

Series 100 Controller



Installation Maintenance Repair Manual

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I. Introduction

The Advantage Controls Series 100 RO controller is a state of the art control system for commercial and industrial reverse osmosis systems. The S100 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 unit. The S100 displays system status and sensor and switch input status using a status LED and a 3-digit LED display.

II. Model Building and General Specifications

Build a Model

| | Model |
|--|-------|
| Base Control Selection | |
| S100 = Inlet solenoid, flush, pressure switch, and TDS | |
| S101 = Inlet solenoid, flush, pressure switch, and wiring harness kit | |
| Controller Supply Voltage | |
| 1 = 120 VAC | |
| 2 = 220 VAC | |
| 3 = 120 VAC with UL labeling | |
| 4 = 220 VAC with UL labeling | |
| Permeate Conductivity Scale | |
| X = No conductivity | |
| A = 0-50 PPM | |
| B = 0-100 PPM | |
| C = 0-250 PPM | |
| D = 0-500 PPM | |
| E = 0-1,000 PPM | |
| J = 0-50 uS | |
| K = 0-100 uS | |
| L = 0-250 uS | |
| M = 0-500 uS | |
| N = 0-1,000 uS | |
| Enclosure | |
| A = 8.25"x5"x3" | |
| B = 8"x6"x4" poly | |
| X = 10"x8"x6" poly | |
| 4 = 12"x10"x6" poly | |
| 9 = Enclosure defined in Motor Control model number, or no enclosure | |

Specifications

Power

120 VAC or 240 VAC - 15+10%, 50/60Hz

Enclosure

8.25"x5"x3" ABS plastic

Environment

-22°F (-30°C) to 140°F (60°C), 0-95%RH, Non-condensing

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

- **Inlet solenoid valve relay:** 120/240 VAC 5 amp maximum
- **RO pump relay:** 120/240 VAC 1HP, single phase maximum
- **Flush solenoid valve relay:** 120/240 VAC 5 amp maximum

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

III. Installation

Mounting

Mount the S100 in a convenient location on the RO equipment using the integral mounting flanges.

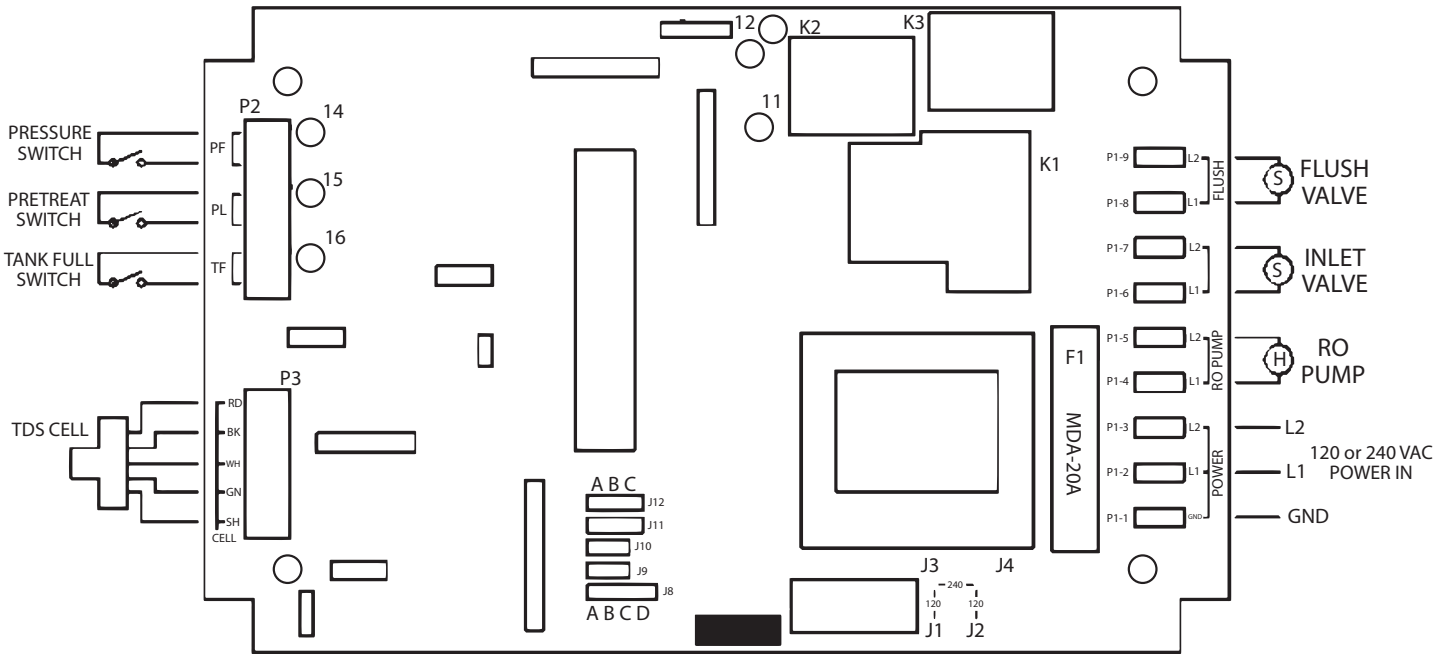
Power Wiring



WARNING: 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 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.

Terminal Strip and Jumper Locations



Pump and Valve Relay Outputs

The S100 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 / Conductivity Cell 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.



WARNING: 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.

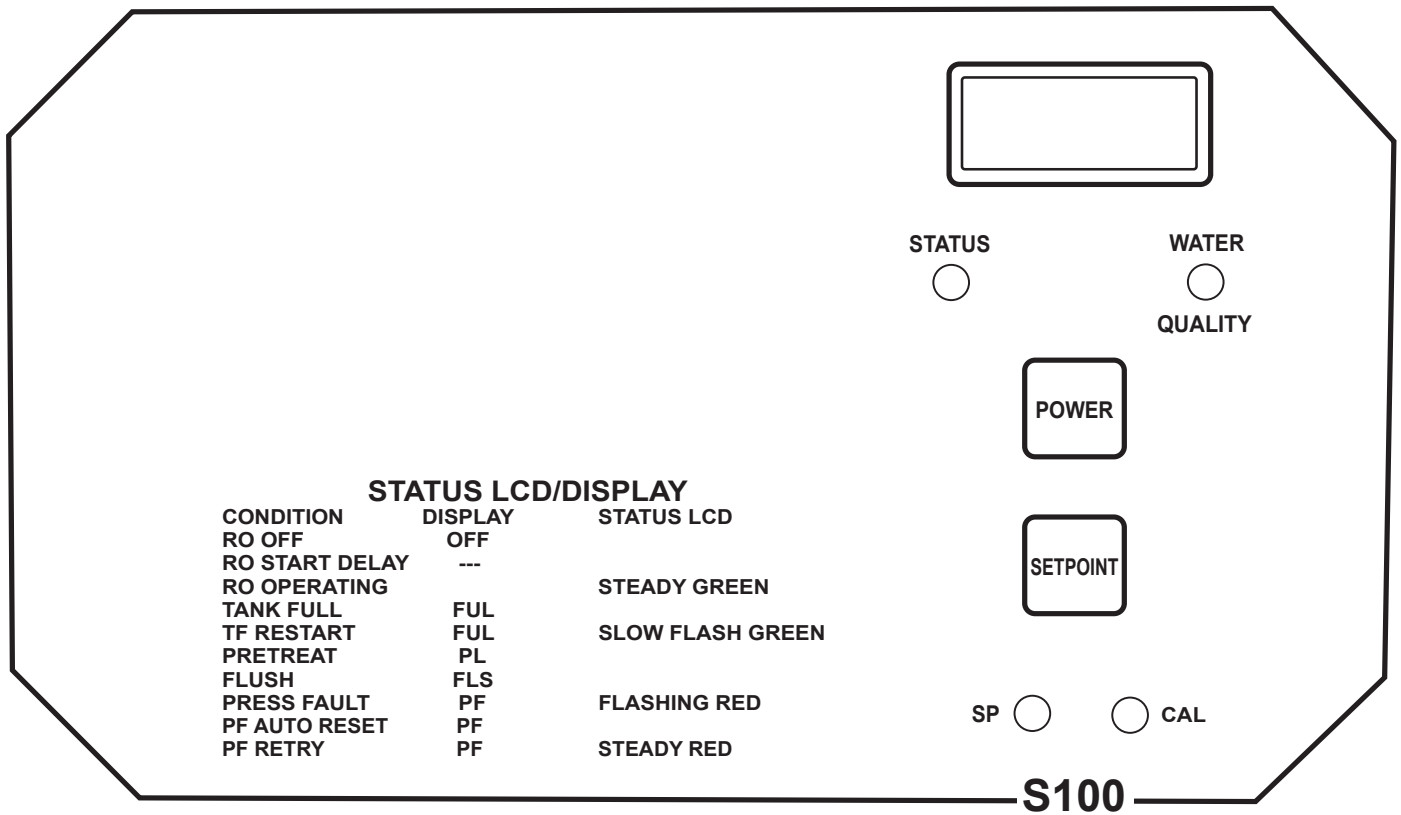
NOTE: The output from the pretreatment device must be a dry contact and must not supply voltage.

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.

|  CAUTION  |
|---|
| 1. There are live circuits inside the controller even when the power switch on the front panel is in the OFF position. Never open the front panel without first disconnecting power from the outlet. Prewired controllers are supplied with an 8 foot, 18 AWG power cord with USA style plug. A #1 Phillips driver is required to open the front panel. |
| 2. Low voltage signal wires (probes, flow switch, water meter, etc.) should never be run in conduit with high voltage (like 115VAC) wires. |
| 3. Never attempt to land connections to the controller without first disconnecting power from the outlet. |
| 4. Do not block access to disconnect power during mounting and installation. |
| 5. The controller should be connected to its own isolated circuit breaker, and for best results, the ground should be a true earth ground, not shared. Any attempt to bypass the grounding will compromise the safety of users and property. |
| 6. The electrical installation of the controller must be performed by trained personnel only and conform to all applicable National, State and Local codes. |
| 7. Operation of this product in a manner not specified by the manufacturer may result in damage to equipment or persons. |
| 8. Avoid mounting in locations that expose the controller to direct sunlight, vapors, vibration, liquid spills or extreme temperatures; less than 0°F (-17.8°C) or greater than 120°F (50°C). EMI(electromagnetic interference) from radio transmissions and electric motors can also cause damage or interference and should be avoided. |

IV. Front Panel Description



- 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.

V. System Operation

Operation

The S100 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.

| 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 |

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 / PR 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

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.

| 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 |

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 0-999 PPM. 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.

VI. Manufacturer's Product Warranty

Advantage Controls warrants to the original purchaser that the products it manufactures will be free from defects in material and workmanship for a period of twelve months from the date of shipment on parts and ninety days on labor. Some non-Advantage manufactured resale items may have warranty periods less than twelve months. Advantage Controls' obligation under this warranty is limited exclusively to the repair or replacement of any product that Advantage finds to be defective. Items returned for warranty consideration must have a return authorization number and be properly packaged, shipped prepaid and insured. This warranty is valid only when the products are properly installed, maintained and used for the purpose for which they were designed. Misuse, neglect, damage, accident, improper repair, or modification not authorized in writing by Advantage Controls will void this warranty.

There are no warranties, expressed or implied, including the implied warranties for merchantability or fitness for a particular purpose that extend beyond the limited warranty expressly stated above. Advantage Controls' liability to any purchaser of its products, whether in contract or in tort, and whether arising out of warranties, representations, instructions, installations, or defects from any cause, will be limited exclusively to repairing or replacing the product or any part thereof under the conditions set out above.

30 Day Billing Memo Policy

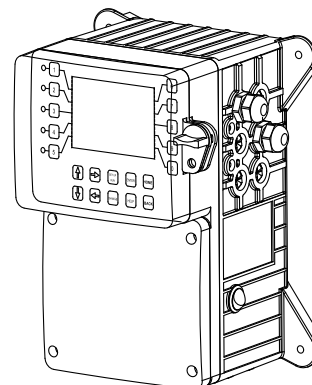
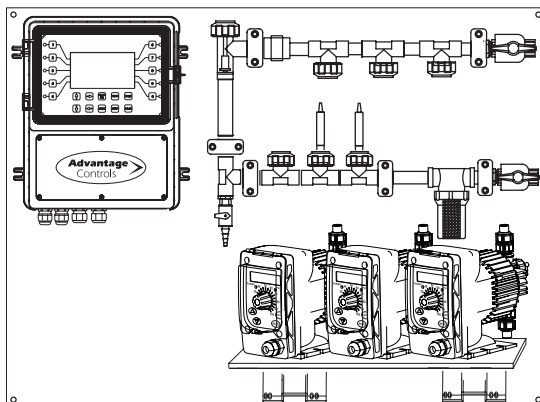
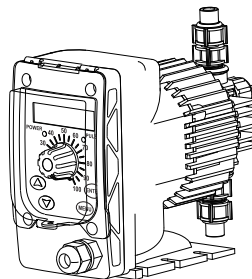
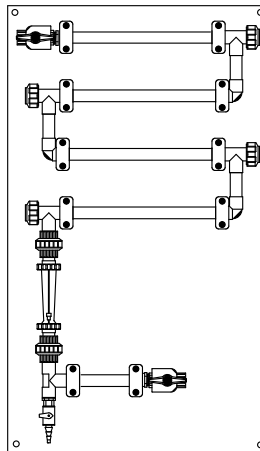
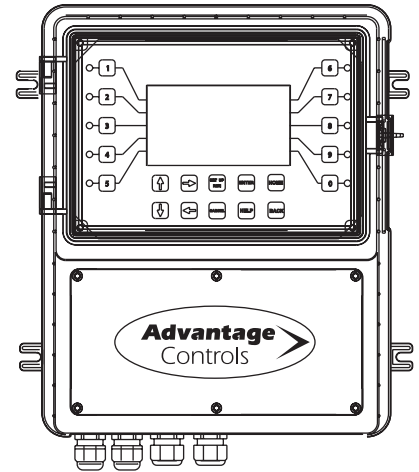
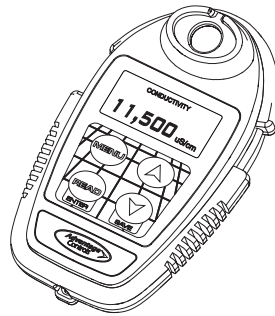
Advantage Controls maintains a unique factory exchange program to ensure uninterrupted service with minimum downtime. If your controller malfunctions, call 1 (918-686-6211 (international customers dial +1(918) 686-6211), and provide our technician with Model and Serial Number information. If they are unable to diagnose and solve your problem over the phone, a fully warranted replacement unit will be shipped, usually within 48 hours, on a 30 Day Billing Memo. This service requires a purchase order and the replacement unit is billed to your regular account for payment. The replacement unit will be billed at current list price for that model less any applicable resale discount. Upon return of your old unit, credit will be issued to your account if the unit is in warranty. If the unit is out of warranty or the damage not covered, a partial credit will be applied based upon a prorated replacement price schedule dependent on the age of the unit. Any exchange covers only the controller or pump. Electrodes and other external accessories are not included.

- Notes -

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