Ghostbusters Ecto Goggles

Created by Billy at Shedtech – Bringing technology out of the lab and to your shed!

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YouTube - https://www.youtube.com/channel/UCSLhccJc34ZlHV2Sk5as9ug

Are you troubled by strange noises in the night? Do you experience feelings of dread in your basement or attic? Have you or your family actually seen a spook, spectre or ghost? If the answer is yes, then don't wait another minute!

Pick up this manual and make yourself a set of unofficial Ghostbuster Ecto Goggles immediately!

These goggles utilize the latest Pimoroni Thermal Imaging sensors as well as top of the range Raspberry Pi optics to help you find the spirits keeping you from a restful nights sleep!

Parts List

1. Raspberry Pi Zero 2
2. Raspberry Pi Camera v2 module (either with or without IR filter. If you build with the NoIR version you can incorporate some IR LED's for night vision)

https://shop.pimoroni.com/products/raspberry-pi-camera-module-v2?variant=19833929735

3. Thermal camera module

https://shop.pimoroni.com/products/mlx90640-thermal-camera-breakout?variant=12536948654163

4. Google cardboard or something equivalent for the lenses

https://www.amazon.co.uk/Virtual-Real-Store-Comfortable-Smartphones/dp/B072ZYWVS5/ref=sr_1_1_sspa?crid=MVLMOQYJXP3I&keywords=google+cardboard&qid=1664386610&qu=eyJxc2MiOiI0LjA5IiwicXNhIjoiMy4yNyIsInFzcCI6IjMuMTYifQ%3D%3D&sprefix=google+cardboard%2Caps%2C73&sr=8-1-spons&psc=1

5. Some thin synthetic leather for the eye piece cushion cover

https://www.amazon.co.uk/gp/product/B09283WWMP/ref=ppx_yo_dt_b_asin_title_o02_s00?ie=UTF8&psc=1

6. Some foam for the eye piece cushion (I just used some packaging foam that was laying around)
7. Brass Snaps –

https://www.vibesandscribes.ie/products/15mm-heavy-duty-snaps-rust-proof-brass-tool-included.html

8. Webbing strapping –
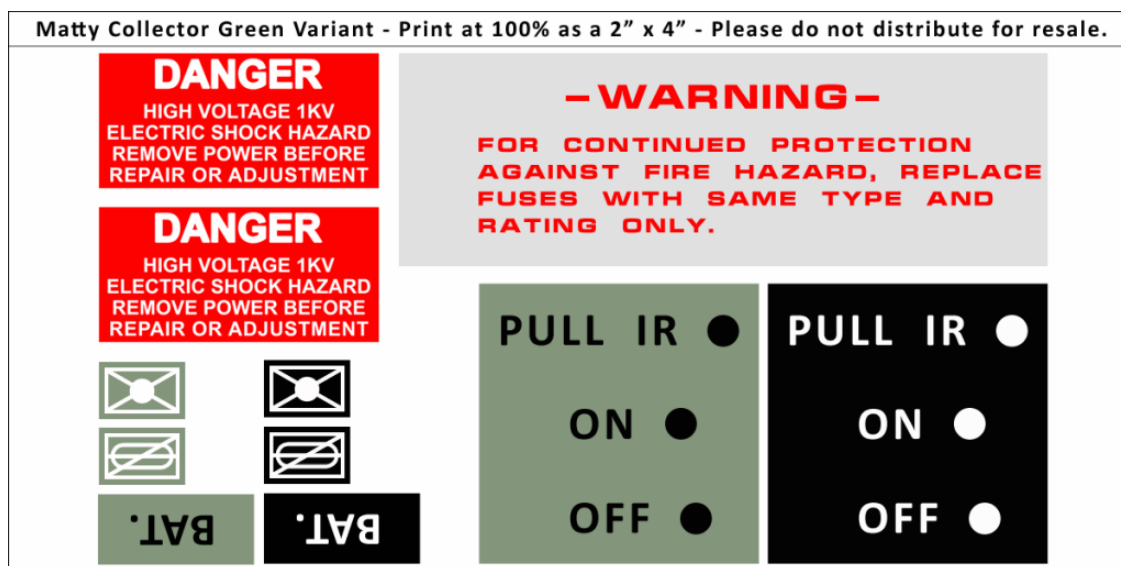

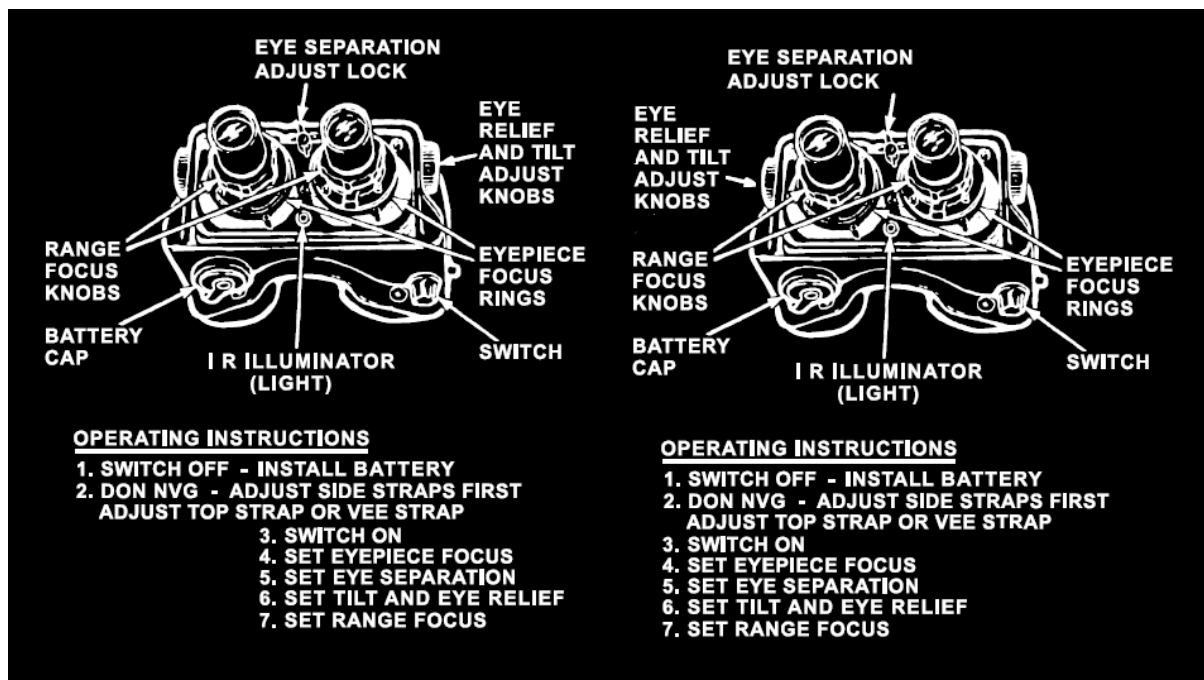https://www.vibesandscribes.ie/products/webbing-strapping-25mm-100-polyester-per-metre.html

9. Labels

Trial and error is needed here to print these off in the size you want.

I printed mine on normal A4 paper and used double sided tape to apply them before applying weathering.

https://www.gbfans.com/forum/viewtopic.php?t=34596

EYE SEPARATION
ADJUST LOCK

EYE
RELIEF
AND TILT
ADJUST
KNOBS

RANGE
FOCUS
KNOBS

EYEPIECE
FOCUS
RINGS

BATTERY
CAP

I R ILLUMINATOR
(LIGHT)

SWITCH

OPERATING INSTRUCTIONS
1. SWITCH OFF - INSTALL BATTERY
2. DON NVG - ADJUST SIDE STRAPS FIRST
   ADJUST TOP STRAP OR VEE STRAP
3. SWITCH ON
4. SET EYEPIECE FOCUS
5. SET EYE SEPARATION
6. SET TILT AND EYE RELIEF
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https://www.gbfans.com/forum/viewtopic.php?t=16191

10. 5 inch screen

https://www.amazon.co.uk/Elecrow-Monitor-800x480-Display-Raspberry/dp/B013JECYF2/ref=sr_1_1_sspa?crid=2HQAQ38RY96OW&keywords=raspberry+pi+screen&qid=1664389029&qu=eyJxc2MiOiI1LjcyIiwicXNhIjoiNS4wOCIsInFzcCI6IjQuMzkifQ%3D%3D&sprefix=raspberry+pi+screen%2Caps%2C82&sr=8-1-spons&psc=1

11. Battery Power Board (I had some of these laying around that allow me to charge the battery and get 5v from the one board, but other boards will do as long as they supply power for everything)

https://shop.pimoroni.com/products/powerboost-1000-charger-rechargeable-5v-lipo-usb-boost-1a-1000c?variant=3226459969

12. Battery (you can get a smaller battery if you want, I just had this laying around)

https://shop.pimoroni.com/products/lithium-ion-battery-pack?variant=23417820487

13. USB C breakout to connect to the battery charging board (you can use the USB micro connection or whatever is built onto your board if you want, but I have lots of USB C cables laying around from phone chargers these days)

https://shop.pimoroni.com/products/adafruit-usb-c-breakout-board-downstream-connection?variant=21780324253779

14. HDMI Cable to connect to between the Raspberry Pi Zero and the screen
15. Sacrificial USB micro cable to power the screen from the power circuit

16. STL's available here –

https://www.printables.com/model/285148-ghostbusters-ecto-goggles

17. Software available here –

https://github.com/billy-osullivan/ecto_googles
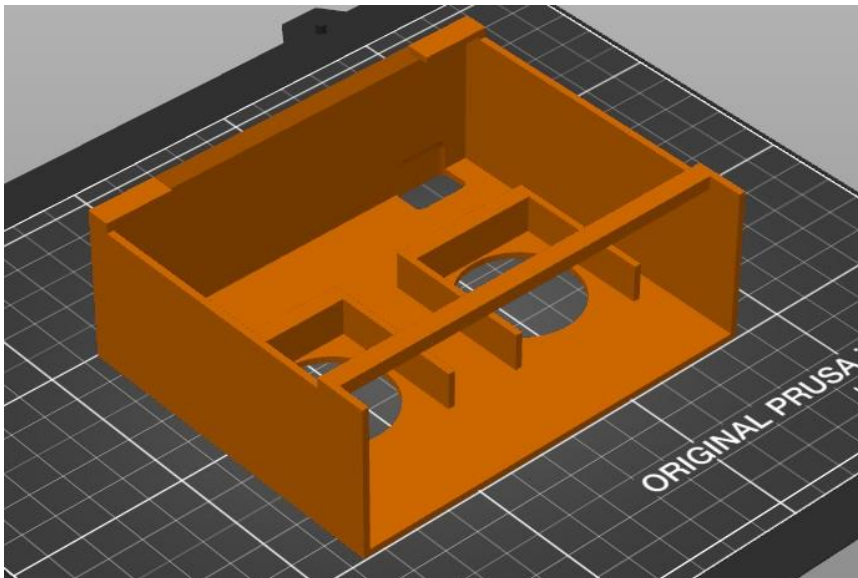
18. Hex bolds and matching brass inserts
19. Paint

Assembly

1. Print all the parts. I used Prusament PLA and a 0.6 nozzle

   Once printed sand all the parts for painting except for part 3.

This is the part that does not require sanding –

2. After sanding, fill where needed, and spray the parts with primer (but not part 3)

3. Paint to the colour of your choosing (I painted mine a dark olive green)

For the 'eye' pieces in part 2 I painted these with a chrome paint first, let it dry and then sealed them with a mat sealer. Then I painted over part ove the chrome/silver with black. This allowed be to later scrape off some of the black paint to help add a weathered effect to the eye pieces.

4. Insert the brass inserts to allow the cover to be screwed on –
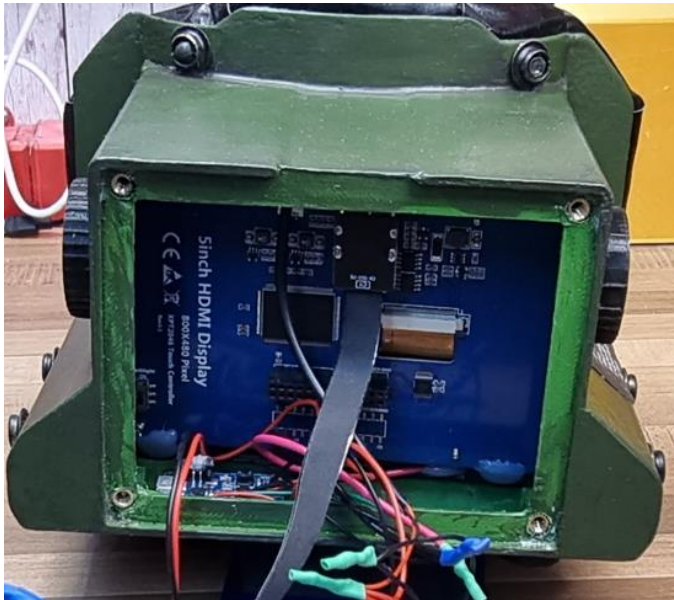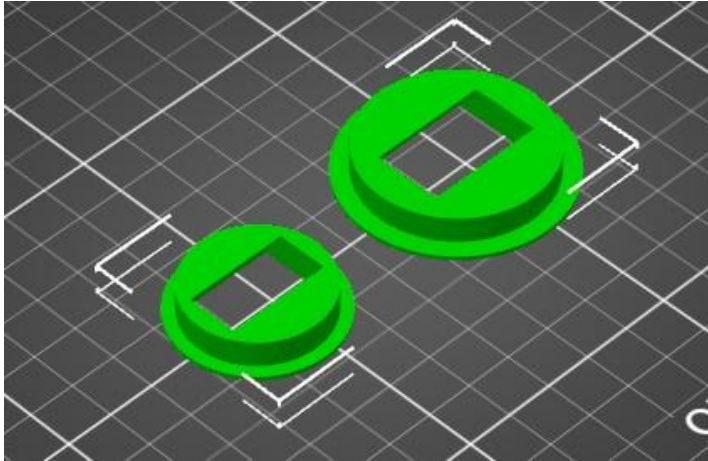

5. Put in the power switch, lenses and USB-C connection (with wires soldered on in the power pads) in part 3 with some hot glue
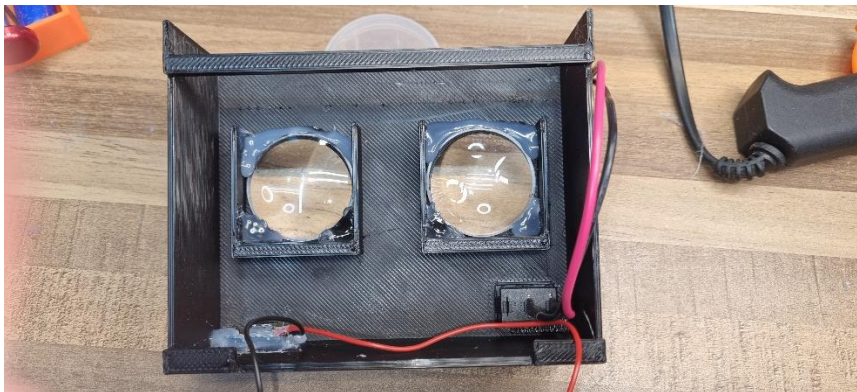
6. Hot glue the screen into place with the screen facing the lenses on part 3.

7. Hot glue the camera and thermal sensors into the mountings (they will only fit in one way, the smaller one is for the thermal sensor)

8. Solder your cables into place

Here is a rough overview of the wiring. Also are links to the Powerboost pin out and raspberry pi pinouts. To be honest it is pretty straight forward, just review the pinouts for your circuitry!

https://learn.adafruit.com/adafruit-powerboost-1000c-load-share-usb-charge-boost/pinouts?gclid=CjwKCAjw4c-ZBhAEEiwAZ105Rfon2fEex6hwJs_Vmstyy9wV9wYTylUchCWH0NolnrOdIKoWa38ObxoCkrIQAvD_BwE

https://www.etechnophiles.com/rpi-zero-2w-board-layout-pinout-specs-price/
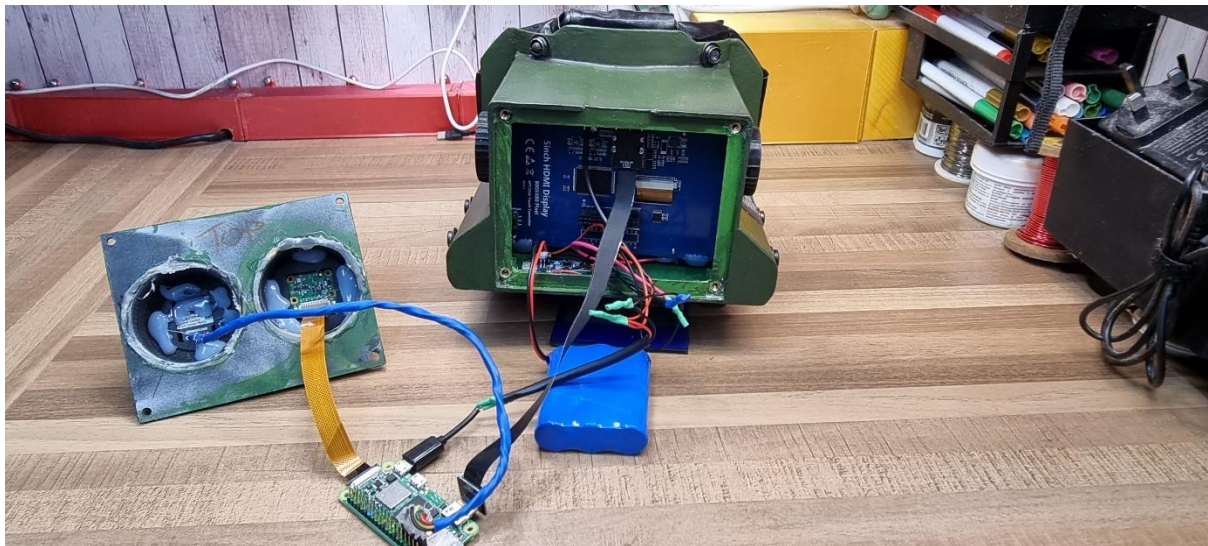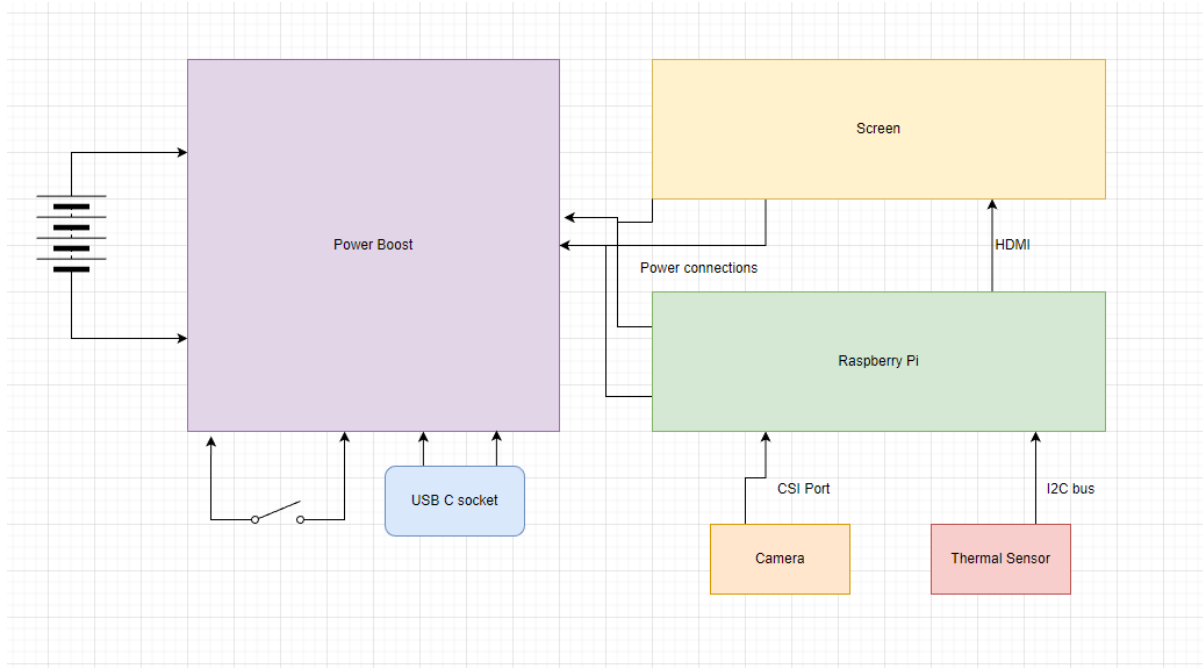
9. Cut your foam to the correct size and wrap in the faux leather. I used super glue to keep this together but it caused an exothermic reaction and heated up the leather and also made it really hard in places. You may get better mileage with hot glue. Punished Props have a good example of how to do this on their ecto goggle build on youtube.

10. Use some epoxy to glue on the snaps that will be used to hold the straps to the goggles. Also glue on some decorative snaps.

11. Stitch together your strapping. You will nee to cut your strapping into 6 pieces and either 3D print or use some other material to act as the strap junction like in the picture below (I used a scrap piece of real leather (not the synthetic stuff) I had laying around –

3 of the pieces will be sewn to a tightening clasp and also have a snap riveted on.

The other 3 pieces will be attached to the strap junction and routed through the tightening clasp.

If you notice the straps loosen when you have the headset on, you can use tape to hold the straps in place.

12. Finishing and Weathering

Stick on your labels. Mix some paint for weathering. For this I mixed black and light brown to make a kind of dark green/brown, almost black oily kind of colour (I only have acrylic paints, so that's what I used!).

Water it down well and then use a brush to apply to anywhere there is a corner. Get the high and low parts. Use a cloth to wipe off excess paint. Be careful when weathering your labels because the paint wont wipe off the paper like it will the other painted surfaces. Also be careful not to get pain on the camera or thermal sensor.

Make sure that you apply the weathering mixture to your strapping also. You can even rub the strapping with a rasp to help add a weathered/worn effect

Give the brass clasps a wipe with some black paint to help age them.

13. Prepare your raspberry pi image.

I just used the latest version available on the official downloader. Make sure to allow SSH and i2c.

14. Upload the software I prepared on github to the raspberry pi

15. Make the following change to the boot config file

From the CLI type 'sudo nano /boot/config.txt'

Add the following line (or if there is already a line specifying the i2c baudrate, edit it): dtparam=i2c1_baudrate=1000000

16. Add the following dependencies again from the CLI

sudo pip3 install adafruit-blinka

sudo pip3 install adafruit-circuitpython-mlx90640

17. Run the script to test its functionality

18. Make the script run on startup

From the CLI type the following 'sudo nano /etc/rc.local'

Add the command to run your script (make sure you specify its file location correctly). For example:

sudo python3 /home/Desktop/ecto_goggles.py

This should be added above the line that says 'exit 0'

Make the rc.local script executable with the command below:

sudo chmod 755 /etc/rc.local

19. Bust some ghosts!