Installation & Operation Manual For Red Sea's 50, 100 & 200 mg/hr AquaZone & AquaZone Plus

Red Sea

1. Introduction to Ozone & Redox Potential

1.1 What is Ozone?

Through an electrical discharge in air, three oxygen molecules can combine to form two ozone (O_3) molecules. In nature this happens for example in a thunderstorm by the action of lightning. Ozone can be made artificially on a small scale through electrical discharges inside an ozone generator. Ozone is a very unstable combination, which will be oxidized by this reaction. Ozone is therefore a very strong oxidizer.

1.2 What can Ozone do for the Aquarium?

Due to its oxidizing capabilities, ozone can break down harmful waste products produced by fish. In a marine aquarium (or in a freshwater tank with pH higher than 7.5), ammonia is efficiently oxidized to less harmful nitrite and further to nitrate. This oxidation reaction can also be performed by bacteria in a biological filter, however it is advantageous to install an ozonizer as a backup to prevent dangerously high ammonia levels. This backup function is especially important in aquaria with a lot of fish and subsequently a lot of waste.

More complex organic wastes, such as the substances that turn the water yellow, cannot be removed by biological or mechanical filtration. Ozone however, breaks up their structure, so that the fragments can be cleared up by the filter's bacteria or through protein skimming. The use of Ozone leads to "Crystal clear" water.

Another important property of Ozone is its sterilizing ability. Harmful bacteria and other possible pathogens that float in the water are efficiently killed by ozone. In the sea the amount of floating bacteria is always very low, due to the antiseptic action of natural sea water. In the aquarium however, bacteria that can be harmful to many aquarium inhabitants, especially fish larvae, find a favorable environment for rapid reproduction. The term "sterilizing" should not be taken too literally. The amount of ozone administered should be just enough to kill only surplus bacteria. Totally sterile water is just as harmful, to fish and invertebrates.

Ozone should never be introduced directly to the aquarium water: it must be administered through an isolated chamber like a pressurized ozone reactor or a protein skimmer. A freshwater aquarium can be ozonized by connecting the ozonizer to an air-driven internal filter.

1.3 How much Ozone should be used?

The ideal dosage will vary for each aquarium. The right dosage of ozone is dependent on a number of factors: the volume of water, the water flow rate, the ozonized air flow rate, the amount of dissolved organic matter, the fish density, the type of biological filtration and additional equipment in use. As a guideline, the ozone production should be between 5 and 15 mg/hr per 25 gallon (100 liter) of aquarium water.

Aquaria densely populated with fish need more ozone input than invertebrate tanks where far less waste products are produced. Small reef aquaria (few fish, many invertebrates) can be successfully maintained with less than 5 mg\hr\25 gallon. Dosages in excess of 15 mg\hr\25 gallon, should be used with extreme caution and only, for example, in a tank densely populated with fish and no invertebrates.

1.4 What is Redox (ORP) Potential?
In every chemical reaction electrons are transferred from one substance to another. The substance that receives electrons is said to have been oxidized, while the one that loses electrons is said to have been reduced. In freshwater and sea water, many of these so called redox reactions occur simultaneously. Because of the constant exchange of electrons the amount of prevailing oxidative or reductive reaction can be measured as a voltage, by means of a platinum electrode and a voltmeter. This millivoltage is called the redox potential also called the ORP (Oxidation Reduction Potential). The higher the redox potential, the greater the oxidizing capacity of the water. Redox potential values of between 300 and 350 mV (recommended as the desirable level) indicate an oxygen rich environment with a low waste material content. The redox potential can therefore be used as an indication of the quality of your Aquarium environment.

Some authorities advise maintaining a redox potential of 400 mV or even higher. Be extremely careful with high redox levels, values higher than 430 mV can be dangerous, values of 600 mV will cause increased levels of sterilization which should not even be considered for aquarium use.

Values below 200 mV indicate an accumulation of organic wastes and a low oxygen level. Negative redox potentials are also possible indicating anaerobic conditions which can occur, for example, under the bottom gravel.

1.5 The Relationship between Ozone use and Redox Potential
As Ozone is applied to aquarium water it will raise the oxygen level and break down organic wastes i.e. sterilizing the water thus raising the redox potential. Since too high a redox potential is as undesirable as a low redox potential it is advisable to keep the redox potential stable by means of applying ozone when the redox potential is lower than the desired value and switching off the ozone when the upper limit of the redox potential has been reached. This can be achieved by combing a Redox controller with the AquaZone (Ozonizer) unit or using the AquaZone PLUS (combined Ozonizer and Redox controller). If ozone is to be applied without the benefit of a redox controller the dosage should be set at a low value so as to prevent too high a redox potential forming in the aquarium.

2. Additional Equipment

In order to operate the AquaZone/AquaZone PLUS you require the following equipment:

1. Air Pump.
2. Air Dryer – Recommended.
3. Ozone Reactor and /or Protein Skimmer.
4. Carbon filter – Recommended.
5. Redox controller. (Integral part of AquaZone Plus)
6. Redox (ORP) electrode. (Supplied with AquaZone Deluxe)

3. Special Instructions and Safety Precautions for using Ozone

3.1 Ozonized air should be prevented from escaping into the room; it is advisable to install a carbon filter on your protein skimmer or ozone reactor where ozonized air escapes.

3.2 Do not let the redox value exceed 400 mV as harmful substances can be produced which could damage sensitive organisms. The aquarium inhabitants should be protected from exposure to free ozone and /or oxidation products. The recommended method to remove any residual free ozone and any free oxidation products is by vigorous aeration followed by filtration through activated carbon. After this treatment the amount of residual ozone should be checked regularly – maximum 0.05 mg per liter. (Recommended: Red Sea Fish Pharm's Residual Ozone Mini-Lab Test).

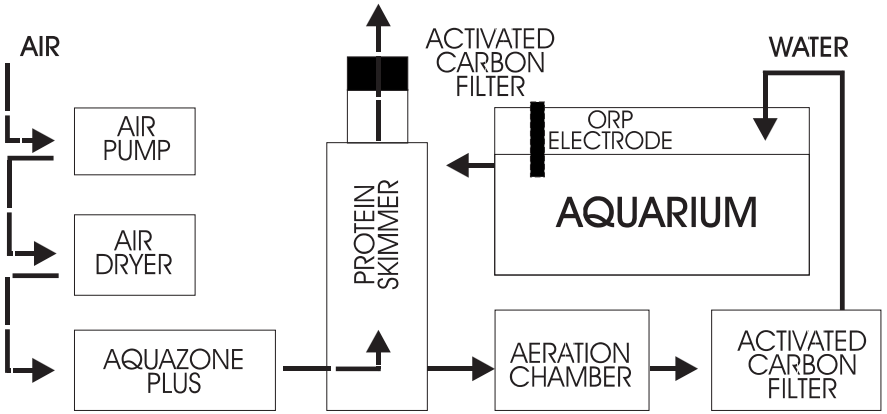
3.3 The Ozone production is affected by the humidity and dust content of the air supply. Use of an air dryer will ensure a consistent ozone output and longer equipment life. Strictly follow the manufacturer's directions in servicing the dryer media.

3.4 All air tube connections should be secured tightly.

3.5 The AquaZone unit should preferably be installed above the aquarium; in this way no water can siphon into the unit in case of a power failure. If the unit is located under the water line of your aquarium, you should install an ozone safe non-return valve (not supplied with the unit) on the air tube connecting the ozonized air to the reactor.

3.6 Ozone treated water should not flow back into the biological wet-dry filter since the nitrifying bacteria are extremely sensitive to residual ozone. Even amounts less than 0.05 mg per liter can adversely affect your filter bed.

IDEAL OZONIZATION CONFIGURATION



4. AquaZone 50/100/200 – Installation and Operation

4.1 Connect your air pump to the (IN) air tube connection on the back panel. Connect the (OUT) air tube connection to the Ozone Reactor or protein Skimmer. (it is advisable to install an ozone safe non-return valve).
4.2 Switch on your air pump and check that air is flowing freely through the unit.
4.3 Set the ozone output to the desired level as recommended in section 1.3 Above. The scale is set as a percentage of the maximum output of 50, 100 or 200 mg/hr according to the model purchased.

Ozone Output level in mg/hr					
Model	5%	30%	50%	75%	100%
50	2.5	12.5	25	37.5	50
100	5	25	50	75	100
200	10	50	100	150	200

4.4 Plug the DC jack into the back of the unit and the AC adapter to a wall mounted receptacle.
4.5 The red light on the front panel indicates that the unit is generating ozone, however it will only be effective when air is forced through the unit.
4.6 It is recommended to use the AquaZone together with a redox controller.

5. AquaZone Plus 50/100/200 – Installation and Operation

The AquaZone PLUS unit includes a ozonizer combined with a redox controller that constantly measures the redox potential (ORP) of your aquarium. When the measured ORP in the aquarium falls below the desired level (ORP SET POINT) the ozonizer is automatically switched on and will remain on until the desired ORP is reached. The AquaZone PLUS provides easy adjustment with digital display of both the desired ORP and the output level of the ozone produced.
The AquaZone PLUS cannot be used without an ORP electrode (see section 6 of manual). The Reagecon ORP electrode is supplied as part of the AquaZone Deluxe Kit or can be purchased separately. Before using the Reagecon ORP electrode remove the plastic cap and rinse the tip in running water.

5.1 Immerse your ORP electrode about halfway into the aquarium water. It should be installed in a flowing water, preferably in a dark place, to avoid fouling with algae. A good place is in the flowing water near the overflow siphon or overflow compartment of your aquarium. An alternative is the sump of your biological filter. Connect the electrode cable to the BNC socket on the front of the unit. If the AquaZone PLUS unit is located under the water level install the electrode with a drip loop in the cable.
5.2 Connect your air pump to the (IN) air tube connection on the back panel of the unit. Connect the (OUT) air tube connection to the ozone reactor or protein skimmer. (it is advisable to install an ozone safe non-return valve).
5.3 Switch on your air pump and check that air is flowing freely through the unit and that there are no leaks at the connections. Switch off pump until setup is complete.
5.4 Turn the "Ozone" knob to the minimum position and the "OPR SET POINT" knob to maximum. Position the selector switch to "ORP READING".

5.5 Plug the DC jack into the back of the unit and the AC adapter to a wall mounted receptacle. The digital display will show the current ORP of the Aquarium water.
5.6 Position the selector switch on the front panel to "Ozone" and set the desired level of ozone output. The digital display shows the ozone level in milligrams of ozone per hour (mg/hr). As a rule of thumb set 10 mg/hr for every 25 gallons (100 liters) of aquarium water. **NOTE**: The ozone level can only be set if the ozonizer is currently producing ozone i.e. the red indicator light is illuminated. This will only occur when the "ORP Set point" is higher than the "ORP reading".
5.7 Position the selector switch on the front panel to "ORP set point" and set the desired redox potential. (Recommended between + 300 and + 350 mV.)
5.8 Switch on the air pump, check that ozone is being produced and that the ozonizer is being switched on and off correctly as the ORP reading varies.

Notes:

a. Redox values differ considerably in different parts of the aquarium. To obtain consistent results one should determine a fixed position for the electrode. Other factors influencing the redox potential are: pH, lighting, temperature, feeding and even the time of day. In order to compare your results and evaluate the changes, take and note several readings at the same time every day. In this way you will be able to compare the different measurements.
b. It may take several days to reach the set point. Preferably the ozone generator should not be set higher than 15 mg/hr/25 gallon (100 liters). Monitor the redox potential carefully for a few days (compare readings taken at the same time every day). If after several days the ORP does not go up significantly, slightly increase the ozone production rate but not more than to 25mg/hr/25 gallon (100 liters). Once the set point has been reached reset the ozone production to between 5 and 15 mg/hr/100 liters.
c. Care should be taken not to move the set point and ozone adjustment knobs (after setting) as this will alter the settings.
d. Humidity may decrease ozone production by 50%. All ozone production settings mentioned in this manual assume that dry air is introduced to the ozonizer.

6. Electrode

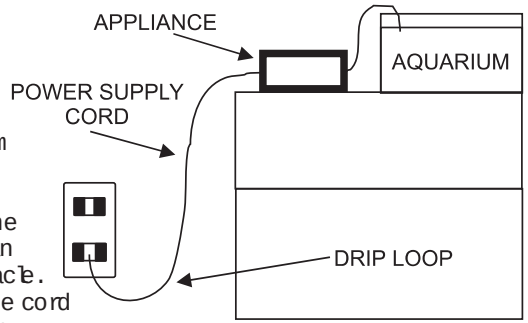
The AquaZone PLUS unit is calibrated and tested with the Reagecon Platinum - Ag/AgCl electrode which is recommended for use with the AquaZone PLUS; should another type/brand of electrode be used with the AquaZone Plus, ensure that you:
Take a reading with your electrode in "Redoxsol" Red Sea Fish Pharm's Electrode test solution. If you receive a reading different to that printed on the test solution bottle, follow the supplied instructions carefully on how to use this electrode with the AquaZone Plus unit.

The electrode should be cleaned every 3 or 4 weeks. (Recommended: ElectroClean, Red Sea Fish Pharm's Electrode Cleaner). After cleaning allow 6 hours to stabilize during which ozone should not be administered. The expected life span of an electrode is approximately 1 to 2 years; after this period to avoid false readings and incorrect ozonization it should be replaced.

IMPORTANT SAFETY INSTRUCTIONS

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

1. READ AND FOLLOW ALL SAFETY INSTRUCTIONS.
2. DANGER – To avoid possible electric shock, special care should be taken since water is employed in the use of aquarium equipment. For each of the following situations, do not attempt repairs yourself; return the appliance to an authorized service facility for service or discard the appliance.
3. If the appliance falls into the water, DON'T reach for it! First unplug it and then retrieve it. If electrical components of the appliance get wet, unplug the appliance immediately.
4. Do not operate any appliance if it has a damaged cord or plug, or if it is malfunctioning or if it is dropped or damaged in any manner.
5. To avoid the possibility of the appliance plug or receptacle getting wet, position the aquarium stand and tank to one side of a wall mounted receptacle to prevent water from dripping onto the receptacle or plug. A "drip loop" shown in the figure, should be arranged by the user for each cord connecting an aquarium appliance to a receptacle. The "drip loop" is that part of the cord below the level of the receptacle, or the connector. Use an extension cord if necessary, to prevent water traveling along the cord and coming into contact with the receptacle. If the plug or receptacle does get wet. DON'T unplug the cord. Disconnect the fuse or circuit breaker that supplies power to the appliance. Then unplug the device and examine for presence of water in the receptacle.



6. Close supervision is necessary when any appliance is used by or near children.
7. To avoid injury, do not contact moving parts or hot parts such as heaters, reflectors, lamp bulbs, and the like.
8. Always unplug an appliance from an outlet when not in use, before putting on or taking off parts, and before cleaning. Never yank cord to pull plug from outlet. Grasp the plug and pull to disconnect.
9. Do not use an appliance for other than its intended purpose. The use of attachments not recommended or sold by the appliance manufacturer may cause an unsafe condition.
10. Do not install or store the appliance where it will be exposed to the weather or to temperatures below freezing.
11. Make sure an appliance mounted on a tank is securely installed before operating it.
12. Read and observe all the important notices on the appliance.
13. If an extension cord is necessary, a cord with a proper rating should be used. A cord rated for less amperes or watts than the appliance rating may overheat. Care should be taken to arrange the cord so that it will not be tripped over or pulled.
14. SAVE THESE INSTRUCTIONS

7. Warranty

Red Sea Fish Pharm Aquarium Products Limited Warranty

The limited warranty sets forth all Red Sea Fish Pharm LTD (Red Sea) responsibilities regarding your product. There are no other express or implied warranties from Red Sea.

Red Sea warrants your product against defects in materials and workmanship for a period of 12 months from the date of original purchase and will repair this product free of charge (not including shipping costs) with new/rebuilt parts. In the event that a problem develops with this product during or after the warranty period contact your dealer or Red Sea (at the company address indicated) for details of your nearest authorized service center.

This warranty is extended only to the original purchaser. Proof of date of purchase will be required before warranty performance is rendered.

This warranty only covers failures due to defects in materials or workmanship which occur during normal use. It does not cover damage which occurs in shipment or failures which result from misuse, abuse, neglect, improper installation, operation, mishandling, misapplication, alteration, modification or service by anyone other than an authorized Red Sea service center.

Red Sea shall not be liable for incidental or consequential damages resulting from the use of this product, or arising out of any breach of this warranty. All express and implied warranties, including the warranties of saleability and fitness for a particular purpose, are limited to the applicable warranty period set forth above.

These statements do not affect the statutory rights of a consumer.

USA

Some states do not allow the exclusion or limitation of incidental or consequential damages, or limitations on how long an implied warranty lasts, so the above exclusions or limitations may not apply to you.

Technical Specifications

Power Source	Ozonizer
18 VDC 0.3A	Corona discharge type
Casing Shockproof plastic	Variable 5… .100%
Height 54mm	
Width 150mm	
Length 170mm	Redox Controller (AquaZone Plus)
Weight 555 grams (without AC)	Measuring range: 0-1999 mV
Adapter	Accuracy: +/-Mv
Environment	Set Point: 0… ..500Mv (+-10%)
Temperature 0-45°C (32-113°F)	Display: backlit LCD
Humidity 5-85%	

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