R & D SPECIALTIES

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SERIES 100

RO CONTROLLER

USERS MANUAL

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INTRODUCTION

The R & D Specialties Series 100 controller is a state of the art control system for commercial and industrial reverse osmosis systems. The Series 100 combines features that have not previously been available in one compact unit.

The Series 100 is a microprocessor controlled system that can monitor pressure and level switches. A TDS monitor/controller with 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.

SPECIFICATIONS

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

Environment: -22°F to 140°F, 0-95% RH, noncondensing

Enclosure: 7.6" X 4.6" X 2.4" (193mm X 117mm X 61mm)

Display: 3 digit red LED

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

Switch Inputs, Dry Contact:
- Pressure fault
- Pretreat lockout
- Tank full

Relay Outputs:

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

Relays supply same output voltage as board power(120 or 240 VAC)
20A maximum total load for all outputs.
* Based on a service factor of 1.0

Cell:
TDS cell with 3 digit display, range: 0-1000PPM. Wetted parts ABS and 316SS, 3/4" NPT, 300 PSI max.

FRONT PANEL CONTROLS AND INDICATORS

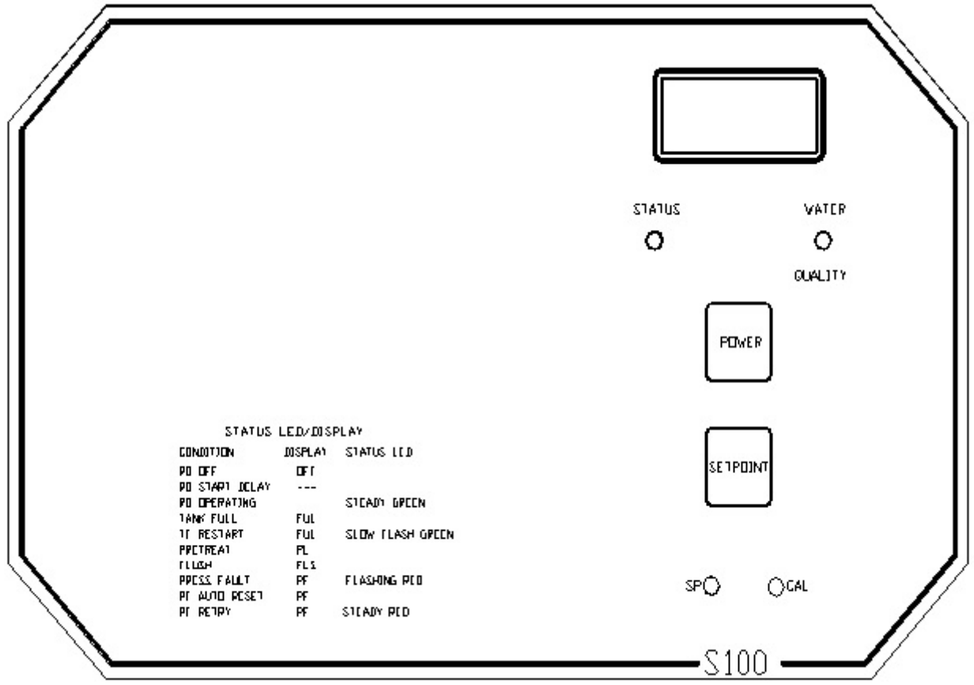

Figure 1

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.

INSTALLATION

Physical Installation

Mount the Series 100 in a convenient location on the RO equipment using the integral mounting flanges.

Terminal Strip and Jumper Locations

Refer to figure 2 for the location of all terminal strips, connectors and jumpers. Figure 2 also shows a sample wiring diagram for the controller. NOTE: All terminals on the board are labeled.

Power Wiring

CAUTION: 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 120VAC operation, there should be a wire jumper installed between J1 and J3 and a second wire jumper installed between J2 and J4. For 240VAC 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 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 2 hot wires, either wire can connect to L1 and L2.

Pump and Valve Relay Outputs

The Series 100 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 P1-4(L1) and P1-5(L2) RO pump terminals. This output can operate 120/240VAC motors up to 1HP directly. For motors larger than 1HP or for 3 phase motors, this output can be used to operate a contactor.

Inlet and Flush Valve Wiring

The inlet and 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 P1-6(L1) and P1-7(L2) inlet terminals. The flush valve connects to P1-8(L1) and P1-9(L2) flush terminals.

TDS Cell Installation and Wiring

For accurate TDS 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 5 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 or normally closed, but all switches must be the same. If the controller is set for normally open switches, all switches must be open for the unit to run. If the controller is set for normally closed switches, all switches must be closed for the unit to run. **NOTE:** J10 selects normally open or normally closed operation. When J10 is in the A position, the unit is configured for normally open switches. When J10 is in the B position, the unit is configured for normally closed switches.

Pressure Fault Switch

On systems where a low feed pressure shut down is required, a feed pressure switch can be connected to the pressure fault input of P2. If a high pump pressure shut down is required, a high pressure switch can be connected to this input. If both low feed pressure and high pump pressure shut down are required, both switches can be connected to this input. Both switches must be either normally open or normally closed 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. NOTE: 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. J9 selects a short or long tank full restart.

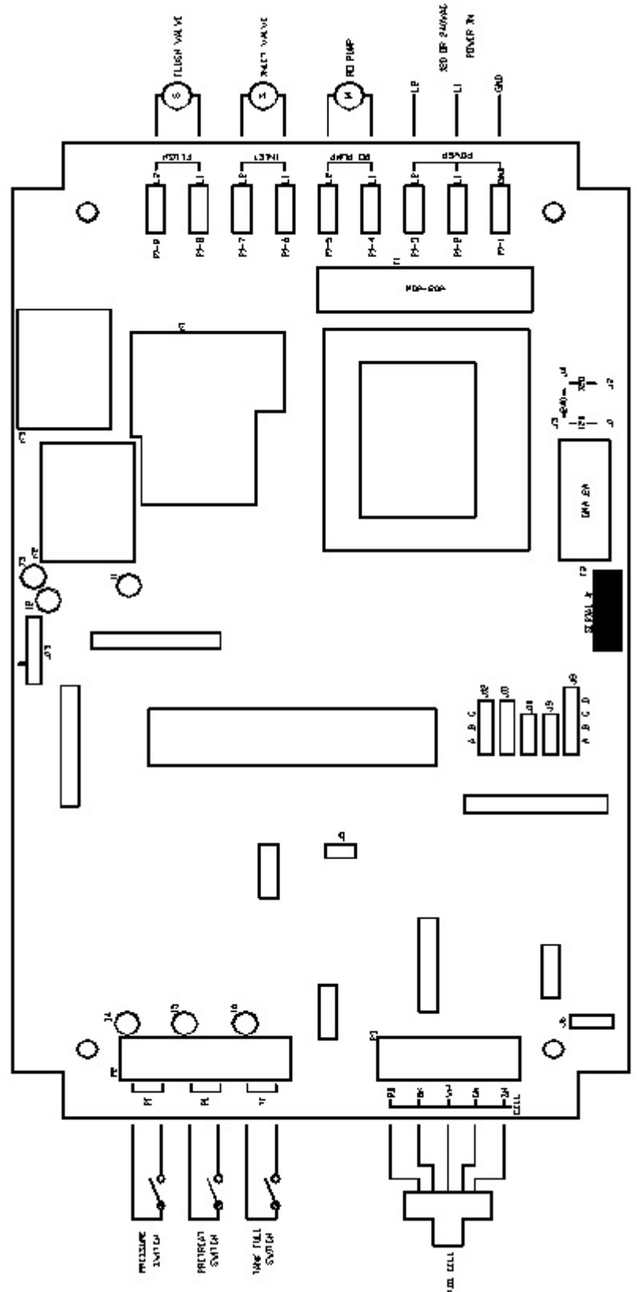

Figure 2

SYSTEM OPERATION

General Operation

The unit has 2 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 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 1 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	
PF AUTO RETRY	PF	STEADY RED

Table 1

RO Start Delay

When the controller is placed in the operating mode or restarts from a shut down condition, the inlet valve will open and a 5 second time 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 2 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 shut down. 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 condition is still active, 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 lamp 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 then attempt to restart. If the pressure fault is still active, the controller will shut down for 5 minutes and then 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 a steady red. If during one of the retries, the controller is able to start and run continuously for 10 seconds, the retry function is reset. If a pressure fault occurs, the PF retry cycle will repeat from the beginning.

When J8 is in the D position, both the PF auto reset AND the PF retry functions are enabled. If a pressure fault condition occurs, the PF retry function will operate as described above. If the retry function locks out, the PF auto reset function will operate as described above. The PF retry and PF auto reset functions will continue in a 30 second, 5 minute, 30 minute and 60 minute cycle until the pressure fault condition clears.

Tank Full

If the tank full input is active for 5 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 2 seconds. With J9 in the B position, the restart delay is 15 minutes. Position A is normally used with tank level switches that have a large span. During the restart time, the status lamp will flash green.

Pretreat Lockout

If the pretreat lockout input is active for 2 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.

Membrane 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 5 minutes. 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 RO pump can be on or off, depending on the jumper settings. Refer to Table 2 for the jumper settings.

J11	J12	FLUSH TYPE	INLET	RO 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 2

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 is 0 - 999PPM. If the water quality is above 999, the display will show ^ ^ ^. 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 0-999. If set to 999, 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 adjustment to the desired setpoint value. Press the Setpoint key to return the display to the water quality display.

Calibration

To adjust the calibration of the water quality, measure the water with a meter calibrated to a known standard. Using a small screwdriver, adjust the CAL adjustment to get the correct reading on the 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 the power is turned 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 be inoperative.

System Inoperative

Is the water quality display lit? If no, check fuse F2 located below the transformer. If the fuse is OK, use a voltmeter to verify that power is applied to 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

Is the controller off? If no, are any shut down conditions active? If no, is the inlet LED, I2 lit? If no, replace the board. If yes, check fuse F1. If bad, replace the fuse. If it is OK, check the inlet terminals for power. Is there power? If no, replace the board. If yes, check the valve and valve wiring.

RO Pump Will Not Operate

Is the controller off? If no, are any shut down conditions active? If no, is the RO LED, I1 lit? If no, replace the board. If yes, check fuse F1. If bad, replace the fuse. If it is OK, check the RO pump terminals for power. Is there power? If no, replace the board. If yes, check the pump motor and motor wiring.

No Flush or Not Flushing Correctly

Verify that the flush jumpers, J11 and J12 are set correctly.

No or Incorrect TDS Reading

Is the sensor wired correctly? If no, correct wiring. Is the sensor installed as described in the installation section? If no, install correctly. Is unit calibrated correctly? If no, recalibrate. Disconnect green and white wires of sensor from P3. Does reading show 0? If no, replace board. If yes, reconnect wires and remove sensor from piping and dry. Does reading show 0? If no, replace sensor. If yes, short pins of sensor. Does reading show ^ ^ ^? If no, replace board.