Assembly Instructions

ACP3 Primary Helm Control Panel for Artemis Spaceship Bridge Simulator

(Assembly ACP3-H-PRI)

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Appendix – cut-out template for mounting control panel

1.0   Introduction and Scope

The purpose of this guide is to help the reader assemble and begin using the ACP3 primary helm control panel for *Artemis Spaceship Bridge Simulator* (Artemis SBS). This control panel and others like it are not required to play Artemis SBS. However, some people may find the inclusion of this optional hardware enhances the gameplay experience.

This guide assumes that the reader has a functional ACP3 controller unit (assembly ACP3-X-CTL), Windows PC[1], and Artemis SBS host software configured to play the Helm station. This guide assumes that the reader has all of the ACP3-H-PRI kit parts as well as the tools and supplies outlined in Section 3.0. This guide also assumes that the reader is skilled in the use of the recommended tools. The appearance and quality of the assembled kit will depend on the skill and diligence of the reader in carefully assembling the parts using these tools and supplies.

This guide contains information useful for the following purposes:
- Careful handling and preservation of the kit parts to ensure future control panel functionality (Section 2.0)
- Kit part inventory and gathering of recommended tools and supplies for assembly (Section 3.0)
- Recommended steps to prepare and assemble the parts for use (Section 4.0)
- Plugging control panel into controller to enable use playing Artemis SBS (Section 5.0)
- Updating controller software to improve control panel performance and functionality (Section 6.0)
- Troubleshooting common problems using the control panel (Section 7.0)
- Cutting out a hole to mount the control panel to custom-built furniture (Appendix)

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[1] while other operating systems and hardware may support Artemis SBS, the author has no experience with them

2.0   Important Information

The ACP3-H-PRI kit contains various components that are sensitive to physical and electrical damage. The following precautions are recommended to protect these components against damage that would prevent their intended use.

- when handling circuit boards and other electronic components, ground hands to mounting hardware or other connected non-electronic parts to prevent static discharge to electronic components
- when handling circuit boards, handle from board edges and avoid touching conductors (metal parts other than standoffs and screws)
- make sure all sources of electric power are disconnected from controller (assembly ACP3-X-CTL) when connecting or disconnecting cables
- avoid creasing or kinking wires and ribbon cables, which can cause them to fail
- avoid straining the wire connections on the edge light assemblies (ACP3-X-LTE). These connections can become fragile with repeated bending and break
- do not apply external sources of electric power to control panel other than the power provided by the USB connection to the PC via the controller (assembly ACP3-X-CTL)
- do not hit or drop the acrylic faceplate on its edges or corners, which can lead to factures in the faceplate
- avoid tearing or straining the faceplate sticker
- when mounting the control panel to other fixtures, make sure to support the entire assembly from either the pressboard backplate or around the entire perimeter of the acrylic faceplate. Partial support can result in bending and breaking the faceplate during use

3.0   Kit Parts and Recommended Tools & Supplies

3.1   Items Required to Play Artemis SBS using ACP3-W-PRI

Item	Availability	Other Information
Artemis SBS software	online	https://artemisspaceshipbridge.com/
engineering bridge station PC	various	needed to connect controller
other bridge station PCs and LAN network	various	needed to play game, refer to Artemis SBS documentation
ACP3 controller (ACP3-X-CTL)	from kits	https://www.etsy.com/shop/AORshipyard
USB micro-B to A cable	various, office supply	

3.2   ACP3-W-PRI Kit Contents

| Item	Quantity	Other Information
pressboard backplate	1	
4-40 screws	44	
3/4-inch hex standoffs	6	
3/8-inch hex standoffs	4	
1/2-inch standoffs	12	
helm control board (ACP3-H-PR1-PCB)	1	
helm control board (ACP3-H-PR2-PCB)	1	
helm control board (ACP3-H-PR3-PCB)	1	
joystick assembly (ACP3-X-JOY-PCB)		
slider assembly (ACP3-H-SLD-PCB)		
6-position jumper cable	1	
helm panel ribbon cable (20-wire)	1	
Silicone Elastomer buttons	15	
slider knobs	2	
edge light assemblies (ACP3-X-LTE-PCB)	10	provided pre-wired
face plate (ACP3-H-PRI-FCP)	1	acrylic, laser-etched
face plate sticker (ACP3-H-PRI-STK)	1	vinyl sticker with protective backing
white diffusion film for status lights and power lights	6	various sizes

3.3   Recommended Tools and Supplies

Item	Availability	Other Information
small Philips-head screwdriver	hardware and home improvement stores	
scissors	hobby stores	
hobby knife	hobby stores	
2- or 3-inch foam paint roller	hardware and home improvement stores	
small paint brush	hobby stores	
3/4-inch black vinyl electrical tape	hardware and home improvement stores	
masking tape	hardware and home improvement stores	
white multi-surface acrylic craft paint	hobby stores	
firm scrap cardboard	notepad backing, various sources	used as supporting surface for cutting vinyl sticker
scrap wood or painter's pyramid stands	hardware and home improvement stores	used to support faceplate during painting

4.0   Assembly Instructions

Bridge builders are strongly recommended to read through all of the following instructions before beginning assembly of the kit. Several of the early steps will make more sense after reading the later steps. Also, some steps are difficult and may require others' assistance to successfully execute.
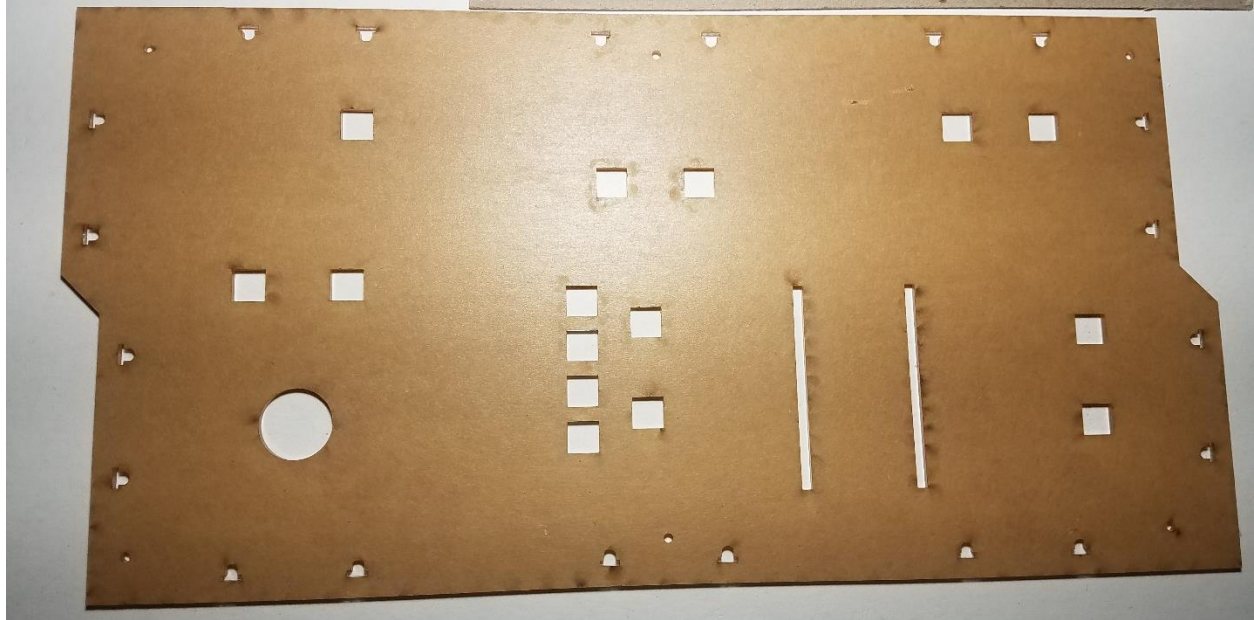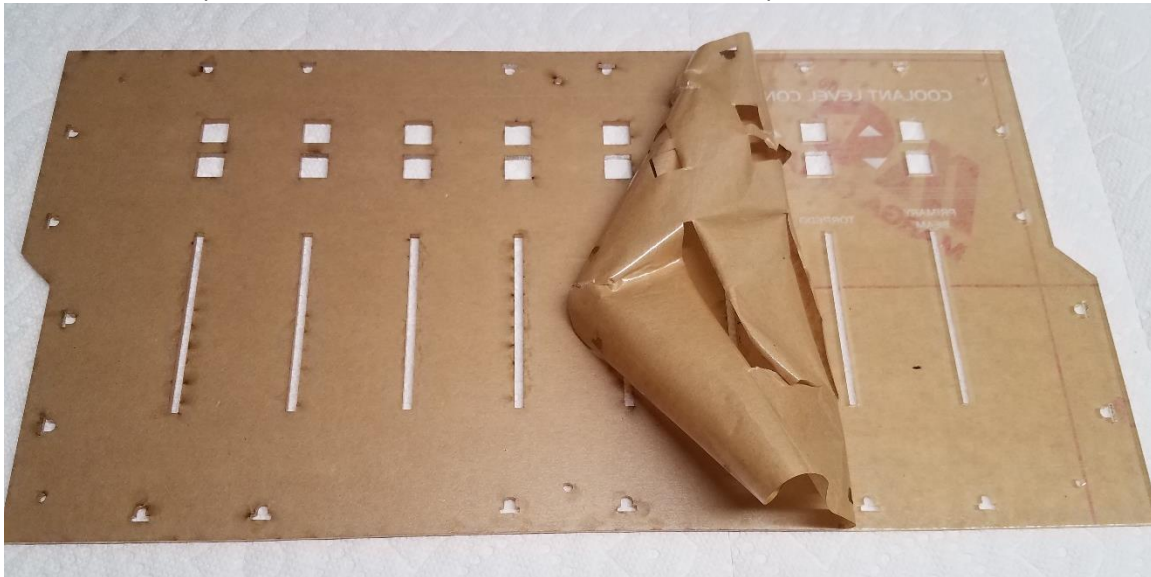
1. Gather tools and supplies.
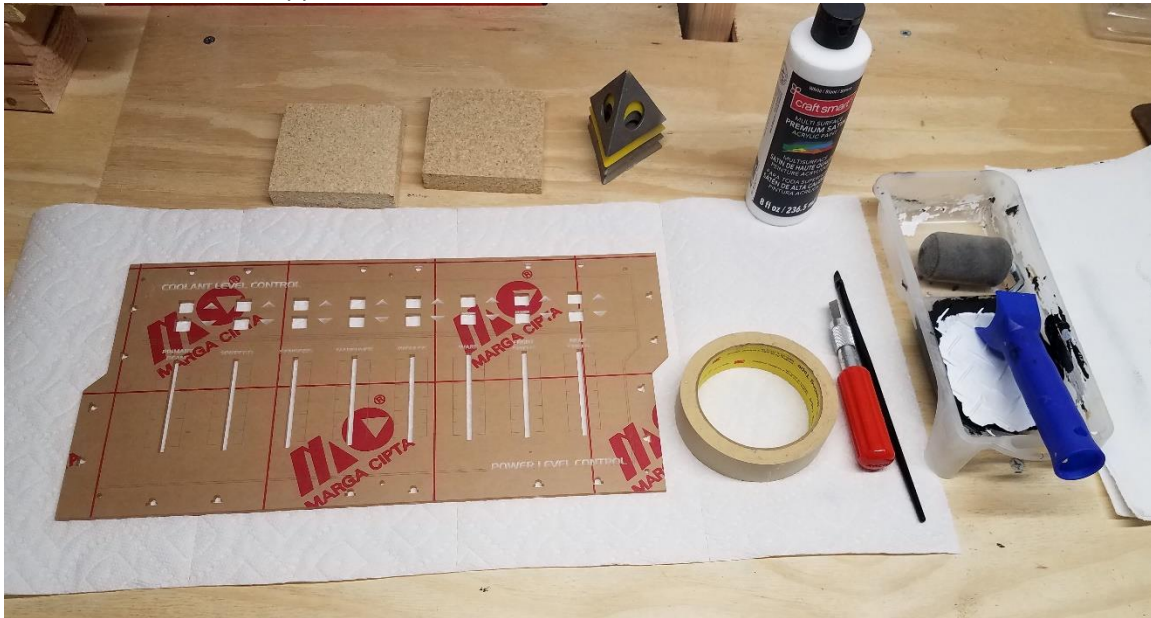
2. Inspect faceplate. The front side is the side where the text is visible through the protective paper cover.
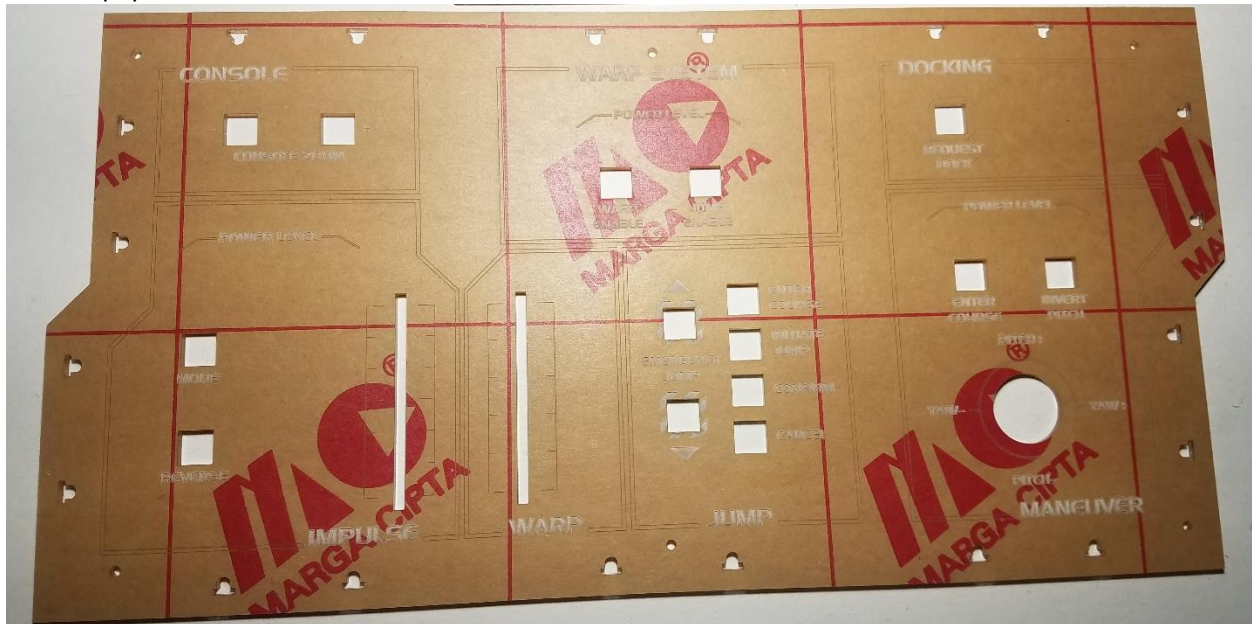
3. Turn over the faceplate to the back side. The back side has no visible text when the protective paper cover is in-place

4. Remove the protective cover from the back side of the face plate.
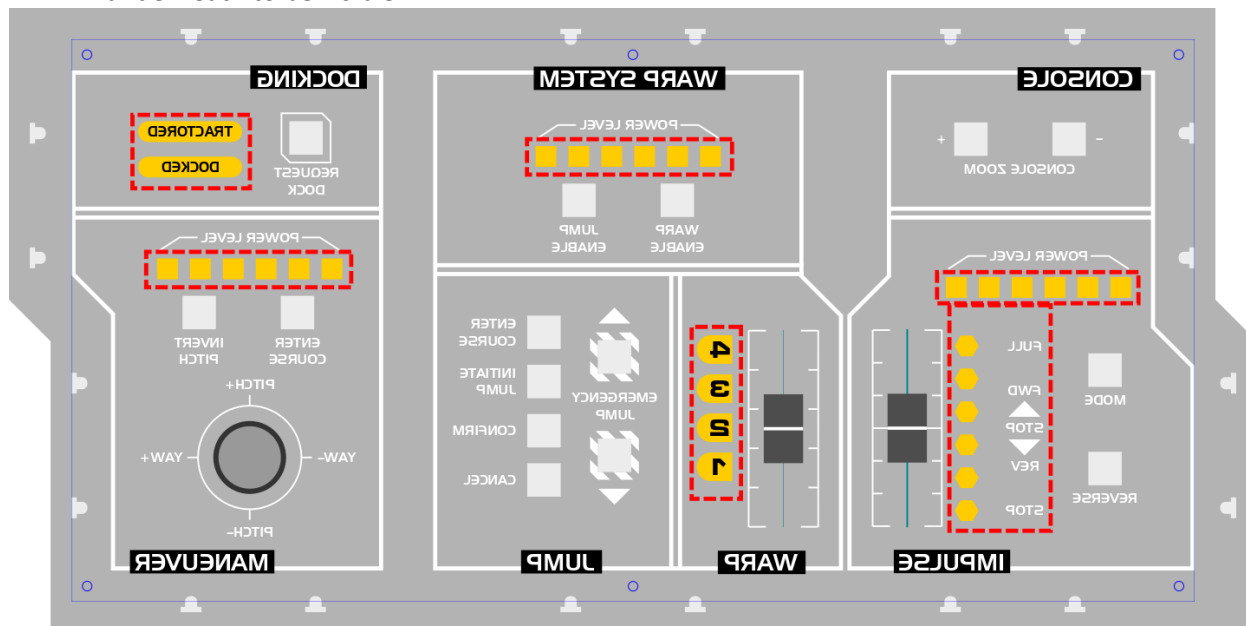
5. No protective cover should remain on the back of the faceplate. All of the protective cover should remain on the front side.
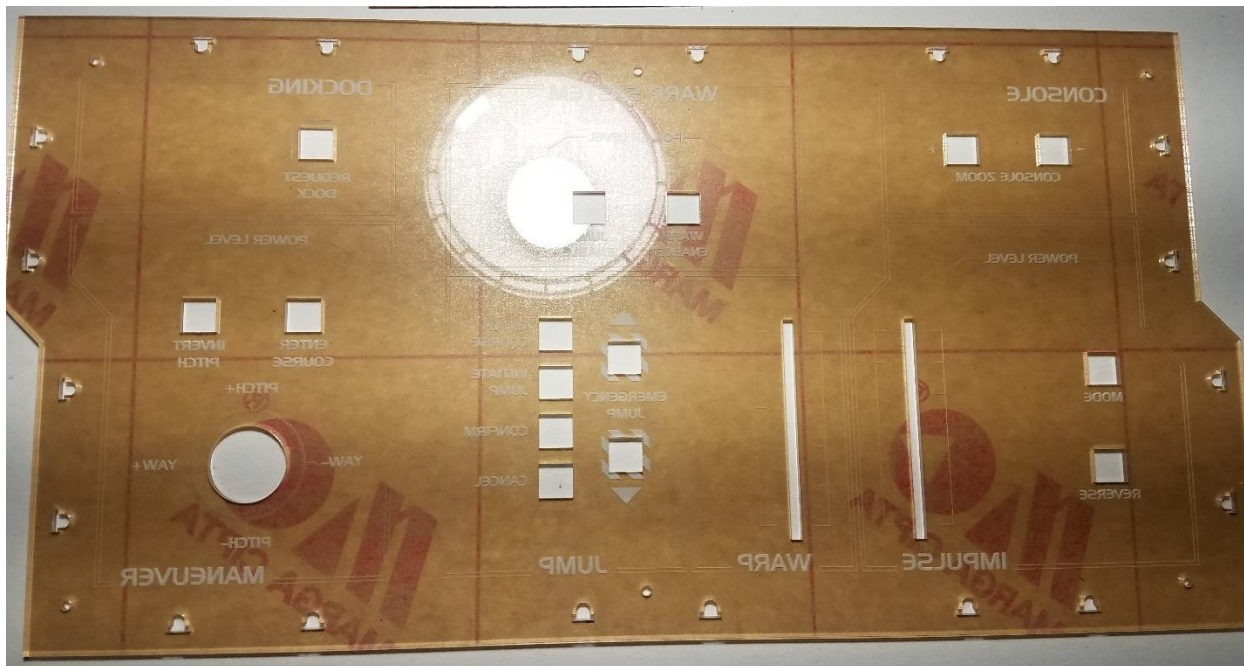
6. Firmly place masking tape over the areas of the faceplate that will have lights shining through them.

7. The following areas (outlined with red dashes) need to be free of paint to allow the lights underneath to be visible:


8. Place the faceplate on painter's pyramids or scrap wood so that the edges are accessible for painting.

9. Using white acrylic craft paint and a small brush, paint the insides of the button holes. Be careful not to leave blobs of paint that will prevent smooth operation of the buttons later.


10. The purpose of the paint inside the button holes is to limit the illumination of the buttons by the panel edge lights. The painted button holes will look similar to the following photo:
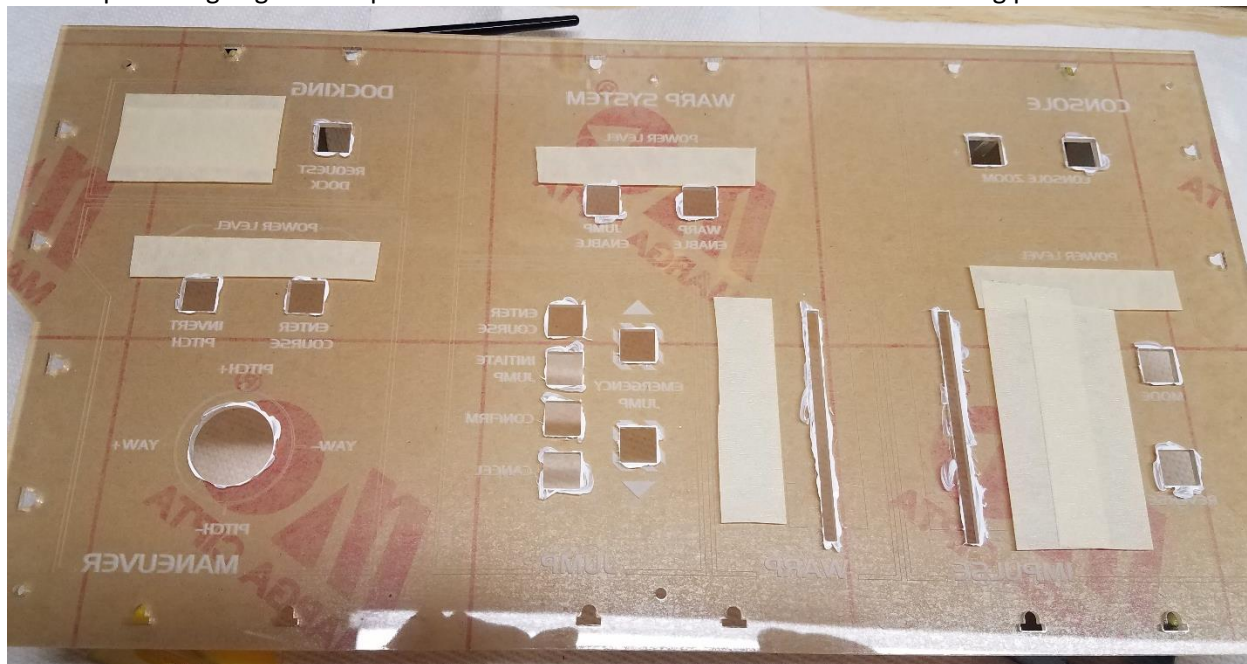
11. Using a dense foam roller, evenly apply a coat of paint to the back of the faceplate, being careful not to drip into the openings in the faceplate.

12. Wait for paint to partially dry and apply second coat. Typical view after first coat:
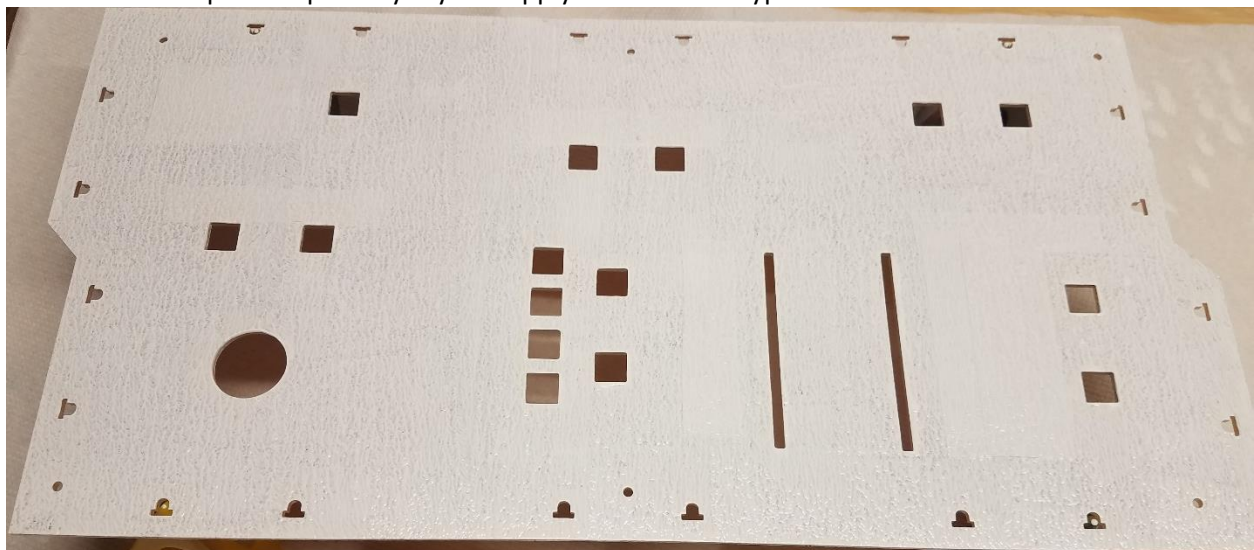
13. Inspect the light holes to see if any paint drips have formed. These can be removed later using a hobby knife. Example paint drips:

14. Allow paint to cure at least 24 hours before proceeding.

15. Use a hobby knife to scrape all paint from the insides of the light holes. Any paint left in these holes will prevent the proper illumination of the faceplate and will also make inserting the edge lights very difficult.

16. Remove protective paper cover from front of faceplate. If possible, try to avoid tearing paper so that as much of the cover can be removed in one piece.

17. Some pieces of the protective cover will remain, especially those inside the etched lines. These remaining pieces can be removed by using a hobby knife to lift them from the acrylic.
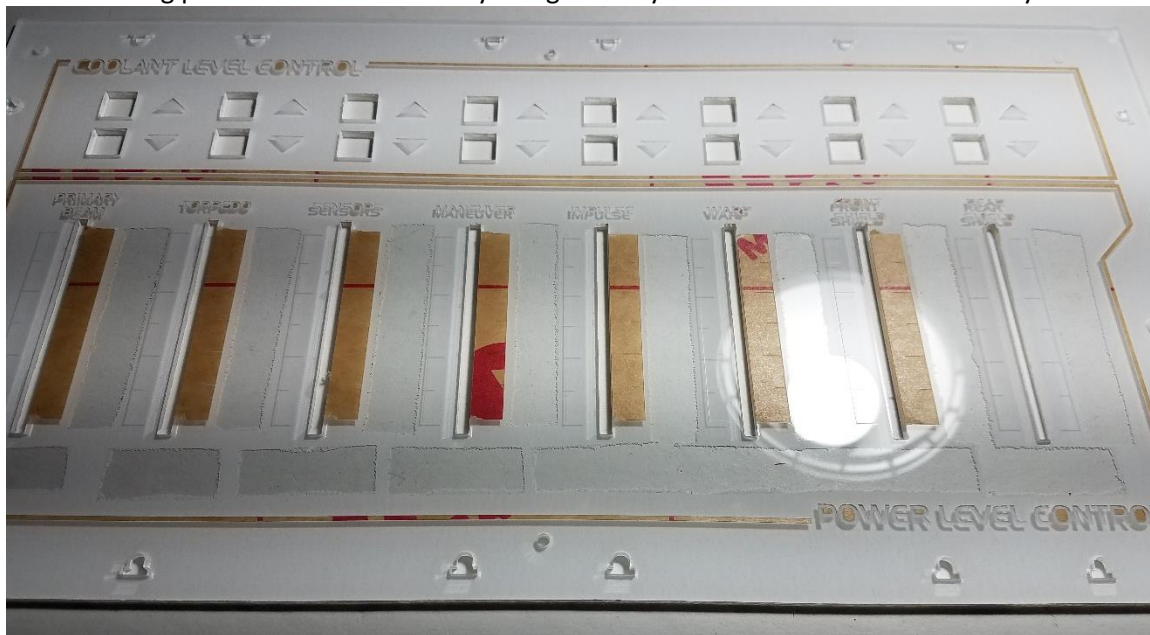
18. Holding the hobby knife so that the blade is almost flat to the surface, lift the remaining cover pieces and discard them.
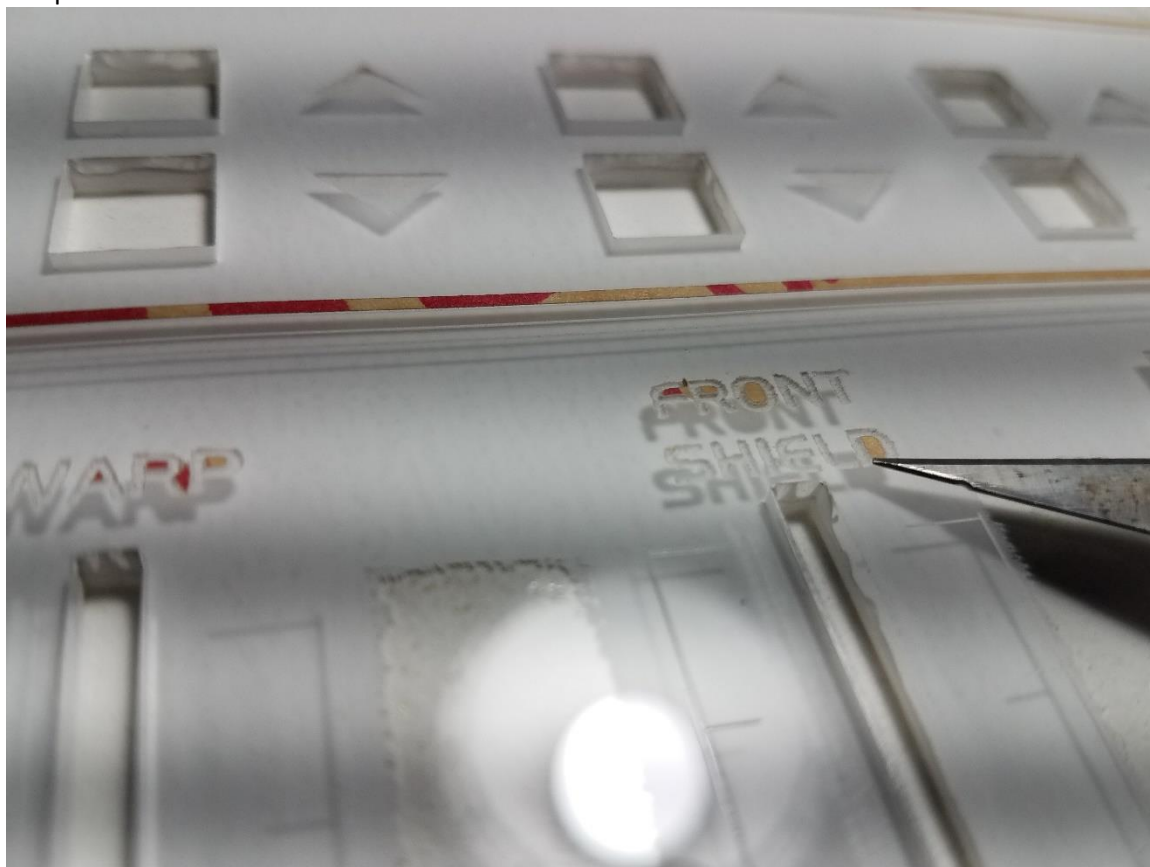
19. When complete, no paper cover should remain. If dust or other debris are on the faceplate, remove them using a damp anti-static cloth or other method that will prevent fresh dust accumulation on the acrylic face.
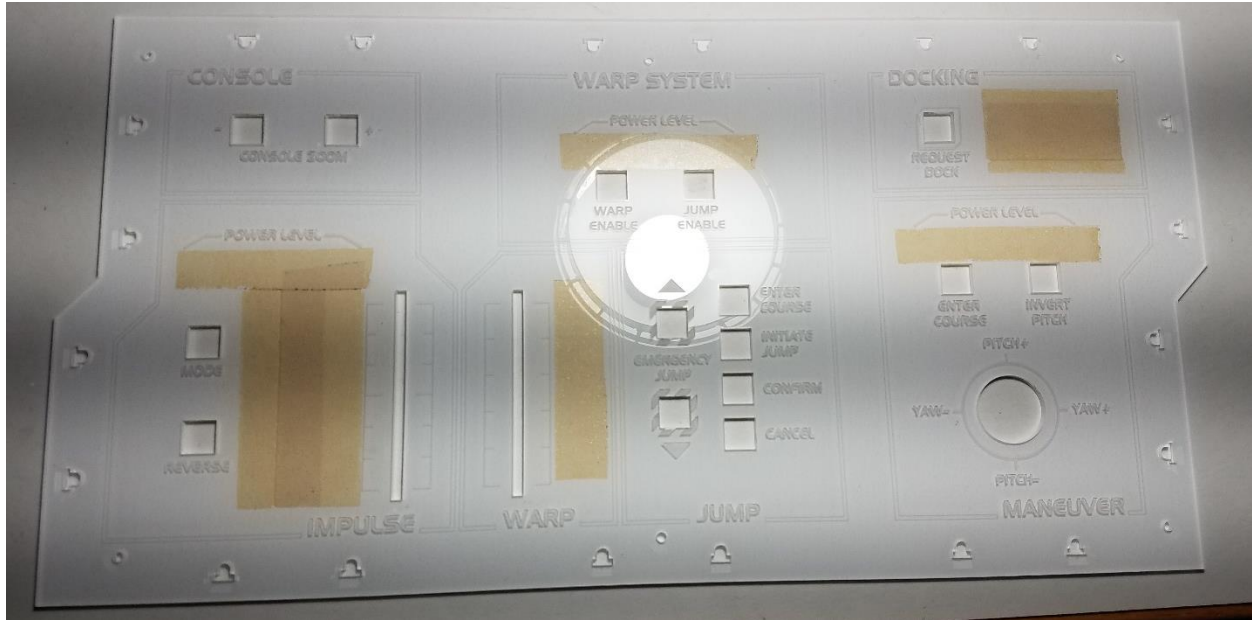
20. Firmly apply ¾-inch wide black vinyl electrical tape to the front edge of the faceplate, being careful not to cover any etched lines or text. In some cases, tape that covers part of the border line can be removed by scoring the electrical tape along the etched line using a hobby knife. For a smooth final faceplate surface, overlaps in the tape can also be scored with a hobby knife and the excess tape removed. Finally, tape that overhangs the edge of the faceplate can be trimmed by carefully cutting with a hobby knife with the edge of the blade running along the top corner of the faceplate edge. The purpose of the tape is to prevent edge light bleed-through in the border of the faceplate.

21. When complete, the tape should look similar to the following photo:
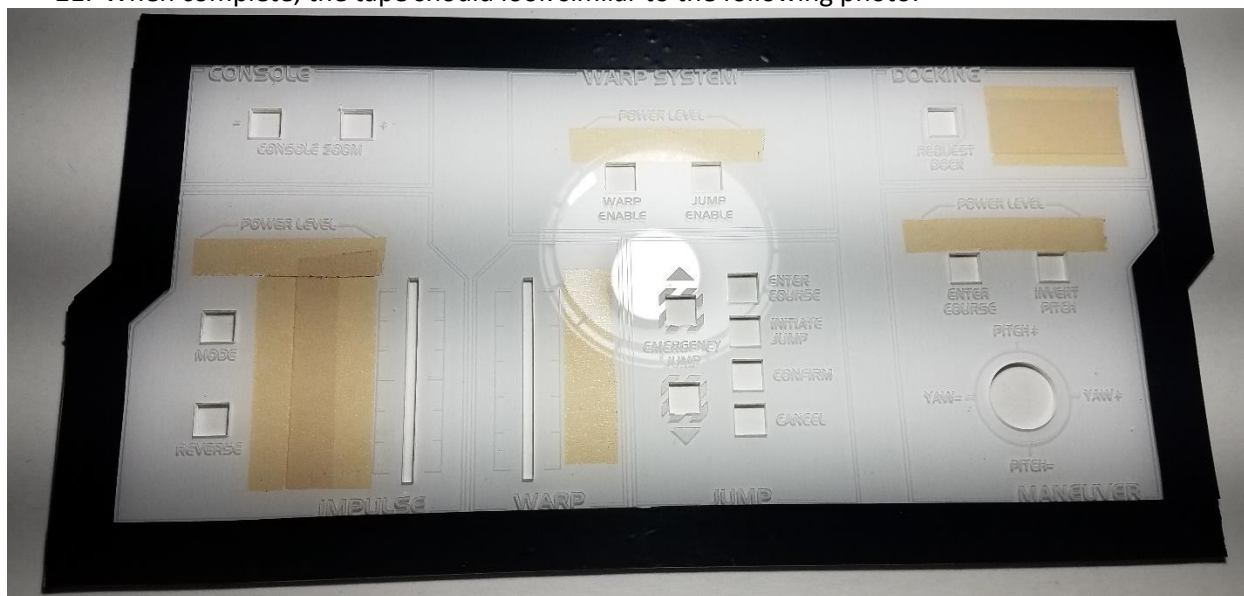
22. Place the faceplate sticker on a stiff cardboard backing and use a hobby knife to cut out the button holes, joystick hole, and excess clear edge.

23. The areas of the sticker shown in bright red below need to be removed for the buttons, sliders, and joystick to fit through the faceplate. Check to make sure that none of the removed parts of the sticker remain before proceeding to the next step.
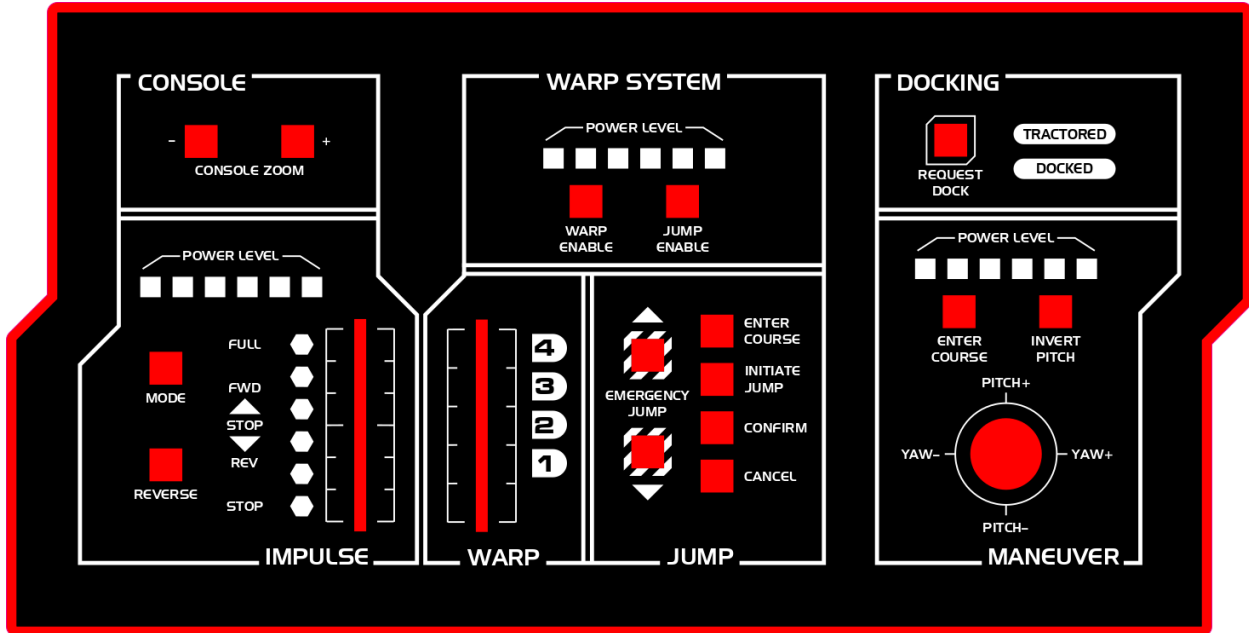
24. This step is difficult. Make sure that the faceplate is face up, clean, and on a firm, flat working surface prior to proceeding. Familiarize yourself with the orientation of the buttons holes, text, and border. Carefully remove the protective backing from the sticker and align the sticker with the holes, text, and border of the faceplate, being careful not to allow the sticker to touch the faceplate until the orientation is correct. Once aligned, place the sticker onto the faceplate and press firmly to attach the sticker to the faceplate, working from one end to the other to prevent trapped air bubbles. Small misalignments (< 2mm) in the text will not hurt text visibility. If needed, the sticker can be carefully removed and re-aligned, if needed. However, re-positioning the sticker is difficult and risks tearing the sticker.
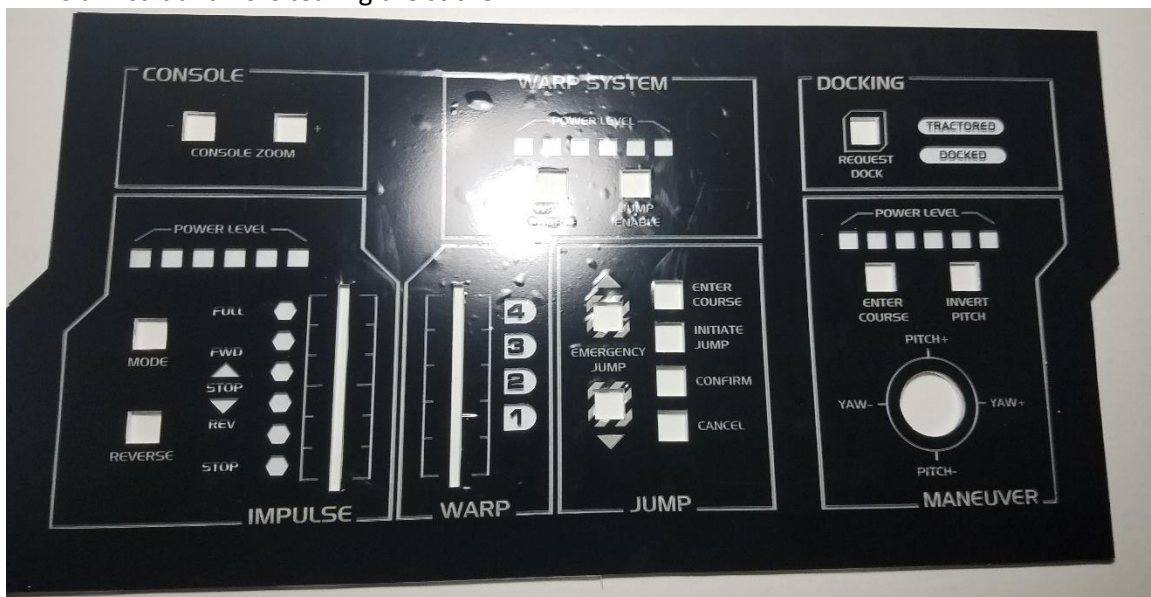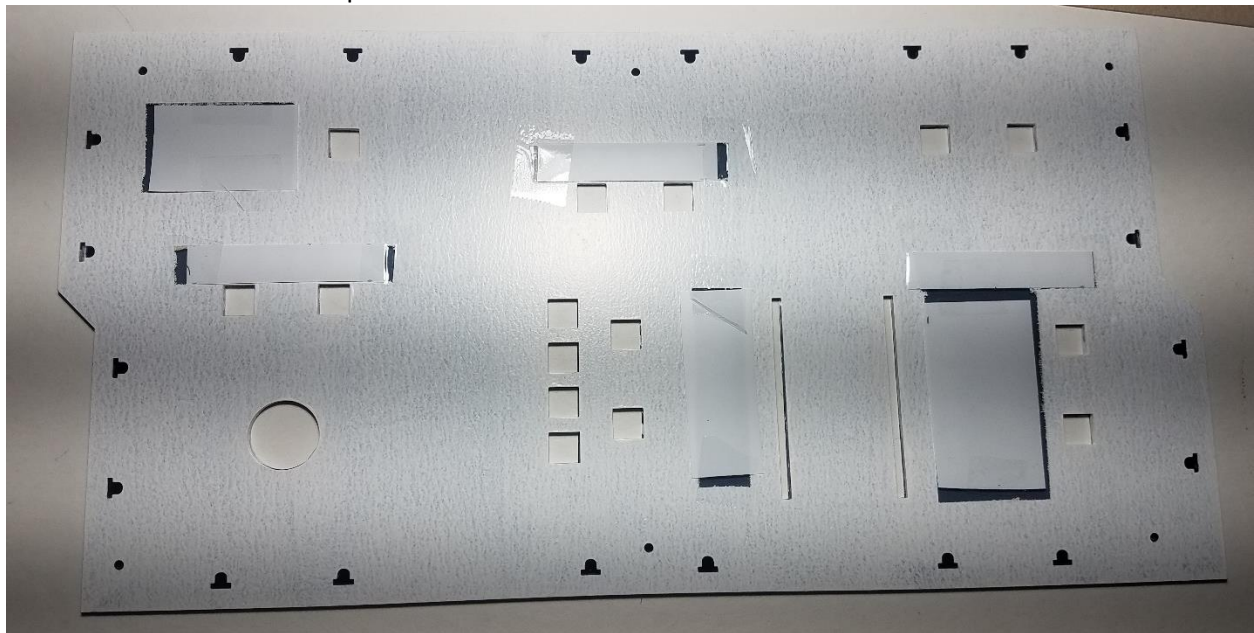
25. Remove masking tape. If needed, a hobby knife can be used to peel up the edges of the tape.

26. Gather the diffusion film pieces:

27. One at a time, use clear tape to attach the diffusion film pieces and cover the masked areas of the back side of the faceplate.

28. Place the faceplate face-down into a firm, flat working surface. Then insert the edge light assemblies into their corresponding holes as shown below. Use firm finger pressure to insert the edge light assemblies, taking care not to bend or break either the assemblies or the faceplate. If the holes offer too much resistance to the lights, carefully inspect them for remaining paint and remove it with a hobby knife. Use electrical tape to secure the wires between assemblies so that they do not obstruct buttons, status lights, or stand-offs. Make sure that the light assembly power plug is in the position shown below:
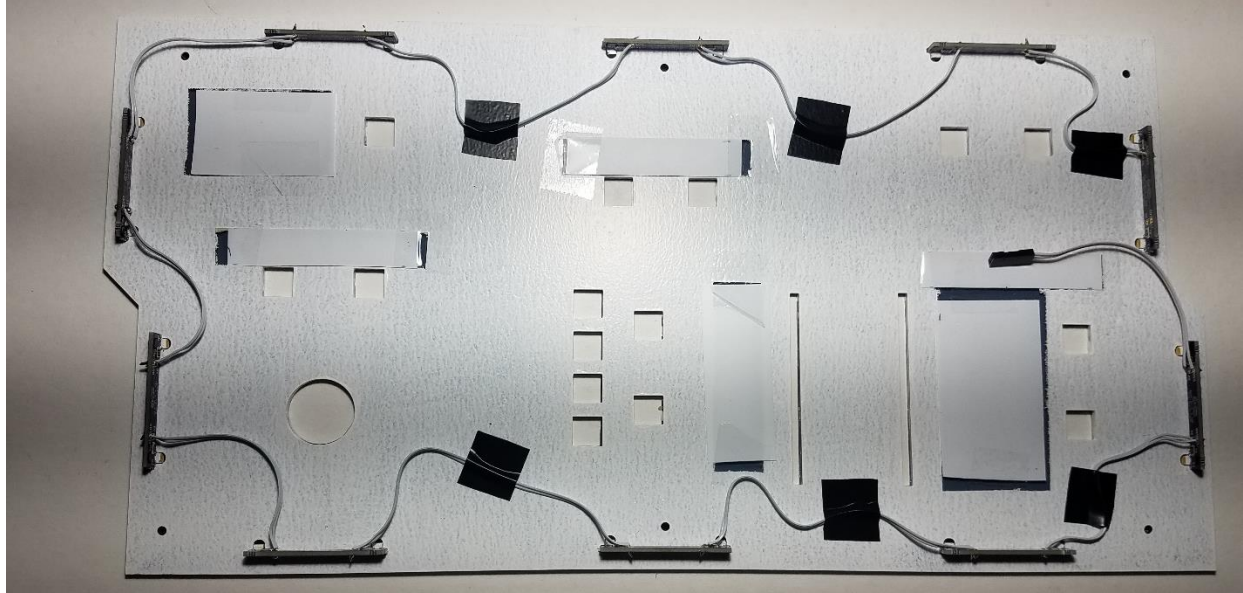
29. Place the faceplate, face down, next to the mounted circuit boards so that the left edges of both are adjacent to each other. Plug the edge lights into the power header ("J2") on the underside of the ACP3-H-PR1 board. The connector to the wire with the red stripe should be on the bottom when viewed from above.
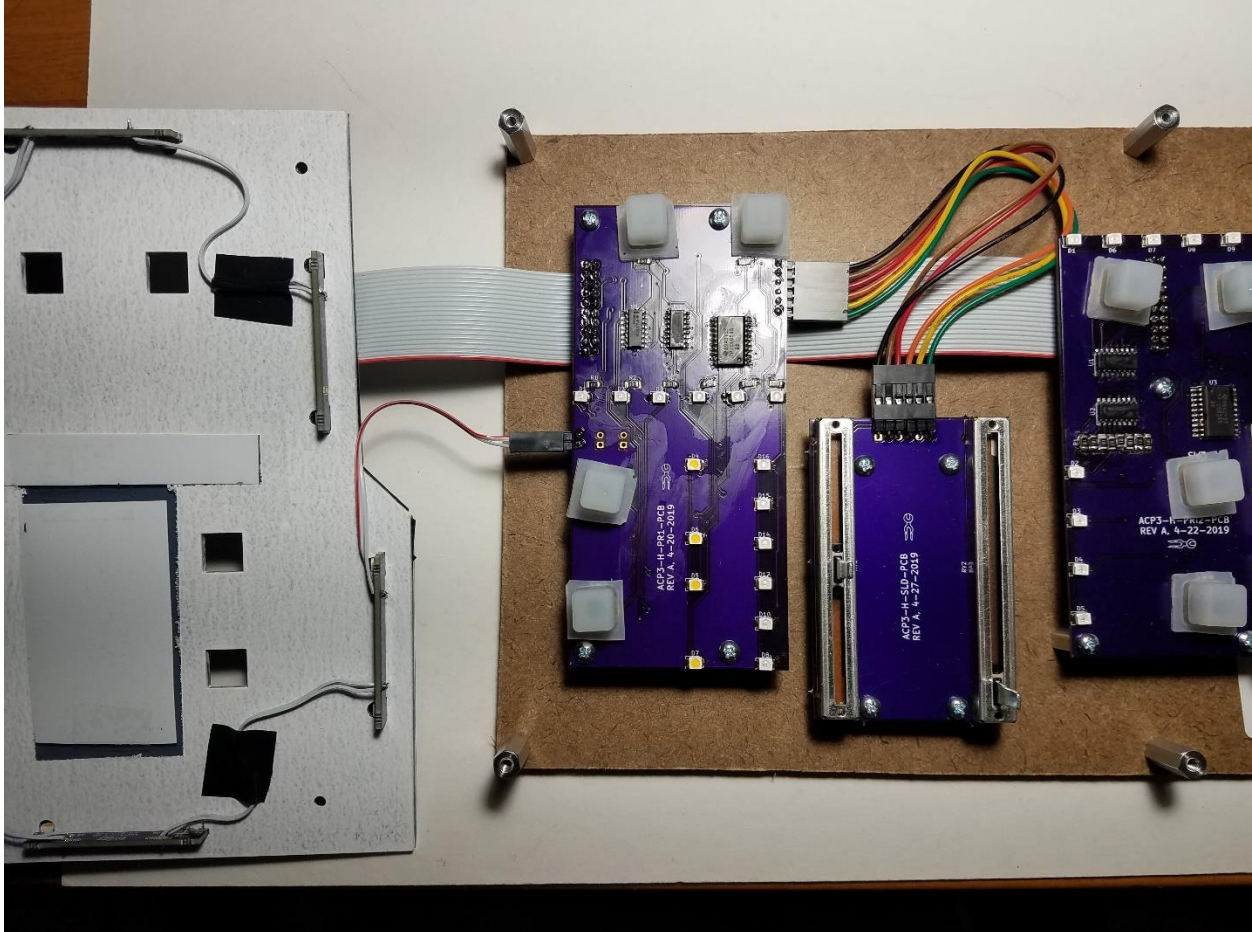
30. Separate the silicone buttons as needed using a scissors to cut through the middle of the web between them. Also, if the buttons are not lying flat, use a scissors, hobby knife, or clippers to remove the raised bumps from the underside of the web between buttons. Be careful not to disturb the raised square or the conductive ring under the buttons.
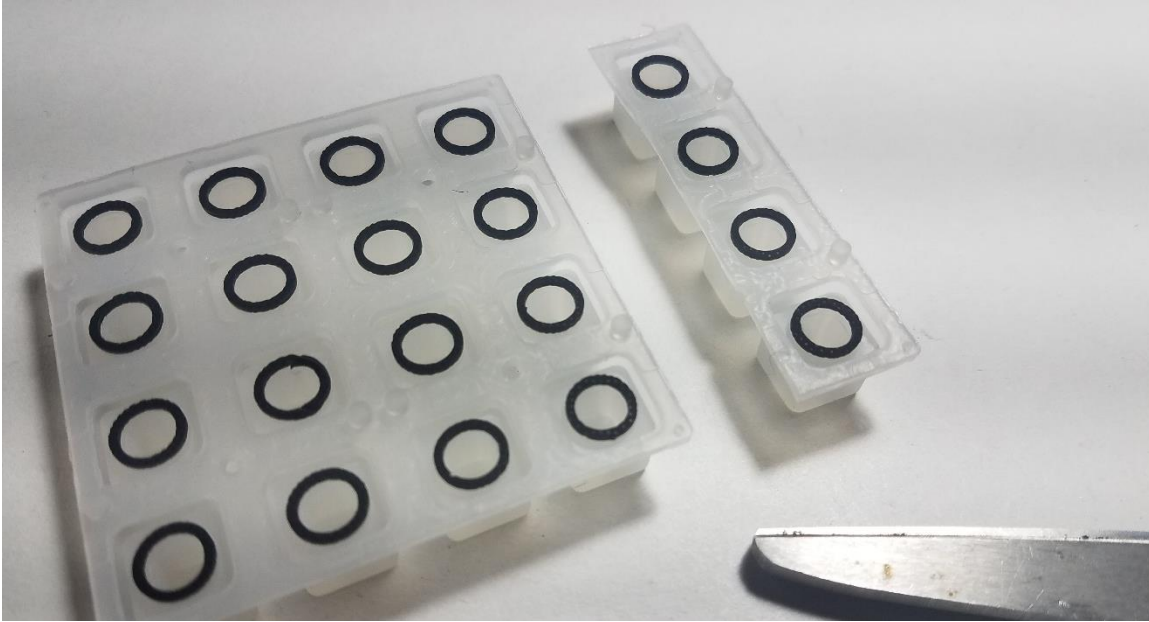
31. Place the separated buttons into the faceplate button holes or over the button LEDS on the circuit boards in the positions shown below.
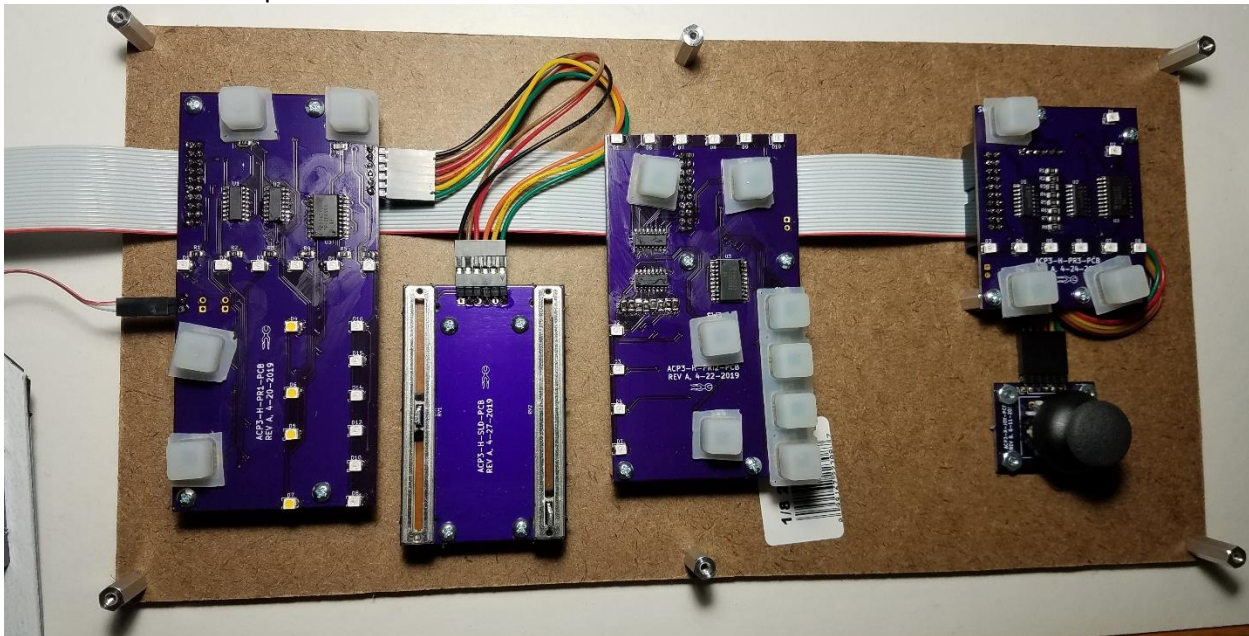
32. Flip the Faceplate over and position the buttons, sliders, joystick, and stand-offs to align with their respective holes in the faceplate. Locate the mounting holes under the sticker using fingers. Use a hobby knife to puncture the sticker and tape over the mounting holes, taking care not to damage the adjacent parts of the sticker. Place the mounting screws through the holes and use a screwdriver to firmly seat the screws in pace, securing the faceplate to the panel. Place the knobs on the sliders using firm finger pressure, rocking back-and forth as necessary to seat the knobs in place.
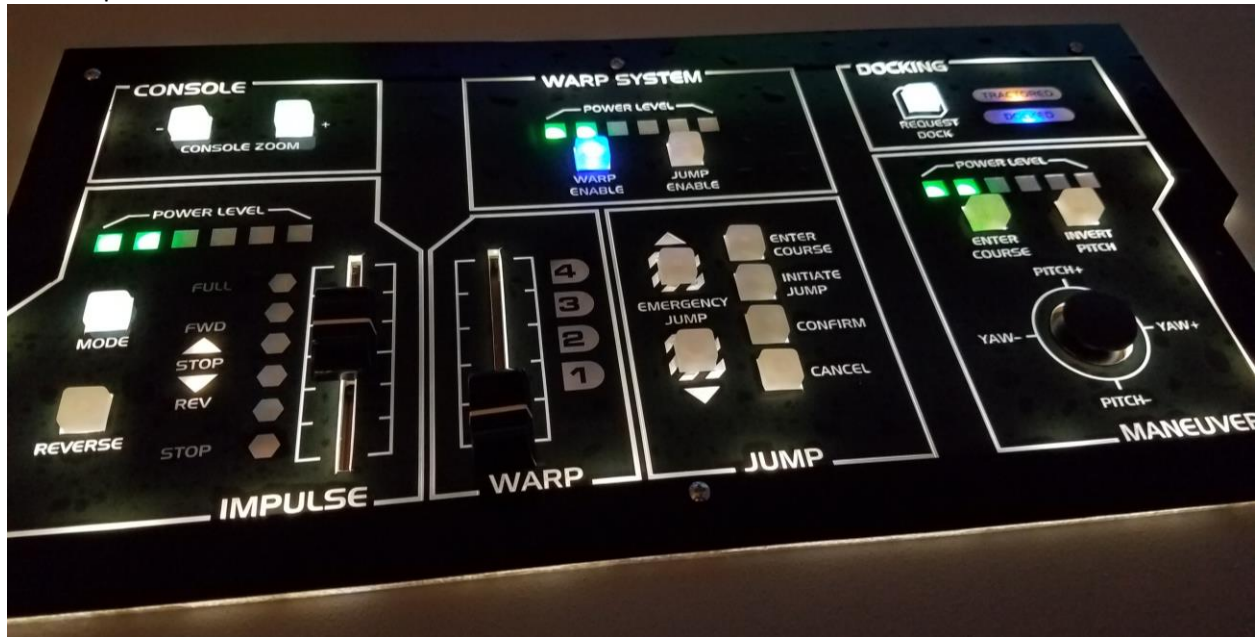
5.0   Setup and Use

- If the controller (ACP3-X-CTL) has not been programmed for helm, refer to Section 6.0 to update the controller software.
- plug in the ribbon to the controller (see below)
- plug in the Ethernet cable to other controls (if applicable)
- connect the controller to the PC running engineering using a micro-B USB cable
- if not already running, load Artemis SBS with a screen resolution of 1280 x 720 (the program on the controller is optimized for this resolution – other resolutions will not work).
- play Artemis SBS with your friends and share your awesome controls
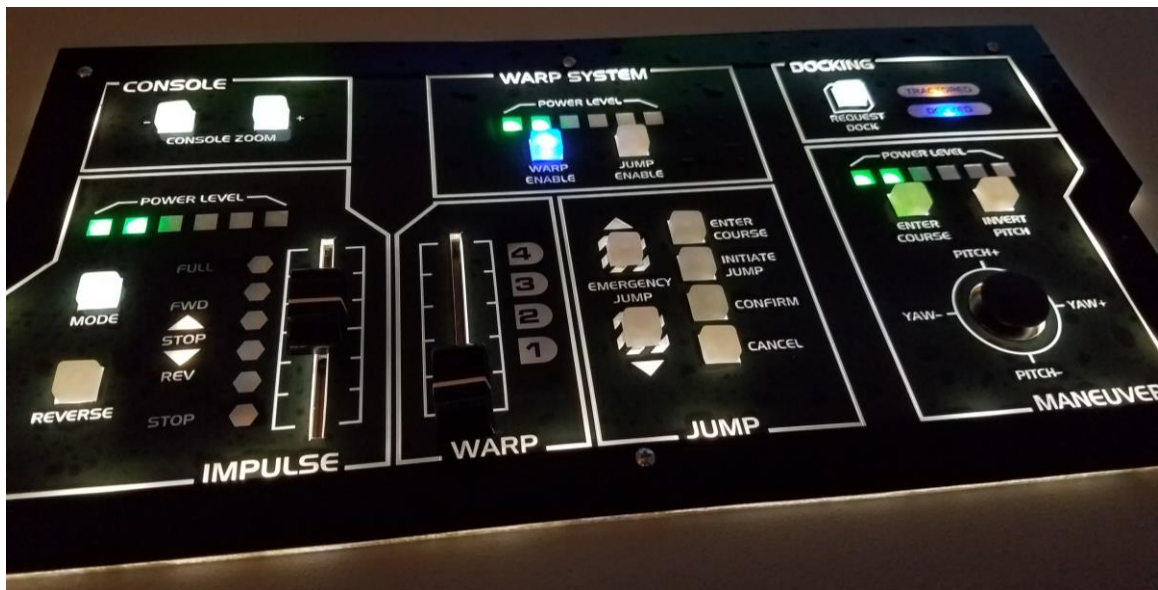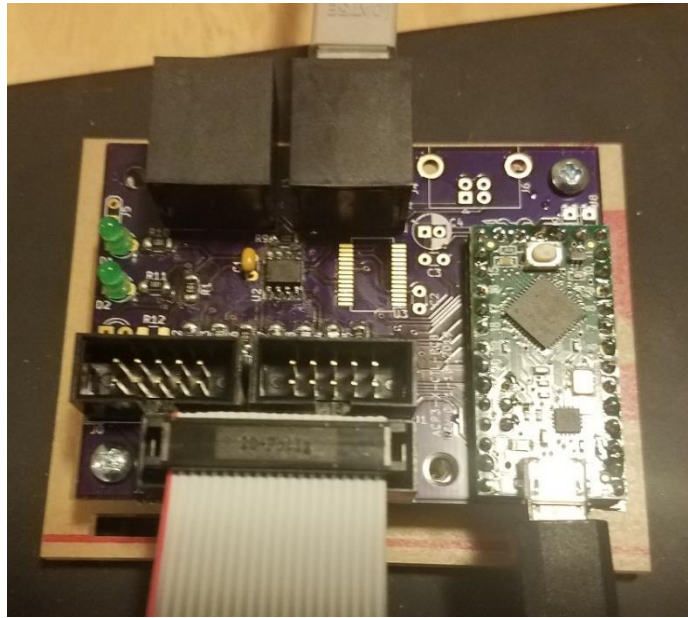
6.0   Updating Software

The weapons console requires a programmed ACP3 controller to function. The ACP3 controller uses a programmable Teensy-LC microcontroller development board to accomplish most functions. To update the ACP3 software on the Teensy-LC, a micro-B USB cable connection to a PC running Arduino and Teensyduino is needed.

Arduino software: https://www.arduino.cc/en/Main/Software
Teensyduino software: https://www.pjrc.com/teensy/td_download.html

Install the above software following the instructions provided in the links. Once installed, the Arduino sketch (code) for helm ("ACP3-H-CTL … .ino") can be opened. These sketches are available here:

https://github.com/angelofrust/ACP3

Before compiling and uploading the sketch, make sure the following settings are selected in the Arduino software:
Tools > Board: "Teensy-LC"
Tools > USB Type: "Serial + Keyboard + Mouse + Joystick"

Once the sketch is loaded and the above settings are made, click Sketch > Upload to compile and upload to the controller. It is recommended to unplug the ribbon cable from the controller during this step because the helm control program could make multiple mouse movements on the screen when booting with the control panel attached. These movements can make unexpected changes to the Arduino sketch on screen.

7.0   Troubleshooting

Problem	Potential Cause	Solution
no lights or controls	not plugged in to active controller	make sure the ribbon cable is plugged into an ACP3 controller that is powered by a micro-B USB cable from a PC.
controls and indicator lights work, but no edge lights	edge light power plug is either disconnected or reversed	re-connect edge light power plug in correct orientation
only some edge lights work	damage to edge light assembly	repair wires, as needed
indicator lights flicker and/or mouse behaves erratically on screen	loose ribbon cable	make sure the ribbon cable is connected securely in all four locations (three boards, plus controller)