INSTALLATION, OPERATION AND MAINTENANCE INSTRUCTIONS

10-001-262

REV 8

AQUAFORCE Pump Controller

VARIABLE SPEED PUMPING SYSTEMS

GOULDS WATER TECHNOLOGY

a xylem brand

Table of Contents

1. Introduction and Safety

1.1 Introduction

1.1.0 Purpose of the manual

The purpose of this manual is to provide necessary information for:

- Installation
- Operation
- Maintenance

CAUTION:

Read this manual carefully before installing and using the product. Improper use of the product can cause personal injury and damage to property, and may void the warranty.

NOTICE:

Save this manual for future reference, and keep it readily available at the location of the unit.

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

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

Further information pertaining to the installation, operation, and maintenance of your AquaForce pump controller can be found in the IOMs for the associated equipment provided Maintenance section for a list of relevant manuals.

Equipment cannot operate well without proper care. To keep this unit at top efficiency, follow the recommended installation and servicing procedures outlined in this manual.

1.2 Safety

WARNING:

- The operator must be aware of safety precautions to prevent physical injury.
- Any pressure-containing device can explode, rupture, or discharge its contents if it is over-pressurized. Take all necessary measures to avoid over-pressurization.
- Operating, installing, or maintaining the unit in any way that is not covered in this manual could cause death, serious personal injury, or damage to the equipment. This includes any modification to the equipment or use of parts not provided by Xylem. If there is a question regarding the intended use of the equipment, please contact an Xylem representative before proceeding.
- This manual clearly identifies accepted methods of disassembling units. These methods must be adhered to. Trapped liquid can rapidly expand and result in a violent explosion and injury. Never apply heat to impellers, propellers, or their retaining devices to aid in their removal.
- Do not change the service application without the approval of an authorized Xylem representative.

1.3 Safety terminology and symbols

1.3.0 About safety messages

It is extremely important that you read, understand, and follow the safety messages and regulations carefully before handling the product. They are published to help prevent these hazards.

- Personal accidents and health problems
- Damage to the product
- Product malfunction

1.3.1 Hazard levels

Hazard level	Indication
DANGER:	A hazardous situation which, if not avoided, will result in death or serious injury.
WARNING:	A hazardous situation which, if not avoided, could result in death or serious injury.
CAUTION:	A hazardous situation which, if not avoided, could result in minor or moderate injury.
NOTICE:	• A potential situation which, if not avoided, could result in undesirable conditions. • A practice not related to personal injury.

1.3.2 Hazard categories

Hazard categories can either fall under hazard levels or let specific symbols replace the ordinary hazard level symbols.

Electrical hazards are indicated by the following specific symbol.

Electrical Hazard:

These are examples of other categories that can occur. They fall under the ordinary hazard levels and may use complementing symbols:

- Crush hazard
- Cutting hazard
- Arc flash hazard

1.4 Environmental safety

1.4.0 The work area

Always keep the station clean to avoid and/or discover emissions.

1.4.1 Waste and emissions regulation

Observe these safety regulations regarding waster and emissions:

- Appropriately dispose of all waste.
- Handle and dispose of the processed liquid in compliance with applicable environmental regulations.
- Clean up all spills in accordance with safety and environmental procedures.
- Report all environmental emissions to the appropriate authorities.

1.4.2 Electrical installation

For electrical installation recycling requirements, consult your local electric utility.

1.5 Recycling guidelines

Always follow local laws and regulations regarding recycling.

1.6 User safety

1.6.0 General safety rules

These safety rules apply:

- Always keep the work area clean.
- Pay attention to the risks presented by gas and vapors in the work area.
- Avoid all electrical dangers. Pay attention to the risks of electric shock or arc flash hazards.
- Always bear in mind the risk of drowning, electrical accidents, and burn injuries.

1.6.1 Safety equipment

Use safety equipment according to the company regulations. Use this safety equipment within the work area:

- Helmet
- Safety goggles
- Protective shoes
- Protective gloves
- Gas mask
- Hearing protection
- First-aid kit
- Safety devices

NOTICE:

Never operate a unit unless safety devices are installed. Also see specific information about safety devices in other chapters of this manual.

1.6.2 Electrical connections

Electrical connections must be made by certified electricians in compliance with all international, national, state, and local regulations. For more information about requirements, see sections dealing specifically with electrical connections.

1.6.3 Precautions during work

Observe these safety precautions when you work with the product or are in connection with the product:

- Never work alone.
- Always wear protective clothing and hand protection.
- Stay clear of suspended loads.
- Always lift the product by its lifting device.
- Beware of the risk of a sudden start if the product is used with an automatic level control.
- Beware of the starting jerk, which can be powerful.
- Rinse the components in water after you disassemble the pump.
- Do not exceed the maximum working pressure of the pump.
- Do not open any vent or drain valve or remove any plugs while the system is pressurized. Make sure that the pump is isolated from the system and that pressure is relieved before you disassemble the pump, remove plugs, or disconnect piping.
- Never operate a pump without a properly installed coupling guard.

1.6.4 Wash the skin and eyes

Do the following if chemicals or hazardous fluids have come into contact with your eyes or your skin:

If you need to wash your . . .	Then . . .
Eyes	1. Hold your eyelids apart forcibly with your fingers. 2. Rinse the eyes with eyewash or running water for at least 15 minutes. 3. Seek medical attention.
Skin	1. Remove contaminated clothing. 2. Wash the skin with soap and water for at least one minute. 3. Seek medical attentions, if required.

2. Transportation and Storage

2.1 Inspect the delivery

2.1.0 Inspect the package

1. Inspect the package for damaged or missing items upon delivery.
2. Note any damaged or missing items on the receipt and freight bill.
3. File a claim with the shipping company if anything is out of order.
   If the product has been picked up at a distributor, make a claim directly to the distributor.

2.1.1 Inspect the unit

1. Remove packing materials from the product.
   Dispose of all packing materials in accordance with local regulations.
2. Inspect the product to determine if any parts have been damaged or are missing.
3. If applicable, unfasten the product by removing any screws, bolts, or straps.
   For your personal safety, be careful when you handle nails and straps.
4. Contact your sales representative if anything is out of order.

2.2 Transportation guidelines

2.2.0 Lifting methods

WARNING:

- Assembled units and their components are heavy. Failure to properly lift and support this equipment can result in serious physical injury and/or equipment damage. Lift equipment only at the specifically identified lifting points. Lifting devices such as eyebolts, slings, and spreaders must be rated, selected, and used for the entire load being lifted.
- Crush hazard. The unit and the components can be heavy. Use proper lifting methods and wear steel-toed shoes at all times.
- Care should be taken to prevent damage due to dropping or jolting when moving the controller. Transportation damage should be brought to the carrier's attention immediately upon receipt.

2.3 Storage guidelines

2.3.0 Storage location

The product must be stored in a covered and dry location protected from extreme cold, heat, dirt, and vibrations.

NOTICE:

- Protect the product against humidity, heat sources, and mechanical damage.
- Do not place heavy weights on the packed products.

2.3.1 Long-term storage

If the controller is stored for more than 6 months, these requirements apply:

- Store in a covered and dry location.
- Store the unit free from heat, dirt, and vibrations.

Extended storage of VFDs may require special attention prior to start-up. See manufacturer's IOM for details.

3. Product Description

3.1 General description

3.1.0 Description

The controller is a specific purpose programmable pump controller. This provides:

- Optimum pump control without the cost of general purpose control hardware.
- Software dedicated and established for the unit.
- Unique analog input protection of other members of the control family. In the event of a short circuit condition, the current limit circuitry prevents failure of the analog input components.

NOTICE:

- Your controller should have a safety instruction decal. If the decal is missing or illegible, contact your representative for a replacement.

3.2 Operational limits

3.2.0 Temperature and ventilation

All electrical equipment is susceptible to failure if operated in ambient temperatures outside of its rating. The OPERATING temperature range for this unit is 0 to 40°C. The relative humidity should not exceed 90% non-condensing. The unit should not be operated outside these extremes.

3.3 Nameplate information

3.3.0 Important information for ordering

Every pump station has a nameplate that provides information about the pump station. The pump station nameplate is located on the inside of the control enclosure door.

When ordering spare parts, be prepared to identify the nameplate information when contacting the factory.

- Model
- Size
- Serial number
- Item numbers of the required parts

Model Number	
Serial Number	
Station Voltage	
System FLA	
SCCR	
Largest Motor HP	
Station Flow	
Suction Pressure	
Discharge Pressure	
Pump Boost	
Date Code	
Residential & Commercial Water Dallas, Texas, U.S.A	

Nameplate Data	Explanation
Model Number	The manufacturer's number to indicate the particular type of product which has been acquired.
Serial Number	A set of characters that uniquely identifies a single unit and can be used for traceability and warranty purposes.
Station Voltage	The rated voltage at which the station has been designed for. Should match the application site supply voltage.
System FLA	The full-load-amperage at which the station can operate.
SCCR	"Short-Circuit Current Rating". Represents the maximum level of short-circuit current that a component or assembly can withstand.
Largest Motor HP	The rated HP for the largest Pump in the system.
Station Flow	The designed duty point, in GPM, LPH, etc.
Suction Pressure	The line pressure on the input side of the pump station.
Discharge Pressure	The line pressure on the output side of the pump station.
Pump Boost	The difference between the input side of the pump station and the output side of the pump station.
Date Code	Marking of products to indicate their date of manufacture.

3.4 Main parts and functions

3.4.0 Input voltage

The VFD and AquaForce Pump Controller can be set up to operate across a broad range of voltages. It was factory set to operate on the voltage shown on the nameplate. Check the VFD nameplate for the proper input and output voltages before wiring the VFD.

The voltage tolerance is +10/-5% and phase to phase voltage must not have an imbalance greater than 5 VAC.

3.4.1 Ground connections

A grounding terminal is provided for a dedicated ground wire connection. All provisions of the National Electrical Code and local codes must be followed.

WARNING:

- 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.

3.4.2 Power wiring

Power wire types and sizes must be selected based upon conformance with the National Electrical Code and all local codes and restrictions. In addition, only copper (Cu) wire rated for 75°C (minimum) may be used for the power connections. Refer to the input current as listed on the nameplate affixed to the enclosure door when sizing wire.

3.4.3 Output/motor disconnect

It is necessary that any device which can disconnect the motor from the output of the VFD be interlocked to the emergency shutdown circuits of the VFD. This will provide an orderly shutdown if the disconnecting device is open circuited while the VFD is in operation. Failure to provide this interlock may result in damaged components due to improper installation.

CAUTION:

- Metal filings can create electrical short circuits. Do not drill, saw, file or perform any operation on the VFD conduit entry plate while attached to the VFD.

3.4.4 Analog signals

Shielded cable (#22 AWG, Belden type 8762, Alpha #2411, or equal) should be installed for all D.C. control wiring. The shield must be terminated in the Controller panel. Do not connect the shield at the other end of the cable! Insulate the shield so that no electrical connection is made at the other end of the cable. A twisted pair of #22 AWG conductors (Belden 8442, or equal) can be used in place of shielded cable. The cable length must be limited to 5,000 feet for #22 AWG wire.

3.4.5 Field connection diagrams

Refer to the pump Installation, Operation, and Maintenance Manual for specific details unique to the pump.

Refer to the flow sensor/transmitter Installation, Operation, and Maintenance manual for specific details unique to the flow sensor/transmitter.

Job specific wiring and dimensional drawings and typical field connection diagram should be reviewed prior to unit installation and operation.

3.5 Glossary of terms

VFD	Variable Frequency drive; converts a constant power input into a variable power output for the motor; a device for controlling motor speed.
Alternation	Process of determining which pump will serve as lead pump and which pump will serve as lag pump.
Destage	To turn off a lag pump.
Lag pump	Standby pump which activates only when lead pump alone cannot efficiently provide sufficient pressure or flow rate.
Lead pump	Duty pump which runs continuously until a standby pump is required.
LED	Light emitting diode, located on OIP and controller.
OIP	Operator Interface Panel.
PID	Proportional Integral Derivative; 3 variables required for error control.
PV (Process Variable)	Signal generated by a sensor which is set up to control the system.
Proof timer	Minimum time period before controller acknowledges an input; time period for which a signal must be stable before it is accepted by the controller as a sustained and valid signal.
RTC	Real time clock.
Stage	To start a lag pump.
SP	Set point.
HD	Hard Deck.
UV	Undervoltage
OV	Overvoltage
OC	Overcurrent

4. Installation

4.1 Field connections

4.1.0 Diagrams

Review the wiring diagrams and dimensional drawings before you install and operate the unit.

4.1.1 Electrical precautions

WARNING:

- Prevent electrical shocks. Disconnect the power supply before beginning installation. FAILURE TO FOLLOW THESE INSTRUCTIONS COULD RESULT IN SERIOUS PERSONAL INJURY, DEATH AND/OR PROPERTY DAMAGE.
- Each motor must have a properly sized drive. Ground fault protection should be sized properly. Refer to local electrical codes for sizing and selection.
- Refer to the motor manufacturer's IOM for specific installation information.
- Motor can start automatically. Keep hands away from output shaft until motor is completely stopped and input power is removed from the motor control panel. Lockout main power switch while working near motor shaft.
- The use of motor disconnect switches is acceptable. Consult the factory for proper interlocking with variable frequency drives.
- Motor control equipment and electronic controls are connected to hazardous line voltages. When servicing electronic controls, there will be exposed components at or above line potential. Extreme care should be taken to protect against shock. Stand on an insulating pad and make it a habit to use only one hand when checking components. Always use accurate test meters when checking electrical components. Always work with another person in case of an emergency. Disconnect power when performing maintenance. Be sure equipment is properly grounded. Wear safety glasses whenever working on electronic control or rotating equipment.

DANGER:

- Troubleshooting live control panels exposes personnel to hazardous voltages. Electrical troubleshooting must only be done by a qualified electrician. FAILURE TO FOLLOW THESE INSTRUCTIONS COULD RESULT IN SERIOUS PERSONAL INJURY, DEATH, AND/OR PROPERTY DAMAGE.

4.2 Earth (ground connections)

WARNING:

- 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 or death, property damage.

A grounding terminal is provided for a dedicated earth (ground) wire connection. You must follow all provisions of the National Electrical Codes and local codes.

4.3 Sensor and control wiring

The following sections are based on the installation of standard AquaForce product. Because of customized software and hardware, the installing contractor should base all wiring connections on the wiring diagrams that accompany each controller. These sections are meant to complement, not replace, those wiring diagrams.

To control variable frequency drives it is necessary to wire RS485 with each VFD.

With certain bypass and control methods it is necessary to disable the adjustable frequency drive from running. This is accomplished by wiring from the terminals to each VFD's interlock terminals. Should this wiring be required, any jumpers which may be found on the VFD's interlock terminals should be removed.

The control family may be provided with the capability to accept many analog inputs. Typically all analog inputs must be 4-20mA and powered by the 24VDC power supply in the controller. All shields must be grounded in the controller only to prevent ground loops and improper signals.

Hardwire communications refers to the capability of the Controller to communicate with an energy management system. Standard communication features are listed below:

Remote Start/Stop – Remove the jumper from Terminal 200 and install a switch as indicated on the wiring diagram. CLOSED CONTACT of this switch will provide the start signal.

Remote Alarm Indication – A digital output rated 2.5 AMPs at 240V is supplied. This output closes to indicate an alarm condition exists.

User Configurable I/O – The Controller comes equipped with the capability to define the operation of any unused input or output signal. Refer to System Set Up I/O menus.

4.4 Pump package location guidelines

WARNING:

- Assembled units and their components are heavy. Failure to properly lift and support this equipment can result in serious physical injury and/or equipment damage. Lift equipment only at the specifically identified lifting points. Lifting devices such as eyebolts, slings, and spreaders must be rated, selected, and used for the entire load being lifted.

Guideline	Explanation
Make sure that the space around the pump package is sufficient.	This facilitates ventilation, inspection, maintenance, and service.
If you require lifting equipment such as hoist or tackle, make sure that there is enough space above the pump package.	This makes it easier to properly use the lifting equipment and safely remove and relocate the components to a safe location.
Protect the unit from weather and water damage due to rain, flooding, and freezing temperatures.	This is applicable if nothing else is specified.
Do not install and operate the equipment in closed systems unless the system is constructed with properly-sized safety devices and control devices.	Acceptable devices: • Pressure relief valves • Compression tanks • Pressure controls • Temperature controls • Flow controls If the system does not include these devices, consult the engineer or architect in charge before you operate the pump.
Take into consideration the occurrence of unwanted noise and vibration.	The best pump location for noise and vibration absorption is on a concrete floor with subsoil underneath.

4.5 System piping and unit installation – final checklist

1. Check that the unit base is properly leveled, grouted and secured.
2. Check that all lubrication points are properly lubricated per motor manufacturer's instructions.
3. Check that the shut-off valves to the transmitters open.
4. Check that the shut-off valves to the pump suction open.
5. Check that the shut-off valves to the discharge line open.
6. Check that the piping is properly supported to prevent strains on the unit.
7. Check that the system, including pumps and valving, are purged of debris and air.

CAUTION:

• Seal damage may occur. Do not run pumps dry. Fill and vent the pump volute prior to operation. FAILURE TO FOLLOW THESE INSTRUCTIONS COULD RESULT IN PROPERTY DAMAGE AND/OR MODERATE PERSONAL INJURY.

4.6 Electrical wiring and control settings – final checklist

1. Check the unit nameplate or motor terminal connection to ensure the feeder line voltage corresponds to the unit voltage

WARNING:

- Electrical shock hazard. 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 THESE INSTRUCTIONS COULD RESULT IN SERIOUS PERSONAL INJURY, DEATH, AND/OR PROPERTY DAMAGE.

2. Check that feeder wires are correctly sized for the load.
3. Check that the fuses are correctly sized. They must not exceed 1.75 times the full load current of the motor. Usual sizing is 1.15 to 1.5 times the full load current.

DANGER:

- High voltage 3 phase power can kill. Disconnect and lockout power prior to servicing. FAILURE TO FOLLOW THESE INSTRUCTIONS COULD RESULT IN SERIOUS PERSONAL INJURY, DEATH, AND/OR PROPERTY DAMAGE.

WARNING:

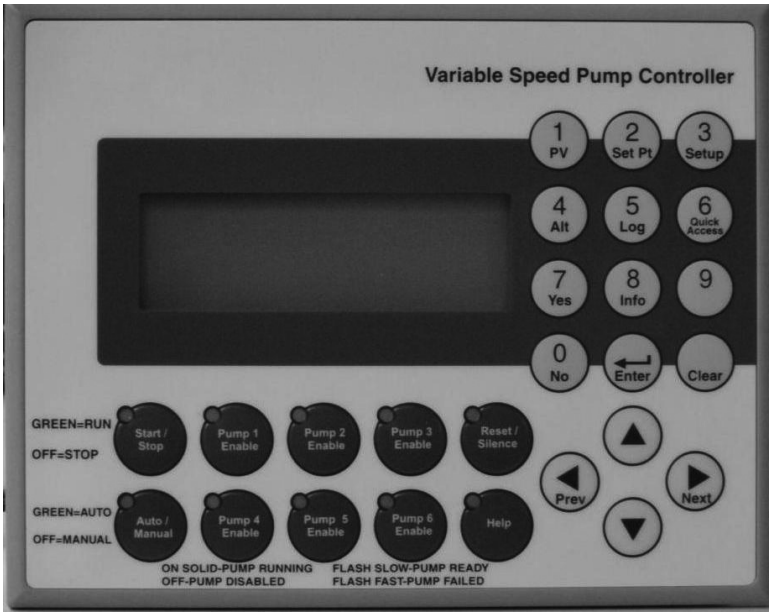
- Conduit grounds are not adequate. A separate ground wire must be attached to the ground lug provided in the enclosure to avoid potential safety hazards. FAILURE TO FOLLOW THESE INSTRUCTIONS COULD RESULT IN SERIOUS PERSONAL INJURY, DEATH, AND/OR PROPERTY DAMAGE.

4. Check that the unit is properly grounded.
5. Make sure all the power terminals in the control panel have been tightened.

4.7 Operator interface panel

4.7.0 Diagrams

The OIP consists of a 4 x 20 character LCD screen and a 26 button keypad with LEDs which display system status. The OIP communicates through a CAN bus to the CPU



4.7.1 Key functionality

The names of the keys on the Operator Interface Panel (OIP) are shown as CAPITAL LETTERS in this manual. Table 1 shows the functionality of the keys on the OIP.

4.7.2 Table 1 Key Functionality

Key Name	Functionality
START/STOP	Starts or stops the system.
AUTO/ MANUAL	Toggles the operation mode. The system must be stopped to change the operation mode.
PUMP 1-4 ENABLE	Enables or disables the corresponding pump. Pumps cannot be disabled while they are failed.
RESET/ SILENCE	This key is used to reset alarms and events. When the A/V Alarm relay output is set. Pressing of this key resets the alarms and events.
HELP	Press the HELP button, from the status screens, to view alarms or events while the HELP LED is flashing. While in the Alarm screen, press the HELP button again to view help messages for active alarms. Press HELP any other time to view screen specific help messages.
PV/1	Press PV from the status screens, to bring up the process variable screen
SETPT/2	Press SET PT from the status screens, to bring up the set point menu shown in section 5.5
SETUP/3	Press SETUP, from the status screens, to bring up the Setup Menu shown in section 4.10
ALT/4	Press ALT, from the status screens, to manually alternate the pump staging sequence.
LOG/5	Press LOG, from the status screens, to bring up the Log Menu, shown in section 6.14.0
YES/7	Press YES at OK prompts to accept values and proceed
INFO/8	Press INFO, from the status screens, to bring up the program type and version number shown in section 6.14
NO/0	Press NO at OK prompts to edit the parameters
ENTER	Confirms entries
CLEAR	Clears entries or used to exit some screens
PREV/(◀)	Navigates to neighboring screens
NEXT/(▶)	Navigates to neighboring screens
UP (▲)	Used to modify values and navigate to neighboring screens
DOWN (▼)	Used to modify values and navigate to neighboring screens

Note: Setting the display contrast.

The Contrast on the display is set at the factory. However, the user can make a different contrast setting as desired. To do this press “Enter”. while holding down this key, the “UP” and “DOWN” key can be used to set contrast.

ENTER + UP... increase contrast
ENTER + DOWN... reduce contrast

4.8 LEDs

Table 2 gives the meaning of the LED states.

LED	Description
START/STOP	On = Start Off = Stop
AUTO/ MANUAL	On = Auto Off = Manual
PUMP 1-4	On = Pump On Off = Pump Disabled Blink = Pump Ready, Blink Fast = Pump Failed
RESET/ SILENCE	Off = OK Blink = Reset Required
HELP	Off = OK Blink = Event/Alarm(press HELP from the status screens to view)

4.9 I/O

4.9.0 Analog Inputs

The AquaForce Pump Controller is equipped with 2 analog input channels. The analog inputs must provide a 4-20mA signal. Typically, analog inputs will be powered by the 24V power supply within the panel. For analog inputs which source their own power, consult factory.

Shielded 22 AWG cable should be installed for all analog input wiring. The shield must be terminated in the AquaForce Pump Controller. Do not connect the shield at the other end of the cable! Insulate 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. The cable length must be limited to 2,500 feet for #22 AWG wire.

4.9.1 Digital Inputs

The AquaForce Pump Controller is equipped with (3) 24VDC digital input channels. This signal voltage must be obtained from the 24VDC power supply mounted to the subpanel. It is not recommended that other power sources be used without factory approval. All digital inputs are automatically assigned based on Table 3. See the typical wiring diagram in Appendix.

Table 3: Digital Inputs Functionalities

Functionality	DI #	Description
Start/Stop Sw	1	Remote contact can be used to start/stop the system.
Optional DI	2	This digital input can be used as a optional low water switch.
Optional DI	3	This digital input can be used as a push to silence switch.

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

4.9.2 Digital Output Module

The digital output consists of 1 normally open and 1 normally closed contact for each output rated at 2.5A at 240V. Customer connections are made directly to the terminals mounted on the digital output module. Refer to section 4.10.13 for relay output setup.

4.10 Set up & features

Note: Many sections of the Set up & Features show a path for navigation. An example is shown below to understand the given path.

Example for system setup path.

Path: Status Screen / Setup(3) / System(4)

To follow the above path press the SETUP/3 key from the system status screen. Then press the ALT/4 key for number 4 which is a selection number for system and press ENTER key. It will lead to the system setup screen.

Upon powering up the controller, the display will light and show the following screen:

< SEQ 1 >

DIS = ### SP = ###

SUC = ### Spd = ###%

STOP MANUAL NORM

Press the **SETUP/3** key once and the following **MAIN SET UP** menu items will be displayed:

SELECTION: # 0=EXIT

1 = Q-START 4 = SYSTEM

2 = SENSORS 5 = TEST

3 = PUMPS 6 = ALRM/EVT

4.10.0 Sensor Setup

Press the **SET PT/2** key at the Main Set Up menu display. Then press the **ENTER** key.

The **SENSOR SET UP MENU** will be displayed as shown below:

AI 1 TYPE: $$$

SPAN= ### MIN= ##

< OK $ (Y/N) >

To accept the current values, press **YES/7** key and then press the **ENTER** key.

To set up each field, press the **NO/0** key and then press the **ENTER** key.

The current **TYPE** field starts blinking. Press the up **(▲)** and down **(▼)** keys to navigate to the desired **TYPE** and then press the **ENTER** key to confirm selection.

The following selections are valid:

DIS (Discharge Pressure)

SUC (Suction Pressure)

REDIS (Redundant Discharge Pressure)

NONE

If **REDIS** is selected as a desired field, the following screen will get displayed:

ACTIVE SENSOR ##

DRIFT THRESHOLD ##%

DRIFT PR TM ###s

OK $ (Y/N)

REDIS MENU ITEMS				
Menu Item	**Variable**	**Default**	**Range**	**Field Value**
REDIS	Active Sensor : ## Enter the active discharge pressure sensor number	1	1-2	
	Drift Threshold: ##% Pressure difference limit between the active and redundant pressure sensor in %	5	0-100	
	Drift Pr Tm : ##s Proof timer prior to give warning when exceed the drift threshold limit, in seconds	0	0-999	

To set up each field, press the **NO/0** key and then press the **ENTER** key.

The **ACTIVE SENSOR** field will start blinking. Change the current value in Active Sensor field by pressing desired numeric Keys and then press **ENTER** key to confirm.

Press **ENTER** key to accept the current **DRIFT THRESHOLD** value. To change the value in **DRIFT THRESHOLD** field, press the desired Numeric Keys and then press **ENTER** to confirm.

Press **ENTER** key to accept the current value of **DRIFT PR TM.** To change the value in **DRIFT PR TM** field press the desired Numeric Keys and then press **ENTER** to confirm.

To accept the current values, press **YES/7** key and then press **ENTER** key. The screen will go back to the **SENSOR SET UP** menu displayed above.

Press the **NEXT/(▶)** key if additional sensors need to be set up. Repeat the above steps for all remaining sensors.

Pressing **YES/7** key and then the **ENTER** key at the **SENSOR SET UP** screen will take the display back to the **MAIN SET UP** screen.

4.10.1 Pump set up

Paths: Status Screens / Set up(3)

Press the **SET UP/3** key at the Main Set Up menu screen. Then press the **ENTER** key.

The **PUMP SET UP MENU** will get displayed as shown below:

SELECTION: # 0= EXIT

1 = NUMBER OF PUMPS

2 = PUMP NAMEPLATE

3 = RESET PUMP TIME

To change the values in **NUMBER OF PUMPS** field, press **PV/1** key then press the **ENTER** key. The following menu will get displayed:

TOTAL PUMPS: #
STANDBY PUMPS: #
OK $ (Y/N)

To set up each field, press the **NO/0** key and **ENTER** key. Modify the values as desired using the appropriate numeric key. The pump number is limited to the maximum number of pumps.

To accept the current values, press **YES/7** key and then press **ENTER** key.

The screen will go back to the **PUMP SET UP MENU** display.

To change the values in **PUMP NAMEPLATE** field, press **SET PT/2** key then press the **ENTER** key. The following menu will get displayed:

<PUMP 1 NAMEPLATE>
AMPS: ###.# HP: ###.#
VOLTS: ### Hz: ##
Spd: #### OK $ (Y/N)

To set up each field, press the **NO/0** key and **ENTER** key. Modify the values as desired using the appropriate keys. Modify the values as desired for pump 1.

Note: For example, to enter a value of 3.5 Amps, go to the amps field, press numerical key 3 and press enter. Then press key 5 and enter.

To change the values for other pumps, press the **NEXT/(▶)** key. This is only applicable if the total numbers of pumps selected in **TOTAL PUMPS: #** field are more than 1.

Note:
All values will be copied to the next screen by pressing **NEXT/(▶)** key. They will only be copied the first time the screens are visited. To edit the values, press the **NO/0** key and **ENTER** key. Modify the values as desired.

To confirm the modified values, press **YES/7** key and then press **ENTER** key.

The screen will go back to the **PUMP SET UP MENU** display.

To change the values in **RESET PUMP TIME** field, press the **SETUP/3** key then press the **ENTER** key. The following menu will get displayed:

RESET PUMP TIME?
P1: N P2: N
P3: N P4: N
OK $ (Y/N)

To reset the pump(s) run time, press **NO/0** key and **ENTER**.

By default, **N** will be displayed next to the pump fields (P1: , P2: etc.) depending upon number of pumps selected. **N** corresponding to **P1**: field will start blinking. To reset the pump run time for pump 1, press the **YES/7** key and **ENTER**. Similarly modify the values for the rest of the pumps as applicable.

Note: This selection is only valid for the pumps selected. For example, if the number of pumps selected is 2, the following screen will get displayed:

RESET PUMP TIME?
P1: N P2: N
P3: N/A P4: N/A
OK N (Y/N)

To confirm all the selections made, press **YES/7** key and then press **ENTER** key. The screen will go back to the **PUMP SET UP MENU** display.

Pressing the **NO/0** key and then **ENTER** key at the **PUMP SET UP** screen will take the display back to the **MAIN SET UP** screen.

4.10.2 System set up

Paths: Status Screens / Set up(3)

Press the **ALT/4** key at the Main Set Up menu screen. Then press the **ENTER** key.

The first screen will get displayed as shown below:

< SELECTION: # >
1 = STAGE/DESTAGE
2 = VFD
3 = EXERCISE 0 = EXIT

Press the **NEXT/(▶)** key to go to the next screen. The display now shows:

< SELECTION: # >
4 = ALTERNATION 5=PID
6 = RESET TOTALS
7 = DATE, TIME 0 = EXIT

Press the **NEXT/(▶)** key to go to the next screen. The display now shows:

< SELECTION: # >

8 = PASSWORD 0 = EXIT

9 = I/O SETUP

10 =COMMUNICATIONS

Press the **NEXT/(▶)** key to go to the next screen. The display now shows:

< SELECTION: # >

11 = FRIC. LOSS COMP.

12 = SAVE/LOAD

13 = DISPLAY 0 = EXIT

Pressing the **NEXT/(▶)** key again will take the screen back to the first screen.

Use the appropriate numeric key to select the desired menu, then press the **ENTER** key. A detailed description of each menu follows. For example, to select the **STAGE/DESTAGE** menu, press the **PV/1** key and then press the **ENTER** key.

4.10.3 Stage/ destage menu

Paths: Status Screens / Set up(3) / System(4) / StageDestage(1)

The first screen has been displayed below:

SELECTION: #

1 = PV STAGE 0=EXIT

2 = PV DESTAGE

6 = POWER LIMIT STAGE

By pressing the appropriate numeric key and **ENTER** key, the setup can be completed.

See the following table for all **STAGE/DESTAGE** menu items.

STAGE/DESTAGE SETUP MENU ITEMS				
Menu Item	**Variable**	**Default**	**Range**	**Field Value**
PV Stage	Stg Spd: ##% The maximum speed at which the lead pump will operate prior to starting a lag pump, %.	95	0-100	
	Stg Proof Timer: ### s Proof timer prior to starting lag pump, seconds.	30	0-999	
	Stab Timer: ###s Staging stabilization time, delay prior to calculating destage value, seconds.	60	0-999	

STAGE/DESTAGE SETUP MENU ITEMS (continued)				
Menu Item	**Variable**	**Default**	**Range**	**Field Value**
PV Destage	Destage: ###% Enter the percentage of the stabilized speed at which the lag pump will stop, %.	85	0-100	
	Destg Pr Timer: ### s Proof timer prior to stopping lag pump, seconds.	30	0-999	
	HD Spd: ### % The lowest speed at which parallel pumps will operate prior to destaging the lag pump, %. It must be greater or equal to minimum frequency.	50	0-100	
	HD Pr Tm: ### s The proof timer prior to destaging the lag pump when operating below the HD speed, seconds.	30	0-999	
Power Limit Stage	Enable Power Stage Limit $ (Y/N) Exit: $(Y/N) Reads motor current entered in pump set up to stage on next pump after a fixed time delay should current limit be reached.	N	Y/N	

4.10.4 VFD menu

Paths: Status Screens / Set up(3) / System(4) / VFD(2)

The first screen has been displayed below:

<Selection:# >
1 = VFD Setup
2 = VFD Set Parameter*
3 = VFD Read Parameter*

Press the **NEXT** (▶) key to go to the next screen.
The display now shows:

<Selection: # >
4 = All DIS SEN Fail

***** Only available for the system with ABB Drive.

Use the appropriate numeric key to select the desired menu, then press the ENTER key. See the following table for all VFD menu items.

VFD Menu Items				
Menu Item	**Variable**	**Default**	**Range**	**Field Value**
VFD Setup	Accel Tm: ## Drive acceleration time in seconds from zero to maximum frequency ramp	5	0-1800	
	Decel Tm: ## Drive acceleration time in seconds from maximum to zero to maximum frequency ramp	5	0-1800	
	Freq Max : ## Enter the maximum limit for the drive output frequency	60	0-60	
	Freq Min : Enter the minimum limit for the drive output frequency	30		
VFD Set Parameter*****	VFD: # The VFD number in which the parameter needs to be set.	0	0-65, 535	
	ADDRESS: Enter the parameter code from the parameter list available in the ABB user's manual supplied.			
	RESOLUTION: # Enter the value of parameter "Resolution" from the parameter list available in the ABB user's manual supplied.			
	VALUE: Enter the desired parameter value.			
VFD Read Parameter*****	VFD: # The VFD number from which the parameter needs to be read.	0	0-65, 535	
	ADDRESS: Enter the parameter code from the parameter list available in the ABB user's manual supplied.			
	RESOLUTION: # Enter the resolution from the parameter list available in the ABB user's manual supplied.			
	OFFSET: Enter the lower limit of the parameter "Range" from the parameter list available in the ABB user's manual supplied.			
	READ: Press YES/7 key and ENTER key to read the parameter values			
All Dis Sen Fail	PUMP SPEED: Enter the % speed for the drive(s) to operate at in the event that all discharge sensor fail.	100	0-100	
	NO OF PUMP RUN: Enter the number of pumps that should operate at the above speed in the event that all discharge sensor fail.	1	1-4	

***** Only available for the system with ABB Drive.

Note:

1. Use the (▲) and (▼) keys to select the appropriate resolution values

2. Use the Next/(▶) key and Prev/(◀) key to select the desired sign(+ or -) for **VALUE** and **OFFSET** variables

4.10.5 Exercise menu

Paths: Status Screens / Set up(3) / System(4) / Exercise(3)

See the following table for all **EXERCISE** menu items.

Exercise Menu Items				
Menu Item	**Variable**	**Default**	**Range**	**Field Value**
Exercise	Period : #Hrs Amount of time between automatic exercising of the pumps, in seconds. A value of 0 disables pump exercising	0	0-999	
	Duration : ###s Amount of time pumps will be exercised, all pumps which have not run in the last period will be exercised simultaneously	0	0-999	

Pump exercising will ensure that no pumps go for long periods of time without running. Note that automatic alternation can also provide this functionality. Pump exercising will only occur when the system is started and in automatic operation. All pumps which need exercising will exercise on startup.

4.10.6 Alternation menu

Paths: Status Screens / Set up(3) / System(4) / Alternation(4)

The following **ALTERNATION** menu options are available:

4.10.7 Timed auto alternation

See the following table for **TIMED AUTO ALTERNATION** menu items.

Timed Auto Alternation Menu Items				
Menu Item	**Variable**	**Default**	**Range**	**Field Value**
Timed Auto Alt	Period: #Hrs Time between pump alternations when using "Timed Auto Alternation", in hours. A value of 0 will disable this function	168	0-999	
	Duration: ###s Amount of time that the running pumps will remain on during alternation, in seconds	10	0-99	

4.10.8 Alternation basis

See the following table for **ALTERNATION BASIS** menu items.

Alternation Basis Menu Items				
Menu Item	**Variable**	**Default**	**Range**	**Field Value**
Alternation Basis	1=Pump Sequence (The next pump in sequence will become the lead pump after alternation) 2=Pump Run Time (The pump with the lowest run time will become the lead pump after alternation)	1	1-2	

4.10.9 PID menu

Paths: Status Screens / Set up(3) / System(4) / PID(5)

See the following table for all **PID** menu items.

PID Menu Items				
Menu Item	**Variable**	**Default**	**Range**	**Field Value**
PID	PID-P ### Enter the desired proportional value.	300	0-999	
	PID-I ### Enter the desired integral value.	1	0-999	
	PID-D ### Enter the desired derivative value.	15	0-999	
	SP Deviation ### Enter the value for the number of discharge pressure units at which a dead band will be created around the setpoint. The PID will be modified within the dead band per the index setting below.	0	0-999	
	Index ### Enter a value to buffer the response of the PID while operating in the dead band defined above. Index = 1 (no impact) Index = 999 (maximum buffer.)	0	0-999	
	Start Up ## Start up delay in seconds	5	0-60	

4.10.10 Reset totals menu

Paths: Status Screens / Set up(3) / System(4) / Reset Totals(6)

See the following table for all **RESET TOTALS** menu items

Reset Totals Menu Items				
Menu Item	**Variable**	**Default**	**Range**	**Field Value**
Reset Totals	RESET TOTAL KW-HRS $ Press **YES/7** key and **ENTER** key to reset the total KW-HRS	N	Y or N	

4.10.11 Date, time menu

Paths: Status Screens / Set up(3) / System(4) / Date, Time(7)

See the following table for all **DATE, TIME** menu items

Date, time Menu Items				
Menu Item	**Variable**	**Default**	**Range**	**Field Value**
Date/Time	MM Enter the current month using both digits, example Jan. should be entered as 01.			
	DD Enter the current date using both digits, example the 6th should be entered as 06.			
	YYYY Enter the current year using all 4 digits.			
	HH Enter the hours using the 24 hour format, example 9:00 p.m. should be entered as 21.			
	MM Enter the minutes using both digits.			
	Display 24 Hour Fmt: ? (Y/N) Press **YES/7** key and **ENTER** key to display the time in the 24 hour format. Press **NO/0** key and **ENTER** key to display the time in **AM/PM** format.	N	Y or N	
	Daylite Savings Tm: ?(Y/N) Press YES/7 key and ENTER key for automatic set back during daylight saving time. Press NO/0 key and ENTER key to disable the automatic set back during daylight savings time	N	Y or N	

4.10.12 Password menu

Paths: Status Screens / Set up(3) / System(4) / Password(8)

See the following table for all **PASSWORD** menu items

Password Menu Items				
Menu Item	**Variable**	**Default**	**Range**	**Field Value**
Password	ENABLE PASSWORD TO SETUP MENU: ? Press **YES/7** key and **ENTER** key for password protection of the entire setup menu. If the above is set to **YES**, the user will be prompted to input a password prior to entering the Setup Menu. Upon exiting the above screen, the user will be prompted to define and confirm a new password.	N	Y or N	
	ENABLE PASSWORD TO SET POINT MENU: ? Press **YES/7** key and **ENTER** key for password protection of the entire set point menu.	N	Y or N	
New Password	ENTER NEW PASSWORD > _ _ _ _ _ _ < If either of the above are set to yes this screen prompts the user to define the password.	None	0-999999	

Password Menu Items (continued)				
Menu Item	**Variable**	**Default**	**Range**	**Field Value**
Verify	VERIFY THE PASSWORD PASSWD >_ _ _ _ _ _< After entering data in password definition screen this screen requires the user to confirm the requested password. If the confirmed number does not agree with the first number the Enter New Password screen is repeated to allow the user to get both input screens to agree.			

4.10.13 I/O setup menu

Paths: Status Screens / Set up(3) / System(4) / IO Setup(9)

See the following table for all **I/O Setup** menu items.

NOTE: The total available number of **I/O** to be configured depends on the system setup. Complete all previous setup screens, specifically pumps and sensors prior to completing the following.

I/O Setup Menu Items				
Menu Item	**Variable**	**Default**	**Range**	**Field Value**
DO	Total Avail. DO = # This screen can not be modified. It is here to advise the user of how many digital outputs can be customized	N/A	0-99	
	* DO No: #### Enter the output to be configured as it appears on the terminal number.	N/A	0-999	
	* Code: ### Enter the code to define the desired functionality of the output. Valid codes are defined in the Appendix of this manual.	0	0-255	
AO	Total Avail. AO = # This screen can not be modified. It is here to advise the user of how many analog outputs can be customized	N/A	0-99	
	* Code: ### Enter the code to define the desired functionality of the output. Valid codes are defined in the Appendix of this manual.	0	0-255	

NOTE: If a programming error happens, an error message is displayed. An error may be due to reprogramming an input that is currently used by the system or inputting an undefined code number.

4.10.14 Communication Menu

Paths: Status Screens / Set up(3) / System(4) / Communication(10)

The **MODBUS** screen is displayed below:

Modbus

9600, 8, 1, 1, N RTU

Node: # Al Ovrd: $

OK: $(Y/N)

The first line confirms setup for Modbus protocol. The second line defines the 9600 bps baud rate, 1 stop bit, 1 start bits, and no parity. The third line requires user input. Obtain the node number from the manufacturer that supplied the device that will communicate with the Controller.

See following table for all **MODBUS** menu items.

Modbus Menu Items				
Menu Item	**Variable**	**Default**	**Range**	**Field Value**
Modbus	Baud: ##### The baud rate is user adjustable parameter	9600	9600, 19200, 38400	
	Node: ### The node number should be supplied by the BMS communications port.	10	0-255	
	AI Ovrd: $ Select "Y" to override analog inputs through the communications port.	N	Y/N	

4.10.15 Analog Input Override

If "Y" was entered for "AI Ovrd" in any of the communication setup screens above, the following screen will be automatically displayed:

AI Override

AI1: $ AI2: $

OK $(Y/N)

Enter a "Y" next to each analog input type that will be overridden through the communications port.

4.10.16 Dynamic Flow Loss Compensation:

This energy savings feature allows user to compensate for the friction losses of system. As flow increases, the pressure losses due to friction in the system will increase accordingly. This feature will allow controller to modify the setpoint in real time based on the speed changes to compensate system friction loss. The controller will log the last 40 real time setpoint changes. Figure 1 shows how this function works with setup parameters using an example of a three pump system.

Paths: Status Screens / Set up(3) / System(4) / Frict. Loss Comp. (11)

The Friction Loss Compensation screen has been displayed below:

Frict. Loss: ### >

Auto: $ Enable: $

Log Stab Tmr: ###S

Log Reset: $ OK? $

Press the **YES/7** key to confirm the selection or Press next (►) key to go to the next screen. The display now shows:

<Total:#### OK? $

Loss1 : ### Loss4 : ###

Loss2 : ###

Loss3 : ###

Press the Y**ES/7** key to confirm the selection.

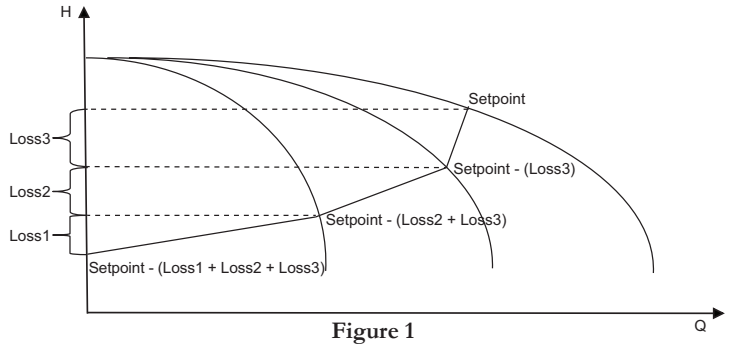


Figure 1

Note: "Setpoint" In figure 1 is the maximum control setpoint, will correspond to the controlling setpoint from the SP1 value. Refer to section 5 for SP1 value selection.

Friction Loss Compensation Menu Items				
Menu Item	**Variable**	**Default**	**Range**	**Field Value**
Frict. Loss Comp.	**Frict. Loss: ###** Total friction loss of the system in PSI. Contact to piping engineer to calculate system friction loss.	0	0-999	
	Auto: $ Select "Y" and enter to calculate Loss1 thru 4 value automatically. Summation of Loss1 thru 4 will be equal to Frict. Loss if calculated using this parameter. Value of Loss1 to 4 can be also overwritten as required.	N	Y/N	
	Enable: $ Select "Y" to enable friction loss compensation.	N	Y/N	
	Log Stab Tmr: ###S Time in seconds for which new setpoint must stabilize to log.	30	0-255	
	Log Reset: $ Select "Y" and enter to reset run time setpoint log.	N	Y/N	
	Total: #### Displays the total of Loss1 to 4 (read only).	N/A	N/A	
	Loss1: ### The max loss in PSI that will be compensated for one pump. This value will be used to adjust the setpoint when one pump is running.	0	0-999	
	Loss2 : ### The max loss in PSI that will be compensated for two pumps. This value will be used to adjust the setpoint when two pumps are running. This value will get subtracted from the setpoint as a fixed value when less than two pumps are running.	0	0-999	
	Loss3 : ### The max loss in PSI that will be compensated for three pumps. This value will be used to adjust the setpoint when three pumps are running. This value will get subtracted from the setpoint as a fixed value when less than three pumps are running.	0	0-999	
	Loss4 : ### The max loss in PSI that will be compensated for four pumps. This value will be used to adjust the setpoint when four pumps are running. This value will get subtracted from the setpoint as a fixed value when less than four pumps are running.	0	0-999	

4.10.17 Save/load menu

Note: Password protected. Consult factory for information.

Paths: Status Screens / Set up(3) / System(4) / SaveLoad(12)

The Save/Load menu has been displayed below:

Selection: # 0=Exit

1=Save to Flash

2=Load from Flash

3=Load Default

Use the appropriate numeric key to select the appropriate menu desired, press the **ENTER** key. A detailed description of each menu follows.

4.10.18 Save to flash

The Save To Flash screen is displayed below:

SAVE TO FLASH

Previously Saved Data

Will be overwritten!

PROCEED: $(Y/N)

Press **YES** and **ENTER** to save all of the user setup to the flash memory. Saving to flash will overwrite any data that was previously saved. Saving to flash memory will save all setup information to the Flash PROM chip within the controller

A **load from flash** will have to be performed to recover this saved data. See the following section.

4.10.19 Load from flash

The Load From Flash screen is displayed below:

LOAD FROM FLASH

All Settings will be

Overwritten!

PROCEED: $ (Y/N)

Press **YES/7** and **ENTER** to overwrite all of the current user setup information with the data that was previously saved to the flash memory. Loading from flash memory will load all setup information that was saved to the Flash PROM chip within the controller.

4.10.20 Load default

The Load Default screen is displayed below:

LOAD DEFAULTS

Settings will be

Overwritten by the

defaults! PROCEED:$(Y/N)

Press **YES/7** and **ENTER** to overwrite all of the current user setup information with the factory defaults.

4.10.21 Display menu

Paths: Status Screens / Set up(3) / System(4) / Display(13)

The DISPLAY menu has been shown below:

Delay to Display

Status # m

Rate ##s Exit $(Y/N)

Press the next (▶) key to go to the next screen. The display now shows:

<Backlight

Off Tmr: ###m

Exit $ (Y/N)

To edit the values, press the **NO/0** key and **ENTER** key. Modify the values as desired.

See following table for all **DISPLAY** menu items.

Display Menu Items				
Menu Item	**Variable**	**Default**	**Range**	**Field Value**
Display	Delay to Display Status: ## The time in minutes after which the fourth line at initial system status screen will start showing system status if any key has not been pressed	3	0-99	
	Status Line Refresh Rate: ## The time in seconds prior to change the next system status line	10	0-99	
	The time in minutes after which the backlight display will turn off if a key has not been pressed. A value of 0 disables this function	60	0-999	

4.10.22 Test set up

Paths: Status Screens / Set up(3) / Test(5)

The **TEST** menu screen gets displayed:

Test Selection: #

1=DI 4=AO 7=Disp

2=DO 5=LED 8=Comm

3=AI 6=Key 9=VFD Comm

Press the numeric key corresponding to the desired sub-menu, and then press the **ENTER** key.

4.10.23 Digital input test

Paths: Status Screens / Set up(3) / Test(5) / DI(1)

The Digital Input Test screen is displayed below:

Digital Inputs

1 2 3
# # #

Press Clear to Exit

The 0 below each corresponding input will change to a 1 upon receiving a 24VDC digital input on that channel. Press **CLEAR** key to exit the test.

4.10.24 Digital output test

Paths: Status Screens / Set up(3) / Test(5) / DO(2)

The Digital Output Test screen is displayed below:

Digital Outputs

1 2
# #

Enter DO# # (0=Exit)

Press the numeric key corresponding to the digital output for which the state is to be changed, and then press **ENTER** to change it. Pressing **ENTER** multiple times will toggle between 0 and 1. A 1 indicates that the corresponding relay is closed. When the relay is closed, the corresponding LED on the digital output module will be lit. Press **0** and **ENTER** to exit the test.

Note: Any device connected to the relay will be energized.

4.10.25 Analog input test

Paths: Status Screens / Set up(3) / Test(5) / AI(3)

The Analog Input Test screen is displayed below:

Analog Inputs

1=###%

2=###%

The signal received on the corresponding analog input channel will be indicated in percent next to each input. 4mA = 0%, and 20mA = 100%. Analog inputs 1-2 are 4-20mA inputs. Press **CLEAR** key to exit the test.

4.10.26 Analog output test

Paths: Status Screens / Set up(3) / Test(5) / AO(4)

The Analog Output Test screen is displayed below:

Analog Output Test

AO1=###%

OK: $(Y/N)

The signal sent through the corresponding analog output channel will be indicated in percent next to each output. 4mA = 0%, and 20mA = 100%. Analog output is 4-20mA output. Press **CLEAR** key to exit the test.

4.10.27 LED test

Paths: Status Screens / Set up(3) / Test(5) / LED(5)

The LED test screen is displayed below:

LED Test

***** SOLID *****

***** OFF *****

***** FLASHING *****

All of the LED's on the keypad will turn on, off, and then flash. The current status will be displayed on the screen. The LED test is self terminating.

4.10.28 Key test

Paths: Status Screens / Set up(3) / Test(5) / Key(6)

The **KEY** test screen is displayed below:

Key Test

Press a key to test

Press clear to exit

Press any key except for the **CLEAR** key, and the display will confirm that the key is working by displaying the key name. Press **CLEAR** key to exit.

4.10.29 Display test

Paths: Status Screens / Set up(3) / Test(5) / Display(7)

The **DISPLAY** test screen is shown below:

Press Clear To Exit

< 1 2 3 4 5 6 7 8 9

< 1 2 3 4 5 6 7 8 9

< 1 2 3 4 5 6 7 8 9

The display will show all black characters. Press **CLEAR** key to exit the test.

4.10.30 Communication test

Paths: Status Screens / Set up(3) / Test(5) / Comm(8)

The **COMMUNICATION** test screen is shown below:

Communication Test

Read: ####

Write: ####

Press Clear to Exit

If the controller is communicating properly with the building automation system, both numbers will continue increasing in value. For Modbus protocol, the read and write numbers should be equal and increasing with every poll.

If both numbers are not increasing in value, the controller is not communicating properly. Check the wiring at the terminal blocks. See section 4.10.14 for more information on communications setup. Press **CLEAR** to exit this test.

4.10.31 VFD comm

Paths: Status Screens / Set up(3) / Test(5) / VFD Comm(9)

The **VFDCOMMUNICATION** test screen is shown below:

VFD Comm Test

VFD Number: # (Same as Pump number)

Press Clear To Exit

Input the VFD number using the desired numeric keys for which the VFD Communication test needs to be performed and then press the **ENTER** key. The following screen gets displayed:

VFD # (Same as Pump number)

Write: #####

Read: #####

Press Clear To Exit

If the controller is communicating properly with the VFD selected, both numbers will continue increasing in value.

4.10.32 Alarm/events set up

Paths: Status Screens / Set up(3)

Press the **QUICK ACCESS/6** key at the Main Set Up menu display. Then press the **ENTER** key.

The first screen of Alarm/Events menu gets displayed:

< Selection: # 0=Exit >

2=Low Discharge

3=High Discharge

4=Low Suction

Press the **NEXT/(▶)** key to go to the next screen. The display now shows:

< Selection: # 0=Exit >

6=NFSD

7=Low Water

9=VFD / Comm

Pressing the **NEXT/(▶)** key again will take the screen back to the first screen.

Use the appropriate numeric key to select the setup menu desired, then press the **ENTER** key. A detailed description of each menu follows. For example, to select the Low Discharge menu, press the **SET PT/2** key and then press the **ENTER** key.

4.10.33 Low discharge pressure

Paths: Status Screens / Set up(3) / AlrmEvt(6) / Low Discharge(2)

The Low Discharge Pressure menu is displayed below:

Low Dis Press: ##PSI

Low Dis Pr Tm: ##s

Alarm: $ Stop Pumps: $

OK? $ (Y/N)

See following table for all **LOW DISCHARGE PRESSURE** menu items.

Low Discharge Pressure Menu Items				
Menu Item	**Variable**	**Default**	**Range**	**Field Value**
Low Discharge Pressure	Low Dis Press: ### PSI The pressure below which an alarm or event will be set, in PSI	Set 15 PSI below system setpoint	0-999	
	Low Dis PrTm: ###s The proof timer prior to setting an alarm or event, in seconds. A value of 0 disables this alarm or event.	30	0-999	
	Alarm: $ Set this value to "Y" to consider low discharge pressure an alarm, or set it to "N" to consider it an event.	Y	Y/N	
	Stop Pumps: $ Set this value to "Y" to stop all pumps in the event of a low pressure alarm or event. Set it to "N" to continue operation normally during this alarm or event.	Y	Y/N	

4.10.34 High discharge pressure

Paths: Status Screens / Set up(3) / AlrmEvt(6) / High Discharge(3)

The High Discharge Pressure menu is displayed below:

High Dis Press: ##

High Dis Pr Tm: ##s

OK? $ (Y/N)

See following table for all **HIGH DISCHARGE PRESSURE** menu items.

High Discharge Pressure Menu Items				
Menu Item	**Variable**	**Default**	**Range**	**Field Value**
High Discharge Pressure	High Dis Press: ### PSI The pressure above which an alarm will be set, in PSI.	112	0-999	
	High Dis Pr Tm: ##s The proof timer prior to setting an alarm, in seconds, A value of 0 will disable this alarm.	20	0-999	

4.10.35 Low suction pressure

Paths: Status Screens / Set up(3) / AlrmEvt(6) / Low Suction(4)

The Low Suction Pressure menu is displayed below:

Low Suct. Press: ##

Pr Tm: ##s Alarm: $

Auto Rst: $

Reset PSI: ## OK: $ (Y/N)

See following table for all **LOW SUCTION PRESSURE** menu items.

Low Suction Pressure Menu Items				
Menu Item	**Variable**	**Default**	**Range**	**Field Value**
Low Suction Pressure	Low Suct Press: ### The pressure below which an alarm or event will be set.	5	0-999	
	Pr Tm: ###s The proof timer prior to setting an alarm or event. A value of 0 will disable this alarm.	20	0-999	
	Auto Reset: $ Select "Y" to allow this alarm or event to be automatically reset.	Y	Y/N	
	Reset PSI: ### The pressure at which the controller will automatically reset when the suction pressure rises above it.	10	0-999	
	Alarm: $ Set this value to "Y" to consider low suction pressure an alarm, or set it to "N" to consider it an event.	N	Y/N	

4.10.36 No flow shut down

Paths: Status Screens / Set up(3) / AlrmEvt(6) / NFSD(6)

The **No Flow Shut Down** menu is displayed below:

NFSD Tst Pr Tmr ###s

Min Spd . Pr Tmr ##s

Restart PSI Drop ##

Min Run ##m OK $(Y/N)

See following table for all **NO FLOW SHUT DOWN** menu items.

No Flow Shut Down Menu Items				
Menu Item	**Variable**	**Default**	**Range**	**Field Value**
No Flow Shut Down	NFSD Tst Pr. Tmr: #s The No Flow Shut Down test proof timer is the amount of time, in seconds, the controller will run the system while the Discharge Pressure is greater then SP. A value of 0 will disable this alarm.	10	0-999	
	Min Spd Pr. Tmr #s The Minimum Speed Proof Timer is the amount of time, in seconds, the system will run at minimum speed before shutting off.	30	0-999	
	Restart PSI Drop ## The Restart PSI Drop is the value the Discharge Pressure needs to be less then the SP in order to restart the system.	10	0-999	
	Min Run: ##m Minimum Run is the minimum amount of time, in minutes, that the system will run once it shuts down from a no flow condition and restarts.	1	0-999	

4.10.37 Low water

Paths: Status Screens / Set up(3) / AlrmEvt(6) / LowWater(7)

The Low Water menu is displayed below:

Low Water

Proof Time: ###s

Alarm: $(Y/N)

OK: $ (Y/N)

See following table for all **LOW WATER** menu items.

Note: To use the Low Water function connect the low water switch as a optional D1. See the wiring diagram in Appendix to connect the switch.

Low Water Menu Items				
Menu Item	**Variable**	**Default**	**Range**	**Field Value**
Low Water	Proof Time: ###s The proof time, in seconds prior to setting a low water alarm or event. A value of 0 in Proof Time variable disables the Low Water function.	0	0-999	
	Alarm: $(Y/N) Set this value to "Y" to consider Low Water an alarm, or set it to "N" to consider it an event.	N	Y/N	

4.10.38 VFD/Comm Failure

Paths: Status Screens / Set up(3) / AlrmEvt(6) / VFD Comm(9)

The **VFD/Comm Failure** menu is displayed below:

VFD Proof Time: ###s

VFD COMM Pr Tm: ###s

OK: $(Y/N)

Press the **NEXT/(▶)** key to go to the VFD **UV/OV/OC Failure** screen.

The **UV/OV/OC Failure** is displayed below:

< UV/OV/OC Failure

Pr Tm: ###s Rst No: #

Rst Delay: ##s

Rst Pr Tm: ##m OK $

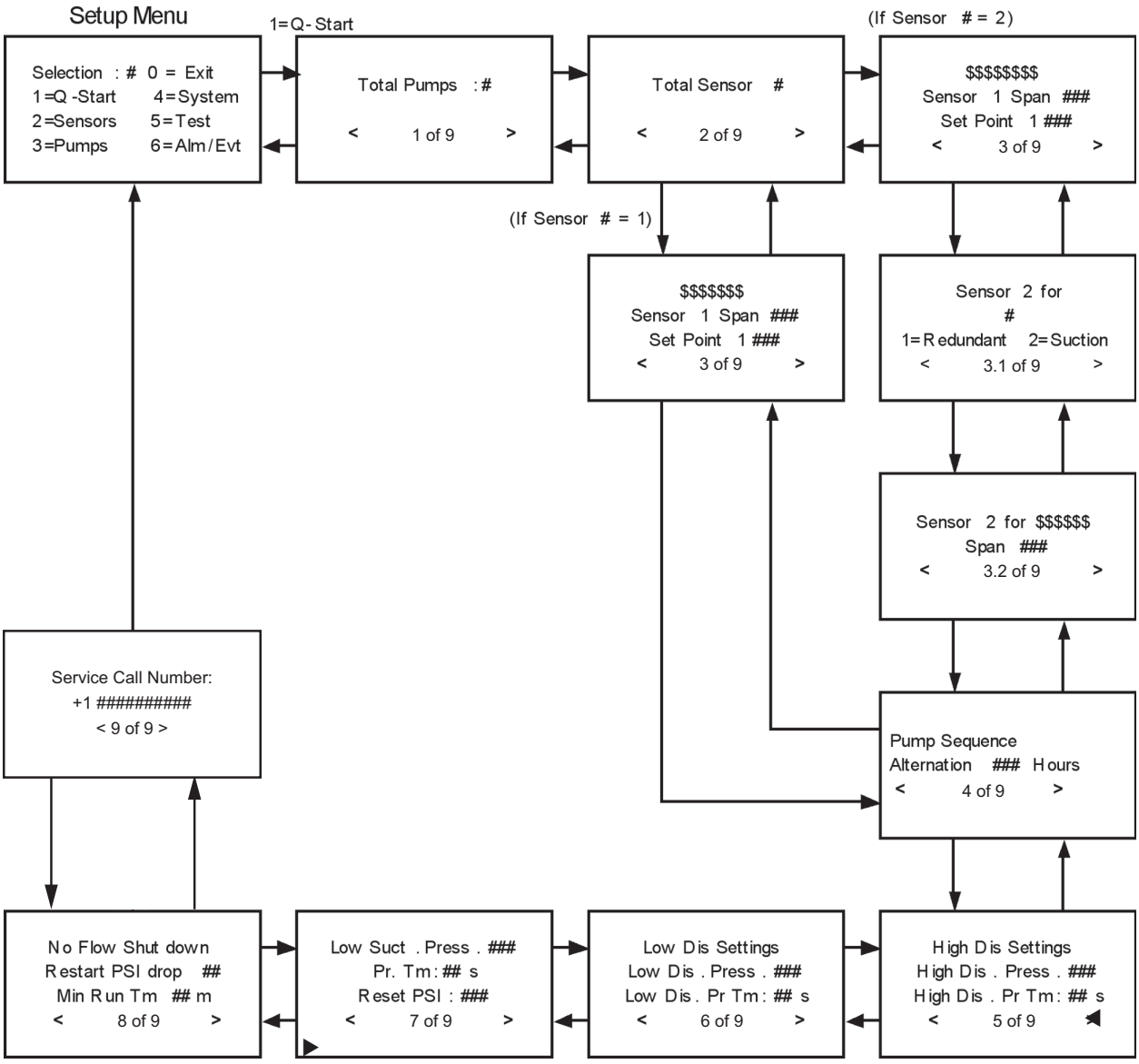
See following table for all **VFD/COMM FAILURE** menu items.

VFD/Comm Failure Menu Items				
Menu Item	**Variable**	**Default**	**Range**	**Field Value**
VFD Comm Failure	VFD Proof Time: ###s The proof timer prior to setting the VFD fail alarm, in seconds.	30	30-999	
	VFD COMM Pr Tm: ###s The proof timer prior to setting the VFD communication fail alarm, in seconds. VFD communication failure gets reset automatically as soon as it resumes.	30	30-999	
VFD UV/OV/OC Failure	Pr Tm: ###s The proof timer prior to setting the VFD UV/OV/OC fail alarm, in seconds.	10	0 – 999	
	Rst No: # Number of automatic resets attempt for VFD UV/OV/OC failure.	3	0 – 5	
	Rst Delay: ##s The time delay between VFD UV/OV/OC failure and automatic reset attempt, in seconds.	0	0 – 99	
	Rst Pr Tm: ##m The proof timer prior to setting the reset count to zero, in minutes. Timer starts from the last reset attempt and run until controller detects UV/OV/OC fault or timer lapse.	5	0 – 99	

4.11 Quick Start-Up Guide

NOTE: For most parameters the information will only need to be confirmed to be correct. Specific values will already be entered and show on these screens, and values will be based on the information given when the package was ordered.

Press the SETUP/3 key from the main screen. Then press the PV/1 key and press the ENTER key. It will lead to the Q-Start menu. Screen flow chart for the QStart menu is noted below.



Note: Description of each variable is available from help menu. To access the help menu for each screen needs to press the HELP key. Use NEXT and PREV key to navigate other pages of the HELP key. Press CLEAR key to exit HELP.

Screen 1 of 8:

First screen is for setting number of pumps. Press the appropriate key for the number of pumps and press the ENTER key. Press the NEXT key to navigate the next screen. Sensor number screen will appear.

Screen 2 of 8:

Press the appropriate key for the number of sensors (1 or 2) and press the ENTER key. Press the NEXT key to navigate the next screen.

Note: It is assumed that system has one or two sensors. Analog input one is used for discharge sensor and analog two input is for the suction sensor. (Screen 3 of 8 will cover sensor one and screen 3.1 of 8 will cover sensor two.)

Screen 3 of 8:

Press the appropriate key for the sensor 1 span (our standard sensor span is 300) and press the ENTER key. Press the appropriate key for setpoint 1 and press the ENTER key. Press the NEXT key to navigate the next screen. If sensor number had been selected 1 in previous screen then it will jump to the screen 4 of 8 otherwise it will go to the screen 3.1 of 8.

Screen 3.1 of 8:

Press the appropriate key to select the type of sensor 2 then press the ENTER key. Press the NEXT key to navigate the next screen.

Screen 3.2 of 8:

Enter the appropriate span for sensor 2 (our standard sensor span is 300) then press the ENTER key. Press the NEXT key to navigate the next screen.

Screen 4 of 8:

Press the appropriate key to select the pump sequence alternation hours then press the ENTER key. Press the NEXT key to navigate the next screen.

Screen 5 of 8:

Press the appropriate key(s) for the high discharge pressure then press the ENTER key (setting should be 15psi above your discharge pressure). Press the appropriate key(s) for the high discharge proof timer then press the ENTER key (Do not set at 0). Press the NEXT key to navigate the next screen.

Screen 6 of 8:

Press the appropriate key(s) for the low discharge pressure and press the ENTER key (setting should be 15psi below your discharge pressure). Press the appropriate key(s) for the low discharge proof timer then press the ENTER key (Do not set at 0). Press the NEXT key to navigate the next screen.

Screen 7 of 8:

Press the appropriate key(s) for the low suction pressure then press the ENTER key.
Press the appropriate key(s) for the low suction proof timer then press the ENTER key.
Press the appropriate key(s) for the low suction reset PSI then press the ENTER key.
Press the NEXT key to navigate the next screen.

Note: Low suction alarm settings are only applicable if a suction sensor is installed.

Screen 8 of 8:

Press the appropriate key(s) for the restart PSI drop then press the ENTER key. Press the appropriate key(s) for the minimum run timer then press the ENTER key. Press the NEXT key to go back on setup menu screen. (typically no changes are needed here)

Pump Nameplate:

Press the SETUP/3 key and press the ENTER key at setup menu screen. Press the SETPT/2 key then press the ENTER key. Pump 1 nameplate screen will appear. Press NO/0 key then press ENTER to edit the pump nameplate data. Modify the values for pump 1 as per available on the motor nameplate using the appropriate keys.

Note: To enter the AMPS and HP values, user will have to feed two separate value for before decimal and after decimal. For example, if need to enter input value 3.5, user needs to press 3 and ENTER key then press 5 and ENTER key.

To change the values for other pumps, press the NEXT key. This is only applicable if the total numbers of pumps selected in TOTAL PUMPS: # field are more than 1.

Note: All values will be copied to the next screen. Press NEXT key to see the same data for each pump in the system.

Complete the all pump data setup and press YES/7 key and then press ENTER key to confirm the modified values.

Press the NO/0 key then press the ENTER key to exit the pump setup menu. Once again press the NO/0 key and press the ENTER key to exit the setup menu. It will ask for save changes. Press the YES/7 key and press the ENTER key. It will save all changed values modified in the setup and main screen will appear. Now your system is ready to run.

Run each motor in manual to verify safe operation:

-Auto/Manual key should be off (LED not lit)

-Pump Enable key should be lit for only one of the available pumps

-Press the Start/Stop key so that the LED is lit

-Use the up arrow to start and speed up the drives

NOTE: drives will not run until the manual speed is above the minimum speed setting -- which defaults at 30Hz. (50% on the controller speed output)

-Verify rotation, make sure there are no alarms on the VFD and listen for unusual pump noise (rattling, grinding etc.)

-Ramp down using the down arrow until the pump/VFD stop running

-Press the Start/Stop key so that the LED is off

-Disable the pump by pressing the Pump Enable key and then enable the next available pump that has not been tested and repeat the same procedure.

Verify the following sequence of operation in AUTO:

From the main screen press the next arrow until you see the screen that reads Seq at the top. Here you will find critical information to verify the unit is running correctly in auto.

Dis = Actual pressure in system (downstream of pumps)

SP = Set-point (the pressure that is trying to be maintained)

Suc = Supply pressure coming into the package

Spd = Speed output of the controller to the drive/s

1. Enable all available pumps, have the controller in Auto and press start
2. Station should begin to run one pump.
3. Pump accelerates and maintains set point via PID loop.
4. If the initial pump exceeds 95% of it's speed for 30 seconds a second pump will stage on.
5. For a 3 pump system, if the 2 pumps exceed 95% of 60HZ (for 30 seconds) then the 3rd pump will stage on. The same sequence follows for units with more than 3 pumps.
6. Once the set point is met, a stabilized speed is quickly established.
7. When the motor speed drops 5% below the stabilized speed or down to 70% of 60HZ, a pump will de-stage. This will continue until one pump is running.
8. When only one pump is running at minimum speed and still maintaining set point it is determined that there is no longer a demand in the plumbing system.No Flow Shut Down (NFSD) then occurs, and awaits a 10psi drop from set point to start again.

If any other values are changed, we advise you to document those changes. The following tables are from the manual that came with the package and left on site. Manually record/document field changes in the appropriate spaces.

NOTE: These are not all of the changeable fields. The vast majority of the time the ones not listed do not need to be changed. Please consult the IOM for full list.

Paths: Status Screens / Set up(3) / System(4) / StageDestage(1)/ PV Stage(1)

STAGE/DESTAGE SETUP MENU ITEMS				
Menu Item	**Variable**	**Default**	**Range**	**Field Value**
PV Stage	Stg Spd: ##% The maximum speed at which the lead pump will operate prior to starting a lag pump, %.	95	0-100	
	Stg Proof Timer: ### s Proof timer prior to starting lag pump, seconds.	30	0-999	
	Stab Timer: ###s Staging stabilization time, delay prior to calculating destage value, seconds.	60	0-999	

Paths: Status Screens / Set up(3) / System(4) / StageDestage(1)/ PV Destage(2)

STAGE/DESTAGE SETUP MENU ITEMS				
Menu Item	**Variable**	**Default**	**Range**	**Field Value**
PV Destage	Destage: ###% Enter the percentage of the stabilized speed at which the lag pump will stop, %.	85	0-100	
	Destg Pr Timer: ### s Proof timer prior to stopping lag pump, seconds.	30	0-999	
	HD Spd: ### % The lowest speed at which parallel pumps will operate prior to destaging the lag pump, %. It must be greater or equal to minimum frequency.	50	0-100	
	HD Pr Tm: ### s The proof timer prior to destaging the lag pump when operating below the HD speed, seconds.	30	0-999	

Paths: Status Screens / Set up(3) / AlrmEvt(6) / High Discharge(3)

High Discharge Pressure Menu Items				
Menu Item	**Variable**	**Default**	**Range**	**Field Value**
High Discharge Pressure	High Dis Press: ### PSI The pressure above which an alarm will be set, in PSI.	112	0-999	
	High Dis Pr Tm: ##s The proof timer prior to setting an alarm, in seconds, A value of 0 will disable this alarm.	20	0-999	

Paths: Status Screens / Set up(3) / System(4) / VFD(2) / VFD Setup(1)

VFD Menu Items				
Menu Item	**Variable**	**Default**	**Range Value**	**Field**
VFD Setup	Accel Tm: ## Drive acceleration time in seconds from zero to maximum frequency ramp	5	0-1800	
	Decel Tm: ## Drive acceleration time in seconds from maximum to zero to maximum frequency ramp	5	0-1800	
	Freq Max : ## Enter the maximum limit for the drive output frequency	60	0-60	
	Freq Min : Enter the minimum limit for the drive output frequency	30		

Paths: Status Screens / Set up(3) / System(4) / VFD(2) / VFD Setup(1)

PID Menu Items				
Menu Item	**Variable**	**Default**	**Range**	**Field Value**
PID	PID-P ### Enter the desired proportional value.	300	0-999	
	PID-I ### Enter the desired integral value.	1	0-999	
	PID-D ### Enter the desired derivative value.	15	0-999	
	SP Deviation ### Enter the value for the number of discharge pressure units at which a dead band will be created around the setpoint. The PID will be modified within the dead band per the index setting below.	0	0-999	
	Index ### Enter a value to buffer the response of the PID while operating in the dead band defined above. Index = 1 (no impact) Index = 999 (maximum buffer.)	0	0-999	
	Start Up ## Start up delay in seconds	5	0-60	

Paths: Status Screens / Set up(3) / AlrmEvt(6) / Low Discharge(2)

Low Discharge Pressure Menu Items				
Menu Item	**Variable**	**Default**	**Range**	**Field Value**
Low Discharge Pressure	Low Dis Press: ### PSI The pressure below which an alarm or event will be set, in PSI	Set 15 PSI below system setpoint	0-999	
	Low Dis PrTm: ###s The proof timer prior to setting an alarm or event, in seconds. A value of 0 disables this alarm or event.	30	0-999	
	Alarm: $ Set this value to "Y" to consider low discharge pressure an alarm, or set it to "N" to consider it an event.	Y	Y/N	
	Stop Pumps: $ Set this value to "Y" to stop all pumps in the event of a low pressure alarm or event. Set it to "N" to continue operation normally during this alarm or event.	Y	Y/N	

Paths: Status Screens / Set up(3) / AlrmEvt(6) / Low Suction(4)

Low Suction Pressure Menu Items				
Menu Item	**Variable**	**Default**	**Range**	**Field Value**
Low Suction Pressure	Low Suct Press: ### The pressure below which an alarm or event will be set.	5	0-999	
	Pr Tm: ###s The proof timer prior to setting an alarm or event. A value of 0 will disable this alarm.	20	0-999	
	Auto Reset: $ Select "Y" to allow this alarm or event to be automatically reset.	Y	Y/N	
	Reset PSI: ### The pressure at which the controller will automatically reset when the suction pressure rises above it.	10	0-999	
	Alarm: $ Set this value to "Y" to consider low suction pressure an alarm, or set it to "N" to consider it an event.	N	Y/N	

5. Operation

5.1 Normal Scrolling Operation

Other screens may be viewed by scrolling from the AquaForce Pump Controller screen shown below:

<AQUAFORCE PUMP>
CONTROLLER
MM/DD/YY HH:MM:SS A/P
STAT1 STAT2 STAT3

The **STAT1** portion of the display indicates the current start/stop status of the system.

The **STAT2** portion of the display indicates the current auto/manual mode of operation.

The following table indicates all possible options:

STAT2	Description	Sections for Additional Information
AUTO	Pump Controlled by Controller	5.2
MANUAL	Pumps Controlled by User	5.4

The STAT3 portion of the display indicates the current alarm/event status. If **NORMAL** is displayed there are no alarms. If **ALARM or EVENT** is displayed there are alarms/events that may prevent normal operation, refer to Section 5.7 for additional information. In case of no flow shut down it displays *NFSD*.

Press the **NEXT/ (▶)** key. The display now shows:

< PUMP STATUS >
P1: RDY P2: N/A
P3: N/A P4: N/A
STAT1 STAT2 STAT3

Press the **NEXT/ (▶)** key. The display now shows:

<Seq 1-2 >
Dis = ### SP = ###
Suc = ### Spd = ###%
STAT1 STAT2 STAT3

Press the **NEXT/ (▶)** key. The display now shows:

< Power (KW) >
P1: ## P2: ##
P3: N/A P4: N/A
STAT1 STAT2 STAT3

Press the **NEXT/ (▶)** key. The display now shows:

< Current (A) >
P1: ## P2: ##
P3: N/A P4: N/A
STAT1 STAT2 STAT3

Press the **NEXT/ (▶)** key. The display now shows the following if the system is in **MANUAL** mode:

< >
Manual Speed: #%
STAT1 STAT2 STAT3

Press the **NEXT/ (▶)** key. The display now returns back to the AquaForce Pump Controller screen.

Note:
When system is showing any of the above screens and if any key is not pressed for "Delay to Display status" time, then the fourth line will start showing the system status.

5.2 Auto Operation

System can run up to 4 pumps/VFDs in Auto Operation. All pumps may stage and run variable speed.

Confirm the setup of the following items:

Section	Item	Value
4.10.1	Total # of pumps	Up to 4
4.10.3	PV stage speed %	95%

5.2.0 Local automatic operation

With the JUMPER connected on Terminal 200 and +24V check that the LED indicators on the Operator Interface Panel (OIP) for two pumps are as follows:

LED	Condition	Meaning
Start/Stop	Off	System is stopped. No pumps running.
Pump 1 On/Off	Flashing Green	Pump1 is enabled but not on.
Pump 2 On/Off	Flashing Green	Pump2 is enabled but not on.

Take note of the pump sequence. Only the first pump in the sequence will run in normal operation. The second pump is a standby and will run only if the duty fails. To change which pump is the duty pump press the **4** key.

Press the **START/STOP** key. The Off LED will turn solid green and the message **START UP** will be displayed. After a start-up delay, the duty pump LED will turn solid green indicating that it is running variable speed. It will then try to maintain setpoint by varying pump speed. The lag pump will stage on if required.

5.2.1 Remote automatic operation

With the Remote start/stop contact is connected on Terminal 200 and +24V, check that the LED indicators on the Operator Interface Panel (OIP) are as follows:

LED	Condition	Meaning
Start/Stop	Off	System is stopped. No pumps running.
Pump 1 On/Off	Flashing Green	Pump1 is enabled but not on.
Pump 2 On/Off	Flashing Green	Pump2 is enabled but not on.

If a pump is not running this means the start contact (from the energy management system or other source) is not closed and the controller has not been given a start signal.

Once operating in remote it is possible to stop operation (i.e., override the remote start command) by pressing the **START/STOP** key on the OIP.

5.3 Pump Rotation

1. It will be necessary to operate all pumps in variable speed to check for proper rotation.
2. Place the AquaForce into operation as described in previous sections.
3. Run each pump in auto noting rotation in each.
4. If rotation is wrong, exchange the wiring on two motor phases.

NOTE: Changing phase at VFD input does not change output phasing.

DANGER:

• High voltage 3 phase power can kill. Pumps can start automatically. Disconnect and lock-out power prior to servicing pumps. FAILURE TO FOLLOW THESE INSTRUCTIONS COULD RESULT IN SERIOUS PERSONAL INJURY, DEATH, AND/OR PROPERTY DAMAGE.

5.4 Hand Manual Operation

1. If system is running press the **START/STOP** key to stop the system. The solid green LED for start/stop will turn off and any running pumps will stop.
2. Press the **AUTO/MANUAL** key and the screen will display the following:

< **>**

Manual Speed: #%

STAT1 STAT2 STAT3

3. If the **PUMP LED** is not flashing green, enable a pump to run in manual by pressing the **PUMP 1** or **PUMP 2** key.
4. Press the **START/STOP** key to run the enabled pump(s) in manual. After a brief time delay the pump(s) starts, and the flashing green LED(s) for pump(s) will turn solid green.
5. Press the **UP (▲)** key to increase pump speed to a maximum of 100% of rated speed. Press the **DOWN (▼)** key to decrease the speed to 0% where the pump will run at the minimum speed configured in the VFD, typically 30 HZ.
6. Press the **START/STOP** key to stop the system. The running pump(s) will stop.

5.5 Setpoint Modification

To modify the setpoint, press the **SETPT/2** key. The following **SET POINT SELECTION** screen will be displayed:

Selection: # 0=Exit

1= Set Point

3= Control Set Point

Use the appropriate numeric key to select the desired menu, then press the **ENTER** key. A detailed description of each menu follows. For example, to select the **SET POINT** menu, press the **PV/1** key and then press the **ENTER** key. The following menu will be displayed:

SP1= ##

Exit: $ (Y/N)

If you agree with the current setpoint settings press the **YES/7** key followed by **ENTER**. If you would like to modify the setpoint press the **NO/0** key followed by **ENTER** at which point the setpoint in the upper left portion of the screen will begin flashing.

Press the numeric key to modify the setpoint and press **ENTER**.

After modifying the set point, press the **YES/7** key to accept the values and return to the **SET POINT SELECTION** screen.

To select the **CONTROL SET POINT** menu, press the **SETUP/3** key and then press the **ENTER** key. The following menu will be displayed:

Control Selection: #

1= Set Point

3 = Com Ovrd Exit $(Y/N)

The displayed # value indicates the current active method for set point. To change the active control method, press the **NO/0** key and then press the **ENTER** key.

The Control Selection field will start blinking. Change the current value by pressing desired numeric Keys and then press **ENTER** key to confirm. Press the **YES/7** key and **ENTER** key to accept the selection and return to the **SET POINT SELECTION** screen.

5.6 Process Variable Monitoring

To view the actual process variable signals that are being sent to the controller press the **PV/1** key.

The following will be displayed:

ACT = ### **SP1 = ###**

HZ = ##

The # symbol will be replaced by the actual value of process variables and set points.

5.7 Alarms/Events

When the controller detects an alarm/event condition, the display will flash *ALARM/EVENT* in the lower right corner of the main screen.

The green LED on the **HELP** key will also flash during an alarm/event condition. Press the **HELP** key for additional information on the alarm(s)/event(s). If there are more than one alarm(s)/event(s), the alarm(s)/event(s) will be listed in order of occurrence.

To view possible causes for alarm/event, press the **HELP** key again after the alarm/event is displayed. Refer to table below for an overview of the possible alarm/event and their respective causes.

Press the **CLEAR** key to return to the main screen. After addressing the source of the alarm/event, press **RESET** to re-start the system and/or clear the alarm/event.

The controller logs alarm/event as they occur to aid in troubleshooting unobserved alarm/event. Refer to Section 6.14.0 for alarm/event logging information

Help Screen Alarm	Help/Help Screen Display	Detailed Description
VFD Failure	"Check communication wiring, and VFD display"	The controller is not receiving a closed run signal from VFD number X after it has been given a start command or communication failure or VFD fault
High Discharge	"Check discharge pressure – manual RESET required"	Check the pressure setting in the setup menu.
Low Discharge	"Check discharge pressure"	Check the pressure setting in the setup menu.
Low Suction	"Check setting of the low suction switch" or low suction settings in the ALARM/EVENTS set up	Check for open or closed contacts and low suction settings, refer to wire diagram for proper connection
Low Water	"Check setting of level switch"	Check for open or closed contacts, refer to wire diagram for proper connection.
NFSD	"System will restart automatically when flow occurs"	Check the Reset PSI Drop value and the pressure sensor connections, refer to the wire diagram.
Sensor Fail	"Check wiring, piping, polarity, continuity"	The controller is not receiving the proper 4-20mA
Sensor Reading Drift	"Check wiring of both sensors, and compare the pressure reading of both sensors with pressure gauge "	"Check wiring of both sensors, and compare the pressure reading of both sensors with pressure gauge "
Low Battery	Replace OIP battery	Replace OIP battery

5.8 Quick Access

Using quick access function user can directly jump to the setup screen need to be setup. To use this function press **QUICK ACCESS/6** key from status screen. The display now shows.

Enter Quick Access Number. See Section 7.6 for Quick Access numbers.

Exit $ (Y/N)

Press **NO/0** to edit the page number. Enter the screen number need to be access and press the **ENTER** key. It will lead to the setup screen entered. Refer the appendix for the quick access screen numbers.

6. Maintenance

6.1 Preface

The following is a description of the hardware, diagnostics, and corrective action to maintain a process being controlled by the Pump Controller.

NOTE: THE FOLLOWING SHOULD NOT BE INTERPRETED AS THE MAXIMUM CONFIGURATION OF THIS CONTROLLER, RATHER THIS DESCRIBES ITS APPLICATION AS AN AQUAFORCE PUMP CONTROLLER ONLY.

6.2 Technical Overview

The Pump Controller is a microprocessor based dedicated pump controller unique to and exclusively manufactured by Xylem Goulds Pumps. All aspects of this unit are strictly proprietary to Xylem Goulds Pumps.

6.3 Digital Inputs

The controller has provision for digital inputs with an operating voltage of 24 VDC. This signal voltage must be obtained from the 24 VDC power supply mounted to the subpanel.

It is not recommended that other power sources be used without factory approval.

Customer connections are made directly to the terminals blocks wired to the digital input module.

6.4 Digital Outputs

The controller has provision for relay outputs to control 240V 50/60 HZ devices.

The relays are not removable. If defective, the digital output module must be returned to the factory for repair.

All relays operate as single pole single throw. Components are provided to reduce contact arc and extend electrical life.

Customer connections are made directly to the terminals blocks wired to the digital output module.

6.5 Analog Inputs

Analog inputs are provided for process variables and optional transmitters. All analog inputs operate at 4-20mA. They must be powered from 24 VDC power supply included with the controller

6.6 Memory

The logic is stored in a non-removable flashPROM chip which can only be updated from the RS-232 program port on the CPU. The user setup data is stored in non-volatile memory of fixed RAM. While the controller is powered up, the CPU controller provides the power to save the user values. When the controller is powered down a 3V lithium ion battery provides the power to store the user's values. When the battery voltage drops below 2.5VDC the controller will display *ALARM*. The battery should be replaced as soon as practical to avoid losing all station settings in the event of a power loss.

6.7 CPU

The CPU does not require any maintenance, and cannot be replaced as a field repair.

6.8 Power Supply

The power supply provides 24 VDC for all digital and analog signals as well as the CPU. It is specifically rated only for the controller and other loads should not be applied without factory approval.

The power supply is protected with both primary and secondary fusing as indicated in the wiring diagram. The size of these fuses is indicated on a sticker inside each enclosure.

DANGER:

• Troubleshooting live control panels exposes personnel to hazardous voltages. Electrical troubleshooting must only be done by a qualified electrician. FAILURE TO FOLLOW THESE INSTRUCTIONS COULD RESULT IN SERIOUS PERSONAL INJURY, DEATH, AND/OR PROPERTY DAMAGE.

6.9 Protection

Analog inputs – the analog inputs provided on the AquaForce Pump Controller must be wired according to the wiring diagram that shipped with the unit.

Protection – all analog inputs are protected from high voltage, crossed wiring, etc. A sustained fault will be limited to 20mA by the current limiting circuit.

Digital Inputs – as long as input power is derived from the integral 24VDC power supply they are protected.

Digital Outputs – each output shall not exceed the ratings on the digital output module.

6.10 Instruments and Their Use

With the diagnostics described herein extensive instruments are not required. However, the instruments used should be quality units to meet the following at a minimum.

Under no circumstances shall any instrument be used to test any on board components. Especially risky is an ohmmeter with battery voltage higher than TTL logic or applied with incorrect polarity.

6.10.0 AC/DC voltmeter

• Input impedance shall not be less than 10 MEGOHM.

• Accuracy - AC ± 2% of Full Scale

• DC ± 3% of Full Scale

• Rated circuit to ground voltage = 1000V.

6.10.1 Ohmmeter

• Accuracy ± 2%

• Overload protection voltage = 1000V.

6.10.2 Millimeter

• Accuracy ± 2% of Full Scale

6.10.3 Signal generator (analyzer) – recommended

A. Beta calibrator Model 434 20mA signal analyzer.

B. Altek calibrator Model 334 4-20mA loop analyzer.

Either instrument may be purchased from a Local Process Control Distributor.

NOTE: If some other instrument is used it must float above ground, preferably battery powered.

6.11 Field Repair

6.11.0 General

Typical field repair should include: replacing fuses, replacing input/output modules and assuring connections are correct and secure.

DANGER:

• Troubleshooting live control panels exposes personnel to hazardous voltages. Electrical troubleshooting must only be done by a qualified electrician. FAILURE TO FOLLOW THESE INSTRUCTIONS COULD RESULT IN SERIOUS PERSONAL INJURY, DEATH, AND/OR PROPERTY DAMAGE.

6.12 Program updating

To update to a new version of the program the program must be downloaded through the RS-232 port on the CPU. This can be accomplished by one of the following means:

To update to a new version of the program the program must be downloaded through the RS-232 port on the controller. This can be accomplished by one of the following means:

1) A factory authorized technician uploads on job site.

2) Replace the controller with one that has been pre-programmed at the factory.

Contact your Goulds Pumps representative for the preferred method of upgrading your software.

6.13 Troubleshooting

VFD FAILURE

a. Remedy:
   i. Cycle Power to VFD and Station.
   ii. Check power wiring and fuses for affected VFD.
   iii. Check all wiring between VFD and PLC.
   iv. Check to be sure VFD is not in LOC mode.

HIGH SYSTEM (Discharge):

a. Remedy:
   i. Check application for high discharge pressure conditions. Does the mechanical gauge on the discharge header match the actual pressure displayed on the PLC?
   ii. Check suction pressure conditions. Is suction pressure significantly higher than original system design point?
   iii. Check Ramp Speed settings. Fast ramp speeds can increase the chance of over-pressurizing the system, especially with larger pumps.

LOW SYSTEM (Discharge):

a. Remedy:
   i. Check application for low discharge pressure conditions. Does the mechanical gauge on the discharge header match the actual pressure displayed on the PLC?
   ii. Are the pumps running in the correct direction?
   iii. Check suction pressure conditions. Is suction pressure significantly lower than original system design point?
   iv. Is the system drawing a vacuum? Can the water supply keep up with demand?
   v. Could there be a broken pipe/leak in the system? In other words, does the system seem to be running in a 'open discharge' condition?
   vi. Check Ramp Speed settings. Slow ramp speeds can increase the chance of a rapid drop in system pressure.

LOW SUCTION:

a. Remedy:
   i. Check application for legitimate 'low suction' pressure fault. Is a PRV set incorrectly?
   ii. Could the system be drawing a vacuum?
   iii. Check that PLC is properly programmed for the correct number of switches/sensors.
   iv. Check for open or closed switch contacts. Refer to wire diagrams for proper connection.

6.14 Program type and version number

To check the program type and version number, press the **INFO/8** key while at the Pump Controller status screen.

The screen will now display:

Sys Info CPU V ### >

AS V ### OS ####

Prog Type: #####

Scheme No: # SW# ##

Press the **NEXT/(▶)** key to go to the next screen. The display now shows:

< For Service Call:

+1##########

Please note info from previous screen

Press the **CLEAR** key to exit this screen.

The # symbol will be replaced by the actual version numbers and program type. If the factory is called for information or service on this unit this information may be requested.

6.14.0 Log menu

To view the **LOG MENU**, press the **LOG/5** key while at the Status Screens.

The **LOG MENU** screen will be displayed as shown below:

<SELECTION: # >

1 = ALARM LOG

2 = PUMP LOG

3 = DATA LOG 0 = EXIT

Press the **NEXT/(▶)** key to go to the next screen. The display now shows:

<SELECTION: # >

4 = OPERATION

5 = SERVICE LOG 0 = EXIT

Use the appropriate numeric key to select the desired menu, then press the **ENTER** key. A detailed description of each menu follows. For example

6.14.1 Alarm log

Paths: Status Screens / Log(5)/Alarm Log(1)

The display now shows:

MMDD HHMM alarm message

MMDD HHMM alarm message

MMDD HHMM alarm message

MMDD HHMM alarm message

Every alarm that occurs will be logged with a date and time stamp. The forty most recent alarms will be stored. The date is displayed in MMDD format and the time in 24 hour HHMM format. The most recent alarm is shown first. Press **NEXT/(▶)** and **PREV/(◀)** view more log events. Press **CLEAR** to exit.

6.14.2 Pump log menu

Paths: Status Screens / Log(5)/Pump Log(2)

The display now shows:

Selection: # 0=Exit

1=Pump Log

2=Pump Run Time

3=Pump On/Off Times

Use the appropriate numeric key to select the desired sub-menu, then press the **ENTER** key. A detailed description of each sub-menu appears.

6.14.3 Pump log

Paths: Status Screens / Log(5) / Pump Log (2) / Pump Log(1)

The display now shows:

MMDD HHMM PUMP ON/OFF MESSAGE

MMDD HHMM PUMP ON/OFF MESSAGE

MMDD HHMM PUMP ON/OFF MESSAGE

MMDD HHMM PUMP ON/OFF MESSAGE

Every pump **ON/OFF** occurrence will be logged along with the date and time. The forty most recent occurrences will be stored. The date is displayed in MMDD format and the time is displayed in HHMM format. The most recent occurrence is shown first. Press **NEXT/(▶)** and **PREV/(◀)** view more log events. Press **CLEAR** to exit.

6.14.4 Pump run time

Paths: Status Screens / Log(5) / Pump Log (2) / Pump Run Time(2)

The display now shows:

Pump Run Time

P1: # P2: #

P3: # P4: #

The pump run time is displayed in total accumulated elapsed time in hours

6.14.5 Pump on/off times

Paths: Status Screens / Log(5) / Pump Log (2) / Pump On Off Times(3)

The display now shows:

Pump On/Off

P1: # P2: #

P3: # P4: #

The pump on/off times are displayed in total accumulated times the pumps are switched on and off.

6.14.6 Data log

Paths: Status Screens / Log(5) / Data Log(3)

The display now shows:

Selection: # 0=Exit

1=Sensor

2= Totalized Value

Use the appropriate numeric key to select the desired sub-menu, then press the **ENTER** key. A detailed description of each sub-menu appears.

6.14.7 Sensor

Paths: Status Screens / Log(5) / Data Log(3) / Sensor(1)

The display now shows:

<SENSOR TYPE MAX: # >

MM/DD/YY 00:00:00

NOW: #MIN: #

MM/DD/YY 00:00:00

The sensor type is displayed along with its current, maximum, minimum values. The times and dates that the max and min values occurred are also displayed. To view other sensors, press the Next Screen button.

Press **PV/1** and **ENTER** keys together to reset the max value.

Press **SET PT/2** and **ENTER** keys together to reset the min value.

6.14.8 Totalized value

Paths: Status Screens / Log(5) / Data Log(3) / Totalized Value(2)

The display now shows:

Total KWHr ###

The total accumulated kilowatt hours and Flow is displayed as the Totalized Value

6.14.9 Operation

Paths: Status Screens / Log(5) / Operation(4)

The display now shows:

<Selection: # >

1=Op Mode Changes

2=Power Cycles

3=Events

Press the **NEXT/(▶)** key to go to the next screen. The display now shows:

<SELECTION: # >

4 = VFD

5 = EXERCISE

6 = Set Point

Use the appropriate numeric key to select the desired sub-menu, then press the **ENTER** key. A detailed description of each sub-menu appears.

6.14.10 Operation mode changes

Paths: Status Screens / Log(5) / Operation(4) / Op Mode Changes(1)

The display now shows:

MMDD HHMM Manual/Auto

MMDD HHMM Manual/Auto

MMDD HHMM Manual/Auto

MMDD HHMM Manual/Auto

Every time the **AUTO/ MANUAL** key is pressed, the event will be logged by showing the state of operation mode. The forty most recent operation mode changes will be stored. The date is displayed in MMDD format and the time in 24 hour HHMM format. The most recent event will be shown first.
Press **NEXT/(▶)** and **PREV/(◀)** view more log events. Press **CLEAR** to exit.

6.14.11 Power cycles

Paths: Status Screens / Log(5) / Operation(4) / Power Cycles(2)

The display now shows:

MMDD HHMM Power Up/Down

MMDD HHMM Power Up/Down

MMDD HHMM Power Up/Down

MMDD HHMM Power Up/Down

Each time the controller is powered up or down, the event will be logged. "Power Up" will be shown if powered up, and "Power Down" will be shown if powered down. The forty most recent logs will be stored. The date is displayed in MMDD format and the time in 24 hour HHMM format. The most recent event will be shown first. Press **NEXT/(▶)** and **PREV/(◀)** view more log events. Press **CLEAR** to exit.

6.14.12 Events

Paths: Status Screens / Log(5) / Operation(4) / Events(3)

The display now shows:

Selection: # 0=Exit

1=System On/Off

2=Alternation

3= Sys Rset 4=Events

Use the appropriate numeric key to select the desired sub-menu, then press the **ENTER** key. A detailed description of each sub-menu appears.

6.14.13 System on/off

Paths: Status Screens / Log(5) / Operation(4) / Events(3) / System On Off(1)

The display now shows:

MMDD HHMM Start/Stop

MMDD HHMM Start/Stop

MMDD HHMM Start/Stop

MMDD HHMM Start/Stop

Every time the **START/STOP** key is pressed, the event will be logged by showing the system start/stop state. The forty most recent logs will be stored. The date is displayed in MMDD format and the time in 24 hour HHMM format. The most recent event will be shown first. Press **NEXT/(▶)** and **PREV/(◀)** to view more log events. Press **CLEAR** to exit.

6.14.14 Alternation

Paths: Status Screens / Log(5) / Operation(4) / Events(3) / Alternation(2)

The display now shows:

MMDD HHMM Seq#

MMDD HHMM Seq#

MMDD HHMM Seq#

MMDD HHMM Seq#

Every time the pump sequence is changed, the event will be logged by showing the sequence. The forty most recent logs will be stored. The date is displayed in MMDD format and the time in 24 hour HHMM format. The most recent event will be shown first. Press **NEXT/(▶)** and **PREV/(◀)** to view more log events.
Press **CLEAR** to exit.

6.14.15 Sys Rset

Paths: Status Screens / Log(5) / Operation(4) / Events(3) / Sys Rset(3)

The display now shows:

MMDD HHMM Sys Reset Message
MMDD HHMM Sys Reset Message
MMDD HHMM Sys Reset Message
MMDD HHMM Sys Reset Message

Every time the system is reset, the event will be logged by showing the system reset. The forty most recent logs will be stored. The date is displayed in MMDD format and the time in 24 hour HHMM format. The most recent event will be shown first. Press **NEXT/(▶)** and **PREV/(◀)** to view more log events. Press **CLEAR** to exit.

6.14.16 Events

Paths: Status Screens / Log(5) / Operation(4) / Events(3) / Events(4)

The display now shows:

MMDD HHMM Event Message
MMDD HHMM Event Message
MMDD HHMM Event Message
MMDD HHMM Event Message

Every time an event occurs, it gets logged. The forty most recent logs will be stored. The date is displayed in MMDD format and the time in 24 hour HHMM format. The most recent event will be shown first. Press **NEXT/(▶)** and **PREV/(◀)** to view more log events. Press **CLEAR** to exit.

6.14.17 VFD

Paths: Status Screens / Log(5) / Operation(4) / VFD(4)

The display now shows:

MMDD HHMM VFD Failure Message
MMDD HHMM VFD Failure Message
MMDD HHMM VFD Failure Message
MMDD HHMM VFD Failure Message

Every time VFD failure occurs, it gets logged. The forty most recent logs will be stored. The date is displayed in MMDD format and the time in 24 hour HHMM format. The most recent event will be shown first. Press **NEXT/(▶)** and **PREV/(◀)** to view more log events. Press **CLEAR** to exit.

6.14.18 Exercise

Paths: Status Screens / Log(5) / Operation(4) / Exercise(5)

The display now shows:

MMDD HHMM Pump #
MMDD HHMM Pump #
MMDD HHMM Pump #
MMDD HHMM Pump #

Every time a pump is exercised, it gets logged. The forty most recent logs will be stored. The date is displayed in MMDD format and the time in 24 hour HHMM format. The most recent event will be shown first. Press **NEXT/(▶)** and **PREV/(◀)** to view more log events. Press **CLEAR** to exit.

6.14.19 Set Point

Paths: Status Screens / Log(5) / Operation(4) / Set Point(6)

The display now shows:

MMDD HHYY Set point change message

MMDD HHYY Set point change message

MMDD HHYY Set point change message

MMDD HHYY Set point change message

Every time setpoint change, it gets logged. The forty most reset logs will be stored. the date is displayed in MMDD format and the time in 24 hour HHMM format. The most resent event will be shown first. Press **NEXT/(▶)** and **PREV/(◀)** to view more log events. Press **CLEAR** to exit.

6.14.20 Service log

Paths: Status Screens / Log(5) / Service Log(5)

The display now shows:

<Selection: # 0=Exit>

1 = Error Log

2 = Operation Hours

3 = Destage Speed

Press the Next (▶) key to see the next display. The display now shows:

<Selection: # 0=Exit>

4 = Run Time Setpoint

Use the appropriate numeric key to select the desired sub-menu, then press the **ENTER** key. A detailed description of each sub-menu appears.

6.14.21 Error log

Paths: Status Screens / Log(5) / Service Log(5) / Error Log(1)

The display now shows:

MMDD HHMM Error Code

MMDD HHMM Error Code

MMDD HHMM Error Code

MMDD HHMM Error Code

6.14.22 Operation hours

Paths: Status Screens / Log(5) / Service Log(5) / Operation Hours(2)

The display now shows:

Operating Since

MM/DD/YY HH:MM:SS

Total Hours #####

The start date and time is displayed in the MM/DD/YY and HH:MM:SS format respectively. The total number of hours that the unit has been in operation is also displayed.

Press **SETUP/3**, **QUICK ACCESS/6** and **ENTER** keys together to reset or start the function. Press **CLEAR** to exit.

6.14.23 Destage Speed

Paths: Status Screens / Log(5) / Service Log(5) / Destage Speed(3)

The display now shows:

Destage Speed = ### %

It shows the speed at which current lag pump will destage.

6.14.24 Run Time Setpoint

Paths: Status Screens / Log(5) / Service Log(5) / Run Time Setpoint(4)

The display now shows:

MMDD HHMM SP ^More	**Up Key**	**Pump**	**Speed**	**Suction**	**vLog**
MMDD HHMM SP Info	**---------→**	**Pump**	**Speed**	**Suction**	**Data**
MMDD HHMM SP	**←--------**	**Pump**	**Speed**	**Suction**	
MMDD HHMM SP	**Down Key**	**Pump**	**Speed**	**Suction**	

Every time setpoint change for friction loss compensation, it gets logged. At the same time it also logs number of running pump, pump speed & suction pressure. The forty most recent logs will be stored. The date is displayed in MMDD format and the time in 24 hour HHMM format. The most recent event will be shown first. Press **NEXT**/(►) and **PREV**/(◄) to view more log events. Press **CLEAR** to exit.

6.15 Maintenance (Physical)

6.15.0 Electrical

No maintenance is required for the electrical panel except to keep the modules free of dirt and dust that might hold moisture. Cabinet door should be kept closed, and the components kept dry.

6.15.1 Mechanical

- If a Goulds pump was supplied it was lubricated at the factory. Future lubrication should be according to the instructions that came with the pump.
- If there is a danger of freezing, drain the pump. Inspect pump and system piping regularly.
- For leaky seals or gaskets and loose or damaged components, replace or repair as required.

7. Appendix

7.1 Valid I/O Codes

Code	Function Description	I/O Type	Range	Equate to the Signal
101	Pump 1 Status (On/Off)	DO	1/0	On/Off
102	Pump 2 Status (On/Off)	DO	1/0	On/Off
103	Pump 3 Status (On/Off)	DO	1/0	On/Off
104	Pump 4 Status (On/Off)	DO	1/0	On/Off
121	VFD 1 Failure	DO	1/0	On/Off
122	VFD 2 Failure	DO	1/0	On/Off
123	VFD 3 Failure	DO	1/0	On/Off
124	VFD 4 Failure	DO	1/0	On/Off
140	A-V Alarm Output	DO	1/0	On/Off
201	Speed Signal	AO	0-100	4 - 20 ma
203	System KW	AO	0-Span	4 - 20 ma
204	Discharge Pressure	AO	0-Span	4 - 20 ma
205	Suction Pressure	AO	0-Span	4 - 20 ma
211	Analog Input 1	AO	0-Span	4 - 20 ma
212	Analog Input 2	AO	0-Span	4 - 20 ma

7.2 AquaForce MODBUS Communication Points

Function Code	Points #	Point Description	Range/ Value	Modbus Address	Units
02	1	Pump #1 VFD Failure	1 = Failure 0 = O.K.	10001	
02	2	Pump #1 Off Alarm	1 = Alarm 0 = O.K.	10002	
02	3	Pump #2 VFD Failure	1 = Failure 0 = O.K.	10003	
02	4	Pump #2 Off Alarm	1 = Alarm 0 = O.K.	10004	
02	5	Pump #3 VFD Failure	1 = Failure 0 = O.K.	10005	
02	6	Pump #3 Off Alarm	1 = Alarm 0 = O.K.	10006	
02	7	Pump #4 VFD Failure	1 = Failure 0 = O.K.	10007	
02	8	Pump #4 Off Alarm	1 = Alarm 0 = O.K.	10008	
02	9	System Reset Required	1 = Yes 0 = No	10009	
02	10	Pump #1 Enabled	1 = Enabled 0 = Disabled	10010	
02	11	Pump #2 Enabled	1 = Enabled 0 = Disabled	10011	
02	12	Pump #3 Enabled	1 = Enabled 0 = Disabled	10012	
02	13	Pump #4 Enabled	1 = Enabled 0 = Disabled	10013	
02	14	Pump #1 On/Off	1 = On 0 = Off	10014	
02	15	Pump #2 On/Off	1 = On 0 = Off	10015	
02	16	Pump #3 On/Off	1 = On 0 = Off	10016	
02	17	Pump #4 On/Off	1 = On 0 = Off	10017	
02	18	System Start/Stop	1 = Start 0 = Stop	10018	
02	19	Analog Input #1 Failure	1 = Failure 0 = O.K.	10019	
02	20	Analog Input #2 Failure	1 = Failure 0 = O.K.	10020	
02	21	General Alarm	1 = Alarm 0 = O.K.	10021	
02	22	System Operation Mode	1 = Auto 0 = Manual	10022	
05	1	Pump Sequence Alternation	1 = Yes 0 = No	00001	
05	2	System Reset Request	1 = Yes 0 = No	00002	
05	3	System Start / Stop	1 = Start 0 = Stop	00003	
04	1	Discharge Pressure	0 to Span (in AquaForce User Setup Menu)	30001	PSI
04	2	Suction Pressure	0 to Span (in AquaForce User Setup Menu)	30002	PSI
04, 06	3	AI #1	0 to Span (in AquaForce User Setup Menu)	30003, 40003	
04, 06	4	AI #2	0 to Span (in AquaForce User Setup Menu)	30004, 40004	
04, 06	5	Setpoint #1	0 to Span (in AquaForce User Setup Menu)	30005, 40005	
04	6	System Power (KW)	0 to Span (in AquaForce User Setup Menu)	30006	KW
04	7	Drive #1 Current	0 to Span (in AquaForce User Setup Menu)	30007	A
04	8	Drive #2 Current	0 to Span (in AquaForce User Setup Menu)	30008	A
04	9	Drive #3 Current	0 to Span (in AquaForce User Setup Menu)	30009	A

7.2 AquaForce MODBUS Communication Points (Continued)

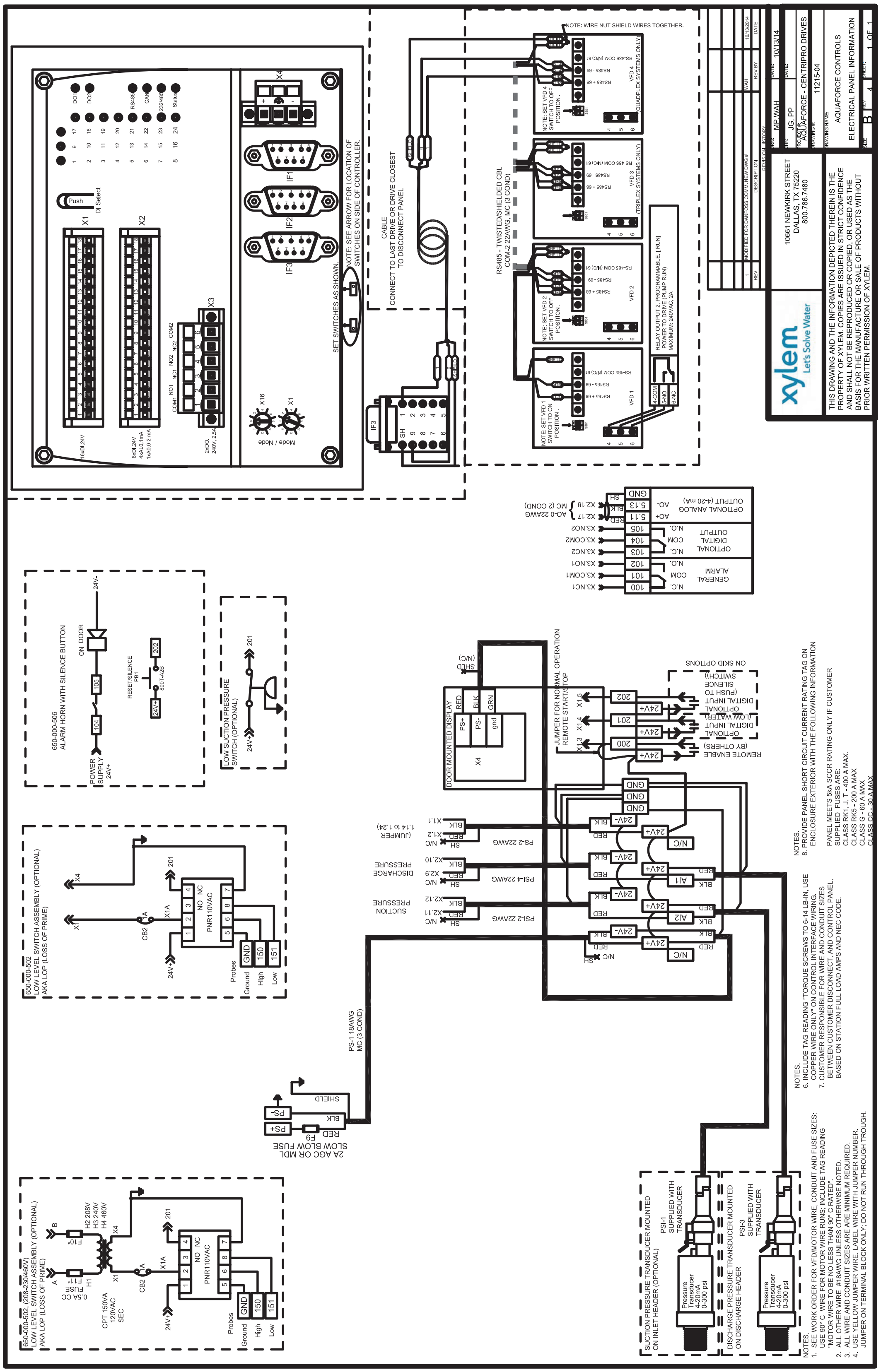
Function Code	Points #	Point Description	Range/ Value	Modbus Address	Units
04	10	Drive #4 Current	0 to Span (in AquaForce User Setup Menu)	30010	A
04	11	Drive #1 Power (KW)	0 to Span (in AquaForce User Setup Menu)	30011	KW
04	12	Drive #2 Power (KW)	0 to Span (in AquaForce User Setup Menu)	30012	KW
04	13	Drive #3 Power (KW)	0 to Span (in AquaForce User Setup Menu)	30013	KW
04	14	Drive #4 Power (KW)	0 to Span (in AquaForce User Setup Menu)	30014	KW
04	15	Speed %	0 to 100	30015	%
04	16	Lead Pump Number	1 to Pump # (in AquaForce User Setup Menu)	30016	

7.3 Quick Access Number Table

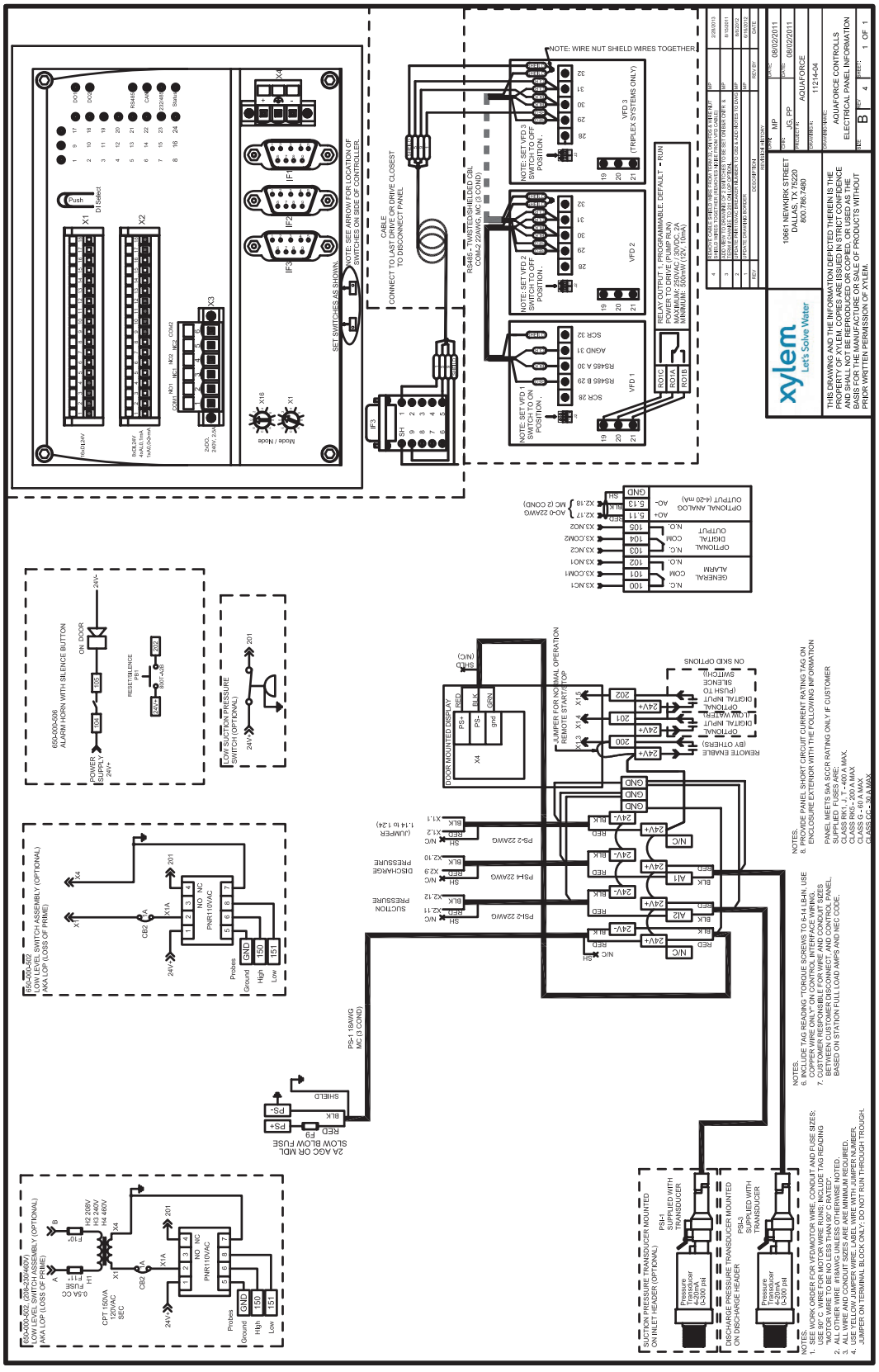
Screen Name	Quick Access Number	Screen Name	Quick Access Number
Sensor Setup (AI1)	1001	Pump Exercise	3031
Sensor Setup (AI2)	1002	Timed Auto Alt	3041
Number of Pumps	2001	Alternation Basis	3046
Pump Nameplate (Pump 1)	2002	PID	3051
Pump Nameplate (Pump 2)	2003	Reset Totals	3061
Pump Nameplate (Pump 3)	2004	Date, Time	3071
Pump Nameplate (Pump 4)	2005	Password	3081
Reset Pump Time	2008	Spare DO Setup	3092
PV Stage	3011	Spare AO Setup	3093
PV Destage	3012	Modbus	3103
Limit Power Stage	3016	Frict. Loss Comp.	3111
VFD Setup	3021	Save to Flash	3121
VFD Set Parameter*	3022	Load from Flash	3122
VFD Read Parameter*	3023	Load Defaults	3123
All Sys Sen Fail	3024	Display	3131

* Only available for the system with ABB Drive.

7.4 Typical Wiring Diagrams



7.4 Typical Wiring Diagrams (continued)



8. Symbols

 # - Numeric input field, such as 0, 1, 2,...9

$ - Enter a text character, such as “Y” for Yes, “N” for No

9. Product warranty

COMMERCIAL WARRANTY

Warranty. For goods sold to commercial buyers, Seller warrants the goods sold to Buyer hereunder (with the exception of membranes, seals, gaskets, elastomer materials, coatings and other “wear parts” or consumables all of which are not warranted except as otherwise provided in the quotation or sales form) will be (i) be built in accordance with the specifications referred to in the quotation or sales form, if such specifications are expressly made a part of this Agreement, and (ii) free from defects in material and workmanship for a period of one (1) year from the date of installation or eighteen (18) months from the date of shipment (which date of shipment shall not be greater than thirty (30) days after receipt of notice that the goods are ready to ship), whichever shall occur first, unless a longer period is specified in the product documentation (the “Warranty”).

Except as otherwise required by law, Seller shall, at its option and at no cost to Buyer, either repair or replace any product which fails to conform with the Warranty provided Buyer gives written notice to Seller of any defects in material or workmanship within ten (10) days of the date when any defects or non-conformance are first manifest. Under either repair or replacement option, Seller shall not be obligated to remove or pay for the removal of the defective product or install or pay for the installation of the replaced or repaired product and Buyer shall be responsible for all other costs, including, but not limited to, service costs, shipping fees and expenses. Seller shall have sole discretion as to the method or means of repair or replacement. Buyer’s failure to comply with Seller’s repair or replacement directions shall terminate Seller’s obligations under this Warranty and render the Warranty void. Any parts repaired or replaced under the Warranty are warranted only for the balance of the warranty period on the parts that were repaired or replaced. Seller shall have no warranty obligations to Buyer with respect to any product or parts of a product that have been: (a) repaired by third parties other than Seller or without Seller’s written approval; (b) subject to misuse, misapplication, neglect, alteration, accident, or physical damage; (c) used in a manner contrary to Seller’s instructions for installation, operation and maintenance; (d) damaged from ordinary wear and tear, corrosion, or chemical attack; (e) damaged due to abnormal conditions, vibration, failure to properly prime, or operation without flow; (f) damaged due to a defective power supply or improper electrical protection; or (g) damaged resulting from the use of accessory equipment not sold or approved by Seller. In any case of products not manufactured by Seller, there is no warranty from Seller; however, Seller will extend to Buyer any warranty received from Seller’s supplier of such products.

THE FOREGOING WARRANTY IS EXCLUSIVE AND IN LIEU OF ANY AND ALL OTHER EXPRESS OR IMPLIED WARRANTIES, GUARANTEES, CONDITIONS OR TERMS OF WHATEVER NATURE RELATING TO THE GOODS PROVIDED HEREUNDER, INCLUDING WITHOUT LIMITATION ANY IMPLIED WARRANTIES OF MERCHANTABILITY AND FITNESS FOR A PARTICULAR PURPOSE, WHICH ARE HEREBY EXPRESSLY DISCLAIMED AND EXCLUDED. EXCEPT AS OTHERWISE REQUIRED BY LAW, BUYER’S EXCLUSIVE REMEDY AND SELLER’S AGGREGATE LIABILITY FOR BREACH OF ANY OF THE FOREGOING WARRANTIES ARE LIMITED TO REPAIRING OR REPLACING THE PRODUCT AND SHALL IN ALL CASES BE LIMITED TO THE AMOUNT PAID BY THE BUYER FOR THE DEFECTIVE PRODUCT. IN NO EVENT SHALL SELLER BE LIABLE FOR ANY OTHER FORM OF DAMAGES, WHETHER DIRECT, INDIRECT, LIQUIDATED, INCIDENTAL, CONSEQUENTIAL, PUNITIVE, EXEMPLARY OR SPECIAL DAMAGES, INCLUDING BUT NOT LIMITED TO LOSS OF PROFIT, LOSS OF ANTICIPATED SAVINGS OR REVENUE, LOSS OF INCOME, LOSS OF BUSINESS, LOSS OF PRODUCTION, LOSS OF OPPORTUNITY OR LOSS OF REPUTATION.

LIMITED CONSUMER WARRANTY

Warranty. For goods sold for personal, family or household purposes, Seller warrants the goods purchased hereunder (with the exception of membranes, seals, gaskets, elastomer materials, coatings and other "wear parts" or consumables all of which are not warranted except as otherwise provided in the quotation or sales form) will be free from defects in material and workmanship for a period of one (1) year from the date of installation or eighteen (18) months from the product date code, whichever shall occur first, unless a longer period is provided by law or is specified in the product documentation (the "Warranty").

Except as otherwise required by law, Seller shall, at its option and at no cost to Buyer, either repair or replace any product which fails to conform with the Warranty provided Buyer gives written notice to Seller of any defects in material or workmanship within ten (10) days of the date when any defects or non-conformance are first manifest. Under either repair or replacement option, Seller shall not be obligated to remove or pay for the removal of the defective product or install or pay for the installation of the replaced or repaired product and Buyer shall be responsible for all other costs, including, but not limited to, service costs, shipping fees and expenses. Seller shall have sole discretion as to the method or means of repair or replacement. Buyer's failure to comply with Seller's repair or replacement directions shall terminate Seller's obligations under this Warranty and render this Warranty void. Any parts repaired or replaced under the Warranty are warranted only for the balance of the warranty period on the parts that were repaired or replaced. The Warranty is conditioned on Buyer giving written notice to Seller of any defects in material or workmanship of warranted goods within ten (10) days of the date when any defects are first manifest.

Seller shall have no warranty obligations to Buyer with respect to any product or parts of a product that have been: (a) repaired by third parties other than Seller or without Seller's written approval; (b) subject to misuse, misapplication, neglect, alteration, accident, or physical damage; (c) used in a manner contrary to Seller's instructions for installation, operation and maintenance; (d) damaged from ordinary wear and tear, corrosion, or chemical attack; (e) damaged due to abnormal conditions, vibration, failure to properly prime, or operation without flow; (f) damaged due to a defective power supply or improper electrical protection; or (g) damaged resulting from the use of accessory equipment not sold or approved by Seller. In any case of products not manufactured by Seller, there is no warranty from Seller; however, Seller will extend to Buyer any warranty received from Seller's supplier of such products.

THE FOREGOING WARRANTY IS PROVIDED IN PLACE OF ALL OTHER EXPRESS WARRANTIES. ALL IMPLIED WARRANTIES, INCLUDING BUT NOT LIMITED TO THE IMPLIED WARRANTIES OF MERCHANTABILITY AND FITNESS FOR A PARTICULAR PURPOSE, ARE LIMITED TO ONE (1) YEAR FROM THE DATE OF INSTALLATION OR EIGHTEEN (18) MONTHS FROM THE PRODUCT DATE CODE, WHICHEVER SHALL OCCUR FIRST. EXCEPT AS OTHERWISE REQUIRED BY LAW, BUYER'S EXCLUSIVE REMEDY AND SELLER'S AGGREGATE LIABILITY FOR BREACH OF ANY OF THE FOREGOING WARRANTIES ARE LIMITED TO REPAIRING OR REPLACING THE PRODUCT AND SHALL IN ALL CASES BE LIMITED TO THE AMOUNT PAID BY THE BUYER FOR THE DEFECTIVE PRODUCT. IN NO EVENT SHALL SELLER BE LIABLE FOR ANY OTHER FORM OF DAMAGES, WHETHER DIRECT, INDIRECT, LIQUIDATED, INCIDENTAL, CONSEQUENTIAL, PUNITIVE, EXEMPLARY OR SPECIAL DAMAGES, INCLUDING BUT NOT LIMITED TO LOSS OF PROFIT, LOSS OF ANTICIPATED SAVINGS OR REVENUE, LOSS OF INCOME, LOSS OF BUSINESS, LOSS OF PRODUCTION, LOSS OF OPPORTUNITY OR LOSS OF REPUTATION.

Some states do not allow limitations on how long an implied warranty lasts, so the above limitation may not apply to you. Some states do not allow the exclusion or limitation of incidental or consequential damages, so the above exclusions may not apply to you. This warranty gives you specific legal rights, and you may also have other rights which may vary from state to state.

To make a warranty claim, check first with the dealer from whom you purchased the product or visit www.xyleminc.com for the name and location of the nearest dealer providing warranty service.

Notes

Xylem |'zīləm|

1) The tissue in plants that brings water upward from the roots;
2) a leading global water technology company.

We're a global team unified in a common purpose: creating innovative solutions to meet our world's water needs. Developing new technologies that will improve the way water is used, conserved, and re-used in the future is central to our work. We move, treat, analyze, and return water to the environment, and we help people use water efficiently, in their homes, buildings, factories and farms. In more than 150 countries, we have strong, long-standing relationships with customers who know us for our powerful combination of leading product brands and applications expertise, backed by a legacy of innovation.

For more information on how Xylem can help you, go to www.xyleminc.com

xylem
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