

# Chapter 1: General System Information

## HOW THE MACHINE IS USED

The B-1 Mixer is used to mix and deliver concrete to job sites.

Most of the controls are electrically operated through the PLC (Programmable Logic Controller) inside the cab. The driver operates these controls through switches in the cab or at the rear of the machine.

The drum is supported and rotated by a motor and gearbox at the front pedestal and supported by two rollers at the rear pedestal. Gravity holds the drum in place, but the drum can lift free of the rollers a small distance and drop back onto them. Flat spots can develop on the rollers and drum as the result of a stationary drum bouncing as the truck travels. To prevent this, the driver always has the drum rotating when the truck is moving.

The drum is rotated at approximately 20 rpm while mixing, then slowed to 1 rpm while enroute to and from the job site. To discharge the concrete, rotation is reversed and the drum is turned at whatever rate is needed to supply concrete down the chute to the contractor.

To properly mix the concrete, the driver rotates the drum a certain number of times. A drum rotation counter on the control panel counts and displays the number of revolutions.

The flighting or fins welded into the drum roll and mix the material as the drum rotates. To discharge the mix, the driver reverses the direction of the drum rotation. The flighting is shaped to auger the mix up and out of the drum opening when the drum rolls in reverse.

The driver raises the bridge axle for all activities except travelling on paved roads. When loaded with five or more yards of concrete, the bridge axle is lowered (on paved roads) to spread the weight, dramatically reducing road wear and allowing heavier legal payloads. The wheels of the bridge axle caster to allow easier steering. Since they would hinder steering in reverse, the bridge axle automatically raises when the driver shifts the truck into reverse.

When loaded, the driver physically adjusts a knob controlling a pressure reducing valve to set the downforce of the bridge axle for the weight of the load.

*Continued on next page...*

At the top rear of the drum, a hopper can be lowered to direct dry materials into the drum when loading. The hopper is raised to allow a larger exit opening when the concrete is discharged at the job site. The hopper automatically lowers whenever the bridge axle is lowered or when the truck is shifted into reverse gear.

At the site, the driver can hydraulically raise and lower the chute and physically move it from side to side, provided the bridge axle is fully raised.

The strength and quality of finished concrete depends heavily on how wet the mix is when it is poured. The wetness or “slump” is measured by a slump meter (actually a pressure gauge). (The slump meter is optional.) It measures the amount of resistance to drum rotation caused by the mix riding up the drum walls on the flighting. A wet mix pours off of the flighting while a drier mix clings to the flighting longer as it is carried up the drum wall.

The slump meter has moveable markers attached to the exterior of the gauge face which can be positioned to indicated “slumps” of 1 inch, 2 inches, 3 inches, etc.

If the mix is too dry, the driver can add water from the water tank directly to the drum.

After completing the pour, the driver can use a water hose (one at ground level and another at the top of the ladder) to wash wet concrete off of the truck before it hardens. Usually, the remaining water is added to the empty drum to slosh out the drum interior as the truck travels back to the plant.

## SYSTEM OVERVIEW

The Housby B1 Mixer system is designed to:

- operate the hopper, used for loading dry materials in to the drum
- rotate the drum to mix dry materials with water and to discharge the concrete
- supply additional water to the mix, if needed, and supply pressurized water for after-pour wash-down.
- raise and lower the chute used to deliver discharged concrete to the forms
- raise, lower and provide proper downforce to the bridge axle, to allow the truck to legally transport greater loads.

## SUBSYSTEMS OVERVIEW

### Hopper and Chute Circuits

These rotate the hopper to the charging and discharging positions, and raise and lower the chute, and lock/unlock the chute pivot (to allow it to swing right and left).

### Drum Subsystem

This rotates the drum at variable speeds in charge direction to mix materials, and in discharge direction to force the mix out of the drum and into the chute. When not mixing or discharging, a 1 RPM setting turns the drum slowly to prevent the concrete from hardening or prevent the truck's bouncing from pounding flat spots in the drum.

The drum subsystem also includes the water tank used to add water to the mix.

### Bridge Axle Subsystem

This raises and lowers the bridge axle and provides proper downforce on the bridge axle to spread vehicle and load weight while in transit on hard surfaced roads.

### Common Components

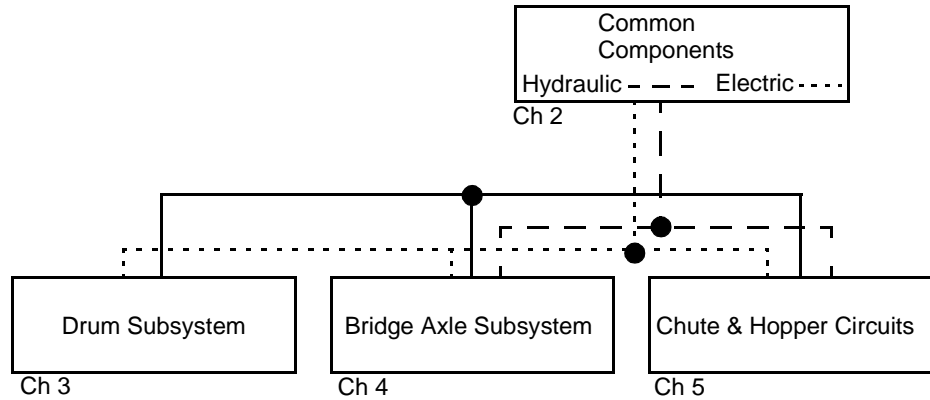
In addition to these three subsystems, the system also includes components common to two or more subsystems. The system is divided this way to allow easier discussion and troubleshooting of the system.

# BLOCK DIAGRAMS

## Structural Block Diagram

The material is grouped and presented in the manuals according to the structural block diagram.

**Housby B1 Mixer System**



## Functional Block Diagrams

Each of the subsystems, and the common components chapter, has a functional block diagram, found on pages XX through XX. Functional block diagrams help explain the system and illustrate logical interdependencies of inputs to outputs of the subsystem. These assist the technician when making decisions about how to troubleshoot the system.

## HOUSBY B1 MIXER SYSTEM SERVICE

This manual is designed to help the technician repair a faulty system and return it to service as quickly as possible. The manual is divided into five main sections:

- Volume A—Theory of Operation
- Volume B—Performance Checks
- Volume C—Troubleshooting
- Volume D—Repair
- Volume E—Schematics and Diagrams (11 x 17" format)

A glossary of abbreviations and terms and an index are provided at the back of the Repair volume.

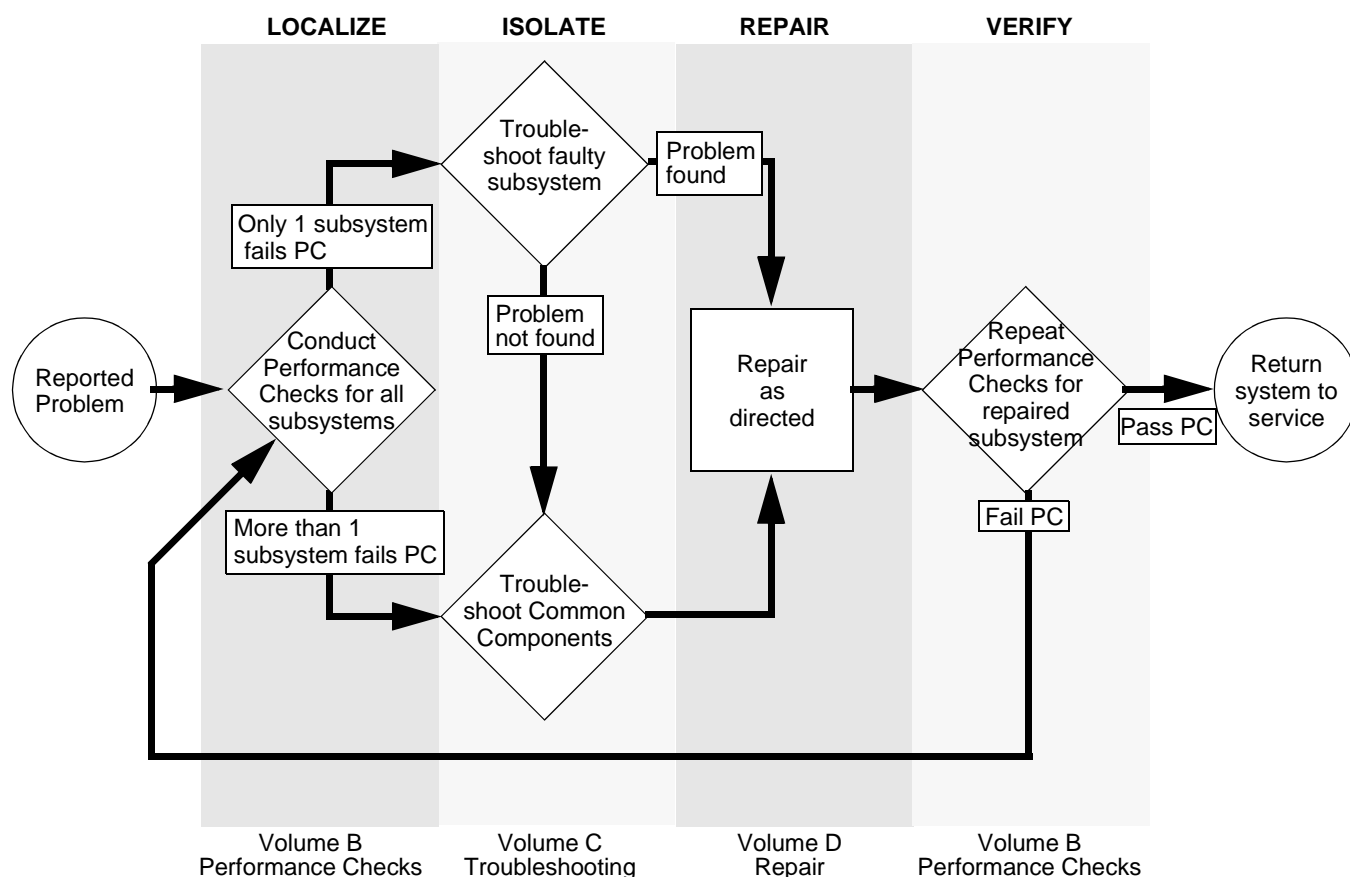
**NOTE:** This manual does not cover the truck chassis, engine or items related to the chassis or engine. Consult the appropriate manuals from the chassis and engine manufacturer when necessary.

### Service Process Flow Chart

The tasks involved in returning a malfunctioning system to service are to:

- localize the reported problem
- isolate faulty components from functioning components
- repair the faulty components
- verify that the repairs solved the problem

As this flow chart indicates, this volume—Volume A - Theory of Operation—is not critical to the repair process. The intent of this volume is to familiarize you with the machine and its subsystems.



A1

General System Information

## ABOUT THIS MANUAL

**NOTE:** This manual provides information and service procedures based upon machine knowledge and configuration at the time the manual was written. Due to ongoing efforts to continuously improve the equipment, there may be changes on the machine not reflected in this manual.

Procedures given in this manual provide one method for completing a given task. Additional information may be available through HOUSBY Service Support resources.

## Organization of Material

Volumes A, B, C and D of this manual are divided into chapters for:

- Safety and General Information (Chapter 1)
- Common Components of the other subsystems (Chapter 2)
- Drum subsystem (Chapter 3)
- Bridge Axle subsystem (Chapter 4)
- Chute and Hopper circuits (Chapter 5)

Chapters are added to cover ancillary items:

- Engine Speed Control (Chapter 6)
- Work Lights (Chapter 7)

Volume E is large format pages showing schematics functional diagrams and harness diagrams.

## Currency of Material

The instructions, illustrations and specifications in this manual are based on the latest information available at the time of publication. A given machine may have product improvements and features not described in this manual.

Housby Mixer Group reserves the right to make changes at any time without notice or obligation.

Operating instructions are found in the Housby B-1 Mixer System Operator's Manual. Lubrication and maintenance procedures are found in the Housby B-1 Mixer System Owner's Maintenance Manual.

## Visual Cues to Locating Information

The front page of each chapter holds a detailed table of contents for the chapter.

The lower outer corner lists the primary section. The outer upper corner of the page of the lists the major topic covered on the page.

## REFERENCE PUBLICATIONS

### Housby Publications

The following Housby Publications are necessary for reference:

- Housby B-1 Mixer Operator's Manual
- Housby B-1 Mixer Parts Manual
- Housby B-1 Mixer Maintenance Manual

Contact Housby to order these publications.

### Vendor Publications

The following vendor publications are optional reference materials included at the back of this binder:

- Sauer Sundstrand Series 90 pump and motor service manual
- Sauer Sundstrand Series HPM 61.2 Transit Mixer Drive start up and maintenance information
- Powermate Company hydraulic flow diagrams
- Hydraforce information on solenoid valves, directional valves, flow controls, pressure controls and technical data
- Eaton Model 70122 Pump parts and repair information
- Pinnacle Engineering electrical trouble-tree, diagrams, schematics and control system overview
- Westport Axle Corporation tag axle service manual



## WARRANTY CONSIDERATIONS

### Housby Warranty

Scott: Please provide what info you want given here about Housby warranties

**Vermeer's one year warranty** is printed inside the front cover of the 520 Brick Press Operator's Manual. The warranty requires that all service work be conducted by an authorized Vermeer dealership or the warranty shall become void.

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## Chapter 2: Common Components

### DEFINITION OF COMMON COMPONENTS

A “common component” is one that has a general function not specific to any one given subsystem or circuit. As an example, a circuit breaker that supplies current to several subsystems and/or circuits would be considered a common component. Also, a flow control valve providing flow to enable more than one hydraulic function would be considered a common component.

### ELECTRICAL COMMON COMPONENTS

#### Inputs

The key switch supplies 12 volts dc to the electrical common components. (See diagram on page [A2-4](#).)

#### Outputs

- To Drum Subsystem** A 12 volt dc output energizes a relay that switches the polarity of a variable voltage signal to the EDC controlling the hydrostatic pump that rotates the drum—reversing the polarity reverse the direction of drum rotation. A variable voltage output to the EDC controls the speed of drum rotation.
- To Bridge Axle Subsystem** The 12 volt dc outputs power solenoids that operate hydraulic directional control valves used for raising and lowering the bridge axle.
- To Chute and Hopper Circuits** The 12 volt dc outputs power solenoids that operate hydraulic directional control valves used for raising and lowering the chute and hopper and for unlatching the chute.
- Other 12 volt dc outputs illuminate indicator lamp and worklights.

## The Components

See [Common Components on page E-8](#).

- the 12 to 24 volt converter and 2 amp fuse protecting the converter
- the programmable logic computer (PLC)
- the three 2 amp fuses and the 15 amp circuit breaker protecting the PLC
- the control switches on the control console, rear panel and optional hand-held remote panel that provide inputs to the PLC
- the low hydraulic oil relay
- the hydraulic oil level switch

## HYDRAULIC COMMON COMPONENTS

### Inputs

Torque from the truck's PTO gearbox rotates the pump. Be aware that the ratio of engine input speed to the PTO out speed varies with truck manufacturer.

- Mack trucks are 1.23 engine to 1 PTO.
- Trucks with Cummins engines are 1.15 engine to 1 PTO.
- Trucks with Caterpillar engines are 1.31 engine to 1 PTO.

### Outputs

#### To the Bridge Axle Subsystem

Flow from the hydraulic common components is used to raise and lower the bridge axle and provide downforce to shift weight from the truck's drive wheels to the wheels of the bridge axle. Flow is also used to overpower the spring-loaded latch mechanism that holds the bridge axle in its fully-raised position.

#### To the Chute and Hopper Circuits

Flow from the hydraulic common components is used to raise and lower the hopper, to overcome the spring-loaded chute lock and to raise and lower the chute.

## The Components

See [Common Components on page E-8](#).

- the hydraulic oil tank or reservoir
- return filter and its pressure gauge
- the Eaton model 70122 pressure compensated pump serving the bridge axle, hopper and chute circuits
- the front valve assembly (A1)

## PNEUMATIC COMMON COMPONENTS

### Inputs

The truck's air compressor provides compressed air to the air reservoir.

### Outputs

**To Drum Subsystem** Air pressure from the reservoir is used to push water to the manifold used for adding water to the drum, or operating the wash down hoses.

**To Bridge Axle Subsystem** Air pressure from the reservoir is used to operate the air brakes on the wheels on the bridge axle.

### The Components

See [Common Components on page E-8](#)

- the bridge axle reservoir

## ELECTRICAL COMPONENT DETAILS

### PLC

The programmable-logic control (PLC) controls all the solenoids that operate the hydraulic valves and it operates the electric displacement control (EDC) that controls the speed of the mixer drum. The PLC is located inside the control console inside the cab.

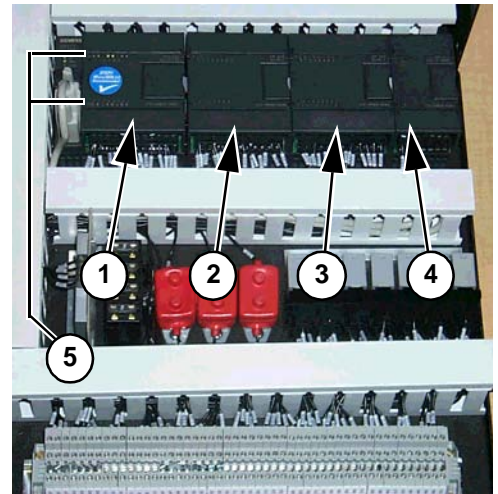
The PLC responds to 24 volt input signals from the switches on the control panels and produces:

- 12 volt outputs to operate solenoid valves, the Charge/Discharge relay and illuminate indicator bulbs on the console control panel
- 24 volt outputs to illuminate indicator bulbs located in switches on the console control panel
- variable voltage outputs to the EDC to control the speed of the mixer drum

The PLC is separated into different modules; a primary module (1) where the logic occurs, a 24 volt input/output module (2), a 12 volt input/output module (3) and an analog output module (4). The modules are separately protected by:

- primary module—a 2 amp fuse between the converter and the PLC
- 24 volt input module—a 2 amp fuse between the converter and the switches
- 24 volt output module—a 2 amp fuse between the converter and the PLC
- 12 volt output module—a 15 amp circuit breaker between the key switch and the PLC

Small LEDs (light emitting diodes) (5) on the modules illuminate when different inputs and outputs are received and sent. The inputs and outputs are labeled on the modules and shown on the electrical schematics.



## Converter—12 to 24 Volt

The PLC uses 24 volts, the truck electrical system supplies 12 volts, so a converter is installed to power the PLC. The converter's power comes directly from the truck's ignition key, with a 2 amp fuse between the key and the converter to protect the converter.

## Hydraulic Oil Level Switch and Low Oil Relay

The level of the oil in the hydraulic reservoir is monitored by a float-switch. If the level falls below an acceptable level, the contacts of the switch connect and ground the solenoid of the Low Oil relay—energizing the relay's coil with 12 volts from the key switch.

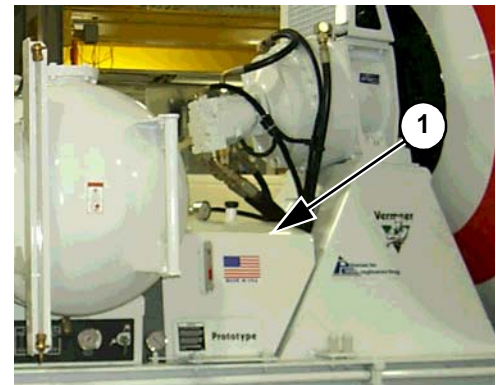
The Low Oil relay, when energized, closes contacts allowing 24 volts from the converter to reach node I 2.7 of the PLC 24 volt input module.

The length of time that I 2.7 continues is used to differentiate low oil from sloshing oil. If the signal continues for longer than several seconds, the PLC sends a 12 volt output through node Q 2.4, which lights the Low Oil indicator on the control console in the cab.

## HYDRAULIC COMPONENT DETAILS

### Tank

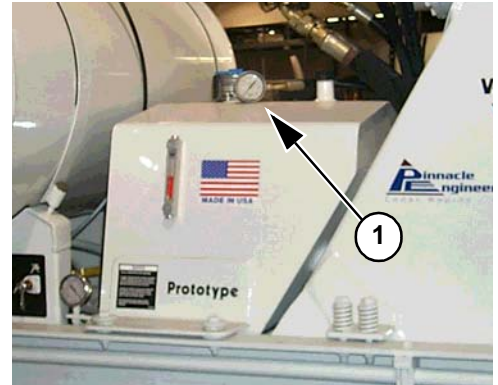
The tank or reservoir (1) stores the oil and allows contaminants to settle out of suspension and entrained air to escape. It also helps cool the oil. The tank holds 27 gallons.



## Return Filter and Filter Pressure Gauge

Oil returning to the tank from the cylinders passes through the return filter. The filter catches dirt and contaminants that may ingress through the rod seals of the cylinders. The filter is mounted inside the tank, attached to the top of the tank.

If the filter becomes clogged with dirt, flow through the filter will be restricted and pressure upstream of the filter will rise. Rather than allow excess pressure to burst a hose or fitting, a bypass valve is installed in the filter head that will open at 22 psi.



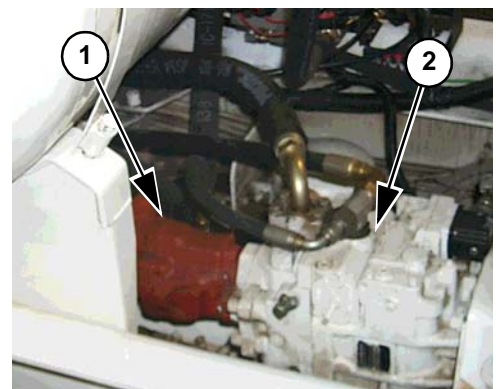
The optional pressure gauge (1) installed on the filter head provides a rough indication of the filter life remaining. The indicated pressure will be low unless a large amount of flow is returning to tank, such as when the bridge axle is being raised. If return pressure at the filter approaches 22 psi, the filter should be replaced. If return pressure remains very low, and does not increase visibly when the bridge axle is raised, examine the filter head to ensure the bypass valve is not stuck in the open position.

## Pressure Compensated Pump

The pressure compensated (PC) pump (1) is mounted on the rear of the hydrostatic pump (2). The PC pump is a variable displacement piston pump with a special spool valve that controls the displacement. This spool valve is the pressure compensator (PC).

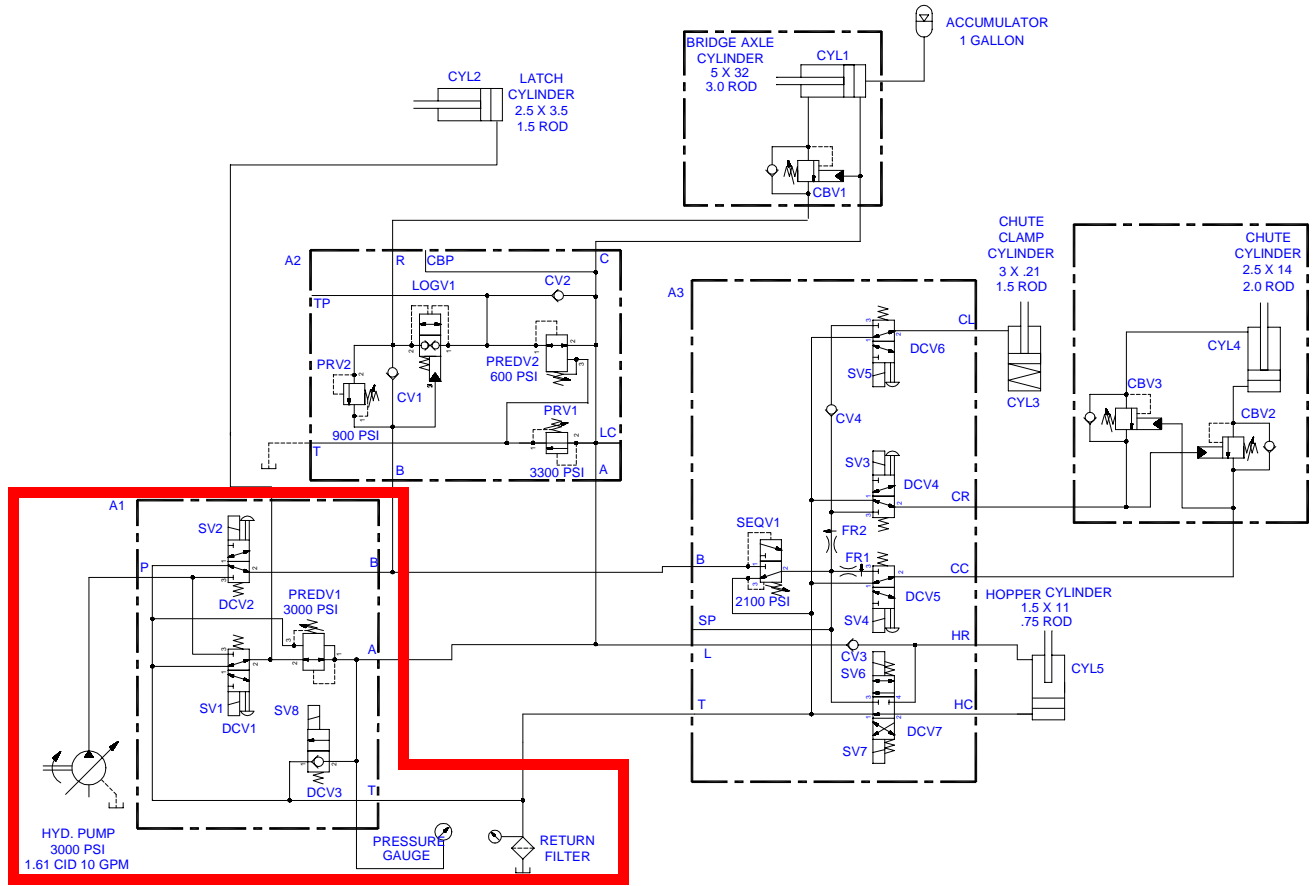
The PC is constantly adjusting the angle of the swash plate (the displacement control) in reaction to the pressure at the outlet port of the pump.

The compensator attempts to maintain a constant pressure of 3000 psi. If the pressure reaches 3000 psi, it decreases the angle of the swash plate to zero to stop producing flow. If the pressure falls below 3000 psi, the PC will increase the angle of the swash plate to increase the flow from the pump.





### Schematic of Common Hydraulic Components



A2

Common Components

## Front Valve Assembly (A1)

### Directional Control Valves

These solenoid-operated valves (DCV1 and DCV2) open when the PLC energizes the solenoids.

DCV1, when open, allows flow from the pump to extend the latch cylinder, retract the hopper cylinder and extend the bridge axle cylinder (to lower the bridge axle).

Show A1 valve assembly

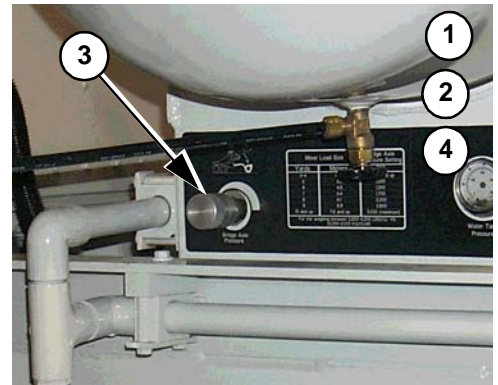
DCV2, when open, sends flow to retract the bridge axle cylinder and to the sequence valve (SEQV1) in valve assembly A3.

The small knurled knobs at the ends of the valves are manual overrides. If the valve will not operate electrically, it can be moved out of its normal (closed) position by pushing in on the knob, rotating it 180° and allowing it to pop up.

**IMPORTANT:** Do not use this override for continuous operation. Fix the electrical problem as soon as possible. The interlocks that prevent damage to the bridge axle or chute are provided electrically. Manually overriding the valve will also override the interlocks.

### Pressure Reducing Valve

This pressure reducing valve (3) (PREDV1) is manually adjusted by the truck driver to adjust the amount of downforce the bridge axle is putting against the pavement. Adjusting the valve limits the amount of pressure in the lines downstream from the valve.



### Drain Valve

This solenoid-operated valve (DCV3) is energized by the PLC whenever DCV2 is energized. It opens a path to tank for the oil from the cap end of the bridge axle cylinder when DCV2 sends oil to the rod end of the cylinder to retract it.

## Pressure Gauge

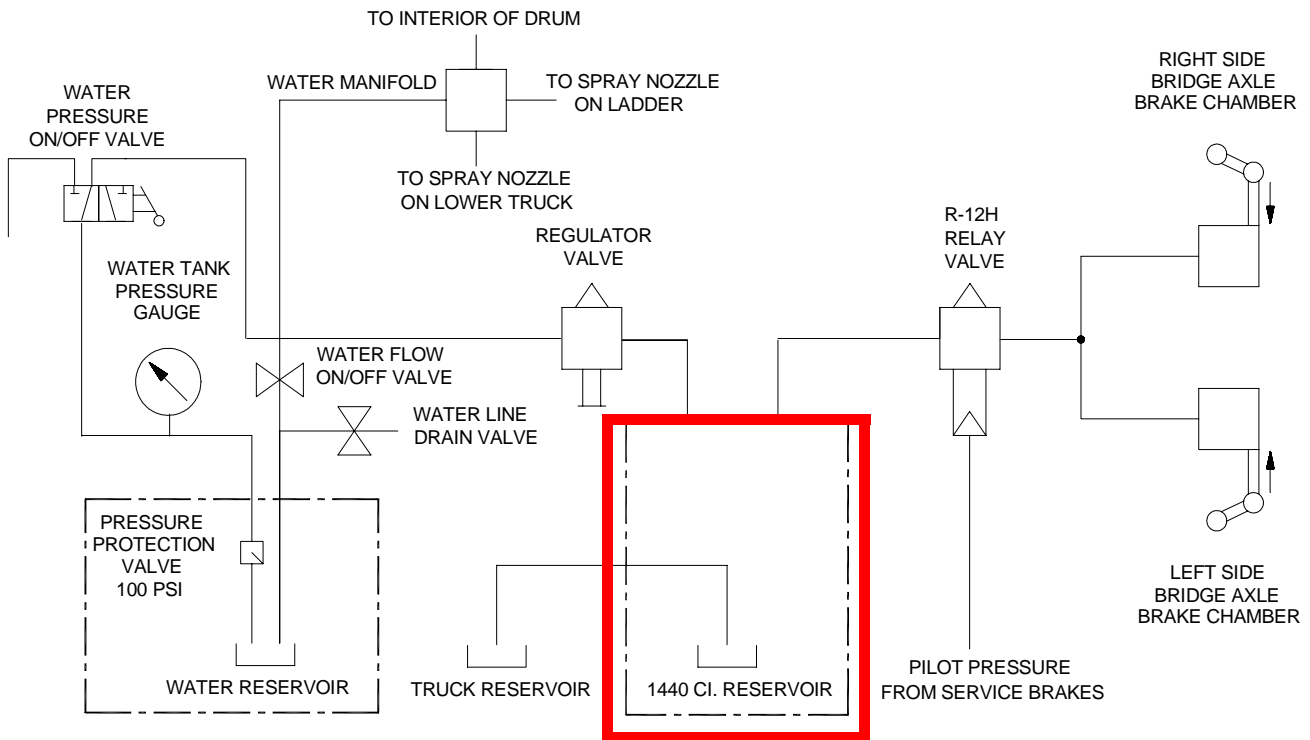
This pressure gauge is mounted in the cab. It displays the pressure present at the cap end of the bridge axle cylinder. The driver watches this gauge as he adjusts the pressure reducing valve (PRedV1) to provide the proper amount of bridge axle down force for the size of the load in the drum.

## PNEUMATIC COMPONENT DETAILS

### Bridge Axle Reservoir

If the truck needs added air storage capacity to supply the extra demands of the bridge axle air brakes, a bridge axle reservoir is added to the truck chassis and tied into the truck's pneumatic system. Not all the trucks will have this. Many will simply connect to the existing air tank(s).

The bridge axle reservoir supplies the water reservoir and the bridge axle brakes with compressed air.



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## Chapter 3: Drum Subsystem

### OVERVIEW

See [Drum Subsystem on page E-9](#) for reference.

Circuits in the drum subsystem rotate the mixing drum in forward and reverse and at different speeds. A counter circuit counts rotations and the water circuit provides water to thin the mix or to wash down the chute after the pour. Since the drum rotation circuit adds most of the heat to the hydraulic oil, the oil cooler and its associated components are also grouped with the drum subsystem.

### DRUM ROTATION CIRCUIT

The rotation of the drum is hydraulically operated and electrically controlled. The direction of drum rotation is determined by the direction that the oil flows through the closed loop. The speed of rotation is determined by the rate of flow through the closed loop.

Both speed and direction are controlled by the swashplate of the pump. The swashplate can move from 17° in one direction (full speed in CHARGE), through the “zero angle” (drum stopped), to 17° in the opposite direction (full speed in DISCHARGE).

The swashplate is controlled by the Electronic Displacement Control (EDC). The EDC is controlled by the PLC.

### Electrical Controls

#### Stop/Resume Rotation

Three momentary switches are wired in parallel to allow the operator to stop or resume drum rotation from three different places. The STOP/RESUME switches are located on the control console in the cab, on the rear control panel near the ladder, and on the optional hand-held remote panel.

See [Electrical Schematic of 24 Volt Inputs to PLC on page E-3](#). See [Electrical Schematic of PLC Outputs on page E-4](#).

In the RESUME position, a discreet 24 volts dc signal (input I2.0) passes to the PLC. In response, the PLC provides (restores) an analog output (4 to 24 milliamps) to terminal IO representing the last speed control output to the EDC coils via the Charge/Discharge relay. The PLC also applies current at approximately 24 volts dc to the Drum Run indicator bulb, mounted behind the STOP/RESUME switch.

In the STOP position, a discreet 24 volt dc signal (input I 1.7) passes to the PLC. The PLC responds by terminating the analog signal at terminal IO.

**Rotation Direction**

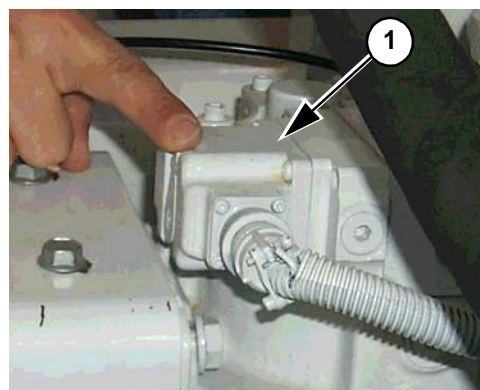
Three momentary switches are wired in parallel to allow the operator to reverse the direction of drum rotation from three different places. The CHARGE/DISCHARGE switches are located on the on the control console in the cab, on the rear control panel near the ladder, and on the optional hand-held remote panel.

See [Electrical Schematic of 24 Volt Inputs to PLC on page E-3](#). See [Electrical Schematic of PLC Outputs on page E-4](#).

In the DISCHARGE position a 24 volt dc signal (input I1.4) passes to the PLC. The PLC responds by passes a 12 volt dc signal (output Q2.2) to the Charge/Discharge relay.

In the CHARGE position, a 24 volt dc signal (input I1.3) passes to the PLC. The PLC responds by terminating the current 12 volt dc signal (output Q2.2) to the coil of the Charge/Discharge relay.

The Charge/Discharge relay is actually two relays, CR1A and CR1B working in tandem. The coils of both are energized or de-energized at the same time. When energized, they position the contacts to route the current at terminal IO across the coil of the EDC (1) so it causes the pump to rotate the drum in the Discharge direction.



When the coils of CR1A and CR1B are not energized, the contacts of the spring back—reversing the polarity of the EDC coil, and thus the direction of drum rotation.

If the operator turns the CHARGE/DISCHARGE switch from one direction to the other, the logic in the PLC recognizes that the drum is currently turning at a certain speed. It steps down the current at terminal IO to 4 milliamps, then either sends or stops output Q2.2 (to reverse drum direction), then steps up the current to the same level as used for the previous drum speed.

**Speed Control—  
Increase Decrease**

Three momentary switches are wired in parallel to allow the operator to increase or decrease the speed of drum rotation from three different places. The INC/DEC switches are located on the on the control console in the cab, on the rear control panel near the ladder, and on the optional hand-held remote panel.

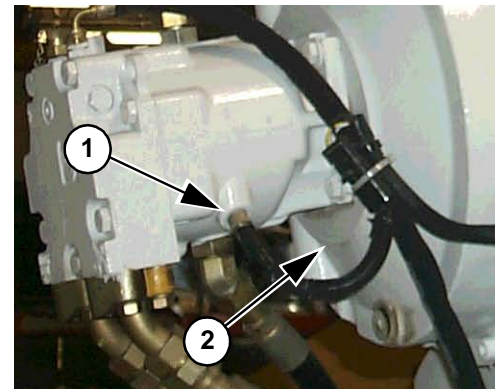
See [Electrical Schematic of 24 Volt Inputs to PLC on page E-3](#). See [Electrical Schematic of PLC Outputs on page E-4](#).

In the INC position, a 24 volt dc signal (input I1.5) passes to the PLC. The PLC responds by increasing the current at terminal IO to the next step. (The current ranges from 4 to 24 milliamps.) If the switch is held in the INC position, the PLC continues stepping up the current until full speed (24 milliamps) is reached.

In the DEC position, the 24 volt dc signal (input I1.6) passes to the PLC. It responds by stepping down the current at terminal IO. If held in the DEC position, the PLC steps down the current to 4 milliamps, resulting in the pump swashplate moving to the zero angle, stopping drum rotation.

**Speed Control—One  
RPM**

The momentary 1 RPM switch is located on the control console in the cab. When in the ON position, a 24 volt dc signal (input I0.1) passes to the PLC. The PLC responds by monitoring the input signal (I0.0) from (1) the pulse pickup unit (PPU) in the hydraulic motor and adjusting the output current at terminal IO. As noted above, the current at IO regulates the EDC, which controls the swashplate, which controls the rate of flow from the pump which controls the speed of the motor.



The motor drives the drum through a gearbox (2) with a 111: 1 gear ratio, so the PLC adjusts the current at output IO to produce 111 rpm at the motor.

When the feedback from the PPU indicates that 111 motor rpm is reached, the PLC applies current at approximately 24 volts dc (output Q0.5) to the 1 RPM indicator bulb, mounted behind the 1 RPM switch.

**Drum Rotation  
Counter**

The PLC also uses input from the PPU (see above) to determine when the motor has completed 111 revolutions (one drum revolution). The PLC then applies a 12 volt dc signal (output Q2.3) to the coil of the drum counter relay.

When the relay energizes, it contacts the two terminals of the drum counter, which increments the drum counter LCD readout. The drum counter has its own internal battery. A button on the drum counter allows the driver to reset it to zero.

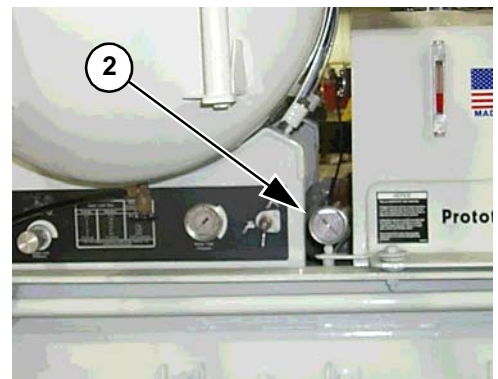
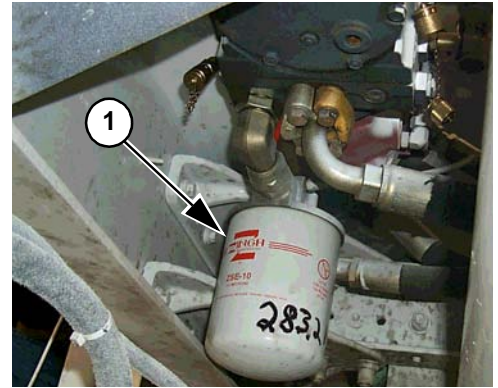


### Hydrostatic Loop

The hydrostatic loop that rotates the gearbox and drum is comprised of a Series 90 Sauer Sundstrand pump and motor. The motor includes a hot oil shuttle to drain a small amount of oil from the closed loop and the pump includes a gerotor-type charge pump to replenish the loop with cool oil from the tank.

### Suction Filter and Vacuum Gauge

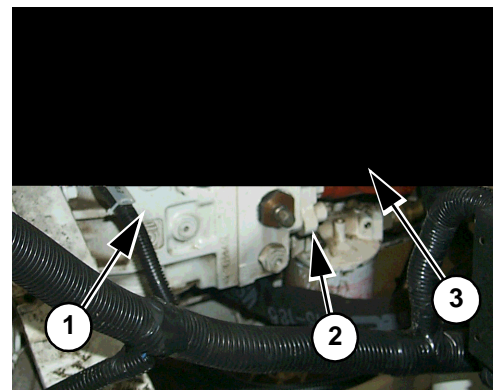
The charge pump draws cool oil through the suction filter (1) which filter removes dirt and other particles from the oil. A vacuum gauge (2) at the suction filter measures the amount of suction needed to pull oil through the filter. Replace the filter (see page XX) if the gauge indicates more than 5" Hg when the oil is warmer than 120° F, or more than 10" Hg for oil colder than 120° F.



### Charge Pump and Charge Relief

The flow from the charge pump (2) enters low pressure side of the closed loop through one of two check valves. The charge pump continuously adds oil to the loop until the pressure in the low side of the loop builds to 350 psi. Above 350 psi, the charge relief valve opens and the flow drains to the pump case and is drained away to the cooler and the tank.

The charge pump is integral to the hydrostatic pump (1). The PC pump (3) is mounted in tandem with the hydrostatic pump.





### Hydrostatic Pump

For different truck engines, different PTOs are used. Pump input shaft speed is engine RPM times:  
 1.23 for Mack  
 1.15 for Cummins  
 1.31 for Caterpillar

The amount of flow produced by the pump is dependent on the speed the pump is turning (PTO gearbox output speed) and the angle of the swashplate. At full displacement (17° on the swashplate) the pump produces 4.57 cubic inches of flow per revolution.

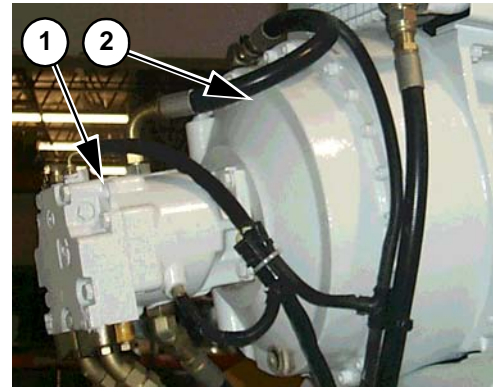
The swashplate angle is controlled by the EDC.

### Motor and Gearbox

The motor (1) has a fixed displacement. For each 4.57 cubic inches of flow pushed through the motor, the motor makes one full revolution.

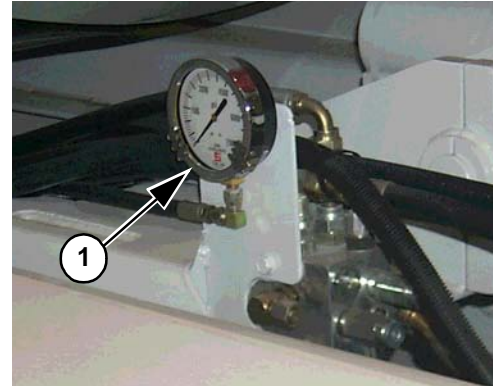
**NOTE:** The displacements given here are theoretical. Actually, a piston pump and a piston motor are each about 97% effective when new, and wear reduces the efficiency further.

The motor is mounted on the gearbox (2). For each 111 revolutions of the motor, the gearbox makes one revolution.

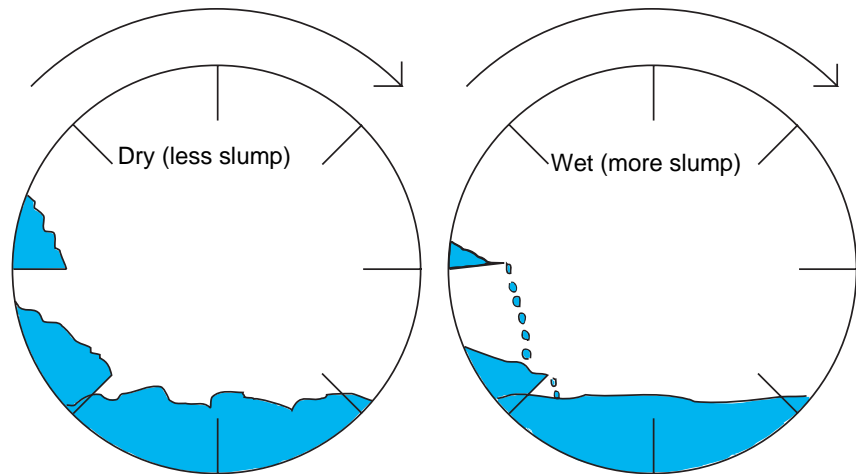


**Slump Meter**

The optional slump meter (1) is simply a pressure gauge that measures the resistance to pump flow caused by the work being done. When the concrete is relatively dry, more material is lifted by the flighting in the drum and carried higher. The pressure indicated for each slump will vary with the amount of concrete in the drum. The driver consults a chart to determine how much water to add to get the desired slump.



The slump meter is plumbed into the side of the loop that is under high pressure when the drum is rotated in the CHARGE direction.



A3

Drum Subsystem

## COOLING CIRCUIT

### Case Drains

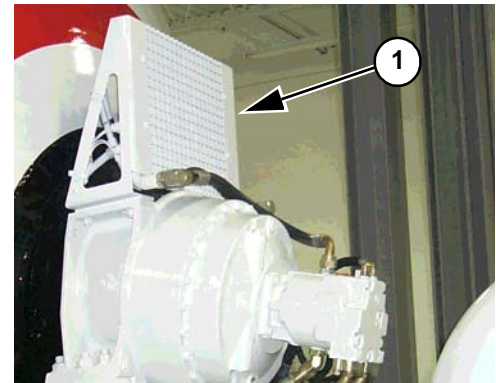
When the charge pressure reaches 350 psi, additional flow from the charge pump passes through the charge relief valve and into the pump case. In addition, any leakage through the internal clearances in the pump also enters the case. The oil in the case is used to lubricate the rotating group of the pump. As additional oil fills the pump case, the overflow travels via the case drain line to a case drain port in the bottom of the motor.

The motor case gets additional oil from the hot oil shuttle valve (sometimes called a loop flushing shuttle valve). The hot oil shuttle drains a portion of the oil from the low pressure side of the loop to allow the charge pressure to cycle cool oil from the tank into the loop. As with the pump, leakage through clearances of the moving parts also contributes to case flow.

The motor case overflow port is located on the top of the motor case. Hoses lead the overflow to the oil cooler.

### Oil Cooler

Heat from the oil is drawn off by air passing through the fins of the oil cooler (1). The cooled oil is drained away to the tank, where further cooling occurs.



## Oil Cooling Controls and Indicators

Two switches wired in parallel control the oil cooler fan; the Fan AUTO/MANUAL switch and the 160° Temperature switch.

### Fan Auto/Manual

The Fan AUTO/MANUAL switch is located on the control console in the cab. When in the AUTO position, the switch is open.

When in the MANUAL position, the switch is closed, applying 12 volts dc from the key switch to the coil of the oil cooler fan relay and to the Oil Cooler Fan indicator bulb, mounted behind the AUTO/MANUAL switch.

### Oil Cooler Relay

When the coil of the Oil Cooler relay is energized, the contacts close and applies 12 volts dc from the 15 amp circuit breaker to the motor of the oil cooler fan.

### 160° F Temperature Switch

Located at the inlet of the oil cooler are two temperature switches. One closes at 160° F, the other at 180° F. When the 160° switch closes, it applies 12 volts dc from the key switch to the coil of the oil cooler fan relay and to the Oil Cooler Fan indicator bulb, mounted behind the AUTO/MANUAL switch.

### Hot Hydraulic Oil Indicator

When the 180° F temperature switch closes, it applies 12 volts dc from the key switch to the Hot Hydraulic Oil Indicator bulb located on the control console in the cab.

### Bulb Test Diode

If the STOP/RESUME switch is held in the STOP position (input I 1.7) and the 1 RPM switch is simultaneously held in the OFF position (input I 0.2), the PLC responds by sending 12 volts dc to the all indicator bulbs on the console. The bulb test diode prevents the bulb test current from energizing the coil of the Oil Cooler Relay.

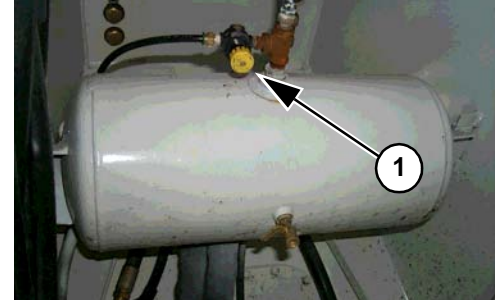
## WATER CIRCUIT

### Air Pressure to Water Tank

Air pressure pushes the water through the water lines.

#### Pressure Regulation

Air pressure from the truck's pneumatic system passes through a regulator valve (1) which limits the air pressure used for the water system to 80 psi above ambient air pressure. The regulator setting is adjustable.

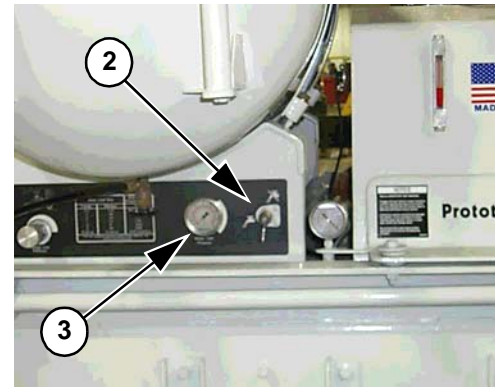


#### Water Pressure On/Off

The two-position, water pressure ON/OFF valve (2) controls whether the air pressure is allowed to charge the water tank.

In the ON position, the 80 psi air flows to the water tank.

In the OFF position, the 80 psi air flow is shut-off, and the air pressure in the water tank is ported to atmosphere.

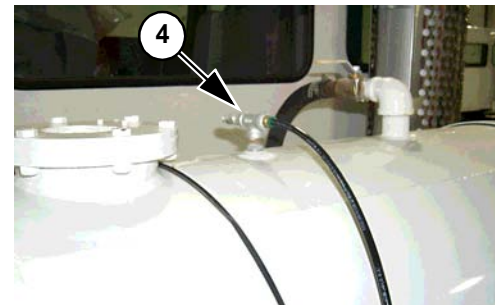


#### Pressure Gauge

The pressure of air in the tank is displayed on the air pressure gauge (3).

#### Pressure Protection Valve

Air pressure in the water tank can be increased by heating due to sunlight or other sources. The pressure protection valve (4) is a poppet set to vent pressure to atmosphere if pressure rises above 100 psi.



## Water to Hoses or Drum

### Water Tank

A simple flap covers the water inlet (1) on the water tank. To fill, the pressure is bled from the tank with the three-way valve, then a hose is pushed into the inlet past the flap. When the desired water level is indicated on the sight gauge, the hose is withdrawn, the Water Flow ON/OFF valve is closed and the Water Pressure ON/OFF valve is moved to the ON position to charge the water tank with air pressure. The air pressure holds the flap closed.

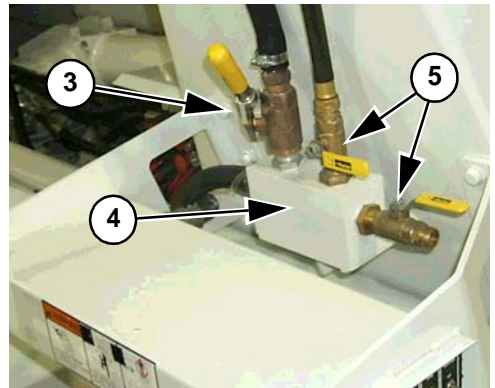


### Water Flow ON/OFF Valve

A water line leads from the bottom of the tank through the top of the tank to a Water Flow ON/OFF valve (2). The valve enables or stops flow to the water manifold.

### Flow to Drum

At the water manifold (4) is a spring-loaded Water Injection valve (3) that ports water to the interior of the drum when increased slump is desired. Pull the handle to add water, release it to stop.

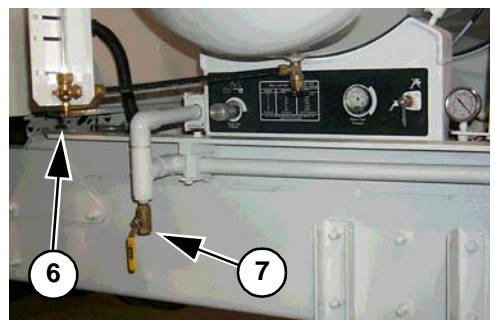


### Flow to Wash-Down Hoses

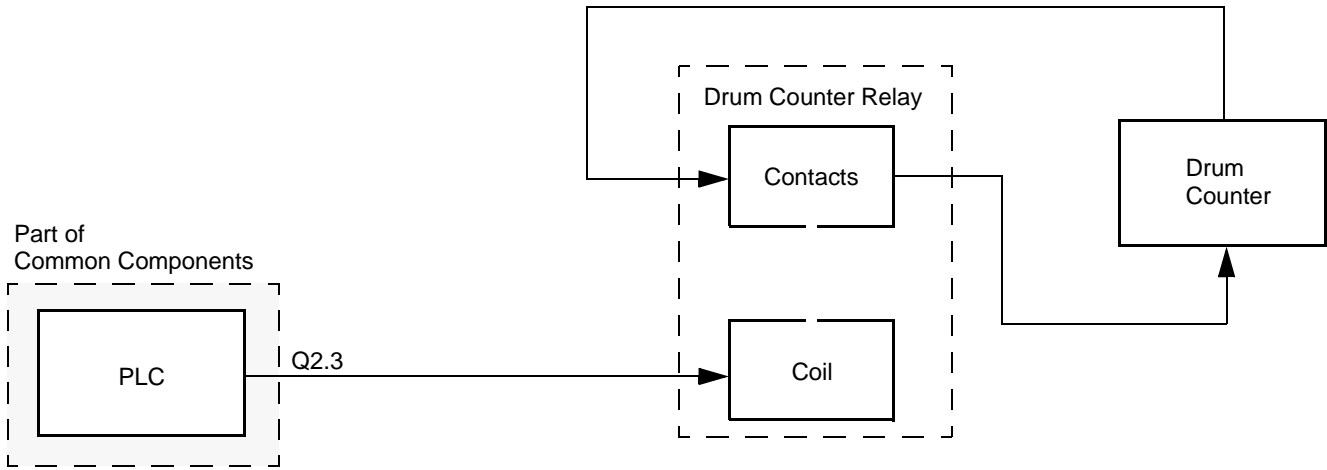
Two on/off valves (5) allow flow to the upper and lower wash-down hoses. The hoses are usually equipped with spray nozzles.

### Water System Drain Valves

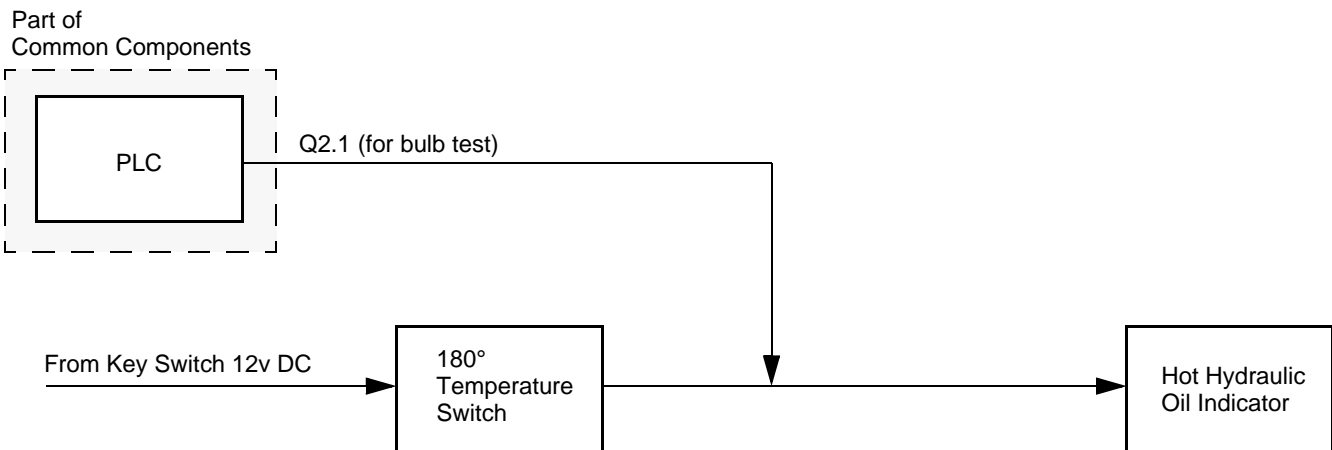
- Water tank drain valve (beneath tank)
- Water line drain valve (6)
- Sight gauge drain valve (7)



### Drum Counter Circuit

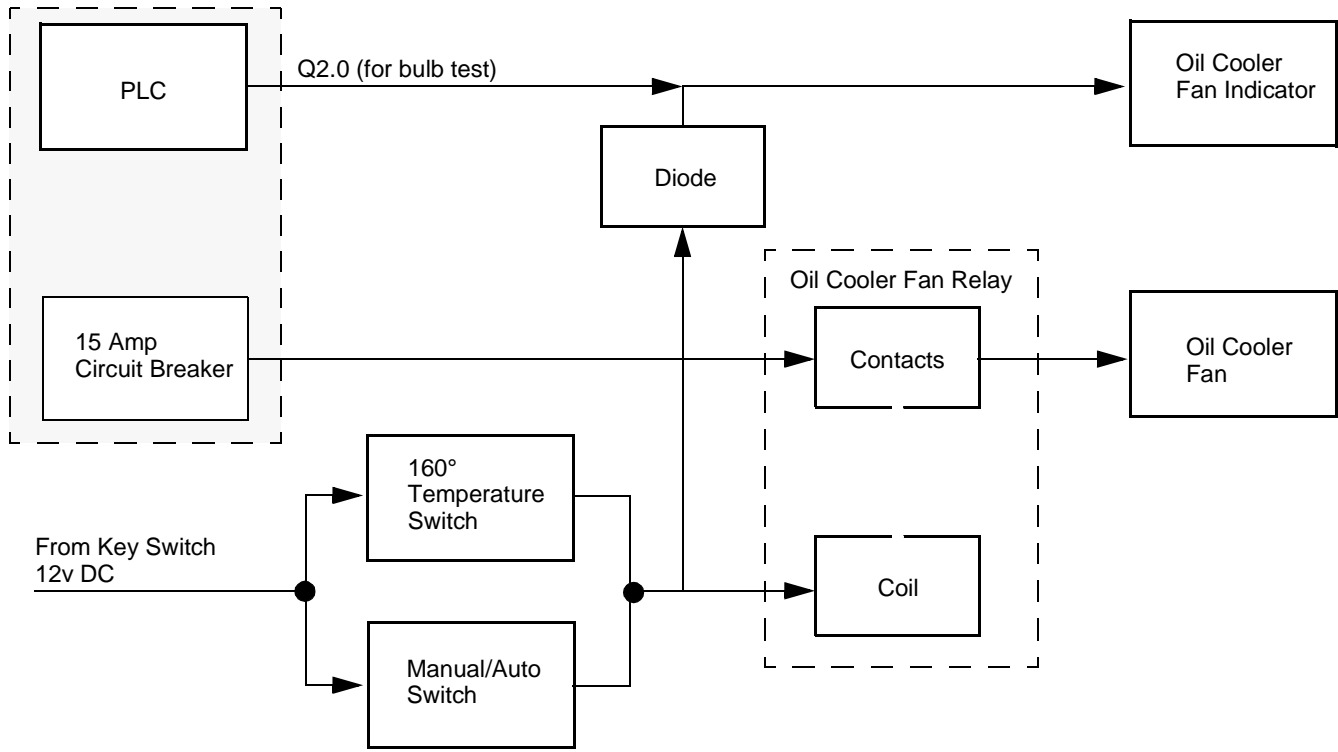


### Hot Oil Indicator Circuit



### Oil Cooler Fan Circuit

Part of  
Common Components

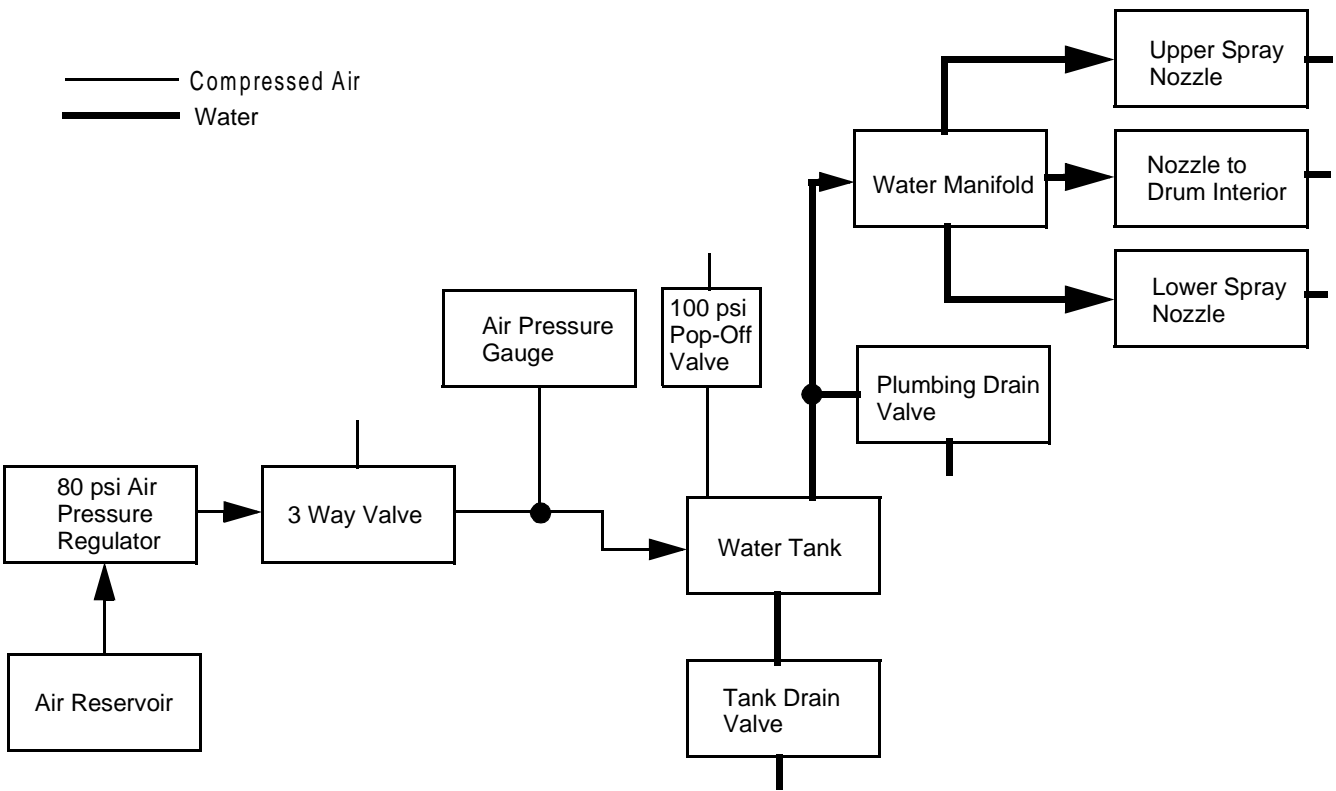


A3

Drum Subsystem



Water Circuit



A3

Drum Subsystem

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