



Alfred Horticulture

DWC System



Setting up

The Grow Tent



Let's begin by finding a location for your new grow room. Just about anywhere in your home will work, but here are a few guidelines:

- Find a flat, level space. It's easier to tend to plants and manage a reservoir when they are straight and level.
- There should be an electrical outlet nearby to provide power to your grow equipment.
- The grow room should not be placed near heaters, air conditioning vents, or in direct sunlight. To properly control the environment inside your tent, outside influences should be kept to a minimum.
- Once you've chosen the space for your garden, assemble your BlackBox grow tent according to its assembly instructions. Place the grow tent into its space and verify it is level. Make any level adjustments necessary now.

Next we'll start equipping your grow room! Let's start at the top and work down.

Air Exchange and Odor Control

There are a few ways to cleanse your grow room's air of odors:

Exhaust Filter – The fan sucks air in through the carbon filter and expels clean air outside the grow room.

Intake Filter – The fan sucks air through its intake, and exhausts clean air through the filter out of the grow room.

Scrubbing - The fan sucks air in through the carbon filter and expels clean air into the sealed grow room.

The Stealth carbon filter should be connected directly to the Stealth inline fan as an exhaust filter. With no ducting between the two, the airflow is more efficient and you save valuable space in the grow tent.

Using the 2 cinch straps included with the grow tent, mount your Stealth carbon filter to the grow tent top bar.

Now install the inline fan by inserting its intake funnel into the Stealth carbon filter's flange and mounting it on the grow tent frame. The inline fan can be hung using rope ratchets, tie wraps, or similar products. Using the wraps, attach the inline-fans power cord out of the way, along the grow tent's frame and towards the tent's door.

Next, seal the carbon filter and fan connection with ducting tape and then attach the required length of ducting from the fan's exhaust to the grow tents exhaust hole using the included duct clamps. Always try to keep the bends and kinks in the duct line to a minimum.

Your odor control fan and filter are now installed, ducted, and nearly ready to go.

Connect the end of the inline fan's power cord to the Fan Speed Controller's inlet, and mount the Fan Speed Controller in an easily accessible position on the tent frame. Using the ties, run the power cord out of the way, along the grow tent's frame and towards the tent's door.



What's this do?

Grow tents are fantastic for growing plants indoors. The enclosed space gives you total control over the growing environment and more effective use of both water and light.

Temperature, humidity, and odor control can be easily adjusted by fans and filters, allowing you to create the perfect growing environment.

The reflective tent walls are easy to clean and designed to reflect the light beam back towards your plants. A good reflective material increases light efficiency by ensuring your plants are receiving as much as possible.

The enclosed design not only keeps the good, plant growing conditions in. It also keeps the bad, plant eating pests out. Though no garden is invulnerable, problems can be kept to a minimum or eliminated if proper precautions are taken.



The inline fan and air filter serve two very important purposes.

For one, plants can emit strong odors when they flower or fruit. To keep these smells under control, we highly recommend using a Stealth carbon filter and inline fan.

Activated carbon filters do an excellent job of removing odors. Through a process called adsorption, the smell causing contaminants penetrate into the pores of the activated carbon and stick to the surface, where chemisorption causes the media surface to react, trapping the contaminant on the activated coco carbon filter material.

In simpler terms, the invisible smell causing particles that float through the air become trapped in the tiny holes within the carbon, and the air leaving the filter is then odor free.

How much can one activated carbon filter absorb? One gram of activated carbon can have a surface area greater than 32,000 sq. Ft., or two NHL hockey rinks!

The second purpose of the inline fan and air filter is to exchange the air within the grow tent. This is vital.

Your plants use CO₂ for photosynthesis. Unless you are supplementing with CO₂ (for experienced growers only) they will quickly use up all the CO₂ present in a sealed grow room. By exchanging the air every 1 (ideal) to 3 minutes, you supply fresh CO₂ to your plants and rid the grow tent of used, stagnant air.

This same air exchange also helps to remove excess heat and humidity. When heat and humidity levels are too high, your plant's growth suffers and health declines. This leaves it vulnerable to diseases like powdery mildew and mold or plant eating pests like spider mites and fungus gnats.

EXHAUST



Setting up

Installing Your Grow Light and Reflector

Assemble the grow light fixture or reflector according to the manufacturer's instructions and install the lamp. Connect the light hangers that were included with the grow light fixture.

The grow light fixture should be installed in parallel or directly below any filters or inline fans. This is important to not obstruct the amount of light reaching your plants.

Prepare the rope ratchets by releasing the lock and pulling the cord until maximum length is reached, being careful not to pull the cord completely out of the rope ratchet. Clip one carabiner of the rope ratchet through the grow light fixture's left side triangle hanger, then thread the opposite end over and under the top bar. Connect this end to the grow light fixture's triangle hanger, again on the left side.

Repeat this procedure on the right hand side.

Adjust the rope ratchets so that the grow light fixture is at the desired height and level.

Integrated and Mounted Ballast's

LIGHTSPEED 150W HPS



Using the ties, run the power cord out of the way, along the grow tent's frame and towards the tent's door. Since your reflector's height will vary with the height of your growing plants, it is necessary to leave enough slack to allow for future adjustment.



TimeMaster T-100

Connect the TimeMaster T-100 lighting timer to an appropriate power source and plug the fixture power cord into the lighting timer.

LIGHTSPEED 315W CMH



External Ballast

CMH Reflector



Connect the male XM01 power cord of the reflector to the female end of the ballast. Using the ties, run the power cord out of the way, along the grow tent's frame and towards the tent's door. Since your reflector's height will vary with the height of your growing plants, it is necessary to leave enough slack to allow for future adjustment.

Install your ballast in the desired location and position. Connect the TimeMaster T-100 lighting timer to an appropriate power source and plug the ballast power cord into the lighting timer.



TimeMaster T-100



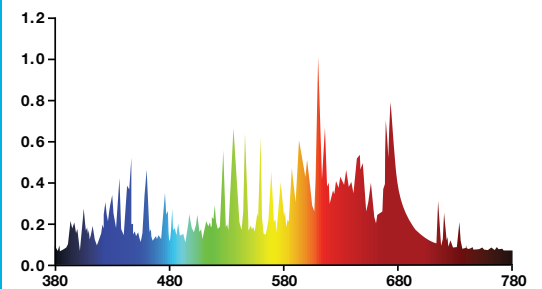
LIGHTSPEED
Ballast

What's this do?

Lamps and lighting systems developed for indoor growing mimic the spectrums produced by the sun and used by plants. Though the sun generally provides a better quality of light, you cannot control its schedule, intensity, or spectrum, in the same way as horticultural grow lights. This level of control can produce fruits and flowers that surpass the greatest outdoor garden.

It's important to note the term "horticultural grow lights". Your standard home bulbs do not put out the correct spectrums with enough intensity for plant growth. What is bright and functional for human eyes has nothing to do with what your plants need to grow healthy and strong. Always use lamps that are designed for indoor gardening and hydroponics.

GROWTH LAMP SPECTRAL GRAPH



The most popular and successful grow lights use HID lamps mounted horizontally within a reflector, connected to a ballast for power. The reflector's job is to redirect all light towards your plants. Unless you're growing plants on the ceiling, it would be a waste to send plant nourishing light there.

The ballast provides power to the lamp and can be integrated within the reflector, mounted externally to the reflector, or connected remotely by a power cable. It's only a matter of choice.

What's this do?

External Ballast

In an external ballast configuration, the ballast should be placed outside of the grow room. This will both reduce heat and minimize the chance of electrical shock from water contact.



Setting up

Clip-on Fan

Assemble the clip fan according to the manufacturer's instructions.

Position the clip fan so that the air is blowing across the plant canopy, but not directly on the plants.

Using the ties, run the power cord out of the way, along the grow tent's frame and towards the tent's door.



Thermometer Hygrometer

The sensors should be placed at canopy height and out of the path of any circulation fans.

The display screen must be in a place that is easy to read and access.



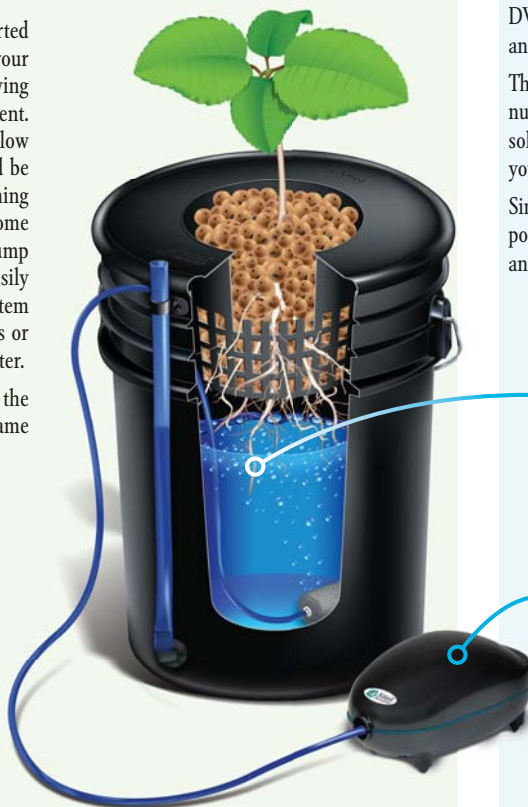
Power Cords

At this point, there remains only the hydroponic grow system to install. There should be nothing on the floor of your grow tent. Before bringing in the system, it's a good idea to sort out the power cords by adding extensions and ties where needed so that all the male ended plugs are outside of the tent and ready to be powered.

Grow System

With the power cords sorted out, you can now place your assembled hydroponic growing system into the grow tent. Starting at the center below the grow light, plants should be evenly spaced and not touching in order to leave them some room to grow. The air pump should be in a position to easily feed air to the hydroponic system without stress on the airlines or exposing the air pump to water.

Run the power cord out of the way, along the grow tent's frame and towards the tent's door.



What's this do?



A steady breeze across your plants canopy helps to keep them healthy. The air cools the plants, and the soft movement encourages them to grow stronger, thicker stems and branches. In turn, they can support more weight come fruiting or flowering season.

However, you want to create some gentle leaf movement, not simulate a hurricane. **Do not point the fan directly at your plants.** Too much wind dries the media and creates wind burn, both of which will stunt plant growth and health.

A thermometer and hygrometer will help you monitor the environment inside your grow tent and make adjustments to keep your plants in optimal health.

The temperature and humidity requirements of your plants will change along with their lifecycle stage.

Humidity & Temperature Chart

Stage	Clones	Vegetative	Flowering	Final Weeks
Relative Humidity	70-80%	40-70%	40-50%	<40%
Temperature	22°-27°C	22°-28°C	20°-25°C	18°-24°C

There are many ways to grow plants hydroponically, each with their own pros and cons. The Alfred Horticulture Grow System uses the Deep Water Culture, or DWC, method. DWC is one of the most popular hydroponic growing methods, thanks to its simplicity and impressive results.

The Alfred DWC System holds your plants, in mesh baskets, above an oxygenated nutrient solution. Your plants roots grow through the mesh and into the nutrient solution, with the majority of your root ball remaining submerged. Through the roots, your plant "feeds" off the nutrients present in the pH balanced water.

Since the plants roots are submerged in water and nutrient solution instead of in air-pocket containing soil, it is vitally important the water is oxygenated using an air pump and diffuser. Without oxygen in the water, your plants will drown!

Plant roots are constantly submerged directly into the nutrient reservoir.

Air pump is constantly in operation supplying the roots with oxygen.

Getting Started

Hydroponic Nutrients for Plants

Filling the Bucket

First, fill your bucket to the line marker on the blue water level tube or slightly below the bottom of the net pot. For best result use clean, filtered water.

Next, add the nutrients to the bucket water one at a time in this order – first the micro-nutrient mix, followed by grow-nutrient mix, then bloom-nutrient mix. Do not mix the nutrient concentrates together.



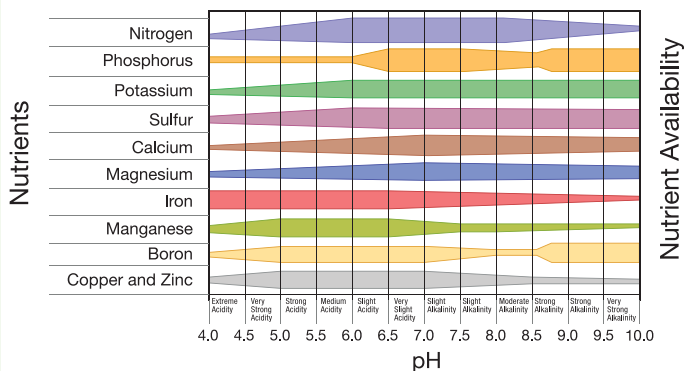
Balanced pH

After adding nutrients to the water, the pH should be balanced. Without the correct acidity/alkalinity, the ability of your plants roots to uptake critical nutrients is severely limited.

To determine the pH of the nutrient solution, simply dip the testing zone of the litmus strip in a sample of nutrient solution, hold for 3-5 seconds, and you're done. Now remove the testing strip from the solution, and match its' color to the pH Range Color Chart. The closest matching color is your approximate pH level.

Compare this pH level to your plants required range of pH, and adjust your nutrient solution as needed using pH Up or pH Down products. To do this, make a separate mixture of diluted pH water by adding a drop or two of pH down to a gallon of water. Then, slowly add the diluted pH down to your nutrient solution, stopping to check pH levels frequently.

Influence of pH on Available Plant Nutrients



What's this do?

Wondering why your plant needs more than one bottle of concentrated nutrients?

By separating the mixtures, elements that would react to each other are kept apart. When certain nutrients contact each other, they "react", the elements bond, and fall out of the solution. Keeping them separate means higher concentrations of nutrients can be used, and so less product can be used to make the same strength nutrient solution.

This is also why the products must be mixed into the reservoir one at a time. The concentrates become diluted by the reservoir water, and at those levels they are not likely to react to each other.

Be sure to stir very well after adding each component. Once all nutrients have been mixed into the solution, let it stand for ten minutes before testing the pH.

The pH scale measures acid-to-alkaline balance, where 1 is the most acidic, 7 is neutral, and 14 is most alkaline. For most hydroponic crops a pH level between 5.5 and 6.5 is optimal. This acidic pH range within the crop keeps essential plant nutrients available and ready for uptake. If the pH level goes too low (acidic), acid salts will bind the nutrients and prevent them from being absorbed. When the pH level is too high, nutrients become unavailable and toxic salt buildup can occur which essentially prevents the plant from absorbing water. In both situations, your plants are dying a slow death.

Once you have determined your pH level is either too high or too low, use an additive in the solution to help balance out the levels. In hydroponics, these additives are commonly referred to as "pH UP", most often in the form of potassium hydroxide, and "pH DOWN", usually in the form of phosphoric acid.

Due to the concentrated strength of pH adjusters, they should be used sparingly. Add just a little at a time while testing the pH levels, and repeat the application until the desired pH level is achieved.

By checking the pH level daily and ensuring it remains stable and in the optimum range, your plants will have access to all the provided nutrients they need to achieve their maximum potential.



pH level between 5.5 and 6.5 is optimal.

Getting Started

Creating Negative Pressure

To create negative pressure within the grow space, the air intake pressure must be lower than the exhaust.

On small to medium grow tents, simply opening one of the intake ports at the bottom of the tent will create enough inflow. Most growers prefer this passive method to replenish fresh air.

On larger tents, an inline fan may be required to ensure enough fresh air is brought in for your plants. Place the inline fan (exhausting into the tent) on the floor of the tent and connect the grow tent's intake duct to the fan intake.

Connect the end of the inline fan's power cord to the Fan Speed Controller's inlet, and mount the Fan Speed Controller in an easily accessible position on the tent frame. Using the ties, run the power cord out of the way, along the grow tent's frame and towards the tent's door.



Negative air pressure

Prevents air and odors inside the room from escaping, draws fresh air in passively, sucks odors out and through the air filter via forced air (Inline fan).

What's this do?

Your growing environment should be working under a slight "Negative Pressure". It should be exhausting more air than it is bringing in. This helps to contain odors within the grow space, and any air being released from the grow tent can be controlled and filtered before exhausting.

In a "Positive Pressure" environment, there is more air being brought into the garden than being expelled. This will be easy to see in a grow tent, the walls will bow outwards from the volume of air. With this much pressure, air will look for any leak or pinhole to escape – and along with it any odors your plants may be releasing.

A fan speed controller lets you reduce or raise the fan blade's speed. By reducing the fan speed, you prevent the air in your grow room from drying out and causing over-transpiration of your plants.

When heat or humidity accumulate, increasing the fans speed will help cool the air and expel excessive humidity.



Positive air pressure

Fresh air is drawn into the room via forced air (Inline fan), and passively exits the room into an air filter. Air and odors will exit through any leaks found within the grow room.

Getting Started

Adjusting the Grow Light Height

Using the installed rope ratchets, the height of your grow light fixture must be positioned to compensate for the height of your plants. As the plants grow, the grow light will need to be adjusted.

The chart below lists the recommended distance to keep your grow lamp from the plant canopy, based on the lamp output in watts.

HID Lamp Type	Suggested Height Above Canopy	Footprint
150W	6" – 12"	2' x 2'
250W	6" – 15"	2' x 2'
400W	8" – 22"	2' x 4'
600W	12" – 28"	3' x 3'
1000W	16" – 36"	4' x 4'
T5 Fluorescent	4" – 10"	Direct Coverage
315W CMH	16" – 24"	3' x 3'

LED Lamps – Find the HID equivalent wattage and add 4" to the min and max suggested height.

Clay Pebble Media

When your seedling or cutting's roots reach one inch long, they are ready to be transplanted into the clay pebble media.

Start by filling the net pot 1/3 full with the prepared clay pebble media. Gently place your seedling upright into the net pot and fill to the top with clay pebbles, surrounding the seedling. A portion of the plant should remain above the top line of media. Water your newly potted seedling with diluted nutrient solution and place it in your grow system.



Light Timer

Program the light timer per the instructions provided by the manufacturer.

Choose an appropriate light cycle for the chosen plant's photoperiod.

TimeMASTER T-100 Lighting Timer



What's this do?

The height of your grow light fixture is as critical as the nutrient supply and humidity levels.

Too close to the grow light and:

- Plants will burn from over exposure, dehydrating the tissue and creating a fire hazard.
- Leaves will fold over on themselves, trying to provide their own shade.
- Slows or stops growth as the plant cannot deal with such an overabundance of light.
- Light that is too intense will evaporate the chlorophyll out of your plants tissue, producing bleached or white leaves.
- Light spread is reduced, limiting the light reaching the extremities of the canopy

Too far from the grow light and etiolation, or weakening, of your plants will occur. This results in:

- Spindly plants with long internodes and few leaves.
- Yellowing of new foliage and lower leaves.
- Poor nutrient uptake.
- Small leaves, poor growth.
- Plants cannot manufacture food through photosynthesis, decline, and die.

Clay pebble media, often referred to as hydroton or leca, is an easy to use growing media for hydroponic systems. Formed from an abundant resource, it is reusable and environmentally friendly.



Clay pebble media maintains a neutral pH and drains well, retaining some water without suffocating your plant's roots.

The disadvantage to using clay pebble media is the need for a constant source of water. If your reservoir fails or runs dry, the pebbles do not retain enough water to sustain your plants for very long.

Check your reservoir daily!

Light timers give you control over your plants photoperiod, so you can dictate it's growing cycle.

By keeping the lights on for 16 to 24 hours a day, your plants will believe it is springtime and remain in a constantly growing, vegetative state.

To make your plants flower or fruit, the light cycle can be changed to 12 hours on and 12 hours off. This simulates the shorter daylight hours of the fall, and triggers the flowering stage.

During the lights off stage of the flowering cycle, it is imperative that no light reaches your plant. Any light that touches your plant could cause it to believe the longer hours of springtime are back, and revert to the vegetative stage. It could then take weeks before flowering can be attempted again.

When programming your light timer, it is good practice to confirm all the ducting and accessory inlets of the grow tent are sealed light tight. Light entering through ducting can be eliminated by incorporating an "S" curve into the ducting.

A good way to confirm all is well is to stand inside the tent and seal it shut. If you can faintly see your fingers in front of your face, there is too much light entering the grow tent. It should be absolute darkness.



Alfred Horticulture Growing System Checklist

Grower's Checklist

Catching grow room problems like pests, diseases, nutrient deficiencies, and equipment malfunctions early can save a great deal of time and effort. It might even save your crop!



To Do	Tip
<input checked="" type="checkbox"/> Check that all powered units (lights, timers, pumps, etc.) have current and are working.	Visually confirm that each unit has power and is working fine. Working and walking around the grow room can lead to accidental unplugging of vital plant gear.
<input checked="" type="checkbox"/> Check that all power cords and surge protectors are in good shape and properly connected.	For safety's sake, do not use equipment with frayed, exposed, or unshielded wires. Ensure plugs are pushed completely into the power outlet.
<input checked="" type="checkbox"/> Confirm all bulbs are working and burning brightly.	If you have more than one light, it will be easy to spot a problem. Just look for any that are burning differently than the majority.
<input checked="" type="checkbox"/> Check the distance between your plants canopy and the grow light, and adjust as necessary.	Too close to the canopy, and the lights can burn or dry out your plants. Too high above the canopy, and the PAR is lost before it reaches your plants.
<input checked="" type="checkbox"/> Confirm all fans are working properly and air is flowing as designed.	There should be enough air movement to keep temperature and humidity levels in check, and create slight movement among the plant's leaves.
<input checked="" type="checkbox"/> Verify the temperature and humidity levels are within the desired range.	Too wide of a variation from the ideal range will stunt your plants growth and invite pests and diseases to move in.
<input checked="" type="checkbox"/> Check the reservoir level and fill/add water and nutrients as required.	Some reservoir water will evaporate, but the nutrients do not. In the short term, adding some water to the reservoir is all that is needed. Check your EC to confirm.
<input checked="" type="checkbox"/> Check pH and EC (PPM) levels.	If your pH levels are not in the correct range, your plants cannot absorb the nutrients they need to grow strong and healthy. Your EC levels, or PPM's, will confirm if there is enough (or too much) nutrients in the reservoir water.
<input checked="" type="checkbox"/> If using a drip system, confirm that all plants are receiving water and there are no blockages.	Dirt and debris that find their way into your irrigation system can block delivery of water and nutrients to your plants. Check your plants daily to be sure the irrigation system is delivering to the plants.
<input checked="" type="checkbox"/> Scout your plant for predators and diseases, checking both the top and bottom of leaves for signs, as well as the growing media.	The sooner these problems are spotted, the less damage they will be able to cause.
<input checked="" type="checkbox"/> Scout for signs of nutrient deficiencies and other abnormalities in your plants and growing media.	The movement, shape, and color of your plant's leaves will give the first signs of any health problems.
<input checked="" type="checkbox"/> If possible, rotate your plants.	Rotating your plants helps to improve light penetration and give exposure to all parts of the plant.
<input checked="" type="checkbox"/> Remove any dead plant material that was trimmed or may have fallen off.	Decomposing plant material is an open invitation to gnats and other pests.
<input checked="" type="checkbox"/> Check if your odor control system is working.	It's best that you notice if something is wrong with the odor control before anyone else does. Be a good neighbor!



<input checked="" type="checkbox"/> Clean and wipe down the grow area.	A clean environment keeps pests and diseases away, keeps your end product away from any risk of contamination, and is simply a more pleasant environment to work in.
<input checked="" type="checkbox"/> Dust and wipe off light reflectors.	Dust and particles can accumulate on reflectors. With regular cleaning, you can avoid contaminating your crop and a fire hazard.
<input checked="" type="checkbox"/> Clean reflector's glass.	If you're using an enclosed grow light fixture, keep the inside and out of the glass seal crystal clear.
<input checked="" type="checkbox"/> Clean and calibrate your pH Meter and any other testing and measurement tools.	These sensitive tools need to be calibrated regularly to ensure they are as precise as possible. Any inaccuracies will affect how you manage your plants.



<input checked="" type="checkbox"/> Flush plants and system.	Run pure water or a high quality flushing product through your hydroponic system and your plants. This will help get rid of excess salts and residue that may have accumulated.
<input checked="" type="checkbox"/> Check plants vs feeding and light schedule.	Confirm that your plants are growing as expected, and make any adjustments needed to the lights or feeding schedule.
<input checked="" type="checkbox"/> Check bulbs work life.	Double check how long your lamps have been in use and, if needed, plan for relamping.