Installation, Operation, and Maintenance Manual

BLS 9000 Optimum

REVERSE OSMOSIS SYSTEM

AUGUST 2023

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BLS Reverse Osmosis System Introduction

Your BLS Reverse Osmosis System has been designed to produce quality water for a variety of applications. We are confident that you will find BLS Systems provide quick and simple installation, hassle-free maintenance, and years of reliable and trouble-free operation.

BLS RO Systems incorporate years of engineering experience, dedicated workmanship, and quality manufactured components. Each system is built with pride and is factory tested for superior performance.

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

HOW REVERSE OSMOSIS WORKS

In the reverse osmosis process, water is forced under pressure through a semipermeable 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 conventional 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 water are not held within the system, but instead flushed away.

DEFINITIONS

Feed Water – The incoming water to be processed by the RO system.

Product Water (permeate) – The portion of the feed water that has passed through the membrane element. It is the desired result of a RO system.

Concentrate Water (reject or drain water plus recirculation) – The portion of the 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 as a way to minimize the amount of water sent to drain.

Recovery – The percentage of feed water which 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).

FACTORS AFFECTING SYSTEM OPERATION AND PERFORMANCE

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 above 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, the pH is not within the tolerable range, or when hydrogen sulfide is present. Refer to the System Specifications section of this manual. Additional pretreatment may be required in these cases.

Bacteria – When RO systems are operated intermittently, they will likely be exposed to bacteria. Following a prolonged shutdown or storage period, the system should be sanitized. Refer to the Sanitizing the RO System section in this manual regarding sanitization.

Membrane Element Fouling or Surface Coating – Fouling is a common problem with membrane elements as a result of salts, hardness, iron, etc. collecting on the membrane surface. As the pores and channels of the membrane element become plugged, the water production rate is reduced. Pretreatment equipment, such as a water softener, iron filter, or activated carbon filter will reduce membrane element fouling and extend its life.

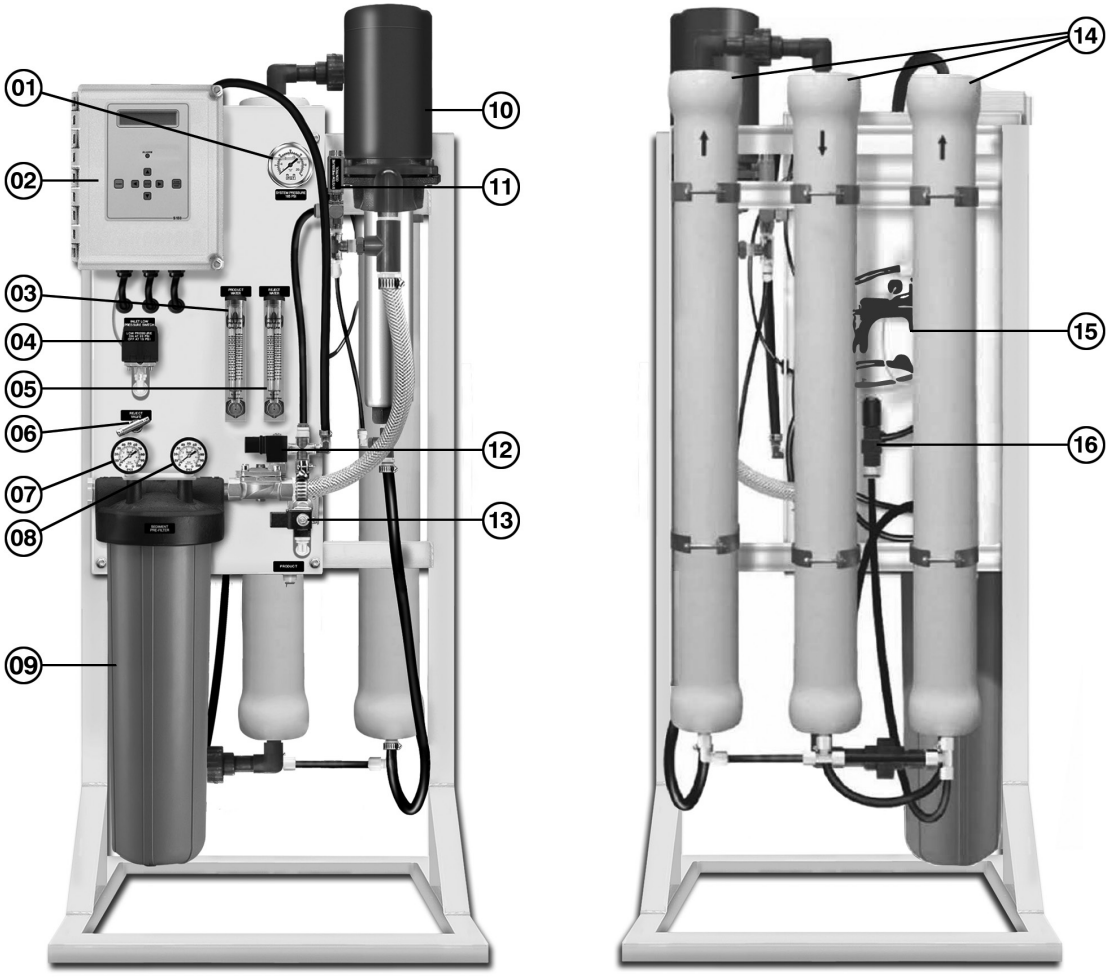
GETTING TO KNOW YOUR BLS RO SYSTEM

BLS 9000 OPTIMUM

It is important that you familiarize yourself with the BLS RO System. Pictured below is the BLS RO System with the main components identified. These components will be referred to throughout the manual. Noting their location will assist you in startup and maintenance of the RO system.

MAJOR COMPONENTS PARTS LIST

1. System Operating Pressure Gauge
2. S-150 RO Controller
3. Product Water Flow Meter
4. Inlet Feed Water Low Pressure Switch
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. Pump/Motor
11. Pressure Regulator
12. Inlet Solenoid Valve
13. Auto Flush Solenoid Valve
14. Membrane Pressure Vessels
15. Product Water TDS Probe
16. Product Water Check Valve



THIS MANUAL COVERS THE INSTALLATION, OPERATION, AND MAINTENANCE OF THE BLS 9000 OPTIMUM SYSTEM. IT IS IMPORTANT TO READ THIS MANUAL THOROUGHLY BEFORE INSTALLING THE SYSTEM.

SYSTEM SPECIFICATIONS

SYSTEM OPERATION SPECIFICATIONS

Production Rate	9,000 gpd / 6.3 gpm (34,069 lpd / 23.7 lpm)
Membrane Elements	(3) 4 x 40 High Flux TFC Polyamide
Rejection Rate	95 to 99%
Recovery Rate	50 to 70%
Nominal Flow of Feed Water During Operation	9.45 gpm
Nominal Flow of Feed Water During System Flush	16 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
Product Water Back Pressure Maximum	50 psi
Pre-Filtration Minimum	5 micron*

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

FEED WATER PARAMETERS

This system is designed for use on potable water sources only.

Temperature	40 to 85ºF
Inlet Feed Water Pressure	35 to 85 psi
Chlorine Maximum	0.1 ppm
Hardness Maximum	10 gpg
Oil Tolerance	0.0 ppm
Silt Density Index (SDI)	5
Turbidity Maximum	1 NTU
pH	3 to 10
Hydrogen Sulfide	Must be removed
Iron Maximum (Dissolved Only)	0.01 ppm
TDS Maximum	2,000 ppm
Operating Pressure Maximum	180 psi

DIMENSIONS AND WEIGHT

Height	60 inch (152 cm)
Width	25 inch (64 cm)
Depth	21 inch (53 cm)
Weight (approximate)	300 lb (136 kg)

SERVICE CONNECTIONS

Feed Water Inlet	3/4 inch FNPT
Reject Outlet to Drain	1/2 inch Tube
Product Outlet Storage	1/2 inch Tube

DESIGN TEST CONDITIONS

Feed Water TDS	500 ppm as NaCl
Operating Pressure	165 psi
Feed Water Temperature	77ºF (25ºC)
System Design Recovery	70%

SYSTEM INSTALLATION INSTRUCTIONS

IMPORTANT! ***Installation must comply with local plumbing, electrical, and sanitation codes.***

IMPORTANT! ***Do not use this system to make safe 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 pH of less than 6.5, 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 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.

STEP ONE

Unpack Your BLS 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 container and inspect it for signs of concealed damage which may have occurred during shipping. If damage has occurred, contact the delivering carrier and file a claim for damages.

NOTE! ***Do not, under any circumstances, remove any caution, warning, or other descriptive labels from the BLS RO System.***

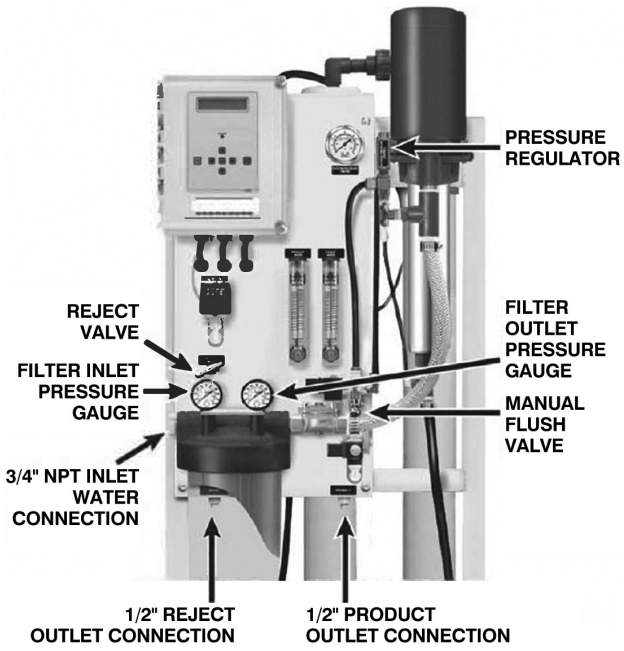
STEP TWO

Select an Installation Site
Your BLS System should be positioned on a hard level surface capable of supporting the entire weight of the system. See the System Specifications section of this manual for approximate weight and dimensions.

STEP THREE

Feed Water Supply Connections
A cold water supply source must be located within close 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 minimum feed water line of 3/4 inch hose or pipe.



CAUTION! ***Do not connect a hot water line to the BLS System. Feed water must be a cold water supply.***

STEP FOUR

Product Water Connection
During the initial startup 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 the first 30 to 60 minutes of operation because membrane elements are treated with preservation solution that should be rinsed free.

If an atmospheric storage tank is being used, a tank level float control switch and repressurization system (optional features) 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 product water safety pressure switch is factory wired to initiate a pressure fault alarm when the product water back pressure reaches 45 psi. The dry contact wires are connected directly to the TANK FULL HIGH terminals of the RO controller. The switch will then shut the system off when the tank pressure reaches 45 psi.

SYSTEM INSTALLATION INSTRUCTIONS (continued)

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 1/2 inch tubing or 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 Startup Procedure section of this manual regarding additional steps required, prior to connecting the storage tank. For now, divert this line to your wastewater drain.

STEP FIVE

Drain/Reject Water 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 1/2 inch tubing or pipe, connect this outlet port to your wastewater drain.

NOTE! ***It is recommended to install an air gap connection to prevent wastewater backflow.***

STEP SIX

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 specified on the serial number label. See the wiring diagrams at the end of this manual for the correct power connections in the control enclosure.

IMPORTANT! ***This system must be installed with disconnecting means required as per electrical code.***

CAUTION! ***A water softener should not be allowed to regenerate while the BLS RO System is operating, unless pre-treatment interlock safeguards are used to be sure the system is shutdown.***

CAUTION! ***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 SEVEN

Tank Level Float Control Switch & Pretreatment Lock-out Switch
On terminal strip P9 on the microprocessor controller PC board, there are terminals labeled TANK FULL HIGH. A jumper was installed across these terminals before the system was shipped. Remove this jumper and connect a Normally Closed (NC) tank level float control switch.

On terminal strip P9 on the microprocessor controller PC board there are terminals labeled PRETREAT. A jumper was installed across these terminals before the system was shipped. Remove this jumper and connect a Normally Closed (NC) switch from the softener or filter which will open during the complete backwash/regeneration cycle.

NOTE! ***If you are not using one or both of these sets of terminals, the jumpers must remain in place or the system will not operate.***

CAUTION! ***Switch inputs are for dry contacts only. Applying any voltage to these terminals will damage the controller.***

STEP EIGHT

Install Filter Cartridge
Refer to the Filter Cartridge Installation and Replacement section in this manual.

STEP NINE

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! ***Prior to startup of the system, visually inspect the inlet, drain, and product water connections completely. Check to be sure the system is connected to a properly grounded electrical power supply with the appropriate voltage, phase, and hertz.***

S-150 RO CONTROLLER GUIDE

IMPORTANT! ***Be sure to read the S-150 RO Controller Guide section carefully before attempting to operate this BLS System and before changing any controller settings. Do not attempt to change any controller settings without carefully reading this section of the manual.***

CONTROLLER INTRODUCTION

Your BLS System is controlled by a Series 150 (S-150) RO Microprocessor Controller. It is a state-of-the-art control system for commercial and industrial RO systems.

The S-150 is a microprocessor controlled system that can monitor pressure and level switches. A TDS/Conductivity monitor/controller with programmable setpoints also plays an integral part of the S-150. The S-150 displays system status, switch conditions, and sensor readings on an easy-to-read backlit display. User programmable setpoints are provided to allow fast and easy adjustments of system parameters.

CONTROLLER SPECIFICATIONS

Power
120/240 VAC –15+10%, 50/60 Hz, 25 Watts

Environment
–22ºF to 140ºF, 0 to 95% RH, non-condensing

Enclosure
8 x 6 x 4 inch (203 x 152 x 102 mm) NEMA 4X

Display
2 line x 20 character, alphanumeric backlit LCD

Front Panel
Overlay with LCD window, alarm lamp, 7-key membrane switch

Switch Inputs, Dry Contact
Pressure fault, pretreat lockout, tank full high, tank full low

Relay Outputs

RO pump relay	120/240 VAC, 1 HP*
Inlet valve relay	120/240 VAC, 5 A
Flush valve relay	120/240 VAC, 5 A

Relays supply the same output voltage as board power (120 or 240 VAC), 20 A maximum total load.

* Based on service factor of 1.0.

Cell
TDS/Conductivity cell with digital display

Standard range	0 to 250 ppm or µS
Other ranges available	50, 100, 500, 1000, 2500, 5000
Wetted parts	ABS and 316SS, 3/4 inch NPTM, 300 psi max.

I/O Expander (Optional)

Aux/divert/boost relay	120/240 VAC, 1 HP
Divert/alarm relay	120/240 VAC, 5 A
Tank low switch input	Dry contact

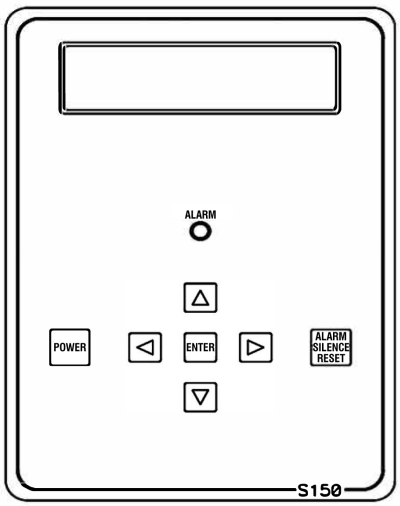


FIGURE 1

FRONT PANEL CONTROLS AND INDICATORS

Display – Shows the status of the RO System.

Alarm Lamp – Flashes when a fault causes an RO system shutdown. On steady when a setpoint is exceeded that does not cause an RO system shutdown.

Power Key – Places the controller in operating or standby mode.

Left Arrow Key – Scrolls through the setpoints starting with the first setpoint.

Right Arrow Key – Scrolls through the setpoints starting with the last setpoint.

Up Arrow Key – Increases the value of a setpoint.

Down Arrow Key – Decreases the value of a setpoint

Enter Key – Confirms the entry of a new setpoint value.

Alarm Silence/Reset Key – Push once for alarm silence, and twice to reset the system after a shutdown has occcurred.

S-150 RO CONTROLLER GUIDE (continued)

IMPORTANT! ***Refer to the BLS RO Controller S-150 Setpoints table in this manual for a list of factory presets. The write protect jumper (J3) is in the ON position (center and right pins). To make changes to setpoints, the write protect jumper must be in the OFF position (center and left pins). After any change is made, remember to press the ENTER button to save changes, and return the jumper back to the ON position. For future reference, a note should be added to the setpoint table to indicate any setpoint changes that were made.***

TERMINAL STRIP, JUMPER, AND ADJUSTMENT LOCATIONS

Refer to the Electrical Schematics in this manual for the location of all terminal strips and connectors. The Electrical Schematics also show all jumper and adjustment locations.

POWER WIRING

Refer to the Electrical Schematics in this manual for terminal strip and jumper locations. Before applying power to the unit, verify that the voltage jumpers are configured correctly for the voltage that will power the unit. The voltage jumpers are located below the transformer. For 120 VAC operation, there should be a wire jumper installed between P2 and P3 and a second wire jumper installed between P4 and P5. For 240 VAC operation, a single wire jumper should be installed between P3 and P4.

AC power for the unit is connected to terminal strip P1. Connect the ground wire of the AC power to the terminal labeled GND. For AC power with a neutral and hot wire, the hot wire connects to L1 and the neutral wire connects to L2. For AC power with two hot wires, either wire can connect to L1 and L2. On AC power with two hot wires, the wire jumper between P6 and P7 should be removed and a fuse (GMA 1/4A) installed in F2.

PUMP AND RELAY OUTPUTS

The S-150 supplies relay outputs to control the RO pump and solenoid valves.

NOTE! ***The relays output the same voltage as the AC power to the board. If the pump and solenoids operate on different voltages, a contactor will need to be supplied to operate the pump.***

RO PUMP WIRING

The RO pump connects to the L1 and L2 RO pump terminals of P1. This output can operate 120/240 VAC motors up to 1 HP directly. For motors larger than 1 HP or 3-phase motors, this output can be used to operate a contactor.

INLET AND FLUSH SOLENOID WIRING

The inlet and flush valves must operate at the same voltage as supplied to the board. These outputs can supply 5 A maximum and are not designed to operate pump motors directly. If these outputs are to be used to operate a boost or flush pump, the output should be used to operate a contactor. The inlet valve connects to the L1 and L2 inlet terminals of P1. The flush valve connects to the L1 and L2 flush terminals of P1.

TDS/CONDUCTIVITY CELL WIRING

For accurate TDS/Conductivity readings, the cell should be installed in a tee fitting where a continuous flow of water passes over the cell and no air can be trapped around the cell. The cell is connected with five wires to terminal strip P10. Connect each colored wire to the terminal labeled with the same color.

SWITCH INPUTS

Switch inputs are connected to P9. The connections for these inputs are not polarity sensitive and can be connected to either terminal. The switch inputs should be dry contact closures only.

SWITCH	NO	NC	VALUE
Pressure Fault	0	1	1
Pretreat	0	2	2
Tank Full High	0	4	4
Tank Full Low	0	8	0
Tank Low	0	16	0
		TOTAL	**7**

TABLE 1

Referencing Table 1, select the type of switch used for each input and put that number in the value column. Add the values and program the total in the Switch Select Setpoint. In the Table 1 example, the Pressure Fault, Pretreat, and Tank Full High inputs are Normally Closed (NC) and the Tank Full Low and Tank Low inputs are Normally Open (NO). Therefore, the value programmed in the Switch Select Setpoint would be 7 (1 + 2 + 4 + 0 + 0).

S-150 RO CONTROLLER GUIDE (continued)

CAUTION! ***Applying voltage to these terminals will damage the controller. The switches can be either Normally Open (NO) or Normally Closed (NC) in any combination. The switch connected to an input that is configured as Normally Open (NO) must be open for the unit to run. The switch connected to an input that is configured as Normally Closed (NC) must be closed for the unit to run. The Switch Select Setpoint allows each input to be configured as Normally Open (NO) or Normally Closed (NC). The Switch Select Setpoint is defaulted to 0, which programs all inputs as Normally Open (NO). This means that all switch inputs must be open for the unit to run. Table 1 lists the values used to program the setpoint to configure the inputs.***

Pressure Fault Switch
On systems where a low feed pressure shutdown is required, a feed pressure switch can be connected to the pressure fault input of P9. If a high pump pressure shutdown is required, a high pressure switch can be connected to this input. If both low feed pressure and high pump pressure shutdowns are required, both switches can be connected to this input. Both switches must be either Normally Open (NO) or Normally Closed (NC) to operate properly.

IMPORTANT! ***The output from a pressure switch must be a dry contact and must not supply voltage.***

Pretreat Switch
In systems with pretreatment, a pretreat lockout switch can be connected to the pretreat input of P9. This switch should operate when the pretreatment device is out of service.

IMPORTANT! ***The output from the pretreatment device must be a dry contact and must not supply voltage.***

Tank Full Switch
In systems with a single tank level switch for controlling the RO pump, the level switch connects to the tank full high input of P9. If dual level switches are used for controlling the RO pump, the upper level switch connects to the tank full high input of P9, and the lower level switch connects to the tank full low input of P9. Remove the red jumper that was shipped with the RO system when this option is used. Refer to the Electrical Schematics in this manual for terminal strip and jumper locations.

IMPORTANT! ***The output from the tank level switch must be a dry contact and must not supply voltage.***

I/O EXPANDER BOARD (OPTIONAL)

If the optional I/O expander board is installed, two additional relay outputs and one additional switch input are provided. AC power for the relays is connected to the L1 and L2 power terminals of P1. Relay 1 is connected to this power input and will supply the same voltage. This relay is rated for 120/240 VAC at 1 HP maximum. Relay 1 can be configured to supply a dry contact by connecting a jumper wire between the L1 and L2 power terminals of P1.

NOTE! ***If Relay 1 is configured as a dry contact, Relay 2 must be configured as a dry contact also. If Relay 1 is configured to supply voltage, Relay 2 can be selected to supply voltage, 120/240 VAC, 5 A maximum, or as a dry contact output.***

Jumpers J1 to J4 are used to select the Relay 2 output type. To output voltage, a wire jumper is installed between J1 and J4 and a second wire jumper is installed between J2 and J3. For a contact closure output, a single wire jumper is installed between J3 and J4. The two relay outputs can be selected to operate as an auxiliary pump output, a divert output, or an alarm output by programming the Expander Mode Setpoint. Table 2 shows the values used to program the relay outputs.

EXPANDER MODE	RELAY 1	RELAY 2
0	Auxiliary Pump	Divert
1	Auxiliary Pump	Alarm
2	Divert	Alarm
3	Boost	Divert
4	Boost	Alarm

TABLE 2

Auxiliary Pump
If the Expander Mode Setpoint is programmed to 0 or 1, Relay 1 operates as an auxiliary pump output. This output is energized when the tank low input is not active. This output will supply power or a contact closure, as determined by the connections L1 and L2 of the terminal strip P1.

Boost Pump
If the Expander Mode Setpoint is programmed to 3 or 4, Relay 1 operates as a boost pump output. This output is energized when the inlet solenoid output is active. This output will supply power or a contact closure, as determined by the connections L1 and L2 of the terminal strip P1.

S-150 RO CONTROLLER GUIDE (continued)

Divert Output
If the Expander Mode Setpoint is programmed to 0 or 3, Relay 2 operates as a divert relay and will operate whenever the unit is in the divert mode. ZThis output will supply voltage or provide a contact closure based on the configuration of Relay 1 and on the position of jumpers J1 to J4. If the Expander Mode Setpoint is programmed to 2, Relay 1 operates as a divert relay and will operate whenever the unit is in the divert mode. This output will supply power or a contact closure, as determined by the connections L1 and L2 of the terminal strip P1.

Alarm Output
If the Expander Mode Setpoint is programmed to 1, 2, or 4, Relay 2 operates as an alarm relay. When an alarm or warning is active, this relay will supply voltage or provide a contact closure based on the configuration of Relay 1 and the position of jumpers J1 to J4.

Tank Low Switch
A tank low switch input can be connected to the tank low input of P2 on the expander board. This input will provide a tank low warning on the unit, and if the expander is programmed to provide an auxiliary pump output, it will provide low tank level protection for this pump.

CHANGE OR DISPLAY SETPOINTS

IMPORTANT! ***Setpoints cannot be changed if the write protect jumper is in the ON position.***

1. Refer to Figure 1 for the location of the keys used to display or change the setpoints, and the Electrical Schematics in this manual for the location of the write protect jumper, J3. For the unit to be able to accept a change in a setpoint, the shorting jumper must be in the OFF position (center and left pins).
2. Use the left and right arrow keys to display the setpoints. Each press of an arrow key will advance the display to the next setpoint. The left arrow key starts with the beginning setpoint, and the right arrow key starts with the last setpoint.
3. The up and down arrow keys are used to increment or decrement the setpoint value. The value will change by one (1) count each time a key is pressed. If the key is pressed and held for approximately one (1) second, the setpoint value will change at a fast rate. When the key is released, the fast rate will be reset. Pressing both the up and down arrow keys together will reset the setpoint value to zero (0).
4. Pressing the Alarm Silence/Reset key at any time will cancel the operation and return the display to the main screen.
5. To save the new setpoint value, press the Enter key.
6. The unit will beep twice if the change is accepted. If the write protect jumper is on, the unit will show WRITE PROTECTED on the display and one long beep will sound.
7. When finished changing setpoints, the write protect jumper should be placed in the ON position (center and right pins).

SYSTEM OPERATION

The unit has two modes of operation, a standby mode and an operating mode. In the standby mode, the unit is effectively off. All outputs are turned off and the display shows STANDBY. In the operating mode, the unit operates automatically. All inputs are monitored and the outputs are controlled accordingly. Pressing the Power key will toggle the unit from standby to operate, or from operate to standby. If power is removed from the unit, when power is reapplied, the unit will restart in the mode it was in when power was removed.

DISPLAY

The display is a 2-line x 20-character backlit liquid crystal display. System operating status and sensor readings are shown on this display. Setpoint information is also shown on this display.

OPERATING STATUS MESSAGE

The operating status of the unit is shown on the top line of the display. The following list describes the items shown for the operating status.

STANDBY — The unit is in the standby mode.

DELAY 99 — The unit is in the RO start delay. The number is the seconds remaining before the RO pump starts.

OPERATING — The RO unit is operating.

TANK FULL — The unit is shut down due to a tank full condition.

TANK FULL 99 — The unit is shut down due to a tank full condition. If the number is blinking, the tank full high switch has cleared, but the tank full low switch is still active. If the number is on steady, both tank level switches have cleared and the delay is counting down.

PRETREAT — The unit is shut down due to a pretreat lockout condition.

PRESS FAULT — The unit is shut down due to a pressure fault condition.

MEMB FLUSH 99 — Membrane flush is active. The number is the minutes remaining in the flush cycle.

S-150 RO CONTROLLER GUIDE (continued)

TDS/CONDUCTIVITY

The TDS/Conductivity is shown on the top line after the unit operating status. When the unit is offline because of a shutdown condition, the reading is replaced with '----'. If the reading is over range, the reading is shown as '^^^^'.

OPERATING HOURS

The current operating hours are shown on the bottom line.

WARNING MESSAGES

Warning messages are also shown on the second line. If any warnings are active, the active warnings will alternate with the normal displays for the bottom line. The following lists the warning messages.

HI TDS/Cond — The TDS/Conductivity reading has exceeded the programmed limit.

TANK LOW — The tank low input is active.

TANK LOW 99 — The tank low input has cleared, but the tank low restart delay is active. The number is the minutes left in the delay.

OP HOURS EXCEEDED — The current operating hours have exceeded the programmed limit.

TANK FULL OPERATION

The unit can be operated with one or two level switches. With one level switch, the switch is connected to the tank full high input. When this switch has been active for five (5) seconds, the unit will shut down on tank full. TANK FULL will show on the display. When the tank full condition clears, the display will show TANK FULL 99. The number is the tank full restart time and the unit will restart when this delay times out.

For two level switch operation, the upper switch is connected to the tank full high input, and the lower switch is connected to the tank full low input. When both switches are clear, the RO unit will run. The RO unit will continue to run when the water level rises and the lower switch becomes active. When the upper switch becomes active, after the five (5) second delay, the RO unit will shut down. TANK FULL will show on the display. When the tank level drops and the upper level switch clears, the display will show TANK FULL 99 and the RO unit will remain off. The number is the tank full restart time and the number will blink until the lower level switch clears. When the lower level switch clears, the number will remain steady and the RO will restart when the delay times out.

TANK FULL RESTART

The tank full restart is the delay before the RO unit starts when a tank full condition clears. This delay can be in minutes or in seconds. The TF Restart Setpoint selects seconds or minutes.

TANK FULL OVERRIDE

A timed tank full override can be initiated when the RO unit is shut down due to a tank full condition. Pressing the Alarm Silence/Reset key for three (3) seconds during a tank full condition will enable the tank full override. The RO will start and TF OVERRIDE 9 will show on the display. The number is the minutes remaining in the override timer. When the override times out, the unit will return to the tank full shut down condition.

PRESSURE FAULT

If the pressure fault input becomes active and stays active for the delay programmed in the PF Delay Setpoint, the unit will shut down for a pressure fault. The display will show PRESS FAULT, the alarm lamp will flash, and the audible alarm will sound. The pressure fault can be cleared by pressing the Alarm Silence/Reset key twice.

AUTO RESET

If a pressure fault shutdown occurs and the Auto Reset Setpoint is programmed to zero (0), the unit will remain shut down until manually reset. If the Auto Reset Setpoint is programmed to a value greater than zero (0), the unit will automatically clear the pressure fault and attempt to restart after this delay times out.

ALARM SILENCE

When a shut down occurs that causes the audible alarm to sound, the alarm can be silenced by pressing the Alarm Silence/Reset key once. The alarm will remain silenced if the Alarm Silence Setpoint is programmed to zero (0). If the Alarm Silence Setpoint is programmed to a value greater than zero (0), the alarm will resound after this delay times out. Pressing the Alarm Silence/Reset key will silence the alarm and reset this delay.

PRETREAT

If the pretreat input becomes active and stays active for two (2) seconds, the unit will shut down in a pretreat lockout condition. PRETREAT will show on the display and the unit will remain shut down as long as the pretreat input is active.

S-150 RO CONTROLLER GUIDE (continued)

MEMBRANE FLUSH

If the BLS RO System is an Optimum (OPTI) model, a flush solenoid valve has been equipped and the Flush Type Setpoints can be used to enable a membrane flush at different times.

If the Flush Type Setpoint is programmed to zero (0), flush is disabled. If membrane flush is desired, several types of flush are available. When the RO system enters a flush cycle, the flush relay will activate. The flush cycle will last for the time programmed in the Flush Time Setpoint. Table 3 shows the value that must be programmed in the Flush Type Setpoint for each type of flush.

FLUSH TYPE	DESCRIPTION
0	NO FLUSH
1	TANK FULL
2	OPERATING HOURS
3	OPERATING HOURS & TANK FULL
4	ELAPSED TIME
5	ELAPSED TIME & TANK FULL
6	OFF HOURS
7	OFF HOURS & TANK FULL
8	RO START/STOP

TABLE 3

TANK FULL — The RO unit will flush each time a tank full condition occurs.

OPERATING HOURS — A flush will occur when the RO pump has operated for the number of hours programmed in the Flush Interval Setpoint.

ELAPSED TIME — A flush will occur after the number of hours programmed in the Flush Interval Setpoint has passed.

OFF HOURS — A flush will occur when the RO has been shut down due to a tank full condition for the number of hours programmed in the Flush Interval Setpoint.

RO START /STOP — A flush will occur each time the RO starts or stops.

The tank full flush can be combined with any of the three interval flush types. A manual flush can be initiated by pressing the Alarm Silence/Reset key for three (3) seconds.

Membrane Flush Mode
The Flush Mode Setpoint can be used to control the operation of the inlet valve and RO pump during flush. Each can be independently programmed to operate during flush. Table 4 shows the values to program into the Flush Mode Setpoint to control the operation of the inlet and RO outputs during flush.

FLUSH MODE	RO PUMP	INLET VALUE
0	OFF	CLOSED
1	OFF	OPEN
2	ON	CLOSED
3	ON	OPEN

TABLE 4

HIGH TDS/CONDUCTIVITY WARNING/ALARM

If the TDS/Conductivity reading exceeds the limit programmed in the TDS/Cond Limit Setpoint for the delay programmed in the TDS/Cond Delay Setpoint, the alarm lamp will light and the HI TDS/Cond warning message will show on the display. This warning will clear when the TDS/Conductivity drops below the setpoint. If the TDS/Cond Shtdwn Setpoint is programmed to 0, the unit will continue to operate. Otherwise, once a high TDS/Cond warning occurs, after the time programmed in this setpoint, the RO unit will shut down and the alarm will sound. The alarm can be cleared by pressing the Alarm Silence/Reset key twice.

NOTE! ***The auto reset function is not active for this shut down.***

OPERATING HOURS EXCEEDED

If the current hours exceed the limit programmed in the Maximum Hours Setpoint, the alarm lamp will light and the OP HOURS EXCEEDED warning message will be shown. This warning can be cleared by programming the current hours to zero (0) or by increasing the maximum hours limit.

I/O EXPANDER (OPTIONAL)

The I/O expander board adds two relays and one switch input. The operation and programming of the two relays is described in the I/O Expander Board section of this manual.

Auxiliary Output
Relay 1 can be used to control a repressurization pump when Relay 1 of the expander board is configured to operate an auxiliary relay. In this mode, this relay will be energized as long as the tank low input is not active. When energized, the relay supplies power to the repressurization pump.

S-150 RO CONTROLLER GUIDE (continued)

Tank Low
When the tank low input has been active for five (5) seconds, the auxiliary output will turn off. The alarm lamp will light and the TANK LOW warning message will show on the display. When the tank low condition clears, the TANK LOW 99 warning message is displayed. The number is the delay in minutes before the auxiliary relay will energize.

For boost pump operation, when the tank low input has been active for five (5) seconds, the boost pump output will turn off, the RO unit will shut down, the alarm lamp will flash, and the audible alarm will sound. The TANK LOW shutdown message will show on the display. When the tank low condition clears, the TANK LOW 99 shutdown message is displayed. The number is the delay before the RO unit will restart. The shutdown can be manually reset by pressing the Alarm Silence/Reset button twice.

Boost Pump Output
Relay 1 can be used to control a boost pump when the expander board is configured to operate Relay 1 as a boost pump relay. This relay will operate the same as the inlet solenoid relay. This option is used to directly operate a boost pump up to 1 HP.

Divert Output
When Relay 1 or Relay 2 has been programmed to operate as a divert relay, the relay will energize when the TDS/Conductivity exceeds the TDS/Cond Limit Setpoint. This will occur as soon as the reading exceeds the limit, there is no delay. When the reading drops below the limit and stays below the limit continuously for five (5) seconds, the divert relay will turn off.

Alarm Output
When Relay 2 has been programmed to operate as an alarm relay, the relay will energize whenever a warning or alarm condition occurs. The relay will remain energized as long as the warning/alarm condition is active.

CONTROLLER ADJUSTMENTS

TDS/Conductivity Calibration
Refer to the Electrical Schematics in this manual for the adjustment location. To calibrate the TDS/Conductivity, place the cell in a known standard solution. Adjust the span control for the correct reading. If the cell is installed, the unit can be calibrated by taking a sample of the permeate water and testing it with a known, good meter.

Adjust the span control until the reading matches the meter.

NOTE: ***If the TDS/Conductivity range is changed, the unit must be recalibrated AND some components may need to be changed.***

Display Adjustment
The display contrast can be adjusted for best viewing by adjusting control R3. This control is located toward the upper right corner of the board, just to the left of the cell connector.

TDS/CONDUCTIVITY EXPANDER (OPTIONAL}

The TDS/Conductivity expander board allows a second TDS/Conductivity to be monitored and displayed by the S-150 controller. The expander board is mounted on the main board to the left of the connector for the first cell. Figure 2 shows the wiring and adjustment information for the expander.

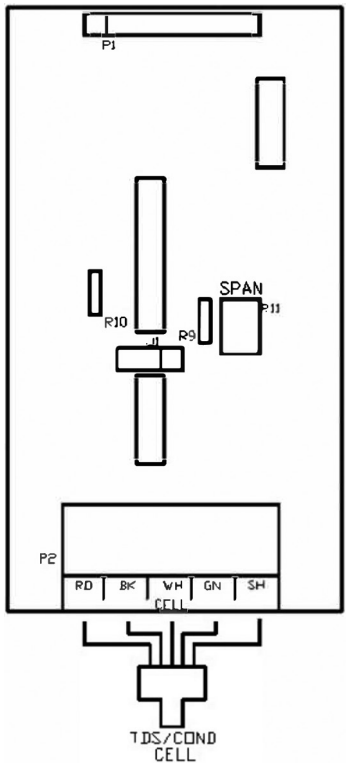


FIGURE 2

Operation
When the TDS/Conductivity expander is installed, the reading will be shown on line 2 and will alternate every three (3) to four (4) seconds with the hours and temperature. If the% rejection display is enabled, it will be shown on line 2 with the second TDS/Conductivity reading.

If the C2 limit is enabled, and the second TDS/Conductivity reading exceeds the limit programmed the C2 Limit Setpoint for the delay programmed in the TDS/Cond Delay Setpoint, the alarm lamp will light and the HI TDS/Cond 2 warning message will show on the display. This warning will clear when the second TDS/Conductivity drops below the setpoint.

S-150 RO CONTROLLER GUIDE (continued)

Calibration
Refer to Figure 2 for adjustment location. To calibrate the second TDS/Conductivity, place the cell in a known standard solution. Adjust the span control for the correct reading. If the cell is installed, the unit can be calibrated by taking a sample of the water and testing it with a known, good meter. Adjust the span control until the reading matches the meter.

Set Points
When the expander is installed, three additional setpoints are provided to allow features of the expander to be changed. Refer to the Change or Display Setpoints section of the manual for information on changing the setpoints. The additional setpoints are listed in Table 5.

SETPOINT	DESCRIPTION	RANGE	DEFAULT
C2 Range	Selects the range of TDS/Conductivity monitor: 0 = 50, 1 = 100, 2 = 250, 3 = 500, 4 = 1000, 5 = 2500, 6 = 5000 NOTE: If this setpoint is changed, the unit must be recalibrated and range components may need to be changed.	0 to 6	2
C2 Limit	When this value is met or exceeded, the alarm lamp will light and high TDS/Cond will show on the display. To disable, set to 0.	0 to 999 µs or ppm	100 µs or ppm
% Rej	If the second TDS/Conductivity is used to monitor feed water, programming this setpoint to 1 allows the % rejection to be displayed.	0 to 1	0

TABLE 5

TROUBLESHOOTING

CAUTION! ***Hazardous voltages are present when power is applied to the unit. Care should be taken when troubleshooting any of the input power or output circuits. When disconnecting or connecting any board or accessory, be sure the power is turned OFF at the disconnect.***

IMPORTANT! ***Before contacting technical support, please verify the programming of all setpoints, check the display, and check the status of all lights and indicators for best results.***

System Inoperative
Is the yellow CPU active LED blinking? If no, is the green power LED, DS1 lit? If no, is the fuse OK? If no, replace the fuse. If yes, with a voltmeter, verify power is applied to the power terminals L1 and L2. If power is applied to the power terminals and the above checks are OK, the board is probably defective and should be replaced. If no power is applied to the board, check the power wiring to the system.

Display Blank
Is the green power LED, DS1 lit? If no, refer to the System Inoperative section above. If yes, is the CPU active LED, DS9 blinking? If no, replace the board. If yes, adjust the display contrast adjustment, R3. Is the display still blank? If yes, replace the board.

Inlet Valve Will Not Operate
Is the system in standby? If no, are any shutdown conditions active? If no, is the inlet LED, DS8 lit? If no, replace the board. If yes, with a voltmeter, verify if there is power on the inlet terminals. Is there power? If no, replace the board. If yes, check the valve and wiring.

RO Pump Will Not Operate
Is the system in standby? If no, are any shutdown conditions active? If no, is the RO LED, DS6 lit? If no, replace the board. If yes, with a voltmeter, verify if there is power on the RO pump terminals. Is there power? If no, replace the board. If yes, check the pump and wiring.

Unit Not Flushing or Not Flushing Correctly
Verify that flush is enabled and what type of flush is selected. Is flush enabled? If no, enable flush. If yes, press the Alarm Silence/Reset key for three (3) seconds. Does the unit show flush on the display? If no, replace the board. If yes, is the flush LED, DS10 lit. If no, replace the board. If yes, with a voltmeter, verify if there is power on the flush terminals. Is there power? If no, replace the board. If yes, check the valve and wiring.

No or Incorrect TDS/Conductivity Reading
Is the sensor wired correctly? If no, correct the wiring. If yes, is the sensor installed as described in the installation section? If no, install correctly. If yes, verify the correct TDS/Conductivity range. Is the range correct? If no, correct the range. If yes, calibrate the unit. Does the unit calibrate OK? If no, disconnect the green and white wires of the sensor. Does the reading show 0? If no, replace the board. If yes, reconnect the wires and remove the sensor from the piping and dry. Does the reading show 0? If no, replace the cell. If yes, short the pins of the cell together. Does the reading show '^^^'? If no, replace the board.

S-150 RO CONTROLLER SETPOINTS

SETPOINT	DESCRIPTION	RANGE	DEFAULT VALUE	PRESET VALUE
TDS/Cond Limit	When this value is met or exceeded, the alarm lamp will light and high TDS/Cond will show on the display. To disable, set to 0.	0 to 999 µs or ppm	100	100
TDS/Cond Delay	When the limit setpoint is exceeded, no alarm will be given until this time has expired.	0 to 999 sec	30 sec	30 sec
TDS/Cond Shtdwn	Once a TDS/Cond alarm is active, if the time is exceeded, a TDS/Cond shutdown will occur. To disable, set to 0.	0 to 99 min	0 min	0 min
RO Start Delay	The length of time between the inlet valve opening and the RO pump start.	0 to 99 sec	5 sec	15 sec
Press Fault Delay	The length of time a pressure fault must be active before a pressure fault shutdown occurs.	0 to 99 sec	5 sec	5 sec
Auto Reset	When a pressure fault shutdown is active, the system will attempt to restart after this delay. If set to 0, system will remain shut down until manually reset.	0 to 99 min	60 min	60 min
Alarm Silence	If the audible alarm is silenced, after this delay, the alarm will resound. If set to 0 minutes, the alarm will remain silenced.	0 to 99 min	0 min	0 min
TF Restart Delay	When a tank full condition clears, the system will restart after this delay.	0 to 99 sec/min	5 sec	5 sec
TF Restart	Selects whether the tank full restart delay is in seconds or minutes. 0 = seconds , 1 = minutes.	0 to 1	0	0
TFO Time	The length of time that a tank full override lasts.	0 to 9 min	5 min	5 min
Tank Lo Restart	When a tank low condition clears, the auxiliary pump will restart after this delay.	0 to 99 min	15 min	15 min
Flush Type	Selects the type of flush. Set to 0 to disable flush.	0 to 8	0	0 (Std) 8 (Opti)
Flush Time	The length of time a membrane flush cycle will last when flush is active.	0 to 99 min	5 min	1 min
Flush Interval	The interval between flush cycles. Only valid with op hour, elapsed time, or off flush types.	0 to 99 hr	24 hr	24 hr
Flush Mode	Selects if the inlet and RO pump relays operate during flush.	0 to 3	0	0 (Std) 3 (Opti)
Maximum Hours	If the current operating hours exceed this limit, the operating hours warning will occur. To disable, set to 0.	0 to 65000 hr	0 hr	0 hr
Current Hours	Current number of hours of RO system operation.	0 to 65000 hr	0 hr	0 hr
Expander Mode	Selects how the relays on the I/O expander board operate.	0 to 4	0	0
Temp Offset	Allows adjustment of the temperature reading by +/-5 degrees.	-5° or +5°	0°	0°
Temp UOM	Selects display of the temperature in °F or °C.	0 to 1	0	0
Switch Select	Selects if the switch inputs are normally open or normally closed.	0 to 32	0	7
TDS/Cond UOM	Selects display of the water quality in µs or ppm	0 to 1	0	1
TDS/Cond Range	Selects the range of the TDS/Conductivity monitor. 0 = 50, 1 = 100, 2 = 250, 3 = 500, 4 = 1000, 5 = 2500, 6 = 5000.	0 to 6	2	1

SYSTEM STARTUP PROCEDURE

STEP ONE

Installation Follow-up

1. Visually inspect the water connections.
2. Be sure the 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 TWO

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 in this manual before operating this system.

STEP THREE

Read the Section on the RO System Controller

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

STEP FOUR

Divert Product Water to Drain

Upon initial system startup, 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 FIVE

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. Press the Power 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 (35 psi minimum).***

STEP SIX

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 Standard (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 Optimum (OPTI) models are equipped with an automatic flush solenoid valve. A one (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 S-150 RO Controller Setpoints section of this manual for more information on the default settings. Note that a manual flush can be initiated by holding down on the Alarm Silence/Reset key of the RO controller.

STEP SEVEN

Adjust System Pressure and Flow Rates

CAUTION! ***Never allow the BLS RO system pressure to exceed 185 psi.***

The BLS 3000, BLS 6000, and BLS 9000 RO systems were designed to operate at 70% 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 70% 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.***

SYSTEM STARTUP PROCEDURE (continued)

IMPORTANT! ***The maximum product water flow rates and associated reject water flow rates for the BLS 3000, BLS 6000, and BLS 9000 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 3000 Models:	0.9 gpm reject water 2.1 gpm product water
BLS 6000 Models:	1.8 gpm reject water 4.2 gpm product water
BLS 9000 Models:	2.7 gpm reject water 6.3 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.

NOTE! ***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 startup is to have a reference point to evaluate system performance during the life of the membrane element(s).***

STEP EIGHT

Connect RO System to Storage Tank

1. After 30 to 60 minutes of system flushing, press the Power key on the RO controller to stop the system.
2. Connect the product water line to your storage tank.
3. 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 NINE

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 shutoff 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 System Pressure Switches section of this manual to verify its setpoints and proper function.

STEP TEN

Final Inspection

Once all startup and installation procedures have been completed, visually inspect all water connections and system readings for proper operation. All connections should be tight, secure, and leak-free.

NOTE! ***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 (NC) 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.***

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 startup. Note that the membrane element(s) have been pre-installed by the manufacturer during the final testing procedures, unless other arrangements have been made.***

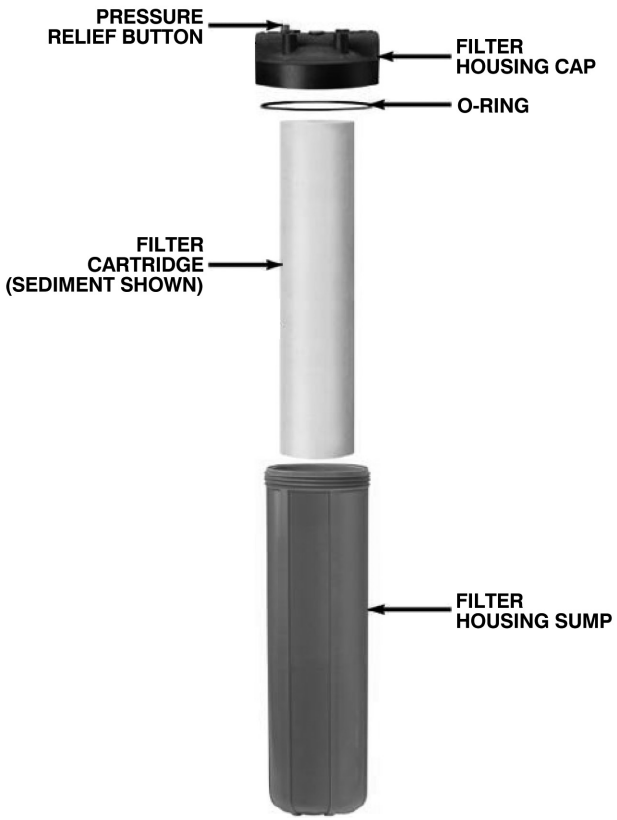
Filter cartridges have a limited service life and should be replaced if you experience noticeable changes in product water taste, color, odor, or flow rate. On average, filter cartridges should be replaced about every three to six months. Your BLS RO system is also equipped with pre-filter inlet and pre-filter outlet pressure gauges. An increase in the pressure difference of 10 to 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 (2) 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 OVERTIGHTEN. 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 BLS RO 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. Push the Power button located on the face of the S-150 RO Controller to restart the system.
12. Check for leaks.
13. Flush the system for a minimum of five (5) minutes while diverting the product water to the drain.

IMPORTANT! ***Before performing ant 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.***

NOTE! ***The manufacturer of the filter housing recommends that the filter sump of all plastic housings be replaced every five (5) years for a clear sump, and every ten (10) years for an opaque sump. Date the bottom of any new or replacement sump to indicate the next recommended replacement date.***



SYSTEM PRESSURE SWITCHES

INLET LOW PRESSURE SWITCH

NOTE! ***The system is preset to cut OFF at inlet pressure below 15 psi, and to cut ON at inlet pressure above 20 psi.***

An inlet low pressure switch is installed on every BLS RO 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 the Inlet Low Pressure Switch Setpoint
To verify the setting, slowly decrease the inlet feed water supply by slowly closing the manual inlet shutoff valve while watching the prefilter 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 whenever the cover is removed from a pressure switch.***

Adjusting the Inlet Low Pressure Switch Setpoint
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 counterclockwise 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.

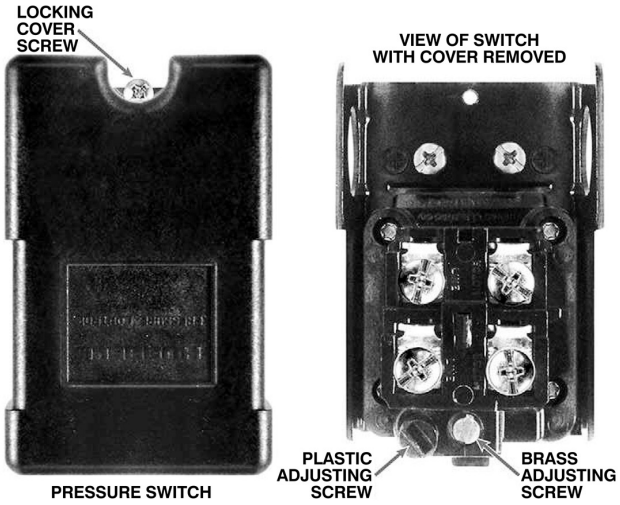
Identifying a Broken Low Pressure Switch
Simply, close the inlet feed water valve, and if the system does not shut down, the pressure switch needs replacing.

PRODUCT WATER PRESSURE SWITCH (OPTIONAL)

NOTE! ***The system is preset to cut OFF at product pressure above 45 psi, and to cut ON at product pressure below 25 psi.***

A product water pressure switch is available as an optional feature. Its purpose is to stop and start the RO system when a pressurized storage tank is used.

Verifying the Product Water Pressure Switch Setpoint
You will need a ball valve and pressure gauge (0 to 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 shutoff valve. Open a valve downstream of the pressurized storage tank to relieve the pressure from the system. Disconnect the tubing from the tank shutoff 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.

IMPORTANT! ***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 counterclockwise 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 shutoff 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.

SERVICING THE MEMBRANE ELEMENT(S)

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 shutoff valve.
2. The BLS RO 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, the brine seal on the membrane element should be at the top of the vessel. IF THE ARROW ON THE VESSEL POINTS UP, the brine seal on the membrane element should be on the bottom of the vessel.***

8. Check the 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.

IMPORTANT! ***The brine seal must always face the high pressure inlet to the 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 the product water line is disconnected from the 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 shutoff valve and allow the system to fill with water.
14. Check for leaks.
15. Open the reject water valve and flush the system for two (2) to three (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.

SANITIZING THE RO SYSTEM

The following procedure is recommended for preventive maintenance along with filter replacement. It is not intended to be effective in sanitizing highly contaminated systems that have been exposed to excessive amounts of bacteria, or systems which have foul-smelling membrane elements or filters. Such systems require extensive cleaning and sanitizing. Consult your BLS RO System representative 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 main power supply.***

3. Relieve the pressure from the system by opening the reject water valve and pressing the pressure relief button on the prefilter housing.
4. Remove the filter housing sump(s) by turning clockwise.
5. Remove and discard the used filter cartridge(s).
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 prefilter sump. Reinstall both filter sump(s) without the filter cartridges, making sure the o-rings are seated properly.

NOTE! ***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 eight (8) hours.
13. Disconnect the main power supply to the system.
14. After eight (8) hours, remove the filter sump as before. Empty the 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 OVERTIGHTEN.
17. Reconnect the main power supply to the system, and turn on the feed water supply. Allow the system to fill with water.
18. Push the Power 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, reconnect the product water line to the storage tank, and return the system back to normal operation.

NOTE! ***The ONLY time the membrane element should come into contact with chlorine is during this procedure.***

IMPORTANT! ***If the product water storage tank is heavily contaminated, it will need to be sanitized separately.***

MEMBRANE FLUSH

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

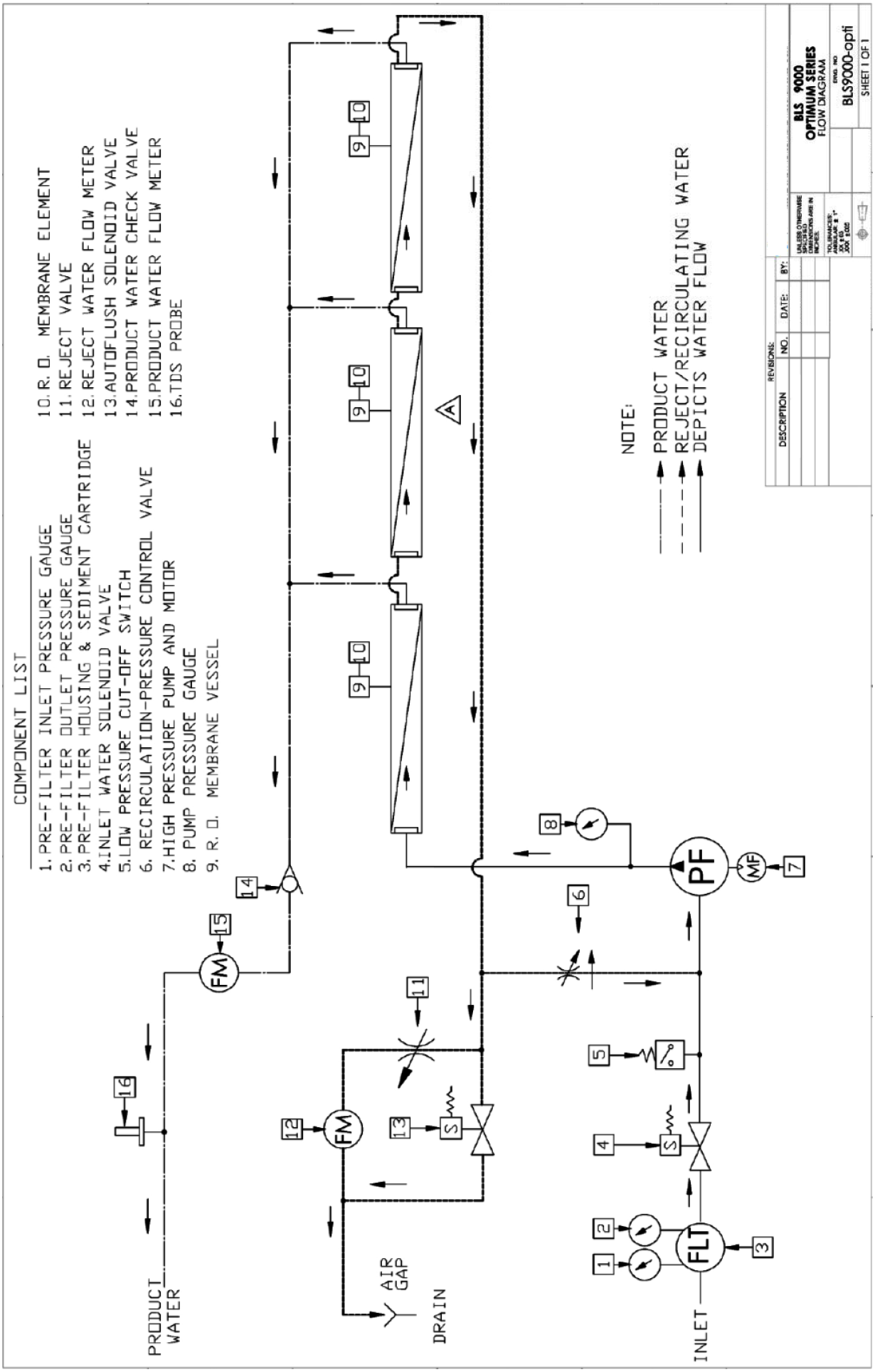
Automatic Membrane Flush Solenoid
The automatic membrane flush solenoid valve is only equipped on the Optimum BLS models. The flush mode is factory set to run the RO pump with the inlet solenoid valve and flush solenoid valve open for 60 seconds upon system startup and shutdown. These settings can be adjusted based on varying feed water conditions and applications. Please review the section on the S-150 RO Controller in this manual for more information.

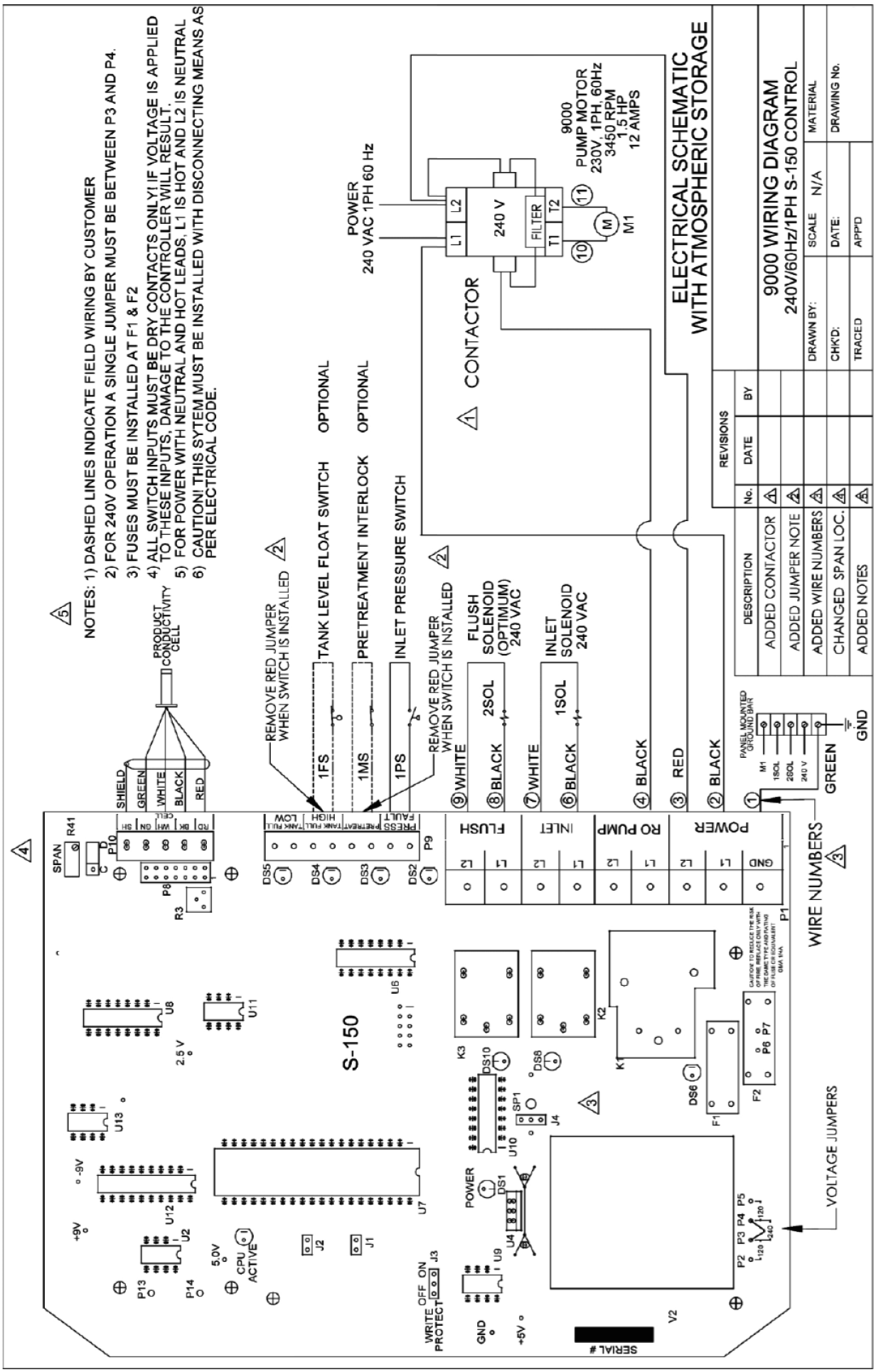
REPLACEMENT PARTS LIST

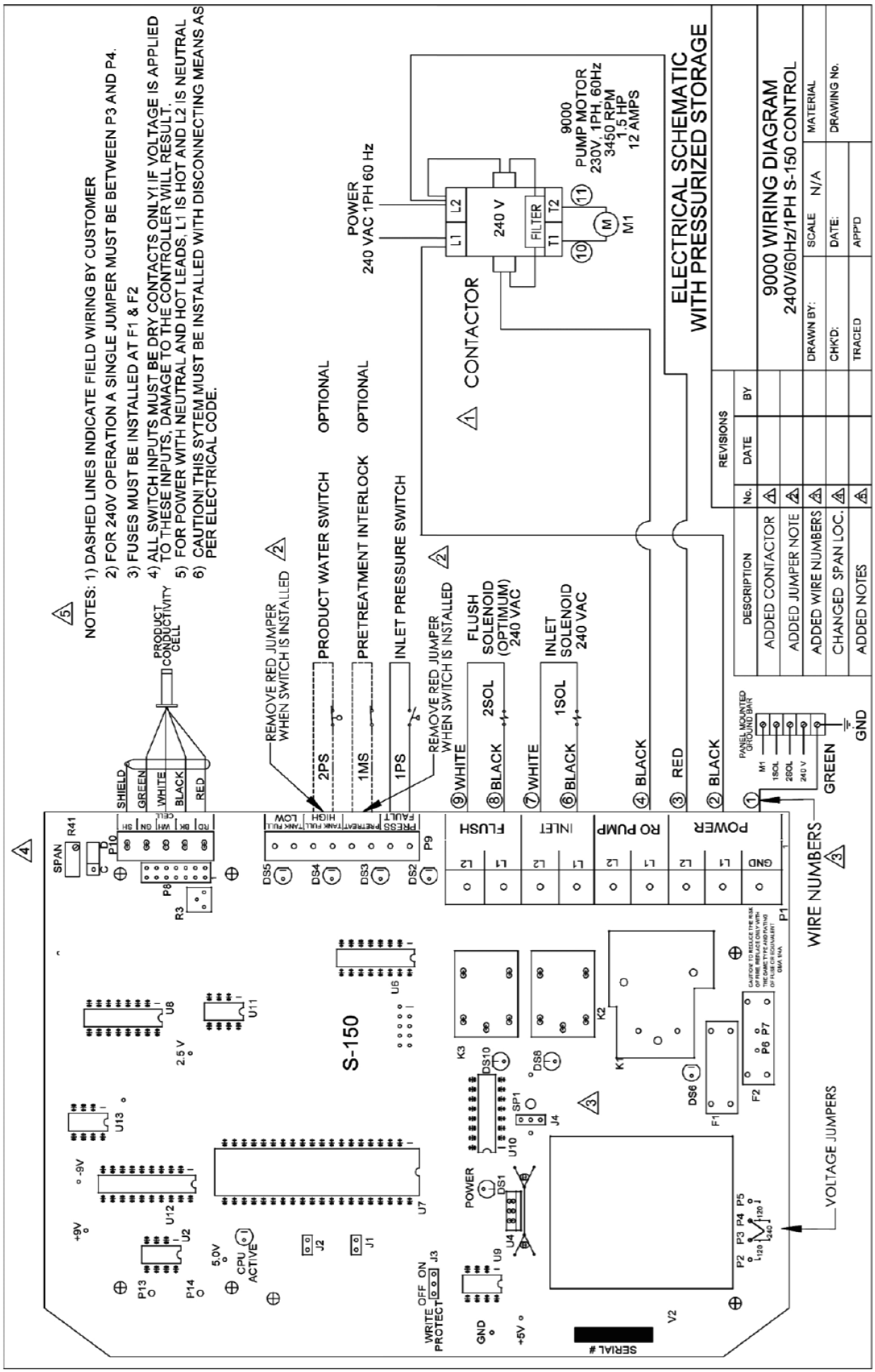
PART NO.	DESCRIPTION	QTY
MEMBRANE ELEMENTS		
60240401	Membrane Element, 4" x 40" (CSM)	3
7030404005	Membrane Element, 4" x 40" (FILMTEC)	3
MEMBRANE PRESSURE VESSELS (STAINLESS STEEL)		
100040402	Membrane Pressure Vessel Assembly, SS, 4" x 40"	3
100041212	Cap w/ O-Rings, 2 Ports, for SS 4" Vessel	6
1300341	O-Ring, External, for SS 4" Cap	12
1300210	O-Ring, Internal, for SS 4" Cap	12
100041215	Clamp Set, for 4" SS Vessel	6
MEMBRANE PRESSURE VESSELS (FRP)		
100040405	Membrane Pressure Vessel Assembly, FRP, 4" x 40"	3
FILTER HOUSINGS & CARTRIDGES		
22150467-2	Filter Housing, 20" Big Blue, 3/4", with IN/OUT 1/4" pressure ports	1
22151122	O-rlng for Big Blue Housing	1
14815564	Prefilter Cartridge, 20" Sediment Cartridge, 5 Micron	1
PUMPS & MOTORS		
3060722	Pump, HP Booster, l-l/2HP, lPH, 230V, 60Hz, Cast Iron – for 120/230V, 60Hz Systems	1
30607205	Pump, HP Booster, 2HP, lPH, 220V, 50Hz, Cast Iron – for 220V, SOHz Systems	1
3060734	Pump, HP Booster, l-l/2HP, 3PH, 460V, Cast Iron – for 460V, 60Hz Systems	1
30607225S	Pump, HP Booster, 1-1/2HP, lPH, 230V, Stainless Steel – for 120/230V, 60Hz Systems (Optional)	1
SOLENOID VALVES		
00934220E	Inlet Solenoid Valve w/ Coil, 3/4", Brass, 220/240V, 50/60Hz	1
00934120E	Inlet Solenoid Valve w/ Coil, 3/4", Brass, 120/240V, 50/60Hz	1
00938220E	Autoflush Solenoid Valve w/ Coil, 3/8", Brass, 220/240V, 50/60Hz	1
00938120E	Autoflush Solenoid Valve w/ Coil, 3/8", Brass, 110/120V, 50/60Hz	1
MISCELLANEOUS		
316051	Check Valve, Product Water, 3/4", PVC	1
4819018	Controller, S150 Microprocessor – for 1.5HP, 230V, 60Hz, 1Ph Systems	1
48450750	Flowmeter, Product, 1-10 gpm	1
48450500	Flowmeter, Reject, 0.5-5 gpm	1
0080016	Gauge, Pressure, Inlet & Filter, 0-100 psi, 2", Bottom Mount	2
0080016SS	Gauge, Pressure, Inlet & Filter, 0-100 psi, 2", Liquid Filled, Bottom Mount, S.S.	2
008013	Gauge, Pressure, System Operating, 0-300 psi, 2.5", Panel Mount	1
1720138	Pressure Regulator, System Operating, 3/8" In, 3/8" Out	1
1720138SS	Pressure Regulator, System Operating, 3/8" In, 3/8" Out, S.S.	1
17506902	Pressure Switch, Low Level Cut-Out	1
17506905	Pressure Switch, Product Water (Optional)	1
312503	Reject Needle Valve, 1/2"	1
0002621007	Inlet Feed Water Manual Shutoff Valve, 3/4" NPTF, PVC (Optional)	1
31400051	3-Way Ball Valve, 1/2" NPTF, PVC, for Product Water Divert [Optional)	1

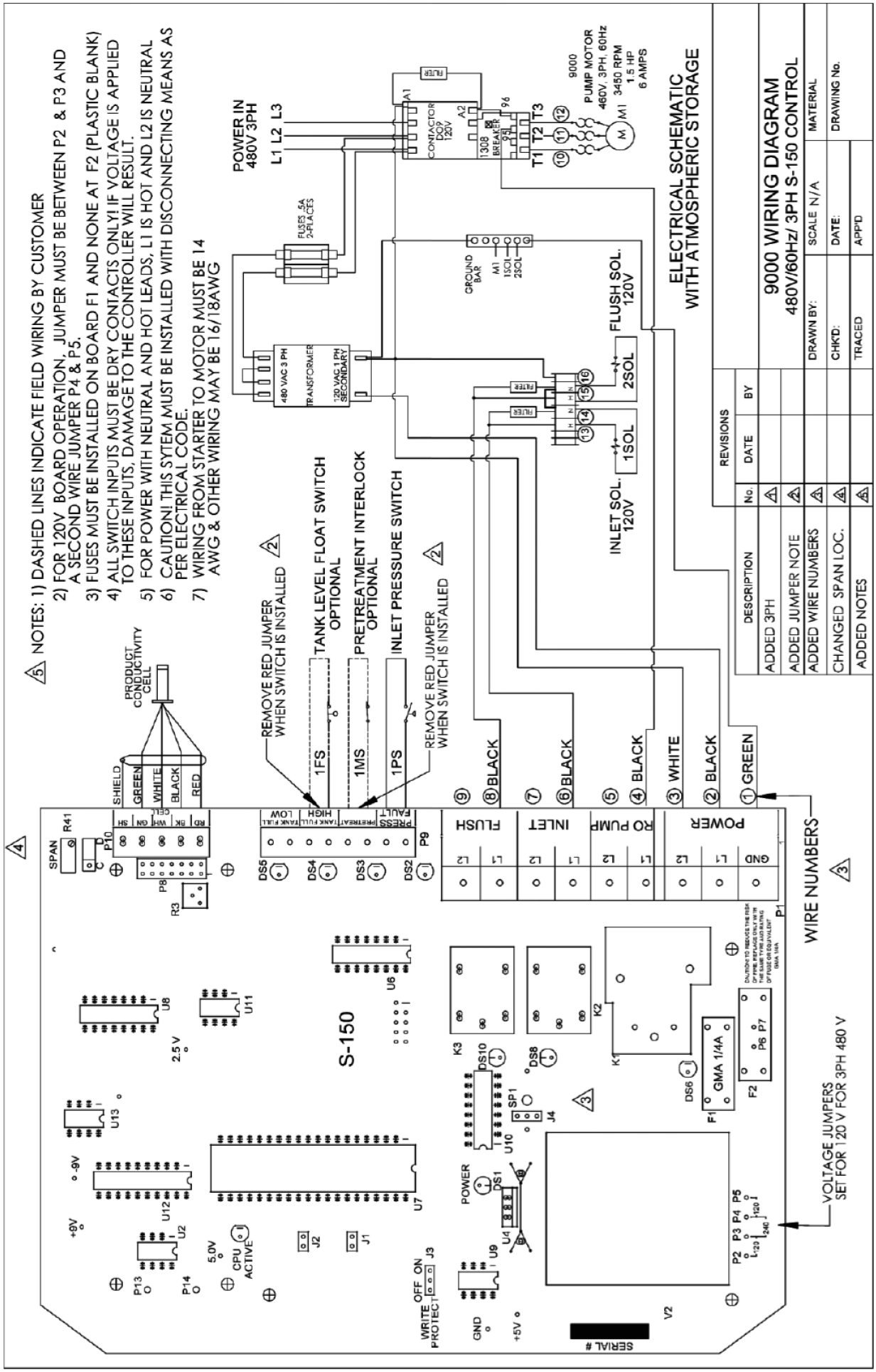
BLS SYSTEM TROUBLESHOOTING

PROBLEM	POSSIBLE CAUSE	SOLUTION
BLS 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 or 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 pretreatment	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 element 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
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 overpressurized	Check tank air pressure. Relieve to 10 psi if necessary
	Membrane element installed backward, or brine seal damaged or rolled	Check, use care when reinstalling the membrane element into the housing
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.
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 element, sanitize system and tank
	Tank contaminated	Sanitize tank
	Tank diaphragm ruptured	Replace tank
	Membrane not flushed completely	Flush one or two tanks of product water to drain
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 System 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 the 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. O. MEMBRANE VESSEL
10. R. O. MEMBRANE ELEMENT
11. REJECT VALVE
12. REJECT WATER FLOW METER
13. AUTOFLUSH SOLENOID VALVE
14. PRODUCT WATER CHECK VALVE
15. PRODUCT WATER FLOW METER
16. TDS PROBE
NOTE:
PRODUCT WATER
REJECT/RECIRCULATING WATER
DEPICTS WATER FLOW
PRODUCT WATER
AIR GAP
DRAIN
INLET
FLT
PF
FM
MF
S
A
REVISIONS:
DESCRIPTION
NO.
DATE:
BY:
BLS 9000
OPTIMUM SERIES
FLOW DIAGRAM
BLS9000-opti
SHEET 1 OF 1


NOTES: 1) DASHED LINES INDICATE FIELD WIRING BY CUSTOMER
2) FOR 240V OPERATION A SINGLE JUMPER MUST BE BETWEEN P3 AND P4.
3) FUSES MUST BE INSTALLED AT F1 & F2
4) ALL SWITCH INPUTS MUST BE DRY CONTACTS ONLY! IF VOLTAGE IS APPLIED TO THESE INPUTS, DAMAGE TO THE CONTROLLER WILL RESULT.
5) FOR POWER WITH NEUTRAL AND HOT LEADS, L1 IS HOT AND L2 IS NEUTRAL
6) CAUTION! THIS SYTEM MUST BE INSTALLED WITH DISCONNECTING MEANS AS PER ELECTRICAL CODE.
ELECTRICAL SCHEMATIC WITH ATMOSPHERIC STORAGE
9000 WIRING DIAGRAM
240V/60Hz/1PH S-150 CONTROL
REVISIONS
DESCRIPTION
ADDED CONTACTOR
ADDED JUMPER NOTE
ADDED WIRE NUMBERS
CHANGED SPAN LOC.
ADDED NOTES
DRAWN BY:
CHK'D:
TRACED
SCALE N/A
DATE:
APP'D
MATERIAL
DRAWING No.
POWER
240 VAC 1PH 60 Hz
CONTACTOR
240 V
FILTER
9000
PUMP MOTOR
230V, 1PH, 60Hz
3450 RPM
1.5 HP
12 AMPS
M1
PRODUCT CONDUCTIVITY CELL
SHIELD
GREEN
WHITE
BLACK
RED
REMOVE RED JUMPER WHEN SWITCH IS INSTALLED
TANK LEVEL FLOAT SWITCH
OPTIONAL
PRETREATMENT INTERLOCK
OPTIONAL
INLET PRESSURE SWITCH
FLUSH SOLENOID (OPTIMUM) 240 VAC
INLET SOLENOID 240 VAC
PANEL MOUNTED GROUND BAR
GREEN
GND
WIRE NUMBERS
VOLTAGE JUMPERS
S-150
SERIAL #


NOTES: 1) DASHED LINES INDICATE FIELD WIRING BY CUSTOMER
2) FOR 240V OPERATION A SINGLE JUMPER MUST BE BETWEEN P3 AND P4.
3) FUSES MUST BE INSTALLED AT F1 & F2
4) ALL SWITCH INPUTS MUST BE DRY CONTACTS ONLY! IF VOLTAGE IS APPLIED TO THESE INPUTS, DAMAGE TO THE CONTROLLER WILL RESULT.
5) FOR POWER WITH NEUTRAL AND HOT LEADS, L1 IS HOT AND L2 IS NEUTRAL
6) CAUTION! THIS SYTEM MUST BE INSTALLED WITH DISCONNECTING MEANS AS PER ELECTRICAL CODE.
ELECTRICAL SCHEMATIC
WITH PRESSURIZED STORAGE
9000 WIRING DIAGRAM
240V/60Hz/1PH S-150 CONTROL
REVISIONS
DESCRIPTION
ADDED CONTACTOR
ADDED JUMPER NOTE
ADDED WIRE NUMBERS
CHANGED SPAN LOC.
ADDED NOTES
DRAWN BY:
CHK'D:
TRACED
SCALE N/A
DATE:
APP'D
MATERIAL
DRAWING No.
POWER
240 VAC 1PH 60 Hz
CONTACTOR
240 V
FILTER
9000
PUMP MOTOR
230V, 1PH, 60Hz
3450 RPM
1.5 HP
12 AMPS
M1
PRODUCT CONDUCTIVITY CELL
SHIELD
GREEN
WHITE
BLACK
RED
REMOVE RED JUMPER WHEN SWITCH IS INSTALLED
PRODUCT WATER SWITCH
OPTIONAL
PRETREATMENT INTERLOCK
OPTIONAL
INLET PRESSURE SWITCH
FLUSH SOLENOID (OPTIMUM) 240 VAC
INLET SOLENOID 240 VAC
PANEL MOUNTED GROUND BAR
GND
GREEN
WIRE NUMBERS
VOLTAGE JUMPERS
S-150
SPAN
FLUSH
INLET
RO PUMP
POWER
SERIAL #


NOTES: 1) DASHED LINES INDICATE FIELD WIRING BY CUSTOMER
2) FOR 120V BOARD OPERATION, JUMPER MUST BE BETWEEN P2 & P3 AND A SECOND WIRE JUMPER P4 & P5.
3) FUSES MUST BE INSTALLED ON BOARD F1 AND NONE AT F2 (PLASTIC BLANK)
4) ALL SWITCH INPUTS MUST BE DRY CONTACTS ONLY! IF VOLTAGE IS APPLIED TO THESE INPUTS, DAMAGE TO THE CONTROLLER WILL RESULT.
5) FOR POWER WITH NEUTRAL AND HOT LEADS, L1 IS HOT AND L2 IS NEUTRAL
6) CAUTION! THIS SYTEM MUST BE INSTALLED WITH DISCONNECTING MEANS AS PER ELECTRICAL CODE.
7) WIRING FROM STARTER TO MOTOR MUST BE 14 AWG & OTHER WIRING MAY BE 16/18AWG
POWER IN 480V 3PH
L1 L2 L3
FUSES .5A 2-PLACES
480 VAC 3 PH
TRANSFORMER
120 VAC 1 PH SECONDARY
CONTACTOR DO9 120V
1308 BREAKER
T1 T2 T3
9000 PUMP MOTOR 460V, 3PH, 60Hz 3450 RPM 1.5 HP 6 AMPS
GROUND BAR
M1 1SOL 2SOL
FLUSH SOL. 120V
2SOL
INLET SOL. 120V
1SOL
ELECTRICAL SCHEMATIC WITH ATMOSPHERIC STORAGE
REVISIONS
DESCRIPTION
ADDED 3PH
ADDED JUMPER NOTE
ADDED WIRE NUMBERS
CHANGED SPAN LOC.
ADDED NOTES
9000 WIRING DIAGRAM
480V/60Hz/ 3PH S-150 CONTROL
DRAWN BY:
CHK'D:
TRACED
SCALE N/A
DATE:
APP'D
MATERIAL
DRAWING No.
PRODUCT CONDUCTIVITY CELL
SHIELD
GREEN
WHITE
BLACK
RED
REMOVE RED JUMPER WHEN SWITCH IS INSTALLED
TANK LEVEL FLOAT SWITCH OPTIONAL
PRETREATMENT INTERLOCK OPTIONAL
INLET PRESSURE SWITCH
1FS
1MS
1PS
REMOVE RED JUMPER WHEN SWITCH IS INSTALLED
9 BLACK
7 BLACK
5 BLACK
4 WHITE
2 BLACK
1 GREEN
FLUSH
INLET
RO PUMP
POWER
GND
P1
WIRE NUMBERS
S-150
VOLTAGE JUMPERS SET FOR 120 V FOR 3PH 480 V
SERIAL #
V2

SYSTEM LOG

MODEL # _____ OPERATOR: _____

SERIAL # _____ FROM _____ TO _____

DATE	PRE-FILTER INLET PRESSURE PSI	PRE-FILTER OUTLET PRESSURE PSI	OPERATING PRESSURE PSI	FEED WATER TEMP	PRODUCT WATER FLOW	REJECT WATER FLOW	FEED WATER TDS PPM	PRODUCT WATER TDS PPM	SEDIMENT PRE-FILTER CHANGE DATE	CARBON PRE-FILTER CHANGE DATE	MEMBRANE ELEMENT CHANGE DATE	FEED WATER HARDNESS GPG	FEED WATER pH	FEED WATER CHLORINE PPM	FEED WATER IRON PPM	NOTES

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