

SHS 1500

BBF XF 20000 SKID

SEAFOOD HOLDING SYSTEM 1500



SHS 1500

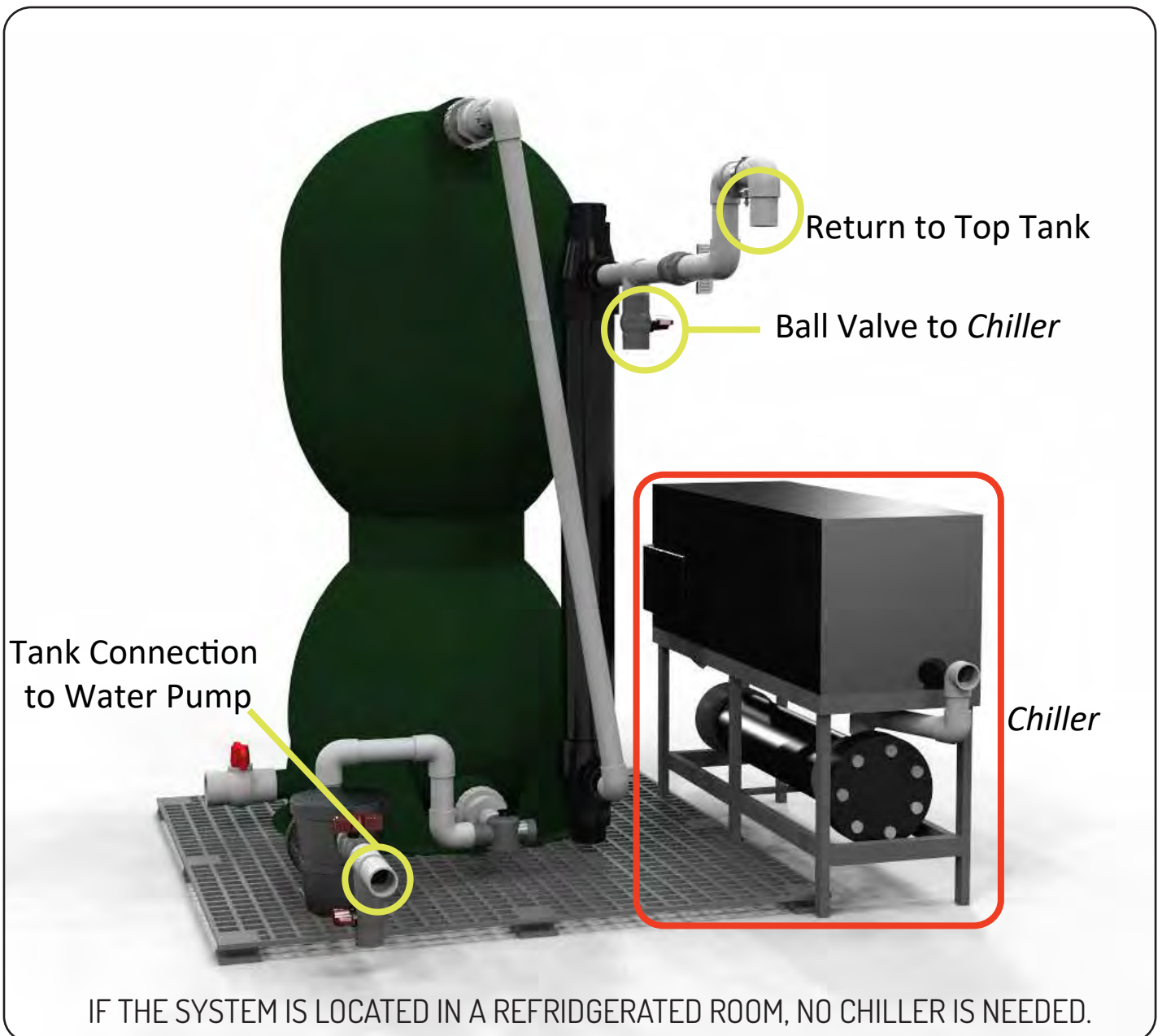
UV STERILIZER FOR SALTWATER APPLICATIONS.

CHILLER RECOMMENDED WHEN SYSTEM IS NOT IN A CHILLED ROOM.

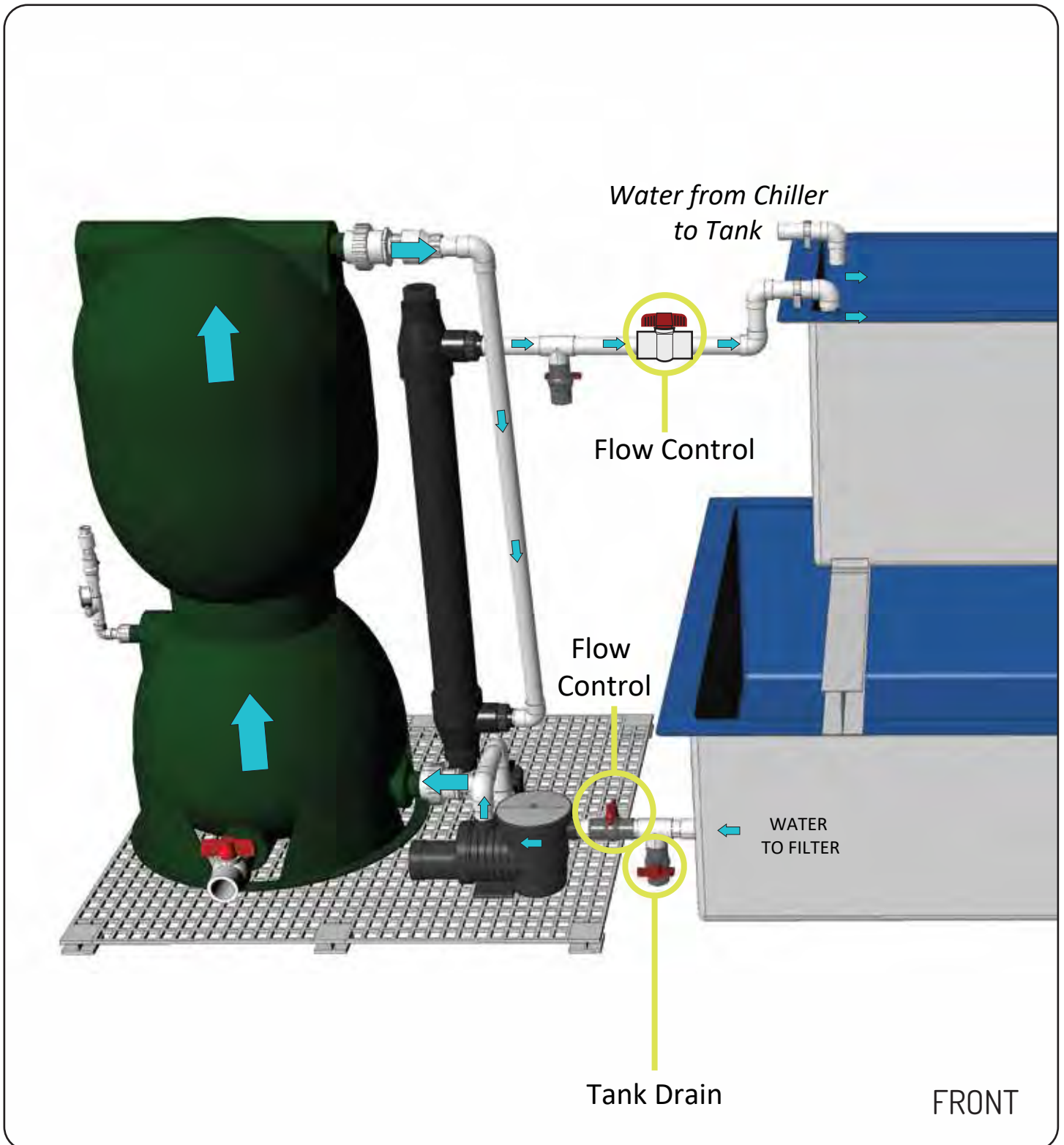
SKID SETUP GUIDE

BBF XF 20000 SKID

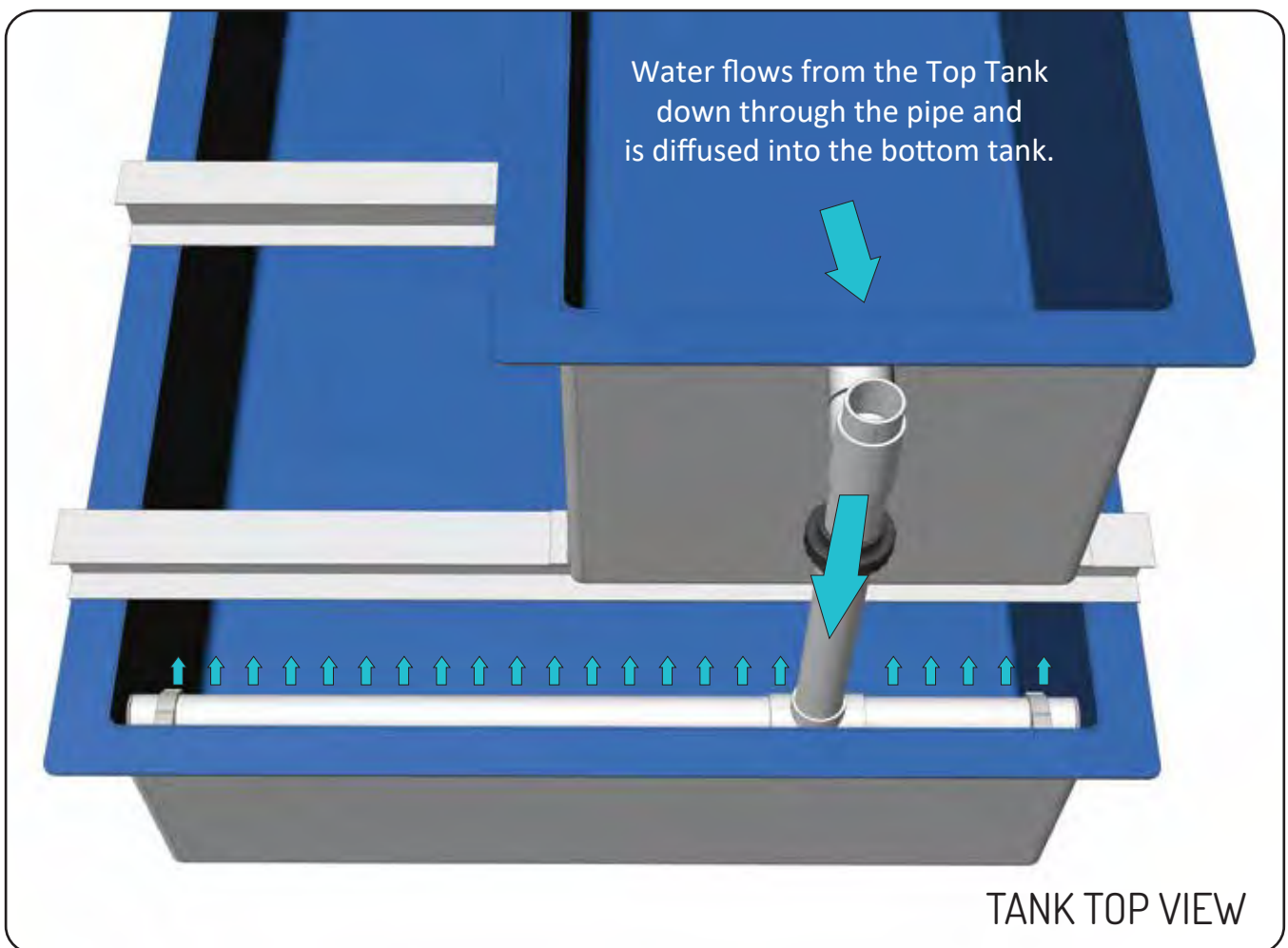
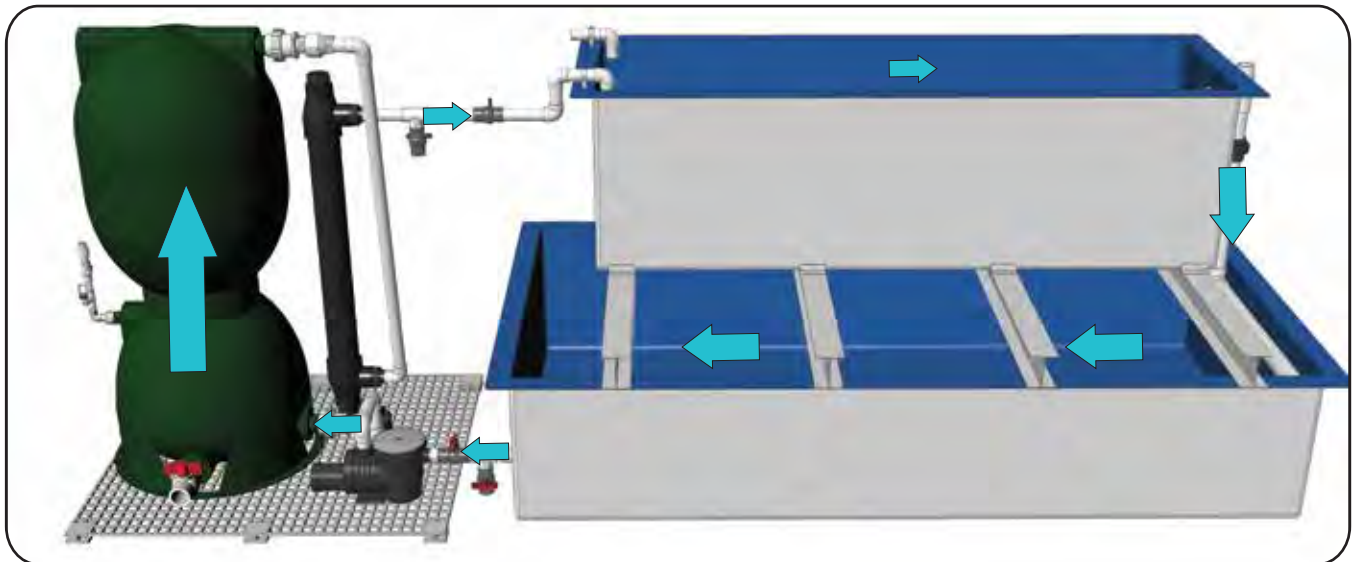
SEAFOOD HOLDING SYSTEM 1500



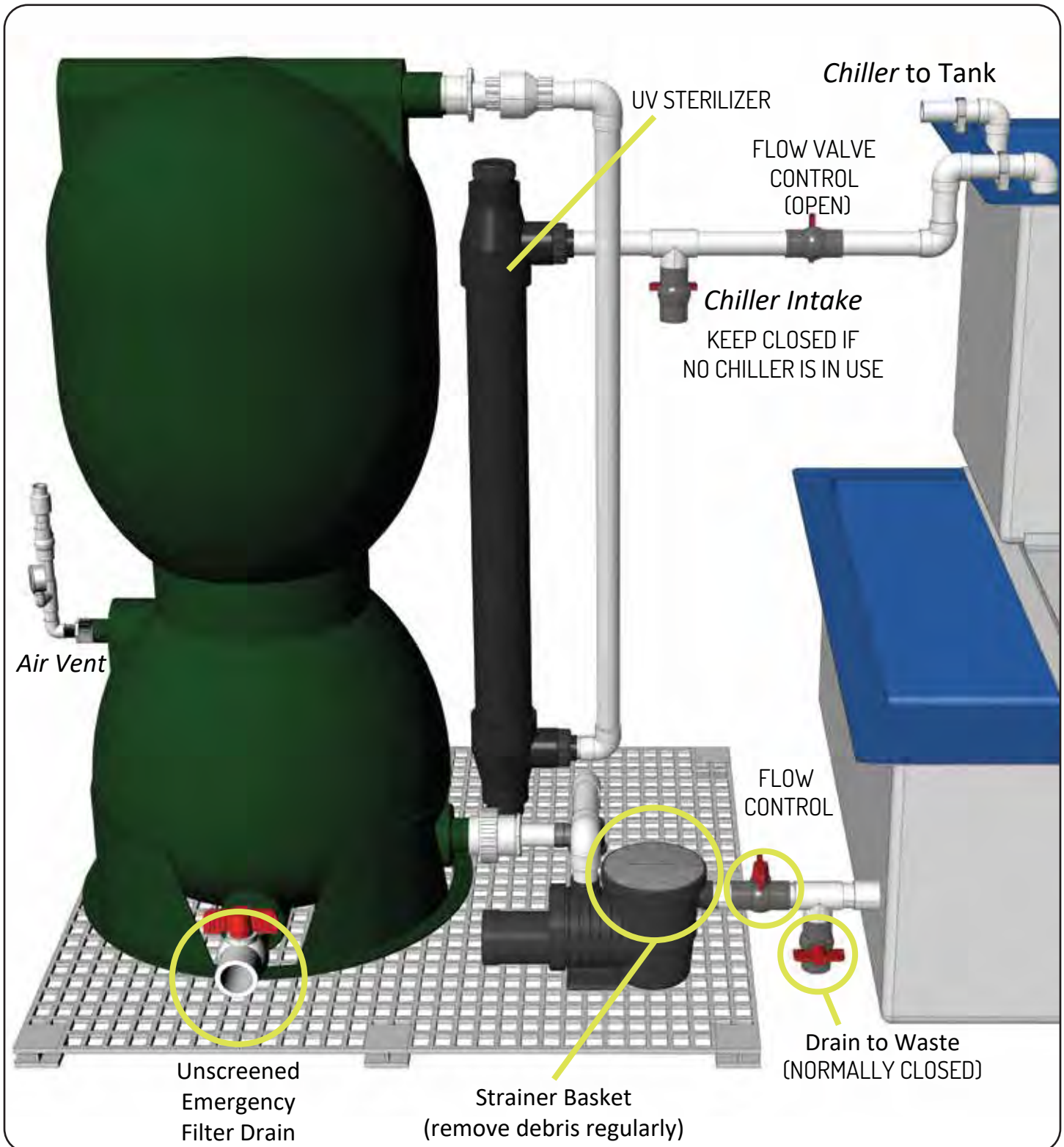
Water Flow Diagram



Water Flow Diagram



Access and Control Points

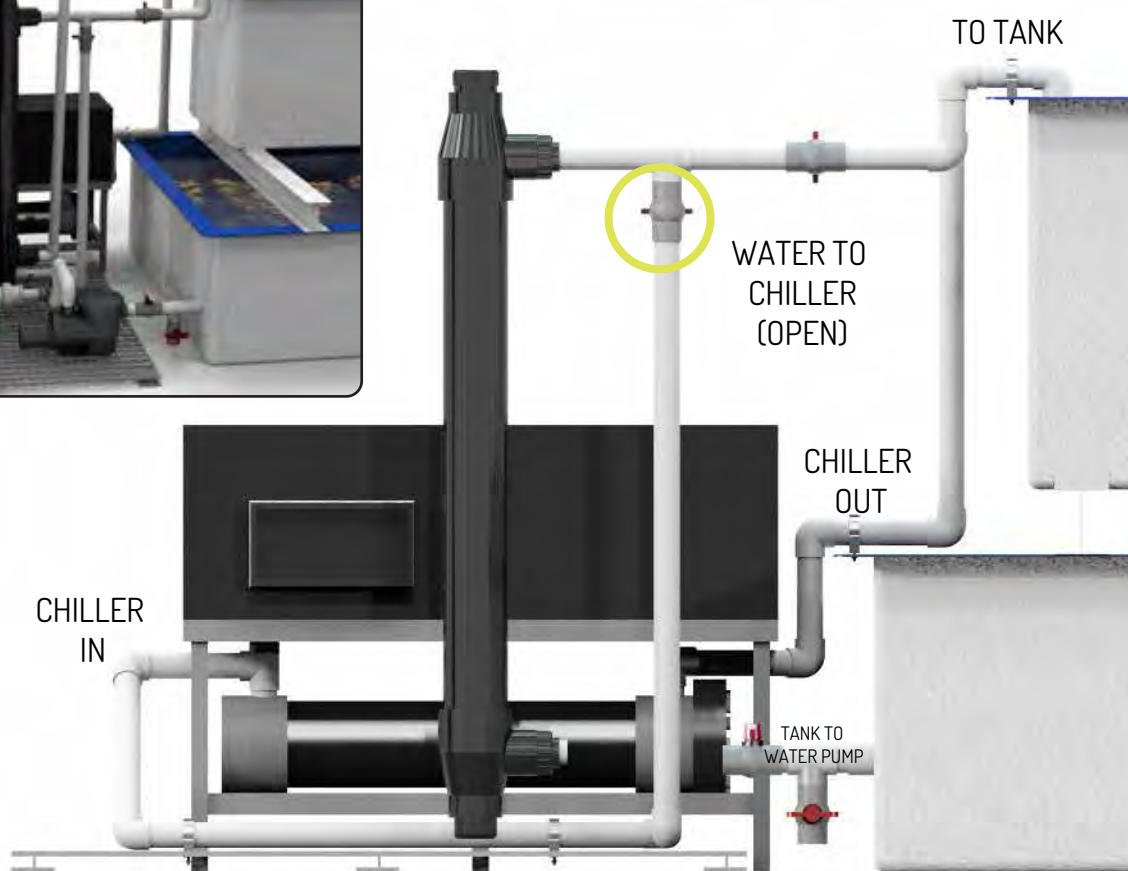


Chiller Connections (Customer Installation)

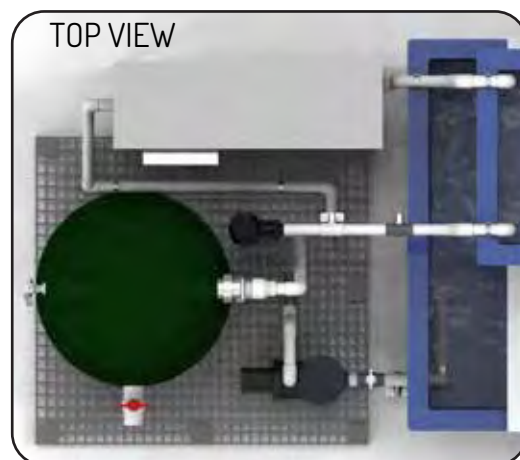


Plumbing to connect a chiller is not provided by AST.

Customer Installation Required.

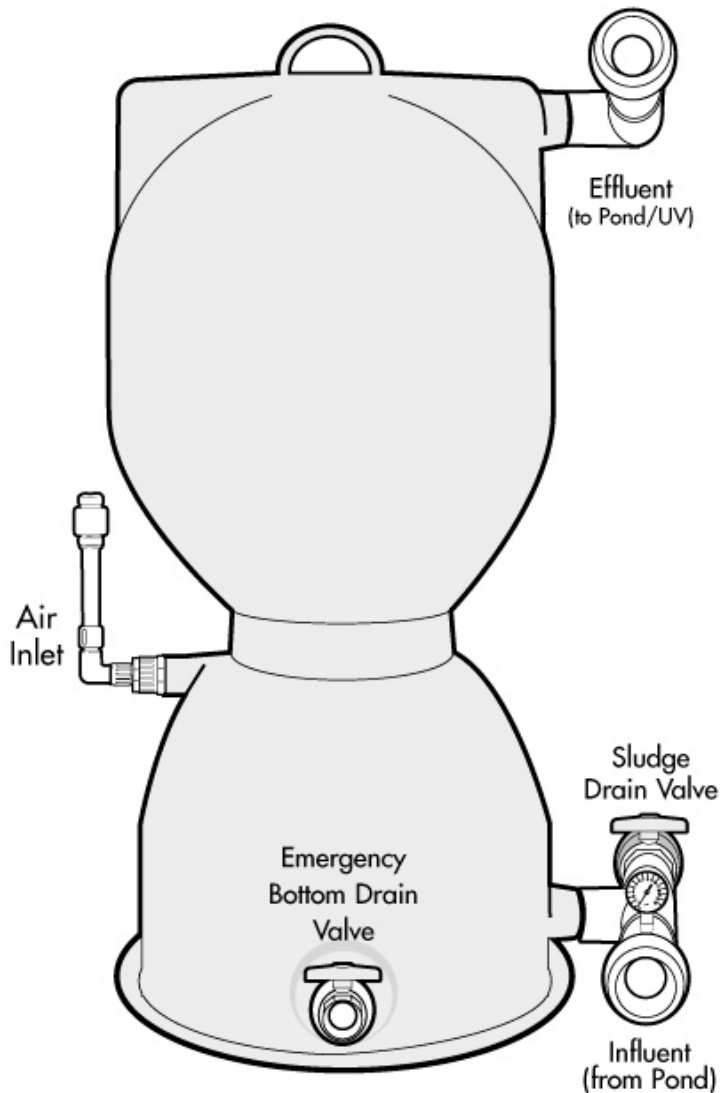


Filter removed to show chiller plumbing.



Model BBF – XF 20000

The Bubble Bead Filtration System



- Provides biological & mechanical filtration
- Uses low HP, low pressure pump
- Easy to install
- Closed filter – perfect to connect to UV
- Corrosion proof
- Superior solids removal
- Excellent nitrification
- No mechanical parts to wear out
- Compact footprint
- Weather & salt water resistant
- Proven product (over 10 years in development under the Louisiana State University Sea Grant Program)

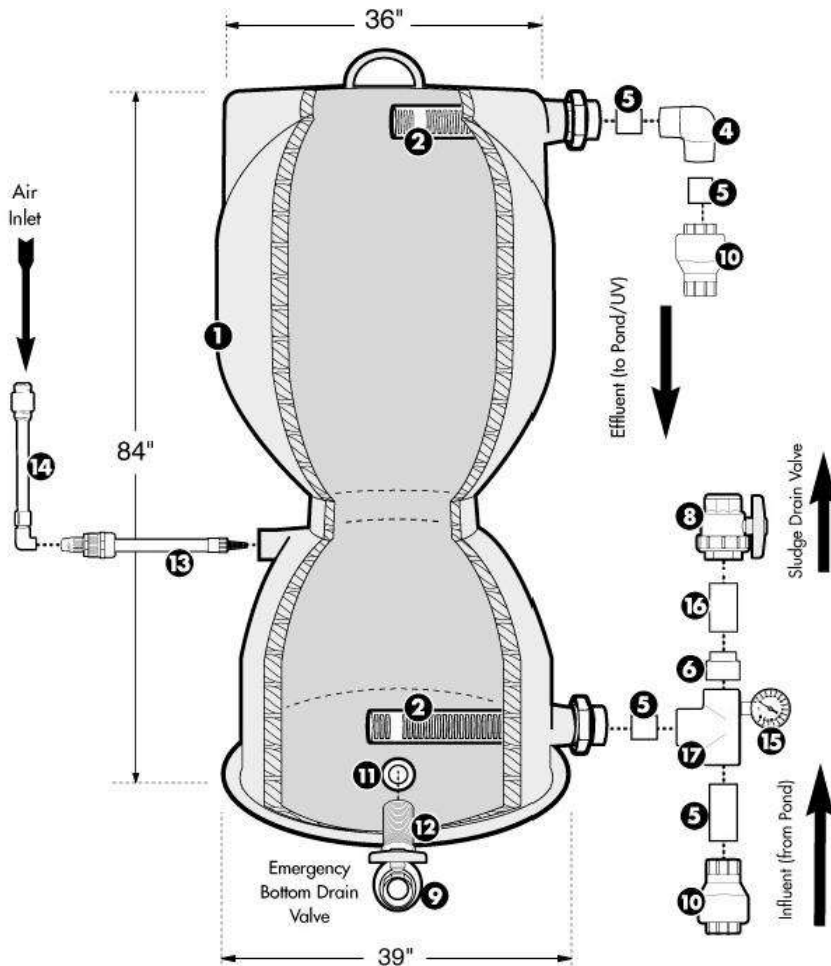
For ponds up to 20,000 gallons • 10 cubic feet of bead media
4,000 square feet of surface area • Maximum flow of 9,000 GPH (150 GPM)



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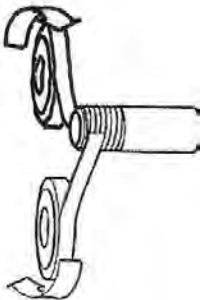
BBF – XF 20000 Assembly Instructions

The following steps assume that a suitable pump (DO NOT EXCEED 15 PSI) has been installed and connected to a GFI-protected line. The use of a GFI around wet conditions cannot be over emphasized.



Part # Description

- | | |
|----|---|
| 1 | Filter Tank |
| 2 | Inlet/Outlet Screens (with 3" union connection) (2) |
| 3 | 330 lbs. Beads (not pictured) |
| 4 | 3" Street Elbow (sp x slip) |
| 5 | 3" PVC Pipe (not included) (4) |
| 6 | 3"x 2" Reducer Bushing (sp x s) |
| 7 | (No longer used) |
| 8 | 2" Ball Valve (slip) |
| 9 | 1.5" Ball Valve (thread) |
| 10 | 3" Swing Check Valves (s x s) (2) |
| 11 | 1.5" Emergency Drain Port (FIPT) |
| 12 | 1.5" Close Nipple |
| 13 | Air Inlet Screen (part B) |
| 14 | Air Inlet Check Valve Assembly (part A) |
| 15 | 30 psi Pressure Gauge |
| 16 | 2" PVC Pipe (not included) (1) |
| 17 | 3" Tee (s x s x s) |



IMPORTANT!

Before assembly **ALL** threaded plumbing parts **MUST** have several wraps of Teflon tape or Teflon paste applied to the threads.

(Note: The direction the tape is wrapped is very important. If, when you install the fittings into the filter, the tape starts to peel off, remove and wrap in the opposite direction. Use Teflon tape or paste on all threaded fittings when assembling your Bubble Bead Filter.)

BBF – XF 20000 Assembly Instructions

IMPORTANT Please read ALL instructions BEFORE assembling your Bubble Bead Filter. Also, a check valve (not included) should be installed between the filter and the pond on the inlet side to prevent the filter from backwashing into the pond due to pump or power failure.

Locate parts 2, 12, 13 and 15 and apply several wraps of Teflon tape or Teflon paste to the threads. (NOTE: The direction the tape is wrapped is very important. Wrap the tape counterclockwise to the threads. When you install the fittings into the filter, if the tape starts to peel off, remove the tape and wrap it in the opposite direction.)

After wrapping/pasting the fittings correctly with Teflon, continue assembly by completing the following steps:

- | | |
|--|---|
| <p>Step #1: Thread Inlet Screen (#2) into the 3" threaded opening at the bottom of the filter tank (#1).</p> <p>Step #2: Thread Air Inlet Screen (#13) into the threaded opening located in the center of the filter hull.</p> <p>Step #3: Thread the FIPT end of the Air Inlet Check Valve Assembly (#14) onto the MIPT end of the Air Inlet Screen (#13) already installed in Step 2.</p> <p>Step #4: Thread the 1.5" close nipple (#12) into the 1.5" ball valve (#9) then thread this assembly into the emergency drain valve port (#11). Be sure the valve is closed.</p> <p>CAUTION: The purpose of the emergency drain valve (#9) is for the removal of sludge that may build up in the bottom of the filter. It should only be opened when the filter is full of water. Opening it once a month for a couple of seconds is more than adequate. If used improperly you can lose all of the beads in your filter.</p> <p>Step #5: Pour the beads (#3) into the filter tank (#1) via the 3" opening located at the top of the filter. The filter may be laid on its side or at an angle.</p> <p>Step #6: Thread the Outlet Screen (#2) into the 3" threaded opening at top of the filter.</p> <p>Step #7: Using PVC primer and glue, glue the 3" Street Elbow (#4) into the union of Outlet Screen (#2). The direction the Elbow faces is at the installer's discretion.</p> <p>Step #8: Using PVC primer and glue, glue a short piece of 3" PVC pipe (#5) into the Street</p> | <p>Elbow (#4)</p> <p>Step #9: Using PVC primer and glue, glue one of the 3" Check Valves (#10) onto the short piece of PVC pipe glued to the 3" Elbow (#4) as described in Step #8. (If the Check Valve is installed in a horizontal position make sure to follow the instructions printed on the valve.) Be sure the flow is directed away from the filter and back to the pond.</p> <p>Step #10: Using a short piece of PVC pipe (#5) glue the 3" Tee (#17) into the bottom Inlet Screen (#2) installed in Step #1.</p> <p>Step #11: Using PVC primer and glue, glue the 3" x 2" reducer bushing (#6) onto the sludge drain side of the Tee (#17).</p> <p>Step #12: Using PVC primer and glue, glue a short piece of 2" PVC pipe (#16) into the 3" x 2" reducer bushing (#6) installed in Step #11.</p> <p>Step #13: Using PVC primer and glue, glue the 2" sludge drain valve (#8) onto the short piece of the 2" PVC pipe (#16) installed in Step #12.</p> <p>Step #14: Using PVC primer and glue, glue a short piece of 3" PVC pipe (#5) into the inlet side of the Tee (#17).</p> <p>Step #15: Using PVC primer and glue, glue the remaining check valve (#10) onto the short piece of 3" PVC pipe (#5) installed in Step #15. Check to be sure the flow is directed from the pump into the filter (see arrow on check valve).</p> <p>Step #16: Using a 1/4" NPT pipe tap and 7/16" drill bit, tap the PVC pipe or fitting in the line between the pump and filter. Install the Pressure Gauge (#15).</p> |
|--|---|

BBF – XF 20000 Operating Instructions

NOTE: It is extremely important that the check valve in Step #9 above is installed for your filter to function properly. It is equally important that the second *check valve is also installed (Step # 15) between the filter and the pump to prevent the filter from backwashing into the pond during a pump or power failure.*

Make sure all valves are set to the correct position. Start the pump. Check for leaks. You will hear some chattering from the beads as the filter fills. Once full, the noise will stop. If there are no leaks and the water output is normal, your Bubble Bead Filter is operating properly. You should check operation and connections every day. After your Bubble Bead Filter has been operating one or two days, you can help the biological process along by adding **One and Only Live Nitrifying Bacteria** from Dr. Tim's Aquatics (www.drTIMSAQUATICS.com), use coupon code **ASTBEADFILTERS** for a courtesy discount. This is the only bacteria on the market that we are aware of that contains bacteria specifically isolated from a pond environment.

The natural acclimation period for your new biological filtration should be 3-4 weeks in warm water (>80 deg F), longer in cooler water.

IF YOU WILL NOT BE OPERATING THE FILTER DURING THE WINTER, DRAIN THE WATER FROM THE FILTER HULL AND OPEN ALL BALL VALVES TO PROTECT THEM FROM DAMAGE DUE TO FREEZING.

BBF – XF 20000 Backwash Instructions

To backwash your Bubble Bead Filter, follow these simple steps:

1. Turn the pump off or bypass the water flow.
2. Rotate the handle of the valve 90 degrees so that the valve to the drain line is in the open position. You will hear the vent valve sucking air and churning of the beads as air boils up into the filter. Best results are obtained when the filter is allowed to drain completely. Observe waste water; large particles caught by bottom screen will wash out first. Debris trapped by the beads will wash out near the end of the flush.
***Note the faster the water drains from the filter the more vigorous the backwash.**
3. Rotate the handle of the valve 90 degrees so that the valve to the drain line is in the closed position. Now is a good time to clean the strainer basket on the pump, if necessary.
4. Turn the pump on. It is normal for the first 1 to 2 gallons of water flowing from the filter after a backwash to be cloudy. If this causes you concern, you can modify your plumbing to direct this water to the drain by installing a 3-way valve and directing the first flow to the drain; then return the flow to your waterfall or other water feature.

Minimum flushing cycles (for heavy loading, more frequent cycles are necessary):

- During Spring and Fall Once a week
- During Summer Three to four times a week
- During Winter Once or twice a month

LIMITED WARRANTY

Aquaculture Systems Technologies LLC (AST) warrants the material and workmanship to be free of defects under designated use and normal service on its **Bubble-Washed Bead Filters** for a period of one (1) year from the date of shipment. All warranty claims must be presented in writing to AST. Normal use and service requires the following:

1. The filter is installed and operated according to the installation and operational instructions supplied by the manufacturer.
2. The excessive weight due to heavy pipes, valves, etc., should not be carried by the inlets or outlets.
3. The filter hull pressure is at no time allowed to exceed the maximum pressure rating as specified by the manufacturer.

This warranty applies only to the original purchase price and is good only when the total payment for the equipment has been received. The limited warranty (expressed or implied) during the warranty period shall consist of the repair or replacement of the items of manufacture, at the discretion of **AST**, and said warranty applies only to the original purchaser. This warranty is void if the items are damaged by negligence or accident after purchase,

used for other than the intended purpose, altered, repaired at other than an authorized service center, or used with other items that affect the integrity, performance, or safety of these items. Liability does not cover indirect or consequential cost, including materials lost, labor or installation/reinstallation cost, injury, property damage, or damages caused by mishandling. Returns for repairs must be pre-approved and the "return authorization number" prominently displayed on the outside of the shipping container. **Returns will not be accepted without a "return authorization number."** Returns for repair must be sent **FREIGHT PREPAID** to the following address:

Aquaculture Systems Technologies LLC
Attention: Warranty Repairs
2120 North 3rd Street
Baton Rouge, LA 70802
(504) 837-5575 (504) 504-5585 fax
info@beadfilters.com

Manufacturer's liability for incidental or consequential damages is specifically excluded to the full extent permitted by the applicable law. This warranty gives you specific legal rights, and you may also have other rights which may vary from state to state. **THIS WARRANTY IS EXCLUSIVE OF ALL OTHER IMPLIED WARRANTIES INCLUDING MERCHANTABILITY AND FITNESS FOR A PARTICULAR PURPOSE.**

Please complete the following for your records.

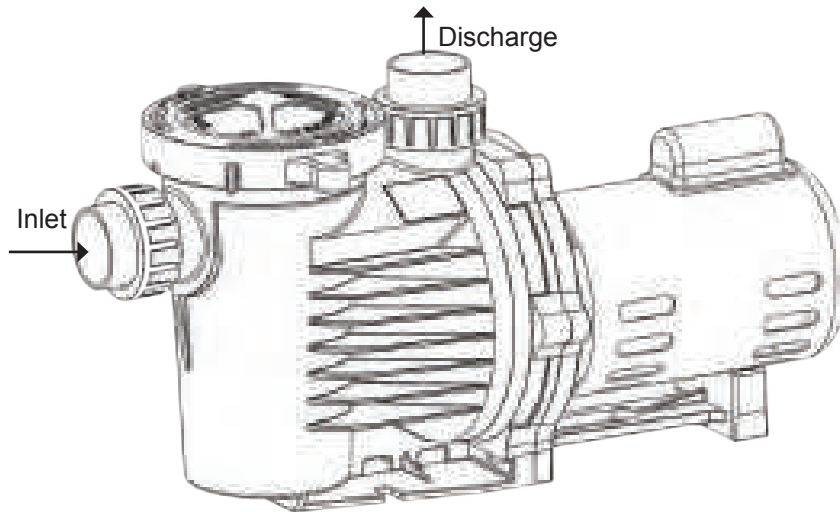
Filter Model #: _____
Date Purchased: _____
Purchased From: _____



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Artesian² Owners Manual

Energy-Efficient, Self Priming Centrifugal Pumps



Important Safety Instructions

Please read all instructions completely before you install or operate your new pump.
Save this manual for future reference.

General Specifications

Housing - Corrosion resistant polypropylene with 2" slip fittings.

Seal - Stationary type - Stainless Steel, with Buna trim, for 5/8" shaft.

Motors - NEMA 56Y Frame

WARNINGS

1. This pump and motor unit should be installed by a qualified electrician or serviceman in accordance with all applicable state and local codes and ordinances, and in accordance with the National Electrical Code. Improper installation may create a mechanical or electrical hazard which could cause damage to property and which could result in serious injury or death. Always follow the schematic on the motor for all electrical connections!
2. In order to avoid serious injury or death, always disconnect power to the motor before servicing the pump.
3. Always use the schematic on the motor for all electrical connections.
4. Never run the pump dry. You must fill the priming pot with water and secure the lid before starting the motor.
5. Never start the pump when the motor shaft is turning. To prevent unwanted motor rotation, install a swing type check valve.
6. If you are not competent to install the pump, get help from a qualified source.
7. Maintain a minimum flow rate of at least two gallons per minute.
8. Visually inspect the pump and motor at least once a month. If there is any leakage from the shaft seal, replace it at once. The seal faces wear (just like car tires) and must be replaced periodically. For critical applications, replace the shaft seal yearly.
9. For 3 phase motors insure proper motor rotation.
See item 7 in electrical for details.



5976 SE Alexander Street, Suite F
Hillsboro, OR 97123
P: 503-356-5888 F: 503-356-1660
www.performancepropumps.com

Installation

General

Proper installation of your Artesian2 pump will help insure years of trouble free service.

1. Position the pump as near to the water and as low as is practical. This will help reduce priming time, avoid cavitation, and maximize your pumps performance.
2. Minimize friction losses by using large diameter pipe, reducing the length of runs, and minimizing the number of elbows and fittings as much as possible.
3. Protect the motor from excessive heat. It is best to provide shade from direct sun, and insure that it has proper ventilation. Excessive heat will shorten the life of the motor and void the warranty.
4. Protect the motor against dirt, water and all foreign matter. If the motor has been flooded, do not operate it until it has been checked by an authorized motor technician and has been found to be safe to operate. If the motor is damaged by dirt, moisture, or corrosion it voids the warranty.
5. Mount the motor to a stable base where it will not get submerged.
6. The pump ports are 2" slip fit on both the inlet and discharge ports. The fittings used to connect to the housing should be plastic. All plumbing lines should be self supported and properly aligned. This will prevent undue stress to the housing. We recommend using a good primer and PVC cement to glue your pipe to the tailpieces.
7. Installations in which the discharge pipe is elevated above the pump must use a swing type check valve to prevent back flow and possible reverse rotation.
8. BEFORE STARTING THE PUMP, YOU MUST FILL THE PRIMING POT WITH WATER.

Electrical

1. If you are not competent to wire an electric motor, hire someone who is!
2. Make sure the power is disconnected before wiring the motor.
3. Make sure that the motor is wired internally so that it matches the supply voltage. If they do not match it will damage your motor and void the warranty (i.e., If you are connecting it to a 115V breaker, make sure the motor connections match the 115V (low) wiring diagram found on your particular motor.) Always follow the schematic on the motor for all electrical connections.

NOTE: Baldor motors have separate wiring schematics for low (115V) and high (230V) applications. Both schematics are shown for dual voltage motors.

AO Smith motors use a switch to change between low (115V) and high (230V) on dual voltage motors. This switch is located under the rear cover on the back of the motor. The wiring schematic is the same for these motors since the switch determines the voltage selected.

4. Use a supply wire of adequate gauge to prevent electrical line losses. The use of properly sized wire will allow the motor to run cooler and more efficiently, by eliminating excessive line voltage loss.
5. Make sure all connections are clean and tight. Properly ground the motor. (There is normally a green ground terminal located inside the motor connection box.) Make sure the ground wire is properly connected to an electrical service ground.
6. Connect the pump permanently to an adequately sized circuit. It is best to have a dedicated circuit that will not suffer a voltage drop from other loads.
7. When using 3 phase power the **motor leads must be energized in the correct sequence to provide the correct motor rotation.** When viewed from the shaft end, the motor must rotate counterclockwise. **Incorrect rotation will destroy the pump and void the warranty.**

If you are unsure of the sequence of your incoming electrical supply lines, remove the volute (front housing) and diffuser from the pump, then connect the power and check rotation. If rotation is incorrect, exchange any two of the connected leads and retest. When the rotation is correct, reinstall the diffuser and volute (front housing).

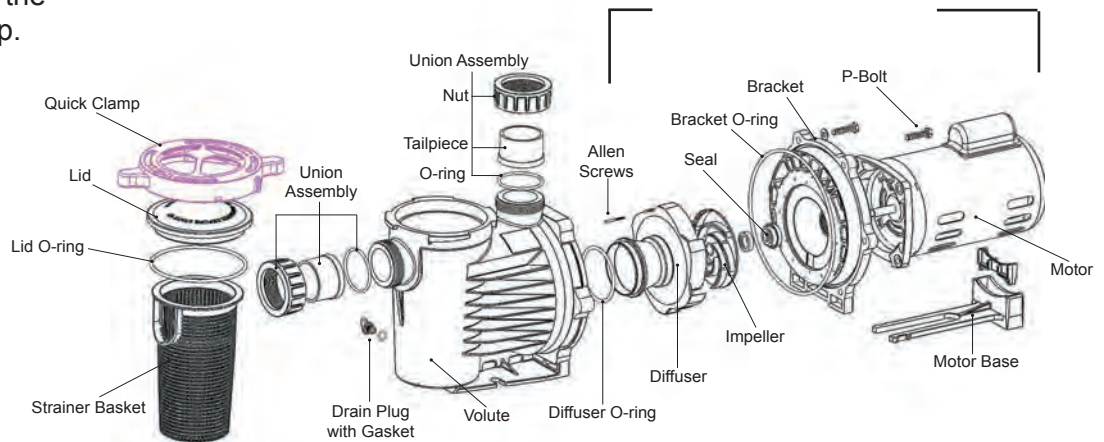
- * **Never test rotation by bumping a connected electrical switch. This will destroy the pump and void the warranty!!!!**

Pump Disassembly

All moving parts are located in the rear sub-assembly of this pump.

Tools required:

1. 3/32 inch Allen wrench.
2. 7/16 inch open end wrench.
3. 9/16 inch open end wrench.
4. Small and large flat bladed screwdrivers.
5. Large Phillips screw driver.

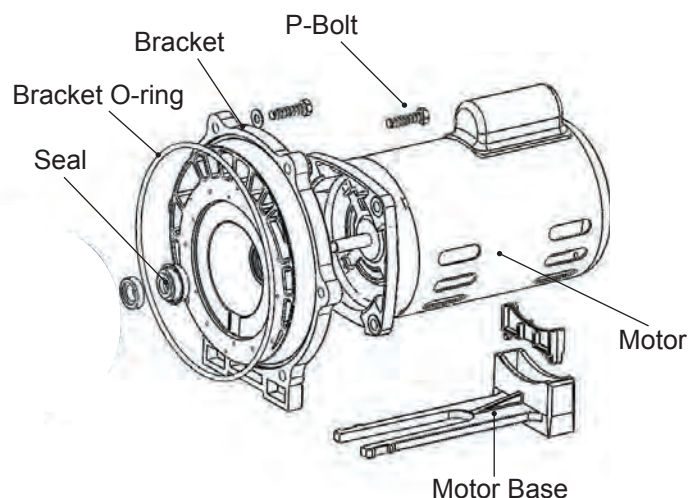


Disassembly and repair of the motor sub-assembly can be made as follows:

1. At the main panel turn off the circuit breaker for the pump.
2. Close all necessary valves on inlet and discharge lines and drain the pump by removing both drain plugs.
3. Loosen and remove the six 3/8" P-bolts that hold the volute and the bracket together.
4. Pull the rear sub-assembly away from the volute. (The volute can remain attached to the plumbing.)
5. Loosen and remove the two 3/32" Allen screws that hold the diffuser to the bracket and remove the diffuser.
6. Remove the set screw (if it has one) from the impeller eye. To do this, hold the impeller stationary, and turn the set screw clockwise (it has a left-handed thread).
7. Hold the motor shaft stationary (by removing the cap on the opposite end of the motor and inserting a screw driver in the slot, or a wrench on the flats, depending on the motor design) and unscrew the impeller by turning it counter clockwise.
8. Loosen and remove the four 3/8" M-bolts that hold the bracket to the motor face.
9. If you wish to remove the shaft seal, place the bracket face down on a flat surface and press out the carbon/spring seal from the back side. Never pry it out from the front.
10. Carefully remove the ceramic from the back impeller hub with a small straight screw driver.
11. Clean the bracket, seal bore housing, and the motor shaft as necessary.

Pump Assembly

1. To install a new shaft seal, clean or replace the o-ring in the bore. If there is no o-ring, clean the bore and apply a bead of 100% silicon sealant inside the bore and around the top edge.
2. Press the seal into the bore (without touching or putting pressure on the delicate carbon face) by pushing on the stainless steel collar. (A large socket or a pipe nipple can be used). Make sure it is uniformly seated all the way around.
3. Clean as necessary the impeller hub, and press in the ceramic. Make sure that it is sitting flat. (The white ceramic face must be showing - Not the rubber boot!)
4. Remount the bracket to the motor. Tighten the four M-Bolts (3/8" cap screws).



Pump Assembly Continued

5. Screw the impeller clockwise onto the motor shaft (while holding the motor shaft stationary) until it makes firm contact. Screw in the impeller set screw (if it has one), with its gasket in place, (counter-clockwise to tighten).
6. Mount the diffuser onto the bracket. Make sure the plastic pins fit into the holes in the bracket, then tighten both Allen head screws.
7. Make sure the diffuser O-ring and bracket gasket are clean and properly seated.
8. Assemble the motor sub-assembly to the volute by using the two P-Bolts (3/8" cap screws) through bolts with nuts for proper alignment. Do not tighten the through bolts until all six P-bolts are in place and finger tightened. Tighten all six bolts uniformly and in a cross pattern.
9. Insert both drain plugs with gaskets and tighten. Install strainer basket and fill the pump with water.
10. Reinstall the lid and quick clamp, and turn it clockwise until snug.

Caution

1. The polished and lapped faces of the seal could be damaged if not handled with care.
2. DO NOT RUN THE PUMP DRY. It must be filled with water before it is turned on.

PerformancePro Pumps

Artesian2 Series

Limited Warranty

This Artesian2 series product is warranted to the Purchaser (defined herein as the original end user) to be free of defects in construction and workmanship at the time of purchase. In the event this product malfunctions within three years (for fresh water use) or one year (for use with salt water or other suitable fluids) from the date of purchase the sole obligation of PerformancePro Pumps will be to replace or make this product capable of being operated according to the original product description without charges for labor or parts to the Purchaser, and are subject to the following conditions:

1. The malfunction is proved attributable to a defect in construction or workmanship, including repairs performed under this warranty. Malfunction for any other reason - including but not limited to misuse, abuse, negligence, accident, corrosion or salt build up, incorrect wiring or electrical supply, tampering with parts, or improper installation - will not be remedied under this warranty. Problems or damage from failure to comply with instructions in the owner's manual, improper plumbing and positioning, flooding, incompatibility with fluid chemistry and running unit dry are not covered under this warranty.
2. PerformancePro Pumps must perform all warranty repairs. Purchaser must retain the purchase receipt and present it with this certificate as proof of ownership and entitlement to warranty repairs. The cost of unauthorized repairs will not be reimbursed to Purchaser by PerformancePro Pumps, and are not the responsibility of PerformancePro Pumps. If repairs by Purchaser or a third party damage the product, such damage is not remediable under this warranty.
3. Purchaser shall bear all shipping, packing, and insurance costs and all other costs, excluding labor and parts necessary to effectuate repairs under this warranty. Purchaser will pay for return freight.
4. For applications that involve fluids other than water, the Purchaser shall retain and present to PerformancePro Pumps evidence of purchaser's compatibility tests under actual operating conditions. Any problems caused by a chemical incompatibility of the fluid with the pump materials, are expressly not covered by this warranty.
5. Periodic check-ups and/or maintenance are not covered by this warranty.
- 6. For all sales in the State of Oregon this is the sole and exclusive manufacturer's warranty. There are no warranties which extend beyond the warranty set forth herein, and in accord with Oregon Revised Statutes ORS 72.3160 any and all implied warranties, including any warranties of merchantability and fitness for particular purpose, are disclaimed and excluded. Some States do not allow disclaimers/exclusions of, or limitations on how long an implied warranty lasts, so in such States, and except as is otherwise provided by applicable law of said States, no action on a warranty implied at law shall be commenced more than one year following the date of purchase. No action shall be brought for breach of any express warranty subsequent to the expiration of the express written warranty.**
- 7. Incidental and consequential damages (specifically including, but not limited to, damages for loss of profits or damages relating to down time of personnel, equipment, or facilities) caused by malfunction, defect, or otherwise, whether alleged to be the result of breach of any express or implied warranty, or the negligence, willful misconduct or other act of PerformancePro Pumps are not the responsibility of PerformancePro Pumps, and to the extent permitted by law, are hereby excluded, including, but not limited to property damage, and to the extent not prohibited by applicable law, personal injury or death and Purchaser hereby agrees to expressly waive any claim for all such damages. If a final determination is made in a court of competent jurisdiction that any one or more of the damages which are disclaimed, excluded and/or waived under this paragraph are not allowed under public policy or applicable law, then the disclaimer, exclusion and waiver of all of the other damages not prohibited by public policy or applicable law shall continue to apply.**
8. This warranty does not apply to any malfunction arising out of any application of this product other than in a use compatible with the manufacturer's product description, unless such application is, upon request, specifically approved in writing by PerformancePro Pumps.
9. The provisions of this warranty are severable and if any provision shall be deemed invalid, the remaining provisions shall remain in full force and effect.
10. This limited warranty extends only to the original Purchaser (end user) and does not extend to transferee or purchaser from the original Purchaser. Any purported assignment without the consent of PerformancePro Pumps shall be null and void.
11. No warranty whatsoever of chemical compatibility or application suitability is given. It is the sole responsibility of the Purchaser to determine if the merchandise purchased is suitable for Purchaser's specific application. PerformancePro Pumps strongly advises that the customer perform any and all tests necessary to determine material compatibility and product suitability for customer's specific conditions and needs.
12. This contract shall be governed by and in accordance with the laws of the State of Oregon. Purchaser agrees that proper jurisdiction and venue for any claim brought hereunder is in Washington County, Oregon.
13. This limited warranty is incorporated by reference into the contract of purchase for the products supplied by PerformancePro Pumps to Purchaser under said contract.



For performance that's OFF THE CHART of ordinary pumps!

ARTESIAN2 PUMP PLACEMENT CHART



When determining the placement of your Artesian2 pump, two factors will be influenced by its height above water level. First, is its ability to self-prime. To insure a reasonable prime time without the use of a swing type check valve (do not use spring loaded check valves), position the pump no higher than the height shown in the "maximum recommended suction lift" column. Second, is its ability to maintain a prime and minimize cavitation. Even with a swing type check valve, we do not recommend a pump be installed more than 9 feet above the water level.

MODEL	MAXIMUM RECOMMENDED SUCTION LIFT	APPROXIMATE TIME TO PRIME
A2-1/8-39	2 FEET	15 MINUTES
A2-1/4-47	3 FEET	15 MINUTES
A2-1/4-58	3 FEET	15 MINUTES
A2-1/3-63	4 FEET	15 MINUTES
A2-1/2-76	5 FEET	15 MINUTES
A2-1/2-HH	3 FEET	10 MINUTES
A2-3/4-HF/HH	4 FEET	10 MINUTES
A2-1-HF/HH	5 FEET	10 MINUTES
A2-1 1/2-HF/HH	6 FEET	10 MINUTES
A2-2-HF/HH	7 FEET	10 MINUTES
A2-3-HF/HH	8 FEET	10 MINUTES

Notes:

1. The data in this chart was compiled using 2" pipe, 10' in length. If you use larger pipe or have longer runs, it will increase the time required to prime.
2. All PerformancePro self-priming pumps have been tested to operate up to a height of 9' above the surface of the water. Do not install your pump higher than 9'.
3. If you use small pipe, more fittings, have longer runs, use strainers, or in any other way make it harder for water to flow easily to the pump - it will reduce your maximum recommended height and may increase the time to prime.

PerformancePro Pumps Inc.

5976 S.E. Alexander St., Suite F, Hillsboro, OR 97123
Phone: 503/356-5888 Fax: 503/356-1660
www.performancepropumps.com



For performance that's OFF THE CHART of ordinary pumps!

WIRING INSTRUCTIONS

IMPORTANT SAFETY INSTRUCTIONS

**Please read all instructions completely before you
install or operate your new pump.
Save these instructions for future reference.**

The motors used with the PerformancePro pumps are high quality, industrial duty motors. Some are dual voltage motors, which can be operated at either 115 volt (low) or 230 volt (high). They have been tested at the factory before being shipped.

It is vitally important to supply proper voltage and amperage to the motor. Set the internal connections on your motor to match your supply line voltage. If these do not match, you will damage the motor and void the warranty. **DO NOT ATTEMPT TO WIRE THE MOTOR IF YOU DON'T KNOW WHAT YOU ARE DOING!!!** Have a qualified electrician do the work.

**The following example shows how to wire a typical Baldor 1/4HP, Single Phase, 1725 RPM motor
(with the following diagram)**

LOW VOLTAGE (115V)		
LINE A	LINE B	TOGETHER
1, 3	4	2, J

HIGH VOLTAGE (230V)			
LINE A	LINE B	TOGETHER	TAPE
1	4	2, 3	J

CONNECTIONS ABOVE GIVE CLOCKWISE ROTATION FACING LEAD END.

For low voltage:

1. Connect your incoming hot lead (normally the black wire) to the wires marked #1 and #3.
2. Connect your incoming neutral lead (normally the white wire) to the #4 wire.
3. Twist wires #2 and #J together.
4. Use appropriately sized wire nuts to insure all connections are secure and insulated.
5. Connect your incoming ground (normally green) to the green screw in the connection box.

For high voltage:

1. Connect your incoming hot lead (normally the black wire) to wire #1.
2. Connect your other hot lead (normally the white wire) to wire #4.
3. Connect wire #2 and #3 together.
4. Tape off the wire marked J.
5. Use appropriately sized wire nuts to insure all connections are secure and insulated.
6. Connect your ground lead (normally green) to the green screw in the connection box.

**Note: Your motor may have a different wiring diagram.
Follow it's instructions for line placement.**

PerformancePro Pumps Inc.

5976 S.E. Alexander St., Suite F, Hillsboro, OR 97123
Phone: 503-356-5888 Fax: 503-356-1660
www.performancepropumps.com



AQUATIC ECO-SYSTEMS™

EMPEROR SMART UV SYSTEMS™ UV STERILIZER



INSTALLATION AND USER'S GUIDE

IMPORTANT SAFETY INSTRUCTIONS
READ AND FOLLOW ALL INSTRUCTIONS
SAVE THESE INSTRUCTIONS

CUSTOMER SERVICE / TECHNICAL SUPPORT

If you have questions about ordering Pentair Aquatic Eco-Systems replacement parts and products, please use the following contact information:

Customer Service

8 AM to 7 PM — Eastern and Pacific Times

US

Phone: (877) 347-4788

Fax: (407) 886-6787

International

Phone: (407) 886-3939

Fax: (407) 886-4884

Web site

Visit www.pentairaes.com

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IMPORTANT UV SYSTEM WARNING AND SAFETY INSTRUCTIONS



IMPORTANT NOTICE

This guide provides installation and operation instructions for the SMART UV System. Consult Pentair with any questions regarding this equipment.

Attention Installer: This guide contains important information about the installation, operation and safe use of this product. This information should be given to the owner and/or operator of this equipment after installation or left on or near the pump.

Attention User: This manual contains important information that will help you in operating and maintaining this product. Please retain it for future reference.

IMPORTANT SAFETY INSTRUCTIONS! PLEASE READ PRIOR TO INSTALLATION AND OPERATION!

Strictly follow the instructions within this manual to ensure the health and safety of both, yourself and the UV system. The installation, operation and maintenance of the UV system can only be carried out after reading and understanding the information contained in this manual.

The installation of the UV system must be carried out in accordance with local regulations and codes.

READ AND FOLLOW ALL INSTRUCTIONS SAVE THESE INSTRUCTIONS



This is the safety alert symbol. When you see this symbol on your system or in this manual, look for one of the following signal words and be alert to the potential for personal injury.

DANGER

Warns about hazards that can cause death, serious personal injury, or major property damage if ignored.

WARNING

Warns about hazards that may cause death, serious personal injury, or major property damage if ignored.

CAUTION

Warns about hazards that may or can cause minor personal injury or property damage if ignored.

NOTE

indicates special instructions not related to hazards.

Carefully read and follow all safety instructions in this manual and on equipment. Keep safety labels in good condition; replace if missing or damaged.

When installing and using this electrical equipment, basic safety precautions should always be followed, include the following:

WARNING

Ultraviolet light is damaging to your eyes and skin! Do not handle or stare at an operating UV lamp.

Note that the UV light rays are invisible to the human eye and precautions should be taken to prevent UV energy from entering the eyes.

CAUTION

The quartz sleeve and or the UV lamp shipped with this product may have been broken or damaged during transit. It is therefore essential that the unit be carefully inspected before connecting to electric power.

WARNING

DO NOT allow system to exceed 20 PSI (Pounds Per Square Inch).

DANGER

To avoid possible electric shock, special care should be taken since water is employed is the use of aquarium and pond equipment. For each of the following situation, DO NOT attempt repairs yourself. Call Pentair Aquatic Eco-Systems, Inc. customer service department at 877-347-4788 for services or discard the appliance.

DANGER

If unit falls into the water, DO NOT REACH FOR IT! First unplug it and then retrieve it. If the internal electrical components of the unit get wet, unplug the unit immediately.

DANGER

If the unit shows any sign of water leakage, immediately unplug it from the power source.

CAUTION

Carefully examine the unit after installation. It should not be plugged in if there is water on any part not intended to be wet.

DANGER

DO NOT operate this unit if it has a damaged cord or plug, if it is malfunctioning, or if it has been dropped or damaged in any manner.

WARNING

Close supervision is necessary when any appliance is used by or near children, and our equipment is no exception.

WARNING

Always unplug the unit from an electrical outlet when not in use or before servicing, cleaning or removing parts. Never yank the cord to pull the plug from the outlet. Grasp the plug and pull to disconnect.

WARNING

SMART UVs are designed for low-pressure water applications with or without aquatic livestock. DO NOT use these units for any application outside of their intended use. The use of attachments not recommended or sold by Pentair Aquatic Eco-Systems, Inc. may cause unsafe conditions and may void any warranty.

WARNING

This unit must be wired in conjunction with a properly grounded, Ground Fault Circuit Interrupter (GFCI). Only three (3) wire grounded cables suitable for outdoor use should be used to connect this unit. If joining cables for outdoor use, a suitable watertight cable connector must be used. If an extension cord is necessary, a cord with a proper rating should be used. A cord rated for less amperes or watts than the appliance's rating may overheat. Care should be taken to arrange the cord so that it will not be tripped over or pulled. If in doubt consult a qualified electrician.

WARNING

Warping of the UV body may occur when left in direct sunlight without water inside to help dissipate the heat.

WARNING

DO NOT operate the unit in "no-flow" situations.

SECTION 1

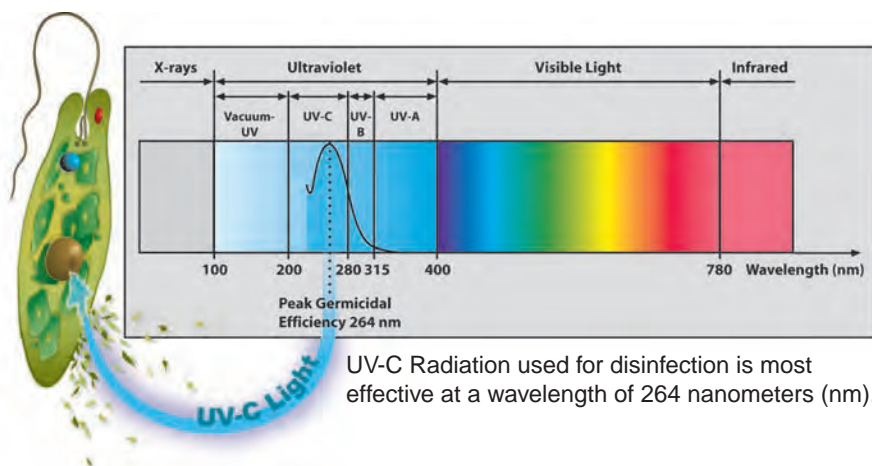
SYSTEM FEATURES AND SPECIFICATIONS

What is Ultraviolet Sterilization?

Using a low-pressure mercury vapor germicidal lamp. Input watts (voltage + current) are supplied to the UV lamp creating an electrical arc with the mercury inside. This reaction creates UV-C light. The UV-C light between 250nm and 280nm (the germicidal action spectrum) when directly exposed to living microorganisms such as bacteria and Protozoa is very effective at altering their DNA, disabling them from reproducing or even destroying them.

Microorganisms vary in type and size. Identifying the targeted microorganism, (Algae, Bacteria etc...) and matching its type and size to its established UV exposure rate, are prerequisites for eliminating that particular microorganism. Successful UV sterilization requires the UV-C (UV radiation @ 250-280nm) light to penetrate the microorganism's cell wall/cell membrane and destroy its nuclear material as discussed and shown in the diagram to the right.

Successful UV sterilization in a water application requires the targeted waterborne microorganism to be in direct contact with the UV-C light (produced by the UV lamp) for a specific amount of time [UV exposure rate]. Established UV exposure rates must be applied to achieve successful UV sterilization.



SMART UV Features

Our GPH T-5 and T-6 low pressure mercury vapor germicidal amps, convert approximately 40% of their electrical input watts into UV-C output watts within the germicidal action spectrum (meaning 40% of electricity used is converted into useful germicidal UV light), the highest UV-C output conversion among all UV lamps.

- UL listed for indoor and outdoor use, fresh and salt water use.
- Long lasting GPH/T5 and GPH/T6 UV lamps (9,000 hours to 80% efficiency).
- Protective Quartz Sleeve (maximizes UV lamp output and safety)
- Watertight Design
- Easy-to-Remove Power Assembly
- Remote Power Supply
- UV Resistant High Density Plastic UV Vessel (Lifetime warranty against UV degradation)
- Utilizes the UV lamp to its maximum potential (maximum UV exposure)
- Non-UV Transmitting Clear Lamp Viewing Ports



SMART UV
Specifications Charts
(See next page)

SMART UV Specification Charts

SMART UV Lite Models

Model No. /Watts	Maximum Pond Size	Maximum Aquarium Size	No. Lamps /Watt	Water Flow Rate Algae & Bacteria 30,000 µWs/cm ² Suggested/Maximum	Water Flow Rate Protozoa 180,000 µWs/cm ² Suggested/Maximum	Input Watts	Output Watts	UV-C Dim. (Inches)	Inlet /Outlet	Input Voltage
02218-B/18	1,100 Gal.	60 Gal.	1/18	219 GPH/356 GPH	37 GPH/60 GPH	18	5	21.75" x 2.5"	1/2" Barb	120VAC 50/60Hz
02225-B/25	1,600 Gal.	90 Gal.	1/25	332 GPH/554 GPH	55 GPH/98 GPH	25	8	29.75" x 2.5"	3/4" Barb	120VAC 50/60Hz
02240-B/40	2,900 Gal.	160 Gal.	1/40	589 GPH/983 GPH	98 GPH/164 GPH	40	14	44.75" x 2.5"	1" Barb	120VAC 50/60Hz
02218-S/18	1,100 Gal.	60 Gal.	1/18	219 GPH/356 GPH	37 GPH/60 GPH	18	5	21.75" x 2.5"	2" Socket	120VAC 50/60Hz
02225-S/25	1,600 Gal.	90 Gal.	1/25	332 GPH/554 GPH	55 GPH/98 GPH	25	8	29.75" x 2.5"	2" Socket	120VAC 50/60Hz
02240-S/40	2,900 Gal.	160 Gal.	1/40	589 GPH/983 GPH	98 GPH/164 GPH	40	14	44.75" x 2.5"	2" Socket	120VAC 50/60Hz
02280-S/80	5,900 Gal.	330 Gal.	2/40	1,178 GPH/1,967 GPH	196 GPH/328 GPH	80	28	44.75" x 14"	2" Socket	120VAC 50/60Hz
02218/18	1,100 Gal.	60 Gal.	1/18	219 GPH/356 GPH	37 GPH/60 GPH	18	5	21.75" x 2.5"	1.5" Union	120VAC 50/60Hz
02225/25	1,600 Gal.	90 Gal.	1/25	332 GPH/554 GPH	55 GPH/98 GPH	25	8	29.75" x 2.5"	1.5" Union	120VAC 50/60Hz
02240/40	2,900 Gal.	160 Gal.	1/40	589 GPH/983 GPH	98 GPH/164 GPH	40	14	44.75" x 2.5"	1.5" Union	120VAC 50/60Hz
02280/80	5,900 Gal.	330 Gal.	2/40	1,178 GPH/1,967 GPH	196 GPH/328 GPH	80	28	44.75" x 14"	1.5" Union	120VAC 50/60Hz
02218-W/18	1,100 Gal.	60 Gal.	1/18	219 GPH/356 GPH	37 GPH/60 GPH	18	5	21.75" x 2.5"	1.5" Union	120VAC 50/60Hz
02225-W/25	1,600 Gal.	90 Gal.	1/25	332 GPH/554 GPH	55 GPH/98 GPH	25	8	29.75" x 2.5"	1.5" Union	120VAC 50/60Hz
02240-W/40	2,900 Gal.	160 Gal.	1/40	589 GPH/983 GPH	98 GPH/164 GPH	40	14	44.75" x 2.5"	1.5" Union	120VAC 50/60Hz
02280-W/80	5,900 Gal.	330 Gal.	2/40	1,178 GPH/1,967 GPH	196 GPH/328 GPH	80	28	44.75" x 14"	1.5" Union	120VAC 50/60Hz

SMART UV Models

Model No. /Watts	Maximum Pond Size	Maximum Aquarium Size	No. Lamps /Watt	Water Flow Rate Algae & Bacteria 30,000 µWs/cm ² Suggested/Maximum	Water Flow Rate Protozoa 180,000 µWs/cm ² Suggested/Maximum	Input Watts	Output Watts	UV-C Dim. (Inches)	Inlet /Outlet	Input Voltage
02025/25	2,400 Gal.	130 Gal.	1/25	472 GPH/788 GPH	79 GPH/131 GPH	25	8	29" x 3.5"	1.5" Union	120VAC 50/60Hz
02040/40	4,700 Gal.	260 Gal.	1/40	943 GPH/1,574 GPH	157 GPH/262 GPH	40	14	43.75" x 3.5"	1.5" Union	120VAC 50/60Hz
02065/65	8,600 Gal.	480 Gal.	1/65	1,710 GPH/2,855 GPH	285 GPH/476 GPH	65	25	70.5" x 3.5"	1.5" Union	120VAC 50/60Hz
02080/80	9,400 Gal.	530 Gal.	2/40	1,885 GPH/3,148 GPH	314 GPH/525 GPH	80	28	44.5" x 15.5"	1.5" Union	120VAC 50/60Hz
02130/130	17,100 Gal.	960 Gal.	2/65	3,420 GPH/5,711 GPH	570 GPH/952 GPH	130	50	71.5" x 15.5"	1.5" Union	120VAC 50/60Hz
02025-W/25	2,400 Gal.	130 Gal.	1/25	472 GPH/788 GPH	79 GPH/131 GPH	25	8	29" x 3.5"	1.5" Union	120VAC 50/60Hz
02040-W/40	4,700 Gal.	260 Gal.	1/40	943 GPH/1,574 GPH	157 GPH/262 GPH	40	14	43.75" x 3.5"	1.5" Union	120VAC 50/60Hz
02065-W/65	8,600 Gal.	480 Gal.	1/65	1,710 GPH/2,855 GPH	285 GPH/476 GPH	65	25	70.5" x 3.5"	1.5" Union	120VAC 50/60Hz
02080-W/80	9,400 Gal.	530 Gal.	2/40	1,885 GPH/3,148 GPH	314 GPH/525 GPH	80	28	44.5" x 15.5"	1.5" Union	120VAC 50/60Hz
02130-W/130	17,100 Gal.	960 Gal.	2/65	3,420 GPH/5,711 GPH	570 GPH/952 GPH	130	50	71.5" x 15.5"	1.5" Union	120VAC 50/60Hz

SMART High-Output UV Models

Model No. /Watts	Maximum Pond Size	Maximum Aquarium Size	No. Lamps /Watt	Water Flow Rate Algae & Bacteria 30,000 µWs/cm ² Suggested/Maximum	Water Flow Rate Protozoa 180,000 µWs/cm ² Suggested/Maximum	Input Watts	Output Watts	UV-C Dim. (Inches)	Inlet /Outlet	Input Voltage
025050/50	5,900 Gal.	330 Gal.	1/50	1,560 GPH/1,980 GPH	260 GPH/330 GPH	50	16	28" x 5.75"	2" Union	120VAC 50/60Hz
025080/80	10,800 Gal.	600 Gal.	1/80	2,700 GPH/3,600 GPH	450 GPH/600 GPH	80	26	43" x 5.75"	2" Union	120VAC 50/60Hz
025120/120	13,800 Gal.	770 Gal.	1/120	3,840 GPH/4,600 GPH	640 GPH/767 GPH	120	36	56" x 5.75"	2" Union	120VAC 50/60Hz
025150/150	19,100 Gal.	1,060 Gal.	1/150	5,040 GPH/6,360 GPH	840 GPH/1,060 GPH	150	47	70" x 5.75"	2" Union	120VAC 50/60Hz
025050-W/50	5,900 Gal.	330 Gal.	1/50	1,560 GPH/1,980 GPH	260 GPH/330 GPH	50	16	28" x 5.75"	2" Union	120VAC 50/60Hz
025080-W/80	10,800 Gal.	600 Gal.	1/80	2,700 GPH/3,600 GPH	450 GPH/600 GPH	80	26	43" x 5.75"	2" Union	120VAC 50/60Hz
025120-W/120	13,800 Gal.	770 Gal.	1/120	3,840 GPH/4,600 GPH	640 GPH/767 GPH	120	36	56" x 5.75"	2" Union	120VAC 50/60Hz
025150-W/150	19,100 Gal.	1,060 Gal.	1/150	5,040 GPH/6,360 GPH	840 GPH/1,060 GPH	150	47	70" x 5.75"	2" Union	120VAC 50/60Hz

Note: PVC Adapter Kits not included

Note: Suggested Water Flow Rates are based on UV Lamp End of Useful Lamp Life, 9,000 hrs. @ 80% output. Maximum Water Flow Rates are based on New Lamp Condition. All water flow rates incorporate a 90% UV transmittance factor, considering "Green Water" conditions.

SECTION 2

PRE-INSTALLATION INSPECTION

All SMART UV Systems™ UV Sterilizer models are packaged complete, with all necessary components that are required to operate the unit. When unpacking your SMART UV, we recommend that a complete component inventory be taken to ensure that all components are included and accounted for, prior to installation.

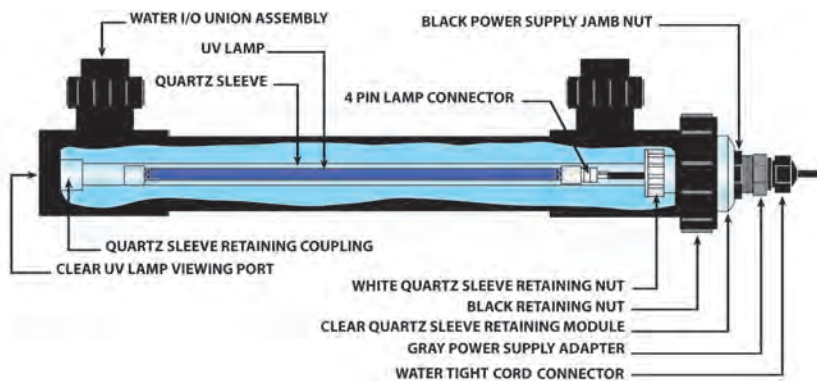
The serial number of your UV unit is located on a small white label near the electrical end of the unit's vessel. Smart HO UV units have their serial number labels located on the UV vessel and on the power supply (ballast) label.

The model number of your UV unit can be found in two locations:

1. On the bar code label at the end of the box.
2. On the label placed in the middle of the UV Vessel, with a hole punch indicating the model number.

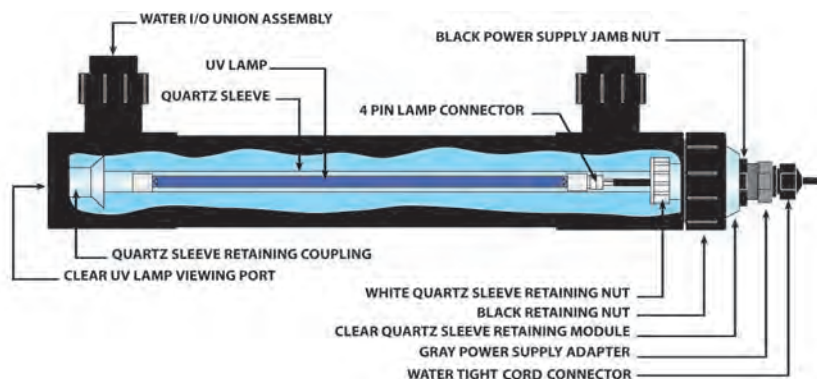
Component Diagrams

Please review the following SMART UV component diagrams, matching the proper diagram to the individual SMART UV model contained in this package. Unpack your SMART UV and lay out the packaged components for inspection. Please review the information listed in this section to become familiar with the equipment's various parts.



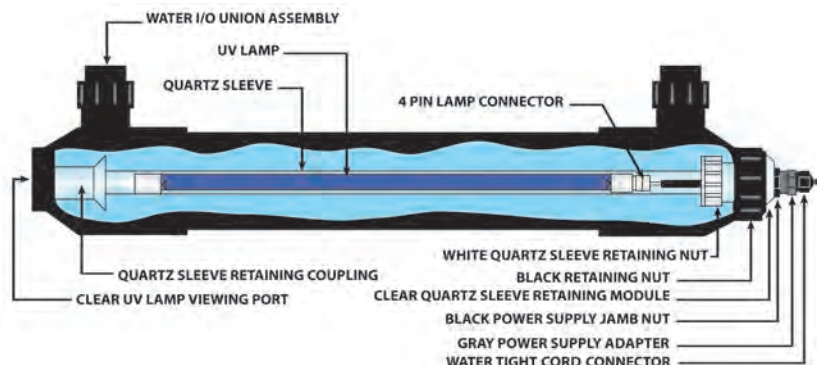
SMART UV Lite Models
(P/N 02218, 02225, 02240, 02280*)

***Note:** Indicates dual body UVs. See page 23 for more information.



SMART UV Sterilizer Models
(P/N 02025, 02040, 02065, 02080*, 02130*)

***Note:** Indicates dual body UVs. See page 23 for more information.



SMART HO UV Sterilizer Models
(P/N 025050, 025080, 025120, 025150)

Power Supplies

Part Numbers:

202150-1 - 150 W (120v)

202150-2 - 150 W (230v)



Fits SMART HO UV
Model 150 Watt

Part Number:

20100 - 18 - W, 25 - W, 40 - W, 65 - W
80 - W (x2), 130 - W (x2)



Fits SMART UV Lites and SMART UV
Models 18 through 130 Watt

Part Number:

20105- 37 - W, 50 - W, 80 - W, 120 - W



Fits SMART HO UV Models 37 through
120 Watt

Quartz Sleeve and UV Lamp Inspection -- When Packed in Tube

Note: The following SMART UV Systems UV Sterilizer Models are packaged with their quartz sleeve assembly pre-assembled inside the UV vessel, the lamp is packaged separately in a corrugated tube:

SMART Lite: P/N 02218, 02218-W, 02225, 02225-W, 02240, 02240-W, 02280, 02280-W

SMART UV: P/N 02025, 02025-W, 02040, 02040-W, 02080, 02080-W

SMART HO UV: P/N 025050, 025050-W, 025080, 025080-W

The Quartz Sleeve Assembly must be removed from the UV vessel and inspected for damage prior to installation. Extreme care should be used while this procedure is being performed.

Quartz Sleeve/UV Lamp Inspection Procedure

1. Carefully unpack the UV lamp(s) from their corrugated packing tubes and inspect for damage including broken glass, cracks, chips, fractures and pin holes. If damage has occurred please contact the place of original purchase immediately.

[Continue on to next page]



Quartz Sleeve/UV Lamp Inspection Procedure [Continued]

- Carefully, remove the quartz sleeve by unthreading the **A** Black Retaining Nut. Gently slide out the quartz sleeve assembly and inspect for damage including chips, cracks and pin holes. If damage has occurred please contact the place of original purchase immediately.



- After inspection, reassemble the quartz sleeve back into the UV vessel. If installing the unit, perform the Mandatory Water Test (see page 10).
- Inspect all other Smart UV components (power supply/power cord, UV vessel and unions) for damage.



Quartz Sleeve and UV Lamp Inspection -- When Packed in Triangle Box

Note: The following SMART UV Systems™ UV Sterilizer Models are packaged with their UV lamp and quartz sleeve assembly separately wrapped and packaged in a corrugated triangle box:

SMART UV: P/N 02065, 02065-W, 02130, 02130-W

SMART HO UV: P/N 025120, 025120-W, 025150, 025150-W

- Carefully unpack the clear quartz sleeve module/quartz sleeve and UV lamp from the triangle corrugated box and lay on a level, stable surface.

[Continue on to next page]



Quartz Sleeve/UV Lamp Inspection Procedure [Continued]

- The quartz sleeve assembly and UV lamp are packaged inside the triangle box separately. Unpack, remove the packaging material, and inspect for shipping damage.



- Inspect all other SMART UV components (power supply/power cord, UV vessel and unions) for damage.



After receipt and inspection of the unit, if broken glass is found (including cracks, chips, pin holes and hair line fractures of any kind) please contact the place of original purchase immediately for replacements. Do NOT call the manufacturer (Pentair Aquatic Eco-Systems, Inc.) regarding this problem.

SECTION 3

INSTALLATION

Quartz Sleeve Assembly

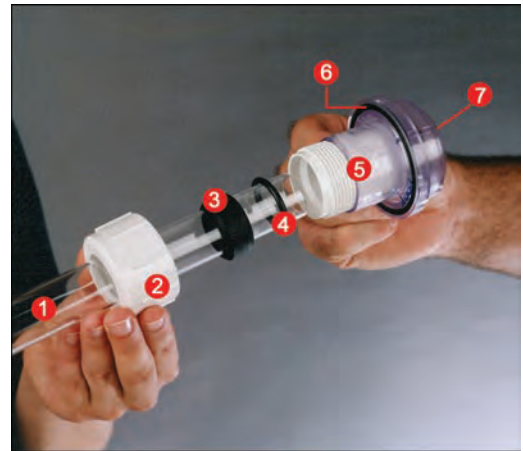
All SMART UV Systems™ UV Sterilizers utilize the same style quartz sleeve module assembly, with the only exception being the **5** Clear Quartz Sleeve Module



WARNING Improper assembly may result in water damage to electrical components and unsafe conditions. Pentair Aquatic Eco-Systems, Inc. is not responsible for damage caused by improper re-assembly of these parts.

Quartz Sleeve Assembly Includes:

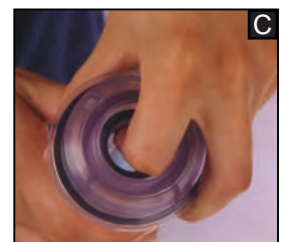
- 1** Quartz Sleeve
- 2** White Quartz Sleeve Retaining Nut
- 3** Rubber Gasket
- 4** Rubber O-ring
- 5** Clear Quartz Sleeve Module
 - P/N 20622 - UV Lite Models
 - P/N 20603 - UV Sterilizer & HO UV Sterilizer Models
- 6** Clear Quartz Sleeve Module O-ring
- 7** Power Supply Gasket



Assembly Instructions

1. Position the white quartz sleeve retaining nut, rubber gasket and rubber o-ring over the open end of the quartz sleeve as shown in **Photo A**.
2. Slide the "open-end" of the quartz sleeve (with nut/gasket and o-ring in position) into the clear quartz sleeve module. See **Photo A**.
3. Thread the white retaining nut onto the clear quartz sleeve module's male threads and hand-tighten. See **Photo B**.
4. While hand-tightening the white retaining nut onto the clear quartz sleeve module, use your index finger to ensure that the open-end of the quartz sleeve mates smoothly with the inside lip of the clear quartz sleeve module; this signifies a good fit. See **Photo C**.
5. With the quartz sleeve positioned inside the clear quartz sleeve module properly, finish hand-tightening the white retaining nut. When the white retaining nut is tight, the quartz sleeve should appear straight inside the clear quartz sleeve module (see **Photo D**).

Note: If the quartz sleeve appears crooked it may leak. Disassemble and try again.



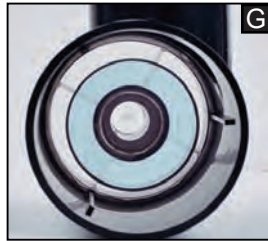
6. Carefully slide the quartz sleeve assembly into the UV vessel (see **Photo E**). The domed-end of the quartz sleeve should slide into the coupling located on the non-electrical end of the UV vessel (see **Photo G** below).



7. With the quartz sleeve assembly properly in place, the quartz sleeve retaining module should sit flush against the top of the UV vessel. See **Photo F**.
Note: Be sure that the clear quartz sleeve module o-ring (item #6 on page 7) is in place.



8. Thread the black retaining nut (see **Photo H**) onto the male threads of the UV vessel. Hand tighten only!



Mounting The Unit

Note: The way UVs are mounted/positioned plays a very important role in the unit's performance and degree of safety. We **STRONGLY RECOMMEND** that you follow these instructions and guidelines precisely. Any deviation from these mounting instructions will void any warranty associated with the UV and all its components and may cause unsafe conditions.

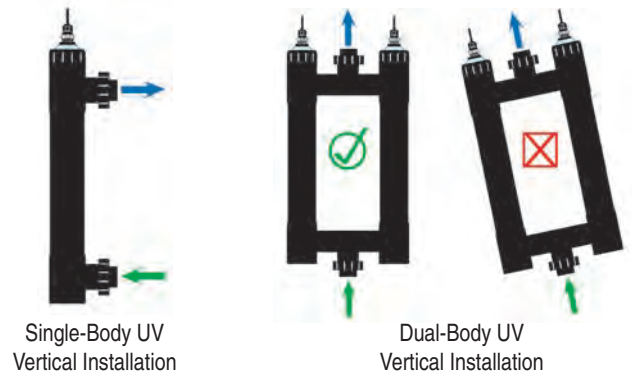
⚠ CAUTION

Trapped air inside the UV vessel during operation may create excessive heat, thus damaging the UV's internal components.

Vertical Mounting

Mount the SMART UV Systems™ UV Sterilizer with the electrical end up. Use the bottom post as the inlet with the top port as the outlet.

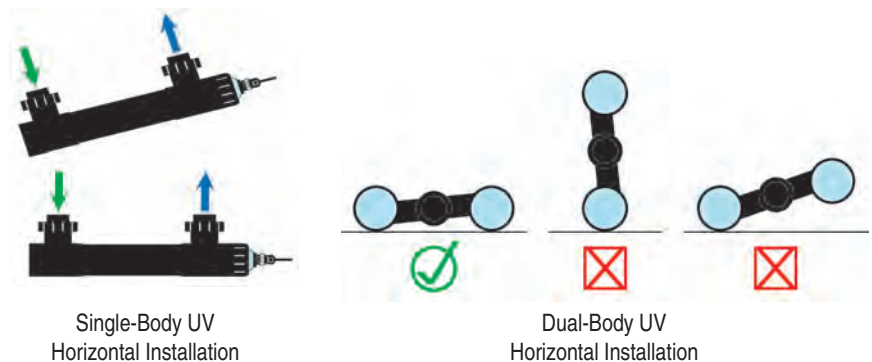
DO NOT mount or use the dual-body UV (80 and 130 watt models) with one "tube" on top of the other, or with one "tube" higher than the other. Keep unit as flat as possible.



Horizontal Mounting

Mount the SMART UV horizontally with the inlet/outlet facing up. If the unit is mounted horizontally but not level, the electrical end of the unit should be positioned higher than the non-electrical end. Choose the lower port for the inlet.

DO NOT mount or use the dual-body UV (80 and 130 watt models) with one "tube" on top of the other, or with one "tube" higher than the other. Keep unit as flat as possible.



Power Supply Mounting

DO NOT SUBMERGE THE POWER SUPPLY IN WATER. The power supply may be camouflaged using rocks.

Note: Do not bury the power supply where heat and moisture can be retained.

Note: The UV sterilizer may be covered in a thin layer of mulch but do not bury the unit.

Mandatory Water Test

A water test should be performed each time the quartz sleeve(s) is installed inside the unit's vessel or when the quartz sleeve or gaskets and o-rings are replaced. [Once annually] Performing a water test is a precautionary measure that will determine whether or not the critical seal between the quartz sleeve and quartz sleeve module has been achieved.

Failure to achieve a proper quartz sleeve/quartz sleeve module seal during SMART UV Systems™ UV Sterilizer operation will allow water to leak into the inside of the quartz sleeve, potentially damaging the UV lamp and other electrical components, which could develop into dangerous situations.

IMPORTANT NOTE: Failure to perform a water test could lead to conditions that will void your product warranty.

To Perform SMART UV Water Test:

1. Prepare the SMART UV for permanent operation by plumbing it in-line, into a filter system using the plumbing hardware of your choice. If PVC glue is used, follow the glue manufacturer's instructions. Use a bypass assembly for greater water flow control. See the **Image A**.
2. With the unit plumbed for operation and the clear quartz sleeve module securely in place, remove the UV lamp from the quartz sleeve module.
3. Roll-up a few paper towels creating a core approximately $\frac{3}{4}$ " in diameter, 10" long then slide into the open quartz sleeve module port. Insert about six inches of the paper towel core down into the quartz sleeve, as shown in **Image B**.
4. With the paper towel in place, turn on the pump and recirculate water through the UV for at least thirty (30) minutes.
5. After thirty (30) minutes of recirculating water through the UV, remove the paper towels from the quartz sleeve module. Inspect closely for moisture. If the paper towels are completely dry, your water test is complete and successful.

If moisture is detected on the paper towel the quartz sleeve's rubber gasket and o-ring have failed to achieve a seal and must be re-assembled; repeat the water test until a seal is achieved. See page 7 for assembly instructions.



Electrical Requirements

The electrical requirements for the UV sterilizer are marked on the unit's power supply label (Ex. 120VAC 50/60Hz.). The unit must be plugged into a well-grounded electrical outlet.

⚠ WARNING Do not attempt to cut the ground post off of the 3-prong plug, doing so will void the unit's warranty.

This product must be grounded. If the unit should fail electrically, grounding provides a path of least resistance for electric current to pass to reduce the risk of electric shock. This product's cord is equipped with an equipment-grounding conductor and a grounding plug. The plug must be plugged into an appropriate outlet that is properly installed and grounded in accordance with all local codes and ordinances. If in doubt consult a qualified electrician.

⚠ WARNING DO NOT operate this equipment with timing devices.

⚠ DANGER Improper connection of the equipment-grounding conductor can result in a risk of electrocution. Check with a qualified electrician or service personnel if unsure that the outlet is properly grounded. Do not modify the product's plug. If it will not fit into the electrical outlet, have a proper outlet installed by a qualified electrician. Do not use any type of plug adapter with this product.

Electrical Requirements (Continued)

Ground Fault Circuit Interrupter (GFCI) Protection

⚠ WARNING This unit must be wired in conjunction with a properly grounded, Ground Fault Circuit Interrupter (GFCI). Only three (3) wire grounded cables suitable for outdoor use should be used to connect this unit. If joining cables for outdoor use, a suitable watertight cable connector must be used. If an extension cord is necessary, a cord with a proper rating should be used. A cord rated for less amperes or watts than the appliance's rating may overheat. Care should be taken to arrange the cord so that it will not be tripped over or pulled. If in doubt consult a qualified electrician.

GFCI's are designed to sense an imbalance in electrical current flow within the main electrical leads (leakage current). When this imbalance (maximum 5 ma per UL) occurs in the main leads, a comparator within the GFCI outlet generates a trip signal which is applied to a coil that trips the main (normally closed) contacts. These contacts open and break the circuit.

Spurious Trips

Consider that all GFCI's must trip at a leakage current of 5 ma. GFCI "Spurious Trips" are caused by electrical devices that have small electrical leakage current to ground. Multiple outlets protected by one GFCI allow for potential cumulative leakage currents caused by multiple appliances each leaking small amounts of current.

Example: One pump plugged into a outlet that is part of a four outlet branch protected by one GFCI will not trip the GFCI with its 2 ma leakage current. However, two pumps and a UV with a cumulative leakage current of 7 ma will trip the GFCI. This is a common problem.

The solution to the GFCI "Spurious Trip" problem is to operate the device on its own GFCI protected outlet, or, remove other devices from the GFCI protected branch of outlets. If the GFCI is over ten years old, you may want to consider replacing it.

UV Lamp Installation

Lamp Styles

UV lamps are manufactured with color coded ceramic bases. White-capped UV lamps signify a Standard-Output UV lamp while red-capped UV lamps signify a High-Output UV lamp.



Power Cord Adjustment

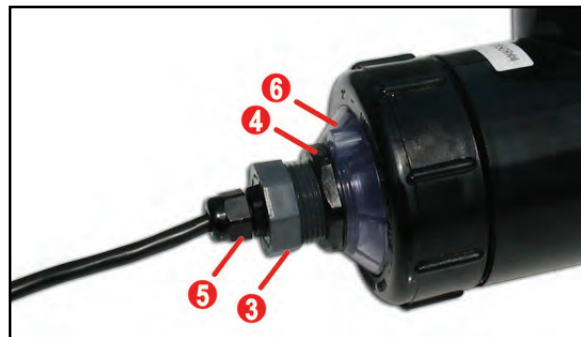
There should be four (4) inches of cord between the Gray Adapter **3** and the 4-pin Lamp Connector **1**. The four (4) inch cord distance **2** positions the lamp properly inside the quartz sleeve.

1. The 3/8 inch Threaded Watertight Cord Connector **5** is adjustable. Loosen it gently move the cord through it. Care must be taken when retightening. If the Connector's Rubber Gasket Seal **4** is dislodged during cord adjustment please make sure that it is properly re-seated inside the male threaded portion of the connector.



2. After a successful water test and without the power supply plugged into an electrical receptacle, attach the lamp's 4-pins to the power cord's white 4-pin Connector **1**. Then slide the UV lamp back into the UV sterilizer's quartz sleeve.

3. Whether the SMART UV Systems™ UV Sterilizer vessel is mounted horizontally or vertically, care should be taken when installing the UV lamp into the vessel's quartz sleeve. Vertical installations require extra attention to eliminate the chance of the lamp dropping into the quartz sleeve and breaking.



4. With the UV lamp/power cord connection complete and the lamp entirely inside the quartz sleeve, carefully screw down the Gray Power Supply Adapter **3** onto the Clear Quartz Sleeve Module **6**; hand tighten only.
5. Screw down the Black Power Supply Jamb Nut **4** until it makes contact with the Clear Quartz Sleeve Module **6**.
- Note:** By loosening the 3/8 inch Threaded Watertight Cord Connector **5**, Power Cord **2** adjustments can be made. Make sure the 3/8 inch Threaded Watertight Cord Connector's gasket is properly in place before retightening.
- Note:** If you do not have the Black Power Supply Jamb Nut **4** back far enough before tightening the Gray Power Supply Adapter **3**, the gray adapter will not make contact with the power supply gasket and will enable outside moisture to enter the quartz sleeve assembly system failure.

Optional Quartz Sleeve Wipers (for SMART UV Lite Models)

Quartz Sleeve Wipers are recommended for freshwater applications only. If you did not purchase a wiper model skip to the next section on page 15.

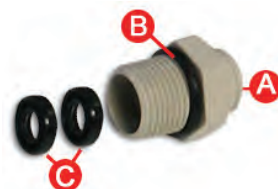
The quartz sleeve wiper seal for all Smart UV Lite Wiper models is located on the non-electrical end of the UV vessel. A Seal Nut creates the seal between the UV vessel and the quartz sleeve wiper rod. Inside the Seal Nut there is a replaceable rubber o-ring and two replaceable Rubber Seals. All are easily replaceable.

Replacing Rubber Seals

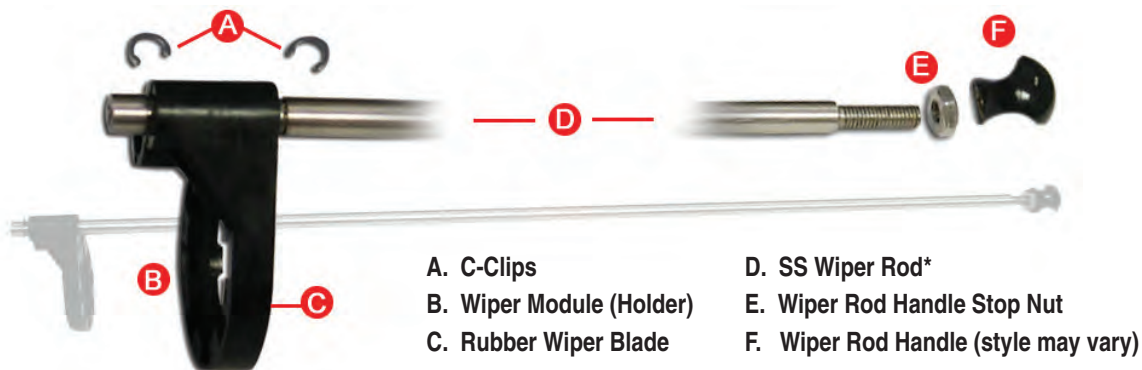
To replace rubber seals, use a small screwdriver to pry the old seals out of the plastic nut. Replace with new seals, ensuring the flat portion of the seals are facing into the nut.

Note: Wetting the seals before installation will assist in creating a watertight seal.

- A. Seal Nut
B. Replaceable Rubber O-Ring
C. Replaceable Rubber Seals



Wiper Assembly Parts Breakdown

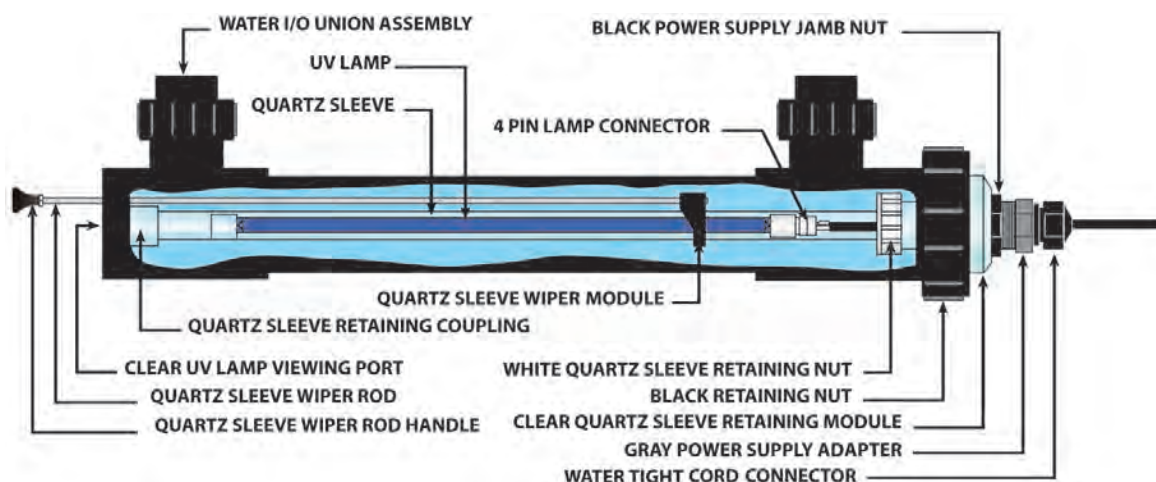


***Larger units use additional wiper modules on a single rod.**

Quartz Sleeve Wiper Assembly

To install the quartz sleeve wiper:

1. Place the non-threaded side of the Wiper Rod through the hole in the Wiper Module and line up the Wiper Module in between the two grooves.
2. Push the C-Clips onto the rod (one into each groove, opposite sides of the wiper module).
3. Push the threaded end of the rod through the assembled and installed Seal Nut from the Inside of the UV vessel.
4. Thread on the Wiper Rod Stop Nut and Wiper Handle.
5. Push the Wiper Rod completely into the UV vessel.
6. Push the assembled Quartz Sleeve Assembly, domed end of the Quartz Sleeve, into the Wiper Module, gently continuing to push until the domed end of the Quartz Sleeve seats itself into the Quartz Sleeve Retaining Coupling.
7. Thread the Black Retaining Nut onto the UV vessel with the Clear Quartz Sleeve Module/Assembly in place, and tighten.
8. Follow the "Mandatory Water Test" instructions on page 10.



Optional Quartz Sleeve Wipers (for SMART UV and SMART HO Models)

Quartz Sleeve Wipers are recommended for freshwater applications only. If you did not purchase a wiper model skip to the next section on page 15.

The quartz sleeve wiper seal for all SMART UV Systems™ Lite Wiper models is located on the clear quartz sleeve module. Two rubber seals create a seal between the clear quartz sleeve module and the quartz sleeve wiper rod. Both are easily replaced.

Replacing Rubber Seals

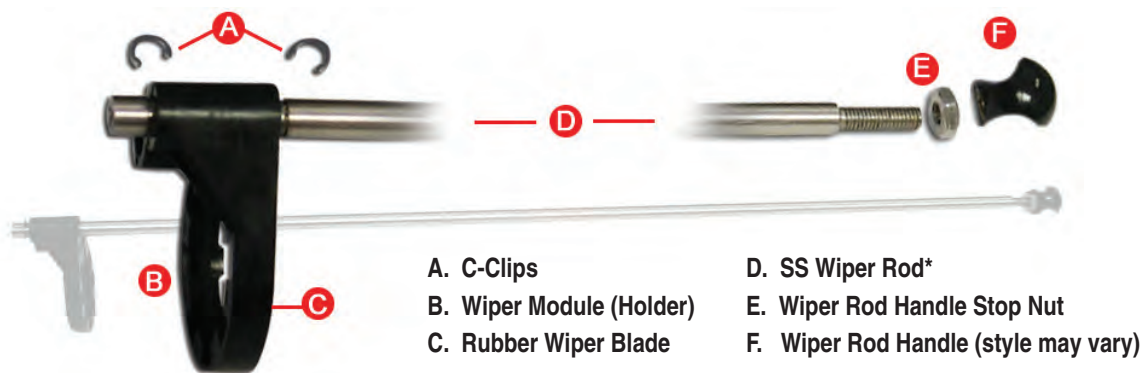
To replace rubber seals, use a small screwdriver to pry the old seals out of the Clear Quartz Sleeve Module. Replace with new seals, ensuring the flat portion of the seals are facing into the Clear Quartz Sleeve Module.

Note: Wetting the seals before installation will assist in creating a watertight seal.

- A. Clear Quartz Sleeve Module
- B. Replacement Rubber Seals



Wiper Assembly Parts Breakdown

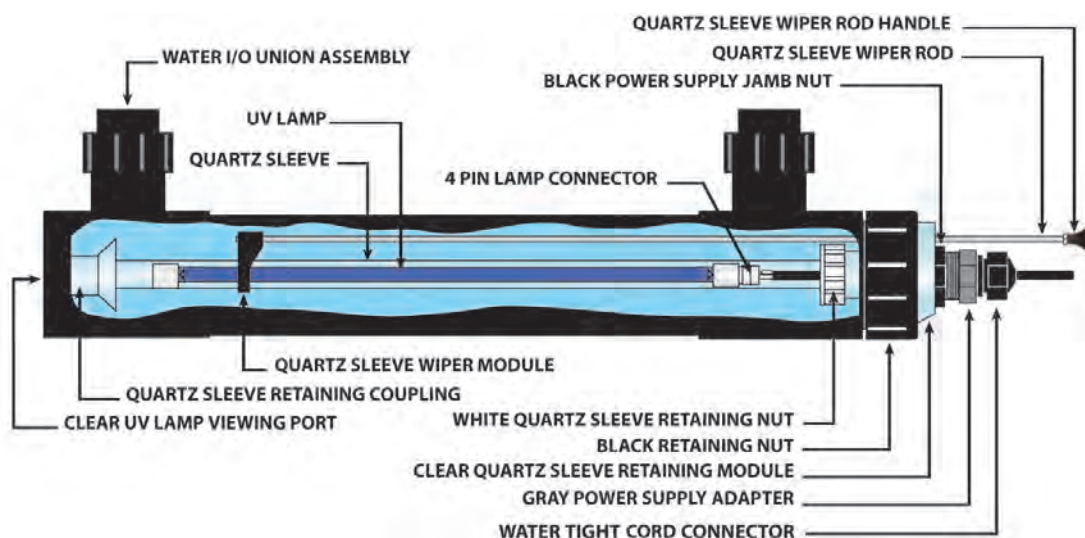


***Larger units use additional wiper modules on a single rod.**

Quartz Sleeve Wiper Assembly

To install the quartz sleeve wiper:

1. Place the non-threaded side of the Wiper Rod through the top hole of the Wiper Module and line up the Wiper Module in between the two grooves.
2. Push the C-Clips onto the rod (one into each groove, opposite sides of the wiper module).
3. Push the domed end of the Quartz Sleeve through the Wiper Module that is attached to the Wiper Rod.
4. Slide the Wiper Module, with Rod attached, two-thirds of the way up the Quartz Sleeve.
5. Push the threaded end of the Wiper Rod completely into and through the Quartz Sleeve Module 1/4 inch hole with Rubber Seals.
6. Thread on the Wiper Rod Stop Nut and Wiper Handle.
7. Push the Quartz Sleeve (open end) with White Retaining Nut, Quartz Sleeve Rubber Gasket and O-ring into the Quartz Sleeve Module respectively, line-up properly and tighten down white nut by hand.
8. Gently slide the entire Quartz Sleeve/Wiper Assembly into the UV vessel. Ensure the domed end of the Quartz Sleeve slides into the Quartz Sleeve Coupling.
9. Thread the Black Retaining Nut onto the UV vessel with the Clear Quartz Sleeve Module/Assembly in place. Hand tighten only.
10. Follow the "Mandatory Water Test" instructions on page 10.



SMART UV Installation and Operation

SMART UV Systems™ UV Sterilizers are used in a variety of applications to control waterborne pathogens. Pentair Aquatic Eco-Systems, Inc. encourages the consideration of the installation/operation recommendations provided here.

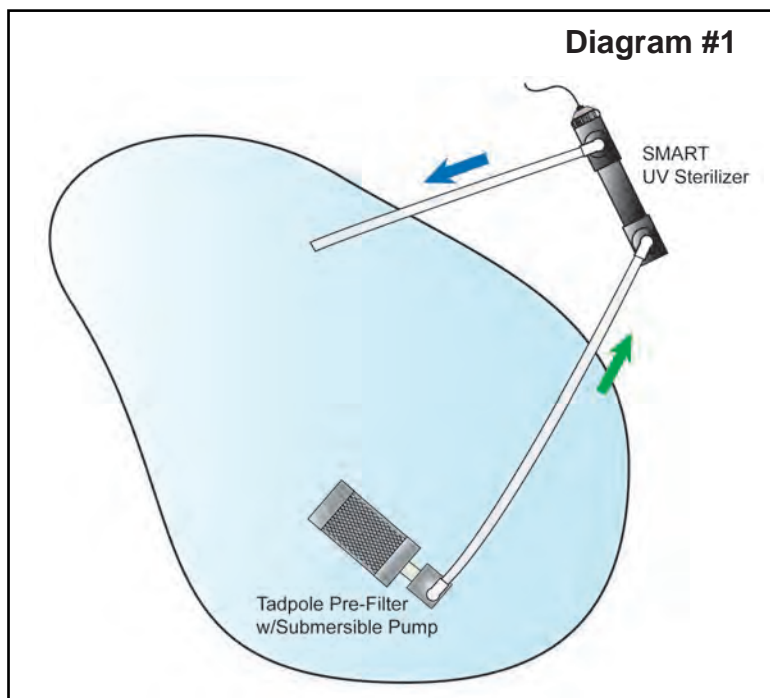
Suspended solid waste will absorb UV light and reduce the UV transmittance through water. By operating the SMART UV after the mechanical filter, the unit's overall performance will be increased.

When operating SMART UV sterilizers please consider the recommended water flow rates.

Pond Installation Configurations

Small Ponds (up to 1,000 Gallons) Using a Dedicated Submersible Pump

For small ponds, or for applications where the SMART UV is operated independently from other filters, this installation is ideal. Matching the submersible pump to the UV sterilizer's recommended flow rate is critical to the UV's overall performance. Installing an adequate mechanical pre-filter on the pump suction ensures that solids-free water will be sent to the SMART UV. See **Diagram 1**.



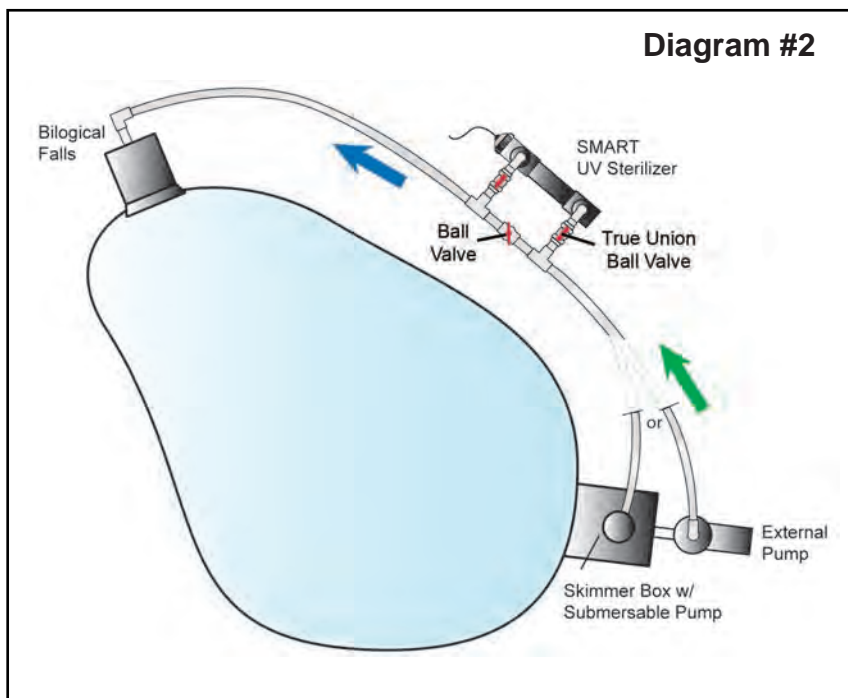
Small to Moderately Sized Ponds (up to 5,000 Gallons) Using Skimmers and Falls

Placing the UV between the skimmer box and the filter ensures that pre-filtered water reaches the UV, increasing its performance while reducing maintenance.

Often the capacity of the pump exceeds the capacity of the UV. If this is the case, install a bypass manifold. Be sure that the skimmer is equipped with mechanical filtering capacity. See **Diagram 2**.

Note: Before gluing piping or reducer bushing into the UV's union or socket, remove the quartz sleeve assembly to prevent glue from dripping onto the quartz sleeve.

Note: Use threaded seal tape on all threaded connections.



Larger Sized Ponds (above 5,000 Gallons) Using Surface Skimmer and Pressurized Filter

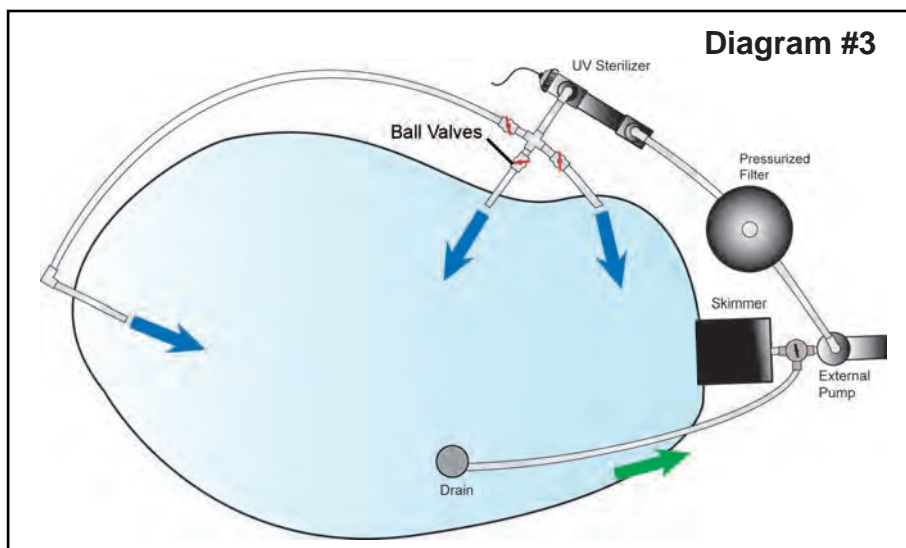
This system is simple yet it achieves critical filtering goals, such as good water circulation for increased solid waste suspension. The bottom drain/surface skimming capabilities ensure maximum waste removal. See **Diagram 3**.

The SMART UV Systems™ UV Sterilizer is positioned after the mechanical filter where it can receive only solid waste free water, optimizing UV transmittance/performance. Notice the 3-way valve that regulates suction from the skimmer and drain to the pump, allowing flow control. Next, multiple “clean water returns”

improve circulation in the pool suspending solid waste and helping it to find the filter. If you have a flow rate that exceeds the UV's, install a by-pass manifold. See **Diagram 2** on page 15.

Note: Before gluing piping or reducer bushing into the UV's union or socket, remove the quartz sleeve assembly to prevent glue from dripping onto the quartz sleeve.

Note: Use threaded seal tape on all threaded connections.



Aquarium Installation Configurations

Canister Filter/Aquarium Installation

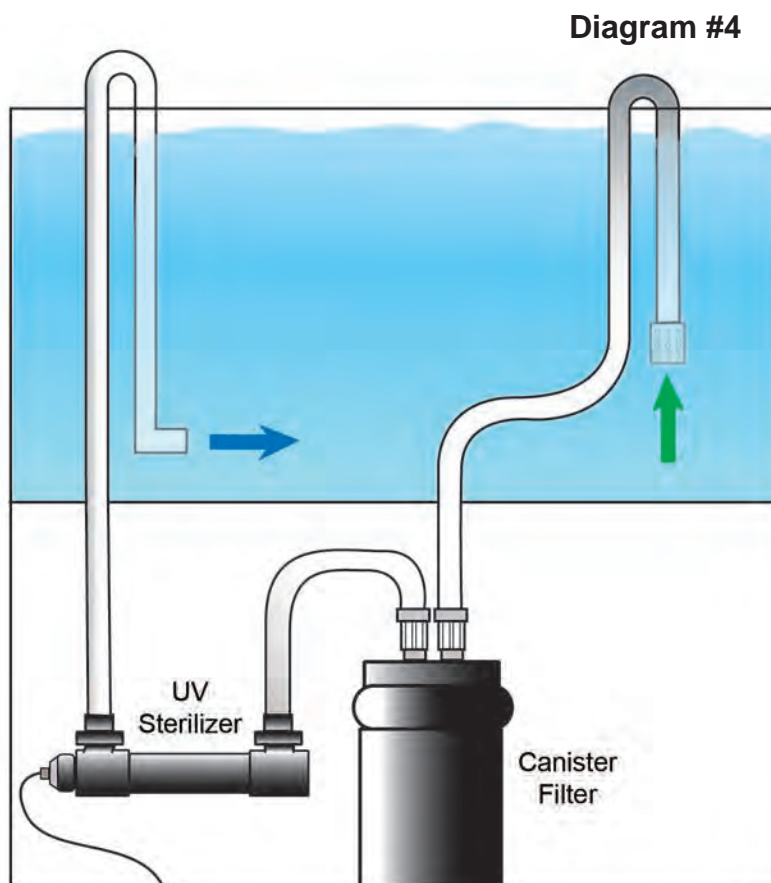
Pressurized Canister filters are commonly used with small freshwater/saltwater aquariums.

Diagram 4 shows a SMART UV Lite model.

It is important to match the Canister Filter's flow rate to the capacity of the SMART UV. If this is not feasible, use a bypass manifold (see **Diagram 6** on page 17). To prevent back-siphoning, consider installing a check valve or ball valve (see filter instructions/recommendations). See **Diagram 4**.

Note: Before gluing piping or reducer bushing into the UV's union or socket, remove the quartz sleeve assembly to prevent glue from dripping onto the quartz sleeve.

Note: Use threaded seal tape on all threaded connections.



Wet-Dry With External or Submersible Pump Installation

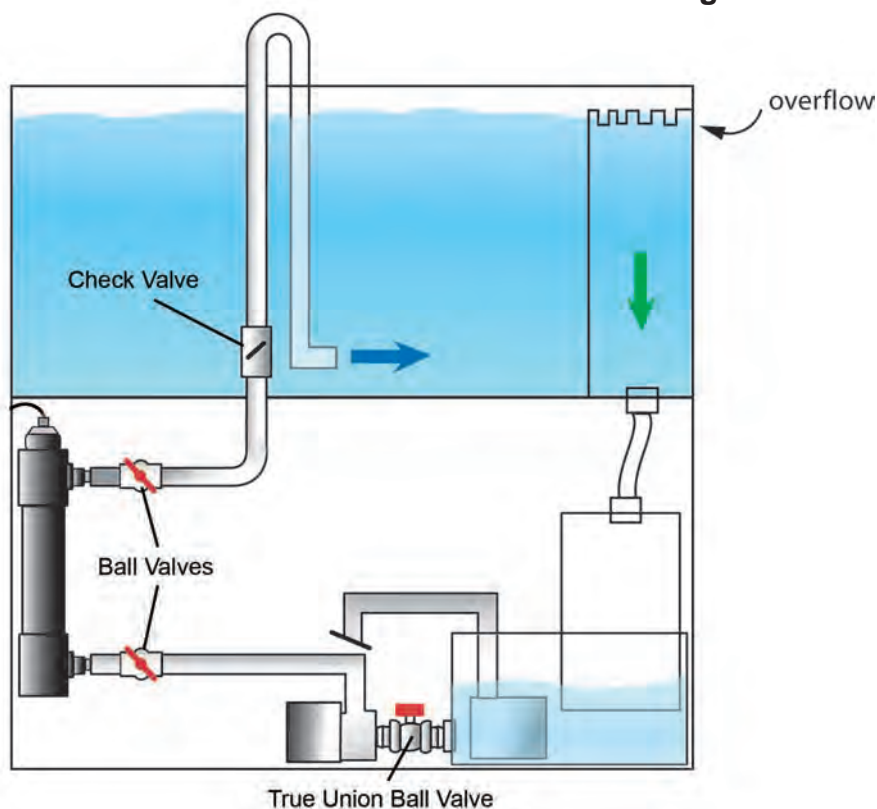
This installation configuration shows the SMART UV Systems™ UV Sterilizer capacity matched to the recirculating flow rate performance of the pump. We recommend mechanical filter media being used inside the over-flow and at the top of the wet-dry filter.

Installing a check valve after the UV will eliminate back siphoning. Installing true-union ball valves will allow flow adjustments and UV removal. For best results, install a saddle-style water flow meter, mounted horizontally on the outlet side of the UV. Follow the water flow meter manufacturer's instructions for proper installation and operation. See **Diagram 5**.

Note: Before gluing piping or reducer bushing into the UV's union or socket, remove the quartz sleeve assembly to prevent glue from dripping onto the quartz sleeve.

Note: Use threaded seal tape on all threaded connections.

Diagram #5



12-2C Wet-Dry w/External or Submersible Pump Installation

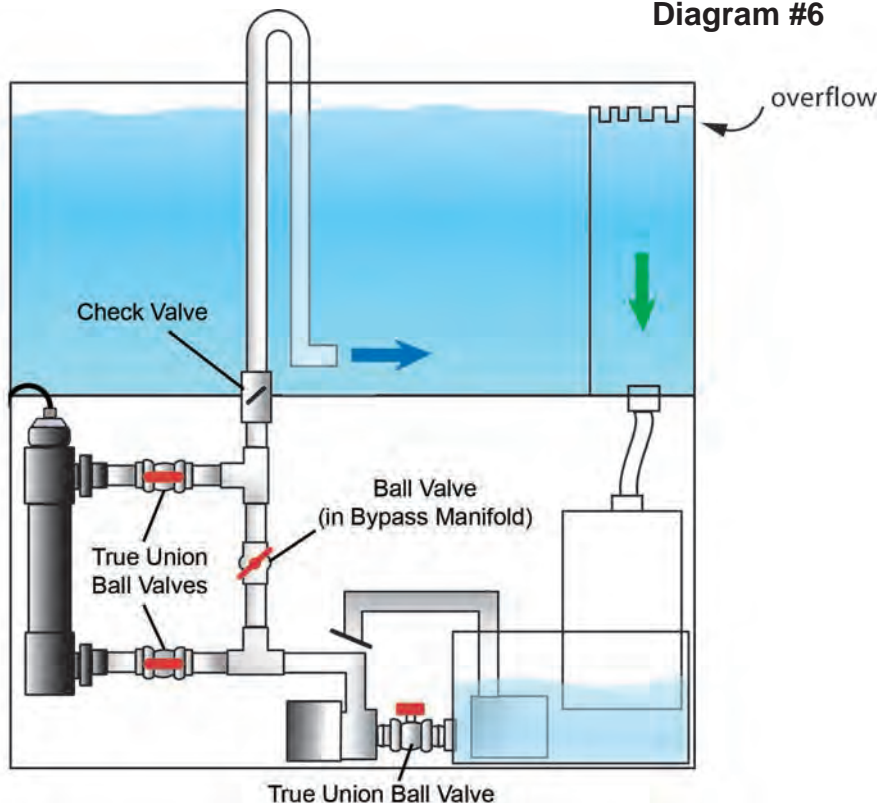
This installation configuration is identical to **Diagram 5** with the addition of a bypass manifold. The bypass is used to deliver a precise water flow to the SMART UV when the overall clean water return flow rate exceeds the UV's capacity.

Installing a check valve after the UV will eliminate back siphoning. Installing true-union ball valves will allow flow adjustments and easy UV removal for servicing. For best results, install a saddle-style water flow meter, mounted horizontally on the outlet side of the UV. Follow the water flow meter manufacturer's instructions.

Note: Before gluing piping or reducer bushing into the UV's union or socket, remove the quartz sleeve assembly to prevent glue from dripping onto the quartz sleeve.

Note: Use threaded seal tape on all threaded connections.

Diagram #6



SECTION 4

UNIT MAINTENANCE

Quartz Sleeve Cleaning

It is recommended that the UV's quartz sleeve be visually inspected for cleaning once every three months of operation. Even the slightest layer of material (slim/dirt) coating the outside of the quartz sleeve can have a substantial affect on UV-C light transmittance through the glass and into the water.

Cleaning frequency is also dependent on how well water is being filtered before reaching the SMART UV Systems™ UV Sterilizer. Water that contains solid waste will deposit greater amounts of material onto the quartz sleeve and will increase the frequency of necessary cleaning.

To Clean the Quartz Sleeve:

1. Unplug the UV sterilizer and disconnect power to the water pump at the circuit breaker.
2. Unthread the Black Retaining Nut and gently remove the Quartz Sleeve Assembly and lamp from the UV vessel.
3. Inspect the Quartz Sleeve and clean as needed with a soft, clean cloth.
4. If calcium deposits are present use vinegar or muriatic acid to dissolve the deposits. Be sure to remove any cleaners or acid from the quartz sleeve assembly before reassembling.

⚠ WARNING



Muriatic acid is corrosive and can lead to inflammation or burns to body tissue. ALWAYS wear rubber gloves, safety glasses and an N-95 dust mask when handling acid to prevent serious bodily injury.

To prevent degradation of the acid by UV light, store muriatic acid in an opaque container and away from direct sunlight.

Lamp Connector Removal

In the event that you would need to replace you 4-pin lamp connector, follow these steps:

1. Unplug the UV sterilizer and disconnect power to the water pump at the circuit breaker.
2. Remove UV lamp from the quartz sleeve.
3. Unplug the UV lamp from the connector/power cord.
4. Grasp the white 4-pin lamp connector with a pair of pliers while standing on the power cord itself.
5. Pull hard, while twisting slightly. The connector will disconnect.
6. Check to be sure the ends of the electrical wires are still tinned; they are pre-soldered before they're pushed into the connector. If they are no longer tinned, you will need to dip them in flux and then solder to make them firm enough to push back in the new lamp connector.

Note: Clean away any residual flux off of the wires before assembling them into the lamp connector.

7. Using a "new" 4-pin lamp connector, push the power cord's tinned wires into the holes of the connector making sure that they are firmly attached. Once attached, the wires should not pull out of the connector. See Diagrams below for wire placement.



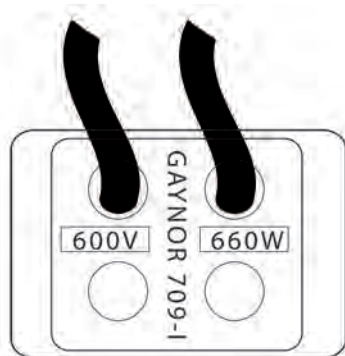
8. Plug lamp back into the connector.
9. When installing the lamp be sure to have Black Power Supply Jamb Nut all the way back on gray adapter. Tighten down the Gray Power Supply Adapter first and then secure the black jamb nut. See "UV Lamp Installation" on page 11.

Note: If you do not have the Black Power Supply Jamb Nut back far enough before tightening the Gray Power Supply Adapter, the gray adapter will not make contact with the power supply gasket and will enable outside moisture to enter the quartz sleeve assembly system failure.

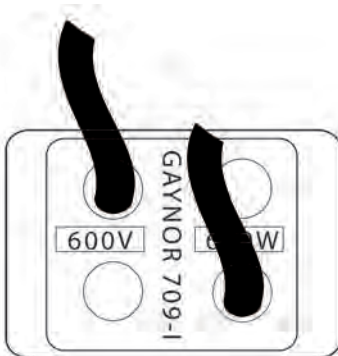


Avoid a configuration where the wires cross directly over the divider. See configuration C.

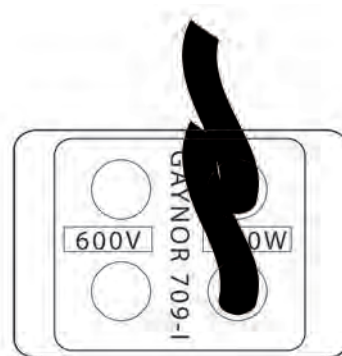
For either style power supply you can use wire configuration A or B.



A



B



C



Winterizing

Using the SMART UV Systems™ UV Sterilizer in extremely cold temperatures can cause damage to the unit, especially if the water is allowed to freeze inside the equipment. Please note that damage to the product by frozen water is not covered under warranty.

Pentair Aquatic Eco-Systems, Inc. recommends shutting the SMART UV down when the temperature consistently falls below 50°F (10°C).

1. Drain and remove the SMART UV from the filtration system.
2. Disassemble the entire unit and carefully clean both the outside and interior of the SMART UV body and components.
3. Once clean and dry, store the SMART UV in a dry place for the winter.
4. Return the SMART UV to service when temperatures consistently return to 50°F (10°C) or greater.

Note: Be sure to replace the quartz sleeve gasket/o-ring and perform a water test prior to operating the equipment.

SECTION 5

TROUBLESHOOTING

Paper Towel Test Indicates a Leak

1. Turn off the water pump at the circuit breaker and be sure all flow to the unit has been stopped.
2. Refer to pages 7-8 for “Quartz Sleeve Assembly” and pages 11-12 for “UV Lamp Installation” (in reverse order) to disassemble the unit.
3. Ensure there are no cracks or breakages in the Quartz Sleeve, that the Quartz Sleeve Gasket and O-ring are properly installed, and that the Quartz Sleeve Retaining Nut has been tightened down completely
4. Reassemble the Quartz Sleeve (see page 7-8) and repeat the mandatory water test (see page 10) until there are no indications of a leak.

GFCI/Breaker is Tripping

1. Immediately unplug the SMART UV Systems™ UV Sterilizer.
2. Turn off the water pump at the circuit breaker and be sure all flow to the unit has been stopped.
3. Refer to pages 7-8 for “Quartz Sleeve Assembly” and pages 11-12 for “UV Lamp Installation” (in reverse order) to disassemble the unit.
4. Check for water/moisture inside the quartz sleeve.
5. Multiple appliance plugged into a brand of outlets protected by one GFCI create the potential for cumulative leakage current resulting in a tripped GFCI. Refer to the “Spurious Trips” on page 11 for more detailed information regarding GFCI breakers.

Pond Still Green After a Week of UV Operation

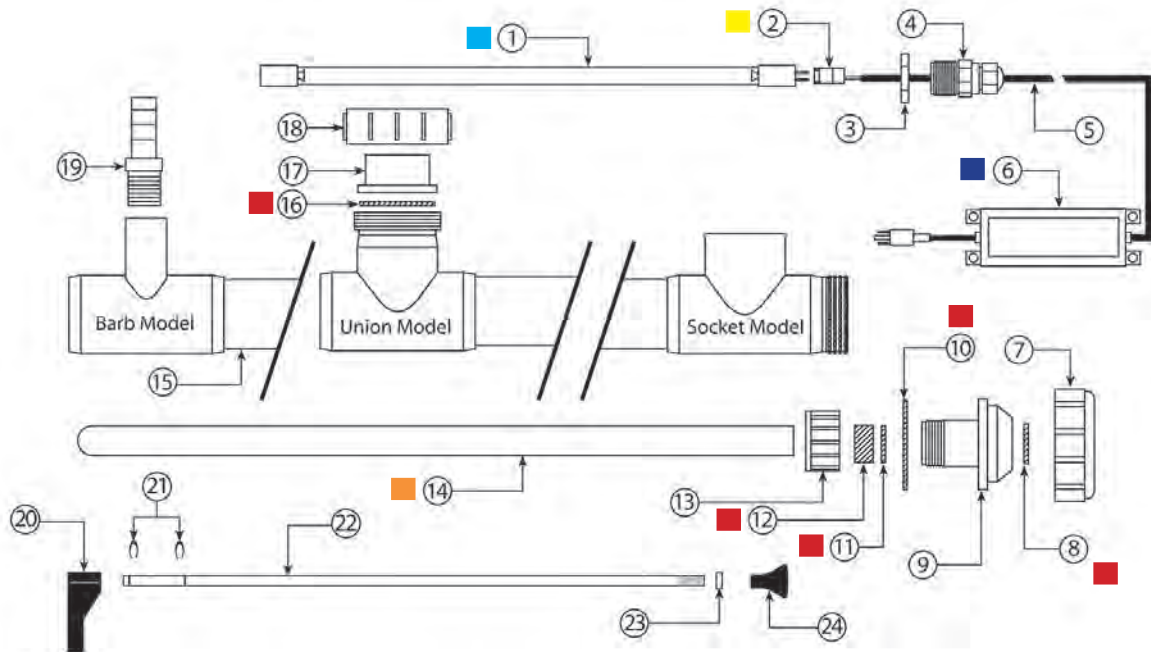
1. Ensure the UV lamp is lit by utilizing the safe viewing port.
2. A dirty quartz sleeve can reduce the UV sterilizer's performance. If the Quartz sleeve is dirty refer to “Quartz Sleeve Cleaning” on page 18 for cleaning procedures.
3. Double check the unit's flow rate and compare to the flow rate chart for your specific UV model.

SECTION 6

REPLACEMENT PARTS

SMART UV Lite Replacement Parts

P/Ns 02218, 02225, 02240, 02280, 02218-W, 02225-W, 02240-W, & 02280-W



Item # Description

1	UV Lamp
2	4-Pin Lamp Connector
3	Black Power Supply Jamb Nut
4	Gray Power Supply Adapter
5	Power Supply Cord
6	Power Supply Module Assembly
7	Black Retaining Nut
8	Power Supply Gasket
9	Clear Quartz Sleeve Retaining Module
10	O-Ring for Clear Quartz Sleeve Retaining Module
11	Quartz Sleeve O-Ring
12	Quartz Sleeve Gasket
13	White Quartz Sleeve Gasket/O-Ring Retaining Nut
14	Quartz Sleeve
15	UV Sterilizer Vessel

Item # Description

16	Water Inlet/Outlet Union O-Ring (union models only)
17	Water Inlet/Outlet Union Socket Half (union models only)
18	Water Inlet/Outlet Union Retaining Nut (union models only)
19	Hose Barb Insert (hose barb models only)
20	Quartz Sleeve Wiper Module (wiper models only)
21	C-Clips (wiper models only)
22	Quartz Sleeve Wiper Rod (wiper models only)
23	Wiper Rod Handle Stop Nut (wiper models only)
24	Wiper Rod Handle (wiper models only)

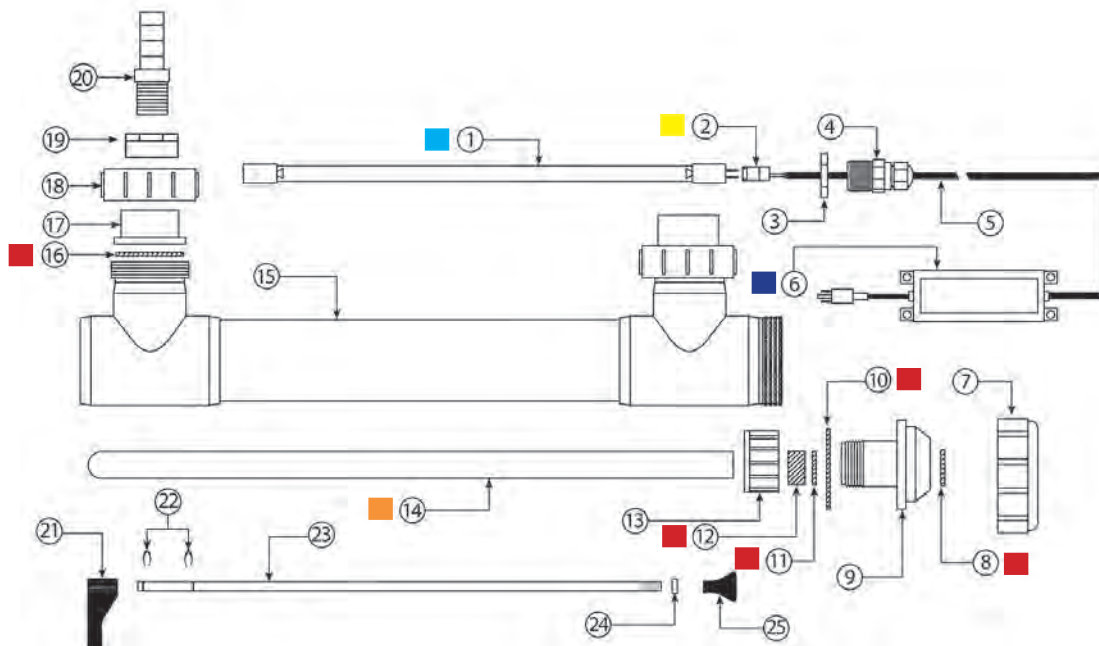
Bolded parts require annual replacement

SMART UV Lite Watts/Model No.	UV Lamp Part No.	Quartz Sleeve Part No.	Power Supply Part No.	Lamp Connector Part No.	Fittings/Mounting Clamps Kit Part No. for 1.5" Unions/2" Socket	Gasket Service Kit Part No.
18 Watt/02218	20018	20318	20225/20100	20077	20061/20062	20624
25 Watt/02225	20025	20325	20225/20100	20077	20061/20062	20624
40 Watt/02240	20040	20340	20100	20077	20061/20062	20624
80 Watt/02280	20040 x 2	20340 x 2	20100 x 2	20077 x 2	20061 x 2/20062 x 2	20625

NOTE: Clear Quartz Sleeve Retaining Module #20622, White Quartz Sleeve Retaining Nut #20079, both fit all SMART UV Lite Models; two required for #02280

SMART UV Sterilizer Replacement Parts

P/Ns 02025, 02040, 02065, 02025-W, 02040-W & 02065-W



Item # Description

1	UV Lamp
2	4-Pin Lamp Connector
3	Black Power Supply Jamb Nut
4	Gray Power Supply Adapter
5	Power Supply Cord
6	Power Supply Module Assembly
7	Black Retaining Nut
8	Power Supply Gasket
9	Clear Quartz Sleeve Retaining Module
10	O-Ring for Clear Quartz Sleeve Retaining Module
11	Quartz Sleeve O-Ring
12	Quartz Sleeve Gasket
13	White Quartz Sleeve Gasket/O-Ring Retaining Nut
14	Quartz Sleeve
15	UV Sterilizer Vessel

Item # Description

16	Water Inlet/Outlet Union O-Ring
17	Water Inlet/Outlet Union Socket Half
18	Water Inlet/Outlet Union Retaining Nut
19	Water Inlet/Outlet Union Reducer Bushing (optional fitting included)
20	Water Inlet/Outlet Union Threaded Hose Barb (optional fitting included)
21	Quartz Sleeve Wiper Module (wiper models only)
22	C-Clips (wiper models only)
23	Quartz Sleeve Wiper Rod (wiper models only)
24	Wiper Rod Handle Stop Nut (wiper models only)
25	Wiper Rod Handle (wiper models only)

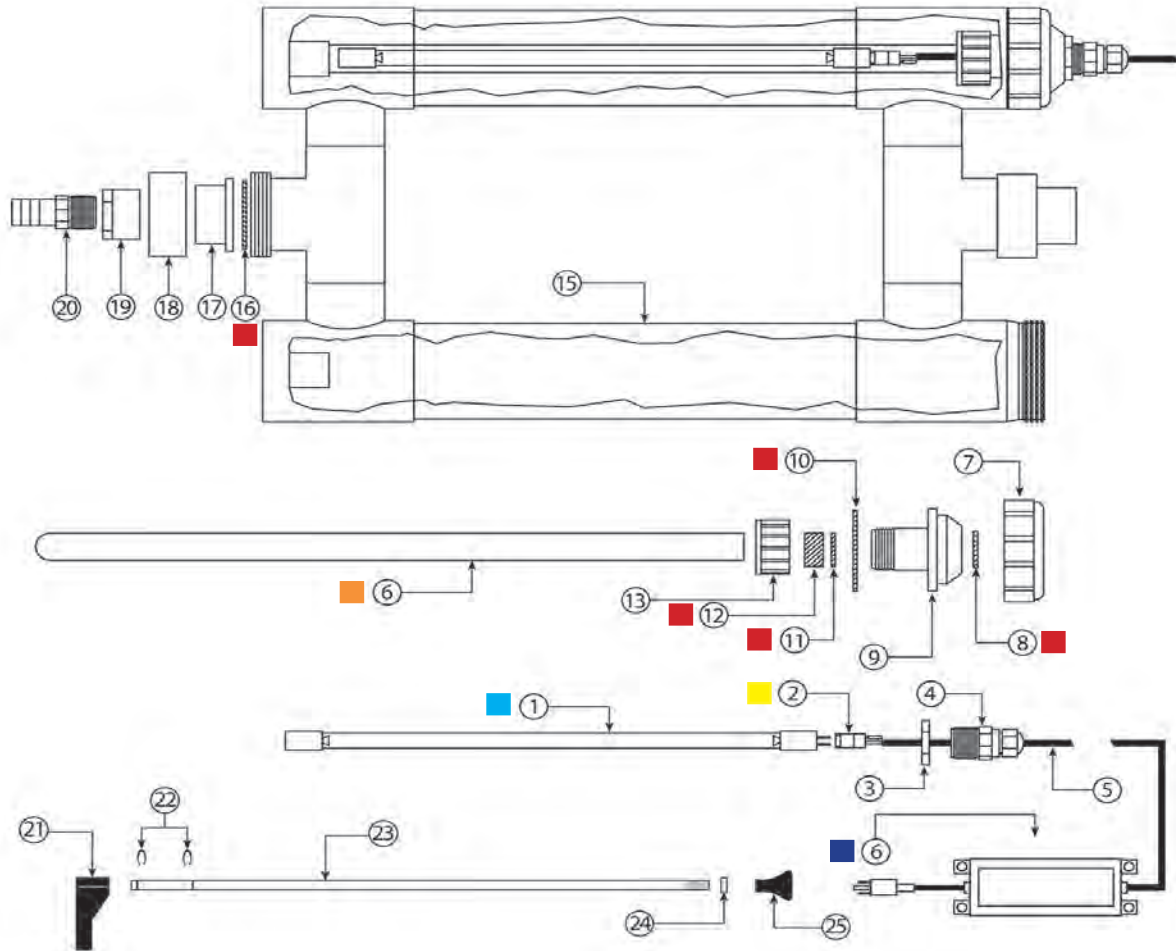
Bolded parts require annual replacement

SMART UV Watts/Model No.	UV Lamp Part No.	Quartz Sleeve Part No.	Power Supply Part No.	Lamp Connector Part No.	Mounting Clamps Kit Part No. for 1.5" Unions	Gasket Service Kit Part No.
25 Watt/02025	20025	20325	20225/20100	20077	20302	20375
40 Watt/02040	20040	20340	20100	20077	20302	20375
65 Watt/02065	20065	20365	20100	20077	20302	20375
80 Watt/02080	20040 x 2	20340 x 2	20100 x 2	20077 x 2	20302 x 2	20376
130 Watt/02130	20065 x 2	20365 x 2	20100 x 2	20077 x 2	20302 x 2	20376

NOTE: Clear Quartz Sleeve Retaining Module #20603, White Quartz Sleeve Retaining Nut #20079, both fit all SMART UV Sterilizer Models; two required for #02080, #02130

SMART UV Sterilizer Replacement Parts

For 80 & 130 Watt UV Sterilizers - P/Ns 02080, 02130, 02080-W & 02130-W



Item # Description

1	UV Lamp
2	4-Pin Lamp Connector
3	Black Power Supply Jamb Nut
4	Gray Power Supply Adapter
5	Power Supply Cord
6	Power Supply Module Assembly
7	Black Retaining Nut
8	Power Supply Gasket
9	Clear Quartz Sleeve Retaining Module
10	O-Ring for Clear Quartz Sleeve Retaining Module
11	Quartz Sleeve O-Ring
12	Quartz Sleeve Gasket
13	White Quartz Sleeve Gasket/O-Ring Retaining Nut
14	Quartz Sleeve
15	UV Sterilizer Vessel

Item # Description

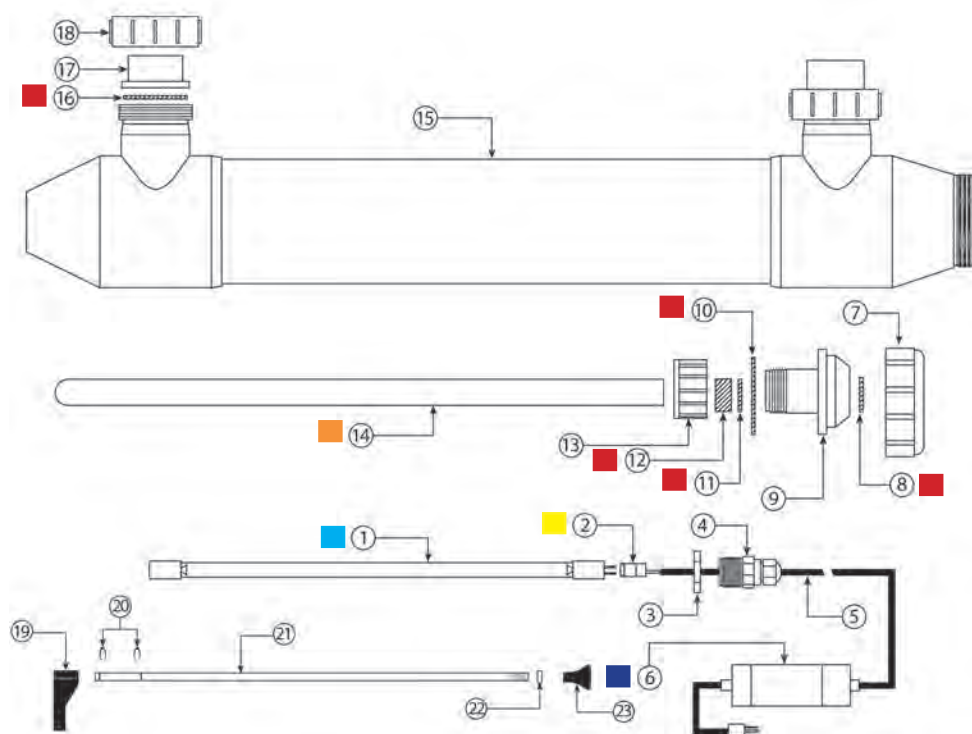
16	Water Inlet/Outlet Union O-Ring
17	Water Inlet/Outlet Union Socket Half
18	Water Inlet/Outlet Union Retaining Nut
19	Water Inlet/Outlet Union Reducer Bushing (optional fitting included)
20	Water Inlet/Outlet Union Threaded Hose Barb (optional fitting included)
21	Quartz Sleeve Wiper Module (wiper models only)
22	C-Clips (wiper models only)
23	Quartz Sleeve Wiper Rod (wiper models only)
24	Wiper Rod Handle Stop Nut (wiper models only)
25	Wiper Rod Handle (wiper models only)

Bolded parts require annual replacement

See chart at the bottom of pg. 21 for part numbers

SMART HO UV Sterilizer Replacement Parts

P/Ns 025050, 025080, 025120, 025150, 025050-W, 025080-W, 025120-W, & 025150-W



Item #	Description	Item #	Description
1	UV Lamp	14	Quartz Sleeve
2	4-Pin Lamp Connector	15	UV Sterilizer Vessel
3	Black Power Supply Jamb Nut	16	Water Inlet/Outlet Union O-Ring
4	Gray Power Supply Adapter	17	Water Inlet/Outlet Union Socket Half
5	Power Supply Cord	18	Water Inlet/Outlet Union Retaining Nut
6	Power Supply Module Assembly	19	Quartz Sleeve Wiper Module (wiper models only)
7	Black Retaining Nut	20	C-Clips (wiper models only)
8	Power Supply Gasket	21	Quartz Sleeve Wiper Rod (wiper models only)
9	Clear Quartz Sleeve Retaining Module	22	Wiper Rod Handle Stop Nut (wiper models only)
10	O-Ring for Clear Quartz Sleeve Retaining Module	23	Wiper Rod Handle (wiper models only)
11	Quartz Sleeve O-Ring		
12	Quartz Sleeve Gasket		
13	White Quartz Sleeve Gasket/O-Ring Retaining Nut		

Bolded parts require annual replacement

SMART HO UV Watts/Model No.	UV Lamp Part No.	Quartz Sleeve Part No.	Power Supply Part No.	Lamp Connector Part No.	Gasket Service Kit Part No.
50 Watt/025050	20050	20325	20105/20250-1	20077	20375
80 Watt/025080	20080	20340	20105/202120-1	20077	20375
120 Watt/025120	200120	203120	20105/202120-1	20077	20375
150 Watt/025150	200150	20365	202150-1	20077	20375

NOTE: Clear Quartz Sleeve Retaining Module #20603, White Quartz Sleeve Retaining Nut #20079, both fit all SMART UV Sterilizer Models as well as all SMART HO UV Sterilizers.



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P/N 02934-INS-SMART REV. B 4/27/15

AQUA LOGIC'S **MULTI-TEMP® and TITAN Series chiller and heat pumps**
MT- 1 thru MT- 8 and HP- 1 thru HP- 5

INSTALLATION & OPERATING INSTRUCTIONS

Effective 1-2016

Thank you for purchasing an Aqua logic chiller and or heat pump. It has been designed and built to provide years of reliable, trouble-free service. It provides a precise water temperature control up to +/- 1.0°F (0.7°C) accuracy and features a continuous LCD display of the current fluid temperature.



BEFORE INSTALLING THE CHILLER
READ BOTH WARRANTY AND INSTALLATION INSTRUCTIONS.

Important: Unpacking your chiller or heat pump

This chiller was properly packed and accepted by the transportation company for shipment. It is the responsibility of the transportation company to deliver it to you in perfect condition.

APPARENT DAMAGE OR LOSS

If, upon delivery, the shipping container or equipment indicates DAMAGE IN TRANSIT, such damaged goods should not be accepted until the transportation company's agent has noted on the freight bill, which he will give you, the nature and extent of the damage. If any part of this shipment is LOST IN TRANSIT, have the shortage noted on the freight bill by the agent.

CONCEALED DAMAGE

If, when this equipment is unpacked, shipping damage is discovered which was not apparent upon delivery, notify the transportation company IMMEDIATELY to inspect the damaged equipment. The inspector is REQUIRED to provide you with a DAMAGE INSPECTION report.

THIS INSPECTION MUST BE REQUESTED WITHIN FIFTEEN (15) DAYS OF DELIVERY. DO NOT MOVE DAMAGED SHIPMENTS FROM POINT OF DELIVERY. RETAIN ALL CONTAINERS AND PACKING FOR INSPECTION.

Protect yourself. File your claim immediately with the transportation company! Remember, Aqua logic Inc. is not responsible for any damage after the carrier accepts a shipment. Claim for FULL VALUE REIMBURSEMENT should be made by you against the transportation company. Replacement of the damaged equipment should be requested by the purchaser as a new order.

WARNING!!!

**THIS DEVICE USES HIGH VOLTAGE ELECTRICAL POWER FOR OPERATION.
SAFETY PRECAUTIONS MUST BE OBSERVED.
CAREFULLY READ AND OBSERVE THE FOLLOWING TO AVOID ELECTRICAL SHOCK
OR SEVERE DAMAGE TO THE EQUIPMENT.**

- We recommend, as with all electrical equipment used in or around water, that you connect your electrical equipment to a ground-fault interrupt (GFI) protection circuit.
- **ALWAYS** turn the power off for the equipment at the source (circuit breaker) if there is any electrical problem, the electrical equipment or controller has been submerged in water.
- **ALWAYS** make sure that the electrical circuit you connect your electrical equipment to is rated at least 20% higher than the maximum current rating on the equipment.
- **ALWAYS** make sure that you operate the equipment at the correct voltage.
- Do **NOT** attempt to turn off the power at the chiller or controller if a problem occurs. Disconnect unit at the main power panel.

Do **NOT** attempt to repair equipment. Call Aqua Logic for instructions.

Very Important!

1. Allow only qualified licensed personnel to supply electric power to chiller or heat pump. Installation must be done in accordance with local and national electrical code. Multi-Temp Chillers and Titan heat pumps need a fusible disconnect installed within five feet. The chiller or heat pump needs a dedicated power supply. **Do not** share the power feed to with any other peripheral devices such as pumps, ultraviolet light sterilizers, or filters. Interlock device prevents the chiller from energizing without the pump being on.
2. Double check electrical specifications on unit's electrical access cover plate making sure of voltage, amperage, phase, and cps before energizing. (**Do not** remove any covers with electrical power on.)
3. Some control packages include condenser fan cycling, and timed switches that delay certain functions on initial start-up. Consult Aqua Logic Inc. for exact details before attempting servicing.
4. **Fluid must flow through the chiller or heat pump at all times.** See specification sheet for minimum and maximum flow rates. Flow rates less than specification may result in evaporator freeze up and cracking PVC plastic evaporator shells. Aqua Logic Inc. does not warranty evaporator shells operating under low flow conditions.
5. Incoming water pressure to the inlet of the evaporator must not exceed 40 psi. Pressures over 40 psi may cause damage to the evaporator shells not covered under warranty.

Installation Instructions:

Installation must proceed in accordance with national building and electrical codes by qualified technicians only.

The chiller or heat pump you have purchased uses Trane condensing units. Consult specification labels on condensing unit for particular details concerning electronic parts, electrical wiring, voltages, amperage, cps, and refrigerant type. These labels are on the backs of covers that require removal to view.

1. Place the chiller or heat pump in a well ventilated area with the condenser fins pointing toward prevailing winds, or source of fresh air intake. Ambient air temperature must never exceed 110° sustained.
2. Aqua Logic Inc. recommends the chiller be mounted outdoors with a protective cover. Outdoor covers must be built allowing ample air flow on five sides.
3. If the chiller is to be located in a building, we recommend providing a source of fresh air such as a hole in an outside wall the size of the condenser fins. Position heat pump within 4' of the air source. Duct and seal condenser fins to outside air if possible.
4. If the chiller must be inside a building without access to outside air, locate unit at least 3' from any single wall and 4' to 6' from any adjacent wall. Locate in such a way as to prevent air recycling. Recycled air may not provide condenser with adequate heat exchange.

5. The evaporator located under the condensing unit, has 2" PVC slip connections on both inlet and outlet. Make sure that inlet and outlet flow is followed if designated.

Safety Precautions

1. Always wear safety eye wear and work gloves when installing equipment.
2. Never assume electrical power is disconnected. Disconnect and check with meter.
3. Keep hands out of fan areas when power is connected to equipment.
4. R-410a escaping into the air can cause frost-bite burns.
5. R-410a is toxic when burned.

Very Important!

1. Before making power available to the chiller, check to see if all fan blades can spin freely. Shipping may have caused fan blades to not turn freely. If this is the case, do not apply power until repaired!
2. Fluid must flow through the chiller or heat pump at all times. See specifications sheet for minimum and maximum flow rates. Flow rates under specifications may result in evaporator freeze up and cracking PVC plastic evaporator shells.
3. Double check specifications on condensing unit making sure of voltage, amperage, phase, and hertz before energizing.
4. Some control packages include condenser fan cycling, and timed switches that delay certain functions on initial start-up. Please consult Aqua Logic Inc. if necessary for exact details of your particular unit.

Initial Start-up: Read all of the instructions before energizing unit.

Caution: It's important to allow the oil in the compressor(s) to warm-up at least 8 hours before starting up the unit. If the ambient air temperature is below 60°F, apply power to the unit and set controller so the compressor(s) do not energize or by-pass the heat exchanger water supply so the flow switch will not activate the unit.

Adjust temperature set point to desired water temperature. When the thermostat calls for cooling, a delay timer will start the system after 3 minutes. The chiller will pull the water temperature down to the set point, and shut the unit down. When the water temperature

risers above the differential setting, the chiller will repeat the delay cycle and cool down to temperature set point.

Very Important!

1. Target fluid temperature is limited to a range of 40° F to 80° F on all standard MultiTemp Chillers. Without special factory installed equipment, possible damage to the unit can occur when attempting to access fluid temperatures outside this range. Aqua Logic, Inc.'s warranty does not apply to application temperatures under 40°F or above 80° F without special factory modifications.
2. Water going to the chiller should be protected by filters to keep debris from collecting in the evaporator shells. Clogged shells lead to heat exchange problems and will void the warranty.
3. Improperly installed or out of adjustment rapid sand filters or fluidized beds can put sand into the stream of water flowing into the chiller. This condition is similar to “sand blasting” and may abrade holes in plumbing lines or the titanium coils. Conditions like these would void the Aqua Logic, Inc. warranty.

40° F to 80° F Fluid Temperature Applications

Wetted parts contain titanium, PVC plastic, rubber, and polymer. These materials are non-reactive with fresh and salt water. You must consult with Aqua Logic, Inc. if any other fluids are to be pumped through the chiller.

If humid or wet conditions exist where chiller is to be located, care must be taken to prevent water from getting on electrical components. Fins on condensing unit are made from aluminum and are subject to rapid corrosion, especially near sea water. Fins are thin to aid in heat exchange. Bent fins reduce efficiency and just brushing up against them can bend them over. Heat pumps should be located away from high traffic areas.

The chiller operates by virtue of a thermostat that senses water temperature inside the probe well. When the temperature set point is satisfied, the supply of refrigerant to the evaporator is stopped. This initiates a pump down, and the compressor shuts off. When the thermostat calls for cooling, the supply of refrigerant is re-established to the evaporator, but the system has a time delay of approximately 3 or 5 minutes before the compressor goes on again.

Chiller Control Set-up

Step	Enunciator	Description	Display
1	F or C	Fahrenheit or Celsius	F
2	S1 (Blinking)	Setpoint Temperature	S1 77
3	DIF (Blinking)	Differential Temperature	DIF 1
4	C1 or H1	Cooling or Heating Mode	C1



Liquid Crystal Display (LCD)

The LCD display provides a constant readout of the sensor temperature and indicates if the output relay is energized. When the **S1** enunciator is constantly illuminated during operation, the relay is energized. The display is also used in conjunction with the keypad to allow the user to adjust the set point temperature, differential and heating /cooling modes.

Programming Steps and Display

The control can be programmed in four simple steps using the LCD display and the three keys on the face of the control. (See photo for display and keys.)

1. To start programming, press the **SET** key once to access the Fahrenheit/Celsius mode. The display will show the current status, either **F** for degrees Fahrenheit or **C** for degrees Celsius. Then press either the up ↑ arrow or down ↓ arrow key to toggle between the **F** or **C** designation.
2. Press the **SET** key again to access the set point temperature. The LCD will display the current set point temperature and the set point enunciator will be blinking on and off to indicate that the control is in the set point mode. Then press either the up ↑ key to increase or down ↓ key to decrease the set point to the desired temperature.
3. Press the **SET** key again to access the differential. The LCD will display the current differential and the **DIF** enunciator will be blinking on and off to indicate that the control is in the differential mode. Then press either up ↑ key to increase or the down ↓ key to decrease the differential to the desired setting (minimum 1°F, maximum 30°F).
4. Press the **SET** key again to access the heating mode. The LCD will display the current mode, **C1** for chiller mode and **H1** is for heater mode. Press the **SET** key once more and programming is complete. Controller **MUST** in the **C1** mode for correct operation.

Controller will automatically drop out of “program mode” and return to “operating mode” 30 seconds after last key press.

Troubleshooting Controller Error Messages:

Display Messages

E1 - Appears when the up ↑ or down ↓ key is pressed when not in the programming mode.

To correct: If the E1 message appears even when no keys are being pressed, replace the control.

E2 - Appears if the control settings are not properly stored in memory.

To correct: Check all settings and correct if necessary.

EP - Appears when the probe and/or flow switch is open, shorted or sensing a temperature that is out of range.

To correct: Check to see if the sensed temperature is out of range. If not, check for probe damage by comparing it to a known ambient temperature between -30°F and 220°F. Replace the probe if necessary. Also check for proper water flow through heater. If water flow is correct, flow switch.

EE - Appears if the EEPROM data has been corrupted.

To correct: This condition cannot be field repaired. Replace the control.

CL - Appears if calibration mode has been entered.

To correct: Remove power to the control for at least five seconds. Reapply power. If the **CL** message still appears, replace the control.

Heat Pump Control Set-up

STEP	ANNUCIATOR	DESCRIPTION	DISPLAY
1	F or C	Fahrenheit or Celsius Scale	F
2	S1 (blinking)	Stage 1 Setpoint Temperature	77 S1
3	DIF1 (blinking)	Stage 1 Differential Temperature	1 DIF1
4	C1/H1	Stage 1 Heating Mode	H1
5	S2 (blinking)	Stage 2 Setpoint Temperature	77 S2
6	DIF2 (blinking)	Stage 2 Differential Temperature	1 DIF2
7	C2/H2	Stage 2 Cooling Mode	C2



Liquid Crystal Display (LCD)

The LCD display provides a constant readout of the sensor temperature and indicates if the output relay is energized. When the **S1** or **S2** annunciator is constantly illuminated during operation, the relay is energized. The display is also used in conjunction with the keypad to allow the user to adjust the setpoint temperature, differential and heating /cooling modes.

Programming Steps and Display

The control can be programmed in four simple steps using the LCD display and the three keys on the face of the control. (See photo for display and keys.)

NOTE: Stage 1 must be set for heat mode and Stage 2 for cool mode for correct operation.

- To start programming, press the **SET** key once to access the Fahrenheit/Celsius mode. The display will show the current status, either **F** for degrees Fahrenheit or **C** for degrees Celsius. Then press either the up ↑ arrow or down ↓ arrow key to toggle between the **F** or **C** designation.
- Press the **SET** key again to access the heat mode setpoint temperature. The LCD will display the current setpoint temperature and the **S1** annunciator will be blinking to indicate that the control is in the setpoint mode. Press either the up ↑ key to increase or down ↓ key to decrease the setpoint to the desired temperature.
- Press the **SET** key again to access the heat mode differential temperature. The LCD will display the current differential and the **DIF 1** annunciator will be blinking to indicate that the control is in the differential mode. Then press either up ↑ key to increase or the down ↓ key to decrease the differential to the desired setting (minimum 1°F, maximum 30°F).
- Press the **SET** key again to select heat mode. The LCD will display the current mode: **C1** or **H1**. Then press either up ↑ key to increase or the down ↓ key to select the correct Stage 1 mode. Stage 1 **MUST** be in the **H1** mode for correct operation.
- Press the **SET** key again to access the chill mode setpoint temperature. The LCD will display the current chill setpoint temperature and the **S2** annunciator will be blinking to indicate that the control is in the setpoint mode. Then press either the up ↑ key to increase or down ↓ key to decrease the setpoint to the desired temperature. **S1** and **S2** should both be set for the same temperature.
- Press the **SET** key again to access the chill mode differential temperature. The LCD will display the current differential and the **DIF 2** annunciator will be blinking to indicate that the control is in the differential mode. Then press either up ↑ key to increase or the down ↓ key to decrease the differential to the desired setting (minimum 1°F, maximum 30°F). **DIF1** and **DIF2** should both be set to the same value for best results.
- Press the **SET** key again to access the heating mode. The LCD will display the current mode: **C2** or **H2**. Stage 2 **MUST** be in the **C2** mode for correct operation.
- Press the **SET** key again to exit programming mode. Controller will display current water temperature.

Controller will automatically drop out of “program mode” and return to “operating mode” 30 seconds after last key press.

Chiller / Heat Pump Maintenance

Heat Exchanger Cleaning:

The heat exchanger should be cleaned approximately every 12 months or as needed to allow proper performance. On some models this process may be done without removal of the heat exchanger shell. (i.e., water flushing system)

WARNING:

When using bleach and acid special care should be observed.
Always wear hand, eye and body protection. Use rubber gloves.

DO pour acid or bleach into the water. **DO NOT** pour water into acid or bleach solution.
DO NOT perform acid and bleach flushing at the same time. The gas generated by the mixture is poisonous and can result in serious injury or death.

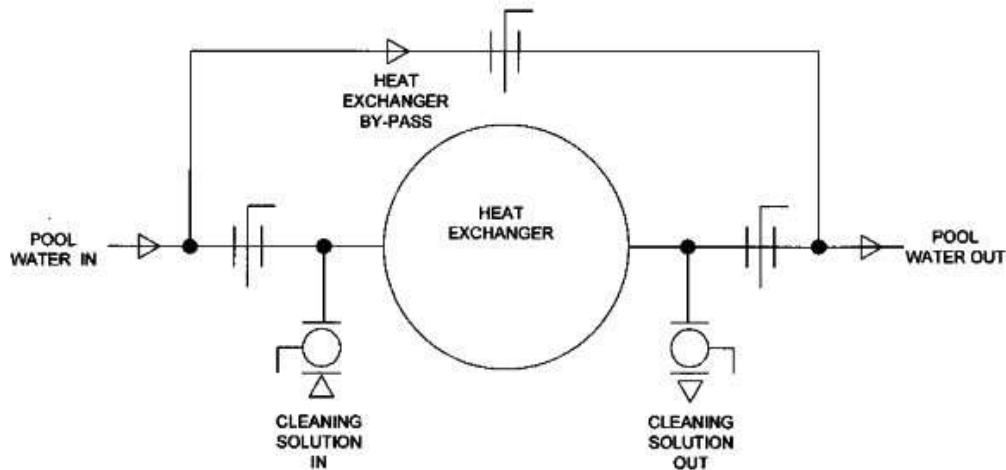
To remove organic deposits from titanium tube bundle without removing the shell:

1. Isolate the heat exchanger. (see drawing next page)
2. Mix 1 part bleach to 3 parts distilled water in 20 gallon tank or larger container.
3. Circulate via pump the solution through heat exchanger for approximately one to two hours or as needed.
4. Thoroughly rinse heat exchanger with clean water.

To remove mineral deposits from titanium tube bundle:

Use the same steps as above, but use muriatic acid instead of bleach. Be sure to follow the muriatic acid manufacturer's instructions for use and safety.

Heat exchanger by-pass plumbing



Condensing unit maintenance:

The condensing unit should be cleaned approximately every 12 months or as needed to allow proper performance.

Note: If located near the ocean, every 6 months a fresh water wash down of the condenser fins should be done to prolong the life of the chiller or heat pump.

1. Clean and inspect the condenser coil for dirt and debris built-up. (If dirty, use compressed air or a pressure washer to clean)
2. Visually inspect connecting refrigerant lines and coils for evidence of oil leaks. (If there is oil residue you may have a refrigerant leak. Call your local HVAC tech)
3. Check wiring for loose connections.

CHILLER AND HEAT PUMP PACKAGES LIMITED WARRANTY TERMS

(PLEASE READ CAREFULLY):

Effective 3 / 2015

Limited Warranty

Aqua Logic, Inc. packaged water chiller and heat pumps have a **one (1) year** parts and **90 day** labor warranty. Heat exchanger (evaporator) has a **one (1) year** parts only warranty.

An extended condensing unit only five year parts and labor warranty is available for an additional charge. This must be added at the time of purchase.

The limited warranty covers only the parts and labor based upon Aqua Logic service cost and Aqua Logic is not liable for field repair work without prior written or verbal agreement with Repair Authorization (RA) number with a fixed maximum charge.

The warranty applies only to the original purchaser and is not transferable.

The warranty covers only the repair or replacement of Aqua Logic products and is limited to Aqua Logic's cost of defective parts.

Once Aqua Logic determines that the defect is due to parts or workmanship and that the product is under warrantee, Aqua logic will repair or replace the product solely at their discretion.

Our warranty does not include the following:

- Damage caused by freezing, inadequate or no water flow.
- Damage caused by improper installation or maintenance by user or their agent.
- Damage caused due to misapplication of the product.
- Damage caused by corrosion, abuse, accident, alteration or improper use.
- Damage caused by flood, fire, earthquake, tornado or other acts of God.
- Damage caused by electrical spikes, surges, brownouts or improper voltage or amperage.
- Damage caused by failure of any third party equipment (ie., controller, pump, etc.)
- Incidental damage to other equipment, property or livestock.
- Damage caused by a contractor in the field with poor installation technique ie., incorrect plumbing size between other equipment.

In the event of a defect or failure of the product, immediately contact Aqua logic for assistance. Aqua Logic will at their discretion:

- Provide user-replaceable parts to restore the unit to proper operation.
- Provide a Repair Authorization (RA) number with a specified dollar limit for a qualified technician to provide a field repair.
- Provide a Return Authorization (RA) number to return the unit with prepaid freight in wood crate that fully protects the unit from damage to: Aqua Logic, Inc., 9558 Camino Ruiz, San Diego, CA 92126
- Include the serial number as well as proof of purchase and /or a copy of the original bill of sale along with the RA number. COD shipments will be refused

Chiller / Heat Pump Start-up

Job Name			
Date			
Model No.			
Serial No.			
Unit Run Volts / phase			
Unit Run Amps			
Water flow rate (GPM)			
Incoming Water Temp (°F)			
Freon Suction (PSI)			
Freon Liquid (PSI)			
Superheat °F			

Start-up procedure:

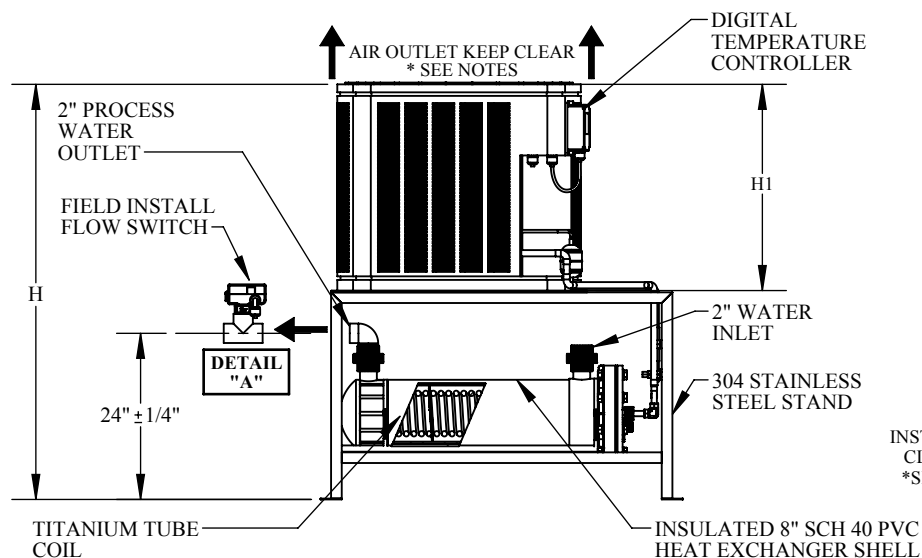
Caution: It's important to allow the oil in the compressor(s) to warm-up at least 8 hours before starting up the unit. If the ambient air temperature is below 60°F, apply power to the unit and set controller so the compressor(s) do not energize or by-pass the heat exchanger water supply so the flow switch will not activate the unit.

1. Remove the cover of the unit. (If applicable)
2. Attach refrigeration suction and liquid hoses and an Amp / Volt meter to the unit.
3. Turn on water pump to heat exchanger. Note: (Make sure water flow rate is within published rate of the chiller.)
4. Adjust the controller below the indicated water temperature to turn on the unit. (After 2-5 minutes the compressor should activate.)
5. Once the compressor(s) are running for approximately 15 minutes, record the information that's listed above.
6. For Heat Pumps, cycle the unit from chilling to heating to make sure the reversing valve is functioning.

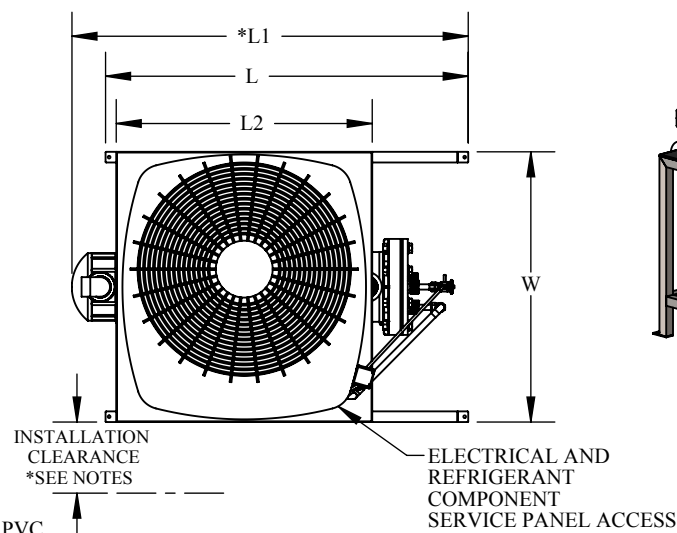
Comments:

MT-1 THRU MT-8 SPECIFICATION

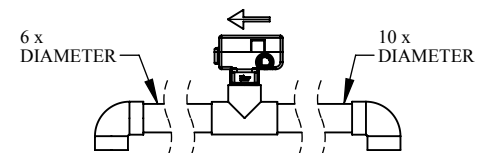
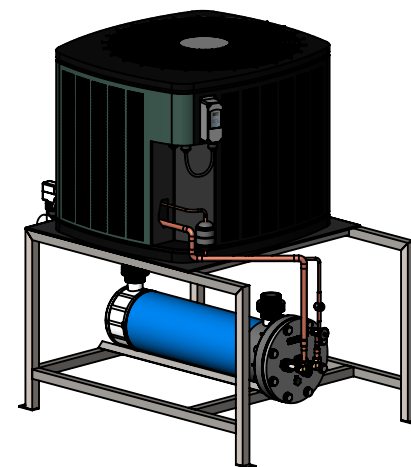
FOR INDOOR OR OUTDOOR FRESH AND SALT WATER APPLICATIONS



FRONT VIEW



PLAN VIEW



IMPORTANT! DETAIL "A"

• FLOW SWITCH MUST BE FIELD INSTALLED HORIZONTALLY WITH NO LESS THAN 10 TIMES THE DIAMETER OF STRAIGHT PIPE ON THE INLET SIDE AND NO LESS THAN 6 TIMES THE DIAMETER ON THE OUTLET SIDE.

OPTIONS:

- SCH 80 SHELL CONSTRUCTION.
- 316 STAINLESS STEEL STAND AND HARDWARE.
- LOW AMBIENT HEAD PRESSURE CONTROL.
- COASTAL MARINE CONDENSER COATING.

MULTI-TEMP WATER CHILLERS												
MODEL NO.	NOMINAL TONS / BTUH / KW	VOLTS / PHASE	AMPS RLA / LRA	WATER FLOW RATE (GPM)	*AIR OUTLET (CFM)	H	H1	L	*L1	L2	W	SHIPPING WEIGHT (lbs.)
MT-1	2 / 24K / 7	208 - 230 / 1	9 / 58	20 / 40	1550	59"	29"	44"	n/a	31"	33"	370
MT-3	3 / 36K / 10.5	208 - 230 / 1	14 / 72	20 / 40	2175	63"	33"	44"	n/a	31"	33"	396
MT-4	3 / 36K / 10.5	208 - 230 / 3	12 / 77	20 / 40	2175	66"	37"	44"	n/a	31"	33"	386
MT-4-460	3 / 36K / 10.5	460 / 3	6 / 35	20 / 40	2175	66"	37"	44"	n/a	31"	33"	386
MT-5	4 / 48K / 14	208 - 230 / 1	21 / 109	30 / 60	2500	59"	29"	51"	n/a	36"	38"	474
MT-6	4 / 48K / 14	208 - 230 / 3	15 / 91	30 / 60	2500	63"	33"	51"	n/a	36"	38"	474
MT-6-460	4 / 48K / 14	460 / 3	7 / 46	30 / 60	2500	63"	33"	51"	n/a	36"	38"	474
MT-7	4 / 60K / 17.5	208 - 230 / 1	27 / 158	30 / 60	3700	59"	29"	51"	56"	36"	38"	520
MT-8	5 / 60K / 17.5	208 - 230 / 3	19 / 137	30 / 60	3700	70"	41"	51"	56"	36"	38"	528
MT-8-460	5 / 60K / 17.5	460 / 3	9 / 52	30 / 60	3700	70"	41"	51"	56"	36"	38"	500

*NORMAL OPERATING AMBIENT AIR TEMPERATURE: 50°F - 115°F.

*ADD LOW AMBIENT HEAD PRESSURE CONTROL FOR OPERATING IN AMBIENT AIR TEMPERATURES FROM 0°F TO 50°F. CONSULT AQUA LOGIC IF OPERATING AT TEMPERATURES OUTSIDE THESE RANGES.

*ALL CONDENSING UNITS HAVE A 13 SEER RATING.

*L1 DIMENSION ARE FOR MODELS MT-7 & MT-8 CHILLERS.

*NOTES:

- TOP DISCHARGE AREA SHOULD BE UNRESTRICTED FOR 60 INCHES MINIMUM.
- UNIT SHOULD BE PLACED SO ROOF RUN-OFF WATER DOES NOT POUR DIRECTLY ON UNIT.
- MINIMUM CLEARANCE FOR PROPER OPERATION IS 12 INCHES FROM WALLS, SHRUBBERY, FENCES, ETC.
- MINIMUM CLEARANCE BETWEEN ADJACENT UNITS IS 72 INCHES.
- ALL DIMENSIONS ARE APPROXIMATE AND CAN CHANGE AT ANY TIME.

* COPYRIGHT *
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DESCRIPTION
MULTI TEMP AIR COOLED WATER CHILLER

DRAWN BY
Arnaldo Guzman

DATE
11/12/2015

REVISION

SCALE
1:25

SHEET #
1 OF 1

DRAWING #
PDF-0052

SHEET TITLE

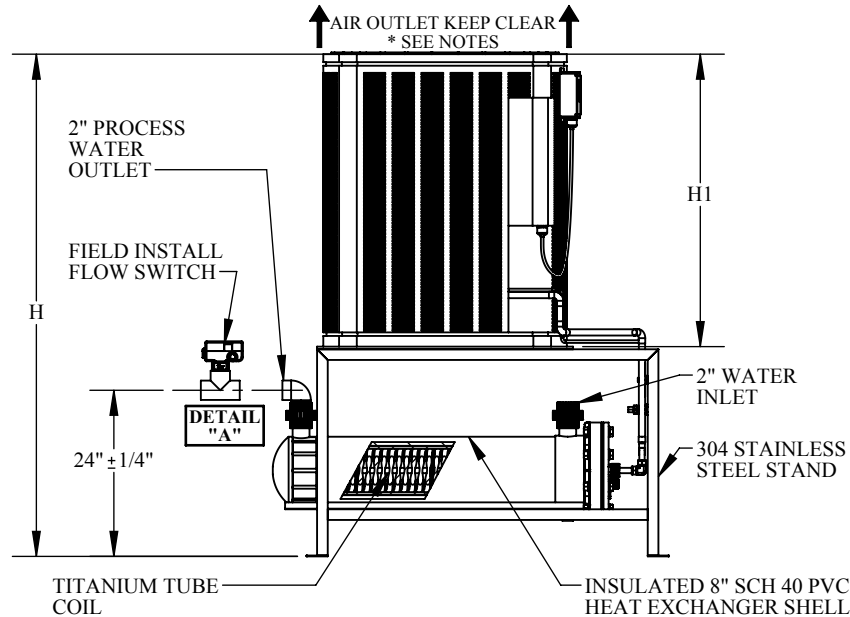
MT-1 THRU MT-8 SPECIFICATIONS

aqua
LOGIC
Aquatic Design, Manufacturing & Integration

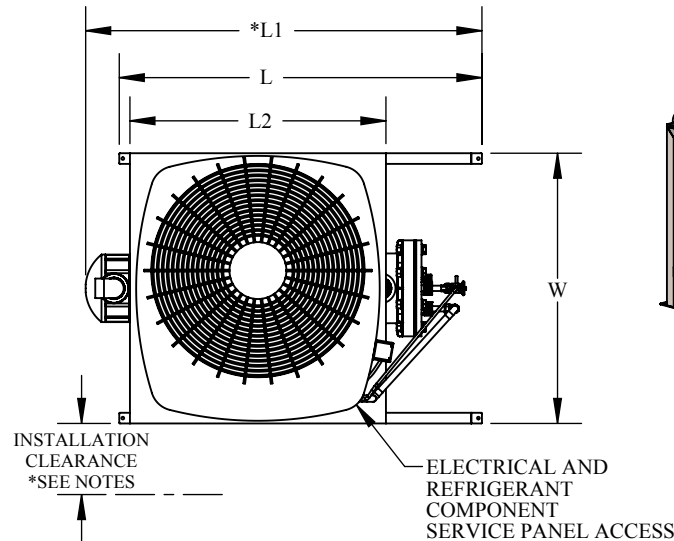
9558 Camino Ruiz, San Diego, CA 92126

HP-1 THRU HP-53 SPECIFICATION

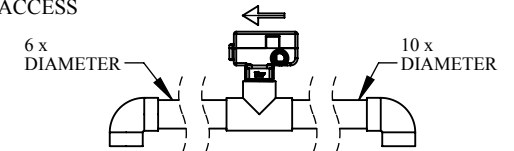
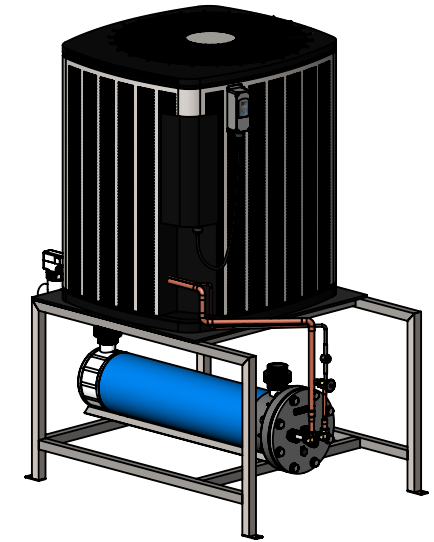
FOR INDOOR OR OUTDOOR FRESH AND SALT
WATER APPLICATIONS



FRONT VIEW



PLAN VIEW



IMPORTANT! ·DETAIL "A"

· FLOW SWITCH MUST BE FIELD INSTALLED HORIZONTALLY WITH NO LESS THAN 10 TIMES THE DIAMETER OF STRAIGHT PIPE ON THE INLET SIDE AND NO LESS THAN 6 TIMES THE DIAMETER ON THE OUTLET SIDE.

OPTIONS:

- SCH 80 SHELL CONSTRUCTION.
- 316 STAINLESS STEEL STAND AND HARDWARE.
- LOW AMBIENT HEAD PRESSURE CONTROL ON COOLING MODE ONLY.
- COASTAL MARINE CONDENSER COATING.

TITAN HEAT PUMPS												
MODEL NO.	NOMINAL TONS / BTUH / KW	VOLTS / PHASE	AMPS RLA / LRA	WATER FLOW RATE (GPM)	*AIR OUTLET (CFM)	H	H1	L	*L1	L2	W	SHIPPING WEIGHT (LBS.)
HP-1	1.5 / 18K / 5.2	208-240 / 1	6 / 38	20 / 40	1550	59"	29"	44"	n/a	31"	33"	406
HP-2	2 / 24K / 7	208-240 / 1	8.7 / 57	20 / 40	1550	63"	33"	44"	n/a	31"	33"	389
HP-3	3 / 36K / 10.5	208-240 / 1	14 / 91	20 / 40	2175	63"	33"	51"	n/a	36"	38"	500
HP-33	3 / 36K / 10.5	208-240 / 3	10.9 / 74	20 / 40	2175	63"	33"	51"	n/a	36"	38"	495
HP-33-460	3 / 36K / 10.5	460 / 3	5.5 / 38	20 / 40	2175	63"	33"	51"	n/a	36"	38"	495
HP-4	4 / 48K / 14	208-240 / 1	18.6 / 94	30 / 60	2500	67"	37"	51"	n/a	36"	38"	518
HP-43	4 / 48K / 14	208-240 / 3	13.7 / 101	30 / 60	2500	67"	37"	51"	n/a	36"	38"	515
HP-43-460	4 / 48K / 14	460 / 3	7.1 / 51	30 / 60	2500	67"	37"	51"	n/a	36"	38"	515
HP-5	5 / 60K / 17.5	208-240 / 1	25 / 148	30 / 60	3700	75"	45"	51"	56"	36"	38"	553
HP-53	5 / 60K / 17.5	208-240 / 3	18.6 / 139	30 / 60	3700	75"	45"	51"	56"	36"	38"	538
HP-53-460	5 / 60K / 17.5	460 / 3	9 / 71	30 / 60	3700	75"	45"	51"	56"	36"	38"	538

*NORMAL OPERATING AMBIENT AIR TEMPERATURE: 50°F - 115°F.

*ADD LOW AMBIENT HEAD PRESSURE CONTROL FOR OPERATING IN AMBIENT AIR TEMPERATURES FROM 0°F TO 50°F.
CONSULT AQUA LOGIC IF OPERATING AT TEMPERATURES OUTSIDE THESE RANGES.

*ALL CONDENSING UNITS HAVE A 14 SEER RATING.

*L1 DIMENSION ARE FOR MODELS HP-5 & HP-53 CHILLERS.

*NOTES:

- TOP DISCHARGE AREA SHOULD BE UNRESTRICTED FOR 60 INCHES MINIMUM.
- UNIT SHOULD BE PLACED SO ROOF RUN-OFF WATER DOES NOT POUR DIRECTLY ON UNIT.
- RECOMMENDED CLEARANCE FOR PROPER OPERATION AND MAINTENANCE IS 24" FROM WALLS, SHRUBBERY, FENCES, ETC.
- MINIMUM CLEARANCE BETWEEN ADJACENT UNITS IS 72 INCHES.
- ALL DIMENSIONS ARE APPROXIMATE AND CAN CHANGE AT ANY TIME.

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and construction techniques herein are the
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manner without the written consent of
Aqua Logic Inc.

DESCRIPTION
TITAN HEAT PUMP AIR COOLED

DRAWN BY
Arnaldo Guzman

DATE
11/13/2015

REVISION
1.27

SHEET #
1 OF 1

DRAWING #
PDF-0237

SHEET TITLE
HP-1 THRU HP-53
SPECIFICATIONS

aqua
LOGIC
Aquatic Design, Manufacturing & Integration

9558 Camino Ruiz, San
Diego, CA 92126



DSP

Digital
Single
Phase

Motor Protector / Power Monitor Installation and Operation Instructions

OVERVIEW:

The DSP-1 Line Voltage Monitor provides continuous monitoring of the power and control signals used to operate any single phase load. Protected devices can include motors, pumps, fans, compressors and other devices.

The DSP-1 protects these devices by keeping a constant watch over the supplied voltage, and when the voltage goes outside of a voltage and tolerance that you select, the DSP-1 opens its control relay.

The time required to respond to the out-of-tolerance conditions is user adjustable and may be set to short times for sensitive devices or longer times to help eliminate nuisance tripping.

When the DSP-1's relay opens, the delay timer starts. This timer keeps track of the time since the output was turned off and prevents the protected equipment from restarting too soon. The delay is also user adjustable. It is particularly useful for the protection of compressors, where an attempted rapid restart can cause a stalled condition and motor burnout.

INSTALLATION:

Installation of the DSP-1 is simple and straight forward.

DISCONNECT ALL POWER BEFORE STARTING THE INSTALLATION OF THE DSP-1

MOUNTING:

Select a cool, dry location for the mounting of the DSP-1. Keep in mind that the front of the unit has the operator controls and the digital display. The front of the DSP-1 should be clear of obstructions and allow easy access to the control buttons. A suitable location may be in the control enclosure, near the motor starter or compressor contactor.

The DSP-1 should be mounted on a metal surface with two #8 sheet metal screws.

WIRING:

If the voltage being monitored is tapped from a high current source, branch circuit protection (fuse or circuit breaker) as described in the National Electric Code should be provided. Since the current drawn by the DSP-1 is a fraction of an Amp, the branch protection can be selected for the wire type used. Typically, a fuse rated at 1 Amp will provide the required protection.

PINOUT DESCRIPTION

L1 & L2

Connect the voltage being monitored to the DSP-1's L1 and L2 terminals. This voltage will also power the DSP-1 and should come from a

source such as the line side of the contactor being controlled.

NC, NO and COM

These terminals connect to the relay output. The relay closes when the line voltage is within the selected tolerance, the control voltage is on and the delay timer has expired. Typically you would connect the COM and NO terminals in series with the control circuit, motor starter or contactor coil.

C1, C2 and C3

Connect a control voltage to C1 and C2. The DSP-1 responds to voltage between 18 and 250 Volts and draws only a fraction of an Amp. To allow the use of a 24 Volt thermostat an internal anticipator load is provided by connecting C2 to C3. Be sure to only connect C3 for 24 Volt or lower operation.

SETUP

After completing the installation, Apply power to the system. The DSP-1's display will show the incoming line voltage. The OVER or UNDER indicators may also be visible depending on the factory versus your incoming line voltage.

Pressing the SELECT button will sequence the display through the following parameters:

VOLTAGE SET POINT
TOLERANCE SET POINT
RESPONSE TIME
DELAY TIME
(BACK TO THE LINE VOLTAGE DISPLAY)

The DSP-1's
LCD DISPLAY

OVER UNDER MEM
888 %
VAC
RESP.
DELAY

If you press SELECT and do not change a parameter by pressing the up or down arrow keys, the DSP-1 automatically returns to displaying the line voltage in 7 seconds.

To set the desired voltage range press the SELECT button once. The VAC indicator will flash, (indicating that you are in the set voltage mode). Press the up or down arrows to change the setting to the voltage range that you desire. You may press and hold the up or down keys to accelerate the setting of any parameter.

SETUP CONTINUED

To set the desired line voltage tolerance (in percent) press the SELECT button a second time. The % indicator will flash (indicating that you are in the set tolerance mode).

Press the up or down arrows to change the setting to the tolerance range that you desire.

To set the desired delay time (in seconds) press the SELECT button a third time. The DELAY indicator will flash (indicating that you are in the set delay time mode).

Press the up or down arrows to change the setting to the response time that you desire.

To set the desired response time (in seconds and tenths of seconds) press the SELECT button a fourth time. The RESP indicator will flash (indicating that you are in the set response time mode).

Press the up or down arrows to change the setting to the response time that you desire.

The new settings are saved in permanent memory when the display returns to displaying the line voltage. The new settings may be verified by pressing the select button to sequence through the various parameters.

OPERATIONAL CHARACTERISTICS

When presented with a voltage of 70 volts or lower, the DSP1 displays "Lo", the output relay is turned off, the delay timer is started and the response timer is disabled. Only when the voltage returns to normal and the delay time has elapsed is the relay allowed to energize.

When the DSP1 is presented with a voltage higher than 324 volts the display will indicate OVER 325 and the control LED will go out. The display will flash over 325 until the voltage returns to 324 volts or less. Note: Any voltage over 324 volts is treated as an overvoltage condition regardless of the voltage or tolerance settings.

To prevent tripping on a 1 volt change, the DSP1 automatically calculates cut-out and cut-in voltages for both overvoltage and undervoltage. The cut-out voltage is always based on the user voltage and tolerance settings, while the cut-in voltage is 3% closer to the nominal voltage setting. This quality is sometimes referred to as hysteresis.

You may test the display by pressing the UP & DOWN keys at the same time. Press SELECT to continue normal operation.

OPERATION WITHOUT A CONNECTION TO THE CONTROL INPUT

To enable operation of the DSP-1 without control voltage connected to the input, a special sequence of key presses is required.

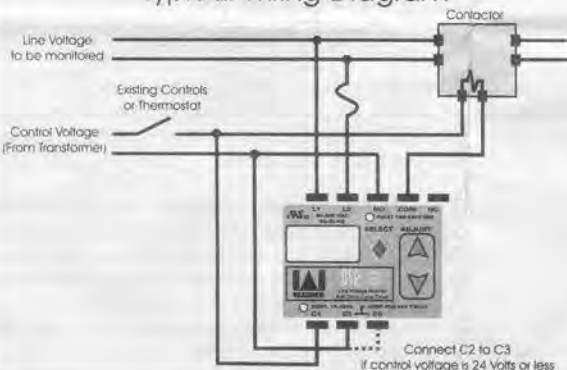
To turn on the control bypass press and hold the UP arrow key then also press the SELECT key. The control LED will begin to blink twice. This double blink is the indication that the control input is bypassed.

To turn off the control bypass simply press and hold the DOWN key then also press the SELECT key. The control LED will stop blinking or just blink once if a control voltage is present.

SPECIFICATIONS

- | | |
|----------------------|---|
| ✓ Operating Voltage: | 90 to 300 Volts |
| ✓ Voltmeter Range: | 70 to 325 Volts |
| ✓ Tolerance Limits: | 6 to 18% |
| ✓ Hysteresis: | 3% of selected operating voltage |
| ✓ Response Timer: | 0.1 to 10 seconds |
| ✓ Delay Timer: | 1 to 720 seconds |
| ✓ Output Relay: | 10 Amps, 250 VAC resistive, single-pole/double-throw |
| ✓ Control Input: | 18 to 250 VAC with anticipator load for 24 volt thermostats |

Typical Wiring Diagram



Factory Settings:

208 volts
12% tolerance
2 second response
30 second delay



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MANUFACTURING
A Division of DiversiTech

Product of DiversiTech Corp.
www.diversitech.com
Designed in the USA
Assembled in China
DW006423-1

Imbalance Voltage Tolerance in %
(% IMBALANCE flashes). The value may be adjusted by pressing the up and down arrows.

Lockout Time in seconds
(SECONDS flashes). The value may be adjusted by pressing the up and down arrows. (This is the delay on break timer value)

Delay time in seconds
(DELAY SECONDS flashes). The value may be adjusted by pressing the up and down arrows. This is the Random Start Delay value. (This is a delay on make timer)

Response time in seconds and tenths of seconds (RESP. SECONDS flashes) The value may be adjusted by pressing the up and down arrows. This is the time that a fault is allowed before shutdown occurs.

Control mode
(ON OFF AUTO flashes) The value may be adjusted to OFF (load will not turn on), ON (load will turn on whenever there are no faults and the timers are finished) and AUTO (load will turn on when there is a control input).

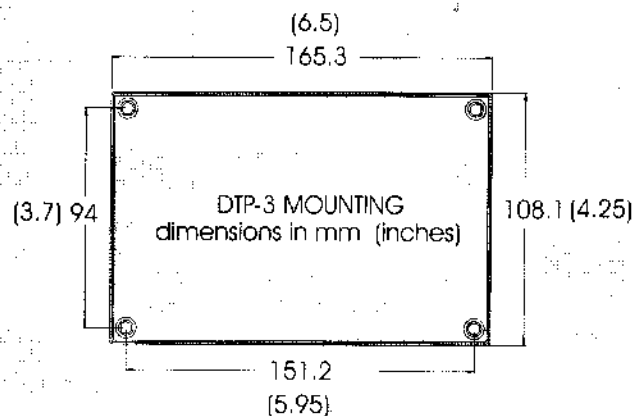
Contactor fault monitor mode
(CONTACTOR FAULT flashes) This option allows you to monitor the contactor and lock it out if the line voltage and load side varies by more than 5 volts. Pressing the up or down arrows selects off (default) or on. The load side of the contactor must be connected to the load terminals of the DTP-3 to use this option.

Display of fault memories
(MEM flashes) Pressing up or down displays the past fault conditions that took your unit off line. The first 25 faults are recorded. The top number displayed represents the fault memory. The middle number represents the total number of faults that have occurred since the fault memory was cleared. To clear the memory, press and hold the up and down keys until the display is cleared.

Notes
If you press SELECT and do not change a parameter by pressing the up or down arrow keys, the DTP-3 automatically returns to displaying the line voltage in a few seconds.

The new settings are saved in permanent memory when the display returns to displaying the line voltage. The new settings may be verified by pressing the select button to sequence through the various parameters.

To prevent tripping on a 1 volt change, the DTP-3 automatically calculates cut-in voltages for return from undervoltage conditions. The cut-out voltage is always based on the user voltage and tolerance settings, while the cut-in voltage is 3% closer to the nominal voltage setting. This quality is sometimes referred to as hysteresis. This is to help reduce oscillation that may occur on weak power distribution systems. When the load is switched off due to undervoltage, the line voltage will increase. Without the hysteresis, the monitor would switch the load back on, the line voltage would again drop, and cause a continuous on-off-on cycling.



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MANUFACTURING
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www.diversitech.com
Designed in U.S.A.
assembled in China

DTP-3
Digital Three Phase

Motor Protector / Power Monitor
Installation and Operation Instructions



KEY FEATURES

- ✓ Digital voltmeter displays instantaneous line voltage for all 3 phase pairs
- ✓ Contactor load side monitor checks for contactor closure
- ✓ One button contactor load side voltage measurement
- ✓ Automatic voltage tester adjusts from 160 to 600 volts
- ✓ Adjustable response timer (0.1 to 20 sec.) prevents nuisance tripping
- ✓ Adjustable delay on break (DOB) timer (0 to 720 sec.) prevents rapid re-starts
- ✓ Adjustable timer (0 to 30 sec.) allows sequencing of multiple units
- ✓ Off, Auto, On settings for operation with or without control inputs
- ✓ Selectable contactor test. Opens contactor if any one of 3 circuits fail
- ✓ Digital display makes for easy viewing and operation
- ✓ Fault memory records up to 25 fault causes

SPECIFICATIONS

✓ Voltmeter:	70 to 650 Volts: simultaneous display of AB BC CA voltages
✓ Accuracy	+/- 2% of indicated average voltage
✓ Tolerance Limits:	6 to 18%
✓ Imbalance:	2 to 25%
✓ Response Timer:	0.1 to 20 seconds
✓ DOB Timer:	0 to 720 seconds
✓ Delay Timer:	0 to 30 seconds
✓ Contactor Test	Contactor opens and remains locked out if voltage difference is 5 volt for any phase pair.
✓ Output Relay:	10 Amps, 250 VAC resistive, single-pole/double-throw
✓ Control Input:	18 to 250 VAC with anticipator load for 24 volt thermostats

OVERVIEW

The DTP-3 Line Voltage Monitor provides continuous monitoring of the power and control signals used to operate any three phase load. Protected devices can include motors, pumps, fans, compressors and other devices.

The DTP-3 protects these devices by keeping a constant watch over the supplied voltage, and when the voltage goes outside of a voltage and tolerance that you select, the DTP-3 opens its control relay.

The time required to respond to the out-of-tolerance conditions is user adjustable and may be set for shorter times for sensitive devices or longer times to help eliminate nuisance tripping.

Each of the three line voltage pairs are

checked for voltage level and phase to phase balance. Further testing of the system includes contactor-load-side monitoring. When enabled, the load side monitor checks the contactor for closure. If the contactor load side voltage does not match the line side voltage to 5 volts within 0.5 seconds after the control relay closes, the control relay is opened and remains locked out until power to the DTP-3 is cycled off and on.

Additionally, phase rotation is tested. If the rotation is reversed, operation of the output relay is inhibited.

If any of the limits that you set are exceeded, the response timer will begin counting. You also have the flexibility to set the response timer -- a short time may be desired for a quick response or a long time may be desired to avoid nuisance tripping. If the voltage

remains outside the tolerance after the response time has elapsed, the DTP-3 will turn off its output relay and protect your device.

When the DTP-3's relay opens, the delay timer starts. This timer keeps track of the time since the output was turned off and prevents the protected equipment from restarting too soon. The delay is also user adjustable. It is particularly useful for the protection of

or compressor contactor.

The DTP-3 should be mounted on a metal surface with four #8 sheet metal screws. Mounting on a metal surface helps dissipate heat and shield the DTP-3 from nearby equipment radiation.

WIRING

If the voltage being monitored is tapped from a high current source, branch circuit protection

load side to the DTP-3's T1, T2 and T3 terminals. Note that the load side monitoring should also include the required fusing to meet the branch circuit protection requirements of the National Electric Code or locale equivalent. If installed, the contactor fault option should be set to "ON".

NC, NO and COM

These terminals connect to the relay output. The relay closes when the line voltage is within the selected tolerance, the control voltage is on and the delay timer has expired. Typically you would connect the COM and NO terminals in series with the control circuit, motor starter or contactor coil.

C1, C2 and C3

Connect a control voltage to C1 and C2. The DTP-3 responds to voltage between 18 and 250 Volts and draws only a fraction of an Amp. An internal anticipator load is provided by connecting C2 to C3 to allow the use of a 24 Volt thermostat. Be sure to only connect C3 for 24 Volt or lower operation.

SETUP

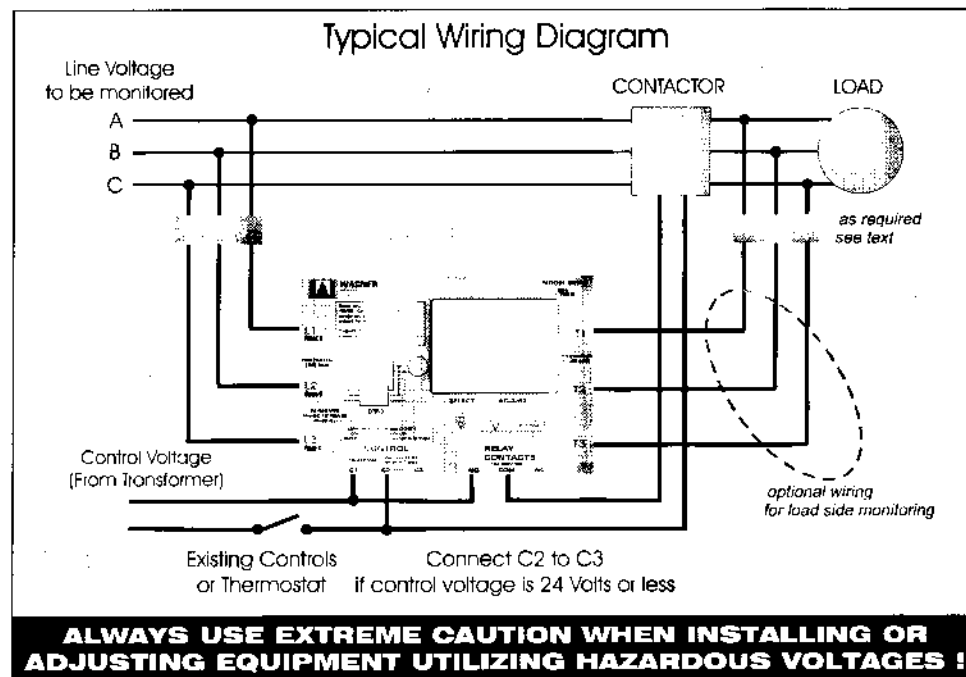
The DTP-3 may be setup at a shop or other location prior to installation by simply applying power to any of the three line-side phase pairs. The DTP-3 will power up on single phase power and allow the setting of user parameters prior to installation in a three phase system. After completing the installation (or for stand-alone setup), apply power to the DTP-3. The DTP-3 display will show a brief display test followed by the firmware revision number. The DTP-3 will then indicate the remaining time on any active timers. If the timers are expired the incoming line voltage will be displayed. The OVERVOLTAGE, UNDERVOLTAGE, PHASE LOSS and/or the PHASE REVERSAL indicators may also be visible depending on the factory settings versus your incoming line voltage.

During any point in the DTP-3's operation, you may read the incoming voltage by pressing the SELECT button to return to the AB BC CA voltmeter. (Normal Display)

THE DISPLAY

The display normally shows the AB BC and CA line voltages.

If the unit is waiting on a timer, that timer will be displayed. The timer display may be switched off by pressing SELECT. The LCD will then



compressors, where an attempted rapid restart can cause a stalled condition and motor burnout.

DISCONNECT ALL POWER BEFORE STARTING THE INSTALLATION OF THE DTP-3

INSTALLATION

Installation of the DTP-3 is simple and straight forward.

MOUNTING

Select a cool, dry location for the mounting of the DTP-3. Keep in mind that the front of the unit has the operator controls and the digital display. The front of the DTP-3 should be clear of obstructions and allow easy access to the control buttons. A suitable location may be in the control enclosure, near the motor starter

(fuse or circuit breaker as described in the National Electric Code) should be provided. Since the current drawn by the DTP-3 is a fraction of an Amp, the branch protection can be selected for the wire type used. Typically, fuses rated at 1 Amp will provide the required protection. If the load side monitor option is utilized, it's wiring must also be current limited.

PINOUT DESCRIPTION

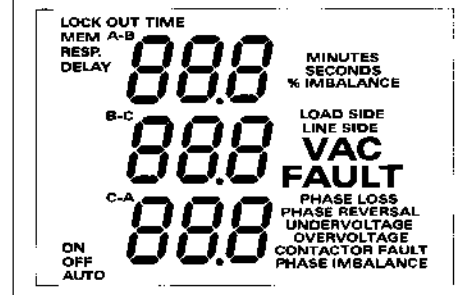
L1, L2 and L3

Connect the voltage being monitored to the DTP-3's L1, L2, and L3 terminals. This voltage will also power the DTP-3 and should come from a source such as the line side of the contactor being controlled.

T1, T2 and T3

If your application requires contactor load side monitoring, you should connect the contactor

The DTP3's LCD DISPLAY



display the normal AB BC CA voltage pairs.

Pressing the SELECT button once shows the contactor load side voltages. (if the load side option is connected) The display automatically returns to the display of line side voltage after a few seconds.

Press the Select button to step through the parameters. As you step through the parameters, the selected parameter will flash. Use the up and down arrow keys to adjust to the desired operating value.

- Line side voltage
- Load side voltage
- Voltage set point
- Under/over voltage tolerance in %
- Imbalance voltage tolerance in %
- Lockout time in seconds
- Delay time in seconds
- Response time in seconds
- Control mode
- Contactor fault monitor
- Fault Memory Display

Parameters adjustment (in order of display)
Active display of Line Voltage (this is the default normal display)

Active display of Load Side Voltage (if connected)

Voltage Set Point (VAC Flashes) The value may be adjusted by pressing the up and down arrows. This may be set to the normal operating voltage of the device being protected in one volt increments.

Under/over Voltage Tolerance in % (UNDERVOLTAGE/OVERVOLTAGE flashes)
The value may be adjusted by pressing the up and down arrows.



ICM450

Programmable Three Phase Voltage Monitor with 25-Fault Memory

Protects motors from premature failure and burnouts



Installation, Operation & Application Guide

For more information on our complete range of American-made products – plus wiring diagrams, troubleshooting tips and more, visit us at www.icmcontrols.com



Specification

Input

- **Line Voltage:** Universal, 190-630 VAC
- **Frequency:** 50-60 Hz
- **Load Side Monitoring:** Optional
- **Control Voltage:** 18-240 VAC
- **Frequency:** 50-60 Hz

Output

- **Type:** Relay, SPDT
- **Voltage Range:** 240VAC @ 10A maximum
- **Frequency:** 50-60 Hz

Control Operating Temperature

- **Operating Temperature:** -40°F to +167°F (-40°C to +75°C)
- **Storage Temperature:** -40°F to +185°F (-40°C to +80°C)

LCD Operating Temperature

- **Operating Temperature:** -4°F to +167°F (-20°C to +75°C)

Mechanical

- **Mounting:** Surface mount using (2) #8 screws
- **Terminations:** Screw terminals
- **Weight:** 12 ounces (341 grams)

Dimensions

- 6 1/2" L, 4 1/4" W, 1 3/8" H (16.5 cm. L, 10.8 cm. W, 3.5 cm. H)

Parameters

Phase Unbalance Protection

- **Voltage Unbalance:** 2-20% adjustable

Over/Under Voltage Protection

- **Under Voltage:** 2-25% adjustable
- **Over Voltage:** 2-25% adjustable

Phase Loss Protection

- **Phase Loss Condition:** Equals 25% of nominal for any given phase; system will shut down and a fault will be recorded should this occur

Delay on Break Timer

- **Control Voltage:** 18-240 VAC
- **Time Delay:** 0 to 10 minutes adjustable

Fault Interrogation Delay

- **Time Delay:** 0 to 15 seconds adjustable
- Provides a delay between fault detection and system shutdown - helps to eliminate nuisance trips or unnecessary shutdowns

Caution

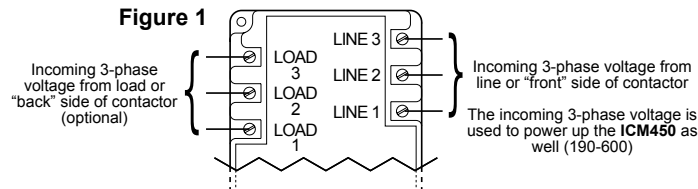
Installation of the ICM450 shall be performed by trained technicians only. Adhere to all local and national electric codes.

Disconnect all power to the system before making any connections.

Installation

1. Using (2) #8 screws, mount the **ICM450** in a cool, dry, easily accessible location in the control panel.
2. Connect voltage as shown in Figure 1 (below). Leave existing line and load side connections intact on the contactor.
3. Load side monitoring is optional (unit may be used to monitor line side only). Wire the contactor and optional control voltage monitoring as in Figures 2 and 3 (below).
**** Note: Load/line wire must be rated for 3-phase voltage rating, 20ga minimum.**
4. Upon application of power, the **ICM450** will be on line and will begin to monitor the system.

Figure 1



- Terminals 1 and 3 are the control signal input terminals
- "Control Mode" is turned ON or OFF in setup
- With "Control Mode" set to "ON," there must be a voltage present on terminals 1 and 3 for the relay output terminals 4 and 6 to close; this voltage can be supplied from a thermostat, pressure switch, etc.
- When the voltage on these terminals is re-applied, the unit will not re-energize until the delay on break (0-10 minutes) time has elapsed
- Use of terminals 1 and 3 is optional; they will be ignored if the "Control Mode" is set to "OFF"

Figure 2

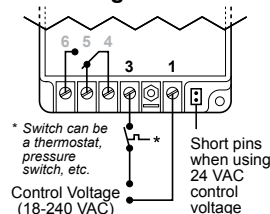
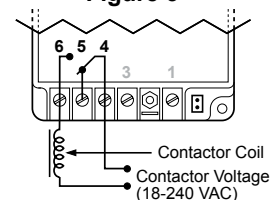


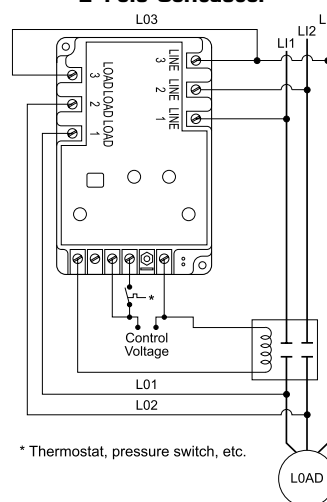
Figure 3



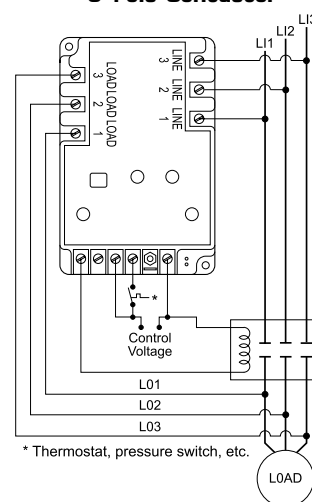
- Terminals 4 and 6 are "dry," normally open contacts
- Terminals 4 and 6 are closed when power is within specifications
- Terminals 4 and 6 open when there is a fault condition
- Terminals 4 and 6 open when there is a loss of the control signal with "Control Mode" set to "ON"

ICM450 Wiring Diagrams

2-Pole Contactor



3-Pole Contactor



Setting the Parameters

1. Press the green **SETUP** button to enter Setup mode. Setup LED will light.
2. Use the ∇ and \blacktriangle arrows to change user parameters.
3. Scroll through setup by pressing and releasing the **SETUP** button.
4. When the last parameter has been set, the phase average will be displayed and the Setup LED will automatically turn OFF.

Button Functions



Press arrows to scroll through and select user parameter settings in Setup mode. HOLD down for fast edit.



Press to enter Setup mode and select user parameters.



Hold for voltage display a \rightarrow b, b \rightarrow c, a \rightarrow c (simultaneously).



Press to read faults. Hold for 5 seconds to clear faults and reset memory.

Parameter	Description	Range	Default	Recommended
Line Voltage	Average phase to phase line voltage	190-600	208	Nameplate Voltage
Delay On Break	Amount of time between the load de-energizing and re-energizing	0-10 minutes	.1 minute	4 minutes**
Fault Interrogation	Amount of time before the load de-energizes due to a non-critical fault*	0-15 seconds	15 seconds	7-8 seconds**
% Over/Under Voltage	Maximum/minimum phase to phase average voltage, respectively	2-25%	20%	12-15%**
% Phase Unbalance	Amount of allowable voltage unbalance	2-20%	20%	4-5%**
Reset Mode	AUTO or number of times the load can be re-energized after a load side fault before a manual reset is necessary ** Note: When monitoring line side only, the reset mode will always be AUTO	AUTO, 0-10	AUTO	AUTO
Control Mode	With control mode set to OFF, the load will energize if no 3- phase fault conditions exist; with control mode ON, the load will energize if no fault conditions exist and control voltage is present at terminals 1 and 3 of the ICM450	ON or OFF	ON	Based on wiring

* Non-critical faults are faults such as High/Low Voltage and Phase Unbalance. Critical faults, such as Phase Loss and Phase Reversal, have a fault interrogation of under 2 seconds and it is not user adjustable.

** For best recommendations, consult manufacturer of equipment.

Fault Conditions

Press and release fault button to scroll through all saved faults.

** Note: For initial setup, press and hold **FAULT** for 5 seconds to remove any previously stored faults.

Fault	Problem	Corrective Action
Back Phase Loss	Not all three of the phases on the load side are present	1. Re-energize the contactor. 2. If the fault reappears after the load energizes: a. Turn all power OFF b. Check all load side connections c. Check the contacts of the contactor for debris or excess carbon.
Back Phase Rev	Loads 1, 2, or 3 are not in sequence (not 120° phase shifted)	1. Turn OFF all power. 2. Swap any 2 phases on the load side of the ICM450 only (example: swap load 1 and load 2) * 3. Re-apply power.
Back Phase Unbalance	A voltage unbalance between the three load phases exceeds the unbalance setpoint	1. Press the READ button to observe the present load voltages. Check system for unbalance cause. 2. Increase the fault interrogation time if necessary. 3. Increase the percent unbalance setting if necessary.
Front Over Voltage	Average phase-phase voltage exceeds the maximum percentage	1. Check system for over-voltage cause. 2. Increase the percent over-voltage setting if necessary. 3. Increase the fault interrogation time if necessary.
Front Phase Loss	Not all three of the phases on the line side are present	1. Press and hold the READ button on the phase monitor or use an AC voltmeter to carefully measure all three phase-phase line voltages (example : Line 1 → Line 2, Line 2 → Line 3, Line 3 → Line 1). 2. Repair the missing phase.
Front Phase Reversal	Lines 1, 2, or 3 are not in sequence (not 120° phase shifted)	1. Turn OFF all power. 2. Swap any 2 phases on the line side of the ICM450 (example: swap Line 1 and Line 2)* 3. Re-apply power.
Front Phase Unbalance	A voltage unbalance between the three line phases exceeds the unbalance setpoint	1. Press the READ button to observe the present load voltages. Check system for unbalance cause. 2. Increase the fault interrogation time if necessary. 3. Increase the percent unbalance setting if necessary.
Front Under Voltage	Average phase-phase voltage is below the minimum percentage	1. Check system for under-voltage cause. 2. Increase the percent under-voltage setting if necessary. 3. Increase the fault interrogation time if necessary.

* Only swap phases during initial setup, not after the **ICM450** has been in operation without errors.

Troubleshooting

Problem	LCD Readout	LED Status	Corrective Action
Load will not energize	Phase Average	All LEDs Off	Confirm that the control input (terminals 1 & 3) is properly connected and configured
Load will not energize	Phase Average	Load LED Off, Fault LED blinking	Press FAULT once to observe the current fault; correct the condition of the first fault that appears (see Fault Conditions above, for a list of corrective actions)
Fault LED blinks repeatedly while load is energized	Phase Average	Fault LED Blinking, Load LED On	Indicates there are faults saved in the memory, press FAULT rapidly to scroll through saved faults; to clear the faults, press and hold FAULT for more than 5 seconds
Load will not de-energize when control voltage is OFF	Phase Average	Load LED On, Control LED Off	The control mode setting is OFF; press SETUP to get to the control mode. Press ↖ to set the control mode ON
Setup LED is on while load is being energized	Anything Other Than Phase Average	Setup LED On, Load LED On	To exit the setup mode, press either READ or FAULT
Load will not energize	Reset	Fault LED Blinking	Unit in lockout; maximum number of retries in manual reset mode has been reached; to reset unit, press FAULT and hold for more than 5 seconds
Load turns ON and OFF repeatedly	Readout is Irrelevant	Fault LED Blinking	Fix load side fault; press FAULT to observe condition; the delay on break period may be too short; press SETUP to enter the delay on break mode; press ↖ to lengthen the delay

ONE-YEAR LIMITED WARRANTY

The Seller warrants its products against defects in material or workmanship for a period of one (1) year from the date of manufacture. The liability of the Seller is limited, at its option, to repair, replace or issue a non-case credit for the purchase prices of the goods which are provided to be defective. The warranty and remedies set forth herein do not apply to any goods or parts thereof which have been subjected to misuse including any use or application in violation of the Seller's instructions, neglect, tampering, improper storage, incorrect installation or servicing not performed by the Seller. In order to permit the Seller to properly administer the warranty, the Buyer shall: 1) Notify the Seller promptly of any claim, submitting date code information or any other pertinent data as requested by the Seller. 2) Permit the Seller to inspect and test the product claimed to be defective. Items claimed to be defective and are determined by Seller to be non-defective are subject to a \$30.00 per hour inspection fee. This warranty constitutes the Seller's sole liability hereunder and is in lieu of any other warranty expressed, implied or statutory. Unless otherwise stated in writing, Seller makes no warranty that the goods depicted or described herein are fit for any particular purpose.



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