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Thank you for purchasing our **Dual Blinker Board, HLIFX_001A**, from the Hobby Link International Shop! We hope that you will enjoy using this control board for your lighting effects needs on your project/scale model build. **This board will produce both a strobing flash effect, as well as a slower blinking navigation/formation light effect.** We have designed this board to be fairly simple in application, whilst also considering size and LED driving capability. As such, we believe that we have developed a "flasher board" that will suit most needs to add simple blinking effects to your project.

Please take the time to carefully, and thoroughly, read and understand these instructions. Any use of this board beyond our recommendations or stated limits, or ignoring any and all warnings is at your own risk. We also take no responsibility if you physically alter or modify the board, or mishandle it in any way. If you have any questions, do not hesitate to contact us using the available information at the end of these instructions.

Included with your kit should be:
1 x Dual Blinker Control Board (HLIFX_001A)

If you also purchased the kit with the optional accessories and components, you should also have:
- 1 x 9V AC-DC Wall Adapter/Transformer
- 1 x Panel-Mount Female DC Jack – The Outer Bent Lead is for + Voltage, the Outer Straight Lead is for – Ground, and the Middle Lead is not connected
- 10 x 3mm 9V Pre-resistored LEDs: 2 x Red, 2 x Green, 2 x Yellow, 4 x White

Other things you will or may also need:
- Hookup Wire
- Wire Cutters/Strippers
- A Soldering Iron or Soldering Station
- Solder with a Flux or Rosin Core
- Heat Shrink Tubing

## SECTION 1:

Let's begin with an overview of the board. On the right is a top down view, the left is bottom up. We have placed connection labels on the underside of the board to save space.


**VIN:** This is the connection for your + voltage supply line. **THE BOARD IS OPTIMIZED TO WORK AT 9V-12V POWER.** We recommend the use of an AC-DC wall adapter/transformer if you are going to be driving more than a handful of LEDs with this board.

**GND:** This is your ground connection, or the negative power connection if you are using a battery or similar source.

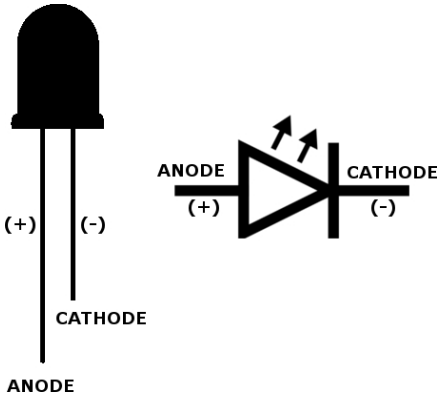
**STRB:** This point is where you will connect your strobing LED circuit as described in SECTION 2. The effect has been programmed so that the LEDs flash for 75 milliseconds and turn off for 1 second. **NEVER connect VIN OR POWER in ANY way to this pin under ANY circumstances or you risk damaging your board!**

**NAV:** This point is where you will connect your navigation LED circuit as described in SECTION 2. The effect has been programmed so that the LEDs turn on for 1.25 seconds and then turn of for 1.5 seconds. **NEVER connect VIN OR POWER in ANY way to this pin under ANY circumstances or you risk damaging your board!**

You can solder wire directly to these thru-hole connections or any other method you prefer.

**SECTION 2:** The board has been designed to allow for the driving of multiple LEDs for both the Strobe and Navigation effect. This section will show you how to connect your LEDs to the board.

Several different types of LEDs can used with this board, including but not limited to: 3mm and 5mm LEDs, surface mount LEDs, as well as sections of LED strip. Below is the standard configuration for a 3mm or 5mm LED (left) and the schematic symbol for an LED (right.)




You can use pre-resistored LEDs, as long as they are rated for the supply voltage you are using. Again, we recommend 9V-12V.
You can also use LEDs plus resistors that you choose to wire up yourself, as long as you choose resistor values suitable for your supply voltage.

**At 9V power, we suggest using at least 470 Ohm, ¼ Watt rated resistors if you choose to wire them up yourself.**
**At 12V power, we suggest using at least 680 Ohm, ¼ Watt rated resistors if you choose to wire them up yourself.**
In which case, you will solder one of the resistor leads to the ANODE(+) of the LED. Then, solder your hookup wire to the other resistor lead and secure the whole thing with heat shrink tubing. Use your soldering iron, heat gun, lighter or similar heat source to carefully shrink the tubing and insulate the connections. Then solder another piece of hookup wire to the CATHODE (-) of the LED and secure with heat shrink.

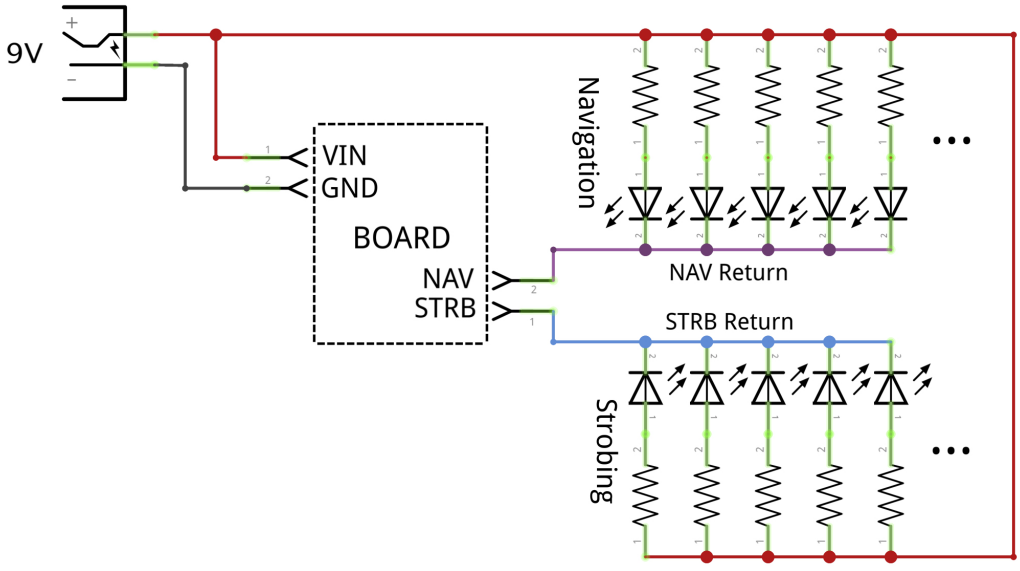
**It is CRITICAL that ALL THE CONNECTIONS TO THE LEDS AND YOUR WIRING ARE INSULATED FROM EACH OTHER AND DO NOT TOUCH, or you could short and potentially damage the circuit!**

Should you choose to use LED strip, also be sure that it is rated for voltages at least as large as your supply voltage.

## As a general rule of thumb, up to 20 LEDs can be driven in parallel for each effect.

So, up to 20 for Navigation lights and up to 20 for the Strobes. You could also use up to 20 segments of LED strip, or even mix and match different types of LEDs/LED strip, as long as the number a parallel branches does not exceed 20 per effect.

The wiring diagram for a typical circuit is shown below. Study it carefully and become familiar with it:



**Your supply voltage (+ 9V-12V) will branch to both VIN of the board and all the high side (+ ANODE) connections of you LED-Resistor pairs.** In the figure above, we have five parallel branches for each effect. But again, you can have up to 20.

If you have the optional panel-mount, female DC power connector, please note that the outer bent lead is for (+) Voltage, the outer straight lead is for (–) Ground, and the middle lead is not connected.

**Notice that for each effect, NAVIGATION and STROBING, all the low side (- CATHODE) connections, or returns, are tied together and run back to their respective connecting points on the board. The common return of the Navigation LEDs runs back to NAV, and the common return of the Strobing LEDs runs back to STRB.**

**AGAIN, YOU MUST ENSURE THAT THE POWER LINE CONNECTIONS NEVER COME INTO CONTACT WITH THE RETURN SIDES OF THE NAV AND STROBE CIRCUITS! OTHERWISE YOU WILL CAUSE A SHORT AND MAY POTENTIALLY DAMAGE YOUR BOARD!**

**The ground of your power supply source, or negative of your battery, only needs to run to the GND connection of the board.**

Once all the connections are made, you simply apply power and the LEDs should start blinking. Be sure to double check that no connections are touching before you apply power. You can use hot glue on the underside of the board to secure it wherever you need to.

## SECTION 3:

Again, our rule of thumb is 20 LEDs in parallel per effect. This assumes that each LED is being driven at or near its maximum current of around 20mA. It is possible to add more LED branches if you use larger resistor values. Or, you could connect a couple of LEDs in series per branch. We leave it up to you and your own devices to work through the math and resistor selection, since those depend on many different factors.

If you decide to go down this route, **you MUST ensure that the total current draw for each effect does not exceed 400mA**. Any more than that, and the onboard circuitry will get warm enough to be problematic if you put the board in an enclosed space. You must know what you are doing and we take no responsibility for driving the board beyond these limits.

Also, if you are driving many LEDs, it is always a good idea to use thicker gauge wire for proper current handling. According to the U.S. Electrical Code, when dealing with around 800mA of current (if you're running the maximum number of LEDs with our board), you should be using 22-23 AWG wire or thicker. This is a very, very conservative estimate, so 24 gauge wire should also work fine, which can be had for cheap from ethernet cabling.

## SECTION 4:

Our circuit, as with most circuits, does require some amount of soldering, so we will discuss that breifly here.

First, a good quality soldering iron is a must, preferably a station with temperature control. Soldering temperatures need not be extreme. The author has had his iron set to about 600F (~320C) for a long time without any issues. Use of a "screwdriver" style iron tip is also helpful. It will transfer heat more effectively than a pointed tip that has a much smaller area of contact.

Flux is also critical. Flux cleans away any oxidation and helps the solder flow over the areas it needs to go, so make sure you are using solder that has a flux core. Keep in mind that lead free solders require higher temperatures to solder properly. 60/40 Tin-Lead Rosin core solder is quite common and effective. A tub of Rosin flux is also useful for applying flux directly to what needs soldering.

It is important to coat your iron tip with a thin layer of solder before getting to work. Sometimes called "tinning" or "pre-tinning." This helps heat transfer more efficiently and reduce oxidation due to high temperatures. When soldering with wires or resistor/LED leads, it is also a good idea to pre-tin them as well before actually soldering them together. Our board connections should already be pre-tinned.

For joining pre-tinned wires, first take both ends you wish to solder and either bring them together or twist them together. Put a small dab of solder onto your tinned iron tip and make contact with the wires on the underside of the joint. Let the wires heat for a few seconds and then touch your solder wire to the joint. The solder should melt and wick into and around the joint. Remove the solder wire and then the iron and wait for the joint to cool and the solder to solidify. The process is very similar to soldering wire to LED and resistor leads. A set of helping hands to hold the wires and leads in place can also be quite useful.

For soldering wire to a circuit board, first take your hookup wire and insert it into the PCB's thru-hole point from the top side down. This way, you can solder on the underside of the board and avoid accidentally damaging components on the top side with your iron tip. Make sure your iron tip is pre-tinned and apply a small dab of solder to it. Bring the tip into contact with both the hookup wire and solder pad of the board, waiting a couple of seconds to heat them up. Then touch the solder wire to the joint, trying to avoid touching the iron tip. The solder should wick and flow around the wire and the pad. Remove the solder wire and then the iron and let the joint cool and solidify.

We will be posting companion videos for our kits and instructions to YouTube in the near future. In the meantime, if you feel that you need a visual aid, there are plenty of YouTube videos and online articles on how to solder wires and leads together, as well as soldering to circuit boards. You can also purchase soldering practice kits from Amazon and eBay to try out before committing to our board.

We thank you once again for purchasing our Dual Blinker lighting kit and hope it serves you well. If you have any questions, please feel free to contact us!

Relevant HLI links and contact info:

Be sure to check back at the Hobby Link International Shop often for other lighting kits and control boards that we will be producing. And if you haven't already, stop by the main Hobby Link International website, and especially our community forums. There are lots of great, friendly people over there with subjects to cover almost every aspect of scale modeling!

Cheers,

Spencer Wolfe – Design and Testing
Tom Conklin – Design and Assembly
Kenny Conklin – Resident "Stress Test" ;) and Sales
Paul Tosney – Procurement and Sales

# Warranty Disclaimer (Light & Sound Kits)

**Warranty**
Thank you for your interest in the products and services of Hobby Link International.

This Limited Warranty applies to physical goods in our light & sound kits purchased from Hobby Link International (the "Physical Goods").

**What does this limited warranty cover?**
This Limited Warranty covers any defects in material or workmanship under normal use during the Warranty Period.

During the Warranty Period, Hobby Link International will repair or replace, at no charge, products or parts of a product that proves defective because of improper material or workmanship, under normal use and maintenance.

**What will we do to correct problems?**
Hobby Link International will either repair or replace the Product at no charge, using new or refurbished replacement parts.

**How long does the coverage last?**
The Warranty Period for Physical Goods purchased from Hobby Link International is 10 years from the date of purchase.
A replacement Physical Good or part assumes the remaining warranty of the original Physical Good.

**What does this limited warranty not cover?**
This Limited Warranty does not cover any problem that is caused by:

- conditions, malfunctions or damage not resulting from defects in material or workmanship

**What do you have to do?**
To obtain warranty service, you must first contact us via info@hobbylinkinternational.com to determine the problem and the most appropriate solution for you.