ENERPAC
POWERFUL SOLUTIONS. GLOBAL FORCE.

Instruction Sheet

ZE3-6 and ZW4-5

L2647 Rev. C 04/13

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Repair Parts Sheets for this product are available from the Enerpac web site at www.enerpac.com, or from your nearest Authorized Enerpac Service Center or Enerpac Sales office.

1.0 IMPORTANT RECEIVING INSTRUCTIONS

Visually inspect all components for shipping damage. Shipping damage is **not** covered by warranty. If shipping damage is found, notify carrier at once. The carrier is responsible for all repair and replacement costs resulting from damage in shipment.

SAFETY FIRST

2.0 SAFETY ISSUES

Read all instructions, warnings and cautions carefully. Follow all safety precautions to avoid personal injury or property damage during system operation. Enerpac cannot be responsible for damage or injury resulting from unsafe product use, lack of maintenance or incorrect product and/or system operation. Contact Enerpac when in doubt as to the safety precautions and operations. If you have never been trained on high-pressure hydraulic safety, consult your distribution or service center for a free Enerpac Hydraulic safety course.

Failure to comply with the following cautions and warnings could cause equipment damage and personal injury.

A **CAUTION** is used to indicate correct operating or maintenance procedures and practices to prevent damage to, or destruction of equipment or other property.

A **WARNING** indicates a potential danger that requires correct procedures or practices to avoid personal injury.

A **DANGER** is only used when your action or lack of action may cause serious injury or even death.

WARNING: Wear proper personal protective gear when operating hydraulic equipment.

WARNING: Stay clear of loads supported by hydraulics. A cylinder, when used as a load lifting device, should never be used as a load holding device. After the load has been raised or lowered, it must always be blocked mechanically.

WARNING: USE ONLY RIGID PIECES TO HOLD LOADS. Carefully select steel or wood blocks that are capable of supporting the load. Never use a hydraulic cylinder as a shim or spacer in any lifting or pressing application.

DANGER: To avoid personal injury keep hands and feet away from cylinder and workpiece during operation.

WARNING: Do not exceed equipment ratings. Never attempt to lift a load weighing more than the capacity of the cylinder. Overloading causes equipment failure and possible personal injury. The cylinders are designed for a max. pressure of 10,000 psi (700 bar). Do not connect a jack or cylinder to a pump with a higher pressure rating.

Never set the relief valve to a higher pressure than the maximum rated pressure of the pump. Higher settings may result in equipment damage and/or personal injury.

WARNING: The system operating pressure must not exceed the pressure rating of the lowest rated component in the system. Install pressure gauges in the system to monitor operating pressure. It is your window to what is happening in the system.

CAUTION: Avoid damaging hydraulic hose. Avoid sharp bends and kinks when routing hydraulic hoses. Using a bent or kinked hose will cause severe back-pressure. Sharp bends and kinks will internally damage the hose leading to premature hose failure.

Do not drop heavy objects on hose. A sharp impact may cause internal damage to hose wire strands. Applying pressure to a damaged hose may cause it to rupture.

IMPORTANT: Do not lift hydraulic equipment by the hoses or swivel couplers. Use the carrying handle or other means of safe transport.

CAUTION: Keep hydraulic equipment away from flames and heat. Excessive heat will soften packings and seals, resulting in fluid leaks. Heat also weakens hose materials and packings. For optimum performance do not expose equipment to temperatures of 150 °F (65 °C) or higher. Protect hoses and cylinders from weld spatter.

DANGER: Do not handle pressurized hoses. Escaping oil under pressure can penetrate the skin, causing serious injury. If oil is injected under the skin, see a doctor immediately.

WARNING: Only use hydraulic cylinders in a coupled system. Never use a cylinder with unconnected couplers. If the cylinder becomes extremely overloaded, components can fail catastrophically causing severe personal injury.

WARNING: BE SURE SETUP IS STABLE BEFORE LIFTING LOAD. Cylinders should be placed on a flat surface that can support the load. Where applicable, use a cylinder base for added stability. Do not weld or otherwise modify the cylinder to attach a base or other support.

Avoid situations where loads are not directly centered on the cylinder plunger. Off-center loads produce considerable strain on cylinders and plungers. In addition, the load may slip or fall, causing potentially dangerous results.

Distribute the load evenly across the entire saddle surface. Always use a saddle to protect the plunger.

IMPORTANT: Hydraulic equipment must only be serviced by a qualified hydraulic technician. For repair service, contact the Authorized ENERPAC Service Center in your area. To protect your warranty, use only ENERPAC oil.

WARNING: Immediately replace worn or damaged parts by genuine ENERPAC parts. Standard grade parts will break causing personal injury and property damage. ENERPAC parts are designed to fit properly and withstand high loads.

WARNING: Do not use electric pumps in an explosive atmosphere. Adhere to all local and national electrical codes. A qualified electrician must do installation and modification.

WARNING: Start the pump with the valve in the neutral position to prevent accidental cylinder operation. Keep hands clear of moving parts and pressurized hoses.

WARNING: These pumps have internal factory adjusted relief valves, which must not be repaired or adjusted except by an Authorized Enerpac Service Center.

CAUTION: To prevent damage to pump electric motor, check specifications. Use of incorrect power source will damage the motor.

3.0 SPECIFICATIONS

3.1 Performance Chart (see Performance Chart below)

3.2 Flow Charts (see Figure 1)

4.0 INSTALLATION

Install or position the pump to ensure that air flow around the motor and pump is unobstructed. Keep the motor clean to ensure maximum cooling during operation.

4.1 Reservoir Breather Cap (See Figure 2)

For shipping purposes, a shipping plug (A) is installed in the breather port on the top of the reservoir. Before using replace the shipping plug with the breather cap (B). NOTE: The breather port (B) is separate from the oil fill port (C). Oil fill port (C) uses a SAE #10 plug.

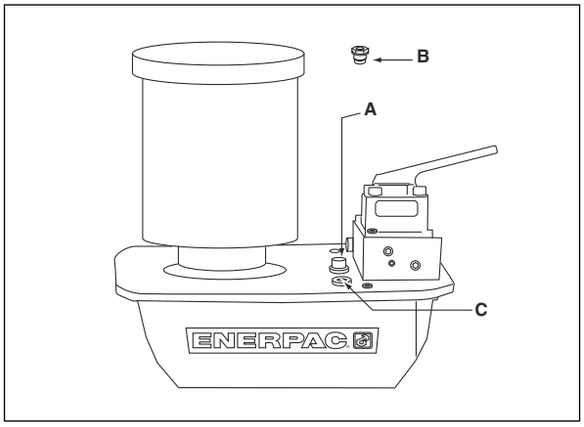
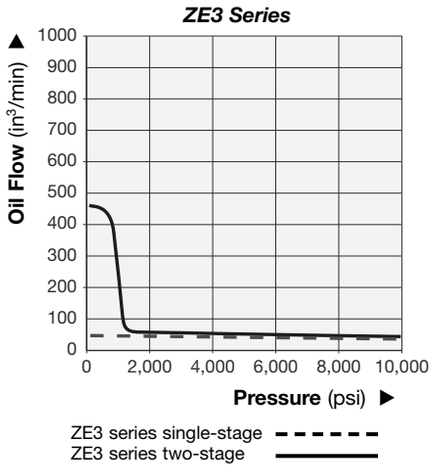
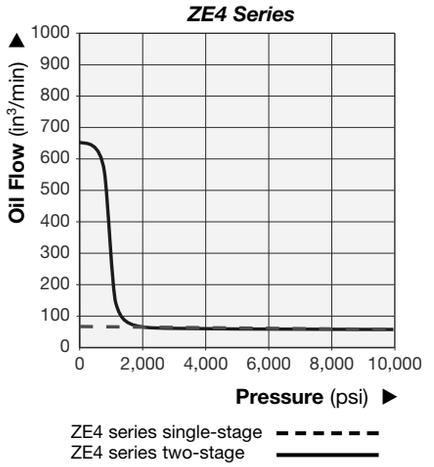
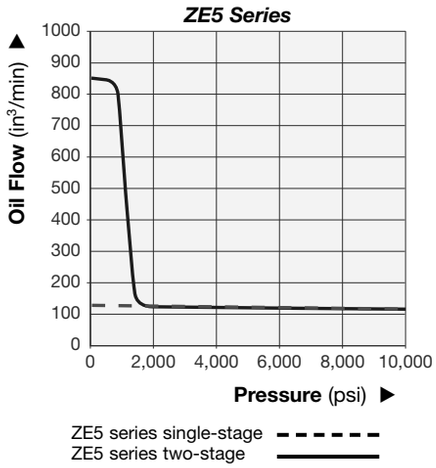


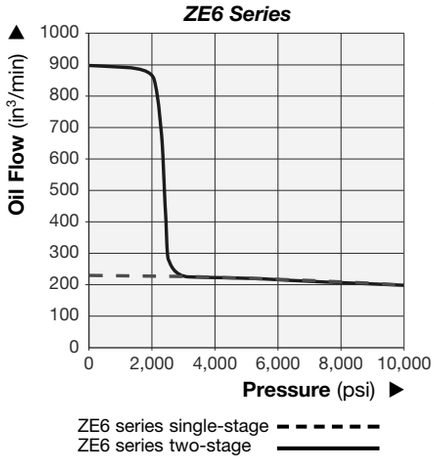
Figure 2, ZE & ZW Breather Installation

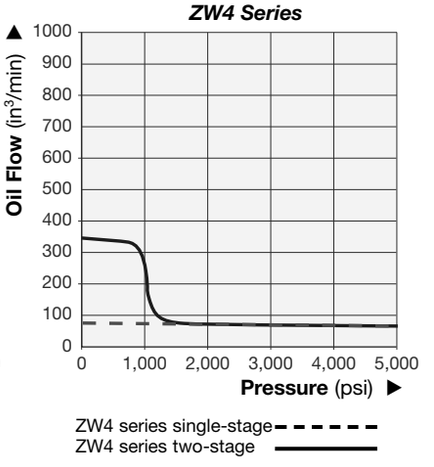
▼ FLOW CHARTS

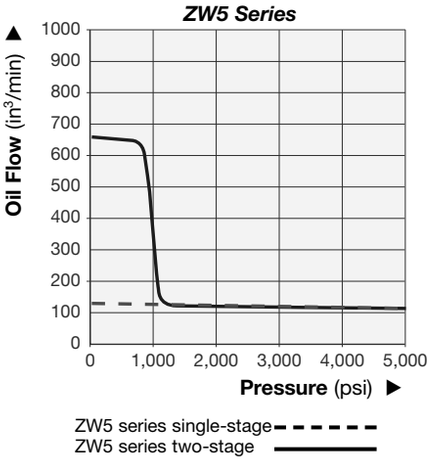












▼ PERFORMANCE CHART

Pump Series	Operation	Output Flow Rate (in³/min)				Motor Size		Relief Valve Adjustment Range (psi)	Sound Level (dBA)
		100 psi	700 psi	5,000 psi	10.000 psi	hp	RPM		
ZE3	**Single-stage**	43	43	42	40	1.0	1750	1,000 - 10,000	75
	Two-stage	450	385	42	40				
ZE4	**Single-stage**	64	64	62	60	1.5	1750	1,000 - 10,000	75
	Two-stage	650	600	62	60				
ZE5	**Single-stage**	128	126	123	120	3.0	1750	1,000 - 10,000	75
	Two-stage	850	825	123	120				
ZE6	**Single-stage**	220	215	210	200	7.5	3450	1,000 - 10,000	80
	Two-stage	900	890	210	200				
ZW4	**Single-stage**	64	63	60	NA	1.0	1750	1,000 - 5,000	75
	Two-stage	350	305	60					
ZW5	**Single-stage**	128	126	120	NA	1.5	1750	1,000 - 5,000	75
	Two-stage	650	602	120					

Output flow rate is listed at 60 Hz.
Flow rate will be approximately 5/6 of these values at 50Hz.

4.2 Pump Mounting

Refer to Figure 3 for mounting dimensions to secure the pump to a fixed surface.

	1, 2 Gal. (4-8 L) in. (mm)	2.5 Gal, (10 L) in. (mm)	5 Gal, (20 L) in. (mm)	10 Gal, (40 L) in. (mm)
A	9.46 (240)	12.0 (305)	16.6 (421)	19.9 (505)
B	3.75 (95)	11.0 (279)	15.6 (396)	18.9 (480)
C	16.28 (414)	17.6 (446)	17.6 (446)	17.6 (446)
D	9.00 (229)	12.0 (305)	12.0 (305)	12.0 (305)
E	2.86 (73)	0.5 (13)	0.5 (13)	0.5 (13)
F	3.64 (92)	2.8 (71)	2.8 (71)	2.8 (71)
G	M8 x 1.25	Ø .34 (8.6) diameter through hole 0.25 (6) deep		

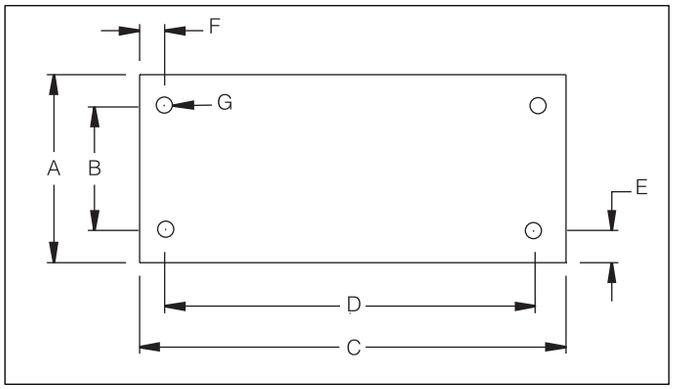


Figure 3

4.3 Electrical Connections

THE PUMP IS FACTORY EQUIPPED WITH THE COMMON ELECTRICAL PLUG FOR A GIVEN VOLTAGE, ALTERING THE PLUG TYPE SHOULD ONLY BE DONE BY A QUALIFIED ELECTRICIAN, ADHERING TO ALL APPLICABLE LOCAL AND NATIONAL CODES.

1. The disconnect and line circuit protection to be provided by customer. Line circuit protection to be 115% of motor full load current at maximum pressure of application (see Figure 1).
2. For more information, refer to pump name plate for power rating.

4.4 Fluid Level

Check the oil level of the pump prior to start-up, if necessary add oil by removing the SAE #10 plug from the cover plate (see Fig. 2). The reservoir is full when the oil level reaches the top of the sight glass. (Fig. 4).

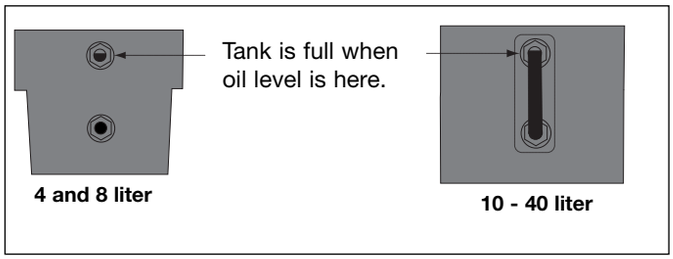
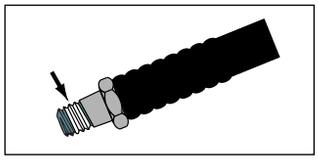


Figure 4

IMPORTANT: Add oil only when all system components are fully retracted, or the system will contain more oil than the reservoir can hold.

4.5 Hydraulic Connections



Apply 1-1⁄2 wraps of Teflon tape or other suitable sealant to the hydraulic hose fitting, leaving the first complete thread free of tape or sealant as shown in Figure 5.

Figure 5

Thread hose(s) into outlet port(s) of the valve (see valve body for port identification).

Extend hose to valve port “A”

Retract hose to valve port “B” (if applicable).

Gauge to valve port “GA, GB, or GP”.

(“GA” measures “A” port pressure, “GB” measures “B” port pressure, “GP measures pump pressure down stream of system check).

5.0 OPERATION

Warning: Pumps with optional pressure transducer, review sections 5.7, 6.4 A-B, and 6.5 A-C on “AUTOMODE” before starting pump.

Warning: Pumps with optional pressure switch, review sections 5.8 before starting pump.

1. Check the oil level of pump and add oil if necessary.
2. Make sure the shipping plug has been removed and the breather cap is installed. (See section 4.1)
3. Place manual control valve (if equipped) in the Neutral position.
4. Connect unit to power. Wait 2 seconds (LCD units, wait until "OK" is displayed) before pressing any button on shroud or pendant. NOTE: During the boot sequence, the microprocessor identifies any button operation as a potential malfunction and prevents the motor from starting. Reset by disconnecting power for 10 seconds.
5. For motor On/Off and valve operation, see sections 5.1 – 5.6 for your specific configuration instructions.

5.1 Manual Valve Operation

VM32 (See Fig. 6)

1. Advance
2. Retract

Shroud On/off=
Toggle Motor On or Off

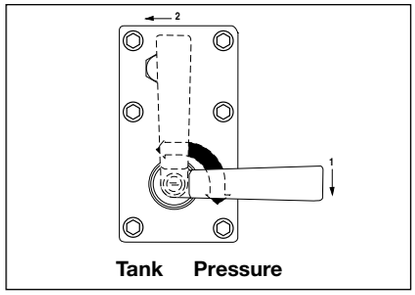


Figure 6

VM33, VM33L, VM43, VM43L (See Fig. 7)

1. Advance
2. Retract
3. Neutral

Shroud On/Off =
Toggle Motor On or Off

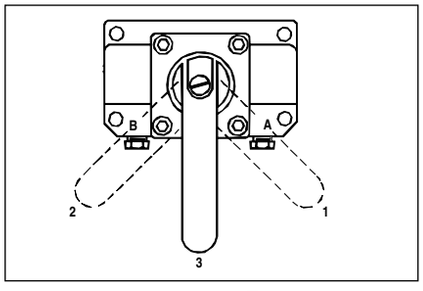


Figure 7

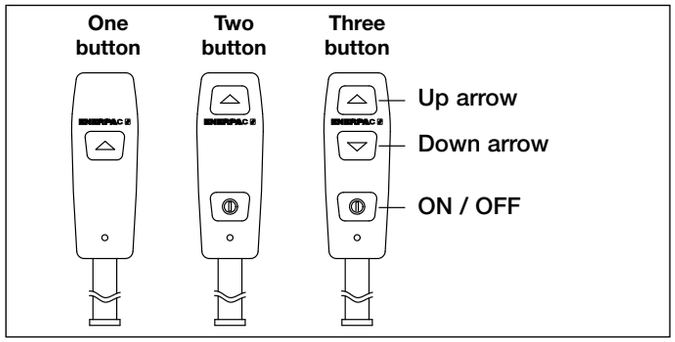


Figure 8, Pendant Button Variations

5.2 VE33 and VE43 Electric Valves with 3-Button Pendant Operation

Also known as a Remote Pump - oil flow and motor are both controlled by the pendant (see Fig. 8).

1. Up Arrow = Momentary Advance
2. Down Arrow = Momentary Retract
3. On/Off = Toggle Motor On or Off

Shroud On/Off = Toggle motor On or Off

5.3 VE32D Electric Valve with 1-Button Pendant Operation

Also known as a Dump Pump - Oil flow and motor are both controlled by the pendant. The pump will run and the cylinder will advance when the pendant button is pressed. Releasing the button will stop the pump and the cylinder will retract automatically (see Fig. 8).

1. Up Arrow = Momentary Advance

Shroud On/Off = Toggle Motor Off Only

5.4 Valves with foot switch (see Fig. 9)

A. All valves except VE32D

1. Momentary advance or motor on
2. Momentary retract (if applicable)

Shroud On/Off = Toggle Motor On or Off

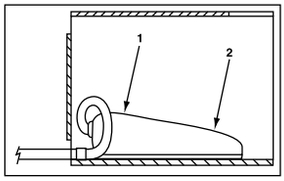


Figure 9

B. VE32D valves

1. Not used
2. Momentary advance

Shroud On/Off = Toggle Motor Off

5.5 Automatic Pump Operation With Pressure Transducer Option

In addition to the normal operation details listed above, pumps with the optional pressure transducer have the ability to react automatically at a user-defined pressure value. The specific operation of the motor / electric valve is factory set by pump model. See the “Pump-Model-Matrix”, Page 16, Table 3 for details by pump model number. See section 6.4 A-B and 6.5 A – C for setting the pressure values.

A. AUTOMODE

1. AUTOMODE OFF

The pump displays pressure as a simple pressure gauge, no additional actions will be performed regardless of HI PRESS and LO PRESS values. Note: The normal operations menu shows “OK” in the text area when AUTOMODE is set to OFF.

2. AUTOMODE ON withLO PRESS OFF

When the HI PRESS pressure value is reached, the pumps will either shift the valve (VE33 and VE43 electric valve) or turn the motor off. Note: The main operations menu text will change from “OK” to “AUTO” to notify the operator that the pump WILL take control when the HI PRESS pressure value is reached.

3. AUTOMODE ON and LO PRESS greater than 0

The pump will de-energize the motor / electric valve when the HI PRESS value is reached and re-energize the motor / electric valve when the LO PRESS value is reached, acting as a pressure make up pump. Note: For an additional notice to the operator, the main operations menu text will change from “AUTO” to “AUTO ON” and the LCD backlight will flash when the pump reaches HI PRESS and takes control of making up pressure.

Warning: When the LCD backlight is flashing and “AUTO ON” is displayed, the pump will automatically start the motor or energize the valve to rebuild system pressure without input from the operator. Set “AUTOMODE” to off and disconnect electrical power to pump before working on pump or hydraulic system.

a. Control Buttons

i. Before “HI PRESS” value is reached:

Pendant buttons and shroud On / Off button function as described in sections 5.1 – 5.4.

ii. After “HI PRESS” value is reached:

Press and release any button on pendant (if applicable) or shroud stops the automatic cycle and “AUTO” is shown on the LCD. (Pressing the pendant Down-Arrow (if applicable) will also retract the cylinder. Pressing the motor On/Off button will also de-energize the motor).

To restart the automatic cycle, press and release the pendant Up-Arrow button (if applicable) or the motor On/Off button (See section 5.1– 5.4).

Caution: Due to motor coast down, valve shift time, and system oil capacitance, always set the user adjustable relief valve 200 psi above the “SET PRES” or “HI PRESS” value to prevent pressure spikes.

5.6 Automatic Pump Operation With Pressure Switch Option

With the optional pressure switch installed, the electric motor will automatically stop and re-start at a user defined setting. This setting is entered via the pressure switch adjusting screw.

1. Connect unit to power, the LCD will show “OK”.
2. Operate pump via section 5.1 - 5.4.
3. When the “A” port pressure reaches the user defined limit, the pressure switch opens, the motor is de-energized, the LCD screen shows “AUTO ON” and the back light will flash (the microprocessor is now aware that a pressure switch is controlling the pump).

Warning: When the LCD backlight is flashing and “AUTO ON” is displayed, the hydraulic system is under pressure and the pump will automatically start the motor to rebuild system pressure without input from the operator. Release hydraulic pressure and disconnect electrical power to pump before working on pump or hydraulic system.

4. When the “A” port pressure drops 115-550 psi, the pressure switch closes and the motor is re-energized.
5. Pressing and releasing any button on the pendant (if applicable) or shroud will stop this automatic cycle.
   a. If the pressure switch is closed (motor energized) when the button is pressed, “AUTO” is shown on the LCD.
   b. If the pressure switch is open (motor de-energized) when the button is pressed, “P Switch Open” is shown on the LCD.
   c. Pressing the motor activation button (Section 5.1 - 5.4) reactivates the automatic pressure switch operation.

d. Pressing the pendant Down-Arrow (if applicable) will also retract the cylinder.

5.7 Relief Valve Adjustment

Z-Class pumps are equipped with one user adjustable relief valve (see Figure 10.) It can be adjusted as follows:

1. Install a gauge on the pump. If a unit is equipped with optional pressure transducer, verify AUTOMODE is off. (See section 6.1C for more details).
2. Start the pump to allow the oil to warm.
3. Loosen the set screw locking nut.
4. Shift the control valve and build pressure in the system. Using an Allen wrench, turn the set screw counter-clockwise to decrease pressure and clockwise to increase pressure.

   NOTE: To get an accurate setting, decrease the pressure to a point below the final setting and then slowly increase the pressure until it reaches the final setting.
5. Tighten the locking nut when the desired pressure is set.
6. Shift the control valve to the neutral position, allowing the system pressure to return to 0 psi.
7. Recheck the final pressure setting by shifting the control valve and pressurizing the system.

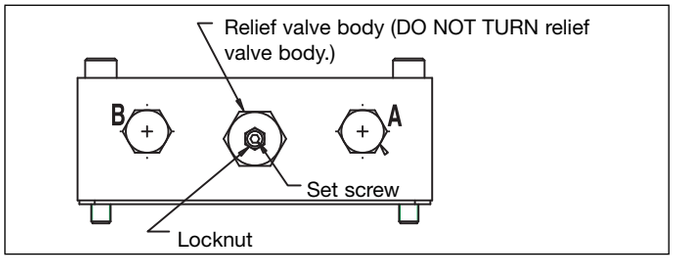


Figure 10

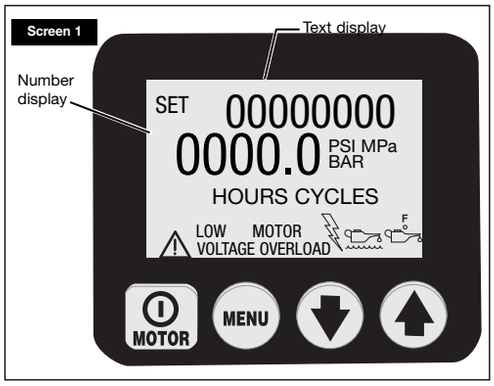
6.0 LCD ELECTRICAL USE INSTRUCTIONS

The LCD version of the Z-class Pump is driven and operated by a set of two boards: the Power Board (PB) and the Control Board (CB), connected to each other by a flat cable.

On the PB are the terminals for the main power supply, the motor power supply and all peripherals such as fan, valve solenoids, pendant, pressure switch, pressure transducer, oil temperature switch, and oil level switch. The PB also contains the transformer, circuit breaker, rectifier and drivers.

CAUTION: The CB is an electrostatic sensitive device. Special care has to be taken while handling this board (i.e.: ESD wristbands).

6.1 LCD Function



Besides the pendant, which is used to switch the motor on/off and operate the valves, the CB with its four-button switches is the main interface between the operator and the pump. With the use of these four-button switches all functions and settings that are described in the following can be activated.

CAUTION: Make sure that the plastic overlay, that protects the LCD screen and the button switches, is not broken or otherwise damaged. Never punch the button switches with a sharp or pointed instrument, use fingertips only. Clean the overlay regularly with a damp cloth; never use aggressive or abrasive detergents.

A. Boot Sequence

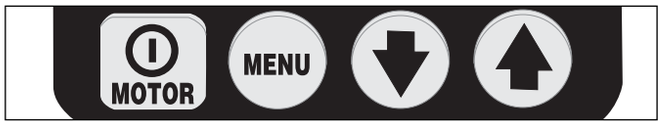
When the pump is connected to electrical power the LCD screen will show: “FIRMWARE” x.x for 1 second, then “Model xx" for 0.5 seconds, and then "Motor UN/1P/3P" for 0.5 seconds. Additional information may appear depending on model and installed accessories. See section 8.0 for more detailed information.

This is setup information about your pump that maybe needed for service. The boot sequence is finished successfully when the text display on the LCD screen shows “OK” (sequence takes approximately 2 seconds).

The micro-controller will automatically recognize the optional pressure transducer (if equipped). In this case the reading after the boot process is “OK” in the text display and the current pump-pressure on the numeric display.

B. LCD Operational Buttons

The CB is equipped with four button switches, from left to right



On/Off / Menu / Down Arrow / Up Arrow

- The On/Off button toggles the motor ON and OFF. The motor OFF function is available on this button even if the pump is NOT in the local mode but is operated by using the pendant.
- The Menu button enables the operator to step from normal operational mode into menus. With repeated pressing the operator steps through the various menus. Pressing the Menu button also saves any changes made. To return to the normal operational mode, press and hold the Menu button for two seconds or don’t push any button for 60 seconds.
- The Down Arrow and Up Arrow buttons serve two purposes. When the display shows one of the menus, the Down Arrow and Up Arrow buttons are used to step through the menu’s options. When the pump is placed in Local Mode, the Down Arrow and Up Arrow buttons switch the B and A electric solenoids (the pendant is non-operational in local mode).

C. Menus Available

The software provides the operator with the following Menus:

- ***Units*** - this menu is only available when the optional pressure transducer is installed. Set the pressure units to PSI / BAR / MPa, with psi being the default setting.

  The hidden menus for "AUTOMODE" (HI PRESS and LO PRESS) and Calibration of the digital gauge are accessed from this menu.
- ***Motor*** - display the motor hour meter and on/off cycle counter (nonresetable)
- ***Low Volt*** - display the low voltage hour-meter (nonresetable)
- ***Advance*** - display the Advance solenoid hour meter and on/off cycle counter (nonresetable)
- ***Retract*** - display the Retract solenoid hour meter and on/off cycle-counter (nonresetable)
- ***Local*** - set the pump local mode on/off

- ***Language*** - set the language of the display to English / Spanish / French / Italian / German / Portuguese, with English being the default setting
- ***Diagnose*** – display to show input signals from the pendant and other electrical accessories

6.2 Fault Conditions

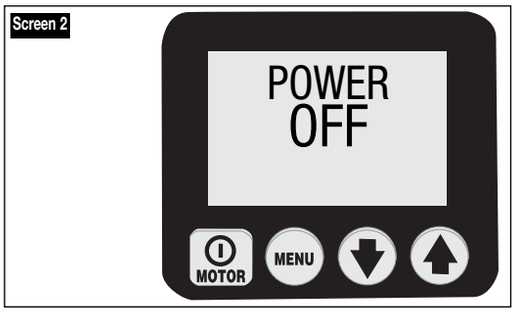
Any fault will shut down and prevent pump from starting.

A. Clearing a Fault Condition from the LCD

After the fault causing problem has been corrected, clear the fault message from the LCD by disconnecting electrical power from the pump, wait until all characters clear the LCD (~ 10 seconds), then reconnect power.

B. Power Failure

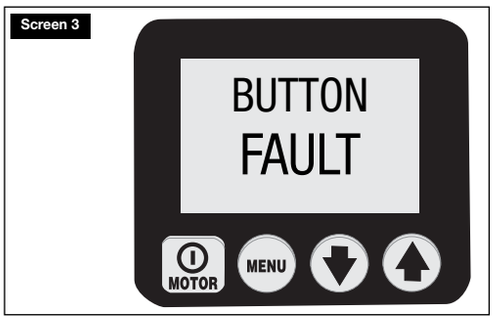
Display: "POWER OFF"



The Power Off fault is displayed when the main power supply drops to 65% or less of nominal voltage. The pump will automatically shut off the valves and the motor, and display “Power Off” on the LCD. NOTE: Power Off is also displayed for several seconds after the unit is disconnected from electrical power.)

C. Button Fault

Display: "Button Fault"

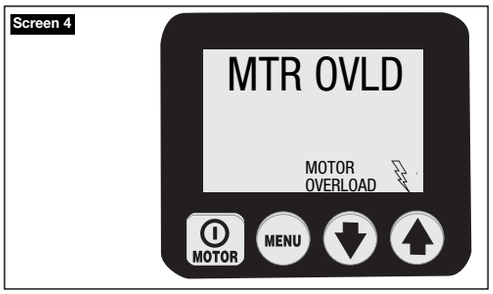


The Button Fault is displayed when the microprocessor detects any button press during the boot sequence or if shroud on/off button is held in for more than 3 seconds.

D. Motor Overload

Display: "MTR OVLD"

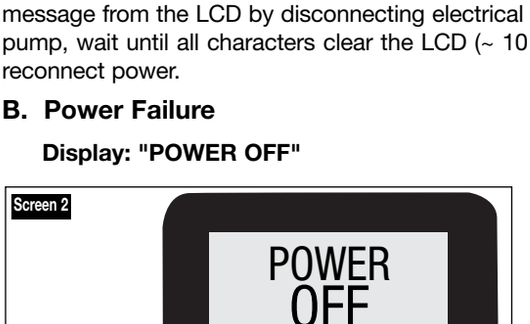
Motor Overload



The Motor Overload fault is displayed when the electric current drawn by the motor exceeds the pre-set limit of the internal circuit breaker. (The internal circuit breaker will automatically reset once the condition has been corrected; however, the operator must clear the fault and then press the motor on/off button to restart the motor).

E. Oil Temperature (requires optional float/temperature switch)

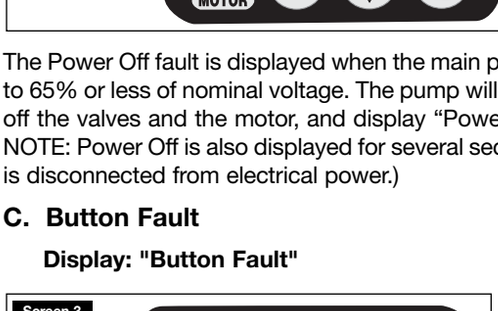
Display: "OIL TEMP"



The Oil Temperature Fault is displayed when the temperature of the oil inside the reservoir exceeds 175 °F (80 °C).

F. Oil Level (requires optional level / temperature switch)

Display: "OIL LEVEL"



The Oil Level Fault is displayed when the oil level inside the reservoir drops below 1.3" (34 mm) from bottom.

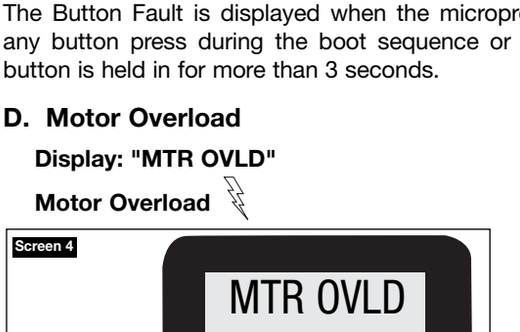
6.3 Warning Conditions

All warnings notify operator of abnormal operating condition, however, allow pump to continue operating. Warnings will automatically clear once issue has been resolved.

A. Low Voltage

Display: "LOW VOLT"

⚠ Low Voltage



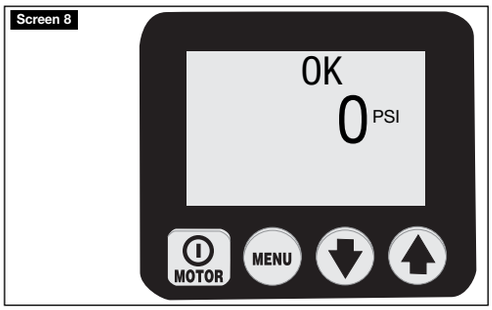
A “Low Voltage" condition is defined as an operating condition with the main power supply is at or below 80% of nominal voltage. While running the pump under this condition, the “Low Voltage” signal will flash on the LCD and the Low Voltage hours will be counted and stored on the control board. Normal pump operation is still provided.

CAUTION: For optimized pump performance it is recommended NOT to run the pump at Low Voltage condition.

6.4 LCD Menus

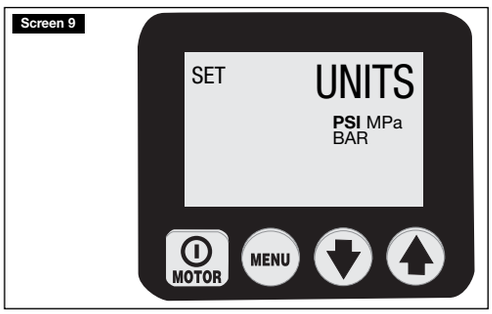
(Also refer to Table 1, Quick Reference Chart (QRC) located after Section 9.0)

A. Normal Operation



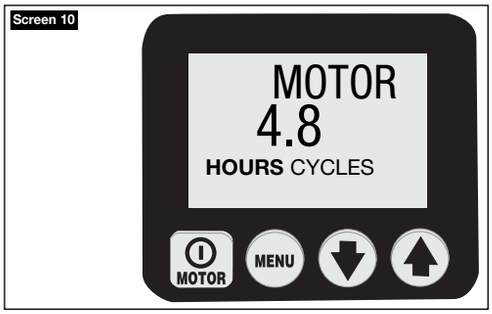
(See Screen 8.) LCD screen on a Z-class pump. CB has booted successfully (OK); the pressure reading is 0 psi. Enter into the menus by pressing the Menu button. See QRC step #1.

B. "Units" Menu



(See Screen 9.) This screen allows the operator to set the unit of pressure-measurement by pressing the Down (Up) Arrow buttons. PSI, BAR, Mpa are the options with PSI being the default. Save setting and step forward by pressing the Menu button. See QRC step #2.

C. "Motor" Menu



(See Screen 10.) This screen allows the operator to read the number of hours (On/Off cycles) the motor has been operated. Toggle between hours and cycles by pushing either the Down or Up Arrow button. Step forward by pressing the Menu button. See QRC step #3.

General note for all hour and cycle displays:

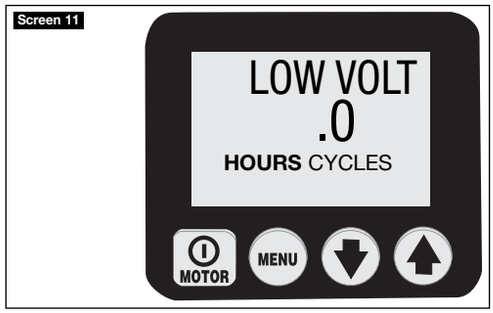
HOURS DISPLAYED

- up to 9999.9 the display will show decimal hours
- between 10,000 - 99,999 whole hours will be displayed (decimal "." is not displayed).
- over 99,999 hours the meter starts over at 0.0 reading decimal hours

CYCLES DISPLAYED

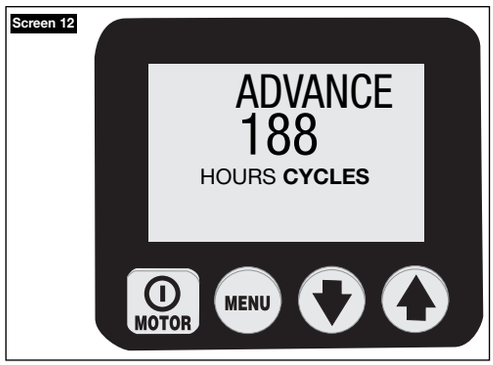
- over 99,999 cycles the meter starts over at 0

D. "Low Volt" Menu



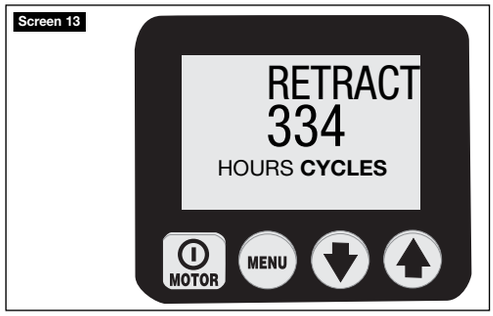
(See Screen 11.) This screen allows the operator to read the number of hours the pump has been operated in low-voltage condition. Step forward by pressing the Menu button. See QRC step #4.

E. "Advance" Menu



(See Screen 12.) This screen allows the operator to read the number of hours (On/Off cycles) the Advance solenoid has been operated. Toggle between hours and cycles by pushing either the Down or Up Arrow buttons. Step forward by pressing the Menu button. See QRC step #5.

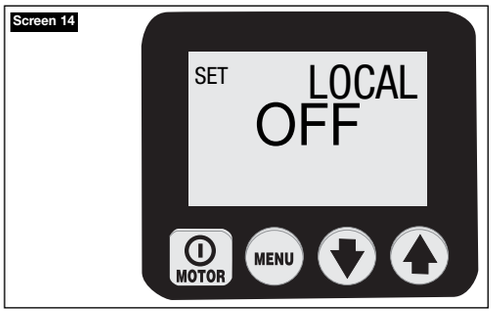
F. "Retract" Menu



(See Screen 13.) This screen allows the operator to read the number of hours (On/Off cycles) the Retract solenoid has been

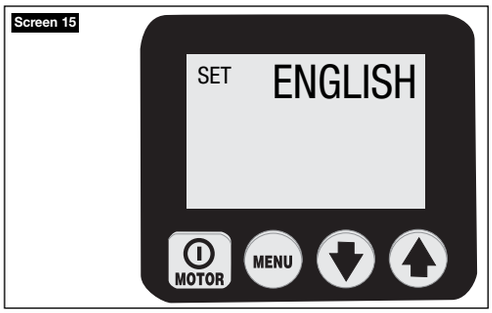
operated. Toggle between hours and cycles by pushing either the Down or Up Arrow button. Step forward by pressing the Menu button. See QRC step #6.

G. "Local" Menu



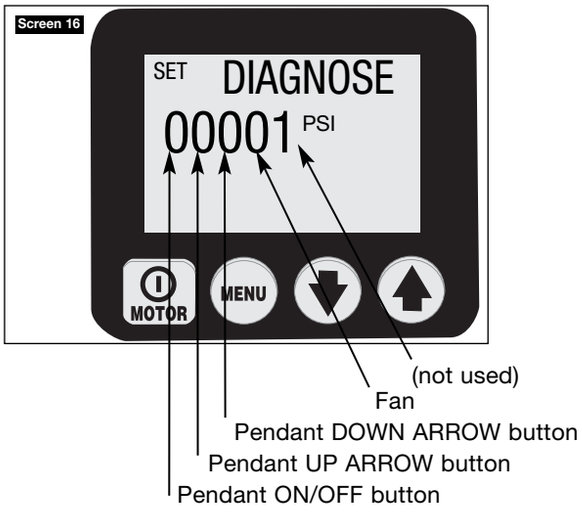
(See Screen 14.) This screen allows the operator to toggle the Local mode ON or OFF, default is OFF. With Local mode ON, the shroud buttons replace the pendant buttons as the method to operate the pump (NOTE: The word "Local" replaces "OK" on the "Normal Operations" display and the pendant buttons become deactivated). Local mode will provide operation of the pump if the pendant or pendant cord is damaged. Toggle Local mode ON or OFF by pressing the Down (Up) Arrow button. Save setting and step forward by pressing the Menu button. See QRC step #7.

H. "Language" Menu

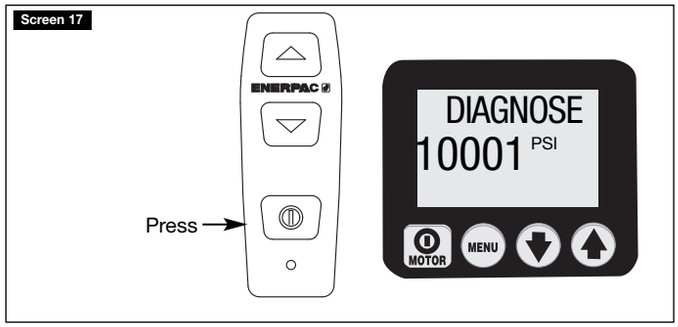


With a language shown on the text display the operator can change the display language by pressing the Down (Up) Arrow buttons. Save setting and step forward by pressing the Menu button. See QRC step #8.

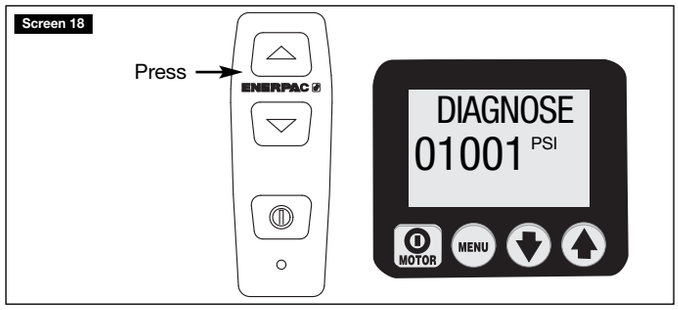
I. "Diagnose" Menu



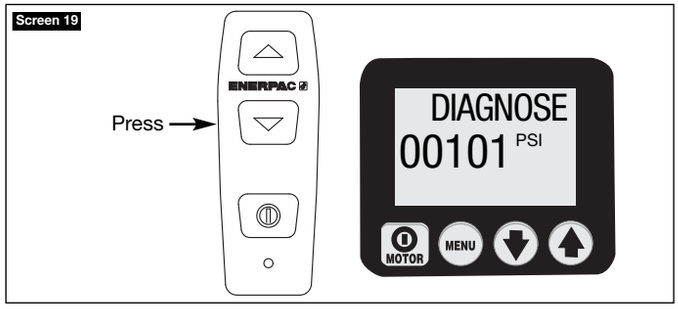
(See Screen 16.) This screen allows the operator to troubleshoot several pendant problems by displaying if the microprocessor has received a signal from the pendant button. No signal indicates the problem is most likely with the pendant keypad or pendant cord. Use Local mode to operate pump until problem can be corrected. See QRC step #9.



(See Screen 17.) Diagnose screen with Pendant motor button pushed.



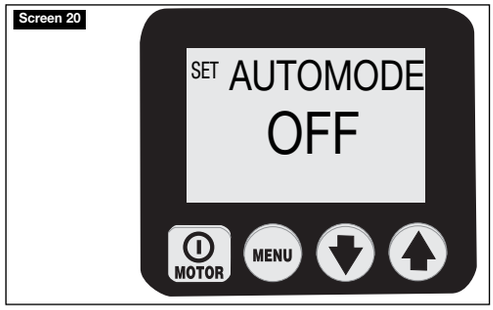
(See Screen 18.) Diagnose screen with Pendant Advance button pushed.



(See Screen 19.) Diagnose screen with Pendant Retract button pushed.

6.5 LCD Hidden Menus - available when the optional pressure transducer is installed

A. "AUTOMODE" Menu



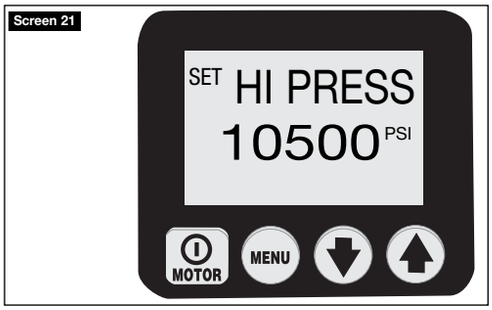
(See Screen 20.) This screen allows the operator to toggle Off and On the pump's ability to automatically control motor / electric valve functions. To access this menu, go to the "UNITS" menu, then press and hold the ON/OFF button in for 7 seconds, ENTRY CODE will appear. Then press and hold ON/OFF and Up-Arrow buttons for 7 seconds.

OFF - the pump displays pressure as a simple pressure gauge, no additional actions will be performed.

ON – the pump will de-energize or energize the motor / electric valve when the hydraulic pressure reaches operator defined

levels, similar to a pressure switch pump. These levels are set in two menus (HI PRESS and LO PRESS) that become available when AUTOMODE is ON. The main operating menu text will change from “OK” to “AUTO” to notify the operator that the pump will take control when certain limits are met. The specific operation of the motor / electric valve is factory set by pump model. See the “Pump-Model-Matrix”, Page 15, Table 3 for details by pump model number.

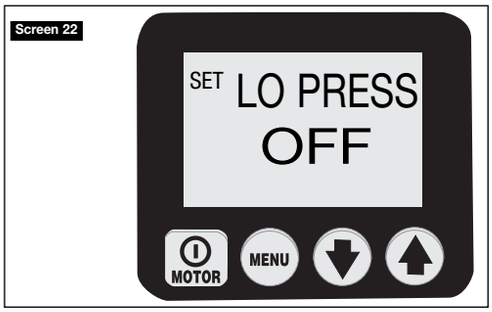
B. “HI PRESS” Menu



(See Screen 21.) This screen allows the operator to set the high-pressure limit for the pump to de-energize the motor / electric valve. Maximum value is 10,500 psi.

Caution: Due to motor coast down, valve shift time, and system oil capacitance, always set the user adjustable relief valve 200 psi above the “HI PRESS” value to prevent pressure spikes.

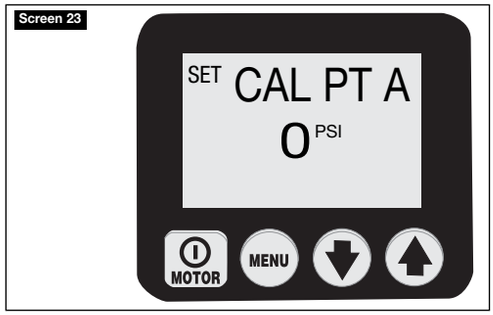
C. “LO PRESS” Menu



(See Screen 22.) This screen allows the operator to set the low-pressure limit for the pump to re-energize the motor / electric valve. Maximum value is 50 psi less than the current HI PRESS value. When LO PRESS is set to a value higher than OFF, the pump will operate like a pressure switch pump, de-energizing the motor / electric valve at the HI PRESS value and re-energizing the motor / electric valve at the LO PRESS value. For an additional notice to the operator, when pump is latched into this “pressure switch” mode, the operating menu text will change to “AUTO ON” and the LCD back light will flash.

Caution: Setting the LO PRESS value too close to the HI PRESS value may cause the pump to cycle on and off too often. Frequent starting and stopping of the motor will increase wear and reduce the life of the pump. Use appropriate valving in the hydraulic circuit to ensure that the pump does not cycle on and off more than 3 times per minute.

D. “Calibration ” Menu



(See Screen 23.) This screen allows the operator to adjust the pressure value shown on the LCD to match a master gauge. To access this menu, go to “UNITS” menu.

Then press and hold the ON/OFF button in for 7 seconds, ENTRY CODE will appear. Then press and hold both Down-Arrow and Up-Arrow buttons for 7 seconds. See Table 2 “Z-Class Pump Calibration” for adjustment steps.

7.0 MAINTENANCE

Frequently inspect all system components for leaks or damage. Repair or replace damaged components. Electrical components, for example, the power-cord, may only be repaired or replaced by a qualified electrician, adhering to all applicable local and national codes.

7.1 Check Oil Level

Check the oil level of the pump prior to start-up, and add oil, if necessary, by removing the fill port cap. Always be sure cylinders are fully retracted before adding fluid to the reservoir. See Figure 2.

7.2 Change Oil and Clean Reservoir

Enerpac HF oil is a crisp blue color. Frequently check oil condition for contamination by comparing pump oil to new Enerpac oil. As a general rule, completely drain and clean the reservoir every 250 hours, or more frequently if used in dirty environments.

NOTE: This procedure requires that you remove the pump from the reservoir. Work on a clean bench and dispose of used oil according to local codes.

1. Unscrew the 13 bolts holding the coverplate to the reservoir and lift the pump unit out of the reservoir. Be careful not to damage the filter screen.
2. Pour all oil out of the reservoir.
3. Thoroughly clean the reservoir and reservoir magnet with a suitable cleaning agent.
4. Remove the pick-up filter screen for cleaning. (Do not pull on the screen or the bottom of the intake to avoid possible damage.) Clean the screen with solvent and a soft brush. Reinstall.
5. Reassemble the pump and reservoir, installing a new reservoir gasket.
6. Fill the reservoir with clean Enerpac hydraulic oil. The reservoir is full when oil level is in middle of the sight gauge (see figure 4).

7.3 Changing the Filter Element (optional)

A return line filter may be ordered as an accessory to the pump. The filter element should be replaced every 250 hours, or more frequently in dirty environments. The filter manifold is equipped with a 25 psi (1,7 bar) bypass to prevent over pressure rupture if filter plugging occurs. Filter element replacement part number is PF25.

8.0 ACCESSORY INSTALLATION

The pressure transducer, heat exchanger, pressure switch, pendant / foot switch, valve solenoids (A) and (B) are supplied with connectors that plug into the proper plug-ins found on the electrical power board (Figure 11).

For further information and instructions on accessories see the following web links:

Pressure Transducer
http://www.wika.de/pdf/betriebsanleitungen/ba_m_1x.pdf

Level/Temp Switch
http://www.barksdale.com/products/level/PDF_level/Pg02_7.pdf
http://www.barksdale.com/products/templ/PDF_temp/ml1s.pdf

Pressure Switch
http://www.barksdale.com/products

Heat Exchanger
http://nmbtc.com/ (in the menu bar slide the mouse over "products" and watch a sub-menu to show up. Click on "cooling solutions", click on "product catalog" in the list on the right-hand side and again click on "dc fan". In the following dialogue-screen enter 5920PL-05W-B40 into the Search-field and click "go".)

8.1 Pressure Transducer Installation (Requires LCD Electric. Not compatible with pressure switch option.)

Install pressure transducer into desired gauge port on valve manifold. "GA" measures "A" port pressure, "GB" measures "B" port pressure (if applicable), and "GP" measures pump pressure before the control valve. NOTE: Factory installed pressure transducers use port "GA".

Disconnect unit from power supply before opening electrical box. Remove LCD half and one small hole plug from back panel. Route wire through back panel, connect to power board (see figure 11), and secure strain relief. Install shroud half.

The microprocessor will automatically detect the pressure transducer and add the "Units" and "AUTOMODE" menus during the following power up. Initial pressure transducer offset and gain values are permanently stored in the microprocessor memory and allow the pressure transducer to be used without further setup. If refinement is needed to certify the LCD reading to a master gauge, see Table 2 for calibration procedure when using port "GA". "Contact Enerpac on procedure changes when using port "GB" or "GP".

NOTE: Pump models with remote VE33 or VE43 electric valves, boot sequence will also show "PRES PORT (A/B)", A = GA, B = GB. This is the pressure port the microprocessor is programmed for the pressure transducer to measure. The location of the pressure transducer must match this value for proper operation of AUTOMODE. Factory default is A. Contact Enerpac Technical Service for procedure to move pressure transducer setting to B port.

Variable Rate Display of Pressure

The pressure transducer is very accurate and measures pressure real time. To aid the operator when pressure is changing rapidly, Z-Class provides a variable rate display.

Pressure values are updated 5x per second on the display.

The microprocessor will automatically change the increment value based on rate of pressure change, increments are 50, 100, 500, and 1000 psi. When the rate of pressure change is slow, the display will update in 50 psi increments. When it changes rapidly, the display will update in 1000 psi increments.

8.2 Pressure Switch Installation (Requires LCD Electric. Not compatible with pressure transducer option, electric valves, or locking manual valves)

Install pressure switch onto desired gauge port on valve manifold. “GA” measures “A” port pressure, “GB” measures “B” port pressure (if applicable), and “GP” measure pump pressure before the control valve. Note Factory installed pressure switches use port “GA”.

Disconnect unit from electrical power supply before opening electrical box. Remove LCD half and one small hole plug from back panel. Route pressure switch wire through back panel, connect to power board (see figure 11), and secure strain relief. Install shroud half.

9.0 TROUBLESHOOTING (SEE TROUBLE-SHOOTING GUIDE)

Only qualified hydraulic technicians should service the pump or system components. A system failure may or may not be the result of a pump malfunction. To determine the cause of the problem, the complete system must be included in any diagnostic procedure.

The following information is intended to be used only as an aid in determining if a problem exists. For repair service, contact your local Authorized Enerpac Service Center.

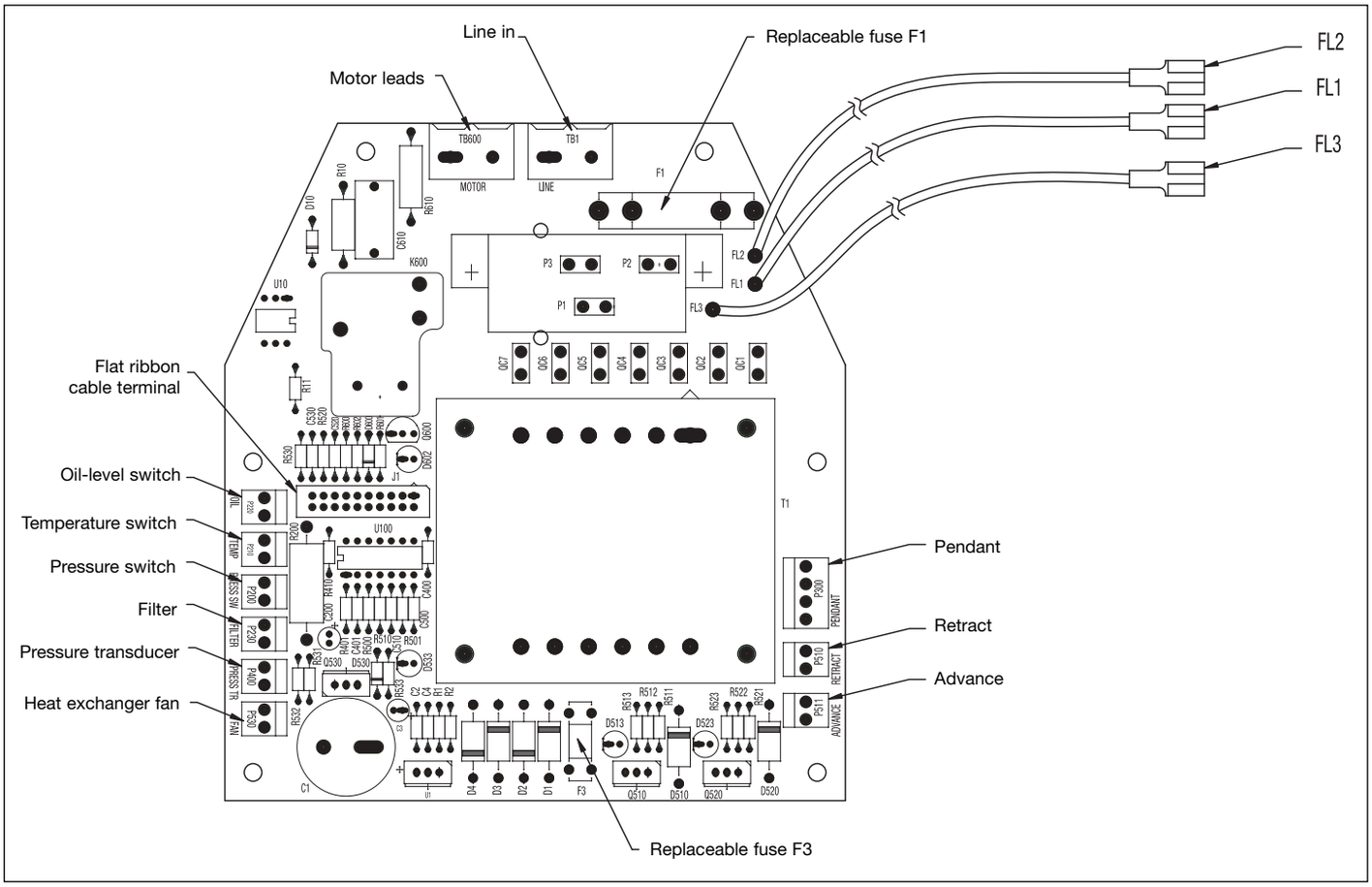


Figure 11, Electric Power Board Configuration

Trouble-shooting Guide		
Problem	**Possible Cause**	**Action***
Pump will not start	Fault condition	See section 5.0 Operation and 6.2 Fault Conditions for details
Pendant does not function	Pump in local mode Pendant damage	See Section 6.4G, Local Menu See Section 6.4I, Diagnose Menu See authorized service center
Motor stops under load	Low voltage	See Section 6.2B and 6.3A Turn off other electric loads Use heavier gauge extension cord
Electric valve will not operate	No power or wrong voltage Solenoid cable disconnected or damaged Valve out of adjustment	Connect to correct power source per pump name plate Connect, repair, or replace cable See authorized service center
Pump fails to build pressure or less than full pressure	Low oil level Relief valve set too low External system leak Internal leak in pump Internal leak in valve Internal leak in system component	Add oil per section 4.4 Adjust per section 5.7 Inspect and repair or replace See authorized service center See authorized service center See authorized service center
Pump builds full pressure, but load does not move	Load greater than cylinder capacity at full pressure Flow to cylinder blocked	Reduce load or add cylinder capacity Check hydraulic couplers for full engagement
Cylinder drifts back on its own	External system leak Internal leak in a system component Non-load holding valve used	Inspect all hydraulic connections and replace or repair See authorized service center See authorized service center
Single-acting cylinder will not return	No load on a "load return" cylinder Return flow restricted or blocked Locking valve used Valve malfunction Cylinder return spring broken	Add load Check couplers for full engagement Run motor while retracting See authorized service center See authorized service center
Double-acting cylinder will not return	Return flow restricted or blocked Locking valve used Valve malfunction	Check couplers for full engagement Run motor while retracting See authorized service center
Pump runs hot	Advance or retract flow restricted High ambient temperature	Check couplers for full engagement Install heat exchanger for hydraulic oil
Pump pressure goes above "HI PRESS" value	Cylinder comes to a sudden stop (i.e., strokes out)	Set user adjustable relief valve 200 psi above "HI PRESS" valve to redirect excess oil flow.
AUTOMODE does not work correctly with VE33 or VE43 valves	Pressure transducer installed in pressure port other than GA	Move pressure transducer to “GA” (see section 8.1). Change microprocessor setting to “GB” (see Authorized Service Center).
After boot-up LCD shows "P switch open"	Pressure switch circuit is open and press transducer is installed	Check power board pressure switch jumper for being lose or missing (see Fig. 11). Remove pressure switch or pressure transducer from pump.
LCD display shows "FILTER"	Loose jumper on power board	Check power board for lose or missing jumper at filter (see fig. 11).

* For LCD versions, also see sections 6.2 Fault Conditions, 6.3 Warning Conditions and 6.4 LCD Menus.

Table 1, QRC : Quick Reference Chart

Step	Switch				Text display	Expected reading / symbol / status digital display	Units	Comments
	MOTOR	MENU	▼	▲				
1					OK			default reading "OK" after power on and boot sequence
2		X			UNITS		PSI	save previous setting and step forward to select units, default is psi
			X		"		BAR	step through units using either the Up or
			X		"		MPA	the Down Arrow button
			X		"		PSI	
								hidden menu
2a	X				UNITS			hold for 7 seconds
	X			X	ITEM	CODE		hold for 5 seconds
					AUTOMODE	ON/OFF		toggle between on and off using the Arrow-buttons
		X			HI PRESS	value of upper pressure limit for Automode		increase/decrease value by using the Arrow-buttons default value is 10500
		X			LO PRESS	value of lower pressure limit for Automode		increase/decrease value by using the Arrow-buttons default value is OFF
								hidden menu
2b	X				UNITS			hold for 7 seconds
			X	X	ITEM	CODE		hold for 5 seconds
					CAL PT A	0 psi		start calibration process, see calibration reference chart for further instructions
3		X			MOTOR	number of hours	HOURS	save previous setting and step forward to select hour-meter function
			X		"	number of cycles	CYCLES	
4		X			LOW VOLT	number of hours at low volt, read 0	HOURS	select low-voltage check function
5		X			ADVANCE	number of hours	HOURS	select hour-meter function
			X		"	number of cycles	CYCLES	only if solenoid valve is attached
6		X			RETRACT	number of hours	HOURS	select hour meter-function
			X		"	number of cycles	CYCLES	only if solenoid valve is attached
7		X			LOCAL	OFF		select local mode
			X		"	ON		toggle between on and off
			X			"	OFF	
8			X		ENGLISH			select language, default is English
			X		ESPANOL			
			X		FRANCAIS			step through languages using either
			X		ITALIANO			the Up- or the Down-Arrow button
			X		DEUTSCH			
			X		PORTUGUES			
			X		ENGLISH			save with Menu button
9		X			DIAGNOSE	00001		the digital display is expected to show processor inputs that are "turned on"
						10001		with pendant Motor-button pushed
						01001		with pendant Arrow-up button pushed
						00101		with pendant Arrow-down button pushed
						psi		psi-reading present, if pressure transducer is attached and has been recognized during boot-up
10		X			OK			hold for 2 seconds to return to "OK" run mode

Table 2, Z-class Pressure Transducer Calibration

No.	Operator action	LCD Reading		Comments
1	Connect master gauge to port A (Advance port) (also connect hand pump if applicable - see comments)			Note - There are two methods of producing the needed pressure in steps 11 and 15, using the pumps "Motor" or separate "Hand pump". Connect a hand pump only if it will be used to create pressure in steps 11 and 15, and verify Z-Class pump user adjustable relief valve is set higher than maximum pressure used is step 15.
2	Connect electrical power to pump.	FIRMWARE x.x, then "OK"	0 psi	Boot sequence
3	Firmware 5.5 and earlier - At main screen, press the Menu button once to display screen "SET PRES". Skip step 4.	SET PRES	xxxx psi	xxxx psi is the current pressure value of SET PRES
4	Firmware 5.6 and later - At main screen, press the Menu button once to display screen "UNITS". Skip step 3.	UNITS	psi	psi is the current unit of pressure measurement
5	Press and hold the ON/OFF button for seven seconds	ENTRY	CODE	First step into the hidden calibration mode
6	Press and hold the Arrow-up and Arrow-down button together for seven seconds	CAL PT A	0 psi	Start of calibration process. The advance-solenoid will be powered up to access the pressure transducer through valve-port A
7.a	"Motor" method - Open the pump's user adjustable relief valve and verify both pump LCD and master gauge read zero	CAL PT A	0 psi	Calibrate the zero-offset, point "A"
7.b	"Hand pump" method - Open the hand pump's user control valve and verify both pump LCD and master gauge read zero	CAL PT A	0 psi	Calibrate the zero-offset, point "A"
8	Press the Menu button to accept the pressure value into temporary memory	SAVE A	no	
9	Press one Arrow button to change from "no" to "yes"	SAVE A	yes	Confirm the pressure data should be stored to memory
10	Press the Menu button once	CAL PT B	2000 psi	Calibrating gain is done with two points, starting with point "B"
11.a	"Motor" method - Press and release the shroud's ON/OFF motor-button to switch the pump motor on. Reading the master gauge, apply a pressure of 2000 psi by closing the pump's user adjustable relief valve	CAL PT B	2000 psi	CAL PT B can be set at any pressure value greater than zero. First obtain the pressure value on the master gauge (ie 2250 psi) then use the arrow buttons to match the LCD value to the master gauge.
11.b	"Hand pump" method - Close the hand pump's control valve. Reading the master gauge, apply a pressure of 2000 psi	CAL PT B	2000 psi	CAL PT B can be set at any pressure value greater than zero. First obtain the pressure value on the master gauge (ie 2250 psi) then use the arrow buttons to match the LCD value to the master gauge.
12	Press the Menu button to accept the pressure value into temporary memory	SAVE B	no	
13	Press one Arrow button to change from "no" to "yes"	SAVE B	yes	Confirm the pressure data should be stored to memory
14	Press the Menu button once	CAL PT C	8000 psi	Calibrating gain is done with two points, finishing with point "C"
15	Reading the master gauge, apply a pressure of 8000 psi	CAL PT C	8000 psi	CAL PT C can be set at any pressure value greater than CAL PT B. First obtain the pressure value on the master gauge (ie 7500 psi) then use the arrow buttons to match the LCD value to the master gauge.
16	Press the Menu button to accept the pressure value into temporary memory	SAVE C	no	
17	Press one Arrow button to change from "no" to "yes"	SAVE C	yes	Confirm the pressure data should be stored to memory
18	Press the Menu button once	USE DFLT	off	Re-confirm calibration data. Leave "off" to proceed with new calibration data. Only set to "on" to change calibration data back to factory default settings. Press Arrow button to change.
19	Press the Menu button once	CAL PT A	0 psi	Save calibration data to permanent memory
20	Press and hold the Menu button for three seconds to step out of the calibration mode	OK	0 psi	Calibration complete, motor stops and electric valves release pressure.

Table 3, Z-class / LCD-version / Pump-Model-Matrix

								What happens when ____ button is pushed in normal operation mode ("OK" is displayed on LCD)				Available with Pressure Transducer Option				
								Pendant Button			LCD Panel Button	Action when HI_PRES (SET_PRES) value is reached	Max value for HI_PRES (SET_PRES)	Action when LO_PRES value is reached (NA - firmware 5.5 and earlier)	Max value for LO_PRES (NA - firmware 5.5 and earlier)	Additional comments
Pump No.	**Pump type**	**Pump type code**	**valve**	**pendant**	**foot switch**	**Item**		**Motor On/Off**	**Arrow down**	**Arrow up**	**Motor On/Off**					
1	**manual w/LCD**	**ZxxxxxLx ZxxxxxHx**	**any manual**	**none**	**NA**	Motor & Fan (if attached)		na - no pendant	na - no pendant	na - no pendant	toggle on/off	off	10,500 psi	on	50 psi less than HI_PRES current value. 0 means LO_PRES is turned off.	
2	**Adv / Hold / Ret**	**Zxx2xxSx**	**VE32**	**3-button**	**Option**	Motor & Fan (if attached)		na - disabled	na - disabled	momentary on (advance)	off	off	10,500 psi	on	50 psi less than HI_PRES current value. 0 means LO_PRES is turned off.	3 button pendant used but only Up and Down Arrow buttons are active
						Solenoid B		na - disabled	momentary on (retract)	na - disabled	off	off		na		
3	**Dump**	**Zxx1xxDx**	**VE32-D**	**1-button**	**Option**	Motor & Fan (if attached)		na - disabled	na - disabled	momentary on (advance)	off	off	10,500 psi	na - can not change LO_PRES value from off	na - can not change LO_PRES value from off	up-arrow now on the middle button-position, using pin #2 of pendant
						Solenoid A		na - disabled	na - disabled	momentary on (advance)	off	off		na - can not change LO_PRES value from off		
4	**TW-Enerpac**	**Zxx2xxTx-Ex**	**VE42-E TW**	**2-button**	**NA**	Motor & Fan (if attached)		toggle on/off	na - disabled	no change	off	na	Note - 11,600 psi	na - LO_PRES is not available on TW pumps	na - LO_PRES is not available on TW pumps	time out off (after 20 seconds of no advance button activity)
		Note - 11,600 psi				Solenoid A		off	na - disabled	momentary auto-cycle on/off (advance/retract)	off	switch off in auto-cycle to stop advancing		na - LO_PRES is not available on TW pumps		rapid valve cycle ~0.5 seconds after motor shut down command to release pump pressure after motor stops spinning
						Solenoid B		on (retract)	na - disabled	momentary auto-cycle on/off (advance/retract)	off	switch on in auto-cycle to start retracting		na - LO_PRES is not available on TW pumps		rapid valve cycle ~0.5 seconds after motor shut down command to release pump pressure after motor stops spinning
6	**remote 3/4-way**	**Zxx3xxSx Zxx4xxSx**	**VE33 / VE43**	**3-button**	**Option**	Motor & Fan (if attached)		toggle on/off	no change	no change	toggle on/off	when HI_PRES is reached only the valve shuts off, motor continues running	10,500 psi	na	na	Pump type 6 is the default factory setting. 0 means LO_PRES is turned off. Default manufacturer setting is AUTO MODE off & LO_PRES is 0
		ZxxxxxWx	**none**	**none**		Solenoid A		no change	off	momentary on (advance)	off	off		on	50 psi less than HI_PRES current value. 0 means LO_PRES is turned off	
						Solenoid B		no change	momentary on (retract)	off	off	off		off	na	

Table 3, Z-class / LCD-version / Pump-Model-Matrix

							What happens when _____ button is pushed in normal operation mode ("OK" is displayed on LCD)				Available with Pressure Transducer Option				
							Pendant Button			LCD Panel Button	Action when HI_PRES (SET_PRES) value is reached	Max value for HI_PRES (SET_PRES)	Action when LO_PRES value is reached (NA - firmware 5.5 and earlier)	Max value for LO_PRES (NA - firmware 5.5 and earlier)	Additional comments
Pump No.	**Pump type**	**Pump type code**	**valve**	**pendant**	**foot switch**	**Item**	**Motor On/Off**	**Arrow down**	**Arrow up**	**Motor On/Off**					
7	**TW**	**Zxx2xxTx**	**VE42-Q TW**	**2-button**	**NA**	Motor & Fan (if attached)	toggle on/off	na - disabled	no change	off	na	Note - 10,000 psi	na - LO_PRES is not available on TW pumps	na - LO_PRES is not available on TW pumps	time out off (after 20 seconds of no advance button activity)
		Note - 10,000 psi				Solenoid A	off	na - disabled	momentary auto-cycle on/off (advance/retract)	off	switch off in auto-cycle to stop advancing		na - LO_PRES is not available on TW pumps		rapid valve cycle ~0.5 seconds after motor shut down command to release pump pressure after motor stops spinning
						Solenoid B	on (retract)	na - disabled	momentary auto-cycle on/off (advance/retract)	off	switch on in auto-cycle to start retracting		na - LO_PRES is not available on TW pumps		rapid valve cycle ~0.5 seconds after motor shut down command to release pump pressure after motor stops spinning
8	**Jog**	**ZxxxxxKx**	**any manual**	**1 or 2-button**	**Option**	Motor & Fan (if attached)	toggle on/off	momentary on	momentary on	toggle on/off	off	10,500 psi	on	50 psi less than HI_PRES current value. 0 means LO_PRES is turned off.	safety feature: Arrow-up and arrow-down buttons switch off motor when pump is running on toggle-on