Express Carwash

Reclaim System

Updated August 2020

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GENERAL INSTRUCTIONS

- It is unsafe to install, operate or service this device without first reading and understanding the Operator's Manual in its entirety. Keep this manual and associated documentation for future reference.
- Eye protection should be worn at all times when operating the reclaim system as unit includes high pressure water lines and 20% hydrogen peroxide which is a strong oxidizer.
- Unit installation must adhere to local codes for electrical wiring and plumbing.
- All maintenance and repair actions are to be performed by personnel who have been trained to support this equipment.
- To avoid electrical shock hazard do not operate this device when covers or controller enclosure are opened.
- Electrical power must be shut off and a lock-out procedure utilized to ensure all electrical power is disabled prior to performing maintenance to any portion of the system.
- Plumbing connections and drains must adhere to local standards and any 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 prior to unit activation.
- Do not operate this unit in an environment where temperatures may be below 40°F or above 90° F.
- Improper water flow for flushing, misuse or improper operation of this device will void manufacturer's warranty.

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

OVERVIEW OF RO SYSTEM

Express Carwash Equipment has developed a proprietary (patent pending) reclaim system to provide high quality reclaim water to reduce municipal water usage and reduce the overall cost of operations.

This reclaim system has been engineered to allow years of trouble-free operation and low life cycle cost for the operator. The system uses a chemical to sanitize the water in a safe and controlled method. All the components (reclaim pump, sand filter, dosing pump, etc) have been selected to improve the system reliability, minimize energy use, and reduce required maintenance.

The reclaim system utilizes three water purification technologies to generate high quality reclaim water which is filtered and odor free.

It is important to completely review the entire operating manual prior to the installation and start-up of the reclaim system. The manual includes installation guidelines, start-up procedures, and operating instructions.

The Reclaim System schematic shows a typical installation which uses a conical bottom Reclaim tank to hold the reclaim until it is used to feed wash operations that can utilize reclaim water and reduces the use of municipal water.

SYSTEM SCHEMATIC - Figure 1 (next page) shows a simplified schematic of the EC Reclaim System. The system uses a submerged water pump to take waste water from the clarifying tank (third in-ground tank) and perform a series of processes designed to reclaim water. These processes include aeration of water, chemical dosing, mechanical filtering, recirculation and storage of treated reclaim water for use in the wash. These processes and equipment provide the basis for a reclaim system which provide a high quality water reclaim system. Components have been selected to provide low operating cost while ensuring high quality reclaim water is available for the carwash operator.

In addition, this system uses a high flow recirculation loop combined with the tank mounted micro-bubbler aeration system to maintain circulation of the water and prevent stagnation of the water when wash is not operating. The aeration system in the underground tank reduces the required chemical usage and eliminates tank odors.

Three air operated solenoid valves in combination with a programmable logic controller (PLC) provide control of the system to perform the following functions:

- Off Mode
- Auto Cycle (Automates reclaim and re-circulation loop)
- Sand Filter Flush Cycle
- Odor Eliminator Button

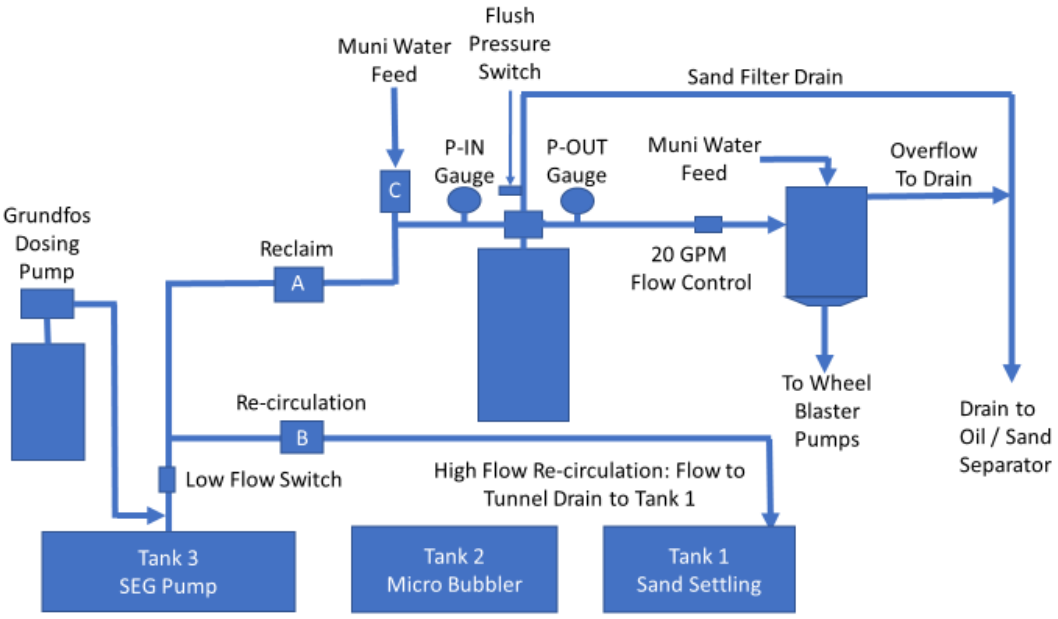


Figure 1 Physical Component Layout of the EC Reclaim System

Each of these functions is designed to ensure a reliable and consistent supply of Reclaim water for use in an carwash tunnel application.

OFF MODE – The unit will always start-up in the OFF mode. In this mode, power is supplied to the PLC and the 24 Volt 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.

AUTO MODE – AUTO Mode will produce Reclaim water or Re-circulate water based on status of the belt command signal from the tunnel controller. When there is a demand signal for reclaim water (belt command signal), then the unit will automatically switch to Reclaim and will turn on the dosing pump (to a manually selected level). Once the belt command stops, the unit will continue to run for a pre-selected time before switching to the Recirculation mode. During re-circulation mode, operator can select to run the re-circulation continuously or on an on/off cycle which saves electricity but still maintains adequate circulation through the in-ground tanks to prevent stagnation leading to odors overnight or if tunnel is closed overnight or for maintenance.

FILTER FLUSH MODE – The reclaim system uses a multi-stage sand filter which provides water filtered to 10 micron particle size. This filter uses a Clack head programmed as a filter and requires back flushing on a daily basis. As the unit operates, particles in the reclaim water will be removed by the sand filter. These particles will slowly increase the pressure drop in the filter which will reduce flow as the filter "loads up". To maximize the life of this filter, the system uses municipal water for the flush cycle. The backflush of the filter should be performed at the end of the day to clean the sand filter. The municipal water flush will help preserve the filter media and protect the Clack head by flushing valve lands to avoid debris from building up in the media or head. Based on testing to date, the flush cycle has been set for an ten minute flush followed by a one minute rinse mode. Once the filter is flushed the pressure drop should return to a clean filter level which is approximately 5 psi at a 20 GPM reclaim flow rate.

ODOR ELIMINATOR BUTTON – The odor eliminator button is designed to provide a quick dose of chemical to eliminate any odors that might occur from the unit being turned off overnight or during extremely warm weather when the potential increases for having smell in the tunnel. The odor eliminator button is programmable for both length of dose and the dosing percent from 0-100% of the dosing pump capacity.

RECLAIM WATER REQUEST USES TUNNEL BELT SIGNAL COMMAND– While operating in the AUTO MODE, the belt command signal is used to switch the reclaim unit from re-circulation to reclaim modes. This signal is controlled directly by the Tunnel System Controller and provides a 24 Volt relay signal to the Reclaim System Controller to provide reclaim "on demand". The reclaim unit will continue in the reclaim mode after the tunnel command signal is removed for a set time to "top off" the reclaim tank. The reclaim tank has a back up source of municipal water using a Jobe valve and float to supplement reclaim water. This feature protects pumps in the event of reclaim system being turned off. Note: it is recommended that the end user wire a low float sensor relay to the pump to eliminate running a dry pump if the water supply is interrupted for any reason.

WARNING – The 24V DC signal may be present in system controller even when the controller power has been shut off. Therefore, you must turn off the 24 V electrical signal (Reclaim Request) from the System Controller prior to performing maintenance or repair to the system controller. Failure to de-energize this circuit could lead to equipment damage or personal injury.

In addition, please verify that the signal from the belt command is a 24 volt signal to the Reclaim Unit. The relay in the controller is designed for a 24 volt input and must be replaced by a 110 Volt relay if the belt command supplies a 110 Volt signal to the reclaim controller.

RECLAIM SYSTEM PERFROMANCE

The Express Carwash reclaim system is designed to provide up to 30 GPM of reclaim water based on the use of the 30 inch diameter sand filter size. This flow level has been engineered to ensure high quality reclaim water and long system life. The units utilize an adjustable globe valve with a sight flow meter or a flow control (Dole valve) to adjust flow rates and allow automated operation with a minimum of customer adjustments once the initial system is installed. The chemical dosing system which uses hydrogen peroxide allows for adjusting dosing level based on the water quality of each site.

The unit is designed to operate in the AUTO Mode continuously and utilizes three water treatment technologies to efficiently provide odor free reclaim water.

The system should be turned on and operated 24 hours a day to ensure proper treatment of the water.

The auto cycle is designed to automatically control the reclaim cycle and includes user selectable cycle length and dosing levels to optimize the reclaim treatment. The tunnel command switches unit to reclaim mode to fill the reclaim tank. Once all cars have exited the tunnel and reclaim tank refills, the unit will start a cycle sequence to protect the water system from generating odors. This cycle uses a recirculation mode, followed by a reclaim mode and finally the unit (if desired) will enter a sleep or stop mode. These modes are programmable by the operator for both duration and dosing levels. The filter flush mode occurs at a set time when the wash is closed to allow the backflush cycle to use the muni water.

The table below helps to guide the unit set-up based on water condition and temperature. These values will vary significantly based on the amount of organic material (both biological material and chemicals entering the wash rinsed from cars, chemicals used in wash and the water temperature).

Baseline Set-up

Mode	Flow Rate	Dosing Level	Time
Belt Command ON Reclaim Mode			
Belt Command Off			
Reclaim	20-30 GPM	30%	On-Command or During Cycle
ADD ADDITIONAL DATA			

The chemical dosing and aeration systems are designed to increase the dissolved oxygen level of the water. Biological and chemicals both pull the oxygen levels down as they oxidize the materials. When the dissolved oxygen levels drops below 60%?? the water will begin to have odor. Higher dissolved oxygen levels help to break down (bio degrade) the organic material. Like a pond, aeration is required to create an aerobic environment in the underground tanks. If the oxygen drops, the water becomes

anaerobic as bateria uses oxygen from the water to digest the biological and chemical material in the tank storage system. This causes the tanks environment to go from an aerobic environment (an oxygen-rich environment) to an anaerobic environment (a low-oxygen environment). Those microorganisms ultimately produce waste products, including carbon dioxide and hydrogen sulfide, which creates a rotten egg smell.

When operating in the re-circulation mode, the system is designed to provide a high flow circulation through the tanks which when combined with aeration will increase dissolved oxygen levels and reduce the amount of chemical required to sanitize the water for reuse. The high flow re-circulation portion of the reclaim cycle has an adjustable length and can include dosing if needed.

The third portion of the auto cycle is a pause or stop function which turns off the SEG pump located in the underground tank.

WARNING: HYDROGEN PEROXIDE I HYDROGEN PEROXIDE IS A STRONG OXIDIZER (MODERATE OXIDIZER IN LOWER CONCENTRATIONS), AND CAN BE CORROSIVE TO THE EYES, SKIN, AND RESPIRATORY SYSTEM. THIS CHEMICAL CAN CAUSE BURNS TO THE SKIN AND TISSUE DAMAGE TO THE EYES.S

IN THE EVENT OF EXPOSURE TO HYDROGEN PEROXIDE, SEEK MEDICAL ATTENTION AND FOLLOW THESE FIRST AID GUIDELINES:

INHALATION—SEEK FRESH AIR. IF VICTIM'S BREATHING IS DIFFICULT, ADMINISTER OXYGEN. IF BREATHING IS ABSENT, GIVE ARTIFICIAL RESPIRATION AND SEEK MEDICAL ATTENTION IMMEDIATELY.

EYE CONTACT—REMOVE CONTACT LENSES IF PRESENT. IMMEDIATELY FLUSH EYES WITH PLENTY OF WATER FOR AT LEAST 15 MINUTES, AND SEEK MEDICAL ATTENTION.

SKIN CONTACT—FLUSH SKIN WITH PLENTY OF WATER AND COVER IRRITATED SKIN WITH AN EMOLLIENT. REMOVE CONTAMINATED CLOTHING. IN CASE OF SERIOUS SKIN EXPOSURE, USE DISINFECTANT SOAP AND AN ANTI-BACTERIAL CREAM AND SEEK MEDICAL ATTENTION.

INGESTION—DO NOT INDUCE VOMITING. LOOSEN TIGHT CLOTHING. NEVER GIVE ANYTHING BY MOUTH TO AN UNCONSCIOUS PERSON. SEEK MEDICAL ATTENTION.

KEY RECLAIM SYSTEM COMPONENT / TERMS

Waste Water

Waste water is water that drains to the municipal sewer.

Micro-Bubbler

The micro-bubbler is designed to increase the dissolved oxygen levels in the water circulating in the underground tank system. This feature uses the available compressed air supply from the carwash and reduces the required chemical dosing needed to sanitize the reclaim water. The bubbler is operated by the compressed air supply in the carwash. The unit includes a regulator and air flow meter which should be adjusted to 6-8 SCFM total air flow to the stand which includes two 9" bubbler disks. The bubbler should be located in the center of the second tank to allow maximum circulation within the tank.

Dissolved Oxygen Level

Dissolved Oxygen is present in all water that is exposed to the atmosphere and . Carwash waste water includes both chemicals and biological

SEG Pump

The Grundfos SEG pump is located in the third underground "clarifying" tank. This location is the best location to pull the reclaim water from to utilize for reclaim. The pump is designed for harsh environments and has been proven reliable in a submerged application. Sand and dirt that settles in tanks must be pumped out before the sediment starts to build up in the second or third (clarifying tank).

Dosing Pump

The dosing pump is designed to inject a chemical sanitizer into the reclaim flow which increases the dissolved oxygen in the reclaim water. The increased DO levels provide a method to sanitize the water in a safe and controlled manner.

Sand Filter

The multi-media sand filter provides excellent filtering of the reclaim water and removes particles great than 5 micron size. In addition, the brass Clack filter head provides for automatic daily backflushing to clean and re-establish the filter bed and flush any particles to the municipal sewer line. This provides a high capacity filter system which automatically flushes each night. If the filter loses flow capacity and flow drops below 8 GPM, the unit will switch to recirculation. Once the flush cycle occurs, the unit will return to full function.

Reclaim Water

Water which has been filtered and treated to allow recycling in certain wash functions. Reclaim water is not municipal water and is not intended to be used for critical chemical operations or final rinsing of vehicles as it has high TDS and will create spotting on glass or flat surfaces. Reclaim is intended for non-critical rinse operations such as wheel blasters, underbody wash or initial rinse operations to remove dust or dirt from the surface of the car.

Reclaim Tank

The reclaim system tank is designed to collect the reclaim water and feed the high pressure Hydro-Cell pumps used for wheel blaster and underbody rinse. This tank allows use of reclaim water and includes a municipal water line connected to a Jobe float style valve to ensure that the if the water demand exceeds the reclaim flow the Jobe valve float will turn on the municipal water and prevent the tank from going empty. For extra pump protection, it is recommended that a low level float switch be wired into the hydro-cell pumps to avoid the potential of dry running the pumps. The reclaim tank is designed to overflow during operation to prevent silicone or oil to accumulate in the tank. The drain of this tank should be plumbed to the sand / oil separator tank to remove contaminates from the water.

Programmable Logic Controller (PLC)

The reclaim system is controlled by an Allen Bradley PLC which allows completely automated operation of the unit. Built-in diagnostics help to troubleshoot the system by identifying the location of any faults. The faults are recorded to allow rapid detection and correction if a component of the system fails. The PLC includes maintenance and setting screens in addition to the main system screen. In addition, the unit provides a "healthy signal" to the overall tunnel controller confirm that the reclaim system is functioning without the operator

INSTALLATION

Important: Reclaim system installation must conform to local plumbing, electrical, and sanitation codes. It is the customer's responsibility to obtain all permits and install equipment to conform to all state and local codes.

SEG PUMP INSTALLED IN UNDERGROUND CLARIFYING TANK

The SEG (grinder pump) is located in the clarifying tank and supplies the pump for both the reclaim and recirculation modes. This pump is a 3 phase 5 HP centrifugal pump with a grinder function to prevent any foreign objects from clogging the filter or lines. to This pump flows up to 85 GPM of water in the recirculation mode (using 2 inch flow lines) and flows reduce to 20-30 GPM during the reclaim mode (using 1.5 inch line size).

ELECTRIC POWER REQUIREMENTS

The unit has been designed to utilize 480 VAC 3 Phase power with ground from the facility. Review the electrical schematic (Appendix 2) for required current ratings and integration of the system controller.

The Reclaim pump is 5 HP.

Power requirement is 15A, 3 Phase 480VAC fed by a trip class 10 or higher. Wiring and conduits as permitted by local code. A 24 V tunnel command signal is used to request reclaim unit production

WARNING: THE 24V SIGNAL FROM THE SYSTEM CONTROLLER CAN ONLY BE TURNED ON OR OFF AT THE WASH CONTROLLER. THE 24 VOLT SIGNAL POWER MUST BE TURNED OFF AT THE SYSTEM CONTROLLER RELAY BEFORE OPENING THE RECLAIM SYSTEM CONTROLLER FOR MAINTENANCE.

SAND FILTER

The Clack Valves located on the sand filter requires a 115 VAC, 1 Amp, waterproof grounded receptacle to support the Clack low voltage power supply.

FLOOR DRAIN

All water drains and overflow lines must drain to the floor drain and the plumbing should be constructed to allow a visual indication of water flowing to drain to help diagnose proper system operation. **Note: The RO Reject tank overflow line must be sized to gravity flow 15 GPM during the initial start-up and check-out of the system.**

The water lines from the RO System to the RO Product and RO Reject Tanks should be sized to minimize pressure drops. Lines should be sized for a maximum of 2 psi drop at the following flow rates to ensure proper function of the unit.

COMPRESSED AIR SUPPLY

The pilot-operated solenoid 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 unit. Add a ball valve and fitting to allow running an air-line to the pressure regulator / water separator located on the RO frame. This air supply is required to operate the ASCO 8290 air operated solenoid valves. The 24 Volt pilot valves are located on the left side of the RO system controller housing and are controlled by the RO controller. The supply pressure must be between 80-150 psi. The regulator should be adjusted to provide 80 psi to the pilot solenoid valves. The water separator should be checked on a daily basis to ensure dry air is supplied to the solenoid valves.

THE MEDIA FROM CLUMPING. REGENERATION WILL MAXIMIZE THE LIFE AND PERFORMANCE OF THE CARBON FILTER.

IF POWER IS LOST FOR ANY REASON FOR OVER 8 HOURS OR THE BATTERY FAILS IN THE CLACK HEAD, THE TIME MUST BE RESET. ADDITIONAL SPECIFICS FOR TROUBLESHOOTING AND MAINTENANCE OF THE CLACK HEAD ARE INCLUDED IN THE CLACK MANUAL.

RECLAIM SYSTEM INSTALLATION

The RO Unit should be located 4-6 inches from the back wall. There are a total of five water lines that must be attached to the unit (refer to RO unit pictures in Appendix 1).

1. Municipal Water Feed to flush Filter Head– 1.5 inch Hose
2. SEG Pump to Reclaim Unit 2.0 inch Hose
3. Reclaim Flow to Reclaim Tank – 1.5 inch Hose
4. Air Feed Line from regulator to Bubblers Tank Feed ¾ inch air line to bubblers

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 plumbing connections. If needed, install additional clamps or hose supports to Reclaim frame to reduce hose weight on fittings.

ELECTRICAL INSTALLATION

The electrical schematics and connection points in the controller are designated in Appendix 2.

PLEASE NOTE EACH CONTROLLER HAS A SERIAL NUMBER LOCATED INSIDE THE CONTROLLER ON THE LOWER LEFT SIDE OF THE HOUSING (FOR EXAMPLE AG8B05-1). THIS LOCATION IS SHOWN IN THE PICTURE BELOW AND SHOULD BE USED WHEN REQUESTING SUPPORT ON THE RO SYSTEM AS THIS NUMBER LINKS TO BOTH THE CONTROLLER SOFTWARE AND HARDWARE.

IMPORTANT: FOLLOW ALL LOCAL CODES.

Main Control Fuse Block (FB1) – Bussmann LP-CC-15 fuses are used for the 480 VAC primary

MOTOR Protection Circuit Breaker (M1, M2) – Individually sized for each motor. These provide short circuit protection to the motor as well as thermal overload protection.

DC Power Supply (PS1) – Converts 480 VAC to 24 VDC for control circuit components.

PLC (PLC) – Programmable Logic Controller – Executes a program that controls the sequence and times of the operation through I/O (inputs and outputs).

HMI (HMI) – Human Machine Interface – Executes a graphical interface program that communicates with the PLC to let the operator know the state of the equipment.

Black terminals (L1, L2, L3) – Electrical connection point for the 480 VAC 3 phase main power.

Control Relay (CR1) – Land the 24V request for Reclaim water signal from the tunnel to this component.

RECLAIM TANK MUNICIPAL WATER VALVE

The reclaim tank is designed to support the operation of the system

ELECTRICAL WIRING OF THE RO LEVEL TRANSDUCER.

The pressure sensor uses a 24 V signal from the RO System Controller and attaches to the terminals shown in the wiring schematic (located in Appendix 2). The sensor has been selected for long life and high reliability. Make sure to tighten the wiring connector screw (in top of the connector) to ensure the connector seal is adequately compressed to avoid moisture entering the sealed connector.

RECLAIM SYSTEM CONTROLLER

The brain of the Reclaim unit is the PLC controller. This controller uses a number of inputs (switches, sensors, signals, etc.) to direct the Reclaim system and supply Reclaim water to the car wash based on the tunnel command. This unit has been designed to utilize the highly reliable Allen Bradley (A-B) Programmable Logic Controller. In addition, the electrical switch gear (relays, motor starter, transformers and circuit breakers) are all commercial equipment manufactured by A-B. This system is designed to provide many years of service life. In addition, the A-B hardware and software systems will be supported for many years in the future to avoid equipment obsolescence.

The unit includes maintenance screens and a setting screen which are accessible from the touchscreen located on the cover of the system controller. The controller system is UL listed and each unit is manufactured to conform to the UL standard. The PLC program (software) can be updated in the field (if needed) by installation of a new "memory module" that can be shipped to customer. Loading the new program is accomplished by turning power off on external switch, installing the memory module and turning power back on. Verify that download occurred by checking the Version level on the HMI screen.

HUMAN MACHINE INTERFACE (HMI)

The HMI screen provides a touchscreen input from which the operator may select the operating mode, visually monitor the system operate, and keep tracks of important maintenance and operation data. Maintenance screens show cycle counts for solenoids and hour meters on all the critical components (pumps, sand filter, valves, etc.)

The HMI screen connects to the PLC using a serial port which simplifies the wiring and permits the ability to update the system with addition features needed to support the car wash operating and maintenance requirements.

Hydrogen Peroxide Data Sheet

COLUMBUS CHEMICAL INDUSTRIES INC.

Safety Data Sheet

Hydrogen Peroxide 20% (w/w)

1. PRODUCT AND COMPANY IDENTIFICATION

Product Name: Hydrogen Peroxide 20% (w/w)

Synonyms/Generic Names: Peroxide

Product Number: 2658

Product Use: Industrial, Manufacturing or Laboratory use

Manufacturer: Columbus Chemical Industries, Inc.
N4335 Temkin Rd.
Columbus, WI. 53925

For More Information Call: 920-623-2140 (Monday-Friday 8:00-4:30)

In Case of Emergency Call: CHEMTREC - 800-424-9300 or 703-527-3887 (24 Hours/Day, 7 Days/Week)

2. HAZARDS INDENTIFICATION

OSHA Hazards: Oxidizer, Target organ effect, Toxic by ingestion, Corrosive, Carcinogen

Target Organs: Eyes, Skin, Respiratory system

Signal Words: Danger

Pictograms:

GHS Classification

Oxidizing liquids	Category 1
Acute toxicity, Dermal	Category 4
Acute toxicity, Oral	Category 4
Skin corrosion	Category 1A
Eye irritation	Category 1
Acute aquatic toxicity	Category 3

GHS Label Elements, including precautionary statements:

Hazard Statements:

H271	May cause fire or explosion; strong oxidizer
H302	Harmful if swallowed
H314	Causes severe skin burns and eye damage
H402	Harmful to aquatic life

Precautionary Statements:

P210	Keep away from heat/sparks/open flames/hot surfaces. No smoking.
P220	Keep/Store away from clothing and other combustible materials.
P221	Take any precaution to avoid mixing with combustibles.
P260	Do not breathe dust/fume/gas/mist/vapors/spray.
P264	Wash hands thoroughly after handling.
P270	Do not eat, drink or smoke when using this product.
P273	Avoid release to the environment.
P280	Wear protective gloves/protective clothing/eye protection/face protection.
P283	Wear fire/flame resistant/retardant clothing.
P301+P330+P331	IF SWALLOWED: Rinse mouth. Do not induce vomiting.
P303+P361+P353	IF ON SKIN (or hair): Take off immediately all contaminated clothing. Rinse skin with water/shower.
P304+P340	IF INHALED: Remove person to fresh air and keep comfortable for breathing.
P305+P351+P338	IF IN EYES: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing.
P310	Immediately call a POISON CENTER/doctor/physician.
P363	Wash contaminated clothing before reuse.
P370+P378	In case of fire: Use appropriate media to extinguish.
P371+P380+P375	In case of major fire and large quantities: Evacuate area. Fight fire remotely due to the risk of explosion.
P405	Store locked up.
P501	Dispose of contents/container in accordance with local regulations.

Potential Health Effects

Eyes	May cause serious damage.
Inhalation	Irritating to the respiratory system. Causes irritation to the respiratory tract.
Skin	Irritating to skin. Contact causes redness, burns, itching and pain. Prolonged or repeated skin exposure may cause dermatitis.
Ingestion	Causes irritation and pain.

NFPA Ratings

Health	3
Flammability	0
Reactivity	1
Specific hazard	OX

HMIS Ratings

Health	3
Fire	0
Reactivity	1
Personal	D

3. COMPOSITION/INFORMATION ON INGREDIENTS

Component	Weight %	CAS #	EINECS# / ELINCS#	Formula	Molecular Weight
Hydrogen Peroxide	19-21	7722-84-1	231-765-0	H_2O_2	34.01 g/mol
Water	Balance	7732-18-5	231-791-2	H_2O	18.00 g/mol

4. FIRST-AID MEASURES

Eyes	Rinse with plenty of water for at least 15 minutes and seek medical attention immediately.
Inhalation	Move casualty to fresh air and keep at rest. If breathing is difficult, give oxygen. If not breathing, give artificial respiration. Get medical attention.
Skin	Immediately flush with plenty of water for at least 15 minutes while removing contaminated clothing and wash using soap. Get medical attention immediately.

Ingestion	**Do Not Induce Vomiting!** Never give anything by mouth to an unconscious person. If conscious, wash out mouth with water. Get medical attention immediately.

5. FIREFIGHTING MEASURES

Suitable (and unsuitable) extinguishing media	Use water spray, alcohol-resistant foam, dry chemical or carbon dioxide. Use flooding quantities of water to cool containers.
Special protective equipment and precautions for firefighters	Wear self-contained, approved breathing apparatus and full protective clothing, including eye protection and boots.
Specific hazards arising from the chemical	Product components will burn producing oxygen. (See also Stability and Reactivity section).

6. ACCIDENTAL RELEASE MEASURES

Personal precautions, protective equipment and emergency procedures	See section 8 for recommendations on the use of personal protective equipment.
Environmental precautions	Prevent spillage from entering drains. Any release to the environment may be subject to federal/national or local reporting requirements.
Methods and materials for containment and cleaning up	Neutralize spill with sodium bicarbonate or lime. Absorb spill with noncombustible absorbent material, then place in a suitable container for disposal. Clean surfaces thoroughly with water to remove residual contamination. Dispose of all waste and cleanup materials in accordance with regulations.

7. HANDLING AND STORAGE

Precautions for safe handling
See section 8 for recommendations on the use of personal protective equipment. Use with adequate ventilation. Wash thoroughly after using. Keep container closed when not in use.

Conditions for safe storage, including any incompatibilities
Store in cool, dry well ventilated area. Isolate from combustible material. Store in the dark. Keep away from incompatible materials (see section 10 for incompatibilities).

8. EXPOSURE CONTROLS / PERSONAL PROTECTION

Occupational exposure controls:

Component	Exposure Limits	Basis	Entity
Hydrogen Peroxide	1 ppm 1.4 mg/m^3	TLV	ACGIH
	1 ppm 1.4 mg/m^3	PEL	OSHA
	1 ppm 1.4 mg/m^3	REL	NIOSH

TWA: Time Weighted Average over 8 hours of work.
TLV: Threshold Limit Value over 8 hours of work.
REL: Recommended Exposure Limit
PEL: Permissible Exposure Limit
STEL: Short Term Exposure Limit during x minutes.
IDLH: Immediately Dangerous to Life or Health

WEEL: Workplace Environmental Exposure Levels
CEIL: Ceiling

Personal Protection

Eyes	Wear chemical safety glasses with a face shield for splash protection.
Inhalation	Provide local exhaust, preferably mechanical. If exposure levels are excessive, use an approved respirator.
Skin	Wear neoprene or nitrile gloves, apron and other protective clothing appropriate to the risk of exposure.
Other	Not Available

Other Recommendations
Provide eyewash stations, quick-drench showers and washing facilities accessible to areas of use and handling. Have supplies and equipment for neutralization and running water available.

9. PHYSICAL AND CHEMICAL PROPERTIES

Appearance (physical state, color, etc.)	Clear, colorless liquid
Odor	No Odor
Odor threshold	Not Applicable
pH	Not Available
Melting point/freezing point	Not Available
Initial boiling point and boiling range	Not Available
Flash point	Not Flammable
Evaporation rate	Not Available
Flammability (solid, gas)	Not Flammable
Upper/lower flammability or explosive limit	Not Explosive
Vapor pressure	Not Available
Vapor density	Not Available
Relative density	1.0700
Solubility (ies)	Completely soluble in water
Partition coefficient: n-octanol/water	Not Available
Auto-ignition temperature	Not Applicable
Decomposition temperature	Not Available

10. STABILITY AND REACTIVITY

Chemical Stability	Stable
Possibility of Hazardous Reactions	Will not occur.
Conditions to Avoid	Store out of direct light
Incompatible Materials	Brass, Copper, Powdered metals, Iron, Iron and iron salts, combustible materials
Hazardous Decomposition Products	Not Available

11. TOXICOLOGICAL INFORMATION

Acute Toxicity
Hydrogen Peroxide

Skin	LD50 Dermal – rat – 4060 mg/kg
Eyes	Not Available
Respiratory	Not Available
Ingestion	LD50 Oral – mouse – 2000 mg/kg

14. TRANSPORTATION INFORMATION

US DOT	UN2014, Hydrogen peroxide, aqueous solutions 5.1, (8), pg II
TDG	UN2014, HYDROGEN PEROXIDE, AQUEOUS SOLUTIONS 5.1, (8), PG II
IMDG	UN2014, HYDROGEN PEROXIDE, AQUEOUS SOLUTIONS 5.1, (8), PG II
Marine Pollutant	No
IATA/ICAO	UN2014, Hydrogen peroxide, aqueous solutions 5.1, (8), pg II

15. REGULATORY INFORMATION

TSCA Inventory Status	All ingredients are listed on the TSCA inventory.
DSCL (EEC)	All ingredients are listed on the DSCL inventory.
California Proposition 65	Not Listed
SARA 302	Listed: Hydrogen Peroxide
SARA 304	Listed: Hydrogen Peroxide
SARA 311	Acute Health Hazard, Reactivity Hazard
SARA 312	Acute Health Hazard, Reactivity Hazard
SARA 313	Listed: Hydrogen Peroxide
WHMIS Canada	Class C: Oxidizing Material Class D-2B: Toxic Material Causing Other Toxic Effects

16. OTHER INFORMATION

Revision	Date
Revision 1	01/16/2014
Revision 2	05/28/2015

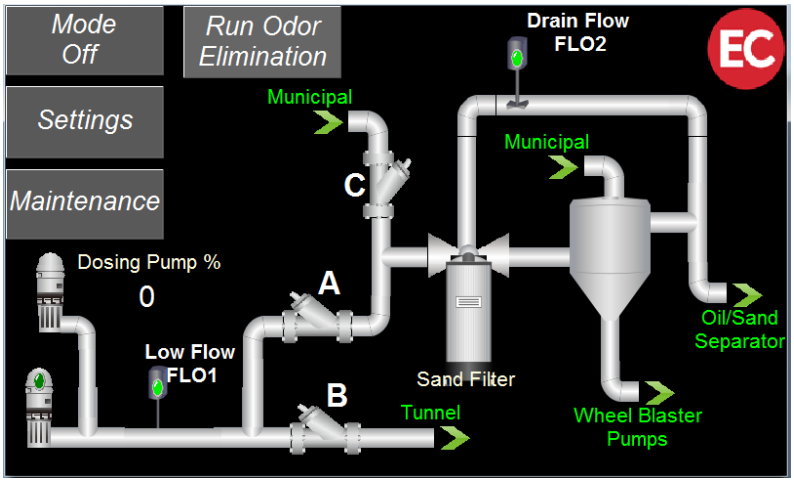
HUMAN MACHINE INTERFACE (HMI SCREEN) OPERATING MODES

Off Mode

When the external power switch is in the ON position a flashing red dot will appear in the Mode Button of the HMI touch screen. The HMI will show the main screen and the unit will start in the OFF mode.

In this mode, the PLC is ON but it does not turn on any other devices (Solenoids or Pumps).

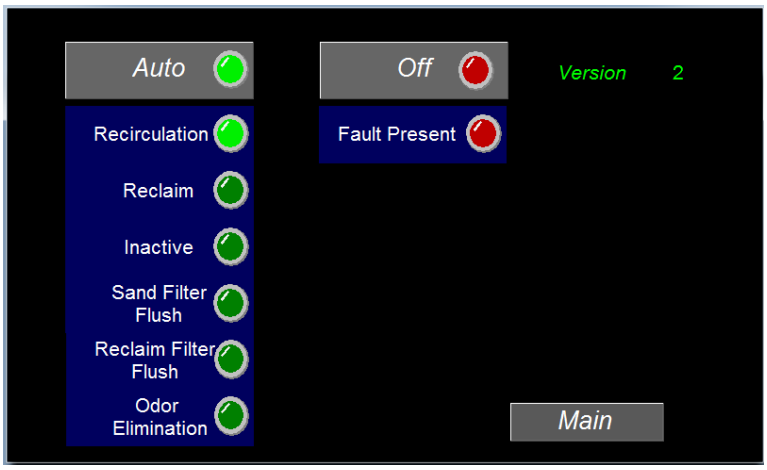
The screenshot below shows the system with external power ON and the PLC in the OFF Mode. Multiple electrical voltages (480, 110, & 24) are energized in this mode.



Off Mode Screen – Mode Button Flashes Red

CAUTION: WHEN THE EXTERNAL POWER SWITCH IS IN THE ON POSITION, 480V THREE PHASE POWER FROM THE FACILITY WILL STILL BE ENERGIZED IN THE CONTROL BOX ALONG WITH THE 24V POWER TRANSFORMER AND 24V RO COMMAND SIGNAL FROM THE TUNNEL CONTROLLER. AT NO TIME SHOULD THE CONTROLLER HOUSING BE OPENED WITH THE EXTERNAL POWER SWITCH (LOCATED ON THE SIDE OF THE CONTROLLER BOX) IN THE 'ON' POSITION.

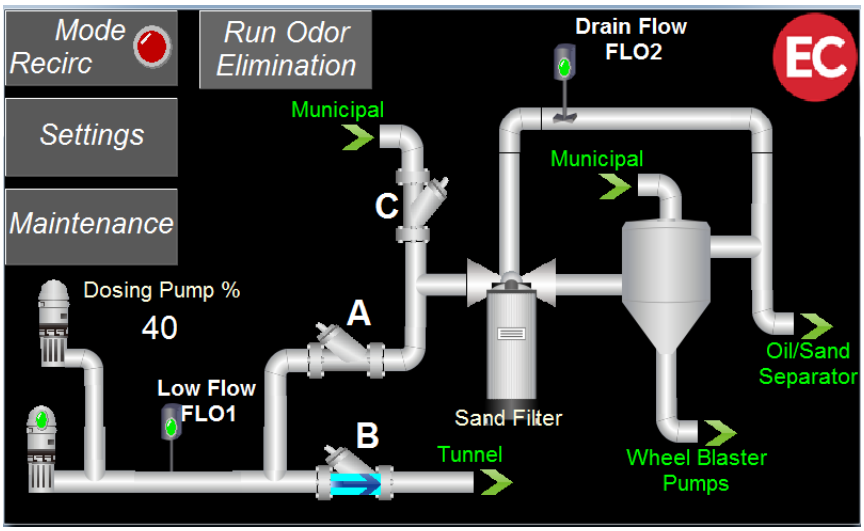
IF MAINTENANCE FOR ANY COMPONENT OF THE CONTROLLER OR WIRINGIS REQUIRED, LOCK OUT / TAG OUT PROCEDURES MUST BE USED. FAILURE TO UTILIZE SAFE MAINTENANCE PROCEDURES COULD LEAD TO INJURY OR DEATH FROM ELECTRICAL SHOCK OR POTENTIAL ARC FLASH AS A RESULT OF WORKING ON AN ENERGIZED CONTROLLER.



Mode Screen

Off Mode (Fault Present Indicator will blink when a fault is active)

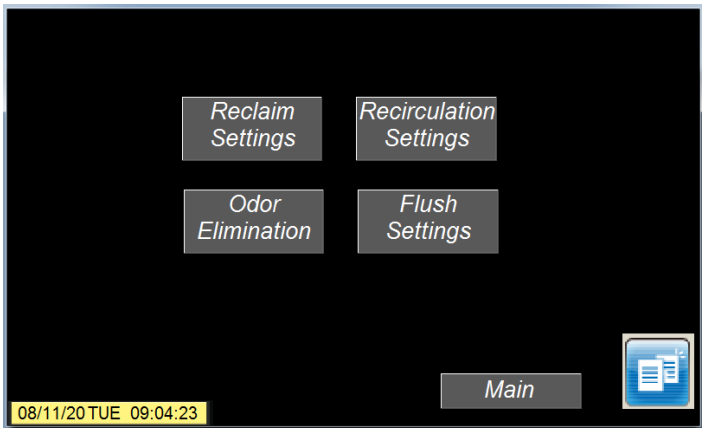
Mode Screen Recirc (Auto)



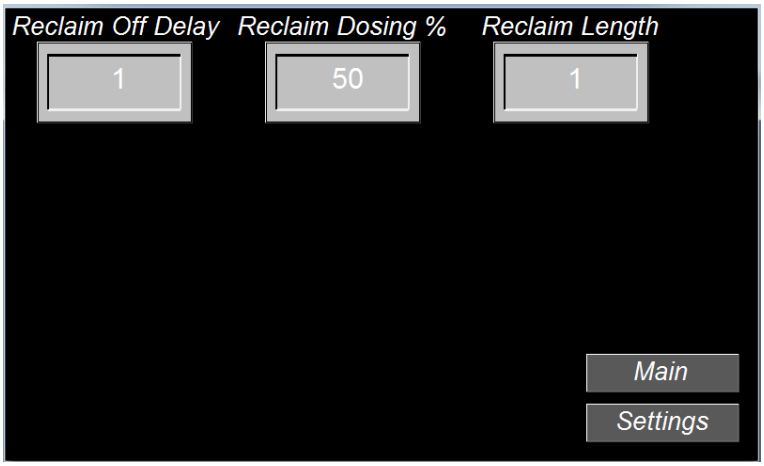
Recirc (Auto)

Solenoid B is open to the tunnel

Setting Screen The Reclaim System is designed to allow a number of operator selectable features including dosing levels, delays and the ability to cycle the pump on and off during the re-circulation mode. These features are all controlled by the setting screen and allow custom settings based on wash volume and seasonal changes in the water including temperature and amount of contamination coming off vehicles into the drain water.



Reclaim Settings

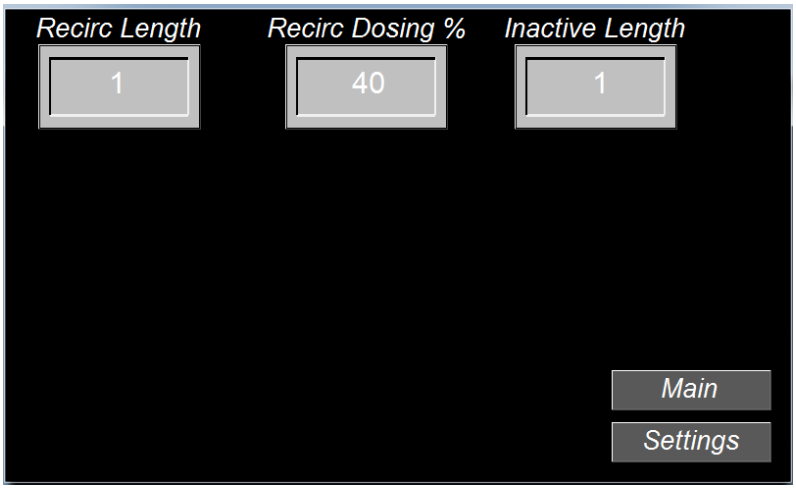


Reclaim Off Delay – When the Belt Command Signal has been turned off, Reclaim will run a specified amount of time afterwards. This value is in minutes.

Reclaim Dosing % - During Reclaim, the pump will dose at this output percentage. 400 mL/hr = 100%

Recirc On Delay – When unit enters recirculation mode, there is an initial delay/pause before the SEG pump starts to run. This unit is in minutes. Entering a value of 0 will cause the unit to have no delay.

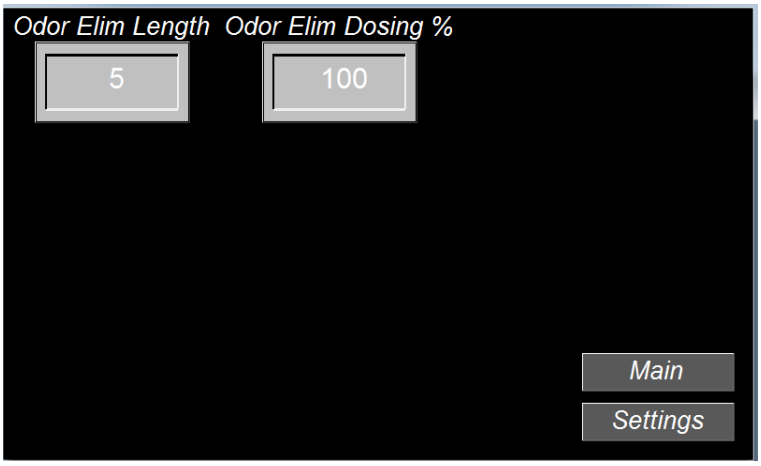
Recirculation Settings



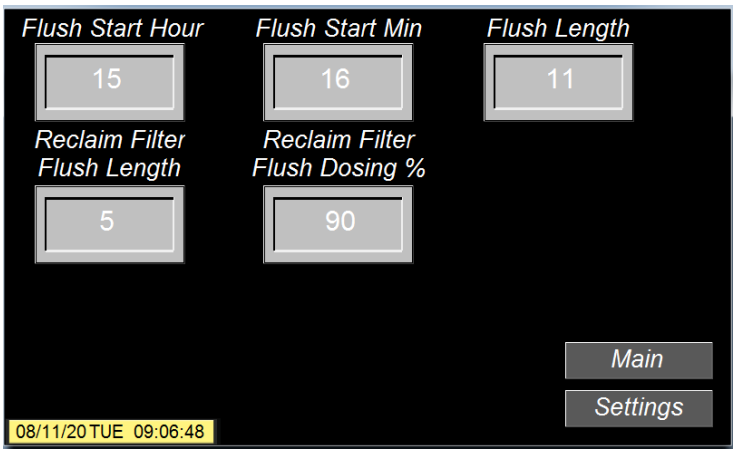
Pump Cycle Time – In Recirculation mode, the pump alternates on and off in order to conserve energy. The time (in minutes) will cause the pump to cycle on for that amount of time and off that amount (Example: 15 = 15 minutes on followed by 15 minutes off and will continue to alternate until the unit is turned off or a belt command causes it to enter Reclaim mode). Setting this number to 0 will command the SEG Pump to run continuously.

Recirc Dosing % - During Recirculation mode, the pump will dose at this output percentage.

Odor Eliminator Settings



Flush Settings



Flush Start Hour – The hour during which the flush cycle will start

Flush Start Minute – The minute during which the flush cycle will start

To command an immediate flush, set these parameters to 1 minute past the current time (Shown at bottom of screen. If this time is incorrect you will need to update the time on the HMI)

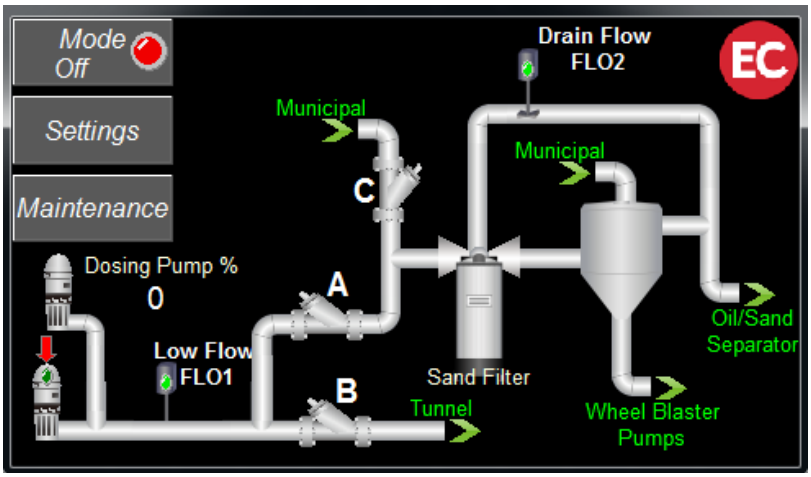
Flush Length (min) – This is the length of the flush cycle in minutes. This value should not be adjusted unless the flush and rinse cycle on the control valve has been adjusted. 11 minutes is timed for an 8 minute backflush and a 2 minute rinse cycle. 15 seconds before the flush cycle starts municipal water will run continuously until 15 seconds after the entire cycle.

Reclaim Filter Flush – Puts unit into reclaim mode and doses the water to prevent municipal water from sitting in the filter overnight.

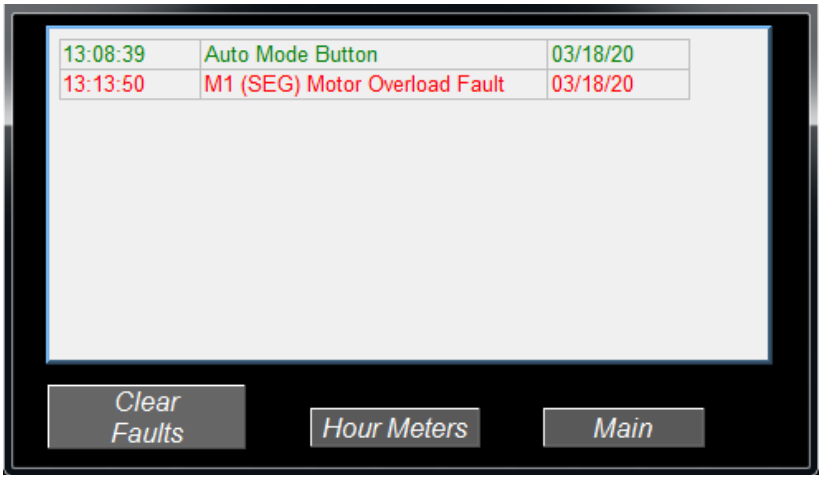
HUMAN MACHINE INTERFACE (HMI SCREEN) FAULTS

The Reclaim System controller is designed to include diagnostic signals for all the critical components of the system. Flow and pressure switches are located to be able to diagnose the system and identify if a component in the system has failed to operate properly. If a fault occurs, the "Reclaim Status signal" (PLC output relay) will be turned off. This signal should be integrated to the tunnel system controller and will tell operator when the unit needs support. If the dosing tank is empty, the unit will automatically switch to re-circulation mode and turn off the "Reclaim Status" signal.

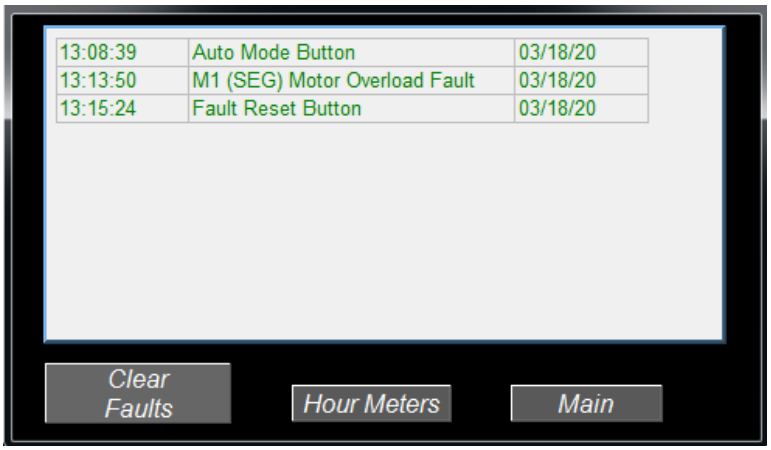
SEG Pump Has Faulted – Machine Automatically Turns to Off Mode. Red Arrow Indicates where the fault is. In the case shown below, the fault is at the SEG pump meaning the pump has tripped a breaker or had an electrical fault.



Maintenance Screen shows the active fault in red and logs all faults.

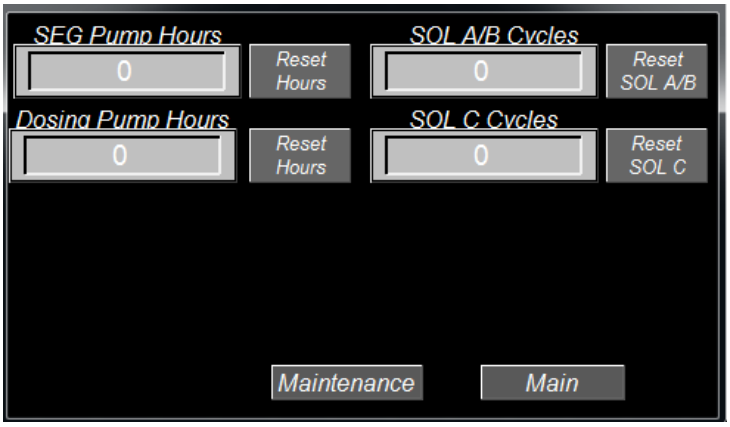


Clear Faults will reset the fault. Green means the fault has been cleared.



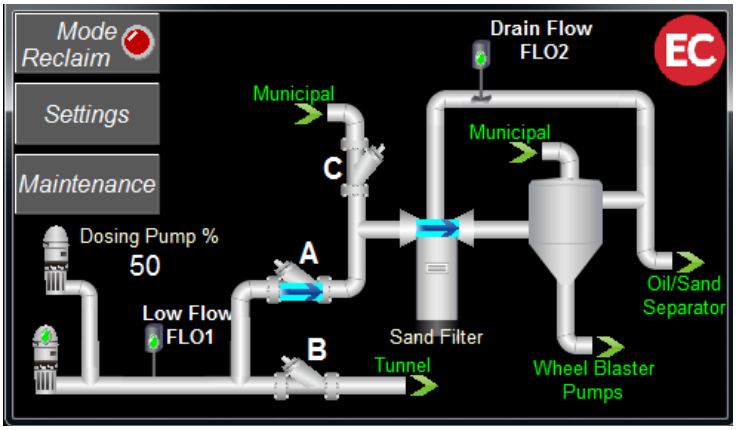
Hour Meters

Shows the hours the pumps have ran and the solenoid cycle counts. To restart the counts use the reset button.



Reclaim Mode (Auto w/ belt command)

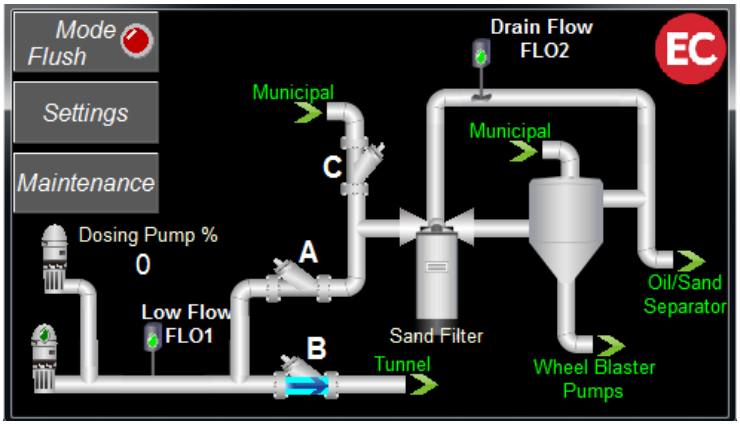
Shows the unit in reclaim. Solenoid A is open and flow is going through the sand filter to the tank.



Auto Mode

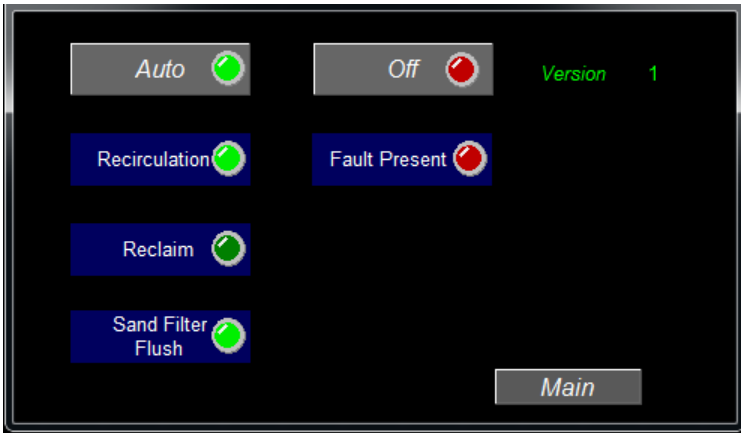
Reclaim Active

Flush Mode – In this graphic, the unit has just entered Flush Mode based on time of day. Unit is operating in recirc (Pump alternates on and off and solenoid B is open). Solenoid C has not yet opened and the sand filter is preparing to enter backflush.



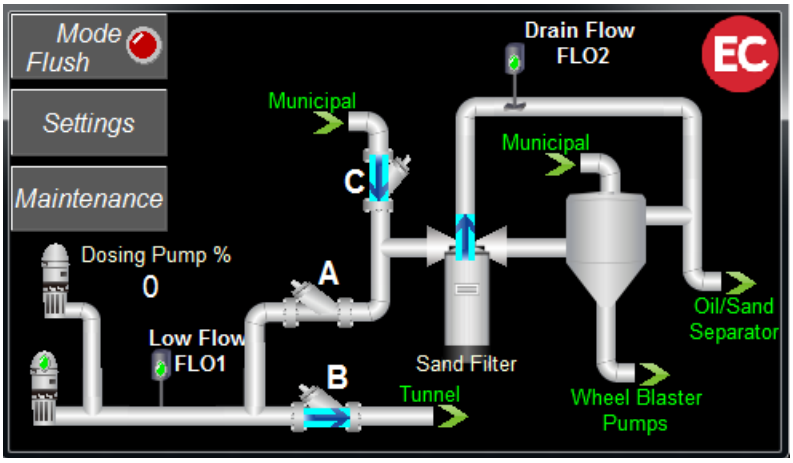
Unit is in Auto

Flush and Recirculation Are Active

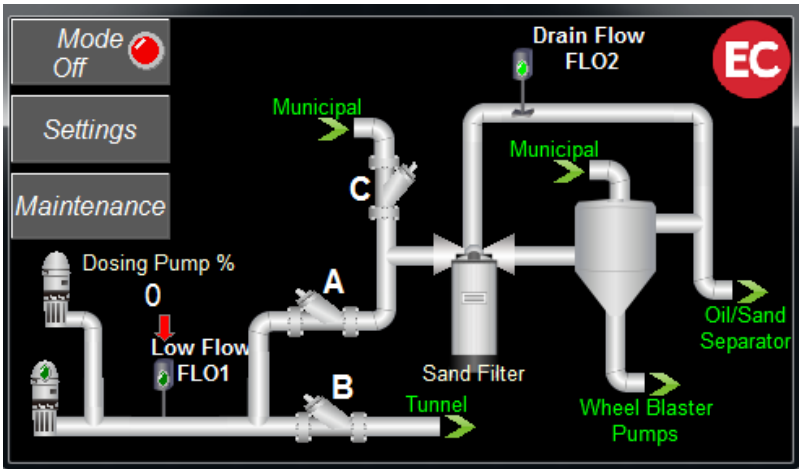


Flush Mode

Solenoid C (municipal water) is open and backflush is active.

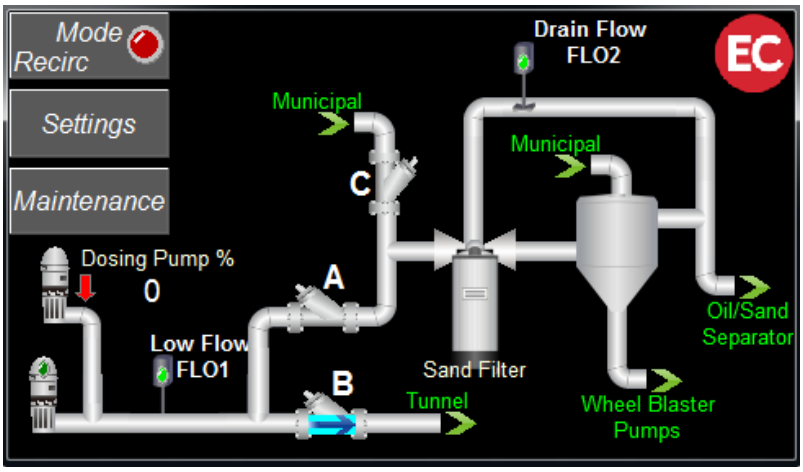


Low Flow Fault at FLO1 (SEG pump). Unit automatically turns to OFF.

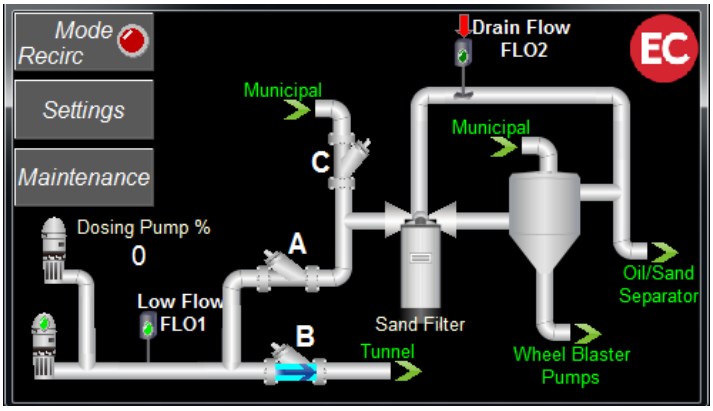


Dosing Pump Tank Is Low/Empty

Unit Automatically enters and stays in Recirc Mode



Unit was in flush mode and there was a fault at FLO2 (low flow in drain). Unit automatically enters recirculation mode.



Off Mode

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The screenshot below shows the system with external power ON and the PLC in the OFF Mode. Multiple electrical voltages (480, 110, & 24) are energized in this mode.

Off Mode Screen – Mode Button Flashes Red

CAUTION: WHEN THE EXTERNAL POWER SWITCH IS IN THE ON POSITION, 480V THREE PHASE POWER FROM THE FACILITY WILL STILL BE ENERGIZED IN THE CONTROL BOX ALONG WITH THE 24V POWER TRANSFORMER AND 24V RO COMMAND SIGNAL FROM THE RECLAIM CONTROLLER. AT NO TIME SHOULD THE CONTROLLER HOUSING BE OPENED WITH

THE EXTERNAL POWER SWITCH (LOCATED ON THE SIDE OF THE CONTROLLER BOX) IN THE 'ON' POSITION.

IF MAINTENANCE FOR ANY COMPONENT OF THE CONTROLLER OR WIRINGIS REQUIRED, LOCK OUT / TAG OUT PROCEDURES MUST BE USED. FAILURE TO UTILIZE SAFE MAINTENANCE PROCEDURES COULD LEAD TO INJURY OR DEATH FROM ELECTRICAL SHOCK OR POTENTIAL ARC FLASH AS A RESULT OF WORKING ON AN ENERGIZED CONTROLLER.

the RO production cycle has a low pressure fault.

System Start-Up PROCEDURE

1.

MAINTENANCE

The Reclaim System has been designed to provide 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 is performance or operation is observed, it is important to take corrective action quickly to minimize the potential damage to the system.

There are elements of the system which will require replacement during normal maintenance actions. These items include:

Sand Filter –

SEG Pump –

Dosing Pump

Pressure Switches – The Dietz pressure switch has a design life of over 1 million cycles. Replace the PRS4 pressure switch when the Solenoid Valve D reaches a million cycles (on maintenance counter) to avoid unplanned downtime.

ASCO 8290 Solenoid Valves (Solenoids A-E) – These valves are designed for multi-million cycle design life which should provide 5-10 year lifespan in most car wash systems. Note that Solenoid C (RO to tunnel) sees 50 times the number of cycles of the other four solenoid valves and will wear accordingly.

Air Pilot Solenoid Valves – These valves typically have a 1 million cycle life. As a minimum, the operator should keep spares in the event of a failure.

Pumps – The Grundfos pumps are designed for a 20,000 hour life. Pump seals will typically fail first and having a seal kit available for each pump is recommended.

Electrical / Controller Hardware – The motor contactors for the re-pressurization pump experience high cycles in the car wash application and keeping spares is recommended. The PLC controller and associated equipment should be very reliable unless the ambient temperature of the controller exceeds maximum temperature ratings.

APPENDIX 1 – RECLAIM SYSTEM PACKAGING

UPDATE TO ADD RECLAIM PHOTOS

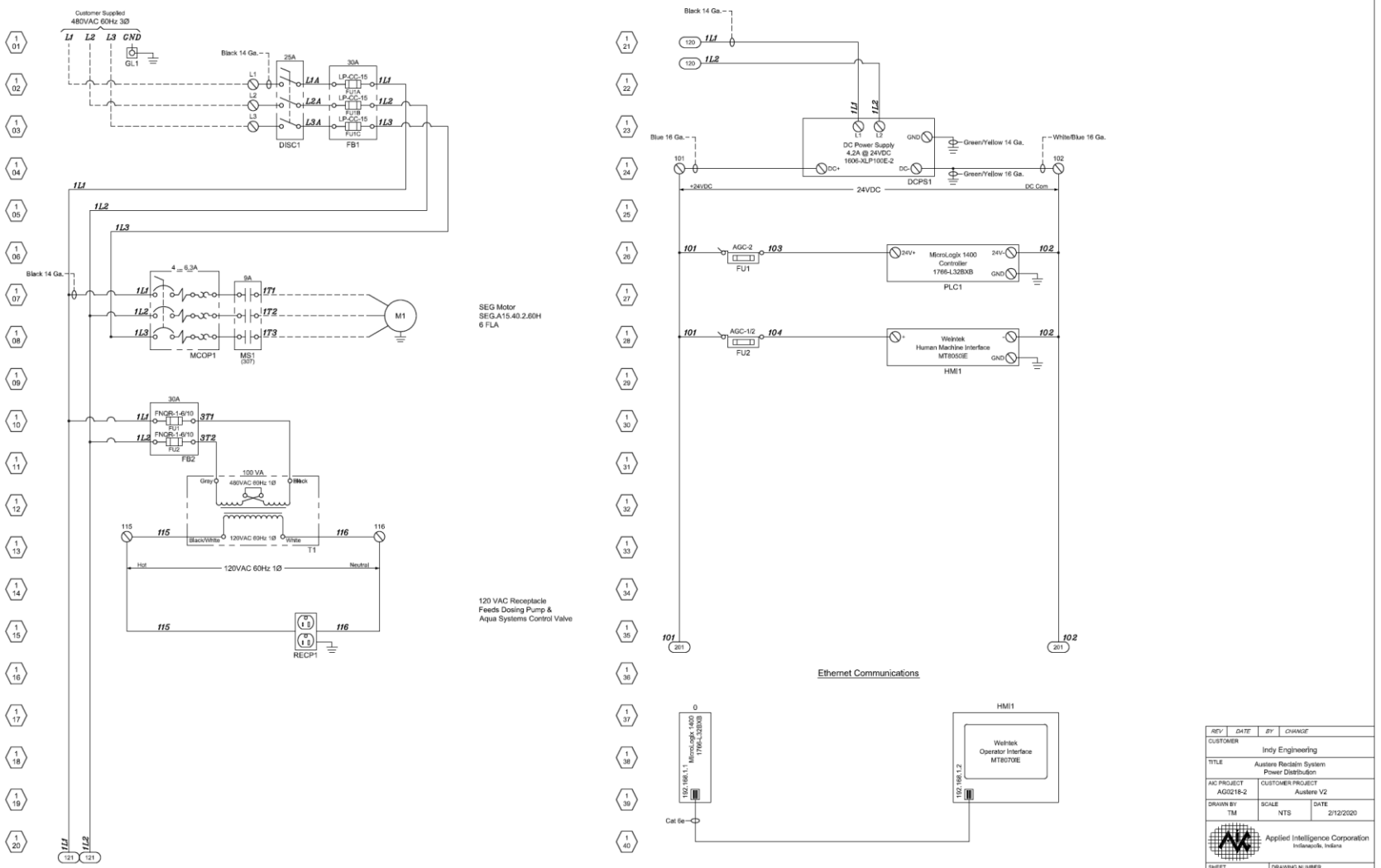
Front View of RECLAIM Unit (With Controller Removed)

Left Side View of RECLAIM unit

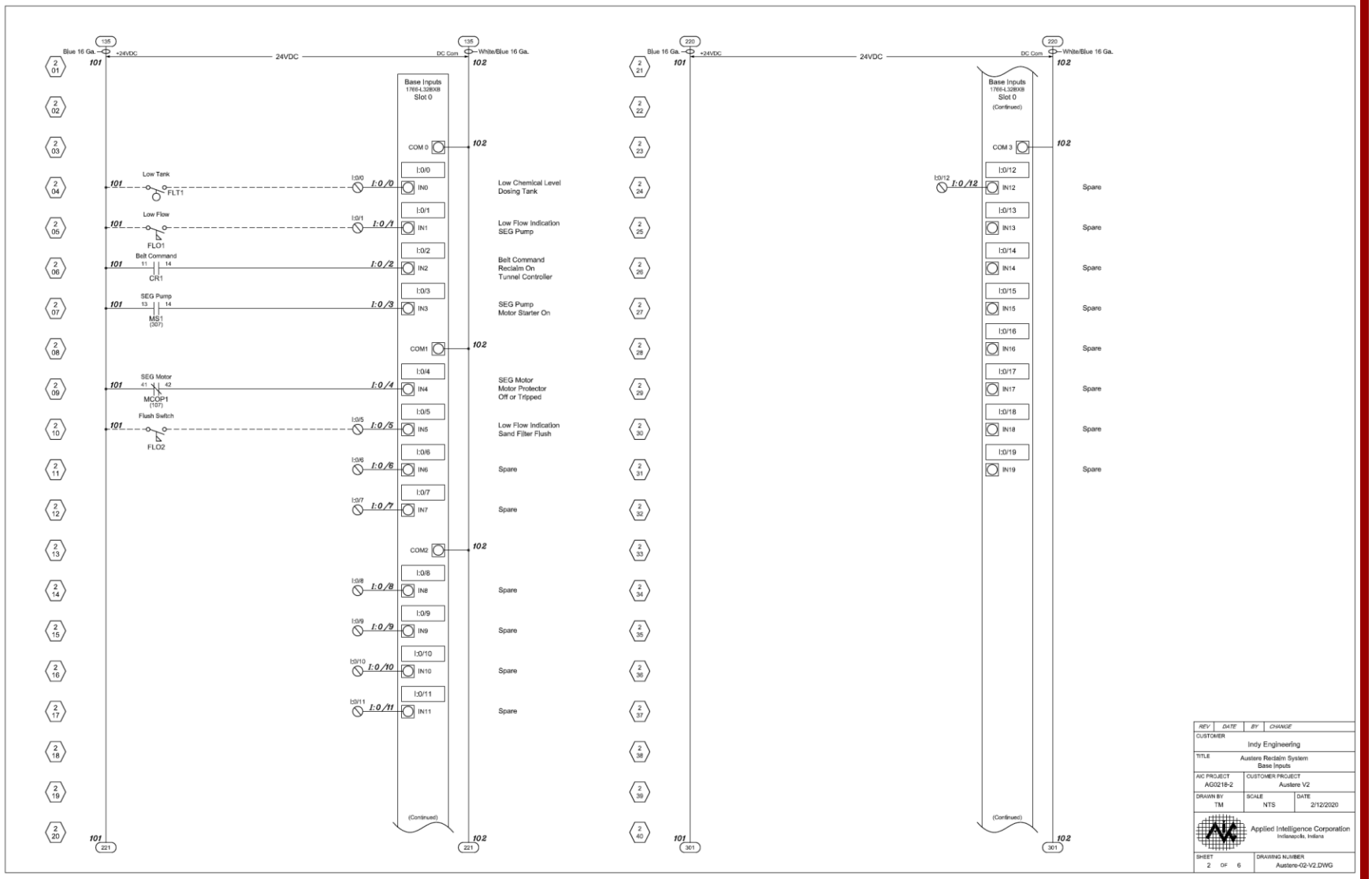
Rear View of RECLAIMO System

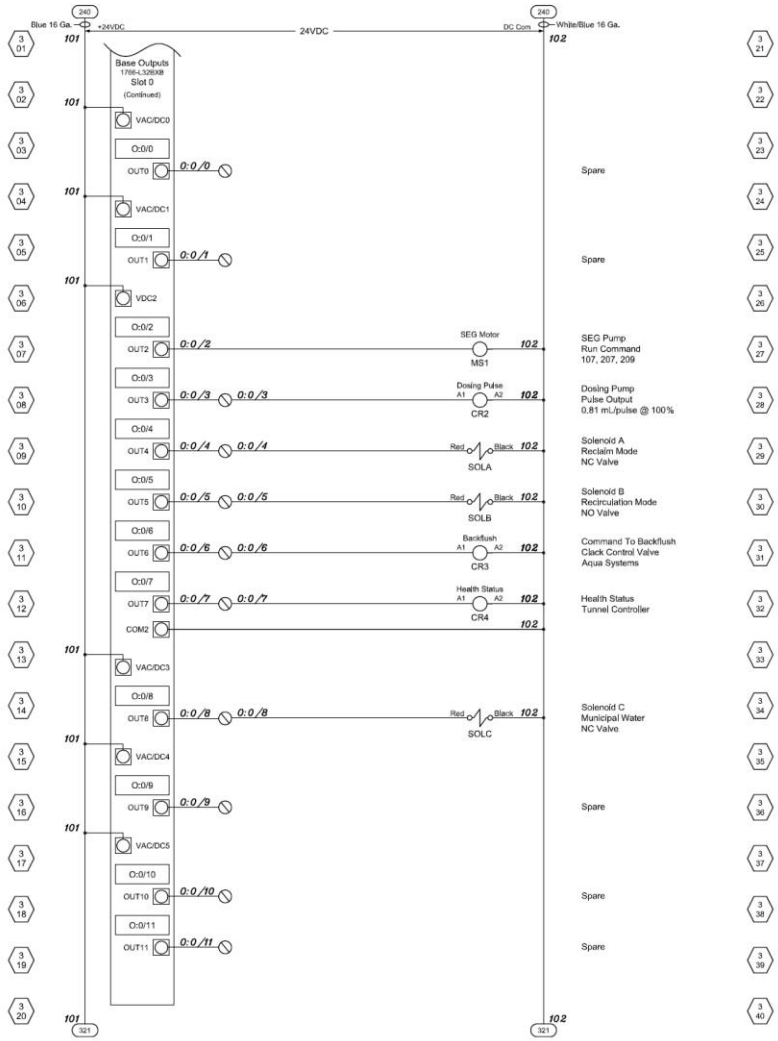
Right Side View of the RECLAIM Unit

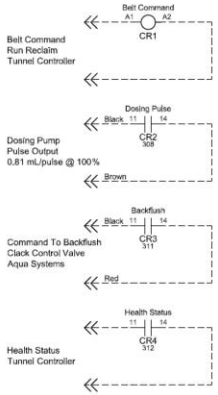
APPENDIX 2 – ELECTRICAL SCHEMATICS



REV	DATE	BY	CHANGE
CUSTOMER	Indy Engineering		
TITLE	Austere Reclaim System Power Distribution		
AIC PROJECT	AG0218-2	CUSTOMER PROJECT	Austere V2
DRAWN BY	TM	SCALE	NTS
DATE	2/12/2020		
Applied Intelligence Corporation Indianapolis, Indiana			
SHEET	1 OF 6	DRAWING NUMBER	Austere-01-V2.DWG


Blue 16 Ga.
+24VDC
24VDC
DC Com
White/Blue 16 Ga.
Base Inputs
1769-IL32BXB
Slot 0
(Continued)
COM 0
COM1
COM2
COM 3
Low Tank
FLT1
Low Flow
FLO1
Belt Command
CR1
SEG Pump
MS1
(307)
SEG Motor
MCOP1
(107)
Flush Switch
FLO2
Low Chemical Level
Dosing Tank
Low Flow Indication
SEG Pump
Belt Command
Reclaim On
Tunnel Controller
SEG Pump
Motor Starter On
SEG Motor
Motor Protector
Off or Tripped
Low Flow Indication
Sand Filter Flush
Spare
REV
DATE
BY
CHANGE
CUSTOMER
Indy Engineering
TITLE
Austere Reclaim System
Base Inputs
AIC PROJECT
AG0218-2
CUSTOMER PROJECT
Austere V2
DRAWN BY
TM
SCALE
NTS
DATE
2/12/2020
Applied Intelligence Corporation
Indianapolis, Indiana
SHEET
2 OF 6
DRAWING NUMBER
Austere-02-V2.DWG





REV	DATE	BY	CHANGE
CUSTOMER	Indy Engineering		
TITLE	Austere Reclaim System Base Outputs		
AIC PROJECT	AG0218-2	CUSTOMER PROJECT	Austere V2
DRAWN BY	TM	SCALE	NTS
DATE	2/12/2020		
Applied Intelligence Corporation Indianapolis, Indiana			
SHEET	3 OF 6	DRAWING NUMBER	Austere-03-V2.DWG

4 01

4 02

4 03

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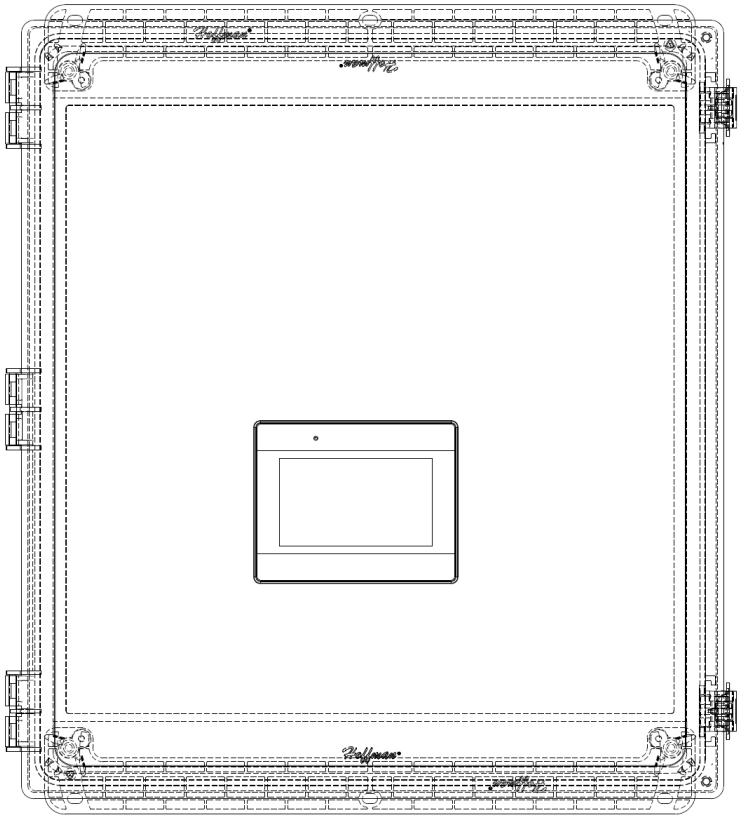
REV	DATE	BY	CHANGE

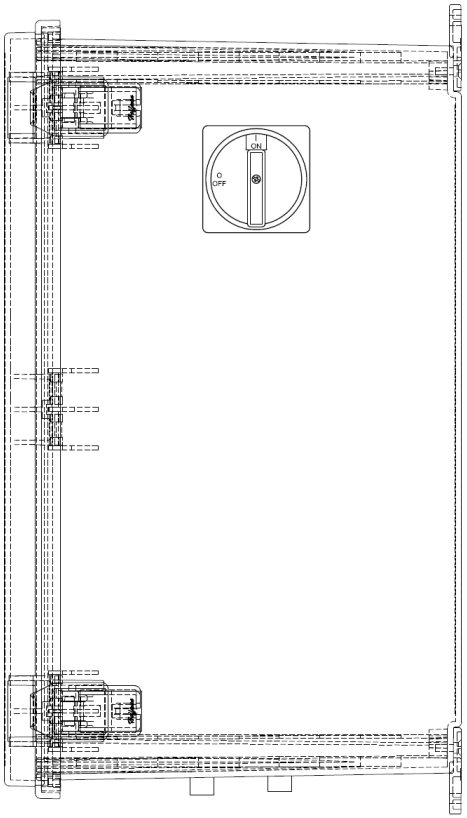
CUSTOMER	Indy Engineering	
TITLE	Austere Reclaim System Spare Sheet	
AIC PROJECT AG0218-2	CUSTOMER PROJECT Austere V2	
DRAWN BY TM	SCALE NTS	DATE 2/12/2020

Applied Intelligence Corporation
Indianapolis, Indiana

SHEET 4 OF 6	DRAWING NUMBER Austere-04-V2.DWG

Item	Qty	Part Number	Description	Manufacturer	Device List
1	1	194LE251753	Load Switch, 25A, 3 Pole	Allen Bradley	DISC1
2	1	194LHE6N175	Handle, On-Off, Red/Yellow	Allen Bradley	DISC1
3	1	MT8050iE	HMI, 4.3" Color	Rohtek	HMI1
4	1	A181610PHC	Enclosure, Polyester	Hoffman	
5	1	A18P16G	Enclosure Back Panel	Hoffman	
6	1	SS5Y3200400T	Manifold, 4 Station	SMC	
7	3	SY31205LZN7	Solenoid, 24VDC	SMC	SOL A/B, SOL C
8	3	SY100304A10	Cable, 1M	SMC	
9	1	SY3000-26-9A	Blank Station Kit	SMC	





REV	DATE	BY	CHANGE

CUSTOMER: Indy Engineering

TITLE: Austere Reclaim System
Panel Layout and Bill of Materials

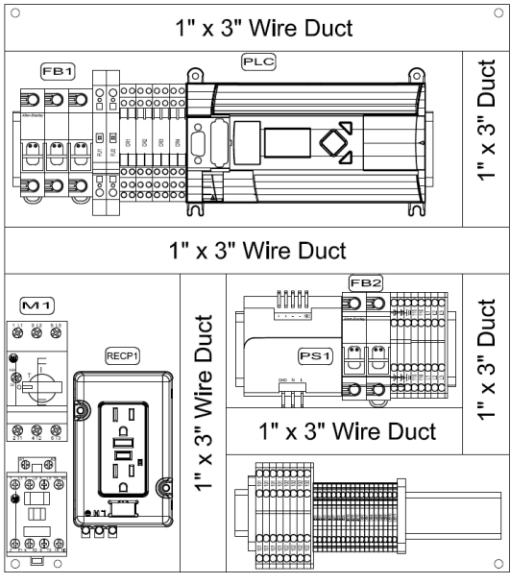
AIC PROJECT	CUSTOMER PROJECT
AIC0218-2	Austere V2

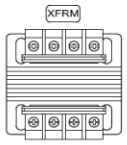
DRAWN BY	SCALE	DATE
TM	NTS	2/12/2020

Applied Intelligence Corporation
Indianapolis, Indiana

SHEET	DRAWING NUMBER
5 OF 6	Austere-05-V2.DWG

Item	Qty	Part Number	Description	Manufacturer	Device List
1	1	1766L32BXB	Micrologix 1400, 20 DC In, 12 DC Out, 24VDC Input	Allen Bradley	PLC1
2	1	1606XLP100E2	Power Supply, 480VAC, 2-Phase, 24VDC, 4.2A	Allen Bradley	PS1
3	1	100C09EJ10	Contactor, 9A, 24VDC Coil	Allen Bradley	M1
5	1	140MC2EB63	Motor Protector, 4-6.3A	Allen Bradley	MCOP1
6	1	140MCPEC23	Motor Contactor/Protector Connector	Allen Bradley	
7	1	140MCASA11	Auxiliary Contact, 1NO, 1 NC	Allen Bradley	MCOP1
8	1	CHCC3DU	Fuse Holder, 3 pole, Type CC fuse, 600V AC/DC	Bussmann	FB1
9	2	1492-RAFB424	Fuse Holder, 1 pole, LED Indicator	Allen Bradley	FU1, FU2
10	3	LPCC 15A	Fuse, 15A	Bussmann	FB1
11	1	AGC 2A	Fuse, 2A	Bussmann	FU1
12	1	AGC 1/2A	Fuse, 1/2A	Bussmann	FU2
13	13	1492-L3Q	Terminal Block, Spring Clamp, 1-circuit, 4-point	Allen Bradley	
14	3	1492-LG3Q	Terminal Block, Spring Clamp, Feed Through Ground	Allen Bradley	
15	29	1492-L3	Terminal Block, Spring Clamp, 1-circuit, 2-point	Allen Bradley	
16	2	1492-EBL3Q	End Barrier for L3Q Terminal	Allen Bradley	
17	1	1492-EBL3	End Barrier for L3 Terminal	Allen Bradley	
18	12	1492-ERL35	End Anchor	Allen Bradley	
19	6	1492-CJK5	Center Jumper for L Series Terminal	Allen Bradley	
20	A/R	F1X3LG6	Wire Duct, 1X 3	Panduit	
21	1	TR150VA008	Transformer, 480-120 V, 150VA	Functional Devices	XFRM
22	2	FNQR-1-6/10	Fuse, 6/10A	Bussmann	XFRM
23	1	CHCC2DU	Fuse Holder, 2 pole, Type CC fuse, 600V AC/DC	Bussmann	FB2
24	1	1492-REC15	Din Rail Receptacle, 15A, Standard Duplex	Allen Bradley	RECP1
25	4	700-HLT2Z24	Terminal Block Relay, 24 VDC, SPDT, Spring Clamp	Allen Bradley	CR1-CR4





*Mounted on right side of enclosure

REV	DATE	BY	CHANGE
CUSTOMER	Indy Engineering		
TITLE	Austere Reclaim System Panel Layout and Bill of Materials		
AIC PROJECT	AG0218-2	CUSTOMER PROJECT	Austere V2
DRAWN BY	TM	SCALE	NTS
DATE	2/12/2020		
Applied Intelligence Corporation Indianapolis, Indiana			
SHEET	8 OF 6	DRAWING NUMBER	Austere-06-V2.DWG

APPENDIX 3 – REPLACEMENT PARTS LIST

Part Name	Description	Part Number	Quantity
Controller			
Reclaim Pump	Grundfos SEG.A15.40.2.60H Pump P/N 98280877		1
Lifting Chain	13 Foot Stainless Steel Lifting Chain P/N 98989666		1
Auto Coupler Kit 2"	Auto Coupler 2" Kit P/N 98245790		1
~~SEG Foot Kit~~	~~SEG Foot Kit P/N 96076196~~		~~1~~
Intermediate Rail Bracket	Intermediate Rail Bracket P/N 96887609		1
Dosing Pump	DDE 6-10 PR-PVC/V/C-X-31I003BG	P/N 98147341	1
Dosing Pump Cable	4 Pole M12 5M cable socket 2+4	P/N 9660916	1
Sika Flow Switch	SIKA Flow Switch VK306M2P1CPP3K		1
1.5 inch ASCO 8290	ASCO 8290A021		2
2.0 inch ASCO 8290	ASCO 8290A034		1
Air regulator	Filter / Air Regulator	P12B-02G	1
Air Reg Mounting Bracket	Air Regulator Mounting Bracket	PK-12	1
Dietz Pressure Switch	Dietz Pressure Switch 5-30 psi D30001		1
Connector	Cannfield Connector (P/N 5F681000US0A)		1
Pressure Gauges	2" 0-100 psi P/N 202L-204E-Express		3
Micro Bubbler Disk	FLEXAIR 9” Fine Bubble Diffuser ($23.00 each)	P/N 32186	2
Air Flow Meter 0-10 CFM	King 0-15 SCFM Flow Meter	7205007222A	1
Reclaim Flow Sight Gauge	King 4-40 GPM 316 SS Flow Meter	7205020131W	1
Float 6.0 ball	9775K16		
Multi-Layer Sand Filter	15 cubic foot sand filter	WS2AQMM1500HL	
Globe Valve	1.5 Inch Stainless Steel		
Jobe Valve	1 inch Topaz Standard		

- APPENDIX 4 – RECLAIM SYSTEM DATA LOG