

Instruction Manual

for the New Life International water purifier

MIN

Assembly and Operation

New Life
INTERNATIONAL

Winter 2011

A Personal Note from Duvon McGuire, the Inventor of the Water Purification Systems

It has been said that for every one thousand people who are hacking at the branches of poverty, there are just a few who are working at cutting its roots. The fact you are reading this means you are working at cutting the roots of poverty.

The manual you are holding and the water purification system you are about to implement are a partial answer to a question that has been heavy on my heart for over thirty years. The question was inspired by a 1980 summer I spent in India and several visits to slums and rural areas: "If I lived where these people lived [rural area or slum], what would I want for me and my family?" This was a very difficult question, and more than thirty years later, I am still asking it; and I am still working for ongoing answers.

Safe drinking water has emerged as one of the starting items I have focused on as a critical need. Waterborne illnesses cause multiple entanglements to poverty on many levels. There are endless challenges to providing safe water in environments where the connections between unsafe water and disease are poorly understood. What I have tried to do as I developed this technology is to create a safe water solution that is affordable, effective, and capable of operating on a large enough scale that no one is left out. Part of the idea is for people to be empowered to start small, start now, and to think and dream big as to the ongoing possibilities. This water purification system is a tool designed to bring people together on a community level to give them grass roots capability to locally help overcome waterborne diseases. Over the years we have received feedback from village communities that before they used what they often call "the machine" they were divided without unity. But after working with "the machine" it brought them together into a community who began to learn how to better care for each other.

I have witnessed how unsafe water gives rise to many mysterious diseases that are often blamed on witchcraft, spells, or curses. Innocent people get sick and other innocent people are mistakenly blamed for things they had nothing to do with. Such things cause division and distrust. We must all come to a place of working together as healthy coworkers to make the world a better and safer place to live.

My dream is that this technology will be used to bring people together to help them grow into vibrant communities and they will have more abundant lives.

We have made some changes to the water purification systems since we first started doing this internationally more than twelve years ago. Recently we have standardized our systems into a Model 11 kit with quick connect fittings to make them easier to setup and move if necessary. We also changed our disaster relief/community development kits into a separate add-on package. To help accommodate a wide range of changing and uncertain conditions, this emergency and development package can be added to any of the Model 11 systems.

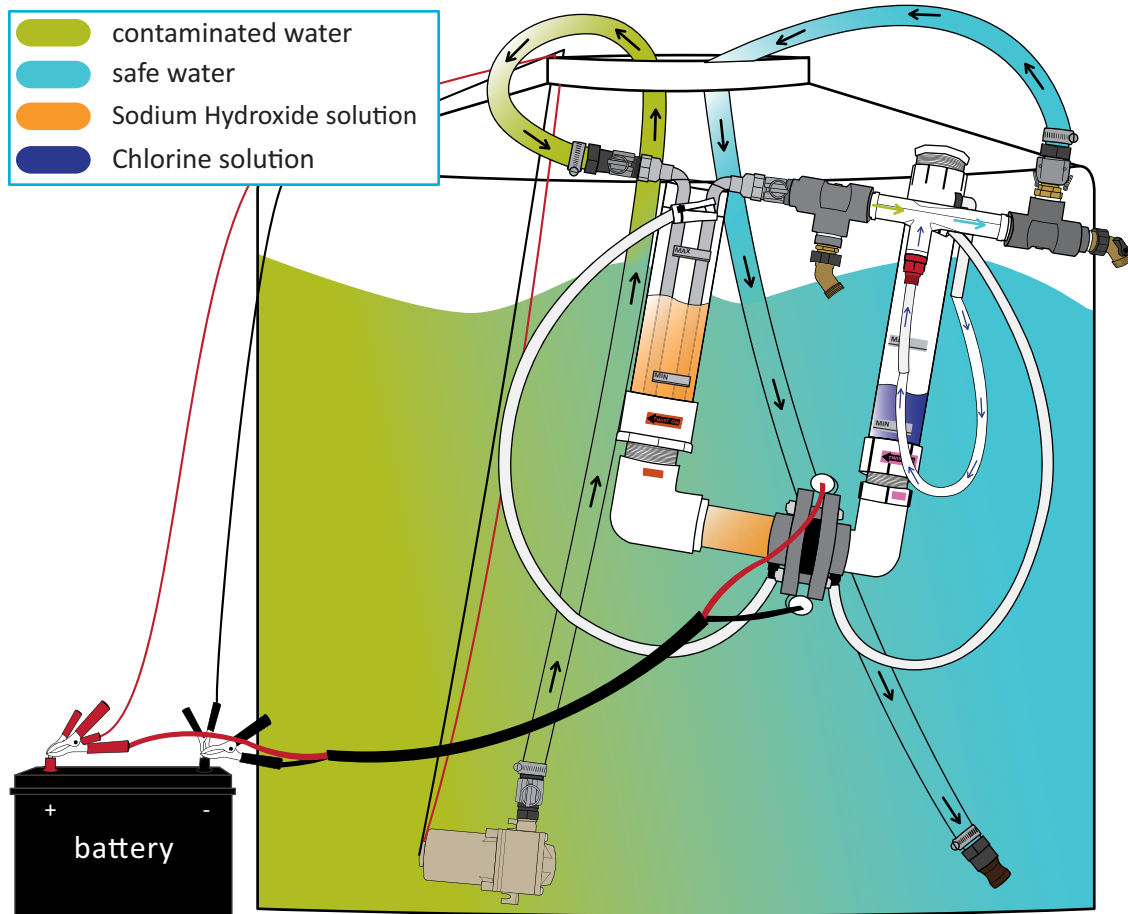
It is our prayer that this water purification system will be a blessing to you and the community it serves. Please give us your feedback and communicate with us if you have questions, clarifications, or need setup help. Also, please share your successes and challenges to community development with us so that others can learn and benefit from our journey together.

Blessings,

B. Duvon McGuire
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How it Works:

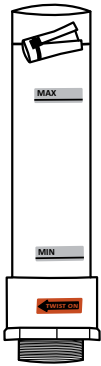
- 1) Water is placed in the Sodium Hydroxide tube and salt water is placed in the Chlorine tube.
- 2) Water is pumped through the purifier and the purifier is attached to the battery.
- 3) An electrolysis process in the hub separates the sodium from the chlorine in the salt water.
- 4) The sodium migrates through the hub and into the Sodium Hydroxide tube leaving only chlorine and water in the Chlorine tube.
- 5) The water that is being pumped through the Venturi creates a vacuum.
- 6) This vacuum draws air through the chlorine $\frac{3}{8}$ " drain tubing and into the Chlorine tube.
- 7) The chlorine gas is then drawn out of the Chlorine tube through the Chlorine to Venturi tubing into the Venturi where it mixes with the water.
- 8) Once the chlorine in the water reaches a concentration of 5 ppm, the water is allowed to sit for an hour which gives the chlorine time to kill disease-causing bacteria and parasites in the water.

Summary:

The purifier uses an electrolysis process to create chlorine gas from salt water. As the contaminated water is pumped through the purifier, it is mixed with chlorine gas which spreads throughout the tank and kills disease-causing bacteria and parasites in the water.

What's Included

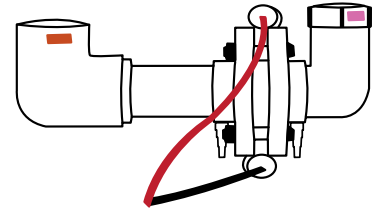
The purifier - Model 11



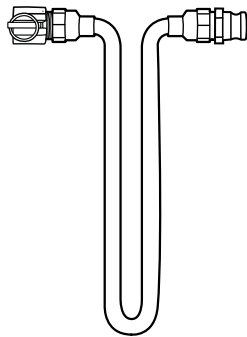
Sodium Hydroxide Tube



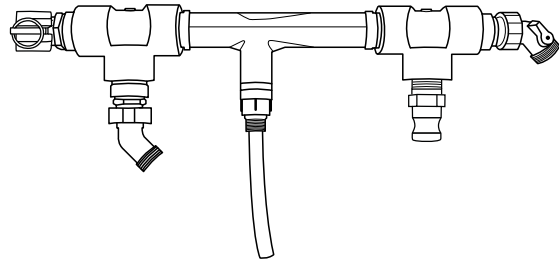
Chlorine Tube



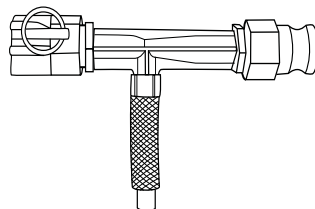
The Hub



Heat Exchanger



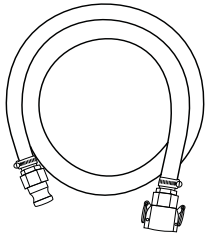
Large Venturi with test valves



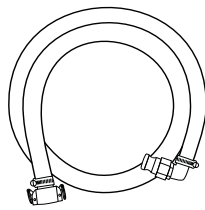
Small Venturi replaces Large Venturi in some systems

What's Included

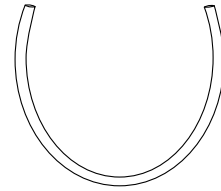
The parts



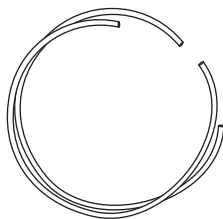
3/4" hose with 1" Quick Connect fittings



3/4" hose with 3/4" Quick Connect fittings



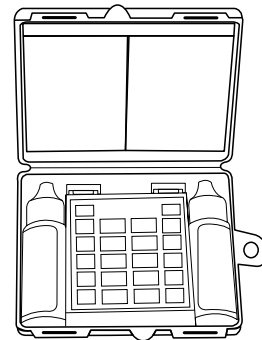
1/4" Chlorine to Venturi tubing



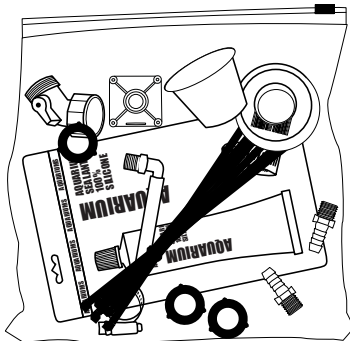
3/8" drain tubing (2 ea.)



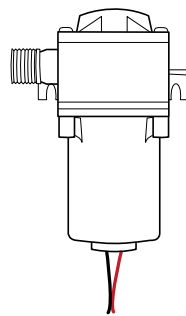
Water Bottle



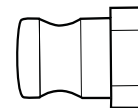
Chlorine Testing Kit



Accessory Bag



Submersible Pump

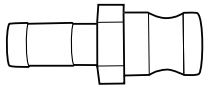


Submersible pump connector

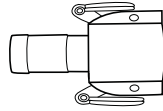
What's Included

The Accessory Bag

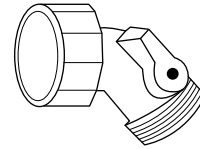
NOTE: Except for the measuring cup, which measures the salt poured into the Chlorine tube, these items are included for repair or replacement parts.



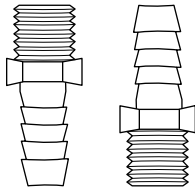
3/4" Male adapter with hose barb



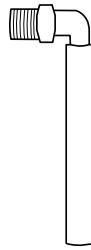
3/4" Female coupler with hose barb



Test Valve



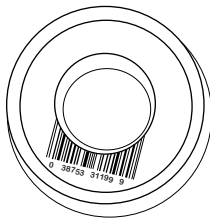
2 Drain barbs



Chlorine tube barb



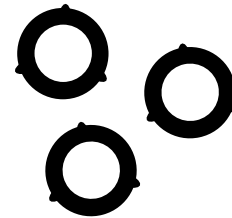
Measuring cup



Teflon tape



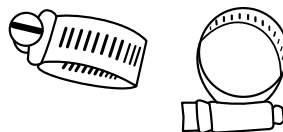
10 Cable ties



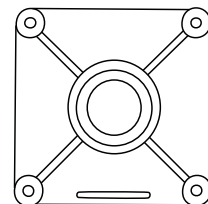
3 Rubber Washers



Marine Sealant



Two hose clamps

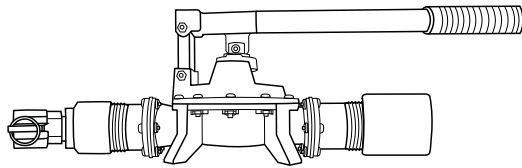


Submersible Pump Intake

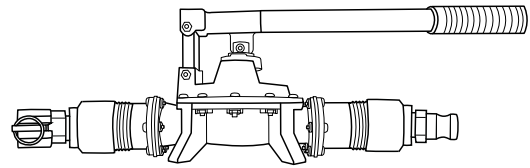
Optional Parts

These parts are not a part of the Model 11 purifier package, but can be purchased separately if needed.

Manual pumps with connectors

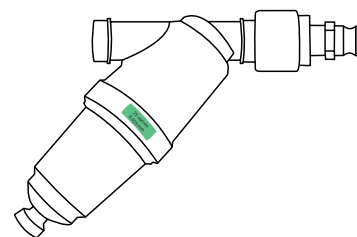
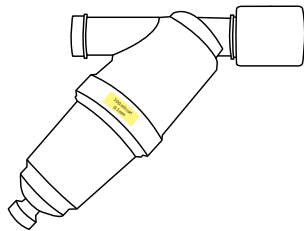


Manual pump to use with filters



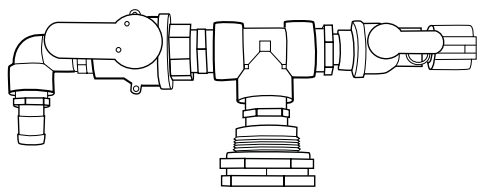
Manual pump to use with hose

Filters with connectors

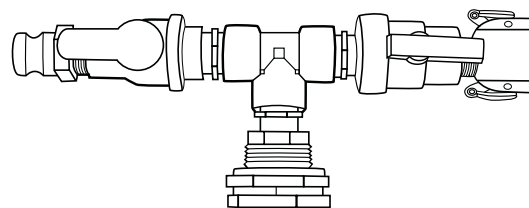


100 and 25 micron filters

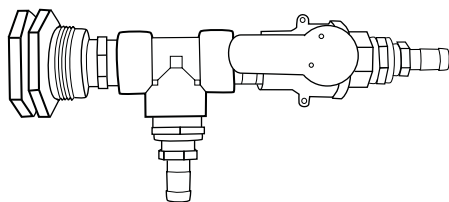
Fittings



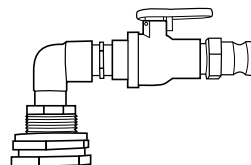
Two Valve Tee 1-1/2" & 1"



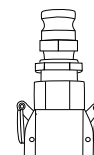
Two Valve Tee 1"



User Tank Valve 1-1/2"



Dump Tank 90° Valve

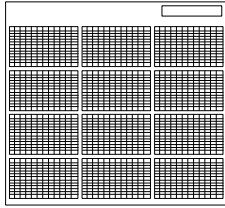


1" to 3/4" Reducing
Quick Connect

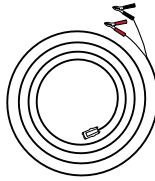
Optional Parts

These parts are not a part of the Model 11 purifier package, but can be purchased separately if needed.

Solar panel with extension cord

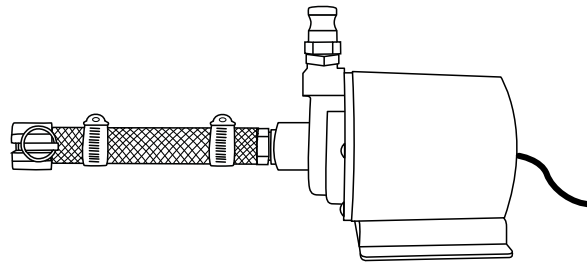


Solar panel



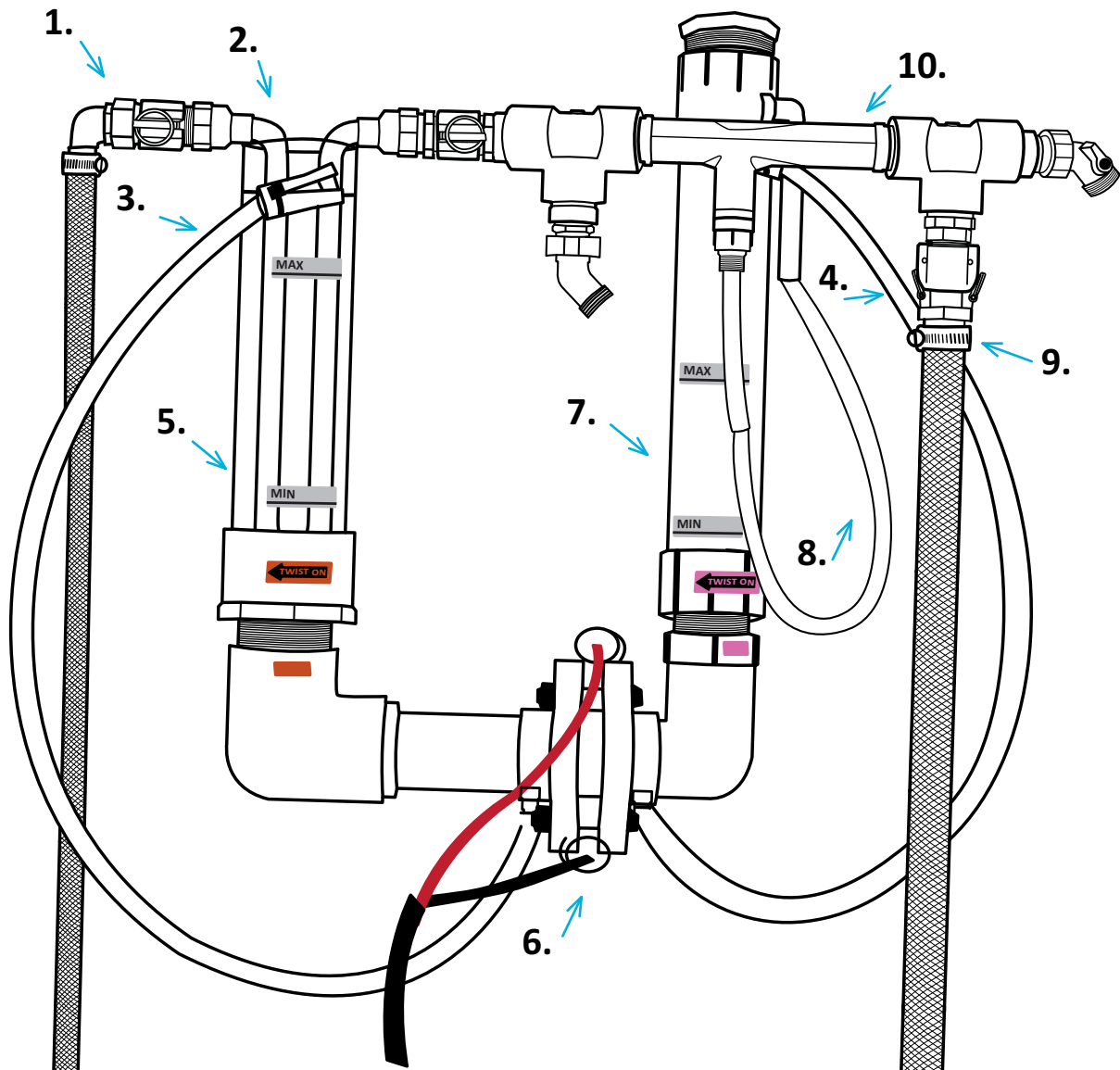
Panel extension cord

AC pump with Quick Connect Fittings



AC Pump

The Assembled Purifier

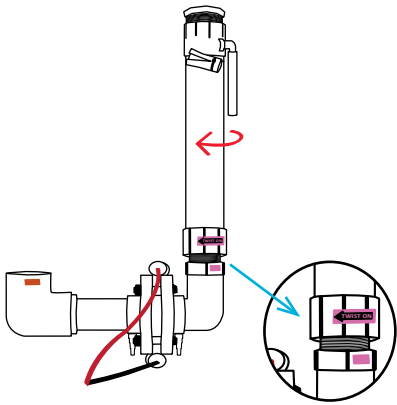


The Parts:

- 1) Hose with 3/4" male adapter Quick Connect fitting
- 2) Heat exchanger
- 3) 3/8" Sodium drain tubing
- 4) 3/8" Chlorine drain tubing
- 5) The Sodium Hydroxide Tube
- 6) The hub with electrical leads attached
- 7) The Chlorine Tube
- 8) 1/4" Chlorine to Venturi tubing
- 9) Hose with the 1" female coupler Quick Connect fitting
- 10) Large Venturi with test valves

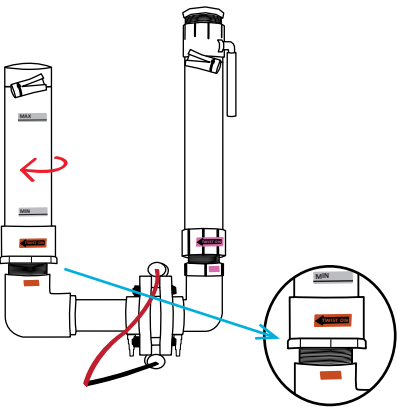
Assembling the Purifier

The body



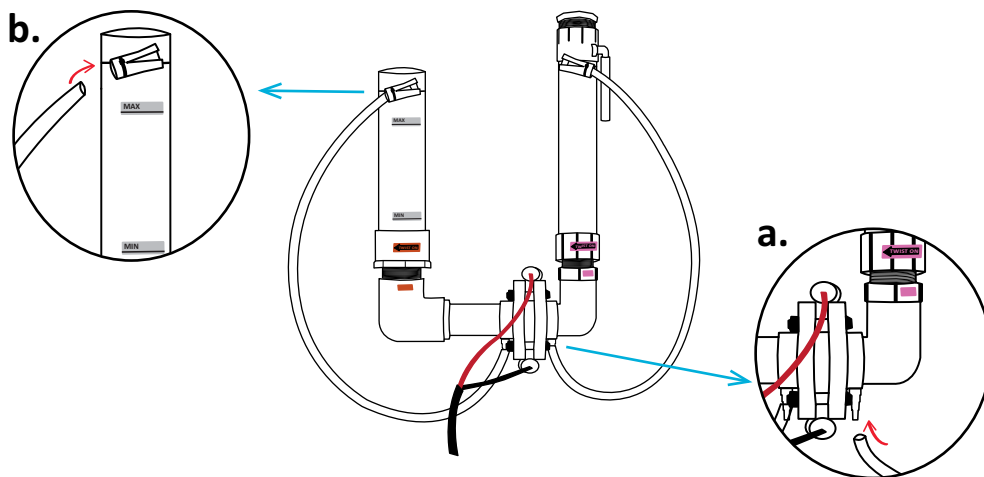
Step 1

Hand tighten Chlorine tube.
(the tube with the pink sticker goes on the side of the hub with the pink sticker)



Step 2

Hand tighten Sodium Hydroxide tube.
(orange sticker tube goes on the orange sticker side of the hub)

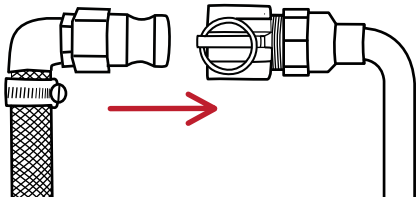


Step 3

- Connect the 3/8" tubing to the barbs at the bottom of the hub.
- Slide the tubing into the tubing keepers at the top of both tubes.

Assembling the Purifier

Hooking up the hoses and venturi

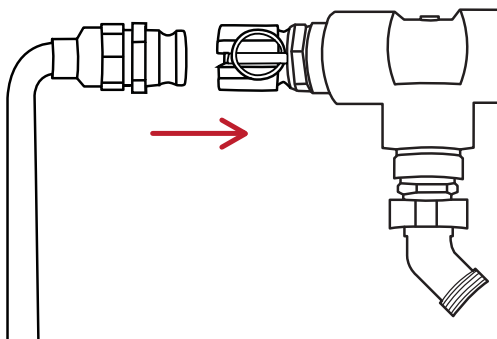


Step 4

Pull rings on female coupler on heat exchanger towards male adapter on end of hose. Insert male adapter into female coupler. Push rings on female coupler towards heat exchanger until closed.

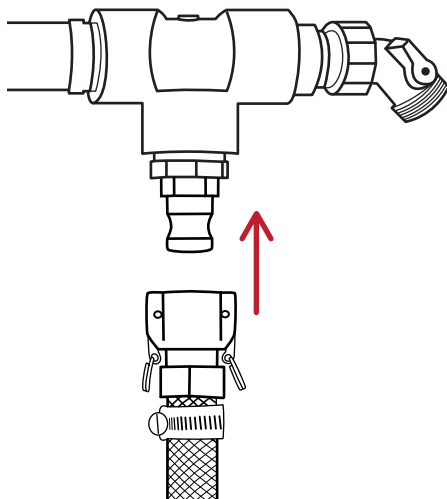


WARNING: NEVER use the heat exchanger as a handle when connecting the hose or the venturi to the heat exchanger.



Step 5

Push rings on female coupler on Venturi towards male adapter on heat exchanger. Insert male adapter into female coupler. Pull rings on female coupler towards Venturi until closed.

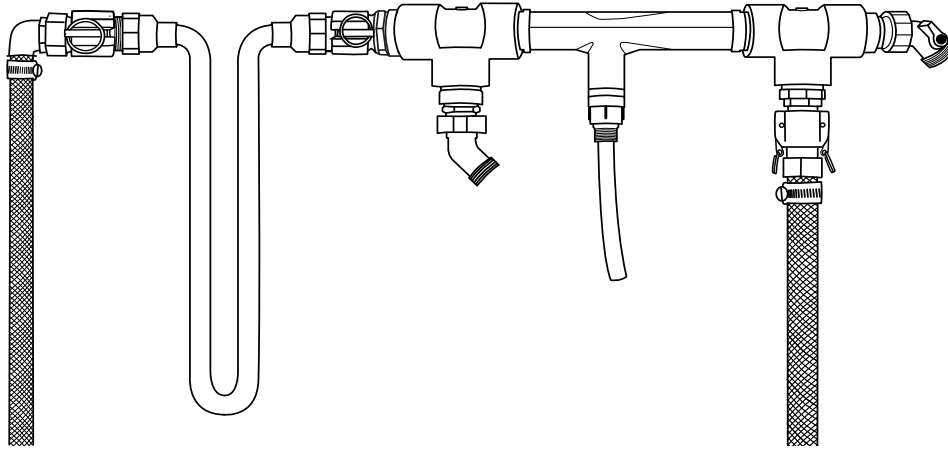


Step 6

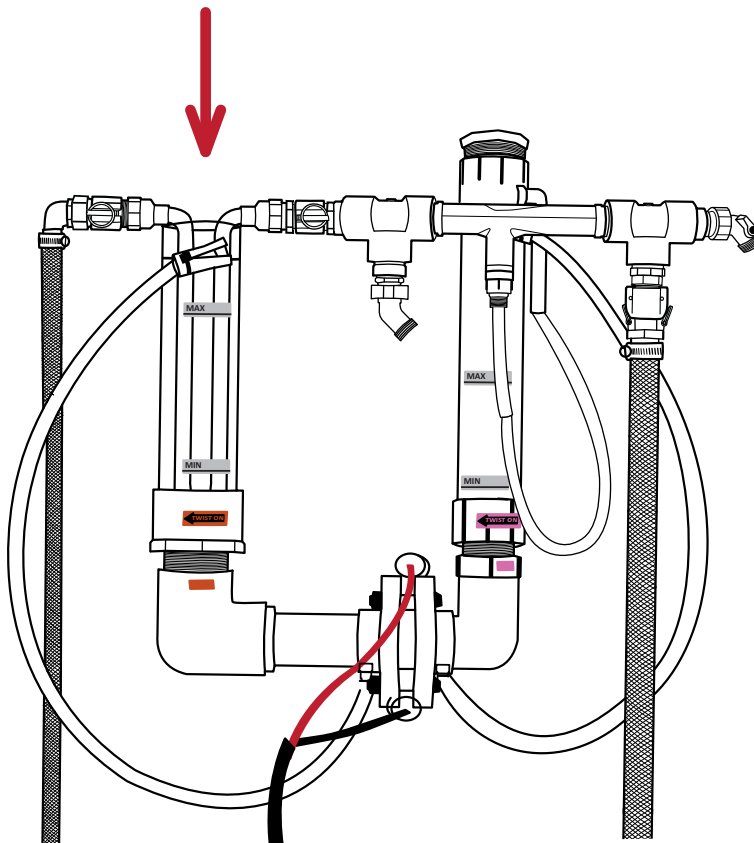
Grasp hose and push rings on female coupler towards male adapter on Venturi. Insert male adapter into female coupler. Pull rings towards hose until closed.

Assembling the Purifier

Hooking up the hoses and Venturi



This is how it should look once assembled.

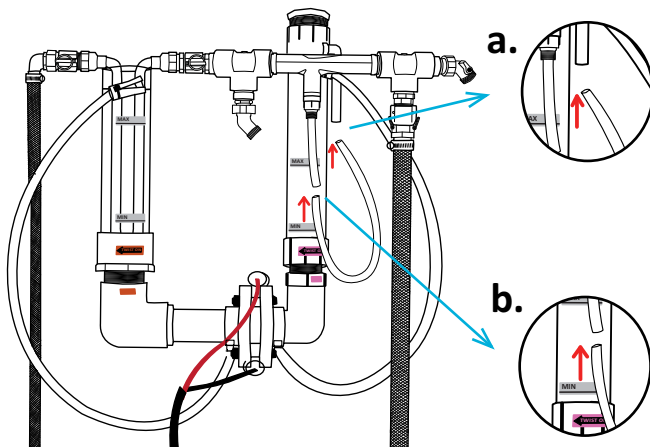


Step 7

Place the heat exchanger inside the Sodium Hydroxide tube.

Assembling the Purifier

Hooking up the hoses and venturi

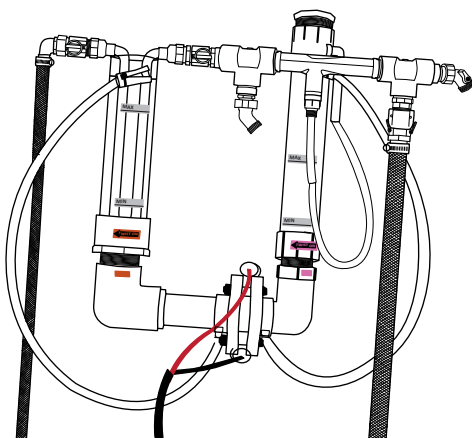


Step 8

a) Insert one end of the 1/4" tubing into the tubing on the "L" shaped barb on the side of the Chlorine tubing.

b) Insert the other end of the 1/4" tubing into the tubing on the Venturi barb.

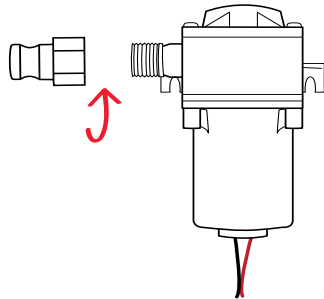
Hanging the purifier



The purifier should be hung outdoors or in a well-ventilated room. It should be secured to a wall, tree, post, or some other solid object.

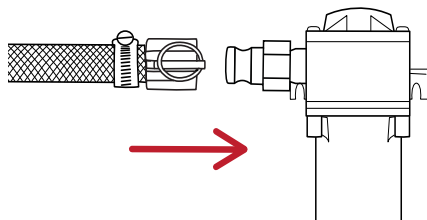
NOTE: the Sodium Hydroxide tube should be hung slightly higher than the Chlorine tube. This greatly increases the efficiency of the purifier.

Assembling the Submersible Pump



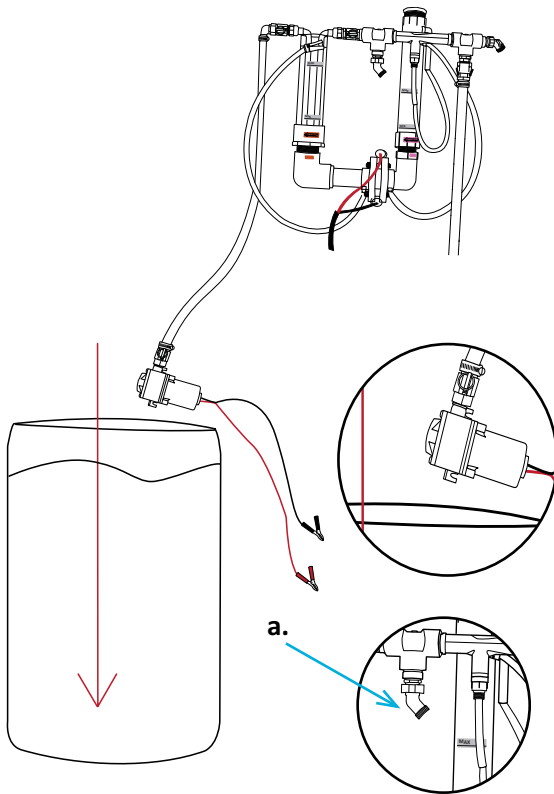
Step 1

Screw the 3/4" male adapter on the submersible pump connector.



Step 2

Connect the 3/4" hose from the heat exchanger to the male adapter on the submersible pump.



Step 3

The pump is now ready to be placed at the bottom of whatever drum, cistern, or tank is being used. Once it is in the water, open the test valve (a) to release any air bubbles in the pump. Close test valve.

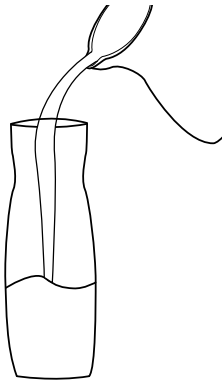
NOTE: DO NOT attach the wires to the battery until you are ready to operate the purifier! NEVER run the pump unless it is in water.

Operating the Purifier

Step 1 - filtering the water

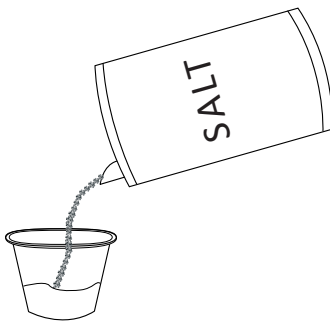
The New Life International water purifier will kill harmful bacteria in the water, but it will not filter out larger particles such as dirt, wood or plant material. Filtering out these particles before treating the water greatly improves the efficiency of the purifier as well as the overall water quality. This can be done using manufactured filters (New Life has reusable filters available for purchase), cloth, sand or by allowing the sediment to settle to the bottom of a container prior to purification. Once this is done, the water is ready to be purified.

Preparing the salt solution



Step 2

Pour water into the water bottle until it is approximately half way full (this does not have to be purified water).



Step 3

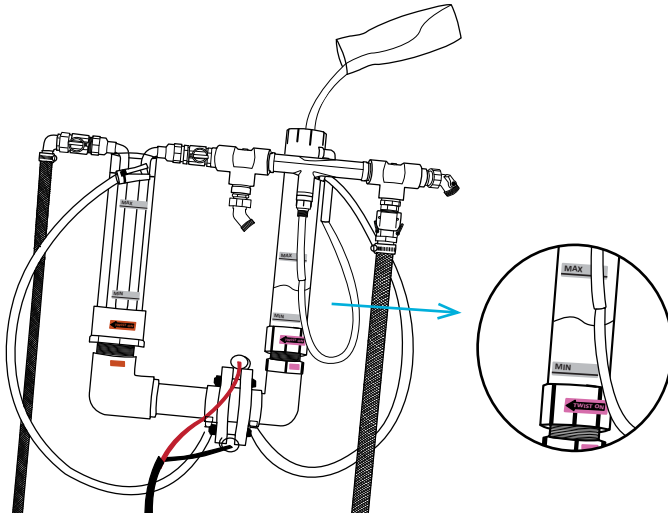
Pour salt into the measuring cup until it is full.



Step 4

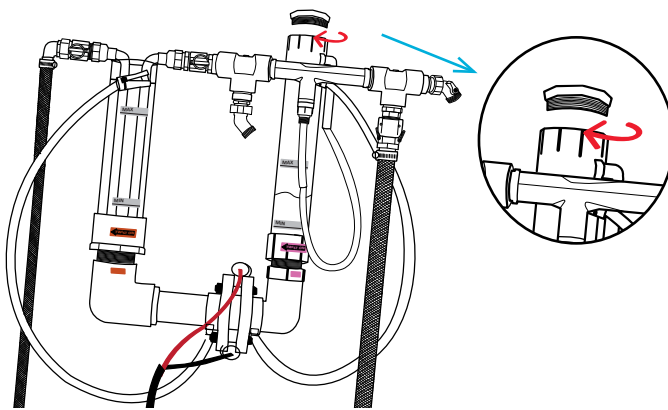
Pour the salt into the water bottle, replace the lid, and shake until the salt has dissolved in the water.

Operating the Purifier



Step 5

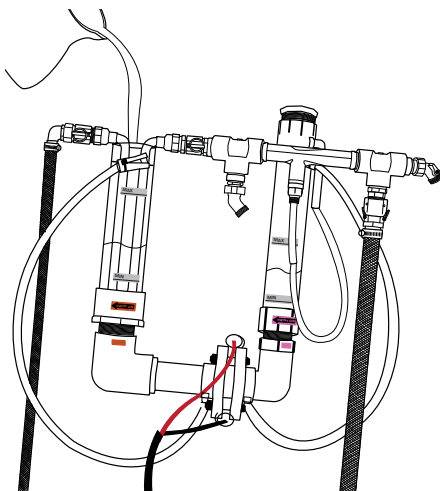
Pour the salt water solution into the Chlorine tube. The water level should be between the MIN and MAX stickers on the tube (extra water may need to be added in order to reach the desired level).



Step 6

Screw the plug into the top of the Chlorine tube. Hand tighten.

Preparing the Sodium Hydroxide Solution



Step 1

Pour water into the Sodium Hydroxide tube (this does not have to be purified water). The water level should be between the MIN and MAX stickers on the tube.

Step 2

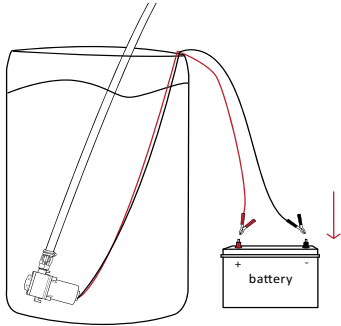
If using plain water, add a pinch of salt. If using sodium hydroxide solution from a previous use of the purifier, this step is not necessary.

RECOMMENDATION: When done using the purifier, save the sodium hydroxide solution in a labeled bottle to be used the next time the purifier is operated. This increases the efficiency of the purifier.

Starting the Purifier

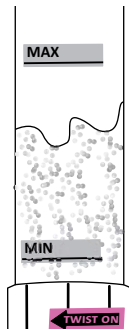
Step 1

Make sure that the solutions are in both the Chlorine and Sodium Hydroxide tubes and all of the hoses and tubing are connected. **Make sure the plug is on the Chlorine tube and that the test valves are closed!**



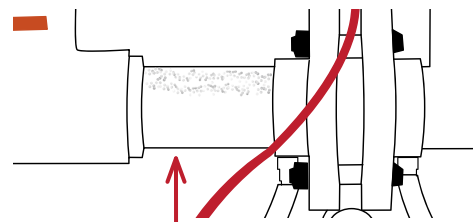
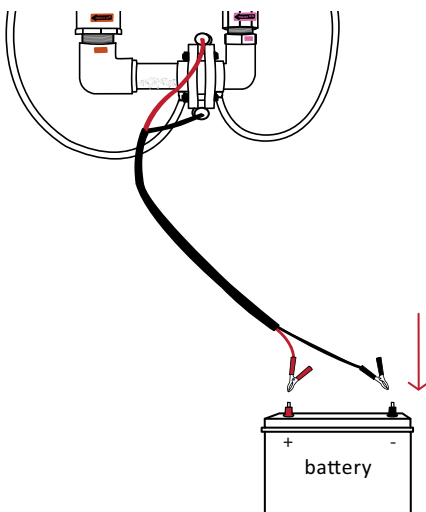
Step 2

Start the submersible pump by attaching the leads to the battery (red to positive and black to negative). **DO NOT connect the purifier to the battery yet!**



Step 3

Check the Chlorine tube. If pump is operating correctly there will be bubbles in the tube.

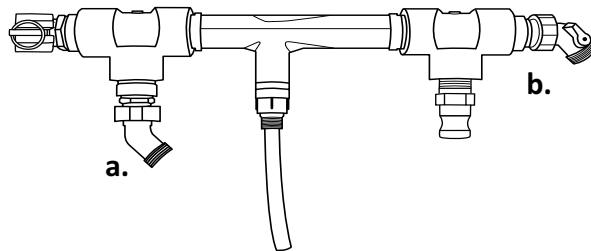


Step 4

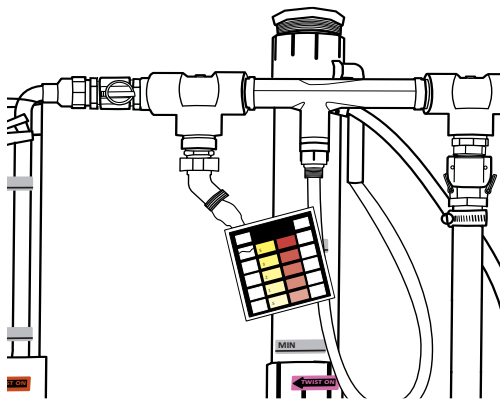
Once there are bubbles in the Chlorine tube, it is OK to connect the purifier to the battery (red to positive, black to negative). If the purifier is working, there will be bubbles in the clear tube on the left side of the hub.

Testing the Water

Once the purifier is operating, the chlorine level of the water must be tested. This can be done with the chlorine testing kit which is included.

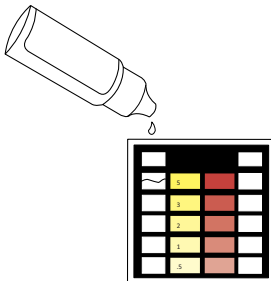


On the venturi there are two water testing valves. The first valve (a.) is for testing chlorine levels in the tank. The second valve (b.) is for testing the chlorine levels coming out of the purifier.



Step 1

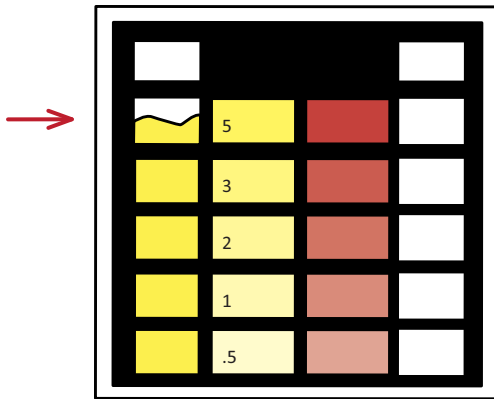
Once the purifier has been running for several minutes, use the first valve to test the chlorine level. Fill the left side (yellow) with water from the valve.



Step 2

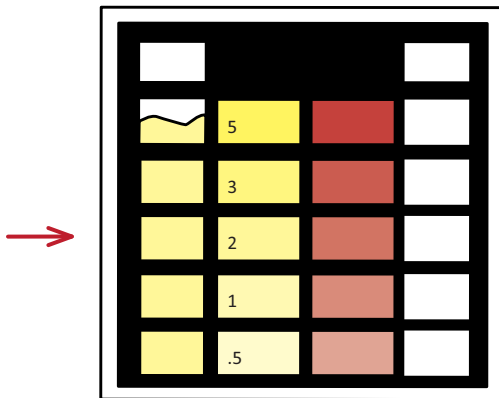
Add ONE drop of solution from the bottle to the water. Cover the opening with the cap or a finger and shake.

Testing the Water



Step 3

Compare the color of the water with the yellow blocks next to it. If it is the same color as the top block (5 ppm) or darker, the water has enough chlorine in it to kill disease-causing bacteria and parasites. The purifier can now be turned off. If the water is a lighter yellow than the top block, keep the purifier going and continue to check the water periodically.

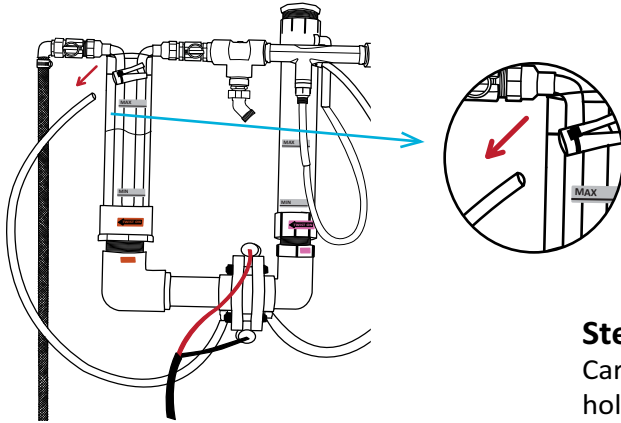


Step 4

Once the chlorine level has reached 5 ppm, the water should be allowed to sit for 1 hour to give the chlorine time to kill the bacteria and parasites. **After one hour, re-test the water in the tank.** If the water is the same color as the middle yellow box (2 ppm) or brighter, the water is safe to drink. If it is lighter, or there is no color at all, check for contaminants in the tank. Rerun the purifier.

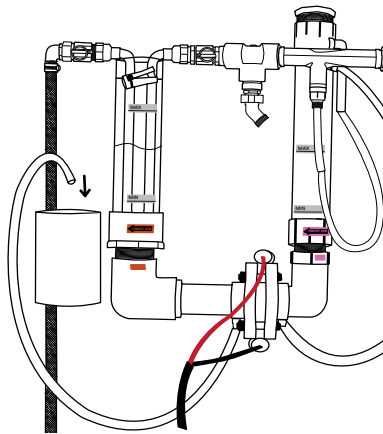
Draining the Purifier

When finished using the purifier, the solution in the Chlorine and Sodium Hydroxide tubes needs to be drained.



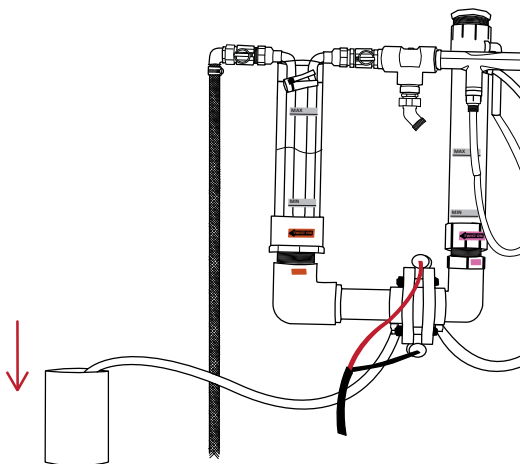
Step 1

Carefully remove the $\frac{3}{8}$ " tubing from the holder on the Sodium Hydroxide tube.



Step 2

Hold a container at the same height as the purifier and insert the tube.



Step 3

Slowly lower the container with the tube inside until all the solution has been drained from the Sodium Hydroxide tube.

Step 4

Repeat this process with the Chlorine tube solution.

Draining the Purifier



Step 5

At least half of the Sodium Hydroxide solution should be saved so it can be used next time the purifier is operated. The solution should be stored in a labeled container. The solution can also be poured into a pit latrine to keep the smell and flies down.



Step 6

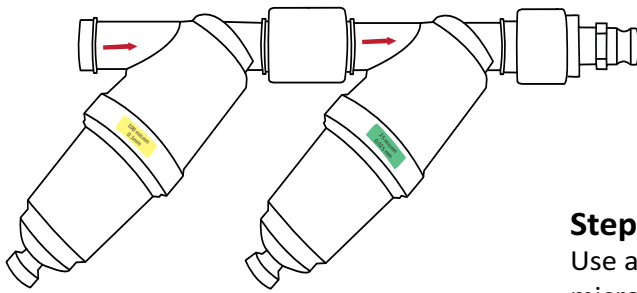
The Chlorine solution can be used as a cleaning agent as it is basically bleach. Otherwise, it can be mixed with the Sodium Hydroxide solution to neutralize it and then poured on the ground.

NOTE:

Be careful not to touch the Sodium Hydroxide or Chlorine solutions. They can cause a slight burning sensation.

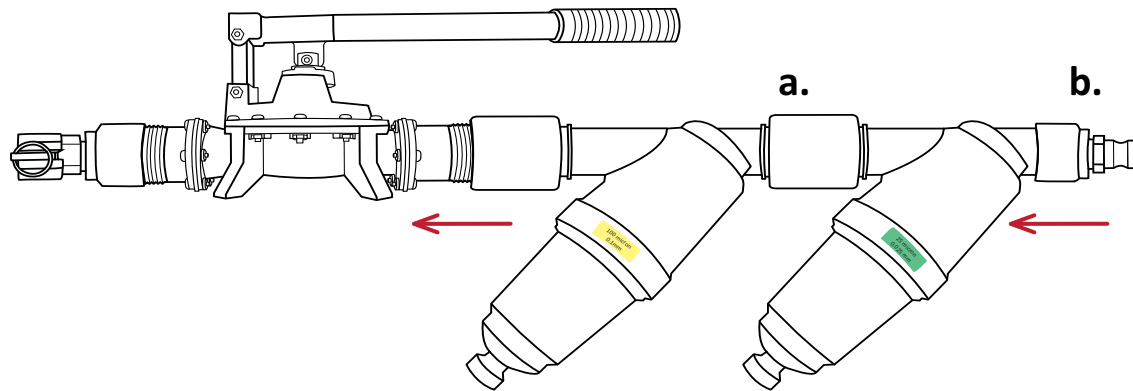
Attaching the filters

These filters are optional



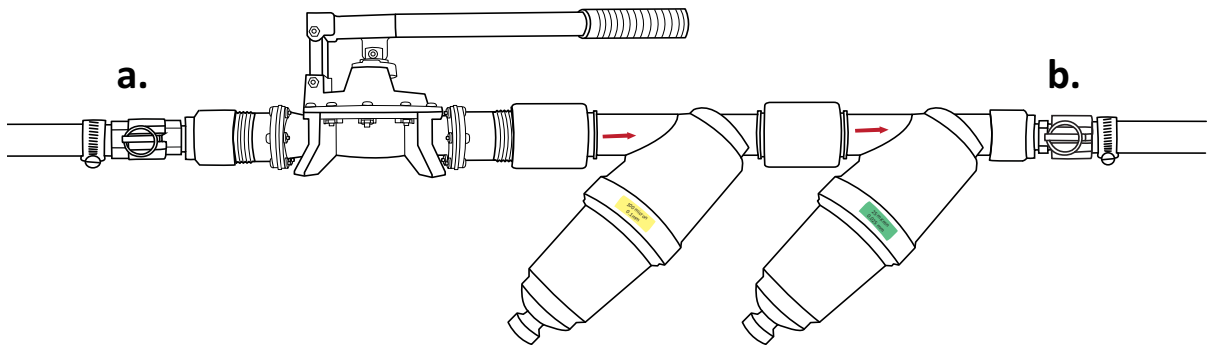
Step 1

Use a connector to attach the 100 micron and 25 micron filters as shown.



Step 2

(a.) Use a connector to attach the filters to the right hand side of the manual pump. (b.) Attach the hose with the 1" female coupler to the 1" male adapter on right hand side of the filters.

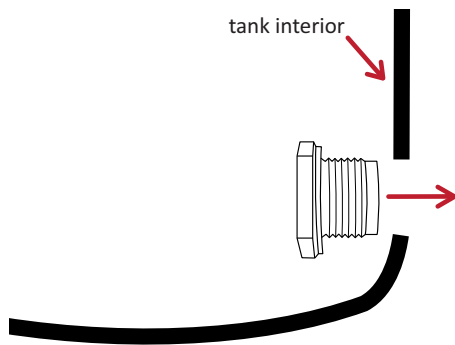


Step 3

(a.) The hose coming from the dump tank should be attached on the left side of the manual pump, and (b.) the hose going to the treatment tank on the right hand side of the purifier.

Assembling the Electric Pump

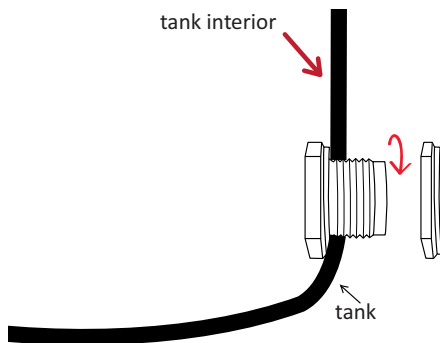
This pump is optional



Step 1

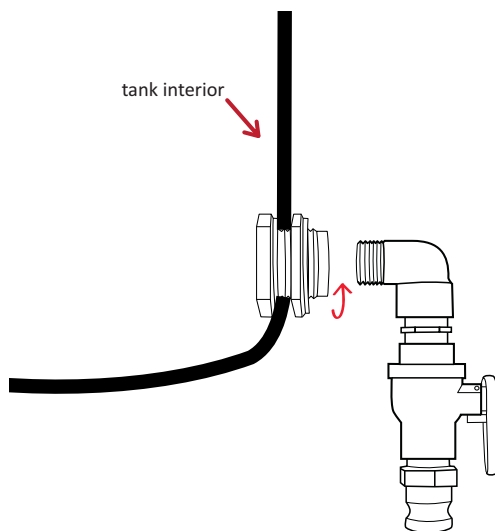
Drill a hole near the bottom of the tank (this can be done using a drill or the saw blade on a Swiss army knife). Push the large bulkhead piece through the hole from inside the tank.

Note: Be sure the rubber seal is to the inside surface of the tank, NOT on the outside next to the twisting action during tightening.



Step 2

Screw the thin bulkhead piece COUNTERCLOCKWISE onto the large bulkhead piece and tighten.

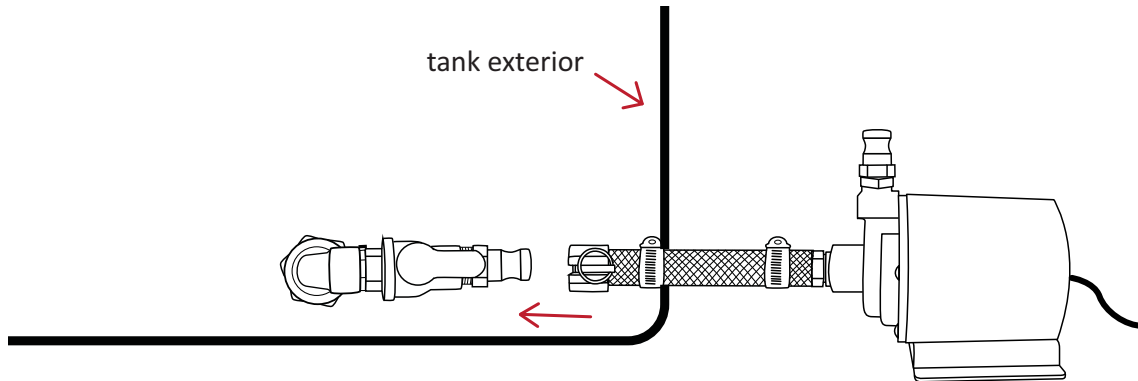


Step 3

Screw the bulkhead valve fitting clockwise into the large bulkhead piece.

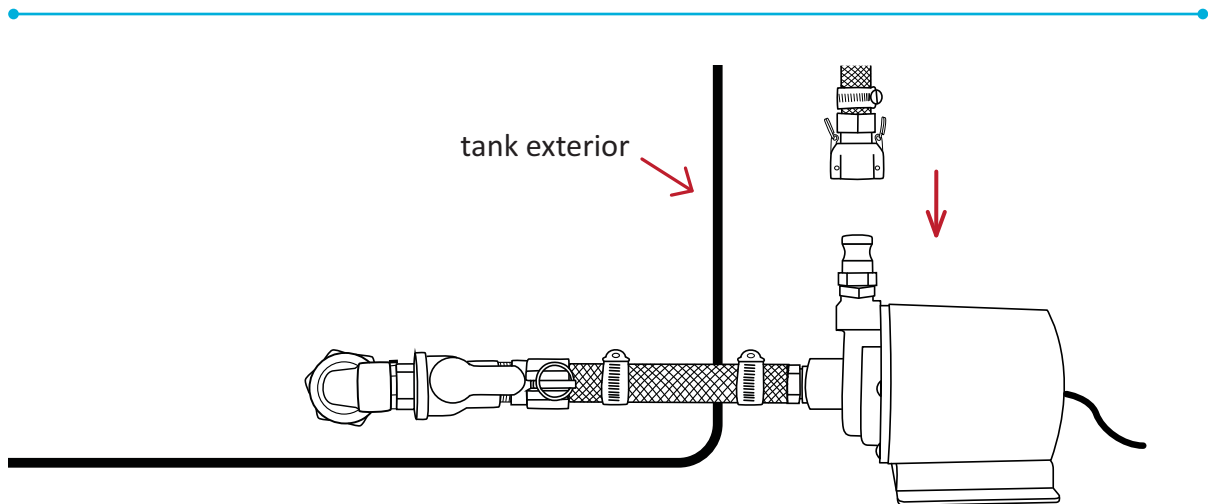
Assembling the Electric Pump

This pump is optional



Step 4

Connect the pump to the bulkhead fitting using the Quick Connect.

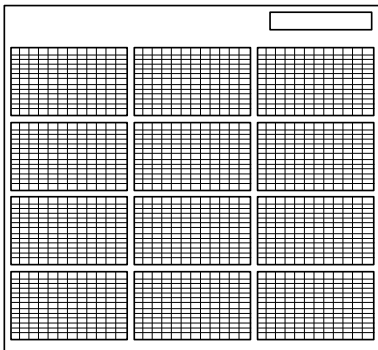


Step 5

Attach the hose going to the purifier to the male adapter on top of the pump.

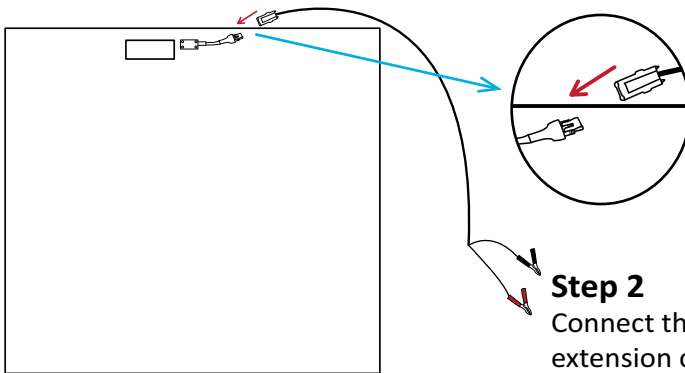
Using the solar panel

The solar panel is optional



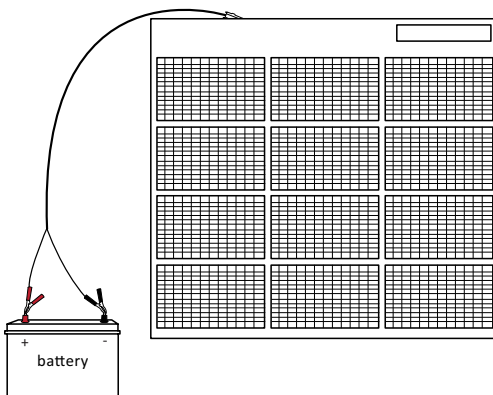
Step 1

Unfold the solar panel and place it so that the panels are facing the sun.



Step 2

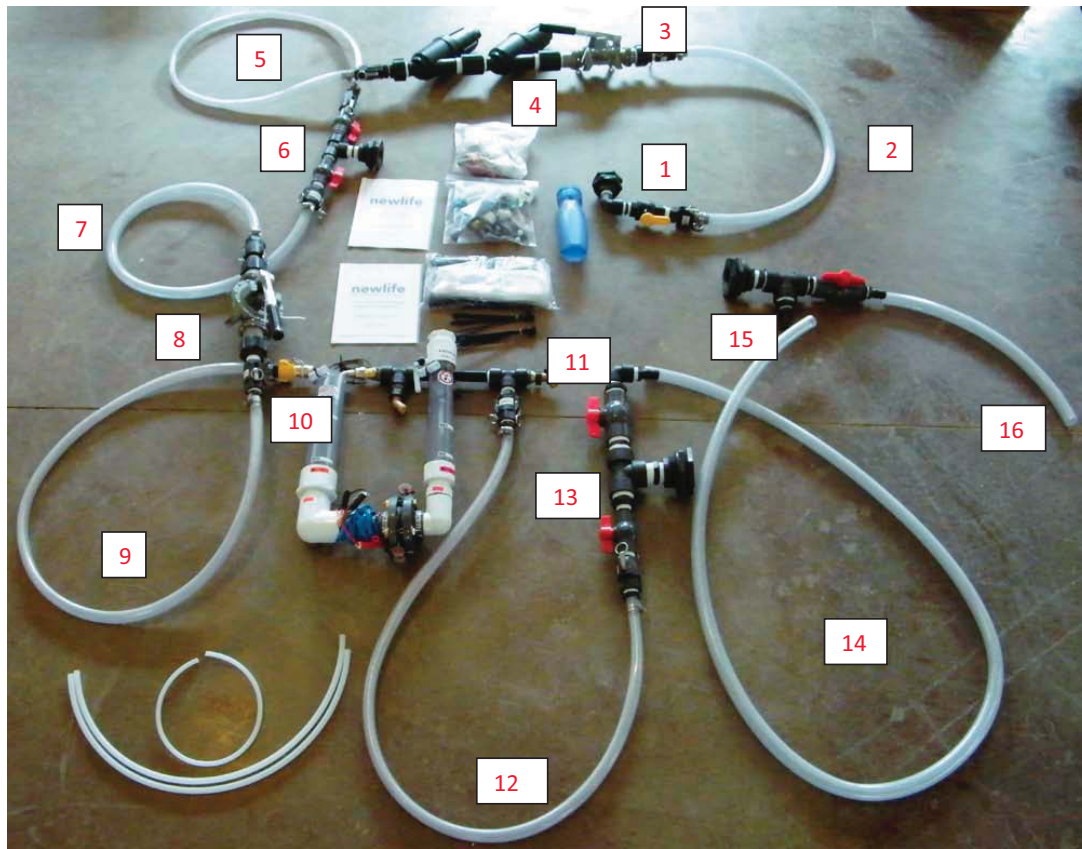
Connect the wires on the panel to the provided extension cord.



Step 3

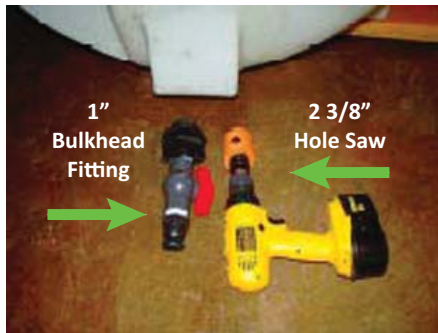
Attach the clips on the extension cord to the battery (red to positive, black to negative).

Parts for 3-tank System Layout



- 1) Dump Tank (Pour water into from Jerry Can or other water source) Outlet 1" Bulkhead fitting (requires 2 3/8" opening), Elbow 1" Valve.
- 2) 1" Hose with Male and Female Quick Connect Fittings
- 3) Hand Pump with Male and Female Quick Connect Fittings and replacement diaphragm
- 4) 100 micron and 25 micron disc filters with Quick Connect Fittings
- 5) 3/4" Hose with 1" Female and Male Quick Connect Fittings
- 6) Circulation Tank (Upper Tank) Outlet 1" Bulkhead fitting (requires 2 3/8" opening), 1" valves with Quick Connect fittings
- 7) 1" Hose with Male and Female Quick Connect Fittings
- 8) Hand Pump with Male and Female Quick Connect Fittings and replacement diaphragm (Note: A/C pump may be used as a substitute pump. See page 9 for details).
- 9) 3/4" Hose with 3/4" Female Quick Connect and 3/4" Male Quick Connect Fittings
- 10) Heat Exchanger with 3/4" Female Quick Connect fitting
- 11) Venturi assembly with 1" Male Quick Connect Fitting
- 12) 3/4" Hose with 1" Male and Female Quick Connect Fittings
- 13) Circulation Tank 1-1/2" Bulkhead Fitting (requires 3" opening) going into a Tee Fitting Assembly with 1" Female Quick Connect and 1" Valve and a 1-1/2" outlet valve, 1-1/2" x 1" poly bushing and 1" Barb on the opposite side
- 14) 1" Hose Assembly—10 Foot Length to run from one Tank to another (Not Shown in Picture)
- 15) User Tank (Lower Tank) 1-1/2" Bulkhead Fitting (requires 3" opening) going into Tee Fitting with a 1-1/2" x 1" poly bushing and 1" Barb for water coming from Circulation Tank and a 1-1/2" Valve for the outlet
- 16) 1" Hose for use to fill the Jerry-Cans and Water Containers

Installing Bulkhead Fittings



Step 1

Cut or drill opening for the bulkhead fitting using a small saw blade, or a hole saw. Cut a 2 3/8" round hole for the 1" bulkhead fitting and a 3" round hole for the 1 1/2" bulkhead fitting. Try to center the hole on a flat surface if available. Be sure to check clearances around the planned opening before cutting to insure there is no interference with the nut and inside tank wall and bottom.



CAUTION: Hold securely onto the drill with both hands as the drill will try to spin when the hole saw touches the tank and starts cutting the hole. Apply very light pressure while the drill is rotating. While cutting the hole, do not force the saw into the tank or the drill will spin out of your hands!!!

Be very cautious if a smaller hole is already drilled and you are enlarging the hole as the pilot drill cannot be used. Use a template to hold the drill in place if necessary.



Step 2

The bulkhead fitting should be installed from the inside of the tank with the threads extending to the outside of the tank. The bulkhead fitting nuts are threaded backwards and should be tightened counter-clockwise! 16" channel lock pliers are needed to tighten the nut securely. Ensure that the nuts are very tight as they are hard to tighten after the additional hardware is installed.

Note: The rubber gasket must be **inside** the tank.

Filled Tank Size vs. Weight Chart

TANK SIZE	SAME AS	WEIGHT—LB's	WEIGHT—KG's
50 Gallons	189 Liters	417 lbs.	189 kg
100 Gallons	379 Liters	834 lbs.	378 kg
250 Gallons	947 Liters	2085 lbs.	946 kg
500 Gallons	1890 Liters	4170 lbs.	1890 kg
1000 Gallons	3790 Liters	8340 lbs.	3780 kg
100 Liters	26.4 Gallons	221 lbs.	100 kg
250 Liters	66 Gallons	551 lbs.	250 kg
500 Liters	132 Gallons	1101 lbs.	500 kg
1000 Liters	264 Gallons	2202 lbs.	1000 kg
2500 Liters	660 Gallons	5505 lbs.	2500 kg
5000 Liters	1320 Gallons	11,009 lbs.	5000 kg

RECOMMENDED TOOLS FOR INSTALLING BULKHEAD FITTINGS:

Required Items:

1. 16" Channel Lock Pliers - Very Important!!
2. 10" Channel Lock Pliers and/or Large Crescent Wrench
3. Utility Knife or Swiss Army Knife or Leatherman Multi-Purpose Tool

Optional Items:

1. Electric or Battery Operated Drill
2. 3" and 2 3/8" Hole Saw
3. 25' tape measure