waterleaf

Estuary™
Residential Greywater Reuse System

Owner's Manual

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Contact Information

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Safety

Read this manual before installing and/or using the Estuary system.

 WARNING- ELECTRICAL HAZARDS

- **Dedicated GFCI Circuit Required:** The Estuary must be connected to a dedicated 20-amp circuit with GFCI protection. Do not share this circuit with other high-power devices. This prevents circuit overloading and reduces the risk of electrical shock.
- **Do Not Open or Service:** Never open the electrical control enclosure or attempt to service internal components. The Estuary contains hazardous voltages and must only be serviced by approved Waterleaf technicians. Opening the unit will void your warranty and may result in serious injury or death, electrical shock, or property damage.

 WARNING - BIOLOGICAL HAZARDS

- **Non Potable Water:** The Estuary system supplies NON-POTABLE water. DO NOT drink, cook with, or otherwise consume recycled water from the Estuary.
- **Greywater Only:** Never use dark greywater from kitchen sinks or dishwashers. See the *Limitations* section below for more information.

Recommendations

- Become familiar with the location and operations of the greywater diversion valve.
- Add reminders on your calendar to turn the diversion valve to irrigation in the summer and turn it to the sewer system in the fall.

Responsibility and liability

Manufacturer

Waterleaf warrants the proper working of the system according to its general sales conditions. Waterleaf is not liable in the following cases:

1. Failure to follow instructions for installation and maintenance of the Estuary system.
2. Failure to follow instructions and safety warnings for use of the Estuary system.
3. Inadequate or insufficient maintenance of the Estuary system.

Installer

The installer is responsible for the installation and initial commissioning of the Estuary system.

1. The Estuary system should always be installed according to local regulations and standards.
2. Perform initial commissioning and necessary checks.
3. Explain the installation to the owner/user.
4. Hand over all manuals to the owner/user.

Owner/User

To ensure optimal functioning of the Estuary system, please observe the following:

1. Read and follow the instructions for operation of the Estuary system.
2. Request assistance of a qualified installer for installation, commissioning, servicing, and maintenance.
3. Ask the installer for an explanation of the installation.

Introduction

The Estuary Residential Greywater Reuse System is designed to reduce household water consumption. It collects gently used greywater from sinks, showers, and washing machines and cleans and recycles it for garden irrigation and toilet flushing. The Estuary is the only living, modular, ecological water treatment system powered by the biological systems of natural wetlands and the purifying properties of volcanic soils to clean and recycle water for reuse in the home and garden.

The ecological treatment module(s) performs Type 2 greywater treatment as described by Oregon DEQ: "Greywater that has passed through some type of chemical or biological process, such as a wetland, to further reduce solids and organic matter." It is a performance-based treatment system that is capable of meeting Type 2 water quality standards.

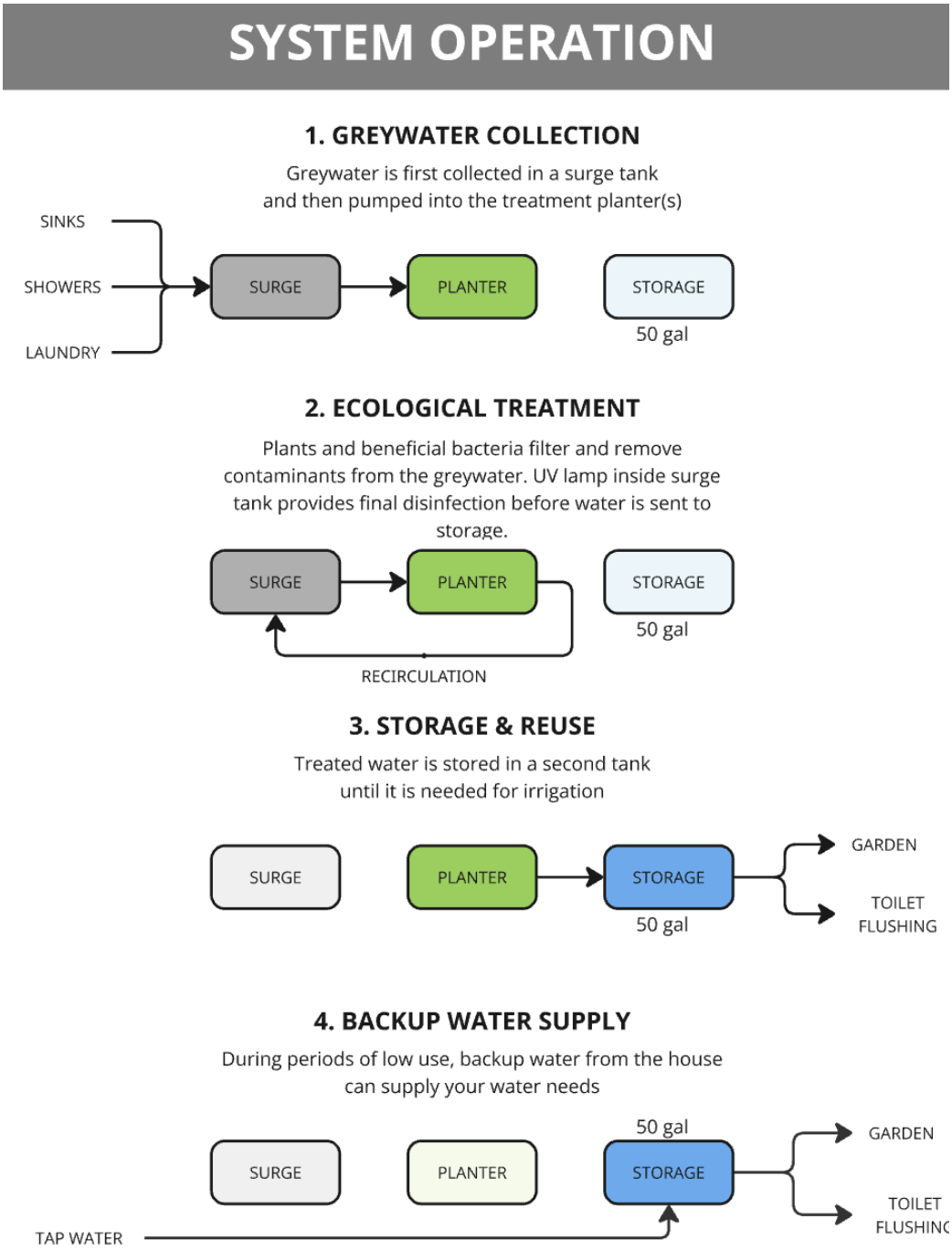
The system consists of one or more surge/settling tanks, one or more ecological treatment modules, a 50 gallon storage tank for the treated greywater, and an attached irrigation system. The surge/settling tanks and storage tank may be buried in the ground. The ecological treatment modules are placed on top of the other modules or on the ground.

The treatment system supplies treated water to an attached irrigation system.

System design

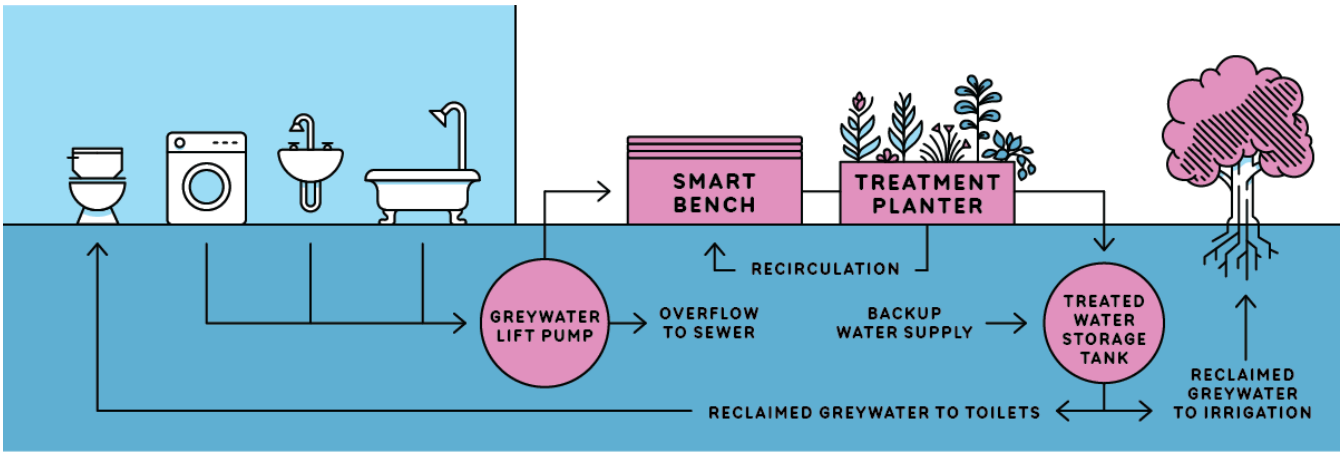
Components

- One smart bench that receives greywater and holds it temporarily until it can be treated
- One or more treatment planters that filter and remove contaminants
- One or more storage tanks that store treated water until it's needed for irrigation, see Appendix A - Site Plan for more information
- A lift pump for supplying household greywater to the Estuary system
- A distribution pump for supplying recycled water to irrigation or toilets



Requirements

- A greywater inlet from bathing water and/or laundry water sources
- A recycled water outlet
- A connection to backup water supply
- A connection to sewer
- A connection to electrical power (minimum 20 A)
- A connection to WiFi with a 2.4GHz band (b, g, n, ax, be)



Installation

The Estuary system should only be installed by authorized technicians.

See the **Installation Manual** for more information.

Startup and commissioning

The Estuary needs a few weeks to develop the ecological treatment process and become fully operational. Backup water will be supplied until this process is complete. After this startup period, recycled water will become available.

Periods of inactivity

The Estuary system works completely automatically and adapts to household activity. Always keep the Estuary switched on, even when leaving the house for an extended period of time.

If there is no incoming water flow, the Estuary will automatically go into standby mode. The planters will maintain a minimum amount of water to maintain the ecological health of the system.

If the Estuary does not receive any water flow after 1 month, it may need another commissioning period to restart the ecological treatment process.

Power outages

If electric power to the device is cut off, the device will not supply recycled water. However, backup water is always supplied to the storage tank. When power is restored, the system will restart automatically and resume treatment.

System malfunction

The Estuary continuously monitors itself and reports its status to the remote monitoring server via WiFi. In the unlikely event a component fails, the device will stop supplying recycled water and send a warning message to the remote monitoring server.

Warning: *The Estuary system is designed for 'normal usage' and is not designed to receive solids like food waste or stones, chemicals, paint residues, hair dye, excessive amounts of bleach, and harsh commercial disinfectants or any other matter that is unusual for bathing or laundry water, such as washing of soiled diapers or other infectious materials. In the event these substances enter the device, the system itself can be damaged and the ecological water treatment process can be disrupted. Any discharge of these materials is to be diverted to the sanitary sewer. The occupants of the house are responsible to ensure the diversion valve is switched to discharge to the sewer system when any of these waste streams are entering the system and when more greywater is produced than is needed for irrigation. The diversion valve can be switched back once the drainage system has been flushed of these materials and when the vegetation can utilize the graywater. Waterleaf is not liable for any damage if the above or any other abnormal substances enter the system.*

Do you need assistance? *Contact technical support at support@waterleaftech.com*

Operation & Maintenance

Description of Activities Required to Operate and Maintain the System

The following system operations should be performed annually by the homeowner or a qualified service technician.

- Turning the greywater treatment system on or off.
- Flushing distribution lines.
- Installing and adjusting the irrigation system.
- Draining irrigation lines before winter.

Owners will be responsible for switching the 3-way diversion valve in the spring and fall to prevent harsh chemicals or contaminated material from entering the greywater system as well as or when the garden plants no longer need water. See site plan above for the valve's location, denoted in red, marked "3-W". Reference Appendix A for more information. Valve will be clearly marked, showing paths to sewer vs. path to treatment system.

Greywater Monitoring Procedures

Treated effluent water samples will be collected annually and tested by a local third-party lab. A qualified technician will collect and submit effluent samples. Samples will be collected from the bench module and transported under ice en route to the testing location. Homeowners will submit monitoring data and an annual report to the DEQ by January 15th each year.

Treatment parameters:

- BOD
- TSS

Though internal water levels and flow rate are continually monitored with embedded sensors and computers, we recommend an in-person check performed by a Waterleaf accredited installer once every year.

This check contains the following elements:

- Documenting system condition and noting any concerns
- Checking connected household plumbing for leaks or clogs
- Performing any maintenance needed
- Collecting samples of treated water for testing and reporting to local agencies (if required)
- Pruning and weeding the plants

Planters

In certain climates, annual pruning of the plants may help maintain the overall health and beauty of the system.

Fallen debris such as leaves and pine needles may accumulate in the planter. This has no effect on system performance, but can be cleaned out for aesthetic considerations.

Winter weatherization

In colder climates, the device and its connected plumbing may need to be drained to prevent damage from freezing temperatures.

FAQs

For the most up-to-date information, visit our website at www.waterleaftech.com

What is greywater?

Greywater is lightly contaminated wastewater from bathroom sinks, showers, and washing machines. It does not include wastewater from kitchen sinks, dishwashers, or toilets.

How safe is recycled greywater?

Recycled water from the Estuary system is clean, safe, and tested to meet international water quality standards for recycled greywater. Recycled water from the Estuary should not be used as drinking water.

Can I drink treated water from the Estuary?

No, you should never drink the recycled water from the Estuary. Treated greywater from the Estuary is not suitable for drinking. It also shouldn't be used for showering, food preparation, or cooking. The recycled water is disinfected and safe to use for garden irrigation and toilet flushing only. See the Specifications section for more information about disinfection.

What happens if all the recycled water is used up?

If all the recycled water has been used, backup water will be supplied instead. The Estuary will automatically switch back to providing recycled water as soon as it becomes available.

What happens if I am away from home for a long time?

The Estuary will continue to function even when you are away for extended periods of time. See the Periods of Inactivity section above for more information.

Does the system make any noise?

The system makes some noise, but generally no more than 30 decibels. The pump used to circulate water within the system or to supply recycled water to the garden makes sound intermittently when it is used to pump water.

How often do I need to do maintenance?

We recommend annual preventive maintenance performed by an authorized technician. In case of any abnormal behavior, the Estuary system automatically sends a warning message to the remote monitoring server. See the Maintenance section above for more information.

Do you still have questions? *We're here to help! Please contact us at info@waterleaftech.com*

Limitations

Water temperature

The Estuary system can process water with a maximum temperature of 140° F / 60° C. Using higher temperatures can damage the system. The Estuary can process water with a minimum **water** temperature of 32 degrees. Operating the Estuary while frozen water is present in the system can damage pipes, pumps, and other components.

Cleaning chemicals

Cleaning the shower and bath with aggressive cleaning products containing excessive amounts of chlorine bleach is not recommended as this can damage the ecological treatment process and its seals. If such products are used, be sure to switch the diversion valve to discharge to the sewer system and flush the drain lines with water to ensure all the chemicals are out of the system before switching the diversion valve back to the Estuary system.

We recommend using environmentally friendly cleaning products. If using other cleaning products, please check that they do not contain excessive amounts of bleach.

Warning: *The Estuary system can only accept greywater from the shower, bath, and washing machine. Product warranty will be void if wastewater from other sources is supplied to the system.*

Warranty

See your **Product Warranty** for more information.

Specifications

Dimensions (LxWxH)

48 in x 24 in x 22 in per module (bench and planter)

Power supply

120 VAC, 20 Amp dedicated circuit

Estimated power consumption

±160 kWh/year

UV Disinfection

The Estuary system uses a UV disinfection system in the last stage of treatment to disinfect recycled water before treated water is sent out to storage. The UV lamp is located inside the Estuary's surge tank module, identified by its manufacturer **Aquasure**, specifications below:

- 32 W bulb
- 8 GPM
- Designed for 1-3 bathroom homes

Average recycled greywater quality

The Estuary system has been designed and tested to meet the NSF/ANSI 350 standard for residential greywater reuse:

- CBOD5 (mg/L) < 10
- TSS (mg/L) < 10
- Turbidity (NTU) < 5
- E. coli (MPN/100 mL) < 14
- pH (SU) 6.0 – 9.0

Noise level

30 dB

SAFETY INSTRUCTIONS

WARNING - To guard against injury, basic safety precautions should be observed, including the following:

1. **READ AND FOLLOW ALL SAFETY INSTRUCTIONS.**
2. **CAUTION** - Disconnect power before servicing.
3. **DANGER** - To avoid possible electric shock, special care should be taken since water is present near electrical equipment. Unless a situation is encountered that is explicitly addressed by the provided maintenance and troubleshooting sections, do not attempt repairs yourself, refer to an authorized service technician.
4. Carefully examine the UV system after installation. It should not be plugged in if there is water on parts not intended to be wet.
5. Do not operate the UV system if it has a damaged cord or plug, if it is malfunctioning or if it is dropped or damaged in any manner.
6. Always disconnect water flow and unplug the UV system before performing cleaning or maintenance activities. Never yank the cord to remove from an outlet; grasp the wall plug and pull to disconnect.
7. Do not use this UV system for other than intended use (potable water applications). The use of attachments not recommended or sold by the manufacturer/distributor may cause an unsafe condition.
8. Intended for indoor use only. Do not install this UV system where it will be exposed to the weather or to temperatures below freezing. Do not store this UV system where it will be exposed to the weather. Do not store this UV system where it will be exposed to temperatures below freezing unless all water has been drained from it and the water supply has been disconnected.
9. Read and observe all the important notices and warnings on the water UV system.
10. 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 UV system rating may overheat. Care should be taken to arrange the cord so that it will not be ripped over or pulled.
11. **SAVE THESE INSTRUCTIONS.**

WARNING: The UV light given off by this unit can cause serious burns to unprotected eyes and skin. Never look directly at an illuminated UV lamp. When performing any work on the UV system always unplug the unit first. Never operate the UV system while the UV lamp is outside of the UV chamber.

Note: *The UV lamp inside of the UV system is rated at an effective life of approximately 9000 hours. To ensure continuous protection, replace the UV lamp annually.*

OPERATION PARAMETER

IMPORTANT: *The following conditions for feed water supply must be met or warranty will be void and the manufacturer assumes no responsibility for damage to system or property.*

1. Water Temperature Parameter
   The system MUST NOT be installed in an area where it is exposed to direct sunlight and must be protected against freezing and extreme heat.
   - Maximum: 100° F (37.8° C)
   - Minimum: 32° F (0° C)

2. Water Pressure Parameter
   The maximum allowable inlet water pressure is 125 psi. If daytime pressure is over 80 psi, night time pressure may exceed the maximum allowed water pressure. Use a pressure reducing valve (PRV) to reduce the pressure if needed.
   - Maximum: 125 PSI (8.78 kg/cm2)
   - Minimum: 25 PSI (1.75 kg/cm2)

3. Water condition tolerance
   Water passed through the unit must fall within the following parameters:
   a) Iron: <0.3 ppm (0.3 mg/L)
   b) Hardness*:<7 ppm (120 mg/L)
   c) Turbidity: < 1 NTU
   d) Manganese: < 0.05 ppm (0.05 mg/L)
   e) Tannins: < 0.1 ppm (0.1 mg/L)
   f) UV Transmittance: > 75% (call factory for recommendations on applications where UVT < 75%)
   * Where total hardness is more than 7 gpg, the water should be softened.

OPERATION & MAINTENANCE

Quartz Sleeve Replacement And/Or Cleaning:
If the water contains any hardness minerals (calcium or magnesium), iron or manganese, the quartz sleeve will require periodic cleaning. To remove the quartz sleeve, follow the steps below:

1. Shut off water supply and drain all lines.
2. Drain the UV chamber (use a small bucket under the unit to prevent a spill), using drain port provided.
3. Remove nuts from chamber, checking for the free floating spring inside sleeve at the opposite end to the lamp connection (do not allow quartz sleeve to fall).
4. Carefully remove O-rings from the quartz sleeve. As the O-ring may tend to adhere to the quartz sleeve, it is recommended to replace the O-rings annually.
5. Clean the quartz sleeve with a cloth soaked in ***CLR***, vinegar or some other mild acid and then rinse avoiding the introduction of any water to the inside of the sleeve.
6. Re-assemble the quartz sleeve with spring in the UV chamber allowing the sleeve to protrude an equal distance from chamber.
7. Wet the O-rings and slide onto each end of the quartz sleeve.
8. Reassemble the gland nuts (hand tight is sufficient).
9. Re-tighten all connections, turn on water and check for leaks. Re-install the UV lamp and lamp connector as per prior instructions
10. Reconnect system to power source.

Note: *If the system is put on a temporary hold, bypassed, removed, or if it becomes contaminated after the UV system, It will be necessary to shock the system with household bleach for a full 20 minutes before resuming use of the water.*

UV Lamp Replacement And/Or Cleaning:

WARNING! *Regularly inspect your system unit to ensure the UV light is still glowing. Replace the UV lamp annually to ensure optimal performance.*

IMPORTANT! *During the assembly and handling of the quartz sleeve and or UV Lamp it is recommended to wear plastic gloves. DO NOT touch the quartz or UV lamp with bare hands. Fingerprints can reduce the performance of the UV lamp.*

1. Disconnect the power
2. Shut off water supply and drain all lines.
3. Pull the UV lamp off of the chamber while it is still connected to the ballast line.
4. Disconnect the old UV lamp from the ballast.
5. Connect the ballast plug to the new UV lamp electrical prongs.
6. Reinsert the lamp back into the chamber carefully.
7. Turn on the water supply and check for leaks.
8. Reconnect the power

Note: *If the system is put on a temporary hold, bypassed, removed, or if it becomes contaminated after the UV system, It will be necessary to shock the system with household bleach for a full 20 minutes before resuming use of the water.*

SYSTEM WARNING & TROUBLESHOOT

Lamp Failure System

The audible alarm and indicator lights on the systems continuously monitor the lamp operation. If the lamp does not start at any time, the indicator red light will glow and audible alarm will sound. This alarm indicated the UV lamp is no longer operating and must be corrected. Please refer to Troubleshooting Guide for corrective procedures.

Ultraviolet Monitoring System

The ultraviolet system features a complete warning system for continuous water protection by constantly sensing the UV light operation. The system features a single LED indicator light, which will operate two distinct colors, **GREEN** and **RED**. When the
UV output level changes, the warning system will operate in the following manner:

GREEN 🟢 Indicates that the UV lamp is satisfactory and the unit is in good working order.

RED 🔴 Indicates that the unit needs immediate attention, the audible alarm will automatically sound when the LED monitor light switches to red if the lamp has been in service for a year or more it should be replaced. The quartz sleeve and/or sensor probe may require cleaning. The alarm will continue until the sensor detects adequate UV intensity. When the lamp is replaced it is recommended to clean the quartz sleeve and sensor probe prior to returning the system to service.

THIS ADVANCED WARNING SYSTEM HAS BEEN INSTALLED TO PROVIDE YOU WITH THE OPTIMUM PRECAUTIONS TO ENSURE HIGH EFFICIENCY IN THE PROTECTION AGAINST MICROBIOLOGICAL CONTAMINATION IN YOUR WATER. DO NOT DISREGARD THE WARNING LIGHTS.

THE BEST WAY TO CHECK UV OPERATION IS TO HAVE THE WATER TESTED FOR BACTERIA BY A RECOGNIZED TESTING AGENCY ON A REGULAR BASIS.

WARNING! *When there is no flow, the water in the cell will become warm, as the UV system lamp is always on. To remedy this, run cold water tap anywhere in the house for a minute to flush out the warm water.*

As the system requires time to reach its full operating capacity, please allow the UV system to operate 3-5 minutes prior to using the water from unit. In addition, to clear any air or debris form the system, open the faucet and allow water to run through the UV system for 2-3 minutes.

Troubleshooting Guide

CAUTION: *When performing any work on the UV system unplug the unit first and never look directly at the burning UV lamp.*

SYMPTOM	POSSIBLE CAUSES	REMEDY
PRESSURE DROP	The sediment pre-filter is clogged	Replace filter cartridge with appropriate five micron cartridge. NOTE: Check source of water supply as fluctuations may occur in source pressure
WARM PRODUCT WATER	Common problem caused by infrequent use	Run water
WARM WATER APPEARS "MILKY"	Caused by air in the water lines	Run water until air is purged
UNIT LEAKING WATER	Problem with O-ring seals (on gland nuts and/or sensor probe on monitored units)	Ensure the O-ring is in place, check for cuts or abrasions, clean O-ring, moisten with water and re-install, replace if necessary
	Condensation on reactor chamber caused by excessive humidity	Check location of UV system and control humidity
	Inadequate inlet/outlet port connections	Check thread connections, re-seal with Teflon tape and re-tighten

SYSTEM STATUS			REMARKS
LAMP STATUS (GREEN LED)	***AUDIBLE ALARM***	***UV LAMP***	
ON	**OFF**	**ON**	Correct operating conditions, unit is functioning properly
OFF	**ON**	**OFF**	The UV lamp is spent, requires replacement lamp. UV lamp not connected to power source. Check connection and reconnect lamp. Ballast has switched off. To reset ballast remove power to unit by disconnecting power cord from electrical plug for a minimum of 30 seconds then reapply power. LED indicator burnt out or wire lead broken. Replace LED assembly.
OFF	**OFF**	**ON**	LED indicator burnt out or wire lead broken. Replace LED assembly.

WATER CHEMISTRY

Water quality is extremely important for the optimum performance of your UV system. The following levels are recommended for installation:

- Iron:<0.3 ppm (0.3 mg/L)
- Hardness *:< 7 ppm (120 mg/L)
- Turbidity: < 1 NTU
- Manganese: < 0.05 ppm (0.05 mg/L)
- Tannins: < 0.1 ppm (0.1 mg/L)
- UV Transmittance: > 75%
  (Call factory for recommendations on applications where UVT < 75%)

** Where total hardness is more than 7 gpg, the UV unit should operate efficiently provided the quartz sleeve is cleaned periodically. If total hardness is over 7 gpg, the water should be softened.*

If your water chemistry contains levels in excess of those mentioned above, proper pre-treatment is recommended to correct these water problems prior to the installation of your UV system. These water quality parameters can be tested by your local dealer, or by most private analytical laboratories. Proper pre-treatment is essential for the UV system to operate as intended.