



AQUAVAR[®] SOLO²

CONSTANT PRESSURE CONTROLLER

INSTALLATION, OPERATION AND TROUBLESHOOTING MANUAL

Owner's Information

Controller Model Number: _____
 Controller Serial Number: _____
 Pump Model Number: _____
 Pump Serial Number: _____
 Motor Model Number: _____
 Motor SFA: _____
 Tank Serial Number: _____
 Installer: _____

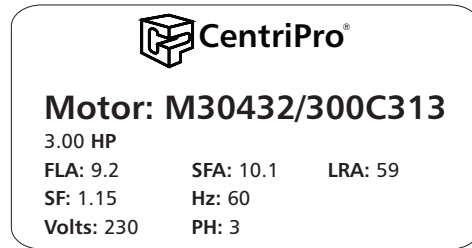
 Installer Telephone Number: _____
 Installation Date: _____
 Wire Lengths (Feet)
 Service Entrance to Controller: _____
 Controller to Well: _____
 Top of Well to Motor: _____
 Incoming Voltage: _____

NOTICE: RECORD THE MODEL NUMBERS AND SERIAL NUMBERS FROM THE PUMP AND CONTROLLER IN THIS INSTRUCTION MANUAL FOR FUTURE REFERENCE. GIVE IT TO THE OWNER OR AFFIX IT TO THE CONTROLLER WHEN FINISHED WITH THE INSTALLATION.

Table of Contents

SUBJECT	PAGE
1. Safety Instructions	3
Ratings	3
Required Materials	3
2. Typical Installation	3
Controller.....	3-4
Pump and Piping.....	4
Splicing Drop Cable to Motor Leads.....	4
Tank Sizing and Tank Pressure Setting.....	4
Wiring – Transducer, Motor, etc.	4-6
Wire Sizing	6
User Interface Board	7
3. Installer Pre-Start Selections	8
Display and Button Functionality.....	8
Maximum Frequency (Speed) Switch.....	9
Dry Well Sensitivity	9
Low Pressure Cut-Off.....	9
Pressure Drop	9
Motor Overload Setting Dial	9
4. Start Up Procedure	9
Purging System, Adjusting Pressure	9
Pressure Adjustment.....	9
Check for Leaks, Checking Rotation.....	10
5. Run/Stop Input Options	10
6. Advanced Menu	11
7. Troubleshooting, Fault Codes	14
8. Insulation and Winding Resistance Tests.....	19
Limited Warranty	20

Water Ends and CentriPro Motors include these extra data labels. Please attach them to the inside cover of the Aquavar SOLO² Controller for future pump and motor identification.



PLEASE USE THIS CONTROLLER INSTALLATION, OPERATION AND TROUBLESHOOTING MANUAL (IOM) IN CONJUNCTION WITH THE PUMP IOM. THE CONTROLLER IOM COVERS THE CONTROLLER ELECTRICAL INSTALLATION AND ANY SPECIAL INSTALLATION PROCEDURES REQUIRED WITH VARIABLE SPEED CONTROLLERS.

XYLEM WILL NOT BE RESPONSIBLE FOR ANY DAMAGES TO AN INSTALLATION WHERE THE PRESSURE RELIEF VALVE IS ALLOWED TO DISCHARGE INTO A FINISHED LIVING SPACE OR TO OTHERWISE DAMAGE A CUSTOMERS PROPERTY. PLUMBING SAFETY DEVICES SUCH AS PRESSURE RELIEF VALVES TO AN APPROPRIATE DRAIN IS THE RESPONSIBILITY OF THE INSTALLER AND IS OUT OF OUR CONTROL.

1: SAFETY INSTRUCTIONS

TO AVOID SERIOUS OR FATAL PERSONAL INJURY OR MAJOR PROPERTY DAMAGE, READ AND FOLLOW ALL SAFETY INSTRUCTIONS IN MANUAL AND ON EQUIPMENT.

THIS MANUAL IS INTENDED TO ASSIST IN THE INSTALLATION AND OPERATION OF THIS UNIT AND MUST BE KEPT WITH THE UNIT.



This is a **SAFETY ALERT SYMBOL**. When you see this symbol on the pump, the controller or in the manual, look for one of the following signal words and be alert to the potential for personal injury or property damage.



DANGER Warns of hazards that **WILL** cause serious personal injury, death or major property damage.



WARNING Warns of hazards that **CAN** cause serious personal injury, death or major property damage.



CAUTION Warns of hazards that **CAN** cause personal injury or property damage.

NOTICE: INDICATES SPECIAL INSTRUCTIONS WHICH ARE VERY IMPORTANT AND MUST BE FOLLOWED.

THOROUGHLY REVIEW ALL INSTRUCTIONS AND WARNINGS PRIOR TO PERFORMING ANY WORK ON THIS CONTROLLER.

MAINTAIN ALL SAFETY DECALS.

WARNING This controller is not designed for use around swimming pools, open bodies of water, hazardous liquids, or where flammable gases exist.

WARNING Do not use GFCI input power. This will cause nuisance faults.

WARNING Disconnect and lockout electrical power before installing or servicing any electrical equipment.

WARNING **ELECTROCUTION HAZARD. CONTROLLER INPUT GROUND TERMINAL (GND) AND ALL EXPOSED METAL PIPING, INCLUDING PRESSURE TRANSDUCER CASE, MUST BE CONNECTED TO THE SERVICE ENTRANCE GROUND TERMINAL.**

WARNING All electrical work must be performed by a qualified technician. Always follow the National Electrical Code (NEC), or the Canadian Electrical Code, as well as all local, state and provincial codes. Code questions should be directed to your local electrical inspector. Failure to follow electrical codes and OSHA safety standards may result in personal injury or equipment damage. Failure to follow manufacturer's installation instructions may result in electrical shock, fire hazard, personal injury or death, damaged equipment, unsatisfactory performance, and may void manufacturer's warranty.

NOTICE: Some installations pull a vacuum on the transducer when the system is drained. The new controller is designed to protect against up to 17" Hg. of vacuum on the transducer. An optional Gauge Guard, order no. 6K210, will protect the transducer from a vacuum and corrosive or dirty water.

Installation Quick Steps

1. Mount the controller in a vertical position.
2. Wire input power to unit.
3. Wire motor drop cable to unit. All splices done with heat shrinks.
4. Mount pressure transducer.
5. Wire and ground pressure transducer.
6. User Interface Board:
 1. Set overload per motor SFA
 2. Select maximum frequency (3Ø only)
 3. Dry Well Sensitivity - High
 4. Low pressure cut-off – On
 5. Pump stop sensitivity - Low (1Ø only)
7. Adjust tank pre-charge
8. Power on and purge system of air.
9. Adjust set point pressure.
10. Check rotation and performance.

Ratings

Refer to serial number label on enclosure.

Required Materials

- Pump Controller with Transducer and Transducer Wire
- Pump (water end)
(see *Speed Selector Switch for 60 Hz or 80 Hz Operation*)
- Motor
- Pressure Relief Valve – piped to a drain for safety
- Pressure Gauge – for setting system pressure
- Heat Shrink Kit – one required for each underwater or underground splice (mandatory)
- Tank Tee or (2) ¼" NPT Female pipe fittings for pressure sensor and pressure gauge connections
- Pipe and fittings – as necessary per each system
- Disconnect Switch: 230 V, 2 pole, properly sized
(see *Controller, Breaker, Generator Sizing Table*)
- Copper Wire: Size wire ampacity for 75°C rated wire, double jacketed is recommended but not mandatory
(see *Wire Sizing table*)
- Tank: diaphragm style tank
(see *Tank Sizing Section and Chart*)

2: TYPICAL INSTALLATION

Determine where the Controller, Pressure Tank and Transducer will be located before starting the installation.

Controller

The controller is rated NEMA 3R (Raintight) so it may be located outdoors. It must be mounted vertically. Locate the enclosure in a shaded area where the temperature stays within -4°F to +122°F (-20°C to +50°C). Since the controller is designed for outdoor mounting it may be located at the wellhead.

Opening Controller Cover

CAUTION Lay the controller on a flat surface or hang on wall before removing the cover screw.

Failure to do so may result in dropping and damaging the unit. Once screw is removed, lift the cover up and out to remove. There is a hole in the bottom right side of the enclosure cover and enclosure base to accommodate a padlock if so desired.

Mounting Controller

Three screws are provided for mounting the enclosure.

Using the enclosure as a guide, select a mounting location. First install the top screw in the mounting surface leaving the head of the screw approximately 1/8" from the surface. Hang the enclosure on this screw. Finish by installing the two bottom screws and tightening the top screw. **Be sure to leave a minimum of 6" of clearance on each side of the controller to ensure proper cooling.**

Pump and Piping

WARNING Do not install any valves (except check valves), flow control devices or filters between the pressure transducer and the pump. It is allowable to run branches off the pipe between the pump and transducer as long as no flow restricting devices are between the pump and transducer.

NOTICE: The terms Transducer and Pressure Sensor are equal and interchangeable.

WARNING EXPLODING TANK CAN INJURE OR KILL.

Always protect the tank from over pressure by installing a pressure relief valve large enough to limit the system pressure below the maximum working pressure of the tank. Install the tank at a point in the system where the maximum possible system pressure cannot exceed the maximum working pressure of the tank. Install the pressure relief valve at the tank.

CAUTION Avoid property damage caused by pressure relief valve opening. Pipe the pressure relief valve discharge to a drain or other location so that property damage and flooding will not occur.

CAUTION Locate the tank and transducer where they will not freeze.

Ensure the system pressure setting does not exceed the maximum working pressure of the tank.

For optimum performance, as a minimum, we recommend using the same size pipe as the pump discharge between the pump and the tank. Smaller diameter pipe may severely limit the maximum capacity of the system. On long runs, larger pipe may be beneficial for optimum performance and flow.

CAUTION If using a torque arrestor, install it on the discharge pipe before connecting pipe to the discharge head.

Check Valve

Use a spring check valve between pump and tank for reliable turn-off when flow stops.

TANK SIZING AND TANK PRESSURE SETTING - Refer to Table 1 for recommended tank size. On pre-existing systems, larger tanks may be used.

Table 1: Systems with Small Tanks

Pump Size GPM	Minimum Tank Total Volume
5-6	2
7-8	2
10-12	2
13-15	4
18-20	4
25-28	5
33-35	7
40-45	9
55-60	12
75-80	15

For a 5 PSI Pressure Drop Set-up:

Set the tank pressure, while tank is empty of water, to 20 psi below the desired system pressure setting. Ex. for a 60 psi system pressure, charge the tank to 40 psi. *

For a 20 PSI Pressure Drop Set-up:

Set the tank pre-charge to 30 psi below the desired system pressure setting. Ex. for a 60 psi system pressure, charge the tank to 30 psi. *

* The tank pre-charge is always checked with the tank empty of water.

Splicing Drop Cable To Motor Leads

The underwater connection where the drop cable connects to the motor wires must be done using a waterproof heat shrink kit. To make the connection, first strip the wires 1/2" and place the heat shrink tubes over the wires. Then, connect the wires using the crimps. Finish by shrinking the tubes over the crimps heating from the center outward. The sealant in the tube will flow out the ends making a watertight seal. If a heat shrink tube is burnt or split, the connection will need to be remade.

CAUTION Vinyl electrical tape is not acceptable for underwater splices when using variable speed drives due to the high potential for leakage to ground through taped joints. **Failure to use a waterproof heat shrink kit will void the warranty.**

Before installing the motor in the well, the drop cable must be connected to the motor wires. Refer to the wire size chart when selecting wire size for the drop cable. *See Wire Sizing Table.*

Wiring Pressure Transducer

CAUTION Transducer wires must never be in same conduit with power wires. There should always be a minimum of 12" between transducer wires and power wires. Failure to separate these wires can cause controller malfunctions.

The pressure transducer cable is pre-wired at the factory. If desired, the length of the cable can be changed. The cable can also be put in conduit to protect against damage.

To change the length of the transducer cable:

- Cable length cannot exceed 200'.
- Disconnect transducer wires from terminal block by pushing down on tabs at rear of block one at a time and pulling the wires out of the terminal.
- Splice additional cable to transducer wire, cut off excess as required.

- Reconnect wires to terminal block. Be sure wire colors match labels on circuit board (B = Black, R = Red, W = White, G = Green).

To put the transducer cable in conduit, do the following: Disconnect the cable from the terminal block and remove the cable strain relief in the bottom of the enclosure. Starting at the enclosure, run flexible or rigid 1/2" conduit to where the transducer is located. The last few feet of conduit adjacent to the transducer will need to be flexible. The conduit must be well supported – NO stress can be placed on the pressure transducer connector. Use a strain relief bushing to seal around the pressure transducer connector.

CAUTION After reconnecting the transducer wires to the terminal block and ground terminal, tug on each wire individually to ensure they are tight.

CAUTION Any exposed metal in the system piping, including transducer case, must be grounded to the service entrance per NFPA 70: National Electrical Code, Article 250.

The transducer cable has a Green ground wire and a ground clamp supplied to facilitate grounding the transducer. See Figure 1.



Figure 1: Transducer Grounding

Motor Wires – See Table 2

NOTE: SIZE WIRE AMPACITY FOR 75°C COPPER WIRE.

Refer to the Table 2 for wire sizing and maximum wire lengths. Charts are designed to limit voltage drop to 5%.

Insure that the wire is rated for direct burial and/or submergence.

Figure 2 shows the terminal block where the motor and input wires connect. The circuit board near the terminal block is labeled to show where to connect the motor wires. For all motors, the green wire from the motor must be attached to the terminal labeled GND.

For 2-wire, 1Ø motors with 2 black wires, connect one black wire to each of the terminals labeled BLK and leave the terminal labeled X empty. It doesn't matter which black wire goes to which BLK terminal.

For 3Ø or 3-wire, 1Ø motors with red, black and yellow wires, connect the red wire to RED, black wire to BLK and yellow wire to YEL.

Input Power

⚠ DANGER SHOCK OR ELECTROCUTION HAZARD

⚠ CAUTION Do not use this controller on a power supply capable of delivering more than 5000 ARMS symmetrical, 240V Maximum.

NOTE: SIZE WIRE AMPACITY FOR 75°C COPPER WIRE.

Connect a ground wire from the service panel to the terminal marked GND. Controller has high leakage to ground. Controller ground terminal must be connected to the service entrance ground terminal. Failure to do so will result in high voltage being present on the controller chassis. Connect two “hot” wires from the 2 pole circuit breaker to the terminals marked L1 and L2.

The input power system used must be a grounded power system. The voltage measured from L1 to L2 must be in the range of 196Vac to 265Vac. The voltage measured from L1 to GND must be equal to the voltage measured from L2 to GND. These voltages must be within the range of 120Vac +/- 10%. Reduced input voltage will reduce system performance.

Do not use a Ground Fault Circuit Interrupter (GFCI) with this product or nuisance tripping will result.

The use of Metal or Metallized Conduit with Metal Conduit liquid tight connectors is recommended for all electrical power connections.

Input Power and Motor Lead Connections

1AS15



1Ø - 2W/3W Wires to Motor

3AS_ _

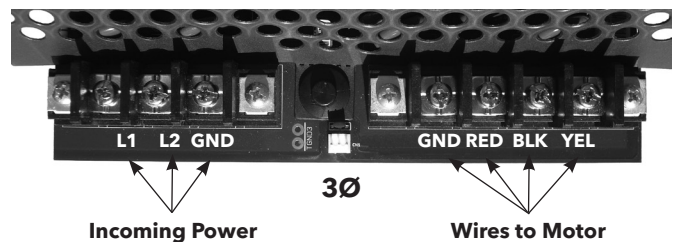


Figure 2: Wiring Connections

Table 2: Wire Sizing
Maximum Cable Lengths in Feet to Limit Voltage Drop to 5% for 230 V Systems ①

1AS15 Controller to Motor - Controllers with 2-Wire 1Ø Motors

Motor Lead Lengths - CentriPro 2-Wire Motors - Based on Service Factor Amps, 30° C Ambient and 5% Voltage Drop														
Motor Rating				60° C & 75° C Insulation - AWG Copper Wire Size										
Volts	HP	kW	SFA	14	12	10	8	6	4	2	1/0	2/0	3/0	4/0
230	½	0.37	4.7	466	742	1183	1874	2915	4648	7379	11733	14803	18688	23544
	¾	0.55	6.4	342	545	869	1376	2141	3413	5419	8617	10871	13724	17290
	1	0.75	9.1	241	383	611	968	1506	2400	3811	6060	7646	9652	12160
	1½	1.1	11.0	199	317	505	801	1246	1986	3153	5013	6325	7985	10060

1AS15 Controller to Motor - Controllers with 3-Wire 1Ø Motors

Motor Lead Lengths - CentriPro 3-Wire Motors (CSIR) - Based on Service Factor Amps, 30° C Ambient and 5% Voltage Drop														
Motor Rating				60° C & 75° C Insulation - AWG Copper Wire Size										
Volts	HP	kW	SFA	14	12	10	8	6	4	2	1/0	2/0	3/0	4/0
230	½	0.37	6.3	348	553	883	1398	2175	3467	5505	8753	11044	13942	17564
	¾	0.55	8.3	264	420	670	1061	1651	2632	4178	6644	8383	10582	13332
	1	0.75	9.7	226	359	573	908	1413	2252	3575	5685	7173	9055	11408
	1½	1.1	11.1	197	314	501	793	1234	1968	3124	4968	6268	7913	9969
	2	1.5	12.2	180	286	456	722	1123	1790	2843	4520	5703	7199	9070

All Models - Service Entrance to Controller

Controller Input	Motor HP	Copper Wire Size 75°C Insulation Exposed to a Maximum of 50°C (122°F) Ambient Temperature ②																		
		14	12	10	8	6	4	3	2	1	1/0	2/0	3/0	4/0	250	300	350	400	500	
230V 1PH	¾	279	445	706	1020	1608	2552	3186	4019	5065	6383	8055								
	1	226	360	571	824	1300	2064	2576	3250	4095	5161	6513	8201							
	1½	*	286	455	657	1036	1644	2052	2589	3262	4111	5188	6533	8236	9710					
	2	*	*	331	478	754	1197	1495	1886	2376	2995	3779	4759	5999	7073	8455	9852			
	3	*	*	246	355	561	890	1111	1401	1766	2225	2808	3536	4458	5256	6283	7321	8343		
	5	*	*	*	218	343	545	680	858	1081	1363	1720	2165	2730	3219	3847	4483	5109	6348	

3AS20, 30, 50 Controller to Motor - Controllers with 3Ø Motors

Controller Output	Motor HP	Copper Wire Size 75°C Insulation Exposed to a Maximum of 50°C (122°F) Ambient Temperature ②																		
		14	12	10	8	6	4	3	2	1	1/0	2/0	3/0	4/0	250	300	350	400	500	
230V 3PH	¾	690	1100	1748	2523	3978	6316	7884	9945											
	1	558	890	1413	2040	3216	5106	6375	8041											
	1½	445	709	1126	1625	2562	4068	5078	6406	8072										
	2	324	516	820	1184	1866	2963	3699	4666	5879	7410	9351								
	3	241	384	609	880	1387	2202	2749	3467	4369	5506	6949	8750							
	5	*	235	373	539	849	1348	1683	2123	2675	3372	4255	5358	6755	7964	9520				

① Reduce lengths by 13% for 200V systems.

* Wire does not meet the N.E.C. ampacity requirement.

② Lengths in bold require 90° C wire.

■ Shading indicates 40° C maximum ambient.

The lengths in each of the Wire Sizing tables represent 100% of the allowable voltage drop when motor is running at full load. When sizing wire, the voltage drop of each wire segment must be included. The total must not exceed 100% of the allowable drop. Take for example a 1.5 HP 3Ø motor with a distance from Service Entrance to Controller of 100' and 500' between the Controller and Motor.

- Service Entrance to Controller = 100' of 10 AWG (100/455) = 22 % (455' is from the S.E. to Controller chart)
 - Controller to Motor = 500' of 12 AWG (500/709) = 71 % (709' is from the Controller to Motor chart)
- Total Drop (must be ≤ 100%) 93 %

If the distance from the Controller to Motor was 600' (600/709) = 85% + 22% = 107%, we would need to use #10 wire for that segment, ex. 600/1126 = 53% + 22% (for 100' of #10) = 75% which is acceptable. It is also acceptable to use different wire sizes for the Buried and Well sections of wire.

USER INTERFACE BOARD

1AS Controllers

3AS Controllers

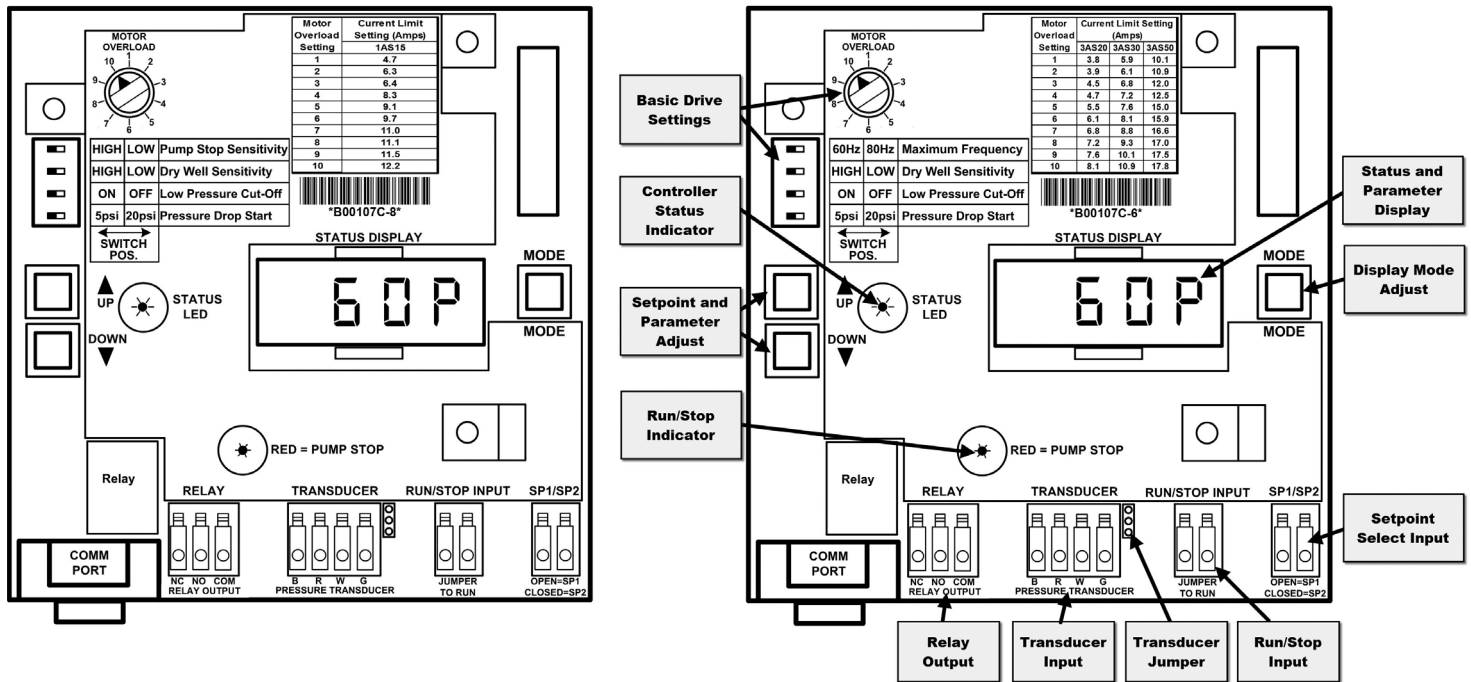


Figure 3: UIB (User Interface Board)

Table 3: Controller, Breaker, Generator Sizing

Motor		Controller Model ②				Circuit Breaker ③	Generator ④ (VA)
HP	Voltage ①	1AS15	3AS20	3AS30	3AS50		
1/2	230					15	2200
	200						2900
3/4	230					20	3500
	200						4400
1	230					30	6100
	200						8100
1 1/2	230					40	8100
	200						13300
2	230					50	13300
	200						
3	230						
	200						
5	230						
	200						

① Supply voltage must be 196 VAC - 265 VAC.
 ② Shaded areas indicate which controller models can be used with which motors. Lighter shading indicates combinations where controller will limit peak performance to 85% of catalog value for pump/motor.
 ③ Circuit Breaker or Dual Element Time Delay Fuse Size (Amps) protecting branch circuit supplying controller.
 ④ Minimum size of single phase 240 V generator required.

Table 4: Service Factor Amps – All Motors

HP	230 Volt									200 Volt	
	1Ø 2-Wire			1Ø 3-Wire			3Ø			3Ø	
	CentriPro	Franklin	Grundfos	CentriPro	Franklin	Grundfos	CentriPro	Franklin	Grundfos	CentriPro	Franklin
1/2	4.7	6	6	6.3	6	6	3.0	N/A	N/A	3.5	N/A
3/4	6.2	8	8.4	7.9	8	8.4	4.0	3.8	N/A	4.7	4.4
1	8.1	9.8	9.8	9.5	9.8	9.8	4.9	4.7	N/A	5.7	5.4
1 1/2	10.4	13.1 ¹	13.1 ¹	11.1	11.5	11.6	6.6	5.9	7.3	7.6	6.8
2	N/A	N/A	N/A	12.2	13.2 ¹	13.2 ¹	8.0	8.1	8.7	9.3	9.3
3	N/A	N/A	N/A	N/A	N/A	N/A	10.1	10.9	12.2	12	12.5
5	N/A	N/A	N/A	N/A	N/A	N/A	17.5	17.8	19.8 ¹	20.2 ¹	20.5 ¹

1. Amps are higher than the controller rating - use of these motors will limit current and reduce performance.

3: INSTALLER PRE-START SELECTIONS

DISPLAY AND BUTTON FUNCTIONALITY

Controller Status Indicator

(Light Visible Through Window in Cover)

The controller status indicator light has 3 possible modes:

- Solid green = Standby, pump not running. There is no water flow or the Run/Stop Input is open.
- Blinking green = Pump running. There is flow and the Run/Stop Input terminals are connected to each other (closed).
- Red = Error/Fault. Light will blink to indicate a particular fault. See Troubleshooting Section for Fault Codes.

Status and Parameter Display

The Status and Parameter Display shows controller information and advanced settings. The default display mode of the Status Display is to show the actual system pressure. The system pressure will be displayed as: **0000P** where “0000” is the value of pressure and “P” represents the units of PSI. The maximum value of pressure shown will depend on the pressure range selected (see Advanced Settings). The Status Display will show other information depending on the display mode of the controller.

Setpoint and Parameter Adjust Buttons

The Setpoint and Parameter Adjust Buttons (UP/DOWN) allow changing of the desired system pressure (setpoint), navigation through the Advanced Menu or changing a parameter in the Advanced Menu.

Pressure Setpoint Adjust

- To adjust the pressure setpoint, ensure the Status Display is in the default display mode. Press the UP button to increase the pressure setpoint or DOWN to decrease the pressure setpoint. If the active pressure setpoint is Setpoint 1 (refer to Setpoint Select Input for details) the Status Display will blink “**SP 1**” for 3 seconds indicating that Setpoint 1 is being adjusted followed by the value of Setpoint 1. This also indicates that Setpoint 1 is being used as the active target pressure. If Setpoint 2 is the active setpoint, the Status Display will blink “**SP 2**” for 3 seconds followed by the value of Setpoint 2. If no buttons are pressed for 10 seconds, the Status Display will automatically return to the default display mode which shows that actual system pressure. The controller automatically saves the pressure setting when either setpoint is changed.
- The default setting for Setpoint 1 (“**SP 1**”) is 60 PSI. The default setting for Setpoint 2 is (“**SP 2**”) 70 PSI. When setting the system pressure setpoint be sure to adjust the tank air pressure according to the Tank Sizing and Tank Pressure Setting section.
- The controller has a minimum setpoint of 20 PSI. The controller has different maximum pressure setpoints depending on the pressure range selected. Refer to the Sensor Range Select section for details on how change the sensor range. The table below lists the maximum pressure setpoint for each pressure transducer range.

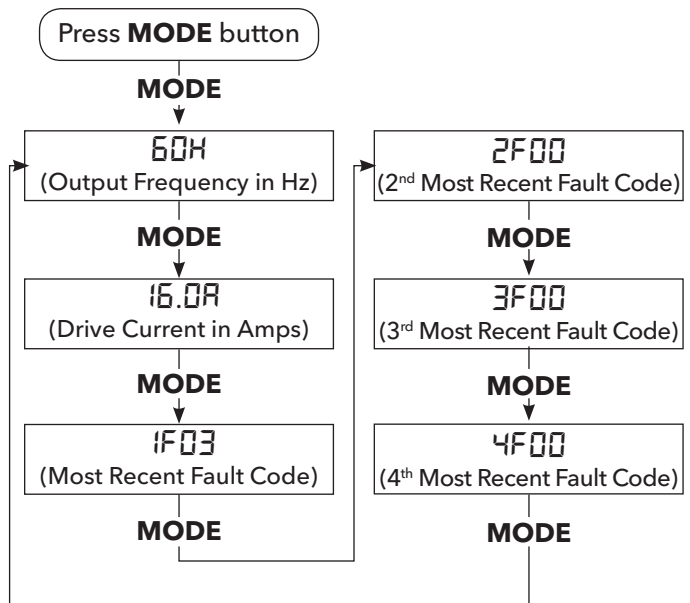
Pressure Transducer Range	Maximum Pressure Setpoint
100 PSI	85 PSI
200 PSI	170 PSI
300 PSI	255 PSI

System Reset

- A System Reset can be performed to reset the controller back to factory default settings. The controller Fault History will not be reset. Use the **FRST** function in the Advanced Menu to reset the Fault History. The settings made in the Advanced Menu and setpoints will be returned to the factory default settings. Some faults will be cleared by performing the System Reset. Refer to the Troubleshooting Section for details on which faults will be reset.
- To perform a System Reset, press and hold both the UP and DOWN buttons for 10 seconds. The controller will blink the red Status Indicator light rapidly and then the controller will reset.
- **NOTE:** The controller may attempt to restart the pump/motor based on the system conditions.

Display Mode Button

- The Display Mode Button (MODE) selects the controller information to be shown on the Status Display, selects parameter settings in the Advanced Menu and allows navigation through the Advanced Menu. When the Status Display is in the default display mode, press the MODE button once to display the output frequency applied to the motor. The output frequency is shown as “**60H**” where “60” is the value of frequency and “H” represents the units of Hertz (Hz).
- Press the MODE button again to display the motor output current. The output current is shown as “**16.0A**” where “16.0” is the actual value of motor current and “A” represents the units of Amperes (Amps).
- Pressing the MODE button again will display the most recent fault recorded by the controller. The fault history will be displayed as “**1F03**” where “1” represents the most recent fault and “F03” represents the code of the recorded fault. “F00” indicates that no fault was logged. Pressing the MODE button again will show the previous fault (2), followed by 3 and 4, and will then transition back to output frequency. If no buttons are pressed for 15 seconds, or if both UP and DOWN buttons are pressed at the same time, the Status Display will change to the default display. This functionality is shown in the flow diagram below:



- The MODE button is also used to access the Advanced Menu. To enter the Advanced Menu, press and hold the MODE button for 5 seconds. See the Advanced Menu section for details.

Setpoint Select Input

- The controller can store 2 different pressure setpoints. Only 1 setpoint is active at any time. The active setpoint is the target pressure for the controller. The active setpoint is selected through the Setpoint Select Input on the UIB.
- This input can be used to produce 2 different operating conditions for the system. This can be useful in irrigation and geothermal systems. Devices such as a timer controlled relay, float switch, pressure switch or any other non-powered switch can be used to control this input.
- **CAUTION** The Setpoint Select Input wires must never be in the same conduit with power wires. There should always be a minimum of 12" between the Setpoint Select Input wiring and the power wires. Failure to separate these wires can cause controller malfunction.
- When the Setpoint Select Input is open the active setpoint is set to Setpoint 1 ("SP1"). When the Setpoint Select Input is closed the active setpoint is set to Setpoint 2 ("SP2").

BASIC DRIVE SETTINGS AND PROTECTION

Maximum Frequency (Speed) Switch 3AS __ Models Only

This switch is only on models no.'s starting with 3AS. It selects the maximum frequency (motor speed) used to energize the motor to be either 60 or 80 Hz.

- 60 Hz - Use for matched pump-motor combinations where the motor HP and pump HP are the same. Example: 2 HP WE and 2 HP Motor
- 80 Hz - Use for mis-matched pump-motor combinations where motor HP is larger than the pump HP (typically 2x larger). Example: 1 HP WE and 2 HP Motor

Pump Stop Sensitivity – 1AS __ Model Only

This switch is only on model numbers starting with 1AS. Selections are High or Low. High will stop the pump when speed drops to 40Hz. This provides the fastest turn off when flow stops. If the pump stops when there is flow in the system, set the Pump Stop Sensitivity to Low. Low will stop the pump when speed drops to 30Hz. Low is less likely to cycle but slower turn-off.

Dry Well Sensitivity

Selections are High or Low. This function protects the system from running dry. The selection depends on several conditions and pump size.

Start with the sensitivity on high and test by running pump at various flows. If a dry well fault is triggered, switch to low setting.

Restart times vary based on the selections made in the dSEt menu.

Low Pressure Cut-Off

This fault is disabled for the first 10 minutes of pump run time after power up to allow the system to be purged.

ON Position - Used for constant pressure systems. The

drive will turn off if the system pressure drops 20 PSI below the system set point pressure for 30 seconds. *This fault must be manually reset, it will not clear automatically, this may prevent property damage if a pipe breaks.*

OFF Position - Use for open discharge situations such as filling a pond or tank, or whenever the system pressure will be 20 PSI or more below the system set point pressure.

Pressure Drop – 5 PSI or 20 PSI

The pressure drop before the pump restarts can be set to the standard 5 PSI or to 20 PSI.

The 20 PSI setting results in fewer starts for systems with leaks. It is recommended for irrigation systems. It will require a tank pre-charge adjustment. See *Tank Sizing and Tank Pressure Setting*.

CURRENT LIMIT PROTECTION

Motor Overload Setting Dial

WARNING Failure to properly adjust the Motor Overload Setting before applying power may damage the motor or wire and void the warranty.

- Use Tables 3 and 4 to determine which controller and setting to use. Note that some 200V motors require upsizing to the next larger controller.
- Set the Motor Overload - Turn the dial pointer to align with the motor's service factor amps (SFA). For three phase motors and any other motor without integral thermal protection choose the amperage value on the UIB that is less than or equal to the SFA listed on the nameplate. For single phase motors and other motors with integral thermal protection choose the amperage value on the UIB that is closest to the SFA listed on the nameplate.
- If the output current exceeds the motor overload setting, the controller will limit current by reducing the output voltage and frequency. This will reduce the performance of the pump. The controller tracks the thermal load of the motor by monitoring the output current and comparing this value to the motor overload setting. If the motor overload setting is set too low, nuisance tripping on Over Current (F04, 4 red blinks) can result.
- While the Over Current fault is active, the controller will display a countdown timer showing the time in seconds until the controller attempts to restart the motor. For additional information, consult the Troubleshooting section.

4: START UP PROCEDURE

Purge the System of Air

- Insure that plumbing connections are tight and wire connections are correct.
- Partially open a valve and turn power to controller on.
- Run the pump and controller with the furthest and highest faucets or valves in the system open. This will allow all air to escape the piping system.
- When flow is constant, close the faucets or valves and allow the system pressure to reach the pressure setpoint and shutdown.

PRESSURE ADJUSTMENT – Only if pressure other than 60 PSI is desired:

- Adjust tank pressure according to the desired set pressure - see Tank Sizing and Tank Pressure Setting section.
- Open a faucet and allow pump to start and purge the system of air.
- Press and Hold the UP or DOWN button until the desired pressure setpoint is shown on the Status Display.
- The larger the tank the longer it will take to increase pressure.
- When desired pressure is reached, close the faucet and allow the system to shut down.

Pump size determines the maximum flow and head which can be provided, if flow or head are not sufficient and rotation on three-phase units has been verified, a larger pump is required.

Checking for leaks

Constant pressure systems utilizing small tanks run whenever there is demand. Even small leaks can prevent a pump from turning off. To check for leaks, close all valves, turn power off to the controller, and note the pressure displayed on the pressure gauge. Tap the gauge to ensure you get an accurate reading.

Wait ten minutes and check the gauge again tapping to prevent the needle from sticking. If the pressure dropped then the system may have a leak*.

*If a system is pressurized after having been un-pressurized, it will continue to expand for several minutes. This expansion causes the pressure to drop and can be misinterpreted as a leak. Allow a system to stabilize for 10 minutes under pressure before performing the aforementioned leak test.

A spring check valve placed on the pump side of the tank and transducer will often improve the ability of the system to shut down.

Checking Rotation – 3AS – Models Only

⚠ WARNING This step only applies to controllers whose model no.'s begin with 3AS. Do not do this test with 1AS controllers.

Single phase motors having Red, Black & Yellow wires must always be connected to the RED, BLK and YEL terminals only. Failure to do so will damage the motor.

For three phase motors, it is possible for the motor to rotate in the wrong direction. If running backwards, the pump will work but it will have greatly reduced performance.

To check rotation, perform the following tests: Connect an amp probe to one of the power supply wires. Run the system with several valves open and note the pressure and amps. Leave the valves open, turn the power off.

⚠ DANGER Electrocutation Hazard. After turning off power, wait 5 minutes for hazardous voltages to discharge before proceeding to swap wires.

Swap red and black motor leads where they connect to the controller terminal block (NOT L1 and L2).

Turn power back on and let the system pressure stabilize. Again note the pressure and amps. Whichever wire position provided the most pressure/flow is the correct wire position. If there was little difference in the pressure/flow, then whichever had the lower amp reading

is the correct wire position.

Turn the power off, wait 5 minutes and swap the wires back if necessary.

Replace the plastic protective covers on the terminal block.

5. RUN/STOP INPUT OPTIONS

Run/Stop Input

⚠ DANGER Electrocutation Hazard. Opening RUN/STOP INPUT does not de-energize controller or any of its outputs. Always treat wire terminals of this controller as energized until power supply to the controller has been removed for 5 minutes.

RUN/STOP INPUT - for connection of an external switch or control device used to start and stop the pump. Devices such as an over-pressure switch, level (float) switch or any other non-powered switch (time delay, flow, etc.) can be connected to this input.

⚠ CAUTION Run/Stop Input wires must never be in the same conduit with power wires. There should always be a minimum of 12" between the Run/Stop Input wiring and the power wires. Failure to separate these wires can cause controller malfunction.

The Run/Stop Input terminals have a Jumper Wire installed at the factory (do not confuse the jumper wire on the Run/Stop Input with the Transducer Jumper next to the Transducer Connection Terminals, see Transducer Jumper below). The Run/Stop Input terminals must be connected (closed) for the pump to operate. If they are not connected the Run/Stop Indicator (visible inside the enclosure) will be Solid RED, the Status Display will display **5EOP** and the Controller Status Light will be Solid GREEN indicating that the pump-motor is off. Remove the Jumper Wire when connecting a float or over-pressure switch.

CONSTANT PRESSURE SYSTEM - with an Over-Pressure Switch:

- Connect two wires from the Load and Lead connections of a pressure switch to provide over-pressure protection. In the event the pressure transducer fails, this will prevent high pressure from damaging piping.
- The over-pressure switch cut-out setting must be a minimum of 10 PSI higher than the system set point pressure.
- Set the over-pressure switch cut-out 5 - 10 PSI lower than the pressure relief valve (PRV) pop-off pressure. This will turn the system off before the pressure relief valve opens.
- Ex. On a system with a 50 PSI set point, set the over-pressure switch cut-out at 60 PSI with a typical PRV setting of 75 PSI. In the event the transducer fails at high pressure the switch will turn the system off before the PRV pops.
- Typical UIB Settings For This Type System:
 - For 3AS controllers, 60 or 80 Hertz (depends on pump/motor)
 - For 1AS controllers, Pump Sensitivity Stop – High (switch to low if control cycles on/off)
 - Dry Well - High (switch to low if it trips while pumping water)
 - Low Pressure Cut-Off - On
 - Pressure Drop - 5 PSI
 - Transducer - Connected
 - Transducer Jumper - Bottom Position (Factory Setting)
 - Pressure Switch Connected to Run/Stop Input

FLOAT SWITCH OPERATION - Filling a Pond or Tank (Non-Constant Pressure System):


- Connect two wires from a float (level) switch to fill or empty a tank, pond, etc. The pump will run when the level switch contacts close. The maximum switch wire length tested is 200'. The pump will run at maximum speed when the float switch is closed.
- Typical UIB Settings For This Type System:
 - 60 or 80 Hertz (depends on pump/motor) (3AS__ only)
 - Pump Sensitivity Stop – High (1AS15 only)
 - Dry Well - High (switch to low if it trips while pumping water)
 - Low Pressure Cut-Off - Off
 - Pressure Drop - 5 or 20 PSI
 - Transducer - Not Connected
 - Transducer Jumper - Top Position (Installer Must Move)
 - Float Switch Connected to Run/Stop Input

FLOAT SWITCH OPERATION - Filling a Pond or Tank and Constant Pressure System:

- Connect two wires from a float (level) switch to fill or empty a tank or pond and a pressurized system. The maximum switch wire length tested is 200'. The pump will operate at various speeds and try to maintain the set point pressure. If piping is large and it cannot maintain set point pressure it will operate at maximum speed.
- Typical UIB Settings:
 - 60 or 80 Hertz (depends on pump/motor) (3AS__ only)
 - Pump Sensitivity Stop – High (1AS15 only)
 - Dry Well - High (switch to low if it trips while pumping)
 - Low Pressure Cut-Off - On (switch to off if pressure drops by 20 PSI or more)
 - Pressure Drop - 5 PSI
 - Transducer - Connected
 - Transducer Jumper - Bottom Position (Factory Setting)
 - Float Switch Connected to Run/Stop Input

NOTE: Not recommended to operate by switching drive On/Off. It is recommended for these applications to use run/stop input.

Transducer Jumper

 DANGER Explosion Hazard. Keep jumper in bottom position whenever a pressure transducer is used. Failure to do so may cause a pressure transducer error to be ignored and an over-pressure hazard to result.

For applications not requiring a pressure transducer such as level control using a float switch, the transducer can be removed. When the transducer is not used, the Transducer Jumper must be placed in the top position to prevent a sensor error. Never place the jumper in the top position when using a pressure transducer. Note that the Status Display will show a low pressure (<5 PSI) when this is done.

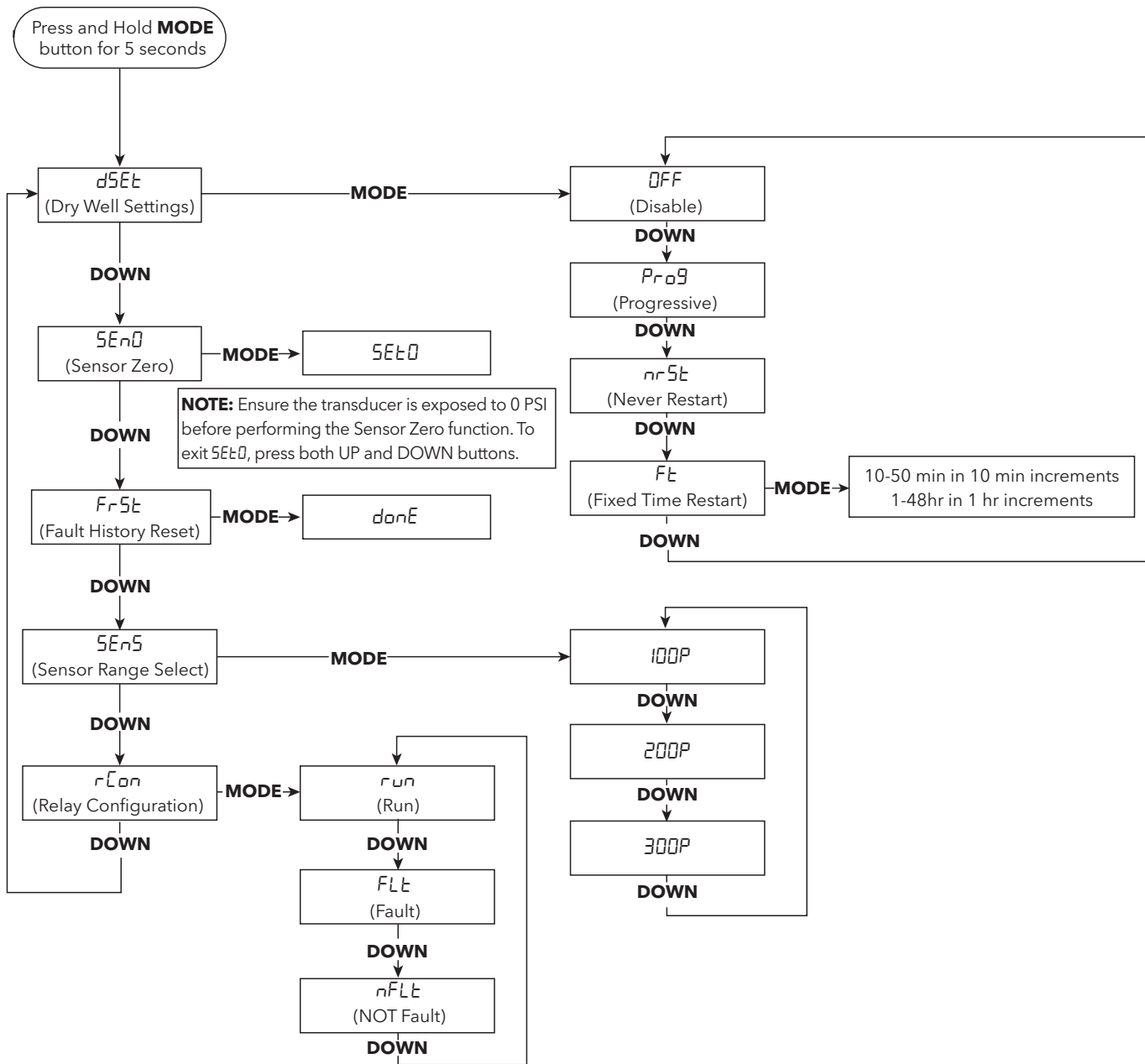
6: ADVANCED MENU

The Advanced Menu can be used to configure various functions within the controller. These functions include configuring the Dry Well function, Sensor Zero function, Fault Code History Reset function and configuring the functionality of the Relay Output.

NAVIGATION

To enter the Advanced Menu press and hold the MODE button for 5 seconds. The Parameter Display will then indicate the name of the first parameter group within the parameter group list, Dry Well Settings, “dSEt”. The UP and DOWN buttons can be used to navigate to the next parameter group. Pressing the MODE button again will enter the parameter group to allow configuring the settings within the group. The UP and DOWN buttons can then be used to navigate through the settings within the parameter group. Pressing the MODE button while within the parameter group will select or activate the desired setting. The parameter display will blink to confirm the parameter was saved. An indicator light in the lower-right corner of the display will illuminate to show that it is the active or selected setting within the parameter group. Pressing both the UP and DOWN buttons together will exit the parameter group or exit the advanced menu if in the parameter group list. The controller will automatically exit the Advanced Menu if no buttons are pressed for 15 seconds. The flow diagram on the next page illustrates this functionality. Note that the diagram shows that the DOWN button is used to navigate through the menu but the UP button can be used to navigate in the opposite direction.

- To exit the Advanced Menu, in the parameter group list, press UP and DOWN buttons together or the menu will automatically exit if no buttons are pressed for 15 seconds.
- To return to the parameter group list, press UP and DOWN buttons together.
- To save, select or activate the displayed setting, press the MODE button. The parameter display will blink to confirm the setting was saved or made active.
- The active or selected setting within a parameter group is indicated by an indicator light in the lower right corner of the parameter display.



DRY WELL SETTINGS - dSEt

The Dry Well function is used to protect the pump against damage caused by situations such as running dry, running against at no flow or running while air bound. Use the dSEt menu to configure this function.

OFF – Disable. This selection will disable the Dry Well function. If selected there will be no protection against damage to the pump from a dry well condition. Make this selection only if the pump will never run out of water, break suction, run against a closed valve or become plugged.

Pr09 – Progressive Restart. This selection controls the restart feature of the Dry Well function. When selected, the controller will automatically reset the Dry Well Fault (F02, 2 blinks) according to the Progressive Reset schedule. This is the default setting for the dSEt menu.

PROGRESSIVE RESET SCHEDULE	
Number of Dry Well Faults Detected	Reset Time
1	1 minute
2	10 minutes
3	20 minutes
4	30 minutes
5 and greater	60 minutes

nrSt – Never Restart. This selection disables the restart feature of the Dry Well function. When selected, the controller will never reset if a Dry Well Fault (F02, 2 blinks) is detected. If this setting is selected the Dry Well fault can only be reset by powering down the controller or by pressing the UP and DOWN buttons at the same time.

FLt – Fixed Time Restart. This selection allows the user to select a fixed time between detection of a Dry Well fault and an automatic restart. This function will continue to reset the Dry Well fault and restart the controller after the specified

restart time regardless of the number of Dry Well faults detected. To select a fixed restart time, select **FE** from within the **dSEt** parameter group. Then use the UP and DOWN arrows to select the desired restart time. The default restart time is 10 minutes. The restart time can be adjusted from 10 minutes to 50 minutes in 10 minute increments or from 1 hour to 48 hours in 1 hour increments.

SENSOR ZERO - 5En0

The Sensor Zero function is used to calibrate the 0 PSI output value of the transducer to the controller. Performing the Sensor Zero will correct any errors in the pressure reading on the Parameter Display. This procedure is recommended when changing transducers. To perform the Sensor Zero function, select **5En0** from the Parameter Group list and press MODE. If the pump is running, the controller will stop the pump and will display **5Et0**. After the display shows **5Et0** bring the system pressure to 0 PSI by opening valves to release the system pressure. After the system pressure reaches 0 PSI, press the MODE button to perform the Sensor Zero function. The display will blink the **5Et0** screen to indicate the process has completed successfully. If the display does not blink, ensure the voltage on the pressure transducer input (measure DC voltage from the white wire to the black wire) is between 0.3Vdc and 0.7Vdc. Press both the UP and DOWN buttons to exit from the **5Et0** screen.

FAULT HISTORY RESET - Fr5t

The Fault History Reset function can be used to reset the last four faults that are stored by the controller. This function can be used as a diagnostic tool to track the occurrence of faults or to validate that troubleshooting efforts have solved an existing issue. To reset the controller fault history, select **Fr5t** from the parameter group list and press MODE. When the fault history has been reset, the display will blink **d0nE**.

SENSOR RANGE SELECT - 5En5

The controller can be configured to operate with pressure transducers having different maximum pressure ranges. This can be done to achieve a higher system pressure. For example, if the controller is supplied with a 100 PSI pressure transducer the maximum allowable pressure setpoint is 85 PSI. If a pressure setpoint higher than 85 PSI is desired a 200 PSI pressure transducer can be used which increases the maximum allowable pressure setpoint to 170 PSI.

To configure the transducer pressure range, select **5En5** from the parameter group list and press MODE to enter the parameter group. Use the UP and DOWN arrows within the parameter group to select the desired maximum pressure range. Select either: **100P**, **200P** or **300P** for 100 PSI, 200 PSI and 300 PSI respectively. To select and save the maximum pressure range, press MODE. The controller will blink the pressure range to indicate the parameter was saved. The indicator light in the lower right corner of the display will indicate the selected pressure range.

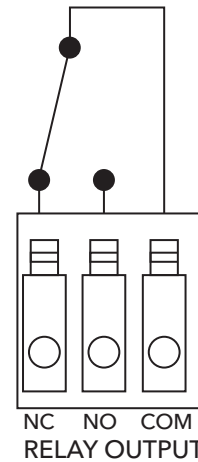
NOTE: The pressure setpoint will be adjusted when changing the sensor range. For example, if the pressure setpoint is set to 60 PSI and the Sensor Range is set to 100 PSI and then the Sensor Range is changed to 200 PSI, the resulting pressure setpoint will be 120 PSI. Ensure the pressure setpoint is verified after changing the Sensor Range.

RELAY CONFIGURATION - rC0n

The **rC0n** function can configure the Relay Output on the UIB to activate under various conditions. The Relay Output can be configured to activate when the pump is running (**r0n**), on a fault (**FLE**) or on when there is no fault (**nFLE**).

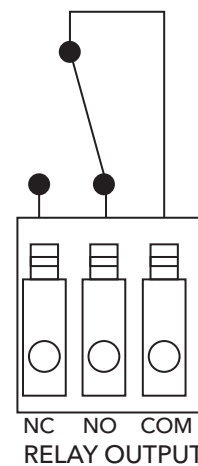
The relay can be used to control an external device such as an auxiliary pump, accessory device or status sending device. The relay can directly control an external device rated up to 10A at 120Vac, or 5A at 240V. If the power requirements of the external device are greater than these ratings, use the relay output to power the coil of an external power contactor or higher rated relay.

When the Relay Output is INACTIVE or OFF, the relay is in the NORMAL state. In the NORMAL state the coil of the relay is OFF and the contacts inside the relay will connect the COM (common) terminal to the NC (normally closed) terminal. The diagram below illustrates these connections.



Relay Off/Normal State

When the Relay Output is ACTIVE or ON, the coil of the relay is ON and the contacts inside the relay will connect the COM (common) terminal to the NO (normally open) terminal. The diagram below illustrates these connections.



Relay Active/On

The default setting is **r0n** which means that when the pump is running, the relay is active/on and when the pump is off the relay is off/normal state. Select **FLE** to activate the relay when a fault occurs. Select **nFLE** to activate the relay when the system is not faulted. This setting is useful to detect when the system has lost power. Note that the **FLE** setting will not detect loss of power as a fault.

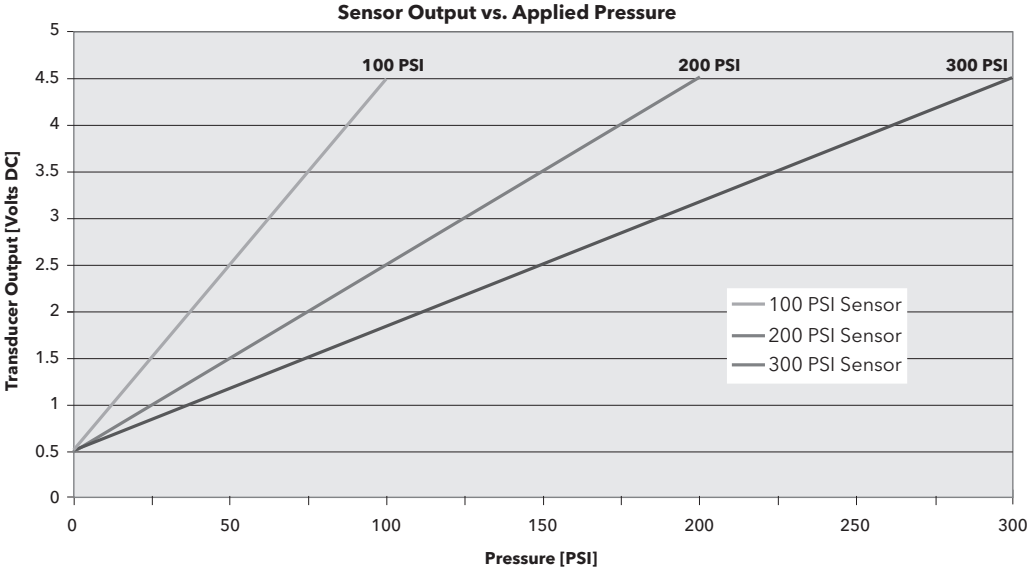
7: TROUBLESHOOTING

Troubleshooting Error Codes

The Status Indicator and Parameter Display are visible through the cover lable to indicate the system status, i.e. running, stopped or faulted. When faulted, the status indicator light will be Red and the Parameter Display will show the error code in the format **F00** where "F" indicates fault and "00" will be the fault code number. The Status Indicator will flash the error code as the number of flashes followed by a 1 second pause. The number of flashes can be from 2 to 9. The error code will be repeated until the fault is cleared. The following describes state of the Status Indicator and Parameter Display duing various conditions and faults:

NO LIGHT			
Parameter Display	Status Indicator	Controller Status	Description
No Light	No Light	Low/No Input Voltage	Check the input voltage to the controller. Measure the voltage between L1 and L2 using an AC Voltmeter. This voltage should be greater than 190Vac.
Pr00	No Light	Program Mode	The controller is set to programming mode when the Programming Position (located in the upper-left corner of the UIB) pins are connected together at power up. To remove the controller from Program Mode, remove the jumper/ connection connecting the Programming Position pins, turn off power to the controller, wait 1 minute, turn on power to the controller.
GREEN LIGHT CODES			
Parameter Display	Status Indicator	Controller Status	Description
Various	Constant Green	Standby/Low Voltage	Constant Green Light indicates the pump is in Standby mode with the pump stopped. The system is in Standby mode when there is no flow in the system and the pressure setting has been reached. It is also possible the system is in a Low Voltage condition where the line input voltage is between 85-190VAC.
STOP	Constant Green	Pump Stopped	A Constant Green Status Indicator along with a STOP message on the Parameter Display indicates that the Run/ Stop input is open which forces the pump to stop. Check the device controlling the Run/Stop Input for proper operation. Verify the input is wired correctly. The Run/Stop Input wiring must never be installed in the same conduit as power wiring and there must be a minimum of 12" between the Run/Stop Input wiring and the power wires.
Various	Blinking Green	Pump Running	Flashing Green Light indicates the pump is running.
RED LIGHT CODES			
Parameter Display Fault Code	Flashes	Controller Status	Description
F01	Constant Red	Controller Error To clear fault perform a System Reset, or turn off power to controller, wait 1 minute, turn on power to controller. If fault persists contact installer.	This information is to be used by professional installers or qualified personnel only. Internal controller fault. To clear the fault, turn off power to the controller, wait 1 minute, turn on power to the controller. If fault persists Replace controller.

RED LIGHT CODES			
Parameter Display Fault Code	Flashes	Controller Status	Description
F02	2 Blinks	Dry Well No Water/Loss of Prime	<p>This information is to be used by professional installers or qualified personnel only.</p> <p>This fault can be caused by:</p> <ul style="list-style-type: none"> • Water supply level in well falls below suction inlet of pump. • Plugged suction screen. • Restriction in pipe between pump and pressure sensor. • Air bound pump – see “Purging System” • Incorrect setting of “MAXIMUM SPEED” switch. Be sure to set the “MAXIMUM SPEED” switch to 80 Hz when using mismatched pumps (water ends) and motors. • Incorrect setting of “MOTOR OVERLOAD SETTING (SFA)” switch. Ensure the Motor Overload Setting (SFA) Switch is not set higher than the Service Factor Amps (SFA) listed on the motor nameplate. <p>Refer to the dSEt menu for details on configuring the Dry Well Function. The controller may automatically restart if Progressive (Pr oG) or Fixed Time (FE) restart is selected.</p> <p>If nuisance tripping continues after adequate water supply has been verified:</p> <ul style="list-style-type: none"> • Set the Dry Well Sensitivity switch to LOW • Measure the maximum possible output current for the system. Set the MOTOR OVERLOAD Setting according to this value instead of motor SFA. • Turn the Dry Well Function off by selecting OFF in the dSEt parameter group in the Advanced Menu. <p>Dry Well can be reset by pressing both pushbuttons at the same time or by turning off the power to the controller.</p>
F03	3 Blinks	Sensor Fault	<p>This fault can be caused by:</p> <ul style="list-style-type: none"> • Disconnected sensor. Disconnect sensor from sensor cable connector and reconnect to ensure a good connection. • Disconnected sensor cable lead inside the controller. Check for loose wires where the sensor cable connects to the circuit board by tugging on each wire. • Broken wire in the sensor cable. • Miswired sensor cable. Check that the wires are connected to the correct terminals on the sensor connector. The correct location of the wires is indicated on the circuit board. B=Black, R=Red, W=White, G=Green. • Failed sensor. With the sensor cable connected to the circuit board, measure the DC voltage between the black and white wires of the sensor cable at the sensor connector. The voltage measured should be between 0.5Vdc and 4.5Vdc depending on the system pressure, see chart below. • A vacuum on the sensor (transducer) of 17" Hg or more will cause a sensor fault, eliminate the vacuum. <p>NOTE: Ensure the Transducer Jumper is properly placed for the application. Refer to the Transducer Jumper Section for details.</p>

RED LIGHT CODES																																			
Parameter Display Fault Code	Flashes	Controller Status	Description This information is to be used by professional installers or qualified personnel only.																																
F03	3 Blinks	Sensor Fault (continued)	 <p>The graph shows three linear relationships between pressure and transducer output. The 100 PSI sensor has the steepest slope, reaching 4.5V at 100 PSI. The 200 PSI sensor reaches 4.5V at 200 PSI. The 300 PSI sensor has the shallowest slope, reaching 4.5V at 300 PSI. All three sensors start at 0.5V at 0 PSI.</p> <table border="1"> <caption>Sensor Output vs. Applied Pressure</caption> <thead> <tr> <th>Pressure [PSI]</th> <th>100 PSI Sensor [Volts DC]</th> <th>200 PSI Sensor [Volts DC]</th> <th>300 PSI Sensor [Volts DC]</th> </tr> </thead> <tbody> <tr> <td>0</td> <td>0.5</td> <td>0.5</td> <td>0.5</td> </tr> <tr> <td>50</td> <td>1.5</td> <td>1.25</td> <td>1.0</td> </tr> <tr> <td>100</td> <td>2.5</td> <td>2.0</td> <td>1.5</td> </tr> <tr> <td>150</td> <td>-</td> <td>2.75</td> <td>2.0</td> </tr> <tr> <td>200</td> <td>-</td> <td>3.5</td> <td>2.5</td> </tr> <tr> <td>250</td> <td>-</td> <td>4.25</td> <td>3.0</td> </tr> <tr> <td>300</td> <td>-</td> <td>5.0</td> <td>3.5</td> </tr> </tbody> </table>	Pressure [PSI]	100 PSI Sensor [Volts DC]	200 PSI Sensor [Volts DC]	300 PSI Sensor [Volts DC]	0	0.5	0.5	0.5	50	1.5	1.25	1.0	100	2.5	2.0	1.5	150	-	2.75	2.0	200	-	3.5	2.5	250	-	4.25	3.0	300	-	5.0	3.5
Pressure [PSI]	100 PSI Sensor [Volts DC]	200 PSI Sensor [Volts DC]	300 PSI Sensor [Volts DC]																																
0	0.5	0.5	0.5																																
50	1.5	1.25	1.0																																
100	2.5	2.0	1.5																																
150	-	2.75	2.0																																
200	-	3.5	2.5																																
250	-	4.25	3.0																																
300	-	5.0	3.5																																
F04	4 Blinks	Over Current	<p>This fault can be caused by:</p> <ul style="list-style-type: none"> • Using wrong motor (wrong voltage or phase). • Mechanical binding from debris in pump. • Electrical or mechanical failure of the motor. • Incorrect setting of "MOTOR OVERLOAD SETTING (SFA)" switch. The controller will issue an Over Current fault if the switch is set too low. <p>The controller estimates the motor temperature by comparing the output current to the Motor Overload Setting and monitoring the output frequency. If the motor runs at high output current or is current limiting the motor temperature estimate increases. If the temperature estimate is too high the controller stops the motor and issues an Over Current fault. While the overcurrent fault is active, the controller will display a countdown timer showing the time in seconds until the controller attempts to restart the motor. It can take up to 15 minutes (900 seconds) for the controller to automatically attempt to restart the motor. Once countdown expires the controller will automatically clear the fault and attempt to restart the motor. If three overcurrent faults are detected the controller will not longer attempt to restart, at this time the controller will display rSEt. If rSEt is shown the controller must be manually reset by turning power off to the controller for 1 minute. Once power is restored, the controller will attempt to restart the motor. If the motor is still in an overcurrent condition the sequence above will repeat. If the fault persists, troubleshoot the output cable, motor and pump to determine the cause of the over current.</p> <p>While system troubleshooting, the motor temperature estimate and countdown timer should be reset by performing a system reset (software versions 6x.4.xx and later). To perform a system reset, press and hold the UP and DOWN buttons at the same time for 10 seconds. It is also recommended to reset the fault history (refer to Advanced Menu section for details) since the number of Over Current faults stored in fault history is used to determine the motor temperature estimate and the restart time.</p> <p>The controller has turned off the motor to protect it against damage due to an over current or overload condition. If 3 Over Current faults are detected, the controller will need to be manually reset. If fault persists contact installer.</p>																																

RED LIGHT CODES			
Parameter Display Fault Code	Flashes	Controller Status	Description
F05	5 Blinks	<p><u>Short Circuit</u></p> <p>The controller will not restart if displaying this fault. To clear the fault perform a System Reset, or turn off power to the controller, wait 1 minute, turn on power to the controller. If fault persists contact installer.</p>	<p>⚠ WARNING Repeated exposure to Short Circuit conditions can damage the controller. Do not reset this fault without fixing the short circuit condition more than twice.</p> <p>This fault can be caused by:</p> <ul style="list-style-type: none"> • Electrical failure of the motor. • Electrical failure of wiring between controller and motor. <p>Verify the error by turning power to controller off for 1 minute and then on. If error persists, motor and wiring between controller and motor must be checked. Turn power off for 5 minutes. Remove the motor wires from the output terminal block. Check wiring and motor for shorting phase to phase and phase to ground. Perform the tests described in the Insulation and Winding Resistance Tests section of this manual. Refer to motor's manual for information on resistance readings.</p>
F06	6 Blinks	<p><u>Ground Fault</u></p> <p>The controller will not restart if displaying this fault. To clear the fault perform a System Reset, or turn off power to the controller, wait 1 minute, turn on power to the controller. If fault persists contact installer.</p>	<p>⚠ WARNING Repeated exposure to Ground Fault conditions can damage the controller. Do not reset this fault without fixing the ground fault condition more than twice.</p> <p>⚠ WARNING This device does not provide personnel protection against shock. This function is intended for equipment protection only.</p> <p>This fault can be caused by:</p> <ul style="list-style-type: none"> • Electrical failure of the motor • Electrical failure of wiring between controller and motor. • Miswiring of motor cable. <p>Verify the error by turning power to controller off for 1 minute and then on. If error persists, motor and wiring between controller and motor must be checked. Turn power off and wait 5 minutes. Remove the motor wires from the output terminal block. Perform the tests described in the Insulation and Winding Resistance Tests of this manual.</p>
F07	7 Blinks	<p><u>Temperature</u></p> <p>The controller will automatically restart when the temperature reaches an acceptable level. If fault persists contact installer.</p>	<p>This fault can be caused by:</p> <ul style="list-style-type: none"> • High ambient temperature. The maximum ambient temperature rating is 122° F (50° C). • Low ambient temperature. The minimum ambient temperature rating is -4° F (-20° C). <p>Check for a fan failure. The fan will turn on when the temperature inside the controller reaches 140° F (60° C). The fan will turn on for 1 second each time the controller starts the motor. The fan will run for 10 seconds during the first start of the motor after power up. If the fan never turns on, check fan connections and replace as needed. Ensure that the fan is not bound or clogged</p>

RED LIGHT CODES

Parameter Display Fault Code	Flashes	Controller Status	Description
F08	8 Blinks	<u>Open Lead</u> The controller will not restart if displaying this fault. To clear the fault perform a System Reset, or turn off power to the controller, wait 1 minute, turn on power to the controller. If fault persists contact installer.	<p>This information is to be used by professional installers or qualified personnel only.</p> <p>This fault can be caused by:</p> <ul style="list-style-type: none"> • Disconnected or broken wire between the controller and motor. <p>Verify the error by turning power to controller off for 1 minute and then on. If error persists, motor and wiring between controller and motor must be checked. Turn power off for 5 minutes. Remove the three motor wires from the terminal block. Using an ohmmeter, measure the resistance from phase to phase. A disconnected or broken wire will be indicated by a high resistance reading (20 ohms or higher).</p>
F09	9 Blinks	<u>Low Pressure Cut-Off</u> The controller will not restart if displaying this fault. To clear the fault perform a System Reset, or turn off power to the controller, wait 1 minute, turn on power to the controller. If fault persists contact installer.	<p>This fault can be caused by:</p> <ul style="list-style-type: none"> • Pressure 20 PSI below set point for 30 seconds. May be a broken pipe or tripped pressure relief valve. If 20 PSI or more pressure drop for 30 seconds is normal for the system, switch the Low Pressure Cut-Off protection off or change system to prevent the pressure drop.

8: INSULATION AND WINDING

RESISTANCE TESTS

INSULATION RESISTANCE

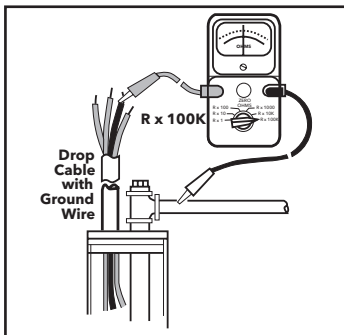
⚠ DANGER Electrocution Hazard. Turn off power and wait 5 minutes before opening cover.

1. Set the scale lever to R x 100K and adjust to 0.
2. Disconnect motor leads from controller (note position of wires). Connect an ohmmeter lead to any one of the motor leads and the other to the metal drop pipe. If the drop pipe is plastic, connect the ohmmeter lead to the metal well casing or ground wire.

Normal Ohm and Megohm Values (Insulation Resistance) Between All Leads and Ground

Insulation resistance does not vary with rating. All motors of all HP, voltage and phase rating have similar values of insulation resistance.

Condition of Motor and Leads	Ohms Value	Megohm Value
A new motor (without drop cable).	20,000,000 (or more)	20.0
A used motor which can be reinstalled in the well.	10,000,000 (or more)	10.0
New motor in the well	2,000,000 (or more)	2.0 (or more)
Motor in the well in good condition	500,000 - 2,000,000	0.5 - 2.0
Insulation damage, locate and repair	Less than 500,000	Less than .50



What it Means

1. If the ohm value is normal, the motor windings are not grounded and the cable insulation is not damaged.
2. If the ohm value is below normal, either the windings are grounded or the cable insulation is damaged. Check the cable at the well seal as the insulation is sometimes damaged by being pinched.

MOTOR WINDING RESISTANCE CHECKOUT

1. Set the scale lever to R x 1 for values under 10 ohms. For values over 10 ohms, set the scale lever to R x 10. Zero balance the ohmmeter.

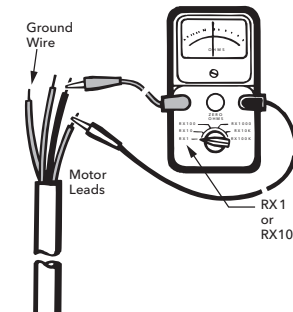
⚠ DANGER Electrocution Hazard. Turn off power and wait 5 minutes before opening cover.

2. Connect the ohmmeter leads as shown below.

Cable Resistance – Copper

Size Cable	Paired Wire
	Resistance (ohms per foot)
14	.0050
12	.0032
10	.0020
8	.0013
6	.0008
4	.0005
2	.0003
0	.0002
00	.00015
000	.00013
0000	.00010

If aluminum cable is used the readings will be higher. Divide the ohm readings on this chart by 0.61 to determine the actual resistance of aluminum cable.



See motor data pages for motor resistance ratings.

What it Means

1. If all ohm values are normal, the motor windings are neither shorted nor open, and the cable colors are correct.
2. If any one ohm value is less than normal, the motor is shorted.
3. If any one ohm value is greater than normal, the winding or the cable is open or there is a poor cable joint or connection.
4. If some ohm values are greater than normal and some less and the motor is single phase with red, black and yellow wires, then the leads are mixed.

LIMITED CONSUMER 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.

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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.xylem.com for the name and location of the nearest dealer providing warranty service.



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