



## EBB-1 / Ebb & Gro™ Hydroponics system

*The Ebb & Gro system from CAP has been designed to allow you to grow up to 48 plants in an easy to use system that requires minimal maintenance. The EBB-1 increases the Oxygen levels around the roots by repeated flood & drain cycles resulting in accelerated plant growth.*

- ✓ Individual pots (modules) allow you to easily move / relocate plants.
- ✓ Each EBB-1 controller can control from 6 up to 48 plant sites... plenty of room for expansion.
- ✓ A smaller reservoir (55-gal) can be used with less water compared to flood & drain tables.
- ✓ Reservoir does not have to be lower than the plants!
- ✓ The EBB-1 controller is all you need to control all pumping and level control functions.
- ✓ “Active” hydroponics system compared to rockwool resulting in faster growth and larger yields.



### DESCRIPTION

The Ebb & Gro system is a multi-pot hydroponics system that uses two 2-gallon buckets and clay Hydroton as a growing medium. The two buckets are nested one on top of the other, the top bucket holds the Hydroton and the lower bucket holds and catches the nutrient water. The lower buckets have a ½” tubing line connected to the bottom that links the 2 gallon “modules” to the controller bucket. The top bucket has a series of holes punched through the bottom, which allows the water to percolate up through the holes when filling or drain back down when in the drain cycle.



### FILL CYCLE

When the systems “fills” water is pumped from the 55-gallon reservoir into the controller bucket. The 3 ½ gallon controller bucket has several float switches installed, which keeps the water at the proper levels during the filling and draining cycles. As the water flows from the highest point (the controller bucket) to the lowest point (each of the 2 gallon modules) gravity provides the mechanism to ensure that all the buckets are filled to the proper level. As the water enters the bottom of the 2-gallon “catch” bucket under very low pressure, it slowly fills from the bottom of the inner bucket to submerge the roots in freshly circulated nutrient water. In the process, gasses that are expelled by the roots are pushed up and out of the root zone. Once the water has been distributed to all of the modules, the pump is shut off. A timer controls how long the fill cycle is and how long the drain cycle is.

**NOTE: Of the main advantages that the Ebb & Gro system has, perhaps none is greater than its amazing root and plant growth. Hydroton is a very “active” grow medium compared to soil or even rockwool because of the many air spaces that exist between the rocks.**

### DRAIN CYCLE

When the “drain” cycle is activated, the water is pumped from the controller bucket, back into the 55-gallon reservoir. As it enters the reservoir, the water is allowed to dump back into the nutrients which provides some natural aeration. But that’s not where the Oxygen is needed... it is needed at the **ROOT ZONE**. As the plants grow, the roots also take in oxygen and expel gasses into the area surrounding the roots. Once the oxygen is depleted and the expelled gasses build-up, the plant slows down growth. So the key is to replenish the air surrounding the roots while removing the gasses that build up. And that’s exactly what the Ebb & Gro does. When the water is drained from the 2-gallon modules, fresh air is naturally drawn back down into the root zone through the vacuum that occurs as the water is drained back into the controller bucket. Again, only a small pump and gravity are used to drain the lower buckets and to introduce fresh air to the roots. Once the float switches in the bottom of the controller bucket sense the water has been drained, the pump is shut off and the systems is ready for its next fill cycle.

**NOTE: During the drain cycle, fresh oxygen is drawn back into the root space, allowing for prolific root growth!**

## REQUIRED PARTS

Before starting, familiarize yourself with the parts you will be using. The EBB-12 comes complete with all of the parts listed.

- (50') ½" irrigation tubing
- (13) ½" straight connectors
- (8) tees
- (22) ½" rubber grommets
- \* (2 grommets pre-installed)
- (6) zip-ties
- (2) Ft white spiral wrap



- \* (1) special ½" 90° elbow with "vacuum break hole" (Identified by silver tab wrapped around fitting)



- (12) 2 gallon inner buckets
- (12) 2 gallon outer buckets
- (1) 55-gallon drum



- (1) EBB-1 3 ½ gallon controller bucket w / cover
- (2) submersible pumps

## Installation

First, determine the desired location for the EBB-1. The only critical factor is that the plant buckets must all be at the same level as the controller bucket.

**NOTE:** If the controller is higher than the module buckets, the float switches may not be able to keep the water from overflowing the lower module bucket.

### Controller bucket

- 1) The controller bucket has three float switches installed inside the unit.  
**Make sure the floats pivot freely and nothing interferes with their movement.**
- 2) Insert (6) grommets and (6) straight connectors into the holes in the bottom of the controller.
- 3) Insert (2) grommets into the 2 smaller holes drilled in the controller cover. The third larger hole is used for the pump power cable to pass through.
- 4) Install (2) ½" straight connectors in the grommets. **Wetting the connector before pressing it into place makes it much easier.** Push them in until the connector comes through the grommets and "snaps" into place. The first "barb" should extend all the way through the rubber grommet.
- 5) Cut a piece of ½" tubing 10" long and press it on to the left side straight connector.
- 6) Snap the controller cover on the controller bucket.
- 7) Place one of the pumps inside the controller as shown in the picture. It must be facing down and positioned at the bottom of the bucket.
- 8) Cut a piece of ½" tubing long enough to connect the pump to the bottom of the right hand straight connector
- 9) To install the tubing on the pump outlet you may first have to soak the end of the tubing in some warm to hot water, this will soften the plastic so that it is easier to press onto the pump fitting. Then connect the other end to the straight connector on the drum cover.
- 10) Pass the pumps power cable out the larger hole on the top of the cover.

Fill tubing connected to pump inside 55-gallon drum

Drain tubing connects to pump inside controller bucket



Float switches

Stick pump to the side with the opening facing down.

## 55-gallon reservoir

- 1) Insert (1) straight connector into one of the rubber grommets pre-installed on the 55-gallon drum cover.
- 2) **IMPORTANT! Install the special pre-drilled 90° elbow fitting into the other grommet. Press it into place from the bottom side of the cover. The “vacuum break” hole must be positioned so that it is inside the drum with the hole facing down.** (See Picture)
- 3) Cut a piece of ½” tubing long enough not to “kink” and connect it from the vacuum break elbow to the pump which is located on bottom of the drum.
- 4) Press one end of the ½” tubing onto the pump outlet. (Use water to help lubricate during assembly)

Vacuum break fitting installed w /drain hole facing down inside drum.



An adapter is used to connect the tubing to the pump.



The ½” hose fits tightly over the pump adapter. The hose can be stretched easier if you *soak the hose under warm to hot water* before installing it.



- 5) Connect the other end of the hose to the “vacuum break” elbow fitting. Use a zip-tie to doubly secure the tubing to the 90° fitting.
- 6) Place the submersible pump in the 55-gallon drum and pass the power cable out the larger hole. Once you know where you want to place the 55 gallon drum and the controller bucket, they can be connected together with (2) pieces of ½” tubing.
- 7) Cut (2) pieces of tubing long enough to get from the top of the drum to the fittings on the top of the controller bucket.
- 8) Attach (1) tubing from the special 90° elbow fitting on the drum cover to the connector on the controller bucket cover that has the 10” long tube connected to it on the inside.
- 9) Attach the other ½” tubing to the straight fitting on the top of the 55 gallon drum and to the fitting on the controller that is connected to the pump inside the controller bucket.
- 10) Use the provided zip-ties and spiral wrap to secure the tubing to the fittings. The spiral wrap is used to keep the tubing from bending too tightly and “kinking”.

Spiral-wrap and zip-ties secure tubing to drum cover and keeps tubing from collapsing.



## 2 gallon bucket “modules”

- 1) CAREFULLY Install a rubber grommet into the hole in the bottom of each of the outer buckets. Pressing too hard will cause the hole in the bucket to rip and it will not be watertight.
- 2) Arrange the buckets on the floor in the manner you want them to be laid out.  
**NOTE:** Keep in mind that there are (6) outlets from the controller bucket that can be used. The buckets will fill faster if all the outlets are used however, outlets that will not be used can be plugged using a short piece of tubing “looped” back to another outlet or “closed off” with a zip-tie.
- 3) Decide which bucket modules will need tee fittings and which will need 90° elbows (elbows are used at the end of the line). Install as required, remember to use some water to lubricate the fittings as they are pressed into the grommets.
- 4) Cut lengths of ½” tubing and connect each of the modules to the controller. Be sure that none of the lines are twisted or “kinked” and that the tubing lies flat on the floor.
- 5) Place the inner buckets with the holes in the bottom into the outer buckets.  
**NOTE:** BEFORE filling the buckets with the Hydroton, rinse the Hydroton to remove clay dust and residue on the rocks.
- 6) Fill the inner buckets with Hydroton to within 3 inches of the top. It takes about (1) 50-liter bag of Hydroton to fill (6) 2-gallon bucket modules. The water level will rise to about 3” from the top when in operation. When transplanting, keep the bottom of the cube / roots at least 3” from the top of the bucket. As the plant grows, the roots will travel down into the rocks and may grow all the way down into the bottom bucket.

## Start up

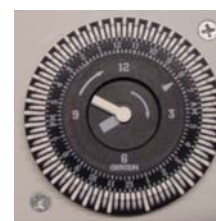
Once the system has been assembled and all of the tubing has been connected, you're ready for some water. Double check all your connections and make sure the buckets are all at the same level as the controller bucket.



- 1) Fill your 55 gallon reservoir at least ½ full with water.
- 2) Set the timer to the current time by rotating the dial to the current time.
- 3) To set the “Fill” times, pull the individual tripper “tabs” outward for the amount of time you want to fill the buckets. Each tab represents a 15-minute interval. Normally, 15 minutes is enough time to fill up to 24 modules. Up to 30 minutes may be required to fill more than 24 modules.
- 4) Normally, you should fill and drain about 3-4 times per day for 15 minutes each time.
- 5) The system will be drained when the tripper tabs are in the inner position.
- 6) There are two indicator lights on the front of the controller. The “Fill” indicator will remain on as long as the timer is in the fill mode. The “Drain” indicator light will remain on as long as the timer is in the drain mode.

***NOTE:** The pumps will continue to cycle on and off until the float switches inside the controller bucket are satisfied. During this time, the indicator lights remain ON and are not affected by the pump operation.*

- 7) When you are ready, plug the main power cable from the controller into a source of 120-vac power. Depending on where the timer is set at that time, the unit may begin filling.



Pull tabs outward for Fill times, leave inward for drain times

## Testing and operation

To test the unit, turn the time clock clockwise until the “Fill” light is illuminated. After a 5 second delay, the pump inside the 55-gallon drum should turn on and begin to fill the controller bucket. As the controller bucket is filling, the water automatically begins to fill all of the 2-gallon modules.

**\*NOTE: Make sure a small amount of water is dripping back into the 55-gallon drum from the vacuum break fitting. If this fitting gets clogged, the entire contents of the 55-gallon drum can be siphoned from the drum into the buckets causing them to overflow.**

The water will continue to be pumped into the controller until all of the buckets have been “topped off”. The pump may pause for a few moments and then resume pumping... this is normal. The float switches are doing their job of not allowing too much water to enter the modules too fast. Once the pumps stops, the water will remain in the buckets until the time-clock times out and switches to the drain mode.

To test the drain mode, allow the timer to time out and switch over OR rotate the time clock clockwise until the clock clicks over to the “Drain” mode and the Drain light is illuminated. The pump inside the controller bucket should now begin to pump the water back into the 55-gallon drum. As it enters the drum, it is allowed to “free-fall” which provides some aeration for the nutrients. Once the water has been drawn back to the controller from all of the 2 gallon modules, the pump may cycle a couple more times to get as much water out as possible. A small amount of water should remain in the bottom of the individual outer buckets, this provides a small “buffer” in the event of pump failure once the root system is large enough to extend into the bottom bucket.

You will have to change out the nutrient solution from time to time depending on the use. For most people, that will be anywhere from 1 to 2 weeks. In between, add water or 1/3 strength nutrient solution to keep the reservoir at the proper level.

To drain the reservoir, switch to the drain cycle to move the nutrient solution to the drum. Unplug the EBB-1 controller and drain the reservoir by disconnecting the line from the fitting on top of the drum. You can then plug the fill pump in and use it to drain out the water.

It is a good idea to thoroughly inspect the entire system each time you drain the reservoir. Here is a quick list.

- 1) Make sure the drain hole in the vacuum break elbow is clear.
- 2) Inspect the tubing for obstructions or kinks.
- 3) Clean the inlets of the pumps.
- 4) Make sure the float switch pivot freely.

## Troubleshooting / FAQs

- ◆ There is water on the floor.
  - ◆ Check all tubing and grommets for leaks.
  - ◆ Verify the float switches inside the controller are not obstructed by the pump or tubing.
  - ◆ Verify the “vacuum break” fitting is free of debris. A small amount of water should trickle from the hole in the fitting when the unit is filling.
- ◆ The 2 gallon buckets do not fill all the way.
  - ◆ If only individual units seem to have a problem, check for kinks or blockages or replace the ½” tubing to those buckets.
  - ◆ Make sure you have enough water in the reservoir to fill all the buckets.
  - ◆ When using 20 or more bucket modules, the “Fill” time may have to be increased to 30 minutes.
- ◆ When the drain cycle is activated, the pump inside the controller makes noise but does not pump water.
  - ◆ The pump has become air-locked. The first time the unit is run, it may be necessary to “prime” the pump by tilting it to release the air bubbles trapped inside.
- ◆ When the fill cycle is activated, the pump inside the drum makes noise but does not pump water.
  - ◆ The pump has become air-locked. The first time the unit is run, it may be necessary to “prime” the pump by tilting it to release the air bubbles trapped inside.
- ◆ My older plants seem to be having problems, looking unhealthy.
  - ◆ As the plant’s root system grows downward, the roots eventually reach the lower bucket. The remaining 1” of water in the lower bucket may be affecting the plants. The bucket modules can be raised by an inch to fully remove the remaining water.
- ◆ How do I drain the reservoir?
  - ◆ You can attached another piece of ½” tubing to the fill pump and let the fill pump empty the reservoir. When changing the nutrient solution, some people like to “flush” the lines and leach out some of the built-up nutrient “salts” that accumulate on the Hydroton. Re-fill the reservoir ½ way and allow the nutrient to be pumped a couple of times before discarding the rinse water.

## Precautions

- 1) Do not remove or relocate the inner pots when the outer buckets are filled with water. The controller may overflow the buckets and when the inner pots are re-submerged, the water will spill over the top of the modules.
- 2) Do not allow the system to run dry, keep the reservoir AT LEAST ½ full.
- 3) Do not “top-off” the reservoir unless the system is in the “Drain” cycle. (Too much water will overflow the reservoir)

## Warranty

The EBB-1 is warranted against defects in workmanship for THREE years.

## Specifications

Power supply IN	120vac	Max amperage	Fused @ 10-amps
Reservoir volume	55 gallons	Bucket volume	2 gallons
Pumps	(2) Via Aqua 305	Max buckets	48
Minimum Fill time	15 minutes	Minimum Drain time	15 minutes

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