This manual covers the servicing and general maintenance requirements for Aquafine Ultraviolet Water Treatment equipment.

**DISINFECTION • TOC REDUCTION • OZONE DESTRUCTION • CHLORINE/CHLORAMINE DESTRUCTION**

**MPR Series**

*Installation &
Operation Manual*

It is imperative that those responsible for the installation of this equipment, as well as operating personnel, read this manual and carefully follow all instructions and guidelines. **EQUIPMENT OPERATORS AND INSTALLERS MUST COMPLY WITH OPERATIONAL SAFETY REQUIREMENTS.**
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p 661.257.4770 or 800.423.3015 (outside CA within domestic US)
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PURPOSE & SCOPE

The purpose of this manual is to provide instructions for the installation and operation of the MPR™ Series models and intended for personnel that have a working knowledge of servicing electrical and mechanical equipment.

For application and sizing contact Aquafine’s Engineering Department.

WARNING

- Remove all electrical power to the unit before servicing the unit. The electrical panel is an electrical hazard. Death can result if the proper safety precaution are not obeyed. All electrical power to the equipment, including power from the signal and control systems must be completely isolated.

- Never service the system under pressure. The treatment chamber must be valved off from the water source, the pressure released, and then the system drained.

- Never look at UV lamps! The lamps produce harmful radiation and will damage the eyes and skin. Always use protective gear.
DESCRIPTION

MPR™ SERIES

The MPR™ Series is an advanced generation of ultraviolet equipment designed to provide enhanced efficiency. The unit consists of an individual UV treatment chamber (Reactor) and an electrical control enclosure. The UV treatment chamber contains single ended UV lamps, encased inside individual single ended quartz sleeves. Inside the treatment chamber, a motor driven wiper system ensures the quartz tubes housing the lamps remains clean. This advanced design saves you time and money on routine maintenance and power consumption. The electrical control enclosure contains the controls for energizing, monitoring, and alarm functions.

Power is switched on through a power disconnect switch that also acts as an enclosure lock to prevent opening the enclosure with powered on. A contactor relay controls the voltage going to the lamp ballast. The front panel accessible control PLC enables the contactor and wiper functions. Depressing the ‘RUN’ button on the PLC, enables input power to be connected through the contactor to the lamp ballast, and the lamps are energized. The PLC also controls the automatic and manual wiper functions, monitoring of vital sensors, and alarm thresholds.

KEY FEATURES

- Wetted 316L SS metal components
- UV G400 Controller
- 150psig (10.34 bar) rated treatment chamber
- Remote/Local operation
- All models are CE® and UL® (pending)

UNIT DESCRIPTION

Elements to identify the MPR™ Series are: (see Fig. A.)

1. Control Cabinet
2. End plate
3. Drain Port - located behind
4. Cleaning Port
5. Treatment Chamber
6. Quartz Sleeves & Lamps - located inside
7. Wiper System - located inside
8. Socket Cover

FIG. A  MPR™ SERIES UNIT IDENTIFIED ELEMENTS

CONTROL CABINET

The control cabinet is defined on the following page.

END PLATE

The treatment chamber is provided with a single, removeable end plate assembly. It is installed with a sealing O-ring and located between the end plate and the treatment chamber.

DRAIN PORT

The treatment chamber is provided with a drain port to drain the cylinder completely. A drain valve should be installed on the port.

CLEANING PORT

The treatment chamber is provided with a cleaning port to allow the cylinder to be filled with a cleaning solution. A valve should be installed on the port.

TREATMENT CHAMBER

The UV treatment chamber is manufactured from 316L stainless steel.
DESCRIPTION

QUARTZ SLEEVES & LAMPS
The quartz sleeves and lamps - located inside, are described below. See Fig. B

WIPER SYSTEM
The quartz sleeves and lamps - located inside, are described on the following page.

SOCKET COVERS
The socket cover on the end of the treatment chamber provides protection of the lamp socket and wiper assemblies.

QUARTZ SLEEVES & LAMPS
The quartz sleeves and lamps fit inside the UV chamber. The lamp sockets connect to the lamps, creating a water resistant seal and a vibration proof grip. The socket cover on the end of the chamber protects the lamp socket assembly from the environment. The MP lamp socket assembly is depicted below.

FIG. B MP LAMP SOCKET ASSEMBLY IDENTIFIED ELEMENTS
Elements to identify the Lamp Socket Assembly are:

1. MP Lamp Socket
2. Lamp Retaining Cap
3. Gland Seal Plate
4. O-ring
5. UV Lamp
6. Quartz Sleeve

FIG. C STANDARD CARBON STEEL CABINET WITH UV-G400
Elements to identify the Lamp Socket Assembly are:

1. Main Power Switch - isolates all electrical power to unit
2. UV G400 Controller
3. Control Cabinet handle
4. Emergency START/STOP Switch

STANDARD CONTROL PANEL
The control panel contains the ballast(s) and controller for the unit. Different electrical configurations are available. The UV G400 controller is shown below in a carbon steel cabinet, both standard in the MPR™series.
INSTALLATION GUIDELINES

The following are the guidelines and procedures for installing the MPR™ Series.

LOCATION

A. Install the UV treatment unit in a horizontal position in a sheltered, well ventilated area. Ambient temperatures surrounding the unit should be between 35° (2°C) and 100°F (38°C).

B. Operating water temperature should be between 40°F (4°C) to 80°F (27°C).

C. Protect the equipment from the environment. Do not expose the equipment to direct water spray.

D. As an ultraviolet UV treatment unit does not introduce any chemical residue within the water, it is desirable to install the unit as close as possible to the point-of-use in order to avoid potential recontamination by discharge pipes, fitting, etc.

E. The base of the UV treatment unit should be mounted on suitable support to avoid undue strain on the unit or related pipes and fittings.

F. Allow sufficient service access clearance, at least 72" (61cm) of clearance on the lamp-changing end of the unit. At the opposite end, there should be a minimum of 24" (61cm) of clearance for maintenance. Refer to mechanical drawings. Clearance for servicing the electrical cabinet should be allowed.

ELECTRICAL POWER

A. The power requirements for each unit depends on the number and type of lamps used in the treatment chamber. The overall power consumption of each unit is indicated on the equipment nameplate decal on the unit. The unit’s circuit breaker, or main fuse, provides primary over-current protection. Refer to wiring diagram.

B. UV Performance is line voltage sensitive. Line voltage should be ±5% of rating shown on the electrical nameplate decal. Voltage outside these limits will affect the performance of the UV equipment.

C. Control wiring should reference the appropriate wiring diagram. Control wiring is based upon customer requirements and installed options.

PLUMBING

A. Limit overhead piping load to 25lbs (11.3kg), for 2" & 3", 50lbs (23kg), for 4" and 75lbs (34kg), for 6" or above. Additional bracing and supports should be installed on any additional piping and valves in order to reduce the stress on the treatment chamber Inlet/Outlet nozzles.

B. Verify the location is free from vibration, which could be caused by proximity to heavy equipment and the erratic or improper pumps. Excessive vibration will damage internal electrical components and cause premature failure of the UV lamps.

C. Each unit has been designed with a 1" drain connection. Install a drain valve and pipe to drain.

D. Install sample port valves, if equipped.

E. If your piping system is subject to impulse pressure resulting in a “water hammer” condition, a surge tank or other means must be provided to remove this condition; otherwise the extreme momentary pressure may rupture and fracture the quartz sleeves.

F. All units are rated for a maximum operating pressure of 150psig (10.3 bar).

G. Ultrapure water users have reported that over time, exposure to ultraviolet light may photochemically degrade nonmetallic piping materials, including most or all fluoro-polymers, resulting in a material breakdown and/or structural failure. Should your water application and piping material be so classified, we recommend that you install "UV light traps" to isolate any susceptible material from direct exposure to the ultraviolet light. Install the UV light trap to the inlet/outlet of the UV treatment chamber prior to the connection of any non-metallic piping.

H. Provide isolation valves on the inlet and outlet nozzles.

NOTE: It is imperative that the unit be properly grounded for safe and proper operation. FAILURE TO PROPERLY GROUND THE UV TREATMENT UNIT AUTOMATICALLY VOIDS ALL EQUIPMENT WARRANTY.

WARNING

Should your requirements differ, please contact your local Aquafine® representative or Aquafine® Customer Service.
INSTALLATION

Isolation valves will allow safe maintenance of the equipment.

I. After installation of quartz sleeves, always pressure test the system prior to installation of the UV lamps and applying electrical power. During pressure testing, DO NOT stand in direct line with quartz sleeves.

J. Before start-up, flush the UV unit and discharge piping to rinse out debris left from installation.

K. The UV chamber should be filled with water.

L. For Pressure Head Loss, see the Flow Rate chart below:

<table>
<thead>
<tr>
<th>Flow Rate (GPM)</th>
<th>Total Head Loss</th>
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<tr>
<td>500</td>
<td>0.26</td>
</tr>
<tr>
<td>1,000</td>
<td>0.72</td>
</tr>
<tr>
<td>1,500</td>
<td>1.40</td>
</tr>
<tr>
<td>2,000</td>
<td>2.41</td>
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SE MP QUARTZ SLEEVE INSTALLATION

Single-ended (SE) medium pressure (MP) quartz sleeves are open on one end and closed on the other. The closed end of the quartz is inserted into the threaded nipple and then through the wiper system in the chamber. Within the wiper, Teflon bearings and wiper seals provide additional support to the quartz sleeves. The following are the guidelines and procedure for quartz sleeve installation.

1. Turn off all electrical power to the unit. Depressurize the system and isolate all piping.

2. Wear clean cotton gloves to prevent contamination of the quartz sleeve.

3. Carefully remove each quartz sleeve from the factory packaging. Handle these with care, as they are fragile.

4. Visually inspect all quartz sleeve for cracks or damage. DO NOT install damaged quartz sleeves.

5. Remove socket cover on the end of the treatment chamber.

6. Remove all gland plate seals and supports from the end plate (if installed). See Fig. A

7. Placed the closed end of the quartz sleeve into the gland opening and slowly push the sleeve into the chamber. Some resistance may be felt from the Teflon bearing and wiper seal on the wiper system and Teflon sleeve support.

8. Install the O-ring by placing the O-ring over the quartz sleeve. Insert the Quartz sleeve into the gland opening. Verify O-ring seating inside gland opening. See Fig. B & C

9. Place the gland plate seal or support at the end of the quartz sleeve until it touches the O-ring. Some pushing and twisting may be required. Deionized water may be used as a lubricant.

10. Tighten the gland plate seal or support using the shoc screws. See Fig. D

11. Slowly pressurize the system and fill the chamber with water to check for leaks. If there are leaks in any gland assembly, depressurize the system and reinstall the gland assembly. Ensure correct seating of the O-ring.

12. Retest until a leak-free installation is verified.

13. You are now ready to install the UV lamps.

FIG. A REMOVE GLAND SEAL

FIG. B PLACE O-RING OVER SLEEVE

FIG. C O-RING SEATED INSIDE GLAND OPENING

FIG. D TIGHTEN GLAND PLATE SEAL
SE MP UV LAMP INSTALLATION

The following procedures are for units manufactured with Single-ended (SE) medium-pressure (MP) lamp design. Once it has been verified that there are no leaks in the system, the unit is ready for UV lamp installation.

1. Remove all power to the UV unit. Depressurize the system.

2. Wear clean cotton gloves to prevent contamination of the UV lamps.

3. Carefully remove each UV lamp from the factory packaging. Handle these with care, as they are fragile.

4. Visually inspect all lamps for cracks or damage. Do not install damaged lamps.

5. Using both hands, slowly insert the lamp into the quartz sleeve by pushing one end of the lamp with one hand, while continuing to support the lamp in a level horizontal position with the other. This is very important; if not installed properly, lamp or quartz sleeve breakage will occur. See Fig A

6. Verify the lamp arrows are pointing upwards, towards the ceiling. See Fig B

7. The pins in the lamp must be pushed down to fit securely into the lamp socket connector.

8. Rotate and screw the lamps socket cap into place. Only hand tightening is required. DO NOT OVERTIGHTEN! See Fig C

**NOTE:** Prior to energizing the lamps and ballasts, ensure there is no leaking water into the quartz sleeves and comp. nut cavity. High voltage is present at the lamp pins and receptacles of the lamp connectors during operation. Prolonged flooding of a quartz sleeve and comp. nut cavity can cause premature lamp failure due to repeated arcing, overheating of the lamp connector cable and may result in a meltdown of the cable insulation.
OPERATIONAL GUIDELINES

1. Release the pressure in the UV treatment chamber before attempting to remove the protective covers and sealing items.

2. Disconnect all power to the UV unit before servicing. The unit operates on high voltage and should only be serviced by qualified personnel.

3. Do not allow the unit to overheat by operating without water flow. Standard flow rates are based on water temperatures of 40°F (4.4°C) to 80°F (26.7°C). For applications outside these temperatures, contact customer service for assistance. In no case should the water temperature be below 40°F (4.4°C) or above 120°F (48.8°C).

4. Intermittent operation is allowed as long as the water temperature does not exceed 80°F (26.7°C); optional devices are available to prevent this problem. Should the unit be used for batch flow operations, it can be turned “ON” and “OFF” manually. Make sure the unit is allowed to warm up for at least 3 minutes before use, and make sure the unit it turned “OFF” after each session.

5. Do not allow the flow to exceed the maximum rated capacity.

6. DO NOT electrically cycle the unit more than 3 “ON/OFF” cycles in a 24 hour period. Cycling more than this will reduce End-of-Life output and/or premature lamp failure.

7. If the system is shutdown, the UV G400 controller has a 5 minute cool down cycle counter to ensure the lamps are properly cooled before next start-up.

POWERING UP

Prior to turning on the UV unit, the following must be verified:

A. The UV chamber should be filled with water. The flow of water for the initial filling should not exceed 50 GPM. Failure to comply may result in quartz sleeve breakage. Ensure there are no system leaks and no piping connection leaks.

B. All earth ground connections are properly made.

C. All lamp connections are properly made.

D. The socket cover is secured to the end of the UV treatment unit.

E. All excess air has been removed from the chamber.

F. Verify that all incoming power conductors, including the ground conductor, are properly terminated.

G. Verify that the primary over-current protection device, molded case circuit breaker (MCOB) is in the closed position.

H. Turn the main power disconnect switch to the “ON” position. The enclosure fans, UV Vision-2000 display screens and the ballasts will be energized.

I. Using a digital multi-meter (DMM), verify that the correct voltages are present at terminal block TB-IN and terminal No.1L on the isolator switch and/or between TB-3HL and TB-4NI. Measure the voltages for L-N.

J. For local ON/OFF control, push the START/STOP button of the UVG400 controller. To turn the individual treatment chamber “ON” and “OFF” manually, LOCAL option of the “operator control options” should be selected. Refer to Controller section of this manual.

K. For remote ON/OFF control, set the UV G400 controller to REMOTE mode. For remote operation of the unit, the enclosure is provided with an isolation relay. This HOA relay is controlled by a customer-supplied voltage source (24V DC maintained) which is to be wired to a connection point within the enclosure. Opening or closing the 24V DC will energize and de-energize the HOA relay and the individual treatment chamber will be turned ON/OFF accordingly.

L. When the ballasts are energized and all the lamps are turned “ON”, a green “SYSTEM ON” indicator light underneath the UV G400 controller display will illuminate. If one or more lamps are not operating, a red “SYSTEM FAULT” indicator light will illuminate.

NOTE: DO NOT look at lighted UV lamps. DO NOT operate the UV lamps outside of the UV treatment chamber. EXPOSURE CAN SEVERELY BURN AND DAMAGE EYES AND SKIN!
CUSTOMER CONNECTIONS
The following Customer Interface connections are terminals for customers to connect to, providing control and status indication remotely.

SYSTEM READY
This closure will occur when the system is in “REMOTE” and is ready to operate. The “SYSTEM READY” will be indicated during the cool down period when the system has no “FAULTS.”

REMOTE SYSTEM ON
This closure will occur when the system is in “REMOTE” and the customer “REMOTE ON/OFF” is activated. During the cool down period, there is no closure at this terminal. After the cool down period, this closure will re-engage when the customer “REMOTE ON/OFF” switch is cycled. During a system “FAULT” this closure will oscillate “OPEN” to “CLOSE” at one second intervals.

REMOTE ON/OFF
These terminals require only a contact closure to operate the remote relay. When the UVG400 is set to “REMOTE” operation, the closure at these terminals will “START/STOP” the system from a remote location.

4-20mA OUTPUT TERMINALS
These terminals will indicate a respective UV intensity received from the UV sensor. A 4ma reading is a 0 UV output, a 20ma reading would indicate a full intensity or 100% UV output. The 100% UV value is set in the UVG400 controller “MAINT. MENU.”
RECOMMENDED MAINTENANCE GUIDELINES

The following provides users of Aquafine MPR™ and ChloRid® series UV treatment equipment with recommendations and procedures that will maximize the efficiency, consistency, reliability and longevity of the equipment. Once the equipment is properly installed and fully operational, this will provide time-oriented guidelines for:

1. Performance monitoring.
2. Recognizing the need for time based preventative measures.
3. Organized analysis of performance, based on your particular operational environment.
4. Establishing optimum parameters for periodic replacement of vital components.

Keep in mind that operating conditions can differ substantially for identical UV models even within the same building due to such variables as:

- Water quality (tap water, DI water, pH level, chemical content, solids, etc.)
- Entering water temperature
- Flow rate (high, low or constant)
- Process status (continuous, intermittent)

Because of these variable, each UV unit may have to be serviced differently. For instance, those with continuous high flow, or with lower quality water require more frequent cleaning of the quartz sleeves than those exposed to cleaner water, lower flow rates and/or intermittent usage.

Regarding UV lamp replacement, the rule is to replace the lamps every 5,000 hours or every 12 months, whichever comes first. Meaning, units which are continuously used for 24 hours a day, will reach 85,000 hours within 208 days.

The following table represents the recommended Preventative Maintenance (PM) for the equipment.

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### PREVENTATIVE MAINTENANCE SCHEDULE

<table>
<thead>
<tr>
<th>Maintenance</th>
<th>Initial Start-up</th>
<th>Daily/Monthly</th>
<th>Annually</th>
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<tbody>
<tr>
<td>OPERATING CONDITIONS</td>
<td>X</td>
<td></td>
<td>X</td>
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<tr>
<td>CLEANING THE UNIT</td>
<td>X</td>
<td></td>
<td></td>
</tr>
<tr>
<td>QUARTZ SLEEVE MAINTENANCE</td>
<td>X</td>
<td>X</td>
<td>X</td>
</tr>
<tr>
<td>PHYS/CHEM WIPER MAINTENANCE</td>
<td>X</td>
<td>X</td>
<td>X</td>
</tr>
<tr>
<td>INSPECTION FOR LEAKS</td>
<td>X</td>
<td>X</td>
<td>X</td>
</tr>
<tr>
<td>SET DETECTOR 100%</td>
<td>X</td>
<td></td>
<td>X</td>
</tr>
<tr>
<td>INSPECTION FOR LAMP OPERATION</td>
<td>X</td>
<td>X</td>
<td>X</td>
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<tr>
<td>REPLACEMENT OF UV LAMPS</td>
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<td></td>
<td>5,000 HRS</td>
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<td>LAMP SOCKET INSPECTION</td>
<td></td>
<td>X</td>
<td></td>
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<tr>
<td>COOLING FAN INSPECTION</td>
<td>X</td>
<td>X</td>
<td>X</td>
</tr>
</tbody>
</table>

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The most important consideration for proper installation, operation and maintenance of any piece of equipment is operator safety. The following caution statements directly relate to operator safety. Please review with all applicable personnel to ensure continuous compliance.
SAFETY REQUIREMENTS

The following safety requirements are mandatory. Failure to carefully follow them can cause injury to the operator and damage to the UV unit.

OPERATING CONDITIONS

A. Never look at lighted ultraviolet lamps. Never operate the ultraviolet lamps outside the UV treatment chamber. UV lamp exposure can severely burn and damage eyes and skin.

B. Properly ground the UV treatment unit. Failure to do so can result in severe electrical shock hazard.

C. Provide watertight piping and compression nut seal. Failure to do so can cause damage to electrical components, as well as create an electrical hazard to operating personnel.

D. Disconnect power before servicing unit. The UV lamps and electrical components are operated with high voltage electrical power. DO NOT attempt to service the UV treatment unit without first disconnecting power to the unit. Shut off the source of power at the equipment main panel breaker and use appropriate tag-out or lockout procedures to prevent accidental power-up by other personnel. Only qualified personnel should perform service.

E. Remove pressure before servicing unit. The UV unit has components under pressure.

CLEANING THE UNIT

1. Depending on the environment of the installation, clean the exterior surfaces of the UV treatment chamber, and electrical enclosure. The frequency of cleaning will be dependent upon the environmental condition. In some cases, it may be necessary to clean the unit from once a month to yearly.

2. Use a soft cloth with soap and water, or any commercial stainless steel cleaner.

3. Avoid scratching the display screen.

4. Interior of the electrical cabinet should be inspected for debris. Any dirt, dust or external material should be removed with a vacuum. The electrical terminal should be cleaned with a commercial electrical contact cleaner.

QUARTZ SLEEVE MAINTENANCE

As water passes through the UV treatment unit, debris and other matter in the water will settle and deposit on the quartz sleeves. This will impair the ability of the ultraviolet rays to penetrate into the water. Therefore, it is imperative to determine a cleaning schedule for the quartz sleeves. The frequency will depend on the specific type of water being processed, such as its turbidity, flow rate, and on the duty cycle, i.e. 24 hour continuous or intermittent at planned or random intervals. Replacement of the quartz sleeves should be completed every 2 years of operation.

Inspect the quartz sleeves one month after the first installation for a good indication of the degree of contamination you can expect over subsequent or longer periods. Then you will be able to determine a reasonable schedule for periodic cleaning.

If the water has been conditioned through deionization, reverse osmosis or distillation, the cleaning frequency can be set at once per year. If clear, fresh water is used, the cleaning frequency should be anywhere from once every thirty days to once every six months. With super clean water, this can be extended even further. Determine cleaning frequency by visually inspecting any one quartz sleeve to see how much debris or film has settled on the outside of it.

Clean In Place (CIP) cleaning is sometimes effective in the removal of debris from the sleeves. A test should be completed to determine the effectiveness of a CIP cleaning. After a chemical CIP has been completed, the quartz sleeves should be visually inspected for the removal of material. If CIP is not effective, then a manual cleaning or replacement of the sleeves will be required.

SAFETY REQUIREMENTS

TO BE OBSERVED AT ALL TIMES

Never operate the unit for more than 20 minutes without flow of water. Elevated water temperatures can be dangerous and damaging to the unit. Do not exceed three (3) “START/STOP” cycles per 24-hour period; otherwise lamp filaments will be subjected to excessive thermal stress, which could cause premature failure.
CLEANING THE QUARTZ SLEEVES

Visually inspect the quartz sleeve thirty days after use to see if any debris or film has settled on the outside. If dirty, use the following procedures. Should this be insufficient, they should be replaced.

1. Turn off the water to the unit.
2. Disconnect the electrical circuit.
3. Drain the UV treatment chamber.
4. Remove the service endplate.
5. Wear clean gloves to prevent contamination of the quartz sleeves and UV lamps.
6. Remove lamp sockets.
7. Remove UV lamps from inside the quartz sleeves.
8. Remove gland plates and carefully remove the quartz sleeves.
9. Wash the quartz sleeves with mild soap and water. Rinse in clean, hot water.
10. Verify that the UV sensor is clean.

INSPECTION FOR LEAKS

To ensure there are no leaks, a visual inspection of the treatment chamber should be made. The source of any leaking should be found and repaired.

Visually inspect the bottom pans at both ends of the cylinder for dripping water. If a leak is detected, follow this procedure:

1. Shut off all electrical power. Shut off source power at the facilities main panel and use appropriate tag-out safety procedures to prevent accidental power-up by other personnel.
2. Remove the socket cover from the leaking end.
3. Determine whether the leak comes from one or more of the lamp socket nipples (leaking quartz tube), or from the main end plate gasket.

CLEANING THE SENSOR WINDOW

1. Shut off the flow and release the pressure.
2. Shut off all power to the UV unit.
3. Remove the communication cable.
4. Remove the sensor retaining cap.
5. Remove the sensor from inside the quartz sleeve.
6. Use a lint-free cloth with alcohol and very carefully wipe the lens face on the front of the Detector.
7. Replace the sensor and the cable.
8. Turn the power “ON” and resume operation.

The most important consideration for proper installation, operation and maintenance of any piece of equipment is operator safety. The following caution statements directly relate to operator safety. Please review with all applicable personnel to ensure continuous compliance.

**CAUTION**
MAINTENANCE MPR

WARNING

NOTE: Failure to perform quartz sleeve cleaning maintenance may cause inadequate UV treatment and low sensor values. The quartz sleeve maintenance is very important to the overall operation of the equipment. If the quartz sleeves are not properly maintained, the UV efficiency will be reduced.

SET DETECTOR 100%
See Controller section: Setting UV Detector to 100%.

INSPECTION FOR LAMP OPERATION
A visual check of the Lamp Status screen should be made.

WARNING

NOTE: The Lamp Out Alert alarm and function will not activate after the first 30 seconds of operation after the lamps have been turned “ON”.

REPLACEMENT OF UV LAMPS
The UV lamps are rated for 5,000 hours or every 12 months, whichever comes first. This means that the units, if continuously used for 24 hours a day, will reach 5,000 hour limit within 208 days. After this time, the lamp glass will photo chemically change and no longer allow sufficient UV light through the glass to effectively kill bacteria.

GLAND PLATE INSPECTION
When replacing lamps, inspect the gland plates and related hardware. They should be inspected for corrosion of the metal contact, deterioration of the metal or burning.

1. Be sure all power to the equipment is disconnected.
2. Inspect the condition of the gland plate O-rings. If they show signs of cracking or any chemical degradation, they should be replaced.
3. Inspect the condition of the gland plate.
4. Metal contacts must be clean, free of corrosion and straight.
5. Resiliient boots must be clean, free of cracks and free of any chemical degradation.
6. The wires must be clean, with all insulation and no signs of brittleness.

If none of the descriptions are prevalent, replace entire lamp socket assembly.

COOLING FAN INSPECTION
While the unit is in normal operating mode, check to see that there is airflow at the exhaust ports and that no obstructions are present. If there is no airflow, the fan(s) should be replaced immediately.

REPLACEMENT OF BALLASTS
Ballast replacement is not part of the UV units routine maintenance. However, in the event that the ballast needs to be replaced, the following procedure should be followed:

1. Shut the power to the UV unit “OFF”.
2. Locate the old ballast to be replaced. Refer to the electrical diagram if necessary.
3. Isolate the old ballast from the rest of the system by disconnecting the ballast connector.
4. Remove and discard the old or defective ballast.
5. Install the new ballast.
6. Reconnect the ballast connector(s).
7. Turn the power to the UV unit “ON”.

NOTE: Failure to replace the ultraviolet lamps on a timely basis of at least once every 5,000 hours may cause the equipment to fail. With intermittent use, in no case should the UV lamps be used for more than 12 months, regardless of the number of hours of operation, due to normal operational degradation of the UV lamp.
CAUTION

NOTE: If the voltage reading is zero, or a number above or below the acceptable range, this indicates a ballast fault and the ballast connected to the faulty UV lamp must now be replaced. If the reading is in the acceptable range, but the LED does not light, the LED board has failed and needs to be replaced.

SAMPLE PROCEDURES

1. Prior to taking the water sample, have on hand an adequate supply of sterile bottles. These should be obtained from a source laboratory and should have been autoclaved and contained within a plastic outer wrapping.

2. The inside diameter of a sample valve may not exceed 1/4” (6mm) to ensure proper velocity. Prior to taking a sample, it’s imperative that the test sample valve be fully opened under full pressure for a full three and a half minutes. Temporary tubing or some other material may be used to direct the water into a container or drain to avoid unnecessary spillage.

3. After the valve has been left fully open for three and a half minutes, reduce the flow to a reasonable stream of water (not less than 50% of full flow). Continue flowing to drain 3 additional minutes.

4. Remove any temporary tubing used for flow diversion.

5. Open the sterile bottle. Holding the cap in a down position, the operator should then hold his breath while taking the sample so as to avoid atmospheric contamination of the sample. The operator must also not allow any fingers to touch the inside of the cap or neck of the bottle.

6. After the water sample has been taken, the cap should be immediately secured on the sample container.

7. The sample container should be labeled and placed in a plastic wrapping and must be taken to the laboratory for plating as soon as possible. Processing should begin within 3 hours of sample collection and should comply with accepted standard methods.

MEASURING PERFORMANCE

Every UV unit should be tested periodically to verify actual efficiency. Regardless of the intended application or any optional equipment that may have been provided with the unit, the most accurate and dependable procedure is to conduct post-UV sample analysis in accordance with standard testing methods.

OBTAINING PROPER WATER SAMPLES

Our experience has shown that the vast majority of unsatisfactory post-UV bacteriological samples are directly related to improper sample taking techniques. There are a variety of commercial sample collection apparatuses available. Should you chose one, be sure to follow the manufacturers recommended procedures.

Optional sample unit fittings on both the intake and discharge UV chamber flange risers can be provided. We recommend you use the fittings to collect “before and after UV” water samples to eliminate the possibility of contamination by nearby piping, fittings, etc. We recommend you select a valve with a discharge orifice no larger than 1/4” (6mm).

REPLACING/CLEANING THE AIR FILTER

There are two intakes ports located on the bottom of the control cabinet, each containing air filters. Visually inspect the air filter weekly or more, depending on the environment of the site installation to see if any debris or film has settled. If the filter is dirty, the following procedures are provided:

1. Remove the covers from the intake ports on the underside of the enclosure.

2. Remove the air filters. See photo below.

3. For cleaning, use a soft sponge with soap and water, or any commercial stainless steel cleaner.

4. Replace filter after air drying.

5. Replace the intake fan shroud covers
UVG400 OPERATION

UVG400 CONTROLLER
The UVG400 is controller for the MPR™ and ChloRid® series and is the interface for operating the system, including the lamps, temperature, wiper and alarms. The controller should be preset at the factory to operate the number of UV lamps and configured options.

The system consists of two main components: The controller and the Ballast Control Board (BCB). There is one MUX board per UV unit, which digitizes each lamp signal.

FIG. A UV400 CONTROLLER

STARTING UP
Upon start-up, the MAIN SCREEN appears which is described below. Following the MAIN SCREEN description are the button and actions for operating the control interface.

Main Screen
This screen appears directly after Start-Up and provides Lamp Status, Alarm Status and REMOTE/LOCAL Status. The alarms indicated below are the major alarms and will shut down the system, with the exception of “LOW UV.” During the shutdown period there is no power to the ballast, lamps or wiper system. To return to the MAIN SCREEN from any screen, press the ESC button twice.

1. 1, 2, 3... - Number of lamps installed
2. LAMP STATUS/ RUN - signifies the lamp is operating by a filled icon.

Controls/Screens
The controller has four main buttons for operating, not including the arrows for toggling, ESCAPE for returning to the home screen, ENTER (the left arrow) and the set button for setting an action. They are all easily identifiable on the controller face. The following identifies the four main buttons and describes the screens corresponding with each.

Button to identify the Controller are:
1. START/STOP
2. STATUS
3. MAINTENANCE
4. SETUP

START/STOP
The START/STOP is a touch button switch which can activates the lamps or the system depending on the screen and mode.

1. Pressing the START/STOP will switch the UV lamps ON or OFF if the “Local” option is selected.
2. Pressing the START/STOP button will turn the system “ON/OFF” in the START-UP or UV Status screens only.

3. LAMP STATUS/ LAMP OUT - signifies the lamp is a LAMP OUT/LAMP FAILURE condition by a filled icon.
4. LOW WATER - “ALARM” will appear if water level is below required levels for safe Lamp Operation.
5. HIGH TEMP - “ALARM” will appear if reactor temperature exceeds safe operating temperatures.
6. E STOP - (Emergency Stop) “ALARM” appears when the emergency stop button is depressed.
7. REMOTE or LOCAL - appears when the system is set to either operation.
8. RUN/STOP ICON - When the system is operating, it is in “RUN” mode. The icon appears as a “running man.” A “hand” will appear as the icon for “STOP” mode.
9. LOW UV - “ALARM” will appear if reactor UV output fall below set value.
10. GFI - “ALARM” will appear when there is a ground fault interrupt trip. Or when the GFI circuit is being tested.
UVG400 OPERATION

STATUS

The main function of this multiple menu is to view the status of the system. This will provide access to the UV Status, Wiper Status and Lamp Profile screens.

1. Pressing the STATUS key will navigate into the System Status menus.

2. Continue pressing the STATUS key and you will view through three screens: UV Status, Wiper Status and Lamp Profile.

When viewing the UV Status, Wiper Status and Lamp Profile screens, the status of the system will also be noted, such as "Remote Control Mode." There will also be "Alarm Text Messages" that may appear. These alert you to alarms within each STATUS. Below are the various "Alarm Text Messages", followed by the UV Status, Wiper Status and Lamp Profile screens.

Alarm Text Messages

A. SYSTEM RUNNING - System is powered "ON."

B. LOW UV ALARM - actives when UV is below UV alarm set point.

C. LOCAL CONTROL MODE - The system is in local control.

D. HOURS - Counts the hours of operation.

E. CYCLES - Counts the number of times the system has been turned "ON/OFF."

F. LAMP LIFE OK - Indicates lamps are operating below the hours of recommended replacement.

G. REMOTE - The system is in remote control.

H. COOLING DOWN - If the system is shutdown, the UV G400 controller has a 5 minute cool down cycle counter to ensure the lamps are properly cooled before next start-up. During this time the lamps are "OFF."

UV Status Screen

This screen displays the irradiated output measured from the UV sensor.

Wiper Status Screen

This screen provides status of the Acticlean™ Cleaning System (ACS) or, "Wiper." ACS data such as, Wiper Movement, Home Switch Status and Cycle Count are represented.

Lamp Profile Display Screen

This screen displays lamp operating hours and cycles along with the current operating controls mode.

MAINTENANCE

The maintenance menu is typically used by service personnel only. The main screens are: UV Set 100%, ACS/Wiper Data/System, Lamp Hours/Reset, GFCI Test, Ballast Data/System, System Software and Contact Screen.

1. Pressing the MAINT. key will navigate into the system maintenance menu.

2. This selection has been password protected to prevent unauthorized resetting of the software.

3. Enter password "1234."

4. The MAINT. menu will be displayed.

5. Pressing the ESC. key at any time will exit the MAINT. menu.

6. Continue pressing the MAINT. key to view through the entire maintenance menu.
UV G400 OPERATION

UV Set to 100% Screen

This screen allows testing for the Ground Fault Circuit Interrupt (GFCI) and indicates the current status of the GFCI.

Depressing the SET key twice will trip the GFCI, disabling power to ballasts, lamps, and wiper system. Pressing the SET key once will reset the system to previous operation.

Ballast Data/System Screen

This screen provides control of the Acticlean™ Cleaning System (ACS) or “Wiper.” ACS data such as, Movement, Home Switch Status and Cycle Count are represented.

Depressing the 7 key will activate the ACS or “Wiper.”

Lamp Hours/Reset Screen

This menu allows the display of the two timers on the UV unit and resetting of the lamp timer. Lamp Data is the current operating hours and numbers of cycles on the lamps. Total run data is the total operating hours on the UV unit, and cannot be reset.

Depressing the SET key will reset the lamp hours and cycles to “0”. This is completed when new lamps are installed.

ACS (WIPER) Data/System Screen

This menu sets the relative UV to 100%. Depressing the SET key will set the relative detector.

Depressing the 7 key will activate the ACS or “Wiper.”

NOT OPERATIONAL AT THIS TIME.

System Software Data Screen

This screen provides the current software information.

SETUP

The set up menu is typically completed at the factory. The user generally will not have to reset the features inside this menu.

1. Pressing the SETUP key will navigate into the system SETUP menu.

2. This selection has been password protected to prevent unauthorized setting of the software.

3. Enter password “123”.

4. The SETUP menu will be displayed.

5. Pressing the ESC. key at any time will exit the SETUP menu.

6. Continue pressing the SETUP key to view through the entire setup menu.
UV G400 OPERATION

Set Time & Date Screen

This menu allows the local time and date to be set for date stamping and trending functions.
- Use the numeric keypad to enter time and date values, pressing enter when complete.
- Press the Enter button 3 times to scroll thru the screen, without changing any values.

Set Up Display 2 Screen

The operator control offers two options, LOCAL and REMOTE. If LOCAL is selected, the UV unit can be operated by the START/STOP button. If REMOTE is selected, the UV unit can be operated by the remote contact ONLY.

SET LOW UV ALARM MINOR allows the setting of the low level UV Alarm and appears on the UV Set to 100% screen. Used with Sensor option.

SET LOW UV ALARM MAJOR allows the setting of the low level UV Alarm and appears on START-UP screen. Used with Sensor option.

Set Up Display 3 Screen

SELECT LAMP LIFE HOURS allows the lamp life to be set according to the manufacturers rated lamp life. When the lamp hours reach the set point, the “System Fault” RED indicator will be displayed.

SELECT ANALOG OUTPUT allows selection between absolute or relative.

WIPER FREQUENCY allows to set automatic wiper operation from a selection of 1-9 hours. Must be enabled on Set Up Display Screen 4, “WIPER MODE OPERATION.”
- Press the UP/DOWN arrows to scroll the menu options.
- Depressing the SET key toggles between the selections.

Set Up Display 4 Screen

LAMP SYSTEM sets the software to match the number of lamps installed in the UV unit.
- Press the UP/DOWN arrows to scroll the menu options.

AUTO RESTART ENABLED enables activation or deactivation of the AUTO RESTART system. Enabling this function will cause the unit to automatically restart after power has been removed and returned.

WIPER MODE OPERATION enables FIXED INTERVALS or MANUAL operation - in reference to “WIPER FREQUENCY” on the Set Up Screen 3 on previous screen.
- Press the SET button to toggle between FIXED or MANUAL option.
ACTICLEAN™ CLEANING SYSTEM

ACTICLEAN™ CLEANING SYS. (ACS)
The MPR™ and ChloRid® series can be provided with an on-line sleeve ActiClean™ Cleaning System (ACS).

The chemical/mechanical cleaning system uses stainless steel wiper collars containing a food-grade cleaning agent that sits between two rubber wipers. The wiper collars are equipped with a food grade pressure membrane to balance pressure between the collar and water inside the UV Reactor (UVR). This is designed to minimize the potential for leakage of the food grade cleaning agent.

The following covers the operation of the ACS.

KEY FEATURES

- Reduces amount/time of scheduled maintenance.
- Simplifies Quartz cleaning process.
- Ease of operation.
- Integrated system, no additional materials necessary.

The chemical/mechanical cleaning system uses stainless steel wiper collars containing a food-grade cleaning agent that sits between two rubber wipers. The wiper collars are equipped with a food grade pressure membrane to balance pressure between the collar and water inside the UV Reactor (UVR). This is designed to minimize the potential for leakage of the food grade cleaning agent.

The cleaning system is driven by an internal drive screw with an externally mounted electric motor as the direct drive. The drive screw is installed within the UVR chamber. The electric motor is mounted on the service end of the UVR and is protected within the service end cap.

Wiper collars are mounted onto a single yoke attached to a drive nut, which moves the wiper along the sleeve.

SYSTEM DESCRIPTION

Elements to identify the ACS are:

1. Collar
2. Hex Nut
3. Retaining Plate
4. Housing
5. Spacer
6. Drive Screw
7. Retaining Cap
8. Leadscrew Nut
9. Key

CLEANING AGENT

The cleaning agent, ActiClean™ Gel, is a proprietary food-grade agent developed by Trojan. Trojan has obtained NSF 60 approval for ActiClean™ Gel as an additive to drinking water.

SYSTEM OPERATION

The ACS is controlled via the Control Power Panel's (CPP) operator interface. Here the operator sets the ACS to clean at regular intervals. In addition, the operator may initiate an immediate cleaning sequence at any time. For details on how to adjust the cleaning frequency, and how to initiate a cleaning cycle, please refer to the UV G400 Operation Chapter.
ACTICLEAN™ CLEANING SYSTEM MAINTENANCE

RECOMMENDED MAINTENANCE GUIDELINES

The following provides users of ActiClean™ Cleaning System (ACS) or Wiper, with recommendations and procedures that will maximize the efficiency, consistency, reliability and longevity of the equipment. If your system is equipped with a chemical/mechanical ACS, required maintenance consists of replacing the wipers, and recharging the wiper collars with ActiClean™ Gel. The frequency of service depends upon the:

- Nature of the fouling agent
- Rate of fouling
- Frequency of cleaning

On average, rubber wipers should be inspected and, if necessary, replaced every six months or whenever sleeves are checked. ActiClean™ Gel should be recharged whenever sleeves are checked or a minimum of every 6 months.

SAFETY REQUIREMENTS

The following safety requirements are mandatory. Failure to carefully follow them can cause injury to the operator and damage to the UV unit.

OPERATING CONDITIONS

A. Never look at lighted ultraviolet lamps. Never operate the ultraviolet lamps outside the UV treatment chamber. UV lamp exposure can severely burn and damage eyes and skin.

B. Disconnect power before servicing unit. The UV lamps and electrical components are operated with high voltage electrical power. DO NOT attempt to service the UV treatment unit without first disconnecting power to the unit. Shut off the source of power at the equipment main panel breaker and use appropriate tag-out or lockout procedures to prevent accidental power-up by other personnel. Only qualified personnel should perform service.

C. Remove pressure before servicing unit. The UV unit has components under pressure.

CAUTION

The most important consideration for proper installation, operation and maintenance of any piece of equipment is operator safety. The following caution statements directly relate to operator safety. Please review with all applicable personnel to ensure continuous compliance.

Procedure:

1. Turn the system OFF. See procedures in the System Operation chapter.
2. Shut off the main power to the system by turning the rotary disconnect switch on the face of the Control Panel to the OFF position.
3. De-pressurize and drain the UV reactor.
4. Remove the UV lamp (see Lamp Installation chapter). NOTE: QUARTZ SLEEVE MUST REMAIN IN UV REACTOR FOR THIS PROCEDURE.
5. Remove Service Endplate.
6. Remove the hand pump from the ActiClean™ Gel bottle.
7. Place the pump’s suction hose into bucket containing water.
8. Place end of drain hose into a separate bucket or receptacle. See Fig. A

NOTE: Allow UV power supply, AccUVSensor™ and UV lamps to cool before handling. Ultraviolet lamps become hot during operation. Hot lamps can cause serious burns. Prior to removing the lamps, allow lamps to cool for a minimum of 5 minutes. This prevents burns and damage to the lamp.

FLUSH / DRAIN THE ACTICLEAN™ GEL

Required tools:

- Nature of the fouling agent
- Rate of fouling
- Frequency of cleaning
- 3/16” Allen key
- Bucket (or suitable drain receptacle),
- Clean water
- ActiClean™ Gel bottle and associated tubing (provided with system)
- Hand pump.

Procedure:

1. Turn the system OFF. See procedures in the System Operation chapter.
2. Shut off the main power to the system by turning the rotary disconnect switch on the face of the Control Panel to the OFF position.
3. De-pressurize and drain the UV reactor.
4. Remove the UV lamp (see Lamp Installation chapter). NOTE: QUARTZ SLEEVE MUST REMAIN IN UV REACTOR FOR THIS PROCEDURE.
5. Remove Service Endplate.
6. Remove the hand pump from the ActiClean™ Gel bottle.
7. Place the pump’s suction hose into bucket containing water.
8. Place end of drain hose into a separate bucket or receptacle. See Fig. A
ACTICLEAN™ CLEANING SYSTEM MAINTENANCE

9. Attach drain hose’s quick connect coupling to the top nipple of the wiper collar.

10. Attach the pump connection’s quick connect coupling to the bottom nipple of the wiper collar.

11. Pump water into the collar to flush the cleaning agent and allow water to drain from the collar.

12. When water from drain is running clear, stop and remove connections. NOTE: TO CONNECT TO NIPPLE, PULL BACK ON THE ALUMINUM RING OF THE QUICK CONNECT COUPLING, PUSH IT OVER THE NIPPLE, AND RELEASE THE RING. LIGHTLY TUG ON THE HOSE TO ENSURE THAT TIGHT CONNECTION HAS BEEN MADE.

Procedure:

1. Turn the system OFF. See procedures in the System Operation chapter.

2. Shut off the main power to the system by turning the rotary disconnect switch on the face of the Control Panel to the OFF position.

3. De-pressurize and drain the UV reactor.

4. Follow steps in the section Flush/Drain the ActiClean™ Gel to remove the UV lamp and drain the existing ActiClean™ Gel.

5. Place the open end of the drain hose into a bucket or suitable drain. See Fig. B

6. Attach the drain hose’s quick connect coupling to the top nipple.

7. Attach the pump connection’s quick connect coupling to the bottom nipple.

8. Hand pump ActiClean™ Gel into the collar. When ActiClean™ Gel starts to come out of the drain connection at the top, the collar is full. Ensure that the drain hose is free of air for at least 2 pumps.

9. Remove the bottom hose first and then the top hose, this will ensure that the wiper collar does not become pressurized.

10. Reinstall Service Endplate.

11. Reinstall the lamp and gland seal plates following procedures in the Lamp Installation Chapter.

12. Repeat procedure for all lamps. NOTE: IF THE TOP (DRAIN) HOSE IS REMOVED FIRST AND ANY ADDITIONAL GEL IS PUMPED INTO THE COLLAR IT WILL BE PRESSURIZED. IF THE COLLAR BECOMES PRESSURIZED DAMAGE TO THE WIPING SYSTEM OR SLEEVES MAY OCCUR. IF THIS HAPPENS RECONNECT THE TOP DRAIN HOSE, AND DISCONNECT THE BOTTOM FILL HOSE FIRST BEFORE DISCONNECTING THE TOP (DRAIN) HOSE AGAIN.

RECHARGE THE ACTICLEAN™ GEL

Required tools:

- ActiClean™ Gel
- ActiClean™ Gel bottle & associated tubing (provided with the system)
REMOVE / REPLACE LAMP SLEEVE WIPER COLLAR

Use this procedure to remove a lamp sleeve wiper collar to:

- Inspect wiper components
- Prepare for the replacement of a rubber wiper (see the section Remove/Replace Rubber Wipers and Bearings)
- Replace a defective lamp sleeve wiper collar.

Required tools:
- 1/8” Allen Key (“T” handle is the best option)

Procedure:
1. Once the service plate is removed you will see the wiper collar and fastening screws.
2. Use the 1/8” Allen key to loosen the screws holding the wiper collar assembly.
3. Remove the wiper collar for inspection of the rubber wipers and wiper bearings. Be careful not to drop the collar into the UVR.
4. Follow the procedures in Remove/Replace Rubber Wipers and Bearings to replace the wipers and bearings, if needed.
5. After inspection or replacement of wiper components, reinstall wiper collar assembly.
6. When installing the wiper collar use Loctite 242 on the threads of the fastening screw.

NOTE:
Only Loctite 242 can be used as it is NSF approved for use in potable drinking water applications.

WARNING

NOTE: Ensure that the pressure membrane is at the bottom of the wiper collar and the nipple fittings are facing outward.

REMOVE/REPLACE A ACCUVSENSOR™ SLEEVE WIPER COLLAR

Use this procedure to remove an accuvsensor™ sleeve wiper collar to:

- Inspect wiper components
- Prepare for the replacement of a wiper (see the section Remove/Replace Rubber Wipers and Bearings) or
- Replace a defective AccUVSensor™ sleeve wiper collar.

1. Turn the system OFF. See procedures in the System Operation chapter.
2. Shut off the main power to the system by turning the rotary disconnect switch on the face of the Control Panel to the OFF position.
3. De-pressurize and drain the UV reactor.
4. Remove the UV lamp (see Lamp Installation chapter) gland plate, quartz sleeve and access port for the lamp closest to the AccUVSensor™ port. This gain access inside the UV reactor.
5. Put your hand inside the access port and remove the AccUVSensor™ sleeve wiper collar out of the slot in the yoke. This can be accomplished by pushing in the spring-loaded pin, located just to the side of the wiper collar. This pin holds the collar in place on the yoke. Then slide the collar to the large opening at the end of the slot, ensuring not to drop the wiper collar once it is free.
6. Remove the AccUVSensor™ sleeve wiper collar (see above) from the UVR through the Lamp access port.
**ACTICLEAN™ CLEANING SYSTEM MAINTENANCE**

7. Follow the procedures in Remove / Replace Rubber Wipers and Bearings to replace the rubber wipers and bearings, if needed.

8. After inspection or replacement of wiper components, reinstall wiper collar assembly.

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**REMOVE/REPLACE RUBBER WIPER AND BEARINGS**

The following procedure is used to replace the rubber wipers and Teflon® bearings from either the lamp sleeve wiper collar or the AccuVSensor™ sleeve wiper collar. Although the procedure is the same for each type of wiper collar, the following illustrates the replacement of a wiper from the lamp sleeve wiper collar.

**Required tools:**
- Small flathead screwdriver

**Procedure:**

1. Remove the wiper collar. See Remove/Replace a Lamp Sleeve Wiper Collar or Remove/Replace a AccuVSensor™ Sleeve Wiper Collar for details.

2. Use a small flat head screwdriver to pry the rubber wiper from the groove and remove from the wiper collar.

3. Repeat the procedure for the other rubber wiper and the Teflon® (white) bearing(s).

4. Clean the inside of the wiper collar seal groove of any debris. Use a small brush and water spray if necessary.


6. Install new rubber wipers into the grooves. When installing the black U-cup seal in the lamp sleeve wiper collar, ensure that the “U” lip faces towards the outside of the collar.

7. Re-install the wiper collars.

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**REMOVE/REPLACE THE PRESSURE MEMBRANE ON WIPER COLLAR**

**Required tools:**
- Philips screwdriver

**Procedure:**

1. Remove the wiper collar. See Remove/Replace a Lamp Sleeve Wiper Collar for details.

2. Using a Philips screwdriver, unscrew the screws that are holding the cap plate to the pressure membrane.

3. Remove the cap plate and pressure membrane.

4. Check for deterioration of the membrane and debris within the membrane chamber. Replace the membrane if damaged.

5. Reassemble the membrane and cap plate.
The following installation and operating conditions are considered hazardous and damaging to the equipment, compromising the ability of the Aquafine unit to perform as intended.

Any of the following conditions will void the equipment warranty:

1. Failure to supply the correct voltage and frequency as indicated on the nameplate decal.
2. Failure to comply Aquafine electrical drawings and with local electrical codes.
3. Failure to properly ground the unit.
4. Failure to eliminate excessive vibration, piping, movement, or “water hammer”.
5. Failure to exercise caution in the handling of the sensitive and delicate components (such as lamps, quartz sleeves, electronic boards, etc.) during installation and/or maintenance procedures.
6. Failure to avoid excessive stops and starts. Not more than three (3) “ON/OFF” cycles per 24 hours of operation.
7. Operation of visibly damaged equipment.
8. Failure to avoid undue overhead piping stress, which can result in structural damage to the UV unit. Limit the load to 25 lbs (11.3 kg), for 2” & 3”, 50 lbs (23 kg), for 4” and 75 lbs (34 kg), for 6” or above. Torsion loads or side loading of the risers should be eliminated.
9. Use the components other than those provided or authorized by Aquafine.
10. Failure to correct overhead piping connection leaks or compression nut seal leaks which result in damage to the electrical components.
11. Allowing operating water temperature to exceed 120°F.
12. Operating the units without water flow.

**NOTE:** To register your UV system for warranty, go online to [www.aquafineuv.com](http://www.aquafineuv.com)

**REMEMBER, ALWAYS USING GENUINE AQUAFINE PARTS KEEPS YOUR WARRANTY, UL, CE & NSF CERTIFICATIONS VALID.**

Please see Aquafine’s official warranty on the following page.
AQUAFINE EQUIPMENT WARRANTY

The following terms and conditions will govern the equipment warranty provided by Aquafine Corporation Inc. to the Owner/Operator:

Aquafine Corporation (“Aquafine”) warrants to the Owner/Operator noted above (the “Customer”) that if within 12 months from equipment start-up or 18 months from the date of delivery, whichever comes first, equipment manufactured by Aquafine (the “Equipment”) will be free from defects in material and workmanship and will function in accordance with the specifications agreed to by Aquafine for the Equipment.

This warranty shall not apply to any failure or defect which results from the Equipment not being operated and maintained in strict accordance with instructions specified in the Operation and Maintenance manual or which results from mishandling, misuse, neglect, improper storage, improper operation of the Equipment with other equipment furnished by the Customer or other third parties or defects in designs or specifications furnished by or on behalf of the Customer by a person other than Aquafine. In addition, this warranty shall not apply to Equipment that has been altered or repaired after start-up by anyone except: (a) authorized representatives of Aquafine, or (b) Customer acting under specific instructions from Aquafine.

Customer must notify Aquafine in writing within 5 days of the date of any Equipment failure. This notification shall include a description of the problem, a copy of the operator’s log, a copy of the Customer’s maintenance record and any analytical results detailing the problem. If Customer has not maintained the operator’s log and maintenance record in the manner directed in the Operation and Maintenance manual, or does not notify Aquafine of the problem as specified above, this warranty may, in Aquafine’s discretion, be invalid.

Customer will fully cooperate with Aquafine, in the manner requested by Aquafine, in attempting to diagnose and resolve the problem by way of telephone support. If the problem can be diagnosed by telephone support and a replacement part is required Aquafine will either, at Aquafine’s expense, ship a repaired, reworked or new part to the Customer who will install such part as directed by Aquafine or will direct Customer to acquire, at Aquafine’s expense, such part from a third party and then install such part as directed by Aquafine.

In the event that Aquafine determines that the problem cannot be resolved by way of telephone support and/or shipment by Aquafine, or acquisition by the Customer, of a replacement part for installation by the Customer, Aquafine will send one or more persons to make an on site inspection of the problem. If an on site visit is made, Aquafine personnel will evaluate the problem and repair or replace any Equipment determined to be in breach of this warranty. If the problem is not attributable to a breach of this warranty, Aquafine reserves the right to invoice the Customer for this service.

Equipment components manufactured by third parties but furnished to Customer by Aquafine are warranted by the original manufacturer, only to the extent of the original manufacturer’s warranty, and are not covered by the above warranty.

This warranty is the exclusive remedy for all claims based on a failure of or defects in the Equipment, whether the claim is based on contract (including fundamental breach), tort (including negligence), strict liability or otherwise. This warranty is in lieu of all other warranties whether written, oral, implied or statutory. Without limitation, no warranty of merchantability or fitness for a particular purpose shall apply to the Equipment.

Aquafine does not assume any liability for personal injury or property damage caused by use or misuse of the Equipment. Aquafine shall not in any event be liable for special, incidental, indirect or consequential damages including, without limitation, lost profits, lost business opportunities, lost revenue or loss or depreciation of goodwill, even if it has been advised of the possibility thereof. Aquafine’s liability shall, in all instances, be limited to repair or replacement of Equipment in breach of this warranty and shall not exceed the cost of such repair or replacement. This liability with respect to repair or replacement will terminate upon the expiration date of this warranty.

In addition to the foregoing, in no event shall Aquafine’s liability relating to the Equipment, or the agreement between Aquafine and the Customer relating to the Equipment, exceed that portion of the purchase price for the Equipment which is actually paid to Aquafine.
# MP UV G400 TROUBLESHOOTING

## SYSTEM ALARM MESSAGE

<table>
<thead>
<tr>
<th>MESSAGE</th>
<th>PROBABLE CAUSE</th>
<th>REMEDY</th>
</tr>
</thead>
<tbody>
<tr>
<td>System OK</td>
<td>Activates when there are no system alarms</td>
<td></td>
</tr>
<tr>
<td>Lamp OFF alarm</td>
<td>UV lamp</td>
<td>Activates when one or more UV lamps in not ON.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>The UV lamps should be inspected for damage.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Replace UV lamp(s).</td>
</tr>
<tr>
<td></td>
<td>Ballast</td>
<td>Ballast may be defective.</td>
</tr>
<tr>
<td></td>
<td>Water temperature</td>
<td>When temperature has reached its set point, system will automatically shut OFF and restart when temperature has cooled to 20°F.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Let system cool, or allow cooler water to enter the treatment chamber.</td>
</tr>
<tr>
<td>Time to change lamps</td>
<td>Lamp operating hours</td>
<td>The lamp operating hours has reached the Alarm Set Point.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Replace lamps and reset the lamp operating hours.</td>
</tr>
<tr>
<td>Low UV Alarm</td>
<td>UV lamps</td>
<td>As the UV lamps age, the lamps solarize. Lamps should be replaced after specified lamp life, which is determined by lamp life.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Please note, lamps will remain lit many hours after specified lamp life, but the UV output will decline.</td>
</tr>
<tr>
<td></td>
<td>Quartz sleeves/Sensor fouling</td>
<td>In raw water applications (non RO/DI), minerals or debris will attach to the quartz sleeves. The material will block the transmission of the UV energy into the water. The quartz sleeves must be replaced or cleaned.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>CIP does not always properly clean the quartz sleeves.</td>
</tr>
<tr>
<td></td>
<td>Water quality</td>
<td>Any changes in the water transmission or quality will cause the sensor reading to change. In some applications where the water is blended, the transmission properties can change.</td>
</tr>
<tr>
<td></td>
<td>Temperature</td>
<td>UV output of the lamps is sensitive to temperature. If the UV sensor is set with a water temperature of 70°F and the operational temperature is 50°F, the sensor reading will be less.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>The Detector should be set to the “normal” operating temperature.</td>
</tr>
</tbody>
</table>
## TROUBLESHOOTING UV G400 MP

### SYSTEM ALARM MESSAGE

<table>
<thead>
<tr>
<th>MESSAGE</th>
<th>PROBABLE CAUSE</th>
<th>REMEDY</th>
</tr>
</thead>
<tbody>
<tr>
<td>Low UV Alarm</td>
<td>Low UV Alarm Set Point wrong</td>
<td>Reset Alarm Set Point.</td>
</tr>
</tbody>
</table>
| High Temperature Warning | Water temperature                                   | Water temperature is approaching the Alarm Set Point.  
                            |                                                     | Provide cooler water.                                      |
| Water Temperature Too    | Water temperature                                   | Water temperature has reached its set point. System will automatically 
                        | High Water temperature                                              | shut OFF and restart when temperature has cooled to 20ºF.    |
                        |                                                     | Let system cool, or allow cooler water to enter the treatment chamber. |
| Water Level Warning      | Water level to high/low                             | Check for appropriate water level.                                    |

### SYSTEM NOT OPERATING

<table>
<thead>
<tr>
<th>SYMPTOM</th>
<th>PROBABLE CAUSE</th>
<th>REMEDY</th>
</tr>
</thead>
<tbody>
<tr>
<td>System Not Operating</td>
<td>Defective Temp. Switch</td>
<td>The Temp. Switch provides a temperature signal to the controller.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>If the system has a Water Temperature Too High warning and the water</td>
</tr>
<tr>
<td></td>
<td></td>
<td>temperature is below the set point, the sensor may be defective.</td>
</tr>
<tr>
<td></td>
<td>Blown fuse/circuit breaker</td>
<td>Check main fuse or circuit breaker.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>A complete inspection to determine the cause of failure should be</td>
</tr>
<tr>
<td></td>
<td></td>
<td>completed.</td>
</tr>
<tr>
<td></td>
<td>Control fuses</td>
<td>There are two fuses for the controller, AC and 24V DC.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Both fuses need to be checked.</td>
</tr>
</tbody>
</table>
## MP UV G400 TROUBLESHOOTING

### SYSTEM NOT OPERATING

<table>
<thead>
<tr>
<th>SYMPTOM</th>
<th>PROBABLE CAUSE</th>
<th>REMEDY</th>
</tr>
</thead>
<tbody>
<tr>
<td>System Not Operating</td>
<td>Power to the Unit</td>
<td>Main power to the unit should be checked.</td>
</tr>
<tr>
<td></td>
<td>GFI</td>
<td>Some UV units are equipped with a GFI. Resetting the GFI will restore power to the unit.</td>
</tr>
<tr>
<td></td>
<td>Local/Remote Operation</td>
<td>If the unit has been set to operate in Remote mode, the START/STOP button will not start the unit.</td>
</tr>
<tr>
<td></td>
<td>Lamp Fault</td>
<td>Inspect and check lamp socket connection.</td>
</tr>
<tr>
<td></td>
<td>High water temperature</td>
<td>If “Water Temperature Too High” message is displayed, the unit will not start. The water temperature must be below 20°F below the set point to restart.</td>
</tr>
</tbody>
</table>

### LEAKING

<table>
<thead>
<tr>
<th>SYMPTOM</th>
<th>PROBABLE CAUSE</th>
<th>REMEDY</th>
</tr>
</thead>
<tbody>
<tr>
<td>Leaking</td>
<td>Gland plate</td>
<td>Inspect the gland plate seal and O-ring to insure that they are installed properly.</td>
</tr>
<tr>
<td></td>
<td>Over pressure limit</td>
<td>System pressure greater than the design pressure will cause the sealing material to fail.</td>
</tr>
<tr>
<td></td>
<td>Gasket failure</td>
<td>The gasket or O-rings should be inspected for deterioration. These materials can be subjected to damage by UV, Ozone and heat.</td>
</tr>
<tr>
<td></td>
<td>O-rings</td>
<td>The gasket or O-rings should be inspected for deterioration. These materials can be subjected to damage by UV, Ozone and heat. Reinstall and replace the O-ring.</td>
</tr>
<tr>
<td></td>
<td>Sealing material</td>
<td>The gasket or O-rings should be inspected for deterioration. These materials can be subjected to damage by UV, Ozone and heat.</td>
</tr>
<tr>
<td></td>
<td>“Water Hammer”</td>
<td>“Water hammer” pressure can be 5-10X higher than the static pressure of a water system and can cause leaking and/or breakage to the quartz sleeves.</td>
</tr>
</tbody>
</table>
# TROUBLESHOOTING UV G400 MP

## LEAKING

<table>
<thead>
<tr>
<th>SYMPTOM</th>
<th>PROBABLE CAUSE</th>
<th>REMEDY</th>
</tr>
</thead>
<tbody>
<tr>
<td>Leaking</td>
<td>Broken quartz sleeves</td>
<td>Inspect the ends of the sleeves for cracks and chips. Any broken sleeves should be replaced.</td>
</tr>
</tbody>
</table>

## LAMP FAILURE

<table>
<thead>
<tr>
<th>SYMPTOM</th>
<th>PROBABLE CAUSE</th>
<th>REMEDY</th>
</tr>
</thead>
<tbody>
<tr>
<td>Premature lamp failure</td>
<td>Leaking/water in quartz sleeve</td>
<td>If water is present in the quartz sleeve, repair the leak immediately.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Water can cause the lamp socket to arc, corrosion on the lamp pins, burning of the lamp sockets and damage to the ballast and LED components.</td>
</tr>
<tr>
<td>Lamp cycling</td>
<td></td>
<td>Systems in which the UV is turned ON and OFF frequently (more than 4X) will cause the lamp filament damage.</td>
</tr>
<tr>
<td>Electrical power</td>
<td>Low/High equipment power</td>
<td>Cause damage to the electrical equipment.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>The electrical power should be within 5% of the name plate voltage.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Small transformers may be required to boost low voltages.</td>
</tr>
<tr>
<td>Heat</td>
<td>Excessive heat from no flow</td>
<td>Conditions can damage the lamps.</td>
</tr>
<tr>
<td>Mechanical vibration</td>
<td>Vibration from &quot;water hammer&quot;,</td>
<td>Pumps and unsupported piping can cause excess stress to the lamp filament and equipment.</td>
</tr>
<tr>
<td></td>
<td>pumps and unsupported piping</td>
<td></td>
</tr>
<tr>
<td></td>
<td>can cause excess stress to</td>
<td></td>
</tr>
<tr>
<td></td>
<td>the lamp filament and equipment.</td>
<td></td>
</tr>
<tr>
<td>Electrical connection</td>
<td>Vibration can cause the electrical connections to become loose.</td>
<td></td>
</tr>
<tr>
<td></td>
<td>All connections should be</td>
<td>inspected and repaired if damaged.</td>
</tr>
</tbody>
</table>

## UV SYSTEM PERFORMANCE

<table>
<thead>
<tr>
<th>SYMPTOM</th>
<th>PROBABLE CAUSE</th>
<th>REMEDY</th>
</tr>
</thead>
<tbody>
<tr>
<td>UV system non-performance -</td>
<td>Sampling procedures</td>
<td>Sampling procedures can contribute to measuring errors.</td>
</tr>
<tr>
<td>Bacteria, Ozone</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Concentration spikes</td>
<td>Contamination or concentration</td>
<td>Spikes can result in temporary negative performance.</td>
</tr>
<tr>
<td></td>
<td>spikes</td>
<td></td>
</tr>
<tr>
<td>Piping contamination</td>
<td>System sanitation is critical.</td>
<td>If the pipe system is contaminated, then performance may be flawed.</td>
</tr>
<tr>
<td></td>
<td>If the pipe system is</td>
<td></td>
</tr>
<tr>
<td></td>
<td>contaminated, then performance</td>
<td>may be flawed.</td>
</tr>
<tr>
<td></td>
<td>may be flawed.</td>
<td></td>
</tr>
<tr>
<td>Leaking</td>
<td>Leaking can result in system</td>
<td>contamination.</td>
</tr>
<tr>
<td></td>
<td>contamination.</td>
<td></td>
</tr>
<tr>
<td>TOC &amp; Chlorine performance</td>
<td>For TOC and Chlorine applications, lamps with 185nm output must be used.</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Water flow too high</td>
<td>If the capacity of the equipment exceeds the design capacity, then performance will be compromised.</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
# MP UV G400 TROUBLESHOOTING

## UV SYSTEM PERFORMANCE

<table>
<thead>
<tr>
<th>SYMPTOM</th>
<th>PROBABLE CAUSE</th>
<th>REMEDY</th>
</tr>
</thead>
<tbody>
<tr>
<td>UV system non-performance -</td>
<td>Water quality</td>
<td>If the water has debris, chemicals or materials which absorb the UV energy, the performance will be compromised.</td>
</tr>
<tr>
<td>Bacteria, Ozone</td>
<td></td>
<td></td>
</tr>
<tr>
<td>UV lamp maintenance</td>
<td></td>
<td>The lamps may require maintenance.</td>
</tr>
<tr>
<td>Quartz sleeve maintenance</td>
<td></td>
<td>The quartz sleeves may need maintenance</td>
</tr>
<tr>
<td>ALARM MESSAGE</td>
<td>PROBABLE CAUSE</td>
<td>REMEDY</td>
</tr>
<tr>
<td>---------------------</td>
<td>----------------------------------------------------</td>
<td>------------------------------------------------------------------------</td>
</tr>
<tr>
<td>SYSTEM OK</td>
<td>Activates when there are no system alarms.</td>
<td></td>
</tr>
<tr>
<td>LAMP OFF ALARM</td>
<td>UV lamp</td>
<td>Activates when one or more UV lamps is not ON. The UV lamps should be inspected for damage. Replace UV lamp.</td>
</tr>
<tr>
<td></td>
<td>Ballast</td>
<td>The ballast maybe defective.</td>
</tr>
<tr>
<td></td>
<td>Water temperature</td>
<td>Water temperature has reached its set point. System will automatically shut OFF and restart when temperature has cooled 20°F. Let system cool or allow cooler water to enter the treatment chamber.</td>
</tr>
<tr>
<td>LAMP FAULT</td>
<td>Activates when the UV lamp and lamp socket are not engaged properly.</td>
<td>Inspect lamp socket and lamp connection. Repair and replace lamp if required.</td>
</tr>
<tr>
<td></td>
<td>Water Temperature</td>
<td>Water temperature has reached its set point. System will automatically shut OFF and restart when temperature has cooled 20°F. Let system cool or allow cooler water to enter the treatment chamber.</td>
</tr>
<tr>
<td>TIME TO CHANGE LAMPS</td>
<td>Lamp Operating Hour</td>
<td>The lamp operating hours has reached the alarm set point. Replace lamps and reset the lamp operating hours.</td>
</tr>
<tr>
<td>LOW UV ALARM</td>
<td>UV Lamps</td>
<td>As the UV lamps age, the lamps solarize. After a normal operation of 5,000 hours, the lamps should be replaced. Please note that the lamps will remain lit for many hours after 5,000 hours but the UV output will decline.</td>
</tr>
<tr>
<td></td>
<td>Quartz Sleeve/ Detector Fouling</td>
<td>In raw water applications (non RO/DI), minerals or debris will attach to the quartz sleeves. The material will block the transmission of the UV energy into the water. The quartz sleeves must be replaced or cleaned.</td>
</tr>
<tr>
<td></td>
<td>Water Quality</td>
<td>Any changes in the water transmission or quality will cause the sensor reading to change. In some applications where the water is blended, the transmission properties can change.</td>
</tr>
<tr>
<td></td>
<td>Temperature</td>
<td>UV output of the lamps is sensitive to temperature. If the UV detector is set with a water temperature of 70° F and the operational temperature is 50°F, the sensor reading will be less. The detector should be set to the “normal” operating temperature.</td>
</tr>
<tr>
<td></td>
<td>Low UV Alarm Set Point Wrong</td>
<td>Reset the alarm set point.</td>
</tr>
</tbody>
</table>
# TROUBLESHOOTING MPR

<table>
<thead>
<tr>
<th>ALARM MESSAGE</th>
<th>PROBABLE CAUSE</th>
<th>REMEDY</th>
</tr>
</thead>
<tbody>
<tr>
<td>HIGH TEMP WARNING</td>
<td>Water temperature</td>
<td>Water temperature is approaching the alarm set point. Provide cooler water.</td>
</tr>
<tr>
<td>WATER TEMP TO HIGH</td>
<td>Water temperature</td>
<td>Water temperature has reached its set point. System will automatically shut OFF and restart 5 minute lamp cool down cycle. Let system cool or allow cooler water to enter the treatment chamber.</td>
</tr>
<tr>
<td>WATER LEVEL SWITCH</td>
<td>No water/water level too low</td>
<td>Check for appropriate water level.</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>SYMPTOM</th>
<th>PROBABLE CAUSE</th>
<th>REMEDY</th>
</tr>
</thead>
<tbody>
<tr>
<td>SYSTEM NOT OPERATING</td>
<td>Defective Temp. Switch</td>
<td>If the Temp. Switch is installed, the switch provides a signal to the controller. If the system has a Water Temperature Too High Alarm and the water temperature is below the set point, the switch may be defective.</td>
</tr>
<tr>
<td></td>
<td>Blown fuse/Circuit breaker</td>
<td>Check main fuse or circuit breaker. A complete inspection to determine the cause of failure should be completed.</td>
</tr>
<tr>
<td></td>
<td>GFI</td>
<td>Some UV units are equipped with a GFI. Resetting the GFI will restore power to the unit.</td>
</tr>
<tr>
<td></td>
<td>Power to the Unit</td>
<td>Main power to the unit should be checked.</td>
</tr>
<tr>
<td></td>
<td>Auto Mode Operation</td>
<td>If the unit has been set to operate in Auto mode, the START/STOP button will not start the unit.</td>
</tr>
<tr>
<td></td>
<td>Lamp Fault</td>
<td>Inspect and check lamp socket connection.</td>
</tr>
<tr>
<td></td>
<td>High Water Temperature</td>
<td>If water temperature too high message is displayed, the unit will not start. The water temperature must be 20°F below the set point to restart.</td>
</tr>
<tr>
<td></td>
<td>No water/water level too low</td>
<td>Check for appropriate water level.</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>SYMPTOM</th>
<th>PROBABLE CAUSE</th>
<th>REMEDY</th>
</tr>
</thead>
<tbody>
<tr>
<td>LEAKING</td>
<td>Gland Plate</td>
<td>Inspect the gland plate and O-ring to insure that they are installed properly.</td>
</tr>
<tr>
<td></td>
<td>Over Pressure</td>
<td>System pressure greater than the design pressure will cause the sealing material to fail.</td>
</tr>
<tr>
<td></td>
<td>O-ring Failure</td>
<td>The O-rings should be inspected for deterioration. These materials can be subjected to UV, Ozone and heat that is damaging to the material.</td>
</tr>
</tbody>
</table>
## MPR TROUBLESHOOTING

### SYSTEM LEAKING

<table>
<thead>
<tr>
<th>SYMPTOM</th>
<th>PROBABLE CAUSE</th>
<th>REMEDY</th>
</tr>
</thead>
<tbody>
<tr>
<td>LEAKING</td>
<td></td>
<td></td>
</tr>
<tr>
<td>O-ring Installation</td>
<td>O-rings that are not compressed properly will cause the quartz sleeves to leak. Reinstall and replace the O-ring.</td>
<td></td>
</tr>
<tr>
<td>Sealing Material</td>
<td>O-ring materials that are damaged due to UV, Ozone and physical damage will result in leaking. The material should be changed.</td>
<td></td>
</tr>
<tr>
<td>Water Hammer</td>
<td>Water hammer pressure can be 5-10 times higher than the static pressure of a water system can cause leaking and breakage to the quartz sleeves.</td>
<td></td>
</tr>
<tr>
<td>Broken Quartz Sleeves</td>
<td>The ends of the sleeves should be inspected for cracks and chips. Any broken sleeves should be replaced.</td>
<td></td>
</tr>
</tbody>
</table>

### LAMP FAILURE

<table>
<thead>
<tr>
<th>SYMPTOM</th>
<th>PROBABLE CAUSE</th>
<th>REMEDY</th>
</tr>
</thead>
<tbody>
<tr>
<td>PREMATURE LAMP FAILURE</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Lamp Cycling</td>
<td>Systems in which the UV is turned ON/OFF frequently (more that 3 times) will cause the lamp filament damage.</td>
<td></td>
</tr>
<tr>
<td>Electrical Power</td>
<td>Low equipment power causes damage to the electrical equipment. The electrical power should be within 5% of the name plate voltage. Small transformers may be required to boost low voltages.</td>
<td></td>
</tr>
<tr>
<td>Electrical Connection</td>
<td>Vibration can cause the electrical connects to become loose. The connection should be inspected and repaired.</td>
<td></td>
</tr>
<tr>
<td>Heat</td>
<td>Excessive heat from no flow conditions can damage the lamps.</td>
<td></td>
</tr>
<tr>
<td>Mechanical Vibration</td>
<td>Vibration from water hammer, pumps and unsupported piping can cause excess stress to the lamp filament and equipment.</td>
<td></td>
</tr>
<tr>
<td>Leaking/Water in Quartz Sleeve</td>
<td>If water is present in the quartz sleeve, the leak should be repaired immediately. Water can cause the lamp socket to arc, corrosion on the lamp pins, burning of the lamp sockets and damage to the electrical components.</td>
<td></td>
</tr>
</tbody>
</table>

### UV SYSTEM PERFORMANCE

<table>
<thead>
<tr>
<th>SYMPTOM</th>
<th>PROBABLE CAUSE</th>
<th>REMEDY</th>
</tr>
</thead>
<tbody>
<tr>
<td>UV SYSTEM NON-PERFORMANCE, BACTERIA</td>
<td>UV Lamp Maintenance</td>
<td>The lamps may require maintenance.</td>
</tr>
<tr>
<td>Quartz Sleeve Maintenance-Dirty</td>
<td>The quartz sleeves may need maintenance</td>
<td></td>
</tr>
</tbody>
</table>
# Troubleshooting MPR

## UV System Performance

<table>
<thead>
<tr>
<th>Symptom</th>
<th>Probable Cause</th>
<th>Remedy</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>UV System Non-performance, Bacteria</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Sampling Procedures</td>
<td>Sampling procedures can contribute to measuring errors.</td>
<td></td>
</tr>
<tr>
<td>Concentration Spikes</td>
<td>Contamination or concentration spikes can result in temporary negative performance.</td>
<td></td>
</tr>
<tr>
<td>Piping Contamination</td>
<td>System sanitation is critical. If the pipe system is contaminated, then performance may be flawed.</td>
<td></td>
</tr>
<tr>
<td>Leaking</td>
<td>Leaking can result in system contamination.</td>
<td></td>
</tr>
<tr>
<td>Water Flow to High</td>
<td>If the capacity of the equipment exceeds the design capacity, then performance will be compromised.</td>
<td></td>
</tr>
<tr>
<td>Water Quality</td>
<td>If the water has debris, chemicals or materials which absorb the UV energy, the performance will be compromised.</td>
<td></td>
</tr>
</tbody>
</table>