

GROBOT EVOLUTION

Robotic Automation for Hydroponic Growers

July 1, 2012
GroBot Evo 3.20



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Very Important Things

Nutrients

Avoid nutrients that need to be stirred often or look like mud. Will work, but a lot of trouble to clean.

pH Up

Sodium Hydroxide is most common. This is lye and will dissolve skin as well as GroBot parts. Fill GroBot Container with water to halfway, then add your pH Up.

pH Down

Sulfuric acid is preferred. Nitric acid is acceptable, Phosphoric acid is not recommended. Fill GroBot Container with water to halfway, then add your pH Down.

DO

Use Firefox, Chrome or Safari as your Browser. Internet Explorer does not work. Lubricate your Dosing Container o-rings once in a while with Vaseline or o-ring lube.

DO NOT ...

DO NOT use Advanced Nutrients pH Up or pH Down, they will dissolve your GroBot. DO NOT use Acetic acid (vinegar) in or on any plastic parts.

START Here

Welcome to the state of the art in Computer Controlled Growing!

This is the ADD / Quick Start section to get you up and going FAST.

If you printed this manual yourself, keep in mind that it's intended to be a spiral-bound book so the pages with the screenshots are next to the pages with the text about them. Makes it easier!

Take a minute and read the manual, starting with the Troubleshooting section first, then flip through the book and check out the screenshots. It's more interesting, and is a quick intro to what you'll be doing.

So:

FIRST: Make sure you've got everything

- GroBot EVO controller
- Plug-in wall transformer
- pH probe
- TDS probe
- Water level sensor
- Pluggable Relay
- Circulating pump
- Replacement o-rings and sealing washers for dosing containers

SECOND: Connect to your network

The GroBot EVO comes out of the box with it's own wireless web server. All you have to do is:

- If you don't already have it, download Firefox at <http://firefox.com> and use this as your browser for the GroBot. Safari works fine too, but Internet Explorer is just too buggy under Ajax so we don't support it. Firefox is fast, free and it works.
- Plug in the Wall Transformer and power up the 'Bot. Wait 2-3 minutes for the network to come online, then:
- Search for wireless networks in range on your computer or phone. EVO makes it's own wireless hotspot, so look for it like you were connecting to a new network like in the pic below:

- Connect to the one that says **GroBot EVO**
- Open Firefox and check out your new GroBot EVO! Try to go to purgro.com. Doesn't matter what URL you enter, this network only goes one place. 😊
- While you have the GroBot up and running, now is a good time to check out the Setup page and calibrate your pH and TDS probes.

MAKE SURE to let the GroBot run for an hour or so before trying to calibrate it. Like all precision electronic instruments, it works much better when at a stable operating temperature.

Remember to put the pH probe back in the storage solution when you're done.

- Once you've looked through the interface, have calibrated the probes, it's time to check out the Pluggable relays and install the 'Bot in your grow room.



FINALLY: Install The GroBot EVO in your Grow Room

- Mount the GroBot about chest high in your grow room where she can sample the air for Temperature, Humidity and CO2 measurements. Plug in the wall transformer and connect it to the GroBot.
- Install the circulating pump in your reservoir and plumb it to the GroBot EVO with ½” flexible tubing. We recommend 90 degrees elbows to attach your tubing to fit the GroBot’s ¾” female NPT threads. The pump input is on the LEFT, the return to your reservoir is on the RIGHT.

Leave the pump unplugged, you’ll be doing that next.

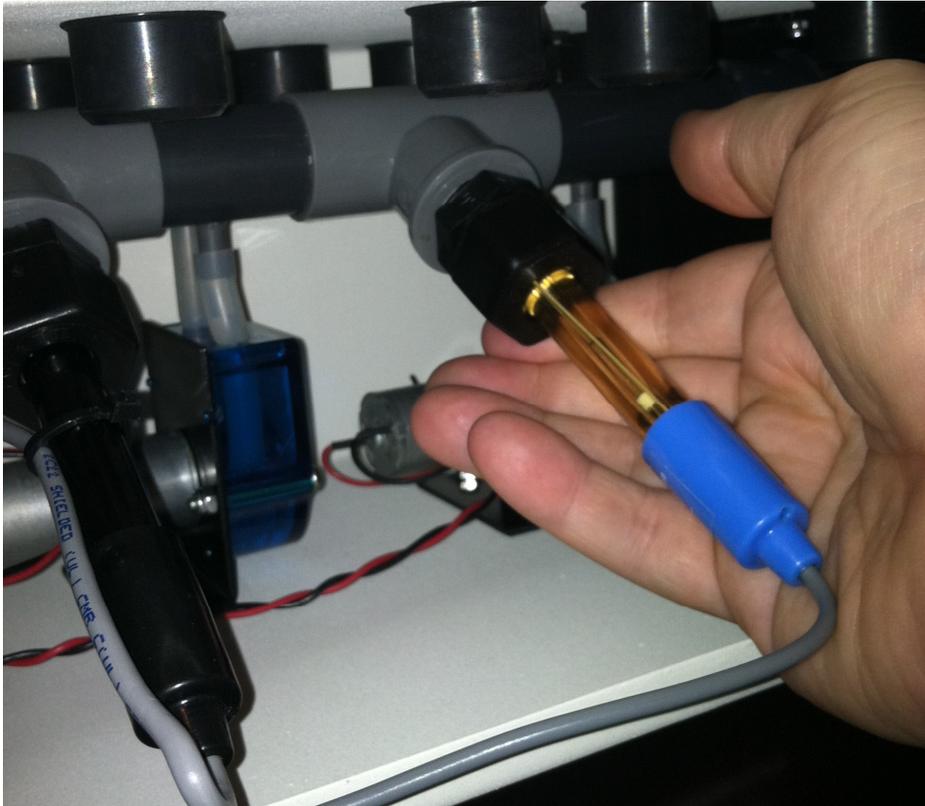
- Mount the Water Level sensor down low near the bottom of your reservoir.



The BEST way to do this is to drill a hole in the side of the res and install a bulkhead fitting with ½” NPT threads. Screw the sensor into the fitting and tighten it down. If that’s not possible, you can Tee it into your drain line. The sensor measures the WEIGHT of the water column as pressure, and requires no setup or calibration.

Do NOT toss the sensor in the reservoir! The wiring needs to be on the outside of the res, the stainless steel diaphragm on the inside.

- Remove the four screws on the back of the GroBot EVO and remove the back cover. Install and hand-tighten the pH sensor and TDS sensor. No wrenches, please!



Once the sensors are installed, plug in the circulating pump and check for leaks.

NOTE: pH sensors are best stored wet. If you are going to shutdown your GroBot's circulating pump for more than a day or so, remove the sensor and put it in a storage solution. pH 4 is best, pH7 is OK, tap water is OK, Reverse Osmosis water is NOT good.

- For each external device (fan, light, CO2 valve, pump) configure a Pluggable Relay and plug it in to power. Make sure to test each channel on the Setup page before firing up the system in Grow mode. You don't want to guess what will happen, you want to KNOW.

Before plugging in the circulating pump, remember that it DOES matter which direction water flows through the EVO. The pH sensor, like all such devices, reacts slowly when driven with strong acids or alkalis. We make sure this doesn't happen by pumping water from Left to Right, since the sensor is on the left.



Fire up the circulating pump that came with your EVO and make sure nothing leaks and everything is clean and secured. Pump pressure comes in on the left, return hose to your res on the right. Make sure there is nothing else in the return hose (like a chiller) that could cause backpressure on the EVO.

So:

Your GroBot Evo should now be powered up, wireless network running, probes installed, with water circulating through it with no leaks.

Take a look at the next section to see how it all works!

Web Interface Guide

GroBot is operated via a Web interface which can be used on a laptop, tablet or mobile device like an iPhone. The Home page is where you'll be checking in on the system for status, and is sized for a mobile phone. The setup screens are larger and are easier to use on a laptop, although you can scroll through them on your mobile if need be. We recommend using a laptop to set everything up, and then use your phone or whatever you like best to run and monitor the system. During setup, the more you can see, the easier it is.

Home

PurGro

Robotic Automation for Hydroponic Growers



9/20/2011 at 1:30:30 pm

Temperature	74.0 F
Relative Humidity	46%
Water Level	0.0"
pH	14.0
Nutrients	2570 ppm
CO2 Enrichment	680 ppm

[Home](#) [Cameras](#) [Calendar](#) [Email](#) [Setup](#)

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The Home page shows today's date and time, and a run down of what's going on in the grow room or greenhouse. From here, you can look at the Cameras, set up your grow Calendar, Email or various calibration functions in Setup. The Home page updates every five (5) seconds and looks like this:

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Grow / Stop



Growing indicates that your GroBot is running and cycling the lights, CO2, fans, running drain and fill cycles, maintaining pH and Nutrient levels and whatever else you have defined. This symbol means GroBot is up, running and may switch things on or off. Important safety tip – Growing means GroBot may power up something you are working on, which brings us to this symbol:



Stopped means that GroBot is not going to turn anything else on or off, which is a real help when you're inside working on the pumps and don't want the 'Bot soaking you down.

When you click on the **Growing** symbol and the potted plant turns into the **Stopped** symbol, GroBot does a few things to stabilize the system before just stopping cold:

- Fill Channel, Drain Channel, Foliar Pump, Nutrient Pump (if using Ebb/Flow), CO2, Heat, Cool, Humidify and Dehumidify Channels are powered OFF so you can work on them.

All other channels stay in whatever state they were in, so if you're running an Aeroponic or DWC system GroBot's not going to shut down your pumps, or drop the lights and leave you in the dark.

Status Line

Just below the PurGro logo is the status line that tells you what your 'Bot is doing.

- Initializing ...
- Flooding tables for: NN sec (where NN is seconds left to flood)
- Flood wait for: NN sec (where NN is seconds left to drain back after flood)
- CO2 Enrich
- CO2 Purge
- Injecting Nutrients
- Adjusting pH
- Draining
- Filling
- Manual Injection
- Circulating Injection Five (5) minute mixing period after manual injection
- Blank – running and watching

Cameras

Growers are hands-on kind of folk, and seeing your plants growing is just as important as making sure no one is prowling around your facility. Most network cameras like the Panasonic or Axis come with a pile of software so you can set up as many as you like, arrange them in a matrix, zoom in and out, etc. The Axis even has audio so you can talk back and forth to someone in the room!

When you click on Cameras, the 'Bot brings up the URL you specified which will drive over to your camera page. Enter whatever URL you are using to view your camera per the cameras instructions.



GroBot Sunflowers

Webcam image courtesy of Atlantis Hydroponics, Atlanta GA

This page is also blank.

Calendar

Grow Week and Day

GroBot runs a 16 week grow calendar, and regardless of what the calendar on the walls says, what's counts is where you are in the Grow Calendar. Week 3, Day 6 is a lot more meaningful to a growing plant than 15 December. Enter a week from 1 – 16, and a Day from 1 - 7.

Grow Hour is the same as the hour on the clock – 2:00 PM is hour 14 -- UNLESS you are running a shorter than 24 hour day, as some growers do. This is the hour in your current Grow Day, which might be only 18 hours long! Set this to the current Grow Hour if you need to adjust it.

9/20/2011 at 1:36

Grow Week	Grow Day	Grow Hour	Hours in a Grow Day
<input type="text" value="1"/>	<input type="text" value="1"/>	<input type="text" value="0"/>	<input type="text" value="24"/>

Grow Calendar [External Devices](#) [Nutrient Pumps](#)

Week	Lights On	Lights Off	Foliar Feed	pH	PPM	Air Temp	Rel Humidity	CO2
1	<input type="text"/>							
2	<input type="text"/>							
3	<input type="text"/>							
4	<input type="text"/>							
5	<input type="text"/>							
6	<input type="text"/>							
7	<input type="text"/>							
8	<input type="text"/>							
9	<input type="text"/>							
10	<input type="text"/>							
11	<input type="text"/>							
12	<input type="text"/>							
13	<input type="text"/>							
14	<input type="text"/>							
15	<input type="text"/>							
16	<input type="text"/>							

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Sixteen Week Grow Calendar

This is where all the heavy lifting happens, so let's take each element one at a time.

The Green Bar

The bar moves to highlight whichever week is the current week. You can change this by altering Grow Week and Grow Day above if you need to move your schedule around.

Lights On / Lights Off

Choose a time for your lights to come on and off. If you leave Lights Off blank, the Bot will turn them on when you say and never turn them off. Remember – blank means “Don't do anything here”

Foliar Feed

Foliar starts when the lights go out, as specified in the External Devices section on Foliar Feeding.

pH

GroBot will maintain any pH setting between 3.0 and 9.0 for you. A blank pH target means “leave it alone” and GroBot will not attempt to control pH for that week.

PPM

Set your PPM (nutrient concentration) target for this week here. Enter a number between 100 and 3000 and GroBot will maintain this level for you too. A blank or zero PPM target means “Don't do anything here” and GroBot will not inject nutrients to control PPM.

PPM is typically computed using the NaCl (table salt) coefficient of 500 from Electrical Conductivity (EC). You can calibrate your GroBot to read in any units you want.

Air Temp

Set your desired air temperature here.

Rel Humidity

Set point for your humidity control devices defined on the External Devices panel below.

CO2

Most growers want something in the 1200-1500 range. GroBot assumes anything above 2000 or below 400 is a mistake and will reset to blank.

External Devices – Part I

This panel has all the details on how your Grow Room is set up and what's connected where. The documentation is right on the screen, but a few tips that may come in handy:

9/20/2011 at 2:19

Grow Week	Grow Day	Grow Hour	Hours in a Grow Day
1	1	16	24

[Grow Calendar](#) External Devices [Nutrient Pumps](#)

Network Number	This GroBot is using Network Number <input type="text" value="1"/>	The top rotary switch on each Pluggable Relay sets the Network Number that unit listens to. Use different numbers if you have more than one GroBot. Choose a number from 1-9.
Lights	Primary Grow lights are on Channel <input type="text" value="0"/> Secondary Grow lights are on Channel <input type="text" value="0"/>	Grow lights are in your main growing area and are controlled by the Calendar above. Both come on at the same time. If Air Temperature reaches 5 degrees over your chosen setpoint, GroBot will turn off the Secondary lights to help cool the room.
	Mother lights are on Channel <input type="text" value="0"/> They come on at <input type="text" value="Midnight"/>	Mother lights are for Mother Plant rooms, offices, anywhere you might want another light on a timer. Most often used for for Mother Plants on a fixed lighting schedule.
	... and turn off at <input type="text" value="Midnight"/>	
Foliar Feed	Is on Channel <input type="text" value="0"/> and runs for <input type="text" value="0"/> minutes every <input type="text" value="0"/> days	Foliar feed starts when the lights turn off and runs for a specified number of minutes. Set days to 1 for every day.
Heating and Cooling	<input type="radio"/> GroBot thermostat on channel <input type="text" value="0"/> -or- <input checked="" type="radio"/> Individual heating and cooling units: Heat on channel <input type="text" value="0"/> Cool on channel <input type="text" value="0"/>	GroBot can control your air temperature either through a GroBot integrated thermostat, or individual relays for separate heating and cooling units.
Humidity Control	Humidifier is on channel <input type="text" value="0"/> Dehumidifier is on channel <input type="text" value="0"/>	Connect your humidity source (spray bar, mister, humidifier) and your dehumidifier here. Use Pluggable Relays to control these units.
CO2 Enrichment	Enrich for <input type="text" value="0"/> hours then purge for <input type="text" value="0"/> minutes	The CO2 valve opens until the desired CO2 level is met and will then be maintained automatically. You can leave the CO2 on until lights out, or run a Purge fan periodically to keep odors from leaking out of your grow room. You can also optionally run a purge cycle when the lights go out if you like, as some growers prefer.
	CO2 valve is on channel <input type="text" value="0"/> Purge fan is on channel <input type="text" value="0"/>	
	Purge at lights out? <input type="text" value="No"/>	

- **Grow Week** we thought it would be convenient to have this here too.
- **Network Number** is to keep multiple GroBots on separate channels. If you only have one 'Bot, set this number to 1. All your Pluggable Relays need to be set to the Network Number you choose here.

Each Pluggable has a channel you set to match whatever you choose for each device here. Channel 0 is unused and means "don't do anything here".

- **Lights** are associated with clock time (am and pm) you entered on the Setup page. Everything else on this page (Foliar, CO2, Nutrient Pump, Drain/Fill) has a run time or a number of days associated. Run time uses an internal stopwatch, so changing date, time or Grow Week doesn't screw up the timing. We do this so changing your Grow Calendar doesn't do things you wouldn't want or expect.
- **Foliar Feed** is based on an every N day cycle, which starts counting On Grow Day 1. Keep in mind this is based on Grow Days, which may have less than 24 hours.
- **Heating and Cooling** can use either a GroBot Thermostat interface, which wires up just like a regular thermostat to your HVAC system, or individual Pluggable relays fro Heat and Cool.
- Humidity Control is run with two Pluggables or a radio Panelboard on individual channels.
- **CO2** enriches for N hours and then purges the room for some number of minutes. This starts at lights on and continues to lights off. If you want continuous CO2 with no purge, just set the CO2 Enrich time to 24 and it will run until lights out. You can also optionally purge at light out as some growers do.

There's quite a lot that can be done with this section even if you aren't using CO2. Set it up to run your fresh air fans every so many hours, for example.

External Devices – Part II

Nutrient Pump	Nutrient Pump is on channel <input type="text" value="0"/>	<p>If you have an Ebb & Flow or Drain-To-Waste system, the Nutrient Pump floods your tables or pots on a schedule. The feeding plan can be different for different parts of the day if you want.</p> <p>Just set Minutes To Feed and Every ... for how often you want to pump, and set the Start Times to match your schedule. You can have up to four separate feeding schedules per day (or just one if you want).</p> <p>Every time you bring up this page, GroBot updates the Next Flood field so you know how long from now until the next flood. This is hours and minutes from Now, not clock time.</p>																				
	<input type="radio"/> Ebb & Flow: <table border="1" style="width: 100%; border-collapse: collapse;"> <thead> <tr style="background-color: #00FF00;"> <th>Start Time</th> <th>Minutes to Feed</th> <th>Every ... (hours/min)</th> </tr> </thead> <tbody> <tr> <td>Midnight ▾</td> <td><input type="text" value="0"/></td> <td><input type="text" value="0"/> : <input type="text" value="0"/></td> </tr> <tr> <td>Midnight ▾</td> <td><input type="text" value="0"/></td> <td><input type="text" value="0"/> : <input type="text" value="0"/></td> </tr> <tr> <td>Midnight ▾</td> <td><input type="text" value="0"/></td> <td><input type="text" value="0"/> : <input type="text" value="0"/></td> </tr> <tr> <td>Midnight ▾</td> <td><input type="text" value="0"/></td> <td><input type="text" value="0"/> : <input type="text" value="0"/></td> </tr> <tr> <td colspan="2">Daily feeding stops at</td> <td>Midnight ▾</td> </tr> <tr> <td colspan="2">Next flood in</td> <td>--:--</td> </tr> </tbody> </table>		Start Time	Minutes to Feed	Every ... (hours/min)	Midnight ▾	<input type="text" value="0"/>	<input type="text" value="0"/> : <input type="text" value="0"/>	Midnight ▾	<input type="text" value="0"/>	<input type="text" value="0"/> : <input type="text" value="0"/>	Midnight ▾	<input type="text" value="0"/>	<input type="text" value="0"/> : <input type="text" value="0"/>	Midnight ▾	<input type="text" value="0"/>	<input type="text" value="0"/> : <input type="text" value="0"/>	Daily feeding stops at		Midnight ▾	Next flood in	
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Daily feeding stops at		Midnight ▾																				
Next flood in		--:--																				
-or-		<p>If you have an Aeroponic system, the pumps runs continuously except during drain / refill cycles. Check the box that's closest to what you're doing.</p>																				
<input checked="" type="radio"/> Aeroponic: Pump continuously (except during Drain / Refill)																						
Drain / Refill	Next drain in <input type="text" value="Today"/> days, then every <input type="text" value=""/> days at <input type="text" value="Midnight"/>	<p>Every so often you'll want to drain your reservoir and refill it with fresh water and nutrients. This is where you set that up. Water level is automatically maintained by the fill valve if you have one connected. Minimum water level is 4 inches, maximum water level is 132 inches.</p>																				
	Drain pump is on channel <input type="text" value="0"/> Fill valve is on channel <input type="text" value="0"/> Desired water level is <input type="text" value="4"/> inches																					
External Timers	<table border="1" style="width: 100%; border-collapse: collapse;"> <thead> <tr style="background-color: #00FF00;"> <th>Channel</th> <th>On (hours/min)</th> <th>Off (hours/min)</th> <th>When?</th> </tr> </thead> <tbody> <tr> <td><input type="text" value="0"/></td> <td><input type="text" value="0"/> : <input type="text" value="0"/></td> <td><input type="text" value="0"/> : <input type="text" value="0"/></td> <td>Day ▾</td> </tr> <tr> <td><input type="text" value="0"/></td> <td><input type="text" value="0"/> : <input type="text" value="0"/></td> <td><input type="text" value="0"/> : <input type="text" value="0"/></td> <td>Day ▾</td> </tr> <tr> <td><input type="text" value="0"/></td> <td><input type="text" value="0"/> : <input type="text" value="0"/></td> <td><input type="text" value="0"/> : <input type="text" value="0"/></td> <td>Day ▾</td> </tr> <tr> <td><input type="text" value="0"/></td> <td><input type="text" value="0"/> : <input type="text" value="0"/></td> <td><input type="text" value="0"/> : <input type="text" value="0"/></td> <td>Day ▾</td> </tr> </tbody> </table>	Channel	On (hours/min)	Off (hours/min)	When?	<input type="text" value="0"/>	<input type="text" value="0"/> : <input type="text" value="0"/>	<input type="text" value="0"/> : <input type="text" value="0"/>	Day ▾	<input type="text" value="0"/>	<input type="text" value="0"/> : <input type="text" value="0"/>	<input type="text" value="0"/> : <input type="text" value="0"/>	Day ▾	<input type="text" value="0"/>	<input type="text" value="0"/> : <input type="text" value="0"/>	<input type="text" value="0"/> : <input type="text" value="0"/>	Day ▾	<input type="text" value="0"/>	<input type="text" value="0"/> : <input type="text" value="0"/>	<input type="text" value="0"/> : <input type="text" value="0"/>	Day ▾	<p>You can use up to four (4) channels for timed events instead of having to buy individual plug-in cycle timers. Just set it up here, and the Bot will run the timers for you and keep them all synchronized.</p> <p>Enter On and Off times in hours and minutes, and When. When is when lights are on (Day), when lights are off (Night) or Both to cycle continuously.</p>
	Channel	On (hours/min)	Off (hours/min)	When?																		
<input type="text" value="0"/>	<input type="text" value="0"/> : <input type="text" value="0"/>	<input type="text" value="0"/> : <input type="text" value="0"/>	Day ▾																			
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- **Nutrient Pump** runs on a timer for Ebb & Flow or Drain To Waste systems, or runs all the time for Aeroponic, DWC and similar. Check the one that is closest to what you are doing.

If you're running Ebb & Flow (on a timer), you have up to four (4) separate feeding schedules you can run each day. The simplest thing is to choose a Start Time, Set Minutes to Feed and Every hh:mm to what you want, like:

Start Time	Minutes to Feed	Every ... (hours/min)
8:00 am	6	2 : 15
	0	0 : 0
	0	0 : 0
	0	0 : 0
Daily feeding stops at		7:00 pm

This starts pumping a 8:00 am and feeds for 6 minutes every 2 hours and 15 minutes.

So you'll feed for 6 minutes at 8:00, 10:15, 12:30, etc.

If you want to change cycles timing during the day, add more Start Times and GroBot will feed on the schedule you set by breaking the day into parts. This is common in greenhouses where you want to feed more often as the sun climbs higher and the greenhouse heats up. Daily Feeding can optionally stop at the time you choose, and some growers maintain there's no point in feeding at night. If you leave it blank, that means feed 24/7.

After feeding, the GroBot waits 15 minutes for the waste to drain back before refilling and re-dosing the reservoir.

- **Drain / Refill** counts down the number of days until drain, and starts that cycle at whatever time you specify. You choose a number of days from now to repeat the cycle

GroBot EVO drains your res until it gets to 2 inches of water, then keeps draining until there is no change in level for approximately three (3) minutes. This allows GroBot to pump the res dry without burning up your pumps. You have a total of 60 minutes to drain or the 'Bot assumes something went wrong and will abort the drain cycle and email you about it. It will also set your Drain Channel to 0 so that it won't try to drain again until you fix the pumps.

Water Level has a minimum, and it's four (4) inches. If you enter a smaller number, GroBot will change it to 4.00 to prevent setting the FULL level so low that nothing works. Ebb & Flow flooding will still happen with a disconnected sensor, but Drain / Refill and automatic level maintenance will not. You'll get an email on it. You have a total of 60 minutes to Fill your reservoir or GroBot assumes something went wrong and will abort the fill cycle and email you about it. It will also set your Fill Channel to 0 so that it won't try to fill again until you get things fixed.

- **External Timers** run Day, Night or Both for the On time and Off time you set. Great for aeroponic misters, air stones, that sort of thing.

Nutrient Pumps

Your GroBot EVO has four removable dosing containers, and you can add another four by plugging in an external dosing rack. This panel is where you set up what's in each container.

9/20/2011 at 3:00

Grow Week	Grow Day	Grow Hour	Hours in a Grow Day
1	1	17	24

[Grow Calendar](#) [External Devices](#) Nutrient Pumps

Nutrients are mixed and injected as needed to maintain desired PPM level. You don't have to set an amount or a schedule for Nutrients, but you can optionally set a Ratio, or dosing recipe, if you want. Gallons, Liters or whatever units don't matter, so long as they're the same unit for each Nutrient.

Example Recipe:

- 7 mL/Gal of Nutrient A
- 7 mL/Gal of Nutrient B
- 2 mL/Gal of Additive X
- 3 mL/Gal of Additive Y

In this example, enter 7 for both Nute A and Nute B, 2 for AdditiveX and 3 for AdditiveY and GroBot will inject them by ratio whenever PPM needs to raised.

If you leave all the Ratio fields blank, Grobot will inject equal amounts of each Nutrient. Makes it all easier.

pH control is injected as needed to maintain pH. Just tell the 'Bot where the solutions are.

You can also do a one-time Manual Injection of a specified number of milliliters by entering a value in Manual Dose.

So:

Each unit has four (4) containers. Tell me what's in each one?

Rack	Pump	Type	Name	Ratio	Manual Dose
GroBot EVO	1	Nutrient			
	2	Nutrient			
	3	Nutrient			
	4	Nutrient			
External Pump Rack	1	Nutrient			
	2	Nutrient			
	3	Nutrient			
	4	Nutrient			

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- Dosing containers count from Left to Right, with #1 being the first one on the left facing the GroBot.
- Containers #1 and #2 may not be used for pH Up or pH Down. THIS IS IMPORTANT.

The pH sensor takes much longer to react when dosed with acid or alkali, and will slow down your pH adjustments by A LOT. Make sure you put your pH control solutions in #3, #4 or an external pump rack if you want. So – anyplace is fine cool but NOT in 1 or 2.

- USE CLEAR NUTRIENTS IN YOUR PUMP RACK. Muddy nutes dry out to be hard and crusty, and you'll end up having to clean out your pumps if you let the nutrient jars run dry. Use clear nutes and you'll run clean.
- If you set up multiple containers with the same type of material, say two marked NUTRIENTS, GroBot will inject equal amounts from both and treat them as one container. Just the thing for A/B nutes, or things you use a lot of.
- Dosing Ratios are really very nice to work with. If you have Nutrients that you mix A/B or A/B/C with additives, just enter the ratios from the supplier and you're all set. GroBot will inject them according to ratio every time it needs to raise PPM. Just type in your "formula" and the 'Bot will mix it that way.
- pH controls are done automatically by sensor. Just tell the 'Bot where the Up and Down are.
- Manual Dosing is great for those times you just want to shoot a little bit of something in the reservoir. Just type in how many milliliters, hit OK, and the 'Bot will inject it for you. This is an approximate amount, so please keep in mind that it may not be very precise.

Also keep in mind that you can only run a manual injection when you are Growing, and nothing else is being injected.

- You can add an External Pump Rack if you want to put another four (4) dosing containers online. They're available from PurGro and can connect directly to 6 gallon cans!

Email

The Email page sets up your Email account, Internet access and Internet Security. Let's take a look at each section one at a time:

Email

To:	<input type="text"/>	Address to get 'Bot emails
Subject:	<input type="text"/>	Cookies are burning, or ...
Port:	<input type="text" value="25"/>	426 for PurGro mail server
Email when?	<input type="radio"/> Never <input checked="" type="radio"/> Alerts Only	When do you want your 'Bot to email you?
Email now?	<input type="checkbox"/>	Send status email now

The 'Bot will send you an email when:

Parameter	Difference from Setpoint To Trigger Alarm Email
Temperature	+/- 5 degrees
Relative Humidity	+/- 10%
pH	+/- 0.75 points
TDS (Nutrient ppm)	+/- 100 ppm
Water Level	+/- 3 inches, or sensor failed / disconnected
CO2	+/- 400 ppm
Fill timeout	Fill cycle did not complete in 60 minutes
Drain timeout	Drain cycle did not complete in 60 minutes
Alarm	One of the hardwired alarms tripped

Internet

When we built your 'Bot she was assigned IP address 192.168.100.210. Works for us in the shop, but might not be what you want. Please see the section *Putting Your GroBot EVO On The Internet* for step-by-step instructions.

HTTP Port	<input type="text" value="80"/>	The GroBot EVO is a Web Server and serves pages on Port 80, which is standard. If you need to change to another port, you can set it here.
SSID	<input type="text" value="Greg's Woost House"/>	Name of the wireless network your want your GroBot EVO to join. Also the name you want the 'Bot to use when operating as a stand-alone wireless device.
Type	<input type="text" value="Join an Existing Network"/>	Choose Join an Existing Network when you want the Bot to join a wireless network you already have. Choose Stand-Alone when you want the GroBot EVO to create its own network for you to connect to.
Security	<input type="text" value="None"/>	Set security to match your wireless network
Key	<input type="text" value="0"/>	WiFi security key / passphrase, if used
Region	<input type="text" value="USA (FCC)"/>	Choose the area that matches your router's settings.
Fixed IP	<input type="text" value="192.168.100.210"/>	Set your GroBot's IP, Gateway, Netmask and DNS
Gateway IP	<input type="text" value="192.168.100.1"/>	
Netmask	<input type="text" value="255.255.255.0"/>	
DNS	<input type="text" value="8.8.8.8"/>	

- **HTTP Port** is standard at 80, but may need to be changed if you have more than one 'Bot.
- **SSID** is the name of the network you want the GroBot EVO to join, or the name of the network you want it to create in Stand-Alone mode.
- **Type** can be Join an Existing Network, or Stand-Alone to connect the 'Bot directly.
- **Security** can be one of many types supported.
- **Key** is the security key if used. If NOT used, set to 0.
- **Region** defines which channels are OK to scan. Pick USA if not sure.

IP, Gateway, Netmask and **DNS** are as defined by your network. See the section on *Putting Your GroBot EVO On The Internet* for more details.

Security

User Name	<input type="text"/>	UserID and Password for using GroBot over the Internet. Leave both of these blank for open access.	
User Password	<input type="text"/>		
Admin Password	<input type="text"/>	Use this password lets you change settings on the Grobot. The above UserID / Password lets you in to look, this is the one on the Home Page screen that lets you actually change things.	
GroBot Name	<input type="text" value="GroBot 3.10"/>	This is the name that shows up on emails, and at the bottom of each page here. Can be a real help if you have several GroBots so you can tell who's emailing you.	
Webcam URL	<input type="text"/>	IP Address or URL of webcam page	
Alarms	1	<input type="text"/>	Name of each of eight (8) alarm channels. This is the name that appears in the email when an alarm is tripped. Alarms are wired Normally On, so that cutting a wire or unplugging a device will generate an alert.
	2	<input type="text"/>	
	3	<input type="text"/>	
	4	<input type="text"/>	
	5	<input type="text"/>	
	6	<input type="text"/>	
	7	<input type="text"/>	
	8	<input type="text"/>	

While you may want to have your 'Bot where anyone can see it, most growers prefer to lock things down so people can't fool around with their grow. You can configure a UserID and Password to get access to the GroBot, and rename the 'Bot if you want so you can tell which one is emailing you (if you've got a few of them).

There is also an Admin password you can set so that people can watch your grow, but not change anything without logging in. This is the password on the home page where it says Login. If you don't set one, anyone who has access to the page can change anything – great for open access in a secure facility. If you're going to be on the Internet, we suggest locking down changes and using an Admin password.

GroBot does not announce what or where she is until you log in successfully. Secured is a good thing.

There are also eight (8) hard-wired alarms you can hook up and name. The name is used in email alerts so you can make it anything you want.

- **Date & Time**

Set by entering the Date in MMDDYY format, the Time in HHMM and either am or pm.

- **pH**

You can get buffered test solutions from your local grow shop, or online. You'll need pH 4.0 and pH 7.0. Procedure is this:

1. Clean the probe, rinse it in water and dry it off.
2. Pour some of the pH 7.0-test solution in a clean, dry glass. A shot glass in perfect. Select **pH 7** and click OK. The GroBot will return to the home page and start counting down 20 seconds as the pH probe is calibrated.
3. Rinse the probe again in clean water, and dry it off.
4. Pour some pH 4.0-test solution in a clean, dry glass. Select **pH 4** and click OK. The GroBot will return to the home page and start counting down as above.

- **TDS**

Calibrating TDS is much the same as pH – define a zero point, then one measured against a known value. Here's how:

1. Zero PPM is easy – unplug one of the probe leads, select **Zero PPM** and click OK.
2. Remove the probe and thread it into a ½" NPT fitting like this one from Home Depot:



Pour solution into the fitting, select that value and click OK.

Do NOT dunk the whole probe. It won't calibrate correctly.

NOTE: If you have a meter you trust, you can set the GroBot to match that meter by typing the reading in the box instead of using calibration solution. This way, you don't have to take anything apart.

- **CO2**

The sensor in your GroBot is a non-dispersive infrared type, and will probably not require calibration. If it does, here's how you can do it:

Take your GroBot outside in the open air, select 400 PPM in the CO2 section and click OK. It takes 10 seconds or so for the sensor to realign itself, after which you'll be reading 400 PPM as ambient CO2. It sounds like a hack, but it's actually very, very close most places. As noted earlier, it's unlikely you'll ever have to bother.

Setup – Part I

The settings page is where you set the clock, calendar and do all the occasional maintenance work that all fine instrumentation requires.

Date & Time

Set Date / Time	Date <input type="text"/> (MMDDYY)
	Time <input type="text"/> (HHMM) <input checked="" type="radio"/> am <input type="radio"/> pm

Sensor Calibration & Test

pH	<input type="radio"/> pH 4 <input type="radio"/> pH 7 <input type="radio"/> pH 10 <input type="radio"/> pH 14 <input checked="" type="radio"/> None	<p>Check the box for your calibration source or solution.</p> <p>Set pH7 first, then either pH4 or pH14 to set the gain. pH4 is a commonly available test solution, pH14 is used by electronic pH probe emulators.</p>
TDS	<input type="radio"/> Zero PPM <input type="radio"/> 750 PPM <input type="radio"/> 1000 PPM <input type="radio"/> 1382 PPM <input type="radio"/> 1500 PPM <input type="radio"/> 2000 PPM <input checked="" type="radio"/> None	<p>You only need two calibration points for TDS: Zero, and one of the other known solutions. Zero is done with the probe clean and dry. The other values are for commonly available TDS calibration solutions.</p> <p>Swish the probe around in the solution and make sure all is well-mixed. Then choose your calibrated value on the left and click OK below. Make sure to keep the probe in the solution until calibration countdown is done!</p>
CO2	<input type="radio"/> 400 PPM <input checked="" type="radio"/> None	<p>CO2 calibration can be done approximately by assuming free air is 400 PPM. It's actually pretty close most places. You'll need to take the Bot outside and let things stabilize for about 15 minutes. Try not to breathe CO2 into the sensor!</p>
Channel Test	Channel <input type="text"/> <input checked="" type="radio"/> OFF <input type="radio"/> ON	Individually turn channels on and off. Be aware that if GroBot is not Stopped on the Home page, she'll override your choice in a few seconds.
Cleaning Cycle	<input type="checkbox"/> Initiate Cleaning?	Flushes and refills the system
Update	<input type="checkbox"/> Download new firmware?	Download new GroBot firmware from PurGro.com (see release notes on the website!)
Reboot	<input type="checkbox"/> Reboot Grobot?	Reboots as if from power on

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Setup – Part II

Date & Time

Set Date / Time	Date <input type="text"/> (MMDDYY)
	Time <input type="text"/> (HHMM) <input checked="" type="radio"/> am <input type="radio"/> pm

Sensor Calibration & Test

pH	<input type="radio"/> pH 4 <input type="radio"/> pH 7 <input type="radio"/> pH 10 <input type="radio"/> pH 14 <input checked="" type="radio"/> None	<p>Check the box for your calibration source or solution.</p> <p>Set pH7 first, then either pH4 or pH14 to set the gain. pH4 is a commonly available test solution, pH14 is used by electronic pH probe emulators.</p>
TDS	<input type="radio"/> Zero PPM <input type="radio"/> 750 PPM <input type="radio"/> 1000 PPM <input type="radio"/> 1382 PPM <input type="radio"/> 1500 PPM <input type="radio"/> 2000 PPM <input checked="" type="radio"/> None	<p>You only need two calibration points for TDS: Zero, and one of the other known solutions. Zero is done with the probe clean and dry. The other values are for commonly available TDS calibration solutions.</p> <p>Swish the probe around in the solution and make sure all is well-mixed. Then choose your calibrated value on the left and click OK below. Make sure to keep the probe in the solution until calibration countdown is done!</p>
CO2	<input type="radio"/> 400 PPM <input checked="" type="radio"/> None	<p>CO2 calibration can be done approximately by assuming free air is 400 PPM. It's actually pretty close most places. You'll need to take the Bot outside and let things stabilize for about 15 minutes. Try not to breathe CO2 into the sensor!</p>
Channel Test	Channel <input type="text"/> <input checked="" type="radio"/> OFF <input type="radio"/> ON	<p>Individually turn channels on and off. Be aware that if GroBot is not Stopped on the Home page, she'll override your choice in a few seconds.</p>
Cleaning Cycle	<input type="checkbox"/> Initiate Cleaning?	<p>Flushes and refills the system</p>
Update	<input type="checkbox"/> Download new firmware?	<p>Download new GroBot firmware from PurGro.com (see release notes on the website!)</p>
Reboot	<input type="checkbox"/> Reboot Grobot?	<p>Reboots as if from power on</p>

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- **Channel Test**

To answer the eternal electronic question of “Hey, is this thing on?” you can select any channel, On or Off and click OK to find out. It takes a couple seconds for the network to relay the command to all devices, so please be patient.

We suggest test-firing all channels before running any new system. If you don’t test it, how will you know?

If you are GROWING, the ‘Bot will override what you ask for here so keep that in mind – you need to be STOPPED.

- **Cleaning Cycle**

If you’d like to initiate a drain and refill cycle NOW, all you have to do is check the **Initiate Cleaning?** box and click OK. GroBot will start a drain/refill cycle immediately.

Note -- The ‘Bot will not drain or fill unless you have a working Water Level sensor.

- **Update**

Want to get the latest firmware from PurGro? Check the box and hit OK. The ‘Bot will go offline for about 3-5 minutes as it downloads the update, installs it and reboots. You can check the software release number at the bottom of the screen to see that you’ve got the new stuff.

Don’t turn the GroBot off while it’s updating! It may take up to 10 minutes depending on your Internet connection speed. Note also the onscreen clock will not be updating while firmware is being loaded.

Note – Make sure you can send email first and that you have a good Internet connection before trying this. If you want to watch the update progress, the LED on the WiFi module will flash as it downloads the new code, and then sit solid for about a minute verifying the data, and then blink again as it updates the chip.

- **Reboot**

Everyone likes a Reboot function and, although it’s likely you’ll ever use it, it helps us do software updates and field diagnostics. This is the same as powering the ‘Bot off then on, except you can do it remotely.

Connecting External Devices

Our Pluggable Relays are designed to control everything external to the GroBot. The kit comes with one of these, but you may want to automate your flood and drain, fans, dampers, CO2 valves, just about anything. Runs on 120 or 240 volts AC and can handle 2000 Watts max.

Network

On the back of each Pluggable are three two rotary switches numbered 0-9. The top one is Marked Network and this is so you can have multiple GroBots in the same room. Set this to 1 if you only have one GroBot.

Channel

You can choose any channel from 1 – 32, and you can have up to 16 radio devices (Pluggables or Panelboards) on a single GroBot. Your GroBot can control:

1. Primary Lights
2. Secondary Lights
3. Mother Room Lights
4. Foliar Feed Pump
5. Heat
6. Cool
7. Humidify
8. Dehumidify
9. CO2 Generator
10. CO2 Purge Fan
11. Nutrient (Feed or Aeroponic) Pump
12. Drain Pump
13. Fill Valve
14. Four (4) External Timers



Dosing and pH Control is wired internally

Setting Channel Switches

The Channel switches are set them from top to bottom.

- To set channel 4, set the top switch to 0, the bottom to 4.
- To set channel 12, set the top switch to 1, the bottom to 2.

Pluggable relays have a range about the same as a wireless LAN since they use the same 2.4 GHz radios. You'll get best results with the Pluggable in the same room and within sight of your GroBot.

Turn It On

Fire up your Browser and go to the Setup page on your GroBot. Enter the channel number of the Pluggable, choose On and hit OK. It can take up to 10 seconds for the device to turn on. We suggest using a desk lamp or something similar and easy to test your Pluggables for the first time.

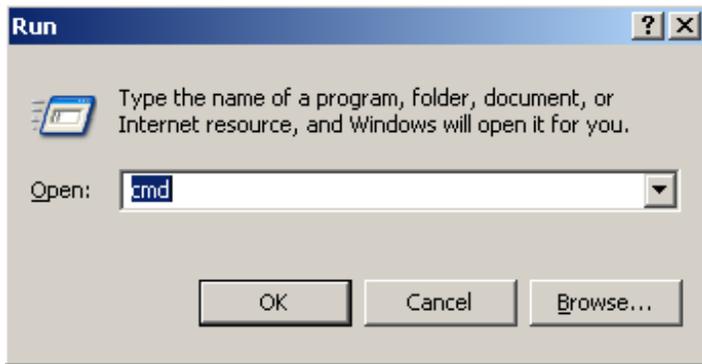
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Putting Your GroBot EVO On The Internet

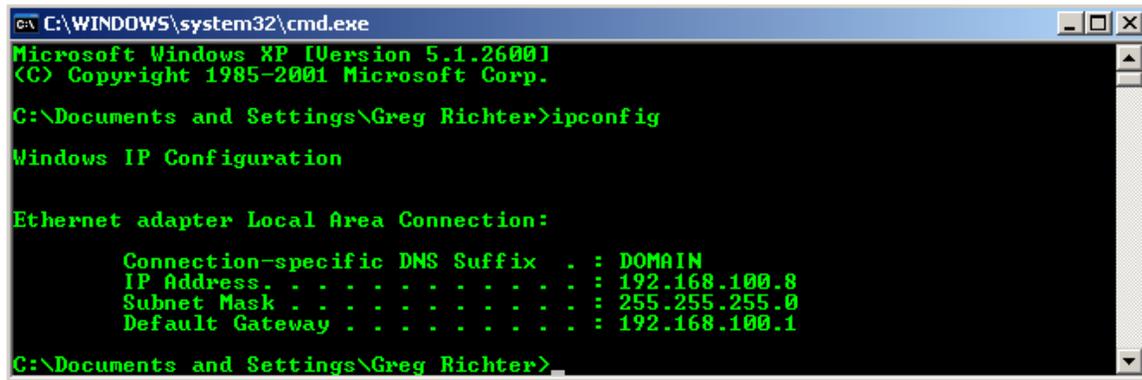
If you want to use your GroBot on a local network or connect to the Internet all we need to do is point the 'Bot at your local wireless network. Here's how:

1. Find out what your local IP addresses look like.

Your wireless router hands out IP addresses which are like phone number for computers -- every device has to have it's own. You can find your computer's IP address in Windows by running the command IPCONFIG by clicking on Start and Run. Like this:



After you click OK, you get a command window where you can enter the command IPCONFIG. You should get a screen that looks like this:

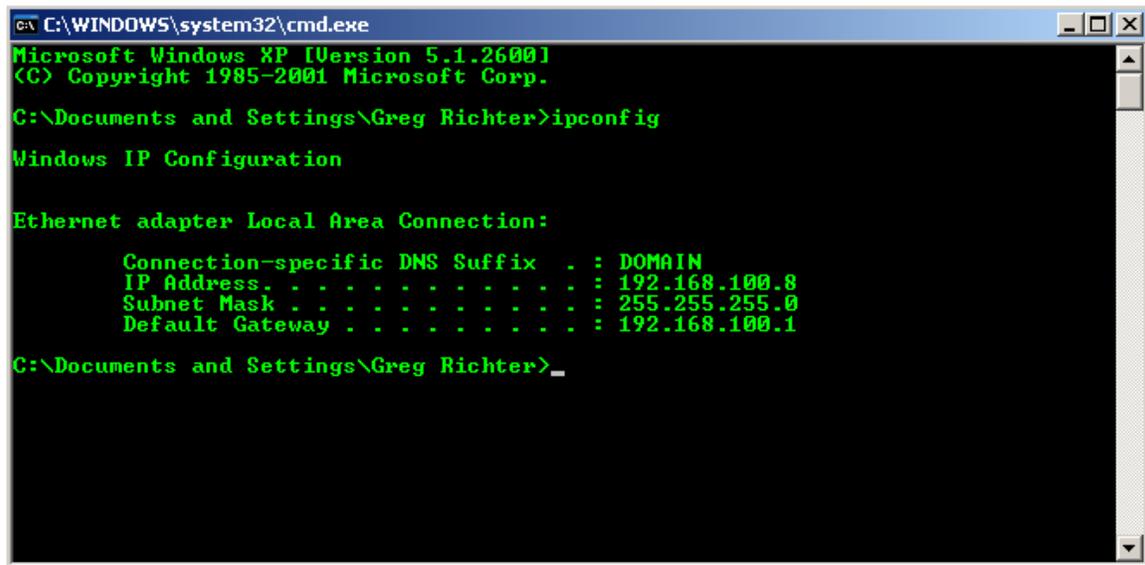


Your screen may have a LOT more stuff on it depending on your computer, but the important parts are:

- **IP Address** – the IP of your computer
- **Default Gateway** – the IP Address of your router

To put your GroBot EVO on this network, you need to assign it an IP Address in the same range as your computer. We usually suggest using the same IP Address as your computer with a different last number.

In our example:



```
C:\WINDOWS\system32\cmd.exe
Microsoft Windows XP [Version 5.1.2600]
(C) Copyright 1985-2001 Microsoft Corp.

C:\Documents and Settings\Greg Richter>ipconfig

Windows IP Configuration

Ethernet adapter Local Area Connection:

    Connection-specific DNS Suffix  . : DOMAIN
    IP Address. . . . .               : 192.168.100.8
    Subnet Mask . . . . .             : 255.255.255.0
    Default Gateway . . . . .         : 192.168.100.1

C:\Documents and Settings\Greg Richter>
```

The router is assigning addresses starting at 192.168.100.1 (the router) and the computer is at 192.168.100.8.

So we assign the GroBot **192.168.100.210** since it's high enough not to conflict with anything else, and matches the existing network except for the last number, kind of like an extension in the office phone system. Every device has to have its own IP address, so we pick one for the GroBot that's not being used and is likely to be out of the way.

If you have a bunch of GroBots, we suggest starting the at 192.168.xxx.210 and count up from there 192.168.xxx.211, 192.168.xxx.212, etc. Keeps is simple and clean.

2. Tell the 'Bot where to connect

Go to the Email page, and set up the GroBot to join your local network instead of running her own hotspot:

Internet

HTTP Port	<input type="text" value="80"/>	The GroBot EVO is a Web Server and serves pages on Port 80, which is standard. If you need to change to another port, you can set it here.
SSID	<input type="text" value="Greg's Woost House"/>	Name of the wireless network your want your GroBot EVO to join. Also the name you want the 'Bot to use when operating as a stand-alone wireless device.
Type	<input type="text" value="Join an Existing Network"/>	Choose Join an Existing Network when you want the Bot to join a wireless network you already have. Choose Stand-Alone when you want the GroBot EVO to create its own network for you to connect to.
Security	<input type="text" value="None"/>	Set security to match your wireless network
Key	<input type="text" value=""/>	WiFi security key / passphrase, if used
Region	<input type="text" value="USA (FCC)"/>	Choose the area that matches your router's settings.
Fixed IP	<input type="text" value="192.168.100.210"/>	Set your GroBot's IP, Gateway, Netmask and DNS
Gateway IP	<input type="text" value="192.168.100.1"/>	
Netmask	<input type="text" value="255.255.255.0"/>	
DNS	<input type="text" value="8.8.8.8"/>	

In this example, we're telling the GroBot EVO to connect to a network called *Greg's Woost House* with no security, no security key and using the USA channels. You should enter your wireless network parameters here to match what you're doing.

- The Fixed IP is the one we picked earlier.

Note: 192.168.100.210 is the default IP as shipped from PurGro.

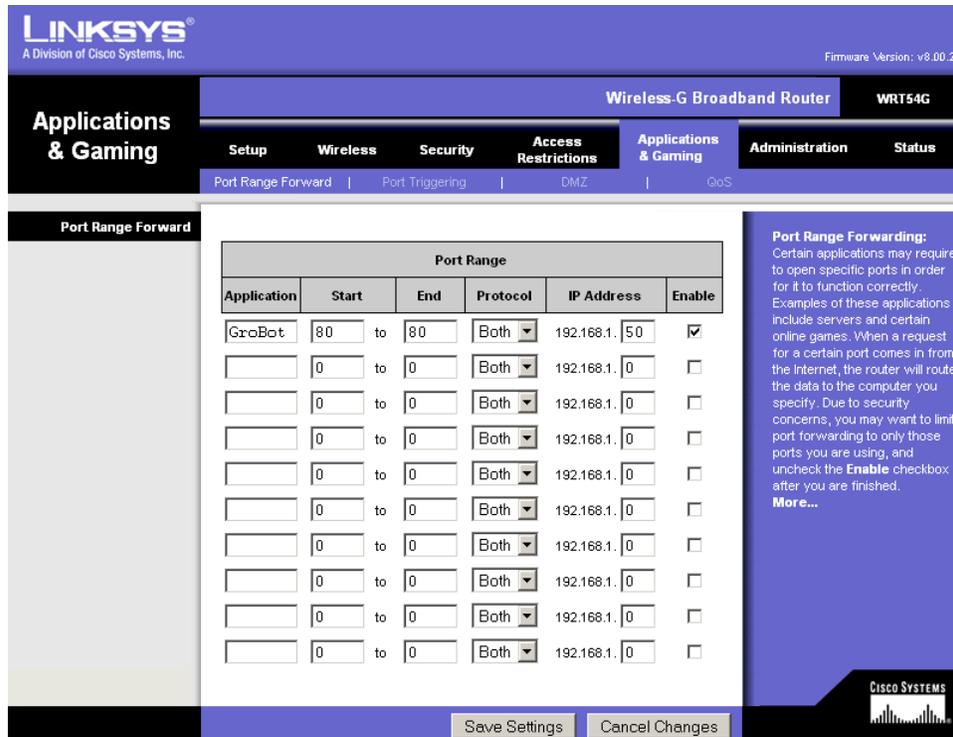
- Gateway IP is the Router address we got from Windows earlier
- Netmask indicates anything that doesn't match the first three sets of numbers in the IP address will get handed to the router to go out over the Internet.
- DNS is the IP address of the Domain Name Server for looking up websites, like PurGro.com for sending email. 8.8.8.8 belongs to Google, and it's both fast, free and we suggest you use it too.

3. Click OK, and you're connected! Look for your 'Bot on the NEW network in about 60 seconds on the Fixed IP Address you gave it above. Just type it into Firefox.

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- To see your GroBot EVO from the outside Internet, you'll need a tunnel through your router, which sounds complicated, but isn't that bad.

Here's the screen from my LinkSys router:



All you have to do is tell the router than any requests for Port 80 go to the GroBot EVO at the address you picked earlier. The example shows our office 'Bot at 192.168.1.50.

Example:

PurGro's Static IP is: 204.12.16.169. This is the address I use to see the PurGro office network from the Internet. Point your browser at the Static IP address your ISP assigned you, and your router is going to try and figure out which device at the office gets requests for Port 80.

Since we have our office GroBot on 192.168.1.50, I just went to the router configuration page and added a tunnel for Port 80 to 192.168.1.50 as shown above. That means that I can access my static IP from anywhere in the world, and the office GroBot comes up onscreen. Sweet.

Check with your ISP if you're not sure on how to set this up. They (hopefully) do this all the time. If you can't get your router to work, we keep a few in stock that we know work great. Just call and we'll set one up for you and send it out. They're pretty inexpensive.

Wireless Panelboard

The GroBot EVO controls external devices through either Pluggable relays or the Wireless Panelboard. The Panelboard has eight (8) 30 amp double-pole relays, and is less expensive and more flexible when designing a new grow room.

Just like the Pluggable Relays, the Panelboard has a Network and Channel setting.

Network

On the back of each Pluggable are three two rotary switches numbered 0-9. The top one is marked **Network** and this is so you can have multiple GroBots in the same room. Set this to 1 if you only have one GroBot.

Channel

You choose the first channel, and each relay is numbered after that one. If you choose channel 1, the relays (from top to bottom) are on channels 1-8. If you choose channel 11, the relays are on 11-18. To keep it simple, we suggest channel 11 – just set ‘em both to 1.

Your GroBot can control:

- Primary Lights
- Secondary Lights
- Mother Room Lights
- Foliar Feed Pump
- Heat
- Cool
- Humidify
- Dehumidify
- CO2 Generator
- CO2 Purge Fan
- Nutrient (Feed or Aeroponic) Pump
- Drain Pump
- Fill Valve

Dosing and pH Control is wired internally

Setting Channel Switches

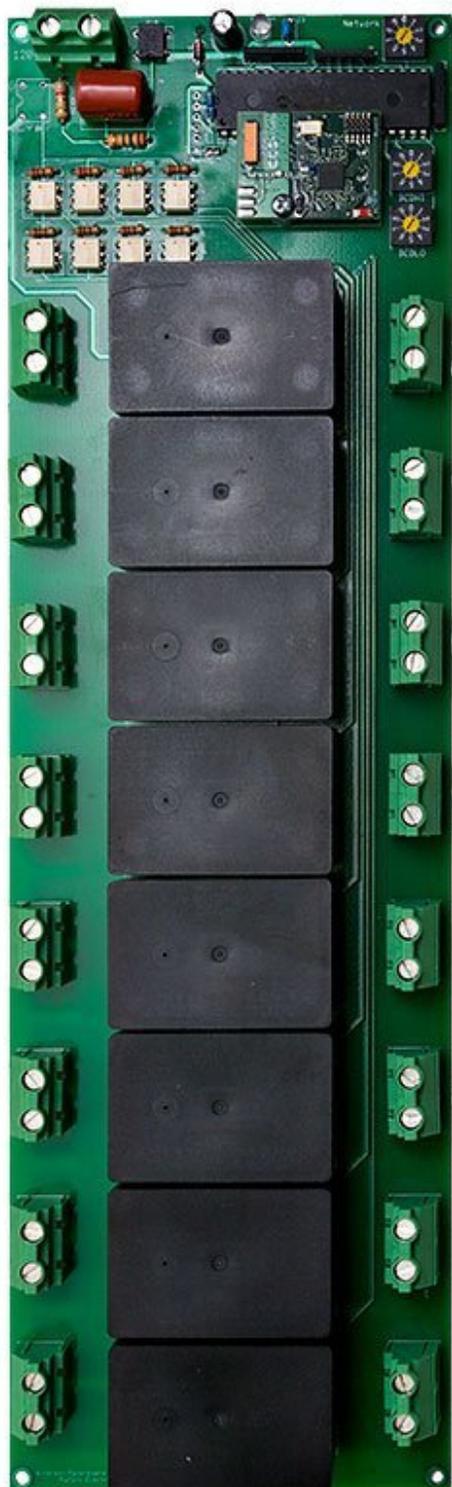
The Channel switches are set them from top to bottom.

- To set channel 1, set the top switch to 0, the bottom to 1.
- To set channel 12, set the top switch to 1, the bottom to 2.



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The radio in your Panelboard has about the same range about the same as a wireless LAN since it uses the same 2.4 GHz radios. You'll get best results with the Panelboard in the same room and within sight of your GroBot. If you put it in a box, make SURE the box is plastic and not metal!



120 Volt Power

The Panelboard runs on 120 volts AC, and you need to wire the connector at the top, left of the board that's labeled **120V** to a 120v circuit to power it up. The blue power LED will light, and the red LED on the radio board will flash every so often.

Wiring Eight (8) Double Pole Relays

Each relay has two terminals on the left and two on the right. You can connect incoming power from a circuit breaker the pair of terminals on the left, and the load to be powered to the two terminals on the right. When the relay is energized, the load is connected. That's all there is to it.

Electrician's Notes

We typically wire these in a plastic NEMA-12 enclosure (available from PurGro) and mount a ground bar at the top of the box. This puts all the power in one place for ease of testing and repair, and keeps all the grounds bonded in one spot.

The relays are DPDT, and can be treated as Two In, Two Out. If you want to split poles for a pair of 120v loads like two pumps, you can wire the neutrals straight through and use the top terminals on one relay for the first load and the bottom terminals for the second load. We use the technique often for the GroBot circulating pump and an Aeroponic or UnderCurrent pump so they that come on and off together.

Check with a meter if you're not sure!

Technical Data / Periodic Maintenance

Update Rate and Accuracy

Each element on the home page is reported to the precision available. Temperature is reported to the nearest 1/10 of a degree and is accurate to +/- 1/2 a degree C.

Relative Humidity is reported to the nearest percent and Water Level to the nearest 1/10 of an inch. Your GroBot will do her best to let you know when a sensor isn't to be believed by showing ??? onscreen.

pH is reported to the nearest 1/10 of a point

Nutrient level is reported as Total Dissolved Solids in parts per million to the nearest 10 ppm. This is calibrated using whatever solutions you used, typically the NaCl scale, where PPM = 500 * EC.

CO2 is also reported to the nearest 10 PPM.

Sensors are sampled at 40 Hz, and updated onscreen every second.

Software Updates

Your GroBot comes with a boot-loader to keep itself up to date with the latest PurGro firmware. See the *Update* section on the Setup screen for details.

Removable Dosing Containers

Your Dosing Containers use O Rings which will eventually need replacement. You can get them from us, Lowe's Home Depot, Grainger, just about anywhere since they are standard AS568A-012, Buna-N O Rings, 3/8 ID, 1/2" OD 1/16 thickness. Don't forget to use a little Vaseline or O Ring Lube on your O Rings to keep them sealing easily without forcing.

pH

pH sensors, like batteries, are truly awful, fussy bits of 1930's technology. A pH sensor is, in essence, a battery made with silver and silver chloride with an open circuit voltage that varies with the solution it's dunked in. Like all batteries, they wear out. Here's how to keep yours in top shape:

- Clean the probe every three months. We recommend this procedure:
 - Swirl the probe in pH Down (acid) for 15 seconds
 - Rinse the probe in RO water
 - Swirl the probe in pH Up (hydroxide) for 15 seconds
 - Rinse the probe in RO water

Repeat this process three times to clean all the gunk off your probe. If that doesn't clear up pH issues, REPLACE IT.

- Recalibrate the probe every three months, and you'll always read accurately. We recommend *verifying* calibration rather than just redoing it since the EVO probes don't drift much. Our friends at Atlantis Hydroponics ran almost TWO YEARS (and counting) without having to recalibrate. Odds are you won't need to calibrate unless you replace the probe.
- Replace every year. You can wait for it to fail in two, or just replace it. It's cheap insurance.

pH probes are so cheap, and a bad one can cause you such problems, its no surprise that most of our top growers replace them after each harvest. Sounds like overkill, but bad pH probes are the bane of hydroponic growing and they really are cheap enough to treat as disposable.

TDS

Conductivity sensors just need to be cleaned every three months. Check calibration then, too.

External Alarms

The DB9 connector at the TOP of the connector panel has pins for external alarms. Alarms are Normally On, dry contacts, which means the GroBot supplies power, and all you have to do is provide a switch or relay that's closed when things are good. This way, cutting a wire or unplugging a device will trigger an alarm. Especially good for glass break sensors and door switches!

The connector pinout is:

Pin	Function
1	Alarm 1
2	Alarm 2
3	Alarm 3
4	Alarm 4
5	Alarm 5
6	Alarm 6
7	Alarm 7
8	Alarm 8
9	+6.0 Volts DC

Alarms are enabled and disabled by clicking on the Lock icon on the GroBot home page. If an alarm trips, the GroBot will send you an email telling you about it.

External Pump Rack Cable

Your GroBot EVO comes with four (4) integrated dosing containers. If you want to connect another External Pump Rack, you can order one from PurGro and it that comes with a standard cable 10 foot long flexible cable. Should you decide to make or lengthen your cable, use #20 AWG (or larger) stranded wire. Pinouts are below.

Pin	Function
2	Pump 5
3	Pump 6
4	Pump 7
5	Pump 8
6	+6.0 Volts DC

If you order a cable from Frye's or CablesToGo or similar, we recommend wiring ALL pins just to avoid confusion on the tech's part. It's simpler for all concerned.

Just tell them: "All pins, straight through, #18 or #20 AWG stranded. No shield is needed."

Dosing Containers

Your GroBot EVO comes with four (4) removable dosing containers, which have foot valves in the bottom. We've enclosed a set of replacement silicone o-rings and sealing washers for the foot valves, should you ever need to replace them. The valves are there to make it easier for you to swap nutes, but aren't perfectly leak-proof and are not recommend for long-term storage of pH control solutions.

Sensor Specifications

Each sensor has a calibrated range over which they can be trusted. Anything outside this range your GroBot reports as a bad sensor. It might actually be -40F in your greenhouse, but the 'Bots not buying it since it wouldn't be running.

Sensor	Calibrated Range
Air temperature	-20C to 100C
Relative Humidity	5% to 99%
Water Level	1" to 132" deep
PH	2.0 to 12.0
Nutrient PPM	0 to 3000 PPM
Water temperature	-20C to 100C
CO2 PPM	0 to 2000 PPM

Troubleshooting

Before you call, look here. We're going to ask you these questions anyway, so ...

- **Why can't I put pH down in Container #1 or #2?**

Because it will inject on top of the pH sensor making it take longer to dose while the sensor recovers. Faster is better, right?

- **My pH reading goes INSANE when I try to adjust pH for just a second.**

Pump input to the GroBot EVO is on the LEFT. If you are running it backward, you're dumping acid directly on your probes, which would make anyone crazy. Switch the tubing so the pump comes in from the LEFT and the return to the res is on the RIGHT.

- **What's the dosing system doing? What's going on in there?**

Your GroBot EVO waits 30 seconds between pH doses to let the probe readings stabilize and the solution circulate in your system. It also waits 30 seconds between Nutrient doses. Once it gets the gain figured out, it waits 2 minutes between doses to allow things to circulate.

The first time you fire up your 'Bot, the pumps are dry and will take time to pump all the air out of the lines. It's not unusual for the first dosing to take 30-45 minutes to get going. You can get around that by doing a Manual Injection to prime the pumps if you want, or just be patient. She'll work it all out.

The GroBot Evo is designed to be a fully automatic, "set it and forget it" kind of system. Watch and see what she does while injecting, and you'll become comfortable with how the machine reacts to various inputs. Each dosing container lights up when the injection pump is running, so you can tell what's going on.

- **Aigh! I hosed up the network somehow and can't connect to the GroBot!**

Fear not, we gotcha covered. Open the back of your GroBot and find the WirelessBoot switch.



Unplug the 'Bot. Hold the switch down and power the 'Bot back up, holding the switch down until the LED on the WiFi radio lights up (about 5 seconds).

Your EVO will be back in Stand-Alone mode and you can connect to it by looking for a wireless network called **GroBot EVO**. Good thing we thought of that, eh?

If you can't get your router to work, we have some in stock that we know work great. Just call and we'll set one up for you and send it out. They're pretty inexpensive.

- **How do I connect multiple GroBots to the Internet?**

The GroBot EVO has a built-in web server and serves pages on port 80, like all web servers. If you have a bunch of GroBots, you need to assign each one its own IP address, which is easy enough (see the section on how).

For each GroBot you want to see on the Internet, you need to pick a different port, too. We set them up on Port 80,81,82,83 ...

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- **My GroBot is on port 420, not port 80 and I can't see it in Firefox**

The URL you enter in your browser assumes port 80 unless you say otherwise. Use a colon : to indicate the web server is on a different port.

192.168.100.210	web server on port 80 (default)
192.168.100.210:420	web server on port 420

- **The CO2 sensor is reads wrong**

The CO2 sensor takes about 2 hours to stabilize once you power it up. After that, it can take a day or so to settle in to it's calibrated set point. If you think it's not reading properly, blow in the slotted air intake on the back of the GroBot and then watch the number change on screen. Remember – if you have two guys in a 10x10 room you are making more than 600 ppm of CO2 by yourselves just breathing! Ambient CO2 levels outside are around 400-450.

Make sure you dose CO2 slowly if using bottled gas! Dumping CO2 really fast in a room can overshoot the setpoint before the gas makes its way across the room to the sensor.

- **GroBot doesn't Drain or Fill**

Make sure you have a Water Level sensor connected and that it's reading correctly. If the 'Bot doesn't know how much water is in the res, she won't try to change it, possibly flooding your shop.

- **I set the Drain or Fill channel, but GroBot keeps setting it back to zero**

You've got One (1) hour to Drain the res. You also have 1 hour to Fill it back up. If it takes longer than that, the 'Bot assumes something is wrong and disables Drain or Fill and sends you an email telling you it timed out. This keeps the 'Bot from getting stuck waiting forever for something that's not going to happen. If you have a really slow pump or gravity feed system that takes forever to fill, call PurGro and we'll figure something out for you.

- **pH or TDS reads wrong**

You can calibrate the sensors by going to Setup and using a known calibration solution. This requires shutting down the GroBot and removing the pH and TDS probes and dunking them in test solutions. pH calibration should be good for about a year, which is a good time to be proactive and change probes anyway. TDS calibration is generally stable for about a year, but we do recommend cleaning the probes after each grow cycle, or at least once a year depending on how muddy your nutes are.

- **pH isn't dosing right**

GroBot will adjust pH when it moves 0.15 points from your desired setpoint. If the pH goes the opposite direction, GroBot will wait until it moves 0.45 points before adjusting it the other way to keep from salting up your reservoir with opposite solutions.

Example:

1. Your res starts out at pH 6.8 and you ask for 6.1.
2. GroBot doses the res down to 6.1 points.
3. If the res then drifts up to 6.25 [6.1 + 0.15] GroBot will dose it back DOWN to 6.1
4. If the res drifts down to 5.65 [6.1 - 0.45] GroBot will dose it back UP to 6.1

So:

If the dose is the same direction, GroBot maintains precise control – within 0.15. If the dose is in the opposite direction of the previous dose, GroBot lets it drift 0.45 points before injecting the opposite solution to keep from salting up your res with a pH control solutions.

This direction hysteresis is reset the next time GroBot adds nutrients, which can go either way in terms of pH. After GroBot injects nutrients, pH is adjusted to within 0.15 points regardless of previous dosing direction.

- **pH reading is unstable**

pH sensors are sensitive and last only a few years even with proper care. If you let a pH sensor dry out in the grow room under lights, its junk in about an hour. Always keep your sensor wet!

If the readings are unstable, change the probe. pH sensors, like all electrochemical cells, are truly delicate things and we recommend keeping a spare. For what little they cost, most top growers replace them after each crop just to never be bothered with sensors going bad and the GroBot dosing wrong because the sensor reads wrong.

- **GroBot overshoots my pH setpoint**

The first time you fire up your 'Bot the pumps are spinning dry, so the GroBot will miscalculate the amount needed based on pump runtime. Next time she'll nail it exactly, so don't worry about a 0.20 point overshoot the first time you run it. It'll get better.

If you want perfection right away, do a series of small, manual injections to prime the pump and the 'Bot will nail it perfectly the very first time out.

- **My pH reads right when I calibrate, but WRONG in my rez!**

If you calibrate the probe and it reads properly in the solutions, but reads WAY off in the reservoir you may have a ground loop. Ground loops are caused by bad grounding, failing pumps or other electrical anomalies and can be found in any pH process control system.

Respected pH probe maker Sensorex says:

When a pH system is unstable, erratic, or the offset drifts, the most common problem is an electrical ground loop in the system, particularly if the tank and/or pipes are plastic. To verify this problem, remove the electrode and calibrate it in a known buffer in a beaker. If the electrode measures within specification (stable and adjustable offset) when calibrated, place a copper wire in the beaker and the other end in your system. If the reading becomes unstable or shifts, a ground loop is your problem.

To isolate a ground loop, turn off everything that contacts the water in your rez. If the problem goes away, turn things on one at a time until you find the one that's causing the problem. Air stones, pumps and other electronic controllers can all cause grounding problems in plastic reservoirs, especially on concrete floors.

Ground loops are rare, but can be frustrating to chase down. Check the rez solution with the GroBot running, and then again in a cup with the probe dunked in it. If they read differently, you've got a ground loop.

Ground Loops are building electrical problems, not GroBot problems, but we'll certainly help you solve them. Call tech support if you run into one of these and need our help. We want you to be successful!

To debug a pH probe, please consult the following table:

pH Reading	Cause	Corrective Action
6.2-6.8 in all solutions	Cracked pH glass	Replace
7.00 in all solutions	Internal short	Replace
Sensor reads close to correct value but speed of response is slow (>30 seconds)	Dirty electrode pH glass and/or reference junction	Clean electrode with electrode cleaning solution
Calibrates fine, reads wrong in reservoir	Ground loop	Ground reservoir solution to earth ground, or find defective electrical device
Unstable or drifting reading	Reference dirty or plugged	Clean electrode with electrode cleaning solution.

The light didn't come on when I asked it to

Go to the Setup page and turn the channel on manually. Still no go? Unplug the Pluggable and plug it back in to restart it, then retry it manually. If it works manually, check your Date and Time on the Setup page.

Keep in mind, that if you have a Drain, Fill or Nutrient Pump channel defined and try to test it manually it won't respond. Here's why:

- In STOP mode, the 'Bot turns these off every cycle to make SURE everything stays off. So, no response to a manual input if Stopped.
- In Grow mode, the 'Bot will be overriding your manual input according to the schedule you set. So, no luck in Grow mode either.
- Answer? Set your channel to 0 on the External Devices page, then test it manually if you want. This way, the 'Bot won't try to fight you for control.

- **I forgot my password**

Call PurGro and we'll get a replacement GroBot coming your way. There is no back door in the GroBot to bypass system security and the chip has to be reloaded from scratch. You wanted it secure, right?

- **Why am I getting all these emails?**

Look at the Calendar to see what the setpoints are. If you have 2% set for Humidity, for example, you're gonna get an email every hour when the humidity isn't 2%. Anything the 'Bot isn't controlling for you set to BLANK or she'll email you when it's not where you asked it to be. If you don't want to be bothered, check the box that says Email Never.

- **Email doesn't work**

Check your port, it should be 426. If that's right, usually the Gateway IP address or DNS is wrong, or you have no Internet connection. Google has a free DNS at 8.8.8.8, which is a good one to use. Your Gateway is the IP address of your Internet router, which you can lookup in Windows by clicking Start -> Run and entering the command IPCONFIG.

- **My Nutrient jar dried out and the pumps are filled with what looks like brown concrete**

Easy enough to fix, just run your dosing containers through the dishwasher. You can take the valve apart if you have to by squeezing the end together and pressing it into the container. You can usually clean the receiver out with warm (not boiling!) water to and rinse out all the muddy, crusty nutrients. Once you get it all cleaned out, try doing a Manual Injection on the Setup page to try and pump some warm water through and clear out all the hardened material. Next time run clear nutrients!

- **My tables flood later than I expected**

The Bot floods the tables according to the schedule you set. After flooding, GroBot waits 15 minutes before refilling and redosing the reservoir. If you ask for the next flood before the last flood-drainback cycle is done, GroBot will skip a cycle to catch up. Try to allow at least 15 minutes between floods to allow GroBot to refill and redose the reservoir before the next flood. You can always look on the External Devices page and see how long until the next flood is scheduled.

- **I have external flood timers (or an Ebb & Grow system) and GroBot overdoses**

The Bot floods the tables according to the schedule you set. If you are not flooding with your GroBot, you should still use the Ebb & Flow schedule in External Devices to keep the 'Bot from dosing when your other timers are draining your reservoir to feed. Best answer is to use the GroBot to automate all that, and then it'll work like you want. ☺ If you must use an external device that either raises or lowers your reservoir level, make sure the 'Bot isn't trying to dose when that's happening.

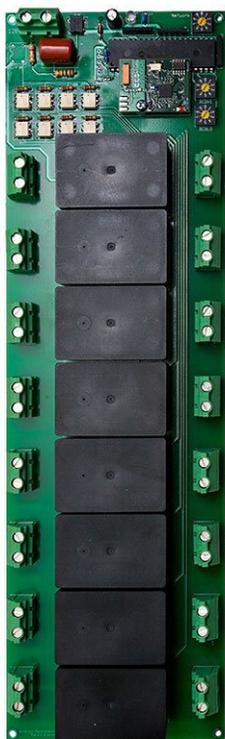
Other Goodies You Might Want

Extra Dosing Containers



Great to have a spare set on hand when switching from veg to bloom. Just drop the dirty ones in the dishwasher!

Wireless Panelboard



If you're retrofitting an existing room, there's nothing easier and more convenient than PurGro's Pluggable Relays. Plug 'em in, and you're ready to go. If you're building a new Grow Room, though, the Wireless Panelboard is probably going to be cheaper, and more flexible.

The Panelboard has eight (8) big, 30 amp double pole relays that you can use to switch eight 240v loads, sixteen 120v loads, or whatever combination of eight relays with two poles works best for you.

Think of it as a lighting controller and box of Pluggables for a lot less money. Since the Panelboard can handle up to 240 amps, PurGro recommends a qualified electrician install this device.

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