Big Easy Modeling Solutions Presents:

The TOS Captain Series SFX Upgrade Board™

INTRODUCTION

Welcome to Big Easy Modeling's lighting kit for the TOS Starship model kit! THIS BOARD IS DESIGNED TO WORK IN CONJUNCTION WITH THE COMMANDER SERIES BOARD! In purchasing this kit and the effects board it is designed for, it can be assumed you're building a very serious model requiring countless hours of work and planning and building and, most of all, FUN! And you're likely looking for a very accurate representation of the beautiful Enterprise as she appeared on the original television show or, in some cases, your own version of the Grand Lady! We're here to help you in the process so you can hopefully have less aggravation and more "WOW!" as you assemble this wonderful model.

This model kit is one of the most challenging and involved kits a modeler can face, especially when it comes to lighting, so make sure to follow all steps carefully and test all connections as you go.

The manual that follows is designed to help you easily install and connect all the lighting you need to make your model stand out. We've taken great consideration to make this kit as easy to install as possible, though some soldering will be necessary to get the results you want. Basic soldering skills are assumed with this kit, but if you need help or are not as experienced, feel free to contact us at Big Easy and we'll do our best to assist you! We are confident that anyone can learn the skills necessary to make this lighting kit work for your build and we'll help you in any way we can!

This manual is intended to be a usable reference for how the lighting kit is designed to work with the JAZZ MINI 2 TOS Captain Series effects board. It is not the ONLY way to do things and you, as the builder, are perfectly welcome to deviate and experiment with your own version of lighting the Big E. (ONLY recommended for experienced builders) However, we do caution against using other materials (such as LED's, wires, resistors, etc) not included with this kit as you may damage the lights you're using or, worse, the board itself. Big Easy Modeling Solutions claims NO RESPONSIBILITY for any damage caused by incorrectly using the supplied products or any damage caused by using materials other than those included in this kit.

*Note: using materials or components other than those included in this kit may void your warranty on your product!

HOW TO USE THIS GUIDE

This guide is presented in a format intended to be easy to decipher for the intermediate to advanced model builder who is passably familiar, at least, with lighting diagrams and electrical current flow. For the beginner, this kit is certainly usable! But you might want to take some time to gather some information and familiarize yourself with basic terminology and knowledge on electrical diagrams and current. This is especially true if you intend to deviate at all from the instructions for this kit.

The guide is presented in an "easy-to-read" format where the builder can simply solder the string of lights, as marked, and connect them to the color-coded terminal points, as marked. However, to ensure better connections, it is HIGHLY RECOMMENDED that the model builder solder the connecting wires together whenever possible! Terminal connections may not always be absolutely secure. Twisting the ends of wires together may also create some issues getting good connections. It is much more preferable to solder the end connections together whenever possible before inserting the wires into the corresponding terminal points. If connecting only a single wire, particularly wire wrapping wire (thin shielded wire) or magnet wire (thin coated wire), we recommend making a tiny "hook" by carefully curving the end of the wire back on itself to fit into the terminal. This helps to hold the wire in place so it doesn't slip out of the screw lock.

Ultimately, it's up to you, the builder, to choose how best to secure your wiring. We've made every possible attempt to make this process as simple as possible for builders of all levels. But you must choose the most secure method you prefer for your building style to ensure the best, lasting connection. We will make suggestions in the guide to help whenever possible/necessary.

There may be some times when a group of wires do not easily fit into a terminal, particularly on the main board. You may choose to make a "ponytail" by bringing together all the wires for that terminal and soldering them together or using a wire nut with a single short additional wire leading out which will connect to the terminal and supply current to all the connected wires. Instead of, say, 4 wires going into one terminal, you now have only the one.

A note on magnet wire and/or wire wrapping wire: Many of the solutions used for wiring LED's in this kit involve the use of magnet wire or wire wrapping wire, both a form a thin, highly conductive wire used to reduce the visible profile of standard 24-28 gauge wire inside the model. Magnet wire is wonderful stuff! But, it's also thin and potentially fragile. Pieces prewired with magnet wire (red and green in this kit) should be handled delicately so as not to damage the connections. Also note that, while all magnet wire pieces included have been prepared for connection, magnet wire can be a bit challenging to "strip" to prepare for proper connection. If your prewired LED's with magnet wire don't seem to be functioning, please double check to make sure the colored wire shielding has been stripped away at its connecting point and, if not, carefully use a #11 hobby blade to scrape away any shielding to expose wires as necessary.

Getting Started

So you're ready to embark on your mission? Ok, the first step is to check the contents of the kit to make sure you have all included parts. There may be some modifications necessary to the model kit to accommodate lighting and wires you will need to make before completing installation. If so, you will need different tools to complete the various modifications. We recommend using a rotary tool such as a Dremel for the majority of them, but you should also need a drill or pin vise and a jeweler's file.

Here is a useful chart for non-metric drill bit sizes to accommodate standard size LED's if you need to change any mounting hole sizes:

1.8mm/2mm LED = 3/32" Drill bit
3mm LED = 1/8" Drill bit
5mm LED = 13/64" Drill bit

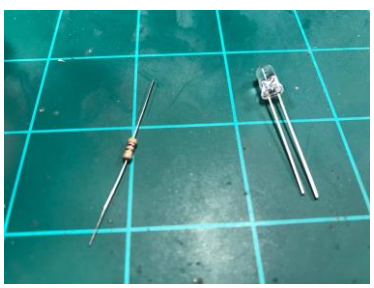
WE ALSO RECOMMEND MARKING THE INSIDE OF THE MODEL DESIGNATING WHERE YOU WILL BE INSTALLING LED'S.

Tools Needed:

- Jeweler's standard (flat head) screwdriver.
- Low Temp hot glue gun. (optional to secure wires
- Wire snips and wire stripper
- Soldering iron with 60/40 rosin core solder

Soldering an LED

We realize not everyone has experience with electronics and, in particular, using a soldering iron. So the Big Easy team thought it would be a good idea to include a little basic tutorial here to make this process simple for you. With just a little bit of practice, you can solder an LED like the pros! Let's check it out… (if you're familiar with this technique, feel free to skip to the next section)

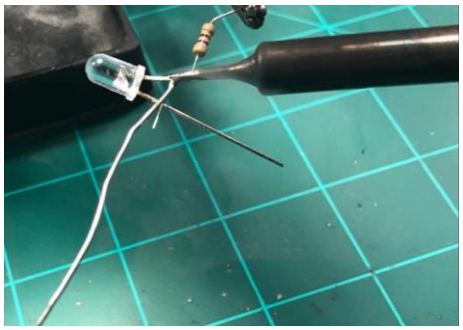


Obviously, the first thing you'll need is an LED and a resistor. For this example, we're using a 5mm Cool White LED and a standard 470 ohm resistor, like most of the resistors included in your kit. These resistors are designed for a 9V or 9V power source. Use a resistor calculator (or "Ohm's Law") for help in finding out which ohm rating you need for your power source if using something different. Your kit comes with appropriate resistors for the included power source. (Deflector/Impulse resistors may be different as those effects connect to a 5V terminal instead of the higher 9V or 9V)

Notice on your LED that each has a long metal lead and a shorter one. In almost all cases, the longer leg is positive and the shorter leg is negative. Also, on 3mm and 5mm LED's, there is a noticeable indentation on the very low ring around the base of the bulb on the negative side. These will help you know which lead is which.

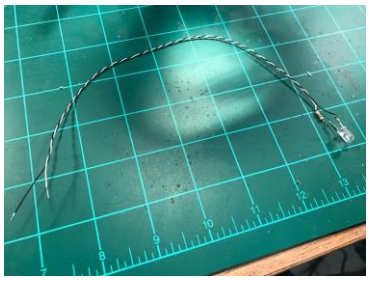
The first step is to wrap one metal lead (leg) of the resistor around one lead (leg) of the LED. NOTE: It does not matter which leg of the resistor goes on the LED leg as resistors are not polarized. Also NOTE: The resistor can be put onto EITHER leg of the LED. However, we strongly recommend always choosing the same one. (we tend to choose positive, as shown, because that's how we were each taught, but it doesn't matter) The reason to always use the same leg is so that, once you clip off any excess metal on the leg of the LED, you'll still know positive from negative.

Soldering an LED (pg2)




Next, slide the coiled resistor up the LED leg a bit and apply the solder by touching the iron and the tip of the solder coil to the wrapped resistor. For most LED's, you should keep your soldering iron from 335˚C to 400˚C. Leave just enough solder to secure the two wire leads together. Then trim the excess wire from the LED leg and the resistor leg, making sure not to cut into the solder itself and separate the two again.

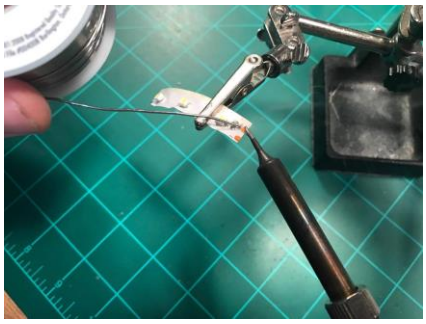
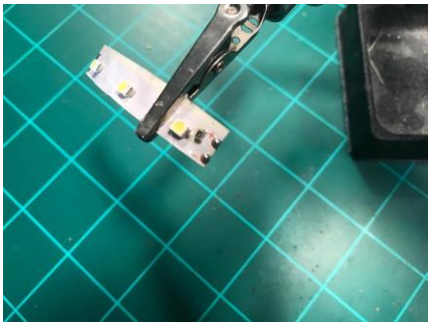
Next, repeat the same process with the wire by coiling about a cm of exposed (stripped) wire around the other end of the resistor and adding solder the same way. Then repeat this step for the negative wire and LED leg. (NOTE: you only need a resistor on one LED leg) Again, trim off any excess LED leg metal.

Finally, twist your attached wires tightly for a tidy finish, strip off a little shielding at the end of the wire, and you should be done! Test your LED by connecting the negative wire to negative on your power source and positive to the positive. (in this case, 9V-9V) If you see light, you've got it right!

Soldering an LED Strip


LED strips are convenient for several lighting needs! They are prewired with resistors to operate at 9V – 9V and may be cut every third LED into smaller strips. However, when cutting the LED strip, you must add solder to the connection points on the strip. This process is actually fairly simple and, since you don't need a resistor for the strips themselves, it is a fast and easy process.

Notice that at the connection points, there is a positive side and a negative side. This is where we will add some solder before attaching the wire. (called "tinning" the solder point) Again, touch the solder coil and soldering tip together to the copper solder points, not just the iron tip with solder on it. "Drag" the melting solder from the solder coil onto the copper pads. You should have a small bead of solder at the point when finished.

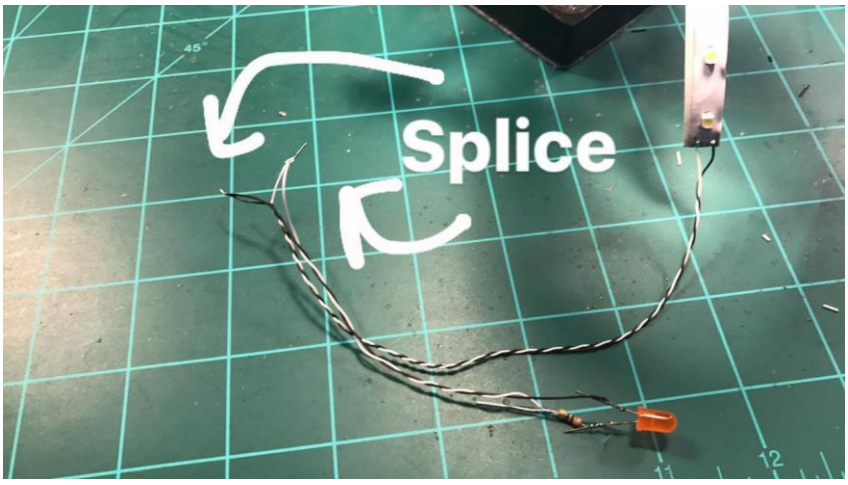
Next, strip off only about a half a millimeter of wire to attach to the points. Simply touch the iron tip to the solder point to re-melt the solder and slip the exposed wire into it and remove the iron, holding the wire still a second or two until the solder hardens. Repeat the process for both positive and negative contact points. That's it! It's wired!

Wiring tips and tricks

"How do those pro and advanced builders get such tidy wires without a rat's nest?" We hear this question a lot. The trick is learning to be efficient with your wiring. It's also important to understand current, voltage, and terms such as "common ground," "common positive (hot)," and other terms and concepts such as voltage drop. For our purposes, we'll focus on "common" connections. This concept basically uses the idea that you can connect either a positive or negative leg of one LED (with proper resistors) to another one on the same wire and terminal and they'll share the terminal's function. For this lighting kit, most of the effects terminals are negative. (you'll connect the negative wire of the LED's to this terminal to get the effect and the positive to the 9V terminal) This means that, while different LED's in one section may all be on separate effects, they can share one common 9V positive wire. This means, if you plan out your wiring carefully, almost all the LED's in, say, your saucer section can have one positive wire spliced from each LED and strip to the next with only a single positive wire having to go back into the 9V terminal instead of all of the positive wires from each LED. Talk about a space saver!

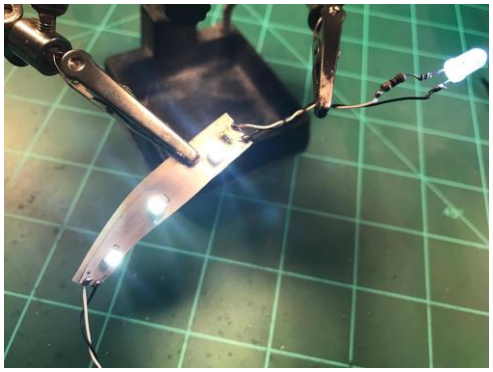
The negative wires will each go to their respective effects terminal. But you can share the wires from each effect as well if multiple LED's have the same effect. (for example, each NAV light can share one negative wire) Then you can do the same for shared strobe (STR) lights, for instance.

To achieve this "common" wiring, you will need to learn how to make a "splice" and a "pigtail" with your wires. A splice is simply twisting two exposed sections of wire together and soldering them together. You can also twist the two wires together, then around an LED or resistor leg to have two wires attached to that leg, one that can go back to the terminal and the other to the next LED or strip. (NOTE: Each LED will still get its own resistor!) That basically makes it where the two wires are joined together to become one common wire. You'd simply connect the positives of each splice to the next LED positive leg and splice another there to go to the next.



A “pigtail” is similar to a splice except, in this case, we’ll twist multiple (common positive, for example) wires together from several LED’s with one additional wire attached to go back to the terminal. That way, instead of trying to fit 10 wires into one terminal, you can simply have one. You will likely want to cover up the splice point of the pigtail with electrical tape or shrink tubing to avoid any possibility of crossing other wires and causing a short.

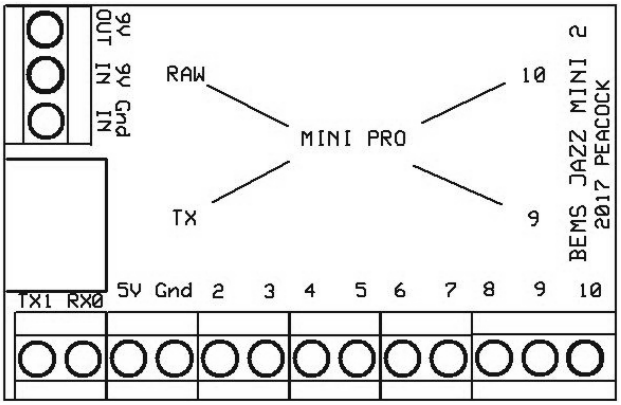
One more trick is using LED strips as a contact point for other LED’s. (as long as either the positive or negative wires or both connect to the same voltage and effects terminal) In the picture below, you can see where an LED has been attached to the LED strip on the contact points opposite of the wire end. The attached LED will behave with the same effect and button functions as the LED strip it’s attached to.



We hope some of these tricks make sense and help you with your wiring to keep things neat and tidy! Feel free to practice with spare LED’s and strips, if you have some. The more you do these steps, the easier it gets!

Board Layout

To begin, let's have a look at the board layout. The diagram below should line up with your BEMS Captain Series TOS Effects Board. The terminals each have an effect assigned to them and your LED's will and switches will connect using the screw terminals by simply inserting the stripped wire into the terminal and then tightening the screw down in place to secure the wire in the terminal. You may find it best to make a hook with the end of the wire when inserting it into the terminal so that it's "double thick." That will help the terminal have more to secure to. Also note that the polarity of the output terminal will be different for some effects.



TOS CAPTAIN Series Terminals

TERMINAL	EFFECT	POLARITY/CONNECTION
0(TX)	SOUND CARD OUT	Connect to RX on the Sound Card
2	SWITCH – PHASER	SWITCH WIRE 1 HERE SWITCH WIRE 2 to GR
3	SWITCH - TORPEDO	SWITCH WIRE 1 HERE SWITCH WIRE 2 to GR
4	SWITCH - WARP	SWITCH WIRE 1 HERE SWITCH WIRE 2 to GR
5	WARP	NEGATIVE to LED
6	PHOTON TORPEDO	NEGATIVE to LED
7	PHASER	NEGATIVE to LED
8	SWITCH – AMBIENT SOUND AND MUSIC	SWITCH WIRE 1 HERE SWITCH WIRE 2 to GR
9	IMPULSE ENGINE	NEGATIVE to LED
GR	GROUND (NEGATIVE) OUT	SOME NEGATIVE LED LEADS (As indicated only) and SFX GR connect here
5V	5V VC POSITIVE OUT	Connect SFX 5V here

Connecting power to the Captain Series Board

To connect power to this board, you do not need a power jack. Simply connect the 9V IN terminal to the 9V OUT terminal on the Commander Series Board and the GR Terminal to the GR Terminal on the Commander Series Board. You can also splice in the positive and negative wires from the power supply jack if you prefer.

9V IN/9V OUT	POSITIVE IN/OUT	Connect 9V IN to the 9V power terminal on the Commander Series board or main 9V power. Connect positive LED legs to 9V OUT as indicated.
GR IN	NEGATIVE IN/OUT	Connect this terminal to GR on the Commander Series board or the main power negative line.

Board Layout Description

0(TX) – AUDIO CARD SERIAL INTERFACE – This terminal controls the SFX Sound Card. Connect a wire from this terminal to the RX terminal on the SFX Sound Card.

2 - SWITCH PHASER – This terminal controls the switch for the Phase Cannons. Connect one pole on the switch to this terminal and the other pole on the switch to GR.

3 - SWITCH PHOTON TORPEDO – This terminal controls the switch for the Torpedoes. Connect one pole on the switch to this terminal and the other pole on the switch to GR.

4 - SWITCH WARP – This terminal controls the switch for the Warp Effect. Connect one pole on the switch to this terminal and the other pole on the switch to GR.

5 – WARP - This terminal controls the LED's for the Warp Effect. Connect the negative point of your warp LED strips to this terminal. Connect the positive point of your warp LED strips to the 9V terminal. For the "always-on" LED's in the nacelles, use blue standard LED's with 470 ohm resistors with the negative leg connected to GR and the positive to 9V.

6 - PHOTON TORPEDO – This terminal controls the LED for the Quantum Torpedo. Connect the negative leg of your torpedo LED to this terminal.

7 – PHASER - This terminal controls the LED for the Phase Cannon effect. Connect the negative leg of your phase cannons LED to this terminal. Connect the positive leg of your phase cannons LED's (with 470 ohm resistor) to the 9V terminal. You can choose which location you wish to have the phase cannons fire from by simply drilling a small hole at the location/locations you want it to fire from and placing an LED, a fiber optic wire, or lasers there. Lasers connect the same to this terminal (negative wire here) but do not need resistors and the positive wire will connect to VC. (5V)

8 - SWITCH AMBIENT SOUNDS/MUSIC/SOUND BYTES - This terminal controls the switch for the Music and Sound Bytes. Connect one pole on the switch to this terminal and the other pole on the switch to GR. You can cycle through the sound bytes, music, and ambient sounds by pressing this switch repeatedly. Pressing the other switches for the other effects (warp and weapons) will reset this switch back to the bridge sound first.

9 – IMPULSE ENGINE ALTERNATE - This terminal controls the alternate Captain Series Impulse Engine effect. This effect is different from the one on the Commander Series board as it is linked with the Warp effect. The Impulse Engines will turn off when the ship goes to warp, then come back on once it completes the warp cycle. Connect the negative leg of your Impulse Engine LED's to this terminal and the positive leg of the Impulse LED's (with 470 ohm resistor) to the 9V terminal.

SFX Sound Board Layout

Now let's look at how to connect and operate the sound card. There are 4 terminals on the SFX Sound Card. Only three are used for connection to this board. Pay very close attention to the voltage here as more that 5V will damage the sound card rendering it inoperable!

RX – Connect this terminal to the TX terminal on the main Captain Series board.

TX – This terminal is not used.

GR – Connect to GR on the Captain Series.

5V – Connect ONLY to the VC terminal on the Captain Series board!

For any questions, contact us anytime through our Facebook page or at:
www.bigeasymodelingsolutions.com
Thank you and happy modeling!!!