

There is a guide for printing too, see the docs section of the website.

There is also a document that discusses the design and why it is the way it is, what else has been tried etc., in case you would like to change the design, this allows you to start where I left off, instead of repeating things. This is not included in the source releases, usually, but it's on the website.

Inspect the fusion 360 file in fusion, you can download a copy for free and get a free personal use license. I recommend inspecting the whole machine and getting an idea of how the parts fit together. Use the section analysis and toggle visibility of the various parts so you can see in there.

The lower grid and top grid bodies are printed with grid infill and no top or bottom layer, to form a grid with about 4mm spacing. They are merged in Cura. Fusion can't handle actually modeling the grid structure, so it has to be done this way for now.

Stls are not really source code, they are more like compiled code.

I still need to make some videos and pics to show the assembly process.

See the file on printing notes for the details of how to produce good parts. I will publish the cura files I use after I do another test run, but it's different for every printer anyway so this isn't that important.

Do some basic checking to see if the parts are within tolerance. Put the bearings in and make sure they fit tightly but go in ok, and try putting some on the relevant shafts, ideally they fit tightly but a loose fit is ok, too.

If not sometimes you can sand the parts to fit, if they are too far off in the wrong way, you have to reprint them. Sometimes you can use glue etc. to compensate for parts that are too small.

Then, assemble the thermal wheel. First, load the straws into regenerator module. This is kind of a drag and takes about 45 minutes. I can make a video later to show the general technique I have developed. Just put straws in by hand, tap things in various ways to get them so settle and be parallel to each other, and add more till there is room for a few more in each compartment, fill all compartments like that and then go back and add the last few straws, keep going around in a circle so no one compartment bulges too much into the other ones.

Then snap the top grid in place, it takes some force. If it's not going, sand it down. The center takes more force than the outside. Glue it in place with some CA glue, this isn't always necessary, depending on print quality. I use the low viscosity stuff, "lepage ultra liquid super glue". Make sure it doesn't stick up anywhere, be careful not to glue it in a bad position, that would be a real problem. The top of the grid component should be flush with the top edge of the regenerator media holder component. You can hold it in place while the glue sets in one area,

then apply glue in another area and similarly hold it down, it gets glue on your fingers but it seems to be a good way to do it.

Once you have a good regenerator component done, put the bearings into their sockets, and put the regenerator into the base component. Then put the belt approximately in place, put the outer seal component on, screw it in place with minimal number of screws, and make sure everything turns ok, no noise, no touching. If anything touches, you have to figure out where it touches and dismantle and sand that area until it's all good. If the print quality is good and the post processing removed all goobers and z seam stuff, that shouldn't happen.

Pick the thermal wheel module up and make sure that even if you squeeze or bend it a bit, things still don't touch or make noise.

Then, add grease to the main seals. You can either continue assembling things until the motor and belt are in place, and then turn it on and use the syringe and needle to inject grease, or you can add it by dismantling the thermal wheel and putting it on the components and then reassembling them. I recommend the dismantling method, it is less stressful and prone to error. You need to do this after checking for rotation and fit because it is hard to sand after you add grease. Basically you would have to remove the grease again and start over.

Don't get any grease on the regenerator media, ideally.

Reassemble it all, don't forget the belt as you go, and turn it a few times to make sure it turns well.

Then assemble the motor and pulley and its mounting bracket, the glue takes a few hours to set for the pulley. Usually I glue the motor to the mounting bracket. Be careful not to let any glue get anywhere it might cause a problem. Don't use too much glue. I have tried shoe goo and also CA glue from the dollar store, which has a small amount of thickener or something in it, not like the super liquid stuff, and both work ok. There shouldn't be a ton of force on the motor so the glue job doesn't have to be stellar, but don't put too little glue on either. Future versions may use screws instead, but the motors are all different and use unusual screw sizes, and finding a reliable vendor that would ship the same motor every time was a problem, so it was a problem to use screws.

Put a rubber washer on each 20 mm screw for the mounting bracket, so they are ready, and put the screws through the holes in the mounting bracket, and put more washers on the other side.

Put the motor and pulley with mounting bracket in place, and drive the screws in most of the way, but don't tighten them, so it can still slide some.

Put the belt over the motor.

Adjust the position of the motor so the belt is a bit tight, but not too tight, there should be basically no actual tension on the belt while it's not moving. Tighten the screws a bit, move the belt several full rotations to make sure things are in place, check the alignment of the motor if the belt is wandering to the end of the pulley, the shaft should be parallel to the axis of rotation of the thermal wheel. Rotate everything carefully by pulling on the belt or rotating the motor and observe that things are nicely aligned.

Once things are aligned, tighten the screws that mount the bracket to the base.

Attach the motor drive board.

Wire up the motor, put the power plug into its mounting point, solder the wires, and connect things so that the gimbal motor will turn when things are powered on. Connect everything except for the wall wart to the AC plug, then turn the potentiometer all the way counterclockwise to turn the speed way down (when viewed from the end of the board away from the screw terminals). Plug in the wall wart, and turn up the speed with the pot carefully. The motor should stutter and start. It stutters at first as a result of how the motor driver works. If the motor stalls, it detects this and tries to re-start it repeatedly. So if it stutters, it's because something is jammed.

Pick it up, squeeze it and distort it carefully but firmly to make sure everything works smoothly and reliably despite any external forces

If it's ok, you are done the thermal wheel. That's the hardest part.

Run the wires for the motors, then tape the motors in place, onto the duct modules. I use 3 loops of tape in a triangle around the hole, to act like double sided tape, to hold the motors in place, then seal the edges with more tuck tape. Try to make the tape so that it doesn't show after adding the rain/cosmetic covers.

Finish the electronics in the interior duct module, wire the potentiometer, connect the fans etc.

Check for any errors.

Test everything by powering up the electronics before you screw the duct/motor assemblies in place. The fans should spin up, turn the pot to adjust their speed, make sure things work.

Put the screws slightly into the holes on the corners of the duct/fan sections, so it is not hard to drive the screws the rest of the way later, the screw is in place ready to be driven. Otherwise it's hard to get the screw in, and if you drop one into the duct it is a real problem.

Put the duct/fan assembly units in place and screw them on.

Only partially tighten the screws, because the base components curls during printing, you have to be careful not to overtighten the screws, or it may cause distortion and cause the thermal wheel to jam. I leave the thermal wheel turning during this stage to make sure there are no issues as I tighten the screws, but it's a matter of preference.

Future versions can be made so the curling is matched by the shape of the duct part.

As you add each duct, turn the gimbal motor/ pull on the belt to rotate things, and make sure things still work ok, or leave it turned on.

Turn the thermal wheel on after adding both duct modules, to make sure things still work ok, if it was not turned on during the process.

Now things are almost done, just screw/glue the rain covers in place and seal things up. Only the outside rain cover needs to be sealed, the indoor side should be fine, however you may wish to add some sealant to prevent air from leaking through the crack around the duct and thermal wheel, especially if you cannot fully tighten the screws, there may be a substantial sized crack due to the curling, in particular.

Pick it up carefully, turn it upside down etc, squeeze it a bit perhaps, and and make sure it keeps turning and working ok. If so, you are done. Don't drop it!