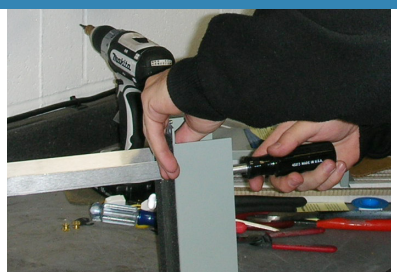
ClearWater Tech, LLC

Corona Discharge Ozone Generators







Service & Maintenance Binder

ClearWater Tech, LLC
Ozone Systems for Water and Air Purification
800-262-0203 • 805-549-9724
850 Capitolio Way, San Luis Obispo, CA 93401 • sales@cwtozone.com • www.cwtozone.com

Service Tool Kit
From ClearWater Tech, LLC.

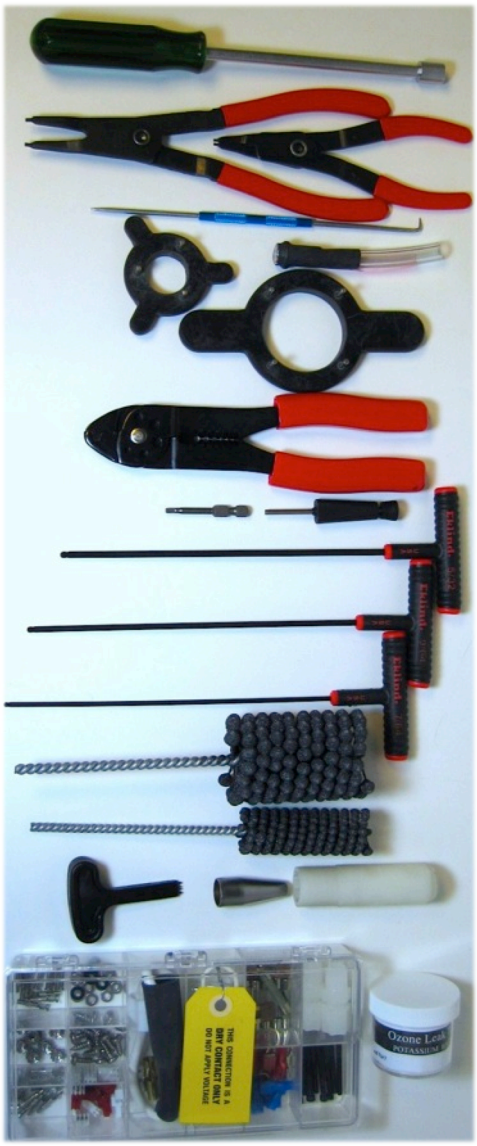


ClearWater Tech, LLC has built all systems to provide years of reliable service with minimum maintenance. Some preventative maintenance is critical for the ozone systems' longevity and efficiency.

We have designed a specialty tool kit to aid our customers in these annual maintenance procedures required and outlined in the ClearWater Tech installation and operation manual.

Service Tool Kit - #STK10

- Long body nut driver, 11/32" - #ST25
- Dryer chamber retaining ring pliers, large - #ST30
- Dryer chamber retaining ring pliers, small - #ST31
- O-ring pick removal tool - #ST35
- High voltage test probe - #ST40
- 2" end cap removal tool - #ST50
- 1" end cap removal tool - #ST55
- Amp pin crimping tool - #ST65
- Amp pin removal tool - #ST67
- Power driver bit, 7/64 - #ST66
- Extra long tee handler (5/32") for #10 hex screw - #ST20
- Extra long tee handler (9/64") for #8 hex screw - #ST15
- Extra long tee handler (7/64") for #6 hex screw - #ST7
- Reaction chamber hone 2" - #ST10
- Reaction chamber hone 1" - #ST11
- 1" O-ring installation tool - #ST12
- MTA punch down tool - #ST68SA
- Ozone leak test kit - #STK13
- Miscellaneous parts kit - #STK14



Please contact your ClearWater Tech dealer for more information

Service Tool Kit
From ClearWater Tech, LLC.

Miscellaneous Parts Kit - #STK14


- Amp connector, male - #CON130


- Hardware Kep nut, 8/32” - #HWN8002


- Amp connector, female - #CON125


- MTA-100 Connector, 2 pin, White - #CON160


- MTA-100 Connector, 2 pin, Red - #CON162


- MTA-100 Connector, 3 pin, White - #CON165


- Shorting jumper connector - #ECC10


- Screw, Phillips pan head, #8 x1/2”- #HWS3002


- Sealing Viton washer - #HSW100


- Washers for sealing and screws - #HWS9004


- High voltage wiring assembly - #RCC85SA


- Silicon dielectric lubricant - #CHM321


- External loop wire assembly - #WA238


- Ring terminal connector - #CON450


- Tab connector, female, red - #CON505


- Tab connector, female, blue, small - #CON810


- 5A fuse, used in most units - #FUS20


- 10A fuse, for NX series and Aerous - #FUS25


- 5A fuse for PSR820 power supplies - #FUS50


- 5A fuse for H.O. drive boards - #FUS75


- Screws for end cap mounting - #HWS2010

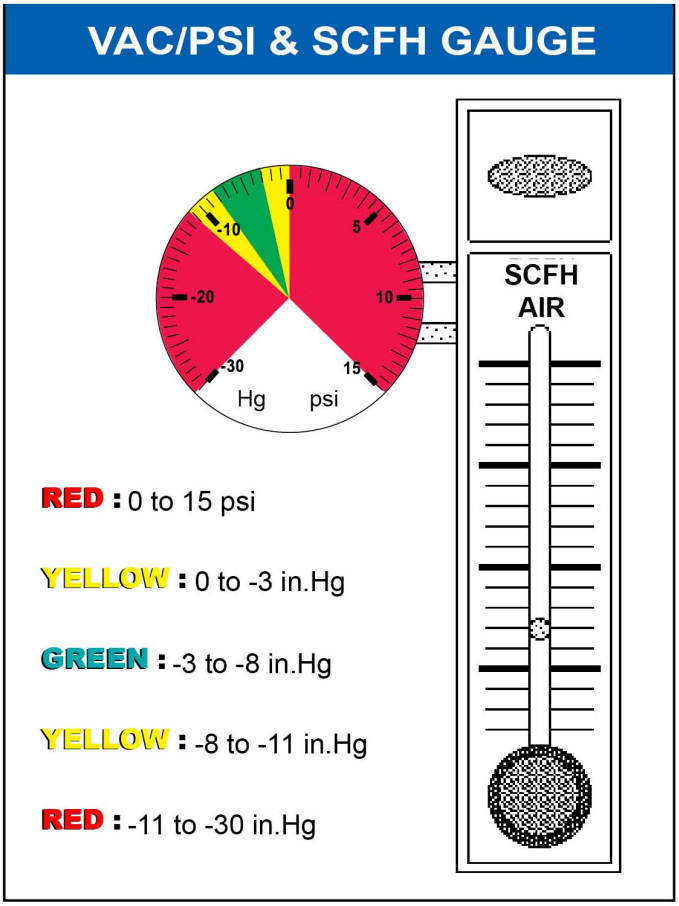

- ¼” Compression fitting x ¼”MPT , Kynar- #FTK134


- UV window, clear - #PP70



Air Flow & Vacuum Operating Parameters

All ClearWater Tech ozone generators have established airflow and vacuum operating parameters that allow for optimum system performance. Some models have built-in airflow and vacuum gauges to monitor these parameters, while others are not so equipped. It is recommended that pre-assembled gauge kits (available from ClearWater Tech) are used on models not equipped with built-in gauges.



The optimum amount of airflow into the ozone generator (measured in SCFH, or Standard Cubic Feet per Hour) will vary depending on the model. A general rule is as follows: Each vacuum operated 2" ozone reaction chamber requires 7 SCFH. Each vacuum operated 1" ozone reaction chamber requires 4 SCFH.

The correct amount of vacuum will be identical for all corona discharge ozone generators in the ClearWater Tech product line. The VACUUM/PSI gauge supplied by ClearWater Tech is color-coded for easy reading – the RED zones indicate excessive pressure or vacuum (immediate adjustment is necessary), the YELLOW zones are caution areas, and the GREEN zone is the ideal operating range (slight vacuum).

To make air flow adjustments, use the adjustment valve on the SCFH gauge (either built-in or supplied as a kit) until the correct amount of air flow is achieved. These specifications are outlined in the "Start-Up and Calibration" section of the ozone generator Installation and Operation Manual.

To make adjustments to the amount of vacuum, use the ball valve on the ozone injector manifold(s). If the needle on the VACUUM/PSI gauge is in the red zone on the left side of zero (excessive vacuum), slowly open the ball valve until the needle is in the green zone. If the needle is in the red zone on the right side of zero (excessive pressure), slowly close the ball valve until the needle is in the green zone. **Note: The correct amount of vacuum for all ClearWater Tech ozone generators is –3 to –8 in./Hg (inches of mercury). In all cases, extreme vacuum or pressure conditions must be avoided!**

VACUUM/PSI Gauge

- **RED ZONE** – left (excessive vacuum – immediate attention required): -11 to -30 in./Hg
- **YELLOW ZONE** – left (caution – over vacuum): -8 to -11 in./Hg
- **GREEN ZONE** – ideal operation: -3 to -8 in./Hg
- **YELLOW ZONE** – right (caution – low vacuum): 0 to -3 in./Hg
- **RED ZONE** – right (excessive pressure-immediate attention required): 0 to 15 lb./sq. in. (psi)

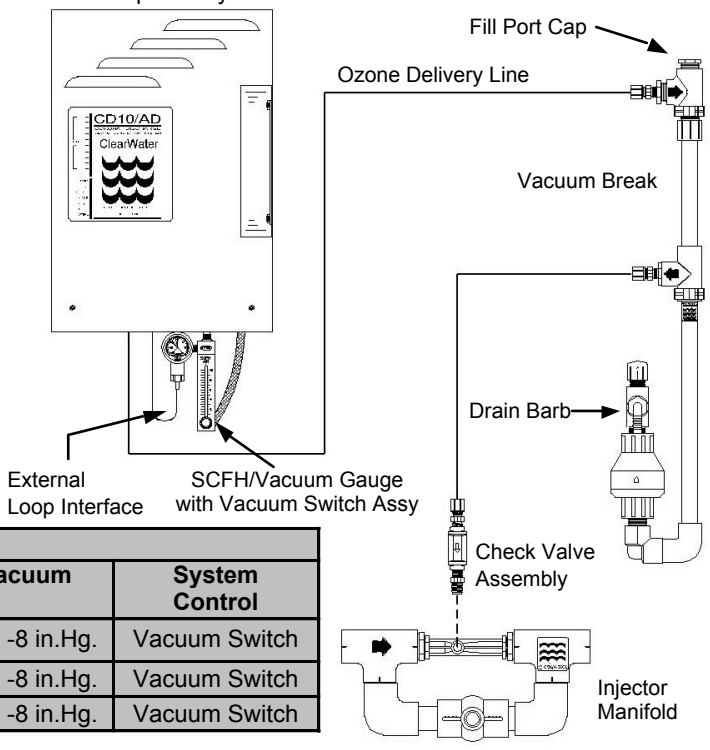
Note: This information supersedes the airflow and vacuum information presented in this manual.

Apex II and III Quick Installation Guide

Product Description

The ClearWater Tech, Apex Packages are complete and fully integrated for easy installation. The Apex II system includes the CD10/AD ozone generator with internal air dryer for output efficiency, a variable 0-100% ozone output control, with a LED display. The Apex III system includes the CD12/AD or M15/AD ozone generator with internal air dryer. All systems include a positive atmospheric Vacuum Break for water back flow prevention, an Injector Manifold with Check Valve Assembly for mass transfer of ozone in solution, and a SCFH (Standard Cubic Feet Per Hour) and Vacuum Gauge Assembly for accurate operating parameter measurements. This gauge assembly also includes a normally open Vacuum Switch that connects to the External Loop of the ozone generator. When vacuum is sensed this vacuum switch will close creating continuity through the External Loop and initiate ozone production, similarly when vacuum is not sensed the vacuum switch will open interrupting ozone production. A booster pump, contact vessel and off-gas vent not included in this system may also be required.

Shown: Apex II System



Specification Chart				
System	**Ozone Generator**	**Ozone Output**	**Vacuum**	**System Control**
APEX II	CD10/AD	1.3g/h @ 4 SCFH 1% by weight	-3 to -8 in.Hg.	Vacuum Switch
APEX III	CD12/AD	2.8g/h @ 7 SCFH 1% by weight	-3 to -8 in.Hg.	Vacuum Switch
APEX III	M15/AD	2.8g/h @ 7 SCFH 1% by weight	-3 to -8 in.Hg.	Vacuum Switch

Quick Install

NOTE: The CD10/AD, CD12/AD, and M15/AD ozone generators are equipped with an internal heat regenerative dry air system. It is recommended that the unit be energized for 24 hours prior to installation. This will allow the dryer to reach operating temperature and vaporize any moisture that may have built up in the sieve beds.

Step 1: Unpack and placement. Mount ozone generator to a suitable flat vertical surface.

Step 2: Plug the ozone generator into a main power source (CD10/AD 90-250VAC 47-63Hz., CD12/AD 90-240VAC 47-63Hz., M15/AD 120/240VAC 50/60Hz.) **NOTE: The ozone generator must be energized by a constant unswitched power source.**

Step 3: Mount the SCFH/Vacuum Gauge with Vacuum Switch Assembly to the ozone generator according to the installation directions provided.

Step 4: Mount Vacuum Break to a suitable flat vertical surface, using the Clic® clamps provided.

Step 5: Install the side stream booster pump, if required. The booster pump will require separate dedicated power.

Step 6: Install the Injector Manifold and thread the Check Valve Assembly into the Venturi. To prepare for start-up close the by-pass valve half way. This will create vacuum at the injector as soon as the water is flowing through the injector manifold.

Step 8: Install the contact vessel and off-gas vent (if so equipped).

Step 9: Remove Vacuum Break Fill Port Cap. Fill the Vacuum Break with water through fill port until the water spills out of the drain barb. Replace fill port cap.

Step 10: Connect the Teflon® ozone delivery line; from the ozone generator to the vacuum break, then from the vacuum break to the injector manifold check valve assembly.

Step 11: An external 4-20mA control signal may be used to control ozone output. According to the 4-20mA control device I/O Manual, wire in the Orange (+) and Purple (-) leads (located under the CD10/AD and CD12/AD) to the 4-20mA controller. **NOTES: The 4-20mA signal will over-ride the Manual Ozone Output Control setting. This feature is only available with the CD10/AD and CD12/AD.**

Step 12: The External Loop (located under the ozone generator) must be removed. Install the two-position male connector of the Vacuum Switch (located on the gauge assembly) into the two-position female connector located on the chassis of the ozone generator. **NOTE: The term 'dry contact' means that this loop does not supply output nor except input voltages.**

Step 13: Switch the main power switch of the ozone generator to the 'ON' position (if not already done so).

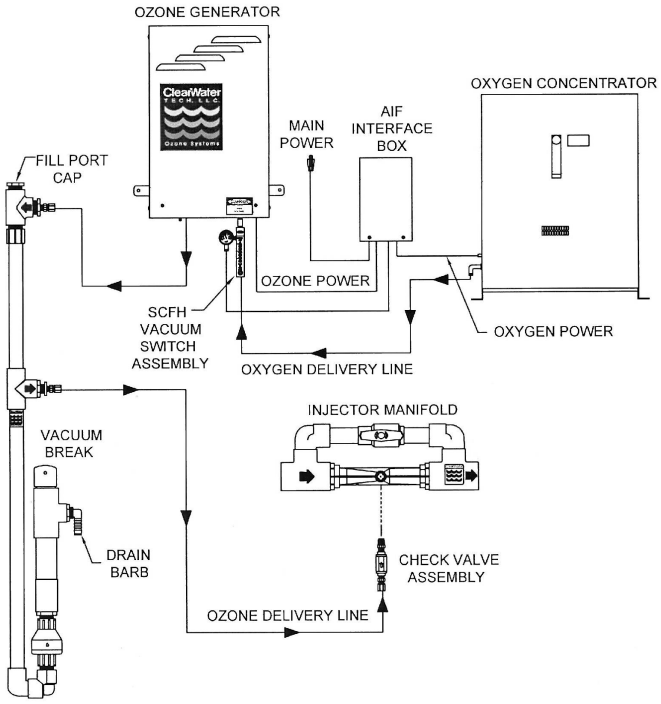
Step 14: Apply main power to the booster pump and/or side stream booster pump to initiate water flow.

Step 15: Make final adjustments to the to by-pass valve on the injection manifold and needle valve of the SCFH/Vacuum gauge with Vacuum Switch Assembly to set the SCFH, while at the same time achieving the correct vacuum (middle of the 'Green Zone'). **NOTE: See Specification Chart above for the normal operating parameter settings.**

Apex IV and VI Quick Installation Guide

Product Description

The ClearWater Tech, LLC. Apex Packages are complete and fully integrated for easy installation. The Apex IV and VI both use Pressure Swing Absorption (PSA) oxygen technology for maximum ozone output efficiency, a variable output Ozone Generator with an LED light display, a positive atmospheric Vacuum Break for water back for prevention, an Injector Manifold with Check Valve Assembly for mass transfer of ozone in solution and an SCFH (Standard Cubic Feet Per Hour) and Vacuum Gauge Assembly for accurate operating parameter measurements. The assembly also includes a normally open Vacuum Switch that will signal the AIF interface box, which will energize and de-energize the ozone generator and the oxygen concentrator.



Specification Chart				
System	**Ozone Generator**	**Ozone Output**	**Vacuum**	**System Control**
Apex IV	CD10	4.0g/h @ 4 SCFH 3% by weight	-3 to -8inHg	Vacuum Switch
Apex VI	CD12	8.0g/h @ 8 SCFH 3% by weight	-3 to -8inHg	Vacuum Switch

Quick Install

Step 1: Unpack and placement. Mount ozone generator to a suitable flat vertical surface.

Step 2: Install the side stream booster pump, if required. The booster pump will require separate dedicated power.

Step 3: Install the Injector Manifold and thread the Check Valve Assembly into the Venturi. To prepare for start-up close the by-pass valve half way. This will create vacuum at the injector as soon as water is flowing through the injector manifold.

Step 4: Install the contact vessel and off-gas vent (if so equipped).

Step 5: Apply separate power to the oxygen concentrator and set the air flow to 4 SCFH for an Apex IV or 8 SCFH for an Apex VI before connecting delivery line to the ozone generator. **NOTE: The SCFH gauge on the oxygen concentrator will reduce in flow rate after connecting the oxygen delivery line.**

Step 6: AIF10 120VAC 60 Hz - Plug in both the ozone generator and oxygen concentrator into the outlets provided. **NOTE: There is no specific orientation of the plugs.** AIF20 240VAC 50/60Hz - Cut off the plugs of the ozone generator and oxygen concentrator main power cords. Strip cord back and terminate inside the AIF20 to the main terminal strip provided. **NOTE: Use main power ground stud (inside AIF20) to ground both units.**

Step 7: Mount the SCFH/Vacuum Gauge Assembly to the ozone generator according to the installation directions provided. **NOTE: Plug 2-position connector into the bottom of the AIF interface box.**

Step 8: An external 4-20mA control signal may be used to control ozone output. According to the 4-20mA control device I/O Manual, wire in the Orange (+) and Purple (-) leads located under the ozone generator to the 4-20mA controller. **NOTES: The 4-20mA signal will over-ride the Manual Ozone Output Control setting.**

Step 9: Attach the barbed fittings to the indicator cartridge and connect the braided oxygen delivery lines using hose clamps.

Step 10: Connect the Teflon® ozone delivery line; from the ozone generator to the vacuum break, then from the vacuum break to the injector manifold check valve assembly.

Step 11: Remove Vacuum Break Fill Port Cap. Fill the Vacuum Break with water through fill port until the water spills out of the drain barb. Replace fill port cap.

Step 12: Switch the main power switch of the ozone generator to the 'ON' position (if not already done so). Apply Main Power to the AIF box.

Step 13: Apply main power to the booster pump and/or side stream booster pump to initiate water flow.

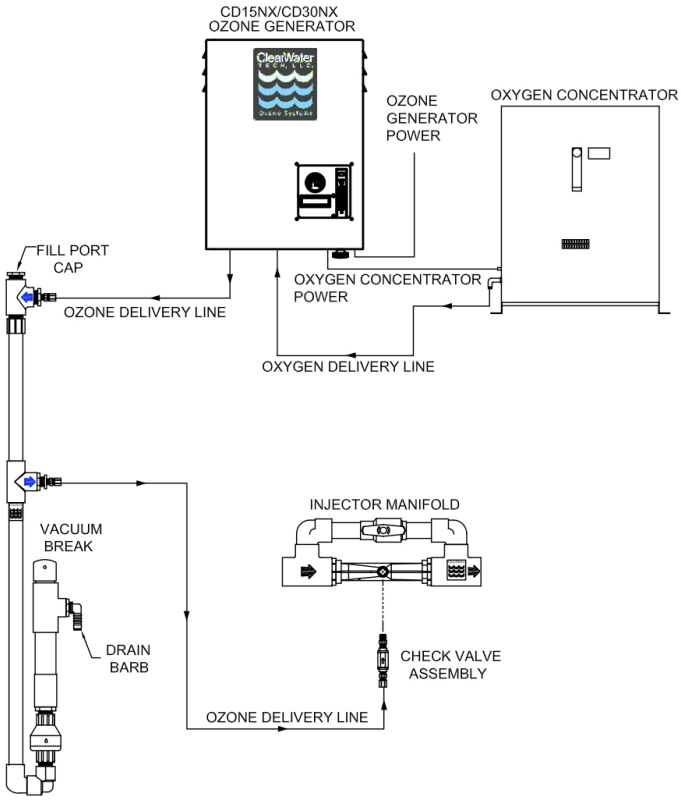
Step 14: Make final adjustments to the to by-pass valve on the injection manifold and needle valve of the SCFH/Vacuum gauge assembly to set the SCFH, while at the same time achieving the correct vacuum (middle of the 'Green Zone').

NOTE: See Specification Chart above for the parameter settings.

Apex VII and VIII Quick Installation Guide

Product Description

The ClearWater Tech, LLC. Apex Packages are complete and fully integrated for easy installation. The Apex VII and VIII both use Pressure Swing Absorption (PSA) oxygen technology for maximum ozone output efficiency, a variable output Ozone Generator with an LCD display, a positive atmospheric Vacuum Break for water back flow prevention, and Injector Manifold with Check Valve Assembly for mass transfer of ozone in solution.



Specification Chart				
System	**Ozone Generator**	**Ozone Output**	**Vacuum / Pressure**	**System Control**
Apex VII	CD15nx	15.0g/h @ 7.5 SCFH 5% by weight	-3 to -8inHg / 10PSI	Vacuum & Pressure Switch
Apex VIII	CD30nx	30.0g/h @ 15 SCFH 5% by weight	-3 to -8inHg / 10PSI	Vacuum & Pressure Switch

Quick Install

Step 1: Unpack and placement. Mount ozone generator and peripheral equipment to a suitable flat vertical surface.

Step 2: Install the side stream booster pump, if so required. The booster pump will require separate dedicated power.

Step 3: Install the Injector Manifold and thread the Check Valve Assembly onto the Venturi. To prepare for start-up close the by-pass valve half way. This will create vacuum at the injector as soon as water is flowing through the injector manifold.

Step 4: Install the contact vessel and off-gas vent (if so equipped).

Step 5: Apply separate power to the oxygen concentrator and set the air flow to 15 SCFH prior to connecting delivery line to the ozone generator. **NOTE: The SCFH flow meter on the oxygen concentrator will reduce in flow rate after connecting the oxygen delivery line.**

Step 6: Remove the ½ inch conduit knockout located at the bottom of the ozone generator and install the ½ inch strain relief fitting and lock-nut (located in the parts back), into the exposed conduit knockout hole.

Step 7: Cut the plug off from the oxygen concentrator cord, and feed the cord into the strain relief, and tighten strain relief fitting.

Step 8: Terminate the oxygen concentrator wires to the terminal strip located inside the ozone generator, as instructed by the terminal strip diagram, located on the inside of the ozone generator cover. **NOTE: The oxygen concentrator must be rated for the same voltage that will be applied to the ozone generator.**

Step 9: An external 4-20mA control signal may be used to control ozone output. See the detail installation steps of this procedure in the ozone generator manual.

Step 10: Connect the Teflon® ozone delivery line; from the ozone generator to the vacuum break, then from the vacuum break to the injector manifold check valve assembly.

Step 11: Remove Vacuum Break Fill Port Cap. Fill the Vacuum Break with water through fill port until the water spills out of the drain barb. Replace fill port cap.

Step 12: Apply main power to the ozone generator. Switch the main power switch of the ozone generator to the 'ON' position (if not already done so).

Step 13: Apply main power to the main circulation booster pump and/or side stream booster pump to initiate water flow.

Step 14: Make final adjustments to the to by-pass valve on the injection manifold to insure a vacuum is present. Adjust the backpressure needle valve (located at the bottom of the ozone generator) till the pressure gauge (located on the front view window of the ozone generator achieves 10 PSI. **Note: The LCD screen located on the front of the ozone generator will read "No Vacuum" and/or "No Pressure" until adequate levels are achieved. See Specification Chart above for the parameter settings.**

Step 15: To adjust the ozone output manually, use the two programming buttons located at the bottom of the ozone generator. Holding down the left button will reduce ozone output and the right button will increase the ozone output. **Note: For further programming and control see the ozone generator manual.**

Normal Operating Parameters

Vacuum Operated Ozone Generators

ClearWater Tech. Product:_____

Serial Number:_____

Installation Date:_____

SCFH: Oxygen Generator_____

Vacuum: (-3) - (8) in. Hg. ***ORP: _____***

Ambient Temp:20° F to 85° F ph:

<u>Cabinets Only:</u>

Vacuum Switch Setting: -3 in. Hg.

Ozone Output 0-100%: set by customer (if so equipped)

Maintenance Schedule

Monthly Check List
•Check All Normal Operating Parameters •Observe Fan (s) On •Clean Fan Filter(s) (1) •Unit should be warm to touch •Observe Indicating lights

		YEAR				
		1	2	3	4	5
MONTH	1					
	2					
	3					
	4					
	5					
	6					
	7					
	8					
	9					
	10					
	11					
	12					

Annual Maintenance
•Replace non-indicating desiccant •Replace Indicating desiccant (as required)

Year	
1st	
2nd	
3rd	
4th	
5th	

1 - Under normal operation the indicating desiccant will be blue and white in color. If moisture is present the desiccant will change to pink and white orall white.

2- Determined by the ambient humidity conditions, the non-indicating desiccant may need to be replaced more frequently.

Normal Operating Parameters

Pressure Operated Ozone Generators

ClearWater Tech. Product:_____

Serial Number:_____

Installation Date:_____

SCFH: Oxygen Generator_____

Pressure: 9 to 12 psi *ORP: _____*

Ambient Temp:20° F to 85° F *PH: _____*

Pressure switch setting: 9 psi

Ozone output 0-100%: set by customer (if so equipped)

Maintenance Schedule

Monthly Check List
•Check All Normal Operating Parameters
•Observe Fan (s) On
•Clean Fan Filter(s) (1)
•Inspect ozone delivery line for water
•Observe Power Light on Drive(s)
•Clean booster pump basket

		YEAR				
		1	2	3	4	5
MONTH	1					
	2					
	3					
	4					
	5					
	6					
	7					
	8					
	9					
	10					
	11					
	12					

Annual Maintenance
•Replace fan filter(s) (1)
•Replace check valve(s)
•Replace inline filter
•Rebuild solenoi(s) if so equipped
•Remove & clean dielectric
•Clean vacuum break

Year	
1st	
2nd	
3rd	
4th	
5th	

1 - Operating conditions in the equipment area will dictate the frequency required of this procedure

2- See Installation and Operation Manual for all maintenance prodedures

Rev. 9/02

Normal Operating Parameters
Oxygen Concentration Systems

ClearWater Tech. Product:_____

Serial Number:_____

Installation Date:_____

SCFH:_____

Ambient Temp: 20° F to 85° F

Relative Humidity: 0 - 90 %

Maintenance Schedule

Monthly Check List
•Check All Normal Operating Parameters
•Observe Fan(s) On (if app.)
•Clean Fan Filter(s) (1) (if app.)
•Inspect Air Prep Desiccant (blue and white)

		YEAR				
		1	2	3	4	5
MONTH	1					
	2					
	3					
	4					
	5					
	6					
	7					
	8					
	9					
	10					
	11					
	12					

Annual Maintenance
•Change External Air Filter(s) (if app.) (1)
•Change Compressor Inlet Filter(s) (1)
•Rebuild Compressor(s)

Year	
1st	
2nd	
3rd	
4th	
5th	

1 - Operating conditions in the equipment area will dictate the frequency required of this procedure

2 - Under normal operating conditions the ATF module require any maintenance

Rev. SEP02

Annual Maintenance Procedure

FOR USE WITH CD10, CD10/AD, CD12 & CD12/AD

Maintenance of the ozone system is critical to its longevity and operating efficiency. Follow the steps below to perform the preventative annual maintenance. If you have additional questions regarding the maintenance of your ozone installation, please consult the operation manual or contact your dealer.

Before you start:

System Shutdown Procedures

Step 1: Turn off power to any peripheral system hydraulic components and air prep system.

Step 2: Turn the Main Power switch on the ozone generator to the "OFF" position. The LED display on the front cover should *not* be illuminated.

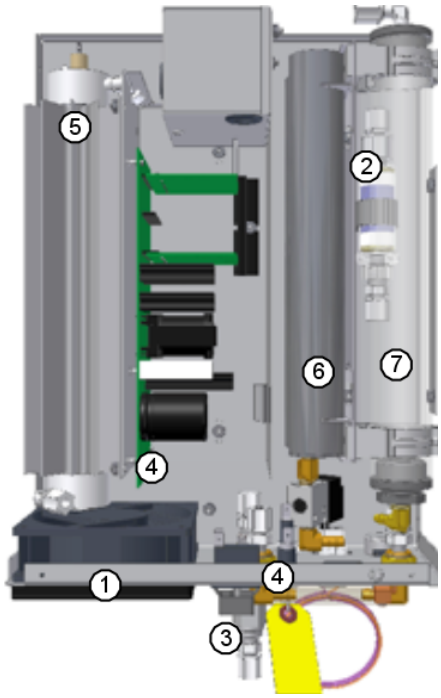
Step 3: Disconnect the power to the ozone system at the service disconnect box (if so equipped), main circuit breaker or by disconnecting the power cord.

Recommended Tools

Nut Drivers: 5/16", 11/32"
Screwdrivers: Phillips and flat-head
O-Ring Removal Pick
Hex Key: 7/64"
Marking Pen
Wrench: 5/8" or adjustable
1" Ball hone (optional)
Channel lock-type Pliers
Snap Ring Pliers (for CD10/AD & CD12/AD)
Cloth Shop Towel
Denatured Alcohol
Teflon Sealing Tape

Video Walkthroughs

Visit our video channel at:
http://www.youtube.com/ClearWaterTech
These, and other procedures are shown.



Included in this maintenance kit:

Pictured are the contents of a CD10/AD maintenance kit and an overview image of the CD10/AD.

Numbered items correspond to descriptions below and their installed locations within the ozone generator.

CD10, CD12 & CD12/AD systems will have similar maintenance kits and generator layouts. They will have differences in quantity of parts, however the steps will be the same.

The CD10 & CD12 models will not have the media for internal air dryers (#6 & #7).

CD12 & CD12/AD models will have a second set of o-rings (#5), as the units have two reaction chambers.



Maintenance Will Involve the Following:

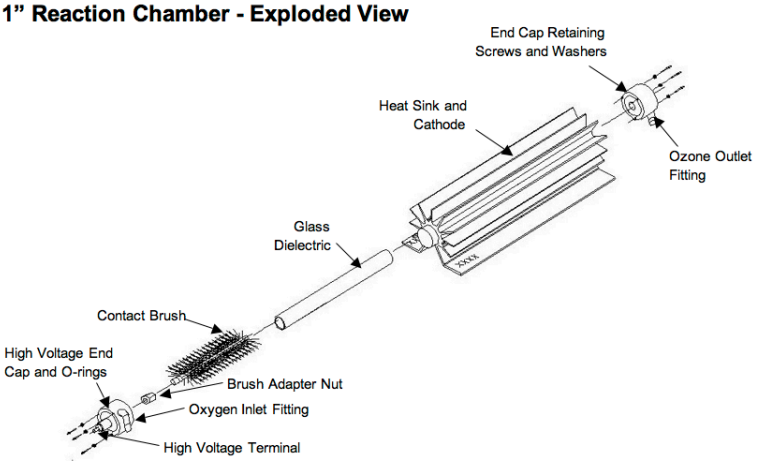
1. **Cooling Filter:** Clean or replace the cooling fan filter elements as required.
2. **Inline Particulate Filter:** Remove colored protective caps before installing the new filter. Re-tape threads with Teflon tape. Orientation is universal.
3. **Check Valves:** Replace both check valves, one at the ozone generator and one at the injector. Make note of check valve direction before removing old check valve and reinstall new valve in same direction. Re-tape threads with Teflon tape.
4. **Fuses:** Save the replacement fuses for use as needed.
5. **Reaction Chamber O-Ring Replacement:** See page 2 for reaction chamber maintenance instructions.
6. **Air Dryer Media:** See page 3 for air preparation maintenance instructions.
7. **Indicating Media:** See page 3 for air preparation maintenance instructions.

Annual Maintenance Procedure

FOR USE WITH CD10, CD10/AD, CD12 & CD12/AD

Reaction Chamber Removal and Disassembly:

1" Reaction Chamber - Exploded View



Note: Read through all the steps before disassembling the reaction chamber.

Step 1: Make sure all power to the ozone generator has been disconnected according to the "System Shutdown Procedures" outlined above.

Step 2: Disconnect the high voltage lead from the reaction chamber(s).

Step 3: Disconnect the tubing connections on both ends of the reaction chamber(s).

Step 4: Remove the 4 nuts securing each chamber and remove the reaction chamber from ozone generator.

Step 5: Make note or mark the position of the end caps and their elbow fittings on the reaction chambers, during re-assembly the end caps will need to return to original positions. The orientation of the end caps and the chamber itself is different between the two CD12 chambers.

Step 6: Remove retaining screws and washers from the two end caps (3 each).

Step 7: Using a gentle back-and-forth twisting motion, remove the non-high voltage end cap (the one *without* the high voltage attachment screw) from the heat sink/cathode assembly. A flat-head screwdriver may be used to gently pry the end cap off, as long as equal pressure is applied to each side of the end cap.

Step 8: Remove the high voltage end cap and dielectric from the heat sink/cathode assembly.

Step 9: The high voltage end cap can be removed by holding the glass and turning the end cap counter-clockwise approximately 6 turns. Pull the end cap off the glass. Push the contact brush out of the dielectric glass. A screwdriver can be used to push the brush, and pliers to pull it out once the opposing end is exposed.

Step 10: Inspect the dielectric, end caps and cathode for breakage, corrosion or debris; then follow the assembly and re-installation steps below.

Reaction Chamber Assembly and Re-installation:

Step 1: Remove o-rings from end caps, clean the dielectric glass, end caps and interior of the stainless steel cathode cylinder. Use denatured alcohol, shop towels to clean and be sure to remove all old o-ring debris. A 1" ball hone can be used to clean the major debris out of the cathode if there is heavy buildup.

Step 2: Prepare the end caps for re-assembly by replacing the o-rings. Thread the hex brush adapter nut, with contact brush attached, onto the end of the high voltage end cap (cap with the high voltage attachment screw) center screw. Re-tape the threads of the elbow fittings if needed.

Step 3: Using a gentle twisting motion, press the *non*-high voltage end cap onto the heat sink/cathode assembly until flush with the heat sink cooling fins. Turn the end cap to the correct orientation.

Step 4: Slide the three end cap retaining screws with washers through the holes in the non-high voltage end cap, aligning them with the heat sink screw bosses. Thread screws into screw bosses until heads are snug against the end cap.

Step 5: Next we focus on assembling the rest of the subcomponents, before installing them into the reaction chamber. *Slowly* insert the brush (installed onto the high voltage end cap) into the dielectric glass. **Note:** Go slowly in order to prevent or minimize bending the center wire of the brush during this procedure. It is normal for the bristles to bend flat against the dielectric glass. Fully seat the dielectric glass into the high voltage end cap. Clean the glass with denatured alcohol once more, and do not retouch the glass without re-cleaning.

Step 6: Hold the reaction chamber upright on a flat surface, empty high voltage side up. Grasp the high voltage end cap and lower the glass into the reaction chamber. Press directly downwards on the high voltage end cap to fully seat the dielectric assembly; the end caps should be flush with the heat sink cooling fins. Turn the end cap to the correct orientation.

Step 8: Slide the three end cap retaining screws with washers through the holes in the end cap, aligning them with the heat sink screw bosses. Thread screws into screw bosses until heads are snug against the end cap.

Step 9: Re-install the complete reaction chamber assembly into the ozone generator by securing the reaction chamber to its mounts, securing delivery line and connecting the high voltage insulated wire.

Annual Maintenance Procedure

FOR USE WITH CD10, CD10/AD, CD12 & CD12/AD

Air Preparation System

CD10/AD and CD12/AD only: The tan colored beads are an air dryer desiccant. The blue and white media is typically called indicating media. It is silica gel and acts as an indicator of the health of the air dryers.

If the air dryer desiccant requires replacement, moisture will be present in the dryer's output. The silica media will absorb the moisture and will change the blue crystals to pink, then white. If the indicating media has changed color, this maintenance of replacing the media should resolve the issue and restore proper ozone output. If the indicating media has yet to change color, it is recommended to replace the air dryer media for preventative maintenance. The indicating crystals can be saved for future use, or installed; it is optional in this case.

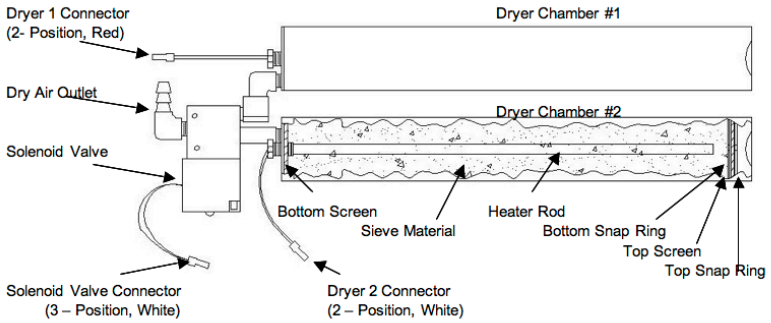
For steps regarding replacement of these medias see "Air Dryer Desiccant Replacement" and "Indicating Media Replacement" below.

CD10 and CD12 only: Your air prep system will consist of either a PSA Oxygen Concentrator or LPSA Dry Air. Compressors, PSA Oxygen Concentrator or LPSA Dry Air: Following the procedures outlined in the compressor rebuild kit, rebuild the two compressor heads and replace all filters.

Note: Manufacturers' recommended interval is 5,000 to 12,000 hours of operation. Compressor performance and/or operating conditions in the equipment area will dictate the required frequency of this procedure.

Air Dryer Desiccant Replacement

Note: You will need to remove the unit from the wall in order to pour out the media. Allow the air dryer chambers to cool completely and read all steps before continuing.



Step 1: Straighten out the ends of the dryer chambers using pliers.

Step 2: Using a snap ring tool, remove the top snap rings.

Step 3: Remove the top screens; the o-ring pick is handy for this. The bottom snap ring may be left remaining within the air dryer chambers.

Step 4: Turn the ozone generator over to pour the old sieve material from the dryer chambers and dispose. **Note:** When removing the sieve material, be sure not to discard the bottom screens.

Step 5: Re-seat/Re-install the bottom screens. **Note:** The heater rod must be put through the center of the bottom screens.

Step 6: Fill chamber with new sieve material to 3/4" to 1" below the top of the dryer chambers. You will have more media than needed.

Step 7: Re-install the top screens.

Step 8: Using a snap ring tool, place the top snap rings snug against the top screen.

Step 9: Bend the ends of the dryer chambers in-ward for added retention of the sieve material (optional).

Step 10: The ozone generator must be turned on for 24 hours prior to system start-up to eliminate any moisture trapped in the new sieve material.

Indicating Media Replacement

Step 1: Using wrench, loosen and disconnect the compression fitting located at the top of the indicating media chamber.

Step 2: With a flat-head screwdriver, unlock the two gray clamps securing the indicating media chamber.

Step 3: Pull the chamber free of the clamps, the chamber will only be held within the unit by the bottom cap. Rotate the chamber downwards to position the bottom cap to be at the top of the chamber.

Step 4: Secure the bottom cap with channel lock pliers and turn the chamber counter-clockwise to unscrew it. Be mindful to not spill the indicating media.

Step 5: Remove the indicating chamber from the unit, **remove the interior screen** and dispose of the media.

Step 6: Remove the Teflon tape from the bottom cap's threads and re-tape the threads with 2-3 wraps.

Step 7: Refill the indicating chamber with new blue and white indicating crystals. You will have more media than needed.

Step 8: Replace the interior screen and reinstall the chamber following steps 1 through 4 in reverse order.

Annual Maintenance Procedure

FOR USE WITH CD1500P, CD2000P, CD15nx & CD30nx

Maintenance of the ozone system is critical to its longevity and operating efficiency. Follow the steps below to perform the preventative annual maintenance. If you have additional questions regarding the maintenance of your ozone installation, please consult the operation manual or contact your dealer.

Before you start:

System Shutdown Procedures

Step 1: Turn off power to any peripheral system hydraulic components and air prep system.

Step 2: Turn the Main Power switch on the ozone generator to the "OFF" position.

Step 3: Disconnect the power to the ozone system at the service disconnect box (if so equipped), main circuit breaker or by disconnecting the power cord.

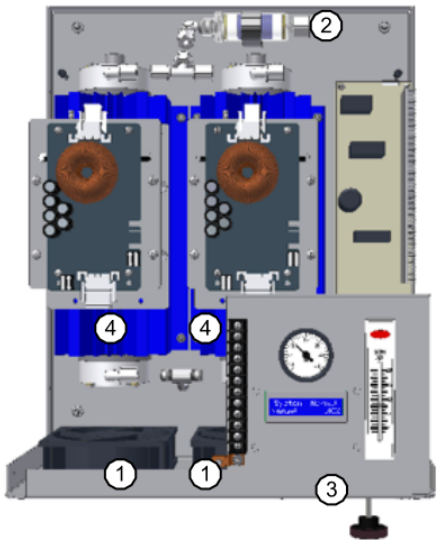
Recommended Tools

Nut Driver: 11/32", 3/8"
Screwdrivers: Phillips and flat-head
O-Ring Removal Pick
Hex Key: 7/64"
Wrench: 5/8" or adjustable
2" Ball hone (optional)
Cloth Shop Towel
Denatured Alcohol
Scissors
Teflon Sealing Tape

Video Walkthroughs

Visit our video channel at:
http://www.youtube.com/ClearWaterTech
These, and other procedures are shown.

CD30nx – Ozone Generator



Included in this maintenance kit:

Pictured are overview images of the CD30nx and the contents of a CD30nx maintenance kit.

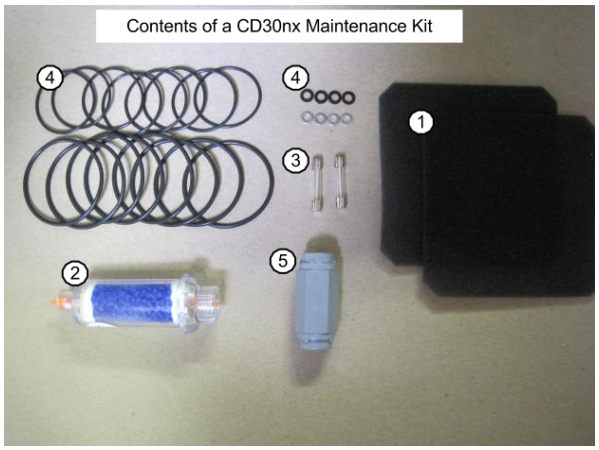
Numbered items correspond to descriptions below and their installed locations within the ozone generator.

CD1500P, CD2000P & CD15nx systems will have similar maintenance kits and generator layouts. They will have differences in quantity of parts and type of circuit boards however the steps will be the same.

The CD1500P & CD15nx models will have a single set of o-rings (#4), as the units have one reaction chamber.

Maintenance Will Involve the Following:

1. **Cooling Filter:** Clean or replace the cooling fan filter elements as required.
2. **Inline Particulate Filter:** Remove colored protective caps before installing the new filter. Re-tape threads with Teflon tape. Orientation is universal.
3. **Fuses:** Save the replacement fuses for use as needed.
4. **Reaction Chamber O-Ring Replacement:** See page 2 for reaction chamber maintenance instructions.
5. **Check Valve:** Replace the check valve at the injector. Make note of check valve direction before removing old check valve and reinstall new valve in same direction. Re-tape threads with Teflon tape.

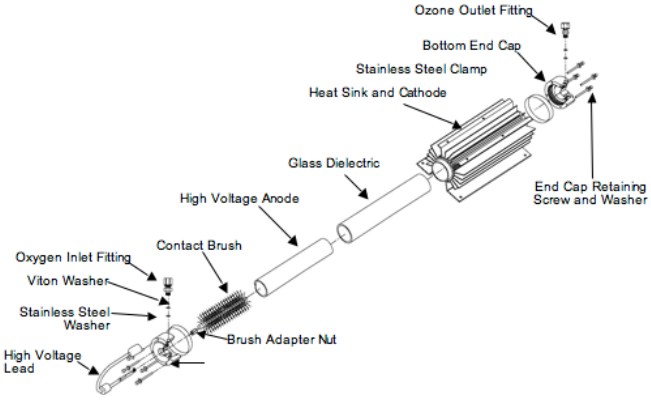


Annual Maintenance Procedure

FOR USE WITH CD1500P, CD2000P, CD15nx & CD30nx

Reaction Chamber Removal and Disassembly:

2" Pressurized Reaction Chamber – Exploded View



Note: Read through all the steps before disassembling the reaction chamber.

Step 1: Make sure all power to the ozone generator has been disconnected according to the "System Shutdown Procedures" outlined above.

Step 2: Disconnect the white high voltage lead from the black transformer, the black insulation boot will have to be drawn back to expose the connection.

Step 3: If rebuilding a CD1500P: Disconnect wire connections to the drive board and remove the 4-20mA control board with mounting bracket from the reaction chamber.

Step 4: Disconnect the tubing connections on both ends of the reaction chamber.

Step 5: Remove the 4 nuts securing each chamber and remove the reaction chamber from ozone generator.

Step 6: Remove retaining screws and washers from the end caps (4 each).

Step 7: Using a gentle back-and-forth twisting motion, remove the non-high voltage end cap (the one *without* the high voltage attachment screw) from the heat sink/cathode assembly. A flat-head screwdriver may be used to gently pry the end cap off, as long as equal pressure is applied to each side of the end cap.
Note: The stainless steel straps should not be removed.

Step 8: Remove the high voltage end cap and dielectric from the heat sink/cathode assembly.

Step 9: Draw back the white cap along the white high voltage lead at the end cap, this will expose a screw to be removed. Pull/twist the end cap off the glass. Push the contact brush out of the dielectric glass. Also remove the anode (foil-like material) from within the glass, it may come out with the brush.

Step 10: Inspect the dielectric, foil, end caps and cathode for breakage, corrosion or debris; then follow the assembly and re-installation steps below.

Reaction Chamber Assembly and Re-installation:

Step 1: Remove o-rings from end caps, then clean the dielectric glass, end caps and interior of the stainless steel cathode cylinder. Use denatured alcohol and shop towels to clean and be sure to remove all old o-ring debris. A 2" ball hone can be used to clean the major debris out of the cathode if there is heavy buildup.
Note: If the brush's core is intact, but discolored, it is likely fine. The anode foil may also have been discolored from residual oil and heat; it will not require replacement. If there are ragged ends on the foil, trim them off (1/8"-1/4") with a pair of scissors.

Step 2: Prepare the end caps for re-assembly by replacing the o-rings and replacing the Viton washers installed under the elbow fittings.
Notes: A small amount of dielectric silicon lubricant can be used on the o-rings, cathode and/or dielectric glass to make installation easier.
When replacing washers under the elbow fittings, the stainless steel washer is installed first, then the Viton washer. Re-tape the elbow fittings. The stainless steel elbow fitting is used on the non-high voltage (bottom) end cap.
Attach the high voltage lead to the screw and install it onto the high voltage end cap. Thread the hex brush adapter nut, with contact brush attached, onto the interior of the high voltage end cap.

Step 3: Using a gentle twisting motion, press the *non*-high voltage end cap onto the heat sink/cathode assembly until flush with the heat sink cooling fins. Turn the end cap to the correct orientation.

Step 4: Slide the four end cap retaining screws with washers through the holes in the non-high voltage end cap, aligning them with the heat sink screw bosses. Thread screws into screw bosses until heads are snug against the end cap.

Step 5: Next we focus on assembling the rest of the subcomponents before installing them into the reaction chamber. Roll and insert the anode foil into the glass dielectric, center the anode foil in the glass. Secure the foil with a finger against the inside of the glass to keep it centered and insert the contact brush into the dielectric. Insure the foil is centered before fully seating the glass into the high voltage end cap. Clean the glass with denatured alcohol once more, and do not retouch the glass without re-cleaning.

Step 6: Hold the reaction chamber upright on a flat surface, empty side up. Grasp the high voltage end cap and lower the glass into the reaction chamber. Press directly downwards on the high voltage end cap to fully seat the dielectric assembly; the end caps should be flush with the heat sink cooling fins. Turn the end cap to the correct orientation.

Step 7: Slide the four end cap retaining screws with washers through the holes in the end cap, aligning them with the heat sink screw bosses. Thread screws into screw bosses until heads are snug against the end cap.

Step 8: Re-install the complete reaction chamber assembly into the ozone generator by securing the reaction chamber to its mounts, securing delivery line and connecting the high voltage insulated wire. If the ozone generator is a CD15000P, reinstall the 4-20mA control board with bracket, and reconnect disconnected wires. **Note:** Insure the black and red wires are reconnected to the proper slots to prevent damage to the 4-20mA control board.

Annual Maintenance Procedure

FOR USE WITH M1500, CD1500, P2000 & CD2000

Maintenance of the ozone system is critical to its longevity and operating efficiency. Follow the steps below to perform the preventative annual maintenance. If you have additional questions regarding the maintenance of your ozone installation, please consult the operation manual or contact your dealer.

Before you start:

System Shutdown Procedures

Step 1: Turn off power to any peripheral system hydraulic components and air prep system.

Step 2: Turn the Main Power switch on the ozone generator to the "OFF" position.

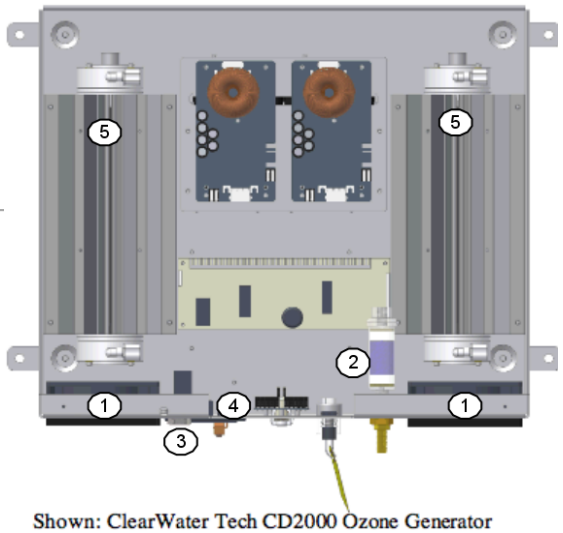
Step 3: Disconnect the power to the ozone system at the service disconnect box (if so equipped), main circuit breaker or by disconnecting the power cord.

Recommended Tools

Nut Driver: 11/32", 3/8"
Screwdrivers: Phillips and flat-head
O-Ring Removal Pick
Hex Key: 7/64", 9/64" (for CD1500)
Wrench: 5/8" or adjustable
2" Ball hone (optional)
Cloth Shop Towel
Denatured Alcohol
Scissors
Teflon Sealing Tape

Video Walkthroughs

Visit our video channel at:
http://www.youtube.com/ClearWaterTech
These, and other procedures are shown.



Shown: ClearWater Tech CD2000 Ozone Generator

Included in this maintenance kit:

Pictured are overview images of the CD2000 and the contents of a CD2000 maintenance kit.

Numbered items correspond to descriptions below and their installed locations within the ozone generator.

M1500, CD1500 & P2000 systems will have similar maintenance kits and generator layouts. They will have differences in quantity of parts and type of circuit boards however the steps will be the same.

The M1500 & CD1500 models will have a single set of o-rings (#5), as the units have one reaction chamber.



Maintenance Will Involve the Following:

1. **Cooling Filter:** Clean or replace the cooling fan filter elements as required.
2. **Inline Particulate Filter:** Remove colored protective caps before installing the new filter. Re-tape threads with Teflon tape. Orientation is universal.
3. **Check Valves:** Replace both check valves (one at the ozone generator and one at the injector). Make note of check valve direction before removing old check valve and reinstall new valve in same direction. Re-tape threads with Teflon tape.
4. **Fuses:** Save the replacement fuses for use as needed.
5. **Reaction Chamber O-Ring Replacement:** See page 2 for reaction chamber maintenance instructions.

Annual Maintenance Procedure

FOR USE WITH M1500, CD1500, P2000 & CD2000

Reaction Chamber Removal and Disassembly:

Note: Read through all the steps before disassembling the reaction chamber.

Step 1: Make sure all power to the ozone generator has been disconnected according to the "System Shutdown Procedures" outlined above.

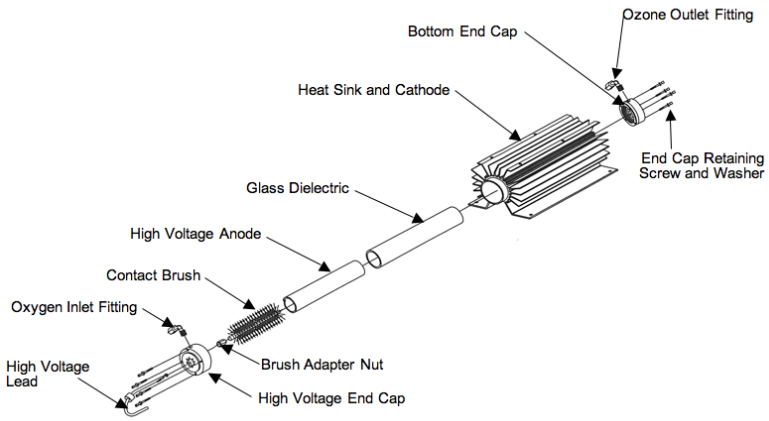
Step 2: Disconnect the white high voltage lead from the black transformer, the black insulation boot will have to be drawn back to expose the connection.

Step 3: Disconnect the tubing connections on both ends of the reaction chamber.

Step 4: Remove the 4 nuts securing each chamber and remove the reaction chamber from ozone generator.

Step 5: Remove retaining screws and washers from the end caps (4 each).

2" Reaction Chamber – Exploded View



Step 6: Using a gentle back-and-forth twisting motion, remove the non-high voltage end cap (the one *without* the high voltage attachment screw) from the heat sink/cathode assembly. A flat-head screwdriver may be used to gently pry the end cap off, as long as equal pressure is applied to each side of the end cap.

Step 7: Remove the high voltage end cap and dielectric from the heat sink/cathode assembly.

Step 8: Draw back the white cap along the white high voltage lead at the end cap, this will expose a screw to be removed. Pull/twist the end cap off the glass. Push the contact brush out of the dielectric glass. Also remove the anode (foil-like material) from within the glass, it may come out with the brush.

Step 9: Inspect the dielectric, foil, end caps and cathode for breakage, corrosion or debris; then follow the assembly and re-installation steps below.

Reaction Chamber Assembly and Re-installation:

Step 1: Remove o-rings from end caps, then clean the dielectric glass, end caps and interior of the stainless steel cathode cylinder. Use denatured alcohol and shop towels to clean the above components and be sure to remove all old o-ring debris. A 2" ball hone can be used to clean the major debris out of the cathode if there is heavy buildup. **Note:** If the brush's core is intact, but discolored, it is likely fine. The anode foil may also have been discolored from residual oil and heat, it will not require replacement. If there are ragged ends on the foil, trim them off (1/8"-1/4") with a pair of scissors.

Step 2: Prepare the end caps for re-assembly by replacing the o-rings. Attach the high voltage lead to the screw and install it onto the high voltage end cap. Thread the hex brush adapter nut, with contact brush attached, onto the interior of the high voltage end cap. Re-tape the threads of the elbow fittings if needed.

Step 3: Using a gentle twisting motion, press the *non*-high voltage end cap onto the heat sink/cathode assembly until flush with the heat sink cooling fins. Turn the end cap to the correct orientation.

Step 4: Slide the four end cap retaining screws with washers through the holes in the non-high voltage end cap, aligning them with the heat sink screw bosses. Thread screws into screw bosses until heads are snug against the end cap.

Step 5: Next we focus on assembling the rest of the subcomponents before installing them into the reaction chamber. Roll and insert the anode foil into the glass dielectric, center the anode foil in the glass. Secure the foil with a finger against the inside of the glass to keep it centered and insert the contact brush into the dielectric. Insure the foil is centered before fully seating the glass into the high voltage end cap. Clean the glass with denatured alcohol once more, and do not retouch the glass without re-cleaning.

Step 6: Hold the reaction chamber upright on a flat surface, empty side up. Grasp the high voltage end cap and lower the glass into the reaction chamber. Press directly downwards on the high voltage end cap to fully seat the dielectric assembly; the end caps should be flush with the heat sink cooling fins. Turn the end cap to the correct orientation.

Step 8: Slide the four end cap retaining screws with washers through the holes in the end cap, aligning them with the heat sink screw bosses. Thread screws into screw bosses until heads are snug against the end cap.

Step 9: Re-install the complete reaction chamber assembly into the ozone generator by securing the reaction chamber to its mounts, securing delivery line and connecting the high voltage insulated wire.

Annual Maintenance Procedure

FOR USE WITH M15/AD & CD15/AD

Maintenance of the ozone system is critical to its longevity and operating efficiency. Follow the steps below to perform the preventative annual maintenance. If you have additional questions regarding the maintenance of your ozone installation, please consult the operation manual or contact your dealer.

Before you start:

System Shutdown Procedures

Step 1: Turn off power to any peripheral system hydraulic components and air prep system.

Step 2: Turn the Main Power switch on the ozone generator to the "OFF" position. The LED display on the front cover should *not* be illuminated.

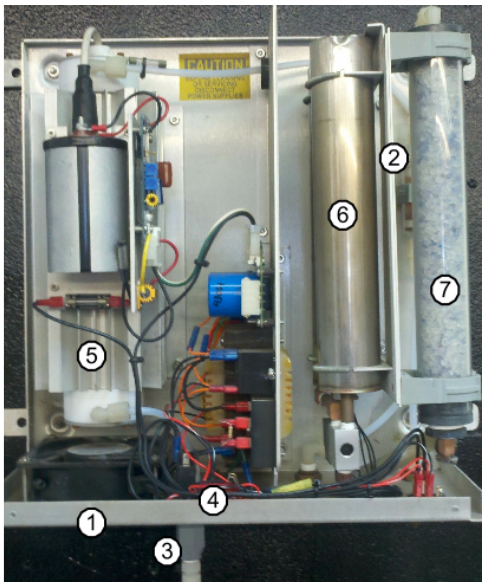
Step 3: Disconnect the power to the ozone system at the service disconnect box (if so equipped), main circuit breaker or by disconnecting the power cord.

Recommended Tools

Nut Drivers: 11/32", 3/8"
Screwdrivers: Phillips and flat-head
O-Ring Removal Pick
Hex Key: 7/64", 9/64"
Marking Pen
Wrench: 5/8" or adjustable
2" Ball hone (optional)
Channel lock-type Pliers
Snap Ring Pliers
Cloth Shop Towel
Denatured Alcohol
Scissors
Teflon Sealing Tape

Video Walkthroughs

Visit our video channel at:
http://www.youtube.com/ClearWaterTech
These, and other procedures are shown.



Included in this maintenance kit:

Pictured are overview images of the M15/AD and the contents of a M15/AD maintenance kit.

Numbered items correspond to descriptions below and their installed locations within the ozone generator.

M15/AD & CD15/AD systems will have the same maintenance kits and generator layouts. The difference between the systems are the drive systems and control options. Maintenance steps are the same.

Maintenance Will Involve the Following:

1. **Cooling Filter:** Clean or replace the cooling fan filter elements as required.
2. **Inline Particulate Filter:** Remove colored protective caps before installing the new filter. Re-tape threads with Teflon tape. Orientation is universal.
3. **Check Valves:** Replace both check valves, one at the ozone generator and one at the injector. Make note of check valve direction before removing old check valve and reinstall new valve in same direction. Re-tape threads with Teflon tape.
4. **Fuses:** Save the replacement fuses for use as needed.
5. **Reaction Chamber O-Ring Replacement:** See page 2 for reaction chamber maintenance instructions.
6. **Air Dryer Media:** See page 3 for air preparation maintenance instructions.
7. **Indicating Media:** See page 3 for air preparation maintenance instructions.



Annual Maintenance Procedure

FOR USE WITH M15/AD & CD15/AD

Reaction Chamber Removal and Disassembly:

Note: Read through all the steps before disassembling the reaction chamber.

Step 1: Make sure all power to the ozone generator has been disconnected according to the "System Shutdown Procedures" outlined above.

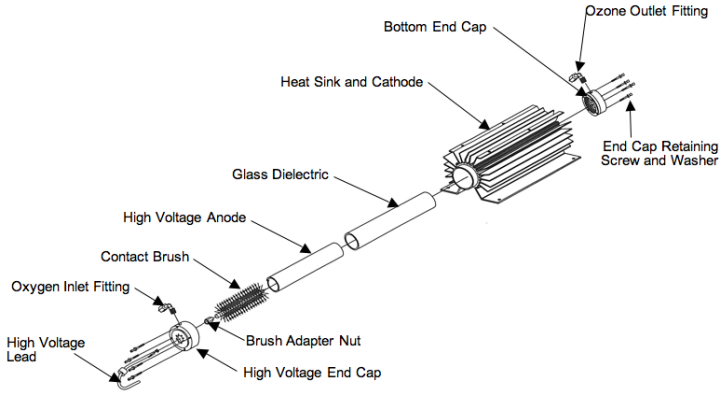
Step 2: Disconnect the white high voltage lead from the black transformer, the black insulation boot will have to be drawn back to expose the connection.

Step 3: Disconnect the tubing connections on both ends of the reaction chamber.

Step 4: If rebuilding a M15/AD: Disconnect wires from the drive module, you may leave it attached to the reaction chamber for this process.
If rebuilding a CD15/AD: Disconnect wire connections to the drive board and remove the 4-20mA control board with mounting bracket from the reaction chamber.

Step 5: Remove the 4 nuts securing the chamber and remove the reaction chamber from ozone generator.

2" Reaction Chamber – Exploded View



Step 6: Remove retaining screws and washers from the end caps (4 each).

Step 7: Using a gentle back-and-forth twisting motion, remove the non-high voltage end cap (the one *without* the high voltage attachment screw) from the heat sink/cathode assembly. A flat-head screwdriver may be used to gently pry the end cap off, as long as equal pressure is applied to each side of the end cap.

Step 8: Remove the high voltage end cap and dielectric from the heat sink/cathode assembly.

Step 9: Draw back the white cap along the white high voltage lead at the end cap, this will expose a screw to be removed. Pull/twist the end cap off the glass. Push the contact brush out of the dielectric glass. Also remove the anode (foil-like material) from within the glass, it may come out with the brush.

Step 10: Inspect the dielectric, foil, end caps and cathode for breakage, corrosion or debris; then follow the assembly and re-installation steps below.

Reaction Chamber Assembly and Re-installation:

Step 1: Remove o-rings from end caps, then clean the dielectric glass, end caps and interior of the stainless steel cathode cylinder. Use denatured alcohol and shop towels to clean the above components and be sure to remove all old o-ring debris. A 2" ball hone can be used to clean the major debris out of the cathode if there is heavy buildup. **Note:** If the brush's core is intact, but discolored, it is likely fine. The anode foil may also have been discolored from residual oil and heat, it will not require replacement. If there are ragged ends on the foil, trim them off (1/8"-1/4") with a pair of scissors.

Step 2: Prepare the end caps for re-assembly by replacing the o-rings. Attach the high voltage lead to the screw and install it onto the high voltage end cap. Thread the hex brush adapter nut, with contact brush attached, onto the interior of the high voltage end cap. Re-tape the threads of the elbow fittings if needed.

Step 3: Using a gentle twisting motion, press the *non*-high voltage end cap onto the heat sink/cathode assembly until flush with the heat sink cooling fins. Turn the end cap to the correct orientation.

Step 4: Slide the four end cap retaining screws with washers through the holes in the non-high voltage end cap, aligning them with the heat sink screw bosses. Thread screws into screw bosses until heads are snug against the end cap.

Step 5: Next we focus on assembling the rest of the subcomponents before installing them into the reaction chamber. Roll and insert the anode foil into the glass dielectric, center the anode foil in the glass. Secure the foil with a finger against the inside of the glass to keep it centered and insert the contact brush into the dielectric. Insure the foil is centered before fully seating the glass into the high voltage end cap. Clean the glass with denatured alcohol once more, and do not retouch the glass without re-cleaning.

Step 6: Hold the reaction chamber upright on a flat surface, empty side up. Grasp the high voltage end cap and lower the glass into the reaction chamber. Press directly downwards on the high voltage end cap to fully seat the dielectric assembly; the end caps should be flush with the heat sink cooling fins. Turn the end cap to the correct orientation.

Step 8: Slide the four end cap retaining screws with washers through the holes in the end cap, aligning them with the heat sink screw bosses. Thread screws into screw bosses until heads are snug against the end cap.

Step 9: Re-install the complete reaction chamber assembly into the ozone generator by securing the reaction chamber to its mounts, reinstalling the delivery line and connecting the drive board and high voltage insulated wires. For CD15/AD: Reinstall the 4-20mA control board with bracket, and reconnect disconnected wires. **Note:** Insure the black and red wires are reconnected to the proper slots to prevent damage to the 4-20mA control board.

Annual Maintenance Procedure

FOR USE WITH M15/AD & CD15/AD

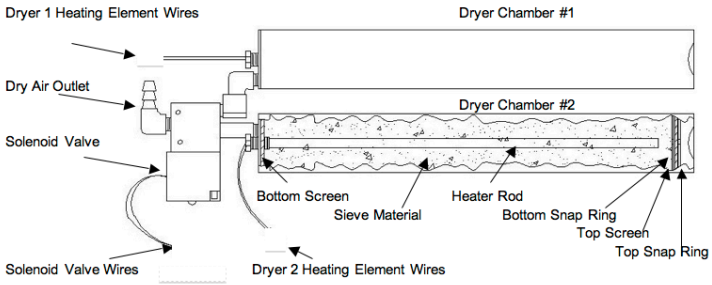
Air Preparation System

The tan colored beads in the maintenance kit are an air dryer desiccant. The blue and white media is typically called indicating media. It is silica gel and acts as an indicator of the health of the air dryers.

If the air dryer desiccant requires replacement, moisture will be present in the dryer's output. The silica media will absorb the moisture and will change the blue crystals to pink, then white. If the indicating media has changed color, this maintenance of replacing the media should resolve the issue and restore proper ozone output. If the indicating media has yet to change color, it is recommended to replace the air dryer media for preventative maintenance. The indicating crystals can be saved for future use, or installed; it is optional in this case.

Air Dryer Desiccant Replacement

Note: You will need to remove the unit from the wall in order to pour out the media. Allow the air dryer chambers to cool completely and read all steps before continuing.



Step 1: Straighten out the ends of the dryer chambers using pliers.

Step 2: Using a snap ring tool, remove the top snap rings.

Step 3: Remove the top screens; the o-ring pick is handy for this. The bottom snap ring may be left remaining within the air dryer chambers.

Step 4: Turn the ozone generator over to pour the old sieve material from the dryer chambers and dispose. **Note:** When removing the sieve material, be sure not to discard the bottom screens.

Step 5: Re-seat/Re-install the bottom screens. **Note:** The heater rod must be put through the center of the bottom screens.

Step 6: Fill chamber with new sieve material to 3/4" to 1" below the top of the dryer chambers. You will have more media than needed.

Step 7: Re-install the top screens.

Step 8: Using a snap ring tool, place the top snap rings snug against the top screen.

Step 9: Bend the ends of the dryer chambers in-ward for added retention of the sieve material (optional).

Step 10: The ozone generator must be turned on for 24 hours prior to system start-up to eliminate any moisture trapped in the new sieve material.

Indicating Media Replacement

Step 1: Using wrench, loosen and disconnect the compression fitting located at the top of the indicating media chamber.

Step 2: With a flat-head screwdriver, unlock the two gray clamps securing the indicating media chamber.

Step 3: Pull the chamber free of the clamps, the chamber will only be held within the unit by the bottom cap. Rotate the chamber downwards to position the bottom cap to be at the top of the chamber.

Step 4: Secure the bottom cap with channel lock pliers and turn the chamber counter-clockwise to unscrew it. Be mindful to not spill the indicating media.

Step 5: Remove the indicating chamber from the unit, **remove the interior screen** and dispose of the media.

Step 6: Remove the Teflon tape from the bottom cap's threads and re-tape the threads with 2-3 wraps.

Step 7: Refill the indicating chamber with new blue and white indicating crystals. You will have more media than needed.

Step 8: Replace the interior screen and reinstall the chamber following steps 1 through 4 in reverse order.

Annual Maintenance Procedure

FOR USE WITH ECO1 & ECO2

Maintenance of the ozone system is critical to its longevity and operating efficiency. Follow the steps below to perform the preventative annual maintenance. If you have additional questions regarding the maintenance of your ozone installation, please consult the operation manual or contact your dealer.

Before you start:

System Shutdown Procedures

Step 1: Turn off power to any peripheral system hydraulic components and air prep system.

Step 2: Turn the Main Power switch on the ozone generator to the "OFF" position. The LED display on the front cover should *not* be illuminated.

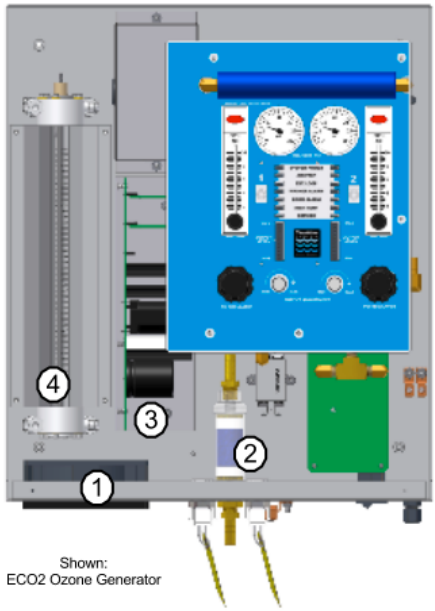
Step 3: Disconnect the power to the ozone system at the service disconnect box (if so equipped), main circuit breaker or by disconnecting the power cord.

Recommended Tools

Nut Drivers: 5/16", 11/32"
Screwdrivers: Phillips and flat-head
O-Ring Removal Pick
Hex Key: 7/64"
Marking Pen
Wrench: 5/8" or adjustable
1" Ball hone (optional)
Cloth Shop Towel
Denatured Alcohol
Teflon Sealing Tape

Video Walkthroughs

Visit our video channel at:
http://www.youtube.com/ClearWaterTech
These, and other procedures are shown.



Shown:
ECO2 Ozone Generator

Included in this maintenance kit:

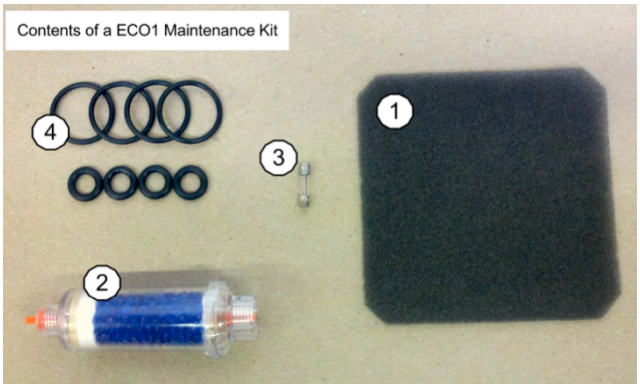
Pictured are the contents of an ECO2 maintenance kit and an overview image of the ECO2 ozone generator.

Numbered items correspond to descriptions below and their installed locations within the ozone generator.

ECO1 & ECO2 systems will have similar maintenance kits and generator layouts. They will have differences in quantity of parts, however the steps will be the same.

Maintenance Will Involve the Following:

1. **Cooling Filter:** Clean or replace the cooling fan filter elements as required.
2. **Inline Particulate Filter:** Remove colored protective caps before installing the new filter. Re-tape threads with Teflon tape. Orientation is universal.
3. **Fuses:** Save the replacement fuses for use as needed.
4. **Reaction Chamber O-Ring Replacement:** See page 2 for reaction chamber maintenance instructions.

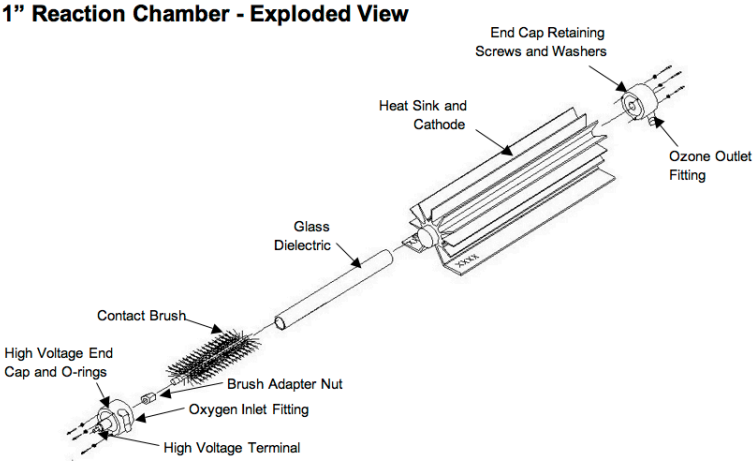


Annual Maintenance Procedure

FOR USE WITH ECO1 & ECO2

Reaction Chamber Removal and Disassembly:

1" Reaction Chamber - Exploded View



Note: Read through all the steps before disassembling the reaction chamber.

Step 1: Make sure all power to the ozone generator has been disconnected according to the "System Shutdown Procedures" outlined above.

Step 2: Disconnect the high voltage lead from the reaction chamber(s).

Step 3: Disconnect the tubing connections on both ends of the reaction chamber(s).

Step 4: Remove the 4 nuts securing each chamber and remove the reaction chamber from ozone generator.

Step 5: Make note or mark the position of the end caps and their elbow fittings on the reaction chambers, during re-assembly the end caps will need to return to original positions.

Step 6: Remove retaining screws and washers from the two end caps (3 each).

Step 7: Using a gentle back-and-forth twisting motion, remove the non-high voltage end cap (the one *without* the high voltage attachment screw) from the heat sink/cathode assembly. A flat-head screwdriver may be used to gently pry the end cap off, as long as equal pressure is applied to each side of the end cap.

Step 8: Remove the high voltage end cap and dielectric from the heat sink/cathode assembly.

Step 9: The high voltage end cap can be removed by holding the glass and turning the end cap counter-clockwise approximately 6 turns. Pull the end cap off the glass. Push the contact brush out of the dielectric glass. A screwdriver can be used to push the brush, and pliers to pull it out once the opposing end is exposed.

Step 10: Inspect the dielectric, end caps and cathode for breakage, corrosion or debris; then follow the assembly and re-installation steps below.

Reaction Chamber Assembly and Re-installation:

Step 1: Remove o-rings from end caps, clean the dielectric glass, end caps and interior of the stainless steel cathode cylinder. Use denatured alcohol, shop towels to clean and be sure to remove all old o-ring debris. A 1" ball hone can be used to clean the major debris out of the cathode if there is heavy buildup.

Step 2: Prepare the end caps for re-assembly by replacing the o-rings. Thread the hex brush adapter nut, with contact brush attached, onto the end of the high voltage end cap (cap with the high voltage attachment screw) center screw. Re-tape the threads of the elbow fittings if needed.

Step 3: Using a gentle twisting motion, press the *non*-high voltage end cap onto the heat sink/cathode assembly until flush with the heat sink cooling fins. Turn the end cap to the correct orientation.

Step 4: Slide the three end cap retaining screws with washers through the holes in the non-high voltage end cap, aligning them with the heat sink screw bosses. Thread screws into screw bosses until heads are snug against the end cap.

Step 5: Next we focus on assembling the rest of the subcomponents, before installing them into the reaction chamber. *Slowly* insert the brush (installed onto the high voltage end cap) into the dielectric glass. **Note:** Go slowly in order to prevent or minimize bending the center wire of the brush during this procedure. It is normal for the bristles to bend flat against the dielectric glass. Fully seat the dielectric glass into the high voltage end cap. Clean the glass with denatured alcohol once more, and do not retouch the glass without re-cleaning.

Step 6: Hold the reaction chamber upright on a flat surface, empty high voltage side up. Grasp the high voltage end cap and lower the glass into the reaction chamber. Press directly downwards on the high voltage end cap to fully seat the dielectric assembly; the end caps should be flush with the heat sink cooling fins. Turn the end cap to the correct orientation.

Step 8: Slide the three end cap retaining screws with washers through the holes in the end cap, aligning them with the heat sink screw bosses. Thread screws into screw bosses until heads are snug against the end cap.

Step 9: Re-install the complete reaction chamber assembly into the ozone generator by securing the reaction chamber to its mounts, securing delivery line and connecting the high voltage insulated wire.

Annual Maintenance Procedure

FOR USE WITH ECO3 & ECO4

Maintenance of the ozone system is critical to its longevity and operating efficiency. Follow the steps below to perform the preventative annual maintenance. If you have additional questions regarding the maintenance of your ozone installation, please consult the operation manual or contact your dealer.

Before you start:

System Shutdown Procedures

Step 1: Turn off power to any peripheral system hydraulic components and air prep system.

Step 2: Turn the Main Power switch on the ozone generator to the "OFF" position. The LED display on the front cover should *not* be illuminated.

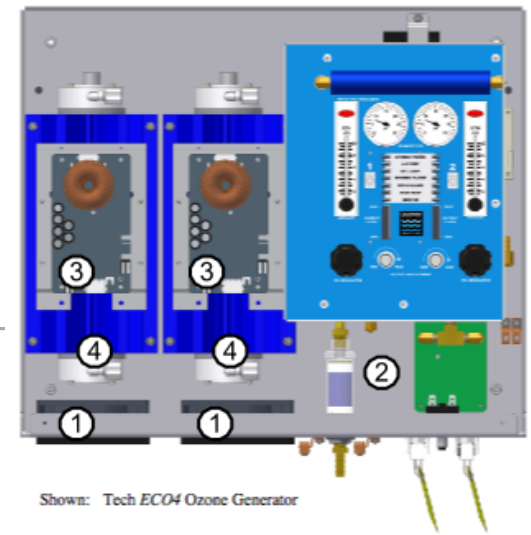
Step 3: Disconnect the power to the ozone system at the service disconnect box (if so equipped), main circuit breaker or by disconnecting the power cord.

Recommended Tools

Nut Driver: 11/32"
Screwdrivers: Phillips and flat-head
O-Ring Removal Pick
Hex Key: 7/64"
Wrench: 5/8" or adjustable
2" Ball hone (optional)
Cloth Shop Towel
Denatured Alcohol
Scissors
Teflon Sealing Tape

Video Walkthroughs

Visit our video channel at:
http://www.youtube.com/ClearWaterTech
These, and other procedures are shown.



Shown: Tech *ECO4* Ozone Generator

Included in this maintenance kit:

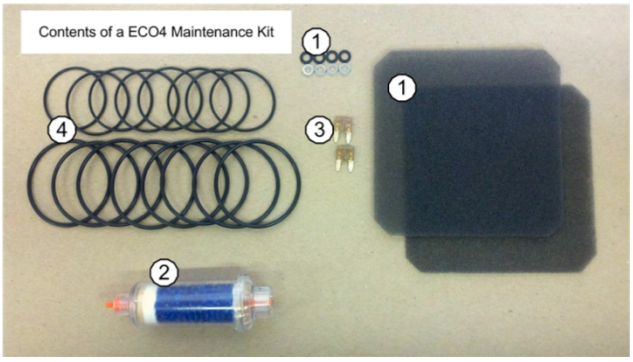
Pictured are the contents of an ECO4 maintenance kit and an overview image of the ECO4 ozone generator.

Numbered items correspond to descriptions below and their installed locations within the ozone generator.

ECO3 & ECO4 systems will have similar maintenance kits and generator layouts. They will have differences in quantity of parts, however the steps will be the same.

Maintenance Will Involve the Following:

1. **Cooling Filter:** Clean or replace the cooling fan filter elements as required.
2. **Inline Particulate Filter:** Remove colored protective caps before installing the new filter. Re-tape threads with Teflon tape. Orientation is universal.
3. **Fuses:** Save the replacement fuses for use as needed.
4. **Reaction Chamber O-Ring Replacement:** See page 2 for reaction chamber maintenance instructions.

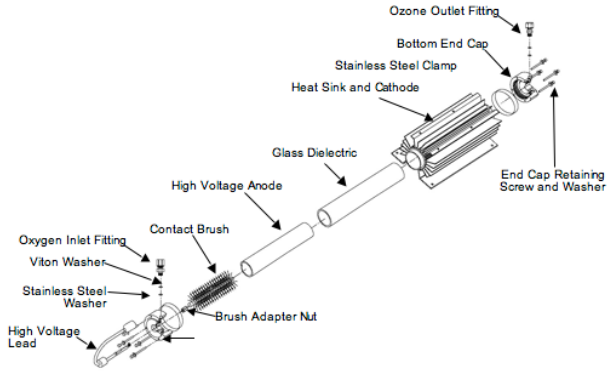


Annual Maintenance Procedure

FOR USE WITH ECO3 & ECO4

Reaction Chamber Removal and Disassembly:

2" Pressurized Reaction Chamber – Exploded View



Note: Read through all the steps before disassembling the reaction chamber.

Step 1: Make sure all power to the ozone generator has been disconnected according to the "System Shutdown Procedures" outlined above.

Step 2: Disconnect the white high voltage lead from the black transformer, the black insulation boot will have to be drawn back to expose the connection.

Step 3: Disconnect the 3-wire plug and ribbon cable from the drive board mounted to the reaction chamber. The drive module can be removed from the reaction chamber by removing the 4 screws on the mounting plate. Removal of the drive module is recommended.

Step 3: Disconnect the tubing connections on both ends of the reaction chamber.

Step 4: Remove the 4 nuts securing each chamber and remove the reaction chamber from ozone generator. **Note:** The ECO4 will only have 3 nuts securing the right-side reaction chamber.

Step 5: Remove retaining screws and washers from the end caps (4 each).

Step 6: Using a gentle back-and-forth twisting motion, remove the non-high voltage end cap (the one *without* the high voltage attachment screw) from the heat sink/cathode assembly. A flat-head screwdriver may be used to gently pry the end cap off, as long as equal pressure is applied to each side of the end cap. **Note:** The stainless steel straps should not be removed.

Step 7: Remove the high voltage end cap and dielectric from the heat sink/cathode assembly.

Step 8: Draw back the white cap along the white high voltage lead at the end cap, this will expose a screw to be removed. Pull/twist the end cap off the glass. Push the contact brush out of the dielectric glass. Also remove the anode (foil-like material) from within the glass, it may come out with the brush.

Step 9: Inspect the dielectric, foil, end caps and cathode for breakage, corrosion or debris; then follow the assembly and re-installation steps below.

Reaction Chamber Assembly and Re-installation:

Step 1: Remove o-rings from end caps, then clean the dielectric glass, end caps and interior of the stainless steel cathode cylinder. Use denatured alcohol and shop towels to clean and be sure to remove all old o-ring debris. A 2" ball hone can be used to clean the major debris out of the cathode if there is heavy buildup. **Note:** If the brush's core is intact, but discolored, it is likely fine. The anode foil may also have been discolored from residual oil and heat; it will not require replacement. If there are ragged ends on the foil, trim them off (1/8"-1/4") with a pair of scissors.

Step 2: Prepare the end caps for re-assembly by replacing the o-rings and replacing the Viton washers installed under the elbow fittings.
Notes: A small amount of dielectric silicon lubricant can be used on the o-rings, cathode and/or dielectric glass to make installation easier.
When replacing washers under the elbow fittings, the stainless steel washer is installed first, then the Viton washer. Re-tape the elbow fittings. The stainless steel elbow fitting is used on the non-high voltage (bottom) end cap.
Attach the high voltage lead to the screw and install it onto the high voltage end cap. Thread the hex brush adapter nut, with contact brush attached, onto the interior of the high voltage end cap.

Step 3: Using a gentle twisting motion, press the *non*-high voltage end cap onto the heat sink/cathode assembly until flush with the heat sink cooling fins. Turn the end cap to the correct orientation.

Step 4: Slide the four end cap retaining screws with washers through the holes in the non-high voltage end cap, aligning them with the heat sink screw bosses. Thread screws into screw bosses until heads are snug against the end cap.

Step 5: Next we focus on assembling the rest of the subcomponents before installing them into the reaction chamber. Roll and insert the anode foil into the glass dielectric, center the anode foil in the glass. Secure the foil with a finger against the inside of the glass to keep it centered and insert the contact brush into the dielectric. Insure the foil is centered before fully seating the glass into the high voltage end cap. Clean the glass with denatured alcohol once more, and do not retouch the glass without re-cleaning.

Step 6: Hold the reaction chamber upright on a flat surface, empty side up. Grasp the high voltage end cap and lower the glass into the reaction chamber. Press directly downwards on the high voltage end cap to fully seat the dielectric assembly; the end caps should be flush with the heat sink cooling fins. Turn the end cap to the correct orientation.

Step 7: Slide the four end cap retaining screws with washers through the holes in the end cap, aligning them with the heat sink screw bosses. Thread screws into screw bosses until heads are snug against the end cap.

Step 8: Re-install the complete reaction chamber assembly into the ozone generator by securing the reaction chamber to its mounts, securing delivery line, remounting the drive module (if removed), reconnecting of the 3-wire plug and cable and connecting the high voltage insulated wire.

DIELECTRIC INSTALLATION INSTRUCTIONS
RCC71SA, RCC73SA and RCC76SA

1" Reaction Chamber, See Figure 1. 2" Reaction Chambers (Vacuum and Pressurized), See Figure 2

Step 1: Make sure the glass dielectric is clean (free of dust, dirt, grease, oils, etc.).

Step 2: Clean and hone the reaction chamber cathode.

Step 3: Prepare the end caps for re-assembly by cleaning the end caps and replacing the O-rings. Thread the hex brush adapter nut, with contact brush attached, onto the end of the high voltage end cap (2" RC: end cap with the high voltage white power lead attached. 1" RC: end cap with the high voltage attachment screw) center screw. **Note: Do not remove the stainless steel clamp from the pressurized reaction chamber end caps.**

Step 4: Using a gentle twisting motion, press the *non*-high voltage end cap onto the heat sink/cathode assembly until flush with the heat sink cooling fins. **Note: The end cap must be orientated correctly on the heat sink/cathode assembly.**

Step 5: Slide the end cap retaining screws through the holes in the non-high voltage end cap, aligning them with the heat sink screw bosses. Thread screws into screw bosses until heads are snug against the end cap.

Step 6: **1" Reaction Chamber Only:** *Slowly* insert the brush (installed onto the high voltage end cap) into the dielectric glass. **Note:** Go slowly in order to prevent or minimize bending the center wire of the brush during this procedure. It is normal for the bristles to bend flat against the dielectric glass. Fully seat the dielectric glass into the high voltage end cap. Clean the glass with denatured alcohol once more, and do not retouch the glass without re-cleaning.

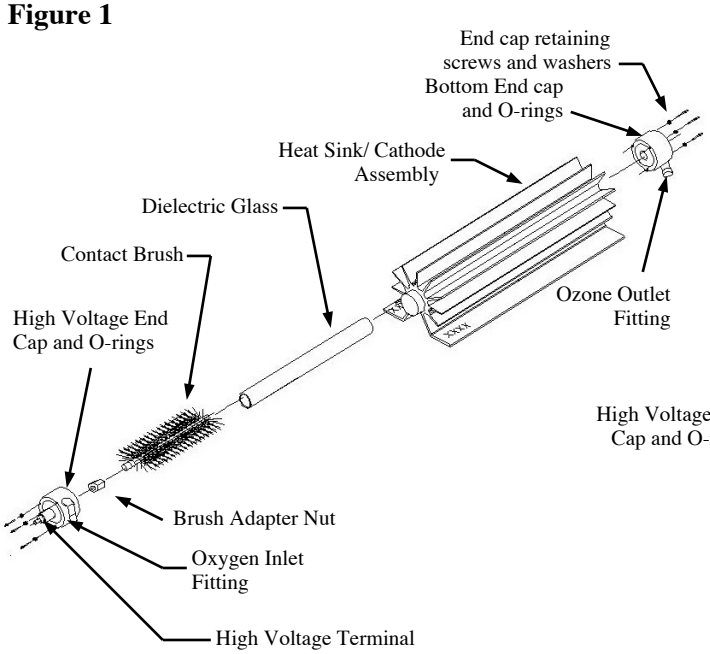
2" Reaction Chamber Only: Roll the high voltage anode (foil-like material) lengthwise, preserving the *longer* dimension. Insert the rolled anode into the dielectric glass. Center the anode in the dielectric glass (approximately 1/2" from either end of the glass), making sure it is rolled squarely. Secure the anode with a finger against the inside of the glass and insert the contact brush into the dielectric. Insure the anode is centered before fully seating the glass into the high voltage end cap. Clean the glass with denatured alcohol once more, and do not retouch the glass without re-cleaning.

Step 7: Hold the reaction chamber upright on a flat surface, empty side up. Grasp the high voltage end cap and lower the glass into the reaction chamber. Press directly downwards on the high voltage end cap to fully seat the dielectric assembly; the end caps should be flush with the heat sink cooling fins. Turn the end cap to the correct orientation.

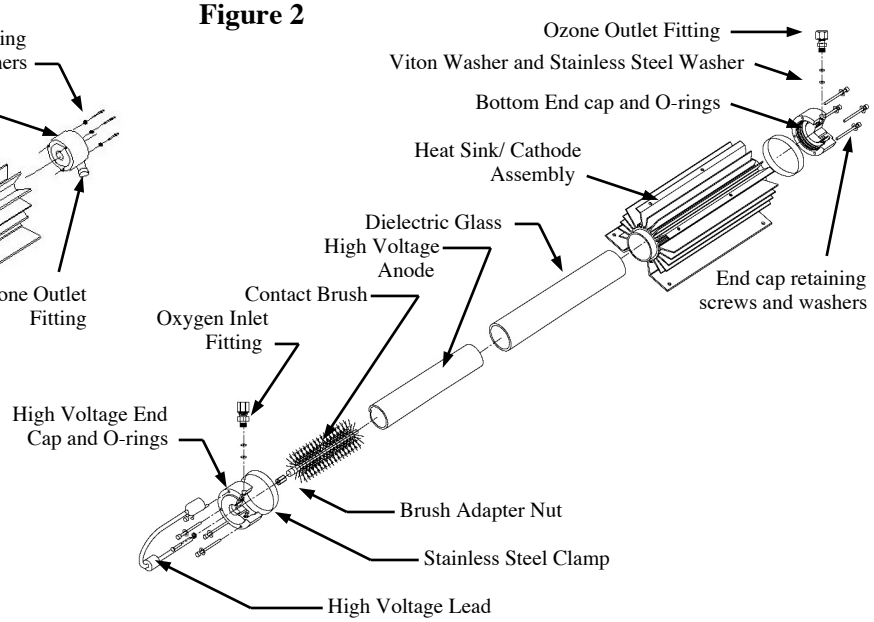
Step 8: Slide the end cap retaining screws through the holes in the end cap, aligning them with the heat sink screw bosses. Thread screws into screw bosses until heads are snug against the end cap.

Step 9: Re-install complete reaction chamber assembly into the ozone generator.

1" Reaction Chamber Exploded View
Figure 1



2" Reaction Chamber Exploded View
Figure 2



Shown: 2" Pressurized Reaction Chamber. Note: Viton washers, Stainless Steel washers and Stainless Steel Clamps are not used with the 2" Vacuum Reaction Chamber

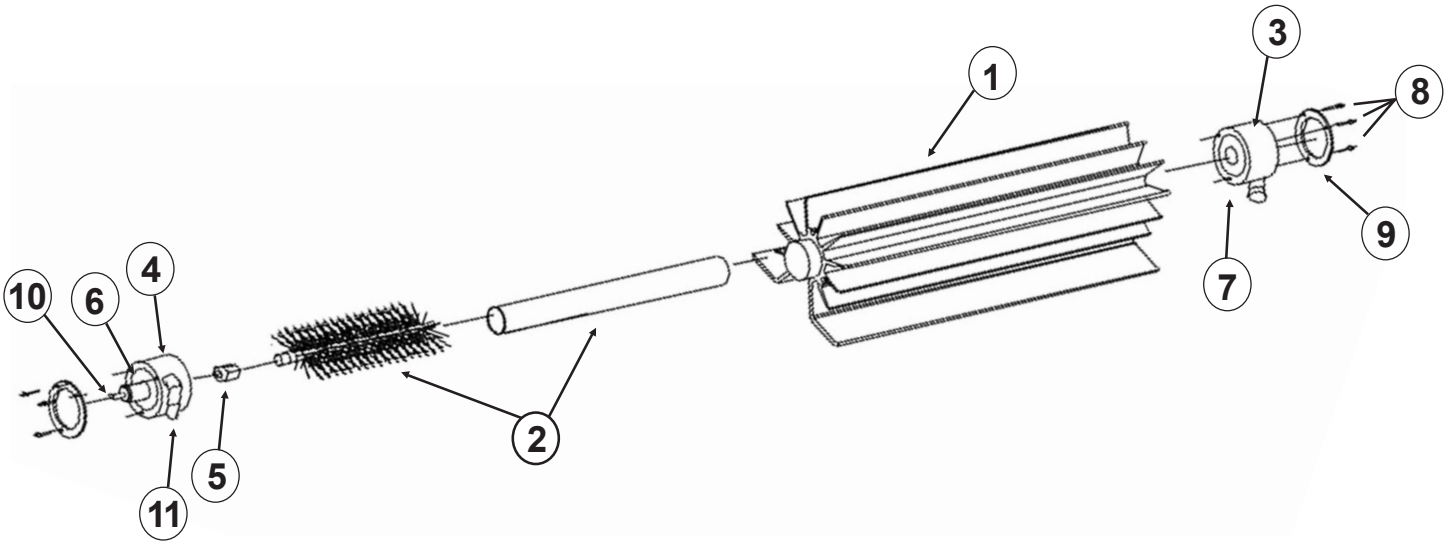
ClearWater Tech, LLC.
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850-E Capitolio Way, San Luis Obispo, CA 93401 • email: service@cwtozone.com • www.cwtozone.com

LIT65 • REV071212

1” Vacuum Operated Reaction Chamber

FIND#	QTY.	PART#	DESCRIPTION
1	1	RCC250	CD Chamber, 1”, Heat sink and S.S. Cathode
2	1	RCC76	Dielectric Assembly, 1" Reaction Chamber
3	1	RCC57	Teflon End Cap Assembly 1” Non High Voltage
4	1	RCC53	Teflon End Cap Assembly 1” High Voltage
5	1	HWNO97	Nut, 5/16 High Voltage Adaptor, Brush Nut
6	1	HWSO03	Stand off, 1/2" x 3/4" Nylon
7	1	ORS50	O-Ring Set
8	6	HWS2009	Hardware Screw, #6-32 x 1 1/4 SHCS Black Alloy
9	2	CWT30001	Washer, Grammar End Cap Retaining Washer
10	1	HTS321	Hardware, Threaded Stud 6-32 x 1- 3/4” Stainless
11	2	FTK325	Fitting, 1/8” MPT x 1/4” comp 90º Elbow, Rynar

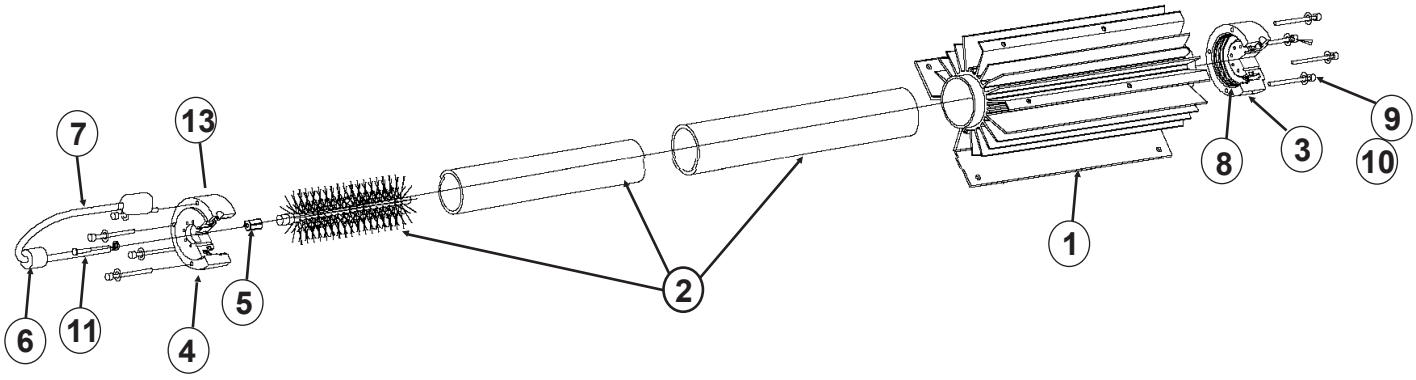
ENLARGED VIEW – 1” VACUUM OPERATED REACTION CHAMBER



2” Vacuum Operated Reaction Chamber

FIND#	QTY.	PART#	DESCRIPTION
1	1	RCC200	CD Chamber, 2", Heatsink and S.S. Cathode Assembly
2	1	RCC73	Dielectric Assembly, 2” Vacuum Operated Reaction Chamber Anode (REV’s 2, 3, 4)
3	1	RCC107	Teflon End Cap Assembly, 2" Non High Voltage, Vacuum Operated Reaction Chamber
4	1	RCC102	Teflon End Cap Assembly, 2" High Voltage, Vacuum Operated Reaction Chamber
5	1	HWNO97	Nut, 5/16 High Voltage Adaptor, Brush Nut
6	1	RCC120	H.V. Lead Cap, 2" Reaction Chamber, Teflon
7	1	RCC85	H.V. Lead, 2" Reaction Chamber
8	1	ORS30	O-Ring Set
9	8	HWS2012	Screw, #6-32 x 2” Long, SHCS Black Alloy
10	8	HWW9003	Washer, Flat Brass, #6
11	1	HWS2006	Screw, #6-32 x 3/4 Pan Phil, S.S.

ENLARGED VIEW – 2” REACTION CHAMBER

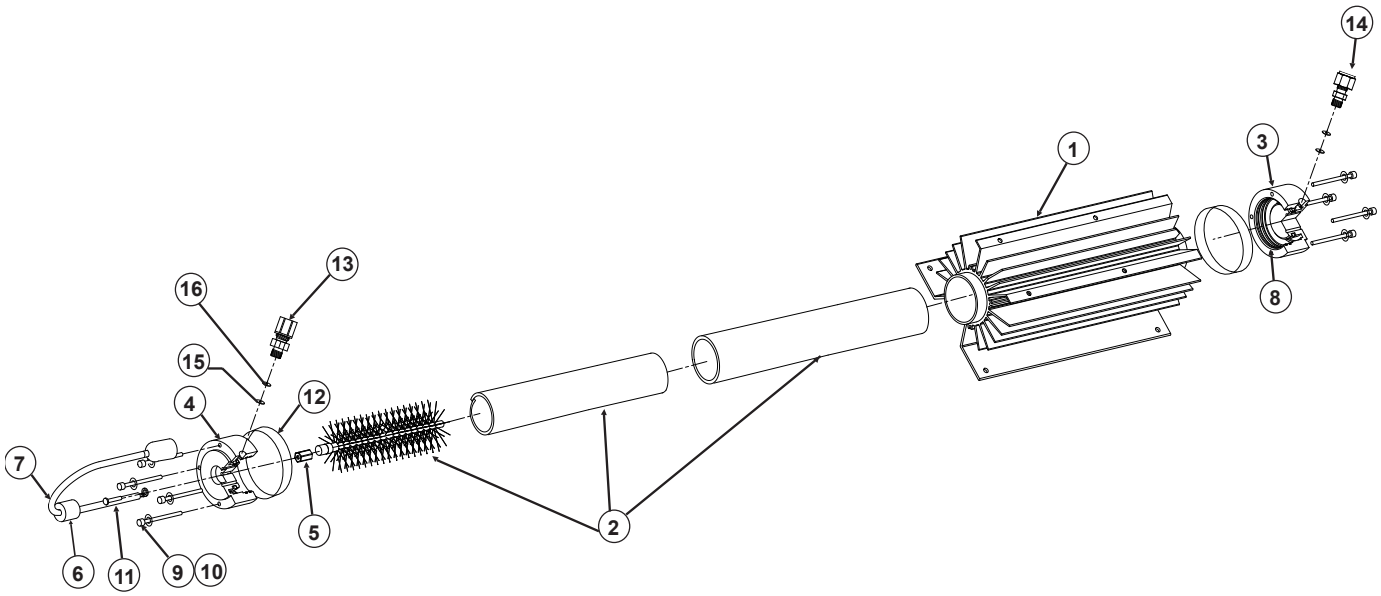


2” Pressure Operated Reaction Chamber

FIND#	QTY.	PART#	DESCRIPTION
1	1	RCC210	CD Chamber, 1”, Heat sink & S.S. Cathode
2	1	RCC71	Dielectric Assembly for 2" Pressure Operated Reaction Chamber
3	1	RCC115	Teflon End Cap Assembly 2” Non High Voltage, Pressure Operated Reaction Chamber
4	1	RCC110	Teflon End Cap Assembly 2” High Voltage, Pressure Operated Reaction Chamber
5	1	HWNO97	Nut, 5/16 High Voltage Adaptor, Brush Nut
6	1	RCC120	H.V. Lead Cap, 2" Reaction Chamber, Teflon
7	1	RCC85	H.V. Lead, 2" Reaction Chamber
8	1	ORS40	O-Ring Set
9	8	HWS2012	Screw, #6 - 32 x 2" Long, SHCS Black Alloy
10	8	HWW9003	Washer, Flat Brass, #6
11	1	HWS2006	Screw, #6 - 32 x 3/4" Pan Phil, S.S.
12	2	WRT16	Stainless Steel Clamp
13	1	FTK320	Fitting, 1/8" mpt x 1/4" comp, Kynar
14	1	FTS325	Fitting, 1/8" mpt x 1/4" comp, S.S.
15	2	HWW08001	Washer, Flat S.S., 1/4"
16	2	HSW100	Washer, Flat Viton, 1/4"

***NOTE: Inlet and outlet fitting will differ with unit.**

ENLARGED VIEW – 2” PRESSURE OPERATED REACTION CHAMBER



Maintenance Kits

Maintenance of ClearWater Tech ozone systems is critical to longevity and operating efficiency. While all system components are built to provide years of reliable service, minimum maintenance is strongly recommended.

MAINTENANCE KITS
ClearWater Tech also provides complete maintenance kits, which include all parts required for routine annual maintenance of all individual ozone generators and related equipment.

Important: With a commitment to providing the most technologically advanced products available, some important design changes have been made to our products. These modifications have affected the parts that are included in our maintenance kits. To insure you receive the maintenance kit that is correctly matched to the equipment being serviced, match the model and serial number of your unit with the part number below. If you need help to find the correct kit, please have the serial number and model number available and contact the ClearWater Tech Service Department.

Part Number	*Catalog Description*
ASP100	Maintenance kit - UV2800, unsealed lamp
ASP102	Maintenance kit - UV2800, sealed lamp
ASP110A	Maintenance kit - CD10AD, SN 96284 - 31443 to 98296 - 42597
ASP110B	Maintenance kit - CD10AD, SN 98307 - 42858 to current
ASP111A	Maintenance kit - CD10, SN 96242 - 30824 to 98156 - 40612
ASP111B	Maintenance kit - CD10, SN 98348 - 43643 to current
ASP112	Maintenance kit - CD12, SN 98300 - 42710 to current
ASP120A	Maintenance kit - M15AD, SN 95144 - 25996 to 97336 - 37590
ASP120B	Maintenance kit - M15AD and CD15AD, SN 97342 - 37687 to 99146 – 46043
ASP120C	Maintenance kit - M15AD and CD15AD, SN 99179 - 46783 to 99242 - 47949
ASP120D	Maintenance kit - M15AD and CD15AD, SN 99242 - 47950 to current
ASP125A	Maintenance kit - M1500, SN 95137 - 25905 to 97342 - 37718
ASP125B	Maintenance kit - M1500 and CD1500, SN 98019-38128 to 99155 - 46101
ASP125C	Maintenance kit - M1500 and CD1500, SN 99173 - 46692 to 01278 - 62928
ASP125D	Maintenance kit - M1500 and CD1500, SN 01344 - 64102 to current
ASP128A	Maintenance kit - P2000, SN 95164 - 26257 to 97336 - 37584
ASP128B	Maintenance kit - P2000 and CD2000, SN 97338 - 37653 to 99125 – 45732
ASP128C	Maintenance kit - P2000, SN 99218 - 47552 to 01045 - 59325
ASP128D	Maintenance kit - CD2000, SN 99172 - 46527 to 01352 - 64339
ASP128E	Maintenance kit - P2000, SN 01117 - 60608 to current
ASP128F	Maintenance kit - CD2000, SN 02018 - 64638 to current
ASP140A	Maintenance kit - M15/O2, SN 95151 - 26023 to 97231 - 35630
ASP140B	Maintenance kit - M15/O2, SN 98127 - 40042 to 99104 - 45444
ASP140C	Maintenance kit - M15/O2 and CD15/O2, SN 99260 - 48597 to 01344 - 64104
ASP140D	Maintenance kit - M15/O2 and CD15/O2, SN 02029 - 64774 to current
ASP156A	Maintenance kit - P20/O2, SN 95198 - 26597 to 97302 - 36897
ASP156B	Maintenance kit - P20/O2, SN 97350 - 37805 to 98114 - 39791
ASP156C	Maintenance kit - P20/O2 and CD20/O2, SN 98188 - 41025 to 99125 - 45725
ASP156D	Maintenance kit - P20/O2, SN 99218 - 47560 to 01045 - 59306
ASP156E	Maintenance kit - CD20/O2, SN 99328 - 50208 to 01345 - 64143
ASP156F	Maintenance kit - P20/O2, SN 01135 - 60978 to 01352 - 54334
ASP156G	Maintenance kit - P20/O2 and CD20/O2, SN 02018 - 64646 to current
ASP160A	Maintenance kit - CD4000, SN 95164 - 26254 to 97328 - 37406
ASP160B	Maintenance kit - CD4000 and CD4000HO, SN 97339 - 37679 to 99047 - 44465
ASP160C	Maintenance kit - CD4000 and CD4000HO, SN 99169 - 46526 to 00301 - 57595
ASP160D	Maintenance kit - CD4000 and CD4000HO, SN 01046 - 59333 to current
ASP165	Maintenance kit - CD4000P, SN 03251 - 79707 to current
ASP176A	Maintenance kit - CD6000 and CD6000HO, SN 95234 - 27138 to 97300 - 36847
ASP176B	Maintenance kit - CD6000 and CD6000HO, SN 97364 - 37935 to 98092 - 39520
ASP176C	Maintenance kit - CD6000 and CD6000HO, SN 00168 - 54430 to 00176 - 54489
ASP176D	Maintenance kit - CD6000 and CD6000HO, SN 00340 - 58489 to current

Part Number	*Catalog Description*
ASP180A	Maintenance kit - CD8000, SN 95215 - 26888 to 97259 - 35912
ASP180B	Maintenance kit - CD8000 and CD8000HO, SN 97343 - 37728 to 99112 - 45648
ASP180C	Maintenance kit - CD8000 and CD8000HO, SN 99188 - 46850 to 00263 - 56601
ASP180D	Maintenance kit - CD8000 and CD8000HO, SN 01029 - 59139 to current
ASP240A	Maintenance kit - CD12000, SN 95171 - 26287 to 972925 - 36765
ASP240B	Maintenance kit - CD12000, CD12000HO, SN 97309 - 37011 to 99141 - 45966
ASP240C	Maintenance kit - CD12000, CD12000HO, SN 99204 - 47277 to 00250 - 56279
ASP240D	Maintenance kit - CD12000, CD12000HO, SN 00332 - 58194 to current
ASP280A	Maintenance kit - AD40, SN 95151 - 26036 to current
ASP285	Maintenance kit - OXS400 and OXS430, SN 03247 - 79581 to current
ASP290A	Maintenance kit - OXS500 and OXS505, SN 00356 - 58783 to 01081 - 60119
ASP290B	Maintenance kit - OXS500 and OXS505, SN 02248 - 70590 to current
ASP291A	Maintenance kit - OXS510 and OXS512, SN 00084 - 52958 to 01267 - 62855
ASP291B	Maintenance kit - OXS510 and OXS512, SN 02189 - 69577 to current
ASP292A	Maintenance kit - OXS515 and OXS520, SN 00146 - 54121 to 01331 - 63965
ASP292B	Maintenance kit - OXS515 and OXS520, SN 02112 - 66370 to current
ASP80	Maintenance kit - OXS80's, OXS90's, SeQual SN 10001 to 10070, CWT SN 02077 - 65443
ASP85A	Maintenance kit - OXS100's, SeQual SN 10001 to 42223
ASP85B	Maintenance kit - OXS100's, SeQual SN 10520 to 10536, CWT SN 02072 - 65274 to current
ASP86	Maintenance kit - PDA20's and PSA60's, SN 02039 - to current
ASP90A	Maintenance kit - PRO10, PRO12 and PRO14, SN 95296 - 27735 to current
ASP95A	Maintenance kit - POE10, SN 97010 - 32309 to 98195 - 41143
ASP95B	Maintenance kit - POE10, SN 99075 - 45037 to current
ASP96A	Maintenance kit - POE15, SN 97101 - 33502 to 97335 - 37563
ASP96B	Maintenance kit - POE15, SN 97353 - 37864 to 98314 - 43016
ASP96C	Maintenance kit - POE15 and POE20, SN 99179 - 46792 to current
ASPHD10A	Maintenance kit - HDO3-I, SN 01222 - 62440 to current
ASPHD20A	Maintenance kit - HDO3-II, SN 02046 - 65069 to current
ASPHD30A	Maintenance kit - HDO3-III, 02126 - 66832 to current
ASPM246A	Maintenance kit - CD1500P, SN 02254 - 70674 to current
ASPP246A	Maintenance kit - CD2000P, SN 02085 - 65574 to current
ASPHD20A	Maintenance kit - CD30nx, SN C279159 to current
ASPP246A	Maintenance kit - CD15nx, SN C286224 to current

Note: Replacement lamps for our H.V.A.C. air purification units and Ultraviolet ozone generators are also available. Please have the serial number available.

Ultraviolet Lamp Selection Guide

When service is needed for your UV ozone system, usually it's only the lamp needs to be replaced. The ballast that powers the lamp is typically fine and can last a number of years before showing any signs of wear.

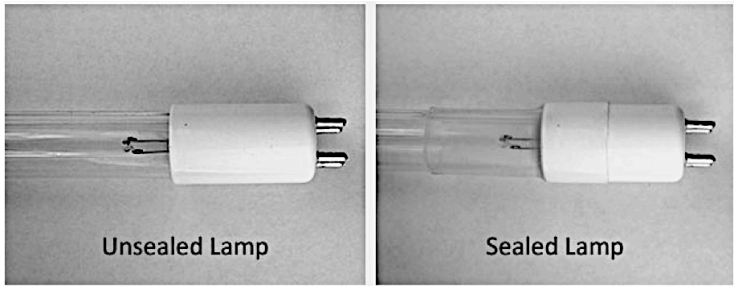
Below is a list of the common lamps that are used in our UV systems.

Note: If your lamp does not have any of the part IDs listed in this chart, you will need to refer to the model of generator or the lamp descriptions.

Generator Model	Part ID	UV Type	End Cap Color	# of Pins	Lamp Length (with pins)	Lamps Per Unit
AirWaves™	LAHV90L	Ozone	White	4	10 1/4″	1
	LAHV91	Germicidal	White	4	14 1/4″	1
AirWaves™ (old)	LAHV90*	Ozone	White	4	8 1/4″	1
	LAHV95*	Germicidal	Yellow	4	14 1/4″	1
ComAir20T™	LA15	Ozone	White	4	17 1/2″	1
	LAHV92	Germicidal	White	4	14 1/8″	1
Airwaves™ Mistral	LAHV98	Germicidal	Purple	4	14 1/4″	1
MZ250	LA40	Ozone	White	4	8 1/2″	1
S1200 (unsealed)	LA15	Ozone	White	4	17 1/2″	1
S1200 (sealed)	LA20**	Ozone	White	4	17 1/2″	1
CS1400 (unsealed)	LA25	Ozone	White	4	29″	1
CS1400 (sealed)	LA30**	Ozone	White	4	29″	1
UV2800 (unsealed)	LA28	Ozone	White	4	29″	1
UV2800 (sealed)	LA30**	Ozone	White	4	29″	1
UV10	LA10	Sterilizer	White	1 per end	14 3/4″	1
UV30	LA35	Sterilizer	White	1 per end	33 3/4″	1
UV60	LA35	Sterilizer	White	1 per end	33 3/4″	1
ZAP	LA40	Ozone	White	4 pins	8 1/2″	1

* These lamps are used for older versions of the Airwaves™ HVAC air purifier. Part number HVRK276 is an upgrade kit that can be purchased to bring the unit to the current version; the kit includes new lamps.

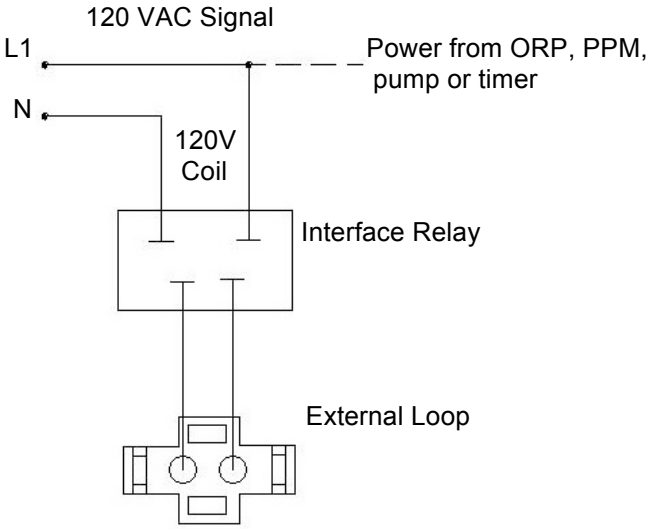
** On older versions of these sealed units, there is no indication on the data plate of the unit that tells you that the unit contains a sealed version of lamp. You can determine if your lamp is a sealed lamp by simply removing the lamp looking for a clear sleeve on the bottom end cap near the pins. See photo below.

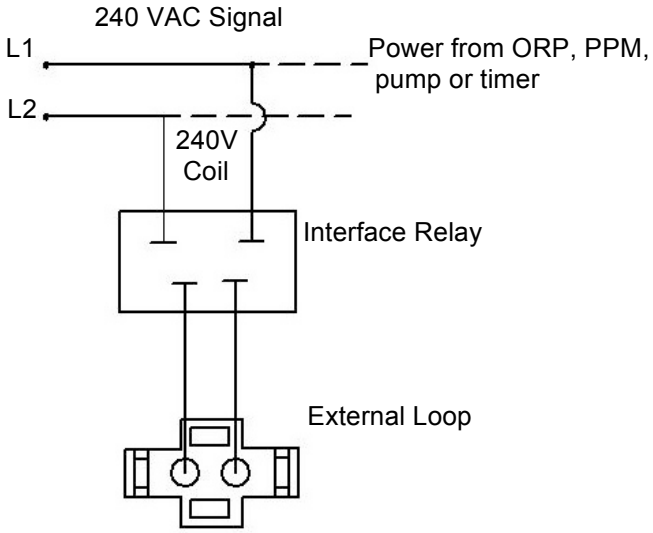


CWT External Loop Interface

CWT External Loop (EXT LOOP):
The external loop is a true dry contact interface designed to allow main power of the ozone generator to remain "ON" while only energizing or de-energizing the ozone reaction chamber(s). **Note: The term 'dry contact' means that this loop does not supply output nor except input voltages. Warning: Supplying voltage to the external loop will cause damage to the ozone generator and void warranty.** Under normal operation the external loop will effectively interrupt the ozone output when the loop has lost continuity. When continuity through the external loop is restored ozone output will continue.

The function of the external loop, a removable two-position plug with a white 18AWG wire is to interface the ozone generator to any control device, i.e., pressure switch, vacuum switch, flow switch, float switch, ORP controller, PPM controller, ambient ozone monitor or timer. To interface a control device to the external loop, cut the white 18AWG wire in half. Connect the control device to each leg of the external loop. **Note: External Loop control devices supplied by CWT may come equipped with a two-position male connector ready to be plugged into the female two-position connector mounted to the chassis of the ozone generator.** If the control device used supplies an output voltage a single pole single throw (SPST) normally open relay may be used to create a dry contact interface (see diagram below), **Note: Attached to the white 18 AWG external loop is a warning, "THIS CONNECTION IS A DRY CONTACT ONLY, DO NOT APPLY VOLTAGE".**

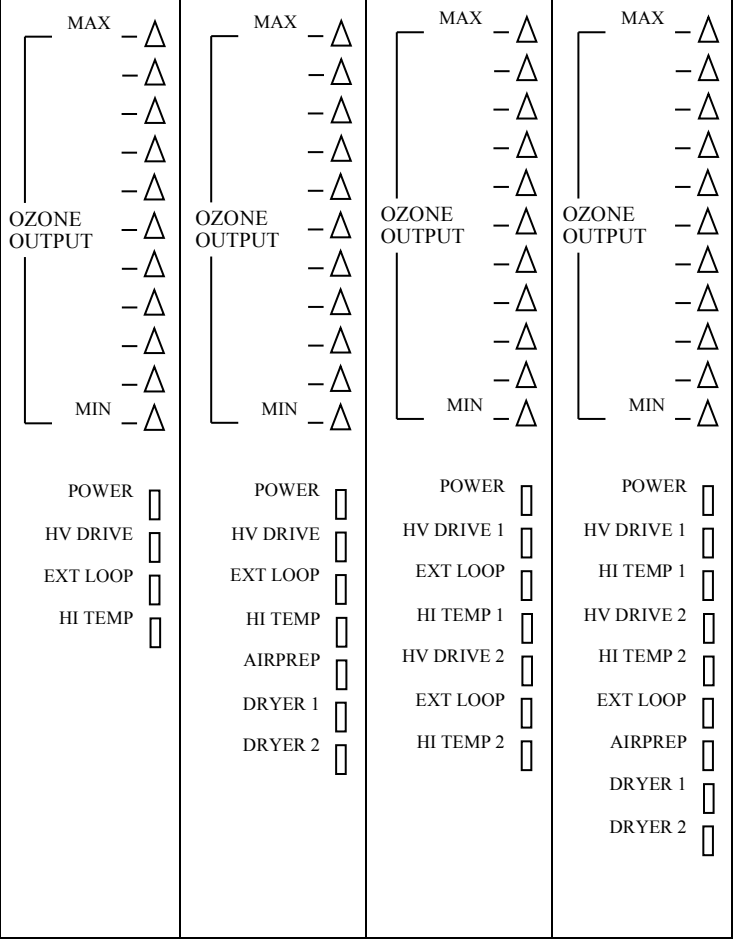




Miniseries Ozone Generator LED Display

The ClearWater Tech CD10 Series ozone generators are equipped with a LED display for simplicity of checking operational status. This chart provides information regarding the function of each LED. For further information regarding CWT equipment please contact our Service department.

LED	Function
OZONE OUTPUT	The ten LEDs represent 0-100%, minimum to maximum ozone output. Each LED is equal to 10% output. These LEDs can be adjusted with the manual output control knob located at the bottom of the ozone generator or automatically with a remote 4-20mA control signal.
POWER	Main Power is "ON" to the ozone generator, when LED is illuminated.
HV DRIVE	Power is being sent to the high voltage drive board, when the LED is illuminated.
EXT LOOP	The External Loop has continuity through it when the LED is *not* illuminated, which indicates ozone is being produced. The External Loop *does not* have continuity, when the LED is illuminated, which indicates no ozone production.
HIGH TEMP	The High Temp LED will not be illuminated during normal operation. If the ozone generator's internal temperature is in excess of 150˚F the High Temp LED will illuminate, which will also discontinue ozone production.
AIR PREP	CD10/AD and CD12/AD Only: The Dryer Timer LED will flash continuously during normal operation and indicates that the dryer timer cycle is operating correctly.
DRYER 1	CD10/AD and CD12/AD Only: DRYER 1 LED will be illuminated when dryer chamber 1 is heating.
DRYER 2	CD10/AD and CD12/AD Only: DRYER 2 LED will be illuminated when dryer chamber 2 is heating.



Ozone Output Control Function Chart

Ozone Output Control – ClearWater Tech ozone generators are equipped with two options for controlling the ozone output. The first, a manual 0-100% ozone output control and the second option, a remote 4-20mA control signal. The top function chart relates to CWT wall-mount HO, CD10 Series and Pressurized ozone generators, November 2004 and newer. The bottom chart relates to all CWT wall-mount HO ozone generators November 2004 and older and all cabinet HO and Pressurized ozone generators. For further information regarding CWT equipment please contact our Service department.

FEATURE	EXTERNAL LOOP	MANUAL ADJUST	4-20mA	OZONE OUTPUT
MANUAL OZONE OUTPUT CONTROL	IF REMOVED (circuit open)	N/A	N/A	0%
	IF IN PLACE (circuit closed)	YES	N/A	0-100%
REMOTE 4-20mA CONTROL	IF REMOVED (circuit open)	N/A	N/A	0%
	IF IN PLACE (circuit closed)	N/A	4-20mA Control Signal	0-100%

Manual Ozone Output Control -Turning the control knob counterclockwise will decrease the ozone output to down 0%, while turning the knob clockwise will increase the ozone output up to 100%.

Remote 4-20mA Control: A 4-20mA control signal to the ozone generator may be used to control the ozone generator output. The ozone generator will automatically sense the 4-20mA input signal and override the setting of the manual ozone output control. Based on the 4-20mA signal, ozone output will increase or decrease, 4mA = 0% ozone output, 20mA = 100% ozone output. **Note: If the remote 4-20mA signal fails or is missing, the system will default to the manual ozone output setting. Check and adjust the manual ozone output control knob to avoid over-ozonation.**

FEATURE	CONTROL MODE	EXTERNAL LOOP	MANUAL ADJUST	4-20mA	OZONE OUTPUT
MANUAL OZONE CONTROL	"VARIABLE/ON" (Left Position)	IF REMOVED (circuit open)	N/A	N/A	0%
		IF IN PLACE (circuit closed)	YES	N/A	0-100%
OZONE BYPASS	"Bypass/Off" (Center Position)	N/A	N/A	N/A	0%
REMOTE 4-20mA CONTROL	"4-20 mA/Auto" (Right Position)	IF REMOVED (circuit open)	N/A	N/A	0%
		IF IN PLACE (circuit closed)	N/A	4-20mA Control Signal	0-100%

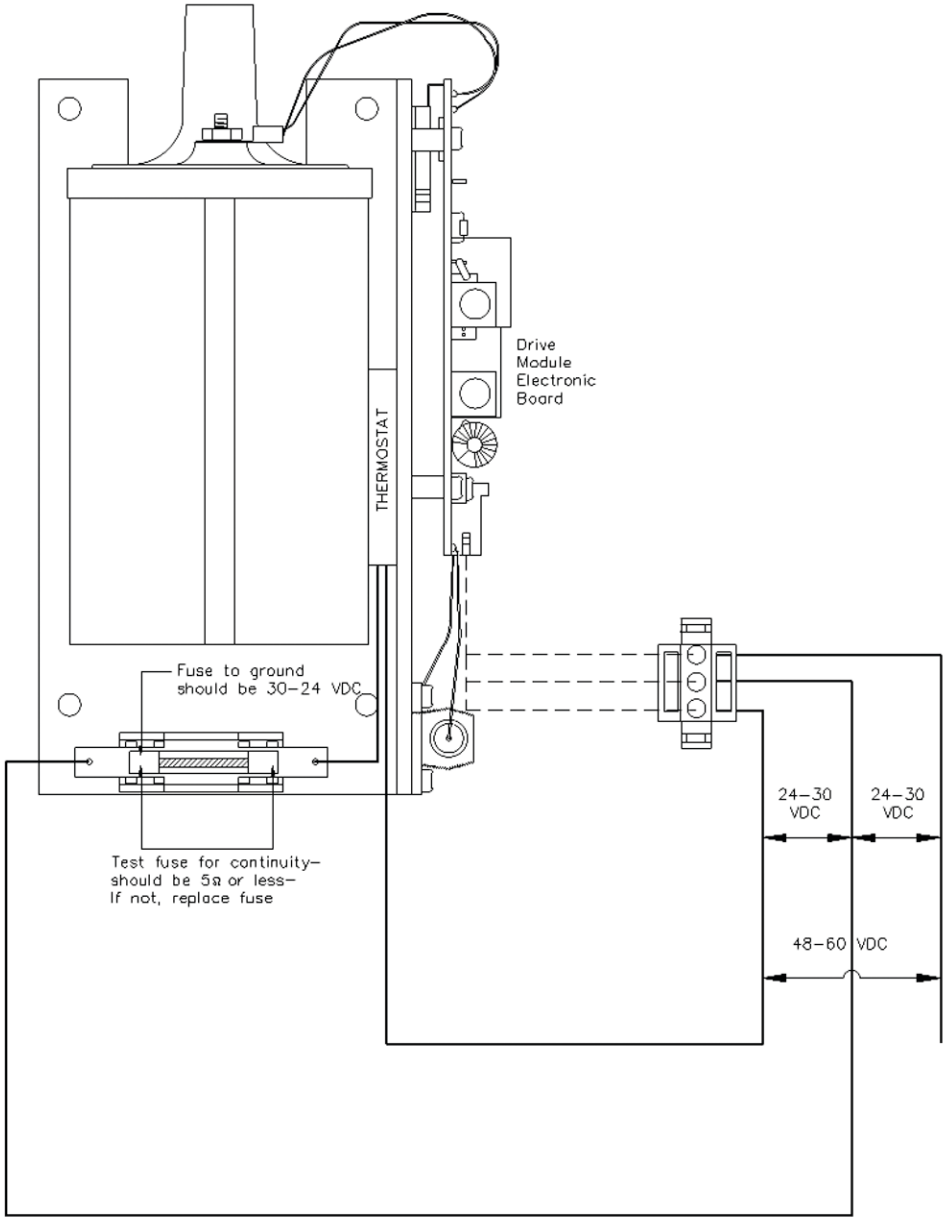
Variable/On - feature allows for manual control of the ozone output (0-100%) using the potentiometer with the external loop circuit closed. When the external loop circuit is open, the ozone output will be zero (0%) and cannot be manually controlled.

Ozone Bypass/Off – This feature provides (0%) ozone output, with other controls (EXTERNAL LOOP, POT or 4-20mA) having no effect on ozone output. This function is for set up of SCFH, testing troubleshooting of the equipment only, without ozone being generated.

4-20mA Control/Auto – This feature allows for control of the ozone output (0-100%) from an external source that supplies a 4-20mA signal (ORP, PPM controller, etc.). The external source provides a 4mA signal to give zero (0%) ozone output, and a 20mA signal to give full (100%) ozone output with the external loop circuit closed. Any percentage between 0% and 100% is achieved by varying the 4-20mA signal with the external loop circuit closed. Opening the external loop circuit will shut down the ozone output to zero (0%), regardless of the 4-20mA signal level.

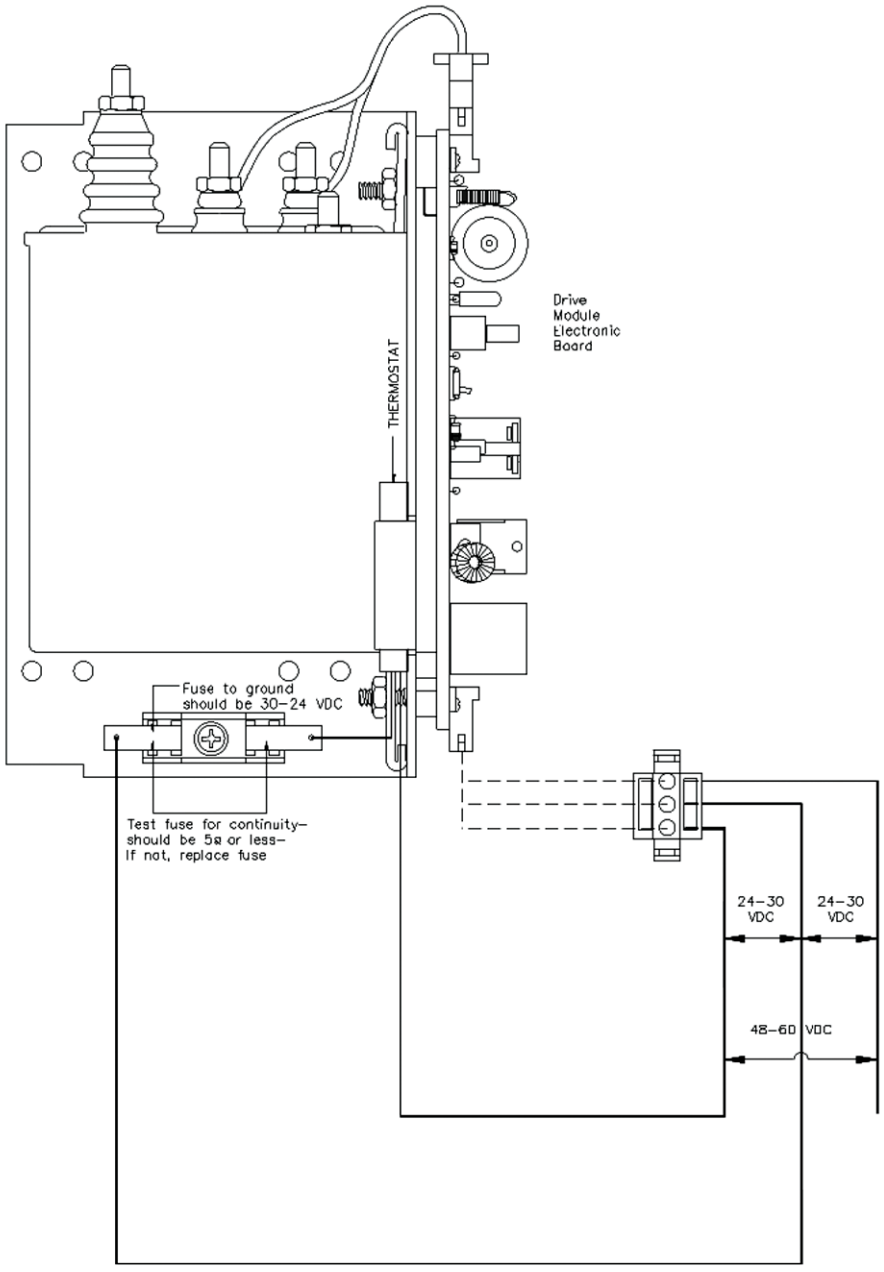
Drive Module Input

Shown: Standard Drive Module

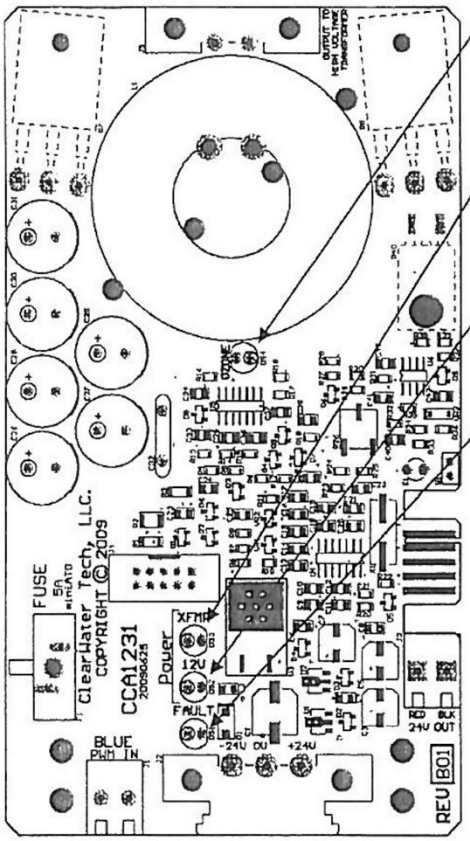


HO Drive Module Input Voltages

Shown: HO Drive Module



CWT High Output Drive Board Function



Ozone LED – An orange/yellow light indicating ozone production in the chamber. Light will blink as ozone production is turned up and down.

XFMR LED – A green light indicating that the positive 24V rail is correctly powering the drive board.

12V LED – A green light indicating that microprocessor on the board is operating correctly.

Fault LED – A red light indicating when the board has shut down due to a fault condition. The light will blink to indicate the reason for the fault.

1 blink every second – The drive board is pushing as much power into the chamber as it can, but the microprocessor is sensing less than 50% of the necessary power going into the chamber. This is indicative of a dead short on the high voltage lead.

2 blinks every second – The drive board's feedback had a series of sudden dips indicative of unusual arcing occurring somewhere in the system.

3 blinks every second – High temperature. The thermal switch on the board has closed indicating that it was exposed to temperatures exceeding 140F.

High Output Drive Board Selection

Over the last few years we've upgraded and enhanced the drive system (this is the drive board and high output transformer assembly) in some of our higher output ozone generators. When it comes time to replace a drive board or transformer, these version changes do make it more complicated to get the correct component, as **the drive board needs to be used with its intended transformer**.
If the pictured transformers do not match what is in your ozone generator, there's no need to read on as it this does not apply to your ozone generator.

When replacing a component of a drive system there are two options: Order the correct version component (if available), or upgrade to the current revision.

To find out what version components you require for your drive system, first compare the high output transformers pictured below to the transformer(s) in the ozone generator. Pictures of the associated version drive board are included.

Pictured to the right are the current transformer, the HVT275 and the current drive board CCA1231.

Replacement transformers are available; the part number is HVT275SA.
Replacement drive boards are available for this transformer; the part number is CCA1231SA.

HVT275



CCA1231



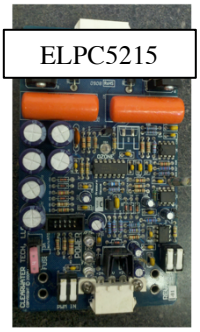
Pictured are the HVT250, sometimes listed as the HVT255, transformer and the associated drive board is the ELPC5215.

If you require a replacement transformer of this type, unfortunately, it is no longer available. You will need to install a drive upgrade kit, listed below (see Upgrading section).
Drive boards for this version transformer are available; the part number is ELPC5215SA.

HVT250



ELPC5215



Pictured are the HVT200 transformer and the associated drive boards, ELPC5210 and ELPC5200.
If you require a replacement transformer of this type, unfortunately, it is also no longer available. You will need to install an upgrade kit, listed below (see Upgrading section).
If you require a replacement drive board for this transformer, a compatibility test will have to be performed. The ELPC5200 is no longer available.

HVT200



ELPC5210



ELPC5200



Note: The ELPC5215 and ELPC5210 are nearly identical. Look for the part number labeled on the board, or identify the transformer version to select the correct drive board.

High Output Drive Board Selection

HVT200 – ELPC5210 Compatibility Test
Follow these steps:

- Scrape away a small portion of the black paint on any side other than the top (the top has the five connection points). The underside of the transformer is recommended.
- If the material under the black paint is aluminum, the drive board compatible with this transformer is no longer available, install a drive upgrade kit, listed below (see Upgrading section).
- If the material is copper, you can order a replacement board.

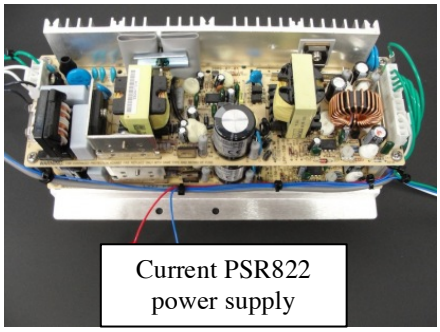
The part number for a replacement drive board for the HVT200 (copper) is ELPC5210SA. Here is a sample photo of the underside of a HVT200 transformer that displays copper. Your transformer's color should be easily identifiable like this example.



Upgrading
Upgrading the drive system is only necessary if you require a replacement transformer. If you require a replacement drive board because of the usual heat, age, and environmental issues, these boards are still available. Consider upgrading to the current drive system if you are replacing an older drive board; the price is comparable.
Upgrade kits are sorted by model number of the ozone generator. The kits include the current transformer and drive board system, hardware specific to the generator, and installation instructions. For dual drive systems, you have the option of upgrading just one half of the drives, or the complete drive system.

Model CD2000 & CD2000P (These systems have two drive systems)
Upgrade kit for single drive: HVT204SA
Upgrade kit for both drives: DRM60SA

Model CD1500 & CD1500P (A15e)
Upgrade kit for drive system: HVT205SA
Important: If your power supply is of an older version, it will also need to be upgraded in order for the current drive system to operate properly.
Pictured is the current version power supply.



PSR822 Power Supply
If the installed power supply differs in type and/or location in the ozone generator, order the power supply upgrade kit.
Upgrade kit for power supply: PSR1500SA

Model CD15/AD
Upgrade kit for drive system: HVT206SA
All other generator models have the drive system mount directly to the reaction chamber. These models include: SC27P, Mobile Wash Carts, and the HO and P versions of cabinets (example: CD8000P and CD12000HO)
Upgrade kit for single drive system: HVT207SA
Note: When installing the upgrade kit, new holes will have to be drilled into the heat sink to mount all four corners. Installing only using two points is an option, assuming you are not shipping the system.

General Troubleshooting Guide

This guide goes over the standard troubleshooting that is performed during periodic check-ups on a system or if it is suspected of not performing properly.
It looks like a long list of things to do, but in practice it only takes a few moments. The installation of a gauge assembly on the system makes it much easier.

To have the expected amount of ozone oxidizing the water, four factors have to be taken into account. If one of these is not working properly it will result in a reduced amount of ozone oxidizing the water, and thus low ORP and ozone ppm readings.

These factors include the ozone generator, air preparation system, confirming there are no air leaks and general water properties that affect the ozone's oxidation potential.

The Ozone Generator

In all of our systems there is a display light of some kind that you typically see during ozone production. If it is illuminated, we can expect ozone is being generated.
All of our corona discharge ozone generators are "all-or-nothing" type machines.
The cause for any reduction in ozone output will likely be found in the other three sections.
There are enough diagnostics built in to most systems that will disable the "ozone" light if there is an issue.

If the output light is not illuminated, please observe any other lights on all circuit boards, along with all gauge readings for us to continue with the troubleshooting of the unit. At this point gathering the model and serial number of the unit is rather helpful.

The test: If you wish to confirm ozone is being generated, read on.

The overall test for the ozone generator is simply disconnecting the tubing leading in and out of the unit and blowing air manually through the generator while it is on and the output lights indicate it is producing ozone.

Note: Do not breathe the ozone directly into your lungs. Let the outlet gas flow into one's hand and smell said hand.

If ozone is detected, then the generator is working.

If there is no scent of ozone, note down all display lights, gauge readings. Write down the model and serial number of the unit and contact your distributor or ClearWater Tech to continue troubleshooting.

Questions that may come up during the test:

- Where is this inlet and outlet tubing?

The outlet tubing is easy to find, it is likely connected to a stainless steel bulkhead fitting, where a PVC check valve may be installed. It is an opaque, ¼" Teflon delivery line.
If a check valve is present, temporarily remove it as they are difficult to blow through.
The inlet tubing connection can vary from model to model. Typically you will disconnect tubing from the gauge assembly and blow air into the bottom of it, lifting the ball on the SCFH gauge. Usually this is a 3/8" thick-walled, braided tubing.

Alternatively, you can open the cover of the unit and follow the tubing that connects to the top of the reaction chamber(s) and find a convenient location on the underside of the unit to route air into the reaction chambers.

- I see two or more reaction chambers in the unit, is that going to make a difference?

If the ozone generator has two or more reaction chambers, you may want to disable power being sent to one of the drive boards of a chamber to individually test each reaction chamber for ozone, as they are independent from each other.
This is done by disconnect a power plug that will cause the "ozone" light on that board no longer be lit when the system is powered on again.
The air inlet tubing will be a common port shared by the fitting at the top of each reaction chamber, blow air into this common port for the test.

- What's dangerous inside this unit? I don't want to lose limbs.

Yes, there's high voltage in the box. If you disconnect the power cord, you'll be fine.
If you happen to have the generator in operation, with the cover off, keep clear of the top of the reaction chambers. Typically there is a high voltage sticker in the area.
Normally you are not going to operate the unit while it is uncovered unless we're troubleshooting within the unit.
If we are operating the unit without the cover, follow the usual guideline of not touching anything inside the electrical device while it is powered.

- Nothing works! Now there are no lights and the fan isn't coming on. What happened?

There is a door interlock switch that is depressed by the cover to turn the unit off when the cover is lifted. Replace the cover to operate the system, or manually depress the switch with a pen/pencil/screwdriver.

The location of the interlock switch will vary depending on model. If you cannot find it, look to the inside of the cover for the peg that will engage the switch in order to find the corresponding location.

Air Preparation

Our corona discharge ozone generators require some sort of air preparation system to, at the very least, dry the air prior to routing it through the reaction chamber(s).
If the air is not dried properly, ozone output is reduced. It's as simple as that. Additionally, nitric oxide/acid is generated, which looks like powdered rust when dry or when wet, a yellow liquid. This byproduct tends to stain things and clog check valves.
Some air preparation systems are designed to send 90%+ oxygen to the ozone generator. They're appropriately called oxygen concentrators. While they are a more expensive type of air preparation system, they dry the air much more than a standard air dryer, and the increased concentration of oxygen greatly increases the output of the ozone generator.

That is the basic information regarding an air prep system. They are integral to our ozone systems, the importance of them cannot be understated.

Our purpose here is to find out if the air prep system is working properly or not.


Indicating Chamber


Inline Particulate Filter

The test:

Confirm the color of the silica gel in the indicating chamber or particulate filter is still blue.

- What? Please explain this further, but try to not hit me with another wall of text.

There will be some sort of silica, indicating desiccant installed within the ozone generator.
Either it will be displayed as a media chamber that can be seen through a view window of the ozone generator cover, or mounted on the output of an oxygen concentrator.
If no such chamber is installed, you can look at the inline particulate filter of all of our ozone generators. This filter is clear, plastic and would fit in the palm of your hand. It is located on the air inlet side of the ozone generator (usually on the right-side). Filter media is packed into each end of it, with silica gel beads in the middle.

We're looking for a color change. In the larger chambers, the silica is mixed as blue and white crystals. In the inline filters, they are all blue beads.

If the air preparation system failed, moist (ambient) air will be blown through the silica gel, and it will turn the blue crystals pink, then eventually all white.

In short, we're looking to confirm the originally blue silica gel is still blue. If it is any other color, we can assume there is an issue with the air preparation system, be it an air dryer or oxygen concentrator.

Gather the model and serial numbers and contact your distributor or ClearWater Tech to continue troubleshooting.

If the media is still blue (or mixed blue and white), we can assume the air dryers are operational and continue looking for a root cause for the reduction in ozone effectiveness in the other sections.

General Troubleshooting Guide

Air Leaks

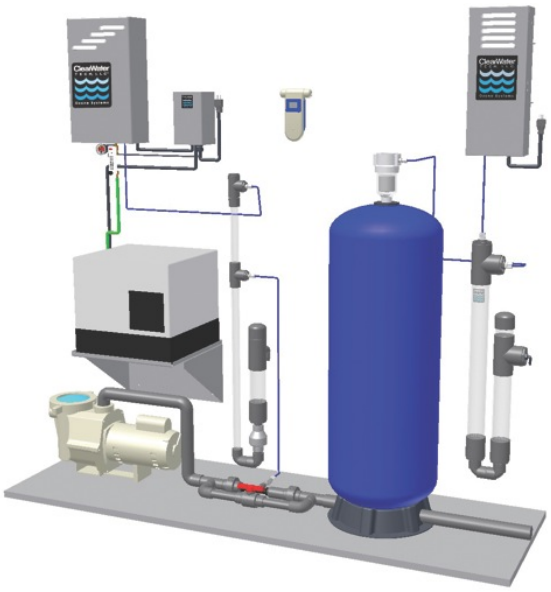
Most installations of our ozone generators involve a venturi injector plumbed into a pressurized water line; this creates a suction that draws the ozone gas into the water.
If there are any breaks in the line, or any component, ambient air enters the line supplanting the ozone, diluting it or if the leak is far enough back, corrupting the dried air from the air prep. Any of these things will result in lowering the ozone output of a system.

Test #1: This test is used if you have a vacuum/SCFH gauge mounted on the ozone generator.

Insure the needle is kept between -3 to -8"Hg. This is likely color-coded to a "green" area of the gauge.
If the needle cannot be brought into the ideal zone, and remains at 0 or -1"Hg proceed to Test #2 to find the leak.

Test #2: This test is used if you do not have a vacuum gauge assembly installed on the ozone generator.
Confirm the level of vacuum at the injector is maintained throughout the ozone system.

- Okay, give me the steps…



First, turn off the ozone generator. We'll be disconnecting tubing and we do not want to expel any more ozone out into the room.

Disconnect the tubing at the injector and place your thumb over the injector fitting. You're going to use the tactile suction present to give you a baseline level of suction.

Compare this level of suction to each point of tubing connections after reconnecting the injector. Proceed to the end of each tubing connection starting from the injector back to the air preparation system.

Specifically check before and after vacuum break (the J-shaped thing that may be mounted on the wall next to the ozone generator). This is a water trap to keep the ozone generator from getting wet if the check valves fail. In order to remain sealed, there needs to be water on top of the white PVC flapper valve in the base of the J-break.

If vacuum is felt before the ozone generator, but is not detected after it; our leak is obviously within the ozone generator. Insure the power cord is disconnected and remove the cover of the unit. Continue to check within the ozone generator, before and after the reaction chambers is an ideal test.

By now, you've verified there are no leaks or have found an area that is leaking. Consult with your distributor or ClearWater Tech to find out what is involved in resolving the leak (usually maintenance).

Water Chemistry

This area is typically explored when we suspect low ozone output, and the first three sections show to have no issues.
If you still have low readings, we'd look at the final things might cause this.

Abnormal pH
7.2 is optimal for ozone, the farther you are away from 7.2 you will experience lower ozone oxidation and ppm retention time.

Higher temperature
The hotter the air or water is, the faster ozone will convert back to oxygen.
Anything over 85 deg F will be considered 'hot' by these systems. As temperatures will normally go over this level depending on season or heated pools, all ozone systems are typically oversized to take this into consideration.

Atmospheric breaks
While pressurized in a contact tank or in the pipe, ozone will oxidize the water and build up a small residual ppm level before converting back to oxygen.
If the pressure is suddenly lost due to being introduced to an open (atmospheric) tank or a water feature such as a waterfall, we can expect the ozone to jump out of solution of the water. Oxidation and ppm retention will continue, but at a reduced level in and after this point.

Congratulations, you made it to the end! Go take a nap.

Miniseries Inspection Sheet

FOR USE WITH CD10, CD10/AD, CD12 & CD12/AD

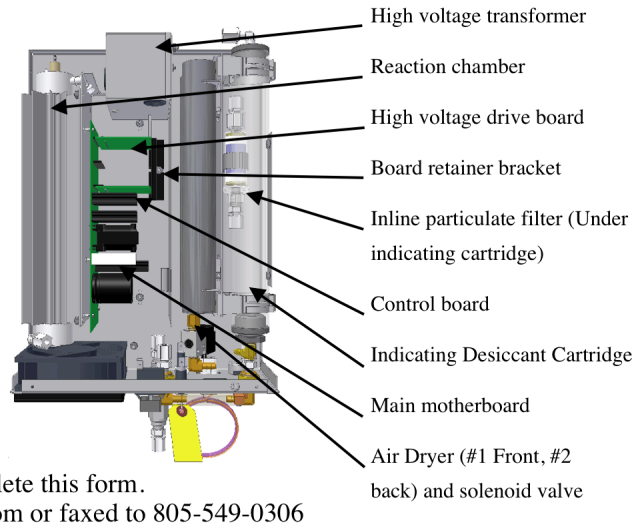
Ozone generator model: _____
Ozone serial number: _____

Oxygen concentrator: _____
Oxygen serial number: _____
(If installed)

Date of inspection: _____
Date of installation: _____

Inspector name: _____
Contact #/email: _____

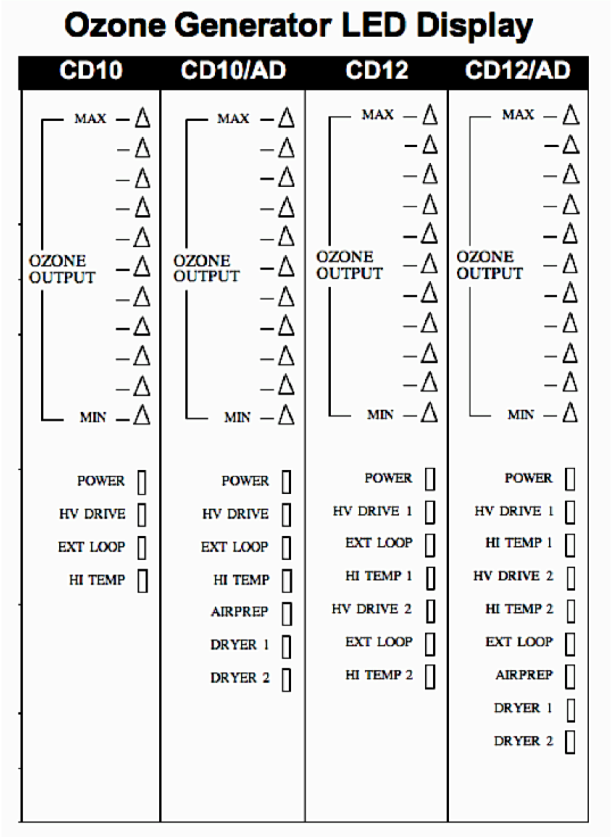
Shown: CD10/AD



When performing an inspection or troubleshooting a system please complete this form.
For troubleshooting assistance, it can be emailed to service@cwtozone.com or faxed to 805-549-0306

1. Display Lights

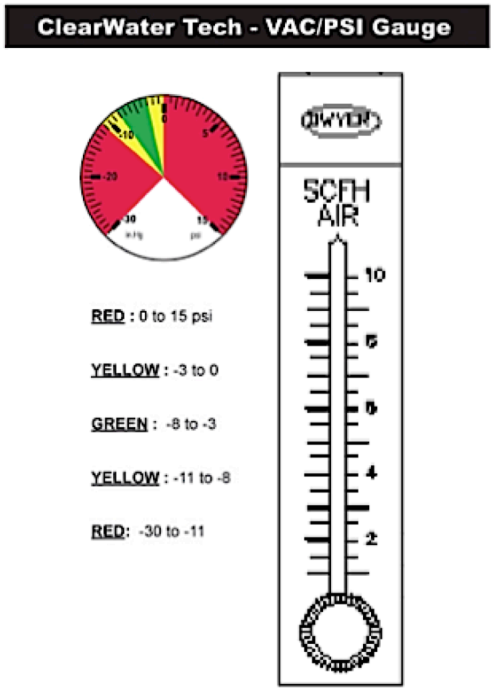
Mark the illuminated (if any) display lights on the chart Below
Notes: The "AIRPREP" light will always blink on and off. There is a 30 minute period where Dryer #1 & Dryer #2 are off, this is normal. The dryers are in a cool down phase before switching.



2. Gauge Readings

If a gauge assembly is installed, mark or list the readings observed during normal operation.

VAC/PSI: _____ (Expected: -3 to -8"Hg)
SCFH: _____ (Expected: 4 SCFH for CD10 and CD10/AD, 8 SCFH for CD12 and CD12/AD)



Miniseries Inspection Sheet

FOR USE WITH CD10, CD10/AD, CD12 & CD12/AD

3. Colored Crystals

Look for the inline particulate filter within the ozone generator; it is pictured to the right.
In CD10/AD units, look for the desiccant chamber visible through the cover.
The color of the media serves as a status check of the air dryer or oxygen concentrator.
The normal color for the inline particular filter is blue, for the chamber visible through the cover; it is mixed blue and white crystals.

Inline Particulate Filter



Any moisture passing through this media will be absorbed by the media and produce a color change from blue, to pink and finally to white. This serves as a status check of the air dryers or oxygen concentrators.

Color of media: _____ (Blue / Pink / White / Other)

Air Dryer Solenoid Valve



4. Solenoid Valve Status

Valid only for the CD10/AD and CD12/AD
Confirm the integrity of the air dryer solenoid valve. If compromised, it will require replacement. Alternatively, the air dryer assembly as an entirety can be replaced.

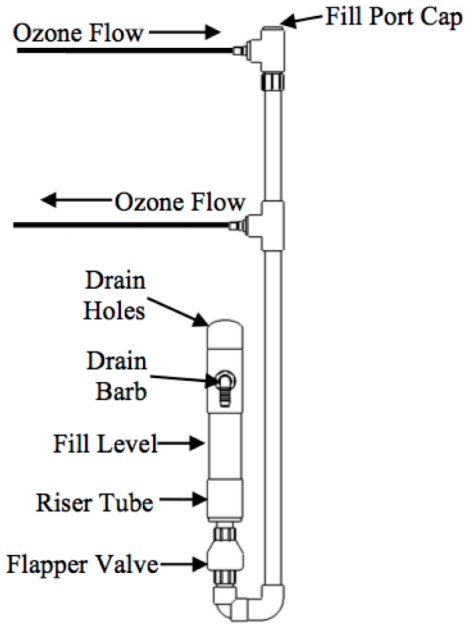
Solenoid Status: _____ (Good / Bad)

5. Vacuum Break Status

If a vacuum break is installed, confirm there is water present within the riser tube and there are no bubbles in this water. If there are bubbles, confirm their direction of flow: up or down the riser tube.

Water present: _____ (Yes / No)
Air bubbles: _____ (Yes / No)
Bubble direction: _____ (Up / Down / NA)

Vacuum Break Detail



6. Off Gas Vent Status

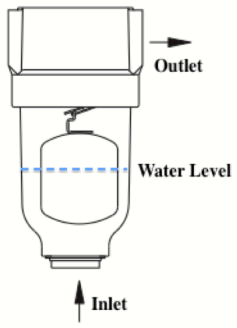
If a contact tank is installed downstream of the venturi injector, there will be an off gas vent present on top of the tank.

Under normal operation, water should be present within the clear bowl with air bubbling up regularly and flowing out of the outlet.

If the ozone generator is suspected of not generating ozone, check the vent's outlet for the smell of ozone (direct airflow over your hand, do not inhale directly).

Water level: _____ (None / At water level / Full)
Air venting: _____ (Yes / No)
Ozone scent: _____ (Yes / No)

Off Gas Vent



Pressurized Inspection Sheet

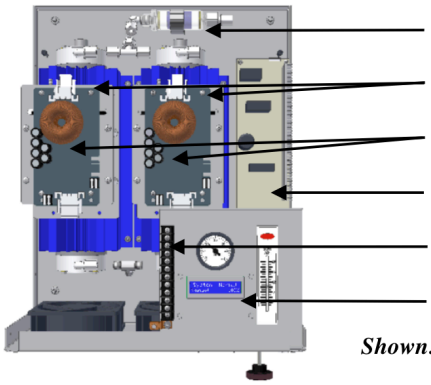
FOR USE WITH CD15NX & CD30NX

Ozone generator model: _____
Ozone serial number: _____

Oxygen concentrator: _____
Oxygen serial number: _____

Date of inspection: _____
Date of installation: _____

Inspector name: _____
Contact #/email: _____



Shown: CD30nx

When performing an inspection or troubleshooting a system please complete this form.
For troubleshooting assistance, it can be emailed to service@cwtozone.com or faxed to 805-549-0306.

1. System Information Display

If the system is operating normally, the display screen will cycle through the model number and other information and will display "System Normal"
If there is an issue with the system it will display "System Problem" and will list useful information regarding it such as "Output 1" or an error code such as A3B0C0. Note the message on the display screen.

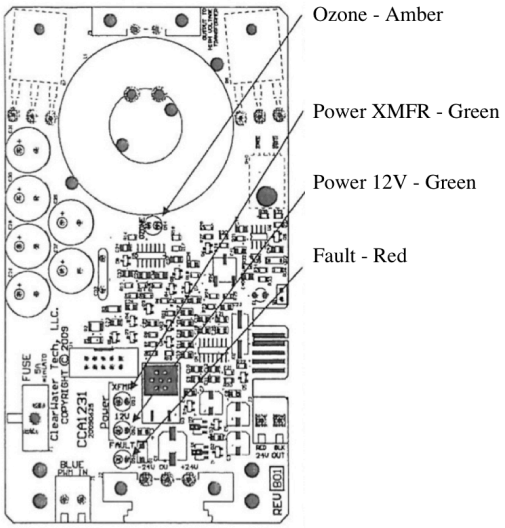
System: _____ (Normal / Problem)
Error Message / Code: _____
_____

2. Display Lights

If an error is observed and noted in the display screen, remove the cover and confirm the status of the lights on the drive board(s) and power supply boards within the ozone generator.

If no lights are visible on any board, confirm the cooling fans are spinning. If there is no fan movement, re-check the on/off switch and fuse.

CCA1231 Drive Board LEDs



Drive board LED status:
Ozone LED -*Amber*: _____ (On / Off)
Power -XMFR -*Green*: _____ (On / Off)
Power - 12V -*Green*: _____ (On / Off)
Fault LED -*Red*: _____ (On / Off /Flashing -1, 2, or 3 beat pattern)

If the Ozone LED is not illuminated, but both green power lights are illuminated, perform the following test. Disconnect power from the ozone generator, disconnect the ribbon cable from the drive board(s), then power the system and attempt ozone generation; does the Ozone LED illuminate now?

Ozone LED with ribbon cable disconnected: _____ (On / Off)

Power supply LED status:
The power supply boards have a green LED in a corner of the boards indicating they are powered properly; consult the status of this LED on both power supply boards.

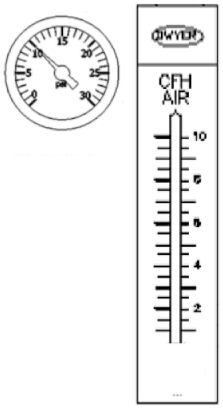
Power LED -*Green*: _____ (Both on / One on / Both off) Green

Pressurized Inspection Sheet

FOR USE WITH CD15NX & CD30NX

3. Gauge Readings

PSI: _____ (Expected: 9-11 PSI)
CFH: _____ (Expected: 3-4 CFH for CD15nx, 6-8 CFH for CD30nx)

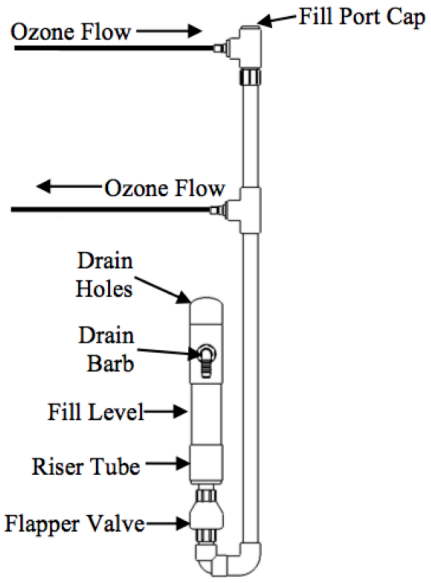


4. Vacuum Break Status

If a vacuum break is installed, confirm there is water present within the riser tube and there are no bubbles in this water. If there are bubbles, confirm their direction of flow: up or down the riser tube.

Water present: _____ (Yes / No)
Air bubbles: _____ (Yes / No)
Bubble direction: _____ (Up / Down / NA)

Vacuum Break Detail



5. Colored Crystals

Look for the inline particulate filter within the ozone generator The color of the media serves as a status check of the air dryer or oxygen concentrator.
The normal color for the inline particular filter is blue.

Any moisture passing through this media will be absorbed by the media and produce a color change from blue, to pink and finally to white. This serves as a status check of the air dryers or oxygen concentrators.

Color of media: _____ (Blue / Pink / White / Other)

Inline Particulate Filter



6. Off Gas Vent Status

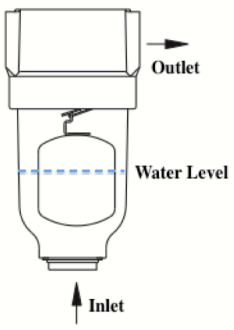
If a contact tank is installed downstream of the venturi injector there will be an off gas vent present on top of the tank.

Under normal operation, water should be present within the clear bowl with air bubbling up regularly and flowing out of the outlet.

If the ozone generator is suspected of not generating ozone, check the vent's outlet for the smell of ozone (direct airflow over your hand, do not inhale directly).

Water level: _____ (None / At water level / Full)
Air venting: _____ (Yes / No)
Ozone scent: _____ (Yes / No)

Off Gas Vent



Pressurized Inspection Sheet

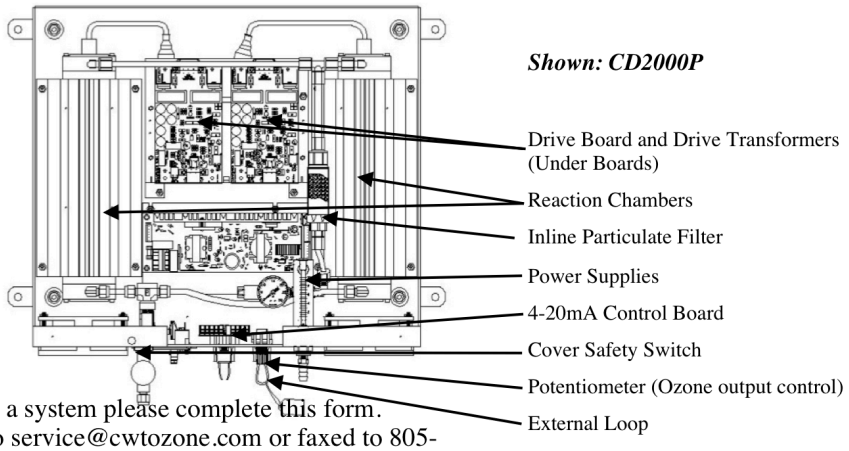
FOR USE WITH CD1500P & CD2000P

Ozone generator model: _____
Ozone serial number: _____

Oxygen concentrator: _____
Oxygen serial number: _____

Date of inspection: _____
Date of installation: _____

Inspector name: _____
Contact #/email: _____



Shown: CD2000P

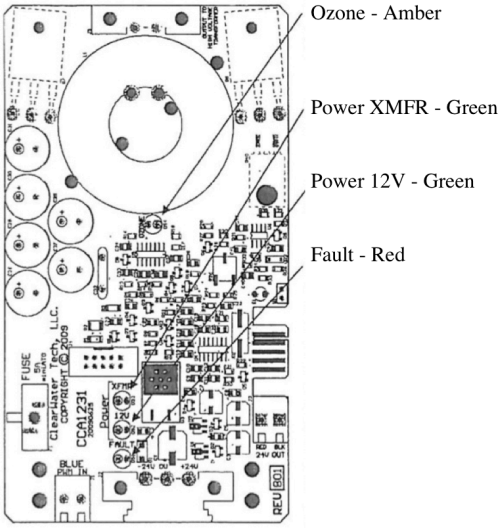
When performing an inspection or troubleshooting a system please complete this form. For troubleshooting assistance, it can be emailed to service@cwtozone.com or faxed to 805-549-0306.

1. Drive System Version

Consult the High Output Drive Component Selection supplement at the end of this form to note the version drive board, transformer and power supply installed in your system.
Note: If the power supply of your system does not match that pictured in the supplement, note your power supply version as "old"

Drive board version: _____ (CCA1231 / ELPC5215 / ELPC5210)
Transformer version: _____ (HVT275 / HVT250 / HVT200)
Power supply version: _____ (Current / Old)

Shown: CCA1231 Drive Board LEDs



2. Display Lights

Observe the status of the lights on the drive board, control board, and power supply boards within the ozone generator.
To access the lights: Remove the cover, manually depress the door safety switch and power the unit for ozone operation.

If no lights are visible on any board, confirm the cooling fans are spinning. If there is no fan movement, re-check the cover safety switch, on/off switch and fuses.

Drive board LED status:
Note: The status of the lights will vary depending on board version. On the ELPC5200 version, there are only two lights, Power (green) and Ozone (red), adjust the responses accordingly.

Ozone LED -*Amber*: _____ (On / Off)
Power -XMFR -*Green*: _____ (On / Off)
Power - 12V -*Green*: _____ (On / Off)
Fault LED -*Red*: _____ (On / Off /Flashing -1, 2, or 3 beat pattern)

If the Ozone LED is illuminated, rotate the potentiometer knob located on the underside of the ozone generator to vary the ozone output; does the Ozone LED adjust accordingly?

Control of Ozone LED: _____ (Yes / No)

Pressurized Inspection Sheet

FOR USE WITH CD1500P & CD2000P

If the Ozone LED is not illuminated, but both green power lights are illuminated, perform the following test. Disconnect power from the ozone generator, disconnect the blue PWM wire from the drive board(s), then power the system and attempt ozone generation; does the Ozone LED illuminate now?

Ozone LED with Blue wire disconnected: _____ (On / Off)

Power supply LED status:
The current version power supply boards have a green LED in a corner of the boards indicating they are powered properly, consult the status of this LED on both power supply boards.

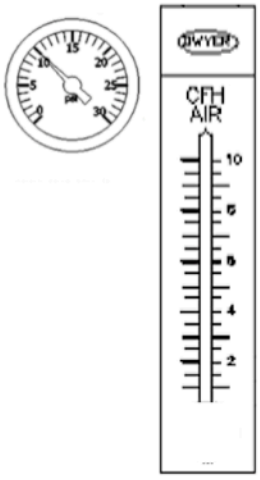
Power LED -*Green*: _____ (Both on / One on / Both off) Green

Control Board LED status:
The (4-20mA) control board located at the bottom of the unit, and is indicated on the above illustration. A red LED will illuminate on this board when the external loop circuit is opened, this will disable ozone output. Consult the manual for more information on the external loop circuit.

Control LED -*Red*: _____ (On / Off)

3. Gauge Readings

If a gauge assembly is installed, mark or list the readings observed during normal operation.
PSI: _____ (Expected: 9-11 PSI)
CFH: _____ (Expected: 3-4 CFH for CD1500P, 6-8 CFH for CD2000P)



4. Colored Crystals

Look for the inline particulate filter within the ozone generator The color of the media serves as a status check of the air dryer or oxygen concentrator.
The normal color for the inline particular filter is blue.

Any moisture passing through this media will be absorbed by the media and produce a color change from blue, to pink and finally to white. This serves as a status check of the air dryers or oxygen concentrators.

Color of media: _____ (Blue / Pink / White / Other)

Inline Particulate Filter



Pressurized Inspection Sheet

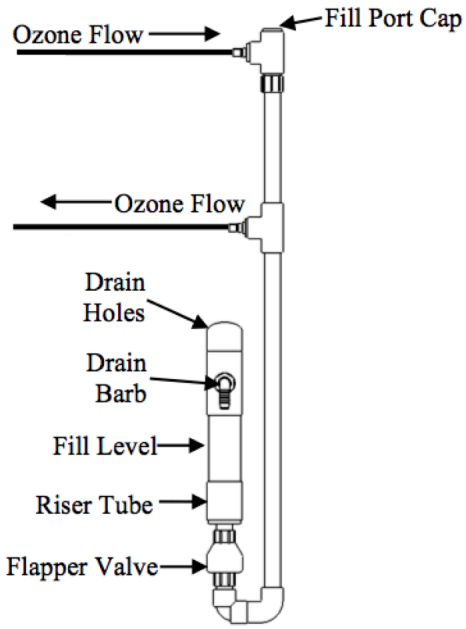
FOR USE WITH CD1500P & CD2000P

5. Vacuum Break Status

If a vacuum break is installed, confirm there is water present within the riser tube and there are no bubbles in this water. If there are bubbles, confirm their direction of flow: up or down the riser tube.

Water present: _____ (Yes / No)
Air bubbles: _____ (Yes / No)
Bubble direction: _____ (Up / Down / NA)

Vacuum Break Detail



6. Off Gas Vent Status

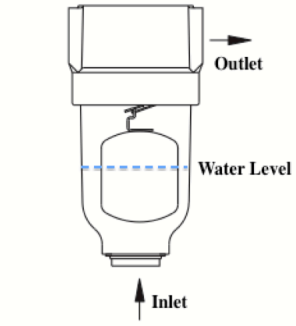
If a contact tank is installed downstream of the venturi injector there will be an off gas vent present on top of the tank.

Under normal operation, water should be present within the clear bowl with air bubbling up regularly and flowing out of the outlet.

If the ozone generator is suspected of not generating ozone, check the vent's outlet for the smell of ozone (direct airflow over your hand, do not inhale directly).

Water level: _____ (None / At water level / Full)
Air venting: _____ (Yes / No)
Ozone scent: _____ (Yes / No)

Off Gas Vent



High Output Inspection Sheet

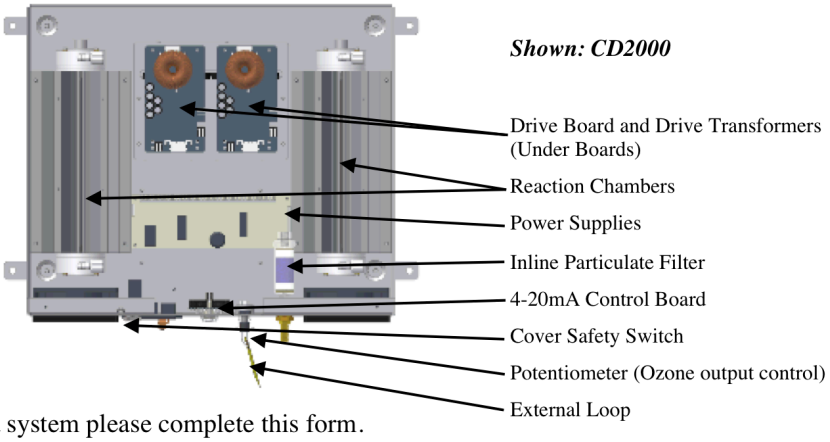
FOR USE WITH CD1500, CD15/AD & CD2000

Ozone generator model: _____
Ozone serial number: _____

Oxygen concentrator: _____
Oxygen serial number: _____

Date of inspection: _____
Date of installation: _____

Inspector name: _____
Contact #/email: _____



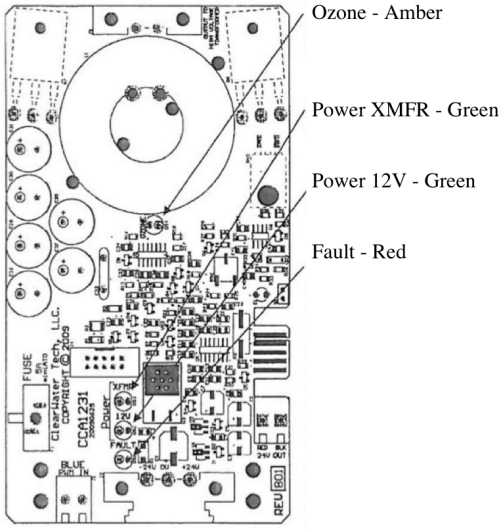
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For troubleshooting assistance, it can be emailed to service@cwtozone.com or faxed to 805-549-0306.

1. Drive System Version

Consult the High Output Drive Component Selection supplement at the end of this form to note the version drive board, transformer and power supply installed in your system.
Note: If the power supply of your system does not match that pictured in the supplement, note your power supply version as "old"

Drive board version: _____ (CCA1231 / ELPC5215 / ELPC5210 / ELPC5200)
Transformer version: _____ (HVT275 / HVT250 / HVT200)
Power supply version: _____ (Current / Old)

Shown: CCA1231 Drive Board LEDs



2. Display Lights

Observe the status of the lights on the drive board, control board, and power supply boards within the ozone generator.
To access the lights: Remove the cover, manually depress the door safety switch and power the unit for ozone operation.

If no lights are visible on any board, confirm the cooling fans are spinning. If there is no fan movement, re-check the cover safety switch, on/off switch and fuses.

Drive board LED status:
Note: The status of the lights will vary depending on board version. On the ELPC5200 version, there are only two lights, Power (green) and Ozone (red), adjust the responses accordingly.

Ozone LED -*Amber*: _____ (On / Off)
Power -XMFR -*Green*: _____ (On / Off)
Power - 12V -*Green*: _____ (On / Off)
Fault LED -*Red*: _____ (On / Off /Flashing -1, 2, or 3 beat pattern)

If the Ozone LED is illuminated, rotate the potentiometer knob located on the underside of the ozone generator to vary the ozone output; does the Ozone LED adjust accordingly?

Control of Ozone LED: _____ (Yes / No)

High Output Inspection Sheet

FOR USE WITH CD1500, CD15/AD & CD2000

If the Ozone LED is not illuminated, but both green power lights are illuminated, perform the following test. Disconnect power from the ozone generator, disconnect the blue PWM wire from the drive board(s), then power the system and attempt ozone generation; does the Ozone LED illuminate now?

Ozone LED with Blue wire disconnected: _____ (On / Off)

Power supply LED status:
The current version power supply boards have a green LED in a corner of the boards indicating they are powered properly, consult the status of this LED on both power supply boards.

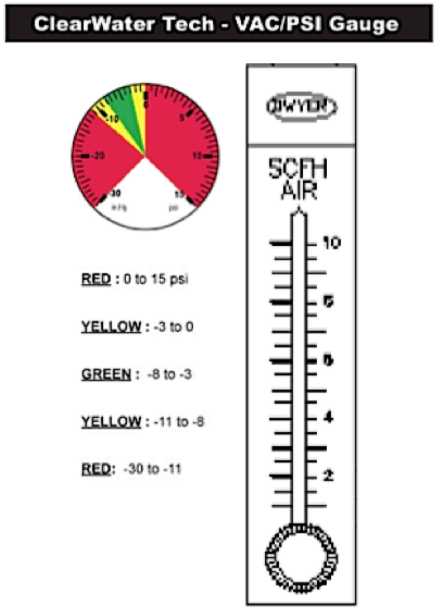
Power LED -*Green*: _____ (Both on / One on / Both off) Green

Control Board LED status:
The (4-20mA) control board located at the bottom of the unit, and is indicated on the above illustration. A red LED will illuminate on this board when the external loop circuit is opened, this will disable ozone output. Consult the manual for more information on the external loop circuit.

Control LED -*Red*: _____ (On / Off)

3. Gauge Readings

If a gauge assembly is installed, mark or list the readings observed during normal operation.
VAC/PSI: _____ (Expected: -3 to -8"Hg)
SCFH: _____ (Expected: 7 SCFH for CD1500 and CD15/AD, 14 SCFH for CD2000)



4. Colored Crystals

Look for the inline particulate filter within the ozone generator In CDS15/AD units, look for the desiccant chamber visible through the cover.
The color of the media serves as a status check of the air dryer or oxygen concentrator.
The normal color for the inline particular filter is blue. For the chamber visible through the cover; it is a mix of blue and white crystals.

Any moisture passing through this media will be absorbed by the media and produce a color change from blue, to pink and finally to white. This serves as a status check of the air dryers or oxygen concentrators.

Color of media: _____ (Blue / Pink / White / Other)

Inline Particulate Filter



High Output Inspection Sheet

FOR USE WITH CD1500, CD15/AD & CD2000

5. Solenoid Valve Status

Valid only for the CD15/AD model only

Confirm the integrity of the air dryer solenoid valve. If compromised, it will require replacement. Alternatively, the air dryer assembly as an entirety can be replaced.

Solenoid Status: _____ (Good / Bad)

Air Dryer Solenoid Valve

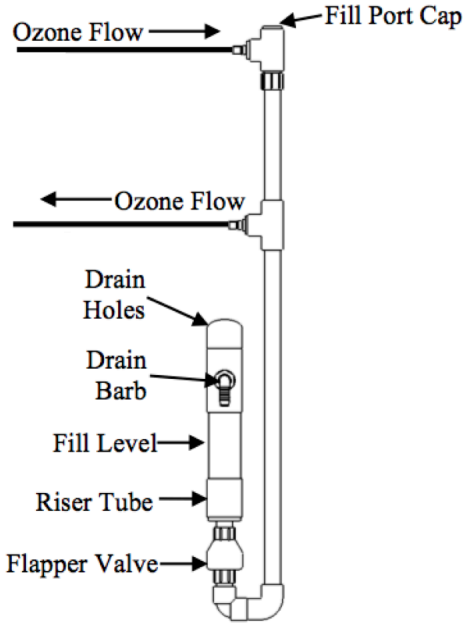


6. Vacuum Break Status

If a vacuum break is installed, confirm there is water present within the riser tube and there are no bubbles in this water. If there are bubbles, confirm their direction of flow: up or down the riser tube.

Water present: _____ (Yes / No)
Air bubbles: _____ (Yes / No)
Bubble direction: _____ (Up / Down / NA)

Vacuum Break Detail



7. Off Gas Vent Status

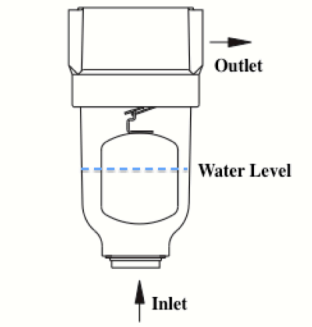
If a contact tank is installed downstream of the venturi injector there will be an off gas vent present on top of the tank.

Under normal operation, water should be present within the clear bowl with air bubbling up regularly and flowing out of the outlet.

If the ozone generator is suspected of not generating ozone, check the vent's outlet for the smell of ozone (direct airflow over your hand, do not inhale directly).

Water level: _____ (None / At water level / Full)
Air venting: _____ (Yes / No)
Ozone scent: _____ (Yes / No)

Off Gas Vent



Standard Output Inspection Sheet

FOR USE WITH M1500, M15/AD & P2000

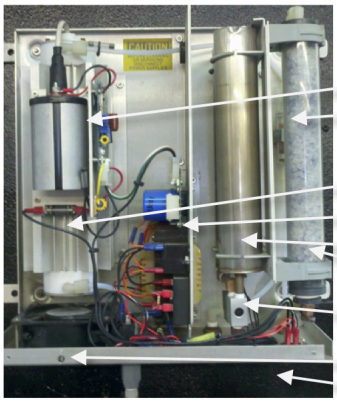
Shown: M15/AD

Ozone generator model: _____
Ozone serial number: _____

Oxygen concentrator: _____
Oxygen serial number: _____
(If installed)

Date of inspection: _____
Date of installation: _____

Inspector name: _____
Contact #/email: _____



When performing an inspection or troubleshooting a system please complete this form. For troubleshooting assistance, it can be emailed to service@cwtozone.com or faxed to 805-549-0306

1. Display Light & Coil Status

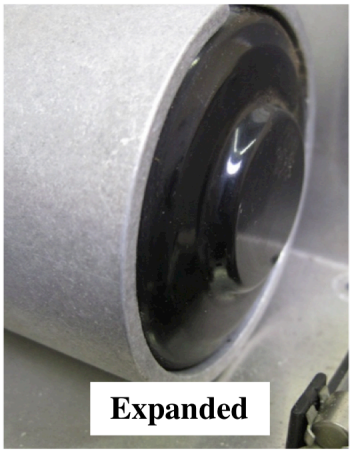
The drive board has a single red LED. During normal operation, note if the LED is illuminated; this indicates ozone output.

Ozone LED -*Red*: _____ (On / Off)

Also, note the status of the drive coil. Examine the underside of the coil to see if it has overheated and the bottom edge has expanded downwards.

Drive coil status: _____ (Normal / Expanded)

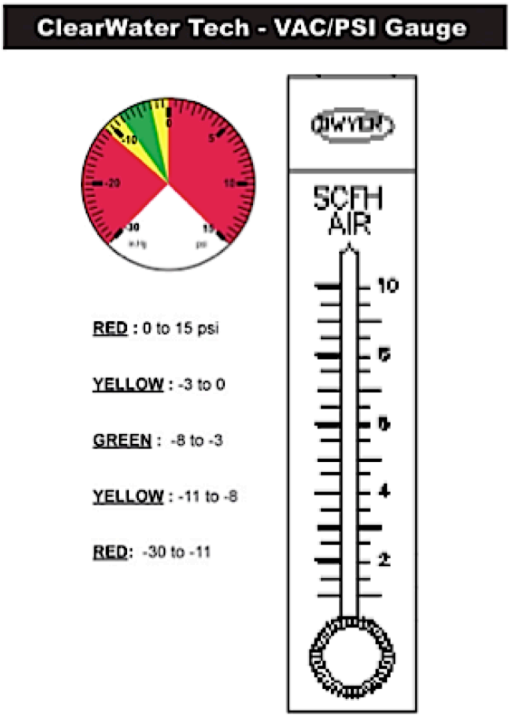




2. Gauge Readings

If a gauge assembly is installed, mark or list the readings observed during normal operation.

VAC/PSI: _____ (Expected: -3 to -8"Hg)
SCFH: _____ (Expected: 7 SCFH for M1500 and M15/AD, 14 SCFH for P2000)



Standard Output Inspection Sheet

FOR USE WITH M1500, M15/AD & P2000

3. Colored Crystals

Look for the inline particulate filter within the ozone generator.
In M15/AD units, look for the desiccant chamber visible through the cover.
The color of the media serves as a status check of the air dryer or oxygen concentrator.
The normal color for the inline particular filter is blue. For the chamber visible through the cover, it is mixed blue and white crystals.

Inline Particulate Filter



Any moisture passing through this media will be absorbed by the media and produce a color change from blue, to pink and finally to white. This serves as a status check of the air dryers or oxygen concentrators.

Color of media: _____ (Blue / Pink / White / Other)

Air Dryer Solenoid Valve



4. Solenoid Valve Status

Valid only for the CD10/AD and CD12/AD
Confirm the integrity of the air dryer solenoid valve. If compromised, it will require replacement. Alternatively, the air dryer assembly as an entirety can be replaced.

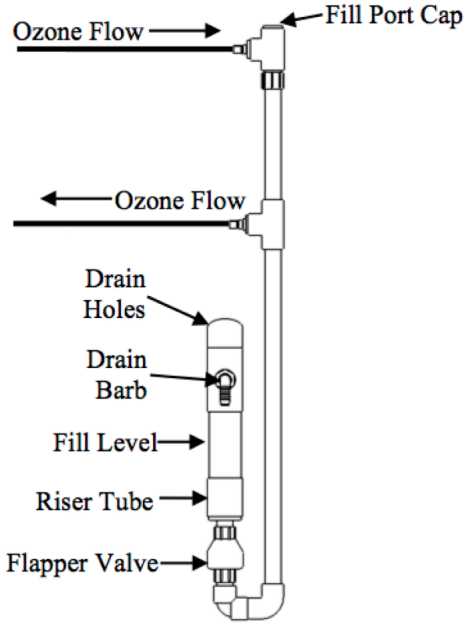
Solenoid Status: _____ (Good / Bad)

5. Vacuum Break Status

If a vacuum break is installed, confirm there is water present within the riser tube and there are no bubbles in this water. If there are bubbles, confirm their direction of flow: up or down the riser tube.

Water present: _____ (Yes / No)
Air bubbles: _____ (Yes / No)
Bubble direction: _____ (Up / Down / NA)

Vacuum Break Detail



6. Off Gas Vent Status

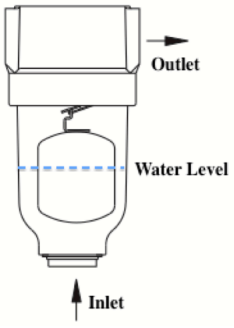
If a contact tank is installed downstream of the venturi injector, there will be an off gas vent present on top of the tank.

Under normal operation, water should be present within the clear bowl with air bubbling up regularly and flowing out of the outlet.

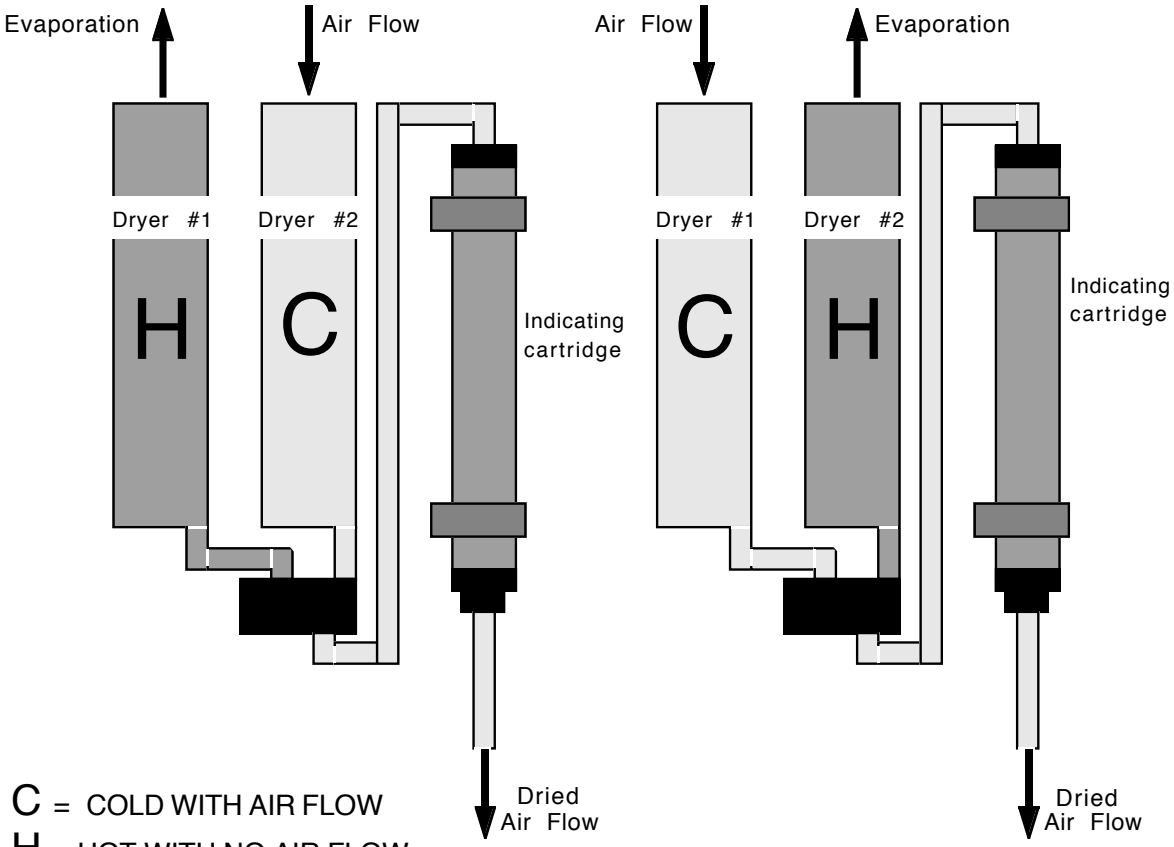
If the ozone generator is suspected of not generating ozone, check the vent's outlet for the smell of ozone (direct airflow over your hand, do not inhale directly).

Water level: _____ (None / At water level / Full)
Air venting: _____ (Yes / No)
Ozone scent: _____ (Yes / No)

Off Gas Vent



CD10/AD Air Dryer Function Diagram



C = COLD WITH AIR FLOW

H = HOT WITH NO AIR FLOW

The CD10/AD heat regenerative air dryer system dries ambient air. This system requires continous power to operate properly. Vacuum drawn on this air dryer should not exceed 10 hours in a 24 hour period.

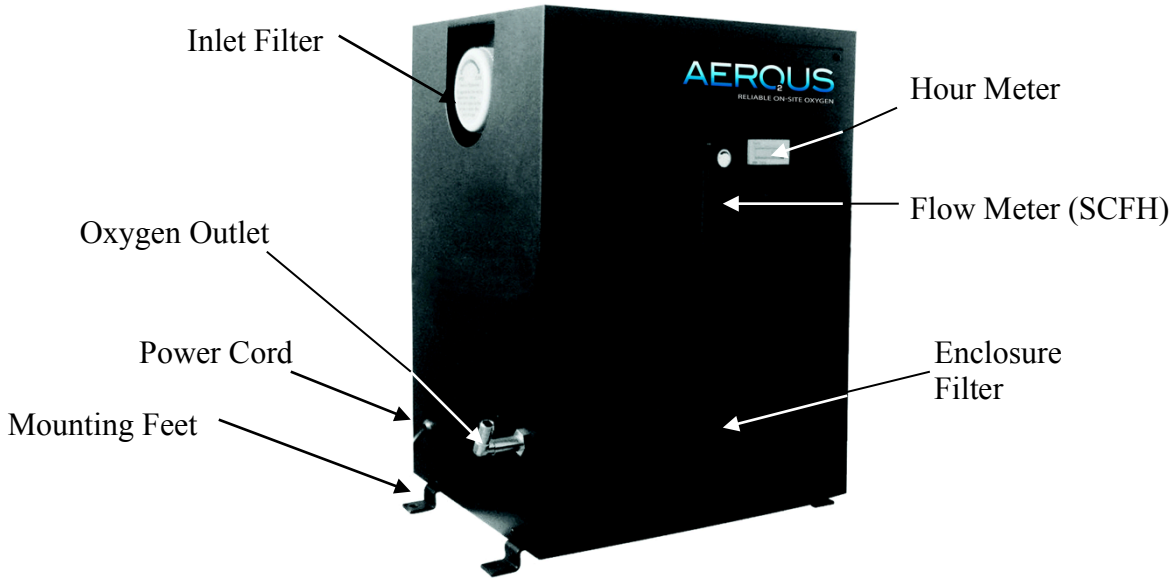
As the air travels through the dryer chamber the sieve traps the moisture from the air and allows the oxygen to pass into the ozone reaction chamber. The heat generated by the heater rods inside the dryer chamber evaporate the moisture that has been trapped in the sieve beds. That evaporation then expels off the top of the sieve bed.

The two dryer chambers and attached 3-way solenoid valve operate on a timed sequence. Dryer #1 heats first while the solenoid is energized allowing the vacuum from the venturi to draw air flow through Dryer #2. During this 2 1/2 hour cycle the Air Prep LED will flash and Dryer #1 LED will be lit continously. After 2 1/2 hours there is a 1/2 hour cool down cycle that will shut down Dryer #1 and its LED. **Note:** The air prep LED will remain flashing.

After the cool down cycle Dryer #2 will heat, the solenoid valve will denergize allowing the vacuum from the venturi to draw air flow through Dryer #1. During this 2 1/2 hour cycle the Air Prep LED will flash and Dryer #2 LED will be lit continuosly. After 2 1/2 hours there is a 1/2 hour cool down cycle that will shut down Dryer #2 and its LED. **Note:** The air prep LED will remain flashing.

AEROUS Oxygen Concentrator Troubleshooting Guide

Oxygen Concentrator Components



System Operation

The AEROUS Oxygen Concentrator is a PSA (pressure swing adsorption) system. The system operation begins with ambient air being drawn in through the compressor air inlet filter. The air is then compressed and pressurized before being delivered to the sieve beds. The sieve beds trap most of the moisture and nitrogen allowing the oxygen to pass through. This oxygen is concentrated in the sieve beds where some of the pressure created by the compressor delivers oxygen out of the system at 90-93%. The remaining pressure is used in the sieve bed recovery cycle. In the recovery cycle the residual pressure continually purges the sieve beds of the moisture and nitrogen. The solenoid valve opens allowing one of the sieve beds to dispense oxygen to use, while the other sieve bed is depressurized in the recovery cycle expelling moisture and nitrogen in a vapor form to waste. If the recovery cycle fails, the sieve beds can become saturated. This will cause back pressure to the compressor, which will cause the compressor pressure relief valve (PRV) to relieve air. The PRV relieving air is typically an audible noise, anytime the PRV is relieving air the oxygen concentrator should be shut down and troubleshooting steps should be taken.

Setting System Air flow

All AEROUS oxygen concentrators must be set to standard atmospheric pressure. This means, the oxygen SCFH flow meter must be set ***without*** the oxygen delivery line connected, see the Normal Operating Parameters Chart for correct SCFH setting. **Note: Once the oxygen delivery line is connected the oxygen flow will drop from this set point due to back pressure through the system, this is normal, DO *NOT* READJUST THE SCFH FLOW METER. Warning: Failure to set the oxygen concentrator correctly will cause premature failure. Warranty will be VOID if this step is not completed correctly upon start-up.**

Testing Oxygen Purity

Using an oxygen meter, test the oxygen purity level. If the purity is found to be low, further troubleshooting must be completed. If immediate troubleshooting cannot be done, the system should be shut down until it is possible. Degradation level of the SIEVE BEDS can be found based on the level of oxygen purity, see chart below.

Oxygen Purity	88% +	40% - 87%	Below 40%
Action	System is in good condition, no action required	Check for leaks and determine if PRV is opening.	Sieve beds and/or solenoid valve may need replacing

Troubleshooting

Signs of Failure:

- Low oxygen output percentage
- Pressure relief valve relieving air or “Popping Off”

- No Flow

Possible Reasons for System Failures:

- Insufficient Power
- Compressor inlet filter is dirty
- Pressure relief valve has failed
- Compressor requires rebuild
- Solenoid valve not working, or is leaking.
- Ambient humidity above 95% RH or condensing
- SCFH oxygen flow not set properly
- Vacuum drawn through system with main power off
- Air leak in fittings or hose clamp not tight

Insufficient Power – AEROUS Oxygen concentrators require correct input power, +/- 10% rated input voltage and correct cycle. Voltage outside specification can cause the compressor to heat up, decreasing compressor life and decreasing oxygen concentration.
Compressor Inlet Filter is Dirty – The compressor inlet filter's suggested replacement period is every six months of operation. If the filter becomes dirty to the point at which insufficient air is drawn through, this will starve the compressor of air resulting in insufficient air flow and pressure to be delivered to the sieve beds. Because of insufficient air flow and pressure, the sieve beds will be unable to purge moisture and nitrogen sufficiently and become saturated.
Pressure Relief Valve has Failed – The PRV's suggested replacement period is every 8,500 to 12,000 hours of operation. Over time the PRV can wear causing it to leak. If the PRV has failed, it will need to be replaced.
Compressor Requires Rebuild - The compressor's suggested rebuild period is every 17,000 hours of operation. If the compressor requires rebuild or is rebuilt improperly, this may cause insufficient air flow and pressure to the sieve beds. Which will cause the sieve beds to insufficiently purge moisture and nitrogen and become saturated.
Air Leak in Fittings or Hose Clamp not Tight – If there is an air leak due to a loose fitting or hose clamp, this will cause insufficient air flow and pressure to the sieve beds. Which will cause the sieve beds to insufficiently purge moisture and nitrogen and become saturated. Tighten all fittings and hose clamps.
Solenoid Valve Not Operating – The solenoid valve is a critical component to the oxygen concentrator. If this assembly is not operating it will cause the sieve beds to insufficiently purge moisture and nitrogen and saturate the sieve beds. To check the solenoid valve, check for air flow from both outlets. When operating properly, the cycle is:

1) Air Flow on one side only for 6-10 seconds.
2) Air flow on both sides for 1-2 seconds.
3) Air flow switches to other side only for 6-10 seconds.

If the solenoid valve is not operating correctly, it needs to be replaced. Be sure to check oxygen purity as the sieve beds may already be saturated if the solenoid valve is faulty.
Ambient Humidity Above 95%RH Condensing – All ambient air parameters must be met when using this equipment. Using the equipment outside the manufactures specifications may result in premature failure. In a condensing environment a coalescing filter with auto-drain must be used.
SCFH Oxygen Flow not Set Properly – As stated above, setting the oxygen concentrator to its specified SCFH at atmospheric pressure is a critical step in the set up of the system. If the oxygen flow rate is set above the rated specification for the system there will be insufficient back pressure to the sieve beds, which will cause the sieve beds to insufficiently purge moisture and nitrogen and become saturated. **Note: The oxygen flow rate may be set lower than the specified amount.**
Vacuum Draw through System with Main Power 'OFF' – At no time should a vacuum be drawn through the oxygen concentrator. In a standard ozone system installation a vacuum created by a venturi is used to draw ozone gas into the water line. If this vacuum is drawn while the oxygen concentrator is 'OFF', the sieve beds will trap the moisture and nitrogen in the same fashion. However, because the compressor and solenoid valve is not 'ON', the sieve beds cannot be purged of the adsorbed moisture and nitrogen, which will saturate the sieve beds causing failure.

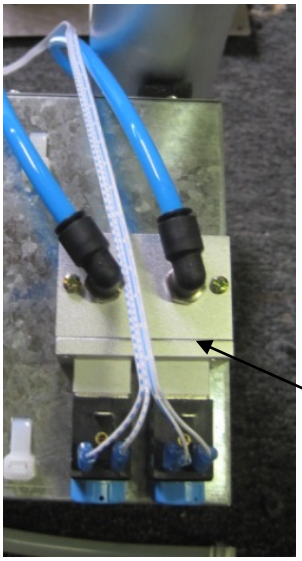
Testing Pre Sieve Beds Pressure Swing:

If a visible failure cannot be found the pre sieve bed pressure swing should be tested. Because the oxygen concentrator relies on this pressure swing, any deviation of the normal operating swing parameters will help aide the trouble shooting process.

- Tee a liquid PSI gauge between the compressor and PRV or between the solenoid and the sieve beds
- Apply power to oxygen concentrator
- Observe swing, see the Normal Operating Parameters Chart below.

Product	PRV Set Point	Pre SIEVE BEDS PSI	Post SIEVE BEDS PSI	Oxygen Output SCFH Flow Rate	Oxygen Output Percentage
Aerous 8	45 PSI	25-30	25-30	8 SCFH @10 PSI	90% +3/-5%
Aerous 15	45 PSI	25-30	25-30	15 SCFH @10 PSI	90% +3/-5%

Result	Possible Cause	Solution
Low Pre SIEVE BEDS Pressure Swing	- Compressor inlet filter is dirty - Compressor not operating properly - Leak in fitting or hose clamp not tight - PRV is relieving air - Solenoid valve has failed	- Replace compressor inlet filter - Rebuild compressor heads - Tighten all fittings and hose clamps - Check PRV set point, replace as required - Replace solenoid valve
High Pre SIEVE BEDS Pressure Swing	- Sieve beds are saturated with moisture and/or nitrogen.	- Replace sieve beds.

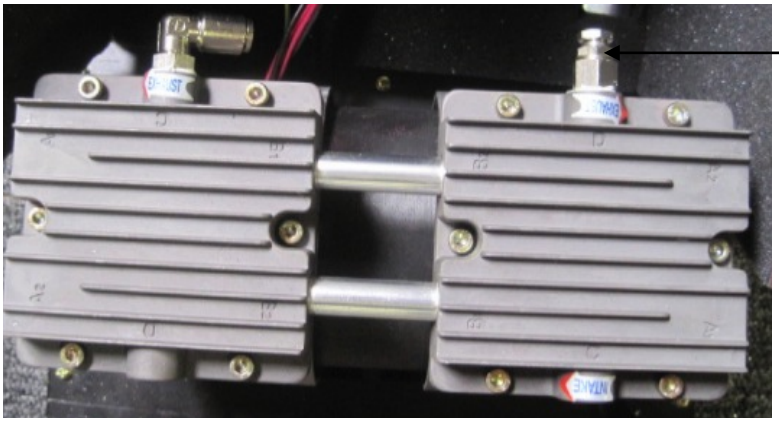


Solenoid Valve

Regulator and Accumulator

Sieve Bed



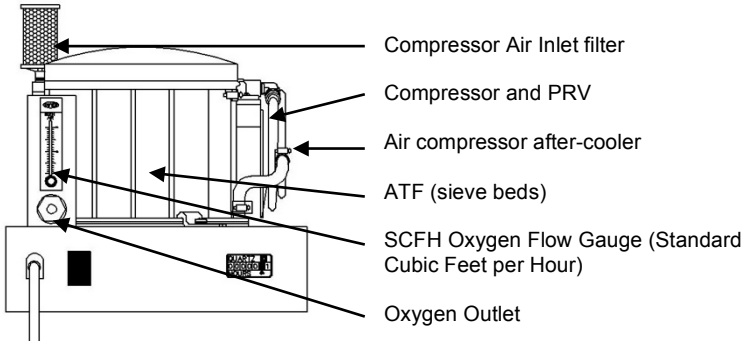


PRV

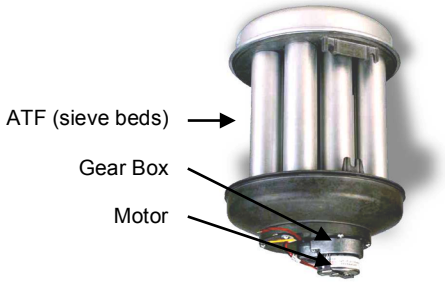
SeQual Oxygen Concentrator Troubleshooting Guide

Oxygen Concentrator Components and Normal Operating Parameters

Oxygen Concentrator – Shown: Workhorse 8C



ATF – Advanced Technologies Factionator



Normal Operating Parameters						
Product	**PRV Set Point (PRE 010106)**	**PRV Set Point (POST 010106)**	**Pre ATF PSI Swing**	**Post ATF PSI**	**Oxygen Output SCFH Flow Rate**	**Oxygen Output Percentage**
Workhorse 8c	35 PSI	45 PSI	17 to 19	5 to 7 PSI	8 SCFH	90% +3/-5%
Workhorse 12c	40 PSI	45 PSI	24 to 28	9 to 12 PSI	12 SCFH	90% +3/-5%
Workhorse 15c	35 PSI	45 PSI	17 to 19	5 to 7 PSI	15 SCFH	90% +3/-5%
Ambient Conditions: Temperature 40˚ to 95˚F, Humidity 0 to 95% RH non-condensing, Ambient Oxygen Level 20.0% minimum.						

System Operation

The SeQual Oxygen Concentrator is a PSA (pressure swing adsorption) system. The system operation begins with ambient air being drawn in through the compressor air inlet filter. The air is then compressed and pressurized through an after-cooler before being delivered to the ATF or sieve beds. Within the ATF, each of the 12 sieve beds trap most of the moisture and nitrogen allowing the oxygen to pass through. This oxygen is concentrated in the ATF where some of the pressure created by the compressor delivers oxygen out of the system at 90-93%. The remaining pressure is used in the ATF recovery cycle. In the recovery cycle the residual pressure continually purges the ATF of the moisture and nitrogen. The motor at the bottom of the ATF turns the gears in the gear box, which turns a disc within the ATF. This disc rotates allowing one third of the sieve beds to dispense oxygen to use, while the one third of the remaining sieve beds are depressurized in the recovery cycle expelling moisture and nitrogen in a vapor form to waste, and another third of the beds are equalizing. If the recovery cycle fails the sieve beds can become saturated. This will cause back pressure to the compressor, which will cause the compressor pressure relief valve (PRV) to relieve air. The PRV relieving air is typically an audible noise, anytime the PRV is relieving air the oxygen concentrator should be shut down and troubleshooting steps should be taken.

Setting System Air flow

All SeQual oxygen concentrators must be set to standard atmospheric pressure. This means, the oxygen SCFH flowmeter must be set ***without*** the oxygen delivery line connected, see the Normal Operating Parameters Chart for correct SCFH setting. **Note: Once the oxygen delivery line is connected the oxygen flow will drop from this set point due to back pressure through the system, this is normal, DO *NOT* READJUST THE SCFH FLOW METER. Warning: Failure to set the oxygen concentrator correctly will cause premature failure. Warranty will be VOID if this step is not completed correctly upon start-up.**

Testing Oxygen Purity

Using an oxygen meter, test the oxygen purity level. If the purity is found to be low further troubleshooting must be completed. If immediate troubleshooting cannot be done the system should be shut down until it is possible. Degradation level of the ATF can be found based on the level of oxygen purity, see chart below.

Oxygen Purity	88% +	40% - 87%	Below 40%
Action	ATF is in good condition, no action required	If no further issues are found, perform a recovery purge cycle	If no further issues are found, the ATF module may need to be replaced

Troubleshooting

Signs of Failure:

- Low oxygen output percentage
- Pressure relief valve relieving air or “Popping Off”
- If an Indicating cartridge color turns from blue and white to pink or all white, if so equipped

Note: These signs of failure can be directly related to the failure of the ATF module.

Possible Reasons for ATF Failures:

• Insufficient Power
• Compressor inlet filter is dirty
• Pressure relief valve has failed
• Compressor requires rebuild
• ATF Motor/Gear box not operating
• Ambient humidity above 95% RH or condensing
• SCFH oxygen flow not set properly
• Vacuum drawn through system with main power off
• Air leak in fittings or hose clamp not tight

Insufficient Power – SeQual Oxygen concentrators require correct input power, +/- 10% rated input voltage and correct cycle. If a low or high voltage or incorrect cycle is used this will cause the motors to turn slower or faster, which will cause insufficient air flows and pressure to be delivered to the ATF. Voltage outside specification can also cause the compressor to heat up, decreasing compressor life and decreasing oxygen concentration.

Compressor Inlet Filter is Dirty – The compressor inlet filter's suggested replacement period is every 4000 hours of operation. If the filter becomes dirty to the point at which insufficient air is drawn through, this will starve the compressor of air resulting in insufficient air flow and pressure to be delivered to the ATF. Because of insufficient air flow and pressure, the ATF will be unable to purge moisture and nitrogen sufficiently and become saturated.

Pressure Relief Valve has Failed – The PRV's suggested replacement period is every 8,500 to 12,000 hours of operation. Over time the PRV can wear causing it to leak. The PRV is an adjustable valve made up of a set-nut and a jam-nut. If the jam-nut is not tightened against the set-nut the vibration of the compressor can cause the set-nut to loosen, causing an air leak.

Setting the PRV:

- Tee a liquid PSI gauge between the compressor and PRV
- Loosen the jam-nut
- Apply power to oxygen concentrator
- Slowly apply back pressure on the compressor by kinking the air compressor delivery tubing to the ATF.
- As back pressure builds on the PSI gauge, listen for the air relief break point of the PRV
- Adjust the set-nut of the PRV until the correct air relief PSI break point is observed. See Normal Operating Parameters Chart above for the correct set point for the system.
- While holding the set-nut stationary tighten the jam-nut against the set-nut

Compressor Requires Rebuild - The compressor's suggested rebuild period is every 8,500 to 12,000 hours of operation. If the compressor requires rebuild or is rebuilt improperly, this may cause insufficient air flow and pressure to the ATF. Which will cause the ATF to insufficiently purge moisture and nitrogen and become saturated.

Air Leak in Fittings or Hose Clamp not Tight – If there is an air leak due to a loose fitting or hose clamp, this will cause insufficient air flow and pressure to the ATF. Which will cause the ATF to insufficiently purge moisture and nitrogen and become saturated. Tighten all fittings and hose clamps.

ATF Motor/Gear Box not Operating – The ATF motor/gear box assembly is a critical component to the oxygen concentrator. If this assembly is not operating it will cause the ATF to insufficiently purge moisture and nitrogen and saturate the ATF. To check the motor/gear box assembly operation, locate the spindle on the gear box. When the system is in normal operation this spindle will turn slowly. Make a mark on the spindle with a felt tipped ink pen to observe it turning. If the spindle is not turning replace the ATF motor/gear box assembly. Be sure to check oxygen purity as the sieve beds may already be saturated if the motor/gear box assembly is faulty.

Ambient Humidity Above 95%RH Condensing – All ambient air parameters must be met when using this equipment. Using the equipment outside the manufactures specifications may result in premature failure. In a condensing environment a coalescing filter with auto-drain must be used.

SCFH Oxygen Flow not Set Properly – As stated above, setting the oxygen concentrator to its specified SCFH at atmospheric pressure is a critical step in the set up of the system. If the oxygen flow rate is set above the rated specification for the system there will be insufficient back pressure to the ATF, which will cause the ATF to insufficiently purge moisture and nitrogen and become saturated. **Note: The oxygen flow rate may be set lower than the specified amount.**

Vacuum Draw through System with Main Power 'OFF' – At no time should a vacuum be drawn through the oxygen concentrator. In a standard ozone system installation a vacuum created by a venturi is used to draw ozone gas into the water line. If this vacuum is drawn while the oxygen concentrator is 'OFF' the sieve will trap the moisture and nitrogen in the same fashion. However, because the compressor and ATF motor/gear box assembly is not 'ON' the ATF cannot be purged of the adsorbed moisture and nitrogen, which will saturate the ATF causing it to fail.

Testing Pre ATF Pressure Swing:

If a visible failure cannot be found the Pre ATF pressure swing should be tested. Because the oxygen concentrator relies on this pressure swing any deviation of the normal operating swing parameters will help aide the trouble shooting process.

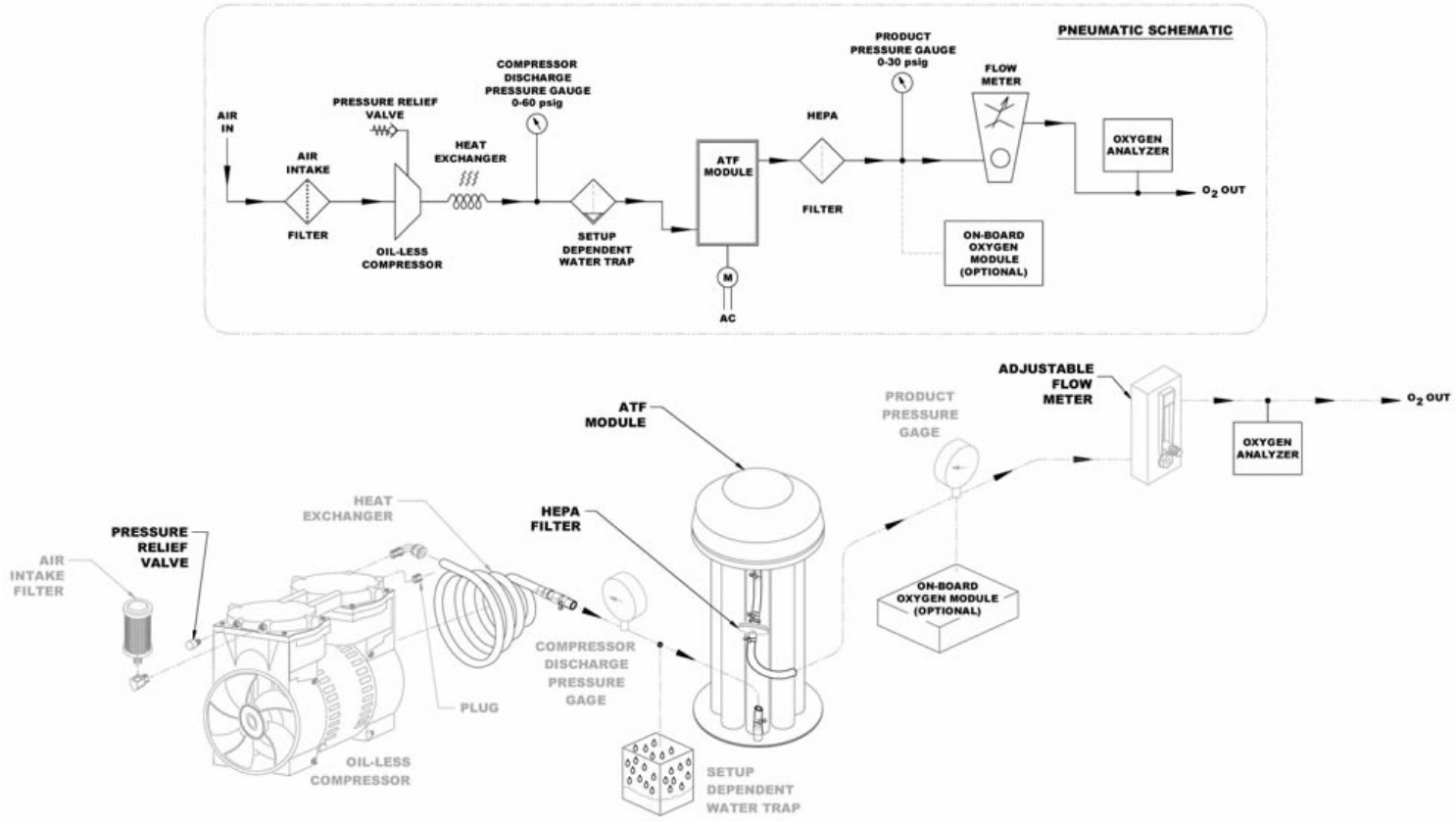
- Tee a liquid PSI gauge between the compressor and PRV or between the after-cooler and the ATF
- Apply power to oxygen concentrator
- Observe swing, see the Normal Operating Parameters Chart above.

Result	Possible Cause	Solution
Low Pre ATF Pressure Swing	- Compressor inlet filter is dirty - Compressor not operating properly - Leak in fitting or hose clamp not tight - PRV is relieving air	- Replace compressor inlet filter - Rebuild compressor heads - Tighten all fittings and hose clamps - Check PRV set point, replace as required
High Pre ATF Pressure Swing	- ATF motor/gear box is not operating properly - ATF is saturated with moisture and/or nitrogen. To be certain of saturation take a weight of the ATF module by itself. This weight can be checked against the original weight at the date of manufacturing.	- Replace ATF motor/gear box assembly if it is not operating. - Complete the steps below for the ATF Recovery Purge Cycle or replace the ATF as required.

ATF Recovery Purge Cycle:

If after all troubleshooting and testing has been completed and the ATF is found to be saturated, a recovery purge cycle of the ATF may return the ATF to normal operating status. However, the success of this recovery purge is dependent upon the saturation level of the ATF, see the "Oxygen Purity Chart" to decide if a recovery purge is relevant. The basis of this recovery purge is to allow 'all' of the pressure and air flow created by the compressor to purge the sieve beds to waste. Over time this recovery purge can clean the ATF sieve beds to the point of normal operational status.

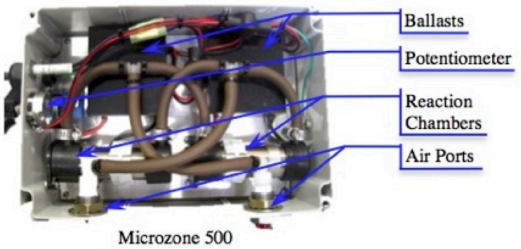
To run the ATF recovery purge cycle, first test the oxygen purity level to create an oxygen purity starting point. Provide main power to the oxygen concentrator and close the oxygen output SCFH needle valve completely. The oxygen concentrator should be run for a minimum of 24 hours, and then oxygen purity should be tested again. If the oxygen purity level has increased to 88% or greater then the ATF has been recovered, if the oxygen purity level has increased though not up to 88%, run the recovery cycle for another 24 hours. As long as an increase in purity is observed after each 24 hour period the recovery cycle may be continued. If the oxygen purity level is not increasing after one or two attempts, then the ATF must be replaced.



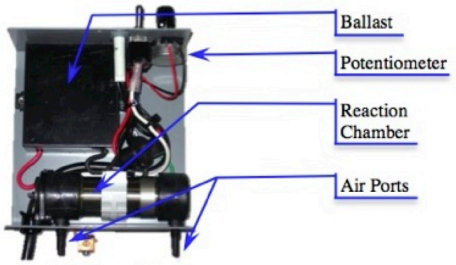
Microzone Troubleshooting & Maintenance Guide

Microzone 300 & 500 series

Troubleshooting



Microzone 500



Microzone 300

Possible Symptoms:

- Suspected loss of ozone output
- Low water quality
- Loss of the bubbles typically seen in the water where the ozone is introduced.

In order for the ozone installation to be successful, we need two simple things to occur:

- Ozone must be produced
- The ozone must be delivered to the water

Troubleshooting the installation involves testing each of these necessities.

It is recommended to read the steps involved prior to performing them. Be aware that maintenance is recommended annually to maintain optimum output. Proceed to the "Maintenance" section for more information.

Testing of the Microzone 300 & 500 Ozone Output

Disconnect tubing and any filters that may be installed on one port of the ozone generator. Apply power and set the ozone output to maximum by turning the black potentiometer knob clockwise. Cup one hand around an empty air port and push air into the other port. It is expected that ozone gas will be expelled into your hand. Confirm the scent of ozone.

Note: Ozone has an overly sweet and cloying scent, commonly present around thundershowers and copy machines. *Do not breathe ozone directly into your lungs; simply smell your hand.*

- If ozone is detected, skip down to the "Air Flow" section.
- If no ozone is detected, turn the black ozone output control knob from maximum to minimum and listen for the voltage arcing noise to decrease and increase appropriately.

If turning the ozone output knob up and down does nothing, meaning makes no sound, then:

- Replace the potentiometer (requires soldering). Refer to the pictures to obtain the part number of your version potentiometer.

Note: The potentiometer can be bypassed if the ozone output of the unit is run at 100% and output control is not needed. Solder/crimp a resistor between the two wired points on the potentiometer (see pictures). 250k ohms resistance between these points will equate to 100% output. The wattage of the resistor is not a factor. A 220k ohm resistor may be used, as they are more common.


ELRP5055 | ELRP5056 Current | Bypassed Potentiometer

If turning the ozone output knob up and down creates a change in sound, then:

- Rebuild or replace the reaction chamber(s). Replacement part number for one chamber is CD287. For rebuilding instructions see the "Maintenance" section.

Note: The ballast(s) of the Microzone series units rarely have failures. Voltage spikes are the only reason found to require replacement.

Regarding potentiometers:

Failures of older potentiometers are usually due to either a minor ozone leak or environmental damage. In newer units, we have reinforced this component by installing a sealed potentiometer and moving the on/off switch function to the silver toggle switch installed next to the new potentiometer. Pictured are the two versions of potentiometers. Upgrading to the current style will involve drilling and mounting the on/off toggle switch. Replacement of the unit with the current version, and harvesting the original unit for spare parts is a common choice when forced to replace the potentiometer.

Microzone Troubleshooting & Maintenance Guide

Microzone 300 & 500 series

Microzone 300 & 500 Airflow
There are two methods of introducing ozone to water: Suction with a venturi injector and Diffusion through a diffusion stone with a compressor. *Note:* If you are using the ozone generator to introduce ozone gas into the air, such as for deodorizing, you are using the diffusion method.

Testing Venturi Airflow:
We will check for two things, the presence of suction at the venturi and then confirm there are no air leaks in the tubing or unit. If there are any air leaks, ambient air enters the line replacing or diluting the ozone.

Disconnect the tubing at the injector and place your thumb over the injector fitting for 5 seconds. You're going to use the tactile suction present to give you a baseline level of suction. After reconnecting tubing to the injector, disconnect it from the next connection point and compare the level of suction found to that present at the injector. Continue checking for suction until suction has been confirmed between the venturi injector and all components, to the ozone generator's air inlet fitting.
Replace the components found to be leaking.
Note: When confirming suction, press your finger over the line for 5 seconds at each testing point. It should hold suction the entire time. If a leak has occurred, the suction will be present initially, but will fade as the leak is drawn through.

If no suction is detected at the venturi injector:

- Adjust the injector bypass valve to route more water through the injector
- Confirm the water pump is operational and not cavitated.
- Remove the check valve at the injector (slowly) to see if it is clogged and may require replacement. CWT part # CKV60
- Check for blockages downstream which would cause excessive backpressure
- Examine the suction port of the injector for debris physically blocking the port

Testing Diffusion Airflow
Symptom – "No bubbles in water" In diffusion setups, we're testing for two things, the compressor pressurizing air and confirming there are no leaks between the compressor and to the point of delivery.

Disconnect power from the ozone generator; there is no need to generate ozone for these tests.
Disconnect tubing from the output of your air compressor (usually a quality aquarium pump), power the compressor and confirm air is being pressurized.
Note: The Microzone 300 & 500 do not have internal compressors. If the diffusion method is being used a compressor has been purchased along with the ozone generator or added after installation.
To extend the longevity of the pump, please see the "Maintenance" section.

If no pressure is detected at the compressor outlet: Replace/rebuild the compressor.
If pressure is detected, reconnect the tubing. Perform the same test, checking for pressurized airflow at each tubing connection, checking for leaks. Replace components found to be leaking.

If the leak is found at the reaction chamber(s) due to the glass being pushed out of the chamber housing, see "Rebuilding the Reaction Chamber" section for instructions on how to reinstall the glass. This issue is caused by excessive pressure being delivered to the reaction chambers. Do not exceed the maximum pressure of 5 PSI. The ideal range is 3 PSI. Clogged diffusion stones can increase the pressure, see "Maintenance".

Maintenance of Microzone 300 & 500
In order to maintain optimum output and longevity, preventative annual maintenance is recommended.
Replace the following annually:

- Check valve CWT Part #: CKV60
- Filter (Used in Microzone 500) CWT Part #: FLT34
- Diffusion stone: CWT Part #:DIF12
  Alternatively, the diffusion stone can be cleaned. Soak overnight in a 50% solution of muriatic acid and rinse.
- Reaction chamber(s) CWT Part #: CD287
  Alternatively, the reaction chamber can be rebuilt, assuming no components are broken.

Microzone Troubleshooting & Maintenance Guide

Microzone 300 & 500 series

Note about reaction chambers:
Compaction of media within the reaction chamber will occur after an extended time, typically 1-3 years depending on usage. Ozone output is reduced while it is in this state. For this reason, we recommend replacing or rebuilding the reaction chamber annually.

Rebuilding the Reaction Chamber
Rebuilding the reaction chamber is delicate work, but easy to master. It is recommended to have a replacement reaction chamber on hand when performing a rebuild, as the glass within may be broken.

You will need a Phillips head screwdriver, (needle-nose) pliers, sheet of paper / paper plate, denatured alcohol, shop towel for cleaning. A ½" drill bit is recommended.

To begin, you will need unplug the unit from its power source and remove the cover. Then remove reaction chamber from its stabilizing clips and wires. Once the reaction chamber is removed, continue with the chamber rebuild steps below.

Step 1: Remove the test tube-like glass from the cathode chamber housing by removing the outer retaining nuts/screws on high voltage end. This glass tube should slide out easily.
Note: if the glass is broken or cracked upon removal, replace entire reaction chamber and ignore remaining steps.



Step 2: Extract the rubber plunger by unscrewing the nut that secures the anode post (threaded screw without a head) and, using a pair of pliers, pull it straight out of the glass tube.
Note: Any sideways movement may break the glass.





Step 3: Dump the loose media into a square container or paper plate. The remaining media will be media tightly packed within the tube.

Step 4: To remove the remaining media, run a powered drill bit, slightly smaller than the tube itself, through the media in a slow and controlled manner to work out the media.
Note: This method is preferred compared to chipping out the media, as it does not involve contact with the glass, limiting breakage.

Step 5: Once the media is removed, and broken down to no longer be tightly packed, it can be poured back into the tube
Note: You will likely not be able to fit all the media back into the tube, save or discard the excess.

Step 6: Press the rubber plug back in slowly, avoiding any sideways movement. Secure the nut on threaded screw, clean the exterior of the glass tube with denatured alcohol and reassemble.

ClearWater Tech. LLC.

System Commissioning

* Overview

• Observe equipment room
- Proper ventilation
- Sufficient air turn over
- Clean area that will not clog filters
- Equipment is not subject to weathering conditions
- Equipment is not subject to potential failure due to effects of surrounding equipment

• Observe proper mechanical installation
- Inspect equipment for shipping damage
- Equipment is mounted properly
- All electrical panels, doors and covers are easily accessible
- Equipment is easily accessible for future maintenance
- All meters, light, switches and gauges should be visible and accessible

• Observe Hydraulics
- Size of pipe for installation
- Contact tank(s) plumbed correctly
- Injector Manifolds plumbed correctly
- Ozone injection located upstream of residual sanitizer
- pH control feeder place downstream of residual sanitizer
- ORP probe location on suction side of main return pump
- Inspect for back pressure possibilities
- Insure proper back flow prevention devices
- Observe isolation valves and bypass loops for maintenance purposes
- Observe filtration to ozone loop as required

• Observe Electrical
- Insure proper electrical hook ups of equipment
- Insure the use of a “true neutral” when required (not a floating neutral)
- Equipment is placed as close as possible to the point of injection (20’ max)
- Insure constant power to equipment that requires it
- Insure proper rotation of 3 Phase pumps
- Insure proper position of voltage selector switch(es)

• Observe Pneumatics
- Sufficient tubing lengths
- No kinks
- Connectors and hose clamps tight
- Water in vacuum break

* Start-up and Calibration

• Hydraulics
- Flow through ozone loop
- Check for vacuum on venturi

• Heat Regenerative Air dryer
- Dryers are heating and cycling

• Oxygen Concentrators and LPSA Dry Air
- All packaging material has been removed
- Compressor inlet filter is installed
- SCFH set at atmospheric pressure (not connected to ozone generator). The SCFH set must not exceed the output of the unit used, ie: Workhorse 15C, 15 SCFH max.

• Ozone Generator
- Turn on system
- Observe cooling fan(s) on
- Observe all main power lights for operation
- Observe all drive modules LED's for operation
- Insure proper position of the On/Off/Auto or Variable/Bypass/4-20mA switch(es)
- Set SCFH and adjust vacuum

• Vacuum Break
- Bubbles must not be present

• Ozone Destruct System
- Adjust ball valve on water trap as required
- Insure Off Gas Destruct is heating
- Insure ozone off gas is not present in the ambient air

• Over Vacuum Relief Valve
- Insure valve is opening (use an instrument for initial break of valve)
- Valve arrow must be in the direction of ozone gas flow
- Insure there are no obstructions of the valve

*** Final**
- Overlook installation

*** Training**
- Train on sight staff of operation of equipment and preventative maintenance

Serial Number of Equipment:_____

Model of Equipment:_____

Job Name:_____

Job Location:_____

Job Contact:_____

Commissioning Provided By:_____ Date: _____
Signature

Commissioning Approved By:_____ Date:_____
Signature

Service Contract

Agreement made this _____ day of _____, 20__, between _____, hereinafter First Party, and _____, hereinafter Second Party.

The parties to this agreement, in consideration of the mutual covenants and stipulations set out, agree as follows:

Both parties agree to a maintenance contract for the period of ____ to ____ . The cost of _____, due the 1st day of the month, paid to the first party, for the maximum of one (1) hour labor per month, with equipment to inspect, adjust, clean filters and make minor repairs as required to the following systems:_____, system electronic controllers, contact tank/relief valves, filter tank/relief valves, control valves, compressors/ filters, cooling radiators, recirculating pump/ filter basket, poly tank floating valves and mazzie venturi installed on the site of the second party. Additional labor time of the first party to be billed at $_____per hour and paid on terms of net 30. Any and all additional parts, charged at wholesale, to be invoiced and paid on terms of net 30. Plus, once in a 12 month period a total of eight (8) hours of labor of the first party for general maintenance on the site of the installation of the _____, to be billed at $_____ per hour plus parts and paid on terms of net 30.

SECTION I
INSTRUMENT AS ENTIRE AGREEMENT

This instrument contains the entire agreement between the parties, and no statements, promises, or inducements made by either party or agent of either party that are not contained in this contract shall be valid or binding; this contract may not be enlarged, modified, or altered except in writing signed by both parties and endorsed on this agreement.

SECTION II
EFFECT OF AGREEMENT

This agreement shall inure to the benefit of and be binding on the heirs, executors, assignees, and successors of the prospective parties.

IN WITNESS WHEREOF, the parties have executed this agreement on the day and year first above written.

_____	_____
Signature of First Party	Signature of Second Party
_____	_____
Print Name of First Party	Print Name of Second Party
_____	_____
Address of First Party	Address of Second Party

ClearWater Tech, LLC Limited One-Year Warranty

Summary of the Warranty

ClearWater Tech, LLC ("CWT") makes every effort to assure that its products meet high quality and durability standards and warrants the products it manufactures against defects in materials and workmanship for a period of one (1) year, commencing on the date of original shipment from CWT, with the following exceptions: 1) The warranty period shall begin on the installation date if the installation is performed within 90 days of the original shipment from CWT; 2) The warranty period shall begin on the date of the bill of sale to the end user if the installation date is more 90 days after the original shipment date. To validate the warranty, a warranty card, accompanied by a copy of the bill of sale, must be returned to CWT and must include the following information:

- End user name
- Complete address, including telephone number
- Date installed
- Complete model and serial number information
- Name of company from which the unit was purchased

Repairs and replacement parts provided under this warranty shall carry only the unexpired portion of this warranty or 90 days, whichever is longer.

Items Excluded from the Warranty

This warranty does not extend to any product and/or part from which the factory assigned serial number has been removed or which has been damaged or rendered defective as a result of:

- an accident, misuse, alteration or abuse
- an act of God such as flood, earthquake, hurricane, lightning or other disaster resulting only from the forces of nature
- normal wear and tear
- operation outside the usage parameters stated in the product user's manual
- use of parts not sold by CWT
- service or unit modification not authorized by CWT
- check valve/solenoid valve failure
- damage which may occur during shipping
- failure to meet service requirements as outlined in the I & O manual

Obtaining Service Under the Warranty

Any product and/or part not performing satisfactorily may be returned to CWT for evaluation. A Return Goods Authorization (RGA) number must first be obtained by either calling or writing your local authorized dealer, distributor or CWT direct, prior to shipping the product. The problem experienced with the product and/or part must be clearly described. The RGA number must appear prominently on the exterior of the shipped box(es). The product and/or part must be packaged either in its original packing material or in comparable and suitable packing material, if the original is not available. You are responsible for paying shipping charges to CWT and for any damages to the product and/or part that may occur during shipment. It is recommended that you insure the shipment for the amount you originally paid for the product and/or part.

If, after the product and/or part is returned prepaid and evaluated by CWT, it proves to be defective while under warranty, CWT will, at its election, either repair or replace the defective product and/or part and will return ship at lowest cost transportation prepaid to you **except for shipments going outside the 50 states of the United States of America.** If upon inspection, it is determined that there is no defect or that the damage to the product and/or part resulted from causes not within the scope of this limited warranty, then you must bear the cost of repair or replacement of damaged product and/or part and all return freight charges. Any unauthorized attempt by the end user to repair CWT manufactured products without prior permission shall void any and all warranties. For service, contact your authorized dealer or distributor or CWT direct at (805) 549-9724, extension 23.

Exclusive Warranty

There is no other expressed warranty on CWT products and/or parts. Neither this warranty, or any other warranty, expressed or implied, including any implied warranties or merchantability of fitness, shall extend beyond the warranty period. Some states do not allow limitations on how long an implied warranty lasts, so that the above limitation or exclusion may not apply to you.

Disclaimer of Incidental and Consequential Damages

No responsibility is assumed for any incidental or consequential damages; this includes any damage to another product or products resulting from such a defect. Some states do not allow the exclusion or limitation of incidental or consequential damages, so that above limitation or exclusion may not apply to you.

Legal Remedies of Purchaser

This warranty gives you specific legal rights and you may also have other rights which vary from state to state.

THIS STATEMENT OF WARRANTY SUPERSEDES ALL OTHERS PROVIDED TO YOU AT ANY PRIOR TIME.