AmeriWater
The Water Purification Specialists

Operation & Maintenance Manual

PRO4

Reverse Osmosis System

3345 Stop 8 Rd, Dayton, OH 45414 | 800 535 5585 | www.ameriwater.com

098-0004 Rev C

Manufactured With Pride in The USA

Table of Contents

1. GENERAL INFORMATION 4
   1.1. Introduction 4
   1.2. Cautionary Symbols 4
2. TECHNICAL INFORMATION 5
   2.1. Theory of Operation 5
   2.2. Specifications 5
      2.2.1. Feed Water Specifications 5
      2.2.2. RO Specifications 5
      2.2.3. Electrical Specifications 5
   2.3. Environmental/Transport 6
3. COMPONENTS IDENTIFICATION AND SCHEMATICS 7
   3.1. Component Identification 7
      3.1.1. Standard Model 7
      3.1.1. Deluxe Model 9
   3.2. Electrical Schematic 11
      3.2.1. Standard Model 11
      3.2.2. Deluxe Model 12
   3.3. Flow Schematics 13
      3.3.1. Standard Model 13
      3.3.2. Deluxe Model 14
      3.3.3. Membrane Flow Configuration 15
4. CONTROLLER 16
   4.1. User Interface 16
   4.2. Controller Inputs/Outputs 16
      4.2.1. Standard Model 16
      4.2.2. Deluxe Model 17
   4.3. Modes of Operation 18
      4.3.1. Tank Full (Idle) 18
      4.3.2. RO Running 18
      4.3.3. Manual Run 18
      4.3.4. Manual Flush 18
      4.3.5. Flush 18

4.3.6. System Off 19
4.4. Display and Status Indicators 19
4.5. Controller Menu Navigation/Adjustments 23
4.5.1. Menu Navigation 23
4.5.2. Settings Description/Defaults 25
4.6. Controller Detail View 26
4.6.1. Standard Model 26
4.6.2. Deluxe Model 28
4.7. Default Programs 30
4.7.1. Standard Controller 30
4.7.2. Deluxe Controller 32
4.7.3. Parameter Description 33
4.8. Programming Interface 35
4.8.1. Installing ROC Program on Windows PC 35
4.8.2. Communicating with the RO Controller 37
4.8.3. Transferring Changes to RO Controller 38
5. INSTALLATION 41
5.1. PRO4 Installation 41
5.2. Rewiring RO Pump for 460 VAC 3 Phase Power Supply 45
5.3. Connecting Auxiliary Pump to RO Controller 46
5.3.1. Standard Model 46
5.3.2. Deluxe Model 46
6. SYSTEM START-UP 48
6.1. Initial Start-up Procedure 48
6.2. Start-up Data Table 49
7. SYSTEM OPERATION 49
7.1. Tankless Operation 49
8. MONITORING 51
9. MAINTENANCE 52
9.1. PRO4 Consumable Replacement 52
9.1.1. Pre-filter Replacement 52
9.1.2. RO Membrane Replacement 52
9.1.3. Calibration of RO Product Conductivity Display 54

9.1.4. RO Membrane Cleaning 54
9.1.5. RO Disinfection 55
9.1.6. Repairing Scuffs on RO Frame 55
9.1.7. RO Membrane Profiling 55
10. ALARMS 56
10.1. PRO4 Fault Conditions Display 56
11. TROUBLESHOOTING 58
12. WARRANTY POLICY 60
13. SPARE PART LISTING 61
13.1. Controller Board/Fuse Replacements 61
13.2. Consumables 63
13.3. Spare Parts 64
13.3.1. Standard Model 64
13.3.2. Deluxe Model 65

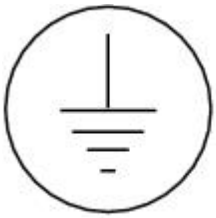
1. GENERAL INFORMATION

1.1. Introduction

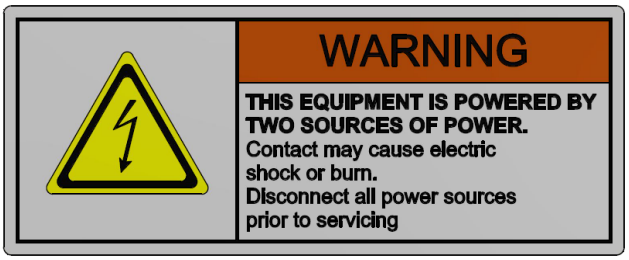
This system is designed to purify water for use in Industrial type applications. This Operation Manual will cover both the Standard and Deluxe PRO4 Reverse Osmosis (RO) model without a storage tank. Your PRO4 RO system was thoroughly tested and in excellent condition when it was shipped to you. However, because damage during shipment is possible, please unpack and carefully inspect your system as soon as it is received by you. Please notify AmeriWater if you have any questions, or if any problems are encountered.

Please read the Operation Manual before using the system. Contact AmeriWater Customer Service with any questions at 1-800-535-5585 Monday through Friday 8:00 a.m. to 5:00 p.m. eastern standard time. For after-hours emergencies call 1-800-535-5585 and follow the instructions on the recorded message. Our on-call technician will return your call as soon as possible. This entire Operation Manual should be read before operating or servicing the system. This Operation Manual should then be kept near the system and used as a reference and troubleshooting guide.

1.2. Cautionary Symbols



Earth Ground Terminal



Equipment is powered by 2 sources of power. Risk of electrical shock

Open by qualified Service personnel only

Denotes suitable location for moving the RO using a pallet jack or fork lift

2. TECHNICAL INFORMATION

2.1. Theory of Operation

Osmosis is the process by which solutions with different concentrations of dissolved solids can pass through a semi permeable membrane. The solvent (water) moves from the lower concentration of ionic materials to the higher concentration of ionic material. The process will occur until the concentrations become equal (equilibrium). Reverse Osmosis is the process of reversing this natural process. A high pressure pump is used to apply pressure which is greater than the osmotic pressure of the solution to the solution as it passes over a semi permeable RO membrane. As the water passes through the membrane, the dissolved solids are removed. The water that passes through the membrane is referred to as **PRODUCT** (or permeate) water. This water will contain much less dissolved solids than the feed water to the RO system. The water which is left behind is referred to as the **CONCENTRATE** (or reject) water. This water will be sent to a drain and contains a high level of dissolved solids.

2.2. Specifications

2.2.1.Feed Water Specifications

Inlet Pressure	30-80	**PSI**
Temperature	50-85	**°F**
Continuous Free Chlorine	<0.1	**ppm**
Salt Density Index	<3	
RO Pre-filter	1	**micron**
RO Low Pressure Switch	5	**PSI**

2.2.2.RO Specifications

SPECIFICATIONS													
Model #	Flow Rate* (GPM)	Nominal Recovery %**	Capacity (GPD)	Mem Qty	Piping Connections (NPT)			Nominal Operating Pressure (psi)	Pump HP	Operating Power (Requires Two Power Sources)			Shipping Weight (Lbs.)
					Inlet Feed	Product	Reject			Control	Pump (3φ)***	Amps	
000-PRO4-2400-S,D	1.67	50%	2,400	1	¾″	½″	½″	100-180	0.5	120V	208-230V	3.10	311
											460V	1.55	
000-PRO4-4800-S,D	3.33	50%	4,800	2	¾″	½″	½″	100-180	0.75	120V	208-230V	3.60	334
											460V	1.80	
000-PRO4-7200-S,D	5.00	50%	7,200	3	¾″	¾″	¾″	100-180	1	120V	208-230V	4.70	374
											460V	2.35	
000-PRO4-9600-S,D	6.67	50%	9,600	4	1″	¾″	¾″	100-180	2	120V	208-230V	8.50	419
											460V	4.25	
000-PRO4-12000-S,D	8.33	50%	12,000	5	1″	¾″	¾″	100-180	2	120V	208-230V	8.50	450
											460V	4.25	
000-PRO4-14400-S,D	10.00	50%	14,400	6	1¼″	1″	1″	100-180	3	120V	208-230V	11.50	491
											460V	5.80	
000-PRO4-16800-S,D	11.67	50%	16,800	7	1¼″	1″	1″	100-180	3	120V	208-230V	11.50	521
											460V	5.80	
000-PRO4-19200-S,D	13.33	50%	19,200	8	1¼″	1″	1″	100-180	3	120V	208-230V	11.50	551
											460V	5.80	

* Permeate flow based on the following standard test conditions: 2000 ppm NaCI, 150 psi, 77°F, pH 8 and 50% recovery. RO flowrate may vary ±20%.

** RO set for 50% recovery from factory. Can be operated up to 75% recovery with reduced RO membrane life.

*** Standard factory setting is 208-230V, 3 phase power. If 460V is required it must be rewired in the field according to section 5.2.

2.2.3.Electrical Specifications

RO Controller 120 VAC, 15 Amp @ 60 Hz

RO Pump Motor	208/230-460*, 3 Phase	**VAC**
Recommended wire gauge	14 AWG, 600 V	
Solenoid coil supply	120 VAC @ 60 Hz	
Solenoid power-In rush	46	**W**
Solenoid power-Holding	22	**W**
Low Pressure Switch Contacts	5 A @ 120 VAC	

* See section 5.2 for rewiring RO pump for 460 VAC operation

2.3. Environmental/Transport

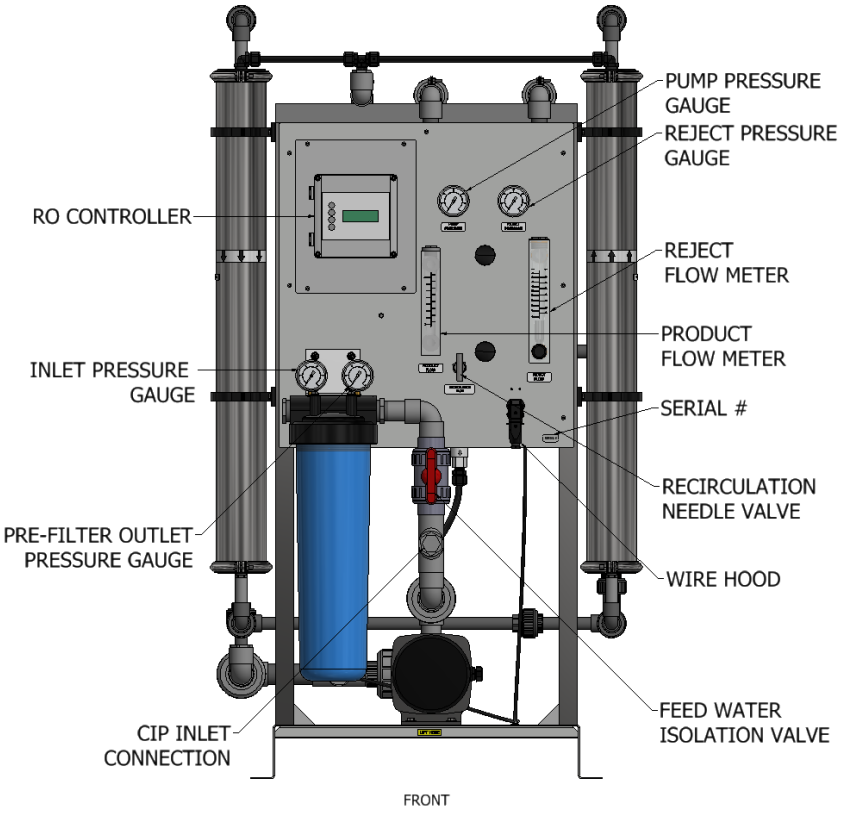
This Device is intended for use/transport in the following conditions:

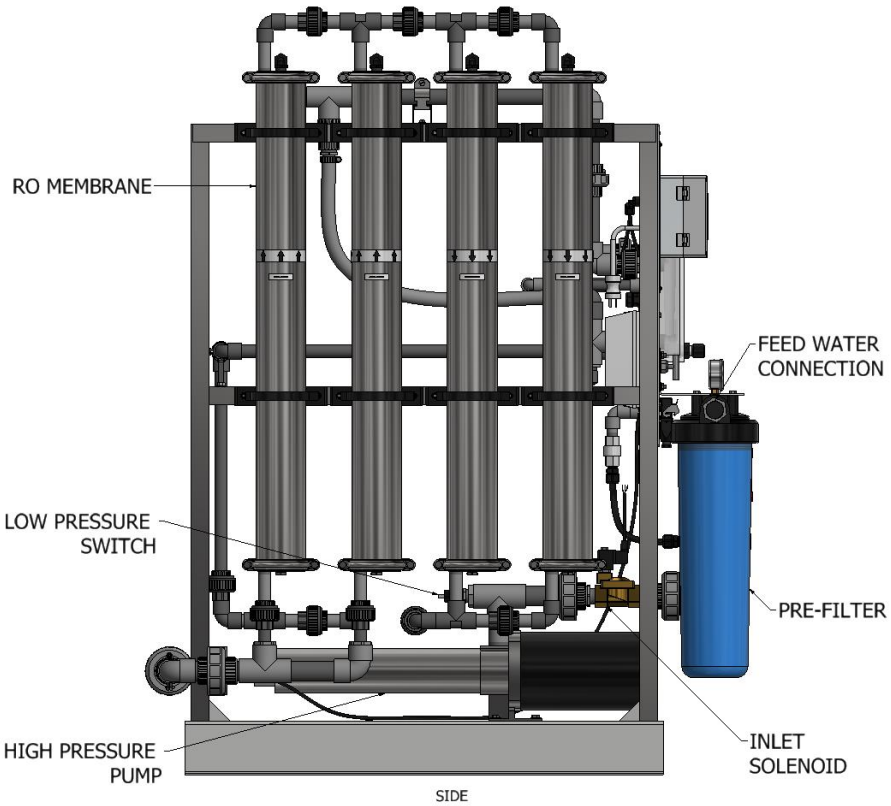
Location	Indoor
Altitude [m]	Up to 2000
Ambient Temperature range [°C]	5-40
Relative Humidity	80% up to 31 °C decreasing linearly to 50% at 40 °C
Mains Supply Voltage Fluctuation	±10% of the nominal voltage

3. COMPONENTS IDENTIFICATION AND SCHEMATICS

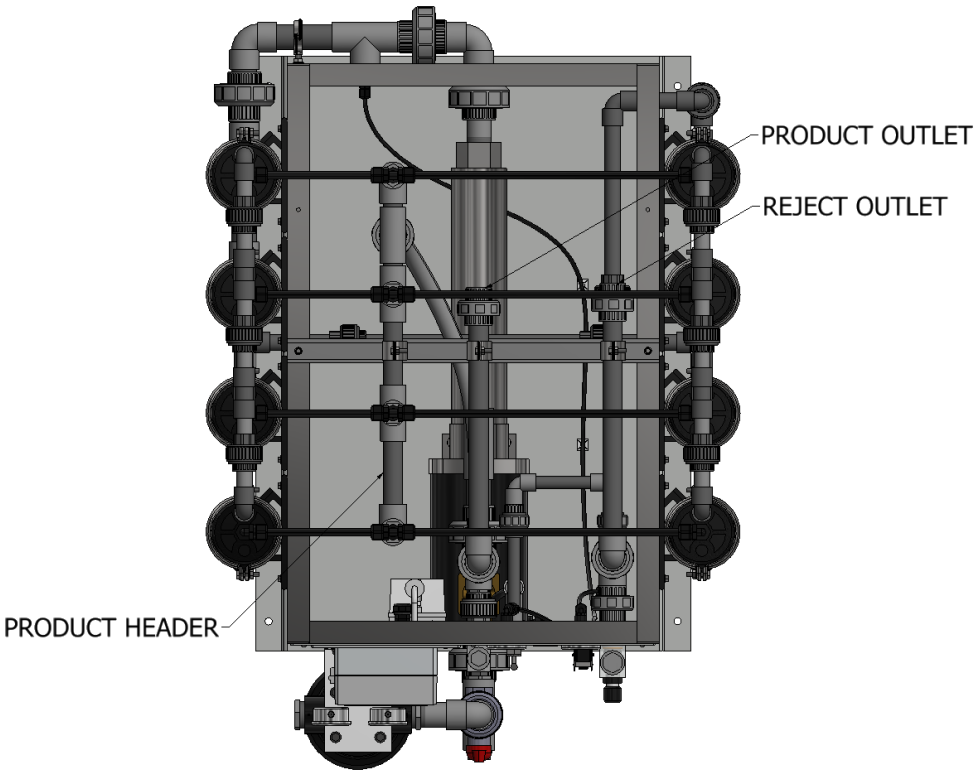
3.1. Component Identification

3.1.1.Standard Model



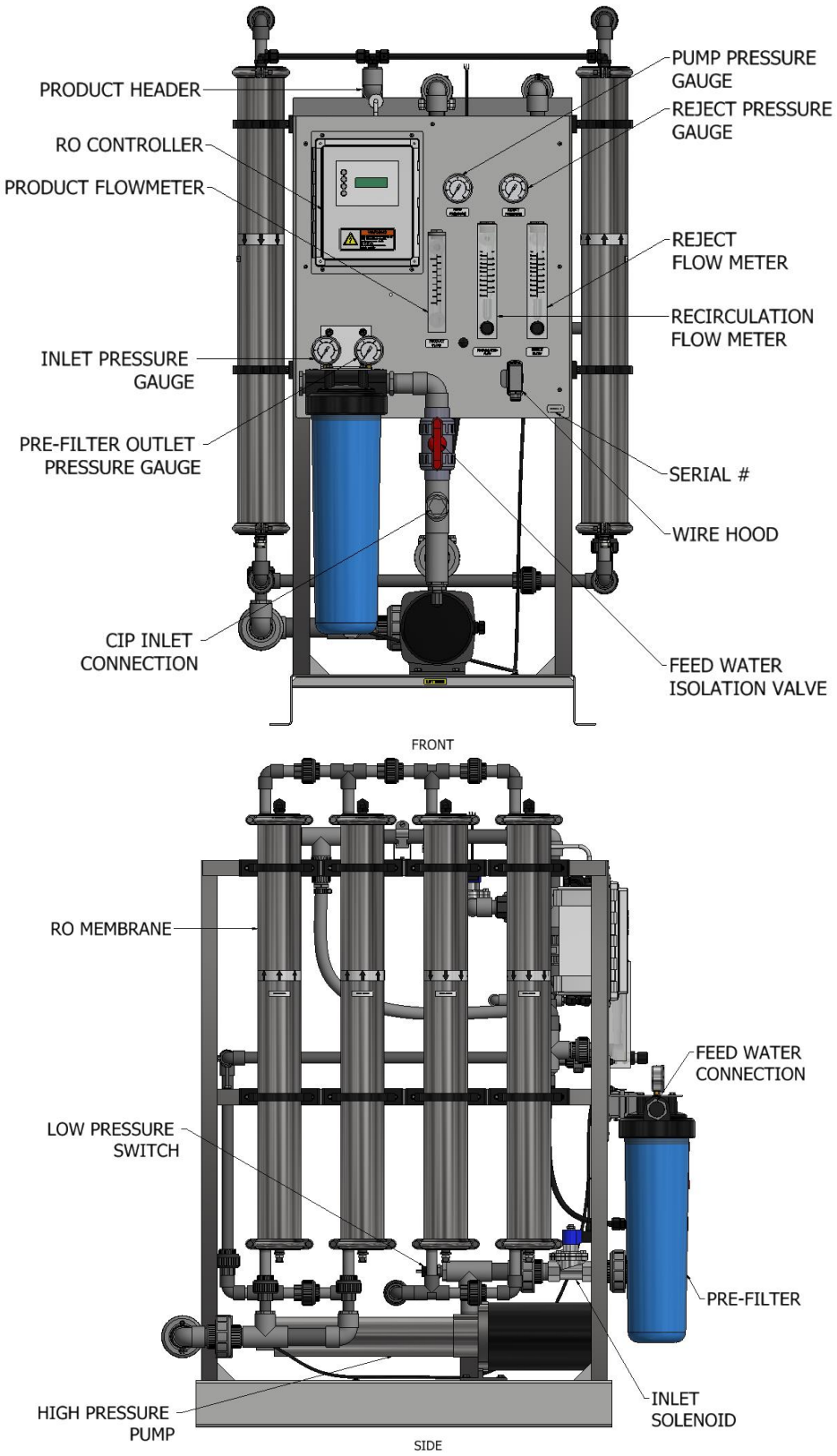

RO MEMBRANE
FEED WATER CONNECTION
LOW PRESSURE SWITCH
PRE-FILTER
HIGH PRESSURE PUMP
INLET SOLENOID

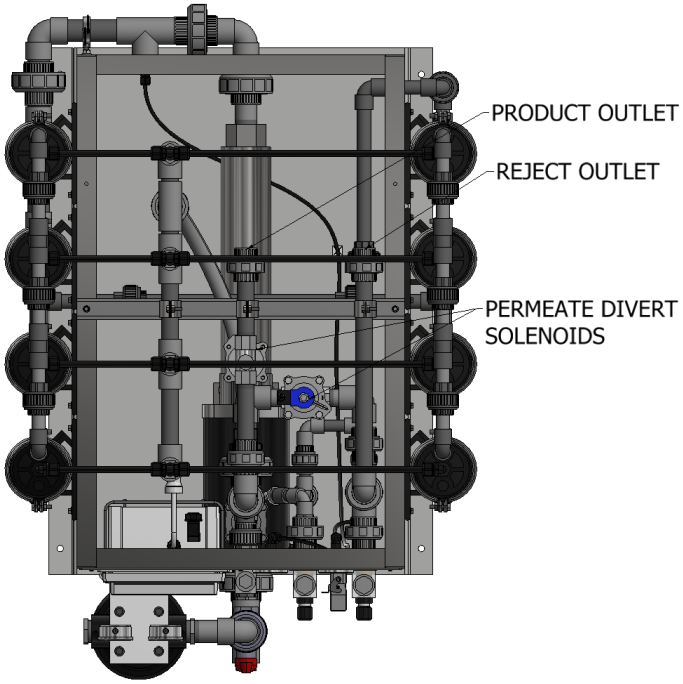
SIDE


PRODUCT OUTLET
REJECT OUTLET
PRODUCT HEADER

TOP

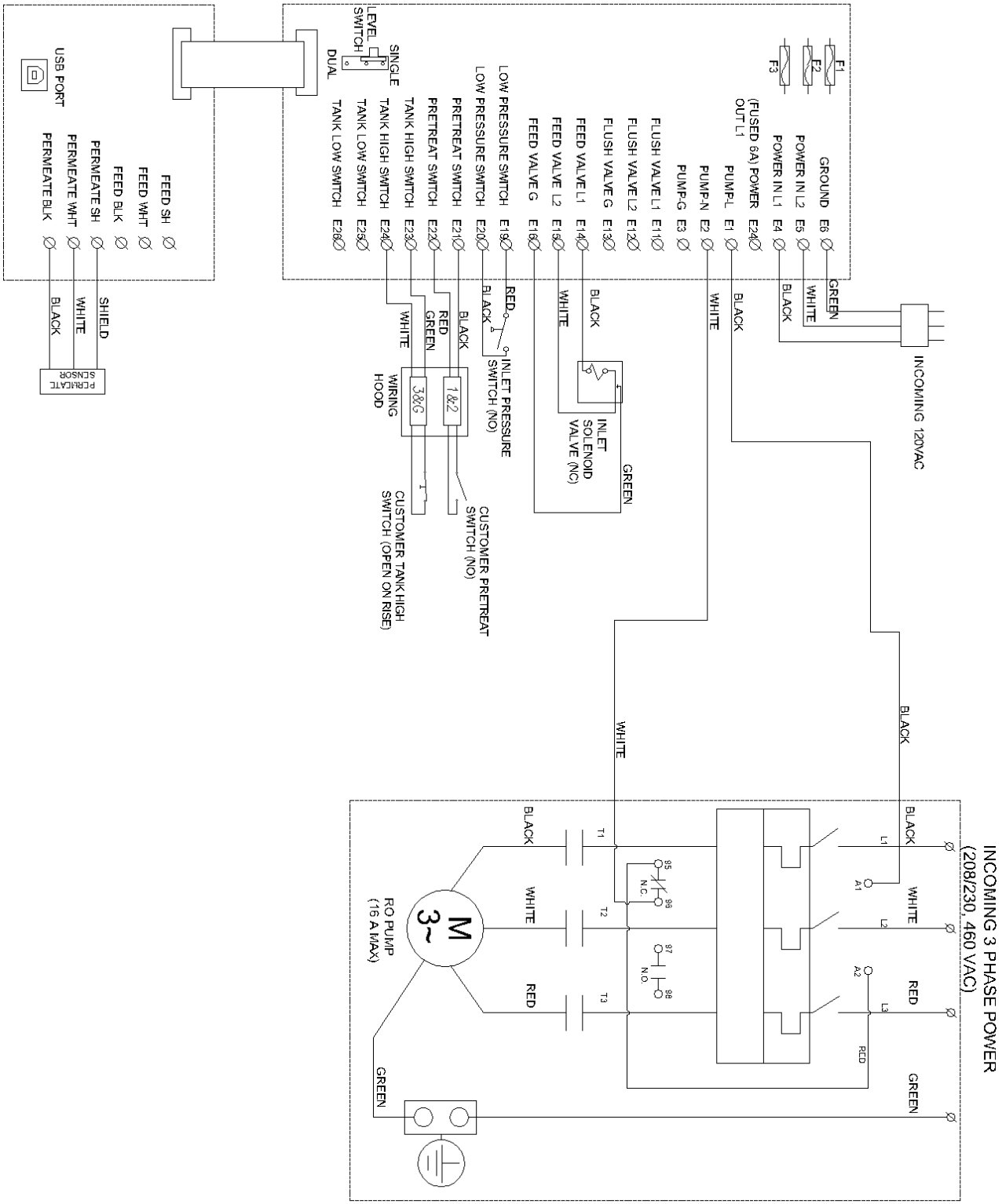
3.1.1. Deluxe Model



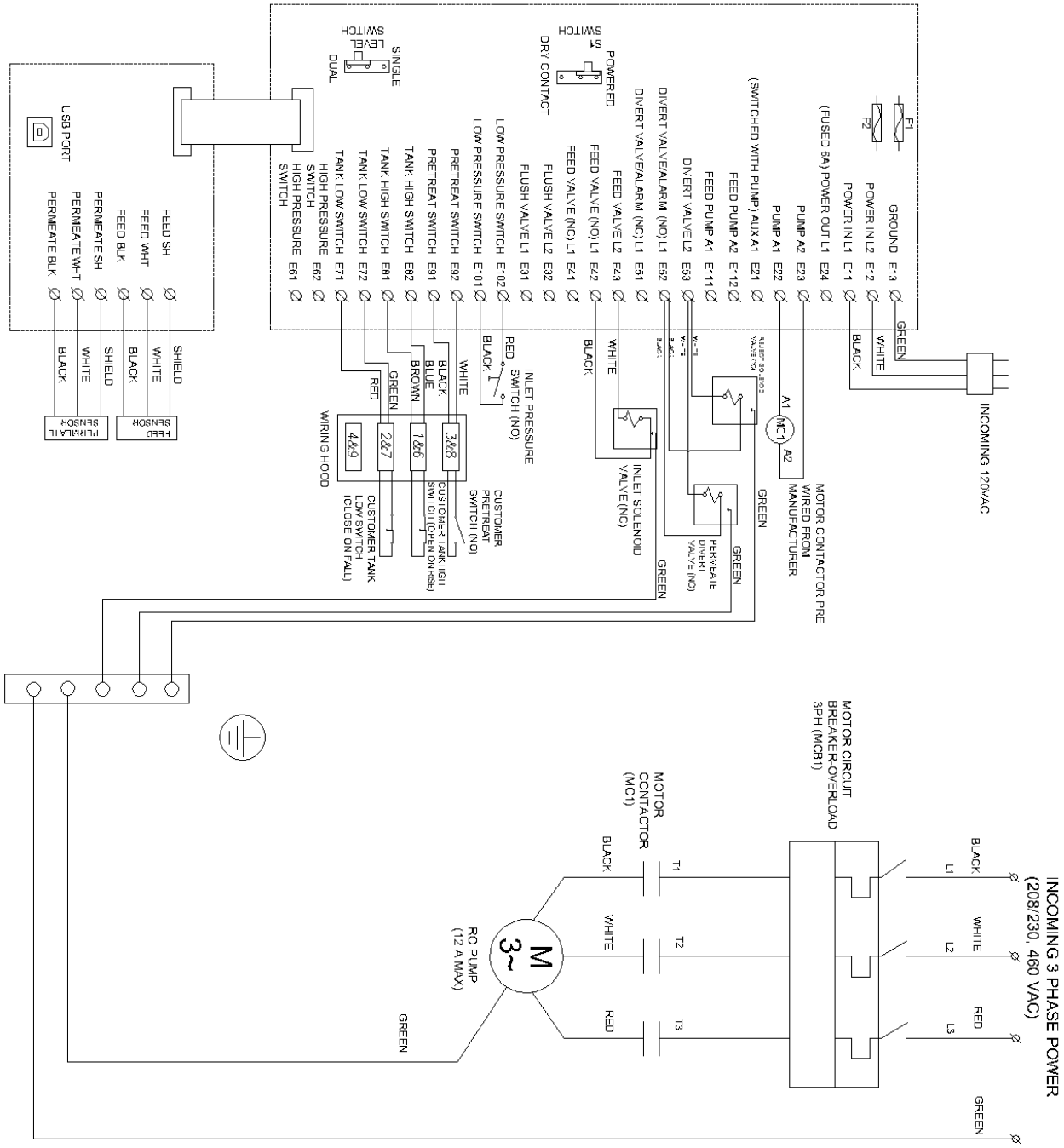

PRODUCT OUTLET
REJECT OUTLET
PERMEATE DIVERT
SOLENOIDS
TOP

3.2. Electrical Schematic

3.2.1.Standard Model

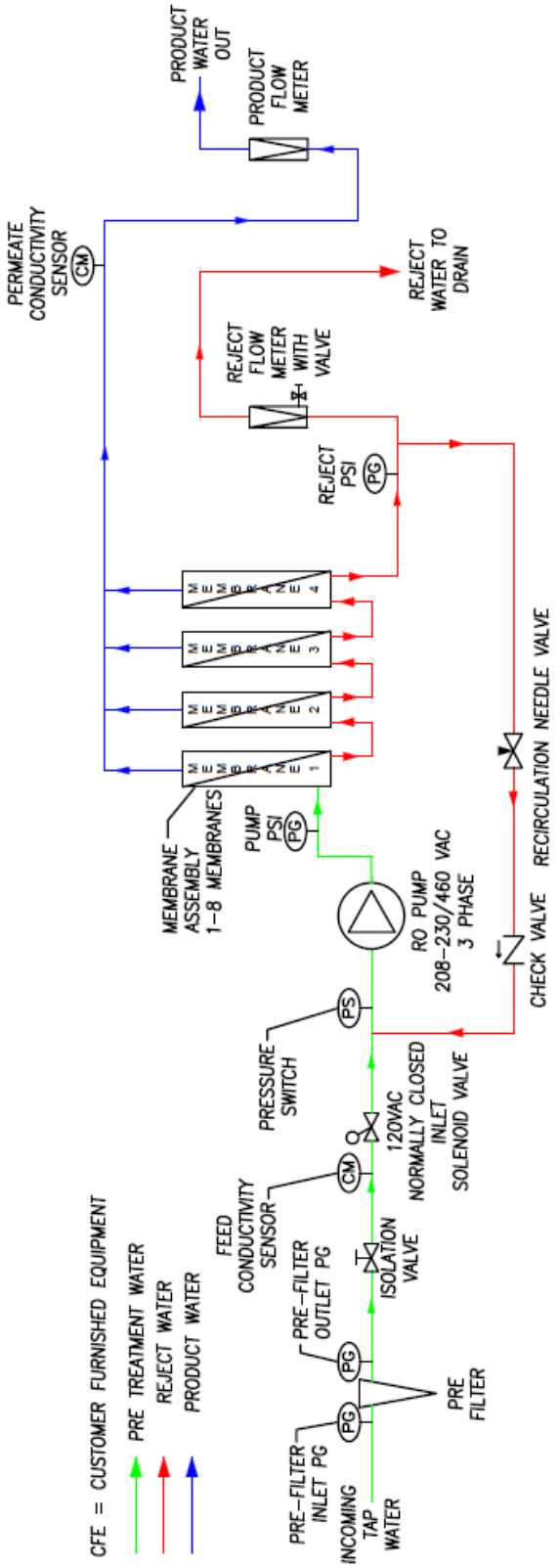


3.2.2.Deluxe Model

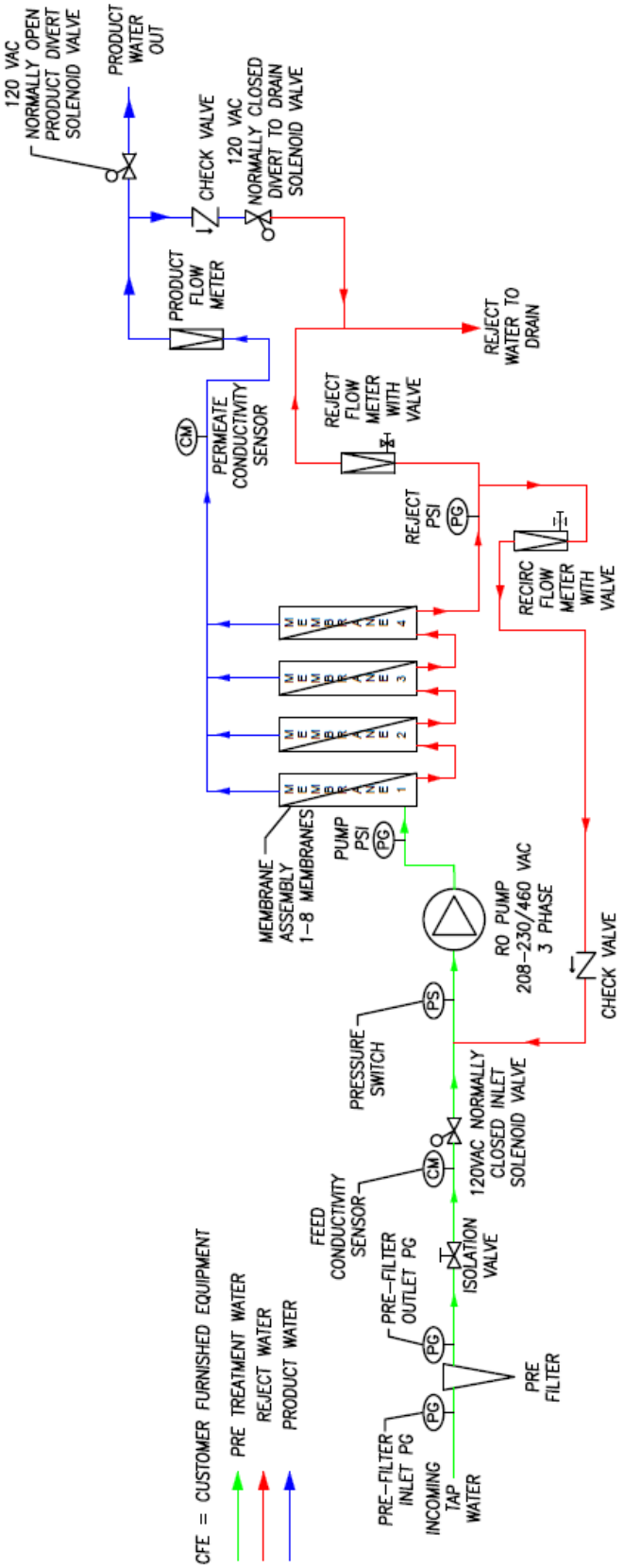


3.3. Flow Schematics

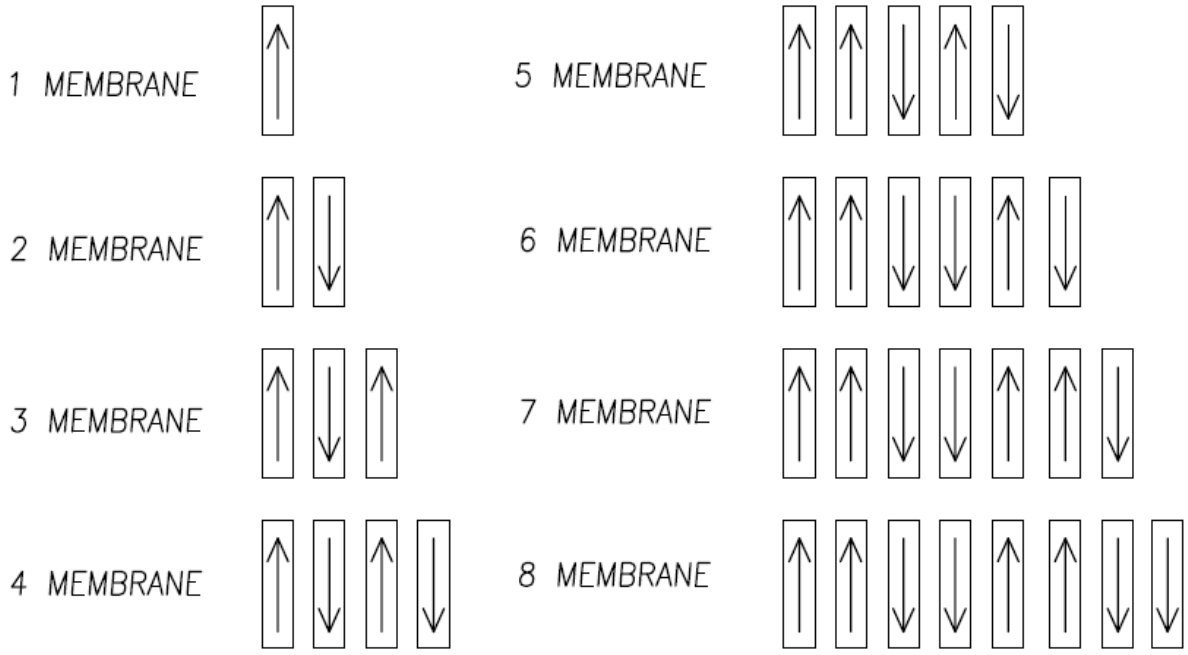
3.3.1.Standard Model



3.3.2.Deluxe Model



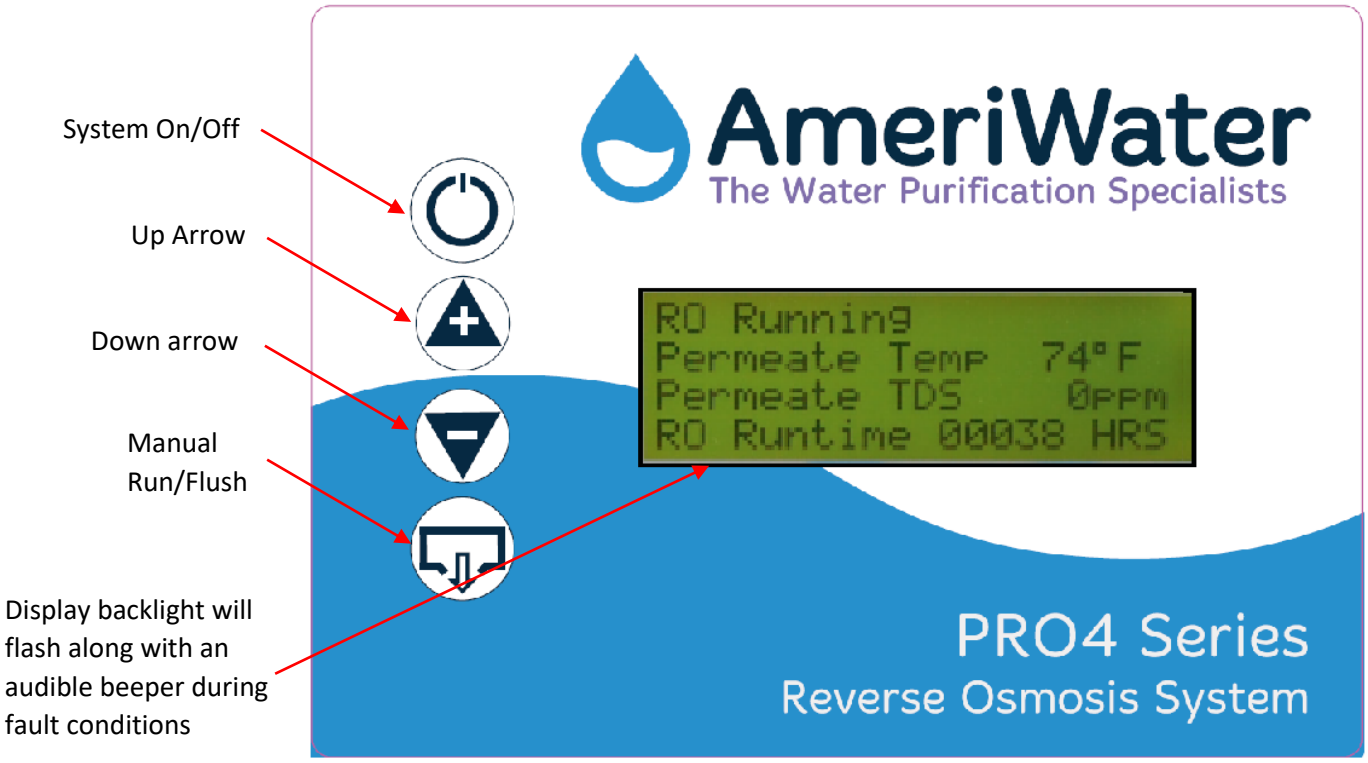
3.3.3.Membrane Flow Configuration



4. CONTROLLER

4.1. User Interface

Both the Standard and Deluxe systems will use the same user interface for interacting with the RO system. The system uses a 4 line 20 character LCD display which can be navigated using the 4 buttons on the left hand side of the display. See the following image for a description of each button and what the button is used for.



- **System On/Off**
  - Hold the button down for 1 second to shut the system off. When navigating the hidden programming menu, pressing the button will exit to the home screen.
- **Up Arrow**
  - Used to navigate the hidden programming menu
- **Down Arrow**
  - Used to navigate the hidden programming menu
- **Manual Run/Flush**
  - This button is used to manually run or flush the RO system. See the below table for explanation of the buttons functions while the RO is in operation. While navigating the hidden programming menu, the button will allow users to change settings.

Table 1

Operation Mode	First Button Press	Second Button Press
TANK FULL	Manual Run	Manual Flush
RO RUNNING	Starts Manual Flush	Ends Manual Flush

4.2. Controller Inputs/Outputs

4.2.1.Standard Model

Inputs

Tank Level Switches*	2 Normally-Closed. Set up for single float operation
Inlet Pressure Switch*	Normally-Open
Pretreatment Lockout Switch*	Normally-Open
Controller Power	120 VAC @ 60 Hz
Permeate Conductivity	0-3000 PPM, 0-6000 µS (Sensor K=0.75)
Feed Conductivity (Not Used)	0-3000 PPM, 0-6000 µS (Sensor K=0.75)

***Switch inputs are dry. Do not supply voltage to switch inputs.**

Output Relays (Relays are fused with 6A fuse)

Feed Solenoid	10A Resistive, 5A inductive @ 120 VAC
Flush Solenoid (Not Used)	10A Resistive, 5A inductive @ 120 VAC
Motor	40A Resistive @ 120VAC

4.2.2.Deluxe Model

Inputs

Tank Level Switches*	2 Normally-Closed. Can be used with a single level switch
Inlet Pressure Switch*	Normally-Open
Pretreatment Lockout Switch*	Normally-Open
High Pressure Switch (Not Used)*	Normally-Open
Controller Power	120 VAC @ 60 Hz
Permeate Conductivity	0-3000 PPM, 0-6000 µS (Sensor K=0.75)
Feed Conductivity	0-3000 PPM, 0-6000 µS (Sensor K=0.75)

***Switch inputs are dry. Do not supply voltage to switch inputs.**

Output Relays (Relays are fused with 6A fuse)

Feed Solenoid	0.5 A @ 120 VAC
Flush Solenoid (Not Used)	0.5 A @ 120 VAC
Feed Pump Terminals	0.5 A @ 120 VAC
Divert Relay	0.5 A @ 120 VAC (Can be made dry contact with switch S1. Changing this will disable permeate divert functionality)
Motor Contactor Coil	0.5 A @ 120 VAC

4.3. Modes of Operation

4.3.1.Tank Full (Idle)

Tank Full is activated when the **HI LEVEL** switch opens as the water level in the storage tank rises. When the RO is in **TANK FULL** mode, the Idle Flush (if active) timer will begin to count down. If the Tank Full flush is activated, the RO will enter Flush mode for the allotted time upon entering **TANK FULL** mode.

With the RO in Tank full mode, the system will be allowed to enter **MANUAL RUN** and **MANUAL FLUSH** mode by pressing the manual run/flush button.

4.3.2.RO Running

RO Running means that the RO system is producing RO water. In this mode, the inlet solenoid valve and pump are active. For systems with single float switch operation, **RO RUNNING** mode will begin upon closure of the **HI LEVEL** float switch. For systems using dual float operation, **RO RUNNING** mode will begin upon closure of the **LO LEVEL** float switch. The LO Level float switch will be placed at a predetermined location near the middle of the storage tank.

As the RO is operating in **RO RUNNING**, the LCD display will display the runtime of the system, the Permeate conductivity, the Feed conductivity (Deluxe models only), the Percent Rejection (Deluxe models only), and the Permeate water temperature.

4.3.3.Manual Run

Manual run mode will place the RO into operation regardless of the float level switch position(s). The RO will operate for a predetermined time period see section 4.7 for the time period that the RO will operate for when the manual run button is pressed. The manual run function may be disabled if a value of 0 min is set for the manual run timer. During manual run, the inlet solenoid, and RO pump will be active.

NOTE: During manual run mode, RO water will be sent to a storage tank (if connected) regardless of the tank level.

4.3.4.Manual Flush

Manual flush mode will be activated by pressing the Manual run/flush button on the front of the RO controller (see Table 1, section 4.1). When in manual flush mode, the RO will go into flush mode for a predetermined time period regardless of the level switch position or operation mode. The time period for the manual flush is adjustable (see section 4.7). The manual flush function may be disabled if a value of 0 min is set for the manual flush timer. During manual flush, the inlet solenoid, flush solenoid (no valve connected) and RO pump will be active.

NOTE: During manual flush mode, RO water will be sent to a storage tank (if connected) regardless of the tank level

4.3.5.Flush

Flush will be activated if the RO satisfies one of the conditions for flush as listed in section 4.7. See below for detailed descriptions of the flush types available:

Table 2, Flush Mode Interactions

	High Pressure	Low Pressure (Inlet Closed)	Low Pressure (Inlet Open)

Inlet Valve	On	Off	On
Inlet Pressure Switch	Active	Ignore	Ignore
Hi Pressure Pump	On	Off	Off
Hi Pressure Switch (Deluxe Only)	Active	Off	Off
Flush Relay	On	On	On
Divert Valve (Deluxe Only)	Off	Off	Off

- **Startup Flush**
  - Activate flush on startup of the RO system
- **Periodic Flush**
  - Automatic flush while the RO is running. If the time period set for the flush is passed while the RO is operating the system will go into flush mode
- **Tank Full Flush**
  - Activates flush at the end of the RO run cycle, when the storage tank is full
- **Idle Flush**
  - Automatically starts up the system and activates the flush while the system is idle, not running. Intended for environments where leaving the RO idle for long periods would invite bio-fouling.

NOTE: During flush mode, RO water will be sent to a storage tank (if connected) regardless of the tank level.

4.3.6.System Off

When the System is Off, all RO operations will stop and the display back light will be dim. To turn the controller On or Off, you must hold this button for 1 seconds. The controller will remember this mode even if the supply power is cycled off then on.

4.4. Display and Status Indicators

• **In Power Off mode, the display backlight will dim and all RO operations will stop**	Power Off
• **Standard RO models will display this message when the RO is signaled to turn on and run by the RO float switches**	RO Starting Pump Delay ---- sec RO Runtime 00000 HRS
• **Deluxe RO models will display this message when the RO is signaled to turn on and run by the RO float switches**	RO Starting Pump Delay ---- sec Permeate Divert RO Runtime 00000 HRS

• **Standard RO models will display the following message while the RO is running. The Permeate temp and permeate conductivity are constantly displayed on the LCD display**	RO Running Permeate Temp ---- °F Permeate Cond ---- µS RO Runtime 00000 HRS
• **Deluxe RO models will display the following message while the RO is running. The Permeate Conductivity, Feed Conductivity, Water Temperature, and Percent Rejection are cycled through over a 30 sec period.**	RO Running Permeate Cond ---- µS Feed Cond ---- µS RO Runtime 00000 HRS RO Running Water Temp ---- °F Percent Reject ---- % RO Runtime 00000 HRS
• **Both standard and deluxe models will display the following message as the RO is in flush mode. The timer will count down until the flush duration completes.**	RO Running System Flushing Flush Ends in 00:00 RO Runtime 00000 HRS
• **Deluxe models will have a Permeate divert to drain option for high conductivity water. When the permeate quality exceeds the set-point, the RO will display the following message alerting the user that the permeate water is diverted.**	RO Running Permeate High Divert Permeate Cond ---- µS RO Runtime 00000 HRS
• **Standard RO models will display the following message in a tank full condition. Line 2 of the display will display the last recorded temperature and conductivity values from the last time of RO operation. Ro is considered in "idle" mode at this time.**	Tank Full Water Temp ---- °F (From Last Run) RO Runtime 00000 HRS
• **Deluxe RO models will display the following message as the tank is drawn down to the Low level float switch. Once the Low level float switch is activated the RO will return to service**	Tank Full -- Draw Down Water Temp ---- °F (From Last Run) RO Runtime 00000 HRS

• **Standard RO models will display the following message while the RO is running in manual run mode. The Permeate temp and permeate conductivity are constantly displayed on the LCD display. The run timer will count down as the unit run.**	Manual Run 00:00 Permeate Temp ---- °F Permeate Cond ---- µS RO Runtime 00000 HRS
• **Deluxe RO models will display the following message while the RO is running in manual run mode. The Permeate Conductivity, Feed Conductivity, Water Temperature, and Percent Rejection are cycled through over a 30 sec period. The run timer will count down as the RO runs.**	Manual Run 00:00 Permeate Cond ---- µS Feed Cond ---- µS RO Runtime 00000 HRS Manual Run 00:00 Water Temp ---- °F Percent Reject ---- % RO Runtime 00000 HRS
• **When a low pressure fault is detected, the RO controller will display the following message. A max of 5 faults while attempting to restart will occur before shutting to RO down. The event number indicates the number of times the RO has tried to restart in a 10 min period**	Low Pressure Event - RO Runtime 00000 HRS
• **Message will be displayed after 5 low pressure events occur in a 10 min period. RO will attempt to restart after the restart timer countdown completes. An audible alarm will sound as this message is displayed**	Service Fault Low Feed Pressure Restart in MM:SS
• **This message will be displayed if the pretreatment switch is closed indicating that the RO pretreatment has been placed into backwash. An audible alarm will sound while the message is displayed.**	Service Fault Pretreat Check Pretreat system

• **The following message will be displayed when the Permeate Conductivity exceeds the set-point if the water quality alarm is activated (deactivated by default)**	Service Fault Permeate Cond ---- µS Alarm SP ---- µS To Reset Push OFF/ON
• **The following message will be displayed when the Feed Conductivity exceeds the set-point if the water quality alarm is activated (deactivated by default)**	Service Fault Feed Cond ---- µS Alarm SP ---- µS To Reset Push OFF/ON

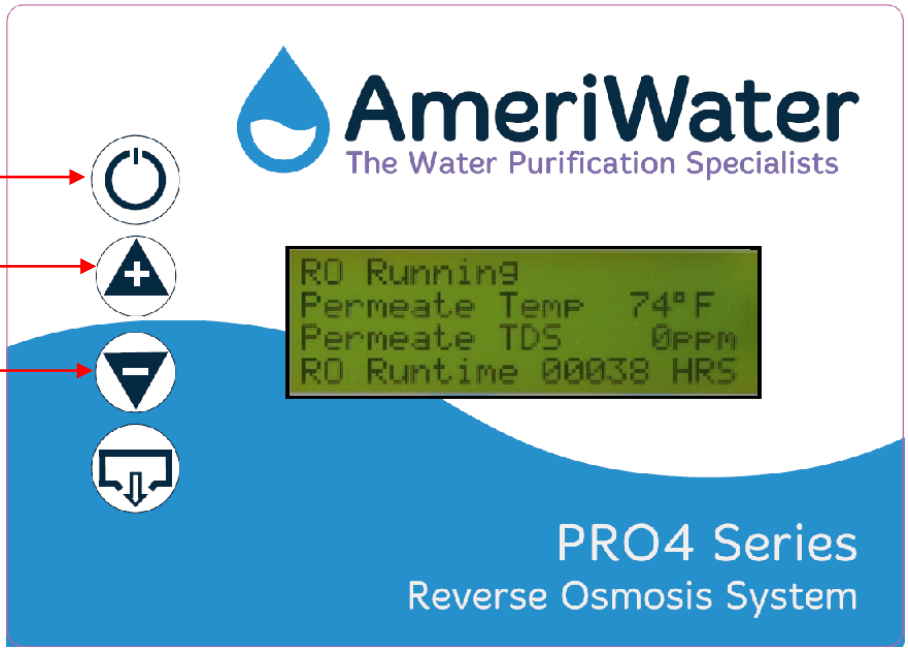
4.5. Controller Menu Navigation/Adjustments

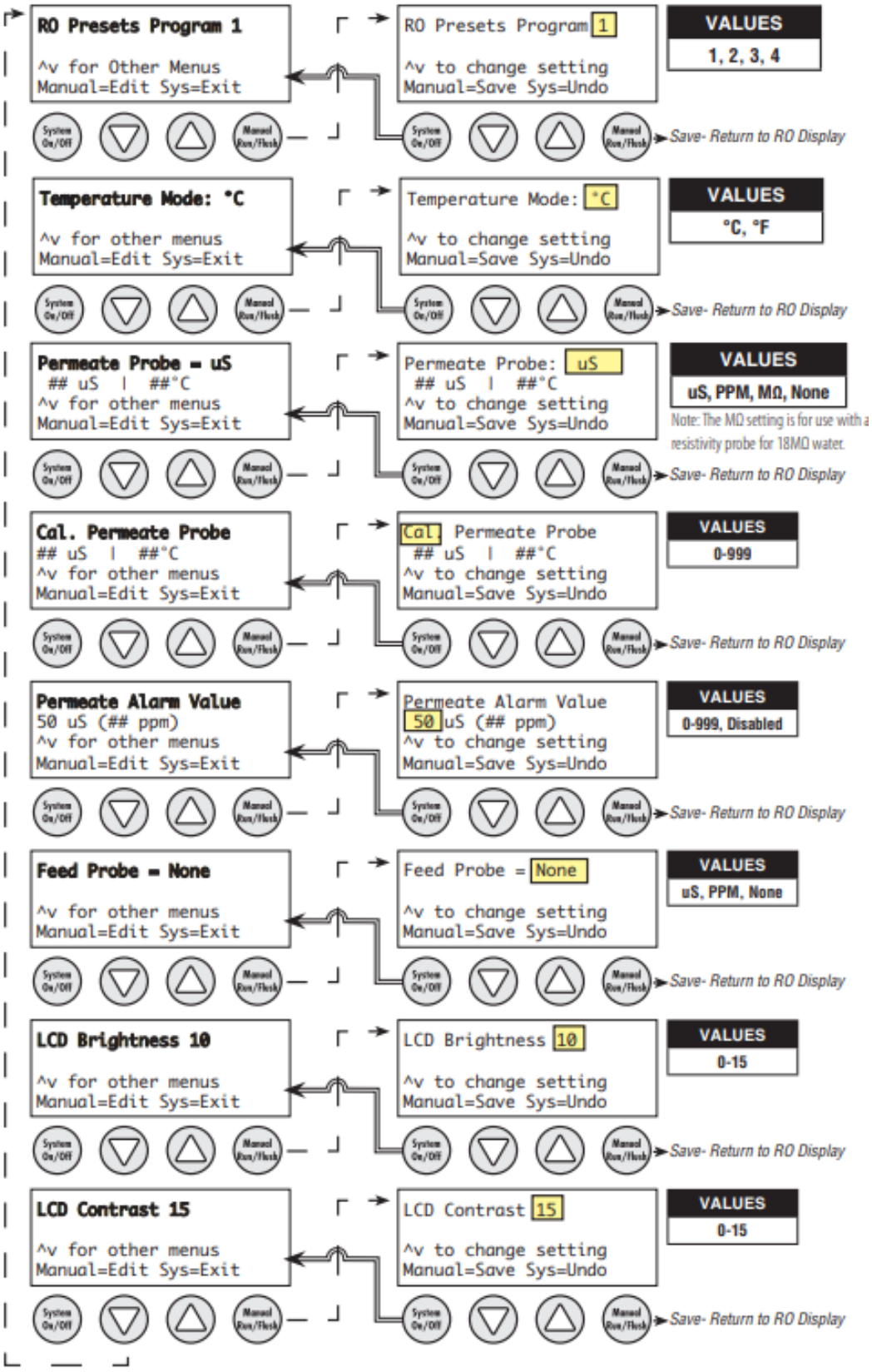
4.5.1.Menu Navigation

Accessing the hidden programming menu:

1) With the system ON, Press and hold the UP and DOWN arrows

2) With the UP and DOWN arrows depressed, press the System On/Off Switch. The menu will switch to RO presets menu as shown in the figure below




RO Presets Program 1
^v for Other Menus
Manual=Edit Sys=Exit
RO Presets Program 1
^v to change setting
Manual=Save Sys=Undo
VALUES
1, 2, 3, 4
Save- Return to RO Display
Temperature Mode: °C
^v for other menus
Manual=Edit Sys=Exit
Temperature Mode: °C
^v to change setting
Manual=Save Sys=Undo
VALUES
°C, °F
Save- Return to RO Display
Permeate Probe = uS
uS | ##°C
^v for other menus
Manual=Edit Sys=Exit
Permeate Probe: uS
uS | ##°C
^v to change setting
Manual=Save Sys=Undo
VALUES
uS, PPM, MΩ, None
Note: The MΩ setting is for use with a resistivity probe for 18MΩ water.
Save- Return to RO Display
Cal. Permeate Probe
uS | ##°C
^v for other menus
Manual=Edit Sys=Exit
Cal. Permeate Probe
uS | ##°C
^v to change setting
Manual=Save Sys=Undo
VALUES
0-999
Save- Return to RO Display
Permeate Alarm Value
50 uS (## ppm)
^v for other menus
Manual=Edit Sys=Exit
Permeate Alarm Value
50 uS (## ppm)
^v to change setting
Manual=Save Sys=Undo
VALUES
0-999, Disabled
Save- Return to RO Display
Feed Probe = None
^v for other menus
Manual=Edit Sys=Exit
Feed Probe = None
^v to change setting
Manual=Save Sys=Undo
VALUES
uS, PPM, None
Save- Return to RO Display
LCD Brightness 10
^v for other menus
Manual=Edit Sys=Exit
LCD Brightness 10
^v to change setting
Manual=Save Sys=Undo
VALUES
0-15
Save- Return to RO Display
LCD Contrast 15
^v for other menus
Manual=Edit Sys=Exit
LCD Contrast 15
^v to change setting
Manual=Save Sys=Undo
VALUES
0-15
Save- Return to RO Display

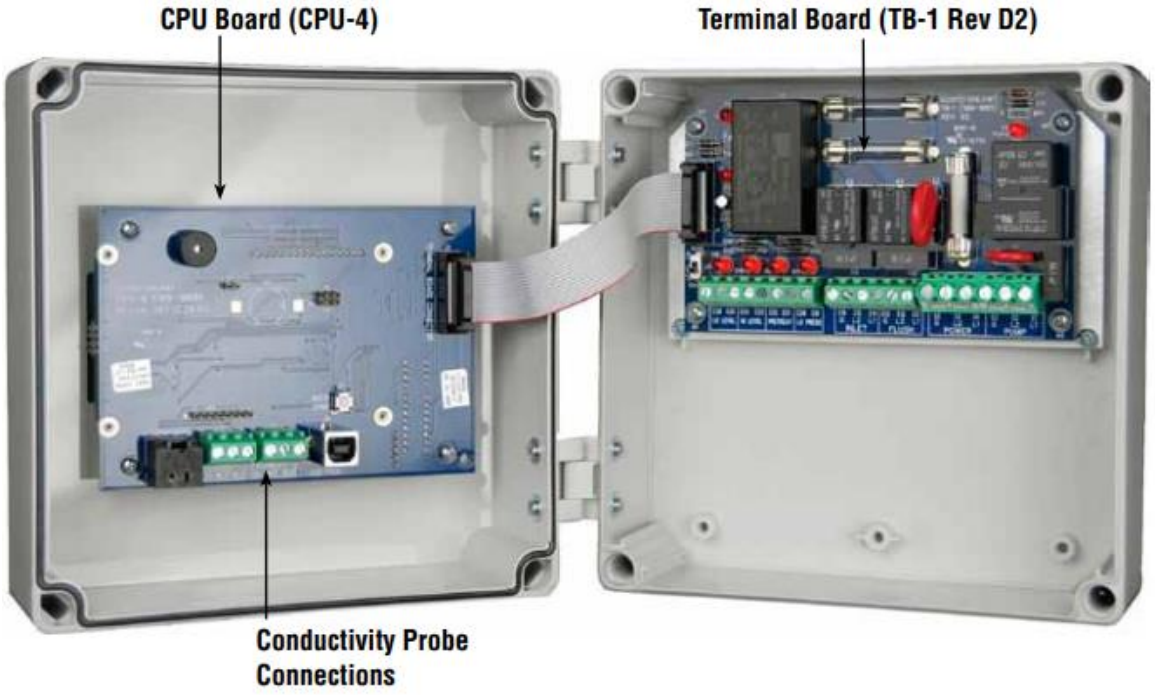
4.5.2.Settings Description/Defaults

Setting	Description	Default	Setting Range
Language	Sets the Language for the RO controller	English	English, Polish
RO Presets Program	Chooses the RO program from the list of default programs. See section 4.7 For list of default programs	1	1-4
LCD Contrast	Adjusts the contrast of the LCD display. Higher values indicate more contrast	5	0-10
LCD Brightness	Adjusts the brightness of the LCD display. Higher values indicate brighter display.	6	0-10
Cal Feed Probe	Allows the user to adjust the reading of the feed conductivity cell to match the feed water supply to the RO.	0	0-999
Feed Probe Cell Constant	Allows the user to enter a K value for the Feed water conductivity cell	0.75	0.1-10.0
Feed Probe	Allows the user to change between TDS and µS or deactivate the Feed Conductivity cell	µS	µS, TDS, None
Permeate Alarm Value	Allows the user to set the Permeate alarm set-point value for divert to drain functionality (deluxe models only) or Permeate alarm	Depends on feed water quality	0-2000
Cal. Permeate Probe	Allows the user to adjust the reading of the Permeate conductivity cell to match the feed water supply to the RO.	0	0-999
Permeate Probe Cell Constant	Allows the user to enter a K value for the Permeate water conductivity cell	0.75	0.1-10.0
Permeate Probe	Allows the user to change between TDS and µS or deactivate the Permeate Conductivity cell	µS	µS, TDS, None
WQ Loss of Signal	When the controller samples the water quality signal, it performs noise filtering and analyzes the signal for integrity. If the sample is determined to be too poor to use for a measurement, it is discarded and a counter is incremented. A good measurement will reset the counter to zero. If the counter exceeds the Loss of Signal count, the error noted on the LCD display "WQ Los of Signal" message. This feature is useful when running your pump with a VFD or operating in a noisy environment.	3	0-15
Audible Alarm	Allows the user to enable or disable the audible alarm for fault conditions	ON	ON,OFF
Temperature Mode	Allows the user to alternate between °F and °C for the water temperature display	°F	°F, °C

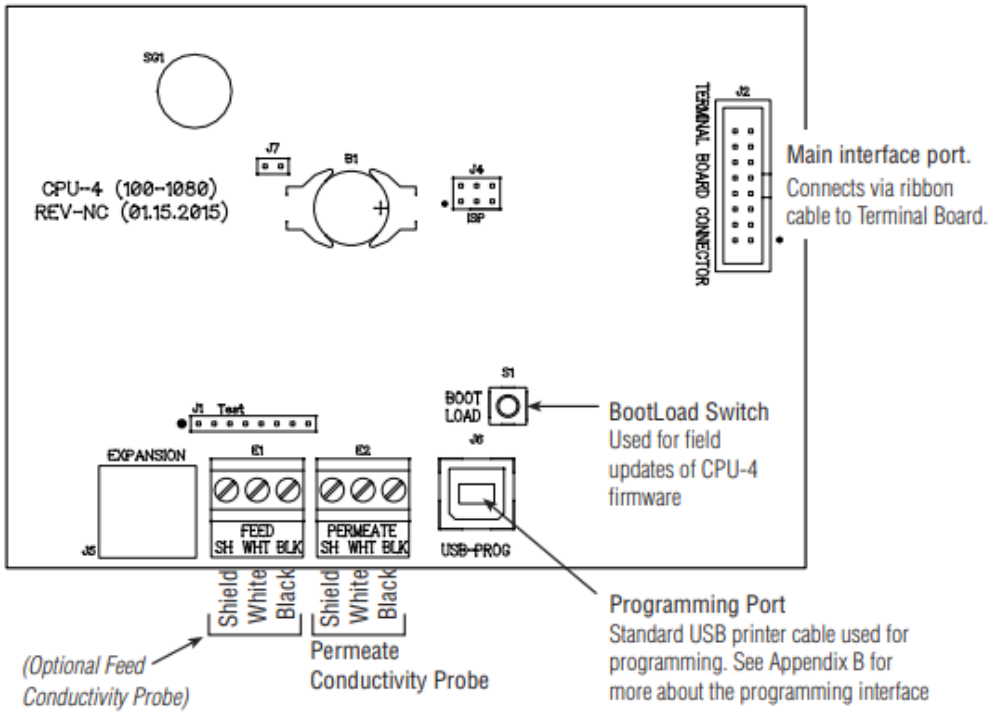
4.6. Controller Detail View

4.6.1.Standard Model

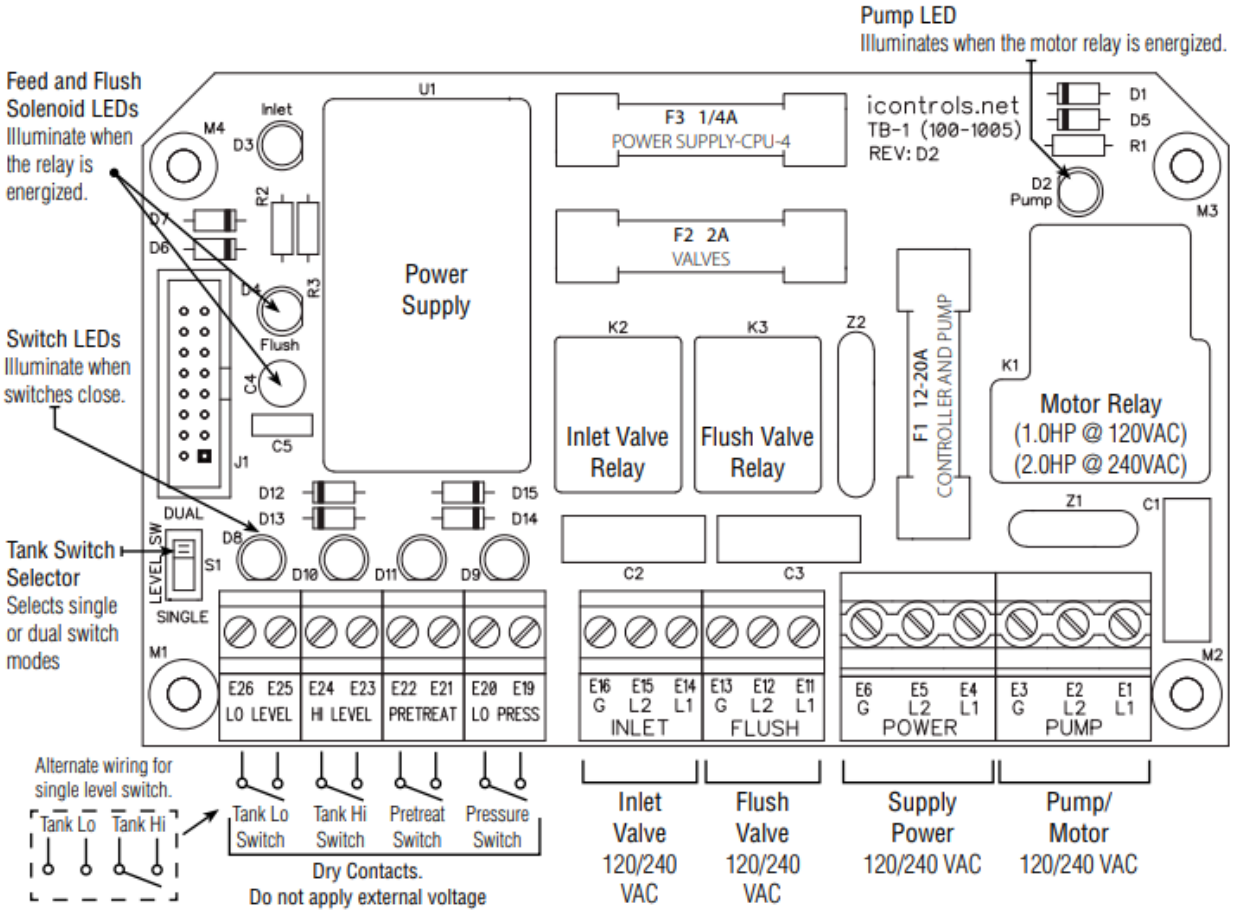
Controller Overview:



CPU Board Detail:

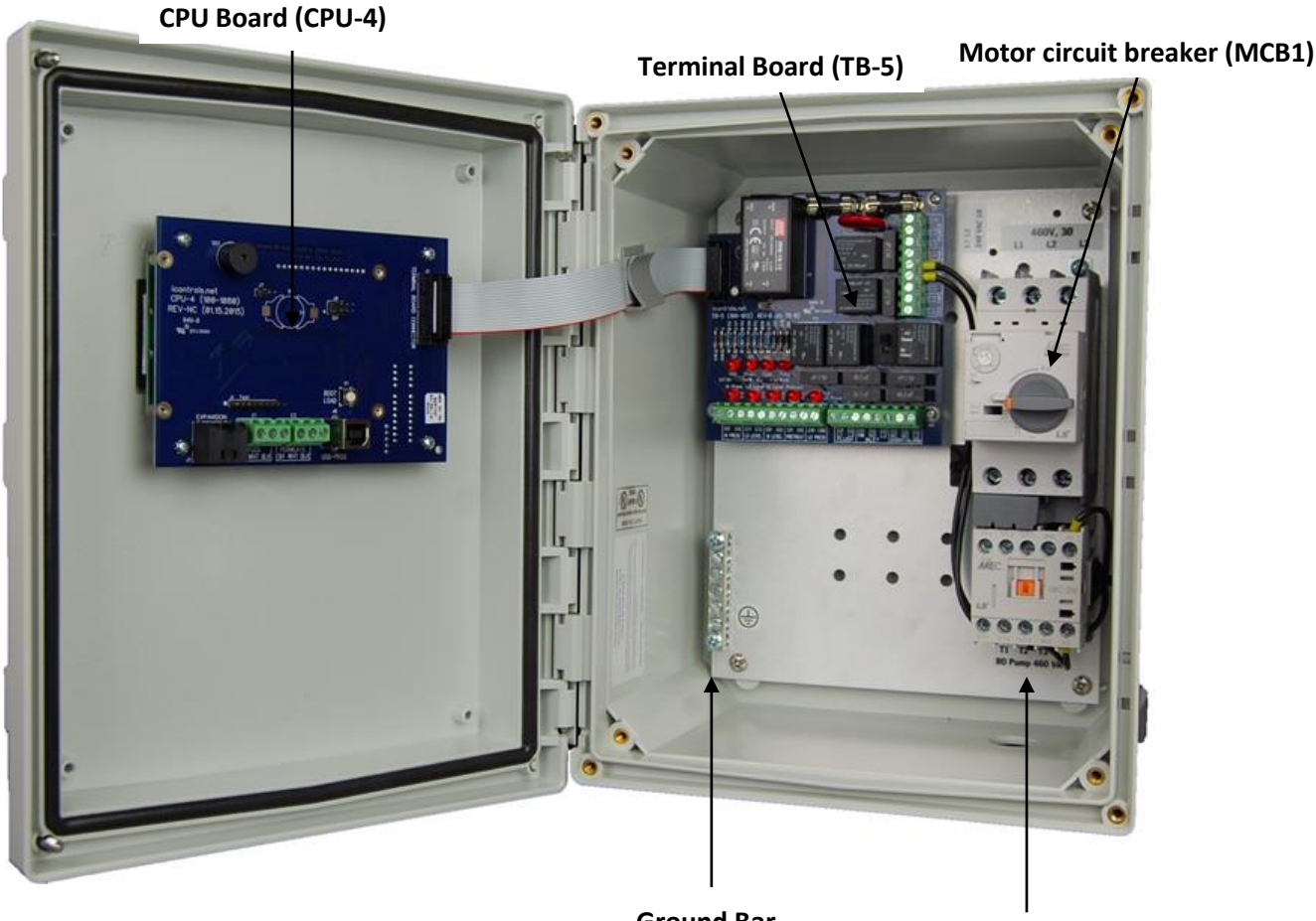


Terminal Board Detail:

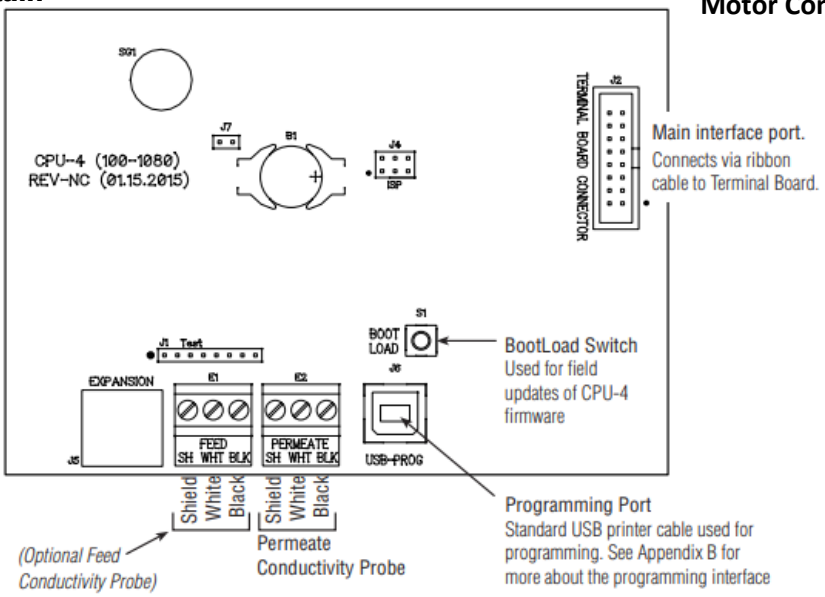


4.6.2.Deluxe Model

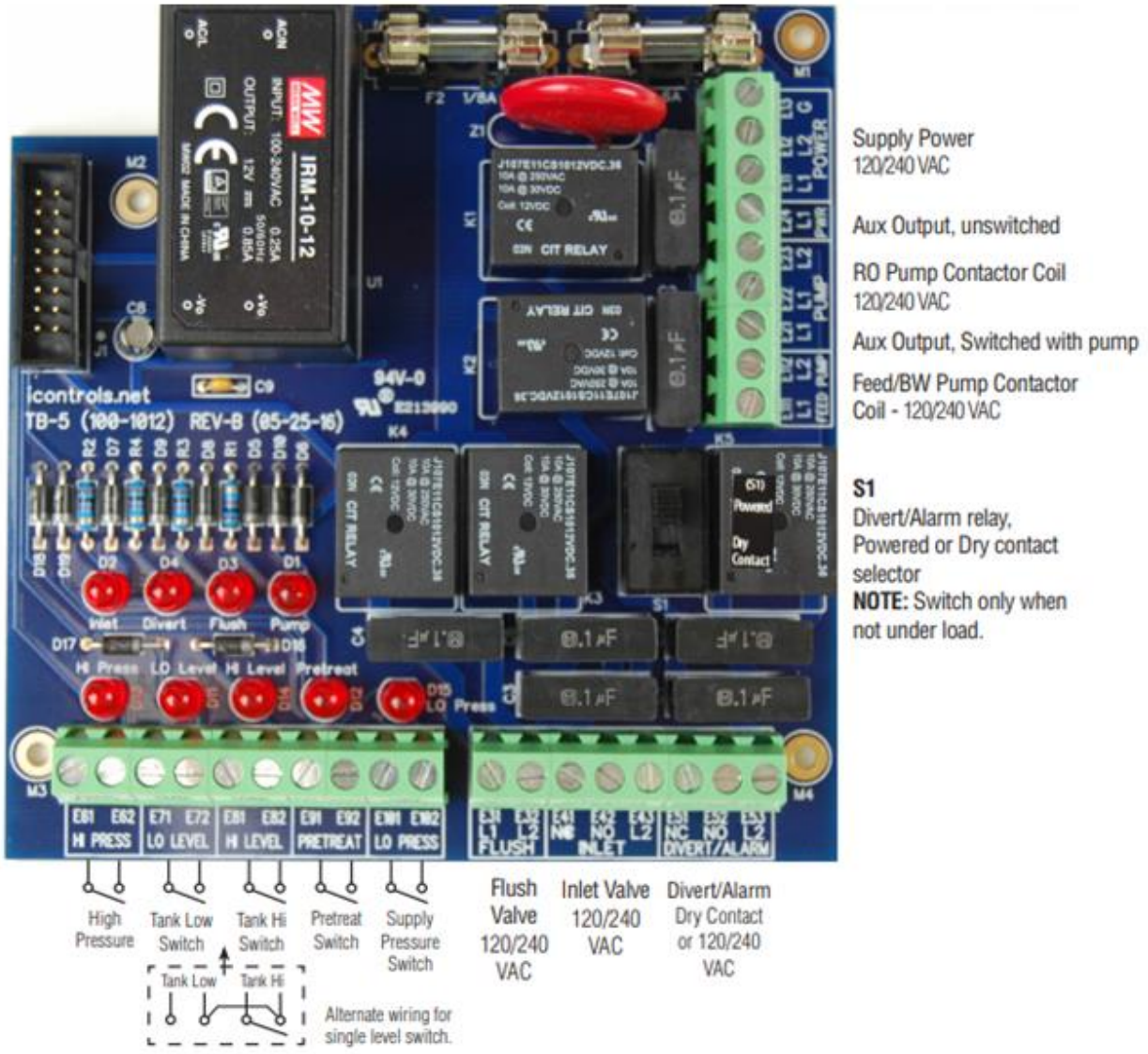
Controller Overview:



CPU Board Detail:



Terminal Board Detail:



4.7. Default Programs

4.7.1.Standard Controller

Program #1 active by default, can be changed via the hidden menu as described in section 4.1.

PARAMETER	VALUE	PROGRAM 1	PROGRAM 2	PROGRAM 3	PROGRAM 4
RO TAB					
RO TIMING					
TIMED MANUAL RUN	MINUTES	240	240	240	240
SWITCH DEBOUNCE					
TANK LEVEL	SECONDS	5	5	5	5
LOW PRESSURE	SECONDS	2	2	2	2
PRETREAT	SECONDS	2	2	2	2
DELAY					
PUMP START	SECONDS	10	10	10	10
LOW PRESSURE RESTART	SECONDS	60	60	60	60
INLET STOP	SECONDS	1	1	1	1
LOW PRESSURE BEHAVIOR					
MAX NUMBER OF FAULTS		5	5	5	5
DURING PERIOD	MINUTES	10	10	10	10
SHUTDOWN RESET	MINUTES	60	60	60	60
TIMEOUT FAULT	SECONDS	60	60	60	60
ALARM/DIVERT RELAY					
DISABLE RELAY		X	X	X	X
ALARM MODE (ACTIVE ON SHUTDOWN)					
DIVERT MODE (ACTIVE ON DIVERT)					
END OF RUN (TIMED ACTIVE AT END OF RUN)					
FLUSH SETTINGS					
NONE		X			
HIGH PRESSURE			X		X
LOW PRESSURE (INLET VALVE CLOSED)					
LOW PRESSURE (INLET VALVE OPEN)					
CUSTOM				X	
STARTUP					
TIME FROM LAST FLUSH	MINUTES	NA	0	30*	0
DURATION	SECONDS	NA	0	60*	0
PERIODIC (HIGH PRESSURE ONLY)					
INTERVAL	MINUTES	NA	0	0	0
DURATION	SECONDS	NA	0	0	0
TANK FULL					
TIME FROM LAST FLUSH	MINUTES	NA	0	0	0
MINIMUM OPERATION	MINUTES	NA	0	0	15
DURATION	SECONDS	NA	0	0	120
MANUAL					
DURATION	SECONDS	NA	0	0	0
IDLE					
INTERVAL	HOURS	NA	2	2**	2
DURATION	SECONDS	NA	300	300**	300
DELAY					
LOW PRESSURE	SECONDS	NA	3	3	3
HIGH PRESSURE	SECONDS	NA	0	0	0
WQ/CONDUCTIVITY SHUTDOWN TIMER					
SHUTDOWN	MINUTES	0	0	0	0

*Low Pressure/inlet open Flush

** High Pressure Flush

PARAMETER	VALUE	SETTING
WQ TAB		
PERMEATE		
SENSOR MODE		
NONE		
µSiemen		X
TDS		
ALARM SET-POINT		
HI µSiemen	µS	45
CALIBRATION		
PROBE CONSTANT		0.75
TEMPERATURE OFFSET	DEGREE C	0
CABLE LENGTH	FT	8
TEMPERATURE COMPENSTATION		
NON TEMP COMP PROBE	DEGREE C	0
FEED		
SENSOR MODE		
NONE		X
µSiemen		
TDS		
ALARM SET-POINT		
HI µSiemen	µS	0
CALIBRATION		
PROBE CONSTANT		0.75
TEMPERATURE OFFSET	DEGREE C	0
CABLE LENGTH	FT	8
TEMPERATURE COMPENSTATION		
NON TEMP COMP PROBE	DEGREE C	0

4.7.2.Deluxe Controller

Program #1 active by default, can be changed via the hidden menu as described in section 4.1.

PARAMETER	VALUE	PROGRAM 1	PROGRAM 2	PROGRAM 3	PROGRAM 4
RO TAB					
RO TIMING					
TIMED MANUAL RUN	MINUTES	240	240	240	240
SWITCH DEBOUNCE					
TANK LEVEL	SECONDS	5	5	5	5
LOW PRESSURE	SECONDS	2	2	2	2
PRETREAT	SECONDS	2	2	2	2
DELAY					
PUMP START	SECONDS	10	10	10	10
LOW PRESSURE RESTART	SECONDS	60	60	60	60
INLET STOP	SECONDS	1	1	1	1
LOW PRESSURE BEHAVIOR					
MAX NUMBER OF FAULTS		5	5	5	5
DURING PERIOD	MINUTES	10	10	10	10
SHUTDOWN RESET	MINUTES	60	60	60	60
TIMEOUT FAULT	SECONDS	60	60	60	60
ALARM/DIVERT RELAY					
DISABLE RELAY					
ALARM MODE (ACTIVE ON SHUTDOWN)					
DIVERT MODE (ACTIVE ON DIVERT)		X	X	X	X
END OF RUN (TIMED ACTIVE AT END OF RUN)					
FLUSH SETTINGS					
NONE		X			
HIGH PRESSURE			X		X
LOW PRESSURE (INLET VALVE CLOSED)					
LOW PRESSURE (INLET VALVE OPEN)					
CUSTOM				X	
STARTUP					
TIME FROM LAST FLUSH	MINUTES	NA	0	30	0
DURATION	SECONDS	NA	0	60	0
PERIODIC (HIGH PRESSURE ONLY)					
INTERVAL	MINUTES	NA	0	0	0
DURATION	SECONDS	NA	0	0	0
TANK FULL					
TIME FROM LAST FLUSH	MINUTES	NA	0	0	0
MINIMUM OPERATION	MINUTES	NA	0	0	15
DURATION	SECONDS	NA	0	0	120
MANUAL					
DURATION	SECONDS	NA	0	0	0
IDLE					
INTERVAL	HOURS	NA	2	2	2
DURATION	SECONDS	NA	300	300	300
DELAY					
LOW PRESSURE	SECONDS	NA	3	3	3
HIGH PRESSURE	SECONDS	NA	0	0	0
WQ/CONDUCTIVITY SHUTDOWN TIMER					
SHUTDOWN	MINUTES	0	0	0	0

*Low Pressure/inlet open Flush

** High Pressure Flush

PARAMETER	VALUE	SETTING
WQ TAB		
PERMEATE		
SENSOR MODE		
NONE		
µSiemen		X
TDS		
ALARM SET-POINT		
HI µSiemen	µS	45
CALIBRATION		
PROBE CONSTANT		0.75
TEMPERATURE OFFSET	DEGREE C	0
CABLE LENGTH	FT	8
TEMPERATURE COMPENSTATION		
NON TEMP COMP PROBE	DEGREE C	0
FEED		
SENSOR MODE		
NONE		
µSiemen		X
TDS		
ALARM SET-POINT		
HI µSiemen	µS	0
CALIBRATION		
PROBE CONSTANT		0.75
TEMPERATURE OFFSET	DEGREE C	0
CABLE LENGTH	FT	8
TEMPERATURE COMPENSTATION		
NON TEMP COMP PROBE	DEGREE C	0

4.7.3.Parameter Description

Parameter	Description
RO Timing	
TIMED MANUAL RUN	Activated by the "Manual Run/Flush" button on the front panel of the controller. This value controls the duration of the run. Setting this value to zero will disable Manual Run.
TANK LEVEL	Specifies the time that the tank switch must be closed or open before the controller accepts it as a valid condition. Prevents nuisance tripping of the RO, especially in small tanks or turbulent tanks (e.g. Reed switches with no hysteresis)
LOW PRESSURE	Specifies time the pressure switch must be closed or open before the controller accepts it as a valid condition. Since the pressure switches usually have built in hysteresis, this value can be set to 0
PRETREAT	Specifies the time that the pretreatment switch must be closed or open before the controller accepts it as a valid condition.
PUMP START	On RO startup, after the tank switch closes, the inlet solenoid valve is energized. When the inlet pressure switch closes the pump start delay begins. If the pressure switch remains closed, the pump will start after the time selected here
LOW PRESSURE RESTART	This value sets the delay for the pump to be off following a low pressure event before attempting a restart. The pressure switch must remain closed for the duration of the period shown before the pump will restart
INLET STOP	Sets the delay for the inlet solenoid valve to be turned off following the motor being turned off. Prevents the pump from operating against a closed suction on shutdown. Longer values require the inlet valve to be capable of operating at low or 0 differential pressure
Low Pressure Behavior	

MAX NUMBER OF FAULTS	Max number of faults/minutes during period work together to set the number of fault conditions over time that are required for a "low pressure fault shutdown"
DURING PERIOD	Max number of faults/minutes during period work together to set the number of fault conditions over time that are required for a "low pressure fault shutdown"
SHUTDOWN RESET	This is the period that the RO will remain idle before trying to restart. The purpose of the low pressure fault shutdown is to prevent an RO from turning on/off repeatedly without any limit
TIMEOUT FAULT	This value sets the time limit for the RO to operate with the inlet valve open with low pressure (as indicated by an open inlet pressure switch) before a low pressure fault is added to the low pressure fault counter
Alarm/ Divert Relay	
DISABLE RELAY	Disables the alarm/divert relay. Not available on standard RO models
ALARM MODE	The relay is active during RO shutdown. This condition can occur during High Pressure Shutdown, Low Pressure Shutdown, Water Quality Shutdown or Pretreat Lockout. Not available on standard models. Deluxe models utilize the relay for the divert to drain solenoids.
DIVERT MODE	The relay is active during RO Startup, Flush and Water Quality reading greater than the alarm set-point. Only Deluxe models utilize a divert to drain relay.
Flush Settings	
NONE	Flush disabled
HIGH PRESSURE	Flush will occur with pump on, inlet valve on
LOW PRESSURE (INLET VALVE CLOSED)	Pump off, inlet valve closed
LOW PRESSURE (INLET VALVE OPEN)	Pump off, inlet valve open
CUSTOM	Combination of above
STARTUP-TIME FROM LAST FLUSH	Time since last flush
STARTUP-DURATION	Duration of startup flush
PERIODIC-INTERVAL	This sets the time between flushes (a 0 disables the periodic flush)
PERIODIC-DURATION	Sets the duration of the periodic flush
TANK FULL-TIME FROM LAST FLUSH	Sets the minimum run time since last flush to enable flush on tank full (a 0 value allows flush to occur irrespective of the last flush)
TANK FULL-MINIMUM OPERATION	Sets the run time required to enable flush on tank full (a 0 value allows flush to occur irrespective of runtime)
TANK FULL-DURATION	Sets the duration of the tank full flush
MANUAL-DURATION	Ro will operate in manual flush for the duration selected here
IDLE-INTERVAL	Sets a time after which the RO will automatically perform a flush. The interval timer is set/reset based on the last flush performed. Use of a tank full flush is recommended to ensure a predictable interval for performing the idle flush. (0=disabled)

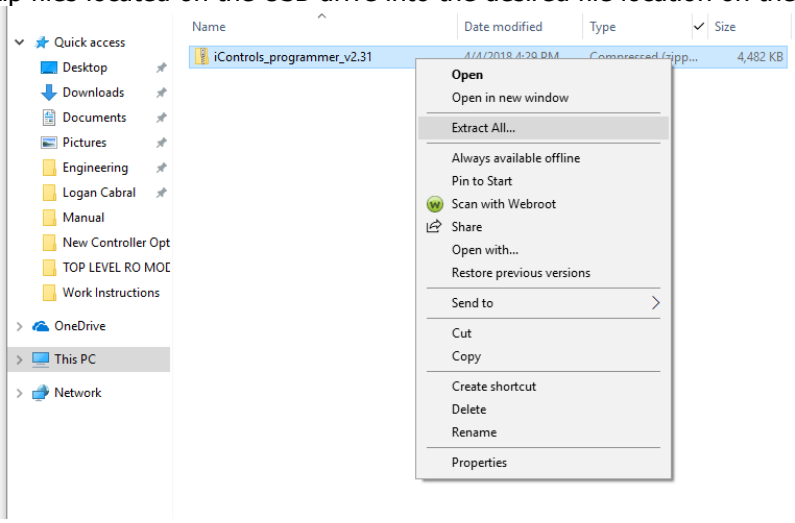
IDLE-DURATION	Sets the duration of the idle flush
DELAY-LOW PRESSURE	When a Low Pressure flush is due, the RO pump needs to turned OFF. This is the delay after the pump relay is de-energizing and starting the flush (Pump OFF → Delay → Flush).
DELAY-HIGH PRESSURE	When a flush is due and the RO is idle, as in Idle Flush or Scheduled Flush, the controller must open the inlet and start the pump before starting the flush. This delay occurs between the pump ON and starting the flush (Inlet ON → Pump ON → Delay → Flush).

4.8. Programming Interface

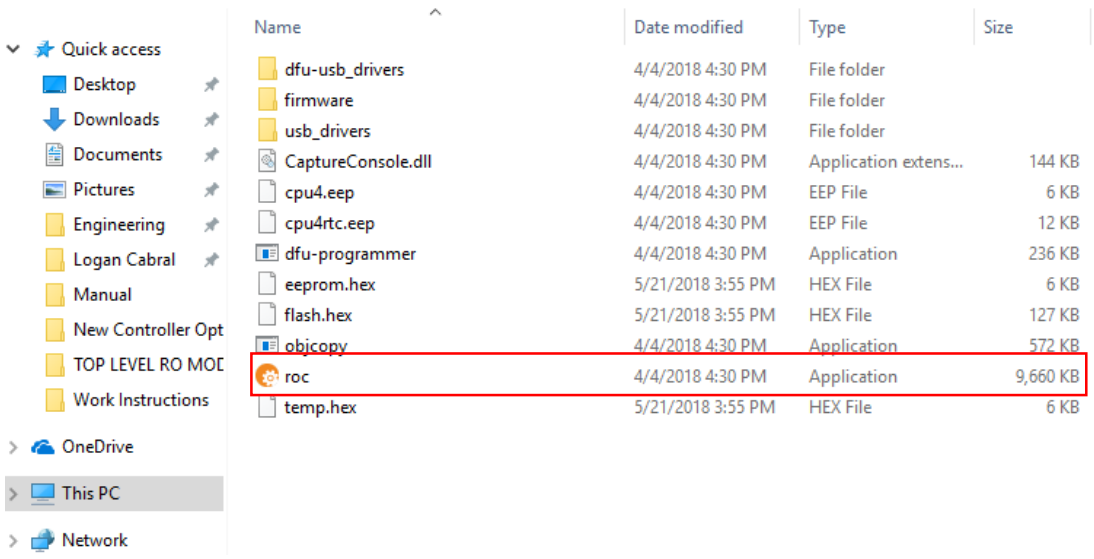
4.8.1.Installing ROC Program on Windows PC

The RO Controller programming Interface supports Windows XP, Window 7, Windows 8 and Windows 10 (32 and 64 Bit). Included with every AmeriWater PRO4 RO system is a USB flash drive which includes this manual and the ROC programming interface software. Use the following steps to install the ROC programming interface onto your PC. The following steps are written for Windows 10. The RO controller will receive power from the USB cable.

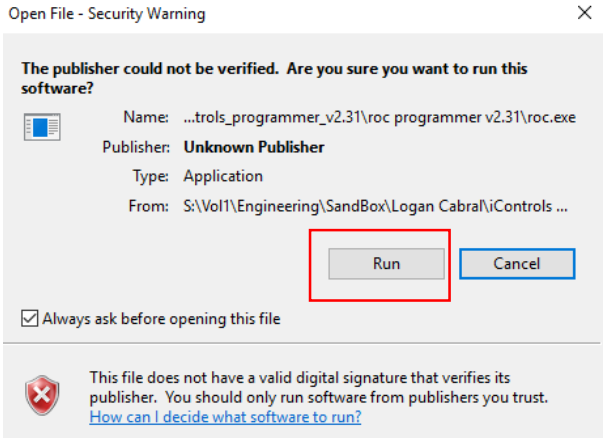
- Extract the .zip files located on the USB drive into the desired file location on the PC.



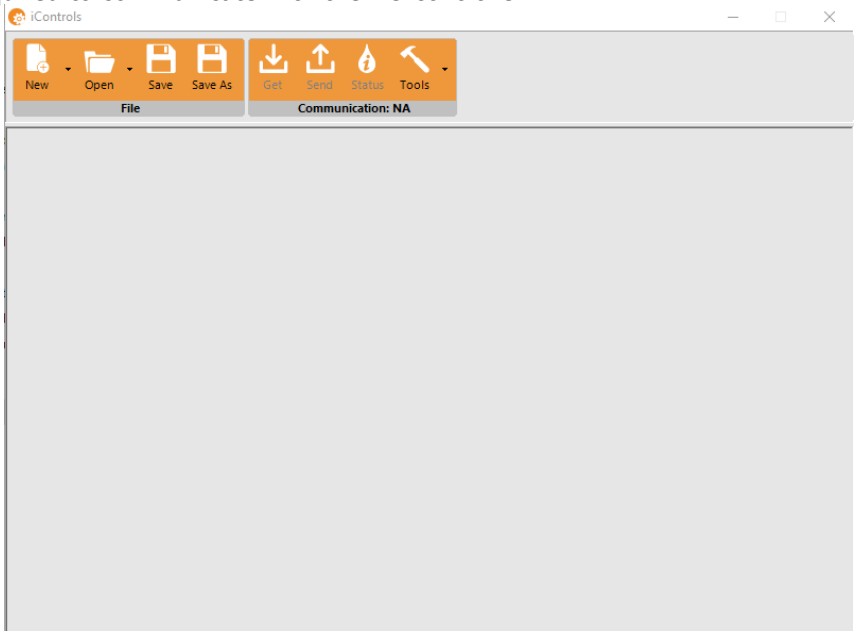
- Once the files are in the desired folder location, navigate to that folder and select the application file named "roc".



- If prompted with a warning message, select Run to start the program



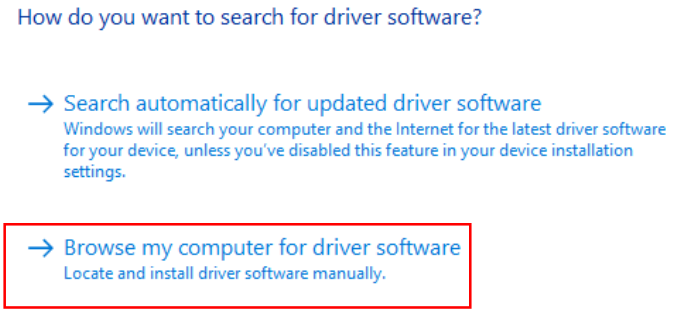
- Once the program opens, the following screen should be displayed. Continue to the next section for steps required to communicate with the RO controller.



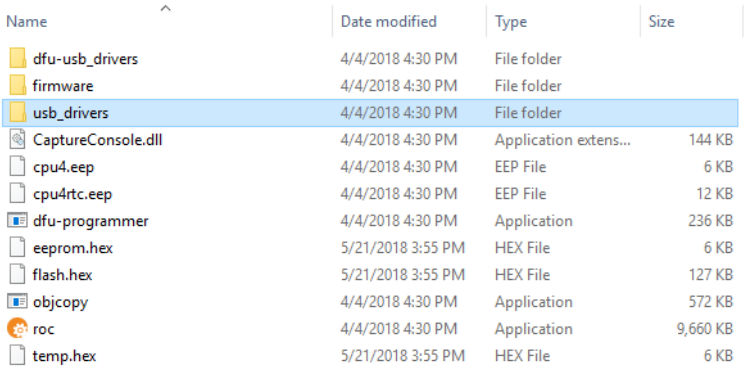
4.8.2.Communicating with the RO Controller

Before the RO controller can communicate with the programming interface, the USB drivers must be installed. This will only be required the first time the RO controller is connected to a PC. A **USB A to USB-B cable (not supplied)** will be required to interface with the RO controller.

- With the ROC programming interface open, plug the USB A to USB B cable into the PC and the RO Controller. Connect to the "**Programming Port**" as shown in the CPU Board detail in section 4.6.
- When the RO controller is connected to the PC, open the device manager located in Control Panel. Use the search function in the Control Panel to locate device manager.
- Locate the new "Unknown Device" and select "Update Driver Software"
- Select "Browse my computer for driver software".



- Browse to the ROC programmer folder set up in section 4.8.1. select the sub folder "usb_drivers"



- If prompted with a warning, select "Install this driver software anyway"
- Once the driver is installed, Windows will map the connected controller as a COM port. The controller should be ready to communicate with the ROC programming interface software.

NOTE: If you see the message "**Windows encountered a problem installing the driver software for your device. Windows found driver software for your device but encountered an error while attempting to install it**. **The hash for the file is not present in the specified catalog file. The file is likely corrupt or the victim of tampering**" when installing the driver, use the following steps to disable driver signing. Steps shown for Windows 10.

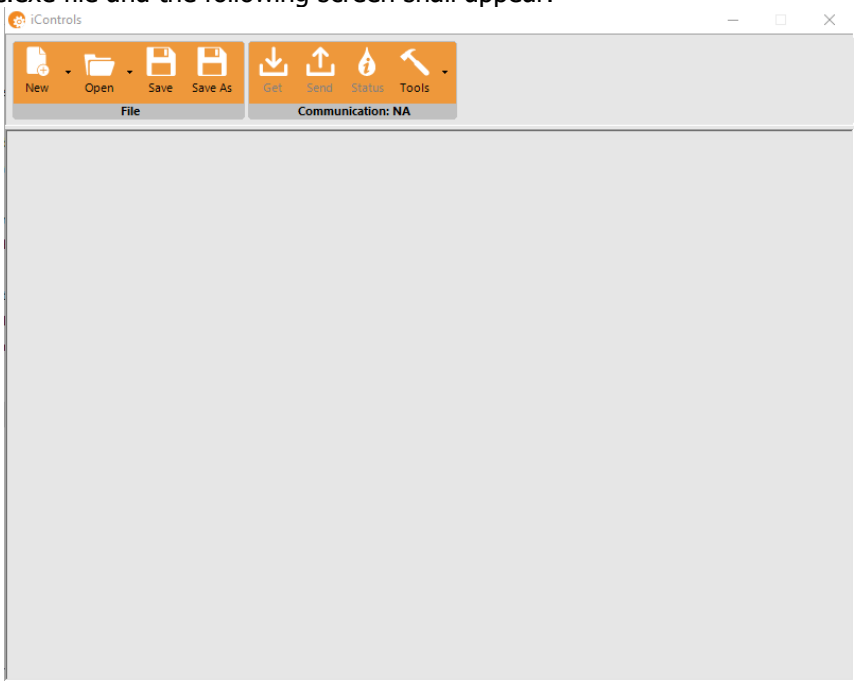
- Select the start button in the bottom right hand corner.
- Type "**startup**". Select "**Change advance startup settings**".
- Select "**Restart now**" under the "**Advance startup**" area
- Select "**Troubleshoot**"
- Select "**Advance Options**"
- Select "**Startup Options**"
- Select "**Restart**"

- A menu will appear where you can press "**7**" on the keyboard to choose "**Disable driver signing enforcement**". The device driver signing should be disabled allowing you to install any driver until you reboot the system.

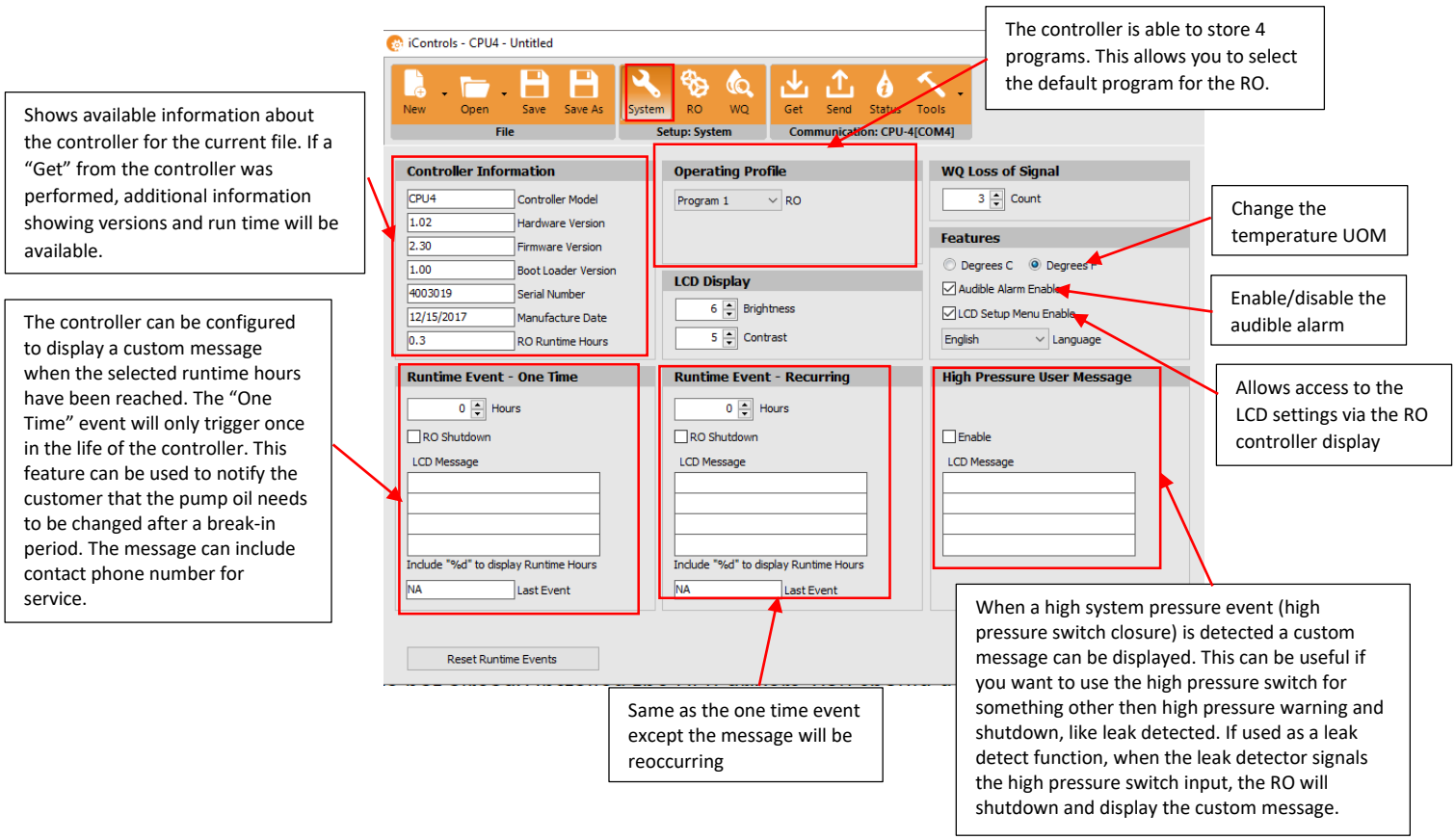
4.8.3. Transferring Changes to RO Controller

With the RO controller recognized by the programming interface and connected to the PC, changes can be made to the RO controller. The steps below describe the process of receiving, sending and saving data on the RO controller.

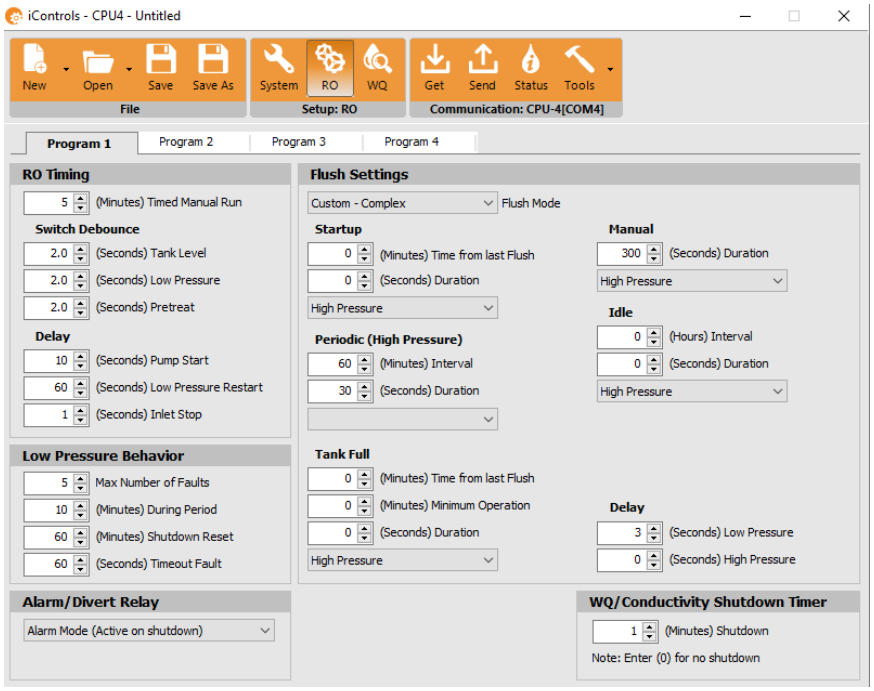
- Open the roc.exe file and the following screen shall appear.

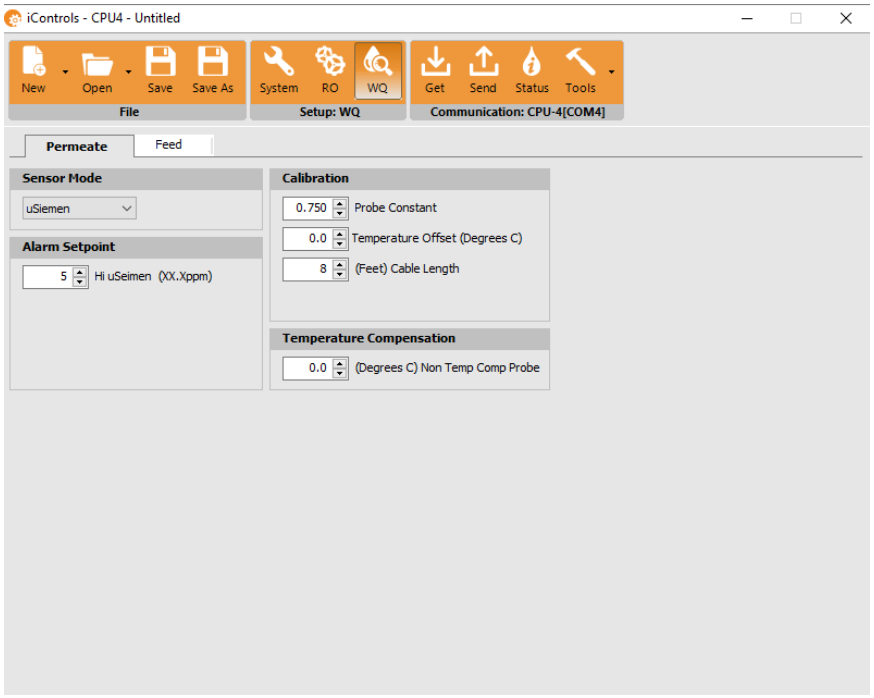


- Select the button labeled "Get" to receive the data from the RO controller. The System screen is shown below.



- A dialog box will appear informing the user of the status of the data transfer. This will say "Transfer Succeeded" when successful. Select "Ok".
- The data from the RO controller shall now be available. There are 3 menus available: System, RO, and WQ. The following images show each screen. All of the adjustable values are described in section 4.7.

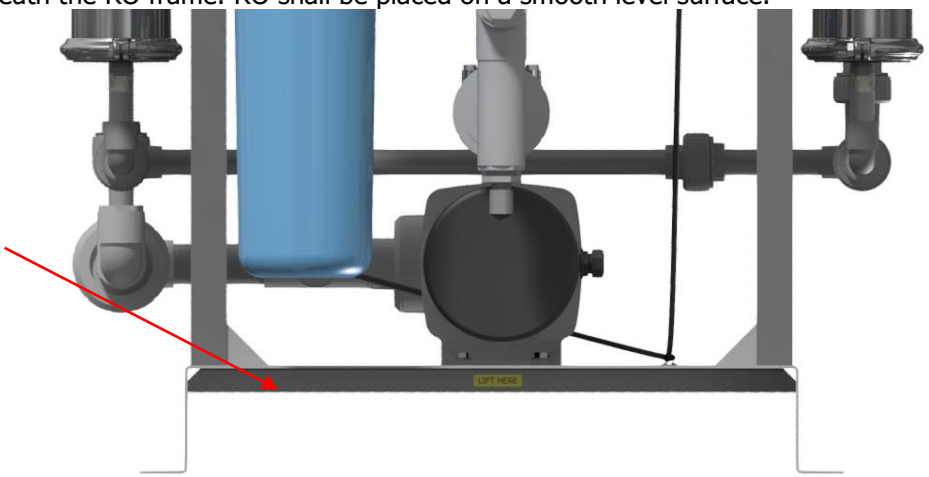




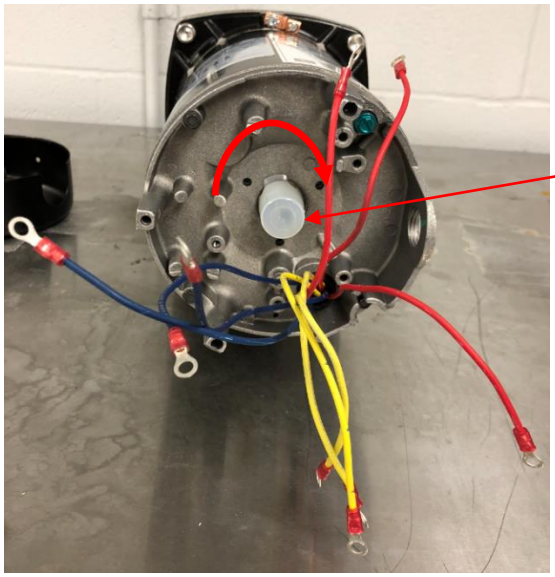
- Adjust the values as needed, then save the program to a desired file location.
- To transfer the data to the RO, select the send button. A dialog box shall appear to let the user know when the transfer has completed.

5. INSTALLATION
5.1. PRO4 Installation

- Move the RO to its permanent location near a dedicated 115 VAC power source and 208-230 VAC 3 phase power source for the RO pump. The RO may be moved using a forklift or pallet jack underneath the RO frame. RO shall be placed on a smooth level surface.



- The electrical source for the RO controller must be a single-phase, 3-conductor receptacle with a ground fault interrupter (GFI) at 115 VAC, 15 A @ 60 Hz. The proper polarity and ground integrity must be checked initially and maintained. Failure to do so may cause electrical shock or failure of the RO controller.
  NOTE: the PRO4 RO system must only be connected to a GFI receptacle. Avoid using an extension cord or power strip to operate the RO controller.
- Connect a 208-230 VAC 3 phase with disconnect dedicated power source to the RO motor starter. If supplying the RO with 460 VAC, skip to section 5.2 for instructions on rewiring the RO pump.
  NOTE: If pump rotation is backwards (remove rear cover on pump and check motor shaft for direction of rotation), reverse any (2) wires on the 3 phase power source to correct the rotation



Remove plastic cover to expose motor shaft. Check for correct rotation direction. RO pump shall be labeled with direction of rotation on front of pump.

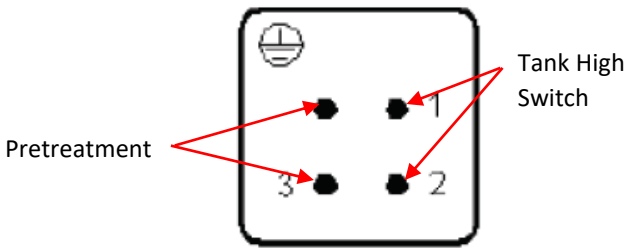
- With the RO controller and motor starter connected to their appropriate power supply, connect the feed water supply to the RO system. Inlet connection sizes are listed in section 2.2.

- Route the RO reject water to a suitable drain that is capable of handling the reject water flow rate. Dain line shall maintain at least a 2" air gap to prevent siphoning. See section 2.2 for reject connection sizes and flow rate specifications.
- Connect the RO product water to the desired point of use for the RO product water. See section 2.2 for specifications on the product connection size and expected flow rates.
- Both Standard and Deluxe RO models use a quick connect wiring hood for the storage tank level switches and pretreatment connections. See the following diagrams for the appropriate wiring connections. Refer to section 4.2 for controller input specifications.

CAUTION: All input devices connected to the RO controller must be dry contact switches. Powered inputs to the RO controller will cause permanent damage to the terminal board inside the RO controller.

Standard

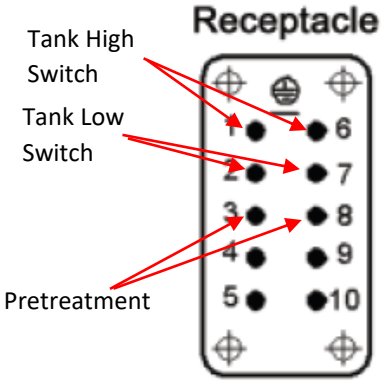
Receptacle



Input Device	Terminals	Switch Style
Tank High Switch	1&2	Open on Rise
Pretreatment	3&Gnd	NO

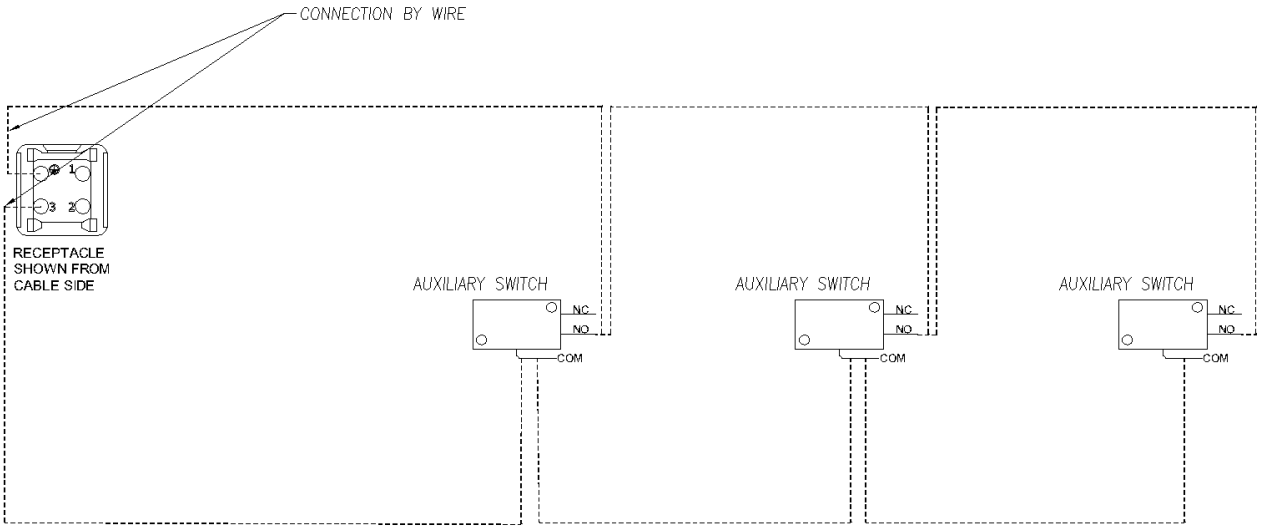
Deluxe

Receptacle



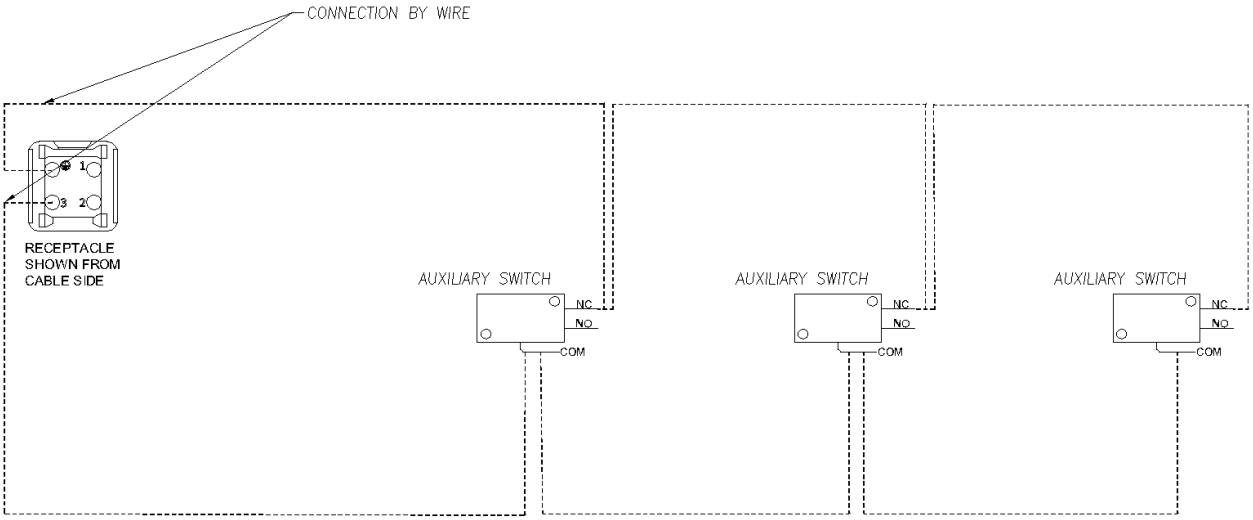
Input Device	Terminals	Switch Style
Tank High Switch	1&6	Open on Rise
Tank Low Switch	2&7	Close on Fall
Pretreatment	3&8	NO

CLACK HEAD PRE-TREATMENT LOCKOUT FOR ALL STANDARD PRO4 RO'S



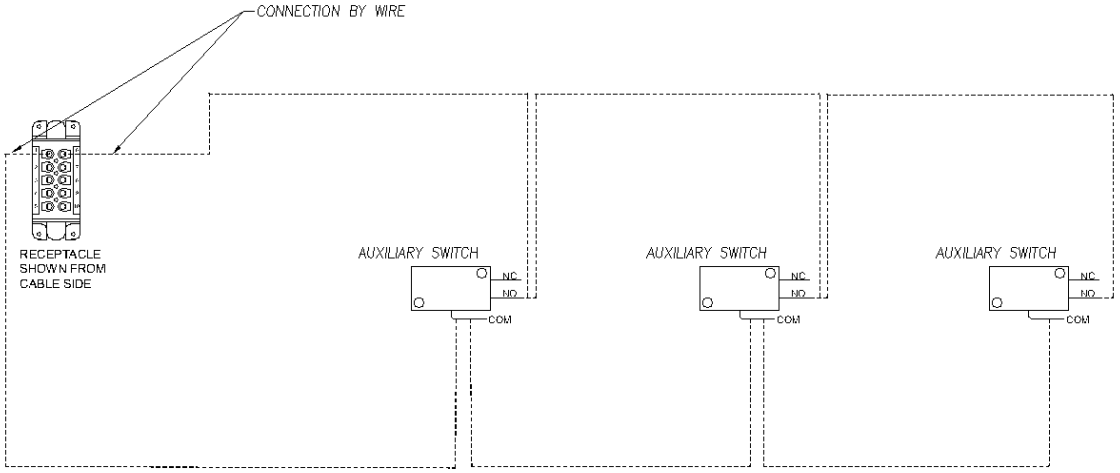
NOTE: THIS DIAGRAM SHOWS THREE VALVES ALL BEING CONNECTED TO THE DELUXE RO WIRING HOOD FOR PRE-TREATMENT LOCKOUT. THIS DIAGRAM IS FOR ALL STANDARD PRO4 RO'S.

FLECK HEAD PRE-TREATMENT LOCKOUT
FOR ALL STANDARD PRO4 RO'S



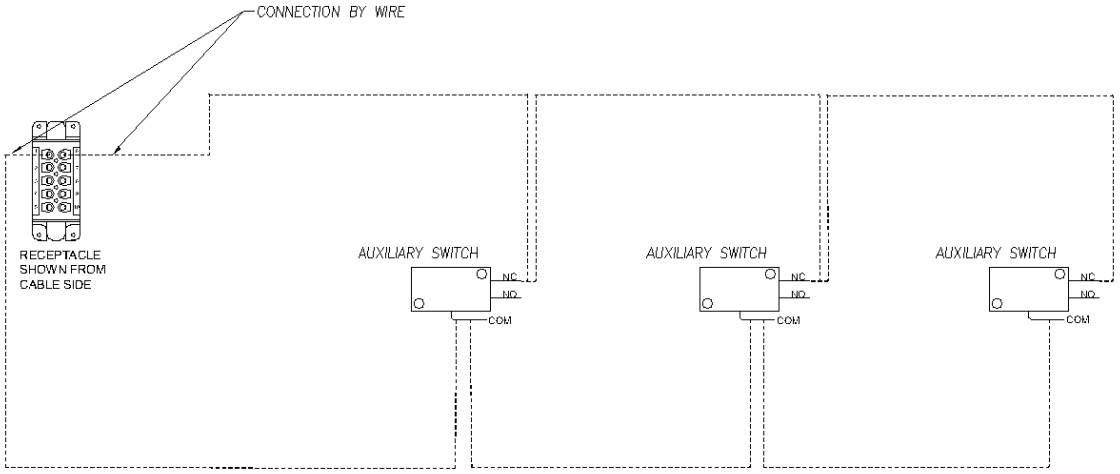
NOTE: THIS DIAGRAM SHOWS THREE VALVES ALL BEING CONNECTED TO THE DELUXE RO WIRING HOOD FOR PRE-TREATMENT LOCKOUT. THIS DIAGRAM IS FOR ALL STANDARD PRO4 RO'S.

CLACK HEAD PRE-TREATMENT LOCKOUT
FOR ALL DELUXE PRO4 RO'S



NOTE: THIS DIAGRAM SHOWS THREE VALVES ALL BEING CONNECTED TO THE DELUXE RO WIRING HOOD FOR PRE-TREATMENT LOCKOUT. THIS DIAGRAM IS FOR ALL DELUXE PRO4 RO'S.

FLECK HEAD PRE-TREATMENT LOCKOUT
FOR ALL DELUXE PRO4 RO'S



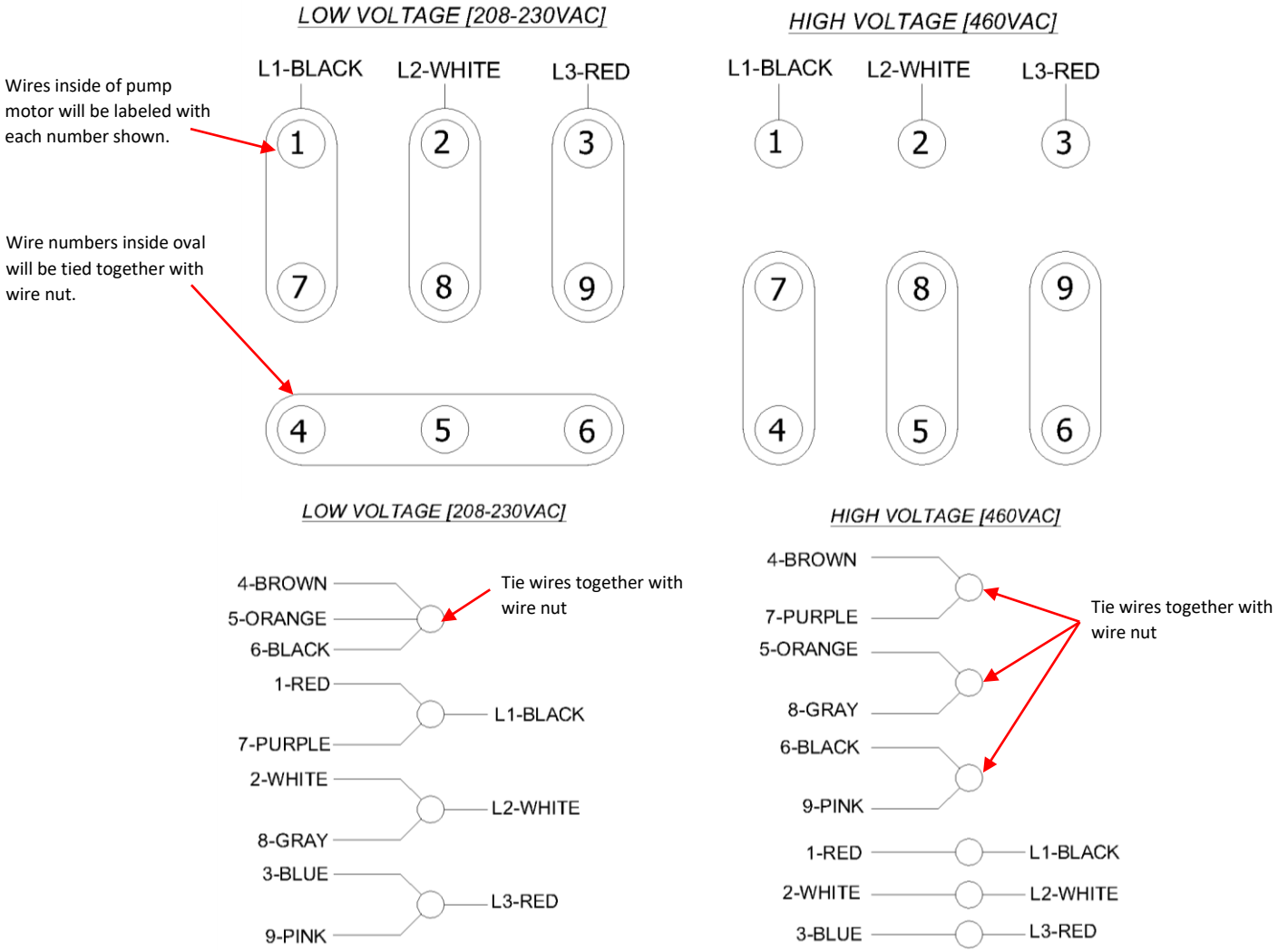
NOTE: THIS DIAGRAM SHOWS THREE VALVES ALL BEING CONNECTED TO THE DELUXE RO WIRING HOOD FOR PRE-TREATMENT LOCKOUT. THIS DIAGRAM IS FOR ALL DELUXE PRO4 RO'S.

5.2. Rewiring RO Pump for 460 VAC 3 Phase Power Supply

The High pressure RO pump on all PRO4 RO systems come prewired for 208-230 VAC 3 Phase power supplies. If the system is to be operated on a 460 VAC 3 phase power supply, use the following steps to change the pump motor to operate at 460 VAC.

CAUTION: Failure to change the RO pump for 460 VAC operation WILL cause failure of the RO pump motor.

- Ensure the 115VAC power supply and 3 phase power supply for the RO system are switched off at the disconnect before proceeding.
- Isolate the RO system from the incoming water supply for the system
- Remove the rear cover for the pump motor by removing the (2) bolts securing the cover to the motor.
- Locate the label on the exterior of the RO pump which shows the wiring for Low/High voltage operation of the RO pump.
- Using suitable wire nuts for 14 AWG wire, connect the wiring of the RO pump as shown below. RO pumps may have one of the (2) possible wiring styles shown below. Refer to the label on the pump motor for correct wiring for motor.



- Ensure that all bare wires are terminated and return the RO to operation. Verify the rotation of the RO pump is correct according to section 5.1.

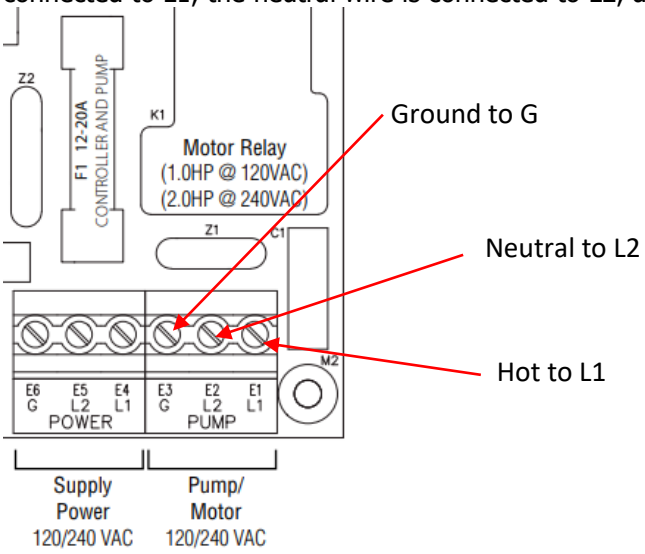
- With the RO pump rotation verified, replace the motor cover and return the RO to service.

5.3. Connecting Auxiliary Pump to RO Controller

If using the RO system with a dosing pump for antiscalant instead of a water softener to reduce RO membrane scaling, use the following steps to slave the dosing pump with the operation of the RO pump.

5.3.1.Standard Model

- Power down the RO system by disconnecting the 120 VAC and 3 phase power supply for the system before proceeding.
- Use an existing strain relief, or make a hole for a new strain relief in the RO controller to route the 120 VAC power cord for the RO dosing pump into the RO controller.
- Strip back the ends of the wire for the dosing pump to expose the wire leads. There should be 3 wires, L1 (hot), L2 (Neutral) and Ground
- Strip the insulation back on each wire approximately 1/8".
- Insert the wires into the "**Pump Power**" terminal strip ensuring that the hot wire for the pump is connected to L1, the neutral wire is connected to L2, and the ground wire is connected to G.

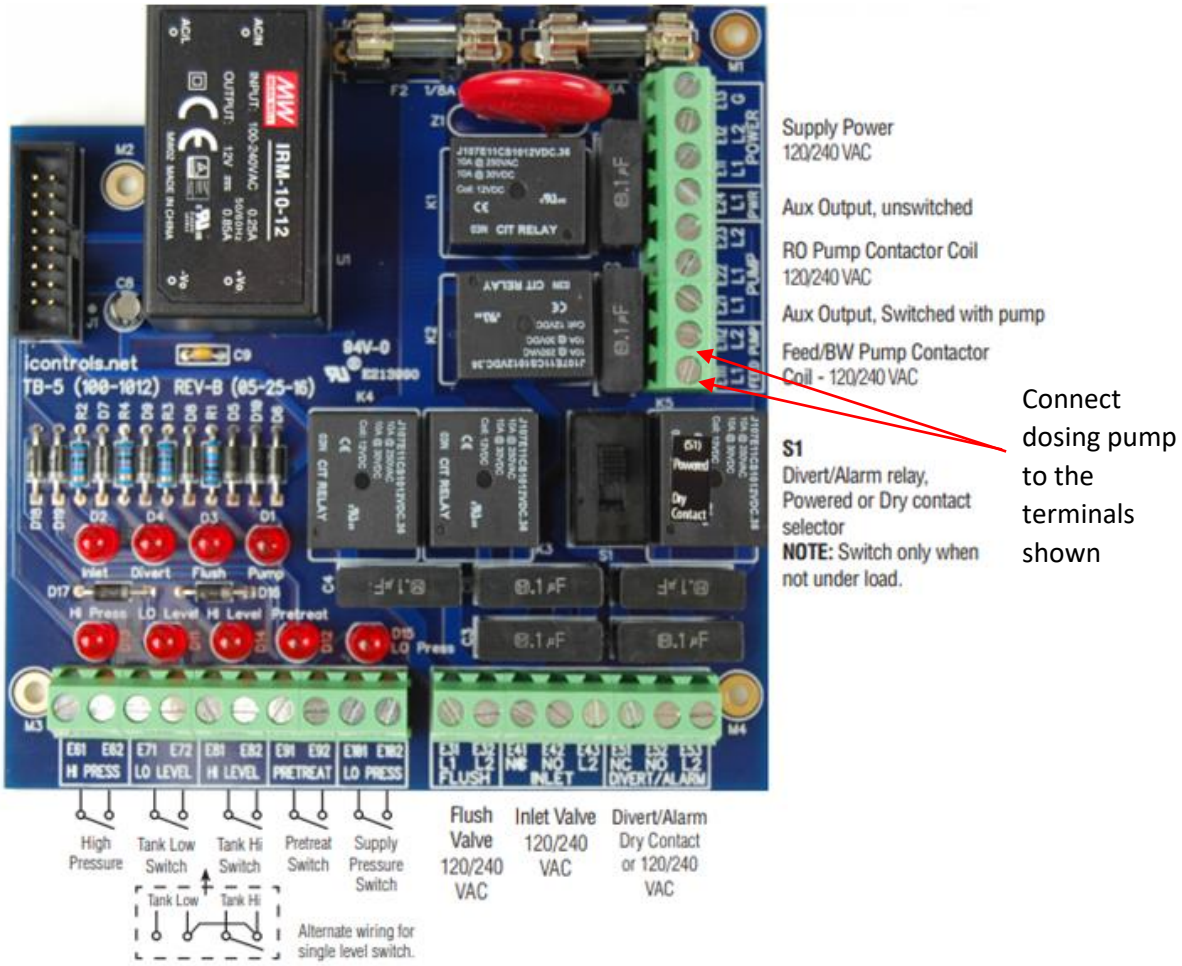


- With the wires secure in the terminal strip, turn the system on and verify the dosing pump operates as intended.

5.3.2.Deluxe Model

Deluxe RO models are equipped with an unused auxiliary pump output. The output will supply 120 VAC which is switched with the RO pump.

- Power down the RO system by disconnecting the 120 VAC and 3 phase power supply for the system before proceeding.
- Use an existing strain relief, or make a hole for a new strain relief in the RO controller to route the 120 VAC power cord for the RO dosing pump into the RO controller.
- Strip back the ends of the wire for the dosing pump to expose the wire leads. There should be 3 wires, L1 (hot), L2 (Neutral) and Ground
- Strip the insulation back on each wire approximately 1/8".
- Connect the dosing pump to the "**Feed Pump**" output on the terminal board of the controller. Connect the Hot wire to L1, Neutral wire to L2, and Ground wire to the common ground bar located inside the RO controller panel.



- With the wires secure in the terminal strip, turn the system on and verify the dosing pump operates as intended.

6. SYSTEM START-UP

6.1. Initial Start-up Procedure

- Ensure the RO is installed according to the previous section before attempting to start the system up for the first time. Failure to install the system correctly may lead to premature failure of the RO.
- Open the Reject control valve completely before turning water on to the RO system.
- Turn the feed water supply to the device one and verify that at least 30 PSI (**do not exceed 60 PSI at initial startup**) is displayed on the pressure gauge located on the RO pre-filter.
- Direct the RO product line to a suitable drain upon the initial start-up of the system. Allow the first 2 hours of RO product water to be discarded before supplying RO water to a storage tank.
- Connect the RO controller to a suitable 115 VAC power supply. If the screen displays "SYSTEM OFF" on the LCD, press the power button on the front of the controller for 1 second.
- Allow the RO to open the inlet solenoid valve and flush air from the system until all bubbles have been removed from the flowmeters on the system (**at least 30 min**) before turning the RO pump on. Failure to do so may lead to telescoping of the RO membrane or other damage to the system.
- After all of the air has escaped from the system, press and hold the power button to turn the system off. Check the system for leaks at this point.
- With the RO off, activate the RO motor starter power supply.
- Turn the RO controller back on using the power on button. Allow the RO to turn on. Verify that the pump rotation is correct. Refer to section 5.1 for instructions of checking the RO pump direction.

NOTE: Slowly open the feed valve to the system to increase pressure at a rate of 10 psi/sec to achieve a successful soft start.

- With the RO operating, slowly close the concentrate control valve until the system operates at ~50% recovery.
- Allow the RO to run for 2 hours to drain. **RO Permeate from the first 2 hours of operation should be discarded.**
- Verify that each of the flowmeters and gauges function and record the performance information in the following start-up table provided in section 6.2.
- After 2 hours, turn the RO system off and return the RO product flow to the storage tank.

6.2. Start-up Data Table

Record performance parameters at start-up in the following table. Refer to section 2.2 for expected RO performance based on the model.

RO Model:

Parameter	After 5 min	After 1 hr
Inlet Pressure [PSI]		
Post Pre-filter Pressure [PSI]		
RO Reject Pressure [PSI]		
RO Pump Pressure [PSI]		
Product Flow Rate [GPM]		
Reject Flow Rate [GPM]		
Recirculation Flow Rate* [GPM]		
Feed Water Conductivity* [µS]		
Product Water Conductivity [µS]		
Percent Rejection* [%]		
Water Temperature [°F]		

*Deluxe RO models only

7. SYSTEM OPERATION

Once the PRO4 system is powered on and connected to a storage tank, the system will run until the high level float switch opens on the storage tank. At this point, the RO will enter idle mode until the float switch closes (standard model) or the tank low level switch closes (deluxe RO models). When the low level signal trips, the RO system will turn back on and begin to produce RO water. The RO pump will wait for 10 seconds after the opening of the RO inlet solenoid before turning on the pump (soft start) to prevent damage to the RO membrane. If a tank full flush is programmed in the system, the RO continue to operate at the tank full signal for the duration of the flush cycle. If an idle flush is set for the RO, the system will begin a countdown for the idle flush when the tank becomes full.

In the event that the RO product conductivity increases above the set-point, the standard RO models will continue to operate with a message stating "High Permeate Conductivity". Deluxe models will divert the product water to the drain until the conductivity drops below the set-point. The storage tank operation will not be affected by the RO status, however, if the RO is diverting product water to the drain, or the RO is in an alarm condition, the RO will not be providing water to the tank.

7.1. Tankless Operation

The PRO4 RO System is designed to be used with a storage tank with tank level switches to start and stop the device. If the system is to be operated **without** a storage tank, a jumper wire will be required to continuously operate the RO system on. Use the following steps to allow the RO to operate as a stand alone unit.

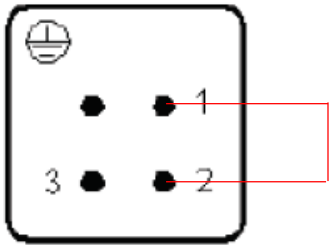
NOTE: The "Manual Run" button will turn the RO on and run regardless of float switch position for 4 hours. If the system is to operate without a storage tank for greater than 4 hours, use the steps below.

- Isolate the RO from all mains power and water supplies.
- Disconnect the quick connect wiring hood from the bottom right hand corner of the front panel using the latch.

- Remove the connector from the cover and locate an insulated, stranded 18 AWG copper wire. Use the following table to jumper the float switch input(s) inside the connector allowing the RO to operate anytime the system is not in "System Off" Mode.

Standard

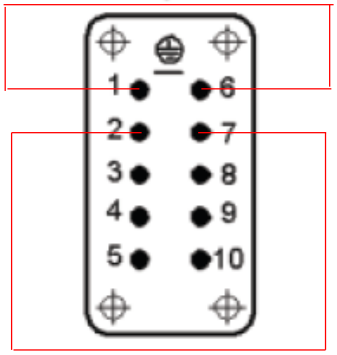
Receptacle



Input Device	Terminals	Jumper
Tank High Switch	1&2	Yes

Deluxe

Receptacle



Input Device	Terminals	Jumper Wire
Tank High Switch	1&6	Yes
Tank Low Switch	2&7	Yes

- After connecting the jumper wire(s), reinstall the receptacle into the cover and reinstall the receptacle onto the RO.
- Return the mains water and power sources to the system and the RO shall go into operation. Press the "System On/Off" button to turn the RO on or off.

8. MONITORING

Fill out the monitoring log prior to each use. Having this information available will help to quickly diagnose issues related to performance. Failure to carry out the daily monitoring and maintenance at the indicated intervals will result in reduced performance of the PRO4 system and may void the warranty.

PRO4 LOG (SHOULD BE COMPLETED EVERY TIME THE SYSTEM IS USED)

DATE							
PRO4 Performance							
Inlet Pressure (30-80) [PSI]							
Post Pre-filter Pressure [PSI]							
Filter Pressure Drop (maximum 10 psi)							
RO Reject Pressure [PSI]							
RO Pump Pressure (100-180) [PSI]							
Product Flow Rate [GPM]							
Reject Flow Rate [GPM]							
Recirculation Flow Rate* [GPM]							
Feed Water Conductivity* [µS]							
Product Water Conductivity [µS]							
Percent Rejection* [%]							
Water Temperature (41-90) [°F]							
Feed Water Conditions							
Hardness (<1) [Grains]							
Free Chlorine (<.1) [ppm]							
Exchange							
1 Micron Pre-Filter							
Membrane							
Optional Equipment							
Antiscalant System Tank (Monthly Check)**							
INITIALS							

*Deluxe RO models only

**If using antiscalant in place of a water softener. Check that tank is greater than half full.

9. MAINTENANCE

The Pre-filter and RO membranes are consumables that will require changing periodically. The following sections describe the process required for replacing consumables on the PRO4 RO System. Use the following maintenance schedule as reference for expected annual maintenance:

Daily	Complete a daily log (section 8). Ensure system is operating within the expected parameters.
Monthly	Check antiscalant system (if used in place of water softener) tank level and verify that pump is primed.
Yearly	Check product water conductivity (section 9.1.3)
As needed	Replace RO membrane
	Clean RO membrane if 10-15% loss of product flow or >10% rise of product conductivity
	Replace RO Pre-filter (>10 PSI ΔP)

9.1. PRO4 Consumable Replacement

9.1.1.Pre-filter Replacement

All PRO4 RO systems are equipped with a 1 micron sediment pre-filter. This filter will require replacement when the **ΔP** across the filter **exceeds 10 PSI**. The feed water supply will have a significant effect on the frequency of filter replacements. Expect to perform this task at least 1 time per month. Reference section 13 for the replacement filter part number.

- Isolate the RO system from the feed water supply.
- Turn the RO on to relieve pressure. A "Low Pressure" alarm should activate. Ensure the inlet pressure gauge drops to 0 PSI.

CAUTION: Even after relieving the pressure from the system and filter assembly, the filter housing could still be full of water. Use care to prevent spilling.

- Isolate the RO system from all mains power supplies.
- Locate the 6-nub filter wrench included with the RO system.
- Use the wrench to loosen the pre-filter housing.
- Drain any excess water from the housing and discard the original sediment pre-filter.
- Partially unwrap the plastic from the new filter. Holding the end covered in plastic, place the new filter inside of the housing. Discard the remaining plastic after installation.
- Inspect the O-ring at the top of the pre-filter housing for nicks or tears and verify that the O-ring remains in the groove of the pre-filter housing.
- Screw the filter housing back onto the filter header. **Hand tighten only**
- Return the RO system to service.

9.1.2.RO Membrane Replacement

All PRO4 RO Systems are equipped with 4"x40" RO membranes. As the RO is used, the membrane performance may degrade. Regular RO cleanings using an acid & base cleaner may help to extend the life of the RO membrane. The system was designed to provide approximately 3 years of life from the RO membrane. Feed water conditions will have a significant impact on the life of the RO membrane. RO membranes shall be replaced when the rejection percentage drops below 94% and cannot be recovered by a simple RO cleaning.

MEMBRANE REPLACEMENT:

- Isolate the RO system from feed the feed water supply.

- Turn on the RO on to relieve pressure. A "Low Pressure" alarm should activate. Ensure the inlet pressure gauge drops to 0 PSI.

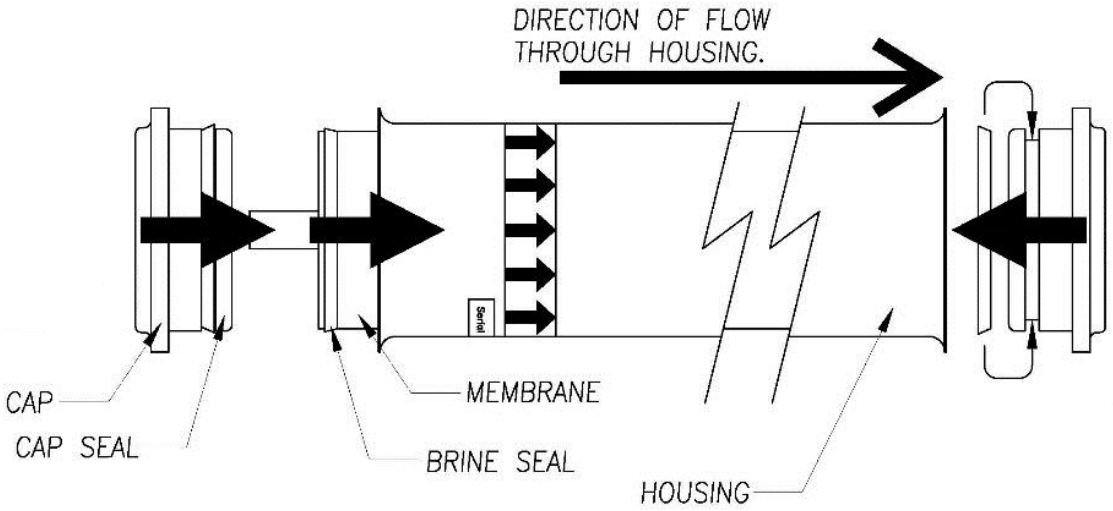
CAUTION: Even after relieving the pressure from the system and filter assembly, the filter housing could still be full of water. Use care to prevent spilling.

- Isolate the RO system from all mains power supplies.
- Remove the tubing connecting the product outlet of the RO membrane to the product header for all membranes being removed.

NOTE: The plastic compression fitting will remain with the tubing on which it was connected.

- Unscrew the unions on the reject side of the RO membrane for the membrane being removed. The water should drain from the RO membrane housing.
- After all of the water is drained, loosen the clamps that hold the end caps onto the RO membrane housing.
- Loosen the clamps that hold the RO membrane to the RO frame and remove the membrane from the system.
- Place the RO membrane onto a suitable work surface and remove both end caps from the housing. Note the orientation of the end caps before removing to prevent errors during reinstallation.
- Pull the RO membrane out of the housing in the direction of the arrow tape on the housing.
- Load the replacement membrane into the housing ensuring that the brine seal is toward the water inlet side.

CAUTION: You must insert membranes into the inlet of the housing. Inserting a membrane from the discharge end will cause damage to the brine seal



- Lubricate all seals and replace the end caps in the same orientation that they were removed and secure the clamps.
- Reinstall the membrane onto the RO frame and secure the clamps.
- Connect all fittings back in their original location.
- Replace additional membranes following the steps listed above.

RINSE OUT PROCEDURE:

It is important to put the RO through a rinse out cycle to ensure that any preservative in the RO membrane is flushed from the system.

- Direct the RO product water to a suitable drain.
- Return power to the RO controller and return the feed water supply to the system. **DO NOT** return power to the RO pump at this time.
- Turn the RO on and allow the system to run at line pressure (if line pressure exceeds 60 PSI, throttle back to 60 PSI) to wet the RO membrane until all air is purged from the system. All of the air will be purged from the system once the flowmeters provide a steady reading. Allow the system to operate like this for approximately 30 minutes.

NOTE: Failure to purge air from the system will cause damage to the RO membrane.

- Shut the RO system off and return power to the RO pump.
- Turn the RO system on and allow the pump to operate. Turn the reject flowmeter knob counter clockwise until the valve is 100% open. This will allow more reject water to pass through the RO system.
- Allow the system to operate like this for approximately 2 hours.
- After 15 min, readjust the reject flow control knob to its original position.
- Verify that the RO is operating at the normal operating parameters listed in section 2.2. This can be verified with the daily log data for the system.
- Discard the first 2 hours of RO product water before directing the product water back to the storage tank.
- Return the RO system back to normal operation.

9.1.3.Calibration of RO Product Conductivity Display

The RO product conductivity sensor used on the PRO4 RO system is designed to operate from 0-6000 µS. The sensor is calibrated prior to shipment of the system, however, it may be necessary to calibrate the sensor **yearly**. Use the following steps to calibrate the conductivity sensor on the PRO4 RO system.

NOTE: Operate the system for a minimum of 10 min to ensure the RO operation has stabilized before performing calibration on the sensor.

- Remove the conductivity cell from the RO system, then reconnect the conductivity cell to the RO controller.
- Locate a conductivity calibration solution with a known conductivity value >100 µS or use a handheld conductivity meter to determine conductivity of test solution.
  Calibration Solution/Handheld reading _____ µS
- Completely submerge the stainless steel probes of the conductivity cell into the calibration solution.
- Navigate to the "**Permeate Calibration**" setting in the menu using the up arrow and press the Manual Run button to make changes.
- Use the up or down arrow to change the value displayed to match the actual conductivity recorded using the handheld meter.
- Press the manual run button to save the changes.
- Press the system on/off button to exit back to the main menu on the controller.
- Dry the conductivity cell and remove the wires from the RO controller.
- Reinstall the cell into the piping of the PRO4 RO system.
- Turn on the RO and allow the system to run. Verify the Conductivity reading is now accurate.
- Steps shown also apply to the feed cell conductivity on deluxe models.
-

9.1.4.RO Membrane Cleaning

As the RO system operates, scale will build up on the RO membranes. This scale may cause a drop in the performance of the RO. If the RO product drops below 10-15% of its normal operation or the product conductivity rises 10-15% above the normal operating point, the system may require cleaning. The quality of the feed water supply will have a significant effect on the frequency of RO membrane cleaning. To clean the RO system, connect a CIP system to the RO. Remove the NPT plug on the inlet header and connect the discharge of the CIP pump to this connection. Close the feed water isolation valve to ensure the feed supply is not contaminated with the RO cleaning solution. Direct the RO product and reject flow into the CIP tank. Follow the steps in the CIP manual to mix the solution and clean the PRO4 RO system.

NOTE: The RO controller does not have a CIP mode, therefore a high conductivity alarm may occur during cleaning. This alarm can be ignored during the cleaning.

RO Flowrate (GPD)	CIP Port Size

2400,4800,7200, 9600, 12000	¾" NPT
14400, 16800, 19200	1" NPT

9.1.5.RO Disinfection

Depending on the Application of the PRO4 RO system, disinfection may be required periodically. The RO will be disinfected using a CIP system to draw chemical into the RO. Peracetic acid (PAA) is the recommended disinfectant for the system. See section 0 for a list of part numbers for the disinfectant and test strips. Use the following steps to disinfect the RO system.

- Fill the CIP tank with RO product water and mix the PAA disinfectant at a ratio of **1:100** for the amount of water in the CIP tank.

CAUTION: Always use appropriate PPE (gloves, goggles, & apron) when handling PAA. PAA exposure to the skin can cause severe chemical burns.

- Isolate the feed water supply to the RO and relieve pressure from the system.
- Close the feed water isolation ball valve to prevent disinfectant from contaminating the RO feed water supply.
- Remove the plug on the CIP port and connect the CIP pump discharge to the CIP inlet. Direct the product and reject hoses into the CIP tank.
- Turn the RO on to open the inlet solenoid valve, then turn on the CIP pump.
- Allow the RO to circulate for ~20 min in this configuration. The **PRODUCT** line shall have 250 ppm while the **REJECT** hose shall have a concentration of **500 ppm** before allowing the system to soak.
- After 20 min, shut the RO system off and turn the CIP pump off. Allow the system to soak for 1 hr.
- After the soak period, drain the CIP tank and flush the RO to drain using a clean feed supply. Operate the RO with the product directed to a drain until no trace of PAA can be detected at the product line before returning the system to service. The CIP tank may require several flushes and refills to remove all PAA trace.
- Disconnect the CIP system and return the RO system to service.

9.1.6.Repairing Scuffs on RO Frame.

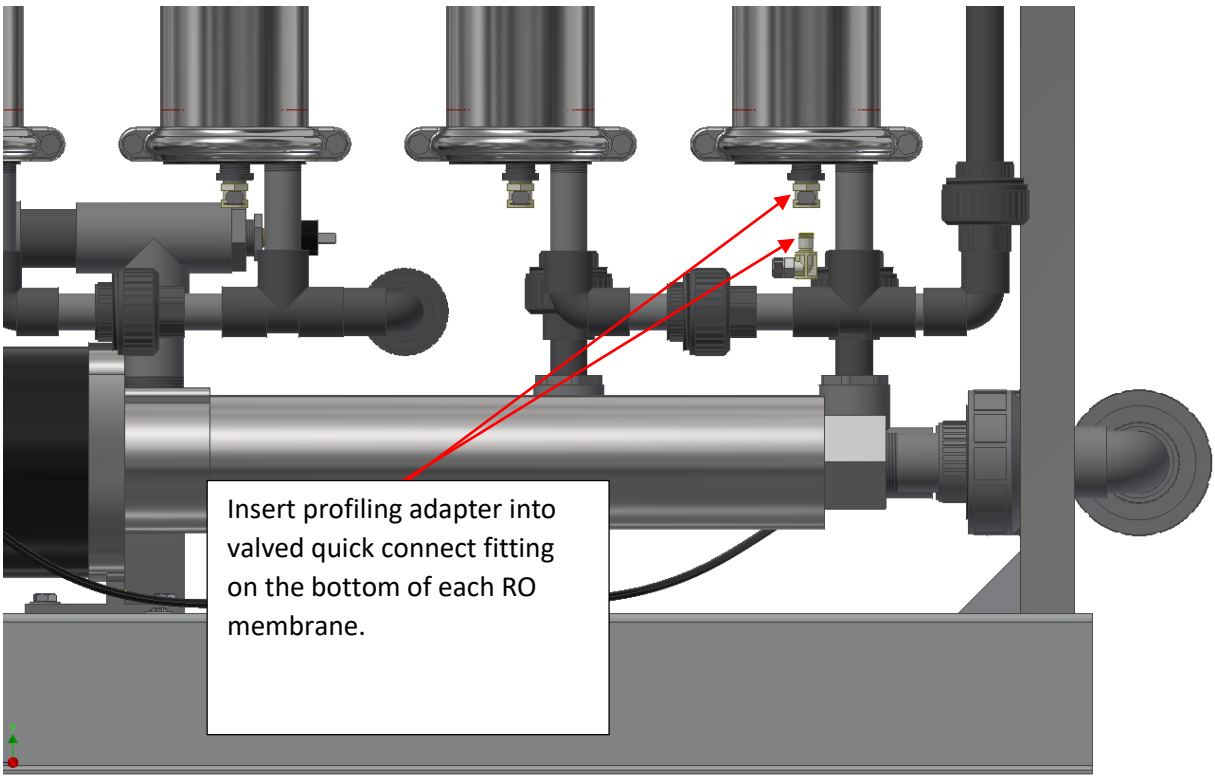
If the RO frame is constructed of steel. If the powder coating on the RO frame becomes scuffed or damage exposing bare metal, use the following information to repair the frame to prevent rust at the site of bare metal.

- Obtain a can of **Orbit Touch-up paint designed for powder coated finishes** in **RAL 7035 Light Grey**.
- Ensure the site to be touched up is clean, dry. Remove any flaking or loose paint from the surface.
- Hold the can square to the surface being touched up at 10-12 inches away. Apply light coats to prevent runs in the paint.
- Recoat once the paint becomes tacky. Use enough coats to completely cover damage to the frame.
- Hold the spray can upside down and press the spray tip until clear gas is released from the can to prevent clogging of the spray nozzle.

9.1.7.RO Membrane Profiling

Deluxe PRO4 RO models have the ability to profile the RO membrane to determine the conductivity for that particular membrane. Included with the PRO4 system is a quick connect fitting and 6" section of tygon tube. This fitting will be used to take samples of the

- With the RO in operation, insert the membrane profiling connector into the port on the bottom of each RO membrane.



- Water will begin exiting the fitting. Direct this RO product water into a sample cup.
- Remove the fitting from the connector by pressing the small metal clip and pulling on the fitting. This will stop the water flow.
- With the RO water in a sample cup, use a handheld conductivity meter to test the conductivity of the membrane

10. ALARMS

10.1. PRO4 Fault Conditions Display

Fault Condition	Fault Description	What to Check
High Pressure Fault* Line 1: "Service Fault" Line 2: "High System Pressure" Line 3: Line 4: "To Reset Push OFF/ON"	Occurs when the High Pressure Switch Closes	• Are wires connected between terminals on High Pressure Switch Input? • Is LED light above High Pressure Terminal strip illuminated? • Power down RO Controller and test for resistance across High pressure switch input. Terminal should be open.
Low Pressure Fault* Line 1: "Service Fault" Line 2: "Low System Pressure" Line 3: Line 4: "Reset in MM:SS"	System is responding to low pressure condition per system setting	• Check pre and post pre-filter pressure gauge are above 5 PSI • Check that spade terminals on pressure switch are secure on terminals. • Check wires for Low pressure switch input are tight in terminal strip. • Check that LED light above low pressure switch input is on while >5

		PSI is shown on inlet pressure gauges.
Pre Treat Fault Line 1: "Service Fault" Line 2: "Pretreat" Line 3: Line 4: "Check Pretreat Sys"	Pretreatment switch is closed	• Verify that pretreatment systems are in backwash mode.
Permeate Conductivity Fault Line 1: "Service Fault" Line 2: "Permeate TDS xxx µS" Line 3:"Alarm SP xxx µS" Line 4: "To Reset Push OFF/ON"	Permeate Conductivity is higher than alarm set-point. (Will only occur if WQ Shutdown is active)	• Verify Permeate Conductivity with calibrated handheld meter • Check Alarm set-point in hidden menu of RO controller • Perform RO cleaning or replace RO membrane(s)
Feed Conductivity Fault Line 1: "Service Fault" Line 2: "Feed TDS xxx µS" Line 3:"Alarm SP xxx µS" Line 4: "To Reset Push OFF/ON"	Feed Conductivity is higher than alarm set-point. (Will only occur if WQ Shutdown is active. Disabled by default)	• Verify Feed Conductivity with calibrated handheld meter • Check pretreatment system to ensure there is no brine carryover
Conductivity Probe Error messages Line 2: "Over-Range"	Measurement is out of range for the circuit, probe may also be shorted	• Check the water quality to verify water quality is <6000 µS
Line 2: "Probe shorted"	Short circuit detected on temperature sensor in probe	• Replace sensor
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	

11. TROUBLESHOOTING

WARNING: Only authorized persons should attempt to troubleshoot or service the PRO4 RO System. Ensure power is disconnected before opening or servicing the control system.
CONTACT INFO: For Technical assistance, contact AmeriWater at 1-800-535-5585.

FAULT CONDITION	POSSIBLE CAUSE	WHAT TO CHECK
RO will not start	Faulty tank float switch input	• Verify that tank float switches move freely in storage tank. • Verify that the float switches are set to open on rise of water level • Attempt to place RO in manual run mode. If RO turns on, the issue is with the float switch.
	RO controller not plugged in	• Verify that the RO controller is connected to 120 VAC outlet and the circuit breaker for the outlet is not tripped.
	RO Controller in fault condition	• Refer to section 10.1 for controller fault conditions
	RO in pretreatment lockout	• Verify that Pretreatment tanks are in backwash. If tanks are not in backwash, verify that pretreatment wiring is correct via section 5.1
	RO Controller fuse (F1) blown	• Remove fuse F1 from controller an check for continuity. Replace if necessary.
System has power but no water flow from system	Feed water supply closed/blocked	• Verify that the inlet water supply for the RO is turned on
	Feed water isolation valve after RO pre-filter closed	• Verify that the feed water isolation valve is open
	Inlet solenoid valve failed closed	• Verify that the RO controller supplies 120 VAC to the inlet solenoid valve.
	Inlet solenoid valve output on RO controller failed	• Verify that the RO controller supplies 120 VAC to the inlet solenoid valve.
	RO controller relay fuse blown	• Verify that the RO controller supplies 120 VAC to the inlet solenoid valve.
	RO pre-filter clogged	• Verify the filter ΔP does not exceed 10 psi
Low product flow rate	Low pump pressure	• Verify that RO pump rotation direction is correct. • Verify RO pump is operating

		• Verify motor circuit breaker is in the ON position (deluxe models)
	Low inlet feed water pressure	• Verify RO feed water pressure >30 PSI
	RO recovery >50%	• Adjust RO recovery to desired point using adjustable reject and recirculation valves
	Excessive product line backpressure	• Check for restrictions in RO product line
	Permeate divert valve failed closed	• Verify water exits the RO permeate line while the RO is NOT in Divert mode (deluxe model only)
	Reject divert valve failed open	• Verify water exits the RO permeate line while the RO is NOT in Divert mode (deluxe model only)
	RO prefilter clogged	• Verify ΔP across pre-filter <10 PSI.
	RO membrane requires cleaning	• Perform RO membrane cleaning using acid and base membrane cleaners
	RO membrane requires replacement	• Replace RO membrane
Low Pressure Fault	Incoming pressure to the system <5 psi	• Increase pressure to the RO system
	Inlet Solenoid valve failure	• Verify inlet solenoid valve is operational
RO Pump making excessive noise	Pump rotating backwards	• Verify pump is rotating in correct direction
	Pump motor or impeller failure	• Check that RO is operating within parameters stated in section 2.2
	Low feed pressure to RO	• Verify ΔP across pre-filter <10 PSI. • Verify feed supply is >30 psi
Poor quality permeate water	RO membrane requires replacement	• Replace RO membrane
	RO membrane requires acid/base cleaning	• Perform RO membrane cleaning using acid and base membrane cleaners
	High chlorine level in feed water supply	• Verify RO pretreatment is functioning properly
	RO pump pressure low	• Verify RO pump is operating within correct operating parameters
	Product Conductivity cell out of calibration	• Verify RO permeate conductivity using a calibrated handheld conductivity meter.

		Recalibrate sensor following section 9.1.3
	Rolled/torn/missing O-ring in RO membrane housing	• Visually inspect o-rings in RO membrane housing.

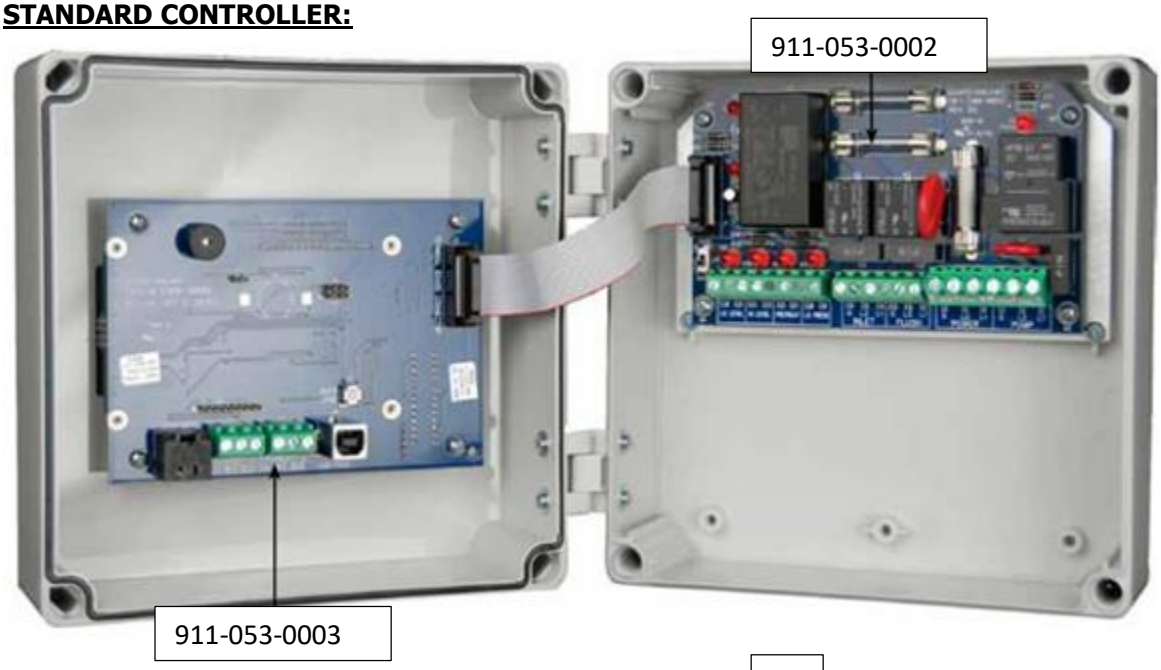
12. WARRANTY POLICY

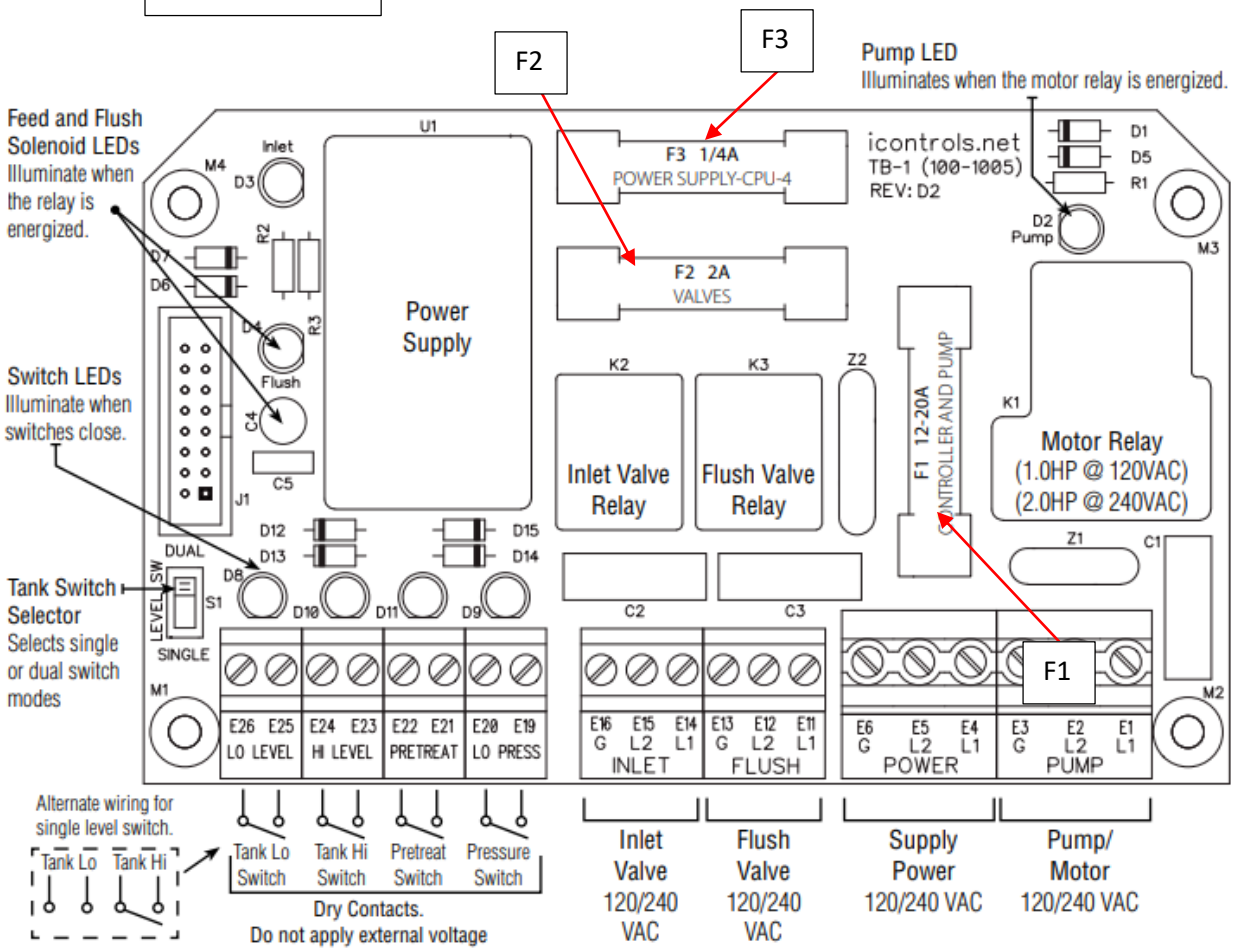
This product is covered under the standard AmeriWater warranty policy. For specific terms and conditions, please contact your AmeriWater Sales Representative.

13. SPARE PART LISTING

13.1.Controller Board/Fuse Replacements

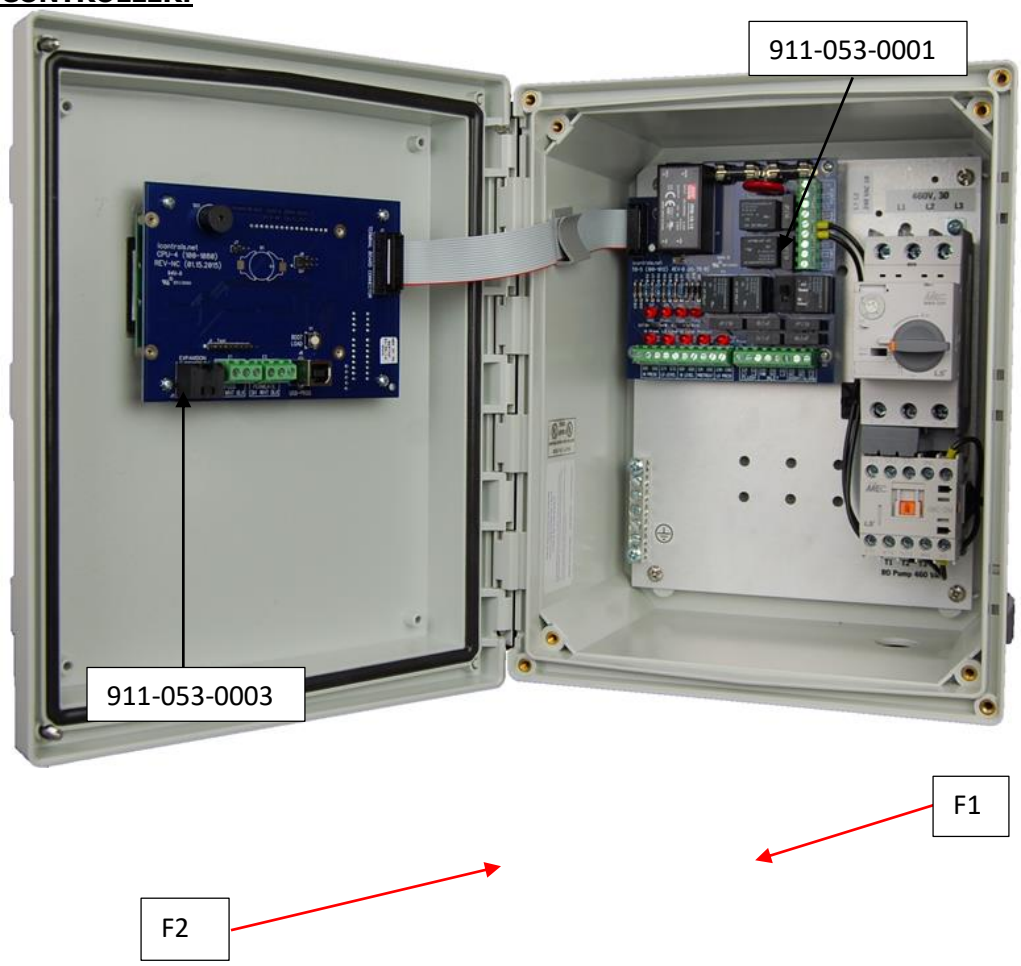
STANDARD CONTROLLER:

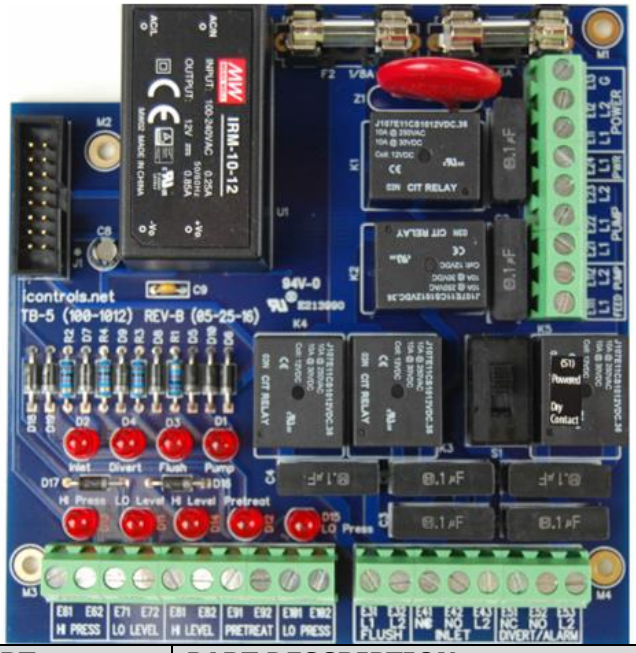




FUSE	PART NUMBER	PART DESCRIPTION
F1	063-0003	FUSE,20A,6x32mm,314 SERIES
F2	063-0004	FUSE, 2A, 1/4x1 ¼,TIME DELAY, 3SB SERIES
F3	063-0005	FUSE, .25A, 1/4x1 ¼,TIME DELAY, 3SB SERIES

DELUXE CONTROLLER:





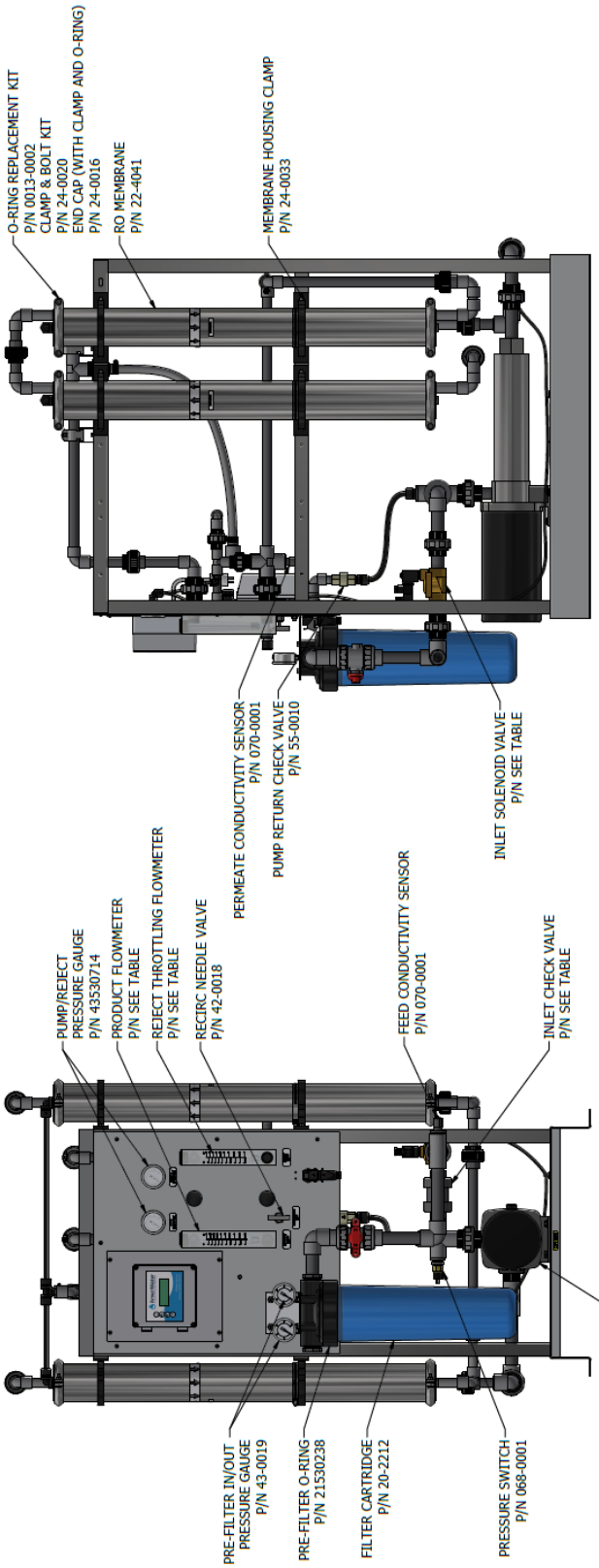
FUSE	PART NUMBER	PART DESCRIPTION
F1	063-0001	FUSE,6A,5x20 mm,234 SERIES
F2	063-0002	FUSE,.125A,5x20 mm, TIME DELAY,218 SERIES

13.2.Consumables

Part Number	Description
16-0073	CPC,EL,.38 PTFXCOUP,NO SHUTOFF,PP,EPDM SEALS (RO membrane profile port adapter)
14530810	TUBING,.375ODX.25ID,PVC,CLEAR (RO membrane profile port adapter)
95-0013	PERACIDIN DISINFECTANT, 4 GALLONS
95-0020	PERACIDIN DISINFECTANT, 1 GALLON
97WS20301	Test Strips Water Soft, Water Hardness (6 bottles of 100 strips each)
97HP20401	Test Strips Peracetic acid Test (6 Bottles of 100 Strips each) For Measuring High Range Paracetic Acid
97PH20901	Test Strips pH (6 Bottles of 100 Strips each) For Measuring pH/Water
97RC22101	WaterCheck RC (6 Bottles of 100 Strips each) For Measuring Residual Chlorine
97CM20201	WaterCheck 2 (6 Bottles of 100 Strips each) For Measuring Low Level Chlorine/Chloramine

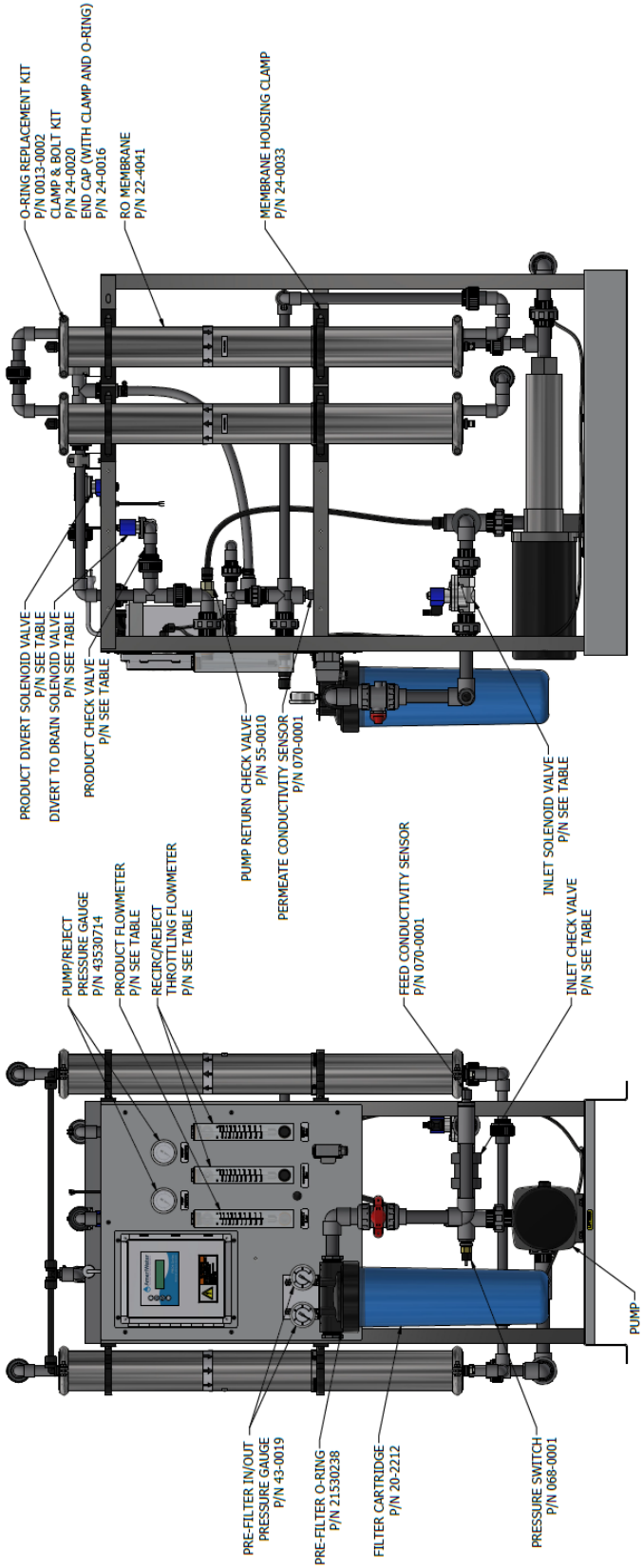
13.3.Spare Parts

13.3.1. Standard Model



COMPONENT	000-PRO4-2400-S	000-PRO4-4800-S	000-PRO4-7200-S	000-PRO4-9600-S	000-PRO4-12000-S	000-PRO4-14400-S	000-PRO4-16800-S	000-PRO4-19200-S
PUMP	080-0004	080-0005	080-0006	080-0007	080-0007	080-0008	080-0008	080-0009
REJECT THROTTLING FLOWMETER	41-0022	41-0022	41-0035	41-0035	41-0025	41-0025	41-0025	41-0025
PRODUCT FLOWMETER	041-9002	041-9002	41-0034	41-0034	41-0032	41-0032	41-0032	41-0032
INLET SOLENOID VALVE	59-0025	59-0025	59-0025	59-0028	59-0028	59-0028	59-0028	59-0028
INLET CHECK VALVE	55-0004	55-0004	55-0004	041720168	041720168	041730384	041730384	041730384

13.3.2. Deluxe Model



COMPONENT	000-PRO4-2400-D	000-PRO4-4800-D	000-PRO4-7200-D	000-PRO4-9600-D	000-PRO4-12000-D	000-PRO4-14400-D	000-PRO4-16800-D	000-PRO4-19200-D
PUMP	080-0004	080-0005	080-0006	080-0007	080-0007	080-0008	080-0008	080-0009
RECIRC/REJECT THROTTLING FLOWMETER	41-0022	41-0022	41-0035	41-0035	41-0025	41-0025	41-0025	41-0025
PRODUCT FLOWMETER	041-9002	041-9002	41-0034	41-0034	41-0032	41-0032	41-0032	41-0032
PRODUCT DIVERT SOLENOID VALVE	59-0006	59-0006	59-0019	59-0019	59-0019	59-0056	59-0056	59-0056
DIVERT TO DRAIN SOLENOID VALVE	59-0002	59-0002	59-0015	59-0015	59-0015	59-0027	59-0027	59-0027
PRODUCT CHECK VALVE	55-0010	55-0010	55-0004	55-0004	55-0004	55-0026	55-0026	55-0026
INLET SOLENOID VALVE	59-0015	59-0015	59-0015	59-0027	59-0027	59-0060	59-0060	59-0060
INLET CHECK VALVE	041831809	041831809	041831809	041720168	041720168	041730384	041730384	041730384

⚠ WARNING

This product can expose you to chemicals such as vinyl chloride (used in the production of PVC) or Nickel (used in the production of stainless steel), that are known to the State of California to cause cancer. For more information go to www.P65Warnings.ca.gov.

Dear Valued Customer,

California Proposition 65 (Prop 65) is the Safe Water and Toxic Enforcement Act of 1986. The State of California began enforcing amendments to California Prop 65 at the end of August 2018. Prop 65 requires manufacturers to provide a clear and reasonable warning to residents of California about chemicals used in products that they purchase that are included on the Prop 65 Chemical List. The chemicals included on the list are chemicals that are known to the State of California to cause cancer, birth defects, or other reproductive harm. One such chemical is Vinyl Chloride, a compound used to produce Polyvinyl Chloride (PVC). The AmeriWater system you have purchased may contain PVC or stainless steel parts.

While warnings are only required in the State of California, AmeriWater has initiated the use of Prop 65 labeling for all products to ensure compliance with California regulations. Please note that the above warning does not necessarily mean that the product that you have purchased is unsafe. Products that have been cleared for market by FDA have been determined to be safe and effective by the United States Food and Drug Administration. The warning is simply a requirement by the State of California. If you wish to obtain additional information, please visit: p65warnings.ca.gov. You may also contact your AmeriWater representative if you have any questions.

Thank you for your understanding and we look forward to continuing to serve you.