

## LEDs in Large Scale Rail Roding By Revell Walker

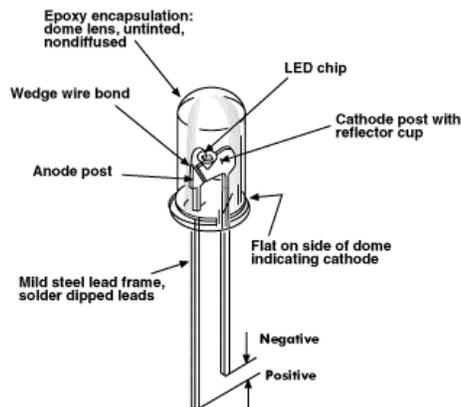
LEDs or Light Emitting Diodes are the latest in ingenious ways to illuminate electronic devices. You may see these on the all the current diesel offerings from USA Trains and Aristocraft as marker lights and in some cases main headlights. They replace the grain-of-wheat bulb (GOW) in these applications because they use less current, run cooler, and don't melt your surrounding plastic.

Many modelers have replaced their GOW headlamps in favor of a new class of LED, the super-bright LED. Super bright LEDs can throw a beam of light up to ten feet down the track at night. Here, you can see how effective they are when placed in a GP-38-2.



### How They Work:

Here is a diagram of the typical LED. They are polarity sensitive (only work in one current direction) so knowing where the positive (+) and negative (-) leads are is important.



The negative lead is always the shortest. If you should cut that lead and forget which one, the one with the “flag” is the negative.

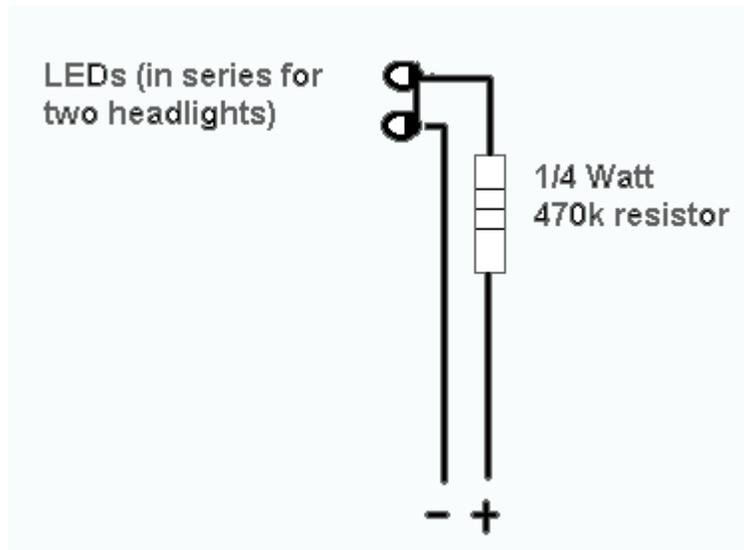
### Typical Loco Uses:

Most of us will want to upgrade existing lamps from either a dull LED as supplied with the model or an incandescent lamp change out. The scratchers and bashers among us will want to do more things.

If you upgrade to super bright from a dull LED, there isn't much to do except watch your soldering and note the existing polarity as you remove/install. The resistors that step down current are already in the circuit board. The Aristocraft RS-3, Critter, and Center Cab follow this practice. Using a 5mm LED makes this an easy mod.

If you are replacing a GOW, you need to know what current the bulbs are using. In the case of USA products, the bulbs are pretty much in the 3volt class and a resistor steps down the current. For a single lamp as installed on the NW-2, 55 Ton and S-4, simply hook up a 3mm super bright where the old bulb used to be.

If you are replacing the lamps in one of the EMD dual lamp products (GP-9 et al), there may or may not be resistors in the cab lighting system. If there aren't you need to follow this layout:



The resistor is key to the operation of the LED. It is a low voltage diode and runs on up to 3 volts. Because our engines typically operate in the 12 to 18 volt range, these diodes can't survive for long at that current. The formula for sussing this out is as follows:

LED rating: 3 volts @ 20 milliamps (.02amps) / Track current: 18 volts

$18 - 3 = 15$  volts step down / Resistance = volts/current =  $15 / .02 = 750$  ohms

Here are two links that will help work this out as well. The first one is for determining the resistor needed for single lamp:

<http://led.linear1.org/1led.wiz>

The next shows what's needed for multiple series hook-ups like dual headlamps

<http://led.linear1.org/led.wiz>

Put in your values and it will show you what resistor you will need and the schematic of the wiring you need to fashion.

The blocks are filled in thus:

Source Voltage = power supply voltage

Forward Voltage= LED voltage (usually 3.5 volts, but consult your specs)

Diode Forward Current = LED current is often rated at 20 milliamps, or 20ma

#### **LED sources:**

On the web, there are a number of places where you can order them in quantity.

- <http://www.superbrightleds.com/>
- <http://www.hebeiltd.com.cn/?p=z.pricelist.led.diode>
- <http://www.besthongkong.com/?ref=4>
- <http://www.fiberopticproducts.com/Led.htm>

RaM Electronics has a great selection of LED lighting units for train applications, and they make single and dual lamp LED sets in low power and 24-volt sets.

<http://www.ramcandramtrack.com/rtlights.html>

This is one of their units installed in my RS3U



There are a number of applications for LEDs in our hobby. You can make your own flashing FRED unit, illuminate interiors, ditch lights for diesels, the list is endless. Go out and give it a try!

Another good source for info is George Schreyer's White LED tips on his train technical tips pages, [http://www.qjrr.org/qjrr/tips/tips7/white\\_led\\_tips.html](http://www.qjrr.org/qjrr/tips/tips7/white_led_tips.html).