



CHIP

Reverse Osmosis System Controller

Documentation

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©2018 iControls Technologies Inc

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Welcome.

Thank you for purchasing an iControls RO 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, thanks for your purchase. Welcome to the community of iControls users.



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Table 1. Specifications

Inputs

Tank level switch	(1) Normally-Closed. <i>RO Runs on switch closure.</i>
Inlet pressure switch	Normally-Open. <i>Switch opens on low pressure.</i>
Pretreat lockout switch	Normally-Open. <i>Pretreat lockout active with switch closure.</i>
	NOTE: All switch inputs are dry contacts. Voltage applied to the switch inputs will damage the controller.
Controller Power	120/240 VAC 1, 60/50Hz (Range: 96-264 VAC) The switching power supply automatically adjusts to supply voltage. Voltage applied to the input is the same voltage the motor and valves will operate on.

Output Circuit Ratings

Feed Solenoid	2A. Output Voltage is the same as motor/supply voltage.
Flush Solenoid	2A. Output Voltage is the same as motor/supply voltage.
Motor	1.0 HP @ 120VAC, 1PH, 2.0 HP @ 240VAC, 1PH.

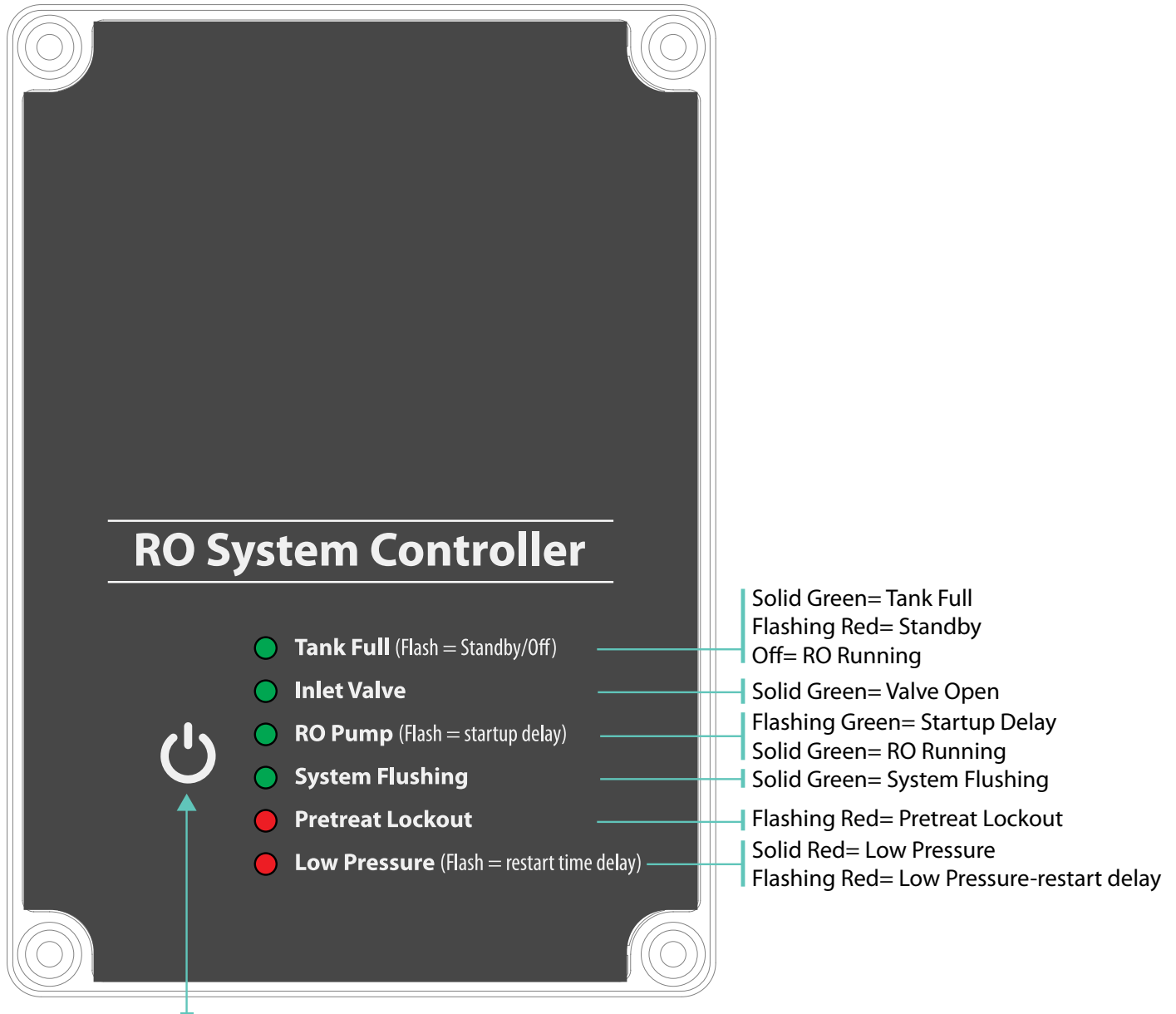
Circuit Protection

Controller Power Fuse	F1 5x20mm 1/4 (0.25) Amp LittleFuse O218.250MXP <i>Branch circuit protection, motor and valve protection must be provided externally.</i>
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Other

Dimensions	7" tall, 5" wide, 2.375" deep. Nema 4X Polycarbonate Enclosure.
Weight	1.1 lb.
Environment	0-50°C, 10-90%RH (non-condensing)

Figure 1. Controller Overview-Vertical



Standby/ON Switch

Capacitive touch switch. Tank Full LED turns Red to confirm button contact. Touch switch for 1-2 seconds to switch Power On/Off. Also used to control a Manual Run and/or Manual Flush.

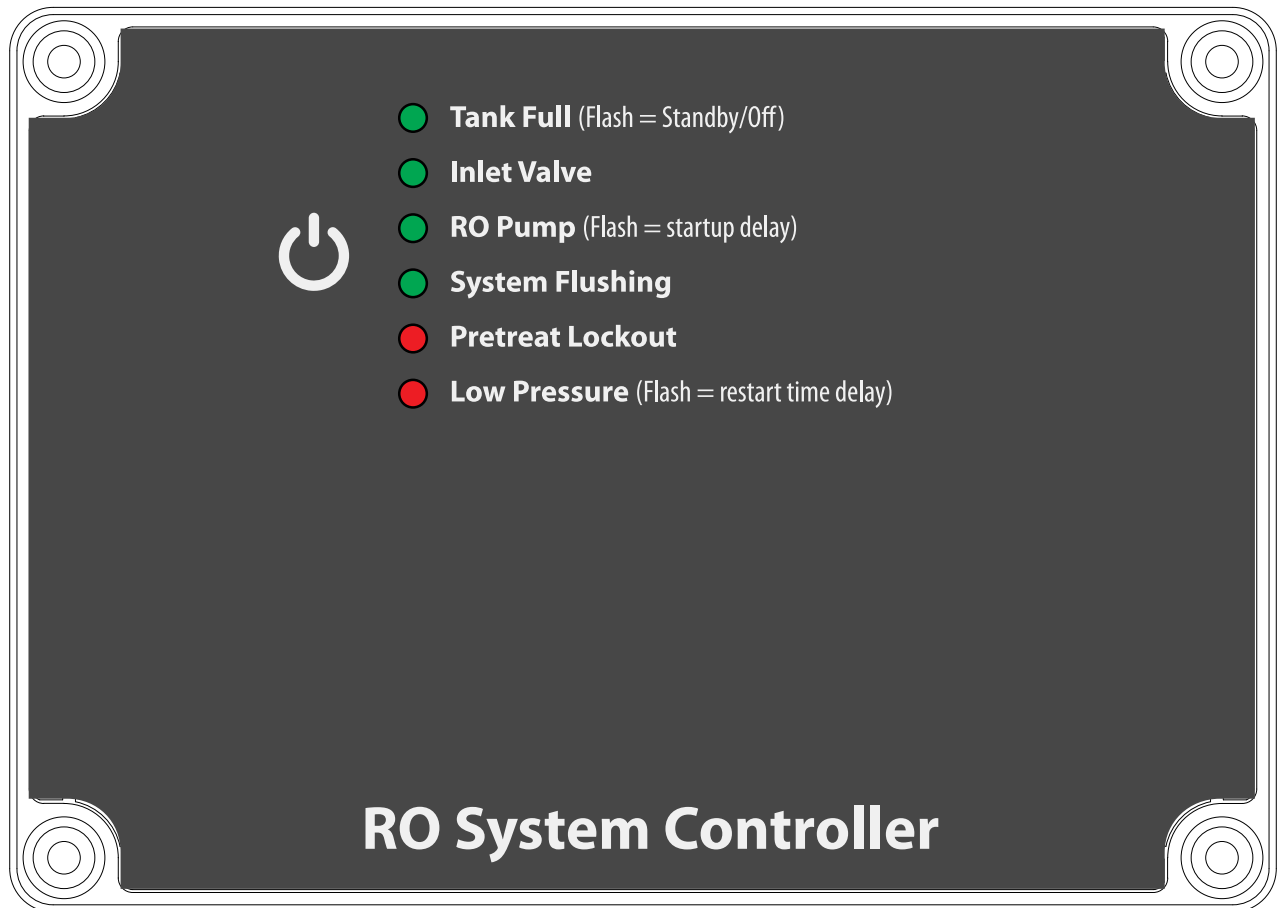
Manual Run/Manual Flush

The CHIP controller can perform a timed manual run and a timed manual flush. The default duration is 5 minutes. The duration can be changed using our programming interface.

To start a Manual Run, the controller must be in the Tank Full state. Touch the ON switch briefly 2 times. Please note that the Tank Full LED turns Orange to acknowledge the key press. The RO will start and run normally. The RO pump LED turns Orange to indicate that the controller is performing a manual run/flush.

Once the controller is in Manual Run, a Manual Flush can be triggered by 2 more brief key presses. To end the Manual Run/Flush, touch and hold the ON switch for 2 seconds.

Figure 1a. Controller Overview, Horizontal option



The CHIP controller is also available in a horizontal orientation. The features are identical to the Vertical Orientation shown on the previous page.

Figure 2. Controller Detail

Switching Power Supply
Operates on 96-264VAC, adjusts automatically to line voltage. Voltage at the supply terminals is the voltage for the pump and valves..

Programming Port
Standard USB port for connection to computer for programming.

DIP Switches
Select RO Program

Switch
System ON/Standby



Figure 3. Controller Detail-Vertical

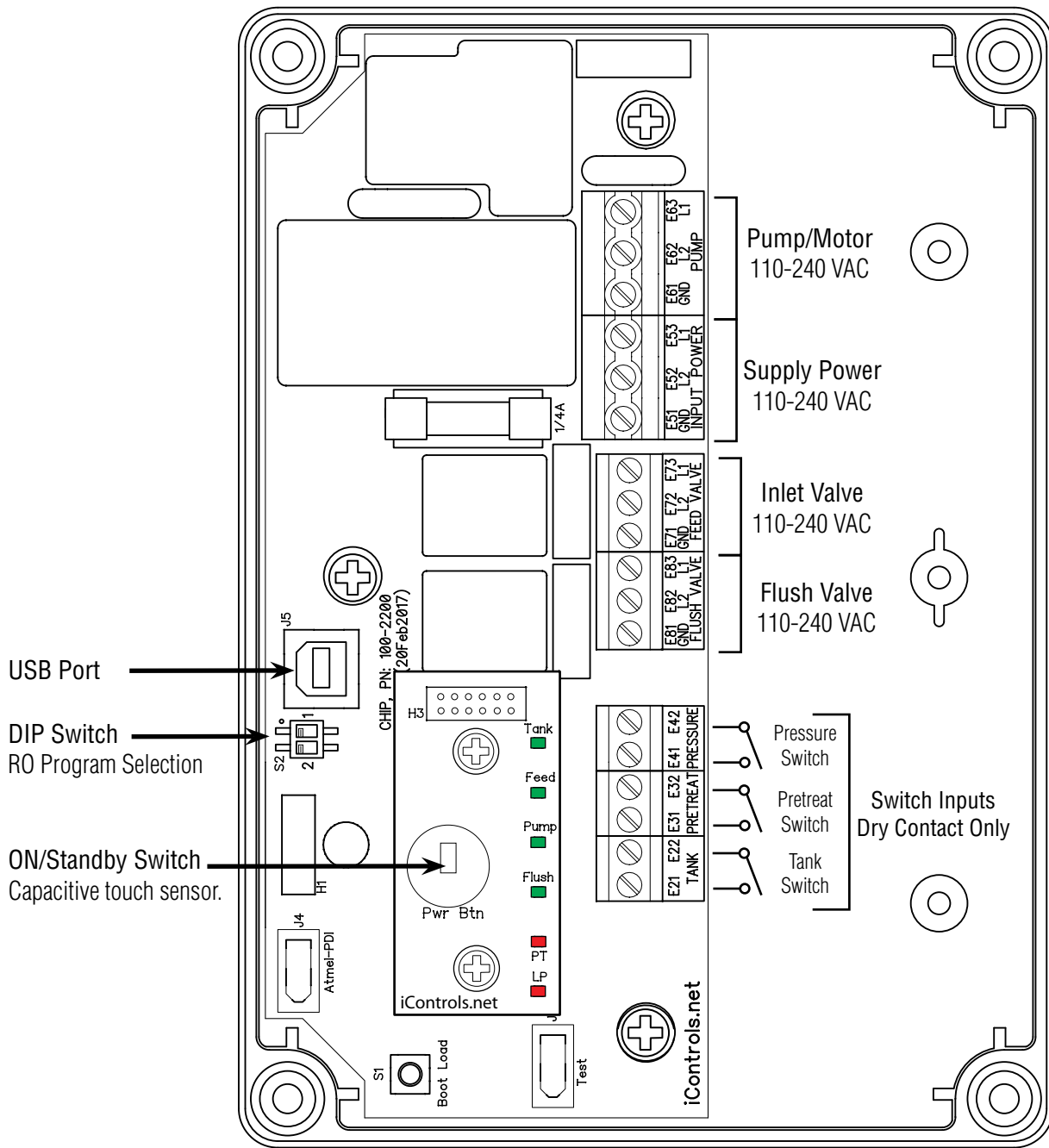


Figure 3a. Controller Detail-Horizontal

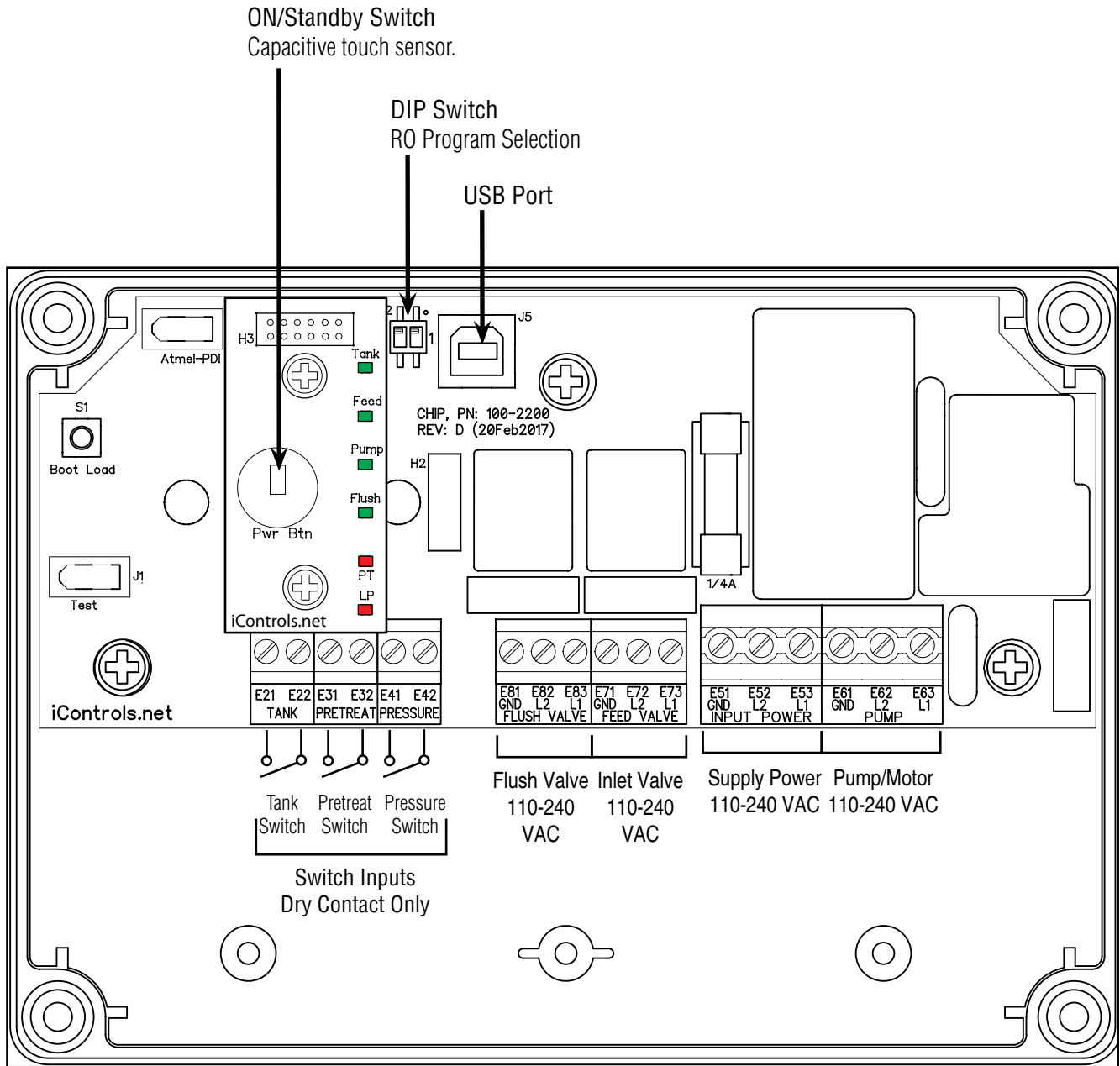
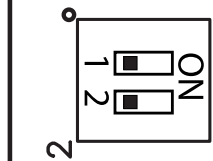
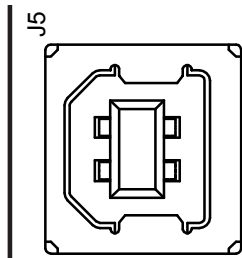


Figure 4. DIP Switch Settings

See Page 9 for details on the RO Program settings.



RO Program Settings

Switch 1	Switch 2	Program
OFF	OFF	1
ON	OFF	2
OFF	ON	3
ON	ON	4

Table 2. Controller Programming: CHIP Program Selections

The controller has 4 separate user-selectable sets of settings for configuring the RO. The factory default settings are shown below. The settings are identical except for variations in the flush behavior.

- **Program 1, High Pressure flush.**
- **Program 2, No Flush**
- **Program 3, Permeate Flush, (low pressure, inlet valve closed)**
- **Program 4, Low Pressure, feed water flush**
- See the previous page for instructions on how to select these programs.
- See Appendix A for a detailed explanation of the Parameters and their affect on the RO's operation.
- See Appendix B for information on the programming interface for use in modifying these settings.

Parameter	Value	Program 1	Program 2	Program 3	Program 4
Tank Level Switch delay (actuation and de-actuation)	Seconds	2	2	2	2
Pressure Switch delay (actuation and de-actuation)	Seconds	2	2	2	2
Pretreat Switch delay (actuation and de-actuation)	Seconds	2	2	2	2
Pump start delay	Seconds	10	10	10	10
Inlet Solenid stop delay	Seconds	1	1	1	1
Pump start retry interval (restart delay after LP fault)	Seconds	60	60	60	60
Low pressure fault shutdown, # of faults	Faults	5	5	5	5
Low pressure fault shutdown, time period to count faults	Minutes	10	10	10	10
Low pressure fault shutdown, reset after shutdown	Minutes	60	60	60	60
Low pressure timeout fault	Seconds	60	60	60	60
Flush Behavior		High Pressure	No Flush	Permeate Flush	Low Pressure Flush
Startup Flush: Minutes from last flush	Minutes	0	0	0	0
Startup Flush: Duration	Seconds	0	0	0	30
Periodic Flush: Interval	Minutes	60	0	0	0
Periodic Flush: Duration	Seconds	30	0	0	0
Shutdown Flush: Time from last flush	Minutes	10	0	0	0
Shutdown Flush: Minimum operation	Minutes	30	0	0	0
Shutdown Flush: Duration	Seconds	60	0	60	60
Idle Flush: Interval *	Minutes	0	0	0	0
Idle Flush: Duration *	Seconds	0	0	0	0

* These features are disabled by default due to the potential for confusion on the part of end-users in the field. They can be enabled when needed via the OEM PC programming interface which allows changes to all of the values shown above.

Appendix A. Controller Programming: Parameters Explained

Parameter	Value	Range	Example
Input Switch Behaviors			
Tank Level Switch delay (actuation and de-actuation)	Seconds		2.0
<i>This specifies the time that the tank switch must be closed or open before the controller accepts it as a valid condition. The function is to prevent nuisance tripping of the RO especially in small tanks or turbulent tanks</i>			
Pressure Switch delay (actuation and de-actuation)	Seconds		3
<i>This specifies the time that the pressure switch must be closed or open before the controller accepts it as a valid condition. Since pressure switches usually have built-in hysteresis this value is set at 0.</i>			
Pretreat Switch delay (actuation and de-actuation)	Seconds		2
<i>This is the time that the pretreat switch must be OPEN before the controller accepts it as a valid condition.</i>			
Pump/Inlet Solenoid Behaviors			
Pump start delay	Seconds		10
<i>On RO start-up, after the tank switch opens, the inlet solenoid valve is energized. When the inlet pressure switch closes this begins the "Pump start delay". If the pressure switch remains closed, the pump will start after 10 seconds.</i>			
Inlet Solenoid stop delay	Seconds		1
<i>This value sets the delay for the inlet solenoid valve to be deenergized following the deenergizing of the motor on RO shut down. The purpose is to prevent the pump from operating against a closed suction as the pump spins down.</i>			
Low Inlet Pressure Behaviors			
Pump start retry interval (restart delay after LP fault)	Seconds		60
<i>When the inlet pressure switch opens, the controller deenergizes the motor and the inlet solenoid valve remains open. The controller will continue to monitor the inlet pressure switch. After the switch is closed for the duration of the "Pump start retry interval" the motor is reenergized.</i>			
Low pressure fault shutdown, # of faults	Faults		5
Low pressure fault shutdown, time period to count faults	Minutes		10
Low pressure fault shutdown, reset after shutdown	Minutes		60
<i>These three values work together to determine how the RO handles Low Pressure conditions. The first two values, "# of faults" and "time period to count faults", sets the limit for the number of low pressure fault conditions over time that are required to place the RO in "Low Pressure Fault Shutdown". The third value sets the duration of the "Low Pressure Fault Shutdown" which 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 OFF/ON repeatedly without any limit.</i>			
Low pressure timeout fault	Seconds		60
<i>If the inlet valve is open, but the pressure isn't sufficient to close the inlet pressure switch, the RO would run indefinitely on line pressure. 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 counter above</i>			

Appendix A. Controller Programming: Parameters Explained

Flush Behavior			
Time from last flush before Flush on Shutdown	Minutes		15
Minimum operation before Flush on Shutdown	Minutes		60
Flush duration on Shutdown	Seconds		60
Periodic Flush interval	Minutes		60
Periodic Flush duration	Seconds		30
Unit Idle Flush interval *	Minutes		0
<i>The Unit Idle Flush Interval sets a time after which the RO will start-up and run in the flush mode. This is disabled by default because of the danger of over-flowing a tank if not properly implemented. It is intended for environments where leaving the RO idle for long periods would invite bio-fouling. (0)=disabled</i>			
Unit Idle Flush duration *	Seconds		0
<i>Sets the duration of the Idle Flush. (0)=disabled</i>			

Appendix B. Programming Interface

The screenshot displays the iControls - CHIP - Untitled software window. The interface includes a menu bar with options: New, Open, Save, Save As, System, RO (selected), WQ, Port, Get, Send, and Status. The status bar shows 'Setup: RO Prog-1' and 'Communications: COM6'. The main area is divided into two panels: 'RO Timing' and 'Flush Settings'.

RO Timing

- 5 (Minutes) Timed Manual Run
- Switch Debounce**
 - 2.0 (Seconds) Tank Level
 - 2.0 (Seconds) Low Pressure
 - 2.0 (Seconds) Pretreat
- Delay**
 - 10 (Seconds) Pump Start
 - 60 (Seconds) Low Pressure Restart
 - 1 (Seconds) Inlet Stop
- Low Pressure Behavior**
 - 5 Max Number of Faults
 - 10 (Minutes) During Period
 - 60 (Minutes) Shutdown Reset
 - 60 (Seconds) Timeout Fault

Flush Settings

High Pressure Flush Mode

- Startup**
 - 0 (Minutes) Time from last Flush
 - 0 (Seconds) Duration
- Periodic (High Pressure)**
 - 60 (Minutes) Interval
 - 30 (Seconds) Duration
- Shutdown**
 - 10 (Minutes) Time from last Flush
 - 30 (Minutes) Minimum Operation
 - 60 (Seconds) Duration
- Manual**
 - 300 (Seconds) Duration
- Idle**
 - 0 (Hours) Interval
 - 0 (Seconds) Duration
- Delay**
 - 3 (Seconds) Low Pressure
 - 0 (Seconds) High Pressure

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

Appendix C. Warranty

iControls Limited Warranty

What the warranty covers:

iControls warrants the CHIP controller to be free from defects in materials and workmanship during the warranty period. If a product proves to be defective during the warranty period, *iControls* will at its 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 CHIP 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 *iControls*
 - 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 *iControls*, 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 merchantability and fitness for a particular purpose.

Exclusion of damages:

iControls' liability is limited to the cost of repair or replacement of the product. *iControls* 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.