

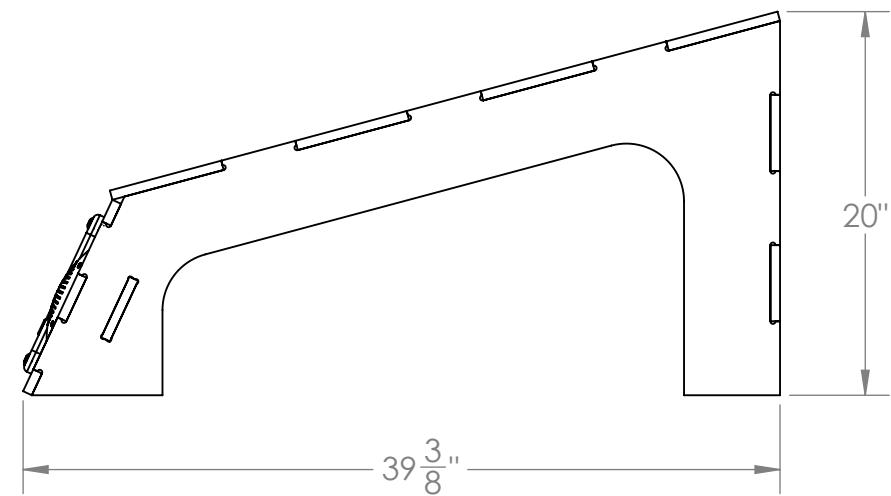
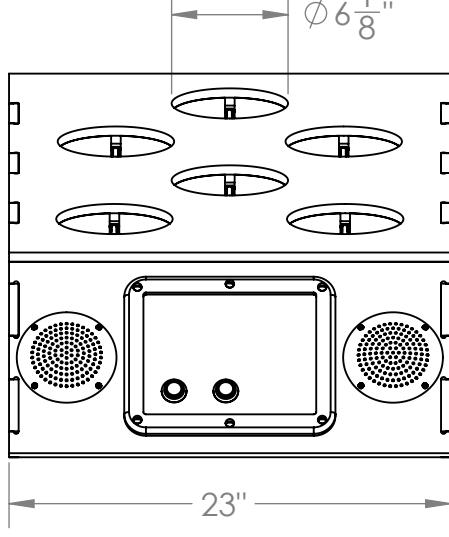
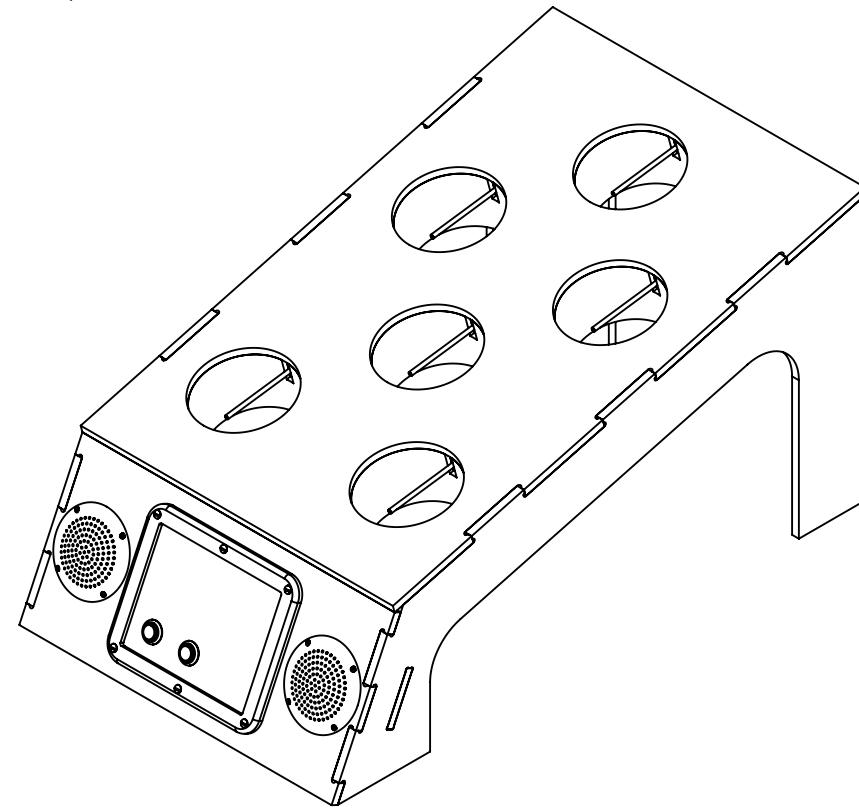
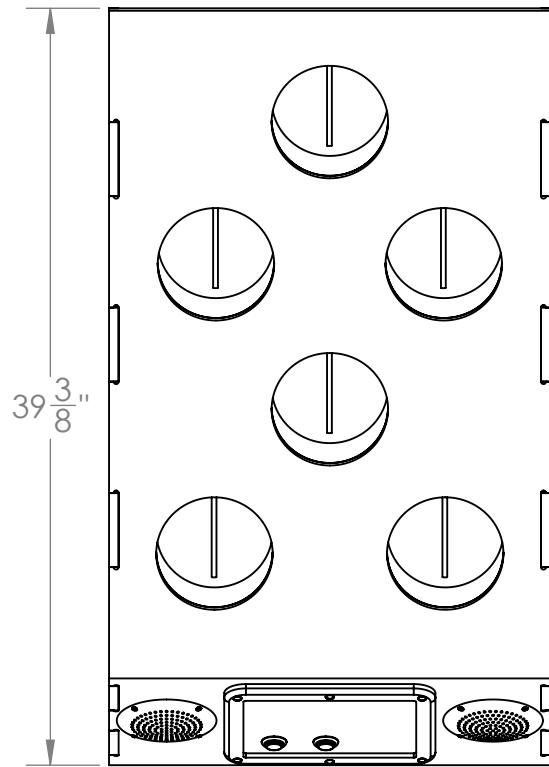
# Electric Cornhole Game

Featuring the Intel® Galileo Gen 2 Development Board

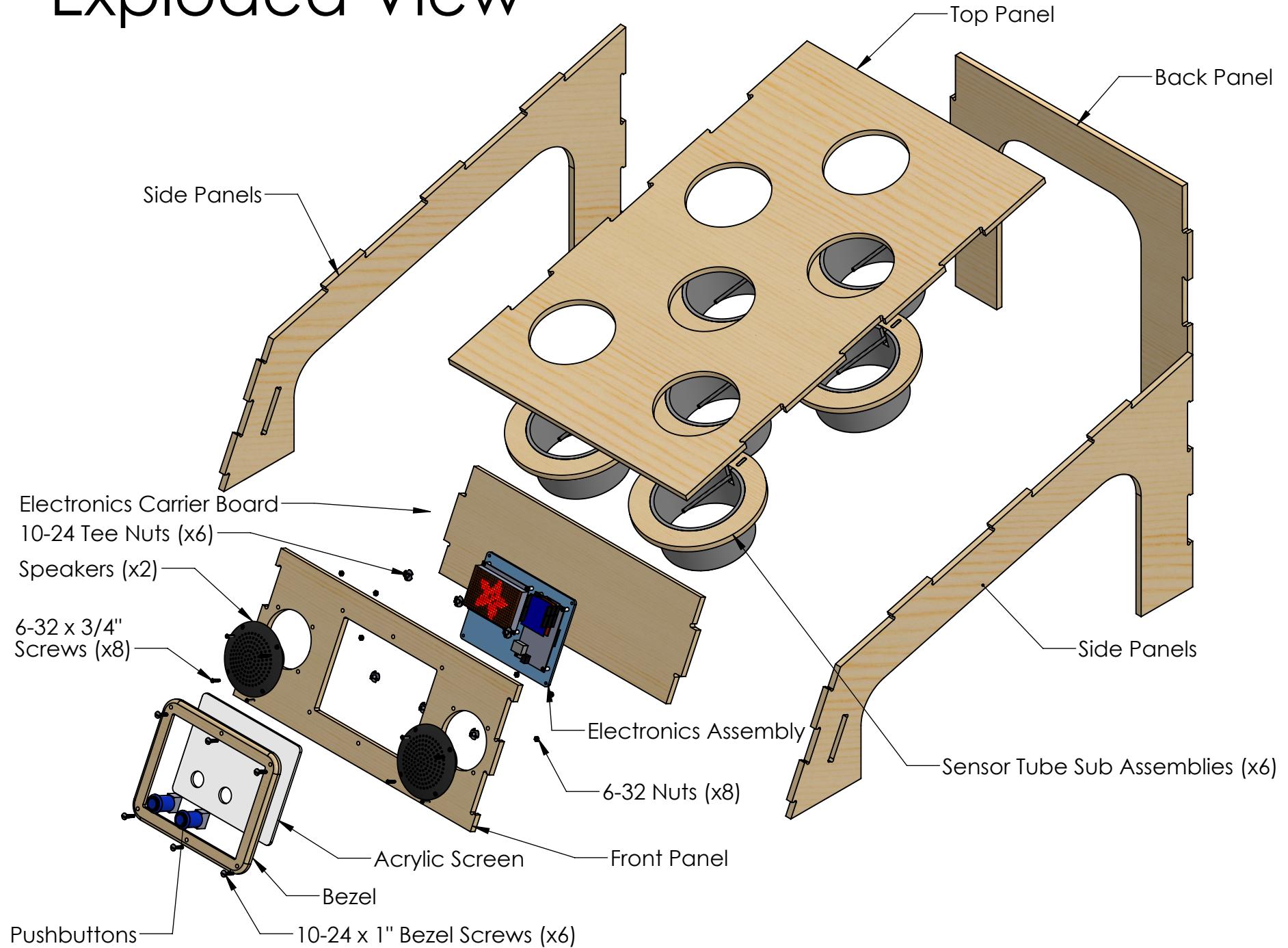
## Building Guide



Electric Cornhole, Overall Dimensions

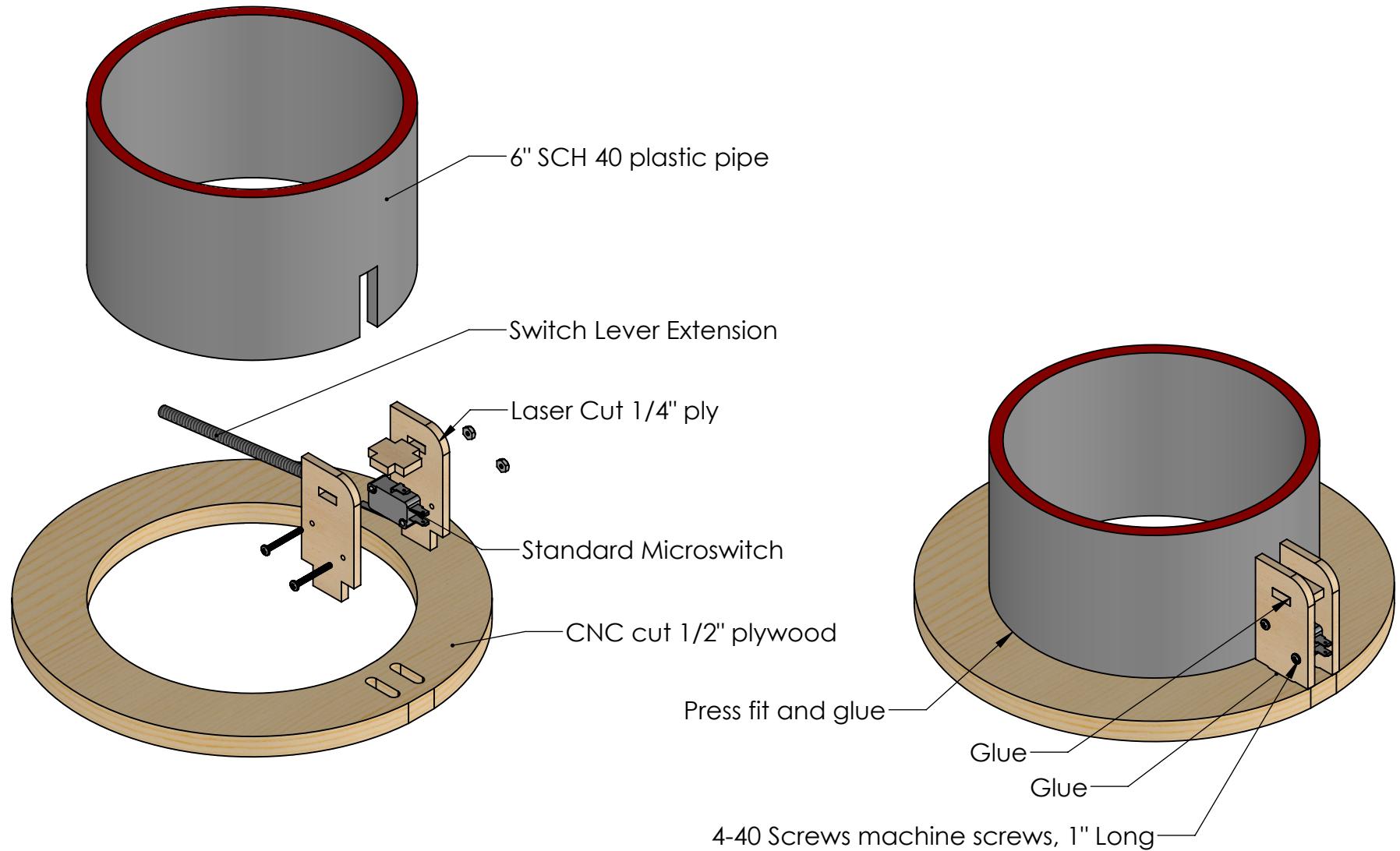


# Exploded View



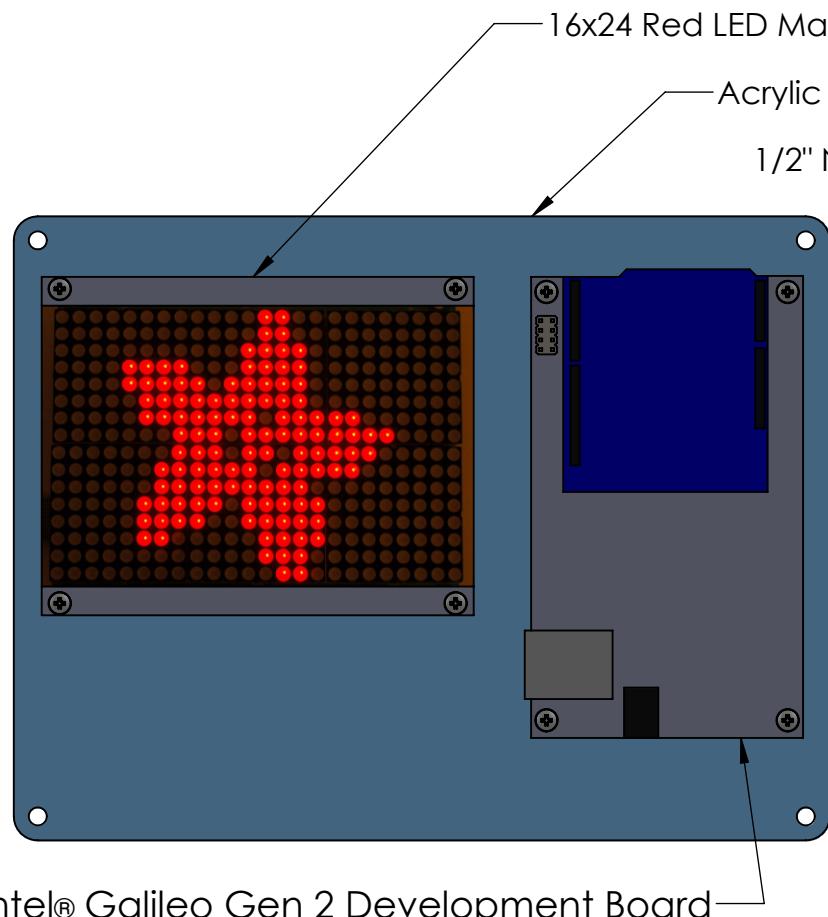
# Sensor Tube Assembly

Total 6 pieces, all identical copies.



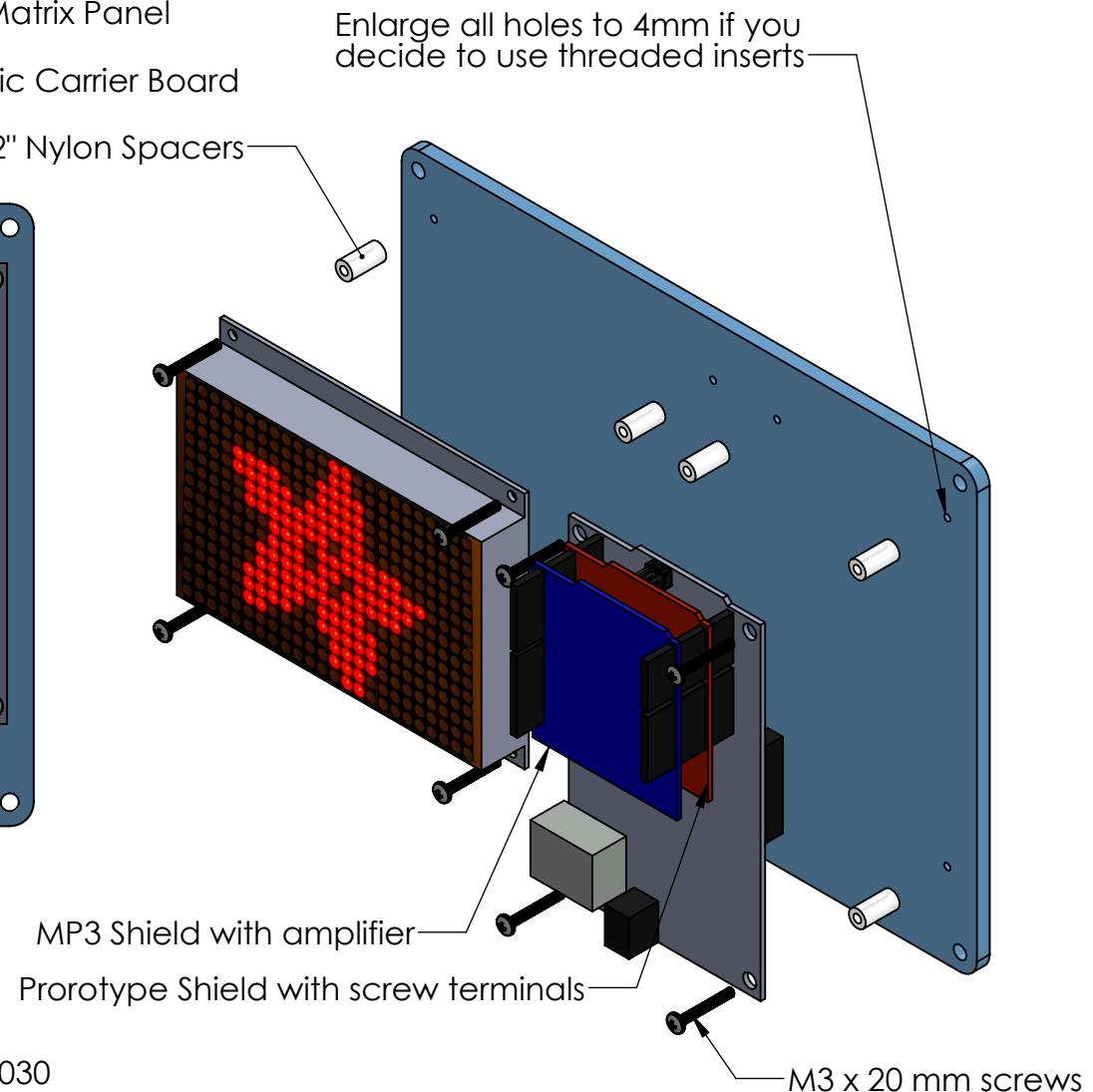
# Electronics Carrier Board Assembly

Acrylic carrier board can be laser or CNC cut



Intel® Galileo Gen 2 Development Board

Mount the electronics using M3 screws and 1/2" long nylon spacers. Screws should easily thread in to plastic without tapping. Alternatively, drill holes out to 4 mm and use McMaster Part 94510A030 threaded inserts which can be pressed in with a hot soldering iron.

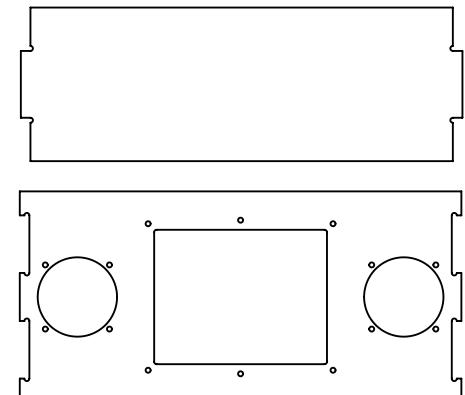
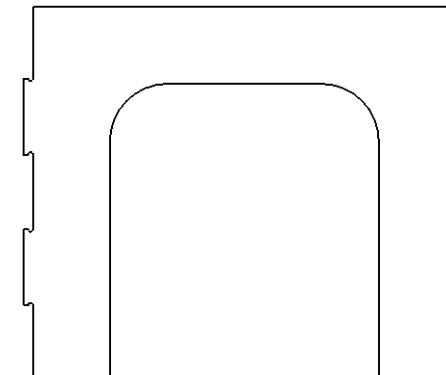
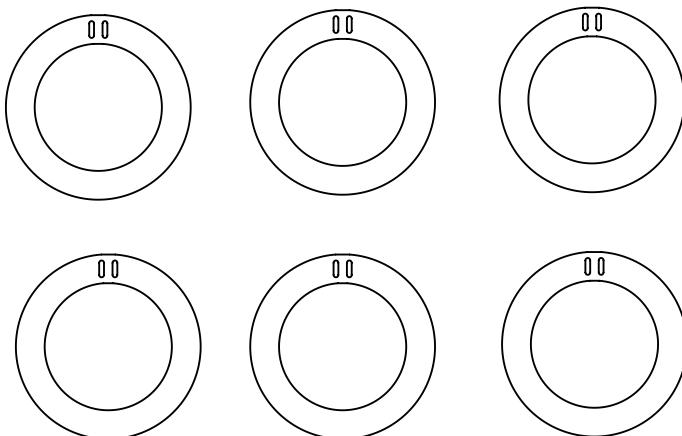
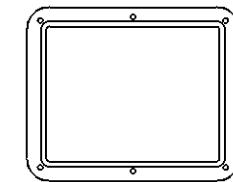
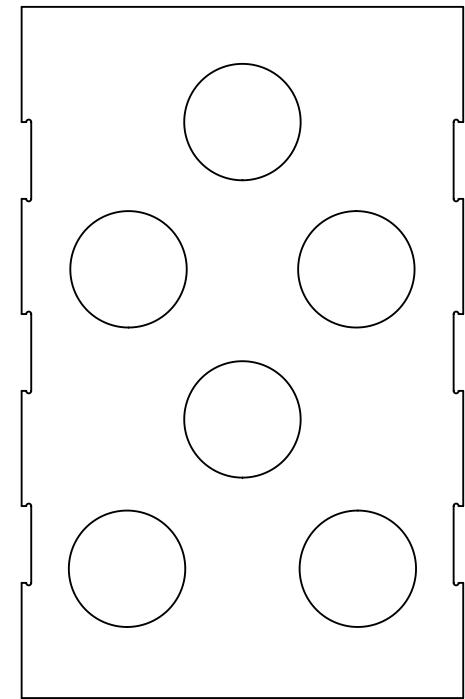
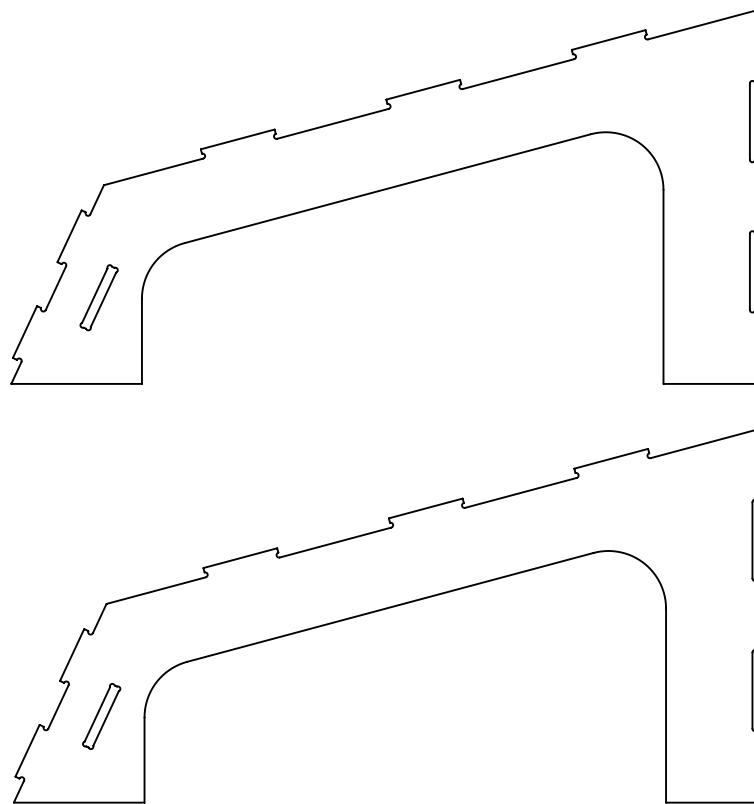


See photos for additional details - Actual products may vary slightly from these illustrations

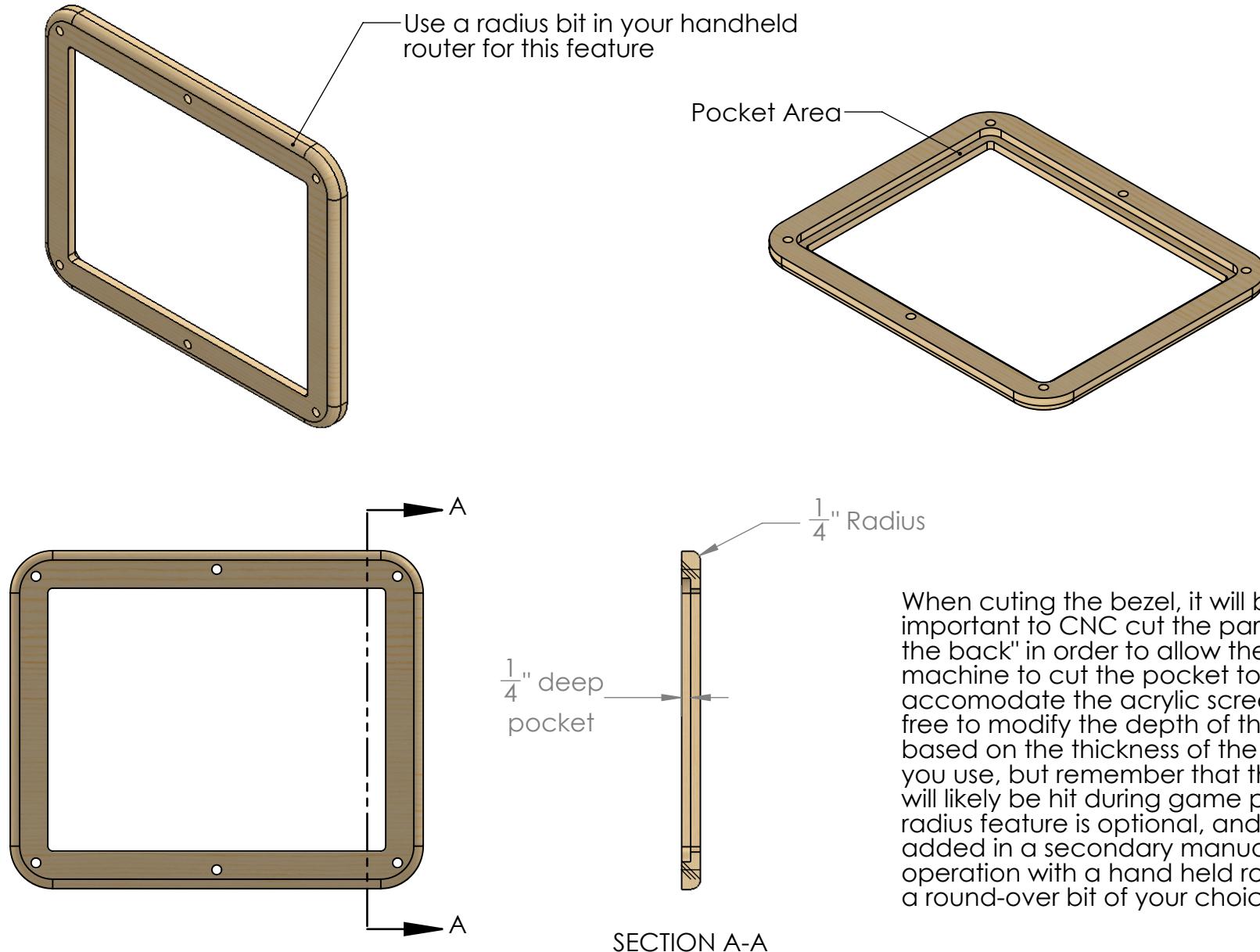
# 1/2" Plywood CNC Routed Parts

## Shop Notes:

For best results, use a high quality 1/4" diameter router bit. For the bezel, it will be important to machine it "from the back" since there is a shallow pocket to accomodate the clear acrylic protective screen. To improve the overall quality of the build, use a radius bit in your hand-held router to put a round edge on the bezel. Depending on thickness tolerances of the plywood you use, it also may be advisable to use a flush-trim router bit to remove any protruding edges after assembly. These files are available as a DXF file for importing in to most CAM software.

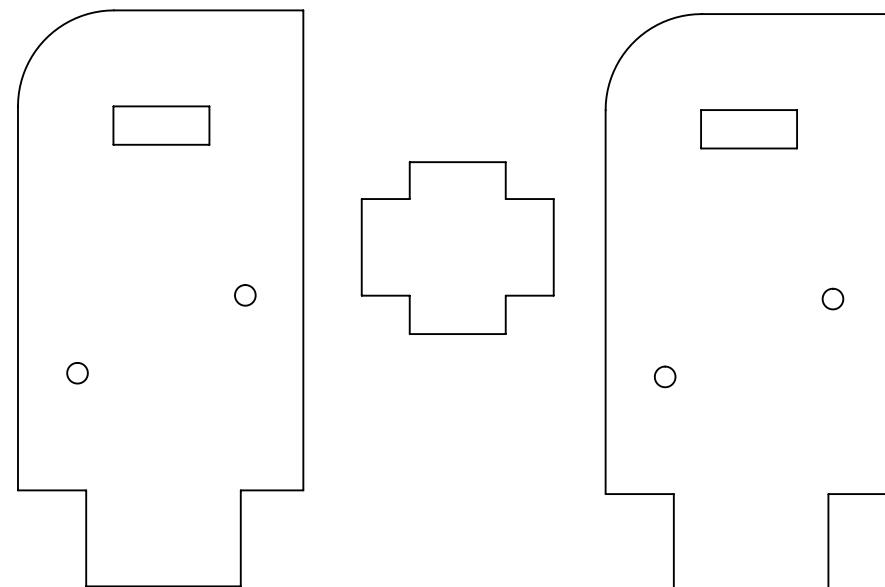
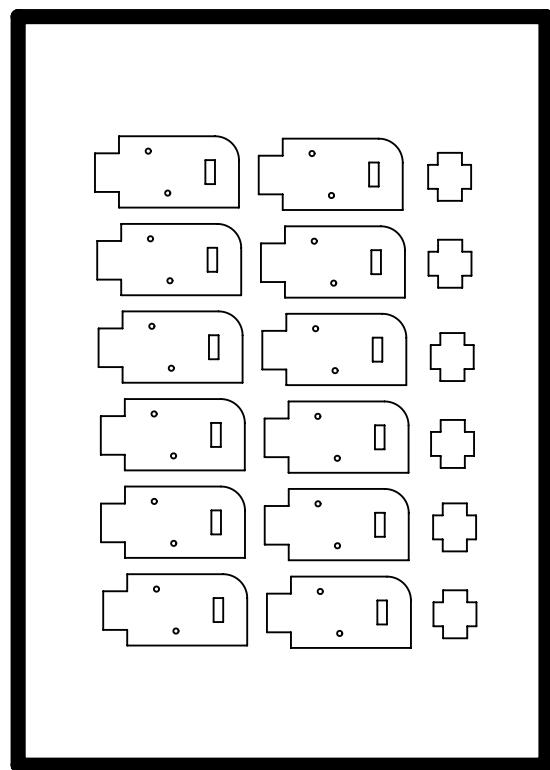


# Bezel Notes



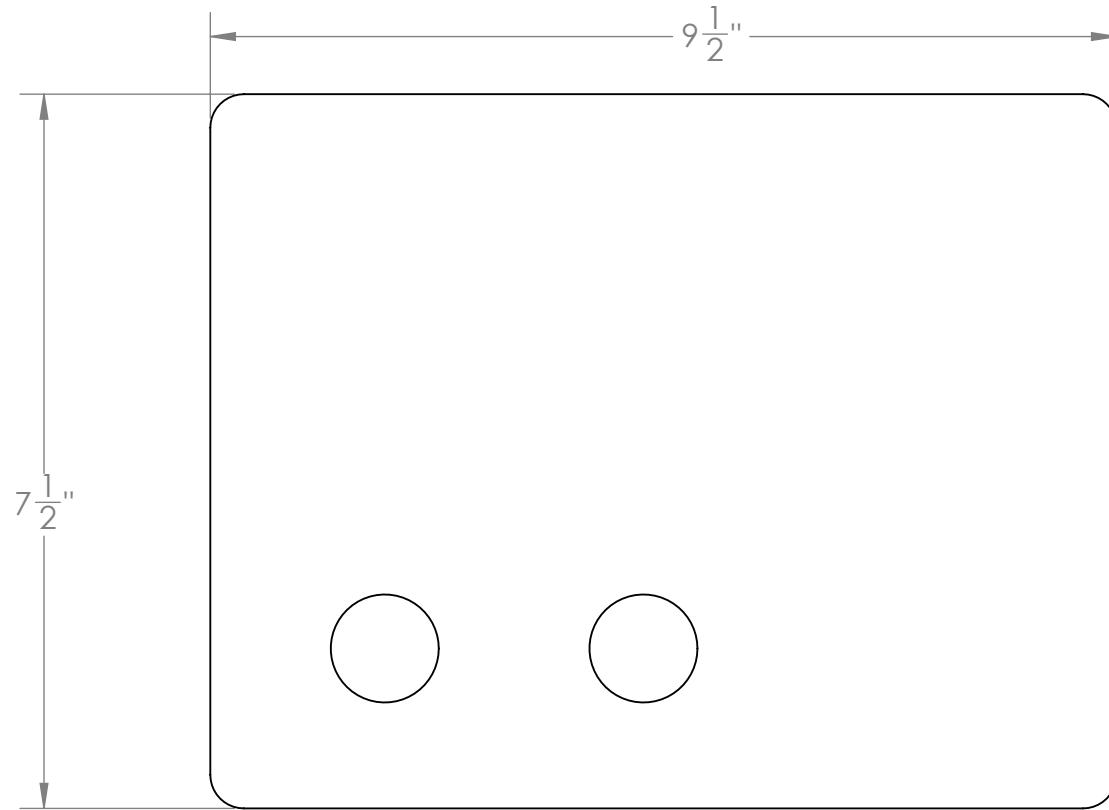
Laser Cut Parts, 1/4" plywood  
Switch mounting parts

Laser cut SIX of these sets (one for each sensor tube)



# Acrylic Screen

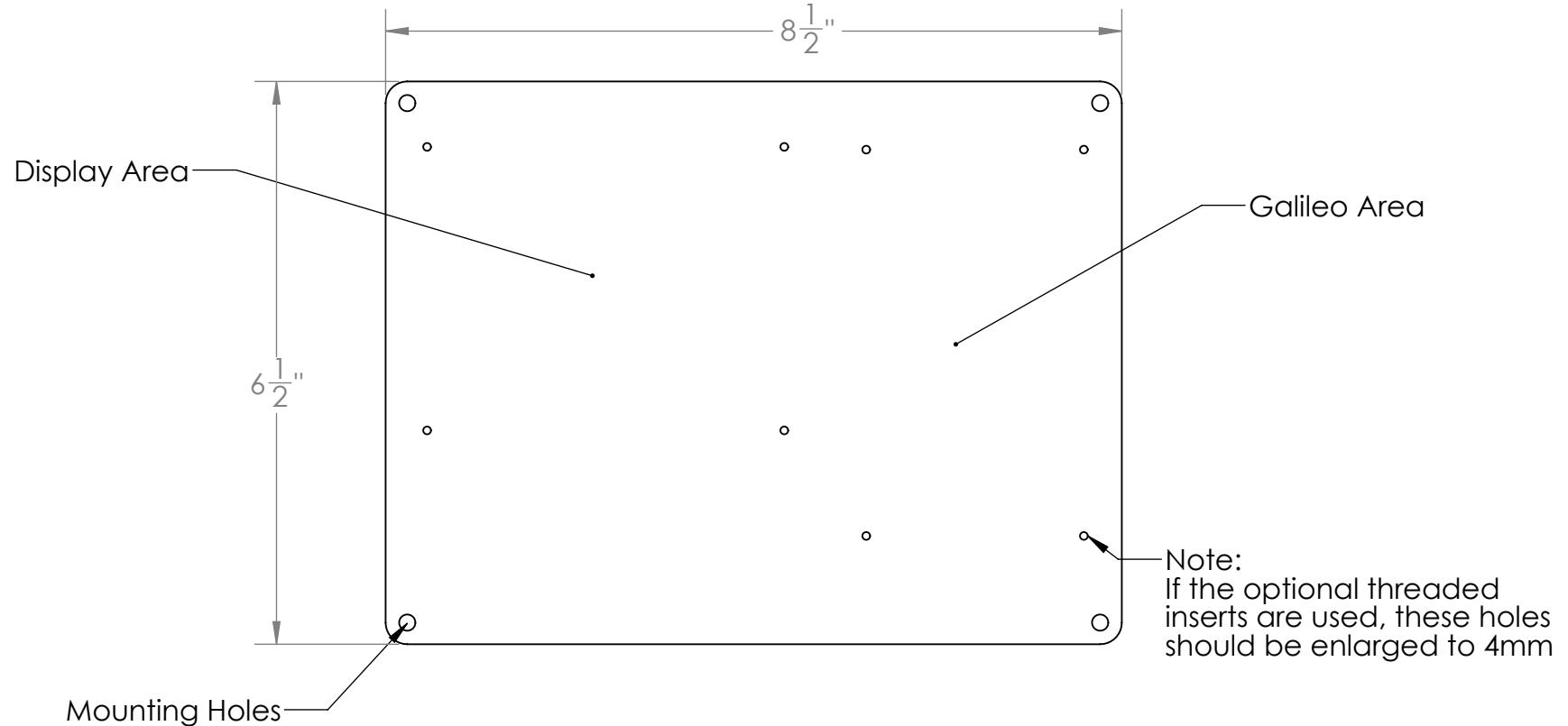
1/4" to 1/8" thick clear acrylic, laser cut or CNC Routed



This piece of acrylic can be laser cut or CNC routed from any piece of transparent material, up to 1/4" in thickness, provided it will be able to withstand the impacts of beanbags or other abuse that may be directed towards it. Please adjust the depth of the pocket in the bezel to accomodate whatever thickness you end up using. Holes for control buttons can be changed to suit whatever hardware you choose. Holes are currently sized for SUZO-HAPP pushbuttons, specifically the common 58-91xx series horizontal microswitch variety.

# Acrylic Electronics Carrier Board

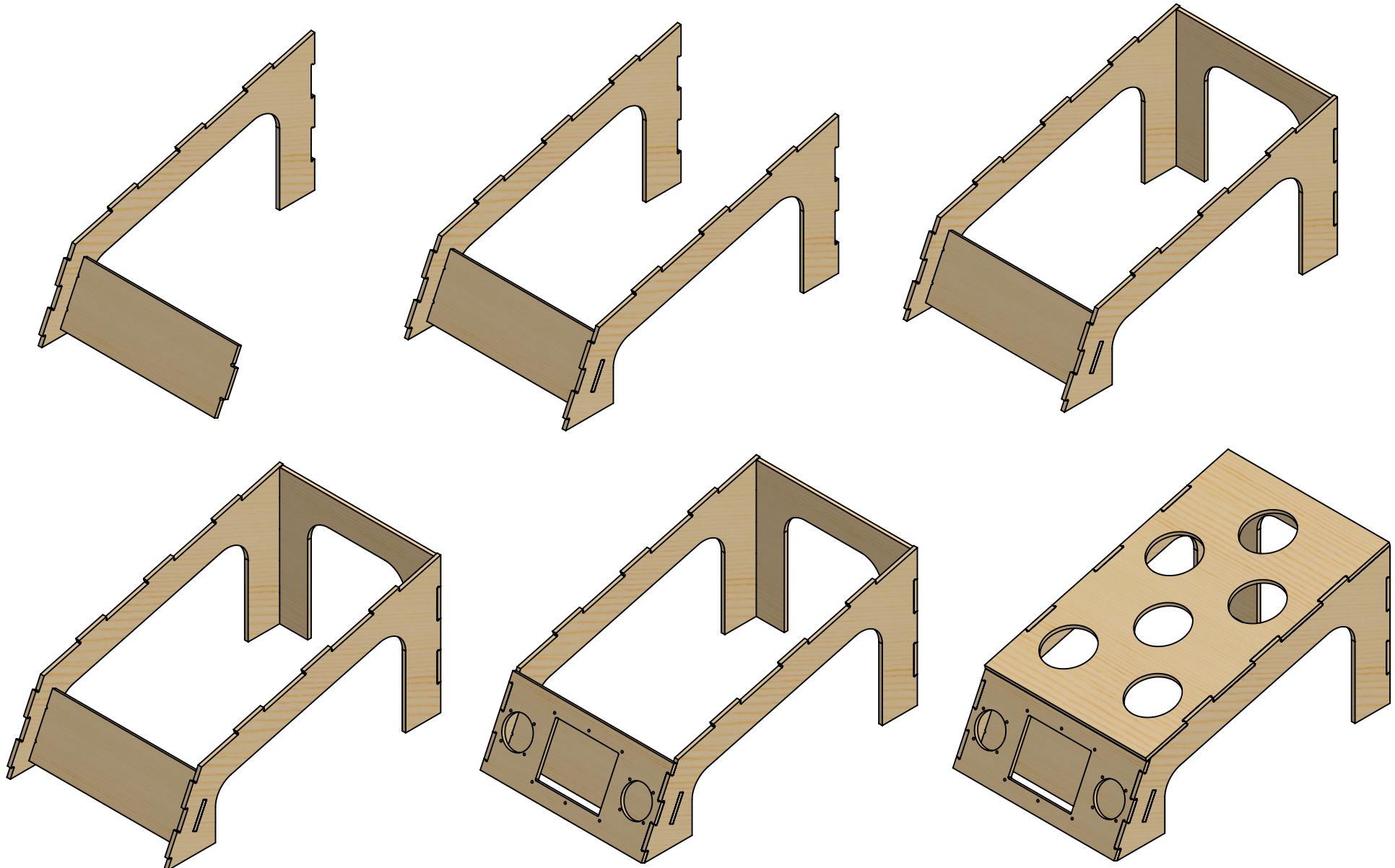
1/4" to 1/8" thick clear acrylic, laser cut or CNC Routed



Fasten the circuit boards to the carrier board with M3 screws and appropriate stand-offs. It is advised to leave a small gap behind the Galileo to improve cooling. This part can be laser cut or CNC routed from any piece of acrylic material, or omitted entirely, in which case the circuit boards are screwed directly to the wood with the fastener of your choice. The M3 screws specified should easily thread in to the plastic without any tapping, however for a more secure and professional attachment, use plastic at least 1/4" thick, enlarge the holes to 4mm and use the optional threaded inserts specified in the Bill of Materials. Threaded inserts are carefully pressed in to the plastic using a hot soldering iron. Be careful to observe their front and back directions.

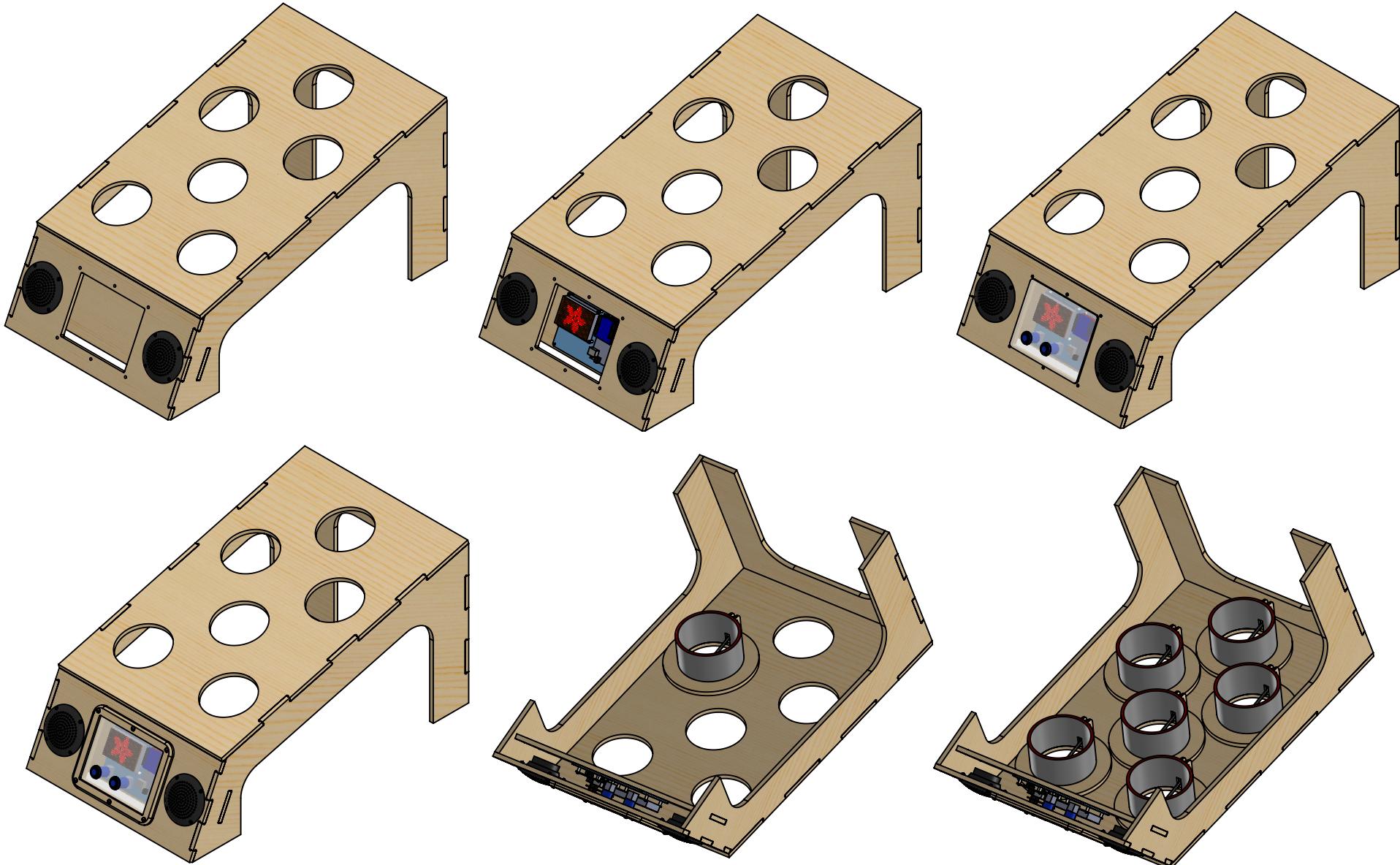
# Base Assembly Steps

Assemble the main base in this order using wood glue and clamps. A soft rubber mallet will be helpful for fitting the parts together. No screws or nails should be required in this stage of the project.



# Base Assembly Steps

Mount speakers with nuts and bolts. Use tee nuts in the main panel for mounting the bezel. Use double sided tape or screws to mount the electronics panel. Use glue or 3/4" long wood scrwes to mount the sensor tubes. Mount buttons of your choice in the acrylic screen.



# Electronics & Firmware Notes

This software is designed to work on the Intel Galileo Rev 2 along with an Adafruit amplified MP3 Shield and an Adafruit Ptotu Screw Shield and an HT1632C 16x24 LED Matrix

<http://www.adafruit.com/product/2188> - Intel Galileo R2  
<http://www.adafruit.com/products/1788> - Adafruit amplified MP3 Shield  
<http://www.adafruit.com/product/196> - Proto Screwshield / Wingshield  
<http://www.adafruit.com/products/555> - HT1632C 16x24 LED Matrix

In addition to the major electronic components, six microswitches will be required along with two pushbuttons for selecting game type.

These components can be sourced from any vendor, but some minor adjustments to the code, particularly pin assignments, may be required. This exercise is left to the student.

The SD and SPI libraries are probably included with the defaule Galileo libraries. Download and install the HT1632C 16x24 LED Matrix libraries from the vendor's website and take a peek at their tutorials and hookup guides as well.

No library is required for the MP3 shield, since all functionality is included in this sketch.

Please see the comments in the included Arduino sketch for more detailed information.

# Electric Cornhole Bill Of Materials

Qty	Item	Vendor	Link / Part Number	Note
2	1/2 " Plywood Sheets, 4'x8'	Lumber Yard		Good quality!
6	6" Schedule 40 plastic pipe	Plumbing Supply		4 inch long pieces
1	1/4" thick clear acrylic, 12x24 stock	Hardware store		Screen cover, electronics mounting plate
2	FR 10 WP Speakers, 4"	Parts Express	<a href="http://www.parts-express.com/visaton-fr10wp-4-outdoor-4-full-range-speaker-4-ohm-black--292-514">http://www.parts-express.com/visaton-fr10wp-4-outdoor-4-full-range-speaker-4-ohm-black--292-514</a>	Black or white available
1	Intel Galileo Rev 2	Adafruit	<a href="http://www.adafruit.com/product/2188">http://www.adafruit.com/product/2188</a>	
1	MP3 Shield with Amp	Adafruit	<a href="http://www.adafruit.com/products/1788">http://www.adafruit.com/products/1788</a>	
1	Screw Prototype Shield	Adafruit	<a href="http://www.adafruit.com/product/196">http://www.adafruit.com/product/196</a>	
1	HT1632C LED Display Matrix	Adafruit	<a href="http://www.adafruit.com/products/555">http://www.adafruit.com/products/555</a>	
6	Microswitches	All Electronics	<a href="http://www.allelectronics.com/make-a-store/item/sms-332/3a-spdt-snap-action-switch-w/lever/1.html">http://www.allelectronics.com/make-a-store/item/sms-332/3a-spdt-snap-action-switch-w/lever/1.html</a>	CAT# SMS-332
2	"HAPP" switches, concave button	Sparkfun	<a href="https://www.sparkfun.com/products/9340">https://www.sparkfun.com/products/9340</a>	Pick any color
1	4-40 Hex Screws, 1", Box	McMaster.com	90272A115	
1	4-40 Hex Nuts, Box	McMaster.com	90480A005	
1	6-32 Screws, 3/4", Box	McMaster.com	90272A151	
1	6-32 Hex Nuts, Box	McMaster.com	90480A007	
1	10-24 Screws, 1", Box	McMaster.com	90271A247	
1	10-24 Tee Nuts, Box	McMaster.com	90975A041	
1	Insulated Barrel Quick-Disconnect	McMaster.com	7060K15	100 pack
1	Wire, 20 Gauge, 100 Feet Spool	McMaster.com	6659T64	Use any color
1	Nylon Spacers, 1/2" Long	McMaster.com	94639A106	
	M3 Screws, 20 mm long	McMaster.com	92005A128	
1	Zip Ties	Hardware Store		Assorted Sizes
1	** OPTIONAL ** Threaded inserts, One box	McMaster.com	94510A030	Electronics Board

# Electric Cornhole Required Tools

Tool	Purpose	Note
CNC Router	Production of main box panels	This is usually outsourced
Laser Cutter	For cutting of the acrylic & Switch Holders	Generally oursourced. Can also be CNC routed
Hand Router	Cleanup & Radius cuts	Flush trim & Radius bits also required
Jig Saw	Cutting of plastic pipes	Select a blade suitable for plastic
Rubber Mallet	Final fitting of panels and pipe	A regular hammer and block of wood can be used as well
Large clamps	For gluing	Straps or bungee cord can also be helpful
Wood glue	Main assembly	Any standard wood glue or construction adhesive will work
Hammer	For setting Tee nuts	These can also be pulled in with the 10-24 machine screws
Screwdrivers	Assembly	Don't use a power driver!
Small Adjustable Wrench	Assembly	Pliers may also be acceptable
Wire Cutters	Wiring	
Wire Strippers	Wiring	
Insulated Terminal Crimper	Wiring	For microswitch connections
Galileo Programming gear	Software, USB cables, power supply	See Galileo website
Soldering Iron	Wiring, Insert setting (optional)	