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FLICKER-FREE
PASSENGER CAR AND CABOOSE LIGHTING CIRCUITS

by Jim Murphy

Photo 1

Below are simple circuits for Passenger Car (or even caboose) interiors. The circuits are fine for DCC or conventional DC. Do not use with more than 14 volts RMS on the track, or you will need higher rated capacitors. Since DCC actually puts AC on the rails, the diode bridge rectifier is required to provide DC to the circuit. The rectifier allows lighting circuits to illuminate no matter which way the train is moving. We assume that there is power pick-up from the rails to the trucks and into the car interior. Trucks with pick-ups are available at local hobby shops. You can easily make your own wheel pick-ups from internet instructions.

Although DCC carrier voltage is on the track at all times, interruptions occur. Flickering is caused by dirt, rail gaps and turnout frogs. A Memory Back-Up Capacitor, a super-high capacitance (up to 1 Farad) commonly used to maintain dynamic memory when power is off, greatly reduces the problem by holding charge like a battery. I prefer the compact memory capacitors to rechargeable batteries. They're small and only a few dollars each. Depending on how many bulbs are connected, this circuit could keep a car illuminated for up to one minute when the power stops.

Photo 3

The higher the voltage is on a capacitor, the larger the physical size. The first circuit sees 12 volts on the lights or more so the capacitor is rated for 16 volts. A 0.33 F cap is ½" dia. by ¾" tall, about the maximum for an HO installation. The next two circuits put the cap on the 3.3 volt or lower side. A 1.0 F cap for lower voltage is ½" dia. by ¼"thick, allowing N scale installs.

Photo 2

A variable resistor or potentiometer will adjust the lights' brightness. As you get satisfied with the brightness on the layout, measure the resistance in Ohms across the pot and use a fixed resistor of the same value in your future installations.

See photo 1. Turn the pot down a third of a rotation to get a nice realistic glow.

The first circuit, Strip LEDs, is quickest to install.

Connect track pick-up wires to the rectifier AC (~) terminals, with one leg including the variable resistor, and the ± to the LED strip terminals. Lights must be connected in sets of three. Six or nine lights work for most cars.

The next circuit, Warm White, is the most versatile and works best for individual LEDs. Using an IC called a voltage regulator; the circuit puts an exact voltage across the lights. See photo 2.

Any number of LEDs can be used due to the low current draw. The large 1.0 F capacitor virtually eliminates flickering. See photo 3

The last circuit, Incandescent, is better for 1.5 volt micro-incandescent bulbs. It is the only choice for Utah Pacific® marker lights. See left edge of photo 4.

As the current is much higher for incandescents, a heat sink is necessary on the IC chip and the capacitor should be 0.47 F max. In the example, the end of the car was pot metal, so the IC was Gooed® in place. See photo 5.

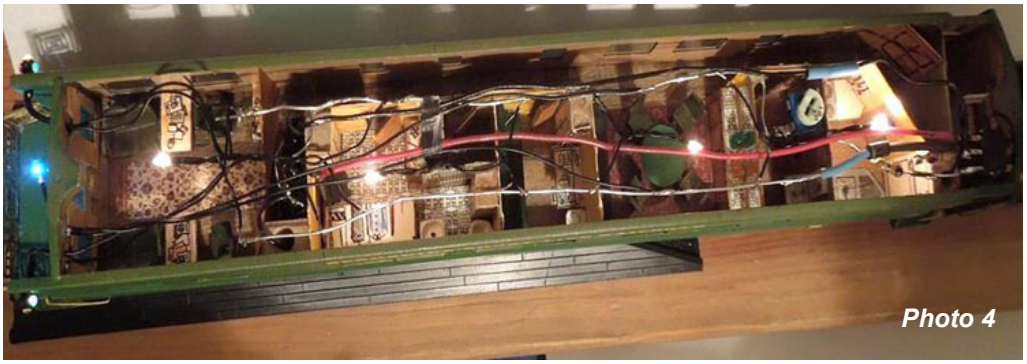
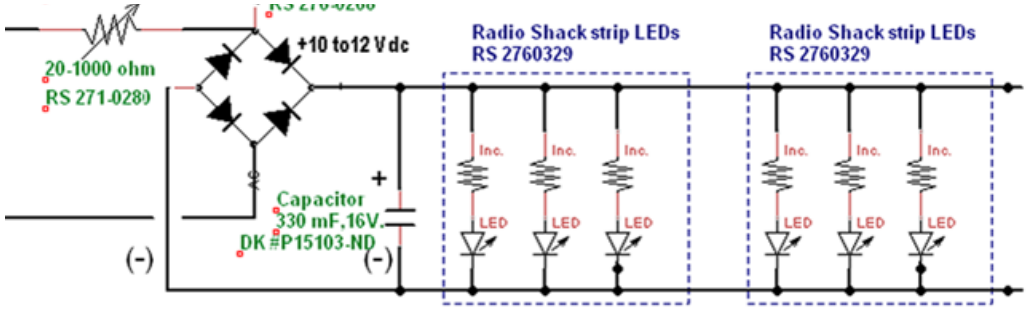


Photo 4

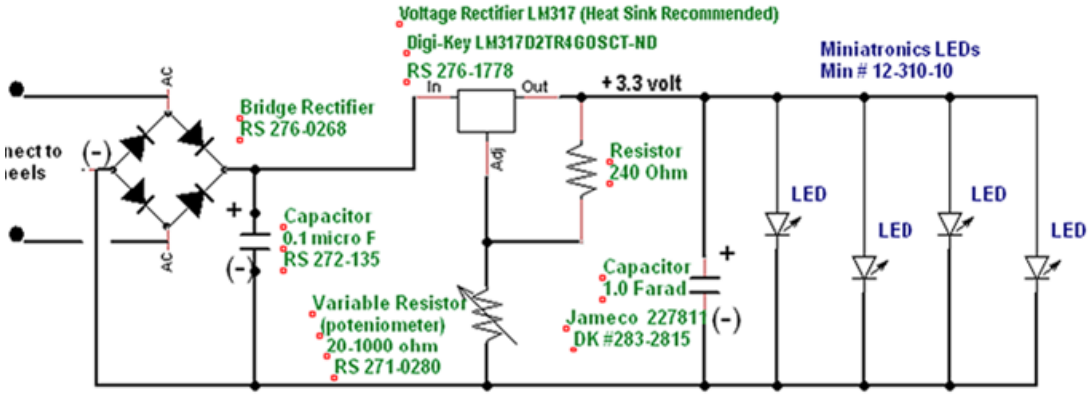
For brighter lighting, lowering the adjusting resistance increases voltage and the brightness. Remember that more brightness means shorter bulb life. For longer bulb life, limit the voltage to 1.65 v. The Miniatronics® #18-001, 15mA bulb works for most cars but for a brighter interior, use the #18-201, 40mA bulb. Remember to place the potentiometer in a screwdriver-accessible position. See photo 5.

Please see lighting schematics on following page

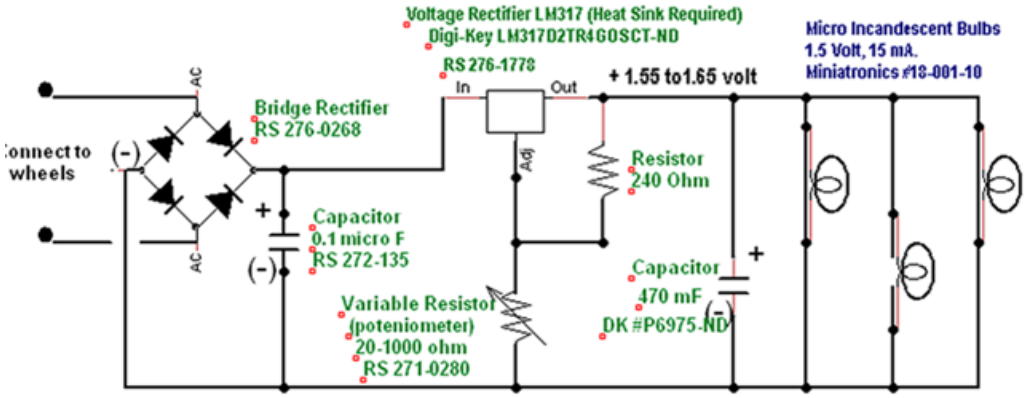
Photo 5



Lighting Schematic for Radio Shack Strip LEDs



Lighting Schematic for Warm White LEDs



Lighting Schematic for Incandescent Bulbs

Title	Lighting Schematic for Passenger Cars	
Author	J. P. Murphy	
File	:\Sketchup Drawings\Lighting Cars JPMurphy.png	Document
Revision 1.0	Date 31-Jan-2015	Sheets 1 of 1