HOFFMAN INNOVATEIT

REVERSE OSMOSIS

Fully Integrated, High-Efficiency R.O. Spot-Free Rinse System

Instruction Manual

REV2.00

Updated 11/2/2023

For Further Assistance Please Contact
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Introduction

1. Introduction

The manufacturer **innovateIT Car Wash Equipment LLC** is committed to the continuous improvement of its equipment construction quality and the safe operation of its equipment.

1.1 Warranty

This manual covers the installation, intended use, and maintenance of the Reverse Osmosis (RO) Spot-Free Rinse System. Misuse or improper operation of this device will void the manufacturer's warranty.

A 1-year limited warranty from the shipping date covers this product. This warranty shall be void and of no effect if:

- Any installation defect that was apparent or ascertainable at the time of installation was completed but was not promptly reported to innovateIT Car Wash Equipment LLC.
- Damage occurs due to the customer's failure to observe any instructions from innovateIT Car Wash Equipment or an authorized distributor and/or requirements of the manufacturer with respect to the product.
- The breach results from misuse of the equipment as outlined in the instruction manual.

When purchasing through a distributor, please ask about their warranty coverage on the unit.

1.2 Safety Information

CAUTION!

FAILURE TO FOLLOW INSTALLATION AND OPERATING INSTRUCTIONS MAY RESULT IN DAMAGE TO EQUIPMENT OR PERSONAL INJURY.

The instructions in this manual provide you with the information necessary to install and operate the R.O. System. Before starting installation, the instruction manual should be carefully read and understood. **This relates to all Reverse Osmosis Spot-Free Rinse System documents from innovateIT Car Wash Equipment.**

The basic pre-requisite for safe working is compliance with all the safety and handling instructions stated in this manual. Furthermore, follow all local accident, hazard prevention regulations or general safety regulations when installing and operating the R.O. System.

The equipment's operation, maintenance, and troubleshooting must only be carried out by trained personnel. Personnel be able to interpret a wiring diagram, use a multimeter to read AC and DC, and apply Lock Out Tag Out safety procedures specific to the equipment.

Eye protection should be worn at all times when operating the RO. System, as the unit includes high pressure water lines and membrane housings which may leak if fittings loosen over time.

Electrical installation must adhere to local codes and the National Electrical Code, ANSI/NFPA 70 for electrical wiring. To avoid electrical shock hazards, do not operate this device when controller enclosures are open and energized. Electrical power must be shut off and a lock-out procedure utilized to ensure all electrical power is disabled before performing maintenance to any

portion of the system.

Plumbing installation must adhere to a local code and Uniform Plumbing Code (UPC), and plumbing connections and drains must adhere to local standards and facility codes.

- Do not remove any Caution, Warning, or any other descriptive labels from the RO system.
- Do not operate this device in an explosive environment or in the presence of flammable materials.
- Movement or vibrations during shipment may cause connections to loosen. **Check all connections before starting up a unit.**
- Do not operate this unit in an environment where water temperatures may be below 40°F or above 80° F.
- This equipment is intended for installation in ordinary locations, by the National Electrical Code, ANSI/NFPA 70, where the ambient temperature does not exceed 104°F maximum.

innovateIT Car Wash Equipment LLC does not accept liability for accidents or damages due to negligence or disregard for the instructions in this manual. Also, the Company does not accept liability for damages due to improper use of the equipment.

This instruction manual should always be kept in a safe and easily accessible place near the equipment's site of installation and operation, and be available for the operator at the user site at any time.

I**f the manual is damaged, lost, or misplaced, you should mmediately request a new copy from innovateIT Car Wash Equipment LLC.**

2. System Overview

innovateIT Car Wash Equipment LLC has developed a high-efficiency reverse osmosis system to provide spot-free rinse service for express car wash applications.

The system uses “Flow on Demand” control algorithm to adjust pump pressure based on number of cars being washed, operator demand, and condition of the membranes.

The VFD pump allows the system to respond to the car wash demand for RO water and is sized to generate RO needed to match the demand throughout the day. This approach allows the use of a reduced-size RO storage tank which is fully integrated into the RO stainless steel stand.

In addition, the VFD pump allows the unit to produce full flow (10 GPM – Standard Flow, 15 GPM – High Flow) down to 40F feed water temperature to ensure consistent flow for the wash even in extremely frigid winter climates.

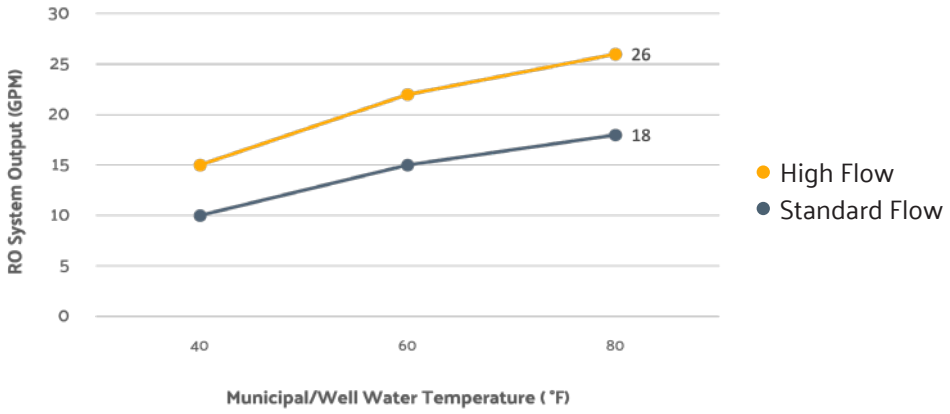


fig. 2 - 1 - Feed water temperature vs. RO output

RO usage is monitored and the RO production rate is automatically adjusted to meet the demand (number of cars in the tunnel) to improve the energy efficiency of the system and eliminate the on/off cycling typical of existing RO systems.

In addition, the integrated system eliminates the cost of buying and installing large buffer storage tanks needed to meet the high-volume tunnel demand at busy washes.

This R.O. System has been engineered to allow years of trouble-free operation and low life cycle costs for the operator. The system utilizes commercial (high efficiency) RO membranes that operate from 70 to 200 psi pump pressures. All the components (chlorine filter, pumps, membrane, etc.) have been selected to improve the system’s reliability, minimize energy use, and reduce required maintenance.

A large touchscreen Human Machine Interface (HMI) provides an intuitive screen display for the operator to monitor and fine-tune system performance according to the wash site.

The unit includes the RO storage tank but requires a separate tank for the rejected water. RO reject water is recommended for use for other wash processes which include wheel blasters, underbody spray, and various rinse processes.

2.1 Principles of Operation

NOTE: Most car washes operate with varying feed water temperatures over the course of the year. This unit is designed to ensure that the unit produces adequate RO for rinsing cars across a wide range of feed water temperatures and levels of dissolved solids.

The system is designed to automatically generate the required RO for the demand of the tunnel (up to 24,480 GPD with the Standard Flow system or 37,440 GPD with the High Flow system.

The unit uses the Grundfos VFD Pump along with a PLC controller to match the RO production to the RO usage. This approach produces high quality water with maximum operating efficiency.

The tank level sensor (pressure sensor) is used to generate the request for RO production flow rate which varies based upon the RO storage tank level. This feature allows the system to increase flow as the tank level drops. When matched to properly sized nozzles in the tunnel, the unit is designed for up to 200 cars per hour continuously.

The variable flow approach based on tank level allows the use of a smaller RO storage tanks which integrate directly to the RO system. The result of this feature allows the pump to operate at lower pressures for longer periods, increasing membrane life and reducing pump cycling. This avoids short cycling the pump and allows unit to run efficiently even during periods of low or intermittent carwash tunnel volume.

An electrical control box is installed on the unit which includes the PLC, HMI, and mechanical disconnects from the main power supply, to convert the 480VAC three-phase power to 24 VDC to power the HMI, PLC, and air solenoids and water quality TDS sensor (24Volt).

The control box also includes a motor starter for the re-pressurization pump which uses RO water from the storage tank and delivers RO flow to the tunnel. The re-pressurization pump is turned on based on an RO request signal from the tunnel controller and does not integrate into the RO production pump controller.

A flow switch and an air operated solenoid valve have been added to the re-pressurization pump output to protect the pump from a dry running condition. This feature will turn off the re-pressurization pump and register a fault if the flow switch fails to close.

The electrical inputs and outputs (I/O) has been selected to minimize the number of sensing devices while providing the ability to diagnose failure of the equipment.

2.2 System Operation

The following input and output signals are used to provide the controller information to operate and troubleshoot the system. These sensors are shown on the system schematic (Appendix 2).

2.2.1 Pump Inlet Pressure Switch - PS1

- 0-5 psi adjustable pressure switch which is used to detect an issue with the water supply. The switch is normally open and if this switch fails to close after start-up, it will turn off the RO pump and register a system fault. A PS1 fault will shut down the RO Production Pump and log a fault in the data log.

2.2.2 RO Pump Pressure Sensor – PS2

- This pressure sensor is used to protect the system from operating over the setpoint pressure.
- The system can produce 10 GPM (Standard Flow) or 15 GPM (High Flow) of RO below 200 psi at a water temperature above 40F.
- This pressure set point is to allow the use of membranes that might be lower-pressure or cold-water membranes.
- This situation may occur as the membranes reach the end of life or if feed water drops below 40 F.

2.2.3 RO Product Flow Sensor – ROFLO

- This sensor provides the feedback signal to the pump controller to adjust RO Pump speed and pressure to achieve the desired RO flow rate. The programmed flow rate is adjustable on the PLC settings screen.
- This sensor provides a 4-20 mA signal to the controller and the calibration is set in the controller software. This allows the operator to adjust the requested flow based on the tank level. As the tank level decreases, the flow is set to increase. This approach allows the unit to generate RO at the lowest energy cost to meet the flow required by the tunnel.
- 'RO Production' turns on when the tank level drops to 75% and fills it back to 95%.
- Verify the RO pump turns on when the tank level drops to 75% tank level.
- Once the re-pressurization pump is commanded off, the unit will keep running continuously until the level reaches 100%. The system will wait 15min then initiate a RO MEMBRANE FLUSH CYCLE before shutting down.
- During the flush cycle, the RO pump circulates a few gallons of RO water to the feed side of the membranes. RO water pulls deposits from the surface of the membranes. **The flush water (RO water) remains in the dirty (concentrate) side of the membranes until the next production cycle.**
- Using this method, the feed (concentrate side) of the membranes will always be cleaning the membranes between the RO production cycles.

The tank is divided into three sectors which allow flexibility in set-up. The objective is to allow the unit to adjust flow based on tank level with lower flow rates as the tank is nearing 100% full and higher flow rates as the tank approaches empty.

The 'RO Production Turn On' level is adjustable and will normally be set in the 60% range. In the screen shot above the operator has set this number to 80%. Based on the settings above the unit will ramp from 0 GPM to 8 GPM when the tank reaches 80% full condition.

2.2.4 Tank Level Sensor

- The tank sensor is a low-pressure sensor that measures the static water head pressure based on the depth of water in the tank.
- The 0-5 psi sensor is scaled to a 4-20 mA signal. This signal is used to request flow rate based on the tank level. This signal is an input to the PLC which is used to modify the flow request based on the tank level.

2.2.5 Recirculation Flow Switch

- The recirculation flow switch verifies that the recirculation loop flow (the combined flow of the recirculation flow and reject flow) is operating at more than 12 GPM of flow during operation.
- This switch protects the membranes from fouling, verifying that Valve C is open and the recirculation and reject flow orifices are not blocked during RO production. If the reject flow orifice or the recirculation orifice becomes blocked it would increase RO recovery and potentially damage the membranes. The switch will not close if the RO pump pressure is less than 70 psi.

2.2.6 Re-Pressurization Pump Flow Switch

- The switch closes as RO pressure at the pump flow reaches 5 GPM.
- This switch verifies that when the RO Request for water is sent from the tunnel controller, Valve D has opened, the delivery pump has turned ON, and RO water is flowing to the tunnel.
- If this switch fails to close it will turn off the re-pressurization pump to protect it from running in a dead-head or dry running condition. **(It is recommended that you have a spare flow switch and cable to allow quick repair if the switch fails. PN: Flow Switch- RC-FS VK309)**

2.3 System Functions

The following diagram shows how the system works and shows the operating steps to operate in START mode.

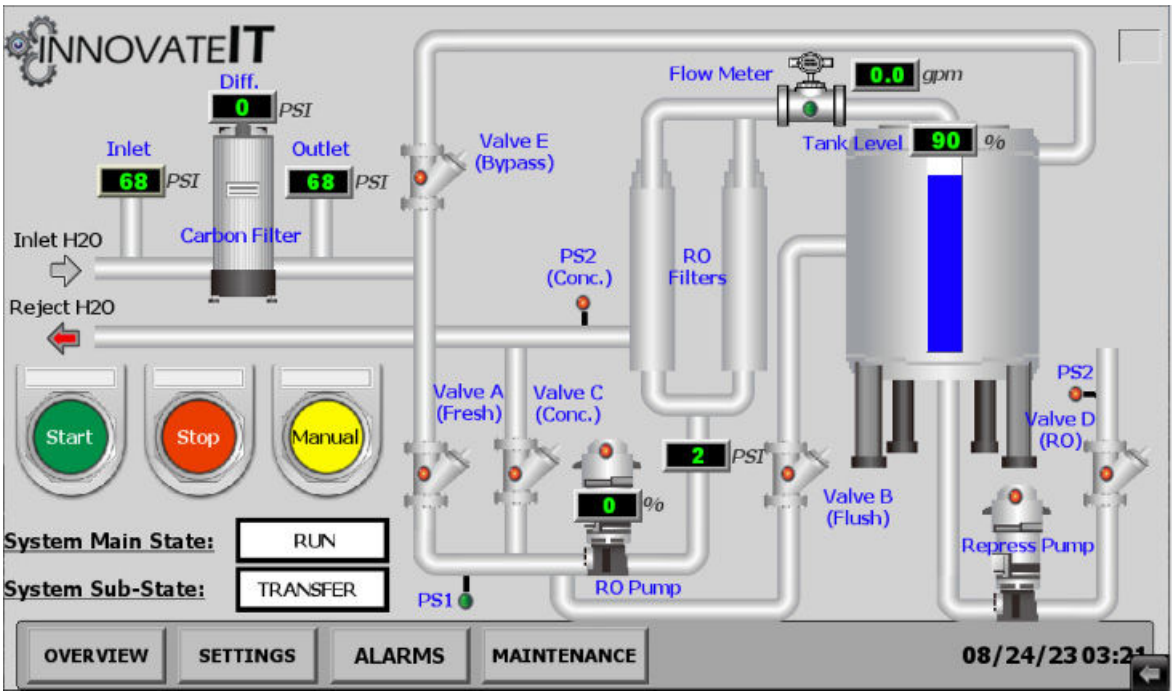


fig 2.3 - 1 - HMI screen in START mode

Each of these functions is designed to ensure a reliable and consistent supply of RO water for the spot-free rinse portion of the wash.

2.3.1 Stop Mode

The unit will always start up in the STOP mode. In this mode, power is supplied to the RO system, and the 24vac signals are energized. However, the pumps and solenoid valves are all commanded off. The HMI will show a red dot in the mode button on the main screen.

2.3.2 Start Mode

Press START on the HMI (fig. 2.3.2 - 1)

- The system will go through a short initialization of 5 to 10 seconds.
- START MODE will produce RO water until the tank is full (Set maximum tank %)
- The RO pump will continue to operate until the tank reaches the set tank level %.

- If the unit is inactive for 15 minutes, the unit will perform a flush cycle.

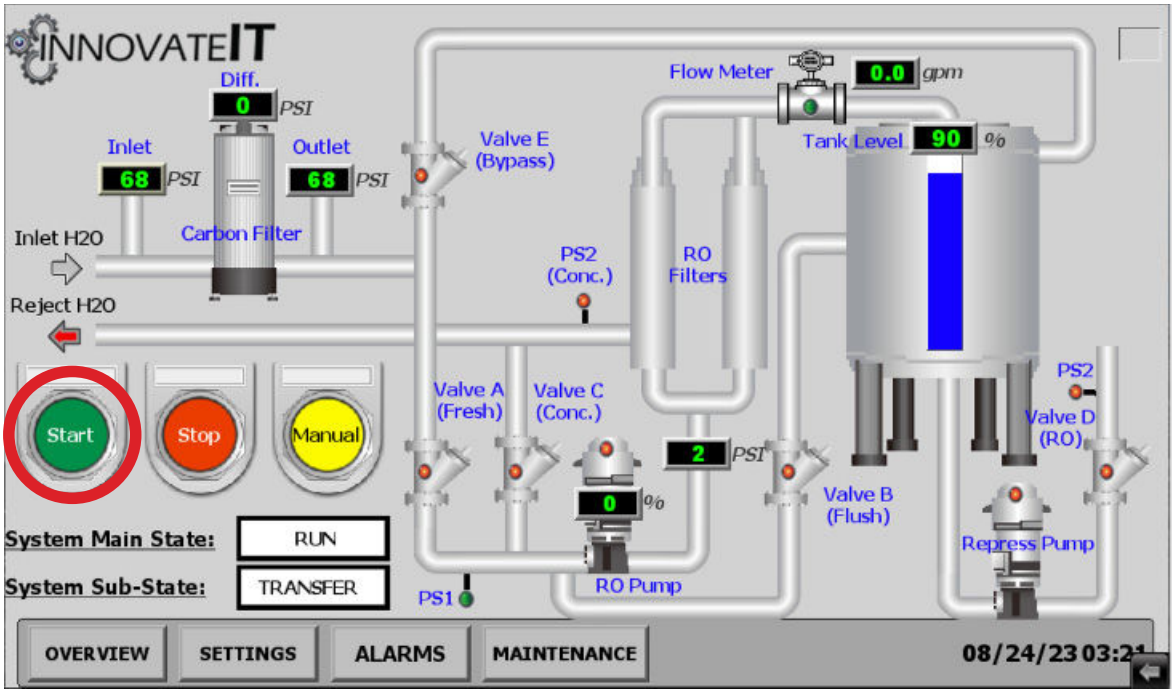


fig 2.3.2 - 1 - START button

Note: In the event of either low RO flow from the system (due to failed membranes or pump problems) or if the demand from the tunnel exceeds the flow from the RO system, there is a municipal water line that uses a valve (E) to fill the RO tank if the water level drops drop below 25%. This is to protect the re-pressurization pump and ensure rinse water is delivered to the tunnel.

2.4 Tunnel Signal Command for RO Water Delivery to Tunnel

This signal is controlled directly by the tunnel system controller using a 24 Volt DC relay signal to the R.O. System Controller and is used to turn on the Re-Pressurization Pump.

This signal switches on and off for each car in the tunnel based on the conveyor speed. The re-pressurization pump is limited to 180 cycles per hour (maximum continuous cycle rate).

2.5 RO Storage Tank

The stainless steel RO storage tank is integrated into the stainless steel stand. Municipal water flows to a solenoid outside the tank to automatically supply municipal water to the tank if there is a failure in the system.

Note: The solenoid supplies water if the RO pump or membranes have reduced RO flow.

⚠ WARNING!

THE 24V DC SIGNAL MAY BE PRESENT IN THE SYSTEM CONTROLLER EVEN WHEN THE CONTROLLER POWER HAS BEEN MANUALLY DISCONNECTED FROM THE 3-PHASE POWER SOURCE. YOU MUST TURN OFF THE 24 V ELECTRICAL SIGNAL (RO REQUEST) FROM THE RO SYSTEM CONTROLLER BEFORE PERFORMING MAINTENANCE OR REPAIR TO THE SYSTEM CONTROLLER. FAILURE TO DE-ENERGIZE THIS CIRCUIT COULD LEAD TO EQUIPMENT DAMAGE OR PERSONAL INJURY.

2.6 System Performance

The stainless steel RO storage tank is integrated into the stainless steel stand. Municipal water flows to a solenoid outside the tank to automatically supply municipal water to the tank if there is a failure in the system.

RO systems are designed to provide spot-free rinse water to the car wash tunnel and are rated by the volume of RO water produced per day. Membranes are extremely sensitive to feed water temperature and will typically lose approximately 2% of flow for every 1F drop in feed water temperature at constant pressure.

The innovateIT R.O. System is conservatively rated for consistent performance from 40F to 80F feed water temperatures. The system utilizes oversized membranes operating at conservative flux ratings combined with daily RO flush cycles to achieve high-quality water and long membrane life.

The unit provides 10 GPM (Standard Flow)/15 GPM (High Flow). The maximum commanded flow at low tank levels is 18 GPM (Standard Flow)/26 GPM (High Flow) are programmed. These max flow ratings can only be achieved when the water temperature is 77F or above.

The RO volume (gallons per car) should be set for the coldest expected feed water which eliminates the need to adjust the flow to the tunnel throughout the year to adjust for changes in municipal water temperature variation. The pressure required to generate full flow will range from 70 psi (@ 80°F) to 200 psi (@ 40°F).

The Grundfos VFD pump has been oversized to allow this wide range of temperature capability while using Dupont (formerly Dow Filmtec) membranes which ensure high quality (low TDS RO water). The VFD pump also allows pumping at the correct pressure and flow to generate the needed RO flow to support the tunnel demand.

Although the unit has a 7.5 HP pump, most of the time this system will be running at much lower power. The electrical energy used to generate the RO increases as the RO membrane flow increases.

The result of generating RO at the rate required to satisfy the tunnel demand results in reduced energy consumption per gallon of RO produced. The membrane's performance varies as the feed water temperature changes. This means the RO pump pressure must increase to maintain flow as feed water temperature drops.

Over time, the flow and pressures may vary. Lower flow rates would indicate potential scaling or fouling of the membranes and higher RO flows or increasing RO TDS readings may indicate either membrane damage (caused by chlorine damage) or a membrane O-ring seal leak.

The TDS of the RO water ranges between 0 and 15 PPM with new membranes. New membranes process chemicals in the RO membrane material, and the initial 60 minutes of operation the TDS will go from 200 ppm or higher down to the normal 0-15 ppm level.

This represents normal start-up for new membranes. If after an hour of operation, the TDS is still running above 15 ppm the operator should pull a sample from the bottom of each membrane to determine if a seal was cut during assembly of the mem-

branes into the membrane housings.

In addition, TDS should be checked after the RO pumps runs for a couple of minutes as when the unit sits overnight or when unit is stopped during the day as there will be “TDS creep” as salts will migrate across the membranes when unit is sitting in standby mode.

3. Installation Requirements

Note: Failure to properly pre-treat the water may result in reduced membrane life and premature membrane failure and is not covered under the limited warranty.

Listed below are all the critical water specification limits and the required pre-treatment regimens.

Feed Water Limits and Recommended Pre-Treatment Approach

Specification	Limit	Recommended Pre-Treatment
Water Hardness	< 1 grain	Ion-exchange Water Softener
Iron (Fe)	< 0.5 mg/L	Iron Filter
Iron Ferrite	0.05 mg/L	Iron Filter
Free Chlorine (Cl2)	< 0.1 mg/l 0.1 PPM	Activated Carbon
Turbidity (dirt) - (NTU)	< 0.2 NTU	Ultrafiltration (UF)/Microfiltration (MF)/Multimedia Filtration (MMF)
Manganese (Mn)	< 0.05 mg/L	Ion-exchange Water Softener
Hydrogen Sulfide (H2S)	> 0.0 mg.L	Oxidation, Aeration
Organics	> 0.0 mg/l	Activated Carbon
Total Dissolved Solids	1,000 mg/l (max)	Feed water must be below 1000 mg/l

3.1 Pre-Treatment Solutions

Water Softener

The ideal water hardless is < 1 Gain to maximize life of the membranes. The membranes will experience shorter life as the water hardness increases.

The capacity water softener needs to be sized to supply continuous soft water during the R.O. System operation.

3.1.1 Carbon Block for Chlorine and Chloramine Removal

Most municipal water supplies treat their water with either chlorine or chloramine. Some water suppliers will use a combination of chlorine and chloramine or change the treatment from season to season, so you must contact your municipal water supplier and decide if the water treatment will result in free chlorine in the feed water.

The filmTec RO (Eco Pro-440i type) membranes are not tolerant towards free chlorine, and as such require a chlorine filter system to remove free chlorine from the feed water. Properly sized activated carbon filters (chlorine treated water) or catalytic carbon filters (chloramine treated water) supply the ability to remove the free chlorine from the feed water.

A weekly check needs to be performed to ensure the carbon filter system is functioning properly and the level of free chlorine measures < 0.10 PPM during system operation. Membrane failure due to chlorine exposure occurs in less than 200 hours (8 days) when exposed to a 0.5 PPM level of free chlorine.

Note: Running the system with a depleted or non-functioning chlorine filter will at once start to damage the RO membranes and avoid any warranty from the membrane manufacturer.

3.1.2 Additional Feed Water Pre-Treatment

Water quality varies significantly in different areas of the country. In addition, municipal water suppliers add chemicals and adjust pH levels in the water to prevent corrosion in the distribution lines.

A water analysis will need to be performed at each new site to ensure that the water and pre-treatment solutions are compatible with the RO membranes and pre-treatment approach.

3.1.3 System Requirements

Requirements	Standard Flow	High Flow
Dimensions	92" w x 80" h x 37 "d	92" w x 80" h x 45" d
Operating Pressure (Water Supply)	25GPM @ 40-60PSI	35GPM @ 40-60PSI
Operating Pressure (Air Supply)	1 SCFM @ 80-100PSI	
Electrical Supply*	480 VAC/3PH 24 VDC	

* 480 VAC 3 Phase power with ground from the facility. Review the electrical schematic for required current ratings and integration of the system controller. The primary RO pump is 7.5 HP, and the re-pressurization pump is a 1.5 HP pump.

- RO Power requirement is 15A, 3 Phase 480VAC fed by a trip class 10 or higher. Wiring and conduits as allowed by local code and NEC-70.

WARNING!

THE MAIN DISCONNECT POWER MUST BE TURNED OFF AT THE DISCONNECT SWITCH ON THE FRONT OF THE ENCLOSURE BEFORE OPENING THE RO SYSTEM CONTROLLER FOR MAINTENANCE.

3.2 Installation Preparation

RO system installation must conform to local plumbing, electrical, and sanitation codes. The customer is responsible for obtaining all permits and installing equipment to conform to all state and local codes.obtain all permits and install equipment to conform to all state and local codes.

3.2.1 Water Supply

The water supply must be able to supply a minimum of 25 GPM (Standard Flow)/35 GPM (High Flow) at 40-60 psi to the RO unit. The flow lines need to be sized to minimize pressure drops per accepted plumbing design guidelines.

Normal operating feed flow will vary between 10 and 22 GPM depending on water temperature. At this condition, the feed water pressure does not exceed 70 psi. HF unit will vary between 15 and 35 GPM depending on the RO flow demand. If you are using a booster pump, set the booster pump to 60 psi.

3.2.2 Floor Drain

All water drains and overflow lines must drain to the floor drain. The R.O. System plumbing is constructed to allow a visual indication of water flowing to the drain to help diagnose proper system operation. The RO tank has a 2" female overflow plug equipped from the manufacturer.

3.2.3 Compressed Air Supply

- (1CFM 80-100PSI) Hook up ¼" push connect. The pilot-operated air valves require a supply of compressed air to operate.
- Install a compressed air supply line on the back wall of the equipment room in the vicinity of the RO System.
- Add a ball valve and fitting to allow running an airline to the pressure regulator/water separator located on the RO frame.

This air supply is required to operate the ASCO 8290 air-operated air valves. The air valve manifold is located inside the RO System controller. The regulator should be adjusted to provide a minimum of 80 psi to the pilot solenoid valves. The water separator is checked daily to ensure dry air is supplied to the solenoid valves.

3.2.4 Unit Placement

Locate where the equipment will be installed with your installer. The R.O. System should be located 4-6 inches from the back wall.

There are a total of three water lines that must be attached to the unit:

1. Municipal Water Feed – 1.5" Hose
2. RO Reject to RO Reject Tank – 1.5" Hose
3. Re-pressurization Pump to Tunnel – 1.0" Hose

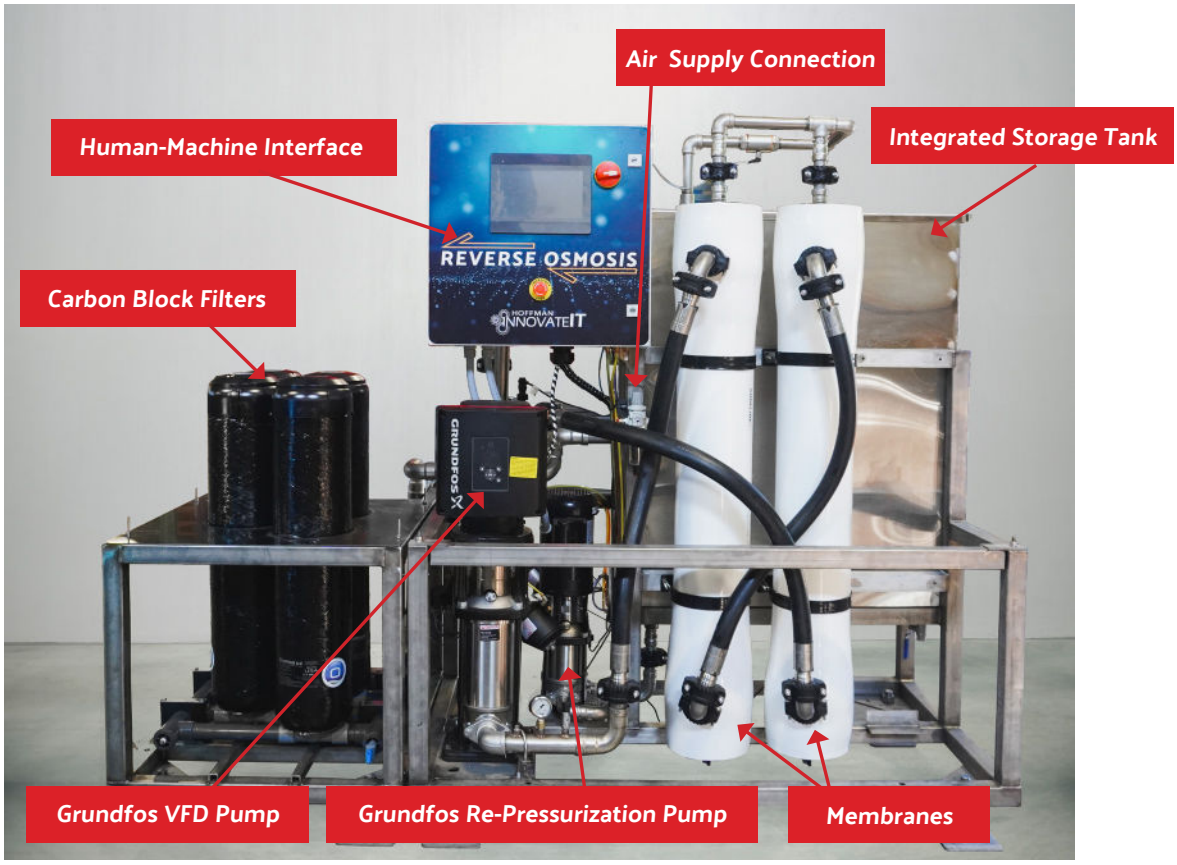
Use 200 psi hose (Eaton BOSFLEX or equivalent) and heavy-duty stainless steel hose clamps on every connection to ensure reliable operation.

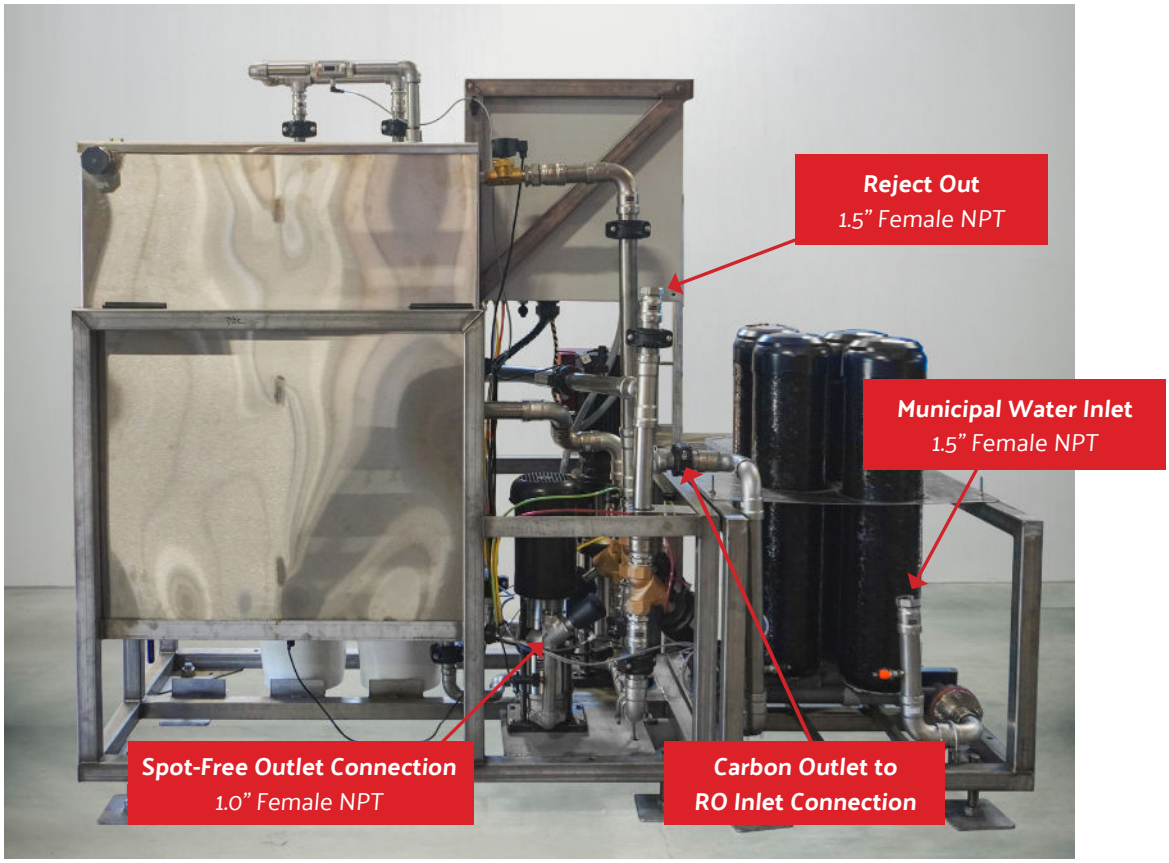
Lines should be positioned to minimize bends, and lines from tanks should hang in a manner to minimize loading on the stainless fittings.

If needed, install additional clamps or hose supports to RO frame to reduce movement of hoses during operation.

3.4 Reverse Osmosis System Identification

Note: See **APPENDIX 1** for more R.O. System identification.





4. Installation

WARNING!

DO NOT ATTEMPT TO REMOVE THE FILTER COVER IF THE PRESSURE IN THE HOUSING IS NOT ZERO. IF THE CAP IS REMOVED WHILE THE UNIT IS PRESSURIZED, THE CAP COULD CAUSE SERIOUS INJURY OR DEATH.

- Install an air supply to the ¼" push connector air regulator. (Verify air supply can supply 80-100PSI, 3CFM) and adjust the air regulator to 80-100 PSI. (fig. 4 - 1)

fig. 4 - 1 - Air regulator supply line

- Connect a municipal water inlet to RO 1.5" male NPT hose (verify municipal water can supply 25GPM for (Standard Flow) or 35GPM for (High Flow) @ 40-60 psi.

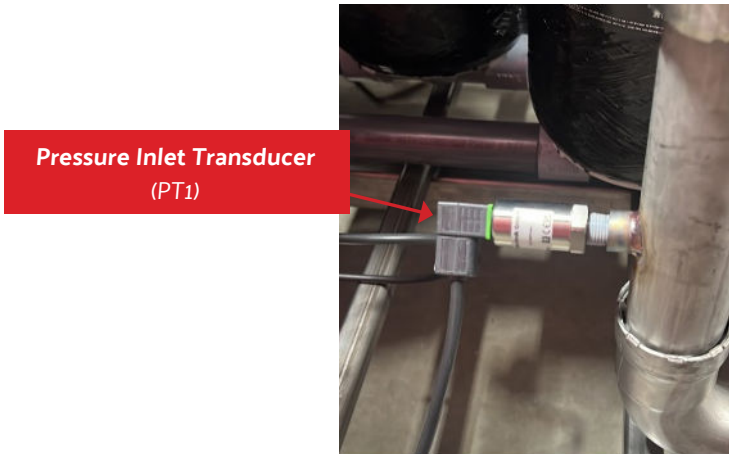
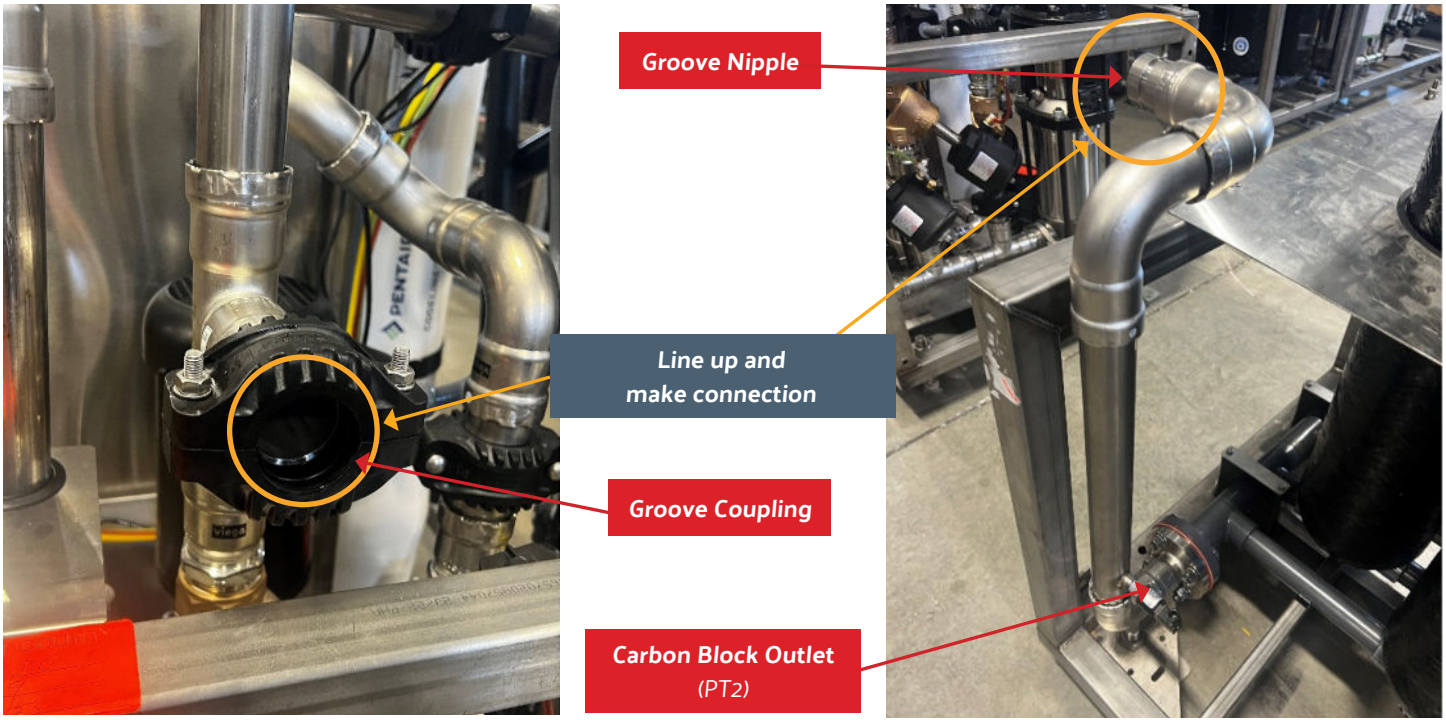


fig. 4 - 2 - Pressure inlet transducer

- Line up the carbon block assembly to the RO unit and loosen groove coupling.
- Slide the carbon block groove nipple to the groove coupling and tighten back up (fig. 4 - 3)



fig, 4 - 3 - Connecting carbon block assembly to RO unit

- Connect reject water to either reject tank or drain, with a 1.5" male NPT hose (fig. 4 - 4).

fig, 4 - 4 - Reject out connection

- Connect spot-free outlet to a wash Rain-bar with a 1.0" male NPT hose (fig. 4 - 5).

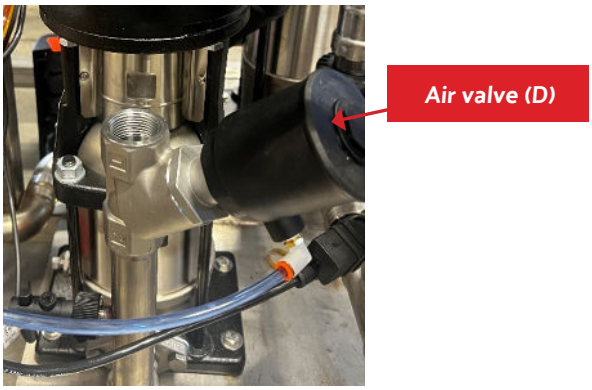


fig. 4 - 5 - Spot-free outlet connection

4.1.1 RO Membrane Installation

The membranes utilize an integrated locking jumper tube (Dupont iLEC) system which allows removal and replacement without removal of the membrane housing, hoses, or bottom caps.

However, if the ceiling height does not permit the membrane to be removed while the housing is on the RO unit, the IPS split clamps will need to be removed in order to remove the feed hoses and membrane housings. Code Line and Dupont have excellent online videos that show the proper way to remove and replace membranes.

The following procedure lists all the steps to remove and replace the membranes.

Note: If there is room to remove the membranes from the top of the unit, skip steps 4-7 during removal and step 11 of the RO membrane installation.

- Turn off the feed water from the supply line. Turn off the power on the controller and verify the feed pressure is 0 psi.

STEPS:

Note: Steps 4-8 are only required when you can't pull the membrane out from the top due to ceiling height.

1. Open the drain on the underside of the membrane housing.
2. Disconnect flow sensor cable on top manifold.
3. Remove spit clamp from top manifold to disconnect plumbing.
4. Remove the split clamps from the side ports of the membrane housings, disconnecting the hose.
5. Remove the band that holds the membrane on the stand.
6. Remove membrane housings and lay them on cardboard or soft material to avoid damage to the housings.
7. Remove the top and bottom caps and look over them to ensure they are not cracked or damaged. Replace the cap assembly if the damage is seen.
8. Install new O-ring seals on the cap (large diameter ring) and smaller O-rings on membrane adapters.
9. Apply a generous layer of silicone grease to the rubber seals, the brine seal (on the membrane), and the membrane housing chamfers/seal bore to avoid rolling or cutting during installation.
10. Insert membrane (re-use i-LEC adapters on new membranes) into housing from the top opening (feed side)
11. The feed water flow runs from the top to the bottom of the membrane housings.
12. The membrane brine seal (black seal at one end of the membrane - fig. 4.1.1 - 1) must be located at the feed port end (top port) to ensure proper flow of feed water through the membrane.

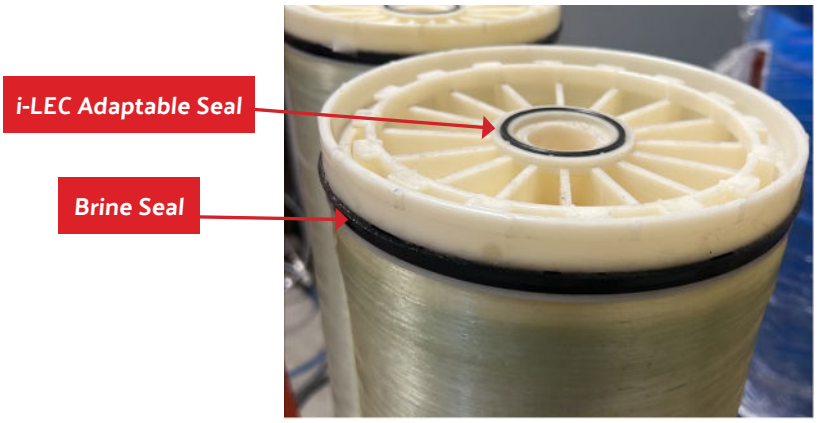


fig. 4.1.1 - 2 - Membrane seals

13. Carefully install the bottom caps and top caps (engage the adapter seal by hand and once aligned tap the cap on using a rubber mallet and block of wood).

14. Re-install the spiral snap ring.
15. After reinstalling spiral snap ring verify that the top of spiral snap ring is pushing against the top of the membrane housing slot. If not, when the system is pressurized, it makes a loud bang.
16. Reconnect unions, split clamps (if required), and membrane bands to complete installation.
17. New membranes are installed to dry. It will take a few hours of operation for the manufacturing chemicals to flush off the surfaces of the membranes and for the RO TDS to drop below 20TDS.
18. During start-up or after membrane replacement it is suggested that the RO line be disconnected from the RO tank and the first RO production be dumped to drain until the TDS level comes down to normal operating levels (20 TDS or lower).

Note: Use silicone grease to lubricate O-rings before assembly of new membranes, and membrane housing caps. Be sure to coat the O-rings and the mating surfaces with grease to avoid rolling, tearing, or cutting the seals.

4.1.2 Electrical Installation

WARNING!

ELECTRICAL INSTALLATION TO BE PERFORMED BY A QUALIFIED ELECTRICIAN.
FOLLOW ALL LOCAL CODES

The electrical schematics and connection points in the controller are designated in **APPENDIX 1**.

NOTE: Each electrical box has a serial number located inside the controller on the lower left side of the enclosure door (fig 4.1.2 - 1) . This number should be referenced when requesting support on the R.O. System as this number links to both the controller software and hardware.

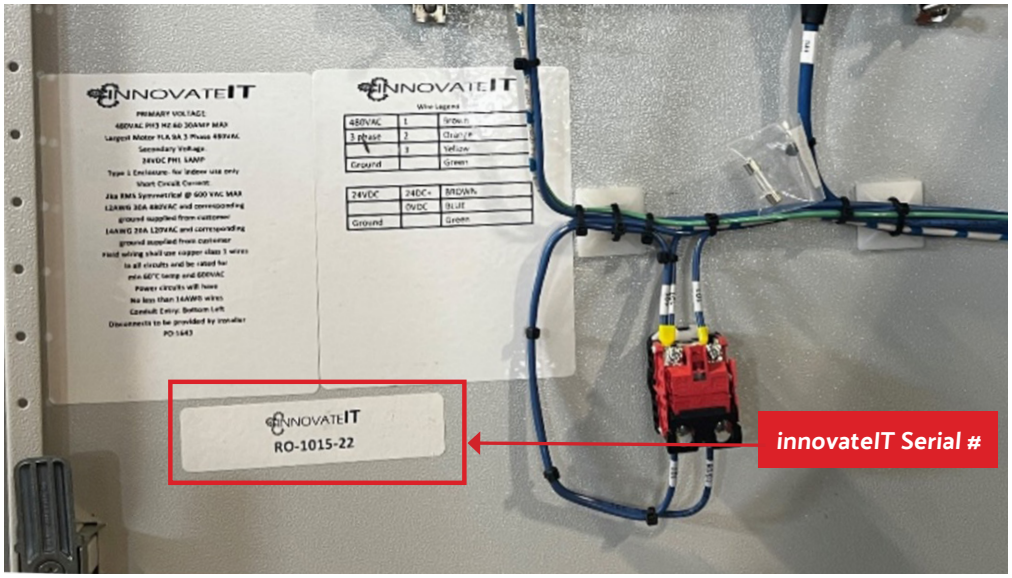


fig. 4.1.2 - 1 - RO System serial # location

- Locate customer network interface (fig. 4.1.2 - 2)

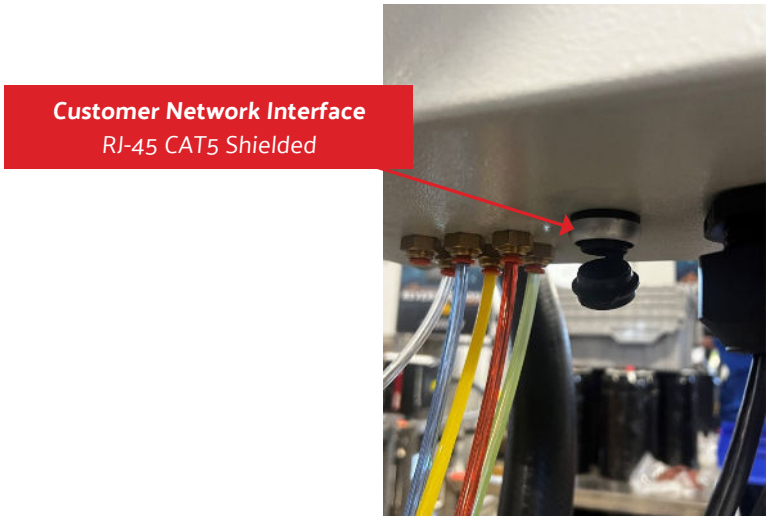


fig. 4.1.1 - 2 - Customer network interface

- Main Control Disconnect (**DS1**) is used to disconnect all power to the unit.
- Run customer supplied power (480VAC/3PH) to DS1 according to the system schematic (fig, 4.1.1 - 3).

NOTE: Verify a Phase Rotation before making 480VAC connection to DS1 (L1= BRW, L2=ORG, L3=YEL)

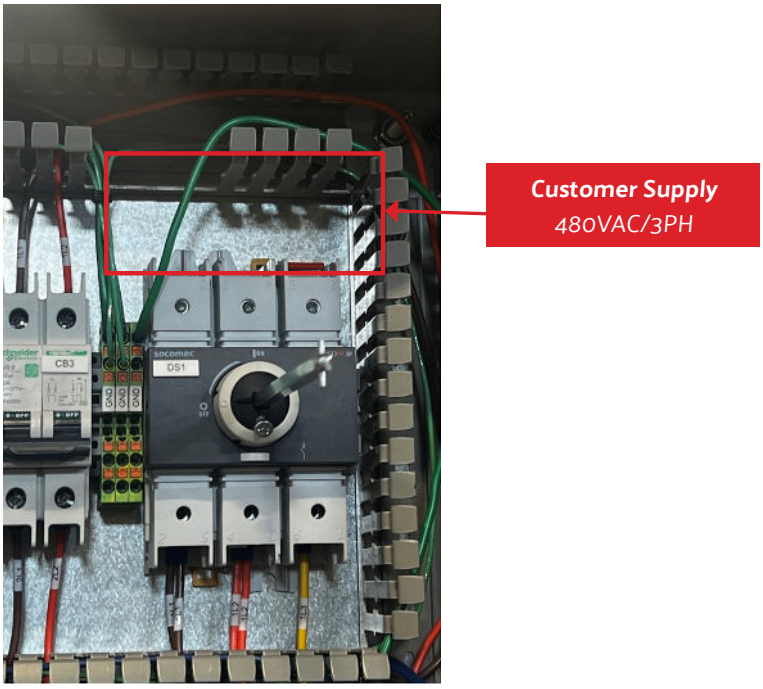


fig. 4.1.1 - 3 - 480VAC/3PH connection

- **Motor Protection Circuit Breaker UL489 (M1, M2)** – Individually sized for each motor. These provide short-circuit protection to the motor as well as thermal overload protection.
- **DC Power Supply (PWS1)** – Converts 480 VAC to 24 VDC for **PLC, HMI, TDS sensor**, and control circuit components.
- **PLC Controller** – Executes a program that controls the sequence and times of the operation through I/O (inputs and outputs).
- **Human Machine Interface (HMI)** – Executes a graphical interface program that communicates with the PLC to let the operator know the state of the equipment.
- **Main Disconnect Switch** - Electrical connection point for the 480 VAC 3-phase main power.
- **Control Relay (CR1)** – Land the 24V request for RO water signal from the tunnel to this component.

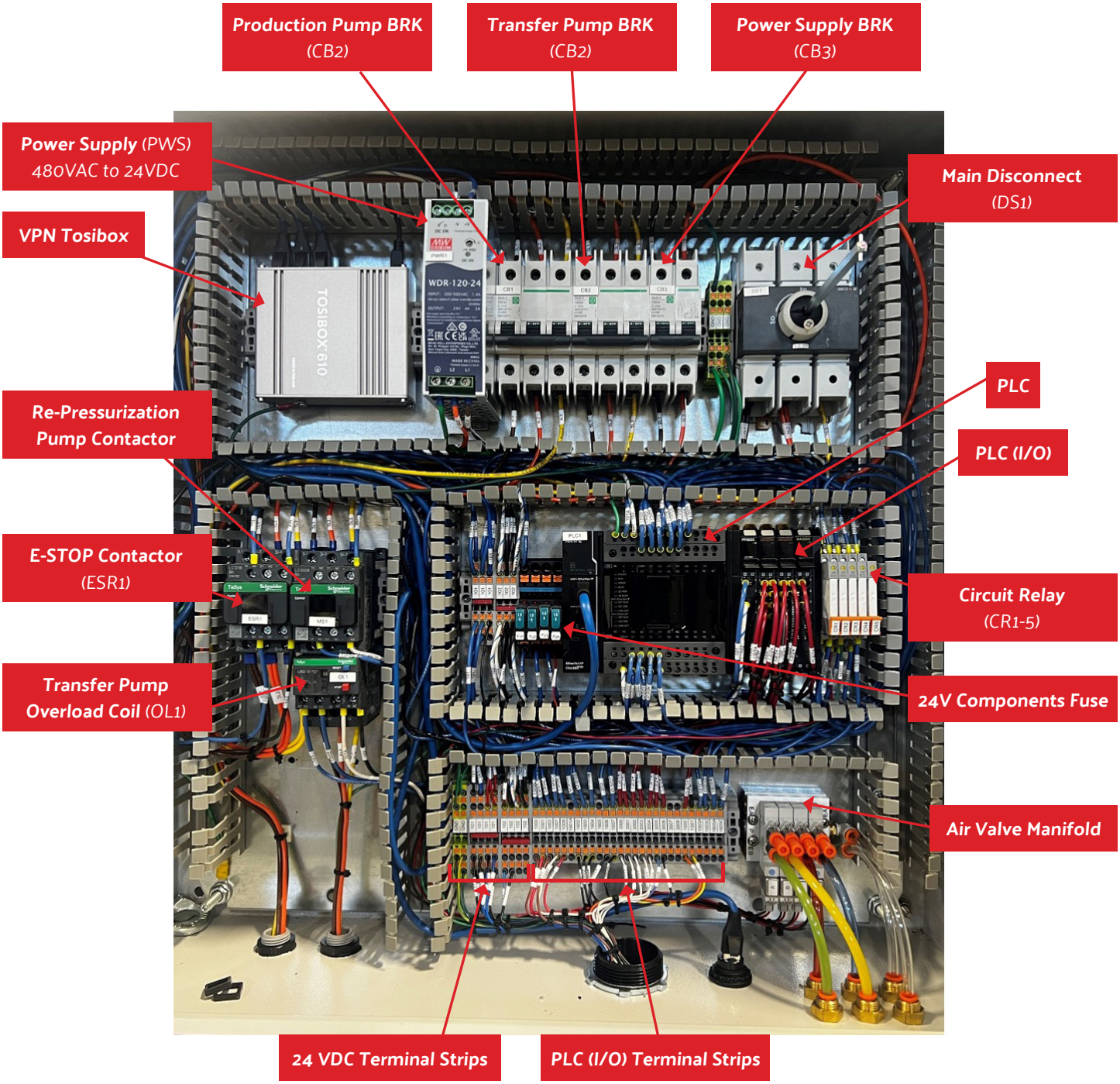


fig. 4.1.1 - 4 - RO Control Box Identification

5. System Startup

⚠ WARNING!

ELECTRICAL INSTALLATION TO BE PERFORMED BY A QUALIFIED ELECTRICIAN.

FOLLOW ALL LOCAL CODES

NOTE: Before starting up a unit, please make sure to refer to the **Installation Requirements** and **Installation** sections in this Reverse Osmosis Instruction Manual before activation.

NOTE: Verify phase rotation from utility power supply to the R.O. System. This is critical for pump rotation to operate correctly.

CAUTION!

Going to START mode (which starts the RO pump) before purging air from the pump can result in compromised pump shaft seal or, if left long term, may require the pump to be replaced

STEPS:

1. Verify all drain ports are closed (membrane housing, carbon manifold, and RO tank)
2. Set the air regulator to **80 PSI**. Slowly turn on the municipal water.
3. Press down the red air valve on top of the carbon housing to bleed air out of carbon housing.
4. Release carbon tank air valve when water stream is developed from the red valves.
5. This process may take **10-15 MINUTES** or more but it is a **critical step** to protect the system during initial start-up or after any maintenance during which air could enter any part of the system.
6. Turn on the utility power from the wash to the R.O. System.
7. Turn **480VAC** Main Disconnect switch to **ON** position (on the front of the enclosure)
8. Press the power button on the **HMI** and wait until the Overview Screen appears. verify the HMI screen is the same as the one in **fig. 5 - 1**. If not, please contact **support@innovatelTcarwash.com** for more information.
9. Place the unit in **MANUAL** mode before moving to the air valve testing page (fig. 5 - 1).

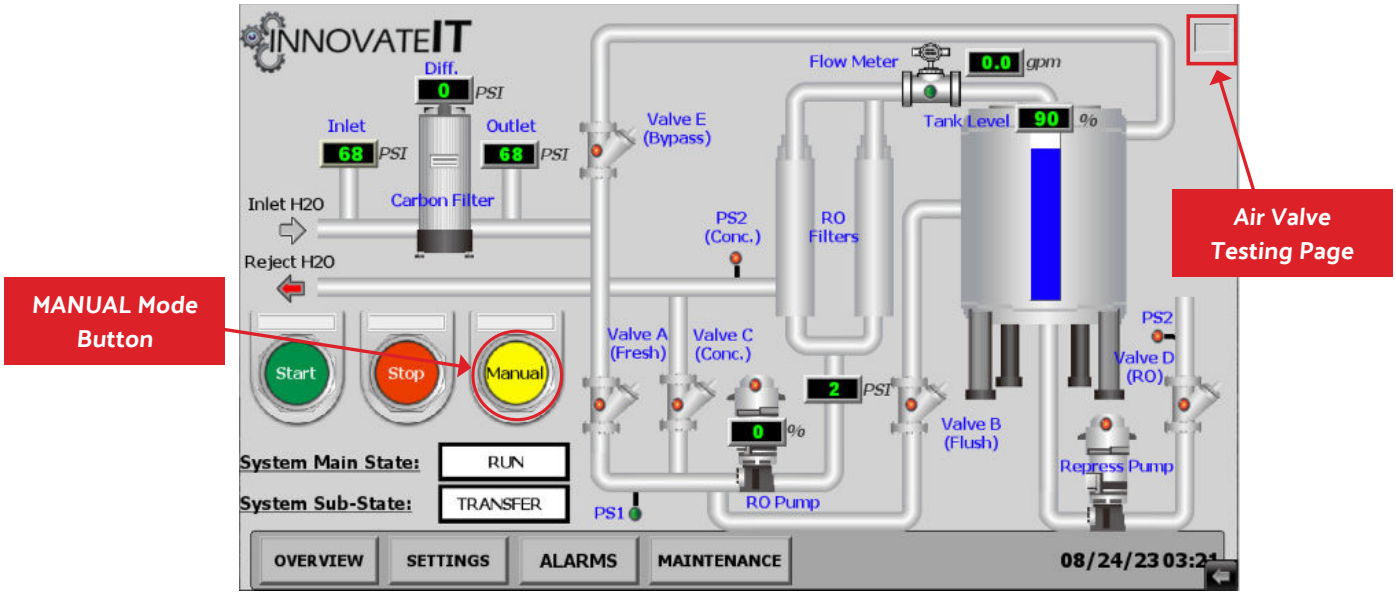


fig. 5 - 1 - HMI Overview Screen

10. Navigate to the **AIR VALVE TESTING PAGE** by pressing the square in the upper right corner of the HMI and verify Valve A is open (fig. 5 - 2).

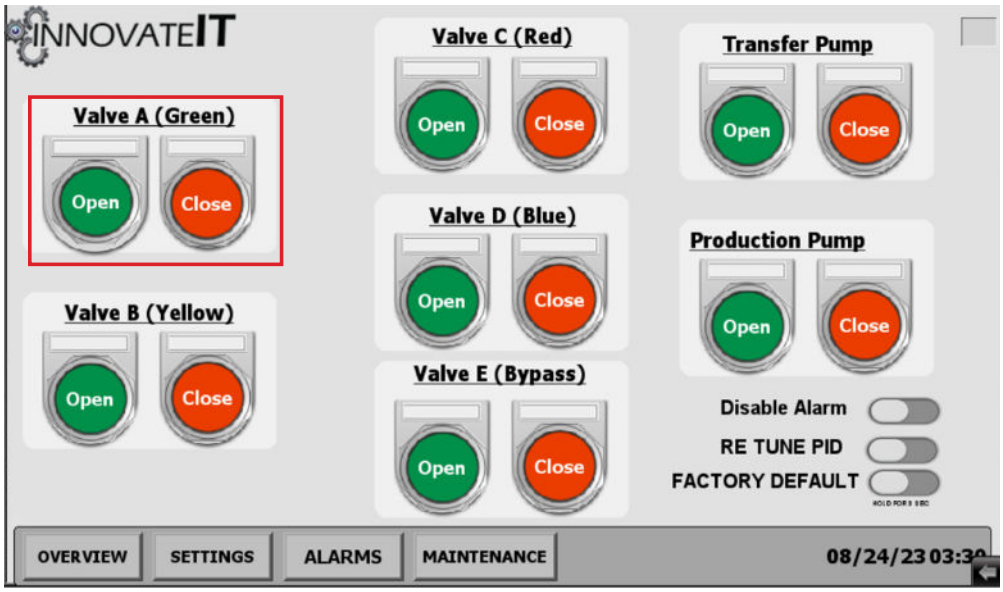


fig. 5 - 2 - Air Valve Testing Page

11. Loosen the Production Pump priming vent plug (fig. 5 - 3) with a 10mm wrench until there is constant stream flowing, then tighten the vent plug.
12. Verify there is a constant stream of water flow out of the check valve.
13. Verify all the air out of the pump, lines, and membranes before operating the production pump. **This process will take 30-40 sec after Valve A is open.** Valve A needs to remain open to allow water to start filling the RO storage tank in order to bleed the re-press pump before operation. This also allows time for municipal water to saturate the membranes.

fig. 5 - 3 - Production Pump priming vent plug

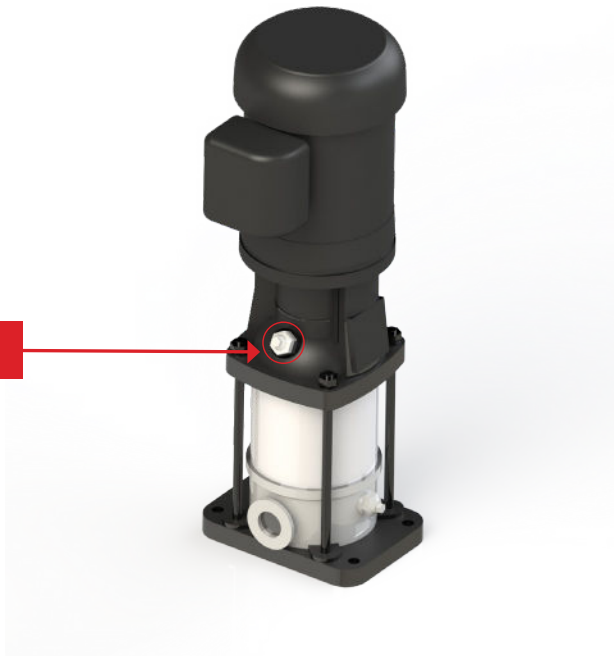


fig. 5 - 4 - Transfer Pump priming vent plug

14. Loosen the Transfer (Re-Pressurization) Pump priming vent plug with a 10mm wrench until there is constant stream flowing then tighten the Vent plug back in (fig. 5 - 4).
15. Cycle all the valves on the Air Valve Testing page by opening and closing each valve (B, C, D, and E).
16. Verify the direction of rotation of the pump motors. The correct direction of rotation is shown by the arrow on the black casing by the priming vent valve (fig. 5 - 5-6). The motor direction should be counterclockwise when viewed from the top.

NOTE: Verify that both Grundfos Transfer Pump and Production Pump motors are rotating correctly. **This needs to be done by the electrician prior to completing electrical installation.**

NOTE: If the pump fan rotates clockwise, stop the pump and turn off the **Main disconnect** and the **utility supply power**.

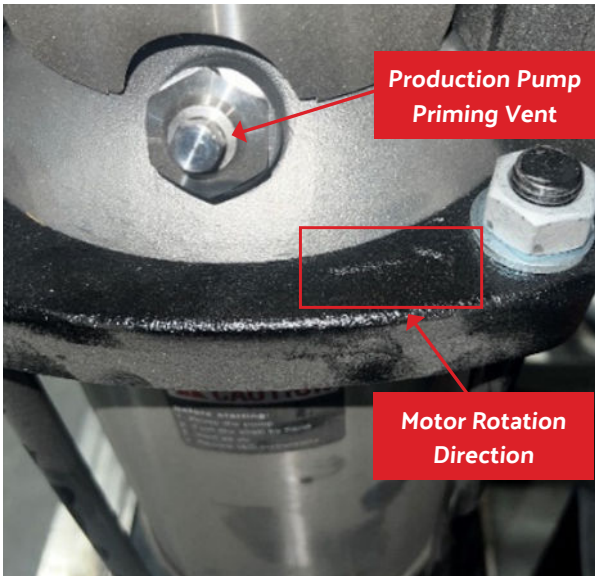


fig. 5 - 5 - Production Pump motor rotation direction

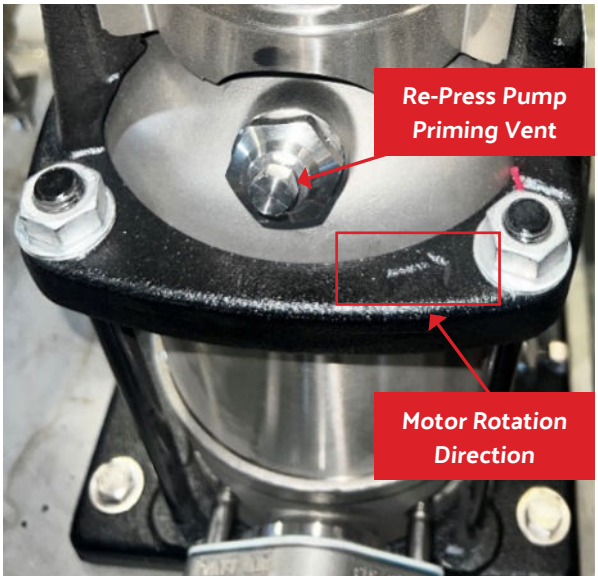


fig. 5 - 6 - Transfer Pump motor rotation direction

17. To (Bump start) both Grundfos pumps (Transfer Pump and Production Pump), press Open (**Pump ON**) for a second, then press Close (**Pump OFF**) (fig 5 - 7).

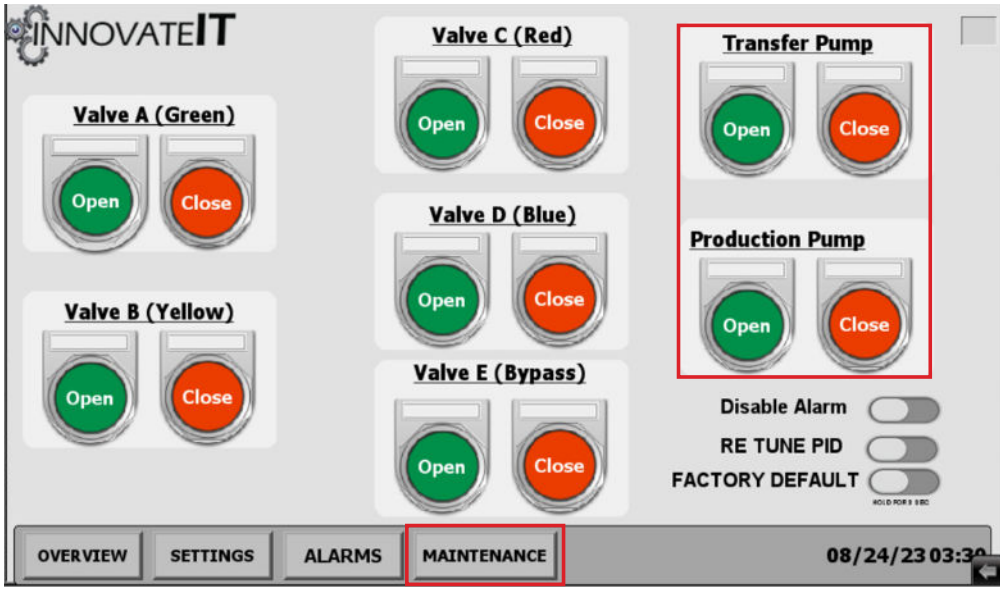


fig. 5 - 7 - Bump starting Production and Transfer Pumps

18. Repeat steps 10-14. This process will eliminate any air trapped in the pumps.
19. Check the system for leaks and repair any leaks before continuing operation.

NOTE: Default Tank span is set to 2500SP but can be adjusted to a higher number if needed (Follow steps 20-23).

20. Navigate to the **MAINTENANCE** screen by pressing the Maintenance button on bottom of the HMI. (fig. 5 - 7)
21. Press **START** (**Tank Fill**) to fill the tank with municipal water from solenoid E. (fig. 5 - 8).
22. Press the **STOP** when water is at top of the tank (first elbow). 2500SP is recommended.
23. Press **Set** (Tank span).

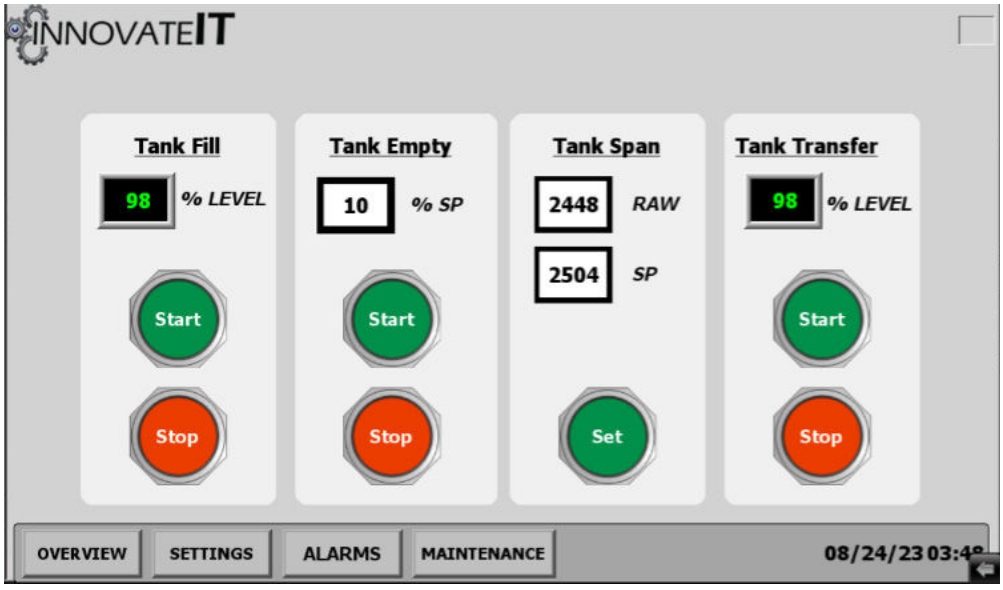


Fig. 5 - 8 - HMI Maintenance Screen

NOTE: To avoid tank overflow the RO unit will not operate if the Tank level sensor is reading a current outside of the 4-20mA sensor operating limits.

24. Return to the **OVERVIEW** screen and place unit in **AUTO** mode by selecting **START** (fig. 5 - 9).

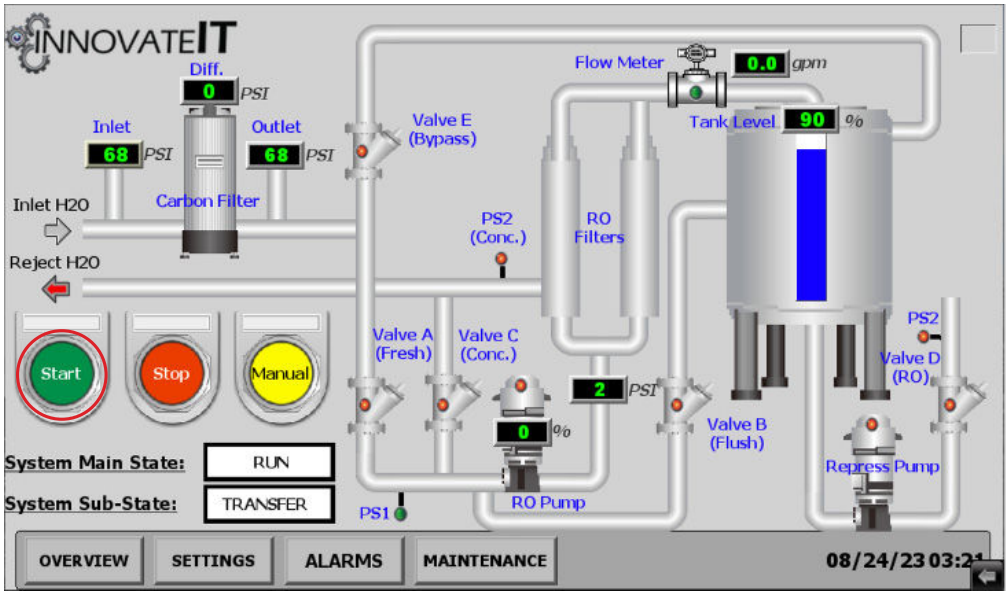


fig. 5 - 9 - HMI Overview screen and Start button

25. Verify tank is filling.
26. Verify Reject water is flowing to the reject.
27. The initial RO water produced by the unit will need to be dumped down the drain. During the first 2 hours of RO production the water is high concentrate.
28. The initial TDS from the unit will be high (**50-150 PPM**) because of manufacturing chemicals rinsing from the dry membrane.
29. The TDS will slowly go down as the unit operates, stabilizing in the **1-20 PPM** TDS range (based on the TDS of the feed water) within the first few hours of operation.
30. If the TDS of the RO remains higher than **20 PPM** a seal in the RO housing may be damaged.
31. Operator will need to identify the damaged seal ring and replace it. (See Troubleshooting section for more information)
32. With new membranes, normal TDS will remain below **10 TDS**.
33. Verify the RO Pump shuts down once the RO tank is FULL, and the unit goes into flush mode after 15min of inactivity.
34. During the **FLUSH CYCLE** air valves A and C close, and air valve B opens.

6. Maintenance

The innovateIT R.O. System has been designed to provide a long life and require minimum maintenance. The best method to maintain this system is to take a few minutes daily to review and record the operational data from the system and examine the unit for leaks or any indication of a mechanical or electrical fault.

If a change in performance or operation is observed, it is essential to take corrective action quickly to minimize the potential damage to the membranes or other parts of the system.

There are elements of the system that will require replacement during normal maintenance actions. These items are listed in the following section.

6.1 Replacement Parts

6.1.1 Catalytic Carbon Block Assembly

NOTE: The standard activated carbon blocks are highly effective in removing free chlorine from feed water that has been treated with chlorine. However, chloramines are harder to remove and require special catalytic carbon blocks to remove the chloramine.

Based on your municipal water supplier, water treatments vary significantly across the country with many differing levels of sanitizing agents used and variation throughout the year.

Please consult with innovateIT Car Wash Equipment LLC to determine the type of carbon block to use and the estimated replacement interval as the dosing level in PPM, water pH, and chloramine mixture will greatly impact the performance of the carbon blocks. If the estimated life of the carbon block is too short, innovateIT Car Wash Equipment will recommend the use of a traditional carbon filter.

innovateIT uses a Catalytic Carbon Block to remove both chlorine and chloramine to maximize the longevity of the membrane.

6.1.2 Carbon Filter

Verify free chlorine/chloramine level on the outlet of the carbon filter manifold. This should be done every week, and the carbon filter must be replaced if the unit is not removing the chlorine/chloramine from the municipal water (<0.10 PPM)

Some municipalities increase chlorine/chloramine levels for a few months each year to sanitize the distribution system so verifying complete chlorine removal is critical to proper operation of the system.

6.1.3 RO Membrane System (Membranes and O-Ring Seals in Housing)

Clean or replace membranes when the TDS levels exceed 20PPM, or the RO generation flow rate reduces by 20% of the design flow rate.

Membrane failures are normally initiated by free chlorine “breakthrough,” which damages the membranes by creating holes in

the membrane.

Every effort has been made to utilize the best equipment available to ensure long life and low maintenance costs, as some car wash systems accumulate thousands of cycles per day.

6.1.4 Pressure Switches

The Dietz pressure switch PS1 has a design life of over 1 million cycles.

6.1.5 ASCO 8290 Air Vales (A-D)

These valves are designed for multi-million cycle design life, which converts to a 5–10-year lifespan in most car wash systems. Solenoid Valve D will experience the highest cycle counts and a spare should be available once the unit reaches 1 million cars.

6.1.6 Air Pilot Valve

These valves typically have a multi-million cycle life.

6.1.7 Pumps

The Grundfos pumps are designed for a 20,000-hour life. Units have successfully provided RO for over 3 million cars without pump repair or replacement.

6.1.8 Electrical/Controller Hardware

The motor contactors for the Transfer Pump experience high cycles in the car wash application. It is recommended that the operator contact innovateIT help for spare parts.

The Overload Relay for the Production Pump will also experience high cycles during busy day, so having an extra parts in hand is recommended.

The PLC controller and associated equipment are reliable unless the ambient temperature of the controller exceeds the maximum temperature (104 F ambient) for UL508 Standard.

6.2 Maintenance Schedule

Checking Free Chlorine Level

- While the unit is running, drain out a small amount of sample water from an outgoing ball valve on the carbon filter manifold. The ball valve has ¼" push connect build in for ease of use (fig. 6.2 - 1).
- If the result of is free of chlorine (0.00 PPM or <0.10 PPM) the unit carbon filter is working well. If not, the carbon filter will need to be replaced.

fig. 6.2 - 1 - Carbon filter ball valve

NOTE: If not replace soon, the chlorine will damage the membrane on the unit.

Visual Inspection (Leaking/Bad Hose)

- Check for leak/dripping water from connection/manifold and pumps etc.
- Verify there is no bad hose (bend, crink, bad connection and rips.

Date	Water Temp (F)	Free Chlorine Level (PPM)	RO Pump Feed Pressure (psi)	TDS Out

7. Troubleshooting

Problem	Potential Causes	Solution
Pump inlet pressure switch fails to close after start-up (PRS1)	• Municipal Water Supply is turned OFF to unit	• Verify municipal water is turned ON
	• Air supply is OFF or is adjusted to less than 80 psi needed to open ASCO 8290 air operated valves. A leak in the air line to the valve can also create this fault	• Verify that the air supply is 80PSI
	• Carbon Block has high pressure drop due to debris or clogged blocks	• Verify Valve A is actuating (red indicating nipple visible on head of valve)
	• A failed switch (or corrosion in the connector) can cause a high resistance and cause the system to fault	• Verify sensor cable is installed correctly
Reduced RO flow rate (PRS2)	• Restriction in the RO flow loop (lines, membranes, recirculation loop, reject orifice, etc) which increase the RO pump pressure rapidly during operation. A spike in pressure above the setpoint will result in a shutdown.	• Verify there is nothing clogged in the system
	• Damaged membranes which are fouled are restricting the RO flow, commanding higher pressure.	• Replace membrane if flow is 20% lower than the target for the tank level at which you are operating
	• Water temperatures lower than 40F will create a reduced RO flow rate. The membrane flow will drop approximately 2% for each degree F the water temperature drops below 77F. As the water reaches 40F, the pump pressure required to generate flow reaches a maximum pressure	• If the feed water is consistently at or below 40F, consider installing an in-line water heater or a hot water mixing water. • If the water feed temperature is always low (40-50F), consult with innovateIT for a recommendation on a cold-water membrane (DuPont XLE-440i membrane would improve cold weather performance)

Problem	Potential Causes	Solution
RO production cycle not starting as tank drops	• Tank level sensor is disconnected or has failed	• Verify the connector pin (longer pin connect to GND), drain tank and replace sensor if necessary
	• The PLC calibration screen which allows the system to function is set for an incorrect storage tank height storage tanks. • The 0-5 psi sensor allow use of tanks up to 11.5 foot tall if needed for a non-standard installation.	• Re-span tank to recalibrate level sensor
Recirculation flow switch not closing	• This switch will not close if the RO pump pressure is less than 70 psi.	• Increase production flow rate in the HMI setting screen.
Re-pressurization pump flow switch	• Repress pump does not turn on	• Verify switch operation by removing switch and manually activating the switch to ensure the switch closes as flow increases
	• Valve D is not opening	• Enter **MANUAL** mode and bump start transfer pump
	• Too much resistant after Valve D	• Ensure the plumbing line is not shut off by a ball valve or other impedance further downstream

7.1 HMI Fault Codes

#	Delay	HMI Alarm	Cause
1	-	SENSOR 01 (FLOW METER) SIGNAL FAULT	Signal could be high/low, or sensor disconnected
2	-	SENSOR 02 (TANK LEVEL) SIGNAL FAULT	Signal could be high/low, or sensor disconnected
3	-	SENSOR 03 (PRODUCTION PUMP DISCHARGE PRESSUERE) SIGNAL FAULT	Signal could be high/low, or sensor disconnected
4	-	SENSOR 04 (CARBON FILTER INLET SENSOR) SIGNAL FAULT	Signal could be high/low, or sensor disconnected
5	-	SENSOR 05 (CARBON FILTER OUTLET SENSOR) SIGNAL FAULT	Signal could be high/low, or sensor disconnected
6	-	SENSOR 06 (TEMPERATURE SENSOR) SIGNAL FAULT	Signal could be high/low, or sensor disconnected
7	20s	PUMP DISCHARGE LOW PRESSURE SWITCH FAILED TO CLOSE	Pressure switch located before the inlet to the pump is too low
8	5s	PUMP DISCHARGE VFD FAULT RELAY	VFD is faulted
9	5s	TRANSFER PUMP MOTOR STATER OVERLOAD RELAY	The overload relay tripped
10	10s	PRODUCTION PUMP PRESSURE OVER LIMIT	Production pump is creating more than 200 psi
11	3s	CARBON FILTER DIFFERENTIAL PRESSURE TO HIGH	The differential pressure between the carbon filter sensors is too high
12	10s	PRODUCTION PUMP FEEDBACK SIGNAL BAD QUALITY	Check signal wiring from the pump
13	10s	PRODUCTION PUMP IS NOT RUNNING	Run status relay on pump did not close
14	30s	TRANSFER PUMP FLOW SWITCH IS OPEN	No flow was detected after the production pump. Check Valve D - sensor stuck or Transfer Pump never ran.
15	5s	LOW PRESSURE DURING CLEAN/FLUSH MODE	Flow meter is reading less the 1gmp during flush
16	5s	CONCENTRATE FLOW SWITCH FAIL TO CLOSE	No flow was detected through the concentrate return line. Sensor stuck, or pump never ran.

#	Delay	HMI Alarm	Cause
17	-	PRODUCTION TANK HAS OVERFILLED OR IS IN TROUBLE	Production tank over flowed, valves may be stuck open
18	1s	EMERGENCY STOP HAS BEEN DEPRESSED	E-Stop engaged
19	-	PRODUCTION TANK WAS NOT SPANNED. DEFAULT VALUE USED.	Fill the tank and set the span on the maintenance screen - value should be around 2500
20	-	CARBON FILTER INLET & OUTLET SENSORS REVERSED	Carbon filter sensor see a -2psi difference, sensor is plugged in backwards
21	10s	VALVE B FAILED TO OPEN	Flow meter seeing less than .5 gpm during run mode

8. Glossary of Terms

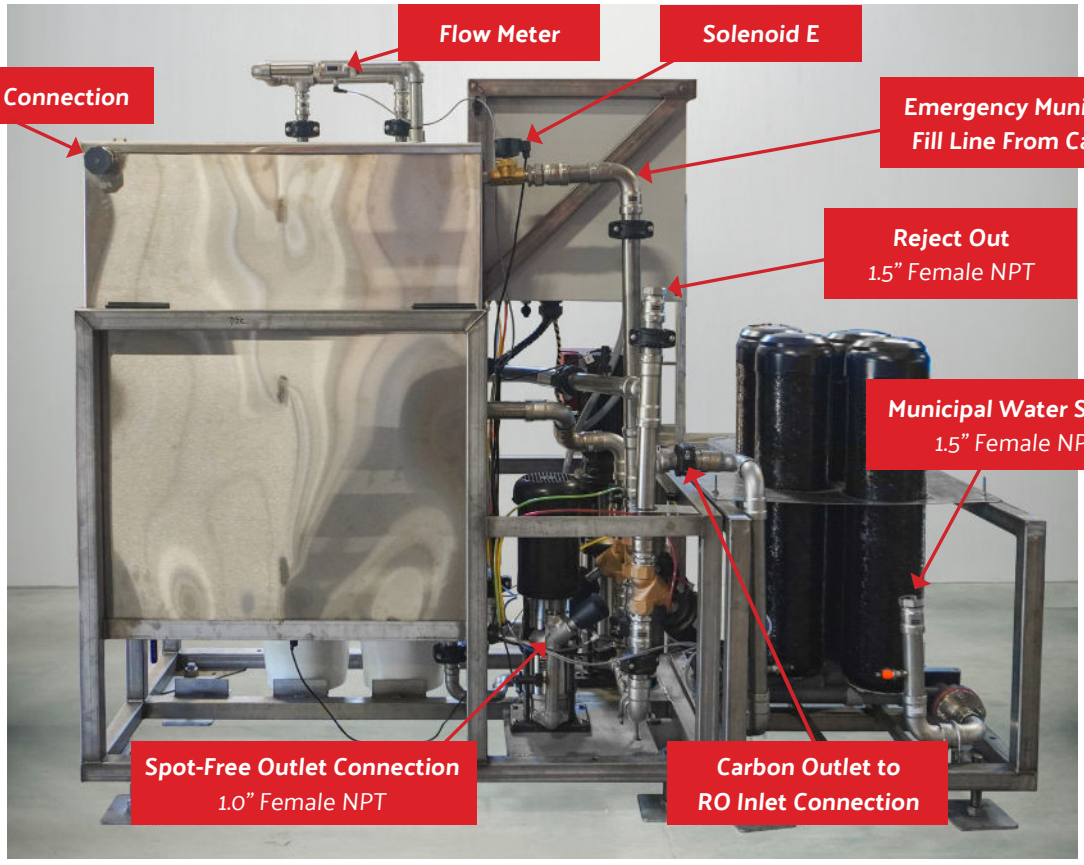
The following list includes terms and abbreviations used in this document.

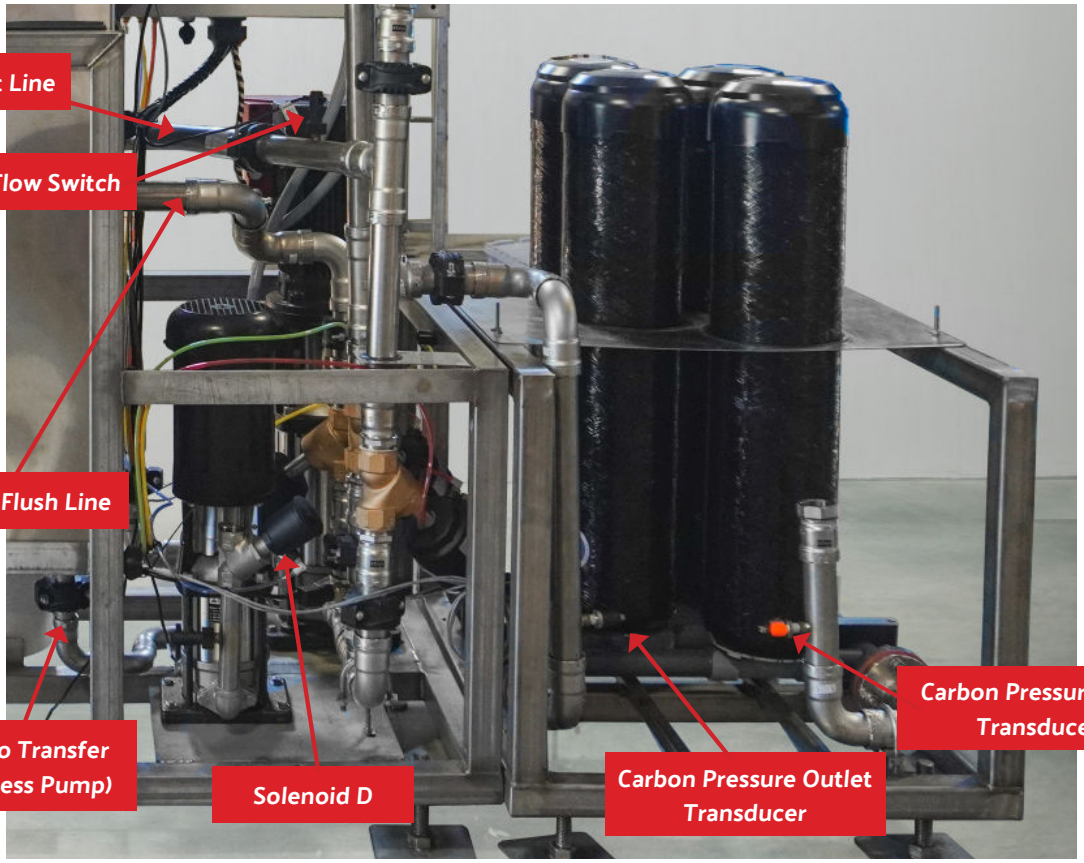
- **Reverse Osmosis -** A water purification technology that uses a semi-permeable membrane to remove dissolved substances from the water. In reverse osmosis, an applied pressure is used to overcome osmotic pressure, forcing water molecules to pass through the membrane while all dissolved solids remain in the feed water side of the membrane.
- **Transfer Pump (Re-Press Pump) -** A pump that delivers RO water to a wash, which is run by a command from the wash tunnel
- **Production Pump -** VFD pump that matches the pump speed with municipal water pressure, to ensure the system delivers maximum RO water to the tunnel.
- **Thin Film Composite Membrane (TFC)** - Thin Film Composite (TFC) membranes are a special type of RO membrane which offers high efficiency, long life and resistance to most adverse water conditions.
    - The membrane material is very sensitive to free chlorine. If the feed water is chlorinated a chlorine pre-filter must be used to protect the membrane.
    - Free chlorine must be controlled to 0.00 PPM level as even 0.1 PPM will damage membranes. The DOW/ Dupont membranes have a 1,000 hour life at 0.1 PPM free chlorine level in the feed water. Damage accumulates proportional to the free chlorine level.
    - A failure in the carbon filter (chlorine removal) will quickly lead to a membrane failure which will require membrane replacement. Verifying that the carbon filter is operational is a critical maintenance check to avoid damage or failure of the membranes.
- **Municipal Feed Water** - The incoming water supply which is directed into the membrane for processing.
    - This water must be pre-conditioned to meet the membrane manufacturer's water requirements to prevent damage to the membrane.
    - Pre-treatments may include water softening, chlorine removal, sediment filters, and other chemical treatments based on the water analysis of the wash site.
- **Product Water (RO Product)** - The purified water that has been separated from the feed water stream by the reverse osmosis membranes.
- **Recovery** – The amount of RO Product water produced as a percent of the total amount of feed water.
    - Example: If the system feed flow is 20 GPM and the RO Product produced is 10 GPM, then the recovery would be 50%.
    - This RO system has been designed for a maximum of 65% recovery. If the reject water is not being recycled for other wash purposes, the recovery can be increased by replacing the 10 GPM flow orifice with a 6 GPM orifice.
        - This change would reduce the maximum feed water rate to 16 GPM and increases recovery to 62.5 %.
    - Because the Reject water (or concentrate) is normally re-used in other wash operations the recovery is set to 50% to 65%.
- **Reject Water (RO Reject or Concentrate)** – The portion of the feed water that does not pass through the RO membrane and is delivered to the Reject Tank.
    - This water has a higher level of impurities than the municipal feed water and is captured in storage tank for other uses in the wash system. This flow rate is set by a reject line orifice and does not require adjustment.
- **Percent Rejection** – The percentage of TDS removed from the feed water.
    - Membranes typically reject greater than 99.5 % of the dissolved solids which are present in the feed water.
    - Example: If the incoming feed water is 200 TDS, the RO water will measure approximately 1 ppm TDS.

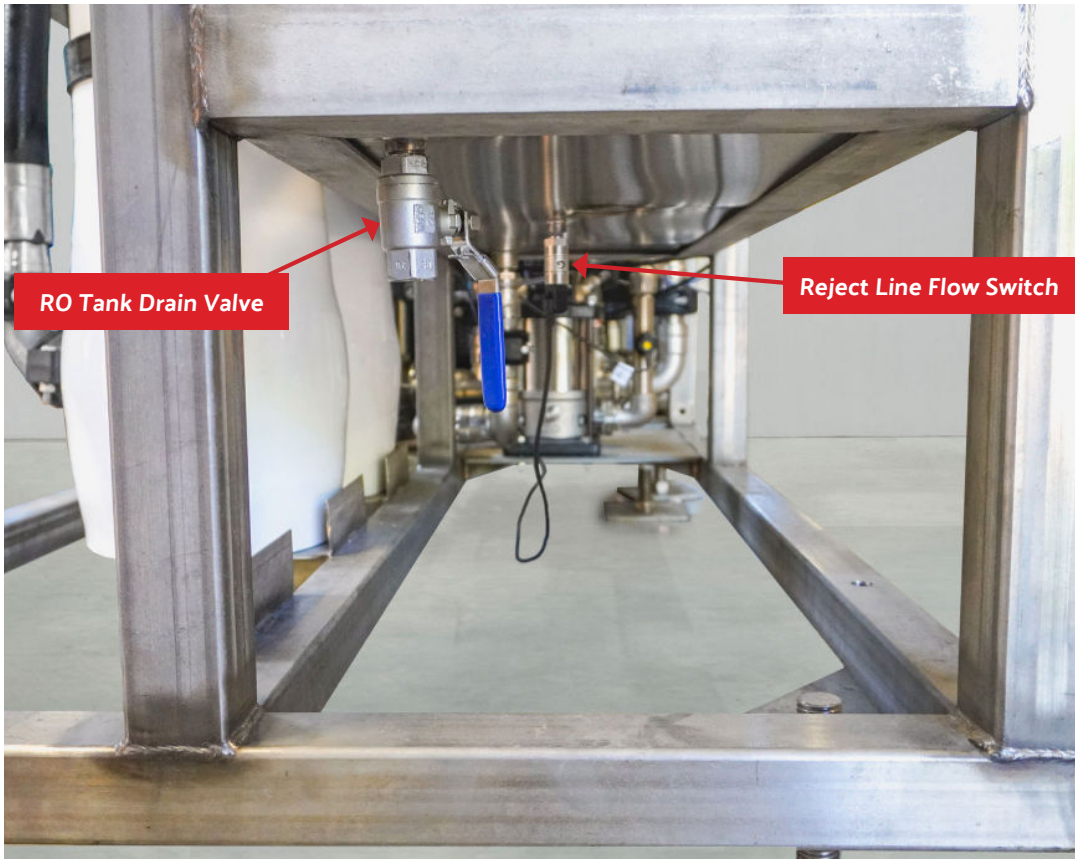
- **Dissolved Solids (TDS)** – Municipal water contains dissolved solids (calcium, magnesium, etc.) at levels which may vary dramatically over the course of a year depending on the water source and treatment methods.
    - Contact your local water supplier to understand the water quality, and water treatment sanitizing approach used throughout the year.

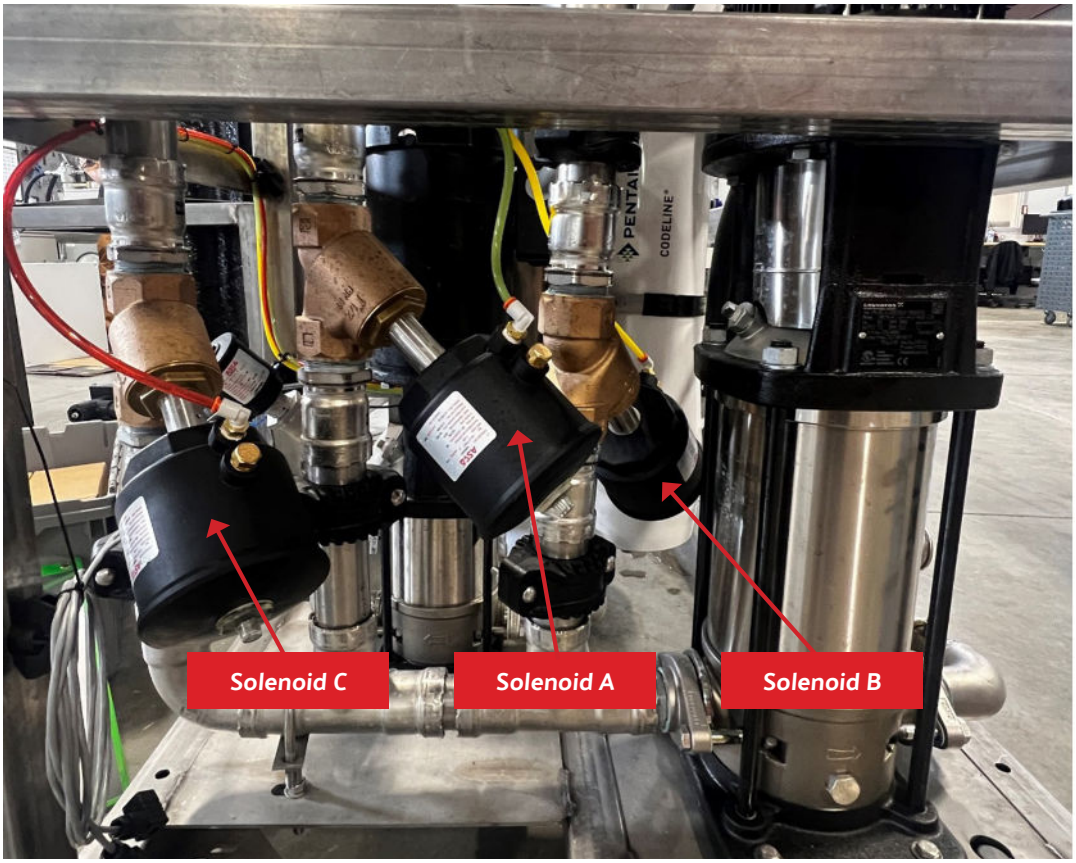
    - TDS is measured in parts per million (PPM). The innovateIT RO system is designed to operate with feed water with TDS levels up to 1000 PPM which is much higher than general municipal water standards.
- **Parts Per Million (PPM)** – PPM is the standard measure of total dissolved solids where 1 PPM is equivalent to 1ml / Liter of liquid.
    - The RO membranes remove 99.5% of the dissolved solids from the water.
    - Using typical water, this unit should produce water with TDS of 1 to 5 PPM. As the membranes age, the TDS will normally increase.
    - Generally, TDS levels below 20 PPM will provide a spot free rinse. Above 20 ppm the operator will see visible outline on glass or dark painted if water spots are allowed to remain on the surface.
    - TDS levels above 40 PPM will leave spots on cars so it is critical that the system be checked on a daily basis to ensure proper water quality.
- **Membrane Flush Cycle** – RO membrane flush cycle starts 15 minutes after the tank is filled (flush cycle only starts if the wash tunnel do not demand RO water from the unit).
    - innovateIT's system uses RO water to flush the membrane for longevity of the membrane also reduce scaling build up.

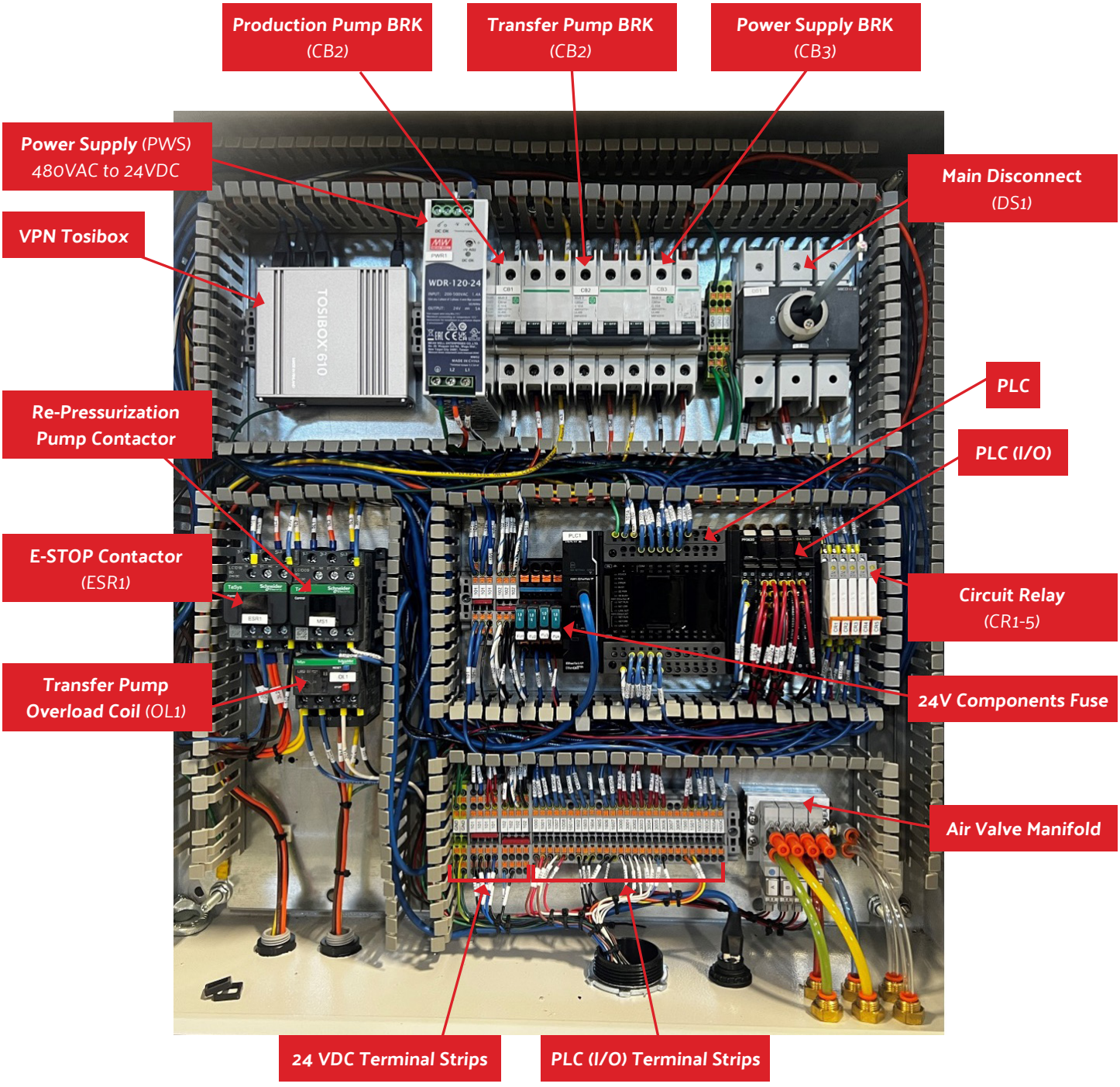
Appendix 1 - RO System Identification



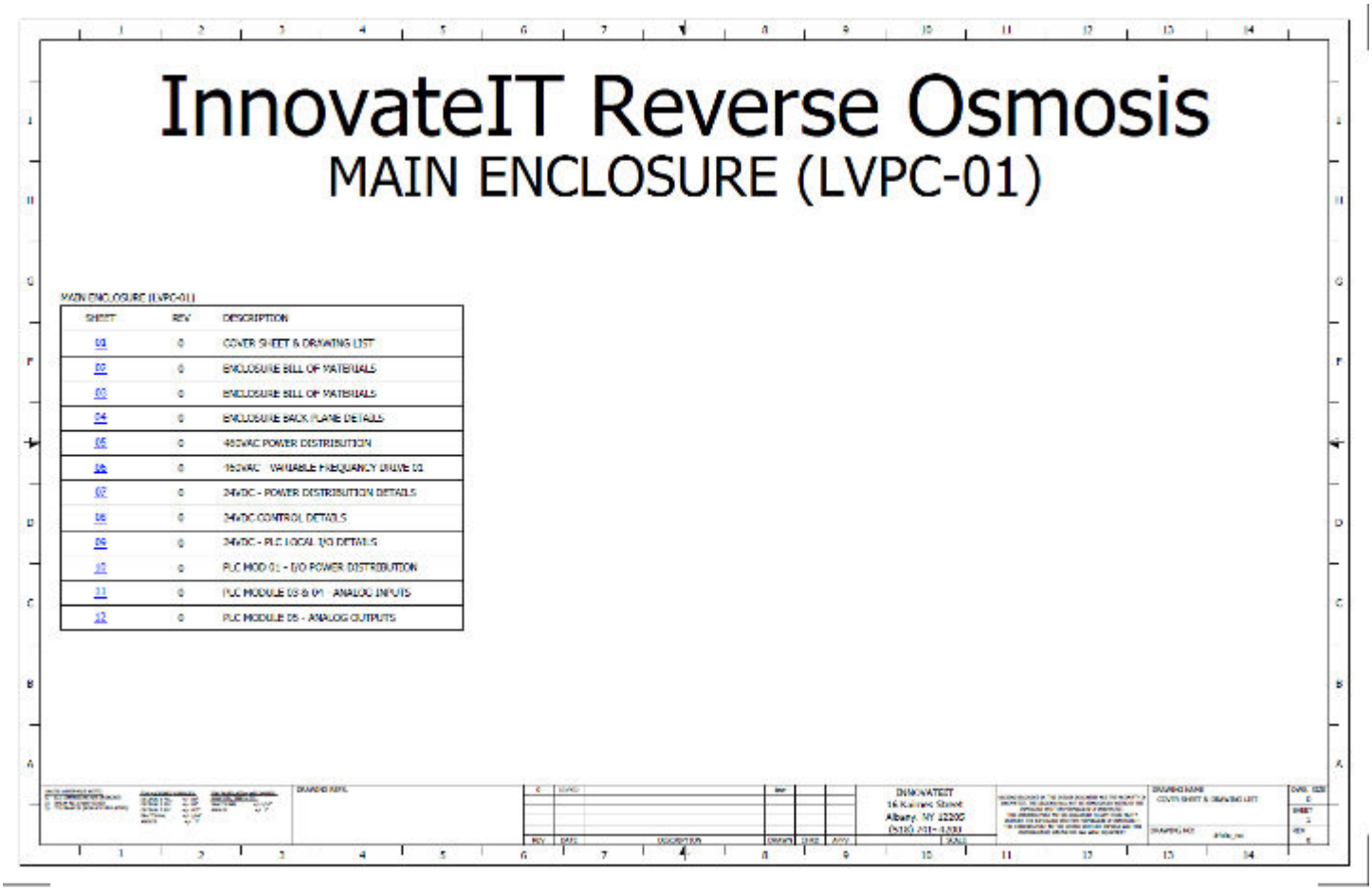

Reject Line
Reject Line Flow Switch
Membrane Flush Line
RO Water to Transfer Pump (Repress Pump)
Solenoid D
Carbon Pressure Outlet Transducer
Carbon Pressure Inlet Transducer


RO Tank Drain Valve
Reject Line Flow Switch


Solenoid C
Solenoid A
Solenoid B


Production Pump BRK (CB2)
Transfer Pump BRK (CB2)
Power Supply BRK (CB3)
Power Supply (PWS) 480VAC to 24VDC
Main Disconnect (DS1)
VPN Tosibox
PLC
PLC (I/O)
Re-Pressurization Pump Contactor
E-STOP Contactor (ESR1)
Circuit Relay (CR1-5)
Transfer Pump Overload Coil (OL1)
24V Components Fuse
Air Valve Manifold
24 VDC Terminal Strips
PLC (I/O) Terminal Strips
WDR-120-24
TOSIBOX 610

Appendix 2 - Electrical Schematic

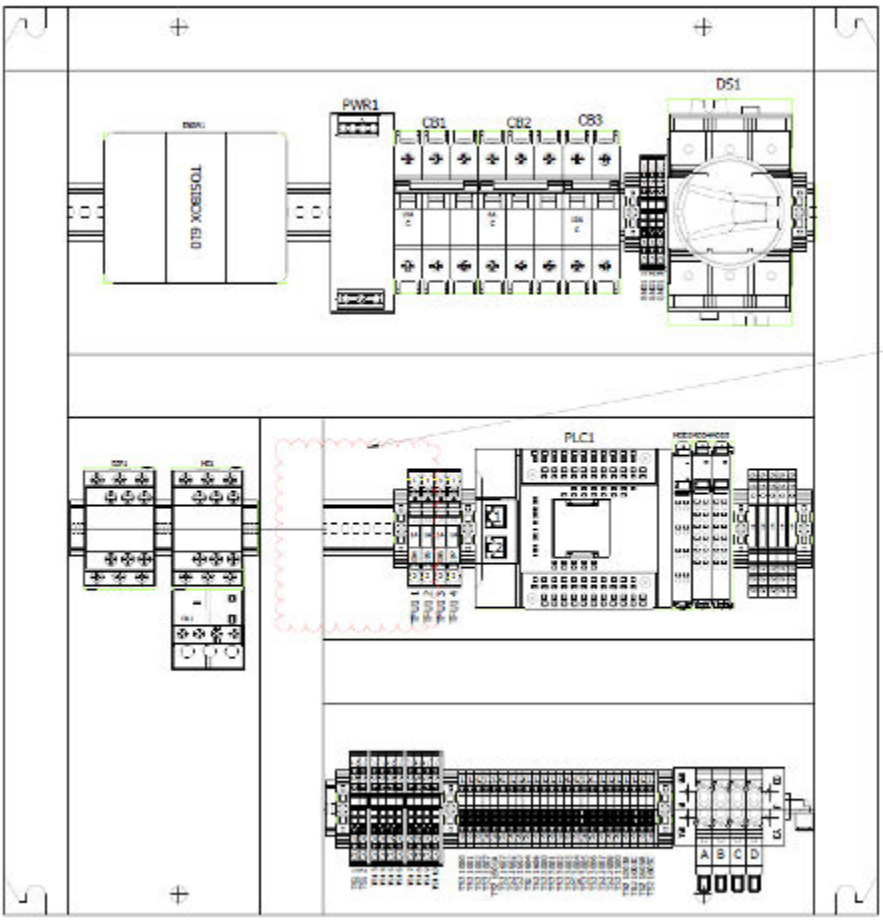


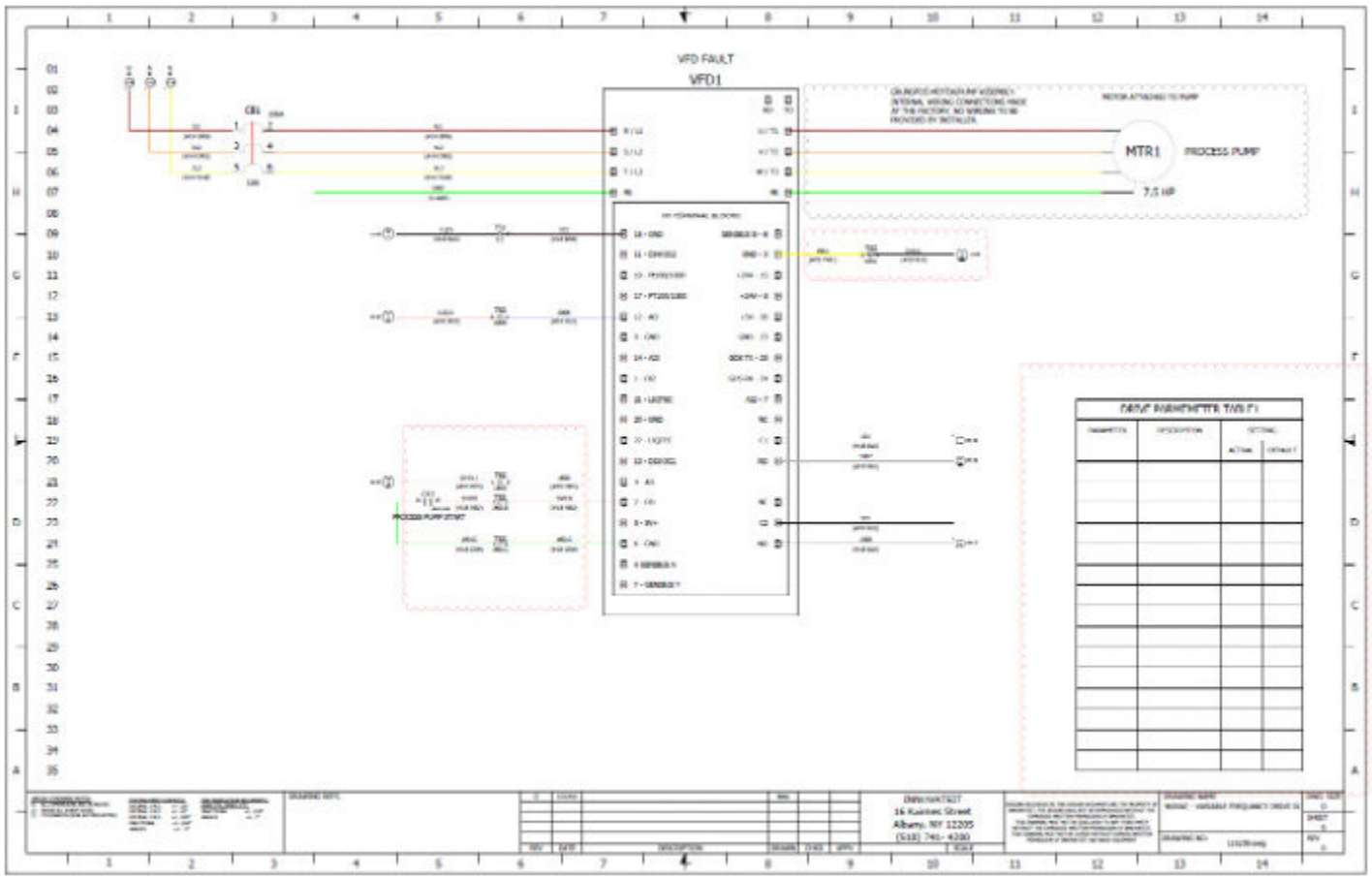
InnovateIT Reverse Osmosis

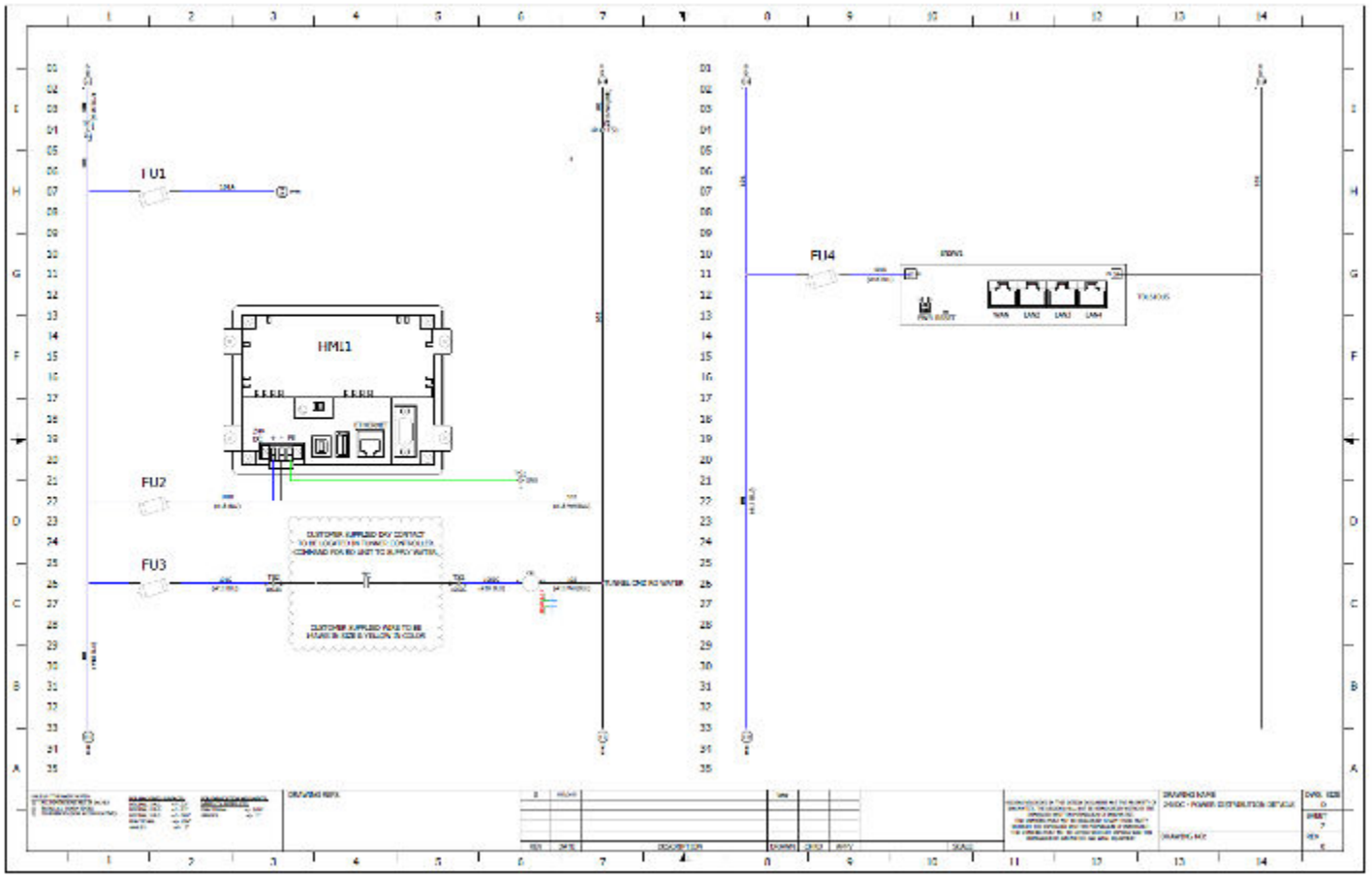
MAIN ENCLOSURE (LVPC-01)

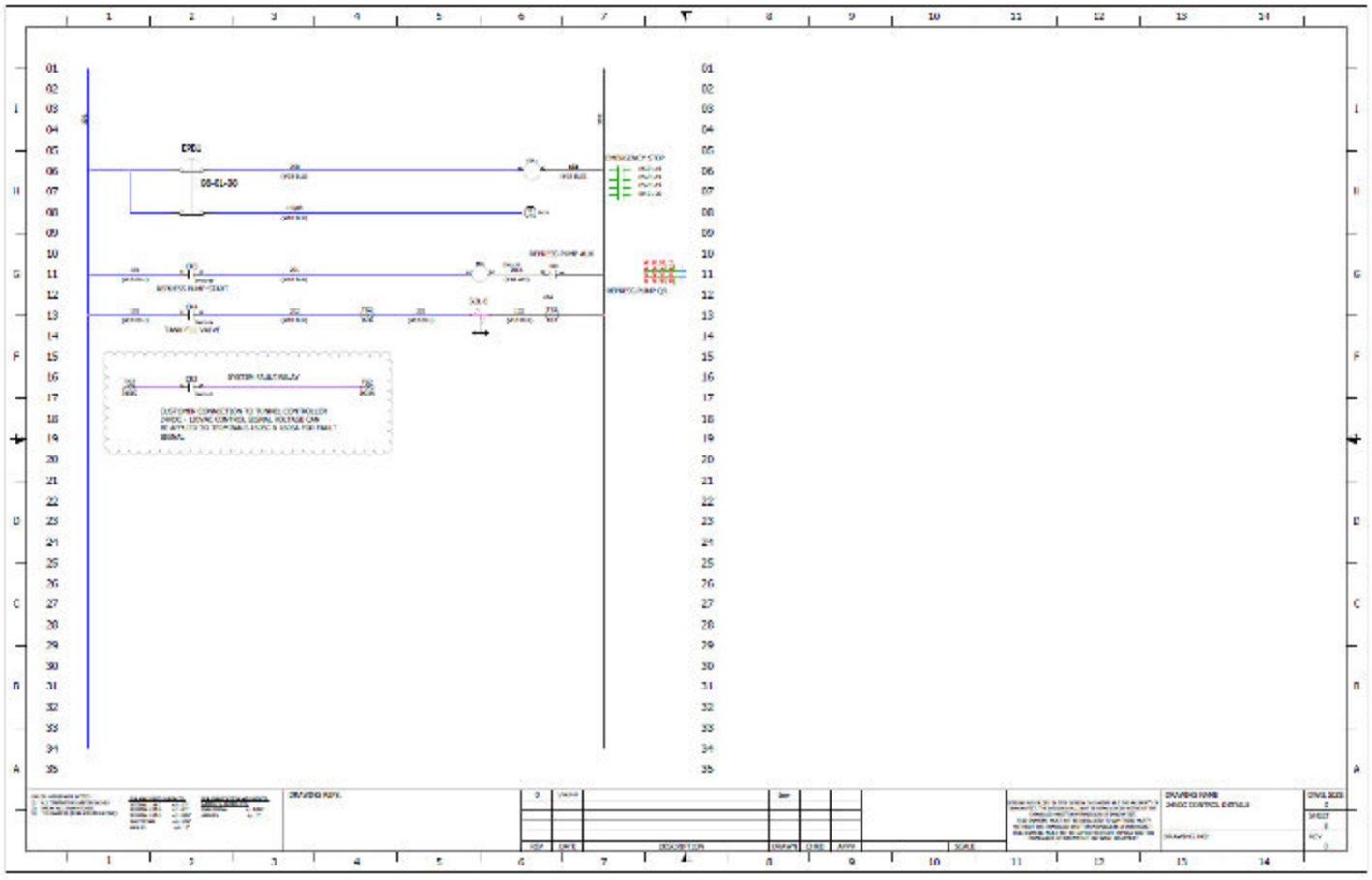
MAIN ENCLOSURE (LVPC-01)

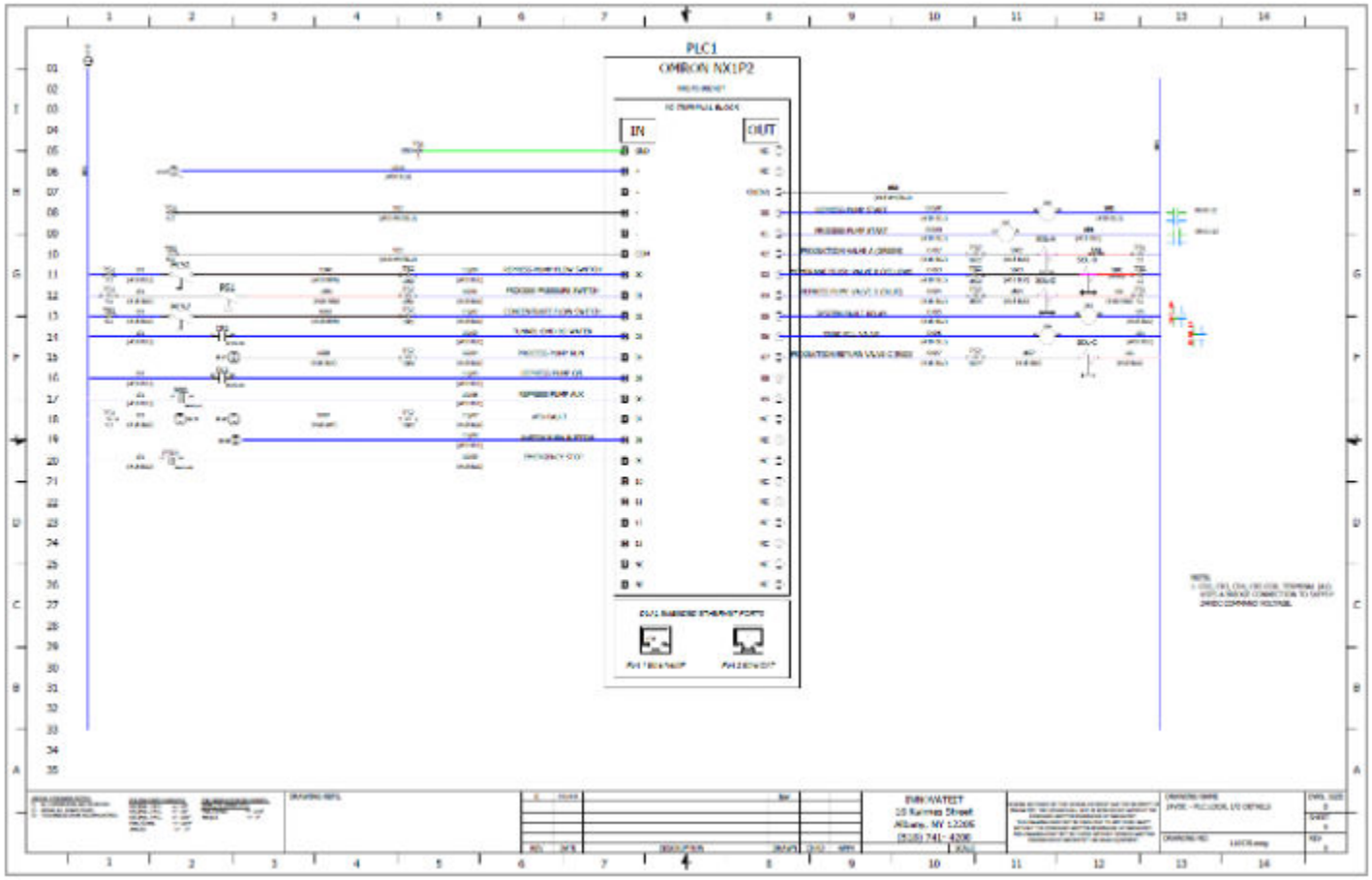
SHEET	REV	DESCRIPTION
01	0	COVER SHEET & DRAWING LIST
02	0	ENCLOSURE BILL OF MATERIALS
03	0	ENCLOSURE BILL OF MATERIALS
04	0	ENCLOSURE BACK PLANE DETAILS
05	0	480VAC POWER DISTRIBUTION
06	0	480VAC VARIABLE FREQUENCY DRIVE 01
07	0	24VDC - POWER DISTRIBUTION DETAILS
08	0	24VDC CONTROL DETAILS
09	0	24VDC - PLC LOCAL I/O DETAILS
10	0	PLC MOD 01 - I/O POWER DISTRIBUTION
11	0	PLC MODULE 03 & 04 - ANALOG INPUTS
12	0	PLC MODULE 05 - ANALOG OUTPUTS

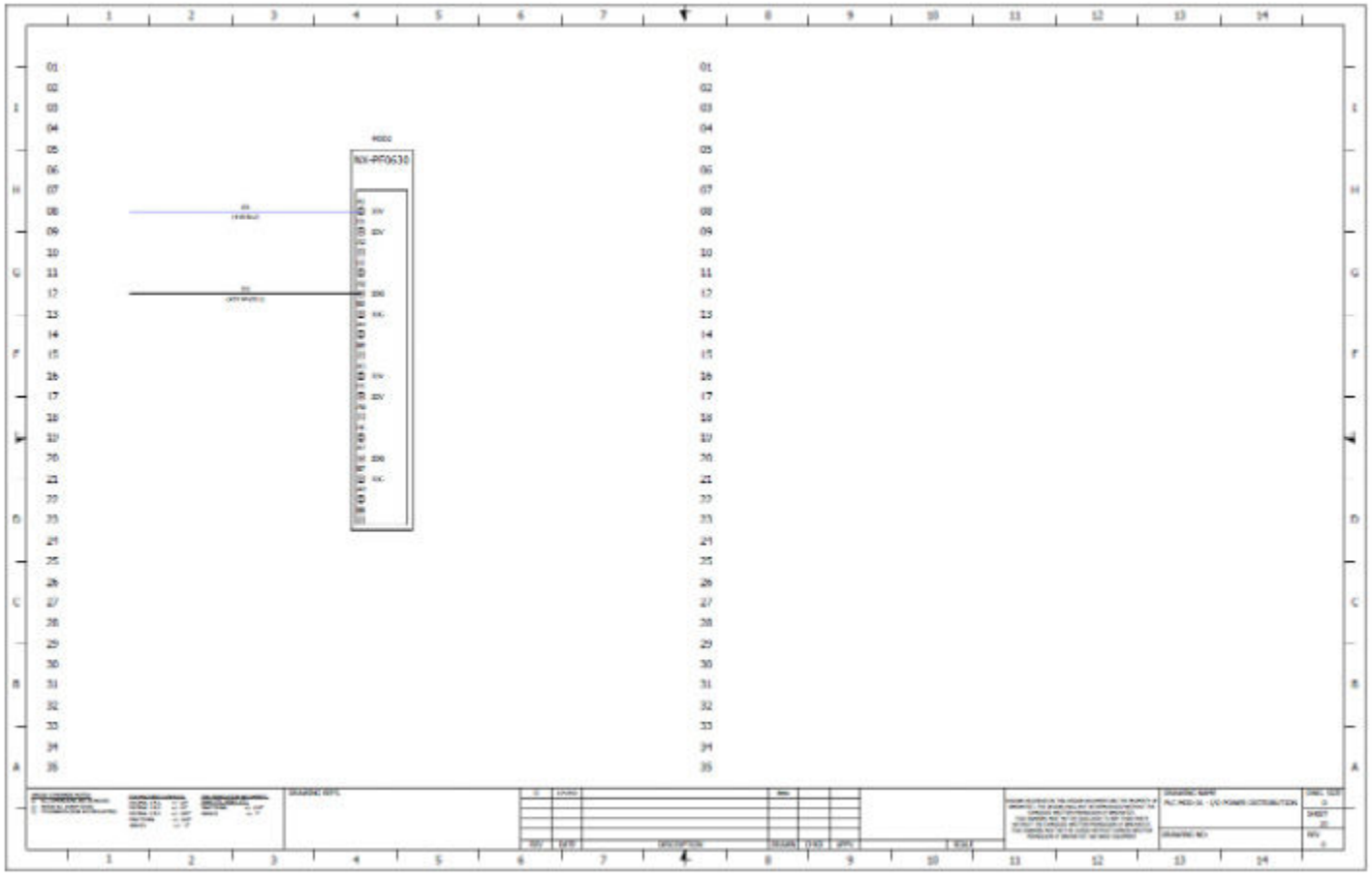

PWR1
CB1
CB2
CB3
DS1
PLC1
NEED TO INSTALL A 24VDC DISTRIBUTION TERMINAL BLOCK. SIZE HAS TO DETERMINED DURING CONSTRUCTION.

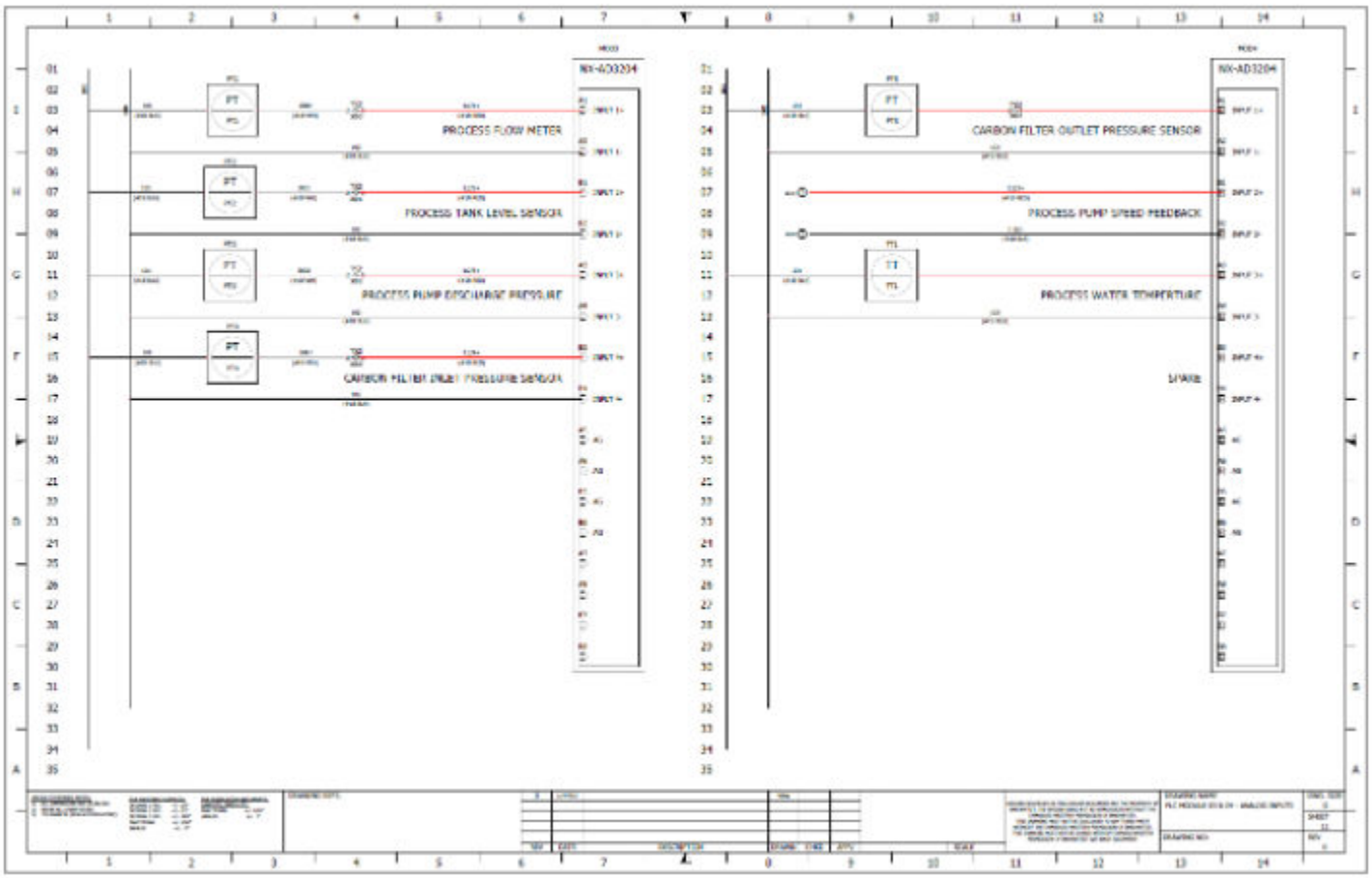

VFD FAULT
VFD1
MTR1
PROCESS PUMP
7.5 HP


FU1
HMI1
FU2
FU3
FU4


EPO


PLC1
OMRON NX1P2
IN
OUT


NX-PT0630


NX-AD3204
PROCESS FLOW METER
PROCESS TANK LEVEL SENSOR
CARBON FILTER OUTLET PRESSURE SENSOR
PROCESS PUMP SPEED FEEDBACK
PROCESS WATER TEMPERTURE


NX-DA3203
PROCESS PUMP VFD COMMAND SIGNAL

Appendix 3 - Spare Parts

innovateIT Product Number	Description
EL-PS-WDR-120-24	POWER SUPPLY, AC-DC,24V,5A,200-
OMRON-NXAD3204	OMRON ANALOG INPUT 4-20MA-4POI
OMRON-NXDA3203	PLC, NX SERIES, ANALOG OUTPUT,
6203237	1A THERMAL MINI CIRCUIT BREAK
EL-TRM-2966184	24VDC/AC VARIANT PLC RELAY MOD
ELE-MS-OVRLD-LRD07	TESYS LRD THERMAL OVERLOAD REL
ELE-BRK-M9F42210-10A	UL489 TYPE NA 2 POLE 10 AMP SC
6203213	10 A 3P MULTI 9 C60BP MINIATURE
ELE-CONTACTOR-18A-24VDC	IEC CONTACTOR, TESYS DECA, NON
ELE-CONTACTOR-9A-24V	CONTACTOR 3P,9A,24VDC COIL
6103403	DISCONNECT SWITCH 3P 30A
ELE-SEN-C-M12-10	M12 10M CABLE
7203254	1/8” BRASS COUNTERSINK PLUG M
RO-MNFLD-SS5Y3-20-04-00T	MANIFOLD ASSY, 4 STAT, BODY PO
RO-AV-SY3120-5LZ-N7	SOLENOID VALVE, AIR, 2-POSITIO
EL-PPT-492075	RJ45 PANEL PASS THROUGH, CAT5E
RO-PB-AR22V0R-01R	FUJI ELECTRIC EMERGENCY STOP P
RO-CA-SY100-30-4A-10	CONNECTOR ASSEMBLY, FOR DC, 10
SMC-BLK-4	SMC BULKHEAD UNION SMC BULKHEA
RO-SLNCR-AN10-C07	SMC PLUG-IN SILENCER, RESIN FO
SMC-PLG-KQ2P-07	SMC PLUG FOR 1/4” ONE-TOUCH FI
ELE-PB-BLCK-NC	FUJI ELECTRIC CONTACT BLOCK, R
ELE-ETHRNT-STP-PTCH-3	3 FT SHIELDED CAT 5E EIA568 PA
OMRON-NXPF0630	OMRON, NX IO POWER FEED, 5-24V
RO-CPLNG-1.5	1.5” IPS GROOVE COUPLINGS
RO-CPLNG-1.0	1” STYLE P COUPLING RESIN W/ E
8290A021	SOLENOID A, B, AND C – RC-VLV
8290A395	SOLENOID D- RO-VLV
RO-A418P.4D	SOLENOID E – RO
RO-GRU92823542	RO PUMP ASSEMBLY
RO-GRU99916446	RE-PRESSURIZATION PUMP ASSEMBLY
6603400	FLOW SENSOR 0-20 GPM
RC-FS-VK309	FLOW SWITCH
RC-PS-D30000	PRESSURE SWITCH
RC-TRAN-AV300	0-100 PSI PRESSURE TRANSDUCER

innovateIT Product Number	Description
RC-TRAN-AV300P300	0-300 PSI PRESSURE TRANSDUCER
RO-TRAN-AV300P005	0-5 PSI TANK LEVEL SENSOR
RO-FLTR-15000600	1.25 INCH CARBON FILTER HEAD/BASE TEE
RO-HS-11/2BKFRNTR200RL	HOSE CLAMPS 1.5-INCH HOSE
RO-MBRN-440I	RO MEMBRANE
RO-CBF-CAT-01230065	RO 3 MICRON CARBON FILTER
RO-HSNG-80S30-1	RO MEMBRANE HOUSING