MAX·Q+

MODULAR SYSTEMS

USER MANUAL & INSTALLATION GUIDE

1/ GENERAL

Congratulations on joining an elite group of like-minded boat and yacht owners, who value their investment and have chosen the industry's most reliable and advanced marine reverse osmosis system available. A great deal of time and effort has been put into the design and manufacture of your new FCI Watermakers desalination system. Please take time to read this entire manual and familiarize yourself with its operation. It will benefit you by insuring long trouble-free operation.

Thank you for purchasing FCI Watermakers Reverse Osmosis System. Your choice of FCI Watermakers proves that quality, craftsmanship and performance do matter. The system you have chosen is of the highest quality, and it is the most advanced watermaker available today. Over 25 years of experience of engineering and extensive lab testing has gone into the design of your watermaker. In fact many industry standards are a result of innovations made by FCI Watermakers, including one-touch commands, multiple station operation, remote system control, touchscreen displays, and automated pressure control. Each component was chosen for its ability to withstand the marine environment and to provide a lifetime of trouble-free operation. Design considerations included noise, size, ease of use and simple maintenance. Its open-frame construction allows quick, easy inspections, and it aids in shipboard or land-based maintenance without having to move the system from its location.

The intent of this manual is to allow the operator to become familiar with each component of the reverse osmosis system. By understanding the function, importance, and normal operation of each watermaker module, the operator can readily diagnose minor problems. When such problems first arise, they usually require minor maintenance and the issue is easily corrected. However, if left unattended, a problem in one component may eventually affect the rest of the system and it could lead to further repairs.

FCI Watermakers systems use non-proprietary membranes that are readily available worldwide, and the systems are designed to be more tolerant of water conditions. Your vessel travels around the world and encounters water that varies in both salinity and particulate. FCI utilizes low RPM components that allow full function operation in these conditions.

FCI has the most comprehensive warranty on the market. The Max•Q^{+} system is covered for one year on all non-consumable parts. A copy of our warranty is included in this manual. Please read and familiarize yourself with it.

PREFACE

We are committed to customer service that exceeds your expectations. If at any time you have questions about what's covered in this manual, our hands-on technical support will never leave you adrift. This manual contains technical information & instructions for the installation, operation, maintenance, and troubleshooting for FCI Watermakers Desalination Systems. Anyone responsible for the installation, operation, and maintenance of a FCI Watermakers Desalination System must read and understand the contents of this manual, and comply with these instructions, guidelines and safety requirements at all times.

The term *system* will be used throughout this manual, and it generally refers to the FCI Watermakers System. Reading this manual in its entirety will familiarize you with the system and the operation of its components. By understanding the system in its entirety, one can readily operate and diagnose problems.

All references within this manual refer to other sections unless specifically defined. Graphics and illustrations are used for reference only and may not represent the actual part or arrangement of parts in a customized system.

ABOUT SAFETY NOTES

Safety issues requiring users attention are highlighted throughout this manual as follows:

WARNING:
Provides critical information in order to prevent the possibility of injuries and/or death.

CAUTION:
Provides important information to prevent the possibility of damaging the device or equipment.

NOTE:
Provides additional information to safely and properly operate the equipment.

NEW SYSTEM PERFORMANCE

Although each system has been fully tested prior to shipping, there will be a break-in period. During this period, approximately 48 hours, the pumps and membrane performance will change or settle. Small adjustments will need to be made to the high-pressure valve and the water quality and quantity will vary. For installations without APC, the high-pressure valve will need to be increased (turned clockwise) and the water quality produced will improve over this break-in period. For systems with APC, this adjustment will be automatic.

GLOSSARY OF TERMS

Following terms are helpful in becoming familiar with a FCI Watermakers Reverse Osmosis System.

BOUNDARY LAYER / CONCENTRATION POLARIZATION
When water permeates through the membrane, nearly all the salt is left behind in the brine channel. In any dynamic hydraulic system, the fluid adjacent to the wall of the vessel is moving relatively slow. Even though the main body of the stream is turbulent, a thin film adjacent to the wall (membrane) is laminar. This thin film is called the boundary layer.

If the feed water flow is insufficient, the salts are saturated at the boundary layer and can readily adhere to and pack into the R.O. membrane element surface. For this reason, it is important to maintain sufficient feed water flow through the R.O. membrane element and prevent concentration polarization.

BRINE VELOCITY
The brine velocity, or flow, over the membrane surface is very important to both product water quality and quantity. At low flows, concentration polarization occurs, causing the water quality to decline.

In addition to inferior product water quality, low brine flows can increase the precipitation of sparingly soluble salts. The salts will foul the R.O. membrane element surface (concentration polarization). If this occurs, the product water flux (production) will decline.

The feed pump integrated design provides a relatively smooth and continual flow of feed water across and through the R.O. membrane element.

COMPACTION
Some densification of the membrane structure may take place while operating at elevated pressures, above 1000 PSI. The change is known as compaction and is accompanied by a reduction in the water permeation rate.

When the R.O. membrane element is subjected to elevated pressures beyond 1000 PSI, the product water channel becomes squeezed, resulting in restriction and product water recovery reduction.

OSMOTIC PRESSURE
The transfer of the water from one side of the membrane to the other will continue until the head (pressure) is great enough to prevent any net transfer of the solvent (water) to the more concentrated (feed water) solution.

At equilibrium, the quantity of water passing in either direction is equal, and the head pressure is then defined as the “osmotic pressure” of the solution having that particular concentration of dissolved solids.

PRESSURE
The operating pressure has a direct effect on product water quality and quantity. Both factors will increase as the system pressure increases (within design limits).

The system must be operated at the lowest pressure required to achieve the designed product water flow rate. This parameter also minimizes compaction, which occurs faster at higher pressures and temperatures.

At low temperatures or high salinity feed water, the system will have to operate at higher than normal pressure to maintain the specified amount of product water flow. This is normal and is due to the design characteristics of the system.

SPIRAL-WOUND MEMBRANE
The spiral-wound membrane consists of multiple membrane envelopes, each formed by enclosing a channelized product water carrying material between two large flat membrane sheets. The membrane envelope is sealed on three edges with a special adhesive and attached with the adhesive to a small diameter pipe.

A polypropylene screen is used to form the feed water channel between the membrane envelopes. A wrap is applied to the membrane element to maintain the cylindrical configuration. The center tube is also the permeate (product water) collecting channel. Several elements may be connected in series within single pressure vessel or multiple pressure vessels.

WATER TEMPERATURE EFFECT
The product water flow through the membrane is significantly affected by the water temperature. At any given pressure, this flow increases with increasing water temperature and is reduced at lower temperatures. The system pressure will need to be adjusted to maintain a precise amount of product water flow. For systems with APC, this adjustment will be automatic.

LIMITED WARRANTY

This policy will define, in detail, what is and is not covered under warranty. It will also define how to obtain warranty service and approval.

FCI Watermakers warrants that consumer systems perform according to the specifications for a period of one year from the date of the date of shipment. FCI Watermakers is not, under any circumstances, liable for any damages arising out of or in any way connected with the failure of the system to perform as set forth herein. This limited warranty is in lieu of all other expressed or implied warranties, including those of merchantability and fitness for a particular purpose. This warranty is extended to the original owner / purchaser of record and is not transferable.

NOTE: Warranty registration is required to activate your warranty. Please be sure to fill out the registration included in this manual and provide a copy to FCI Watermakers, Inc.

1.0 WARRANTY PERIOD

1.1 The following items are covered under warranty for the periods designated:

Max•Q^{+} and Max•Q^{+APC} Systems:	
System and Accessories	1 (one) year from the date of shipment of the System
Pressure Vessel Tubes	Lifetime
Repairs after warranty	3 (three) months

1.2 The following items are considered normal user maintenance and are NOT covered under limited or implied warranty:

1. Sea Strainer Element
2. Cartridge Filter Elements
3. Pump Packing Assemblies
4. Pump Seal Assemblies
5. Pump Valve Assemblies
6. Pump Crankcase Oil
7. Gauge Instrument Calibration
8. Fuses
9. Valve Seals and Packings
10. Exterior Corrosion
11. Membrane Elements

1.3 Installation of components not supplied by FCI Watermakers, is not covered by this or any limited warranty.

1.4 System failure or component failure or decline in performance as a result of improper installation is not covered by this or any limited warranty.

1.5 The Reverse Osmosis Membrane Elements are not covered under warranty for any specific period by FCI Watermakers. Any misuse or improper operation or maintenance of the system that causes premature fouling of the Membrane Element is not under warranty. The warranty does not cover a Membrane Element which has been subject to: iron fouling (rust), chemical or petroleum products attack, extreme temperatures (over 120°F or under 32°F), drying out or extreme pressures (over 1000 psi).

1.6 In the event of a defect, malfunction or failure, specifically covered by this warranty and during the warranty period, FCI Watermakers will repair or replace, at its option, the product or component therein, which upon examination by FCI Watermakers appears to be defective.

2.0 PROCEDURE FOR OBTAINING WARRANTY

2.1 The defective product or part must be returned to an authorized FCI Watermakers Factory Service Center (dealer) or directly to FCI Watermakers. The end user must pay any transportation and labor expenses incurred in removing and returning the product to the service center or FCI Watermakers, pending evaluation and warranty approval.

3.0 EXCEPTIONS AND LIMITATIONS

3.1 The limited warranty does not extend to any system or system component which has been subjected to alteration, misuse, neglect, accident, improper installation, inadequate or improper repair or maintenance or subject to use in violation of instructions furnished by FCI Watermakers, nor does the warranty extend to components on which the serial number has been removed, defaced or changed.

3.2 FCI Watermakers reserves the right to make changes or improvements in its product, during subsequent production, without incurring the obligation to install such changes or improvements on previously manufactured equipment.

3.3 The implied warranties, which the law imposes on the sale of this product, are expressly LIMITED in duration to the time period above. FCI Watermakers Corp. shall not be liable for damages, consequential or otherwise, resulting from the use and operation of this product, or from the breach of this LIMITED WARRANTY.

CAUTION: Use of non FCI Watermakers supplied parts and accessories, including but not limited to maintenance parts, pre-filter elements, membranes, cleaning and storage chemical, pump oil, spare parts, replacement parts, system components, installation components and/or system accessories, shall void all warranty expressed or implied.

WARRANTY REGISTRATION

INSTRUCTIONS: At the time of purchase of the FCI Watermakers system, please complete the warranty information listed below. After completing this form, please make a copy and submit the copy using one of the options at the bottom of the page— Keep this copy in your manual for future reference.

SYSTEM INFORMATION:
Model #
Serial #
Operating Voltage:

Date Purchased:

Date Commissioned:

DEALER INFORMATION:
Dealer Name:
Address:
City: State:
Country: Postal Code:
Dealer Invoice #:

CUSTOMER INFORMATION:
Customer Name:
Address:
City:
State: Postal Code:
Country:
Phone: Fax:
E-mail:

VESSEL INFORMATION:
Boat Manufacture:
Boat Model:
Boat Name:
Boat Length:

LAND BASED INFORMATION:
Installation site:
Site Name: (resort, company etc)

Application:

Operator Contact Information:
(person in charge of system maintenance and operation)
Name:
E-mail:
Phone:

COMMERCIAL APPLICATION:
Rig Name:
Rig Location:
Operator Name:
Operator E-mail:

Mail a copy to:

FCI WATERMAKERS, INC
ATTENTION: WARRANTY REGISTRATION
3782 W 2340 S, STE E
WEST VALLEY CITY, UT 84120-7291 USA

E-MAIL: info@fciwatermakers.com
Subject: Warranty Registration

FAX: +1-801-883-9985

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FCI CONTACT INFORMATION

If you have questions regarding your FCI Watermakers system or the contents of this manual, or if you need replacement parts, please do not hesitate to contact us immediately. Our hands-on technical support is always at your service.

FCI WATERMAKERS, INC.
3782 W 2340 S, STE E
WEST VALLEY CITY, UT 84120-7291

phone: 801 906 8840
fax: 801 883 9985
e-mail: info@fciwatermakers.com

fciwatermakers.com

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GENERAL INFORMATION

FCI watermakers are the most advanced desalinating systems available, which produce potable water from seawater or brackish water. For over a twenty years, FCI Watermakers, Inc. has pioneered technology and innovated features that have become standards for today's desalinators: one-touch commands, multiple station operation and remote system control and monitoring, touchscreen displays, and automated pressure control. As both engineers and craftsmen, we specialize in high-performance, value-driven watermakers and are proud of the thousands of continuously operating units that have been cruising the globe for decades.

At FCI Watermakers, our commitment and attention to detail transcends beyond materials and construction. Things that are seemingly trivial are never overlooked. For instance, your system's specifications formulate the Model Number. It is comprised of the Series, GPD, Voltage, and options of the unit:

A	B	C	D	E	F	G
MQM	7	2	6	3	+	APC

A	B	C	D	E	F	G
Series MQM: Max·Q Modular System	GPD 7: 700 12:1,275 18:1,850	Voltage 1: 120VAC 2: 240VAC 3: 380VAC 4: 480VAC	Hertz* 5: 50Hz 6: 60Hz	Phase BLANK: Single 3: Three	Plus +: V4 Control System	Options: BLANK: Standard APC: Automatic Pressure Control

Your FCI Reverse Osmosis Desalination System is designed to provide lasting performance using high-grade materials and uncompromising engineering. FCI systems utilize high-grade alloys in critical components, where competing brands often use inferior material that compromise system operation and jeopardize the vessel.

NEW SYSTEM PERFORMANCE

Although each system has been fully tested prior to shipping, there will be a break-in period. During this period, approximately 48 hours, the pumps and membrane performance will change or settle. Small adjustments will need to be made to the high-pressure valve. The water quality and quantity will vary. For a typical installation, the high-pressure valve will need to be increased (turned clockwise) and the water quality produced will improve over this break-in period. For systems with APC, this adjustment will be automatic.

THEORY OF OPERATION

The process of reverse osmosis (R.O.) represents the finest level of liquid filtration available today. Though the term sounds mysterious, reverse osmosis isn't really that complicated.

Reverse osmosis is a process in which a semipermeable membrane is used to separate fluids of various qualities into a highly saturated concentrate (brine) and a high quality permeated fluid low in dissolved solids. The separation is accomplished by passing the fluid across the membrane at a specified pressure and velocity (*Figure 1*). The membranes contain pores which approximate two hundred molecular weight in diameter. This allows the fluid and approximately one to two percent of the solids to pass through and be collected for storage. The concentrated solution (brine) unable to pass through the membrane is then processed out of the system. Unlike standard filtration where contaminates continually build up on the filter surface area and gradually decrease the filtering capabilities of the system, reverse osmosis filtration systems provide a self cleaning system by allowing the unfiltered fluid to continuously pass across the membrane surface, removing the contaminants as a concentrated solution, and preventing surface fouling.

Typical applications for reverse osmosis are the purification of seawater, waste water, brackish well water, and city water. However, as the industry grows many more applications are being implemented and researched, many of which have nothing to do with water purification. Presently this technology is being expanded to include gas separation in the oil industry, protein concentration, brew, wine and food processing, maple syrup production, dairy processing, removal of cholesterol from butter, undesirable bacteria removal, undesirable pyrogen removal from I.V.'s, etc. As the market expands the industries future prospects are excellent and should continue to expand well into the next century.

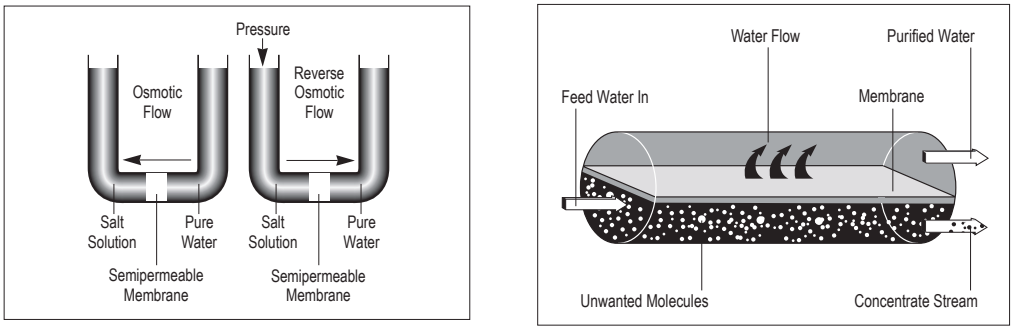


Figure 1: R.O. Process

SEMIPERMEABLE MEMBRANES

Reverse Osmosis Membranes are a spiral wound filtration system using alternating semipermeable and permeable materials to process and separate the product fluid from the concentrate solution. Their filtration capabilities and application are dependent on several factors: chemical composition of the fluid to be filtered, properties of the semipermeable material required due to this composition, fluid temperature, operating pressure, total dissolved solids to be removed, as well as several other small factors. The filter size or permeate flow rates are determined as a function of the square foot of semipermeable material used in the membrane, as well as the factors described above. The typical rejection rate of reverse osmosis filters is 90 to 99.9 percent of Sodium Chloride, as well as many other impurities. This constitutes an excellent utilization of available water resources for large scale water purification requirements. Filter sizes for both commercial and residential applications generally range from 2" X 12" to 8" X 40". These sizes will meet almost all applications in today's water purification industry.

TYPICAL MEMBRANE ELEMENT

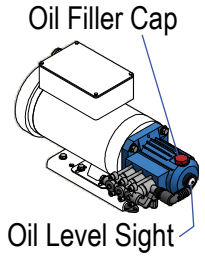
The typical membrane element has the following properties:

- Semipermeable Materials
- Thin Film Composite (TFC)
- Chlorine sensitive, chlorine must be removed up stream of the membrane
- Bacteria resistant
- pH range is 3.0 to 11.0
- Highest water production rate of all reverse osmosis membranes

2/ PRE-INSTALLATION

This section provides key information for a successful install, leading to long-term enjoyment of your FCI desalination system. It includes warnings, cautions and notes associated with the preparatory work necessary to properly install and maintain your watermaking system.

The FCI Watermakers system is supplied with an installation kit which includes an assortment of hoses needed to install the system. Because of the various options with regard to location, voltage and optional accessories, wire is not provided with the system and some installations will require additional hose. Please contact your local dealer for these supplies. Be sure to follow all local codes when installing your new FCI watermaking system.



Always use genuine FCI approved parts to ensure proper operation of your watermaker.

The high-pressure pump ships with oil and is ready to run. Should you need to add oil, be sure NOT to over fill the pump. With the oil fill plug removed, oil will not be visible through the opening—this is normal. The correct level is the middle of the sight glass.

PRE-INSTALLATION PRECAUTIONS

STORAGE PRIOR TO REMOVAL FROM CRATE

Adhere to crate markings:

- **DO NOT store in direct sunlight;**
- **DO NOT store above 120° F (50° C);**
- **DO NOT freeze;**
- **DO NOT store longer than 4 months without flushing with storage chemical;**
- **STORE ONLY on base with ARROWS UP.**
- **KEEP THE R.O. MEMBRANE ELEMENT WET AT ALL TIMES.**

REVERSE OSMOSIS MEMBRANE ELEMENT IS SUSCEPTIBILITY TO CHEMICAL ATTACK

CAUTION: Do Not expose the FCI Watermakers system to intake Feed Water from any chemical, not approved in writing by FCI Watermakers or any of the following chemicals:

- **Hydrogen peroxide**
- **Chlorine dioxide**
- **Bromine phenolic**
- **Chloramines**
- **Hypochlorite**
- **Bromide**
- **Chloramines-T**
- **Chlorine**
- **Disinfectants**
- **N-chlorioisocyanurates**
- **Iodine**
- **Petroleum products**

USE OF NON-AUTHORIZED OR MISUSE OF AUTHORIZED CHEMICALS VOIDS SYSTEM WARRANTY

Do not connect any water line to the system that may contain any of the aforementioned chemicals. Example: Do not connect the inlet of the system to the ship's potable water system if the ships system contains chlorinated or brominated water. These chemicals destroy the copolymer components within the R.O. system. These oxidants and others also damage the R.O. membrane element. If equipped, the fresh water flush system can be used to remove chlorine and bromine from the ship's potable water system.

DO NOT PERFORM INSTALLATION UNLESS:

1. **The system feed water sea cock valve is closed.**
2. **The system main electrical disconnect switch is switched OFF, LOCKED, and TAGGED.**
3. **A volt/ohm meter will be necessary.**

WARNING: ELECTRICAL SHOCK HAZARD. The installation procedures expose the installer to HIGH VOLTAGE and electrical shock hazard. Only attempt installation if you are a qualified electrician and only if surrounding conditions are safe.

QUALIFICATIONS

Technicians must have technical knowledge and ability in the following fields:

a) **Electrical, Electronic, Electric Motors and Circuits**
b) **Electromechanical and Mechanical Systems**
c) **Hydraulic and Liquid Pressure and Flow Systems**
d) **Piping and Plumbing Systems**
e) **Water Suction and Pressure Lines**
f) **Thru-Hull Fitting below and above water level**

WARNING: Do not attempt installation, commissioning, troubleshooting, or repair if you are not proficient in the above fields of expertise.

SPECIAL CONSIDERATIONS INSTALLATION CAUTIONS

Do not over tighten PVC fittings. If threaded pipe fittings leak after installation, remove the fitting, clean the mating threads, apply 3 to 4 wraps of Teflon tape to the male threads, apply liquid Teflon pipe sealer sparingly, and thread the parts back together. PVC fittings should only be hand tightened without the use of a wrench. The sea cock valve, in-line pressure gauge (if equipped), sea strainer, rinse-clean inlet valve (if equipped), and low pressure pump should be installed at or below water level. This will aid the low pressure pump in priming.

Always allow hoses and tubes to enter and exit straight from the connection for a minimum of one inch prior to a bend. If stress is placed on the fitting due to a tight bend the fitting will leak and may break.

Avoid skin and eye contact with the membrane packaging solution. In case of skin contact, rinse the skin thoroughly with water. In case of eye contact, flush repeatedly with water and notify a physician immediately. R.O. membrane elements are stored in sodium bisulfite.

NEVER mount liquid-holding component above any electrical or electronic device. Extensive damage to the electronic device will result if liquid enters device during maintenance and or component failure.

CONNECTION LINE CAUTIONS— All connection lines should be as short and straight as possible using minimum fittings. The connection lines must not be kinked.

ACCESSIBILITY CAUTIONS— This is a simple rule: Install the system and its supporting components in an accessible manner. The electrical control display or panel must be accessible for operation and monitoring of the system.

ELECTRICAL POWER REQUIREMENTS— Ensure that the power source is sufficiently sized to provide the correct voltage and cycles during start up and operation. If unsure, please consult with your local installation specialist or qualified electrician.

R.O. MEMBRANE ELEMENT NOTES

CAUTION: Some systems are shipped WITHOUT the reverse osmosis membrane element. This is to accommodate boat builders that will install the system well in advance of commissioning the boat and the system.

DOES THIS SYSTEM HAVE R.O. MEMBRANE(S) INSTALLED OR NOT?

If not, is it your intention to install the R.O. membrane(s) at this time, or do you wish to install them at a later date when the boat is commissioned?

If the R.O. membrane element has been installed, there will be a R.O. membrane element serial number tag attached to the high pressure vessel(s). Find this serial number tag to ensure that the R.O. membrane element(s) have been installed. If the R.O. membrane element serial number tag is missing or does not contain a serial number, then the R.O. membranes are not installed. If the R.O. membrane elements are not installed and you wish to install them at this time, contact FCI Watermakers, Inc. and supply us with your original purchase order number, FCI's invoice number, and this system's serial number.

WARNING: If the reverse osmosis membrane element is not to be installed at this time, ensure that you leave a visible note at the system controller and the front of the control panel informing the end user that:

- **The reverse osmosis membrane elements are not installed.**
- **Contact the factory for the R.O. membrane elements.**
- **DO NOT operate the system without the R.O. membrane elements installed.**
- **Extensive damage will occur if the system is operated without the R.O. membrane elements installed.**

Damage to the system caused by the operation of the system without R.O. membrane elements installed:

- **Is NOT covered by the FCI Watermakers, Inc. warranty.**
- **Is the liability of the installer if the installer did not notify the end user.**
- **Is the liability of the end user if the installer notified the end user that the R.O. membranes were not installed and to not operate the system without the R.O. membrane elements installed.**

Figure 2 introduces the basic components required for the install. Each component plays an important part in the install and is reference throughout this manual.

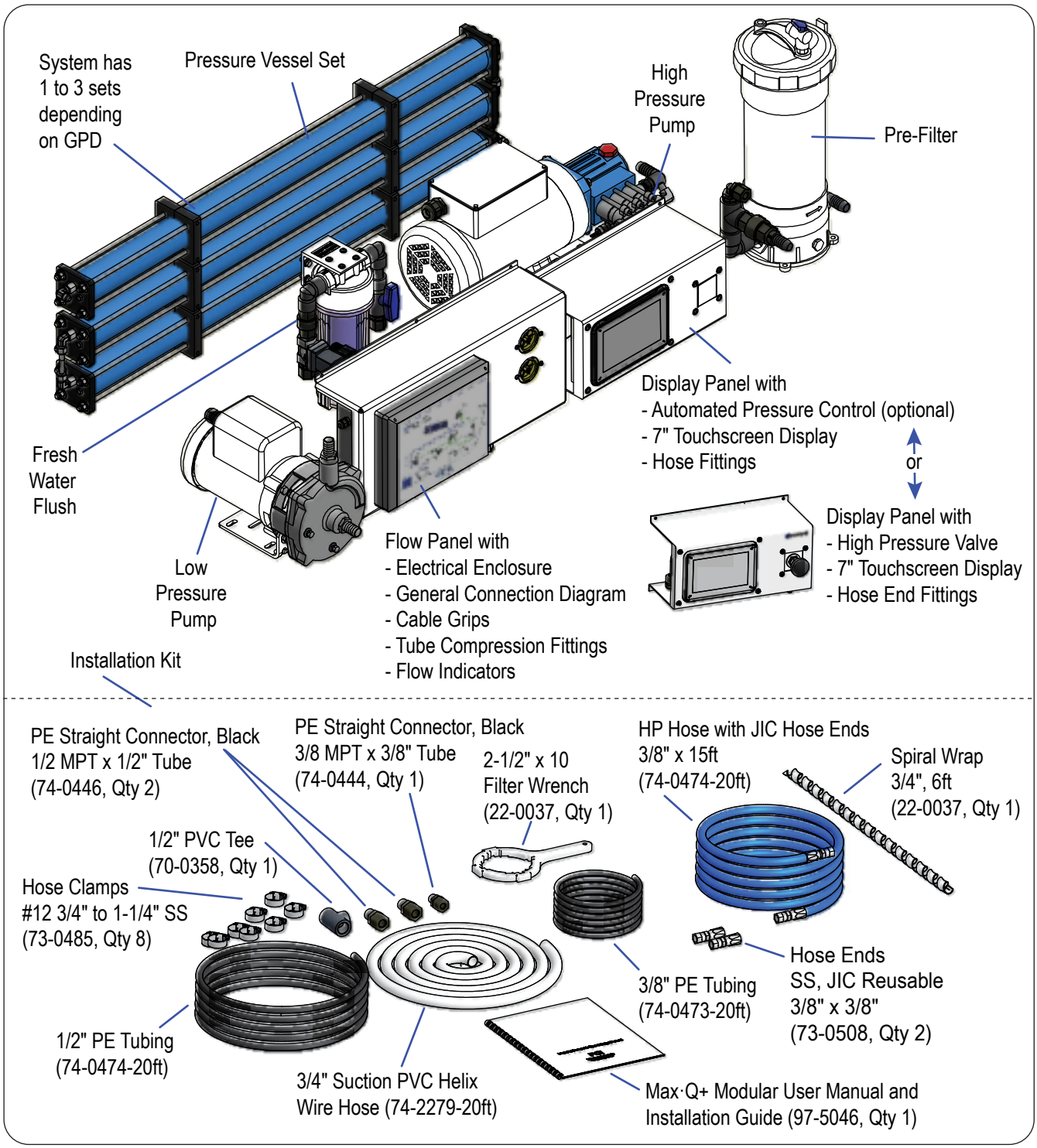


Figure 2: System Components Identification

PIPING & INTERCONNECT DIAGRAM

Figure 3 shows the piping and interconnect of the components, including standard and optional accessory configurations. Determine the pre-filtration and post-filtration components that were supplied with your system, and identify how each component interconnects.

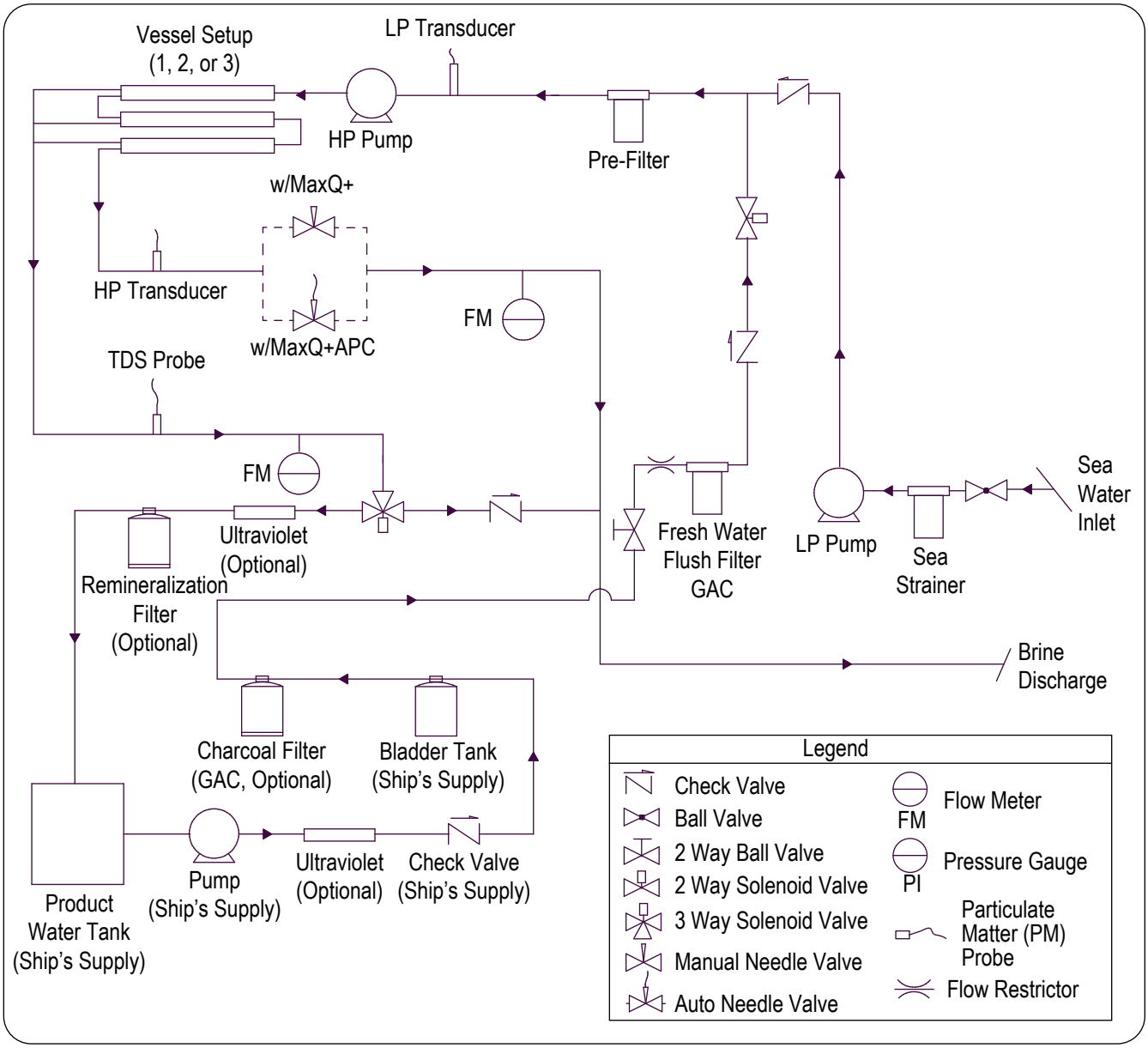
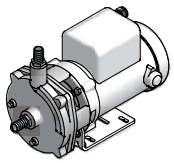


Figure 3: Piping & Interconnect Diagram

COMPONENT DESCRIPTIONS

The standard and optional components are described in this section, and items required for or desired by the installer are listed. The location, operation, and purpose of each major component of your FCI Watermakers system is briefly explained.

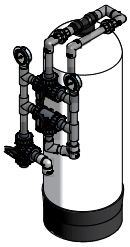
Use of third party, Non-FCI (or unauthorized) components may lead to premature failure, added operating and maintenance costs, and increased labor. Using third party, Non-FCI components may void any and all FCI Watermakers Warranty. We only wish to help you enjoy the luxury of owning a FCI Desalinating System. Treat it properly by using only FCI supplied parts, recommended consumables, and authorized accessories.



LOW PRESSURE PUMP
The low-pressure pump has 1/2 horsepower. Inlet and discharge connections are 3/4" hose. The pump should be mounted at or below the waterline to allow the pump to be flooded. Wiring diagrams are provided on the capacitor cover and in "SYSTEM INSTALLATION / ELECTRICAL CONNECTIONS" on page 51. Wire was not provided with the pump because of unknown distances, and can be provided by the installer or authorized FCI dealer.

> **NOTE: Follow all local codes when wiring the motor. Connection points for the low-pressure pump to the main control can be found in the schematics starting on page 60.**

INLET ACTUATED VALVE (optional)
The actuated valve is comprised of a 2-way union ball valve with an actuated motor drive on top. The valve is equipped with a post on the top that indicates the valve position (open / closed). The actuated valve is used in place of the low pressure pump for installations where the inlet feed is already pressurized.

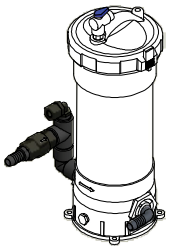


MEDIA FILTER (optional)
For operation with iron or heavy particulate in the feed water, the optional media filter will help remove the contaminants before they damage the high pressure pump or foul the membranes.

The media filter consists of a tank, valve assembly, and pressure gauges. The media is loaded in the tank. The valve assembly is used to set the media filter to *in-service* or *backwash*.

The media filter requires backwashing for 20 minutes on first use and when the pressure across the filter is greater than 15 psi.

It is recommended to replace the media every year.



PRE-FILTER

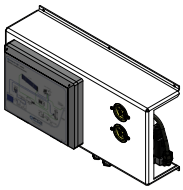
The system comes with one 5 micron, 40-sq. ft. pre-filter. Connections are 3/4" hose barb for the inlet and discharge line and 1/2" tubing compression fitting for the fresh water flush connection.

The filter should be cleaned or replaced when the low-pressure reading reaches 5 PSI or when the system shuts down on low pressure. The filter can be cleaned once or twice before replacing. When cleaning the pre-filter, do not scrub the pleats to the point that the material begins to fray. If fraying occurs, replace element.

NOTE: The pre-filter is your first line of defense protecting the high-pressure pump and membrane. Keeping the filter in good condition will help insure trouble-free operation.

WARNING: PRE-FILTER ELEMENT Do not use third party pre-filter elements, use only FCI pre-filter elements. Third party pre-filter elements do not properly fit and the seams fall apart. They also allow by-pass resulting in extensive and very costly damage to the high pressure pump as well as premature fouling of the R.O. membrane element(s).

CAUTION: PRE-FILTER ELEMENT Do not use "string wound" or "fiber" pre-filter elements. String wound and fiber filter elements are designed for the photographic film developing industry. When used in seawater, they will plug up rapidly in 1/10th or less the time of a FCI supplied pre-filter cartridge element. This will cause frequent shut downs of the system and very frequent changing will result in very high cost of maintenance, and user frustration.

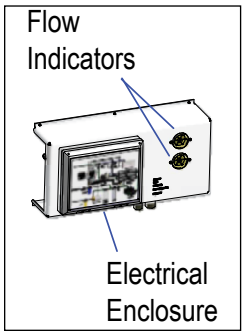


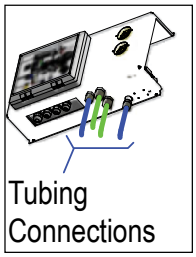
FLOW PANEL

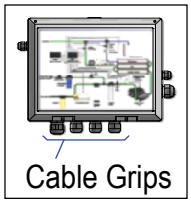
The flow panel provides visual indication of product and brine flow. All electrical connections for the transducers, probes, and motors terminate in the electrical enclosure. Connections for the tubing are made with various sizes of low-pressure compression fittings that do not require any special tools to install.

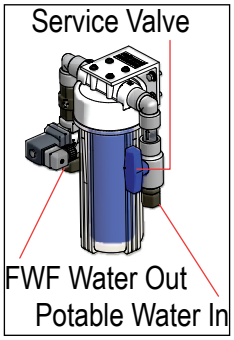
USEFUL AMENITIES

Cable grips are provided for the various wires that will need to be run to the electrical enclosure. You will also find a service valve on the fresh-water-flush assembly to allow you to change the filter without having to shutdown the onboard pressure system.



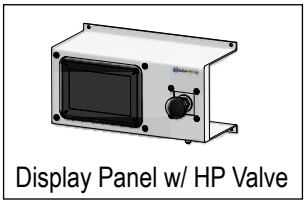


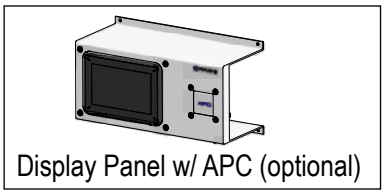


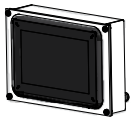


DISPLAY PANEL

The display panel contains the touchscreen display, and the high pressure valve or the optional Automated Pressure Control. Each feature is described in the following paragraphs

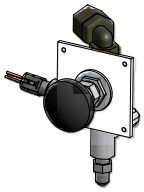

Display Panel w/ HP Valve


Display Panel w/ APC (optional)



TOUCHSCREEN DISPLAY

The 7" display provides touchscreen convenience and at-a-glance monitoring. The display allows you to interface with the V4 Control System, the intelligence that runs the watermaker. While the setpoints (parameters the V4 Control System uses to make decisions) are pre-set at the factory to get you up and going quicker, as you familiarize yourself with your watermaking needs, the system is fully programmable. Also an optional 7" or 4.3" display may be installed for remote operation.

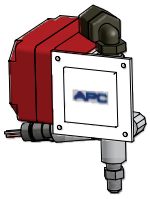


HP VALVE

On standard systems, pressure is regulated manually by the HP valve. When running the system, the HP valve is turned counterclockwise to lower production and clockwise to raise production until the production matches the system's rated output. The system's rated output can be found on the information section of the display.

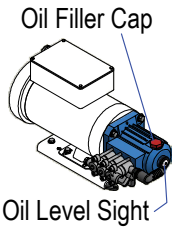
It's important to match the system's rated output for optimum water quality and long membrane lifetime.

The High Pressure Transducer (HPT) is located near the HP valve , and connects with wires to the PC board inside the electronic enclosure.



AUTOMATED PRESSURE CONTROL (optional)

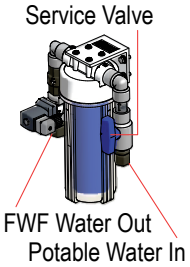
On systems with Automated Pressure Control (APC), the pressure is regulated automatically. The High Pressure Control Valve (HPCV) and the High Pressure Transducer (HPT) are located near the assembly and connect to the PC board with wires.



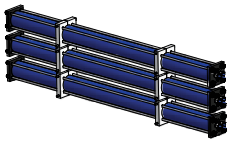
HIGH PRESSURE PUMP ASSEMBLY

The pump and motor is mounted on a base with four vibration mounts. This is a direct drive assembly without belts or pulleys. Oil changes are necessary; the V4 control system will alert you when an oil change is needed. There will be a break-in oil change after approximately 50 hours. Connections for low-pressure inlet water from the pre-filter, and the high-pressure discharge to membrane are made here. Cable connections to the Low Pressure Transducer (LPT) are made here.

COMPONENT DESCRIPTIONS (continued)

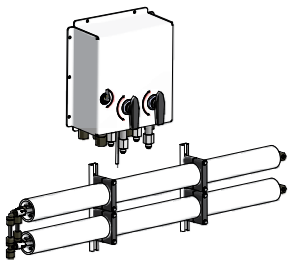


FRESH WATER FLUSH ASSEMBLY
The fresh-water-flush feature of the system allows the system to be flushed with fresh water after each use or on a programmed schedule. Seawater, if left un-flushed, can be more corrosive, promote biological growth and it naturally decays materials. The carbon filter removes particulate, chlorine or bleach from the fresh water holding tank. These elements can be harmful to the membrane. The shut-off, service valve allows the filter cartridge to be replaced without having to depressurize the on-board pressure system.



PRESSURE VESSEL ASSEMBLY
The vessels house the membranes, which are the heart of the system. A system can be equipped with 1, 2 or 3 assemblies depending on the GPD output ordered. If the system is a 700 or 1,275 GPD unit, additional pressure vessel assemblies can be added to increase the output of the watermaker. (Consult your dealer or FCI Watermakers directly to upgrade your system.)

PRODUCT TDS PROBE
This probe measures the total dissolved solids in the product water and sends the measurement to the control system. When water quality is sufficient, the control system diverts the product water to the product water tank.



DOCKSIDE TREATMENT SYSTEM (optional)
While the practice of running dock water through standard seawater systems has been done for some time now, the downside has always been the premature failure of the seawater membranes due to exposure to chlorine, hot water, hard water and various other contaminates that can foul a membrane. The Dockside Treatment System (DTS) allows a boater to run dock water through the watermaker without the risk of damaging the seawater membranes installed on the watermaker. The V4 Control System of the Max•Q^{+} is set up to work with the DTS, should you ever upgrade with the optional accessory.

3/ INSTALLATION

Refer to the outline below for an overview of the installation process and the structure of this chapter.

Each system has its unique environment. To allow for this, the instructions are presented in part by discussion rather than by procedure. Start by reading through this chapter completely, matching the tasks to your environment.

DTS INSTALLATION (optional)
If you are installing the DTS, additional considerations to those presented in this manual will be required. Refer to the instructions provided with the DTS to mount, plumb, and wire the DTS.

COMPONENTS SUPPLIED BY INSTALLER
The first section lists the items not included with the system that you may need to supply for the installation.

DIAGRAMS SHOWING THE COMPONENTS AND LAYOUT
The pages that follow the first section contain diagrams of the system components with their dimensions and footprints. The system layout is also shown in plumbing diagram. The diagrams are used to become familiar with how the parts fit together.

SYSTEM INSTALLATION / MOUNTING
Instructions on mounting the components follow the diagrams. The footprint and layout diagrams of the previous section are available for reference when mounting the system components.

SYSTEM INSTALLATION / PLUMBING
After the mounting instructions, the installation focuses on plumbing. The plumbing connections are listed, referring to the tubes and hoses by letter. The plumbing diagram presented earlier illustrates the tubes and hoses and calls out their letters. A chart within the plumbing diagram describes the connections, tubes, and hoses. The plumbing diagram is available for reference when connecting the plumbing.

SYSTEM INSTALLATION / ELECTRICAL CONNECTIONS
The next task is connecting the electrical wiring. This includes wiring power from the main source to the electrical enclosure contactor blocks, and wiring power from the enclosure's contactor blocks to the pumps. Also, the wiring from the display and FWF solenoid are routed though a cable grip and connected to the PC board located on the back of the enclosure's cover. The optional APC, remote, and inlet actuated valve are likewise wired to the PC board.

WIRING SCHEMATICS
Wiring diagrams and schematics are available for reference when connecting the wiring.

FINAL INSTALLATION CHECKLIST
After completing the installation, a checklist is provided to help you check your work.

COMPONENTS SUPPLIED BY INSTALLER

Most of what you will need to install your system is included in your package. As each system installation varies, not all installation fittings, hose and tubing can be provided. There are a few items that you will need to consider for your individual system.

Select a suitable location for the components and evaluate where you plan to place them. Obtain a good working estimate as to the footage of hose that will be needed and contact your dealer or FCI for the supplies. Table 1 summarizes the specifications for components supplied by installer.

Table 1: Specifications for Components Supplied by Installer

Connection	Specification
Inlet Thru Hull	3/4" minimum
Connection at Inlet Thru Hull	3/4" hose barb
Brine Discharge Thru Hull (If installing optional media filter, the backwash line can tee into the brine discharge line. Add a check valve on the brine discharge line to prevent back flow to the system.)	1/2" minimum at water level
Connection at Brine Discharge Thru Hull	1/2" tubing
Connection at Ship's Unpressurized Potable Water Storage Tank	3/8" tubing compression fitting x 3/8" NPT
Connection at Ship's Pressurized Water Supply	1/2" tubing compression fitting x 1/2" NPT
Incoming Power	120VAC, 240VAC, 380VAC, or 480VAC, 50/60 Hz as listed on system's serial number plate
Incoming Wire Size	Per local electrical specifications
Current Draw (Actual current draw will vary with incoming power conditions)	28.4 A (120VAC, single phase systems)
	14.2 A (240 VAC, single phase systems)
	10.4 A (240 VAC, three phase systems)
	6.3 A (380 VAC, three phase systems)
	5.1 A (480 VAC, three phase systems)

COMPONENTS SUPPLIED BY INSTALLER

CAUTION: All fittings, valves, and piping installed prior to, within, and after the system must not contain iron. If the resulting failure of the R.O. membrane element is attributed to improper installation, it is the liability of the installer.

1 *Inlet Thru Hull Fitting with Forward Facing Scoop and Shut-off Valve:* The inlet thru hull fitting must be minimum 3/4" and dedicated to only the FCI system. It is important that the installer utilizes a forward-facing scoop so that the system receives a positive flow of water as the boat is under way. The fitting must be installed on the boats hull in a position that provides continual feed water flow without air to the system.

CAUTION:

- **A flush inlet thru-hull fitting will cause a vacuum as the boat is under way, and this will cause loss of feed water flow and cavitation of the pumps, resulting in continual system shut down.**
- **The FCI Watermakers System must receive an uninterrupted supply of feed water without air.**
- **The FCI Watermakers System must not be tied into another existing auxiliary water line already supplying another accessory on the boat.**
- **If the FCI Watermakers System is connected to a sea chest or stand pipe, DO NOT plumb the FCI Watermakers System feed line to the top of the sea chest or stand pipe. Plumb the FCI Watermakers System to the bottom of such feed-water arrangements to ensure a continual air-free supply of feed water to the system.**

2 *Connection at Inlet Thru Hull* is 3/4" barb.

3 *3/4" Sea Strainer*

4 *Brine Discharge Thru Hull* is 1/2" minimum at or above water level.

If installing the optional media filter, the backwash line can tee into the brine discharge line. Add a check valve on the brine discharge line to prevent back flow to the system.

5 *Connection at the Brine Discharge Thru Hull* is 1/2" tubing.

6 *Connection at the Ship's Unpressurized Potable Water Storage Tank:*
3/8" tubing compression fitting x 3/8" NPT. In order to avoid problems such as reverse flow from the tank to the system and chlorination attack of the R.O. membrane element, the fitting must terminate above the maximum water level.

WARNING: No valves should be installed in this line. A blockage or closed valve in the product water line will cause extensive damage to the system and R.O. membrane element.

7 *Connection at the Ship's Pressurized Water Supply:*
1/2" tubing compression fitting x 1/2" NPT.

8 *Circuit Breaker with appropriate Amperage Rating*:
Consult your local electrician for proper size.

NOTE Actual current draw will vary with incoming power conditions.

9 Properly sized *Power Cables*. Consult local regulations for proper sizing.

10 *Electrical Power Source* capable of delivering the required constant voltage and cycles during start up and operation of the system:
120VAC, 240VAC, 380VAC, or 480VAC, 50/60 Hz as listed on system's serial number plate.

Match the components included with the Max•Q+ installation kit to the items listed in *Figure 4*.

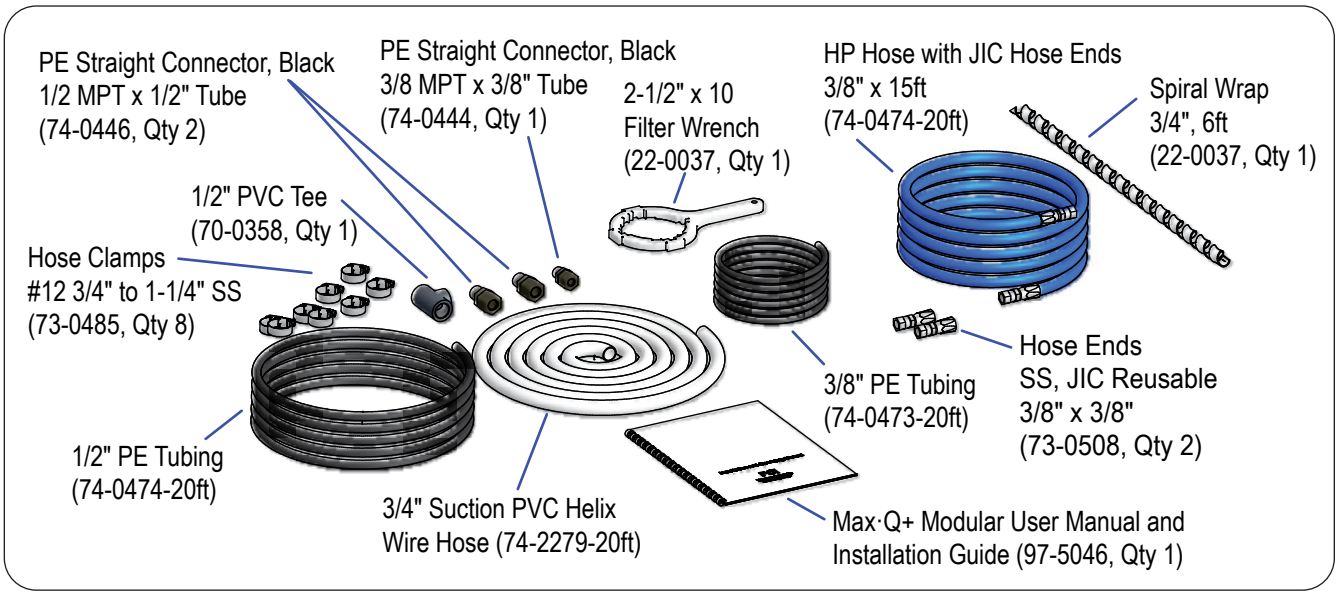


Figure 4: Components with Max•Q+ Installation Kit

Dimensions and footprints of the systems components are shown in *Figure 5* to Figure 13. Refer to the figures appropriate to your system components when planning where to mount the components. Planning considerations are discussed in "SYSTEM INSTALLATION / MOUNTING" on page 45.

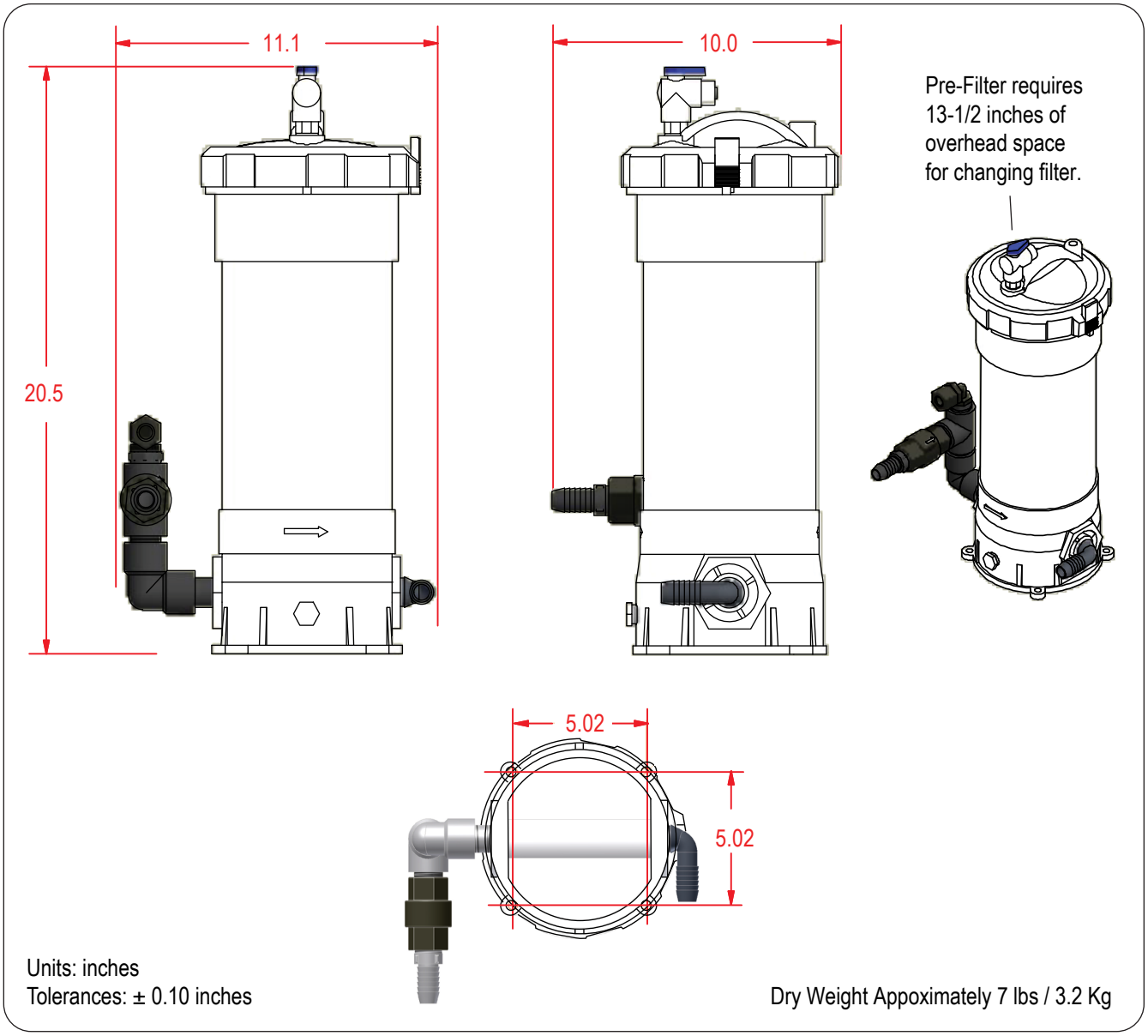


Figure 5: Dimensions, & Footprint for Pre-Filter

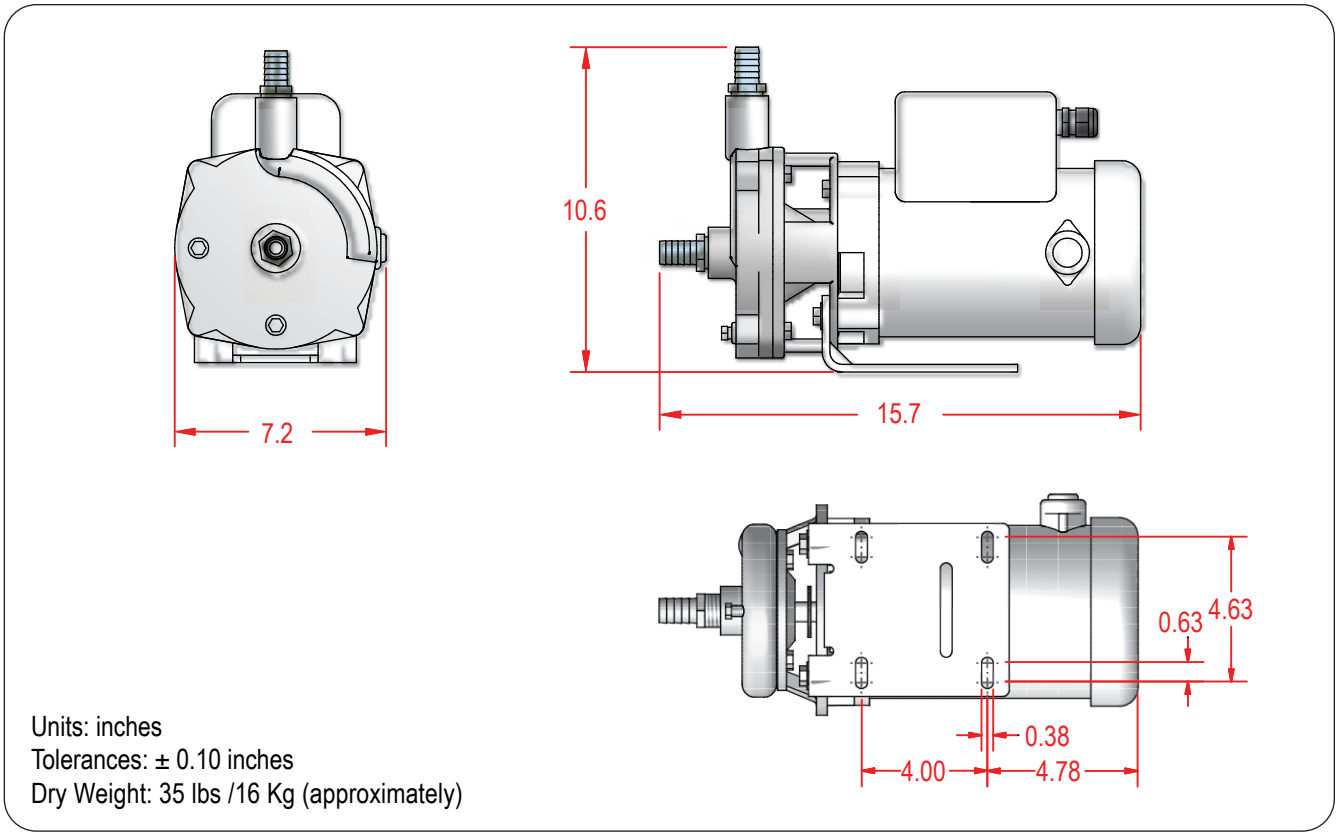


Figure 6: Dimensions, & Footprint for Low Pressure Pump

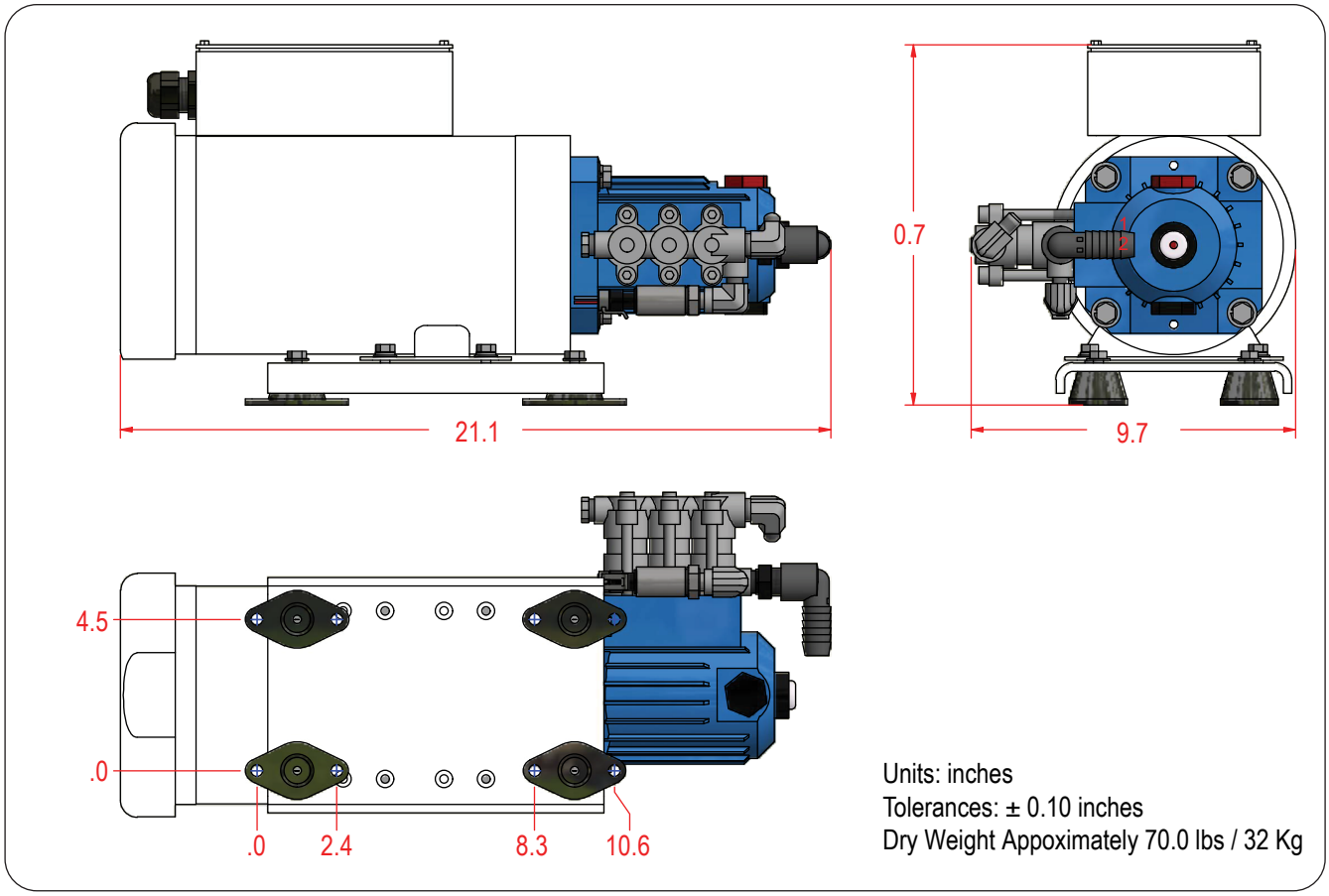


Figure 7: Dimensions, & Footprint for High Pressure Pump

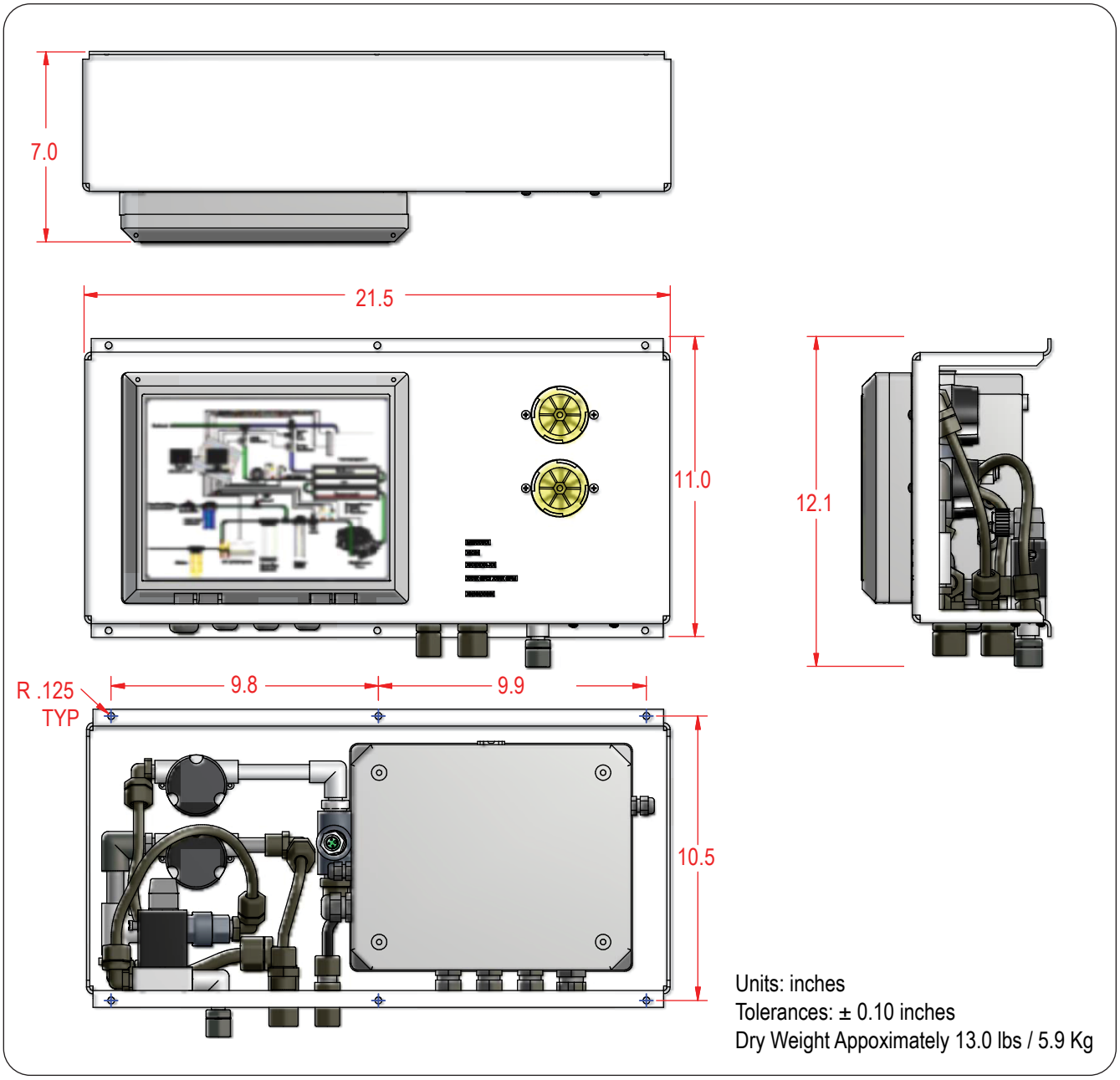


Figure 8: Dimensions & Footprint for Flow Panel

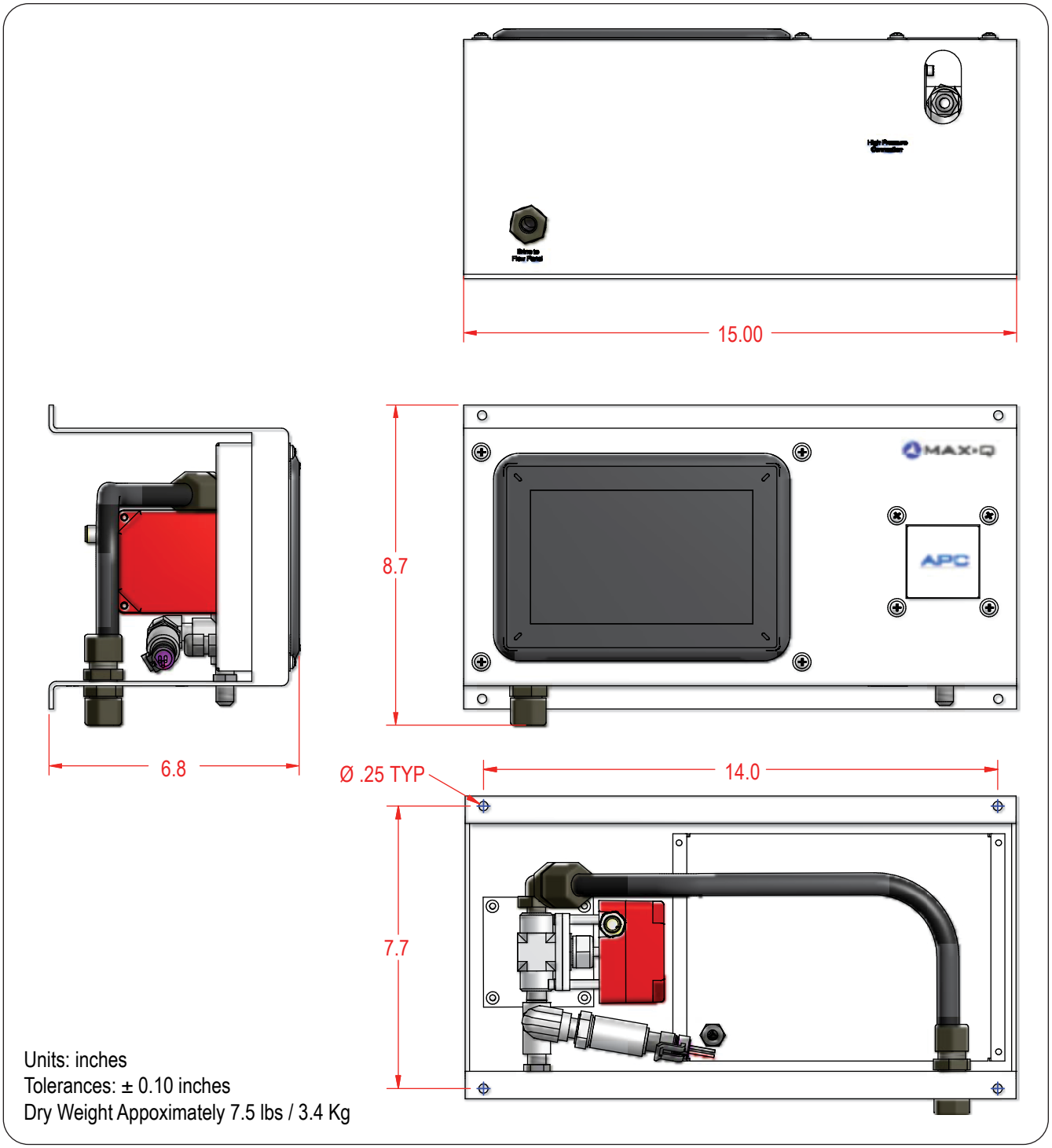


Figure 9: Dimensions & Footprint for Display Panel

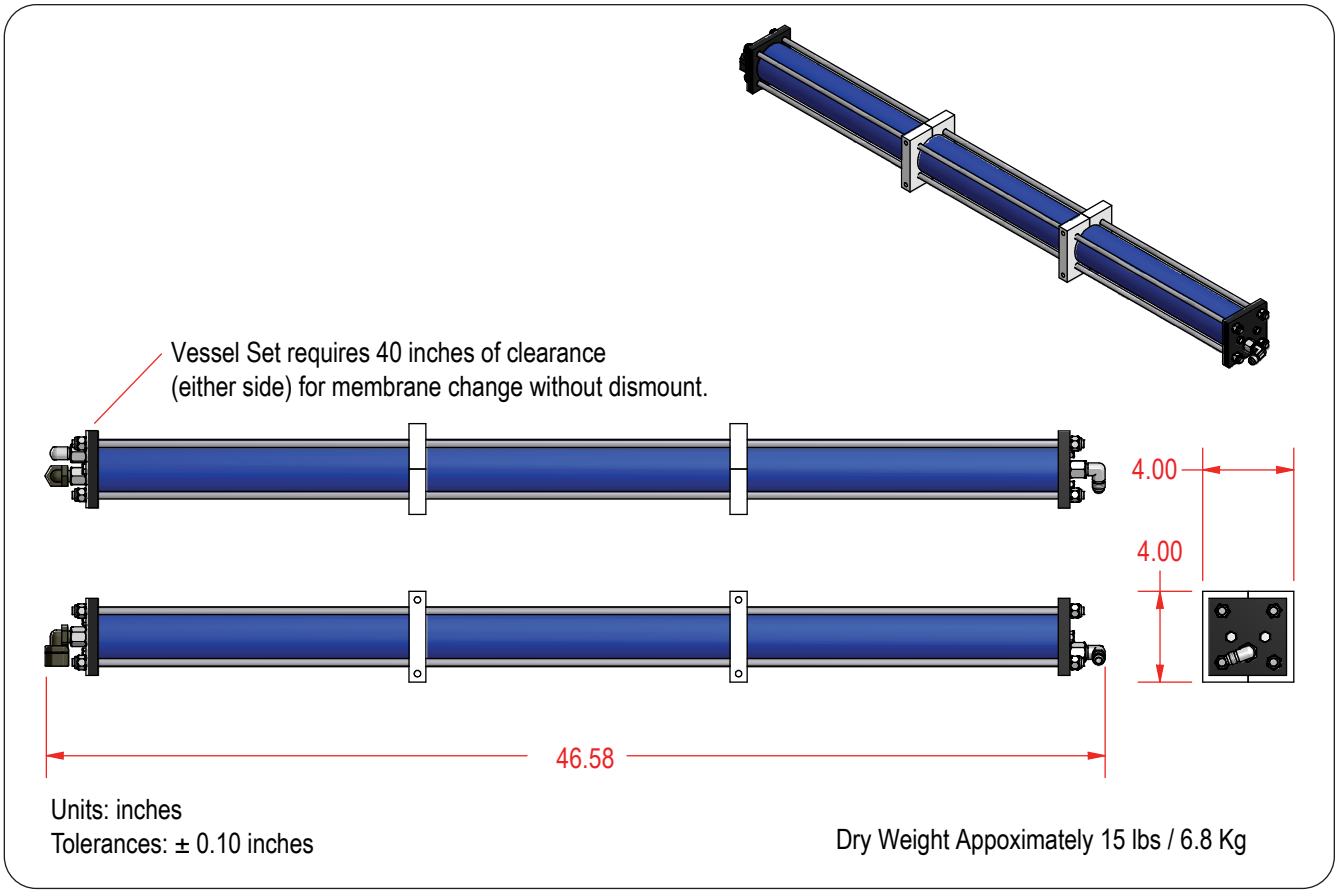


Figure 10: Dimensions for Pressure Vessel (one set)

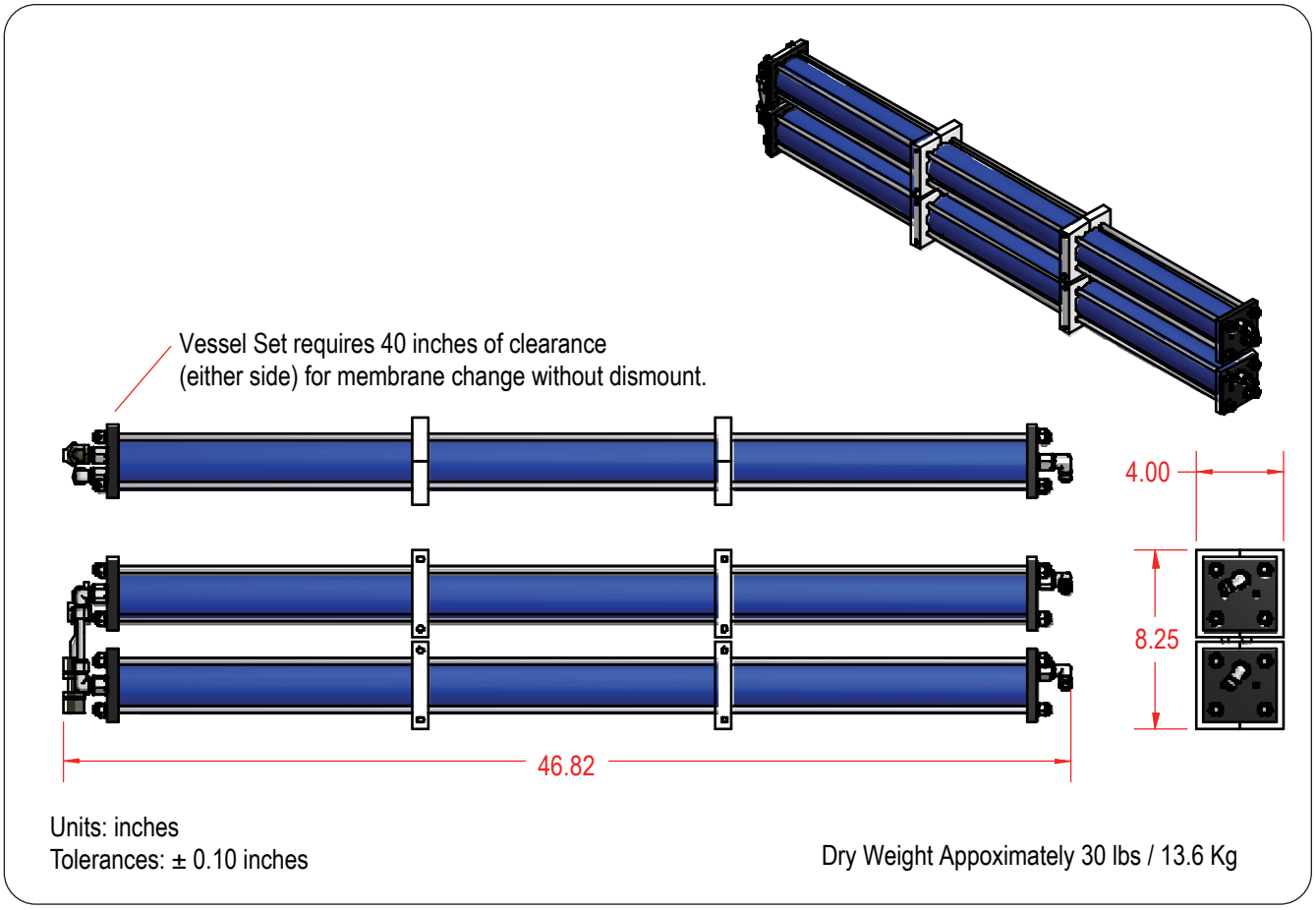


Figure 11: Dimensions for Pressure Vessels (two sets)

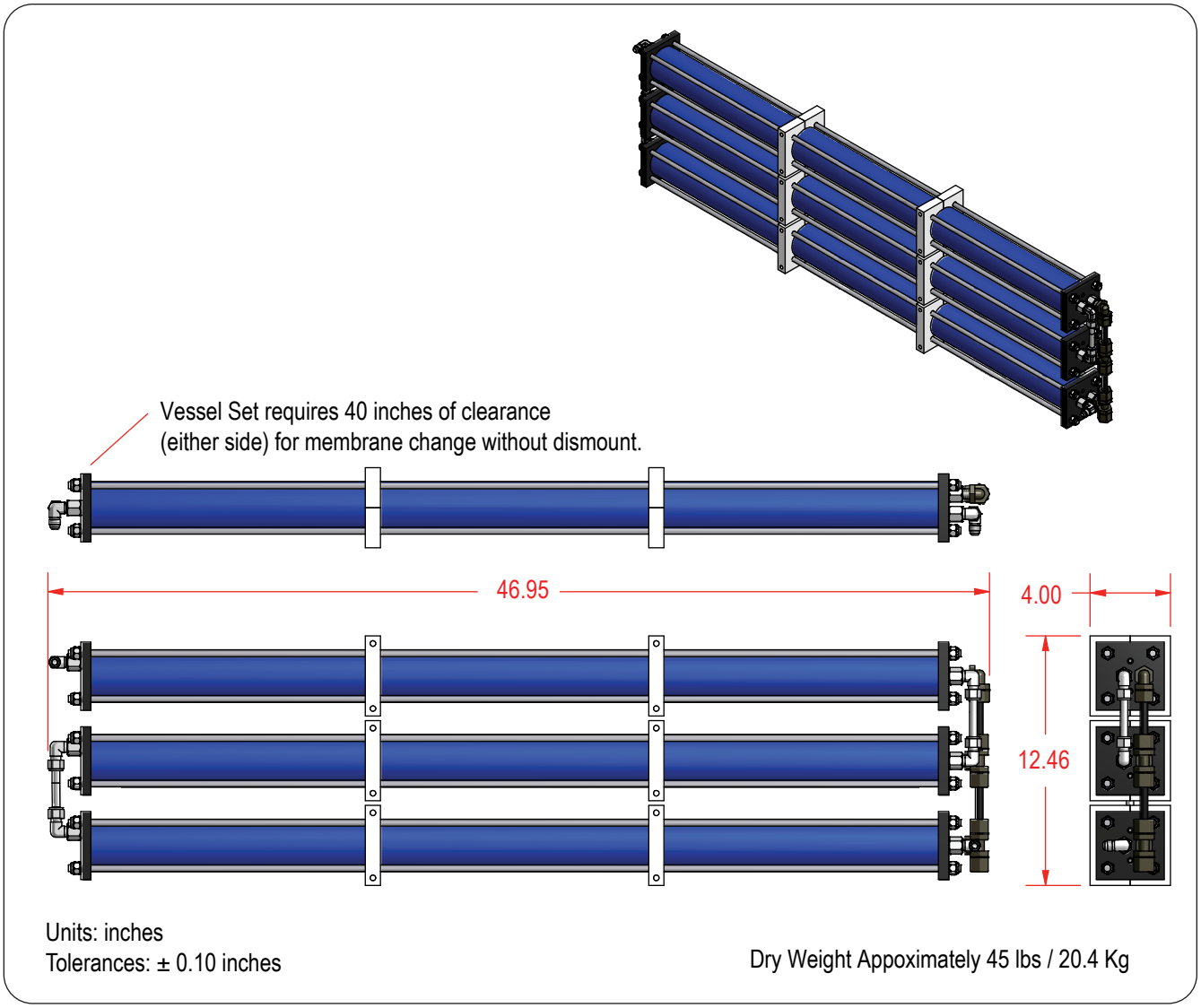


Figure 12: Dimensions for Pressure Vessels (three sets)

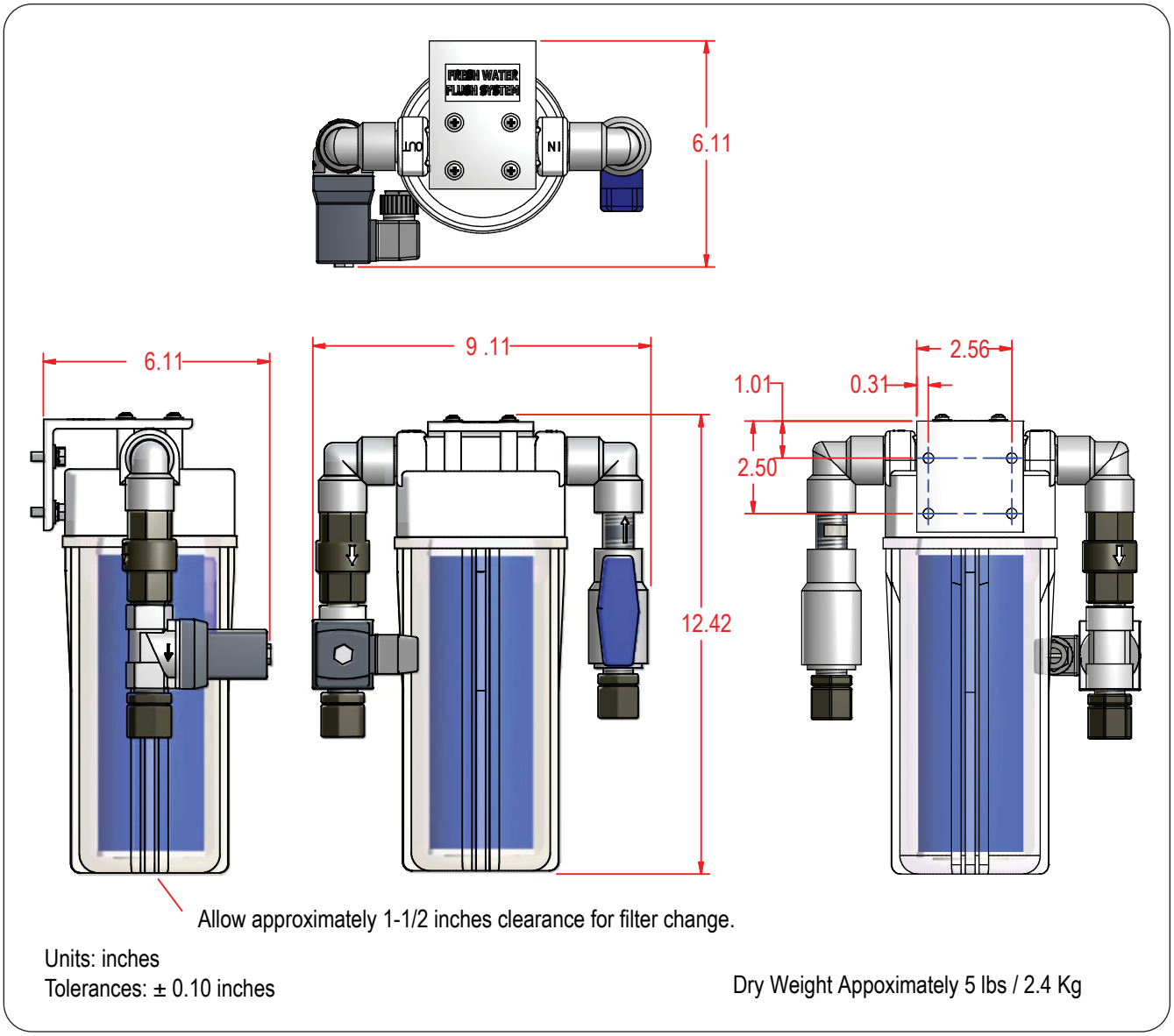


Figure 13: Dimensions for FWF Assembly

If you are installing any of the optional equipment, Figure 15, Figure 16, or Figure 14 will help you plan a location. For the Dockside Treatment System (DTS), refer to the manual provided with the DTS.

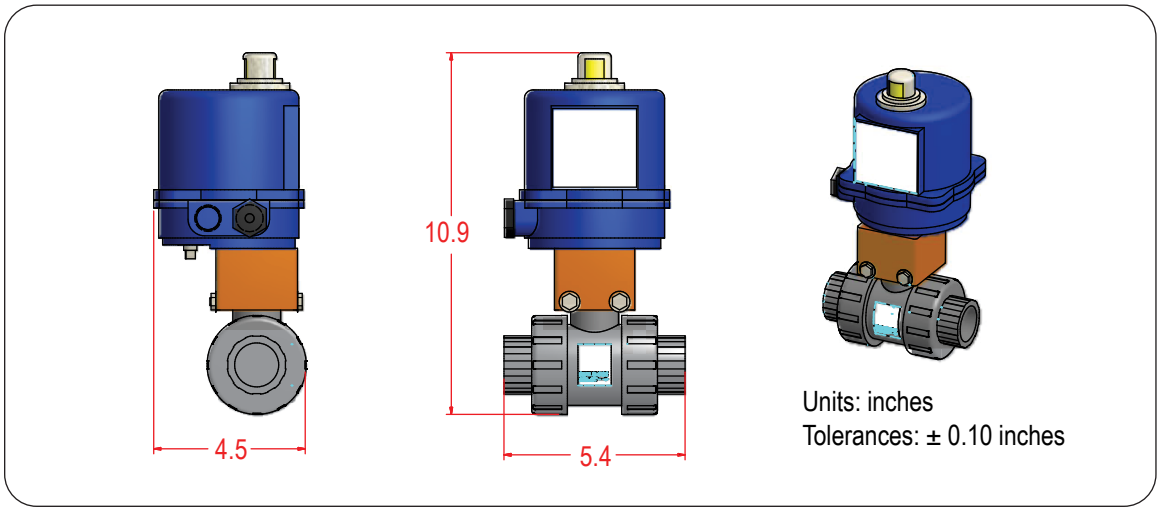


Figure 14: Dimensions for Low Pressure Actuated Valve (optional)

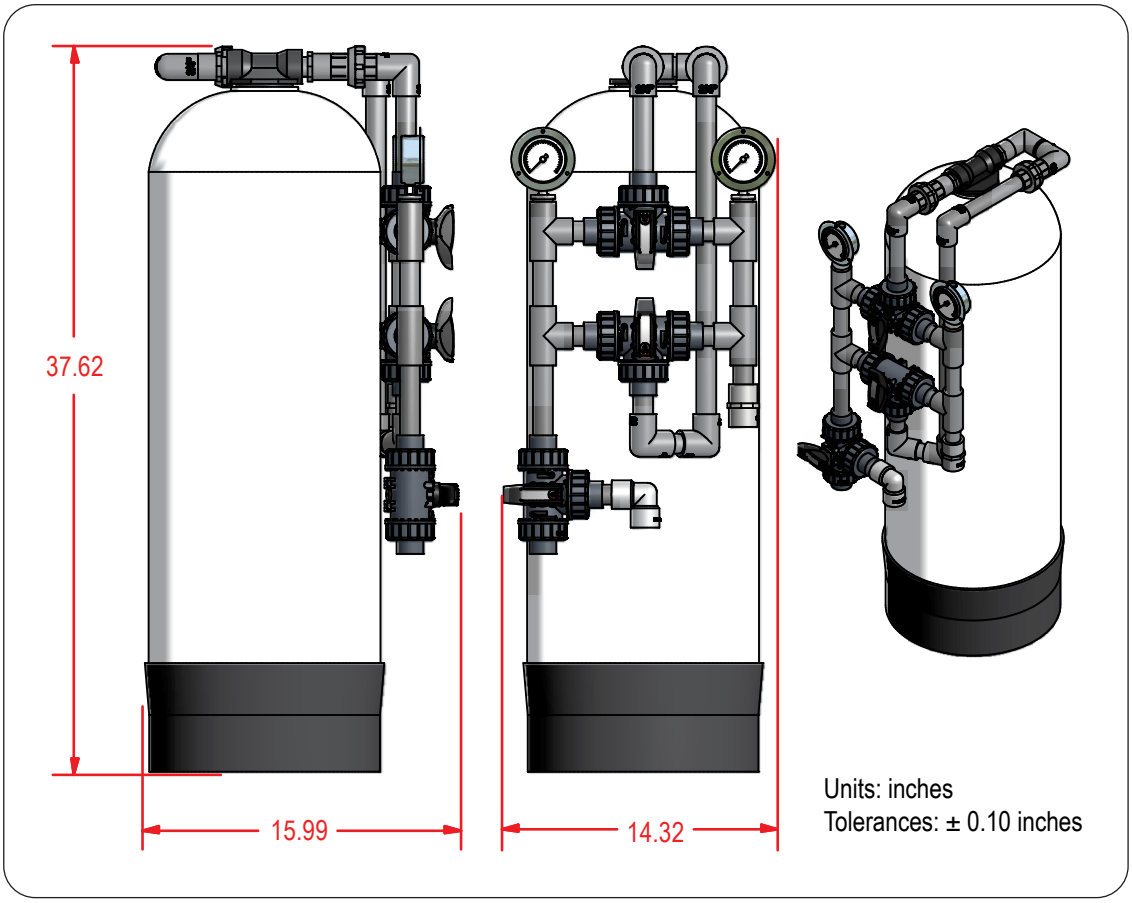


Figure 15: Dimensions of Media Filter (optional)

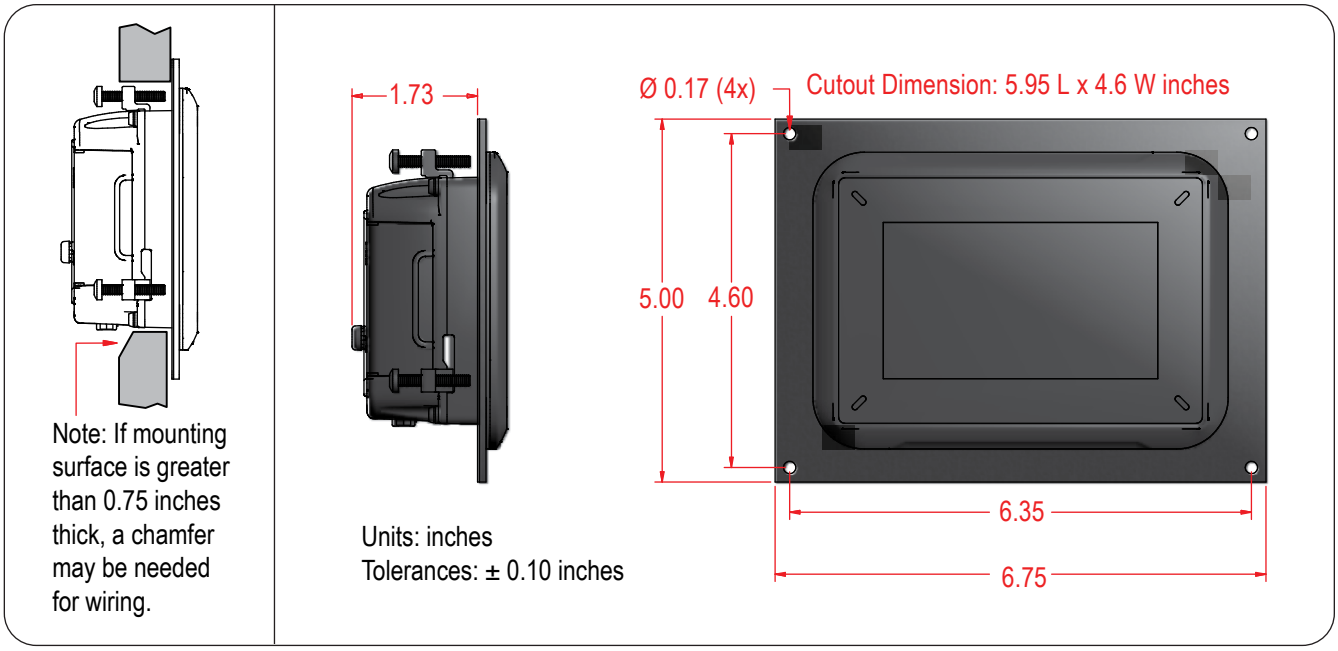


Figure 16: Dimensions, & Footprint for 4.3" Remote (optional)

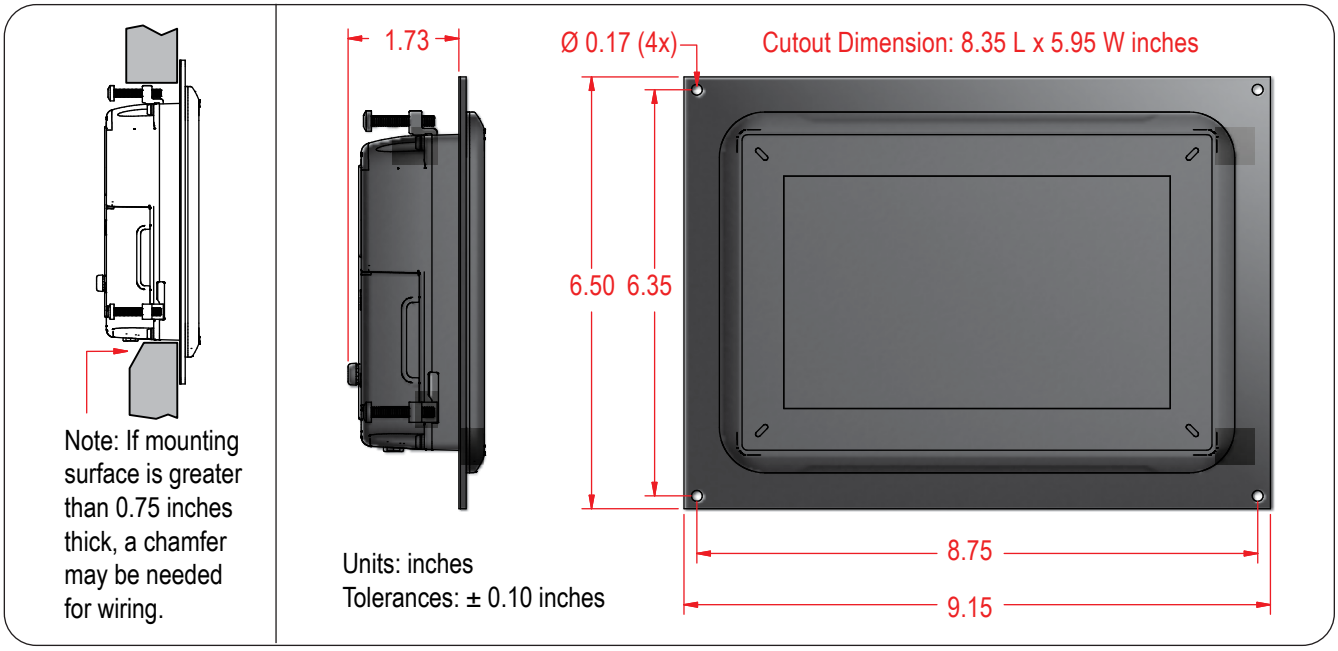
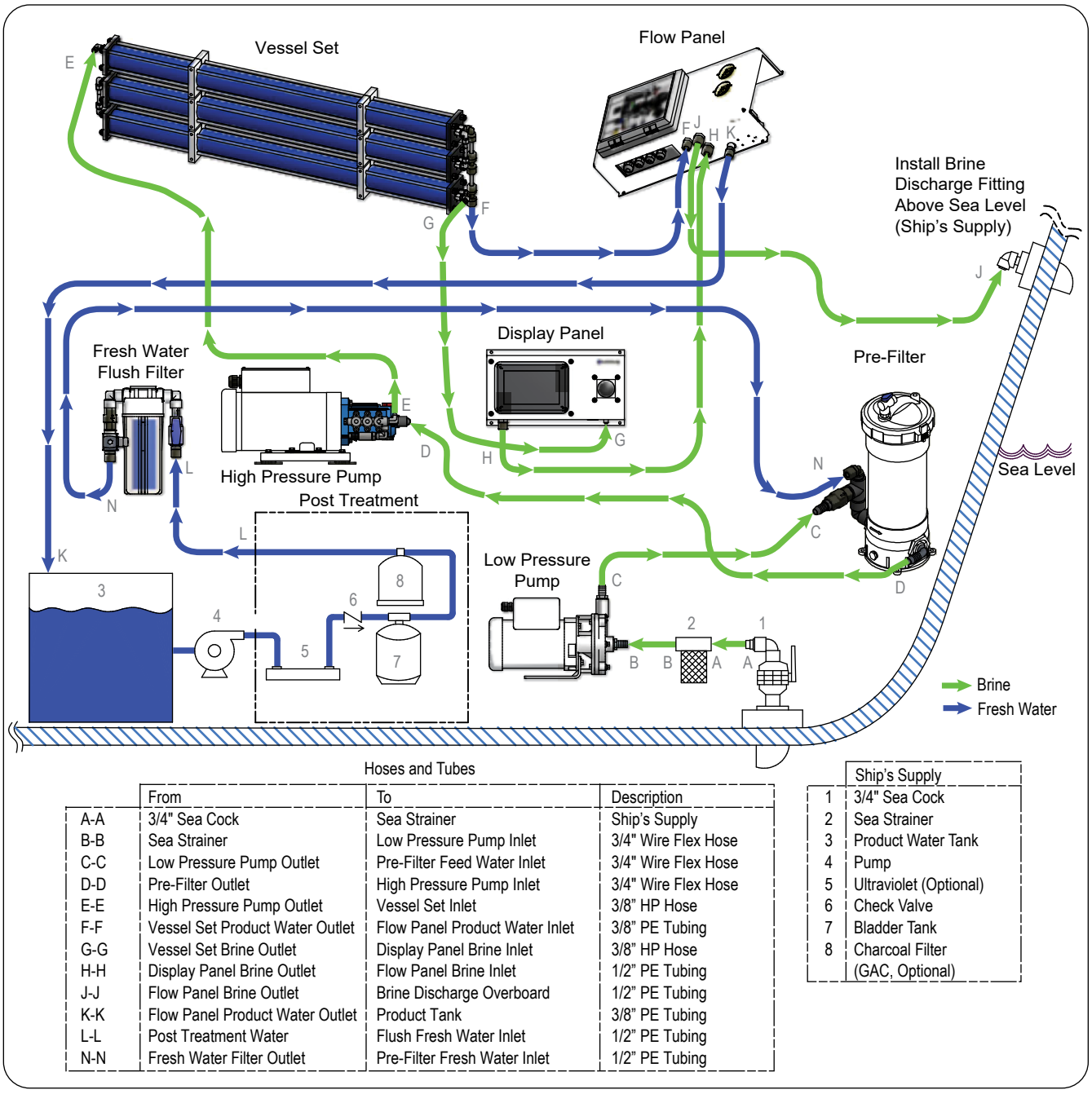


Figure 17: Dimensions, & Footprint for 7" Remote (optional)

The plumbing layout is shown in *Figure 18*. If you are installing the optional media filter with the system, refer to *Figure 19*. The plumbing installation is discussed in "SYSTEM INSTALLATION / PLUMBING" on page 47.

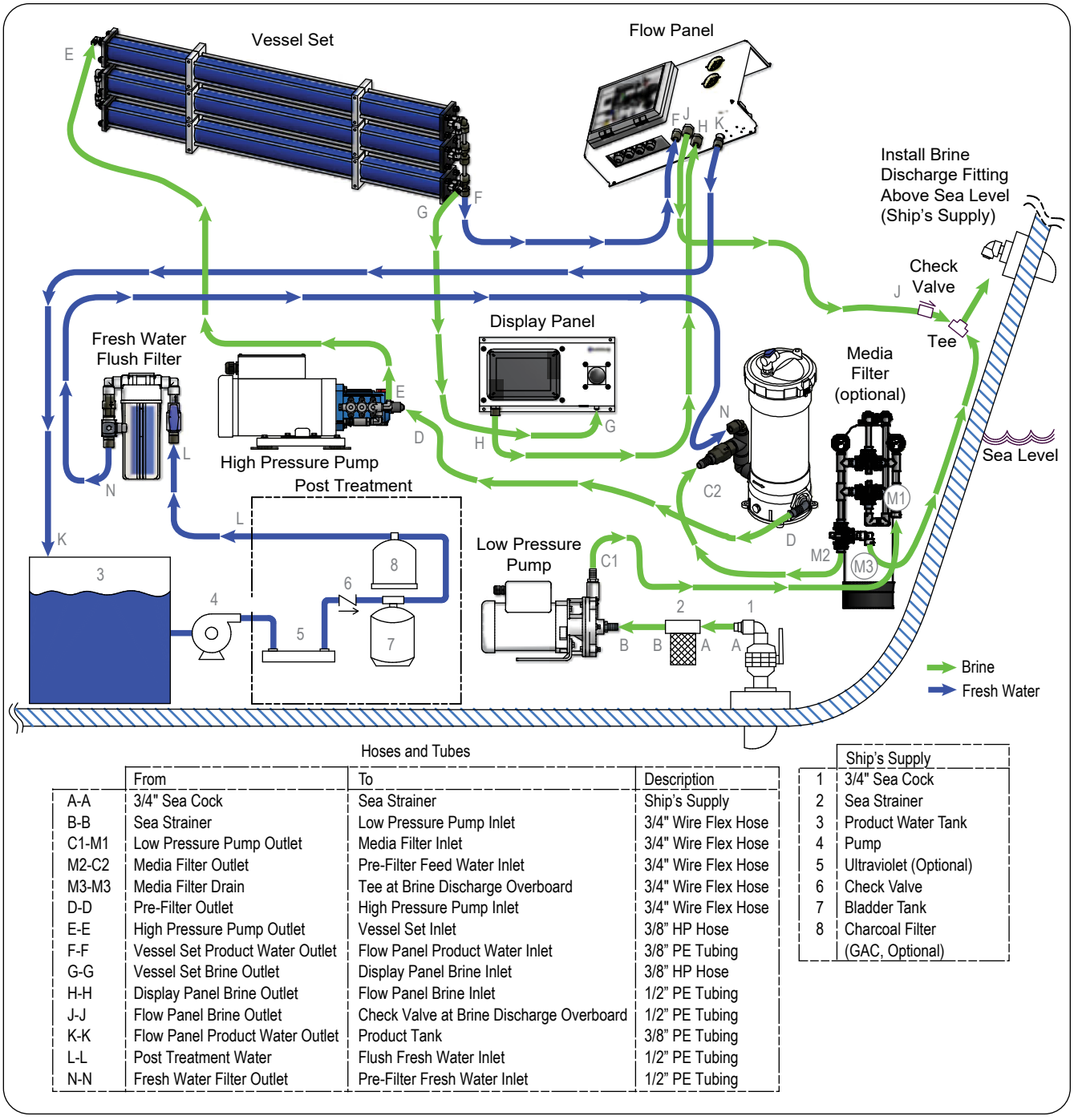


Hoses and Tubes

	From	To	Description
A-A	3/4" Sea Cock	Sea Strainer	Ship's Supply
B-B	Sea Strainer	Low Pressure Pump Inlet	3/4" Wire Flex Hose
C-C	Low Pressure Pump Outlet	Pre-Filter Feed Water Inlet	3/4" Wire Flex Hose
D-D	Pre-Filter Outlet	High Pressure Pump Inlet	3/4" Wire Flex Hose
E-E	High Pressure Pump Outlet	Vessel Set Inlet	3/8" HP Hose
F-F	Vessel Set Product Water Outlet	Flow Panel Product Water Inlet	3/8" PE Tubing
G-G	Vessel Set Brine Outlet	Display Panel Brine Inlet	3/8" HP Hose
H-H	Display Panel Brine Outlet	Flow Panel Brine Inlet	1/2" PE Tubing
J-J	Flow Panel Brine Outlet	Brine Discharge Overboard	1/2" PE Tubing
K-K	Flow Panel Product Water Outlet	Product Tank	3/8" PE Tubing
L-L	Post Treatment Water	Flush Fresh Water Inlet	1/2" PE Tubing
N-N	Fresh Water Filter Outlet	Pre-Filter Fresh Water Inlet	1/2" PE Tubing

	Ship's Supply
1	3/4" Sea Cock
2	Sea Strainer
3	Product Water Tank
4	Pump
5	Ultraviolet (Optional)
6	Check Valve
7	Bladder Tank
8	Charcoal Filter (GAC, Optional)

Figure 18: Plumbing Diagram



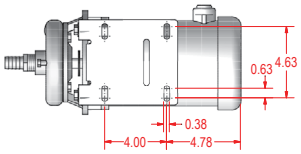
Hoses and Tubes

	From	To	Description
A-A	3/4" Sea Cock	Sea Strainer	Ship's Supply
B-B	Sea Strainer	Low Pressure Pump Inlet	3/4" Wire Flex Hose
C1-M1	Low Pressure Pump Outlet	Media Filter Inlet	3/4" Wire Flex Hose
M2-C2	Media Filter Outlet	Pre-Filter Feed Water Inlet	3/4" Wire Flex Hose
M3-M3	Media Filter Drain	Tee at Brine Discharge Overboard	3/4" Wire Flex Hose
D-D	Pre-Filter Outlet	High Pressure Pump Inlet	3/4" Wire Flex Hose
E-E	High Pressure Pump Outlet	Vessel Set Inlet	3/8" HP Hose
F-F	Vessel Set Product Water Outlet	Flow Panel Product Water Inlet	3/8" PE Tubing
G-G	Vessel Set Brine Outlet	Display Panel Brine Inlet	3/8" HP Hose
H-H	Display Panel Brine Outlet	Flow Panel Brine Inlet	1/2" PE Tubing
J-J	Flow Panel Brine Outlet	Check Valve at Brine Discharge Overboard	1/2" PE Tubing
K-K	Flow Panel Product Water Outlet	Product Tank	3/8" PE Tubing
L-L	Post Treatment Water	Flush Fresh Water Inlet	1/2" PE Tubing
N-N	Fresh Water Filter Outlet	Pre-Filter Fresh Water Inlet	1/2" PE Tubing

	Ship's Supply
1	3/4" Sea Cock
2	Sea Strainer
3	Product Water Tank
4	Pump
5	Ultraviolet (Optional)
6	Check Valve
7	Bladder Tank
8	Charcoal Filter (GAC, Optional)

Figure 19: Plumbing Diagram with Media Filter (optional)

Please refer to the appropriate footprint and layout diagrams from "DIMENSIONS & FOOTPRINT" on page 32 to page 42.
All components should be mounted as close to each other as possible while still allowing easy access for service and operating adjustments. Try to avoid elbows in the plumbing whenever possible and make hose connections as straight and as clean as possible.



LOW PRESSURE PUMP MOUNTING

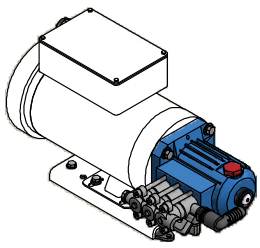
The low-pressure pump should be mounted below the waterline. If the low pressure pump must be mounted above the waterline, install a check valve to insure the pump keeps its prime. Allow plenty of room around the pump motor to provide proper ventilation. The suction line should be fitted to allow at least one foot straight section of pipe on the inlet and discharge lines.

Position the pump in the desired location and trace around the mounting holes on the base. Remove the base from the pump by loosening the securing bolts. Mount the base using 5/16" lag bolts or through bolts with back nuts. If desired, a neoprene or rubber pad may be installed under the base to further insolate the pump from the hull or foundation. Replace pump and motor on base and tighten the bolts.

PRE-FILTER MOUNTING

Mount the pre-filter assembly in an accessible area to allow for changing the filter elements. Allow at least 13-1/2" above the housing to allow for removal of the 5-micron cartridge. Do not install over any electrical components in case of leakage or dripping when changing cartridges.

Position the housing in the area desired, taking into consideration the above mentioned issues. Using #10 lag screws with washers, secure using the four mounting holes on the base.

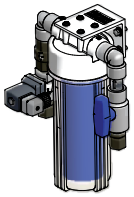


HIGH PRESSURE PUMP AND MOTOR

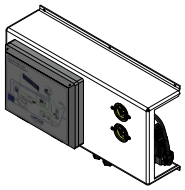
Securely mount on a level, firm platform in an area that is accessible to allow for general servicing requirements. To minimize the noise level, do not mount over void areas or compartments that can act as echo chambers. Take into consideration changing the oil and airflow from the fan end of the motor.

Position the pump and motor assembly in the desired location. Trace around the mounts to provide a template for location. Remove the four mounts from the pump base and mount to the platform using 1/4" lag screws or through bolts with backing nuts. Replace pump and motor assembly on the mounts and secure.

SYSTEM INSTALLATION / MOUNTING (continued)

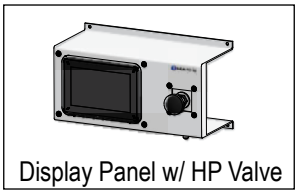


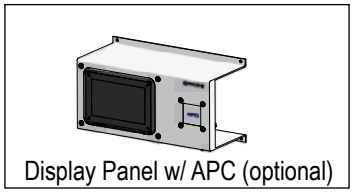
FRESH WATER FLUSH SYSTEM
Find a suitable location to mount the Fresh Water Flush Assembly. Take into account the filter needs to drop down 1-1/2" to change the cartridge. The inlet source of water is your vessel's pressurization fresh water system.

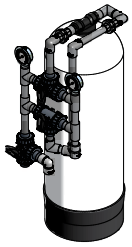


FLOW PANEL
Locate an area to mount the flow panel. All your electrical connections terminate at this panel inside the electrical enclosure. Flow indicators provide a visual indication of water flow but are not a necessary component to view for everyday operation. A convenient flow schematic for your reference is located on the enclosure door and an additional electrical schematic is located inside the electrical enclosure. Using #8 screws, mount the panel to a bulkhead or other secure wall or panel.

DISPLAY PANEL
From the display panel, you will be operating the system by the touchscreen, and adjusting pressure on systems without APC. Place this component in an area that has easy access to accomplish this. Mount the panel with 4-#8 screws.


Display Panel w/ HP Valve


Display Panel w/ APC (optional)



MEDIA FILTER MOUNTING (optional)
Mounting consideration are unique to each installation. FCI Watermakers recommends you consult an installer for installation of the optional media filter.

INLET ACTUATED VALVE MOUNTING (optional)
Mounting consideration are unique to each installation. FCI Watermakers recommends you consult an installer for installation of the optional inlet actuated valve.

Before proceeding, review *Figure 20* and the notes below to ensure proper tube fittings and hose connections.

PROPER INSTALLATION OF HOSE ENDS AND FITTINGS
Follow these best practices when installing fittings and clamps:

- Cut the tube or hose end square and clean. You may use a vise and fine-tooth saw to facilitate a square and clean cut. Remove any burrs.
- For tubes, fittings are supplied. There are two types of fittings. Fittings with release button (called push-in fittings) require you to only insert tube until it bottoms. Fittings with nut require you to loosen nut three turns, insert tube until it bottoms, then tighten nut.
- For PVC helix wire suction hose, feed hose through a two clamps, push hose on over the barb until it bottoms against the barb, and tighten clamps. Do not use lubricant on the tube end; it may leave a residue that compromises the connection. You may, however, soak the hose end in hot water for a few minutes before pushing the hose on the barb.

CAUTION: Always allow slack in all tube and hose lines. Never cause the tube or hose to immediately bend from the fitting. Allow the line to enter or leave from the fitting in a straight manner for several inches to ensure proper connection, to relieve stress to the fitting and tube or hose, and to allow ease of detachment and reattachment during maintenance or repair.

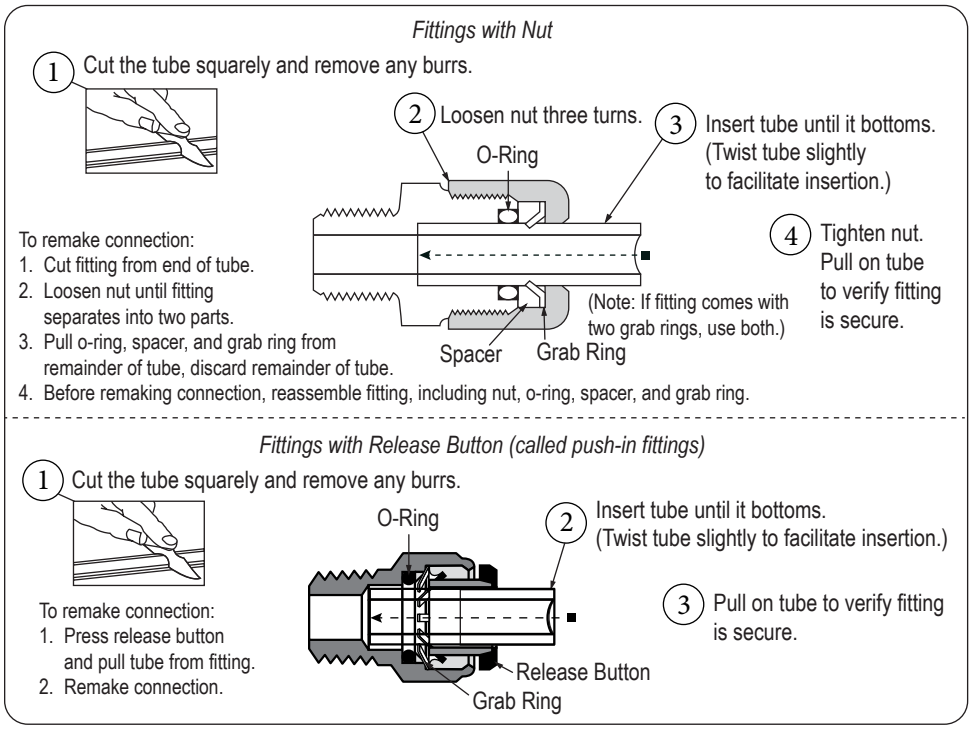
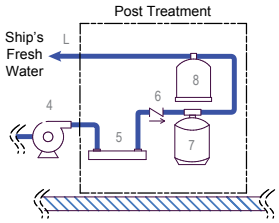


Figure 20: Proper Tube Fitting and Hose Connections

Start the plumbing installation by fitting the ship's water connections. Then complete the "PLUMBING CONNECTIONS" to the system components as described in the instructions on page 49.

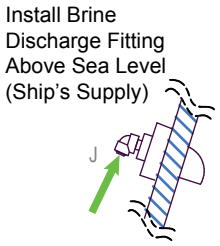
- Connections shown in **bold** refer to "COMPONENTS SUPPLIED BY INSTALLER" on page 29.
- Letters A-A to H-H refer to specific tubes and hoses as shown in the "PLUMBING DIAGRAMS" on page 43.



SHIP'S FRESH WATER SYSTEM TO FRESH WATER FLUSH CONNECTION
Find the following items from the installation kit:

- 1/2" MPT x 1/2" Tube PE Black Straight Connector
- 1/2" PE Tubing
- 1/2" PVC Tee

Using the above connector and tee, connect one end of the 1/2" PE Tubing to the **ship's pressurized water supply 1/2" NPT connection**. This connector should be on the pressure side of the fresh water system after the accumulator tank. Measure the run as straight as possible to the fresh water flush filter, inlet side and cut the tube to length. (See *Tube L-L* on plumbing diagram)

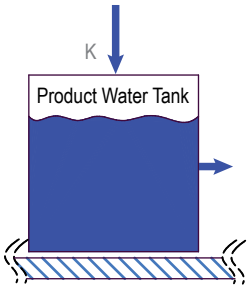


BRINE DISCHARGE CONNECTION
Find the following items from the installation kit:

- 1/2" MPT x 1/2" Tube PE Black Straight Connector
- 1/2" PE Tubing

Using the above connector, attach one end of the 1/2" PE Tubing to the **ship's brine discharge thru hull 1/2" NPT connection**. Be sure the discharge thru-hull is mounted at or above the water line. Measure the run as straight as possible to the flow panel and cut the tube to length. See *Tube J-J* on the plumbing diagrams.

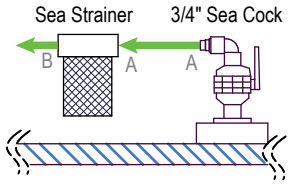
If installing the optional media filter, the drain can tee into the brine discharge line. Add a check valve on the brine discharge line to prevent back flow to the system. See *Hose M3-M3* on the plumbing diagrams.



PRODUCT WATER TO STORAGE TANK CONNECTION
Find the following items from the installation kit:

- 3/8" MPT x 3/8" Tube PE Black Straight Connector
- 3/8" PE Tubing

Using the above connector, attach one end of 3/8" PE Tubing to the **ship's unpressurized potable water storage tank 3/8" NPT connection**. Always make the connection on the top of the tank. Measure the run as straight as possible to the flow panel and cut the tube to length. (*Tube K-K*)



SEAWATER INLET
Find the following items from the installation kit:

- 3/4" Suction PVC Helix Wire Hose (also called 3/4" Wire Flex Hose)
- 3/4" to 1-1/4" Stainless Steel (SS) #12 Hose Clamp (Qty 2)

Using two clamps, attach the suction hose to the outlet side of the **3/4" Sea Strainer.** Measure the run as straight as possible to the low pressure pump inlet, and cut the tube to length (*Hose B-B*)

PLUMBING CONNECTIONS
Refer to the *"PLUMBING DIAGRAMS" on page 43* and *page 44.* Proceed as follows to connect the plumbing to the system components:

1. Find the 3/4" hose previously installed to the outlet side of the sea strainer. Refer to "SEAWATER INLET" on page 49. Connect the free end of the hose to the inlet side of the low-pressure pump. (Inlet side of the low-pressure pump is always the center fitting, located on the front of the pump). See *Hose B-B*. Secure hose connections with hose two clamps.

2. Attach 3/4" hose to the barb at the output of the low-pressure pump using two clamps. Cut the tube to a length suitable to allow the shortest possible run between the low-pressure pump and the feed-water inlet side of the pre-filter assembly. Attach tube to the barbs on the feed-water inlet of the pre-filter assembly using two clamps. See *Hose C-C* on the plumbing diagram.

3. Attach 3/4" hose to the fitting at the outlet of the pre-filter. Route to the fitting at the inlet of the high pressure pump and cut and attach. (See *Hose D-D on the plumbing diagram*.)

4. Using the blue high-pressure hose (provided), connect one end to the high-pressure pump outlet and measure to the inlet of the lead pressure vessel or the one marked #1. Cut the hose to length and install a reusable hose end (provided). (See *Hose E-E on the plumbing diagram*.)

5. Attach 3/8" tubing from the vessel set product water outlet to the flow panel product water inlet. (See *Hose F-F on the plumbing diagram*.)

6. Using the rest of the blue high-pressure hose (provided) connect one end of the hose to the brine discharge on the pressure vessel. Measure to the display panel and cut to length. Install the reusable hose end. If additional high-pressure hose is needed contact your dealer or FCI Watermakers for assistance. (See *Hose G-G on the plumbing diagram*.)

7. Attach 1/2" tubing from the display panel brine outlet to the flow panel product brine inlet. (See *Hose H-H on the plumbing diagram*.)

8. Find the 1/2" tubing previously installed to brine discharge thru-hull. Refer to "BRINE DISCHARGE CONNECTION" on page 48. Connect the free end of the tubing to brine-out fitting on the flow panel. See *Tube J-J*.

9. Find the 3/8" tubing previously installed to the fresh water storage tank. Refer to "PRODUCT WATER TO STORAGE TANK CONNECTION" on page 48. Connect the free end of the tubing to the product-water fitting on the right panel of the system. See *Tube K-K*.

10. Find the 1/2" tubing previously installed to the ship's freshwater pressure system. Refer to "SHIP'S FRESH WATER SYSTEM TO FRESH WATER FLUSH CONNECTION" on page 48. Attach the free end of the tubing to the fitting at inlet side of the fresh-water-flush filter. (*Tube L-L*)

11. Attach 1/2" tubing to the fitting at the outlet side of the fresh-water-flush filter and route and attach tube to the fresh water inlet of the pre-filter.(*Tube N-N*)

12. If installing the optional media filter, splice *Hose C-C* into two hoses (*C1-M1* and *M2-C2*). Attached free end of hose on the low pressure pump side to media filter inlet (*Hose C1-M1*). Attach other free end of hose on the pre-filter side to the media filter outlet (*Hose M2-C2*). Then route 3/4" hose from the media filter drain through a tee to the brine discharge connection (*Hose M3-M3*). Add a check valve on the brine discharge line *(Tube J-J)* to prevent back flow into the system.

Please refer to the wiring schematic for your unit, immediately following these electrical connections instructions.

CAUTION: DO NOT PERFORM INSTALLATION UNLESS:

1. The system feed water sea cock valve is closed.

2. The system main electrical disconnect switch is switched OFF, LOCKED, and TAGGED.

WARNING: ELECTRICAL SHOCK HAZARD. A volt/ohm meter will be necessary. The following installation procedures expose the installer to HIGH VOLTAGE and electrical shock hazard. Only attempt this if you are a qualified electrician and only if surrounding conditions are safe.

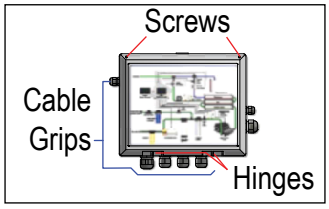
CAUTION: Always allow slack in electrical cables. Allow the cable to enter or leave from the strain relief in a straight manner for several inches to ensure proper connection, to relieve stress to the cable and fitting, and to allow ease of detachment and reattachment for maintenance or replacement. If electrical cables are pulled tight causing them to bend at the strain relief, they will pull out of the strain relief causing a dangerous electrical shock condition.

NOTE:

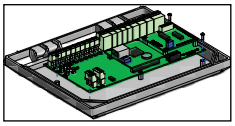
- **Always follow all local and Coast Guard codes when installing this system.**
- **Grounding and circuit protection should be done in accordance with National Electrical Code.**
- **Never attempt to hook-up or service this system without disconnecting all power.**
- **Always check to make sure system voltage matches incoming voltage.**

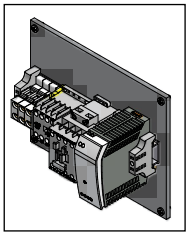
ELECTRICAL ENCLOSURE

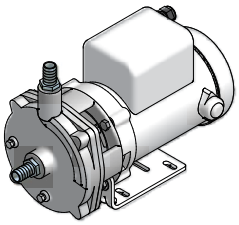
The electrical enclosure is located behind the general connection diagram on flow panel. Cable grips of various sizes are located on the bottom and sides of the system to route the main power, power for the low and high pressure pumps, and the wires to the PC board from the display panel, fresh water flush solenoid, and options. To open the enclosure, loosen the two screws on the top corners of the enclosure's cover and swing door in an arc downwards on its horizontal hinges. Opening the cover will allow access to the PC board (attached to the back of the cover) and the contactor blocks (inside the enclosure).



Electrical Enclosure


PC Board


Contactor Blocks



WIRING THE LOW PRESSURE PUMP

Consult local codes to determine the correct gauge wire and follow standard color coding to attach wire the low pressure pump. Refer to wiring diagram on capacitor cover of pump *(Figure 21)*

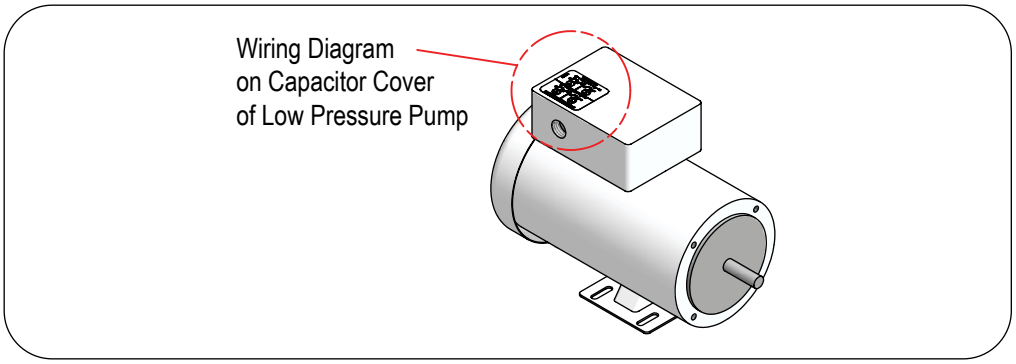


Figure 21: Wiring at the Low Pressure Pump

Next, feed the wires through the cable grip on the system's left panel and into the electrical enclosure.

For single phase power, attach the wires to terminals #2T1 and #6T3 of the LPP contactor, and #G to the green isolated ground block. See *Figure 22 on page 53.*

For three phase power (50 or 60 Hz), attach the wires to terminals #2T1, #4T2, and #6T3 of the LPP contactor, and #G to the green isolated ground block. See *Figure 23 or Figure 24 on page 54.*

CAUTION: Centrifugal pumps must receive an initial prime in ALL cases. DO NOT START PUMP BEFORE PRIMING, except to check for proper rotation for 3-phase applications. Running with reverse rotation may cause impeller to spin off. Merely jog switch to check rotation. DO NOT run pump with liquid in reverse. Completely fill the pump volute and suction line. Remove air from volute by removing top pipe plug of volute while filling. After filling, check by turning pump shaft a few times. Add more water if required. If pump does not build up pressure as motor develops speed, shut down and re-prime. DO NOT attempt to prime pump or add liquid while pump is in operation.

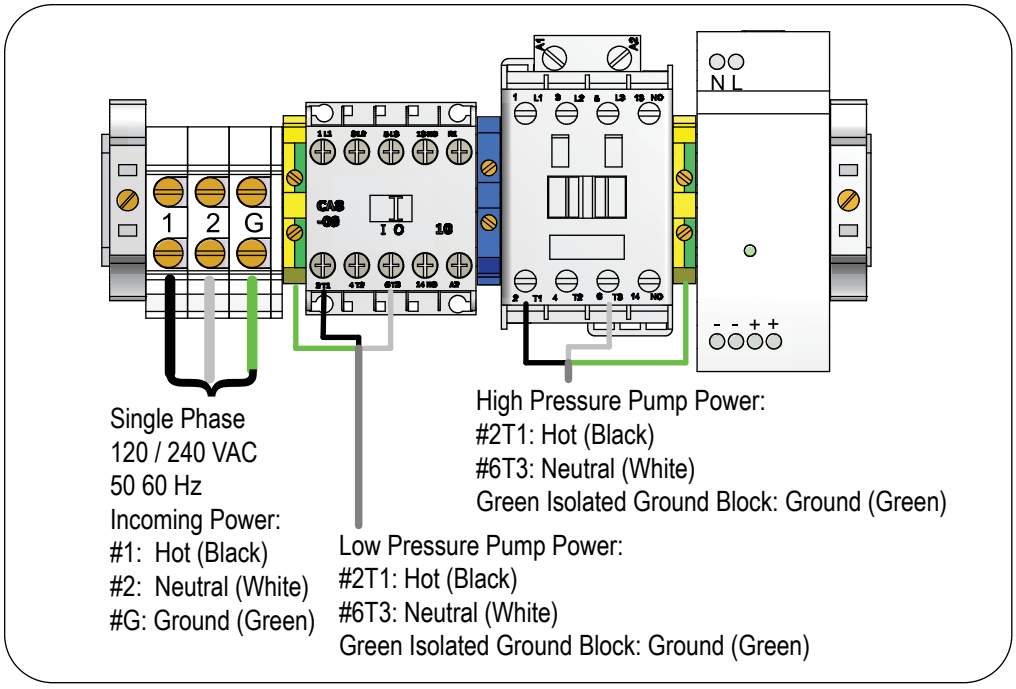


Figure 22: Wiring at the Connector Block (Single Phase)

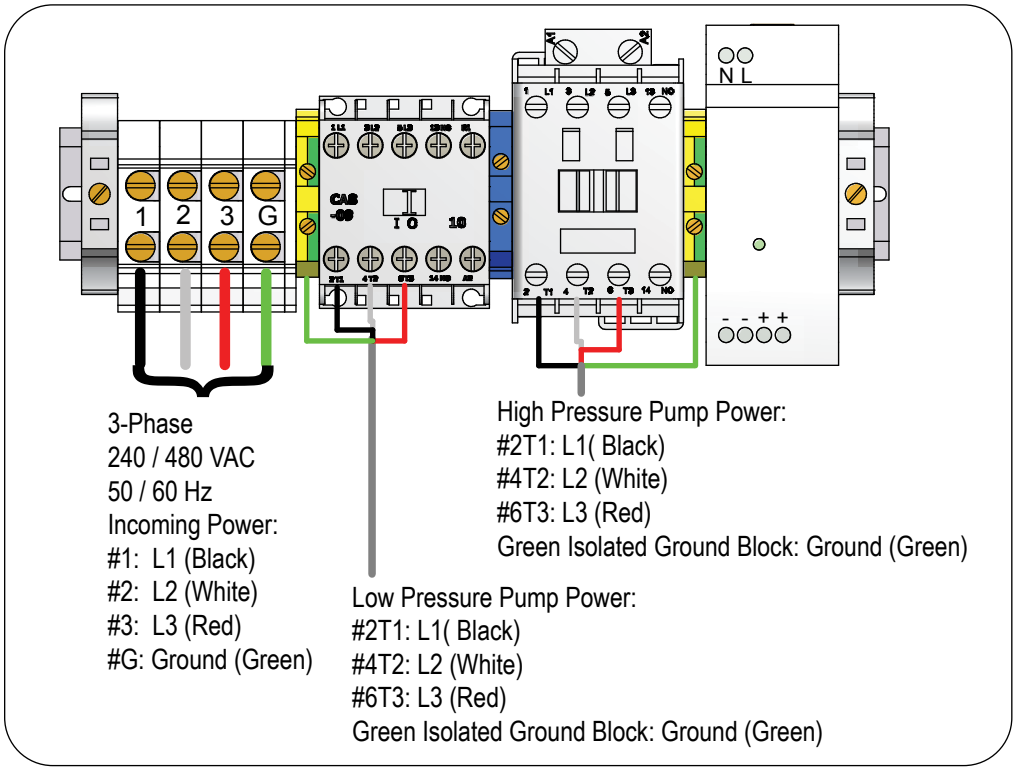


Figure 23: Wiring at the Connector Block (Three Phase 60 Hz)

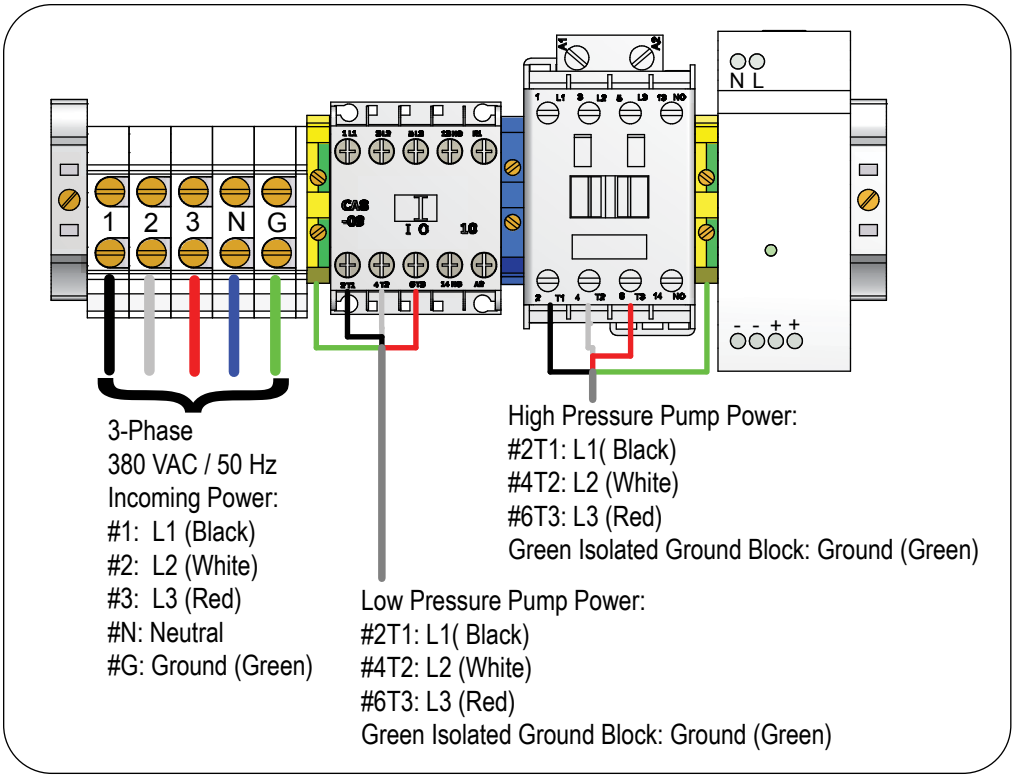


Figure 24: Wiring at the Connector Block (Three Phase 50 Hz)

HIGH PRESSURE PUMP MOTOR

Consult local codes to determine the correct gauge wire. Follow thewiring diagram on high pressure pump's motor. and wire the motor. In some cases, this motor will already be wired.

Feed the wires from the motor through a cable grip and into the electrical enclosure

For single phase power, install wires to terminals #2T1 and #6T3 on the HPP contactor, and #G to the green isolated ground block. See *Figure 22 on page 53.*

For three phase power (50 or 60 Hz), use terminals #2T1, #4T2 and #6T3 on the HPP contactor, and #G on the green isolated ground block. See *Figure 23 or Figure 24 on page 54.*

CAUTION: Centrifugal pumps must receive an initial prime in ALL cases. DO NOT START PUMP BEFORE PRIMING, except to check for proper rotation for 3-phase applications. Running with reverse rotation may cause impeller to spin off. Merely jog switch to check rotation. DO NOT run pump with liquid in reverse. Completely fill the pump volute and suction line. Remove air from volute by removing top pipe plug of volute while filling. After filling, check by turning pump shaft a few times. Add more water if required. If pump does not build up pressure as motor develops speed, shut down and re-prime. DO NOT attempt to prime pump or add liquid while pump is in operation.

WIRING THE INCOMING POWER AND GROUND

Using the proper gauge wire (consult with your local electrical codes), route the wires into the electrical enclosure via the cable grip on the system's left panel. Attach the wires to the contactor block's terminals marked:

- #1, #2, and #G for single phase power *(Figure 22 on page 53)*
- #1, #2, #3, and #G for three phase 60 Hz power *(Figure 23 on page 53)*
- #1, #2, #3, #N, #G for three phase 50 Hz power *(Figure 24 on page 54)*

WIRING THE FWF SOLENOID

Follow *Figure 25*. Connect the wire leads to the FWF terminals on the PC board.

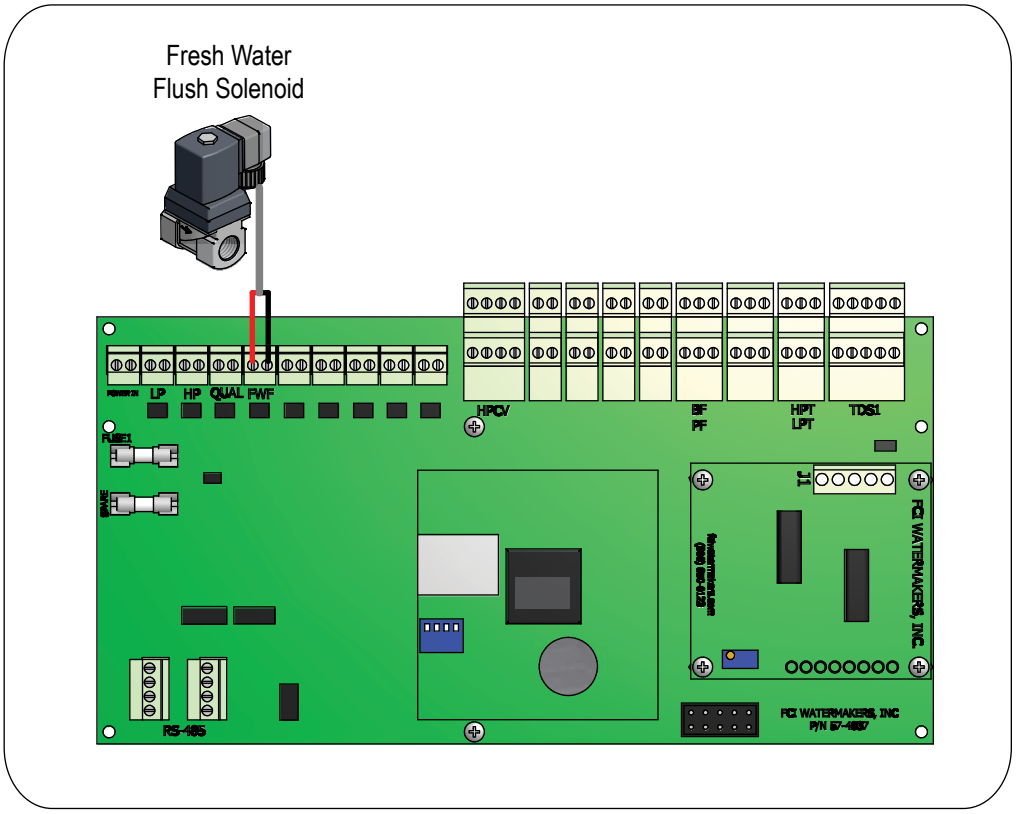


Figure 25: Wiring the FWF Solenoid (optional)

WIRING THE LPT, HPT, AND OPTIONAL HPCV

Refer to Figure 26 for systems with HP Valve and connect the Low Pressure Transducer located on the high pressure pump to the LPT terminals on the PC board. Also connect the High Pressure Transducer located in the disaplay panel to the HPT terminals on the PC board.

Or, refer to Figure 27 on page 57 for systems with APC and connect the Low Pressure Transducer located on the high pressure pump to the LPT terminals on the PC board. Also connect the High Pressure Transducer and the High Pressure Control Valve located in the display panel to the HPT and HPCV terminals on the PC board, respectively.

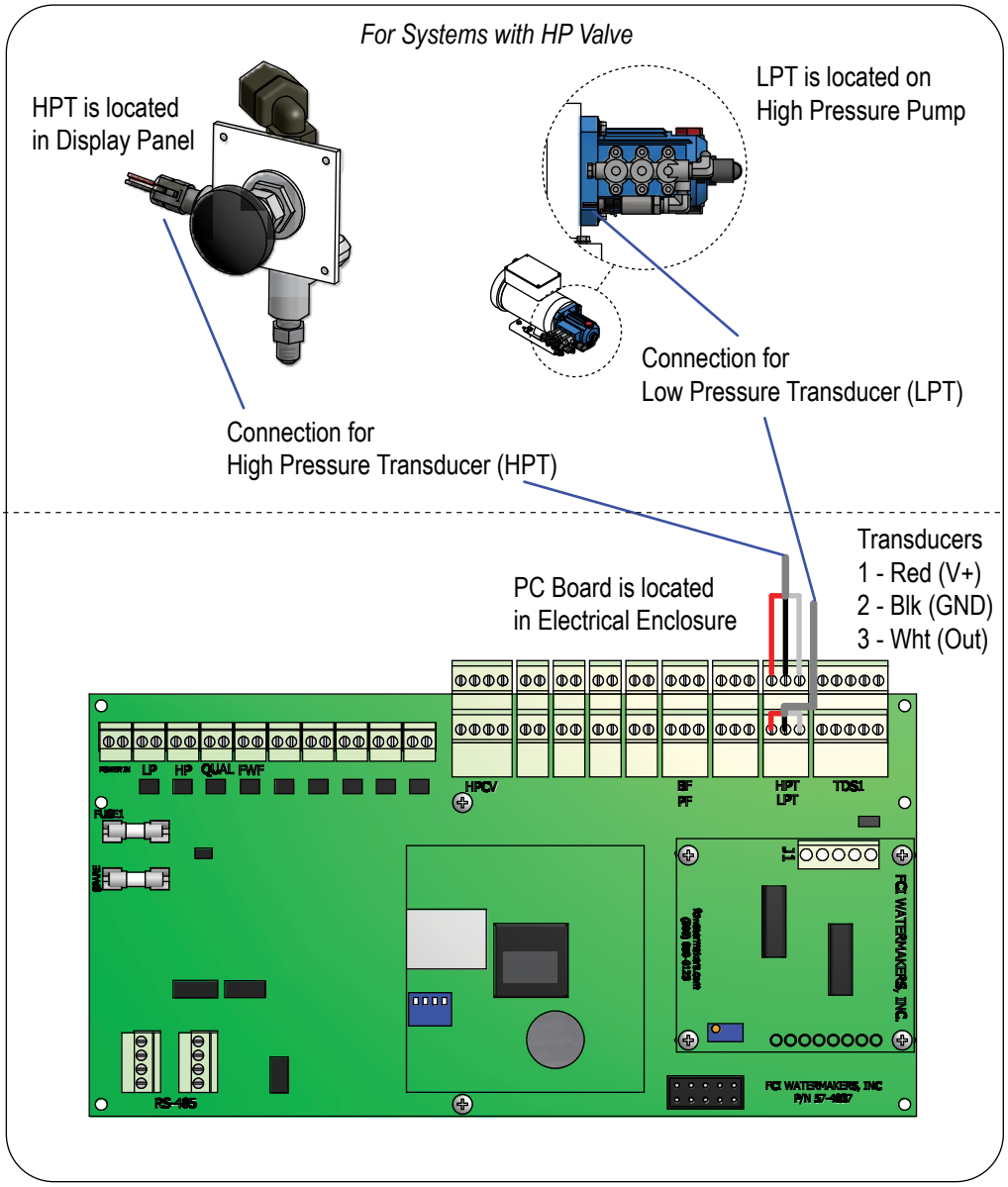


Figure 26: Wiring the LPT and HPT (systems with HP Valve)

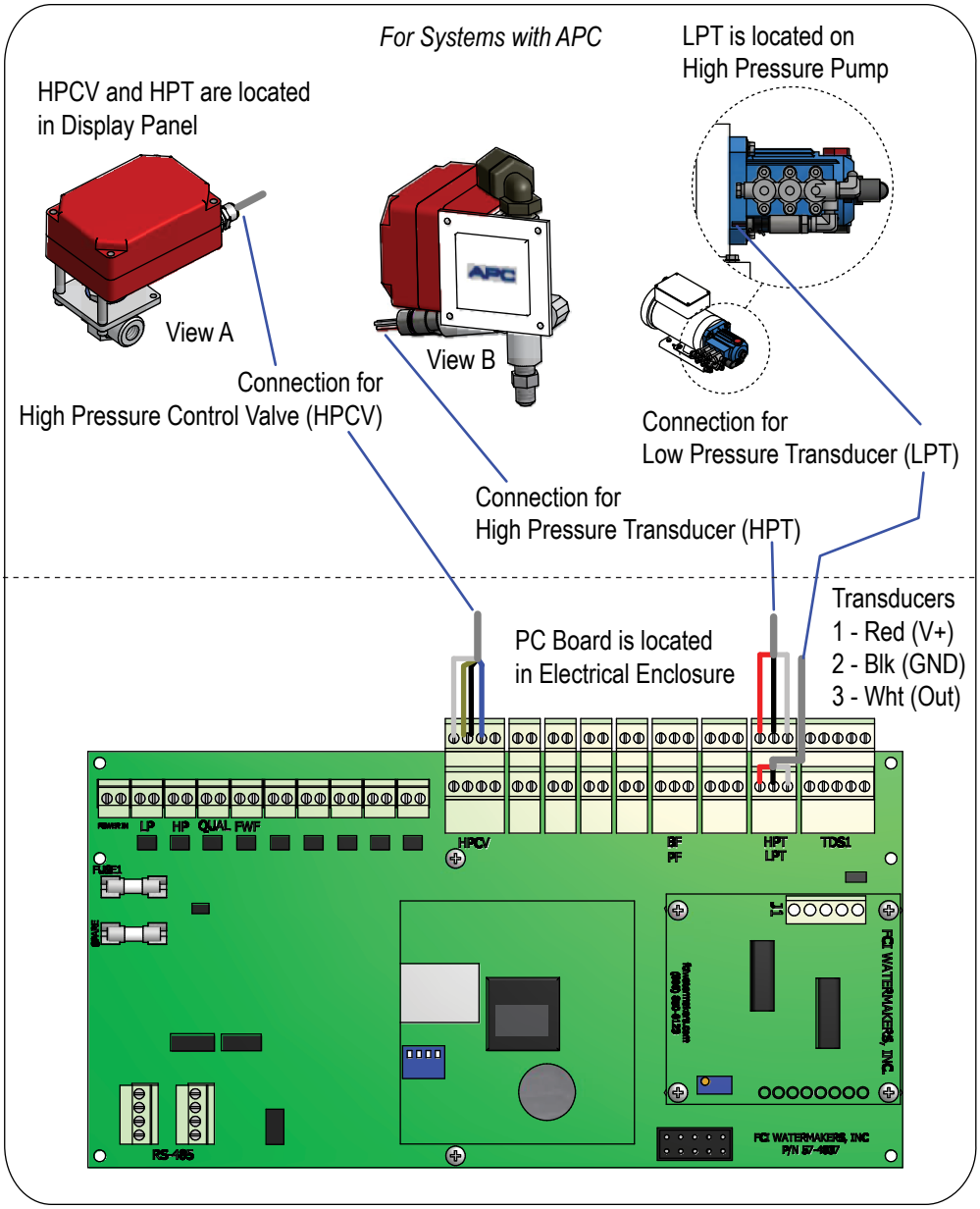


Figure 27: Wiring the LPT, HPT, and HPCV (systems with APC)

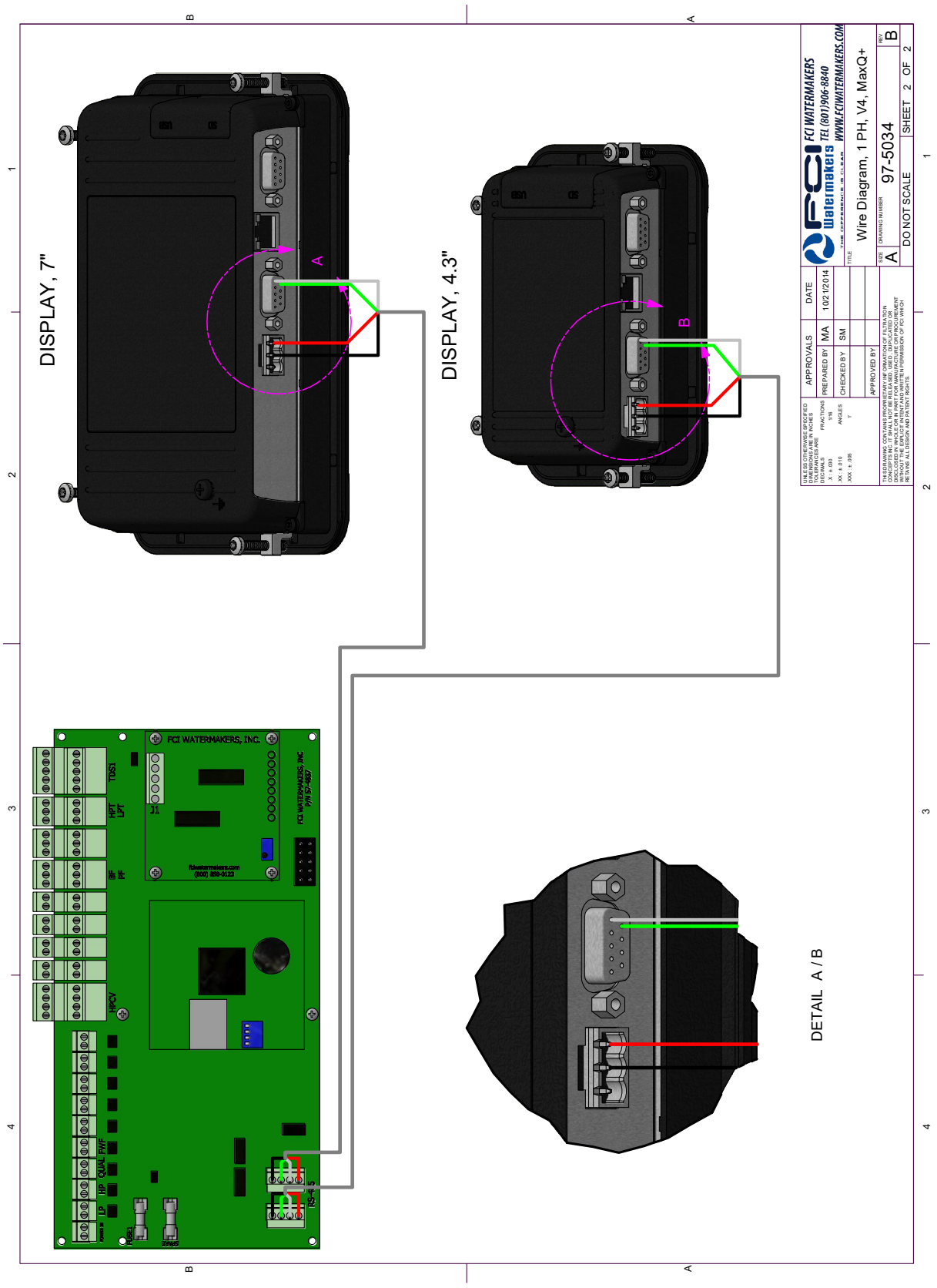
WIRING THE DISPLAY
Refer to *"DISPLAY WIRING DIAGRAM" on page 59,* and connect the display to the PC board. The wiring uses a DB9 connector; soldering tool is needed to make the connections.

WIRING THE REMOTE (optional)
Refer to *Figure 16 or Figure 17 on page 42* for footprint and dimensions of the remote, and mount the remote control panel using four #8 screws of choice (not supplied). Refer to *"DISPLAY WIRING DIAGRAM" on page 59,* and connect the remote control panel to the PC board. The wiring uses a DB9 connector; soldering tool is needed to make the connections.

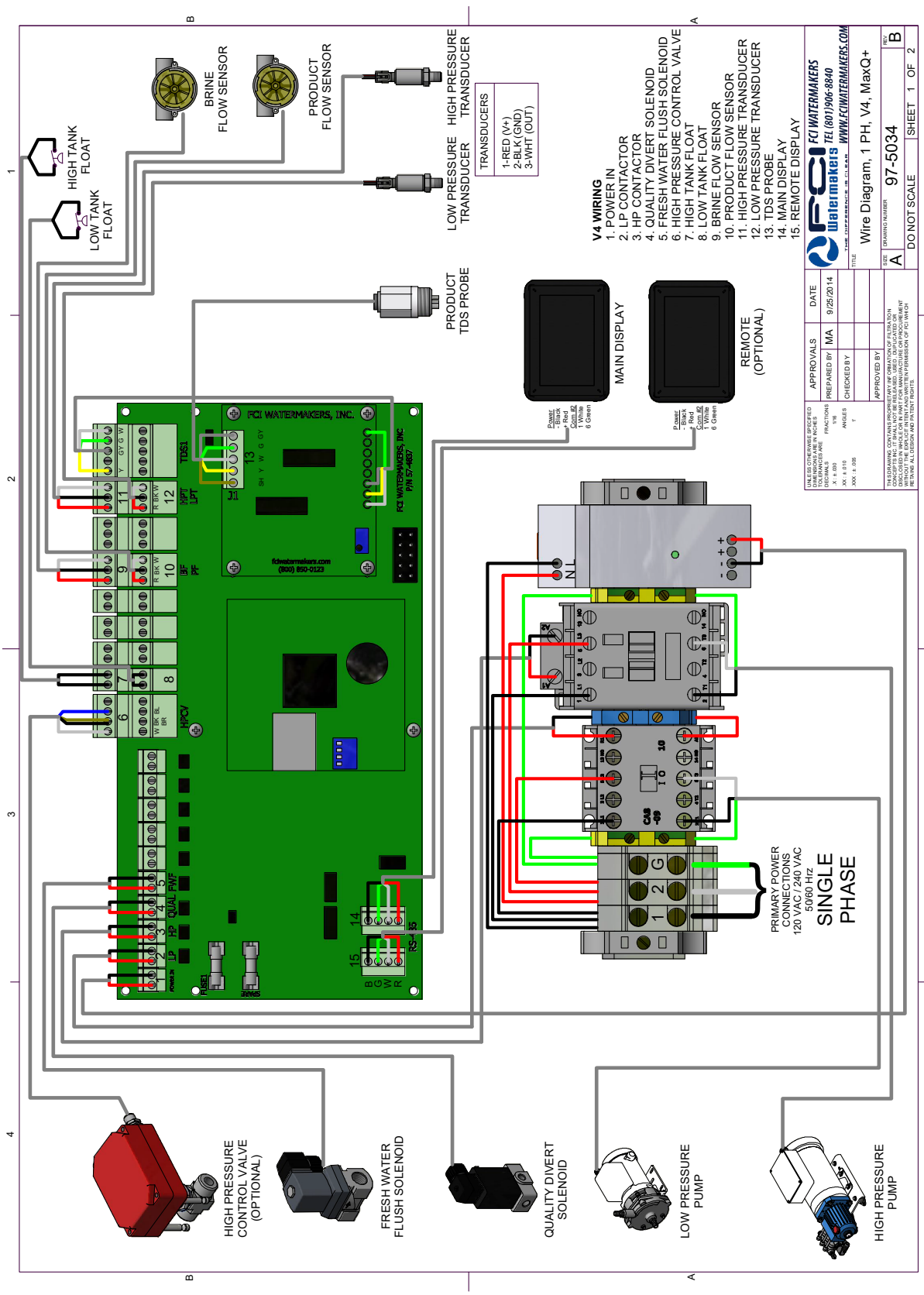
For module with APC, **WIRING THE ACTUATED VALVE (optional)**
If you are installing the optional actuated valve in place of a low pressure pump, refer to the diagrams listed below and wire the actuated valve to the connector block:

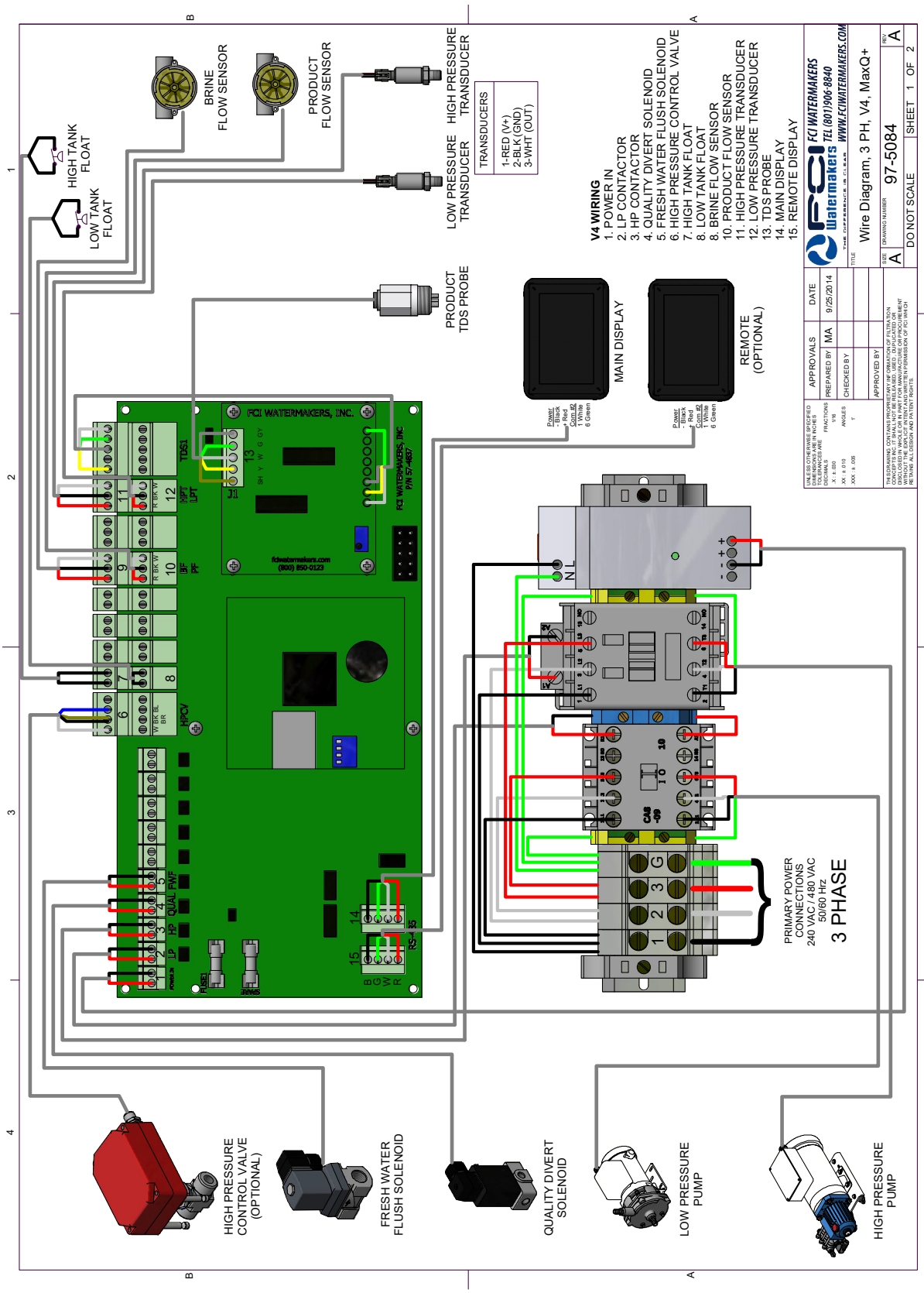
- "SCHEMATICS (Optional Actuated Valve, Single Phase, 120/240V, 50/60Hz)" on page 63.
- "SCHEMATICS (Optional Actuated Valve, Three Phase, 240/480V, 50/60Hz)" on page 64.
- "SCHEMATICS (Optional Actuated Valve, Three Phase, 380V, 50Hz)" on page 65.

DISPLAY WIRING DIAGRAM

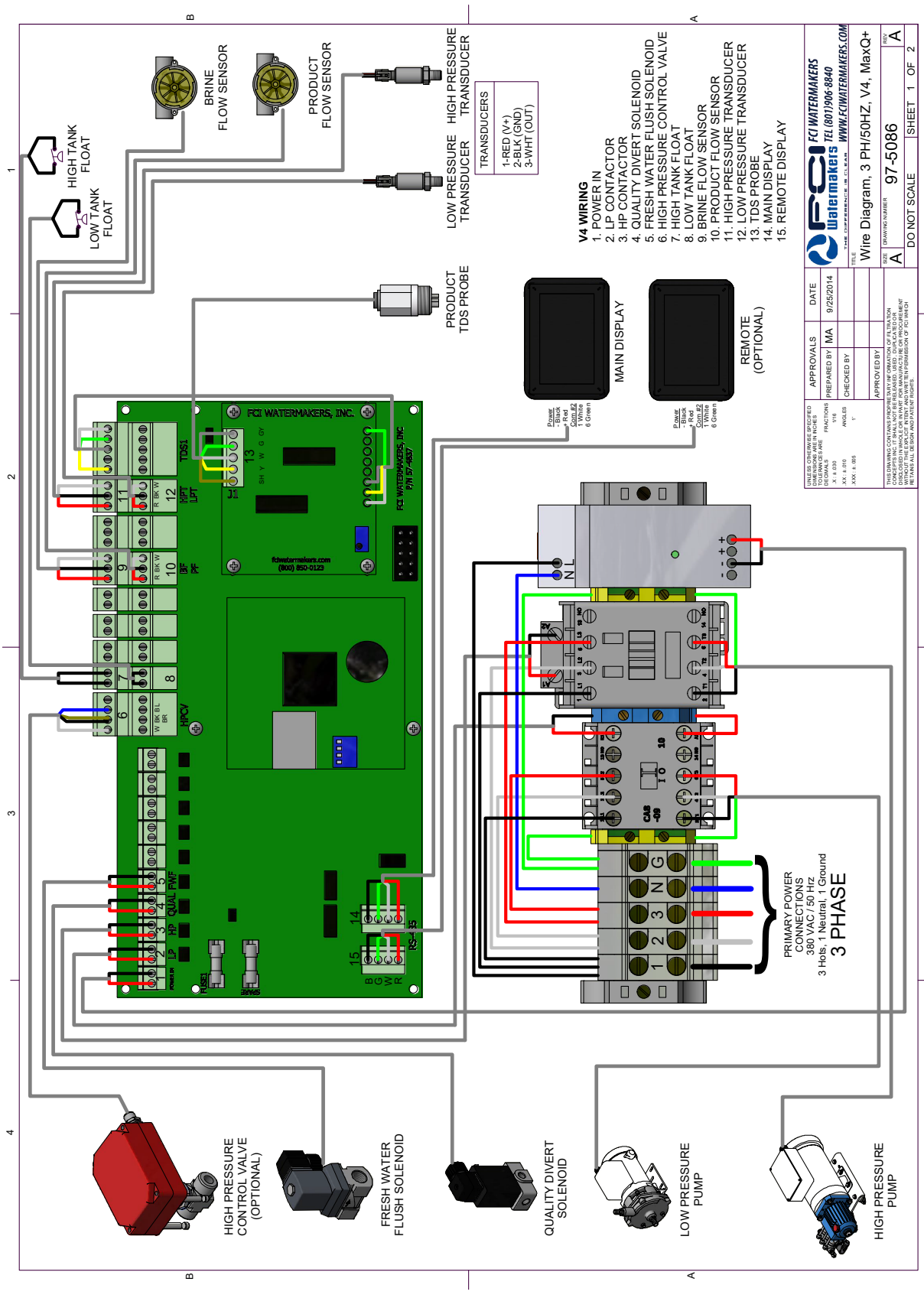


SCHEMATICS (Single Phase, 120/240V, 50/60Hz)

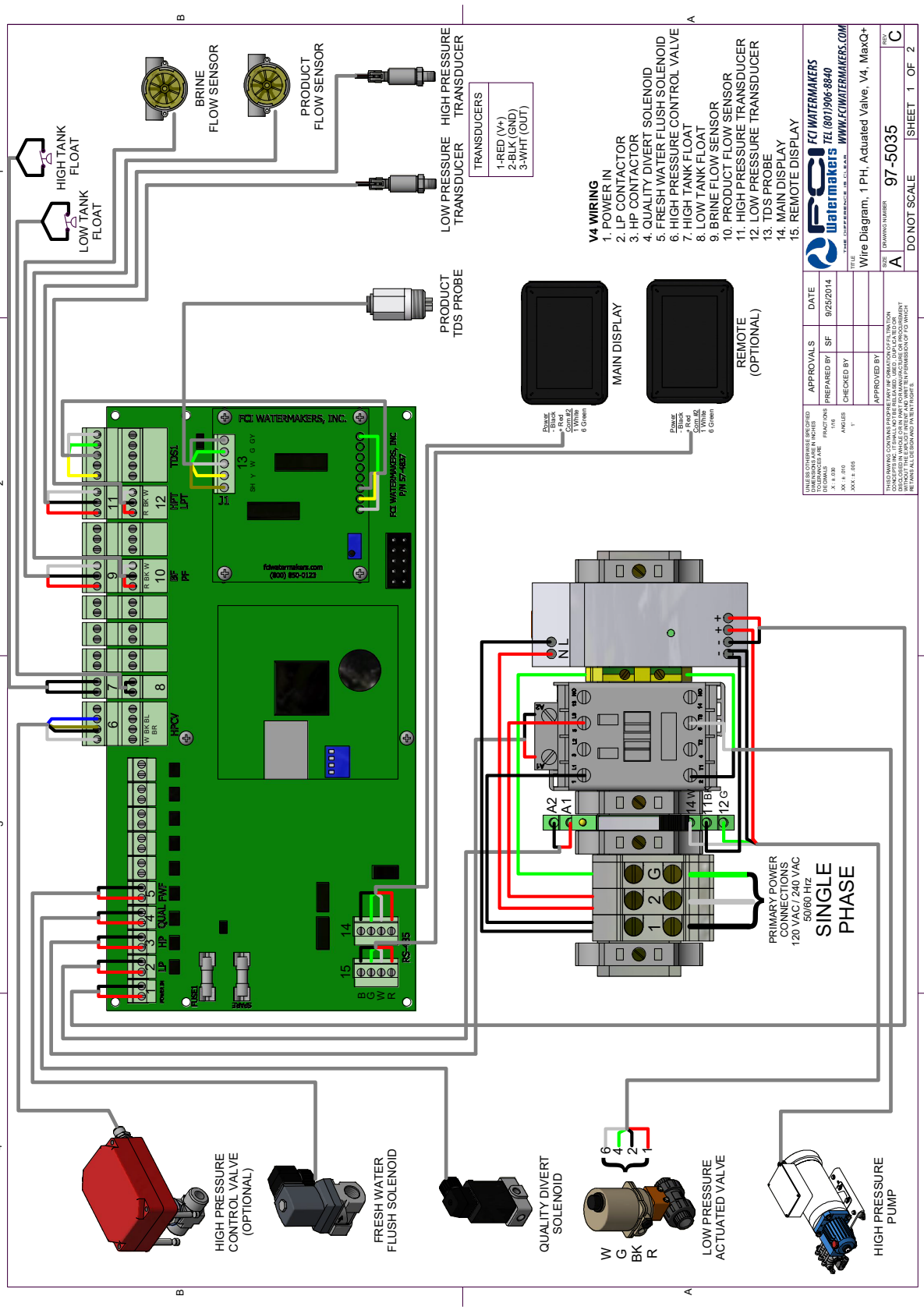



HIGH TANK FLOAT
LOW TANK FLOAT
BRINE FLOW SENSOR
PRODUCT FLOW SENSOR
LOW PRESSURE TRANSDUCER
HIGH PRESSURE TRANSDUCER
TRANSDUCERS
1-RED (V+)
2-BLK (GND)
3-WHT (OUT)
PRODUCT TDS PROBE
MAIN DISPLAY
REMOTE (OPTIONAL)
V4 WIRING
1. POWER IN
2. LP CONTACTOR
3. HP CONTACTOR
4. QUALITY DIVERT SOLENOID
5. FRESH WATER FLUSH SOLENOID
6. HIGH PRESSURE CONTROL VALVE
7. HIGH TANK FLOAT
8. LOW TANK FLOAT
9. BRINE FLOW SENSOR
10. PRODUCT FLOW SENSOR
11. HIGH PRESSURE TRANSDUCER
12. LOW PRESSURE TRANSDUCER
13. TDS PROBE
14. MAIN DISPLAY
15. REMOTE DISPLAY
FCI WATERMAKERS, INC.
PRIMARY POWER CONNECTIONS
240 VAC / 480 VAC
50/60 Hz
3 PHASE
HIGH PRESSURE CONTROL VALVE (OPTIONAL)
FRESH WATER FLUSH SOLENOID
QUALITY DIVERT SOLENOID
LOW PRESSURE PUMP
HIGH PRESSURE PUMP
Wire Diagram, 3 PH, V4, MaxQ+
97-5084
DO NOT SCALE
SHEET 1 OF 2

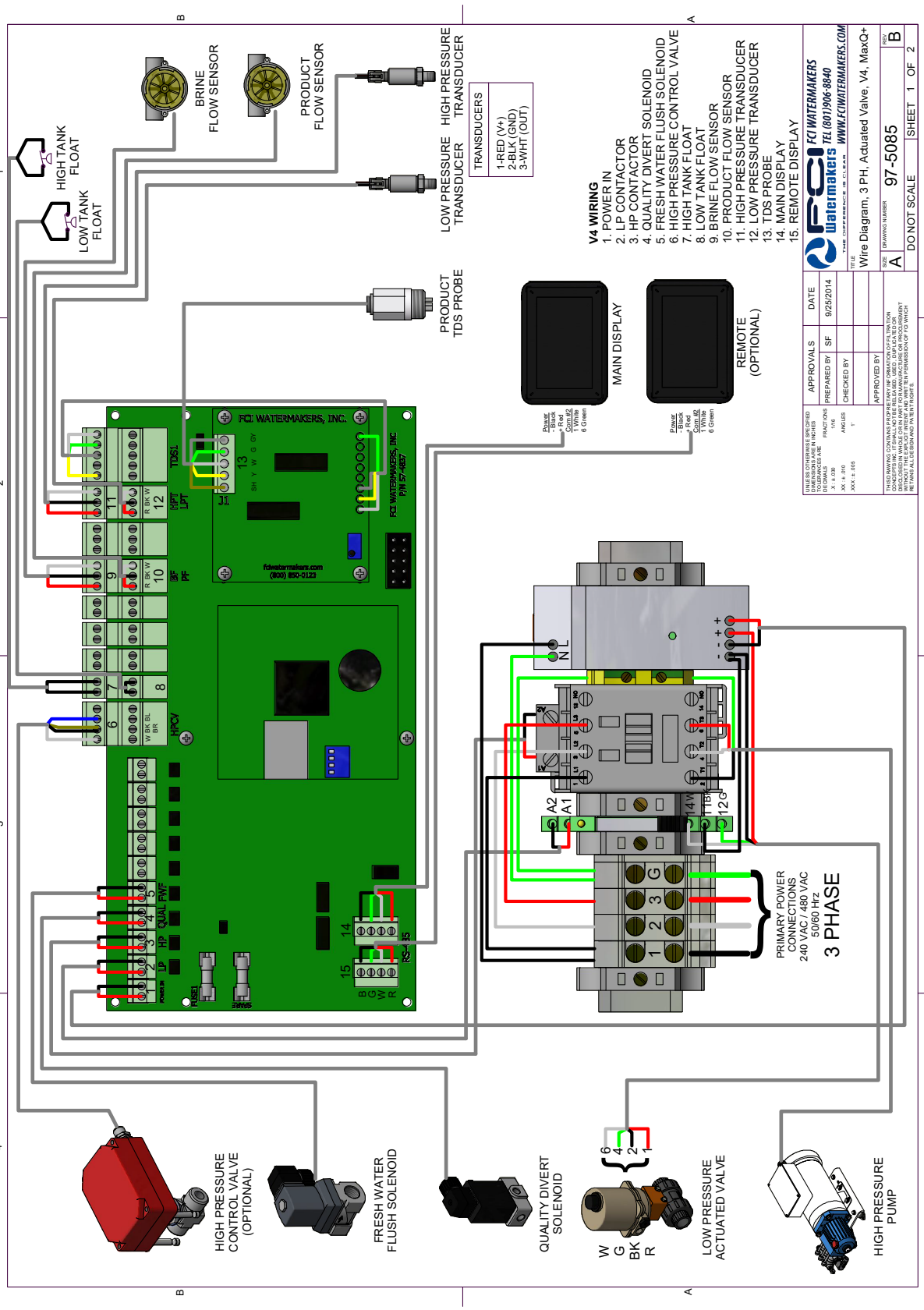
SCHEMATICS (Three Phase, 380V, 50Hz)



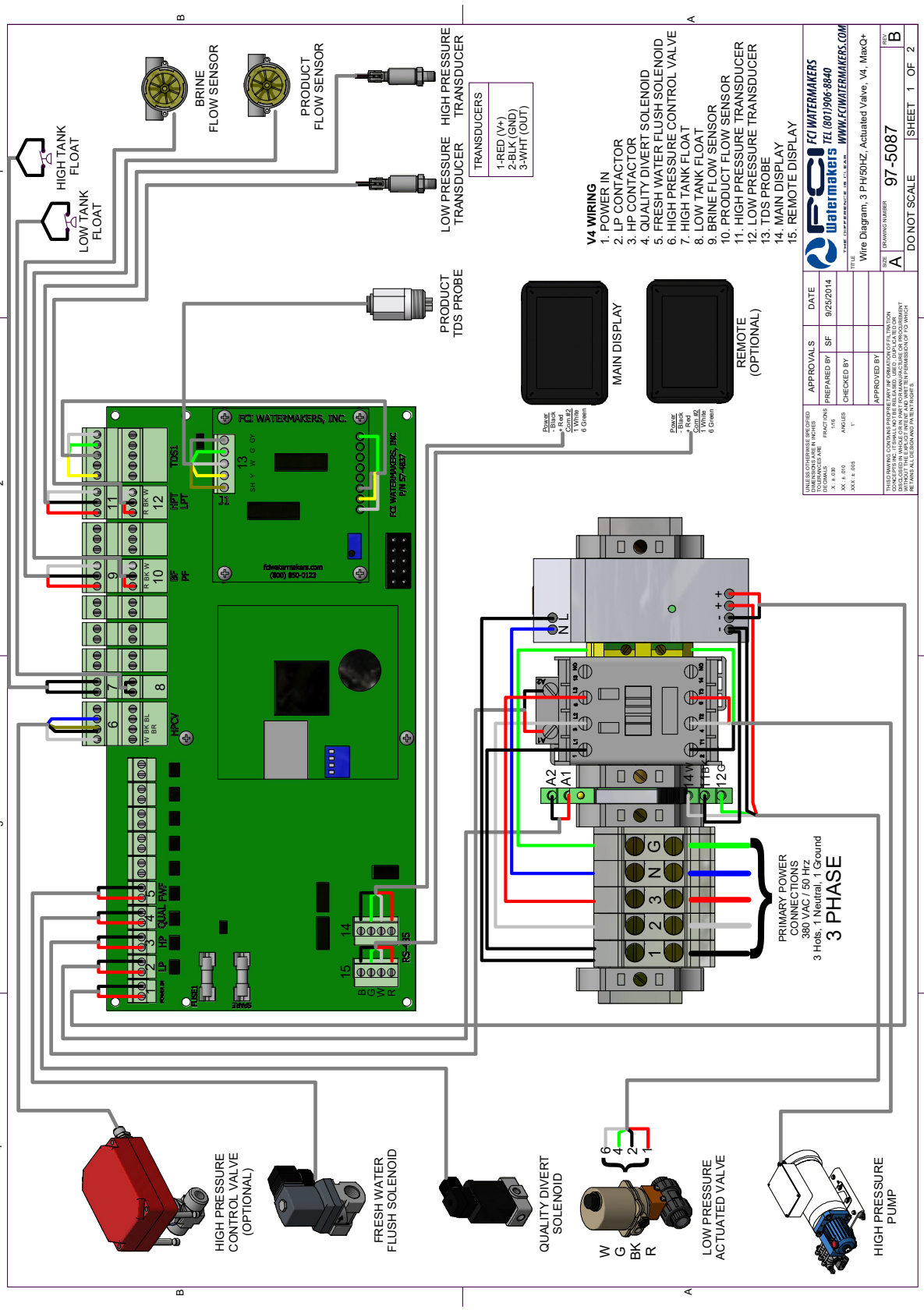
SCHEMATICS (Optional Actuated Valve, Single Phase, 120/240V, 50/60Hz)



SCHEMATICS (Optional Actuated Valve, Three Phase, 240/480V, 50/60Hz)



SCHEMATICS (Optional Actuated Valve, Three Phase, 380V, 50Hz)



FINAL INSTALLATION CHECKLIST

The following list will help ensure a successful installation:

- Ample access around system/components
- All connections are tight
- Supply and discharge valves open
- Electrical connections are secure
- Storage tank is cleaned
- Pump rotations have been checked
- Pump crankcase is filled with oil
- All Coast Guard/local codes have been met
- No iron or ferrous fittings have been used
- Electrical connections are correct
- Plumbing connections do not leak
- Thru hull is open
- Filter housings are tight
- Hose clamps are tight

4/ OPERATIONAL INSTRUCTIONS

Prior to Start-Up, it is important to take note of the following:

FEED WATER — Be aware of the condition of the water the system is processing. Is it muddy, silty, or oily? Does it show signs of other man-made contaminates? If this is the case, DO NOT run the system. If these feed water conditions are unavoidable, additional filtration will be necessary. Consult the factory or your local dealer for further details and assistance with specific water conditions.

SALINITY EFFECT — Like water temperature, the salinity of the seawater has a direct effect on the output of the system and the quality of water produced. Your new watermaker is equipped with protection for overproduction and low quality water produced. When operating in low saline water, like rivers, deltas, or lakes, the "high-pressure" required will be less. For systems without APC, reduce the pressure to the point where you are making the rated output of your system. If this pressure adjustment is not monitored the system may detect a fault condition, protect itself, and shutdown.

PRESSURE EFFECT — The pressure within a system is regulated by the size of the orifice through which the brine stream flows; thus, creating back pressure in the pressure vessel. This pressure squeezes the fresh water out of the seawater stream. The amount of pressure applied through the system directly affects the quantity and quality of water produced. More pressure is needed in cold water than in warm waters. The reason being, membranes contract in cold water, not allowing the fresh water through as easily. When operating systems without APC, always try to maintain the pressure necessary for the system to operate at its rated output. As a safety feature, the system will shutdown when the pressure is too high or too low.

TEMPERATURE & PRESSURE EFFECTS CHART

TEMPERATURE EFFECT — Water temperature has a great effect on the output of the system. Increased water temperatures increases output at a given pressure. For systems without APC, it is very critical to adjust the pressure of the machine to maintain proper fresh-water production rate. It is more important to produce the rated output than it is to achieve a certain pressure. It is perfectly normal and acceptable for your system to produce good quality water while operating at its rated output at a pressure of 600 PSI. This reduced pressure is most likely caused by an increase in the seawater temperature, or a reduction in seawater salinity. Refer to *Figure 28*.

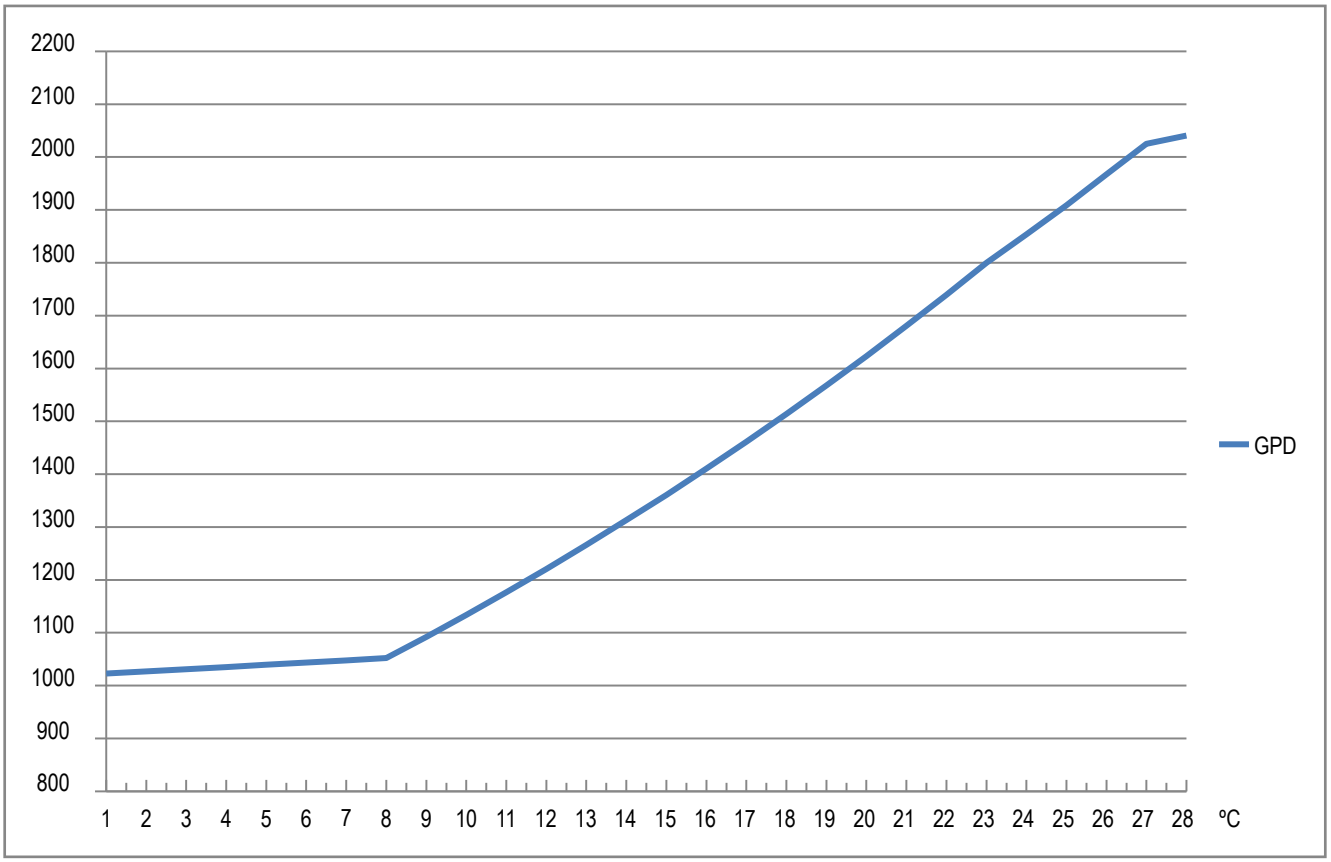
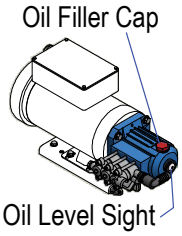
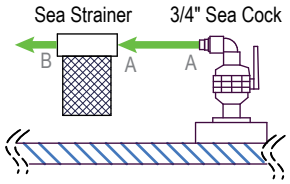


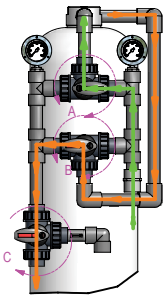
Figure 28: Water Temperature vs. Output (constant pressure)

INITIAL STARTUP AND SHUTDOWN

Follow the instruction below for a summary of the initial startup and shutdown. The pages that follow this summary describe the operation of the system in detail.







1. While the system is shipped with oil in the high pressure pump, it is a good idea to double-check the oil level is in the middle of the oil level sight.
2. Make sure the sea cock is open, the sea strainer is clear and operational, and the brine discharge is unblocked. If your installation includes the optional media filter, make sure the valves are set to "in-service."
3. Apply power to the system. Wait until the LED indicator in the upper left of the display turns a solid blue. This indicates the system is powered up and in standby.
4. The display should show the power up screen. Touch the large watermaker logo to display the home screen.
5. If this is the initial startup and your installation includes the optional media filter, backwash the system for 20 minutes:
   A. Press the setup icon.
   B. The setup screen appears. Press the Media Tank icon.
   C. The backwash screen appears. Press the manual circle and follow on-screen instructions.
   D. You will be instructed to set the media filter valves to the backwash position, and touch confirm when done. Pressing the valves icon will display the valves chart, showing the "backwash" position in which to set the valves before proceeding.
   E. After backwashing is done, follow on-screen instructions to set the valves to "in-service." Touch confirm when done.
6. Press the start icon to start up the system. After priming and initializing, the system will display the run screen. For standard systems, turn the high pressure control valve clockwise until production is equal to the system's rated output. For systems with APC, the pressure will automatically adjust.
7. Production starts when water quality is acceptable.
8. To shutdown, press the stop icon. The system will shutdown and then flush with fresh water for a pre-set time. For standard systems, turn the high pressure valve all the way counterclockwise. For systems with APC, the valve will reset automatically.

V4 CONTROL SYSTEM OVERVIEW

The V4 Control System was specially designed by FCI Watermakers for our reverse osmosis systems. The system is designed to be run either locally via the display, or remotely via remote display or remote IP access.

The V4 Control System continuously monitors all inputs and controls all outputs for proper machine operation,

The Control System is designed to make machine operation as simple as possible for the operator. Once the operator places the machine into production with the appropriate setpoints, the Control System automatically sequences all controlled devices in order to ensure the proper amount of fresh water is delivered. In addition, water quality, flow rates, filter life, pressures, and pump status are all monitored to ensure safe and reliable operation.

All operation, machine setup, and calibration is performed via the display, with factory default settings stored permanently in the system in addition to a user savable settings.

SAFETY

The V4 Control System has four different processes to ensure the safety of the personnel operating the unit and also the unit itself. The process the V4 Control System uses depends on the severity of the issue.

- Notification
- Warning
- Alarm
- Shutdown

The FCI display was specifically selected due to its extreme durability in the marine environment. It is designed to not interfere with marine electronics, features a NEMA 4X design, and can be fully dimmable for night time operation. The display utilizes a resistive touch screen, and unlike most touch screens, the display relies on the press action of your finger in order to make contact with the screen. This allows the user to be able to activate the screen even with gloves on.

The following is a list of basic operational graphics, and a brief description how they function.

NUMERIC INPUT

Numeric Inputs show the value of a setpoint that can be adjusted, for example, a Timer Setpoint or a TDS Setting. These can be found in the setup section of the display. To change a setting, touch the number in white.

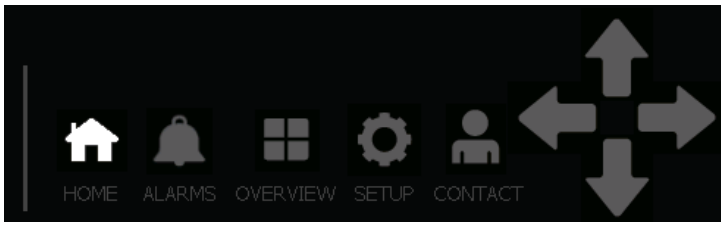
Upon pressing a Numeric Input, the Numeric Keypad will open up.

NUMERIC DISPLAY

Numeric Displays show the value of an device, such as a pressure transducer or flow meter. These values cannot be adjusted and are for reading machine status.

NAVIGATION BAR

The Navigation Bar is positioned at the bottom of each screen for quick and easy navigation between the various screens.



Home – Displays the Home Screen, or the Run Screen when the unit is in operation.

Alarms – Displays the Alarm Screen.

Overview – Displays the Overview Screen which shows a graphical representation of the overall system status.

Setup – Displays the Setup Screen which allows the user to change settings.

Contact – Displays the Contact Screen.

Direction Arrows – Allow the user to navigate through various screens. The arrows will be white when they can be pressed to show additional screens.

STATUS INDICATOR
The Status Indicator shows a quick overview of what is active in the system and if there is any alarm conditions present.

LPP – This shows the status of the Low Pressure Pump:

- Green = Pump On
- Grey = Pump Off

HPP – This shows the status of the High Pressure Pump:

- Green = Pump On
- Grey = Pump Off

TDS – This shows the status of the product quality (Total Dissolved Solids):

- Green = Quality Valve Open/Water Quality Below Setpoint
- Flashing Green = Quality Valve Closed/Checking Water Quality
- Red = Quality Valve Closed/Water Quality Above Setpoint

STATUS BAR
The Status Bar shows a quick overview of what is active in the system and if there is any fault alarm conditions present.

Grey – System is not active and in standby mode.

Flashing Green – System is active, and is either priming or initializing.

Green – System is active and running.

Red – System is shutting down.

Flashing Blue – Fresh water flush delay is active and will start soon.

Blue – Fresh water flush is active.

DISPLAY INDICATOR
Located in the upper left hand corner of the screen is a LED light.
This is used to quickly show the user the status of the system.

Blue – System is not running and in standby mode.

Slow Flashing Blue – System is running.

Slow Flashing Red – System is running, but a warning or alarm condition is present.

Red – System has stopped due to a shutdown.

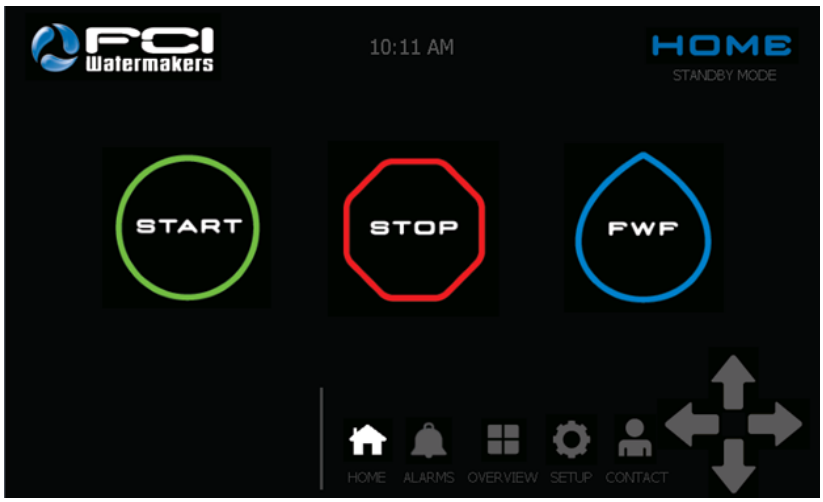
Fast Flashing Blue – System is not ready to start due to
Service Mode or Backwash mode being selected.

DISPLAY SCREENS

STARTUP SCREEN
Upon powering your unit on, the screen will go through its boot process. Once complete, it will show the Startup Screen.

The startup screen displays Model # and Serial # for you reference. Touch the large watermaker logo to proceed to the Home Screen.

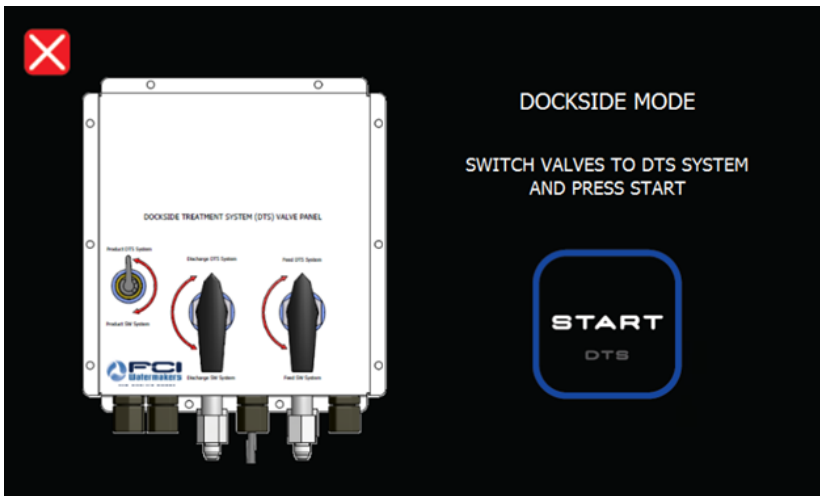
HOME SCREEN
The Home Screen is your main navigation portal.



You will be able to access all screens from here by using the Navigation Bar located on the bottom right. In addition you can Start / Stop / FWF your unit from this screen. If any run options are selected they will be displayed in the lower left hand corner of the screen.

HOME SCREEN (with DTS Installed)
If you have the Dockside Treatment System (DTS) installed on your unit, the home screen will feature a DTS button as shown below.

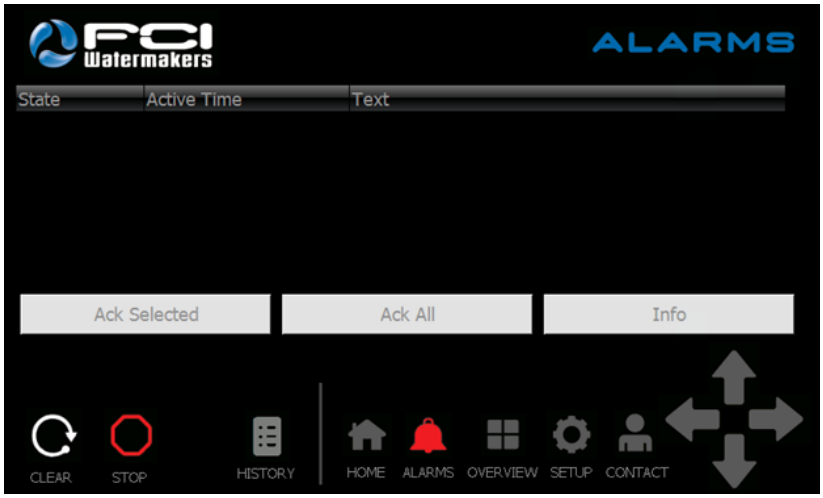
To start the DTS, press the DTS button. The Dockside Mode screen is displayed.



You will need to confirm valve setup and press the Start button to proceed.

ALARMS SCREEN

The Alarms Screen is where you can view and clear any current alarms.



State – Describes the current condition of the alarm, "Active" or "Inactive."

Active Time – This will show the time in which the alarm became active.

Text – This will tell the user what the alarm is.

Ack Selected – This is a button that allows you to acknowledge the alarm. Once the alarm has been acknowledge, you will need to hit the clear button on the lower left to clear the system prior to starting the unit up again.

Ack All – This allows the user to acknowledge all the active alarms.

Info – You can select an alarm by touching it on the screen. Once selected, press the info button. This will give you detailed information about the alarm and helpful troubleshooting tips.

History – This button will take you to the alarm history screen. Once an active or inactive alarm has been cleared, it will move to the alarm history page.

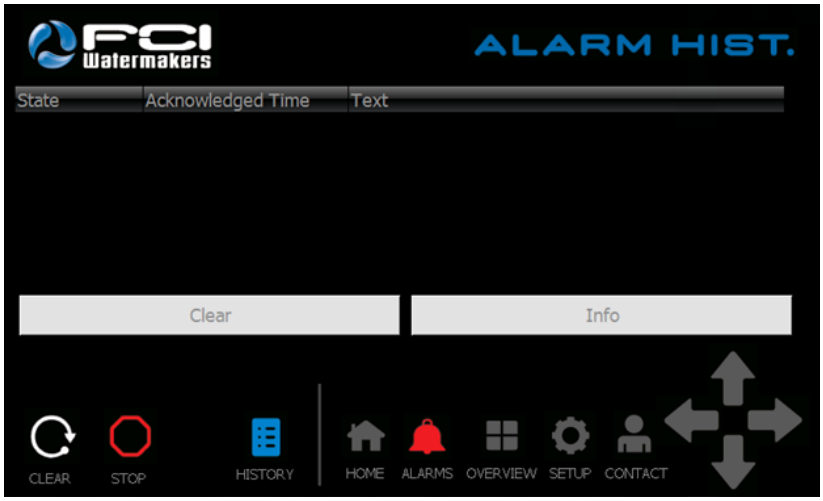
Clear – Press this button to clear the system once a shutdown has taken place.

Stop – Press this button to stop the system.

Navigation Bar – This allows the user to easily navigate between main screens.

ALARM HISTORY SCREEN

The Alarm History Screen is where you can view already-acknowledged alarms.



State – Describes the current condition of the alarm.

Acknowledged Time – This will show the time in which the alarm was acknowledged by the user.

Text – This will tell the user what the alarm is.

Clear – This button will clear the alarm history.

Info – You can select on alarm by touching it on the screen. Once selected, press the info button. This will give you detailed information about the alarm and helpful troubleshooting tips.

History – This button will take you back to the alarm screen.

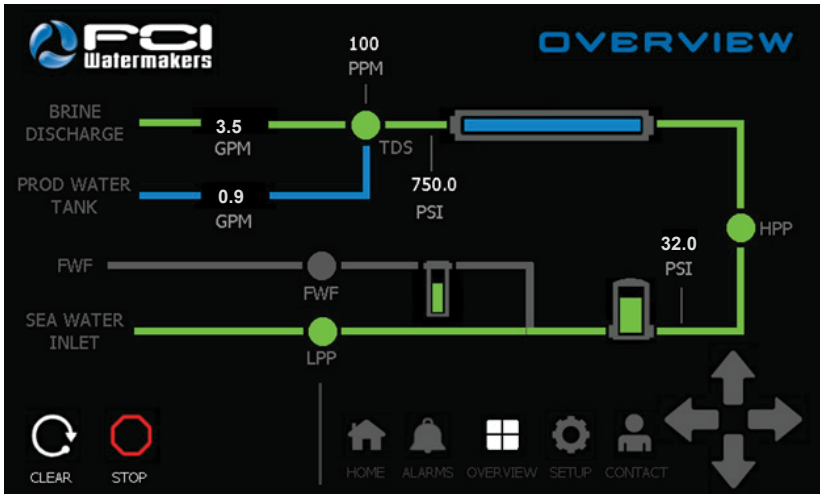
Clear – Press this button to clear the system once a shutdown has taken place.

Stop – Press this button to stop the system.

Navigation Bar – This allows the user to easily navigate between main screens.

OVERVIEW SCREEN

The Overview Screen is a quick reference of the status of the system.



It will display the pressures and flows in your system and show what outputs are active. For example, if you look at LPP, it shows a green circle, meaning the LPP is currently running. You are able to follow the flow of the water, where the green lines indicate sea water and the blue lines indicated fresh water.

Clear – Press this button to clear the system once a shutdown has taken place.

Stop – Press this button to stop the system.

Navigation Bar – This allows the user to easily navigate between main screens.

SETUP SCREEN

The Setup Screen will show you all the areas in which you can adjust settings or see statistics of your system.

Timers – Press the image to take you to the system timers.

Settings – Press the image to take you to the system settings.

Service – Press the image to take you to the system service mode.

Config – Press the image to take you to the system configurations.

APC – Press the image to take you to the system Automatic Pressure Control.

Media Tank – Press the image to take you to the media tank mode.

FWF – Press the image to take you to the Fresh Water Flush Interval settings.

Stats – Press the image to take you to the system statistics.

Clear – Press this button to clear the system once a shutdown has taken place.

Stop – Press this button to stop the system.

Navigation Bar – This allows the user to easily navigate between main screens.

TIMERS SCREEN

The Timers Screen will allow you to adjust timer setpoints for the system.

To adjust a timer, press the white number of the timer you would like to adjust. Once pressed, a numeric keypad will come up.

Prime – The Prime Timer is the amount of time in minutes the Prime Sequence will be active.

Initialization – The Initialization Timer is the amount of time in minutes the Initialization Sequence will be active.

Flush – The Flush Timer is the amount of time the Fresh Water Flush Sequence will be active.

High TDS Shutdown – The High TDS Shutdown Timer is the amount of time the system will allow for a high TDS prior to shutting down the system.

Clear – Press this button to clear the system once a shutdown has taken place.

Stop – Press this button to stop the system.

Navigation Bar – This allows the user to easily navigate between main screens.

Left Arrow – Goes back to the main setup screen.

SETTINGS SCREEN

The Settings Screen will allow you to adjust system settings.

To adjust a setting, press the white number of the setting you would like to adjust. Once pressed, a numeric keypad will come up

Production SP (GPM) – If equipped with APC, this setting is the amount of water your system will produce. It is recommended to keep the setting as is to maintain efficiency and life of your system. If not equipped with APC, this is what you should dial your high pressure control valve to for maximum efficiency and life of your system.

Prod Quality SP (PPM) – This setting is the Product Quality Setpoint. Once the system reaches a number below the setpoint, the system will allow the water to go to your product tank. If the system is above the setpoint, the water will not be allowed to go to the product tank.

Prod Temp Cal – This is your Product Temperature Calibration. This is set by the factory and can be adjusted if needed.

Brine K Factor – This is your Brine Flow Meter Calibration. This is set by the factory and it is not recommended to change this setting.

Prod K Factor - This is your Product Flow Meter Calibration. This is set by the factory and it is not recommended to change this setting.

Clear – Press this button to clear the system once a shutdown has taken place.

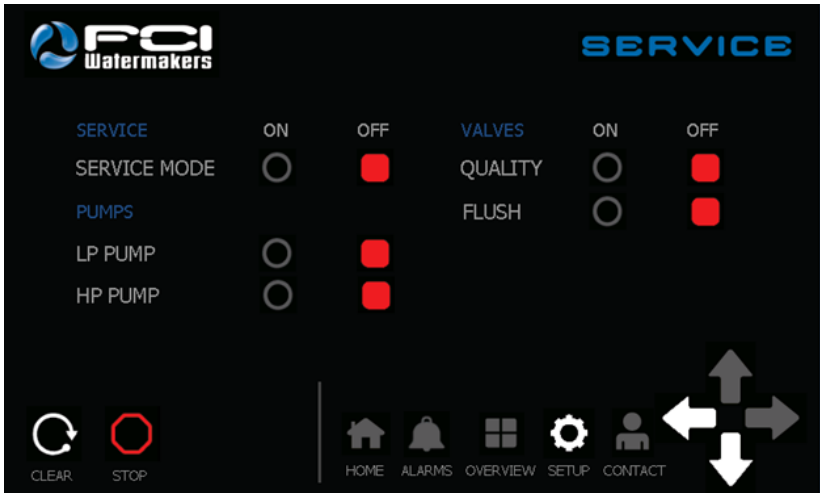
Stop – Press this button to stop the system.

Navigation Bar – This allows the user to easily navigate between main screens.

Left Arrow – Goes back to the main setup screen.

SERVICE SCREEN #1

The Service Screen allows the user to test and run the system in a manual mode.



To turn on a setting, touch the grey circle. The circle will then turn to a green circle, indicating the item is on. To turn off an item, touch the grey square. The square will turn red once the item is off.

Service Mode – Allows the user to turn service mode on/off. When service mode is on, the user can manually activate the pumps and valves. Once complete, turn off service mode in order to run the machine normally. Service mode can only be activated when the machine is not running.

LP Pump – Manually turn on the low pressure pump.

HP Pump – Manually turn on the high pressure pump.

Quality – Manually open or close the quality valve.

Flush – Manually open or close the fresh water flush valve.

Clear – Press this button to clear the system once a shutdown has taken place.

Stop – Press this button to stop the system.

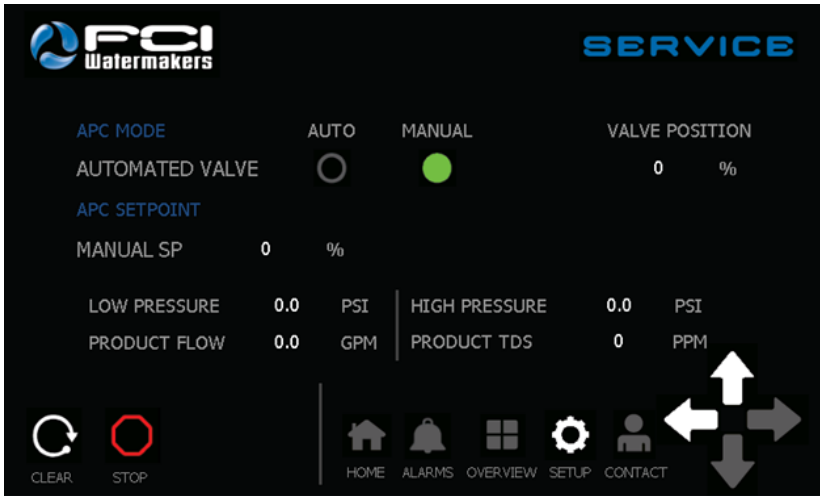
Navigation Bar – This allows the user to easily navigate between main screens.

Left Arrow – Goes back to the main setup screen.

Down Arrow – Goes to page #2 of Service.

SERVICE SCREEN #2

The Service Screen allows the user to test and run the system in a manual mode.



Service Screen #2 gives key pressures and flows to allow the user to run in a manual mode.

Automated Valve – Controls the APC. Auto mode allows the control system to adjust the valve for maximum efficiency. Manual mode allows the user to adjust the valve via Manual SP.

Valve Position – Informs the user the position of the valve in percentage closed.

Manual SP (%) - When the unit is in manual mode, the user can adjust the valve position by touching the numeric input, from 0% (open) to 100% (closed).

Clear – Press this button to clear the system once a shutdown has taken place.

Stop – Press this button to stop the system.

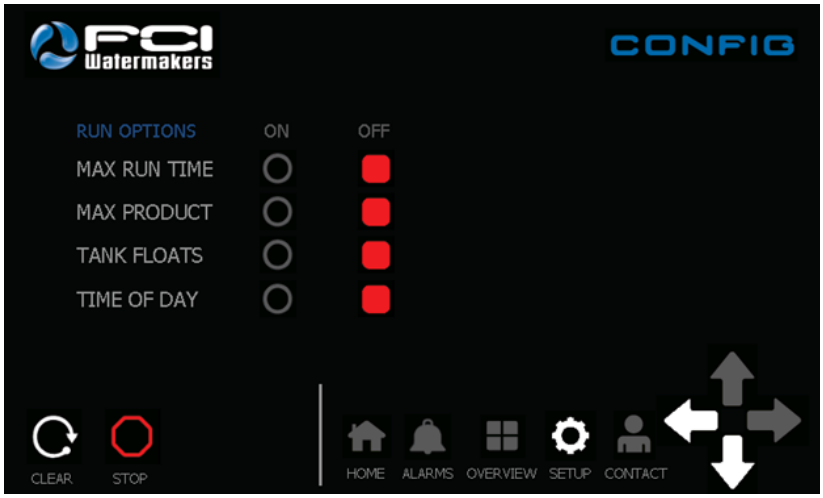
Navigation Bar – This allows the user to easily navigate between main screens.

Left Arrow – Goes back to the main setup screen.

Up Arrow – Goes to page #1 of Service.

CONFIG SCREEN #1

The Config Screen allows the user to select different run options for their unit.



Max Run Time – This allows the user to setup the maximum amount of time the unit will run. Once this option is turned on, you will be able to set the number of hours you want the system to run for prior to shutting down and fresh-water flushing itself.

Max Product – This allows the user to setup the maximum number of gallons the system will produce. Once the option is turned on, you will be able to set the number of gallons you want the system to produce prior to shutting down and fresh-water flushing itself.

Tank Floats – This allows the user to install tank floats on their product water tank and wire the floats to the controller (see instruction in wiring schematic). Once the option is turned on, the controller will wait till both floats are dry and turn on the unit. Once both floats are wet the unit will shutdown and fresh-water flush itself.

Time of Day – This allows the user to set times to start and stop the system. Once pressed, a start hour and minute will appear, and a stop hour and minute will appear. Set your time (24 hour based) and the system will automatically start and stop. Once stopped, the system will shutdown and fresh-water flush itself.

Clear – Press this button to clear the system once a shutdown has taken place.

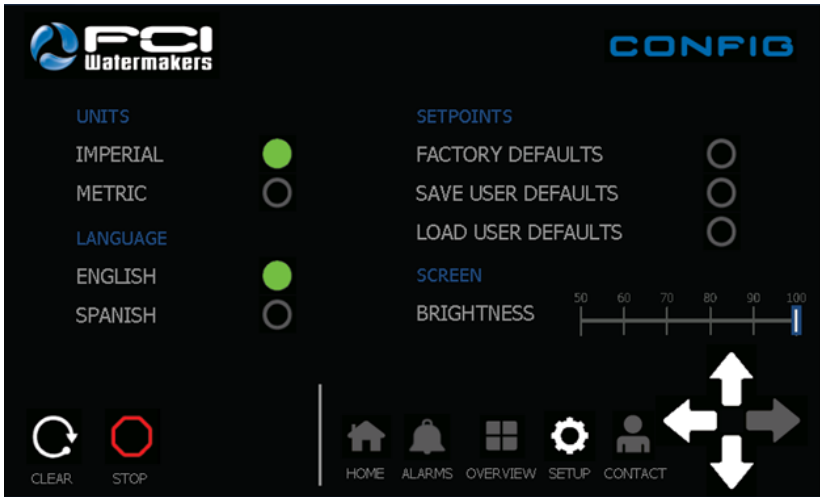
Stop – Press this button to stop the system.

Navigation Bar – This allows the user to easily navigate between main screens.

Left Arrow – Goes back to the main setup screen.

Down Arrow – Goes to page #2 of Config.

CONFIG SCREEN #2
The Config Screen allows the user to adjust units, language, setpoints and screen brightness



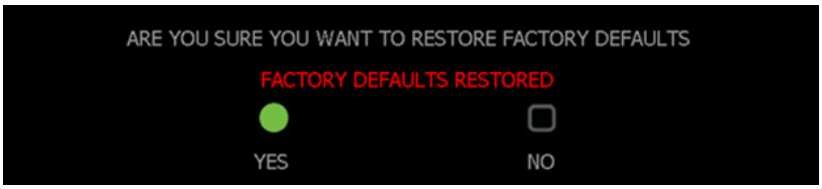
Units – Either Imperial or Metric units can be selected

Language – Either English or Spanish can be selected

Setpoints –

- **Factory Defaults**. This restores the defaults set in place by the factory. Press and hold the grey circle to restore factory defaults, a popup will appear confirming you want to Restore Factory Defaults.

Press and hold Yes until a red FACTORY DEFAULTS RESTORED appears.



- **Save User Defaults**. This allows the user to save their own defaults specific for their system. Press and hold the grey circle to save user defaults, a popup will appear confirming you want to Save User Defaults. Press and hold Yes until a red USER DEFAULTS SAVED appears.
- **Load User Defaults**, this allows the user to load their saved defaults for their system. Press and hold the grey circle to load user defaults, a popup will appear confirming you want to Load User Defaults. Press and hold Yes until a red USER DEFAULTS LOADED appears.

Screen – Brightness – This allows the user to dim their screen for night time operation.

Clear – Press this button to clear the system once a shutdown has taken place.

Stop – Press this button to stop the system.

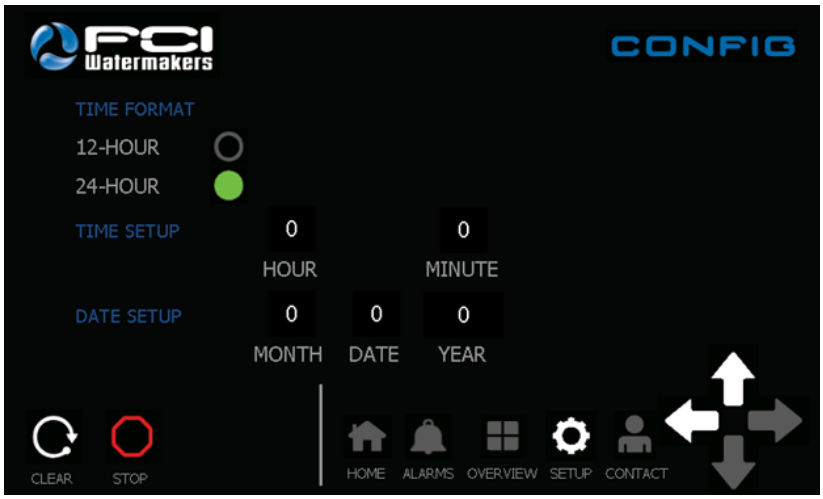
Navigation Bar – This allows the user to easily navigate between main screens.

Left Arrow – Goes back to the main setup screen.

Up Arrow – Goes to page #1 of Config.

Down Arrow – Goes to page #3 of Config.

CONFIG SCREEN #3
The Config Screen allows the user to adjust the time format, time, and date.



Time Format – User is able to adjust the way the time is displayed, 12-hour based time vs. 24-hour based time.

Time Setup – Set the hour and minute (24-hour based).

Date Setup – Set the Month, Date, and Year.

Clear – Press this button to clear the system once a shutdown has taken place.

Stop – Press this button to stop the system.

Navigation Bar – This allows the user to easily navigate between main screens.

Left Arrow – Goes back to the main setup screen.

Up Arrow – Goes to page #2 of Config.

APC SCREEN

If your system is equipped with APC, the screen will graph the controller in action as it is matching your requested product water production. This will assist in troubleshooting if there are any issues. If APC is not equipped, the graph will not show.

PV – Process Variable shows your Product Water Flow Meter Reading.

SV – Set Variable shows your Production Setpoint.

Output – Indicates the output going to the valve.

Clear – Press this button to clear the system once a shutdown has taken place.

Stop – Press this button to stop the system.

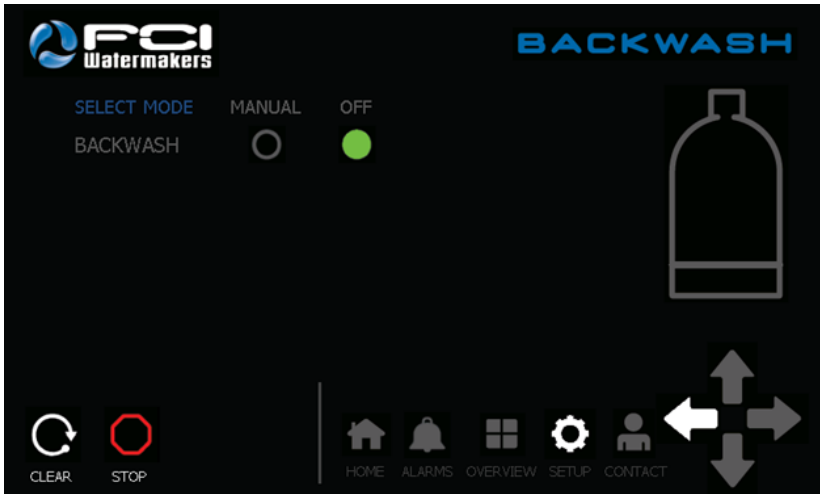
Navigation Bar – This allows the user to easily navigate between main screens.

Left Arrow – Goes back to the main setup screen.

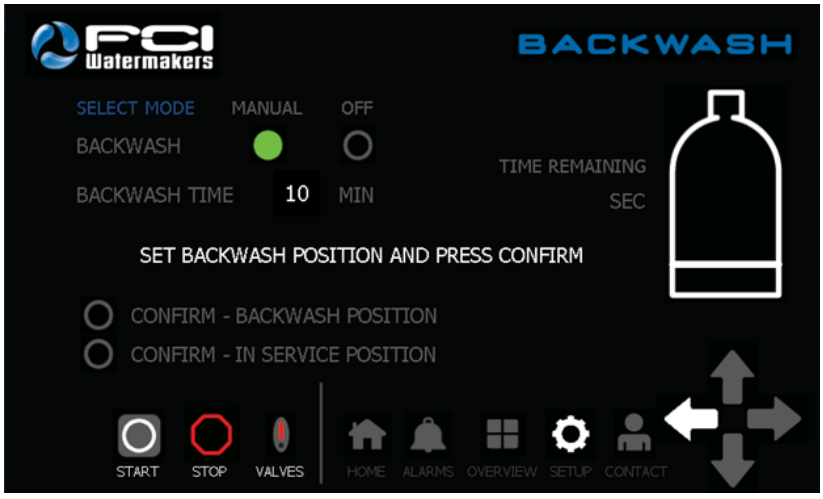
BACKWASH SCREENS

If your system is equipped with a Media Tank, these screens will guide you how to backwash your tank.

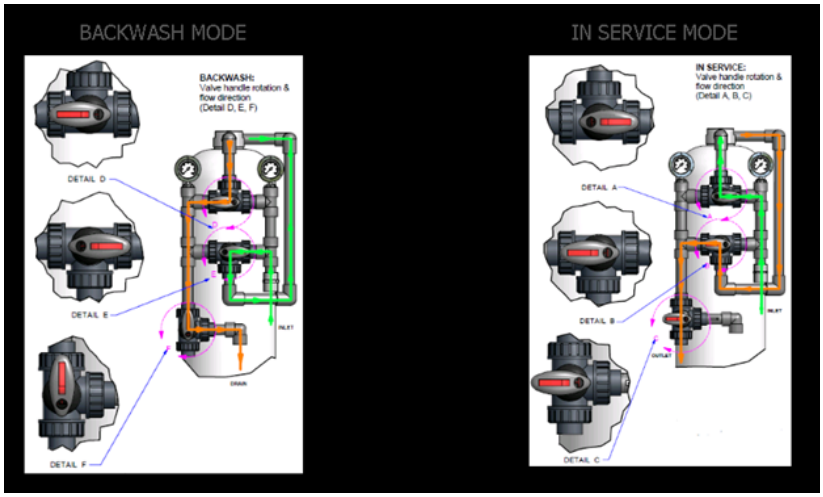
1. Select backwash mode by touching the grey circle marked, "MANUAL."



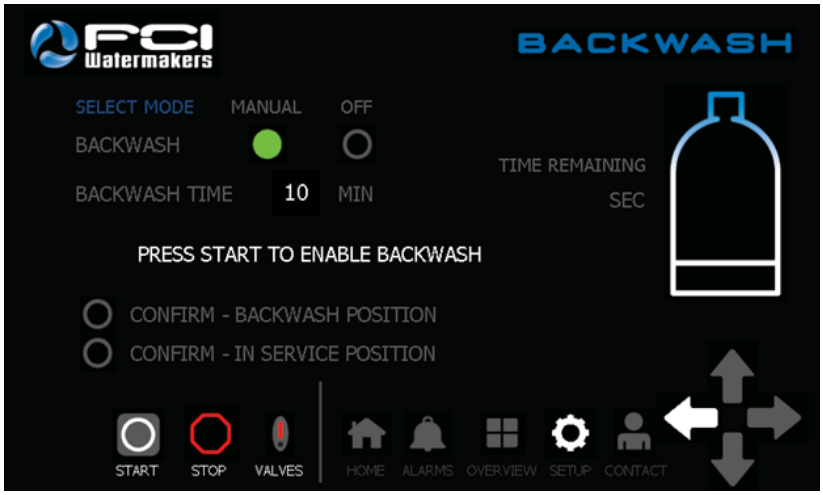
2. Once selected, use the on screen directions to complete a backwash. You will be instructed to set the media filter valves to the backwash position, and touch confirm when done.



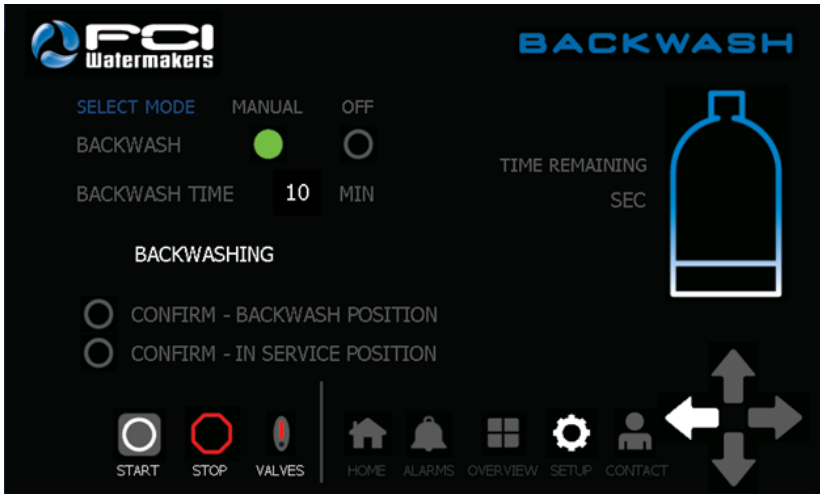
3. You can select the valves icon towards the bottom center of the screen for help in the setup the media tank valves.



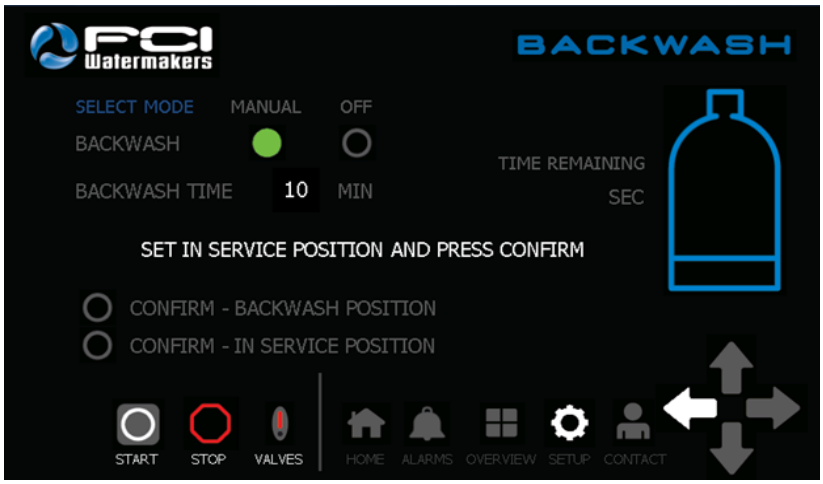
4. Once backwash position is set and the confirm button is pressed, you will be prompted to start the backwash process.



5. During the backwash process, the display will indicate backwashing by flashing the word, “BACKWASHING.” Also, the timer will indicate how many seconds are left in the backwash till completed.



6. Once completed, set the media tank valves back into service position and confirm. Backwashing has now been completed.



FWFLUSH SCREEN

Fresh Water Flush Interval allows you to set how often you would like to fresh water flush your system.

Fresh Water Flush – Select on/off to enable/disable the interval setting.

To set the Fresh Water Flush Interval, proceed as follows:

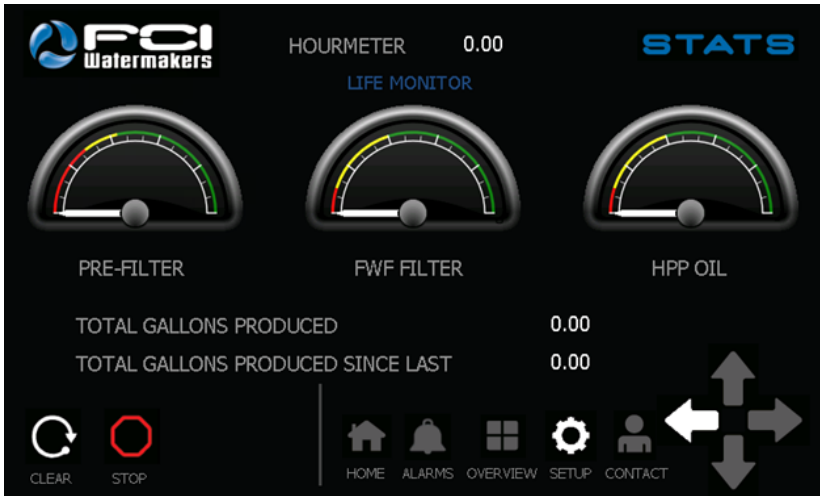
1. Set how often you would like the system to flush, by setting the number of days.
2. Select the time of how long you would like your system to flush.
3. Once completed and with the Fresh Water Flush Interval in the "On" position, the system will automatically flush.

In the example shown in the screen capture above, this system will flush every seven days for seven minutes.

The Fresh Water Flush Interval can be left active even when you run your machine as normal. The control system will calculate and ensure there is a Fresh Water Flush completed on your system based on the number of days set by the user.

STATS SCREEN

The Stats Screen gives the user feedback on a number of different items.



Hour Meter – Indicates the number of run hours on the unit.

Life Monitor –

- **Pre-Filter**. Indicates the current life of the pre-filter while the unit is running.
- **FWF Filter**. Indicates the life of the FWF Filter. The system will warn you when the filter needs to be changed, once changed you will reset the filter on this screen.
- **HPP Oil**. Indicates the life of the High Pressure Pump Oil. The system will warn you when the oil needs to be changed. Once changed you will reset the oil on this screen.

  When you take delivery of your unit the oil life monitor will be in the yellow area. This is because you will need to change the oil after approximately fifty run hours. In addition to the Life Monitor display, the control system will warn you when this is needed to be completed.

Total Gallons Produced – This shows the total number of gallons the unit has produced.

Total Gallons Produced Since Last – This shows the total number of gallons the unit has produced since the last time the unit was started.

Clear – Press this button to clear the system once a shutdown has taken place.

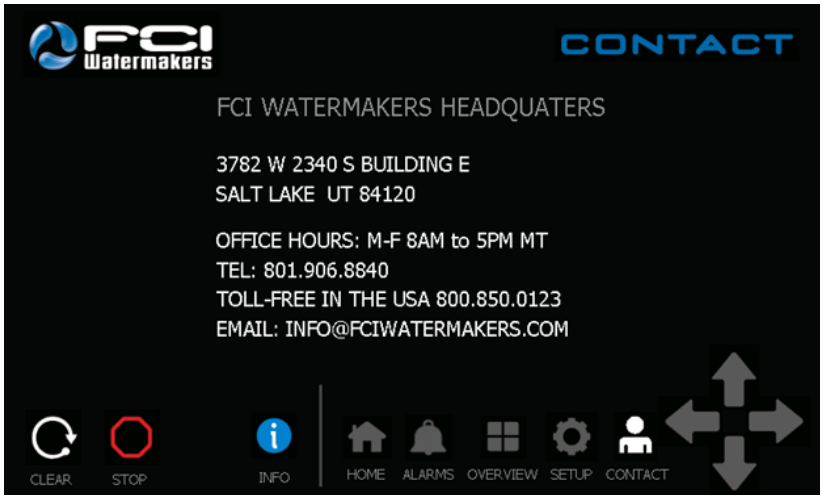
Stop – Press this button to stop the system.

Navigation Bar – This allows the user to easily navigate between main screens.

Left Arrow – Goes back to the main setup screen

CONTACT SCREEN

The Contact Screen shows information of how the company can be contacted if you have any questions.



Clear – Press this button to clear the system once a shutdown has taken place.

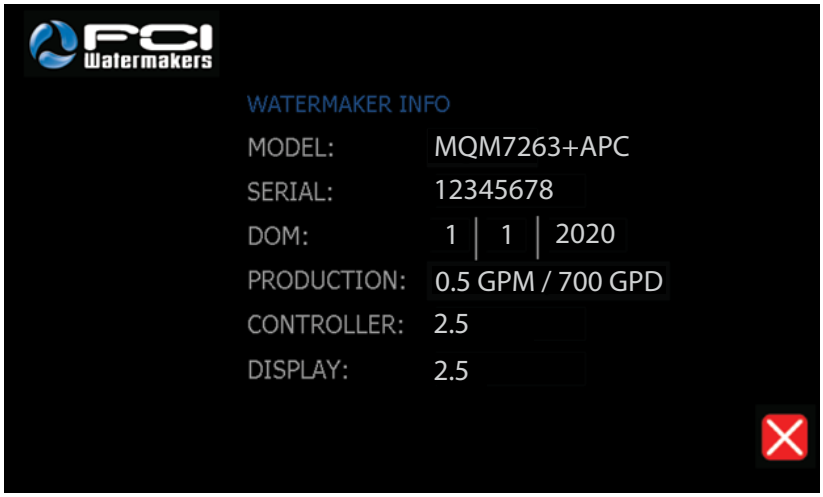
Stop – Press this button to stop the system.

Info – Press this button to get system information. This will be needed for troubleshooting purposes.

Navigation Bar – This allows the user to easily navigate between main screens.

INFO SCREEN

The information screen provides vital data of your system.



STANDBY MODE

When the machine is at rest, the unit will be in standby mode. This is the only time the system can be started. A quick indicator of the system in standby mode is the Display LED located at the top left. It should be solid blue in color.

When the system is in Standby Mode:

LPP – is off

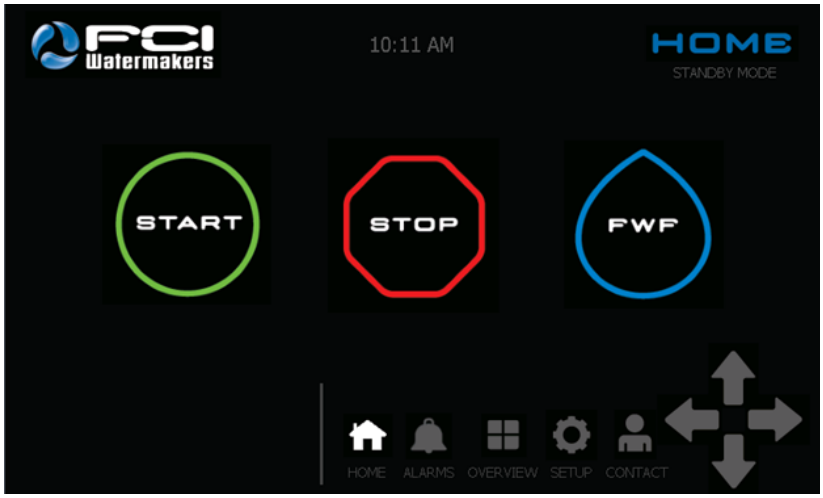
HPP – is off

FWF Valve – is closed

Quality Valve – directed overboard

APC (if equipped) – is in open position

The system can be started at any point during Standby Mode by pressing the Start Button on the Home Screen. Once started, the system will proceed to the Prime Screen. If any Run Options are selected, they will be shown on the Home Screen in the lower left hand area. Certain Run Options will allow the system to start automatically. A manual Fresh Water Flush can also be selected when in Standby Mode from the Home screen.



PRIME SEQUENCE

During the Prime Sequence, the LPP turns on. The pump status is then verified by the Low Pressure Transducer. It must be greater than 3 PSI and less than 50 PSI or the system will shutdown.

When the system is in Prime Sequence:

LPP – is on

HPP – is off

FWF Valve – is closed

Quality Valve – directed overboard

APC (if equipped) – is in open position

The Prime Timer counts down from its setpoint (Prime Timer Setpoint) which is entered by the operator. Once the timer reaches zero, the timer has expired and the system then moves to Initialize Sequence.

Timer – Indicates time left in seconds for the Prime Sequence.

Low Pressure – Shows the Low Pressure Transducer reading.

Brine Flow – Shows the Brine Flow Meter reading.

Clear – Press this button to clear the system once a shutdown has taken place.

Stop – Press this button to stop the system.

Navigation Bar – This allows the user to easily navigate between main screens.

Right Arrow – When pressed, system will proceed to the Initialize Sequence.

INITIALIZE SEQUENCE

During the Initialize Sequence, the HPP turns on. The pump status is verified by the Low Pressure Transducer. It must be greater than 7 PSI or the system will shut down. During this time if the unit is equipped with APC, the High Pressure Control Valve will start to slowly close until the desired production rate is achieved. If your system is not equipped with APC, you will start to turn your High Pressure Valve clockwise until you reach your production rate.

When the system is in Initialize Sequence:

LPP – is on

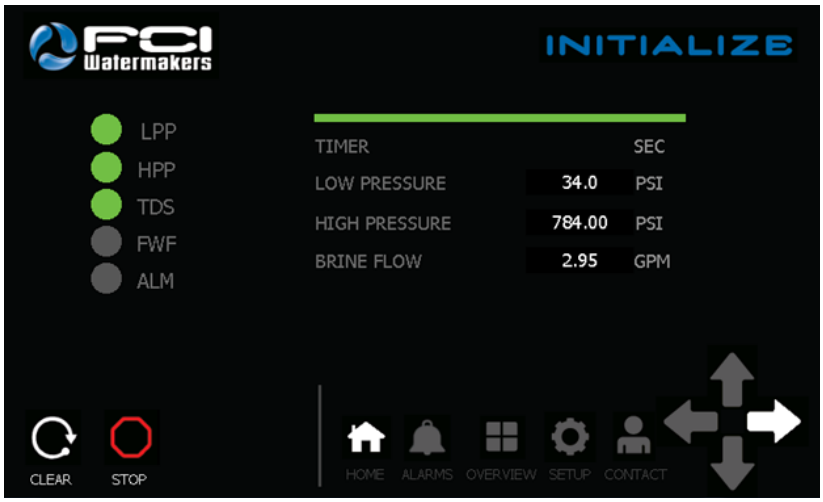
HPP – is on

FWF Valve – is closed

Quality Valve – directed overboard

APC (if equipped) – is starting to close

The Initialize Timer counts down from its setpoint (Initialize Timer Setpoint) which is entered by the operator. Once the timer reaches zero, the timer has expired and the system then moves to Running Sequence.



Timer – Indicates time left in seconds for the Initialize Sequence.

Low Pressure – Shows the Low Pressure Transducer reading.

High Pressure – Shows the High Pressure Transducer reading.

Brine Flow – Shows the Brine Flow Meter reading.

Clear – Press this button to clear the system once a shutdown has taken place.

Stop – Press this button to stop the system.

Navigation Bar – This allows the user to easily navigate between main screens.

Right Arrow – When pressed, system will proceed to the Running Sequence.

RUN SEQUENCE

During the Run Sequence, if equipped with APC, the High Pressure Control Valve will stabilize once the desired production rate is achieved. If not equipped with APC, the High Pressure Valve should be set to where you are making your production rate. The unit's production rate can be found in the info section under the contact screen. The system will wait for a given time period to allow the TDS sensor to verify the PPM reading.

When the system is in Run Sequence and stabilizing:

LPP – is on

HPP – is on

FWF Valve – is closed

Quality Valve – directed overboard

APC (if equipped) – is stabilizing

When the time period has expired, the system will verify the PPM reading. If the PPM reading is below the Product Quality Setpoint for ten seconds, the Quality Valve will divert to the product water tank. If the PPM reading is above the setpoint for more than sixty seconds, you will get a High TDS Alarm. If the PPM reading continues to stay above the setpoint for the set High TDS Shutdown Time (amount of time set by the operator), the system will shut down with a High TDS Shutdown. If at any point during the production the water quality goes above the setpoint, the Quality Valve will immediately divert back to overboard until the Product TDS sensor is able to get a reading below the setpoint for ten seconds. At this point the system will divert back to the product tank.

When the system is in Run Sequence and stabilized:

LPP – is on

HPP – is on

FWF Valve – is closed

Quality Valve – directed to product tank

APC (if equipped) – is stabilized

Low Pressure – Shows the Low Pressure Transducer reading.

High Pressure – Shows the High Pressure Transducer reading.

Brine Flow – Shows the Brine Flow Meter reading.

Product Flow – Shows the Product Flow Meter reading.

Product TDS – Shows the Product TDS meter reading.

System Temp – Shows the temperature of the product water.

Clear – Press this button to clear the system once a shutdown has taken place.

Stop – Press this button to stop the system.

Navigation Bar – This allows the user to easily navigate between main screens.

FLUSH SEQUENCE

At any point when the system is running, the stop button can be pressed. When pressed, the Quality Valve will divert overboard. If equipped with APC, the High Pressure Control Valve with go to its open position. The HPP will turn off. The LPP will turn off. There will be a 10 seconds delay prior to starting the flush.

When the system is in Flush Sequence and the Delay Timer is counting down:

LPP – is off

HPP – is off

FWF Valve – is closed

Quality Valve – directed overboard

APC (if equipped) – open position

Once the delay timer has expired, the Flush Sequence will start. The Fresh Water Flush valve will open and will remain open until the Fresh Water Flush Timer expires. Once completed the system will return to the Home Screen and be in Standby Mode.

When the system is in Flush Sequence and Fresh Water Flush Timer is counting down;

LPP – is off

HPP – is off

FWF Valve – is open

Quality Valve – directed overboard

APC (if equipped) – open position

Timer Delay – Amount of time in seconds prior to the fresh water flush starting.

Timer – Amount of time in seconds left in the fresh water flush sequence.

Low Pressure – Low pressure transducer reading (can be used to confirm FWF pressure).

Brine Flow – Brine flow meter reading (can be used to confirm FWF flow).

Clear – Press this button to clear the system once a shutdown has taken place.

Stop – Press this button to stop the system.

Navigation Bar – This allows the user to easily navigate between main screens.

SYSTEM ALARMS

The V4 Control System Alarms are divided into four categories:

Notification – This is used to alert the user of a situation happening that does not affect the safety of the machine.

Warning – This is used to alert the user that an item needs to be addressed in the near future. An example would be the High Pressure Pump Oil change is due soon.

Alarm – This is used to alert the user that an item needs to be addressed immediately otherwise the system will shutdown. An example would be if the Product TDS is higher than the setpoint. If left alone, the system will safety shut itself down to avoid damage.

Shutdown – This is used to protect both the user and machine. If a condition arises that is considered unsafe, the unit will immediately shutdown. An example would be the High Pressure Shutdown. If the system reaches its high pressure limit the unit will immediately shutdown.

NOTIFICATIONS

The following is a list of notifications and their causes.

1. *High Pressure APC Notification (If equipped with APC):*

Cause: Notification is triggered when the unit is running and the high pressure reaches 950 PSI. The APC system stops running and holds the High Pressure Control Valve at its current setpoint to prevent High Pressure Shutdown. System can be run but production output may be reduced. System will resume APC when pressure is reduced due to water conditions.

Clear: Watermaker is being run in a very high salinity environment or cold water.

WARNINGS

The following is a list of warnings and their causes, and how to clear the warning condition.

1. *FWF Filter Change Warning:*

Cause: Warning is triggered when the Life Monitor indicates the Fresh Water Filter needs to be changed.

Clear: Once you have changed the Fresh Water Flush Filter, navigate to the Setup / Stats. A reset button under the life monitor for the fresh water flush will appear. Hold the button for 5 seconds or until the button disappears.

2. *Oil Change Warning:*

Cause: Warning is triggered when the Life Monitor indicates the HPP Oil needs to be changed.

Clear: Once you have changed the HPP Oil, navigate to the Setup / Stats. A reset button will appear under the life monitor for the HPP Oil. Hold the button for 5 seconds or until the button disappears.

ALARMS
The following is a list of alarms and their causes, and how to clear the alarm condition.

1. Over Production Alarm:

Cause: Alarm is triggered when the Product Flow is 15% greater than the rated output.

Clear: If equipped with APC, check to see if the HPCV is in manual mode, or possible Product Flow Sensor Failure. If not equipped with APC, reduce HPCV by turning the valve counter clockwise until you reach your rated output.

2. High TDS Alarm:

Cause: When the Product TDS is greater than the setpoint for more than 60 seconds.

Clear: Increase product quality be reducing the PPM reading. Check for possible bad membranes.

SHUTDOWNS
The following is a list of shutdowns and their causes, and how to clear the shutdown condition.

1. Inlet Low Pressure Shutdown:

Cause: Triggered when the low pressure reading is below 3 psi for 30 seconds.

Clear: Select the alarm, press the Ack Selected button, then clear the system by pressing icon in the lower left hand corner.

2. Inlet High Pressure Shutdown:

Cause: Triggered when the low pressure reading is greater than 50 psi for 30 seconds.

Clear: Select the alarm, press the Ack Selected button, then clear the system by pressing icon in the lower left hand corner.

3. HPP Feed Pressure Low Shutdown:

Cause: Triggered when HPP is running and the low pressure reading is below 7 psi.

Clear: Select the alarm, Press the Ack Selected button, and clear the system in the lower left hand corner.

4. HPP Interlock Shutdown:

Cause: Triggered when the HPP is running but the LPP pump is not meeting the minimum flow rate.

Clear: Select the alarm, press the Ack Selected button, and clear the system by pressing icon in the lower left hand corner.

5. Over Production Shutdown:

Cause: Triggered when the Over Production Alarm has been active for 60 seconds, or when the Product Flow is 20% greater than the rated output.

Clear: Select the alarm, press the Ack Selected button, and clear the system by pressing icon in the lower left hand corner.

6. High Pressure Shutdown:

Cause: Triggered when the system's pressure reaches 1000 psi.

Clear: Select the alarm, press the Ack Selected button, and clear the system by pressing icon in the lower left hand corner.

7. High TDS Shutdown:

Cause: Triggered when the High TDS Alarm has been active for set High TDS Shutdown Timer duration.

Clear: Select the alarm, press the Ack Selected button, and clear the system by pressing icon in the lower left hand corner.

Troubleshooting and subsequent correction or repair of your watermaker will require understanding of:

- Electrical circuits
- Hydraulic systems
- Mechanical knowledge
- Electronic circuits
- Liquid pressures and flows

DO NOT attempt troubleshooting or repair if you are not familiar with or are not proficient in the above fields of expertise.

USE CAUTION WHEN TROUBLESHOOTING.
DO NOT perform maintenance unless:

1. **The feed water sea cock valve is closed**
2. **The system main electrical disconnect switch is OFF, LOCKED, and TAGGED.**

CAUTION: ELECTRICAL SHOCK HAZARD. A volt/ohm meter will be necessary. The following procedures expose the technician to high voltage and electrical shock hazard. Only attempt this if you are a qualified electrician and only if surrounding conditions are safe.

CAUTION: AVOID CHEMICAL ATTACK TO THE SYSTEM:
Do not use for storage and do not expose the watermaker to:

- **Hydrogen Peroxide**
- **Chlorine Dioxide**
- **Bromine**
- **Chloramines**
- **Hypochlorite**
- **Bromide**
- **Chlorine**
- **Phenolic Disinfectants**
- **N-chloroisocyanurates**
- **Iodine**
- **Petroleum Products**

Or any other specific chemical not approved in writing by FCI Watermakers Inc. Use of non-authorized or misuse of authorized chemicals voids warranty. Never use third party "cleaners" or "storage" chemicals. Third party chemicals will dissolve copolymer components within the watermaker and will destroy the membrane element. Use of and subsequent damage caused by non FCI Watermaker chemicals are the liability and responsibility of the operator and are not covered by the FCI Watermakers warranty.

DO NOT connect any water line to the watermaker system that may contain any of the above listed chemicals.

WEEKLY QUICK CHECK

The following steps ensure that potential problems are resolved, preventing major repairs:

1. Inspect all fasteners for tightness, including brackets, screws, nuts, and bolts. Pay special attention to the high pressure pump and electric motor since they are subject to increased vibration.
2. Clean any salt water or salt deposits from the system with a wet rag.
3. Check for water leaks throughout the system and supporting water lines.
4. Check all tubing and high-pressure hoses for wear and abrasion against rough surfaces. The hoses must not contact heated or abrasive surfaces.

COMPONENT MAINTENANCE INTERVALS

The frequency of required maintenance is dependent on the regularity of usage, the condition of the intake water (the location of use), the length of time the system is exposed to water, the total running time, and the manner in which the system is installed or operated. Because of these factors, it is virtually impossible to comprise an exact timetable for required maintenance. The following maintenance timetable *(Table 2)* is an estimate of the time intervals at which maintenance may be required on the various system components. This is based upon factual data compiled from FCI Watermakers installations around the world. However, this schedule must be adjusted to each individual system depending upon the variables listed.

Table 2: Component Maintenance Intervals

Component	Maintenance Required	Time Interval Continuous	Time Interval Intermittent Duty
SEA STRAINER	Inspect & Clean Screen & Housing	Weekly	100 Hours
MULTI-MEDIA FILTER (if equipped)	Back wash & Rinse	When pressure drop across filter is > 15 PSI	
	Replace media	1 year	
PRE-FILTER	Replace element(s)	Low Pressure reaches 5-7 PSI	Low Pressure reaches 5-7 PSI
LOW PRESSURE PUMP	Seals	6 weeks	1,000 hours
HIGH PRESSURE PUMP	Seals	6 weeks	1,000 hours
	Valves	8 weeks	1,500 hours
	Oil	First 50 / 500 hours	500 hours
MEMBRANE	Clean element	When production or salt rejection decreases by 10%	
SALINITY PROBE	Clean probe	Annually	Annually
FRESH WATER FLUSH FILTER	Replace Element	3 months	3 months
DTS (if equipped)	Refer to the manual provided with the DTS		
PH NEUTRALIZING CARTRIDGE (if equipped)	Replace Element	When Granules are depleted	
U.V. STERILIZER (if equipped)	Replace lamp	Annually	7,000 hours
	Replace quartz sleeve	As needed	As needed
CARBON DOCK FILL TANK (if equipped)	Replace Carbon	25,000 gallons of flow	Annually
ELECTRICAL BOX	Inspect and tighten all connections	6 months	6 months

COMPONENT MAINTENANCE & REPAIR OVERVIEW

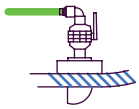
Performing routine maintenance and following proper procedures will ensure worry-free operation for the long haul.

AFTER 50 HOURS / BREAK-IN PERIOD

- Change oil in high-pressure pump
- Check low pressure pump for leaks
- Check inlet hosing and all connections for leaks

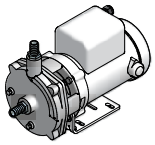
PERIODIC MAINTENANCE

Do a 10-minute visual inspection of the entire system every 500 hours. Start the system and trace the lines from the feed thru-hull to the discharge thru-hull, as well as the fresh water line to tank. This type of preventative check can save time and money in the future.



INLET THRU HULL FITTING

Keep the inlet thru hull fitting free and clear of debris and marine growth.

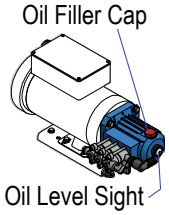


LOW-PRESSURE PUMP

Replace the seal every 1,500 hours or when a leak develops. Refer to "LOW PRESSURE PUMP / MAINTENANCE & REPAIR" on page 112.

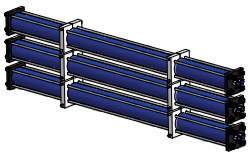
PRE-FILTER

The pre-filter is changed as needed. The cartridge should be changed when the low-pressure reading reaches 5-7 PSI. The cartridge can be cleaned once, using a soft brush or a nozzle on the end of a hose. Gently separate the pleats and remove as much debris as possible. Be careful not to fray the filter material. If the filter shows signs of fraying or does not come clean, replace the cartridge. The cost of a cartridge is not worth the risk of damaging a membrane or high-pressure pump seal.

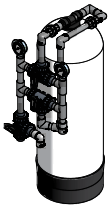


HIGH-PRESSURE PUMP

Replace the seals every 1,000 hours and the valves every 1,500 hours. Replace the oil the first 50 hours and every 500 hours thereafter. Refer to "HIGH PRESSURE PUMP MAINTENANCE & REPAIR" on page 118.

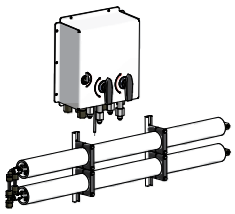


MEMBRANE
The membranes are rated for 3 years of operation. This includes operation time and down time. However, with proper care and the fresh-water-flush system you can achieve significantly longer life. When the PPM reading on the screen starts to climb or the product output is reduced, it may be time to either clean the membranes or replace them. It is best to contact your local FCI representative or the factory for guidance. The system uses a special high-output membrane. This is how we are able to achieve the great quality and quantity of fresh water you have become accustom to. Since our membranes are non-proprietary (or readily available), be sure your technician uses the same type of membrane when they are replaced. Use of membrane brands such as Hydranautics or AquaPro are not recommended, and their use may affect the quality and quantity of water produced.



MEDIA FILTER (optional)
Backwash and rinse the media filters for 20 minutes when pressure drop across filter is greater than 15 psi.

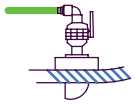
The media in the filter should be replaced every year.



DOCKSIDE TREATMENT SYSTEM (if equipped)
Refer to the manual that is provided with the DTS for maintenance and repair information.

INLET THRU HULL MAINTENANCE & REPAIR

The components are shown on the plumbing and interconnect diagrams located in Installation chapter of this User's Manual.



INLET THRU HULL FITTING
This is a non FCI Watermakers component. Keep the inlet thru hull fitting free and clear of debris and marine growth. If the inlet thru hull fitting is clogged, this results in a low feed pressure condition, which causes the system to shut off.

Blockage at the inlet thru hull fitting causes the system to shut off due to lack of feed water flow. Unfortunately, since it is under water, operators are reluctant to thoroughly inspect the inlet thru hull fitting for problems. This can cause time-consuming frustrations in attempting to gain feed water flow by troubleshooting other components in the system.

The inlet thru hull fitting must be free and clear allowing the system to draw 4.5 U.S. Gallons Per Minute / 17 Liters Per Minute with minimal resistance. Any blockage at the inlet thru hull fitting will cause low pressure and low flow problems at the system. This inlet thru hull fitting must be a forward facing scoop so that the system receives a positive flow of water as the boat is under way. It must be minimum 3/4" inside diameter. It must be installed in a position on the bottom of the hull so as to allow free flowing feed water without air.

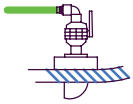
CAUTION: A flat profile, flush mount, inlet thru-hull fitting will cause a vacuum as the boat is under way, and this will cause loss of feed water flow and cavitation of pumps resulting in continual system shut down due to low feed water flow and pressure. The resulting failure of the system to remain in operation is attributed to improper installation, is the liability of the installer, and is not covered by the FCI Watermakers warranty.

CAUTION: If the thru-hull fitting has been placed in a position on the underside of the hull that allows air to continually enter the thru-hull fitting, this will cause the system to continually shut down due to loss of feed water. The resulting failure of the system to remain in operation is attributed to improper installation, is the liability of the installer, and is not covered by the FCI Watermakers warranty.

CAUTION: The FCI Watermakers System must not be tied into another existing auxiliary water line already supplying another accessory on the boat. Using one thru hull fitting for other equipment will cause the FCI Watermakers System to draw air, or cavitate, leading to continual system shut down. The resulting failure of the system to remain in operation is attributed to improper installation, is the liability of the installer, and is not covered by the FCI Watermakers warranty.

CAUTION: If the FCI Watermakers System is connected to a sea chest or stand pipe, do not plumb the FCI Watermakers System feed line to the top of the sea chest or stand pipe. If plumbed into the top of these feed water arrangements, the FCI Watermakers System will experience continual shut down due to air inducement into the system. The resulting failure of the system to remain in operation is attributed to improper installation, is the liability of the installer, and is not covered by the FCI Watermakers warranty. Plumb the FCI Watermakers System to the bottom of such feed water arrangements to ensure a continual air free supply of feed water to the system.

INLET THRU HULL MAINTENANCE & REPAIR (continued)

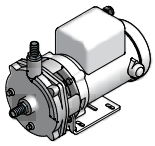


SEA COCK VALVE
This is a non-FCI Watermakers component. The packing and connections of the inlet sea cock valve must be tight and must properly seal. Clean the valve cavity of debris or replace the seal and seat or the entire valve, as required. This section is under a vacuum condition while operating the system. Loose fittings or a worn seal will allow air to enter the system causing continual shut down due to subsequent low feed water pressure.

SEA STRAINER
Keep the mesh screen free and clear of debris. When the mesh screen is clogged, it results in a low-pressure condition causing system shut off. This section is under a vacuum condition while operating the system. If the sea strainer's bowl is loose or if the O-ring seal is worn or not properly seated, air will enter the system causing continual shut down due to subsequent low feed water pressure.

INLET CONNECTION
Replace if damaged.

INLET ACTUATED VALVE (if equipped)
The actuated valve is comprised of a 2-way union ball valve with an actuated motor drive on top. The valve is equipped with a post on the top that indicates the valve position (open / closed). If the valve does not open, turn power off to the system and loosen the union nuts. If they nuts are too tight it will inhibit the ball from being able to turn freely. If after the power is applied the valve will still not actuate, check all wiring connections.



LOW PRESSURE PUMP - ELECTRIC MOTOR
Pump is centrifugal, with a counter clockwise rotation as viewed from volute end (front) of pump.

Troubleshoot electric motor failure to ensure that any abnormality from the power, wiring, connections, contactor, or control circuit are not at fault or at cause. If the electric motor has failed, it will require repair. However, depending upon failure, replacement may be more cost effective than repair. If failure of the motor is due to external source, not the motor itself, then correct the cause or else the replaced or repaired motor will fail again.

FAILURES OF THE ELECTRIC MOTOR MAY BE:

A Bearing failure: Bearings are field replaceable.

B Winding failure: Generally caused by low or high power, below or above the specified voltage requirements of the system. This is NOT economically repairable.

C Internal centrifugal switch: Generally caused by mechanical failure of the switch. Field replaceable.

D Capacitor failure: Generally caused by low power feeding the motor or low cycles from the power source. Also caused by rapidly repeating starting and stopping of the motor. Field replaceable.

THE ELECTRIC MOTOR IS:

- 1/2 horse power
- Totally enclosed fan cooled
- 2 pole, dual cycle
- Dual voltage.

WARNING: The feed pump MUST rotate in the COUNTER CLOCKWISE DIRECTION ONLY Rotating the feed pump in the clockwise direction will cause extensive damage to it. Never operate the feed pump in the clockwise direction.

WARNING: When switching from three phase generator power to three phase shore power ALWAYS check phases prior to operating the system else reverse rotation along with extensive damage to the feed pump will occur should the power be out of phase.

PROBLEMS & SYMPTOMS APPEARING AND CAUSED BY THE FEED PUMP OR ITS ELECTRIC MOTOR:

1 The Single Phase (115 or 230 VAC) Electric Motor hums, pulls starting current (locked rotor) amperage, does not rotate, and trips the supply power circuit breaker when attempting to operate the system.

The Single Phase Electric Motor is a capacitor start motor. If the motor was started with low voltage, a drop in voltage during starting, and if this was repeated several times in rapid concession the capacitor will short out. Without the aid of a working capacitor the motor will hum,

pull starting current (locked rotor) amperage, not rotate, and trip the supply power circuit breaker when attempting to operate the system.

Low voltage will also cause the same symptom. Low voltage is caused by an undersized power supply or generator, undersized power lead wires to the system or motor, loose power wire, or connection at the motor or within the power supply line, and burnt contacts on the motor starter relay (contactor).

SOLUTIONS: Check wiring size and connections to, from, and in between the Power Supply and the electric motor. Correct wire size or any loose wires. Check the capacitor on the motor, and replace it if it has shorted out. Measure voltage at the motor during attempt to start it. If voltage drops more than 10% locate and correct the reason. Check the motor starter relay, contactor, for burnt contacts.

2 The three phase (230, 380, or 460 VAC) electric motor hums, pulls starting current (locked rotor) amperage, does not rotate, and trips the supply power circuit breaker when attempting to operate the system.

The three phase electric motor requires all three power lines (all three phases) to be operative else it will "single phase" causing extensive damage to the motor's internal windings.

Low voltage will also cause the same symptom. Low voltage is caused by an undersized power supply or generator, undersized power lead wires to the system or motor, loose power wire, or connection at the motor or within the power supply line, and burnt contacts on the motor starter relay (contactor).

SOLUTIONS: Check wiring size and connections to, from, and in between the Power Supply and the electric motor. Correct wire size or any loose wires. Measure voltage at the motor during attempt to start it. If voltage drops more than 10% locate and correct the reason. Cross check voltage across all 3 power leads. Check the motor starter relay (contactor) for burnt contacts.

3 The Electric Motor makes an unusual grinding sound when operated.

SOLUTIONS: Check and replace as necessary the front and rear bearings. Check to see if the fan is rubbing against the fan guard.

LUBRICATING BEARINGS: Some Electric Motors supplied by FCI Watermakers have permanently sealed and lubricated bearings. Others require lubrication from time to time. If your Electric Motor has grease jerks at each end of the motor, over the front and rear bearings, the bearings require lubrication every 6 months. Give three pumps of high temperature motor bearing lubricant into each grease jerk. Use a Polyurea Base Grease such as Chevron SRI (Polyurea Base) or Shell Dolium R (Polyurea Base). DO NOT USE LITHIUM OR SILICONE BASE GREASE.

REPLACE THE CERAMIC SEAL (P/N 43-2235):

- Approximately every 1,000 hours, or
- At the sign of leakage

When replacing the ceramic seal, refer to the exploded view of the low pressure pump, shown in the assembly drawing on the next page.

DISASSEMBLY

Before you begin, please be sure to disconnect the electrical power to the system.

Remove the four 3/8-16 Bolts holding the volute to the motor bracket. To remove the impeller, remove the bearing cap on the motor to expose the screwdriver slot on the motor shaft. Hold the motor shaft with a large screwdriver and remove the impeller by grasping it with your hand and turning the impeller counter clockwise. Remove the Seal. Two screwdrivers wedged into the seal at 180 degrees apart serve as tools to wedge the seal out. The ceramic seat is removed by removing the end bell gasket.

REASSEMBLY

Clean the motor shaft and the bracket of any corrosion or salt deposits. Replace the end bell gasket and the tap seat portion into the bracket cavity. Use a new gasket. Place the ceramic seat into the cavity over the shaft. Make sure that the polished side is toward the end of the shaft. Tap into place evenly using a hollow piece of wood or plastic tool. If a metal tool is used to tap it into place, protect the seat with cardboard or a clean cloth. Lubricate the shaft with water, soapy water, or a light oil, and slip the rotating portion of the seal over the shaft with the carbon element toward the ceramic. Slide it down onto the shaft as far as possible. Apply blue Loctite® to the motor shaft threads. Hold the Motor shaft and reinstall the impeller. Tighten the impeller by turning it clockwise until it is snug. Reinstall the volute. Tighten the bolts evenly. Thoroughly prime the pump.

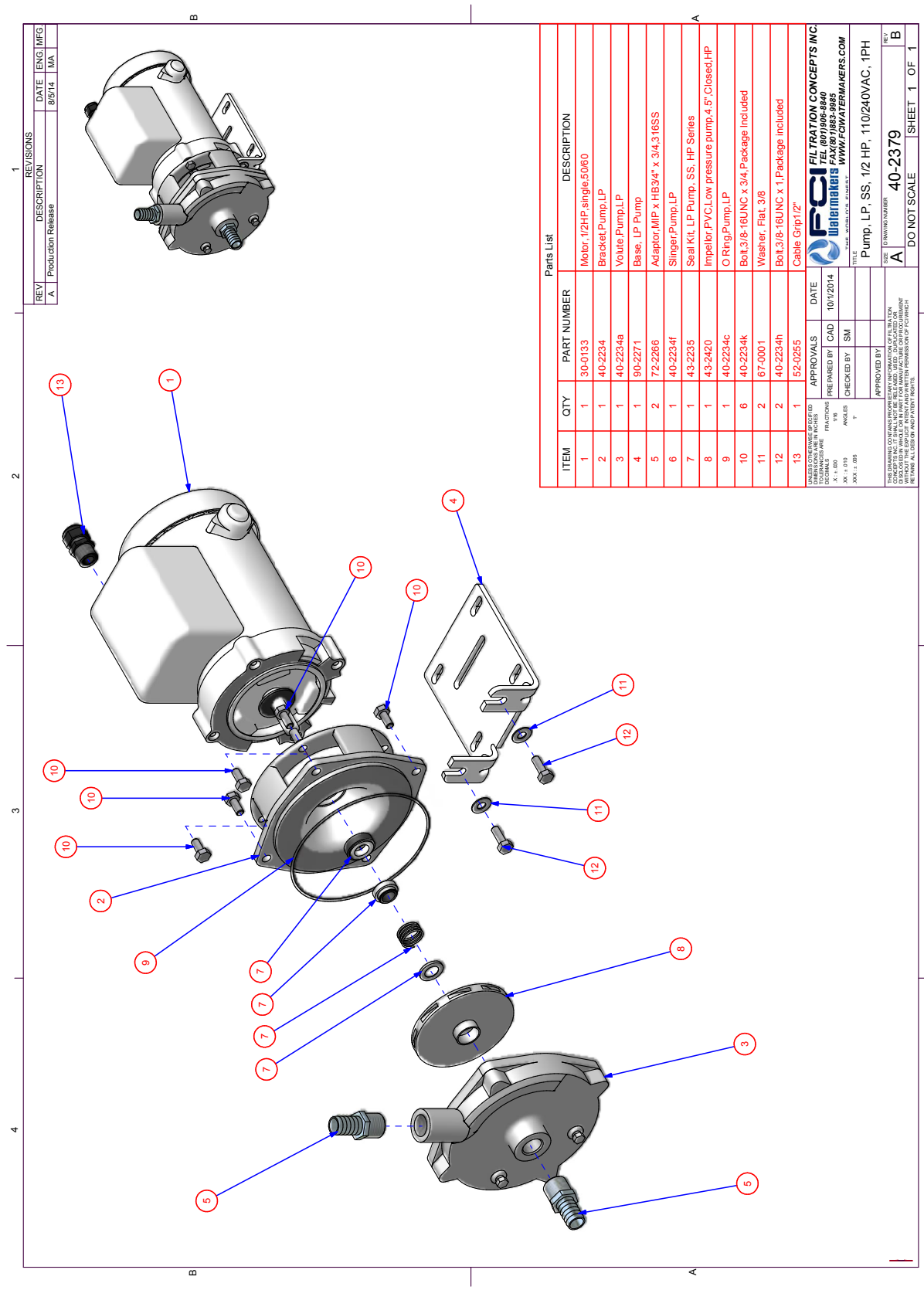


Figure 29: Low Pressure Pump Assembly Diagram

PRE-FILTER ELEMENT REPLACEMENT

PRE-FILTER ELEMENT REPLACEMENT

The pre-filter pleated cartridge element may be cleaned with water spray once or twice. After cleaning the expected life will be reduced in half. Attempts to clean the element more than twice will result in a very short life and will damage the element, rendering it useless. Change the element after the first or second cleaning. Clean or replace the element when plugged. At slightly below 5 PSI the system will turn off and display a fault screen indicating low pressure.

CAUTION: Do not use third party pre-filter elements; use only FCI Watermakers pre-filter elements. Third party pre-filter elements on the market do not properly fit, the seams fall apart, they will allow by-pass.

WARNING: By-pass of debris through the third party element will prematurely foul the R.O. membrane element. Use of third party pre-filter elements will void any and all FCI Watermakers warranty to the R.O. membrane element.

IMPORTANT: Do not use "string wound" or "fiber" pre-filter elements. These type of elements are designed for the photographic film developing industry. When used in sea water, they will plug up rapidly in 1/10th or less the time causing frequent shut down of the system and very frequent changing which will also lead to very high cost of maintenance. Use of string wound or fiber type elements will only lead to user frustration and very high maintenance costs. Use of third party pre-filter elements will void any and all FCI Watermakers warranty to the R.O. membrane element.

DO NOT ACCEPT THIRD PARTY PRE-FILTER ELEMENTS FROM ANY MARINE DEALER. USE ONLY FCI WATERMAKERS SUPPLIED PRE-FILTER ELEMENTS.

The resulting failure of the system to remain in operation, and or damage to the FCI Watermakers system caused by third party pre-filter elements is attributed to improper maintenance and operation, is the liability of the operator and owner, and is not covered by the FCI Watermakers warranty.

TO REPLACE FILTER ELEMENT:
Refer to Figure 30 and proceed as follows:

1 With system off and thru-hull closed, unscrew the bleed valve to relieve any pressure

2 Remove locking ring collar counter-clockwise

3 Firmly grasp lid and twist and lift to remove

4 Remove cartridge, drain and clean debris from inside housing

NOTE: Be careful not discard the spacers and o-rings with the debris. You will need them to re-assemble the pre-filter.

5 Thoroughly clean the inside of the bowl.

6 Install a new FCI cartridge Part #20-2261

7 Replace lid and screw collar on hand tight

8 After a cartridge change, the watermaker will need to be primed and the housing bled of air

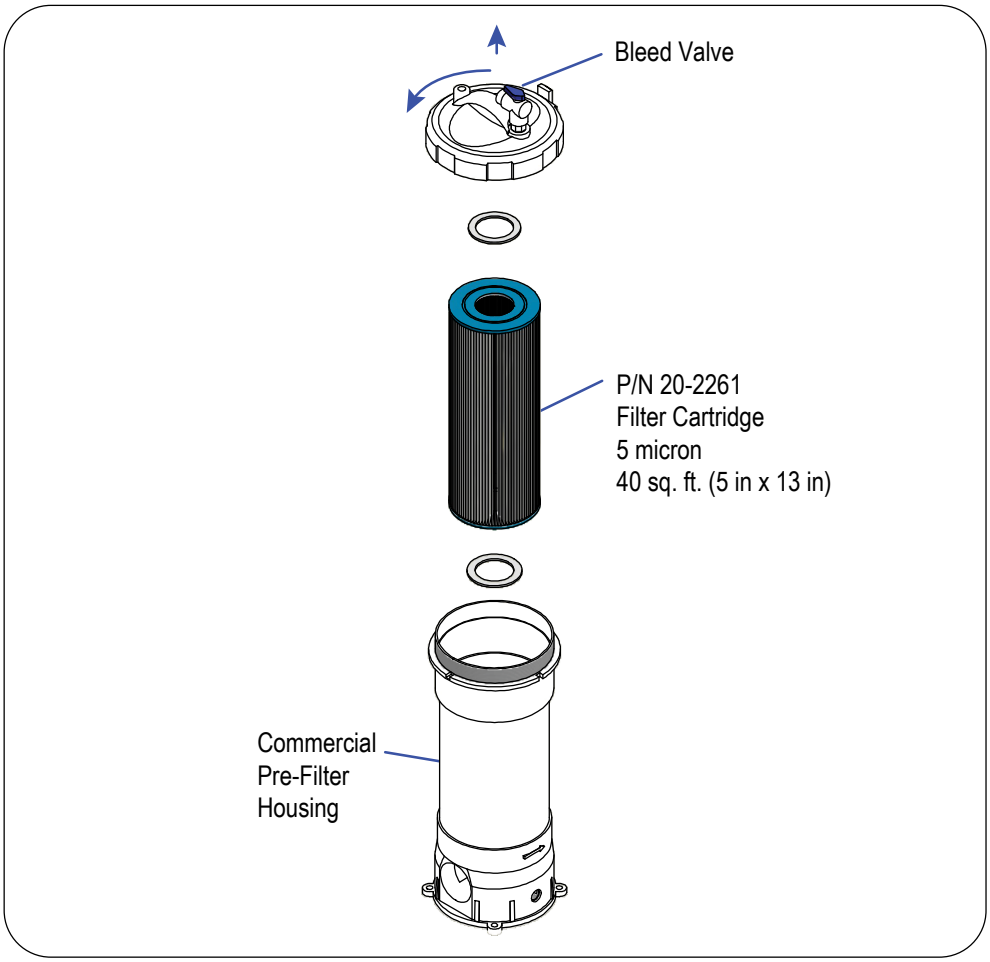
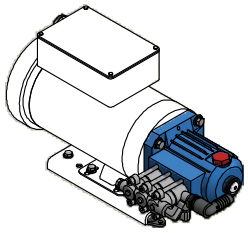


Figure 30: Replacing the Pre-Filter Element



HIGH PRESSURE PUMP - ELECTRIC MOTOR

Troubleshoot electric motor failure to ensure that any abnormality from the power, wiring, connections, contactor or control circuit are not at fault or at cause. If the electric motor has failed, it will require repair. However, depending upon failure, replacement may be more cost effective than repair. If failure of the motor is due to external source, not the motor itself, then correct the cause or else the replaced or repaired motor will fail again.

FAILURES OF THE ELECTRIC MOTOR MAY BE:

A Bearing failure: Bearings are field replaceable.

B Winding failure: Generally caused by low or high power, below or above the specified voltage requirements of the system. This is NOT economically repairable.

C Internal centrifugal switch: Generally caused by mechanical failure of the switch. Field replaceable.

D Capacitor failure: Generally caused by low power feeding the motor or low cycles from the power source. Also caused by rapidly repeating starting and stopping of the motor. Field replaceable.

THE ELECTRIC MOTOR IS:

- 2.5 horse power
- Totally enclosed fan cooled
- 2 pole
- Dual cycle
- Dual voltage.

WARNING: The high pressure pump MUST rotate in the COUNTER CLOCKWISE DIRECTION ONLY. Never operate the high pressure pump in the clockwise direction.

WARNING: When switching from three phase generator power to three phase shore power ALWAYS check phases prior to operating the watermaker. Reverse Rotation will occur should the power be out of phase.

PROBLEMS & SYMPTOMS APPEARING AND CAUSED BY THE HIGH PRESSURE PUMP OR ITS ELECTRIC MOTOR

The single phase (115 or 230 VAC) electric motor hums, pulls starting current (locked rotor) amperage, does not rotate, and trips the supply power circuit breaker when attempting to operate the system.

The single phase electric motor is a capacitor start motor. If the motor was started with low voltage, or a drop in voltage occurred during starting, and if this was repeated several times in rapid concession, the capacitor will short out. Without the aid of a working capacitor the motor will hum, pull starting current (locked rotor) amperage, not rotate, and trip the supply power circuit breaker when attempting to operate the system.

Low voltage will also cause the same symptom. Low voltage is caused by an undersized power supply or generator, undersized power lead wires to the system or motor, loose power wire, loose connection at the motor or within the power supply line, and burnt contacts on the motor starter relay (contactor).

SOLUTIONS: Check wiring size and connections to, from, and in between the power supply and the electric motor. Correct wire size or any loose wires. Check the capacitor on the motor and replace it if it has shorted out. Measure voltage at the motor during attempt to start it. If voltage drops more than 10% locate and correct the reason. Check the motor starter relay (contactor) for burnt contacts.

SERVICING THE HIGH PRESSURE PUMP

When servicing the high pressure pump, refer to the assembly drawing, specifications, and exploded view illustration on the following pages.

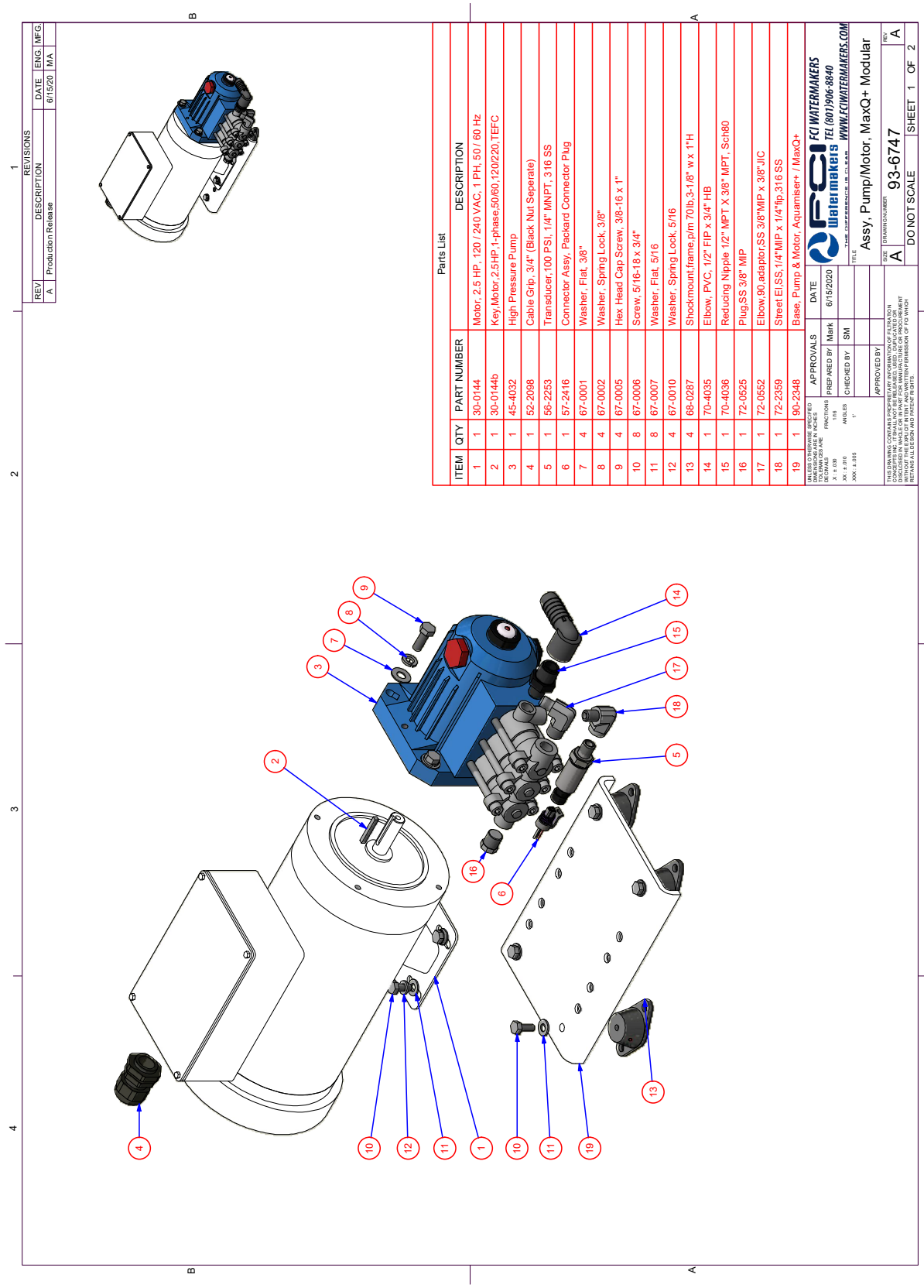
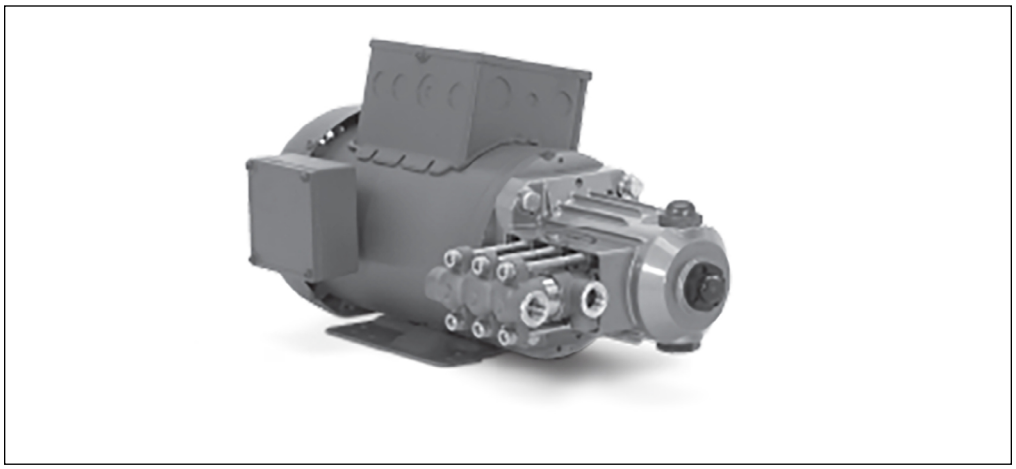


Figure 31: High Pressure Pump Assembly Diagram



FEATURES

- Unique spring-loaded inlet valves and the flow through ceramic plungers provides a smooth, steady flow.
- Hollow shaft direct drive to provide the smallest possible footprint for challenging spaces.
- Designed for applications where a reduced sound level is desirable.

SPECIFICATIONS

Item	Value
Pressure Range	100 – 1200 psi (6.9 – 83 bar)
Pump RPM	1725 rpm
Inlet Pressure Range	Flooded to 60 psi (4.1 bar)
Max. Liquid Temp. (NBR)	160° F (71° C)
Bore	0.789" (20 mm)
Stroke	0.402" (10.2 mm)
Crankcase Capacity	10.1 oz (0.30 l)
Inlet Port (1)	3/8" NPT(F)
Discharge Ports (2)	3/8" NPT(F)
By-Pass Return Port (1)	1/4" NPT(F)
Shaft Diameter	5/8" (15.9 mm)
Weight (Pump Only)	8.9 lbs (4 kg)
Dimensions (Pump Only)	6.8 x 8.7 x 5.2" (173 x 221 x 133 mm)
Weight (Pump Only)	8.9 lbs. (4 kg)
Dimensions (Pump Only)	6.8 x 8.7 x 5.2 inch (173 x 221 x 133 mm)

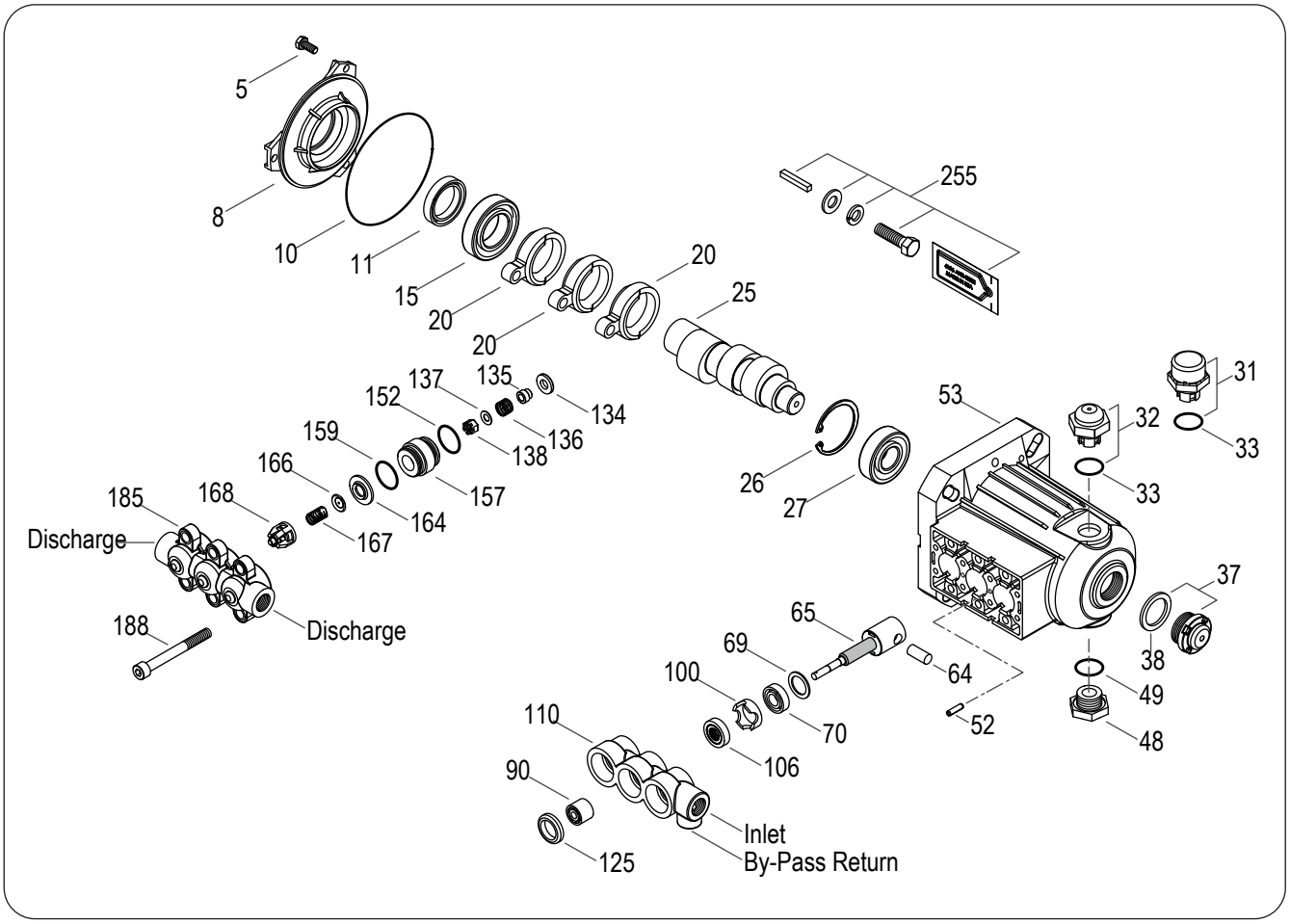


Figure 32: High Pressure Pump Parts - Exploded Diagram

Table 3: High Pressure Pump Part List

Item	Material	Description	Qty
5	S	Screw, HHC Sems (M6 X 14)	3
8	AL	Cover, Bearing	1
10	NBR	O-Ring, Bearing Cover - 70D	1
11	NBR	Seal, Oil Crankshaft	1
15	STL	Bearing, Ball - Inner	1
20	TNM	Rod, Connecting	1
25	CM	Crankshaft, 10.2 mm	1
26	STL	Ring, Retaining, Bearing	1
27	STL	Bearing, Ball - Outer	1
31	—	Cap, Vented w/O-Ring (rain cap)	1
32	RTP	Cap, Oil Filler w/O-Ring	1
33	NBR	O-Ring, Oil Filler Cap - 70D	1
37	PC	Gauge, Oil w/Gasket - 80D	1
38	NBR	Gasket, Flat, Oil Gauge - 80D	1
48	NY	Plug, Drain	1
49	NBR	O-Ring, Drain Plug - 70D	1
52	SSSS	Pin, Guide	2

Item	Material	Description	Qty
53	AL	Crankcase	1
64	CM	Pin, Crosshead	3
65	SSTO	Rod, Plunger	3
69	STCP R	Washer, Oil Seal	3
70	NBR	Seal, Oil Crankcase	3
90	CC	Plunger, Ceramic (M20 x 18)	3
100	PVDF	Retainer, Seal	3
106	NBR	Seal, LPS w/SS - Spg	3
	FPM	Seal, LPS w/SS-Spg	3
	EPDM	Seal, LPS w/SS-Spg	3
	ST	Seal, LPS	3
110	SS	Manifold, Inlet	1
125	SNG	Seal, HPS	3
	ST4	Seal, HPS w/S	3
134	D	Valve, Inlet	3
	SS	Valve, Inlet	3
135	SS	Spacer	3

Table Continued: High Pressure Pump Part List

Item	Material	Description	Qty
136	SS	Spring, Inlet Valve	3
137	S	Washer, Conical (M6)	3
138	SS	Nut (M6)	3
152	NBR	O-Ring, Adapter, Spacer, Inner - 70D	3
	FPM	O-Ring, Adapter, Spacer, Inner - 70D	3
	EPDM	O-Ring, Adapter, Spacer, Inner - 70D	3
	IPFE	O-Ring, Adapter, Spacer, Outer - 70D	3
157	SS	Adapter, Valve	3
159	NBR	O-Ring, Adapter, Spacer, Outer - 70D	3
	FPM	O-Ring, Adapter, Spacer, Outer - 80D	3
	EPDM	O-Ring, Adapter, Spacer, Outer - 80D	3
	IPFE	O-Ring, Adapter, Spacer, Outer - 75D	3
164	SS	Seat	3
166	D	Valve	3
	SS	Valve	3
167	SS	Spring	3
168	PVDF	Retainer, Spring	3
185	SS	Manifold, Discharge	1
188	S	Screw, HSH (M8 X 80)	6
255	STZP R	Assy, Bolt Mount	1
285	STL	Screw (M8 X 1.25 X 80) (Not Shown)	2
300	NBR	Kit, Seal (Incld: 106, 125, 152, 159) STD	1
	FPM	Kit, Seal (Incld: 106, 125, 152, 159) .0110	1
	EPDM	Kit, Seal (Incld: 106, 125, 152, 159) .0220	1
	IPFE	Kit, Seal (Incld: 106, 125, 152, 159) .0770	1
310	NBR	Discharge Valve (Incld: 152, 159, 164, 166, 167, 168)	1
	FPM	Discharge Valve (Incld: 152, 159, 164, 166, 167, 168) .0110	1
	EPDM	Discharge Valve (Incld: 152, 159, 164, 166, 167, 168) .0220	1
	IPFE	Discharge Valve (Incld: 152, 159, 164, 166, 167, 168) .0770	1
311	NBR	Kit, Inlet Valve (Incld: 134 – 138, 152, 159) STD	1
	FPM	Kit, Inlet Valve (Incld: 134 – 138, 152, 159) .0110	1
	EPDM	Kit, Inlet Valve (Incld: 134 – 138, 152, 159) .0220	1
	IPFE	Kit, Inlet Valve (Incld: 134 – 138, 152, 159) .0770	1
	—	Oil, Bottle (21 oz.) ISO 68 Hydraulic (Fill to specified crankcase capacity prior to start up)	1

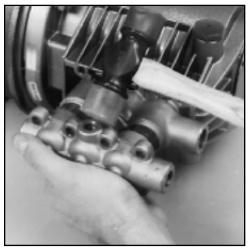
MATERIAL CODES

AL=Aluminum; CC=Ceramic; CM=Chrome-Moly EPDM=Ethylene proplenedienemonamer; FCM=Forged Chrome-moly; FPM=Fluorocarbon; HT=Hi-Temp (EPDM Alternative); NBR=Medium Nitrile (Buna-N); NY=Nylon; PVDF=Polyvinylidene Fluoride; RTP=Reinforced Composite; S=304SS; SNG=Special Blend (Buna); SS=316SS; SSZZ=316SS/Zamak; STL=Steel; STCP=Steel/Chrome Plated; STZP=Steel/Zinc Plated; TNM=Special High Strength

SERVICING THE VALVES

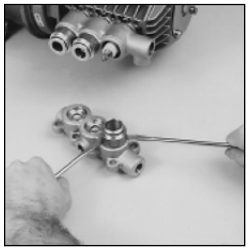
Disassembly of the Discharge Valve Assembly

1. Disconnect all plumbing for ease in servicing.
2. Inspect oil for proper level, presence of water or discoloration and replace as needed.
3. Using a standard M6 Allen wrench remove the six (6) Socket Head Screws from the manifold. Remove the outer screws first, then the center screws.
4. Using a soft mallet tap the back side of the Discharge Manifold from alternate sides to maintain alignment and avoid damage to the plungers.



Removal of Discharge Manifold

5. Grasp the Discharge Manifold from the from underside and gradually lift manifold while you pull away from the Crankcase.
6. The Adapter Spacers may stay with either the Discharge or Inlet Manifold. By inserting two opposing screwdrivers between Spacer and manifold you can easily pry them out of the Discharge Manifold. If they stay in the Inlet Manifold, gently work them up and down as you pull away from the Inlet Manifold.



Removal of Adapter from Discharge Manifold

Removal of Adapter from Inlet Manifold

7. The valve assemblies are in the Discharge Manifold ports and will fall out when manifold is turned over. A complete valve assembly includes: Retainer, Spring, Valve and Seat.

Adapter and Discharge Valve Assembly

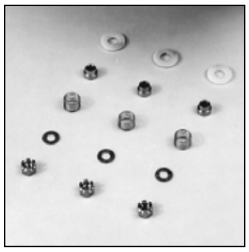
Reassembly of the Discharge Valve Assembly

1. Examine Adapter Spacer O-Rings and replace if worn. Lubricate and install O-Rings and Back-up-Rings on both front and rear of the Adapter Spacer.
2. Examine the Valve Retainers for scale buildup or wear and install into each Discharge Manifold port with tab down into the manifold chamber.
3. Replace worn or damaged Springs and place into Retainers.
4. Examine Valve and Seats for pitting, grooves or wear and replace as needed.
5. Place Valves over Springs with concave side down.
6. Place Valve Seats on Valves with concave side down.
7. Lubricate O.D. of Adapter Spacer and insert smaller I.D. into Discharge Manifold ports. Snap into position. Exercise caution not to cut or pinch o-rings.
8. Carefully guide Discharge Manifold with Spacers over Plunger Rod ends and press into Inlet Manifold.
9. Replace Socket Head Screws and torque per chart. See "TORQUE SEQUENCE" on page 129.
10. If oil was not changed, be certain oil is to mark on Oil Gauge before resuming operation.

SERVICING THE SEALS

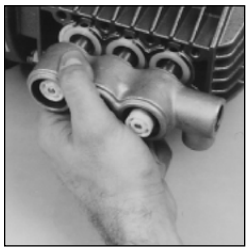
Disassembly of the Seal Assembly

1. Remove the Inlet Valve Assembly from the exposed plunger rod ends, including Cotter Pin, Nut, Washer, Spring, Spacer and Inlet Valve.



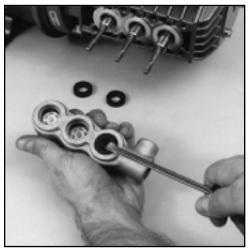
Inlet Valve Assembly

2. Grasp the Inlet Manifold from the front and underside and pull to remove from Plunger Rods.



Removal of Inlet Manifold

3. Carefully examine back side of Lo-Pressure Seal before removing from the Inlet Manifold as it will be damaged during removal. If worn, insert screwdriver into I. D. of seal and pry out from the backside of the I.M. Exercise caution to avoid damage to the Inlet Manifold.



Removal of Lo-Pressure Seal

4. Press ceramic Plunger with thumb or soft tool from back side of Inlet Manifold. The Hi-Pressure Seal may stay with the plungers or remain in the Inlet Manifold. If on the plungers, slide off by hand. If in the manifold, use a reverse pliers to remove.

Plunger, Seals and V-Packing Arrangement

5. Remove Seal Retainers from Crankcase by grasping tab with pliers and pulling out.

6. Examine Crankcase Oil Seal to determine if Crankcase servicing is needed.

7. Examine Ceramic Plunger, Lo-Pressure Seals, V-Packings for scoring, cracks and wear and replace.

8. Examine the Sleeve for grooves for scale buildup and replace as needed. Grasp the Sleeve by hand and pull from the Plunger Rod.

9. Examine the O-Ring and Back-up-Ring under the Sleeve for cuts or wear and replace.

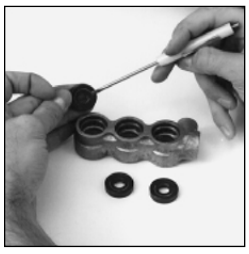
10. Examine the Barrier Slinger for wear and replace as needed. Install the Barrier Slinger with the concave side facing away from the Crankcase.

Reassembly of Seal Assembly

1. With Inlet and Discharge Manifold removed, examine Seal Retainers and replace if worn or damaged. Install on Plunger Rod and press into Crankcase with tab out.

2. Place Inlet Manifold on work surface with Crankcase side up.

3. Lubricate new Lo-Pressure Seals and press into position with garter spring down. Be certain the seal is seated squarely on the shoulder in the inlet manifold chamber.



Installation of Lo-Pressure Seals

4. Place Inlet Manifold on work surface with Crankcase side down (larger I.D. ports up).

5. Carefully examine the Plungers for scoring or cracks and replace if worn.

6. Lubricate Ceramic Plungers and new Hi-Pressure Seals. Press the plunger into the seal and position seal in middle of plunger.

   NOTE: Place the deeper recessed end of the plunger into the seal from the metal back side.

7. Install the Sleeve with the tapered end facing out. Gently press towards the Plunger Rod shoulder until flush with the Barrier Slinger.

8. Carefully install Inlet Manifold over Plunger Rod ends and slowly press into Crankcase.

9. Install the Plungers onto the plunger rods. Press into position using the larger I.D. end of Valve Spacer.

10. Examine Inlet Valve and replace if worn. Inlet valves cannot be reversed if worn. The S.S. Inlet Valves may be lapped if not badly worn. Install the S.S. Inlet valves with square edges towards the plungers (round edges towards the discharge). Install the Nylon Inlet Valve with ridged side towards the discharge.

11. Examine Spacers for wear and replace as needed. Install Spacer on each Plunger Rod with smaller O.D. towards inlet valve.

12. Examine Springs for damage or fatigue and replace as needed. Place on Plunger Rods.

13. Install Washers next with concave side towards Inlet Manifold.

14. Install Nuts and torque per chart. See "TORQUE SEQUENCE" on page 129

15. Always install new Cotter Pins and turn ends to secure in position.

16. Refer to reassembly steps 7-10, under "SERVICING THE VALVES" on page 124, to replace the Discharge Manifold.

TORQUE SEQUENCE

Torque diagonally in order shown. The outer four (4) screws then center screws all hand tight. Then repeat series to specifications in torque chart.

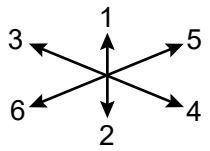


Table 4: HPP Torque Chart

Pump Item	Thread	Tool Size	in. lbs.	ft. lbs.	Nm
Outer Bearing Case Screw	M6	M10 Hex/Phil.	50	4.0	6
Inner Bearing Case Screw	M6	M10 Hex/Phil.	50	4.0	6
Manifold Screw	M8	M6 Allen	115	9.4	13
Plunger Rod Nut	M6	M10 Hex	55	4.4	6
Bubble Oil Gauge	M28	Oil Gauge Tool	45	3.6	5
Adapter Plate to Gas Engine	5/16-24	1/2" Hex	90	7.2	10
Pump to Adapter Plate	3/8-16	9/16" Hex	110	9.0	12
Pump to Electric Motor	3/8-16	9/16" Hex	110	9.0	12

SERVICING THE CRANKCASE SECTION

1. While Inlet Manifold, Plungers and Seal Retainers are removed, examine Crankcase Seals for wear.
2. Check oil level and for evidence of water in oil.
3. Rotate Crankshaft by hand to feel for smooth bearing movement.
4. Examine Crankshaft Oil Seal externally for drying, cracking, or leaking.
5. Consult your local distributor if Crankcase service is required.

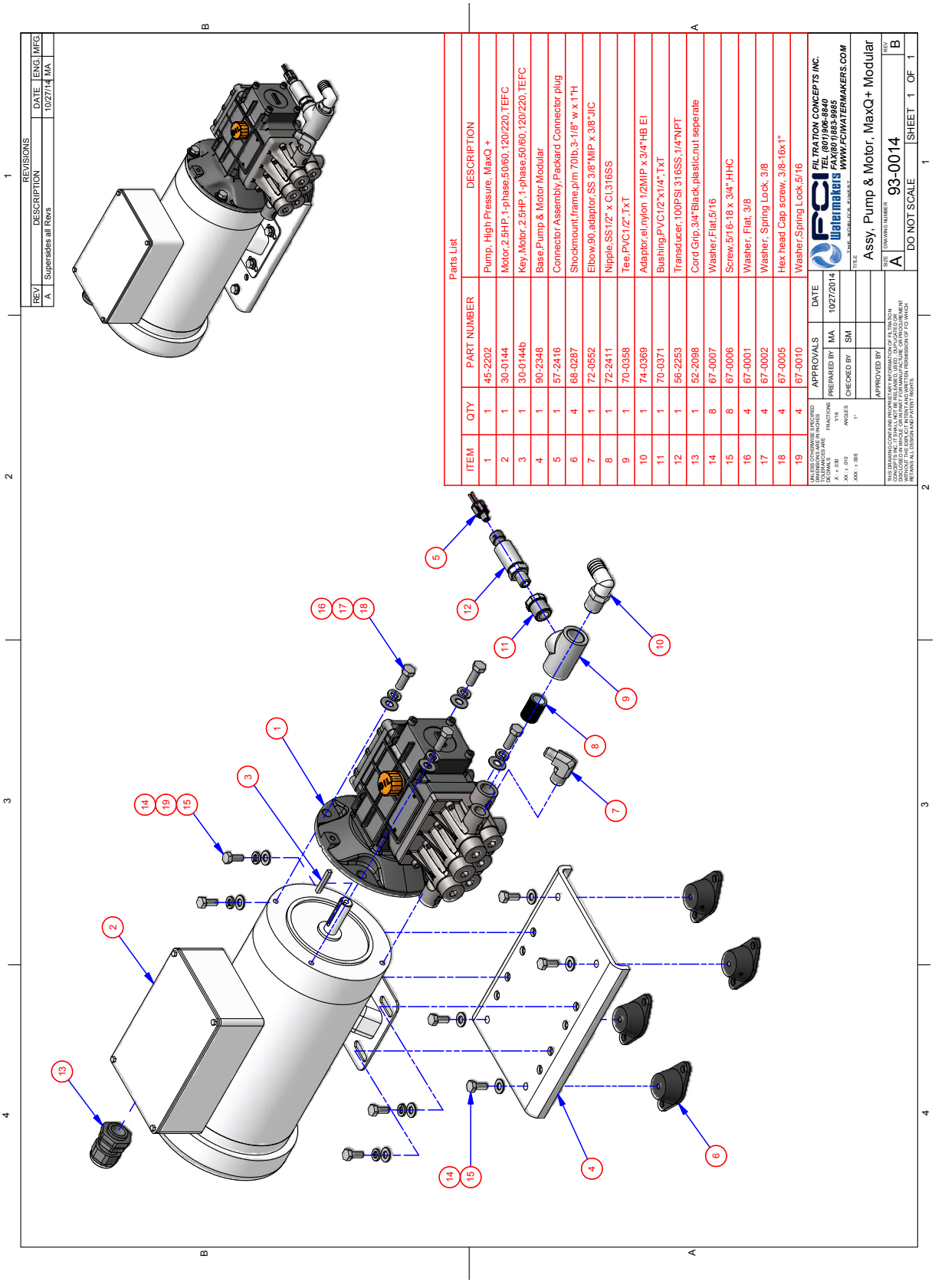


Figure 33: Discontinued High Pressure Pump Assembly Diagram

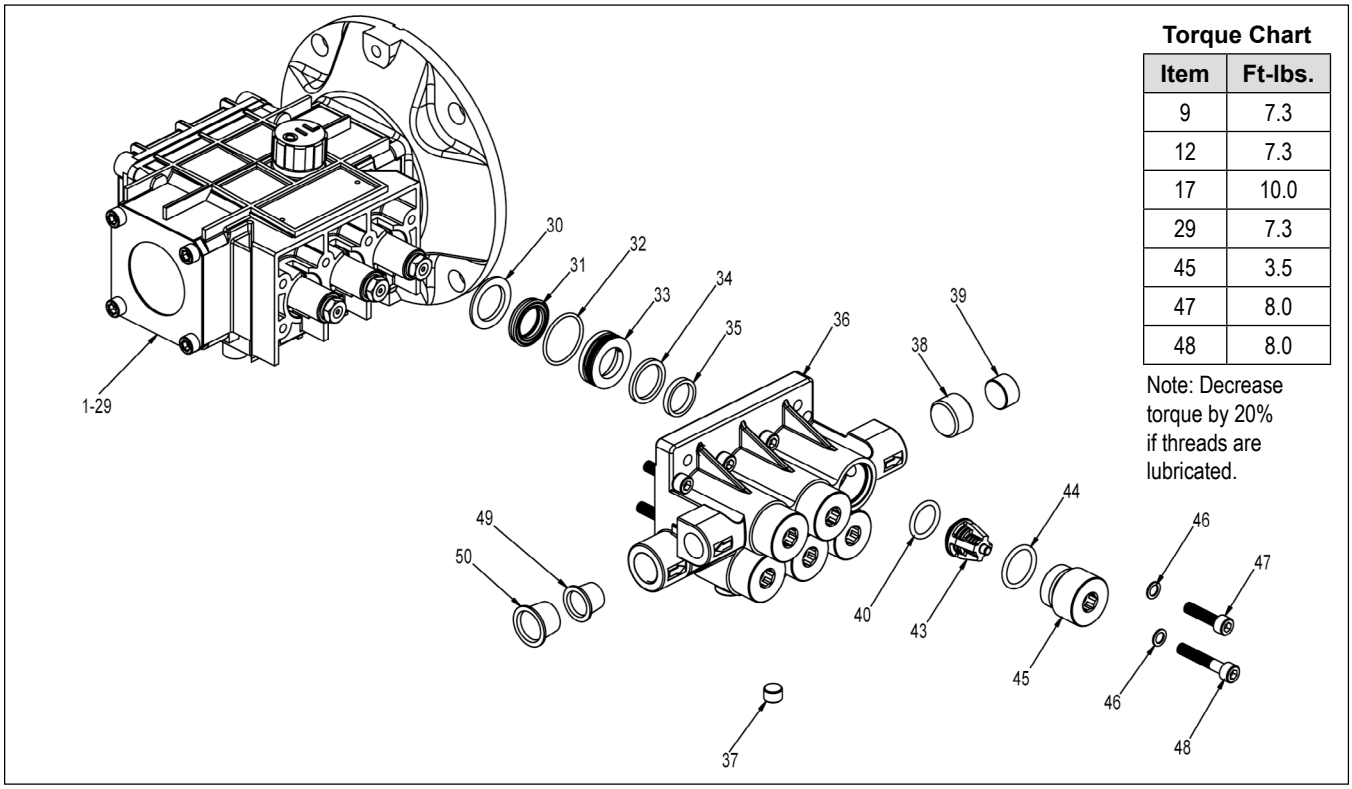


Figure 34: Discontinued High Pressure Pump Parts - Exploded Diagram

Table 5: Discontinued High Pressure Pump Part List

Item	Description	Qty.
1-29	Crankcase Assy	1
1	Crankcase	1
2	Connecting Rod	3
3	Crankshaft	1
4	Bearing	2
5	Oil Seal, Crankshaft	1
6	Retainer, Oil Seal	1
7	O-Ring	2
8	Flange, NEMA 56C Face	1
9	Screw SHCS 18mm Long	4
10	Oil Cap	1
11	Rear Cover	1
12	Screw SHCS 16mm Long	8
13	Sight Glass	1
14	O-Ring, Rear Cover	1
15	Bushing	1

Item	Description	Qty.
16	Washer	1
17	Screw HHCS 20mm long	1
18	Side Cover	1
19	Side Plate	1
20	Oil Drain Plug	1
21	Oil Seal Plunger	3
22	Wrist Pin	3
23	Plunger Rod	3
24	Slinger	3
25	Anti-Extrusion Ring	3
26	O-Ring Plunger	3
27	Plunger 18mm	3
28	Washer, Plunger Rod	3
29	Nut, Plunger Rod	3
30	Seal Retainer	3
31	Low Pressure Seal	3

Item	Description	Qty.
32	O-Ring Seal Case	3
33	Seal Case	3
34	Square Ring, HP Seal	3
35	Glyd Ring, HP Seal	3
36	Manifold	1
37	1/4 NPT Plug	3
38	3/8 NPT Plug	1
39	1/2 NPT Plug	1
40	O-Ring Valve Spacer	6
43	Valve	6
44	O-Ring Valve Cap	6
45	Valve Plug 6	
46	Washer, Ribbed Lock	8
47	Screw SHCS 25mm Long	4
48	Screw SHCS 35mm Long	4
49	Plug, Cap #7	1
50	Plug, Cap #9	1

Repair Kit Available

Item No's Included in Kit	40, 43, 44	30, 31, 32, 33, 34, 35
Number of Assemblies in Kit	6	3
Number of Cylinders Kit Will Service	3	3

MEMBRANE REPLACEMENT PROCEDURE

As your Watermaker ages, your membrane will start to deteriorate and produce lower grade water. When this happens you may try to chemically clean the membrane(s) to recover the performance. Refer to "CLEANING PROCEDURE" on page 136. If this fails you will need to replace the membrane.

Refer to *Figure 35 on page 133* and proceed as follows:

1 Shut the thru-hull, and disconnect the high-pressure (and low-pressure if needed) hose connections from the end of the vessel in question.

2 Using a 9/16 open-end wrench and a slotted screwdriver, remove the four (4) nuts on the end of the pressure vessel.

3 With the nuts off, push the rods back clear of the black anodized plate.

4 Holding the black anodized plate in both hands, twist and pull the plate clear of the vessel. The end plug assembly will be removed with the plate and the membrane will now be visible inside the pressure vessel.

5 Using a pair of needle-nose pliers, grab the exposed white tube. With a firm grip, pull the membrane out of the vessel. If you are taking the membrane(s) out to be returned to FCI for evaluation, do not damage or mar the white tube— doing so will make it impossible for us to evaluate the membrane.

6 Notice the position of the Brine-Seal when the membrane was pulled from the vessel. There is only on brine seal per membrane. The cup portion of the seal must face the incoming flow from the high-pressure pump.

7 Take the new membrane out of the bag. Take care NOT to get the membrane dirty.

8 If the old membrane is being returned to FCI, rinse well with fresh water and place into the bag. Seal the end with tape and return immediately.

9 With the new membrane in hand, lubricate the brine seal and slide into the vessel in the same position as the original came out. Be sure the brine seal has not become unseated.

10 Inspect the o-rings on the end plug, replace if needed, lubricate the o-ring and slide into the vessel.

11 Slide rods forward through the mounting holes and re-assemble nuts. Tighten until the washer does not spin freely. DO NOT OVERTIGHTEN

12 Reconnect the hoses.

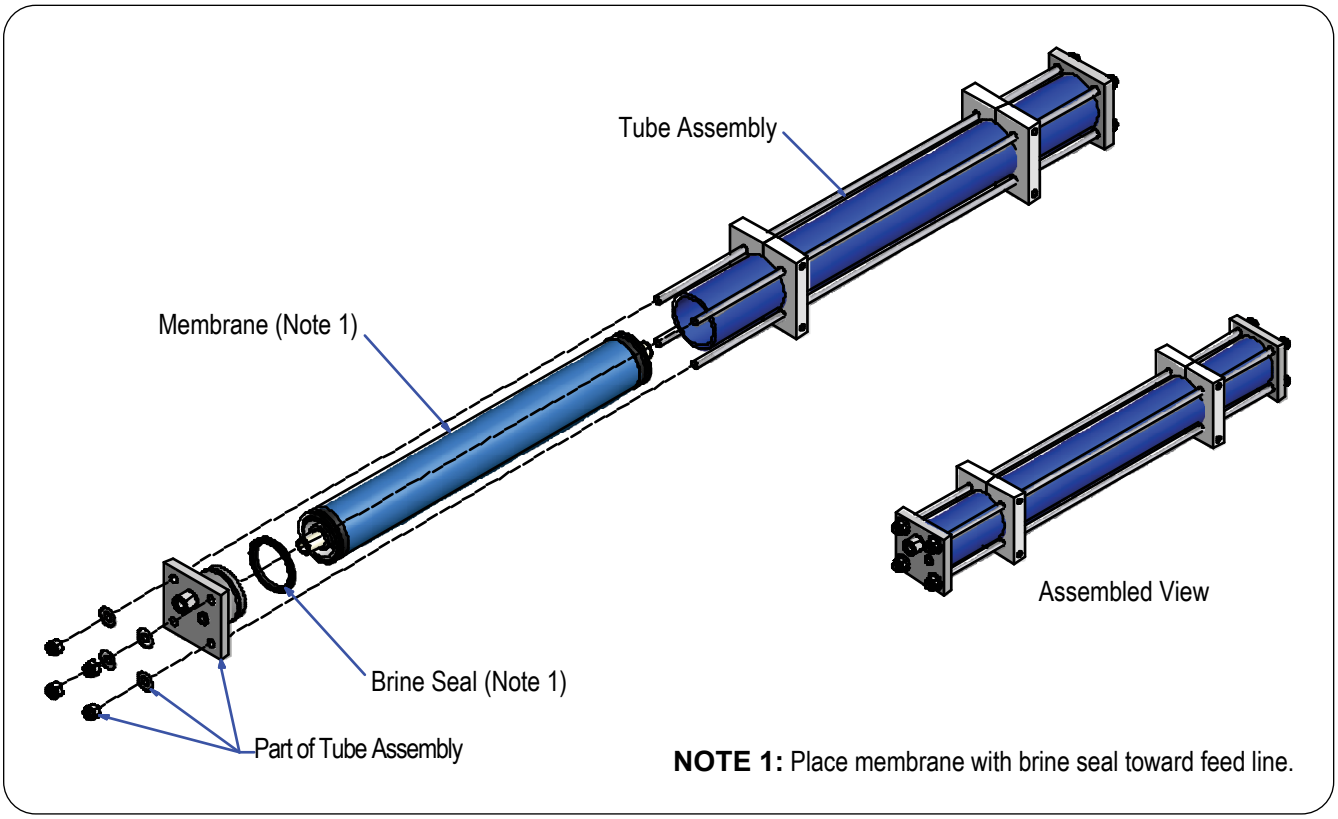


Figure 35: Replacing the Membrane

CLEANING AND STORAGE PROCEDURES

Invariably there will be times when the watermaker will not be used. During this time, it is recommended that the system be shut down and certain precautions are taken. By following these simple instructions, your FCI system will continue to provide you with fresh water for years to come.

SHORT TERM SHUTDOWN (UP TO 6 MONTHS)

You can perform a fresh water flush cycle before shutdown, and no additional procedures are necessary. For systems without the flush installed, it is recommended to manually run fresh water through the system at "0" high pressure, until the majority of the seawater has been displaced by fresh water.

LONG TERM

If the system has fresh water flush installed, set the control system to automatically flush the system every week. Another method is to "pickle", or preserve the system, which will last up to six months. Please refer to "STORAGE PROCEDURE" on page 137.

WARNING: FRESH WATER FLUSH

There must be sufficient fresh water in the potable water storage tank: In order to provide the required flow of water to the system during the fresh water flush cycle, the boat or home's fresh water pressure system must deliver minimum 1 U.S. Gallons (3.8 Liters) Per Minute at minimum 25 PSI (172 kPa) and maximum 60 PSI (414 kPa).

WARNING: FREEZING TEMPERATURE

The system must be protected from freezing if it will be exposed to temperatures below 32° Fahrenheit (0° Celsius). Freezing temperatures (below 32° F / 0° C) will cause extensive damage to the system as the water expands within the system during the freezing process. Resulting damage to the system caused by freezing temperatures is the liability of the operator. DO NOT subject the system to temperatures below 32° Fahrenheit (0° Celsius) unless the system has been rinsed with a solution of product water with twenty percent (20%) food-grade glycerin (propylene glycol).

NOTE: USE OF CHEMICALS

Although chemicals are necessary in some instances, FCI recommends using them only as needed. The chemicals can attack the membrane polymers and weaken the integrity of the membrane.

WINTERIZING PROCEDURE

If the system will be exposed to freezing temperatures the system must be drained of all product water, and rinsed with a solution of product water with 20% food-grade glycerin (propyline glycol).

If system is equipped with the following optional equipment, perform the following after rinsing with glycerin:

- Charcoal Filter (if equipped)

    1. Remove the charcoal filter bowl.
    2. Remove the water from the bowl.
    3. Replace the charcoal filter element with a new charcoal filter element.
    4. Replace the bowl back onto the lid.

- pH Neutralizing Filter (if equipped)

    1. Remove the pH neutralizing bowl.
    2. Remove the water from the bowl.
    3. Replace the bowl and pH element back onto the lid.

- UV Sterilizer (if equipped)

    Disconnect the product water line from the UV sterilizer filter and drain product water from it.

After winterizing the system and optional equipment, switch the power to the system OFF. Lock and tag the power breaker to ensure that no one will accidentally operate the system and displace the winterizing mixture with feed or fresh water.

When returning the system to operation, discard the storage chemical in an environmentally safe manner.

CLEANING PROCEDURE

HIGH PH CLEANER (Green Cap — Part# 14-0013)

1 Disconnect system feed line, turn system on and let drain for 30 seconds.

2 Place feed line and discharge line in a container filled with clean de-chlorinated fresh water.

3 Mix one pound of chemical for every 15 gallons of water.

4 With regulator valves completely open, and a maximum of 50 PSI on the system, circulate the solution through the system for 30 minutes. If solution discolors, dump solution after 15 minutes and start at *Step 2* again.

5 Remove suction line from container and let system drain for 30 seconds.

6 Rinse the system with fresh water, to drain, for 15 minutes.

7 When R.O. unit is first restarted, product water should be diverted to drain for the first 15 minutes.

LOW PH CLEANER (Red Cap — Part# 14-0014)

1 Disconnect system feed line, turn system on and let drain for 30 seconds.

2 Place feed line and discharge line in a clean container filled with de-chlorinated fresh water.

3 Mix one pound of chemical for every 15 gallons of water.

4 With regulator valves complete open, and a maximum of 50 PSI on the system, circulate the solution through the system for 30 minutes. If solution discolors, dump solution after 15 minutes and start *Step 2* again.

5 Remove suction line from container and let system drain for 30 seconds.

6 Rinse system with fresh water, to drain, for 15 minutes.

7 When R.O. unit is first restarted, product water should be diverted to drain for the first 15 minutes.

STORAGE PROCEDURE

MEMBRANE STORAGE AGENT (Blue Cap — Part# 14-0015)

1 Membranes should be cleaned prior to storage. See "CLEANING PROCEDURE" on page 136.

2 Disconnect system feed line, turn system on and let drain for 30 seconds.

3 Place feed line and discharge line in a container filled with clean de-chlorinated fresh water.

4 Mix one pound of chemical for every 10 gallons of water. For 2 1/2" membranes use 15 gallons of water.

5 With regulator valves completely open, and a maximum of 50 PSI on the system, circulate the solution through the system for 10 minutes.

6 After circulation, shut system down and close valves. Make sure solution does not drain out.

7 Upon start up, after storage, open valves for operation. Start the system up and run for 15 minutes, with no applied pressure.

8 When R.O. unit is first restarted, product water should be diverted for 15 minutes.

6/ TROUBLESHOOTING

If you experience drastic changes in performance, take note of the following...

During performance comparisons, feed water temperature, feed water salinity, and system operating pressure must be taken into consideration and be compensated for. After compensations, a 15% decline in productivity (GPH Flow) and/or a 15% increase in salt passage indicate that the R.O. membrane element may require cleaning.

If production rate has dropped dramatically since the last time the system was used, this may be due to drying out of the R.O. membrane element and/or fouling during storage. If the system has not been used for several months and the production rate has dropped dramatically since the last time used, try operating the system for 48 or more continuous hours to saturate the product water channel within the R.O. membrane element.

If production rate drops dramatically from one day to another, this may be due to chemical attack, which is not cleanable. Sewage chemicals or petroleum products cause irreparable damage to the R.O. membrane element. Suspended solids fouling resulting from silt, coral dust, iron (rust), river or inland waterway debris, or other small solid matter may not be cleanable.

For "System Troubleshooting Guide", refer to *Table 6 on page 139*.

SYSTEM TROUBLESHOOTING GUIDE

Table 6: System Troubleshooting Guide

Problem	Probable Cause	Solution
LP FAULT • Low Pressure Feed Pressure Too Low	Pre-filter clogged	Clean (up to 2X) or replace
	Sea strainer clogged	Clean
	Thru-hull obstructed	Clear obstruction
	Kink in feed hose	Correct hose run or replace hose
	LP pump lost prime	Prime Low-pressure pump
	Thru-hull valve closed	Open Thru-hull valve
	Pump Rotation incorrect	Reverse rotation
	Media filter needs back washing (if equipped)	Backwash or change media
	Low-pressure switch	Replace switch
		Tighten wire connections
		Replace cable
	Air in feed line	Install forward facing scoop
		Move thru-hull position
		Use dedicated thru-hull
LP FAULT • LP pump won't run	Fuse blown on Controller	Replace fuse – see electrical diagram
	Capacitor blown on motor	Replace
	Thermal overload tripped on motor	Will automatically reset when cools down
	Thermal overload on contactor tripped (if equipped)	Press reset button on thermal overload (inside electrical box)
	Loose wire in junction box	Check and secure
	Loose wire on control board	Check and secure
	Contactor faulty	Replace
	Loose wire on contactor coil A1, A2	Check and secure
PRE-FILTER LEAKS	O-ring needs replacing	Replace
HP FAULT • System Pressure Too High	Pressure beyond high pressure trip point	Reduce pressure
		Adjust trip point
	Switch has failed or wire connections to switch are loose	Replace switch
		Check wire connection
		Replace wire
	Restriction downstream of brine discharge	Remove restriction

Table 3: System Troubleshooting Guide (continued)

Problem	Probable Cause	Solution
High-pressure Pump Won't Run	Fuse blown on controller	Replace fuse – see electrical diagram
	Capacitors blown (run or start)	Replace
	Motor bearings failed	Replace bearing
	Thermal Overload tripped (if equipped)	Press reset button
	Loose wire in junction box	Check and secure
	Loose wire on control board	Check and secure
	Contactor faulty	Replace
	Loose wire on contactor coil , A1, A2	Check and secure
	High pressure pump has seized	Check and take necessary action
TDS FAULT	Membrane Fouling	Clean or replace membrane
	Loss of feed flow from HP Pump	Check pump RPM, Adjust Belt tension, Service pump seals
	Pressure too low	Increase pressure to rated output
	Product Probe Needs Cleaning	Wipe down probe pins
	Pressure not being applied to system soon enough to allow for water to be made prior to the 3 minute shutdown	Apply pressure when screen advances to the "init" screen to allow for the system to make water sooner
PERM FAULT (Permeate)	System making water beyond rated capacity	Reduce pressure to bring product flow rate within design specifications
System has power, but display is blank	Possible short on flow sensors or switches resulting in power supply shutting down	Kill power to unit. Unplug the flow sensors and transducers. Reapply power. If display comes on, plug each component in one by one and see which one brings the screen down. Replace identified item
	Power supply down on main control board	Check output on power supply. If not 24 VDC return to factory for repair
System has power, but pumps will not turn on	Main fuse on control board has blown. Usually caused by one of the coils in the solenoids or contactors	Replace fuse. Monitor system and determine at what stage the fuse blows. (Ex. When HP pump starts, when fresh water flush solenoid engages etc.) Check connections to that component, secure wires or replace component

Table 3: System Troubleshooting Guide (continued)

Problem	Probable Cause	Solution
System turns off by itself, no fault condition showing	Loss of power	No action
	Program set up to run for a certain amount of time	Adjust as needed (see control section)
	Program set to make a specified amount of water	Adjust as needed (see control section)
	Program set to turn on or off at specified times	Adjust as needed (see control section)
Low-pressure pump will not shut off	Isolation relay on main control board is faulty	Send to factory for repair
High-pressure pump will not shut off	Isolation relay on main control board is faulty	Send to factory for repair
Brine flow paddle wheel does not stop spinning after shutdown	System is in a fresh water flush mode	Wait for fresh water flush to time out
	Fresh water flush solenoid valve is faulty	Replace or repair valve
	Fresh water flush relay on control board has failed	Send to factory for repair
System is making good water but not diverting to fresh water tank	Quality solenoid has failed	Check wiring / Replace valve (use over ride button on valve to divert water until repaired)
	Quality solenoid relay on control board has failed	Return control board to factory for repair
Brine flow is too low	High pressure pump seals worn	Replace seals
Product flow is low	System pressure to low	Increase pressure
	Feed TDS high	Adjust pressure up to 1000 PSI to compensate for high TDS
	Water temperature low	Adjust pressure up to 1000 PSI to compensate for low temperature
	Membranes are fouled	Clean or replace membranes
System does not turn on when power button is pressed	Fuses blown on main control	Replace fuses
	Power not on	Apply power
System draws high amperes	Low or incorrect voltage applied	Adjust voltage to system specifications
High pressure not increasing when HP Valve is turned counter clockwise	HP pump seals need service	Repair high pressure pump
	Valve stem worn	Replace high pressure valve
High quality light does not come on	Pressure too low on system	Increase pressure to rated output
	Membrane is fouled	Clean or replace membrane
	Probe needs to be cleaned	Clean or replace probe

HIGH PRESSURE PUMP TROUBLESHOOTING GUIDE

One of the most important steps in a high pressure system is to establish a regular maintenance program. This will vary slightly with each system and is determined by various elements such as the duty cycle, the liquid being pumped, the actual specifications vs. rated specifications of the pump, the ambient conditions, the inlet conditions and the accessories in the system. A careful review of the necessary inlet conditions and protection devices required before the system is installed will eliminate many potential problems.

These pumps are very easy pumps to service and require far less frequent service than most pumps. Typically, only common tools are required, making in-field service convenient, however, there are a few custom tools special to certain models that do simplify the process. *Table 7* will assist in troubleshooting the high pressure pump.

Table 7: High Pressure Pump Troubleshooting Guide

Problem	Probable Cause	Solution
LOW PRESSURE	Air leak in inlet plumbing.	Tighten fittings and hoses. Use PTFE liquid or tape.
	Pressure gauge inoperative or not registering accurately.	Check with new gauge. Replace worn or damaged gauge.
	Inlet suction strainer (filter) clogged or improperly sized.	Clean/adjust relief valve. Replace worn seats/valves and o-rings.
	Abrasives in pumped liquid.	Clean filter. Use adequate size filter. Check more frequently. Install proper filter.
	Leaky discharge hose.	Replace discharge hose with proper rating for system.
	Inadequate liquid supply.	Pressurize inlet.
	Severe cavitation.	Check inlet conditions.
	Worn seals.	Install new seal kit. Increase frequency of service
	Worn or dirty inlet/ discharge valves.	Clean inlet/discharge valves or install new valve kit.
PULSATION	Foreign material trapped in inlet/discharge valves.	Clean inlet/discharge valves or install new valve kit..
WATER LEAK • Under the manifold • Into the crankcase	Worn V-Packings or Lo-Pressure Seals.	Install new seal kit. Increase frequency of service.
	Worn adapter o-rings.	Install new o-rings.
	Humid air condensing into water inside the crankcase.	Install oil cap protector. Change oil every 3 months or 500 hours.
	Excessive wear to seals and V-Packings.	Install new seal kit. Increase frequency of service.
KNOCKING NOISE • Inlet supply • Bearing • Pulley	Inadequate inlet liquid supply.	Check liquid supply. Increase line size, pressurize.
	Broken or worn bearing.	Replace bearing.
	Loose pulley on crankshaft	Check key and tighten set screw.

Table 4: High Pressure Pump Troubleshooting Guide (continued)

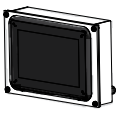
Problem	Probable Cause	Solution
OIL LEAK • Crankcase oil seals. • Crankshaft oil seals and o-rings. • Drain plug • Bubble gauge • Rear Cover • Filler cap	Worn crankcase oil seals.	Replace crankcase oil seals.
	Worn crankshaft oil seals or o-rings on bearing cover.	Remove bearing cover and replace o-rings and/or oil seals.
	Loose drain plug or worn drain plug o-ring.	Tighten drain plug or replace o-ring.
	Loose bubble gauge or worn bubble gauge gasket.	Tighten bubble gauge or replace gasket.
	Loose rear cover or worn rear cover o-ring.	Tighten rear cover or replace o-ring.
	Loose filler cap or excessive oil in crankcase.	Tighten filler cap. Fill crankcase to specified capacity.
PUMP RUNS EXTREMELY ROUGH • Inlet conditions • Pump valves • Pump seals	Restricted inlet or air entering the inlet plumbing.	Correct inlet size plumbing. Check for air tight seal.
	Stuck inlet/discharge valves.	Clean out foreign material or install new valve kit.
	Leaking V-Packings or Lo-Pressure seals.	Install new seal kit. Increase frequency of service.
PREMATURE SEAL FAILURE	Scored plungers.	Replace plungers.
	Over pressure to inlet manifold.	Reduce inlet pressure per specifications.
	Abrasive material in the liquid being pumped.	Install proper filtration at pump inlet and clean regularly.
	Excessive pressure and/or temperature of pumped liquid.	Check pressure and inlet liquid temperature. DO NOT RUN PUMP WITHOUT LIQUID.
	Running pump dry.	Increase hose one size larger than inlet port size. Pressurize.
	Starving pump of adequate liquid.	Increase hose one size larger than inlet port size. Pressurize.
	Eroded manifold.	Replace manifold. Check liquid compatibility.

7/ ACCESSORIES & OPTIONAL EQUIPMENT

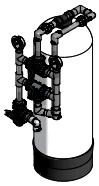
Contact your authorized FCI dealer for the following items:

- REPLACEMENT PARTS
- ACCESSORIES AND OPTIONAL EQUIPMENT

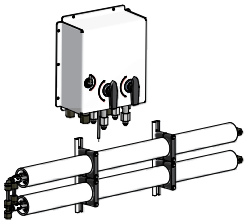
For more information, please call toll-free 1-800-850-0123, or visit us online at fciwatermakers.com



ADDITIONAL DISPLAYS
Monitor, program and access the system from one or more remote locations. Install one on the bridge, in the salon and/or engineering room. In the case of an island installation place one anywhere remote control and monitoring is desired.



MEDIA FILTERS
Multi-Media and Iron Removal Filters remove particulate or iron from the feed water stream. Filter includes valve tree assembly and stainless steel differential gauges.



DOCKSIDE TREATMENT SYSTEM (DTS)
While the practice of running dock water through standard seawater systems has been done for some time now, the downside has always been the premature failure of the seawater membranes due to exposure to chlorine, hot water, hard water and various other contaminates that can foul a membrane. The DTS allows a boater to run dock water through the watermaker without the risk of damaging the seawater membranes installed on the watermaker.

ULTRA-VIOLET STERILIZERS
Stainless Steel, Ultra-Violet Sterilizers provide 99.8% sterilization of bacteria and micro-organisms in water. Available in a variety of flow rates.

Recommended installation is after the holding tank, not immediately after the watermaker, as specified by other manufacturers and/or installers. The reason for this is that in addition to receiving clean water from the on-board watermaker, holding tanks are vented (inviting potential for contaminants) and are also fed by dock-side fillings from shore— there is no control of water quality in the holding tank itself. If a UV sterilizer is used, it should be sized to accommodate the requirements of the boat's fresh water pump.

POST GRANULAR ACTIVATED CARBON FILTERS
Granular-Activated Charcoal Filters are great for post-tank filtration, and remove particulate, chlorine and other contaminants found in your fresh water holding tank.

REPLACEMENT PARTS
FCI carries a complete line of replacement parts including filters, membranes, hoses, fittings, spanners, o-rings and more.

MEDIA FILTER OPERATING DIAGRAMS

If you have the optional media filter installed, refer to Figure 36 for in service and backwash valve settings.

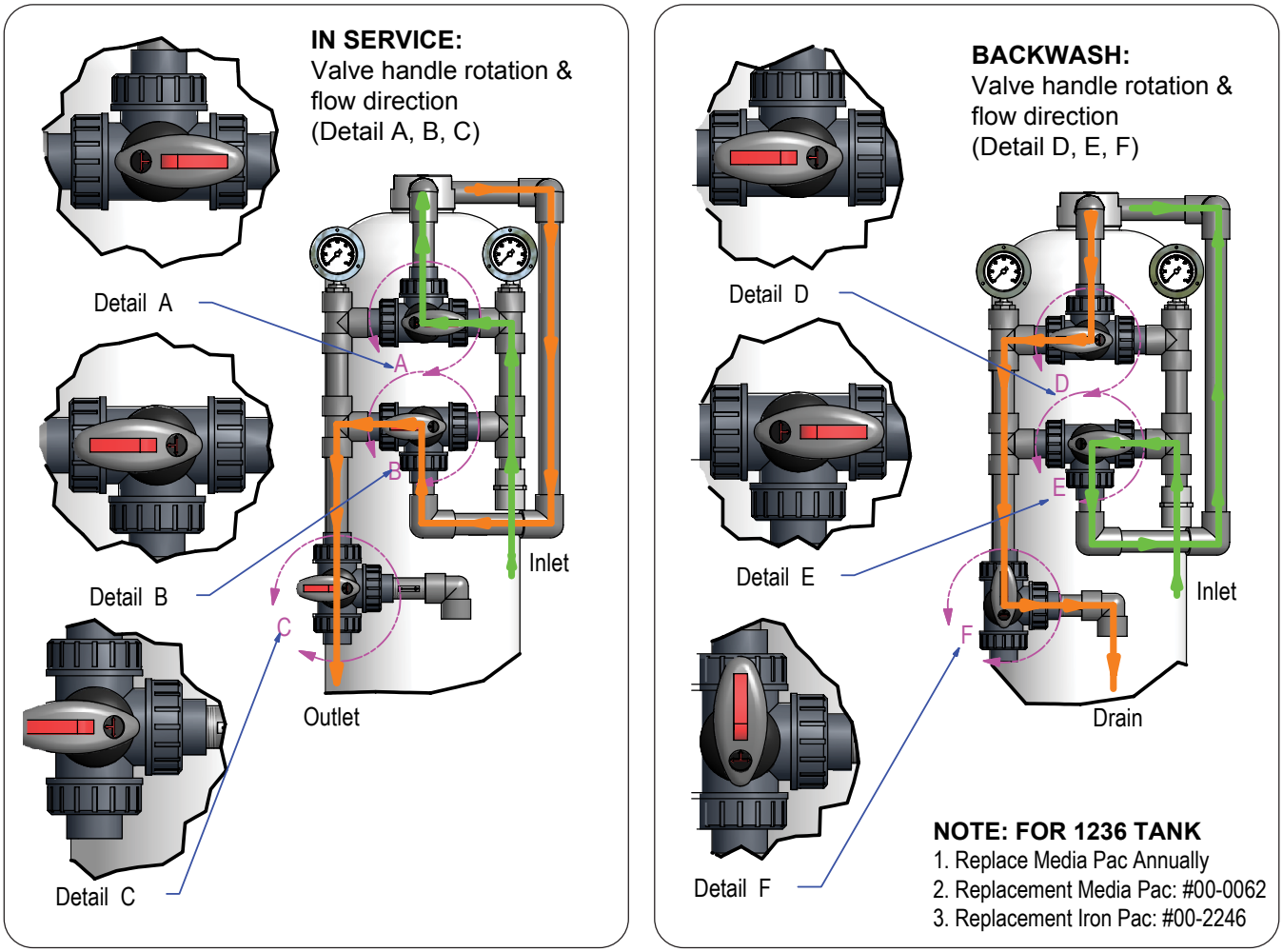


Figure 36: Operating the Media Filter (if equipped)

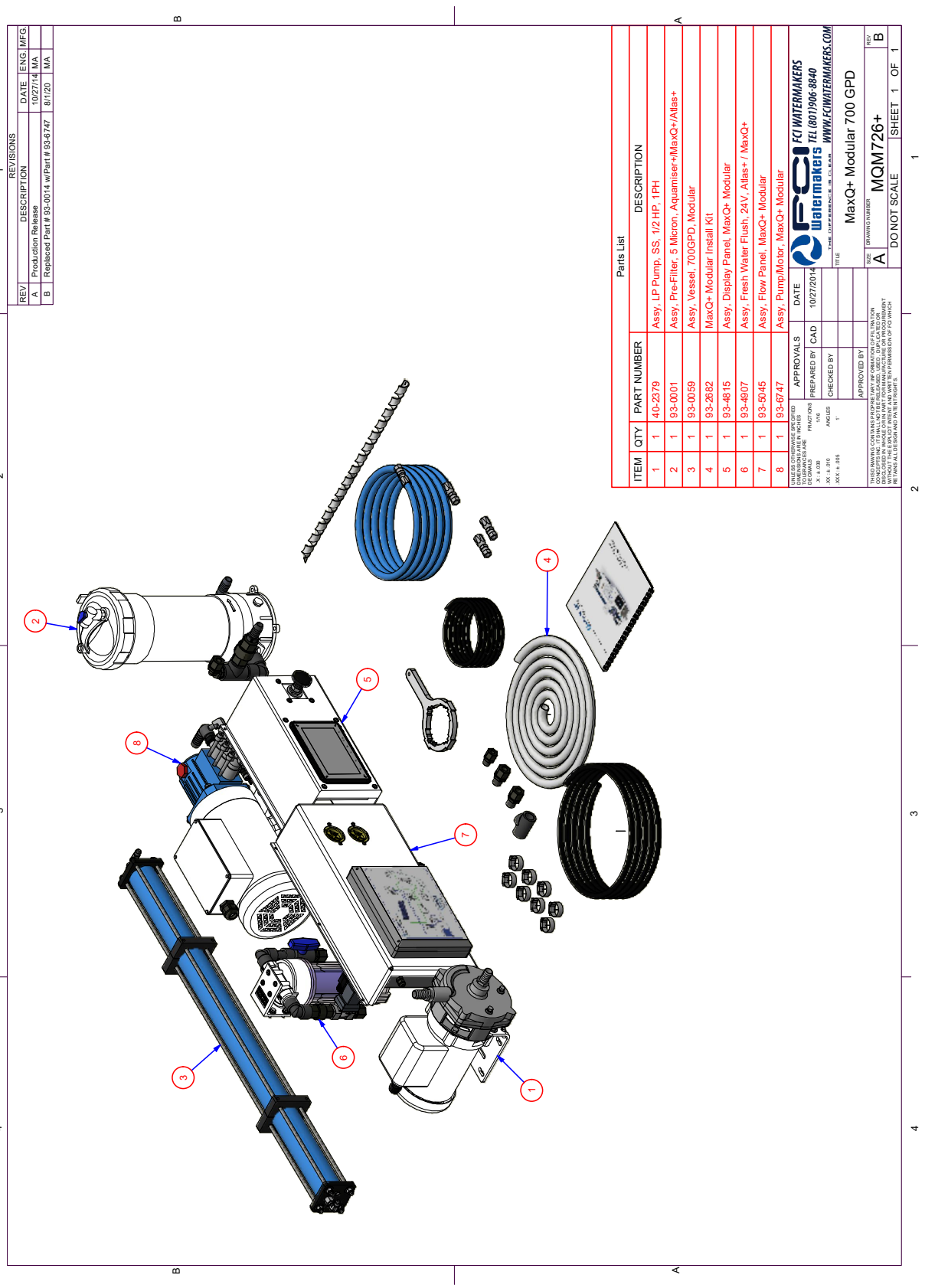
8/ PARTS

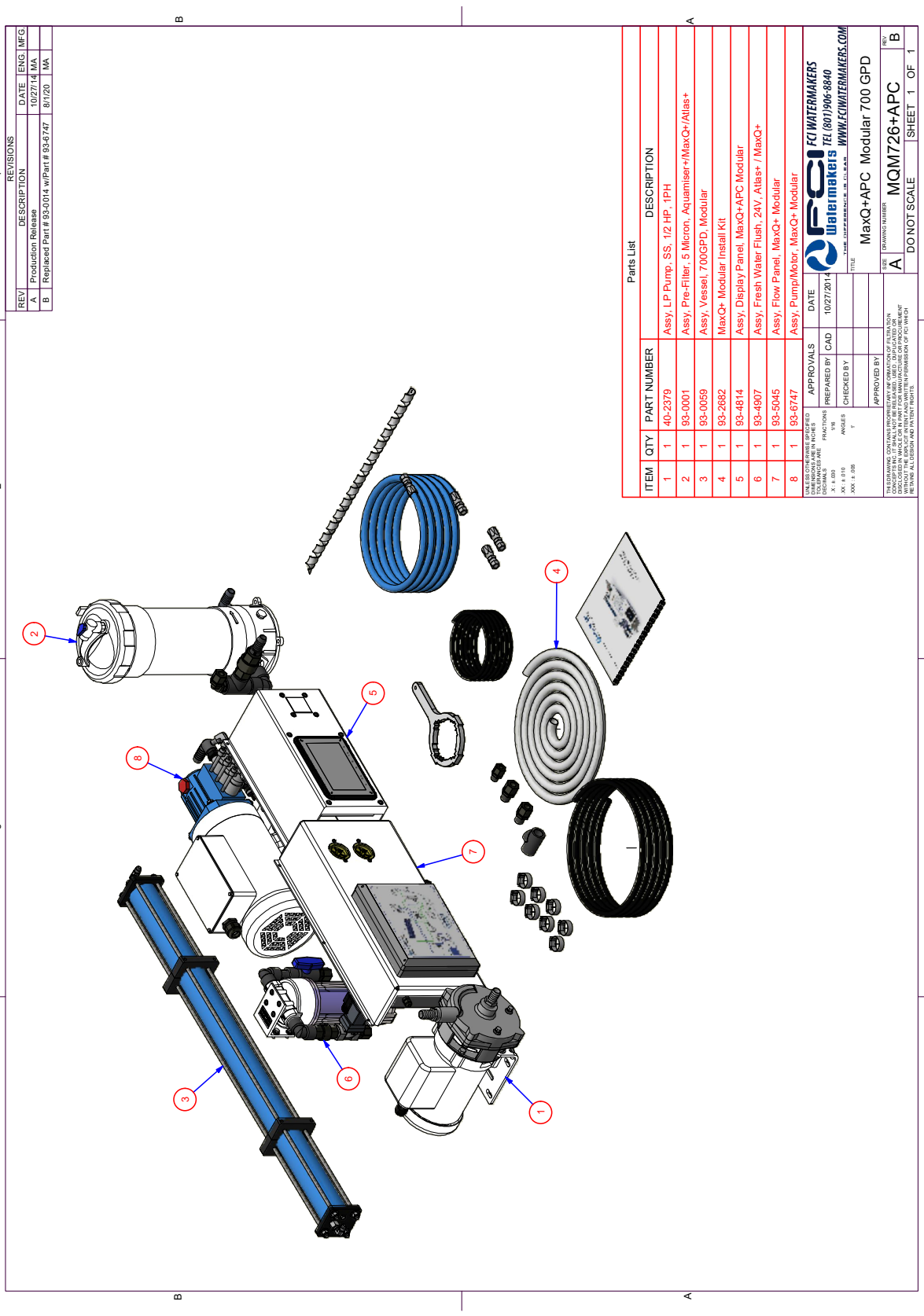
Refer to the General Assembly Diagrams included in this chapter for information about parts used in the system.

The General Assembly Diagrams in this chapter are organized in the following order:

- Systems
- Display Panel
- HP Valve
- Flow Panel
- Flow Indicator
- Pre-Filter
- Quality Valve
- Fresh Water Flush
- HP Pump
- Electrical
- Pressure Vessels

GENERAL ASSEMBLY DIAGRAMS / SYSTEM




REVISIONS
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A | Production Release | 10/27/14 | MA |
B | Replaced Part # 93-0014 w/Part # 93-6747 | 8/1/20 | MA |
Parts List
ITEM | QTY | PART NUMBER | DESCRIPTION
1 | 1 | 40-2379 | Assy, LP Pump, SS, 1/2 HP, 1PH
2 | 1 | 93-0001 | Assy, Pre-Filter, 5 Micron, Aquamiser+/MaxQ+/Atlas+
3 | 1 | 93-0059 | Assy, Vessel, 700GPD, Modular
4 | 1 | 93-2682 | MaxQ+ Modular Install Kit
5 | 1 | 93-4814 | Assy, Display Panel, MaxQ+APC Modular
6 | 1 | 93-4907 | Assy, Fresh Water Flush, 24V, Atlas+ / MaxQ+
7 | 1 | 93-5045 | Assy, Flow Panel, MaxQ+ Modular
8 | 1 | 93-6747 | Assy, Pump/Motor, MaxQ+ Modular
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PREPARED BY | CAD | 10/27/2014
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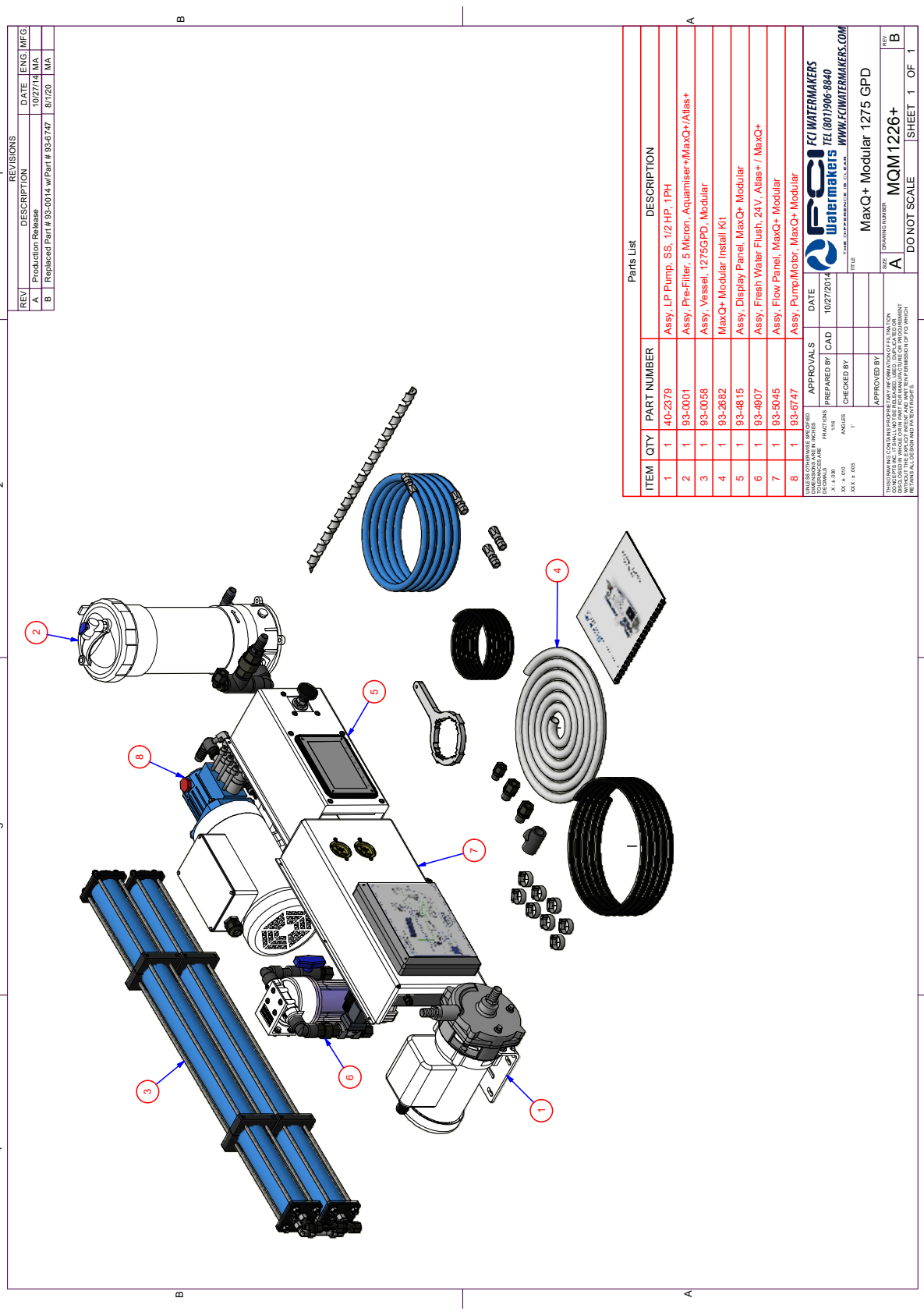
WWW.FCIWATERMAKERS.COM
MaxQ+APC Modular 700 GPD
SIZE | DRAWING NUMBER | REV
A | MQM726+APC | B
DO NOT SCALE | SHEET 1 OF 1


REVISIONS
REV DESCRIPTION DATE ENG. MFG.
A Production Release 10/27/14 MA
B Replaced Part # 93-0014 w/Part # 93-6747 8/1/20 MA
Parts List
ITEM QTY PART NUMBER DESCRIPTION
1 1 40-2379 Assy, LP Pump, SS, 1/2 HP, 1PH
2 1 93-0001 Assy, Pre-Filter, 5 Micron, Aquamiser+/MaxQ+/Atlas+
3 1 93-0058 Assy, Vessel, 1275GPD, Modular
4 1 93-2682 MaxQ+ Modular Install Kit
5 1 93-4815 Assy, Display Panel, MaxQ+ Modular
6 1 93-4907 Assy, Fresh Water Flush, 24V, Atlas+ / MaxQ+
7 1 93-5045 Assy, Flow Panel, MaxQ+ Modular
8 1 93-6747 Assy, Pump/Motor, MaxQ+ Modular
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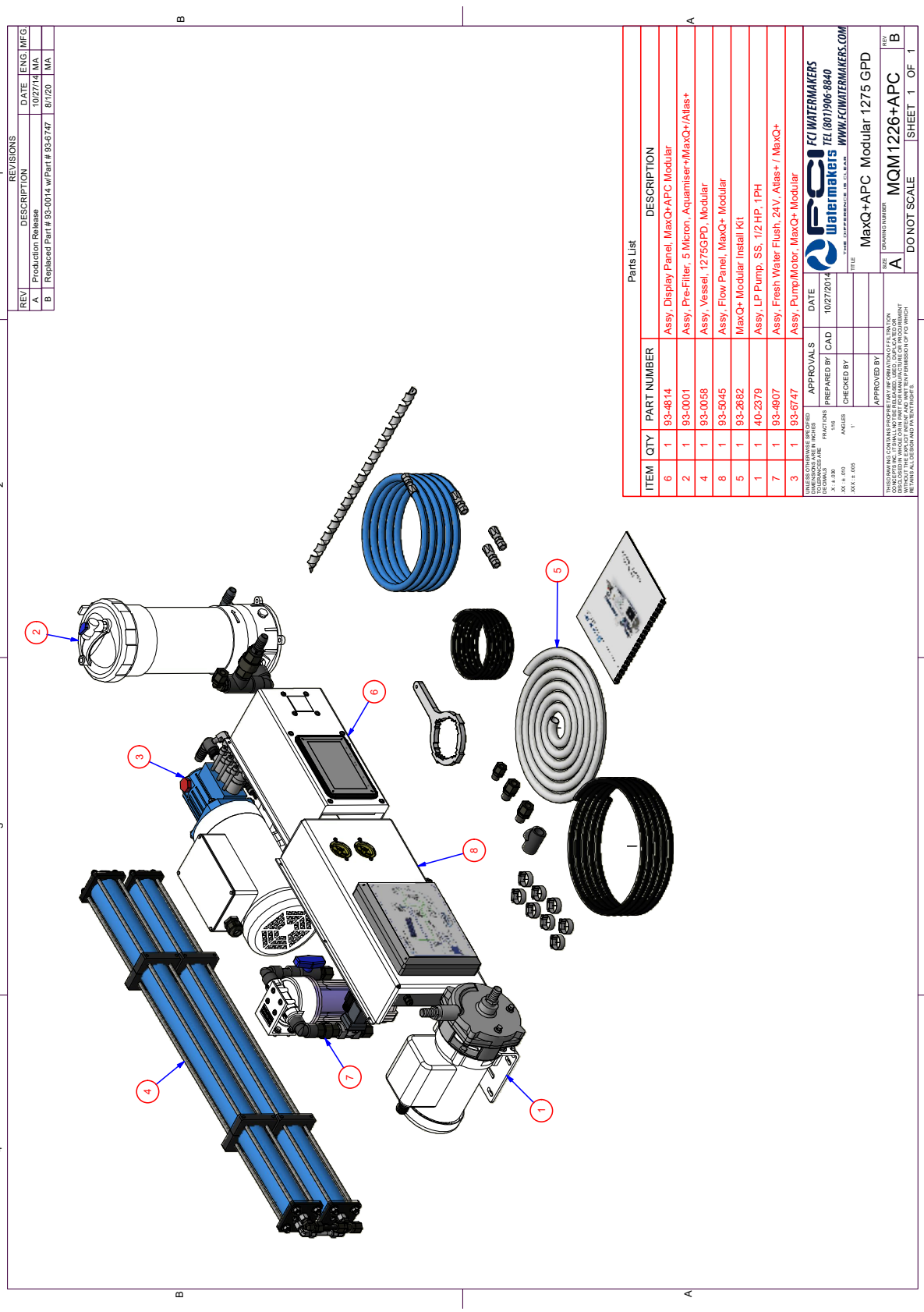
MaxQ+ Modular 1275 GPD
SIZE A DRAWING NUMBER MQM1226+ REV B
DO NOT SCALE SHEET 1 OF 1


REVISIONS
REV DESCRIPTION DATE ENG. MFG.
A Production Release 10/27/14 MA
B Replaced Part # 93-0014 w/Part # 93-6747 8/1/20 MA
Parts List
ITEM QTY PART NUMBER DESCRIPTION
6 1 93-4814 Assy, Display Panel, MaxQ+APC Modular
2 1 93-0001 Assy, Pre-Filter, 5 Micron, Aquamiser+/MaxQ+/Atlas+
4 1 93-0058 Assy, Vessel, 1275GPD, Modular
8 1 93-5045 Assy, Flow Panel, MaxQ+ Modular
5 1 93-2682 MaxQ+ Modular Install Kit
1 1 40-2379 Assy, LP Pump, SS, 1/2 HP, 1PH
7 1 93-4907 Assy, Fresh Water Flush, 24V, Atlas+ / MaxQ+
3 1 93-6747 Assy, Pump/Motor, MaxQ+ Modular
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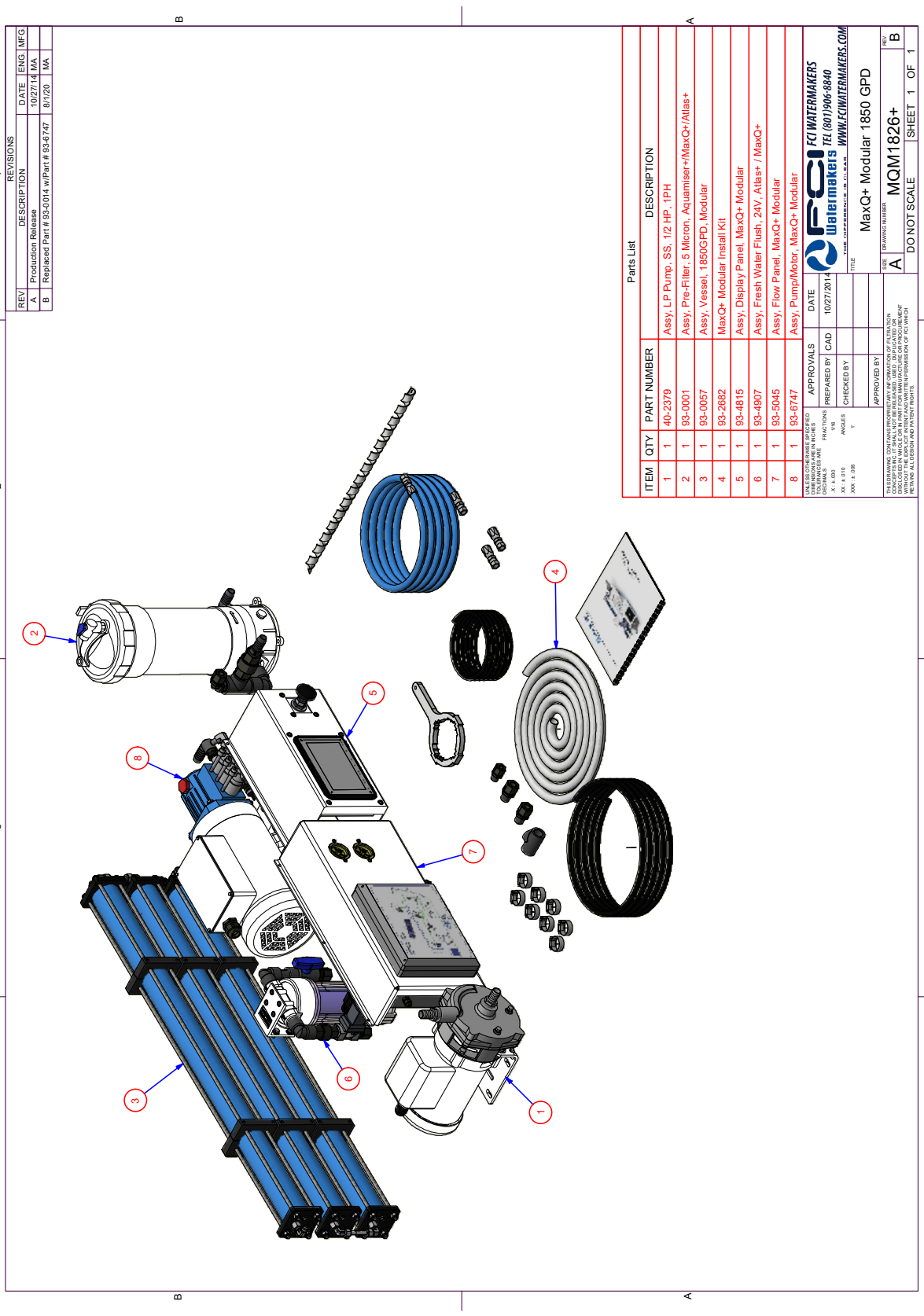
REVISIONS
REV | DESCRIPTION | DATE | ENG. | MFG.
A | Production Release | 10/27/14 | MA |
B | Replaced Part # 93-0014 w/Part # 93-6747 | 8/1/20 | MA |
Parts List
ITEM | QTY | PART NUMBER | DESCRIPTION
1 | 1 | 40-2379 | Assy, LP Pump, SS, 1/2 HP, 1PH
2 | 1 | 93-0001 | Assy, Pre-Filter, 5 Micron, Aquamiser+/MaxQ+/Atlas+
3 | 1 | 93-0057 | Assy, Vessel, 1850GPD, Modular
4 | 1 | 93-2682 | MaxQ+ Modular Install Kit
5 | 1 | 93-4815 | Assy, Display Panel, MaxQ+ Modular
6 | 1 | 93-4907 | Assy, Fresh Water Flush, 24V, Atlas+ / MaxQ+
7 | 1 | 93-5045 | Assy, Flow Panel, MaxQ+ Modular
8 | 1 | 93-6747 | Assy, Pump/Motor, MaxQ+ Modular
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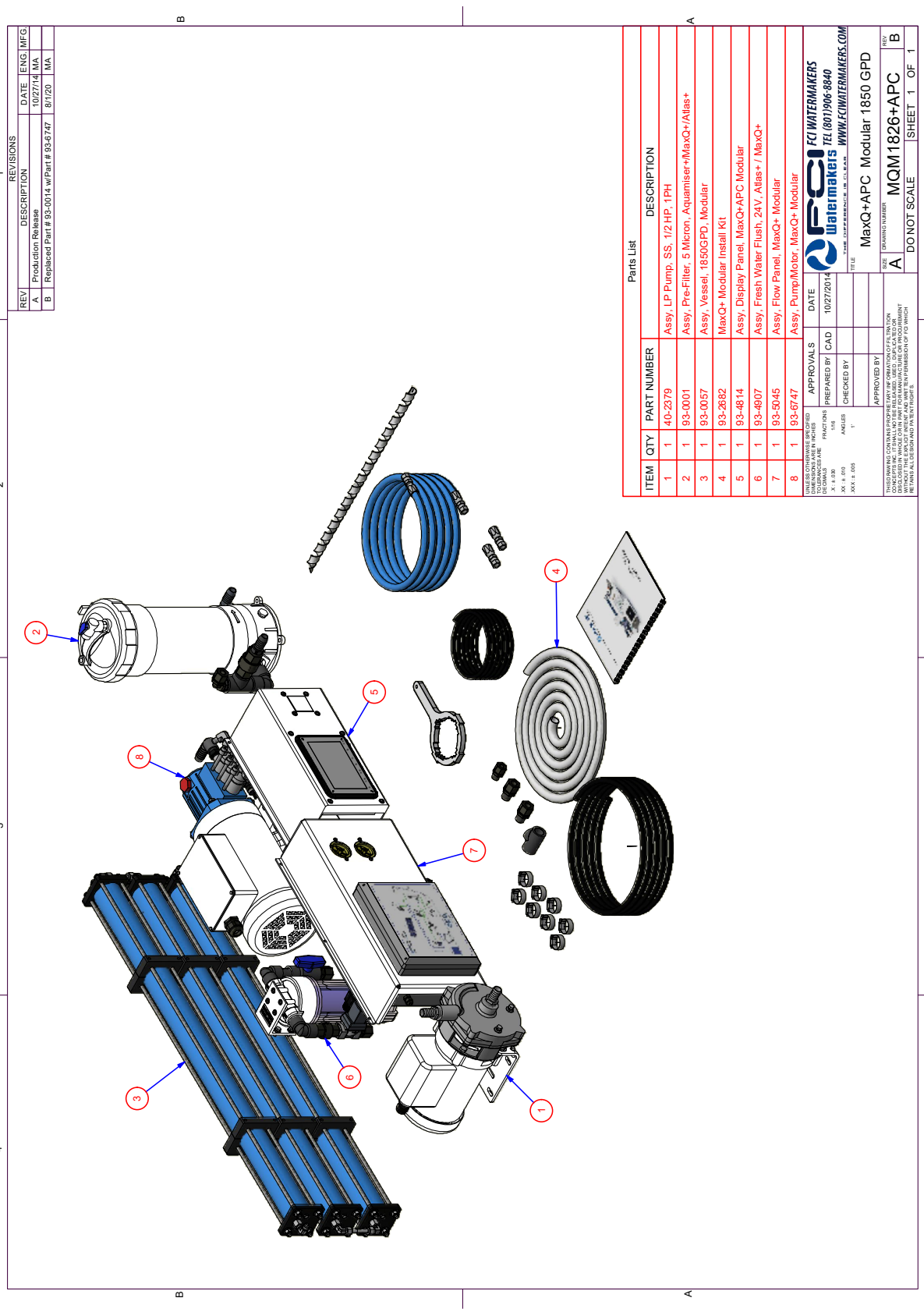
REVISIONS
REV DESCRIPTION DATE ENG. MFG.
A Production Release 10/27/14 MA
B Replaced Part # 93-0014 w/Part # 93-6747 8/1/20 MA
Parts List
ITEM QTY PART NUMBER DESCRIPTION
1 1 40-2379 Assy, LP Pump, SS, 1/2 HP, 1PH
2 1 93-0001 Assy, Pre-Filter, 5 Micron, Aquamiser+/MaxQ+/Atlas+
3 1 93-0057 Assy, Vessel, 1850GPD, Modular
4 1 93-2682 MaxQ+ Modular Install Kit
5 1 93-4814 Assy, Display Panel, MaxQ+APC Modular
6 1 93-4907 Assy, Fresh Water Flush, 24V, Atlas+ / MaxQ+
7 1 93-5045 Assy, Flow Panel, MaxQ+ Modular
8 1 93-6747 Assy, Pump/Motor, MaxQ+ Modular
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MaxQ+APC Modular 1850 GPD
SIZE A
DRAWING NUMBER MQM1826+APC
REV B
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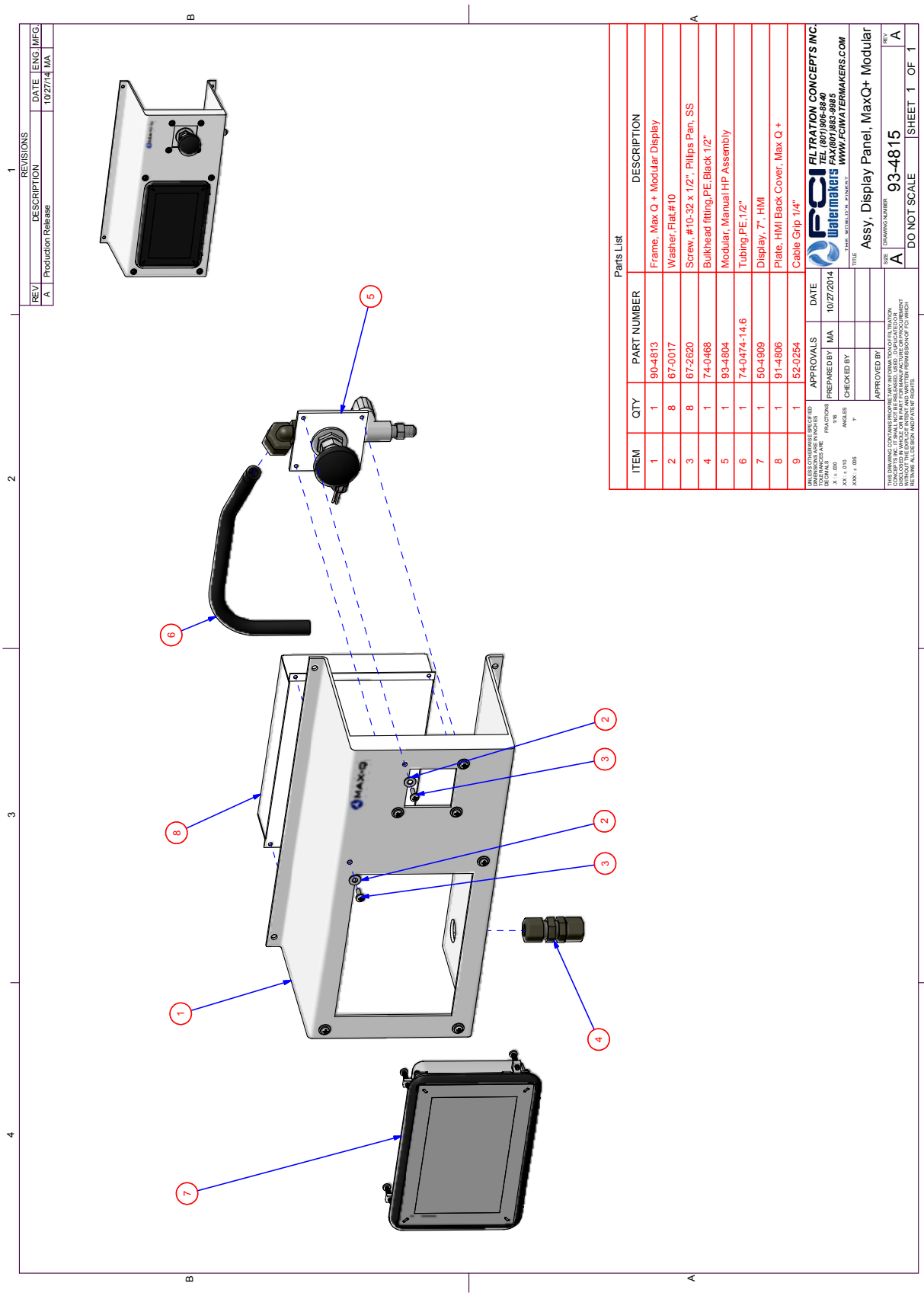
REVISIONS
REV | DESCRIPTION | DATE | ENG. | MFG.
A | Production Release | 10/27/14 | MA
Parts List
ITEM | QTY | PART NUMBER | DESCRIPTION
1 | 1 | 90-4813 | Frame, Max Q + Modular Display
2 | 8 | 67-0017 | Washer,Flat,#10
3 | 8 | 67-2620 | Screw, #10-32 x 1/2", Pilips Pan, SS
4 | 1 | 74-0468 | Bulkhead fitting,PE,Black 1/2"
5 | 1 | 93-4804 | Modular, Manual HP Assembly
6 | 1 | 74-0474-14.6 | Tubing,PE,1/2"
7 | 1 | 50-4909 | Display, 7", HMI
8 | 1 | 91-4806 | Plate, HMI Back Cover, Max Q +
9 | 1 | 52-0254 | Cable Grip 1/4"
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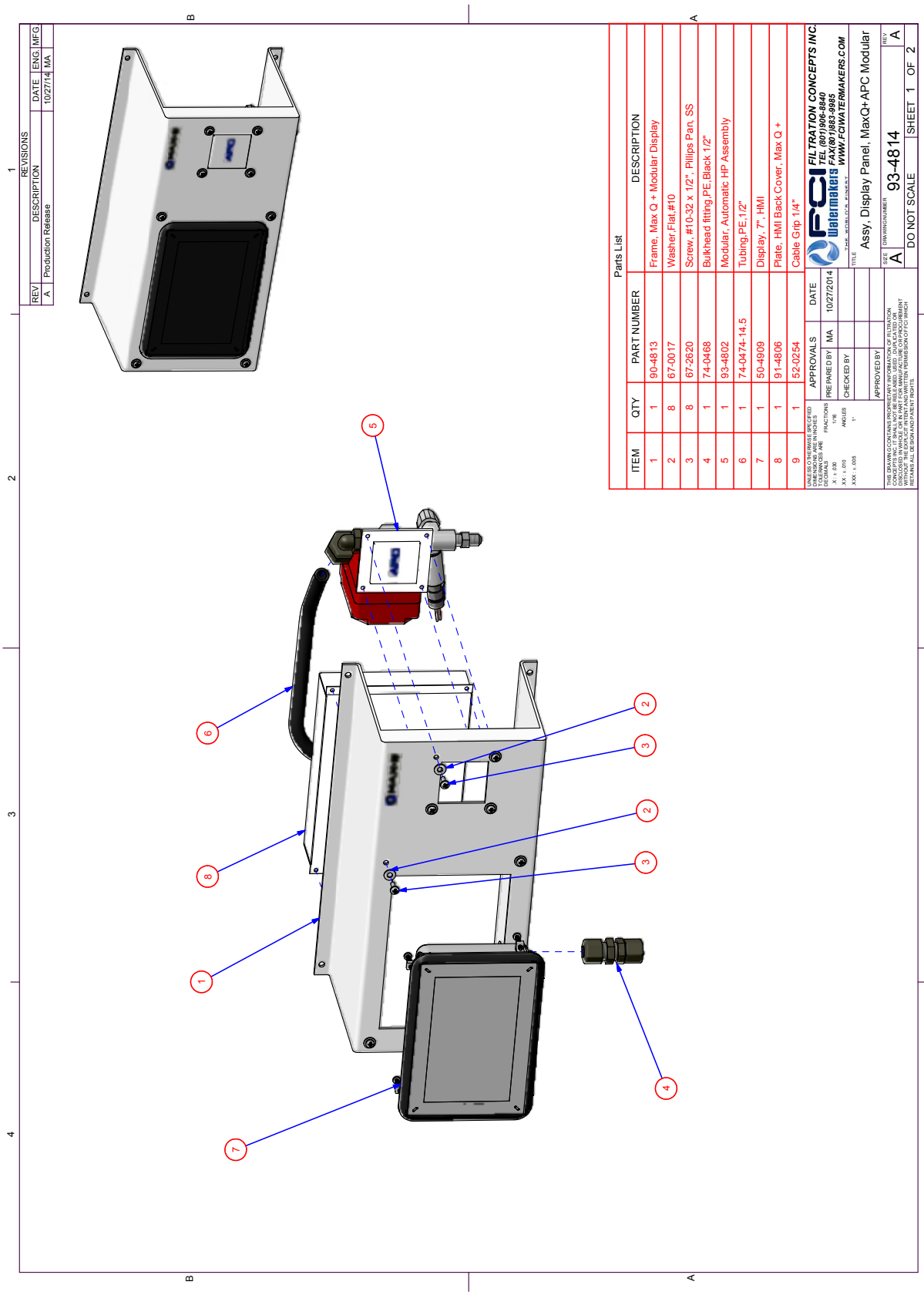
TITLE: Assy, Display Panel, MaxQ+ Modular
SIZE: A | DRAWING NUMBER: 93-4815 | REV: A
DO NOT SCALE | SHEET 1 OF 1
MAX-Q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A | Production Release | 10/27/14 | MA
Parts List
ITEM | QTY | PART NUMBER | DESCRIPTION
1 | 1 | 90-4813 | Frame, Max Q + Modular Display
2 | 8 | 67-0017 | Washer,Flat,#10
3 | 8 | 67-2620 | Screw, #10-32 x 1/2", Pillips Pan, SS
4 | 1 | 74-0488 | Bulkhead fitting,PE,Black 1/2"
5 | 1 | 93-4802 | Modular, Automatic HP Assembly
6 | 1 | 74-0474-14.5 | Tubing,PE,1/2"
7 | 1 | 50-4909 | Display, 7", HMI
8 | 1 | 91-4806 | Plate, HMI Back Cover, Max Q +
9 | 1 | 52-0254 | Cable Grip 1/4"
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SIZE A
DRAWING NUMBER 93-4814
REV A
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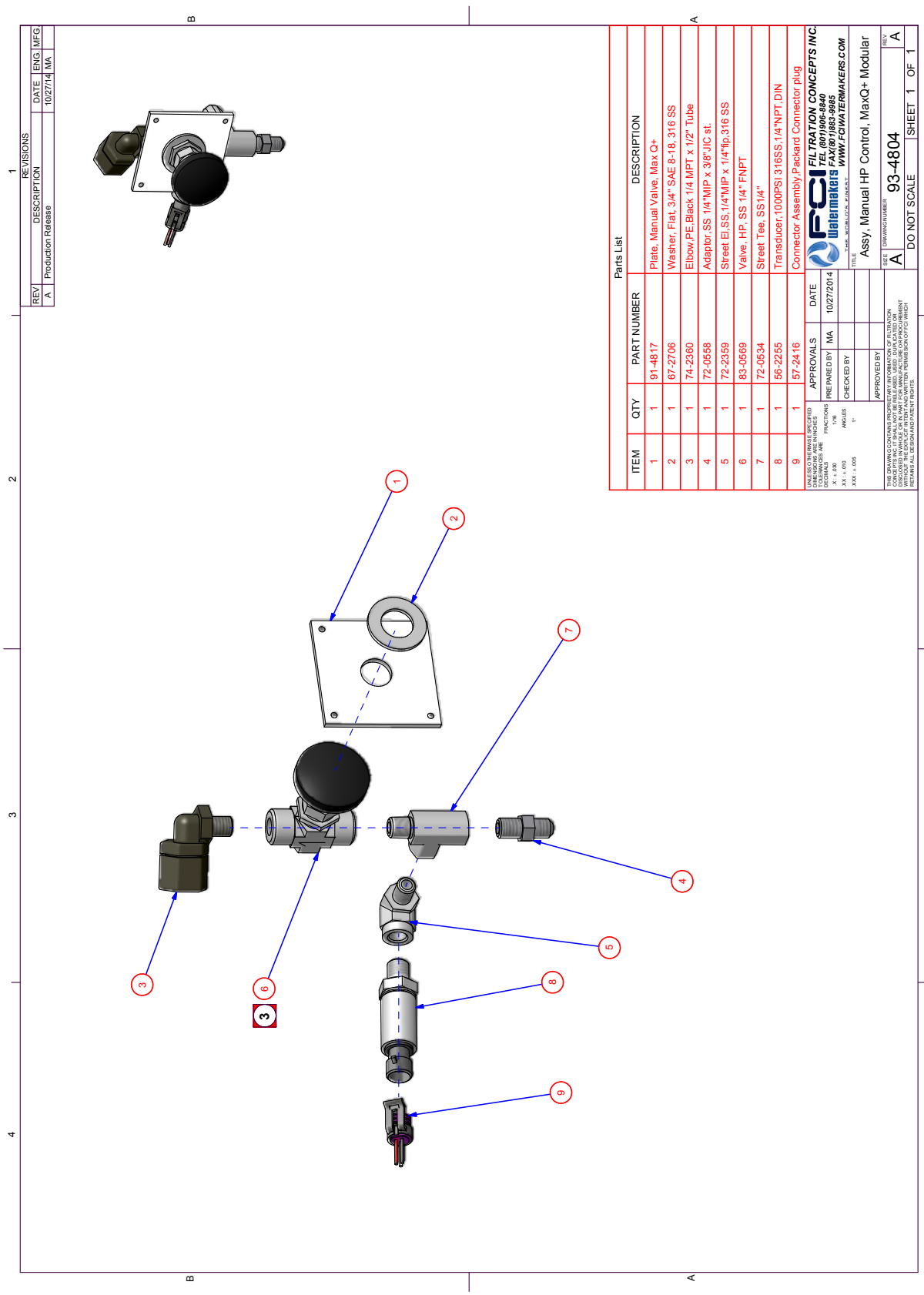
REVISIONS
REV | DESCRIPTION | DATE | ENG. MFG.
A | Production Release | 10/27/14 | MA
Parts List
ITEM | QTY | PART NUMBER | DESCRIPTION
1 | 1 | 91-4817 | Plate, Manual Valve, Max Q+
2 | 1 | 67-2706 | Washer, Flat, 3/4" SAE 8-18, 316 SS
3 | 1 | 74-2360 | Elbow,PE,Black 1/4 MPT x 1/2" Tube
4 | 1 | 72-0558 | Adaptor,SS 1/4"MIP x 3/8",JIC st.
5 | 1 | 72-2359 | Street El,SS,1/4"MIP x 1/4"fip,316 SS
6 | 1 | 83-0569 | Valve, HP, SS 1/4" FNPT
7 | 1 | 72-0534 | Street Tee, SS1/4"
8 | 1 | 56-2255 | Transducer,1000PSI 316SS,1/4"NPT,DIN
9 | 1 | 57-2416 | Connector Assembly,Packard Connector plug
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93-4804
A
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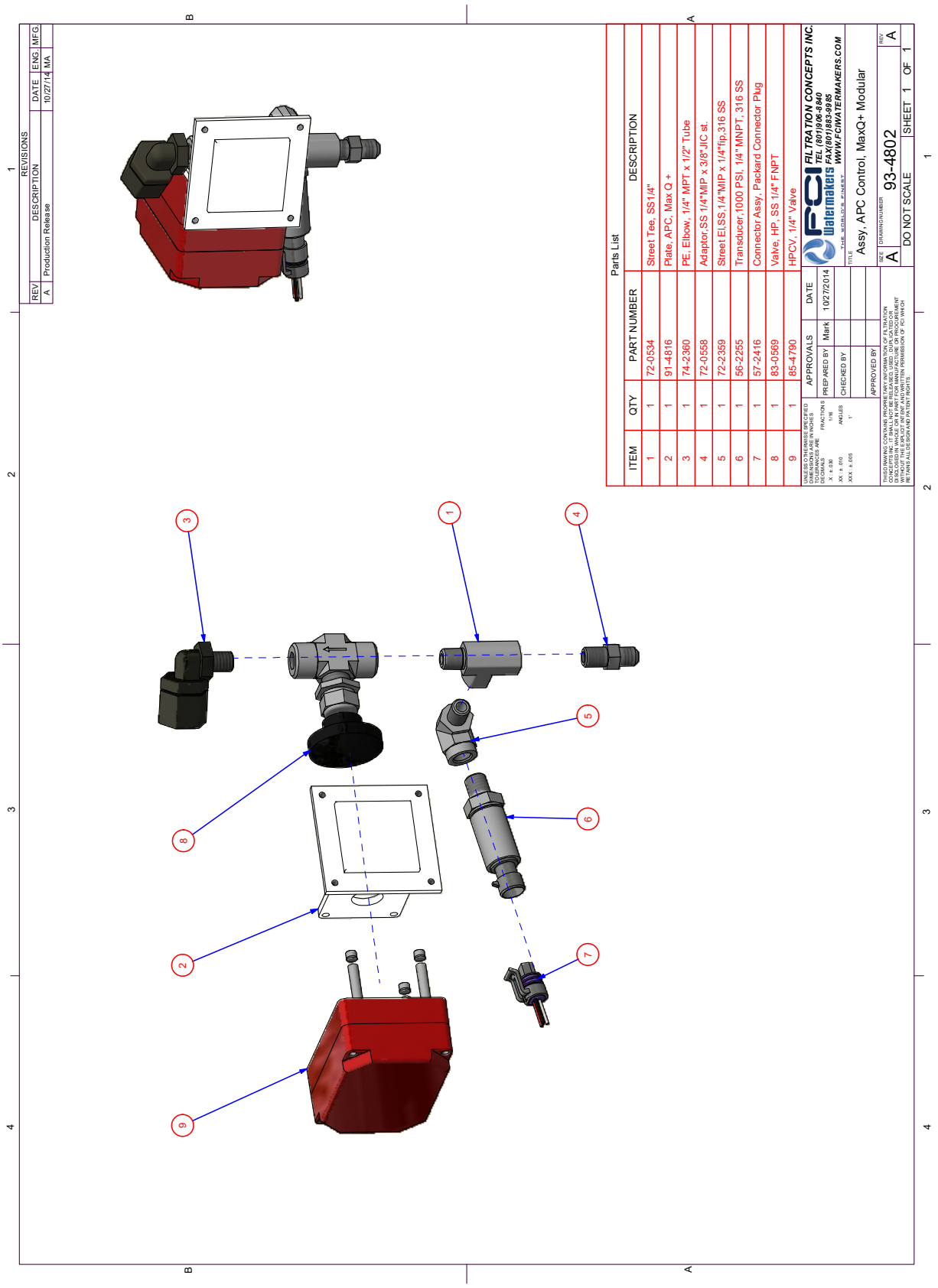
SHEET 1 OF 1

GENERAL ASSEMBLY DIAGRAMS / HP VALVE+APC (optional)



REVISIONS			
REV	DESCRIPTION	DATE	ENG. MFG.
A	Production Release	10/27/14	MA

Parts List

ITEM	QTY	PART NUMBER	DESCRIPTION
1	1	72-0534	Street Tee, SS1/4"
2	1	91-4816	Plate, APC, Max Q +
3	1	74-2360	PE, Elbow, 1/4" MPT x 1/2" Tube
4	1	72-0558	Adaptor,SS 1/4"MIP x 3/8",IIC st.
5	1	72-2359	Street El,SS,1/4"MIP x 1/4"fip,316 SS
6	1	56-2255	Transducer,1000 PSI, 1/4" MNPT, 316 SS
7	1	57-2416	Connector Assy, Packard Connector Plug
8	1	83-0569	Valve, HP, SS 1/4" FNPT
9	1	85-4790	HPCV, 1/4" Valve

UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE IN INCHES TOLERANCES ARE FRACTIONS 1/16 ANGLES 1° X ± .030 XX ± .010 XXX ± .005

APPROVALS DATE
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THIS MODEL OF IS FINEST

TITLE Assy, APC Control, MaxQ+ Modular

SIZE A | DRAWING NUMBER 93-4802 | REV A

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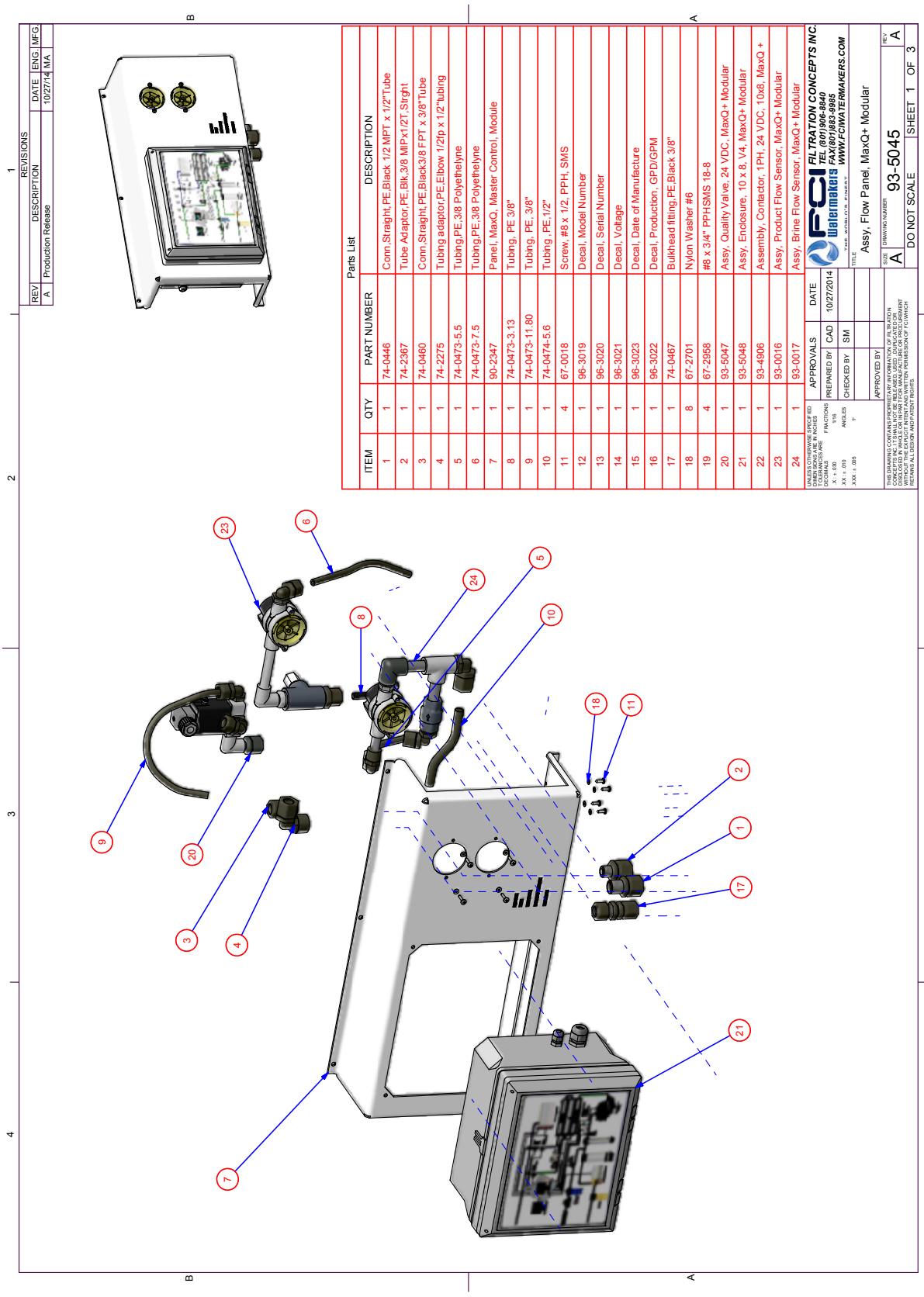

REVISIONS

REV	DESCRIPTION	DATE	ENG	MFG
A	Production Release	10/27/14	MA	

Parts List

ITEM	QTY	PART NUMBER	DESCRIPTION
1	1	74-0446	Conn.Straight,PE,Black 1/2 MPT x 1/2"Tube
2	1	74-2367	Tube Adaptor,PE,Blk,3/8 MIPx1/2T,Strght
3	1	74-0460	Conn.Straight,PE,Black3/8 FPT x 3/8"Tube
4	1	74-2275	Tubing adaptor,PE,Elbow 1/2fp x 1/2"tubing
5	1	74-0473-5.5	Tubing,PE,.3/8 Polyethelyne
6	1	74-0473-7.5	Tubing,PE,.3/8 Polyethelyne
7	1	90-2347	Panel, MaxQ, Master Control, Module
8	1	74-0473-3.13	Tubing, PE 3/8"
9	1	74-0473-11.80	Tubing, PE, 3/8"
10	1	74-0474-5.6	Tubing ,PE,1/2"
11	4	67-0018	Screw, #8 x 1/2, PPH, SMS
12	1	96-3019	Decal, Model Number
13	1	96-3020	Decal, Serial Number
14	1	96-3021	Decal; Voltage
15	1	96-3023	Decal, Date of Manufacture
16	1	96-3022	Decal, Production, GPD/GPM
17	1	74-0467	Bulkhead fitting,PE,Black 3/8"
18	8	67-2701	Nylon Washer #6
19	4	67-2958	#8 x 3/4" PPHSMS 18-8
20	1	93-5047	Assy, Quality Valve, 24 VDC, MaxQ+ Modular
21	1	93-5048	Assy, Enclosure, 10 x 8, V4, MaxQ+ Modular
22	1	93-4906	Assembly, Contactor, 1PH, 24 VDC, 10x8, MaxQ +
23	1	93-0016	Assy, Product Flow Sensor, MaxQ+ Modular
24	1	93-0017	Assy, Brine Flow Sensor, MaxQ+ Modular

UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE IN INCHES
TOLERANCES ARE:
FRACTIONS 1/16
DECIMALS
X ± .030
XX ± .010
XXX ± .005
ANGLES °

APPROVALS		DATE
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APPROVED BY		

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TITLE: Assy, Flow Panel, MaxQ+ Modular

SIZE: A | DRAWING NUMBER: 93-5045 | REV: A

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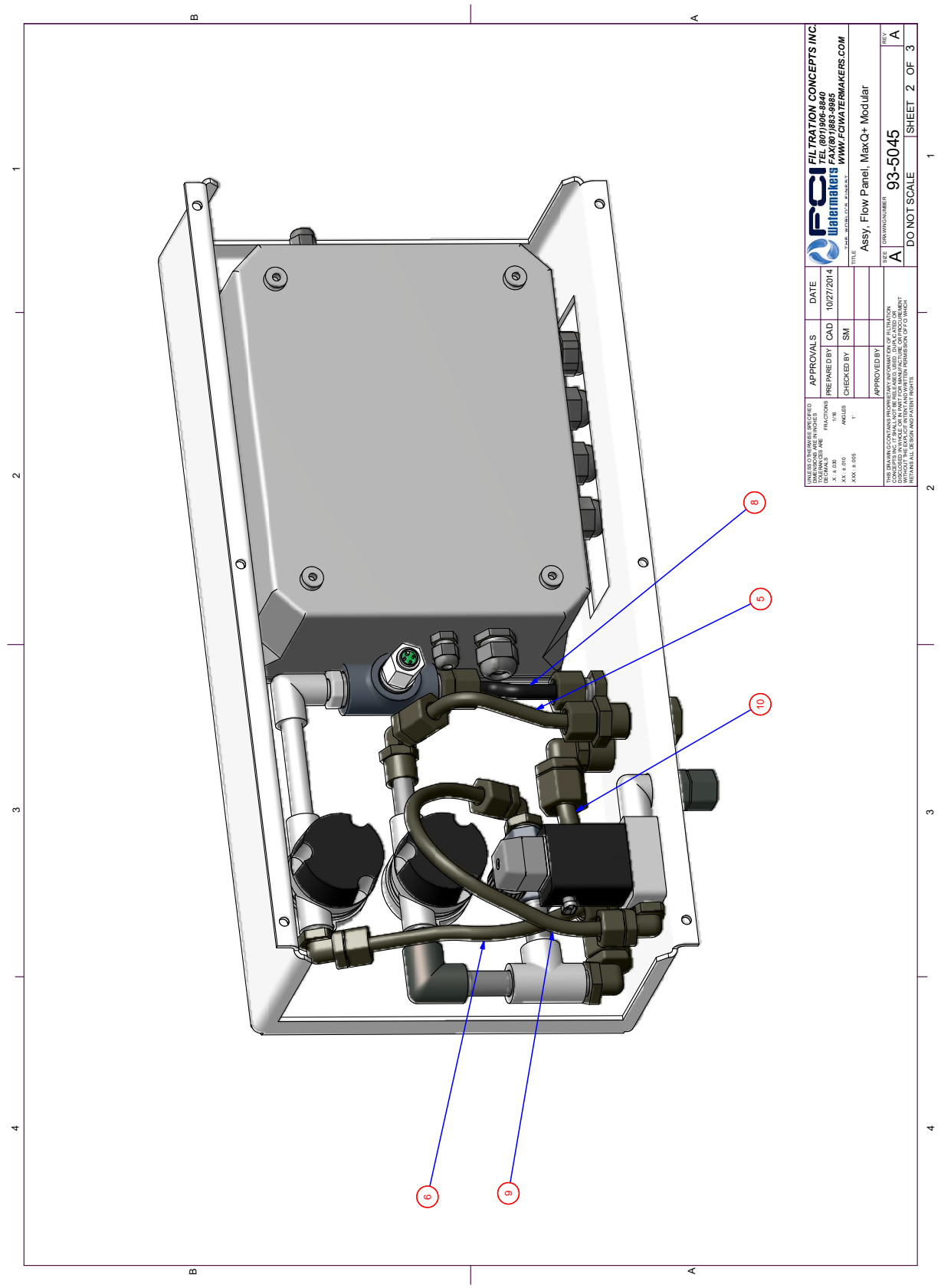
8
5
10
6
9
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Assy, Flow Panel, MaxQ+ Modular
93-5045
A
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SHEET 2 OF 3
APPROVALS
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10/27/2014
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SM
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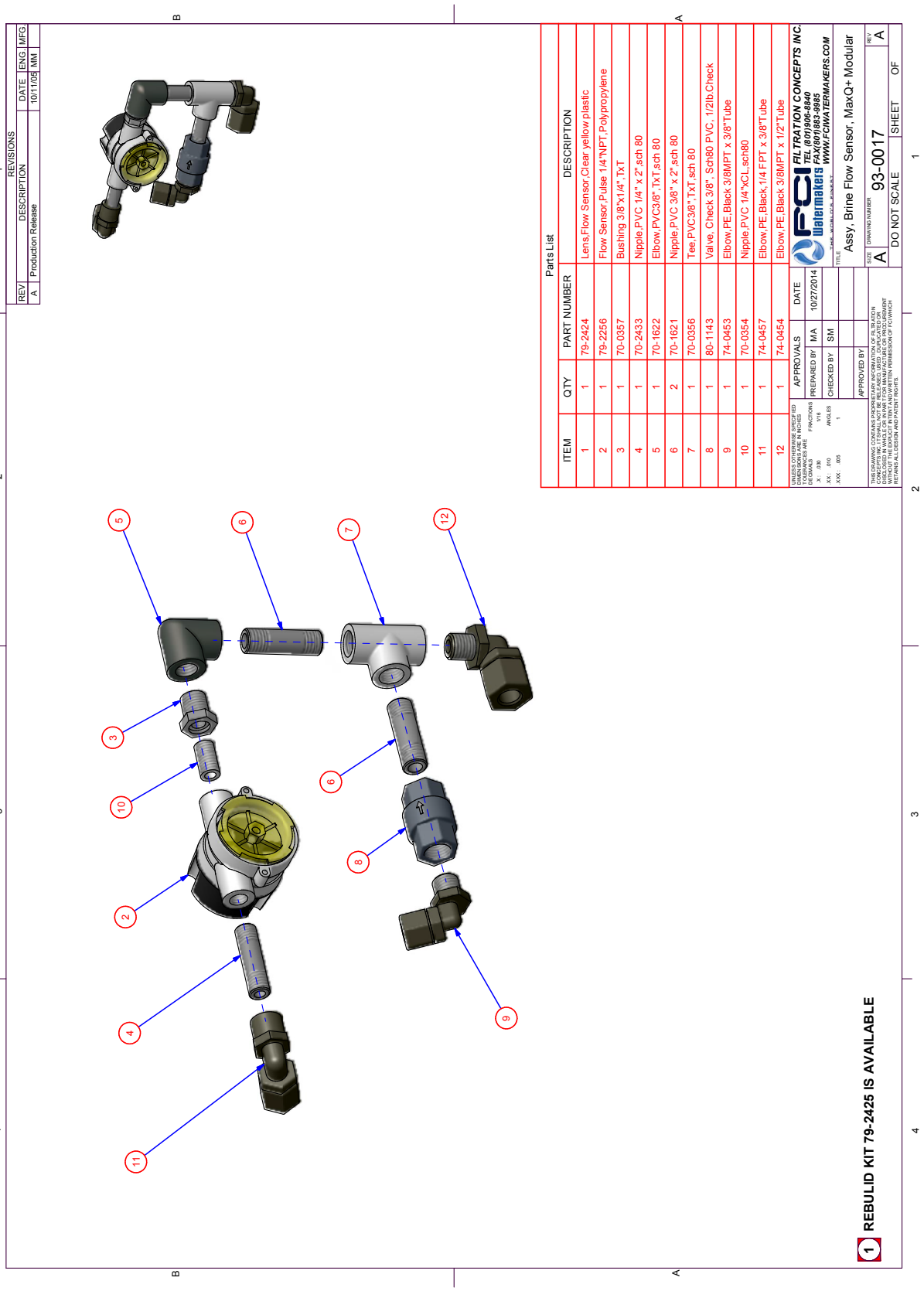
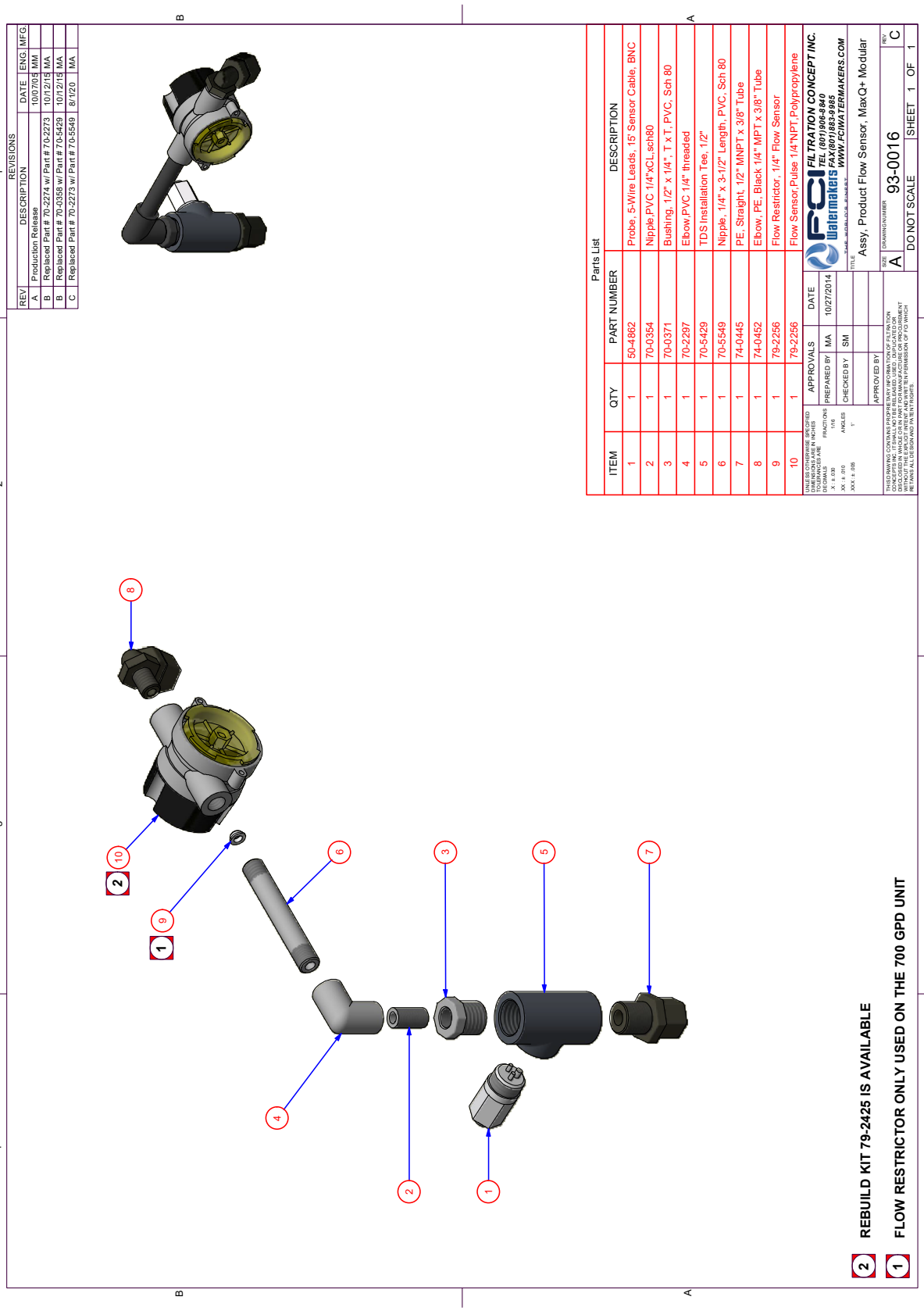
GENERAL ASSEMBLY DIAGRAMS / FLOW INDICATOR




REVISIONS
REV DESCRIPTION DATE ENG. MFG.
A Production Release 10/07/05 MM
B Replaced Part # 70-2274 w/ Part # 70-2273 10/12/15 MA
B Replaced Part # 70-0358 w/ Part # 70-5429 10/12/15 MA
C Replaced Part # 70-2273 w/ Part # 70-5549 8/1/20 MA
Parts List
ITEM QTY PART NUMBER DESCRIPTION
1 1 50-4862 Probe, 5-Wire Leads, 15' Sensor Cable, BNC
2 1 70-0354 Nipple,PVC 1/4"xCL,sch80
3 1 70-0371 Bushing, 1/2" x 1/4", T x T, PVC, Sch 80
4 1 70-2297 Elbow,PVC 1/4" threaded
5 1 70-5429 TDS Installation Tee, 1/2"
6 1 70-5549 Nipple, 1/4" x 3-1/2" Length, PVC, Sch 80
7 1 74-0445 PE, Straight, 1/2" MNPT x 3/8" Tube
8 1 74-0452 Elbow, PE, Black 1/4" MPT x 3/8" Tube
9 1 79-2256 Flow Restrictor, 1/4" Flow Sensor
10 1 79-2256 Flow Sensor,Pulse 1/4"NPT,Polypropylene
APPROVALS DATE
PREPARED BY MA 10/27/2014
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APPROVED BY
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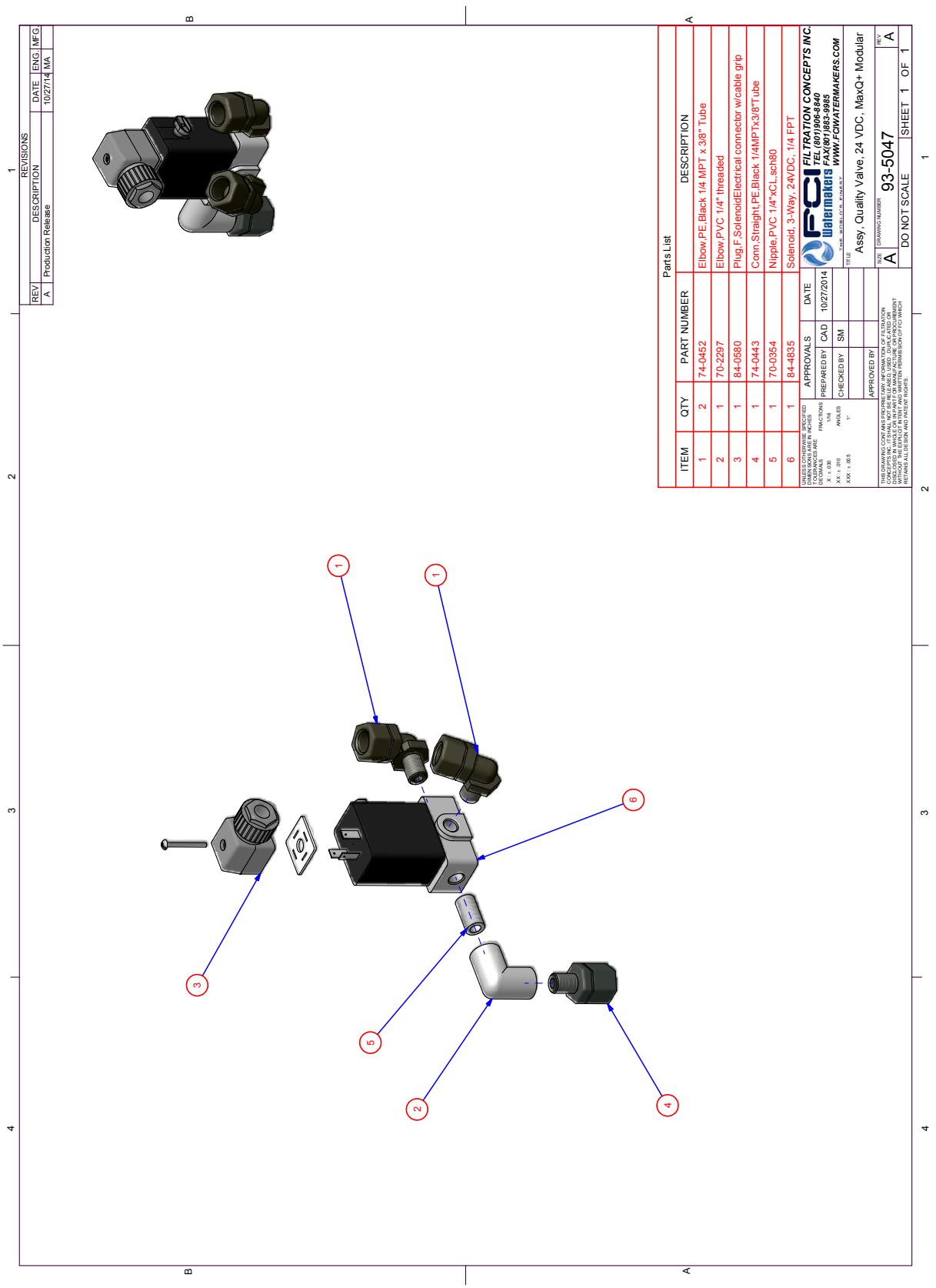
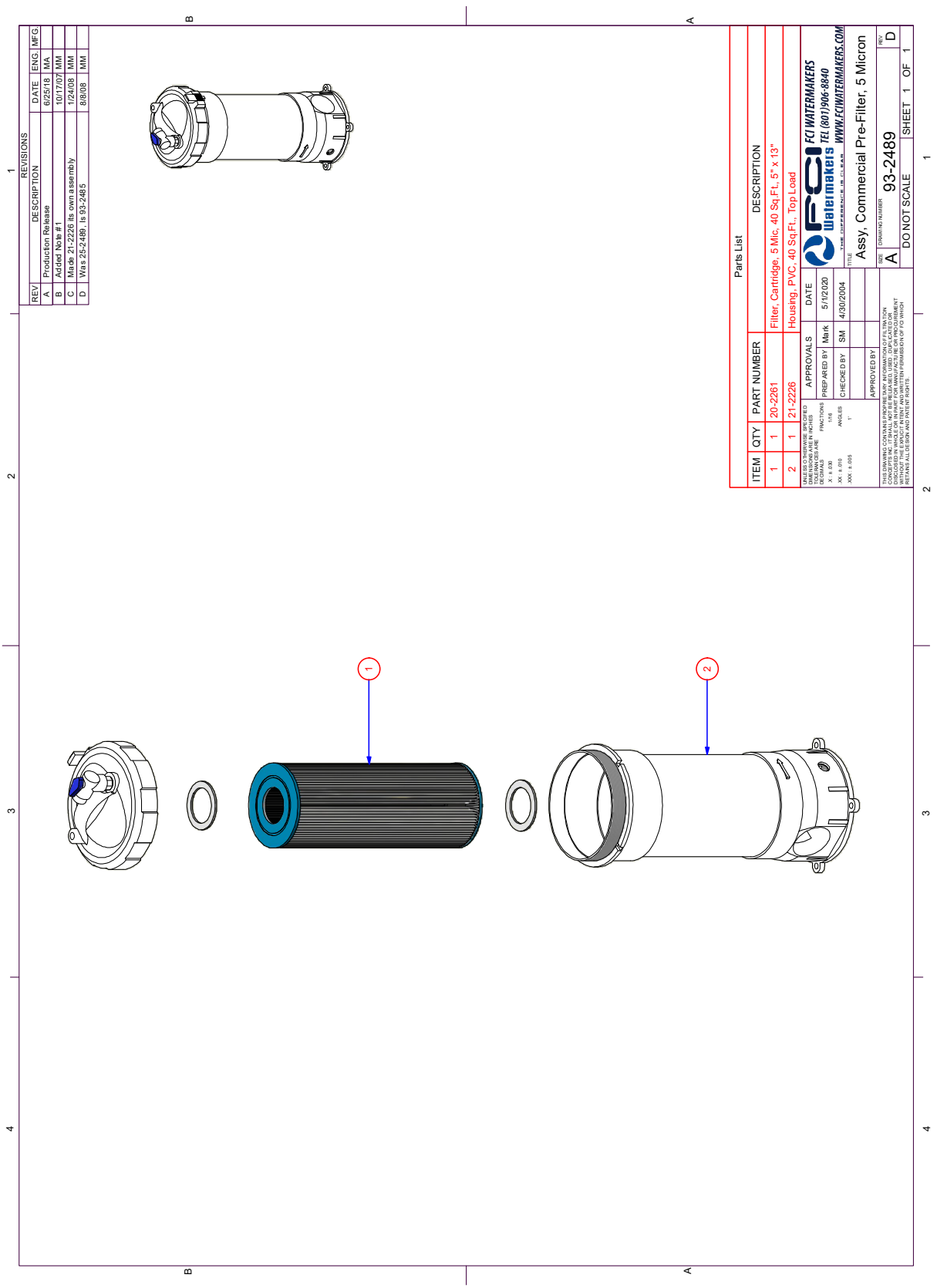
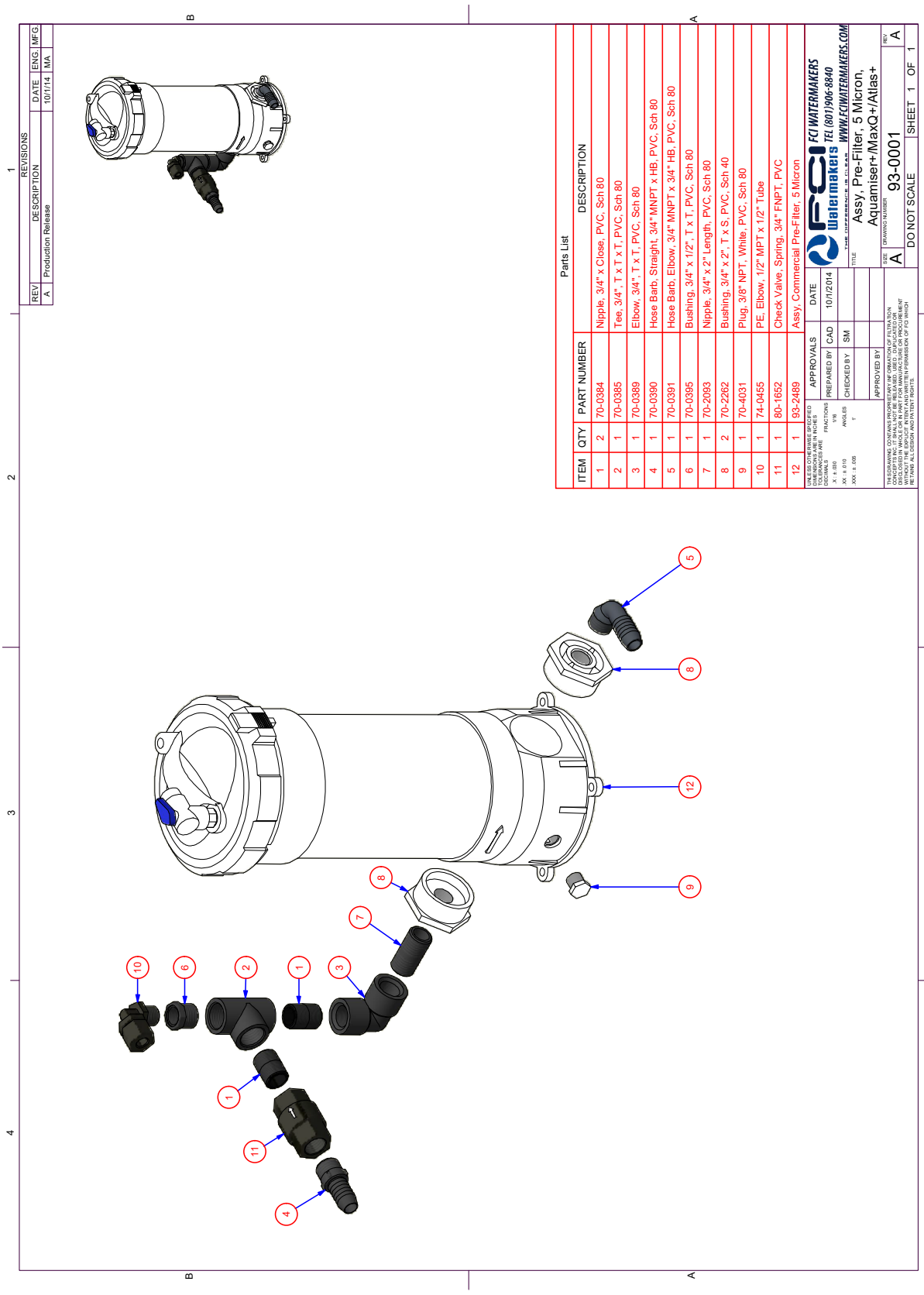
FAX(801)883-9985
WWW.FCIWATERMAKERS.COM
TITLE
Assy, Product Flow Sensor, MaxQ+ Modular
SIZE DRAWING NUMBER REV
A 93-0016 C
DO NOT SCALE SHEET 1 OF 1
2 REBUILD KIT 79-2425 IS AVAILABLE
1 FLOW RESTRICTOR ONLY USED ON THE 700 GPD UNIT

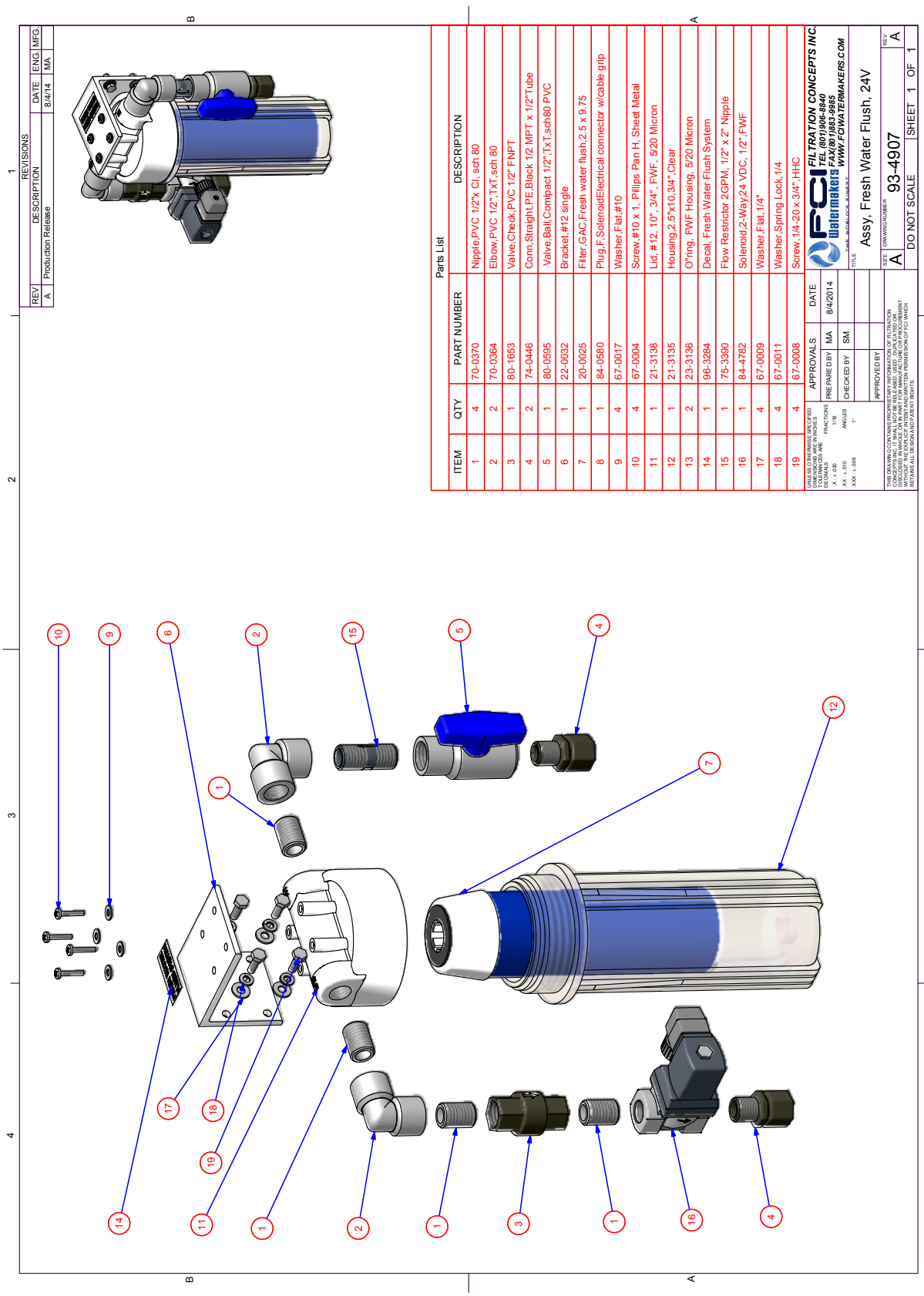
GENERAL ASSEMBLY DIAGRAMS / QUALITY VALVE




REVISIONS
REV | DESCRIPTION | DATE | ENG. | MFG.
A | Production Release | 6/25/18 | MA |
B | Added Note #1 | 10/17/07 | MM |
C | Made 21-2226 its own assembly | 1/24/08 | MM |
D | Was 25-2489, is 93-2485 | 8/8/08 | MM
Parts List
ITEM | QTY | PART NUMBER | DESCRIPTION
1 | 1 | 20-2261 | Filter, Cartridge, 5 Mic, 40 Sq.Ft., 5" x 13"
2 | 1 | 21-2226 | Housing, PVC, 40 Sq.Ft., Top Load
APPROVALS | DATE
PREPARED BY | Mark | 5/1/2020
CHECKED BY | SM | 4/30/2004
APPROVED BY
FCI WATERMAKERS
Watermakers
TEL (801)906-8840
WWW.FCIWATERMAKERS.COM
Assy, Commercial Pre-Filter, 5 Micron
SIZE A
DRAWING NUMBER 93-2489
REV D
DO NOT SCALE
SHEET 1 OF 1
1
2


REVISIONS
REV | DESCRIPTION | DATE | ENG. | MFG.
A | Production Release | 10/1/14 | MA
Parts List
ITEM | QTY | PART NUMBER | DESCRIPTION
1 | 2 | 70-0384 | Nipple, 3/4" x Close, PVC, Sch 80
2 | 1 | 70-0385 | Tee, 3/4", T x T x T, PVC, Sch 80
3 | 1 | 70-0389 | Elbow, 3/4", T x T, PVC, Sch 80
4 | 1 | 70-0390 | Hose Barb, Straight, 3/4" MNPT x HB, PVC, Sch 80
5 | 1 | 70-0391 | Hose Barb, Elbow, 3/4" MNPT x 3/4" HB, PVC, Sch 80
6 | 1 | 70-0395 | Bushing, 3/4" x 1/2", T x T, PVC, Sch 80
7 | 1 | 70-2093 | Nipple, 3/4" x 2" Length, PVC, Sch 80
8 | 2 | 70-2262 | Bushing, 3/4" x 2", T x S, PVC, Sch 40
9 | 1 | 70-4031 | Plug, 3/8" NPT, White, PVC, Sch 80
10 | 1 | 74-0455 | PE, Elbow, 1/2" MPT x 1/2" Tube
11 | 1 | 80-1652 | Check Valve, Spring, 3/4" FNPT, PVC
12 | 1 | 93-2489 | Assy, Commercial Pre-Filter, 5 Micron
APPROVALS | DATE
PREPARED BY | CAD | 10/1/2014
CHECKED BY | SM
APPROVED BY
FCI WATERMAKERS
TEL (801)906-8840
WWW.FCIWATERMAKERS.COM
Assy, Pre-Filter, 5 Micron, Aquamiser+/MaxQ+/Atlas+
SIZE A | DRAWING NUMBER 93-0001 | REV A
DO NOT SCALE | SHEET 1 OF 1

GENERAL ASSEMBLY DIAGRAMS / FRESH WATER FLUSH



REVISIONS

REV	DESCRIPTION	DATE	ENG.	MFG.
A	Production Release	8/4/14	MA	

Parts List

ITEM	QTY	PART NUMBER	DESCRIPTION
1	4	70-0370	Nipple,PVC 1/2"x Cl, sch 80
2	2	70-0364	Elbow,PVC 1/2"TxT,sch 80
3	1	80-1653	Valve,Check,,PVC 1/2" FNPT
4	2	74-0446	Conn,Straight,PE,Black 1/2 MPT x 1/2"Tube
5	1	80-0595	Valve,Ball,Compact 1/2",TxT,sch80 PVC
6	1	22-0032	Bracket,#12 single
7	1	20-0025	Filter,GAC,Fresh water flush,2.5 x 9.75
8	1	84-0580	Plug,F,SolenoidElectrical connector w/cable grip
9	4	67-0017	Washer,Flat,#10
10	4	67-0004	Screw,#10 x 1, Pillips Pan H, Sheet Metal
11	1	21-3138	Lid, #12, 10", 3/4", FWF, 5/20 Micron
12	1	21-3135	Housing,2.5"x10,3/4",Clear
13	2	23-3136	O"ring, FWF Housing, 5/20 Micron
14	1	96-3284	Decal, Fresh Water Flush System
15	1	75-3390	Flow Restrictor 2GPM, 1/2" x 2" Nipple
16	1	84-4782	Solenoid,2-Way,24 VDC, 1/2",FWF
17	4	67-0009	Washer,Flat, 1/4"
18	4	67-0011	Washer,Spring Lock,1/4
19	4	67-0008	Screw,1/4-20 x 3/4",HHC

UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE IN INCHES
DECIMALS ARE
.X ± .030
.XX ± .010
.XXX ± .005
FRACTIONS
1/16
ANGLES
1°

APPROVALS		DATE
PREPARED BY	MA	8/4/2014
CHECKED BY	SM	
APPROVED BY		

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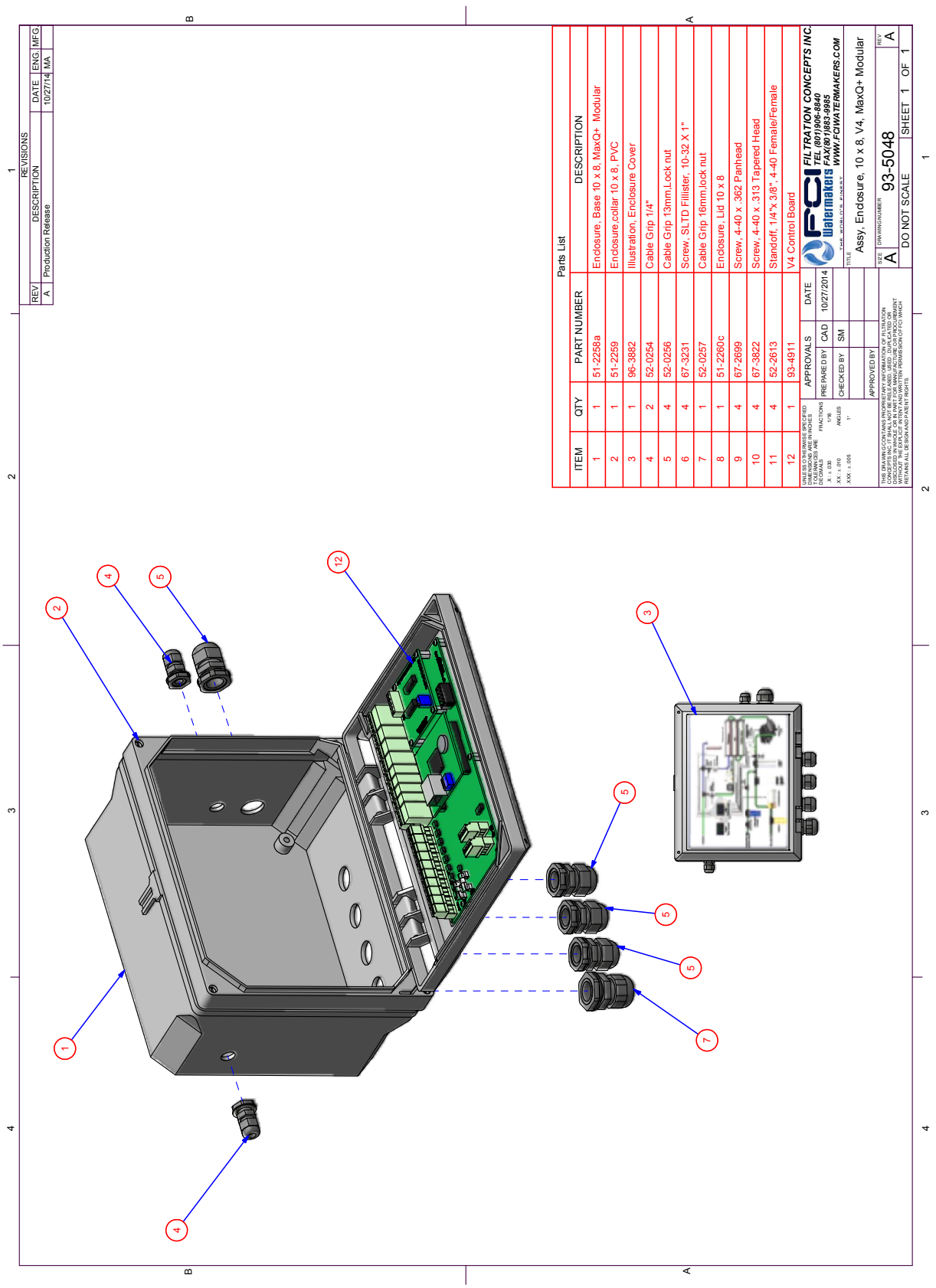
FILTRATION CONCEPTS INC.
TEL (801)906-8840
FAX(801)883-3985
WWW.FCIWATERMAKERS.COM

TITLE: Assy, Fresh Water Flush, 24V

SIZE: A | DRAWING NUMBER: 93-4907 | REV: A

DO NOT SCALE | SHEET 1 OF 1

GENERAL ASSEMBLY DIAGRAMS / ELECTRICAL



REVISIONS

REV	DESCRIPTION	DATE	ENG. MFG.
A	Production Release	10/27/14	MA

Parts List

ITEM	QTY	PART NUMBER	DESCRIPTION
1	1	51-2258a	Enclosure, Base 10 x 8, MaxQ+ Modular
2	1	51-2259	Enclosure,collar 10 x 8, PVC
3	1	96-3882	Illustration, Enclosure Cover
4	2	52-0254	Cable Grip 1/4"
5	4	52-0256	Cable Grip 13mm,Lock nut
6	4	67-3231	Screw, SLTD Fillister, 10-32 X 1"
7	1	52-0257	Cable Grip 16mm,lock nut
8	1	51-2260c	Enclosure, Lid 10 x 8
9	4	67-2699	Screw, 4-40 x .362 Panhead
10	4	67-3822	Screw, 4-40 x .313 Tapered Head
11	4	52-2613	Standoff, 1/4"x 3/8", 4-40 Female/Female
12	1	93-4911	V4 Control Board

UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE IN INCHES
TOLERANCES ARE
FRACTIONS 1/16
ANGLES 1°
.X ± .030
.XX ± .010
.XXX ± .005

APPROVALS | DATE
PREPARED BY | CAD | 10/27/2014
CHECKED BY | SM
APPROVED BY

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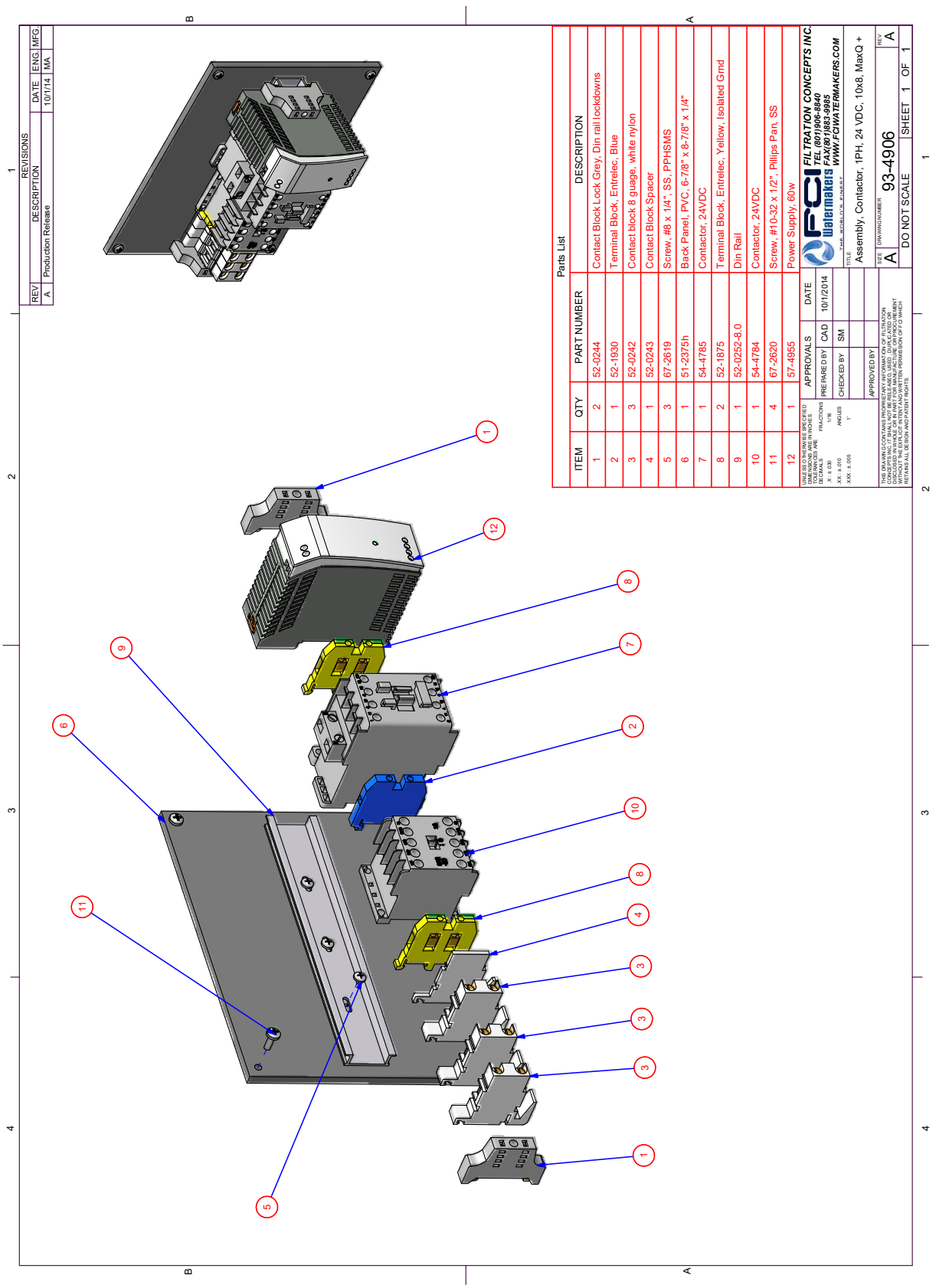
TITLE: Assy, Endosure, 10 x 8, V4, MaxQ+ Modular

SIZE: A | DRAWING NUMBER: 93-5048 | REV: A

DO NOT SCALE | SHEET 1 OF 1


REVISIONS
REV | DESCRIPTION | DATE | ENG. MFG.
A | Production Release | 10/11/14 | MA
Parts List
ITEM | QTY | PART NUMBER | DESCRIPTION
1 | 2 | 52-0244 | Contact Block Lock Grey, Din rail lockdowns
2 | 1 | 52-1930 | Terminal Block, Entrelec, Blue
3 | 3 | 52-0242 | Contact block 8 guage, white nylon
4 | 1 | 52-0243 | Contact Block Spacer
5 | 3 | 67-2619 | Screw, #8 x 1/4", SS, PPHSMS
6 | 1 | 51-23751h | Back Panel, PVC, 6-7/8" x 8-7/8" x 1/4"
7 | 1 | 54-4785 | Contactor, 24VDC
8 | 2 | 52-1875 | Terminal Block, Entrelec, Yellow, Isolated Grnd
9 | 1 | 52-0252-8.0 | Din Rail
10 | 1 | 54-4784 | Contactor, 24VDC
11 | 4 | 67-2620 | Screw, #10-32 x 1/2", Pillips Pan, SS
12 | 1 | 57-4955 | Power Supply, 60w
UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE IN INCHES
TOLERANCES ARE
FRACTIONS
.X ± .030
1/16
.XX ± .010
ANGLES
.XXX ± .005
1°
APPROVALS
DATE
PREPARED BY
CAD
10/1/2014
CHECKED BY
SM
APPROVED BY
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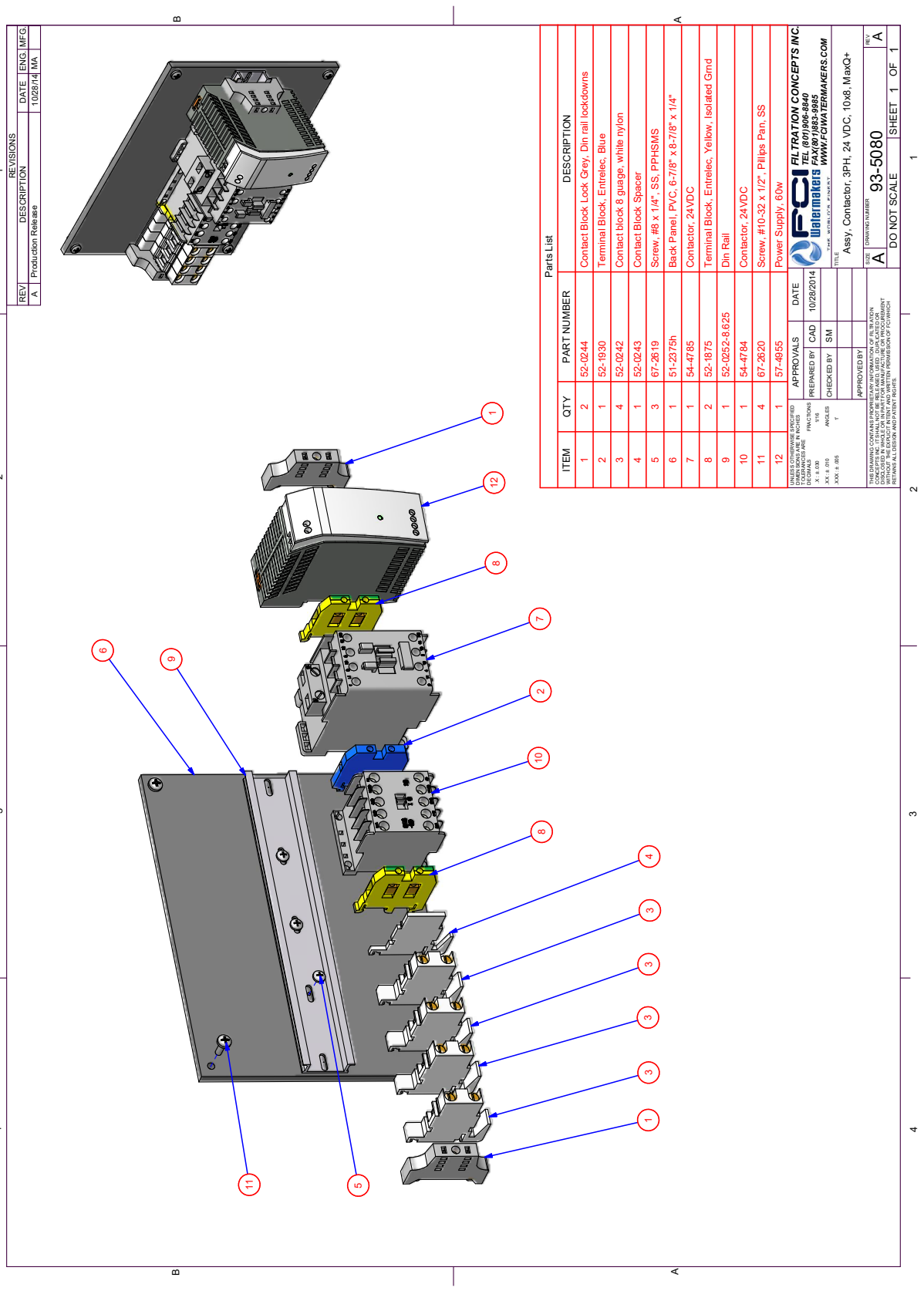
FILTRATION CONCEPTS INC.
TEL (801)906-8840
FAX(801)883-3985
WWW.FCIWATERMAKERS.COM
TITLE
Assembly, Contactor, 1PH, 24 VDC, 10x8, MaxQ +
SIZE
A
DRAWING NUMBER
93-4906
REV
A
DO NOT SCALE
SHEET 1 OF 1


REVISIONS
REV | DESCRIPTION | DATE | ENG. | MFG.
A | Production Release | 10/28/14 | MA
Parts List
ITEM | QTY | PART NUMBER | DESCRIPTION
1 | 2 | 52-0244 | Contact Block Lock Grey, Din rail lockdowns
2 | 1 | 52-1930 | Terminal Block, Entrelec, Blue
3 | 4 | 52-0242 | Contact block 8 guage, white nylon
4 | 1 | 52-0243 | Contact Block Spacer
5 | 3 | 67-2619 | Screw, #8 x 1/4", SS, PPHSMS
6 | 1 | 51-2375h | Back Panel, PVC, 6-7/8" x 8-7/8" x 1/4"
7 | 1 | 54-4785 | Contactor, 24VDC
8 | 2 | 52-1875 | Terminal Block, Entrelec, Yellow, Isolated Grnd
9 | 1 | 52-0252-8.625 | Din Rail
10 | 1 | 54-4784 | Contactor, 24VDC
11 | 4 | 67-2620 | Screw, #10-32 x 1/2", Pillips Pan, SS
12 | 1 | 57-4955 | Power Supply, 60w
APPROVALS | DATE
PREPARED BY | CAD | 10/28/2014
CHECKED BY | SM
APPROVED BY
FILTRATION CONCEPTS INC.
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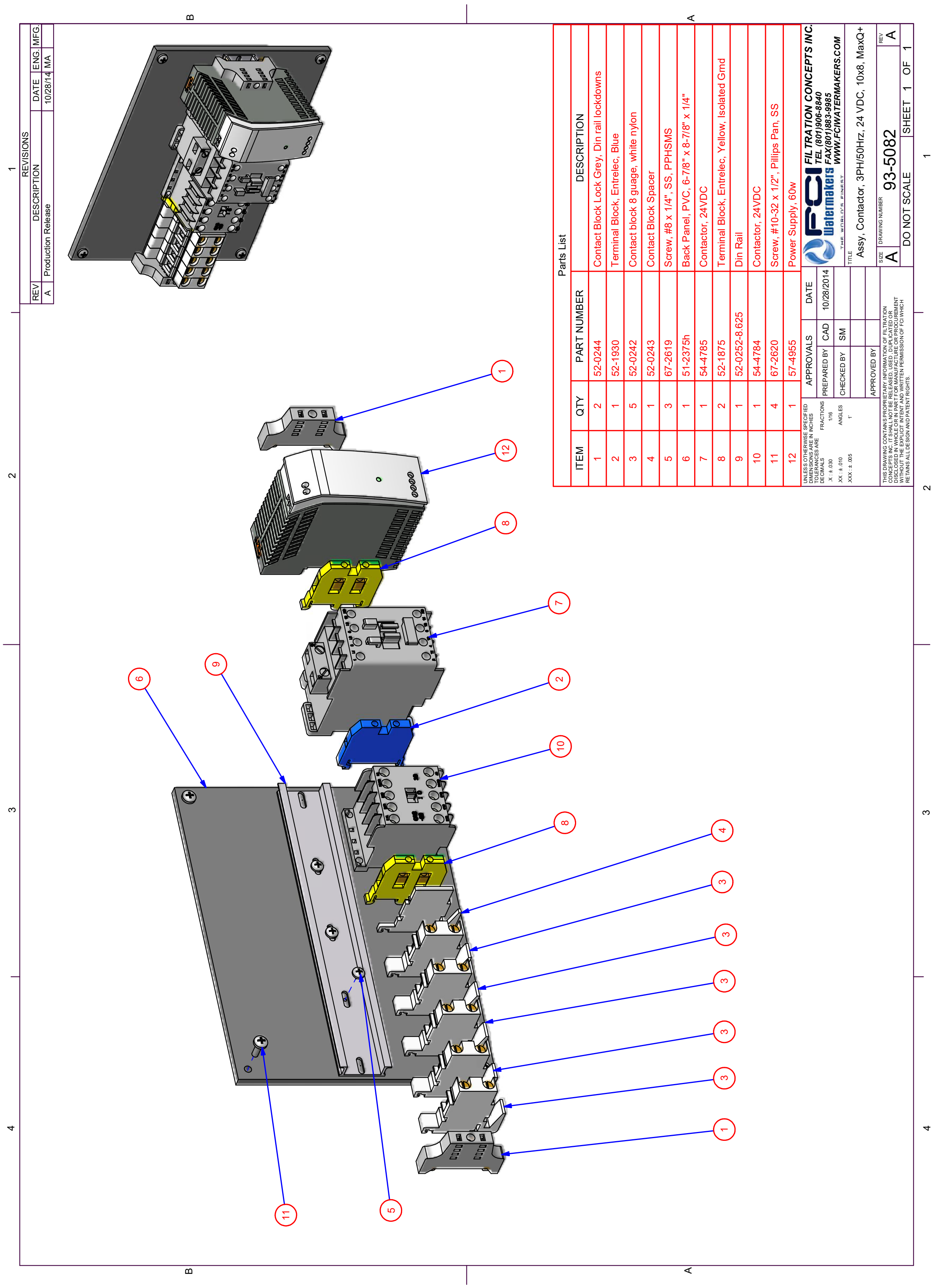
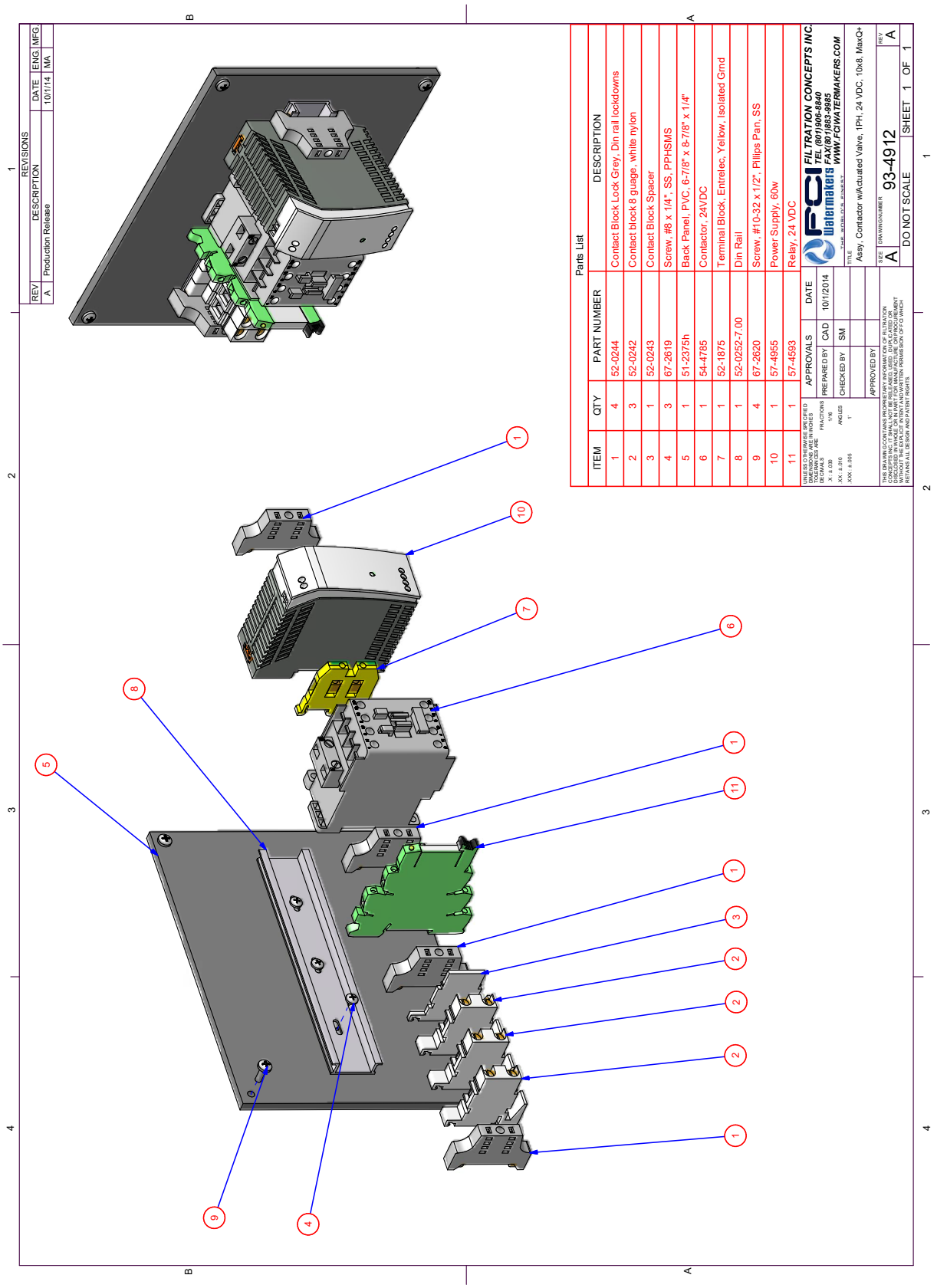
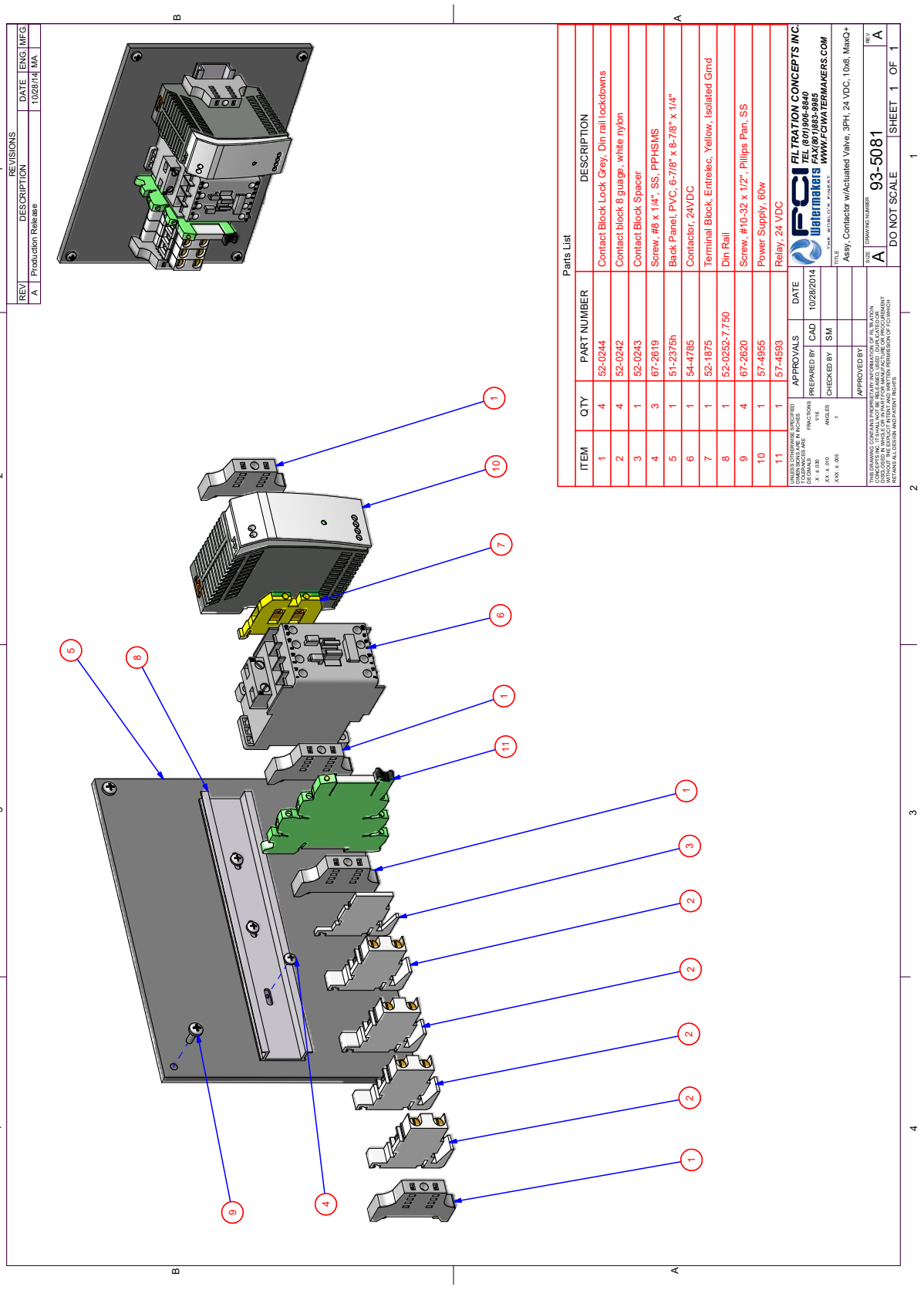
FAX(01)883-9985
WWW.FCIWATERMAKERS.COM
Assy, Contactor, 3PH, 24 VDC, 10x8, MaxQ+
SIZE | DRAWING NUMBER | REV
A | 93-5080 | A
DO NOT SCALE | SHEET 1 OF 1

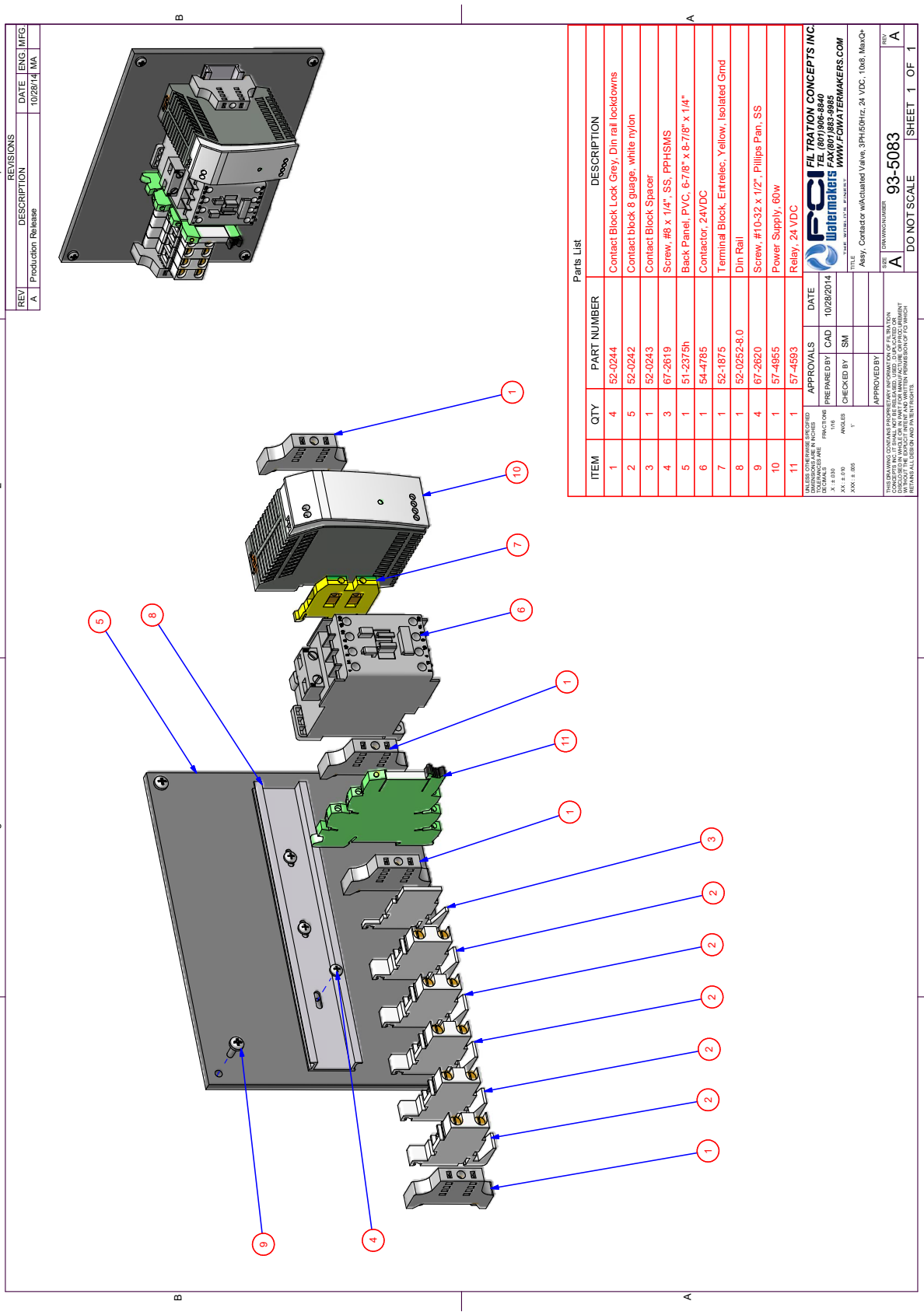


Parts List

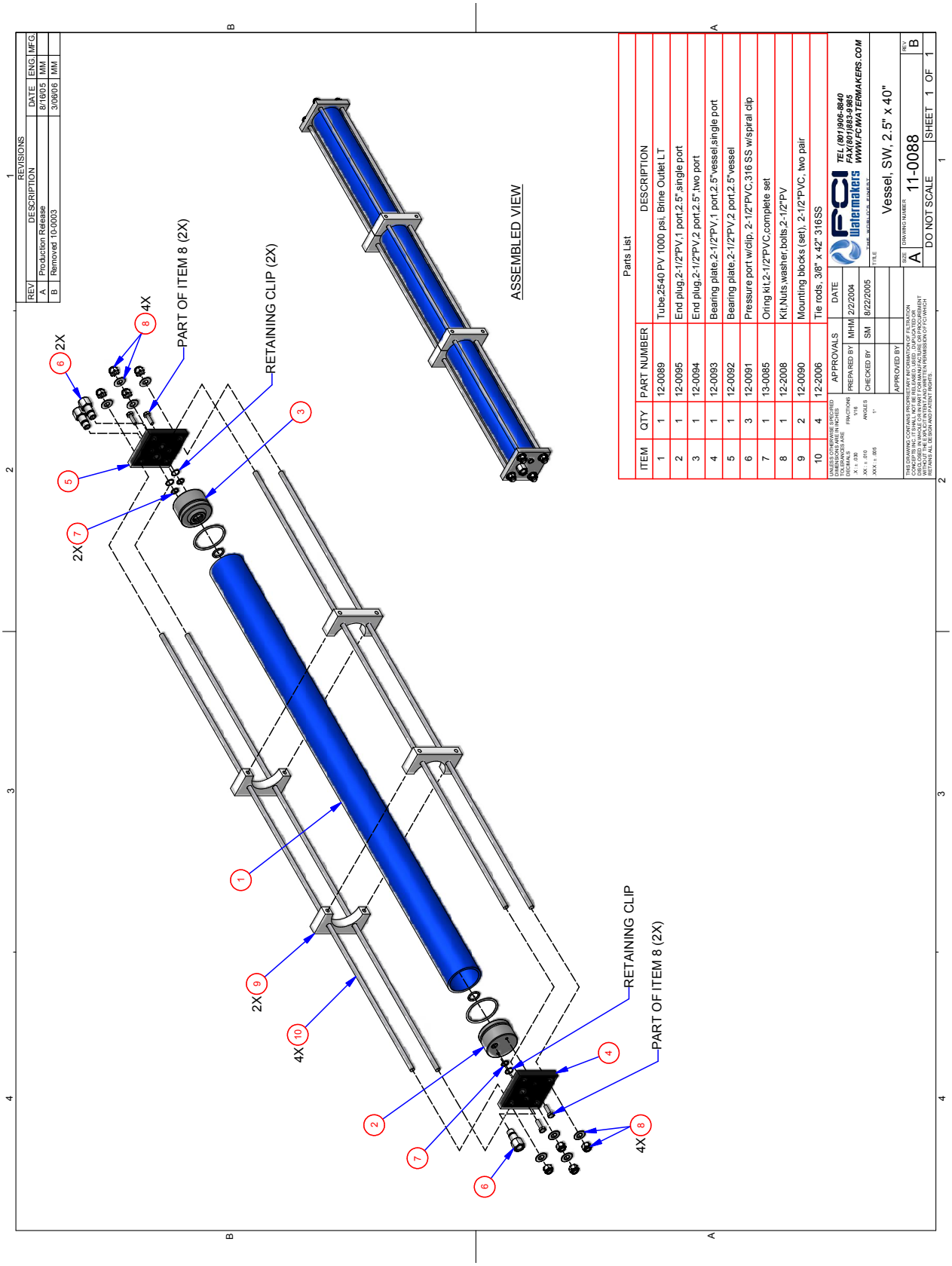
ITEM	QTY	PART NUMBER	DESCRIPTION
1	2	52-0244	Contact Block Lock Grey, Din rail lockdowns
2	1	52-1930	Terminal Block, Entrelec, Blue
3	5	52-0242	Contact block 8 guage, white nylon
4	1	52-0243	Contact Block Spacer
5	3	67-2619	Screw, #8 x 1/4", SS, PPHSMS
6	1	51-2375h	Back Panel, PVC, 6-7/8" x 8-7/8" x 1/4"
7	1	54-4785	Contactor, 24VDC
8	2	52-1875	Terminal Block, Entrelec, Yellow, Isolated Grnd
9	1	52-0252-8.625	Din Rail
10	1	54-4784	Contactor, 24VDC
11	4	67-2620	Screw, #10-32 x 1/2", Pillips Pan, SS
12	1	57-4955	Power Supply, 60w

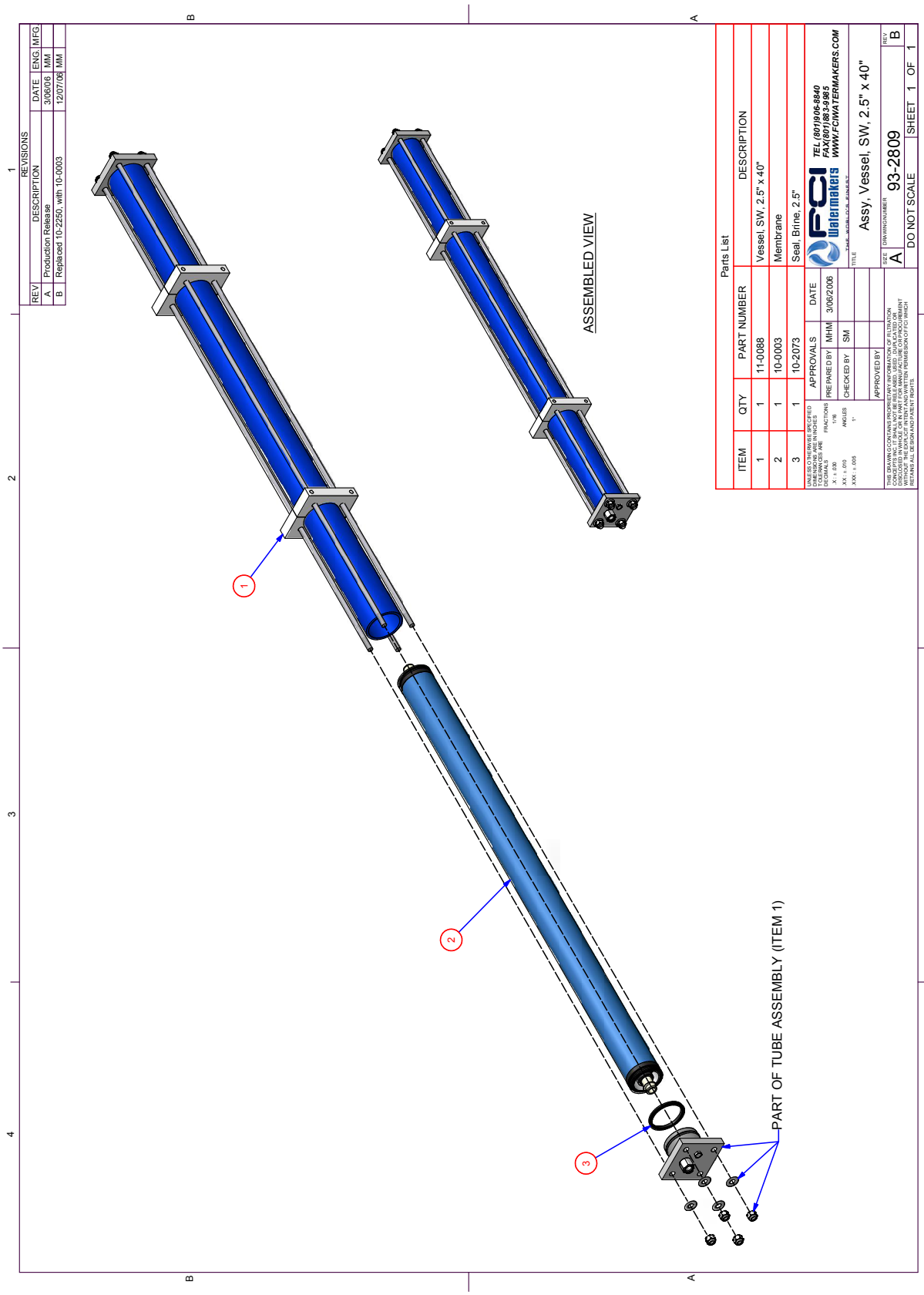

REVISIONS
REV | DESCRIPTION | DATE | ENG. MFG.
A | Production Release | 10/11/14 | MA
Parts List
ITEM | QTY | PART NUMBER | DESCRIPTION
1 | 4 | 52-0244 | Contact Block Lock Grey, Din rail lockdowns
2 | 3 | 52-0242 | Contact block 8 guage, white nylon
3 | 1 | 52-0243 | Contact Block Spacer
4 | 3 | 67-2619 | Screw, #8 x 1/4", SS, PPHSMS
5 | 1 | 51-23751h | Back Panel, PVC, 6-7/8" x 8-7/8" x 1/4"
6 | 1 | 54-4785 | Contactor, 24VDC
7 | 1 | 52-1875 | Terminal Block, Entrelec, Yellow, Isolated Gnd
8 | 1 | 52-0252-7.00 | Din Rail
9 | 4 | 67-2620 | Screw, #10-32 x 1/2", Pillips Pan, SS
10 | 1 | 57-4955 | Power Supply, 60w
11 | 1 | 57-4593 | Relay, 24 VDC
APPROVALS | DATE
PREPARED BY | CAD | 10/1/2014
CHECKED BY | SM
APPROVED BY
FCI Watermakers
FILTRATION CONCEPTS INC.
TEL (801)906-8840
FAX(801)883-3985
WWW.FCIWATERMAKERS.COM
TITLE
Assy, Contactor w/Actuated Valve, 1PH, 24 VDC, 10x8, MaxQ+
SIZE | DRAWING NUMBER | REV
A | 93-4912 | A
DO NOT SCALE | SHEET 1 OF 1

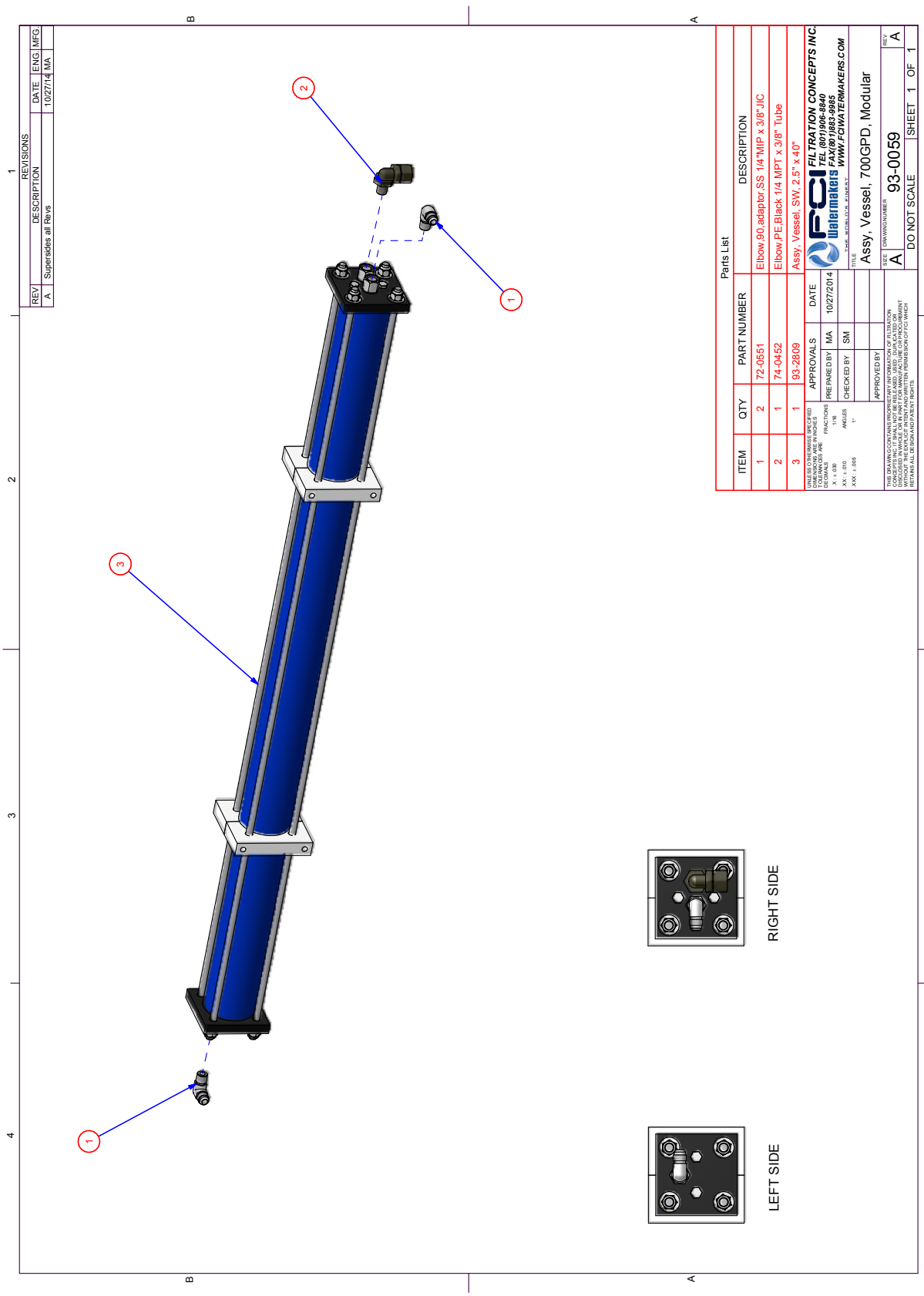

REVISIONS
REV | DESCRIPTION | DATE | ENG. | MFG.
A | Production Release | 10/28/14 | MA
Parts List
ITEM | QTY | PART NUMBER | DESCRIPTION
1 | 4 | 52-0244 | Contact Block Lock Grey, Din rail lockdowns
2 | 4 | 52-0242 | Contact block 8 guage, white nylon
3 | 1 | 52-0243 | Contact Block Spacer
4 | 3 | 67-2619 | Screw, #8 x 1/4", SS, PPHSMS
5 | 1 | 51-2375h | Back Panel, PVC, 6-7/8" x 8-7/8" x 1/4"
6 | 1 | 54-4785 | Contactor, 24VDC
7 | 1 | 52-1875 | Terminal Block, Entrelec, Yellow, Isolated Gnd
8 | 1 | 52-0252-7750 | Din Rail
9 | 4 | 67-2620 | Screw, #10-32 x 1/2", Pillips Pan, SS
10 | 1 | 57-4955 | Power Supply, 60w
11 | 1 | 57-4593 | Relay, 24 VDC
APPROVALS | DATE
PREPARED BY | CAD | 10/28/2014
CHECKED BY | SM
APPROVED BY
FCI WATERMAKERS
FILTRATION CONCEPTS INC.
TEL (801)906-8840
FAX(801)883-9985
WWW.FCIWATERMAKERS.COM
TITLE
Assy, Contactor w/Actuated Valve, 3PH, 24 VDC, 10x8, MaxQ+
SIZE | DRAWING NUMBER | REV
A | 93-5081 | A
DO NOT SCALE | SHEET 1 OF 1

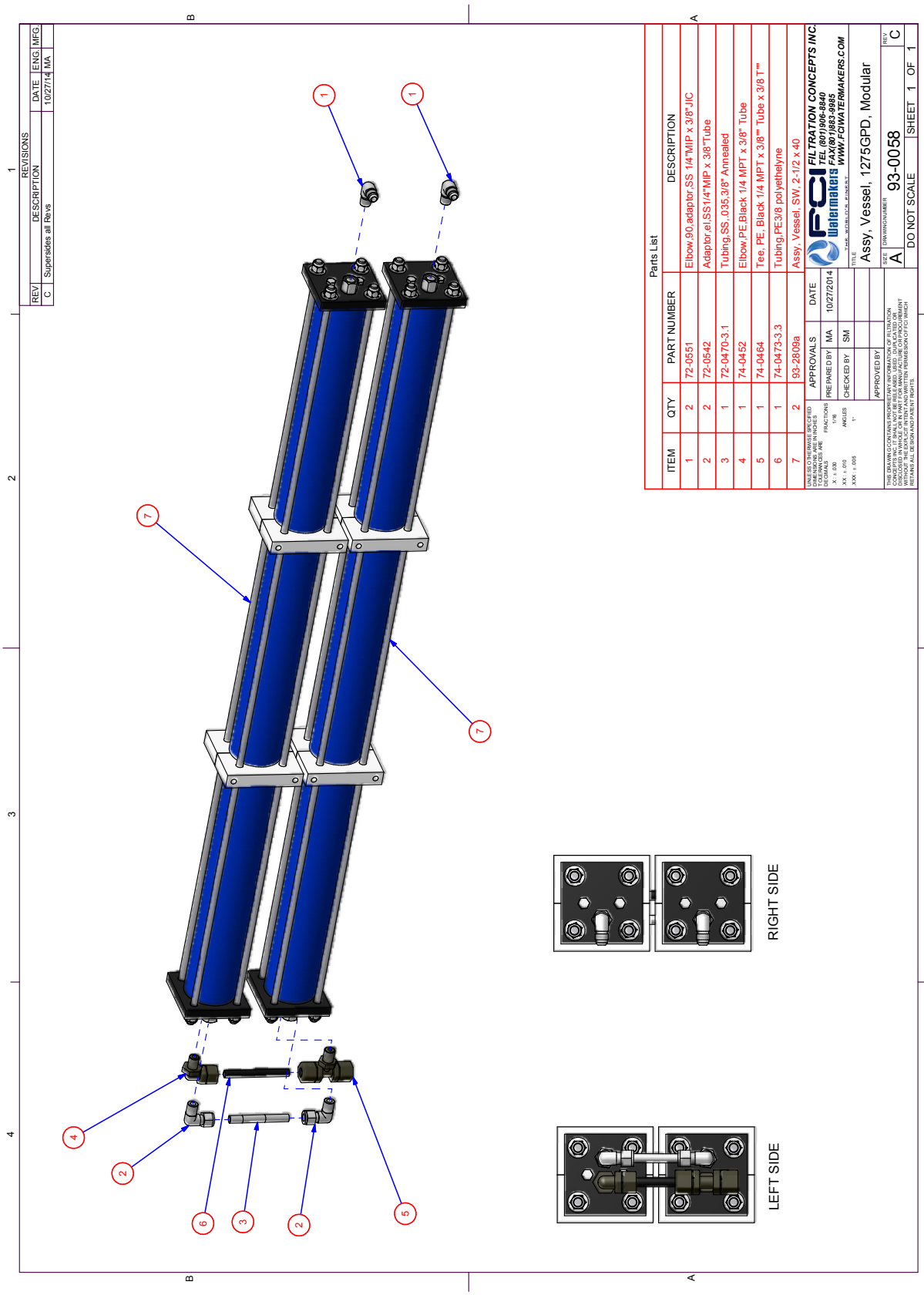

REVISIONS
REV | DESCRIPTION | DATE | ENG | MFG
A | Production Release | 10/28/14 | MA
Parts List
ITEM | QTY | PART NUMBER | DESCRIPTION
1 | 4 | 52-0244 | Contact Block Lock Grey, Din rail lockdowns
2 | 5 | 52-0242 | Contact block 8 guage, white nylon
3 | 1 | 52-0243 | Contact Block Spacer
4 | 3 | 67-2619 | Screw, #8 x 1/4", SS, PPHSMS
5 | 1 | 51-2375h | Back Panel, PVC, 6-7/8" x 8-7/8" x 1/4"
6 | 1 | 54-4785 | Contactor, 24VDC
7 | 1 | 52-1875 | Terminal Block, Entrelec, Yellow, Isolated Gnd
8 | 1 | 52-0252-8.0 | Din Rail
9 | 4 | 67-2620 | Screw, #10-32 x 1/2", Pillips Pan, SS
10 | 1 | 57-4955 | Power Supply, 60w
11 | 1 | 57-4593 | Relay, 24 VDC
APPROVALS | DATE
PREPARED BY | CAD | 10/28/2014
CHECKED BY | SM
APPROVED BY
FILTRATION CONCEPTS INC.
TEL (801)906-8840
FAX(801)883-9985
WWW.FCIWATERMAKERS.COM
TITLE
Assy, Contactor w/Actuated Valve, 3PH/50Hz, 24 VDC, 10x8, MaxQ+
SIZE | DRAWING NUMBER | REV
A | 93-5083 | A
DO NOT SCALE | SHEET 1 OF 1

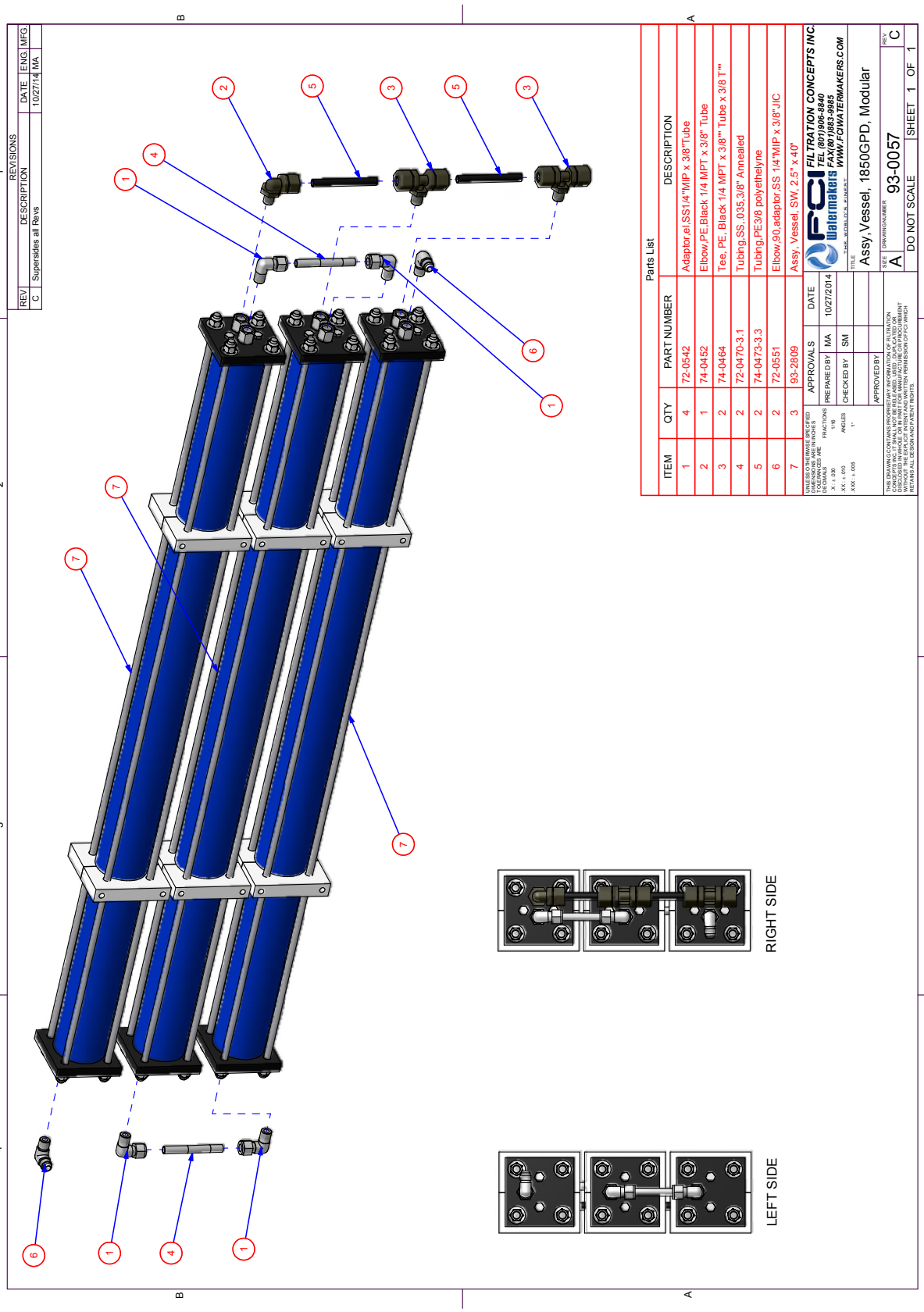
GENERAL ASSEMBLY DIAGRAMS / PRESSURE VESSEL




REVISIONS
REV DESCRIPTION DATE ENG. MFG.
A Production Release 3/06/06 MM
B Replaced 10-2250, with 10-0003 12/07/06 MM
ASSEMBLED VIEW
PART OF TUBE ASSEMBLY (ITEM 1)
Parts List
ITEM QTY PART NUMBER DESCRIPTION
1 1 11-0088 Vessel, SW, 2.5" x 40"
2 1 10-0003 Membrane
3 1 10-2073 Seal, Brine, 2.5"
APPROVALS DATE
PREPARED BY MHM 3/06/2006
CHECKED BY SM
APPROVED BY
FCI Watermakers
TEL (801)906-8840
FAX(801)883-9985
WWW.FCIWATERMAKERS.COM
Assy, Vessel, SW, 2.5" x 40"
SIZE DRAWING NUMBER REV
A 93-2809 B
DO NOT SCALE SHEET 1 OF 1


REVISIONS
REV
DESCRIPTION
DATE
ENG. MFG.
A
Supersides all Revs
10/27/14
MA
Parts List
ITEM
QTY
PART NUMBER
DESCRIPTION
1
2
72-0551
Elbow,90,adaptor,SS 1/4"MIP x 3/8",JIC
2
1
74-0452
Elbow,PE,Black 1/4 MPT x 3/8" Tube
3
1
93-2809
Assy, Vessel, SW, 2.5" x 40"
APPROVALS
DATE
PREPARED BY
MA
10/27/2014
CHECKED BY
SM
APPROVED BY
FCI Watermakers
FILTRATION CONCEPTS INC.
TEL (801)906-8840
FAX(801)883-3985
WWW.FCIWATERMAKERS.COM
TITLE
Assy, Vessel, 700GPD, Modular
SIZE
A
DRAWING NUMBER
93-0059
REV
A
DO NOT SCALE
SHEET 1 OF 1
RIGHT SIDE
LEFT SIDE


REVISIONS
REV | DESCRIPTION | DATE | ENG. MFG.
C | Supersides all Revs | 10/27/14 | MA
Parts List
ITEM | QTY | PART NUMBER | DESCRIPTION
1 | 2 | 72-0551 | Elbow,90,adaptor,SS 1/4"MIP x 3/8" JIC
2 | 2 | 72-0542 | Adaptor,el,SS1/4"MIP x 3/8"Tube
3 | 1 | 72-0470-3.1 | Tubing,SS,.035,3/8" Annealed
4 | 1 | 74-0452 | Elbow,PE,Black 1/4 MPT x 3/8" Tube
5 | 1 | 74-0464 | Tee, PE, Black 1/4 MPT x 3/8 Tube x 3/8 T""
6 | 1 | 74-0473-3.3 | Tubing,PE3/8 polyethelyne
7 | 2 | 93-2809a | Assy, Vessel, SW, 2-1/2 x 40
APPROVALS | DATE
PREPARED BY | MA | 10/27/2014
CHECKED BY | SM
APPROVED BY
FCI WATERMAKERS
FILTRATION CONCEPTS INC.
TEL (801)906-8840
FAX(801)883-3985
WWW.FCIWATERMAKERS.COM
TITLE
Assy, Vessel, 1275GPD, Modular
SIZE | DRAWING NUMBER | REV
A | 93-0058 | C
DO NOT SCALE | SHEET 1 OF 1
RIGHT SIDE
LEFT SIDE


REVISIONS
REV | DESCRIPTION | DATE | ENG. MFG.
C | Supersides all Revs | 10/27/14 | MA
Parts List
ITEM | QTY | PART NUMBER | DESCRIPTION
1 | 4 | 72-0542 | Adaptor,el,SS1/4"MIP x 3/8"Tube
2 | 1 | 74-0452 | Elbow,PE,Black 1/4 MPT x 3/8" Tube
3 | 2 | 74-0464 | Tee, PE, Black 1/4 MPT x 3/8"" Tube x 3/8 T""
4 | 2 | 72-0470-3.1 | Tubing,SS,.035,3/8" Annealed
5 | 2 | 74-0473-3.3 | Tubing,PE3/8 polyethelyne
6 | 2 | 72-0551 | Elbow,90,adaptor,SS 1/4"MIP x 3/8" JIC
7 | 3 | 93-2809 | Assy, Vessel, SW, 2.5" x 40"
APPROVALS | DATE
PREPARED BY | MA | 10/27/2014
CHECKED BY | SM
APPROVED BY
FILTRATION CONCEPTS INC.
TEL (801)906-8840
FAX(801)883-3985
WWW.FCIWATERMAKERS.COM
Assy,Vessel, 1850GPD, Modular
DRAWING NUMBER
93-0057
REV C
SIZE A
DO NOT SCALE
SHEET 1 OF 1
RIGHT SIDE
LEFT SIDE

9/ REVISION HISTORY

REVISION HISTORY

Revision	Date	Descripion
A	12/12/2014	Initial release.
B	06/01/2016	Schematics updated.
C	08/16/2017	Cover photo updated. When winterizing, optional equipment is processed after after rinsing with glycerin.
D	09/19/2020	HPP illustrations and specifications updated. FCI logos updated. General Assembly diagram 93-0016 added and 93-4802 updated. Media Filter Loading removed. Tubing fitting page and graphic updated.Parts List table removed. Pre-filter illustrations updated.

NOTES

Document Part Number: 97-5046 Revision D

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