BOMAG

Instructions For Repair

MPH 362/364-2

S/N 901B23001601>
Cummins QSM 11 360HP

Soil Stabilizer/Asphalt Recycler

ISO 9001:2000 SGS
Printed in U.S.A.

BOMAG FAYAT GROUP
BOMAG Americas, Inc.
2000 Kentville Rd.
Kewanee, IL 61443

Catalog number
0852738

01/01/06

Section 1
INTRODUCTION

GENERAL INFORMATION.

This manual contains OPERATING procedures for BOMAG Recyclers & Stabilizers. (See Figure 1-1).

TECHNICAL DATA.

Standard Equipment.

- Hydrostatic rotor drive with engine load control
- Hydrostatic travel system
- Rear axle - hydraulic motors/planetary gearbox with Spring Applied Hydraulically Released (SAHR) brakes - each wheel
- ASC (electronic traction control)
- Selectable hydrostatic front drive axle (MPH 364-2 ONLY)
- Hydraulic power steering
- Hydrodynamic service brakes
- Single lever control travel and steer assist braking
- 24V electrical system with manual battery disconnect
- Dual element engine air filter
- Warning horns
- Emergency stop
- Back-up alarm
- Gauges
  - Rotor drive pressure
  - Travel drive pressure
- PowerView Monitoring and Display System
  - Fuel level
  - Hour meter
  - Voltmeter
  - High engine coolant temperature
  - High hydraulic oil temperature
  - Low engine oil pressure
  - Low rotor charge pressure
  - Engine inlet air - restriction
  - Hydraulic oil filters - restriction
  - Engine tachometer (RPM)
  - Feet per minute (FPM)/Speedometer (MPH)
- Visual warning indicators
  - Brakes applied
- Audible warning buzzers
  - Sounded in conjunction with PowerView monitoring and display system
- ROPS/FOPS with seat belt, or ROPS with seat belt
- Adjustable operator's seat
- Adjustable tilt steering wheel

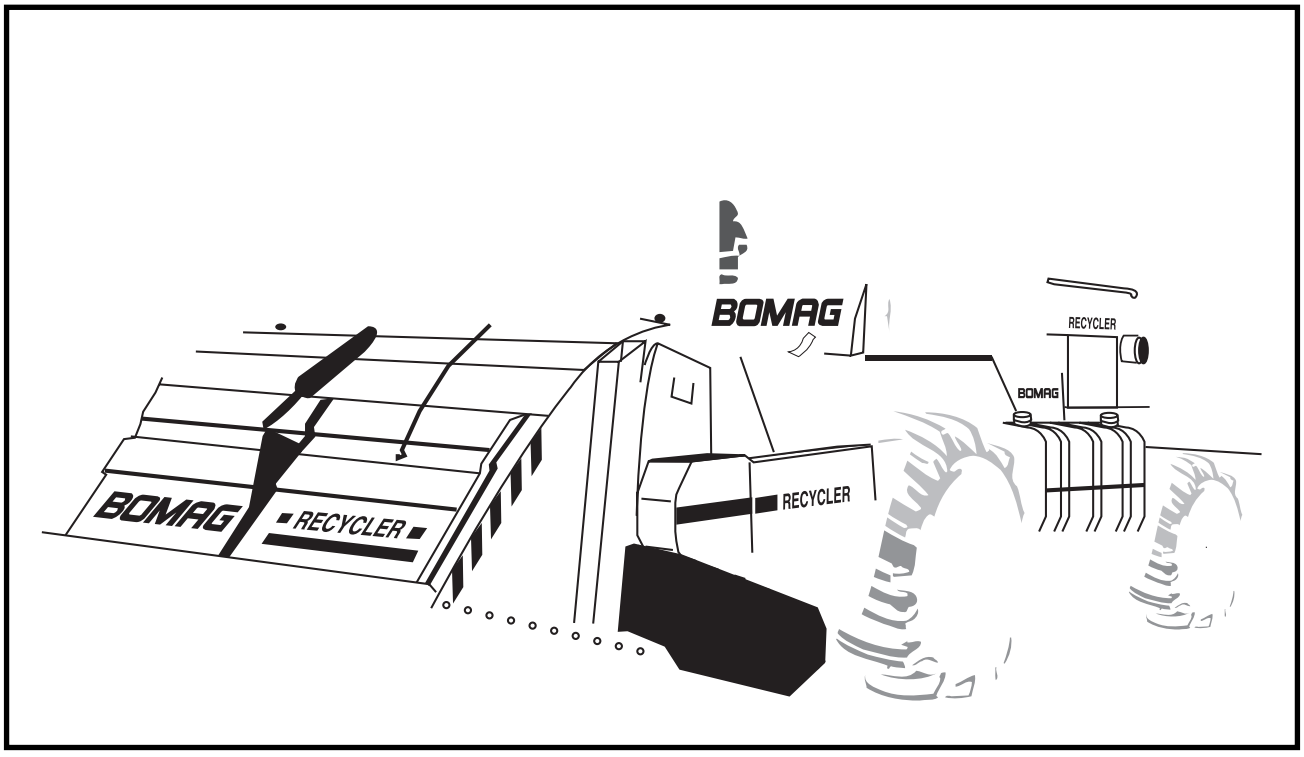


FIGURE 1-1. BOMAG RECYCLER – WITH ROPS/FOPS.

Section 2
SPECIFICATIONS

TABLE 2-8. DIMENSION SPECIFICATIONS.

ITEM	MPH 362-2 - 364-2
Dimensions (see Figure 2-1)	
A. Overall Length	331 in (8407 mm)
B. Overall Width	115 in (2921 mm)
C. Overall Height – With ROPS or ROPS/FOPS	138 in (3505 mm)
D. Overall Height - With Cab	138 in (3505 mm)
E. Height To Top Of Exhaust Pipe	136 in (3454 mm)
F. Height To Top Of Cockpit Handrail	111 in (2819 mm)
G. Wheelbase	129 in (3277 mm)
H. Ground Clearance	19 in (483 mm)
I. Working Width - Rotor	79 in (2007 mm)
I. Working Width - Rotor With Wide Rotor Option	96 in (2438 mm)

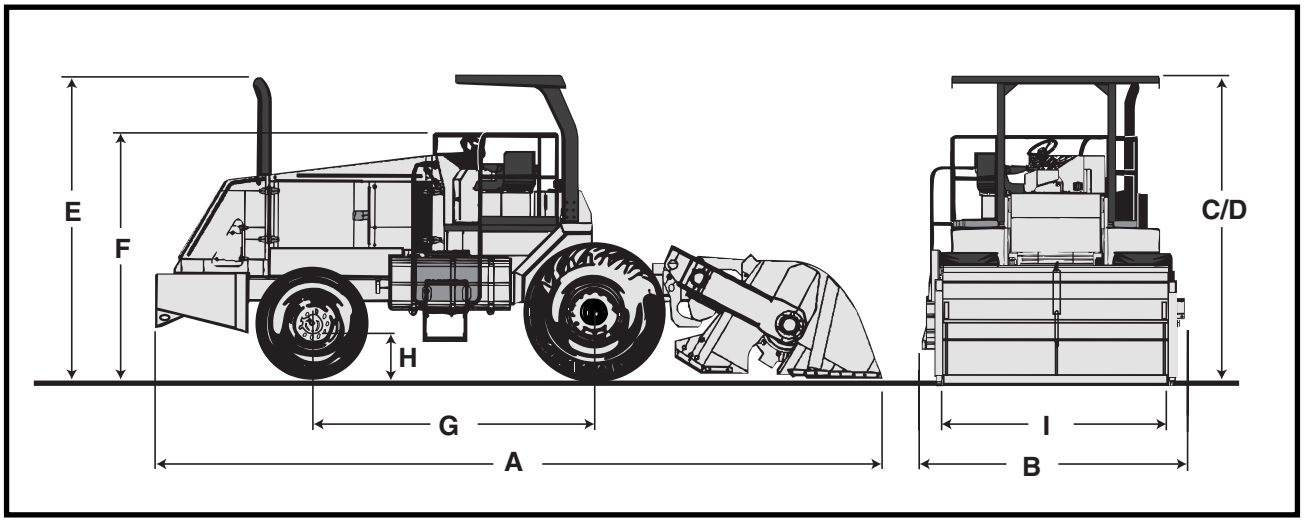
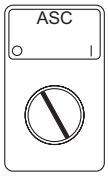
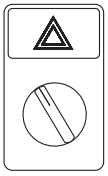
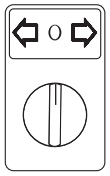
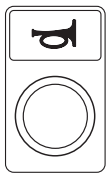
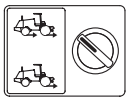


FIGURE 2-1. BOMAG MPH 362-2 AND 364-2 RECYCLER/STABILIZER – DIMENSIONS.

Section 3
OPERATIONS

Table 3-1 – Switch Panel			
ID	**Description**	**Type**	**Function**
5	**Traction Control**	**Two Position Selector Switch** 	"0": Turns OFF electronic traction control. "I": Turns ON electronic traction control. Traction control "active", red light ON. **NOTE: If theere is a problem with the traction control system, red light will "flash" a "blink code".**
6	**Four Way Flasher/Hazard**	**Optional Two Position Selector Switch** 	Left: Off Right: Red Hazard will flash. **NOTE: If less than three bulbs are functional, the switch will not flash red.** **Lights can be turned on without the ignition switch in the "ON" position.**
7	**Turn Signals**	**Optional Three Position Selector Switch** 	Left: Left-hand turn signals are on and switch flashes green. Center: Directional signals are off. Right: Right-hand turn signals are on and switch flashes green. **NOTE: If either front or rear bulb is out, the switch will not flash green.**
8	**Horn**	**Push button** 	Press: Controls both front and rear horns. Press to sound both front and rear horns. **NOTE: Horn will sound without the ignition switch in the "ON" position.**
9	**Four Wheel Drive Select Front Assist [MPH 364-2 R/S ONLY]**	**Two Position Selector Switch** 	Up: Four Wheel Drive Select Front Assist "ON". - Works in Low Range only. - In Low Range, Shift On & Off while moving. Down: Two Wheel Drive Select.

OPERATOR CONTROL PANEL [See Figure 3-6 and Table 3-4].

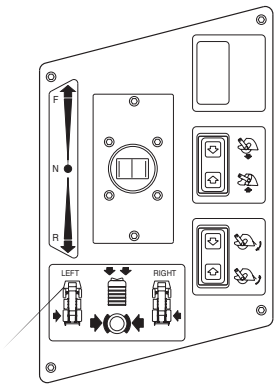
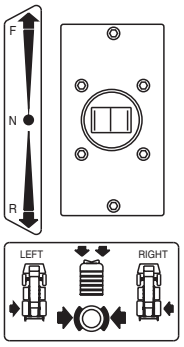


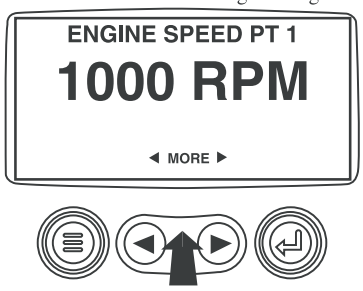
FIGURE 3-6. OPERATOR CONTROL PANEL.

Table 3-4 – Operator Control Panel

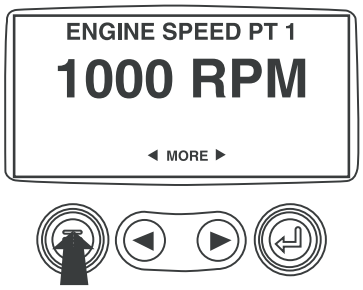
ID	Description	Type	Function
35	**Travel Direction (FNR) And Speed Control Lever**	**Lever** 	Travel direction (FNR) and speed control. Forward: Engages hydrostatic drive forward (F). Neutral: Places hydrostatic drive in neutral (N). Reverse: Engages hydrostatic drive reverse (R). The Travel Direction Control Lever (FNR) is used to control the forward/reverse direction of travel, travel speed and dynamic braking. Motion of the Travel Direction Control Lever (FNR), forward and reverse, will set the direction and speed of travel. When Travel Direction Control Lever (FNR) is set to reverse (R) direction, the backup alarm will sound. Pulling, or pushing, the Travel Direction Control Lever (FNR) towards the center, or neutral, (N) position causes dynamic braking to occur. ***CAUTION:*** **<u>ALWAYS</u> move the <u>Travel Direction Control Lever (FNR) to NEUTRAL</u> and allow the machine to come to a <u>FULL AND COMPLETE STOP</u> before moving the Travel Direction Control Lever (FNR) in the opposite direction (e.g. Forward to Reverse).**

POWERVIEW OPERATION *continued*

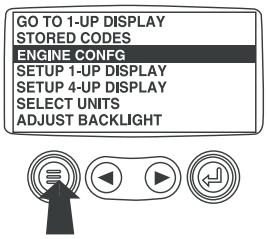
4. Use the "Arrow Buttons" to scroll through the engine configuration data.

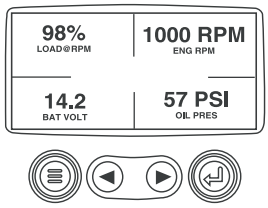


5. Press the "Menu Button" to return to the main menu.



6. Press the "Menu Button" to exit the Main menu and return to the engine parameter display.

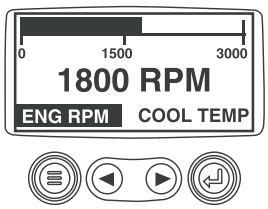


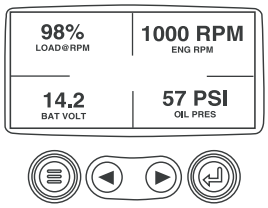


Faults and Warnings

Auxiliary Gage Fault

1. During normal operation the single or four parameter screen will be displayed.

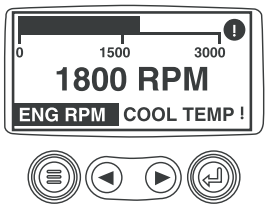


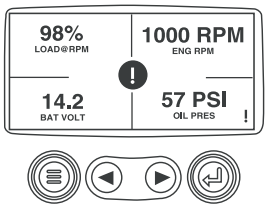


2. The PVA Series of auxiliary gages can be attached to the PowerView. These auxiliary gages communicate with the Modbus master PowerView via a daisy-chained RS-485 port. If at any time during system initialization or normal operation an auxiliary gage should fail the single or four parameter screen will be replaced with the "MLink Gage Fault" message.

3. To acknowledge and "Hide" the fault and return to the single or four parameter display press the "Enter Button".

4. The display will return to the single or four parameter screen.





Indicates Auxiliary Gage Fault

Indicates Fault Warning

Indicates Derate or Shutdown Condition Fault

5. Pressing the "Enter Button" will redisplay the hidden fault. Pressing the "Enter Button" once again will hide the fault and return the screen to the single or four parameter display. NOTE: The fault can only be cleared by correcting the cause of the fault condition.

7. The operator must remain seated, at all times, during machine operation. Keep hands and feet INSIDE the operator's control station at ALL times. Allow NO riders on the machine at ANY time.

8. Do NOT suddenly stop the machine during operation.

9. Report any problem with the machine, noted during operation, and have it repaired immediately.

10. Observe the PowerView display information and other gauges frequently.

11. Keep throttle at HIGH idle while working the machine.

CAUTION: **During operation do NOT slow travel, or rotor speed, by lowering the engine speed. Use only the Travel Direction Control Lever (FNR) to slow the machine.**

12. Do not work under overhangs, electric wires, or where there is danger of a slide.

13. Use extra caution in crossing side hills, ridges, logs, ditches, etc.

14. Maintain ground speed consistent with ground conditions. Do NOT coast.

15. Know and understand the traffic flow patterns of your job, and obey flagmen, road signs, or signals.

WARNING: **Understand the machine's limitations and keep it under control at all times. Do NOT try to do too much work - too fast.**

16. BEFORE getting off the machine, put the directional/speed control handle (FNR) in the "NEUTRAL" (N) position. Set the Brake switch to ON. Stop the engine.

17. Visually check gauges and information accessed on the PowerView display panel. Do NOT let water temperature go above 210° F and oil temperature above 195° F.

NOTE: **The Oil Pressure, Water Temperature and Hydraulic Oil Temperature readings are shown on the PowerView display panel, located on the right-hand operator's panel. If the established temperatures are exceeded, fault codes will be displayed and the audible alarms will sound.**

18. Never introduce dirt, or other contaminants, into the fuel or hydraulic tanks whenever refilling. When adding hydraulic oil to the tank, always filter oil through a minimum 6 micron filter.

19. Never allow engine to run at LOW IDLE for prolonged periods of time.

20. Never move the hydrostatic drive Directional Control Lever (FNR) from forward (F) to reverse (R), or reverse (R) to forward (F), without coming to a complete stop first. Always stop the machine in the NEUTRAL (N) position prior to changing direction of travel.

21. Rotor rotation is allowed in high gear, provided the rotor has been raised above the surface being cut. Attempting to operate the machine while the Recycler/Stabilizer is in high gear and moving will cause hydraulic pump and/or system damage.

22. Do not operate a machine NOT having the "Operating Instructions" and "Warning" decals in place on the machine. The decals MUST remain in good condition and NOT be covered with dirt or grease. Replace damaged or missing decals immediately.

3. Slowly move the FNR switch out of neutral, into the FORWARD position, (away from operator) to move the unit in FORWARD. Adjust engine throttle speed to vary travel speed. If needed, release the FNR switch to slow down, stop and return to NEUTRAL. Slowly move the FNR switch out of neutral, into REVERSE position, (toward operator) to move the unit in REVERSE. Adjust engine throttle speed to vary travel speed. If needed release the FNR switch to slow down, stop and return to NEUTRAL (see figure 3-16).

4. Select the low or high travel gear range by following ALL range selection (shifting) procedures given in THIS Section.

CAUTION: **Smooth operation of the unit will NOT be possible; proportional control is NOT available. Adjust engine throttle speed to vary travel speed, if required. ALWAYS move the FNR switch to neutral and allow the unit to come to a STOP before changing direction of travel. Forward or reverse travel speed is limited to 0.75 mph (66 fpm) in LOW speed range and 3.0 mph (4.8 kph) in HIGH speed range, at FULL throttle (high idle).**

5. When the unit is at the repair site, put the FNR override switch in the OFF (0) (normal operation) position. Put the throttle at low idle speed and run the engine for 3-5 minutes. Stop the engine. Repair the unit before attempting further use.

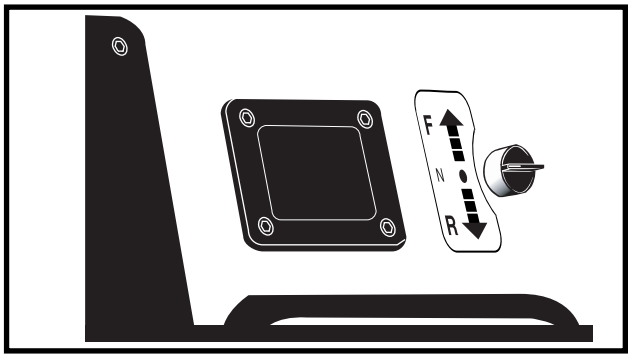


FIGURE 3-16. BACKUP FNR CONTROL SWITCH.

TOWING INSTRUCTIONS
[See Figures 3-17 and 3-18].

CAUTION: **Do NOT tow the machine unless all of the following procedures have been completed. Should the machine become COMPLETELY disabled, and the engine CANNOT be started, use the following procedures to develop sufficient pressure to release the SAHR brakes on the rear axle.**

CAUTION: **Perform this procedure ONLY if the transmission system or engine can NOT be operated and BEFORE attempting to move the machine.**

1. A Portable Hydraulic Power Unit capable of providing 500 psi [+/- 100 psi] pressure to the SAHR brake system is necessary to release the brakes in the axle assembly; left and right ends.

CAUTION: **Do NOT use a portable hydraulic unit that has an "oil supply" other than CLEAN, FILTERED hydraulic oil, using the same type of oil as contained in the hydraulic oil reservoir of the machine.**

2. Place wooden blocks both behind and in front of all four tires.

DANGER: **Securely block the wheels with solid blocking.**

3. Look under the right-hand side of the machine's frame and find the brake valve assembly and the release system connection fitting and cap (Figure 3-17 – Item 1). Removing the right-rear plate from the deck of the operator's compartment can also expose the brake valve.

TABLE 4-1. MAINTENANCE SCHEDULE.

FIG. 4-2 ITEM NO.	ITEM	8 HRS OR DAILY	50 HRS OR 1 WK	250 HRS OR 6 MO	500 HRS OR 1 YR	1000 HRS OR 1 YR	2000 HRS OR 1 YR	2000 HRS OR 2 YRS	QTY	TYPE/REMARKS
6	**ENGINE COOLING SYSTEM**	✓		✓ *				⌫ *	78 Qt. (74 L)	Check coolant level. Fill as required with 50% mixture (approximately) of drinking water and ethylene glycol base antifreeze, with rust inhibitors and antirust qualities. Add one can of “cooling system conditioner” having rust inhibitor properties. See this section.
7	**ENGINE COOLANT FILTER**			⌫ *					1	Remove and replace coolant filter with new. Use APPROVED filter ONLY. See this section.
8	**Engine Radiator - Hydraulic OIL - CHARGE AIR - COOLERS**	**C** ✓							All Three	Clean and inspect the Radiator, Hydraulic Oil and Charge Air Coolers at the start of each shift. Inspect for blockage by dirt or other contaminates. See this section.

5. Fill the new oil filter with clean, correct, lubricating oil before installing it on the engine. A lack of engine lubrication oil while the filter is being pumped full of oil will harm the engine.

6. Apply a light film of lubricating oil to the gasket-sealing surface before installing the new filter.

7. Screw the replacement filter, filled with fresh oil, onto the lubricating oil filter head in a clockwise direction. Hand tighten ONLY.

8. Continue to tighten the filter element until the filter is hand tight and the seal on top of the filter element has been compressed forming a tight seal.

CAUTION: **Do not use any mechanical devices for tightening the oil filter. Mechanical overtightening can distort the threads on the lubricating oil filter head or damage the filter element seal.**

8. Complete the oil change procedure from Step 6 in **Changing Engine Lubrication Oil** procedure above, and start the engine. Carefully inspect the oil filter to make sure there are no leaks. Check the oil pressure reading, shown on the PowerView display, (see Section 3) to confirm proper engine oil pressure exists.

FUEL SYSTEM.

ENGINE FUEL FILTERS.

The Cummins engine uses two fuel filter elements to ensure a clean fuel supply. Located inside the left-hand engine compartment door, both filters are readily accessible and may require service prior to the start of work each day. Reference the Cummins QSM11 Engine "Operation and Maintenance Manual" provided with the machine.

WARNING: **DIESEL FUEL IS VERY FLAMMABLE. USE EXTRA CAUTION.**
Do NOT change the fuel filter elements in an area near open flame.
Do NOT change the fuel strainer or fuel filter elements with the unit's engine running.
Do NOT smoke while changing the fuel strainer or fuel filter elements.
Try NOT to spill fuel. If spilled, clean up fuel spills during strainer cleaning or element change before starting engine.

DAILY FUEL FILTER MAINTENANCE.

At the bottom of each of the two fuel filters are water drains (see Figure 4-6). Prior to starting the engine each day, open the drains at the bottom each of the two filters and drain any collected water. Verify the drains are firmly closed prior to starting the engine.

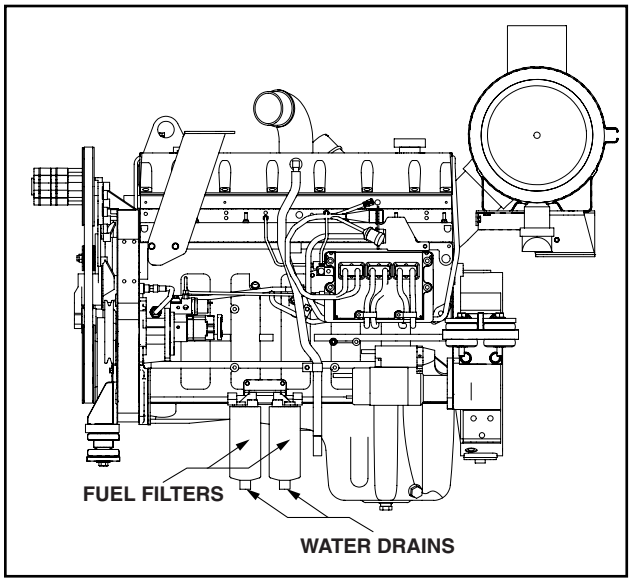


FIGURE 4-6. FUEL FILTERS LOCATION AND WATER DRAINS

CHANGING THE TRAVEL SYSTEM HYDRAULIC OIL FILTER (See Figure 4-16).

1. Stop the engine and allow time for the hydraulic fluid to cool.

2. Wipe the filter head clean using a clean lint free cloth.

3. Use a filter element wrench to loosen the filter element. Remove and discard the filter element.

4. Be sure that the old filter element, rubber gasket is removed and discarded before the new filter element is installed.

5. Apply clean hydraulic oil on the NEW filter element rubber gasket. Fill the element with the correct, new and filtered hydraulic oil.

6. Carefully install the new filter element onto the filter head. Tighten the filter element onto the filter head as directed by the manufacturer.

CAUTION: **Do NOT overtighten the new filter element onto the filter head. Hand tighten only.**

7. Start the engine using the procedures outlined in Section 3.

ALTERNATOR AND FAN DRIVE BELTS.

CHECKING BELTS.

See CUMMINS QSM11 ENGINE Operation and Maintenance Manual, for suggested procedures.

CHECKING AND TIGHTENING THE ENGINE COOLING FAN.

Stop the engine. Visually inspect the fan for apparent looseness, or damage daily.

WARNING: **The engine MUST be "STOPPED" before checking and/or tightening the fan. Serious injury can result from being struck or caught by the fan, belts or moving engine parts.**

If the fan assembly is found loose and requires tightened, loosen and remove the four (4) capscrews and nuts which fasten the LEFT half of the fan guard assembly to the right half of the fan guard.

Loosen and remove the four (4) capscrews that fasten the LEFT fan guard to the cooling package and remove the guard.

Using a 3/8 drive torque wrench and a correct sized socket, tighten each fan mounting bolt to a torque of 22 ft. lbs. (30 N.m).

Put the LEFT fan guard in place against the right guard and align all mounting holes. Install the four (4) capscrews and nuts which fasten the LEFT half of the fan guard assembly to the right half of the fan guard, and tighten.

Install the four (4) capscrews which fasten the LEFT half of the fan guard assembly to the cooling package. If needed, adjust the LEFT fan guard vertically and horizontally to have adequate fan assembly clearance and securely tighten each capscrew.

BATTERIES [See Figure 4-17].

The unit is equipped with a 24 VDC battery system. Two batteries, connected in series, are located in the front left compartment of the ballast container. Perform basic maintenance procedures to help ensure long-life and successful starts.

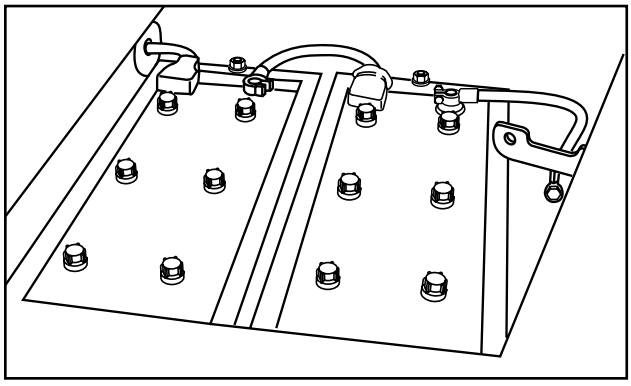


FIGURE 4-17. BATTERIES.

ADDING OIL TO PLANETARY WHEEL ENDS.

Remove the FILL plug, found at the 12:00 o'clock position (See Figure 4-24 – 2). Use a funnel to add oil to the planetary wheel ends through the fill plug hole. Use EP 80W90 when adding oil, until oil flows from the INSPECTION plug hole. Replace both plugs and tighten securely.

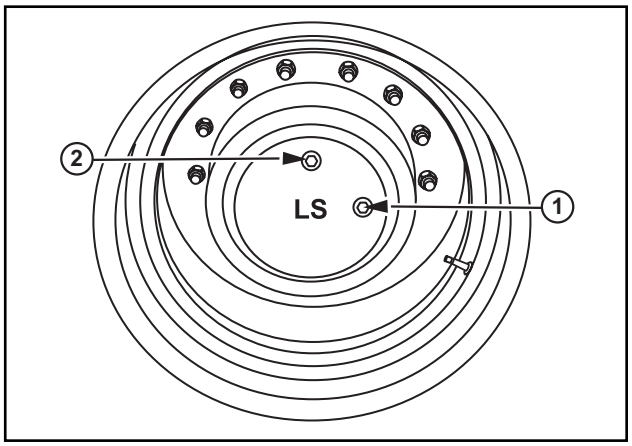


FIGURE 4-24. PLANETARY WHEEL ENDS INSPECTION AND FILL PLUGS.

FUEL TANK BREATHER CAP. (See Figure 4-25).

CHANGING FUEL TANK BREATHER CAPS.

Each of the two 120 gallon fuel tanks is fitted with a breather cap (see figure 4-25). The breather should to be changed every 2,000 hours, or each year.

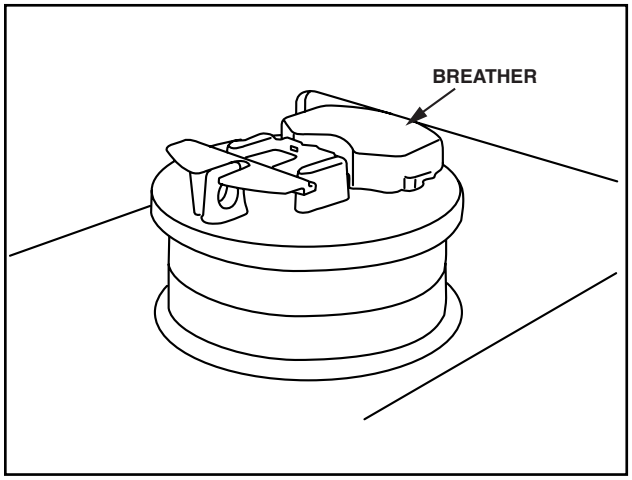


FIGURE 4-25. FUEL TANK CAP.

Replace BOTH fuel tank breather caps each year, or every 2,000 hours of operation, or MORE OFTEN if the machine operates in a dusty environment.

Reference the Spare Parts Catalog for the appropriate part number and order through your Distributor.

ELECTRICAL SYSTEM MAINTENANCE.

The following charts show the assignments for each of the fuses used on this machine. Reference these charts when it is suspected that a fuse is responsible for an electrical problem.

STANDARD INCH FASTENERS.

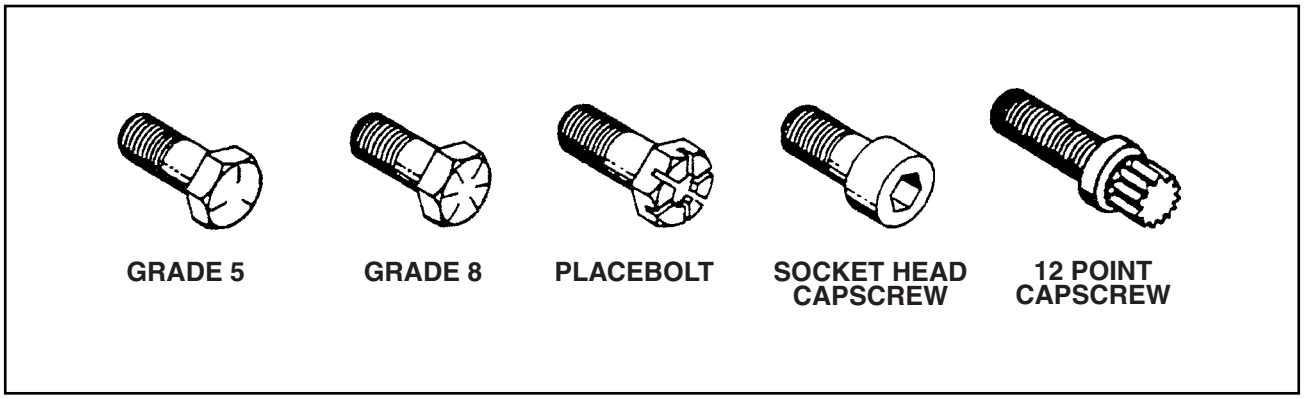


FIGURE 4-30. STANDARD INCH FASTENERS.

Section 6
ENGINE, COOLING, EXHAUST, FUEL SYSTEM, THROTTLE

GENERAL INFORMATION.

This section contains information about the Cummins QSM11 engine used on the MPH 362 and MPH 364-2 Recycler and Stabilizer, the Exhaust System, the Fuel System and the Throttle.

NOTE: **The Cummins Operation and Maintenance manual for the QSM11 is provided with the MPH 362 and MPH 364-2.**

For Engine Operation, Service, Troubleshooting and general Maintenance procedures, see the engine Operation and Maintenance Manual.

EXHAUST SYSTEM.

The Exhaust system includes the Muffler, Tailpipe, Flex Tube, and Thermal Mat. The exhaust system is mounted on the right side of the vehicle.

REMOVAL [See Figure 6-1].

CAUTION: **Exhaust system may be hot if vehicle has recently been in service. Be sure Exhaust system components have cooled down before removing.**

1. Loosen screws on clamp, (Figure 6-1 - 1) and remove Tailpipe (2).
2. Loosen screws on clamp (3) securing Elbow (4) to Muffler (5).
3. Remove four capscrews (6), and washers (7), attaching Muffler (5) and Thermal Pad (8) to hood.
4. Remove Muffler (5) and Thermal Pad (8).
5. Loosen clamp (9) and remove elbow (4).
6. Loosen clamp (10) and remove Flex Tube (11).
7. Loosen V-band clamp (12) and remove Elbow (13) from engine.

INSTALLATION [See Figures 6-1 and 6-2].

1. Install Elbow (Figure 6-1 - 13) on engine and secure with V-band clamp (12).

NOTE: **Install Flex Tube (Figure 6-2 - 3) in a relaxed state. Do not stretch, compress or twist Flex Tube during assembly.**

2. Install Flex Tube (Figure 6-2 - 3) on Elbow (1). Secure with clamp (2). Be sure clamp is oriented so that threaded stud is toward engine.
3. Install Flex Tube (3) on elbow (5) and secure with clamp (4). Be sure clamp is oriented so that threaded stud is toward engine.

NOTE: **Install Thermal Mat (Figure 6-1 - 8) on hood with folded/taped edge up.**

4. Peel backing from adhesive strips and attach to hood, centering holes in mat (Figure 6-1 - 8) over holes in hood.

13. Install the Oil Cooler connection access plate (3) on the upper right of the Cooling Assembly using three bolts (1) and three washers (2).

14. Remove plugs and connect the two hoses to fittings on the lower left side of Oil Cooler Assembly. Match hose label to corresponding fitting label.

15. Install the Oil Cooler connection access plate (6) on the lower left of the Cooling Assembly. Secure plate with three bolts (4) and washers (5).

16. Install short coolant hoses (Figure 6-11 - 7) at bottom of Radiator and secure with two clamps (6).

17. Install short charge air hoses (3) at top of Radiator and secure with two clamps (2).

NOTE: **At this point all coolant and oil lines should be connected to the Radiator/Oil Cooler Assembly.**

18. Close the two petcocks (1) on the lower radiator hose assembly and fill the Radiator with coolant mixture. (See Section 4 - MAINTENANCE).

19. Check for leaks at all coolant and oil line connections.

ENGINE.

This section contains information about the Cummins QSM11 engine used on the MPH 362 and MPH 364 Recycler and Stabilizer and provides information of the removal and installation of the engine.

For engine operation and general manufacturer maintenance procedures, see the CUMMINS Operation and Maintenance Manual, which is supplied with each machine.

For major engine repair requirements contact the nearest CUMMINS Engine Dealer for assistance about major repair procedures, in dealer shop repairs and/or engine parts.

REMOVAL [See Figures 6-11, 6-12 and 6-14 through 6-24].

CAUTION: **Insure that engine temperature is "cold".**

1. Drain the engine oil from the engine (See Section 4 - MAINTENANCE).

2. Loosen the band clamp that fastens the 90 air inlet elbow from the Inlet Air Flange on the Turbocharger and Air Cleaner Assemblies. Move the elbow away from the Turbocharger Air Inlet and Air Cleaner Outlet.

3. Loosen the muffler clamp that holds the flexible exhaust tube to the Turbocharger Outlet elbow and move the flexible exhaust tube away from the Turbocharger Outlet.

4. Loosen and remove the negative (-) battery cable from the negative (-) post of the battery FIRST, and then loosen and remove the positive (+) battery cable from the positive (+) post of the battery. Disconnect both cables.

WARNING: **Battery explosion can occur if the battery terminals are shorted. Always disconnect the negative battery cable from the battery first. Do not smoke or cause a spark while removing the battery cables from the battery.**

5. Place a container under the Radiator and drain the complete cooling system of coolant, including the Engine Cylinder Block (See Section 4 - MAINTENANCE).

WARNING: **Do not drain the cooling system of coolant while the system is hot. Drain when cool only. Hot coolant can cause serious injury.**

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ELECTRICAL

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POWERVIEW MONITORING SYSTEM.

POWERVIEW DISPLAY.

The PowerView Display is located on the Ignition Panel (Right-hand dash). The PowerView multifunction monitoring system provides electronic instrumentation and monitoring of the machine's engine, hydraulic travel, steering and rotor systems.

FUEL LEVEL.

When accessed using the arrow buttons, menu and enter keys, the PowerView display screen will show available fuel contained in both tanks, as a percentage, with 100% indicating full condition.

ENGINE HOURS.

When accessed using the arrow buttons, menu and enter keys, the PowerView display screen will show accumulated hours the engine has been running.

CHARGE VOLTAGE.

When accessed using the arrow buttons, menu and enter keys, the PowerView display screen will show charge voltage from the alternator.

ENGINE COOLANT TEMPERATURE.

When accessed using the arrow buttons, menu and enter keys, the PowerView display screen will show the engine coolant temperature. Anytime the 212° F (100° C) limit is exceeded, the PowerView display screen will show an "active fault code" and "WARNING" icon. The audible alarms will sound and the amber warning light will come on. When the PowerView display receives a "severe fault code", a "SHUTDOWN" icon will be shown on the screen. The alarms will sound and the red shutdown/derate light will come on.

HYDRAULIC SYSTEM OIL TEMPERATURE.

When accessed using the arrow buttons, menu and enter keys, the PowerView display screen will show the hydraulic system oil temperature. Should oil temperature exceed 180°F , the PowerView display screen will show an "active fault code" and "WARNING" icon. The audible alarms will sound and the amber warning light will come on. Should oil temperature exceed 190° F , the PowerView display screen will show a "severe fault code" and "SHUTDOWN" icon. The audible alarms will sound and the red shutdown/derate light will come on.

ENGINE OIL PRESSURE.

When accessed using the arrow buttons, menu and enter keys, the PowerView display screen will show the engine oil pressure. Anytime the minimum allowable oil pressure is reached, the PowerView display screen will show an "active fault code" and "WARNING" icon. The audible alarms will sound and the amber warning light will come on. If the fault condition continues, the PowerView display will show a "severe fault code" and "SHUTDOWN" icon, on the screen. The audible alarms will sound and the red shutdown/derate light will come on.

ROTOR SYSTEM CHARGE FILTER.

The PowerView display screen will indicate if the rotor charge oil filter has reached its maximum holding capacity and must be changed. Anytime the filters maximum holding capacity is reached, the PowerView display screen will show an "active fault code" and "WARNING" icon. The audible alarms will sound and the amber warning light will come on. If the fault condition still exists, after 2 minutes, the PowerView display receives a "severe fault code" and a "SHUTDOWN" icon will be shown on the screen. The audible alarms will sound continuously and the red shutdown/derate light will come on.

TRAVEL SYSTEM CHARGE FILTER.

The PowerView display screen will indicate if the travel charge oil filter has reached its maximum holding capacity and must be changed. Anytime the filter's maximum holding capacity is reached, the PowerView display screen will show an "active fault code" and "WARNING" icon. The audible alarms will sound and the amber warning light will come on. If the fault condition still exists, after 2 minutes, the PowerView display receives a "severe fault code" and a "SHUTDOWN" icon will be shown, on the screen. The audible alarms will sound continuously and the red shutdown/derate light will come on.

TROUBLESHOOTING CHART		
SYMPTOM	**CAUSE**	**REMEDY**
ENGINE THROTTLE SPEED CONTROL CIRCUIT		
ENGINE THROTTLE SPEED WILL NOT CHANGE FROM LOW TO HIGH IDLE OR WILL NOT CHANGE FROM HIGH TO LOW IDLE	Engine ECU malfunction.	Refer to Engine Manual QSM11.
TRANSMISSION SYSTEM CONTROL CIRCUIT		
Caution: The transmission system control circuit used on the MPH362/364 is EXTREMELY sensitive to having the correct voltage supplied to the circuit. Always check the supplied voltage to the circuit before further troubleshooting.		
TRANSMISSION SYSTEM DOES NOT OPERATE IN EITHER DIRECTION IN MAN POSITION OF AUTO/MAN SWITCH	E-Stop brake system control switch is in applied position.	Place switch in released position.
	E-Stop switch defective.	Replace switch.
	Travel and load controller computer defective.	Replace computer.
	FNR controller lever defective.	Replace FNR controller lever.
	Defective EDC coils on travel pump.	Replace coils.
	Defective travel pump.	Replace pump.
TRANSMISSION SYSTEM OPERATES IN ONE DIRECTION ONLY IN MAN POSITION OF AUTO/MAN SWITCH	Travel and load controller computer defective.	Replace computer.
	FNR controller lever defective.	Replace FNR controller lever.
	Defective EDC coil on travel pump.	Replace defective EDC coil.
	Defective travel pump.	Replace pump.
IN AUTO POSITION OF AUTO/MAN SWITCH, TRANSMISSION SYSTEM DOES NOT CHANGE SPEED AS LOAD CHANGES	Defective AUTO/MAN switch.	Replace AUTO/MAN switch.
	Defective pressure transducer.	Replace pressure transducer.
IN AUTO POSITION OF AUTO/MAN SWITCH, TRANSMISSION SYSTEM ENGINE LOAD SET POINT CAN NOT BE CHANGED	Defective engine load control set point potentiometer.	Replace potentiometer.
	Travel and load controller computer defective.	Replace computer.

REMOVAL [See Figure 8-6].

WARNING: **Before breaking any circuit connection, make certain that power is off and the system pressure has been released. Lower all vertical cylinders, discharge any accumulators, and block any load whose movement could generate pressure.**

NOTE: **Plug and cap all lines and ports to prevent entry of dirt into the system.**

1. Place a container under the Hydraulic Tank Assembly to catch any oil when the hydraulic lines are disconnected.
2. Disconnect and label the Hydraulic Hose from fitting (Figure 8-6 – 1). The hose is connected to the Travel Pump.
3. Disconnect and label the hydraulic hose(s) from fitting (2). The hose goes to the Tandem Gear Pump Brake section.
4. Disconnect and label the Hydraulic Hose from fitting (3). This hose is connected to the Tandem Gear Pump Steer/Aux Assembly.
5. Disconnect and label the Hydraulic Hose from fitting (4). This hose is connected to the right-hand Rotor Pump.
6. Disconnect and label the Hydraulic Hose from the Priority Flow Divider Valve connected to fitting (6).
7. Disconnect and label the Hydraulic Hose from the Relief Valve Return Flow connected to fitting (7).
8. Disconnect and label the Hydraulic Hose from the Brake Valve connected to fitting (8).
9. Disconnect and label the Hydraulic Hose from the Front Axle Case Drain connected to fitting (11).
10. Disconnect and label the Hydraulic Hose from the 2-speed Valve connected to fitting (12).
11. Disconnect and label the Hydraulic Hoses from the Rotor Motor Case Flushing and the Steer/Aux Filter connected to fitting (16).
12. Disconnect and label the Hydraulic Hoses from the Tank Manifold Assembly connected to fitting (17).

CAUTION: **The hydraulic tank is heavy and requires a harness or lift for removal.**

13. Attach a harness or lift to the Hydraulic Tank.
14. Remove the six capscrews (18), and then lift Hydraulic Tank off of machine. Three capscrews are located along each side of the Hydraulic Tank attaching the tank to the frame.

NOTE: **If the tank weldment is to be replaced, proceed with step 15 for removal of all parts.**

15. Remove all fittings from strainers and diffusers.
16. Remove diffuser (19) and two diffusers (23).
17. Remove four strainers (21) and one suction strainer (22).
18. Remove two bolts (24), fluid level gauge (25) and two rubber washers (26).
19. Remove fitting (30) from ball-valve (29).
20. Remove bolt (27) and nut (28), then remove ball-valve (29).

NOTE: **Items (32 through 37) are part of item (31).**

21. Remove cover (32).
22. Remove six bolts (33).
23. Remove filler neck (34), gasket (35), strainer (36), and gasket (37).
24. Remove two plugs (41).
25. Remove eighteen capscrews (38) and remove weldment cover (39) and gasket (40).

3. Install fitting (2) in port “L2”. Fitting (2) should be positioned so that it is pointing up at 45° to the horizontal.

4. Install fittings (3) through (5) into their respective ports.

5. Install O-ring and tee fitting (14) on top of the Travel Pump Assembly.

6. Install fitting (6) and test coupling (13).

CAUTION: **The Travel Pump Assembly weighs over 100 pounds. Use a proper lifting device when installing the Travel Pump Assembly into the machine.**

NOTE: **A new Rotor Pump is provided with a cover that has an O-ring between the cover and the Rotor Pump Housing. When the cover is removed to install the Travel Pump Assembly, this O-ring must be retained and is used between the Rotor Pump Housing and the Travel Pump Housing.**

7. Lubricate, then reinstall O-ring (provided with Rotor Pump Cover), between the Rotor Pump and Travel Pump.

8. Lift the Travel Pump and engage the splined input shaft to the Rotor Pump Coupling. Align the four mounting holes on the Travel Pump with the four mounting holes on the Rotor Pump Assembly.

9. Attach the Travel Pump Assembly to the Rotor Pump Assembly with the four capscrews (7) and hardened washers (8).

10. Torque the four capscrews (7) to 100 ft.•lbs. (135.6 N•m).

11. Remove plugs and caps, and connect the hydraulic hose from to the Rear Travel Motors to fitting (1) at port “A” and fitting (15) at port “B”.

12. On MPH 364, remove plugs and caps, and connect the hydraulic hose from the Front Travel Motors to fitting (1) at port “A” and fitting (15) at port “B”.

13. Remove plugs and caps and connect the hydraulic hoses to fittings (2) through (6).

14. Using information in Section 4 - MAINTENANCE, replace the hydraulic filter.

15. Add hydraulic oil as needed.

16. Perform a pressure check on the system as described in the paragraph INSPECTION AND PRESSURE CHECK PROCEDURE at the end of this chapter.

INSPECTION AND PRESSURE CHECK PROCEDURE.

The Load Control Unit (LCU) board referred to in the following procedures is located on the Electrical Panel Assembly on the right side of the Instrument Panel Assembly as shown in Figure 8-13.

1. Warm up the engine, run at idle speed of 800-1000 for 5 minutes.

2. Adjust engine speed (measure off crankshaft only):

   Low idle: 850-900 rpm
   High idle (no load): 2300 +0/-25 rpm
   High idle (full load): 2150 rpm (non-adjustable)

3. In order to warm up the unit to operating temperature (step 4), the rotor speed II must be initially adjusted for full speed of 180 rpm. For rotor pressure adjustment (step 7), the rotor speed I must be initially adjusted for 40-60 rpm. This procedure is for temporary adjustment only. See rotor speed (step 8) for final adjustments.

   a. Turn the RAMP, MIN, and MAX potentiometers (pots) located on the LCU board CCW all the way. These are 10 turn pots so listen carefully for the quiet clicking sound to indicate when the pot is all the way CCW.

Section 9
AUXILIARY HYDRAULICS

AUXILIARY FUNCTION(S) - DOUBLE SPOOL VALVE.

The solenoid-operated Double Spool Valve Assembly (Figure 9-4) is located on the lower frame in front of the operator's platform. One section of the Spool Valve Assembly controls the up/down movement of the Rotor. The other section controls the opening and closing of the Rear (Tailgate) Door.

Hydraulic oil from port "EF" on the priority Flow Divider Valve Assembly is applied at port "P". Pilot pressure from port "M3" on the Travel Pump Assembly is applied at port "X". Hydraulic oil from port "T" is routed to the Steering/Auxiliary Filter inlet then returned to the Hydraulic Tank. Ports "A" and "B" on the two valve sections are connected as follows:

Rotor port "A"	To bottom of Counterbalance Valve Port "V1" (Rotor Up)
Rotor port "B"	To top of Counterbalance Valve Port "V2" (Rotor Down)
Rear Door port "A"	To piston end of cylinder (Closes Door)
Rear Door port "B"	To rod end of cylinder (Opens Door)

All solenoids operate from 24 VDC.

REMOVAL [See Figure 9-4].

WARNING: **Before breaking any circuit connection, make certain that power is off and the system pressure has been released. Lower all Vertical Cylinders, discharge any Accumulators, and block any load whose movement could generate pressure.**

NOTE: **Plug and cap all lines and ports to prevent entry of dirt into the system.**

1. Label and disconnect wire from the four solenoids (Figure 9-4 – 1).

2. Place a container under the Double Spool Valve Assembly to catch any oil when the hydraulic lines are disconnected.

3. Disconnect and label all hydraulic lines connected to the Valve Assembly.

4. Remove the two capscrews (2) securing the right side of the Valve Assembly to the frame.

5. Remove the capscrew (3), washer (4) and locknut (5) securing the left side of the Valve Assembly to the frame, then remove Valve Assembly.

INSTALLATION [SEE FIGURE 9-4].

NOTE: **REPLACE ALL O-RINGS WHEN INSTALLING FITTINGS.**

1. Install new fittings in Double Spool Valve Assembly.

2. Align the Valve Assembly with the mounting holes on the frame.

3. Coat capscrews (Figure 9-4 – 2 and 3) with threadlock, p.n. 0318702, and secure the right side of the Valve Assembly to frame with capscrews (2).

4. Install capscrew (3), washer (4) and flanged locknut (5).

5. Torque the capscrews (2) and (3) to 44 ft•lbs (59.6 N•m).

NOTE: **A container should be placed under the Valve Assembly to catch any oil when the hydraulic lines are reconnected.**

6. Connect all hydraulic lines to the Valve Assembly.

7. Connect electrical wires to the solenoids.

8. Add hydraulic oil, if necessary.

9. Perform an Auxiliary Hydraulics Pressure Check as described in the paragraph AUXILIARY HYDRAULICS PRESSURE CHECKS.

Section 10
REAR DRIVE AXLE ASSEMBLY, FRONT STEERING AXLE ASSEMBLY, WHEELS AND TIRES

GENERAL.

This section provides a description of the following system components:

Rear Drive Axle Assembly
Front Steering Axle Assembly
Wheels and Tires

CLEANLINESS.

When servicing the hydraulic system, it is very important to do the following:

1. Clean surfaces, fittings, and hoses at the point of disconnection.

2. Protect all exposed sealing surfaces from damage and foreign material.

3. All gaskets and O-rings should be replaced.

4. Lightly lubricate all O-rings with hydraulic oil prior to assembly.

5. Whenever a hose is disconnected, immediately cap the fitting and plug the hose to prevent contamination.

REAR DRIVE AXLE ASSEMBLY.

The Rear Axle Assembly includes the ASC Valve assembly, left and right gear boxes, left and right travel motors, and axle assembly. The axle is bolted to the rear of the frame.

WARNING: **Before breaking any circuit connection, make certain that power is off and the system pressure has been released. Lower all vertical cylinders, discharge any accumulators, and block any load whose movement could generate pressure.**

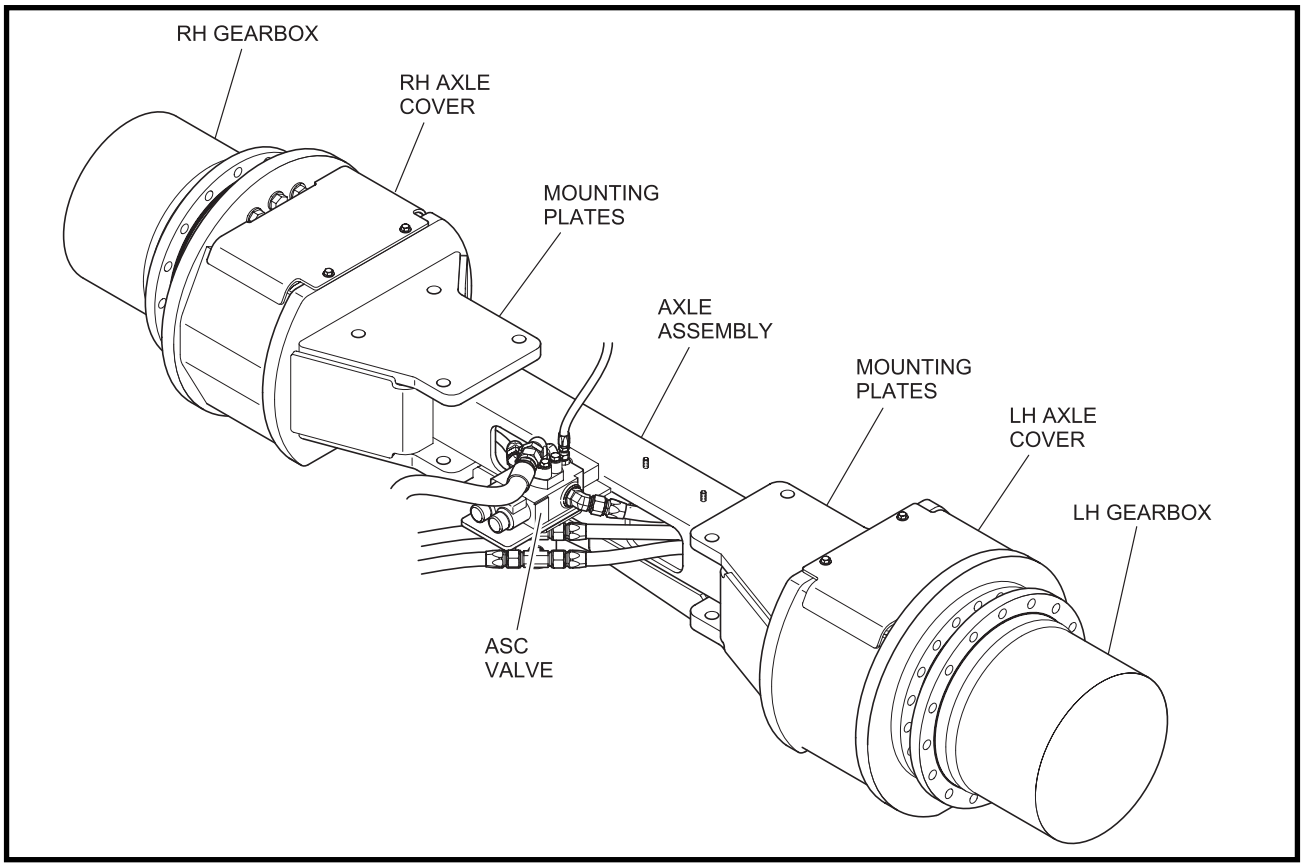

FIGURE 10-1. REAR AXLE ASSEMBLY.

19. Install steering cylinders on front axle as described in Section 12 - STEERING Paragraph STEERING CYLINDER.

20. Bleed the hydraulic system to remove any trapped air.

21. Perform a system pressure check as described in the paragraph SYSTEM PRESSURE CHECKS.

WHEELS AND TIRES.

FRONT WHEEL.

The rim and tire combinations used on the front wheel depend on the vehicle model. The MPH 362 uses 0938468 rim and tire combination on the right-hand side and 0938467 rim and tire combination on the left-hand side. The MPH 364-2 uses 0936340 rim and tire combination on the right-hand side and 0936341 rim and tire combination on the left-hand side.

REMOVAL [See Figure 10-9].

1. Place wooden blocks in front of and in back of the rear wheels.

2. Jack up the wheel to be removed until it just touches the ground.

3. Place wooden supports under the frame in case the jack slips.

4. Remove ten nuts (Figure 10-9-1) securing the wheel (2) to the gearbox. Remove wheel.

5. Using a wire brush clean the lug nut studs.

INSTALLATION [See Figure 10-9].

NOTE: **Be sure tires are mounted on the rim with proper tread orientation as shown in Figure 10-9. The orientation for Model MPH 364-2 is the reverse of Model MPH 362.**

When installing front wheels, make sure the tire treads are oriented as shown in Figure 10-9. The front wheels are driven on the MPH 364-2 and are not driven on the model MPH 362. The tire tread on the 362 is the reverse of the tire tread on the 364-2.

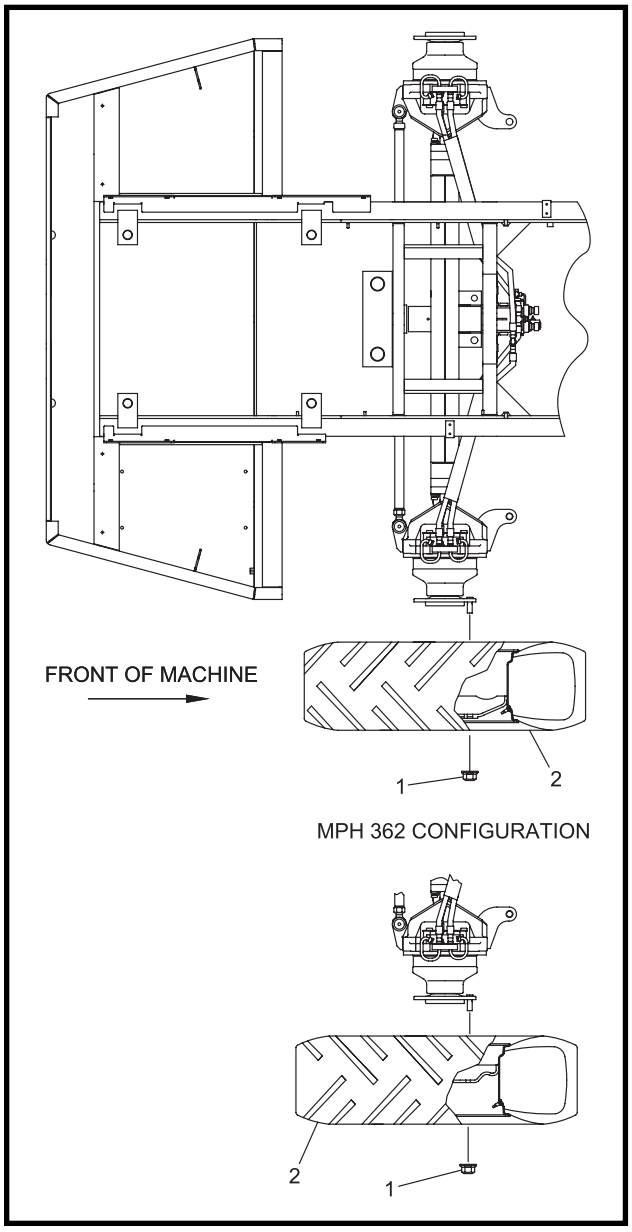

FIGURE 10-9. FRONT WHEEL.

1. Slide the front wheel (2) onto the axle with the tire oriented as shown in Figure 10-9.

2. Secure the wheel with ten nuts (1), with flat side of nut toward the rim.

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SEAL REMOVAL.

1. Note the location and direction of the seals during the removal process. Before removing any seal, be sure there is a matching seal in the seal kit for each seal removed from the cylinder. The seals removed should be nearly identical in terms of overall dimensions, however, the substitute seals may have different material, color or lip design.

2. Place the pack head (7) in a soft-jawed vise with a cloth inserted between the jaws and the pack head to remove the rod seal (10), O-ring (12) and back-up ring (11). Do not clamp on any threads. Remove rod seal (10) and O-ring (12).

3. Turn pack head over and remove rod wiper.

4. Inspect the pack head (7) grooves for nicks, burrs, scratches and rust. Minor nicks, burrs, scratches and rust can be removed with an emery cloth or an approved solvent. If the deformity cannot be removed, replace the damaged pack head. Be sure to check the pack head threads to verify that they are not damaged. Remove all forms of contamination from the pack head with a clean cloth before the new seals are installed.

5. Install the new rod seal (10) into the pack head (7). Form the rod seal into a kidney shape and press the seal carefully into the groove. Snap the wear rings into place while making sure that they have a proper fit.

6. Turn the pack head over. Install the rod wiper (9) by forming the rod wiper into a kidney shape and pressing it into the groove.

7. Install the back-up ring (11) and O-ring (12) carefully over the threads of the pack head.

8. Place the piston (8) in a soft-jawed vise with a cloth inserted between the jaws and the piston. Pry up the piston seals (14) and remove them.

9. Remove O-ring (13).

CAUTION: **Do not scratch the seal groove.**

10. Inspect the piston (8) grooves for nicks, burrs, scratches, dirt or rust. Minor imperfections may be removed with an emery cloth or an approved solvent. Make sure that the piston threads have not been damaged. Remove all forms of contamination from the piston by using a clean cloth before the new seals are installed.

11. Install the piston seals (14) and O-ring (13).

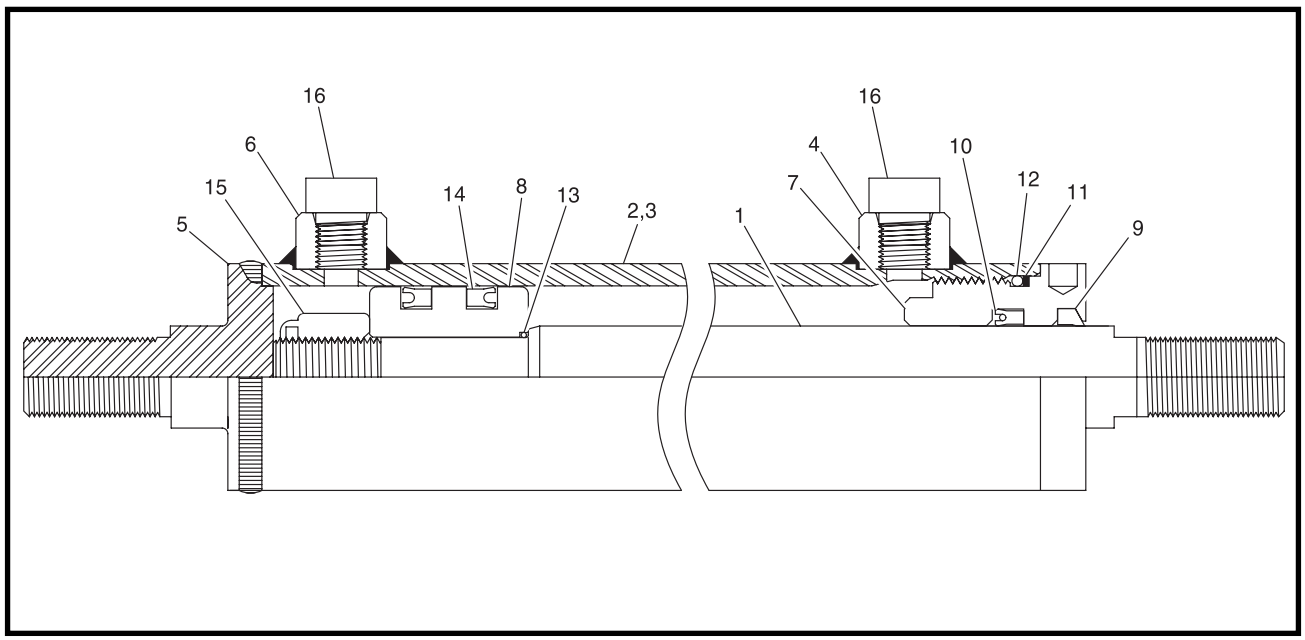

FIGURE 12-9. STEERING CYLINDER.

Section 13
ROTOR HYDRAULIC SYSTEM

ROTOR CHARGE FILTER.

The Rotor Charge Filter Assembly is connected to the Rotor Pump Assembly at ports “D” and “E”. The filter(s) are located on the left side of the machine, attached to the frame under the cockpit. Replacement of the filter element is covered in Section 4, MAINTENANCE. If it is necessary to remove the complete filter assembly, refer to REMOVAL below:

WARNING: **Before breaking any circuit connection, make certain that power is off and the system pressure has been released. Lower all vertical cylinders, discharge any accumulators, and block any load whose movement could generate pressure.**

REMOVAL [See Figure 13-2].

NOTE: **Plug and cap all lines and ports to prevent entry of dirt into the system.**

1. Remove the panel directly behind the boarding ladder underneath the operators platform to gain access to the hydraulic oil filters.

2. Place a container under the Filter Assembly (Figure 13-2) to catch any oil when the hydraulic lines are disconnected.

3. Disconnect and label the two hydraulic lines from Ports “D” and “E” on the top of the Rotor Pump Assembly connected to fittings (1) and (2), for the filter to be replaced.

4. Remove the four capscrews (3), and four washers (4) attaching the Filter Assembly to the frame and remove the Filter Assembly.

5. Remove fittings (1 and 2) from the filter.

6. Inspect fittings and discard any fitting that is damaged.

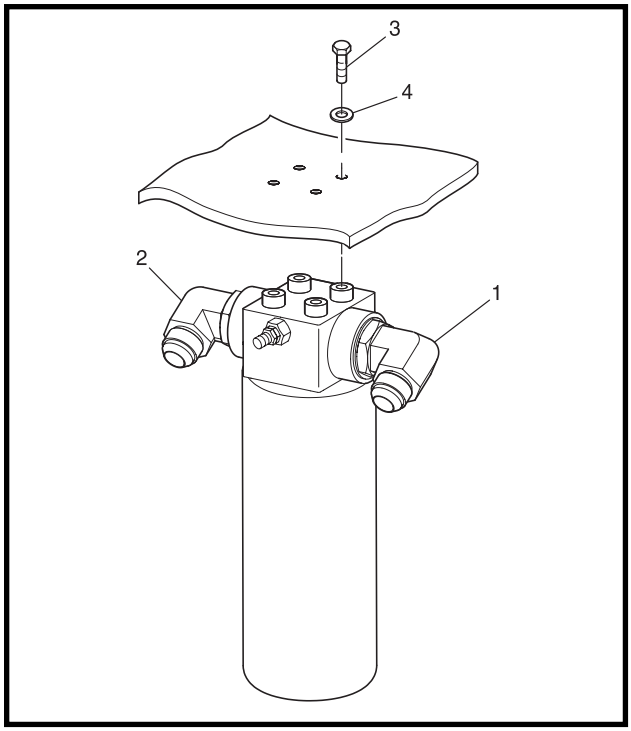

FIGURE 13-2. ROTOR CHARGE FILTER ASSEMBLY.

INSTALLATION [See Figure 13-2].

NOTE: **Use new O-rings when installing fittings.**

1. Install fittings (Figure 13-2 – 1 and 2) on filter being sure not to damage the O-rings. Position fitting (1) to point 30° down and position fitting (2) to point 45° down.

2. Position Filter Assembly on underside of frame with fittings pointing toward center of machine and arrow pointing towards rear of machine, then align filter with mounting holes.

3. Apply threadlock 242 to the four capscrews (3).

4. Secure Filter Assembly to frame with the four capscrews (3) and four washers (4).

5. Torque capscrews (3) to 44 ft•lbs (59.7 N•m).

NOTE: **Hydraulic hoses should be positioned at a 30° angle for attachment to fittings (1) and 45° angle for attachment to fitting (2).**

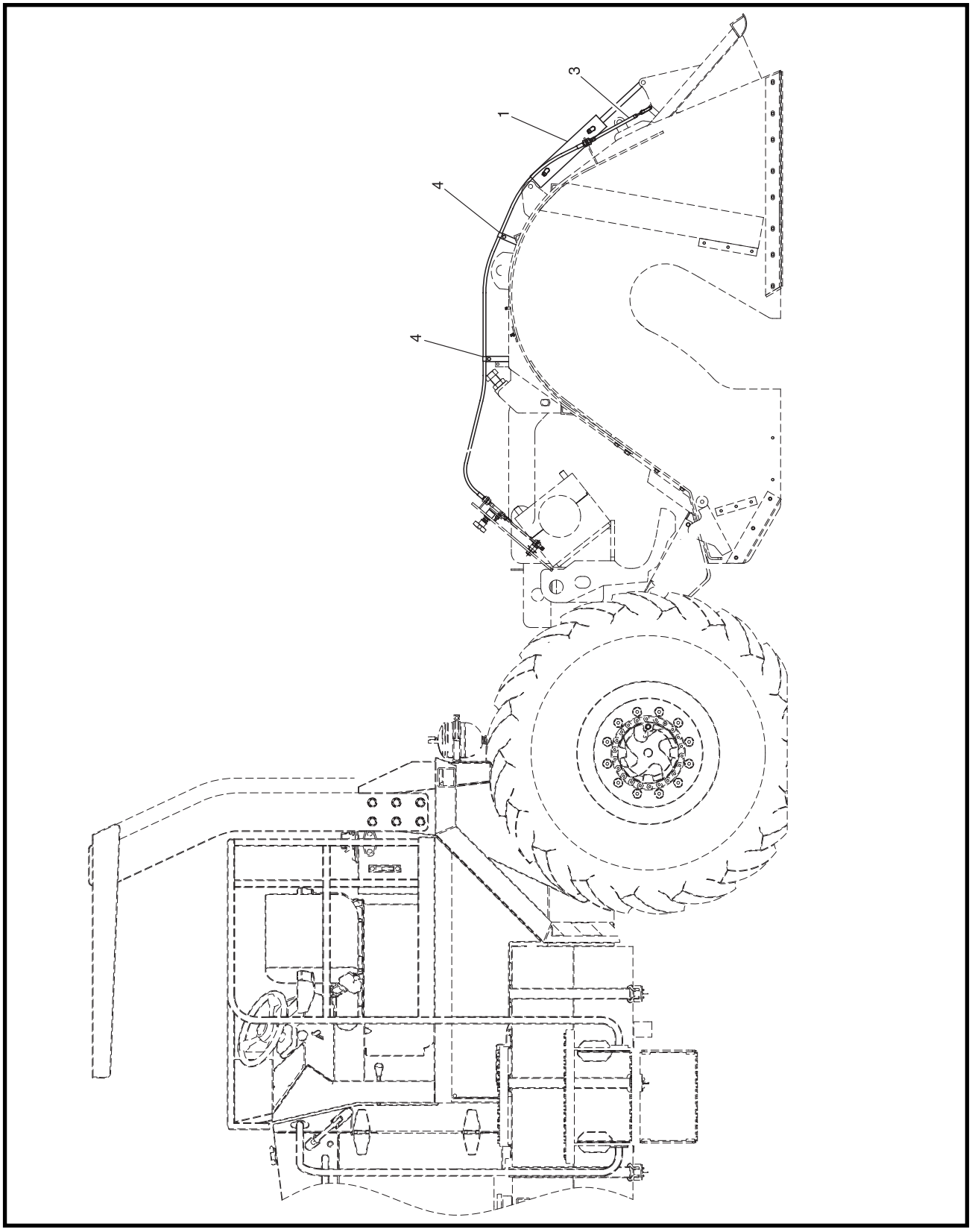

FIGURE 14-2. HOOD ATTACHMENTS.

DEPTH INDICATOR.

The Depth Indicator (pointer) is connected by linkage rod to the pivot crossmember weldment and indicates the Rotor depth on the depth plate. When the Rotor height is changed, the pointer is moved by the linkage rod and indicates Rotor depth. The position of the pointer can be adjusted so that the pointer is pointing to “0” when the Rotor is sitting at ground level.

DISASSEMBLY [See Figure 14-9].

1. The pointer can be replaced by removing knob (Figure 14-9 – 5), washer (4), washer (6) and pointer (1).

2. The linkage rod can be replaced by removing washer (8) and nut (9) at both ends of linkage rod (2) and disengaging linkage rod.

ASSEMBLY [See Figure 14-9].

1. If a new linkage rod is being installed proceed as follows:

    a. Assemble nut (Figure 14-9 – 10) and ball joint (11) to ends of new linkage rod. Adjust linkage rod length with ball joints attached to be the same length (10.38 inch centerline to centerline) as linkage rod is removed.

    b. Lock ball joints (11) in place by tightening nuts (10).

    c. Attach linkage rod (2) to crossmember weldment (3) with washer (8) and nut (9).

    d. Attach linkage rod (2) to depth lever (12) with washer (8) and nut (9).

    e. With Rotor sitting on the ground, loosen knob (3), then position pointer (1) to read “0”.

    f. Tighten knob (3) to lock pointer (1) in position.

2. If a new pointer (1) is being installed, proceed as follows:

    a. Install pointer (1), washer (6), washer (4), and knob (5).

    b. With rotor sitting on the ground, loosen knob (5), then position pointer (1) to read “0”.

    c. Tighten knob (5) to lock pointer in position (1).

ROTOR DEPTH PIVOT SHAFT.

The rotor depth pivot shaft is located on the pivot shaft depth plate and links the pointer to the lever depth indicator weldment.

REMOVAL [See Figure 14-9].

1. Disconnect the linkage rod (Figure 14-9 – 2) from the lever depth indicator weldment (17).

2. Unscrew the knob (5) and remove the knob from the lever depth indicator weldment (17).

3. Remove washers (4 and 6).

4. Remove pointer (1).

5. Remove nut (18).

6. Remove washers (13 and 14).

7. Remove lever depth indicator weldment (17) with bushing (16), spacer (15) and washer (19).

INSTALLATION [See Figure 14-9].

1. Place grease on bushing (Figure 14-9 – 16).

2. Install washer (19) on lever depth indicator weldment (17).

3. Install bushing (16) into rotor depth plate housing.

4. Place spacer (15) on lever depth indicator weldment (17) and insert weldment through the rotor depth plate (7) from the underside.

5. Install washers (13 and 14) on shaft (17).

6. Install nut (18) on shaft (17)

7. Install pointer (1) and washers (6 and 4) on shaft.

8. Screw knob (5) on shaft.

9. Connect the linkage rod (2) to the shaft (17).

10. With rotor sitting on the ground, loosen knob (5), then position pointer (1) to read “0”.

11. Tighten knob (5) to lock pointer in position (1).