

Ultraviolet (UV) Disinfection System Model RC20

INSTALLATION & OPERATION MANUAL

(Please save for future reference)



System tested and certified by CSA International to NSF/ANSI Standard 55 for disinfection performance, Class A and to CSA B483.1

This Class A system conforms to NSF/ANSI 55 for the disinfection of microbiologically contaminated water that meets all other public health standards. The system is not intended to convert wastewater or raw sewage to drinking water. The system is intended to be installed on visually clear water.

NSF/ANSI 55 defines wastewater to include human and / or animal body waste, toilet paper, and any other material intended to be deposited in a receptacle designed to receive urine and / or feces (blackwaste); and other waste materials deposited in plumbing fixtures (grey waste).

TABLE OF CONTENTS

- Safety Instructions 2
- What’s included with the unit 3
- Water Quality 3
- Installation Considerations 4
- Installation Procedure..... 5
- Disinfection Procedure..... 8
- UV Ballast Features..... 9
- Operating and Maintenance 10
- Replacing UV lamp & Cleaning Quartz Sleeve..... 11
- Replacing sensor screen 12
- Specifications & Parts List 13
- Warranty..... 14

SAFETY INSTRUCTIONS

- **DANGER** – *To reduce risk of electrical shock this system must be grounded.* Connect your UV system to a grounded, GFI protected (3 pronged) receptacle (120V, 60HZ) and ensure that the lamp connector ground wire is connected to the ground stud on the top of the disinfection chamber.
- **To avoid** possible electric shock, extra care should be taken since water may be present near electrical equipment. Unless specifically referred to in these instructions, do not attempt repairs yourself. Contact the manufacturer for service advice.
- **DO NOT LOOK DIRECTLY AT UV LAMP WHEN LAMP IS ON.** UV light can cause serious burns to unprotected eyes and skin.
- **Do not** operate the UV lamp outside the UV disinfection chamber.
- **Do not** plug the unit in if any electrical surfaces or electrical parts are wet.
- Do not operate this system if it has a damaged electrical cord or plug, is malfunctioning, or has been dropped or damaged in any way.
- Do not use this unit for anything other than its intended potable water application. The use of attachments not recommended, approved, or sold by the manufacturer/distributor may result in an unsafe condition.
- Do not consume water without boiling if the unit is in an alarm state.
- Before any cleaning or maintenance, always disconnect the unit from the AC supply voltage and de-pressurize the system.
- System must be installed in accordance with all applicable codes and regulations.
- **Do not touch the lamp or quartz dome with dirty or moist hands. Hold the lamp and dome by the ends with soft dry gloves or cloth.**
- Before any cleaning or maintenance on the system, always unplug the unit from the power source. Disconnect from the power outlet by holding the plug. Never pull the cord.
- You must connect your UV unit to a grounded (3-pronged) receptacle (a GFI is preferred) and ensure that the lamp connector ground wire is connected to the stainless steel end of the main chamber. Use of extension cords is not recommended.
- Protect your unit from freezing. Drain all water from the unit if freezing temperatures exist.

- It is strongly recommended to have a dedicated electrical circuit for the UV system. **NEVER INSTALL ON THE SAME CIRCUIT AS A PUMP OR ANY KIND OF MOTOR.**
- To protect the UV electronic controller from power surges, **you must install a CSA or equivalent certified surge protector or power line conditioner** rated for a clamping voltage of less than 400 Volts, response time of less than one nanosecond, and energy absorption of at least 1500 Joules.
- **QUARTZ SLEEVES ARE EXTREMELY FRAGILE. PLEASE HANDLE WITH EXTRA CARE.** Broken sleeves are NOT under warranty.
- Do not install if water does not meet minimum quality requirements listed below

WHAT IS INCLUDED WITH THE UNIT

ITEM	Part #	Quantity
Quartz Sleeve	RC20QS	1
UV Lamp	RC20L	1
Electronic ballast (Controller)	RC20B	1
UV chamber		1
Top Gland Nut	4030-1	1
Bottom Gland Nut with black insert	4031	1
“O” rings for quartz sleeve	4032	2
Mounting clamps	4033	2
Mounting base	4034	2
Lamp spring	4036-1	1
Ballast power cord	4043	1
Cooling Fan	4046	1
Sensor Cable with sensor	4047	1
Probe “O” rings (extra)	4048	2
Probe screen (extra)	4049	1

WATER QUALITY

Your UV disinfection system requires clean water for optimum performance. You should only operate your unit if the source water meets the following standards:

Turbidity	< 1 NTU
Colour/Tannin	None
Total Iron	< 0.3 mg/L (PPM)
Manganese	< 0.05 mg/L (PPM)
Hardness	< 7 GPG (119.7 PPM)
UV Transmissivity	> 80%

If your source water does not meet these water quality parameters, additional pre-treatment will be required. Please call Rainfresh Customer Service for details. Operation of this system with water that does not meet these quality standards will increase the occurrence of nuisance alarms resulting in increased maintenance and more frequent lamp replacement, or will not allow the UV system to operate safely.

Regardless of water quality, the UV system should never be operated without at least a 5 micron filter before the UV.

NOTES AND CAUTIONS BEFORE INSTALLATION

- Select a disinfection system mounting location where a potential leak will not cause water damage. When the disinfection system can only be located where water damage is a possibility, the installation of an automatic leak detector / shut off device is highly recommended
- Install on cold water line only.
- The location for installation must be such that it provides at least 24" of clearance from the top of the top gland nut to allow for extraction of the UV lamp and quartz dome from the unit. It is recommended that you also allow clearance for a drain hose to be connected at the bottom drain.
- The UV must be installed AFTER the water softener and any sediment filters that you may have
- Never install the UV between the pump and pressure tank
- **CAUTION:** Connect inlet and outlet ports as labelled on the unit. Reversing the flow direction by connecting the water source to the output port could result in reduced disinfection performance and improper operation of the flow regulator.
- Install your UV disinfection system indoors in a protected area where the temperature does not fall below 9°C (40°F) and the humidity level is low (to prevent condensation on the chamber). This unit functions ideally in a temperature range from 9°C - 29°C. (49 – 85°F)

- The unit must be installed vertically.
- Use Teflon[®] tape on all pipe connections. **DO NOT USE ANY OTHER SEALANT.**
- To prevent UV failure, the UV should be connected to a dedicated circuit only. Other devices such as pumps, washing machines, motors etc. should never be installed on the same circuit
- To protect the UV electronic controller from power surges, **you must install a CSA or equivalent certified surge protector** rated for a clamping voltage of less than 400 Volts, response time of less than one nanosecond, and energy absorption of at least 1500 Joules.

INSTALLATION

1. Shut off the main water supply valve and depressurize the lines.
2. Mount the unit to the wall using the mounting brackets & clamps provided.
3. Mount ballast beside the chamber. Ensure that the chosen ballast location is not subject to any possible dripping of condensation from either plumbing or system components. Do not connect ballast to electrical supply yet.
4. Install new plumbing as per diagram. **Note:** When installing the 5 micron pre-filter, make sure the flow arrows point in the same direction as the water flow.

WARNING: if soldering, do not allow heat near plastic threads or fittings. If an optional solenoid valve (model RC20S) is to be installed, it should be installed on the outlet of the UV chamber.



5. Gently slide the quartz sleeve "O" ring over the top of the quartz dome to about 1.5" from the open end.

6. Gently insert the quartz sleeve into the gland nut until it goes past the nut O-ring and touches the inside top end of the gland nut.

WRONG

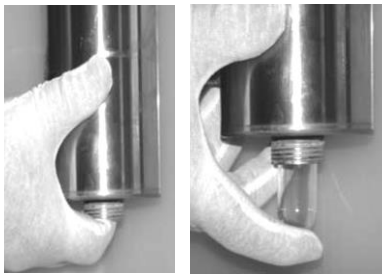
Quartz sleeve is NOT past gland nut O-ring and is NOT touching the inside top end of the gland nut.

CORRECT

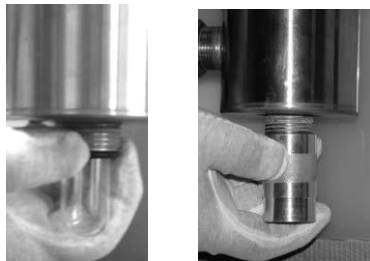
Quartz sleeve is past gland nut O-ring and is touching the inside top end of the gland nut. **Caution:** Do not push hard as it can break the quartz sleeve.



7. Carefully slide the quartz dome with gland nut attached into the opening at the top of the UV chamber.



8. While holding the top gland nut with one hand, use a finger in your other hand to guide the sleeve out through the bottom opening and hold the bottom end of the quartz sleeve to prevent it from falling down. Hand-tighten the top gland nut into place. **Caution:** Do not over-tighten the gland nut as it can break the quartz sleeve. **Note:** *Broken quartz domes are not under warranty.*



9. Slide the second sleeve “O” ring (4032) over the portion of the quartz dome that sticks out from the bottom of the unit. Hand-tighten bottom gland nut (4031)



10. The sensor probe “O” ring (4048) is already mounted on the probe. Slide the probe in to the sensor port on the UV chamber and screw on the cap on to the threads. Insert the other end of the probe into the USB port on the ballast

11. Slowly open the supply valve and let water into the UV system. Check for leaks and fix leaks if necessary before proceeding to next step



12. Slide fan on top of the nut as shown, with the connector facing up



13. Connect the wire labelled "FAN" to this fan connector



14. Slide UV lamp down the top of the gland nut and keep holding it with one hand



15. Attach lamp connector from the ballast to the lamp. Connector goes only one way on the lamp.



16. Slide the connector cover (from the ballast) on top of the top gland nut and tighten the black screw to hold it in place

17. Screw on the green grounding wire from the ballast to the grounding stud on top of the UV chamber



18. Plug in the power cord into the ballast and connect the other end to a surge-protected dedicated power supply. The red timer LED flashes 3 times followed by 3 buzzer beeps and green lamp-on LED will light up. After this, a self-diagnostic sequence takes place as follows:

The display first reads “88” for 1 second, followed by “nd”. Then fan then briefly turns on for a few seconds and then the UV level is displayed. The display can briefly show E1 and as the lamp warms up, E1 will be replaced by UV level and a solenoid, if attached, will turn on. The max display reading is 68. *This can take up to 20 minutes.*

Do not consume water yet

19. Disinfecting the plumbing lines: The UV disinfection process takes place only in the UV disinfection chamber and the process provides no residual disinfection capability, **therefore it is necessary to chemically disinfect the entire plumbing system before using water treated by the UV system.** The following disinfection procedure is generally accepted as being suitable for the disinfection of plumbing systems known to be contaminated. If you are uncertain about the efficacy of this procedure, you are advised to contact the local health authority responsible for water safety.

- The disinfection of the plumbing system is most readily accomplished by removing the 5 micron sediment filter cartridge and adding 250ml - 500ml (1 –2 cups) of standard 5.25% concentration un-scented chlorine bleach to the empty filter housing and re-installing.
- Verify that the UV disinfection unit is connected to the AC supply voltage and operating properly. The addition of chlorine bleach to the plumbing system may cause the water to go cloudy, resulting in a low UV alarm condition. If a solenoid valve is installed it will be necessary to place the solenoid valve in the manual open (bypass) mode.
- Successively open ***all faucets, fixtures and appliances*** until you clearly smell chlorine, then shut off. This includes shower heads, outside taps, dishwashers, laundry equipment and any appliance connected to the plumbing system.
- Leave the bleach solution for at least 4 hours, but preferably overnight.
- Re-install the sediment filter cartridge and thoroughly flush the system at all fixtures and appliances connected to the system.
- **Note:** The introduction of a chlorine disinfection solution to a hot water heater that has been used with untreated hard water or water with excessive iron, manganese or other organic contaminants may lead to oxidization of these materials. If you feel that these conditions may apply to your installation, a thorough flushing of the hot water tank should be undertaken to eliminate the oxidized material from the system.

YOUR UNIT IS NOW READY FOR SERVICE.

We recommend that at least once a year, you confirm water safety by getting a sample of the water tested for microbiological safety from a certified laboratory. **Note:** Commercial facilities may require more frequent testing as per local government guidelines.

UV BALLAST FEATURES

The micro-processor controlled UV ballast has both audio and visual alarm indicators to validate lamp operation and an integral annual lamp change reminder timer.

When powered, the display shows the relative UV level. It can also display lamp life remaining (when timer reset button is pressed), and various error codes to aid in system diagnostics. If the relative UV level falls below 40%, the unit goes into the low UV alarm mode and the solenoid valve, if installed, will stop the flow of water. At this point water should not be consumed and service must be performed immediately.

Normal Operation: During normal operation, the green lamp-on LED is illuminated and the two digit display indicates the actual UV dose in mJ/cm^2 .

Diagnostic Display: Pushing the timer reset button on the UV power source initiates the diagnostic display function of the system. In sequence, the display will output the parameter followed by the parameter value;

- **lr** - Lamp life remaining (weeks)
- **ul** - UV level
- **tf** - Disinfection Chamber temperature °F
- **tc** - Disinfection Chamber temperature °C
- **fn** - Cooling fan status [1=on 0=off]
- **st** - Sensor self-test [1=OK 0=Fail]

Note: The diagnostic display does not function if a lamp failure condition exists.

Time remaining: When the lamp change reminder timer is not in the grace period or lamp change alarm mode, the number of weeks of lamp life remaining will be displayed on the two digit display by pressing the timer reset button. .

Solenoid Valve Output: The UV power source is capable of directly powering a solenoid valve which will shut off water flow during lamp failure alarm conditions.

DISPLAY CODES & LED INDICATORS

DISPLAY	RED LED	GREEN LED	BUZZER	CAUSE	ACTION
BLANK	FLASHING	OFF	BEEP	LAMP FAILURE:	Replace UV Lamp
				AC power out of operating limits	Turn off ballast for 15 seconds and then re-plug ballast
E1	OFF	ON	BEEP	Low UV level	1) Clean quartz dome and sensor probe and clean/replace probe screen 2) Check pre-treatment Water may not be safe during this alarm
E3	OFF	ON	BEEP	Sensor self-test failed	Sensor needs to be replaced
E4	OFF	ON	OFF	Unit was in E1 alarm and you have pressed override button to silence alarm	Clean quartz dome, sensor probe and check pre-treatment. Water may not be safe for consumption until normal operation is restored
E5	OFF	ON	BEEP	Lamp life approaching end	Reminder that the UV lamp should be replaced soon. Pushing the reset button will silence the buzzer but E5 will remain on display for 7 days. You can reset the buzzer 4 times in total, after which buzzer cannot be silenced and lamp must be replaced. After the 4 th time, display will read E6
E6	OFF	ON	BEEP	Lamp expired	The reminder has been silenced 4 times. Must replace UV lamp immediately. Water may not be safe for consumption anymore.
E7	OFF	ON	OFF	Reset button depressed during Oh	Run some water to cool the unit. Unplug the ballast and restart after 15 seconds
Oh	OFF	ON	OFF	Chamber temperature exceeds 37°C	This is not an alarm condition. Simply run some water to cool the chamber. If the reset button is depressed when display reads "Oh", E7 code will also be displayed
BLANK	OFF	OFF	SQUEAL	Ballast not working	Power surge or other conditions have caused the ballast to fail. Replace ballast immediately. Water may not be safe for consumption unless ballast is replaced.

OPERATING AND MAINTENANCE

Your UV system is on continuously during normal use.

After periods of not using your water supply exceeding 2-3 days, it is recommended to open all faucets and flush your plumbing lines for a minute or two.

Caution: Protect your unit from freezing. Drain all water from the unit if freezing temperatures exist.

Ultraviolet lamp replacement: The ultraviolet lamp located inside the chamber will operate effectively, around the clock, for approximately one year. While the lamp will light longer than this, the UV light penetration may fall below the prescribed safety level. Therefore, annual lamp replacement is necessary *regardless of apparent condition*.

REPLACING THE UV LAMP AND CLEANING THE QUARTZ DOME

Note: Do not touch the lamp or the quartz dome with your fingers. Handle by ends only or wear soft gloves.

- Unplug the system from the electrical outlet, turn off all water supplies to the unit, and de-pressurize system
- Wait for at least 10-15 minutes until the lamp cools down.



- Unscrew the black screw on the connector cover.
- Carefully extract the lamp connector from the gland nut & disconnect lamp while holding the lamp base firmly
- Carefully extract the lamp from the chamber, continuing vertically all the way until it is fully out of the chamber.
- Dispose UV lamp according to local regulations.

- Disconnect the fan and slide it out of the gland nut
- Unscrew the top and bottom gland nuts and very carefully extract the quartz sleeve from the chamber, continuing vertically all the way until it is fully out of the chamber.

- Clean the quartz sleeve with a vinegar solution or any readily available scale removal product
- Unpack the new UV lamp. Each new UV lamp comes with a new set of “O” rings (two for the sleeve and one each for the gland nuts). Replace all “O” rings
- Re-install quartz sleeve by reversing procedure above and check for leaks.
- Once it is confirmed that no leaks are present reinstall the fan and lamp, following steps 12 to 18 on page 7.
- **KEEPING THE BLACK TIMER RE-SET BUTTON ON THE BALLAST PRESSED**, PLUG IN THE BALLAST TO THE POWER SUPPLY. The UV power source will emit a solid three second beep indicating that the lamp timer has been reset to zero successfully.

REPLACING SENSOR SCREEN

It is important to ensure that the sensor probe and its screen are clean. If the screen or probe is dirty or stained, the ballast will show a low-UV alarm. To clean the sensor probe, turn the water off by closing the supply valve and open a faucet to release the pressure.

- **Do not touch the screen with moist or dirty hands - use soft cotton gloves**
- **Do not use chemicals or abrasive pads to clean sensor probe or screen**
- Unscrew the sensor probe from the port (some water will come out of the port – keep a pail handy to collect this water and avoid damage to the floor. Wipe with towels if necessary).
- Unscrew the screen cap from the probe and carefully remove the screen. Clean the front of the probe with a mild soap solution.
- Use a soft cloth to wipe the screen. If the screen is old, then discard it. Carefully open the package with the extra screen and replace screen. Hand-tighten the screen cap.
- This is also a good time to replace the probe O-ring (4048)
- Insert the probe into the UV chamber and hand-tighten the cap.
- Slowly open the supply valve and check for leaks. If no leaks are found, fully open the valve.
- The UV level should now be back to normal levels.



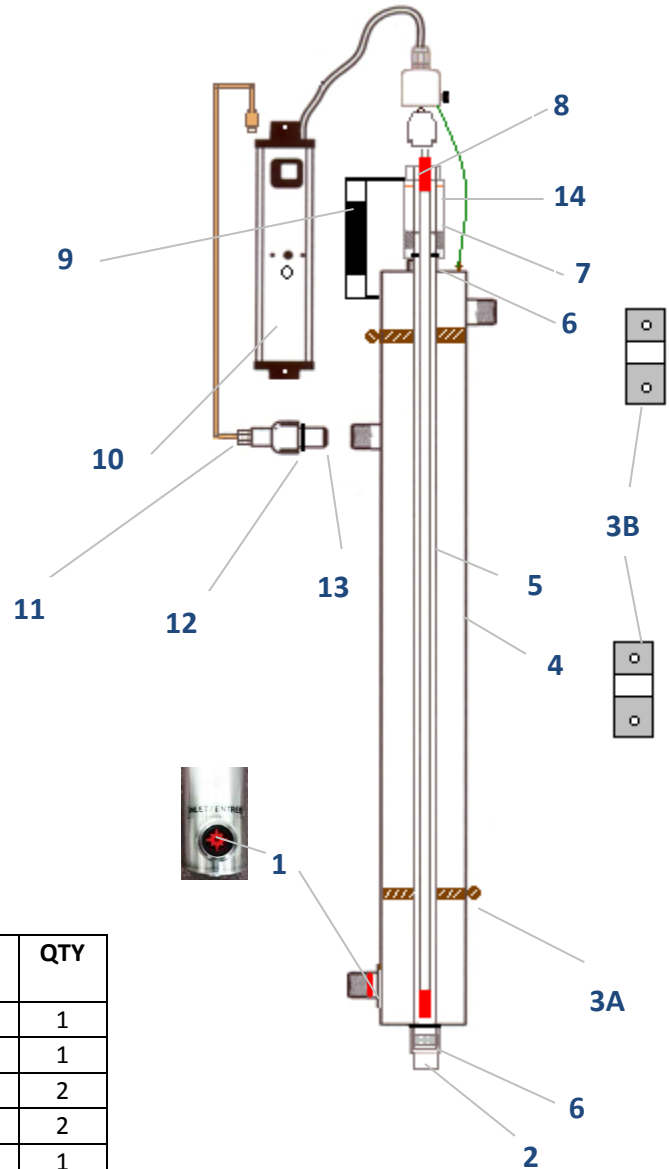
Screen

SPECIFICATIONS

Product Specification	RC20
Maximum rated Flow Rate @ 40mj/cm ² - note 1	20 GPM (75 lpm)
Flow Control	Included
Solenoid output	yes
Cooling Fan	yes
Lamp watts	113 Watt
Total watts	125 Watt
AC Supply Voltage	120V 47-63Hz or (240V 47-63Hz)
Annual Lamp Change Timer	yes
Lamp Change Grace Period	28 days maximum
Grace Period Audio Alarm Disable	Yes (7day increments)
Chamber Material	304SS
Maximum Operating Pressure	100psi (6.9bar)
Maximum Ambient Temperature	40°C (104F)
Water Temperature Range	4 – 37°C (40 – 99F)
Lamp Service Life	9000hrs
Chamber Dimensions (Lx Dia)	47" x 3.5" (119 x 8.9 cm)
Controller Dimensions (L x D x W)	10" x 1.7" x 2.3" (25.4 x 4.3 x 5.8cm)
Shipping Weight	9 Kg (19.8lbs)
Inlet/Outlet Port Size	1.5" MNPT

PARTS LIST

ITEM #	PART/ MODEL NUMBER	DESCRIPTION	QTY
1	FR20	Inlet Flow regulator (20 GPM)	1
2	4031	Bottom Gland nut	1
3A	4033	Mounting Clamp	2
3B	4034	Mounting Base	2
4		UV Chamber	1
5	RC20QS	Quartz Sleeve	1
6	4032	Dome "O" ring	2
7	4030-1	Top Gland Nut	1
8	RC20L	UV Lamp	1
9	4046	Cooling Fan	1
10	RC20B	Electronic Ballast	1
11	4047	Sensor Cable & Sensor	1
12	4048	Sensor Probe "O" ring	1
13	4049	Probe screen	1
14	515	Gland nut "O" ring for top and bottom gland nuts	2



Limited Warranty

The Ultraviolet Water Disinfection Systems stainless steel housing is warranted to the original Consumer purchaser for a period of seven (7) years, from the date of purchase, against defects in materials or workmanship. The Ultraviolet Water Disinfection Systems miscellaneous hardware, seals, sensor, fan and electrical system are warranted to the original Consumer purchaser for a period of one (1) year, from the date of purchase, against defects in material or workmanship. The Ultraviolet lamp is warranted for a period of six (6) months from the date of purchase against defects in materials and workmanship. The company's obligation under this warranty shall consist of repair or replacement, at its option, of any part found by company inspection to be defective, provided that the product has not been misused, abuse, altered or damaged by Consumer with respect to the original installation, as determined by the company. This warranty will not apply if water passing through the Ultraviolet Disinfection System has a) Turbidity / Suspended Solids : More than 5 ppm (mg/l). b) Hydrogen Sulphide concentrations greater than 0.05 ppm (0.05 mg/l). c) Iron concentration greater than 0.3 ppm (0.3 mg/l) or Manganese greater than 0.05 ppm (0.05 mg/l). d) Hardness concentrations greater than 7 grains/gal (119 ppm). e) Tannins or colour. This limited Warranty applies only to a unit when returned to the Warrantor at the owner's expense and in accordance with shipping instructions received from the Warrantor. This warranty does NOT cover, and is intended to exclude, any liability on the part of Envirogard for any incidental damages, consequential damages, labour charges or any other costs incurred in connection with the purchase, installation, use, maintenance or repair or the water filter whether under this warranty or any other warranty implied by law. Some provinces/states do not allow the exclusion of incidental or consequential damages, so the above limitation or exclusion may not apply to you. This warranty gives you specific legal rights and you may also have other rights, which vary from province/state to province/state. This warranty applies only to water filter/systems purchased in Canada or the U.S.A.

Thank you for purchasing one of our Envirogard / Rainfresh UV Water Disinfection Systems. We are committed to ensuring that you are totally satisfied. If you have any questions, concerns or problems related to this unit, please contact us !

(Mon.-Fri.- 8:00 am to 5:00 pm EST)

Help Line: 1-800-667-8072 Toronto & Area: 905-884-9388 Website: www.rainfresh.ca

