

## Replacing Older Bulbs with LEDs on O and S Scale Passenger Cars and Caboosees

[www.modeltrainsounds.com](http://www.modeltrainsounds.com) - Project 11

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Many Lionel (O Scale) and American Flyer (S Scale) passenger cars and some cabooses come with an electric pickup method installed and use incandescent light bulbs that turn on when the train is in motion. A system is described at the website (Project #9) for lighting cars using an on-board 9 Volt battery system that keeps LED lights on even when the train is stopped. In this Project we use the electric pickup present on the car and adapt it to use the LED Driver Circuit Board designed for this lighting purpose. A full Bridge Rectifier is used to correct the current polarity for the AC or DC current used. A capacitor stores voltage to limit flickering and an LED Driver chip limits LED current to 20 milliamps.

All that is needed is to construct the LED Light Circuit, connect it to the LED Driver Board, install an optional switch, hook up the electric pickup wires and install it in the car.

The Kit for replacing incandescent bulbs includes the following components.

- Three Soft white LEDs (5mm), Two Red LEDs (3mm)
- One preassembled LED Driver circuit board that includes the Bridge Rectifier, Electrolytic Capacitor and LED Driver chip along with Blue and Green Connection terminals .
- Connecting wires
- A slide switch
- Heat shrink tubing
- Mounting Putty

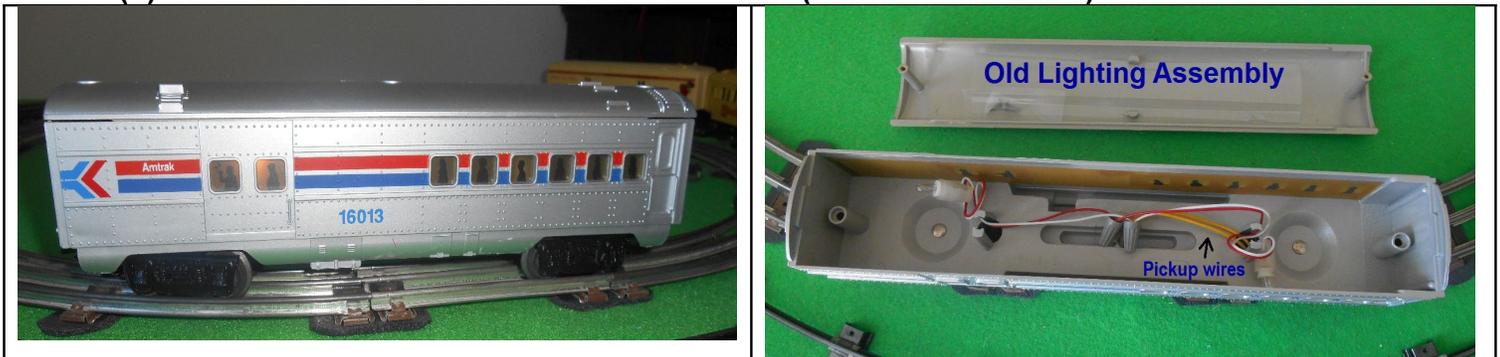


The Kit can be ordered from the website listed above .

Three examples are presented here using 3 different LED lighting circuits made from this kit.

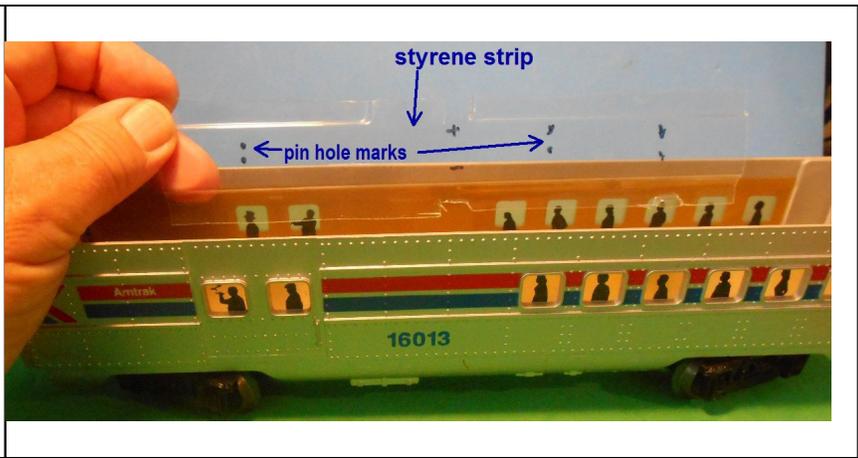
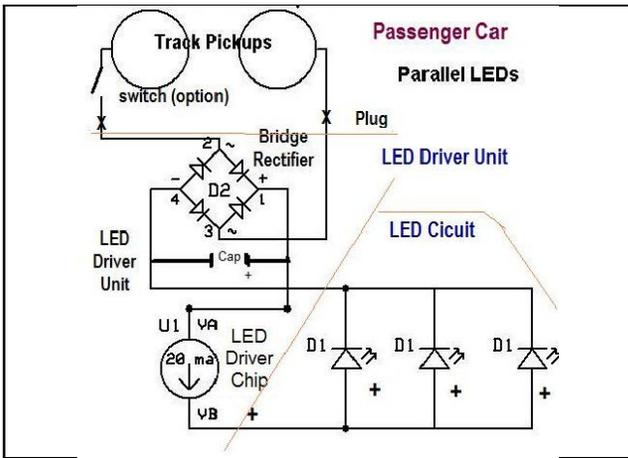


### (1) PASSENGER CAR WITH TRACK PICKUP (3 Soft White LEDs)



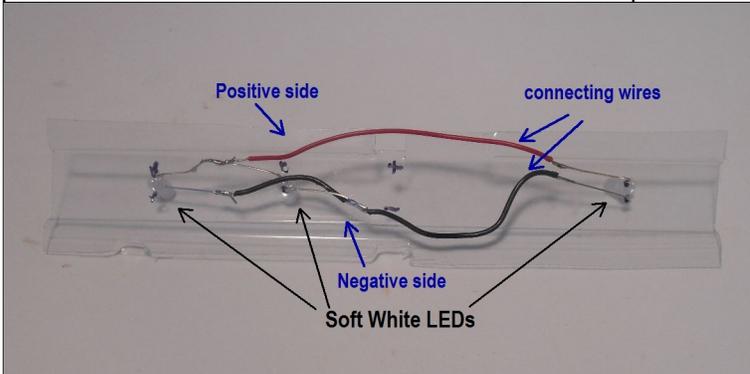
Original lighting in a Lionel O Scale Amtrak passenger car. The roof was secured by 2 retaining screws.

The two bulbs and connecting wires were removed leaving the two yellow pickup wires.

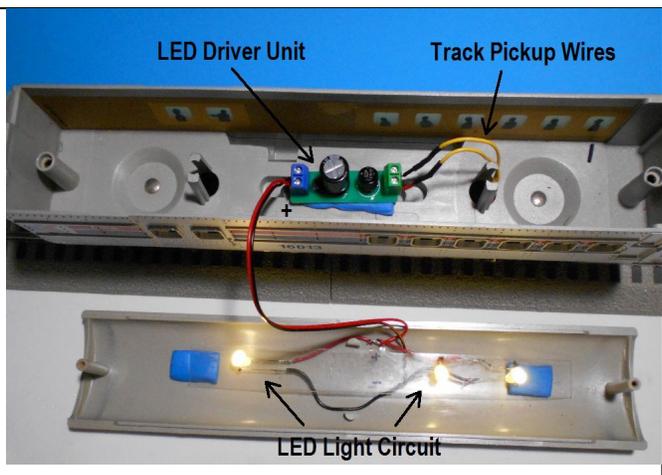
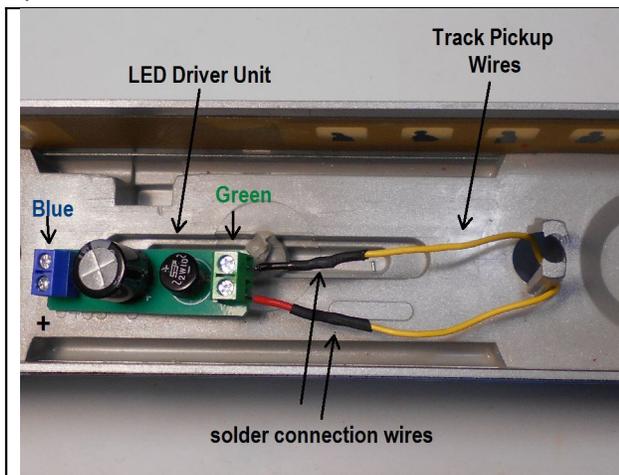


The LEDs in the new circuit are set up in parallel with the positive and negative wires connected to the LED Driver Board Blue terminal. This Board is connected the track pickup via the green terminal.

A piece of clear plastic styrene strip is cut and labeled one side + and the other --. Marks are made as to where the 3 LEDs will be positioned for best illumination. Pin holes are made in the styrene strip, the width of the LED leads. Note that the positive lead of the LED is longer than the negative cathode lead.



The LEDs are inserted with the Positive (longer lead) on the + side. The Positive leads are solder connected together with red wire. The Negative leads are connected with the black wire. This circuit will be connected to the LED driver unit by soldering connection wires to the Red Positive side and black wire to the Negative side.



The track pickup wires are connected to the Green terminal of the LED Driver board either directly or using a piece of connection wires. The solder joints are covered with heat shrink tube to avoid short circuits. The orientation of the wire connection to the green terminal is not important. If the switch is required see option number 3.

The wires from the LED circuit are connected to the LED Driver unit's Blue Terminal. The Positive side is connected to the terminal plug labeled (+) (See under the board.). The board can be seated in the cabin using the adhesive putty as shown. Use enough connection wire to allow for opening up the car roof. The light strip is attached to the roof of the cabin also using adhesive putty

Reassemble the car.  
The LEDs will illuminate when the track voltage generally exceeds 5 - 6 volts.

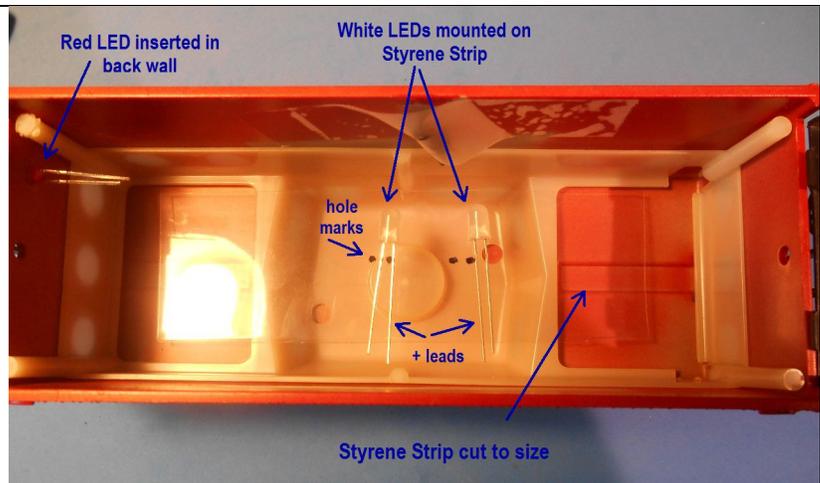
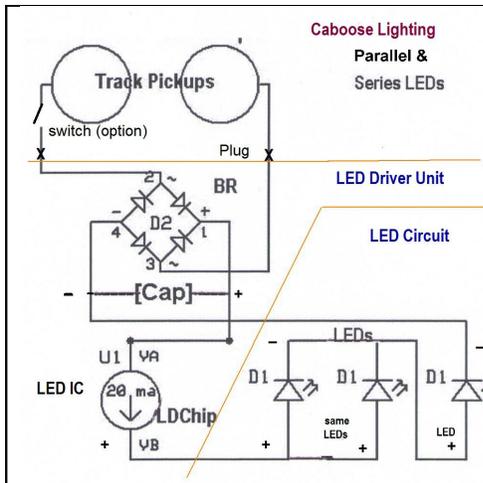


## (2) PORTHOLE CABOOSE WITH TRACK PICKUP (2 White LEDs & One Red rear LED)



This Lionel Porthole Santa Fe Caboose was disassembled. It had track pickup and lighting using one incandescent bulb that had burnt out. The cost for a replacement incandescent bulb was \$10. The LED replacement kit is about the same with improved lighting.

The bulb was removed from the socket. The pickup wires were cut and socket removed. A hole was drilled in the rear wall (7/64") to snugly accommodate the red LED. Because of the ladder and brake wheel present only one red LED was used in the rear of this caboose along with 2 white LEDs for the cabin.



The circuit in this case is different because the white and red LEDs have differing forward voltages. Either two soft white and one red or one white and two red LEDs might be considered. No more than 3 LEDs are advised.

The styrene strip method was used for setting up the circuit for the 2 white LEDs for the cabin. The 3mm red LED was inserted into the hole drilled in the rear wall. The cut styrene is marked for the pin holes that are punched to accommodate the LED leads. The LEDs are inserted with the longer Positive leads in the center and twisted together.



The LED Light circuit was setup in the cabin. The styrene strip was attached to the roof with adhesive putty. The wires were connected to the LED Driver Unit. The driver unit circuit board was secured to the floor with adhesive putty.

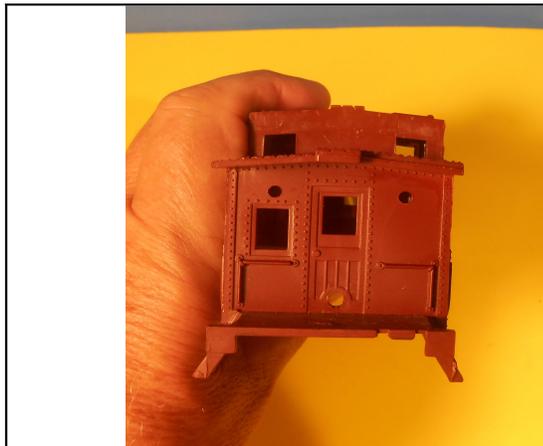
Make sure the board is insulated from any metal floor with the putty. The lights should be tested again before securing the cabin to the chassis. The LEDs should light at around 5-6 volts.

**(3) VINTAGE POST WAR CABOOSE WITH TRACK PICKUP (one White LED and 2 Red rear LEDs plus a switch to turn lights off if not needed.)**

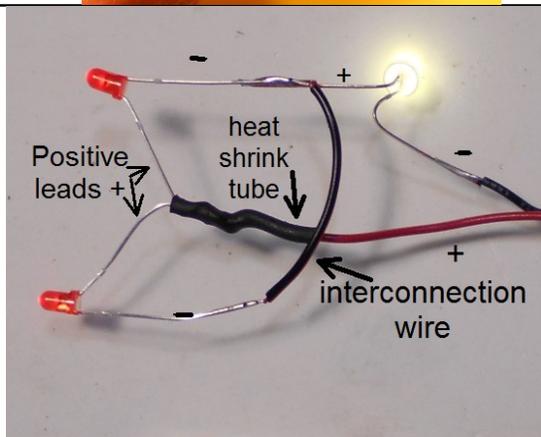


This Lionel O Scale Vintage Caboose with track pickup was used. A single White LED will light the cupola and two red LEDs will be installed in the rear wall of the caboose. A switch was added.

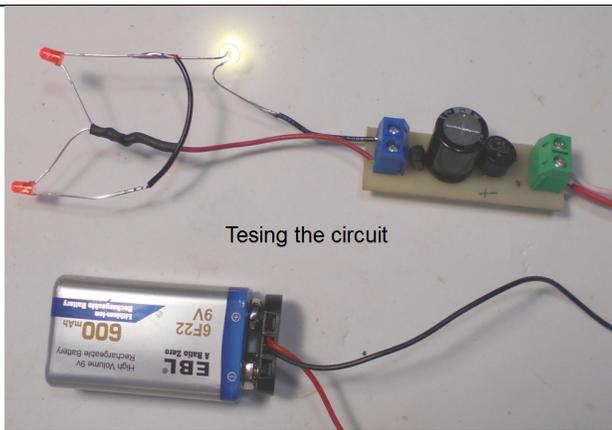
The track electric pickup uses a central roller wheel for contact with the center rail and wipers on the axle for pickup from the outer rails via the metal wheels.



The lighting setup for this caboose is similar to that in Project 8 except that the track pickup is used to light the LEDs. The Caboose is disassembled by removing the screws or bending out the tabs located at both ends of the car. Two holes are drilled in the rear cabin wall. The holes are set apart 1&3/16" (3cm). Drill first with a 1/64" pilot hole, then use a 7/64" and finally use a round fine file till the red LEDs fit snugly into the holes.



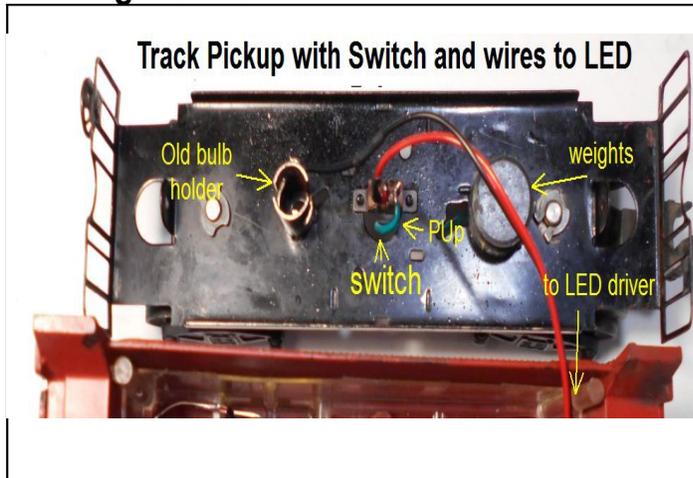
The LEDs are set up with the 2 red LEDs in parallel and the white set in series. The Positive leads of the red LEDs are twisted together then soldered to a wire that connects to the Positive side of the Blue Terminal on the LED Driver board. Heat shrink tubing is used on this joint to prevent a short circuit. The Negative leads from the red LEDs are interconnected by the black wire. The Positive lead of the White LED connects to one of the red LED's Negative leads. The Negative lead of the white LED connects via a black wire to the negative side of the Blue Terminal.



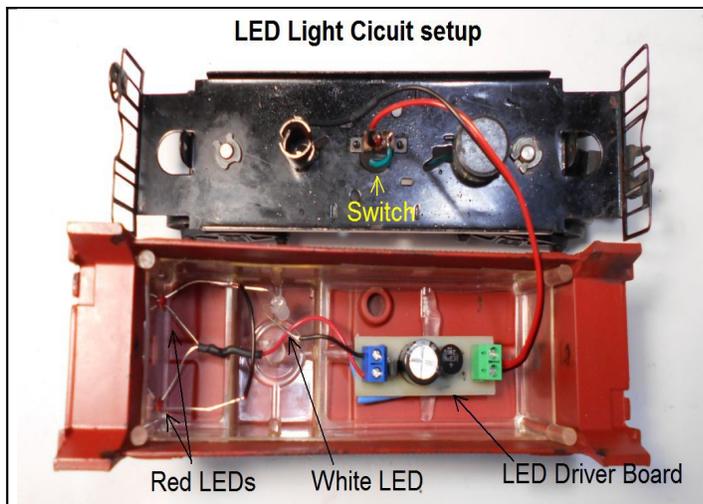
The circuit can be tested by connecting the wires to the Blue terminal of the LED Driver unit and connecting a 9 Volt battery to the Green terminal. The order of connection here does not matter as the Bridge rectifier corrects the polarity for the light circuit.

**DO NOT TEST** without the LED Driver unit present. The LEDs will blow out.

### Adding a Switch to the Cicuit



The switch is super glued to a hole in the floor of the cabin where the pickup wires come through. Use a small amount of glue at the edges and make sure the slide works. Solder one of the pickup wires to one of the end pins on the switch. The red wire is soldered to the middle pin. On this caboose there was only one pickup wire while the metal old bulb holder acts as the ground. The black ground wire is soldered to this and returns with the red wire to the Green terminal on the LED driver board. The order of connection does not matter..



The red LEDs are inserted into the holes in the rear wall of the caboose. If loose the LEDs can be glued into place. The white LED is positioned near to the cupola. Here the LED driver board is secured to the roof rather than on the floor. The cabin is now reattached to the chassis and is ready for the track.

On the track the lights should illuminate at around 4-5 Volts input, whether AC or DC current is applied. If there is dimming add some weight to the floor of the caboose to ensure good contact.