WALCHEM
IWAKI America Inc.

W600 Series Controllers

W600 Series

Water Treatment Controller

Instruction Manual

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Notice

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Proprietary Material

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Statement of Limited Warranty

WALCHEM warrants equipment of its manufacture, and bearing its identification to be free from defects in workmanship and material for a period of 24 months for electronics and 12 months for mechanical parts and electrodes from date of delivery from the factory or authorized distributor under normal use and service and otherwise when such equipment is used in accordance with instructions furnished by WALCHEM and for the purposes disclosed in writing at the time of purchase, if any. WALCHEM's liability under this warranty shall be limited to replacement or repair, F.O.B. Holliston, MA U.S.A. of any defective equipment or part which, having been returned to WALCHEM, transportation charges prepaid, has been inspected and determined by WALCHEM to be defective. Replaceable elastomeric parts and glass components are expendable and are not covered by any warranty.

THIS WARRANTY IS IN LIEU OF ANY OTHER WARRANTY, EITHER EXPRESS OR IMPLIED, AS TO DESCRIPTION, QUALITY, MERCHANTABILITY, FITNESS FOR ANY PARTICULAR PURPOSE OR USE, OR ANY OTHER MATTER.

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1.0 INTRODUCTION

The Walchem W600 Series controllers offer a high level of flexibility in controlling water treatment applications.

One or two sensor inputs are available that are compatible with a variety of sensors:

- Contacting conductivity
- Electrodeless conductivity
- pH
- ORP
- Any Walchem disinfection sensor

An analog (4-20 mA) sensor input card with two input circuits is also available for use with 2, 3 or 4-wire transmitters.

Six relay outputs may be set to a variety of control modes:

- On/Off set point control
- Time Proportional control
- Pulse Proportional Control (requires pulse output relay option)
- Dual set point
- Timer
- Bleed or Feed based on a Water Contactor or Paddlewheel flow meter input
- Cycles of Concentration
- Feed and Bleed
- Feed and Bleed with Lockout
- Feed as a percent of Bleed
- Feed as a percent of elapsed time
- Daily, Weekly, 2-week or 4-week Biocide timers with pre-bleed and post-add lockout of bleed
- Intermittent sampling for boilers with proportional blowdown, controlling on a trapped sample
- Always on unless interlocked
- Diagnostic Alarm triggered by:
  - High or Low sensor reading
  - No Flow
  - Relay output timeout
  - Sensor error

An option card with two isolated analog outputs may be installed to retransmit sensor input signals to a chart recorder, datalogger, PLC or other device. They may also be connected to valves, actuators or metering pumps for linear proportional control.

An Ethernet option provides remote access to the controller's programming via a PC connected directly, via a local area network, or via Walchem's VTouch account management server.

Our USB features provide the ability to upgrade the software in the controller to the latest version. The Config file feature allows you to save all the set points from a controller onto a USB flash disk, and then import them into another controller, making the programming of multiple controllers fast and easy. The data logging feature allows you to save the sensor readings and relay activation events to a USB flash disk.

2.0 SPECIFICATIONS

2.1 Measurement Performance

0.01 Cell Contacting Conductivity

Range	0-300 µS/cm
Resolution	0.01 µS/cm, 0.0001 mS/cm, 0.001 mS/m, 0.0001 S/m, 0.01 ppm
Accuracy	± 1% of reading

0.1 Cell Contacting Conductivity

Range	0-3,000 µS/cm
Resolution	0.1 µS/cm, 0.0001 mS/cm, 0.01 mS/m, 0.0001 S/m, 0.1 ppm
Accuracy	± 1% of reading

1.0 Cell Contacting Conductivity

Range	0-30,000 µS/cm
Resolution	1 µS/cm, 0.001 mS/cm, 0.1 mS/m, 0.0001 S/m, 1 ppm
Accuracy	± 1% of reading

10.0 Cell Contacting Conductivity

Range	0-300,000 µS/cm
Resolution	10 µS/cm, 0.01 mS/cm, 1 mS/m, 0.001 S/m, 10 ppm
Accuracy	± 1% of reading

pH

Range	-2 to 16 pH units
Resolution	0.01 pH units
Accuracy	± 0.01% of reading

ORP

Range	-1500 to 1500 mV
Resolution	0.1 mV
Accuracy	± 1 mV

Disinfection Sensors

Range (mV)	-2000 to 1500 mV
Resolution (mV)	0.1 mV
Accuracy (mV)	± 1 mV
Range (ppm)	0-2 ppm to 0-20,000 ppm
Resolution (ppm)	Varies with range and slope
Accuracy (ppm)	Varies with range and slope

Temperature

Range	23 to 500°F (-5 to 260°C)
Resolution	0.1°F (0.1°C)
Accuracy	± 1% of reading

Analog (4-20 mA)

Range	0 to 22 mA
Resolution	0.01 mA
Accuracy	± 0.5% of reading

Electrodeless Conductivity

Ranges	Resolution	Accuracy
500-12,000 µS/cm	1 µS/cm, 0.01 mS/cm, 0.1 mS/m, 0.001 S/m, 1 ppm	± 1% of reading
3,000-40,000 µS/cm	1 µS/cm, 0.01 mS/cm, 0.1 mS/m, 0.001 S/m, 1 ppm	± 1% of reading
10,000-150,000 µS/cm	10 µS/cm, 0.1 mS/cm, 1 mS/m, 0.01 S/m, 10 ppm	± 1% of reading
50,000-500,000 µS/cm	10 µS/cm, 0.1 mS/cm, 1 mS/m, 0.01 S/m, 10 ppm	± 1% of reading
200,000-2,000,000 µS/cm	100 µS/cm, 0.1 mS/cm, 1 mS/m, 0.1 S/m, 100 ppm	± 1% of reading

Temperature °C	Range Multiplier	Temperature °C	Range Multiplier
0	**181.3**	**80**	**43.5**
10	**139.9**	**90**	**39.2**
15	**124.2**	**100**	**35.7**
20	**111.1**	**110**	**32.8**
25	**100.0**	**120**	**30.4**
30	**90.6**	**130**	**28.5**
35	**82.5**	**140**	**26.9**
40	**75.5**	**150**	**25.5**
50	**64.3**	**160**	**24.4**
60	**55.6**	**170**	**23.6**
70	**48.9**	**180**	**22.9**

Note: Conductivity ranges above apply at 25°C. At higher temperatures, the range is reduced per the range multiplier chart.

2.2 Electrical: Input/Output

Input Power 100 to 240 VAC, 50 or 60 Hz, 7 A maximum
Fuse: 6.3 A

Inputs

Sensor Input Signals (0, 1 or 2 depending on model code)

Contacting Conductivity — 0.01, 0.1, 1.0, or 10.0 cell constant OR
Electrodeless Conductivity — OR
Disinfection — OR
Amplified pH or ORP — Requires a preamplified signal. Walchem WEL or WDS series recommended.
±5VDC power available for external preamps.

Each sensor input card contains a temperature input

Temperature — 100 or 1000 ohm RTD, 10K or 100K Thermistor

Analog (4-20 mA) Sensor Input (0, 2 or 4 depending on model code)

2-wire loop powered or self-powered transmitters supported
3 or 4 –wire transmitters supported
Each sensor input board has two channels
Channel 1, 130 ohm input resistance
Channel 2, 280 ohm input resistance

Available Power — Two independent isolated 24 VDC ± 15% supplies per board
1.5 W maximum for each channel
2W (83 mA at 24 VDC) total power consumption for all channels (four total channels if two boards are installed; 2W is equivalent to 2 Little Dipper sensors)

Digital Input Signals (6):

State-Type Digital Inputs — Electrical: Optically isolated and providing an electrically isolated 9V power with a nominal 2.3mA current when the digital input switch is closed
Typical response time: < 2 seconds
Devices supported: Any isolated dry contact (i.e. relay, reed switch)
Types: Interlock

Low Speed Counter-Type Digital Inputs — Electrical: Optically isolated and providing an electrically isolated 9V power with a nominal 2.3mA current when the digital input switch is closed 0-10 Hz, 50 msec minimum width
Devices supported: Any device with isolated open drain, open collector, transistor or reed switch
Types: Contacting Flowmeter

High Speed Counter-Type Digital Inputs — Electrical: Optically isolated and providing an electrically isolated 9V power with a nominal 2.3mA current when the digital input switch is closed, 0-250 Hz, 1.25 msec minimum width
Devices supported: Any device with isolated open drain, open collector, transistor or reed switch
Types: Paddlewheel Flowmeter

Outputs

Powered mechanical relays (0 or 6 depending on model code):

Pre-powered on circuit board switching line voltage
6 A (resistive), 1/8 HP (93 W)
All six relays are fused together as one group, total current for this group must not exceed 6A

Dry contact mechanical relays (0, 2 or4 depending on model code):

6 A (resistive), 1/8 HP (93 W)
Dry contact relays are not fuse protected

Pulse Outputs (0, 2 or4 depending on model code):

Opto-isolated, Solid State Relay
200mA, 40 VDC Max.
VLOWMAX = 0.05V @ 18 mA

4 - 20 mA (0 or 2) — Internally powered
Fully isolated
600 Ohm max resistive load
Resolution 0.0015% of span
Accuracy ± 0.5% of reading

Ethernet	10/100 802.3-2005 Auto MDIX support Auto Negotiation

Agency Approvals

Safety	UL 61010-1:2012 3rd Ed. CSA C22.2 No. 61010-1:2012 3rd Ed. IEC 61010-1:2010 3rd Ed. EN 61010-1:2010 3rd Ed.
EMC	IEC 61326-1:2005 EN 61326-1:2006

Note: For EN61000-4-6, EN61000-4-3 the controller met performance criteria B.
*Class A equipment: Equipment suitable for use in establishments other than domestic, and those directly connected to a low voltage (100-240 VAC) power supply network which supplies buildings used for domestic purposes.

2.3 Mechanical

Enclosure Material	Polycarbonate
Enclosure Rating	NEMA 4X (IP65)
Dimensions	9.5” x 8” x 4” (241 mm x 203 mm x 102 mm)
Display	320 x 240 pixel monochrome backlit display with touchscreen
Operating Ambient Temp	-4 to 131 °F (-20 to 55 °C)
Storage Temperature	-4 – 176°F (-20 – 80°C)

2.4 Variables and their Limits

	Low Limit	High Limit
Sensor input settings		
Alarm limits	Low end of sensor range	High end of sensor range
Conductivity alarm dead band	Low end of sensor range	High end of sensor range
Cell constant	0.01	10
Installation Factor (Electrodeless conductivity only)	0.5	1.5
Cable length	0.1	3,000
PPM conversion factor (only if units = PPM)	0.001	10.000
Default temperature	-5	500
Deadband	Low end of sensor range	High end of sensor range
4 mA value (analog input only)	0	100
20 mA value (analog input only)	0	100
Flow meter input settings		
Totalizer alarm	0	100,000,000
Volume/contact	0	100,000
K Factor	0	1,000

Relay output settings

Output Limit Time	1 second	86,400 seconds (0 = unlimited)
Hand Time Limit	1 second	86,400 seconds (0 = unlimited)
Min Relay Cycle	0 seconds	300 seconds
Set Point	Low end of sensor range	High end of sensor range
Dead Band	Low end of sensor range	High end of sensor range
Feed duration (Flow Timer mode)	0 seconds	86,400 seconds
Accumulator volume (Flow Timer mode)	0	1,000,000
Feed Percentage (Bleed then Feed mode)	0%	100%
Feed Lockout Time Limit (Bleed & Feed, Bleed then Feed modes)	0 seconds	86,400 seconds
Prebleed Conductivity (Biocide mode)	1 (0 = no prebleed)	30,000
Prebleed Time (Biocide mode)	0 seconds	86,400 seconds
Bleed Lockout(Biocide mode)	0 seconds	86,400 seconds
Event duration (Biocide, Timer modes)	0 seconds	86,400 seconds
Proportional band (Time or Pulse Proportional mode)	0	30,000
Sample period (Time Proportional mode)	10 seconds	3600 seconds
Sample Time (Intermittent Sampling mode)	0 seconds	3600 seconds
Hold Time (Intermittent Sampling mode)	0 seconds	3600 seconds
Maximum Blowdown (Intermittent Sampling mode)	0 seconds	3600 seconds
Wait Time (Intermittent Sampling mode)	0 seconds	86,400 seconds
Max Rate (Pulse Proportional mode)	10 pulses/minute	480 pulses/minute
Minimum Output (Pulse Proportional mode)	0%	100%
Maximum Output (Pulse Proportional mode)	0%	100%

Analog (4-20 mA) output settings

4 mA Value	Low end of sensor range	High end of sensor range
20 mA Value	Low end of sensor range	High end of sensor range
Hand Output	0%	100%
Set Point	Low end of sensor range	High end of sensor range
Proportional Band	Low end of sensor range	High end of sensor range
Minimum Output	0%	100%
Maximum Output	0%	100%
Off Mode Output	0%	100%
Error Output	0 mA	21 mA

Configuration settings

Local Password	0000	9999
VTouch update period	1 minute	1440 minutes
VTouch reply timeout	10 seconds	60 seconds

Graph settings

Low axis limit	Low end of sensor range	High end of sensor range
High axis limit	Low end of sensor range	High end of sensor range

3.0 UNPACKING & INSTALLATION

3.1 Unpacking the unit

Inspect the contents of the carton. Please notify the carrier immediately if there are any signs of damage to the controller or its parts. Contact your distributor if any of the parts are missing. The carton should contain a W600 series controller and an instruction manual. Any options or accessories will be incorporated as ordered.

3.2 Mounting the electronic enclosure

The controller is supplied with mounting holes on the enclosure. It should be wall mounted with the display at eye level, on a vibration-free surface, utilizing all four mounting holes for maximum stability. Use M6 (1/4" diameter) fasteners that are appropriate for the substrate material of the wall. The enclosure is NEMA 4X (IP65) rated. The maximum operating ambient temperature is 131°F (55°C); this should be considered if installation is in a high temperature location. The enclosure requires the following clearances:

Top:	2" (50 mm)
Left:	8" (203 mm) (not applicable for prewired models)
Right:	4" (102 mm)
Bottom:	7" (178 mm)

3.3 Sensor Installation

Refer to the specific instructions supplied with the sensor being used, for detailed installation instructions.

General Guidelines

Locate the sensors where an active sample of water is available and where the sensors can easily be removed for cleaning. Position the sensor such that air bubbles will not be trapped within the sensing area. Position the sensor where sediment or oil will not accumulate within the sensing area.

In-Line Sensor Mounting

In-line mounted sensors must be situated so that the tee is always full and the sensors are never subjected to a drop in water level resulting in dryness. Refer to Figure 2 for typical installation.

Tap off the discharge side of the recirculation pump to provide a minimum flow of 1 gallon per minute through the flow switch manifold. The sample must flow into the bottom of the manifold in order to close the flow switch, and return to a point of lower pressure in order to ensure flow. Install an isolation valve on both sides of the manifold to stop flow for sensor maintenance.

IMPORTANT: To avoid cracking the female pipe threads on the supplied plumbing parts, use no more than 3 wraps of Teflon tape and thread in the pipe FINGER tight plus 1/2 turn! ***Do not use pipe dope to seal the threads of the flow switch because the clear plastic will crack!***

Submersion Sensor Mounting

If the sensors are to be submersed in the process, mount them firmly to the tank, and protect the cable with plastic pipe, sealed at the top with a cable gland, to prevent premature failure. Place the sensors in an area of good solution movement.

Sensors should be located such that they respond rapidly to a well-mixed sample of the process water and the treatment chemicals. If they are too close to the chemical injection point, they will see spikes in concentration and cycle on and off too frequently. If they are too far away from the chemical injection point, they will respond too slowly to the concentration changes, and you will overshoot the set point.

The **contacting conductivity sensor** should be placed as close to the controller as possible, to a maximum distance of 250 ft. (76 m). Less than 25 ft. (8 m) is recommended. The cable must be shielded from background electrical noise. Always route low voltage (sensor) signals with at least a 6" (15 cm) separation from AC voltage wiring.

The **electrodeless conductivity sensor** should be placed as close to the controller as possible, to a maximum distance of 250 ft. (76 m). Less than 25 ft. (8 m) is recommended. The cable must be shielded from background electrical noise. Always route low voltage (sensor) signals with at least a 6" (15 cm) separation from AC voltage wiring. These sensors are affected by the geometry and conductivity of their surroundings, so either maintain 6 inches (15 cm) of sample around the sensor or ensure that any nearby conductive or non-conductive items are consistently positioned. Do not install the sensor in the path of any electrical current that may be flowing in the solution, as this will shift the conductivity reading.

The **pH/ORP electrode** should be placed as close to the controller as possible, to a maximum distance of 1000 feet (300 m) from the controller. A junction box and shielded cable are available to extend the standard 20 foot (6 m) length. pH and ORP electrodes must be installed such that the measuring surfaces will always remain wet. A U-trap provided in the manifold design should achieve this, even if the sample flow stops. These electrodes also must be installed with the measuring surfaces pointing down; that is 5 degrees above the horizontal, at a minimum.

The **disinfection sensor** should be placed as close to the controller as possible, to a maximum distance of 1000 feet (300 m) from the controller. A junction box and shielded cable are available to extend the standard 20 foot (6 m) length. The sensor should be mounted such that the measuring surfaces will always stay wet. If the membrane dries out, it will respond slowly to changing disinfectant values for 24 hours, and if dried out repeatedly, will fail prematurely. The flow cell should be placed on the discharge side of a circulation pump or downhill from a gravity feed. Flow into the cell must come from the bottom side that has the ¾" x ¼" NPT reducing bushing installed. The reducing bushing provides the flow velocity required for accurate readings and must not be removed! A "U" trap should be installed so that if the flow stops, the sensor is still immersed in the water. The outlet of the flow cell must be plumbed to open atmosphere unless the system pressure is at or below 1 atmosphere. If the flow through the line cannot be stopped to allow for cleaning and calibration of the sensor, then it should be placed in a by-pass line with isolation valves to allow for sensor removal. Install the sensor vertically, with the measuring surface pointing down, at least 5 degrees above horizontal. Flow rate regulation must be done upstream from the sensor, because any flow restriction downstream can increase the pressure above atmospheric and damage the membrane cap!

Important Boiler Sensor Installation Notes: (refer to typical installation drawing)

1. Make sure the minimum water level in the boiler is at least 4-6 inches above the skimmer blowdown line. If the skimmer line is closer to the surface, it is likely that steam will be drawn into the line instead of boiler water. The skimmer line must also be installed above the highest tube.

2. Maintain a 3/4 inch minimum pipe ID with no flow restrictions from the tap for the boiler skimmer blowdown line to the electrode. If the ID is reduced below 3/4 inch, then flashing will

occur beyond that point and the conductivity reading will be low and erratic. Minimize the usage of tees, valves, elbows or unions between the boiler and the electrode.

3. A manual shut off valve should be installed so that the electrode can be removed and cleaned. This valve must be a full port valve in order to avoid a flow restriction.

4. Keep the distance between the tap for the boiler skimmer line to the electrode as short as possible, to a maximum of 10 feet.

5. Mount the electrode in the side branch of a cross in a horizontal run of pipe. This will minimize entrapment of steam around the electrode and will allow any solids to pass through.

6. There MUST be a flow restriction after the electrode and/or control valve in order to provide back pressure. This flow restriction will be either a flow control valve or an orifice union. The amount of the flow restriction will affect the blowdown rate as well, and should be sized accordingly.

7. Install the motorized ball valve or solenoid valve per the manufacturer's instructions.

8. For best results, align the hole in the conductivity electrode such that the direction of water flow is through the hole.

Guide to Sizing Blowdown Valves and Orifice Plates

1. **Determine the Rate of Steam Production in Pounds per Hour:**
   Either read off the boiler name plate (water-tube boilers) or
   Calculate from horsepower rating (fire-tube boilers): HP x 34.5 = lbs/hr.
   Example: 100 HP = 3450 lbs/hr.

2. **Determine the Concentration Ratio (BASED ON FEEDWATER)**
   A water treatment chemical specialist should determine the desired number of cycles of concentration. This is the ratio of TDS in the boiler water to TDS in the feedwater. Note that feedwater means the water that is fed to the boiler from the deaerator and includes makeup water plus condensate return. Example: 10 cycles of concentration has been recommended

3. **Determine the Required Blowdown Rate in Pounds Per Hour**
   Blowdown Rate = Steam Production / (Concentration Ratio –1)
   Example: 3450/(10-1) = 383.33 lbs./hr

4. **Determine if Continuous or Intermittent Sampling is Required**
   Use intermittent sampling when the boiler operation or loading is intermittent, or on boilers where the required blowdown rate is less than 25% of the smallest available flow control valve or less than the flow through the smallest orifice. See the graphs on the next page.

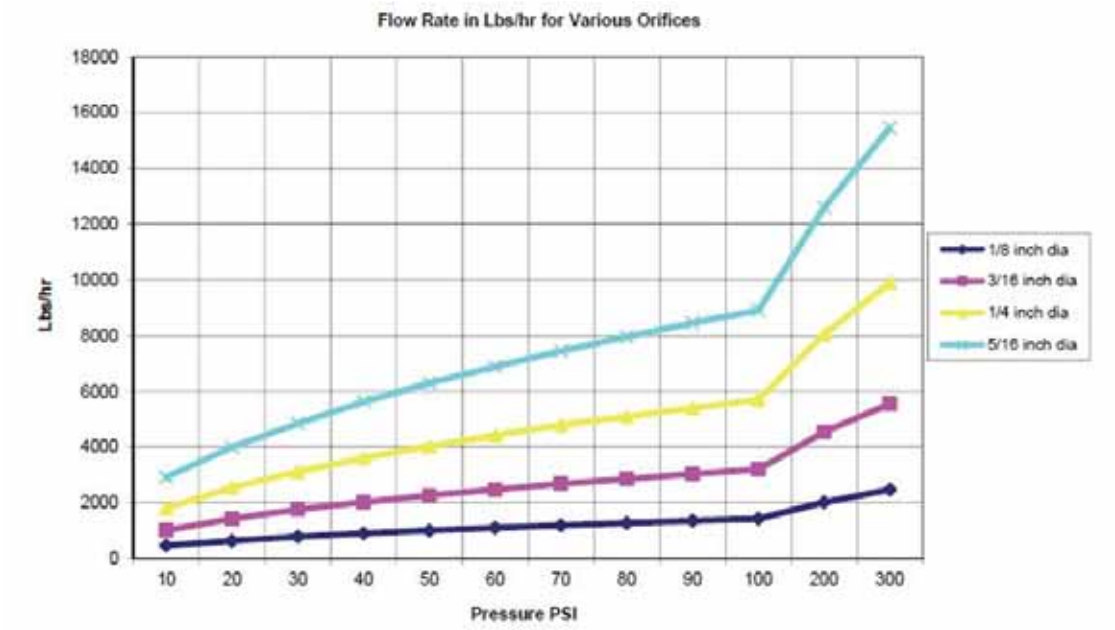
   Use continuous sampling when the boiler is operating 24 hours per day and the required blowdown rate is more than 25% of the smallest applicable flow control valve or orifice. See the graphs on the next page.

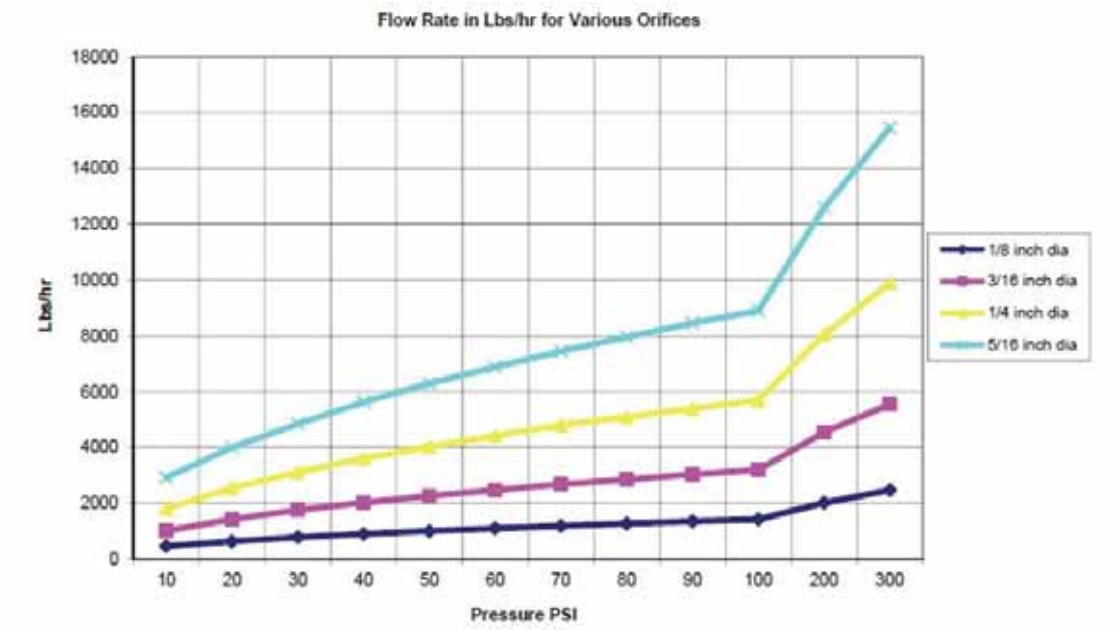
   Use of a flow control valve will give you the best control of the process, since the flow rate can be easily adjusted. The dial on the valve also gives you a visual indication if the flow rate has been changed. If the valve clogs, it can be opened to clear the obstruction, and closed to the previous position.

If an orifice plate is used, you must install a valve downstream from the orifice in order to fine tune the flow rate and provide additional back pressure in many applications.

Example: An 80 psi boiler has a Required Blowdown Rate of 383.33 lbs./hr. The maximum flow rate of the smallest flow control valve is 3250 lbs./hr. 3250 x 0.25 = 812.5 which is too high for continuous sampling. Using an orifice, the flow rate through the smallest diameter plate is 1275 lbs./hr. This is too high for continuous sampling.

5. **Determine the Orifice or Flow Control Valve Size for this Blowdown Rate**
   Use the following graphs to select a flow control device:





3.4 Icon Definitions

Symbol	Publication	Description
	IEC 417, No.5019	Protective Conductor Terminal
	IEC 417, No. 5007	On (Supply)
O	IEC 417, No. 5008	Off (Supply)
	ISO 3864, No. B.3.6	Caution, risk of electric shock
	ISO 3864, No. B.3.1	Caution

3.5 Electrical installation

The various standard wiring options are shown in figure 1, below. Your controller will arrive from the factory prewired or ready for hardwiring. Depending on your configuration of controller options, you may be required to hardwire some or all of the input/output devices. Refer to figures 6 through 17 for circuit board layout and wiring.

Note: when wiring the optional flow meter contactor input, the 4-20 mA outputs or a remote flow switch, it is advisable to use stranded, twisted, shielded pair wire between 22-26 AWG. Shield should be terminated at the controller at the most convenient shield terminal.

 CAUTION 

1. There are live circuits inside the controller even when the power switch on the front panel is in the OFF position! The front panel must never be opened before power to the controller is REMOVED!
   If your controller is prewired, it is supplied with an 8 foot, 18 AWG power cord with USA style plug. A tool (#1 Phillips driver) is required to open the front panel.
2. When mounting the controller, make sure there is clear access to the disconnecting device!
3. The electrical installation of the controller must be done by trained personnel only and conform to all applicable National, State and Local codes!
4. Proper grounding of this product is required. Any attempt to bypass the grounding will compromise the safety of persons and property.
5. Operating this product in a manner not specified by Walchem may impair the protection provided by the equipment.

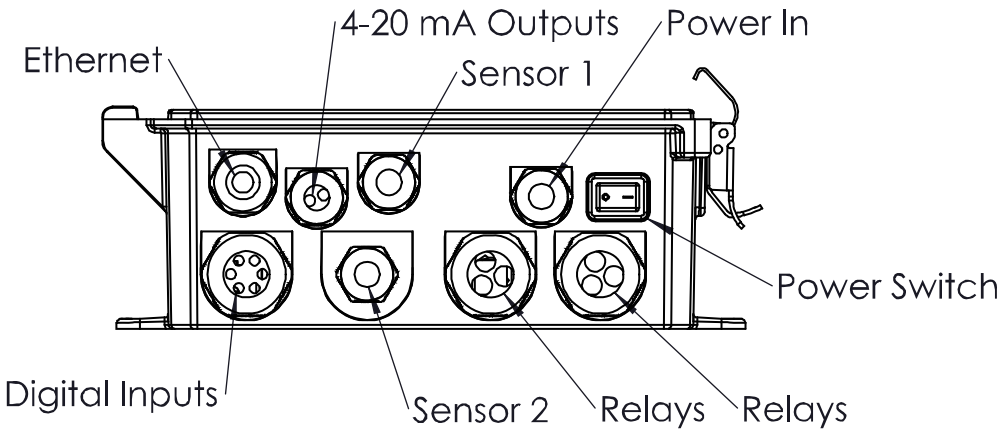


Figure 1 Conduit Wiring

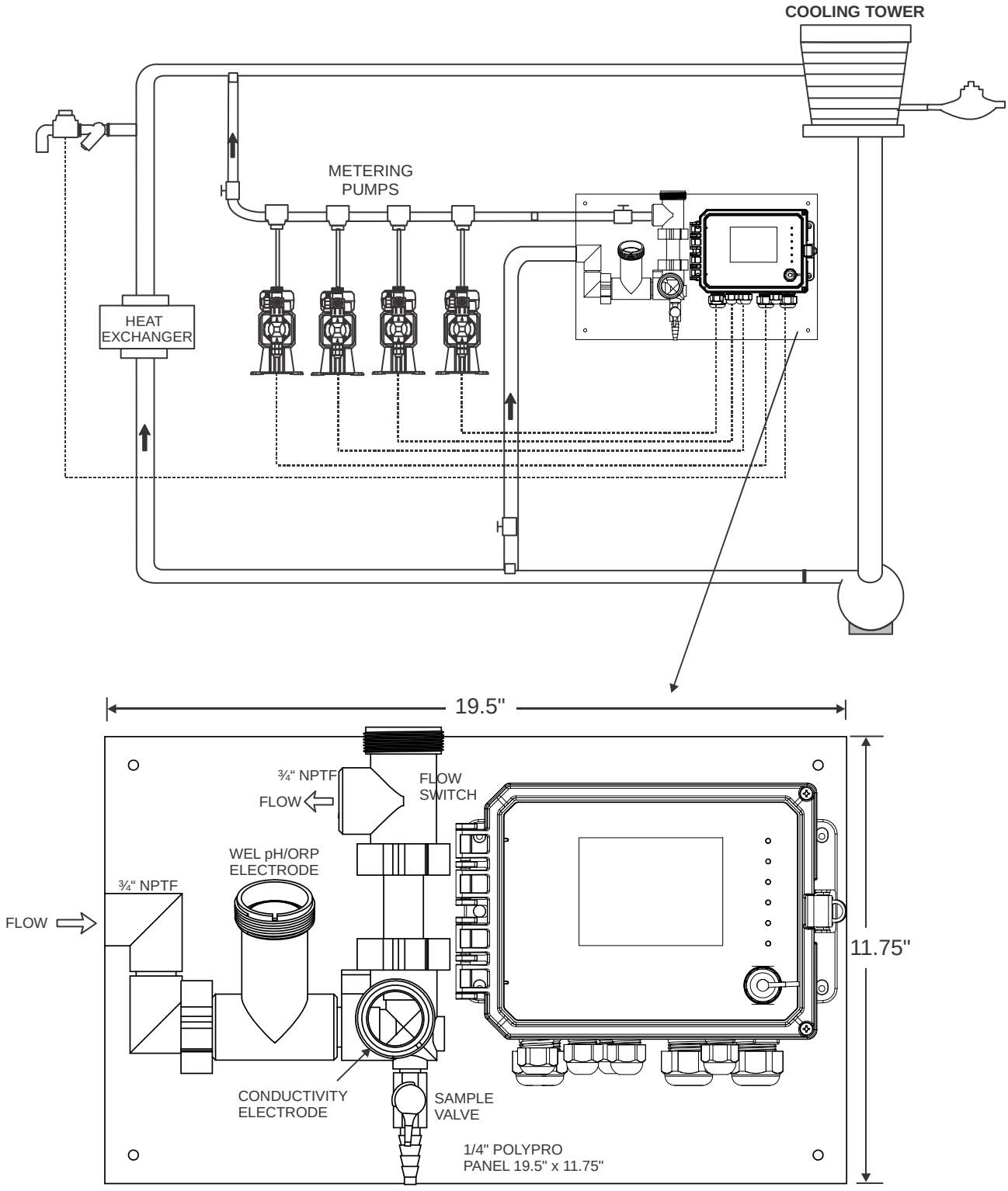


Figure 2 Typical Installation – Cooling Tower

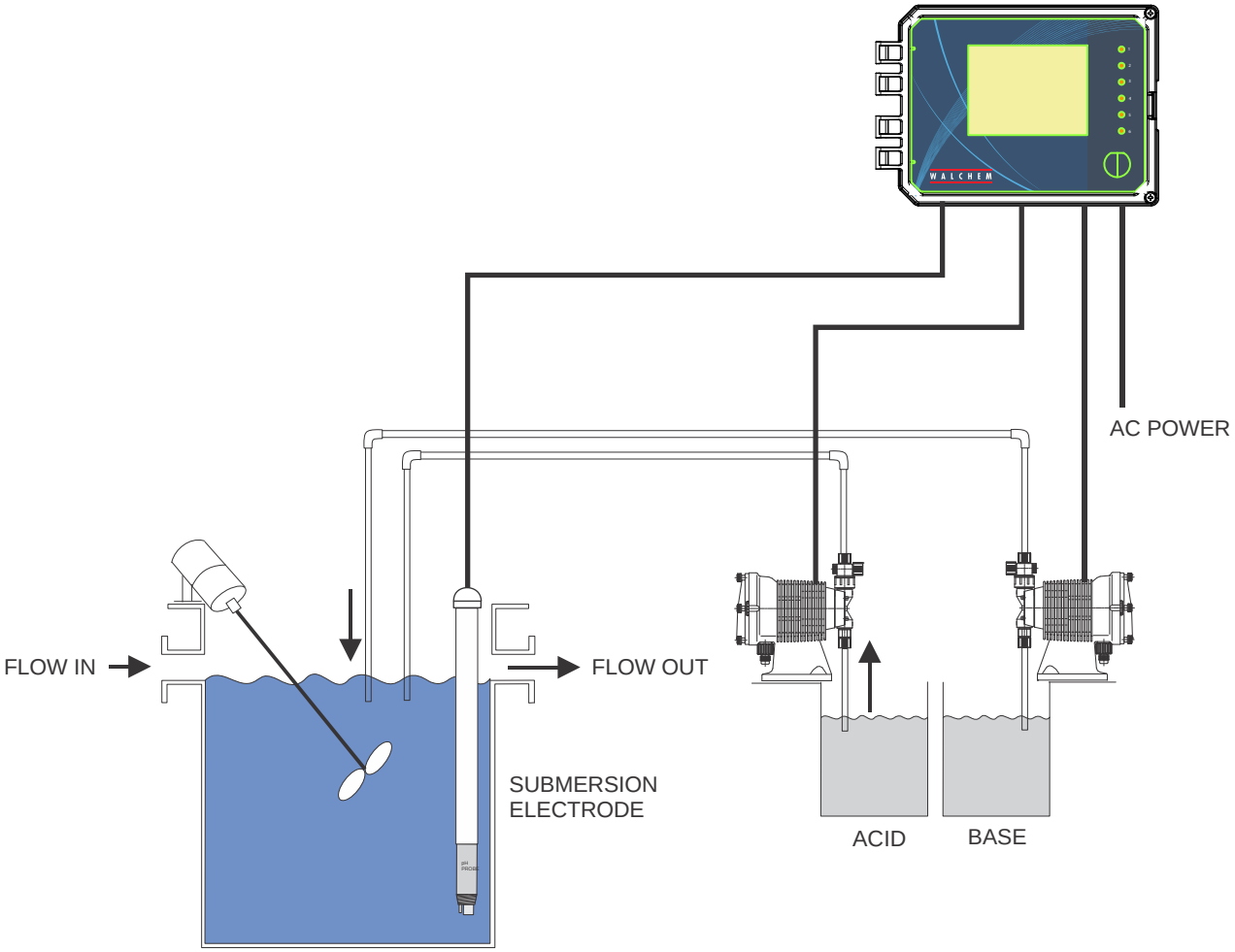


Figure 3 Typical Installation – Cooling Tower Submersion

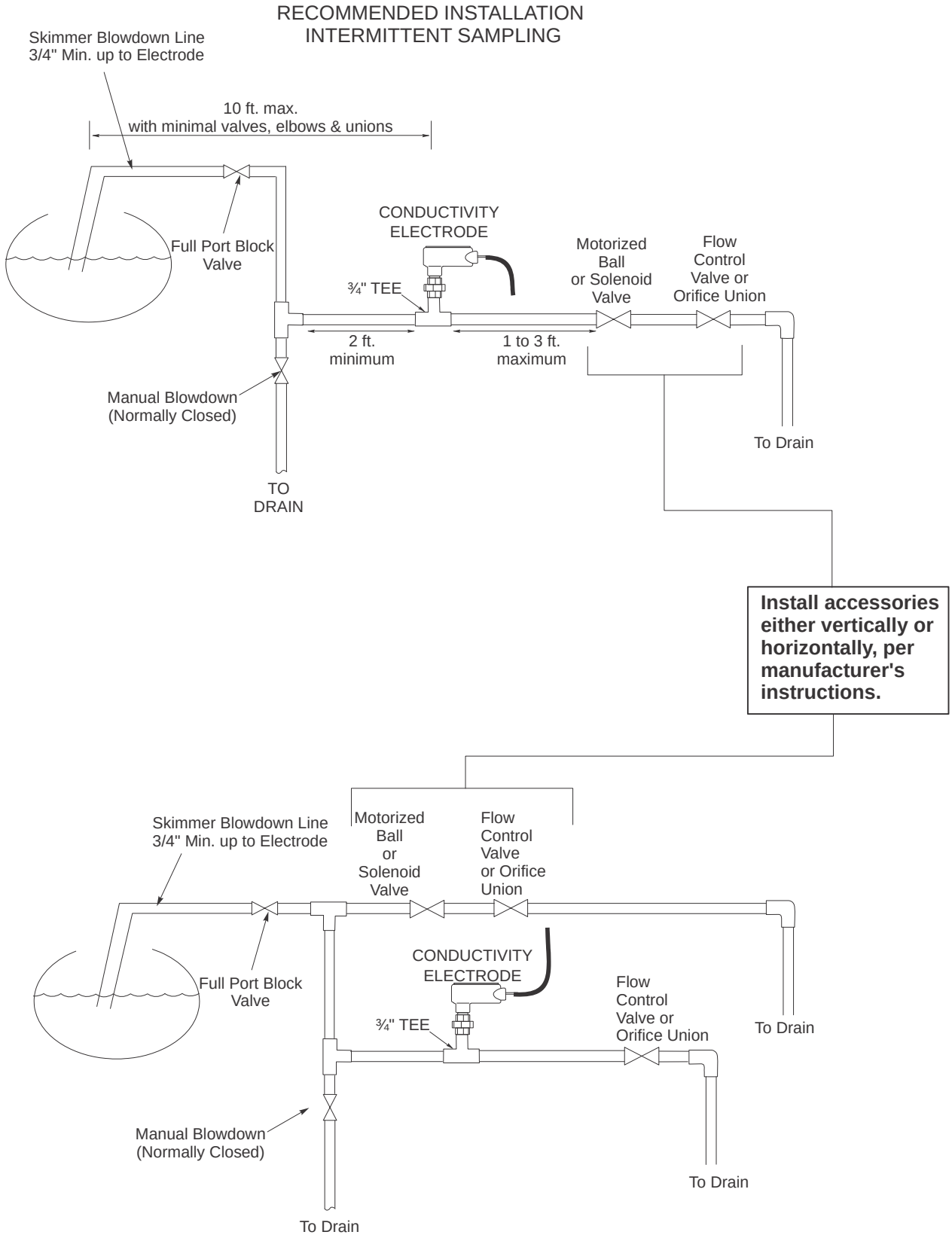


Figure 4 Typical Installation – Boiler

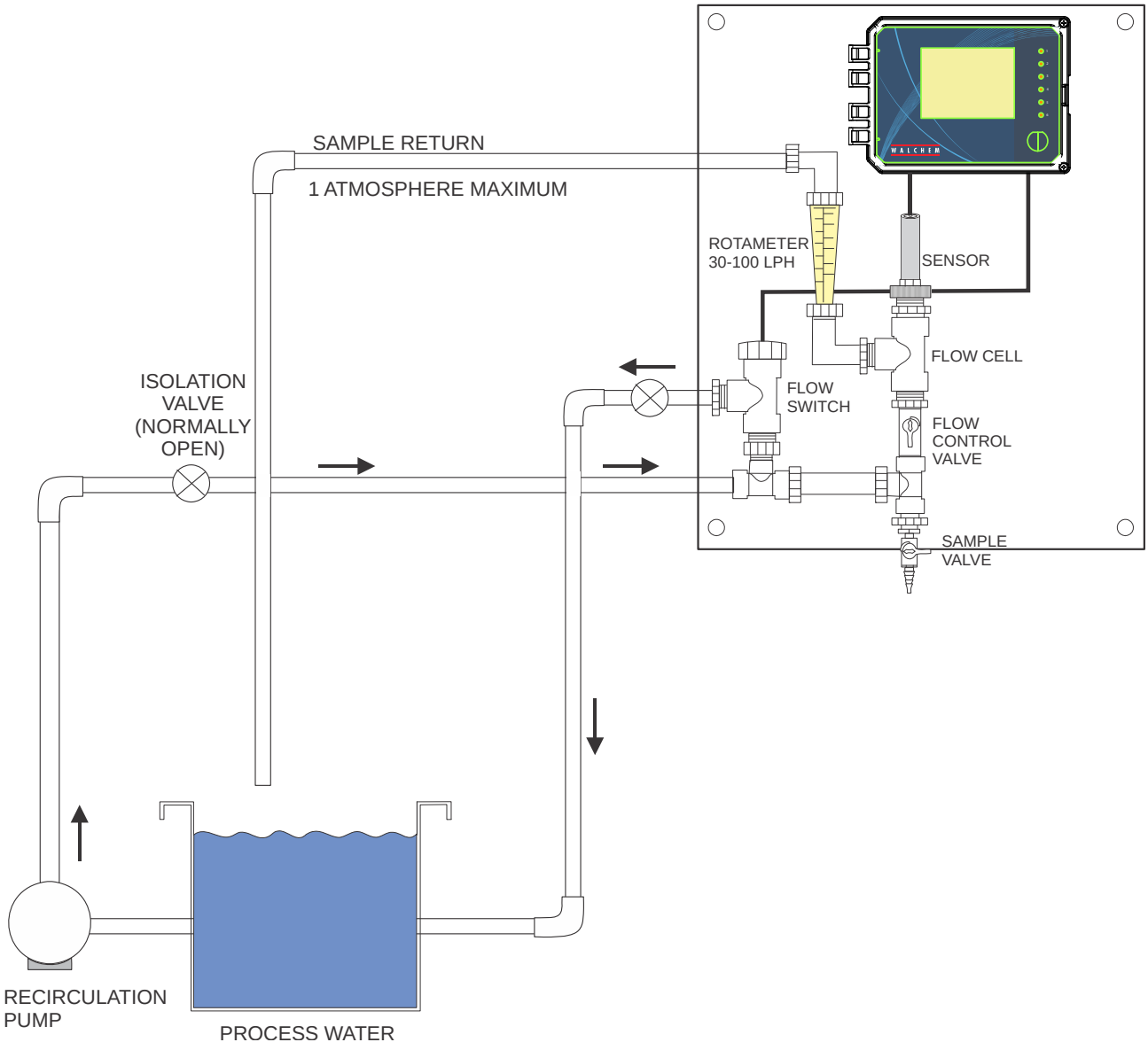


Figure 5 Typical Installation – Disinfection Sensor

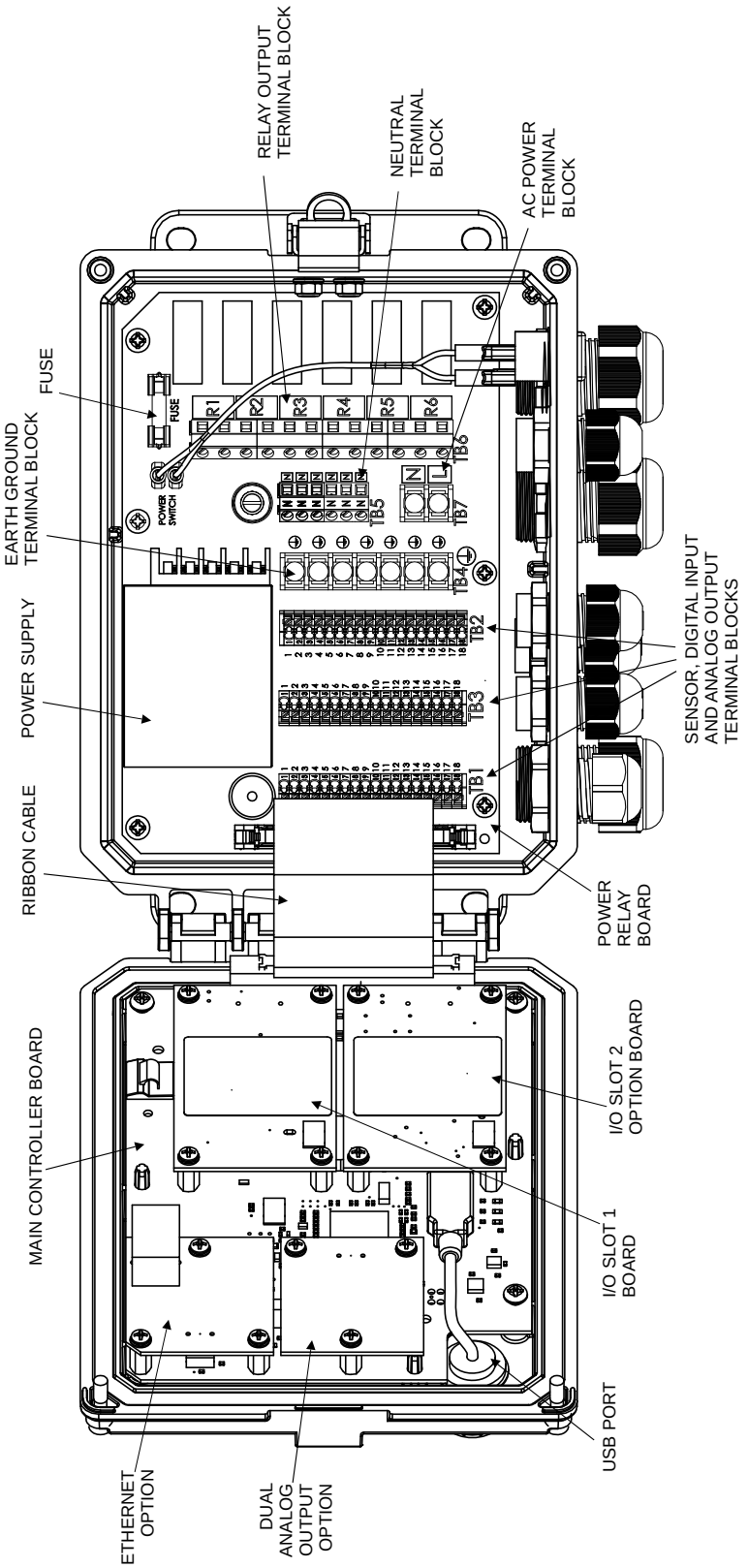
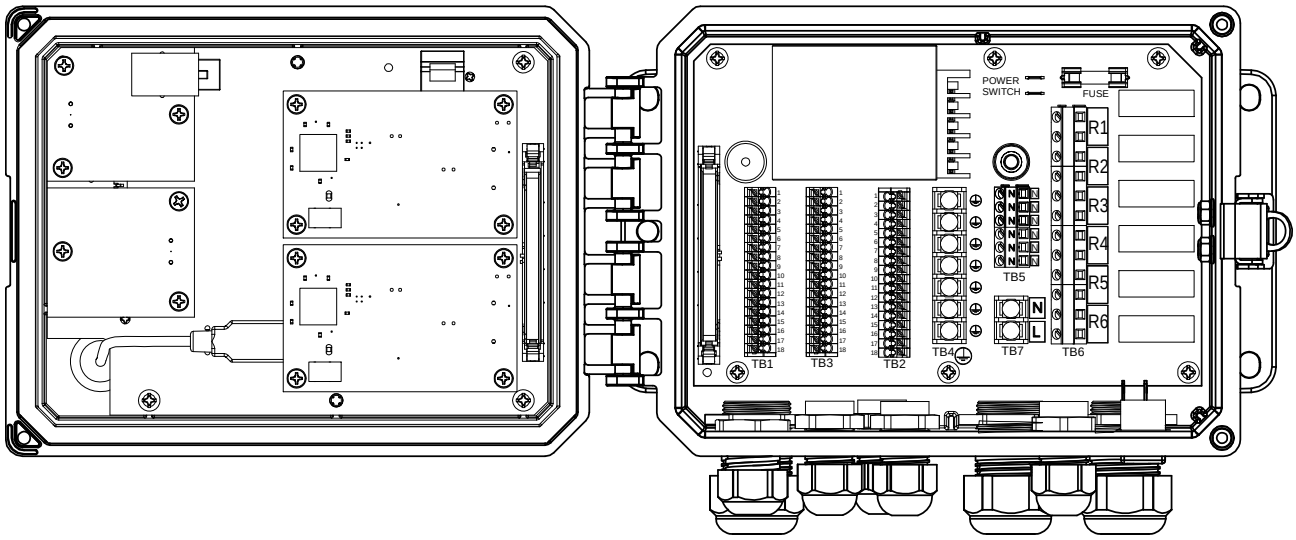


Figure 6 Parts Identification



	ECOND	CCOND	pH/ORP DIS
1	TEMP–	TEMP–	TEMP–
2	TEMP+	TEMP+	TEMP+
3			IN–
4		RCV	IN+
5	RCV–		
6	RCV+		
7	SHIELD	SHIELD	SHIELD
8			+5V
9			–5V
10	XMT+	XMT	
11	XMT–		
12	⏚		

SENSOR LABEL

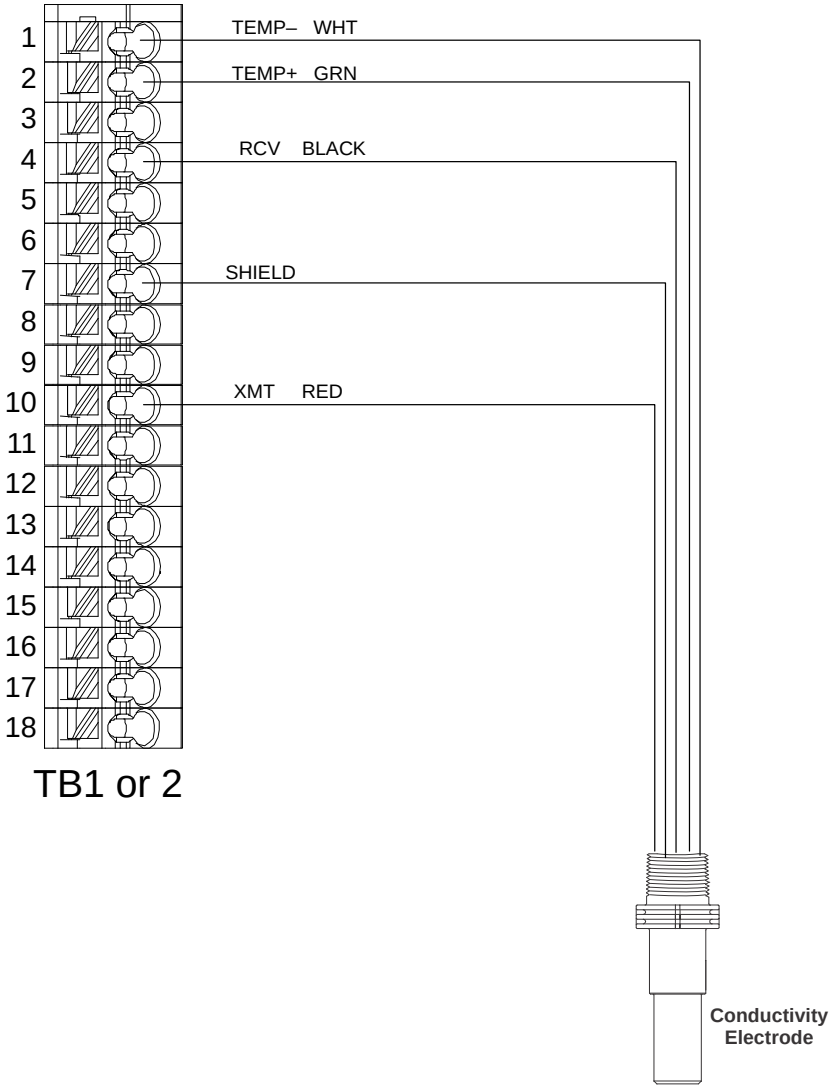
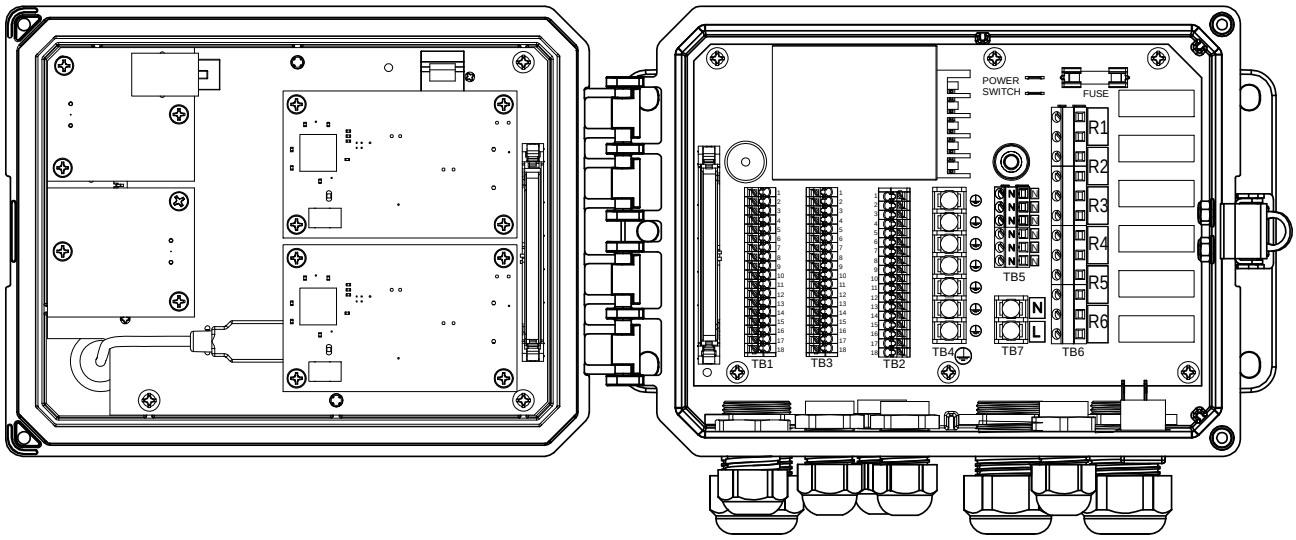


Figure 7 Contacting Conductivity Sensor Input Wiring



	ECOND	CCOND	pH/ORP DIS
1	TEMP–	TEMP–	TEMP–
2	TEMP+	TEMP+	TEMP+
3			IN–
4		RCV	IN+
5	RCV–		
6	RCV+		
7	SHIELD	SHIELD	SHIELD
8			+5V
9			–5V
10	XMT+	XMT	
11	XMT–		
12	⏚		

SENSOR LABEL

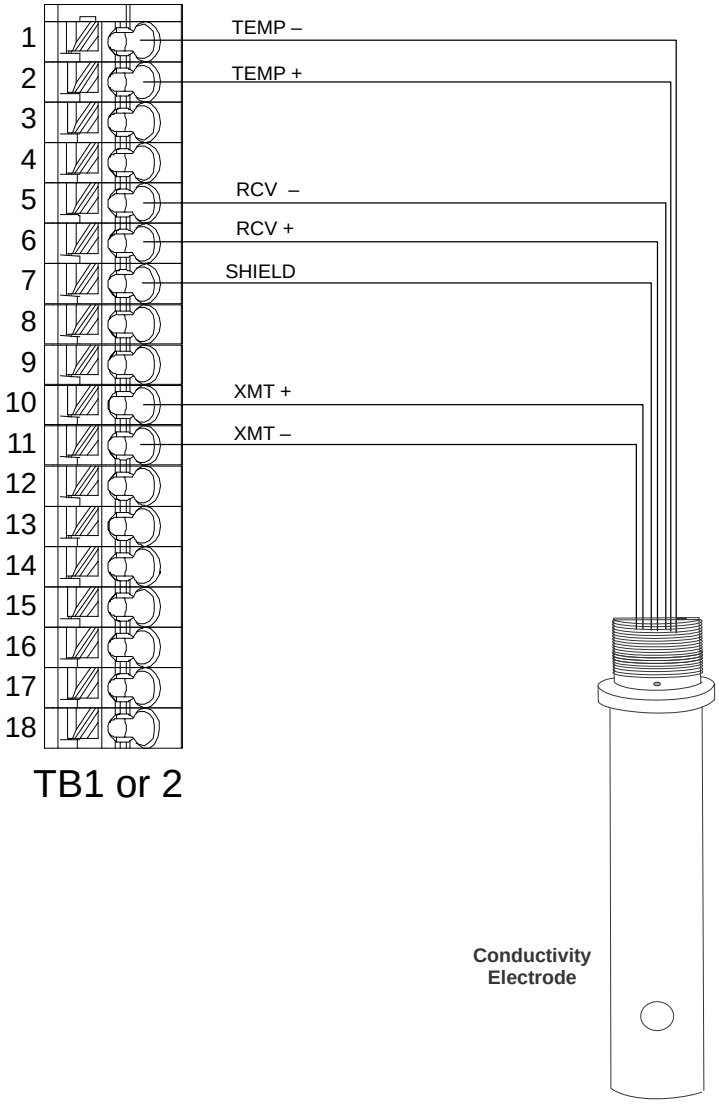
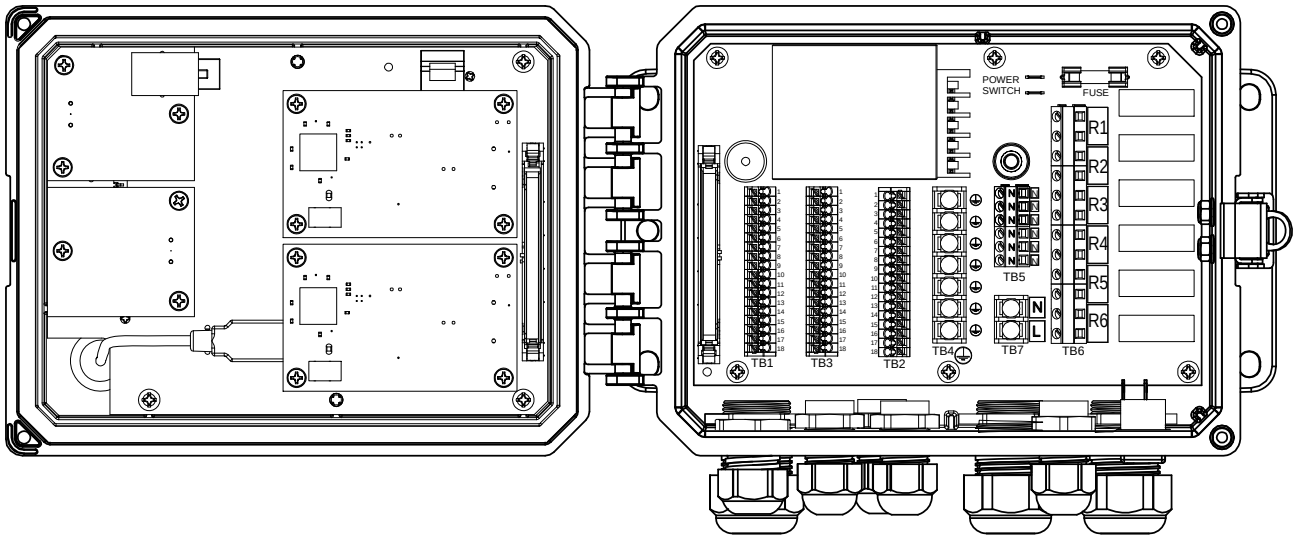
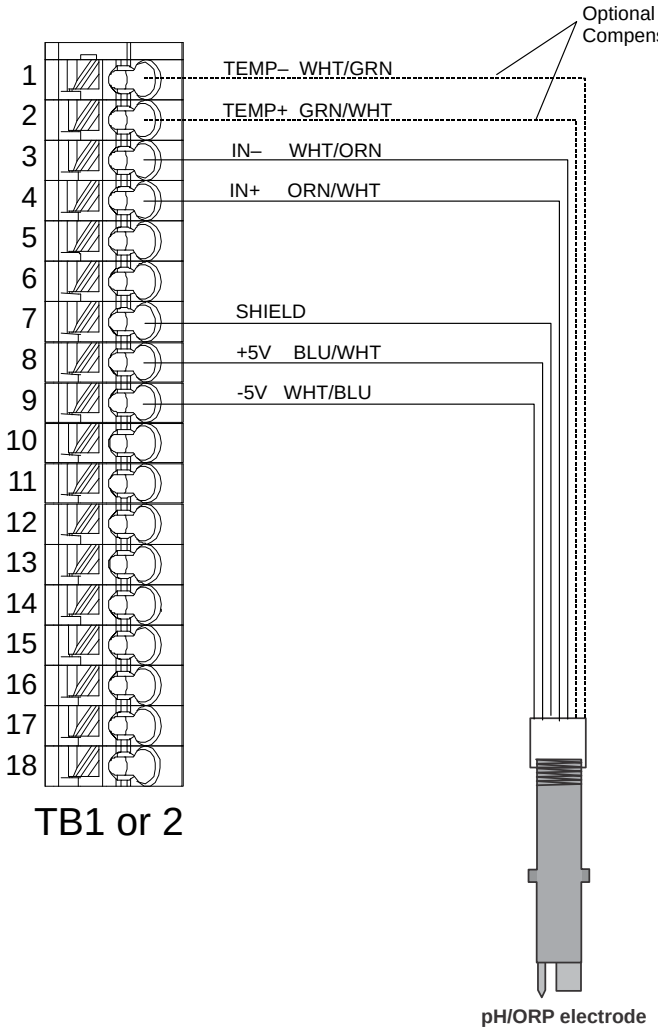


Figure 8 Electrodeless Conductivity Sensor Input Wiring



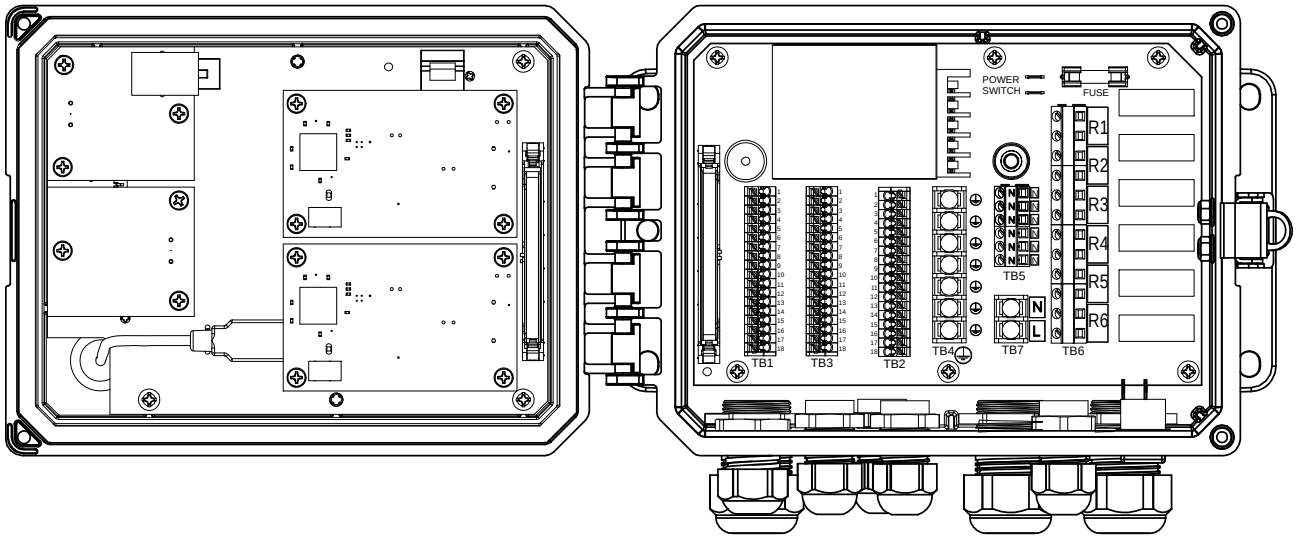
	ECOND	CCOND	pH/ORP DIS
1	TEMP–	TEMP–	TEMP–
2	TEMP+	TEMP+	TEMP+
3			IN–
4		RCV	IN+
5	RCV–		
6	RCV+		
7	SHIELD	SHIELD	SHIELD
8			+5V
9			–5V
10	XMT+	XMT	
11	XMT–		
12	⏚		

SENSOR LABEL



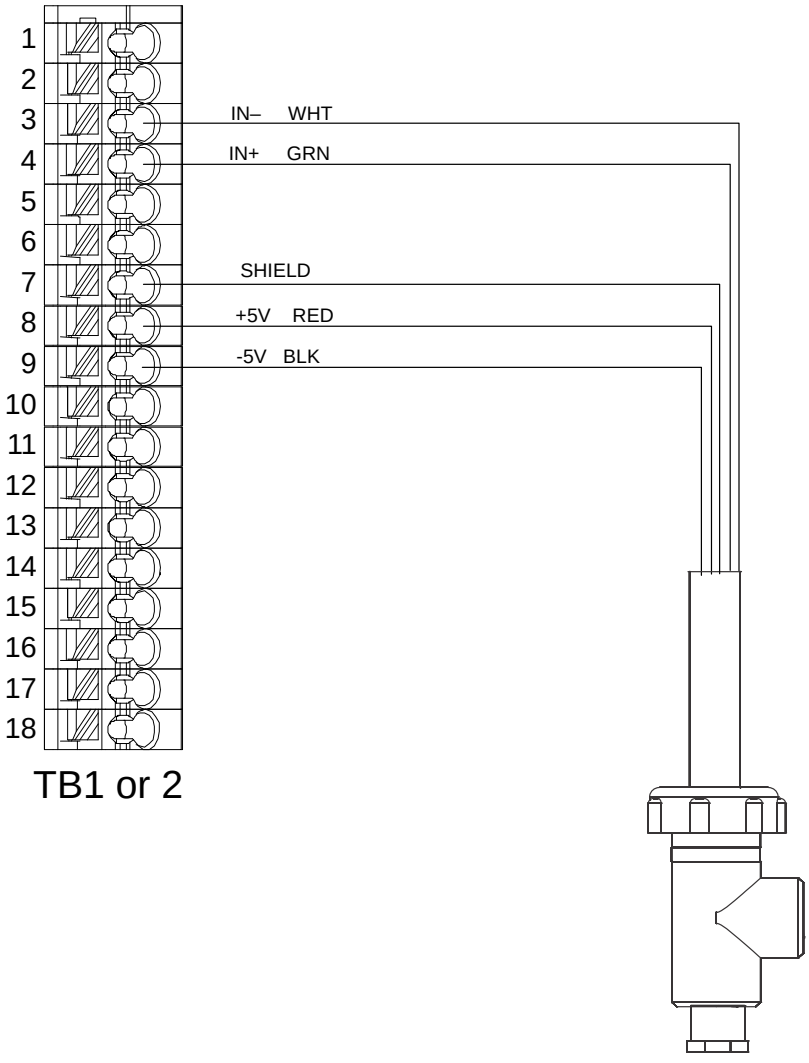
TB1 or 2

Figure 9 pH/ORP Sensor Input Wiring



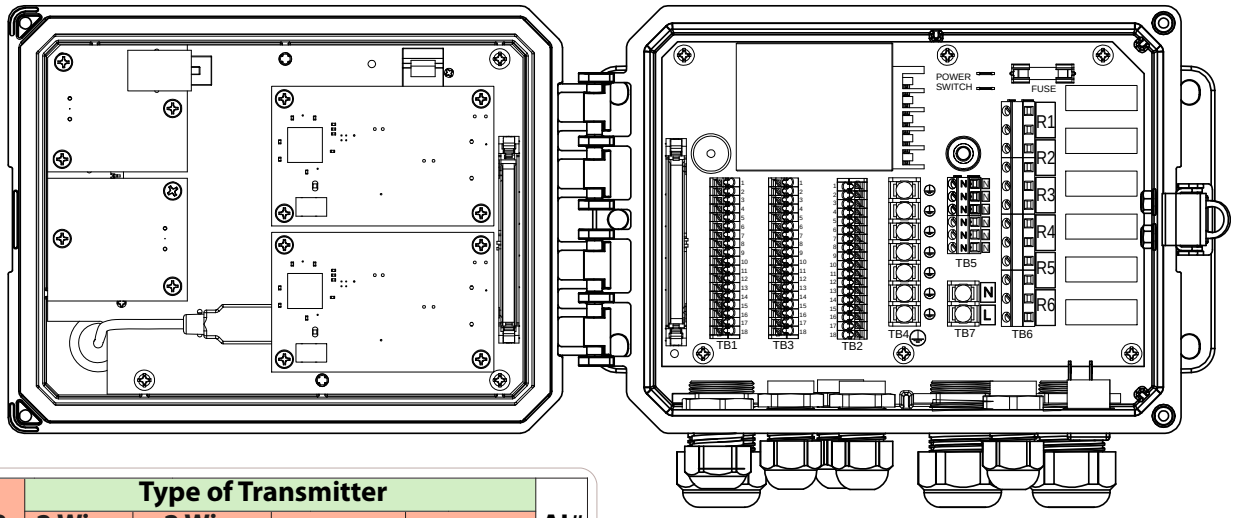
	ECOND	CCOND	pH/ORP DIS
1	TEMP–	TEMP–	TEMP–
2	TEMP+	TEMP+	TEMP+
3			IN–
4		RCV	IN+
5	RCV–		
6	RCV+		
7	SHIELD	SHIELD	SHIELD
8			+5V
9			–5V
10	XMT+	XMT	
11	XMT–		
12	⏚		

SENSOR LABEL

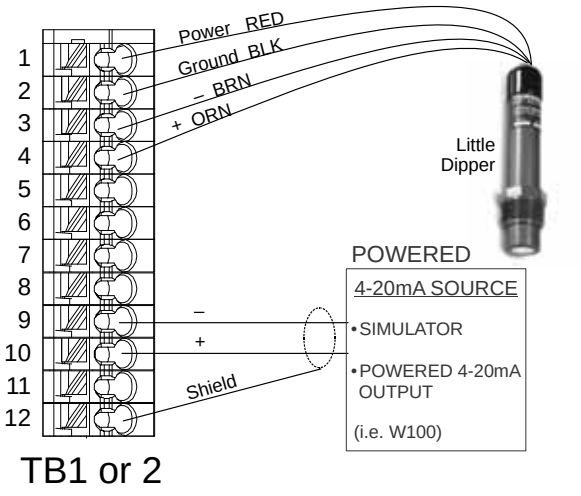


TB1 or 2

Figure 10 Disinfection Sensor Input Wiring

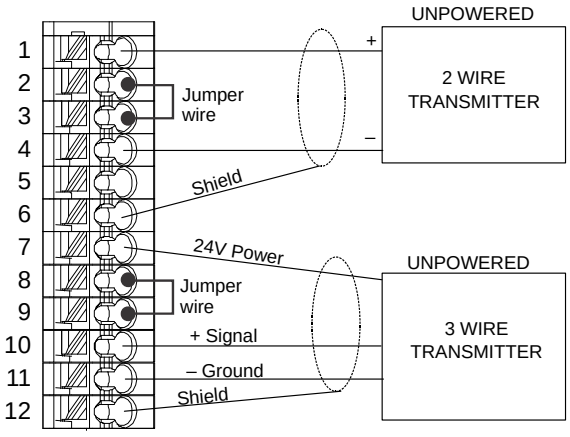


TB Pin#	Type of Transmitter				AI#
	2 Wire Loop	2 Wire Powered	3 Wire	4 Wire	
1	+24V		+24V	+24V	1
2				24V(–)	
3		XMTR–		XMTR–	
4	XMTR–	XMTR+	XMTR+	XMTR+	
5			COM(-)		
6	SHIELD	SHIELD	SHIELD	SHIELD	
7	+24V		+24V	+24V	2
8				24V(–)	
9		XMTR–		XMTR–	
10	XMTR–	XMTR+	XMTR+	XMTR+	
11			COM(-)		
12	SHIELD	SHIELD	SHIELD	SHIELD	



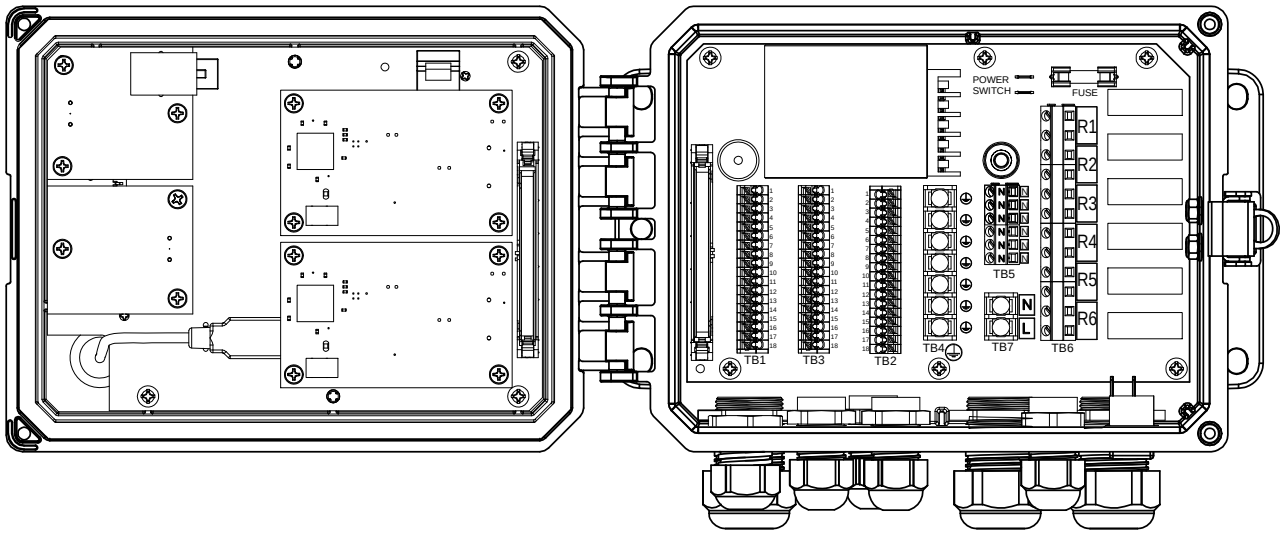
TB1 or 2

TB Pin#	Type of Transmitter				AI#
	2 Wire Loop	2 Wire Powered	3 Wire	4 Wire	
1	+24V		+24V	+24V	1
2				24V(–)	
3		XMTR–		XMTR–	
4	XMTR–	XMTR+	XMTR+	XMTR+	
5			COM(-)		
6	SHIELD	SHIELD	SHIELD	SHIELD	
7	+24V		+24V	+24V	2
8				24V(–)	
9		XMTR–		XMTR–	
10	XMTR–	XMTR+	XMTR+	XMTR+	
11			COM(-)		
12	SHIELD	SHIELD	SHIELD	SHIELD	



TB1 or 2

Figure 11 4-20mA Sensor Input Wiring



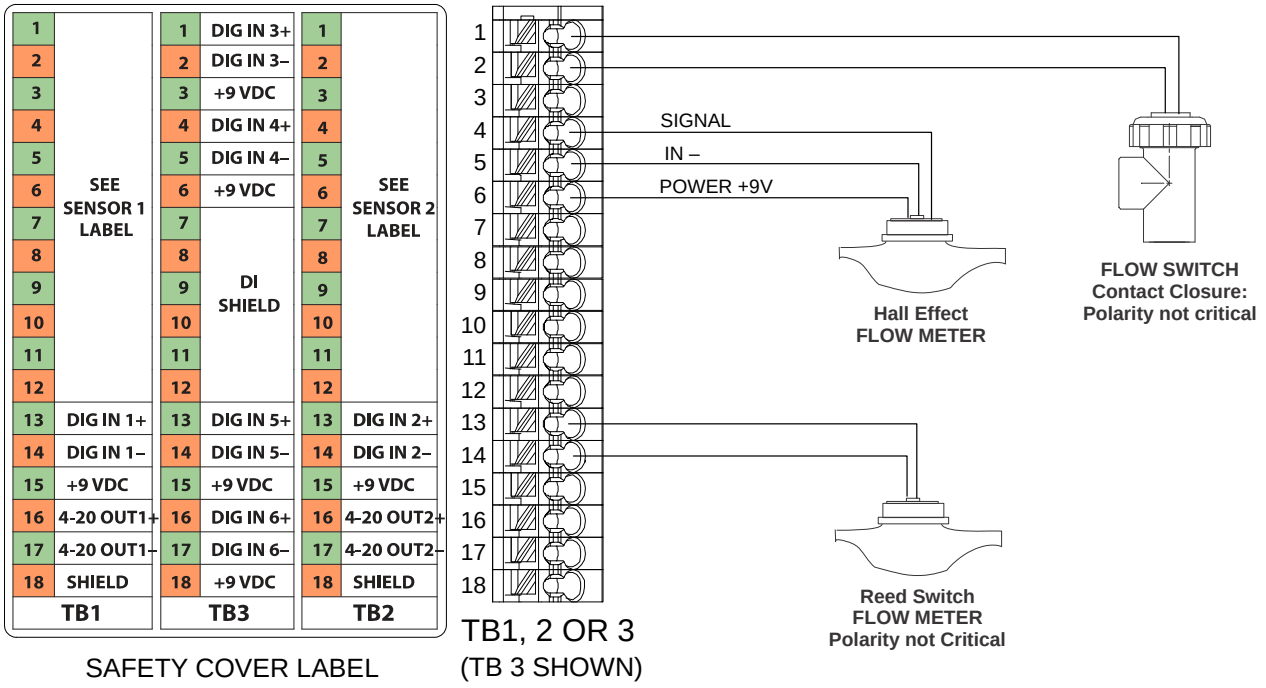


Figure 12 Digital Input Wiring

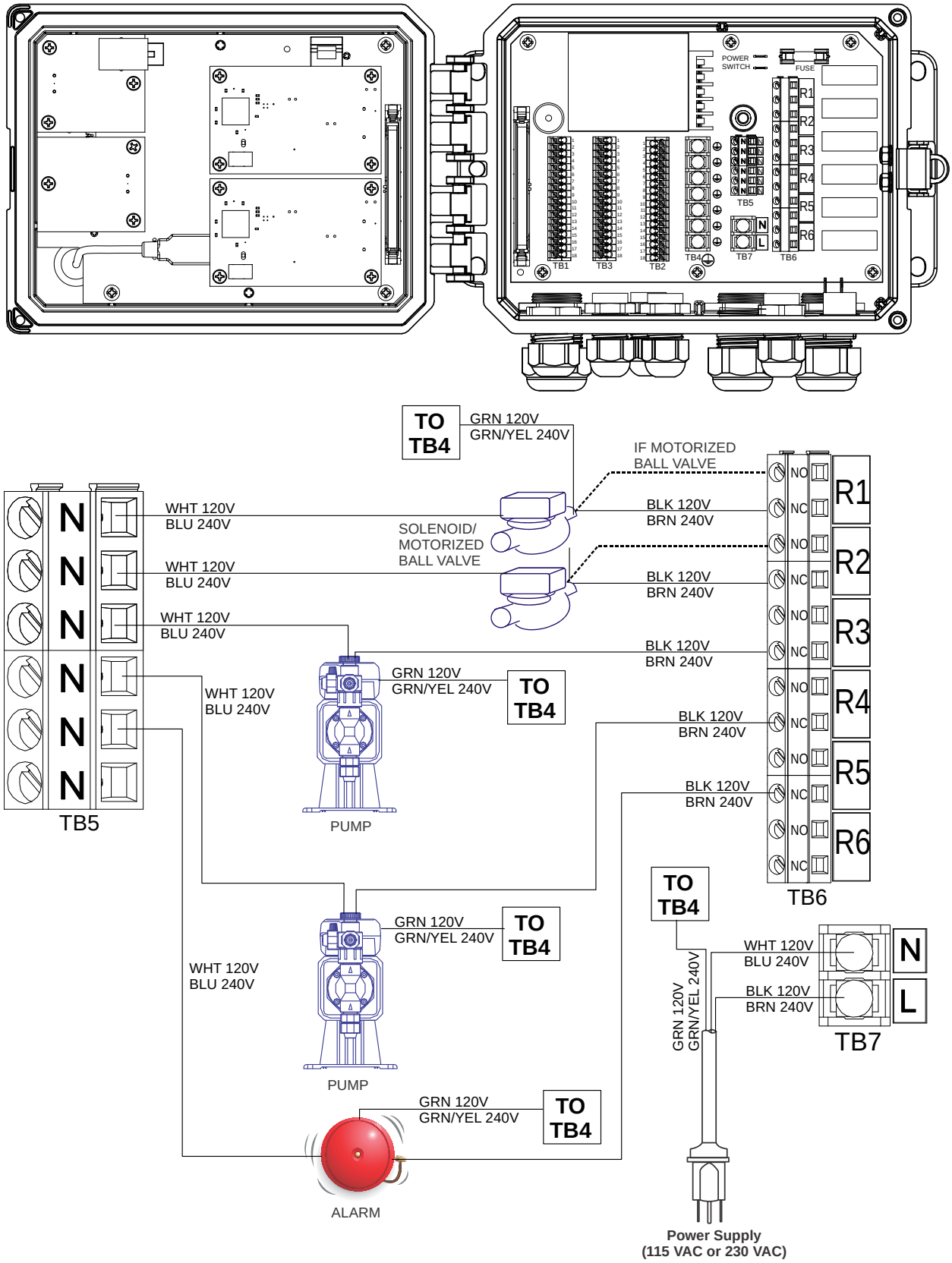
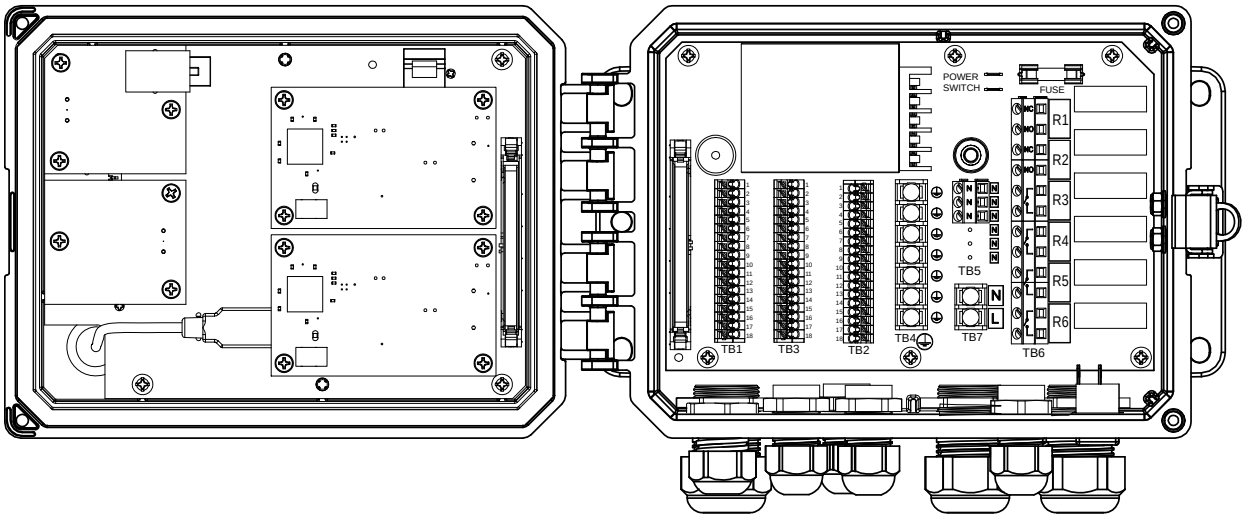


Figure 13 W600 AC Power & Relay Output Wiring



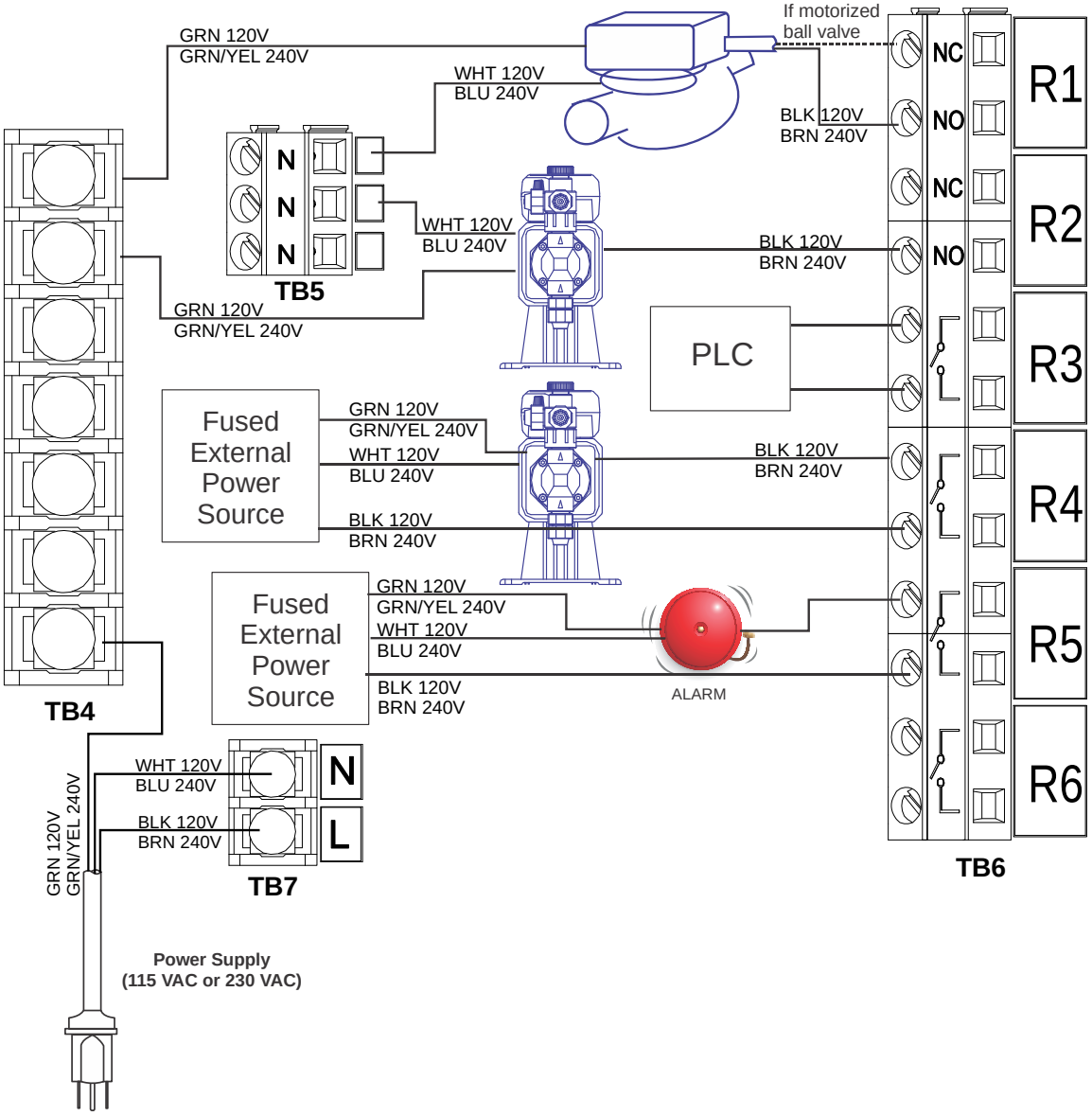


Figure 14 W610 AC Power & Relay Output Wiring

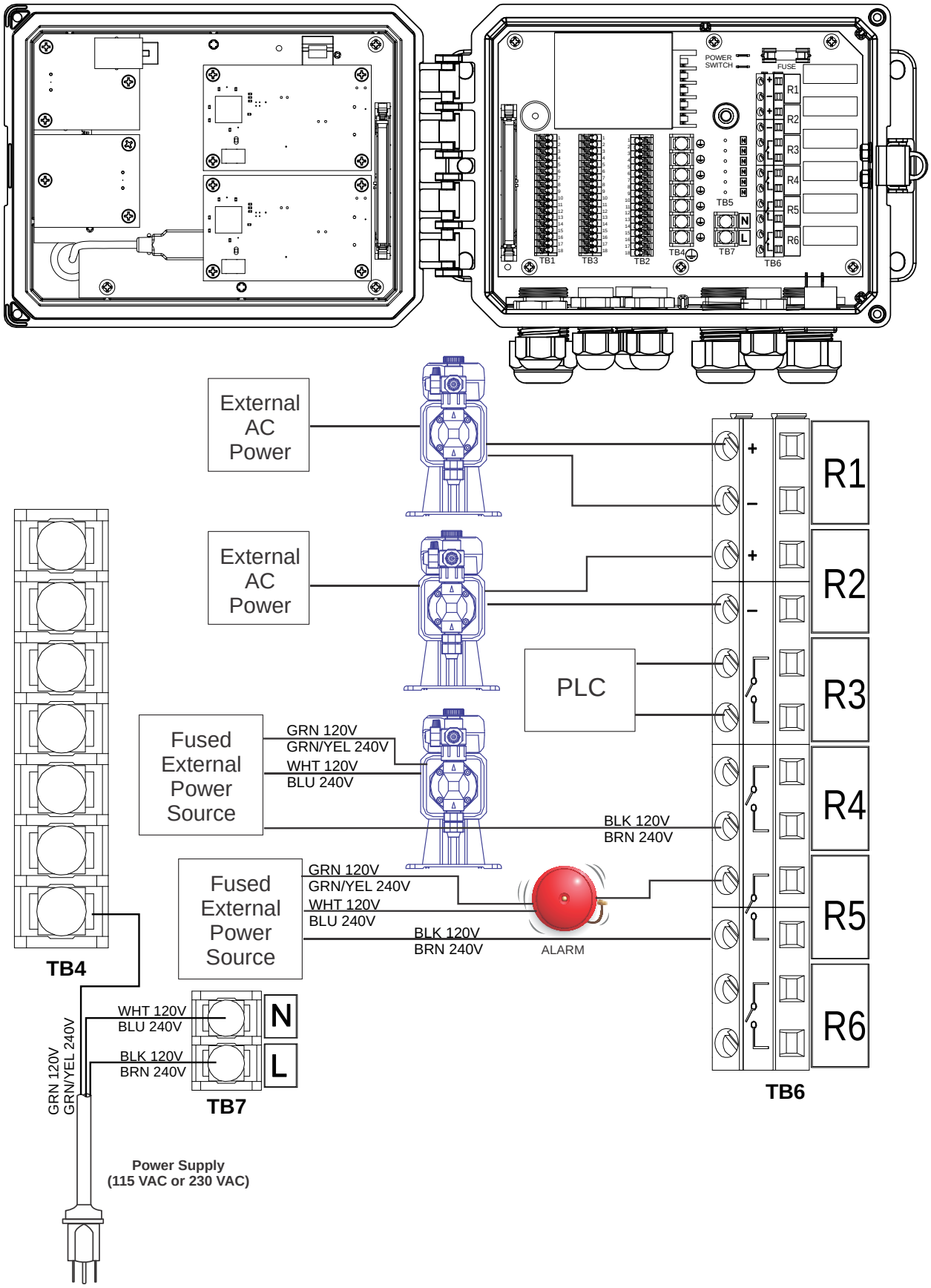


Figure 15 W620 AC Power & Relay Output Wiring

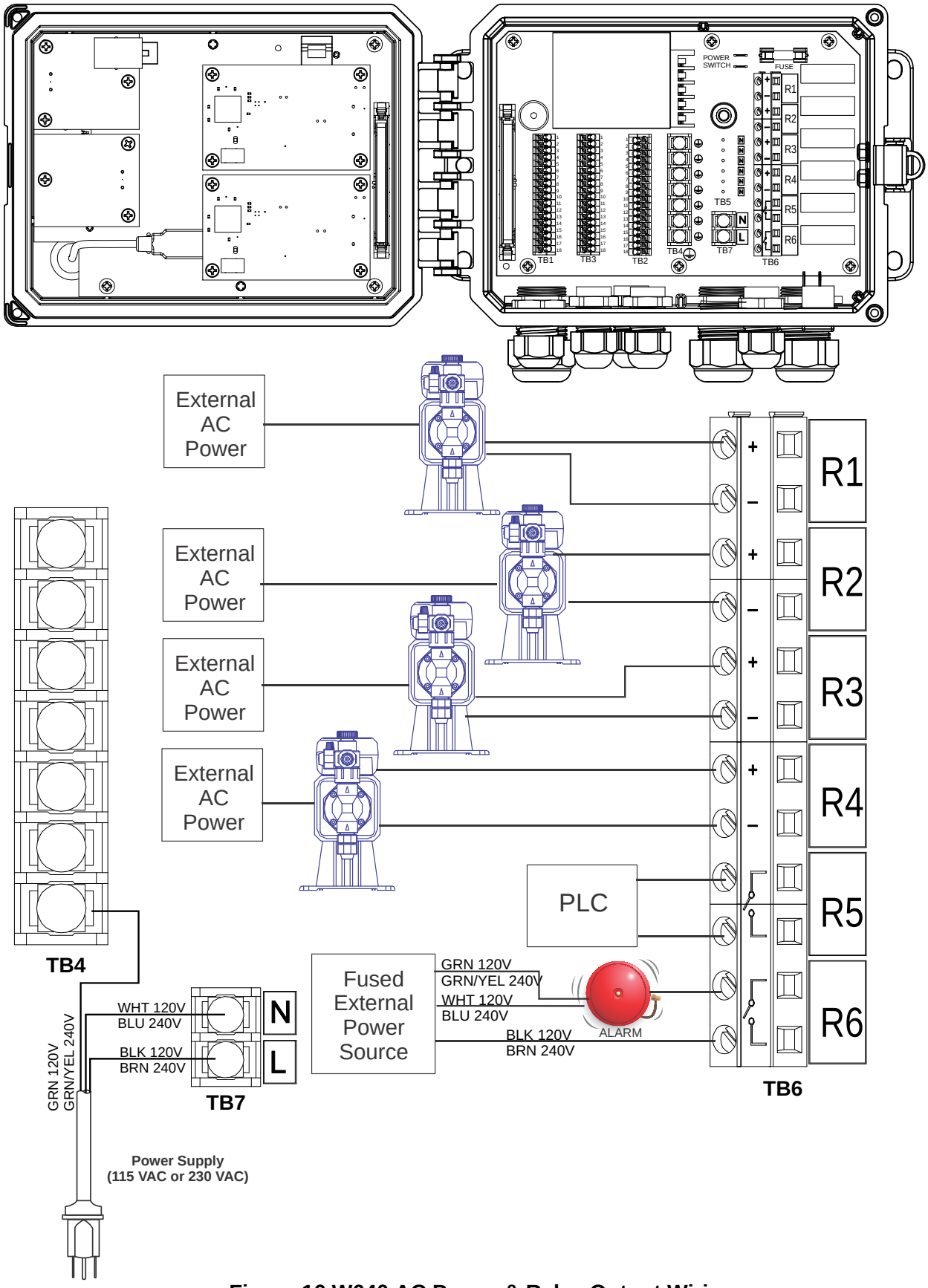
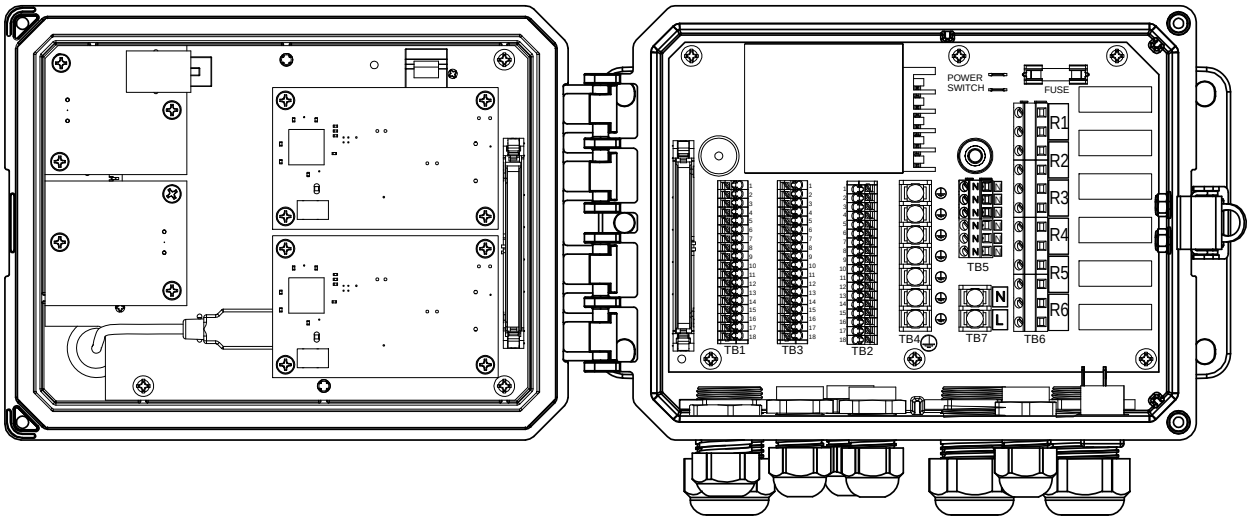


Figure 16 W640 AC Power & Relay Output Wiring



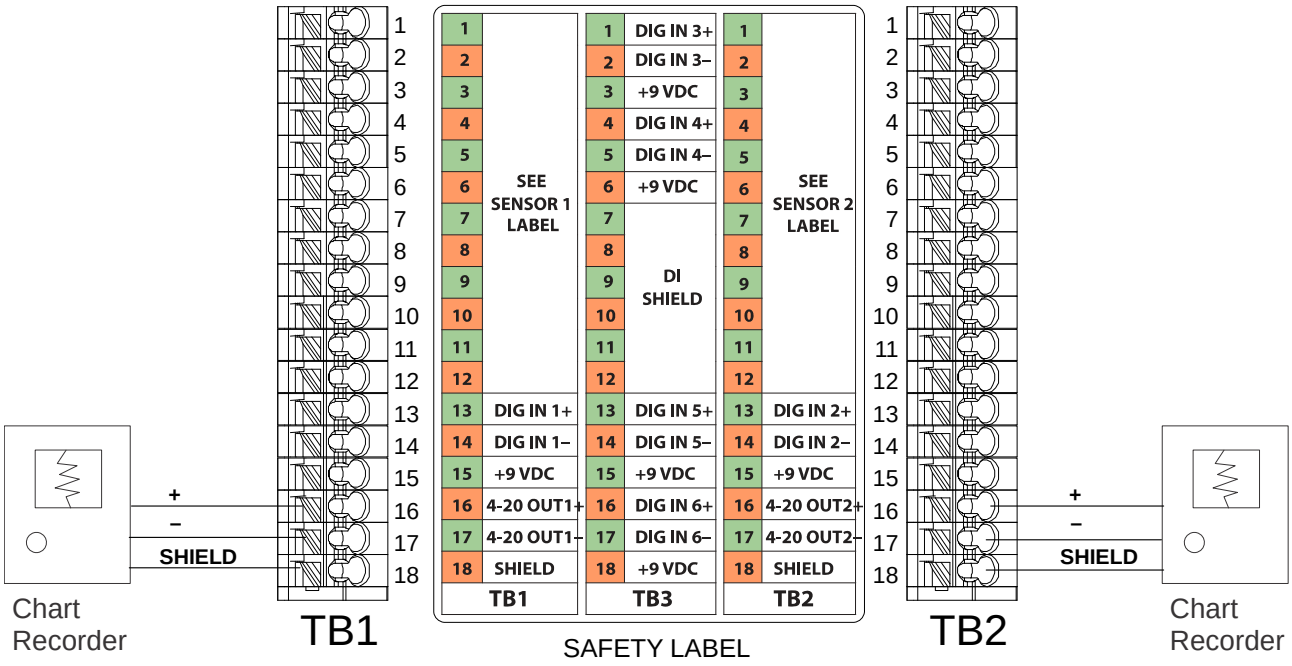


Figure 17 Analog Output Wiring

4.0 FUNCTION OVERVIEW

4.1 Front Panel

Figure 18 Front Panel

4.2 Touchscreen

A Home screen is displayed while the controller is on. This display shows a user-defined list of input readings and the status of any outputs that are tied to that input. Touching any of the input readings will bring up that input's Details screen, where you can access calibration and setting menus. Arrow icons page up or down to additional inputs if more than three are configured to be viewed. Touching the Menu icon brings up the Main Menu screen.

Easy to understand Icons on the bottom of the screens, and areas within the screen that are outlined in black, bring up new screens. These reverse the black and white when touched to give visual feedback.

4.3 Icons

The following icons appear on the Home screen.

The Main Menu icon brings you to the list of menu options listed below.

The following icons appear on the Main Menu screen. Touch the icon to get to the menu selections.

Alarm Menu

Inputs Menu

Outputs Menu

Configuration Menu

HOA Menu

Graph Menu

Home Page

Other icons may appear in the menu screens.

Calibration icon appears in sensor input menus and brings up the calibration menu

Cancel icon aborts a calibration or setting change

The Page Down icon scrolls down to a new page in a list of options.

The Page Up icon scrolls up to a new page in a list of options.

The Back/Return icon returns the display to the previous screen

The Make Character Higher icon is used when making an alphanumeric entry

The Make Character Lower icon is used when making an alphanumeric entry

The Move Cursor icon is used to scroll left to right within an alphanumeric entry

The Confirm icon accepts a choice, finishes entering data, or advances to the next calibration step

Settings Menu

The Character Delete icon deletes part of an alphanumeric entry

The Shift icon switches between upper and lower case alpha entry screens

The Next Screen icon moves to the next step in a calibration sequence. In a Graph it shifts the graph forward in time.

The Previous Screen icon moves back a step in a calibration sequence. In a Graph it shifts the graph backwards in time.

Overview of the use of icons

Changing Numeric Values

To change a number, use the Character Delete icon to the digit to be changed. If the new number will be negative, start with touching the minus sign, then use the numeric touchpad and decimal point to type the number (some entries must be integers and the decimal will be ignored and the setting rounded to the nearest integer). Once the value of the number is correct touch the Confirm icon to store the new value into memory, or touch the Cancel icon to leave the number at its previous value and go back.

Changing Names

To change the name used to identify an input or output, use the Move Cursor icon to the character to be changed and change it using either the Make Character Higher or Lower icons. Upper case and lower case letter, numbers, a blank space, period, plus and minus symbols are available. Move the cursor to the right and modify each character. Once the word is correct, use the Enter icon to store the new value into memory, or use the Cancel icon to leave the word at its previous value and go back.

Choosing from a List

Selecting the type of sensor, the units of measure of an input, or the control mode used for an output, the selection is picked from a list of available options. Touch the Page Up or Down icons if necessary to find the desired option, and then touch the option to highlight it. Touch the Confirm icon to store the new option into memory, or touch the Cancel icon to leave the selection at its previous value and go back.

Hand-Off-Auto Relay Mode

Touch the desired relay mode. In Hand mode the relay is forced on for a specified amount of time and when that time is up the relay returns to its previous mode, in Off mode the relay is always off until taken out of Off mode, and in Auto mode the relay is responding to control set points. Touch the Return icon to go back to the relay settings.

Interlock and Activate with Channels Menus
To select which digital inputs or relays will interlock this relay (Interlock Channels), or which digital inputs or relays will force this relay on (Activate with Channels), touch the input or relay number(s). The background of the selected item will turn dark. When finished selecting as many as needed, touch the Confirm icon to accept the changes or the Cancel icon to leave the selections at the previous settings and go back.

4.4 Startup

Initial Startup

After having mounted the enclosure and wired the unit, the controller is ready to be started. Plug in the controller and turn on the power switch to supply power to the unit. The display will briefly show the model number and then revert to the normal summary (Home) display. Refer to section 5 below for more details on each of the settings.

To return to the summary display, touch the Main Menu icon  and then touch the Home icon.

Settings Menu (see section 5.4)

Choose language
Touch the Configuration Settings icon. Touch Global Settings. Touch the Scroll Down icon until the English word “Language” is displayed and then touch it. Touch the Scroll Down icon until your language is displayed and touch it. Touch the Confirm icon to change all menus to your language.

Set date (if necessary)
Touch the Scroll Up or Down icon until Date is displayed, and then touch it. Touch the Move Cursor icon to highlight the Day, and then use the numeric touchpad to change the date. Touch the Confirm icon to accept the change.

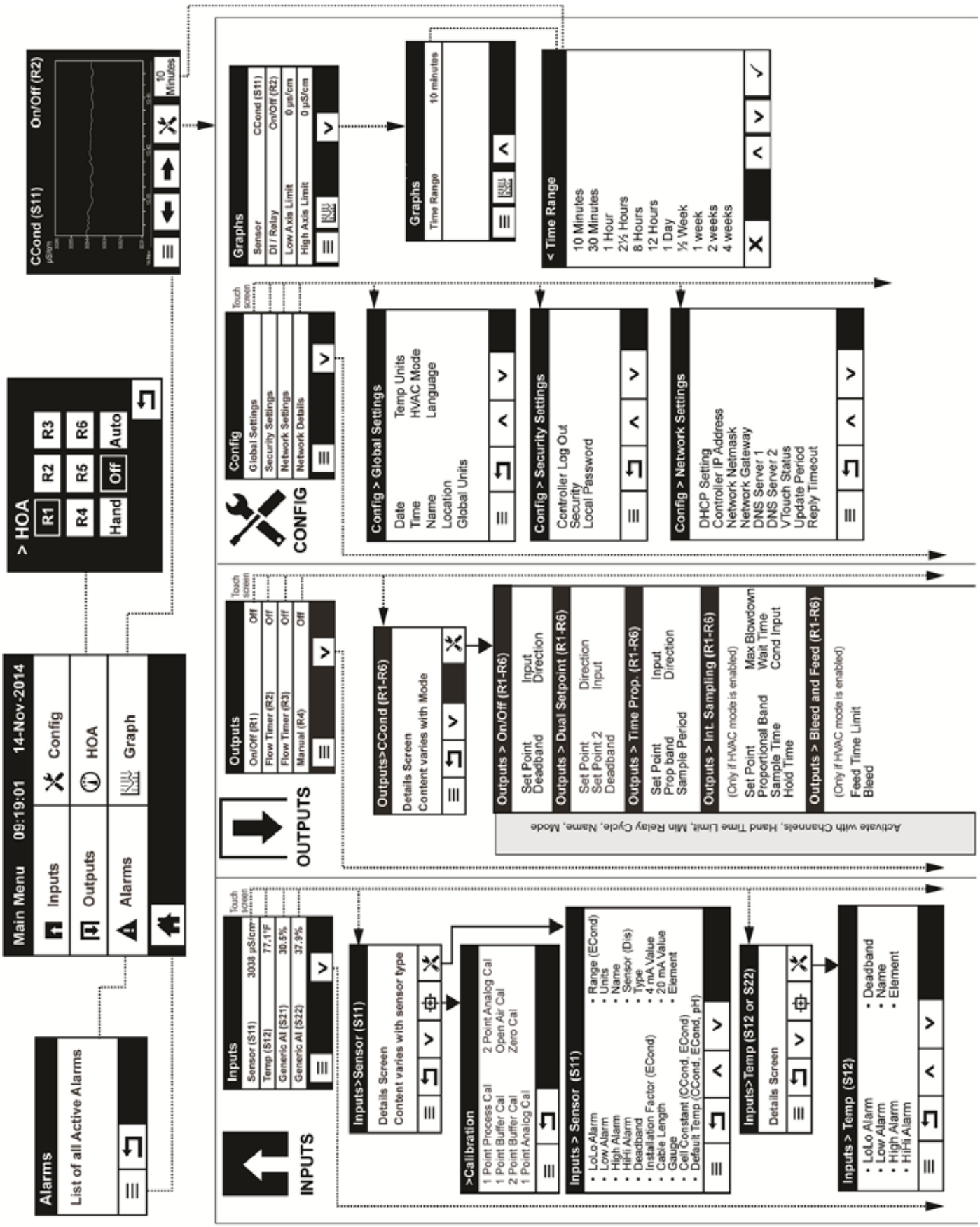
Set time (if necessary)
Touch the Scroll Up or Down icon until Time is displayed and then touch it. Touch the Move Cursor icon to highlight the digit to change, then use the numeric touchpad to change the time. Touch the Confirm icon to accept the change.

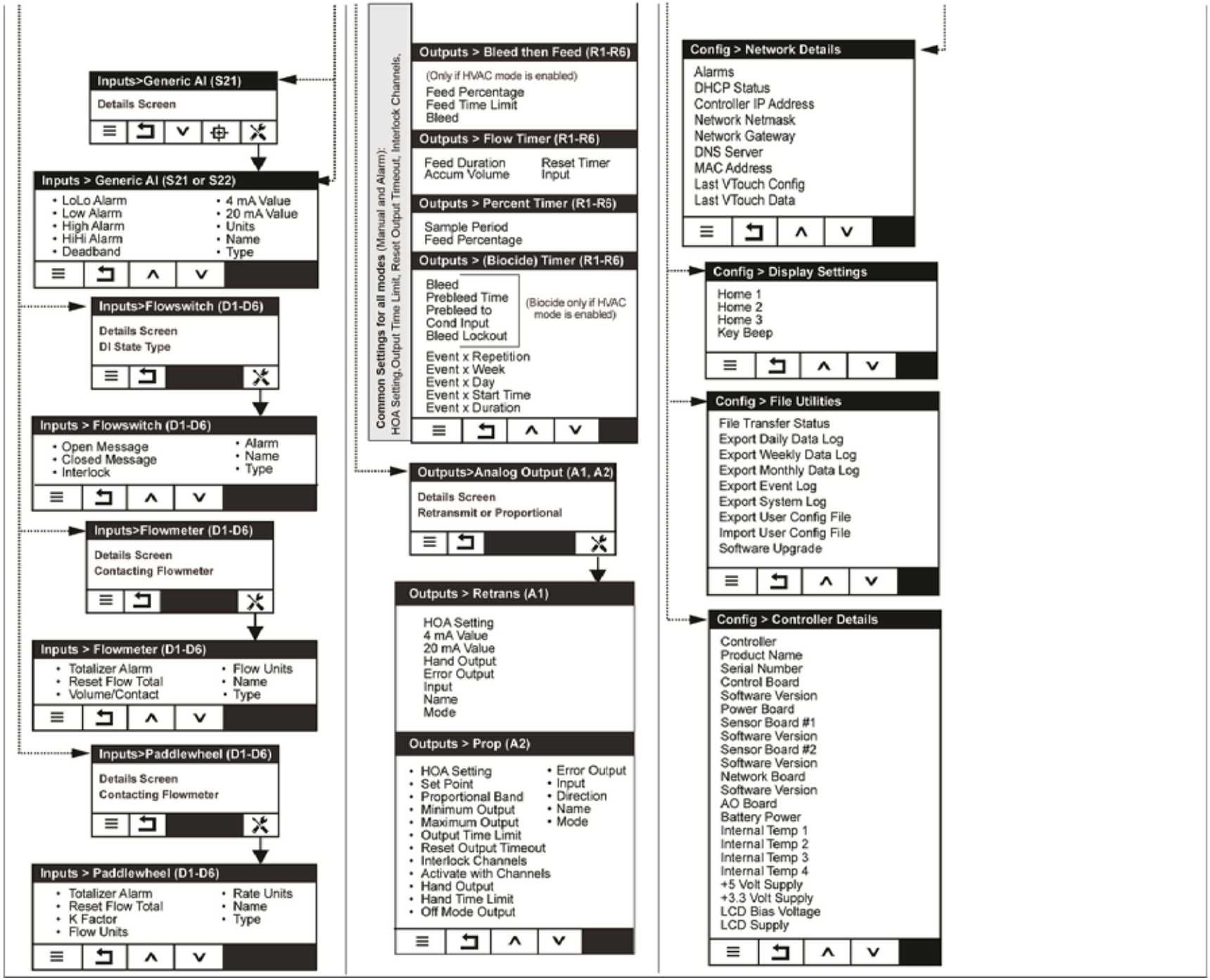
Set global units of measure
Touch the Scroll Up or Down icon until Global Units is displayed and then touch it. Touch the desired units. Touch the Confirm icon to accept the change.

Set temperature units of measure
Touch the Scroll Up or Down icon until Temp Units is displayed and then touch it. Touch the desired units. Touch the Confirm icon to accept the change.

Touch the Main Menu icon. Touch the Inputs icon.

Overview of the menu structure




Inputs>Generic AI (S21)
Details Screen
Inputs > Generic AI (S21 or S22)
• LoLo Alarm
• Low Alarm
• High Alarm
• HiHi Alarm
• Deadband
• 4 mA Value
• 20 mA Value
• Units
• Name
• Type
Inputs>Flowswitch (D1-D6)
Details Screen
DI State Type
Inputs > Flowswitch (D1-D6)
• Open Message
• Closed Message
• Interlock
• Alarm
• Name
• Type
Inputs>Flowmeter (D1-D6)
Details Screen
Contacting Flowmeter
Inputs > Flowmeter (D1-D6)
• Totalizer Alarm
• Reset Flow Total
• Volume/Contact
• Flow Units
• Name
• Type
Inputs>Paddlewheel (D1-D6)
Details Screen
Contacting Flowmeter
Inputs > Paddlewheel (D1-D6)
• Totalizer Alarm
• Reset Flow Total
• K Factor
• Flow Units
• Rate Units
• Name
• Type
Common Settings for all modes (Manual and Alarm):
HOA Setting,Output Time Limit, Reset Output Timeout, Interlock Channels,
Outputs > Bleed then Feed (R1-R6)
(Only if HVAC mode is enabled)
Feed Percentage
Feed Time Limit
Bleed
Outputs > Flow Timer (R1-R6)
Feed Duration
Accum Volume
Reset Timer Input
Outputs > Percent Timer (R1-R6)
Sample Period
Feed Percentage
Outputs > (Biocide) Timer (R1-R6)
Bleed
Prebleed Time
Prebleed to Cond Input
Bleed Lockout
(Biocide only if HVAC mode is enabled)
Event x Repetition
Event x Week
Event x Day
Event x Start Time
Event x Duration
Outputs>Analog Output (A1, A2)
Details Screen
Retransmit or Proportional
Outputs > Retrans (A1)
HOA Setting
4 mA Value
20 mA Value
Hand Output
Error Output
Input
Name
Mode
Outputs > Prop (A2)
• HOA Setting
• Set Point
• Proportional Band
• Minimum Output
• Maximum Output
• Output Time Limit
• Reset Output Timeout
• Interlock Channels
• Activate with Channels
• Hand Output
• Hand Time Limit
• Off Mode Output
• Error Output
• Input
• Direction
• Name
• Mode
Config > Network Details
Alarms
DHCP Status
Controller IP Address
Network Netmask
Network Gateway
DNS Server
MAC Address
Last VTouch Config
Last VTouch Data
Config > Display Settings
Home 1
Home 2
Home 3
Key Beep
Config > File Utilities
File Transfer Status
Export Daily Data Log
Export Weekly Data Log
Export Monthly Data Log
Export Event Log
Export System Log
Export User Config File
Import User Config File
Software Upgrade
Config > Controller Details
Controller
Product Name
Serial Number
Control Board
Software Version
Power Board
Sensor Board #1
Software Version
Sensor Board #2
Software Version
Network Board
Software Version
AO Board
Battery Power
Internal Temp 1
Internal Temp 2
Internal Temp 3
Internal Temp 4
+5 Volt Supply
+3.3 Volt Supply
LCD Bias Voltage
LCD Supply

Inputs (see section 5.2)

Program the settings for each input

The S11 sensor input will be displayed. Touch it to get to the Details screen. Touch the Settings icon. If the name of the sensor does not describe the type of sensor connected, touch the Scroll Down icon until Type is displayed. Touch the Type field. Touch the Scroll Down icon until the correct type of sensor is displayed, then touch it to highlight it. Touch the Confirm icon to accept the change. This will bring you back to the Settings screen. Finish the rest of the S1 settings. For disinfections sensors, choose the exact sensor in the Sensor menu. For contacting conductivity sensors, enter the cell constant. Select the units of measure. Enter the alarm set points and alarm deadband. Set the default temperature that will be used for automatic temperature compensation if the temperature signal becomes invalid.

When finished with S11, touch the Return icon until the list of inputs is displayed. Touch the Scroll Down icon and repeat the process for each input.

The S12 temperature input Element should be set correctly once the S11 sensor type has been set. If not, select the correct temperature element and set the alarm set points and alarm deadband. ORP and disinfection sensors do not have temperature signals and are preset to Unassigned.

To calibrate the temperature, return to the S2 Details screen, touch the Calibrate icon, and touch the Enter icon to perform a calibration.

If a flow switch or liquid level switch is connected, D1 through D6 (whichever one has the device connected to it) should be set to DI State type (if no switch is connected, select No Sensor). Set the state that will possibly interlock control outputs (refer to the Outputs settings to program which outputs, if any, will be interlocked by the switch). Set the state, if any, that will result in an alarm.

If a contacting head or paddlewheel flow meter is connected, D1 through D6 (whichever one has the device connected to it) should be set to that type (if no flow meter is connected, select No Sensor). Set the units of measure, volume/contact or K factor, etc.

Calibrate the sensor

To calibrate the sensor, return to the list of inputs, touch the sensor to calibrate, touch the Calibrate icon, and select one of the calibration routines. For disinfection sensors, start with the Zero Calibration. For electrodeless conductivity, start with the Air Calibration. Refer to section 5.2.

Touch the Main Menu icon. Touch the Outputs icon.

Outputs (see section 5.3)

Program the settings for each output

The R1 relay output will be displayed. Touch the relay field to get to the Details screen. Touch the Settings icon. If the name of the relay does not describe the control mode desired, touch the Scroll Down icon until Mode field is displayed. Touch the Mode field. Touch the Scroll Down icon until the correct control mode is displayed, then touch the Confirm icon to accept the change. This will bring you back to the Settings screen. Finish the rest of the R1 settings.

If you want the output to be interlocked by a flow switch or by another output being active, enter the Interlock Channels menu and select the input or output channel that will interlock this output.
The default is for the output to be in Off mode, where the output does not react to the settings. Once all settings for that output are complete, enter the HOA Setting menu and change it to Auto.
Repeat for each output.

Normal Startup

Startup is a simple process once your set points are in memory. Simply check your supply of chemicals, turn on the controller, calibrate it if necessary and it will start controlling.

4.5 Shut Down

To shut the controller down, simply turn off the power. Programming remains in memory. It is important that the pH/ORP electrode remains wet. If the shutdown is expected for any longer than a day, and it is possible for the electrode to dry out, remove the electrode from the tee and store it in pH 4 buffer or cooling tower water. Take care to avoid freezing temperatures when storing the pH/ORP electrodes to avoid breakage of the glass.

5.0 OPERATION using the touchscreen

These units control continuously while power is applied. Programming is accomplished either via the touchscreen or the optional Ethernet connection. See section 6.0 for Ethernet instructions.

To view the readings of each sensor, or whatever user-defined list of parameters that has been set, touch the Home icon if not already there. The menus for each of these parameters may be accessed directly by touching the parameter.

Keep in mind that even while browsing through menus, the unit is still controlling.

Touch the Main Menu icon  from the home page to access all settings. The menu structure is grouped by alarms, inputs and outputs. Under the Configuration menu will be general settings such as the clock, the language, etc. that do not have an input or output associated with it. Each input has its own menu for calibration and unit selection as needed. Each output has its own setup menu including set points, timer values and operating modes as needed.

5.1 Alarms Menu 

Touch the Alarms icon to view a list of active alarms. If there are more than six active alarms, the Page Down icon will be shown; touch this icon to bring up the next page of alarms.

Touch the Main Menu icon to go back to the previous screen.

5.2 Inputs Menu 

Touch the Inputs icon to view a list of all sensor and digital inputs. The Page Down icon pages down the list of inputs, the Page Up icon pages up the list of inputs, the Main Menu icon brings back the previous screen.

Touch the input to access that input's details, calibration (if applicable) and settings.

Sensor Input Details
The details for any type of sensor input include the current value read, alarms, the raw (uncalibrated) signal, the sensor type, and the calibration gain and offset. If the sensor has automatic temperature compensation, then the sensor's temperature value and alarms, the temperature resistance value read, and the type of temperature element required are also displayed under a separate sensor input menu.

Calibration 
Touch the Calibration icon to calibrate the sensor. Select the calibration to perform: One Point Process, One Point Buffer or Two Point Buffer Calibration. Not all calibration options are available for all types of sensor.

One Point Process Calibration

New Value
Enter the actual value of the process as determined by another meter or laboratory analysis and touch Confirm.

Cal Successful or Failed
If successful, touch Confirm to put the new calibration in memory.
If failed, you may retry the calibration or cancel. Refer to Section 8 to troubleshoot a calibration failure.

One Point Buffer Calibration, Disinfection Sensor Zero Cal, Electrodeless Conductivity Air Cal

Cal Disables Control
Touch Confirm to continue or Cancel to abort
Buffer Temperature (only appears if no temperature sensor is detected for sensor types that use automatic temperature compensation)
Enter the temperature of the buffer and touch Confirm.
Buffer Value (only appears for One Point Calibration)
Enter the value of the buffer being used
Rinse Sensor
Remove the sensor from the process, rinse it off, and place it in the buffer solution (or oxidizer-free water for Zero Cal, or air for the electrodeless conductivity open air cal). Touch Confirm when ready.
Stabilization
When the temperature (if applicable) and signal from the sensor is stable, the controller will automatically move to the next step. If they don't stabilize you may manually go to the next step by pressing Confirm.
Cal Successful or Failed
If successful, touch Confirm to put the new calibration in memory.
If failed, you may retry the calibration or cancel. Refer to Section 8 to troubleshoot a calibration failure.
Resume Control
Replace the sensor in the process and touch Confirm when ready to resume control.

Two Point Buffer Calibration

Cal Disables Control
Touch Confirm to continue or Cancel to abort
Buffer Temperature (only appears if no temperature sensor is detected for sensor types that use automatic temperature compensation)
Enter the temperature of the buffer and touch Confirm.
Buffer Value
Enter the value of the buffer being used
Rinse Sensor
Remove the sensor from the process, rinse it off, and place it in the buffer solution. Touch Confirm when ready.
Stabilization
When the temperature (if applicable) and signal from the sensor is stable, the controller will automatically move to the next step. If they don't stabilize you may manually go to the next step by touching Confirm.
Second Buffer Value
Enter the value of the buffer being used
Rinse Electrode
Remove the sensor from the process, rinse it off, and place it in the buffer solution. Touch Confirm when ready.
Stabilization
When the temperature (if applicable) and signal from the sensor is stable, the controller will automatically move to the next step. If they don't stabilize you may manually go to the next step by touching Confirm.

Cal Successful or Failed
If successful, touch Confirm to put the new calibration in memory. The calibration adjusts the offset and the gain (slope) and displays the new values. If failed, you may retry the calibration or cancel. Refer to Section 8 to troubleshoot a calibration failure.
Resume Control
Replace the sensor in the process and touch Confirm when ready to resume control.

One Point Analog Calibration

OK to disable control?
Touch Confirm to continue or Cancel to abort.
Input Value
Enter the mA value that the transmitter will be sending. Touch Confirm to continue or Cancel to abort.
Please set input signal to specified value
Make sure that the transmitter is sending the desired mA signal. Touch Confirm to continue or Cancel to abort.
Automatic circuit calibration in progress
Cal Successful or Failed
If successful, touch Confirm to **save calibration results**. The calculated offset will be displayed.
If failed, you may retry the calibration or cancel. You may also restore calibration to the factory defaults. The calibration will fail if the measured mA is more than 2 mA away from the Input Value entered.
Please restore input signal to process value
Put the transmitter back into normal measurement mode if necessary and touch Confirm when ready to resume control.

Two Point Analog Calibration

OK to disable control?
Touch Confirm to continue or Cancel to abort.
Input Value
Enter the mA value that the transmitter will be sending. Touch Confirm to continue or Cancel to abort.
Please set input signal to specified value
Make sure that the transmitter is sending the desired mA signal. Touch Confirm to continue or Cancel to abort.
Automatic circuit calibration in progress
Second Input Value
Enter the mA value that the transmitter will be sending. Touch Confirm to continue or Cancel to abort.
Please set input signal to specified value
Make sure that the transmitter is sending the desired mA signal. Touch Confirm to continue or Cancel to abort.
Automatic circuit calibration in progress
Cal Successful or Failed
If successful, touch Confirm to **save calibration results**. The calculated offset and gain will be displayed.
If failed, you may retry the calibration or cancel. You may also restore calibration to the factory defaults. The calibration will fail if the offset is more than 2 mA or the gain is not between 0.5 and 2.0.
Please restore input signal to process value
Put the transmitter back into normal measurement mode if necessary and touch Confirm when ready to resume control.

5.2.1 Contacting Conductivity

Settings 

Touch the Settings icon to view or change the settings related to the sensor.

Alarms	Low-Low, Low, High and High-High Alarms limits may be set.
Deadband	This is the Alarm Deadband. For example, if the High Alarm is 3000, and the deadband is 10, the alarm will activate at 3001 and deactivate at 2990.
Default Temp	If the temperature signal is lost at any time, then the controller will use the Default Temp setting for temperature compensation.
Cable Length	The controller automatically compensates for errors in the reading caused by varying the length of the cable.
Gauge	The cable length compensation depends upon the gauge of wire used to extend the cable
Cell Constant	Do not change unless instructed by the factory.
Units	Select the units of measure for the conductivity.
Name	The name used to identify the sensor may be changed.
Type	Select the type of sensor to be connected.

5.2.2 Electrodeless Conductivity

Settings 

Touch the Settings icon to view or change the settings related to the sensor.

Alarms	Low-Low, Low, High and High-High Alarms limits may be set.
Deadband	This is the Alarm Deadband. For example, if the High Alarm is 3000, and the deadband is 10, the alarm will activate at 3000 and deactivate at 2990.
Default Temp	If the temperature signal is lost at any time, then the controller will use the Default Temp setting for temperature compensation.
Installation Factor	Do not change unless instructed by the factory.
Cable Length	The controller automatically compensates for errors in the reading caused by varying the length of the cable.
Gauge	The cable length compensation depends upon the gauge of wire used to extend the cable
Cell Constant	Do not change unless instructed by the factory.
Range	Select the range of conductivity that best matches the conditions the sensor will see.
Units	Select the units of measure for the conductivity.
Name	The name used to identify the sensor may be changed.
Type	Select the type of sensor to be connected.

5.2.3 Temperature

Settings
Touch the Settings icon to view or change the settings related to the sensor.

Alarms	Low-Low, Low, High and High-High Alarms limits may be set.
Deadband	This is the Alarm Deadband. For example, if the High Alarm is 100, and the deadband is 1, the alarm will activate at 100 and deactivate at 99.
Name	The name used to identify the sensor may be changed.
Element	Select the specific type of temperature sensor to be connected.

5.2.4 pH

Settings
Touch the Settings icon to view or change the settings related to the sensor.

Alarms	Low-Low, Low, High and High-High Alarms limits may be set.
Deadband	This is the Alarm Deadband. For example, if the High Alarm is 9.50, and the deadband is 0.05, the alarm will activate at 9.51 and deactivate at 9.45.
Default Temp	If the temperature signal is lost at any time, then the controller will use the Default Temp setting for temperature compensation.
Cable Length	The controller automatically compensates for errors in the reading caused by varying the length of the cable.
Gauge	The cable length compensation depends upon the gauge of wire used to extend the cable
Name	The name used to identify the sensor may be changed.
Type	Select the type of sensor to be connected.

5.2.5 ORP

Settings
Touch the Settings icon to view or change the settings related to the sensor.

Alarms	Low-Low, Low, High and High-High Alarms limits may be set.
Deadband	This is the Alarm Deadband. For example, if the High Alarm is 800, and the deadband is 10, the alarm will activate at 801 and deactivate at 790.
Cable Length	The controller automatically compensates for errors in the reading caused by varying the length of the cable.
Gauge	The cable length compensation depends upon the gauge of wire used to extend the cable
Name	The name used to identify the sensor may be changed.
Type	Select the type of sensor to be connected.

5.2.6 Disinfection

Settings

Touch the Settings icon to view or change the settings related to the sensor.

Alarms	Low-Low, Low, High and High-High Alarms limits may be set.
Deadband	This is the Alarm Deadband. For example, if the High Alarm is 7.00, and the deadband is 0.1, the alarm will activate at 7.01 and deactivate at 6.90.
Cable Length	The controller automatically compensates for errors in the reading caused by varying the length of the cable.
Gauge	The cable length compensation depends upon the gauge of wire used to extend the cable
Name	The name used to identify the sensor may be changed.
Sensor	Select the specific type and range of disinfection sensor to be connected.
Type	Select the type of sensor to be connected.

5.2.7 Analog Input

Settings

Touch the Settings icon to view or change the settings related to the sensor.

Alarms	Low-Low, Low, High and High-High Alarms limits may be set.
Deadband	This is the Alarm Deadband. For example, if the High Alarm is 7.00, and the deadband is 0.1, the alarm will activate at 7.01 and deactivate at 6.90.
4 mA Value	Enter the value that corresponds to a 4 mA output signal from the transmitter.
20 mA Value	Enter the value that corresponds to a 20 mA output signal from the transmitter.
Units	Select the units of measure for the transmitter.
Name	The name used to identify the transmitter may be changed.
Type	Select the type of sensor to be connected. The choice of Analog Input is only available if that type of sensor card is installed.

5.2.8 DI State

Input Details

The details for this type of input include the current state with a custom message for open versus closed, alarms, the status of the interlock, and the current type of input setting.

Settings

Touch the Settings icon to view or change the settings related to the sensor.

Open Message	The words used to describe the switch state may be customized.
Closed Message	The words used to describe the switch state may be customized.
Interlock	Choose whether the input should be in the interlocked state when the switch is either open or closed.
Alarm	Choose if an alarm should be generated when the switch is open, or closed, or if no alarm should ever be generated.
Name	The name used to identify the switch may be changed.
Type	Select the type of sensor to be connected to the digital input channel.

5.2.9 Flow Meter, Contactor Type

Input Details
The details for this type of input include the total volume accumulated through the flow meter, alarms, and the current type of input setting.

Settings
Touch the Settings icon to view or change the settings related to the sensor.

Totalizer Alarm	A high limit on the total volume of water accumulated may be set.
Reset Flow Total	Enter this menu to reset the accumulated flow total to 0. Touch Confirm to accept, Cancel to leave the total at the previous value and go back.
Volume/Contact	Enter the volume of water that needs to go through the flow meter in order to generate a contact closure.
Flow Units	Select the units of measure for the water volume.
Name	The name used to identify the sensor may be changed.
Type	Select the type of sensor to be connected to the digital input channel.

5.2.10 Flow Meter, Paddlewheel Type

Input Details
The details for this type of input include the current flow rate, total volume accumulated through the flow meter, alarms, and the current type of input setting.

Settings
Touch the Settings icon to view or change the settings related to the sensor.

Totalizer Alarm	A high limit on the total volume of water accumulated may be set.
Reset Flow Total	Enter this menu to reset the accumulated flow total to 0. Touch Confirm to accept, Cancel to leave the total at the previous value and go back.
K Factor	Enter the pulses generated by the paddlewheel per unit volume of water.
Flow Units	Select the units of measure for the water volume.
Rate Units	Select the units of measure for the flow rate time base.
Name	The name used to identify the sensor may be changed.
Type	Select the type of sensor to be connected to the digital input channel.

5.3 Outputs Menu

Touch the Outputs icon from the Main Menu to view a list of all relay and analog outputs. The Page Down icon pages down the list of outputs, the Page Up icon pages up the list of outputs, the Main Menu icon brings back the previous screen.

Touch an output to access that output's details and settings.

NOTE: When the output control mode or the input assigned to that output is changed, the output reverts to OFF mode. Once you have changed all settings to match the new mode or sensor, you must put the output into AUTO mode to start control.

5.3.1 Relay, Any Control Mode

Settings

Touch the Settings icon to view or change the settings related to the relay. Settings that are available for any control mode include:

HOA Setting	Select Hand, Off or Auto mode by touching the desired mode.
Output Time Limit	Enter the maximum amount of time that the relay can be continuously activated. Once the time limit is reached, the relay will deactivate until the Reset Output Timeout menu is entered.
Reset Output Timeout	Enter this menu to clear an Output Timeout alarm and allow the relay to control the process again.
Interlock Channels	Select the relays and digital inputs that will interlock this relay.
Activate With Channels	Select the relays and digital inputs that will activate this relay.
Minimum Relay Cycle	Enter the number of seconds that will be minimum amount of time that the relay will be in the active or inactive state. Normally this will be set to 0, but if using a motorized ball valve that takes time to open and close, set this high enough that the valve has time to complete its movement.
Hand Time Limit	Enter the amount of time that the relay will activate for when it is in Hand mode.
Name	The name used to identify the relay may be changed.
Mode	Select the desired control mode for the output.

5.3.2 Relay, On/Off Control Mode

Output Details

The details for this type of output include the relay on/off state, HOA mode or Interlock status, accumulated on-time, alarms related to this output, and the current control mode setting.

Settings

Touch the Settings icon to view or change the settings related to the relay.

Set point	Enter the sensor process value at which the relay will activate.
Deadband	Enter the sensor process value away from the set point at which the relay will deactivate.
Input	Select the sensor to be used by this relay.
Direction	Select the control direction.

5.3.3 Relay, Flow Timer Control Mode

Output Details

The details for this type of output include the relay on/off state, HOA mode or Interlock status, accumulated on-time, remaining feed time, accumulated flow total, alarms related to this output, and the current control mode setting.

Settings

Touch the Settings icon to view or change the settings related to the relay.

Feed Duration	Enter the amount of time for the relay to activate for once the accumulated volume through the water meter has been reached.
Accumulated Volume	Enter the volume of water to pass through the water meter required to trigger the chemical feed.
Input	Select the input to be used to control this output.

5.3.4 Relay, Bleed and Feed Control Mode

ONLY AVAILABLE IF HVAC MODES ARE ENABLED IN CONFIG MENU – GLOBAL SETTINGS

Output Details

The details for this type of output include the relay on/off state, HOA mode or Interlock status, accumulated on-time, alarms related to this output, and the current control mode setting.

Settings

Touch the Settings icon to view or change the settings related to the relay.

Feed Time Limit	Enter the maximum amount of feed time per bleed event
Bleed	Select the relay to be used for Bleed/Blowdown

5.3.5 Relay, Bleed then Feed Control Mode

ONLY AVAILABLE IF HVAC MODES ARE ENABLED IN CONFIG MENU – GLOBAL SETTINGS

Output Details

The details for this type of output include the relay on/off state, HOA mode or Interlock status, accumulated on-time, remaining feed time, the accumulated bleed time, alarms related to this output, and the current control mode setting.

Settings

Touch the Settings icon to view or change the settings related to the relay.

Feed Percentage	Enter the % of bleed relay activation time to use for the feed relay activation time
Feed Time Limit	Enter the maximum amount of feed time per bleed event
Bleed	Select the relay to be used for Bleed/Blowdown

5.3.6 Relay, Percent Timer Control Mode

Output Details

The details for this type of output include the relay on/off state, HOA mode or Interlock status, cycle time, accumulated on-time, alarms related to this output, and the current control mode setting.

Settings

Touch the Settings icon to view or change the settings related to the relay.

Sample Period	Enter the duration of the sample period.
Feed Percentage	Enter the % of the sample period time to use for the feed relay activation time

5.3.7 Relay, Biocide Timer Control Mode

ONLY AVAILABLE IF HVAC MODES ARE ENABLED IN CONFIG MENU – GLOBAL SETTINGS

Basic Biocide Operation

When a biocide event triggers, the algorithm will first prebleed (if a prebleed is programmed) for the set amount of prebleed time or down to the set prebleed conductivity. Then the biocide relay is turned on for the set duration. This is followed by a post-bio add lockout that blocks the bleed relay from turning on for a set amount of bleed lockout time.

Special Condition Handling

Prebleed

If both a time limit and a conductivity limit are set, the time limit takes precedence. The bleed relay will turn off once the time limit is reached or when the prebleed conductivity limit is reached (whichever occurs first).

Overlapping biocide events

If a second biocide event occurs while the first one is still active (in prebleed, biocide add or lockout), the second event will be ignored. An Event Skipped alarm will be set.

Interlock Conditions

Interlocks override the relay control, but do not change the operation of the timers or related bleed control.

A no-flow (or other interlock) condition does not delay a biocide add. The biocide add duration timer will continue even if the relay is locked out due to a no-flow or other interlock condition. This will prevent delayed biocide adds which can potentially cause higher than expected biocide concentrations in the system when two biocides adds occur close to the same time. Not allowing delayed biocide adds will also prevent incompatible biocides getting added at close to the same time.

"Activate With" Conditions

"Activate with channels" settings override the relay control, but do not change the operation of the timers or related bleed control. The biocide timer continues counting biocide add time when the biocide relay is forced on, and ends at the expected time (biocide event start time plus duration). If the "activate with" condition continues after the end of the biocide feed time, the relay remains activated.

Alarms

An Event Skipped alarm is set when a second biocide event occurs while one event is still running (either in prebleed, biocide add or post-biocide add lockout).

An Event Skipped alarm is also set when the biocide add relay never turns on during a biocide add because of an interlock condition.

The alarm is cleared when the relay is next activated for any reason (the next timer event or HAND mode or "activate with" force on condition).

Output Details

The details for this type of output include the relay on/off state, HOA mode or Interlock status, accumulated on-time, alarms related to this output, and the current control mode setting. The current week number is displayed (even if there is no multi-week repetition event programmed). Cycle Time shows the time counting down of the currently active part of the biocide cycle (pre-bleed, biocide feed, or post biocide feed lockout of the bleed).

Settings 

Touch the Settings icon to view or change the settings related to the relay.

Bleed	Select the relay to be used for Bleed/Blowdown
Prebleed Time	If lowering the conductivity prior to feeding biocide is desired using a fixed time instead of a specific conductivity setting, enter the amount of time for the prebleed. Also may be used to apply a time limit on a conductivity based prebleed.
Prebleed To	If lowering the conductivity prior to feeding biocide is desired, enter the conductivity value. If no prebleed is required, or if a time-based prebleed is preferred, set the conductivity value to 0.
Cond Input	Select the sensor to be used to control the prebleed relay selected above.
Bleed Lockout	Enter the amount of time to lockout bleed after the biocide feed is complete.
Event 1 Repetition	Select the time cycle to repeat the biocide feed event: Daily, 1 Week, 2 Week, 4 Week, or None. An event means that the output is turned on at the same time of day, for the same amount of time, and except for the Daily cycle, on the same day of the week.
Event 1 Week	If the Event Repetition is Daily or 1 Week, select N/A. For longer cycles, select the week during which the event will occur.
Event 1 Day	If the Event Repetition is Daily, select N/A. For longer cycles, select the day of the week during which the event will occur.
Event 1 Start Time	Enter the time of day to start the biocide feed event. The event begins with the Prebleed if applicable, then the chemical feed, and then the Bleed Lockout.
Event 1 Duration	Enter the amount of time that the biocide chemical feed pump will be on.
Repeat for up to 10 events…	

5.3.8 Relay, Alarm Output Mode

Output Details

The details for this type of output include the relay on/off state, HOA mode or Interlock status, accumulated on-time, alarms related to this output, and the current control mode setting.

Settings

An alarm relay will activate if any alarm is active. There are no additional programmable parameters.

5.3.9 Relay, Time Proportional Control Mode

Output Details

The details for this type of output include the relay on/off state, HOA mode or Interlock status, the current % on time calculated for the cycle, the current point in the cycle time, accumulated on-time, alarms related to this output, and the current control mode setting.

Settings

Touch the Settings icon to view or change the settings related to the relay.

Set point	Enter the sensor process value at which the relay will be off for the entire Sample Period.
Proportional Band	Enter the distance that the sensor process value is away from the set point at which the relay will be on for the entire Sample Period.
Sample Period	Enter the duration of the sample period.
Input	Select the sensor to be used by this relay.
Direction	Select the control direction.

5.3.10 Relay, Intermittent Sampling Control Mode

ONLY AVAILABLE IF HVAC MODES ARE ENABLED IN CONFIG MENU – GLOBAL SETTINGS

In an Intermittent Sampling with Proportional Blowdown control mode, the controller reads an analog input on a timed schedule, and the relay responds to maintain the conductivity value at the set point by activating for a programmable amount of time that varies with the deviation from the set point.

The relay goes through a sequence of activation/deactivation as described below. The intended purpose of this algorithm is boiler blowdown. A sample cannot be supplied to the sensor continuously in many boilers because a recirculating loop is not possible, and it would be a waste of hot water to constantly run a sample to a drain. A valve is opened intermittently to supply a sample to the sensor.

Where a non-ideal installation of the sensor can cause the sample to flash to steam, and give a false low reading, this can be corrected by taking the reading with the sample held in the pipe with the sampling valve closed, so the sample is at boiler pressure and therefore back in the liquid state. Because the conductivity reading cannot be trusted while the valve is open, the blowdown is timed rather than in direct response to a sensor reading. Rather than relying upon a fixed time, where the blowdown could be much longer than necessary if the reading is just barely off the set point value, proportional blowdown adjusts the time appropriately.

Output Details

The details for this type of output include the relay on/off state, relay status (HOA mode, Interlock status, Intermittent Sampling cycle step, etc.), time remaining for the active Intermittent Sampling cycle step, alarms related to this output, the live reading of the conductivity, and the current control mode setting.

Settings

Touch the Settings icon to view or change the settings related to the relay.

Set point	Enter the conductivity value below which the controller will not start a blowdown cycle.
Proportional Band	Enter the conductivity value above the set point at which the maximum blowdown time will occur.
Sample Time	Enter the length of time the blowdown valve will be open in order to capture a fresh sample of boiler water.
Hold Time	Enter the length of time the blowdown valve will be closed in order to ensure that the captured sample is at boiler pressure.
Maximum Blowdown	Enter the maximum length of time that the blowdown valve will be open, when the conductivity of the captured sample is above the set point plus the proportional band.
Wait Time	Enter the time to wait to sample the water again once the captured sample is below set point.
Cond Input	Select the sensor to be used by this relay.

5.3.11 Relay or Analog Output, Manual Mode

Output Details

The details for this type of output include the relay on/off state or analog output %, HOA mode or Interlock status, accumulated on-time, alarms related to this output, and the current control mode setting.

Settings

A Manual relay will activate if the HOA mode is Hand, or if it is Activated With another channel. There are no additional programmable parameters.

5.3.12 Relay, Pulse Proportional Control Mode

ONLY AVAILABLE IF CONTROLLER INCLUDES PULSE OUTPUT HARDWARE

Output Details

The details for this type of output include the relay pulse rate, HOA mode or Interlock status, accumulated on-time, alarms related to this output, and the current control mode setting.

Settings

Touch the Settings icon to view or change the settings related to the relay.

Set point	Enter the sensor process value at which the output will pulse at the Minimum Output % set below.
Proportional Band	Enter the distance that the sensor process value is away from the set point beyond which the output will be pulsing at the Maximum Output % set below.
Minimum Output	Enter the lowest possible pulse rate as a percentage of the Maximum Stroke Rate set below (normally 0%).
Maximum Output	Enter the highest possible pulse rate as a percentage of the Maximum Stroke Rate set below.
Maximum Rate	Enter the maximum pulse rate that the metering pump is designed to accept (10 - 360 pulse/minute range).
Input	Select the sensor to be used by this relay.
Direction	Set the control direction.

5.3.13 Relay, Dual Set Point Mode

Output Details

The details for this type of output include the relay on/off state, HOA mode or Interlock status, accumulated on-time, alarms related to this output, and the current control mode setting.

Settings

Touch the Settings icon to view or change the settings related to the relay.

Set point	Enter the first sensor process value at which the relay will activate.
Set point 2	Enter the second sensor process value at which the relay will activate.
Deadband	***Enter the sensor process value away from the set point at which the relay will deactivate.***
Input	Select the sensor to be used by this relay.
Direction	Select the control direction. In Range will activate the relay when the input reading is between the two set points. Out of Range will activate the relay when the input reading is outside the two set points.

5.3.14 Relay, Timer Control Mode

ONLY AVAILABLE IF HVAC MODES ARE DISABLED IN CONFIG MENU – GLOBAL SETTINGS

Basic Timer Operation

When a timer event triggers the algorithm will activate the relay for the programmed time.

Special Condition Handling

Overlapping timer events

If a second timer event occurs while the first one is still active, the second event will be ignored. An Event Skipped alarm will be set.

Interlock Conditions

Interlocks override the relay control, but do not change the operation of the timer control.

A digital input or output interlock condition does not delay the relay activation. The relay activation duration timer will continue even if the relay is deactivated due to an interlock condition. This will prevent delayed events which can potentially cause problems in they do not occur at the correct time.

"Activate With" Conditions

"Activate with channels" settings override the relay control, but do not change the operation of the timer control. The relay activation duration timer continues counting when the timer relay is forced on, and ends at the expected time (event start time plus duration). If the "activate with" condition continues after the end of the event time, the relay remains activated.

Alarms

An Event Skipped alarm is set when a second timer event occurs while one event is still running.
An Event Skipped alarm is also set when the timer relay never turns on during an event because of an interlock condition.
The alarm is cleared when the relay is next activated for any reason (the next timer event or HAND mode or "activate with" force on condition).

Output Details

The details for this type of output include the relay on/off state, HOA mode or Interlock status, accumulated on-time, alarms related to this output, and the current control mode setting. The current week number is displayed (even if there is no multi-week repetition event programmed). Cycle Time shows the time counting down of the currently active part of the timer cycle.

Settings 

Touch the Settings icon to view or change the settings related to the relay.

Event 1 Repetition	Select the time cycle to repeat the timer activation event: Daily, 1 Week, 2 Week, 4 Week, or None. An event means that the output is turned on at the same time of day, for the same amount of time, and except for the Daily cycle, on the same day of the week.
Event 1 Week	If the Event Repetition is Daily or 1 Week, select N/A. For longer cycles, select the week during which the event will occur.
Event 1 Day	If the Event Repetition is Daily, select N/A. For longer cycles, select the day of the week during which the event will occur.
Event 1 Start Time	Enter the time of day to start the timer activation event.
Event 1 Duration	Enter the amount of time that the relay will be active.
Repeat for up to 10 events...	

5.3.15 Analog Output, Retransmit Mode

Output Details

The details for this type of output include the output %, HOA mode or Interlock status, accumulated on-time, alarms related to this output, and the current control mode setting.

Settings

Touch the Settings icon to view or change the settings related to the relay.

4 mA Value	Enter the process value to correspond to a 4 mA output signal.
20 mA Value	Enter the process value to correspond to a 20 mA output signal.
Hand Output	Enter the output % desired when the output is in Hand mode.
Error Output	Enter the output % desired when the input signal is invalid (Error mode).
Input	Select the sensor input to retransmit.

5.3.16 Analog Output, Proportional Control Mode

Output Details

The details for this type of output include the output %, HOA mode or Interlock status, accumulated on-time, alarms related to this output, and the current control mode setting.

Settings

Touch the Settings icon to view or change the settings related to the relay.

Set point	Enter the sensor process value at which the output % will be the programmed minimum %.
Proportional Band	Enter the sensor process value away from the set point at which the output % will be the programmed maximum %.
Minimum Output	Enter the lowest output %. If the output should be off at the set point, this will be 0%.
Maximum Output	Enter the highest output %.
Hand Output	Enter the output % desired when the output is in Hand mode.
Off Mode Output	Enter the output mA value desired when the output is in Off mode, or being Interlocked, or during a calibration of the sensor being used as an input. The acceptable range is 0 to 21 mA.
Error Output	Enter the output mA desired when the sensor is not giving the controller a valid signal. The acceptable range is 0 to 21 mA.
Input	Select the sensor input to use for proportional control.
Direction	Select the control direction.

5.4 Configuration Menu 

The configuration Settings Menu is used for settings and activities that are not tied to Inputs or Outputs.

5.4.1 Global Settings

Date	Enter the current year, month and day.
Time	Enter the current hour (military time), minute, and second.
Name	Enter the name to help identify the controller when it connects to VTouch.
Location	Enter the location to help identify the controller when it connects to VTouch.
Global Units	Select the units to be used for cable length and wire gauge settings, metric or Imperial.
Temperature Units	Select between Fahrenheit and Celsius.
HVAC Modes	Enable HVAC Modes for cooling tower and boiler applications where the relay control modes for Biocide timer, Bleed and Feed, Bleed then Feed, and Intermittent Sampling are required. Disable HVAC Modes if these control modes are not necessary and a more generic timer control mode will replace the Biocide timer.
Language	Select the language the software will use.

5.4.2 Security Settings

Controller Log Out	When Security is Enabled, and after the password has been entered, the controller requires immediate use of a password to calibrate or change settings. Once finished making changes, log out to prevent unauthorized changes by someone else. If not manually logged out, the controller will automatically log out after 10 minutes of inactivity.
Security	Select Enable to require a password in order to calibrate or change settings, or Disable to allow calibration and set point changes without a password. In order to enable security, the default password must be entered first, then touch Enabled, then touch the Confirm icon.
Local Password	Used to change the touchscreen password needed for full configuration capability if security has been enabled. The default local password is 5555. This can and should be changed using this menu if Security is enabled.
Key Beep	Select enable to hear a beep when an icon is pressed, or disable for silence

5.4.3 Network Settings

DHCP Setting	Select Enabled to get an IP address from the LAN or Disabled to use a fixed IP address.
Controller IP Address	Enter the default IP address to use if a network is not available or if DHCP is disabled.
Network Netmask	Enter the default netmask to use if a network is not available or if DHCP is disabled.
Network Gateway	Enter the default gateway address to use if a network is not available or if DHCP is disabled.
DNS Server	Enter the default DNS server IP address to use if DHCP is disabled.
VTouch Status	Select Enabled to activate a connection to VTouch, or Disabled to stop sending data and alarms to VTouch.
Update Period	Enter the time between data updates being sent to VTouch.
Reply Timeout	Enter the maximum time allowed for VTouch to respond.

5.4.4 Network Details

The Network Details are for information only and display the network settings currently in use, and the recent history of the VTouch connection.

Alarms	Displays any active Network-related alarms
DHCP Status	Displays if the connection to the LAN using DHCP was successful or not.
Controller IP Address	Displays the IP address that the controller is currently using.
Network Netmask	Displays the netmask address that the controller is currently using.
Network Gateway	Displays the gateway address that the controller is currently using.
DNS Server	Displays the DNS server address that the controller is currently using.
MAC Address	Displays the MAC address of the Ethernet card.
Last VTouch Config	Displays the date and time of the last attempt to send configuration data to the VTouch server.
Last VTouch Data	Displays the date and time of the last attempt to send a data to the VTouch server.

5.4.5 Display Settings

Home 1	Select the input or output to display on the 1st line of the display Home screen.
Home 2	Select the input or output to display on the 2nd line of the display Home screen.
Home 3	Select the input or output to display on the 3rd line of the display Home screen.
Key Beep	Select enable to hear a beep when an icon is pressed, or disable for silence

5.4.6 File Utilities

File Transfer Status	Displays the status of the last attempt to export a file
Export Daily Data Log	Save the Daily Data Log file to a USB stick. This records all inputs' data from the last 24 hours in 10 second intervals.
Export Weekly Data Log	Save the Weekly Data Log file to a USB stick. This records all inputs' data from the last week in two minute intervals.
Export Monthly Data Log	Save the Monthly Data Log file to a USB stick. This records all inputs' data from the last 96 days in 15 minute intervals.
Export Event Log	Save the Event Log file to a USB stick. This records set point changes, user calibrations, alarms, relay state changes, file exports, etc.
Export System Log	Save the System Log file to a USB stick. This records hardware changes, software upgrades, automatic calibrations, power loss, system-level issues, etc.
Export User Config File	The User Configuration file contains all settings for the controller. Enter this menu to save the controller's settings to an USB stick for using later to restore settings to this controller, or to program additional controllers with the same settings as this one. It takes several minutes to create the file and transfer it to the stick.
Import User Config File	The User Configuration file contains all settings for the controller. Insert an USB stick containing the desired Configuration file. Enter this menu to import the file from the stick onto the controller.
Software Upgrade	Insert a USB stick that has the upgrade file stored in the root directory into the USB connector under the watertight cap on the outside of the front panel (see figure 18). Touch the Confirm icon, and then touch the Confirm icon to start the upgrade.

NOTE: To maintain the IP65 rating, always remove the stick and replace the cap securely over the USB connector when not in use.

5.4.7 Controller Details

Controller	Displays the name for the group of default settings used as built
Product Name	Displays the model of the controller as built
Serial Number	Displays the serial number of the controller
Controller Board	Displays the revision number of the front panel circuit board
Software Version	Displays the software version on the controller board
Power Board	Displays the revision number of the power/relay board
Sensor Board #1	Displays the revision number of the sensor board in the Sensor 1 slot
Software Version	Displays the software version on the sensor board in the Sensor 1 slot
Sensor Board #2	Displays the revision number of the sensor board in the Sensor 2 slot
Software Version	Displays the software version on the sensor board in the Sensor 2 slot
Network Board	Displays the revision number of the network board
Software Version	Displays the software version on the network board
Display Board	Displays the revision number of the display board
AO Board	Displays the revision number of the analog output board
Battery Power	Displays the VDC output of the battery that is used to hold the date and time. The acceptable range is 2.4-3.2 VDC.
Internal Temp 1	Displays the temperature of the main processor. The acceptable range is -10 to 65 C.
Internal Temp 2	Displays the temperature of the sensor input processor installed in I/O slot 1. The acceptable range is -10 to 65 C.
Internal Temp 3	Displays the temperature of the sensor input processor installed in I/O slot 2. The acceptable range is -10 to 65 C.
Internal Temp 4	Displays the temperature of the network card processor. The acceptable range is -10 to 65 C.
+5 Volt Supply	The normal range is 4.75 to 5.25 VDC. The 5 V supply is used for powering all the I/O.
+3.3 Volt Supply	The normal range is 3.135 to 3.465 VDC. The 3V supply is used to run the system.
LCD Bias Voltage	The normal range is -25 to -20 VDC. This is the touchscreen voltage after contrast adjustment.
LCD Supply	The normal range is -25 to -20 VDC. This is the touchscreen voltage before contrast adjustment.

5.5 HOA Menu

The HOA (Hand-Off-Automatic) Menu is used to quickly and easily test all relay outputs, and to stop or enable automatic control.

Touch the relay number in order to change the HOA state of that relay. The relay number will be shaded dark, and its current HOA state will be shaded dark. Then touch the desired state. The change happens immediately unless that relay has a Minimum Relay Cycle programmed that is above 0 seconds.

5.6 Graph Menu

The Graph Menu is used to display a graph containing one sensor or analog input value plus one digital input or relay state. Touch the Graph icon and the controller will display "Generating Graph Please Stand By" for a few seconds then show the graph. The default is to show the value of sensor input S11 and the state of relay output R1 over the past 10 minutes.

Touching any point on either line on the graphs displays a vertical line plus the details for that data point: date and time, value of the sensor, and an arrow showing if the state or the digital input/relay was high or low at that time.

Touching the  or the  icons will redraw the graph forward or backwards in time, in increments of one time range. It can only go back in time to the point where the data log file used to generate the graph starts. Changing the time frame while in the graph view, after moving back in time, shows data from that past time. Exiting the graph menu and returning to the graph menu moves back to the current time.

5.6.1 Settings

Sensor	Enter this menu to select the sensor, analog input, flowmeter type digital input (total flow and/or flow rate if applicable), or analog output value to show on the graph
DI/Relay	Enter this menu to select digital input, or analog output value to show on the graph
Low Axis Limit	The graph auto-scales based on the sensor value if both Low and High Axis Limit are set to 0. To manually adjust the Y axis scale, enter the low limit here.
High Axis Limit	The graph auto-scales based on the sensor value if both Low and High Axis Limit are set to 0. To manually adjust the Y axis scale, enter the high limit here.
Time Range	Select the time range for the X axis of the graph. The time range may also be accessed from the graph view by touching the time range icon in the lower right corner.

The resolution of the screen only allows for 84 data points per graph, so not all data points in each time range can be shown. For finer resolution, download the data log CSV file from the Config – File Utilities menu and graph the data in Excel or equivalent spreadsheet application.

Time Range	Time between data points	Datalog file used
10 minutes	10 seconds	Daily
30 minutes	30 seconds	Daily
1 hour	1 minute	Daily
2½ hours	2 minutes	Weekly
8 hours	6 minutes	Weekly
½ day	10 minutes	Weekly
1 day	20 minutes	Weekly
½ week	1 hour	Monthly
1 week	2 hours	Monthly
2 weeks	4 hours	Monthly
4 week	8 hours	Monthly

6.0 OPERATION using Ethernet

All of the same settings that are available using the touchscreen are also available using a browser that is connected to the controller's Ethernet IP address. The controller may be connected to a Local Area Network (LAN), directly to the Ethernet port of a computer, or to the VTouch account management system server.

6.1 Connecting to a LAN

Connect the controller's network card to the LAN using a CAT5 cable with RJ45 connector.

6.1.1 Using DHCP

Using the touchscreen, from the Main menu, touch Config, then touch Network Settings, then touch DHCP Setting. Touch Enabled, then the Confirm icon.

After a power cycle of the controller, return to Config, then Network Details to view the Controller IP Address that has been assigned to the controller by the network.

6.1.1 Using a fixed IP Address

Using the touchscreen, from the Main menu, touch Config, then touch Network Settings, then touch DHCP Setting. Touch Disabled, then the Confirm icon. Cycle power to the controller. If DHCP is already Disabled then you can skip this step.

Using the touchscreen, from the Main menu, touch Config, then touch Network Settings, then touch Controller IP Address. Enter the IP address provided by the administrator of the LAN then touch the Confirm icon. Repeat for the Network Netmask and Network Gateway settings. Cycle power to the controller.

6.2 Connecting Directly to a Computer

Connect the controller's network card to the computer using a CAT5 cable with RJ45 connector.

Follow the instructions above to give the controller a fixed IP address that is compatible with the network settings of the computer.

Open a browser and type the numeric Controller IP address in the web page address field. The login screen should quickly appear. The default user name is **admin** and the default password is **5555**. The default View-Only user name is **user** and default password is **1111**. These can and should be changed in the Config menu, under Security Settings.

6.3 Navigating the web pages

From any computer that is directly connected to the controller, or is on the same network as the controller, open a browser and type the numeric Controller IP address in the web page address field. The login screen should quickly appear. The default user name is **admin** and the default password is **5555**. The default View-Only user name is **user** and default password is **1111**. These can and should be changed in the Config menu, under Security Settings.

The Home page will appear. This will display the date and time, any active alarms, and the current readings or status of all of the Inputs and Outputs. On the left side of the page you will see links to the Main Menu selections: Alarms, Inputs, Outputs and Config. Hover the mouse pointer over each menu to see the submenus, and click on the submenu to access all of the details and settings associated with it.

7.0 MAINTENANCE

The controller itself requires very little maintenance. Wipe with a damp cloth. Do not spray down the controller unless the enclosure door is closed and latched.

7.1 Electrode Cleaning

NOTE: The controller must be recalibrated after cleaning the electrode.
Frequency

The electrode should be cleaned periodically. The frequency required will vary by installation. In a new installation, it is recommended that the electrode be cleaned after two weeks of service. To determine how often the electrode must be cleaned, follow the procedure below.

1. Read and record the conductivity.
2. Remove, clean and replace the conductivity electrode.
3. Read conductivity and compare with the reading in step 1 above.

If the variance in readings is greater than 5%, increase the frequency of electrode cleaning. If there is less than 5% change in the reading, the electrode was not dirty and can be cleaned less often.

Cleaning Procedure

The electrode can normally be cleaned using a cloth or paper towel and a mild detergent. If coated with scale, clean with a dilute (5%) solution of hydrochloric acid solution. Occasionally an electrode may become coated with various substances that require a more vigorous cleaning procedure. Usually the coating will be visible, but not always. To clean a coated electrode, use fine grit abrasive, such as emery paper. Lay the paper on a flat surface and move the electrode in a back and forth motion. The electrode should be cleaned parallel to the carbon electrodes, not perpendicular.

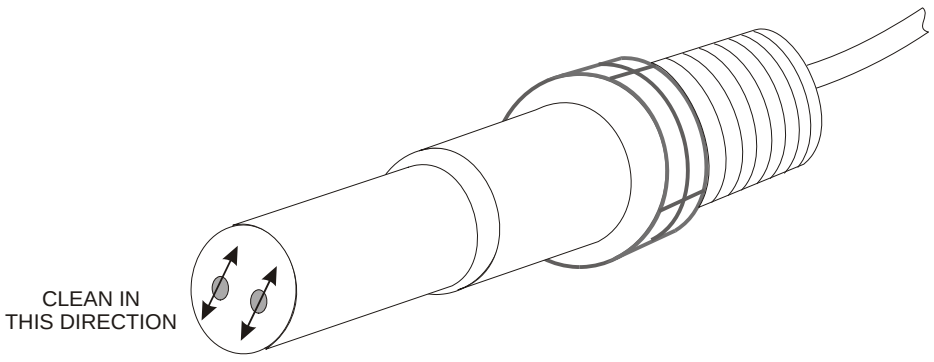


Figure 19 Cleaning the Electrode

7.2 Replacing the Fuse Protecting Powered Relays

CAUTION: Disconnect power to the controller before opening front panel!

Locate the fuse on the circuit board at the back of the controller enclosure under the plastic safety cover. Gently remove the old fuse from its retaining clip and discard. Press the new fuse into the clip, secure the front panel of the controller and return power to the unit.

Warning: Use of non-approved fuses can affect product safety approvals. Specifications are shown below. To insure product safety certifications are maintained, it is recommended that a Walchem fuse be used.

Fuse	Walchem P/N
5 x 20 mm, 6A, 250V	102834

8.0 TROUBLESHOOTING

CAUTION: Disconnect power to the controller before opening front panel!

Troubleshooting and repair of a malfunctioning controller should only be attempted by qualified personnel using caution to ensure safety and limit unnecessary further damage. Contact the factory.

8.1 Calibration Failure

Calibrations will fail if the adjustments to the reading are outside of the normal range for a properly functioning system. Refer to the instruction manual for the specific sensor being used for further information.

8.1.1 Contacting Conductivity Sensors

The calibration will fail if the adjustment to the gain is outside of 0.5 to 2.0.

Possible Cause	**Corrective Action**
Dirty electrode	Clean electrode
Improper wiring of sensor to controller	Correct wiring
Wrong cell constant entered	Program the controller cell constant setting at the value that matches the electrode being used
Incorrect temperature reading or setting	Ensure that the temperature is accurate
Incorrect cable length or wire gauge setting	Set to the correct values
Faulty electrode	Replace electrode

8.1.2 Electrodeless Conductivity Sensors

The calibration will fail if the adjustment to the gain is outside of 0.2 to 10, or the offset is outside of -10,000 to 10,000.

Possible Cause	Corrective Action
Dirty sensor	Clean sensor
Improper wiring of sensor to controller	Correct wiring
Sensor placed too close to container walls	Relocate sensor
Sensor placed in the direct path of electrical current flow	Relocate sensor
Incorrect temperature reading or setting	Ensure that the temperature is accurate
Incorrect cable length or wire gauge setting	Set to the correct values
Faulty sensor	Replace sensor

8.1.3 pH Sensors

The calibration will fail if the adjustment to the gain is outside of 0.2 to 1.2, or if the calculated offset is outside of -60 to 60.

Possible Cause	Corrective Action
Dirty electrode	Clean electrode
Improper wiring of sensor to controller	Correct wiring
Incorrect temperature reading or setting	Ensure that the temperature is accurate
Incorrect cable length or wire gauge setting	Set to the correct values
Faulty electrode	Replace electrode
Faulty preamplifier	Replace preamplifier

8.1.4 ORP Sensors

The calibration will fail if the adjustment to the gain is outside of 0.5 to 1.5, or if the calculated offset is outside of -300 to 300.

Possible Cause	Corrective Action
Dirty electrode	Clean electrode
Improper wiring of sensor to controller	Correct wiring
Faulty electrode	Replace electrode
Faulty preamplifier	Replace preamplifier

8.1.5 Disinfection Sensors

The calibration will fail if the adjustment to the gain is outside of 0.2 to 10.0, or if the calculated offset is outside of -40 to 40.

Possible Cause	**Corrective Action**
Insufficient conditioning	Wait for the appropriate amount of time before attempting a calibration.
Insufficient sample flow	Increase flow rate to between 30 and 100 liter per hour.
Air bubbles on membrane	Dislodge bubbles. Adjust flow rate higher if necessary.
Air bubbles in electrolyte	Refill membrane cap with electrolyte.
Dirty membrane	Clean membrane
Loose membrane cap	Tighten membrane cap.
Faulty membrane	Replace membrane cap.
High Pressure	Reduce pressure to below 1 atmosphere and refill cap with electrolyte
No electrolyte fill solution in membrane cap	Fill membrane cap with electrolyte. Replace membrane cap if it will not hold solution.
Improper wiring of sensor to controller	Correct wiring
Faulty sensor	Replace sensor
Faulty analysis equipment or reagents	Consult test equipment instructions
Sample contaminated with interfering molecule (refer to Sensitivity specification in sensor instructions)	Remove source of contamination

8.1.6 Analog Inputs

The calibration will fail if the adjustment to the gain is outside of 0.5 to 2.0, or if the calculated offset is outside of -2 to 2 mA.

Possible Cause	**Corrective Action**
Improper wiring of sensor to controller	Correct wiring
Faulty sensor	Replace sensor

8.1.7 Temperature Sensors

The calibration will fail if the calculated offset is outside of -10 to 10.

Possible Cause	**Corrective Action**
Improper wiring of sensor to controller	Correct wiring
Temperature input is set to the incorrect element	Reprogram to match the connected temperature element
Faulty sensor	Replace sensor

8.2 Alarm Messages

HIGH or HIGH-HIGH ALARM

Occurs if the sensor reading rises above the high alarm set points. If your unit is programmed for an alarm relay output, the alarm relay will activate. The controller will continue to check the sensor reading, and any outputs using the sensor will remain active.

Possible Cause	**Corrective Action**
The process went further out of control than normal.	May have to increase chemical flow rate.
The chemical supply has run out.	Replenish the chemical supply.
The pump or valve or supply line is faulty.	Repair or replace the control device.
Wrong chemical is being controlled.	Replace with correct chemical.
The sensor is not responding to changes.	Repair or replace sensor. Evaluate mixing or recirculation.
The pump is siphoning, valve leaking.	Repair or replace the control device or re-route tubing.
Control output has been left in "HAND" mode.	Switch back to "AUTO".
It may be a normal part of the process.	None required.

LOW or LOW-LOW ALARM

Occurs if the sensor reading drops below the low alarm set points. If your unit is programmed for an alarm relay output, the alarm relay will activate. The controller will continue to check the sensor reading, and any outputs using the sensor will remain active.

Possible Cause	**Corrective Action**
The process went further out of control than normal.	May have to increase chemical flow rate.
The chemical supply has run out.	Replenish the chemical supply.
The pump or valve or supply line is faulty.	Repair or replace the control device.
Wrong chemical is being controlled.	Replace with correct chemical.
The sensor is not responding to changes.	Repair or replace sensor. Evaluate mixing or recirculation.
The pump is siphoning, valve leaking.	Repair or replace the control device or re-route tubing.
Control output has been left in "HAND" mode.	Switch back to "AUTO".
It may be a normal part of the process.	None required.

DI STATE CUSTOM MESSAGE

A digital input that is a DI State type can be set such that either the open or closed state generates an alarm. The alarm message may be customized. The most common use for this will be a Flow Switch.

Possible Cause	**Corrective Action**
No flow	Check piping for closed valves, blockage, etc. Check recirculation pump.
Faulty flow switch/cable	Check with ohmmeter.
Faulty controller	Check by shorting digital input in controller.

TOTAL ALARM

Occurs if the flow meter totalizer alarm limit is exceeded.

Possible Cause	**Corrective Action**
Normal operation	Reset the total to clear alarm
AC coupled onto flow meter cable	Route cable at least 6 inches (150 mm) away from any AC voltage
Noise coupled onto flow meter cable	Shield cable

TOTAL RANGE LIMIT

Occurs if the flow meter totalizer range limit is exceeded. The maximum flow total is 1 trillion times the increment of the flow meter. For example, if 1 gallon/contact or if K Factor = 1 pulse/liter, the maximum total is 1 trillion gallons.

Normal operation	Reset the total to clear alarm

OUTPUT TIMEOUT

This error condition will stop control. It is caused by the output (either relay or analog) being activated for longer than the programmed Time Limit.

Possible Cause	**Corrective Action**
The process went further out of control than normal.	Increase time limit or reset timer.
The chemical supply has run out.	Replenish the chemical supply.
The pump or valve or supply line is faulty.	Repair or replace the control device.
Wrong chemical is being controlled.	Replace with correct chemical.
The sensor is not responding to changes.	Replace sensor. Evaluate mixing or recirculation.

RANGE ALARM

It indicates that the signal from the sensor is out of the normal range. This error condition will stop control of any output using the sensor. This prevents controlling based upon a false sensor reading. If the temperature sensor goes into range alarm, then the controller will go into manual temperature compensation using the Default Temperature setting.

Possible Cause	**Corrective Action**
Sensor wires shorted	Disconnect short
Faulty sensor	Replace sensor
Faulty controller	Replace or repair controller

EVENT SKIPPED ALARM

An event skipped alarm is set when a second biocide or timer event occurs while one event is still running (either in prebleed, biocide-add or post-biocide add lockout in the case of the biocide timer mode). An event skipped alarm is also set when the timer relay never turns on during an event because of an interlock condition.

The alarm is cleared when the relay is next activated for any reason (the next timer event or HAND mode or "activate with" force on condition).

Possible Cause	**Corrective Action**
Incorrect programming	Reprogram to eliminate overlapping events
Long duration interlock condition	Normal operation
Long duration prebleed	Decrease prebleed time Increase bleed flow rate Reprogram to eliminate overlapping events

SENSOR FAULT

This error indicates that the signal from the sensor is no longer valid at all. This error condition will stop control of any output using the sensor.

Possible Cause	**Correction Action**
Sensor wires shorted	Disconnect short
Faulty sensor	Replace sensor
Faulty controller	Replace or repair controller

INPUT FAILURE

This alarm indicates that the sensor input circuit is no longer working. This error condition will stop control of any output using the sensor.

Possible Cause	**Correction Action**
Faulty controller	Replace or repair controller

BATTERY POWER LOW

This alarm indicates that the battery which holds the date and time in memory is below 2.4 VDC.

Possible Cause	**Correction Action**
Faulty battery	Replace battery

SYSTEM TEMP LOW

This alarm indicates that the temperature inside the controller is below -10 °C.

Possible Cause	**Correction Action**
Low ambient temperatures	Provide heat for the controller

SYSTEM TEMP HIGH

This alarm indicates that the temperature inside the controller is above 65 °C.

Possible Cause	**Correction Action**
High ambient temperatures	Provide cooling for the controller

DISPLAY ERROR

This alarm occurs if the user interface gets lost

Possible Cause	**Correction Action**
Pressing icons very quickly	Exit out of the screen and continue programming

NETWORK CARD FAILURE

This alarm occurs if the Ethernet circuit board fails

Possible Cause	Correction Action
Ethernet card locked up	Try a power cycle to reset it
Ethernet card not seated correctly	Unplug the network card and plug it back in
Faulty Ethernet card	Replace Ethernet card

WEB SERVER FAILURE
This alarm occurs if the web server on the Ethernet circuit board fails

Possible Cause	Correction Action
Web server locked up	Try a power cycle to reset it
Faulty Ethernet card	Replace Ethernet card

VTouch DATA COMM ERROR
This alarm occurs if the controller attempts to send data to VTouch and VTouch fails to acknowledge receipt of the data

Possible Cause	Correction Action
No connection to LAN	Connect Ethernet cable to LAN
Wrong IP, subnet and/or gateway address	Program valid settings for LAN in the controller or use DHCP if supported by the LAN
LAN is blocking outside access	Program LAN's router to open access
Network card failure	See above

VTouch LiveConnect ERROR
Future feature

Possible Cause	Correction Action

8.3 Procedure for Evaluation of Conductivity Electrode

Try cleaning the electrode first (refer to Sect. 7.1).

To check the electrode, check the electrode connections to the terminal strip (refer to Figure 7). Make sure that the correct colors go to the correct terminals, and that the connections are tight. Restore power and see if the conductivity is back to normal. If not, replace the electrode.

8.4 Procedure for evaluation of the pH/ORP electrode

The most common cause of a calibration failure is an electrode problem. First try cleaning the electrode, then retry the calibration. If this fails again, replace the electrode and retry the calibration.

The next most common problem is wet or poor connections. Check the connection of the electrode to the cable for moisture. Check the connections between the cable and the terminal strip. Make sure that they are tight, that the terminal is not clamped to the plastic jacket, and that the wires are routed to the correct terminal. If there is a junction box installed between the electrode and the controller, check the wiring there as well.

You should be able to measure the +5VDC ±5% and -5VDC ±5% vs IN- at the terminal strip. If not, the controller is faulty. You should be able to measure the IN+ vs IN- (DC scale) and get the appropriate values for the buffer solutions used. If not, the preamplifier or its wiring is faulty.

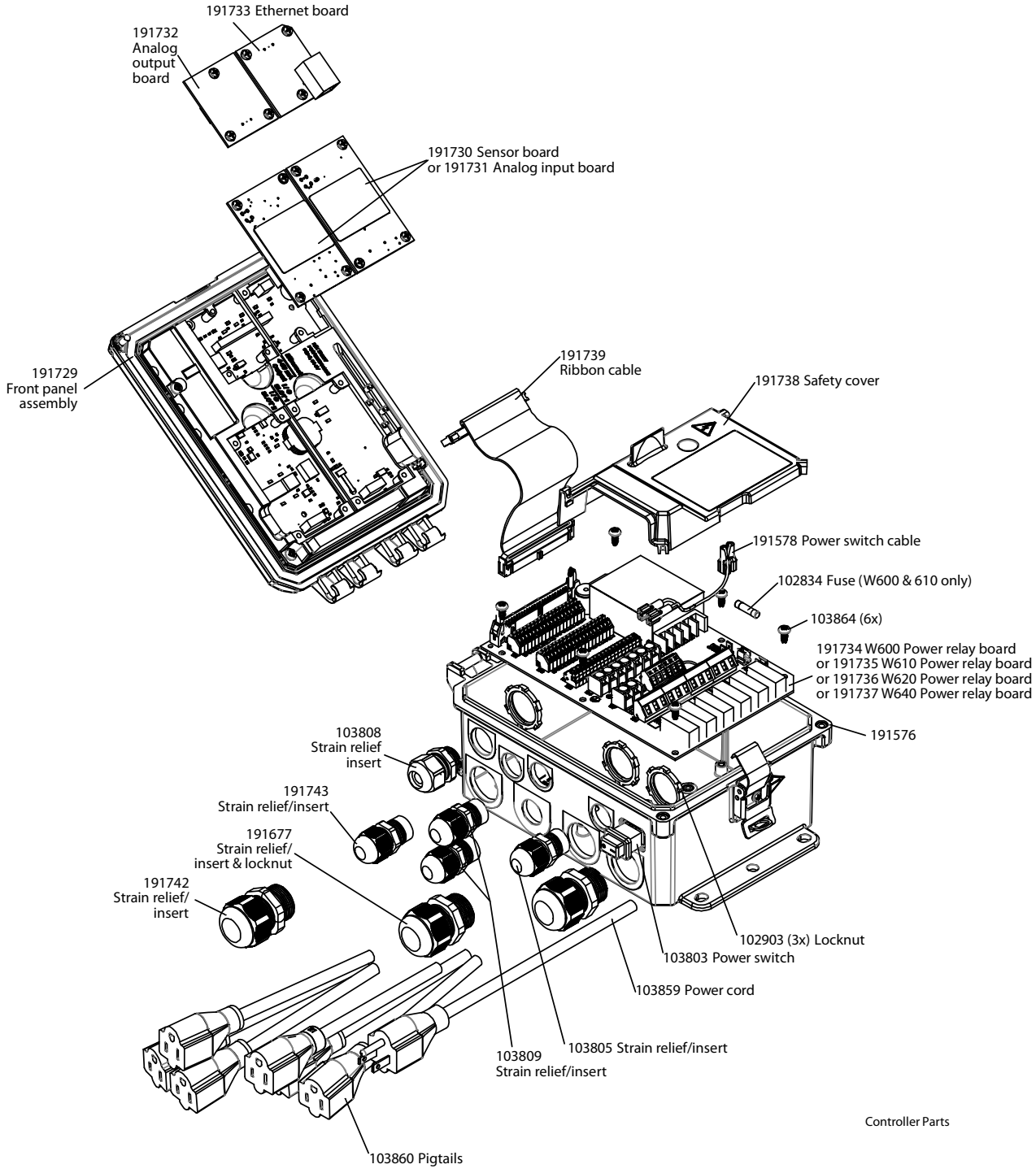
The last possibility is to try replacing the preamplifier.

8.5 Diagnostic Lights

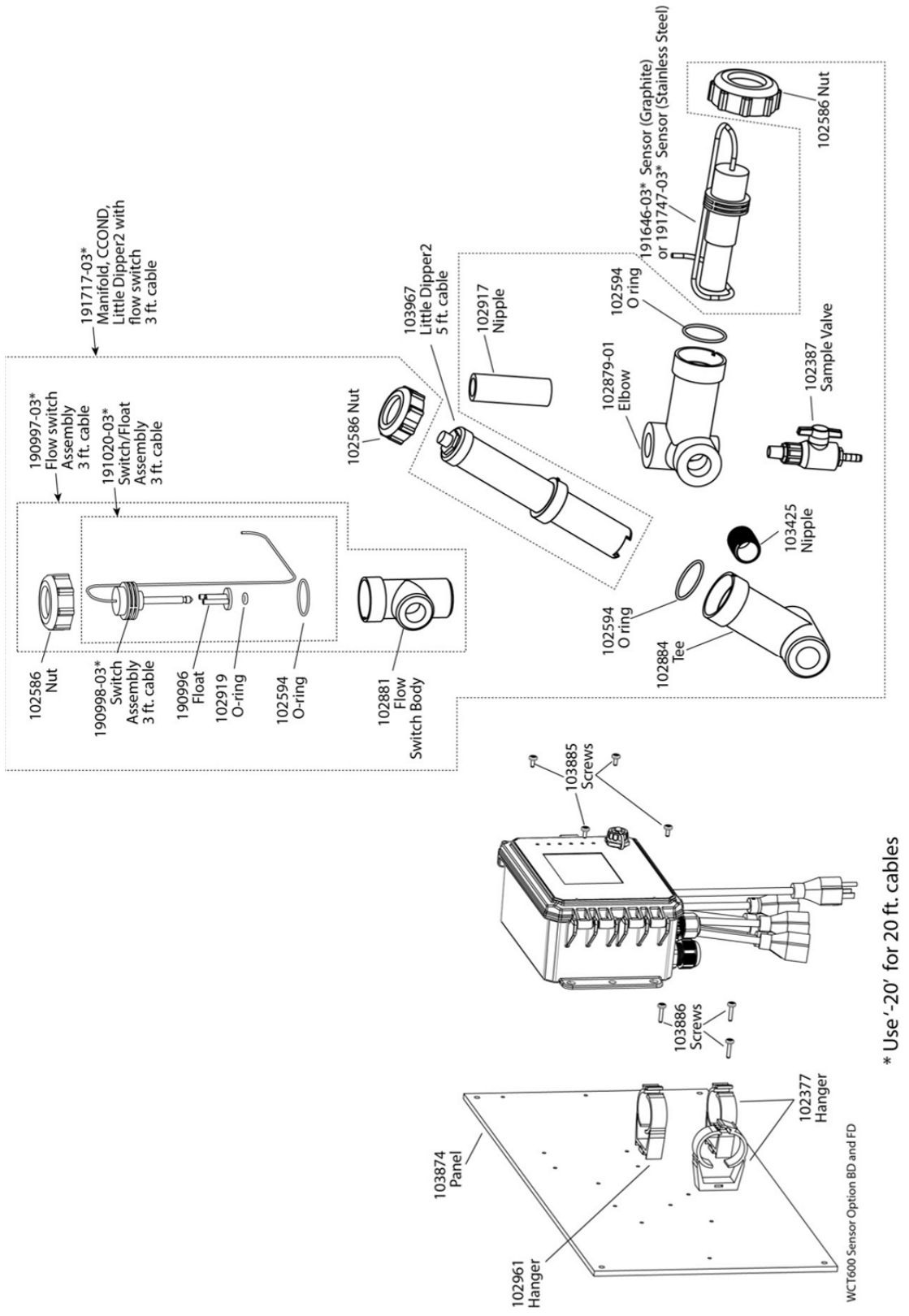
Some of the circuit boards inside the controller have diagnostic lights.

POWER/RELAY BOARD AMBER NEON (ONLY FOR MODELS WITH POWERED RELAYS) Indicates status of the fuse protecting the relays. Normal operation is ON. If not on:	
Possible Cause	**Correction Action**
Fuse has blown or is missing	Replace fuse
Controller model has only dry contact or pulse proportional relays	Normal
CONTROLLER BOARD D7 LED Indicates status of the software application. Normal operation is that 5 seconds after power-up, it does one long blink on, two short blinks, on long blink off. If it is not doing this:	
Possible Cause	**Correction Action**
Controller software is not running	Try a power cycle to reset it
Faulty controller board	Replace controller board
CONTROLLER BOARD D8 LED Indicates the status of the 5 VDC power supply. Normal operation is ON. If not on:	
Possible Cause	**Correction Action**
Faulty ribbon cable	Replace ribbon cable
Faulty power supply	Replace power/relay board
CONTROLLER BOARD D9 LED Indicates the status of the 3.3 VDC power supply. Normal operation is ON. If not on:	
Possible Cause	**Correction Action**
Faulty ribbon cable	Replace ribbon cable
Faulty power supply	Replace power/relay board
SENSOR BOARD LED Indicates the status of the sensor board. Blinks slowly for several seconds during power-up. Normal operation is OFF. If not behaving this way:	
Possible Cause	**Correction Action**
Sensor card locked up	Try a power cycle to reset it
Sensor card not seated correctly	Unplug the card and plug it back in
Faulty sensor card	Replace sensor card

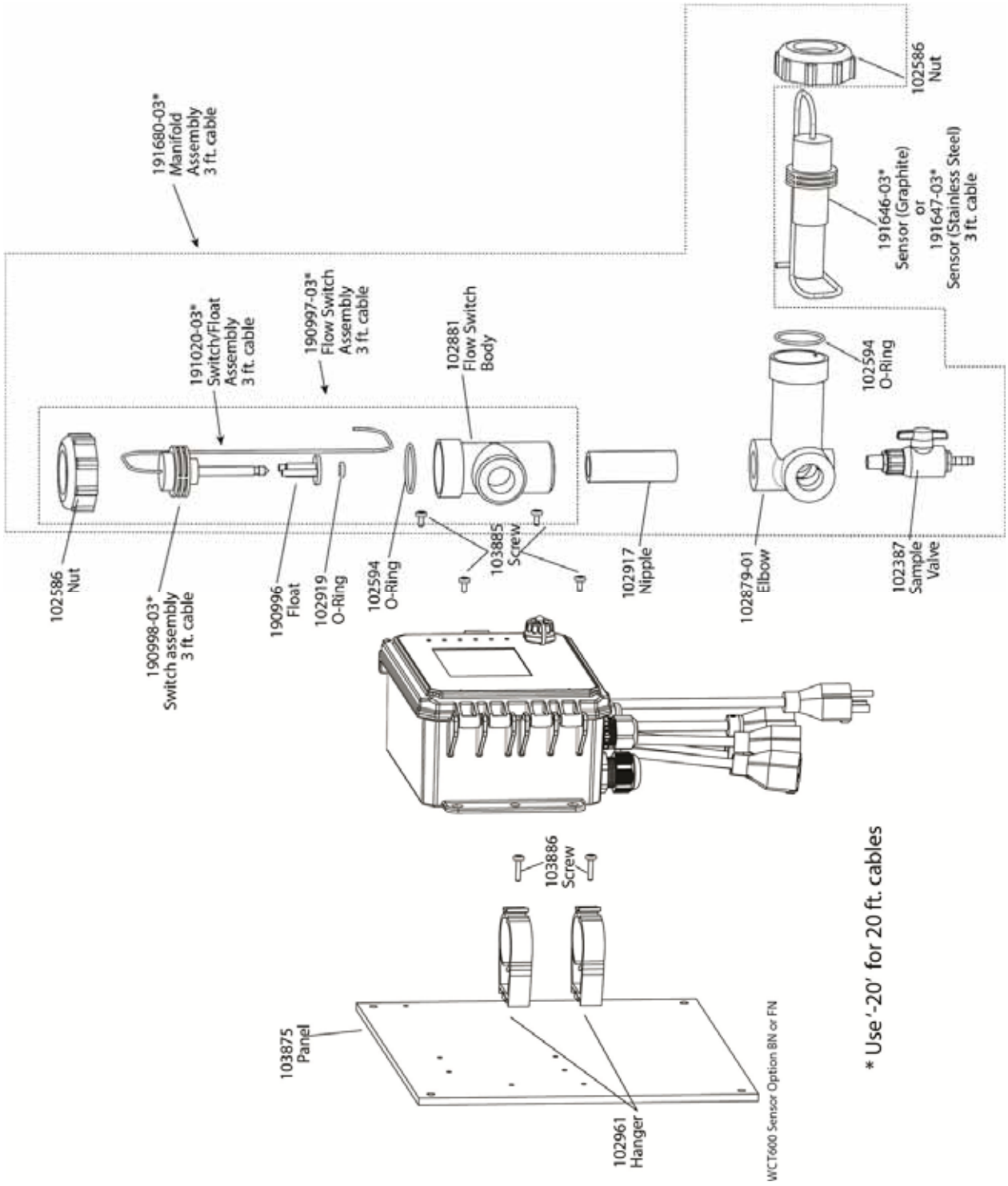
9.0 Spare Parts Identification



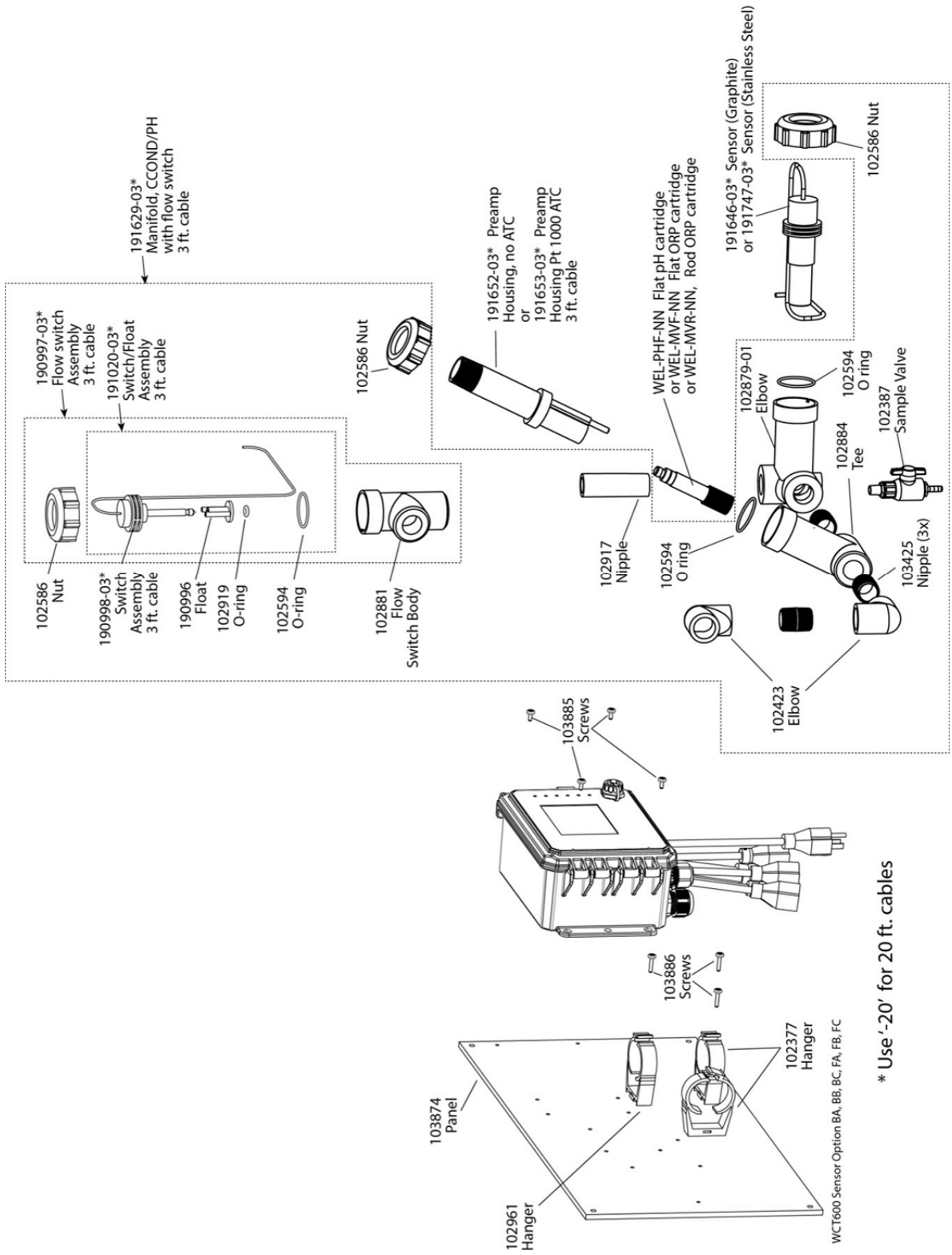
Controller Parts



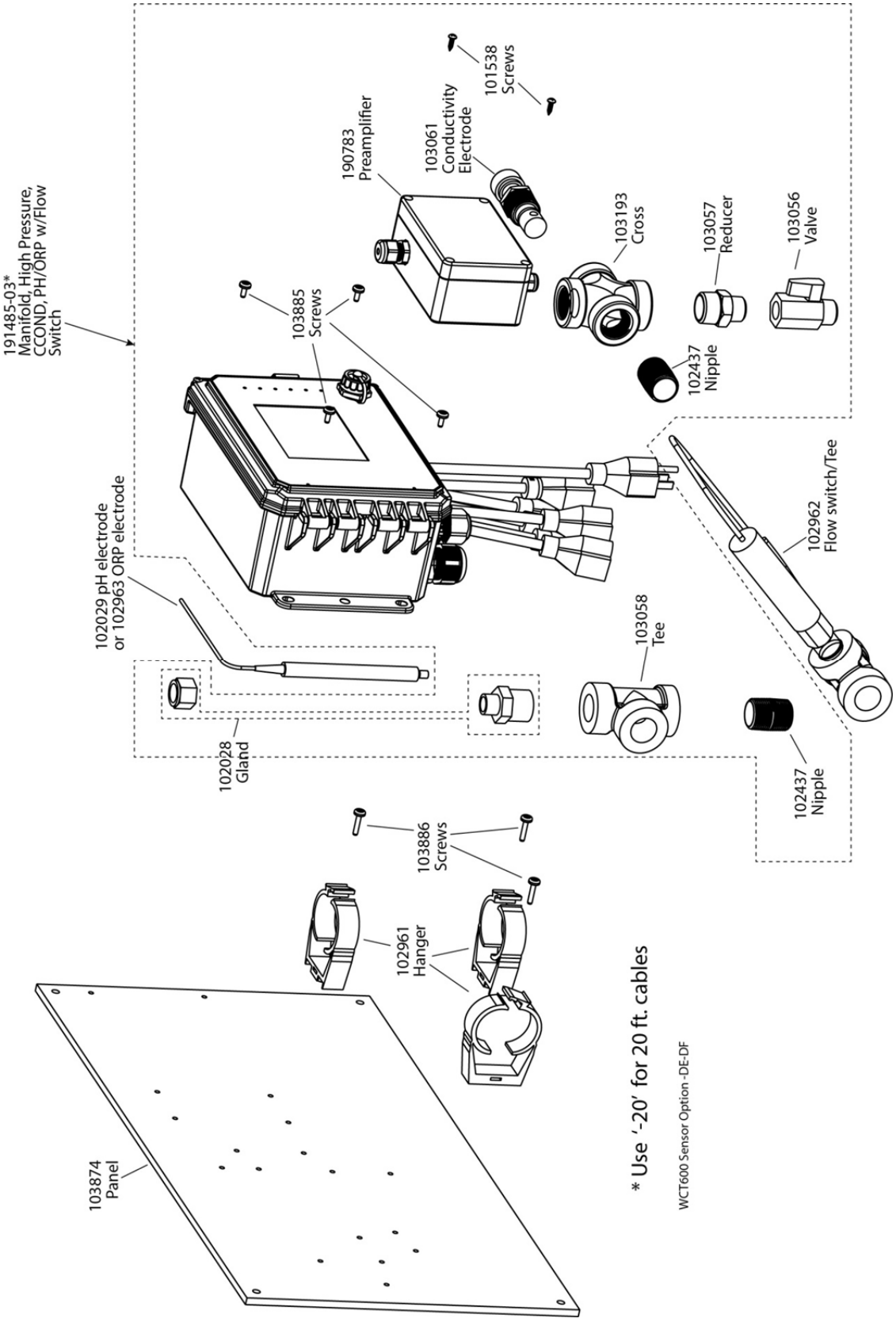
WCT600 Sensor option BD and FD



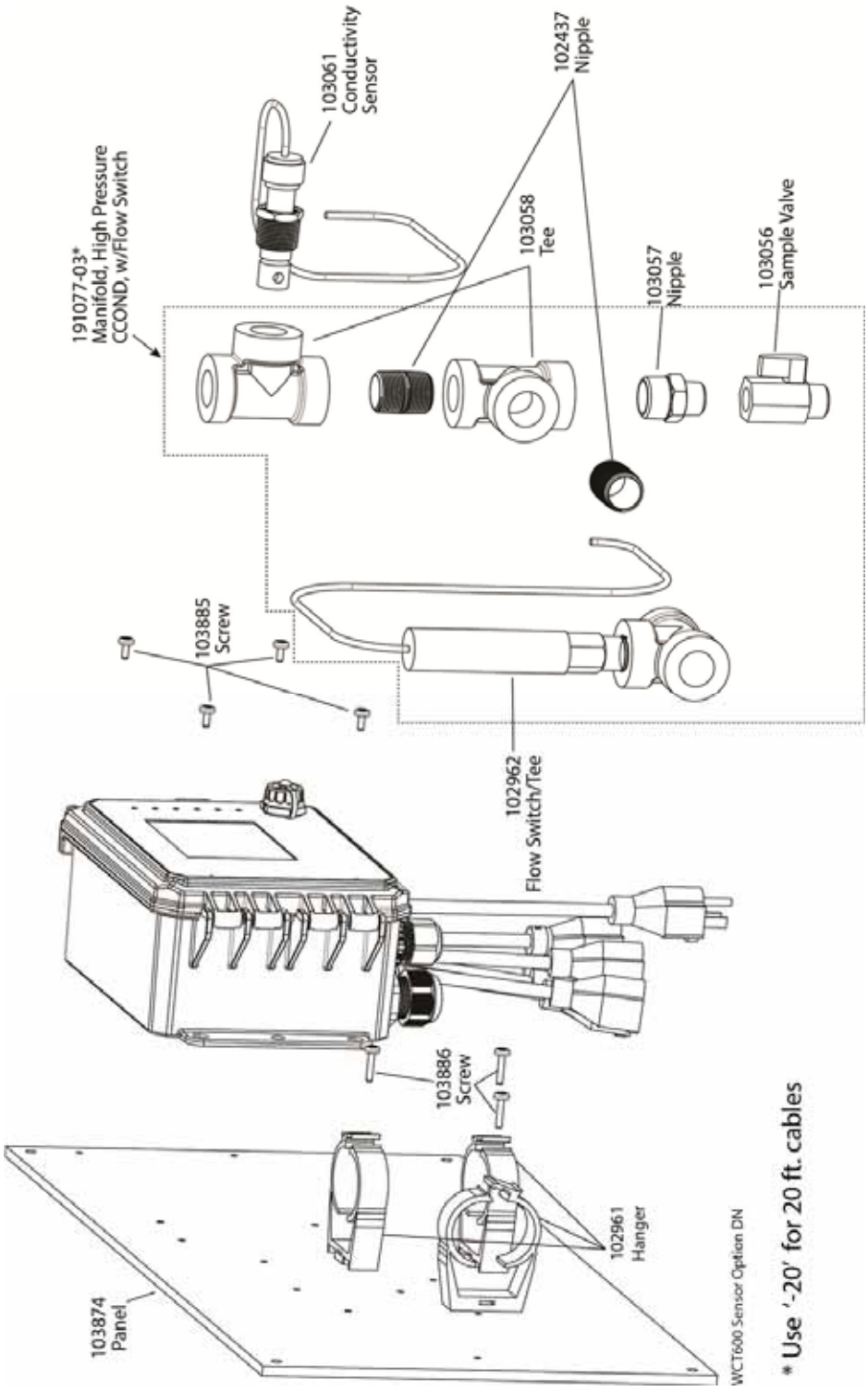
WCT600 Sensor option BN or FN



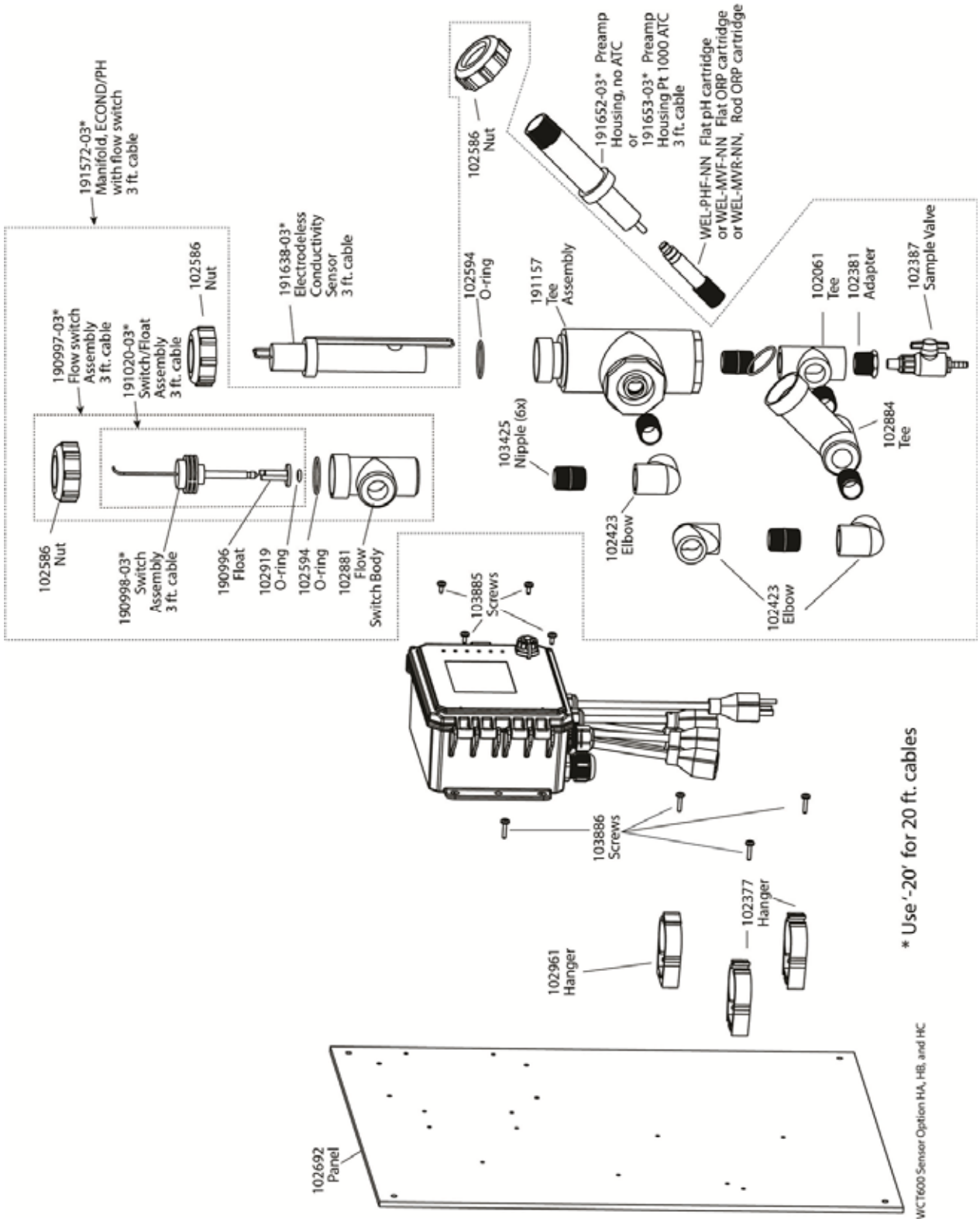
WCT600 Sensor option BA, BB, BC, FA, FB, FC



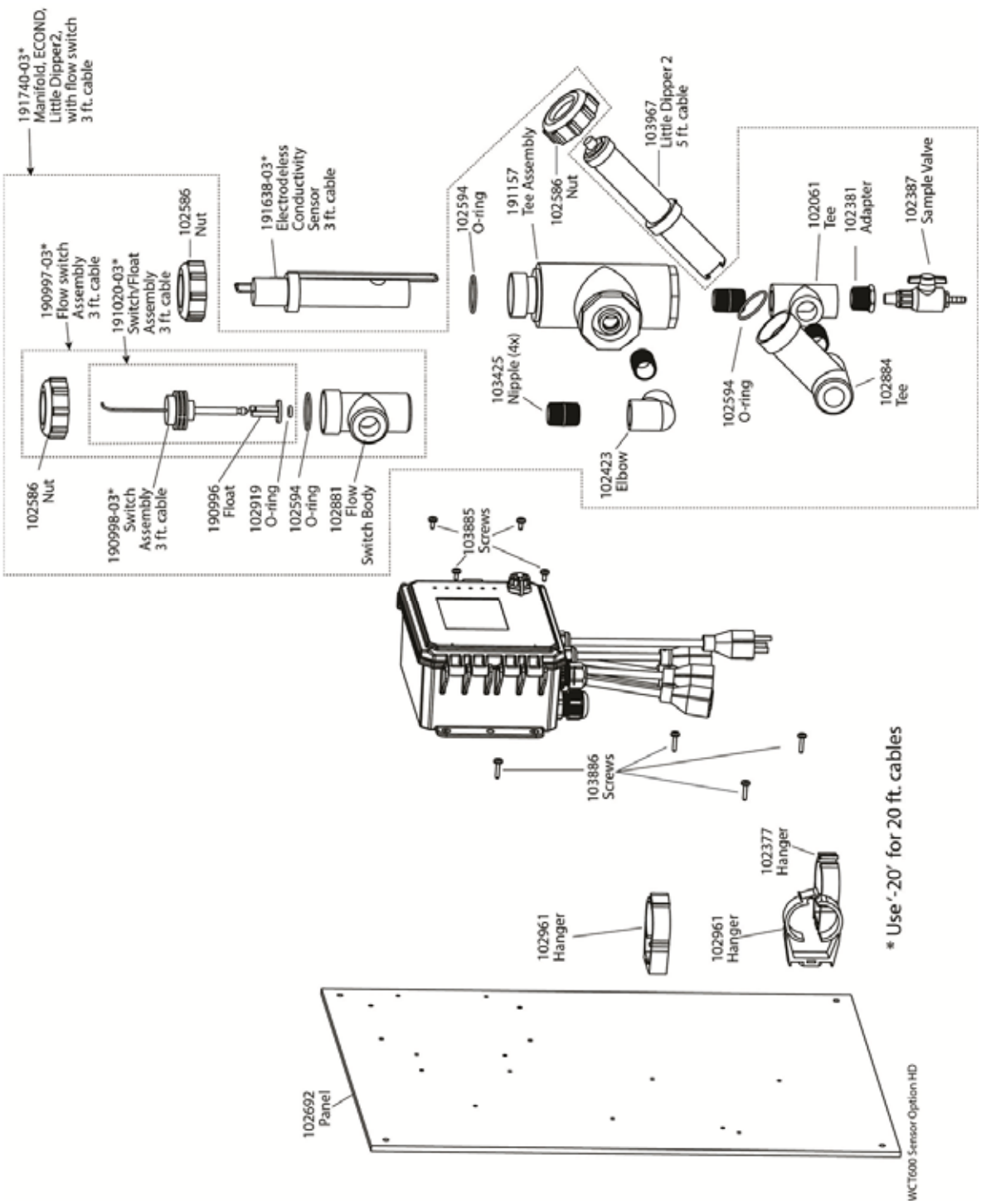
WCT600 Sensor option DE, DF



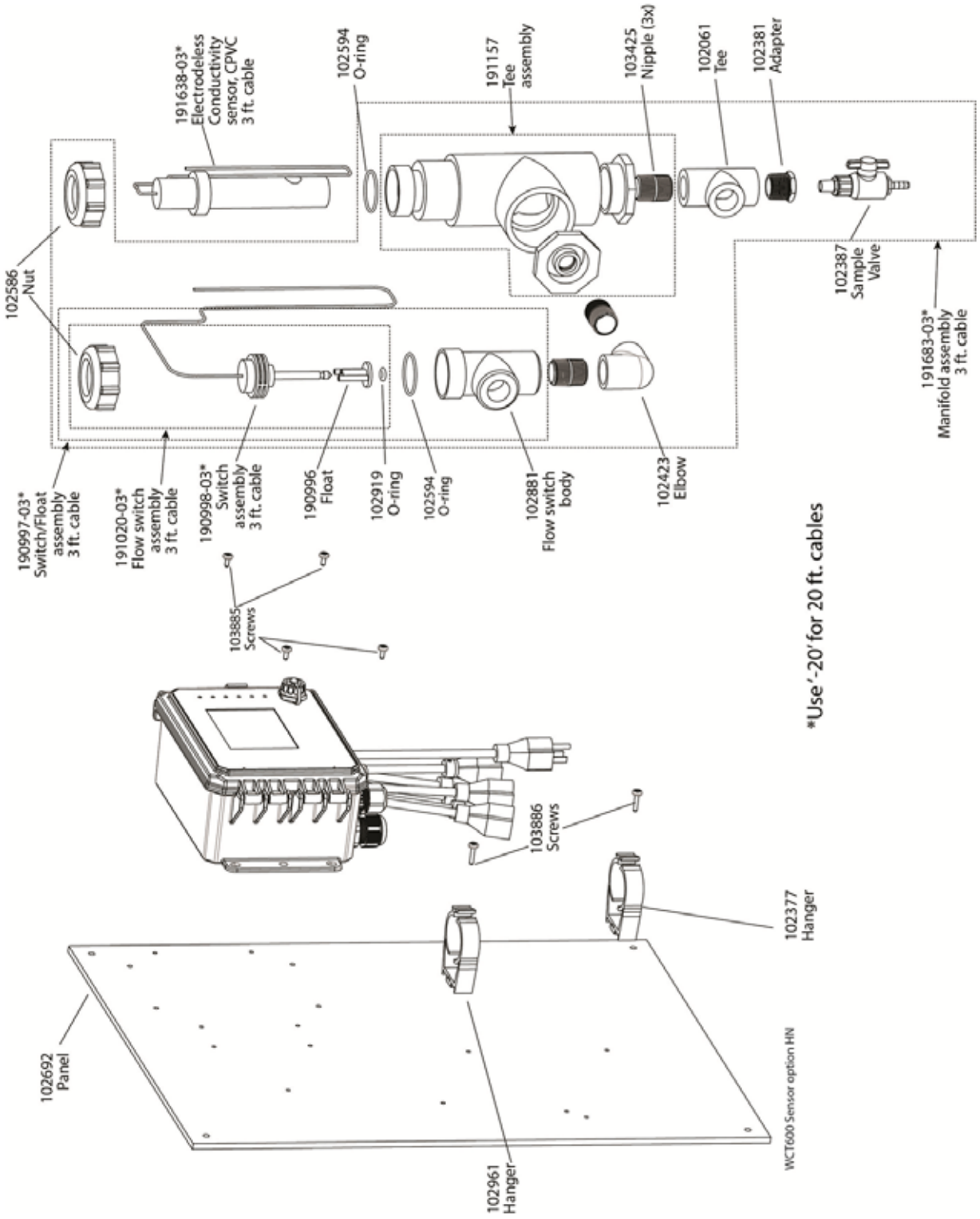
WCT600 Sensor option DN



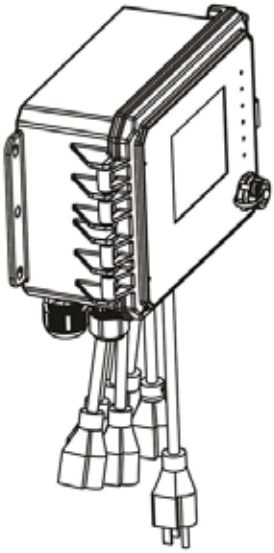
WCT600 Sensor option HA, HB and HC

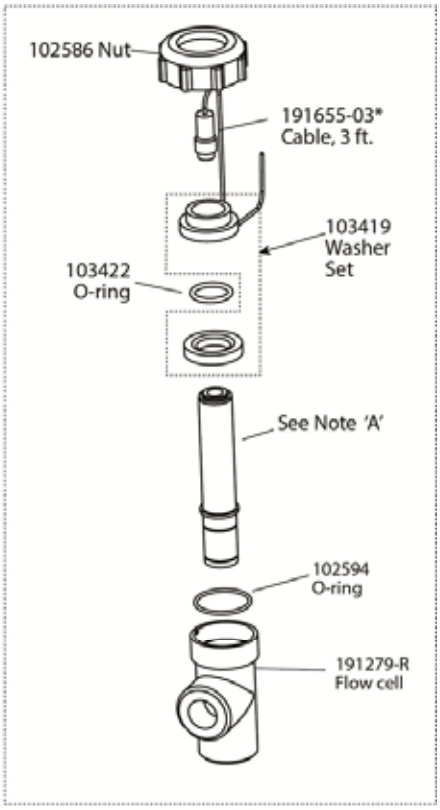


WCT600 Sensor option HD



WCT600 Sensor option HN





-FF has two of these assemblies
-FN has one

NOTE A (Sold separately)

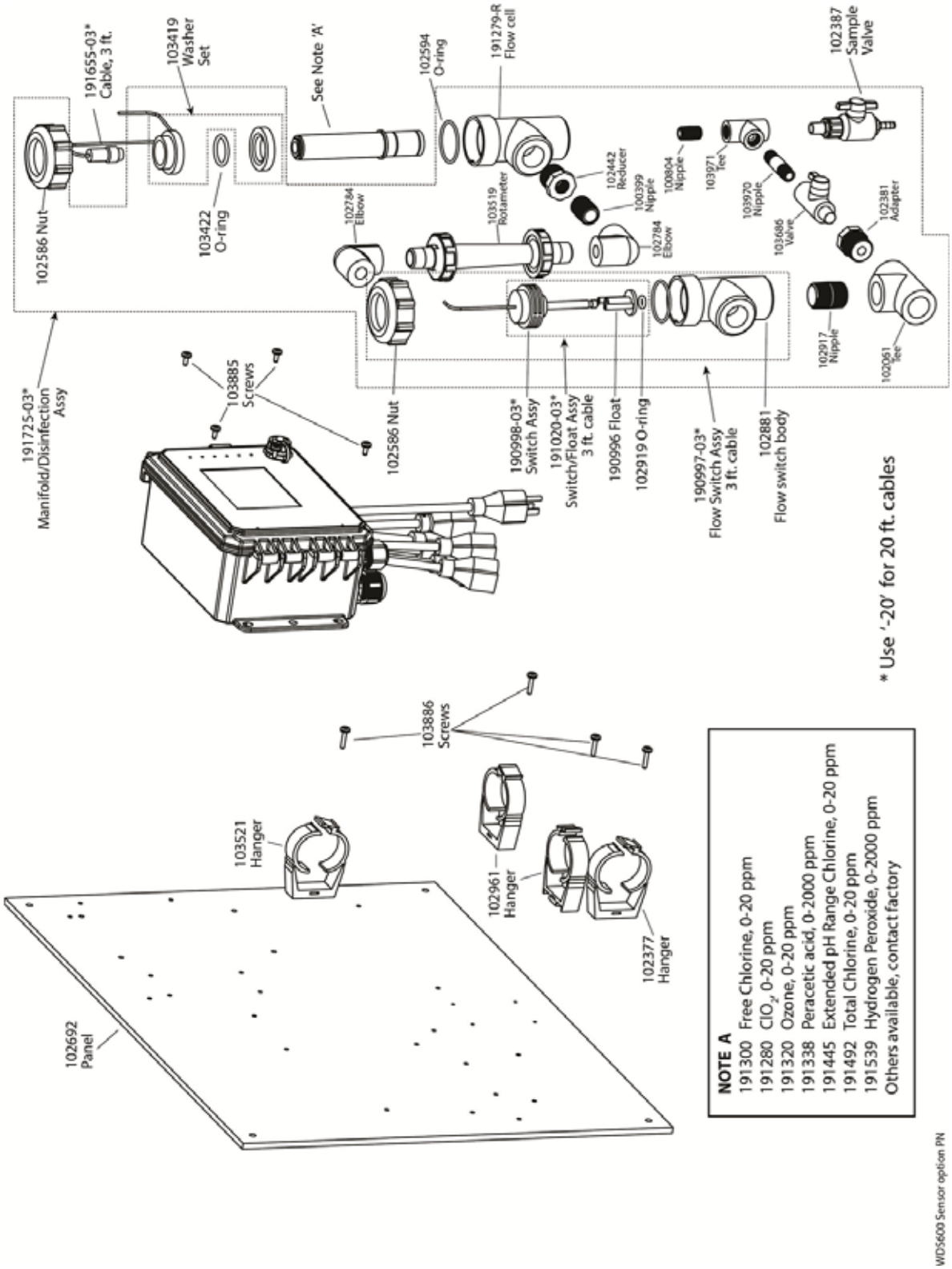
191300	Free Chlorine, 0-20 ppm
191280	ClO_2, 0-20 ppm
191320	Ozone, 0-20 ppm
191338	Peracetic acid, 0-2000 ppm
191445	Extended pH Range Chlorine, 0-20 ppm
191492	Total Chlorine, 0-20 ppm
191539	Hydrogen Peroxide, 0-2000 ppm

Others available, contact factory

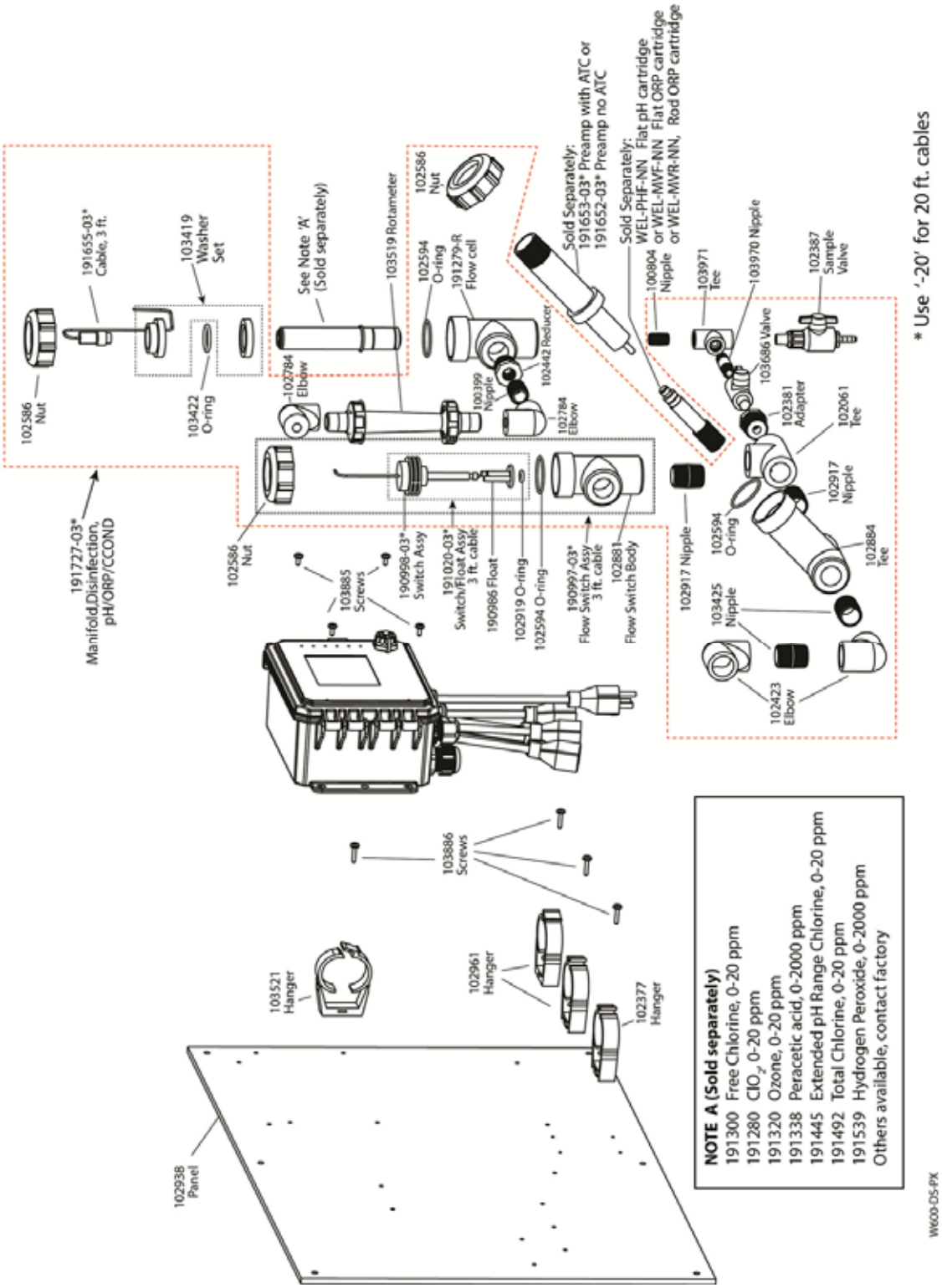
* Use '-20' for 20 ft. cables

WDS600 Sensor option FN and FF

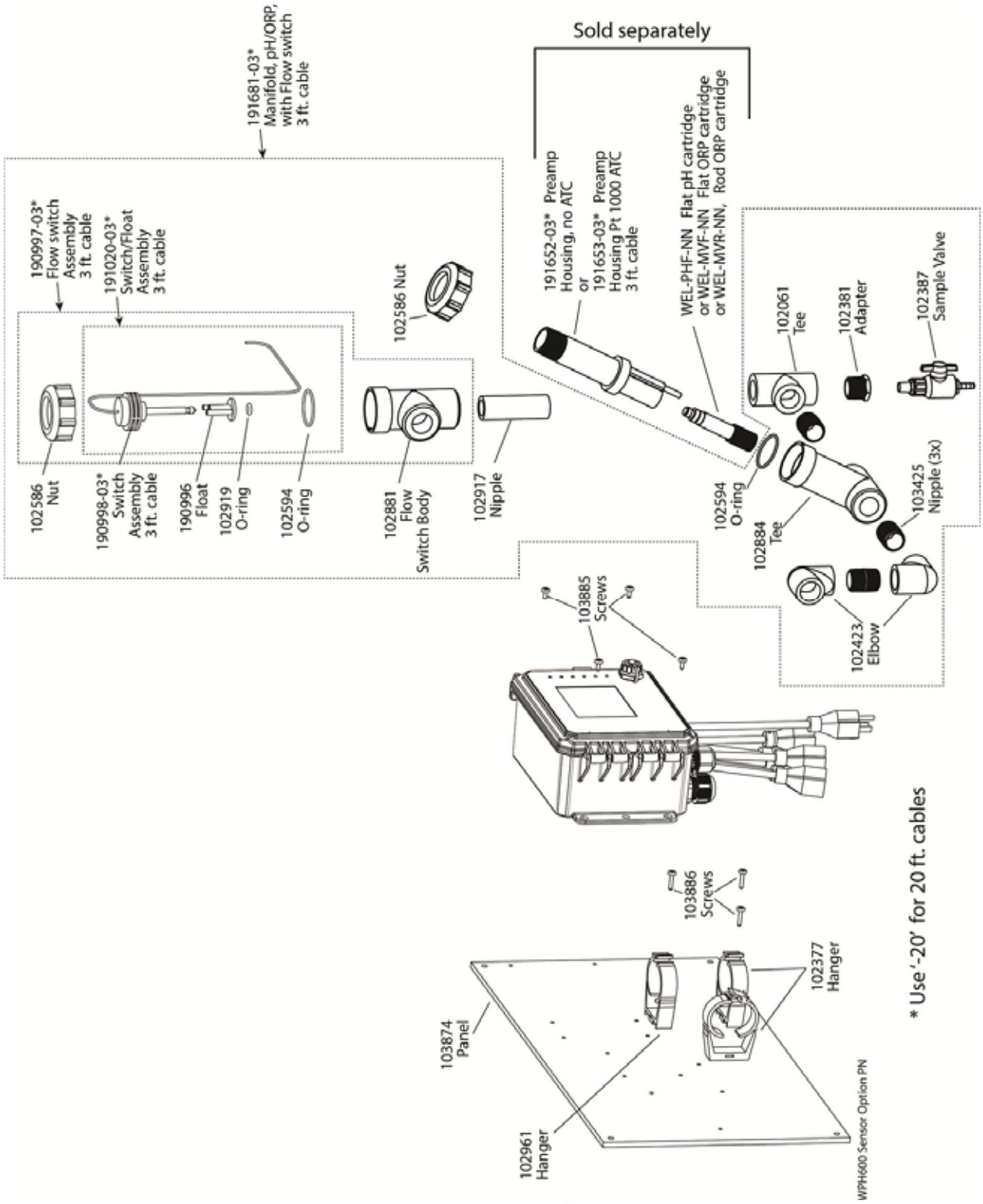
WDS600 Sensor option FF or FN



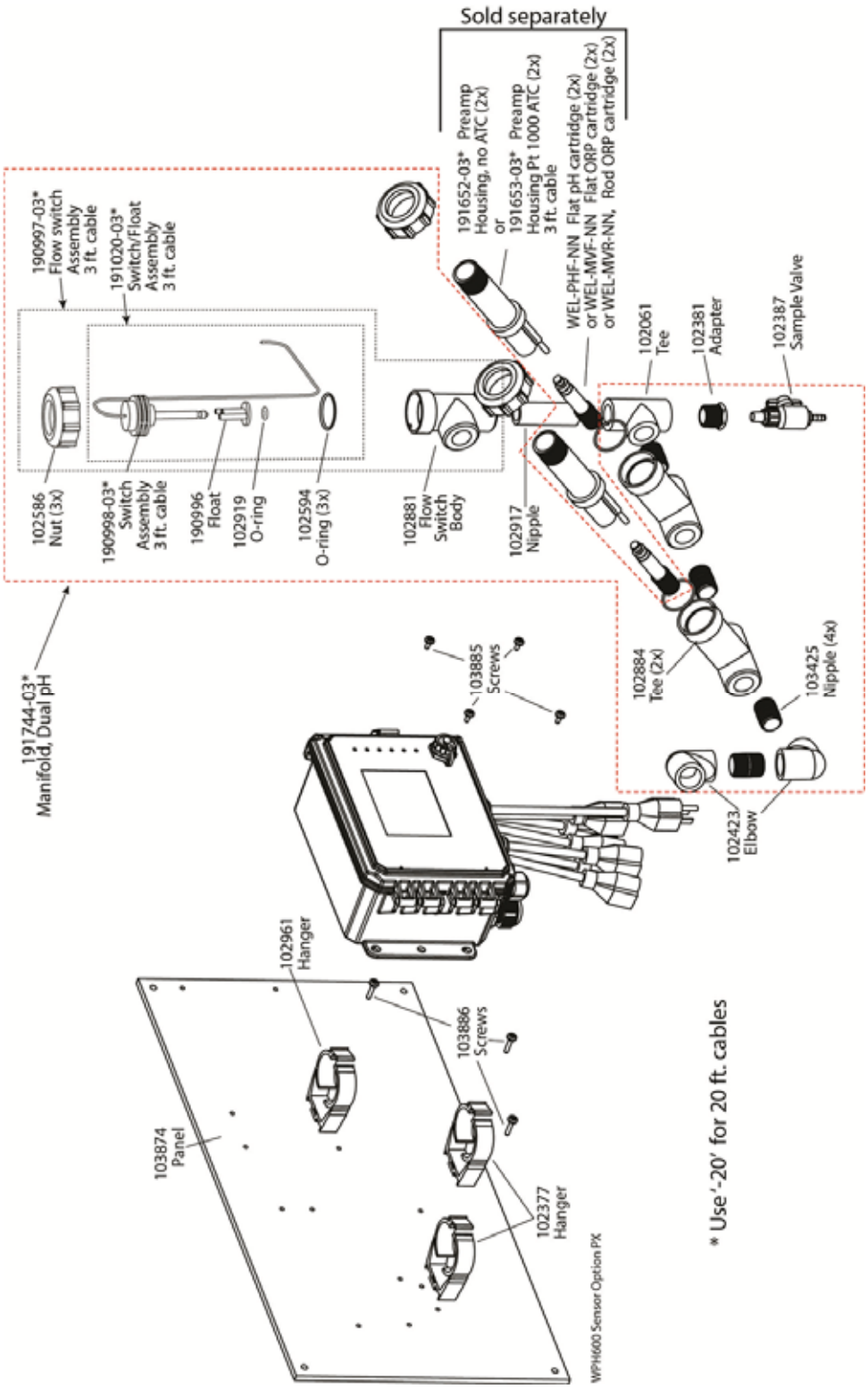
WDS600 Sensor option PN



WDS600 Sensor option PX



WPH600 Sensor option PN



WPH600 Sensor option PX

10.0 SERVICE POLICY

The W600 series controller has a 2-year warranty on electronic components and a 1-year warranty on mechanical parts (terminal strip and relays).

We stock circuit boards for immediate exchange after we have isolated the cause of the problem.

Factory authorized repairs that are received by next-day-air will be returned within 24 hours. Normal priority for returns is two weeks.

Out of warranty repairs or circuit board exchanges are done on a flat fee basis after the warranty is expired.

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