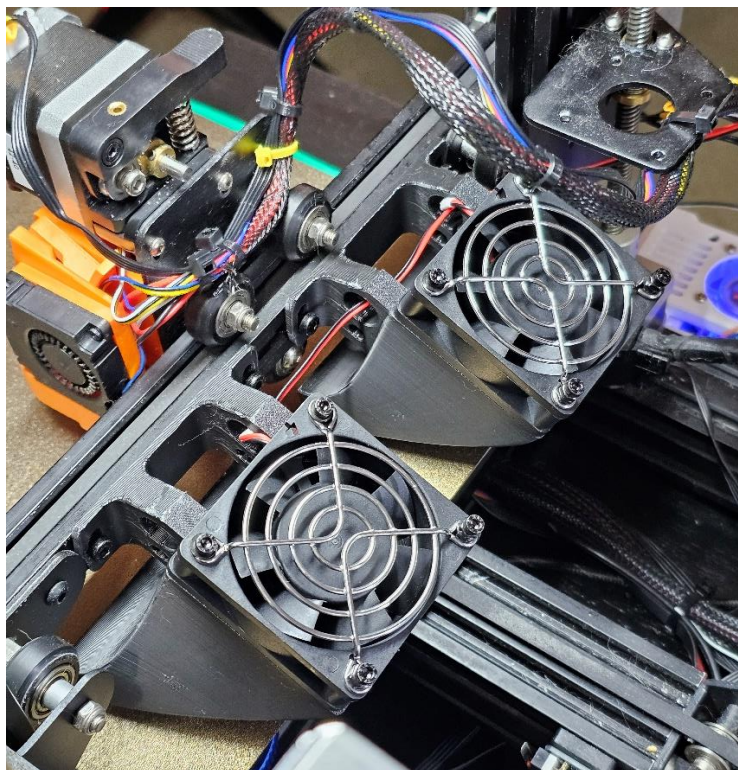# Vortex Gemini High Speed Fan Curtain upgrade for the Ender 3 Pro.

DISCLAIMER: This Modification is based on the FLYN INDUSTIRES Vortex GEMINI High Speed Curtain Fan System for the Sovol SV07 from **Printables.com** and I take zero credit for the design. Flyn does some amazing work and I just modified it for my own needs and did my own work to make it work with Klipper. So, your milage may vary with it.

As most people know the Ender 3 (really any Creality Printer) has very Anemic Parts cooling even at stock speeds and when you are starting to get into highly detailed printing or high-speed printing such as I do, you quickly find out that your prints suck with the poor cooling provided. So, what do you do? Well, most of us start with custom shrouds and even move to mounting some crazy blower fans to our print head in hopes of getting that molten filament cooled enough before the part head moves on allowing for excellent bridging or no warping.

Taking a page from the CoreXY printers, Sovol and Elegoo have both added Auxiliary cooling via an X-Axis mounted Air Curtain to allow more efficient parts cooling without having to design an exotic print head. I wanted this for my heavily modified and Klipper converted Ender 3 Pro. So, I went on the hunt across all the 3D model websites and happened upon this design from Flyn and immediately downloaded and printed it. I did a test fit of the printed parts and they were great except that I didn't have the Clearance to the bed so I modified them in the slicer quick and dirty like to make them fit with additional clearance.

BOM:

- 2x 24v 60mm Fans
- 60mm Fan Cages (optional)
- MOSFET Board
- Wire
- 8x M3 Heat Inserts
- 8x M3 25mm Cap Head Screws
- 4x M4 T Nuts
- 4x 8-10mm M4 Cap Head Screws
- Wire and Shrink Tube
- (Optional) Snake skin for the wire

Installation:

I need to Preface that my install is based on a Klipper Installation on a Raspberry Pi 4. This will also work with a RPi 3 series, RPi CM4 or BTT CB1 if you have a board that has GPIO. If you are still on a Stock Creality Mainboard you could TECHNICALLY wire this in with your Parts cooling fan but, you may damage your mainboard so I don't recommend it.

Add the heat inserts to the 4 fan mount holes, then attach the fans using the M3 25mm bolts.

Then mount the fans to the rear of the X gantry using the T nuts in the gantry V slot. As you look at the front of the printer the units will be marked to say left & right side! Try not to get these reversed. It's your left & right looking at the printer.

Be sure to select the desired level that does not let the Gemini units collide with the bed when homing or when the nozzle is at first layer height. Also give it a little clearance so it won't hit any raised areas of a failed print for example. You must also make sure the lower carriage bolts do not collide with the tips of the ducts under the gantry! Test slowly by hand after install for adequate clearance. You may need to reverse the carriage bolt if it hits anything.

Setting this height correctly & checking carriage clearance is DOWN TO YOU!

Power:

I Control My fans with a MOSFET board I found on Amazon.com wired directly to the 24v Power Supply. The trigger signal to turn on/off is sent to the MOSFET via GPIO from the RPi using Klipper firmware. This allows for software PWM control of the Fans still all though it really isn't required for this install.

Wire the Trigger and Ground from the MOSFET board to a GND GPIO pin and I used GPIO pin 26 as my output trigger to turn on the MOSFET.

Wire the Vin +\- directly to the 24v power supply and the Vout +\- to the fans. Yes, the MOSFET is plenty for 2 fans (and 4 if you are doing a bigger printer) but if you want you can add a heatsink.

That's it, it's really that simple for the electrical wiring for this.

Klipper Config:

To add the Fans to Klipper first you need to setup your install to have a secondary MCU. If you have already setup a klipper_mcu to do input shaping then you are ahead of the game. If you haven't setup a secondary klipper_mcu then jump on over to https://www.klipper3d.org/RPi_microcontroller.html and follow the instructions. This will help you setup your secondary mcu to use with this mod and in the future to do input shaping.

Now in your printer.cfg you will need to define your fan. Here's how it is defined in my config.

[fan_generic curtian]
pin: rpi:gpio26
max_power: 1
shutdown_speed: 0
kick_start_time: 0.1
off_below: 0.10

Once you add this to your printer.cfg and save/reload. On your dashboard you should see a new fan named Curtain with a slider. If everything is wired correctly you should be able to move that slider up and your fans start turning! We're now finished with the hardest parts of the mod!

Right now your fans are completely manual which means they will not turn on with the parts cooling fan. If you are comfortable creating macros you can now make custom macros redefining M106 and M104 so that when that G-Code is sent to the printer your fans will turn on with the Parts cooling blower.

I prefer the route I took which was to do a G-Code substitutions so I could have the option to have the fans turn on with a print or not depending on the preset I used.

If you are using Prusa Slicer or SuperSlicer you just go to Print Settings – Output options – Other (make sure you have expert mode selected) and where G-code substitutions is click the Add Button.
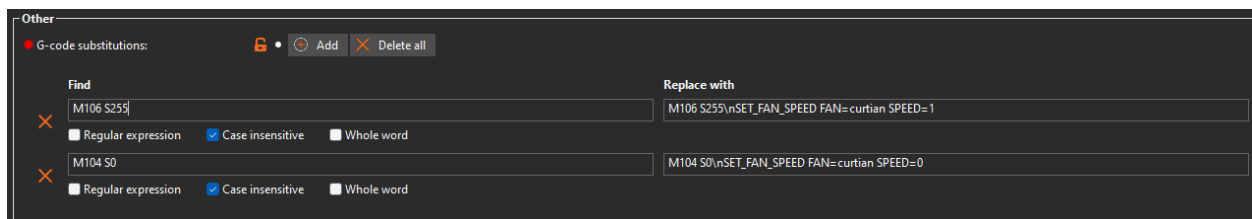
You will need to add **M106 S255** to the Find box and **M106 S255\nSET_FAN_SPEED FAN=curtian SPEED=1** to the Replace with box

Add another substitution by clicking the add button and put **M104 S0** in the Find box and **M104 S0\nSET_FAN_SPEED FAN=curtian SPEED=0** in the Replace with box. Save and you're done. Now anytime you send a print with that system preset selected your air curtain fans will spin up when your parts cooling fan goes to 100%

Summary:

I really enjoyed working on this mod to my printer and it is helping with my print quality. I'd highly recommend this if you are doing complex prints or prints with a lot of bridging. This isn't a cure all for print quality though. You always need to properly tune your printer and do regular maintenance.

I will post my modified STL's for this project on my github for everyone.

Feel free to reach out on my socials for questions and thanks again for supporting my work. I love helping you get better prints however I can.

Billy.