INSTALLATION, OPERATION AND MAINTENANCE INSTRUCTIONS

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.

14 Sunshine Blvd, Ormond Beach, FL 32174 Website: DeltaPCarver.com
Phone: 386-236-0950 Fax: 386-236-0955 Email: sales@deltapcarver.com

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Delta P Carver
We Put the PSI in Water Systems

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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DeltaPCarver
We Put the PSI in Water Systems

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Assembly / Touch Screen Pages

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

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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.

CAUTION

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.

CAUTION

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.

CAUTION

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 1	2nd High System Switch (provided by Manufacturer)		
DI 2	Emergency Stop		

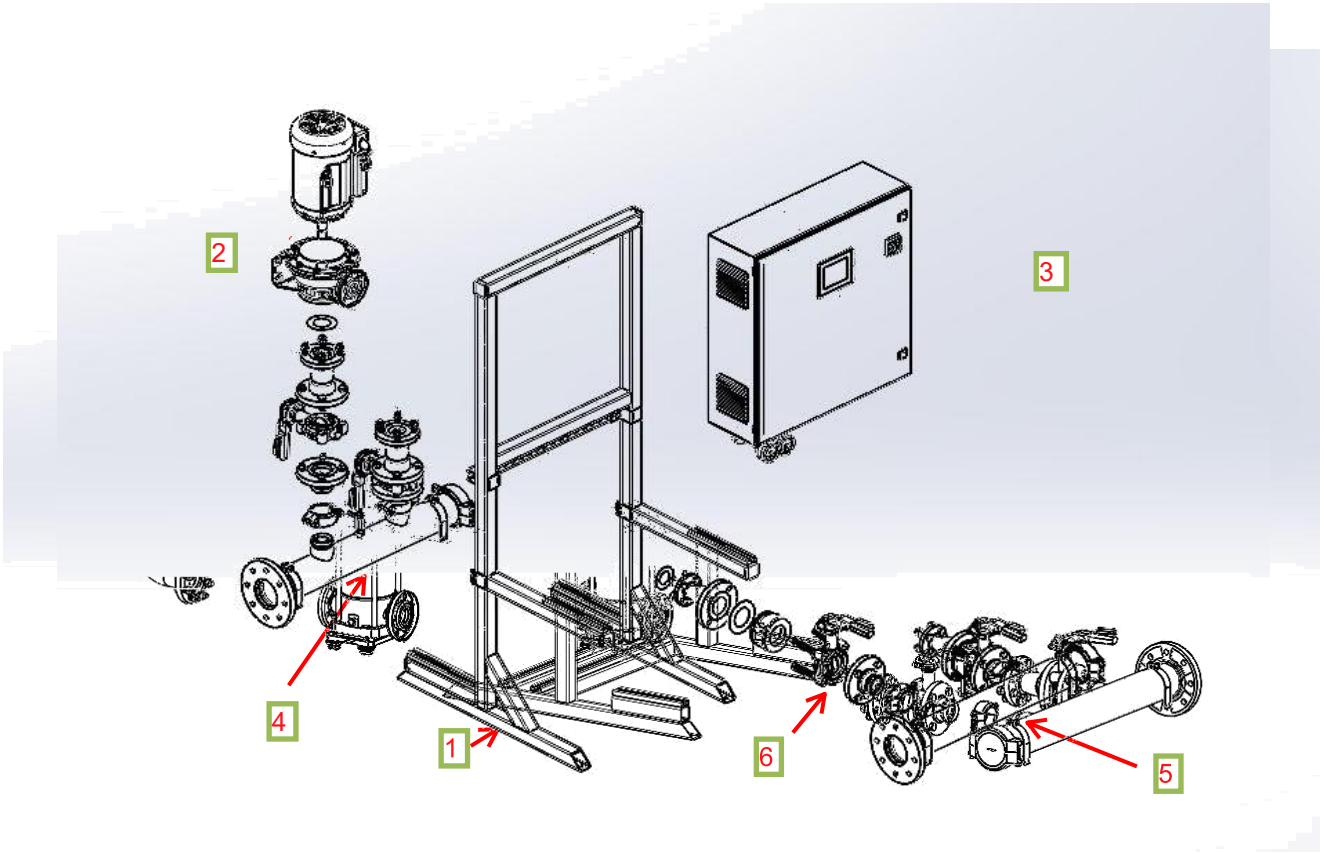
V. MAINTENANCE.

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.

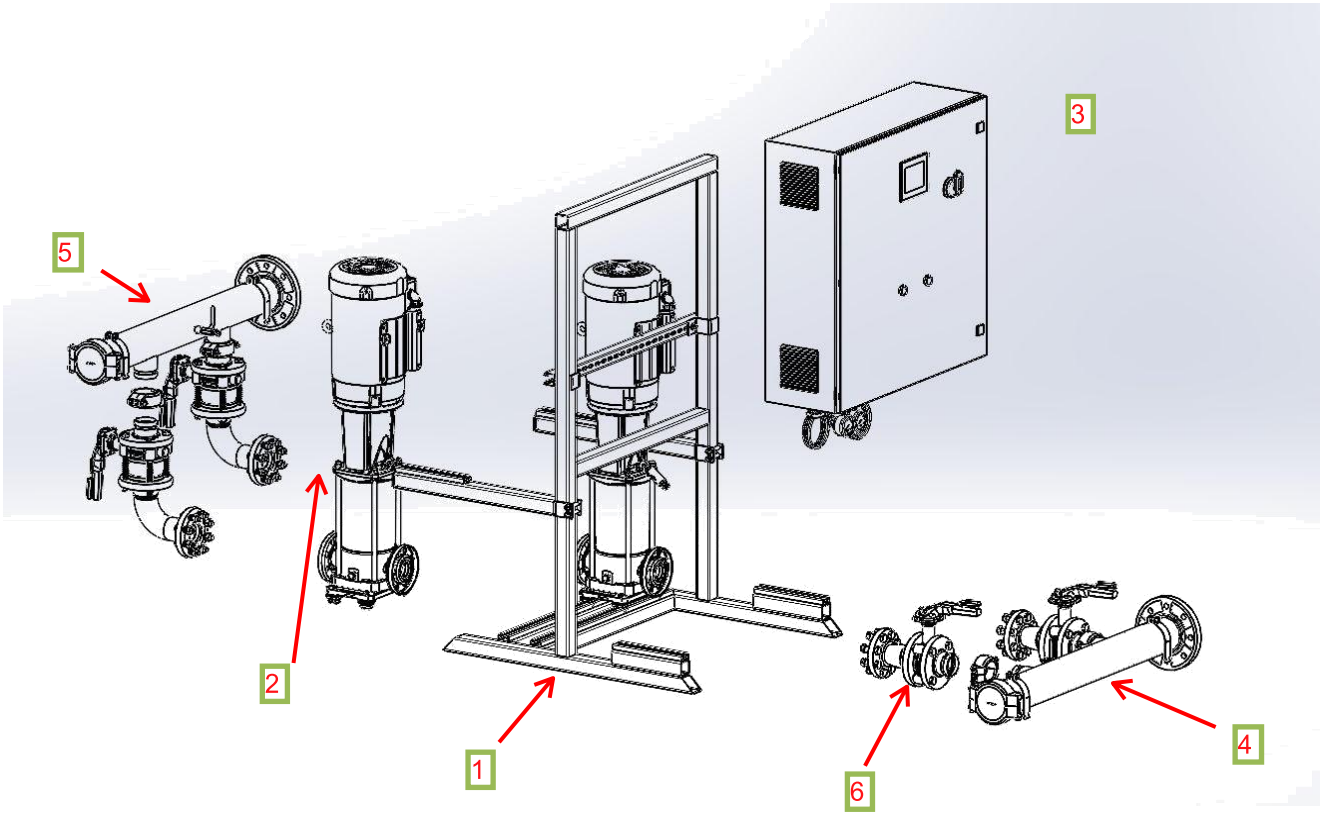
C. TROUBLESHOOTING. If you have followed the installation and starting procedures outlined in this manual, the booster system should provide reliable service and long life. However, if operating problems do occur; significant time and expense can be saved if you refer to Table 2 to eliminate the most 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.

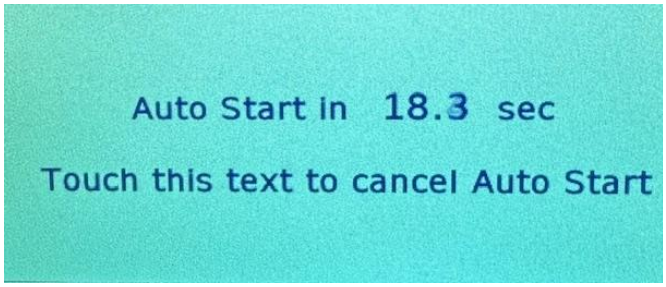
CAUTION

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



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.

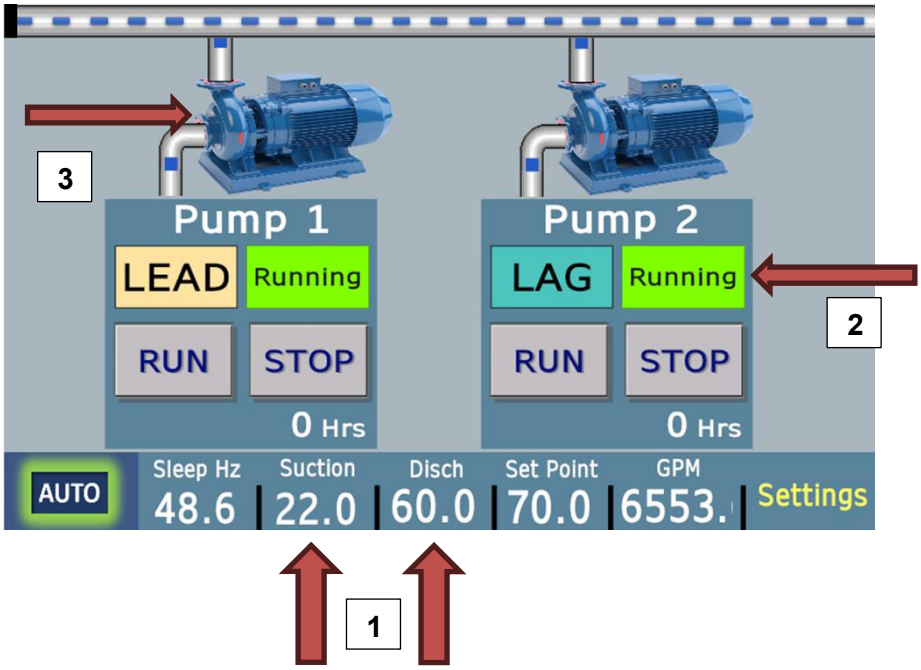
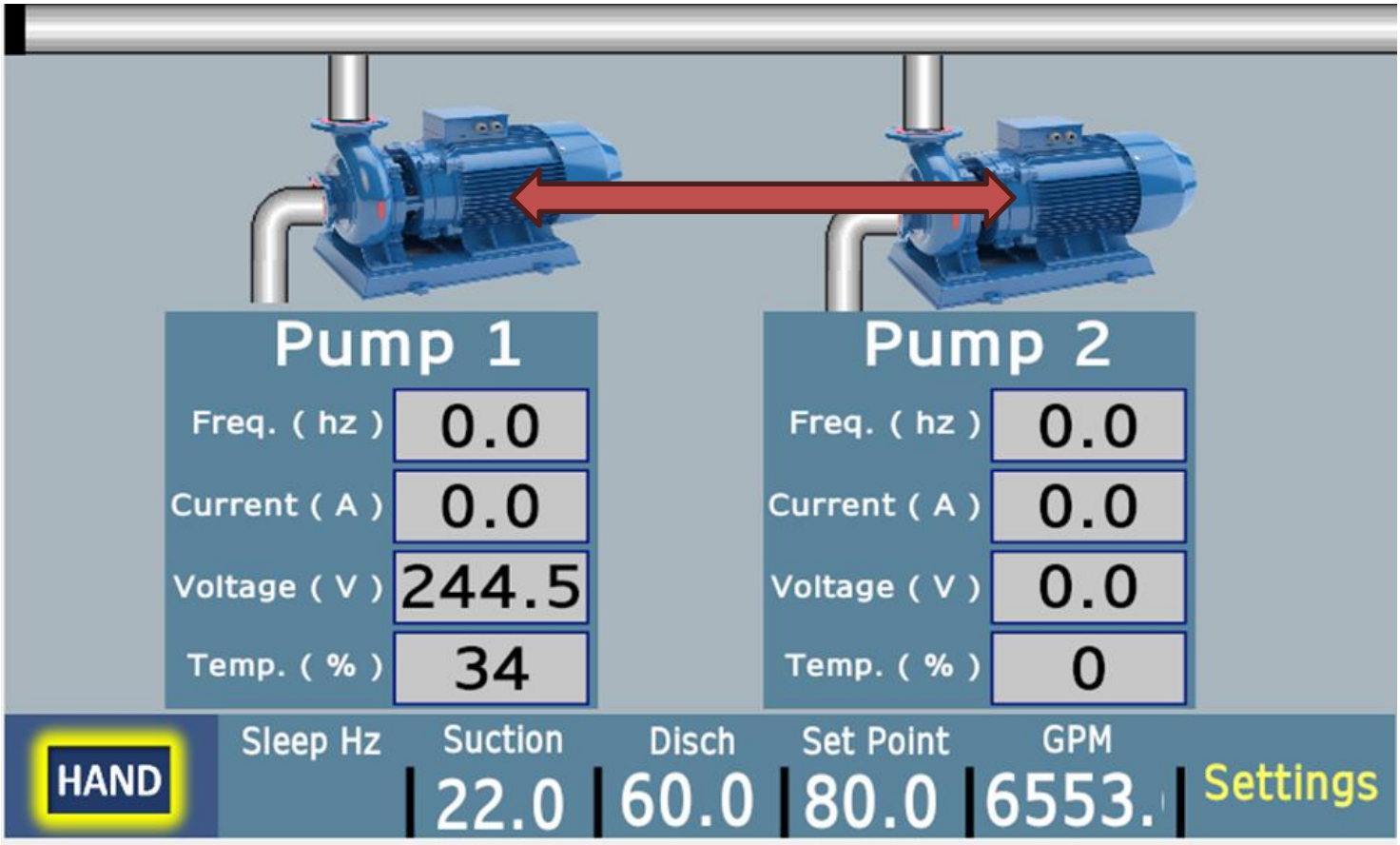


Figure 1: Main Menu

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.
3. **Pump Menu**
   a. Button to access the Pump Menu. Touch Pump Icon and Data will appear. See Image below:



4. **Selecting Pump Data**

    a. **To Select the Pump Data Screen, touch the image of the pump and the data screen for each pump will appear. Touch the pump image again to return to the pump status screen.**

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

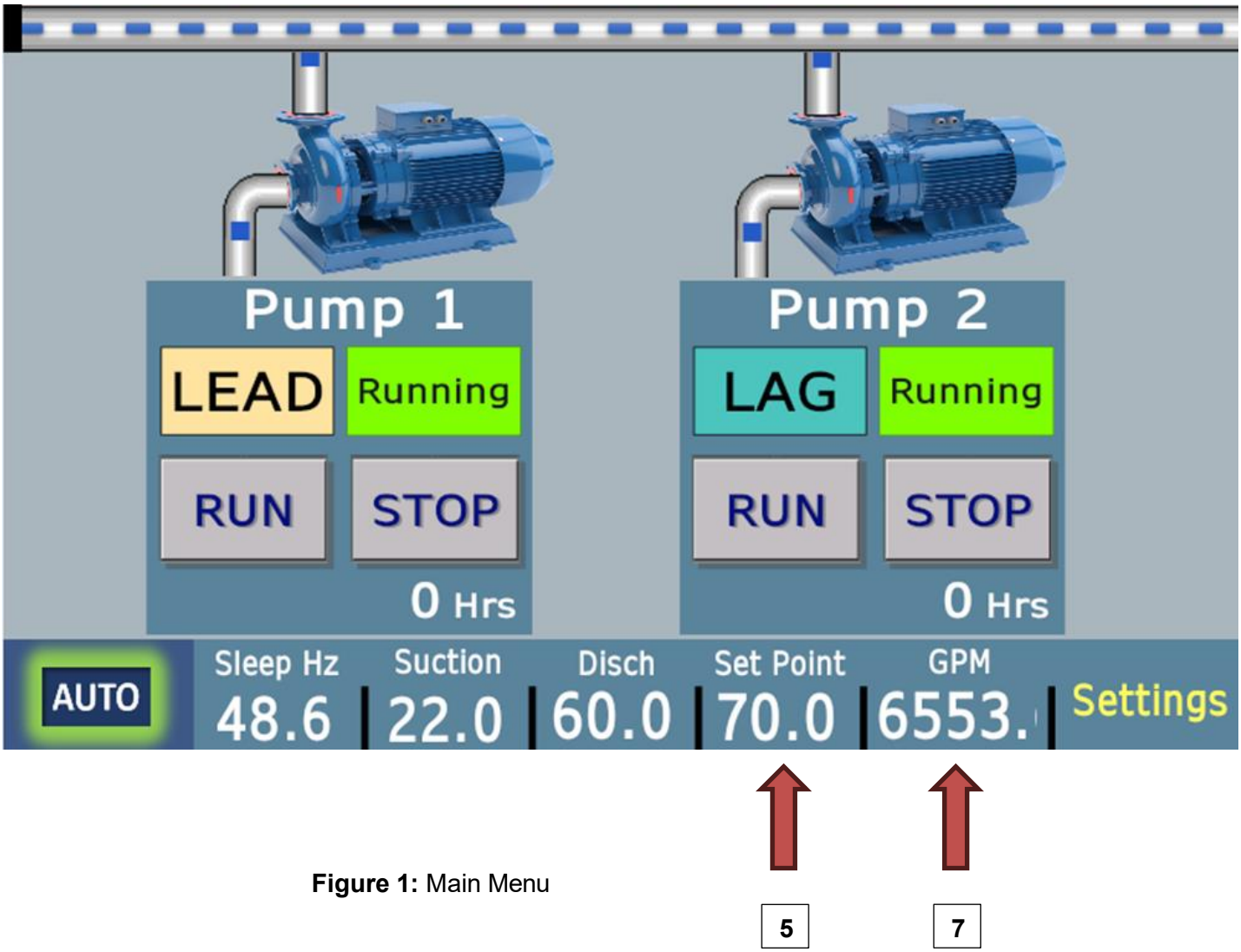
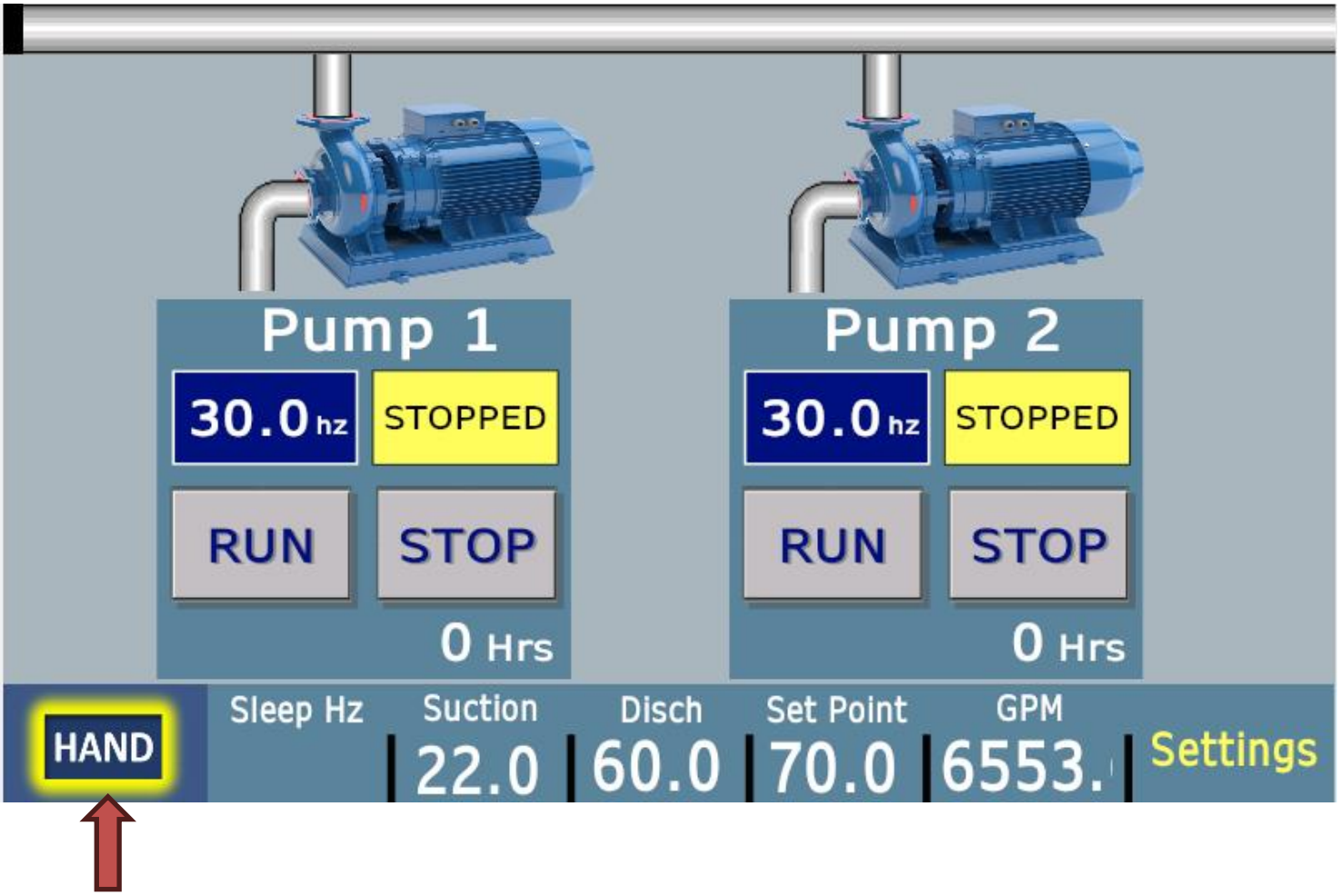


Figure 1: Main Menu

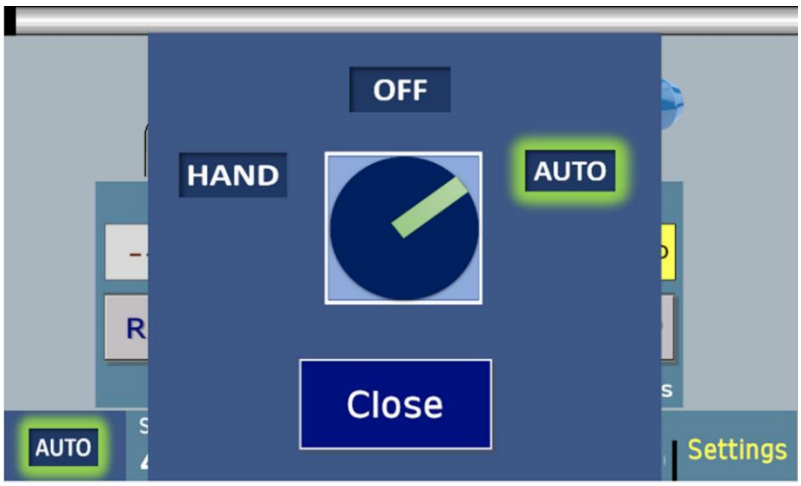
5. **PSI Setpoint**
    a. Displays current user defined setpoint pressure, in psi. Touching here will allow you to adjust the setpoint.
6. **Parameter Backup**
    a. Any changes to the settings will be automatically stored.
7. **Flowmeter display (If equipped)**
    a. Optional – If flowmeter is equipped it will be displayed here.

Main Screen in HAND

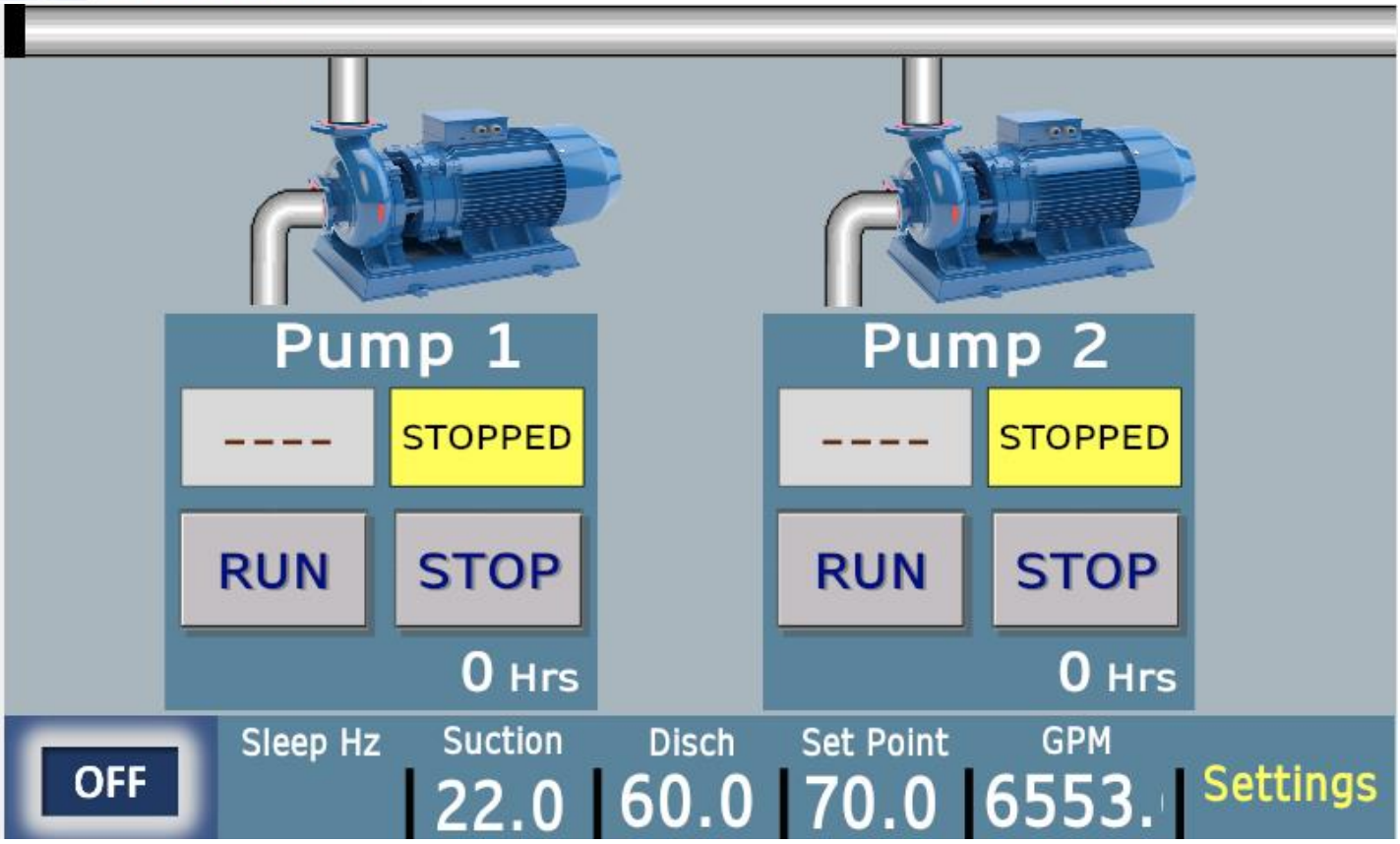


8. Hand/OFF/Auto Selector switch.

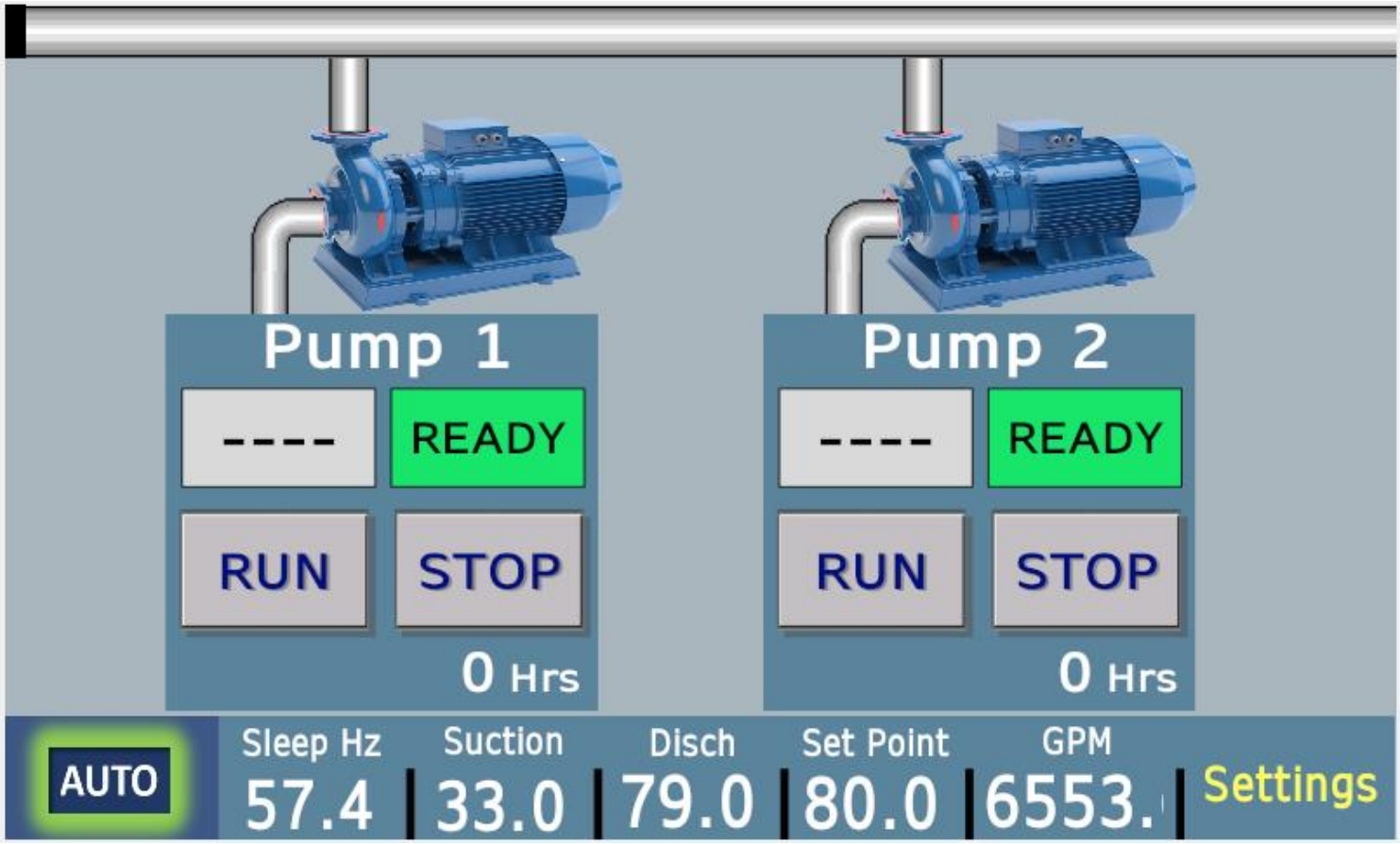
a. By Touching the Selector Switch a screen will appear to select the mode that is desired. Please note that whatever mode you select by touching Hand/Off/Auto, it will be set for both pumps and displayed. See image below:



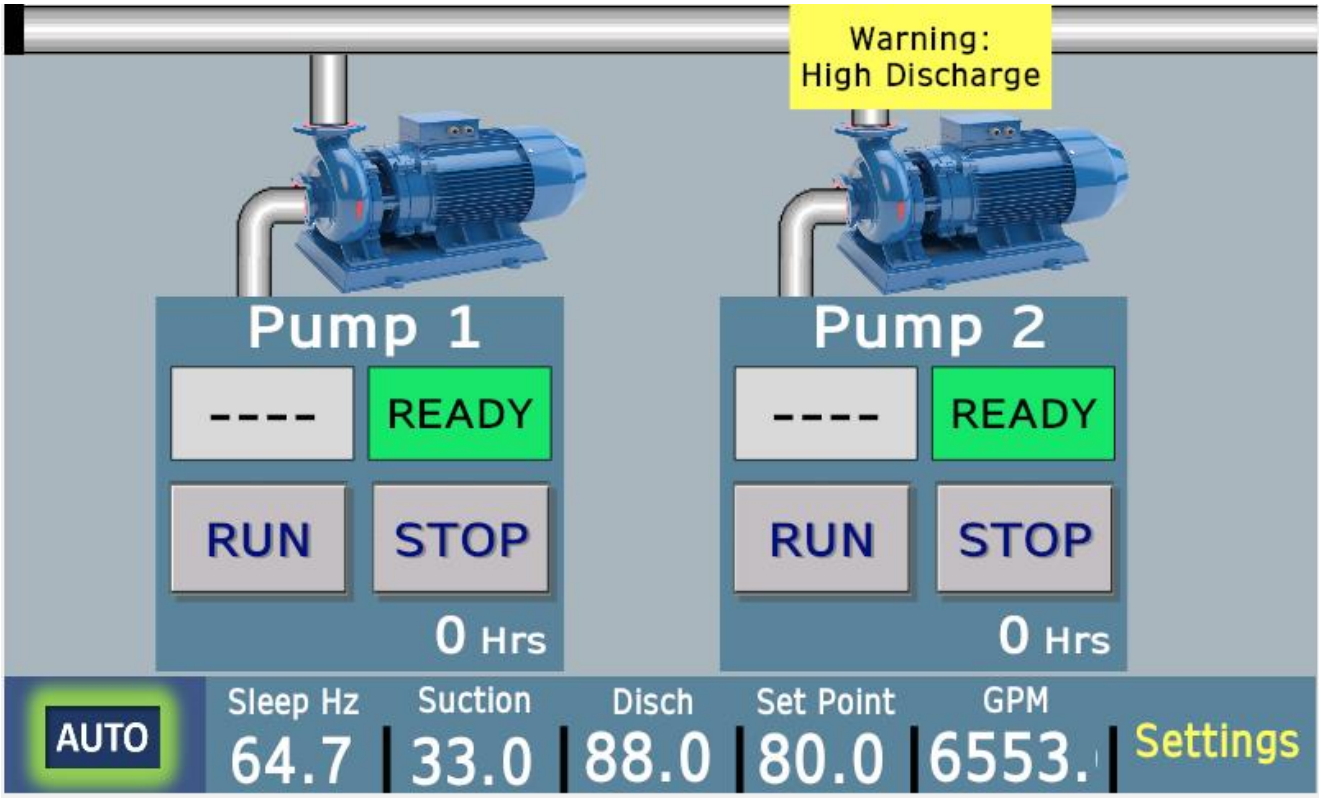
Off andStopped



Ready in Auto

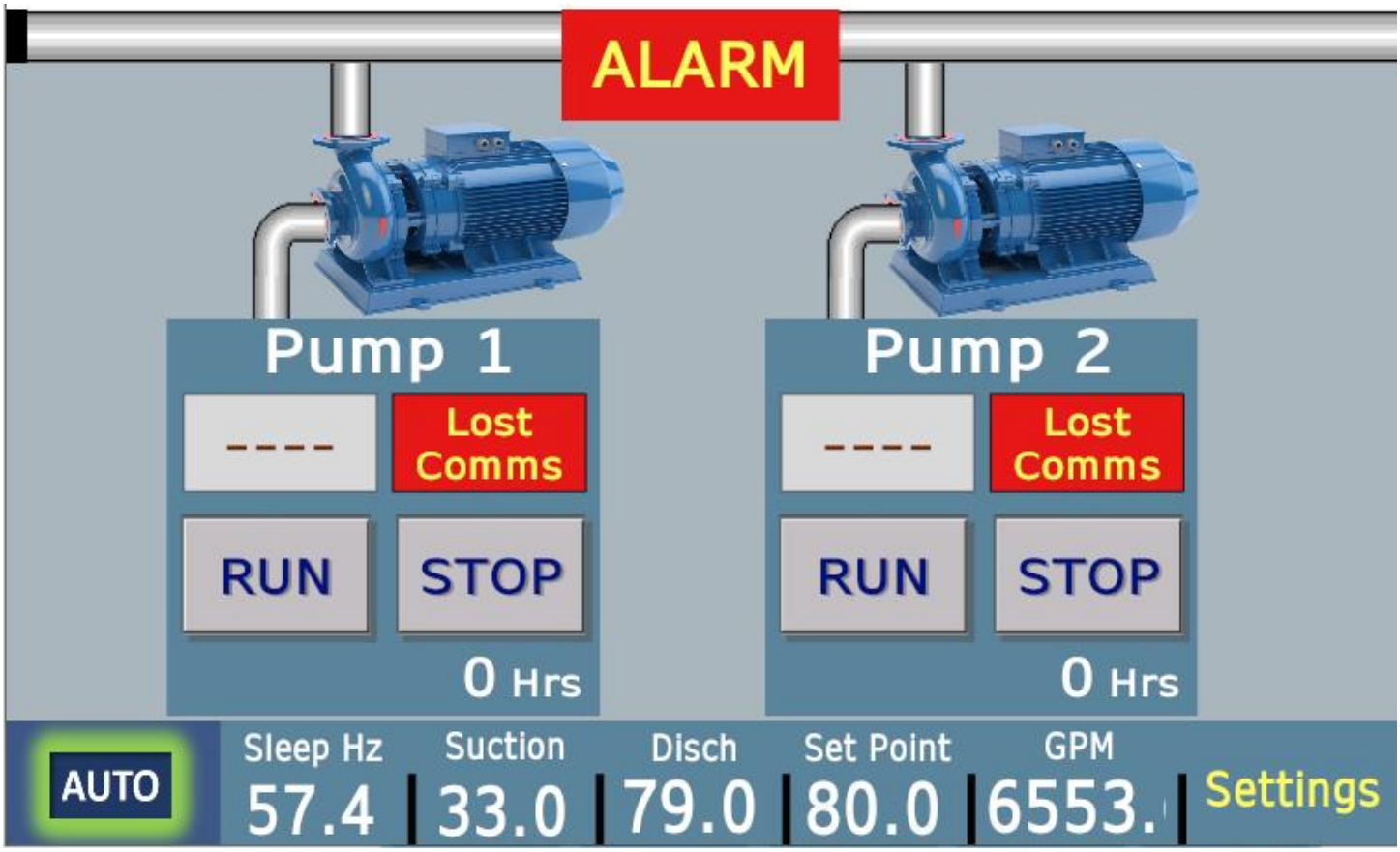


Warning: Flags



9. **Warning Flags**
    a. **Warning Flags at the top of the screen that flash in YELLOW will not shut down the system. They are there to warn you of a condition that is outside of the normal operating range. There is no cause for alarm, but it should be monitored for conditions that changed outside the system.**
        1. **Warnings that <u>will not</u> shut the system down are:**
            a. **High Suction Warning –** incoming water pressure from the city or source has increased which can cause the booster pump system to not perform as designed.
            b. **High Discharge Warning –** pressure after the booster pump system has increased and can cause the booster pump system to not perform as designed.
            c. **High Tank Level Warning –** water has exceeded the limit of the tank and could be losing water to the tank overflow. Pump will remain running, but the tank fill should be checked to prevent overfilling.

Alarm Flags:

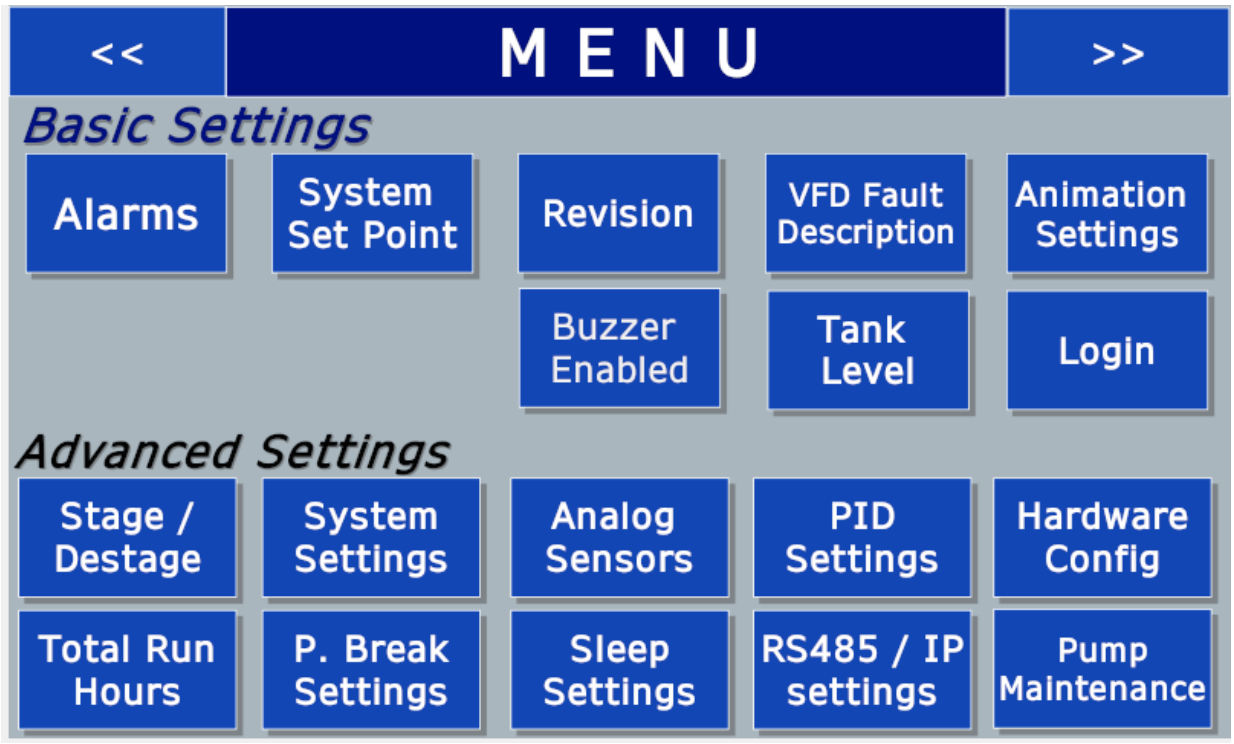


10. Alarm Flag

a. **Flags that appear in RED <u>will</u> shut the system down and <u>will require manual reset on the alarm screen</u> to reset some of the conditions. These types of alarms are critical to the system protecting itself from severe damage. These alarms could include:**

1. **Lost Communication with Drive – Self resetting**
2. **Secondary High Discharge Pressure – Requires Manual Reset**
3. **Suction Pressure is too Low – Self resetting**
4. **Tank Level Low. – Self resetting**

Menu:



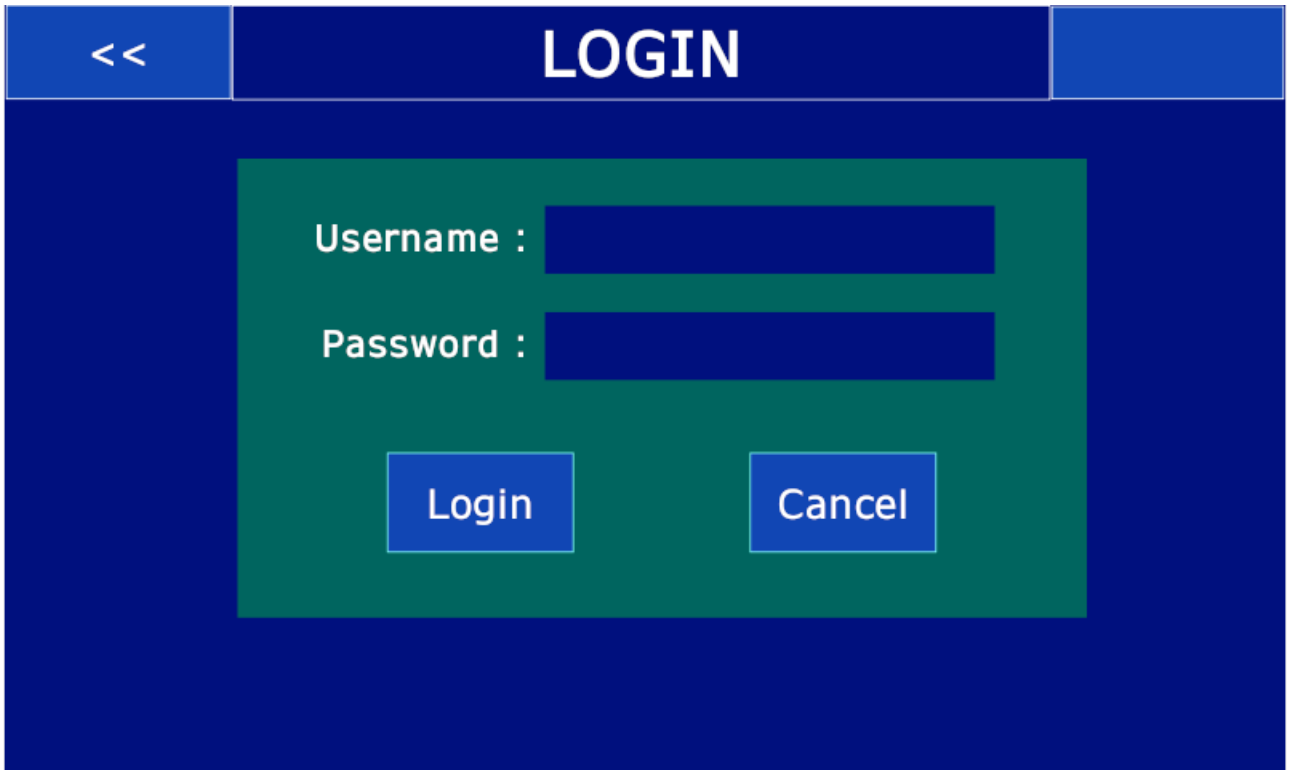
11. Basic Settings

a. Basic settings are settings that can be selected without a passcode. You are able to view and reset alarms, change the setpoint, check the program revision number, view VFD fault descriptions, view the tank level display, and adjust the animation settings

12. Advanced Settings

a. Advanced settings require a passcode to adjust how the system runs. These adjustments should be made by a qualified professional. Please consult the authorized service contractor for additional support.

User Login Screen



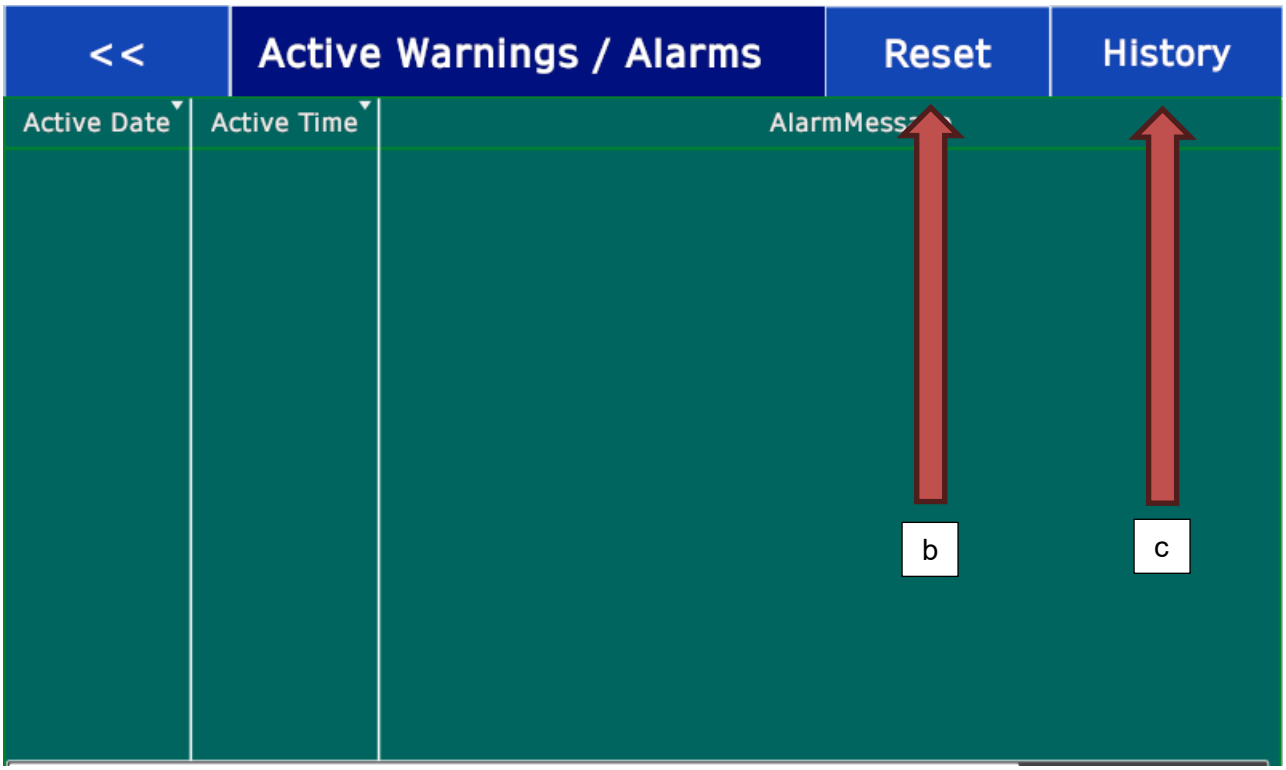
13. Login Screen

a. The login screen will require a user name and passcode to unlock the advanced settings. Once logged in you will have 5 minutes to adjust any settings before the screen will lock and require another login attempt.


<<
LOGIN
press this button
to Log in


<<
LOGIN
You're logged in
press this button
to Log Out

Active Warnings, Alarms, and History Screen



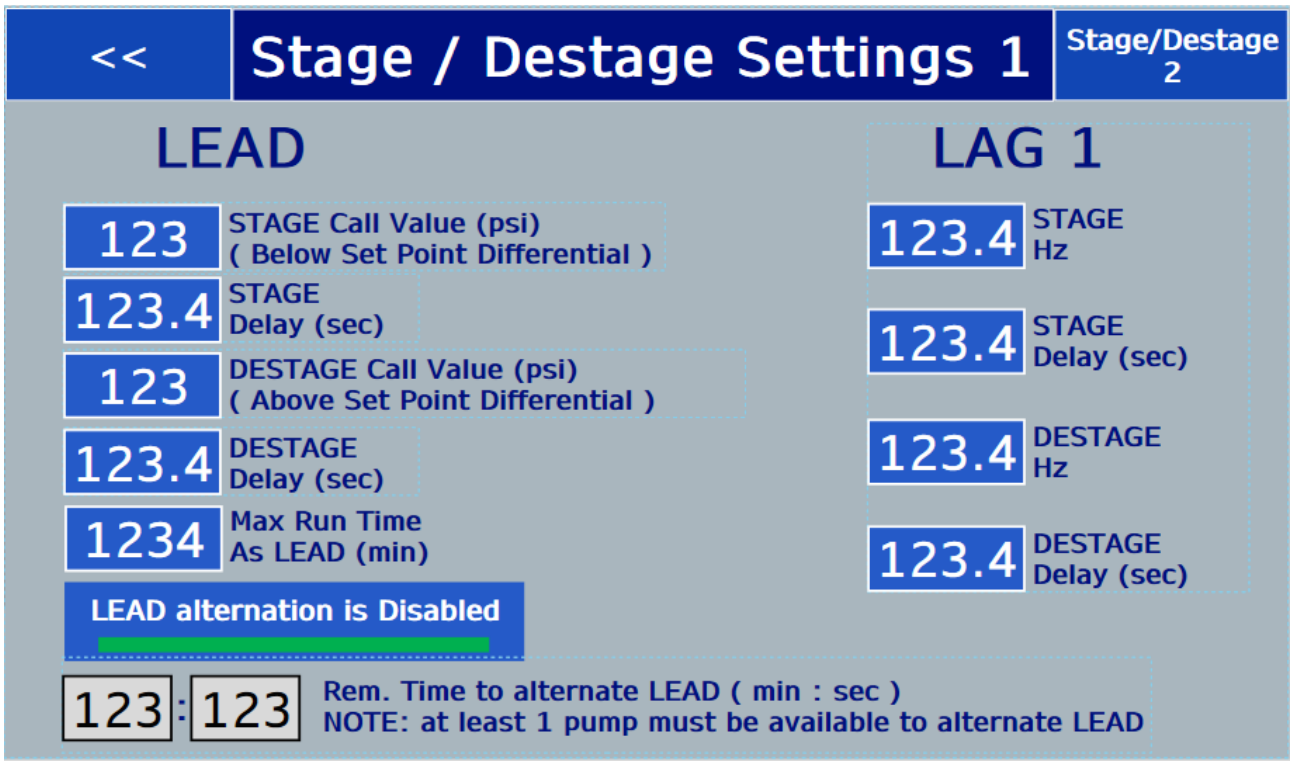
11. Alarm Warnings / Alarms

a. Any message that appear on this screen will be shown in an active state and will be recorded in the history. Items on this screen will show what is currently in alarm status.

b. There is a RESET button at the top of the screen for any alarms that require a manual reset.

c. The alarm HISTORY button, will allow you to see the complete alarm log.

Stage / De-stage Settings



14. Lead Settings

a. Stage Call Value

1. This value is a PSI value that is below the setpoint and tells the lead pump when to turn on. (Typically 5 PSI)

b. Stage Delay

1. This sets the amount of time you would like to delay the Stage Call Value before the condition would be met. (Typically 1 second)

c. De-stage Call Value

1. This value is a PSI value that tells the system when to turn off the lead pump. This value represents how many psi above the setpoint will trigger the condition to turn off the pump. Example: (0 = at setpoint.) or (2 = Setpoint + 2 psi.) (Typically 2)

d. Max Run Time As LEAD

1. Amount of time before the lead pump and lag pump switch positions (Typically 30). Please make sure the Lead Alternation button is enabled and the Next Pump to Start Rule on the System settings 2 Page is not switched on.

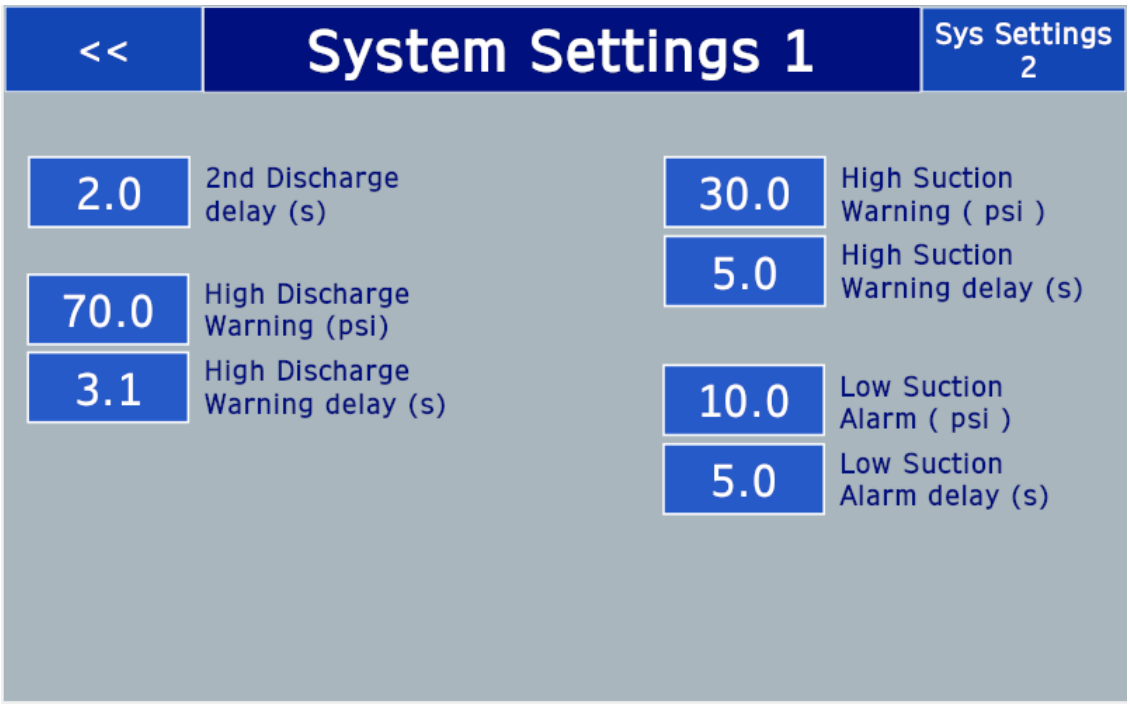
16. Lag Settings

a. Stage Hz
    1. The frequency at which you would like the lag pump to start running. (Check your test sheet for this value set by the factory)

b. Stage Delay
    1. The amount of time in seconds that you would like to delay the lag pump from starting. (Typically 2)

c. De-stage Hz
    1. The frequency at which you would like the lag pump to shut off. (Check your test sheet for this value set by the factory)

d. De-stage Delay
    1. The amount of time in seconds that you would like to delay the condition once it is met. (Typically 10)



17. System Settings 1

a. 2nd Discharge Delay (Seconds)
    1. Delay timer for the 2nd discharge alarm. (Typically 2)

b. High Discharge Warning (PSI)
    1. This warning will occur when the pressure is at or above this value. (Typically set from the factory. Take your setpoint and add 15 PSI for this value.)

c. High Discharge Warning Delay (Seconds)
    1. Delay Timer for the High Discharge Warning.(Typically 5)

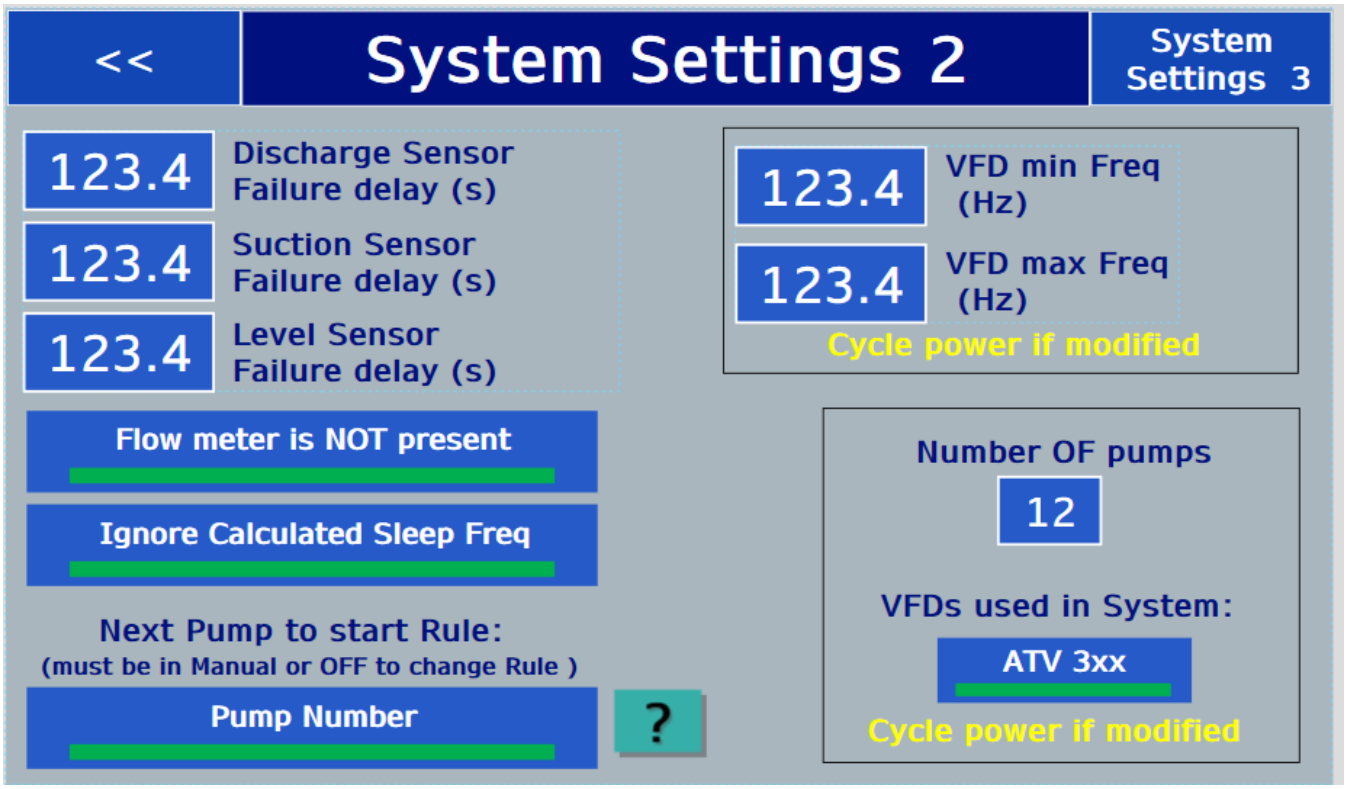
d. High Suction Warning (PSI) (Typically the Suction Pressure + 20 PSI will give you the value)

e. High Suction Warning Delay (Seconds) (Typically 5)

f. Low Suction Alarm (PSI) (Typically 10 PSI for city pressure)

g. Low Suction Alarm Delay (Seconds) (Typically 5)

System Settings 2



18. System Settings 2

a. Discharge Sensor Failure Delay

1. Delay timer (in seconds) if the sensor shows 0 PSI the timer will start. The value entered will delay the condition before the alarm is presented. (Typically 5)

b. Suction Sensor Failure Delay

1. Delay timer (in seconds) if the sensor shows 0 PSI the timer will start. The value entered will delay the condition before the alarm is presented. (Typically 5)

c. Level Sensor Failure Delay

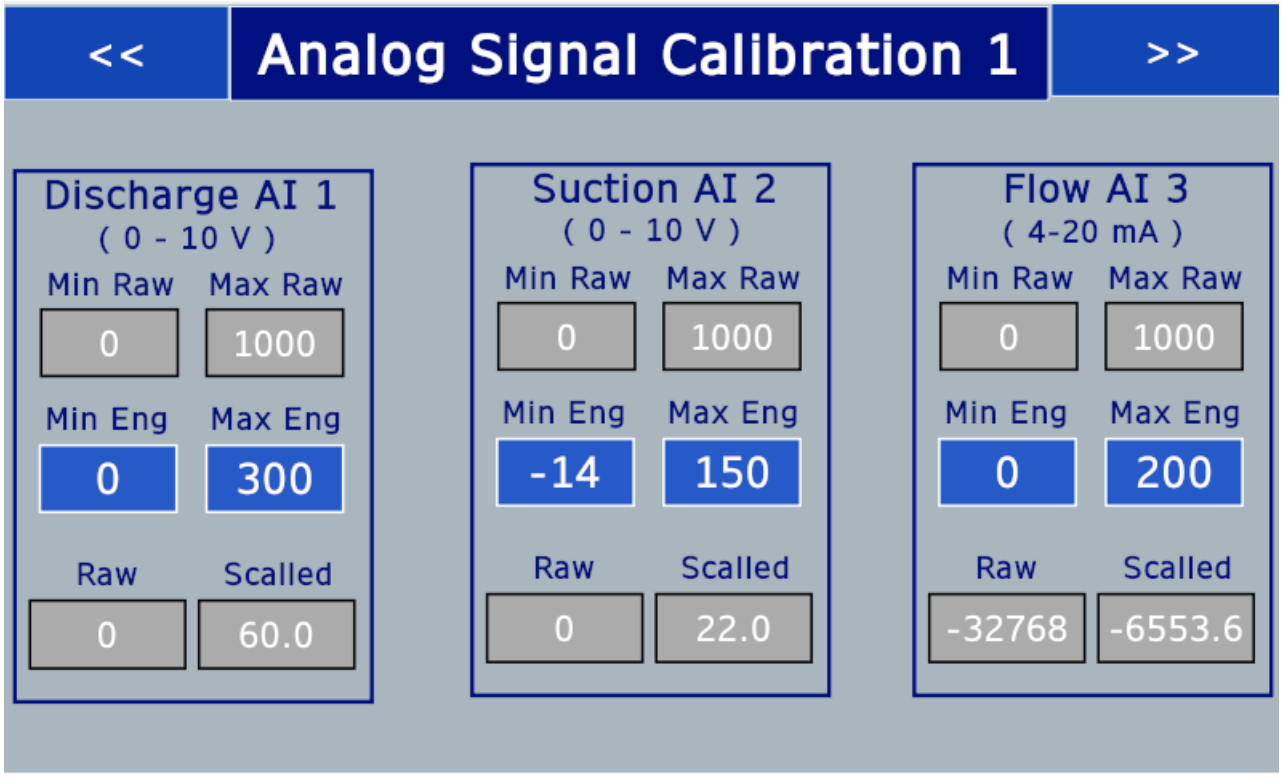
1. Delay timer (In Seconds) once sensor condition is met the timer will start. The value entered will delay the condition before the alarm is presented. (Typically 5)

d. VFD Min Freq

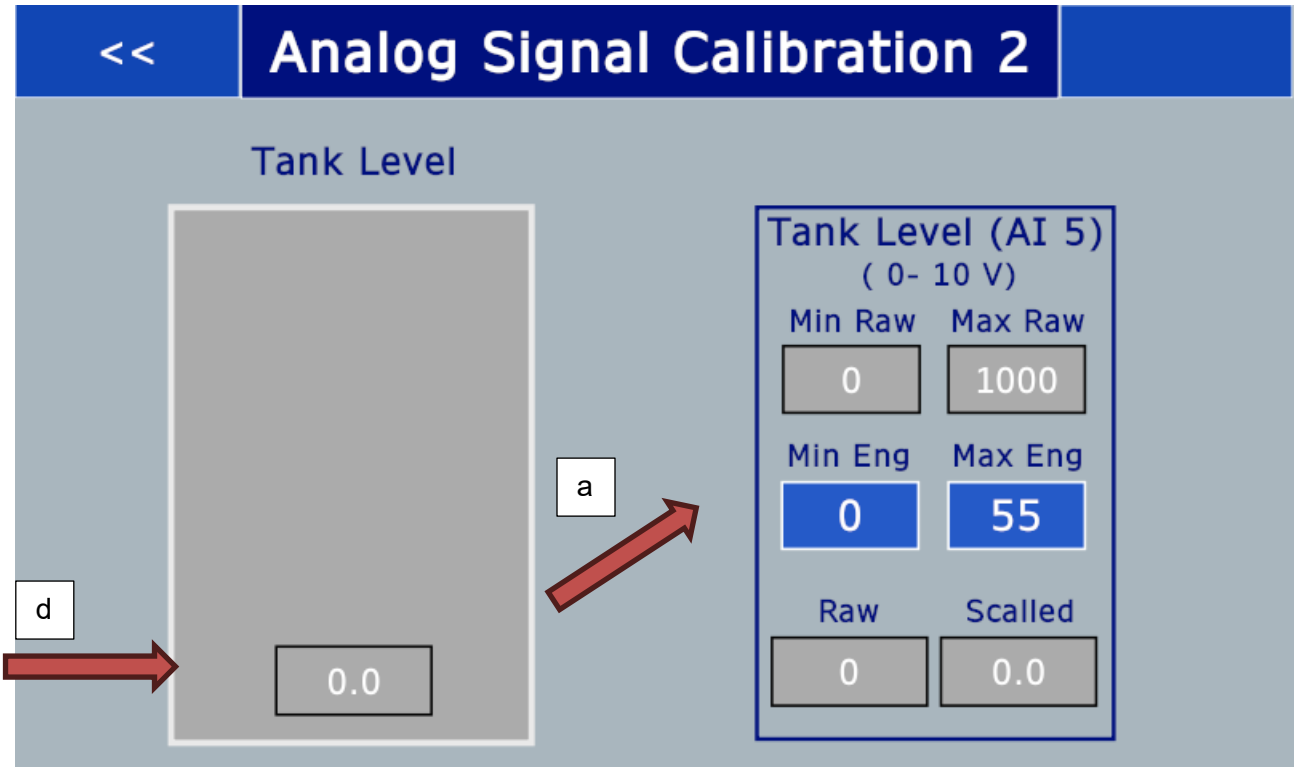
1. Variable Frequency Drive Minimum Frequency. The minimum speed in Hertz that you would like the drive to start at. (Typically 25)

e. VFD Max Freq

1. Variable Frequency Drive Maximum Frequency. The maximum speed in Hertz that you would like the drive to operate at. **(Please reference motor data plate.)**

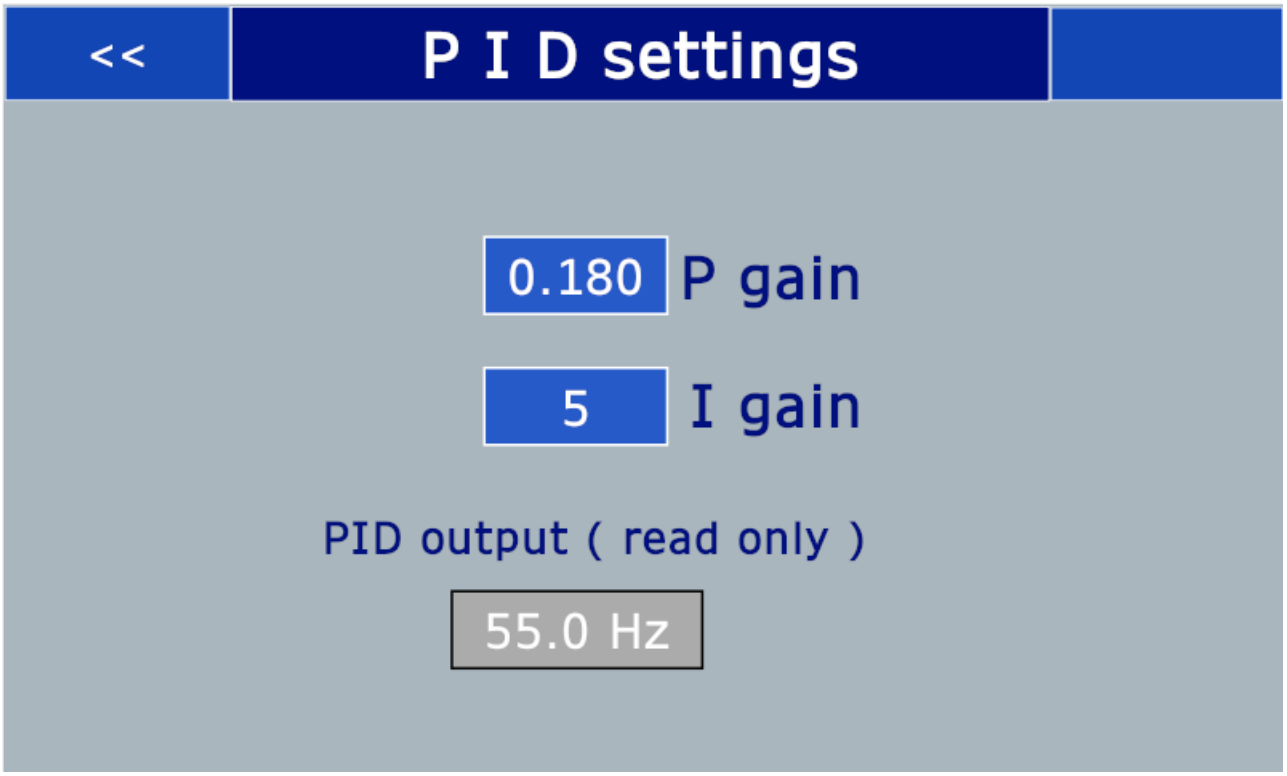


19. Analog Signal Calibration 1
    a. Discharge AI1
        1. Discharge Transducer Input is located on AI1 on the PLC. The signal wire is a 0-10V signal. The blue boxes are values you can adjust to calibrate the digital display against the mechanical gauges. The gray boxes are for raw data that the PLC references.
    b. Suction AI2
        1. Suction Transducer Input is located on AI2 on the PLC. The signal wire is a 0-10V signal. The blue boxes are values you can adjust to calibrate the digital display against the mechanical gauges. The gray boxes are for raw data that the PLC references.
    c. Flowmeter AI3
        1. Flowmeter Transducer Input is located on AI3 on the PLC. The signal wire is a 4-20mA signal. The blue boxes are values you can adjust to calibrate the digital display against the mechanical gauges. The gray boxes are for raw data that the PLC references.



20. Tank Level Calibration:

a. The values in blue are to adjust for the tank height. Change Max Eng for the height of the tank.
b. Tank Level Transducer – Signal wire is on Input AI-5 and is looking at a 0-10 Volt range.
c. Other values are raw data values
d. Tank Level Display will display the actual value in feet.



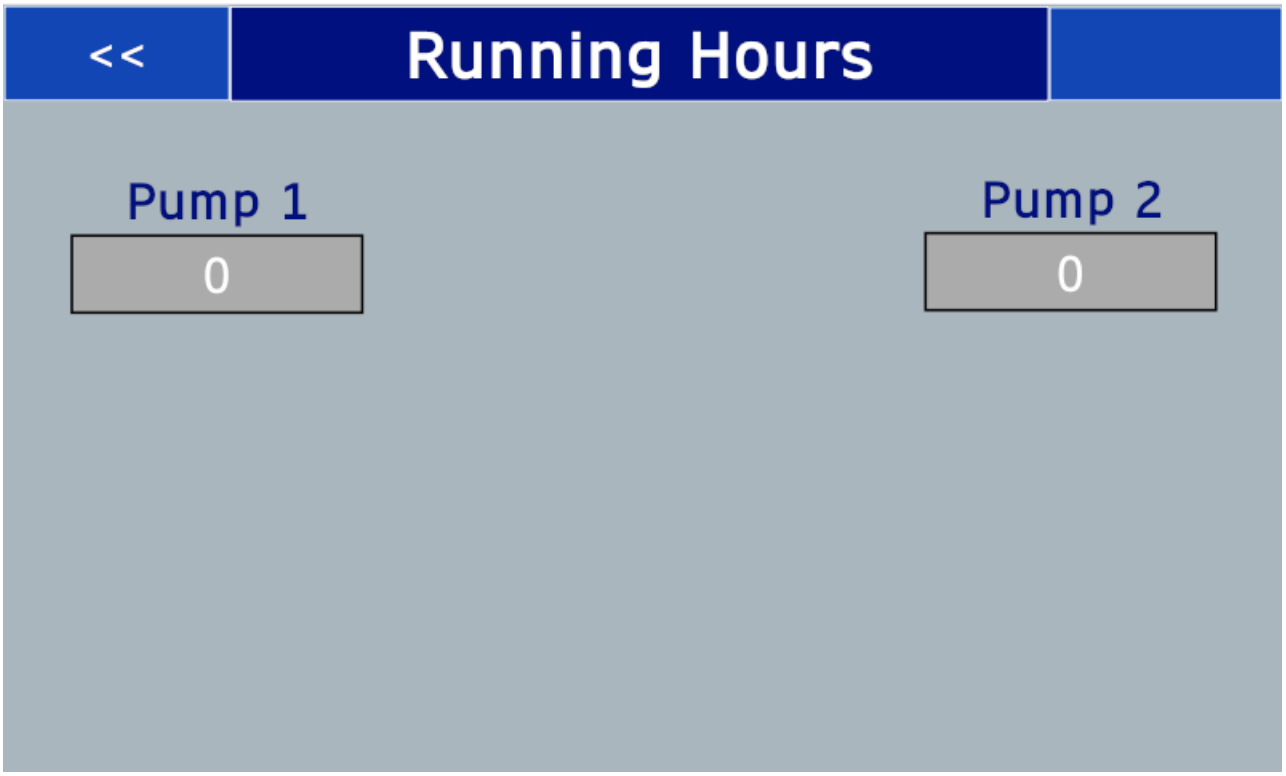
21. PID Settings

a. P gain

1. P gain will adjust the ratio of change in the output to the change of the input.
    a. Small changes in this value are recommend. (Check your test Sheet for the factory set value)

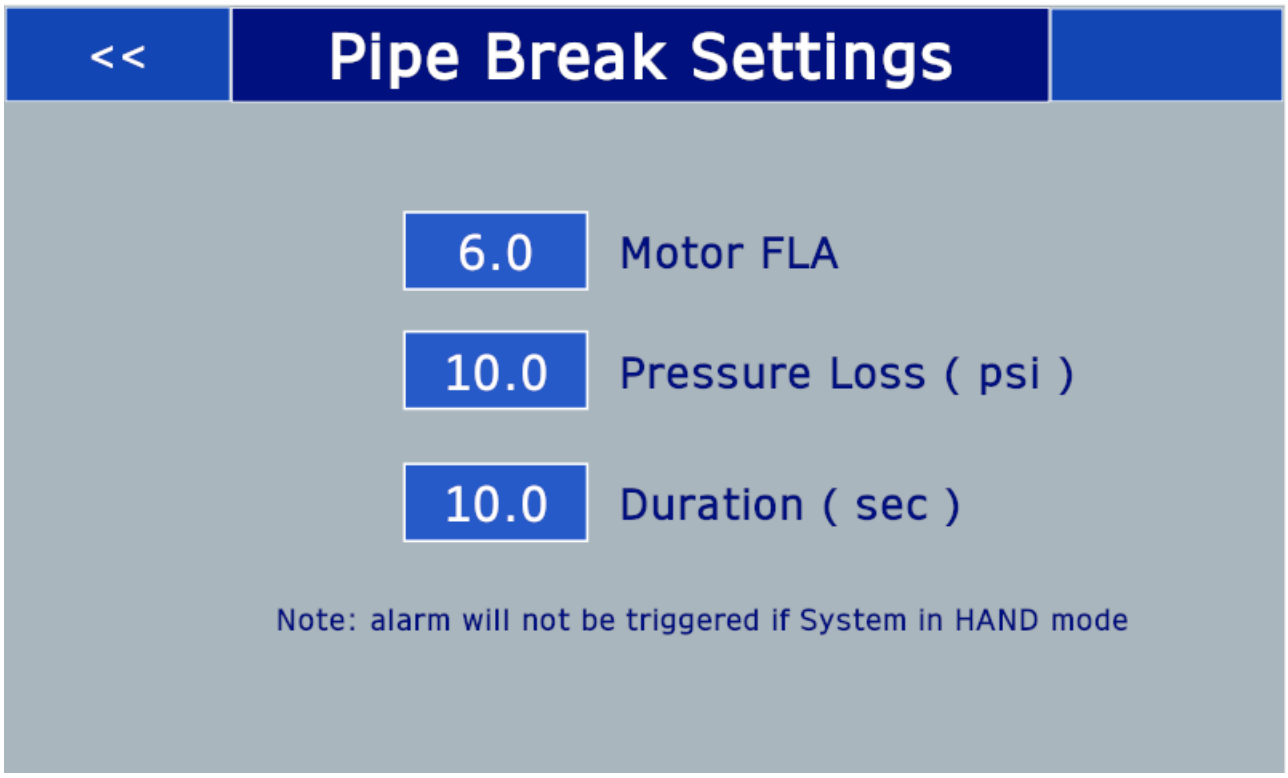
b. I gain

1. I gain will adjust the speed of the signal sent out to the controller output. (Check your test Sheet for the factory set value)



22. Running Hours

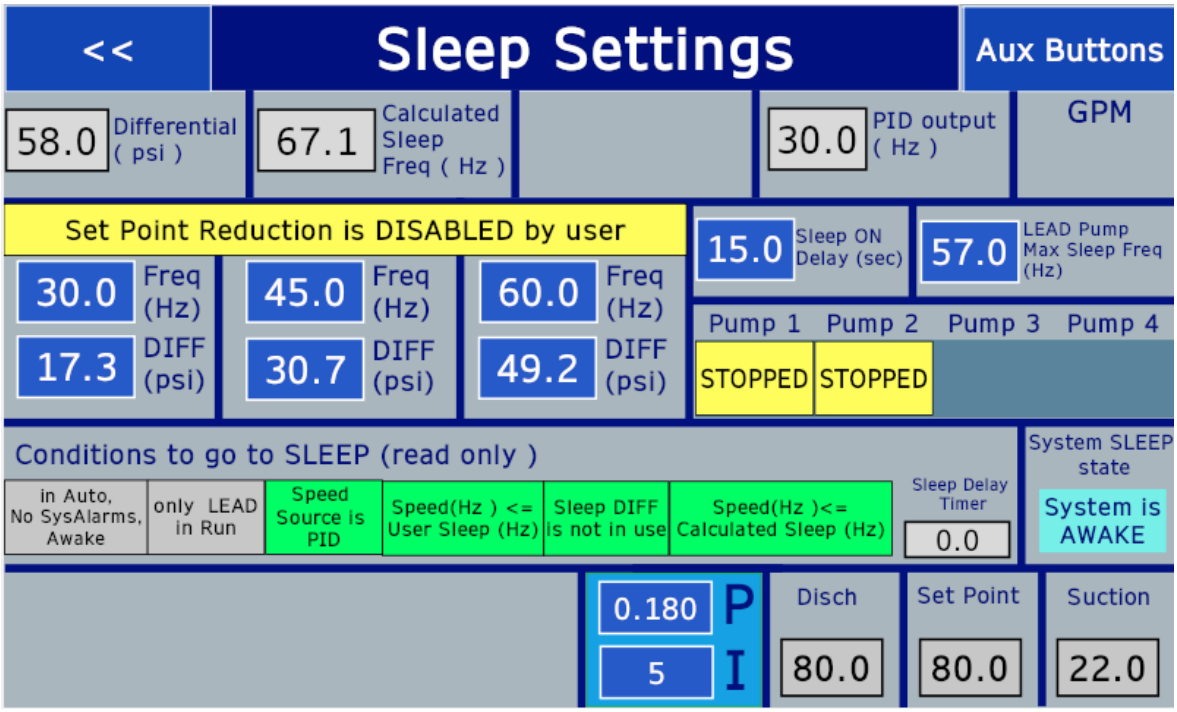
a. Running Hours displays the total number of hours each drive has been running. It is not able to be reset for any reason, including installation of new pumps.



23. Pipe Break Settings

a. This is a setting that uses the motor full load amps based on the motor data plate.

If the motors are running at full load amps and the pressure drops to 10 psi below the setpoint, the timer (Duration) will begin counting down. Once it times out and the condition is triggered, there will be an alarm for a pipe break and the system will shut down. This is a hard stop on all pumps and will need to be reset from the alarm screen.



24. **Sleep Settings**

a. **Differential (PSI)**

1. A measurement in difference between the discharge pressure and the incoming suction pressure.

b. **Sleep Freq (Hz)**

1. The speed at which the pump will enter a sleep state. This occurs when the condition is at or below the sleep frequency.

c. **VFD Speed (Hz)**

1. Actual VFD Speed Hertz

d. **PID Output (Hz)**

1. Actual PID Speed Hertz

e. Conditions To Go To Sleep

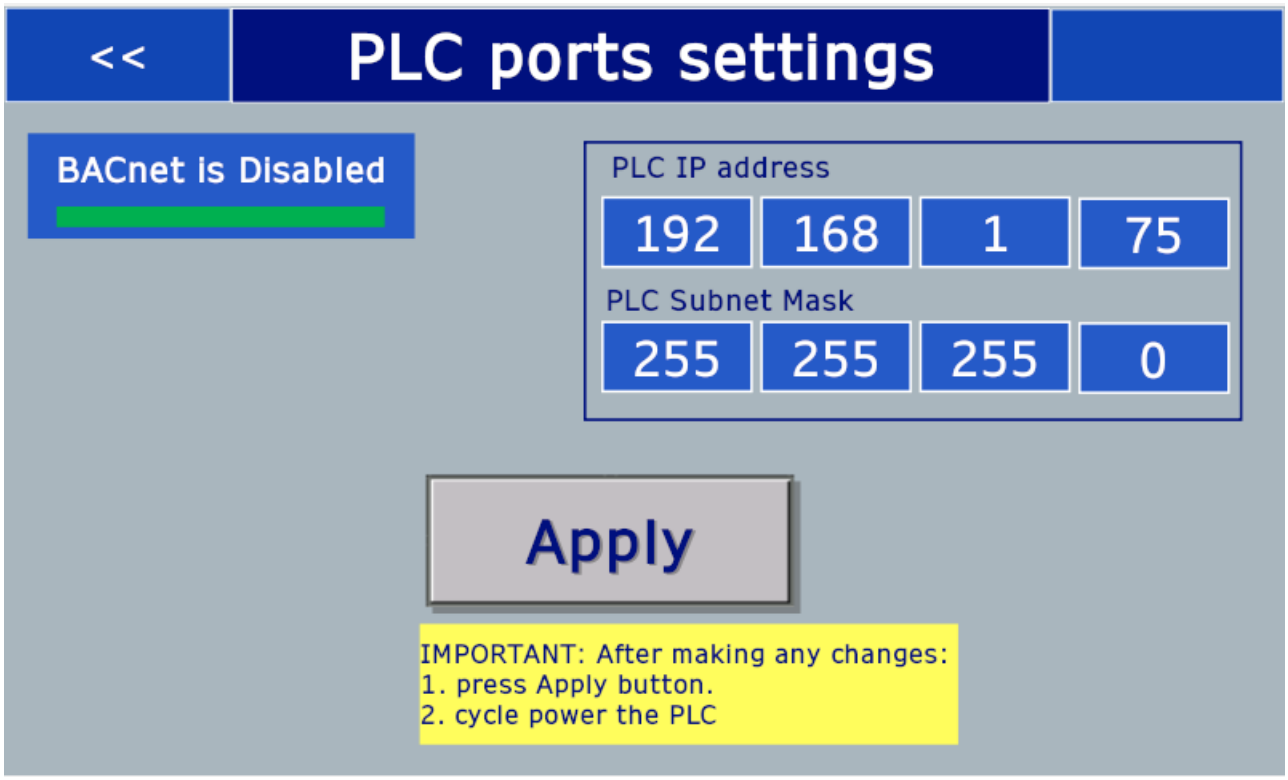
1. If all the buttons are green in this window, the sleep timer will begin a count down. Once the timer is complete the system will remain in this sleep state until the discharge pressure drops to 5 PSI below the setpoint, at which time the system will resume operation.

f. Sleep On Delay (sec)

1. Delay timer (in seconds) that allow the conditions to stabilize before going to a sleep state. (Typically set at 30)

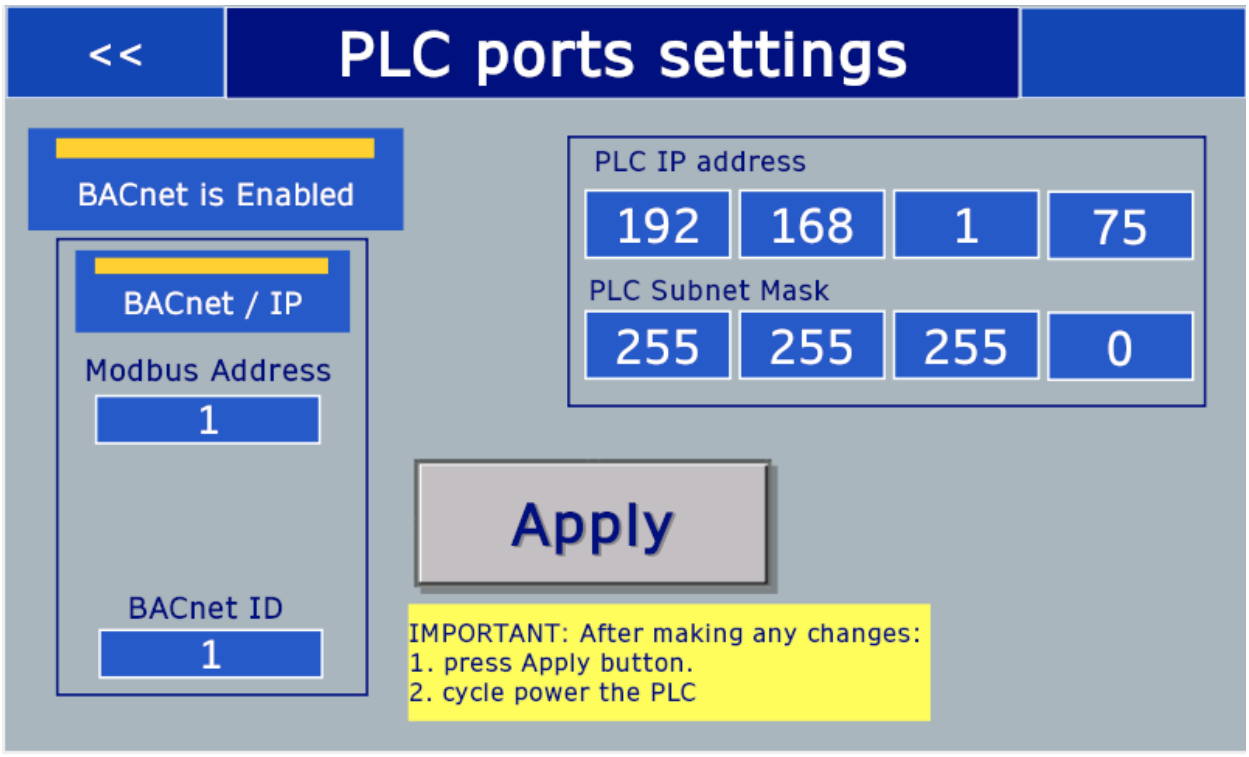
g. **Lead Pump Max Sleep Freq (Hz)**

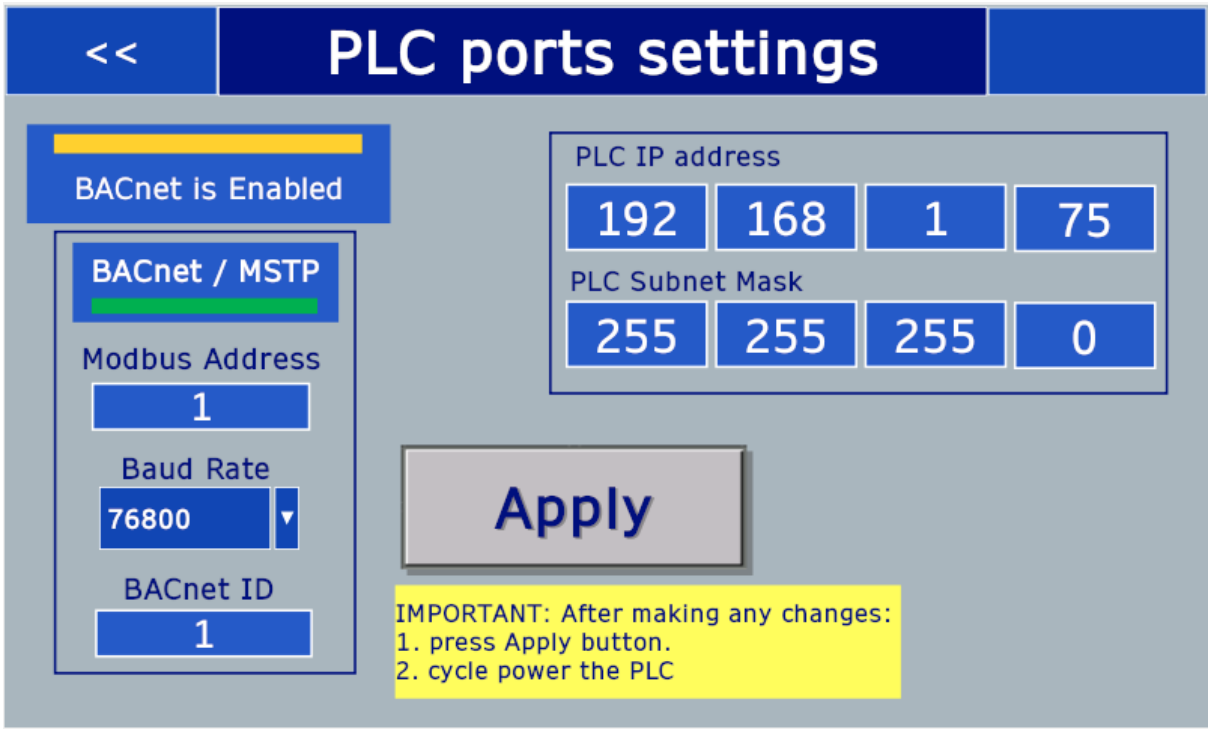
1. ***(Note: Never set to 30Hz or the system will shut itself down and never turn back on.)*** This is the Maximum frequency that the system will be looking for in order to go to sleep. It works in conjunction with the Minimum Sleep Frequency as a window setting. This is designed this way so that if the system were at full flow and the system is at 60 hertz, it will not shut down due to the Calculated Sleep Frequency would be at the value of 60 hertz which would cause the system to shut down. The pump would run at 60 Hertz and then shut off, then turn back on again and keep repeating until a valve after the booster pump and the pressure stabilizes. We typically disregard the calculated sleep frequency and use the Maximum sleep frequency and Minimum sleep frequency window type settings.



25. PLC BACnet TCP/IP

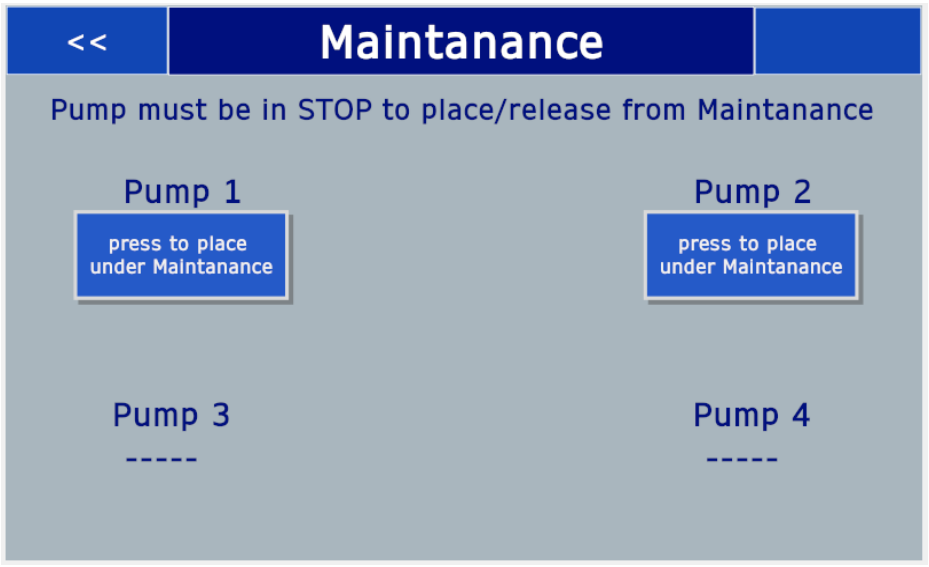
a. To enable BACnet, press the (BACnet is Disabled) button until it turns yellow. See image below. The Modbus address and BACnet ID will appear. Press the apply button and cycle the power to save the settings.

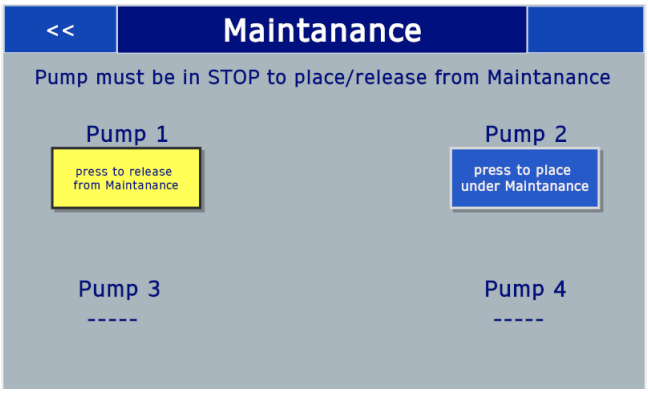


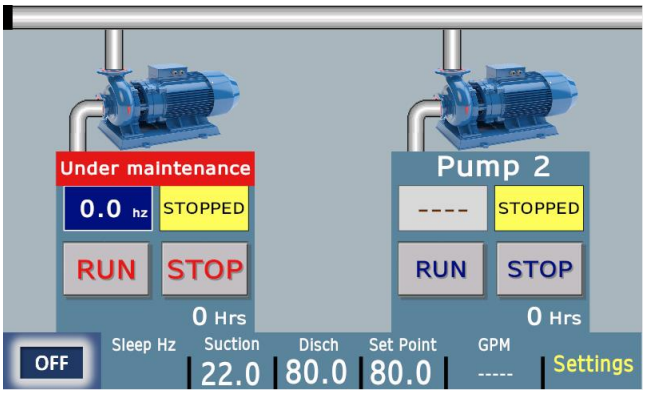


26. PLC BacNet MS/TP

a. To enable BACnet, press the (BACnet is Disabled) button until it turns yellow. Select the BACnet MSTP Option. It will turn green. The Modbus Address, Baud Rate, and BACnet ID will appear. Pease press the apply button and cycle the power to save the settings.







27. Pump Maintenance

a. Allows the user to have one pump in auto mode and control the 2nd pump in a manual mode set by the desired hertz. This can be achieved by stopping the pump you want to work on, by going to the maintenance screen. Press the pump number you want to service. The button will change to yellow in color. Once you go back to the main screen, there will be a “Under Maintenance” flag appear in RED on the pump you selected. The user is now able to control the pump by entering the hertz one would like the speed to operate. Press run to start the pump and press stop to shut off the pump.

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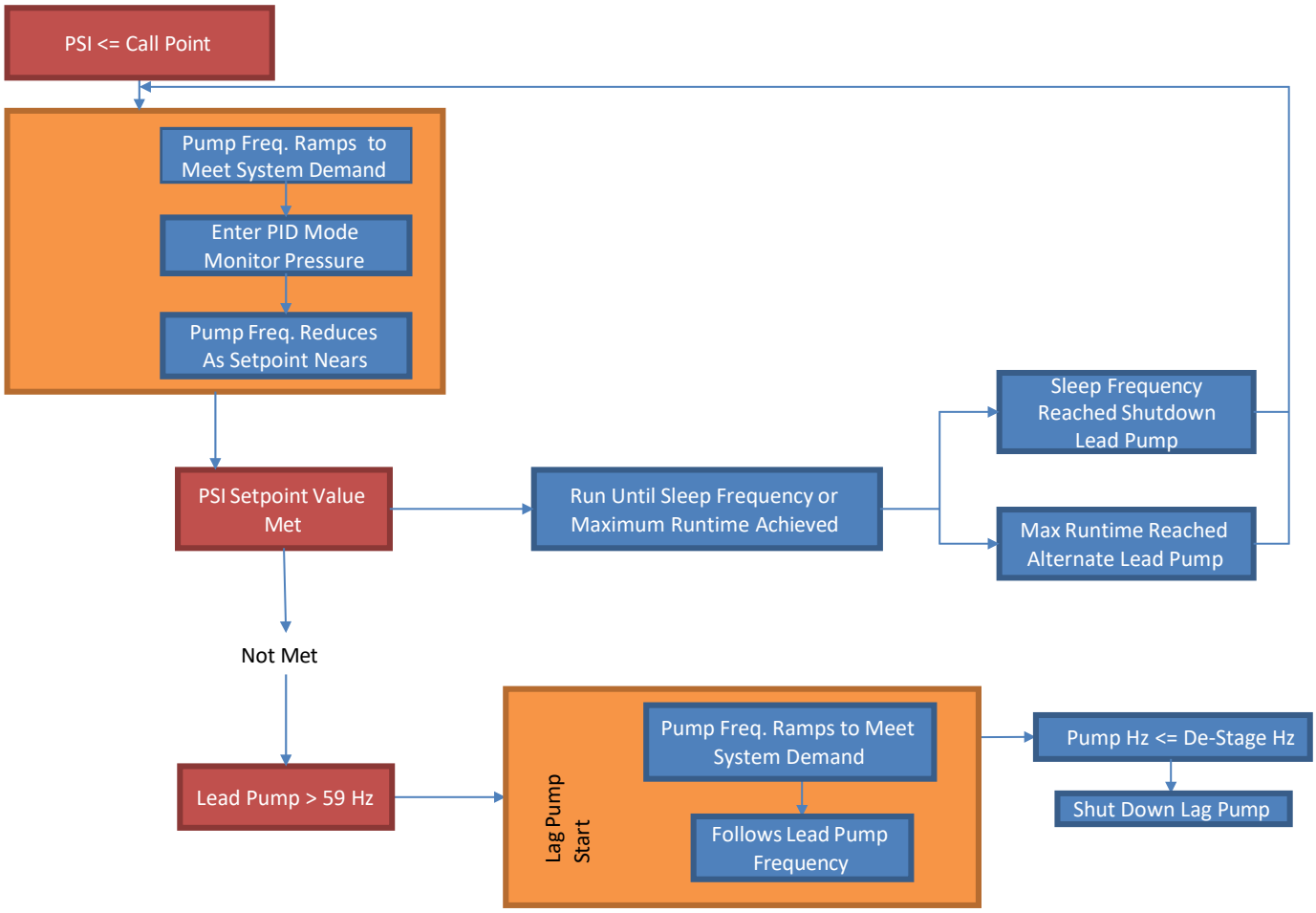
Control Logic Chart



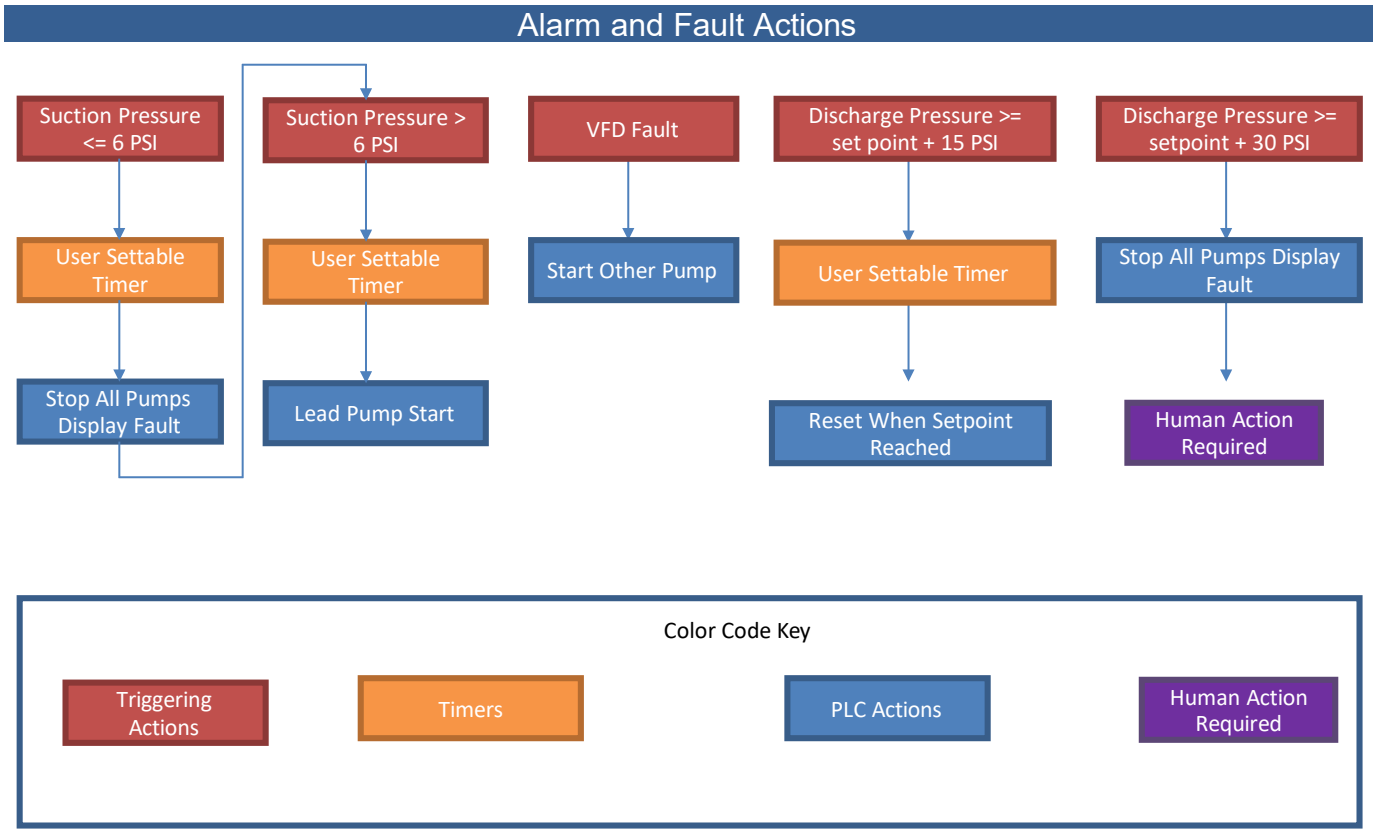


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Table 4. Troubleshooting

Table 4. Troubleshooting – Continued

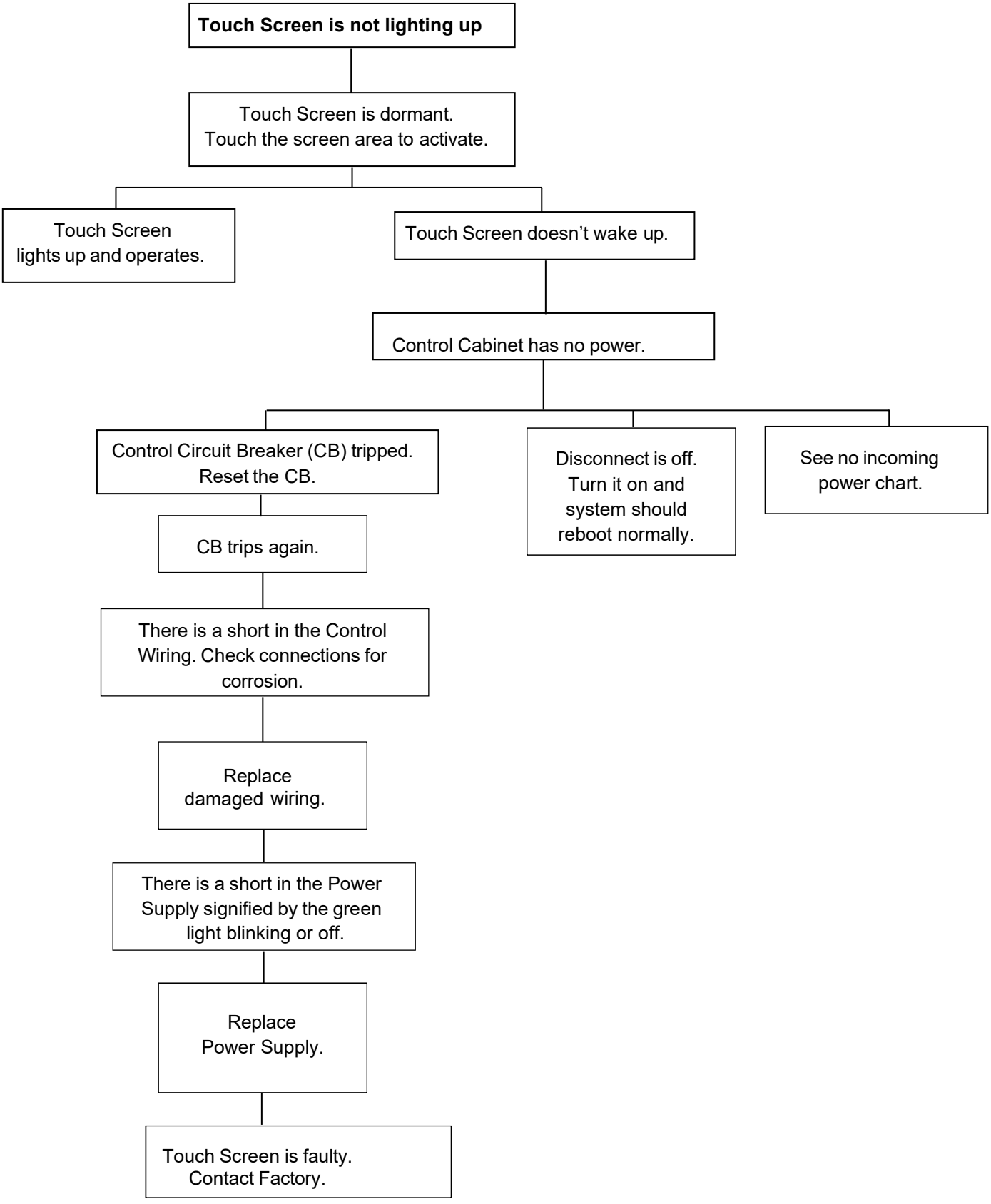


Table 4. Troubleshooting – Continued

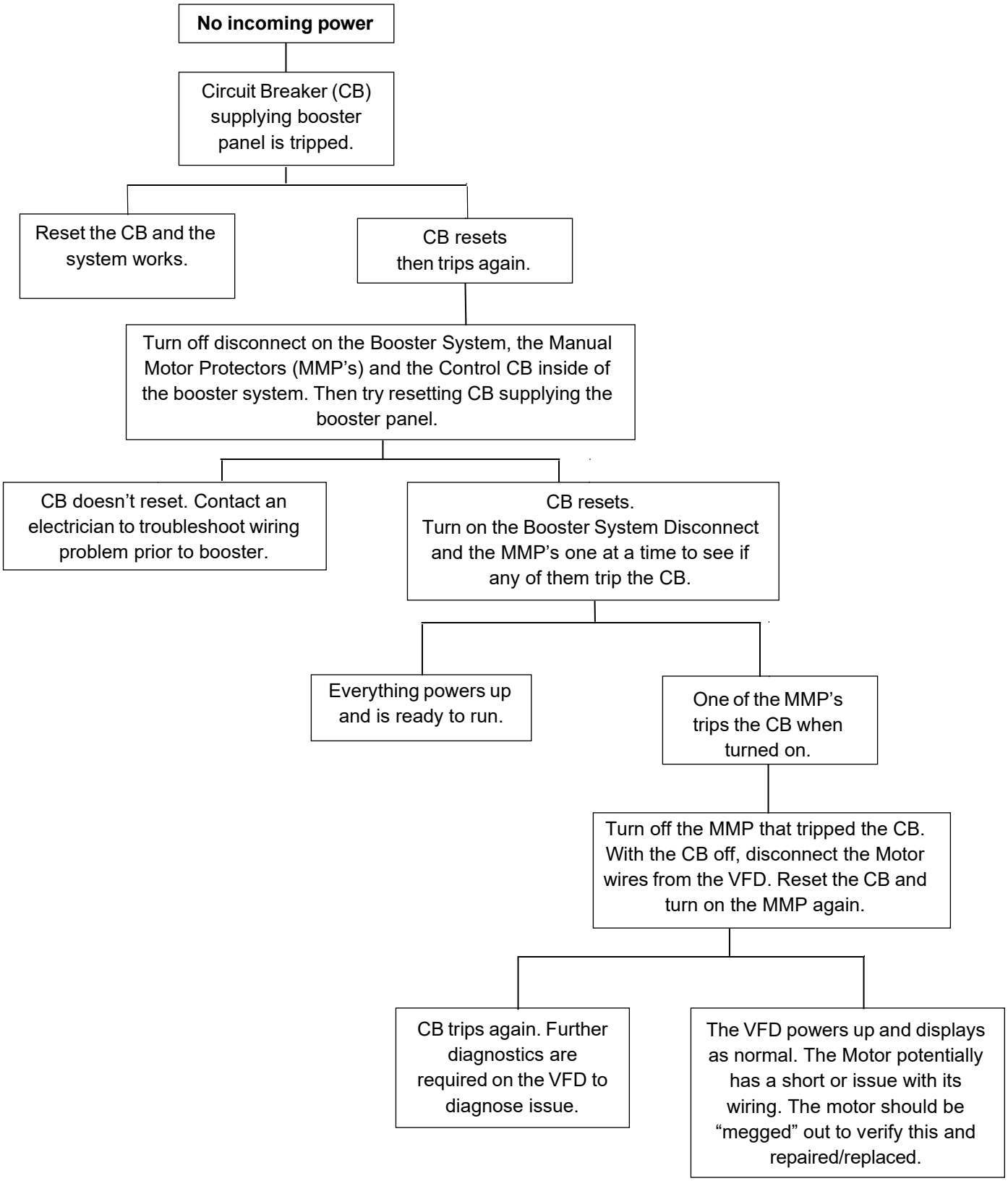


Table 4. Troubleshooting – Continued

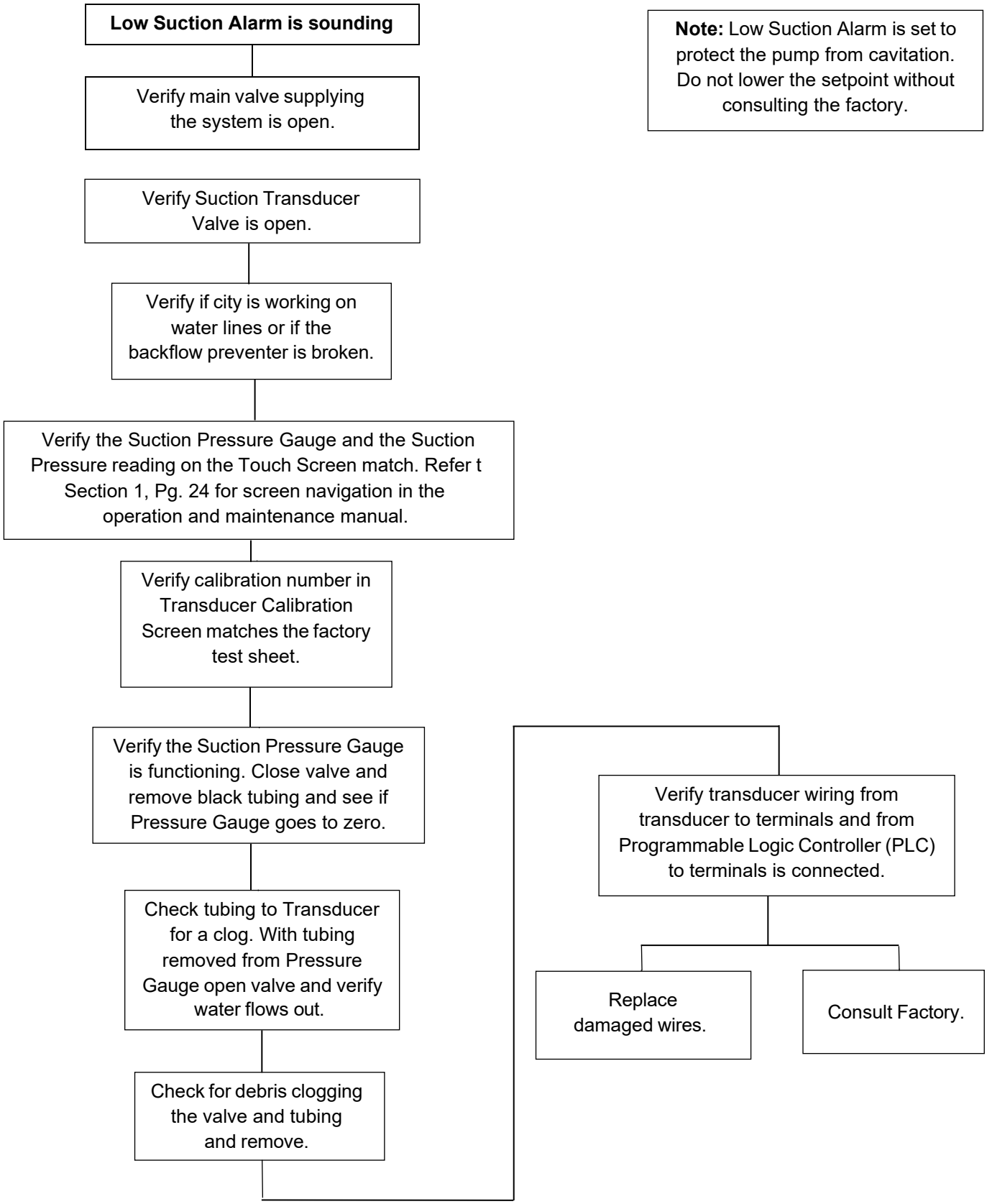


Table 4. Troubleshooting – Continued

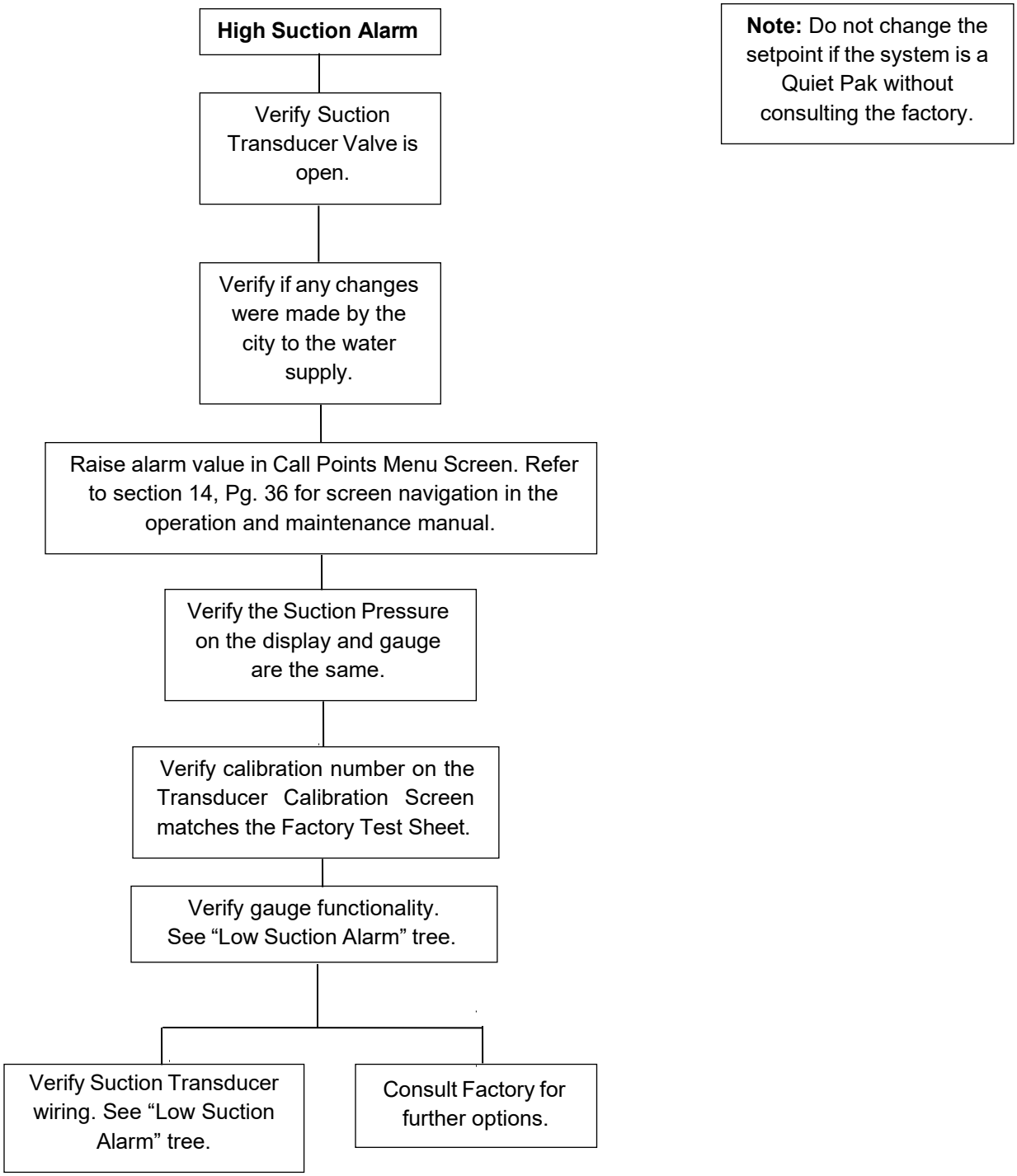


Table 4. Troubleshooting – Continued

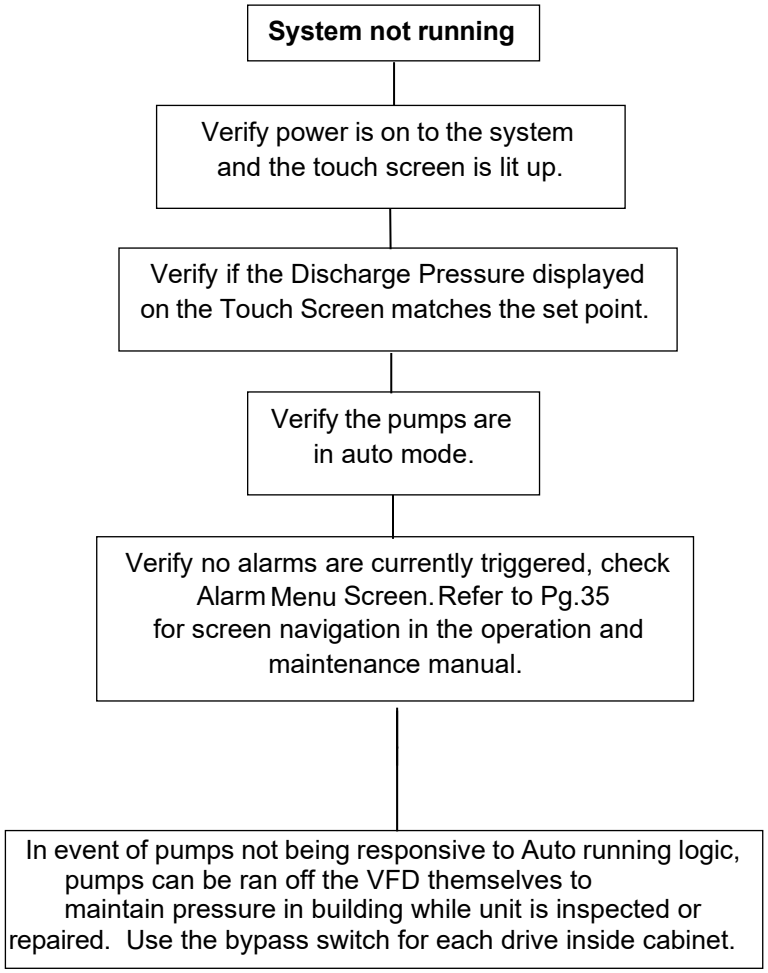


Table 4. Troubleshooting – Continued

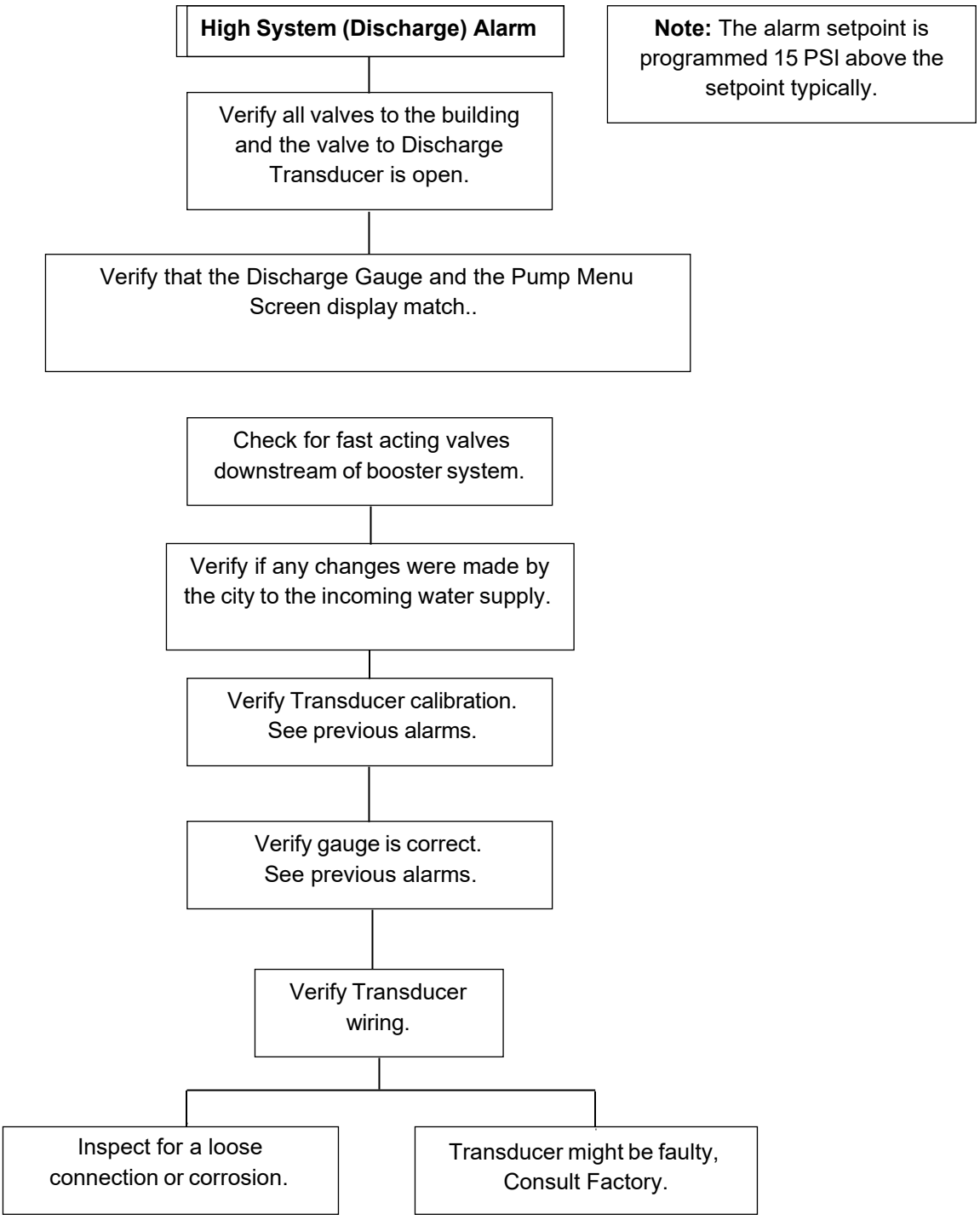


Table 4. Troubleshooting – Continued

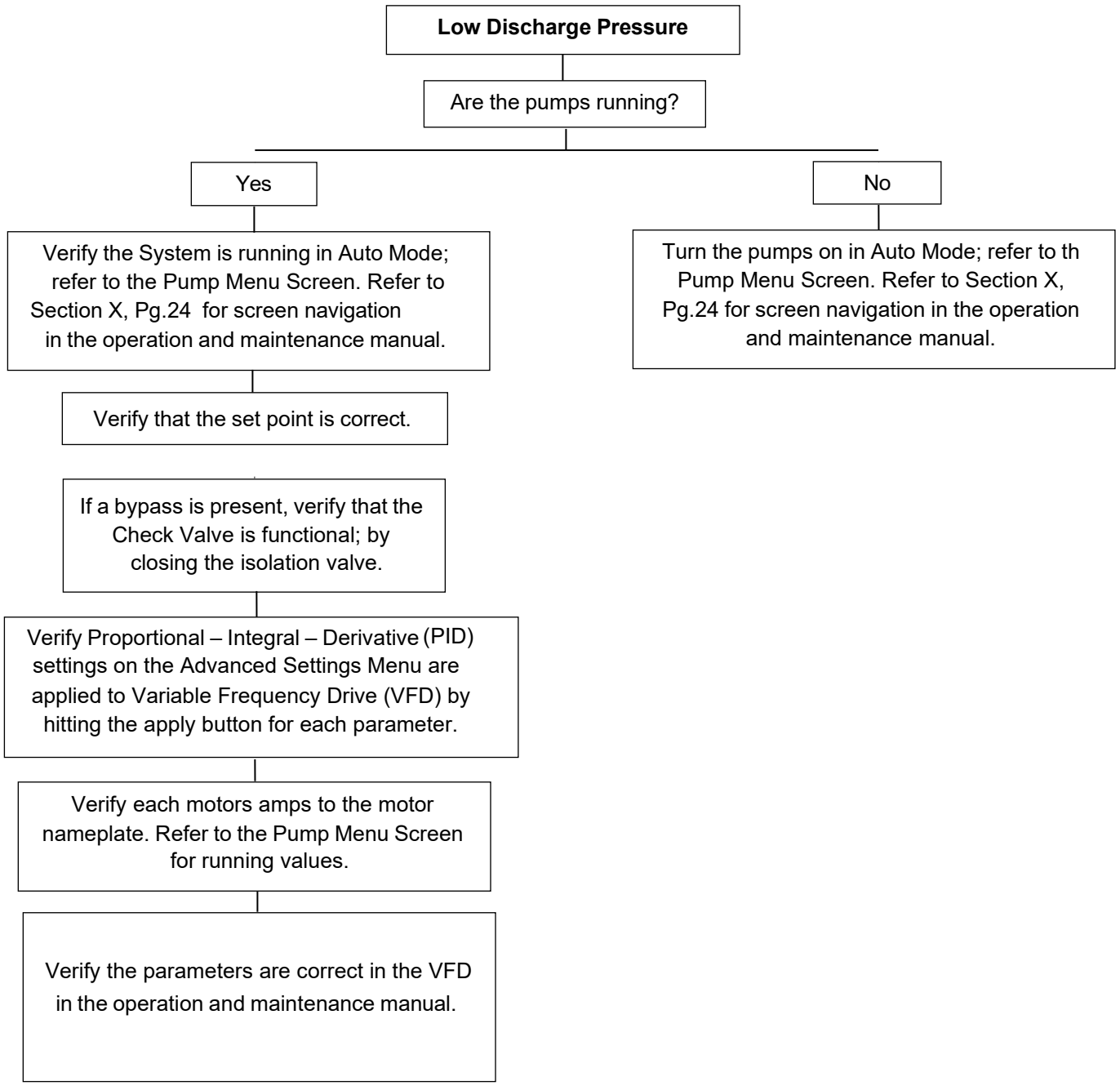


Table 4. Troubleshooting – Continued

2nd High System (Discharge) Pressure

Verify all valves are open on system and downstream of system.

Verify that the Discharge Gauge and the Pump Menu Screen display match. Refer to Section 1, Pg.24 for screen navigation in the operation and maintenance manual.

Reset the alarm from the alarm menu page and see if a pressure spike happens again to trip the alarm.

Try slowing down the Proportional – Integral – Derivative (PID) loop by lowering the gain or raising the integration time.

Verify Transducer calibration in the Pump Menu Screen.

Verify Transducer wiring in not damaged.

Consult Factory.

Note: This alarm is typically set 30psi over the setpoint.

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.

Introduction:

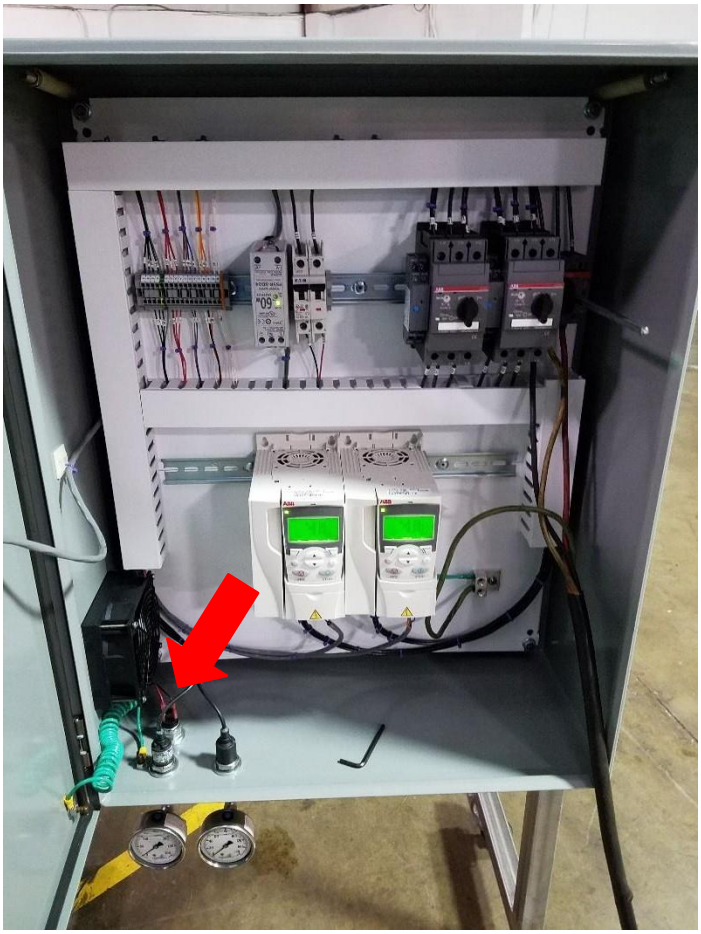
The following steps will walk through setting and calibrating the secondary high-pressure switch which triggers the secondary high system alarm (30 psi) on the HMI/PLC.

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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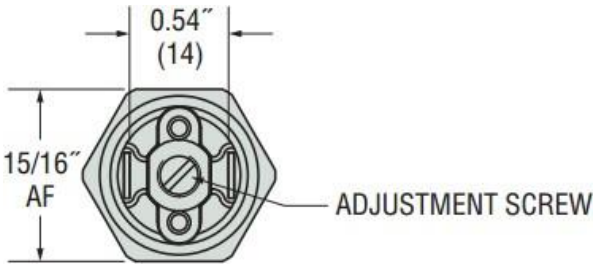
2. On the top of the switch, located the adjustment screw as indicated below. It could be a flat head screw or a 5/32 allen wrench



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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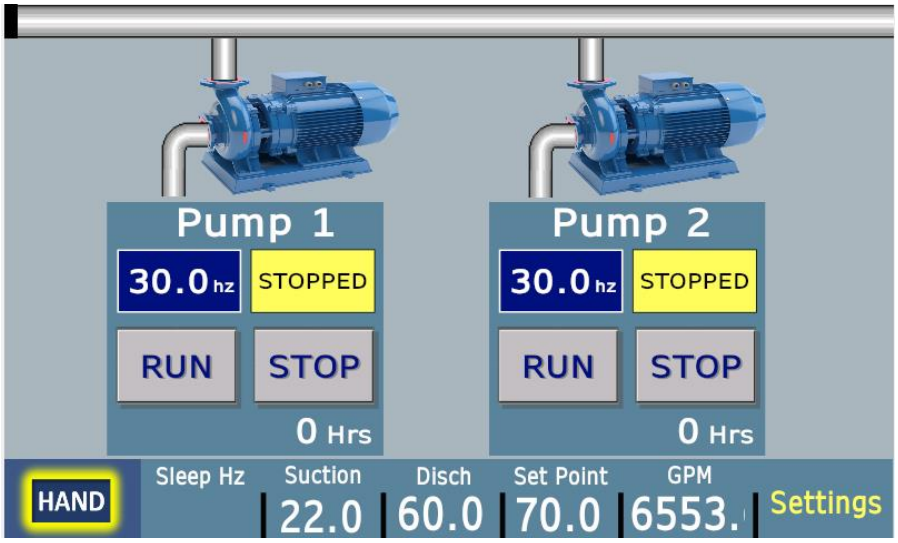
Calibration:

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 **Setting**, then select the **Alarms**. 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. (Don't forget to turn the tone back on once you completed the adjustment.)

3. On the HMI, select a **Pump and press Run**.



4. **Menu**, select the option that reads **"ALL OFF".**

5. Press the digital Auto-Hand switch so that it is showing in Hand. (See above. Shown with a yellow banner around the word hand.)

6. 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 Blue box. A text and a prompt box will appear asking for a new numerical value.

7. 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.

8. With the system isolated from the building, the Hand Hz at 30 Hz and Pump 1 in Hand, press **"Run"** from the **PUMP 1**.

9. 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 at the bottom of the screen.

Example:

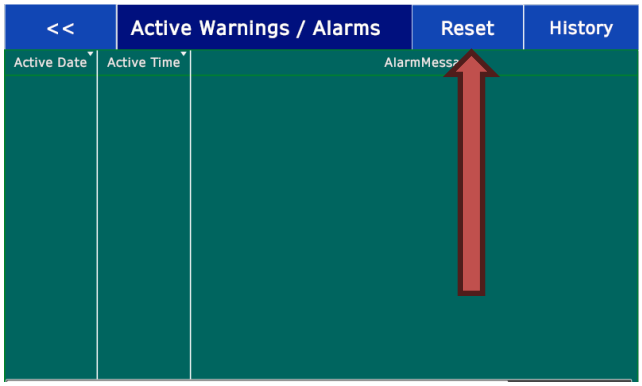
- Setpoint = 60 PSI
- Secondary High Pressure Switch Setting = 90 PSI

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.

10. With the pressure 30 psi above the setpoint, Go Back to the **Settings** Button and select the **Alarm**.

11. 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.

12. With the secondary high switch engaged, slowly turn the set screw (using the Allen Wrench) on the switch clockwise while simultaneously tapping the **2nd High Reset** located in the **Alarm Menu**.

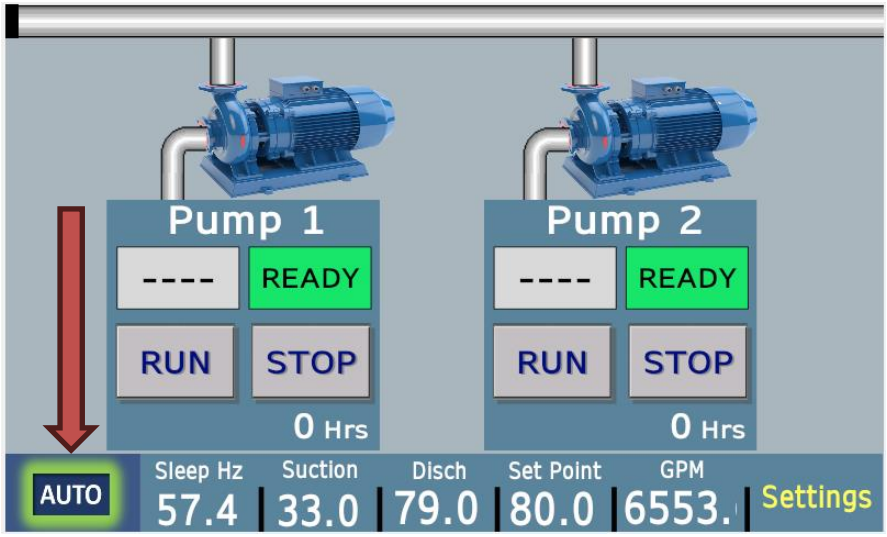


13. Continue turning clockwise and tapping the **2nd High Reset** until the Alarm clears. Once the alarm clears, finish the calibration by turning the set screw an additional quarter turn clockwise.

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.

14. Exit the **Alarm Menu** and go back to the **Pump Menu**. Select **"Stop"**.

15. Press the digital Auto-Hand switch so that it is showing in Auto. (See Below)



16. With the pump back in Auto, slowly open the discharge valve so the booster is connected to the system again.

17. Turn the power off, close the panel door, and turn the disconnect switch back on and let the auto countdown timer resume it's countdown. The system will automatically start up in Auto mode.

18. 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:

Delta P Carver

14 Sunshine Blvd,

Ormond Beach, FL 32174

(386) 236-0950

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

PREVENTATIVE MAINTENANCE CALENDAR

14 Sunshine Blvd, Ormond Beach, FL 32174 Website: DeltaPCarver.com
Phone: 386-236-0950 Fax: 386-236-0955 Email: sales@deltapcarver.com

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 **Motor Lubrication Chart**.				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

DeltaPCarver
We Put the PSI in Water Systems

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.

DeltaPCarver
We Put the PSI in Water Systems

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	
			in^3	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

14 Sunshine Blvd, Ormond Beach, FL 32174 Website: DeltaPCarver.com
Phone: 386-236-0950 Fax: 386-236-0955 Email: sales@deltapcarver.com

Delta P Carver
We Put the PSI in Water Systems

BOOSTER SYSTEM INSPECTION SHEET

CUSTOMER: _____ **DATE:** _____
ADDRESS: _____ **CONTACT:** _____
CITY/STATE: _____ **PHONE #:** _____
GATE CODE
MANUFACTURER: _____ **MODEL #:** _____
SYSTEM CONFIG: _____ **SERIAL #:** _____
USAGE: _____ **DESIGN:** _____ GPM AT _____ TDH _____ PSI

	MANUFACTURER	MODEL/SIZE	SEAL
PUMP #1:			
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
PUMP #2:			
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
PUMP #3:			
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:	
CHECK VALVE #1:			( )YES	( ) NO
CHECK VALVE #2:			( )YES	( ) NO
CHECK VALVE #3:			( )YES	( ) NO

	MFR/MODEL	SIZE	OPERATIONAL:	
ISOLATION #1			( )YES	( ) NO
ISOLATION #2			( )YES	( ) NO
ISOLATION #3			( )YES	( ) NO

TANKS

MANUFACTURER	MODEL	SIZE
HYDRO-ACCUMULATOR:		

PRE-CHARGE: _____P.S.I. CONDITION: _____LOCATION: _____

CONTROLS & 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:	
STAG/DE-STAGE OPERATION	_____	( )YES	( ) NO
NO-FLOW SHUTDOWN	_____	( )YES	( ) NO
PUMP ALTERNATION	_____	( )YES	( ) NO
THERMAL RELIEF TYPE	_____	( )YES	( ) NO

PRESSURE SWITCHES

	MANUFACTURER/MODEL	OPERATIONAL:	
STAGE CALL	_____	( )YES	( ) NO
DE-STAGE 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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NOTES

14 Sunshine Blvd.

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