

BLS 400 Standard

REVERSE OSMOSIS SYSTEM



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Section 1: Introduction

Thank you for choosing a BLS Reverse Osmosis System! Every BLS RO System incorporates years of experienced engineering, dedicated workmanship, and high-quality components. Each system is built with pride and ensures superior performance. We are confident you will find this system to have quick and simple installation, hassle-free maintenance, and years of reliable, trouble-free operation.

As with all products, the customer has the responsibility to ensure that the BLS System is operated under proper conditions and within design limitations. All installation, startup and maintenance instructions must be followed carefully.

IMPORTANT

TO MAINTAIN THE MANUFACTURER'S WARRANTY, AN OPERATING LOG MUST BE MAINTAINED AND COPIES WILL NEED TO BE SENT TO YOUR LOCAL DEALER OR DISTRIBUTOR FOR REVIEW.

PRIOR TO OPERATING OR SERVICING THE REVERSE OSMOSIS SYSTEM, THIS USER'S MANUAL MUST BE READ AND FULLY UNDERSTOOD. KEEP THIS AND OTHER ASSOCIATED INFORMATION FOR FUTURE REFERENCE AND FOR NEW OPERATORS OR QUALIFIED PERSONNEL NEAR THE SYSTEM.

DO NOT UNDER ANY CIRCUMSTANCE REMOVE ANY CAUTION, WARNING, OR OTHER DESCRIPTIVE LABELS FROM THE SYSTEM.

INSTALLATION MUST COMPLY WITH STATE AND LOCAL PLUMBING, ELECTRICAL, AND SANITATION CODES.

DO NOT USE THIS SYSTEM TO MAKE DRINKING WATER FROM NON-POTABLE WATER SOURCES. DO NOT USE THE SYSTEM ON MICROBIOLOGICALLY UNSAFE WATER, OR WATER OF UNKNOWN QUALITY WITHOUT ADEQUATE DISINFECTION BEFORE OR AFTER THE SYSTEM.

BLS RO SYSTEMS WILL OPERATE MOST EFFICIENTLY ON FILTERED WATER WITH A PH OF LESS THAN 6.5, AN SDI OF 5 OR LESS, AND HARDNESS OF LESS THAN 10 GPG. IF THE SYSTEM IS OPERATED WITH LEVELS HIGHER THAN THESE, OTHER FORMS OF PRETREATMENT MAY BE NECESSARY.

FEED WATER MUST NOT CONTAIN FREE CHLORINE, FORMALIN, QUATERNARY GERMICIDES, CATIONIC SURFACTANT, DETERGENTS CONTAINING NON-IONIC SURFACTANT, SUCH AS ALL OR TRITON, OR MEMBRANE ELEMENT CLEANERS OTHER THAN THOSE APPROVED FOR USE.

Safety

The Safety section of this User Manual outlines the various safety headings used throughout this manual.

IMPORTANT

(IMPORTANT) INDICATES STATEMENTS THAT PROVIDE FURTHER INFORMATION AND CLARIFICATION.

CAUTION

(CAUTION) INDICATES STATEMENTS THAT ARE USED TO IDENTIFY CONDITIONS OR PRACTICES THAT COULD RESULT IN EQUIPMENT OR OTHER PROPERTY DAMAGE.

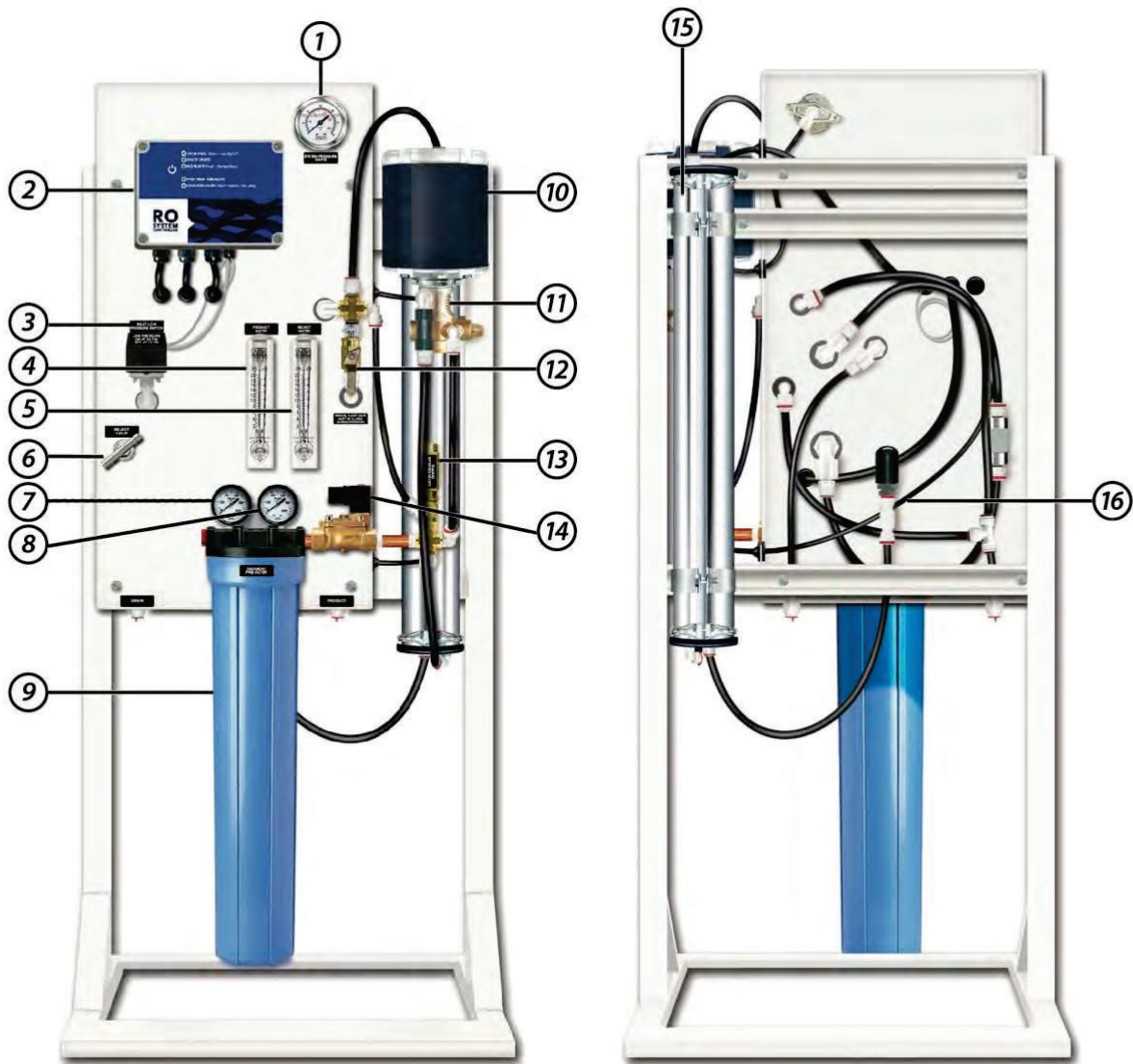


(WARNING) INDICATES STATEMENTS THAT ARE USED TO IDENTIFY CONDITIONS OR PRACTICES THAT COULD RESULT IN INJURY OR LOSS OF LIFE. FAILURE TO FOLLOW WARNINGS COULD RESULT IN SERIOUS INJURY OR EVEN DEATH.

Section 2: Getting to Know Your BLS RO System

It is important to familiarize yourself with your new BLS Reverse Osmosis System.

Pictured below is a front and rear view of the system, with the main components identified. These components will be referenced throughout the manual. Noting their location will assist you in the startup and maintenance of the RO System.



1. System Operating Pressure Gauge
2. RO System Controller
3. Inlet Feed Water Low Pressure Switch
4. Product Water Flow Meter
5. Reject Water Flow Meter
6. Reject Water Control Valve
7. Pre-Filter Inlet Pressure Gauge
8. Pre-Filter Outlet Pressure Gauge
9. Pre-Filter Housing

10. Motor
11. Rotary Vane Pump
12. Manual Flush Valve
13. Pressure Regulator
14. Inlet Solenoid Valve
15. Membrane Pressure Vessel
16. Product Water Check Valve

IMPORTANT

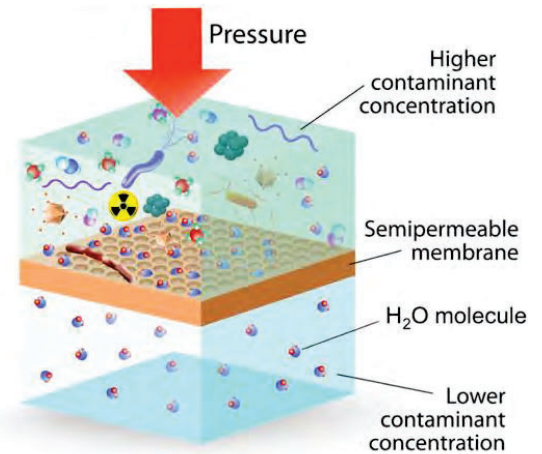
THIS MANUAL COVERS THE INSTALLATION, OPERATION AND MAINTENANCE OF THE BLS REVERSE OSMOSIS SYSTEM. IT IS IMPORTANT TO READ THIS MANUAL THOROUGHLY BEFORE INSTALLING THE SYSTEM. FOR SYSTEMS THAT ARE EQUIPPED WITH OPTIONAL FEATURES, REFER TO THE APPROPRIATE OPTIONAL FEATURE INSERTS, LOCATED AT THE END OF THE MANUAL.

Section 3: Background Information

How Reverse Osmosis Works

In the reverse osmosis process, water is forced under pressure through a semi-permeable membrane to reduce the dissolved mineral content of the water. The membrane allows water molecules to pass through, but blocks/hinders the passage of dissolved substances and suspended particles. This process reduces the levels of dissolved salts, minerals, and suspended particles, while improving the taste, odor, and clarity of the water.

Certain contaminants found in water are measured as Total Dissolved Solids (TDS). Unlike the more common standard filtration systems, reverse osmosis systems divide the feed water into two streams: product water (“permeate”) and drain/reject water (“concentrate”). The product water is the desired outcome of the RO System – much cleaner and fresher tasting water! The drain/reject water is vital for carrying away the dissolved salts, minerals, and suspended particles. Unlike conventional filtration systems, most contaminants removed from your water are not held onto within the system, but instead flushed away.



Factors Affecting System Performance

Feed Water: The incoming water to be processed by the BLS System.

Product Water (Permeate): The portion of the feed water that has passed through the membrane element. It is the desired result of a BLS System.

Concentrate Water (Reject or drain water, plus recirculation): Used to describe the portion of feed water that has flowed across the membrane (not through), and has not been converted to product water. This water now contains a higher concentrate of dissolved solids and may also contain organic matter and suspended particles rejected by the membrane. The concentrate is then split into two streams, reject and recirculation. The recirculated water is mixed with the feed water on the inlet side of the pump. The reject water is sent down the drain. This design is used to minimize the amount of water sent to drain.

Recovery: The percentage of feed water that becomes product water. The recovery rate is determined by the number of gallons (or liters) of product water divided by the total gallons (or liters) of feed water, and multiplied by 100.

Percent Rejection: The percentage of dissolved solids in the feed water that does not pass through the membrane. The membrane prevents passage of dissolved solids and other contaminants into the product water.

Conductivity: The property of a substance to conduct or transmit electricity. The unit of measure is in mhos and is commonly used to determine the purity or quality of water. In the water treatment industry, it is often converted to PPM TDS (Parts Per Million Total Dissolved Solids).

Feed Water Temperature: The volume of product water increases with higher feed water temperatures, and decreases with lower feed water temperatures. Temperatures below 35°F could crack the membrane element, and temperatures exceeding 90°F may cause rapid deterioration. The recommended range is between 45°F and 90°F.

Feed Water Pressure: The recommended range is between 40 PSI and 85 PSI. This is the most common range of municipal water supplies.

Hydrolysis: The natural chemical breakdown of membrane elements when in contact with water. This breakdown is accelerated when the water temperature is above 90°F, when the pH is not within the tolerable range, or when hydrogen sulfide is present. Refer to the System Operating Specifications section of this manual. Additional pre-treatment may be required in these cases.

Bacteria: RO Systems may be exposed to bacteria if operated intermittently. Following a prolonged shutdown or storage period, the system should be sanitized. Refer to the section in this manual regarding sanitization.

Fouling or Surface Coating of the Membrane Element: Fouling is a common problem with membrane elements because of salts, hardness, iron, etc. collecting on the membrane surface. The pores and channels of the membrane element become plugged reducing the water production rate. Pre-treatment equipment, such as a water softener, iron filter, or activated carbon filter will reduce membrane element fouling and extend its life.

Section 4: System Specifications

Operating Specifications

Production Rates:	400 GPD (0.28 GPM)*
Membrane Element:	2.5" x 21" (Qty: 1) – TFC Polyamide, High Flux
Rejection Rate:	95-99%
Recovery Rate:	50%
Nominal Flow of Feed Water During Operation:	0.56 GPM
Nominal Flow of Feed Water During System Flush:	2.1 GPM
Low Feed Water Pressure Switch:	System shuts down at 15 PSI ~ System starts at 20 PSI
Product Water Pressure Switch (Optional):	System shuts down at 45 PSI ~ System starts at 25 PSI
System Operating Pressure:	165 PSI
Max Product Water Back Pressure:	50 PSI
Min Pre-Filtration:	5 Micron**

*System production may vary depending upon incoming water temperature and chemistry.

**An activated carbon filter is required with chlorinated feed water.

Feed Water Parameters

Systems are designed for use with potable water sources only

Temperature:	Minimum 40°F – Maximum 85°F
Inlet Feed Water Pressure:	Minimum 20 PSI @ 2.1 GPM – Maximum 85 PSI
Chlorine:	Maximum 0.1 PPM
Hardness:	Maximum 10 GPG (Over 10 GPG must be softened)
Oil Tolerance:	0.0 PPM
Silt Density Index (SDI):	5
Turbidity:	Maximum 1 NTU
pH Range:	3 to 10
Hydrogen Sulfide:	Must be removed
Iron:	Maximum 0.01 PPM (Dissolved Only)
Feed Water TDS:	Consult Manufacturer if TDS exceeds 2,000 PPM
Max Operating Pressure:	180 PSI

Design Test Conditions

Operating Pressure:	165 PSI
Feed Water TDS:	500 PPM as NaCl
Design Temperature:	77°F (25°C)
Design Recovery:	50%

Design Specifications

Operating Pressure	Inlet Conn.	Product Conn.	Reject Conn.	Filter Housing	Membrane Elements
165 PSI	3/8" FNPT	3/8" TUBE	3/8" TUBE	20" SL	2.5" x 21"

Weight and Dimensions

System Dimensions						
Wgt	Height		Width		Depth	
Lbs	In	Cm	In	Cm	In	Cm
70	50	127	21	54	18	46

Section 5: Installation Instructions

Step 1: Unpack Your BLS RO System

BLS Systems are carefully inspected, tested, and packaged. They are shipped in proper working order and in excellent condition. Remove the system from the shipping carton/container and inspect it for signs of concealed damage, which may have occurred during shipping. If damage has occurred, immediately contact the delivering carrier and file a claim for damages.

Step 2: Select an Installation Site

Determine a desirable location for your BLS System. It should be positioned on a hard level surface capable of supporting the entire weight of the system. See System Specifications for approximate weight and dimensions.

Step 3: Feed Water Supply Connection

A cold water supply source must be located within proximity to the system. This will be the inlet feed water supply. Feed water pressure must be a minimum of 35 PSI.

Remove the plug from the inlet side of the filter housing marked **INLET**. Connect a proper minimum feed water line of **3/8" OD tube/pipe**.



CAUTION

DO NOT CONNECT HOT WATER LINE TO THE RO SYSTEM. FEED WATER MUST BE A COLD WATER SUPPLY.

Step 4: Product Water Connection

During the initial start-up procedure, after a membrane element replacement, or after sanitization of the system, you will want to divert the product water line to your wastewater drain. This can be done by either installing a 3-way valve in the line or by disconnecting the tubing to your storage tank. It is always important to divert the product water to drain for 30 to 60 minutes of operation, because membrane elements are treated with preservative solution that should be rinsed free.

If an atmospheric storage tank is being used, a tank level float control switch and repressurization system (optional accessories) will be required to shut the system off and to pump the product water to your application.

If a pressurized storage tank is being used, the system must be equipped with the product water pressure switch (optional feature), which will shut the system off when the pressure in the tank reaches 45 PSI. The system will turn on again when the pressure in the tank decreases to 25 PSI.

CAUTION

DO NOT INSTALL A VALVE IN THE PRODUCT WATER LINE UNLESS THE PRODUCT PRESSURE SWITCH/PRODUCT PRESSURE RELIEF VALVE OPTION IS INCLUDED WITH THE SYSTEM. SERIOUS DAMAGE CAN OCCUR IF THE SYSTEM IS OPERATED WITH A CLOSED VALVE.

Remove the plug from the product water outlet (marked **PRODUCT**). Connect a proper **3/8" OD tube/pipe** to this port, but do not connect it to the storage tank or other dispensing system right now. There will be further instructions in the System Start-Up section regarding additional steps required, prior to connecting the storage. For now, divert this line to your wastewater drain.

Step 5: Drain/Reject Connection

A wastewater drain must be near the installation site. This will be your connection for the reject water (drain) which is carrying a high level of concentrated dissolved salts, minerals, and suspended particles that were rejected by the membrane element.

Remove the plug from the drain water outlet (marked **DRAIN**) on the left-hand side of the system. Using a proper **3/8" OD tube/pipe**, connect this outlet port to your wastewater drain.

IMPORTANT

AN AIR GAP CONNECTION SHOULD BE INSTALLED TO PREVENT WASTEWATER BACK FLOW.

Step 6: Electrical Connections

A grounded electrical supply of the proper voltage for your system should be near the installation site. The system will be damaged if connected to a power source other than the voltage, phase and hertz that is specified. See the wiring diagram at the end of this manual for the correct power connections in the control enclosure.



THIS SYSTEM MUST BE INSTALLED WITH DISCONNECTING MEANS REQUIRED AS PER ELECTRICAL CODE.

CAUTION

PRE-TREAT EQUIPMENT SHOULD NOT BE ALLOWED TO REGENERATE/BACKWASH WHILE THE BLS RO SYSTEM IS OPERATING, UNLESS PRE-TREATMENT INTERLOCK SAFEGUARDS ARE USED TO BE SURE THE SYSTEM IS SHUTDOWN.

CONNECTING THE SYSTEM TO A POWER SOURCE THAT DOES NOT MATCH THE SYSTEM POWER RATING EXACTLY CAN DAMAGE THE SYSTEM AND VOID THE WARRANTY.

Step 7: Tank Level Float Control Switch

A tank level control switch must be connected at the TANK terminals of the system control board. The control switch must be normally open with dry-contacts only. Please reference the BLS RO System Controller section of this manual for diagrams to help locate these terminals.

The default configuration of your system is for a single, normally closed, tank level float control switch in an atmospheric tank application. A jumper wire will be installed at the TANK terminals if no tank level control switch was included with your order. This jumper can be discarded and replaced with your desired shutoff switch. Note that all switch terminals are dry contact only. Voltage must never be applied to these connections.

If the optional high-level float control switch was specified at the time of your order, this will have been pre-installed for you.

If the optional product water pressure switch for a pressure tank application was specified at the time of your order, this will have been pre-installed and a communication wire will be connected to the TANK terminals.

CAUTION

SWITCH INPUTS ARE FOR DRY CONTACTS ONLY. APPLYING VOLTAGE TO THESE TERMINALS WILL DAMAGE THE CONTROLLER!

Step 8: Pretreatment Lock-Out Switch

If desired, the RO system controller can connect to your pretreatment equipment using the normally open PRETREAT SWITCH terminals of the system control board. Using this feature will prevent the RO system from running during a media filter backwash or softener regeneration cycle. This will help prevent nuisance feed water pressure fault conditions. If you do not wish to connect pretreatment equipment, this step can be skipped.

To connect pretreatment equipment, remove the cover of the RO controller and locate the terminals labeled PRETREAT. Please reference the RO System Controller Guide section of this manual for diagrams to help locate these terminals. Note that all switch terminals are dry contact only. Voltage must never be applied to these connections.

Run a watertight conductor cable from your pretreatment equipment through one of the holes in the 4-port cord grip fitting. Cord grip fittings are pre-installed at the bottom of the RO controller. A hole may need to be poked through an unused port of the gland seal. Once the cable is thread through, secure it to the open PRETREAT SWITCH terminals. Replace the cover to the RO controller and ensure cord grips are tightly secured.

CAUTION

SWITCH INPUTS ARE FOR DRY CONTACTS ONLY. APPLYING VOLTAGE TO THESE TERMINALS WILL DAMAGE THE CONTROLLER!

Step 9: Install Filter Cartridges

Please refer to the Filter Cartridge Installation/Replacement section of this manual.

Step 10: John Guest Safety Locking Clips

To ensure the highest level of reliability and system longevity, red locking clips have been installed on all John Guest tubing connections. This will make the connections more secure and protect the system from accidental disconnects. Two extra locking clips have been included with this manual. These should be attached at the product and drain ports of the system, after you have made your connections.

IMPORTANT

INSTALLATION MUST COMPLY WITH STATE AND LOCAL PLUMBING, ELECTRICAL, AND SANITATION CODES.

THIS SYSTEM IS NOT FOR NON-POTABLE WATER SOURCES. DO NOT USE ON MICROBIOLOGICALLY UNSAFE WATER OR WATER OF UNKNOWN QUALITY WITHOUT ADEQUATE DISINFECTION BEFORE OR AFTER THE SYSTEM.

BLS RO SYSTEMS WILL OPERATE MOST EFFICIENTLY ON FILTERED WATER WITH A PH OF LESS THAN 6.5, AN SDI OF 5 OR LESS, AND HARDNESS OF LESS THAN 10 GPG. IF THE SYSTEM IS OPERATED WITH LEVELS HIGHER THAN THESE, OTHER FORMS OF PRETREATMENT ARE REQUIRED. FEED WATER MUST NOT CONTAIN FREE CHLORINE, FORMALIN, QUATEMARY GERMICIDED, CATIONIC SURFACTANT, DETERGENTS CONTAINING NON-IONIC SURFACTANT, SUCH AS ALL OR TRITON, OR MEMBRANE ELEMENT CLEANERS, OTHER THAN THOSE APPROVED FOR USE.

PRIOR TO THE START-UP OF SYSTEM, VISUALLY INSPECT THE INLET, DRAIN, AND PRODUCT WATER CONNECTIONS COMPLETELY. ALSO, CHECK TO BE SURE THE SYSTEM IS CONNECTED TO A PROPERLY GROUNDED ELECTRICAL POWER SUPPLY WITH THE APPROPRIATE VOLTAGE, PHASE, AND HERTZ.

Section 6: BLS RO System Controller

CAUTION

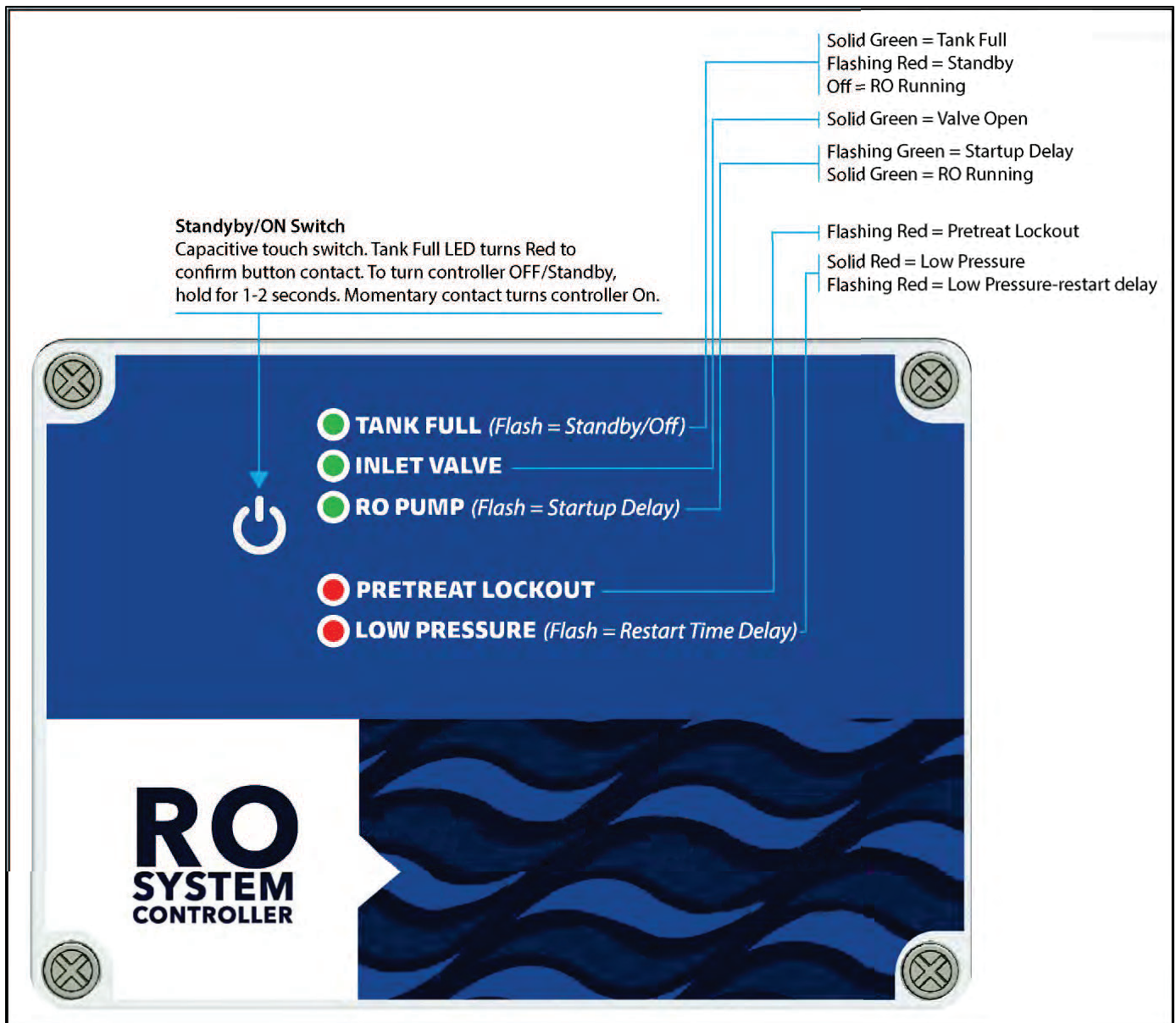
BE SURE TO READ THE RO CONTROLLER SECTION CAREFULLY BEFORE ATTEMPTING TO OPERATE THIS BLS RO SYSTEM, AND BEFORE CHANGING ANY CONTROLLER SETTINGS. DO NOT ATTEMPT TO CHANGE ANY CONTROLLER SETTINGS WITHOUT CAREFULLY READING AND UNDERSTANDING THIS SECTION OF THE MANUAL.

Every BLS Series model is equipped with a Reverse Osmosis System Controller. This state-of-the-art controller will provide advanced, automatic control functions and LED status light indicators. The LED indicators will offer instant feedback on the current state and status of your RO system (e.g. tank full, low inlet pressure, pretreat lockout, and more!).

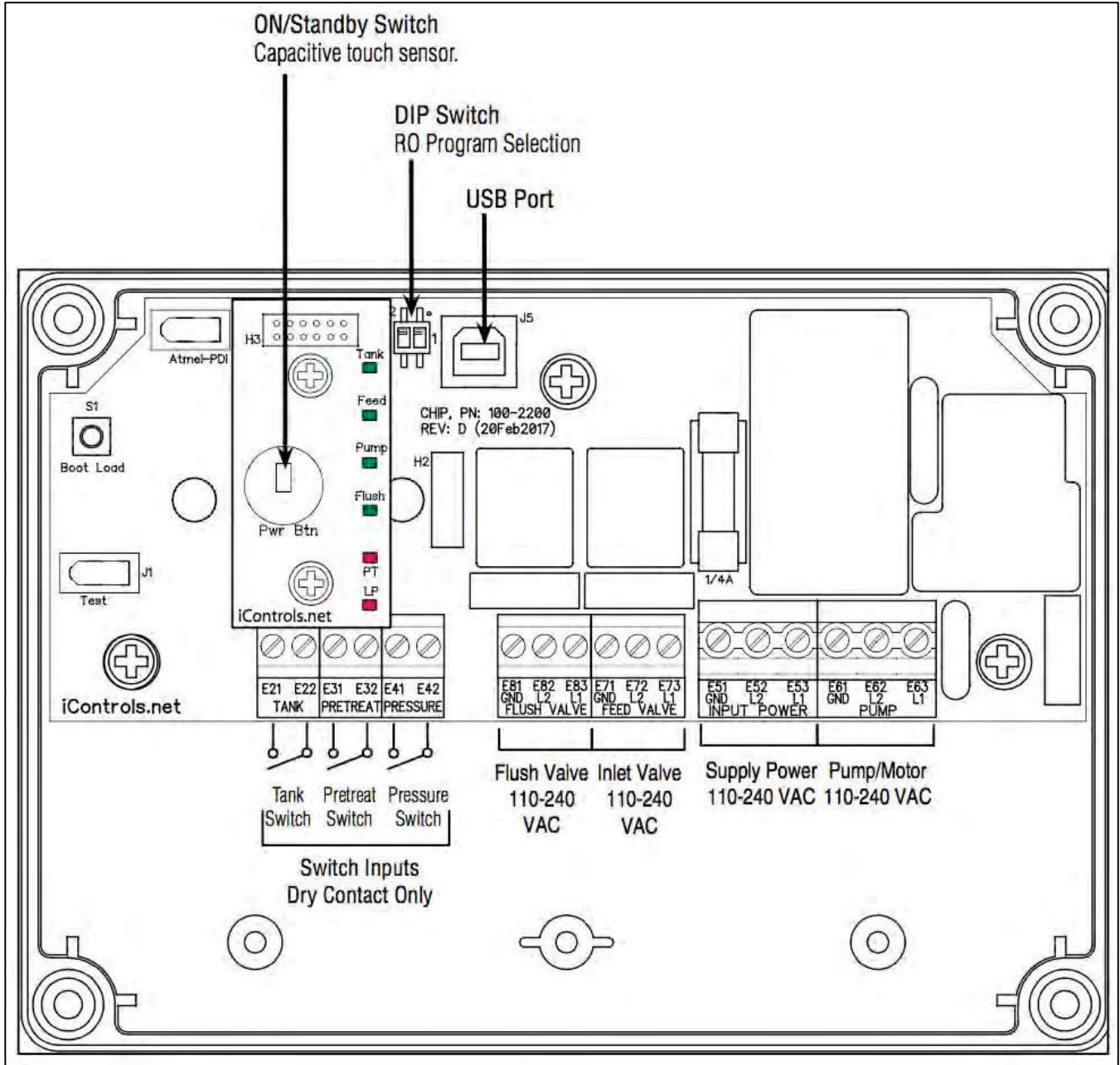
The RO controller's program settings are the following:

PROGRAM 2: NO FLUSH (FOR BLS 400-2400 STANDARD MODELS)

- Upon system startup, the solenoid valve opens and water line pressure will run through the system. After the pump start delay for 10 seconds of line pressure flow, the pump will start for normal system operation.

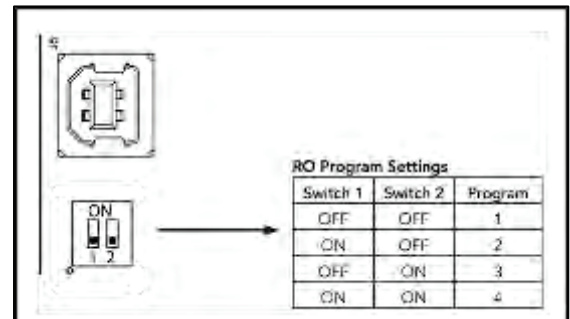


Controller Detail



Program Selection

The RO controller is pre-installed with 4 different “programs” that are user-selectable. See the diagram to the right for dip switch positions to change between programs. Each program has its own set of settings for how the BLS RO system will behave. **The program settings are identical, except for variations in the flush behavior.** Please see the Program Behavior Details section for more information on how the different programs behave.



Controller Specifications

Inputs	
Tank Level Switch:	(1) Normally-Closed RO Runs on switch closure
Inlet Pressure Switch:	Normally-Open. Switch opens on low pressure.
Pretreat Lockout Switch:	Normally-Open. Pretreat lockout is active with switch closure. IMPORTANT: All switch inputs are dry contacts. Voltage applied to inputs will damage the controller!
Controller Power:	120/240 VAC, 60/50Hz (Range 96-264 VAC) Switching power supply automatically adjusts the supply voltage. Voltage applied to the input is the same voltage the motor and valves will operate on.
Relay Output Ratings	
Feed Solenoid:	10A Resistive, 5A (inductive). Voltage is the same as motor/supply voltage.
Flush Solenoid:	10A Resistive, 5A (inductive). Voltage is the same as motor/supply voltage. The solenoid relay ratings above reflect the capacity of the relays only. The current capacity of each circuit is 2A.
Motor:	Up to 1.0 HP @ 120V Up to 2.0 HP @ 240V
Circuit Protection	
Controller Power Fuse:	F1 5x20mm 1/8 (0.125) Amp LittleFuse 0218.125MXP IMPORTANT: Branch circuit protection, motor and valve protection must be provided externally.
Other	
Dimensions:	7" tall, 5" wide, 2.375" deep. Nema 4X Polycarbonate Enclosure
Weight:	1.1 lbs
Environment:	0-50°C, 10-90%RH (non-condensing)

CAUTION

SWITCH INPUTS ARE FOR DRY CONTACTS ONLY. APPLYING ANY VOLTAGE TO THESE TERMINALS WILL DAMAGE THE CONTROLLER!

Program Behavior Details

Program 1: High Pressure Flush, Short Interval & Start-Up

- A high pressure flush occurs every 2 hours (120 minutes) of operation for 30 seconds. A 30 second high pressure flush will also occur at system start-up. The RO pump will run during high pressure flush cycles.

Program 2: No Flush ****FOR BLS 400-2400 STANDARD MODELS****

- All flush cycles are disabled.

Program 3: High Pressure Flush, Start-Up

- A 30 second high pressure flush will occur at system start-up. The RO pump will run during high pressure flush cycles.

Program 4: Low Pressure Flush, Start-Up

- A 30 second low pressure flush will occur at system start-up. The RO pump will NOT run during low pressure flush cycles.

Parameter	Value	Program 1	**MFG** *DEFAULT* Program 2	Program 3	Program 4
Tank Full Switch Delay (actuation and de-actuation)	Seconds	2	2	2	2
Low Pressure Switch Delay (actuation and de-actuation)	Seconds	2	2	2	2
Pre-Treat Switch Delay (actuation and de-actuation)	Seconds	2	2	2	2
Pump Start Delays					
Pump Start Delay	Seconds	10	10	10	10
Inlet Solenoid 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 Parameters					
Low Pressure Fault Shutdown, Number of Faults	Faults	5	5	5	5
Low Pressure Fault Shutdown, Timespan 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 BEHAVIORS ↓					
Startup Flush: Minutes from last flush	Minutes	0	0	0	0
Startup Flush: Duration	Seconds	30	0	30	30
Periodic Flush: Interval	Minutes	120	0	0	0
Periodic Flush: Duration	Seconds	30	0	0	0

Program Parameters Explained

Parameter	Explanation
Tank Full Switch Delay (actuation and de-actuation)	This specifies the time that the Product Water Pressure Switch must be closed or open before the controller accepts it as a valid condition. The purpose is to prevent nuisance tripping of the RO system, especially in small or turbulent tanks.
Low Pressure Switch Delay (actuation and de-actuation)	This specifies the time that the Inlet Low 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 to 0.
Pre-Treat Switch Delay (actuation and de-actuation)	This specifies the time that the pre-treat switch must be OPEN before the controller accepts it as a valid condition.
Pump Start Delay	On RO system start-up, after the Product Water Pressure Switch is open, 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 specified seconds. The purpose is to ensure that the Inlet Solenoid Valve is open and that water is flowing through the system on pump startup.
Inlet Solenoid Stop Delay	This value sets the delay for the Inlet Solenoid Valve to be de-energized following the de-energizing of the motor/pump on RO system shutdown. The purpose is to prevent the pump from operating against closed suction as the pump spins down.
Pump Start Retry Interval (restart delay after LP fault)	When the Inlet Low Pressure Switch opens, the controller turns off the motor and leaves the Inlet Solenoid Valve open. The controller will continue to monitor the Inlet Low Pressure Switch. After the switch is closed for the duration of the "Pump Start Retry Interval" the motor is re-energized.
Low Pressure Fault Shutdown, Number of Faults	These three values work together to determine how the RO system handles low inlet pressure fault conditions. The first two values ("Number of Faults" and "Timespan to Count Faults") set the limit for the how many low-pressure faults can occur over the specified timespan, before the RO system goes into a "Low Pressure Fault Shutdown." The third value sets the duration of the "Low Pressure Fault Shutdown" which is the period that the RO system will remain idle before trying to restart. The purpose of the Low Pressure Fault Shutdown is to prevent the RO system from turning OFF/ON repeatedly without any limit.
Low Pressure Fault Shutdown, Timespan to Count Faults	
Low Pressure Fault Shutdown, Reset After Shutdown	
Low Pressure Timeout Fault	If the Inlet Solenoid Valve is open, but the pressure isn't sufficient to close the Inlet Low Pressure Switch, the RO system would run indefinitely on line pressure. This value sets the time limit for the RO system to operate with the Inlet Solenoid Valve open with Low Pressure, as indicated by an open Inlet Low Pressure Switch before a Low Pressure Fault is added to the counter above.
↓ FLUSH BEHAVIORS ↓	
Startup Flush: Minutes from last flush	The number of minutes that must pass from the last flush before a flush will occur on startup .
Startup Flush: Duration	The number of seconds the system will flush during a Startup Flush.
Periodic Flush: Interval	The number of minutes that must pass before a Periodic Flush will occur. Flush cycle will repeat after the specified time.
Periodic Flush: Duration	The number of minutes the system will flush during a Periodic Flush.

Section 8: Start-Up Procedures

Step 1: Installation Follow-Up

1. Visually inspect the water connections.
2. Be sure filter cartridges have been installed.
3. Confirm connection to the proper power source.

NOTE: The membrane element(s) will have been installed in the system during the final testing procedures unless other arrangements have been made with the manufacturer.

Step 2: RO System Pretreatment

A water analysis of your feed water should have been performed to determine what type of pretreatment may be required. See Feed Water Parameters for this system before operating this system.

Step 3: Read Section on the RO System Controller

It is important to read the BLS RO System Controller section carefully before attempting to operate this BLS RO System, and before changing any controller settings.

Step 4: Divert Product Water to Drain

Upon initial system start-up, or after changing membrane elements, it is important to divert all product water to a wastewater drain for approximately 30 to 60 minutes. Membrane elements are treated with a preservative solution and should be thoroughly rinsed clean before water is retained for use. This can be done either by installing a 3-way valve in the product water line or by diverting your product water line to drain. Do not connect the product water line to a storage tank at this time.

Step 5: Startup the System

1. Turn on the inlet feed water supply source, allowing water to enter the system.
2. Manually adjust (counter-clockwise) the Reject Water Control Valve to the fully open position.
3. Hold the POWER icon key on the RO controller. The inlet solenoid valve will open, and the pump will start after a short delay.

IMPORTANT

THE INLET SOLENOID VALVE IS A SAFETY DEVICE THAT IS USED TO PREVENT WATER FLOW THROUGH THE SYSTEM WHEN IT IS NOT IN OPERATION. LOW INLET FEED WATER FLOW AND LOW PRESSURE CAN RESULT IN DAMAGE TO THE PUMP, MOTOR, AND/OR MEMBRANE ELEMENT. WHEN THE SYSTEM IS TURNED ON, THE SOLENOID VALVE AUTOMATICALLY OPENS. THE VALVE WILL CLOSE WHEN THE SYSTEM IS TURNED OFF. THE SYSTEM WILL ONLY START IF THERE IS SUFFICIENT FEED WATER FLOW AND PRESSURE (MIN 35 PSI).

Step 6: System Flush

Allow the system to operate for 30 to 60 minutes to properly flush the RO membranes of their preservation solution. Please note that there are two different ways to execute a membrane flush, based on the model of your RO system:

“Standard” Models

All “STD” models are equipped with a manual flush valve. To perform a membrane flush, turn this valve to the open position and allow the system to flush for the desired amount of time. Note that this manual flush valve must be in the closed position during system operation.

“Optimum” Models

All “OPTI” models are equipped with an automatic flush solenoid valve. A 1-minute automatic membrane flush is pre-programmed to initiate each time the system starts and stops. The membrane flush type, frequency, and duration is pre-programmed to the Manufacturer’s default settings. Please see the BLS RO System Controller section of this manual for more information on the default settings. Note that a manual flush can be initiated by power cycling the RO system or by temporarily opening the reject control valve completely.

Step 7: Adjust System Pressure and Flow Rates

CAUTION

NEVER ALLOW THE BLS RO SYSTEM PRESSURE TO EXCEED 185 PSI.

The BLS 400-2400 RO systems were designed to operate at 50% recovery. This may vary depending on your feed water conditions and/or application. Adjust the Reject Water Control Valve and Pressure Regulator, while monitoring the Reject Water Flow Meter, Product Water Flow Meter, and System Operating Pressure Gauge. You will need to adjust the Reject Water Control Valve and Pressure Regulator to balance and maintain the 50% product water recovery flow rate. Refer to the GPM flow rates listed below as a guideline.

NOTE: These flow rates should only be used as a guideline! They have been determined based on the Standard Test Conditions. Actual flow rates should be determined based on your specific site conditions.

IMPORTANT

THE MAXIMUM PRODUCT WATER FLOW RATES AND ASSOCIATED REJECT WATER FLOW RATES FOR THE BLS 400-2400 SERIES ARE SHOWN BELOW. REDUCE THE SYSTEM OPERATING PRESSURE, IF REQUIRED, BY ADJUSTING THE PRESSURE REGULATOR TO MAINTAIN THE MAXIMUM PRODUCT WATER FLOW RATE AND THE ASSOCIATED REJECT WATER FLOW RATE.

*BLS 400 Models: 0.28 GPM Reject Water
0.28 GPM Product Water

*BLS 1900 Models 1.32 GPM Reject Water
1.32 GPM Product Water

*BLS 800 Models: 0.56 GPM Reject Water
0.56 GPM Product Water

*BLS 2400 Models 1.67 GPM Reject Water
1.67 GPM Product Water

*BLS 950 Models: 0.66 GPM Reject Water
0.66 GPM Product Water

Record all operating parameters on the System Log Sheet, located at the end of this manual. Product and reject water flow rates can be read directly from the flow meters and will become a reference point for future system performance evaluations.

IMPORTANT

THE GALLONS PER DAY OF PRODUCT WATER PRODUCED WILL VARY AT EACH INSTALLATION BASED ON THE FEED WATER TDS, FEED WATER TEMPERATURE, AND THE BACK PRESSURE ON THE SYSTEM. THE PURPOSE OF RECORDING THE DATA ON THE SYSTEM LOG SHEET AT START-UP IS TO HAVE A REFERENCE POINT TO EVALUATE SYSTEM PERFORMANCE DURING THE LIFE OF THE MEMBRANE ELEMENT(S).

Step 8: Connect RO System to Storage Tank

After 30-60 of system flushing, press the POWER key on the RO controller to stop the system. Connect the product water line to your storage tank. Once product water line is connected to the storage tank, POWER the system back on. The RO system will now automatically run based on the tank full switch.

Step 9: Check Pressure Switches

An inlet feed water low pressure switch is installed on this BLS RO system. It is preset at the factory to cut-out at feed water pressure below 15 PSI and cut-on at pressure above 20 PSI. Its purpose is to prevent damage to the RO system's pump and/or motor if there is inadequate feed water flow or pressure. The following steps are to verify that it is functioning properly:

1. Slowly decrease the inlet feed water supply by closing an installed manual feed water shut-off valve, while watching the Pre-Filter Outlet Pressure Gauge.
2. If you hear the pressure switch open (a quiet, but audible "click"), when the pressure drops to about 15 PSI, then the inlet pressure switch is functioning correctly. After a short nuisance delay, the RO system will go into a pressure fault shutdown.
3. If it is not functioning correctly, please see the System Pressure Switches section of this manual for more information.

If your RO system is equipped with the optional Product Water Pressure Switch, please refer to the Maintenance – System Pressure Switches section of this manual to verify its setpoints and proper function.

Step 10: Final Inspection

Congratulations on the successful installation of your new BLS RO system! We hope it supplies you with many years of reliable operation and trouble-free maintenance. Once all start-up and installation procedures have been completed, please visually inspect all water connections and system readings for proper operation. All connections should be tight, secure, and leak-free.

IMPORTANT

WHEN HUMIDITY IS HIGH, EXPECT CONDENSATION TO FORM ON THE PARTS OF THE SYSTEM WHICH CONTAIN COLD WATER.

IMPORTANT

FREQUENTLY CHECK THE SYSTEM FOR ANY LEAKS THAT MAY DEVELOP OVER TIME.

CAUTION

A WATER SOFTENER SHOULD NOT BE ALLOWED TO REGENERATE WHILE THE BLS RO SYSTEM IS OPERATING, UNLESS SAFEGUARDS ARE USED TO BE SURE THE SYSTEM IS SHUT-DOWN OR OPERATING ON AN ALTERNATE SOURCE OF SOFTENED WATER. TERMINALS FOR SHUTTING DOWN THE SYSTEM DURING SOFTENER REGENERATION ARE PROVIDED. A NORMALLY CLOSED CONTACT FROM THE SOFTENER CONTROLLER CAN BE WIRED TO THE PRETREAT TERMINALS IN THE RO CONTROLLER. BYPASSING THE WATER SOFTENER AND FEEDING HARD WATER DIRECTLY TO THE BLS RO SYSTEM WILL CAUSE PREMATURE FOULING OF THE MEMBRANE ELEMENT.

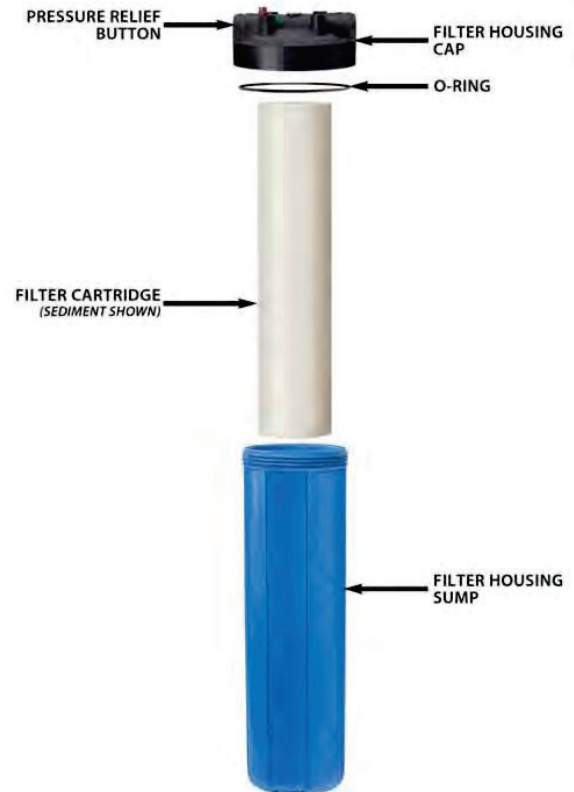
Section 9: Maintenance – Filter Cartridge Installation/Replacement

IMPORTANT

UPON THE PURCHASE OF A NEW BLS RO SYSTEM, THE SEDIMENT FILTER CARTRIDGE HAS BEEN PACKAGED LOOSE INSIDE THE SYSTEM'S CARTON. IT MUST BE INSTALLED PRIOR TO START-UP. NOTE THAT THE MEMBRANE ELEMENT(S) HAVE BEEN PRE-INSTALLED BY THE MANUFACTURER DURING THE FINAL TESTING PROCEDURES, UNLESS OTHER ARRANGEMENTS HAVE BEEN MADE.

Filter cartridges have a limited service life and should be replaced if you experience noticeable changes in product water taste, color, odor, or flow rate. On average, filter cartridges should be replaced about every 3-6 months. Your BLS RO system is also equipped with pre-filter inlet and pre-filter outlet pressure gauges. An increase in the pressure difference of 10-12 PSI between the two gauges is an indication that the filter cartridge may need to be replaced.

1. Ensure feed water supply is turned OFF and that the RO system is shutdown.
2. Relieve all pressure from the system by opening the Reject Water Valve and pressing the pressure relief button on top of the pre-filter housing.
3. Disconnect the main power supply
4. Unscrew the filter housing sump by turning clockwise. Locate and remove the large o-ring; wipe clean and set aside. It is common for the o-ring to lift out of the sump and stick to the cap. If the o-ring appears to be damaged or crimped, it must be replaced.
5. If you are doing a routine maintenance change of the filter cartridge, remove and dispose the old cartridge. It is also recommended that the sump be properly rinsed clean at this time. To sanitize the sump, fill it 1/3 full of water and add about two tablespoons of original household bleach. Gently scrub the cap and housing with a non-abrasive cloth. Observe the precautions printed on the bleach container. Rinse thoroughly when finished.
6. Ensure o-rings are lubricated with a food grade silicone or glycerin. Place o-rings back into the groove in the sumps and smooth into place with your fingers. This step is important to ensure a proper watertight seal.
7. Remove packaging from the new filter cartridge and place inside the sump. Make sure the filter is seated properly over the standpipe at the bottom of the sump.
8. Replace the filter sump on the filter housing cap. DO NOT OVER TIGHTEN. If your system has multiple pre-filter housings, make sure the correct filter is replaced in the correct position. See system labels and the Getting To Know Your System section of this manual for more information.
9. Reconnect the main power supply.
10. Turn on the feed water supply and allow the system to fill with water.
11. Hold the Power icon button located on the face of the RO System Controller to restart the system.
12. Check for leaks.
13. Flush the system for a minimum of 5 minutes while diverting the product water to the drain.



IMPORTANT

BEFORE PERFORMING ANY MAINTENANCE ON YOUR BLS RO SYSTEM, ALWAYS DISCONNECT THE POWER SUPPLY!

CAUTION

IT IS IMPORTANT THAT THE O-RING BE PROPERLY SEATED EACH TIME THE FILTER HOUSING IS REASSEMBLED OR REMOVED. USE ONLY FOOD GRADE SILICONE OR GLYCERIN TO LUBRICATE THE O-RINGS. DO NOT USE A PETROLEUM-BASED PRODUCT SUCH AS VASELINE.

CAUTION

THE MANUFACTURER OF THE FILTER HOUSING RECOMMENDS THAT THE FILTER SUMP OF ALL PLASTIC HOUSINGS BE REPLACED EVERY FIVE YEARS FOR A CLEAR SUMP AND EVERY TEN YEARS FOR AN OPAQUE SUMP. DATE THE BOTTOM OF ANY NEW OR REPLACEMENT SUMP TO INDICATE THE NEXT RECOMMENDED REPLACEMENT DATE.

Section 10: Maintenance – Membrane Flush

The **Manual Flush Valve** is only equipped on the Standard BLS models. It is recommended to open this valve at least once weekly for 5 to 10 minutes to help flush away buildup on the membrane elements. The duration and cycle of this flush can be adjusted based on varying feed water conditions and applications.

The **Automatic Membrane Flush Solenoid Valve** is only equipped on the Optimum BLS models. The flush mode is factory set to run the RO pump with the Inlet Solenoid Valve and Flush Solenoid Valve open, for 60 seconds upon system startup and shutdown. These settings can be adjusted based on varying feed water conditions and applications. Please review the BLS RO System Controller section for more information.

Section 11: Maintenance – System Pressure Switches

Inlet Low Pressure Switch

System preset to cut OFF at inlet pressure below 15 PSI.
System preset to cut ON at inlet pressure above 20 PSI.

An Inlet Low Pressure Switch is installed on every BLS Reverse Osmosis system. The purpose of this switch is to prevent damage to the pump and/or motor if there is inadequate feed water flow or pressure.

Verifying Set-Point of Inlet Low Pressure Switch

To verify the setting, slowly decrease the inlet feed water supply by slowly closing the manual inlet shut-off valve while watching the pre-filter outlet pressure gauge. If the system shuts down when the pressure drops to approximately 15 PSI, then the Inlet Low Pressure Switch is functioning correctly.

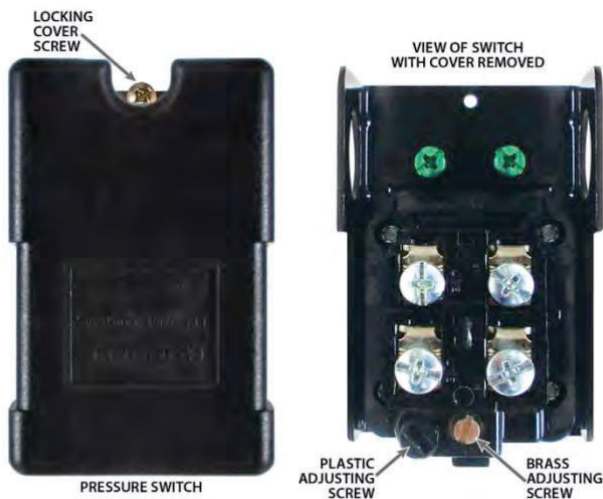
CAUTION DISCONNECT THE POWER ANY TIME THE COVER IS REMOVED FROM A PRESSURE SWITCH.

Adjusting the Inlet Low Pressure Switch Set Point

If it is not set correctly, disconnect the power from the System and remove the black plastic cover of the pressure switch labeled “Inlet Low Pressure Switch.” There are two screws for adjusting the switch settings. **Do not adjust the plastic screw.** Turn the brass screw clockwise to increase both the cut-in and cut-out pressure. Turn it counter clockwise to decrease both the cut-in and cut-out pressure. Turn the screw one half turn only. Temporarily replace the cover, reconnect the power and recheck the setting. Repeat as required.

Identifying a Broken Low Pressure Switch

Simply, close the inlet feed water valve, and if the System does not shut down, the pressure switch needs replacing.



Product Water Pressure Switch

System preset to cut OFF at product pressure above 45 PSI.
System preset to cut ON at product pressure below 25 PSI.

A Product Water Pressure Switch is available as an Optional feature on every BLS Reverse Osmosis system. Its purpose is to stop and start the BLS RO system when a pressurized storage tank is used.

Verifying Set-Point of Product Water Pressure Switch

You will need a ball valve and pressure gauge (0-100 psi) assembly with a tube connection the size of the RO system product tubing. You will also need a container to catch the product water.

Disconnect the power from the System. Close the pressurized storage tank shut-off valve. Open a valve downstream of the pressurized storage tank to relieve the pressure from the system. Disconnect the tubing from the tank shut-off valve. Connect the ball valve/pressure gauge assembly to this tubing. Open the ball valve and put it into the container. Close the downstream valve. Reconnect the power to the RO system. Slowly close the new ball valve. If the RO system shuts down when the pressure gauge reaches approximately 45 PSI, the Product Water Pressure Switch is functioning correctly.

CAUTION DISCONNECT THE POWER ANY TIME THE COVER IS REMOVED FROM A PRESSURE SWITCH.

Adjusting the Product Water Pressure Switch

If it is not set correctly, disconnect the power to the RO system and remove the black plastic cover of the pressure switch labeled “Product Water Pressure Switch.” There are two screws for adjusting the switch settings. **Do not adjust the plastic screw.** Turn the brass screw clockwise to increase both the cut-in and cut-out pressure. Turn it counter clockwise to decrease both the cut-in and cut-out pressure. Turn the screw one half turn only. Temporarily replace the cover, reconnect the power and recheck the setting. Repeat as required. When the Product Water Pressure Switch is set, reinstall the cover and tighten the locking screw. Disconnect the power, remove the ball valve or ball valve/pressure gauge assembly, reconnect the System and open the tank shut-off valve.

Identifying a Broken Product Water Pressure Switch

If the system does not shut down when the pressurized storage tank is full, the Product Water Pressure Switch needs replacing. If your system is equipped with a relief valve below the switch, it should also be expected to open and leak/spray water if the product water pressure becomes too high.

Section 12: Maintenance – Servicing the Membrane Elements

NOTE: Determining how long membrane elements will last is nearly impossible. Normally, replacement is necessary whenever the product water production decreases by 20% at the same operating pressure, or when the TDS exceeds acceptable level.

Membrane Element Replacement

1. Close the manual feed water shut-off valve.
2. The BLS System will automatically shut down.
3. Disconnect the main power supply.

IMPORTANT

BEFORE PERFORMING ANY MAINTENANCE ON YOUR BLS RO SYSTEM, ALWAYS DISCONNECT THE POWER SUPPLY!

4. Remove the upper clamp from the pressure vessel.
5. Carefully remove the top end cap from the membrane pressure vessel.
6. The membrane element may come with the end cap. If so, carefully remove it.
7. Remove the membrane element from the vessel by pulling on the product water tube. Normally this can be done by hand. If additional leverage is required, carefully use pliers.

NOTE: Observe the arrow(s) on the vessel that shows the direction of flow through the membrane vessel. If the arrow on the vessel points down, then the brine seal on the membrane element should be at the top of the vessel.

8. Check internal and external o-rings on the end caps. If they are worn or damaged, they will need to be replaced.
9. Install the new membrane element in exactly the same manner as it was removed.

NOTE: The brine seal end must always face the pressurized feed inlet to the membrane vessel. Please see illustration for example. Refer to flow labels on RO system for proper feed flow of each membrane vessel.

10. Insert the top end cap. Be careful to keep the rubber o-rings in their grooves while inserting the end cap. Use food grade silicone or glycerin to lubricate the o-rings. Do not use a petroleum-based product such as Vaseline.
11. Replace the upper clamp.

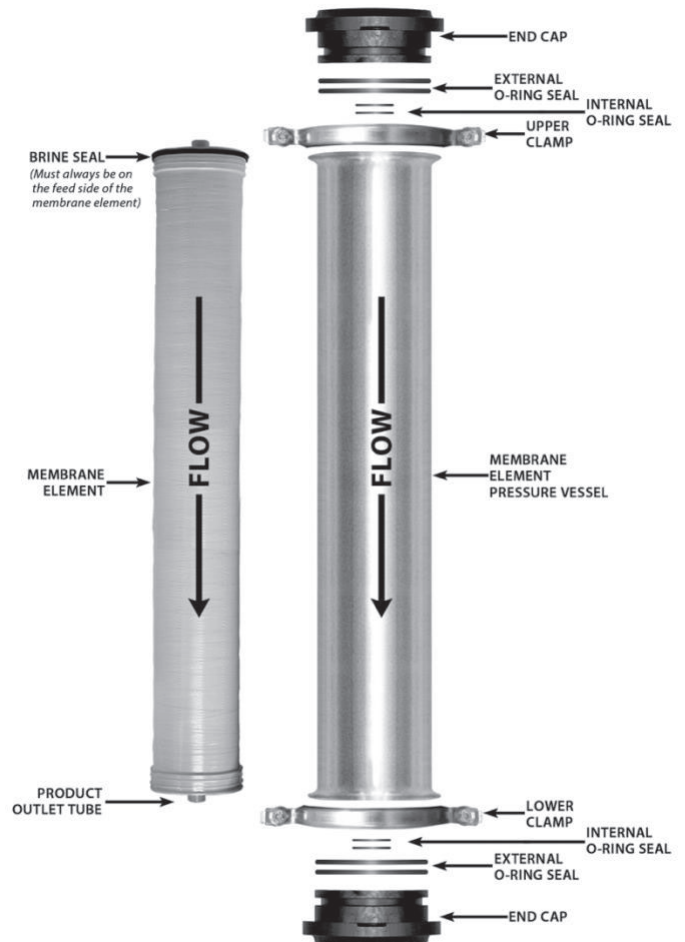
IMPORTANT

DIVERT THE PRODUCT WATER TO DRAIN FOR APPROXIMATELY 30 TO 60 MINUTES AFTER CHANGING A MEMBRANE ELEMENT. THIS IS DONE BECAUSE MEMBRANE ELEMENTS ARE TREATED WITH A PRESERVATIVE SOLUTION AND SHOULD BE THOROUGHLY RINSED CLEAN OF ANY REMNANTS. THIS CAN BE DONE EITHER BY INSTALLING A 3-WAY VALVE IN THE PRODUCT WATER LINE, OR BY DISCONNECTING THE PIPE OR HOSE/TUBE FROM YOUR STORAGE TANK.

CAUTION

BE SURE YOUR PRODUCT WATER LINE IS DISCONNECTED FROM YOUR STORAGE TANK BEFORE RESTARTING THE SYSTEM. DIVERT PRODUCT WATER TO DRAIN FOR 30 TO 60 MINUTES.

12. Reconnect the main power supply.
13. Turn on the feed water supply using the manual inlet shut-off valve and allow the system to fill with water.
14. Check for leaks.
15. Open the reject water valve and flush the system for 2 to 3 minutes.
16. Close the reject water valve and divert the product water to drain for 30 to 60 minutes.
17. After diverting to drain for 30 to 60 minutes, you may now reconnect the product water line to your storage tank.



Section 13: Maintenance – Sanitizing the System

The following procedure is recommended for preventive maintenance. It is not intended to be effective in sanitizing highly contaminated systems that have been exposed to excessive amounts of bacteria, or systems that have foul-smelling membrane elements or filters. Such systems require extensive cleaning and sanitizing. Consult your BLS RO dealer for further information.

1. Turn off the feed water supply to the system.
2. Disconnect the main power supply.

IMPORTANT

BEFORE PERFORMING ANY MAINTENANCE ON YOUR BLS RO SYSTEM, ALWAYS DISCONNECT THE POWER SUPPLY!

3. Relieve the pressure from the system by opening the Reject Water Valve and pressing the pressure relief button on the pre-filter housing.
4. Remove filter housing sump(s) by turning clockwise.
5. Remove and discard the used filter cartridges.
6. Rinse out the bottom of each filter sump and fill about 1/3 full of water. Add about two tablespoons of household bleach and scrub the cap and sump with a non-abrasive sponge or cloth. Observe the precautions printed on the bleach container. Rinse the filter sumps.
7. Pour about two tablespoons of bleach into the Sediment Pre-Filter sump. Reinstall both filter sump(s) without the filter cartridges, making sure the o-rings are seated properly.

IMPORTANT

IT IS IMPORTANT THAT THE O-RING BE PROPERLY SEATED EACH TIME A FILTER HOUSING IS REASSEMBLED OR REMOVED.

8. Empty the product water storage tank.
9. Temporarily disconnect the product water connection from the storage tank and run the line to a drain.
10. Reconnect the power supply.
11. Turn on the feed water supply and run the system until the sanitizing solution can be detected (by smell) in the product water flow.
12. Turn off the system and let it sit for 8 hours.
13. Disconnect the main power supply to the system.
14. After 8 hours, remove the filter sump as before. Empty of chlorinated water. Remove the o-ring and wipe it clean. Lubricate it with a food grade silicone or glycerin. Place the o-ring back into the groove in the sump and smooth it into place with your fingers. This step is important to ensure a proper watertight seal.
15. Insert a new filter cartridge over the standpipe in the bottom of the filter sump.
16. Replace the sump by turning counter-clockwise and hand-tighten. **DO NOT OVER TIGHTEN.**
17. Re-connect the main power supply to the system, and turn on the feed water supply. Allow the system to fill with water.
18. Hold the power icon button to start the system.
19. Check for any leaks.
20. Thoroughly flush the system of any residual chlorine by running water to drain for 10 to 15 minutes.
21. Turn off the system and reconnect the product water line to the storage tank and return the system back to normal operation.

CAUTION

THE ONLY TIME THE MEMBRANE ELEMENT SHOULD COME INTO CONTACT WITH THE CHLORINE IS DURING THIS PROCEDURE.

IMPORTANT

IF THE PRODUCT WATER STORAGE TANK IS HEAVILY CONTAMINATED, IT WILL NEED TO BE SANITIZED SEPARATELY.

Replacement Parts List

BLS 400 Optimum

115V/60Hz Model

MEMBRANE ELEMENT		
PART NO.	DESCRIPTION	QTY
60225210	Membrane Element, 2.5" x 21"	1

MEMBRANE PRESSURE VESSELS		
PART NO.	DESCRIPTION	QTY
100025212	Membrane Pressure Vessel Assembly, S/S, 2.5" x 21"	1
100021212	Cap 2.5" for S/S Vessel, with o-rings, 2 Ports	2
1300116	External O-ring for 2.5" Cap	4
1300209	Internal O-ring for 2.5" Cap	4

FILTER HOUSINGS & CARTRIDGES		
PART NO.	DESCRIPTION	QTY
22158129-2	Filter Housing, 20" Slim Line, 3/8", without pressure relief, D&T	1
22151121	O-ring for Slim Line Housing	1
14815508	Pre-filter 20" 5-Micron Sediment Cartridge	1
149252010	Pre-filter 20" 10-Micron Carbon Block Cartridge <i>(Optional)</i>	1

SOLENOID VALVES		
PART NO.	DESCRIPTION	QTY
00938120E	Inlet Solenoid Valve, w/ Coil, 3/8" Brass, 115V/60Hz	1
009014120E	Auto Flush Solenoid Valve, w/ Coil, 1/4", Brass, 115V/60Hz	1

PUMPS & MOTORS		
PART NO.	DESCRIPTION	QTY
3033501	Pump, Rotary Vane, Brass, 125 GPH, 3/8" NPT, with clamp	1
3033511	Pump, Rotary Vane, Stainless Steel, 125 GPH, 3/8" NPT, with clamp <i>(Optional)</i>	1
3011113	V-Band Clamp for Pump (Replacement only)	1
3100337	Motor, 1/3HP, 115V, 60Hz, 1Ph	1

MISCELLANEOUS		
PART NO.	DESCRIPTION	QTY
4438	Check Valve, Product Water, 3/8", JG	1
48421001	Flowmeter, Product & Reject, 0.1-1 GPM	2
008001	Gauge, Pressure, Inlet & Filter, 0-100 psi, 2", Bottom Mount	2
008013	Gauge, Pressure, System Operating, 0-300 psi, 2.5", Panel Mount	1
1720114	Pressure Regulator, System Operating, 1/4" In, 1/8" Out	1
17506902	Pressure Switch, Low Level Cut-Out	1
17506905	Pressure Switch, Product Water <i>(Optional)</i>	1
312503	Reject Needle Valve, 1/2"	1

BLS RO System Troubleshooting

PROBLEM	POSSIBLE CAUSE	SOLUTION
RO SYSTEM WILL NOT START	No electrical power	Check power supply
	Storage tank full	Drain portion of water out of tank
	Low feed water pressure	See LOW FEED PRESSURE
	Pump/motor malfunction	Check, replace if necessary
	Pressure or float switch defective	Check, replace if necessary
LOW FEED PRESSURE	Manual feed water valve not open	Open valve
	Inlet solenoid valve not open	Check, replace if necessary
	Low inlet water pressure	Check, increase pressure
	Filters plugged	Check, replace if necessary
	Obstructed feed line	Check inlet piping
	Inadequate upstream pre-treatment	Check if sized correctly or fouled
LOW OPERATING PRESSURE	Pressure regulator needs adjustment	Check, adjust if necessary.
	Operating pressure gauge broken	Check, replace if necessary
	Pump impellers worn	Check, replace if necessary
	Pump/motor coupling broken	Check, replace if necessary
	Low water volume to pump	See LOW FEED PRESSURE
	Malfunctioning pump	Check, replace if necessary
	Membrane element brine seal is folded or not sealed against housing wall	Check brine seal, use care when reinstalling the membrane into the vessel
	Inlet solenoid valve not opening	Clean solenoid valve or replace
	Membrane element fouled	Check, clean or replace
	Manual flush valve open	Close manual flush valve
THE PUMP DOES NOT RUN	Pump is bound	Manually check pump rotation, replace if necessary.
	Pump/Motor coupling damaged	Remove pump from motor. Check, replace if necessary.
LOW OR NO REJECT WATER / HIGH PUMP PRESSURE	Restricted orifice	Check and clean
	Clogged drain line	Check and clean
	Membrane element clogged or fouled	Check, clean or replace
LOW OR NO PRODUCT WATER	Operating pressure low	Check and adjust
	Membrane element clogged or fouled	Check, clean or replace
	Water temperature too low	Check, consult dealer if necessary
	Product check valve damaged	Check, replace if necessary
	Tank over - pressurized	Check tank air pressure. Relieve to 10 PSI if necessary
	Membrane element installed backward or brine seal damaged/rolled	Check, use care when reinstalling the element into the housing.

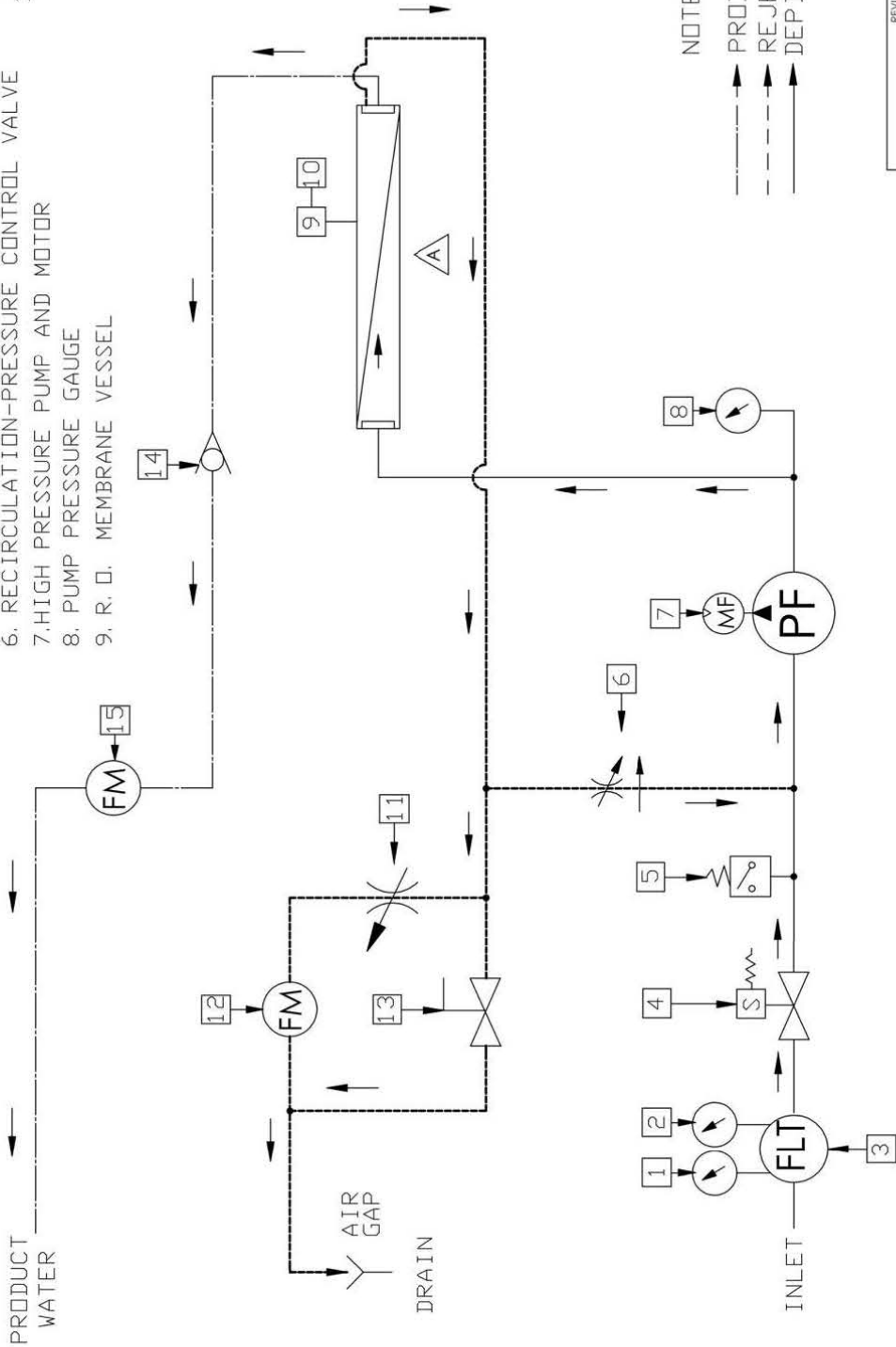
(system troubleshooting continued on next page)

(system troubleshooting continued from last page)

PROBLEM	POSSIBLE CAUSE	SOLUTION
BAD TASTING WATER	Increase in feed water TDS	Check feed water TDS
	Filter cartridges exhausted	Replace filter cartridges
	Tank and system contaminated	Replace filter cartridges and membrane, sanitize system and tank
	Tank contaminated	Re-sanitize tank
	Tank diaphragm ruptured	Replace tank
	Membrane not flushed completely	Flush one or two tanks of product water to drain
CLOUDY WATER	Dissolved air in feed water concentrated in product water	Usually clears up as condition of feed water changes. Letting water stand will allow dissolved air to dissipate
HIGH TDS IN PRODUCT WATER	Membrane element expended	Check, replace if necessary
	Insufficient brine flow rate	Check, reject flow must be at least equal to product flow
	Increase in feed water TDS	Check inlet TDS, see Operating Specifications for rejection rate.
	Product tube o-rings damaged or out of place	Remove membrane element from housing. Re-install or replace o-rings on membrane element product tube

COMPONENT LIST

- 1. PRE-FILTER INLET PRESSURE GAUGE
- 2. PRE-FILTER OUTLET PRESSURE GAUGE
- 3. PRE-FILTER HOUSING & SEDIMENT CARTRIDGE
- 4. INLET WATER SOLENOID VALVE
- 5. LOW PRESSURE CUT-OFF SWITCH
- 6. RECIRCULATION-PRESSURE CONTROL VALVE
- 7. HIGH PRESSURE PUMP AND MOTOR
- 8. PUMP PRESSURE GAUGE
- 9. R. D. MEMBRANE VESSEL
- 10. R. D. MEMBRANE ELEMENT
- 11. REJECT VALVE
- 12. REJECT WATER FLOW METER
- 13. MANUAL FLUSH VALVE
- 14. PRODUCT WATER CHECK VALVE
- 15. PRODUCT WATER FLOW METER

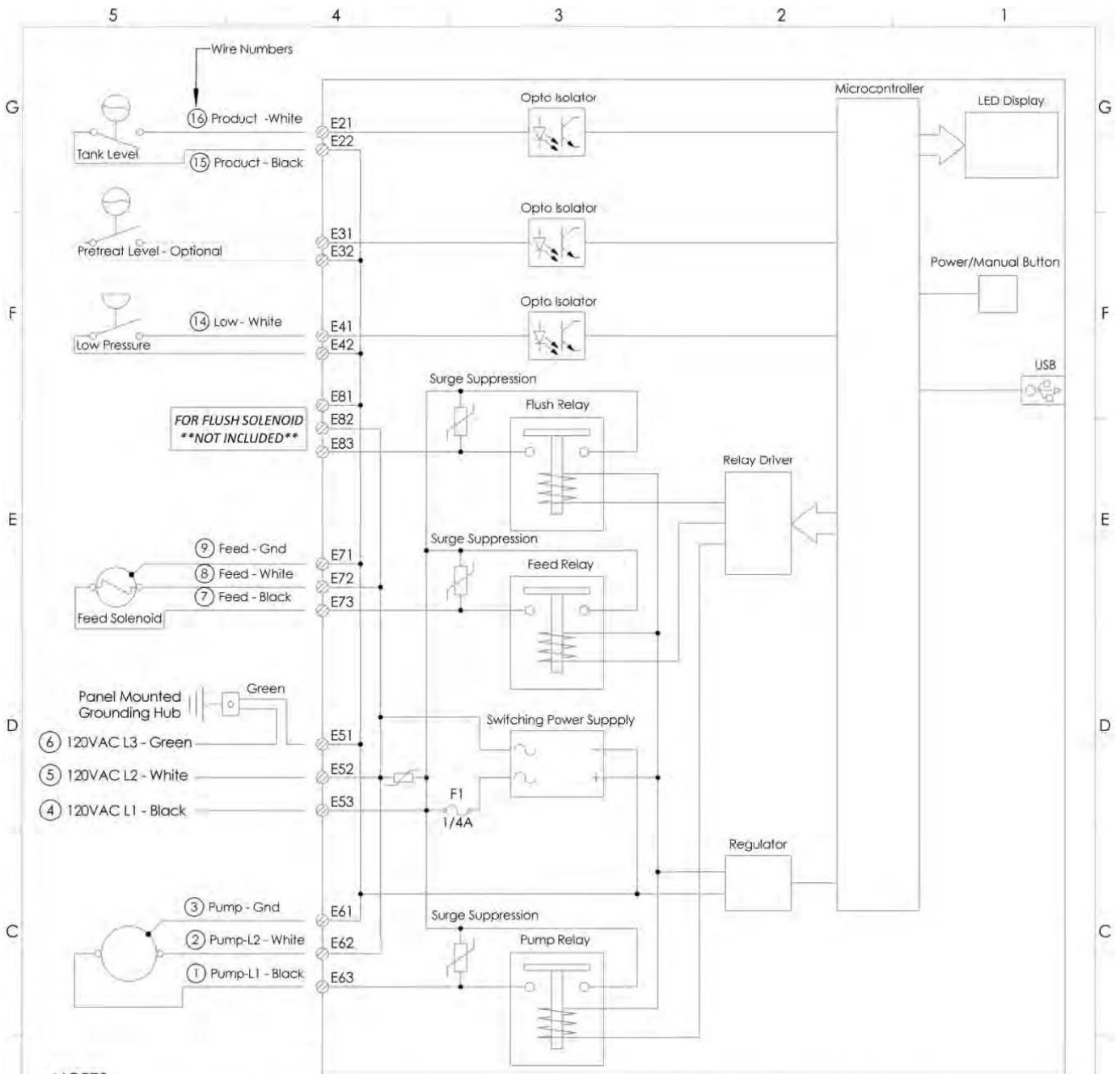


NOTE:

- PRODUCT WATER
- - - REJECT/RECIRCULATING WATER
- DEPICTS WATER FLOW

DESCRIPTION	NO.	DATE:	BY:
REVISIONS:			
UNLESS OTHERWISE DIMENSIONS ARE IN INCHES:			
ANGLES: 1°			
TOLERANCES:			
FRACTIONS: 1/16, 1/8, 1/4, 3/8, 1/2, 5/8, 3/4, 7/8, 1, 1 1/8, 1 1/4, 1 1/2, 1 3/4, 2, 2 1/4, 2 1/2, 3, 3 1/4, 3 1/2, 4, 4 1/4, 4 1/2, 5, 5 1/4, 5 1/2, 6, 6 1/4, 6 1/2, 7, 7 1/4, 7 1/2, 8, 8 1/4, 8 1/2, 9, 9 1/4, 9 1/2, 10			
PROPRIETARY AND CONFIDENTIAL			
DATE: 5/8/08		DWS. NO. BLS400-STD	
DRAWN BY:		SHEET 1 OF 1	

System Electrical Schematic



NOTES:

1. DASHED LINES INDICATE FIELD WIRING BY INSTALLER.
2. ALL SWITCH INPUTS MUST BE DRY CONTACTS ONLY! RO CONTROLLER WILL BE DAMAGED IF VOLTAGE IS APPLIED TO THESE INPUTS.
3. FOR POWER WITH NEUTRAL AND HOT LEADS, L1 IS HOT AND L2 IS NEUTRAL.
4. 12-20A FUSING MUST BE INSTALLED TO SUPPLY POWER.
5. CAUTION! THIS SYSTEM MUST BE INSTALLED WITH DISCONNECTING MEANS AS PER ELECTRICAL CODE.
6. WIRING DIAGRAM APPLIES ONLY TO REO PURE SYSTEM COMPONENTS.

REVISIONS			
#	DESCRIPTION	DATE	BY
PROPRIETARY AND CONFIDENTIAL			

BLS 400-2400 STANDARD MODELS ELECTRICAL SCHEMATIC		
UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE IN INCHES.	TOLERANCES: ANGULAR: ± 1° XX ± 0.3 XXX ± 0.05	
DRAWN BY:	DATE:	SHEET 1 OF 1

