

Do It Yourself: NCC1701 Ship Mod Kit

The following document will attempt to walk you through the installation of the boards necessary to update a [Running Press Starship Enterprise](#) (herein referred to as 1701) so it can be easily installed in a Data East Star Trek or Bally Star Trek pinball machine. *Please note:* the Author of this document is not responsible for any damage you do to yourself or your property. Following document blindly is no excuse for lack of common sense. ;)

Duplication of this document is *not* permitted without written consent.

Tools/Materials Needed:

- 2013 [Running Press Starship Enterprise](#)
- Soldering Iron & Solder
- [Dremel](#) or Drill
- [1/16" drill bit](#) or two or three ... seriously; get more than one
- 5/16" Dremel [#114 High Speed Cutter](#) Bit
- xacto knife with new blade
- [small gauge enamel magnet wire](#)
- 5minute Epoxy and/or SuperGlue

This set of boards provide all the necessary circuits to directly power your 1701 from the Pinball machine's GI circuit. This DIY kit is a super advanced mod which will try your patience and probably take several nights or a weekend to complete. A simplified wiring diagram is provided in Figure 1 below.

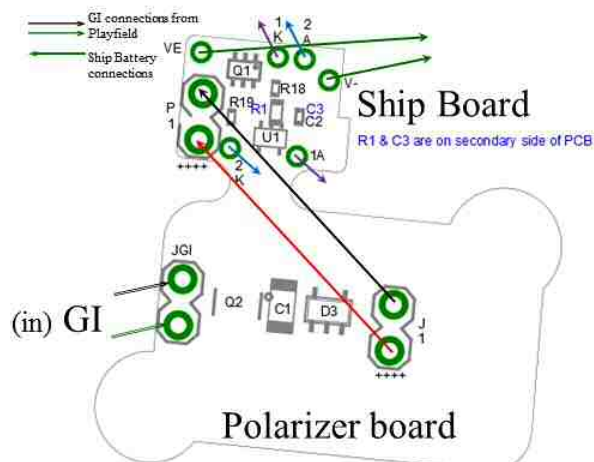


Figure 1. simplified NCC1701 Wiring

Steps 2-13 are the most tedious part of this modifications; you can choose to skip this optional steps; but your nacelles will remain unlit in the final installation.

Here is how your board should look fresh out of the package:

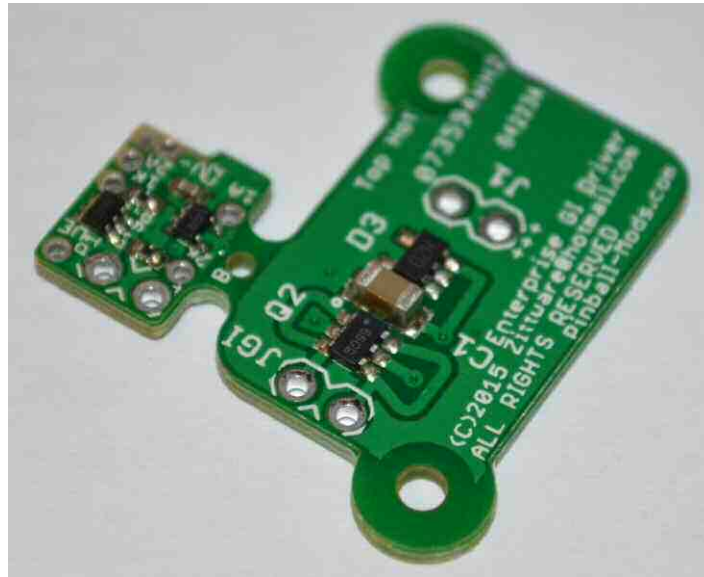


Figure 2. virgin WingLED set

Please Note: Your boards may be green; please do not be alarmed if they are not purple as show in following pictures.

1) Begin by snapping the boards apart. They should easily snap along the holes in the center of the FR4 material. Once the boards are snapped; clean the "[mouse bites](#)" off the PCBs using a dremel or belt sander. This will make the boards look clean when attached to the Enterprise and is **critical** to ensuring the boards will fit inside the ship.

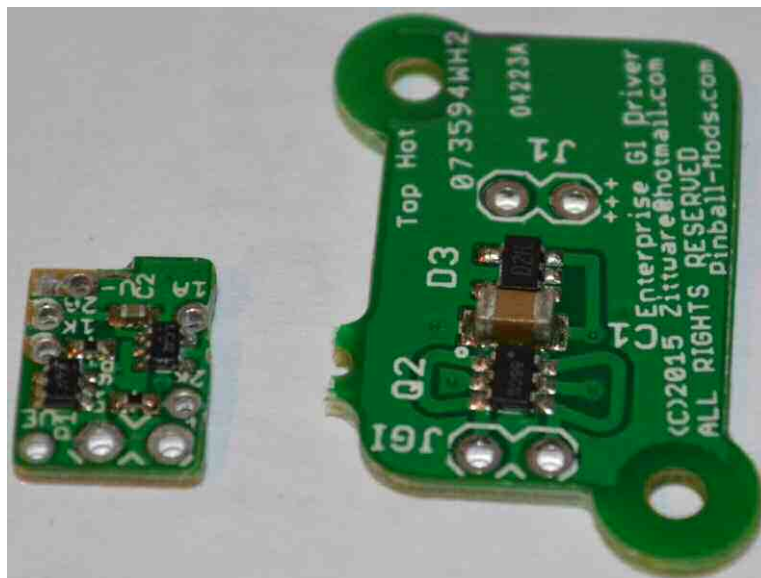


Figure 3. Separated Boards

2) The Running Press ship comes disassembled in the box, locate the nacelle assembly. You'll start by carving a channel in the back of the nacelle braces. This channel will become the hiding place for the enamel magnet wire. I found it easier to use the backside tip of a xacto knife to carve these channels. I also recommend that you use a clean sheet of paper under the nacelle assembly to capture any shavings from the channel to help hide the wire at the end of the assembly. Here's the left nacelle channel carved:



Figure 4. Carve Wire Channel

Repeat the carving on the other nacelle support. Make the channels deep enough to fit two enamel wires in the channel. One for the Anode and one for the Cathode of the LED.

3) With the channels carved; drill a 1/16" hole in the top of the channel into the nacelle. Only go about half of the way thru the nacelle. **Do not** go all the way thru to the other side. Do this on both Nacelles.



Figure 5. Drill top wire hole

With the Top wire hole drilled; do the bottom holes so the wires can enter the secondary hull of the Enterprise:

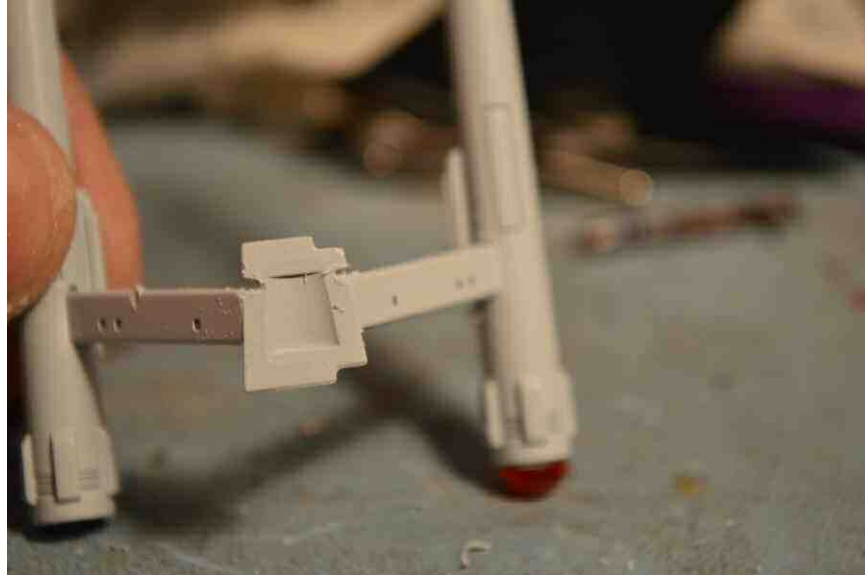


Figure 6. Drill Bottom wire holes

4) The red nacelle jewels are simply glued to the front of the nacelles. Pry off with a xacto knife so you can remove the mirrored finish and prep the nacelle for the LED.



Figure 7. Remove Jewels

5) Using the xacto knife; scrape the mirrored surface off the jewel:



Figure 8. Removing Mirroring from Jewel

6) Now you'll need to drill the Nacelle plastic deep enough to house the LED. For this I tend to use a [#114 High Speed Cutter](#) in my dremel to quickly remove the plastic and then uses the 1/16" to shape the hole enough to fit the LED. You want to remove enough of the material so you can fit the 5mm Red LED in the nacelle.



Figure 9. Remove nacelle material

Keep that paper handy to capture the drill shavings as you did in Step #2. Basically you want the LED to fit snugly in the nacelle; but not be sticking out the front of the nacelle.

7) Using the dremel with a sanding bit; remove the “rim”/ledge of the 5mm LED.

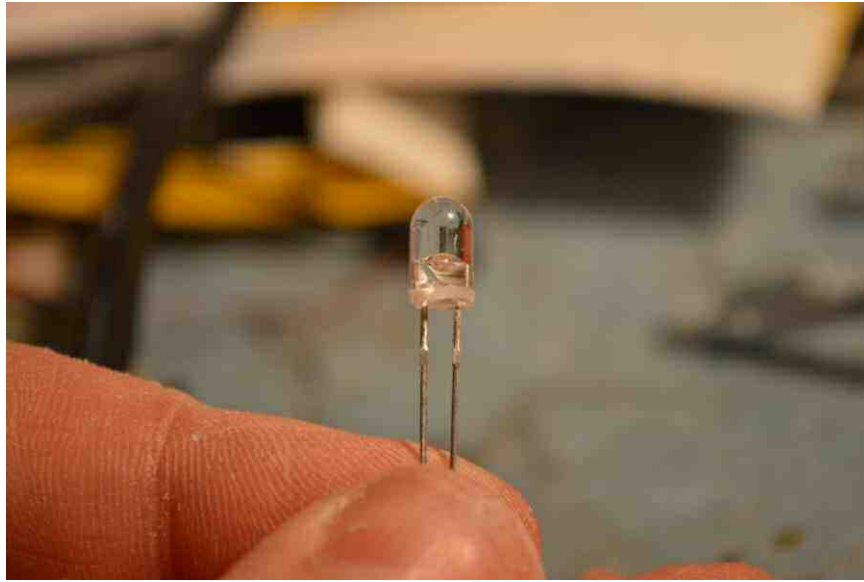


Figure 10. Remove LED Ledge

8) Continue shaping the LED. Shorten the lense to right on top of the LED chip. You want the top to be flat so you can reglue it to the jewel in a later step. You'll also want to keep the leads as short as possible; with just enough length to solder to. Here's an estimate of what your LED will look like:



Figure 11. Basic LED shape

10) Using the Enamel magnet wire; thread the wire into the hole you created in step 3 and out the hole in step 6. Make sure you have enough working length so you can wire the LED outside the Nacelle; and be able to thread it down into the Secondary hull. Remember to do two wires. One for Anode, one for Cathode.



Figure 12. Thread Enamel Wire

9) Solder the enamel wire to the LED. In general the Enamel wire's Varnish will "burn off" when you apply solder to the connection. Make sure you heat the connection well and use Solder with Rosin flux.



Figure 13. solder LED wire

Remember; this Enamel wire is very fragile. It's solid and will break very easily. Don't be surprised if you have to redo a connection or rewire it a couple of times.

At this point; I'd test the electrical connections to the LED using the Diode function of the LED.

Carefully remove any slack of enamel wire with the LED positioned in the Nacelle.

10) Repeat Steps 4-9 for the other Nacelle.

11) Temporarily install the Nacelle assembly on the secondary Hull and use the exacto knife or drill bit to mark the entrance holes for the enamel wire (Step 4, Figure 6).



Figure 14. Mark Wire Entrances

Using those marks; drill out entrances for the enamel wire into the hull with a 1/16" bit.

12) With the Xacto knife; screw the dividing seam of the secondary hull:



Figure 15. Score Seam

13) Work the Seam open using the xacto knife blade back near the shuttle bay. The two halves are glued together but should be somewhat easy to separate once you find the plastic tabs they used to glue the pieces together:



Figure 16. Pry Halves apart using xacto blade.

14) With the nacelle Assembly in place; Carefully thread the enamel wire thru the holes you made in step #11. It might be helpful to have a pair of tweezers and use something to hold the two halves separated. Wire the 2 pairs of enable wire into the battery compartment of the Enterprise.

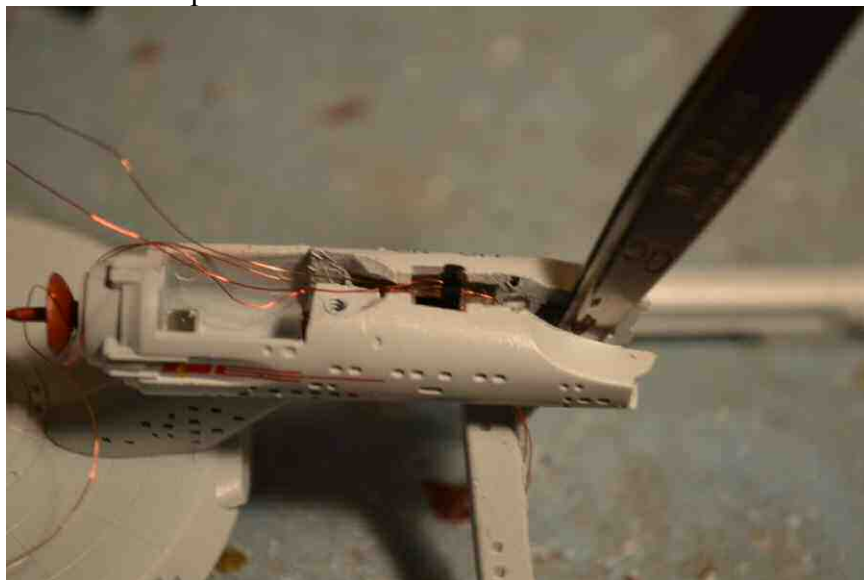


Figure 17. Thread wire to battery compartment

15) Solder a small piece of rework wire to the positive terminal of the battery. The wire should be long enough for you to thread it into the hole on the Ship PCB.

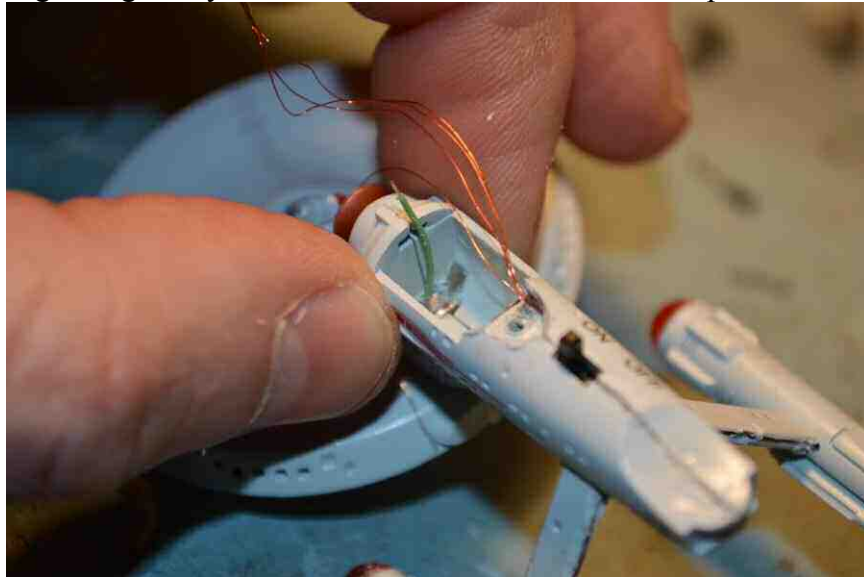


Figure 18. Solder Wire to the + battery terminal

16) Carefully tin the tips of the enamel wire using soldering iron and solder. Using the [Diode Test function of your multimeter](#); identify a pair of Nacelle wires – noting which is the Anode and which is the Cathode. This pair will pair #1. Find the holes labeled 1A and 1K on the Ship PCB. 1A is the Anode, 1K is the Cathode. Thread the enamel wire thru the pads from the bottom side of the board. The Top is facing the viewer in this picture.



Figure 19. Thread Pair 1 into PCB.

Solder enable wire to the pads and thoroughly heat to ensure enamel is burned off with the flux.

17) Identify the Anode and Cathode of the second Pair of wire. Thread the wire into 2A and 2K respectively. Solder the wires to the pads from the underside of the board.

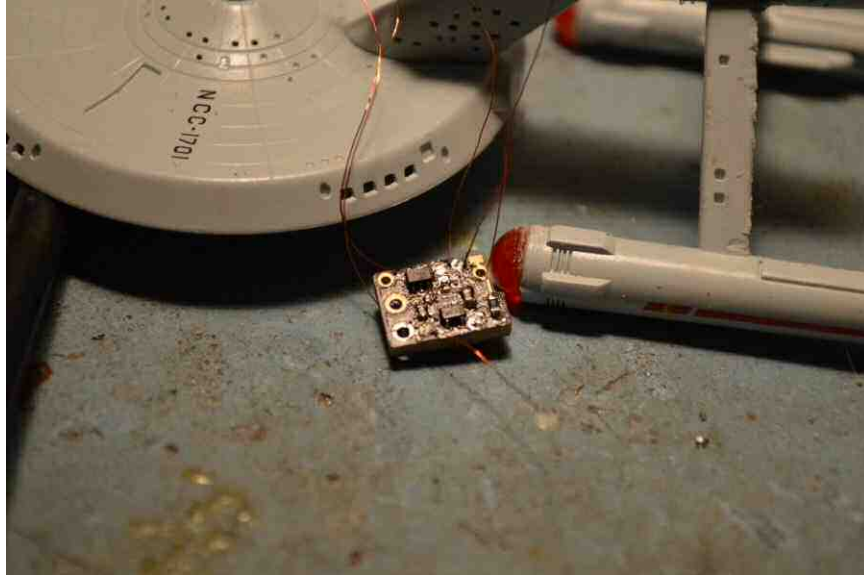


Figure 20. Thread and solder second LED pair

18) Carefully thread the positive terminal wire into the VE pad on the ship board.

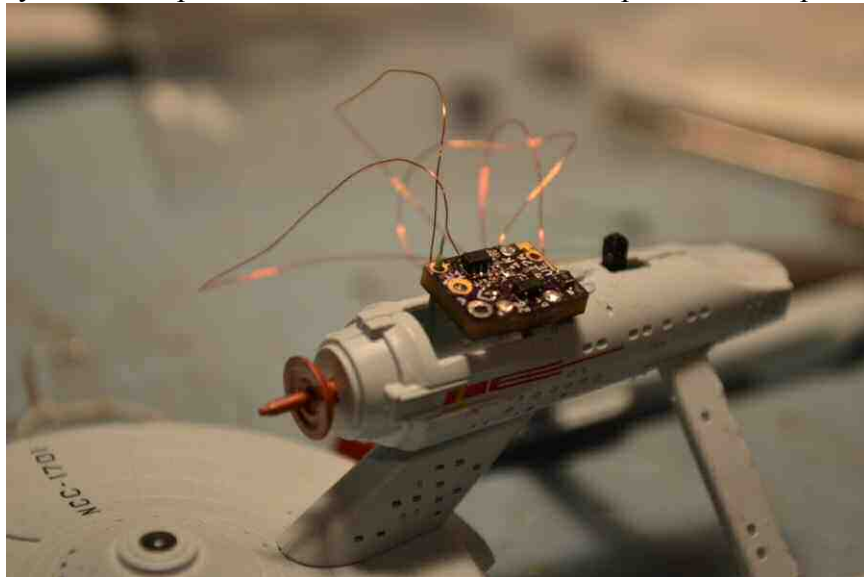


Figure 21. Thread + battery wire to VE.

Remembering the Enamel wire is fragile; stuff the excess wire under the PCB in the battery compartment. You want all the enamel wires to be “under” the ship PCB.

19) Carefully push the ship PCB into the battery compartment. The “notch” in the PCB should fit against the negative battery terminal.

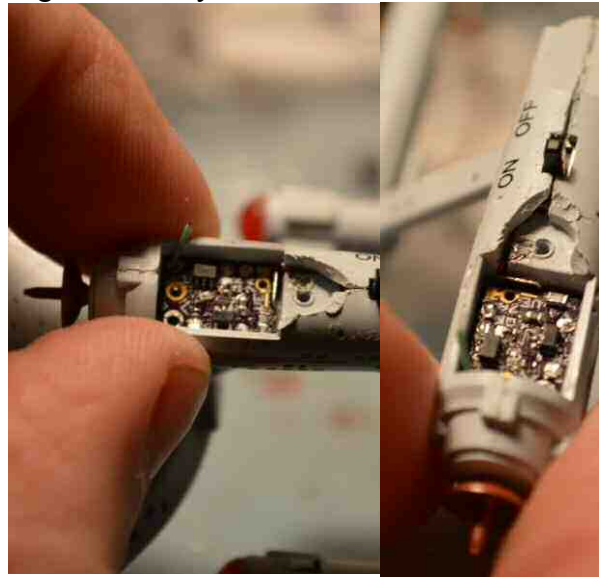


Figure 22. Position Ship Board

The negative battery terminal should provide a friction fit for the PCB. Once you have the Ship PCB in place carefully strip the positive battery wire and solder it to the VE terminal. The negative battery should be easily soldered to the expose “pad” on V-, if not feel free to use a piece of wire to jump from V- to the terminal.

20) At this point the PCB should work properly. You can test for correct model operation by making sure the switch is set to “ON” on the ship. Then attach a +5V source to the positive terminal on the ship pcb. That pad is the outside one. IF in doubt see Figure 1. The negative / ground side is also shown in Figure one. You should see the primary hull light with White LEDs... and both the Nacelles should light red if you wired them in steps 2-13.

Troubleshooting Note: If both Nacelle LEDs fail to light; you either wired them backwards or the #1 Pair is defective. The two Nacelles are “current mirrored” so if the first Pair isn’t wired correctly; the second won’t light at all.

21) After ensuring the PCB works properly in Step 20; it's time to begin reassembling the ship. Using some 5minute epoxy or super glue; glue the two secondary halves back together; also glue the nacelle assembly to the secondary hull. This is done to prevent the enamel wire from breaking when installed in the Pinball Machine. Clamp for an hour if using 5minute epoxy –else follow manufacturer's recommendation.



Figure 234. Glue Hull and Nacelle asm together

22) Using additional 5minute Epoxy; secure the Nacelle LEDs; and attach the Jewels to the front of the Nacelles.

23) With the 1/16" drill bit; drill two holes in the battery compartment, behind the mounting point. Solder two wires to the P1 terminals of the Ship Board. Use different color wires for the positive and negative. The Author used Yellow for the positive and green for the negative.

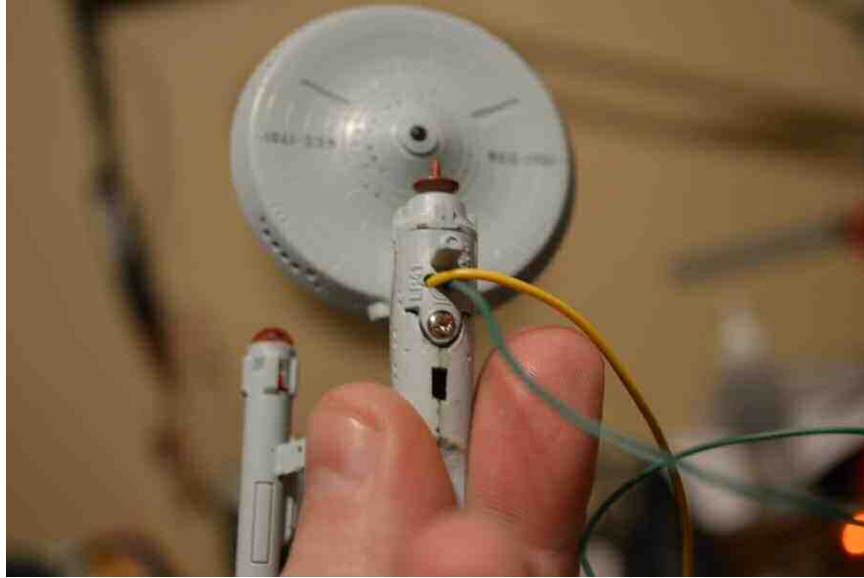


Figure 25. Add Wire to P1

At this point; you can test the ship assembly before in the machine. If you have a +5V bench supply; connect the positive to the +wire (yellow) and ground to the -wire (green). All the LEDs should light. Both Nacelles and White LEDs in the Primary hull. If one or more do not lite; check polarity/wiring.



Figure 26. Pre-Install Test