iControls™

WMC-1

Watermaker System Controller

Documentation

Welcome.

Thank you for purchasing an iControls controller.

You made a good choice in choosing iControls. You can expect years of trouble-free service. With a design based on feedback from leaders in the RO field plus our own experience in RO system design and manufacture, iControls RO controllers are truly best in class.

As good as our controllers are, there's always room for improvement. If you have an experience, idea or input either positive or negative we'd love to hear from you.

Again, thank you for your purchase. Welcome to the community of iControls users.

David Spears

President,
iControls Technologies Inc.

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Table of Contents

Table 1. Specifications

Inputs

Tank level switches	(2) Normally-Closed. *Can be used with a single level switch.*
Start/Stop	Momentary contact, normally open (RJ45 connector, 8 conductor)
Pretreat lockout switch	Normally-Open.
High Pressure switch	Normally-Open.
Controller Power	110/240 VAC, 60/50Hz
Permeate Conductivity	0-3000 PPM, 0-6000 µs (standard sensor, CP-1, K=.75)
Feed Conductivity	not applicable on Seawater

Output Relay Ratings (relays are fused with a 6A fuse)

Feed Valve (Boost Pump Coil)	1A @ 250VAC (with NO and NC contacts for motorized valves)
Flush Valve	1A @ 250VAC.
Divert Valve	1A @ 250VAC (with NO and NC contacts)
Alarm	1A @ 250VAC
HP Pump Motor Coil	1A @ 250VAC

Circuit Protection

Main Power Fuse	F1	6 Amp	5x20mm	LittelFuse 0234.006 or Buss GMC-6R
Power Supply Fuse	F2	1/4 Amp	5x20mm	LittelFuse 0218.250

Other

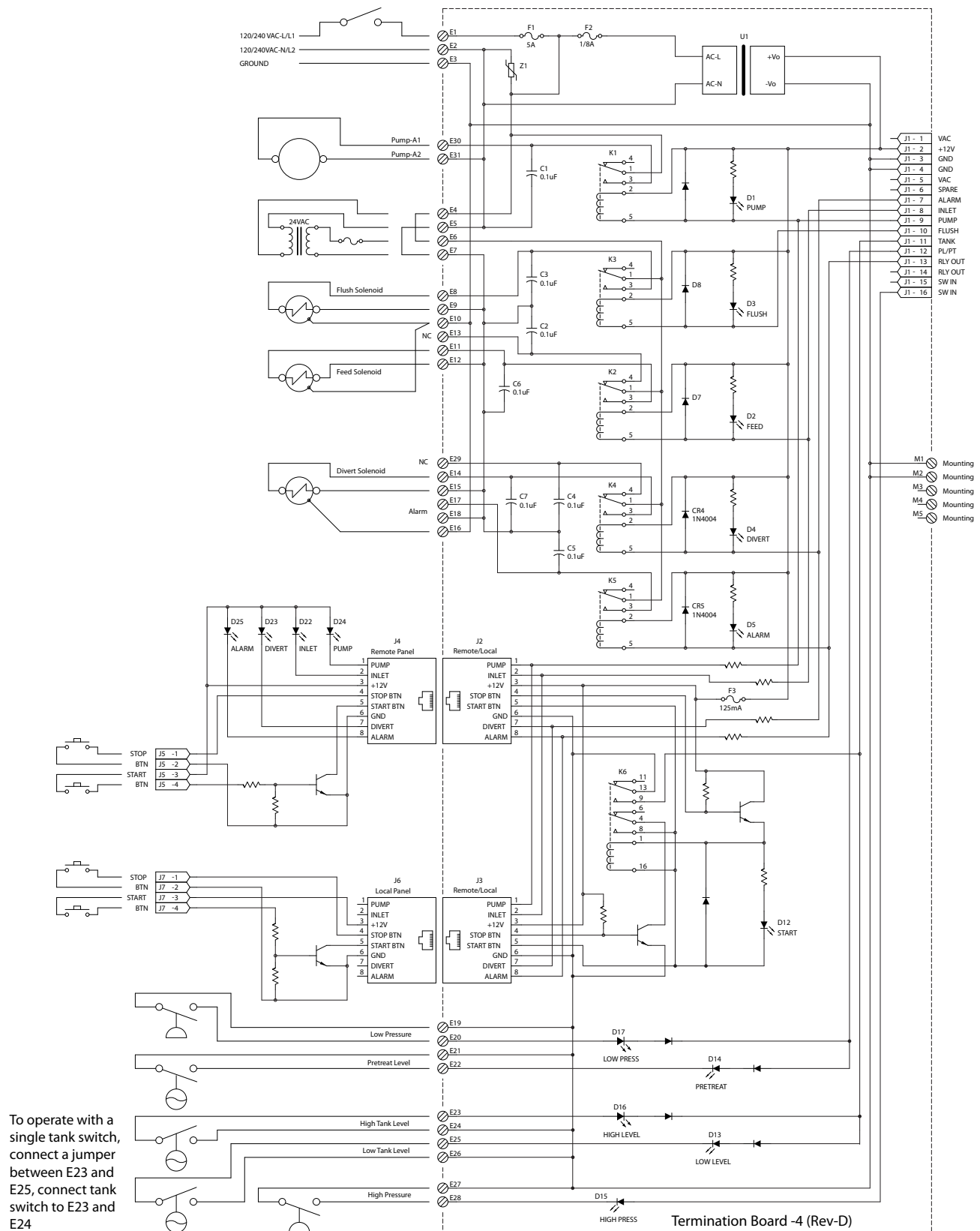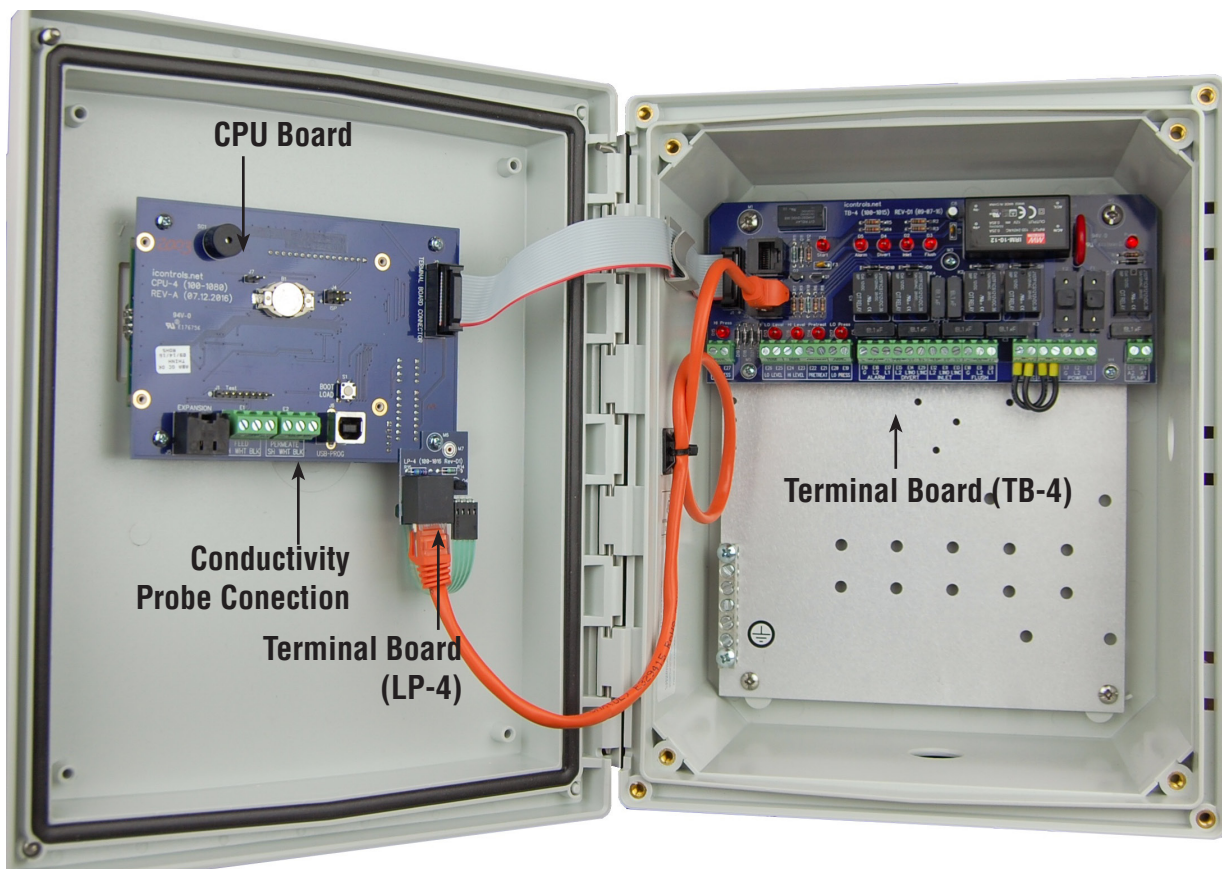|	
Dimensions	10.5" tall, 9.5" wide, 5.0" deep. Nema 4X non-metallic (10x8x4)
	12.5" tall, 11.25" wide, 7.0" deep. Nema 4X non-metallic (12x10x6)
	14.5" tall, 13.5" wide, 7.0" deep. Nema 4X non-metallic (14x12x7)
Weight	4.2 lb. (10.5x9.5) *(Enclosure, CPU-4 and TB-4 only.)*
	6.0 lb. (12.5 x 11.25) *(Enclosure, CPU-4 and TB-4 only.)*
	10.6 lb. (12.5 x 11.25) *(Enclosure, CPU-4 and TB-4 only.)*
Environment	0-50°C, 10-90%RH (non-condensing)

Figure 1. Terminal Board Schematic

To operate with a single tank switch, connect a jumper between E23 and E25, connect tank switch to E23 and E24

Termination Board -4 (Rev-D)

Figure 2. Controller Overview

Watermaker Control Switches

Start

Stop

Remote

Keypad
Power
Up Arrow
Down Arrow
Manual Flush

Display. (4 line, 20 character) Clear, concise feedback on the watermaker's status.

Alarm.
Display backlight flashes along with audible beeper to indicate alarm condition.

WATERMAKER CONTROLLER

START

STOP

RO Pump ON

Boost Pump ON

High Salinity

Pressure Fault

CPU Board

Conductivity Probe Conection
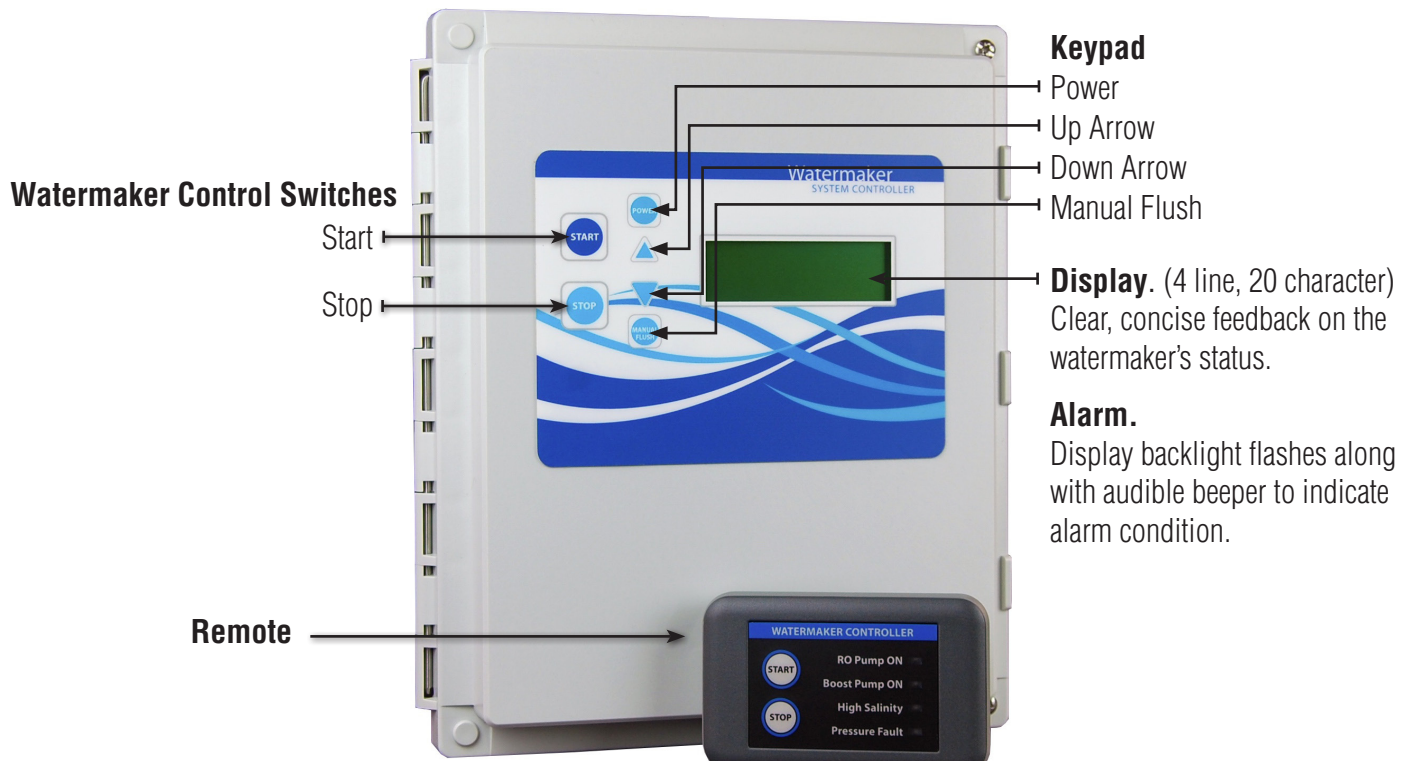
Terminal Board (LP-4)

Terminal Board (TB-4)

Figure 3. Controller Detail: CPU-4/LP-4
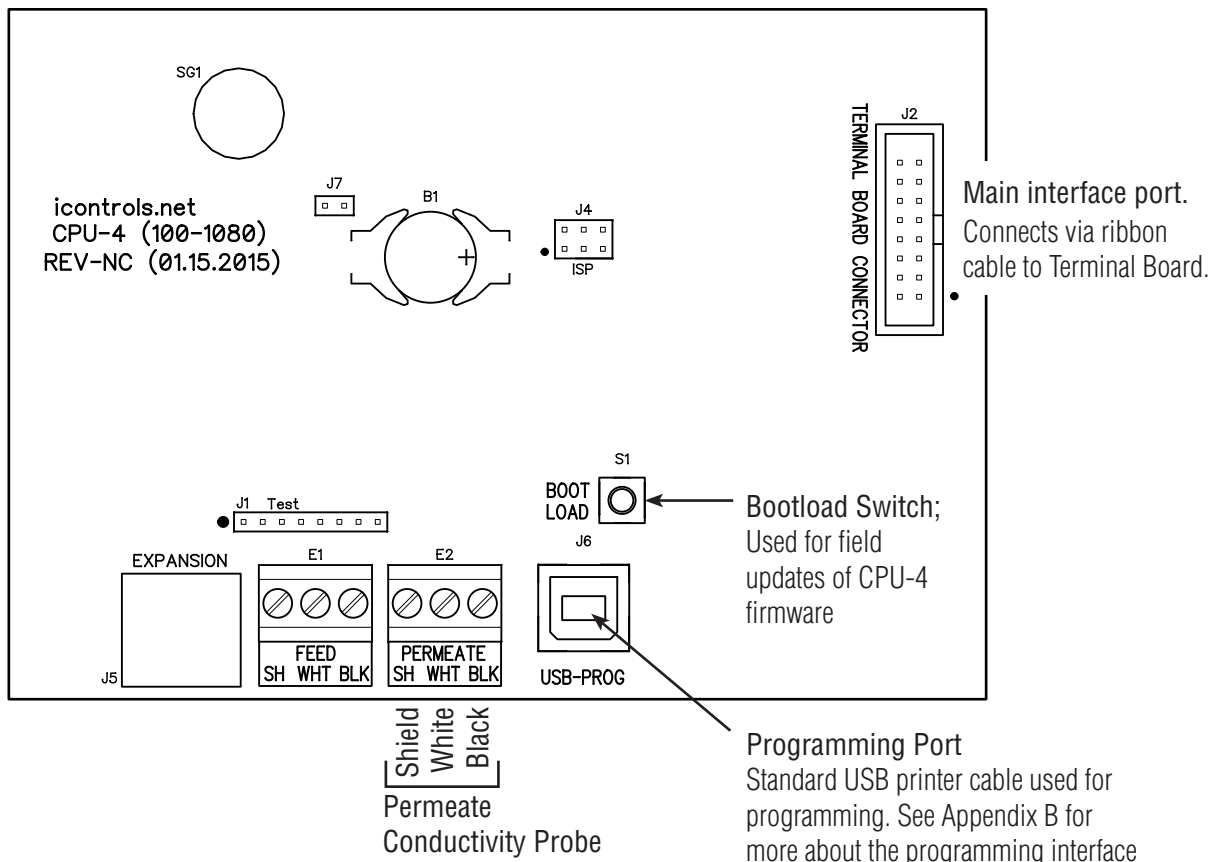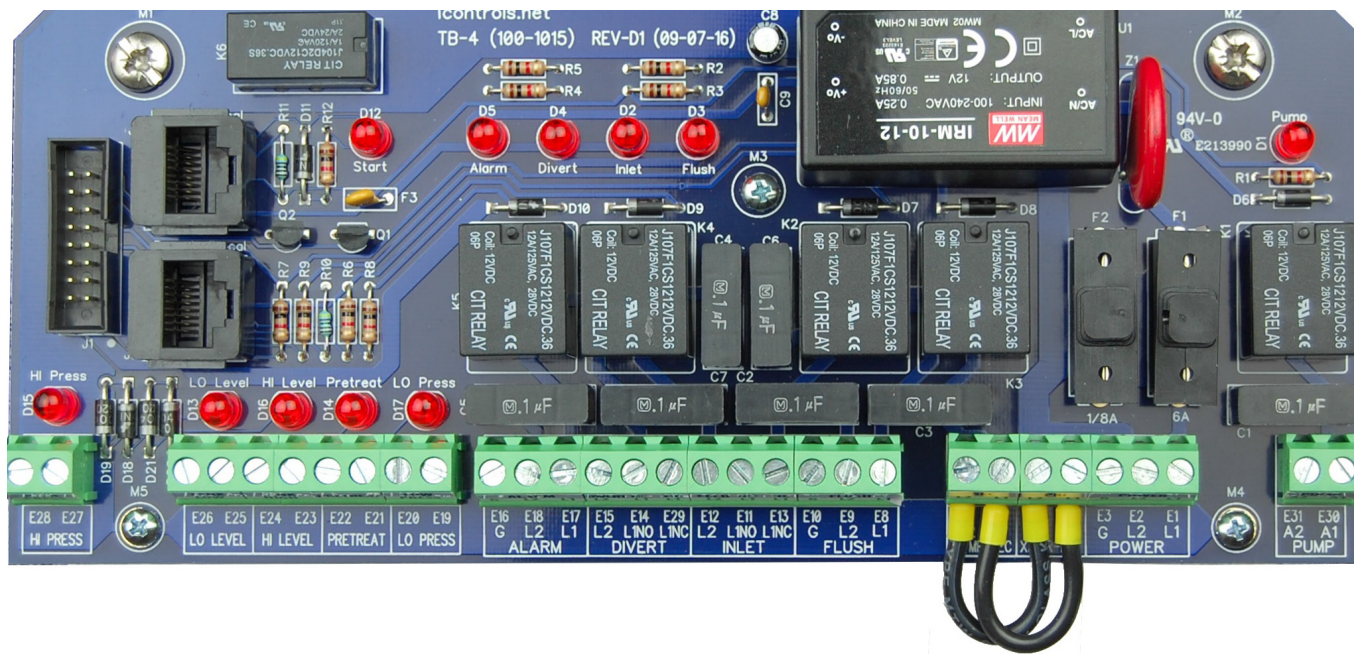
Typical Configuration

Detailed View

Main interface port.
Connects via ribbon cable to Terminal Board.

Bootload Switch; Used for field updates of CPU-4 firmware

Programming Port
Standard USB printer cable used for programming. See Appendix B for more about the programming interface

Shield White Black
Permeate Conductivity Probe
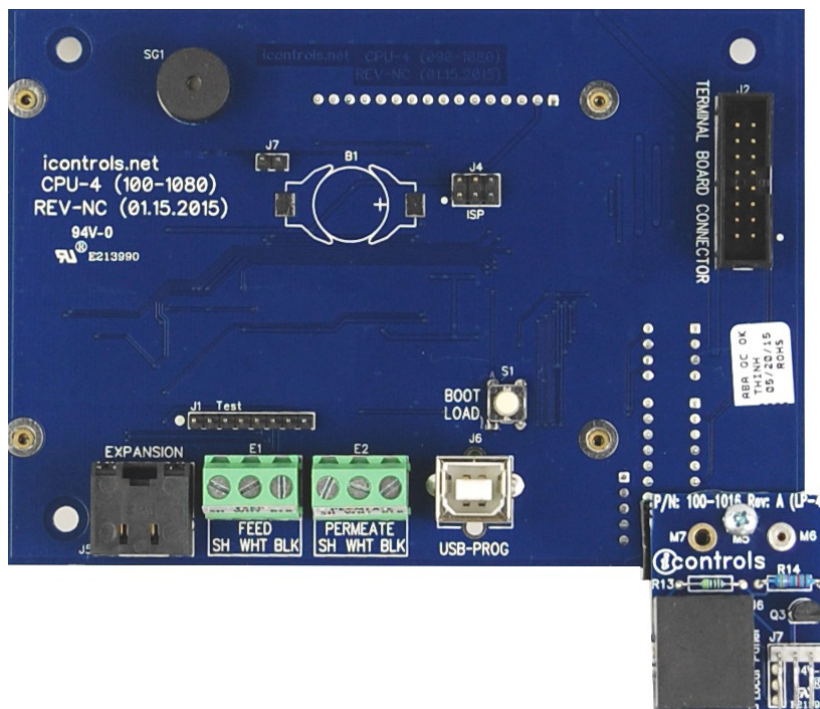
Figure 4. Controller Detail: Terminal Board, TB-4 (See Fig. 1 for schematic)

Switch LEDs
ON when switches close.

Valve LEDs ON when the relay is energized.

Pump LED

Pump High Pressure

Tank Lo Switch Tank Hi Switch Pretreat Switch Pressure Switch

Dry Contacts.
Do not apply external voltage

Alarm 110/240 VAC

Divert 110/240 VAC

Inlet Valve 110/240 VAC

Flush Valve 110/240 VAC

Supply Power 110/240 VAC

Pump/ Motor 110/240 VAC

Alternate wiring for single level switch.
Place a jumper between E23 and E25.
Connect the tank switch to E23 and E24

Note: Tank switch wiring is not used if the system will be controlled manually via either the local panel or the remote panel.

Valve Power Jumpers
Normally jumpered as shown.
E4&E5 are supply power. E6&E7 are inputs to the Inlet Valve, Flush Valve and Divert/Alarm relay. See Figure 1 on page 5 for more detail.

Figure 5. Conductivity Probe Installation

Flow

Flow

Install the Conductivity Probe in the "Run" of a Tee or equivalent location. Orient the probe so that air can not become trapped in the area near the probe.

Conductivity Probe

Conductivity Probe Calibration

Because the conductivity measurement is affected by the physical envioronment in which it operates, it is best to calibrate while installed in the system and operating under normal conditions. This requires an external conductivity measurement device that is known to be accurate to serve as a reference.

1. Operate the RO long enough for the membranes, operating temperature and permeate conductivity reading to stabilize.
2. Take a sample of the permeate and measure it with the reference meter.
3. See Figure 7 for instructions on how to access the Permeate Calibration Menu.
4. Enter the Permeate Calibration menu and use the UP or Down arrow until the value on the controller matches the value obtained on the reference meter.
5. Exit and Save the calibration.
6. The same procedure applies to the Feed Probe calibration.

    NOTE: The probe calibration must be performed using solutions with conductivity of less than 900 ppm or µs. The conductivity calibration circuit will behave erratically if you attempt to calibrate using a higher value. When using a standard calibration solution, the NaCl PPM value can be used in place of the µs value if desired.

Figure 6. Controller Programming. Accessing the hidden menus.

1. With the System ON, Press and Hold the UP and Down Arrows.

2. With the UP and Down Arrows depressed, press the Power Switch. The display will switch to the RO Presets menus where a number of settings can be changed.
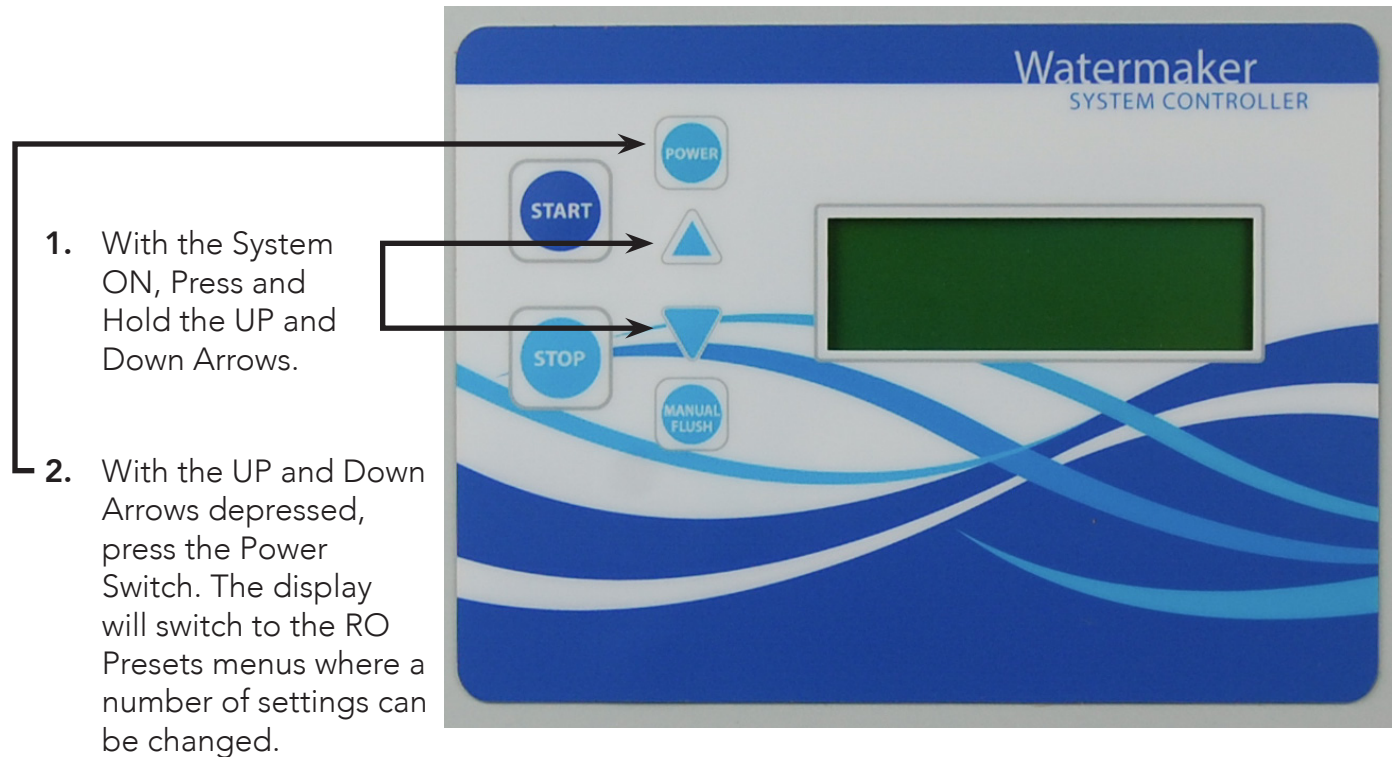
Controller Factory Default Settings

Controller Fault Condition Displays

Below are examples and explanations of the displays which accompany the fault conditions possible in the ROC-3. Fault conditions always indicated a problem of some sort which requires corrective action. the displays provide sufficient information to recognize the source of the fault and the required corrective action.

High Pressure Fault: *(Occurs when High Pressure Switch Closes)*
Line 1 "Service Fault"
Line 2 "High System Pressure"
Line 3
Line 4 "To Reset Push OFF/ON"

Low Pressure Fault: *(System is responding to low pressure condition per system settings)*
Line 1 "Service Fault"
Line 2 "Low Feed Pressure"
Line 3
Line 4 "Restart in MM:SS"

Pre Treat Fault: *(Pretreat Switch is closed indicating problem with pretreat system).*
Line 1 "Service Fault"
Line 2 "Pretreat"
Line 3
Line 4 "Check Pretreat Sys."

Permeate Conductivity Fault: *(Permeate conductivity is higher than the alarm setpoint.)*
Line 1 "Service Fault"
Line 2 "Permeate TDS xxx ppm" or "Permeate Cond xxx uS"
Line 3 "Alarm SP xxx ppm" or "Alarm SP xxx uS"
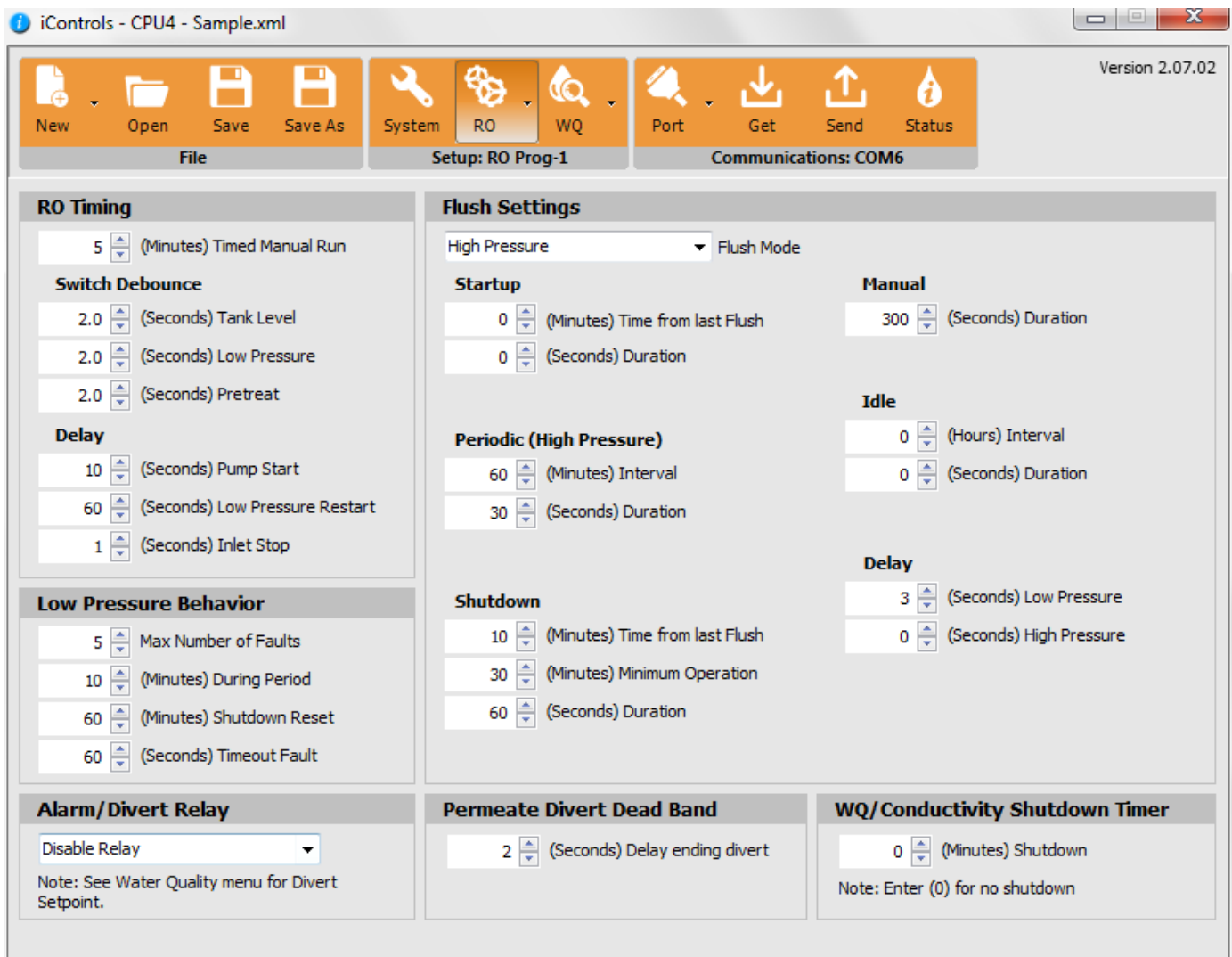Line 4 "To Reset Push OFF/ON"

Feed Conductivity Fault: *(Feed conductivity is higher than the alarm setpoint.)*
Line 1 "Service Fault"
Line 2 "Feed TDS xxx ppm" or "Feed Cond xxx uS"
Line 3 "Alarm SP xxx ppm" or "Alarm SP xxx uS"
Line 4 "To Reset Push OFF/ON"

Conductivity Probe Error messages:
Line 2 "Over-range" - Measurement is out of range for the circuit, probe may also be shorted
Line 2 "Probe shorted"   - Short circuit detected on temperature sensor in probe
Line 2 "Probe not detected" - Open circuit detected on temperature sensor in probe
Line 2 "Probe Startup 1"   - Internal reference voltage too high to make valid measurement
Line 2 "Probe Startup 2"   - Internal reference voltage too low to make valid measurement
Line 2 "Probe Startup 3"   - Internal excitation voltage too high to make valid measurement
Line 2 "Probe Startup 4",   - Internal excitation voltage too low to make valid measurement

The Programming interface is a Windows-based tool for making changes to the ROC software. This screen shows the RO settings available. There are 4 different sets of settings stored in the CPU-.4

Appendix C. Warranty

iControls Limited Warranty

What the warranty covers:
iControls warrants the WMC-1 to be free from defects in materials and workmanship during the warranty period. If a product proves to be defective during the warranty period, iC*ontrols* will at is sole option repair or replace the product with a like product. Replacement product or parts may include remanufactured or refurbished parts or components.

How long the warranty is effective:
The WMC-1 is warranted for one (1) year for parts and labor from the date of the first consumer purchase or 15 months from ship date, whichever comes first.

What the warranty does not cover:
1. Damage, deterioration or malfunction resulting from:
   a. Accident misuse, neglect, fire, water lightning or other acts of nature, unauthorized product modification or failure to follow instructions supplied with the product.
   b. Repair or attempted repair by anyone not authorized by *i-controls*
   c. Any damage of the product due to shipment.
   d. Causes external to the product such as electric power fluctuations.
   e. Use of supplies or parts not meeting *i-controls*' specifications.
   f. Normal wear and tear.
   g. Any other cause which does not relate to a product defect.
2. Transportation costs necessary to obtain service under this warranty.
3. Labor other than factory labor.

How to get service:
1. To obtain warranty service, contact *iControls* for a Return Material Authorization (RMA).
2. You will be required to provide:
   a. Your name and address
   b. A description of the problem
3. Package the controller carefully for shipment and return it to *i-controls*, freight prepaid.

Limitation of implied warranties:
There are no warranties, expressed or implied, which extend beyond the description contained herein including the implied warranty of merchantablility and fitness for a particular purpose.

Exclusion of damages:
iControls' liability is limited to the cost of repair or replacement of the product. *i-controls* shall not be liable for:
1. Damage to other property caused by any defects in the product, damages based upon inconvenience, loss of use of the product, loss of time, loss of profits, loss of business opportunity, loss of goodwill, interference with business relationships or other commercial loss, even if advised of the possibility or such damages.
2. Any other damages, whether incidental, consequential or otherwise.
3. Any claim against the customer by any other party.

Effect of state law:
This warranty gives you specific legal rights, and you may also have other rights which vary from state to state. Some states do not allow limitations on implied warranties and/or do not allow the exclusion of incidental or consequential damages, so the above limitations and exclusions may not apply to you.