

READ THIS MANUAL

PLEASE KEEP FOR PERMANENT REFERENCE

Part No. 116-1, Revised 5/01

This manual covers the preliminary installation, operation and general maintenance requirements for Aquafine Ultraviolet Water Treatment Equipment for the following applications:

- Disinfection
- TOC Reduction
- Ozone Destruction
- Chlorine/Chloramine Destruction



SCD Series *Installation, Maintenance and 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.**

Aquafine Corporation builds the finest quality ultraviolet equipment in the world. When properly installed and operated, Aquafine ultraviolet treatment units will provide many years of service.



Table of Contents



Refer to this nameplate decal on your unit when ordering parts or service.



Installation and Operational Safety	3
Description of Equipment	
SCD Series Ultraviolet (UV) Treatment Unit	4
Aqualogic 2000™ Status Display Panel	4
Treatment Chamber	4
Warranty Information	4-5
Unit Installation	
Where to Install the Unit	6
How to Protect Your Unit	6
Operating Pressure	6
SCD Standard	6
SCD Remote	6
Hot Water Sanitization Information	6
Intermittent Operating Requirements	7
Requirements for Ultrapure Water	7
Connecting Customer Power	7
Installing the Quartz Sleeves	
New Equipment	8
Existing Equipment	9
Installing the Ultraviolet (UV) Lamps	10
Powering Up the Ultraviolet (UV) Unit	11
Monitoring Devices (Aqualogic 2000™)	
Lamps Operational Indicator	12
Lamp Out Alert Indicator	13
High-Temperature UV Shutdown Indicator	13
Running Time/Cycle Display	13
Low UV Intensity Indicator	13
Temperature Display	13
UV Intensity Sensor Display	14
UV Intensity Signal	14
Setting the UV Intensity	14
4-20 mA Output	16
RS-485 Communications Port	16
Remote Control Digital Signal	16
Remote High Temp. Alarm Relay	16
Low UV Intensity Alarm Relay	16
Lamp Out Alert Alarm Relay	16
Maintenance Requirements	17
Cleaning the Unit	17
Aqualogic 2000™ Status Display Panel	17
UV Lamp Replacement	17
Quartz Sleeve Cleaning & Replacement	17
Cleaning the Sensor Probe Window	18
Ballast Replacement	18
Measuring Performance, Sampling	19
Cleaning the Air Filter (HE Series)	20
Parts List	21-23
Drawings, Warranty Reg. Card	Back Pocket

Aquafine®



Installation *and Operational Safety*

safety requirements for UV equipment

The following safety requirements directly relate to operator safety. Please review with all appropriate personnel to ensure continuous compliance.

These safety requirements are **MANDATORY**. Failure to carefully follow these requirements can cause injury to the operator and damage the UV unit.



This “Safety Issue” icon marks all items relating to safety issues. Please read and adhere to these comments carefully.

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 look at the lighted blue ultraviolet lamps. Do not operate the ultraviolet lamps outside of the UV treatment chamber. Exposure can severely burn and damage eyes and skin.
4. Supply the unit with the correct voltage and frequency as indicated on the nameplate decal, ensuring the unit is wired in accordance with local electrical codes.
5. Properly ground the unit. Failure to comply may result in severe or fatal electrical shock.
6. Install the unit away from undue vibration that can damage the electrical components and UV lamps.
7. Ensure all water connections (flanges and compression nuts) are tightly sealed before applying pressure to the UV unit. **Do not stand in a direct line with the end plate when inspecting for water leaks; observe from the front or back.**
8. Do not allow the unit to overheat by operating without water flow. Normal operating temperature for standard UV units is 50° to 100°F (10°-38°C). If your application requires temperatures that are not within the standard temperature range for your unit, please contact Aquafine customer service for assistance.
9. Do not allow the inlet water temperature to exceed 100°F (38°C) for standard applications. For operating temperatures exceeding the parameters mentioned above, please contact the Aquafine customer service department.
10. Do not allow the water temperature to drop below 50°F (10°C) for standard applications. For operating temperatures below 50°F, please contact the Aquafine customer service department.
11. Do not allow the flow rate to exceed the maximum rated capacity.
12. **DO NOT ELECTRICALLY CYCLE THE UV UNIT MORE THAN THREE (3) ON/OFF CYCLES IN A 24-HOUR PERIOD.**
13. Before start up, flush the UV unit and discharge piping to rinse out any debris left from installation.

**DO NOT
LOOK AT
UV LIGHT**



Description *of Equipment*

SCD series

The models in this series contain the electrical components in an electrical enclosure. All electrical service and instrument monitoring can be done at the remote site. The electrical enclosure is connected to the treatment chamber via a flexible, watertight electrical cable.

aqualogic 2000™ display panel

Each UV unit is equipped with an Aqualogic 2000™ electronic control system. The system consists of two printed circuit boards: the Current Sensing Board (CSB) and the Status Display Board (SDB). A flat ribbon cable links the two boards. This custom electronic control system monitors the lamp status and UV intensity through UV sensor, low UV intensity, lamp out alert, unit running time, unit on/off cycles and temperature.

treatment chamber

The UV treatment chamber contains UV lamps. On either end are o-ringed or gasketed end plates which contain the stainless steel nipples and the lamp socket retainer assemblies.

Inside each cylinder is a helical baffle that prevents laminar flow and maximizes the unit's performance. The quartz sleeves fit inside the UV treatment chamber through the holes in the helical baffle. The lamps fit inside the quartz sleeves. The lamp sockets connect to the lamps. The socket covers on the end of the chamber protect the lamp sockets and lamp socket assemblies.

Warranty *Information*

To maintain your UV units warranty, please fill out and mail the Warranty Registration Card in the back pocket of this manual to Aquafine Customer Services.

The following installation and operating conditions are considered hazardous or damaging to the equipment and can compromise the ability of the Aquafine unit to perform as intended.

ANY OF THE FOLLOWING CONDITIONS WILL VOID THE EQUIPMENT WARRANTY.

1. Failure to connect proper electrical service to unit.
2. Failure to properly ground the unit.
3. Failure to eliminate excessive vibration, piping movement, or water hammer.
4. 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.
5. Failure to avoid excessive stops and starts. Not more than three (3) on/off cycles per 24 hours of operation.
6. Operation of visibly damaged equipment.
7. Failure to avoid undue overhead piping stress which may result in structural damage to the UV unit. Limit the load to 150 lbs (68 kg) per flange.
8. Use of components other than those provided or authorized by Aquafine.
9. Failure to correct overhead piping connection leaks or compression nut seal leaks which result in damage to the electrical components.
10. Operating the unit without water flow.



**Aquafine®****WARRANTY**

Aquafine equipment is guaranteed to be free from defects in materials and workmanship (excluding ultraviolet lamps) for a period of one year from the date of purchase. Any part suspected of being defective should be returned prepaid to Aquafine Corporation. If upon our inspection, the part(s) proves to be defective, it will be replaced or repaired (our option) and returned to sender prepaid.

Before returning any part, contact Aquafine Corporation for return authorization and shipping instructions. This guarantee is void if the equipment has not been installed and maintained in accordance with instructions. This guarantee is in lieu of all other warranties, expressed or implied.

To keep your warranty valid and to ensure peak performance, fill out and return your warranty registration card (located in the back pocket of this manual) and use only genuine Aquafine replacement parts.



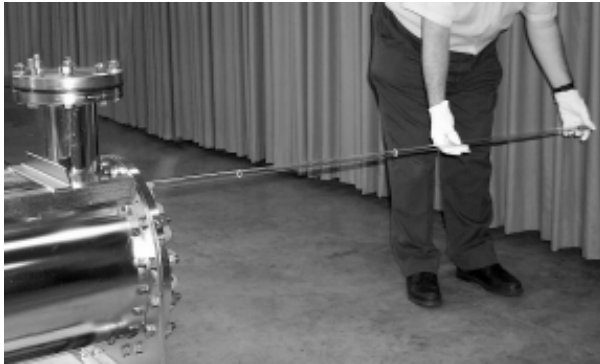
Unit Installation

where to install the unit

Install the UV treatment unit in a horizontal position in a sheltered area with ample ventilation. Ambient temperatures surrounding the unit should be between 50°F (10°C) and 110°F (43°C). Should your requirements differ, contact the factory for assistance.

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

Allow sufficient service access clearance. In making your plumbing connections, provide unions, valves, bypass and drain.



Please allow at least 72" (182 cm) of clearance on the lamp changing end of the unit.

how to protect your unit

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

Limit overhead piping load to 150 lbs (68kg) per flange.

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.



A parts check list was included when this unit was shipped. Please refer to this list and note that some parts are small and can be easily overlooked when discarding packaging.

operating pressure

Standard units are rated for a maximum operating pressure of 150 psig (10.34 bar).

SCD standard

The UV treatment chamber should be firmly mounted on the floor or a suitable stand. 1/2" diameter holes on the chamber foot are provided. The enclosure should be mounted to the two steel frames on top of the treatment chamber. Mounting is completed with two 3/8" studs on the front and 3/8" hardware on the rear. Lifting brackets are provided on the top of the enclosure.

SCD - remote

As with the SCD-Standard, the treatment chamber should be firmly mounted. The enclosure should then be mounted with the four mounting tabs on the enclosure. Lifting brackets are provided on the top of the enclosure.

hot water sanitization

For hot water sanitization (temperatures exceeding 170°F (77°C) up to a maximum of 194°F (90°C)), it is recommended that stainless steel compression nuts be used in place of CPVC compression nuts. During hot water sanitization the S-254 sensor element must be removed. The selection of the elastomers should be considered.



intermittent operation

Never operate the unit without water flow. Permanent damage is caused to the UV lamps, electronic ballast and related components without water flow.

Operating the ultraviolet unit without water flow through the chamber automatically voids the warranty.

If operated without water flow, the fluid within the ultraviolet chamber will become hot causing the UV lamps to lose effectiveness. The heat can permanently damage the ultraviolet lamps. The heat can also damage the lamp ballast components and related instrumentation.

Should the unit be used for specific batch flow operations, it can be turned “On” and “Off” manually. Make sure the unit is allowed to warm up for at least one minute before use, and make sure the unit is turned “OFF” after each session. Do not exceed 3 on/off cycles in 24 hours.

If you need help to determine the best method of operating your UV treatment unit under intermittent conditions, contact your local representative or the factory.

special piping requirements for users of ultrapure water

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 material breakdown and/or structural failure. Should your water application and piping material be so classified, we recommend you install “UV light traps” to isolate any such susceptible material from direct exposure to the ultraviolet light. Install the UV light traps to the inlet/outlet of the UV treatment chamber prior to the connection of any nonmetallic materials. UV light traps protect nonmetallic piping. Should you require additional assistance, please contact your local Aquafine representative or the factory directly.

connecting the customer power to the unit

A cable-entry access port is provided on one side of the UV unit’s electrical enclosure. The following guidelines may be followed when connecting power to an Aquafine SCD unit:

For the following models

- SCD-600, -700, -1000, -1200 -- 120V input
- SCD-600 HE, -700 HE, -1000 HE, -1200 HE -240V input

a single-phase, grounded neutral source is recommended. Incoming power conductors should be terminated at the terminal block, TB1, as follows:

Line conductor	TB1-3
Neutral conductor	TB1-2
Ground conductor	TB1-1

For the following models

- SCD-600, -700, -1000, -1200 -240V input
- SCD-600 HE, -700 HE, -1000 HE, -1200 HE -208V input or models with an externally mounted transformer,

please refer to the following procedures:

- If the external transformer is mounted local to the electrical enclosure and factory-wired by Aquafine, then termination of the incoming customer power conductors is carried out at the transformer primary winding using generally approved wiring termination methods.
- If the external transformer is shipped loose with the main UV unit (as required by the customer), then the secondary leads of the transformer are terminated at terminal block, TB1, as indicated above. Termination of the incoming customer power conductors is carried out at the transformer primary winding using generally approved wiring termination methods.

Installing *the Quartz Sleeves*

single-ended unit design

The quartz sleeves for this unit utilize a design that is open on one end and closed on the other end. The closed end of the tube is inserted into the threaded nipple and then through the baffle system in the chamber. Within the baffle, Teflon bushings provide additional support to the quartz sleeves.

QUARTZ SLEEVE INSTALLATION PROCEDURES FOR NEW EQUIPMENT

For first time unit installations, follow these quartz sleeve installation procedures:

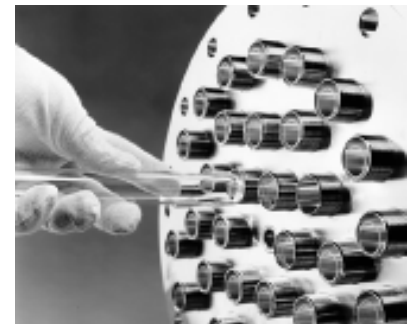
1. Turn off all power to the unit.
2. Wear clean cotton gloves to prevent contamination of the quartz sleeves.
3. Carefully remove each quartz sleeve from the factory packaging. Handle these with care as they are fragile.
4. Visually inspect all quartz sleeves for cracks or other damage. Do not install damaged quartz sleeves.
5. Remove the socket covers on the ends of the treatment chamber.
6. Remove all compression nuts and any packaging material from the end plate (if installed).
7. Place the closed end of the quartz sleeve into the threaded nipple and slowly push the sleeve into the chamber. Some resistance may be felt from the Teflon bushing.
8. Install the compression nut and o-ring by placing the o-ring into the internal relief of the compression nut below the threaded area. The o-ring should fit into the compression nut.
9. Place the compression nut and o-ring onto the end of the quartz sleeve until the end of the quartz sleeve touches the end of the compression nut and hand tighten until snug. Deionized water may be used as a lubricant.
10. Tighten the compression nut approximately 1/2 turn after the threaded nipple and o-ring make contact.
11. Repeat this procedure for all quartz sleeves.
12. Slowly pressurize the system and fill the chamber with water to check for leaks.
13. When applicable, bleed the air from the UV treatment chamber by opening the plug on top of the chamber. Replace with a suitable valve.
14. If there are leaks in any compression nut assembly, depressurize the system and use the compression nut tool to slightly tighten the leaking compression nut assembly.
15. Retest until a leak-free installation is verified.
16. You are now ready to install the UV lamps.



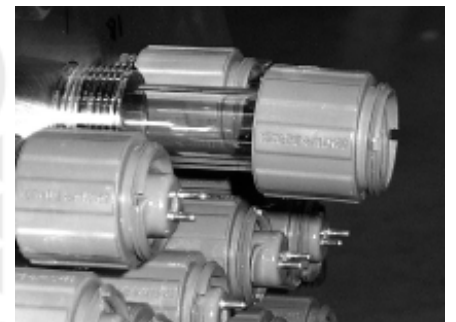
Over tightening can break the quartz sleeves or create leaks.



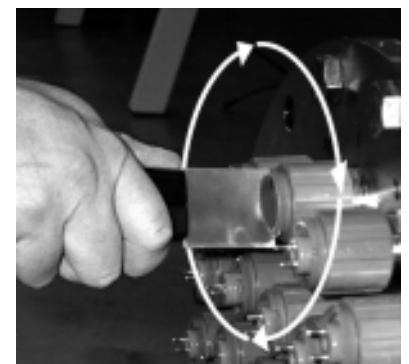
Remove SCD stainless socket cover



Quartz sleeve installation



Compression nut assembled on the quartz sleeve



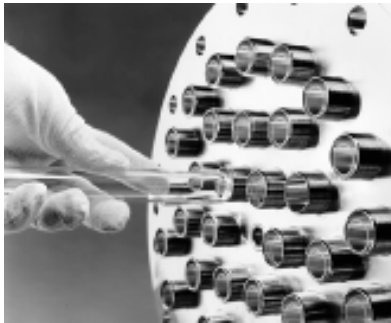
Rotate compression nut clockwise onto the threaded stainless nipped end plate with compression nut tool



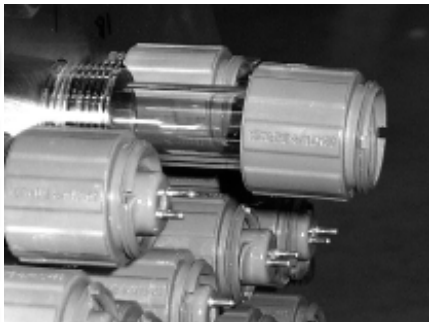
more **Installing** the Quartz Sleeves



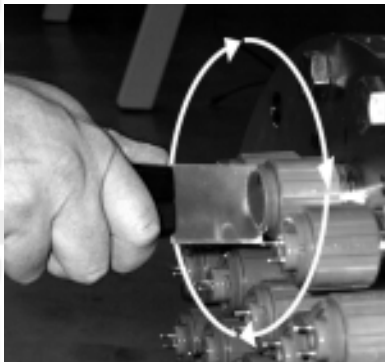
Remove SCD stainless socket cover



Quartz sleeve installation



Compression nut assembled on the quartz sleeve



Rotate compression nut clockwise onto the threaded stainless nipped end plate with compression nut tool

single-ended unit design cont.

QUARTZ SLEEVE REPLACEMENT ON EXISTING EQUIPMENT

For existing equipment, replace the quartz sleeves as follows:

1. Turn off all power to the unit.
2. Depressurize the system and drain the UV unit.
3. Remove the socket covers on the ends of the treatment chamber.
4. Remove all lamp sockets and compression nuts from the end plate.
5. Wear clean cotton gloves to prevent contamination of the quartz sleeves and UV lamps.
6. Remove the existing UV lamps.
7. Remove the existing quartz sleeves.
8. Carefully remove each new quartz sleeve from the factory packaging. Handle these with care as they are fragile.
9. Visually inspect all quartz sleeves for cracks or other damage. Do not install damaged quartz sleeves.
10. Place the closed end of the quartz sleeve into the threaded nipple and slowly push the sleeve into the chamber. Some resistance may be felt from the Teflon bushing.
11. Install the compression nut and o-ring by placing the o-ring into the internal relief of the compression nut below the threaded area. The o-ring should fit into the compression nut.
12. Place the compression nut and o-ring onto the end of the quartz sleeve until the end of the quartz sleeve touches the end of the compression nut and hand tighten until snug. Deionized water may be used as a lubricant.
13. Tighten the compression nut approximately 1/2 turn after the threaded nipple and o-ring make contact.
14. Repeat this procedure for all quartz sleeves.
15. Slowly pressurize the system and fill the chamber with water to check for leaks.
16. When applicable, bleed the air from the UV treatment chamber by opening the plug on top of the chamber. Replace with a suitable valve.
17. If there are leaks in any compression nut assembly, depressurize the system and use the compression nut tool to slightly tighten the leaking compression nut assembly.
18. Retest until a leak-free installation is verified.
19. You are now ready to install the UV lamps.



Over tightening can break the quartz sleeves or create leaks.



Installing the Ultraviolet (UV) Lamps

single-ended UV lamp design

Once it has been verified that there are no leaks in the system, the UV lamps are ready for installation.

1. Remove all power to the UV unit.
2. Depressurize the system.
3. Wear clean cotton gloves to prevent contamination of the UV lamps.
4. Carefully remove each UV lamp from the factory packaging. Handle these with care as they are fragile.
5. Visually inspect all lamps for cracks or damage. Do not install damaged lamps.
6. Using both hands, slowly insert the lamp into the quartz sleeve by pushing it with one hand while guiding it with the other **in a level, horizontal position**. This is very important. If not installed properly, lamp or quartz breakage will occur.
7. Twist the lamp into the locking mechanism of the compression nut. This ensures the lamp is secure within the chamber.
8. Each lamp socket is identified with a number that corresponds to each lamp position marked on the end plate. Match the lamp socket and connect to the appropriate lamp.
9. The lamp pins must be pushed down to fit securely in the lamp socket connector.
10. Rotate and screw the lamp socket cap into place. Only hand tightening is required. **Do not overtighten!**

CAUTION! Prior to energizing the ballasts and lamps, ensure there is no water leaking into the quartz sleeves and compression nut cavities by properly installing these components. Even a small leak can flood a quartz sleeve and compression nut cavity.

During operation, high voltage is present at the lamp pins and receptacles of the lamp connectors. Prolonged flooding of a quartz sleeve and compression nut cavity can cause premature failure of the lamp due to repeated arcing, overheating of the lamp connector cable, and may result in a meltdown of the cable insulation.



Insert the lamp in a level, horizontal position



UV lamp securely inside locking mechanism



Lamp socket ID number on end plate



Secure lamp socket connector to lamp



Screw the lamp socket cap into place



Powering Up *the Ultraviolet (UV) Unit*

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

- With water flowing through the system, ensure there are no system leaks and no piping connection leaks.
 - All earth ground connections are properly made.
 - All lamp connections are properly made.
 - The socket covers are secured to both ends of the UV treatment unit.
1. Verify that all incoming power conductors, including the ground conductor, are properly terminated.
 2. Verify that the pilot “ON/OFF” Switch (SW1) or the HOA Switch is in the **OFF** position.
 3. Verify that the primary over-current protection device, molded-case circuit breaker (MCCB1) is in the closed position.
 4. For UV units without a Main Isolator Switch (SW2), close the upstream power disconnect. For UV units with a Main Isolator Switch (SW2), turn the switch to the **ON** position.
 5. Using a digital multimeter (DMM), verify that the correct voltages are present at terminal block TB1-3, TB1-2 and TB1-1. Measure the voltages for L-N, L-G and N-G.
 6. Upon application of control power, the unit will begin a self-test of the system. The entire display will be RED for a period of about 10 seconds.
 7. Turn the pilot ON/OFF switch to the **ON** position. In the case of an HOA Switch, turn the switch to the HAND position.
 8. If the water temperature is below 120°F, the Status Display Board will transmit a signal to the Current Sensing Board to energize the main contactor.
 9. When the ballasts are energized, the LED panel will display GREEN if each individual lamp is operational, and RED if the lamp is not functioning.

CAUTION! Rapid successive cycling of the power to the ballasts can cause premature failure of the system components.



For a planned shutdown on an HE model, turn off the power to the unit and wait at least three (3) minutes before restoring power to the unit to enable the electronic circuits to reset.



Aquafine®



Monitoring Devices

Aqualogic 2000™ display panel

Each UV unit is equipped with an Aqualogic 2000™ electronic control system. The system consists of two printed circuit boards: the Current Sensing Board (CSB) and the Status Display Board (SDB).

A flat ribbon cable links the two boards. This custom electronic control system monitors the lamp status, UV intensity through UV sensor, low UV intensity, lamp out alert, running time, unit on/off cycles and temperature.

Depending upon the model, the status display panel will consist of 16 to 36 Lamp Status Indicators. Each Lamp Status Indicator is electrically connected to the circuitry of a specific UV lamp. The Lamp Status Indicators are intended to operate GREEN or RED.

If the lamp is normal and operational, the corresponding Lamp Status Indicator will be GREEN. If any lamp is faulty, the corresponding Lamp Status Indicator will turn RED.

Each UV lamp is numbered at the end of the UV treatment chamber which corresponds to the number on the Lamp Status display panel. If a Lamp Status Indicator turns red, you can easily determine which specific lamp requires attention.

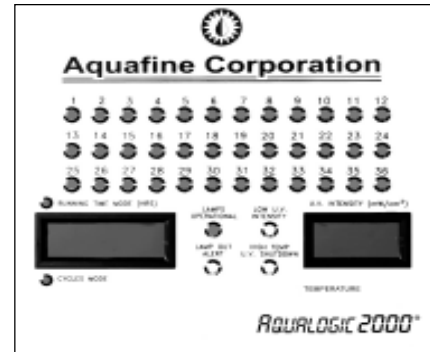
LAMPS OPERATIONAL INDICATOR

When all UV lamps are operating properly the Lamps Operational Indicator will be illuminated Green. If any UV lamp is faulty, the Lamps Operational Indicator will not illuminate.



Upon detecting a lamp out condition, the following actions will take place:

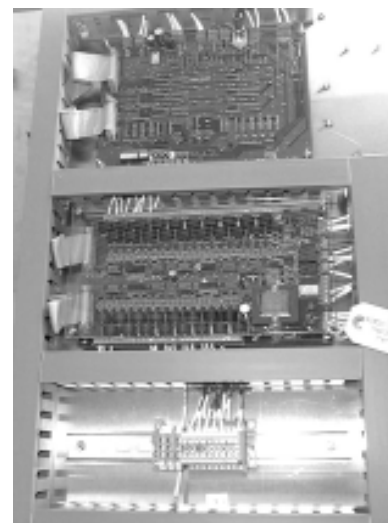
- The Lamp Operational Indicator will not illuminate.
- The Lamp Status Indicator LED for faulty lamps will turn red.
- The Lamp Out Alert Indicator will turn red.
- **The built-in buzzer will sound for 30 seconds.**



Aqualogic display panel with monitoring devices shown



SCD cabinet with Aqualogic 2000™



Top item - Status Display Board (SDB)
Bottom item - Current Sensing Board (CSB)



more **Monitoring Devices**

LAMP OUT ALERT INDICATOR

In the event of a lamp out condition, a buzzer will sound and the Lamp Out Alert Indicator will turn RED. After 30 seconds, the buzzer will automatically shut off, but the Lamp Out Alert Indicator will remain RED until the faulty condition is corrected.

When all UV lamps are operational, the Lamp Out Alert Indicator will not illuminate.

When the UV unit is first powered up, the Lamp Out Alert detector circuit is disabled for about three (3) minutes to allow the system to stabilize. When this three-minute delay is completed, the Lamp Out Alert detection circuit is enabled.

HIGH-TEMPERATURE UV SHUTDOWN INDICATOR

When the water temperature in the UV treatment chamber reaches 115°F, the intensity display will show the temperature, and when the temperature exceeds 120°F (48.9°C), the system will turn the UV lamps OFF. The High-Temperature UV Shutdown Indicator will flash RED and a buzzer will sound for 1 minute.

When the water temperature drops below 100°F (38°C), the system will turn the UV lamps back on.

Activation of the High-Temperature UV Shutdown Indicator will disable the Lamp Out Alert Indicator for three (3) minutes. The buzzer will continue to sound until the water in the treatment chamber cools to less than 100°F (38°C).

RUNNING TIME MODE / CYCLES MODE DISPLAY

This digital display alternates between the number of times the lamps have been cycled on and off and the elapsed time of the unit.

The Cycles Mode Indicator will illuminate when the Running Time/Cycles Mode Display is displaying the number of cycles of the unit.

The Running Time Mode Indicator will illuminate when the Running Time/Cycles Mode Display is displaying the elapsed time of the unit.

After a complete lamp change, the user may reset the Running Time back to zero with the following procedures:

- For 16-, 20-, 24- and 36-lamp SCD non-HE units

manufactured prior to 12-20-00 and SCD-HE units manufactured prior to 10-1-00, press the SW-1 switch on the back of the SDB (P/Ns 18247, 18246, 18245 and 17673 respectively.)

- For SCD-HE 16-, 20-, 24- and 36-lamp units manufactured after 10-1-00 and SCD non-HE units manufactured after 12-20-00 (SDB P/Ns 19028-16, -20, -24 and -36), set the switch SW 7-2 on the SDB to a downward position. Next, push SW-2, located on the SDB. After resetting, return SW7-2 to the upward position.



For HE units, after turning off the unit, wait three (3) minutes prior to turning the unit on again to enable the circuits to reset.

LOW UV INTENSITY INDICATOR

The Low UV Intensity Indicator will turn RED when the lamp intensity drops below a predetermined set point. The alarm set point is preset at the factory.

TEMPERATURE DISPLAY

The water temperature within the UV treatment chamber can be obtained by pressing the button on the front of the enclosure door. This figure will be displayed on the digital display. The customer has the option to choose the scale in °C or °F.

The Aqualogic 2000 has an option of either a 120°F or 170°F high-temperature UV shutdown setting. Starting at 115°F and 165°F correspondingly, the UV intensity readout will display the temperature for 60 seconds every two minutes, which will continue until the high-temperature UV shutdown is reached. During the warning period, the audio alarm will activate with three consecutive beeps followed by a pause of two seconds until the high-temperature UV shutdown is reached. At this point, the high-temperature LED will flash and the audio alarm will become continuous. In case the temperature probe shorts out or is open, the first two digits will show “SH” or “OP,” correspondingly, for 30 minutes. After 30 minutes have elapsed, the system shuts down.



UV INTENSITY SENSOR DISPLAY

This display shows the ultraviolet intensity in milliwatts per centimeter squared (mW/cm²) as detected by the UV sensor at the endplate of the UV treatment chamber.

To calibrate the UV intensity meter for 0% UV output, do the following:

1. Turn the on-off switch to the off position to power down the lamps.
2. For SCD-HE units manufactured prior to 10-1-00 and SCD non-HE units manufactured prior to 12-20-00: Press SW-2 on the Status Display Board (P/N 18247, 18246 and 18245 and 17673 respectively for 16-, 20-, 24- and 36-lamp units).

For SCD-HE units manufactured after 10-1-00 and SCD non-HE units manufactured after 12-20-00: Press SW-3 on the Status Display Board (P/Ns 19028-16, -20, -24 and -36 respectively for 16-, 20-, 24- and 36-lamp units).

A single beep will acknowledge that process auto-zeroing has been completed.

The initial (“zero-hour”) UV intensity as detected by the UV sensor has been set at the factory. An automatic computational routine in the system uses this initial “zero-hour” intensity value to set the low UV intensity alarm threshold which is accepted by the system only if all lamps are operational.

After 100 hours of operation, the system automatically re-calibrates itself. If all lamps are still operational the new UV intensity is read into memory. The new Low UV Intensity Indicator alarm threshold will be based on this new intensity value.

When this 100-hour point is reached, the Running Time Display will flash if a UV lamp(s) is not operational. The new intensity value will not be accepted by the system. The Running Time Display will continue to flash (up to 125 hours) as long as the lamp(s) is not replaced.

When 126 hours have elapsed and all lamps are still not operational, the original “zero-hour” intensity will be used as the reference value (EOL intensity value) for setting the low UV intensity alarm threshold



It is essential that all non-operational lamps be changed immediately to maintain system efficiency.

customer interfacing

UV INTENSITY SIGNAL (ANALOG OUTPUT)

The system provides a 0-1 VDC Analog Output Signal equivalent to 0-20 mW/cm² intensity. The Analog Output Signal Connector, J4, is located on the SDB for SCD-HE units manufactured after 10-1-00 and SCD non-HE units manufactured after 12-20-00 (P/Ns 19028-16, -20, -24 and -36 respectively for 16-, 20-, 24- and 36-lamp units). The Analog Output Signal Connector, J5, is located on the SDB (P/Ns 18245, 18246, 18247 and 17673) for 16-, 20-, 24- and 36-lamp SCD-HE units manufactured prior to 10-1-00 and SCD non-HE units manufactured prior to 12-20-00.

SETTING THE UV INTENSITY

The UV intensity sensor and meter have been set at the factory prior to shipment. However, the operating conditions at the installation site may warrant making adjustments to the UV intensity monitoring system. Depending on the number of lamps in the treatment chamber, the intensity as read by the UV sensor will vary from model to model when all lamps are operating properly. For each SCD model, the beginning-of-life (BOL) intensities after 100 hours of operating time are shown in the following table:

Model	BOL Intensity (mW/cm ²)
SCD-600	5.5
SCD-700	6.3
SCD-1000	7.0
SCD-1200	9.0
SCD-600-HE	7.0
SCD-700-HE	8.0
SCD-1000-HE	9.0
SCD-1200-HE	12.0

Intensity Adjustment for SCD-HE Units Mfg. After 10-1-00 and SCD non-HE Units Mfg. After 12-20-00

The following procedure may be used to readjust the BOL intensity according to the table above after the unit has operated for about 100 hours from the time of first use and/or following a complete lamp changeout.

1. Locate potentiometer, R26, on the back side of the SDB.
2. Switch SW7-3 in downward position.
3. Adjust the intensity by slowly turning potentiometer, R26. Turn R26 clockwise to increase the reading; turn R26 counterclockwise to decrease the reading.



more **Monitoring** *Devices*

- Turn R26 in small increments. Wait about 5 seconds between increments to allow the system to update the display. Continue the incremental adjustments until the desired value is obtained.
- Turn the system to averaging mode using SW7-3 in upward position. (A UV intensity averaging routine in the firmware minimizes environmental noise in the intensity signal.)
- Press and hold SW-3 (set UV sensor) until a single audible beep is heard. This insures that the intensity set number is stored in the unit's memory.
- The low UV alarm will activate when the UV level drops below 60% of the level stored in memory.

Intensity Adjustment for SCD-HE Units Mfg. Prior to 10-1-00 and SCD non-HE Units Mfg. Prior to 12-20-00

The following procedure may be used to readjust the BOL intensity according to the table above after the unit has operated for about 100 hours from the time of first use and/or following a complete lamp changeout.

- Locate the potentiometer, R9, on the back side of the SDB.
- Adjust the intensity by slowly turning potentiometer, R9. Turn R9 clockwise to increase the reading; turn R9 counterclockwise to decrease the reading.
- Turn R9 in small increments. Wait about 25 seconds between increments to allow the system to stabilize and update the display (there is an UV intensity averaging routine in the firmware for minimizing environmental noise in the intensity signal).
- Continue the incremental adjustments until the desired value is obtained.
- Press and hold SW-2 (set UV sensor) until audible beep is heard. This insures that the intensity set number is stored in the unit's memory.
- The low UV alarm will activate when the UV level drops below 60% of the level stored in memory.

Intensity Adjustment During System Maintenance

In the event that several lamps and/or ballasts have been replaced and the operating conditions warrant a UV intensity reading readjustment, the following procedure may be used:

For Units Using Standard Lamps (EOL 8000 hours)

- Follow the procedure as listed in Items 1-4 for "Intensity Adjustment For New Installations".
- Apply a correction factor (due to depreciation) to the

BOL reading in accordance with the formula below:

$$\text{Intensity (Adjusted)} = \text{Intensity (BOL)} \times [1 - (\text{Time Unit in Operation}/20000)]$$

Example, for an SCD-1200:

$$\begin{aligned} \text{Intensity (BOL)} &= 9.0 \text{ mW/cm}^2 \\ \text{Time in Operation} &= 4000 \text{ hours} \\ \text{Intensity (Adjusted)} &= 9.0 \\ &[1 - (4000/20000)] = 7.2 \text{ mW/cm}^2 \end{aligned}$$

Set potentiometer, (R9 for SCD non-HE units manufactured prior to 12-20-00 and R26 for units manufactured after 12-20-00) until the reading of 7.2 is obtained.

For Units Using HE Lamps (EOL 6000 hours)

- Follow the procedure as listed in Items 1-4 for "Intensity Adjustment For New Installations".
- Apply a correction factor (due to depreciation) to the BOL reading in accordance with the formula below:

$$\text{Intensity (Adjusted)} = \text{Intensity (BOL)} \times [1 - (\text{Time Unit in Operation}/15000)]$$

Example, for an SCD-1200-HE:

$$\begin{aligned} \text{Intensity (BOL)} &= 12 \text{ mW/cm}^2 \\ \text{Time in Operation} &= 2000 \text{ hours} \\ \text{Intensity (Adjusted)} &= 12 \\ &[1 - (2000/15000)] = 10.4 \text{ mW/cm}^2 \end{aligned}$$

Set potentiometer (R9 for SCD-HE units manufactured prior to 10-1-00 and R26 for SCD-HE units manufactured after 10-1-00) until the reading of 10.4 is obtained.

4-20 mA OUTPUT (FOR SCD NON-HE UNITS MFG. AFTER 12-20-00 & SCD-HE UNITS MFG. AFTER 10-1-00)

The 4-20 mA loop is passive; therefore, the customer should provide 24VDC to the SDB board J2 pin 1 and ground to J2 pin 3. The 4-20 mA output is at J2 pin 2 and pin 3 as a ground. 20 mA is equivalent to 20 mw/cm² full scale intensity. R17, which is located on the SDB, is used to adjust the output for 4 mA.



4-20 mA OUTPUT (FOR SCD-HE UNITS MFG. PRIOR TO 10-1-00 & SCD NON-HE UNITS MFG. PRIOR TO 12-20-00)

The 4-20 mA loop is passive; therefore, the customer should provide 24VDC to the SDB board J3 pin 1 and ground to J3 pin 3. The 4-20 mA output is at J3 pin 2 and pin 3 as a ground. 20 mA is equivalent to 20 mw/cm² full scale intensity.

RS-485 COMMUNICATIONS PORT

The system provides for RS-485 communication through the J1 connector on the SDB (SDB P/Ns 19028-16, -20, -24 and -36 for 16-to -36 lamp SCD-HE units manufactured after 10-1-00 and SCD non-HE units manufactured after 12-20-00); and through the J2 connector on the SDB (SDB P/Ns 18247, 18246, 18245 and 17673 respectively for 16- to 36-lamp SCD-HE units manufactured prior to 10-1-00 and SCD non-HE units manufactured prior to 12-20-00).

REMOTE CONTROL SIGNAL CONNECTION

The system may be remotely controlled by the customer through the J8 connector located on the CSB.

The accepted signals are: 5-24 VDC, 100-240 V AC/DC and 24 VDC pulsed ON/pulsed OFF.

The exact control signal voltage must be specified at the time of ordering the equipment. Aquafine will pre-configure the jumpers on the CSB to accept the customer's remote control signal.

Connecting a remote control signal voltage other than what was pre-configured will damage the CSB.

HIGH-TEMPERATURE ALARM RELAY

The High-Temperature Alarm can be remotely monitored via a pair of normally open (NO) and a pair of normally closed (NC) dry relay contacts. The contacts are closed when the temperature is normal.

LOW UV INTENSITY ALARM RELAY

The Low UV Intensity Alarm can be remotely monitored via a pair of normally open (NO) and normally closed (NC) dry relay contacts. The contacts are closed when the UV intensity is above the set point.

LAMP OUT ALERT ALARM RELAY

The Lamp Out Alert Alarm can be remotely monitored via two pairs of normally open (NO) and normally closed (NC) dry relay contacts. The contacts are closed when all UV lamps are operational.



Maintenance Requirements

cleaning the unit

The exterior surfaces of the Aquafine UV unit should be kept clean as part of routine maintenance. Use a soft cloth with soap and water or any commercial stainless steel cleaner. Avoid scratching the Lexan instrument window.

Aqualogic 2000™ Status Display Panel

Monitor the Status Display LED Panel daily. Immediately replace any failed UV lamp.

UV lamp replacement

Replace Standard UV lamps after 8,000 hours of use. Replace High Efficiency (HE) UV lamps after 6,000 hours of use. **DO NOT use standard UV lamps in an HE (High Efficiency) UV unit.** After 6000 or 8000 hours have elapsed, the time totalization cycle count (TT/CC) display will flash until the lamps are replaced.

THIS IS BASED ON NO MORE THAN 3 ON/OFF POWER CYCLES PER 24 HR. PERIOD.

Please follow the operating requirements outlined in the warranty section of this manual.

Premature lamp failure or lamp life deterioration can be expected if the UV unit is cycled on/off more than three (3) times per day. To replace the lamps, follow the procedures beginning on page 10.

quartz sleeve cleaning & replacement

As water passes through the ultraviolet treatment unit, minerals, debris and other substances in the water will settle and deposit onto the quartz sleeve. This will impair the ability of the ultraviolet rays to penetrate the water.

Recent studies have shown that degradation of the quartz sleeve from continuous exposure to UV reduces the amount of UV radiation transmitted into the water stream. Based on

CAUTION! Prior to removing the socket cover to access the lamps and quartz sleeves, you must release all pressure to the UV treatment chamber. Drain the chamber if required.



these findings, we recommend the annual replacement of the quartz sleeves and the supporting Teflon bushings in addition to routine cleaning.

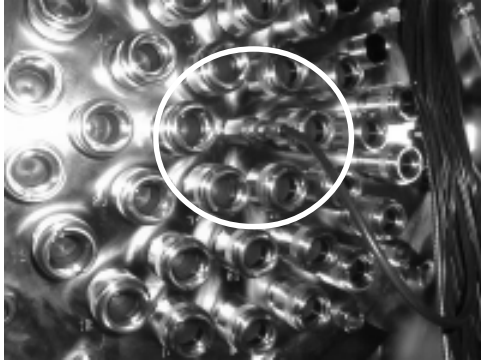
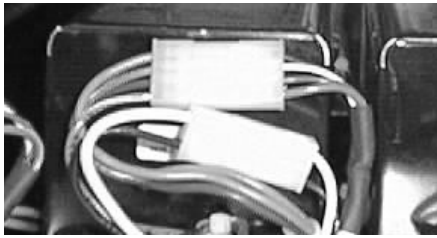
cleaning the quartz sleeves

Visually inspect a quartz sleeve 30 days after use to see if any debris or film has settled on the outside. If dirty, follow these procedures:

1. Turn off the water to the unit.
2. Disconnect the electrical circuit.
3. Drain the UV treatment chamber.
4. Wear clean cotton gloves to prevent contamination of the quartz sleeves and UV lamps.
5. Remove the retainer caps and lamp sockets.
6. Remove the ultraviolet lamps from inside the quartz sleeves.
7. Using the appropriate compression nut tool, loosen the compression nuts and carefully remove the quartz sleeves.
8. Wash the quartz sleeves with mild soap and water and rinse with clean, hot water.

Should this be insufficient to clean the quartz sleeves, they should be replaced. To place an order, contact Aquafine or your local representative. To replace the quartz sleeves, follow the procedures on page 9.



*Sensor probe**Ballast connectors*

cleaning the sensor probe window

1. Shut off the flow and release the pressure.
2. Shut off all power to the UV unit.
3. Remove the coaxial cable by pushing and turning the BNC terminal counterclockwise. The connector will slide off.
4. Twist and pull the probe from the sensor fitting.
5. Use a lint-free cloth with alcohol and very carefully wipe the lens face on the front of the probe. Failure to do so may result in false readings.
6. Replace the probe and the coaxial cable.
7. Turn the power “on” and resume operation.

ballast replacement

Ballast replacement is not part of the UV unit’s routine maintenance. However, in the event that a ballast needs to be replaced, the following procedure should be followed:

1. Power down the UV unit by turning the unit isolator switch, if installed, to the “OFF” position. If not, ensure that power to the unit is removed by opening the switch or breaker upstream of the UV unit.
2. Locate the old ballast to be replaced. Refer to the electrical diagram, if necessary.
3. Isolate the old ballast from rest of system by disconnecting the ballast connector.
4. Using 5/32 L-shaped hex wrench completely remove the bolt securing the ballast to the sub panel. Put the bolt aside.
5. Remove the old ballast by pulling it towards you. Discard the old or defective ballast.
6. Install the new ballast, securing it with the bolt removed earlier.
7. Tighten the bolt with 5/32 L-shaped hex wrench.
8. Reconnect ballast connector(s).
9. Restore the power to the UV unit by turning the unit isolator switch to the “ON” position or by closing the upstream switch or breaker.

more **Maintenance** Requirements

measuring performance

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

Periodic sample collection and testing should be scheduled as often as the user deems sufficient to be assured the quality of the Aquafine ultraviolet unit effluent is acceptable.

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, and should you choose one, be sure to follow the manufacturer's recommended procedures.

We have provided 1/4" NPT threaded fittings on both the intake and discharge UV chamber flange risers. We recommend you use these 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" (6 mm).

sampling procedures

The following procedure is recommended for collecting samples for bacteriological analysis when sample valves are installed:

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 must not exceed 1/4" (6 mm) to ensure proper velocity. Prior to taking the sample, it is imperative that the test sample valve be fully opened under full pressure for a full three and one half minutes. Temporary tubing or some other material may be used to direct the water to a container or drain to avoid unnecessary spillage.
3. After the valve has been left fully open for three and one half minutes, reduce the flow to a reasonable stream of water (not less than 50% of full flow). Continue flowing to drain three 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 his finger to touch the inside of the cap or the 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 three hours of sample collection and should comply with accepted standard methods.

The above procedure was developed by a leading national pharmaceutical firm after an 18-month study. It has been found that virtually all removable debris which may accumulate within a sample valve can be mechanically flushed during the procedures detailed above.

We recommend duplicate samples be taken at each test station, during each specific test, to avoid laboratory error and to ensure reasonable repeatability and validity through comparison.



cleaning the air filter (HE Series)

An air filter is provided for the SCD-HE series only. The air filter is located at the bottom of the enclosure.

Visually inspect the air filter every 30 days to see if any debris or film has settled. If dirty, follow these procedures:

1. Remove the filter (see pictures below):

For remote enclosures: Simply pull out the air filter from intake fan shroud on the underside of the enclosure.

For fixed enclosures: The air filter is held in place by a bracket fixed to the bottom of the enclosure. Using both hands, reach around and beneath the enclosure and locate the filter by touch. Pull the air filter towards you, out of the bracket.

2. For cleaning, use a soft sponge with soap and water or any commercial stainless steel cleaner.
3. Replace filter after air drying.

removing the filter



Remote enclosure: Removing the filter (view from underneath the enclosure)



Fixed enclosure: The air filter is located underneath the enclosure cabinet and must be located by touch because of the close proximity of the treatment cylinder and cabinet.



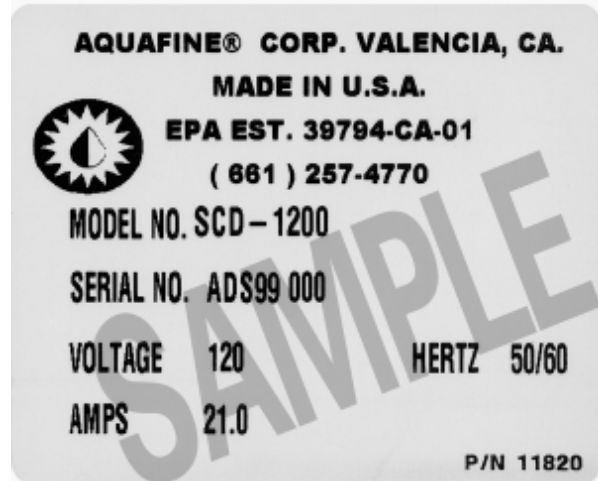
Fixed enclosure: Remove the air filter by feeling for it beneath the enclosure and then pulling it out towards you.



Replacement *Parts List*



Refer to this nameplate decal on your unit when ordering parts or service.



general part description

part number

- | | |
|---|-------|
| 1. UV Lamp SE Standard 254nm - Mauve - 60" Length
Disinfection, Ozone Destruction Applications | 17998 |
| 2. UV Lamp SE Standard 185nm - Blue - 60" Length
TOC Reduction Applications | 17498 |
| 3. UV Lamp SE Validated 254nm - Green - 60" Length
Disinfection, Ozone Destruction Applications | 18060 |
| 4. UV Lamp SE Validated 185nm - Yellow - 60" Length
TOC Reduction Applications | 18061 |
| 5. UV Lamp SE-HE 254nm - Cyan - 60" Length
Disinfection, Ozone Destruction Applications | 18024 |
| 6. UV Lamp SE-HE 185nm - Violet - 60" Length
TOC, Chlorine Destruction Applications | 17820 |
| 7. UV Lamp SE Validated HE - 254nm - Black - 60" Length
Disinfection, Ozone Destruction Applications | 18951 |
| 8. UV Lamp SE Validated HE - 185nm - Orange - 60" Length
TOC, Chlorine Destruct Applications | 18953 |
| 9. Quartz Sleeve - Domed End - 60" Length | 17751 |



more **Replacement Parts List**

general part description cont. part number

10. O-rings	
EPDM	4253
Silicone	12967
Viton	16458
Chemraz	16600
11. Lamp Socket - 30" Lead Wires	18763-3
Lamp Socket - 90" Lead Wires	18763-8
Lamp Socket - 16' Lead Wires	18763-16
12. Lamp Socket Cap	17489
13. Compression Nut - CPVC	17496
Compression Nut - 316L Stainless Steel	18468
14. SCD-1000 & 1200 Cylinder O-ring	
Silicone	16064
EPDM	16063
Viton	17739
Teflon	40301
15. SCD-1000 & 1200 Cylinder Gasket - Goretex	15105
16. SCD-600 & 700 Cylinder O-ring	
Silicone	15991
EPDM	15601
Viton	16457
Teflon	40302
17. SCD-600 & 700 Cylinder Gasket - Goretex	15104
18. Ballast	
HE, 240V/50-60Hz	40328
STD, 120V/50-60Hz	16518
19. Status Display Board (SDB)	
SCD-HE units manufactured prior to 10-1-00 & SCD non-HE units mfg. prior to 12-20-00	
36 Lamp Unit	17673
24 Lamp Unit	18245
20 Lamp Unit	18246
16 Lamp Unit	18247
SCD-HE units manufactured after 10-1-00 & SCD non-HE units mfg. after 12-20-00	
36 Lamp Unit	19028-36
24 Lamp Unit	19028-24
20 Lamp Unit	19028-20
16 Lamp Unit	19028-16

Aquafine[®]



more **Replacement** *Parts List*

general part description cont. part number

20. Current Sensing Board (CSB)
- SCD non-HE Series Units manufactured prior to 12-20-00
- 36 Lamp Unit 17670
- 24 Lamp Unit 18239
- 20 Lamp Unit 18241
- 16 Lamp Unit 18243
- High Efficiency (HE) SCD Series Units manufactured prior to 10-1-00
- 36 Lamp Unit 18840-36
- 24 Lamp Unit 18840-24
- 20 Lamp Unit 18840-20
- 16 Lamp Unit 18840-16
- SCD-HE units manufactured after 10-1-00 and SCD non-HE units manufactured after 12-20-00
- 36 Lamp Unit 19208-36
- 24 Lamp Unit 19208-24
- 20 Lamp Unit 19208-20
- 16 Lamp Unit 19208-16
21. T-120 Temperature Control Switch (for SCD non-HE units mfg. prior to 12-20-00 and SCD-HE units mfg. prior to 10-1-00) 18545
22. T-120 Temperature Probe (for SCD-HE units mfg. after 10-1-00 and SCD non-HE units mfg. after 12-20-00) 16957
23. Fan 4" 120V 3901
- Fan 4" 240V 3903
24. S-254 Sensor Probe
- SCD 600, 700, 1000, 1200 18176-3
- SCD 600-HE, 700-HE, 1000-HE, 1200-HE 18176-5
25. Teflon Quartz Bushing 17490
26. Air filter, SCD-HE Series only 40000

LOW TEMPERATURE APPLICATIONS

27. Current Sensing Board (CSB)
- 36-lamp units 40264-36
- 24-lamp units 40264-24
- 20-lamp units 40264-24
- 16-lamp units 40264-24
28. Quartz sleeves, domed-end, 60" length 16971
29. Compression nut 19685
30. Ballast, 120V/50-60 Hz 19721
31. Teflon quartz bushing 19737

