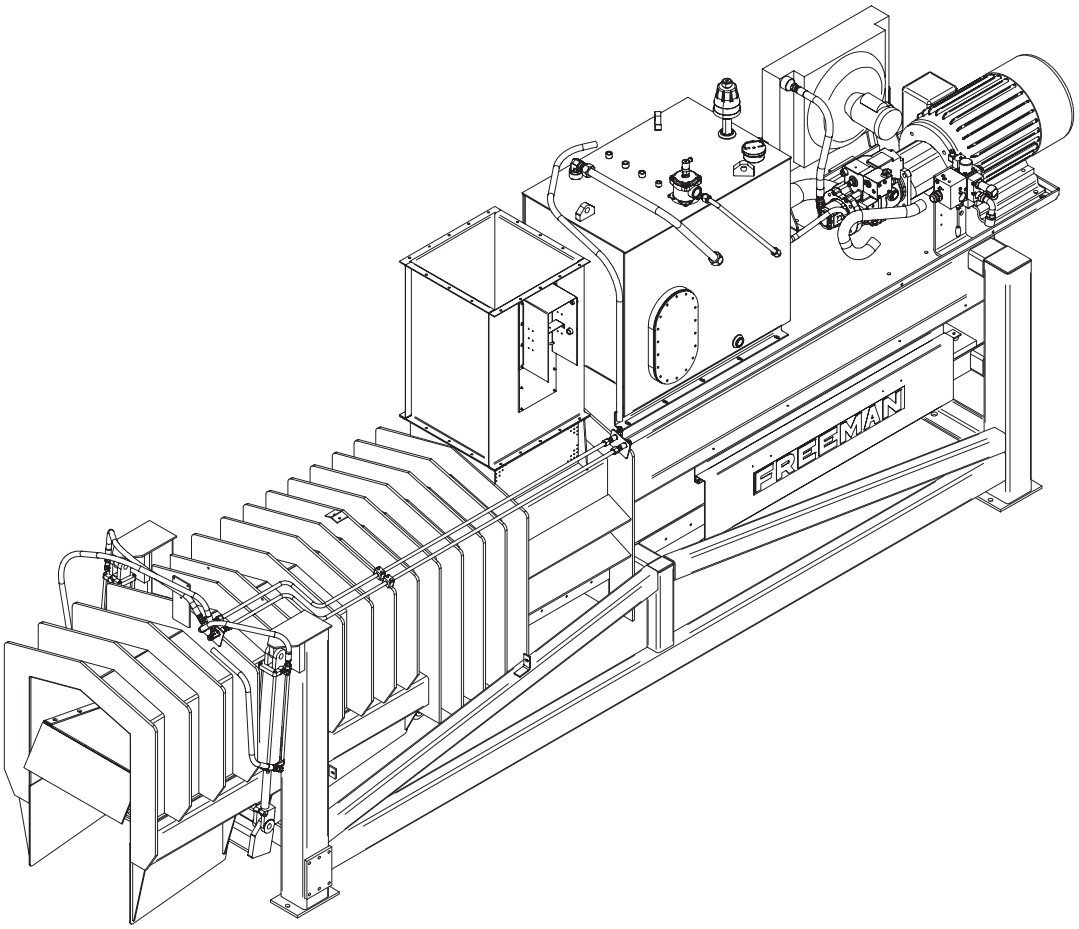
FREEMAN
A Division of Allied Systems Company

WE-4B Water Extractor



Operator's Manual

A Product of
Allied Systems COMPANY
Sherwood, Oregon USA

SAFETY PRECAUTIONS

“THE BEST SAFETY DEVICE IS A CAREFUL OPERATOR”

Always turn off control system and Lock-Out the electrical supply to the machine before inspecting, adjusting or servicing the machine.

Do not clean, lubricate, or make any adjustments on the equipment while it is in operation.

Do not start the equipment until you are certain everyone is clear of the machine and have ensured there are no tools on the unit.

Do not work around equipment in loose clothing.

Do not attempt to service any equipment while the motor is running.

Inspection Covers and Safety Shields should only be removed by authorized service personnel.

After servicing do not place the equipment back into operation until all Safety Shields and Devices have been replaced. Operation without Safety Shields and Devices can place the operator into a hazardous situation.

Do not open or work on the In-Feed System until the flow of material has been stopped and the Baler Motor has been turned off.

Do not make any adjustments or reach under any load bearing surfaces while loaded.

INSTRUCT ALL OPERATORS ON SAFETY PRECAUTIONS.

WARNING: SOME ILLUSTRATIONS IN THIS MANUAL SHOW THE MACHINE WITHOUT SHIELDS TO ALLOW FOR A BETTER VIEW THE AREA BEING ADDRESSED. THE MACHINE SHOULD NEVER BE OPERATED WITH ANY OF THE SAFETY SHIELDS REMOVED

SERIAL NUMBER LOCATION AND BALER IDENTIFICATION

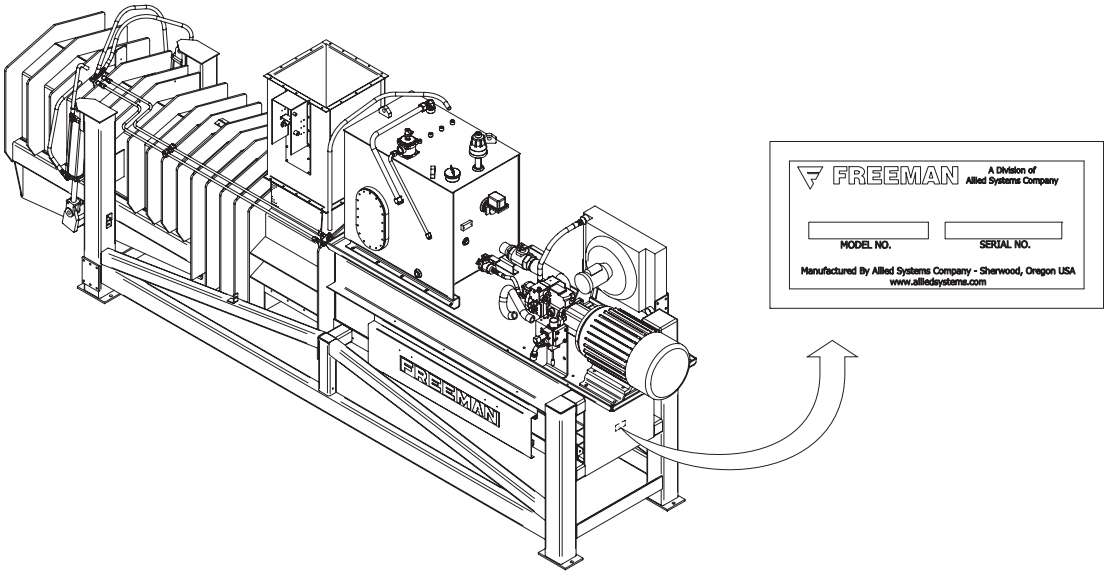
Each Freeman Water Extractor is identified by means of a model number and serial number. As a further identification, all power units are provided with a serial number.

To ensure prompt, efficient service when ordering parts or requesting repairs, record the serial numbers in the spaces provided.

WE-4B SERIAL NUMBER_____
Front side of main frame under motor.

POWER UNIT SERIAL NUMBER
Electric Motor-_____

NOTE: The motor and pump end is considered the front of the Water Extractor. The sides are described as left-hand side and right-hand side as viewed from behind while facing the chamber from the rear.



FOR ASC-0WE4-463 ONLY

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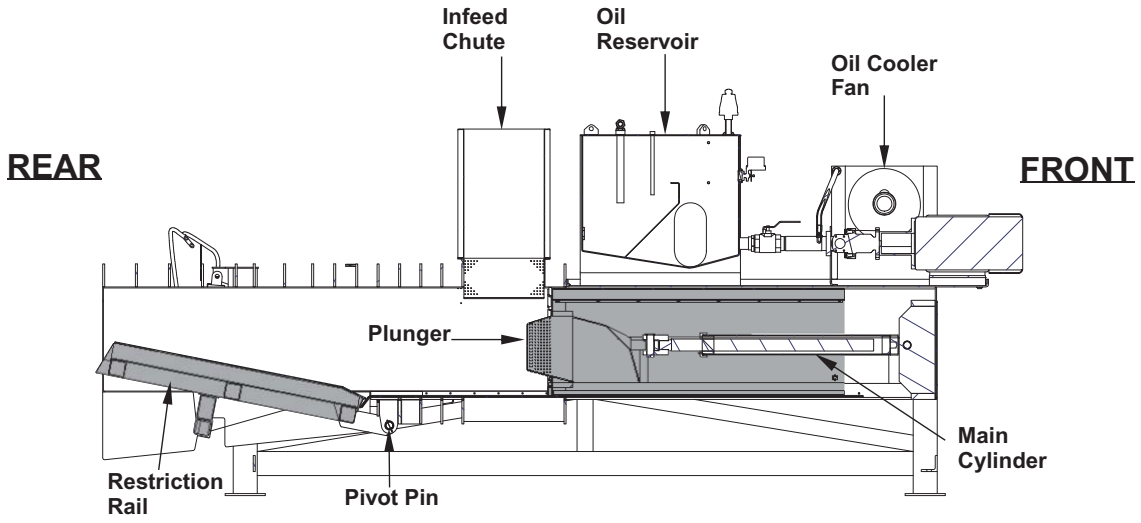

Figure 1. Right Side

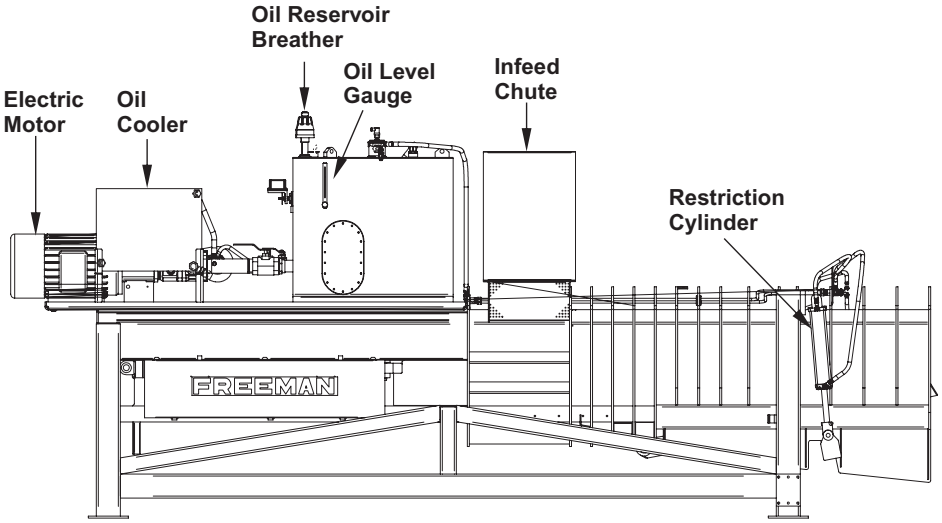

Figure 2. Left Side

Overview

Introduction

Automated water extraction The Freeman Water Extractor is an efficient, automated tool for extracting water from a continuously or intermittently fed product. Product transport is eased with compaction and water removal. A wide variety of adjustments provide a machine to suit most products.

The plunger forces water from the product. A restriction system is activated only when the plunger is advancing. A control box switch allows the restriction rail control system to be bypassed so that pressure is applied continuously for setting pressures, testing, and troubleshooting.

Drawing's and schematics referenced throughout the manual:

902242 Electrical Schematic
902226 Hydraulic Schematic
902243 Wiring Diagram
902302 General Arrangement

Specification

Dimensions / Weight

Length:.....20'
Height: ..... 108"
Width: ..... 48"
Weight: .....Approximately 8500 lbs with out Oil

In-Feed Opening: ..... 20" x 20"
Restriction Rail to ground fully open: ..... 9"

Motor: .....40 hp/440 or 480 Volt

Maximum Plunger Speed .....10 Strokes per minute

Lubrication

Hydraulic Oil: Chevron AW 46 or John Deere HY-GARD or equivalent.
Hydraulic Reservoir Capacity: .....110 Gallon
Check Oil level:.....Daily
Change Oil:..... Once a Year Annually
Change Return Line Filter ..... 500 Operating Hours
Change Breather Filter .....Every 6 months
Grease Electric Motor.....Please see Baldor manual

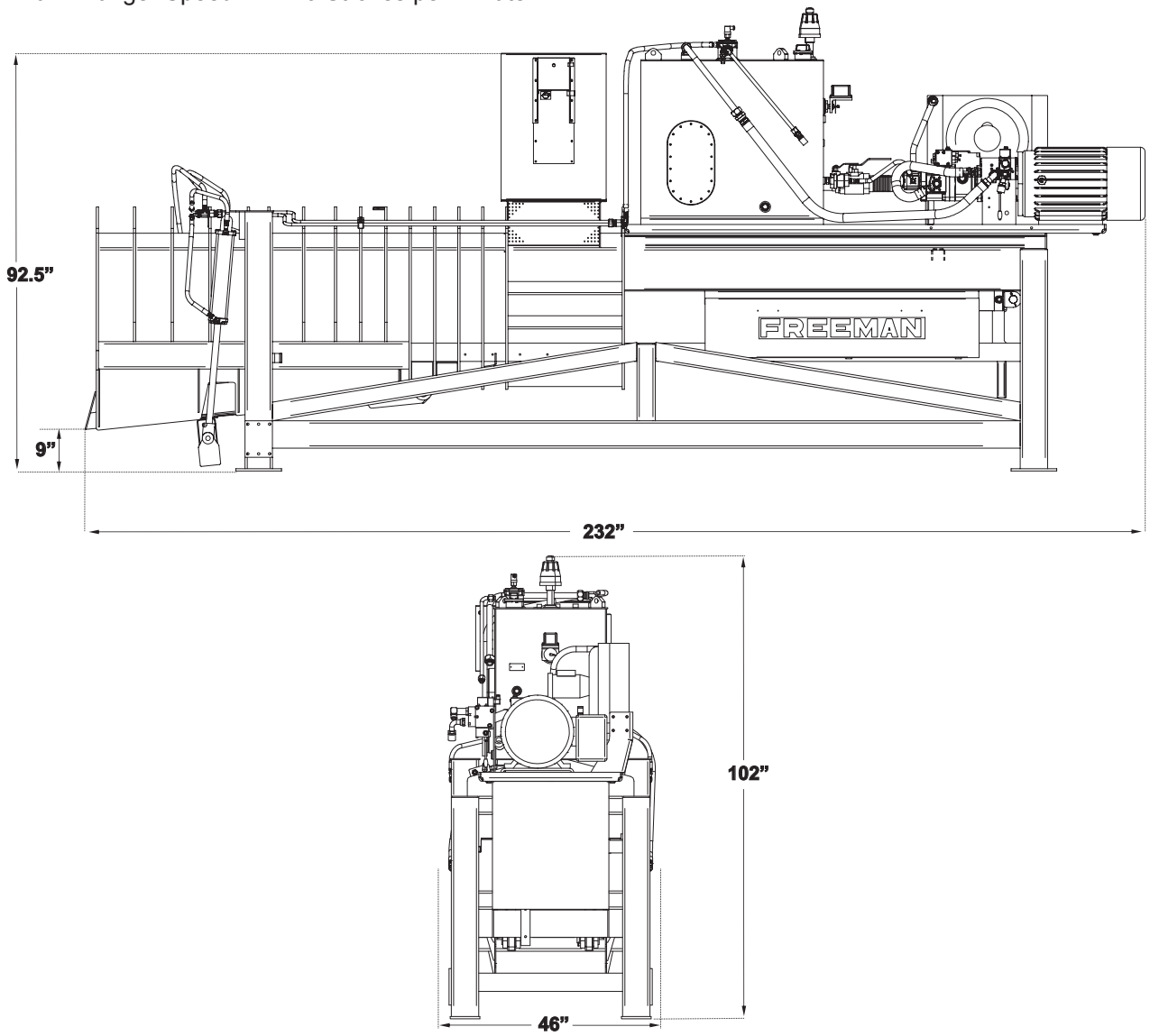

Figure 3. Dimensions

CAUTION: ALWAYS TURN OFF CONTROL SYSTEM AND LOCKOUT THE ELECTRICAL SUPPLY TO THE MACHINE BEFORE INSPECTING, ADJUSTING OR SERVICING THE MACHINE.

Mechanical Installation

Anchor the base The water extractor location should allow efficient joining to the feed chute, and provide personal safety. Provide adequate space for servicing. Locate the discharge so the product discharge falls free, with no backup of the product.

The water extractor should be located within a catchment to provide for water retention and water spray drainage. Use eight 3/4 inch bolts through the foot pads to anchor the water extractor to a foundation of concrete or steel. Use shims to provide a level surface.

Electrical Connection

Power unit connection The 40 horsepower motor operates at 230 or 460 volts. At 230 volts, the rating is 96 amperes at full load, requiring 1 AWG copper wire for short wire runs. 460 volts with 48 amperes at full load requires 6 AWG copper wire for short wire runs. Supply wires should be correctly sized to prevent the motor from stalling during machine operation and momentary overloads. See wiring diagram 902243.

Check Motor Rotation Move the Control Circuit Switch to OFF, Restriction switch to AUTO, and Anti-Plug switch to AUTO (see Figure 4), ("automatic" setting). Remove the motor-pump coupler cover at the right side for viewing. Jog the motor to check for correct rotation. Note the motor shaft direction of rotation (standing at the front of the WE-4B viewing the motor). Correct rotation is clockwise (see Figure 5). Replace the cover.

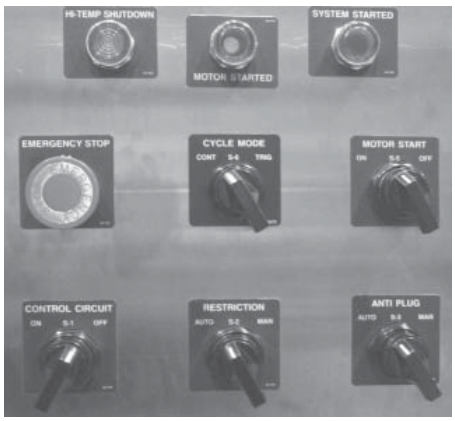

Figure 4 - Control Panel

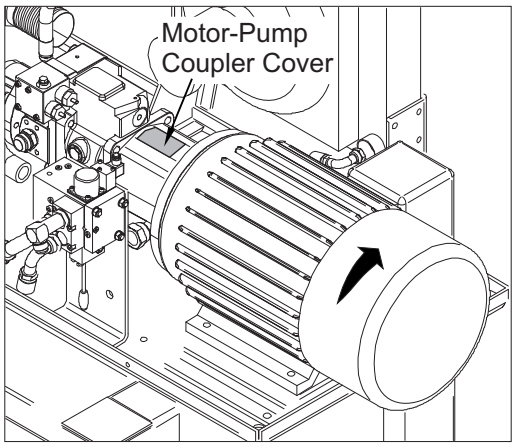

Figure 5 - Correct motor rotation

Motor power must be supplied through an external motor branch circuit disconnect and magnetic starter, incorporating a motor overload disconnect device. The motor branch circuit disconnect should have excess current prevention devices meeting the National Electric Code Table 430-152. Overload disconnects should be set to the motors full load current rating.

Emergency motor stop and low oil shutdown The emergency motor stop switch and low oil shutdown float switch are connected to control box terminals 15 and 16 (see wiring diagram 902243). Connect the motor starter power to terminals 10 and 11 to place the switches in series with the motor control circuit.

Hydraulic Power Unit

Check oil level Check the oil reservoir level, which should be 1" below the HIGH mark with all 3 cylinders retracted and 1 1/2" below the High mark with all three cylinders extended.

Filter and lubrication Dirt is an intolerable element in a hydraulic system. Your power unit is designed to preclude the introduction of external dirt into the system.

All new oil put into the system is added through a "Fill Port." (see Figure 6 page 4) To get from the fill port into the system, the oil must pass through the Fill Screen. This degree of filtration helps to reduce component wear within the system, resulting in long system life.

The oil tank breather cap should be changed every 6 months. (see Figure 6 on page 4).

Each time a new breather filter is installed please take the time to write the six month replacement date on the unit with a black felt pen.

Reservoir capacity is 110 gallons. Oil change intervals vary according to actual operating conditions. Under normal conditions the oil should be changed after 12 months of operation.

Use one of the following oil types:

Chevron AW 46 or John Deere HY-GARD or equivalent. ISO grade 46 is required in some colder climates. (In such cases call Allied Systems for approval).

The reservoir must be filled through the Fill Port.

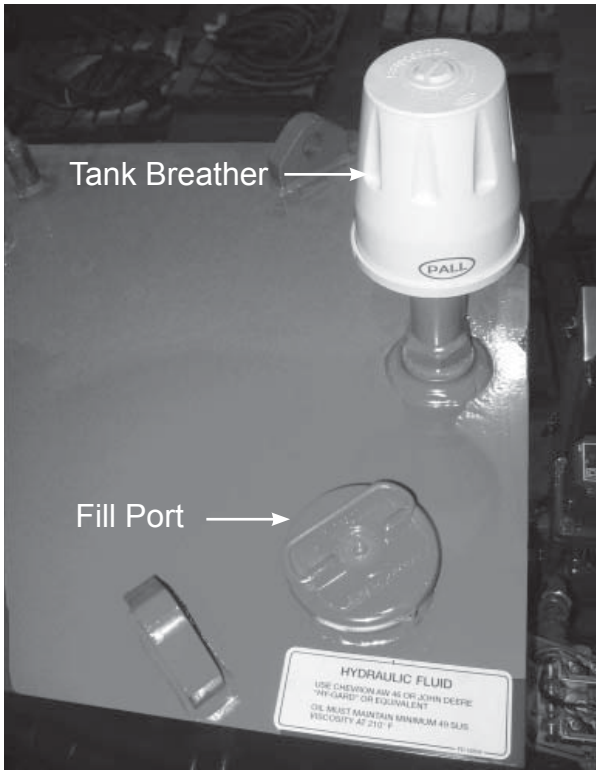

Figure 6 - Fill Port and Breather Cap

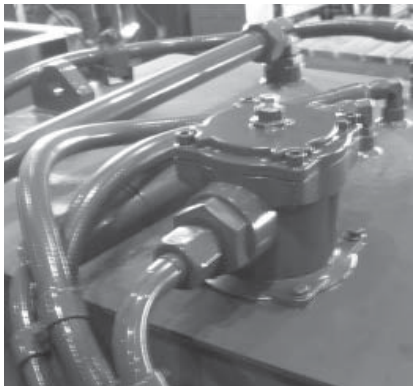

Figure 7 - Return Line Filter

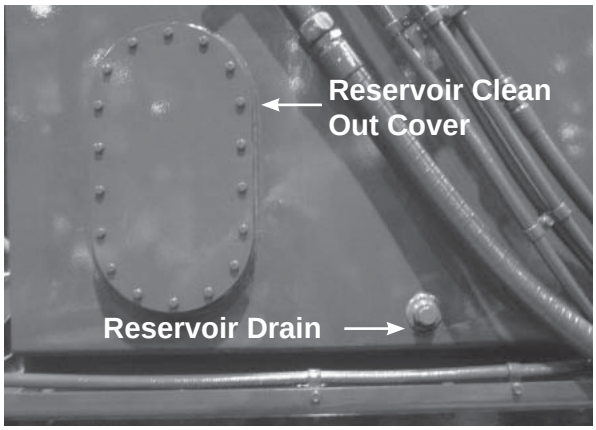

Figure 8 - Reservoir Drain

Oil Level Float Switches An emergency low level float switch is installed to automatically stop the pump to protect it from damage in the event of line breakage or faulty maintenance. The low level float switch is connected to control box terminals 6 and 8. (see wiring diagram 902243)

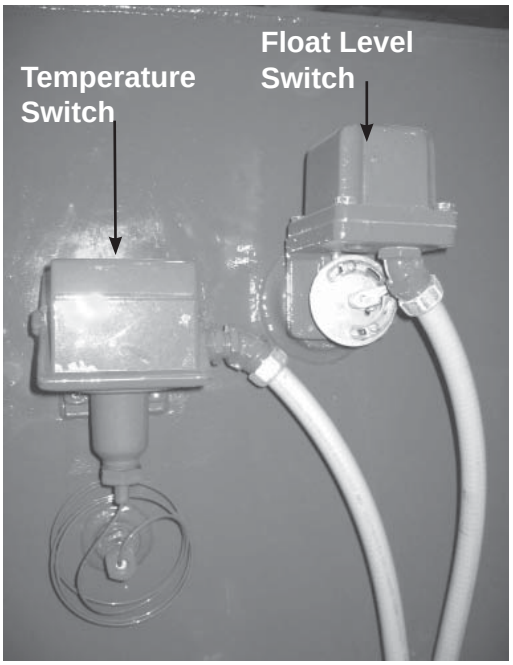

Figure 9 - Temperature and Float Level Switch

Dual Oil Temperature Switches Installed in the WE-4B system to prevent damage caused by high temperatures. One temperature switch Dial #2 (Figure -10 page 5) turns the cooler fan motor on and off. The other Dial #1 stops the pump motor at the high setting. See hydraulic schematic 902226 and manufacture's manual in your document pack for settings.

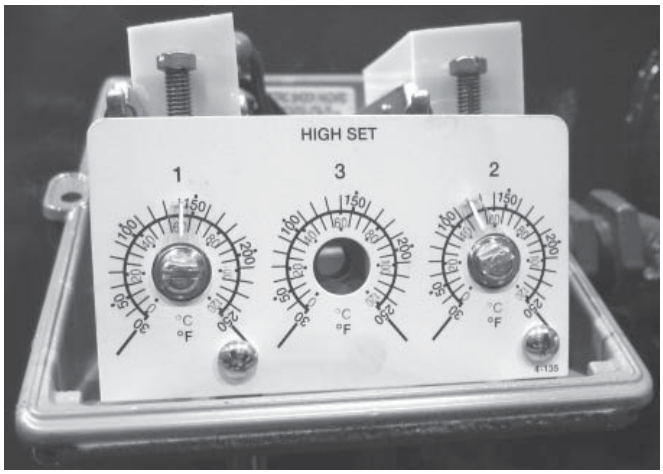

Figure 10 - Temperature Switch

Hydraulic Pump Controls The hydraulic pump has 3 different adjustments (Cut off Pressure, Differential Pressure and Torque Limit) and is pre-adjusted at the factory. **DO NOT make any adjustments unless directed by the factory. Readjustment without the approval of Allied Systems Co. voids the warranty.**

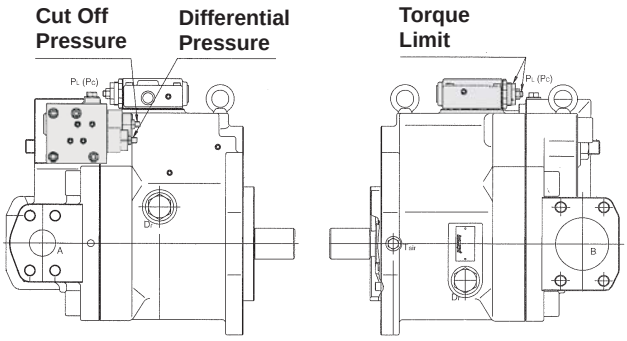

Figure 11 - Hydraulic Pump

Prime pump

Make sure Reservoir is filled with oil before priming the pump.

The pump must be primed when the hydraulics system is drained or an inlet line is removed. Slightly loosen the case drain fitting at the main system pump (see Figure 12). Run the motor (about 30 seconds) until the pump is primed. The main system pump is primed when oil begins to flow from the loosened case drain fitting. Be sure to tighten the line.

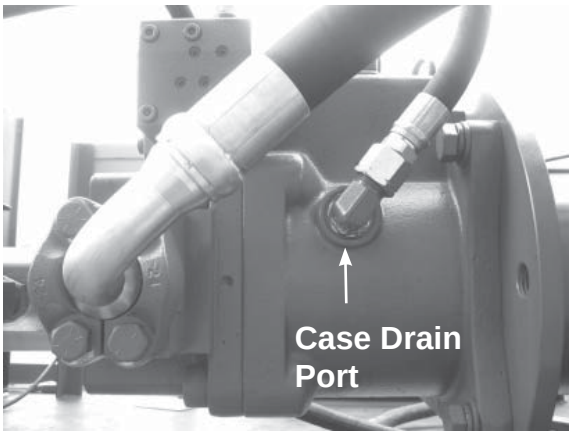

Figure 12 - Prime Pump Location

Do not let motor run continuously before the pumps are primed.

Oil Cooler The Hydraulic system operate's more accurately when the oil viscosity is consistent. Since oil viscosity varies with temperature, your power unit is equipped with a cooler to automatically maintain the oil temperature below 120°F.

Directional Control Valve is for adjusting the direction of the plunger in MANUAL or AUTO using the Control Circuit switch. Control Circuit switch OFF and Motor Start switch ON for operating the plunger manually.

Figure 13 - Directional Valve

Proportional Valve Variable pressure to the restriction rail cylinders is provided by a proportional valve (see Figure 14) driven by an analog valve controller. When the valve controller is energized, the Min-Max pot (located in the panel) provides a control signal which varies the pressure output from the proportional valve. When the pot is set at Min, the pressure in the restriction rail system will be at a minimum 75 psi. When the pot is set at Max, the pressure in the restriction rail system will be at a maximum value 3000 psi. or system pressure.

All pressure adjustment to the restriction rail system is to be done by the Min-Max pot. (see Potentiometer Figure 15)

The valve controller is only energized under two conditions:

When Control Circuit switch (S-1) is set to "On" and Restriction switch (S-2) is set to "Auto", the valve controller is only energized when the plunger is extending. Thus the restriction rail system is only pressurized to the desired setting when the plunger is extending.

When Control Circuit switch (S-1) is set to "On" and Restriction switch (S-2) is set to "Manual", the valve controller is energized at all times.

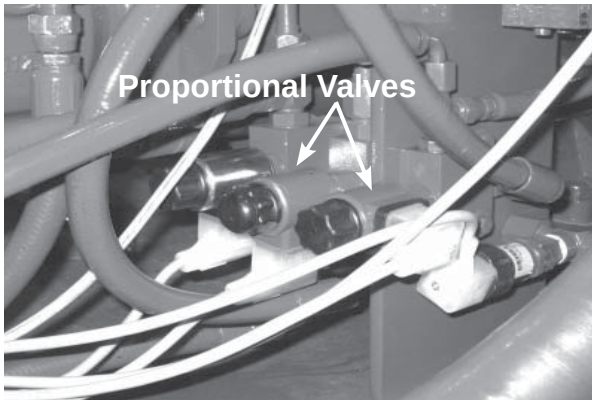

Figure 14 - Proportional Valve

The **Potentiometer** (see Figure 15) located in the control box has 4 adjustments; Extend Delay, Main System Pressure, Restriction Pressure and Retract Delay. The potentiometer can be set from Min to Max (Min being 75 psi and Max being 3000 psi). Pressure can be read on the restrictor rail pressure gauge (see Figure 13).

Adjustments:

Extend Delay is set by the Extend Delay pot shown in Figure 15 (Min being 0 seconds and Max being 20 seconds). Extend Delay restrains the plunger from advancing according to the pot adjustment.

Main System Pressure is set by the Main System Pressure pot shown in Figure 15 (Min being 75 psi and Max being 3000 psi).

Restriction Pressure is set by the Restriction Pressure pot shown in Figure 15 (Min being 75 psi and Max being 3000 psi).

Retract Delay is set by the Retract Delay pot shown in Figure 15 (Min being 0 seconds and Max being 20 seconds). Extend Delay restrains the plunger from advancing according to the pot adjustment.

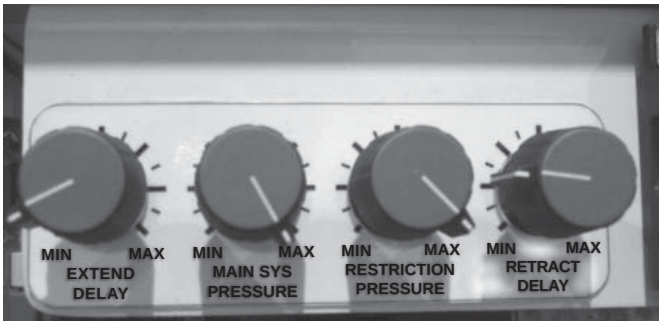

Figure 15 - Potentiometer

Control Panel

The Control Box is used to control your WE-4B. There are controls on the front panel as well as on the inside of the box.

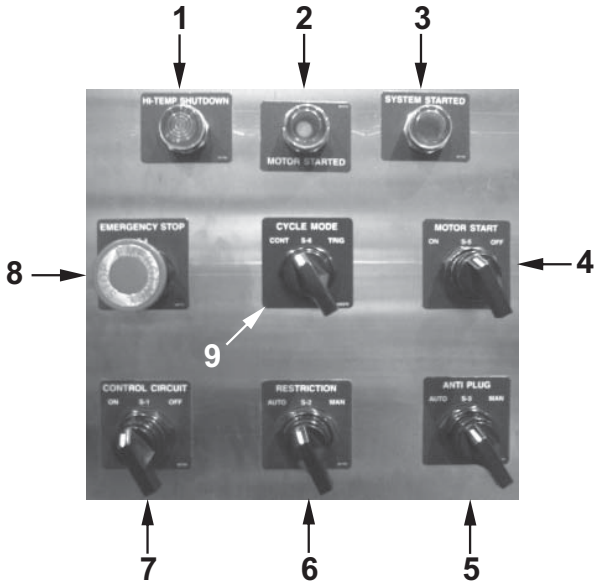

Figure 16 - Control Panel

1. HI-TEMP SHUTDOWN Indicator Light illuminates when the high temperature switch activates and the machine shuts down.

2. MOTOR STARTED Indicator Light illuminates when the motor is on.

3. SYSTEM STARTED Indicator Light illuminates when the system is on.

4. MOTOR START Switch (S-5) Turns the motor ON and OFF.

5. ANTI-PLUG Switch (S-3) AUTO opens Anti-Plug valve when restriction pressure reaches 90% of system pressure. MANUAL Anti-Plug valve open.

6. RESTRICTION Switch (S-2) AUTO Restriction rail closes when plunger is extending and Anti-Plug valve is closed. MANUAL The restriction rail cylinders will close all the time as long as the Anti-Plug valve is closed.

7. CONTROL CIRCUIT Switch (S-1) Sends a signal to the DVC-10 that tells it to start or end the cycle. If switched to off mid cycle the machine will complete its cycle before shutting down.

8. EMERGENCY STOP Switch (S-4)

9. CYCLE MODE Switch (S-6) CONT the machine will continuously cycle with option of delaying plunger extend and retract using the Potentiometer . TRIG will activate the feed sensor on the infeed chute.

Starting your WE-4B

Follow these steps in starting your WE-4B Water Extractor. Factory settings are only a starting point. You may need to make some adjustments to fit your material.

1. Please read entire WE-4B operators manual before start-up.

2. Make sure reservoir is filled with oil, pump is primed and verify that the suction valve is locked in the open position. (see Figure 17)

3. Turn Restriction switch to AUTO.
4. Turn Anti-Plug switch to AUTO.
5. Turn Cycle Mode switch to TRIG.
6. Turn Motor Start switch to ON.
7. Turn Control Circuit switch to ON.
8. Load your material into the feed chute.

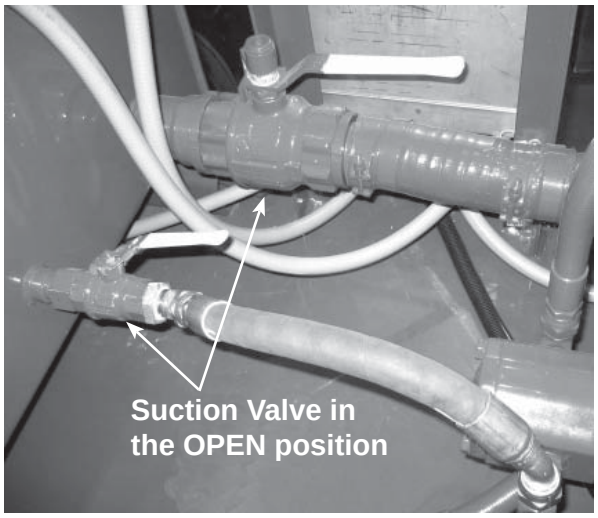

Figure 17 - Suction Valve

Turning off your WE-4B

1. Turn the Control Circuit switch to OFF
2. Turn the Motor Start switch to OFF.

Emergency shut down

1. Push the Emergency Stop switch. (see Figure 16)

Automatic and Manual Operation

Automatic Operation Place the control box CONTROL CIRCUIT switch to ON, RESTRICTION CONTROL switch to AUTO, CYCLE MODE switch to TRIG or CONT and ANTI PLUG switch to AUTO.

Manual Operation Place the control box CONTROL CIRCUIT switch to OFF. Operate lever on directional vale to operate plunger. See Figure 13 page 5

Operation Sequence

Emergency Stop Switch Emergency Stop controls power to the motor starter circuit and DVC-10. Stop is considered "Open" when pushed in and "Closed" when pulled out.

When Emergency Stop is closed, power is supplied to the heat exchanger cooling fan. When the temperature of the hydraulic fluid reaches 110 degrees Fahrenheit, a temperature sensor switch will close, energizing the fan motor starter contacts. If the temperature of the hydraulic fluid reaches 140 degrees Fahrenheit, a second temperature switch will open and remove power from the motor starter and stopping the 40 HP motor. When a "High Temperature Shutdown" occurs, a red light will illuminate on the control panel to indicate a temperature related shutdown.

When Emergency Stop is closed, power is supplied to the 24VDC power supply using a 15 amp fuse. The 24VDC power supply in turn channels power to the DVC-10. (see wiring diagram 902243)

When Emergency Stop (S-4) is closed, power is supplied to the motor starter circuit with the 15 amp fuse. The motor starter circuit is set up to allow for easy installation of the customer's motor starter and overload protection as well as a remote contact for starting. For the 40 HP motor starter to be energized, the following must happen:

- Either the Motor Start Switch (S-5) must be set to "ON" or an optional remote contact must be energized (see wiring diagram 902243).

- The hydraulic fluid float switch must be closed (there must be adequate fluid in the tank).

- The high temperature switch must be closed (the hydraulic fluid must be below 140 degrees Fahrenheit).

When these items are met, power will be supplied to terminal block #16 (see wiring diagram 902243) for the customer supplied motor starter. A green light will be energized on the control panel to indicate that the starting system has been energized either by (S-5) or the remote contact.

Switching Motor Start Switch (S-5) to "OFF" or breaking the remote contact will cut power to terminal block #16 and de-energize the customer supplied motor starter. Hydraulic pressure is not immediately relieved from the system.

When Control Circuit switch (S-1) (Cycle Start) is set to "ON", the system will cycle according to the parameters set in the DVC-10. When (S-1) is set to "OFF" the system will stop cycling. The setting of (S-1) has no effect on the pump motor.

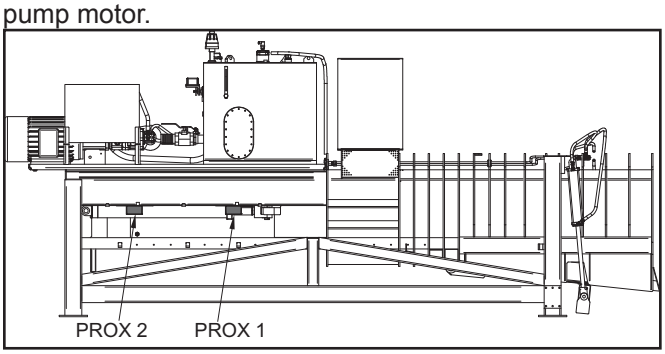

Figure 18 - PROX 2 and PROX 1

Two limit switches allow the DVC-10 to monitor plunger location. LS-1 (see Figure 24) is opened when the plunger is fully extended and closed when the plunger is moving or retracted. LS-2 is closed when the plunger is fully retracted and open when the plunger is moving or extended.

The DVC-10 will energize the extension solenoid valve (SV-1) and extend the plunger until both limit switches (LS-1 and LS-2) are opened. The DVC-10 will then pause the plunger in the extended position for a time interval set at the DVC-10 potentiometer. At the end of this time interval, the DVC-10 will energize the retraction solenoid valve (SV-2) and retract the plunger until both limit switches (LS-1 and LS-2) are closed. The DVC-10 will then pause the plunger in the retracted position for a time interval set at the DVC-10 potentiometer.

When Restriction switch (S-2) is set to "AUTO" the pressure in the restriction rail cylinders will be modulated depending on the direction of plunger movement. When the plunger is extending, the restriction rail will be pressurized to a value controlled by the proportional valve controller setting. When the plunger is retracting, the pressure in the restriction rail cylinders will be allowed to drop gradually until the plunger extends. When Restriction switch (S-2) is set to "MANUAL", the pressure in the restriction cylinders is maintained regardless of the direction of plunger movement.

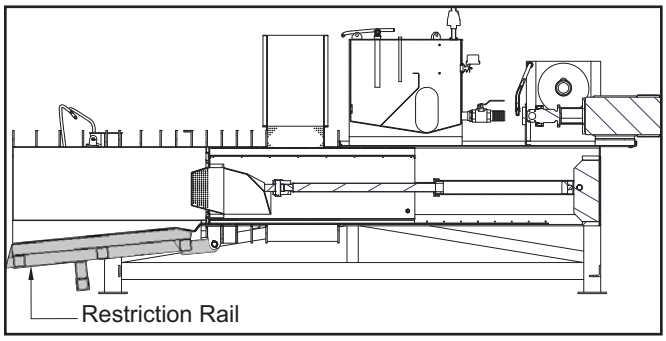

Figure 19 - Restriction Rail Lowered

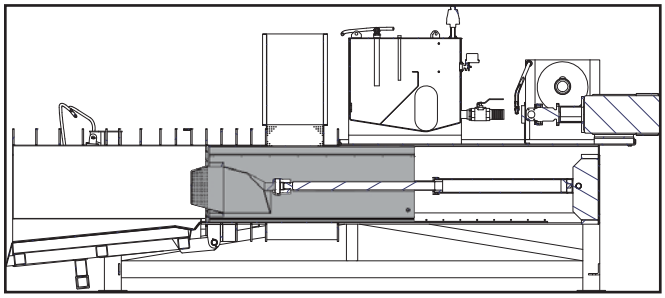

Figure 20 - Plunger Extended

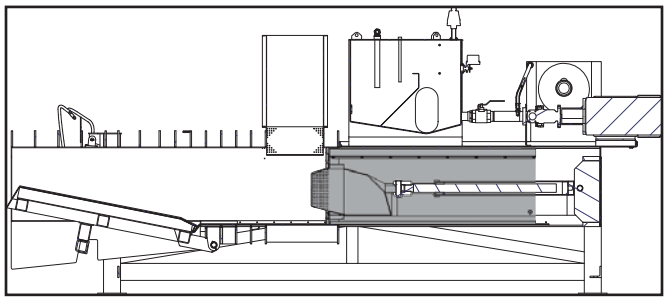

Figure 21 - Plunger Retracted, Restriction Rail Raised

The pressure in the restriction system is set using the rotary Restriction Pressure pot (see potentiometer on page 6) connected to the valve controller. Turning the pot to Min will decrease the restriction rail cylinder pressure to a minimum of 75 PSI. Turning the pot to its Max setting will increase the restriction rail system pressure to 3000 PSI. The valve controller will then limit the pressure across the proportional valves (SV-3).

When switch Anti-Plug (S-3) is set to “Auto” and the restriction pressure exceeds 90% of the system pressure, the pressure in the restriction rail cylinders is relieved by opening the Anti-Plug valve venting pressure back to the hydraulic tank. If restriction pressure is less than 90% of the system pressure the Anti-Plug valve is closed allowing pressure to build in the restriction cylinders. When the Anti-Plug switch (S-3) is set to “Manual” the Anti-Plug valve will open venting all restriction pressure back to the tank until the switch is returned to “Auto”. As long as the Anti-Plug valve is open the restriction rail will be allowed to drop.

Restriction System

There are three modes for controlling the restriction system:

● **Automatic normal operation** The automatic normal operation mode is controlled by the restriction system proportional valve. The restriction system proportional valve is an electronic valve controlled by the plunger hydraulic pressure at a selected dewatering pressure point.

● **Automatic abnormal high-pressure operation** The automatic abnormal high-pressure operation is controlled by the restriction system anti-plug solenoid valve SV-4 (see Figure 22), which is energized by the Anti-Plug pressure switch (see page 7).

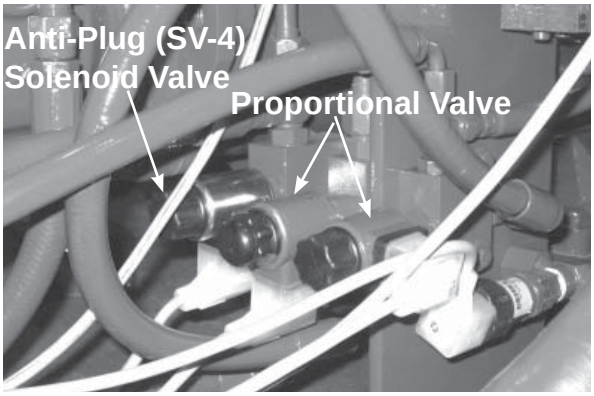

Figure 22 - Restriction System Solenoid Valve

● **Manual operation** The manual operation is controlled by the restriction system anti-plug solenoid valve (SV-4). The restriction system anti-plug solenoid valve is operated with the DVC-10.

Restriction rail The restriction rail (Figure 19), provides a variable restriction (modulation) on the passage of product to the discharge. This restriction regulates the force required from the plunger to push the product toward the discharge. It is the compressing action of the plunger that forces the water from the product. The water is evacuated through the drain holes.

The restriction rail is located at the bottom of the discharge chute. The automatic restriction rail control system controls two hydraulic cylinders that operate the restriction rail. The restriction system proportional valve (Figure 22) controls the force applied by the restriction rail to the product (dewatering pressure), and is adjusted to obtain the desired water content of the discharged product.

The force requirement depends on the products characteristics. The “freeness” and frictional characteristics should be taken into account when adjusting the restriction system proportional valve setting. See the following Restriction System Adjustments and Plunger Delay Adjustment sections.

Note Moving the control box Restriction switch (S-2) from “AUTO” to “MAN” allows the automatic restriction control system feature to be bypassed so that restriction is applied continuously for setting pressures, testing, and troubleshooting.

Plunger Delay Adjustment:

The plunger cycle can be adjusted to have a 0-20 second delay prior to extension or retraction. This delay is set by the Extend and Retract Delay pots in the control panel.

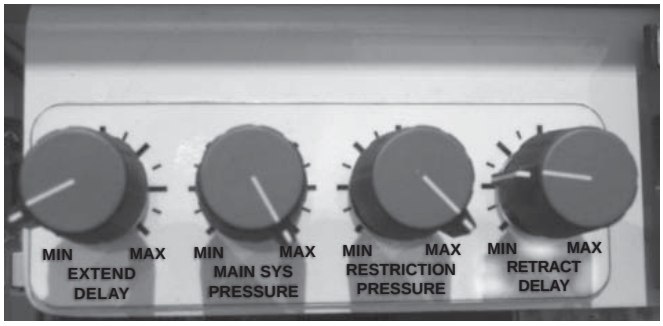

Figure 23 - Surface Pots located in the control box.

-The Retract Delay pot sets the time duration for plunger delay when fully extended.

-The Extend Delay pot sets the time duration for the plunger delay when fully retracted.

Turning the pots fully CCW will set the delays to zero and will allow the plunger to cycle continuously. Turning the pots CW will increase the time delays up to a maximum of 20 seconds.

Level Detector Adjustments

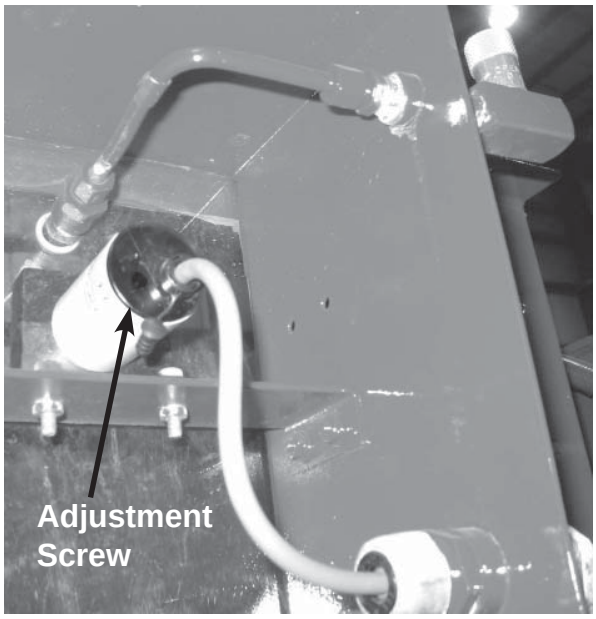

Figure 24 - Level Detector

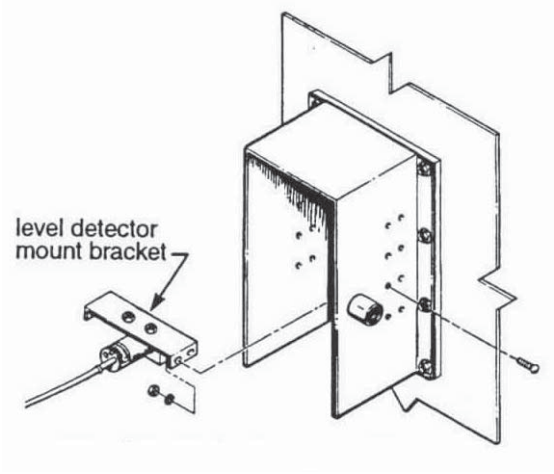

Figure 25 - Level Detector

Level Detector Vertical Position Check that the level detector mount bracket is installed with the mounting flanges down, to the second from the bottom row of mounting holes (Figure 25).

Adjust Level Detector The cover plug at the back of the level detector covers the sensitivity adjustment (Figure 24). Remove the cover plug. The plug provides a seal against dirt and moisture.

Note The level detector sensitivity adjustment screw has no stop. The resistance change of this potentiometer occurs over approximately 16 hours.

Rotating the sensitivity adjustment counterclockwise decreases the detecting distance. Turn the exposed sensitivity adjustment clockwise (+ direction on the detector marking) until the detector switch is turned on (detector light on). Note the position of the screwdriver slot.

Rotating the sensitivity adjustment counterclockwise decreases the detecting distance. Turn the exposed sensitivity adjustment counterclockwise (- direction arrow on the detector marking), noting the number of turns, until the detector switch is turned off (detector light off). Note the number of turns difference between the on and off position.

> **Note** Stable detection will be achieved if the product being sensed provides at least 1.5 turns difference between the detector on positions.

Replace Cover Plug Replace the rubber plug at the back of the level detector. The plug provides a seal against dirt and moisture.

Unplugging

Chamber plugging should never occur unless foreign material gets into the chamber and causes the chamber to plug up.

Anti-plug system operation The control box anti-plug switch energizes the anti-plug solenoid valve (SV-4). The restriction system then opens the restriction rail, permitting the plunger to more easily discharge the product.

Unplugging steps There are two ways to unplug the chamber:

● ANTI-PLUG SWITCH Use the ANTI-PLUG switch to open the restriction rail.

● DIRECTIONAL CONTROL VALE Use the directional control valve to cycle the plunger.

● MANUAL REMOVAL Lock out the power and manually remove the material from the chamber.

1. Turn the CONTROL CIRCUIT switch to ON and ANTI-PLUG switch to MANUAL.

2. Turn CYCLE MODE to CONT. Adjust EXTEND and RETRACT pots to MIN so the plunger continuously cycle with no delay.

Note Proceed to the following steps if step 1 and 2 does not unplug the moisture extractor.

3. HAND REMOVAL If repeating steps 1 to 2 does not break loose the plugging material, then the chamber must be manually cleaned. Move the Anti-Plug switch to MANUAL to open the restriction rail. Stop the motor. Use high pressure water or hand tools to manually remove the plugging material.

CAUTION: ALWAYS TURN OFF CONTROL SYSTEM AND LOCKOUT THE ELECTRICAL SUPPLY TO THE MACHINE BEFORE INSPECTING, ADJUSTING OR SERVICING THE MACHINE.

Warning Pressure greater than 3,000 psi creates a hazard to personnel and can damage the hydraulic system.

Caution An adjustment of the plunger system relief valve to over 3,000 psi will cause pump damage.

Factory Settings

Plunger extension delay: Not pre-set

Plunger retraction delay: Not pre-set

Main system pressure: 3000 PSI

Maximum restriction pressure: 3000 PSI

Minimum restriction pressure: 75 PSI

Maintenance

Safety Precautions If maintenance or repairs are to be performed on machine, the following precautions should be observed.

Shut down the system and lock out the hydraulic pump motor and the cooling fan motor at the disconnect switch.

On some machinery, cylinders hold heavy loads. Opening the hydraulic lines with the load raised may permit the load to fall. Hydraulic lines can inadvertently be opened by disconnecting a hose, pipe, or by removing a high pressure filter bowl to change the element. On such machinery, the load should be lowered to rest position before disturbing the hydraulic circuit.

Maintenance Precautions Think clean!!! The worst enemy of a hydraulic system is contamination. As long as your system is intact, it is nearly impossible for dirt to get into the oil. Dirt gets into the oil when you provide and opening. It can enter through holes left uncovered when you remove some component such as a valve, breather or cap.

If you adhere the following procedure, you will not let dirt into the system.

Clean and wash down the entire area that is going to be worked on. Before removing any component or disconnecting any line, be sure you have the right caps, plugs and cover plates to close the openings that will be exposed.

Thorough cleaning of pipe and hoses before installing or reconnecting is essential. Whenever a pipe or hose is disconnected, or a system component is removed, the system may have to be flushed. For flushing instructions see page 14.

When field repairs on the components are made, flushing the components is necessary. See page 14 for Flushing instructions.

Disassembly of components will void any warranty considerations. Components must be shipped to Allied Systems Co. fully assembled.

Once you have replaced hoses or components, air and contaminants have a chance to enter the system. You must purge the pump for at least 10 minutes to get air out of the system. You may run your pressure up to 3000 once all air is out of the system.

Sight Gauge An oil level gauge is installed on the reservoir. It will indicate oil level and approximate oil temperature.

Figure 26 - Oil level sight gauge

Reservoir Oil Level Two low level switches are installed to detect the oil level. The low level warning switch turns on a warning light when the oil drops 1” below the low index mark. The emergency low level shutdown switch automatically shuts down the system when the oil drops 4” below the low index mark.

Oil Temperature A dual set point temperature switch is installed to detect oil temperature in the system. If the oil reaches the temperature set on the high circuit adjustment, the switch will automatically shut down the system and turn on an indicator light. The lower setting controls operation of the fan motor and the oil cooler.

Warning Avoid high-pressure fluids. Escaping fluid under pressure can penetrate the skin, causing serious injury. Keep hands and body away from pinholes and nozzles which eject fluids under high pressure. Use a piece of cardboard to search for leaks. If any fluid is injected into the skin, it must be surgically removed within a few hours by a doctor familiar with this type injury or gangrene can result.

Pump and Motor Coupler The coupling alignment must be within 0.003 total indicator reading on the horizontal, vertical, and angular planes. Adjust as necessary.

Warning Pressure greater than 3,000 psi creates a hazard to personnel and can damage the hydraulic system.

Procedure To Fill an Empty Reservoir Reference page 4 for hydraulic oil recommendations.

Install a clean filter element in the return line filter.

Clean the are around the power unit "fill port".

Pump one gallon of oil into a waste container to flush the filter pump and hose. **Do not use this oil.**

Remove the cap from the "fill port".

Fill the reservoir. If this is a start-up, see Reservoir Oil Level on page 13.

When reservoir is filled to the "full" index mark on the reservoir's oil level sight gauge, replace cap on fill port.

Open the return line shut-off valve.

Procedure to Add Oil to the Reservoir Reference page 4 for hydraulic oil recommendations.

Lockout the pump at the disconnect switch.

Clean the area around the power unit "fill port".

Pump one gallon of oil into a waste container to flush the filter pump and hose. **Do not use this oil.**

Remove the cap from the "fill port".

Fill the reservoir to the "full" index mark on the reservoir's oil level sight gage.

Close the "fill port" valve and disconnect the filler hose. Replace cap on fill port.

Remove lockout from the disconnect switch.

To Change Oil and Clean a Contaminated Reservoir

Lockout the pump at the disconnect switch.

Completely drain the reservoir, return line filter housing and return lines.

DO NOT attempt to reuse this oil if it does not conform to original manufacturer's specifications. This oil MUST be filtered and then tested by the original manufacturer. The oil **must** conform to the original manufacturer's specification before reusing, if it does not conform to original manufacturers' specifications, catastrophic failure may occur.

Remove the end cover, clean debris out of reservoir and wipe inside completely clean. Install a new gasket and replace cover.

Install a clean element in the return line filter.
Fill reservoir with new oil, see page 4.

Flushing Allied Systems requires a complete system flush after installation, after intrusion into the system or after a catastrophic failure. Actuator flushing is required when prescribed in certain actuator repair procedures and after catastrophic failure.

Most systems can be properly flushed by utilizing the power unit system pump (s) to circulate fluid out through the fluid lines and back through the filter into the reservoir.

Verify the proper amount and type of filtered oil is in the reservoir.

Verify enough spare filter elements for all filters are on site before beginning the flushing process. Note: Use only the Allied Systems Co. specified brands and types of filter media.

Avoid flushing through any valves or actuators. These items are pre flushed by Allied Systems Co. or the manufacturer. Loop the existing field installed hose assemblies around these components using unions, with the exception of the power unit blocking valve. Once flushing has started, it is common to get surges of air from the fluid lines into the reservoir, which may cause the pumps to be noisy as air bubbles are drawn into the pump. If the noise persists for long periods of time, and the fluid is aerated or foamy, stop the flushing process and allow the fluid to settle out overnight. If the noise persists beyond a reasonable period of time, consult the manufacturer.

Turbulent flow is essential to all flushing procedures. To achieve this, the Reynolds number (Re) must exceed 4,000 throughout the system. It is calculated as follows:

(Re)=(14,646 x Q)/(v x d)
Where Q = flow rate in GPM, d = pipe I.D. in inches, v = viscosity of fluid in SSU.

Flush only one leg of the system at a time to insure that

the proper flow velocity and Reynold's Number (Re) is achieved in each leg. Cap off the other legs.

If necessary, tie multiple pumps together to achieve proper (Re) in each leg of the circuit.

Turbulent flow may also be achieved by vibrating or flexing the lines. Back off the pilot chokes and allow the blocking valve to suddenly open, causing the accumulator oil to surge through the system, giving a temporarily high Reynolds Number (R_e).

The system must be flushed so the oil cleanliness meets Allied Systems ISO cleanliness codes 20/17/14. A starting rule of thumb is to flush for a minimum of one hour per 100 ft. of pipe and hose (total of pressure and return lines). While flushing, strike all welds with a hammer to dislodge any scale created as a result of welding.

Before the system may be started-up, the oil **must** be sampled and tested to meet Allied Systems ISO cleanliness codes 20/17/14. This includes every component in the system, especially servo valves and pumps.

If the oil does not meet the ISO cleanliness codes 20/17/14, it could reduce component life or cause Catastrophic Failure, and system flushing must continue.

After flushing is completed, first verify that the oil cleanliness meets Allied Systems ISO cleanliness codes 20/17/14, then verify that no filters are indicating impending bypass. Also verify a supply of spare filter elements are on hand.

Reconnect hoses to actuators & valve packages. Start the pump motor and check for leaks in the entire system.

Warning!!! When the pump is restarted after the flushing procedure has been completed, the actuators may move suddenly. **Be sure the machinery is clear of all objects and people.**

Preventative Maintenance

Daily

Check oil level in power unit reservoir.

Check oil temperature at temperature gauge.

Check heat exchanger for any debris that may be blocking the fins, and use air to blow the debris out.

If the system is operating, the temperature should be between 100 °F and 120 °F.

Check for leaks around power unit.

Weekly

Perform daily service.

Check entire system for leaks.

Check pressure gauge settings.

Check all visual dirt indicators on all filters (Note: Most indicators work only when under full flow condition).

Monthly

Perform Daily & Weekly service.

Clean up any oil that may be in the drip pan.
Check the electric motor to pump coupling insert for alignment and wear and lubricate.

Check reservoir temperature first thing before starting up. The temperature should be at least 80 °F.

Three Months

Perform Daily, Weekly, and Monthly Service.

Sample the oil for cleanliness (see page 4), viscosity and additives. Check for lubrication of the electric motor.

DVC-10

Note:

If any solenoids are disconnected, the DVC10 will detect an open circuit and will not operate these valves after reconnected until the DVC10 power is cycled. Power maybe cycled using the Emergency Stop switch.

Proximity sensors should be adjusted between 3/16” and 1/4” from triggers .

Properly working sensors must provide a signal back to the DVC10. If there is not a light indicating operation on the DVC10 body, this may be checked most easiest at the terminal block. The plunger sensors are normally open and provide a 20 - 24 v signal to the DVC10 when activated while the product sensor is normally closed and removes it’s 20-24v signal when triggered.

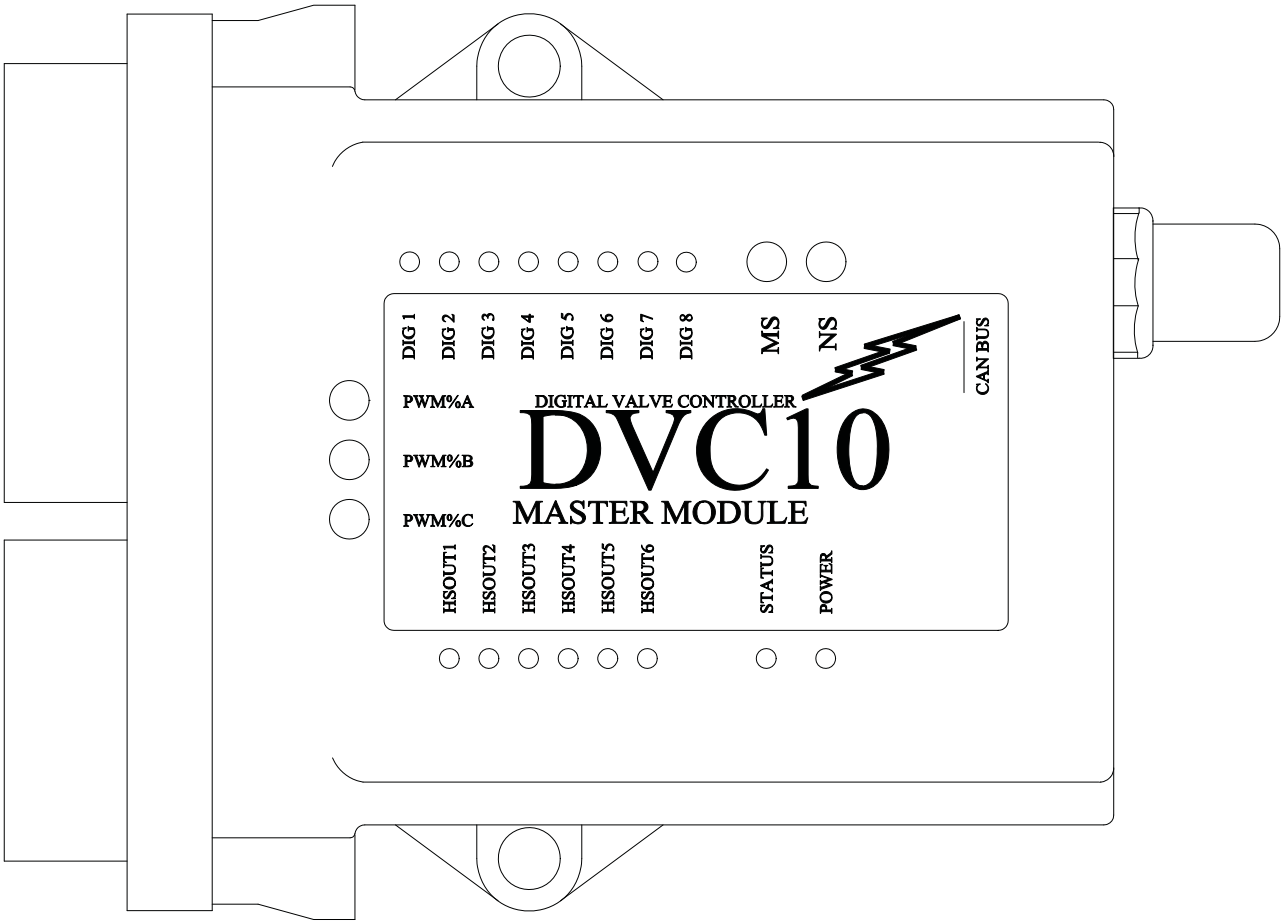

Figure 27 - DVC-10

DVC-10 Continued

LED	Function	Normal (Powered) Condition
MS	Module Status	Lit (green) after power-up. While downloading a program to the module, MS and NS LED's will flash in an alternating fashion.
NS	Network Status	Lit or flashing after power-up. While downloading a program to the module, MS and NS LED's will flash in an alternating fashion.
DIG1	Not Used	N/A
DIG2	Cycle Mode	CONT. Green light on.
DIG3	Level Detector	MANUAL Green light on.
DIG4	Plunger Extended Proximity Switch	Green light on.
DIG5	Plunger Retracted Proximity Switch	Green light on.
DIG6	Control Circuit Switch	ON Green light on.
DIG7	Restriction Switch	AUTO Green light on.
DIG8	Anti-Plug Switch	AUTO Green light on.
PWM%A	Not Used	N/A
PWM%B	Restriction Pressure	Green light on when pressure at 75 psi. and gradually turns solid red at 3000 psi.
PWM%C	Main System Pressure	Green light on when pressure at 75 psi. and gradually turns solid red at 3000 psi.
HSOUT1	Plunger Retract	Green light on.
HSOUT2	Plunger Extend	Green light on.
HSOUT3	Restriction Solenoid	Green light will be on if Anti-Plug is inactive and plunger is extending (switch in auto mode) or Anti-Plug is inactive and restriction is in manual mode
HSOUT4	Anti-Plug Solenoid	Green light on when in Manual or 90% of system pressure.
HSOUT5	Pump Control Power	Green light on only when pump is on.
HSOUT6	Not Used	N/A
STATUS	Not Used	N/A
POWER	Power Indicator	Lit after power-up

HS1 – HS 8 are all outputs. If one of these is slowly blinking there is an open circuit to that output. If it is blinking rapidly there is a short circuit to that output. Under normal trouble free operation the LED will either be on or off. If it is on that output is active, and if the LED is off the output is inactive.

Dig 1 – Dig 8. These show the state of the digital inputs. If the LED is on the DVC is receiving a signal from the input. If the LED is not on there is no signal from the input.

The three LED's labeled PWM%-A – PWM%-B – PWM%-C change color based on how much current is being pushed through that output. If there is no light, the output is currently not in use. If the light is fully green the DVC 10 is driving full current through that output. If it is fully red it is driving minimum or no current through the output. When driving current between min and max the color will change from (minimum to maximum) bright red to lighter red to orange to light green to bright green. When driving from maximum to minimum it does the opposite. If one of these LED's is blinking red there is a short circuit on that output. If it is blinking green there is an open circuit to the output.

The power LED will flash if there is too much voltage being delivered to the unit. If there is no light at the power LED or it is blinking erratically there is not enough voltage to power it up, or it has shut down due to too much voltage. In normal operation this light should be steadily on.

FREEMAN

Troubleshooting

Pump

Symptom	Probable Cause	Remedy	Reference
Excessive pump noise	1. Pump/motor coupling mis-alignment.	Re-align pump & motor accurately. Align to within .003" total indicator reading. Note: Couplings should not be forced tight against each other. Leave a small amount of end play.	
	2. Oil level low.	Fill reservoir so that surface of oil is at the full mark on the oil level gauge. Follow Instructions on page 14.	Page 13 and 14
	3. Air leak in suction line, air leak in case drain line, or air leak around shaft packing.	Apply packing grease on joints & around shaft while listening for change in sound of operation. Tighten or replace.	
	4. Direction of pump rotation not correct.	Arrow on pump case must agree with direction of rotation.	Page 3
	5. Air bound pump.	Air is locked in pumping chamber & has no way to escape. Stop pressure line or install special by-pass line back to tank so that air can pass out of the pump. An air bleed valve need is indicated.	
	6. Restricted flow through suction piping.	Check suction piping & fittings to make sure full size is used throughout. Make sure suction line is not plugged with rags or other foreign material.	
	7. Pump case drain does not terminate below oil level.	Extend slip line piping so that it terminates below the oil surface when oil is at its lowest during any part of one machine cycle.	
	8. Pressure ring is worn.	Replace. This condition caused by hot, thin, dirty oil or no oil at all. An air bound condition will also contribute to the worn pressure ring.	

Pump continued

Symptom	Probable Cause	Remedy	Reference
Excessive pump noise (cont.)	9. Restricted filter or strainer.	Clean filter or strainer.	Page 4
	10. Worn or broken parts.	Replace.	
	11. Reservoir air vent plugged.	Air must be allowed to circulate in the reservoir. Clean and /or replace breather.	Page 4
Filter			
Dirty Oil	1. Plugged Cartridge.	Replace Cartridge.	
	2. Partial bypass continuous.	Correct filter size and oil viscosity.	
	3. Improper micrometer rating.	Check particle size and switch to proper size rating.	
	4. Improper changes.	Correct maintenance procedure or add bypass indicator.	

Filter Continued

Symptom	Probable Cause	Remedy	Reference
Bearing failure	1. Chips or other foreign matter in bearings (contamination).	Make sure clean oil is used. Essential for efficient operation & long life of bearings.	
	2. Coupling misalignment.	Re-align pump & motor.	
Pump not delivering oil	1. Wrong direction of pump rotation.	Observe arrow on pump case of name-plate. Direction of rotation must correspond.	Page 3
	2. Oil level low in reservoir.	Maintain oil level in reservoir well above bottom of suction line at all times.	Page 13 and 14
	3. Air leak in suction line.	Apply good pipe compound non-soluble in oil & tighten joints	
	4. Suction filter or plugged line.	Filters must be cleaned of lint or dirt soon after first start of unit. Periodic checks should be made as a preventive maintenance precaution.	
	5. Bleed-off in other portion of circuit.	Check for open center valves or other controls connected to tank.	
	6. Oil viscosity too high for proper priming.	Thinner oil should be used per recommendations for given temperatures & service.	
	7. Sheared key at rotor or coupling	Check and replace	
	8. Pump cover too loose.	Tighten bolts on pump cover	
Pump not delivering pressure	1. Pump pressure not set high enough	Contact Allied Systems Co. Service Department.	
	2. Oil by-passing to reservoir.	Inspect circuit pressure progressively. Watch for open center valves or other valves open to reservoir.	
	3. Defective pressure gauge or gauge line is shut off. Dirt may plug gauge orifice.	Install good pressure gauge in a line open to pump pressure.	

Filter Continued

Symptom	Probable Cause	Remedy	Reference
System excessively hot	1. Pump operates at higher pressures than required	Contact Allied Systems Co. Service Department.	Page 13 and 14
	2. High ambient temperature.	Relocate power unit or baffle against heat source.	
	3. Oil in reservoir low.	Raise oil level to recommended point.	
	4. Internal System leakage excessive.	Check progressively through the system for losses.	
Leakage at oil seal	1. Seal installed incorrectly.	Correct installation.	Page 14
	2. Pressure in pump case.	Observe case drain line for restriction. Check drain line circuitry for excessive back pressure arrangement.	
	3. Poor coupling alignment.	Re-align pump & motor shafts. Align to within .003" total indicator reading.	
	4. Seals damaged during installation. Damaged or scratched shaft seal.	Contact Allied Systems Co. Service Department..	
	5. Abrasives on pump shaft.	Protect shaft from abrasive dust & foreign material.	
Bearing failure	1. Abuse during coupling installation to pump	Most pumps are not designed to handle end thrusts against the drive shaft. Eliminate excessive force when installing coupling. Couplings should be a slip fit onto the pump shaft.	Page 4
	2. Overhung load.	Many pumps are not designed to handle any overhung load or side thrust on the drive shaft. Contact Allied Systems Co. Service Department..	
	3. Incorrect fluid	See manufacture's oil recommendations.	
	4. Excessive or shock load	Contact Allied Systems Co. Service Department..	

Gauges

Symptom	Probable Cause	Remedy	Reference
Incorrect indication	1. Gauge defective	Check zero pressure & remedy or replace broken tube, broken movement, tube spring, broken needle, pegged needle or gauge pinion gear.	
	2. Check accuracy	Check gauge against calibration standard.	
Poor gauge life	1. Gauge subject to mechanical shock.	Isolate shock by switching to glycerin filled gauge.	
	2. Bourdon tube fatigue	Use gauge isolator to remove continuous pressure on tube.	
	3. Pegged needles	Add pressure flow snubber to restrict needle movement in addition to glycerin (or fluid filled gauge).	
Broken housing	1. Too much pressure	Remove downstream restriction or change to corresponding higher pressure or flow rated filter.	
	2. Too much mechanical shock.	Add shock absorbing material.	
Broken Lens	1. Some degreasers will scratch or “fog” up lens	Replace gauge.	

Machine Function

Symptom	Probable Cause	Remedy	Reference
Adjustments don't seem to work	Not enough time for adjustments to be noticed.	Wait for a minimum of 10 plunger strokes before beginning to judge the effect of the adjustment.	
Plugging	Plunger stalls and motor overload device is tripped.	Reduce restriction pressure.	
Jerky plunger stroke	Air in oil.	The air is most likely between the reservoir and the pump. Replace reservoir filter and make sure fittings are tight between reservoir and pump.	
	Worn or defective plunger piston seals.	Replace piston seals.	
	Intermittent solenoid valve action.	Loose electrical connection. Bad solenoid. Check electrical connection. Replace solenoid.	
	Defective pump.	Replace or have factory service the pump.	
Slow plunger stroke	Air in oil.	The air is most likely between the reservoir and the pump. Replace reservoir filter and make sure fittings are tight between reservoir and pump.	
	A nonstandard size pump.	Only use a pump recommended from Allied Systems.	
	Worn or defective plunger piston seals.	Replace piston seals	
	A restriction in the hydraulic system.	Replace filter in reservoir.	

To find a dealer in your area,
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