

# INSTALLATION, OPERATION AND MAINTENANCE INSTRUCTIONS

Project Name: \_\_\_\_\_

Serial Number: \_\_\_\_\_



**This manual shall always be kept close to the unit's location of operation or directly on the controller.**



**These operating instructions contain fundamental information and precautionary notes. Please read the manual thoroughly prior to installation of the unit, electrical connection and commissioning. It is imperative to comply with all other operating instructions referring to components of individual units.**

**NOTE: The information contained in this manual is intended to assist operating personnel by providing information on the characteristics of the purchase equipment.**

**It does not relieve the user of responsibility to adhere to local codes and ordinances and the use of accepted practices in the installation, operation, and maintenance of this equipment.**



**WARNING:**

Delta P Carver shall not be held liable or responsible for incorrect installation, wiring or operation of system. Please read the manual carefully and be sure to pay attention to new HMI (touchscreen menus) and drive parameters as these have changed.

Any questions should be directed to the factory or local representative:

**Delta P Carver**  
14 Sunshine Blvd.  
Ormond Beach, FL 32174  
(386) 236-0950

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# INSTALLATION, OPERATION AND MAINTENANCE INSTRUCTIONS

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## I. GENERAL DESCRIPTION AND SAFETY PRECAUTIONS.

### A. PURPOSE OF MANUAL.

This manual describes the operation of the Delta P Carver booster system.

The control panel consists of an Operator Interface Panel (OIP), a disconnect switch, motor branch circuit protection including Manual Motor Protectors (MMP's), a 24VDC power supply, and terminal blocks for customer connection if required.

**B. SAFETY PRECAUTIONS.** The manual is designed to provide adequate instructions for the safe and efficient installation, operation, or maintenance of the booster system. Failure or neglect to properly install, operate, or maintain the booster system may result in personal injury, property damage, or unnecessary damage to the booster system.

### C. SUMMARY OF SAFETY MARKING.

The safety instructions contained in this manual whose non-observance might cause hazards to persons are specially marked with the symbol:



General hazard sign to ISO 7000 - 0434.

This safety alert symbol will be used in this manual to draw attention to safety related instructions. When used, the safety alert symbol means: ATTENTION, BECOME ALERT! YOUR SAFETY IS INVOLVED! FAILURE TO FOLLOW THIS INSTRUCTION MAY RESULT IN A SAFETY HAZARD.

The word "DANGER" is used to introduce safety instructions whose non-observance could result in serious personal injury, death and/or property damage.

The word "WARNING" is used to introduce safety instructions whose non-observance may lead to property damage and serious personal injury.

The word "CAUTION" is used to introduce safety instructions whose non-observance may lead to damage to the machine and its functions.

Instructions attached directly to the machine, e.g.

- Arrow indicating the direction of rotation
- Markings for fluid connections must always be complied with and be kept in a perfectly legible condition at all times.

Observe all note, caution, warning or danger tags attached to the equipment or included in this manual.



**CAUTION**

### IMPORTANT SAFETY NOTICE

Installation, use and operating of pumping equipment are affected by various federal, state and local laws and the regulations concerning OSHA. Compliance with such laws relating to the proper installation and safe operation of the pumping equipment is the responsibility of the equipment owner and all necessary steps should be taken by the owner to assure compliance with such laws before operating the equipment.

**D. SAFETY INSTRUCTION DECAL.** The Delta P Carver booster system should have a safety instruction decal located on the front of the enclosure near the disconnect switch. If the decal is missing or illegible contact your Delta P Carver representative for a replacement.

**E. HAZARDOUS VOLTAGE.** Only qualified electricians should perform electrical service of any kind on the control panel or booster system. Visually inspect the control panel for loose or stranded wires and for damaged components or wires prior to performing electrical service. Never troubleshoot or perform service on a live control panel. Do not turn the disconnect switch on while the enclosure door is open. Live voltage is still connected to the incoming side of the disconnect switch even when the disconnect switch is off. Turn off and lockout the incoming power prior to troubleshooting or performing service on this control panel.



**DANGER**

**High Voltage!** Do not work on live control panels. Turn off, lockout and tag "Out of Service" the incoming power prior to performing service on the booster system. FAILURE TO FOLLOW THIS INSTRUCTION MAY RESULT IN DEATH OR PROPERTY DAMAGE.

**F. PUMP/MOTOR SAFETY.** All electrical installation or service on the motors should be performed by a qualified electrician. Ground fault protection should be sized properly. Refer to local electrical codes for sizing and selection. Refer to the motor manual for the motors for specific installation information. Even when the

pumps are stopped, they should be considered alive as long as its controller is energized. Keep hands away from the pumps until the power is disconnected from the pump controller.

### G. MOTOR CONTROL EQUIPMENT SAFETY.



#### DANGER

The heating of water and other fluids causes volumetric expansion. The associated forces may cause failure of system components and the release of high temperature fluids. This will be prevented by the installed temperature relief valves and compression tanks. FAILURE TO FOLLOW THESE INSTRUCTIONS COULD RESULT IN SERIOUS PERSONAL INJURY, DEATH AND/OR PROPERTY DAMAGE.

Do not install and operate a booster system package in a closed system unless the system is constructed with properly sized safety and control devices. Such devices include the use of properly sized and located pressure relief valves, compression tanks, pressure controls, temperature controls and flow controls as appropriate. If the system does not include these devices consult the responsible engineer or architect before making the booster system package operational.

## II. INSPECTION AND STORAGE.

**A. INSPECTION.** Upon receipt of the shipment, unpack and inspect the booster system and individual parts to insure none are missing or damaged. Carefully inspect all boxes and packing material for loose parts before discarding them. Immediately report any missing parts or damage incurred during shipment to the factory and to the Transportation Company and file your "damage and/or lost in shipment" claim with the carrier.

**B. STORAGE.** For long periods of storage, the pumping package should be covered to prevent corrosion and contamination from dirt. It should be stored in a clean, dry location between -20° to 60° Celsius (-4° to 140° Fahrenheit). The relative humidity should not exceed 95%. The unit should be checked periodically to ensure that no condensation has formed. After storage, check that it is dry before applying power.

## NOTE

Improper storage could damage equipment and would result in non-warranty covered restoration of non-warranty covered product failures.

Consider booster system package to be in storage when:

1. It has been delivered to the job site and is waiting to be installed.
2. It has been installed but operation is delayed pending completion of construction.

## III. HANDLING AND INSTALLATION.

### A. HANDLING.



#### DANGER

Heavy load, may drop if not lifted properly. Do not load cables, chains or hoists beyond their rated limits. Use a hoist with adequate lifting capacity. FAILURE TO FOLLOW THESE INSTRUCTIONS COULD RESULT IN SERIOUS PERSONAL INJURY, DEATH AND/OR PROPERTY DAMAGE.

Care should be taken to prevent damage due to dropping or jolting when moving any panel or pumping package. The booster system package should be unloaded and handled by qualified personnel. A booster package that includes this panel may be top heavy due to the position of the motors. Lift the unit with slings placed under the unit base rails. Be sure not to load the lifting mechanism beyond the unit while lifting to prevent overturning.

**B. LOCATION.** Observe local electrical codes concerning control panel spacing. The booster system should be located in an area that will permit periodic inspection, maintenance, and service. Head room and access should be provided and all units should be installed in a dry location with adequate drainage.

1. Allow a minimum of 42 inches of service clearance in front of the electrical control panel.
2. Allow for a minimum of 18 inches clearance from the rear of the system for pump service.



**C. INSTALLATION.** Place the system in position where it will be installed, and square it up with the building walls.

1. Provide a reasonably level floor surface for mounting the structural support frame, shim as required.
2. Mark the floor where the mounting holes are to be drilled. Move the system out of the way and drill holes and insert stainless steel drop-in anchors. Screw in the rubber in-shear vibration isolators to the anchors.
3. Install the male threaded end of the rubber isolator into the drop in masonry anchor. Coat the threads of the isolator with antiseize compound for easy removal later.
4. Place the system back on top of the isolators
5. Level with the stainless steel washers under the support frame. Secure the system to the rubber isolators with 3/8 inch stainless steel bolts and stainless steel washers to secure the booster support frame to the isolators.

**D. PIPING.**



All piping connections must be made with the pipe in a freely supported state. Do not apply vertical or side pressure to align the piping with the pump package.

Be sure to eliminate any pipe strain on the pumping package. Support all pipes independently by use of pipe hangers near the unit. Ordinary wire or band hangers are not adequate to maintain alignment. It is very important to provide a strong, rigid support for the suction and discharge lines. A saddle hanger is recommended. Do not attempt to force the suction or discharge lines into position. Refer to the assembly drawing for customers piping connections.

Inspect all piping connections. Joints may also become loose during transit due to vibration and shock. All joints should be checked for tightness. Flanged joints should be checked for proper torque of all flange bolts prior to filling the system with fluid.

Eccentric increasers may be used in the suction lines when increasing the pipe size, with the straight sides of the increaser on top to eliminate air pockets.

For critical installations, equipment for absorbing expansion and vibration should be installed in the inlet and outlet connections of the unit.

On an open system with a suction lift, use a foot valve of equal or greater area than the pump suction piping. Prevent clogging by using a strainer at the suction inlet next to the foot valve. The strainer should have an area 3 times that of the suction pipe. Provisions must be made to prime the pump suction piping on start up. Do not start the pump unless all suction piping is full of water.

A thermal relief valve is installed on the pump casing or discharge header to prevent potentially dangerous thermal buildup in the booster system. This valve acts as a safety device and it should never be removed or tampered with. It is factory set to open and discharge when the water temperature in the discharge header exceeds 52° Celsius (135° Fahrenheit). The opening of this valve should be piped to a floor drain.



Serious damage to the booster system may result if the main supply line from the water inlet source is not flushed properly. **Failure to do this may void the warranty should damage occur.**

1. Thoroughly flush out the main supply line from the water inlet source to remove any foreign objects or debris. Use full inlet size for 15 minutes.



All piping connections must be made with the pipe in a freely supported state. Do not apply vertical or side pressure to align the piping with the pump package.

2. Connect the buildings suction supply piping to the system suction header connection using the proper connection fittings. Use flexible piping connectors directly onto the pump header connections, both suction and discharge. Should grooved end connectors be used, a flexible connector is not required.

**NOTE**

The fittings should be rated for the maximum shut-off head, plus the maximum municipal supply pressure anticipated to prevent piping system failure. Reference the pump curve data for the maximum pump shut-off head.

3. Connect system discharge to the building water supply distribution system using the proper connecting fittings.
4. Before starting, all pumps and motors should be checked for lubrication.

**E. TEMPERATURE AND VENTILATION.** The operating temperature range for this unit is 0° to 40° Celsius (32° to 104° Fahrenheit). The relative humidity should be kept between 10% and 95% non-condensing. The unit should not be operated outside these extremes.

**F. INCOMING POWER AND GROUND WIRING.****DANGER**

**Conduit grounds are not adequate.** A separate ground wire must be attached to the ground lug provided in the enclosure to avoid potential safety hazards. FAILURE TO FOLLOW THESE INSTRUCTIONS COULD RESULT IN SERIOUS PERSONAL INJURY, DEATH AND/OR PROPERTY DAMAGE.

**Prevent electrical shocks.** Disconnect the incoming power supply to the control panel before beginning installation. FAILURE TO FOLLOW THIS INSTRUCTION MAY RESULT IN DEATH OR PROPERTY DAMAGE.

A qualified electrician should bring incoming power and ground wiring to the disconnect switch. If holes are drilled in the control panel, be sure to not contaminate electrical components with metal fillings. A ground terminal is provided in the enclosure for an incoming ground wire connection. Wire types and sizes must be selected according to the National Electrical Code and all local codes and restrictions. Refer to the input current and voltage as listed on the nameplate on the enclosure door when sizing the power wires. Only copper (Cu) wire rated for 75° Celsius minimum (167° Fahrenheit minimum) may be used for the power connections. The voltage tolerance is ±10% and phase to phase voltage must not have an imbalance greater than ±3% VAC.

1. Verify the proper supply voltage and load center circuit breaker ampacity to the unit with the information in the Submittal data information sheet or electrical drawing.
2. Check voltage phase to phase and phase to ground.

**NOTE**

Power supply required for all variable frequency drive applications. If a delta connection is provided, an isolation transformer must be provided by others.

3. Bring the power supply in to the single point electrical connection located inside the system enclosure, at the main door interlocked, service disconnect switch.
4. Preferably making electrical connection through the bottom of the enclosure, on the same side as the electrical disconnect switch. Avoid making the connection on the top of the enclosure. If a top connection is necessary, use a "seal-tite" type connector.

**CAUTION**

Do not power up unit until factory start-up technician arrives. **Anomalies occurring from improper power supply may void the warranty should damage occur.**

**IV. INPUT/OUTPUT**

**A. ANALOG INPUTS.** The Delta P Carver Booster System is equipped with analog input channels. The analog inputs must provide a 4-20mA or 0-10V signal. Typically, analog inputs will be powered by the 24V power supply within the panel.

Shielded 22 American Wire Gage (AWG) cable should be installed for all analog input wiring. The shield must be terminated in the Delta P Carver Booster System Controller. Do not connect the shield so that no electrical connection is made at the other end of the cable. A twisted pair of #22 AWG conductors can be used in place of shielded cable.

**B. DIGITAL INPUTS.** The Delta P Carver Booster System Controller is equipped with 24VDC digital input channels. This signal voltage must be obtained from the 24VDC power supply mounted to the control panel. It is not recommended that other power sources be used without factory approval. All digital inputs are assigned based on Table 1. Additional sensors not provided by

Delta P Carver.

See the typical wiring diagram provided in the Drawing Section.

#22 AWG cable should be installed for all field wiring to digital inputs.

**Table 1. Digital Inputs Functionalities**

DI#	Description	DI#	Description
DI 0	Low Suction or Low Tank Level Switch	DI 3	Pump 2 Over Temperature Alarm (provided by Manufacturer depending on model)
DI 1	2 <sup>nd</sup> High System Switch (provided by Manufacturer)	DI 4	Pump 3 Over Temperature Alarm (provided by Manufacturer depending on model)
DI 2	Pump 1 Over Temperature Alarm (provided by Manufacturer depending on model)	DI 5	NO Switch when energized turns system off.

## V. MAINTENANCE.

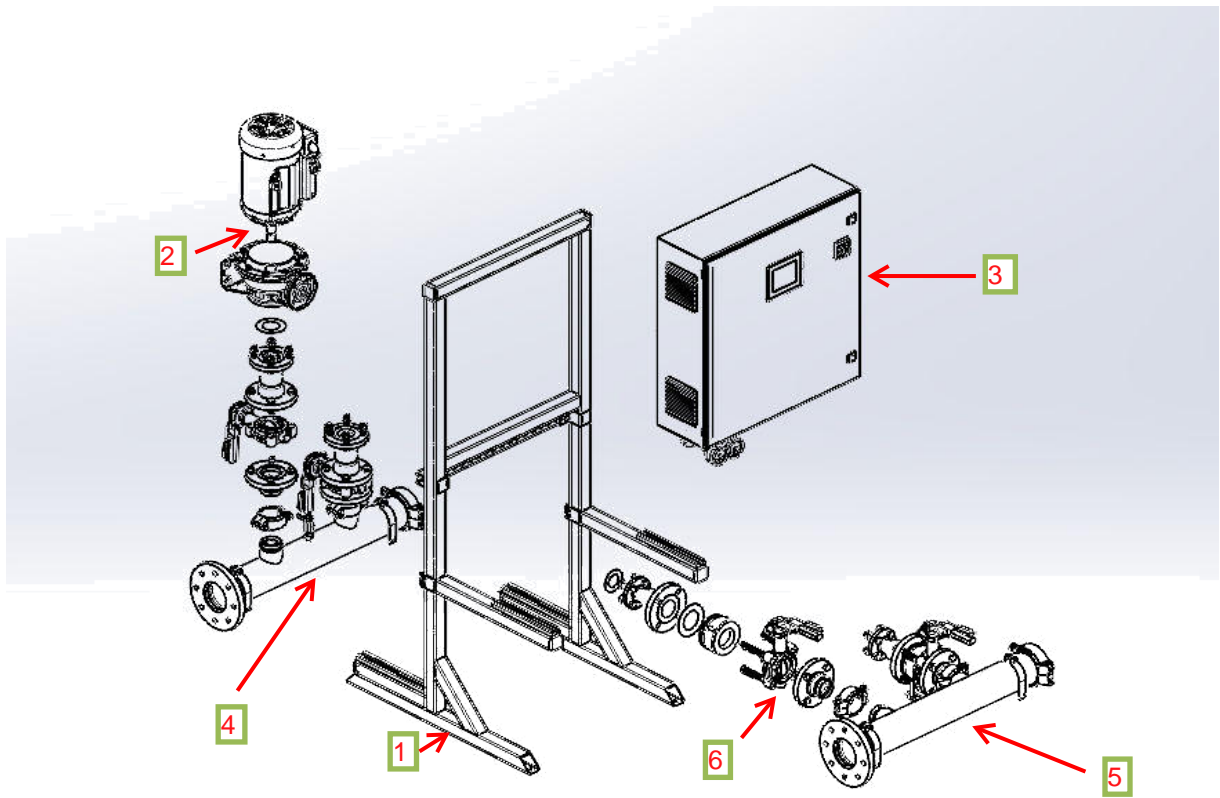
Generally the booster system does not need continuous supervision. Occasional visual checks are recommended. Data should be recorded for each pump to keep track of maintenance which has been performed and to note operational problems. General exploded views of the Delta P ES, Figure 1 and Delta P VM, Figure 2 are included for reference.

**A. BATTERY.** The system memory, including all user data is buffered by an internal battery while the unit is off. When the controller begins to detect low voltage on the battery, it will display an alarm to give the user adequate time to replace it.

**B. FIELD REPAIR.** Typical field repairs include replacing sensors, transducers, power supply, Variable

Frequency Drive (VFD), mechanical seal, and assuring connections are correct and secure. Repair parts are not typically required but a spare set of transducers and mechanical seals are recommended.

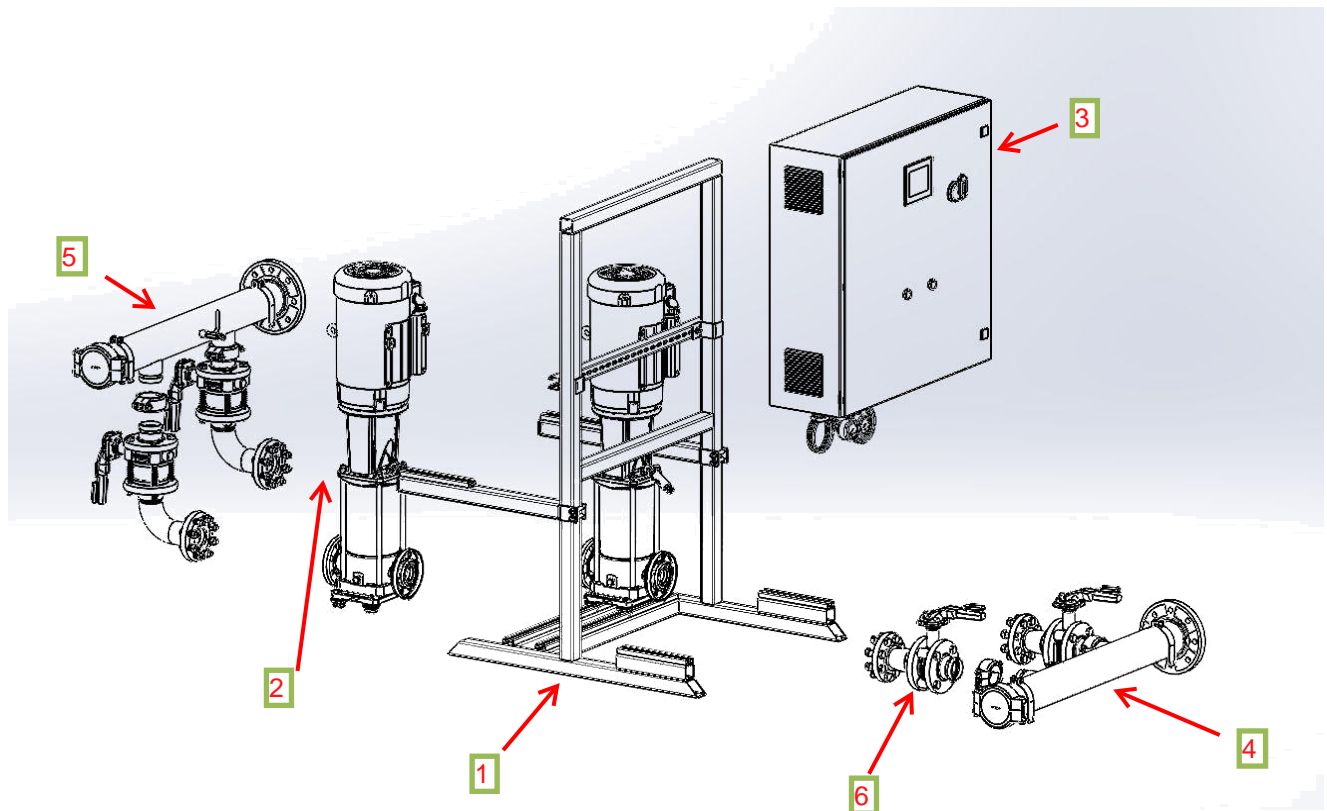
**C. TROUBLESHOOTING.** If you have followed the installation and starting procedures outlined in this manual, the booster system should provide reliable service and long life. However, if operating problems do occur; significant time and expense can be saved if you refer to Table 2 to eliminate the most common causes of those problems. The following information should be used as a guide in determining the cause of the most common problems you may encounter. Should you be unable to correct a specific problem by using this troubleshooting table, contact your Delta P Carver representative for assistance.



ITEM NO.	DESCRIPTION
1	Frame Assembly
2	Pump Assembly
3	Control Pak

ITEM NO.	DESCRIPTION
4	Manifold Assembly Suction (600 PSI)
5	Manifold Assembly Discharge (600 PSI)
6	Stainless Steel Internal Butterfly Isolation Valve (150/300 PSI)

Figure 1. Delta Pak ES Exploded View



ITEM NO.	DESCRIPTION
1	Frame Assembly
2	Pump Assembly
3	Control Pak

ITEM NO.	DESCRIPTION
4	Manifold Assembly Suction (600 PSI)
5	Manifold Assembly Discharge (600 PSI)
6	Stainless Steel Internal Butterfly Isolation Valve (150/300 PSI)

Figure 2. Delta Pak VM Exploded View

## VI. ELECTRICAL WIRING AND CONTROL SETTINGS - FINAL CHECK LIST.



### **DANGER**

**Prevent electrical shocks.** Inspect all electrical connections prior to powering the unit. Wiring connections must be made by a qualified electrician in accordance with all applicable codes, ordinances, and good practices. FAILURE TO FOLLOW THIS INSTRUCTION MAY RESULT IN DEATH OR PROPERTY DAMAGE.

- \_\_\_ 1. Does the feeder line voltage correspond to the unit voltage? Check the unit nameplate.
- \_\_\_ 2. Are the feeder wires correctly sized for the load?
- \_\_\_ 3. Are the breakers sized correctly and the correct style? The breakers should be the size and style per the wiring diagram provided with the booster system to maintain UL508A certification for cabinet.
- \_\_\_ 4. Is the unit properly grounded?



### **DANGER**

**Conduit grounds are not adequate.** A separate ground wire must be attached to the ground lug provided in the enclosure to avoid potential safety hazards. FAILURE TO FOLLOW THESE INSTRUCTIONS COULD RESULT IN SERIOUS PERSONAL INJURY, DEATH AND/OR PROPERTY DAMAGE.

- \_\_\_ 5. Have all the power terminals in the control panel been checked for tightness? This is imperative since stranded wires tend to become loose after initial installation.



### **DANGER**

**High Voltage!** Do not work on live control panels. Turn off, lockout and tag "Out of Service" the incoming power prior to performing service on the booster system. FAILURE TO FOLLOW THIS INSTRUCTION MAY RESULT IN DEATH OR PROPERTY DAMAGE.

- \_\_\_ 6. Are all analog and digital inputs or outputs connected per the wiring diagram?

## VII. SYSTEM PIPING AND UNIT INSTALLATION – FINAL CHECK LIST.

- \_\_\_ 1. Is the unit base properly leveled and secure?
- \_\_\_ 2. Are all lubrication points properly lubricated?
- \_\_\_ 3. Is the outer side of the thermal relief valve connected to the drain with tubing?
- \_\_\_ 4. Are the shut-off valves to the transmitters open?
- \_\_\_ 5. Are the shut-off valves on the pump suction and discharge open?
- \_\_\_ 6. Is the bypass valve, if used, closed? This valve may be left open if check valve is installed in series with it.
- \_\_\_ 7. Is the piping properly supported so as to prevent strains on the unit?



### **CAUTION**

**Seal damage may occur.** Do not run pumps dry. Fill and vent the pump volute prior to operation. FAILURE TO FOLLOW THIS INSTRUCTION MAY RESULT IN DAMAGE TO THE PUMP AND **MAY VOID THE WARRANTY.**

- \_\_\_ 8. Is the system, including the pumps, purged of debris and air?
- \_\_\_ 9. Is the pump rotation correct?

## VIII. PRE-START CHECKLIST



### **CAUTION**

#### **IMPORTANT SAFETY NOTICE**

Installation, use and operating of pumping equipment is guided by various federal, state and local laws and the regulations concerning OSHA. Compliance with such laws relating to the proper installation and safe operation of the pumping equipment is the responsibility of the equipment owner. All necessary steps should be taken by the owner to assure compliance with such laws before operating the equipment.

- \_\_\_ 1. Refer to Sections I and IX for a complete list of safety precautions.
- \_\_\_ 2. Verify piping is connected correctly and that there are no leaks or pipe strain on the unit.



### **CAUTION**

**Prime Pumps** before starting. Dry running may result in pump damage and **may void the warranty.**

- \_\_\_ 3. Verify that all pump isolation valves are open. Remove vent plug from the top of Vertical Multistage pump casings. Ensure all air is purged from the unit. Install plug in casing after water comes from the casing vent.
- \_\_\_ 4. Verify that the tubing is connected to the gauges and transducers and has been purged of air. The discharge tubing can be disconnected to purge air and fill the system with water.



### **WARNING**

**Prevent electrical shocks.** Inspect all electrical connections prior to powering the unit. When the pumps and motors are stopped, they should be considered live as long as its controller is energized.

- \_\_\_ 5. Visually verify the incoming electrical power is the correct voltage for the drives.
- \_\_\_ 6. Visually verify that all of the electrician's wires are secure and not loose.
- \_\_\_ 7. Verify the supplied Prestart Check List (included in your control panel) was filled out by the contractor.

## IX. STARTUP CHECKLIST.

### A. **ELECTRICAL SAFETY:**



### **DANGER**

**Prevent electrical shocks.** Electrical connections must be made by a qualified electrician in accordance with all applicable codes, ordinances, and good practices. **FAILURE TO FOLLOW THIS INSTRUCTION MAY RESULT IN DEATH OR PROPERTY DAMAGE.**

### B. **THERMAL SAFETY:**



### **DANGER**

**Extreme Temperature Hazard.** If pump, motor, or piping are operating at extremely high or low temperatures, guarding or insulation is required. **FAILURE TO FOLLOW THESE INSTRUCTIONS COULD RESULT IN SERIOUS PERSONAL INJURY, DEATH AND/OR PROPERTY DAMAGE.**

**C. MECHANICAL SAFETY:****DANGER**

**Unexpected Startup Hazard.** Disconnect and lockout power before servicing. FAILURE TO FOLLOW THIS INSTRUCTION MAY RESULT IN DEATH OR PROPERTY DAMAGE.

**Excessive Pressure and Temperature Hazard.** Do not operate pump(s) at or near zero flow (closed discharge valve). Explosion could result. FAILURE TO FOLLOW THIS INSTRUCTION MAY RESULT IN DEATH OR PROPERTY DAMAGE.

**DANGER**

**Rotating Components Hazard.** Do not operate the pump without all guards in place. FAILURE TO FOLLOW THIS INSTRUCTION MAY RESULT IN DEATH OR PROPERTY DAMAGE.

**Excessive System Pressure Hazard.** The maximum working pressure of the pump is listed on the nameplate. Do not exceed this pressure. FAILURE TO FOLLOW THIS INSTRUCTION MAY RESULT IN DEATH OR PROPERTY DAMAGE.

**Excessive Pressure Hazard Volumetric Expansion.** The heating of water and other fluids causes volumetric expansion. The associated forces may cause failure of system components and release of high temperature fluids. This will be prevented by installing properly sized and located compression tanks and pressure relief valves. FAILURE TO FOLLOW THIS INSTRUCTION MAY RESULT IN DEATH OR PROPERTY DAMAGE.

**D. STARTUP CHECKLIST:**

- \_\_\_ 1. Complete Section VIII and read these instructions completely before beginning.
- \_\_\_ 2. Confirm job site voltage. Do not apply power or close the disconnect until the following items are completed.

**WARNING**

**Prevent electrical shocks.** Inspect all electrical connections prior to powering the unit. When the pumps and motors are stopped, they should be considered live as long as its controller is energized.

- \_\_\_ 3. Check all power wiring connections and secure as required.
- \_\_\_ 4. Inspect and/or install any customer remote termination required.
- \_\_\_ 5. Make note of the design data supplied on the DPC data label (inside of the control panel door).
- \_\_\_ 6. Use a volt meter to measure phase to phase voltage on the entering power terminals at the disconnect.
- \_\_\_ 7. Compare available voltage to the nameplate.
- \_\_\_ 8. Install bladder storage tank, if provided.
  - \_\_\_ a. Precharge the bladder storage tank before filling with water. The air precharged should be between system setpoint (system discharge pressure) and call pressure.
  - \_\_\_ b. If the storage tank has already been installed and not precharged, disconnect system piping from the tank and equalized to atmospheric pressure, if an isolation valve and drain are provided, use them.
  - \_\_\_ c. Apply air pressure to bladder through the AIC charging valve and pressurize to field conditions.
- \_\_\_ 9. Reconnect to the system piping.
- \_\_\_ 10. Check for available suction water.

**CAUTION**

***Prime Pumps*** before starting. Dry running may result in pump damage and **may void the warranty.**

- \_\_\_ 11. Open all supply and discharge valves.
- \_\_\_ 12. Close bypass valve if installed in the piping by others.



- \_\_\_ 13. Open ball valves feeding the tubing.
- \_\_\_ 14. Ensure that the plastic tubing is not touching any metal surface. Protect tubing with insulation to prevent abrasion where it may be touching metal.
- \_\_\_ 15. Use the system pressure gauges and/or gauge tubing on the manifolds to prove available water for suction. Open a faucet to create a demand for water on the system pressure piping.

 **CAUTION**

Booster System will start to fill building 45 seconds after applying power unless the stop countdown button on the touchscreen is pressed. Failure to stop the countdown may result in water hammer damage.

- \_\_\_ 16. Power up the system.
- \_\_\_ 17. Stop count down.



**Figure 3. Auto Start Screen**

- \_\_\_ 18. Place Pump 1 in hand mode at 30 hz.
- \_\_\_ 19. Press the start button for Pump 1.
- \_\_\_ 20. Open fixtures on top floor to release air as the building fills.
- \_\_\_ 21. Fill the building slowly gradually as to not induce water hammers.
- \_\_\_ 22. Observe system for any leaks, if any leaks are present on the booster system piping, or equipment call the factory for instructions.
- \_\_\_ 23. When building has stabilized and water is coming out of the top fixtures, turn off the pump, place it back in Auto mode and turn all the pumps back on.

## X. OPERATION.

**A. PUMP OPERATION.** The pumps can be controlled manually or automatically, see the following:

1. **Manual Pump Operation.** To manually control the booster system. The hand button is pressed and a frequency is entered. While operating in this mode the VFD ignores analog inputs and alarms.
2. **Automatic Pump Operation.** To automatically control the booster system. The auto button is pressed and the desired setpoint entered from the factory is followed. The VFD uses the analog inputs to enter a PID mode to maintain a desired setpoint.

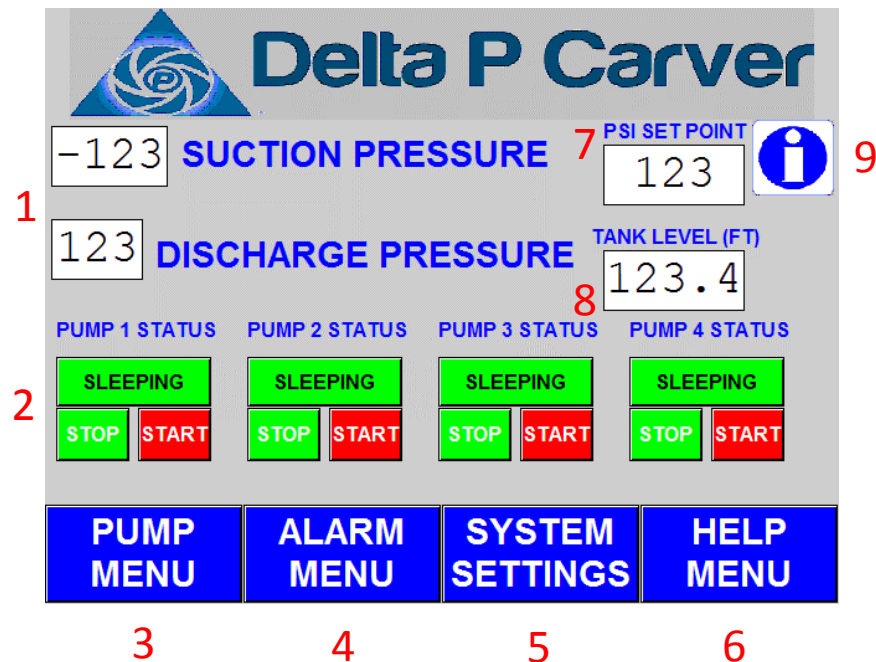
**B. STATUS SCREENS.** The status screens are the main level screens that don't require a password to access. They are accessed by pressing the button "pump menu", selecting a pump and then pressing the pump info button.

1. Output Frequency.
2. Output Current.
3. Output Volts.
4. Output KW.
5. Current internal VFD Temperature
6. VFD Run Hours

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## SCREEN NAVIGATION.

The following figures explain the screens and help with screen navigation.



**Figure 1: Main Menu**

### 1. Pressure Displays

- a. Displays current suction and discharge pressure, in psi.

### 2. Pump Status Indicator Lamps

- a. Indicator lamp(s) that display the current status of each pump.
- b. For a complete list of status that can be displayed, reference

### 3. Pump Menu

- a. Button to access the Pump Menu.

### 4. Alarm Menu

- a. Button to access the Alarm Menu.

### 5. System Settings

- a. Button to access System Settings.

### 6. Help Menu

- a. Displays factory contact information.

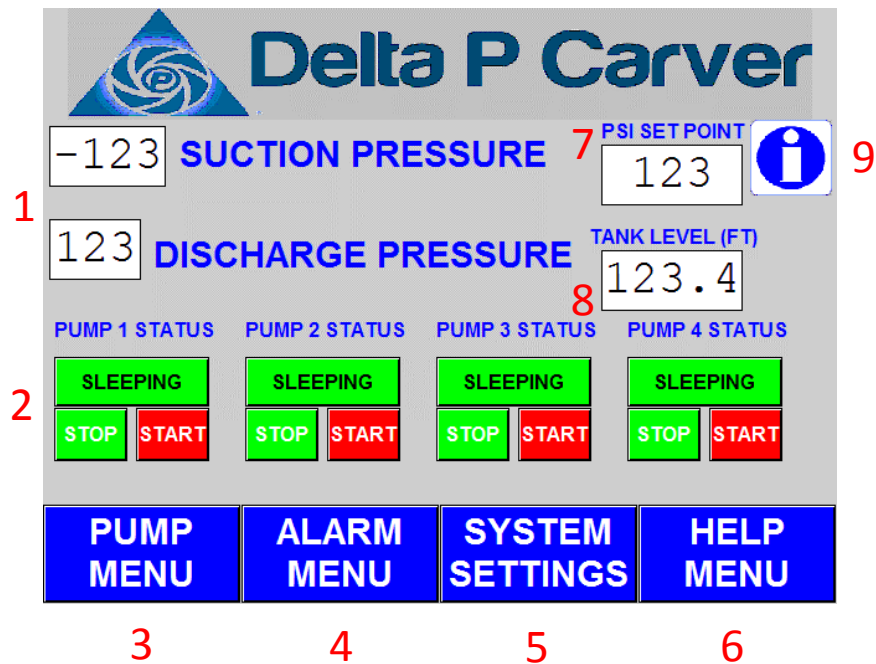


Figure 1: Main Menu

#### 7. PSI Setpoint

- a. Displays current user defined setpoint pressure, in psi.

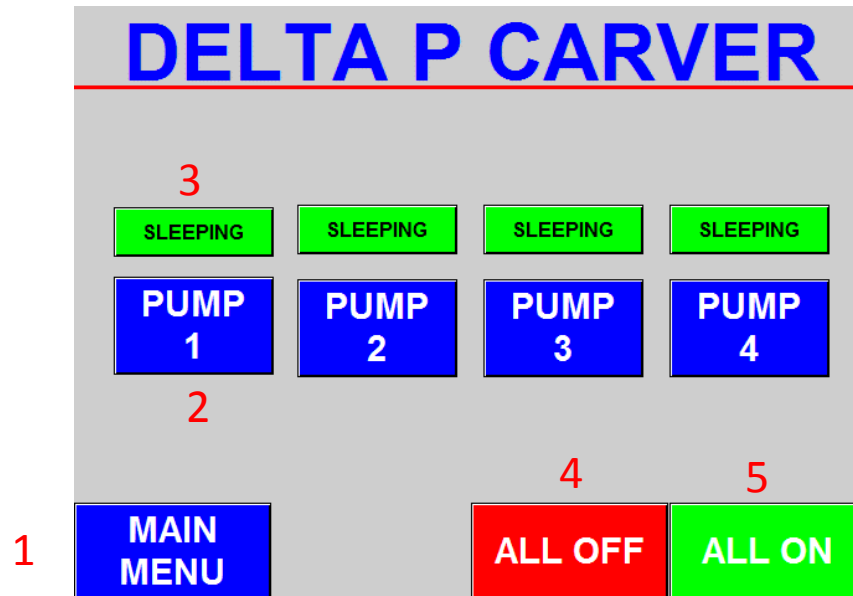
#### 8. Tank Level

- a. Displays calibrated tank level, in feet.(if applicable)

#### 9. Parameter Backup

- a. Save and/or Restore HMI parameters from memory. For Parameter backup instructions, reference **Figure #7** (pg.34)

<b>Table 2 Pump Indicator Light(s)</b>	
<b>Status</b>	<b>Description</b>
<b>RUNNING</b>	Pump is currently running.
<b>STANDBY</b>	Pump is in standby waiting for run command (i.e. setpoint met).
<b>SLEEPING</b>	Pump is Lead and Setpoint has been satisfied. Pump will enter sleep mode until needed again or the Lead sequence changes.
<b>OFF</b>	Pump is currently off through active Alarm* or by user.
<b>FAULT</b>	VFD has fault or communication error.



**Figure 2: Pump Selection Menu**

- 1. Main Menu**
  - a. Return to Main Menu.
- 2. Pump Menu(s)**
  - a. Menu to access individual Pump Menu(s) that allows user to Start/Stop pumps, switch between Hand/Auto via virtual HOA selector switch, determine Lead/Lag and find additional runtime information.
- 3. Pump Status Indicator Lamps**
  - a. Indicator lamp(s) that display the current status of each pump.
- 4. All Off**
  - a. Immediately stops all pumps.
- 5. All On**
  - a. Immediately start all pumps, if available and no active faults or alarms. Pumps will move into Standby, then sequence on as demand requires.

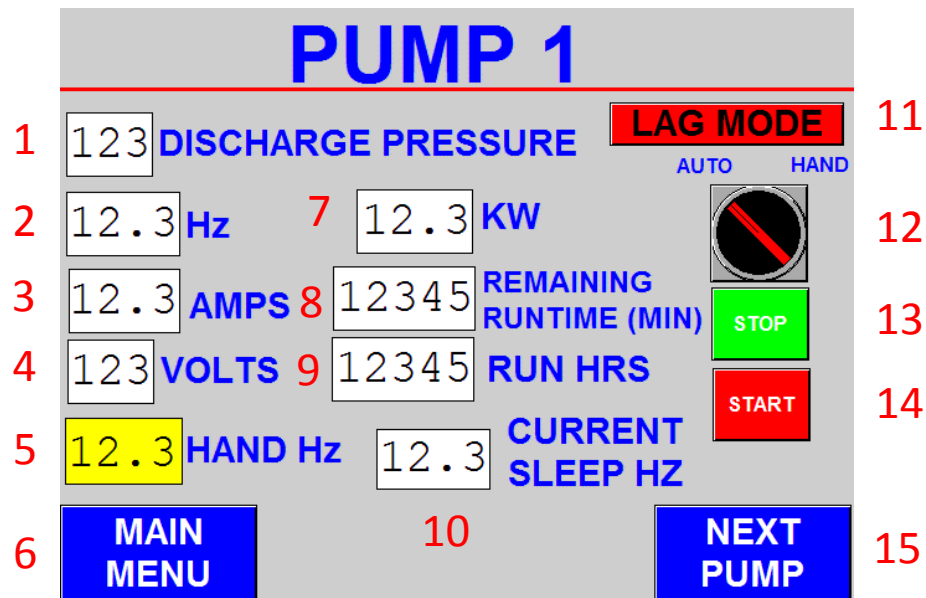


Figure 3: Pump Menu (Pump 1)

1. **Discharge Pressure**
  - a. Current discharge pressure reading (psi).
2. **Pump Running Hz**
  - a. Displays the current operating frequency of the Pump.
3. **Pump Amp Draw**
  - a. Displays the current amp draw of the Pump.
4. **Pump Voltage Usage**
  - a. Displays the current voltage supplied to the Pump.
5. **Hand Frequency (Hz)**
  - a. Frequency at which the pump will ramp up to and run at when in Hand mode. HOA selector switch must be in Hand.
  - b. Pump will continue running at specified Hand Hz (regardless of active faults or alarms) until stopped by user or sequence is switched to Auto via HOA switch.
6. **Main Menu**
  - a. Return to Main Menu.
7. **Pump Kilowatt Usage**
  - a. Displays the current kilowatt draw of the Pump.

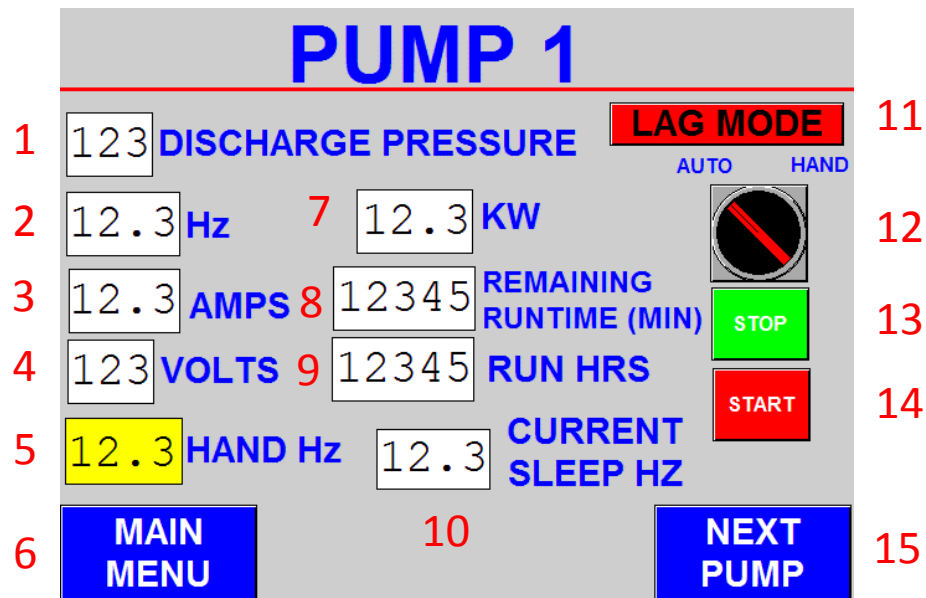


Figure 3: Pump Menu (Pump 1)

**8. Remaining Runtime (Min)**

- a. Displays the remaining runtime until pump lead switch.

**9. Pump VFD Run Hours**

- a. Displays the cumulative run hours for the Pump.

**10. Current Sleep Hz**

- a. Displays current calculated sleep frequency.

**11. Lead/Lag Indicator Lamp**

- a. Indicator lamp that displays current pump sequence.
  - i. Flashes **Green** & **Lead** when current pump is the Lead pump.
  - ii. Flashes **Red** & **Lag** when current pump is the Lag pump.



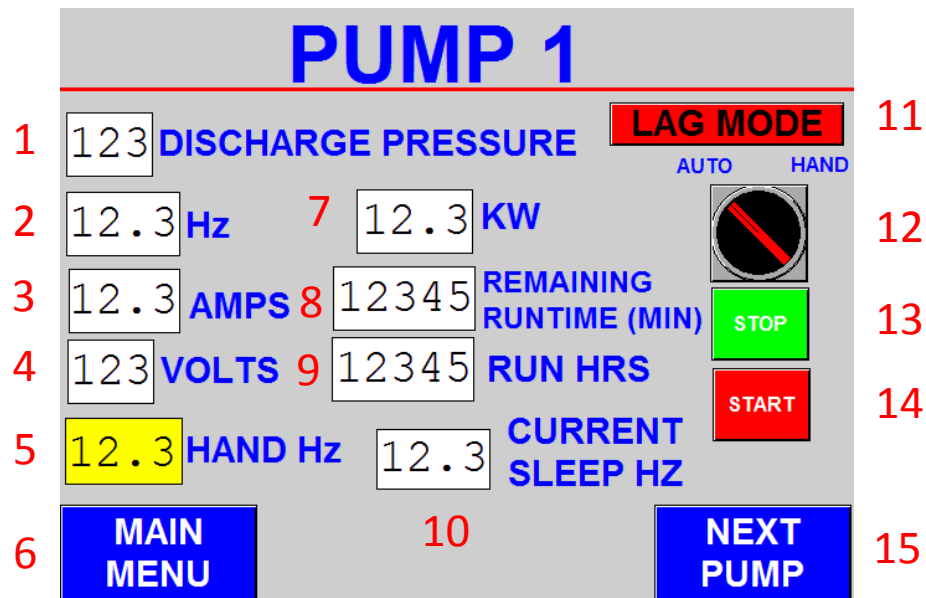


Figure 3: Pump Menu (Pump 1)

## 12. Virtual HOA Selector Switch

- Virtual selector to switch between Automatic (Pressure) and Hand (Constant Speed) modes.

## 13. Stop

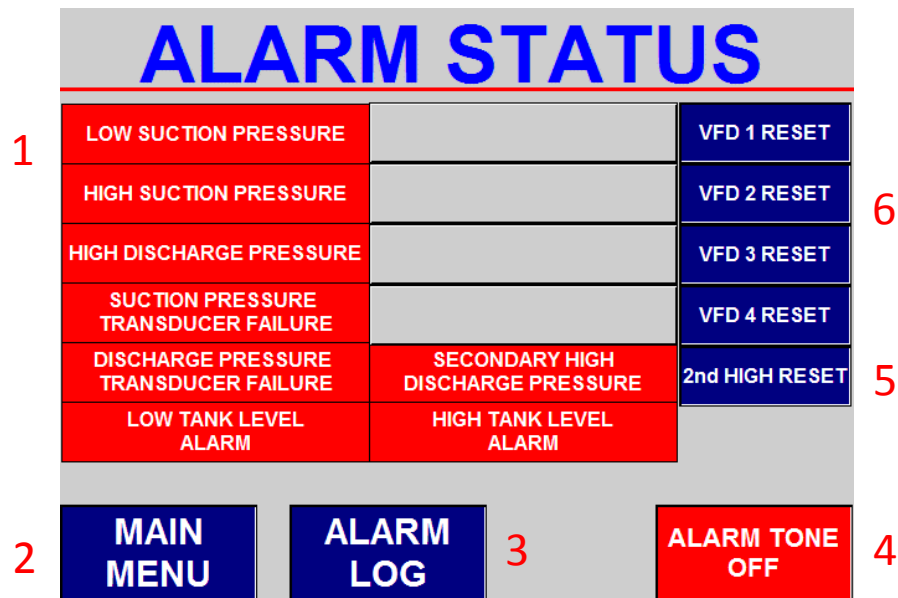
- Immediately stops the pump (if running).

## 14. Start

- Immediately attempts to start the pump based on the HOA selection.
  - Auto: Pump will start, if available and no active faults or alarms.
  - Hand: Pump will start and ramp to user specified Hand Hz.

## 15. Next

- Sequence to next pump menu.



**Figure 4: Alarm Status Menu**

1. **Alarm Status Indicator**
  - a. Displays any current active alarms along with text description.
2. **Main Menu**
  - a. Returns to Main Menu.
3. **Alarm Log**
  - a. Displays active & previous alarms along with time/date stamp.
4. **Tone On/Off**
  - a. Bypasses the Alarm Status Screen for service if an alarm is active.
5. **2<sup>nd</sup> High Reset**
  - a. Attempts to reset the Secondary High Alarm (based on pressure switch).
6. **Drive Reset (D1 – D4 Reset)**
  - a. Attempts to reset the drive, if faulted.
  - b. If the fault reappears immediately after hitting reset, the drive is still faulted. The drive keypad will display the active fault in the form of a four digit identifier. Please log this fault code for use with trouble shooting during service visit/call.

1

Occurrence	Message	Recover	Confirm
01/22 10:52	LOW SUCTION	10:52	10:52
01/22 10:52	HIGH DISCHARGE PRESSURE	10:52	10:52
01/22 10:52	SETPOINT ADJUSTED	10:52	10:52
01/22 10:52	2ND HIGH SYSTEM ALARM	10:52	10:52
01/22 10:52	DRIVE 1 FAULTED	10:52	10:52
01/22 10:52	DRIVE 2 FAULTED	10:52	10:52
01/22 10:52	DRIVE 3 FAULTED	10:52	10:52
01/22 10:52	VFD 1 COMMUNICATION FAULT	10:52	10:52
01/22 10:52	VFD 2 COMMUNICATION FAULT	10:52	10:52
01/22 10:52	VFD 3 COMMUNICATION FAULT	10:52	10:52
01/22 10:52	HIGH SUCTION PRESSURE	10:52	10:52
01/22 10:52	SUCTION TRANSDUCER FAILURE	10:52	10:52
01/22 10:52	DISCHARGE TRANSDUCER FAILURE	10:52	10:52
01/22 10:52	DRIVE 4 FAULTED	10:52	10:52
01/22 10:52	VFD 4 COMMUNICATION FAULT	10:52	10:52
01/22 10:52	PUMP 1 OVERTEMP (TEMP SWITCH)	10:52	10:52

2 SELECT      3 ▲      4 ▼      5 BACK

Figure 5: Alarm Log

### 1. Alarm Log

- Displays the most recent alarms for the system. The most recent or current is at top of the list, which then goes back sequentially. The date, time, and type of alarm are displayed.
- Active alarms are highlighted in **red**.

### 2. Select Button

- Enters the Alarm Log and highlights the most recent alarm.

### 3. Scroll Up

- Once SELECT has been pressed, allows the user to SCROLL UP through the list of alarms.

### 4. Scroll Down

- Once SELECT has been pressed, allows the user to SCROLL DOWN through the list of alarms.

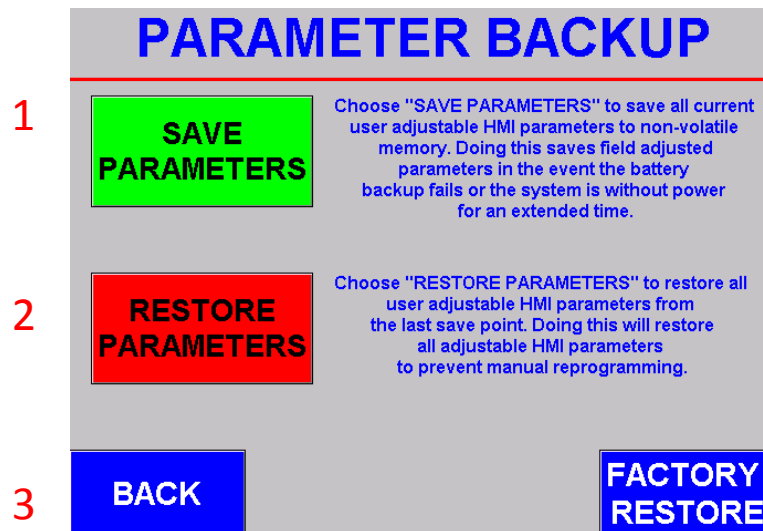
### 5. Back

- Returns to the Alarm Status Menu.



**Figure 6:** Help Menu

- 1. Help Menu**
  - a. Displays factory contact information.
- 2. Main Menu**
  - a. Returns to Main Menu.
- 3. Program Version**
  - a. Displays current program version.



**Figure 7:** Parameter Backup

**1. Save Parameters**

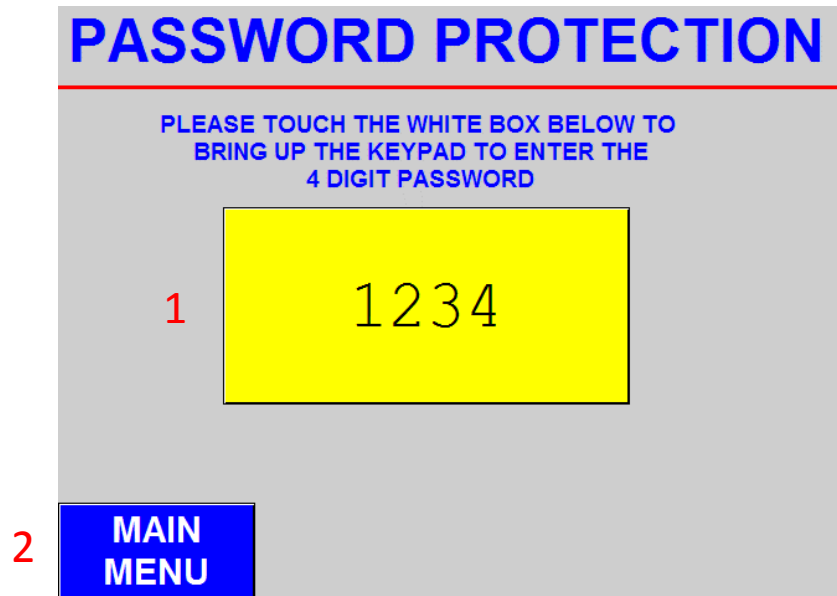
- a. Allows the user to save the user definable settings (Alarm Selections, Timers, Hand Hz) in the event of power loss for extended periods of time.

**2. Restore Parameters**

- a. Allows the user to restore the user definable settings (Alarm Selections, Timers, Hand Hz) after an extended period of power loss so the parameters are not lost if the battery backup fails.

**3. Back**

- a. Return to Main Menu.



**Figure 8:** Enter Password Menu

**1. Password Prompt**

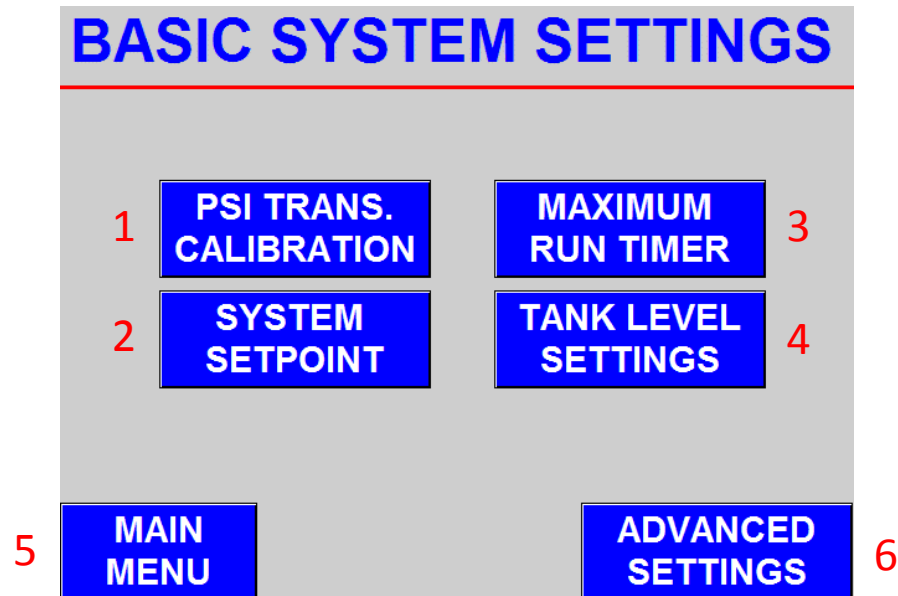
- a. Touch the yellow dialogue box to bring up a keypad input prompt. Type the 4 digit password and press ENT to gain access to various system settings.

**b. Password Levels:**

- i. Basic Settings: 1111
- ii. Advanced Settings: Please reach out to your local representative or call the factory directly. Adjusting advanced settings can lead to system performance issues and/or system failures.

**2. Main Menu**

- a. Returns to Main Menu.



**Figure 9:** Basic Settings Menu

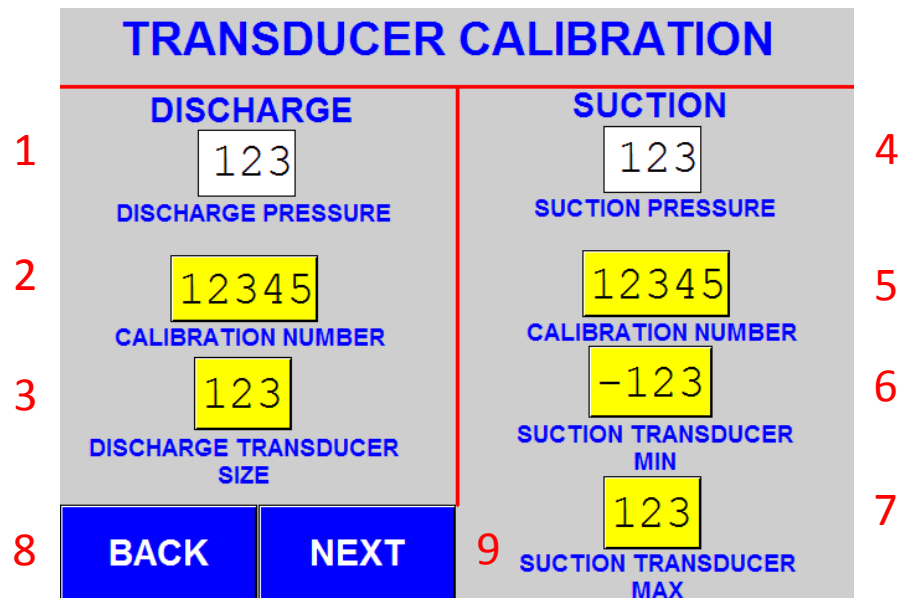
1. **PSI Trans. Calibration (Transducer Calibration)**
  - a. Menu for calibrating the suction and discharge transducers.
2. **System Setpoint**
  - a. Accesses the System Set Point Menu.
3. **Max Run Timer**
  - a. Menu for Max Run Timer.
4. **Tank Level Settings(If Applicable)**
  - a. Tank Settings Menu (**Figure 14, pg. 33**), which includes access to:
    - i. Tank Level
    - ii. Tank LEDs and Manual Override
    - iii. Tank Level Setpoints/Alarms & Timers
    - iv. Tank Level Transducer Calibration
    - v. Tank Height
5. **Main Menu**
  - a. Return to Main Men.
6. **Advanced Settings**
  - a. Menu to Advanced Settings (Figure X, pg. XX). Requires additional password.

TRANSDUCER CALIBRATION		
1	<div style="display: flex; justify-content: space-between;"> <div style="width: 45%;"> <p style="text-align: center;"><b>DISCHARGE</b></p> <p style="text-align: center;">123</p> <p style="text-align: center;">DISCHARGE PRESSURE</p> </div> <div style="width: 45%;"> <p style="text-align: center;"><b>SUCTION</b></p> <p style="text-align: center;">123</p> <p style="text-align: center;">SUCTION PRESSURE</p> </div> </div>	4
2	<div style="display: flex; justify-content: space-between;"> <div style="width: 45%;"> <p style="text-align: center;">12345</p> <p style="text-align: center;">CALIBRATION NUMBER</p> </div> <div style="width: 45%;"> <p style="text-align: center;">12345</p> <p style="text-align: center;">CALIBRATION NUMBER</p> </div> </div>	5
3	<div style="display: flex; justify-content: space-between;"> <div style="width: 45%;"> <p style="text-align: center;">123</p> <p style="text-align: center;">DISCHARGE TRANSDUCER SIZE</p> </div> <div style="width: 45%;"> <p style="text-align: center;">-123</p> <p style="text-align: center;">SUCTION TRANSDUCER MIN</p> </div> </div>	6
8	<div style="display: flex; justify-content: space-between;"> <div style="width: 45%;"> <p style="text-align: center;"><b>BACK</b></p> </div> <div style="width: 45%;"> <p style="text-align: center;"><b>NEXT</b></p> </div> </div>	9
	<div style="display: flex; justify-content: space-between;"> <div style="width: 45%;"></div> <div style="width: 45%;"> <p style="text-align: center;">123</p> <p style="text-align: center;">SUCTION TRANSDUCER MAX</p> </div> </div>	7

**Figure 10:** Transducer Calibration Menu

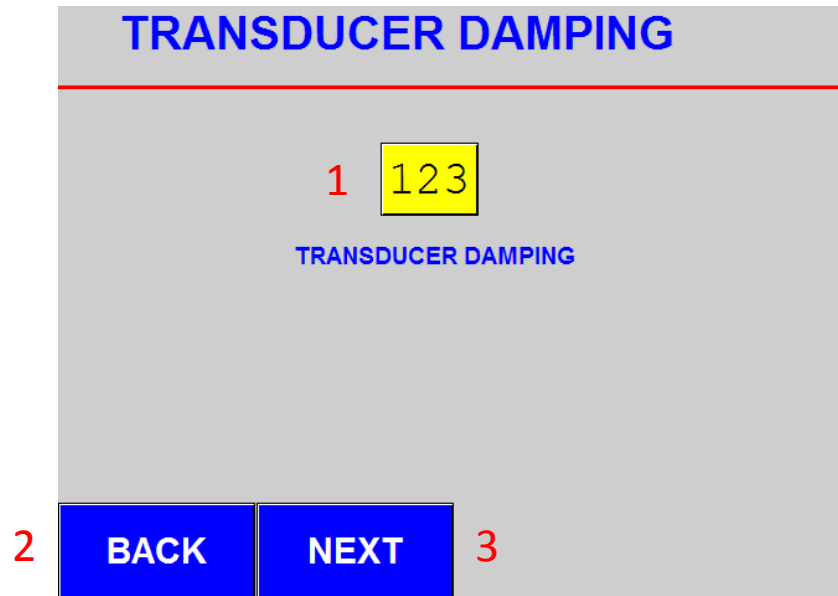
1. **Discharge Pressure**
  - a. Current calibrated discharge pressure (in psi).
2. **Discharge Calibration Number**
  - a. Calibration number required to read pressure value from transducer.
  - b. Factory set to 1000.
3. **Discharge Transducer Size**
  - a. Transducer size required to scale pressure value from transducer. Based on the maximum reading the supplied pressure transducer can read.
  - b. Factory set to 300 (psi).





**Figure 10:** Transducer Calibration Menu

4. **Suction Pressure**
  - a. Current calibrated suction pressure (in psi).
5. **Suction Calibration Number**
  - a. Calibration number required to read pressure value from transducer.
  - b. Factory set to 1000.
6. **Suction Transducer Min**
  - a. Transducer minimum required to scale pressure value from transducer. Based on the minimum reading the supplied pressure transducer can read.
  - b. Factory set to -14 (psi).
7. **Suction Transducer Max**
  - a. Transducer maximum required to scale pressure value from transducer. Based on the maximum reading the supplied pressure transducer can read.
  - b. Factory set to 100 (psi).
8. **Back**
  - a. Return to Basic Settings Menu.
9. **Next**
  - a. Move to Transducer Damping Menu.



**Figure 11:** Transducer Damping Menu

**1. Transducer Damping**

- a. Transducer damping ratio that reduces oscillations of calibrated transducer readings.
- b. Higher values result in less oscillations and a steadier, more consistent transducer reading.
- c. Factory set to 1.

**2. Back**

- a. Return to Transducer Calibration Menu.

**3. Next**

- a. Moves to Flow Meter (if equipped or required).

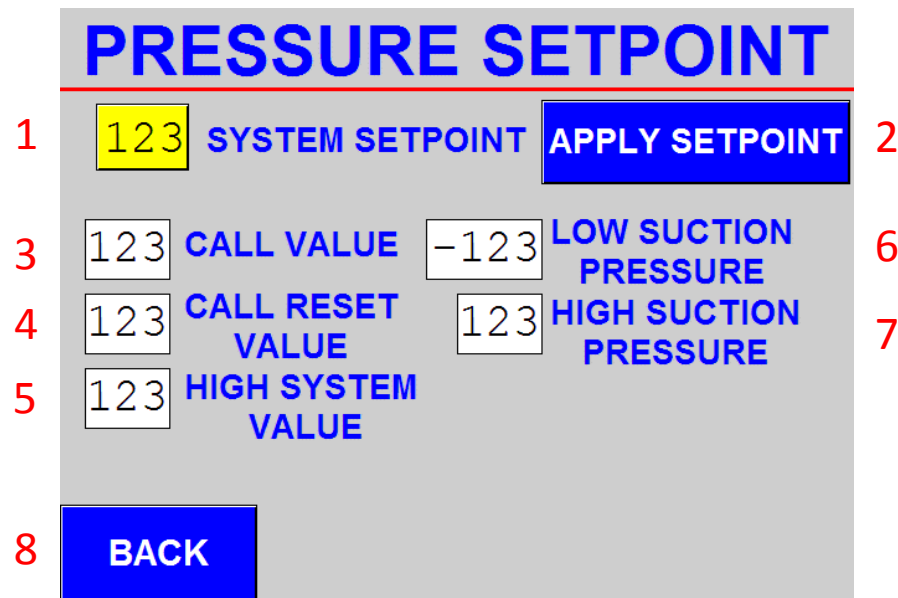


Figure 12: System Setpoint Menu

### 1. System Setpoint

a.C urrent Pressure Setpoint (as set by user) in PSI that the VFD's will maintain when in Automatic Mode.

### 2. Apply Setpoint

a.A pplies the user specified Pressure Setpoint to the system and VFD's so that the new setpoint will be maintained.

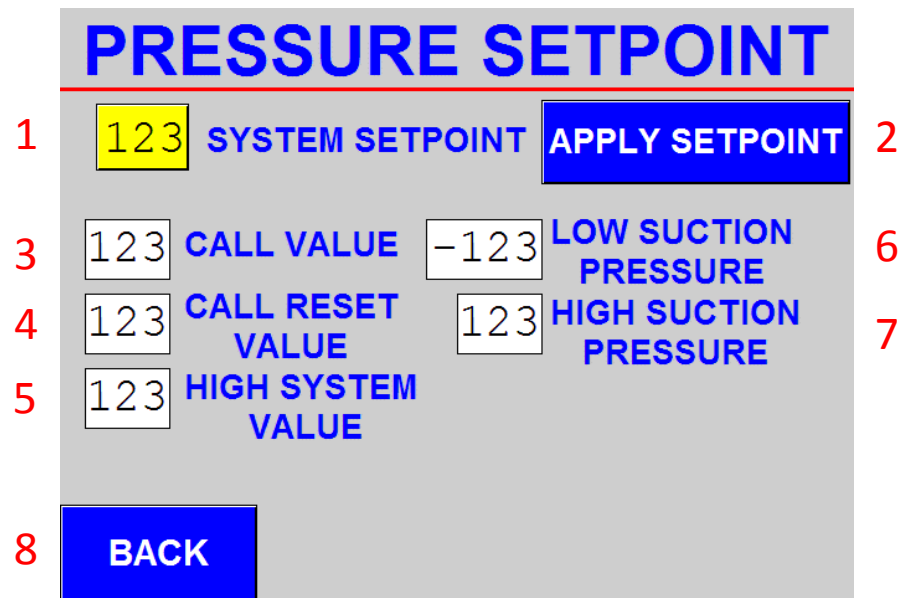
b.R egisters an audiovisual alarm indicating the setpoint has been changed.

c.C hanging the setpoint automatically changes the values displayed for call value, call reset value, high system value, low suction pressure value, and high suction pressure value. **Ensure to hit Apply Setpoint when adjustment is made!**

### 3. Call Value Display

a.D isplays the Call Value that is pressure drop at which the lead pump will sequence on.

b.F actory set to 5 PSI below setpoint. Can be changed in the Advanced Settings Menu (requires an additional password).



**Figure 12:** System Setpoint Menu

#### 4. Call Reset Value Display

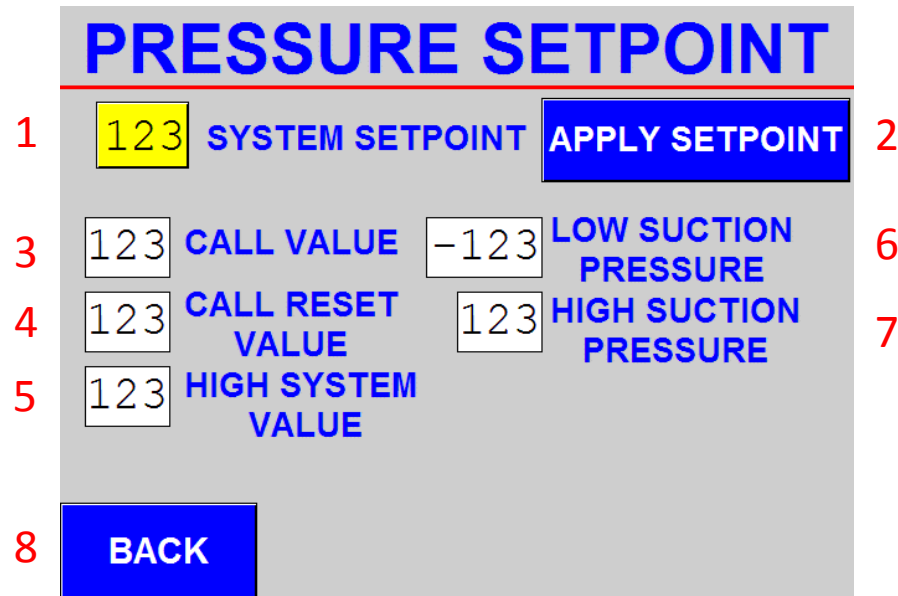
- a. Displays the Call Reset Value that is pressure drop at which the system will reset the call for a lead pump.
- b. Factory set to 4 PSI below setpoint. Can be changed in the Advanced Settings Menu (requires an additional password).

#### 5. High System Value Display

- a. Displays the High System Value that is the pressure in excess of the pressure setpoint at which a High System Alarm will register.
- b. Factory set to 15 PSI above setpoint. Can be changed in the Advanced Settings Menu (requires an additional password).

#### 6. Low Suction Pressure Value Display

- a. Displays the Low Suction Value that is the pressure at which a Low Suction Alarm will register when the suction pressure is at or below the call value.
- b. Factory set to 10 PSI. Can be changed in the Advanced Settings Menu (requires an additional password).



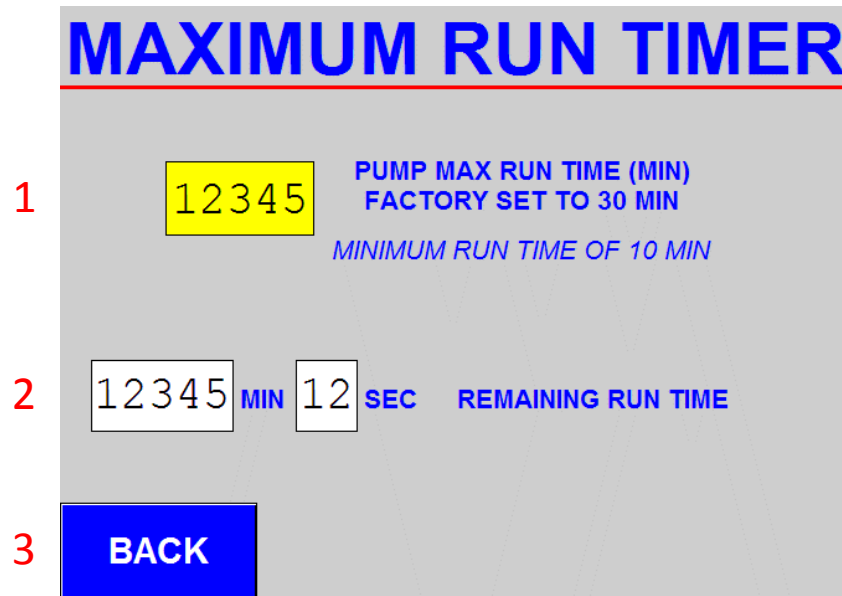
**Figure 12:** System Setpoint Menu

#### **7. High Suction Pressure Value Display**

- a. Displays the High Suction Value that is the pressure at which a High Suction Alarm will register when the suction pressure is at or above the call value.
- b. Factory set to +15 PSI from setpoint. Can be changed in the Advanced Settings Menu (requires an additional password).

#### **8. Back**

- a. Return to Basic Settings Menu.



**Figure 13:** Maximum Run Timer Menu

### 1. Pump Max Runtime

- a. Time to elapse (in minutes) before switching the pump sequence ensuring even pump rotation.
- b. Factory Set to 30 Minutes
- c. Minimum Value = 10 Minutes
- d. Example:
  - i. Max Runtime = 30 Minutes
  - ii. Lead Pump = Pump 1; Lag Pump = Pump 2
  - iii. After the 30 minutes expires and no faults or stop buttons are pressed, Pump 1 will sequence off, switch to Lag, while Pump 2 becomes the new Lead Pump.

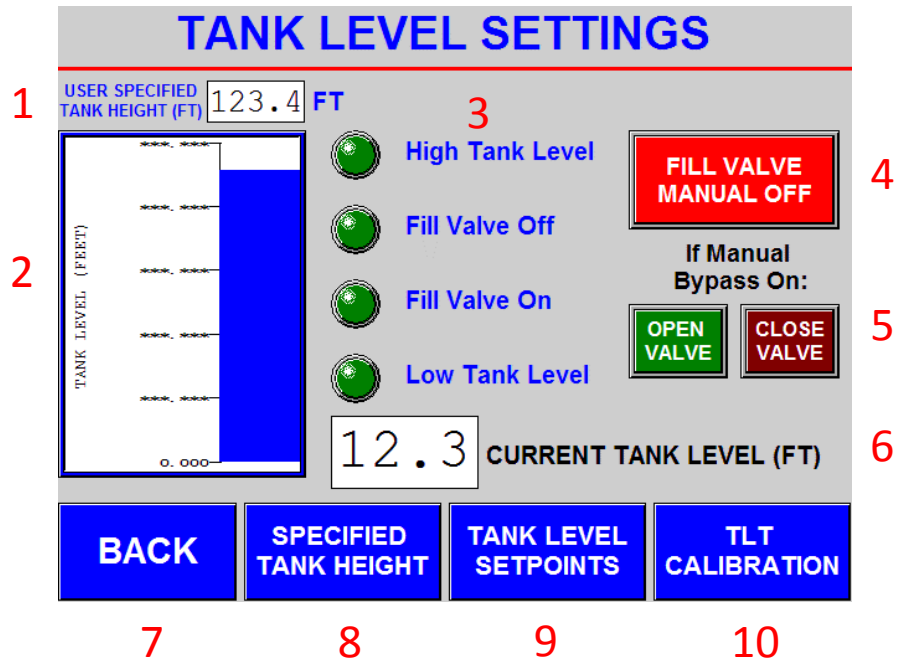
### 2. Remaining Run Time

- a. The remaining runtime in both minutes and seconds before the pump sequence switches Lead/Lag pumps.

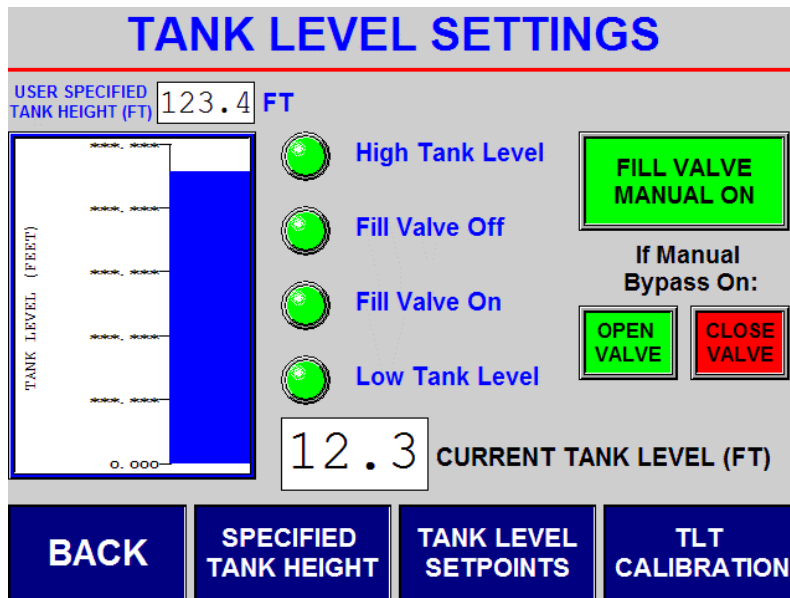
### 3. Back

- a. Return to Basic Settings Menu.

**\*If Equipped\***

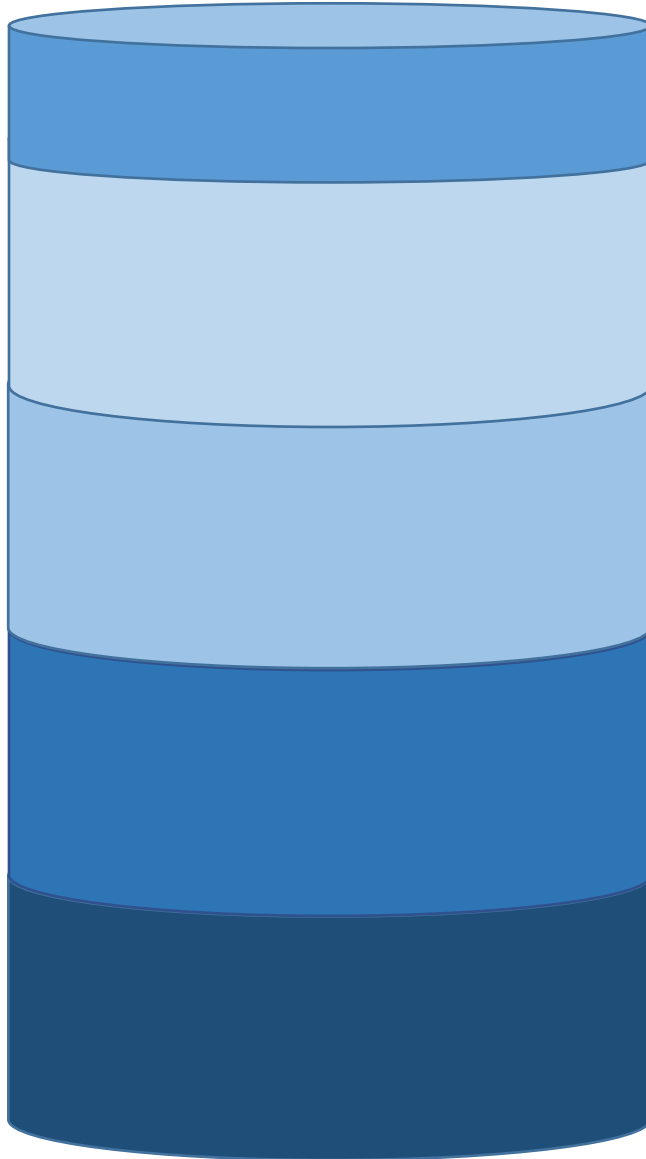


**Figure 14:** Tank Level Menu (LEDs Off)



**Figure 15:** Tank Level Menu (LEDs On)

## Tank Level Call Point Values:



### **Level 1:**

High Tank Level Alarm (Ft.)  
(Set By User)  
Alarm Registered w/ Timestamp

### **Level 2:**

Tank Fill Valve Off (Ft.)  
(Set By User)  
No Signal Sent to Contact Relay

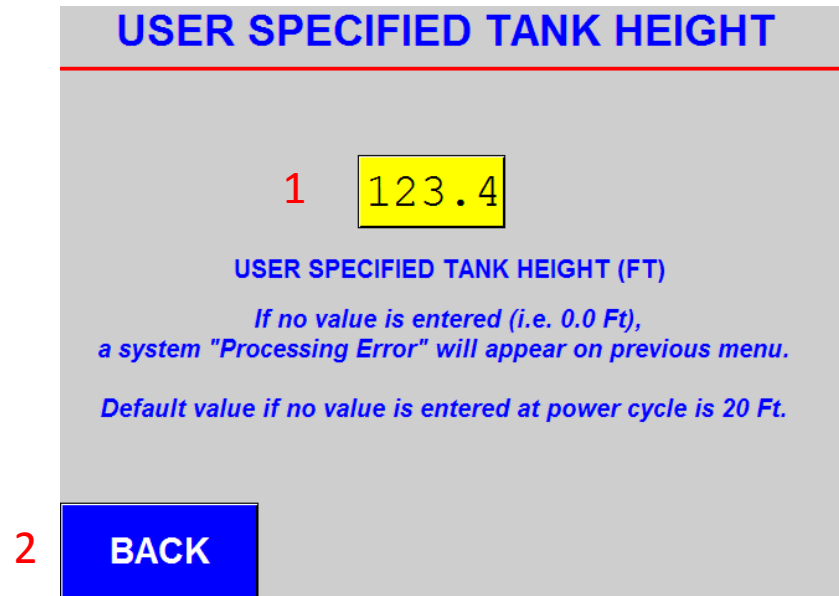
### **Level 3:**

Tank Fill Valve On (Ft.)  
(Set By User)  
Signal Sent to Contact Relay

### **Level 4:**

Low Tank Level Alarm (Ft.)  
(Set By User)  
Alarm Registered w/ Timestamp





**Figure 16:** User Specified Tank Height Menu

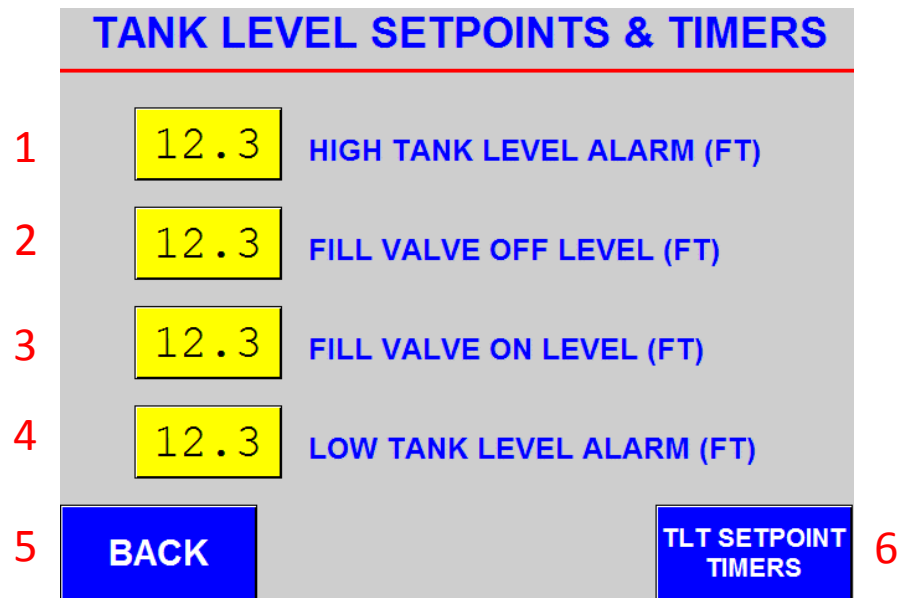
**1. User Specified Tank Height**

- a. Specified Tank Height, in ft. (set by user) for onsite tank. Changing this value will scale the Tank Level Graph automatically to the new value.
- b. Factory set to 20 ft. Max Value is 999.9 ft.

**2. Back**

- a. Returns to Tank Level Menu.





**Figure 17:** User Specified Tank Level Setpoints

**1. High Tank Level Alarm (FT)**

- a. Level at which the High Tank Level Alarm will register when current tank level is at or above the specified value and in automatic fill control.
- b. Reference Alarm & Event Sequence Table (**Section F**).

**2. Fill Valve Off Level (FT)**

- a. Level at which the system will stop sending a signal via the contact relay causing the Tank Fill Valve to close when current tank level is at or above the specified value and in automatic fill control.

**3. Fill Valve On Level (FT)**

- a. Level at which the system will start sending a signal via the contact relay causing the Tank Fill Valve to open when current tank level is at or below the specified value and in automatic fill control.

**4. Low Tank Level Alarm (FT)**

- a. Level at which the Low Tank Level Alarm will register when current tank level is at or below the specified value and in automatic fill control.
- b. Reference Alarm & Event Sequence Table (**Section F**).

**TANK LEVEL SETPOINTS & TIMERS**

1	12.3	HIGH TANK LEVEL ALARM (FT)
2	12.3	FILL VALVE OFF LEVEL (FT)
3	12.3	FILL VALVE ON LEVEL (FT)
4	12.3	LOW TANK LEVEL ALARM (FT)
5	BACK	
		TLT SETPOINT TIMERS 6

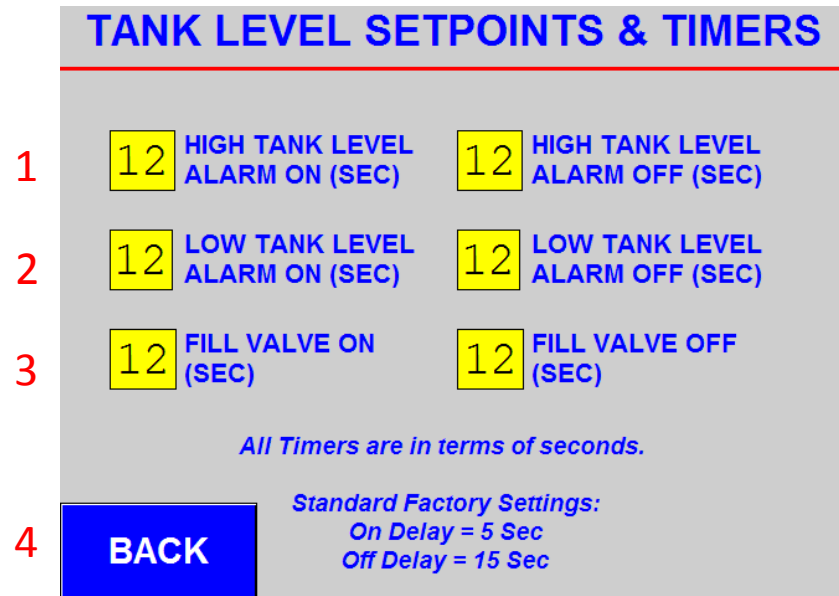
**Figure 17:** User Specified Tank Level Setpoints

**5. Back**

- a. Returns to Tank Level Menu.

**6. TLT Setpoint Timers**

- a. Advances to the Tank Level Setpoint Timers Menu.



**Figure 18:** Tank Level Timers Menu

**1. High Tank Level Alarm Timers**

- a. Delay Time (in sec) for registering/resetting High Tank Level Alarm once calibrated tank level reaches specified call value to prevent nuisance alarms or oscillations.
- b. Minimum Value = 0.0 Sec, Maximum Value = 99 Sec

**2. Low Tank Level Alarm Timers**

- a. Delay Time (in sec) for registering/resetting Low Tank Level Alarm once calibrated tank level reaches specified call value to prevent nuisance alarms or oscillations.
- b. Minimum Value = 0.0 Sec, Maximum Value = 99 Sec

**3. Fill Valve Timers**

- a. Delay Timers for opening/closing Tank Fill Valves once calibrated tank level reaches specified call value to prevent nuisance tripping or oscillations.
- b. Minimum Value = 0.0 Sec, Maximum Value = 99 Sec

**4. Back**

- a. Returns to Tank Level Setpoints Menu.

**TANK LEVEL TRANS. CALIBRATION**

1 **12345**  
CALIBRATION NUMBER  
FACTORY DEFAULT = 1000

2 **123**  
TANK LEVEL TRANSDUCER  
MAX VALUE (IN PSI)  
FACTORY DEFAULT = 30 PSI

3 **BACK**

**Figure 19:** Tank Level Transducer Calibration Menu

1. **Tank Level Transducer Calibration Number**
  - a. Calibration number required to read tank level value from transducer.
  - b. Factory Default = 1000
2. **Tank Level Transducer Max Value (in PSI)**
  - a. Transducer size required to scale level value from transducer. Based on the maximum reading the supplied pressure transducer can read.
  - b. Factory set to 30 PSI
3. **Back**
  - a. Returns to Tank Level Menu.

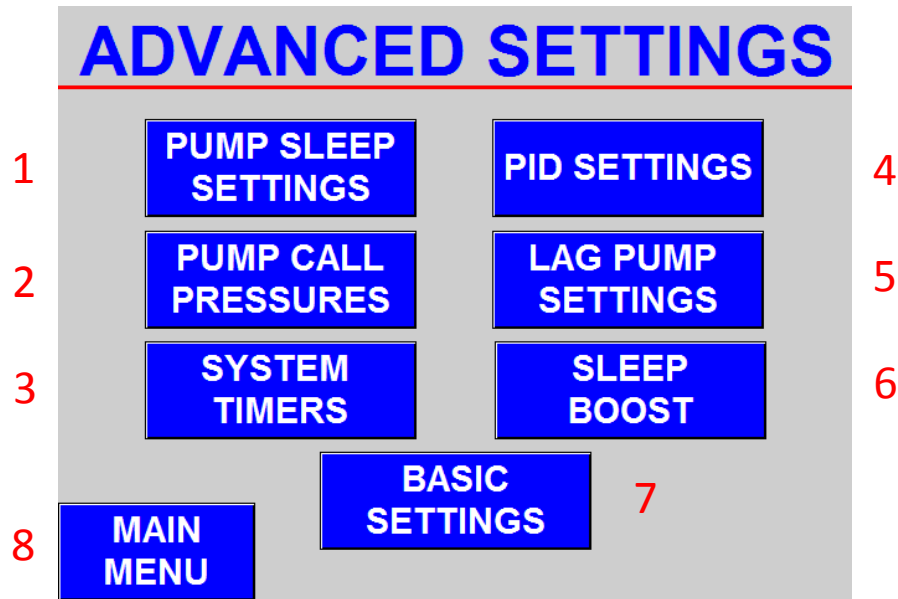
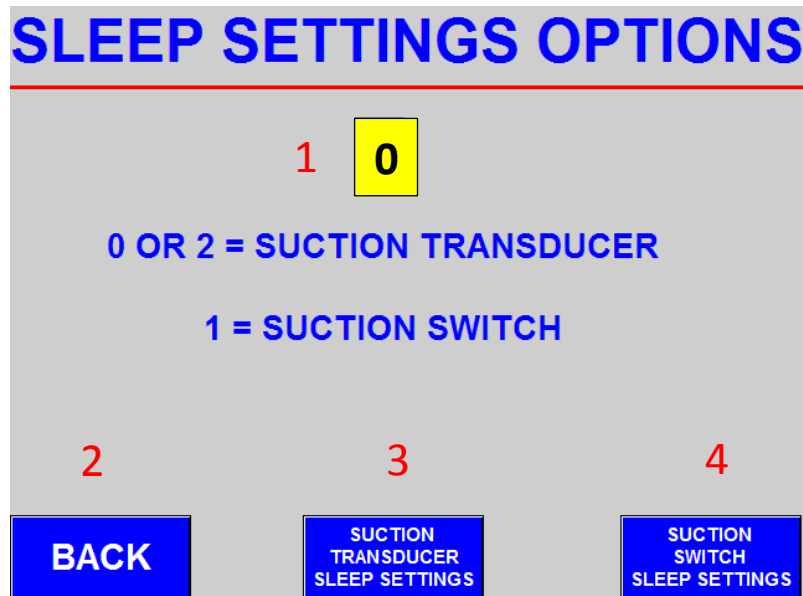


Figure 20: Advanced System Settings Menu

**PLEASE NOTE:** Advanced System Settings menu requires additional password. Altering any advanced system settings can result in system performance issues and system failure. Only factory authorized representatives should make adjustments within this menu.

For additional support, please reach out to the factory directly.

- 1. Pump Sleep Settings**
  - a. Accesses the Pump Sleep Settings Menu.
- 2. Pump Call Pressures**
  - a. Accesses the Pump Call Pressures Menu.
- 3. System Timers**
  - a. Accesses the System Timers Menu.
- 4. PID Settings**
  - a. Accesses the PID Settings Menu.
- 5. Lag Pump Settings**
  - a. Accesses the Lag Pump Settings Menu.
- 6. Sleep Boost**
  - a. Accesses the Sleep Boost Menu. (Not Required)
- 7. Basic Settings**
  - a. Accesses the Basic Settings Menu.
- 8. Main Menu**
  - a. Returns to Main Menu.



**Figure 21:** Sleep Settings Option Selection

**1. Sleep Settings Option Selection**

- a. User selection for suction safety and sleep style based on sensor input:
  - i. 0 or 2 = Suction Transducer
  - ii. 1 = Suction Switch

**2. Suction Transducer Sleep Settings Menu**

- a. Accesses the Suction Transducer Sleep Settings Menu.
- b. This is the default factory setting.

**3. Suction Switch Sleep Settings Menu**

- a. Accesses the Suction Switch Sleep Settings Menu.

**4. Back**

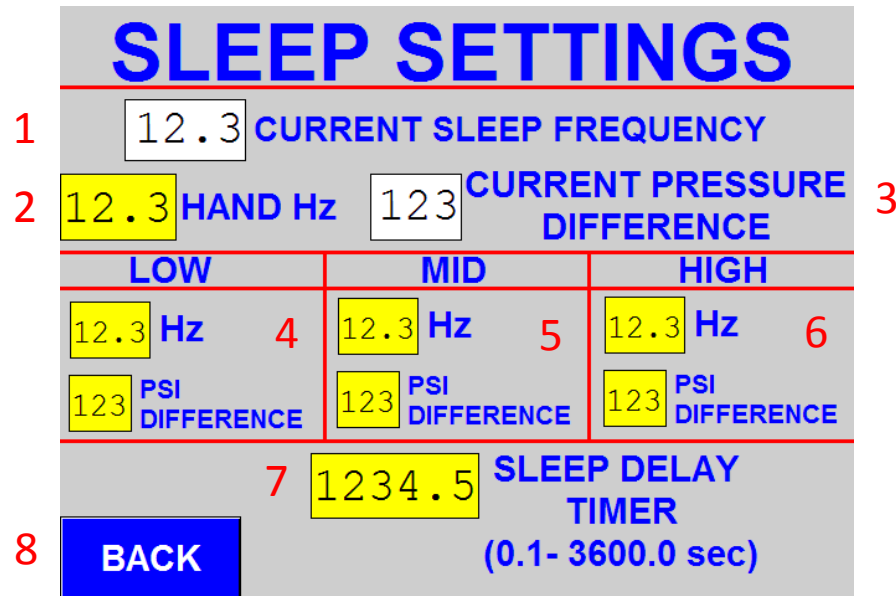
- a. Returns to Advanced System Settings.



**WARNING:**

**DO NOT** select Suction Switch Sleep Settings (Input of 1) when the system is equipped with a suction transducer unless an additional suction switch is installed.





**Figure 22:** Suction Transducer Sleep Settings Menu

**1. Current Sleep Frequency**

- a. Displays the current calibrated sleep frequency as determined and calculated by the system.

**2. Hand Hz**

- a. Current user specified Hand Hz.
- b. Minimum = 30 Hz, Maximum = 60 Hz

**3. Current Pressure Difference**

- a. Displays the current differential pressure between the calibrated suction and discharge pressures.

**4. Low Settings**

- a. **Low Hz:** Frequency at which differential pressure was recorded for automatic sleep Level 1 (typically at minimum speed of 30 Hz).
- b. **Low PSI Difference:** Differential pressure (between suction and discharge) recorded at Low Point Hz while pump was deadheaded.

**SLEEP SETTINGS**

1 12.3 CURRENT SLEEP FREQUENCY

2 12.3 HAND Hz 123 CURRENT PRESSURE DIFFERENCE 3

LOW	MID	HIGH
12.3 Hz 4	12.3 Hz 5	12.3 Hz 6
123 PSI DIFFERENCE	123 PSI DIFFERENCE	123 PSI DIFFERENCE

7 1234.5 SLEEP DELAY TIMER (0.1- 3600.0 sec)

8 BACK

Figure 22: Suction Transducer Sleep Settings Menu

#### 5. Mid Settings

- Mid Hz:** Frequency at which differential pressure was recorded for automatic sleep Level 2 (typically at speed of 45 Hz).
- Mid PSI Difference:** Differential pressure (between suction and discharge) recorded at Mid Point Hz while pump was deadheaded.

#### 6. High Settings

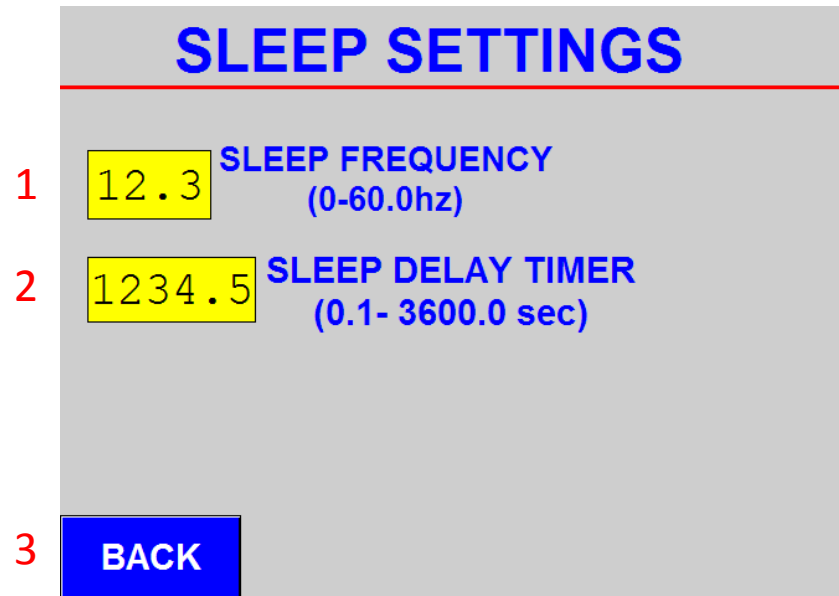
- High Hz:** Frequency at which differential pressure was recorded for automatic sleep Level 3 (typically at maximum speed of 60 Hz).
- High PSI Difference:** Differential pressure (between suction and discharge) recorded at High Point Hz while pump was deadheaded.

#### 7. Sleep Delay Timer

- Delay Time (in sec) specified by user that system waits to write sleep settings to VFD's and allow the Lead Pump to move into Sleep Mode to conserve energy.

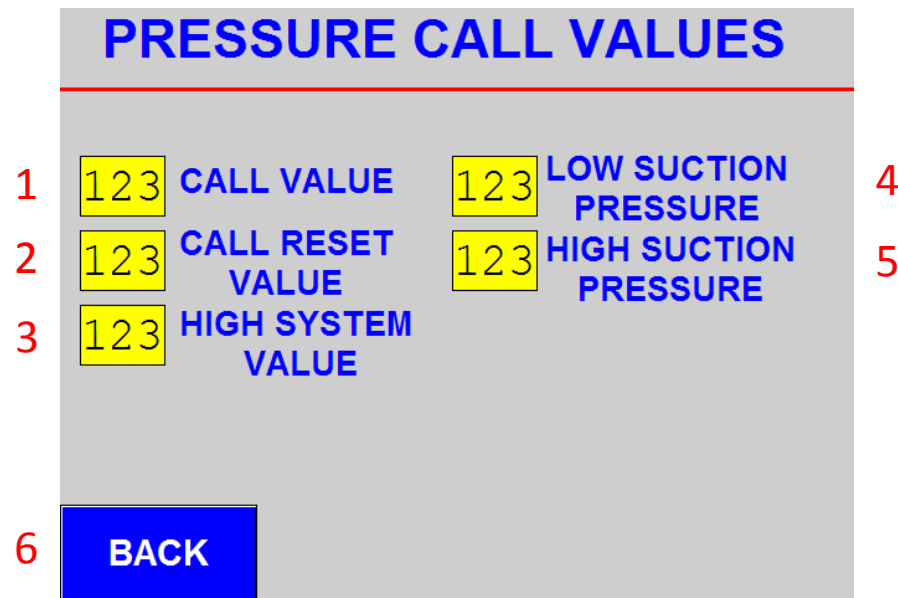
#### 8. Back

- Returns to Advanced System Settings.



**Figure 23:** Suction Switch Sleep Settings Menu

- 1. Sleep Frequency**
  - a. Fixed sleep frequency at which the Lead Pump will go into Sleep Mode to conserve energy. Must be set onsite based on field conditions.
- 2. Sleep Delay Timer**
  - a. Delay Time (in sec) specified by user that system waits to write sleep settings to VFD's and allow the Lead Pump to move into Sleep Mode to conserve energy.
- 3. Back**
  - a. Returns to Advanced System Settings.



**Figure 24:** Pressure Call Values Menu

**1. Call Value**

- a. Call Value that is pressure drop at which the lead pump will sequence on.
- b. Factory set to 5 psi below setpoint.

**2. Call Reset Value**

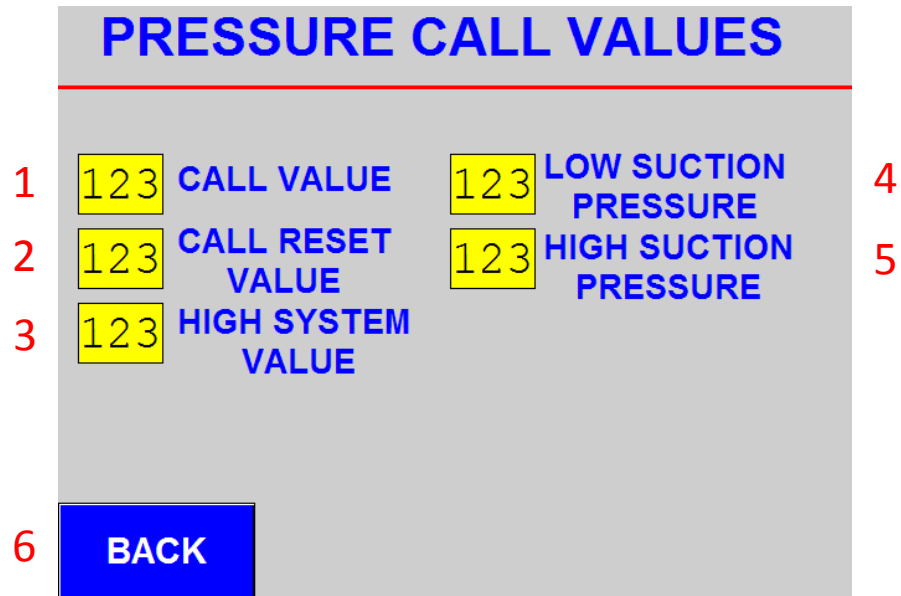
- a. Call Reset Value that is pressure drop at which the system will reset the call for a lead pump.
- b. Factory set to 4 psi below setpoint.

**3. High System Value**

- a. High System Value that is the pressure in excess of the pressure setpoint at which a High System Alarm will register.
- b. Factory set to 15 psi above setpoint.

**4. Low Suction Pressure Value**

- a. Low Suction Value that is the pressure at which a Low Suction Alarm will register when the suction pressure is at or below the call value.
- b. Factory set to 10 psi.



**Figure 24:** Pressure Call Values Menu

**5. High Suction Pressure Value**

- a. High Suction Value that is the pressure at which a High Suction Alarm will register when the suction pressure is at or above the call value.
- b. Factory set to 65 psi.

**6. Back**

- a. Returns to Advanced System Settings.

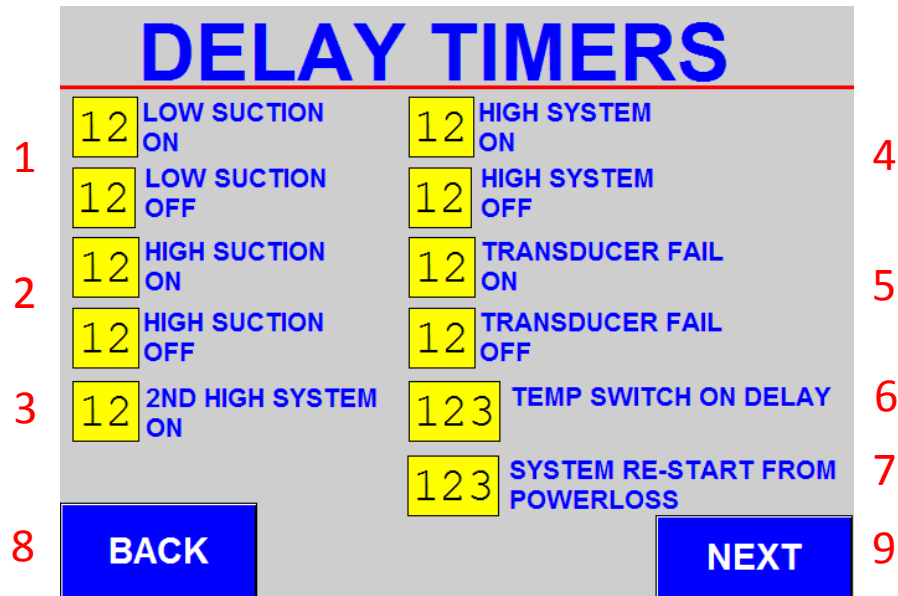


Figure 25: System Timers Menu 1

**1. Low Suction Alarm Timer(s)**

- a. Delay Time (in sec) for registering/resetting Low Suction Pressure Alarm once the calibrated suction pressure reaches the specified call value.
- b. Minimum Value = 0.0 Sec, Maximum Value = 99 Sec
- c. Factory Settings:
  - i. On: 5 Sec
  - ii. Off: 15 Sec

**2. High Suction Alarm Timer(s)**

- a. Delay Time (in sec) for registering/resetting High Suction Pressure Alarm once the calibrated suction pressure reaches the specified call value.
- b. Minimum Value = 0.0 Sec, Maximum Value = 99 Sec
- c. Factory Settings:
  - i. On: 5 Sec
  - ii. Off: 15 Sec

**3. 2<sup>ND</sup> High System Timer**

- a. Delay Time (in sec) for registering Secondary High System Alarm once the discharge switch (separate from transducer) reaches the switch pressure setpoint. Alarm is reset from Alarm Status Menu.
- b. Minimum Value = 0.0 Sec, Maximum Value = 99 Sec
- c. Factory Settings:
  - i. On: 2 Sec

**4. High System Alarm Timer(s)**

- a. Delay Time (in sec) for registering/resetting High System Pressure Alarm once the calibrated discharge pressure reaches the specified call value.
- b. Minimum Value = 0.0 Sec, Maximum Value = 99 Sec
- c. Factory Settings:
  - i. On: 5 Sec
  - ii. Off: 15 Sec

**5. Transducer Fail Alarm Timer(s)**

- a. Delay Time (in sec) for registering/resetting Transducer Failure Alarm once the calibrated transducer values fail to read.
- b. Minimum Value = 0.0 Sec, Maximum Value = 99 Sec
- c. Factory Settings:
  - i. On: 2 Sec
  - ii. Off: 15 Sec

**6. Temperature Switch Timer**

- a. Delay Time (in sec) for registering Temperature Switch Timer (if equipped) once temperature switch reaches the switch temperature setpoint. Alarm is reset from Alarm Status Menu (if equipped).
- b. Minimum Value = 0.0 Sec, Maximum Value = 99 Sec
- c. Factory Settings:
  - i. On: 5 Sec
  - ii. Off: 15 Sec

**7. System Re-Start from Power Loss Timer**

- a. Delay Time (in sec) after power cycle or power loss before automatic sequencing occurs.
- b. Minimum Value = 0.0 Sec, Maximum Value = 99 Sec
- c. Factory Settings:
  - i. On: 45 Sec

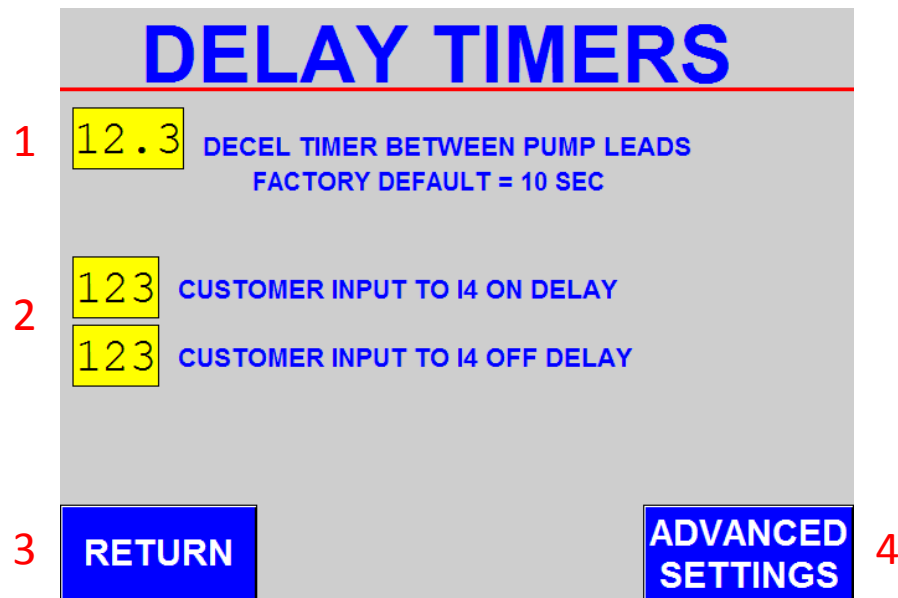
**8. Back**

- a. Returns to Advanced System Settings.

**9. Next**

- a. Advances to System Timers 2 Menu.





**Figure 26:** System Timers Menu 2

### 1. Decel Timer

- a. Delay Time (in sec) the lead pump will remain on during a pump lead sequence change from Lead to Lag. The Lead pump will continue to run the specified amount of time while the new Lead takes over to prevent a significant loss in building pressure.
- b. Minimum Value = 10.0 Sec, Maximum Value = 99.9 Sec
- c. Factory Settings:
  - i. On: 10.0 Sec

### 2. Input 4 (IN4) Timer

- a. Custom Delay Time (in sec) for registering/resetting the condition present on Input 4 (IN4) of the PLC. Typically not used or required.
- b. Minimum Value = 0 Sec, Maximum Value = 999 Sec

### 3. Return

- a. Returns to System Timer Menu 1. **Figure 25, pg. 50**

### 4. Advanced Settings

- a. Returns to Advanced System Settings. **Figure 20, pg. 42**

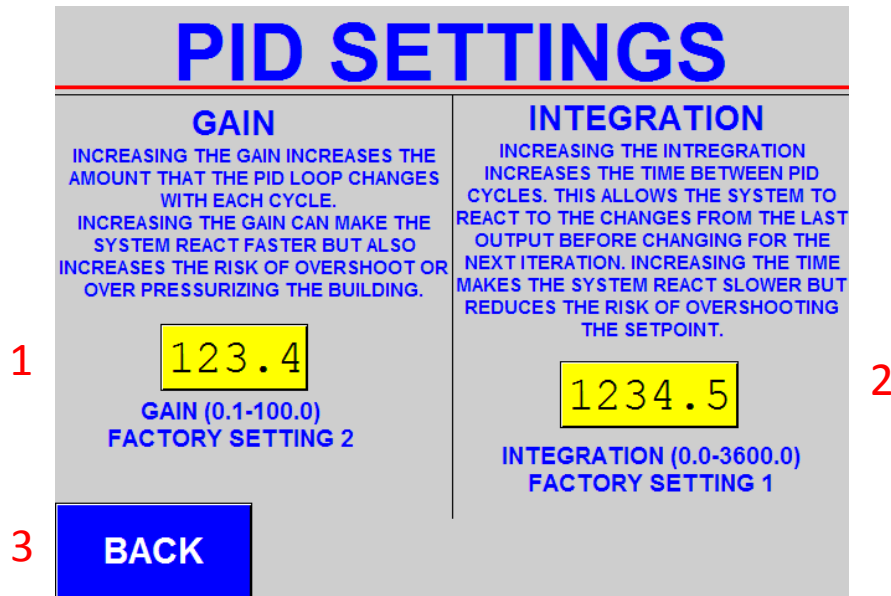
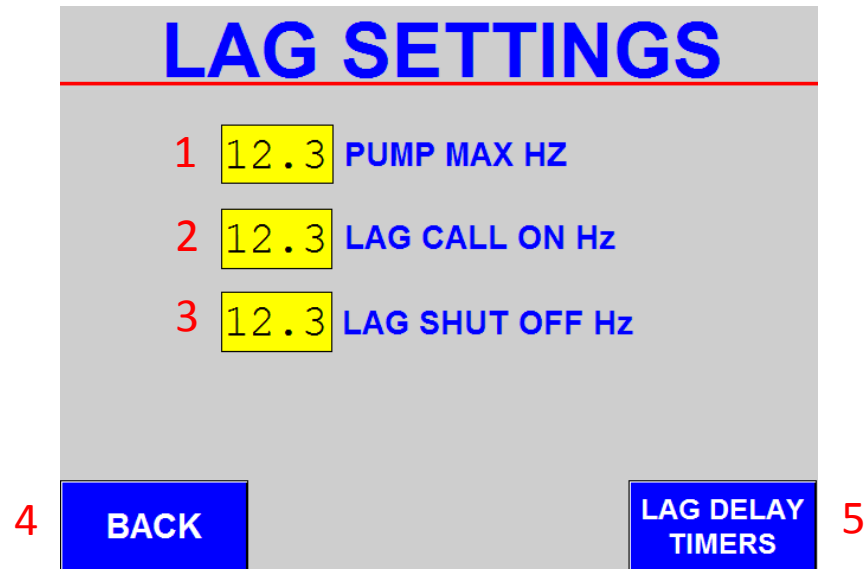


Figure 27: PID Settings Menu

1. **Gain**
  - a. Gain value of PID control algorithm.
  - b. Factory Set to 2
2. **Integration**
  - a. Integration value of PID control algorithm.
  - b. Factory Set to 1
3. **Back**
  - a. Returns to Advanced Settings Menu.

**PLEASE NOTE:** PID Values should **NOT** be adjusted without first consulting factory. Doing so may result in system performance issues or system failures.



**Figure 28:** Lag Pump Settings Menu

**1. Pump Max Hz**

- a. The maximum allowable frequency sent to the VFD that the pump can run.
- b. This value must be greater than 30 Hz (minimum speed) in order for the system to operate. If VFD Keypad reads Fault 1000: PAR HZ RPM, please ensure a value is entered for the Maximum Frequency.
- c. Factory Set to 60 Hz

**2. Lag Call On Hz**

- a. Frequency of Lead Pump at which Lag Pump starts if pressure setpoint has not been satisfied.
- b. Factory Set to 59.0 Hz

**3. Lag Shut Off Hz**

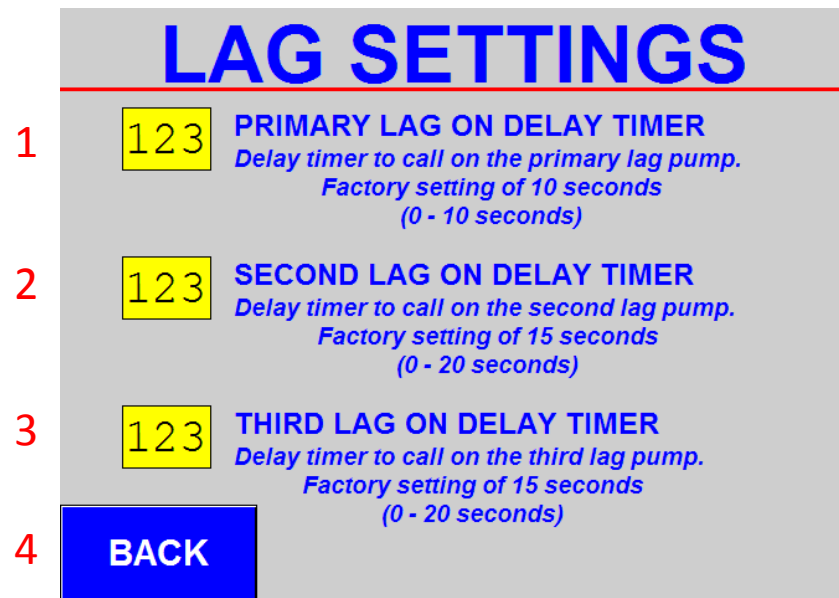
- a. Frequency of Lead Pump at which Lag Pump shuts off once pressure setpoint has been satisfied.
- b. Factory Set based on Selected Pump (Value will change based on pumps used)

**4. Back**

- a. Returns to Advanced Settings Menu.

**5. Lag Delay Timers**

- a. Advances to Lag Delay Timers Menu.



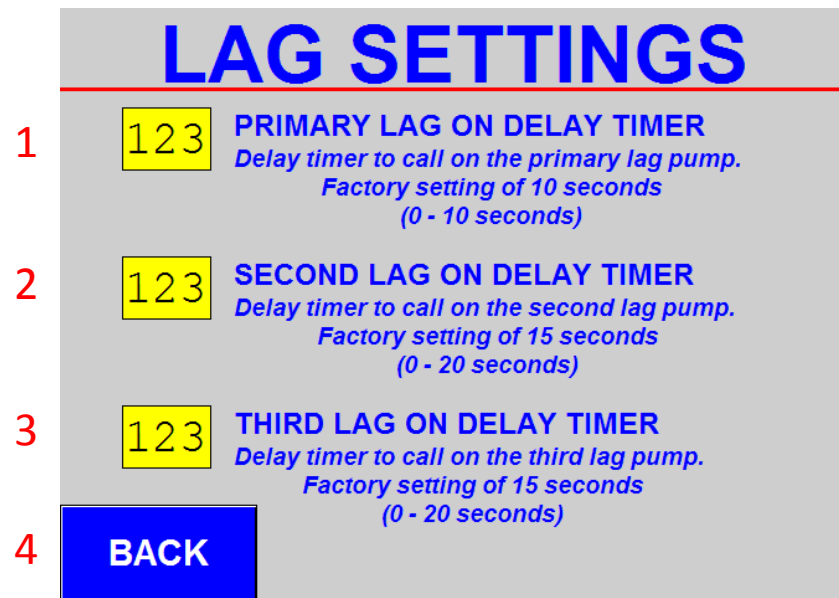
**Figure 29:** Lag Pump Timer Settings Menu

### 1. Primary Lag On Delay Timer

- Delay Time (in sec) before the primary Lag pump in the current sequence turns on after the Lead Pump is above the Lag On Frequency and the setpoint has not been satisfied.
- Minimum Value = 0 Sec, Maximum Value = 10 Sec
- Factory Default = 10 Sec

### 2. Second Lag On Delay Timer

- Delay Time (in sec) before the secondary Lag pump in the current sequence turns on after the Lead Pump is above the Lag On Frequency, the setpoint has not been satisfied, and the Primary Lag pump has started.
- Minimum Value = 0 Sec, Maximum Value = 20 Sec
- Factory Default = 15 Sec



**Figure 29:** Lag Pump Timer Settings Menu

### 3. Third Lag On Delay Timer

- a. Delay Time (in sec) before the third Lag pump in the current sequence turns on after the Lead Pump is above the Lag On Frequency, the setpoint has not been satisfied, the Primary Lag pump has started, and the Secondary Lag pump has started.
- b. Minimum Value = 0 Sec, Maximum Value = 20 Sec
- c. Factory Default = 15 Sec

### 4. Back

- a. Returns to Lag Pump Settings Menu.

**Table 3: Factory Adjusted Default Parameter Settings (ACS310)**

Parameter	Parameter Description	Drive Setting	Parameter	Parameter Description	Drive Setting
1001	EXT 1 COMMANDS	COMM	4001**	GAIN	2
1002	EXT 2 COMMANDS	COMM	4002**	INTEGRATION TIME	1
1102**	EXT1/EXT2 SELECT	MODE DEPENDENT	4006	UNITS	PSI (25)*
1103	REF 1 SELECT	COMM	4007	UNIT SCALE	0
1304	MINIMUM AI2	0	4009	100% VALUE	TRANSDUCER SIZE
1401	RELAY OUTPUT 1	FAULT	4010	SETPOINT SEL	INTERNAL
1601	RUN ENABLE	COMM	4011**	INTERNAL SETPOINT	SYSTEM DEPENDENT
1604	FAULT RESET	COMM	4022	SLEEP SELECTION	INTERNAL
1608	START ENABLE 1	NOT SELECTED	4023**	PID SLEEP LEVEL	SYSTEM DEPENDENT
1611	PARAMETER VIEW	LONG VIEW	4024**	PID SLEEP DELAY	30
2003	MAX CURRENT	MOTOR DEPENDENT	4025	WAKE-UP DEV	5
2007	MINIMUM FREQUENCY	30 Hz	5302	EFB STATION ID	DRIVE DEPENDENT 1-4
2008	MAX FREQUENCY	MOTOR DEPENDENT	5303	EFB BAUD RATE	57.6K
3019	COMM FAULT TIME	3	5304	EFB PARITY	8 NONE 1
3101	NR OF TRIALS	3	5305	EFB CTRL PROFILE	ABB DRV LIM
3104	AR OVERCURRENT	ENABLE	9802	COMM PROT SEL	STD MODBUS
3105	AR OVERVOLTAGE	ENABLE	9902***	APPLIC MACRO	PID CONTROL
3106	AR UNDERVOLTAGE	ENABLE	9905	MOTOR NOM VOLT	MOTOR DEPENDENT
3401	SIGNAL 1 PARAM	OUTPUT FREQ (103)*	9906	MOTOR NOM CURR	MOTOR DEPENDENT
3405	OUTPUT 1 UNIT	Hz (3)*	9907	MOTOR NOM FREQ	MOTOR DEPENDENT
3408	SIGNAL 2 PARAM	PID 1 SETPOINT (128)*	9908	MOTOR NOM SPEED	MOTOR DEPENDENT
3412	OUTPUT 2 UNIT	PSI (25)*	9909	MOTOR NOM POWER	MOTOR DEPENDENT
3415	SIGNAL 3 PARAM	PID 1 FBK (130)*			
3419	OUTPUT 3 UNIT	PSI (25)*			

\*(#) Parameter Selection Value

\*\*XXXX (Highlighted Orange) Indicates parameters controlled via PLC (Write Protected)

\*\*\*XXXX (Highlighted Yellow) Parameter **MUST NOT** be changed. Doing so will reset drive back to factory default.



## Section E: Factory Adjusted Default Parameter Settings (ACS355)

Parameter	Parameter Description	Drive Setting	Parameter	Parameter Description	Drive Setting
1001	EXT 1 COMMANDS	COMM	4001**	GAIN	2
1002	EXT 2 COMMANDS	COMM	4002**	INTEGRATION TIME	1
1102**	EXT1/EXT2 SELECT	MODE DEPENDENT	4006	UNITS	PSI (25)*
1103	REF 1 SELECT	COMM	4007	UNIT SCALE	0
1304	MINIMUM AI2	0	4009	100% VALUE	TRANSDUCER SIZE
1401	RELAY OUTPUT 1	FAULT	4010	SETPOINT SEL	INTERNAL
1601	RUN ENABLE	COMM	4011**	INTERNAL SETPOINT	SYSTEM DEPENDENT
1604	FAULT RESET	COMM	4022	SLEEP SELECTION	INTERNAL
1608	START ENABLE 1	NOT SELECTED	4023**	PID SLEEP LEVEL	SYSTEM DEPENDENT
1611	PARAMETER VIEW	LONG VIEW	4024**	PID SLEEP DELAY	30
2003	MAX CURRENT	MOTOR DEPENDENT	4025	WAKE-UP DEV	5
2007	MINIMUM FREQUENCY	30 Hz	5101	EXT COMM MODULE	0
2008	MAX FREQUENCY	MOTOR DEPENDENT	5302	EFB STATION ID	DRIVE DEPENDENT 1-4
3019	COMM FAULT TIME	3	5303	EFB BAUD RATE	57.6K
3101	NR OF TRIALS	3	5304	EFB PARITY	8 NONE 1
3104	AR OVERCURRENT	ENABLE	5305	EFB CTRL PROFILE	ABB DRV LIM
3105	AR OVERVOLTAGE	ENABLE	9802	COMM PROT SEL	STD MODBUS(FMBA-01)
3106	AR UNDERVOLTAGE	ENABLE	9902***	APPLIC MACRO	PID CONTROL
3401	SIGNAL 1 PARAM	OUTPUT FREQ (103)*	9904	MTR CTRL	SCALAR FREQ (3)
3405	OUTPUT 1 UNIT	Hz (3)*	9905	MOTOR NOM VOLT	MOTOR DEPENDENT
3408	SIGNAL 2 PARAM	PID 1 SETPOINT (128)*	9906	MOTOR NOM CURR	MOTOR DEPENDENT
3412	OUTPUT 2 UNIT	PSI (25)*	9907	MOTOR NOM FREQ	MOTOR DEPENDENT
3415	SIGNAL 3 PARAM	PID 1 FBK (130)*	9908	MOTOR NOM SPEED	MOTOR DEPENDENT
3419	OUTPUT 3 UNIT	PSI (25)*	9909	MOTOR NOM POWER	MOTOR DEPENDENT
			9910	ID RUN	OFF (0)

\*(#) Parameter Selection Value

\*\*XXXX (Highlighted Orange) Indicates parameters controlled via PLC (Write Protected)

\*\*\*XXXX (Highlighted Yellow) Parameter **MUST NOT** be changed. Doing so will reset drive back to factory default.



**Table 3: Factory Adjusted Default Parameter Settings (ACS580)**

Parameter	Parameter Description	Drive Setting	Parameter	Parameter Description	Drive Setting
10.07	DI2 ON delay	2.00 s	40.36	Set 1 output min	30.00 Hz
10.08	DI2 OFF delay	2.00 s	40.37	Set 1 output max	60.00 Hz
10.24	RO1 source	FAULT	40.43	Set 1 sleep level	SYSTEM DEPENDENT
12.25	AI2 unit selection	V	40.44	Set 1 sleep delay	30.0 s
12.27	AI2 min	0.000 V	40.47	Set 1 wake-up deviation	5 PSI
12.28	AI2 max	10.000 V	40.57	PID set1/set2 selection	PID Set 1
12.29	AI2 scaled at AI2 min	0 (TRANSDUCER MIN)	40.60	Set 1 PID activation source	Follow Ext1/Ext2 selection
12.30	AI2 scaled at AI2 max	300 (TRANSDUCER MAX)	40.79	Set 1 units	PSI (76)*
19.01	Actual operation mode	Scalar (Hz)	46.01	Speed scaling	3600.00 rpm
19.11**	Ext1/Ext2 Selection	EFB MCW bit 11	46.02	Frequency scaling	60.00 Hz
20.01	Ext1 Commands	Embedded Fieldbus (14)*	49.01	Node ID Number	DRIVE DEPENDENT 1-4
20.06	Ext2 Commands	Embedded Fieldbus (14)*	49.03	Baud rate	57.6 kbit/s
20.12***	Run enable 1 source	EFB MCW bit 3	49.19	Basic panel home view 1	Freq ref used (14)*
20.19	Enable start command	Selected	49.20	Basic panel home view 2	Output frequency (3)*
21.03	Stop mode	Ramp	49.21	Basic panel home view 3	Motor current (4)*
21.05	Emergency stop source	DI2	49.219	Basic panel home view 4	Output frequency (3)*
22.11	Ext1 speed ref1	EFB ref1	49.220	Basic panel home view 5	Other (40.03)*
22.18	Ext2 speed ref1	PID	49.221	Basic panel home view 6	Other (40.02)*
23.11	Ramp set selection	Acc/Dec time 1	58.01***	Protocol Enable	Modbus RTU (1)*
26.12	Torque ref2 source	PID	58.03***	Node Address	DRIVE DEPENDENT 1-4
28.11	Ext1 frequency ref1	EFB ref1	58.04***	Baud rate	57.6 kbit/s
28.15	Ext2 frequency ref2	PID	58.05***	Parity	8 NONE 1
28.23	Constant frequency sel2	Always Off	58.14	Communication loss action	Fault
28.72	Freq acceleration time 1	10.000 s	58.16	Communication loss time	10.0 s
28.73**	Freq deceleration time 1	40.000 s	58.25**	Control Profile	ABB Drives
30.11	Minimum speed	MOTOR DEPENDENT	58.26	EFB ref1 type	Frequency (5)*
30.12	Maximum speed	MOTOR DEPENDENT	58.27	EFB ref2 type	Frequency (5)*
30.13	Minimum frequency	30.0 Hz	58.28	EFB act1 type	Frequency (5)*
30.14**	Maximum frequency	60.0 Hz	58.29	EFB act2 type	Frequency (5)*
30.17	Maximum current	MOTOR DEPENDENT	96.02	Pass code	Call DPC Factory Support
30.30	Overvoltage control	Enable	96.04***	Macro Select	Panel PID
30.31	Undervoltage control	Enable	99.03	Motor type	Asynchronous motor
30.35	Thermal current limitation	Enable	99.04	Motor control mode	Scalar (1)*
31.14	Number of trials	3	99.06	Motor nominal current	MOTOR DEPENDENT
40.07	Process PID op mode	On When Drive Running	99.07	Motor nominal voltage	MOTOR DEPENDENT
40.08	Set 1 feedback 1 source	AI2 Scaled	99.08	Motor nominal frequency	MOTOR DEPENDENT
40.11	Set 1 feedback filter time	0.5 s	99.09	Motor nominal speed	MOTOR DEPENDENT
40.16	Set 1 setpoint 1 source	Internal	99.10	Motor nominal power	MOTOR DEPENDENT
40.19	Set 1 internal setpoint sel1	Selected	99.13	ID run requested	None
40.21**	Set 1 internal setpoint 1	SYSTEM DEPENDENT	99.16	Motor phase order	U V W
40.26	Set 1 setpoint min	0 PSI (TRANSDUCER MIN)	<b>PAR 31.40 - Disable warning messages - scroll down to "Emergency stop off2" and enter "1" to disable warning messages.</b>		
40.27	Set 1 setpoint max	300 PSI (TRANSDUCER MAX)			
40.32**	Set 1 gain	2.00			
40.33**	Set 1 integration time	5.00 for VM - 1.00 for ES			

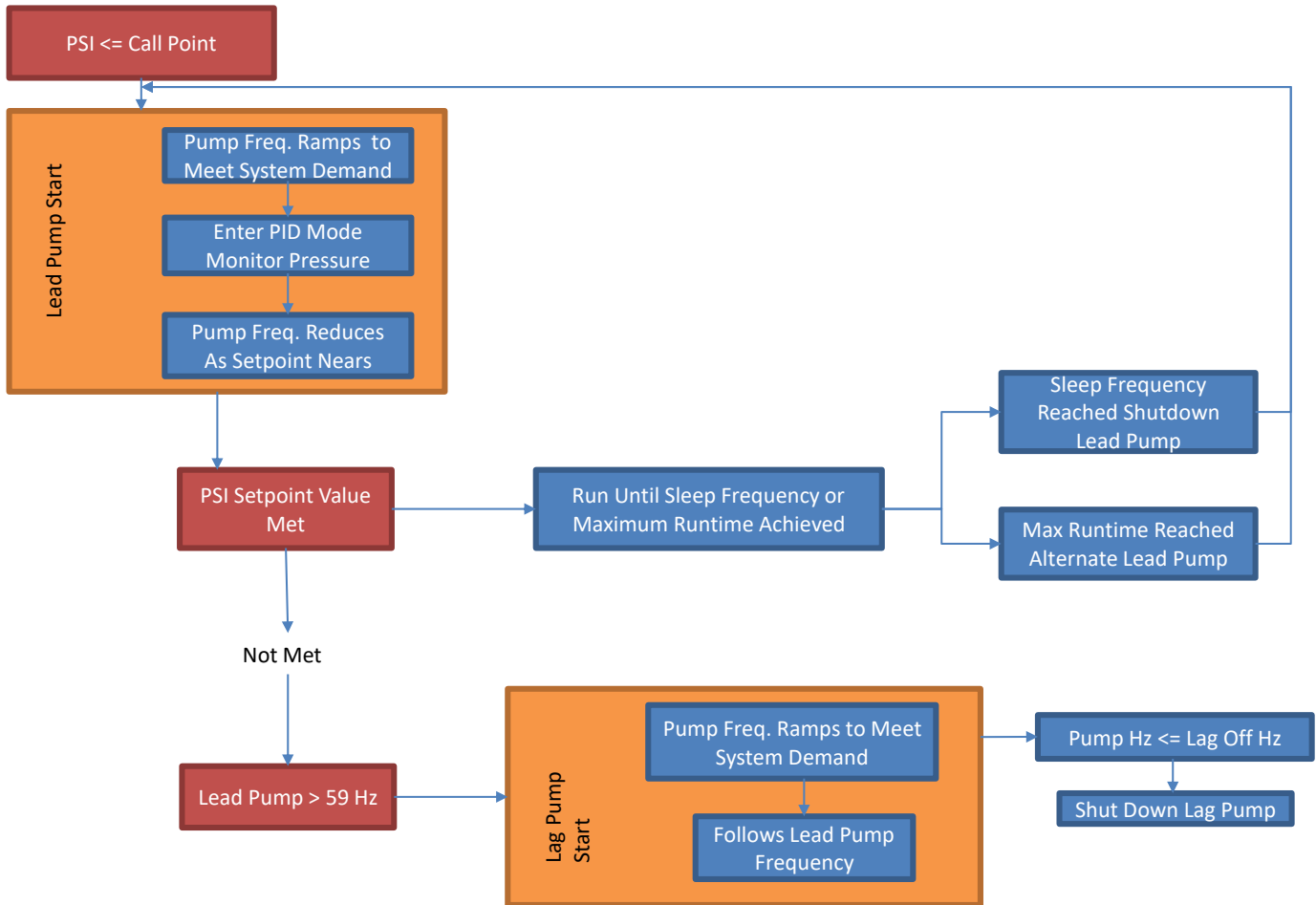
\*(#) Parameter Selection Value

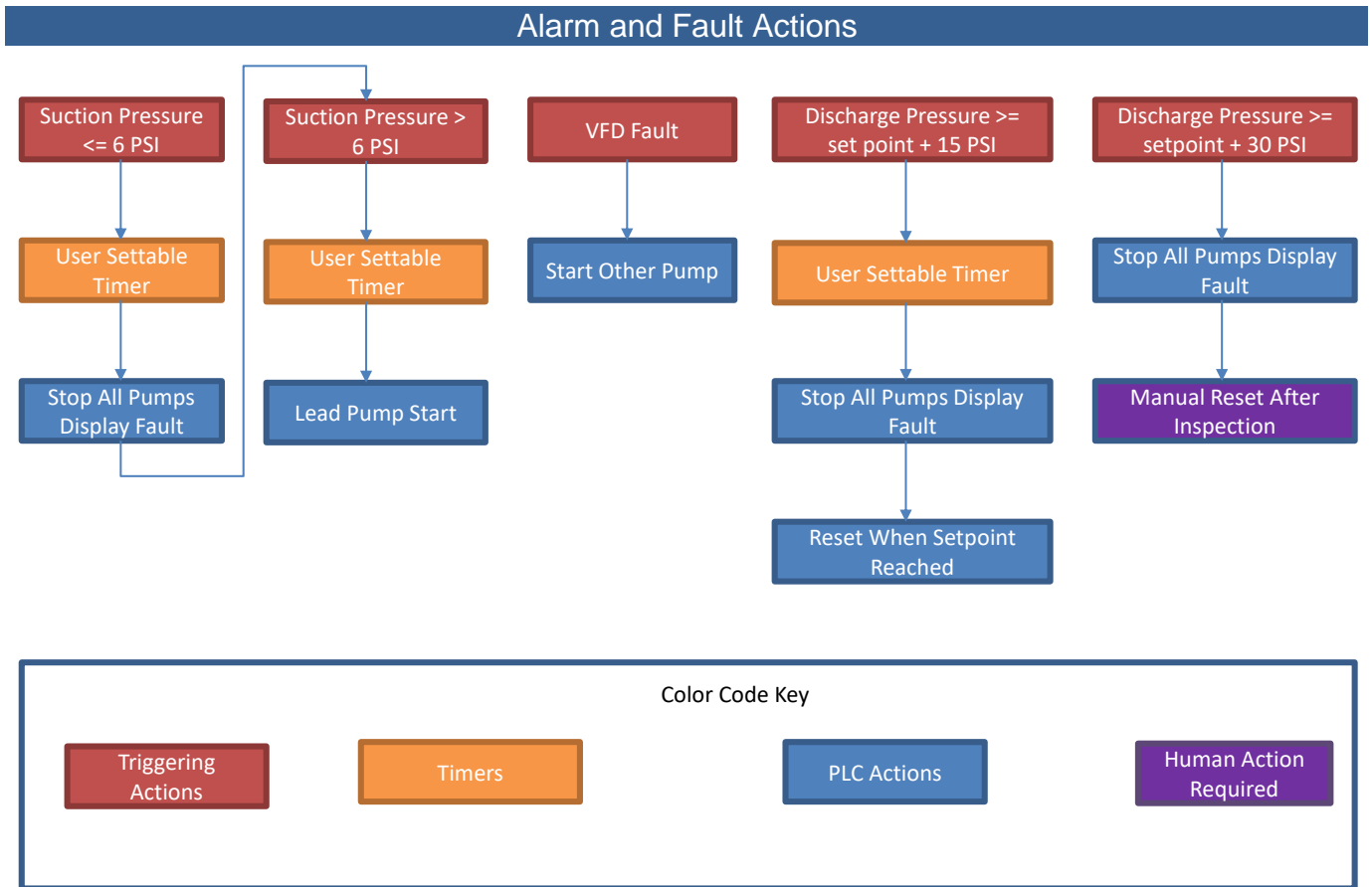
\*\*XXXX (Highlighted Orange) Indicates parameters controlled via PLC (Write Protected)

\*\*\*XXXX (Highlighted Yellow) Parameter **MUST NOT** be changed. Doing so will reset drive to ABB factory settings or disrupt communication to/from PLC. **DO NOT** adjust under any circumstances.



Control Logic Chart





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**Table 4. Troubleshooting**

	<b>PAGE</b>
Touch Screen is Not Lightning Up	71
No Incoming Power	72
Low Suction Alarm is Sounding	73
<b>- Transducer Calibration Field Guide</b>	
High Suction Alarm	74
System Not Running	75
<b>- VFD Local Mode Field Guide</b>	
High System Alarm	76
Low Discharge Pressure	77
2nd High System Alarm	78
<b>- 2nd High Calibration Field Guide</b>	
System Not Connecting Over Ethernet	79
Variable Frequency Drive Fault	80

Table 4. Troubleshooting – Continued

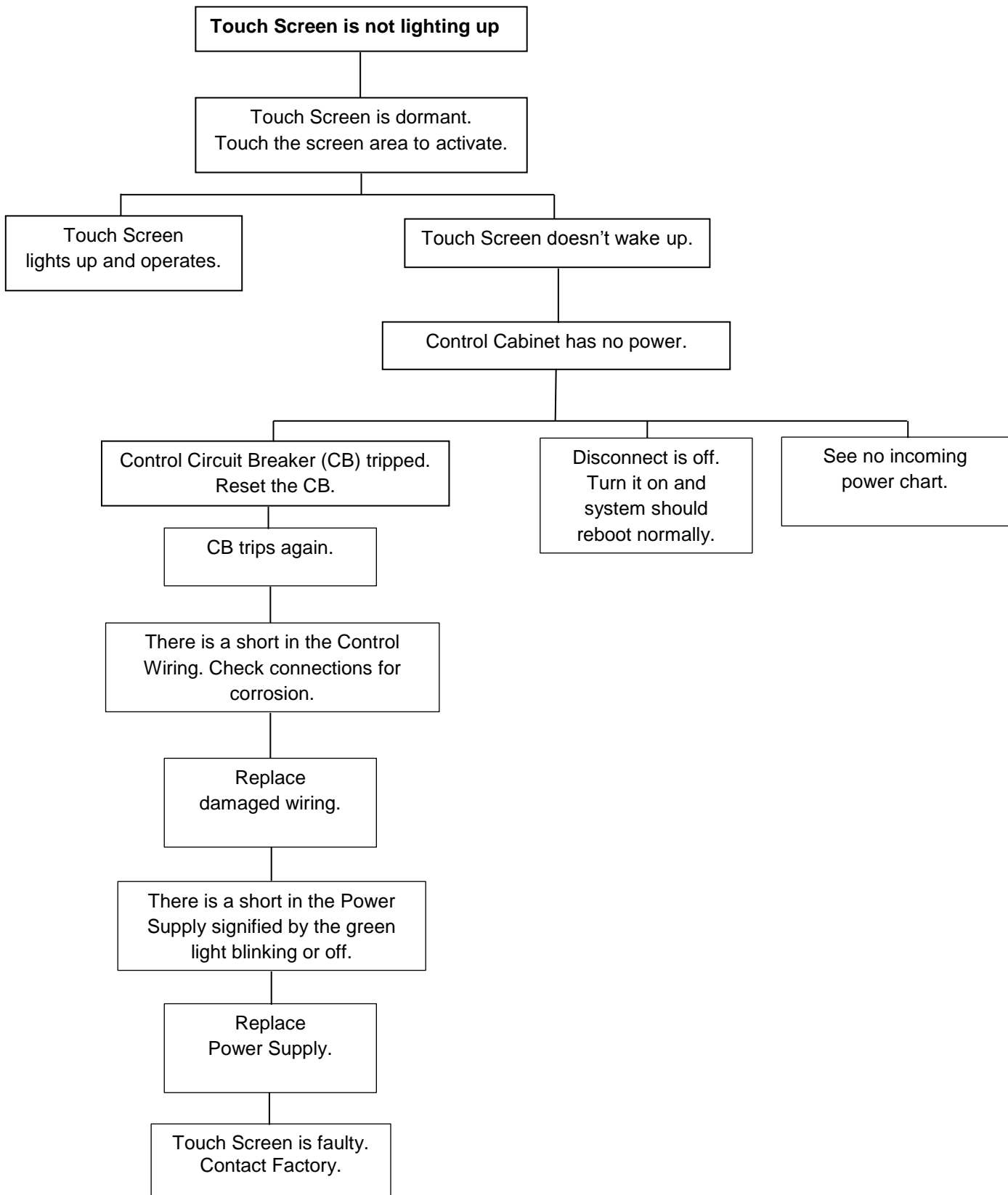
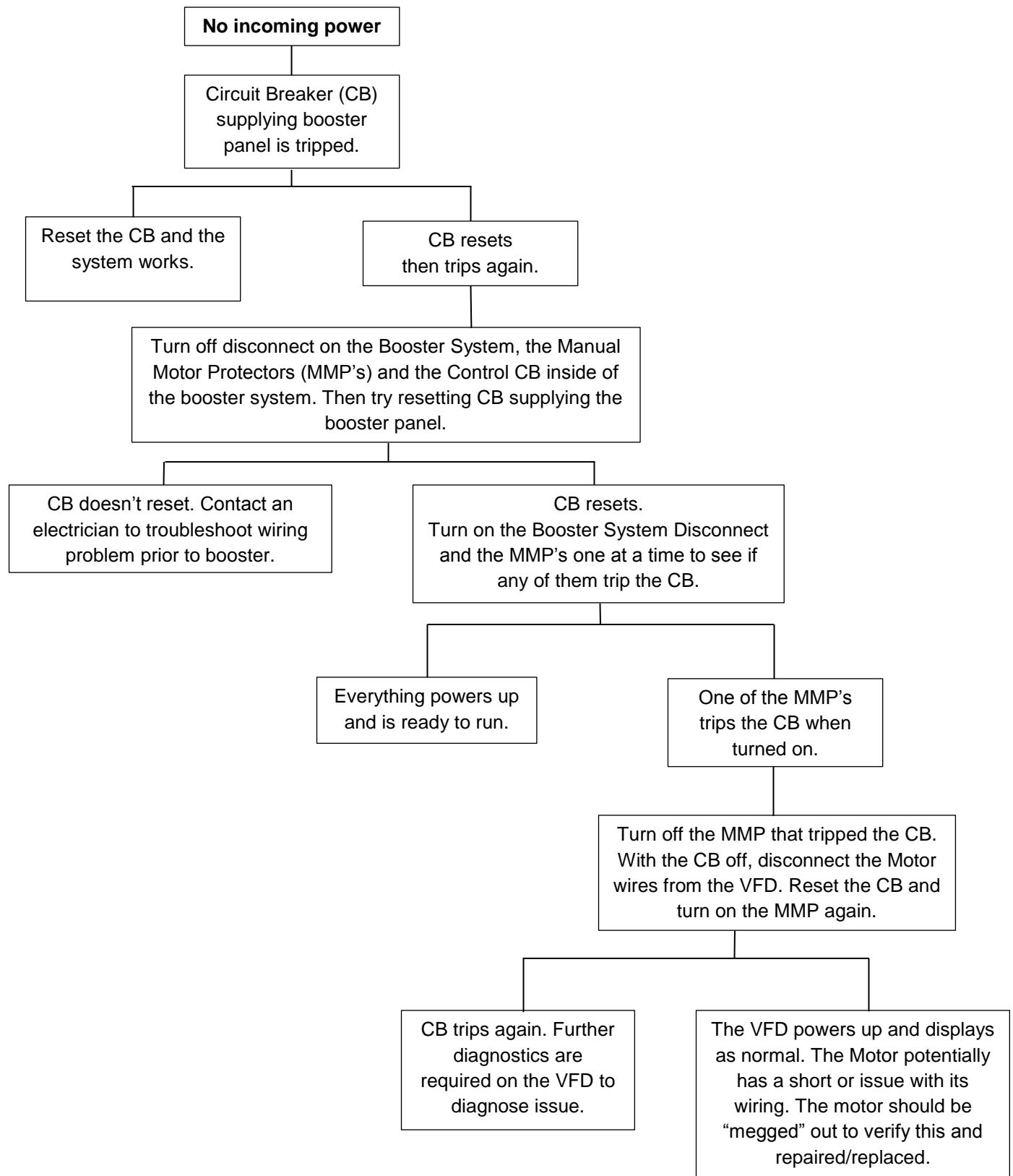
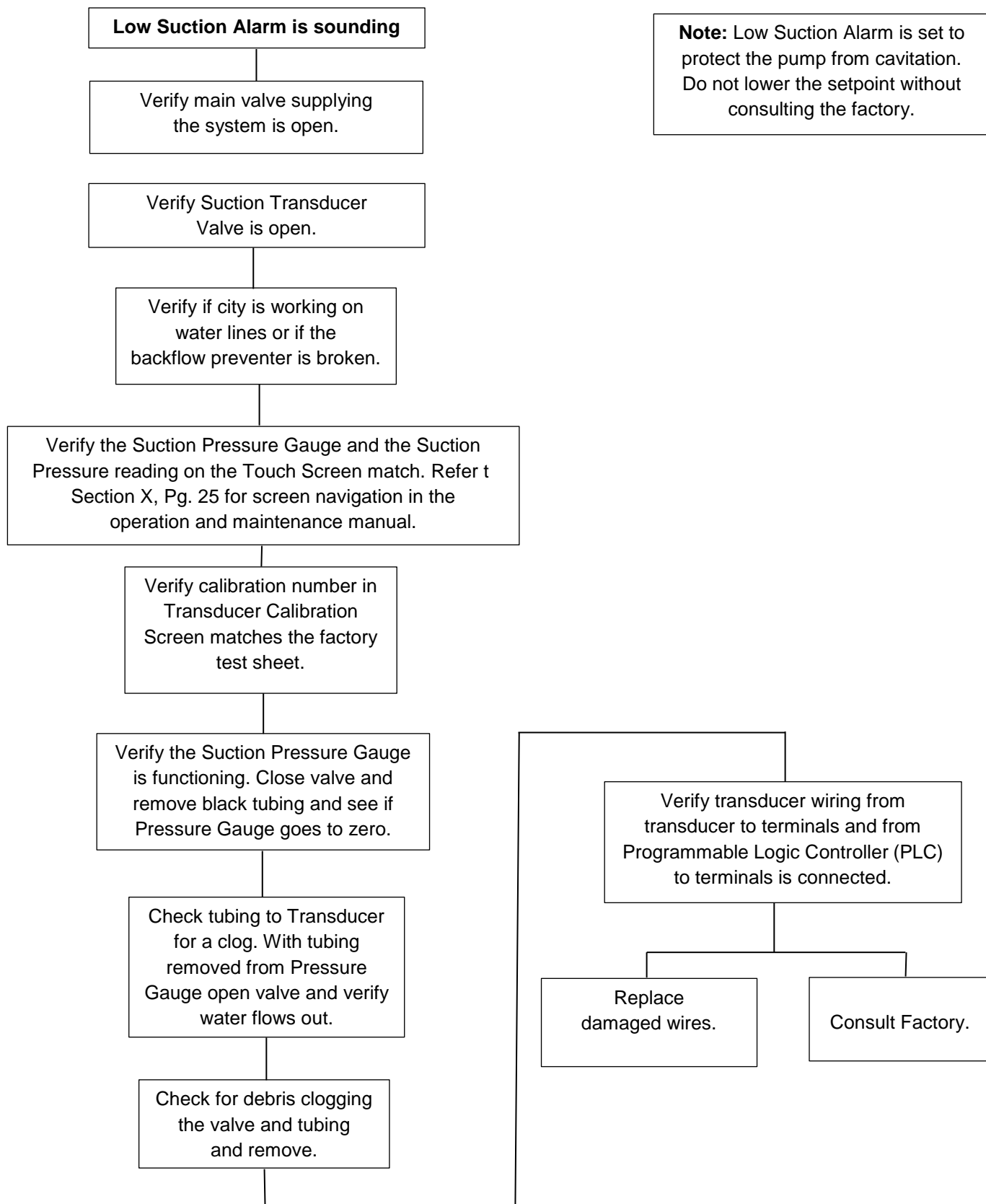


Table 4. Troubleshooting – Continued



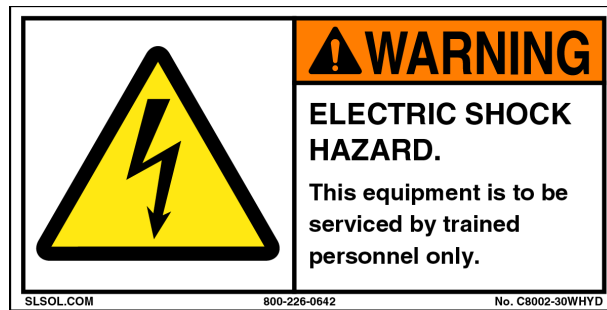
**Table 4. Troubleshooting – Continued**





**Delta P Carver**  
We Put the PSI in Water Systems

## Changing Transducer Sizes



**BEFORE ALTERING ANY PARAMETERS PLEASE READ THE FOLLOWING INSTRUCTIONS CAREFULLY. FAILURE TO DO SO MAY RESULT IN SYSTEM PERFORMANCE ISSUES AND/OR PERSONAL INJURY. DELTA P CARVER TAKES NO RESPONSIBILITY OR LIABILITY FOR FAILURE TO ADHERE TO THE FOLLOWING INSTRUCTIONS OR ANY WORK NOT COMPLETED BY DELTA P CARVER EMPLOYEES OR CERTIFIED REPRESENTATIVES. ALL SERVICE WORK IS TO BE PERFORMED BY TRAINED PERSONNEL ONLY.**





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If a new transducer is installed on the booster with a different range than what was initially installed, settings will need to be changed in both the PLC and VFDs. An example of this would be if the system was originally manufactured with a 0 – 200 psi transducer, and a replacement transducer was sent that was 0 – 300 psi.

## Changing the Parameters in the PLC

### Discharge Transducer

1.) On the touchscreen, please select SYSTEM MAINTENANCE → USE PASSWORD

“1111” → TRANS. CAL.

a. The screen will read “DISCHARGE PRESSURE” in the top left hand corner.

This is the discharge transducer calibration page.

b. For the “TRANSDUCER SIZE” select the input box, and change the value to the max range as shown on the transducer nameplate.

i. If the original transducer was 0 – 200 psi range, the current value will read 200. Tap the box where “200” is displayed, and change it to the new max size of the transducer. If the new transducer is 0 – 300 psi, input 300 as the new max value and hit enter.

2.) Calibration may need to be performed on the new transducer to ensure it is reading an accurate value.

a. The factory base value is “1000”.

b. This value can be reduced or increased as needed to match the mechanical gauge.

---

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# Delta P Carver

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## Suction Transducer

3.) On the touchscreen, please select SYSTEM MAINTENANCE → USE PASSWORD

“1111” → TRANS. CAL.

- a. Select the “NEXT” option located in the bottom right hand corner of the screen.
  - b. The new screen will read “SUCTION PRESSURE” in the top left hand corner of the screen. This is the suction transducer calibration page.
  - c. This screen will look similar to the discharge calibration with the exception of a “TRANSDUCER MIN” option. The transducer min will be the minimum range located on the transducer nameplate.
    - i. If the transducer is a 0 – 150 psi transducer, the “TRANSDUCER MIN” value is 0.
  - d. For the “TRANSDUCER MAX”, select the input box and change the value to the max range as shown on the transducer nameplate.
    - i. If the transducer is a 0 – 150 psi transducer, the “TRANSDUCER MAX” value is 150.
- 4.) Calibration may need to be performed on the new transducer to ensure it is reading an accurate value.
- a. The factory base value is “1000”.
  - b. This value can be reduced or increased as needed to match the mechanical gauge.

---

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# Delta P Carver

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## Changing the Parameters in the VFD

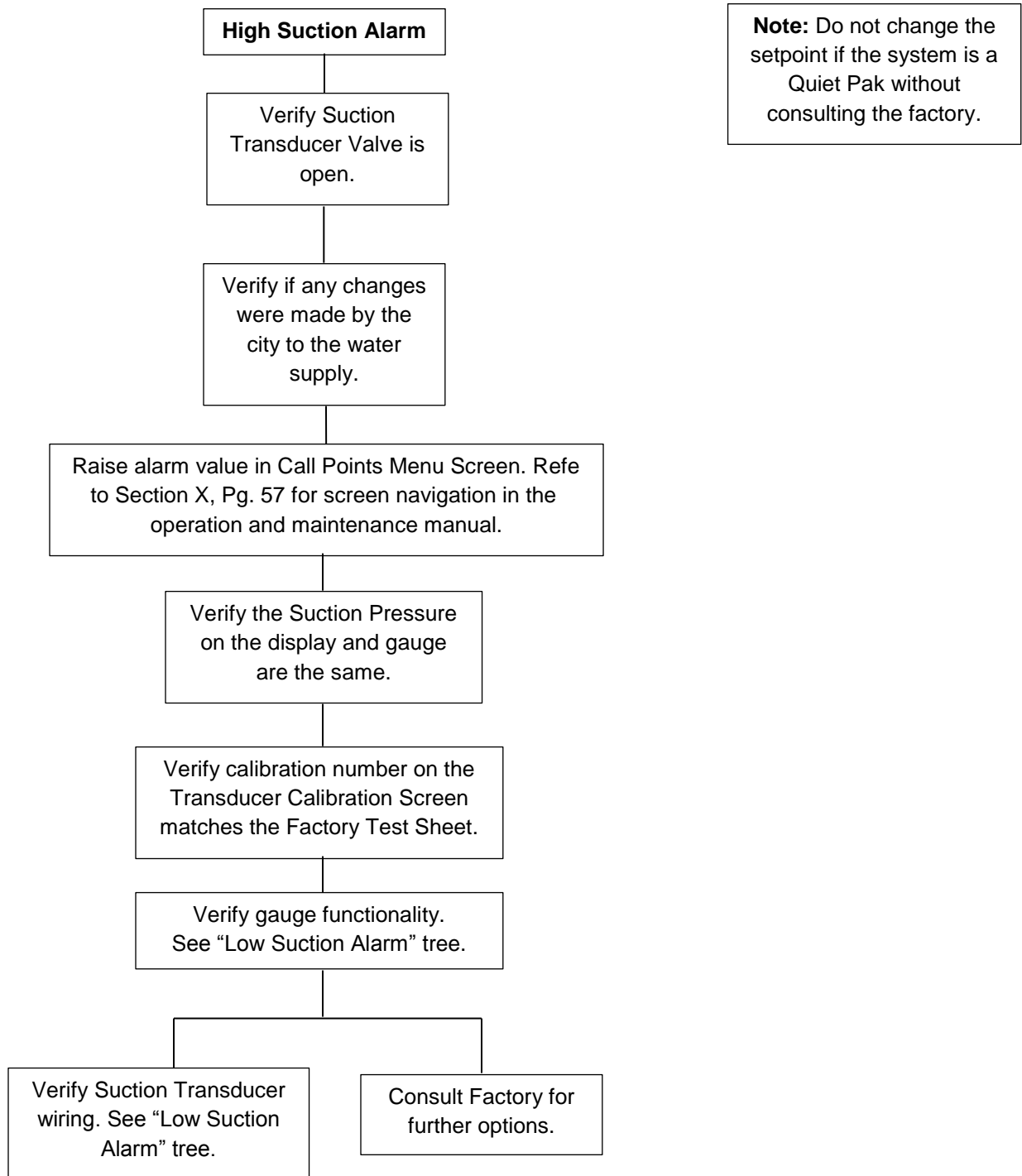
- 1.) With the pumps off and the control enclosure door open, place the drive in LOCAL mode by pressing the LOC/REM button located on the front of the VFD Keypad. An indicator (LOC) will appear in the top left hand corner of the VFD indicating the drive is now in LOCAL mode.
- 2.) On the VFD keypad, please select MENU → PARAMETERS → PARAMETER GROUP 40 “PROCESS PID SET 1” → PARAMETER 4009 “100% VALUE”.
  - a. The current value will read “200” as default. Select EDIT → Change to “300” → Select SAVE. This will change the range from 0 – 200 psi to 0 – 300 psi to read the new transducer properly.
- 3.) Place the drive in REMOTE mode by pressing the LOC/REM button located on the front of the VFD Keypad. An indicator (REM) will appear in the top left hand corner of the VFD indicating the drive is now in REMOTE mode. This will allow communication between the PLC/HMI and VFD.
- 4.) Repeat these steps on all drive(s).

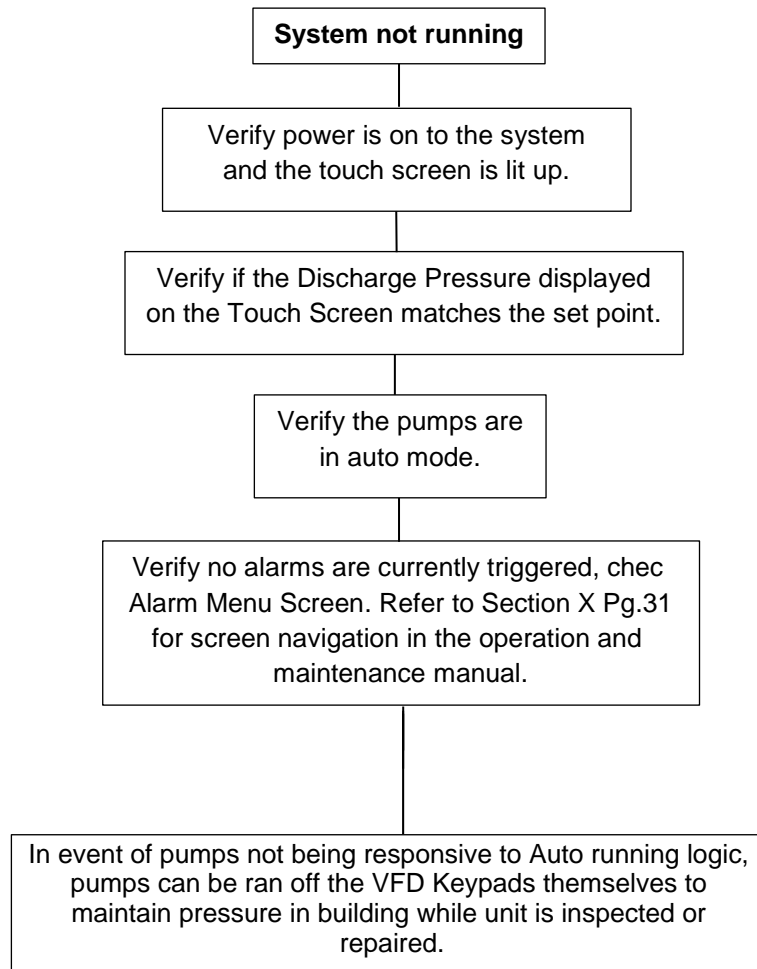
**If there are any further questions or concerns, please don't hesitate to contact us at:**

Delta P Carver  
14 Sunshine Blvd.,  
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(386) 236-0950

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Email: 14 Sunshine Blvd., Ormond Beach, FL. 32174  
Phone: 386-236-0950 Fax: 386-236-0955  
Website: [www.deltapcarver.com](http://www.deltapcarver.com)  
Email: sales@deltapcarver.com

**Table 4. Troubleshooting – Continued**

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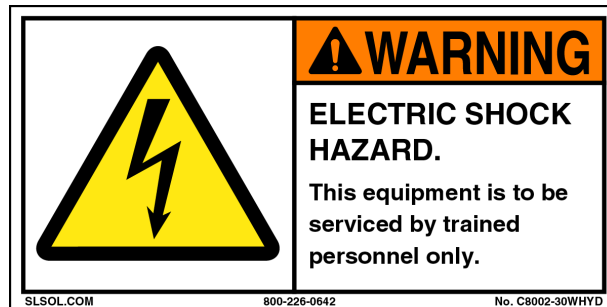


# Delta P Carver

We Put the PSI in Water Systems

Rev: 06/2019

## ABB Drives Local Modes (Local Hand)



**BEFORE ALTERING ANY PARAMETERS PLEASE READ THE FOLLOWING INSTRUCTIONS CAREFULLY. FAILURE TO DO SO MAY RESULT IN SYSTEM PERFORMANCE ISSUES, PROPERTY DAMAGE AND/OR PERSONAL INJURY. DELTA P CARVER TAKES NO RESPONSIBILITY OR LIABILITY FOR FAILURE TO ADHERE TO THE FOLLOWING INSTRUCTIONS OR ANY WORK NOT COMPLETED BY DELTA P CARVER EMPLOYEES. ALL TECHNICAL ADVICE IS PROVIDED AS AN ACCOMODATION. DELTA P CARVER SHALL HAVE NO RESPONSIBILITES OR LIABILITIES WHATSOEVER FOR THE CONTENT OR USE OF SUCH ADVICE. ALL SERVICE WORK IS TO BE PERFORMED BY TRAINED PERSONNEL ONLY.**



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The ABB ACS310 and ACS550 series drives can be controlled locally (VFD as master).

There are a couple of instances where this would be needed,

including:

- Prior to start-up to run individual pumps as needed to help supply pressure at the roof;
- HMI (Display) Failure;
- PLC Failure;
- 24VDC Power Supply Failure;
- Transducer Failure;

In VFD Local Mode, the VFDs would no longer be communicating with the PLC or HMI. The VFD would be the master control with operator's inputs to dictate operation achieved via the Keypad interface located on each drive.

### **Local Hand (Default Recommendation):**

Local Hand is the recommended option as it can be used with any of the above mentioned scenarios without the need for re-wiring, replacement part(s), etc. All that is required is for the operator to alter three parameters located within the drive. Once switched, in Local Hand, the operator will be able to start and stop the pump using the VFD Keypad buttons along a user selectable speed range between 30-60 Hz. The main concern with operating in this mode is that the operation will be constant speed, meaning the pumps will never go to sleep or shut off unless directed to by pressing the STOP button on the VFD Keypad. This is ideal for short periods of time until a proper start-up can be achieved or until replacement part(s) arrive and/or service can be completed.



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# LOCAL HAND PROCEDURES



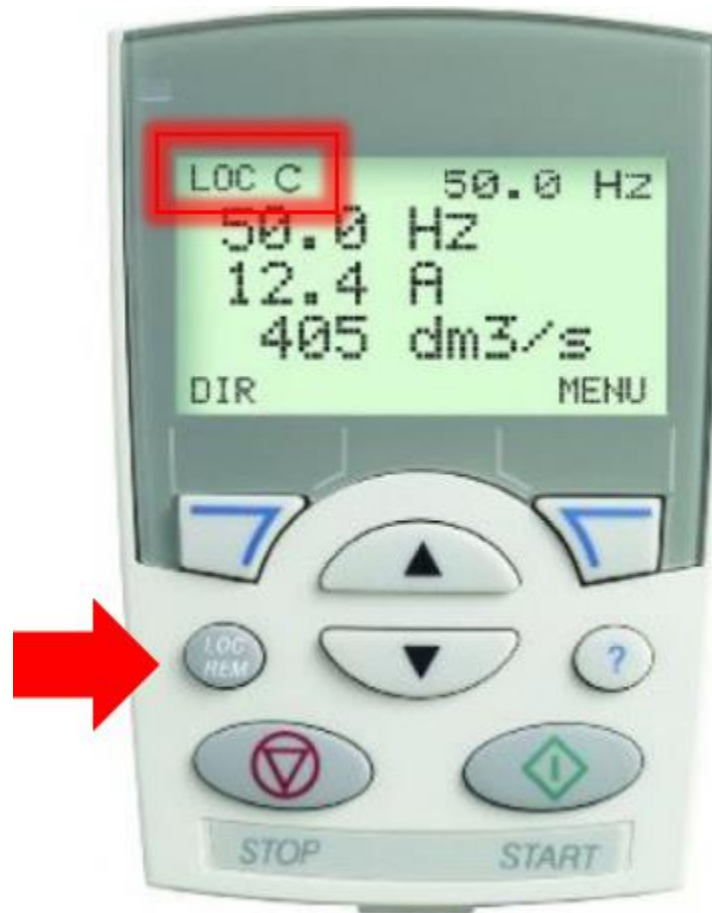


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## Placing ABB Drives to Local Hand (Constant Speed)

1. With the control enclosure door open, place the drive in **LOCAL** mode by pressing the **LOC/REM** button located on the front of the VFD Keypad. An indicator (**LOC**) will appear in the top left hand corner of the VFD indicating the drive is now in **LOCAL** mode.





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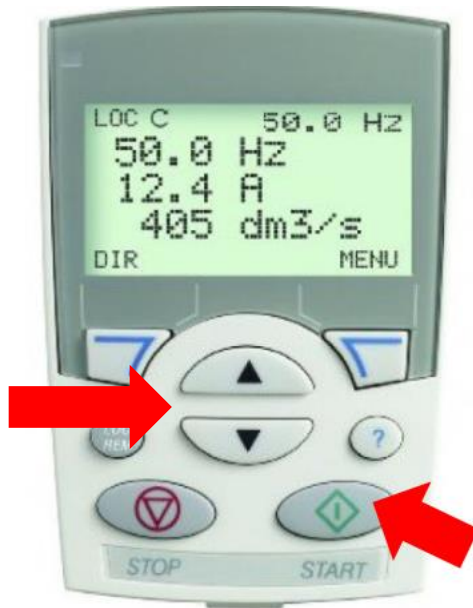
2. On the VFD keypad, please select MENU → PARAMETERS → PARAMETER GROUP 10 “START/STOP/DIR” → PARAMETER **1001** “**EXT1 COMMANDS**”.
  - a. The current value will read “**10 - COMM**” as default. Select **EDIT** → Scroll down to “**8 - KEYPAD**” → Select **SAVE**.
  
3. On the VFD keypad, please select MENU → PARAMETERS → PARAMETER GROUP 10 “START/STOP/DIR” → PARAMETER **1002** “**EXT2 COMMANDS**”.
  - a. The current value will read “**10 - COMM**” as default. Select **EDIT** → Scroll down to “**8 - KEYPAD**” → Select **SAVE**.
  
4. On the VFD keypad, please select MENU → PARAMETERS → PARAMETER GROUP 16 “SYSTEM CONTROLS” → PARAMETER **1601** “**RUN ENABLE**”.
  - a. The current value will read “**7 - COMM**” as default. Select **EDIT** → Scroll down to “**0 - NOT SEL**” → Select **SAVE**.



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- To operate the drive, press “**START**” on the VFD Keypad and use the **UP/DOWN** arrows to vary the speed between the available frequency range of 30-60 Hz.



**NOTE:** The pump will run at the frequency selected until the drive is stopped by pressing **STOP** on the VFD Keypad or until the mode of operation is switched back to Remote Auto with logic controlled via the PLC. The drive will **NOT** shut down in Local Hand.

- To stop the drive, press “**STOP**” on the VFD Keypad.
- To place the drive back into Remote mode (PLC Control), please reverse the steps listed in this section.

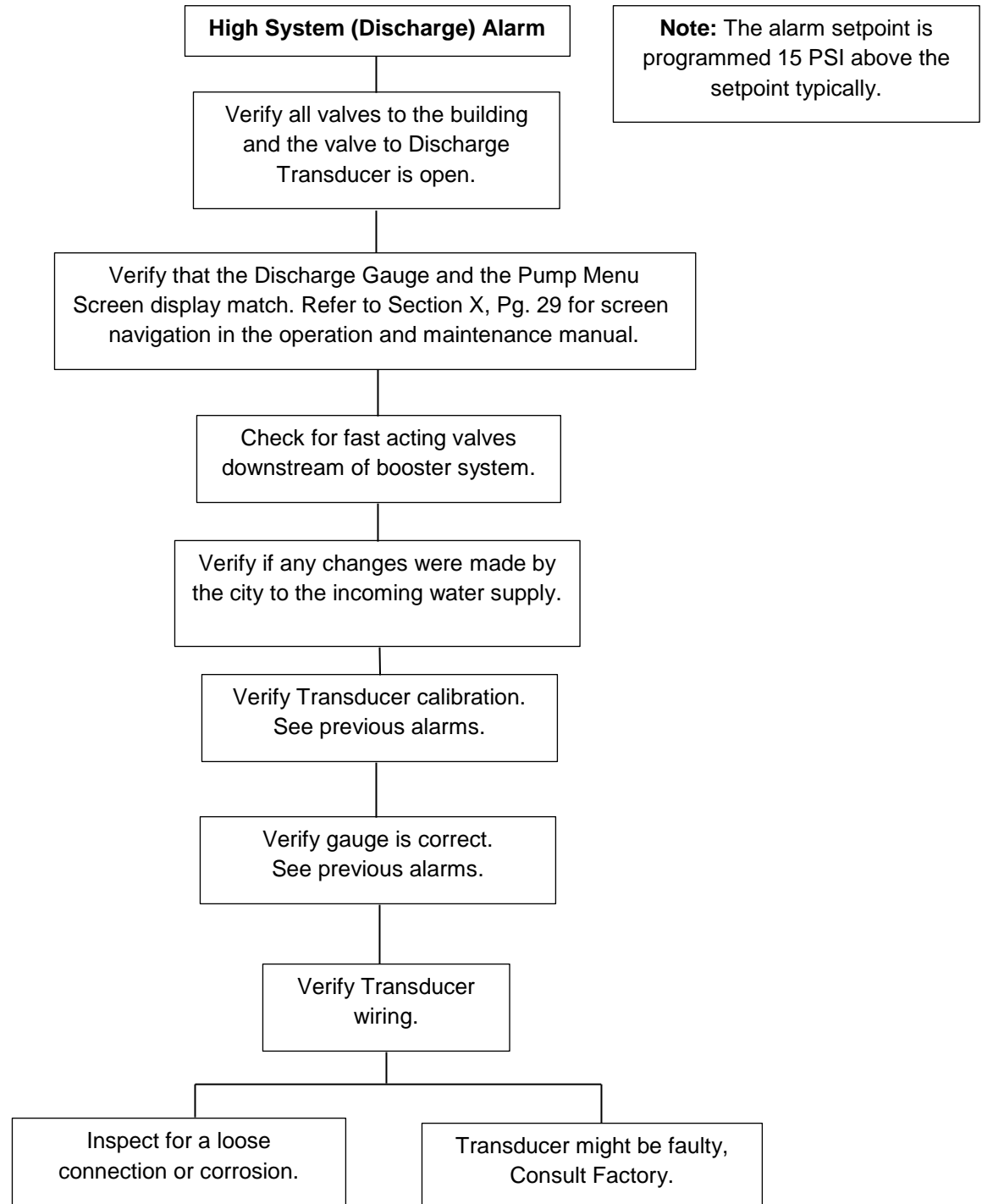
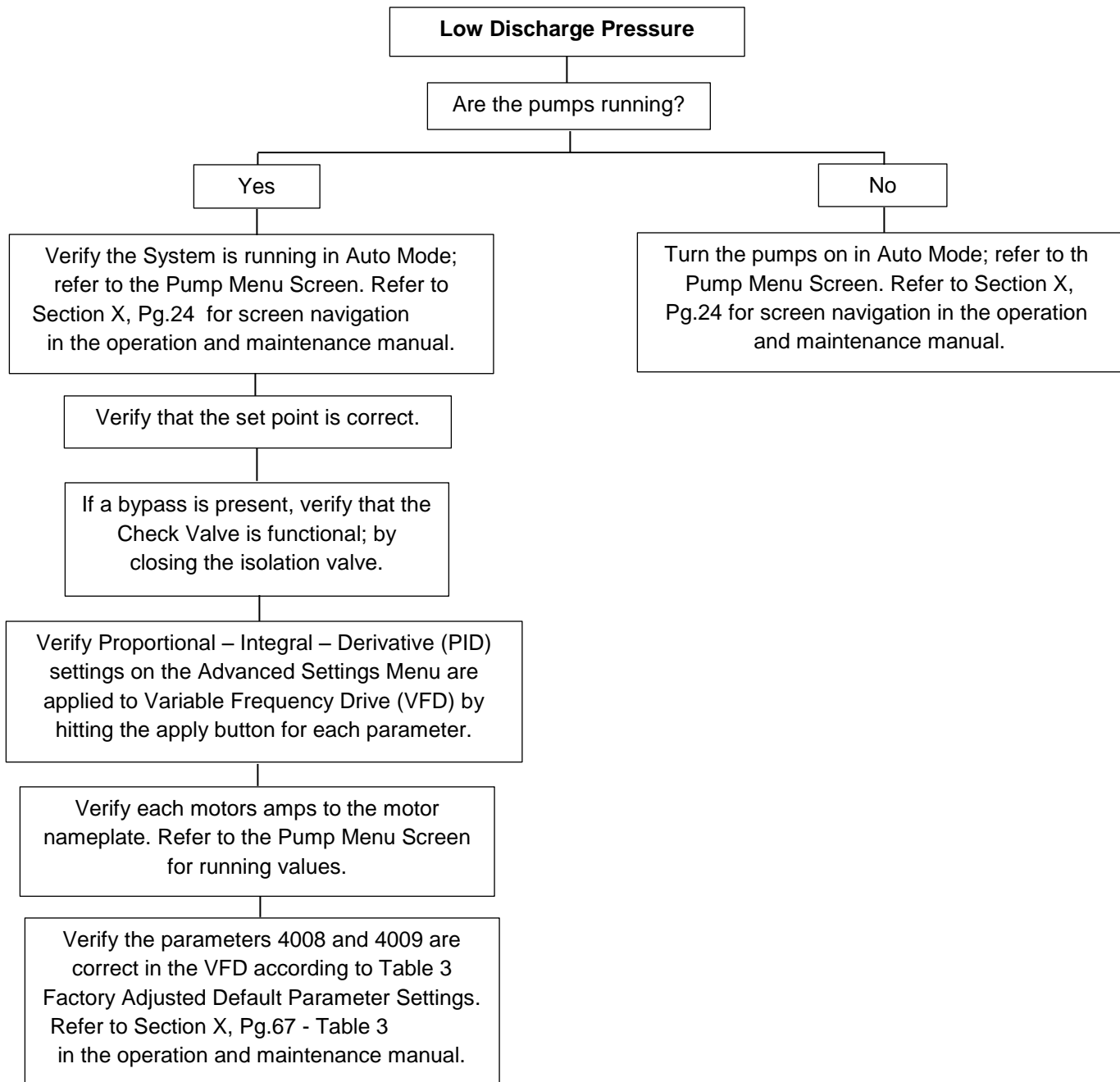
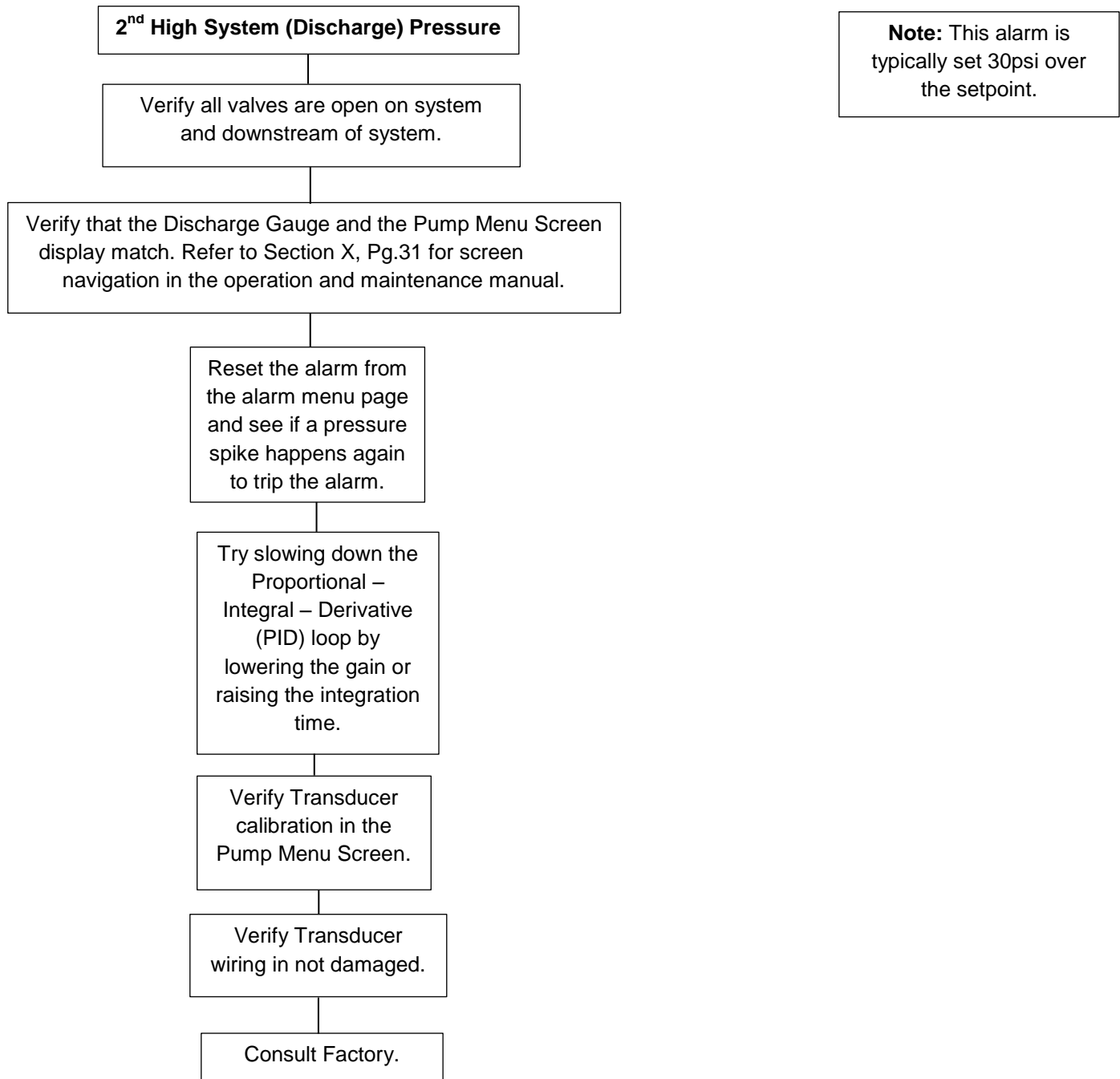
**Table 4. Troubleshooting – Continued**

Table 4. Troubleshooting – Continued

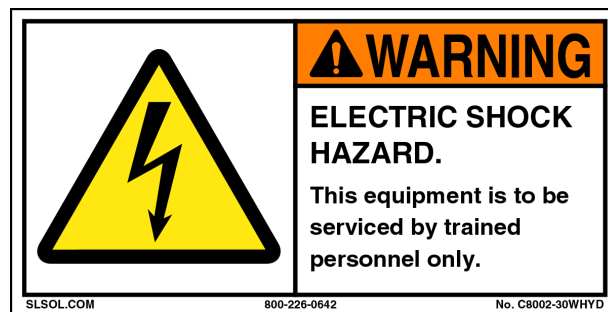


**Table 4. Troubleshooting – Continued**



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## Secondary High Pressure Switch Calibration



**BEFORE ALTERING ANY PARAMETERS PLEASE READ THE FOLLOWING INSTRUCTIONS CAREFULLY. FAILURE TO DO SO MAY RESULT IN SYSTEM PERFORMANCE ISSUES AND/OR PERSONAL INJURY. DELTA P CARVER TAKES NO RESPONSIBILITY OR LIABILITY FOR FAILURE TO ADHERE TO THE FOLLOWING INSTRUCTIONS OR ANY WORK NOT COMPLETED BY DELTA P CARVER EMPLOYEES OR CERTIFIED REPRESENTATIVES. ALL SERVICE WORK IS TO BE PERFORMED BY TRAINED PERSONNEL ONLY.**



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## Introduction:

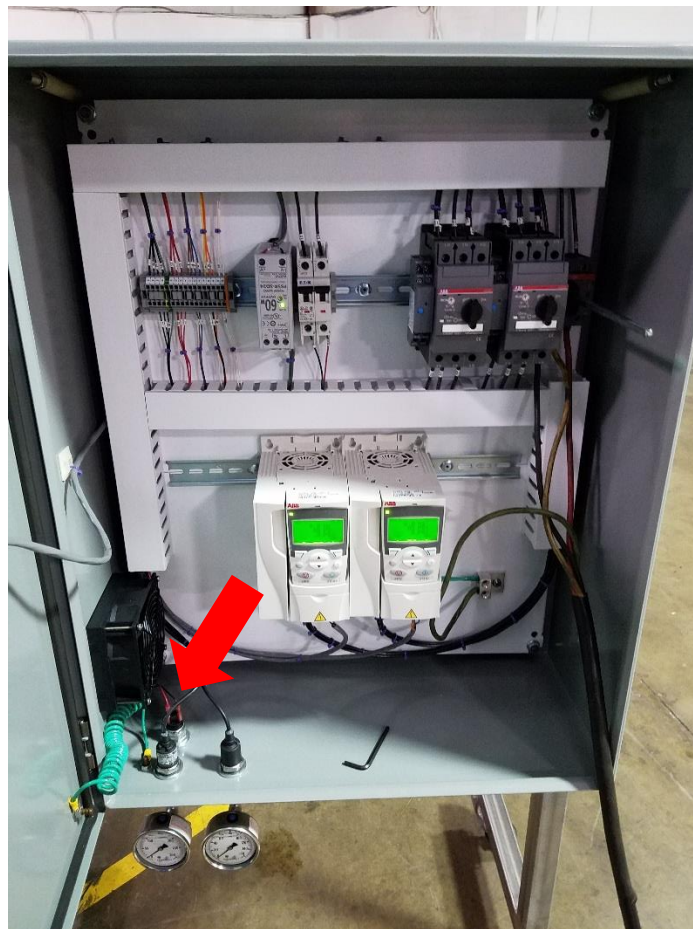
The following steps will walk through setting and calibrating the secondary high pressure switch which triggers the secondary high system alarm (30 psi) on the HMI/PLC.

### Tools Required:

- 5/32" Allen Wrench

## Location and Mechanical Switch Operation:

1. With the control panel door open, locate the secondary high pressure switch inside the cabinet. (See below)



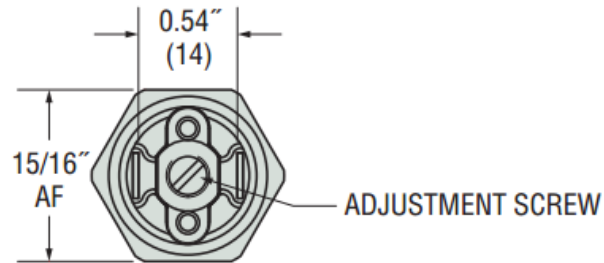




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2. On the top of the switch, located the adjustment screw as indicated below.



3. Turning the set screw clockwise will increase the setpoint (pressure required to activate the electrical contacts) of the switch and counterclockwise to decrease the setpoint.



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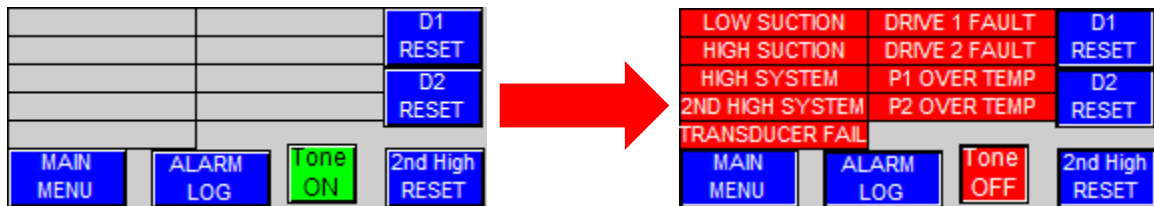
We Put the PSI in Water Systems

## Calibration:

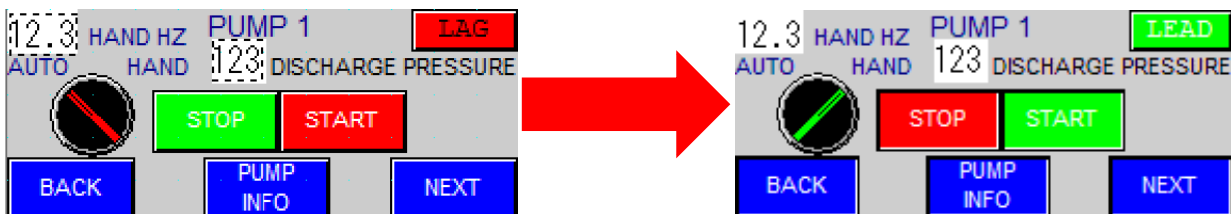
1. To calibrate the switch, leave the control panel door open and move to the HMI (touchscreen interface).

**NOTE:** Calibration requires isolating (deadheading) the system from the building piping. Calibration should NOT be attempted during peak loads or demands.

2. On the HMI from the **Main Menu**, select the **Alarm Menu**. Once in the **Alarm Menu**, press the **TONE ON** button once so that it reads **TONE OFF**. This will allow you to bypass the secondary high alarm until needed in later steps.



3. On the HMI from the **Main Menu**, select the **Pump Menu**. Once in the **Pump Menu**, select the option that reads “**ALL OFF**”.
4. Select **PUMP 1**. Once in the **PUMP 1** menu, press the digital Auto-Hand switch so that it is showing in Hand. (See Below)



5. With the pump in Hand, change the Hand Hz (located in the top left hand corner of the screen) to 30 Hz. Factory settings will have the Hand Hz already at 30 Hz. To change this value, press the white box next to the Hand Hz text and a prompt box will appear asking for a new numerical value.



6. Slowly close a discharge valve external to the system.

**NOTE:** It is important that the system is isolated from the building using an isolation valve external to the system on the building side. Using the butterfly valves in the branch piping will not work as the switch is tied to the discharge manifold. It is also important that the booster is isolated from the building during this calibration as the pressures will exceed the system setpoint by 30 psi or more which could damage fixtures.

Delta P Carver assumes no responsibility for failure to adhere to these instructions.

7. With the system isolated from the building, the Hand Hz at 30 Hz and Pump 1 in Hand, press “**START**” from the **PUMP 1** menu.
8. With the pump running, slowly ramp up the pressure on the system by changing the Hand Hz the pump is running at. The secondary high pressure switch should be set for 30 psi above the setpoint pressure. The pump menu has a discharge pressure display located in the **PUMP 1** menu for convenience.

Example:

- Setpoint = 60 PSI
- Secondary High Pressure Switch Setting = 90 PSI

**NOTE:** Delta P Carver booster systems have an operating range between 30-60 Hz. If you cannot reach 30 psi above the setpoint with the pump running at 60 Hz, finish following the remaining instructions. Once all the instructions are complete, add a final half turn in the clockwise direction to complete calibration.

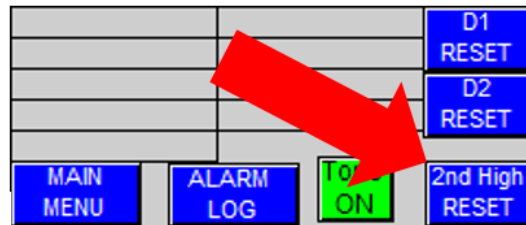
9. With the pressure 30 psi above the setpoint, back out to the **Main Menu** and select the **Alarm Menu**.



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- Place the alarm tone back on, by pressing the **TONE OFF** button, so that it reads **TONE ON**. The secondary high alarm should immediately register. If it doesn't this indicates the switch is set to a higher value (greater than 30 psi above setpoint). Turn the set screw counterclockwise (using the Allen Wrench) until the alarm registers.
- With the secondary high switch engaged, slowly turn the set screw (using the Allen Wrench) on the switch clockwise while simultaneously tapping the **2<sup>nd</sup> High Reset** located in the **Alarm Menu**.



**NOTE:** This step is easier with two people. If performing these instructions alone, it is helpful to reach over the panel door while to the HMI while turning the set screw.

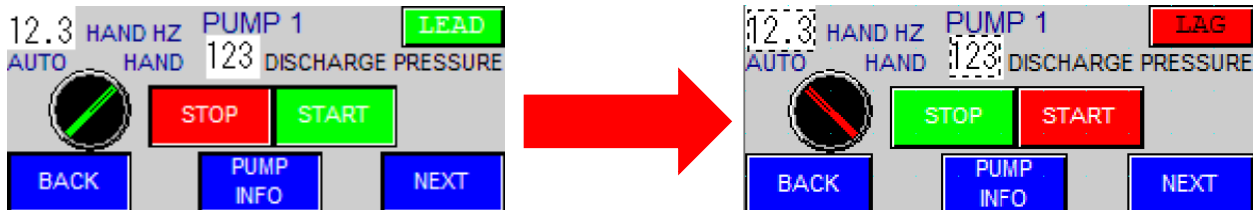
- Continue turning clockwise and tapping the **2<sup>nd</sup> High Reset** until the Alarm clears. Once the alarm clears, finish the calibration by turning the set screw an additional quarter turn clockwise.
- Exit the **Alarm Menu** and go back to the **Pump Menu**. Select **"ALL OFF"**.



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14. Select **PUMP 1**. Once in the **PUMP 1** menu, press the digital Auto-Hand switch so that it is showing in Auto. (See Below)



15. With the pump back in Auto, press the **BACK** button to exit to the **PUMP MENU**.

16. Slowly open the discharge valve so the booster is connected to the system again.

17. On the HMI in the **PUMP MENU**, select “**ALL ON**”.

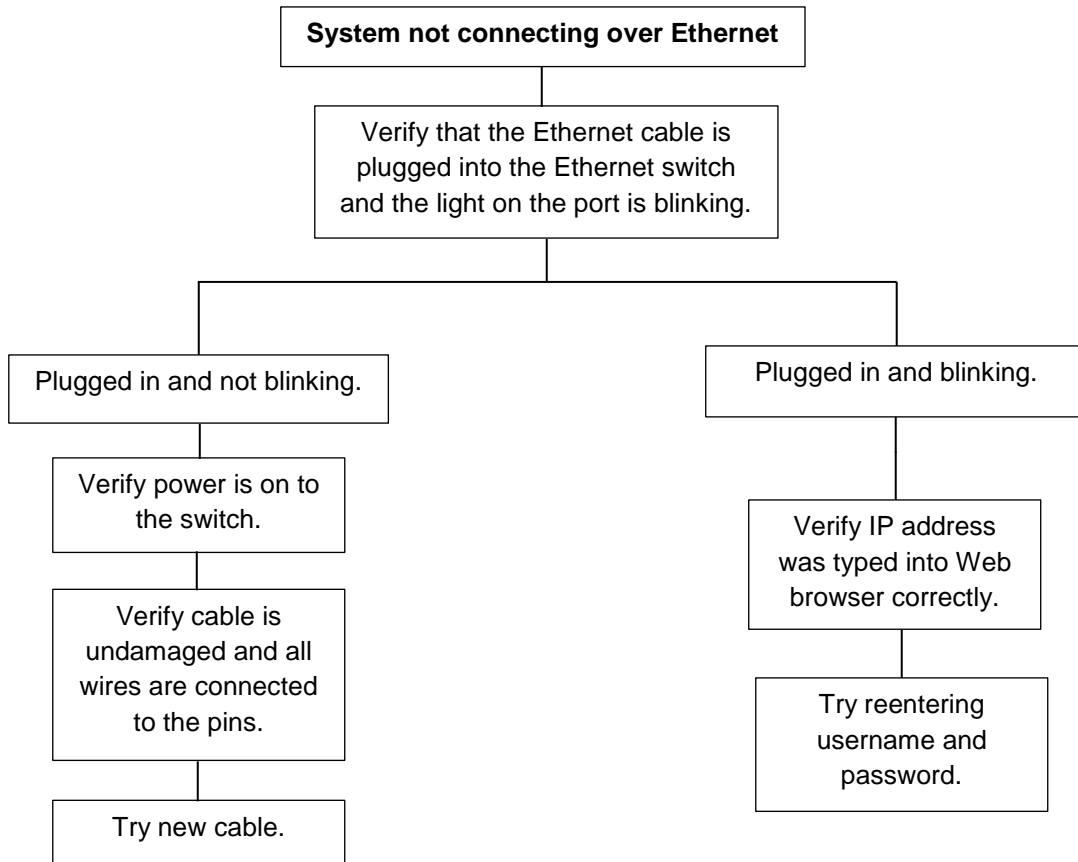
18. Turn the power off, close the panel door, and turn the disconnect switch back on.

19. The secondary high pressure switch is now calibrated and the system will resume automatic operation.

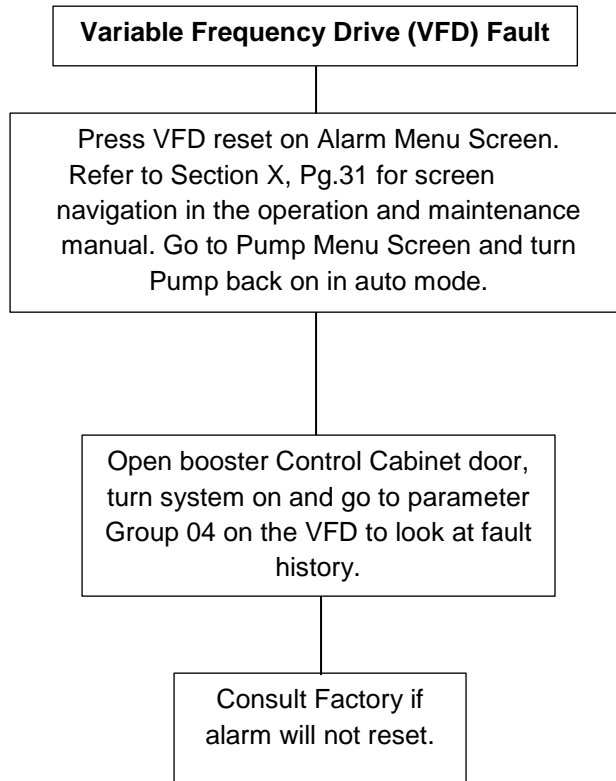
**If there are any further questions or concerns, please don't hesitate to contact us:**

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14 Sunshine Blvd,  
Ormond Beach, FL 32174  
(386) 236-0950

**Table 4. Troubleshooting – Continued**



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**Table 4. Troubleshooting – Continued**

**Section XI:**

# DPC Preventative Maintenance Program

During a Preventative Maintenance Visit:

- Lock and tag out equipment
- Record Equipment Data
- Check all mounting and flange bolts to insure proper torque
- Check equipment base for soundness
- Check for mechanical seal leaks
- Check for thermal relief valve leaks
- Check gauge cluster (including poly tubing, transducers, and gauges)
- Check for any active alarms (use the Alarm Log for a history of alarms)
- Lubricate motor (see calendar and lubrication tables)
- Make notes as needed on inspection sheet of any findings that may require additional work

The following pages include Delta P Carver's Preventative Maintenance Calendar, Motor Lubrication Schedule, and Inspection Sheet.

**If you need further assistance or require a quote for replacement parts, please reach out to us at:**

(386) 236 – 0950

[sales@deltapcarver.com](mailto:sales@deltapcarver.com)



# PREVENTATIVE MAINTENANCE CALENDAR

Delta P Carver Booster Preventative Maintenance Calendar						
Description	Comment	Maintenance Frequency				
		Daily	Weekly	Monthly	Quarterly	Annually
Overall Visual Inspection	Complete Visual inspection to be conducted to make sure all equipment is operating as intended and all safety systems are in place.	X				
Check Motor Lubrication	Assure that all motor bearings are lubricated per the manufacturers specifications, please refer to <b>Motor Lubrication Chart</b> .				X	
Check Motor Bearings	Inspect Motor bearings and drive belts for wear. Adjust, repair, or replace as necessary.					X
Check Motor Condition	Check the overall motor condition this includes, cleanliness, vibration analysis, temperature analysis, and casing inspection.					X
Check Mountings	Check and secure all pump mountings and check for any casing leaks.			X		
Check Gauge Cluster	Check the gauge cluster for the following items: 1) Check that gauges are still functional. 2) Check that the Poly tubing between the gauge cluster, and the transducers is not cut, bent, or damaged in any way. 3) Replace broken components accordingly.			X		
Check the Check and Isolation Valves	Check that there is not any leaking from between the flanges and the butterfly valves and check valve.			X		
Isolation Valve Operation	The isolation valves on each pump should be operated regularly.		X			

# MOTOR LUBRICATION & INTERVALS

## DPC Motor Lubrication Chart

**NOTE:** Refer to motor nameplate for recommended lubricant. If none is shown, please use the table below.

Conditions:	Recommended Lubricant:
Standard	Shell Dolium R or Chevron SRI
Anti-Friction Bearings (-15°F to 120°F)	POLYREX EM
Min Start Temp (-100°F)	AEROSHELL #7
Extreme Conditions (>50°C or Class H Insulation)	Dow Corning DC44
Roller Bearings	ExxonMobil SHC-220

## Relubrication Interval

Table is for Ball Bearing Motors ONLY. For Vertically Mounted Motors or Roller Bearings, divide the relubrication interval by 2. Submersible motors do not require relubrication (water lubricated).

NEMA (IEC) Frame Size:	Rated Speed (RPM)			
	3600	1800	1200	900
Up to 210 incl. (132)	5500 Hrs.	12000 Hrs.	18000 Hrs.	22000 Hrs.
Over 210 to 280 incl. (180)	3600 Hrs.	9500 Hrs.	15000 Hrs.	18000 Hrs.
Over 280 to 360 incl. (225)	2200 Hrs.	7400 Hrs.	12000 Hrs.	15000 Hrs.
Over 360 to 5800 incl. (400)	2200 Hrs.	3500 Hrs.	7400 Hrs.	10500 Hrs.

## Amount of Grease to Add

Frame Size NEMA (IEC)	Bearing Description			
	Bearing	Weight of Grease to Add * oz (Grams)	Volume of Grease to be Added	
			<i>in</i> <sup>3</sup>	teaspoon
56 to 140 (90)	6203	0.08 (2.4)	0.15	0.5
140 (90)	6205	0.15 (3.9)	0.2	0.8
180 (100-112)	6206	0.19 (5.0)	0.3	1
210 (132)	6307	0.30 (8.4)	0.6	2
250 (160)	6309	0.47 (12.5)	0.7	2.5
280 (180)	6311	0.61 (17)	1.2	3.9
320 (200)	6312	0.76 (20.1)	1.2	4
360 (225)	6313	0.81 (23)	1.5	5.2
400 (250)	6316	1.25 (33)	2	6.6
440(280)	6318	1.52 (40)	2.5	8.2
440 (280)	6319	2.12 (60)	4.1	13.4

# INSPECTION SHEET



## BOOSTER SYSTEM INSPECTION SHEET

**CUSTOMER:** \_\_\_\_\_  
**ADDRESS:** \_\_\_\_\_  
**CITY/STATE:** \_\_\_\_\_

**DATE:** \_\_\_\_\_  
**CONTACT:** \_\_\_\_\_  
**PHONE #:** \_\_\_\_\_

**MANUFACTURER:** \_\_\_\_\_  
**SYSTEM CONFIG:** \_\_\_\_\_ TRIPLEX \_\_\_\_\_  
**USAGE:** \_\_\_\_\_ DOMESTIC WATER \_\_\_\_\_

**GATE CODE** \_\_\_\_\_  
**MODEL #:** \_\_\_\_\_  
**SERIAL #:** \_\_\_\_\_  
**DESIGN:** \_\_\_\_\_ GPM AT \_\_\_\_\_ TDH \_\_\_\_\_ PSI \_\_\_\_\_

	MANUFACTURER	MODEL/SIZE	SEAL
<b>PUMP #1:</b>	_____	_____	_____
DRIVE:	_____	_____	_____
MOTOR:	_____	_____	_____
MOTOR:	_____ VOLTS _____	PHASE _____ RPM _____	FRAME: _____
FRONT BEARING:	_____	REAR BEARING: _____	_____
READINGS:	L1: _____ L2: _____	L3: _____	F.L.A.: _____ @ HZ TESTED AT _____ HZ

	MANUFACTURER	MODEL/SIZE	SEAL
<b>PUMP #2:</b>	_____	_____	_____
DRIVE:	_____	_____	_____
MOTOR:	_____	_____	_____
MOTOR:	_____ VOLTS _____	PHASE _____ RPM _____	FRAME: _____
FRONT BEARING:	_____	REAR BEARING: _____	_____
READINGS:	L1: _____ L2: _____	L3: _____	F.L.A.: _____ @ HZ TESTED AT _____ HZ

	MANUFACTURER	MODEL/SIZE	SEAL
<b>PUMP #3:</b>	_____	_____	_____
DRIVE:	_____	_____	_____
MOTOR:	_____	_____	_____
MOTOR:	_____ VOLTS _____	PHASE _____ RPM _____	FRAME: _____
FRONT BEARING:	_____	REAR BEARING: _____	_____
READINGS:	L1: _____ L2: _____	L3: _____	F.L.A.: _____ @ HZ TESTED AT _____ HZ

**CHECK & ISOLATION VALVES**

	MFR/MODEL	SIZE	OPERATIONAL:	
<b>CHECK VALVE #1:</b>	_____	_____	( ) YES	( ) NO
<b>CHECK VALVE #2:</b>	_____	_____	( ) YES	( ) NO
<b>CHECK VALVE #3:</b>	_____	_____	( ) YES	( ) NO

	MFR/MODEL	SIZE	OPERATIONAL:	
<b>ISOLATION #1</b>	_____	_____	( ) YES	( ) NO
<b>ISOLATION #2</b>	_____	_____	( ) YES	( ) NO
<b>ISOLATION #3</b>	_____	_____	( ) YES	( ) NO

## MANUFACTURER

## MODEL

## SIZE

HYDRO-ACCUMULATOR: \_\_\_\_\_

PRE-CHARGE: \_\_\_\_\_

P.S.I.

CONDITION: \_\_\_\_\_

LOCATION: \_\_\_\_\_

## CONTROLS &amp; INSTRUMENTATION

PRIMARY POWER SUPPLY \_\_\_\_\_ VOLTS \_\_\_\_\_ PHASE CONTROL VOLTAGE \_\_\_\_\_ VOLTS

PRIMARY FUSE/BREAKER \_\_\_\_\_ AMP SECONDARY FUSE/BREAKER \_\_\_\_\_ AMP

PUMP 1 \_\_\_\_\_ AMP/BKR PUMP 2 \_\_\_\_\_ AMP/BKR PUMP 3 \_\_\_\_\_ AMP/BKR

## MANUFACTURER/MODEL

## OPERATIONAL:

LEAD/LAG OPERATION \_\_\_\_\_ ( ) YES ( ) NO

NO-FLOW SHUTDOWN \_\_\_\_\_ ( ) YES ( ) NO

PUMP ALTERNATION \_\_\_\_\_ ( ) YES ( ) NO

THERMAL RELIEF TYPE \_\_\_\_\_ ( ) YES ( ) NO

## PRESSURE SWITCHES

## MANUFACTURER/MODEL

## OPERATIONAL:

LEAD CALL \_\_\_\_\_ ( ) YES ( ) NO

LAG CALL \_\_\_\_\_ ( ) YES ( ) NO

LOW SUCTION CUT-OFF \_\_\_\_\_ ( ) YES ( ) NO

## PRESSURE GAUGE

## RANGE

## SIZE

## OPERATIONAL:

SUCTION \_\_\_\_\_ TO PSI \_\_\_\_\_ ( ) YES ( ) NO

PUMP DISCHARGE \_\_\_\_\_ TO PSI \_\_\_\_\_ ( ) YES ( ) NO

## BUILDING DATA

BLDG. HEIGHT \_\_\_\_\_ FEET LEVELS \_\_\_\_\_ # UNITS \_\_\_\_\_

CITY SUPPLY PRESSURE \_\_\_\_\_ PSI

BOOST PRESSURE REQUIRED TO OBTAIN 40 PSI @ TOP LEVEL \_\_\_\_\_ PSI

EXISTING SYSTEM PRESSURE \_\_\_\_\_ PSI



**INSPECTION PERFORMED BY:** \_\_\_\_\_

**APPROVED BY:** \_\_\_\_\_ **APPROVED BY**

**COMMENTS / WORK COMPLETED:**

---

***PARTS USED:***

***SEND PROPOSAL FOR:***

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