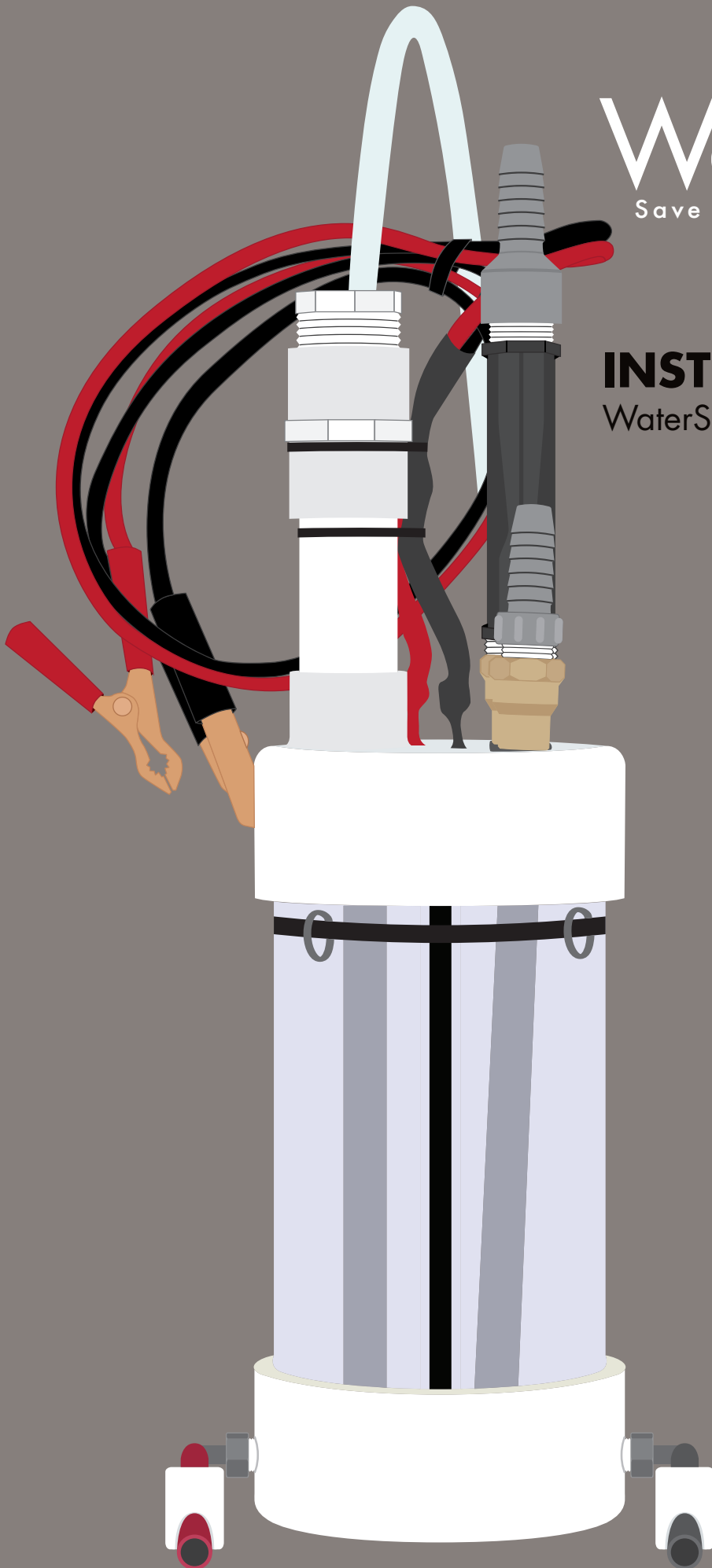




## INSTRUCTION MANUAL

WaterStep M-100 Chlorine Generator



**Read these instructions  
in order to safely and  
effectively use this  
product.**

WaterStep  
625 Myrtle St.  
Louisville, KY 40208 USA  
+1.502.568.6342  
[waterstep.org](http://waterstep.org)

## CONTENTS

Important Safeguards .....	1
Warnings .....	2
What the M-100 Chlorine Generator Does .....	3
What is Included with the M-100 Chlorine Generator .....	4-6
What You Need to Supply Locally .....	6
Installing the M-100 Chlorine Generator .....	7-10
Operating the M-100 Chlorine Generator .....	11-15
Shutting Down the M-100 Chlorine Generator .....	16-17
What to Do with the By-Products .....	18

## IMPORTANT SAFEGUARDS

When using the WaterStep M-100 Chlorine Generator, you should always follow basic safety precautions:

- 1. Read all instructions!**
- 2.** Allow only responsible adults who are familiar with the instructions to operate the M-100.
- 3.** The M-100 produces by-products of liquid chlorine and sodium hydroxide. Use caution when draining the M-100 of these by-products. Rinse any spills immediately.
- 4.** Store these by-products in bottles that are not used for drinking. Using a permanent marker, clearly mark the bottles **CHLORINE** and **SODIUM HYDROXIDE**. Also write in large words: **POISON - DO NOT DRINK. These by-products can be harmful or fatal if swallowed!** ⚠
- 5.** The side of the M-100 labeled CHLORINE produces chlorine gas when the unit is operated as instructed. **Do not open the fill tube and breathe the fumes.** ⚠
- 6.** When draining and rinsing the M-100, be careful not to spill chlorine or sodium hydroxide on your skin or clothes, or splash it in your eyes. **You should wear eye protection.** ⚠
- 7.** To protect against shock, sparks or explosion, never place tools on or near the 12-volt battery.
- 8. Never leave the M-100 running unattended.**
- 9. Avoid over-chlorinating the water by testing chlorine levels frequently as instructed in this manual.** If the water is over-chlorinated, add water to dilute the chlorine to 5 PPM (Parts Per Million).

**SEE WARNINGS ON PAGE 2**

# THE WATERSTEP M-100 CHLORINE GENERATOR GENERATES CHLORINE GAS TO PURIFY WATER. IT DOES SO SAFELY WHEN USED AS INTENDED BY PEOPLE WITH PROPER TRAINING. BUT IT CAN BE DANGEROUS IF NOT USED CORRECTLY.

The M-100 uses salt (sodium chloride, or NaCl) and direct current (DC) electricity to produce chlorine gas ( $\text{Cl}_2$ ) and sodium hydroxide (NaOH). **You should use the M-100 only after you get proper training on how to run it and monitor chlorine levels.**

Chlorine destroys disease-causing organisms in water and is the most commonly used disinfectant in all regions of the world. **It does not kill all viruses, bacteria or protozoa.**

Chlorine does NOT remove salt from salt water. It does NOT remove toxic chemicals. So **water treated with the M-100 could still contain harmful chemicals.** When possible, you should get your source water tested by a certified lab to see what it has in it.

The M-100 can chlorinate water up to a level of **5 PPM (parts per million)**, but no third party or government agency has tested the M-100 for how effectively it kills bacteria or other microbes or viruses. Use the M-100 and the water it produces at your own risk.

**DANGER:** The M-100 produces chlorine gas ( $\text{Cl}_2$ ) and sodium hydroxide (NaOH).



Chlorine gas is **poisonous** - which is why it kills bacteria and other microbes. But it is also poisonous to humans and animals. If you breathe it in, it can burn your lungs. It can also burn your eyes and your skin.

Sodium hydroxide (NaOH) can cause severe skin irritation and burns.



Use the M-100 in a well-ventilated area. Do not breathe in gas from any ports or tubes. Handle the liquid chlorine and sodium hydroxide it produces very carefully, and put them only in containers with large, clear labeling.

## WHAT THE M-100 CHLORINE GENERATOR DOES

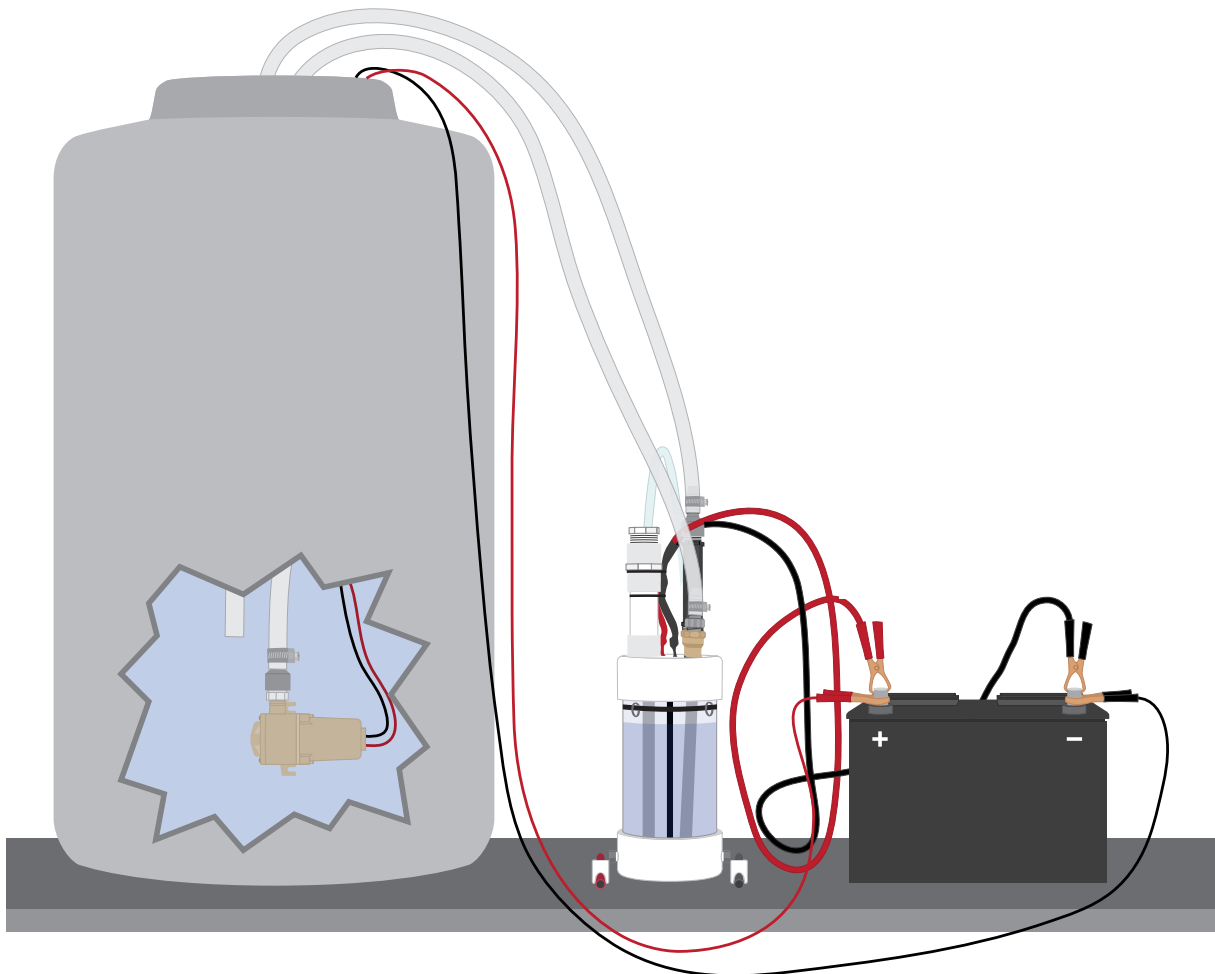
The WaterStep M-100 Chlorine Generator was developed in response to a need that affects nearly one billion people around the globe . . . unsafe drinking water. In fact, waterborne disease claims more lives each day than armed conflict, HIV/AIDS, and cancer combined.

For more than 140 years, chlorine has been added to water to kill disease-causing bacteria and pathogens. The M-100 is a portable, affordable way to chlorinate water for the purpose of eliminating waterborne pathogens.

Through the process of electrolysis, the M-100 creates chlorine gas from salt water. The chlorine gas, which evenly disburses throughout the water, kills waterborne bacteria in two hours.

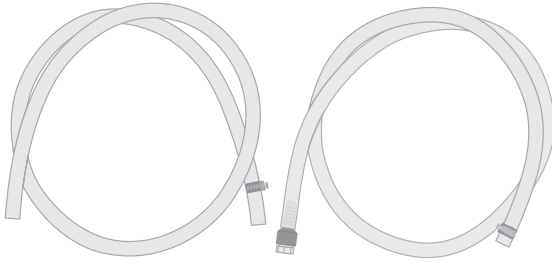
As contaminated water circulates through the system, chlorine gas is injected into the water. When the water has reached the recommended chlorine level of 5 PPM - and still has a 2 PPM chlorine level after setting for two or more hours - the waterborne pathogens have been killed.

The M-100 does not remove salt from seawater. It will also not remove heavy metals or chemicals.



## WHAT IS INCLUDED WITH THE M-100 CHLORINE GENERATOR

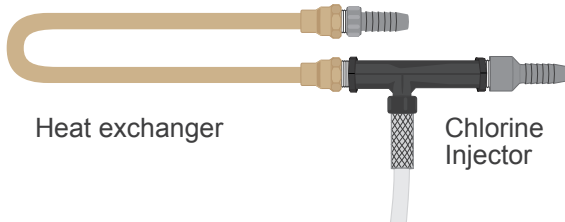
- 1** Two 5/8" (16mm) I.D. Hoses



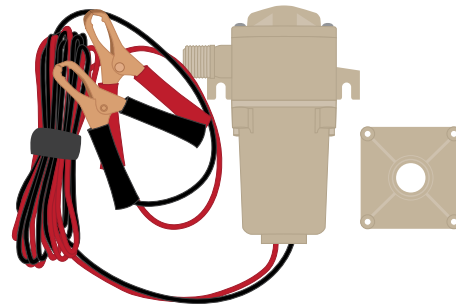
- 2** One 1/4" (6mm) I.D. Tube (Chlorine Gas Tube)



- 3** Chlorine Injector, Heat Exchanger



- 4** Submersible Pump



- 5** Water Bottle



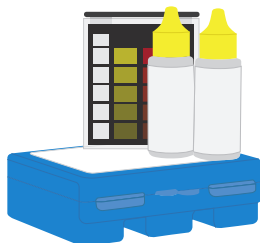
- 6** Parts Bag (Replacement parts)



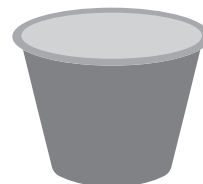
## WHAT IS INCLUDED WITH THE PARTS BAG (Replacement parts)

All of the parts marked “replacement part” are extra parts that can be used if the parts on the purifier are lost or broken.

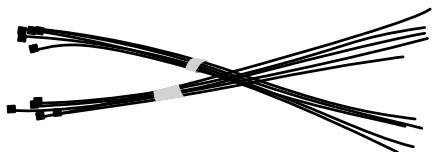
### 1 Chlorine Test Kit



### 2 Measuring Cup



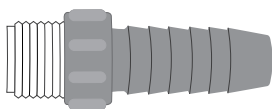
### 3 Zip Ties



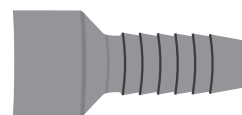
### 4 Teflon Tape (Replacement part)



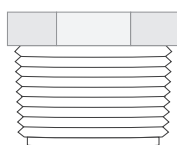
### 5 Barb Fitting (Male) (Replacement part)



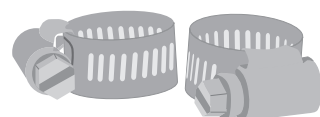
### 6 Barb Fitting (Female) (Replacement part)



### 7 1" (25mm) Plug for Fill Tube (Replacement part)

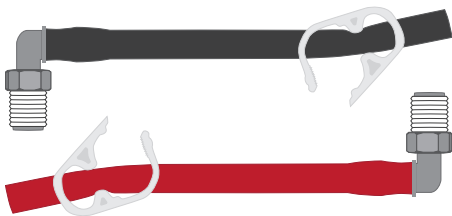


### 8 Hose Clamps (Replacement parts)

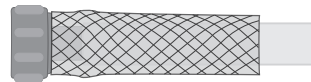


## WHAT IS INCLUDED WITH THE PARTS BAG *Continued*

### **9** Two Drain Tubes (Replacement parts)



### **10** Extra Insertion Tube (Replacement part)



### **11** Small Barb (Replacement part)



### **12** Small Barb with Hose (Replacement part)

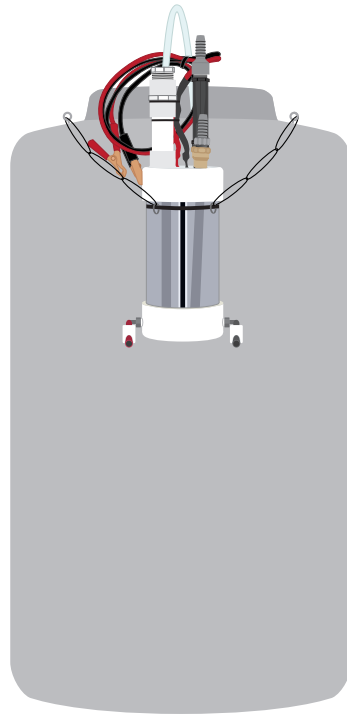
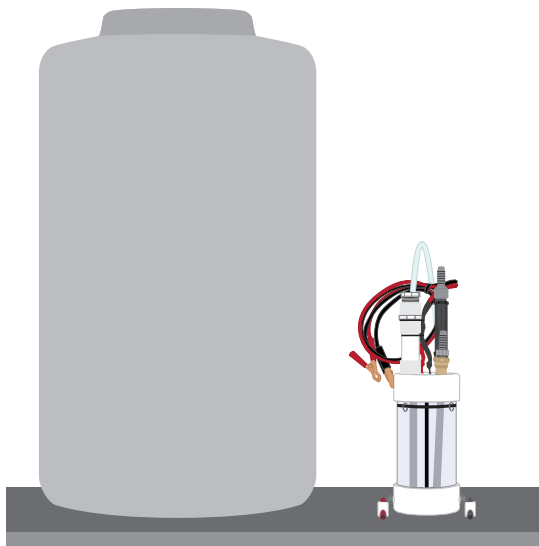


## WHAT YOU NEED TO SUPPLY LOCALLY

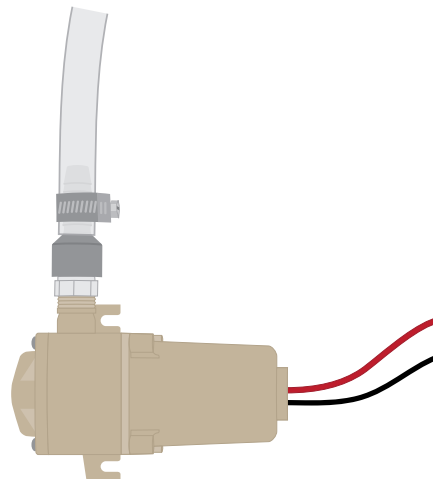
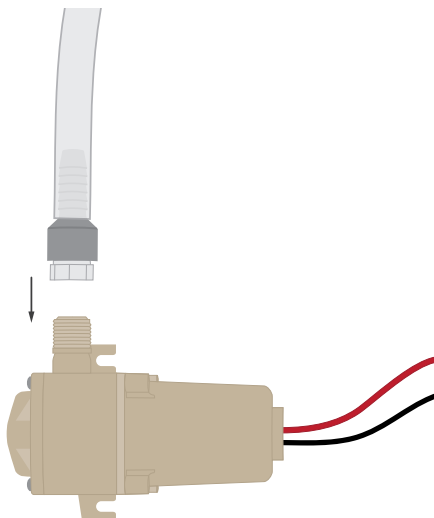
1. 12-Volt DC battery (deep cycle/marine type is best)
2. Solar or electric battery charger for 12-Volt battery
3. Salt/Sodium Chloride (any quality table salt)
4. Slotted screwdriver
5. Measuring tape
6. Large pair of pump pliers
7. Bucket to collect rinse water
8. Water storage tank(s)

# INSTALLING THE M-100 CHLORINE GENERATOR

- 1** Remove the M-100 from the box and bubble-wrap packaging.
- 2** Use zip ties, rope, wire or chain to attach the M-100 securely to a water tank or other support; or secure it firmly to the ground/deck.



- 3** Attach the end of the 5/8" (16mm) hose with the male barb to the outlet side of the circulation pump. Secure with hose clamp.

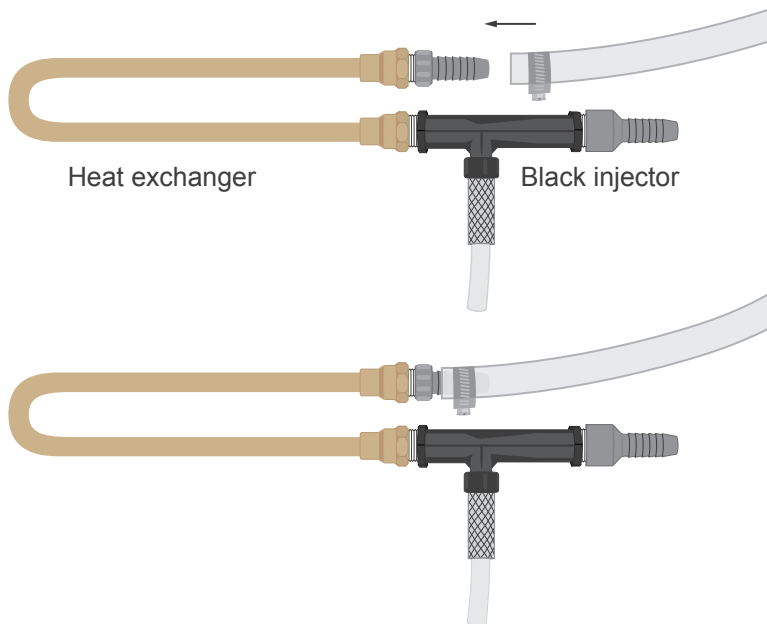




## INSTALLING THE M-100 CHLORINE GENERATOR *Continued*

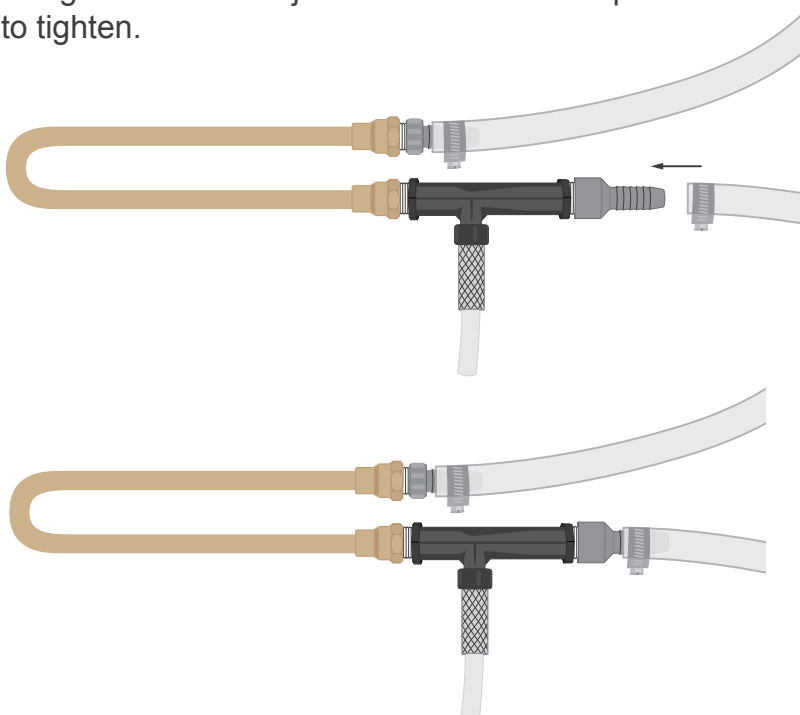
4

Attach the opposite end of this hose to the barb fitting on the short side of the heat exchanger. Tighten the hose clamp as needed.



5

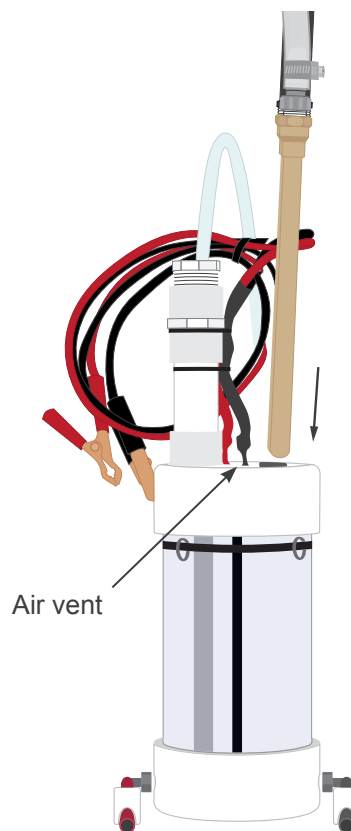
Attach the other braided hose to the barb fitting on the black injector\*. Use hose clamp to tighten.



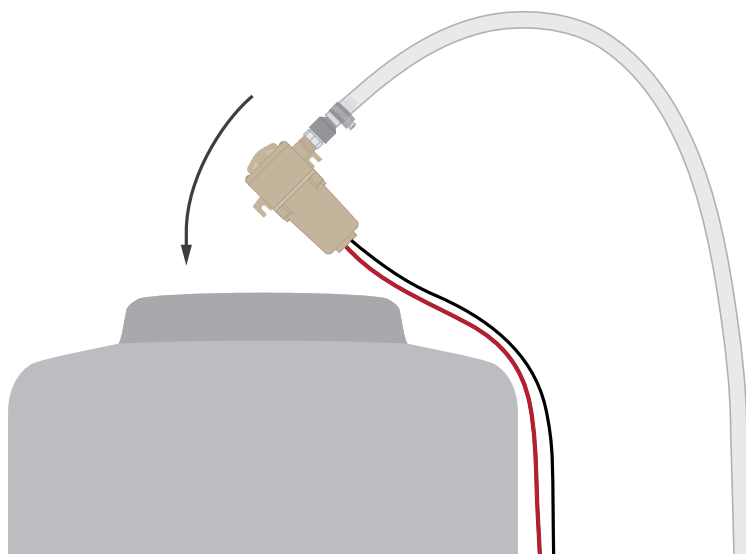
\*The injector (sometimes called a "Venturi") is the device that pulls chlorine gas from the M-100 Chlorine Generator and injects it (the chlorine gas) into the water. The injector is connected to the heat exchanger (the U-shaped piece of piping) during manufacturing. The injector is a vital part of the M-100. Without the injector the M-100 will NOT function.

## INSTALLING THE M-100 CHLORINE GENERATOR *Continued*

- Slide the heat exchanger into the oval-shaped opening on top of the M-100.



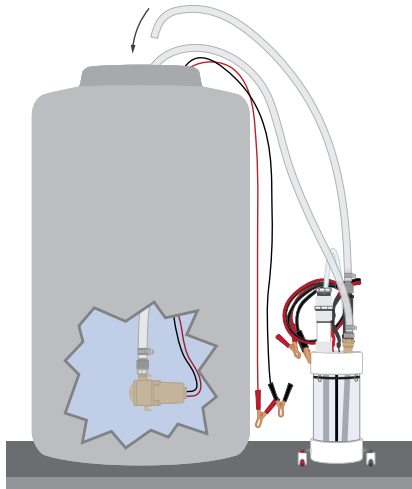
- Place the braided hose with circulation pump into the water tank, leaving the wires hanging outside of the tank.



## INSTALLING THE M-100 CHLORINE GENERATOR *Continued*

8

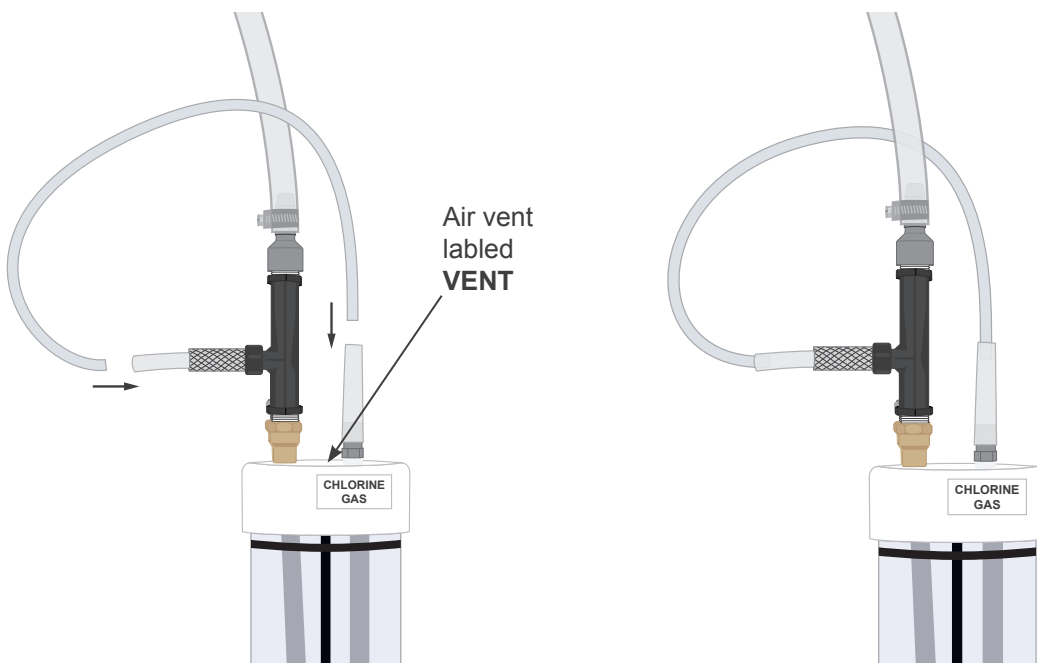
Place the braided hose attached to the injector into the tank that will collect/store the chlorinated water. Note the arrow on the injector showing the direction of the water flow.



Single tank set-up

9

Attach the 1/4" (6mm) Chlorine Gas tube to the injector on one end, and the top of the M-100 on the other end.



# OPERATING THE M-100 CHLORINE GENERATOR

These instructions assume that you have a tank or cistern of water that needs to be chlorinated. It also assumes that you have a means to dispense the water from the tank after it is treated.

## BEFORE OPERATING THE UNIT:

1. Make sure the drain tubes (red and black) at the bottom of the M-100 are clamped shut by the pinch clamps.
2. The 1" (25mm) plug on the fill tube should be "hand tight". **Do NOT overtighten!** Tape threads on plug as needed.
3. Confirm the "vent" hole on the chlorine side is unobstructed and open to the atmosphere.
4. **Make sure you have a fully charged 12-volt DC battery.**

## OPERATING THE UNIT:

- 1** Place about 400ml of water into the empty water bottle.
- 2** Fill the metal measuring cup one and a half times (1-1/2) with table salt (this will be about 125g or 4.5 oz of salt). If rock salt is used, first pound it to small particles before mixing it with water.
- 3** Place cap on water bottle and shake the mixture to allow the salt to completely dissolve.

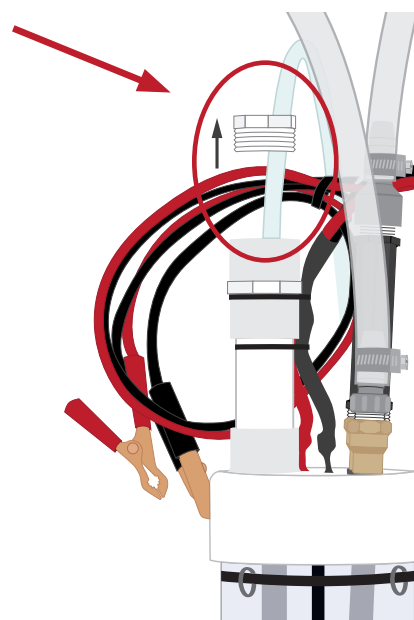


**NOTE:** NEVER add more salt to the M-100 Chlorine Generator after you have started the chlorination process.

## OPERATING THE M-100 CHLORINE GENERATOR *Continued*

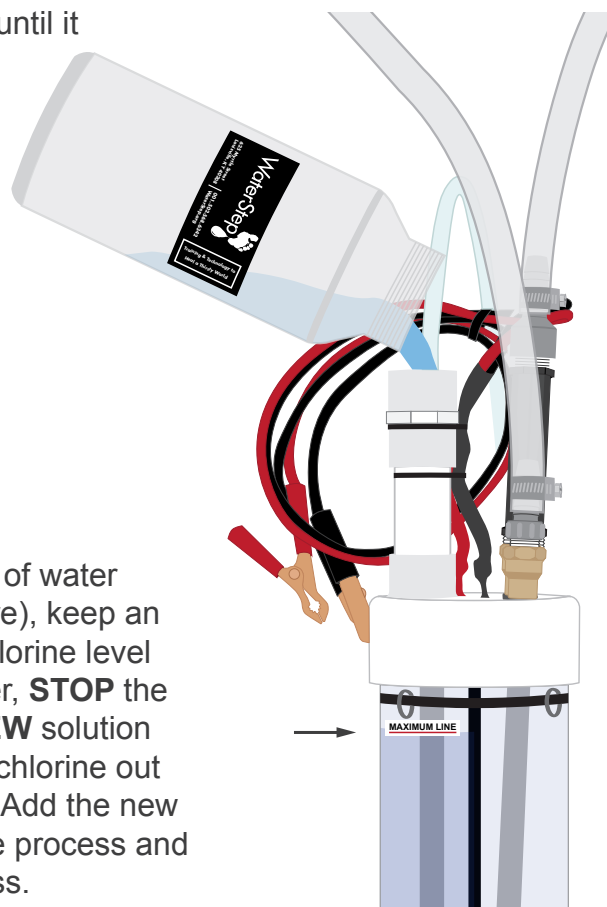
4

Remove the 1" (25mm) plug from the fill tube.



5

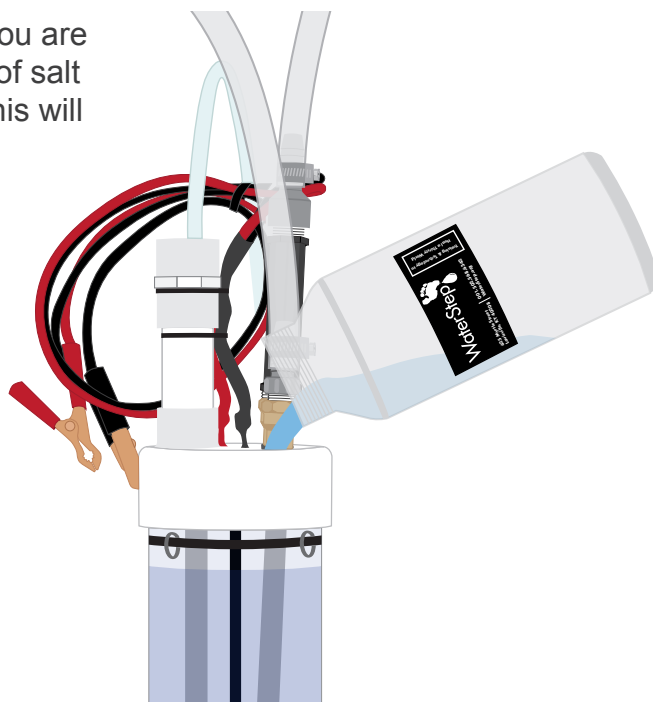
Pour the solution of water and salt into the chlorine generator. Add more water until it reaches the maximum fill line.



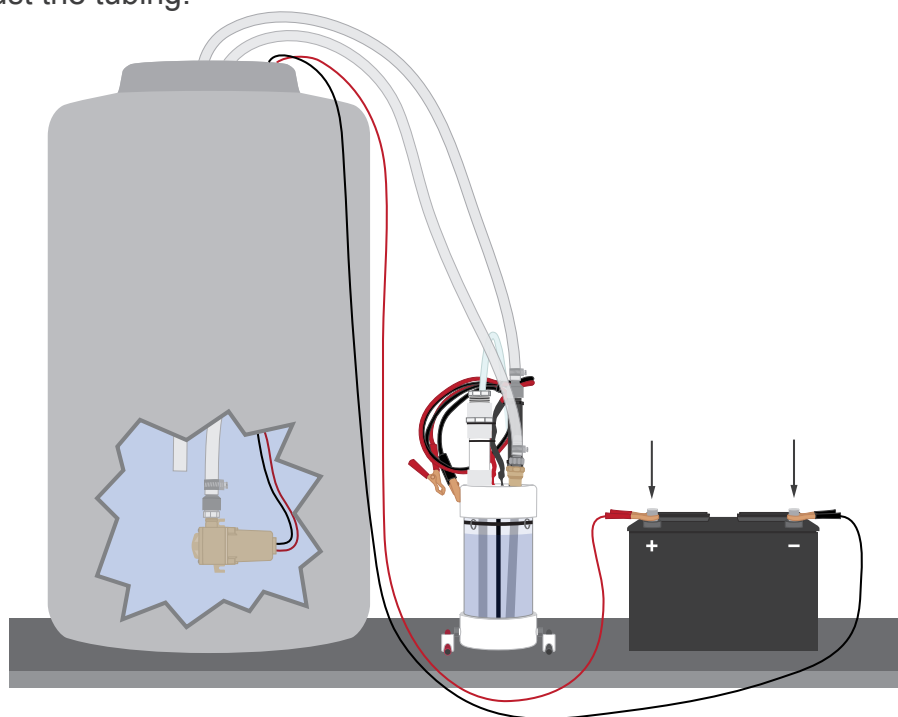
**NOTE:** If chlorinating large volumes of water (10,000 gallons/ 37,854 liters or more), keep an eye on the "Minimum Line". If the chlorine level drops below the minimum line sticker, **STOP** the chlorination process and remix a **NEW** solution of salt and water. Drain the existing chlorine out of the M-100 (see p.16) and save it. Add the new solution of salt and water. Restart the process and continue with the chlorination process.

## OPERATING THE M-100 CHLORINE GENERATOR *Continued*

- 6** Pour approximately 600ml of water (or recycled sodium hydroxide) into the oval-shaped hole at the top of the M-100. If you are using plain water, add about five grams of salt (1/2 teaspoon) into this compartment. This will generate chlorine more quickly.



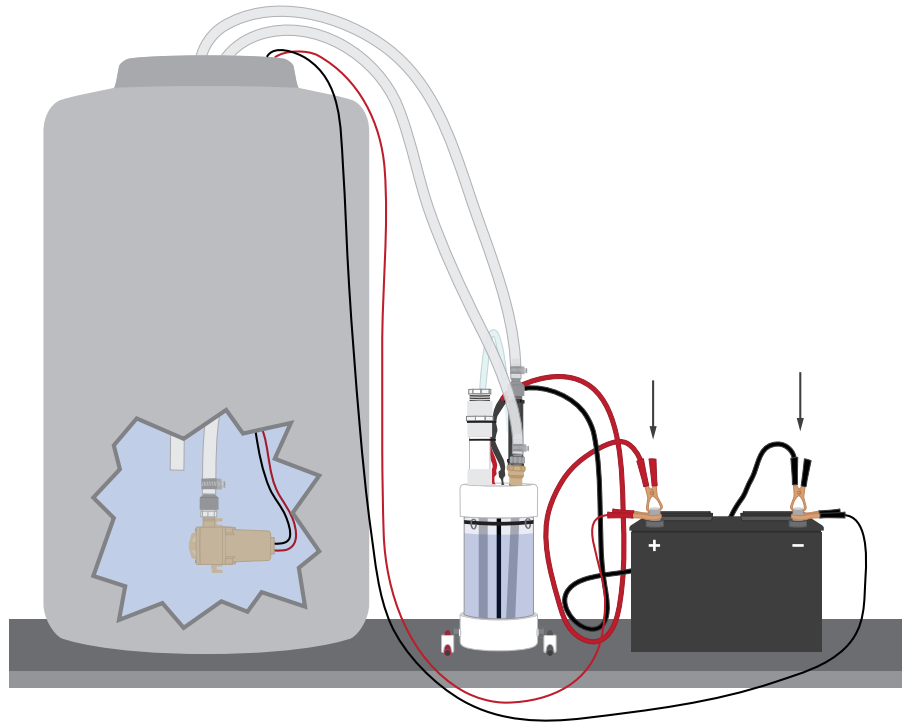
- 7** Connect the wires from the circulation pump to the battery terminal (black to negative/-, red to positive/+). Once water is flowing through the system, check for any water leaks. If leaks or drips are found, adjust the tubing.



## OPERATING THE M-100 CHLORINE GENERATOR *Continued*

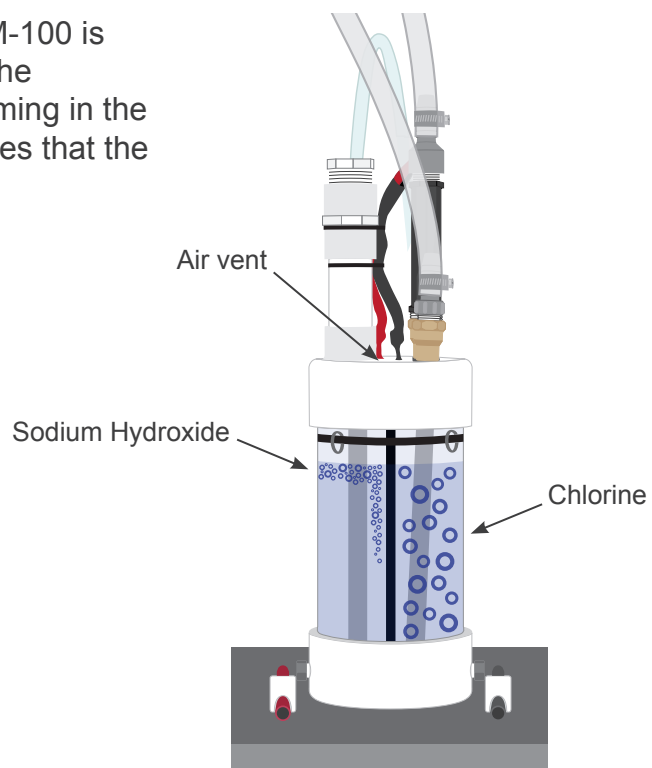
8

Connect the wires from the chlorine generator to the battery (black to negative/-, red to positive/+).



9

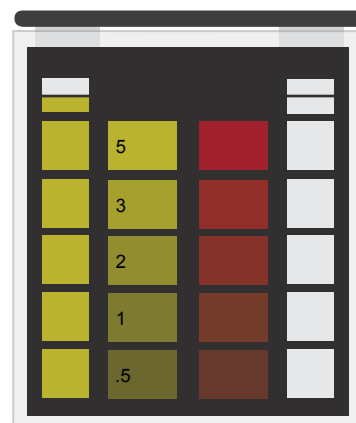
Once the water is flowing, and the M-100 is running, look for bubbling action in the Chlorine side and small bubbles forming in the Sodium Hydroxide side. This indicates that the M-100 is working properly.



## OPERATING THE M-100 CHLORINE GENERATOR *Continued*

- 10** Use the chlorine test kit to test chlorine levels in the water. Get a sample from below the surface of the tank. Add one drop of Orthotolidine and shake the tester to mix. Match the color of the water with the color standard on the tester.

- 11** Continue running the M-100 until the chlorine level reaches **5 PPM (Parts Per Million)**. The time this takes will depend on the size of the tank and the quality of the source water.



- 12** When the chlorine level reaches 5 PPM, remove the 1/4" (6mm) chlorine tube from the venturi. Then, disconnect both the submersible pump and the M-100 from the negative and then the positive side of the battery.
- 13** Allow the treated water to sit for one hour and then re-check the chlorine levels. Levels should be **2 PPM or more**. If the chlorine level is lower than 2 PPM, run the chlorination process again and allow the water to stand for one additional hour and re-test. If the chlorine levels are between 2 and 5 PPM, it is safe to drink.

**NOTE:** If your test kit is no longer yellow and has turned amber or red, there is too much chlorine in the water.

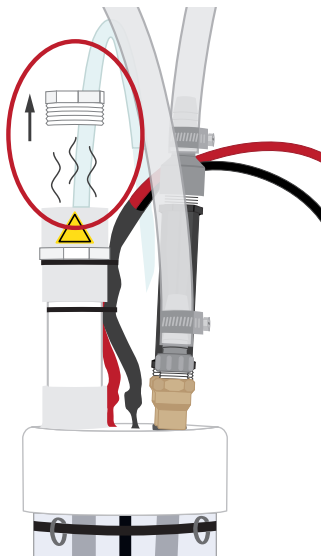
**NOTE:** Because different water sources have different minerals, no minerals, different levels of turbidity, etc. they chlorinate at different rates. The first time you run the M-100, you should test the water every minute or so. After you have gone through the process several times, you will be able to better judge how long it takes for your water to become chlorinated and how often you need to test it. If in doubt, TEST, TEST, TEST! It is much easier to ADD chlorine than to dilute it down.



## SHUTTING DOWN THE M-100 *Continued*

Before the M-100 is completely shut down and stored, have two empty containers - each of which will hold up to two liters of liquid. Use a permanent marker to write **CHLORINE** on one container and **SODIUM HYDROXIDE** on the other container. Please write **POISON - DO NOT DRINK** on each bottle as well. **DO NOT USE SODA BOTTLES...EVER!**

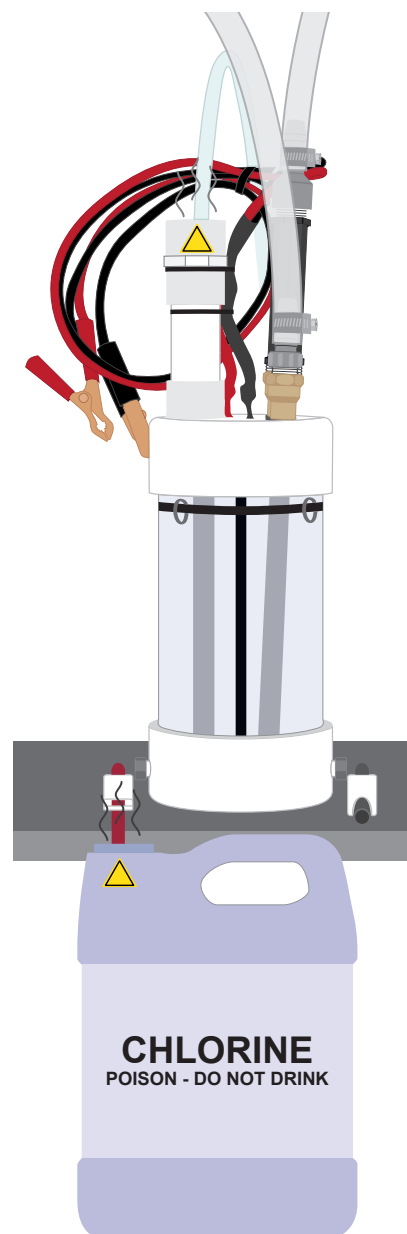
- 1 Loosen and remove the plug at the top of the fill tube on the CHLORINE side. Keep your face away from the fill tube and **DO NOT INHALE THE CHLORINE GAS!**



- 2 Insert the (red) drain tube at the bottom of the Chlorine side of the M-100 into the top of the empty container labeled **CHLORINE**. Release the pinch clamp and let all the chlorine pour into the container. Keep your face away from the opening of the empty container and **DO NOT INHALE THE CHLORINE GAS!**

**NOTE:** Sodium Hydroxide will vary in strength depending on how often you REUSE the Sodium Hydroxide from previous chlorination batches. Sodium Hydroxide will get stronger and stronger with each use.

DO NOT ALLOW MORE THAN THREE CHLORINATION PROCESSES WITH THE SAME BATCH OF SODIUM HYDROXIDE. IT WILL GET VERY STRONG AND WILL BURN YOUR SKIN IF SPILLED.



## SHUTTING DOWN THE M-100 CHLORINE GENERATOR *Continued*

- 3** Squeeze/engage the pinch clamp. Fill the water bottle with plain water and pour into the chlorine side of the M-100. Refill and drain this side three times. Collect rinse water in a bucket. Keep your face away from the opening of the fill tube and drain tube. **DO NOT INHALE THE CHLORINE GAS!**

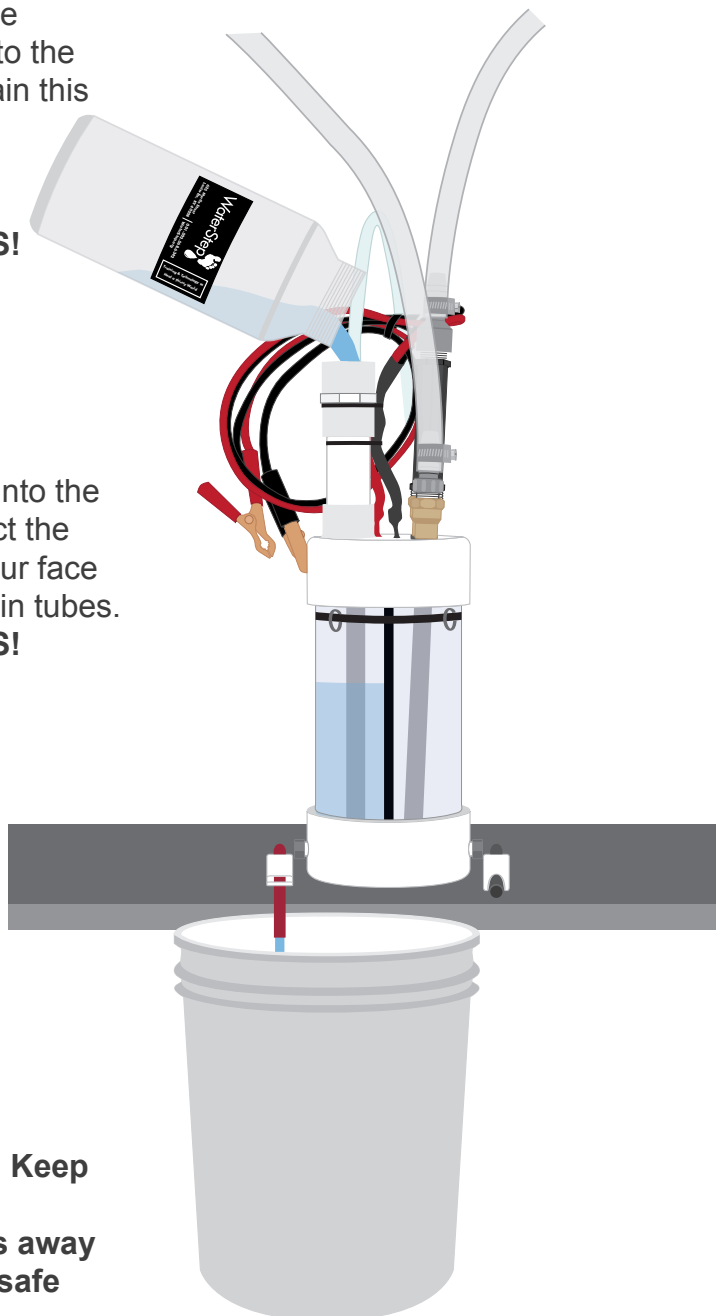
- 4** Repeat the process for the Sodium Hydroxide side, pouring the rinse water into the oval-opening on top of the M-100. Collect the rinse water in the same bucket. Keep your face away from the opening of the fill and drain tubes. **DO NOT INHALE THE CHLORINE GAS!**

- 5** Wipe down the exterior of the M-100 with a cloth to remove dirt and moisture.



Always protect your eyes and skin. Keep all solutions out of eyes and avoid breathing fumes. Keep all solutions away from children. Store solutions in a safe place.

**IMPORTANT:** Recharge the 12-volt battery with an electric battery charger or solar panel.



## WHAT TO DO WITH THE BY-PRODUCTS

If the by-products are not going to be used, both solutions can be poured into the same bucket. They will neutralize each other into saline water and can be safely disposed of on the ground. This neutralized solution will not harm the environment.

**Chlorine:** The chlorine solution may be used as a household disinfectant and cleaning agent. Dilute the solution by at least 1/2 with water.

**Sodium Hydroxide:** The sodium hydroxide solution can be re-used in the side of the M-100 labeled SODIUM HYDROXIDE. This will help the M-100 start much faster than if plain water is used in this side. The sodium hydroxide may be used to kill mosquito larvae and deodorize latrines. Dilute solution as needed.

# CONTACT US

WITH ANY QUESTIONS ABOUT THIS PRODUCT



625 Myrtle Street  
Louisville, KY 40208 USA  
+1.502.568.6342  
[waterstep.org](http://waterstep.org)