CS-40 Manual: Installation / Startup – Shutdown / Maintenance

Modular Watermaker System:

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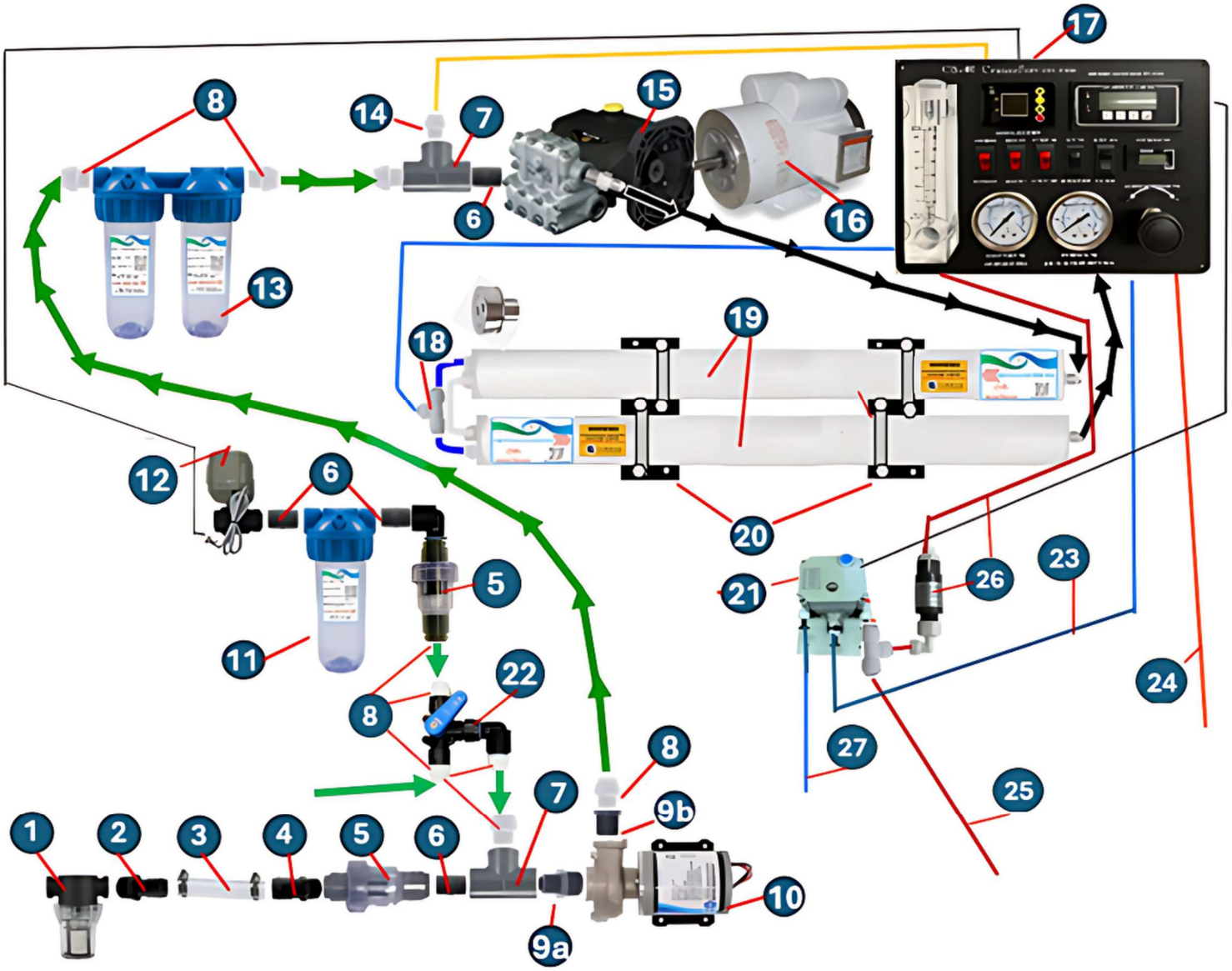
CS-40 Manual Sections:

Section 1 Parts ID and Layout:



CS-40 Components Parts Chart

Part ID	Description	Format
1	Sea Water Strainer	¾” Ports
2	¾”MNPT X ¾” Hose Barb	¾”
3	6’ Clear Braided Hose	¾”
4	½” MNPT X ¾” Hose Barb	½” X ¾”
5	Serviceable Check Valve	½” Ports
6	Close Nipple	½”
7	Tee Fitting	½”
8	Push-on Connector	½” T x NPT
9a	Male Threaded Reducer	½” x ¾”
9b	Male x Female Reducer	¾” x ½”
10	Jabsco Boost Pump	¾” Ports
11	Single Filter Housing	½” Ports
12	Auto Flush Valve	½” Ports
13	2-Stage Filter Housing	½” Ports
14	Boost Pump Pressure Fitting	½”x ¼”
15	General Pump Head - EWM1615C	Stainless
16	1hp 110/220v Drive Motor	Epoxy
17	Main Control Panel	12v Or 24v
18	Tee Fitting	¼”
19	Vessels Housings 2540 Membranes-Fitted	Composite
20	Vessel Mounting Blocks	Composite
21	3way TDS Automation Valve	¼” Ports
22	3way Pickling Valve	½”Ports
23	¼” Blue Product Water	¼”
24	¼” Red Brine Discharge From Needle Valve	¼”
25	¼” Red Purge Line From 3Way Valve	¼”
26	PRV Valve and ¼”Feed Line From Flow Meter Discharge	½”
27	Product Water ¼” Line to Freshwater Tanks	¼”

Section 2 Panel Features:

Overall Dimension; 10-5/8" x 8" Allow 5.5" Backside Clearance

1.**Product Water Flow Meter** with easy-to-read scaling in GPH and LPH for accurate readout of the fresh drinking water production rate.

2.**Automatic Fresh Water Flush Timer** allows for a fully user programmable manual push-button or unattended freshwater flush of the watermaker. Ability to set Both time of fresh water flush and interval between fresh water flushing.

3. **Water Quality TDS Meter with Auto Diversion** displays a real time read out of the drinking water quality while also controlling a 3-way valve to route the good drinking water TO or AWAY from your Ships tank based on user programmable set-points. Also has an audible alarm.

4.**System Hour Meter** displays the total operating hours of the high-pressure pump, which is useful for system maintenance.

5.**Simple Control Switches** allow for easy start-up and shutdown of the watermaker, as well as activating the Automatic freshwater flush and Automatic product water diversion and freshwater system priming. The Hp Pump and Boost Pump panel switches are controlling relays so no heavy DC or AC current is present on the control panel. This helps minimize wire size and voltage line loss to the pumps.

6.**Boost Pump Pressure Gauge** assures that the Hp Pump is being supplied with an adequate supply of sea water and lets you know when it's time for a prefilter change.

7.**Membrane Pressure Gauge** is used to display the system operating pressure of the RO Membranes.

8.**Membrane Pressure Control Valve** is used to set the operating pressure of the RO Membranes to optimize fresh drinking water production for sea water conditions and power usage.

Section 3 Components Inventory:

Considerations for install planning / Dimensions:
1-Maximum length of the ¾" hose from thru hull to boost pump inlet cannot exceed 6 feet. The 6 foot section of ¾" braided hose is supplied.
2-Maximum length ½" Green tubing cannot exceed 20 feet from boost pump to HP pump infeed. 25 foot length of this tubing is supplied. 5 foot is to be used for the Auto Flush feed.
Component 1-Main panel overall dimensions are 10-5/8"/ 270mm x 8" / 203mm. 5.5" minimum backside clearance will be needed to allow for the wiring and tubing connections.

CUT OUT FOR PANEL: 9 5/8" x 6 7/8"

A consideration for the main panel installation is an enclosed door hinged utility enclosure. There are several of these types of enclosures available.

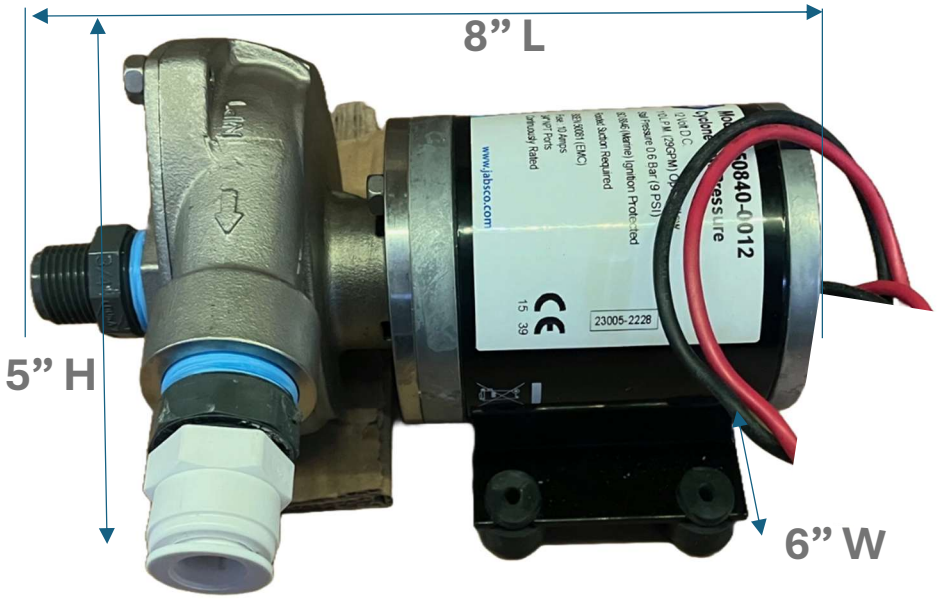
Section 3 Components Inventory Continued:

Component 2- Sea Strainer Specs: dimensions:

Component -3 Overall dimensions of boost pump:

½” MNPT Infeed Connector | ½” Push On Discharge Connector

8” X 6” X 5”



Section 3 Components Inventory Continued:

Component 3- Boost Pump Infeed Assembly:

¾” Hose Barb | Serviceable Check Valve With ½” FNPT Ports | ½” x ½” MNPT Coupling | ½” x ½” ½” Tee FNPT | ½” MNPT x ½ Push On Connector

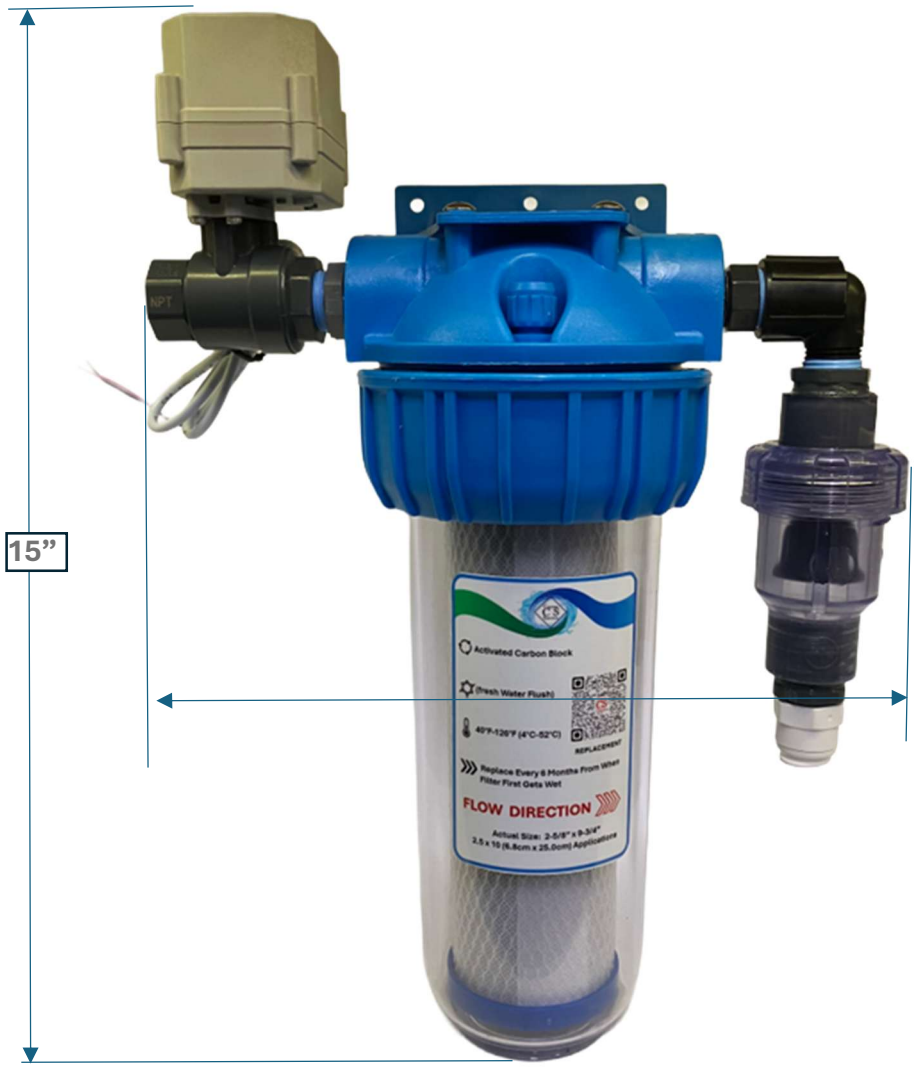
Component 4- 3Way Pickling Bypass Valve:

½” Push on Connectors x ½” FNPT Ports

Section 3 Components Inventory Continued:

Component 5- Fresh Water Flush Assembly:

Automated valve with ½” NPT Inlet Port | Carbon Filter | Serviceable Check Valve | ½” Push On Connector



Section 3 Components Inventory Continued:

Component 6-Prefilters Two Stage 20 Micron / 5 Micron

½” Push On Inlet and Discharge Connectors

Section 3 Components Inventory Continued:

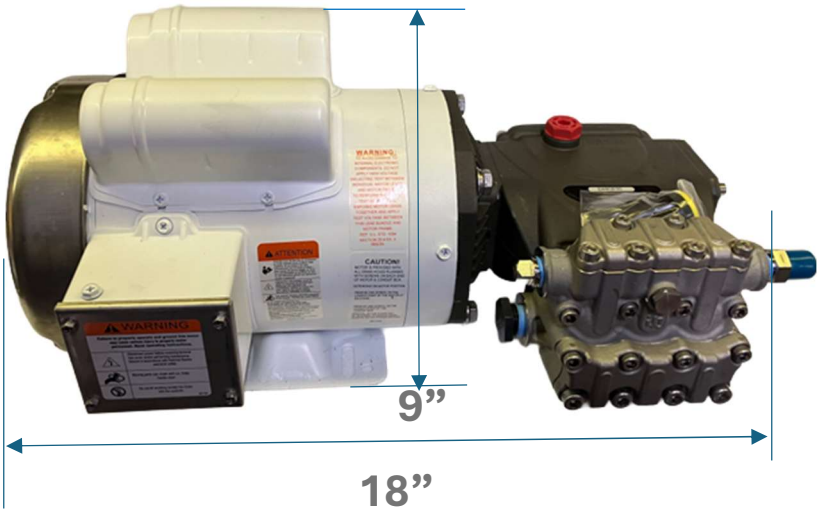
Component 6-High Pressure Pump Infeed Assembly

½” Push On Inlet Connector | ½” to ¼” Tubing Connector

½” MNPT Connector

Component 7-High Pressure Pump and Motor Assembly.

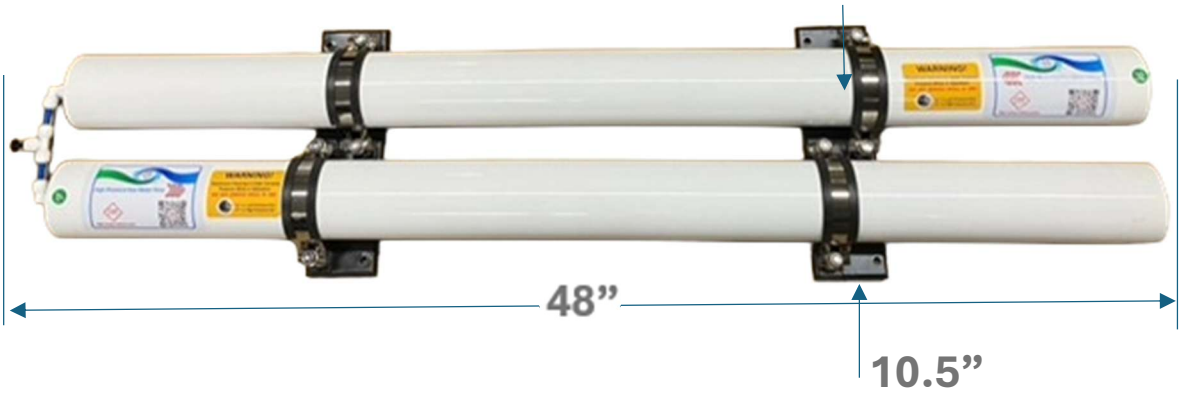
Overall dimensions of high pressure pump and motor assembly: 18” length x 9” tall x 9” wide



Section 3 Components Inventory Continued:

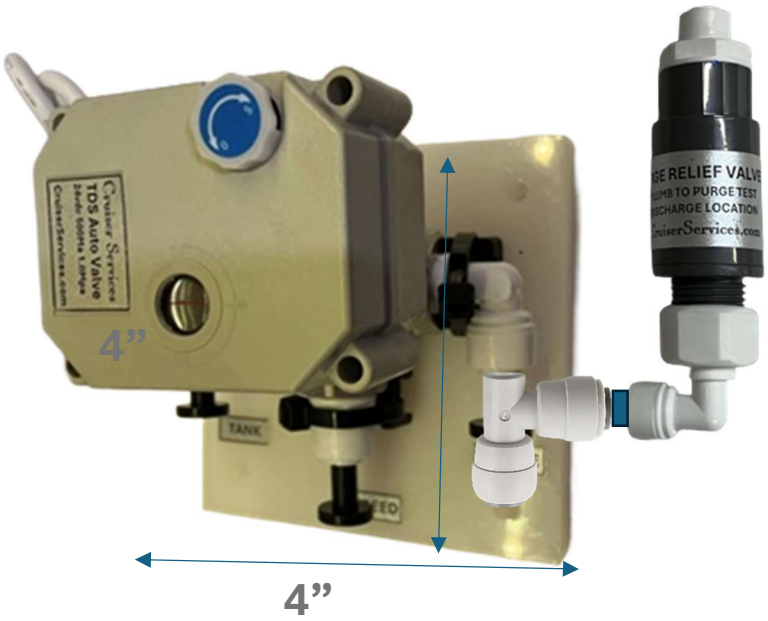
Component 8- Membrane Vessel Assembly

The dimension of the two vessel mounting blocks is 10-1/2” vertical height. Overall vessel footprint is: 10-1/2” x 48”



Component 9-3Way TDS Automation Valve And Purge PRV

¼” x ¼” x ¼” Ports: Feed/Purge/Tank



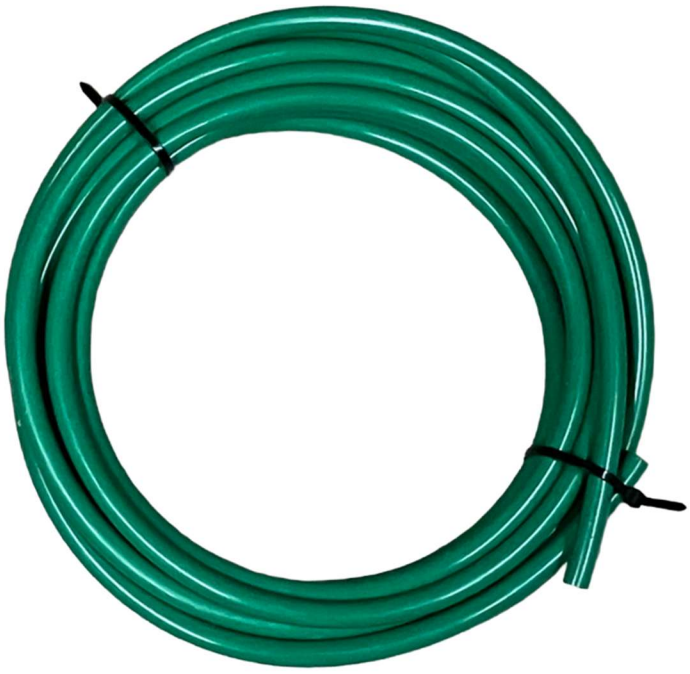
Section 3 Components Inventory Continued:

Component 10-Dual Voltage Relay Junction Enclosure

Section 3 Components Inventory Continued:

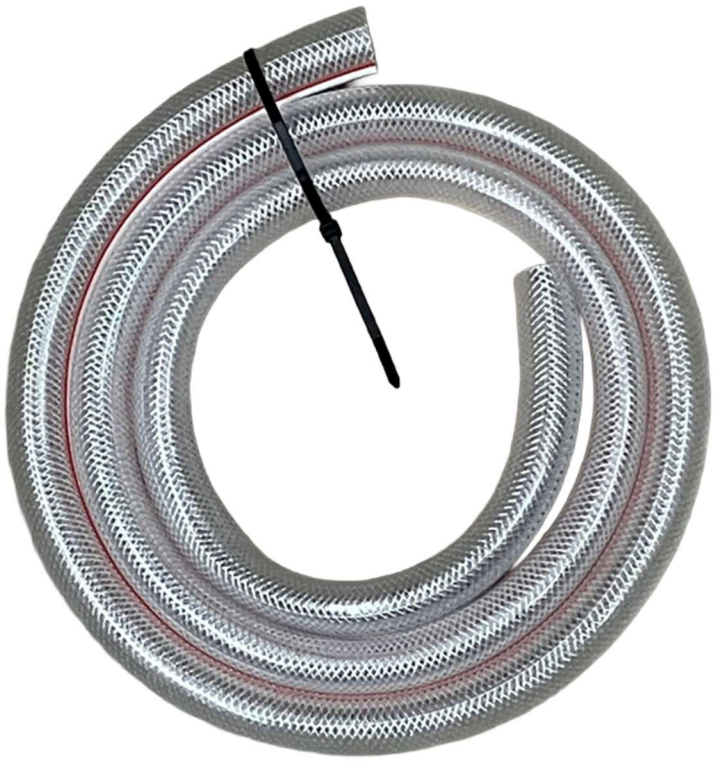
Component 11-High Pressure Hoses 3/8” JIC End Fittings 5’ - 2x

Component 12-25’ Green Tubing ½” OD



Section 3 Components Inventory Continued:

Component 13-6’ ¾” ID Braided Hose



Component 14-30’ ¼” Blue Tubing

Section 3 Components Inventory Continued:

Component 15-30’ ¼” Red Tubing

Component 16-15’ ¼” Yellow Tubing

Section 3 Components Inventory Continued:

Component 17- Pickling Reagent:

Section 4 Installation Requirements and Safety:

CS-40 Watermaker is a component based modular design. The assembly components and panel wiring pig tails are labeled to help guide the installation process.

Planning your layout locations is key to successful installation.

Dimensions for the components are provided in Section 3 of this manual to help you with your layout configuration planning.

Section 4 Installation Requirements and Safety Continued:

Considerations, Requirements, and limitations:

1-A maximum span between the thru hull water inlet and infeed of the boost pump **must not exceed the provided 6'** of ¾" ID Braided hose.

2-A maximum span of ½"OD Green tubing between the Boost pump discharge and the High Pressure pump **must not exceed 20'.** 25' is provided, allowing a 5' surplus to be used for the Auto Flush feed connection.

3-#10 AWG strand 2 wire cores must be utilized for the 12v/24v feed to the Boost Pump relay and from the relay to the Boost pump power connections. (This wire is not provided)

Boost Pump Wire Sizing Chart:

WARNING: Motor may get hot after prolonged use, do not touch. Burns may occur.

WARNING: If the fuse fails repeatedly, do not fit a heavier fuse or bridge the terminals. Fire and death may occur.

Model Number	Voltage	Maximum Current	Fuse Size	Wiring Size*		
				AWG	mm²	Max. Length
50840-XX12	12V	9.0A	10A	14	2.5	4.5m (15 ft)
				10	6.0	9.0m (30 ft)
50840-XX24	24V	4.5A	7A	18	1.0	4.5m (15 ft)
				16	1.5	9.0m (30 ft)
* wire length from battery to pump and back to battery, maximum voltage drop 3%						

4-#10 AWG strand 3 wire cores must be utilized for the A/C source feed to the High Pressure Pump relay and from the relay to the High Pressure pump motor connections.
(This wire is not provided)

Section 4 Installation Requirements and Safety Continued:

5-#16 AWG strand 2 wire cores must be utilized from the vessels 12v/24v battery bank to the main panel feed connection- (Labeled Main RED+ BLK-) (This wire is not provided)

6-#16 AWG strand 2 wire cores from the main panel to the multi-volt Auto Flush activation valve, main panel feed connection- (Labeled AUTO FLUSH RED+ BLK-) (This wire is not provided)

7-#16 AWG strand 3 wire cores from the main panel to the TDS Auto 3Way valve (Labeled RED|GRN|BLK To 3Way Valve) (This wire is not provided)

8-Vessel mounting block screws or nuts and bolts will be needed depending on the chosen location and available mounting surface. (Not included)

9-Filter bracket mounting screws or nuts and bolts will be needed depending on the chosen location and available mounting surface. (Not included)

10-Tubing ties/mounts for tubing management will be needed.

11-1/4" Flat spade connectors will be needed for wire end connections at the relay junction box. A recommended method for this type of wire end connection is available on a Youtube video tutorial:
https://www.youtube.com/watch?v=VoUXb1s2g5U

12- Water supply connection and line from vessel water system to the Auto Flush control valve. This inlet port is a ½" FNPT.

Section 4 Installation Requirements and Safety Continued:

13- Thru hull water supply to the raw water infeed strainer. This infeed port is ¾" FNPT.

14- A designated purge port connection method for the ¼" tubing from the TDS purge line and operation brine discharge line will be needed.

15- A connection method for the ¼" product water tubing to the vessels fresh water holding tank. It is recommended adding a connection point at the top area of the tank or at the tank filling tube area. This will eliminate any unwanted back pressure.

Safety considerations:

Note: The relay junction box containing two relays has both D/C and A/C related voltage and caution should be used to ensure the voltage is not mixed is any way. The relays themselves are activated via 12v signals from the main panel.

Note: The High Pressure motor operates on A/C voltage and should be placed in an area that is dry and ventilated to allow for proper operation.

Section 4 Installation Requirements and Safety Continued:

Note: It is mandatory to ensure there is circuit overload protection in place for both the A/C and D/C power source feeds.

A 10amp maximum inline fuse must be installed on the 12v #16 AWG wire positive feed between the battery bank and the main panel.

A 10amp maximum inline fuse must be installed on the 12v #10 AWG wire feed from the battery bank prior to the Boost Pump relay.

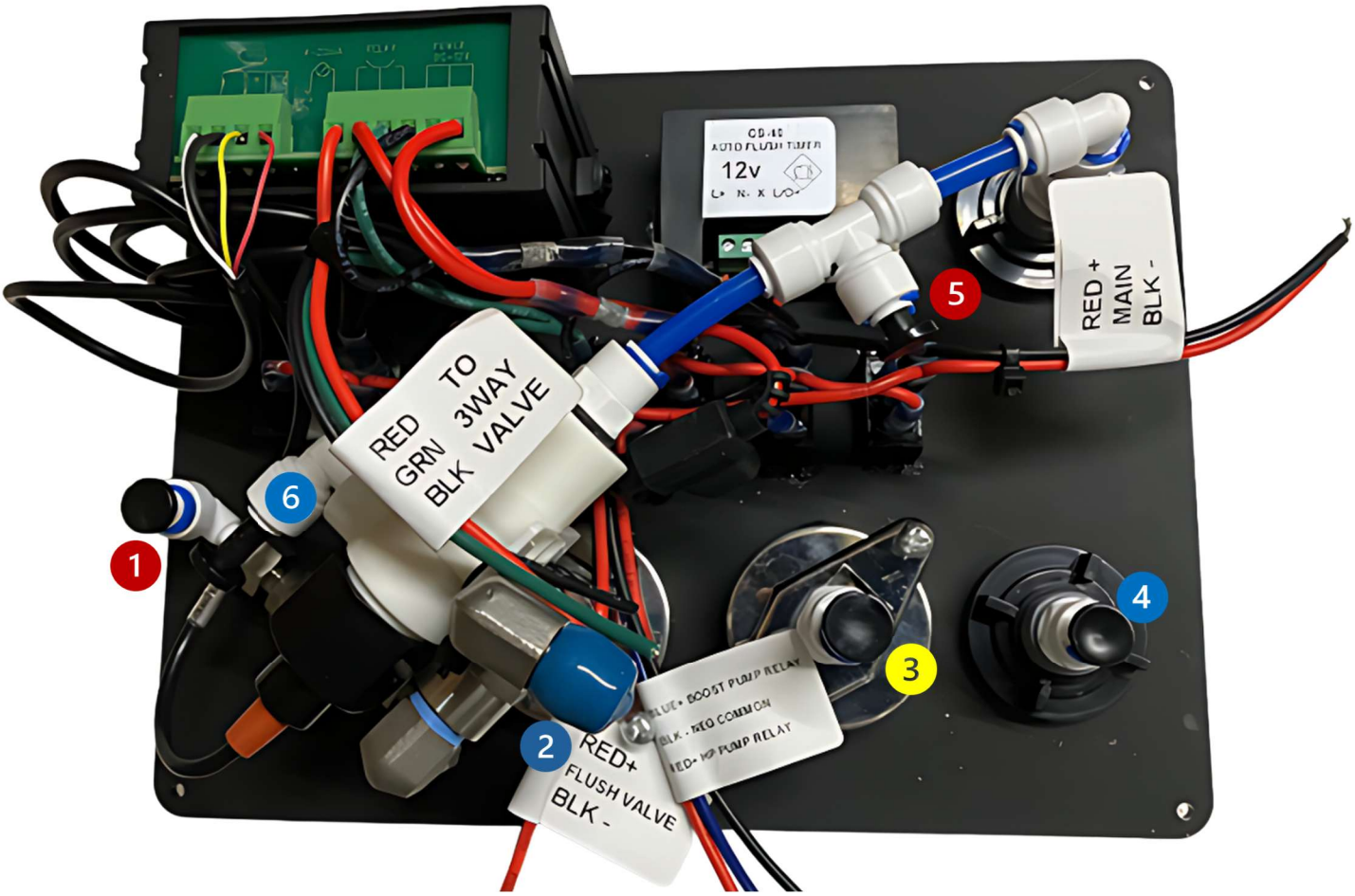
A 20amp maximum size breaker must be installed at the AC power infeed prior to the relay to protect the High Pressure Pump motor.

Note: System operates under high pressure. At no time should any adjustments be made to the plumbing components during operation. If plumbing or fittings need to be serviced, shut the system down and release any residual system pressures prior to servicing.

Section 4 Installation Requirements and Safety Continued:

INSTALLING COMPONENTS:

Main Panel-



Hose And Tubing Connections Points:

1. ¼” **Red** tubing for brine discharge. Install discharge port above water line.
2. 3/8” JIC male fitting. Install **Blue** hose from high pressure membrane housing.
3. ¼” **Yellow** tubing from high pressure infeed to boost pump gauge,
4. ¼” **Blue** tubing from membrane housing TEE fitting to lower flow meter port.
5. ¼” **Red** tubing to purge test location. **(It is highly recommended to install a valveless spigot at a sink location for water quality testing. Lower TDS readings can allow product water that is not of desirable quality to divert to freshwater tanks)**
6. ¼” **Blue** tubing from TDS sensor to automated 3way valve infeed port.

The main panel location should be planned to allow for hose connections and ¼" tubing connections. The required backside clearance allowance should be a minimum of 5.5"inches. Stand off supports or an after market mountable non-metallic box are considerations. The provided high pressure hose from the membrane housing discharge is 5'feet in length. Longer hoses can be ordered to accommodate as needed.

RED Purge Line:

The Red ¼" purge line from the TEE fitting on the back side of the control panel is connected to the PRV valve at the automated three way valve. This is an important safety feature that prevents over pressurizing the system during the 3way valve transitioning. Purge line from the automated valve extends to a water test point. It is recommended to install a valveless test spigot at a sink or other location accessible for testing the product water quality. Lower TDS readings can allow unwanted water to be automatically diverted. The manual purge switch on the main panel prevents this. On start ups and after pickling the manual purge switch should be utilized to ensure only desired water quality is achieved prior to diverting to the freshwater tanks. The WHALE telescopic spout is the most common choice to achieve an easy to access water test discharge point. Small amounts of purge water discharges when the TDS automation valve rotates port directions. Do not place a shut off valve between the purge discharge point and the automated 3way valve. System damage can occur.

Sample Image Of Whale Spigot:

Installing Components:

Sea Stainer-

A dedicated ¾” below water line thru hole inlet is recommended to feed the strainer. This is to prevent possible air bubbles from entering the system. However, a shared thru hull can be utilized using a designated Y-valve that isolates the shared system. Do not share a thru hull for a motor or generator for safety reasons. A head thru hull would be a common choice. The Y-valve must be capable of isolating each system. This can be done temporarily until at which time the vessel is hauled and a planned thru hull can be added.

EXAMPLE OF A Y-VALVE

Installing Components Continued:

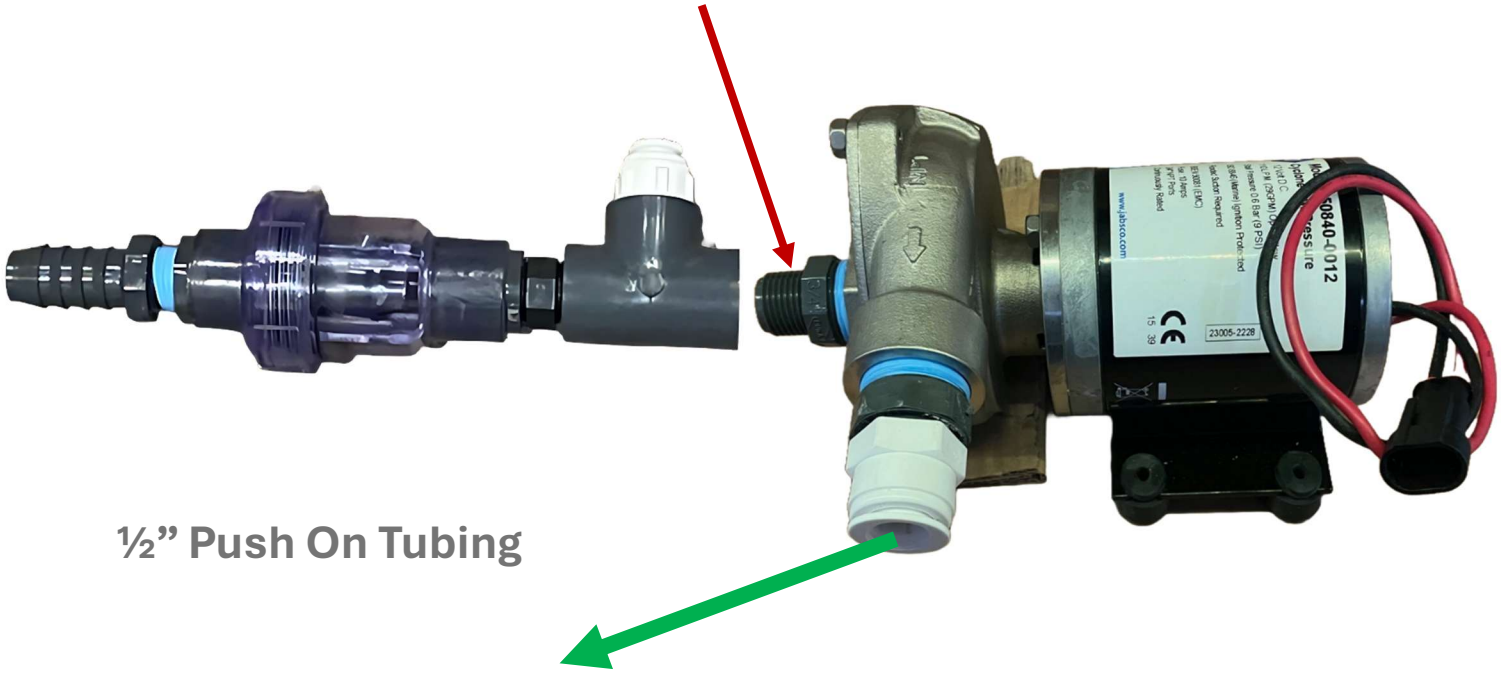
Once a thru hull source is established the strainer component can be installed. Depending on the configuration of the source a fitting may be required. The strainer inlet is a ¾” FNPT. The discharge port is pre-fitted with a ¾” hose barb.

Component -Boost Pump Infeed Assembly;

This is a preassembled ¾” hose barb, one direction check valve, TEE, push on hose fitting and coupling. This assembly is to be connected to the boost pump infeed port and is feed from the strainer assembly via a section of ¾: braided hose.

No greater than 6 feet of hose should span between the assemblies.

Install the boost pump feed assembly to the boost pump utilizing a thread sealing tape.



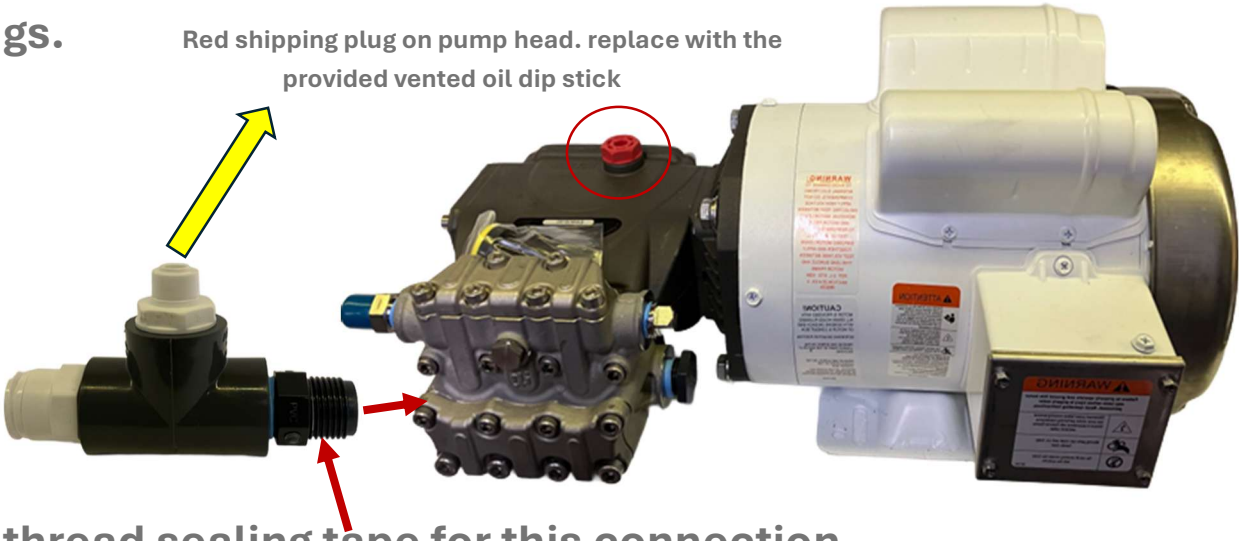
½" Push On Tubing

Component Two Stage Pre-Filters;

This two stage filter assembly contains a 20 Micron filter and a 5 Micron filter. Once mounted a section of the green ½" OD tubing is connected at the Boost Pump discharge and run to the infeed side of the filters. A maximum length of 20' of green ½" OD tubing from the boost pump discharge to the High Pressure pump should not be exceeded.

Component High Pressure pump infeed assembly;

This preassembled component connects to the infeed of High Pressure pump/motor.. A ¼" tubing push on connector is provided for the yellow color coded ¼" tubing and connects from this assembly to the boost pump pressure gauge port at the rear of the main panel. A 5' in length High Pressure hose with a 3/8" JIC Fitting connects from the pump head to a 3/8" JIC Fitting that is pre-installed on one of the membrane housings.



Utilize thread sealing tape for this connection.

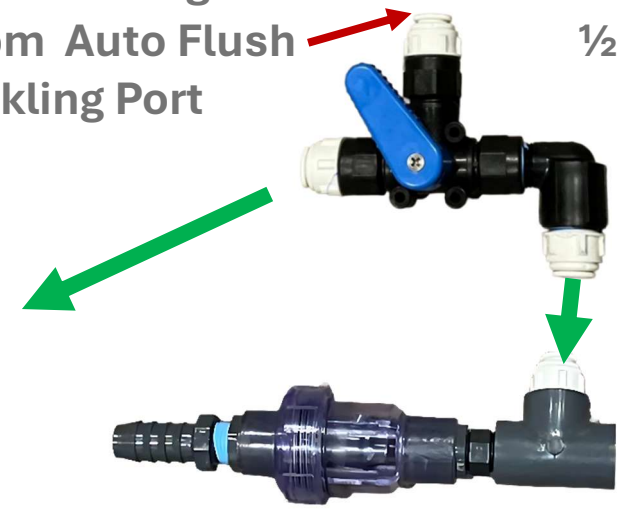
Component 3Way Manual Pickling Valve;

This assembly connects between the boost pump infeed assembly and the Auto Flush filter assembly. Allows for pickling the system as needed when the system is going to be dormant or in a storage state. Contains mounting block for support

From Auto Flush

½" Push On Connections

Pickling Port



Component Auto Flush Valve and Carbon Filter Assembly;

This assembly contains a motorized valve where a fitting will need to be installed on the infeed side to mate to the vessels pressurized freshwater system. The filter is a carbon element which removes harmful chlorine membrane during flushes and system start-ups. The assembly also contains a serviceable check valve with a ½”OD tubing connector that allows a green section of tubing to connect to the pickling valve center common port.

Component-Membrane Housing Vessels

The membrane housing vessels are shipped with the membrane elements installed and the mounting blocks attached. Two 3/8" JIC fitting are pre-installed, the flow direction is indicated on the outer housing. Opposite end contains a ¼" TEE fitting with a removable plug where blue ¼" tubing connects and extends to the fitting at the bottom area of the main panel flow meter.

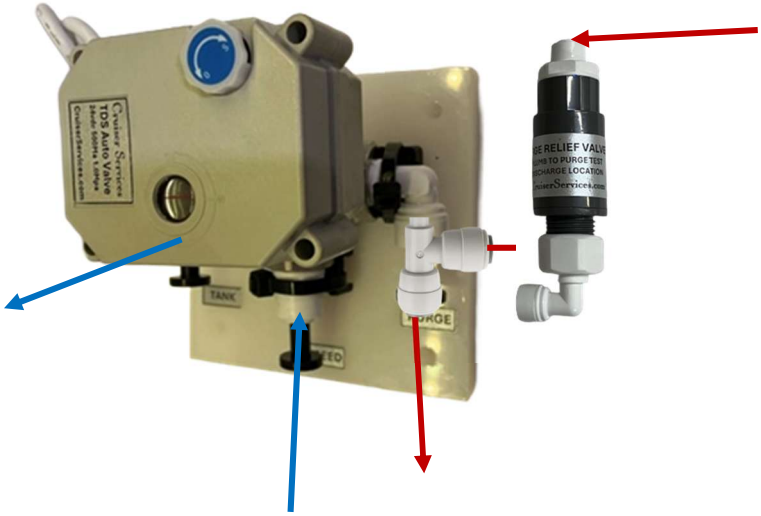
(High pressure hose connection from high pressure pump head)

¼" Tubing To flow meter

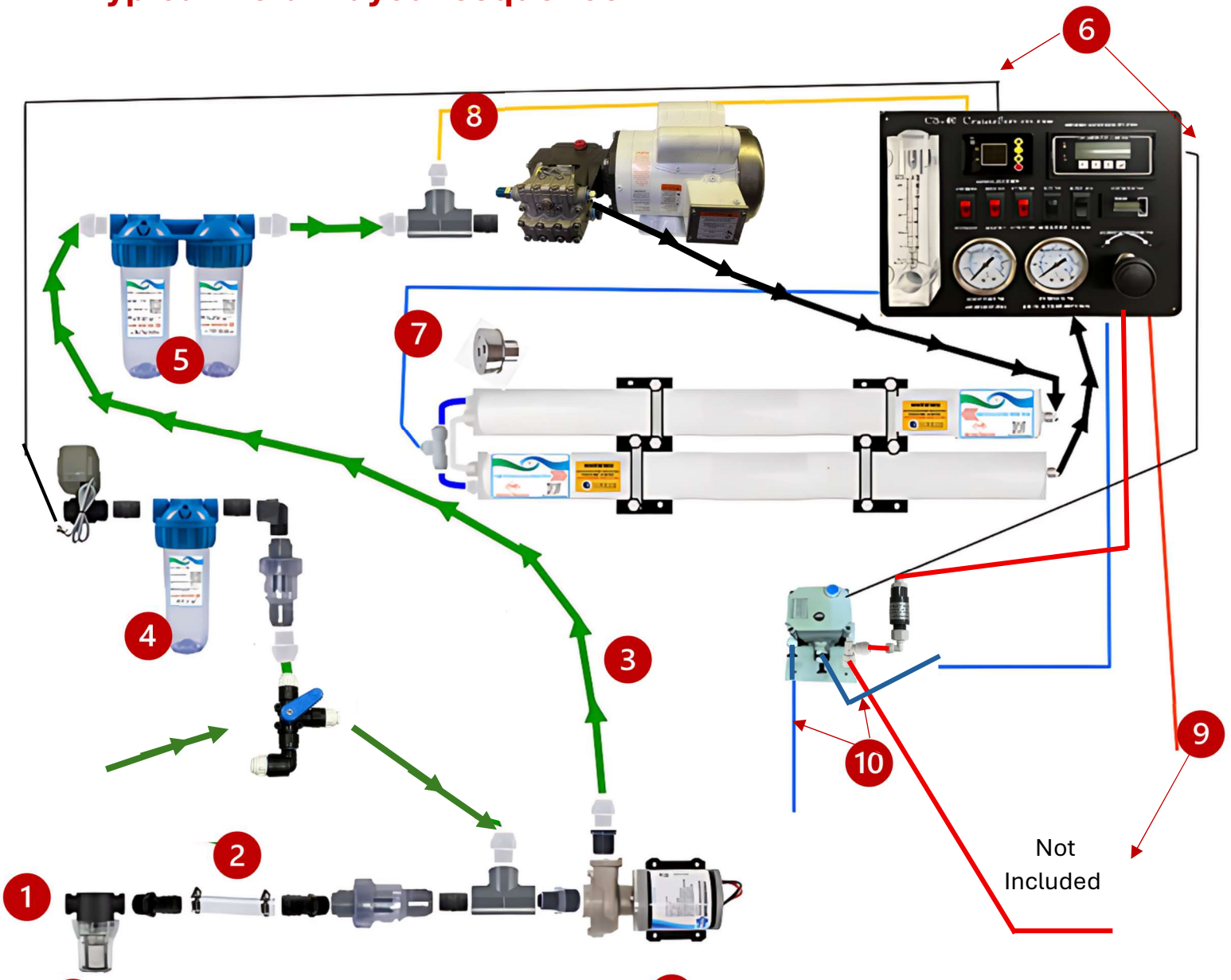
(High pressure hose connection to gauge/needle valve main panel)

Component-TDS Motorized 3Way Valve

Motorized 3Way valve contains four ¼" push on tubing connectors. **Labeled:** **TANKS**-Connects ¼" **blue** tubing to a freshwater tank feed location. **INFEED**-Connects ¼" **blue** tubing from TDS sensor at rear of main control panel. **PRV**-Connects **red** tubing from panel tee between FLOW METER and TDS sensor to PRV valve. **PURGE** Connects ¼" **red** tubing to test location-recommend a valveless spigot for easy access.



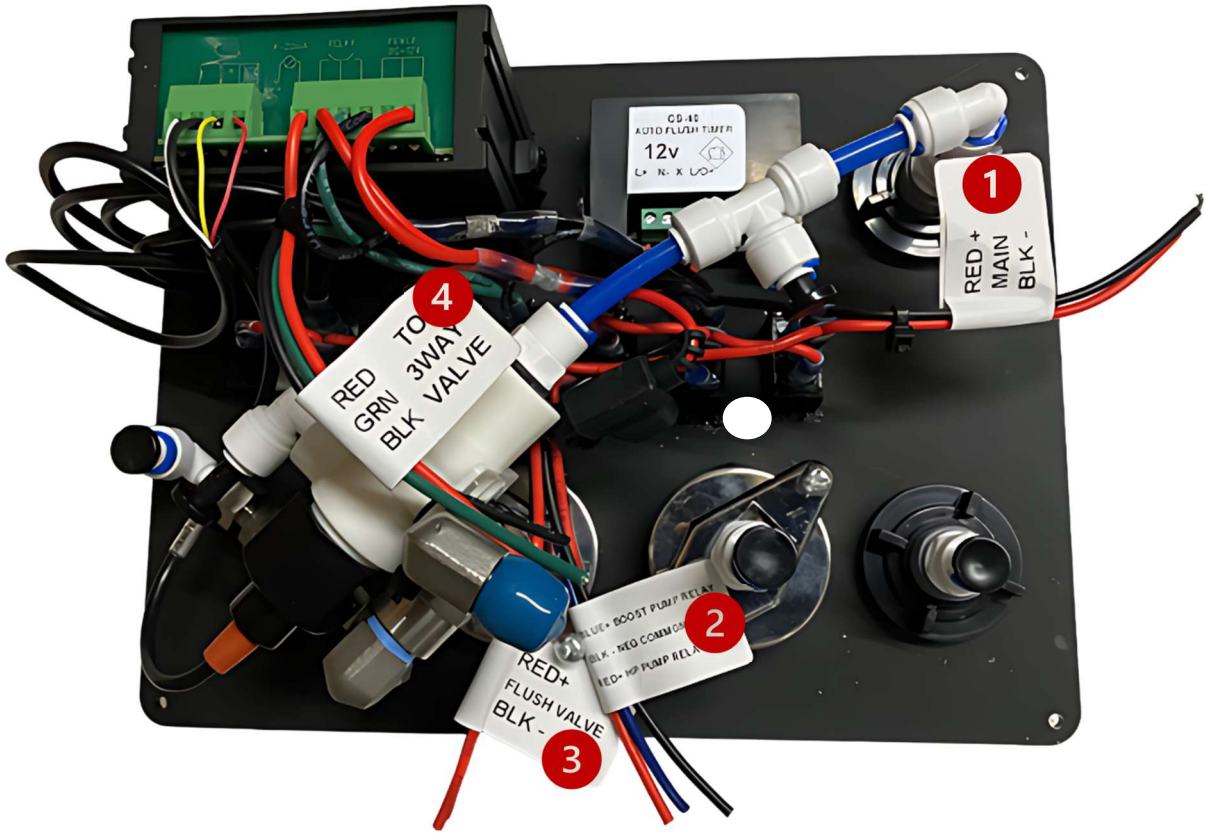
Typical install layout sequence:



1. Strainer infeed from thru hull
2. ¾” ID Braided Hose- **Not to exceed 6’ft / 2m**
3. ½” OD Green tubing – **Not to exceed 20’ft / 6.5m**
4. Carbon freshwater flush filter
   Change every 6mo from when filter first gets wet
5. Two stage prefilters 20MIC /5MIC
   Clean/Change if boost pressure is less than 5psi
6. Control wires from main panel to valves
7. ¼” Blue tubing – from membranes to flow meter
8. ¼” Yellow tubing from connector to boost gauge
9. ¼” Red tubing purge to test spigot & Brine
   Discharge above water line
10. ¼” Blue product water lines

Wiring Configurations:

The backside of the main panel has four clearly tagged wire connections.



1. Main 12v/24v power feed from battery, 10amp inline fuse is required for this connection. **Red +** **Blk -**

2. **Blue +** | **Blk -** | **Red +** 12v feed to relay activator side. Boost pump and high pressure pump.

3. Flush valve 12v feed. **Red +** | **Blk –**

4. **Red** | **Blk** | **Green** Control wire from TDS meter to motorized valve

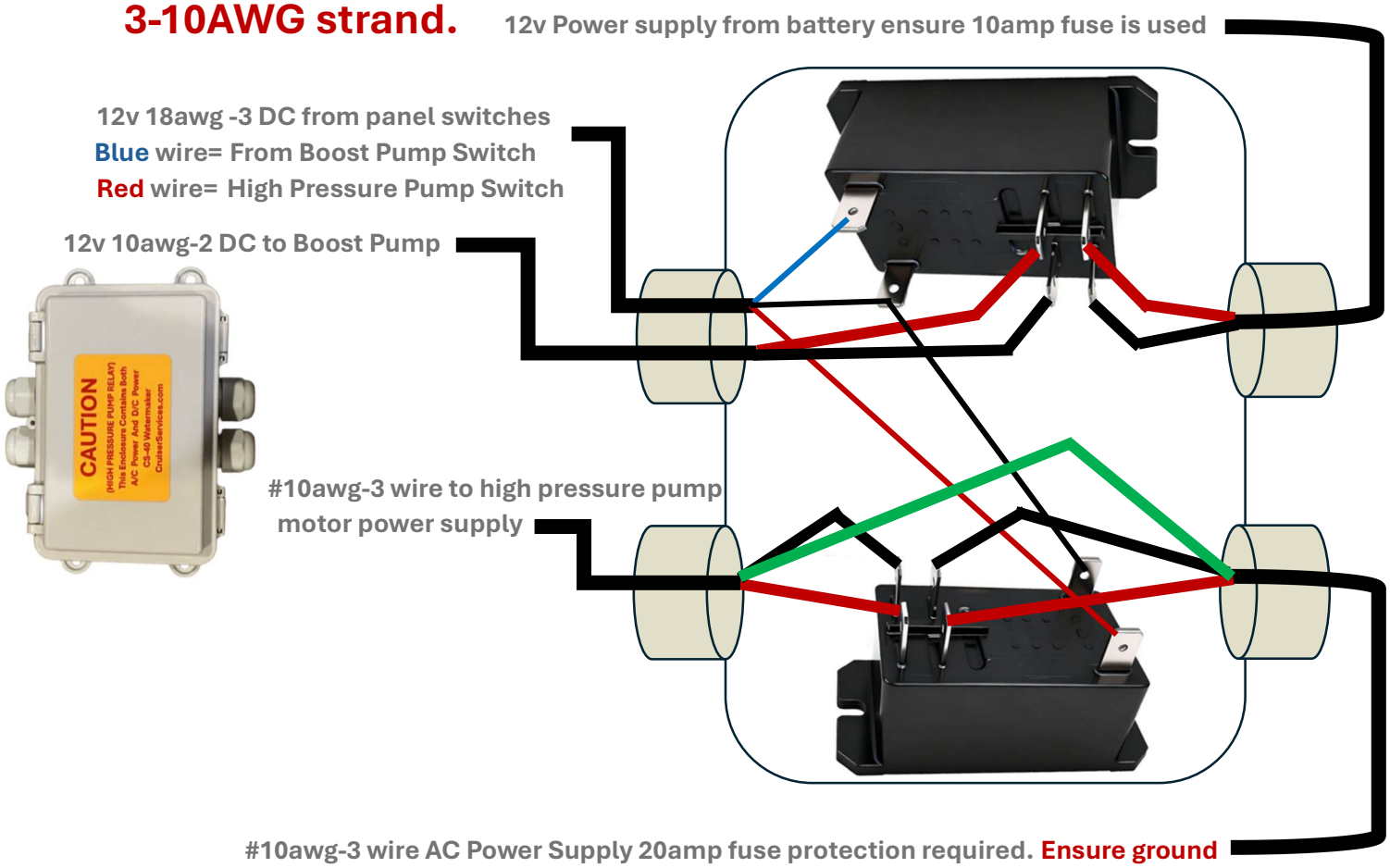
Relay wiring diagram:

The provided relay junction box contains two 12v/24v activated relays. One relay for the operation of the D/C voltage boost pump and one relay for the operation of the A/C voltage high pressure pump. The relay wiring is designed to break the positive leg of both the D/C and A/C circuits.

Control wire **3-18 AWG cable should be run from the main panel connection to the relay junction box for the activation power feeds.**

Minimum wire size to be utilized for the D/C boost pump circuit is designated as 2-10AWG strand. This is to prevent a voltage drop of the boost pump circuit during operation.

Minimum wire size to be utilized for A/C high pressure pump is 3-10AWG strand.



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List of additional Items to complete installation:

1- Thru-hull connection to the provided raw water strainer. This is a ¾”NPT female inlet port. Depending on method a manual Y-valve.

2- Screws or nuts and bolts for the membrane housing mounting pads.

3- Connection fitting to Auto Flush inlet ½”NPT female port and connection TEE fitting with tubing from the vessels house water system.

4- Control wire (#16awg-2 strand and inline fuse protection) 12v/24v power supply from vessel battery bank to main panel control panel.

5- Control wire (#18awg-3 strand) power supply from main panel to provided relay junction box.

6- DC Power transfer wire (#10awg-2 strand minimum requirement) from battery bank to relay junction box and from junction box to boost pump wire leads.

7- AC Power transfer wire (#10awg-3 strand minimum requirement with 20amp fuse/breaker protection) from AC power source to relay junction box and from relay junction box to high pressure pump motor.

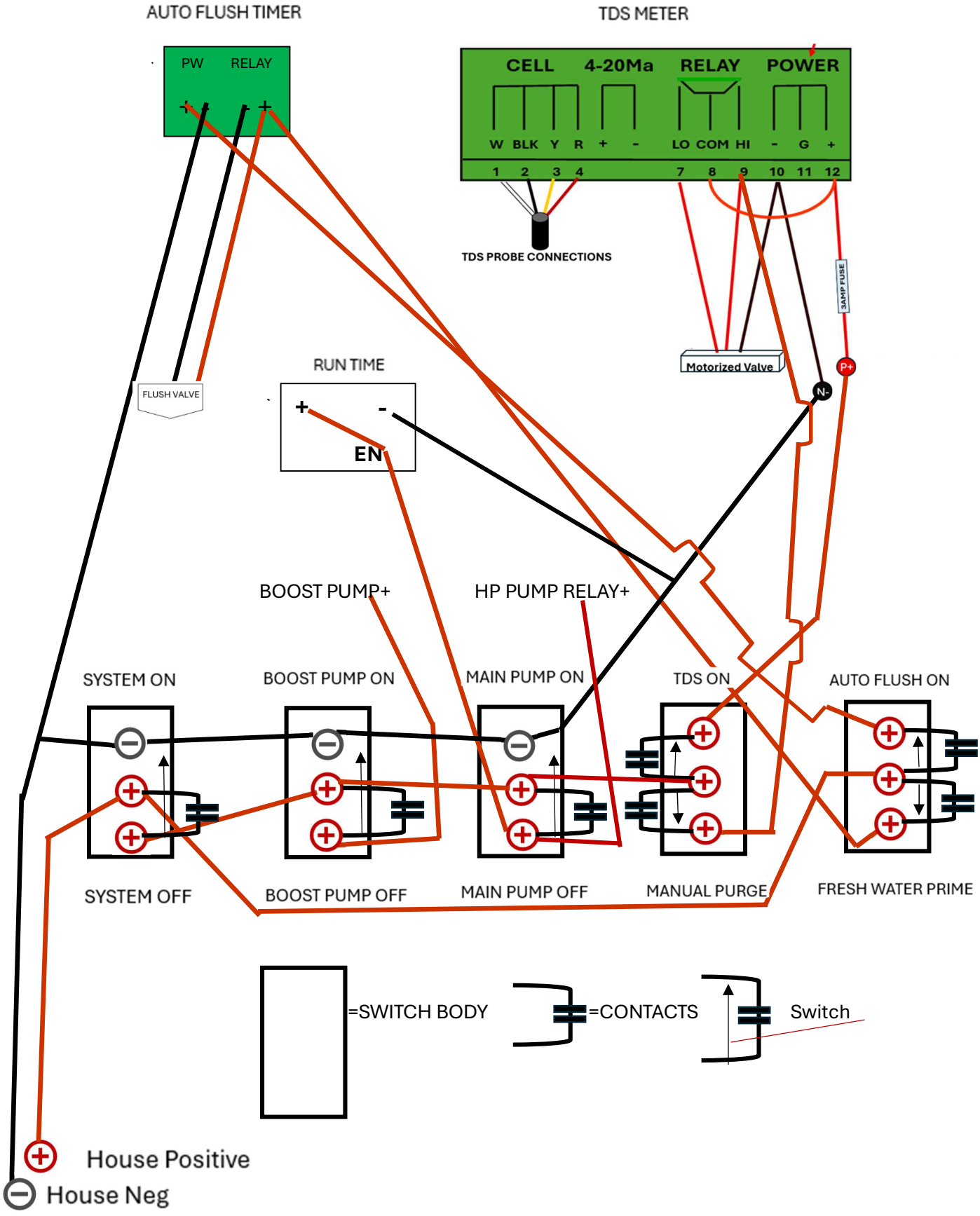
8- ¼”Flat push on electrical wire connectors for connections in the relay box.

9- Control wire(#18-2 strand) from control panel to the Auto Flush valve connection leads.

10- Wire splice connectors. Recommend heat gun shrink tube type for moisture protected connections. 

11- Pipe thread sealant tape, recommend high density type: 

Panel Wiring Schematic



Initial Start Up Procedure And / Or Start Up After Pickling

1. Panel Features:

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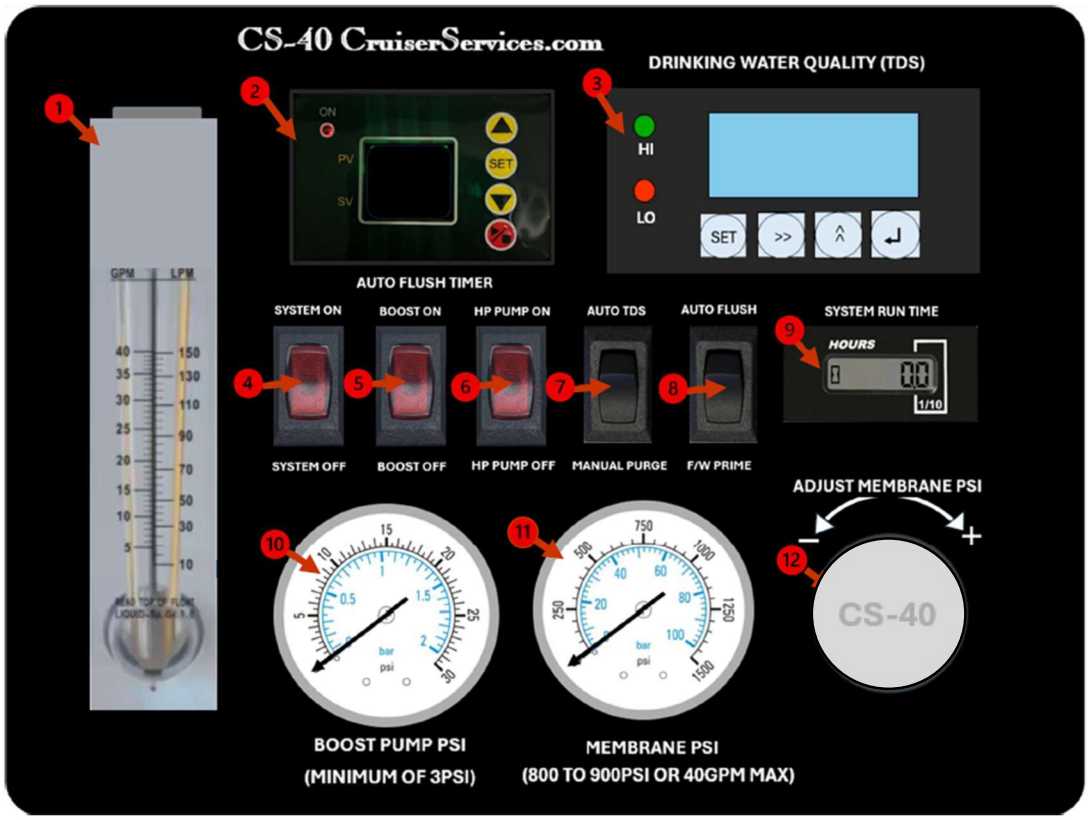


1 -Flow Meter; Measures the rate of product water during production.

2 -Auto Flush Timer; Pre-programmed for 5 minutes every 120 Hours or 5 Days. An optional relay can be added which allows the timer to activate your house water pressure pump. Timer activates a motorized valve allowing house water to feed through a carbon filter and then through the flush port inlet.

3 -TDS Water Quality Monitor / Meter; Pre-programmed to purge product water above 500ppm. The monitoring automatically signals a motorized 3way valve to direct product water to freshwater tank when water quality is below 480ppm.

4 -SYSTEM ON/OFF panel switch; Turn power on/off to panel apart from the Auto Flush which is independent. (Switch ON/OFF)

5 -BOOST ON/OFF panel switch; Turns power on to the boost pump. (Switch ON/OFF)

6 -HP PUMP ON/OFF panel switch; Turns power on and off to the high-pressure pump. (Switch ON/OFF)

7 -AUTO TDS / MANUAL PURGE panel switch; Turns power on to TDS meter or Turns on the manual purge function (Switch ON/ON)

8 -AUTO FLUSH / F/W PRIME panel switch; Turns on AUTO FLUSH function. Turns on F/W aka FRESH WATER PRIME function. Switch is monetary for FRESH WATER PRIME function. (Switch ON/OFF/MOMENTARY)

9 -SYSTEM RUN TIME; Keeps record of overall system runtime, activates when SYSTEM ON panel switch is activated.

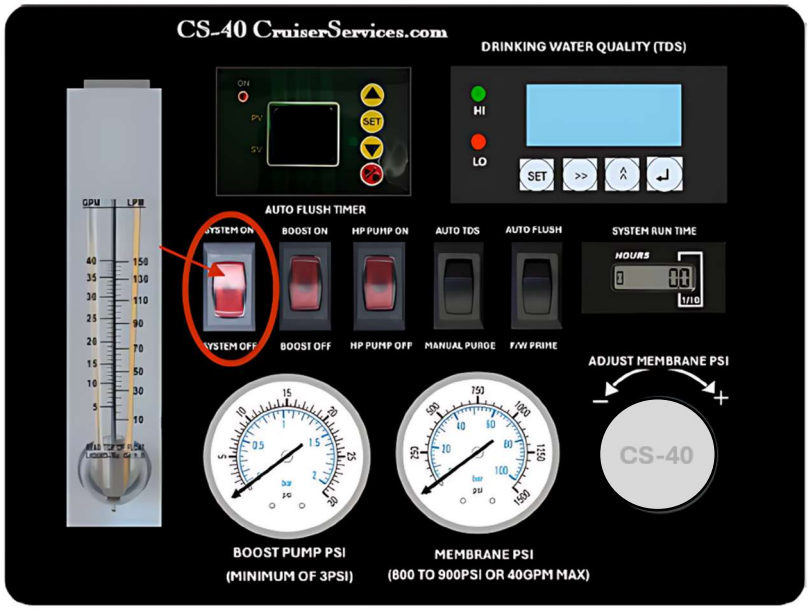
10 -BOOST PUMP PSI gauge; Measures pressure from boost pump flow.

11 -MEMBRANE PSI gauge; Measures pressure membranes are filtering at during production

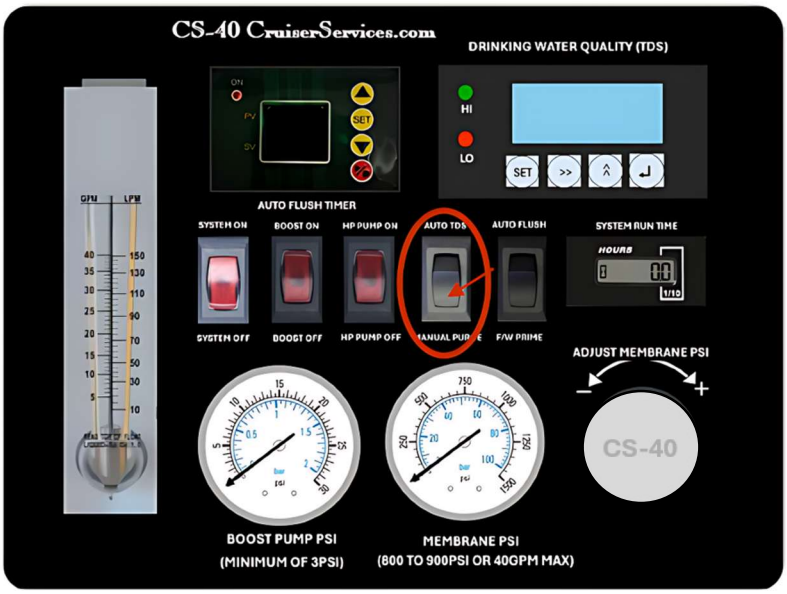
12 -ADJUST MEMBRANE PSI; Needle valve adjustment for membrane operating pressure.

Start by ensuring the three red panel switches are in a downward position and are not illuminated. Ensure your house water pressure pump is on and a connection has been made from your house water system to the Auto Flush carbon filter infeed.

1-Start with a freshwater prime: If your system is properly installed this can be easily achieved by first turning on the RED panel switch labeled (SYSTEM ON) upward, this is the first switch from left and it will illuminate indicating it is on. FIG; 1 Below



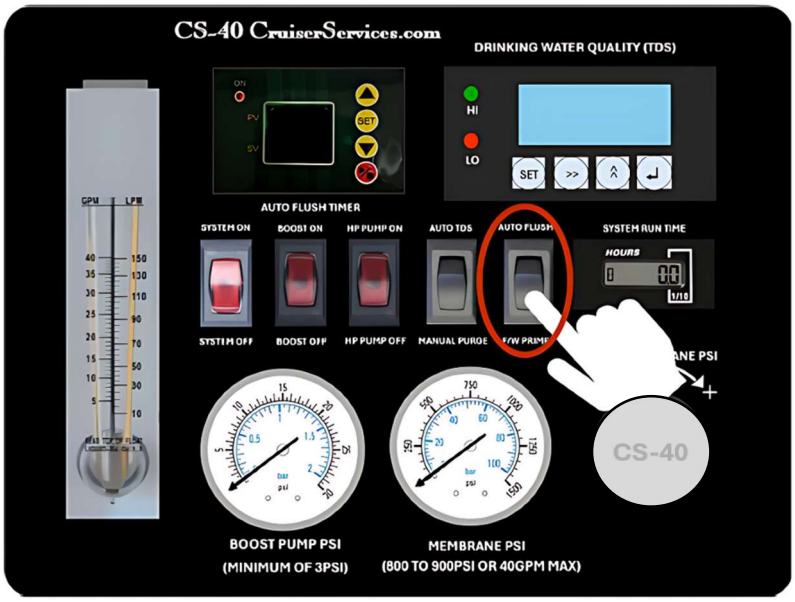
Next push the first BLACK panel switch from left to the downward position which is labeled (MANUAL PURGE) FIG; 2 Below



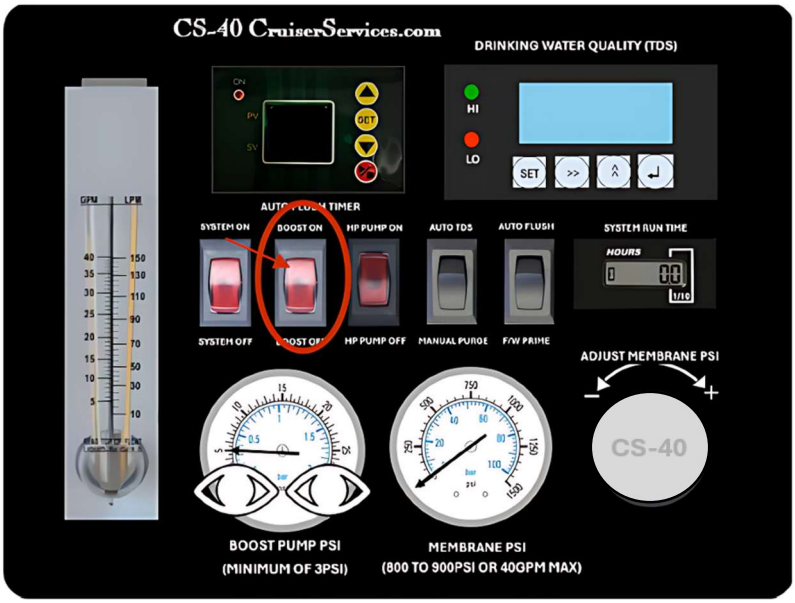
Initial Start Up Procedure And / Or Start Up After Pickling Continued:

Continue with freshwater prime:

Next push and hold the second BLACK switch from left downward where it is labeled (F/W PURGE). Continue this until a steady stream of water is emitted from the exit port. It helps to have a second person look for the purge stream. FIG; 3 Below

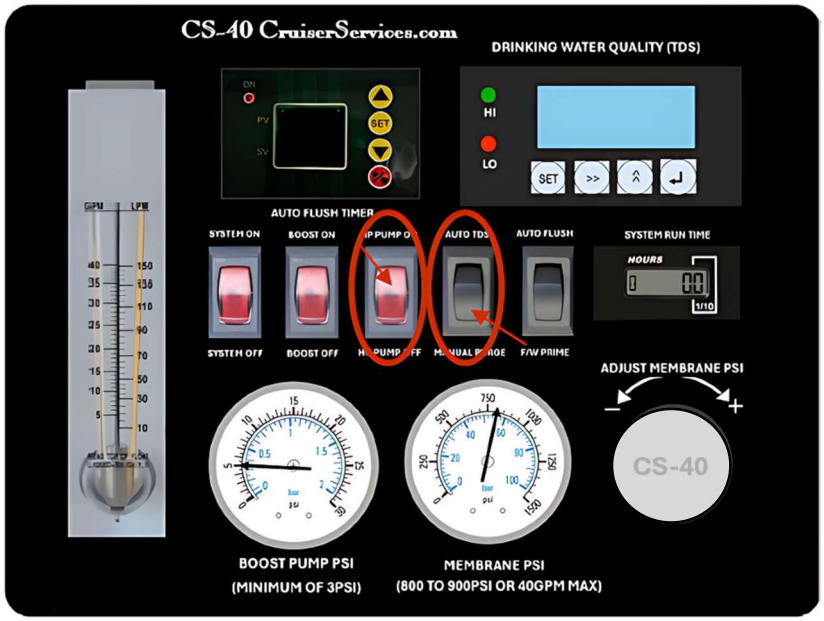


Now Release the (F/W PURGE) panel switch once the freshwater prime has been completed. Next turn on the RED panel switch second from left labeled (BOOST ON), it will illuminate indicating on position. Check the gauge labeled (BOOST PUMP PSI) to ensure that a minimum of 3PSI is achieved - typically 5-9psi with clean pre-filters. FIG; 4 Below



Initial Start Up Procedure And / Or Start Up After Pickling Continued:

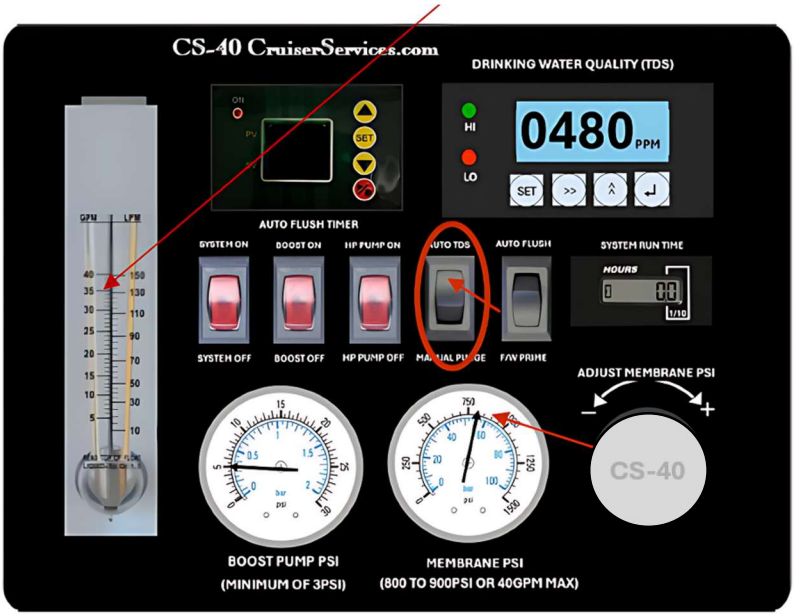
Ensure the BLACK switch forth from left is in the (MANUAL PURGE) position. Ensure the needle valve MEMBRANE PSI knob has been backed off-counter clock wise -.
Then turn on the third from left RED panel switch labeled (HP PUMP ON), it will illuminate indicating it is on, this also activates the hour meter and sends power to the 12v activated relay which in turn powers up the main high-pressure pump. You would need to have a genset or inverter on as well for the current load needed to run the high-pressure pump.
FIG; 5 Below



At this point (ADJUST MEMBRANE PSI) using the CONTROL KNOB to the right of the (MEMBRANE PSI) gauge clockwise + to approximately 600psi. Watch the flow rate meter for air bubbles , check plumbing for any signs of leakage. Once air bubbles have dissipated adjust the CONTROL KNOB clockwise + to approximately 800psi. Run the high-pressure pump for two minutes continuously, during this time product water is purging-check water quality at the purge test point for adverse quality issues-smell and taste. If water quality is acceptable and after two minutes turn on the BLACK panel switch to (AUTO TDS) forth from left side. The TDS monitor is preprogrammed to continue to purge if the product water is above 480PPM. If the product water is below 480PPM the automated 3-way valve will rotate from the purge position to your freshwater storage tank port. Check flow meter to determine production rate-It should be between 33 to 40 GPH FIG; 6 -NEXT PAGE

Initial Start Up Procedure And / Or Start Up After Pickling Continued:

FIG; 6 BELOW **Should be between 33 to 40 GPH**



System Shut Down:

Once the production cycle has been accomplished and the desired amount of freshwater has been produced follow these shut down procedures:

1-Back off the MEMBRANE PSI control knob counterclockwise to below 250psi.

2-Turn off the HP PUMP switch-downward position.

3-Turn off the BOOST switch-downward position.

4-Place the AUTO TDS / MANUAL PURGE switch to the downward manual purge position. This is important to ensure the valve is in correct position for start up and or auto flush cycles.

5-Turn off the SYSTEM switch-downward position.

Setting Auto Flush Cycles

The auto flush timer is preprogrammed for a five minute freshwater flush, every five days as a standard procedure. This can be changed as desired.

Auto flush panel switch has three positions: upward is on, center is off and downward for freshwater prime. Power supply to this switch is independent from the system switch-meaning it is continuous even when the system panel switch is off.

Once the system has been shut down and will not be used again on a regular basis the auto flush timer should be activated to ensure a freshwater flush occurs at the set intervals. **(Important)** During the system shut down procedure the TDS/MANUAL PURGE panel switch should have been pushed downward to the MANUAL PURGE position. If it was not, turn on the system power and activate this switch. This will manually rotate the motorized 3way valve to direct the flow to the purge test point location. Once this has been completed turn off the system power switch.

1-Ensure the ships' house water pressure pump is on.
2-Press the auto flush panel switch to the upward position. LCD read out will illuminate and an auto flush cycle may immediately occur and is indicated by the red dot light illuminated ON the timer face.

3-If the ON indicator light did not appear press the red button on the lower right of the time to initiate an ON flush cycle. Check the purge/test port to ensure water flow is present.

Upper green number displayed 005 is the flush time duration in minutes as preprogrammed. Once a cycle has begun the motorized valve is activated allowing freshwater from the ships pressurized water system to enter through the carbon filter.

Setting Auto Flush Cycles Continued:

Carbon filter removes unwanted harmful chlorine and other VOC's Volatile Organic Compounds from the water source. Timer will countdown for a five minute flush cycle. Once completed the pause cycle will begin in hours indicated by the lower red numbered display (120 – five days) on the timer. Once the set number of hours counts down a repeated flush cycle will be activated and continue to automatically flush the system.

An optional cycle relay can be added to the ship's water pressure system to only pressurize the system during the auto flush cycles. The relay would be activated and wired in conjunction with the auto flush valve.

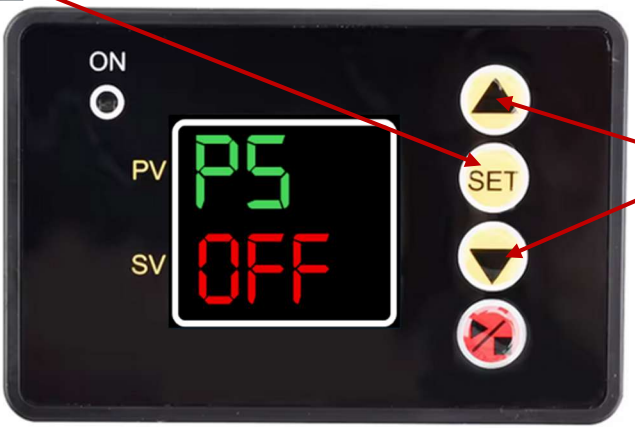
Timer unit is pre-programmed for a 5-minute flush period every 5 days / 120 hours.

The following procedures will describe how to change that setting to your own desired settings.

1- **Timer is in the locked mode. To unlock timer, press and hold the SET button until the first setting appears which will be the image screen below:**

2- **Now press and release the SET button repeatedly which will advance the settings to the lock screen which is PS as seen in the image below:**

3- **Use the arrow buttons to change the -ON to the OFF indicator on the screen, at this point press and release the SET button once. The timer is now unlocked and will return to the timing screen.**

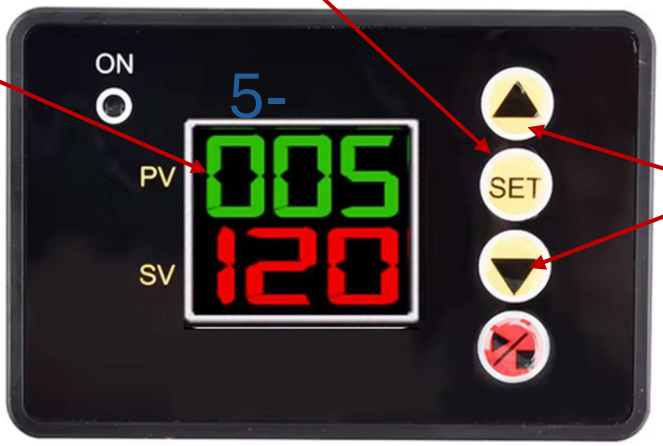


Changing times to your own desired settings.

Once the timer has unlocked the settings can be adjusted. The on time is set for minute countdown which is the top green indicator digits preset to 005 which is 5 minutes.

The off time is set in hours between flushes which is the bottom red indicator digits currently set to 120 hours = 5 days.

4- **To adjust these times double press the SET button. The green minutes on screen will begin to flash, use the arrows to adjust for the desired time interval and press the SET.**



5-Once the on time (in minutes) has been adjusted press the SET button, the red off duration digits will begin to flash. This is currently set for 120 hours or 5 days. Use the arrows to adjust the desired hours between flush cycles.

Once your desired hours are adjusted press the SET button, the timer begins its cycle.

2 days = 048 hours | 3 days = 072 hours | 4 days = 096 hours | 5 days = 120 hours

NOTE: P0 setting is 1 which is minutes on. P1 Setting is 2 which is hours off. It is highly recommended to not adjust these settings as you run the risk of improper duration during flush cycles.

6- Timer is preset for a flush at start. It can be set to start with an OFF cycle first by setting the P2 to OFF. Press and hold the SET button until P0 appears then release the button. Next press the SET button twice to advance to P2, then use the arrow button to change the cycle start from ON to OFF . Press the SET button 3 times to begin the cycle in an off mode.

Starts with a flush cycle on in minutes

Starts with an off cycle in hours

7- P3 setting on the timer is preset to OFF which is a continuous loop. We highly recommend not adjusting this setting as you can run the risk of a failed flush cycle.

OFF = Continuous cycle loop

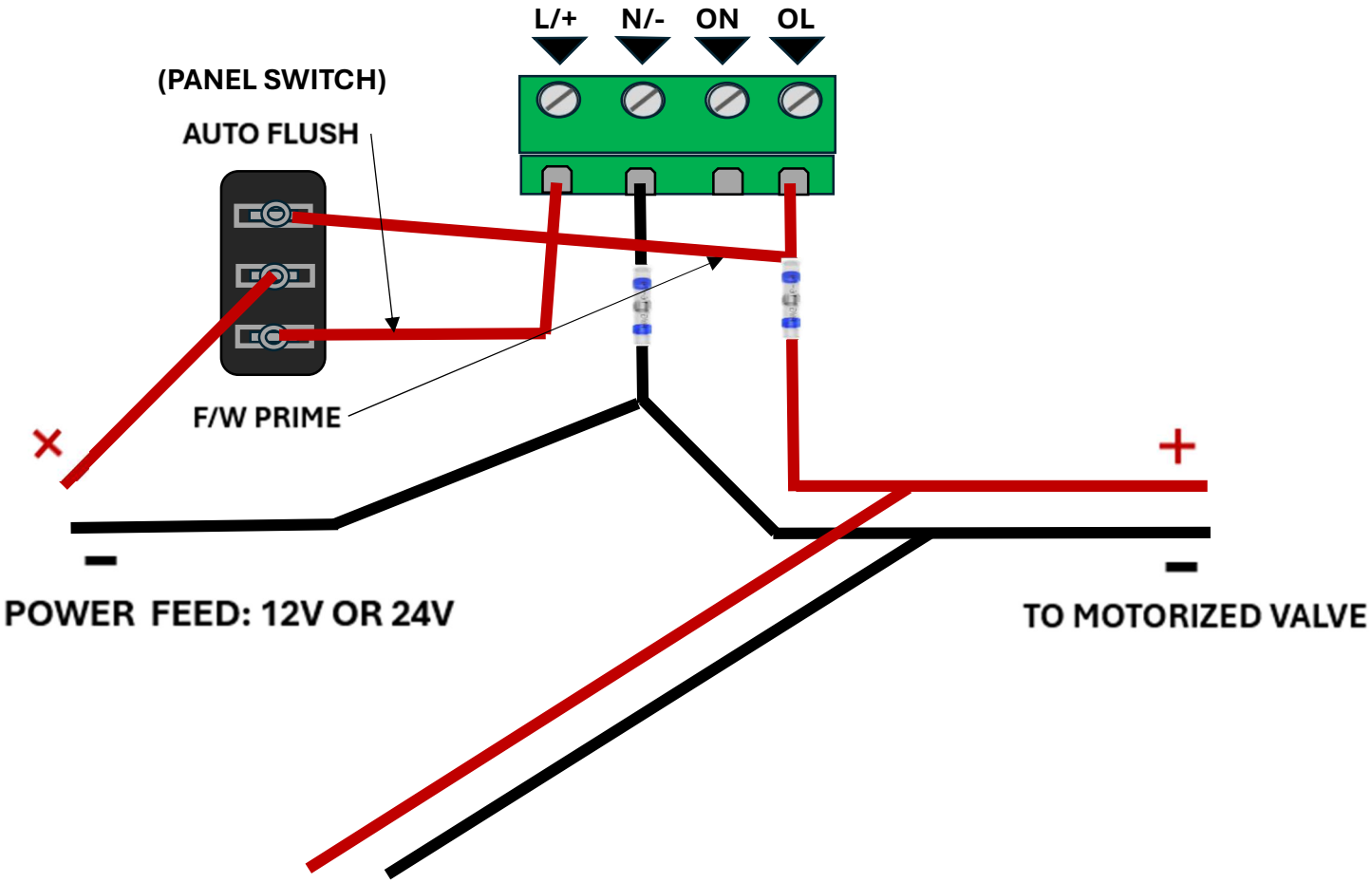
8- P4 setting on the timer is preset to -ON which triggers the flush valve to open during a flush cycle period. We highly recommend not adjusting this setting as you can run the risk of a failed flush cycle.

9- The auto flush panel switch labeled AUTO FLUSH at top and F/W PRIME mode on the lower or downward area. This switch has an ON/OFF/MOMENTARY function. When using it will need to be manually pushed and held down to allow a freshwater prime function to activate. When released the motorized valve will automatically close and will return to the center off position.

The freshwater prime function disables the AUTO FLUSH timer during use and sends power directly to the motorized valve causing it to open and flush or prime the system with fresh water from your tank.

Terminal connections and wiring diagram:

Back side of the timer has the following terminal connections:



Auto Flush Valve / Filter / Check Valve Assembly:

Filter Wrench

Top Mount To Bulkhead 90degrees

Pickling Procedure:

1-Perform a freshwater flush of the system, engage the Auto flush timer and ensure your house water pressure pump is on.

2-Mix 6 tablespoons of the sodium metabisulfite pickling reagent with three gallons of chlorine free freshwater in a 5 gallon bucket.

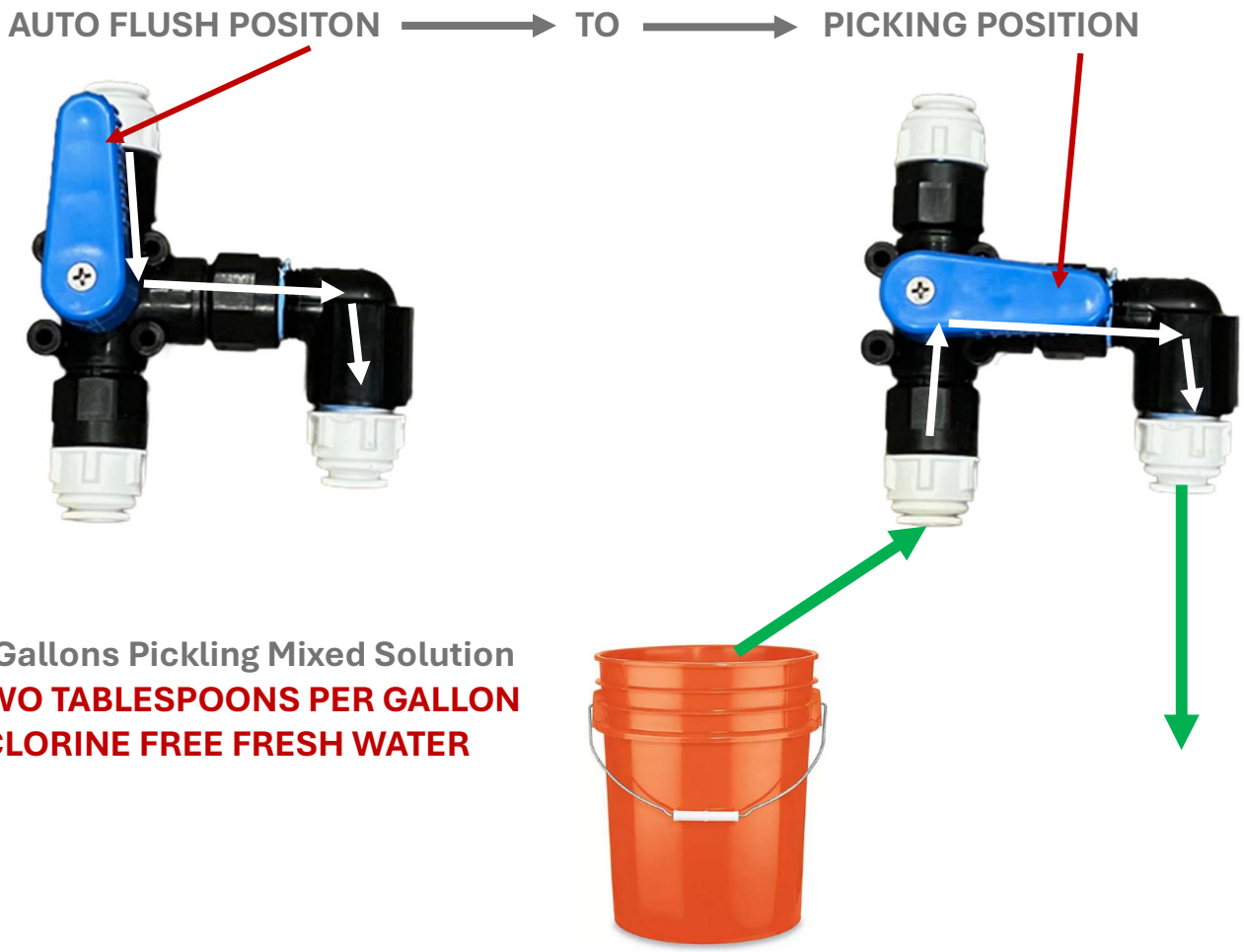
3-Turn off the auto flush system-place panel switch in the center off position.

4-Turn on the SYSTEM panel switch.

5- Ensure the TDS / MANUAL PURGE switch is in the manual purge position-downward.

6-Turn off the thru hull feed valve for the raw water supply.

7-Rotate the pickling manual 3way valve from the auto flush port position to the pickling solution port position.



Pickling Procedure Continued:

8- With the system panel switch on-illuminated turn on the BOOST PUMP panel switch, allow the pickling solution to enter the system. Check the purge test point to ensure flow.

9- Once the solution has been drawn into the system turn off the BOOST PUMP panel switch.

10-Rotate the 3Way pickling valve back to the Auto position

PICKLING POSITION → TO → AUTO FLUSH POSITION

11-Tighten down on the needle valve clockwise to a snug pressure. This seals the brine line and holds back the pickling solution.

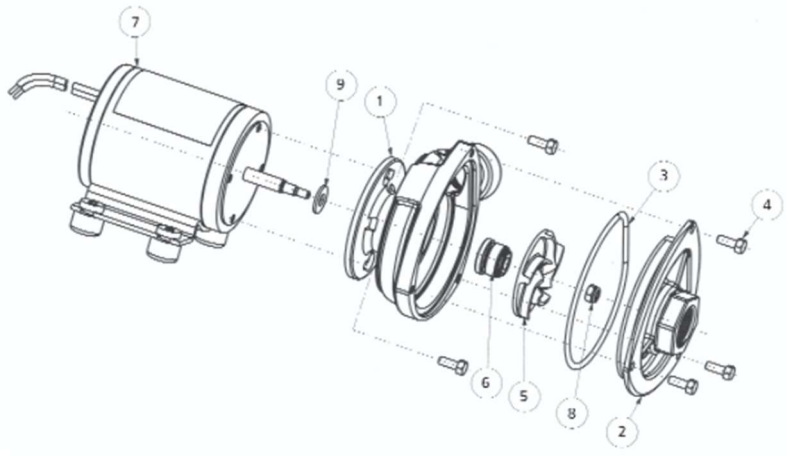
Periodic Maintenance :

Membranes: Under normal circumstances the membranes should have a 5-7 year life cycle. Note: Chlorine is the enemy, avoid allowing chlorine laced to water to come in contact with the membranes. Aways pass through a carbon filter when freshwater flushing the membranes. Always use chlorine free water to mix a pickling solution.

Pre-Filters: The first stage 20micron and second stage 5 micron filters should be checked or changed when the boost pump pressure gauge indicates 5psi or less. Surrounding raw water will dictate a cleaning or replacement.

Carbon Freshwater Flush Filter: The carbon filter **must be changed every six months** from the time it first gets wet. This filter is very important to the freshwater flush cycles in preventing unwanted chlorine from coming in contact with membranes.

Boost Pump: Avoid running the boost pump dry. Rebuild kits are available for the Jabsco pump being utilized . This pump is distributed globally, parts and rebuild kits should be easily available.



(A) Pump Head Kit (NPT) Pump Head Kit (BSP)	50844-0000 50844-2000
(B) Seal Kit	50835-0000
(C) Motor Kit (12V) Motor Kit (24V)	50836-0012 50836-0024

KEY	DESCRIPTION	KIT KEY			QTY PER KIT
		A	B	C	
1	Housing	1			1
2	End Cover	1			1
3	O-Ring	1	1		1
4	Screws	5	5		5
5	Impeller	1			1
6	Seal		1		1
7	Motor			1	1
8	Locking Nut	1	1		1
9	Slinger		1		1

High Pressure Pump:
(General Pump- EWM1615CL)

The CS-40 utilizes a high quality stainless steel pump head as a standard feature.

AGGRESSIVE ENVIRONMENT

FEATURES

- **316 Stainless Steel fluid end for superior corrosion protection**
- **Designed for use in salt water applications**
- **Solid ceramic plungers with advanced surface finish assure durability and longevity.**
- **Compact design offers solutions to space limitations**
- **56C mounting flange**

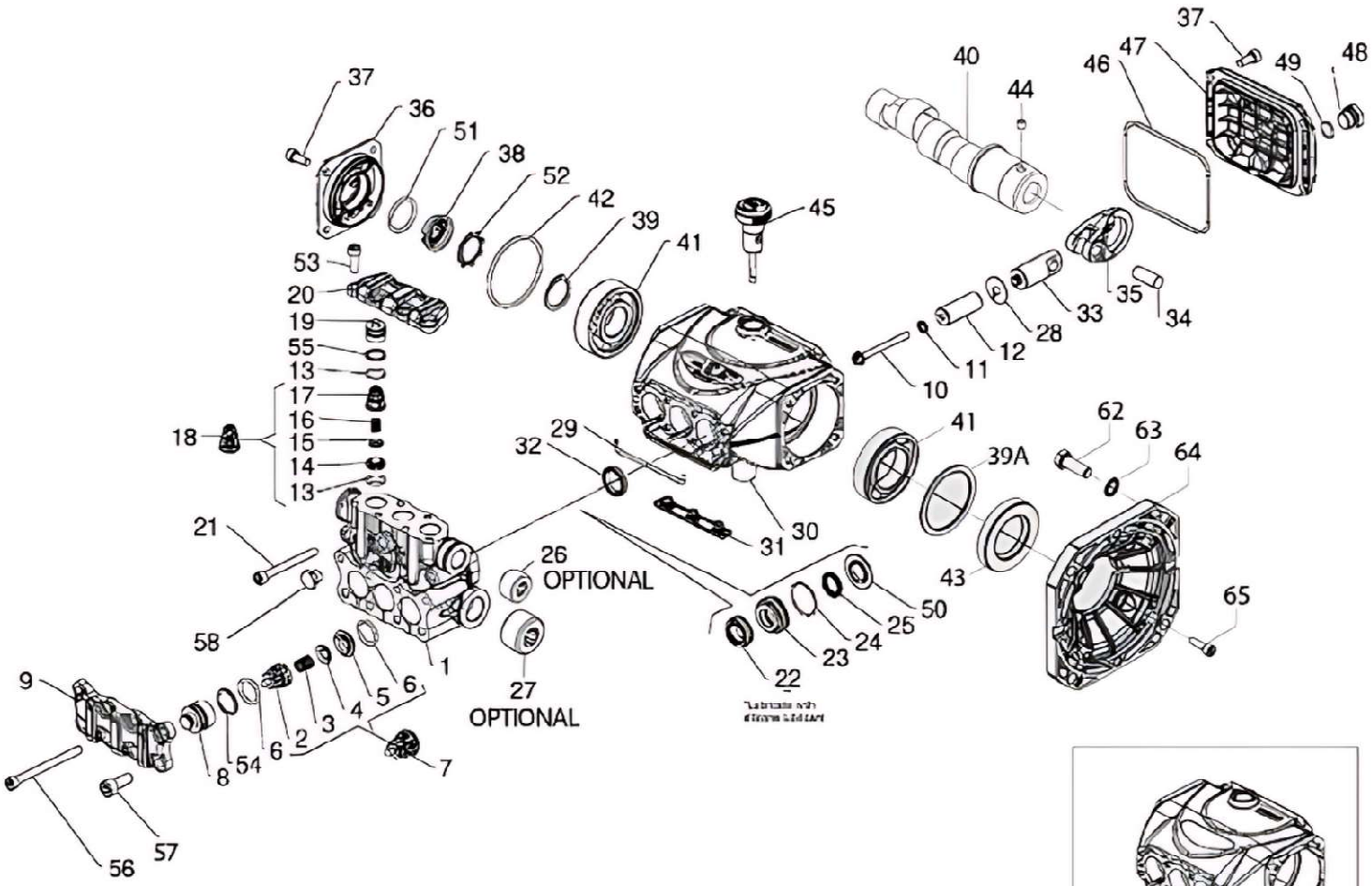
AGGRESSIVE ENVIRONMENT

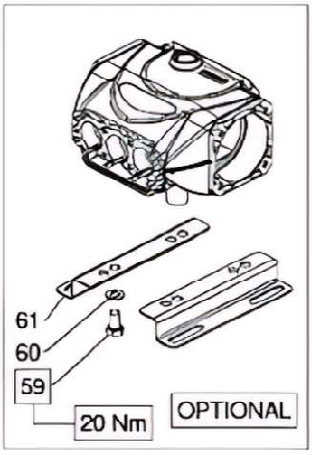
SPECIFICATIONS

Pump Model	EWM1615C							
Maximum Volume	1.6 GPM							
Maximum Discharge Pressure	1,500 PSI							
Maximum Pump Speed	1750 RPM							
Rated Inlet Pressure	125 PSI							
Plunger Bore (in / mm)	.709/18 mm							
Plunger Stroke (in / mm)	.079 in/2mm	.118 in/3mm	.157 in/4mm	.197/5mm	.283/7.2mm	.370/9.4mm	.452/11.5mm	.484/12.3mm
Crankcase Oil Capacity	8.5 oz.							
Maximum Fluid Temperature	185° F							
Inlet Port Thread	1/2" NPT-F							
Discharge Port Thread	3/8" NPT-F							
Shaft Diameter	5/8" Hollow							
Weight	11.05 lbs.							
Dimensions	7.5" x 7.5" x 5.5"							

High Pressure Pump Continued:

EXPLODED VIEW





OIL RECOMMENDATIONS:

Pump crankcase oil must be changed after an initial 50-hour break-in period. Oil must be changed every 500 hours or every other season thereafter. 30wt non detergent oil is the requirement. CAPACITY = 8.5oz

NOTE: Failure to follow these requirements could void pump warranty.

High Pressure Pump Continued:

PARTS LIST:

Item	Part No.	Description	QTY.
1	53123936	Manifold, Ø 18	1
2	36202551	Valve Cage	3
3	94737300	Spring, 9.4x14.8mm, SS	3
4	36200176	Spherical Valve	3
5	36203666	Valve Seat, SS	3
6	701115	O-ring, Ø17.13x2.62	6
7	36713001	Valve Assembly	3
8	53212556	Inlet Valve Plug	3
9	53212336	Inlet Valve Plate	3
10	99169000	Plunger Bolt, M5x55	3
11	96690500	Washer, Ø 5x11.5x0.4	3
12	63040509	Plunger, Ø 18x38.5	3
13	90367400	O-ring, Ø15.60x1.78	3
14	53211166	Valve Seat	3
15	36211276	Poppet Valve, Outlet	3
16	94733300	Spring, Ø6.8x10.8	3
17	36211151	Valve Cage, Outlet	3
18	36724501	Valve Assembly	3
19	36217851	Outlet Valve Plug	3
20	53212436	Outlet Valve Plate	1
21	99199200	Screw, M6x60	8
22	90221000	Seal, HP, HT, 18 X 28 X 10	3
23	53210956	Seal Case,18MM,	3
24	90220000	Seal, LP, 18.0x22.5	3
25	90360400	O-Ring, Ø 25.12x1.78	3
26	520063	Plug, 3/8"-18 NPT (OPTIONAL, not included)	1
27	520062	Plug, 1/2" NPT (OPTIONAL, not included)	1
28	96699000	Washer, Ø 7.5x23x.5	3
29	53210382	Gasket, Ø 3.0x85	1
30	53010022	Crankcase Housing	1
31	58210451	Cover, Drip	1
32	90159300	Oil Seal, Ø18x24x4	3
33	53050166	Plunger Guide	3
34	97733800	Wrist Pin, Ø10x26.5	3
35	53030022	Connecting Rod	3
36	53150022	Cover, Case	18
37	99183800	Screw, M6x14	8

Item	Part No.	Description	QTY.
38	53210851	Oil Sight Glass	1
39	90063500	Stop Ring, A25	2
39A	60210189	O-ring, Ø25.07x2.62	1
40	60022465	Crankshaft, 5 mm, 5/8, Hollow	1
	60022965	Crankshaft, 7.2 mm, 5/8, Hollow	
	60023465	Crankshaft, 9.4 mm, 5/8, Hollow	
	60022265	Crankshaft, 4 mm, 5/8, Hollow	
	60028065	Crankshaft, 2 mm, 5/8, Hollow	
	53020365	Crankshaft, 3mm, 5/8, Hollow	
	53020465	Crankshaft, 11.5mm, 5/8, Hollow	
	53020565	Crankshaft, 12.3mm, 5/8, Hollow	
41	91846400	Crankshaft Bearing	2
42	90389800	O-ring, Ø56.82x2.62	1
43	90167500	Shaft Seal, Ø35x62x10	1
44	99179000	Screw,M6x6	1
45	98210800	Dipstick, G3/8"x45	1
46	90391700	O-ring, Ø88.57x2.62	1
47	63160022	Back Cover	1
48	98204000	Plug, G1/4"x9	1
49	90358500	O-ring, Ø10.82x1.78	1
50	53211056	Support, Ring, 18MM	3
51	90385900	O-ring, Ø25.07x62, NBR 70SH 3100	1
52	90067100	Stop Ring, ZJ30	1
53	99186800	Screw, M6x18	6
54	90514650	Anti-extrusion Ring, Ø 22.4x18.3x1.5	3
55	90509300	Anti-extrusion Ring, Ø 16.4x13.2x1.3	3
56	99199830	Screw, m6x75	4
57	99305800	Screw, M8x20	4
58	98196500	Plug, G1/8x8	1
59	99303700	Screw, M8x16	4
60	96701600	Washer, Ø8.4x14.4x2.0	4
61	50200074	Pump Foot	2
62	99334500	Screw, 3/8-16x1	4
63	96710400	Washer, Ø10.5	4
64	10034422	Flange	1
65	99186800	Screw, M6x18	4

REPAIR KITS

KIT NO.	K341	K334	K311	K382	K384	K384C
ITEM NO'S INCLUDED IN KIT	2, 3, 4, 5, 6, (7)	13, 14, 15, 16, 17, (18)	32	22, 24, 25	22, 23*, 24*, 25, 50	22, 23*, 24*, 25, 50
NUMBER OF ASSEMBLIES IN KIT	3	3	3	3	1	3

TORQUE SPECS*

ITEM	Ft-lbs	Nm
10	4.4	6
21	8.9	12
37	7.4	10
48	14.7	20
56	8.9	12
57	8.9	12
59	14.7	20
65	8.9	12

***NOTE: Pusher (p/n 660062) and install guide (p/n 660281) required for installing item 24 in to item 23**

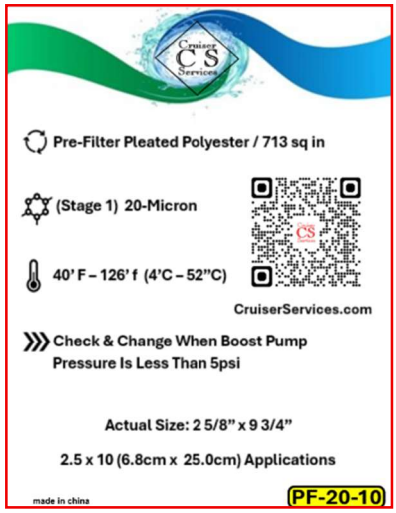
*Decrease torque by 20% if threads are lubricated.

MEMBRANE AND FILTER SPECS:

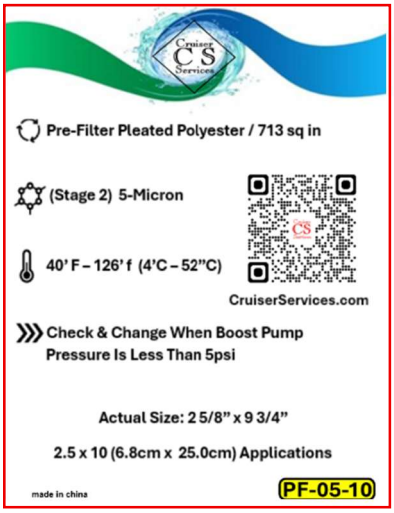
Membrane: Non-proprietary 2540. Two high quality Filmtec SW-30 2540 membranes are preinstalled at the time of assembly and capped/sealed for shipping.

Pre-Filters: Non-proprietary 2.5 X 10" pleated polyester elements.

First Stage:



Second Stage:



Fresh Water Flush Filter: Non-proprietary 2.5 x 10" Carbon Element