

Reverse Osmosis Process Controller

User Manual

Model C – 23



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INTRODUCTION

The C – 23 Controller is an electronic controller that performs all of the functions necessary to operate a Commercial Reverse Osmosis (RO) System. This Controller operates from either 110VAC, or 220VAC, 60Hz power source. It has open contact relays to control valves of any voltage up to 220VAC, while the pump relay controls pumps up to 2HP. This manual provides the operating instructions and specifications for the C – 23 Controller.

FEATURES

Flush Cycles: To help increase the life of the RO membranes, this controller has several programmable flush cycles. These flush cycles can be enabled or disabled with switches S1 – S7 located on the front panel.

During the flush cycle the pump will shut off, and either the flush valve or the inlet (feed) valve, as selected by S7, will open to allow water to pass over the membranes and out the drain. This will reduce any concentrated impurities that have collected on the membrane housing and will help rinse off some of the contaminants on the membrane itself. At the completion of the flush cycle, the controller will go back to the process it was performing prior to the beginning of the flush cycle.

Flush Time: Switches S1, S2 and S3 enable the flush cycle and set the flush time. (See OPTION SETTING SWITCHES.) The selectable flush times are 0.5, 1.0, 1.5, 2.0, 3.0, 4.0 and 5.0 minutes. This flush time will be the same for all flush cycles that are initiated by the controller. The flush cycle can also be disabled.

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 membranes. This helps clean the membranes and improve their 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 OPTION SETTING SWITCHES). Flush cycles must be enabled by S1, S2 and S3 for the process flush to be active.

Tank Full Flush: When the tank is full, the system will perform a flush cycle prior to shut down. During shut down the system is idle and no water passes through the membranes. The C – 23 Controller includes a flush cycle that, when enabled, will perform a flush cycle every 24 hours, keeping the membranes moist. This flush will continue every 24 hours as long as the tank is full. The flush duration is the same as set by the Flush Time.

Permeate or Feedwater Flush: Selection switch S7 selects the type of water to be used during the membrane flush cycle. When switch S7 is OFF, the Inlet (feed) valve will open during a flush cycle and flush the membranes with water from the Inlet. When switch S7 is ON, the flush valve will open during a flush cycle and flush the membranes with permeate water from the tank.

Additional Flush Cycles: The system will perform additional flush cycles in the following instances.

Power – Up Flush: A flush cycle will occur each time power is first applied to the controller. This flush will always be with feed water and will last for only 10 seconds.

Lockout Flush: A flush cycle will occur each time the system returns from a lockout condition. This flush will always be with feedwater and will last for only 10 seconds.

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

Inlet Open to Pump Start Delay:	10 Seconds
Inlet Closed to Flush Open Delay:	1 Second
Pump Off to Inlet Close Delay:	5 Seconds
Return from Pressure Delay:	5 Minutes/6x, 30 Minutes Thereafter
Restart after Tank Full Delay:	5 Minutes

INPUTS

Tank Level Input: The tank level input connects to a float switch located at the top level of the water storage tank. This float switch provides 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 open contacts when the tank is full. The tank float switch must have built-in hysteresis (that is, the on and off positions must be at different levels). Hysteresis prevents the system from cycling on and off from small changes in the water level. An internal 5 – minute restart delay can help prevent excessive cycling of the pump if the float switch has no built – in hysteresis.

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 – treatment unit such as a carbon system. 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 flush will occur.

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 shut down. When shut down 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 is good and remains stable.

OUTPUTS

Pump Relay: The pump relay has normally open contacts that are located at the top of the relay. These contacts are isolated to allow the user the ability to use any pump motor up to 240VAC. (See SPECIFICATIONS for the pump relay rating.) These contacts are arc protected by a snubber network (0.1 mf capacitor in series with a 100 ohm resistor) and voltage clamping varistor. If these contacts are used in a low current application, however, it may be necessary to remove the snubber. (Call the manufacturer for more information regarding your application.)

To help ensure 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 5 seconds after the pump stops.

Flush Valve Relay: This output controls the flush valve. This valve, when active, allows the permeate water to pass over the RO membranes. The relay is used to switch the hot side of the power, with the neutral side hardwired. (See SPECIFICATIONS for the flush valve relay rating.) These contacts are arc protected by a snubber network (0.01 mf capacitor in series with a 100 ohm resistor) and voltage clamping varistor. If these contacts are used in a low current application, however, it may be necessary to remove the snubber. (Call the manufacturer for more information regarding your application.)

Inlet (Feed) Valve Relay: This output controls the inlet valve. This valve, when open, will allow water to pass from the main water line into the system. The relay is used to switch the hot side of the power, with the neutral side hardwired. (See SPECIFICATIONS for the Inlet Valve Relay rating.) These contacts are arc protected by a snubber network (0.01 mf capacitor in series with a 100 ohm resistor) and voltage clamping varistor. If these contacts are used in a low current application, however, it may be necessary to remove the snubber. (Call the manufacturer for more information regarding your application.)

SPECIFICATIONS

Do Not Exceed These Ratings, or Damage May Occur.

Tank Level Input:	Isolated contact closure Open = Stop Close = Run
Lockout Input:	Isolated contact closure Open = Stop Close = Run
Pressure Input:	Isolated contact closure Open = Stop Close = Run
Pump Relay Rating:	30 Amps max 240VAC, 2HP 120VAC, 1HP
Flush Valve Output:	Any voltage up to 240VAC 3 Amps maximum
Inlet (Feed) Valve Output:	Any voltage up to 240VAC 3 Amps maximum
Circuit board Size:	4.0" x 3.5" x 1.25"
Enclosure:	Size: 6.0" x 6.0" x 4.0" Rated: NEMA 4X for Indoor use
Board Power Requirements:	12-24VAC, 50/60 Hz, 100ma (nominal) supplied by Power board
Main Power Ratings:	115/230VAC, 50/60 Hz, 20 Amp Maximum Voltage tolerance: ± 10 % Minimum
Power / Feed Switch Ratings:	125VAC 16 Amp Maximum 250VAC 8 Amps Maximum

OPTION SETTING SWITCHES

Flush Time:	S1	S2	S3	Time
	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

Process Flush Cycle Time:	<u>S4</u>	<u>S5</u>	<u>Time</u>
	Off	Off	No Process Flush
	Off	On	2 hours
	On	Off	3 hours
	On	On	4 hours

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

Type of Flush:	<u>S7</u>	<u>Active</u>
	Off	Feed Flush, Inlet Valve open during flush
	On	Permeate Flush, Flush Valve open during flush

INDICATORS

- Power (Green):** Indicates there is power to the board.
- Tank Full (Blue):** Indicates the water storage tank is full.
- Process (Green):** Indicates the system is processing water. Flashing indicates the system is paused and in a restart timeout.
- Lockout (Red):** Indicates the system is in lockout. Flashing indicates the lockout signal is gone and system will restart soon.
- Flush (Yellow):** Indicates the system is in a flush cycle.
- Pressure (Red):** Indicates the Inlet water pressure is bad. Flashing indicates the pressure is good and the system is waiting to restart.

CONNECTORS

The terminal blocks are pluggable and can be unplugged without the need to remove the individual wires from the terminal block. 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. These connections are on ¼" FASTON spade terminals.

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)

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.

These contacts are arc protected by a snubber network (0.01 mf capacitor in series with a 100 ohm resistor) and voltage clamping varistor. If these contacts are used in a low current application, however, it may be necessary to remove the snubber. (Call the manufacturer for more information regarding your application.)

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

NOTE: The power neutral (or return) is not on this board. If the C – 23 Controller is used, a terminal block is provided on that board for valve power neutral, as long as it is the same voltage as main power.

Pump Relay Output: Two 1/4" FASTON spade terminals are located on top of pump relay (K1). These are normally open contacts to be connected in series 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 SPECIFICATIONS for the pump relay rating. These contacts are protected by a snubber network (0.1 mf capacitor in series with a 100 ohm resistor) and voltage clamping varistor. If these contacts are used in a low current application, it may be necessary to remove this snubber. (Call the manufacturer for more information)

POWER SUPPLY BOARD

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 | |

Connector J2:

Power to Board: For board power input only 12 - 24VAC, 200ma Max.

Power Terminals: 1/4" FASTON spade terminals

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 |

Power Selection Switch S1: Select between 115VAC, and 230VAC main input power.

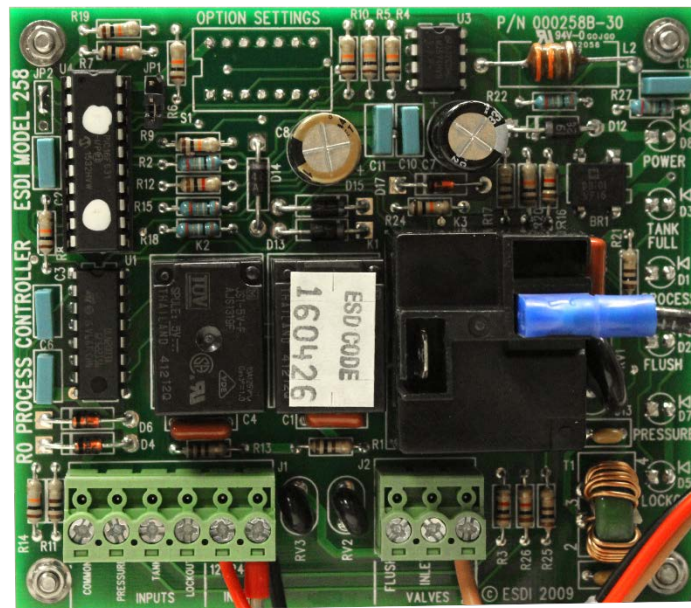
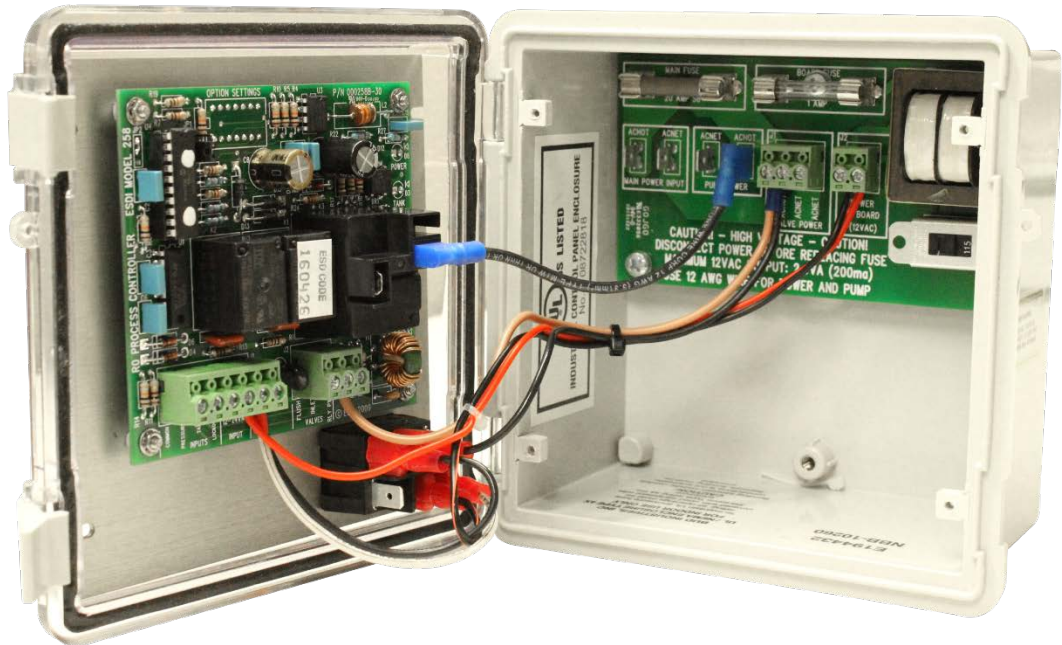
- Fuses:**
- Main Fuse: 20 Amps SloBlo. Use UL type 3AG, 230VAC.
Fuses the main power input and pump output.
 - Board Fuse: 1 Amp. Use UL type 3AG.
Fuses the 12 - 24 VAC power transformer.

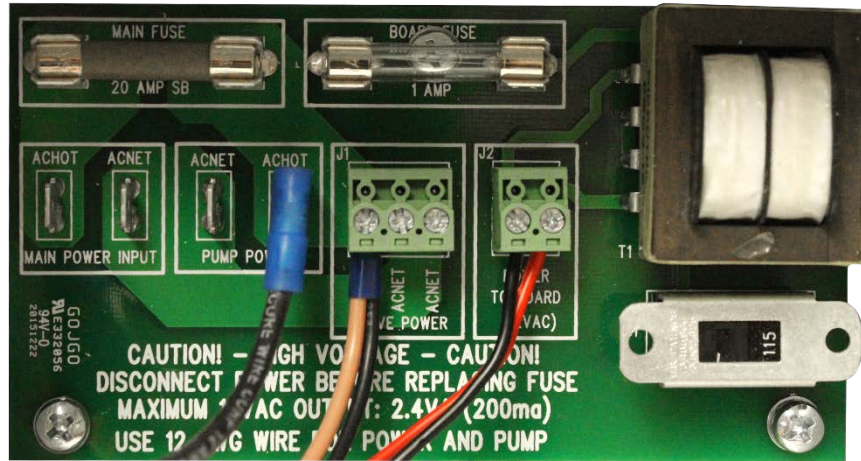
Power / Feed Switch: The Power switch is DPDT and switches both sides of the AC line. This switch has a dual purpose. The center is the Off position. Right side of switch is latching, and will turn the controller power On. The Left side of the switch is momentary, and it will power the feed valve only. Note, in this mode there is no fuse protection, and the controller is Off.

- Connect contact 2 to AC HOT Power Input
- Connect contact 5 to ACNEUTRAL Power Input
- Connect contact 1 to Feed Valve (AC HOT).
- Connect contact 4 to Feed Valve (ACNEUTRAL).

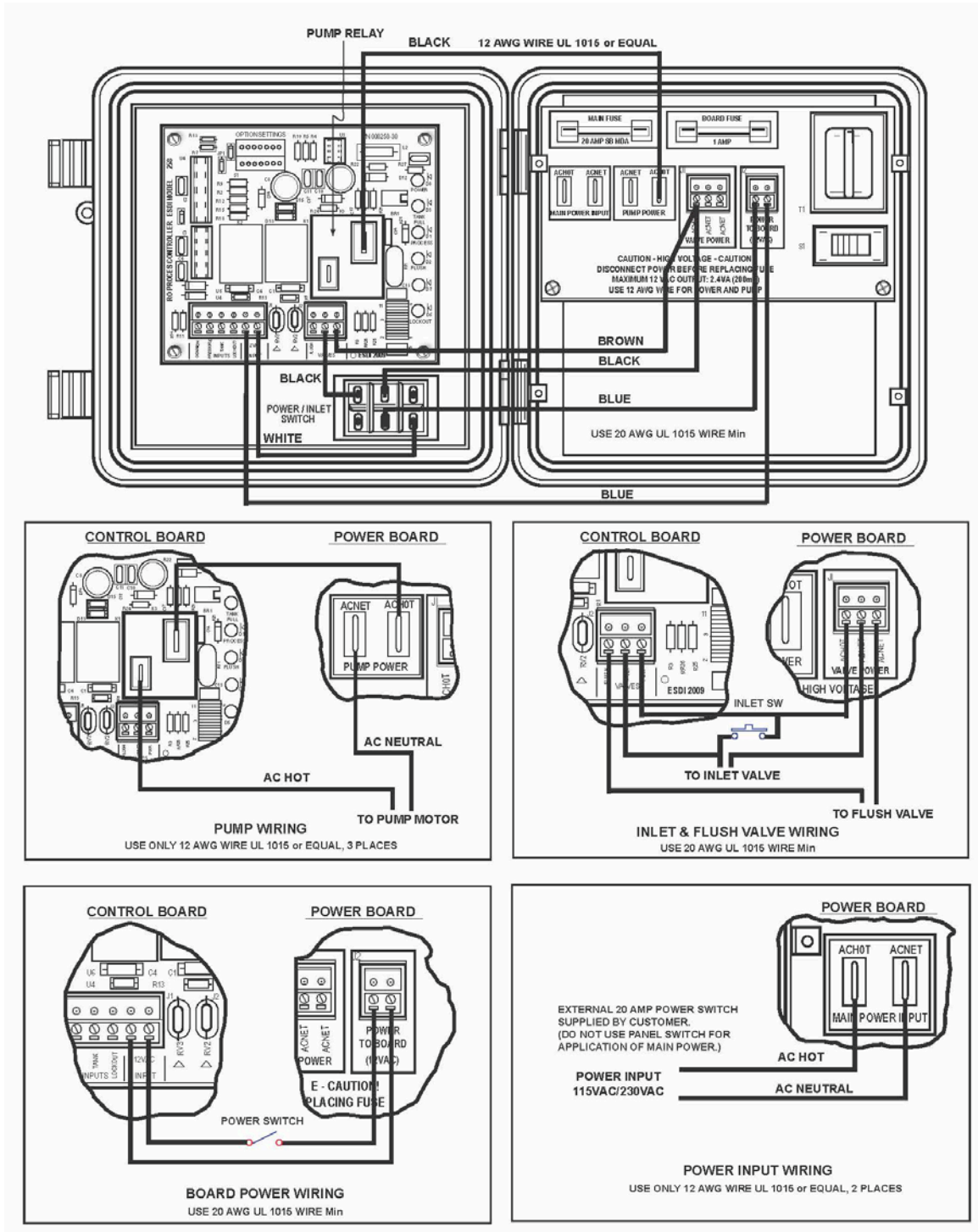
PHOTOGRAPHS

Photographs of C – 23 Controller with Enclosure and Power Board

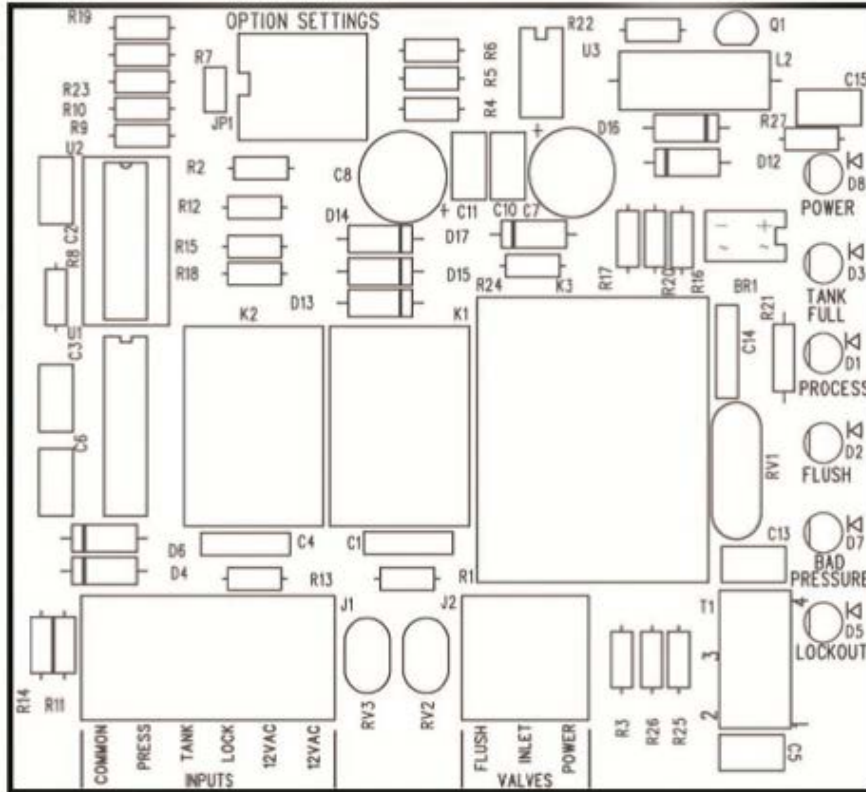




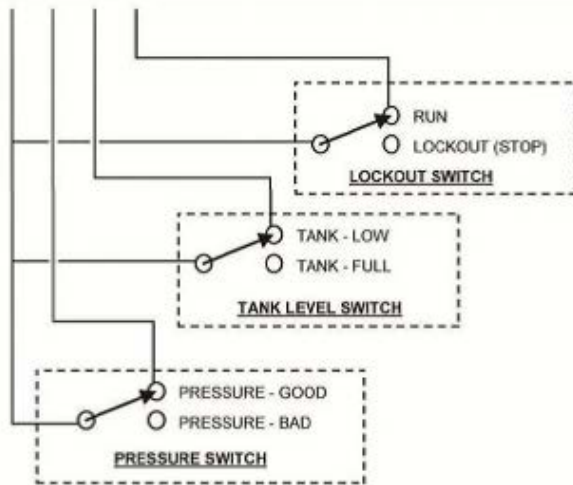
C-23 RO CONTROLLER INPUT WIRING DIAGRAM I



C - 23 RO CONTROLLER INPUT WIRING DIAGRAM II



WIRE SIZE:
20 - 24 AWG
UL-1015



IMPORTANT NOTE:

INPUTS MUST ONLY BE CONNECTED TO ISOLATED CONTACTS
(SWITCHES, RELAYS, ETC.) THAT ARE EITHER OPEN OR CLOSED.
FAILURE TO DO SO MAY CAUSE PERMANENT DAMAGE TO THE CONTROLLER.

Never Apply Any External Voltages to The Signal Inputs, or Damage Will Occur.