Stacking Automated Grow Box

by **BrianG6** on November 30, 2014

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Intro: Stacking Automated Grow Box

Here we see the over all design and goals of our project.

1. Isolation to reduce bugs and disease.

2. Stacking, a vertical grow area allows for compact and dense foliage.

3. Automated reservoir control, to include: Feeding multiple stacks, 3 peristaltic pump dosing, PH monitoring, EC/PPM monitor, Water level, Feed Return Flow monitoring, Auto Fill and Drain

4. Low power LED lighting 150 watts, Ultra quiet 140 mm Fans

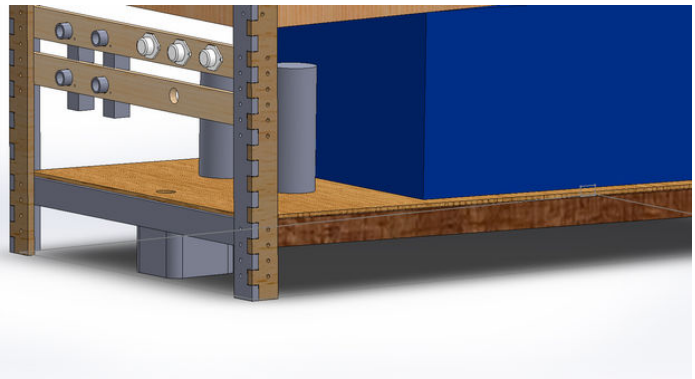
5. LED's Raise with plant growth with a motor control.

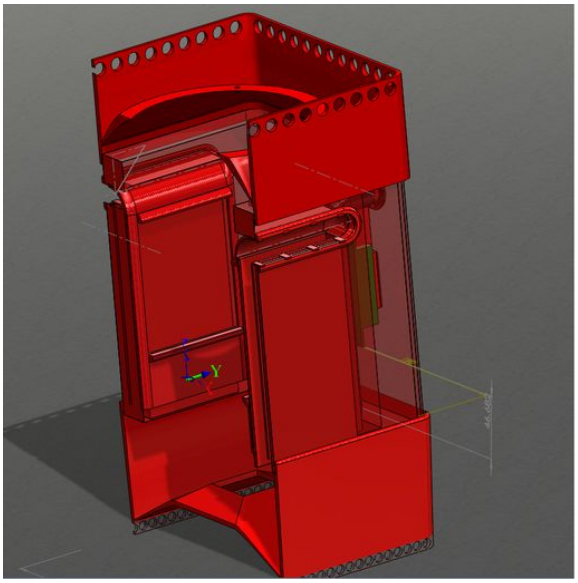
6. Wireless connectivity, Data logging to the cloud, Changing cycle information

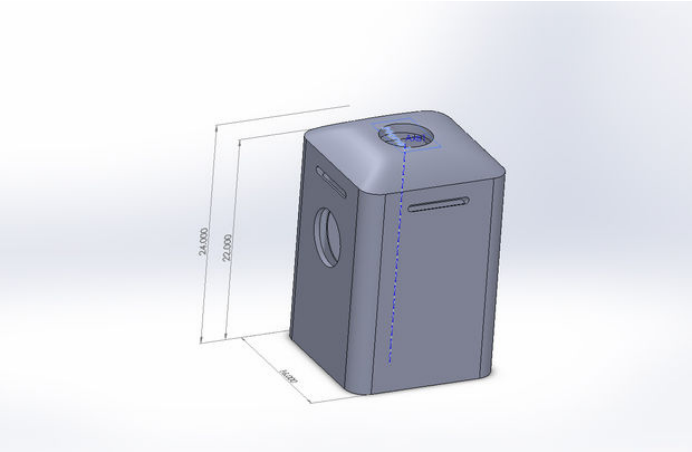
The size of the above image is 2' x 4' x 7.5'

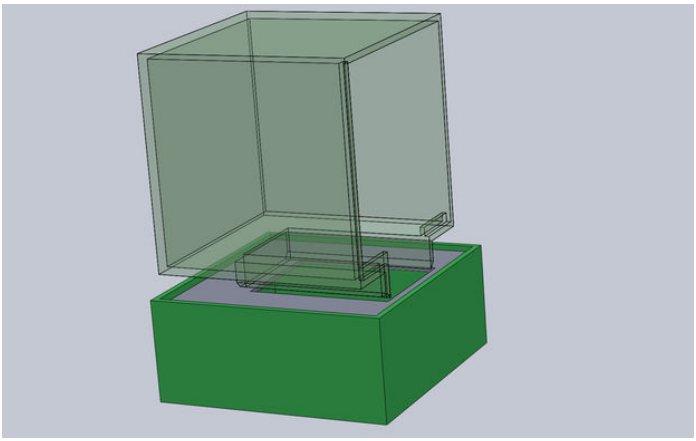
I've been working on this project for about 5 years now, starting with LED panel design, to Micro controllers, to Injection molded frames, then welded metal, In the end none of these methods made sense to ship. I figured out the easiest and cheapest way to communicate this idea to the world is with wood, a material that is easy and simple for most people to work with. This project does Highly recommend the use of a CNC machine to make the cuts.

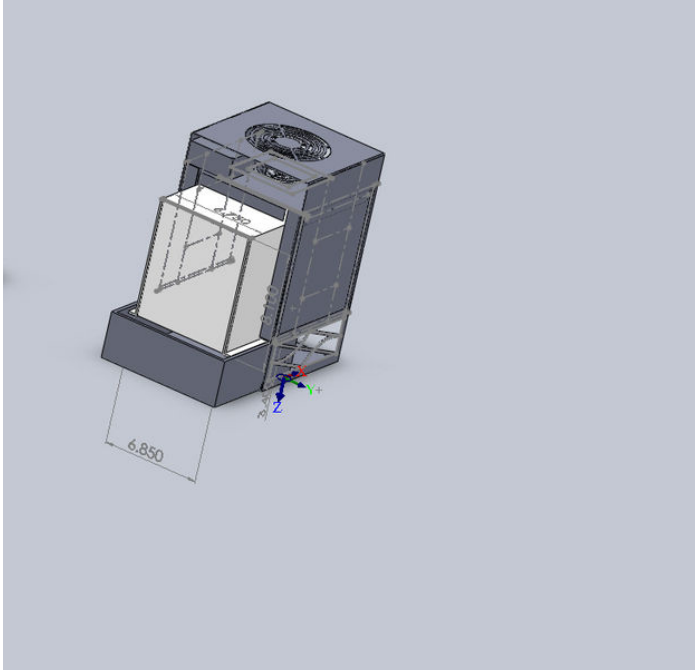
My goal is to kickstart the Electronic hardware and get it onto a production board, so its no longer on a breadboard. But the rest of the idea's in the build are open for public use and adaption. If you read this article and some design files are missing. Let me know and I'll try to upload them shortly. This is a pretty large project so it might take me a while to get into all the little details.

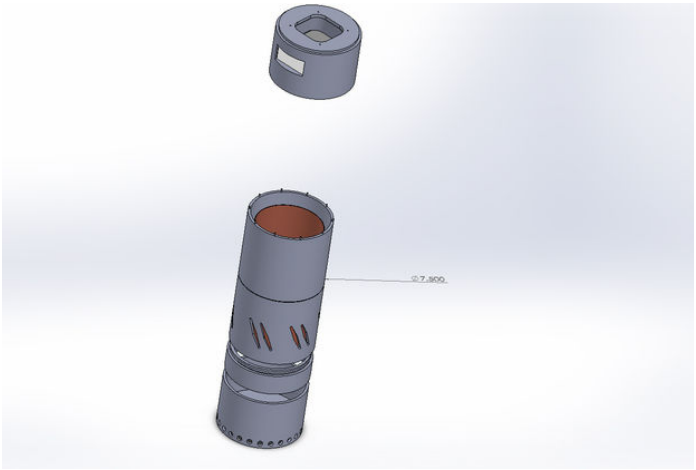












Step 1: The Frame Bottom up, We use CNC machines and Wood

We need ply wood, and a 2'x4' CNC machine

My current design uses 1/2 in ply wood for vertical legs, and 11/17 in ply for the horizontal supports. 1/2 in bolts as connectors.

The images here show the the parts the reservoir frame, and component mounting Peristaltic pumps, Water pump, water valves. Also they show the 1 of the stacking grow area's

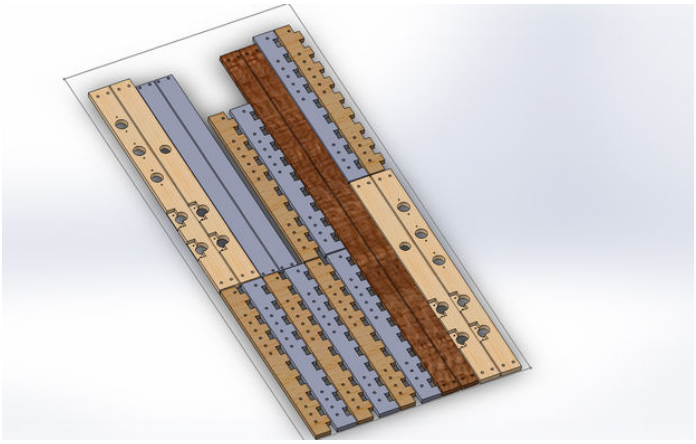
Roof Panel, you'll need 2 140 mm holes to mount he output fans, Also a hole for the motor to raise and lower the light bar.

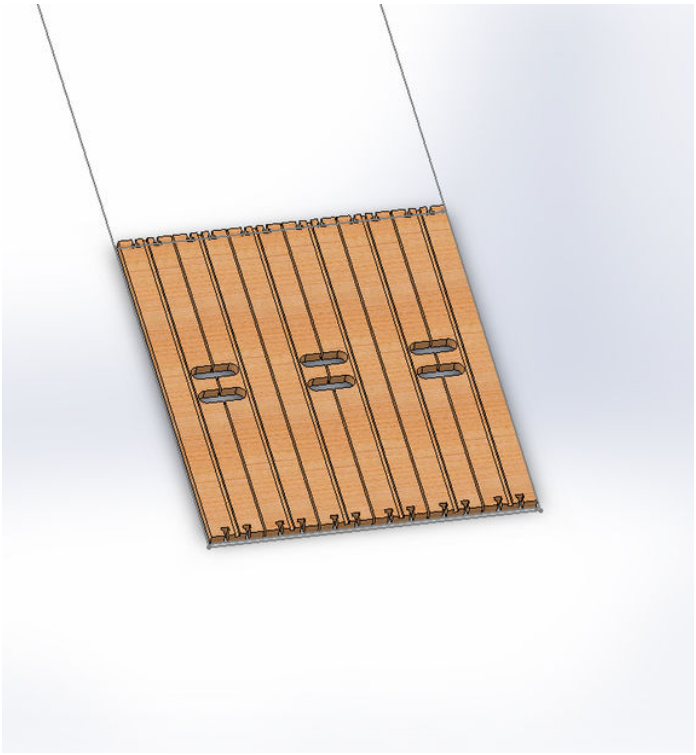
The Wrap, You'll want to goto your local hydroponics store and pick up a white 2x4 tray.

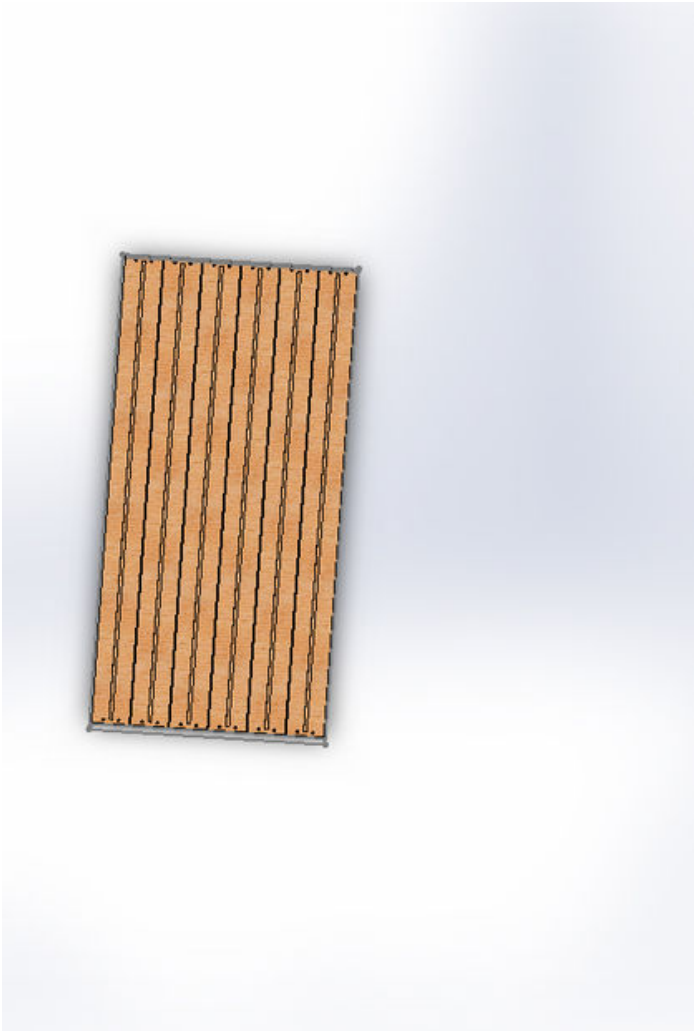
You'll need to order "Grow Tent Fabric", They have it on ebay.

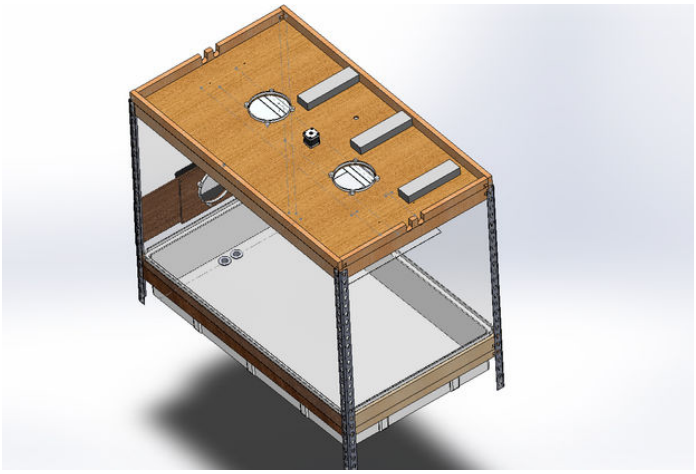
This fabric wraps the outside of the box and keeps everything out and all the light in.

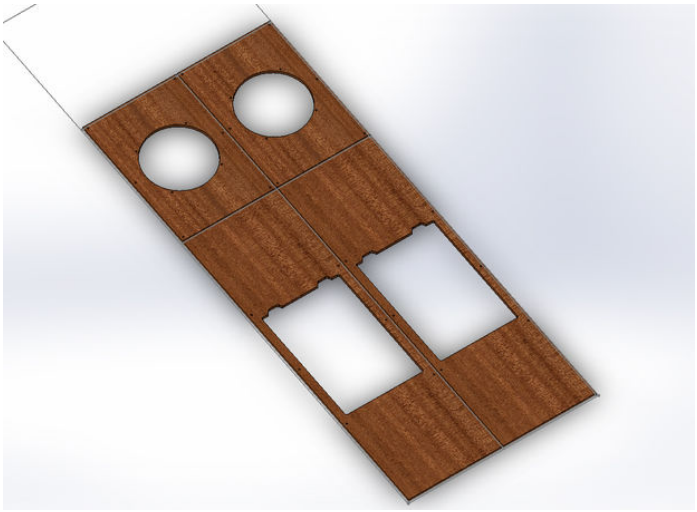
Hepa filter fan intake "Holmes True HEPA Filter HAPF600D-U2"











Step 2: You'll need water

The reservoir is really where all this happens.

I use a 7 gallon water jug from amazon, Because the computer fills and drains the reservoir we only make as much as we need nutrient solution.

Fresh water, Fresh Nutrients, Happy plants! No more stagnant water.

Some nice things,

1. Auto fill from 3/4" water hose line or any house water line,

2. Float ball valve to prevent any over fills.

3. Drain valve, same as the fill just in the other direction.

4. 2 Feed valves to allow the feeding of different crops from the same reservoir

5. Feed drain flow meter, this is a safety valve to ensure that the water pumped to feed the plants returns to the reservoir. Also could indicate pump malfunction or plumbing issues.

6. 3 Peristaltic dosing pumps, This allows for the use of a 3 part nutrient solution.

7. PH / PPM readings, This currently is solely data reporting.

8. Digital water level sensor to allow us to determine how much our plants have taken up.

Step 3: Electronics

1 Spark Core

4 water solenoid values

2 DHT22 Temperature / Humidity

1 Liquid flow sensor

1 water level sensors

4 120v relays

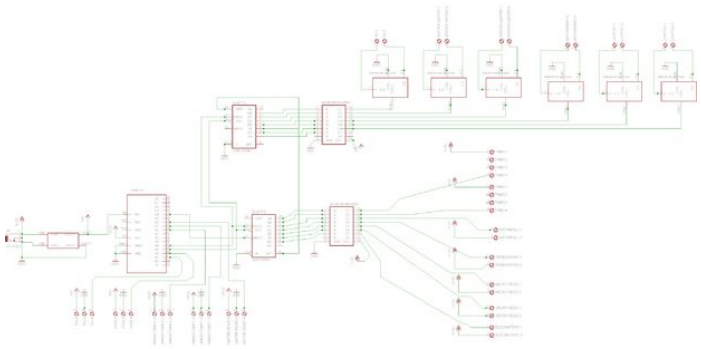
6 140 mm Fans (2 stacked grows area's)

1 PH Sensor and electronics board

1 PPM sensor and electronics board

3 peristaltic pumps

1 water pump



Step 4: LEDS, Light Bar and Netting

Our Light Bar has 4 key aspects.

1. LARGE 2"x1.5"x2" aluminum U Channels that connect all 3 panels together, Also these act as a heat sink

2. We extend netting from the Light bar to ensure the LEDS can be close to the plants but never get too close.

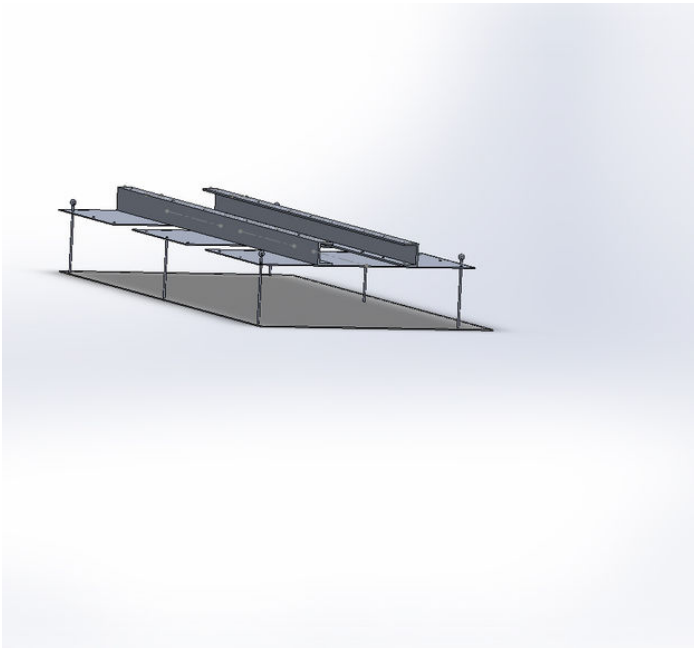
3. This panel moves up and down, So we have a IR sensor that is set above the netting, When the plants touch the netting they push it up into the IR beam then stopping the motor down. keeping the Lights to plants distance perfect every time.

4. the pulleys to allow the motor to move the lights. you'll need 4 on each corner.

We custom order our LED's from a Aluminum PCB manufacturer. They run about $300 each in orders of 10, We use the CREE XP LED's and a Phillip rebel Deep Red, 3 panels 48 watts each running at 700 ma

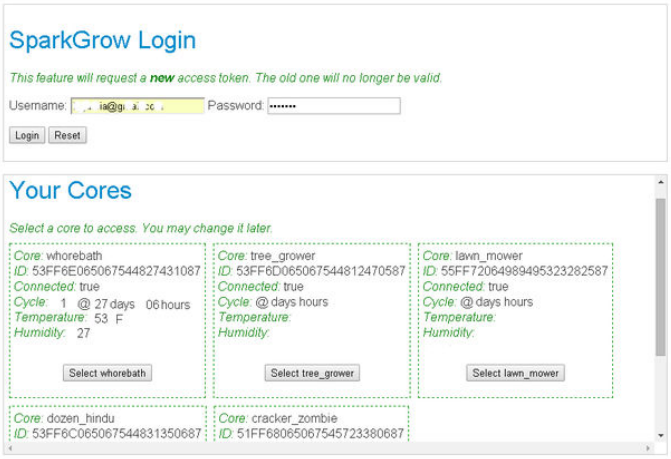
Mix of colors, this is still part of the fun of having multiple grow boxes controlled by the same computer, it allows us to mix and match testing out what colors plants like. The panels are the most expensive part in this setup, because of the low number we order from prototyping PCB companies

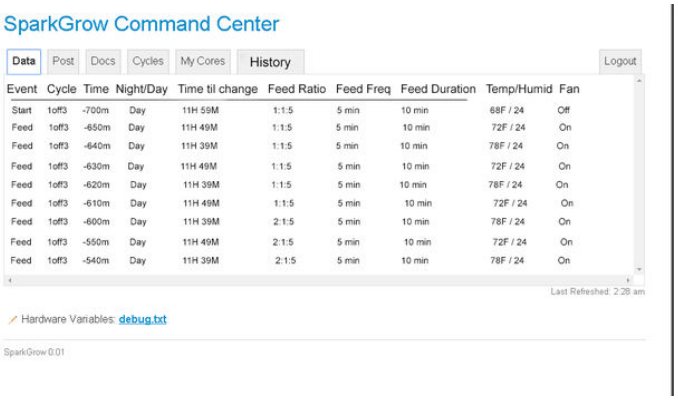
But I'll say there isn't anything on the market up to speed with the newest LED's created by Phillips and Cree.



Step 5: Software

Here is my cloud interaction with the box.





Step 6: The End !

Related Instructables

Hydoponic garden - Gravity feed by agatornz

Hydroponic Drip Garden for Vegetables, Herbs or Flowers by dirty_valentine

Small Aquaponic Unit by leja1965

My First Hydroponic Plant (Beginner's Guide) by ASCAS

Small Indoor hydroponics by zorro3355

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Comments