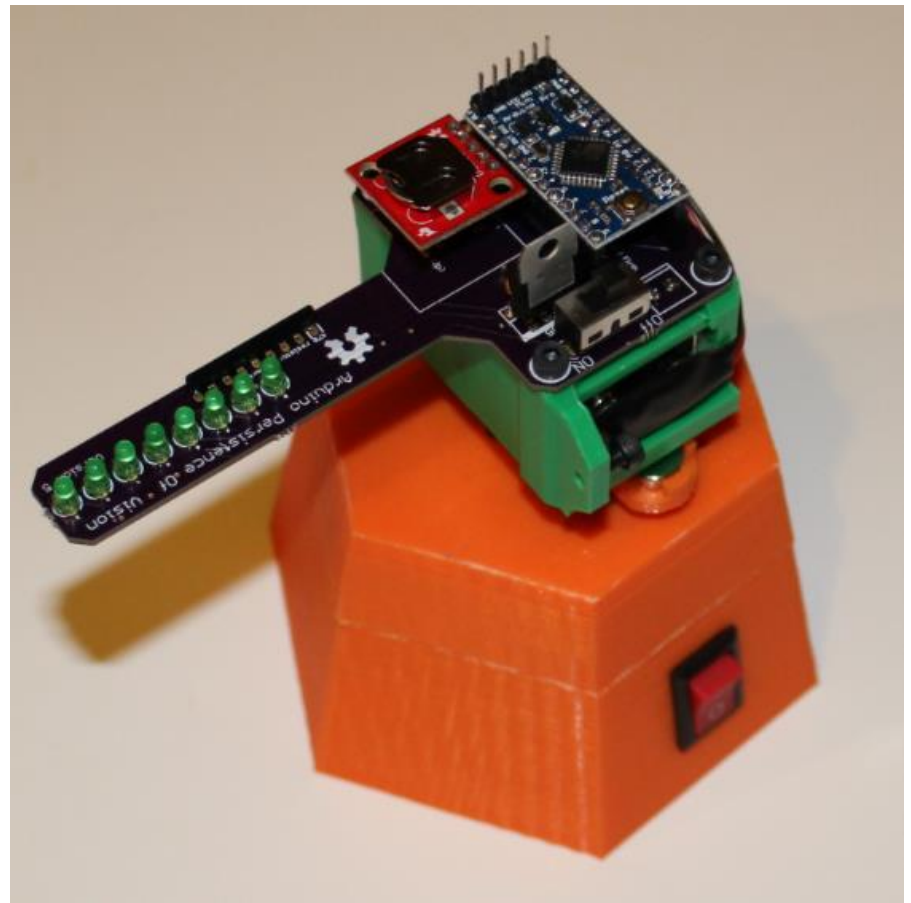
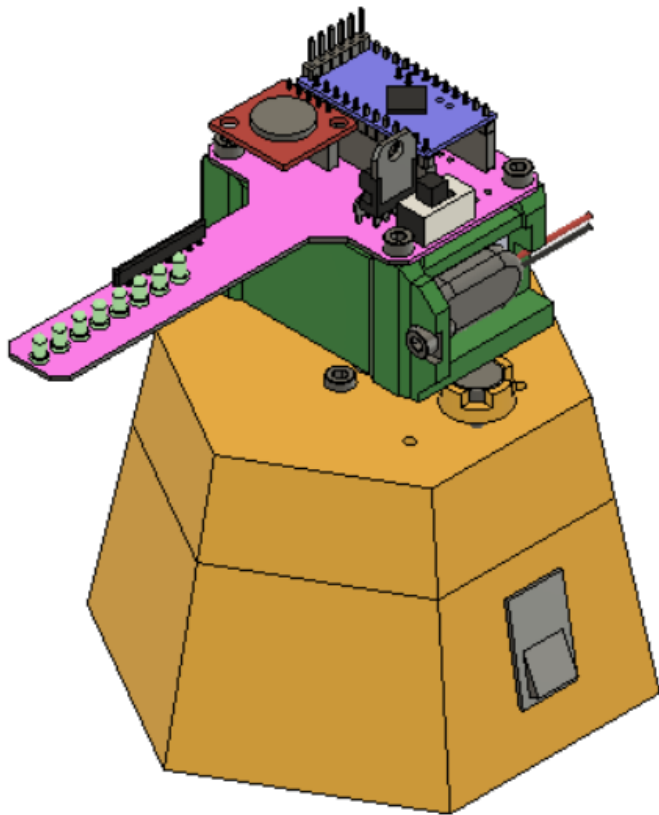
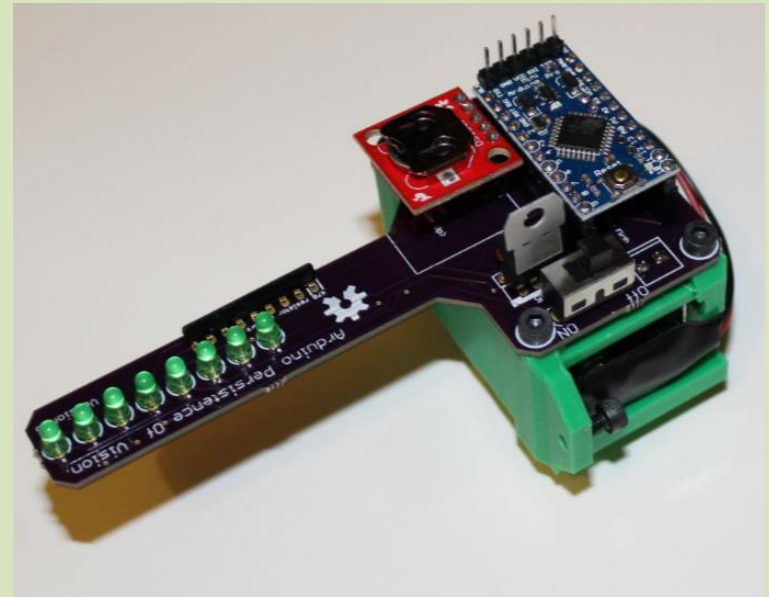
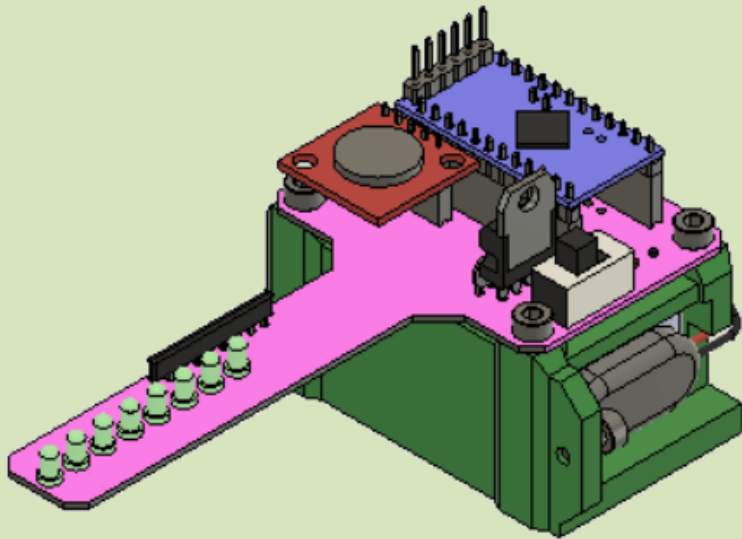


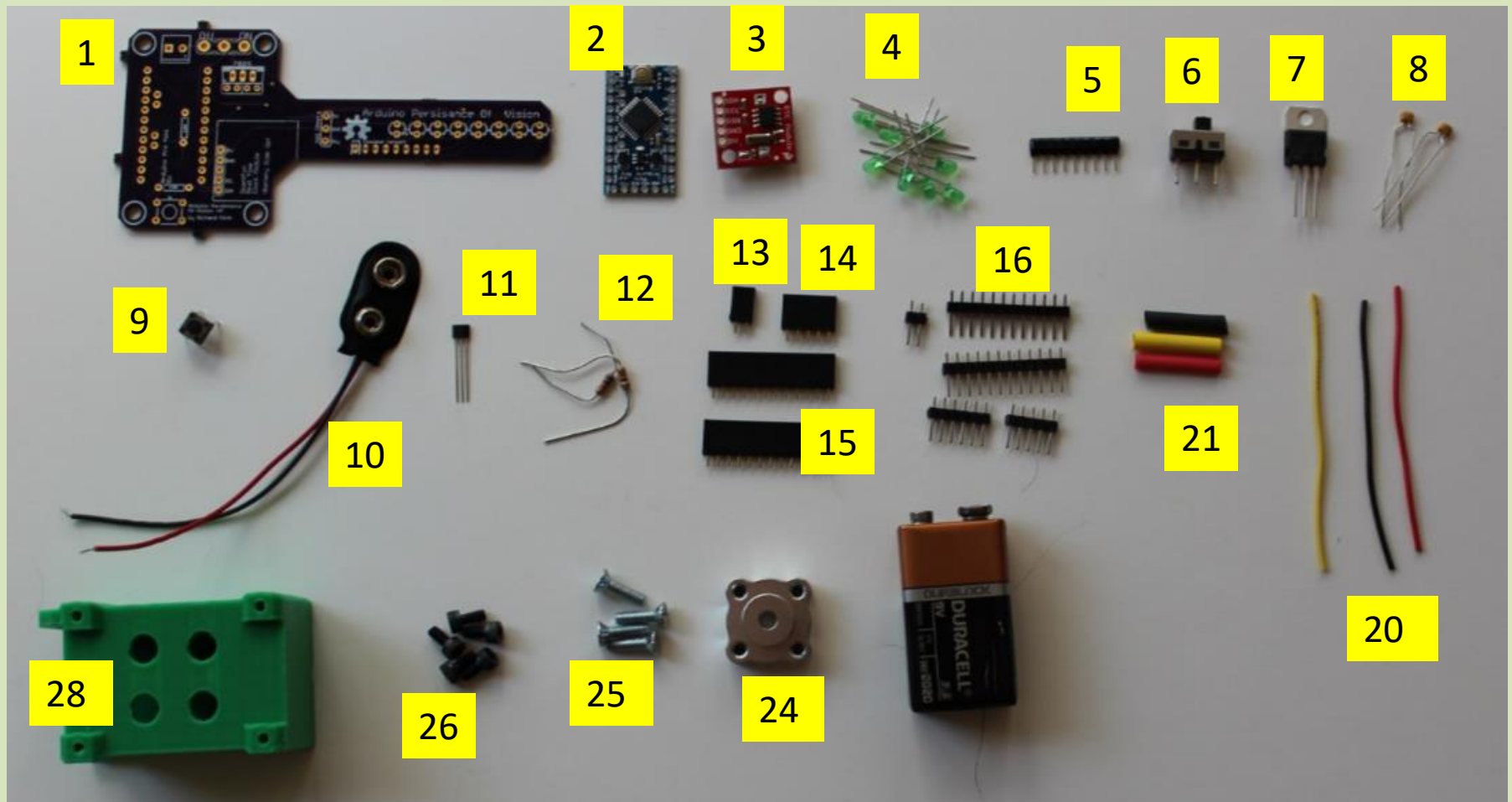
Arduino Based Persistence of Vision



Assembly – Upper Section



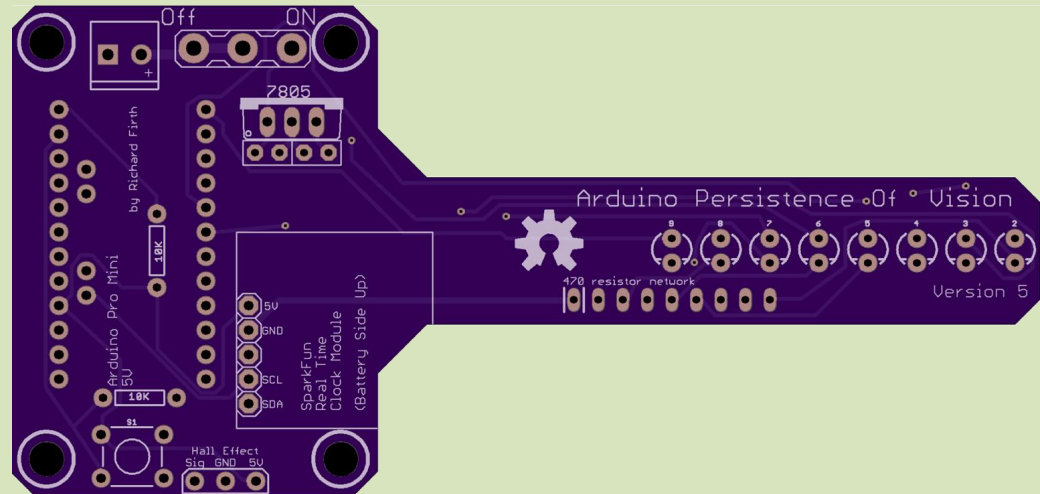
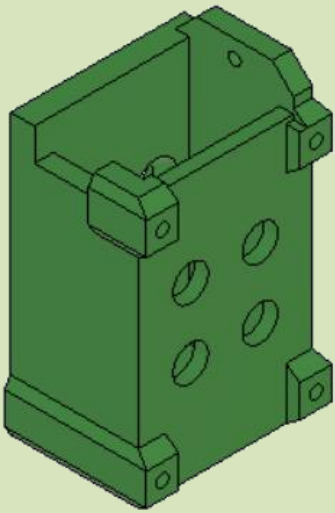
Assembly – Upper Section



Part numbers match BOM at end of presentation

Assembly – Upper Section

- 3D print UpperPart(28)
- M3 Tap the 5 holes
- Order PCB(1) (since these are custom made each time it costs \$42, but you get 3 of them)
- This part has a two week lead time



No female header needed

7

7805 Regulator

4

3mm LEDS

8

0.1uf capacitor

10

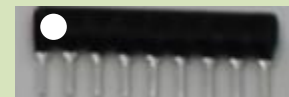
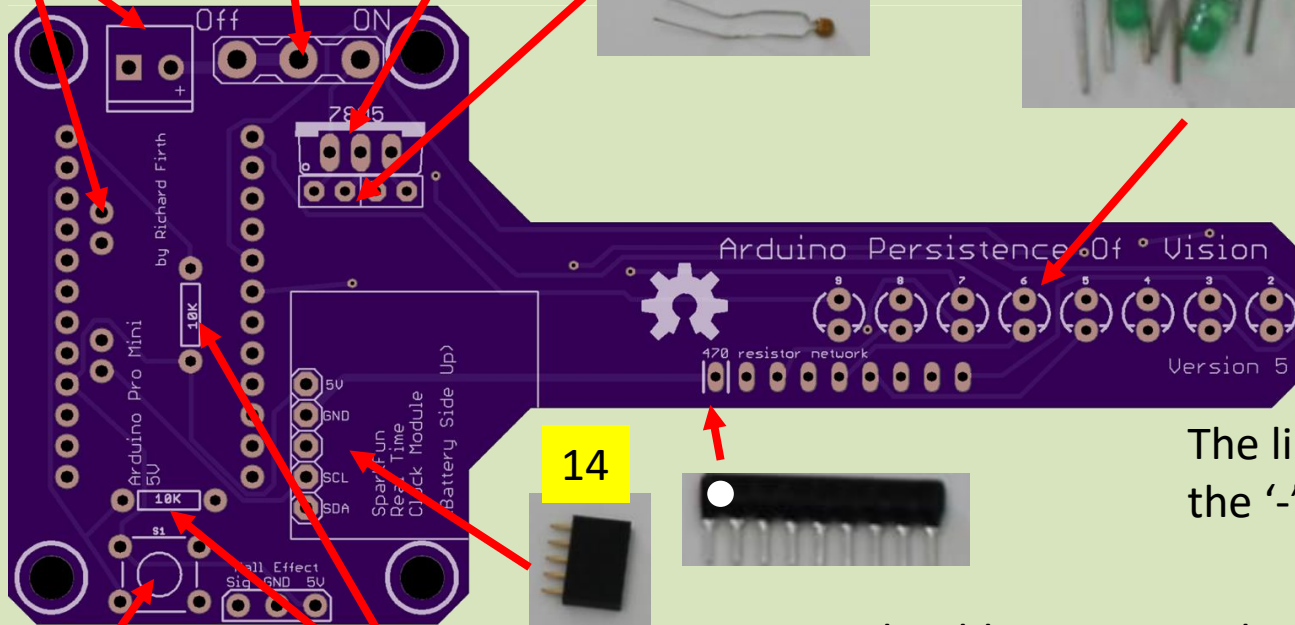
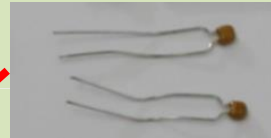
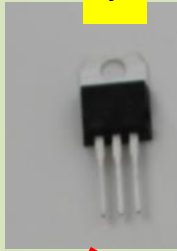
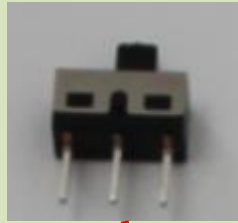
15

14

12

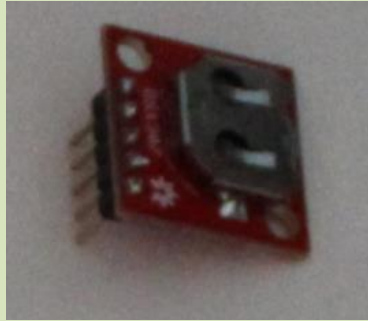
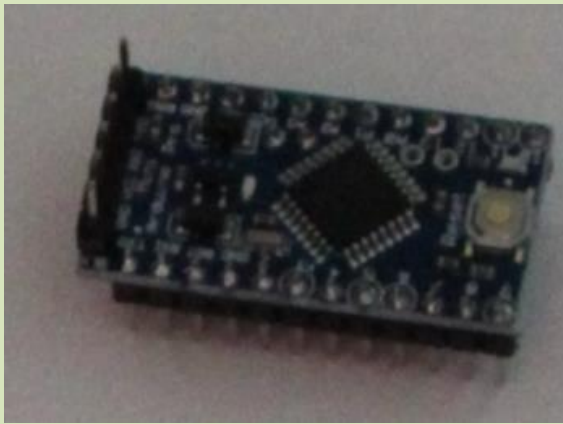
10K ohm

DO NOT SOLDER HALL EFFECT SENSOR YET



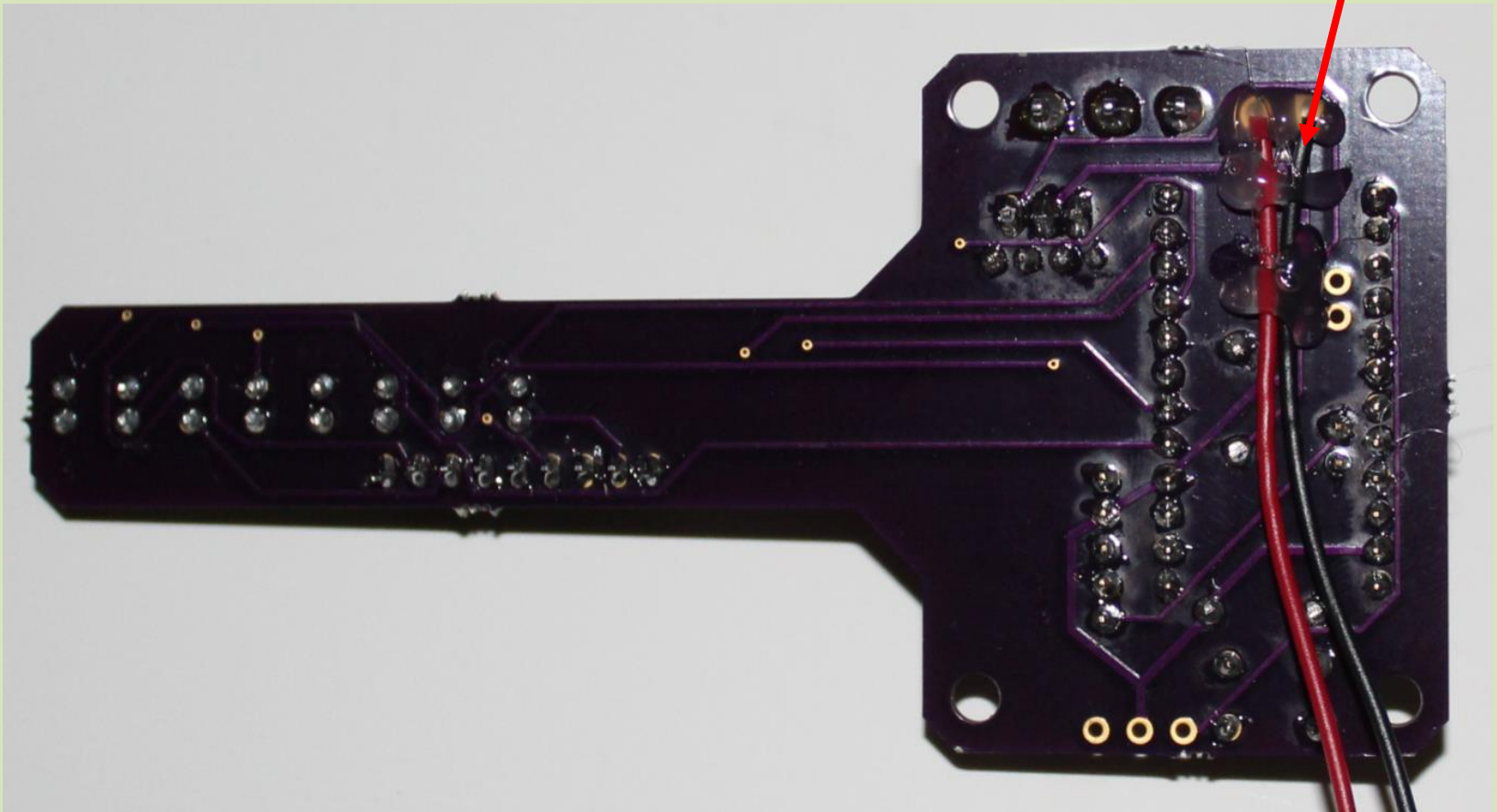
The line represents the '-' of the LEDS

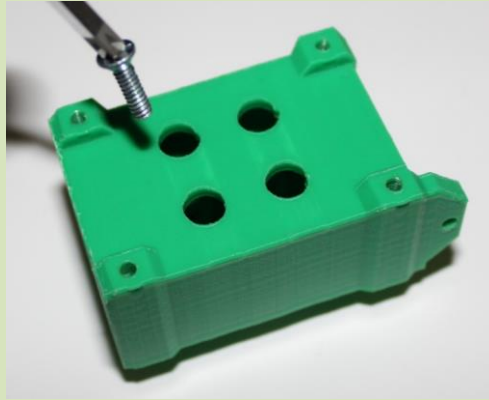
Net should say 471 on the outside
The dot goes between the two lines



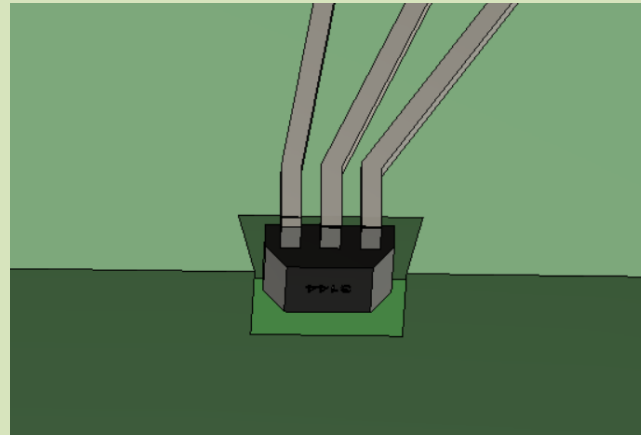
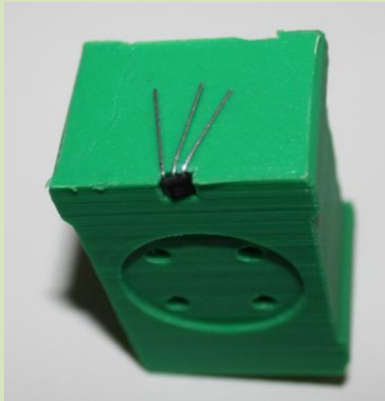
Solder headers coin battery side up
On RTC module

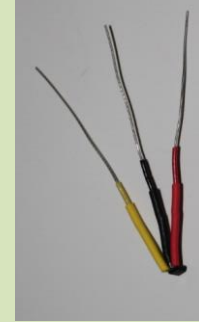
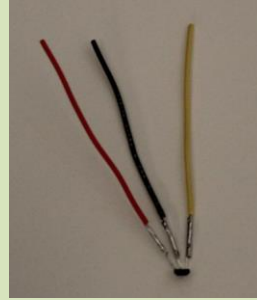
Hot Glue
Battery clip



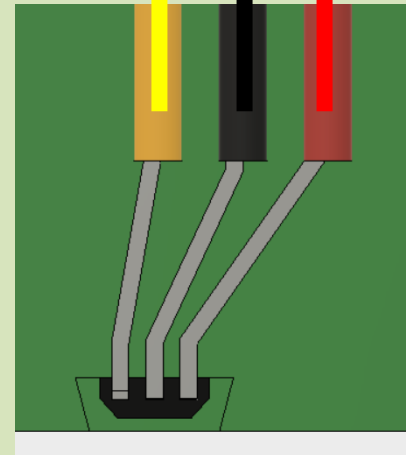
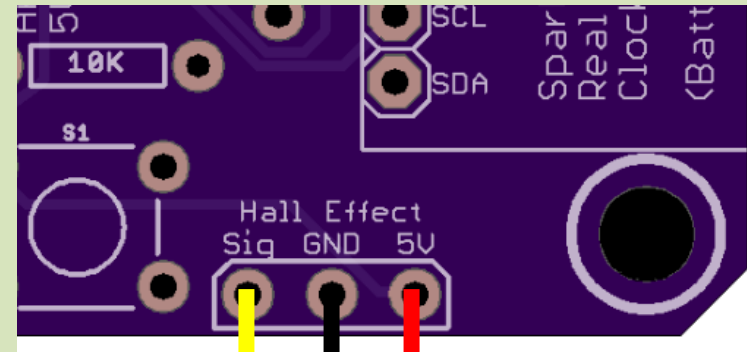


- Use screws(25) to attach hub(24) to UpperPart
- Bend hall effect sensor (11) to fit in gap. (make sure pins match correctly)

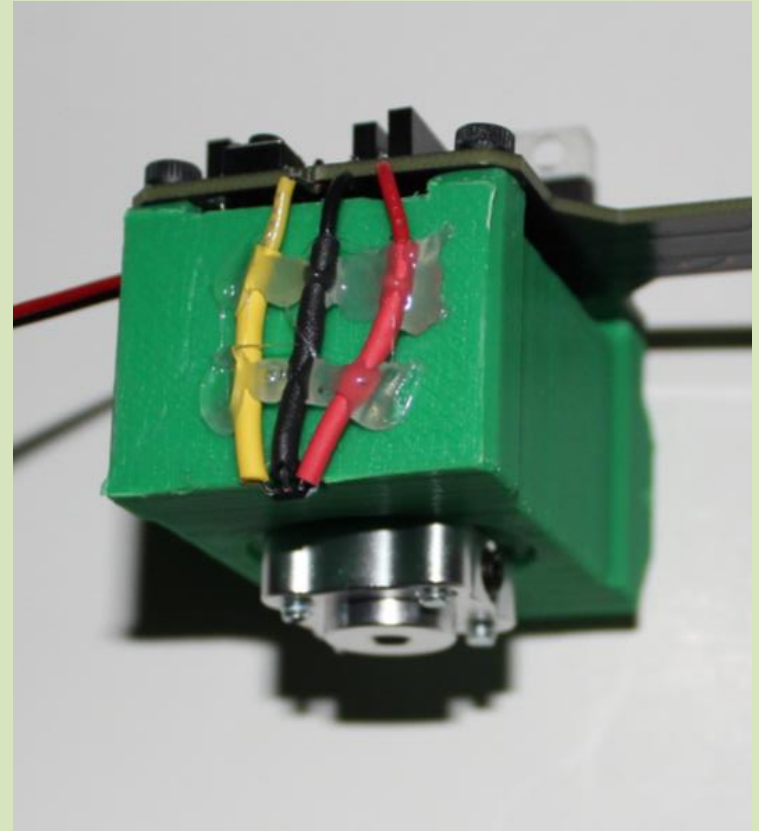
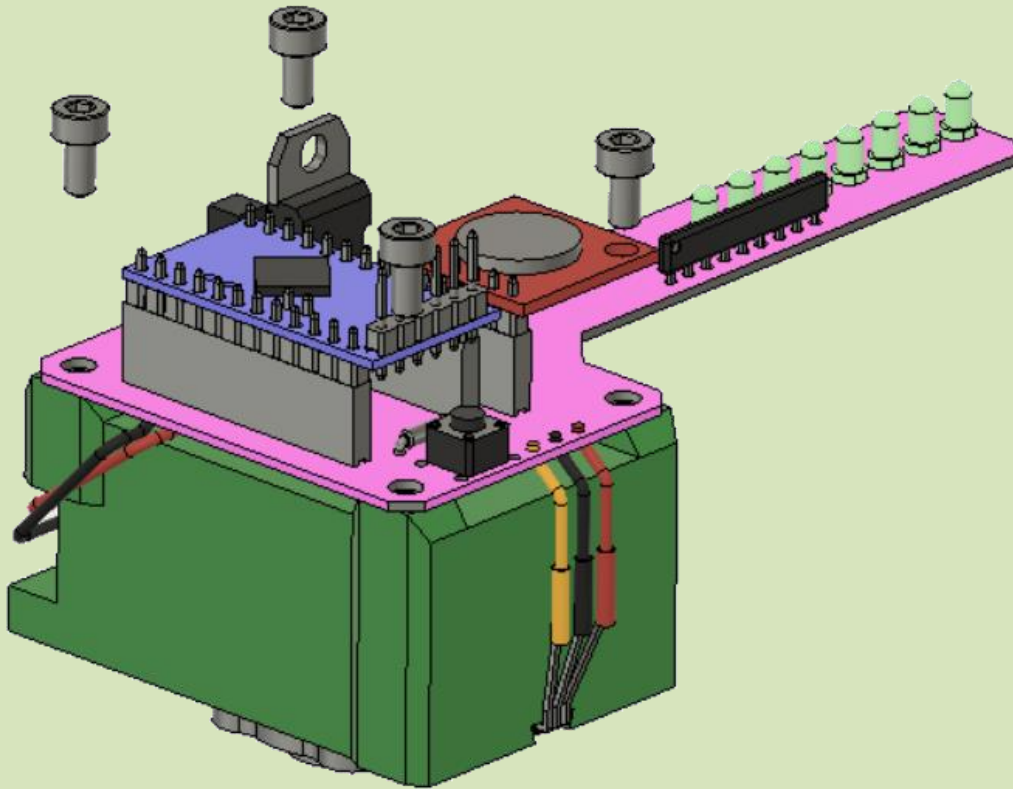




- Solder wires to hall effect sensor and shrink wrap. Then strip wires
- Hot glue the result to the Upperpart, such that the hall effect sensor rests in the gap
- solder the wires attached to the hall effect sensor to the PCB



- Screw the PCB to the upperpart
- Hot glue the wires to the upperpart



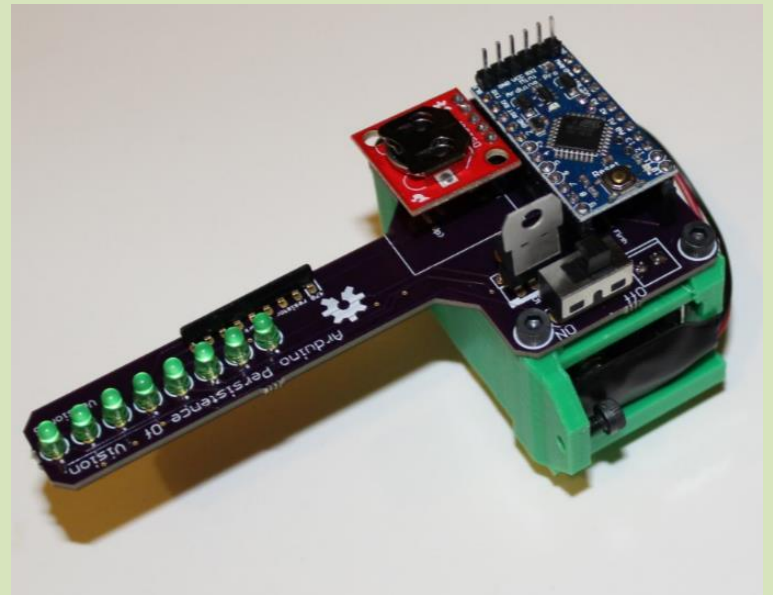
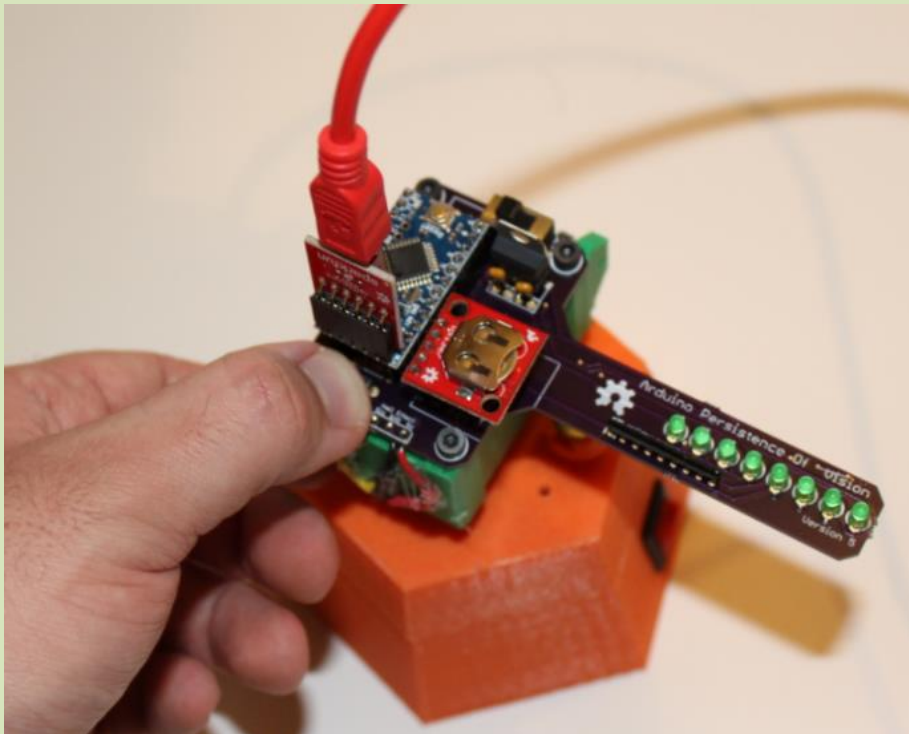
Upload Code

CharacterArrays	8/17/2017 8:37 PM	INO File
PersistentVisionClock	8/17/2017 8:34 PM	INO File
PrintingToPOV	8/13/2017 12:29 PM	INO File

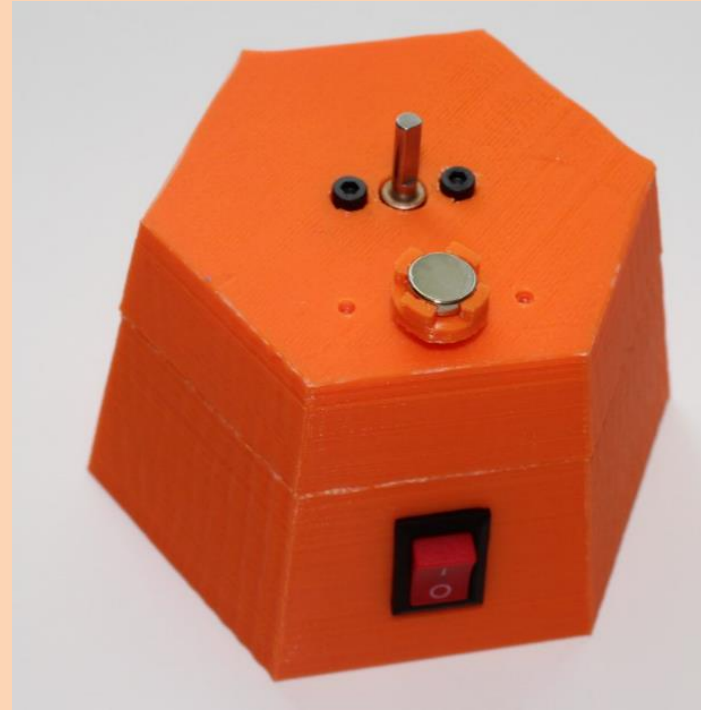
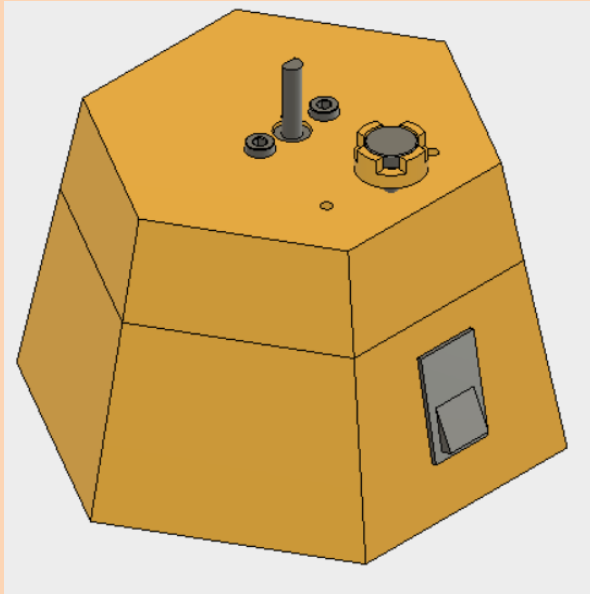
Board: "Arduino Pro or Pro Mini"
Processor: "ATmega328 (5V, 16 MHz)"
Port
Get Board Info



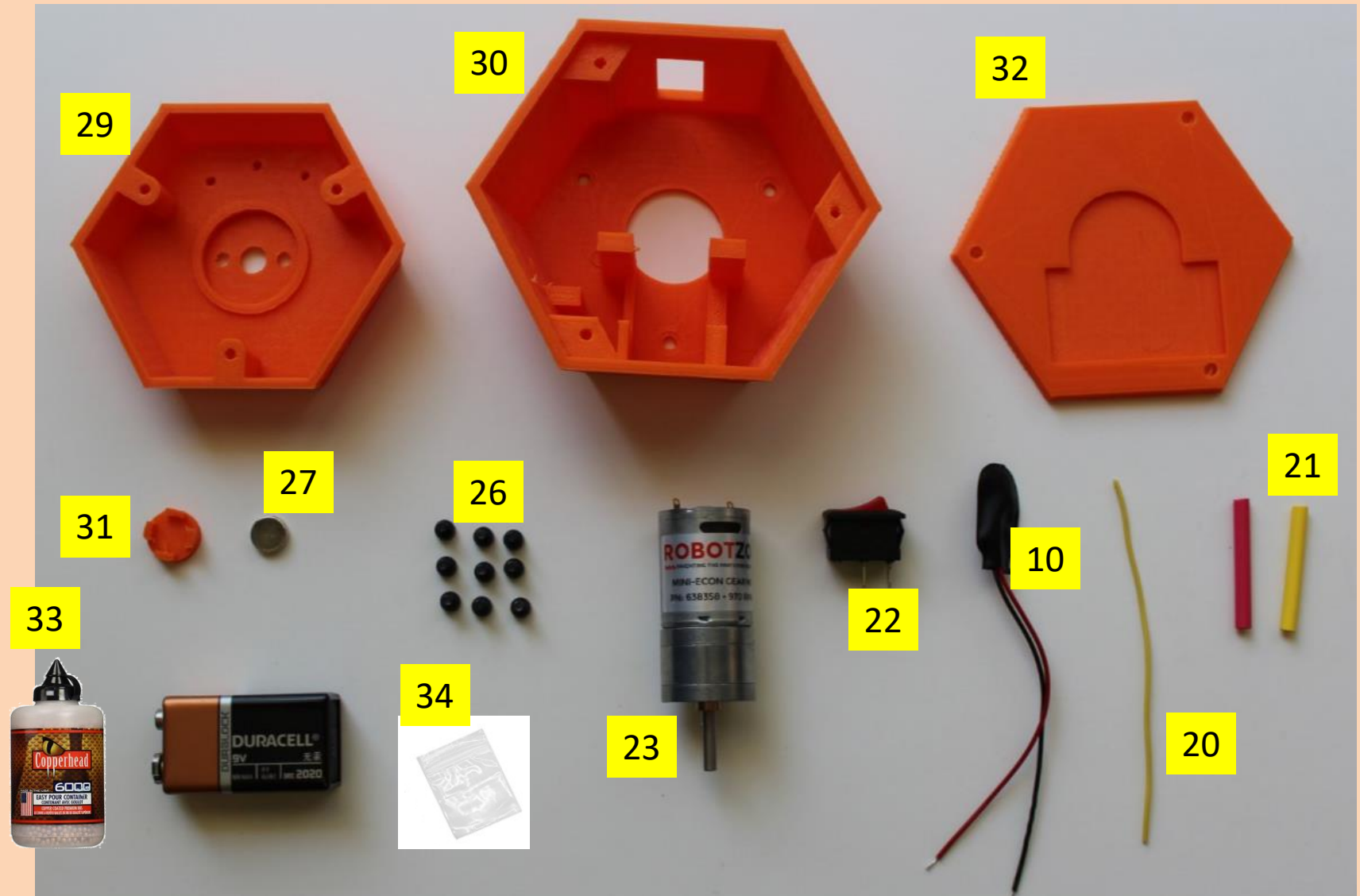
When you first upload, hold down the button to set the RTC to the compiler time.



Assembly – Lower Section



Parts Required

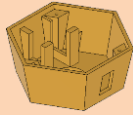


Part numbers match BOM at end of presentation

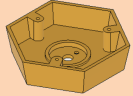
3D print parts 29,30,31,32



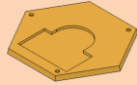
31.MagnetHolder_3DPrint



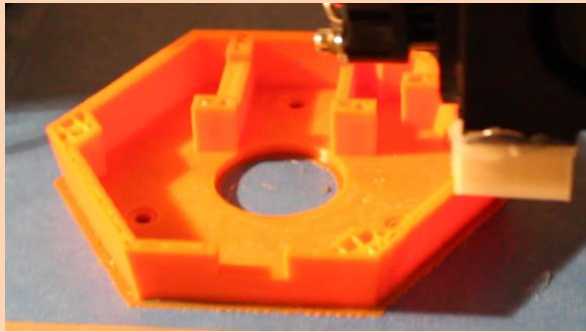
29.LowerCone_3DPrint



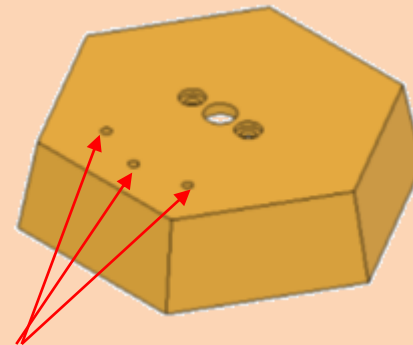
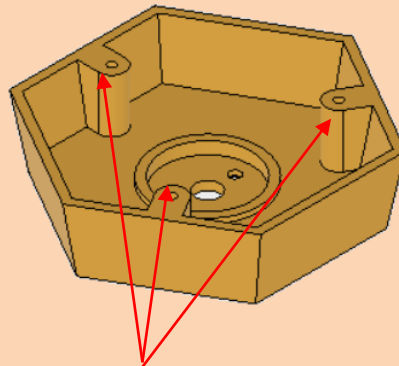
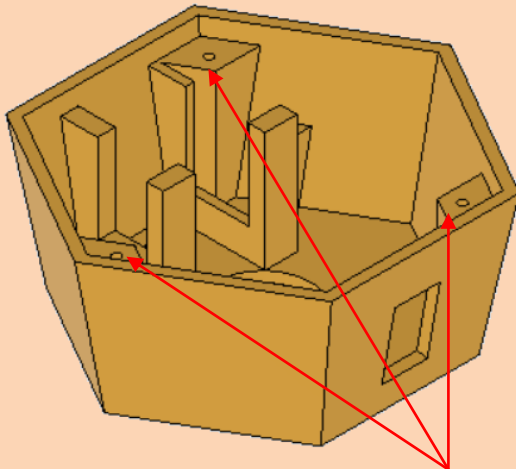
30.UpperCone_3DPrint



32.BasePlate_3DPrint

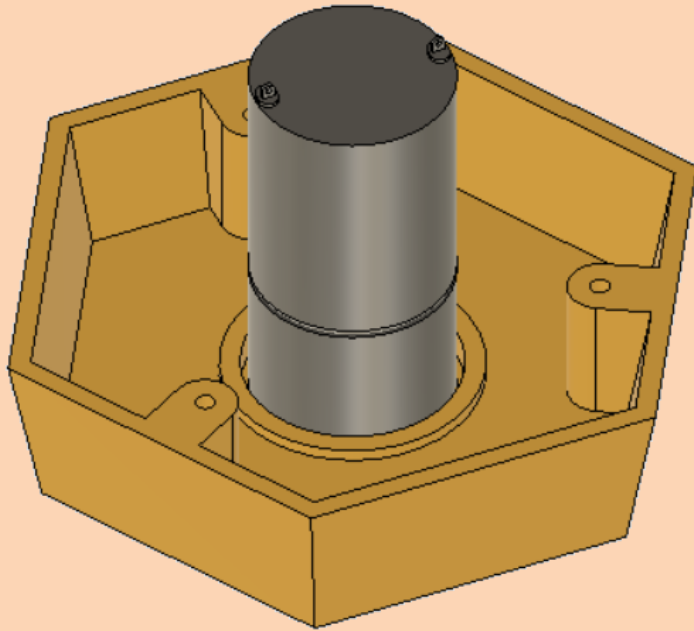


M3 Tap Holes – I found it easiest to tap while The part was stuck to the print bed. The Tap wobbled a bit and it wasn't a 'good' tap, but it will be enough to hold the model together

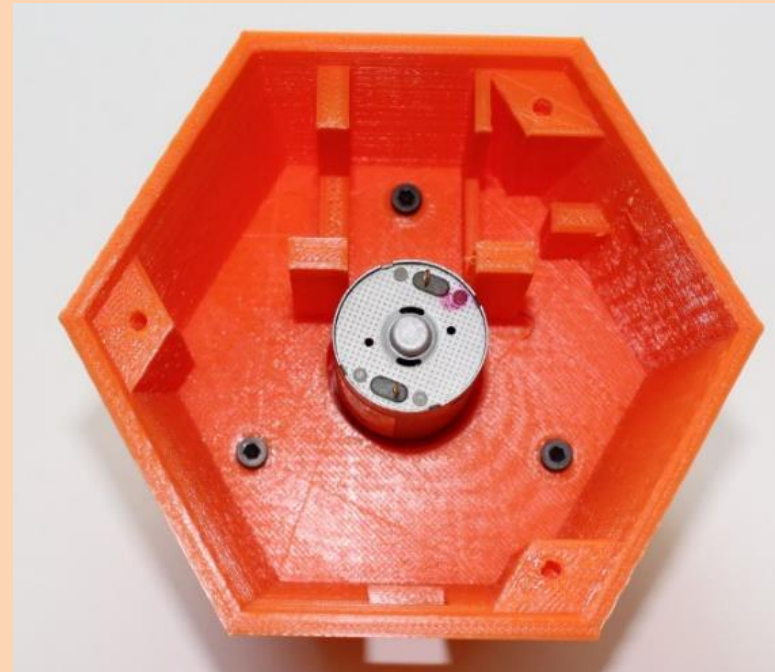


<https://www.mcmaster.com/#2548a12/=18wvpuo>

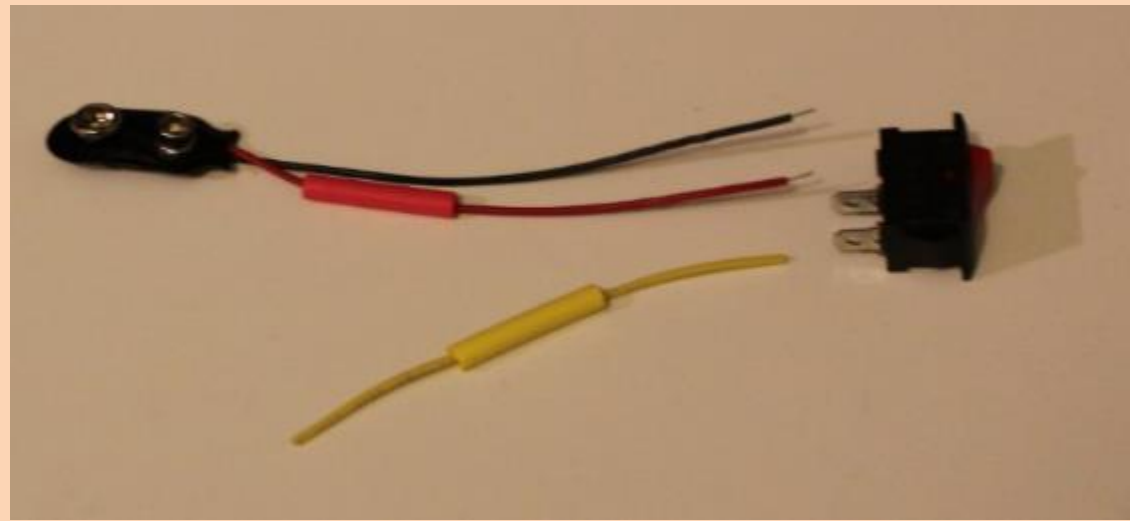
<https://www.mcmaster.com/#27175a511/=18wvqpl>



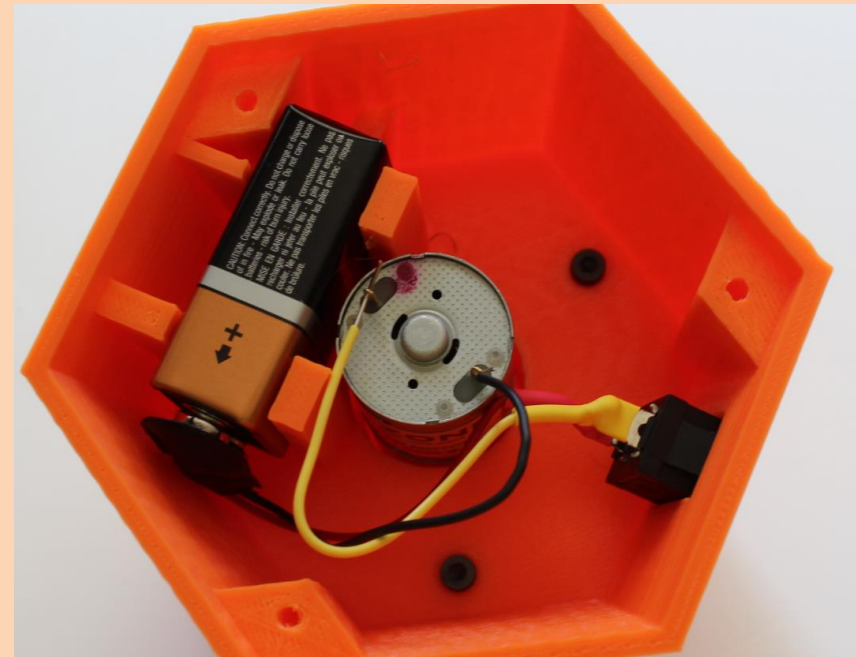
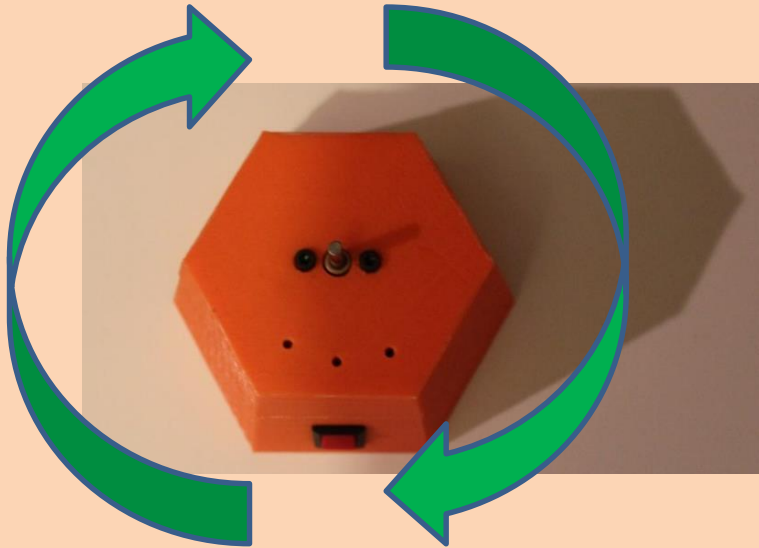
- Use screws to attach motor(23) to upperCone(29)
- Fill upperCone with ballast weight (BB's)(33)
- Screw LowerCone(30) to UpperCone(29)



- Solder Switch(22) to battery clip(10) and wire(20), place in LowerCone
- Test switch before soldering to make sure the motor is turning clockwise when seen from above
- Solder wires to motor, HeatShrink(21).

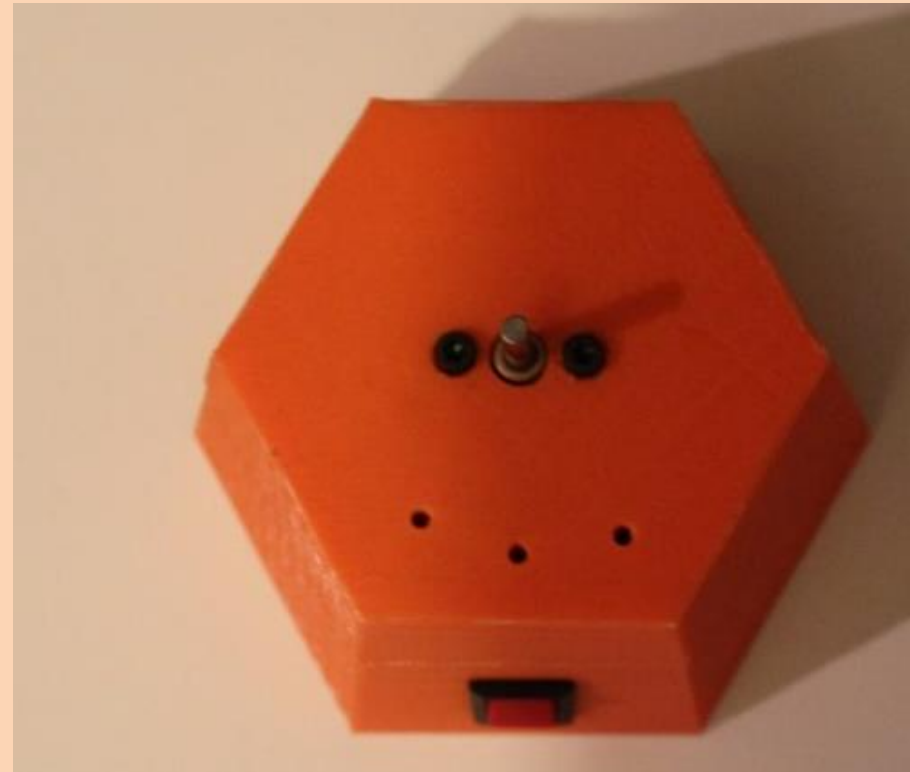
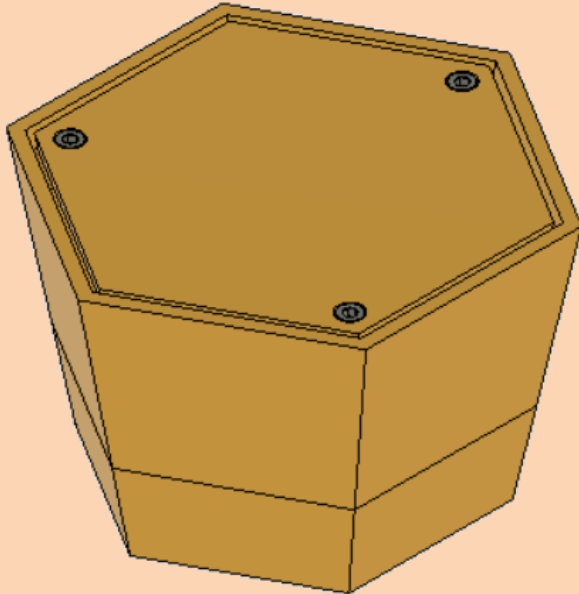


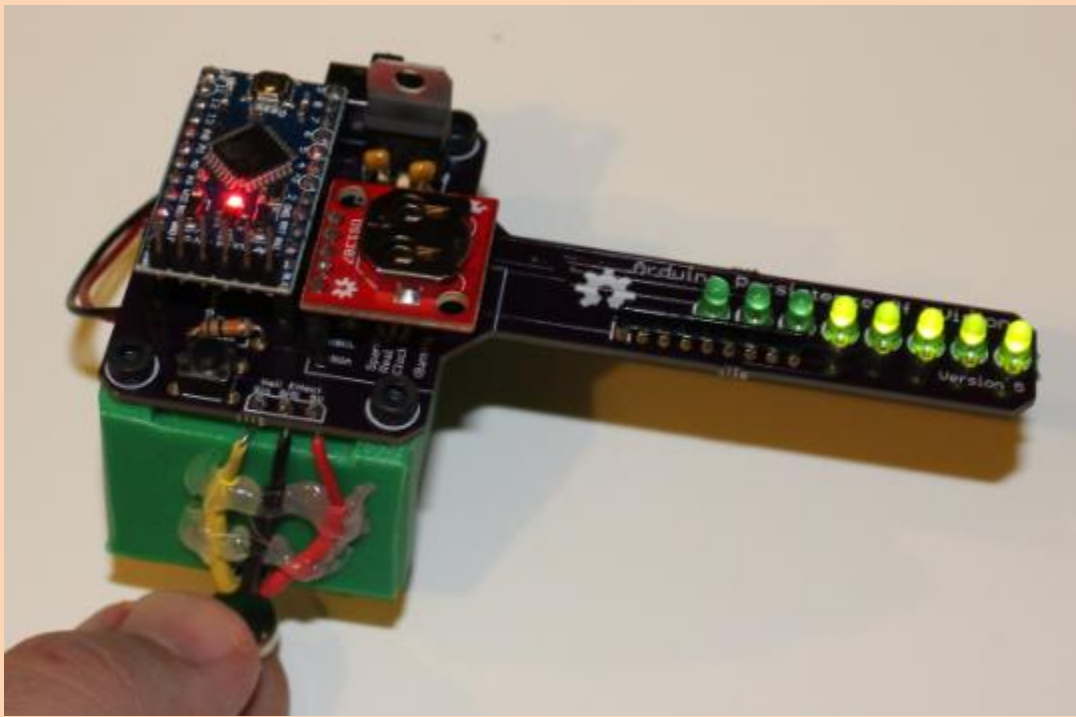
Motor Spin direction:





- Add Small baggies(34) of BB's(33) to the LowerCone
- The baggies are necessary to stop the BB's from shorting the circuit
- Screw down the baseplate (32)





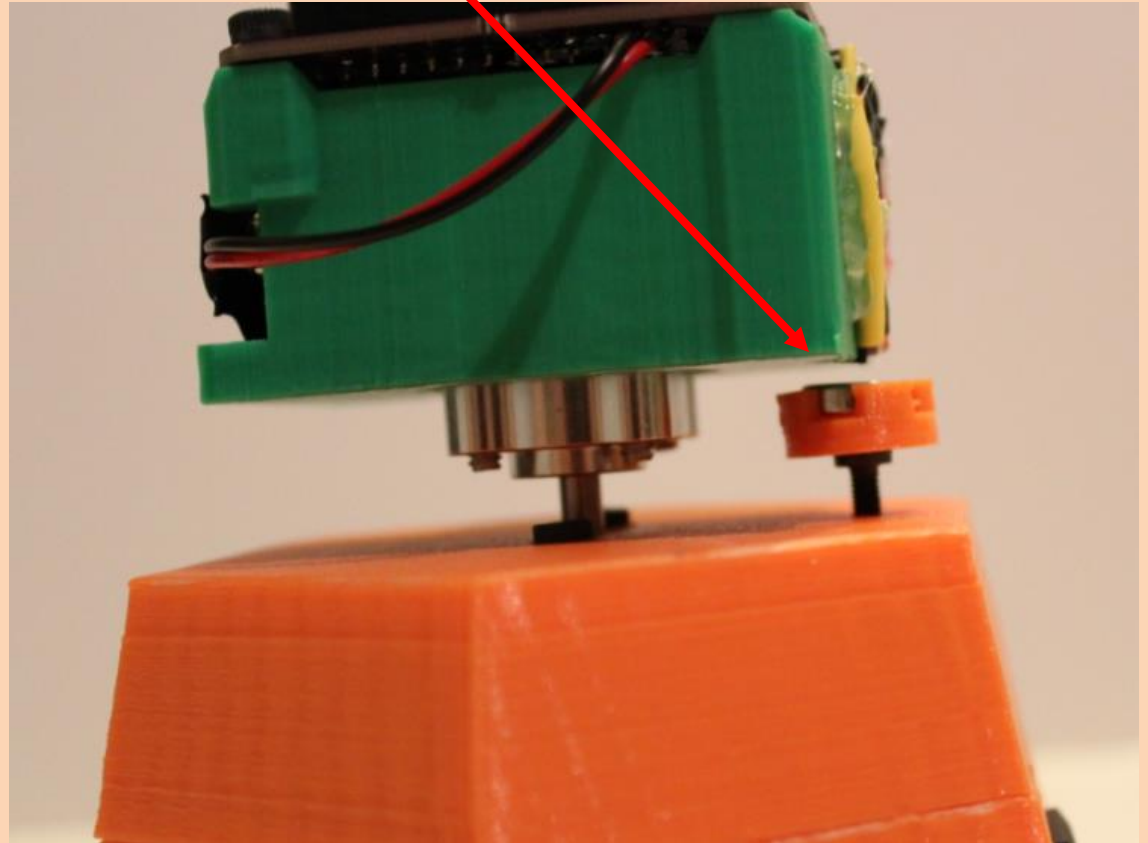
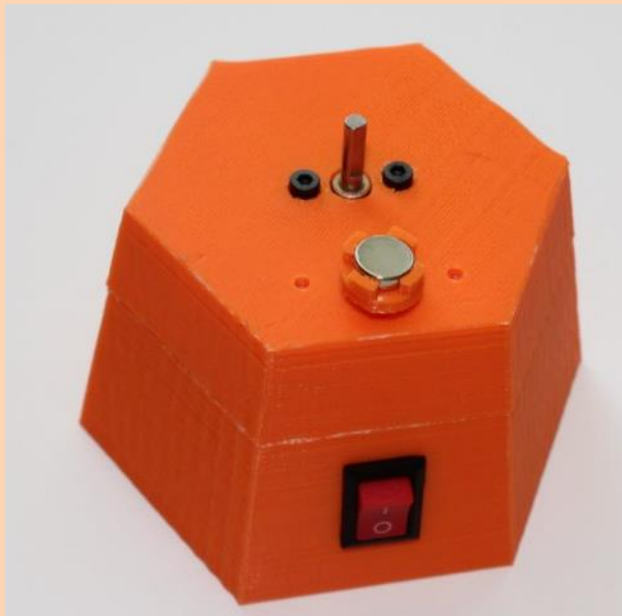
- Switch on upper segment, and hold a magnet against the hall effect sensor.
- The lights will flicker, but only on when the magnet is held upwards (one side works, the other doesn't, since the hall effect sensor only detects one polarity or something)

https://en.wikipedia.org/wiki/Hall_effect_sensor



- Press fit the magnet(27) 'working side up' into the magnet holder(31)
- Press fit screw into magnet holder

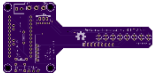

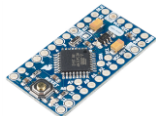





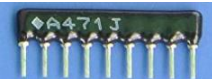



- Screw magnet holder into hole
- Attach upper part to Lower Section
- Adjust magnet to be close, but not touching



- Switch on upper part
- Switch on lower part
- It should spin and tell the time.








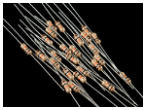



Electronics

Part #	Part	Pic	Source(s)
1	PCB		https://oshpark.com/shared_projects/5128XxVk 
2	ArduinoProMini		https://www.sparkfun.com/products/11113 
3	SparkfunRTC		https://www.sparkfun.com/products/12708 
4	LED_3MM		https://www.sparkfun.com/products/9650 
5	Rnet_470_SIP9		https://www.amazon.com/gp/product/B016MKHX7E/
6	SwitchSPST		https://www.amazon.com/gp/product/B01JUNXVA8/
7	Vreg_7805		https://www.sparkfun.com/products/107 








https://www.sparkfun.com/wish_lists/140325 <- All sparkfun parts

Electronics








Part #	Part	Pic	Source(s)
8	Cap_0.1uF		https://www.sparkfun.com/products/8375 
9	PushButton6mm		https://www.sparkfun.com/products/97 
10	Battery_Clip		https://www.amazon.com/gp/product/B01B2N0UQM/
11	HallSensor		https://www.sparkfun.com/products/9312 
12	Resistor_10K		https://www.sparkfun.com/products/11508 

https://www.sparkfun.com/wish_lists/140325 <- All sparkfun parts

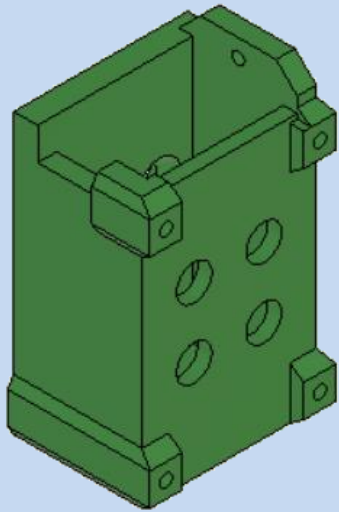
Electronics

Part #	Part	Pic	Source(s)
13	FemHeader_2		https://www.amazon.com/gp/product/B00GYRCJ2A
14	FemHeader_5		https://www.amazon.com/gp/product/B00SUXTBW2/
15	FemHeader_12		https://www.amazon.com/gp/product/B00SUXTBW2/
16-19	Male Header		https://www.amazon.com/gp/product/B015VY056I/ (cut these to size)
20	Wire		https://www.amazon.com/gp/product/B01180QKJ0/
21	HeatShrink_7856K 13		https://www.mcmaster.com/#catalog/123/849/=18wc7l7 (7856K13) McMASTER-CARR.
22	RockerSwitch_SPS T_6A		https://www.amazon.com/gp/product/B009751Y3Q/

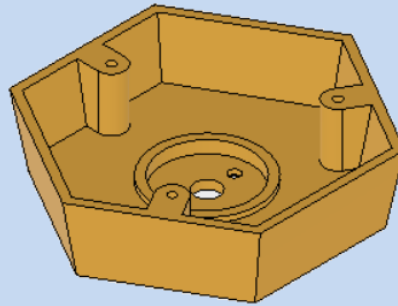
Hardware and Mechanical Parts

Part #	Part	Pic	Source(s)	Price X QTY
23	638358: 970 RPM Econ Gear Motor		https://www.servocity.com/970-rpm-econ-gear-motor	14.99 SERVOCITY
24	545568: 4mm 0.770" Pattern Set Screw Hubs		https://www.servocity.com/770-set-screw-hubs#348=96	\$4.99 SERVOCITY
25	91771A146 6-32 Flat Head Phillips Machine Screws 0.375" (3/8)		https://www.servocity.com/6-32-flat-head-phillips-machine-screws#371=260	\$0.15 X 4 SERVOCITY
26	91290A111 M3 X 6mm Black-Oxide		https://www.mcmaster.com/#91290a111/=18ruyd5	\$8.02 McMASTER-CARR.
27	10MM x 3MM Magnet		https://www.amazon.com/gp/product/B01MFHNNHW/ref=oh_aui_search_detailpage?ie=UTF8&psc=1	\$29.99 On sale for \$10.00 McMASTER-CARR.
33	6000 Copper Coated BBs Cal. 4.5mm in a Bottle (Used as ballast to make lower portion heavy)		https://www.amazon.com/Crosman-Copperhead-Copper-Coated-Bottle/dp/B000HKKY7M	
34	Baggies		https://www.amazon.com/ZIPLOCK-ASSORTED-SIZES-CLEAR-BAGGIES/dp/B00XD2P21Y	

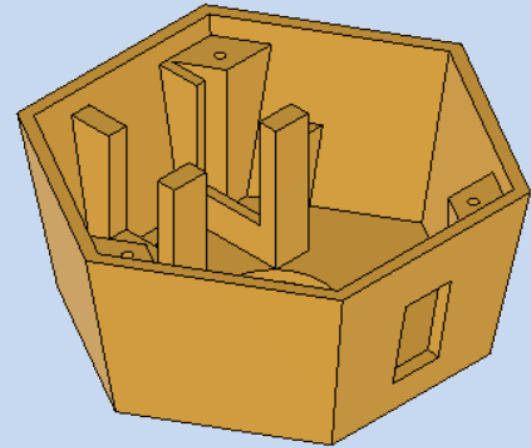
3D Printed



28.UpperPart_3DPrint



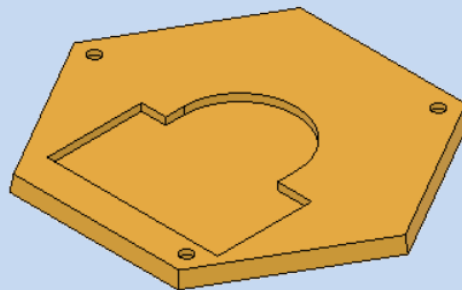
29.LowerCone_3DPrint



30.UpperCone_3DPrint



31.MagnetHolder_3DPrint



32.BasePlate_3DPrint

I used no platform adhesion on 28,31,and 32

Quality	
Layer height (mm)	<input type="text" value="0.1"/>
Shell thickness (mm)	<input type="text" value="1.2"/>
Enable retraction	<input checked="" type="checkbox"/> ...
Fill	
Bottom/Top thickness (mm)	<input type="text" value=".9"/>
Fill Density (%)	<input type="text" value="20"/> ...
Speed and Temperature	
Print speed (mm/s)	<input type="text" value="50"/>
Printing temperature (C)	<input type="text" value="210"/>
Bed temperature (C)	<input type="text" value="60"/>
Support	
Support type	<input type="text" value="None"/> ...
Platform adhesion type	<input type="text" value="None"/> ...
Filament	
Diameter (mm)	<input type="text" value="1.75"/>
Flow (%)	<input type="text" value="100"/>

Tools used

Part	Pic	Source(s)	Price X QTY	Purpose
Ball-End L-Keys (57185A11)		https://www.mcmaster.com/#57185a11/=18rv5oa	0.82 McMASTER-CARR.	Tighten hex head screws
Tap Wrench (2548A12)		https://www.mcmaster.com/#2548a12/=18wvpuo (Cheaper versions on amazon – search “m3 tap”)	55.19 McMASTER-CARR.	Make Tapped holes
M3 Tap (27175A511)		https://www.mcmaster.com/#27175a511/=18wvqpl	17.28 McMASTER-CARR.	Make M3 Tapped holes
1500 Watt Dual Temperature Heat Gun (572°F/1112°F) 120V 6.6 and 12.1 Amps		https://www.amazon.com/gp/product/B0053U2B8G	19.99	Use on heat shrink to shrink it.
LP Wire Stripper, Wire Stripping Tool 8-Inch Self-adjusting Cable Stripper		https://www.amazon.com/gp/product/B01GHDAGKC	29.99	Strips wires easier than pliers. Useful if you do a lot of wire stripping.
General Tools 482 Swivel Head Deburring Tool with Metal Handle		https://www.amazon.com/gp/product/B00004T828	8.92	This scrapes the brim from 3D printed parts in seconds.
Performance Tool W5752 2-Piece Razor Scraper Set		https://www.amazon.com/gp/product/B004HH58TA	11.49	This helps remove stuff from the 3D Printer
SparkFun FTDI Basic Breakout - 5V		https://www.sparkfun.com/products/9716	14.99 	Programs the Arduino pro mini