Installation, Operation, and Maintenance Manual

BLS 1900 Optimum

REVERSE OSMOSIS SYSTEM

JANUARY 2019

Table of Contents

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

Reverse osmosis is a separation process in which water is forced under pressure through a membrane in the opposite direction from normal. The membrane allows water to pass through, and blocks or hinders the passage of dissolved substances and suspended particles. This process reduces the dissolves salts, minerals, and suspended particles, while improving the taste, odor, and clarity of the water. The process is further enhanced by allowing the water to continuously pass over the surface of the membrane, sweeping away the concentrated salts, minerals, and suspended particles.

The RO membrane element divides the feed water into two streams: product water (permeate) which is now purer than before and is the desired result; and concentrate water (reject or drains, plus recirculation) which carries the concentrated dissolved salts, minerals, and suspended particles that were rejected by the membrane element down the drain.

DEFINITIONS

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

Product Water (permeate) – That 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) – Used to describe that 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 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.

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 a 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 OPERATING SPECIFICATIONS. Additional pretreatment may be required in these cases.

Bacteria – When RO systems are operated intermittently, they will likely be exposed to bacteria. Following a 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 as a result 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. Pretreatment equipment, such as a water softener, iron filter, or activated carbon filter will reduce membrane element fouling and extend its life.

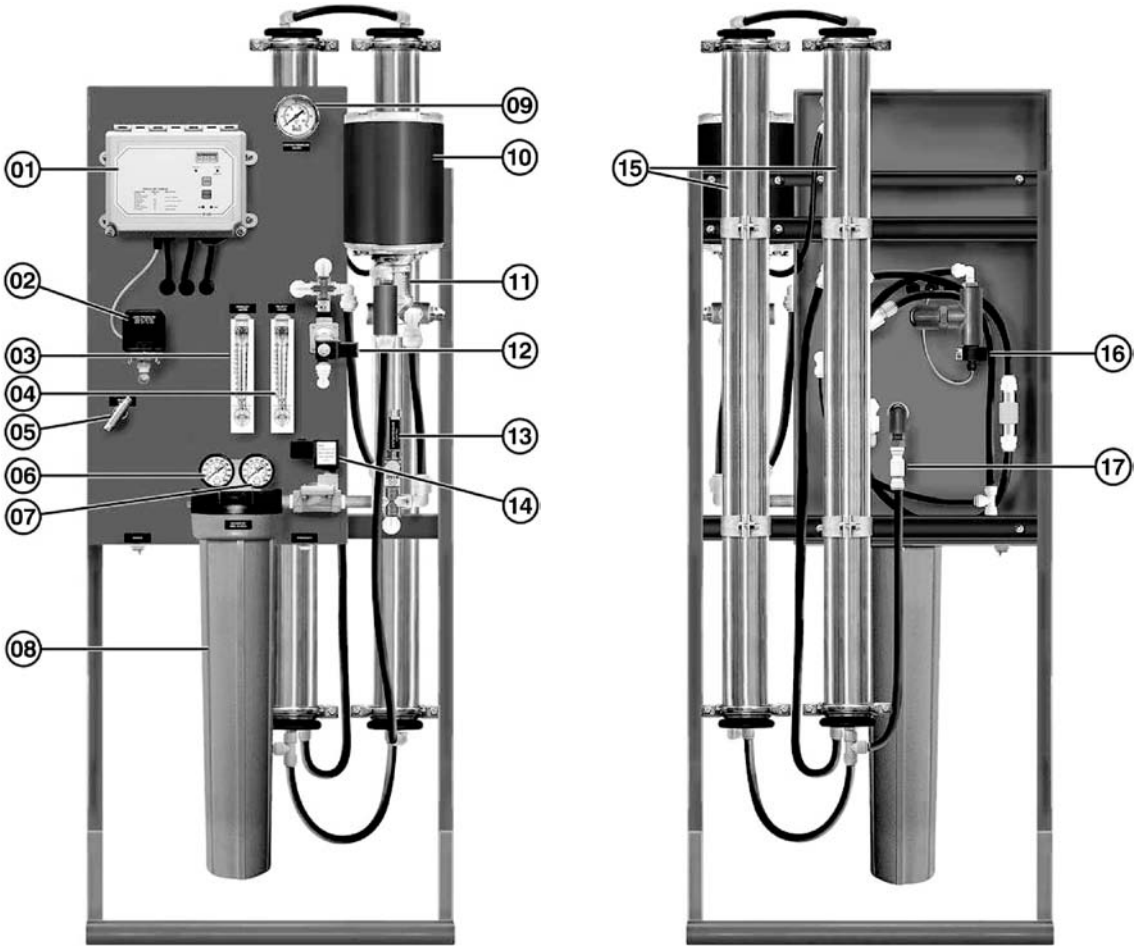
GETTING TO KNOW YOUR BLS RO SYSTEM

BLS 1900 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. S-100 RO Microprocessor Controller
2. Inlet Low Pressure Switch
3. Product Water Flow Meter
4. Reject Water Flow Meter
5. Reject Water Needle Valve
6. Prefilter Pressure Gauge
7. Postfilter Pressure Gauge
8. Prefilter Sediment Housing
9. System Operating Pressure Gauge
10. Motor
11. Rotary Vane Pump
12. Autoflush Solenoid Valve
13. Pressure Regulator
14. Inlet Solenoid Valve
15. Stainless Steel Membrane Pressure Vessels
16. TDS Probe
17. Product Water Check Valve



THIS MANUAL COVERS THE INSTALLATION, OPERATION, AND MAINTENANCE OF THE BLS 1900 OPTIMUM SYSTEM. IT IS IMPORTANT TO READ THIS MANUAL THOROUGHLY BEFORE INSTALLING THE SYSTEM.

BLS 1900 OPTIMUM SPECIFICATIONS

SYSTEM OPERATION SPECIFICATIONS

Flow Capacity ..... 1900 gpd / 1.32 gpm
Typical Recovery 50%
Rejection Rate ..... 95% to 99%
Number of Membrane Vessels ..... (2) 2.5 x 40 S.S.
Number of Membrane Elements ..... (2) HI-FLOW 2.5 x 40
System Operating Pressure ..... 165 psi

FEED WATER PARAMETERS

This system is designed for use on potable water sources only.
If the system is used with chlorinated water, a carbon filter is required.

Nominal Flow of Feed Water During Operation ..... 2.64 gpm
Nominal Flow of Feed Water During System Flush ..... 4.33 gpm
Temperature Range ..... 40 to 90ºF
Minimum Feed Water Pressure ..... 20 psi @ 4.33 gpm
Maximum Feed Water Pressure ..... 85 psi
Maximum Chlorine Tolerance ..... 0.1 ppm
Maximum Hardness ..... 10 gpg
Oil Tolerance ..... 0.0 mg/l
Maximum Feed Water Silt Index 5
Maximum Feed Water Turbidity ..... 1 NTU
Maximum Allowable Product Water Back Pressure ..... 50 psi
pH Range of Feed Water ..... 3 to 10
Minimum Sediment Prefiltration ..... 5 micron

SPACE REQUIREMENTS

Depth ..... 18 inch
Width ..... 21 inch
Height ..... 54 inch
Weight (approximate) ..... 100 lb

SERVICE CONNECTIONS

Feed Water Inlet ..... 1/2 inch FNPT
Reject Outlet to Drain ..... 1/2 inch FNPT
Product Outlet Storage ..... 1/2 inch FNPT

DESIGN TEST CONDITIONS

Feed Water TDS ..... 500 ppm as NaCl
Operating Pressure ..... 165 psi
Feed Water Temperature 77ºF (25ºC)
System Design Recovery 50%

PUMP & MOTOR SPECIFICATIONS

	60 Hz Service – 1 Ph, 115 V	50 Hz Service – 1 Ph, 220 V
Rotary Vane Pump	260 GPH, #3030801	290 GPH, #3030901
Motor	3/4 HP, #31007573	3/4 HP, #31007572

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, immediately contact the delivering carrier and file a claim for damages.

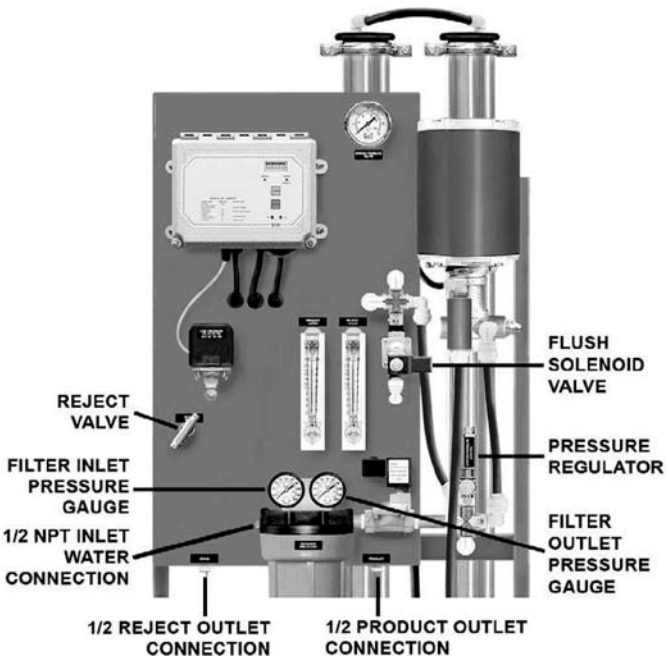
STAP TWO

Locate a Desirable Installation Site
Your BLS System should be mounted on a hard, level surface capable of supporting the entire weight of the system. See the SYSTEM SPECIFICATIONS for approximate weight.

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 1/2 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 pipe or hose from 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—which is factory wired to initiate a pressure fault alarm if the product water back pressure reaches 45 psi—must be wired directly to the TANK FULL HIGH terminals. The switch will then shut the system off when the tank pressure reaches 45 psi. Refer to the section titled, “Product Pressure Switch as System On/Off Control” in this manual.

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 since serious damage can occur to the membrane elements if the system is operated with the valve closed.***

Remove the red plug from the fitting marked PRODUCT on the bottom of the panel toward the right side. Using 1/2 inch OD tubing, connect your product water line. Do not connect the product water line to your storage tank at this time. There will be further instructions in the “System Startup” section regarding additional steps later. 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 red plug from the fitting marked DRAIN on the bottom of the panel toward the left side. Using 1/2 inch OD tubing, connect it to your wastewater drain.

NOTE! ***We recommend installing an air gap connection designed 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 voltage, phase, and hertz specified in the final inspection report at the back of this manual. See the wiring diagram at the end of this manual for the correct power connections in the control enclosure.

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

STEP SEVEN

Electrical Connection of the Tank Level Float Control Switch & Pretreatment Interlock 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 the 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.***

STEP EIGHT

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

CAUTION! ***Connecting the system to a power source which does not match the system power rating exactly can damage the system and void the warranty.***

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

S-100 MICROPROCESSOR CONTROLLER

CAUTION! ***Be sure to read the controller 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 100 Microprocessor Controller. It is a state-of-the-art control system for commercial and industrial systems.

The Series 100 is a microprocessor controlled system that can monitor pressure and level switches. A TDS monitor/ controller with an adjustable limit is an integral part of the Series 100. The Series 100 displays system status and sensor and switch input status using a status LED and a 3-digit LED display.

The following table indicates the jumper presets.

JUMPER	POSITION	PRESET
J8	C	PF AUTO RESET 30 SEC, 5 MIN. & LOCKOUT
J9	A	2 SECOND TANK FULL RESTART DELAY
J10	B	NC SWITCH INPUTS
J11	B	FLUSH 24
J12	C	FLUSH 24

TABLE 1

NOTE! ***See electrical drawings at the end of this manual for additional information.***

CONTROLLER SPECIFICATIONS

Power
120/240 VAC –15+10%, 50/60 Hz, 6 Watts

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

Display
3-digit red LED

Front Panel
Overlay with LED window, status LED, power and setpoint switches

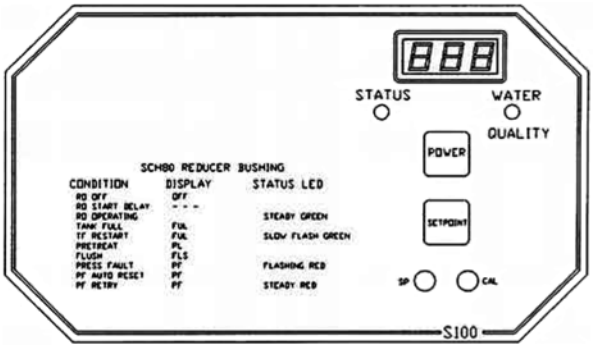


FIGURE 1

Switch Inputs, Dry Contact
Pressure Fault
Pretreat Lockout
Tank Full

Relay Outputs

RO Pump Relay	120/240 VAC, 1 HP
Inlet Valve Relay	120/240 VAC, 5A
Flush Valve Relay	120/240 VAC, 5A

Relays supply same output voltage as board power (120 or 240 VAC)

Cell
TDS cell with 3-digit display, range 0 to 999 ppm, wetted parts ABS and 316 S.S., 3/4 inch NPTM, 300 psi max

FRONT PANEL CONTROLS AND INDICATORS

LED Display – Shows status of system and water quality.

Status LED – Shows operating status of unit.

Water Quality LED – Green if OK; Red if above limit.

Power Key – Places controller in operating or standby mode.

Setpoint Key – Places display in mode to display current setpoint.

SP – Setpoint adjustment screw.

CAL – Calibration adjustment screw.

TERMINAL STRIP AND JUMPER LOCATIONS

Refer to the wiring diagram located on the last page in the manual for the location of all terminal strips, connectors, and jumpers. The wiring diagram also shows a sample wiring diagram for the controller.

NOTE! ***All terminals on the board are labeled.***

S-100 MICROPROCESSOR CONTROLLER (continued)

POWER WIRING

Refer to the Electrical Schematic 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 J1 and J3 and a second wire jumper installed between J2 and J4. For 240 VAC operation, a single wire jumper should be installed between J3 and J4

AC power for the unit is connected to terminal strip P1. Connect the ground wire of the AC power to the terminal labeled P1-1 (GND). For AC power with a neutral and hot wire, the hot wire connects to P1-2 (L1) and the neutral wire connects to P1-3 (L2). For AC power with two hot wires, either wire can connect to L1 and L2

PUMP AND VALVE RELAY OUTPUTS

The Series 100 supplies relay outputs to control the 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 P1-4 (L1) and P1-5 (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 VALVE WIRING

The inlet and optional flush valves must operate at the same voltage as supplied to the board. These outputs can supply 5A 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 P1-6 (L1) and P1-7 (L2) inlet terminals of P1. The optional flush valve connects to the P1-8 (L1) and P1-9 (L2) flush terminals of P1.

TDS/CONDUCTIVITY CELL WIRING

For accurate TDS reading, 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 P3. Connect each colored wire to the terminal labeled with the same color.

SWITCH INPUTS

Switch inputs are connected to P2. 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.

CAUTION! ***Applying voltage to these terminals will damage the controller. The switches can be either Normally Open (NO) or Normally Closed (NC), but must be the same. If the controller is set for Normally Open (NO) switches, all switches must be open for the unit to run. If the controller is set for Normally Closed (NC) switches, all switches must be closed for the unit to run.***

NOTE! ***J10 selects Normally Open (NO) or Normally Closed (NC) operation. When J10 is in the A position, the unit is configured for Normally Open (NO) switches. When J10 is in the B position, the unit is configured for Normally Closed (NC) switches.***

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 P2. 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.

PRETREAT SWITCH

In systems with pretreatment, a pretreat lockout switch can be connected to the pretreat input of P2. This switch should operate when the pretreatment device is out of service. Remove the red jumper when this option is used. Refer to the Electrical Schematic for jumper location.

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

TANK FULL SWITCH

Connecting a tank full switch to the tank full input of P2 can cause the unit to shut down for a tank full condition. Remove the red jumper when this option is used. Refer to the Electrical Schematic for jumper location.

NOTE! ***J9 selects a short or long tank full restart.***

S-100 MICROPROCESSOR CONTROLLER (continued)

SYSTEM OPERATION

General Operation

The unit has two modes of operation—a standby mode and an operating mode. In the standby mode, the unit is effectively off. Outputs are turned off and the display shows OFF. 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 and Status Indicators

The display is a 3-digit display. System operating status, the TDS reading, and the TDS setpoint are shown on this display. A red/green LED indicates the system status in conjunction with the display.

Refer to Table 2 for the description of the operation of the display and LED.

CONDITION	DISPLAY	STATUS LED
RO OFF	OFF	
RO START DELAY	- - -	
RO OPERATING		STEADY GREEN
TANK FULL	FUL	
TANK FULL RESTART	FUL	SLOW FLASH GREEN
PRETREAT LOCKOUT	PL	
FLUSH	FLS	
PRESSURE FAULT	PF	FLASHING RED
PF AUTO RESET	PF	
PS AUTO RETRY	PF	STEADY RED

TABLE 2

Start Delay

When the controller is placed in the operating mode or restarts from a shutdown condition, the inlet solenoid will open and a 60 second delay will start. During the delay, "- - -" will show on the water quality display. After this delay, the RO pump will start. The water quality display will now show the current water quality. The status lamp will show steady green.

Pressure Fault

If the pressure fault input is active for two seconds, a pressure fault condition will occur. This will cause the controller to shut down. PF will show on the water quality display and the status lamp will flash red. To clear the pressure fault, press the power key twice

PF Auto Reset / PF Retry

With J8 in the A position, the power must be cycled using the power key to clear a pressure fault shutdown. A PF auto reset function is enabled by placing J8 in the B position. When a pressure fault occurs with the PF auto reset enabled, the controller will automatically reset after a 60 minute delay and the controller will start. If the pressure fault has cleared, the controller will continue to run. If the pressure fault has not cleared, the controller will again shut down for the pressure fault condition and the auto reset cycle will repeat. During the auto reset delay, the water quality display will show "PF" and the status light will be off.

A PF retry function is enabled by placing J8 in the C position. When a pressure fault occurs with the PF retry enabled, the controller will shut down for 30 seconds and attempt to restart. If the pressure fault is still active, the controller will shut down for 5 minutes and attempt to restart. If the pressure fault is still active, the controller will shut down for 30 minutes and attempt to restart. If the pressure fault is still active, the controller will lockout for the pressure fault. During the retry delays, the water quality display will show "PF" and the status lamp will be steady red. If during one of the retries the controller is able to start and run continuously for ten seconds, the retry function is reset. If the pressure fault occurs, the PF retry cycle will repeat from the beginning

When the J8 is in the D position, both the PF auto reset *AND* the PF retry functions are enabled. If a pressure fault occurs, the PF retry function will operate as described above. If the PF retry function locks out, the PF auto rest function will operate as described above. The PF retry and PF auto rest functions will continue in a 30 second, 5 minute, 30 minute, and 30 minute cycle until the pressure fault condition clears.

Tank Full

If the tank full input is active for five seconds, the controller will shut down for a tank full condition. The water quality display will show "FUL." When the tank full condition clears, the unit will restart after the selected restart delay. The delay is selected with J9. With J9 in the A position, the restart delay is two seconds. With the J9 in the B position, the restart delay is 15 minutes. Position A is normally used with the tank level switches that have a large span. During the restart delay, the status lamp will flash green.

Pretreat Lockout

If the pretreat lockout input is active for two seconds, the controller will shut down for a pretreat lockout condition. The water quality display will show "PL." When the pretreat lockout condition clears, the unit will restart.

S-100 MICROPROCESSOR CONTROLLER (continued)

Flush
A flush function can be enabled using J11 and J12. When a flush is initiated, the flush valve will operate and the flush will last one minute. The flush can occur when a tank full condition occurs or every 24 hours, depending on the jumper settings. The inlet valve can be open or closed and the pump can be on or off, depending on the jumper settings. Refer to Table 3 for the jumper settings.

J11	J12	FLUSH TYPE	INLET	PUMP
A	A	NONE		
A	B	TANK FULL	OPEN	ON
A	C	TANK FULL	CLOSED	ON
B	A	TANK FULL	OPEN	OFF
B	B	TANK FULL	CLOSED	OFF
B	C	24 HOUR	OPEN	ON
C	A	24 HOUR	CLOSED	ON
C	B	24 HOUR	OPEN	OFF
C	C	24 HOUR	CLOSED	OFF

TABLE 3

Water Quality Display
The water quality display shows the current water quality when the controller is operating normally, and status messages when the controller is shut down. The water quality display ranges from 0 to 999 ppm. If the water quality is above 999 ppm, the display will show "Λ Λ Λ." If the water quality is below the setpoint, the water quality lamp will be green. If the water quality is above the setpoint, the water quality lamp will be red.

Water Quality Setpoint
The water quality setpoint can be adjusted from 0 to 999 ppm. If set to 999 ppm, the water quality lamp will always remain green. To set the water quality setpoint, press the SETPOINT key. The display will alternate between the setpoint and "SP." Use a small screwdriver to adjust the SP to the desired setpoint value. Press the SETPOINT key to return the display to the water quality display.

TROUBLESHOOTING

CAUTION! ***Hazardous voltages are present when power is applied to the controller. Pressing the power key DOES NOT remove these voltages. The power must be disconnected from the power source. When connecting or disconnecting any wiring to the unit, be sure to turn off at the disconnect or breaker. Refer to Figure 2 for the location of components.***

NOTE! ***If fuse F1 is blown, none of the outputs will operate. If fuse F2 is blown, the controller will not operate.***

System Inoperative
Check to see if the water quality display is lit. If not, check fuse F2 located below the transformer. If the fuse is OK, use a voltmeter to verify that 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 may be defective and should be replaced. If no power is applied to the board, check the power wiring to the controller.

Inlet Valve Will Not Operate
Check to see if the controller is off. If the controller is on, check for any shutdown conditions that are active. If there are no active shutdown conditions, check to see if the inlet LED L2 is lit. If the inlet LED L2 is off, the board needs to be replaced. If the inlet L2 is on, check fuse F1. If fuse F1 is bad, replace the fuse. If the fuse F1 is OK, check the inlet valve terminals for power. If there is no power, replace the board. If there is power, check the valve and valve wiring.

Pump Will Not Operate
Check to see if the controller is off. If the controller is off, check for active shutdown conditions. If there are no shutdown conditions, check to see if pump LED L1 is lit. If pump LED L1 is off, replace the board. If the pump LED L1 is on, check fuse F1. If fuse F1 is bad, replace the fuse. If fuse F1 is OK, check the pump terminals for power. If there is no power, replace the board. If there is power, check the pump motor and motor wiring.

No Flush or Not Flushing Properly
Verify that the flush jumpers J11 and J12 are set correctly. In flush mode, check to see if flush LED L3 is lit. If flush LED L3 is off, replace the board

No or Incorrect TDS Reading
Check to see if the sensor is wired and installed correctly. If the sensor is wired and installed incorrectly, correct it. Check the unit calibration. If the unit is calibrated incorrectly, recalibrate it. Disconnect the green and white wires of the sensor from P3. If the reading does not show "0," replace the board. If the reading shows "0," reconnect the wires and remove the sensor from piping and dry. If the reading does not show "0," replace the board. If does show does show "0," short the pins of the sensor. Check to see if the reading shows "Λ Λ Λ." If the reading does not show "Λ Λ Λ," replace the board.

SYSTEM STARTUP PROCEDURE

STEP ONE

Installation Follow-up
Visually inspect the inlet, drain, and product water connections. Be sure the filter cartridge has been installed. Confirm the RO system has been connected to the proper power source.

STEP TWO

Read the Section on the RO Microprocessor Controller
It is important to read the RO Controller Section carefully before attempting to operate this system and before changing any settings.

STEP THREE

Divert Product Water to the Drain
During the initial system startup or after changing membrane elements, it is important to divert the product water to a wastewater drain for approximately 30 to 60 minutes. This is required because membrane elements are treated with a preservative solution and should be thoroughly rinsed clean of any remnant before water is retained for use. 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 application.

STEP FOUR

Flush the System
Turn on the inlet feed water supply source, allowing the water to enter the system. Open the manual flush valve. Press the power key on the RO controller front panel. The inlet solenoid valve will open and the pump will start after a 60 second delay. The air will quickly evacuate from the system.

The 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 start only if there are sufficient feed water flow and pressure (minimum 35 psi).

Allow the system to run approximately three to five minutes with the manual flush valve open to bleed all trapped air and to flush the membrane element. Close the flush valve through the controller.

NOTE! ***We recommend the manual flush valve be opened once a week for three to five minutes while the system is operating to flush the membrane elements.***

STEP FIVE

Adjust the System Pressure
Adjust the system pressure regulator so that the system pressure gauge reads 165 psi for all models except model 2400 (the pressure gauge should read 100 psi for BLS 2400). Turn the valve clockwise to increase the pressure, and counterclockwise to decrease the pressure.

STEP SIX

Adjust the System Flow Rates
Adjust the reject valve until the reject water flow rate is the same as the product water flow rate. Adjust the system pressure regulator so that the system pressure gauge reads 165 psi for all models except model 2400 (the pressure gauge should read 100 psi for BLS 2400). Turn the system pressure regulator clockwise to increase the pressure, and counterclockwise to decrease the pressure. You may have to adjust the reject valve and the system pressure regulator several times to control the system pressure appropriately and have the reject water flow rate the same as the product water flow rate.

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

Your BLS RO System was designed to operate at 50% recovery.

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).***

IMPORTANT! ***Frequently check the system for any leaks that may develop.***

STEP SEVEN

Check the Inlet Low Pressure Switch
You will find an inlet feed water low pressure switch installed on the BLS RO System. It is preset at the factory. Its purpose is to prevent damage to the system pump and/or motor if there is inadequate feed water flow or pressure. This step is to verify that it is functioning properly.

Slowly decrease the inlet feed water supply by closing the manual feed water shutoff valve. If you hear the pressure switch open when the pressure drops to approximately 15 psi, then the inlet pressure switch is functioning correctly. If it is not functioning correctly, refer to the section of this manual on “System Pressure Switches.”

NOTE! ***When humidity is high, expect condensation to form on parts of the system which contain cold water.***

SYSTEM STARTUP PROCEDURE (continued)

STEP EIGHT

Purge the System
Allow the system to operate approximately 30 to 60 minutes diverting the product water to drain. Once all of the membrane preservative is flushed from the system, product water may be retained for use.

STEP NINE

Final Inspection of Installation
Once the above procedures are completed, visually inspect all water connections. Check to be certain that all connections are tight and secure.

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

FILTER CARTRIDGE INSTALLATION

A standard BLS RO System is equipped with a 5-micron sediment prefilter cartridge which collects sediment prior to the membrane element. It may also be equipped with an optional carbon block prefilter, which reduces undesirable taste, odor, and chlorine.

NOTE! ***Filter cartridges are packaged separately and will need to be installed prior to startup.***

1. Remove the filter cartridge from its packaging.
2. Remove the filter sump by turning clockwise.
3. Place the sediment cartridge over the standpipe in bottom of the filter sump marked “Sediment Prefilter.” If your system has a second optional prefilter, place the carbon block cartridge over the standpipe in bottom of the filter sump marked “Carbon Prefilter.”
4. Replace the filter sump making sure that the label on the sump matches the label on the cap. DO NOT OVER TIGHTEN.

Note! ***The membrane element(s) has been installed in the system during the final testing procedures, unless other arrangements have been made with the manufacturer.***

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.***

CHANGING FILTER CARTRIDGES

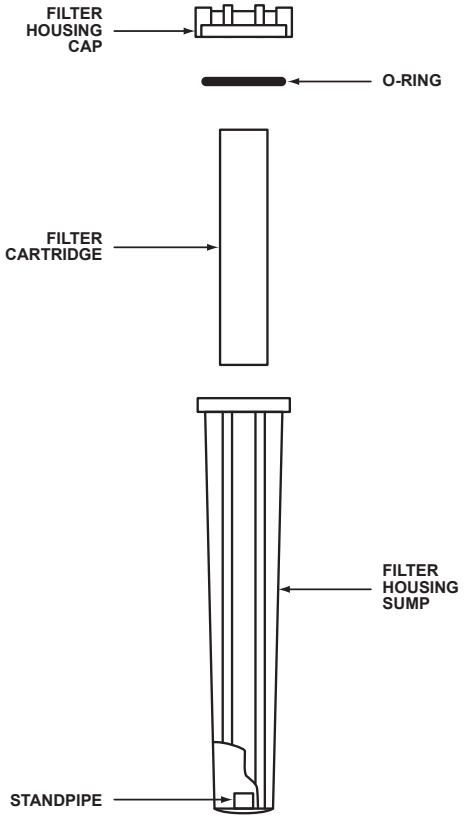
Filter cartridges have a limited service life and should be replaced if you experience noticeable changes in product water taste, color, odor, or flow rate. On average, filter cartridges should be replaced about every three to six months.

Your system is equipped with prefilter inlet and prefilter 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. Close the manual feed water shutoff valve.
2. The system will shut down after five seconds and the PRESSURE FAULT alarm will light/sound.
3. Relieve all the pressure from the system by opening the manual flush valve.
4. Turn off the system power. Disconnect the main power supply.

IMPORTANT! ***Before performing any maintenance on your BLS RO System, ALWAYS DISCONNECT THE POWER SUPPLY!***

FILTER CARTRIDGE INSTALLATION & REPLACEMENT (continued)

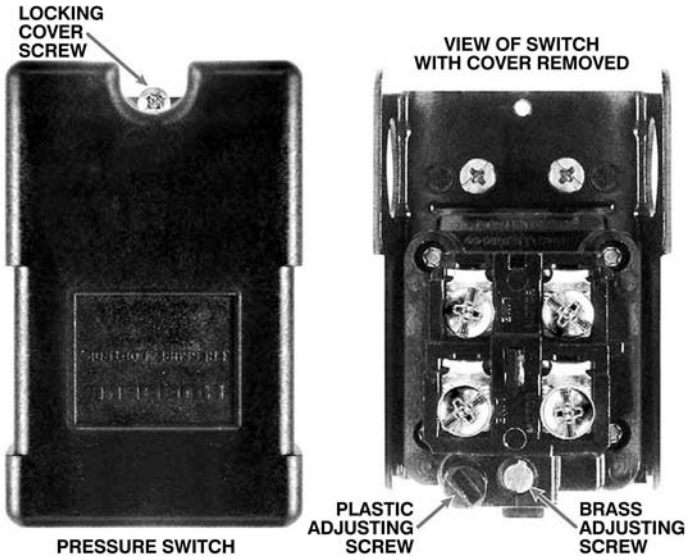


5. Remove the filter sump by turning clockwise. Remove the o-ring, wipe it clean of lubricant, and set aside. It is common for the o-ring to lift out of the sump and stick to the cap. If the o-ring appears to be damaged or crimped, it should be replaced.
6. Remove and discard the used filter cartridge.
7. Rinse out the filter sump and fill it about 1/3 full of water. Add about two tablespoons of bleach and scrub the cap and filter sump with a non-abrasive cloth. Observe the precautions printed on the bleach container. Rinse thoroughly.
8. Lubricate the o-ring with a food grade silicone or glycerin. Place the o-ring back into the groove and smooth into place with your fingers. This step is important to ensure a proper watertight seal.
9. Place the sediment cartridge over the standpipe in the bottom of the filter sump marked “Sediment Prefilter” and place the carbon block cartridge over the standpipe in bottom of the filter sump marked “Carbon Prefilter” (if your system is equipped with this option).
10. Replace the filter sump, making sure that the label on the filter sump matches the label on the cap. DO NOT OVERTIGHTEN.
11. Open the manual feed water shutoff valve and allow the system to fill with water.
12. Open the manual flush valve.
13. Reconnect the main power supply. Turn on the system power.
14. Check for leaks.
15. Flush the system for three to five minutes while diverting the product water to the drain.
16. Close the manual flush valve.

NOTE! ***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.***

IMPORTANT! ***Use sterile procedures when removing or replacing filters and membrane elements, or when working with the tubing containing product water.***

SYSTEM PRESSURE SWITCHES



INLET LOW PRESSURE SWITCH

Preset to shut down the system if the inlet pressure is below 15 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.

How to Verify the Inlet Low Pressure Switch Is Functioning Properly
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.***

How to Adjust 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.

How to Tell if You Have a Bad 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 FEATURE)

Preset to cut-out at 45 psi and cut-in at 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.

How to Verify 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.

How to Adjust 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.

How to Tell if You Have a Bad 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. You should also notice water leaking/spraying from the pressure relief valve.

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 shut down after about five seconds and the PRESSURE FAULT alarm will light/sound.
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, use pliers.

NOTE! ***Observe the arrow on the vessel(s) which shows the direction of flow through the membrane vessel(s). IF THE ARROW ON THE VESSEL POINTS UP, the brine seal on the membrane element should be on the bottom of the vessel. IF THE ARROW ON THE VESSEL POINTS DOWN, the brine seal on the membrane element should be at the top 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.

NOTE! ***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! ***It is important to 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 remnant. 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 and allow the system to fill with water.
14. Turn on the power button located on the RO controller to restart the system.
15. Check for leaks
16. Open the flush valve and flush the system for two to three minutes
17. Close the flush valve and divert the product water to drain for 30 to 60 minutes.
18. 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 which 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. Close the manual feed water shutoff valve. The system will shut down after five seconds and the PRESSURE FAULT alarm will light/sound.
2. Disconnect the main power supply.

IMPORTANT! ***Before performing any maintenance on your BLS RO System, ALWAYS disconnect the main power supply!***

3. Relieve all the pressure from the system by opening the manual flush valve and pressing the pressure relief button on the cartridge filter 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 sump and fill about 1/3 full of water. Add 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 sump(s).
7. Pour about one tablespoon of bleach into the “Sediment Prefilter” sump. Reinstall the filter sump(s) without the filter cartridge(s), making sure the o-ring(s) 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 and temporarily shut off the water supply line from the storage tank to the distribution system.
9. Reconnect the power supply.
10. Turn on the feed water supply.
11. Close the manual flush valve.
12. Run the system until the product water tank is approximately 3/4 full, at which point turn the power switch off. If you allow the storage tank to fill completely, the system will automatically go into an automatic flush cycle.
13. Turn off the system and let it sit for eight hours.
14. Turn off the feed water.
15. Empty the product water storage tank to a wastewater drain.
16. Disconnect the main power supply.
17. Remove the filter sump(s) as before. Empty all chlorinated water.
18. Remove the o-ring from the filter sump and wipe it clean. Lubricate with 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.
19. Place a new sediment cartridge over the standpipe in the bottom of the sump marked “Sediment Prefilter” and place a new carbon block cartridge over the standpipe in the bottom of the sump marked “Carbon Prefilter” (if you system has this option).
20. Replace the filter housing sump(s) on the filter housing cap(s) by turning counterclockwise making sure that the label on the sump matches the label on the cap. DO NOT OVERTIGHTEN.
21. Turn on the feed water supply and allow the system to fill with water.
22. Reconnect the power supply. Turn on the system power.
23. Run the system until the product water tank is full—at which point the system will shut off automatically.
24. Check for leaks.
25. Thoroughly flush the system of any residual chlorine by emptying the product water storage tank again and repeating the prior steps.
26. After the system and storage tank have been thoroughly rinsed of any residual chlorine, you may reconnect your distribution system to the storage tank.

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

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

REPLACEMENT PARTS LIST

PART NO.	DESCRIPTION	BLS SYSTEMS	QTY
MEMBRANE ELEMENTS			
7030254002	XLE-2540 Membrane Element, 2.5" x 40"	950-1900	1 / 2
PRESSURE VESSELS			
100025402	S/S Pressure Vessel, 2.5" x 40"	950-1900	1 / 2
100021212	End Plug, Black, for 2.5" S/S Vessel, 2-Port	950-1900	1 / 2
1300329	O-Ring, External, for 2.5" End Plug	950-1900	2 / 4
1300209	O-Ring, Internal, for 2.5" End Plug	950-1900	2 / 4
100021215	Clamp Set for 2.5" S.S. Vessel	950-1900	2 / 4
FILTER HOUSINGS & CARTRIDGES			
158205-2	#20 Slim Line Housing, 1/2"	950-1900	1
158205-1	#20 Slim Line Housing, 1/2", (Optional Sediment)	950-1900	1
158204-1	#20 Slim Line Housing, 1/2", (Optional Carbon)	950-1900	1
14815508	Prefilter Cartridge, 20" Sediment Cartridge, 5 Micron	950-1900	1
149252010	Prefilter Cartridge, 20" Carbon Block Cartridge, 10 Micron (Optional)	950-1900	1
PUMPS & MOTORS			
3030801	Pump, Rotary Vane, Brass, 260 GPH, w/ V Band Clamp	950-1900 60Hz	1
3030901	Pump, Rotary Vane, Brass, 290 GPH, w/ V Band Clamp (Optional)	950-1900 50Hz	1
31007573	Motor, 3/4HP, 120/240V, 60/50Hz, 1Ph	950-1900	1
3011113	V-Band Clamp (Replacement Part Only)	950-1900	1
SOLENOID VALVES			
00912120E	Inlet Solenoid Valve w/ Coil, 1/2", Brass, 115V	950-1900 60Hz	1
00912220E	Inlet Solenoid Valve w/ Coil, 1/2", Brass, 220V	950-1900 50Hz	1
00938120E	Autoflush Solenoid Valve w/ Coil, 3/8", Brass, 115V (Optimum)	950-1900 60Hz	1
00938220E	Autoflush Solenoid Valve w/ Coil, 3/8", Brass, 220V (Optimum)	950-1900 50Hz	1
MISCELLANEOUS			
17506902	Pressure Switch,Low Cut-Out	950-1900	1
17506905	Pressure Switch, Product Water (Optional)	950-1900	1
0700708	Product Pressure Relief Valve (Optional)	950-1900	1
4438	Product Water Check Valve, 3/8" T, Plastic	950-1900	1
31403844	Manual Flush Valve, 3/8" (Standard)	950-1900	1
008013	System Operating Pressure Gauge, 0-300 psi, Liquid	950-1900	1
008001	Prefilter Inlet Pressure Gauge, 0-100 psi, Dry	950-1900	1
008001	Prefilter Outlet Pressure Gauge, 0-100 psi, Dry	950-1900	1
1720114	System Operating Pressure Regulator, 3/8" In 3/8" Out, Brass	950-1900	1
48421001	Product Water Flow Meter, 0.1-1 gpm, without Valve	950	1
48421001	Reject Water Flow Meter, 0.1-1 gpm, with Valve	950	1
48421002	Product Water Flow Meter, 0.2-2 gpm, without Valve	1900	1
48421002	Reject Water Flow Meter, 0.2-2 gpm, with Valve	1900	1
008011	Product Pressure Gauge, 0-100 psi, Liq. Panel Clamp (Optional)	950-1900	1
4819010	Mini-Trol Controller, 120 VAC 50/60Hz (Standard)	950-1900 60Hz	1
4819020	Mini-Trol Controller, 220 VAC 50/60Hz (Standard)	950-1900 50Hz	1
4819021	S-100 Microprocessor Controller, 110/115 VAC 50/60Hz (Optimum)	950-1900	1
31404251	Inlet Manual Feed Water Shutoff Valve, 1/2" FPT x 1/2" MPT, (Optional)	950-1900	1
4931323	Flow Control Body 3/8" (Econo)	950-1900	1
49346763	Flow Control Adapter 3/8" (Econo)	950-1900	1
4934067	Flow Control Screen (Econo)	950-1900	1
491651	Flow Control Orifice Plate (Econo)	950	1
491691	Flow Control Orifice Plate (Econo)	1900	1

BLS SYSTEM TROUBLESHOOTING

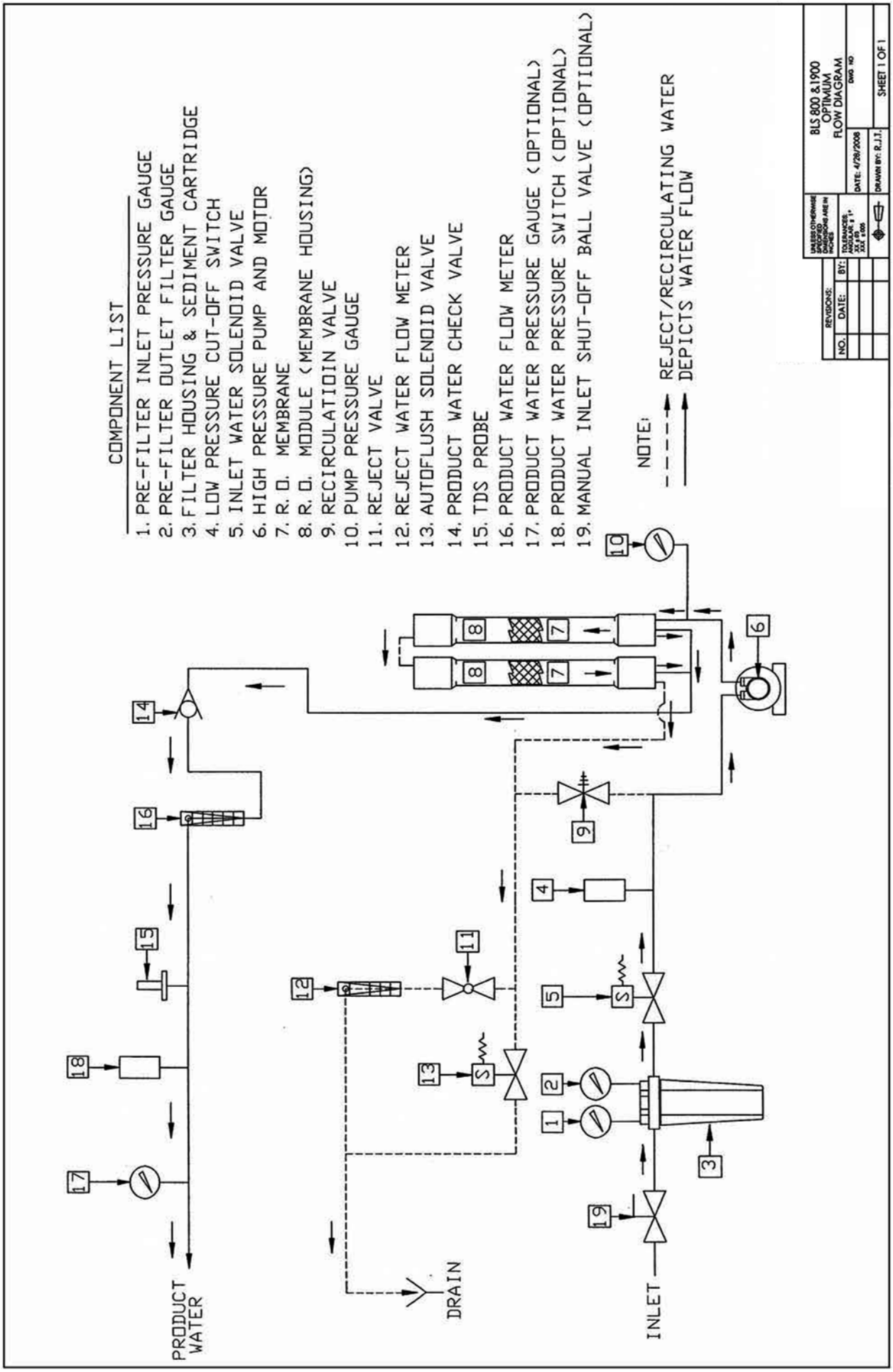
PROBLEM	POSSIBLE CAUSE	SOLUTION
BLS SYSTEM WILL NOT START	No electrical power to microprocessor	Check power supply
	Storage tank full	Drain portion of water out of tank
	Low feed water pressure	See LOW FEED PRESSURE
	Pump / motor malfunction	Check, replace if necessary
	Pressure or float switch defective	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 pretreatment	Check if sized correctly or fouled
LOW OPERATING PRESSURE	System pressure regulator need adjustment	Check, adjust if necessary
	Pump / motor coupling broken	Check, replace if necessary
	Pressure gauge broken	Check, replace if necessary
	Pump impellers worn	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 valve seal, use care when reinstalling the element into vessel
	Inlet solenoid valve not opening	Clean solenoid valve or replace
	Membrane element fouled	Check, clean, or replace
	Autoflush On	Check controller. Check autoflush program
LOW OR NO REJECT WATER / HIGH OPERATING PRESSURE	Blocked drain line	Check and clean
	Reject valve blocked or damaged	Remove reject valve stem. Check for damage or blockage. Clean or replace.
	Flow meter inaccurate	Check reject flow manually with stop watch. Repair or replace flow meter.
	Membrane element clogged or fouled	Check, clean, or replace
LOW OR NO PRODUCT WATER	Pump pressure low	Check and adjust
	Membrane element clogged or fouled	Check, clean, or replace
	Water temperature too low	Check
	Product check valve damaged	Replace check valve
	Membrane element installed backward or brine seal damaged / rolled	Check, use care when replacing element into housing
	Flow meter incorrect	Check product flow manually with a stop watch. Repair or replace flow meter.
BAD TASTING WATER	Increase in feed water TDS	See HIGH TDS IN PRODUCT WATER
	Filter cartridges exhausted	Replace filter cartridges
	Tank and system contaminated	Replace filter cartridges and membrane element, sterilize system and tank
	Tank contaminated	Re-sterilize tank
	Membrane element not flushed completely	Flush one or two tanks of product water
PUMP DOES NOT RUN	Defective controls	Check controller and wiring
	Pump is bound	Manually check pump rotation, replace if necessary
	Pump / motor coupling damaged	Check, replace if necessary
HIGH TDS IN PRODUCT WATER	Membrane element expended	Check, replace if necessary
	Insufficient reject flow rate	Check, reject flow must be at least equal to product flow
	Increase in feed water TDS	Use percent rejection to calculate increase in product TDS
	Product tube o-ring damaged or out of place	Remove top and bottom end caps from housing. Reinstall or replace o-ring.
	Conductivity monitor inaccurate or probe fouled	Calibrate monitor. Check monitor connections. Clean or replace probe.
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.

SYSTEM LOG

MODEL # ________________ **OPERATOR:** ________________

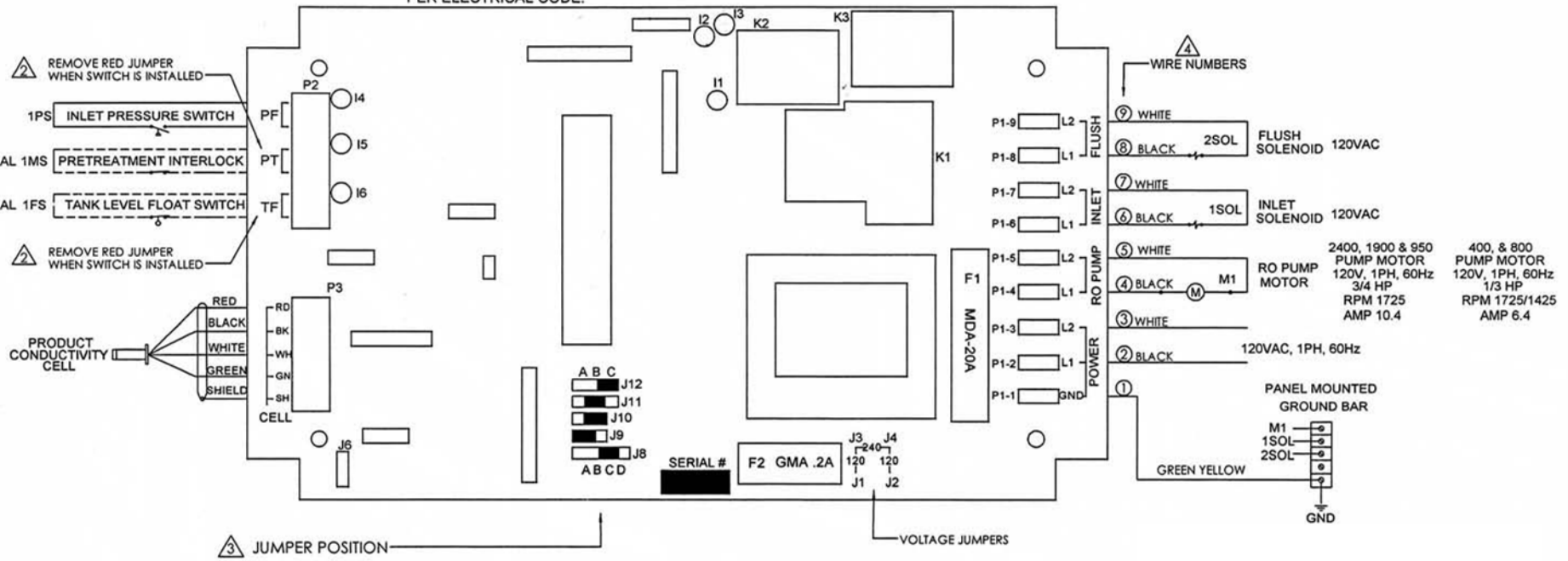
SERIAL # ________________ **FROM** __________ **TO** __________

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


COMPONENT LIST
1. PRE-FILTER INLET PRESSURE GAUGE
2. PRE-FILTER OUTLET FILTER GAUGE
3. FILTER HOUSING & SEDIMENT CARTRIDGE
4. LOW PRESSURE CUT-OFF SWITCH
5. INLET WATER SOLENOID VALVE
6. HIGH PRESSURE PUMP AND MOTOR
7. R.O. MEMBRANE
8. R.O. MODULE (MEMBRANE HOUSING)
9. RECIRCULATIOIN VALVE
10. PUMP PRESSURE GAUGE
11. REJECT VALVE
12. REJECT WATER FLOW METER
13. AUTOFLUSH SOLENOID VALVE
14. PRODUCT WATER CHECK VALVE
15. TDS PROBE
16. PRODUCT WATER FLOW METER
17. PRODUCT WATER PRESSURE GAUGE (OPTIONAL)
18. PRODUCT WATER PRESSURE SWITCH (OPTIONAL)
19. MANUAL INLET SHUT-OFF BALL VALVE (OPTIONAL)
NOTE:
REJECT/RECIRCULATING WATER
DEPICTS WATER FLOW
PRODUCT WATER
DRAIN
INLET
REVISIONS:
NO.
DATE:
BY:
BLS 800 &1900
OPTIMUM
FLOW DIAGRAM
DWG NO
DATE: 4/28/2008
DRAWN BY: R.J.I.
SHEET 1 OF 1

WIRING DIAGRAM APPLIES ONLY TO COMPONENTS

NOTES: 1) DASHED LINES INDICATE FIELD WIRING BY CUSTOMER
2) FOR 120V OPERATION, JUMPER MUST BE BETWEEN J1, J3, AND A SECOND WIRE JUMPER J2 & J4
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.



JUMPER NO.	POSITION	PRE SET
J8	C	PF AUTO RESET 30 SEC,5MIN, 30 MIN. & LOCKOUT
J9	A	TANK FULL RESET DELAY 2 SEC. FOR RESTART
J10	B	N.C. SWITCHES
J11	B	FLUSH TYPE 24 HOUR, INLET OPEN, PUMP ON
J12	C	FLUSH TYPE 24 HOUR, INLET OPEN, PUMP ON

SPECIAL PROGRAMMED CHIP:
RO START DELAY 60 SEC & RO FLUSH TIME 1 MIN.
PRESSURE FAULT AUTO RESET 30 MIN.

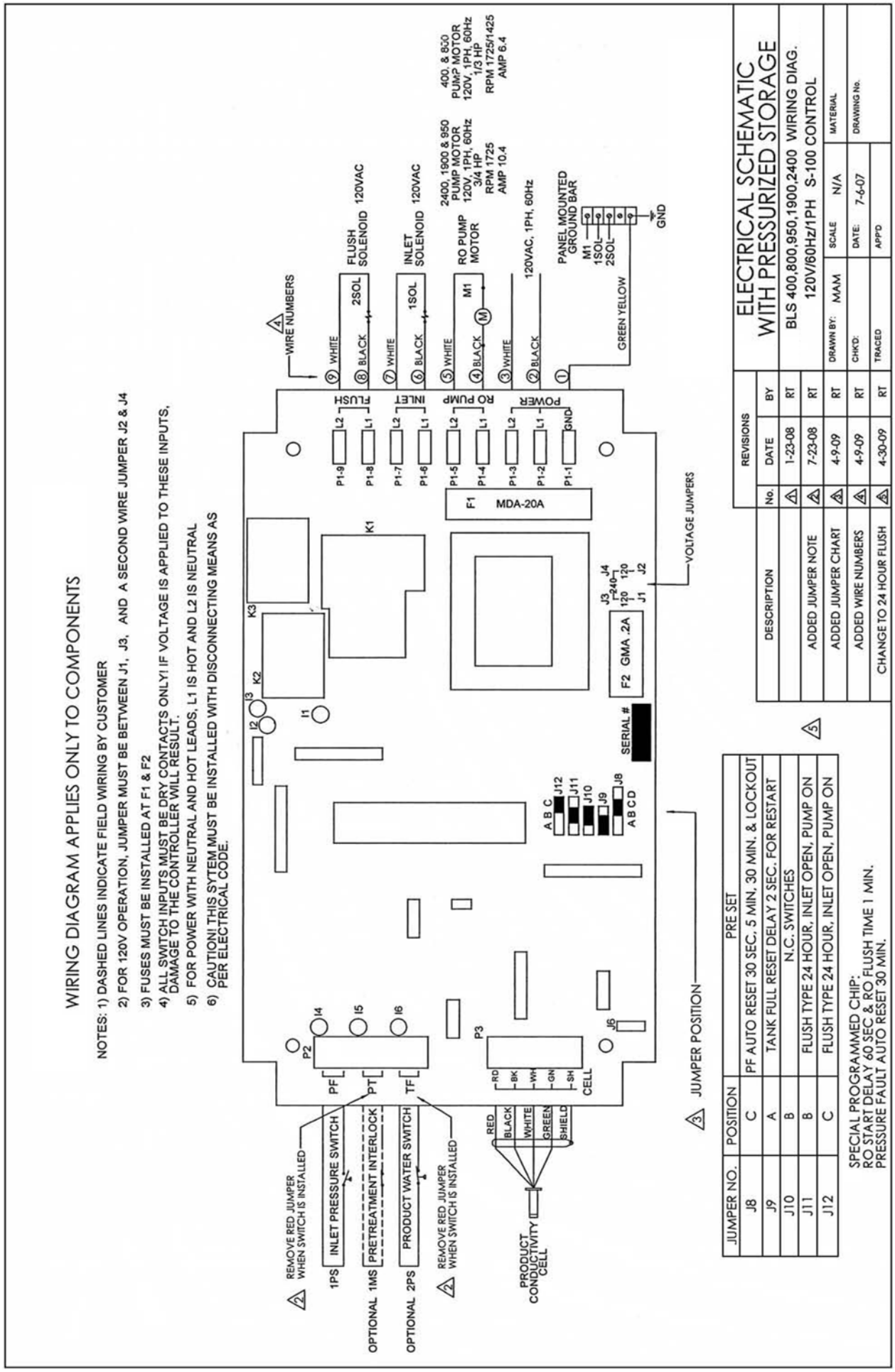
5

DESCRIPTION	REVISIONS No.	DATE	BY
	1	1-23-08	RT
ADDED JUMPER NOTE	2	7-23-08	RT
ADDED JUMPER CHART	3	4-9-09	RT
ADDED WIRE NUMBERS	4	4-9-09	RT
CHANGE TO 24 HOUR FLUSH	5	4-30-09	RT

ELECTRICAL SCHEMATIC WITH ATMOSPHERIC STORAGE

BLS 400,800,950,1900,2400 WIRING DIAG.
120V/60Hz/1PH S-100 CONTROL

DRAWN BY: MAM	SCALE N/A	MATERIAL
CHK'D:	DATE: 7-6-07	DRAWING No.
TRACED	APP'D	

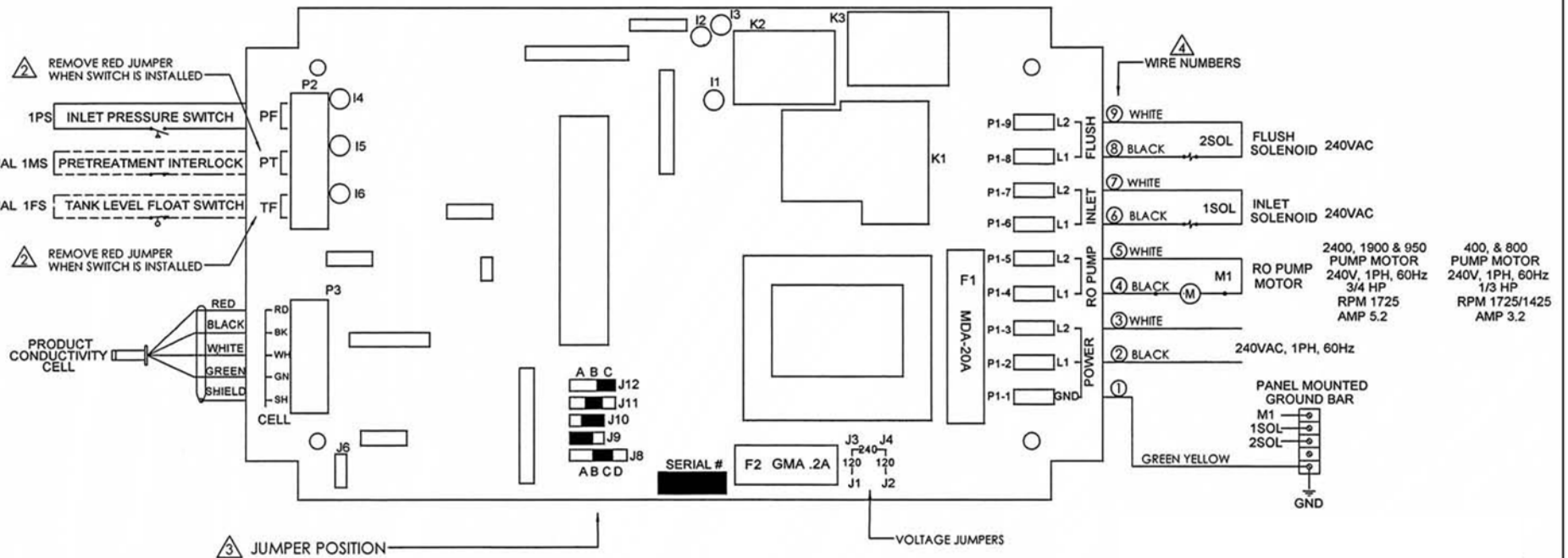


JUMPER NO.	POSITION	PRE SET
J8	C	PF AUTO RESET 30 SEC, 5 MIN, 30 MIN, & LOCKOUT
J9	A	TANK FULL RESET DELAY 2 SEC. FOR RESTART
J10	B	N.C. SWITCHES
J11	B	FLUSH TYPE 24 HOUR, INLET OPEN, PUMP ON
J12	C	FLUSH TYPE 24 HOUR, INLET OPEN, PUMP ON

REVISIONS			
DESCRIPTION	No.	DATE	BY
	1	1-23-08	RT
ADDED JUMPER NOTE	2	7-23-08	RT
ADDED JUMPER CHART	3	4-9-09	RT
ADDED WIRE NUMBERS	4	4-9-09	RT
CHANGE TO 24 HOUR FLUSH	5	4-30-09	RT

WIRING DIAGRAM APPLIES ONLY TO COMPONENTS

NOTES: 1) DASHED LINES INDICATE FIELD WIRING BY CUSTOMER
2) FOR 240V OPERATION A SINGLE JUMPER MUST BE BETWEEN J3 AND J4.
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.



JUMPER NO.	POSITION	PRE SET
J8	C	PF AUTO RESET 30 SEC, 5 MIN, & LOCKOUT
J9	A	TANK FULL RESET DELAY 2 SEC. FOR RESTART
J10	B	N.C. SWITCHES
J11	B	FLUSH TYPE 24 HOUR, INLET OPEN, PUMP ON
J12	C	FLUSH TYPE 24 HOUR, INLET OPEN, PUMP ON

SPECIAL PROGRAMMED CHIP:
RO START DELAY 60 SEC & RO FLUSH TIME 1 MIN.
PRESSURE FAULT AUTO RESET 30 MIN.

	REVISIONS			
DESCRIPTION	No.	DATE	BY	
	1	1-23-08	RT	
ADDED JUMPER NOTE	2	7-23-08	RT	
ADDED JUMPER CHART	3	4-9-09	RT	
ADDED WIRE NUMBERS	4	4-9-09	RT	
CHANGE TO 24 HOUR FLUSH	5	4-30-09	RT	

5

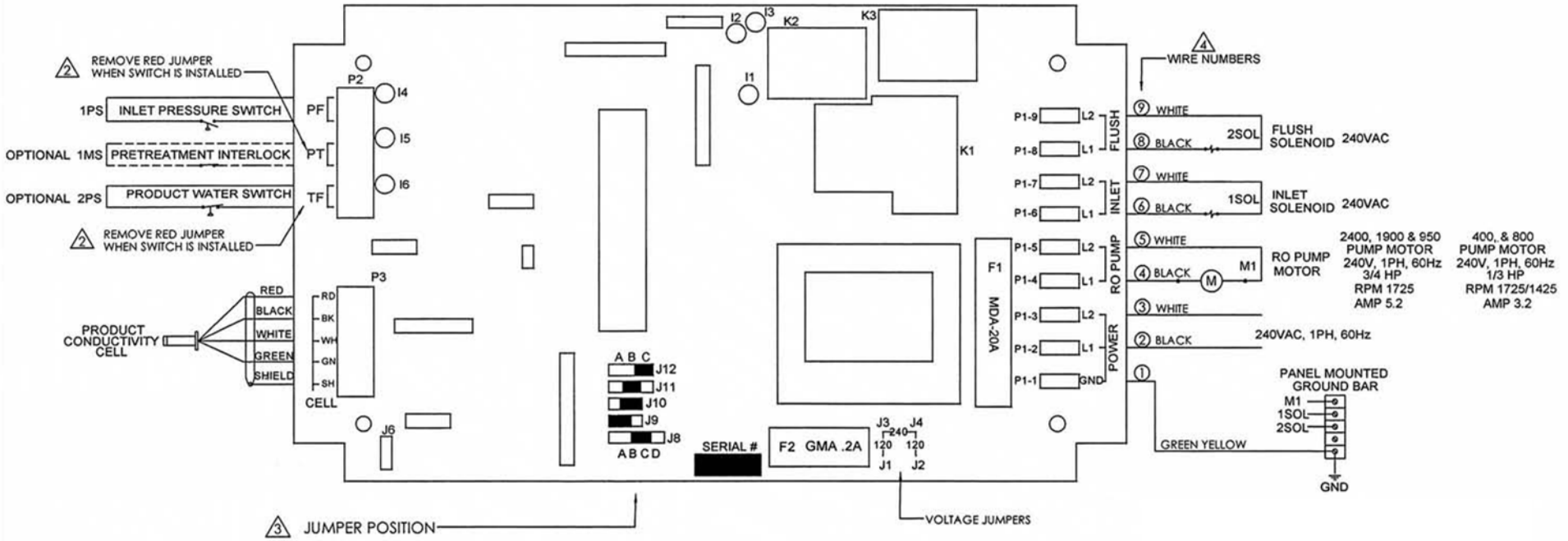
ELECTRICAL SCHEMATIC WITH ATMOSPHERIC STORAGE

BLS 400,800,950,1900,2400 WIRING DIAG.
240V/60Hz/1PH S-100 CONTROL

DRAWN BY: MAM	SCALE N/A	MATERIAL	
CHK'D:	DATE: 7-6-07	DRAWING No.	
TRACED	APP'D		

WIRING DIAGRAM APPLIES ONLY TO COMPONENTS

NOTES: 1) DASHED LINES INDICATE FIELD WIRING BY CUSTOMER
2) FOR 240V OPERATION A SINGLE JUMPER MUST BE BETWEEN J3 AND J4.
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 SYSTEM MUST BE INSTALLED WITH DISCONNECTING MEANS AS PER ELECTRICAL CODE.



JUMPER NO.	POSITION	PRE SET
J8	C	PF AUTO RESET 30 SEC, 5 MIN. & LOCKOUT
J9	A	TANK FULL RESET DELAY 2 SEC. FOR RESTART
J10	B	N.C. SWITCHES
J11	B	FLUSH TYPE 24 HOUR,INLET OPEN, PUMP ON
J12	C	FLUSH TYPE 24 HOUR,INLET OPEN, PUMP ON

SPECIAL PROGRAMMED CHIP:
RO START DELAY 60 SEC & RO FLUSH TIME 1 MIN.
PRESSURE FAULT AUTO RESET 30 MIN.

5

DESCRIPTION	No.	DATE	BY
	1	1-23-08	RT
ADDED JUMPER NOTE	2	7-23-08	RT
ADDED JUMPER CHART	3	4-9-09	RT
ADDED WIRE NUMBERS	4	4-9-09	RT
CHANGE TO 24 HOUR FLUSH	5	4-30-09	RT

REVISIONS

ELECTRICAL SCHEMATIC WITH PRESSURIZED STORAGE

BLS 400,800,950,1900,2400 WIRING DIAG.
240V/60Hz/1PH S-100 CONTROL

DRAWN BY: MAM	SCALE N/A	MATERIAL
CHK'D:	DATE: 7-6-07	DRAWING No.
TRACED	APP'D	

SAFE WATER TECHNOLOGIES, INC.
996 BLUFF CITY BOULEVARD, ELGIN, IL 60120 USA
TELEPHONE 847 888 6900 • FACSIMILE 847 888 6924
E MAIL: info@swtwater.com • WEB SITE: www.swtwater.com