Stern Star Trek
USS Kelvin Ship Mod

The following document walk you through the installation of Pinball-Mods.com's USS Kelvin StadiumLEDs for the Beta Ramp of the Stern Star Trek Pro, Premium, and Limited Edition Pinball Machines. This upgrade is a bolt-on modification which requires no irreversible changes to your pinball machine; however, you may need to solder the power wires to your GI circuits. We recommend you read this document in its entirety prior to purchasing the product; then print it for your reference during the actual mod of the Kelvin.

Please **note**: The Author of this document is not responsible for any damage you do to yourself or your property.

Tools/Materials Needed:

- Hallmark USS Kelvin ship to modify
- Philips Screw driver. Suggestion: UltraLow Profile
- Flush-Cut Wire Cutters
- A soldering iron
- Some solder
- Some hookup wire to connect the boards to each other and to your machine. Suggestions:
  - Red & Black 22AWG stranded wire for GI power.
  - Red & Black Kynar™ Wire for Ship to BAT Board connection.
- Black Electrical tape. Suggestion: 3M 88 Electrical Tape
- Some 5minute Epoxy to re-glue Saucer Hull Pegs
- Small Spring Clamps to clamp Saucer Hull
- A Dremel w/ 1/16” bit

NOTE: The pictures in this document may swap between the prototype Purple PBAs and the production White PBAs as much of this document was written prior to receiving the production PCBs. The color of the PBA doesn’t matter; only the connections / instructions in the document.

The process to install these boards is fairly simple and should only take a couple of hours to complete. These two Printed circuit Board Assemblies (PBAs) has an independent constant current source intended to drive it's on board Stadium LEDs and it provides power to the Hallmark ship.

One of these PBAs mounts inside the ship's battery compartment while the other rectify and regulates the power to the ship and the Stadium LEDs. The PBAs are designed to be powered from the GI circuit of your pinball machine. On the pro; use the 6.3VAC GI circuit. On the Premium/LE; tie these to a GI socket or to the unused GIO2 circuit on the main RGB insert board (#520-6812-00 [see page Y24 in the manual]).

On the Author's machine; he connected the Kelvin to his GI Dimmer via GIO5 with the following Settings:

Normal - On
Klingon MultiBall – On

1) At your work bench; Begin by carefully snapping apart the two PBAs using the provided drill holes. Remove the connecting spurs and for best results trim the mouse bites from the PBAs so they won't be seen when installed. This is critical for the smaller battery board as it must be trimmed clean and flush to fit in the small watch battery compartment of the ship.

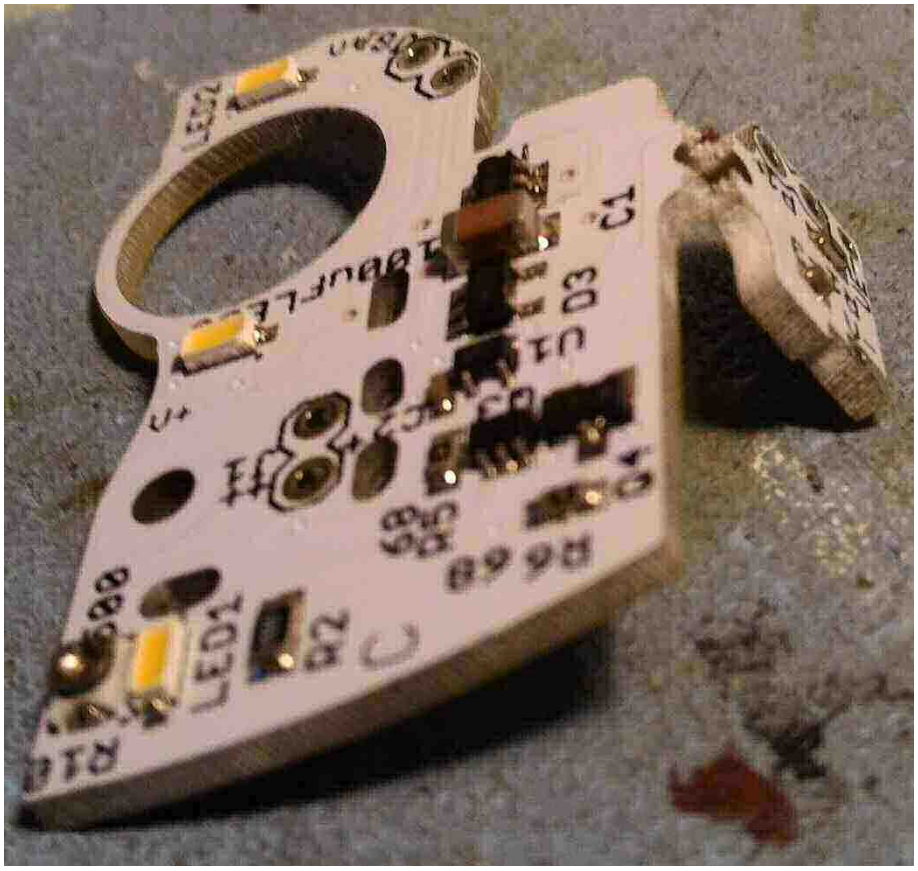

Figure 1 Snap Boards apart

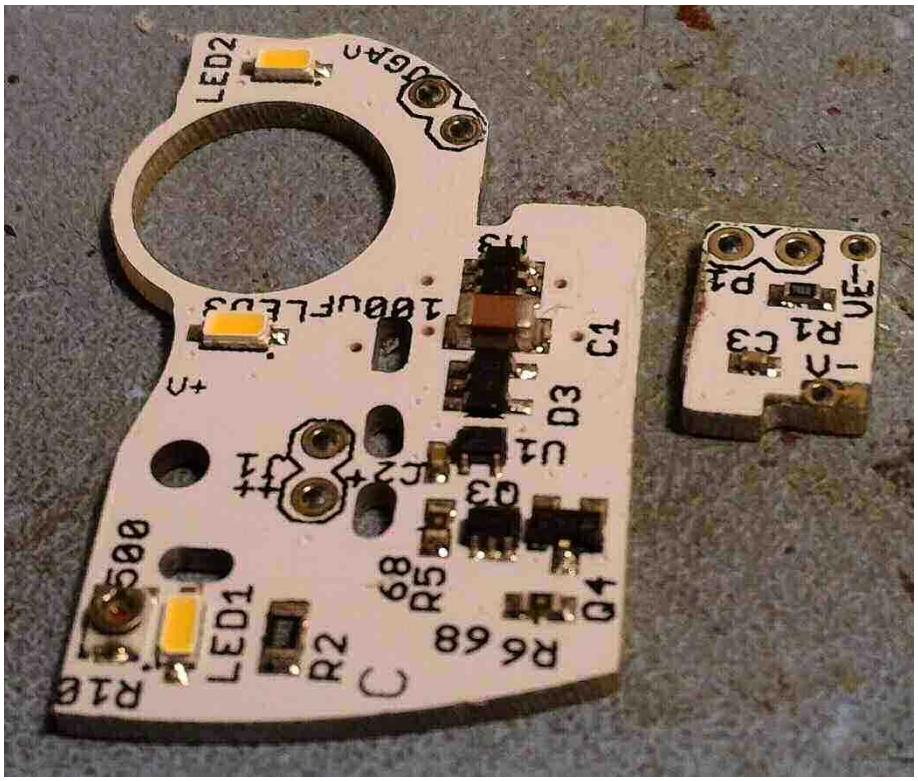

Figure 2 Clean Mousebites

2) Select two different color wire to represent positive and negative GI power leads. The Author picked red for hot; and blue for ground. The color isn't critical; you can use any color you want. Looking at the larger PBAs; you'll see a JGI connection. The mounting hole closest to M3 is the positive (+) connection. The figure below has highlighted the + connection for your reference:

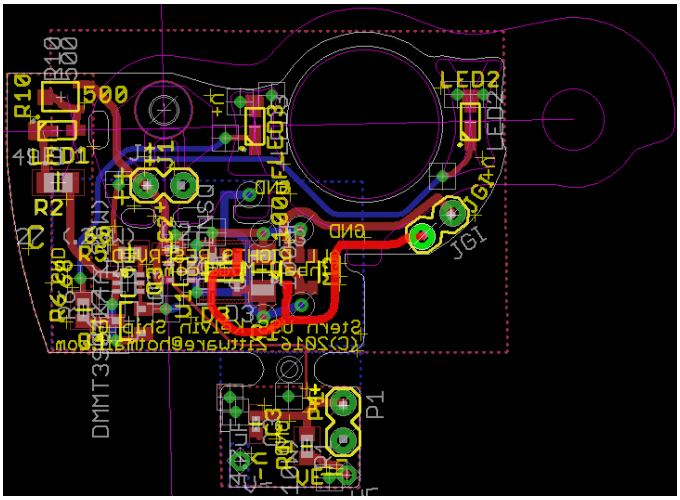

Figure 3 *Positive GI connection*

On the Pro, 6.3VAC is used; so the polarity isn't needed. On Premium/LE machines the polarity matters for best results, but we are getting ahead of ourselves at the moment. On each machine; you'll want about 6-8inches of power leads soldered to the JGI connections from the component side of the PCB. Jot down your color selections here so you can reference it the later steps.

+ = _____ GND= _____

3) Trim the soldered wire flush with the board as pictured. **NOTE:** This is important to prevent the sharp edges of wire from scratching the beta ramp. Once you've trimmed the wire flush with the back of the PBAs; cover the connection with some black electrical tape as an added preventive measure for your ramp.

Figure 4 Trim GI connection flush & cover w/ tape

4) Using the technique identified by BillE on Pinside; using some razorblades or a sharp exacto knife; carefully separate the two halves of the saucer. As Bill stated; there are about 5-6 pegs which glue the two halves together. I cut about half of the pegs … just enough to prop the two halves apart with my thumb so I can use some needle nose pliers to carefully fish the pcb out from the center of the hull.

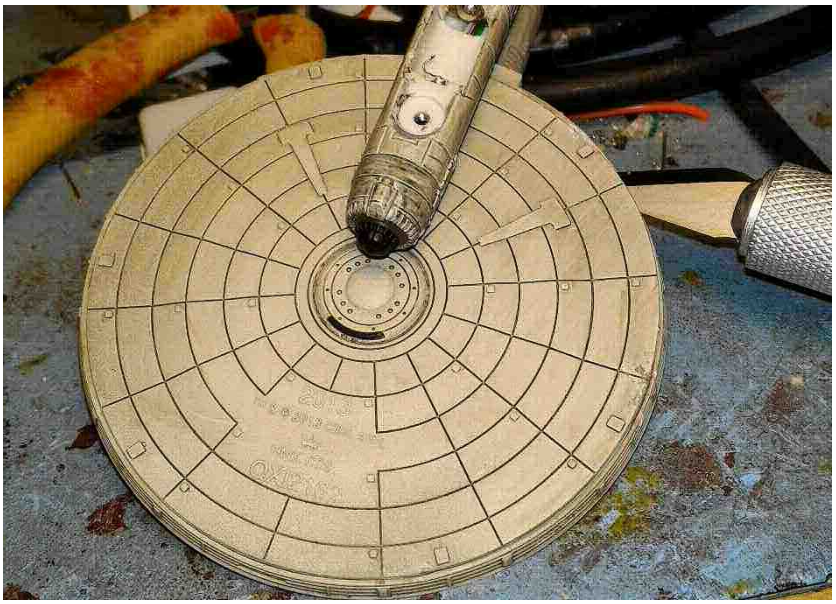

Figure 5 Separate two halves of Primary Hull

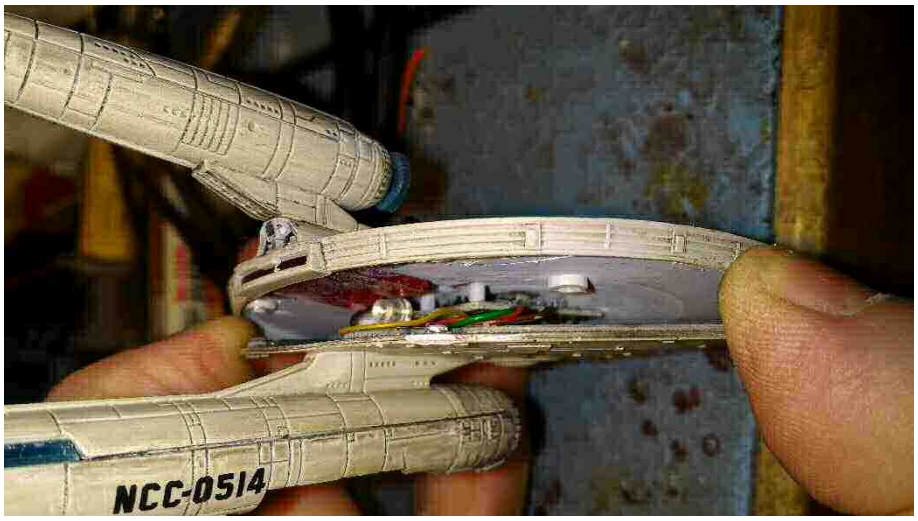

Figure 6 Pegs and Board Revealed

5) Carefully pull the board out from the ship so you can get access to the wired connections:

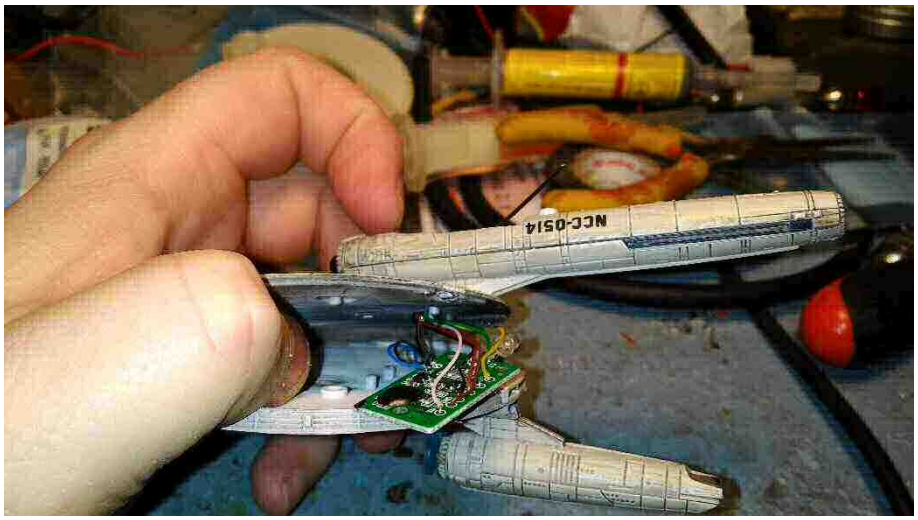

Figure 7 position board for desoldering

6) Carefully desolder the Red (VCC) and White (SW) wires. Leave the other wires intact.

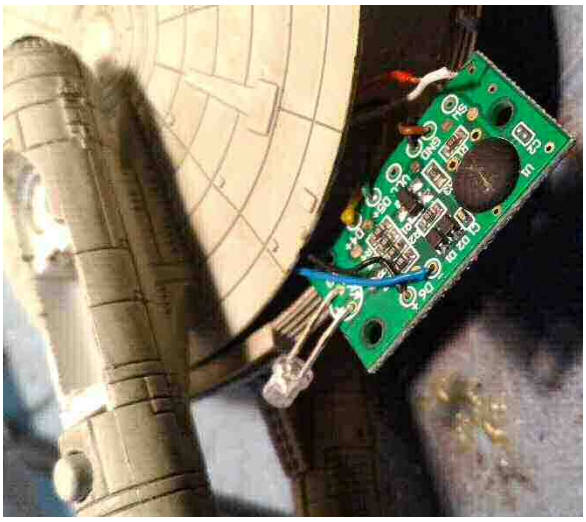

Figure 8 Disconnect VCC and SW

7) Trim the exposed wire ends of the red and white wires and tape them onto the dorsal surface of the saucer section.

Figure 10. Secure loose VCC & SW

8) Patiently feed two solid core Kynar wire or solid core CAT5 wires (as Bill on Pinside suggests) thru the negative terminal hole which goes between the battery compartment and the saucer. You'll want about 4" of each color to ensure you have enough slack to solder to the board between the saucer halves. Note the colors used for each.

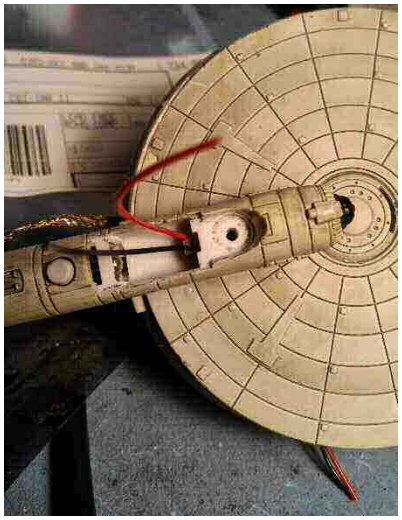

Figure 11. Thread wires to saucer

9) Solder one end of the positive wire to VCC and one end of the negative wire to SW and note the color selection below. NOTE: The Author used Red for VCC and Black for SW.
VCC = _____ SW= _____

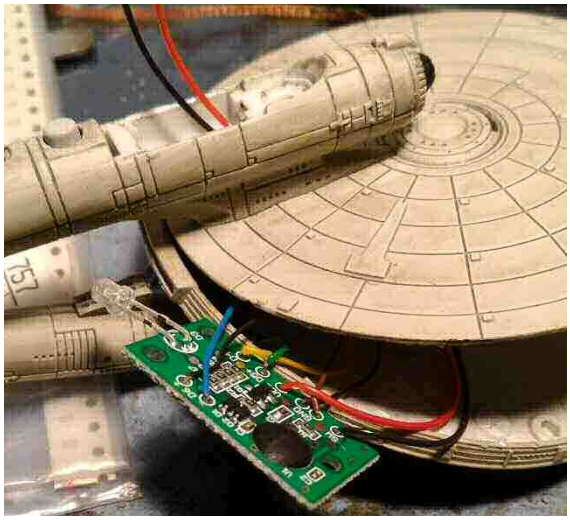

Figure 12 Solder VCC & SW wires to PCB

10) Carefully reposition the internal board onto its three pegs and remove as much slack in the new VCC and SW wires so that you can easily close the saucer section.

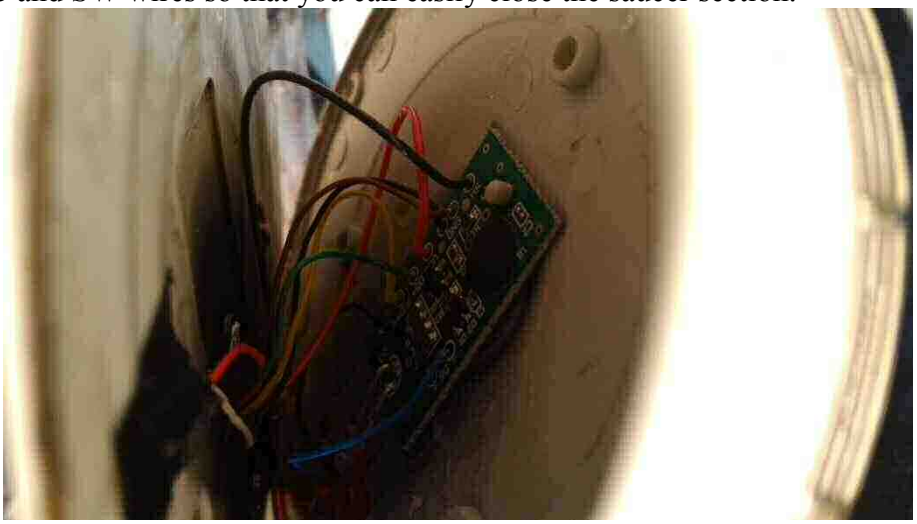

Figure 13 Re-Install internal board

11) At this point; before gluing the two halves of the saucer together; you can briefly connect the VCC wire to +5V and the SW wire to Ground on a +5V power supply. You should see all three LEDs light on the ship... Red Impulse; Blue Nacelles, and Yellow Deflector dish. Do not run this for more than a few seconds as there is no current limiting resistor in place… you risk burning out one or more of the LEDs or the main board.

12) With the connections soldered to the board, reinstall the board in its original location, apply some 5minute epoxy to the original peg locations, and clamp for at least the setting time of the epoxy you used. The Author usually waits for the full cure time which is usually about an hour for the 5minute epoxy before proceeding. (check epoxy label for cure times)

Figure 14 Clamp and Re-glue Saucer Hull

Figure 16 Clamp Saucer sections together

13) While the Epoxy is curing on the ship; glue and clamp the Base PBA to the Kelvin Bracket. It may be necessary to trim a little bit of plastic away from the 3D printed brackets; to ensure the PBA sits flush with the indention on the 3D bracket. Once the fit check looks good; put a little bit of epoxy at a few small areas and then clamping the PBA to the base. The author puts a little bit of 5minute epoxy on the flat spots near the center nipple and along the side near the screw hole:

Figure 15. A little bit of Epoxy

Figure 18 Clamp base board to bracket

14) Once the glue is dry (see epoxy package for full cure time); solder the wires from the saucer board to the battery board. VCC goes to the VE connection and SW goes to the V- connection. You can leave a small service loop on the wires and gently fold them into the battery compartment.

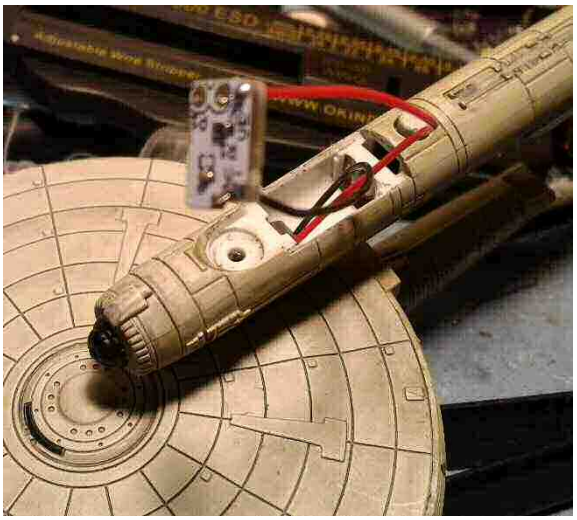

Figure 17 Solder VCC & SW to VE & V- on BAT board

15) Next, solder wires to P1, noting that this connection is also polarized. Select appropriate color coding of the wires noting that the Author again chose Red for positive and black.
P1+ = _____ P1- = _____

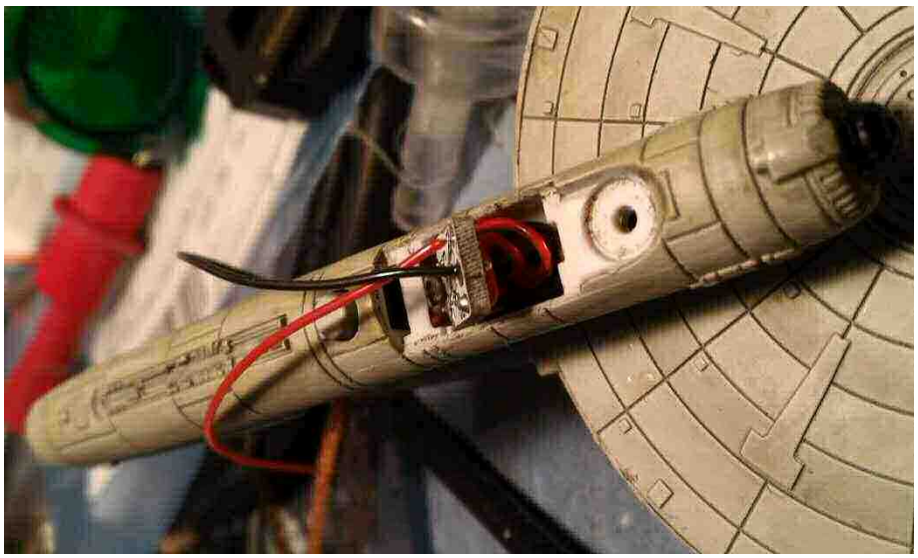

Figure 19 Solder P1 Connections

16) Using a dremel and a 1/16" bit; drill some small wire holes for the P1 connection to exit the battery compartment into the lid of the battery compartment. The author will be orienting his ship at an angle; so he drills as far front and to the right as he can - knowing that the wire management channel of the bracket will be near this point. Your installation may be different so verify in the machine if in doubt.

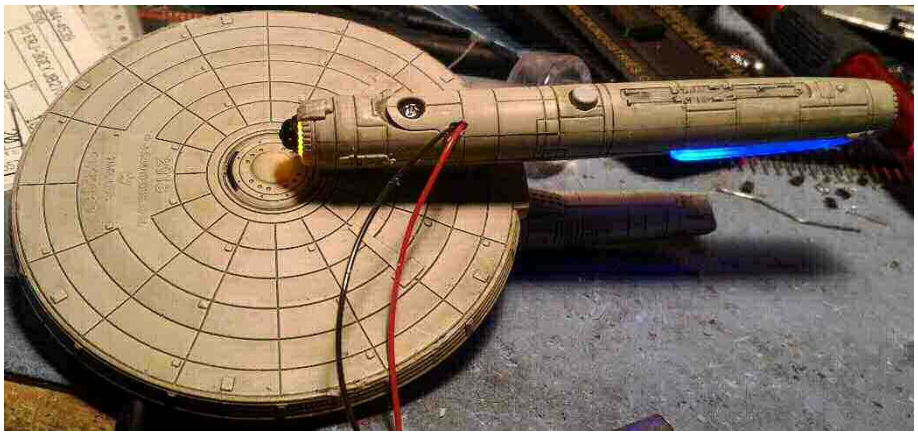

Figure 20 Run P1 wires out of the battery compartment

17) At this point you can again test that all of the connections made thus far are in correct working order by attaching a +5V power supply to the P1 + and P1 – wires made at step#15. All the ships LEDs should light and shouldn't need the switch to be triggered. They will remain lit for as long as there is power supplied at P1. The Battery board has a current limiting resistor in place; so you can run the ship indefinitely using this connection.

18) Feed the ship wires thru the bracket's wire management channel and solder the positive wire from Step 15 to the hole marked with the +. Also solder the negative wire from the ship to the base PBA.

19) Carefully Trim the solder joints flush with the PCB and tape to prevent scratching the beta ramp plastic:

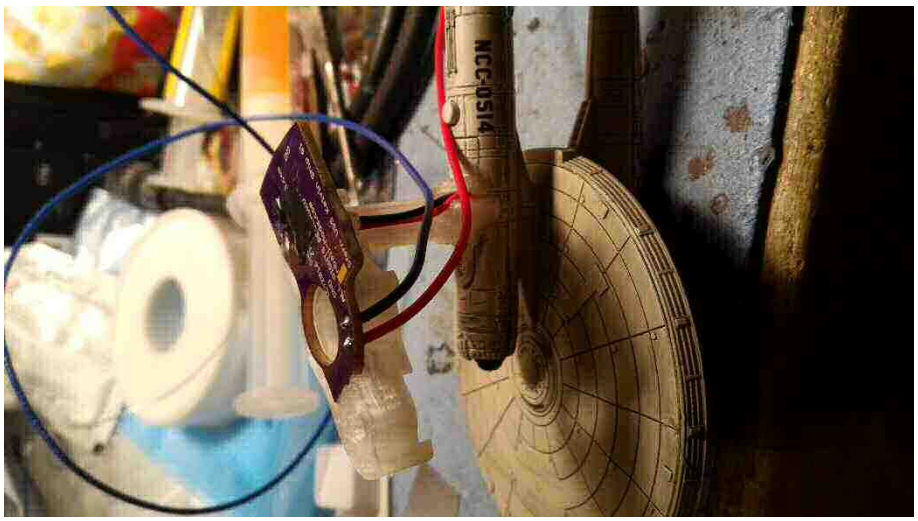

Figure 22 Trim solderjoint flush and tape

20) With the baseboard wired to the ship; you can test that everything is working properly on the bench prior installation in the machine. To do this connect a 5VDC source to the wires connected to JGI connection. The ship should light as well StadiumLEDs:

Figure 23 Bench Test ship

21) To install the ship assembly; remove the machine screw and washer holding the beta ramp near the yellow flasher to the hex post. Install the washer in the indented areas of the bracket and then lightly snug the bracket to the beta ramp with the screw. The screw head holding the top plastic to the ramp will fit inside the center hole of the bracket. No need to remove it. Do not overtighten the beta ramp machine screw – else you risk cracking the mounting bracket.

Figure 24 Mount Assembly to Beta Ramp

22) With the bracket mounted; adjust the Kelvin so that is touches… or almost touches the yellow flasher while keeping the ship in the rounded part of the bracket. Slide the ship as far back on the bracket as you can, leaving only about 1/8 of an inch before the tip of the secondary hull. This is done to keep the USS Vengeance from hitting the Primary Hull of the USS Kelvin. Once you've determined the position and angle of the Kelvin; epoxy the kelvin in place being extra careful to not get epoxy on your machine. If necessary; we have provided a small hole in the top bracket where you can use some fishing line and a slip knot to "hold" and clamp the Kelvin to the bracket while the 5minute epoxy cures. Once cured; you can remove/cut the fishing line off of the model for better visuals.

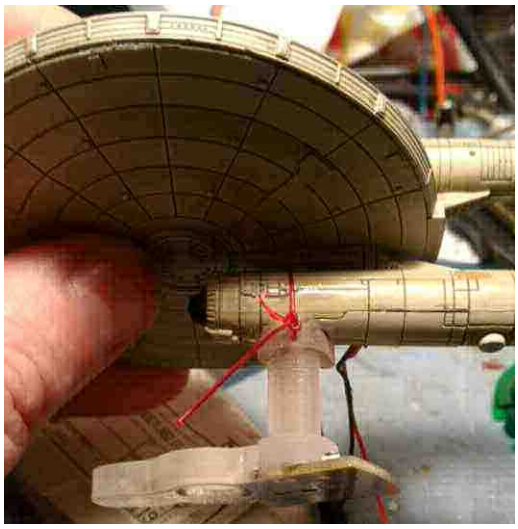

Figure 25 Use Fishing line hold ship

23) Next, feed the Kelvin's GI wires behind the beta ramp thru the beta ramp hole in the backboard:

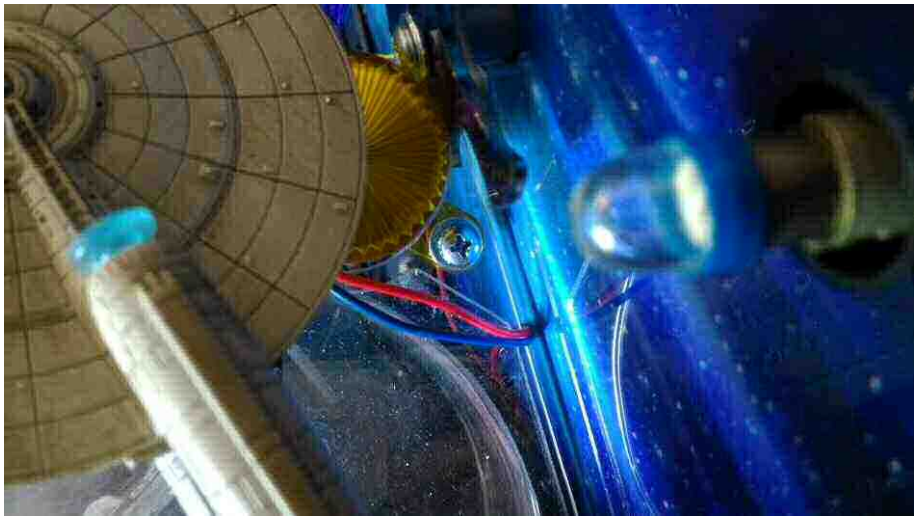

Figure 26 Wire behind Beta Ramp

24) Finally, the wire can be easily slide under the beta ramp where it can be soldered to any GI socket on the machine. On the Pro; one of the backboard's LEDs might be a good spot.

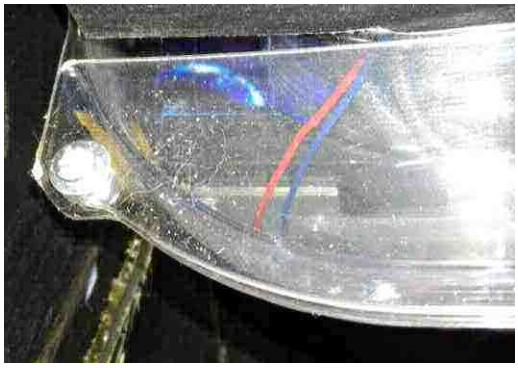

Figure 27 GI wires under beta ramp behind backboard

If you have a GI Dimmer on a Premium or LE machine; you can connect it via GIO5 on J5 like the author did; using the IDC connector provided.

25) If you are using this on a Pro; or without the GI Dimmer – you can use R10 on the PCB to adjust the brightness independent of the ship's LED lighting. You can dim the Stadium LEDs to whatever brightness you desire using that variable resistor.