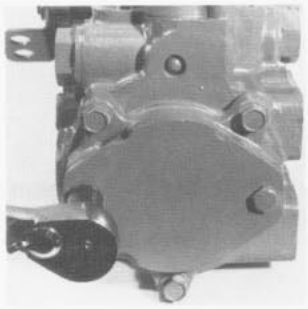


Fig. 41 - Remove Flange Cover

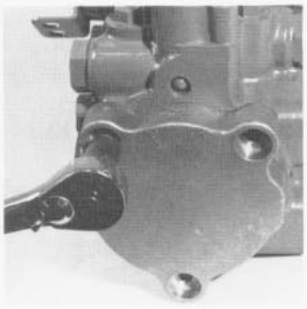


Fig. 42 - Remove Charge Pump Cover

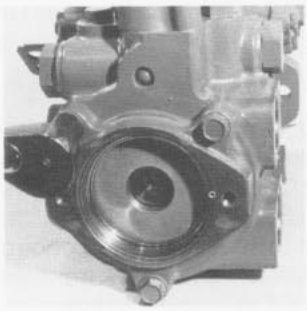


Fig. 43 - Remove Pad Adapter

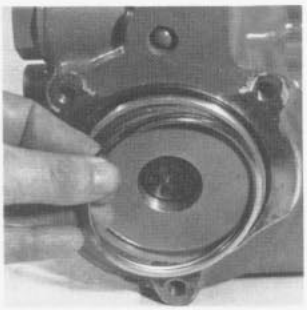


Fig. 44 - Remove Temper Load Ring

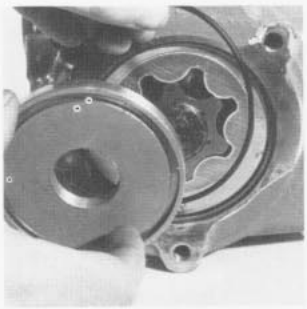


Fig. 45 - Remove Spacer Plate and O-Ring (Earlier Units)

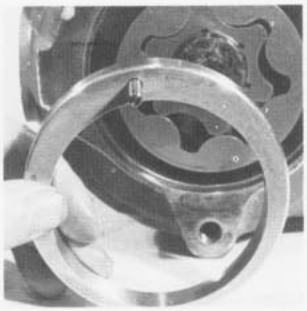


Fig. 46 - Remove Gerotor Ring and Pin (Earlier Units)

Fig. 47 - Remove Gerotor Cover (Later Units)

Fig. 48 - Remove Gerotor Assembly

Integral Charge Pump and Auxiliary Pump Mounting Pad (Variable Pump)

NOTE: Variable Pumps without an integral charge pump have no gerotor or drive parts installed in the charge pump cavity. Procedures for removing and installing the charge pump cavity cover or auxiliary mounting pad are similar to those for units with an integral charge pump.

If the unit is equipped with an auxiliary pump mounting pad, remove the two (2) hex head screws retaining the flange cover or auxiliary pump. Remove the flange cover or auxiliary pump and O-ring.

Using a 9/16" wrench, remove the three (3) hex head screws retaining the charge pump cover or adapter to the housing. Remove the cover or adapter.

Remove the temper load ring and discard. The temper load ring should always be replaced when the cover or adapter has been removed.

On earlier units, remove the O-ring, spacer plate, gerotor ring, and pin. On later units, remove the O-ring, gerotor cover, and pin.

NOTE: The gerotor ring and spacer plate are incorporated into a one (1) piece gerotor cover on pumps built after first quarter, 1986.

Note the orientation of the gerotor ring (or cover) and pin for reassembly.

Remove the gerotor assembly and woodruff key.

Each part should be inspected separately if they are to be reused. If either of the gerotor assembly parts needs to be replaced, they must both be replaced. Always replace the O-rings.

Inspect the woodruff key for damage or wear and replace it if necessary.

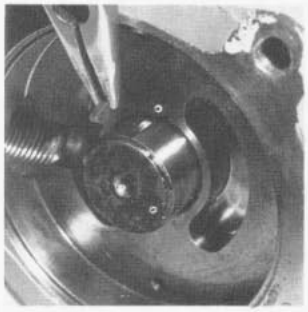


Fig. 49 - Install Drive Key

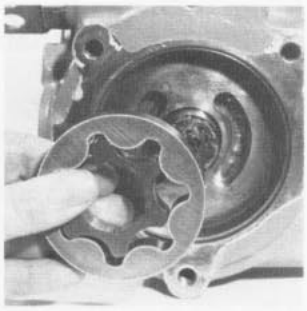


Fig. 50 - Install Gerotor Assembly

Prior to assembly, lubricate the gerotor assembly with clean hydraulic oil. Lubricate the O-rings with petroleum jelly.

Install the woodruff key into the drive shaft.

Slide the gerotor assembly into place in the pump housing. Be certain the gerotor engages the woodruff key in the drive shaft.

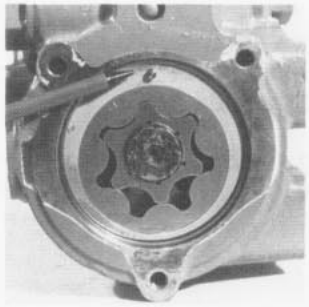


Fig. 51 - Orienting Gerotor Ring and Pin (CW) (Earlier Units Shown)

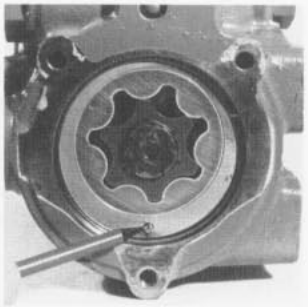


Fig. 52 - Orienting Gerotor Ring and Pin (CCW) (Earlier Units Shown)

NOTE: The charge pump rotation is determined by the position of the gerotor ring (earlier units) or gerotor cover (later units) and locating pin in the pump housing.

Install the gerotor ring and spacer plate or gerotor cover (with locating pin), over the gerotor assembly and into the pump housing, orienting them for the proper input shaft rotation direction. The pin in the gerotor ring or cover should be closest to the control for clockwise (CW) input rotation, and away from the control for counterclockwise (CCW) input rotation.

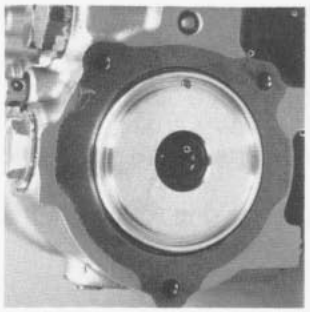


Fig. 53 - Orienting Gerotor Cover and Pin (CW) (Later Units Shown)

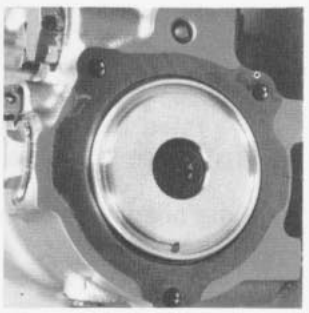


Fig. 54 - Orienting Gerotor Cover and Pin (CCW) (Later Units Shown)

Install a new temper load ring in the groove of the spacer plate or gerotor cover.

Install a new O-ring around the gerotor ring or cover. Install the charge pump cover or pad adapter onto the pump housing.

Reinstall the three (3) hex head screws and torque to 27 to 37 ft.lbs. (37 to 50 Nm). Check for proper internal assembly by slowly rotating the pump shaft while tightening these screws.

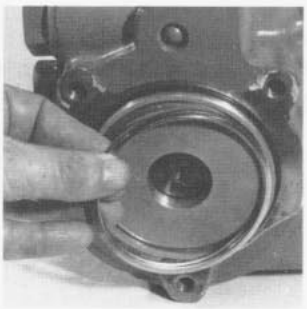


Fig. 55 - Install New Temper Load Ring

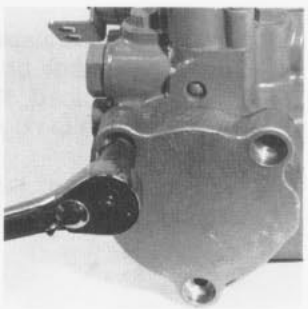


Fig. 56 - Install Charge Pump Cover or Pad Adapter

If the unit is equipped with an auxiliary pump mounting pad, install the O-ring and flange cover or auxiliary pump and secure with the hex head screws. Torque the screws to 20 to 25 ft.lbs. (27 to 34 Nm).

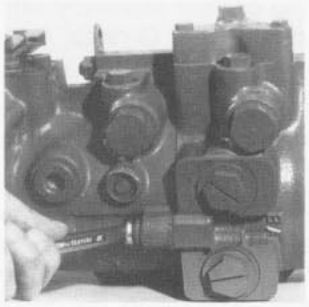


Fig. 57 - Remove 12 Point Screws

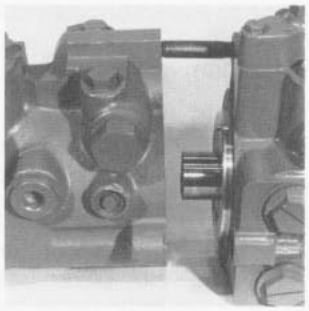


Fig. 58 - Separate Pump Sections

Integral Charge Pump (Tandem Pump)

NOTE: Tandem Pumps without an integral charge pump have a pilot ring and a drive coupling with spring locating pin installed in the charge pump cavity. Procedures for separating and attaching the front and rear pump sections are similar to those for units with an integral charge pump.

Remove the two (2) 12 point head screws (using a 1/2" wrench) and the hex nut (using a 3/4" wrench) which retain the front and rear pump sections together. Separate the front and rear sections of the pump. The gerotor plate (earlier units) usually stays in the rear section of the pump.

Remove the two (2) small O-rings and one (1) large seal ring (a small O-ring and a gasket are used on units manufactured before date code 86-14).

NOTE: The gerotor ring and gerotor plate are incorporated into a one (1) piece gerotor cover on pumps built after first quarter, 1986.

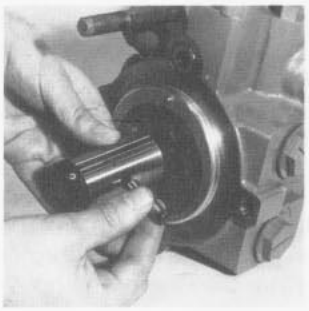


Fig. 59 - Remove Shaft Coupling (Earlier Unit Shown)

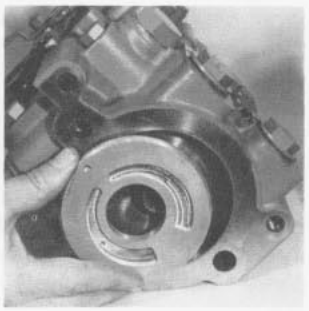


Fig. 60 - Remove Gerotor Plate (Earlier Unit)

On pumps with a separate gerotor ring and spacer plate, remove the shaft coupling and pin from the front section. Remove the gerotor assembly. Remove the gerotor ring and pin. Note the orientation of the gerotor ring and pin for reassembly. Remove the gerotor plate from the rear section of the pump.

On pumps with a one piece gerotor cover, remove the gerotor cover and pin. Note the orientation of the gerotor cover and pin for reassembly. Remove the shaft coupling and pin from the front section. Remove the gerotor assembly.

Remove the front gerotor spacer plate from units equipped with 0.95 in^3/rev (15.6 cc/rev) charge pumps.

Remove the outer O-ring from the rear section of the pump. Remove the inner O-ring from the gerotor plate or cover.

NOTE: Pumps with date code 87-34 and up use a modified gerotor cover and a smaller outer O-ring.

Each part should be inspected separately if they are to be reused. If either of the gerotor assembly parts needs to be replaced, they must both be replaced. Always replace the O-rings (and gaskets, where used).

Fig. 61 - Remove Gerotor Cover (Later Unit)

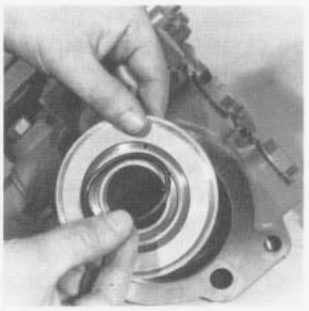


Fig. 62 - Remove O-Rings (Earlier Unit Shown)

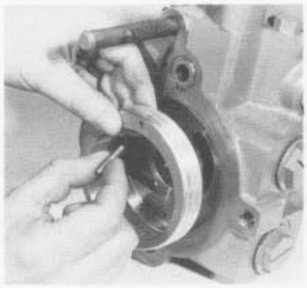


Fig. 63 - Orienting Gerotor Ring and Pin (CW) (Earlier Units)

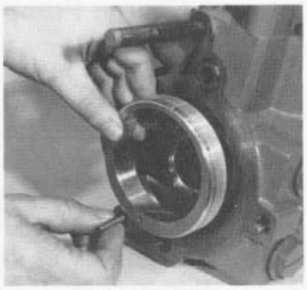


Fig. 64 - Orienting Gerotor Ring and Pin (CCW) (Earlier Units)

Fig. 65 - Install Gerotor Assembly (Earlier Units)

Fig. 66 - Install Drive Coupling (Earlier Units)

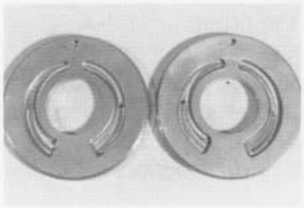


Fig. 67 - Location of Gerotor Plate Balance Hole

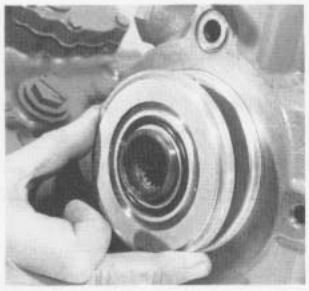


Fig. 68 - Install Gerotor Plate (Earlier Units)

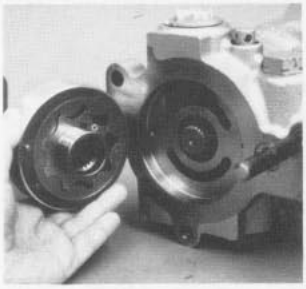


Fig. 69 - Orienting Gerotor Cover and Pin (CW) (Later Units)

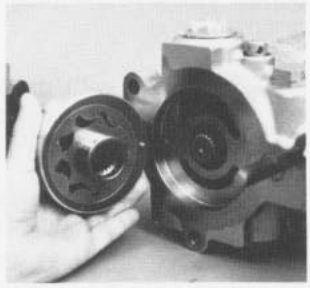


Fig. 70 - Orienting Gerotor Cover and Pin (CCW) (Later Units)

Prior to assembly, lubricate the gerotor assembly with clean hydraulic oil. Lubricate the O-rings with Petroleum jelly.

For units equipped with 0.95 in^3/rev (15.6 cc/rev) charge pumps, install the front gerotor spacer plate into the front pump housing.

NOTE: The charge pump rotation is determined by the position of the gerotor ring (earlier units) or gerotor cover (later units) and locating pin in the front pump housing. In addition, the gerotor plate or gerotor cover has a pressure balance hole which must always be installed on the outlet (pressure) side of the charge pump, opposite the charge inlet port. Different gerotor plates or covers are used for clockwise and counterclockwise rotation pumps.

Install the drive pin into the drive shaft coupling. Install the gerotor assembly into the gerotor ring or cover. Install the assembled gerotor and ring or cover onto the coupling, being certain the drive pin engages the slot in the gerotor.

For pumps with a separate gerotor ring and spacer plate, install the gerotor ring (with gerotor and coupling) into the pump housing, orienting it for the proper input shaft rotation direction. The locating pin hole in the gerotor ring should be closest to the control for clockwise (CW) input rotation, and away from the control for counterclockwise (CCW) input rotation. Install the locating pin into the gerotor ring and pump housing. Install the gerotor plate onto the gerotor ring. The pressure balance hole in the gerotor plate must always be located opposite the charge pump inlet. Install the inner O-ring in the groove on the back of the gerotor plate. Install the outer O-ring into the rear pump housing.

For pumps with a one piece gerotor cover, install the locating pin into the gerotor cover. Install the gerotor cover (with gerotor and coupling) into the pump housing, orienting it for the proper input shaft rotation direction. The locating pin in the gerotor cover should be closest to the control for clockwise (CW) input rotation, and away from the control for counterclockwise (CCW) input rotation. The pressure balance hole in the gerotor cover must always be located opposite the charge pump inlet. Be certain the drive pin engages the slot in the gerotor. Install the outer and inner O-rings in the grooves on the back of the gerotor cover.

NOTE: Pumps with date code 87-34 and up use a modified gerotor cover and a smaller outer O-ring. On these units, install the outer O-Ring into the groove on the gerotor cover, retaining it with petroleum jelly.

Minor Repair and Replacement (Continued)

Install the small O-ring and the gasket (two (2) small O-rings and a large seal ring on units manufactured after date code 86-14).

Slide the front and rear sections of the pump together, rotating the front pump shaft to align the splines on the coupling and rear pump shaft. Install the two (2) 12 point head screws and the hex nut to retain the front and rear pump sections together. Torque the screws and nut to 67 to 82 lbsf•ft (91 to 111 Nm). Check for proper internal assembly by slowly rotating the pump shaft while tightening these screws and nut.

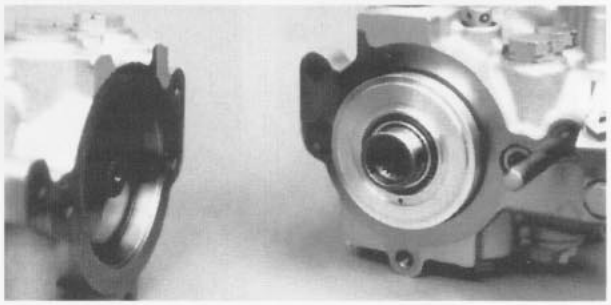


Fig. 71 - O-Rings Installed Between Sections (Later Production Shown)

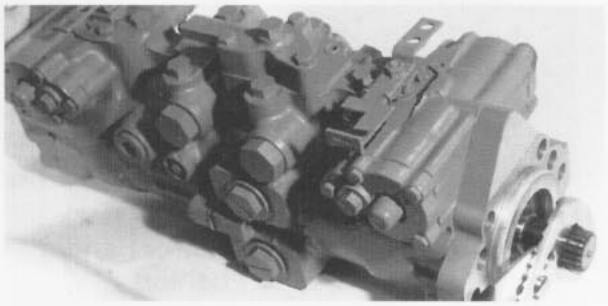


Fig. 72 - Rotating Shaft to Align Splines

Auxiliary Pump Pad

The auxiliary pad cover or auxiliary pump is attached to the auxiliary pad with hex head screws (hex screws and nuts on tandem pumps with SAE "B" pad) and is sealed with an O-ring. For SAE "A" pads, torque these screws to 27 to 37 lbsf•ft (37 to 50 Nm). For SAE "B" pads, torque these screws (and nuts) to 67 to 82 lbsf•ft (91 to 111 Nm).

Filter Adapter

Remove the filter adapter from the pump housing by removing three (3) hex head screws with a 1/2" wrench, or three (3) 12 point head screws with a 5/16" wrench. Remove the O-rings (earlier units) or gasket (later units).

Earliest production units use a filter adapter with two (2) O-rings. Later units have three (3) O-rings on the filter adapter. Always replace the O-rings.

Latest production units use a spacer/gasket between the adapter and the housing.

For earlier units, install new O-rings into the grooves of the filter adapter and install the adapter onto the pump housing. For later units, install the spacer/ gasket and adapter onto the housing. Reinstall the screws and torque to 16 to 21 lbsf•ft (22 to 28 Nm).

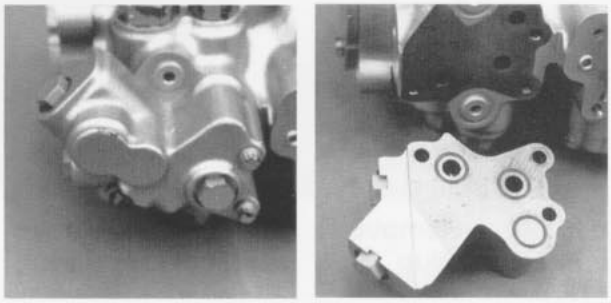


Fig. 73 - Filter Adapter and O-Rings (Earlier Production)

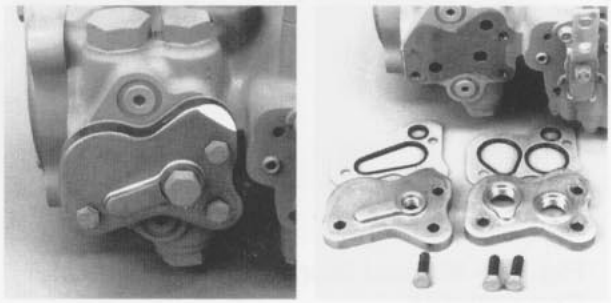


Fig. 74 - Filter Adapters and Gaskets (Later Production)

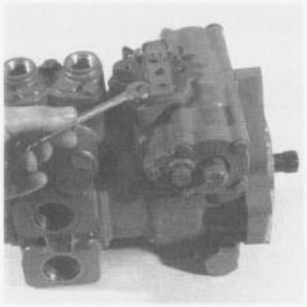


Fig. 75 - Remove Neutral Bracket Screw

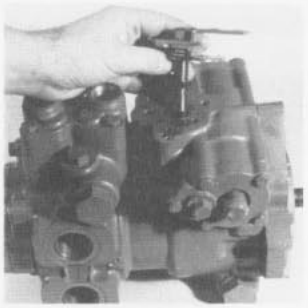


Fig. 76 - Remove Control Spool

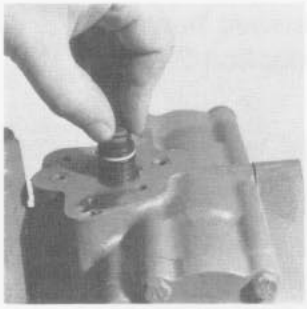


Fig. 77 - Remove Control Sleeve

Fig. 78 - Mark Control Handle Position

Fig. 79 - Remove Passage Plug

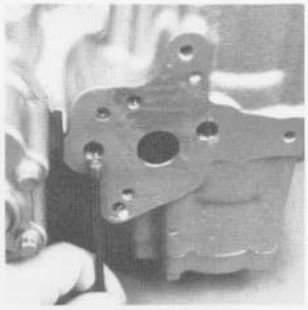


Fig. 80 - Remove Inlet Orifice Plug

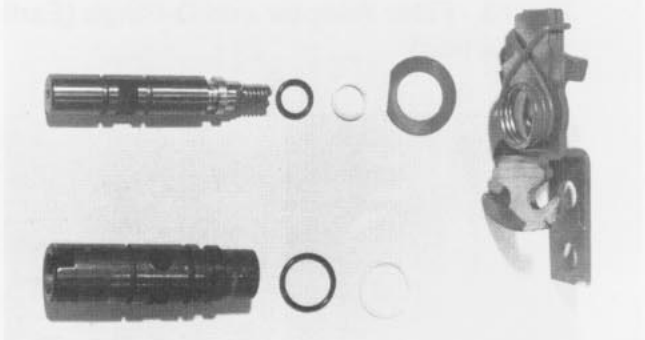


Fig. 81 - Manual Displacement Control Components

Manual Displacement Control (MDC)

CAUTION

The removal of any portion of the control mechanism may result in the loss of neutral, which will necessitate readjustment.

Before disassembly, note the position of the control handle and neutral bracket as either "up" or "down."

Remove the screw and washer or flange head screw retaining the neutral bracket to the housing using a 7/16" or 3/8" wrench.

The spool (with neutral bracket, neutral spring, control handle, and nut) can now be removed from the unit.

Remove the control sleeve from the unit by carefully gripping the end of the sleeve with pliers and pulling out.

If it is necessary to remove the control handle and neutral bracket from the spool, remove the nut from the spool using a 1/2" hex wrench. Remove the lock washer. Disengage the neutral spring from the handle and remove the handle from the spool. The neutral spring and neutral bracket can now be removed from the spool.

To gain access to the control inlet orifice, remove the plug located between the control sleeve bore and the filter adapter, using a hex wrench (9/16") on pumps with date code 86-13 or below, or an internal hex wrench (3/16") on pumps with date code 86-14 or above. Remove the inlet orifice plug using an internal hex wrench (1/8" for pumps with date code 86-13 or below, 5/32" for pumps with date code 86-14 or above).

After disassembly, all parts should be thoroughly cleaned in a suitable solvent. Replace the O-rings and backup rings. Lightly lubricate all O-rings with a small amount of clean petroleum jelly prior to assembly.

Minor Repair and Replacement (Continued)

Inspect the control inlet orifice for plugging.

Always install a control inlet orifice WITH a screen when servicing the pump. Pumps not equipped with an inlet orifice should have a screen plug with a 0.156" (3.96 mm) through-hole installed in the inlet orifice position. Pumps prior to date code 86-14 use an inlet orifice plug with a different thread from later units. Refer to the appropriate Service Parts Manual for orifice part numbers.

Inspect the control drain orifice, which is incorporated into the control valve sleeve. Refer to the appropriate Service Parts Manual for orifice size information and sleeve part numbers.

Install the control inlet orifice/screen plug and torque to 20 to 30 lbsf•ft (2.2 to 3.4 Nm). Install the external plug. Apply a thread sealant to the external pipe plug used on later units.

Install the neutral bracket and neutral spring onto the spool. Install the handle onto the spool, aligning the marks made at disassembly. Engage the neutral spring with the handle and neutral bracket. Install the external tooth lock washer and nut onto the spool and torque to 10 to 12 lbsf•ft (13.6 to 16.3 Nm).

Align the control sleeve so its slot will engage the swashplate feedback pin (slot positioned toward the pump cover) and insert the sleeve into the housing. Install the special washer onto the control sleeve.

Install the control spool assembly into the control sleeve, being certain that the control handle is oriented as noted during disassembly.

CAUTION

The slot in the handle end of the spool must be oriented toward the pump cover.

Orient the control sleeve washer (if used) so its flat clears the neutral bracket. Align the marks made at disassembly and fasten the neutral bracket to the housing with the locking flange head screw.

NOTE: Pumps using a hex head screw and star lock washer to retain the neutral bracket should have this hardware replaced with the locking flange head screw. Refer to the appropriate Service Parts Manual for the part number.

Readjust the neutral position of the control. Refer to the "Inspections and Adjustments" section of the M46 Service Manual for details.

Fig. 82 - Control Valve Sleeve Drain Orifices

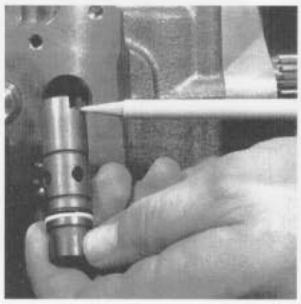


Fig. 83 - Slot in Control Sleeve

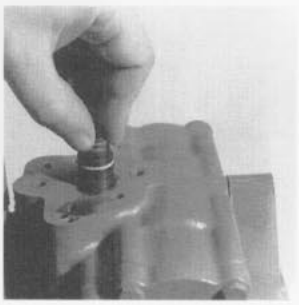


Fig. 84 - Install Control Sleeve

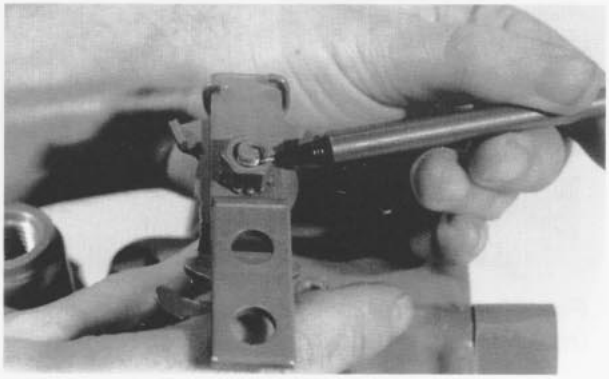


Fig. 85 - Install Control Spool

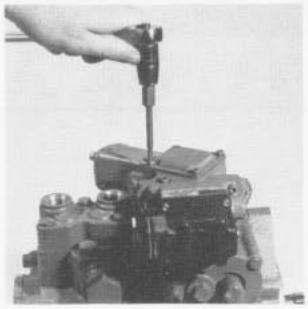


Fig. 86 - Remove Control Cover (SN 02-XX-XXXXX and Below)

Fig. 87 - Remove Control Mounting Screws

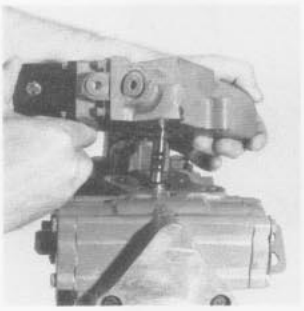


Fig. 88 - Remove Control

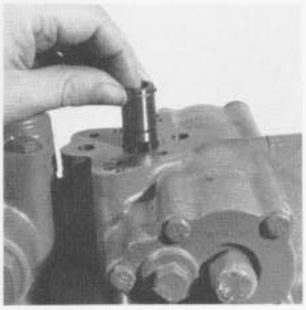


Fig. 89 - Remove Control Sleeve

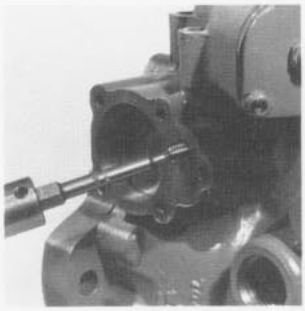


Fig. 90 - Control Orifice Plug

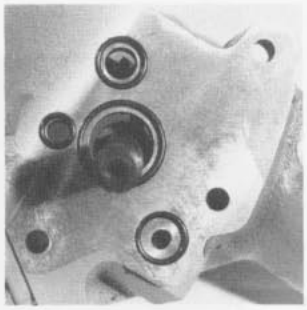


Fig. 91 - Control Housing O-Rings

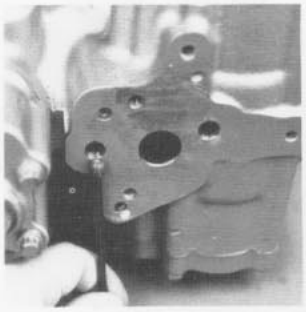


Fig. 92 - Control Inlet Screen Plug

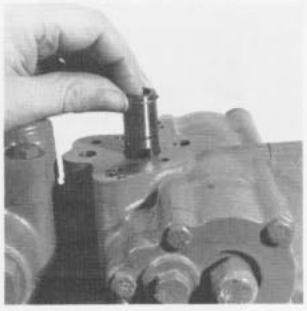


Fig. 93 - Install Control Sleeve

Electrical and Hydraulic Displacement Controls (EDC and HDC)

CAUTION

The removal of any portion of the control mechanism may result in the loss of neutral, which will necessitate readjustment.

On pumps with date code 86-13 or below, one of the control mounting screws is located under the control cover. On these pumps, first remove the four (4) control cover screws using an internal hex wrench (5/32"). Remove the cover and gasket to expose the screw. On pumps with date code 86-14 and above, all of the control mounting screws are external.

Remove the four (4) control mounting screws using an internal hex wrench (3/16").

Carefully lift the control off the pump housing.

Remove the control sleeve from the pump.

On later production pumps, remove the control inlet screen plug from the inlet passage next to the control sleeve bore, using an internal hex wrench (5/32").

The control orifice plugs are located in threaded passages under the servo piston covers. Remove the servo piston covers and gaskets, and remove the orifice plugs using an internal hex wrench (7/32").

Replace the O-rings on the bottom of the control housing. Lightly lubricate all O-rings with clean petroleum jelly prior to assembly. The control spool and sleeve are a matched set and are not available separately.

Reinstall the control orifice plugs into their passages and replace the servo piston covers.

Install the control inlet screen plug and torque to 20 to 30 in.lbs.(2.2 to 3.4 Nm). Always install a screen plug [with a 0.156" (3.96 mm) thru-hole] when servicing earlier production pumps. Pumps prior to date code 86-14 use a plug with a thread that is different from later units. Refer to the appropriate Service Parts Manual for plug part numbers.

Align the control sleeve so its slot will engage the swashplate feedback pin (slot positioned toward the pump cover) and insert the sleeve into the housing. Carefully align the control spool with the sleeve and install the control onto the pump housing. Install the four (4) mounting screws and torque to 10 to 11 ft.lbs (13 to 14 Nm).

On pumps with date code 86-13 or below, install a new gasket and replace the control cover. Install the four (4) cover screws and torque to 18 to 24 in.lbs. (2.0 to 2.7 Nm).

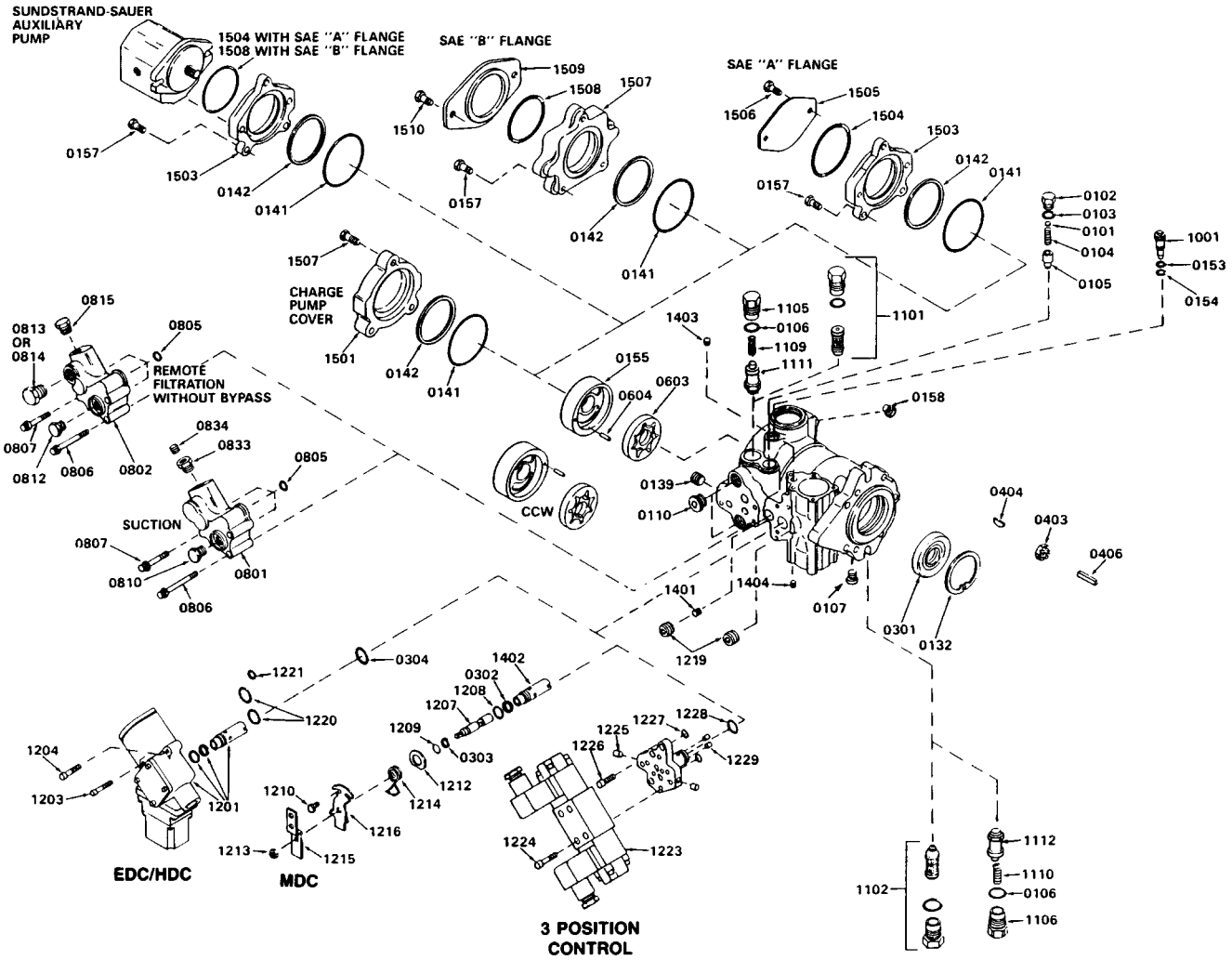
Readjust the neutral position of the control. Refer to the instructions in the "Inspections and Adjustments" section for details.

Notes

General Parts Identification

The following Information is for general parts identification ONLY. Refer to the applicable Service Parts List when ordering service parts

M46 Variable Displacement Pump -- PV (Minor Repair)



M46 Variable Pump -- PV (Minor Repair)

COMMON PARTS GROUP 01		
ITEM	DESCRIPTION	QTY
0101	SHIM KIT CHG RELIEF VALVE	1
0102	PLUG	1
0103	O RING	1
0104	SPRING CHG RELIEF VALVE	1
0105	VALVE REL	1
0106	O-RING	2
0107	PLUG ST THD	2
0110	PLUG	2
0113	PLUG PLASTIC	2
0141	O-RING	1
0142	RING TEMPER LOAD	1
0153	RING BACK UP	1
0154	O-RING	1
0155	COVER GEROTOR	1
0157	SCREW HEX HD	3

SEAL GROUP 03		
ITEM	DESCRIPTION	QTY
0301	SEAL LIP	1
0302	O-RING MDC	1
0303	O-RING MDC	1
0304	O-RING EDC/HDC	1

INPUT/AUX DRIVE CONFIG. GROUP 04		
ITEM	DESCRIPTION	QTY
0403	NUT SLOTTED	1
0404	KEY	1

CHG PUMP DISPLACEMENT GROUP 06		
ITEM	DESCRIPTION	QTY
0603	GEROTOR ASSY	1
0604	PIN	1
0605	KEY WOODRUFF	1
0606	PLUG	1

FILTRATION GROUP 08		
ITEM	DESCRIPTION	QTY
0801	ADAPT SUCTION FILTER INLET	1
0802	ADAPT. REMOTE W/O BYPASS	1
0803	ADAPT. REMOTE W/BYPASS	1
0804	ADAPT. W/BYPASS AND FILTER	1
0805	O-RING	3
0806	SCREW	2
0807	SCREW	1
0808	SCREW	1
0809	SCREW 12 PT	2
0810	PLUG ST THD	2
0812	PLUG PLASTIC	1
0813	PLUG PLASTIC	1
0815	PLUG	1
0816	PLUG	1
0817	PLUG	1
0818	PLUG	1
0819	O-RING	1
0820	VALVE BYPASS	1
0821	SPRING	1
0822	WASHER	1
0823	PLUG EXPANDING	3
0824	PLUG SPECIAL	1
0825	O-RING	1
0826	VALVE BYPASS	1
0827	SPRING	1
0828	WASHER	1
0829	PLUG	2
0830	PLUG EXPANDING	1
0831	FILTER	1
0832	PLUG	1
0833	PLUG ST THD	1
0834	PIPE PLUG	1

BYPASS VALVE GROUP 10		
ITEM	DESCRIPTION	QTY
1001	BYPASS VALVE	1

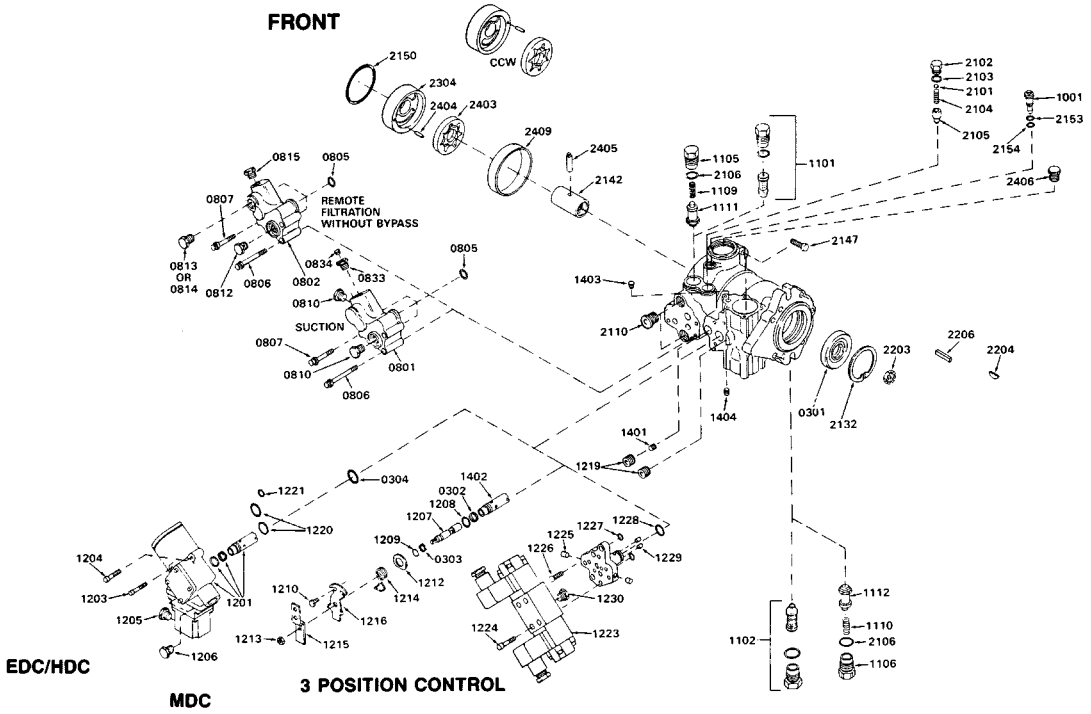
SYS PRESS PROTECTION GROUP 11		
ITEM	DESCRIPTION	QTY
1101	REL VALVE KIT	1
1102	REL VALVE KIT	1
1103	REL VALVE KIT	1
1104	REL VALVE KIT	1
1105	PLUG SPECIAL	1
1106	PLUG SPECIAL	1
1109	SPRING	1
1110	SPRING	1
1111	POPPET, CHECK	1
1112	POPPET, CHECK	1

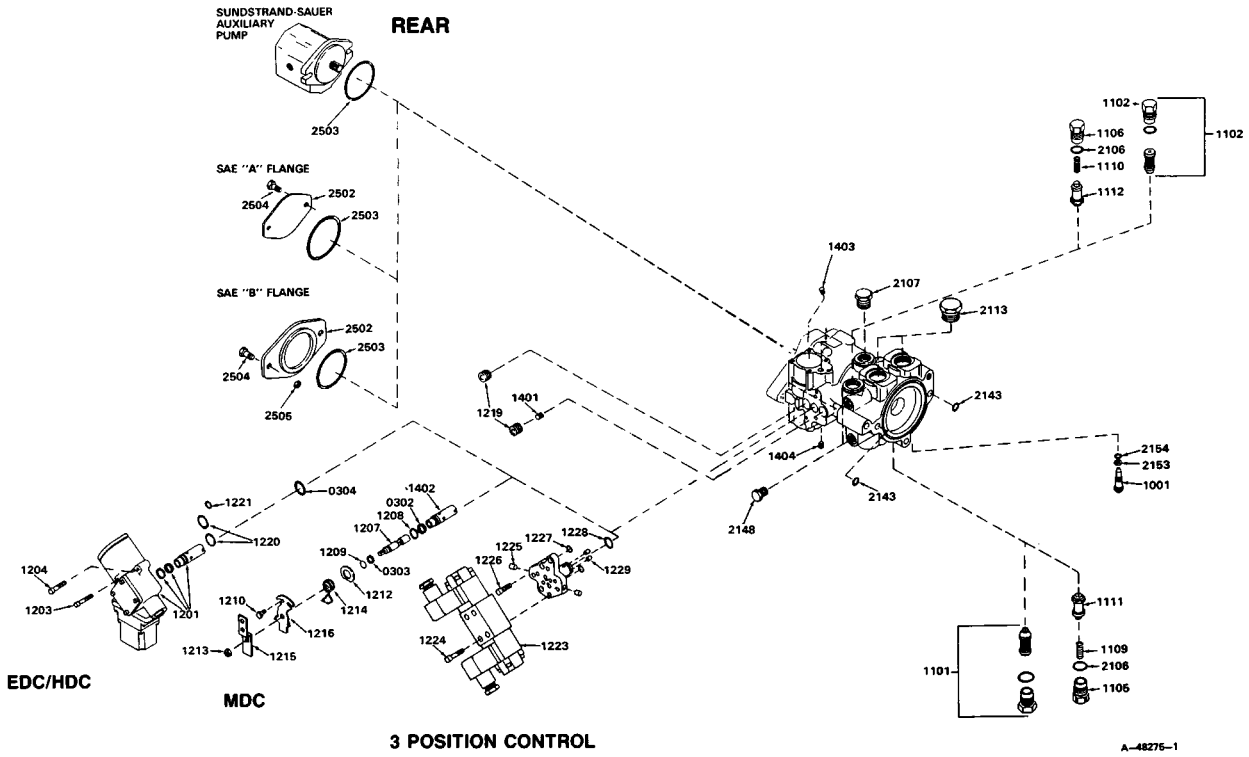
CONTROL GROUP 12		
ITEM	DESCRIPTION	QTY
1201	HDC	1
1201	EDC	1
1203	SCREW	2
1204	SCREW SOC HD	2
1205	CAP PLASTIC	1
1206	PLUG PLASTIC	2
1207	SPOOL ROT VALVE MDC	1
1208	BACK UP RING	1
1209	RING BACK UP	1
1210	SCREW HEX HD	1
1213	NUT SPECIAL	1
1214	SPRING NEUTRAL RETURN	1
1215	HANDLE CONTROL VALVE	1
1216	BRACKET NEUTRAL RETURN	1
1219	PLUG	2
1220	LOCK WASHER (MDC)	1
1220	O-RING (HDC & EDC)	2
1221	O-RING	1
1223	VALVE-SOLENOID CONTROL	1
1224	METRIC SCREW SOC HD	4
1225	MANIFOLD 3-POS CONTROL	1
1226	SCREW SOC HD	3
1227	O-RING	2
1228	O-RING	1
1229	PLUG	2
1230	PLUG	2
1231	COVER PLATE FOR SHIPPING	1
1232	GASKET COVER	1
1233	SCREW	2

CONTROL ORIFICE GROUP 14		
ITEM	DESCRIPTION	QTY
1401	PLUG ORIFICE/SCREEN	1
1402	SLEEVE CONTROL VALVE MDC	1
1403	PLUG ORIFICE HDC/EDC	1
1404	PLUG ORIFICE HDC/EDC	1

AUXILIARY FLANGE GROUP 15		
ITEM	DESCRIPTION	QTY
1501	COVER CHARGE PUMP	1
1503	ADAPTER "A" FLANGE	1
1504	O-RING	1
1505	PLATE COVER	1
1506	SCREW HEX HD	2
1507	ADAPTOR "B" FLANGE	1
1508	O-RING	1
1509	COVER PLATE	1
1510	SCREW HEX HD	2

M46 Tandem Pump -- PT (Minor Repair)





M46 Tandem Pump -- PT (Minor Repair)

SEAL GROUP 03		
ITEM	DESCRIPTION	QTY
0301	SEAL LIP(FRONT PUMP)	1
0302	O-RING MDC	1
0303	O-RING MDC	1
0304	O-RING EDC/HDC	1

FILTRATION GROUP 08		
ITEM	DESCRIPTION	QTY
0801	ADAPT. SUCTION FILTER INLET	1
0802	ADAPT. REMOTE W/O BYPASS	1
0803	ADAPT. REMOTE W/BYPASS	1
0804	ADAPT. W/BYPASS AND FILTER	1
0805	O-RING	3
0806	SCREW	2
0807	SCREW	1
0808	SCREW	1
0809	SCREW 12 PT	2
0810	PLUG ST THD	2
0812	PLUG PLASTIC	1
0813	PLUG PLASTIC	1
0814	PLUG	1
0815	PLUG	1
0816	PLUG	1
0817	PLUG	1
0818	PLUG	1
0819	O-RING	1
0820	VALVE BYPASS	1
0821	SPRING	1
0822	WASHER	1
0823	PLUG EXPANDING	3
0824	PLUG SPECIAL	1
0825	O-RING	1
0826	VALVE BYPASS	1
0827	SPRING	1
0828	WASHER	1
0829	PLUG	2
0830	PLUG EXPANDING	1
0831	FILTER	1
0832	PLUG	1
0833	PLUG ST THD	1
0834	PIPE PLUG	1

BYPASS VALVE GROUP 10		
ITEM	DESCRIPTION	QTY
1001	BYPASS VALVE	1

SYS PRESS PROTECTION GROUP 11		
ITEM	DESCRIPTION	QTY
1101	REL VALVE KIT	1
1102	REL VALVE KIT	1
1103	REL VALVE KIT	1
1104	REL VALVE KIT	1
1105	PLUG SPECIAL	1
1106	PLUG SPECIAL	1
1109	SPRING	1
1110	SPRING	1
1111	POPPET, CHECK	1
1112	POPPET, CHECK	1

CONTROL GROUP 12		
ITEM	DESCRIPTION	QTY
1201	HDC	1
1201	EDC	1
1203	SCREW	2
1204	SCREW SOC HD	2
1205	CAP PLASTIC	1
1206	PLUG PLASTIC	2
1207	SPOOL ROT VALVE MDC	1
1208	BACK UP RING	1
1209	RING BACK UP	1
1210	SCREW HEX HD	1
1213	NUT SPECIAL	1
1214	SPRING NEUTRAL RETURN	1
1215	HANDLE CONTROL VALVE	1

CONTROL GROUP 12 (CON'T)		
ITEM	DESCRIPTION	QTY
1216	BRACKET NEUTRAL RETURN	1
1219	PLUG	2
1220	LOCK WASHER (MDC)	1
1220	O-RING (HDC & EDC)	2
1221	O-RING	1
1223	VALVE-SOLENOID CONTROL	1
1224	METRIC SCREW SOC HD	4
1225	MANIFOLD 3-POS CONTROL	1
1226	SCREW SOC HD	3
1227	O-RING	2
1228	O-RING	1
1229	PLUG	2
1230	PLUG	2
1232	GASKET COVER	1
1233	SCREW	2

CONTROL ORIFICE GROUP 14		
ITEM	DESCRIPTION	QTY
1401	PLUG ORIFICE/SCREEN	1
1402	SLEEVE CONTROL VALVE MDC	1
1403	PLUG ORIFICE	1
1404	PLUG ORIFICE	1

COMMON PARTS GROUP 21		
ITEM	DESCRIPTION	QTY
2101	SHIM KIT REL VAL	1
2102	PLUG	1
2103	O-RING	1
2104	SPRING REL VAL	1
2105	VALVE REL	1
2106	O-RING	4
2107	PLUG ST THD	3
2110	PLUG ST THD	2
2113	PLUG PLASTIC	4
2132	RING	3
2142	COUPLING	1
2143	O-RING	2
2144	NUT	1
2145	STUD	1
2147	SCREW 12 PT	2
2148	PLUG ST THD	2
2150	O-RING OR GASKET	1
2153	RING BACK UP	2
2154	O-RING	2
2155	PLUG ST THD	2

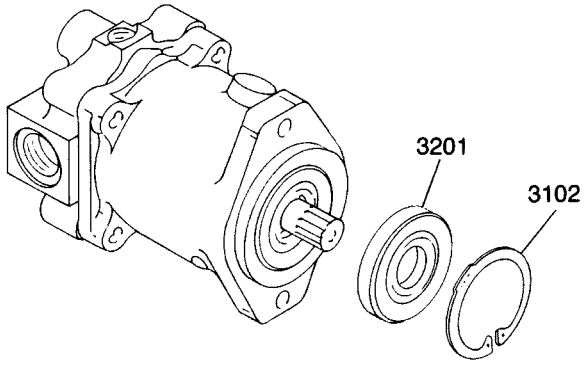
DRIVE SHAFT GROUP 22		
ITEM	DESCRIPTION	QTY
2203	NUT SLOTTED	1
2204	KEY	1
2206	KEY	1

ROTATION/CHARGE PUMP GROUP 23		
ITEM	DESCRIPTION	QTY
2304	COVER GEROTOR (CW / CCW)	1

CHG PUMP DISPLACEMENT GROUP 24		
ITEM	DESCRIPTION	QTY
2402	PLATE SPACER (.95 CIR)	1
2403	GEROTOR ASSY	1
2404	PIN	1
2405	PIN	1
2406	PLUG	1
2407	O-RING	1
2408	O-RING	1
2409	RING PILOT (LESS CHG. PUMP)	1

AUXILIARY FLANGE GROUP 25		
ITEM	DESCRIPTION	QTY
2502	COVER PLATE	1
2503	O-RING	1
2504	SCREW HEX HD	2
2505	NUT "B" FLANGE	2

M46 Fixed Displacement Motor -- MF (Minor Repair)

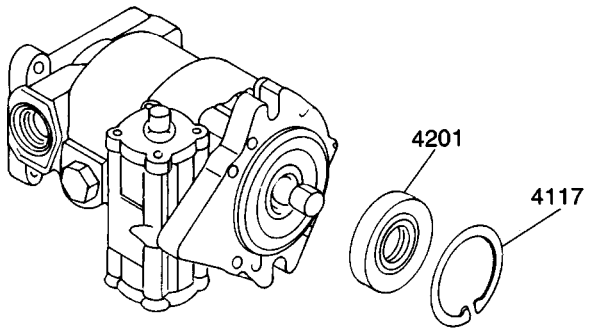


COMMON PARTS GROUP 31		
ITEM	DESCRIPTION	QTY
3102	RING	1
3117	PLUG ST THD	2

SEAL GROUP 32		
ITEM	DESCRIPTION	QTY
3201	SEAL LIP	1
3202	SEAL LIP THRU SHAFT	1

OUTPUT SHAFT / AUX DRIVE GROUP 33		
ITEM	DESCRIPTION	QTY
3303	NUT SLOTTED	1
3304	KEY	1
3306	KEY SQUARE	1

M46 Variable Displacement Motor -- MV (Minor Repair)

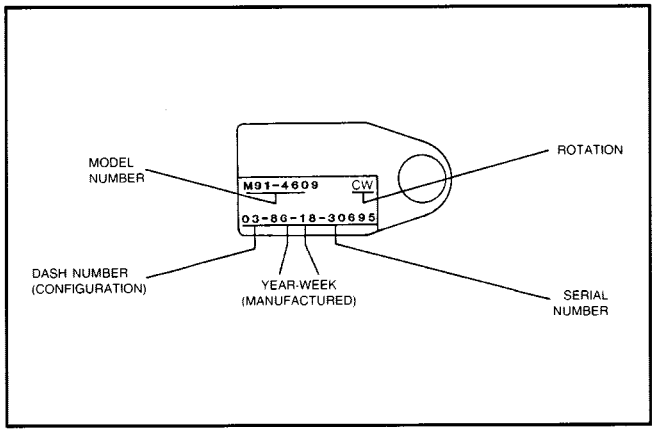


COMMON PARTS GROUP 41		
ITEM	DESCRIPTION	QTY
4117	RING	2
4127	PLUG ST THD	2

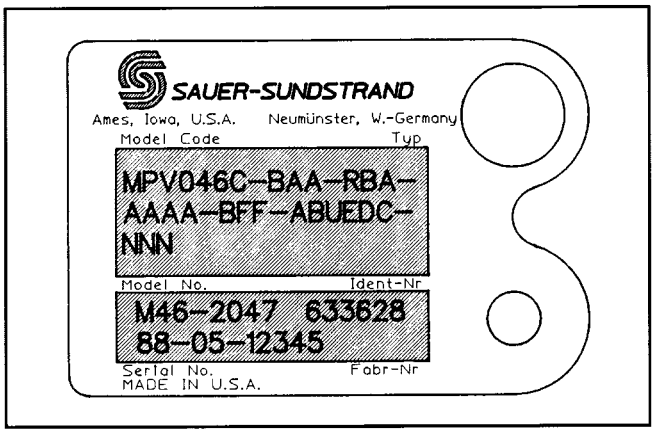
SEAL GROUP 42		
ITEM	DESCRIPTION	QTY
4201	SEAL LIP NITRILE	1
4202	SEAL NITRILE THRU SHAFT	1

OUTPUT SHAFT / AUX DRIVE GROUP 43		
ITEM	DESCRIPTION	QTY
4303	NUT SLOTTED	1
4304	KEY	1
4306	KEY THRU SHAFT	1

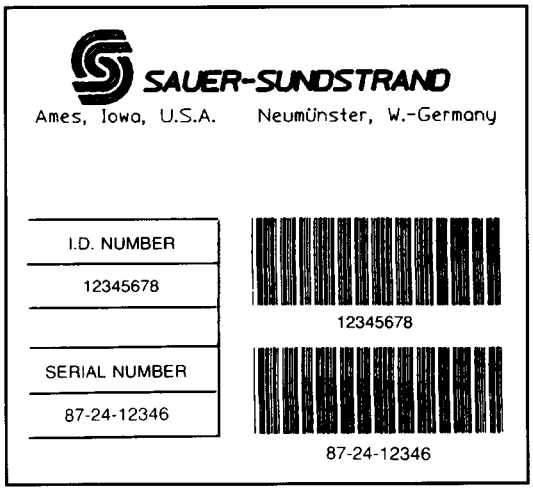
Unit Identification



Name Plate (Earlier Production)



Name Plate (Later Production)



Bar Coding - Tag

Name Plate

Each Series 40 pump and motor will have a name plate affixed to the housing. The name plate will include the following information:

Model (Identification) Number
The Model Number is used by the factory in manufacturing. On repeat orders, a complete unit can be ordered by the Model Number. The Model Number is cross referenced to the specific Model Code (Nomenclature) for the unit.

Model Code
The Model Code for the Series 40 pumps and motors is defined on the following pages. The Model Code completely defines the specific unit and must be used when ordering the complete unit for the first time or for ordering parts to service the product.

NOTE: Earlier production M46 units do not have the Model Code on the name plate.

Serial Number
The Serial Number is used to identify the manufacturing (assembly) location, the build date, and the unit sequence in the build. The Serial Number is also used to identify the unit's warranty time period, and MUST be referenced when ordering service parts.

A "Manufacturing Location" letter code was added to the Serial Number during 1988. This code indicates the location of original manufacture (assembly). "A" indicates the unit was originally assembled in Ames, Iowa, U.S.A.

The first four (4) digits in the Serial Number indicate the Build Date Code. The first number (2 digits) indicates the year of manufacture. The second number (2 digits) indicates the calendar week of manufacture. For example, "86-19" indicates a unit which was manufactured in the nineteenth calendar week of the year 1986.

The third number (5 digits) in the Serial Number is a sequential number used to identify a specific unit.

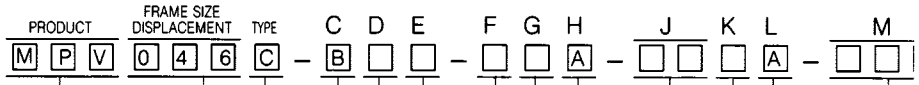
NOTE: Earlier production M46 units have a two (2) digit Dash Number (Configuration Code) preceding the Serial Number.

Bar Coding - Tag

A Universal Bar Code, representing the Identification Number and the Serial Number, will also be affixed to later production units so these items can be read electronically.

Model Code

M46 Variable Displacement Pump -- PV



PRODUCT
MPV = MEDIUM DUTY, PUMP, VARIABLE

DISPLACEMENT
046 = 46 CC/REV (2.8 CU. IN./REV)

TYPE
C = CLOSED CIRCUIT

C: SWASHPLATE GROUP
B = STANDARD

D: SEAL GROUP
A = SHAFT SEAL FOR MDC
B = SHAFT SEAL FOR EDC/HDC

E: INPUT SHAFT/AUXILIARY DRIVE
A = 13T 16/32P SPLINE/NONE
B = 13T 16/32P SPLINE/SAE "A" FLG 9T SPLINE
D = 13T 16/32P SPLINE/SAE "B" FLG 13T SPLINE
G = 15T 16/32P SPLINE/NONE
H = 15T 16/32P SPLINE/SAE "A" FLG 9T SPLINE
► J = 15T 16/32P SPLINE/SAE "A" FLG 11T SPLINE
K = 15T 16/32P SPLINE/SAE "B" FLG 13T SPLINE
► N = 1 IN. DIA TAPERED, 1.5 IN./FT./NONE
► P = 1 IN. DIA TAPERED, 1.5 IN./FT./SAE "A" FLG 9T SPLINE
► S = 1 IN. DIA TAPERED, 1.5 IN./FT./SAE "B" FLG 13T SPLINE
► V = 1 IN. DIA STR KEY/NONE
► W = 1 IN. DIA STR KEY/SAE "A" FLG 9T SPLINE

F: ROTATION
R = CW
L = CCW

G: CHARGE PUMP DISPLACEMENT
► A = NONE
B = 13.9 CC/REV (.85 CU. IN./REV)

H: CHARGE PRESSURE RELIEF VALVE SETTING*
A = 16.0 BAR (230 PSI)

J: FILTRATION
AA = SUCTION
BA = REMOTE PRESSURE W/O BYPASS
► BC = REMOTE PRESSURE W/O BYPASS (FOR NO CHARGE PUMP-OPT)

K: DISPLACEMENT
A = FULL DISPLACEMENT
► G = ADJUSTABLE MAX. STOPS - SUPPLIED WITH STOPS SET AT 46.0 CC/REV (2.8 CU. IN./REV)

L: BYPASS VALVE
A = BYPASS VALVE

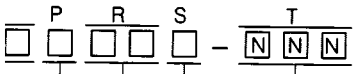
M: SYSTEM PRESSURE PROTECTION

	PROTECTION	
TYPE	**PORT "A"**	**PORT "B"**
A =	NONE	NONE
B =	PRESS. RELIEF	PRESS. RELIEF
C =	PRESS. RELIEF	NONE
D =	NONE	PRESS. RELIEF

SETTINGS (FOR PORT "A" & "B")*

A = NONE
M = 140 BAR (2030 PSI)
B = 175 BAR (2540 PSI)
C = 190 BAR (2755 PSI)
D = 210 BAR (3045 PSI)
E = 230 BAR (3335 PSI)
F = 250 BAR (3625 PSI)
G = 280 BAR (4060 PSI)
H = 300 BAR (4350 PSI)
J = 345 BAR (5000 PSI)

M46 Variable Displacement Pump -- PV (Continued)



T: SPECIAL HARDWARE FEATURES
NNN = NONE

S: AUXILIARY MOUNTING PAD
A = SAE "A" 9T SPLINE
D = SAE "A" 11T SPLINE
B = SAE "B" 13T SPLINE
C = NONE

R: CONTROL ORIFICE DIA

SUPPLY (MDC)	DRAIN (MDC)
F = NONE	F = NONE
A = .031 IN.	A = .031 IN.
B = .036 IN.	B = .036 IN.
C = .041 IN.	C = .041 IN.
D = .046 IN.	D = .046 IN.
E = .054 IN.	E = .054 IN.
ORIFICE "A" (EDC/HDC)	ORIFICE "B" (EDC/HDC)
G = .055 IN.	G = .055 IN.
H = .037 IN.	H = .037 IN.
J = NONE	J = NONE

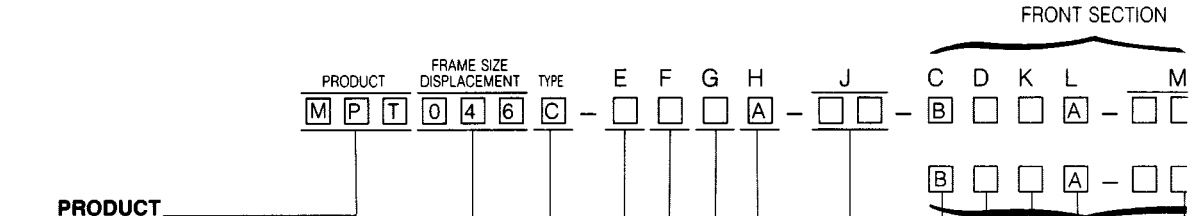
P: HANDLE POSITION
A = NOT APPLICABLE (EDC OR HDC)
D = DOWN
U = UP

N: CONTROL
AB = MDC
► BA = HDC
CA = EDC, SINGLE COIL, DRY CASE, PACKARD CONNECTOR
► CD = EDC, SINGLE COIL, OIL FILLED, MS CONNECTOR

► = Non-Standard

*All pressure settings above are nominal set pressure at factory test conditions. Actual pressures will vary due to actual conditions.

M46 Tandem Pump -- PT



PRODUCT
MPT = MEDIUM DUTY, PUMP, TANDEM

DISPLACEMENT (PER SECTION)
046 = 46 CC/REV (2.8 CU. IN./REV)

TYPE
C = CLOSED CIRCUIT

E: INPUT SHAFT
A = 15T 16/32P SPLINE
B = 19T 16/32P SPLINE
► C = 1 IN. DIA TAPERED, 1.5 IN./FT.
► D = 1 IN. DIA STR KEY

F: ROTATION
C = CW; W/22.9 CC/REV (1.40 CU. IN./REV) CHG PMP
D = CCW; W/22.9 CC/REV (1.40 CU. IN./REV) CHG PMP
► G = CW; W/O CHARGE PUMP
► H = CCW; W/O CHARGE PUMP

G: CHARGE PUMP DISPLACEMENT
A = NONE
C = 22.8 CC/REV (1.40 CU. IN./REV)

H: CHARGE PRESSURE RELIEF VALVE SETTING*
A = 16.0 BAR (230 PSI)

J: FILTRATION
AA = SUCTION
BA = REMOTE PRESSURE W/O BYPASS
► BC = REMOTE PRESSURE W/O BYPASS (FOR NO CHARGE PUMP-OPTION)

C: SWASHPLATE GROUP
B = STANDARD

D: SEAL GROUP
A = SHAFT SEAL FOR MANUAL DISPL. CONT-**FRONT SECTION**
B = SHAFT SEAL FOR EDC/HDC-**FRONT SECTION**
C = SHAFT SEAL FOR MANUAL DISPL. CONT—**REAR SECTION**
D = SHAFT SEAL FOR EDC/HDC-**REAR SECTION**

K: DISPLACEMENT
A = FULL DISPLACEMENT
► G = ADJUSTABLE MAX. STOPS - SUPPLIED WITH STOPS SET AT 46.0 CC/REV (2.8 CU. IN./REV)

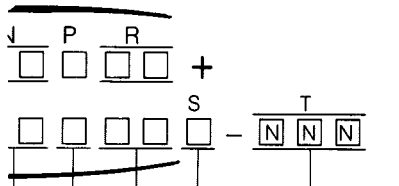
L: BYPASS VALVE
A = BYPASS VALVE

M: SYSTEM PRESSURE PROTECTION*

	PROTECTION	
TYPE	PORT "A" or "C"	PORT "B" or "D"
A =	NONE	NONE
B =	PRESS. RELIEF	PRESS. RELIEF
C =	PRESS. RELIEF	NONE
D =	NONE	PRESS. RELIEF

SETTINGS (SELECT FOR PORT "A" & "B" AND "C" & "D")
A = NONE
M = 140 BAR (2030 PSI)
B = 175 BAR (2540 PSI)
C = 190 BAR (2755 PSI)
D = 210 BAR (3045 PSI)
E = 230 BAR (3335 PSI)
F = 250 BAR (3625 PSI)
G = 280 BAR (4060 PSI)
H = 300 BAR (4350 PSI)
J = 345 BAR (5000 PSI)

M46 Tandem Pump -- PT (Continued)



T: SPECIAL HARDWARE FEATURES
NNN = NONE

S: AUXILIARY MOUNTING PAD
A = SAE "A" 9T SPLINE
► D = SAE "A" 11T SPLINE
B = SAE "B" 13T SPLINE
C = NONE

R: CONTROL ORIFICE DIA

SUPPLY (MDC OR DDC)	DRAIN (MDC OR DDC)
F = NONE	F = NONE
A = .031 IN.	A = .031 IN.
B = .036 IN.	B = .036 IN.
C = .041 IN.	C = .041 IN.
D = .046 IN.	D = .046 IN.
E = .054 IN.	E = .054 IN.
ORIFICE "A" (EDC/HDC)	ORIFICE "B" (EDC/HDC)
G = .055 IN.	G = .055 IN.
H = .037 IN.	H = .037 IN.
J = NONE	J = NONE

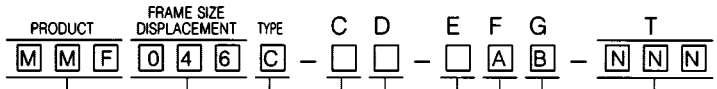
P: HANDLE POSITION
A = NOT APPLICABLE (EDC OR HDC)
D = DOWN
U = UP

N: CONTROL
AB = MDC
► BA = HDC
CA = EDC, SINGLE COIL, DRY CASE, PACKARD CONNECTOR
► CD = EDC, SINGLE COIL, OIL FILLED, MS CONNECTOR

= Non-Standard

*All pressure settings above are nominal set pressure at factory test conditions. Actual pressures will vary due to actual conditions.

M46 Fixed Displacement Motor -- MF



PRODUCT
MMF = MEDIUM DUTY, MOTOR, FIXED

DISPLACEMENT
046 = 46 CC/REV (2.8 CU. IN./REV)

TYPE
C = CLOSED CIRCUIT

C: SEAL GROUP
A = SHAFT SEAL
► B = SHAFT SEAL & SEAL FOR AUXILIARY DRIVE SHAFT

D: OUTPUT SHAFT/AUXILIARY DRIVE CONFIGURATION
A = 13T 16/32P SPLINE/NONE
F = 15T 16/32P SPLINE/NONE
► G = 15T 16/32P SPLINE/13T 16/32P SPLINE
► N = 1 IN. DIA TAPERED, 1.5 IN./FT./NONE
► P = 1 IN. DIA TAPERED, 1.5 IN./FT./13T 16/32P SPLINE
► U = 1 IN. DIA STR KEY/NONE

E: END CAP
A = RADIAL (SIDE) PORTS
B = AXIAL PORTS
► C = RADIAL (SIDE) PORTS W/AUXILIARY DRIVE

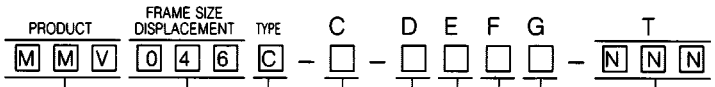
F: CYLINDER BLOCK GROUP
A = STANDARD BLOCK ASSEMBLY

G: BYPASS VALVE
B = NO BYPASS VALVE

T: SPECIAL HARDWARE FEATURES
NNN = NONE

► = Non-Standard

M46 Variable Displacement Motor -- MV



PRODUCT
MMV = MEDIUM DUTY, MOTOR, VARIABLE

DISPLACEMENT
046 = 46 CC/REV (2.8 CU. IN./REV)

TYPE
C = CLOSED CIRCUIT

C: SEAL GROUP
A = SHAFT SEAL
► B = SHAFT SEAL & SEAL FOR AUXILIARY DRIVE SHAFT

D: OUTPUT SHAFT/AUXILIARY DRIVE CONFIGURATION
A = 13T 16/32P SPLINE/NONE
► B = 13T 16/32P SPLINE/13T 16/32P SPLINE
E = 15T 16/32P SPLINE/NONE
► F = 15T 16/32P SPLINE/13T 16/32P SPLINE
► J = 1 IN. DIA TAPERED, 1.5 IN./FT/NONE

E: MINIMUM DISPLACEMENT
A = 11 DEGREE SWASHPLATE ANGLE, 29.5 CC/REV (1.8 CU. IN./REV)
B = 7 DEGREE SWASHPLATE ANGLE, 18.0 CC/REV (1.1 CU. IN./REV)
D = 6 DEGREE SWASHPLATE ANGLE, 16.1 CC/REV (.98 CU. IN./REV)
F = 9 DEGREE SWASHPLATE ANGLE, 24.6 CC/REV (1.5 CU. IN./REV)
H = 8.5 DEGREE SWASHPLATE ANGLE, 22.4 CC/REV (1.36 CU. IN./REV)

F: CONTROL FEATURES

	CONTROL PORT LOCATION	ADJUSTABLE MIN. DISPLACEMENT	MAX. DISPLACEMENT STROKE LIMITER
A =	BOTTOM	NO	NO
B =	BOTTOM & TOP	NO	NO

G: HOUSING/END CAP CONFIGURATION
A = STD. HOUSING/RADIAL (SIDE) PORTED END CAP
► B = STD. HOUSING/RADIAL (SIDE) PORTED END CAP FOR AUXILIARY DRIVE SHAFT

T: SPECIAL HARDWARE FEATURES
NNN = NONE

► = Non-Standard

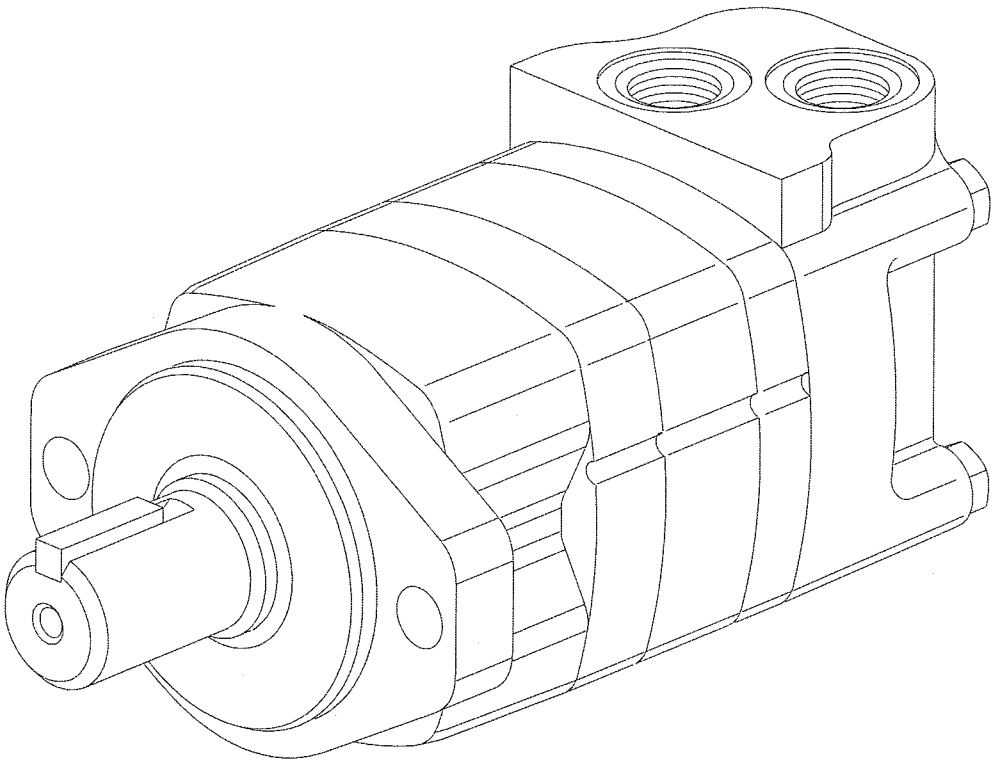
Contents

Char-Lynn®
Hydraulic Motor

No. 7-124
July, 1999

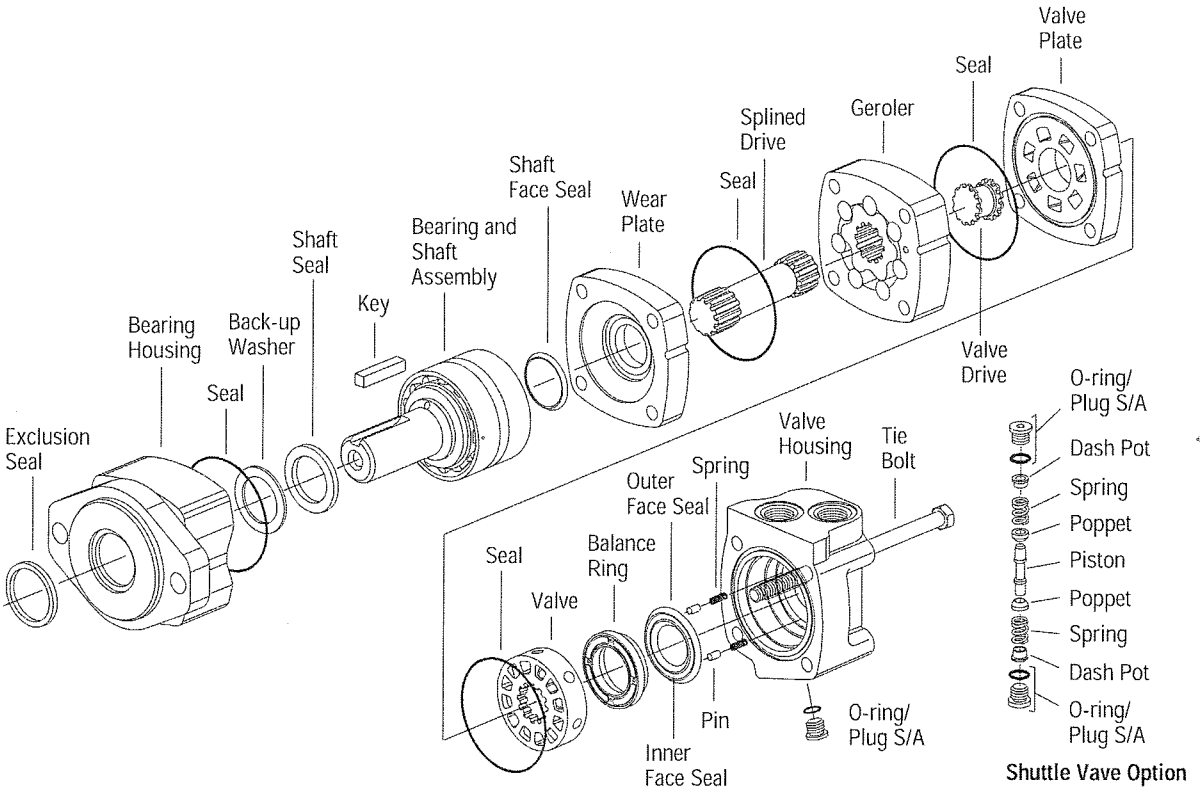
EATON

Repair Information



2000 Series
Disc Valve Geroler Motor

006



Shuttle Vave Option

Tools required for disassembly and reassembly.

Torque wrench 57Nm [500 lb-in] capacity
300-450 [12-16]* breaker bar
9/16 socket
Small screwdriver 150-200 x 6,5 [6-8 x 1/4] blade
3/16 Allen wrench
Press

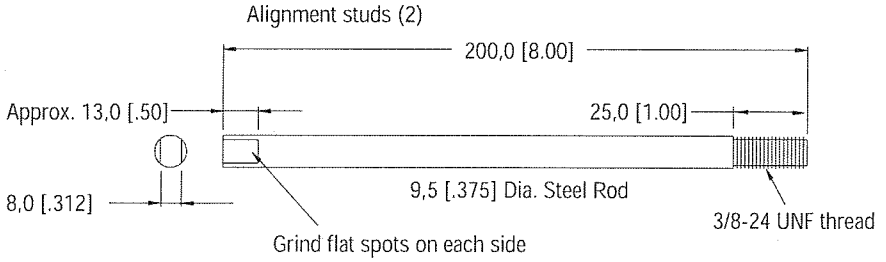
* Unless indicated otherwise, measurements are given in mm [inches]

** Shaft seal installation tool (600496)

** Bullet (600465) for 1 diameter shafts

The following tools are not necessary for disassembly and reassembly, but are extremely helpful.

Alignment studs (2)



Disassembly

Cleanliness is extremely important when repairing a hydraulic motor. Work in a clean area. Before disconnecting the lines, clean the port area of the motor thoroughly. Use a wire brush to remove foreign material and debris from around the exterior joints of the motor. Check the shaft and key slot, remove all nicks, burrs or sharp edges that might damage the bearing housing seals when installing the shaft and bearing assembly. Before starting the disassembly procedures, drain the oil from inside the motor.

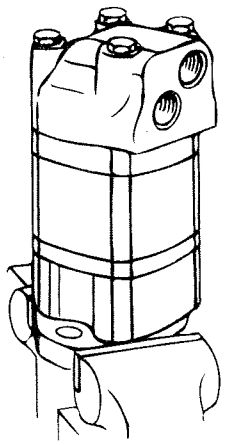


Figure 1

1 Place the motor in a vise with the output shaft down. Clamp across the mounting flange of the motor not the housing. Excessive clamping pressure will cause distortion. When clamping, use some protective device on the vise, such as special soft jaws, pieces of hard rubber or board.

Although not all drawings show the motor in a vise, we recommend that you keep the motor in the vise during disassembly and reassembly. Follow the clamping procedures explained throughout the manual.

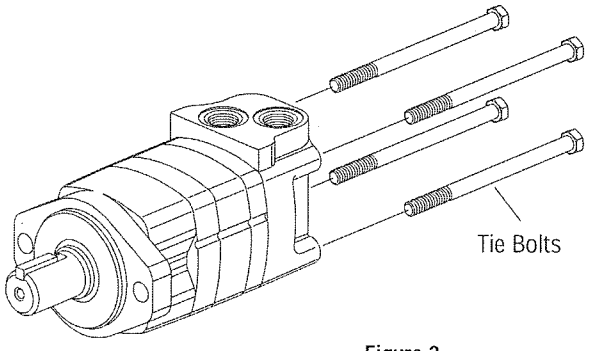


Figure 2

2 Remove 4 bolts from motor.

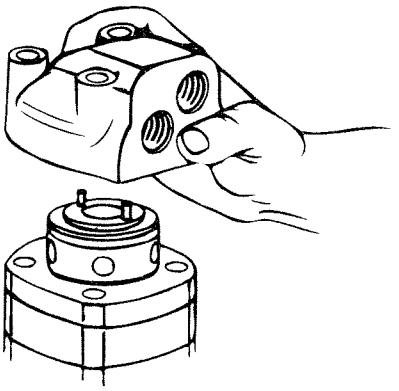


Figure 3

3 Lift valve housing straight up. If done carefully the pins, springs, balance ring assembly, and valve will remain on the valve plate.

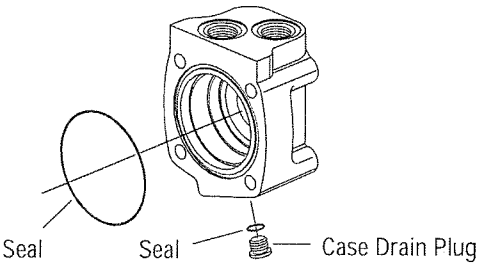


Figure 4

4 Carefully remove 76,0 [3.00] diameter seal from valve housing.

5 Remove case drain plug—with seal, from valve housing.

6 Remove 2 pins and 2 springs from balance ring assembly, see Figure 5.

Disassembly

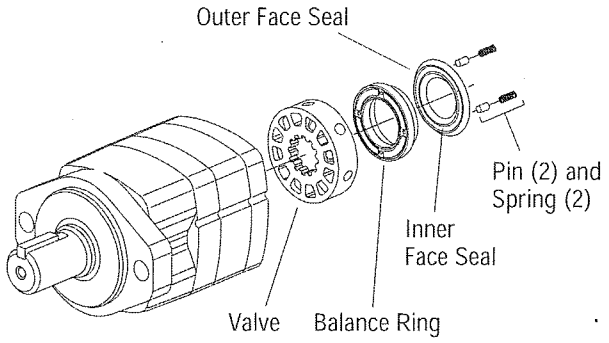


Figure 5

7 Remove balance ring assembly.

8 Remove inner and outer face seals from balance ring.

9 Remove the valve.

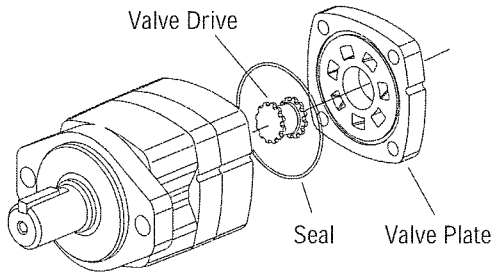


Figure 6

10 Remove the valve plate.

11 Remove the 76,0 [3.00] diameter seal from valve plate.

12 Remove the valve drive.

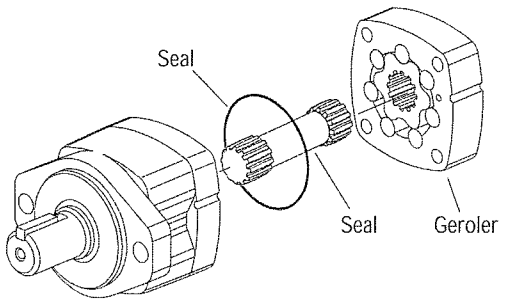


Figure 7

13 Remove the Geroler. Be sure to retain the rollers in the outer ring if they are loose.

14 Remove the drive.

15 Remove the 76,0 [3.00] diameter seal from wear plate, see Figure 7.

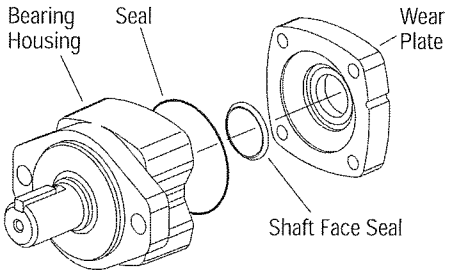


Figure 8

16 Remove the wear plate.

17 Remove the shaft face seal from the wear plate.

18 Remove the 76,0 [3.00] diameter seal from bearing housing.

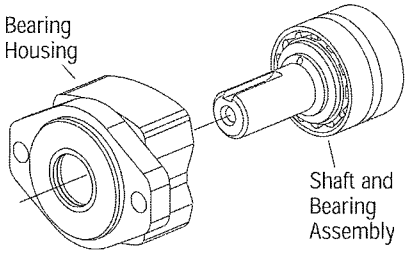


Figure 9

19 You may need a press to remove shaft and bearing assembly from bearing housing. (Key must be removed before removing shaft.)

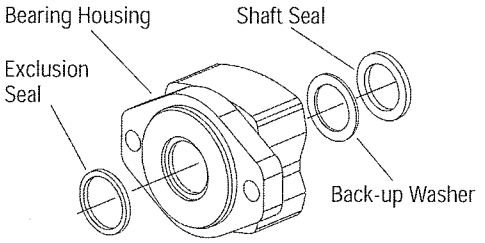


Figure 10

20 Use a small screwdriver to remove shaft seal, back-up washer and exclusion seal from bearing housing, see Figure 10. Do not damage bore of housing.

Note: Individual parts of shaft and bearing assembly are not sold separately. Replace as a unit.

Reassembly

Check all mating surfaces. Replace any parts that have scratches or burrs that could cause leakage. Clean all metal parts in clean solvent. Blow dry with air. Do not wipe dry with cloth or paper towel because lint or other matter can get in the hydraulic system and cause damage. Do not use a coarse grit or try to file or grind these parts. Check around the keyway and chamfered area of the shaft for burrs, nicks or sharp edges that can damage the seals when reassembling the bearing housing.

Note: Lubricate all seals (prior to installation) with petroleum jelly such as Vaseline. Use new seals when reassembling this motor. Refer to parts list (6-129) for proper seal kit number.

21 Use a press to install exclusion seal in outer bore of bearing housing. Lip of seal must face outward. See Figure 11. If a press is not available use a plastic or rubber hammer, being careful not to damage or cock seal in the bore.

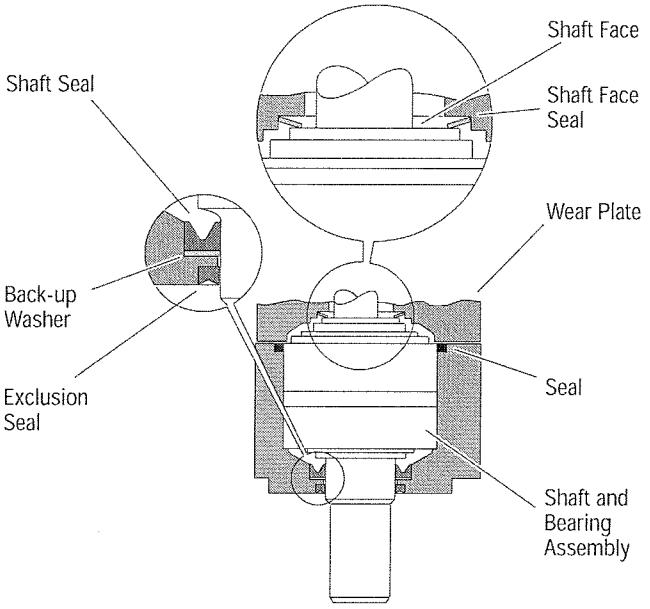


Figure 11

22 Place back-up washer into seal bore. Place shaft seal onto installation tool (600496) and press seal into seal bore of the housing.

23 Clamp housing in vise, see Figure 1.

24 Place protective bullet (see note below) over shaft. Apply petroleum jelly to inside diameter of dust and shaft seal. You may need a press to install shaft and bearing assembly. Do not distort shaft seal. Damage to this seal will cause leakage.

Note: Bullet (600465), for 1inch dia. shafts, available— by special order. Use tape over other shafts to prevent cutting the seals.

25 Apply petroleum jelly to the 76,0 [3.00] diameter seal. Install seal into the bearing housing.

26 Alignment studs can be very helpful in reassembly of the motor. See special tool listing page 2. If you use studs, install 2 studs diagonally opposed in the bearing housing.

27 Install the shaft face seal in the wear plate as shown in Figure 11. Do not distort seal.

28 Install the wear plate, see Figure 11.

29 Apply a light film of petroleum jelly to the 76,0 [3.00] diameter seal and install seal in the wear plate.

30 Install the drive into the output shaft.

31 Align the notch on the outside of the Geroler with the notch on the wear plate. Install the Geroler against the wear plate. Be sure to retain the rollers in the outer ring if they are loose.

32 Install the valve drive in the Geroler.

Note: Installation at this time involves 3 steps in the timing of the motor. Timing determines the direction of rotation of the output shaft. Timing parts include:

1. Geroler
2. Valve Drive
3. Valve Plate
4. Valve

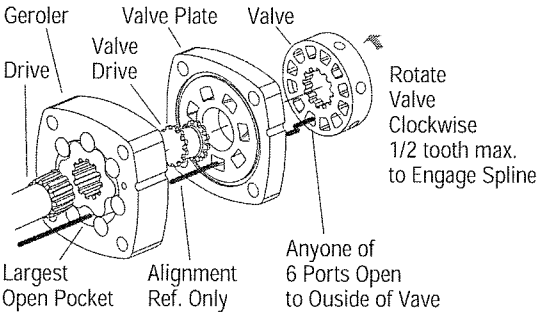


Figure 12 Timing Alignment

Timing Step # 1 — Locate the largest open pocket in the Geroler and mark it on the outside edge of the Geroler.

33 Apply a light film of petroleum jelly to the 76,0 [3.00] diameter seal. Install seal in groove of valve plate.

Reassembly

34 Align the notch on the outside of the valve plate with the notch on the Geroler as shown in Figure 12.

Timing Step # 2 — Locate the slot opening in the valve plate which is in line with the largest open pocket of the Geroler.

Timing Step # 3 — Locate any one of the side openings of the valve and align this opening with the open slot of the valve plate that is in line with the largest open pocket of the Geroler. Install the valve by rotating it clockwise until the spine teeth engage (1/2 spine tooth max.). This will provide the proper rotation when pressurized as shown in Figure 13.

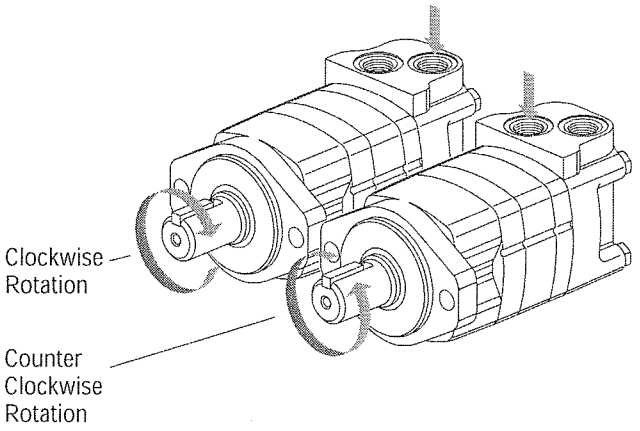


Figure 13

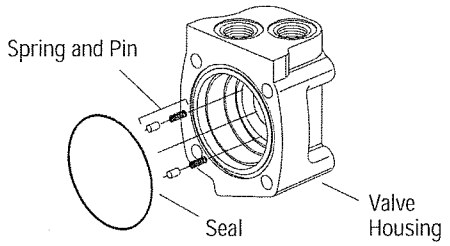


Figure 14

35 Install 2 springs and 2 pins in the holes located in the bore of the valve housing, as shown in Figure 14.

36 Apply a light film of petroleum jelly to the 76,0 [3.00] diameter seal. Install seal in the valve housing.

37 Apply petroleum jelly to inner and outer face seals. Install seals on balance ring as shown in Figure 15.

Important: Install face seals in the positions shown in Figure 15, or the motor will not operate properly. Do not force or bend the face seals. Any damage to these seals will affect the operation of the motor.

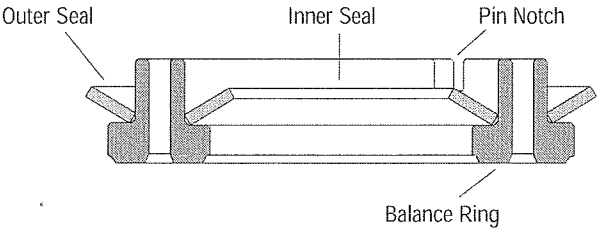


Figure 15

38 Align pin notches in balance ring with pins in bore of valve housing. Install balance ring assembly in valve housing.

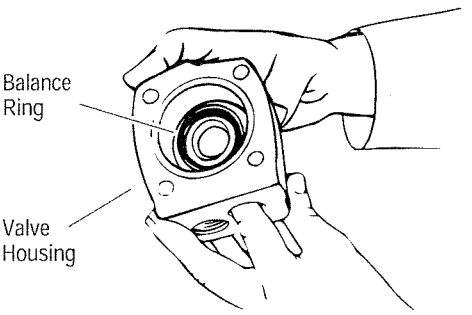


Figure 16

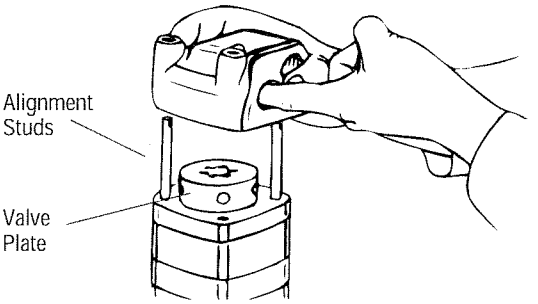


Figure 17

39 Insert your finger through port of valve housing. Apply pressure to side of balance ring as shown in Figure 16. Hold ring in position until valve housing is in place against valve plate (see Figure 17).

Note: After installing the valve housing on the valve plate check for proper placement. Push down on the valve housing. You should get a slight spring action.

Reassembly

40 Install tie bolts. If you use alignment Studs, install 2 bolts opposite the studs. Finger tighten the bolts. Remove the alignment studs and replace with the two remaining bolts. Torque all four bolts alternately to 50 Nm [450 lb-in].

41 Install seal on case drain plug then install in valve housing. Torque to 6 Nm [50 lb-in.]

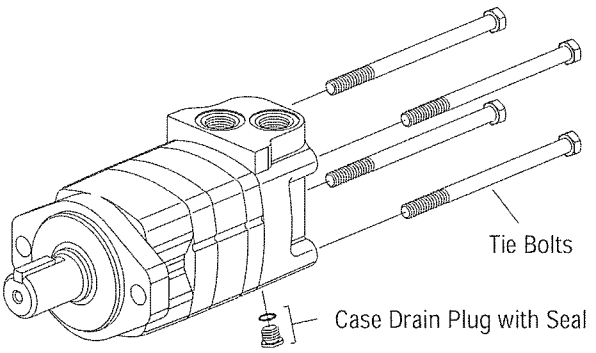


Figure 18

Wheel Motor

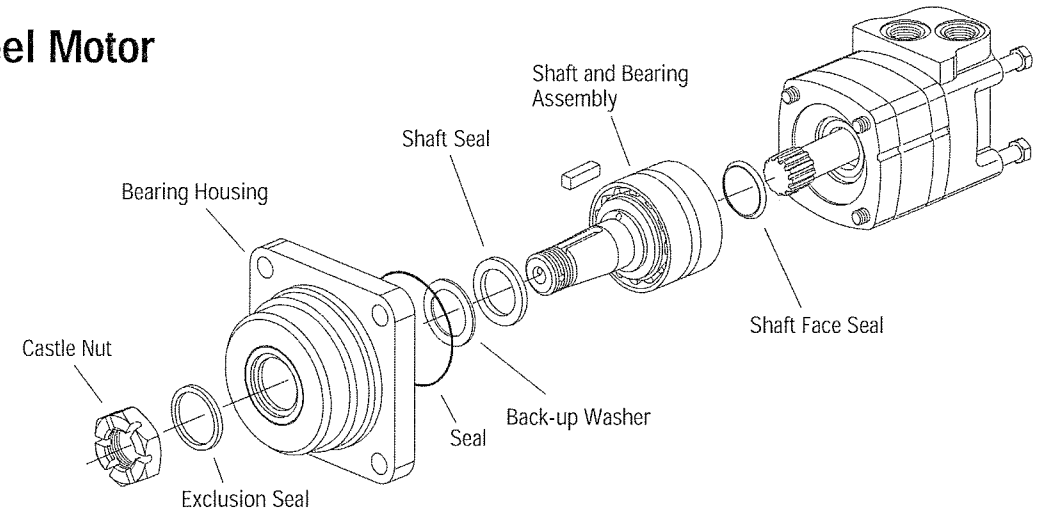
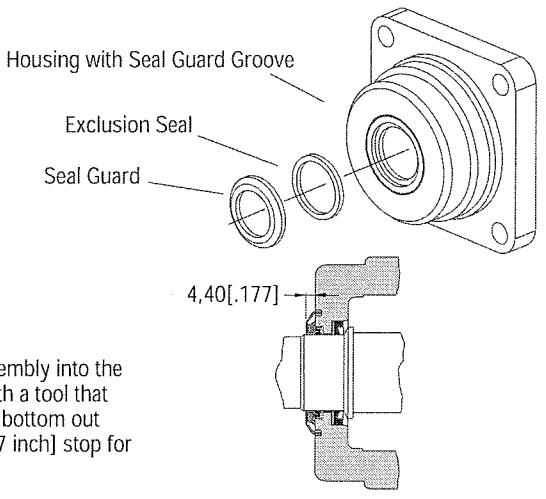


Figure 19

On wheel motors, a different bearing housing is used, see Figure 19. Other than this the parts are the same as the standard motor and the same disassembly and reassembly procedures apply.



Wheel Motor with Seal Guard

Installation of Seal Guard:

After completing assembly of the shaft and bearing assembly into the bearing housing, press the seal guard onto the shaft with a tool that will provide an even push over the seal. This tool must bottom out against the bearing housing and provide a 4,5 mm [.177 inch] stop for the seal guard.

Bearingless Motor

This motor is the same as the standard motor without the shaft/ bearing assembly, and bearing housing. The mounting flange replaces the bearing housing, see Figure 20. Follow same disassembly and reassembly procedures as rear section of standard motor.

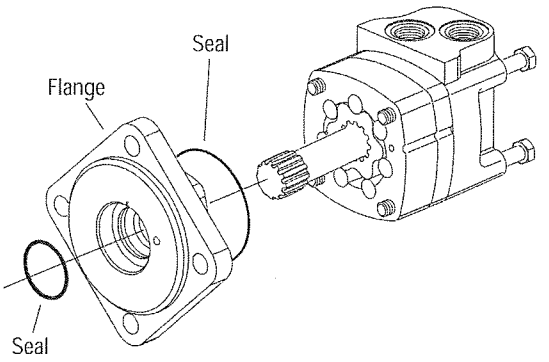
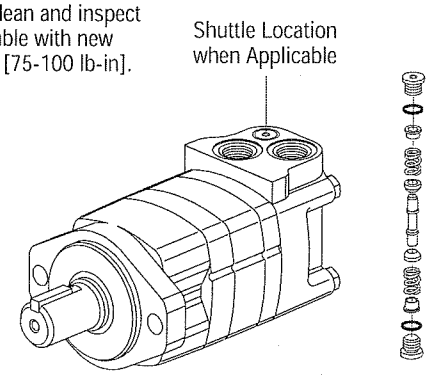


Figure 20

Disassembly Reassembly Shuttle Valve Option

Disassembly of shuttle valve option, this valve is located in the valve housing. Clean and inspect shuttle valve parts and reassemble with new seals, torque plugs to 8-11 Nm [75-100 lb-in].



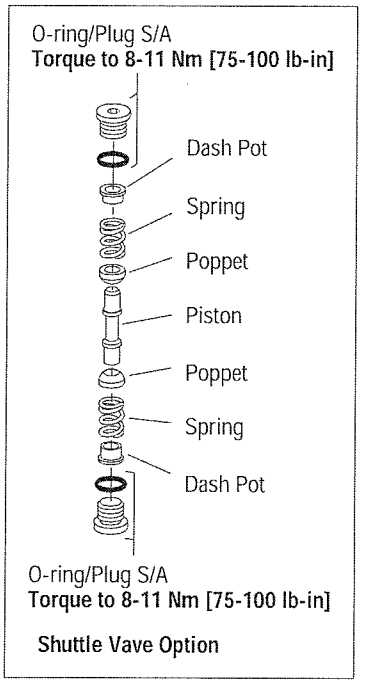


Figure 21

Reassembly — Speed Sensor

1 Rotate the motor shaft until a (gear/target) tooth is centered in the speed sensor port. If this is not done, the sensor may be damaged during the operation of the motor.

2 Make sure the lock nut and its threads are clean and dry for the proper torque. Position the lock nut against the alignment nut as shown in Figure 22.

3 Move the washer and the o-ring up against the speed sensor body threads as shown in Figure 22.

4 By hand, lightly thread the speed sensor body into the housing until the sensor touches against the motor (gear/target) tooth. **Do not force the sensor against the (gear/target) tooth, damage may occur.** Make sure the o-ring or the washer do not touch the housing — see Figure 23.

5 Turn the speed sensor body out one quarter turn (CCW) plus the additional amount (CCW) needed to make the alignment notches perpendicular to the motor shaft centerline (90° +/-5 degrees from the motor shaft centerline — Figure 24 and 25).

6 Maintain the speed sensor body alignment (Figure 25), and tighten the lock nut to 8,5-14 Nm [75-125 lb-in.] (torque values are for clean dry threads).

7 Check the speed sensor body for correct alignment (Figure 25), reinstall the sensor if it is not correct.

Speed Sensor Installation

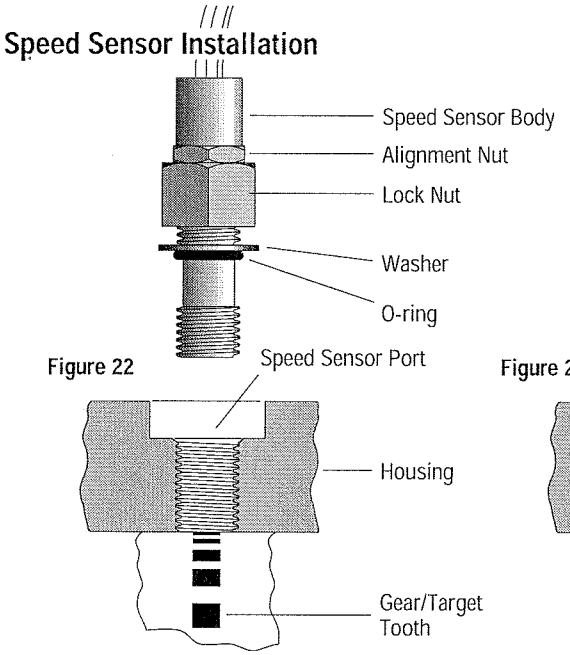


Figure 22

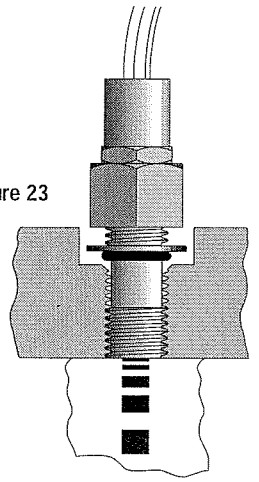


Figure 23

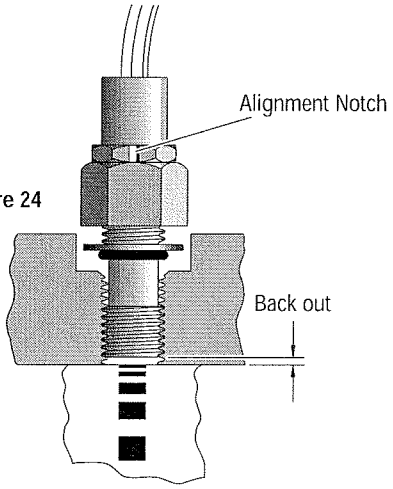


Figure 24

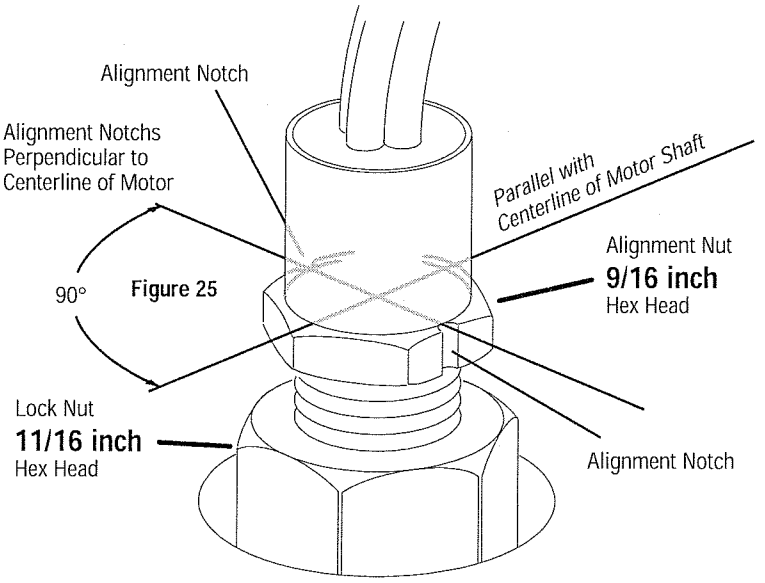


Figure 25

Product Identification

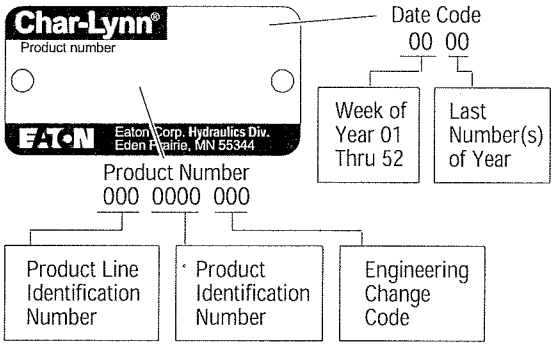
For Additional Literature Contact Eaton Corp. Hydraulics Division 15151 Highway 5 Eden Prairie, MN 55344.

- Specifications and performance data, Catalog No. 11-878
- Replacement part numbers and kit information — Parts Information No. 6-129

How to Order Replacement Parts

Each Order Must Include the Following:

1. Product Number
2. Date Code
3. Part Name
4. Part Number
5. Quantity of Parts



Product Numbers—2000 Series

Use digit prefix —104-, 105-, or 106- plus four digit number from charts for complete product number—Example 106-1039.

104-1007

Mounting	Shaft	Ports	Displacement cm³/r [in³/r] and Product Number								
			80 [4.9]	100 [6.2]	130 [8.0]	160 [9.6]	195 [11.9]	245 [14.9]	305 [18.7]	395 [24.0]	490 [29.8]
2 Bolt SAE A Flange	1 inch Straight	7/8-14 O-ring Staggered	104-1001	-1002	-1003	-1004	-1005	-1006	-1007	-1143	—
		1-1/16—12 O-ring 180° Apart	104-1037	-1038	-1039	-1040	-1041	-1042	-1043	-1044	—
	1-1/4 Inch Straight	7/8-14 O-ring Staggered	104-1022	-1023	-1024	-1025	-1026	-1027	-1028	-1228	-1420
		1-1/16—12 O-ring 180° Apart	104-1061	-1062	-1063	-1064	-1065	-1066	-1067	-1068	-1421
	1-1/4 Inch 14 T Splined	7/8-14 O-ring Staggered	104-1029	-1030	-1031	-1032	-1033	-1034	-1035	-1229	-1422
		1-1/16—12 O-ring 180° Apart	104-1087	-1088	-1089	-1090	-1091	-1092	-1093	-1094	-1423
2 Bolt SAE B Flange	1-1/4 Inch Straight	7/8-14 O-ring Staggered	104-1200	-1201	-1202	-1203	-1204	-1205	-1206	-1207	—
	1-1/4 In. Involute SAE C Splined	7/8-14 O-ring Staggered	104-1208	-1209	-1210	-1211	-1212	-1213	-1214	-1215	—
	1 Inch SAE 6B Splined	7/8-14 O-ring Staggered	104-1193	-1194	-1195	-1196	-1197	-1198	-1199	—	—
	7/8 Inch SAE B Splined	7/8-14 O-ring Staggered	104-1216	-1217	-1218	-1219	-1220	—	—	—	—
Standard with 4 Bolt Square Flange	32 mm Straight	G 1/2 (BSP)	104-1384	-1385	-1386	-1387	-1388	-1389	-1390	-1391	—
	1-1/4 Inch 14 T Splined	G 1/2 (BSP)	104-1376	-1377	-1378	-1379	-1380	-1381	-1382	-1383	—
Wheel Motor	1-1/4 Inch Straight	7/8-14 O-ring Staggered	105- —	—	—	—	—	—	—	—	-1148
		1-1/16—12 O-ring 180° Apart	105- —	—	—	—	—	—	—	—	-1149
	32 mm Straight	G 1/2 (BSP)	105-1134	-1135	-1136	-1137	-1138	-1139	-1140	-1141	—
	1-1/4 Inch Tapered	7/8-14 O-ring Staggered	105-1001	-1002	-1003	-1004	-1005	-1006	-1007	-1060	-1152
		1-1/16—12 O-ring 180° Apart	105-1071	-1072	-1073	-1074	-1075	-1076	-1077	-1078	—
	1-1/4 Inch 14 T Splined	7/8-14 O-ring Staggered	105-1029	-1030	-1031	-1032	-1033	-1034	-1035	-1096	—
		1-1/16—12 O-ring 180° Apart	105-1079	-1080	-1081	-1082	-1083	-1084	-1085	-1086	—
Bearingless		7/8-14 O-ring Staggered	106-1008	-1009	-1010	-1011	-1012	-1013	-1014	-1015	-1047
		G 1/2 (BSP)	106-1038	-1039	-1040	-1041	-1042	-1043	-1044	-1045	—

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Form No. 7-124
Printed in USA

IMPORTANT INFORMATION

Read ALL instructions and safety precautions prior to operating unit. Injury to personnel or unit failure may be caused by improper installation, maintenance, or operation.

Check to verify that the application does not exceed the capacities published in the current catalog.

Written authorization from HUB CITY is required to operate or use gear units in man lift or people moving devices.

The system of connected rotating parts must be free from critical speed, torsional, or other type vibration, regardless of how induced. The responsibility for this system analysis lies with the purchaser of the gear unit.

Buyer shall be solely responsible for determining the adequacy of the product for any and all uses to which the buyer shall apply the product. The application by buyer shall not be subject to any implied warranties of merchantability or fitness for a particular purpose.

LUBRICATION

CAUTION

ALL PARALLEL SHAFT REDUCERS EXCEPT MODEL 251 AND 254 ARE SHIPPED DRY AND OIL MUST BE ADDED PRIOR TO OPERATION. MODELS 251 AND 254 ARE PERMANENTLY LUBRICATED AT THE FACTORY FOR UNIVERSAL MOUNTING EXCEPT FOR VERTICAL SHAFTS. FOR VERTICAL SHAFT APPLICATIONS CONSULT FACTORY.

All HUB CITY Parallel Shaft Reducers are splash lubricated. Figures 1, 2, and 3 indicate oil levels for three basic mounting positions. Shaded area indicates the recommended oil level when input speeds **are greater than 800 RPM**. Dashed lines indicates the recommended oil level when input speeds **are less than 800 RPM**. Always determine mounting position before installing lubricant.

NOTE: When Reducer is mounted so that shafts are in a vertical position (Figure 3), see “Variations From Normal Conditions”.

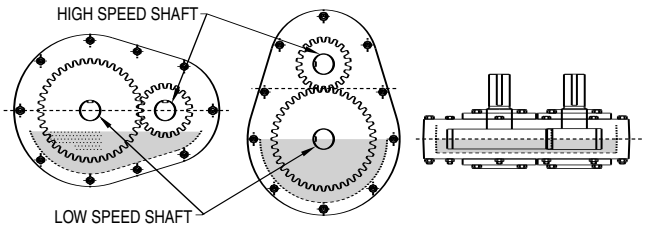

FIGURE 1

FIGURE 2

FIGURE 3

BEFORE OPERATING — Remove uppermost plug and fill Reducer with an approved lubricant as shown on page J-52. Clean threads on removed plugs and plug holes with degreaser; coat with thread sealant and install securely into Reducer case. If fill, level and drain plugs are not located conveniently for your mounting position, additional plugs may be installed.

CAUTION

Do not operate the unit without making sure it contains the correct amount of oil. Do not overfill or underfill with oil, or injury to personnel, unit, or other equipment may result.

CHANGING LUBRICANT — After the first 100 hours of operation, drain out initial oil, flush out the gear case with an approved nonflammable, non-toxic solvent and refill. Thereafter, oil should be changed at least every 2500 operating hours or every 6 months — which ever comes first.

CAUTION

Oil should be changed with greater frequency if unit is used in a severe environment such as dusty or humid.

⚠ WARNING!

Oil housings, and other components can reach high temperatures during operation, and can cause severe burns. Use extreme care when removing lubrication plugs and vents while servicing the unit.

VARIATIONS FROM NORMAL CONDITIONS — When operating High Speed Shaft (Figures 1, 2 and 3) at speeds above 1800 RPM or below 400 RPM, special adjustment in oil level may be required. Consult the HUB CITY Sales Office nearest you for recommendations.

If either shaft is in a vertical position or inclined more than 15°, zerk fittings may be required to lubricate upper bearings. It may also be necessary to make some oil level or plug modifications. Consult your HUB CITY Sales Office.

A SUBSIDIARY OF REGAL-BELOIT CORPORATION
2914 Industrial Avenue, P. O. Box 1089, Aberdeen, South Dakota 57402-1089, U.S.A. • Phone (605) 225-0360 • FAX (605) 225-0567
Form LI-PS-02
Litho in U.S.A.

INSTALLATION

⚠ WARNING!
SHIELD ALL ROTATING PARTS

For safety, purchaser or user must provide protective guards over all shaft extensions and any moving apparatus mounted on the unit. The user is responsible for checking and complying with all applicable safety codes in his area and providing suitable guards. Failure to do so may result in bodily injury and/or damage to equipment.

⚠ WARNING!

Wear protective clothing and eye shields when installing or maintaining unit and machine.

⚠ WARNING!

A unit cannot be used as an integral part of a machine superstructure which would impose additional loads on the unit other than those imposed by the torque being transmitted, or by any shaft mounted power transmitting device such as sprockets, pulleys, or couplings.

⚠ WARNING!

Units **ARE NOT** to be considered fail safe or self locking devices. If these features are required, a properly sized, independent holding device must be utilized. Reducers are not to be used as a brake.

⚠ WARNING!

Any brakes that are used in conjunction with a unit must be sized or positioned in such a way so as to not subject the unit to loads beyond the capacities published in this catalog.

⚠ WARNING!

Make certain that all tools and other items are clear from rotating parts before starting machine. Stand clear, and start machine slowly to be sure all components are secure and operating properly.

⚠ WARNING!

Make certain that the power supply is disconnected before attempting to service or install the unit, or remove or install any components. Lock out the power supply and tag it to prevent unexpected application of power.

⚠ WARNING!

For safe operation and to continue the unit warranty, when installing, reinstalling, or replacing a factory installed fastener for servicing purpose, or accommodate the mounting of guards, shields or other light load imposing devices or for mounting the unit, it becomes the responsibility of the purchaser or user to properly determine the quality, grade of fastener, thread engagement, load carrying capacity, tightening torque, and the means of torque retention.

The basic design of HUB CITY Parallel Shaft Reducers allows operation in virtually any position. However, if your Reducer has a fill/breather plug and/or pipe plugs, the ideal position would be: Fill/breather plug at the top of the Reducer, drain plug at the bottom of the Reducer and a level plug located where oil level is desired according to shaft position and input speed.

Because mounting positions can vary greatly along with the location and availability of plugs in certain model Reducers, it may be necessary to install additional plugs as needed or level gages in level plugs.

Power may be applied (drive shaft) to either the high speed or the low speed shafts providing that the high speed shaft does not rotate more than 1750 RPM. Shafts may rotate in either direction.

Because of varying requirements, mounting hardware is not supplied with these units. Good quality cap screws with lock washers should be used. Base and fasteners for motor and Reducer must be rigid enough to maintain alignment between Reducer and motor and between Reducer and couplings.

COUPLINGS — Flexible couplings to input and output shafts are recommended because they minimize bearing and gear wear caused by slight misalignment. Follow coupling manufacturer's recommendations for installation and shielding.

SHEAVES AND SPROCKETS — When mounting sheaves or sprockets, the center of the load should be located as close to the Parallel Shaft Drive as possible. Excessive overhung loading could result in early failures of bearing or shaft. Refer to the general catalog or contact your local distributor for overhung load ratings. Follow manufacturer's recommendations for installation and shielding.

CAUTION

Exterior threaded or through holes on this drive are for mounting the drive or drive accessories (couplings, sprockets, etc.). They are not to be used for lifting the drive or any driver/driven equipment.

CAUTION

Inspect shafts and components for paint, burrs, or other imperfections before installing components. Do not use excessive force or pounding to install components onto unit shafts, as this may cause damage to shafts, bearings, or gears.

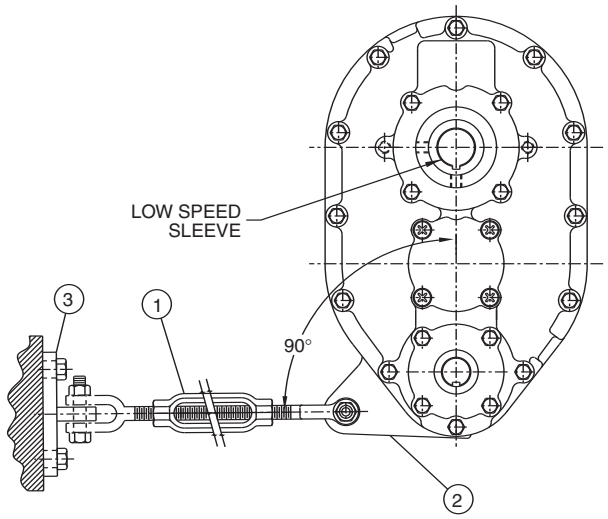

FIGURE 4

SHAFT MOUNTED REDUCERS—The driven shaft must extend through the full width of the Reducer and shaft should be independently supported with pillow block bearings, located as close to the the Reducer as possible.

A torque arm must be installed on shaft mounted Reducers to prevent unit from rotating. Figure 4 shows the suggested installation. A rigid torque arm will cause bearings to “load up”, causing excessive wear. To prevent this, provide a slight amount of “float” at the pivot point. Install Torque Arm so that it is approximately 90° to a line drawn through the low speed sleeve centerline and torque arm pivot point. Brackets must be fashioned by using a minimum of three attaching points on case.

No flexible coupling is required to connect low speed shaft on shaft mounted models but a clutch or torque limiting device is advisable somewhere in the drive train.

CAUTION

Test run unit to verify operation. If the unit being tested is a prototype, that unit must be of current production configuration.

PREVENTATIVE MAINTENANCE—Keep shafts and vent plug clean to prevent foreign particles from entering seals or gear case. Inspect periodically for oil leaks.

CAUTION

Mounting bolts, coupling fasteners, and other power transmitting devices should be routinely checked to ensure that all parts of the unit are firmly anchored to provide proper operation. Loose fasteners can cause alignment problems and excessive wear. Check end play in shafts. Noticeable movement might indicate service or parts replacement is necessary.

CAUTION

If the unit cannot be located in a clear and dry area with access to an adequate cooling air supply, then precautions must be taken to avoid ingestion of contaminants such as water, and to avoid a reduction of cooling ability due to exterior contaminants.

IMPORTANT INFORMATION

In the event of the resale of this Bevel Gear Drive (unit), in whatever form, resellers/buyers will include the following language in a conspicuous place and in a conspicuous manner in a written agreement covering such sale:

The manufacturer makes no warranty or representations, expressed or implied, by operation of law or otherwise, as to the merchantability or fitness for a particular purpose of the goods sold hereunder. Buyer acknowledges that it alone has determined that the goods purchased hereunder will suitability meet the requirements of their intended use. In no event will manufacturer be liable for consequential, incidental, or other damages.

Resellers/buyers agree to include this entire document, including the warnings and cautions listed herein, in a conspicuous place and in a conspicuous manner to instruct users on the safe usage of the product.

HUB CITY has Sales Offices and a network of Industrial Power Transmission Distributors that can serve your needs worldwide. Check the Yellow Pages for one near you or contact the factory sales office.

A SUBSIDIARY OF REGAL-BELOIT CORPORATION

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Form LI-PS-92

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ELECTRIC MOTOR AND HYDRAULIC MOTOR AND PUMP INSTALLATION INSTRUCTIONS

For "C" Flange and Hydraulic Flange Units

1. Be sure all of the paint and masking have been removed from the face and pilot of the flange. Check the bore (input or output) to be sure it contains an adequate amount of anti-sieze compound, which is normally installed at the factory. This compound will inhibit fretting corrosion between the motor or pump shaft and the unit bore.
2. Install the key (if round bore) to the maximum depth of the keyway provided in the bore.
3. Align keyways or splines of motor or pump and bore of unit and install motor or pump into frame.
4. **CAUTION:** HUB CITY "C" flange reducers and Hydraulic Flange Reducers are designed to accept motors with shafts that do not exceed the maximum specified by the N.E.M.A. or SAE standards. If the motor or pump shaft bottoms out before the motor or pump flange seats against the reducer flange face, the motor or pump shaft length must be adjusted to N.E.M.A. or SAE standards.
5. Secure the motor or pump to the unit. Capscrews and lockwashers are provided with "C" flange units.
6. Tightening torques for mounting bolts are provided in the chart below.

CAPSCREW TIGHTENING TORQUE

Grade 5 Capscrews (dry, without lubricant)

Capscrew Size	Tightening Torque (Ft. - Lbs.)
1/4 NC	8
5/16 NC	16
3/8 NC	29
1/2 NC	71
5/8 NC	143
3/4 NC	251

A Parts List and Print for your Drive is available upon request. To obtain the proper Parts List and Print, you must accurately furnish the Assembly Number, Model Number, Ratio, Style and Shipping Code as shown on the metal tag attached to the Gear Drive.
For assistance, phone or write your Industrial Power Transmission Distributor, or the Factory Sales Office.

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