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# Manual

## R.O. Process Controller

### ESDI Model 258

ESDI Part No. 000258



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# Manual

## R.O. Process Controller

### ESDI Model 258

#### **1.0 General:**

The ESDI Model 258 is a low cost electronic controller that performs all of the functions necessary to operate a commercial/industrial Reverse Osmosis Water Purification System. This R.O. Controller operates from either 115VAC, or 230VAC, 50/60Hz power. It has open contact relays to control valves of any voltage up to 240VAC, while the pump relay controls pumps up to 2HP. This manual provides the operating instructions and specifications for the Model 258.

#### **2.0. Features:**

**2.1. Flush Cycles:** To help increase the life of the RO membrane, this controller has several programmable flush cycles. These flush cycles can be enabled, or disabled.

**2.1.1. Flush Time:** Switches S1, S2 and S3 set the Flush Time. (See section 6.0) The selectable flush times are 0.5, 1.0, 1.5, 2.0, 3.0, 4.0 and 5.0 minutes. During this time, the Flush and Inlet Valves are opened and Inlet 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 time will be the same for all flush cycles that are initiated by the controller. The flush cycle can also be disabled.

**2.1.2. Process Flush Cycle:** When the system has been processing water for an extended period of time, it is important that the system periodically flush the RO membrane. This helps clean the membrane and improve its efficiency. This interim Process Flush Cycle is set by switch S4 and S5 to run every 2, 3 or 4 hours, or it can be disabled (See section 6.0). Flush cycles must be enabled by S1, S2, and S3 for the Process flush to be active.

**2.1.3. Tank Full Flush:** When the tank is full, the system will perform a flush cycle prior to shutdown. During shutdown the system is idle and no water passes through the membrane. The Model 258 includes a flush cycle that, when enabled, will perform a flush cycle every 24 hours, keeping the membrane moist. This flush will continue every 24 hours as long as the tank is full. The flush duration is the same as set by Flush Time.

**2.1.4. Additional Flush Cycles:** When the Flush cycle is enabled, the system will perform additional flush cycles in the following instances. The flush duration will be the same as that set in Flush Time.

**2.1.4.1. Power-Up Flush:** A flush cycle will occur each time line power is first applied to the system

**2.1.4.2. Lockout Flush:** A flush cycle will occur each time the system returns from a lockout condition.

**2.1.5. Preset Controller Delays:** The control board has internal preset delays to help the performance of the system and reduce any strain on the pump. The delays are as follows:

2.1.5.1. Inlet Open to Pump Start Delay:	10 Seconds
2.1.5.2. Inlet Open to Flush Open Delay:	No Delay
2.1.5.3. Pump Off to Inlet Close Delay:	5 Seconds.
2.1.5.4. Flush Open to Pump Start Delay:	10 Seconds.
2.1.5.5. Return from Pressure Delay:	5 Min/6x, 30Min thereafter
2.1.5.6. Restart after Tank Full Delay:	10 Minutes

### **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 provides feedback to the controller to maintain a full storage tank. The Tank Level input requires an isolated contact closure when the tank is low, and an open contact when the tank is full. The Tank float must have built-in hysteresis (that is, the float must travel some distance before the float switch can change states). Hysteresis prevents the system from cycling on and off with small changes in water level. A selectable internal 10 minute restart delay can help prevent excessive cycling of the pump.

**3.2. Lockout Input:** The Lockout input requires an isolated contact closure to allow the system to process water. When the input is open, the system will be in Lockout. In Lockout the pump will stop, and all valves will close. The Lockout input allows an external device to disable the controller. It can be connected to a pre-conditioner such as a water softener. This input can be used exclusively, or wired in series with additional items with isolated contacts, such that any single item can lockout the system. There is no delay when returning from Lockout; however, this input must be stable for 10 seconds before it can return. Upon returning from Lockout a power up reset and a start flush will occur, if flushes are enabled.

**3.3 Pressure Input:** The Pressure input requires an isolated contact closure to indicate good water pressure. When the input is open, it indicates bad water pressure, and the system will shutdown. When shutdown occurs, the pump will stop, and all valves will close. There is a 5 minute delay before the system will reset and try again to process water. This 5 minute delay will occur 6 times, and then it will change to a 30 minute delay until the pump pressure remains good.

**4.0. Outputs:**

**4.1 Pump Relay:** The normally open contacts of the pump relay are located at the top of the relay. These contacts are isolated to allow the user the ability to switch any voltage to the pump motor. See 5.3 for the pump relay rating. These contacts are arc protected by a snubber network (0.1 mf in series with a 100 ohm) and varistor (390VDC). If these contacts are used in a low current application, it may be necessary to remove this snubber. (Call the factory for more information regarding this)

To help insure that the pump will not run dry, the controller will open the Inlet valve, delay 10 seconds, and check for good pressure prior to turning on the pump. The Inlet valve will remain open for five seconds after the pump stops.

**4.2. Flush Valve:** This output connects to the Flush Valve. This valve, when active, allows the water to pass over the RO membrane and route the brine water into the drain. See 5.4 for the Flush Valve Relay rating.

**4.3. Inlet Valve:** The Inlet (or feed) Valve is connected to this output. This valve, when open, will allow water to pass from the municipal water line into the system. See 5.5 for the Inlet Valve Relay rating.

**5.0 Specifications:      Do Not Exceed These Ratings, or Damage May Occur.**

- |             |                     |  |
|-------------|---------------------|--|
| <b>5.1.</b> | Tank Level Input:   | Isolated contact closure.<br>Open = Stop.<br>Close = Run.  |
| <b>5.2.</b> | Lockout Input:      | Isolated contact closure.<br>Open = Stop.<br>Close = Run.  |
| <b>5.2.</b> | Pressure Input:     | Isolated contact closure.<br>Open = Stop.<br>Close = Run.  |
| <b>5.3.</b> | Pump Relay Rating:  | 30 Amps max<br>240VAC, 2HP<br>120VAC, 1HP                  |
| <b>5.4.</b> | Flush Valve Output: | Any voltage up to 240VAC,<br>3 Amps maximum                |
| <b>5.5.</b> | Inlet Valve Output: | Any voltage up to 240VAC,<br>3 Amps maximum                |
| <b>5.6.</b> | Circuit board Size: | 4.0" X 3.5" X 1.25"  |
| <b>5.7.</b> | Enclosure:          | Size: 6.0" X 6.0" X 4.0"<br>Rated: NEMA 4X for Indoor use. |

5.8. Board Power Requirements: 12-24VAC, 50/60 Hz, 100ma (nominal).  
supplied by Power board.

5.9. Main Power Ratings: 115/230VAC, 50/60 Hz, 20 Amp Maximum.  
Voltage tolerance: ± 10 % Minimum.

6.0. **Option Setting Switches:**

6.1.1. Flush Time:	<b><u>S1</u></b>	<b><u>S2</u></b>	<b><u>S3</u></b>	<b><u>Time:</u></b>
	Off	Off	Off	No Flush
	Off	Off	On	0.5 minute
	Off	On	Off	1.0 minute
	Off	On	On	1.5 minutes
	On	Off	Off	2.0 minutes
	On	Off	On	3.0 minutes
	On	On	Off	4.0 minutes
	On	On	On	5.0 minutes

6.1.2. Process Flush Cycle Time:	<b><u>S4</u></b>	<b><u>S5</u></b>	<b><u>Time:</u></b>
	Off	Off	No Process Flush
	Off	On	2 Hrs.
	On	Off	3 Hrs.
	On	On	4 Hrs.

6.1.3. Tank Full Flush:	<b><u>S6</u></b>	<b><u>Time:</u></b>
	Off	Flush before Shutdown
	On	Flush before Shutdown and every 24 Hrs.

6.1.4. Restart Delay after Tank Full:	<b><u>S7</u></b>	<b><u>Active:</u></b>
	Off	No Restart Delay
	On	10 Minutes Restart Delay

7.0. **Indicators:** (LED's)

7.1. **Power (Green):** Indicates there is power to the board.

7.2. **Tank Full (Blue):** Indicates the water storage tank is full.

7.3. **Process (Green):** Indicates the system is processing water. Flashing indicates system is paused and in a restart timeout.

7.4. **Flush (Yellow):** Indicates the system is in a flush cycle.

7.5. **Lockout (Red):** Indicates the system is in Lockout. Flashing indicates the Lockout signal is gone & system will restart soon.

7.6. **Pressure (Red):** Indicates the Inlet water pressure is bad. Flashing indicates the pressure is good and the system is waiting to restart.

**8.0. Connectors:** The terminal blocks are pluggable and can be unplugged without the need to remove the individual wires from the terminal block. The pluggable terminal blocks can be oriented either parallel, or perpendicular to the circuit board. It is recommended that all interconnect wiring be with UL type 1015, 20 AWG minimum. The terminal blocks will accommodate up to 16 AWG wire. **All main power & pump relay wiring must be 12 AWG minimum.**

**8.1. Inputs:**

**Do Not Apply Any External Voltages to The Signal Inputs, or Damage Will Occur.**

All control signals must be isolated, and either open, or closed.

J1-1	Common:	Signal Common Only (Not for Power Input)
J1-2	Pressure Input:	Referenced to Common
J1-3	Tank Input:	Referenced to Common
J1-4	Lockout Input:	Referenced to Common
J1-5	12VAC Input:	Board power, 12-24VAC (Non Polar)
J1-6	12VAC Input:	Board power, 12-24VAC Return (Non Polar)

**8.2. Valve Relay Outputs:** Valves can be any voltage up to 240VAC; however, they must all be the same voltage. These outputs are not fused, or current limited. Therefore, care must be taken to prevent shorting, or contacting these outputs. Do not exceed ratings, or damage may occur.

J2-1	Output to Flush Valve
J2-2	Output to Inlet Valve
J2-3	Valve Power Input.

NOTE: The valve power return is not on this board. If the ESDI 000258PB power board is used, a terminal block is provided for the valve power return, as long as it is the same voltage as the main power.

**8.3. Pump Output:** Two 1/4" FASTON terminals are located at the top of the pump relay (K1). These are normally open contacts to be connected in line with the power to the pump motor. This relay will act as a switch to power the pump ON and OFF under automatic control. These contacts are isolated to allow the user the ability to switch any voltage (240VAC, 2 HP Max) to the pump motor.

See 5.3 for the pump relay rating. These contacts are protected by a snubber network (0.1 mf in series with a 100 ohm) and varistor (390VDC). If these contacts are used in a low current application, it may be necessary to remove this snubber. (Call the factory for more information regarding this)

**9.0. Power Supply Board:** Part number 000258PB.

**9.1. Connector J1:**

Valve Power connector is used to power the valve relays when the valves are the same voltage as the main power. Do not use this output if the valve power is different from the main power.

ACHOT:	Main power voltage to valve relay power.	AC Hot
ACNET:	Main power voltage to valve common.	AC Neutral

For convenience 2 terminals are available.

**9.2. Connector J2:**

Power to Board: For board power input only. 12VAC, 200ma Max.

**9.3. Power Terminals:** Quick disconnect spade type, Faston.

**Use 12 AWG wire minimum when connecting to these terminals.**

Main Power Input:	Connect to Main power	115/230 VAC hot
Main Power Input:	Connect to Main power	115/230 VAC neutral
Pump Power Output:	Connect to Pump Relay	115/230 VAC hot
Pump Power Output:	Connect to Pump	115/230 VAC neutral

**9.4. Power Selection Switch S1:**

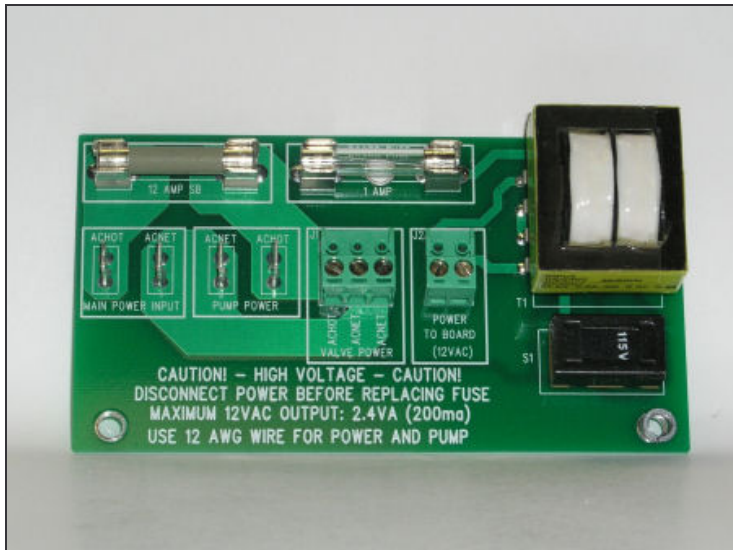
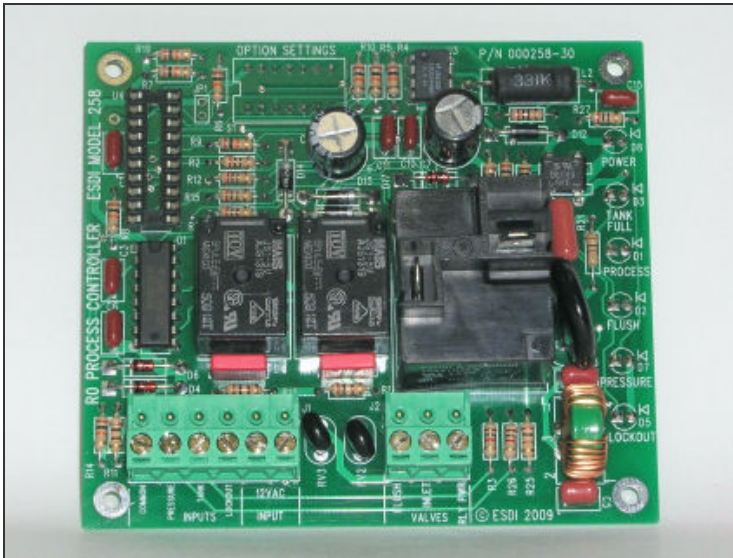
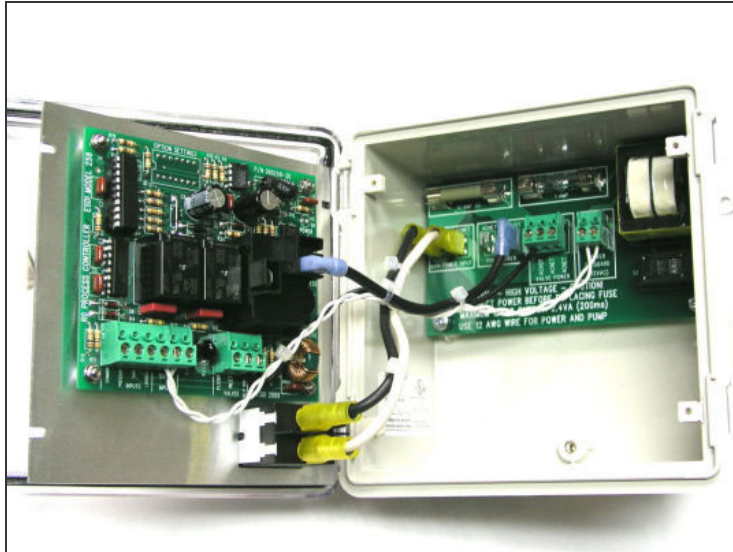
Select between 115VAC, and 230VAC main input power.

**9.5. Fuses:**

Main Fuse: 20 Amps SloBlo. Use UL type 3AG, 230VAC. Fuses the main power input and pump output.

Board Fuse: 1 Amp. Use UL type 3AG. Fuses the 12 VAC power transformer.

Photographs of Model 258 with Enclosure & Power Board:



## ESDI Model 258 RO Controller Pump and Power Wiring

The Model 258 is designed to control pumps up to 2HP (Horsepower). A 2HP pump draws 13 Amps at 115VAC, and 6.5 Amps at 230VAC.

The Power Switch on the Model 258 panel is wired such that it not only controls the power to the controller, but also directly controls the power to the pump (i.e. the pump current runs through the Power Switch).

We are concerned that under certain conditions where the maximum current is exceeded, excessive heat around the Power Switch wiring, could burn, or melt the wire insulation.

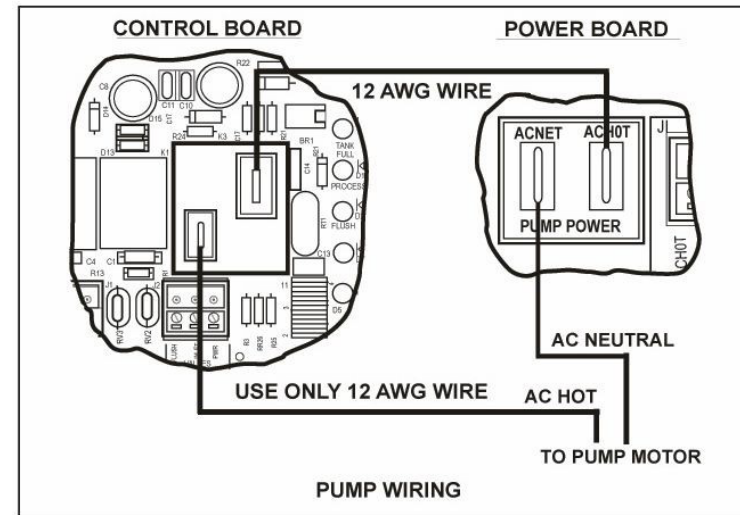
Applications of concern include:

1. Applications where the maximum current of 13 Amps is exceeded.
2. Applications where the wire connections are not crimped properly, or secured tightly onto the power switch, and pump relay terminals.
3. Applications where the power wire is not 12 AWG, UL1015 wire.
4. Applications with long running time where the pump is drawing close to 13 Amps current.

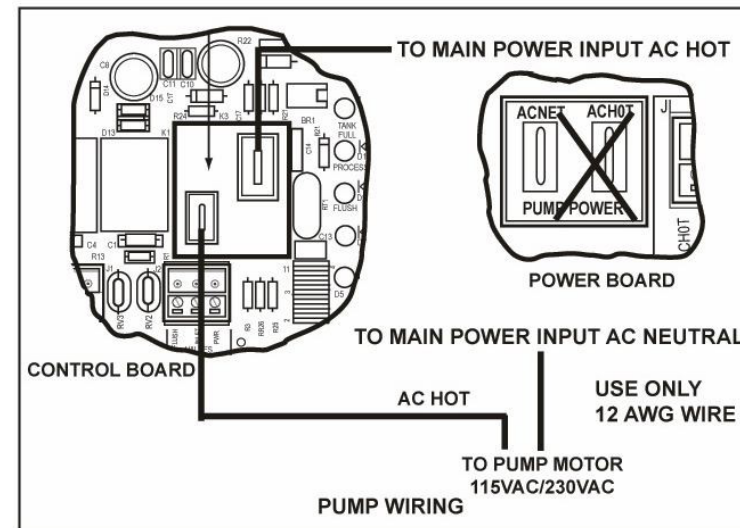
In applications where the pump current is 14 Amps – 20 Amps, the pump current should not run through the panel's Power Switch.

The following drawing shows two ways to wire up the Model 258 pump and power. See schematic on other side.

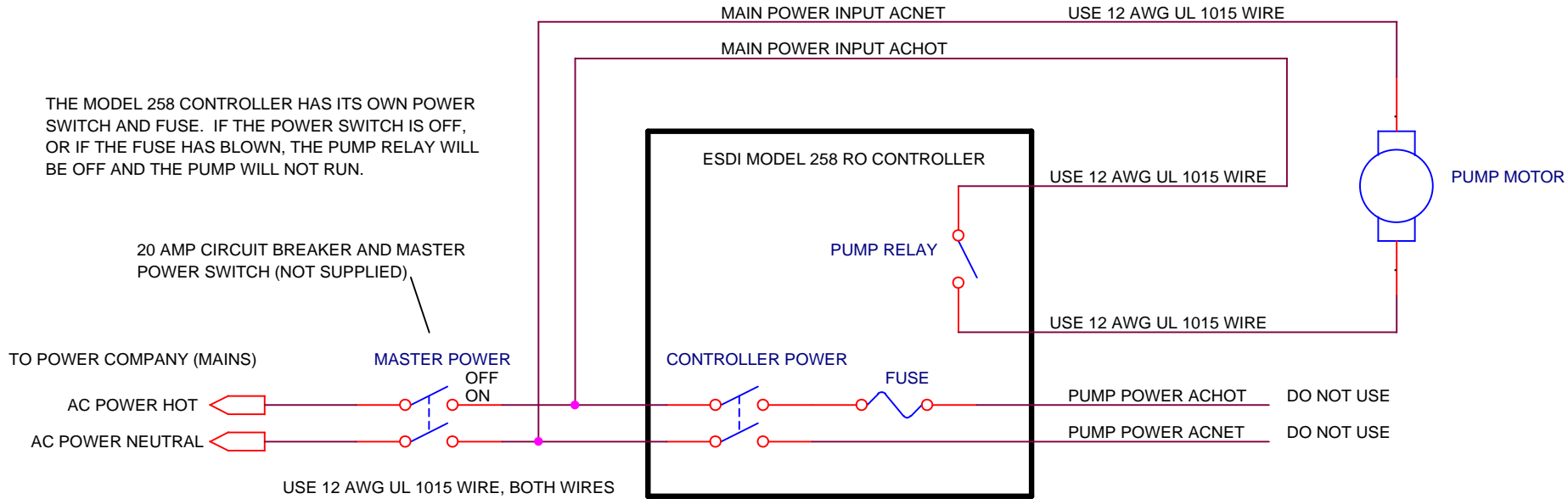
### FOR PUMPS DRAWING LESS THAN 13 AMPS



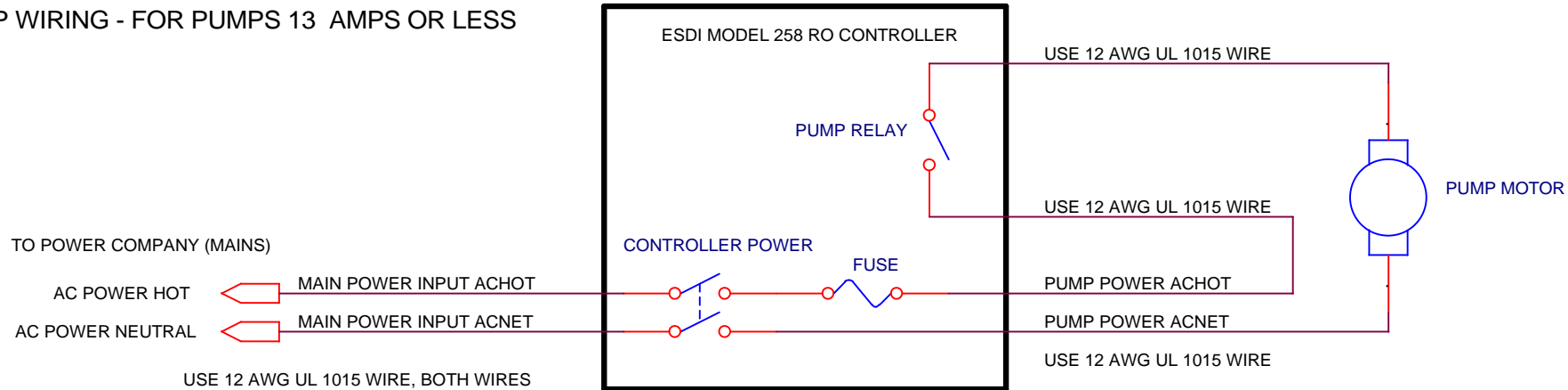
### FOR PUMPS DRAWING MORE THAN 13 AMPS



### PUMP WIRING - FOR PUMPS 14 - 20 AMPS



### PUMP WIRING - FOR PUMPS 13 AMPS OR LESS



CAUTION: MASTER POWER SWITCH MUST BE OFF WHEN SERVICING ANY PART OF THE SYSTEM.

### ESDI MODEL 258 PUMP AND POWER WIRING DIAGRAM

REVISED: MAY 28, 2016