Manual

R.O. Process Controller
ESDI Model 250

ESDI Part No. 000250

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1.0 General:

The ESDI Model 250 is a low cost electronic control board that performs all of the tasks necessary to control a reverse osmosis water purification system.

This R.O. Controller operates from a 24VAC power transformer and directly controls 24VAC valves. The pump output is designed to indirectly control a pump via an external relay or contactor with a coil voltage of 12VDC.

The controller is available as a single circuit board assembly, with or without power transformer. The controller's description, features, and specifications are presented in this document.

2.0. Features:

2.1. RO Membrane Flush Cycles:

To help increase the life of the RO membrane, this controller features several RO membrane flush cycles. These flush cycles can be enabled or disabled by the program option switch S5.

2.1.1. Flush Duration:

Switches S1 and S2 set the Flush Duration. The selectable flush times are 1, 2, 3, and 4 minutes. During this time, the Flush and Feed Valves are opened and feed water is allowed to pass over the membrane and out the Flush Valve to the drain. This will remove any built up brine that has collected in the membrane enclosure and will help rinse off some of the contaminants from the membrane itself. At the completion of the flush cycle, the Flush Valve will close, and the controller will go back to the process it was performing prior to the beginning of the flush cycle. This flush duration will be the same for all flush cycles that are initiated by the controller.

2.1.2. Flush Cycle Time, During Process:

When the system has been processing water for an extended period of time, it is important that the system periodically stops and flushes the RO membrane. This helps clean the membrane and improve its efficiency. This "in process" Flush Cycle can be set by switch S3 to run every 2 hours, or every 4 hours. The flush duration will be the same as that set by switches S1 and S2.

2.1.3. Flush Cycle Time, Tank Full:

When the tank is full, the system is idle in a standby mode. During this time no water passes through the membrane. The Model 250 includes a flush cycle that periodically runs during this standby mode. During this flush, the feed and flush valves are opened, and the flush duration will be the same as that set by switches S1 and S2. The "tank full" Flush Cycle can be set by switch S4 to run every 8 hours, or every 12 hours.

2.1.4. Additional Flush Cycles:

The system is programmed to perform flush cycles in the following instances. The flush duration will be the same as that set by switches S1 and S2.

A flush cycle will occur each time the system starts up and begins to process water.

A flush cycle will occur each time the tank is filled and prior to the system shutting down and going into standby.

A flush cycle will occur each time the system returns after a lockout condition. (Note: 10-minute timeout after lockout condition.)

3.0. Inputs:

3.1. Tank Level Input:

The Tank Level input connects to a float located at the top of the water storage tank. This float is used as feedback to the controller so it can maintain a full storage tank. The Tank Level input requires an isolated contact closure when the tank is low, and an open circuit when the tank is full. The Tank float should have built-in hysteresis to prevent the system from cycling on and off from small changes in water level.

3.2. Lockout Input:

The Lockout input allows an external device to disable the controller. It can be connected to a pre-conditioner (water softener) to disable it while the unit is reconditioning and inlet water is unavailable. It can also be connected to an inlet pressure switch, or TDS monitor to shut down the system if the TDS is too high. These peripherals can be used individually or wired in series to the Lockout input.

An isolated contact closure will enable the system while an open circuit will disable it and place it into Lockout. If this input is not used, place a jumper across the Lockout terminals.

Upon returning from Lockout, the system will time out for ten minutes, and then execute a flush cycle (if selected) and then it will return to its previous status prior to Lockout.

4.0. Outputs:

4.1 Pump Relay:

The Model 250 is designed to work with both low-pressure systems that require no pump, and high-pressure systems that do.

In order to control a pump, an external relay or contactor is required. The coil voltage of the relay should be 12VDC. Connect the relay coil to the Pump Relay output (note polarity). The contacts of the relay can then be used as an On/Off switch, wired in series with the line power, to control the pump. This allows you to choose any power (120/240VAC) to run the pump.

To help insure that the pump will not run dry, the system is programmed to open the Feed valve one second prior to turning on the pump. Upon shutting off the pump, the Feed valve will remain open, and then close one second after the pump is turned off.

4.2. Flush Valve:

This output connects to the Flush Valve. This valve, when open, should allow water to pass by the RO membrane and route the brine water into the drain. This valve should be rated for 24VAC operation.

4.3. Inlet Valve:

The Inlet (or Feed) Valve is connected to this output. This valve, when open, should allow water to pass into the system from the municipal water line. This valve should be rated for 24VAC operation.

5.0 Specifications:

5.1.	Tank Level Input:	Isolated contact closure. Open = Stop. Close = Run.
5.2.	Lock Out Input:	Isolated contact closure. Open = Stop. Close = Run.
5.3.	Pump Relay Coil:	12VDC, 300ma max
5.4.	Flush Valve Output:	24VAC, 2 Amps max.
5.5.	Inlet Valve Output:	24VAC, 2 Amps max.
5.6.	Circuit board Size:	4.125" X 4.875" X 1.25".
5.7.	Power Requirements:	24VAC, 50/60 Hz, 100ma (nominal). Voltage tolerance: ± 10 % Minimum.

6.0. Power Transformer Selection:

It is important to select the proper power transformer. If the transformer is not capable of supplying the required current, the voltage will collapse and the system may not operate correctly. To do this, one must totalize all of the current drawing components. Two examples follow:

Nominal Secondary Voltage: 24 VAC, 50/60 Hz

Example 1:

Inlet Valve (6W):	250 ma
Flush Valve (6W):	250 ma
Control Board:	100 ma
Pump Relay Coil:	100 ma
Total Secondary Current (Minimum):	700 ma

Example 2:

Inlet Valve (24W):	1000 ma
Flush Valve (24W):	1000 ma
Control Board:	100 ma
Pump Contactor:	300 ma
Total Secondary Current (Minimum):	2.4 Amps

7.0. Switches & Indicators:

7.1. Option Settings DIP Switch:

7.1.1. Flush Duration:

S1	S2	Time:
On	On	1 minute
On	Off	2 minutes
Off	On	3 minutes
Off	Off	4 minutes

7.1.2. Flush Cycle Time (Process):

S3	Time:
On	2 Hrs.
Off	4 Hrs.

7.1.3. Flush Cycle Time (Tank Full):

S4	Time:
On	8 Hrs.
Off	12 Hrs.

7.1.4. Flush Status:

S5	Active:
On	On
Off	Off

7.2. Power LED (GRN): Indicates that there is power to the board.

7.3. Tank Full LED (GRN): Indicates that the water storage tank is full.

7.4. Process LED (GRN): Indicates that the system is processing water.

7.5. Flush LED (YEL): Indicates that the system is in a flush cycle.

7.6. Lock Out LED (YEL): Indicates that the system is locked out.

8.0. Connectors:

The terminal block is pluggable and can be removed without having to remove the individual wires from the terminal block. The pluggable terminal blocks can be oriented either vertically or at right angles to the circuit board headers.

It is recommended that all interconnect wiring be with UL type 1015, 20 AWG minimum, with the power input being 18 AWG minimum. The terminal blocks will accommodate up to 16 AWG wire.

8.1. Inputs:

All inputs are low voltage (+5VDC). Signals are either open, or closed. DO NOT APPLY ANY EXTERNAL VOLTAGES TO ANY OF THESE INPUTS, OR CIRCUIT BOARD MAY BE DAMAGED.

J1-1	Tank Level Input Return
J1-2	Tank Level Input
J1-3	Lock Out Input Return
J1-4	Lock Out Input

8.2. Outputs:

Outputs are either 24VAC or 12VDC. These outputs are not fused, or current limited. Therefore, CARE MUST BE TAKEN TO PREVENT SHORTING OF THESE OUTPUTS TOGETHER, TO COMMON, OR TO ANY OTHER VOLTAGE SOURCE, OR CIRCUIT BOARD MAY BE DAMAGED.

J1-5	Pump Control Relay Coil –12VDC
J1-6	Pump Control Relay Coil +12VDC
J1-7	Flush Valve 24 VAC Return
J1-8	Flush Valve 24VAC
J1-9	Inlet Valve 24VAC
J1-10	Inlet Valve 24VAC Return

8.3. Power Input:

The power input should be connected to the secondary of the power transformer, with the transformer primary being connected to the primary power line. It is recommended that a fuse of appropriate current rating be used in series with this input, to help prevent damage to the transformer and circuit board.

J1-11	Power Input 24VAC
J1-12	Power Input 24VAC Return