An EOT (End of Train) Flashing Red Light Project. (FRED) HO Scale

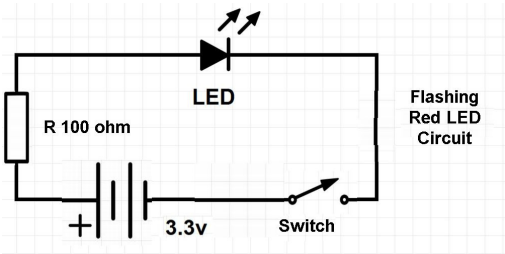
Robert J Wilkins Dec 2017

Since Cabooses have been replaced by a Flashing Rear End Device (FRED) on North American Railroads it seems appropriate to try replicate these devices for model railroads. Commercial EOT units are available which are very prototypical but also quite expensive.
Several options were to be considered.
1 Should the single LED circuit be powered from the track or from its own battery source.
2 If a battery is used should it be internal or externally accessible.
3 Since 3 Volts is all that is needed should two Alkaline (1.5V each) be used or should one dime sized Lithium 3Volt battery be used.
4 Should a simple flashing red LED be used in the rear wall of the Car or should an external device be constructed.
Because of the many options several approaches were made. The project is divided into 2 Parts .

The first Part involves installing the Red Flashing LED and EOT Device with an internal battery. This is the simplest approach. It does require that the Car be disassembled each time the battery is replaced. I set up a test circuit to find out how long a flashing LED would light and discovered that one 3 Volt Lithium battery would flash for 5 days straight before the voltage dropped to 1.5V and the LED ceased to Flash. Since we generally don't run our trains for 5 day sessions (120 hours) and if we use a switch to turn off the EOT device this battery should last for many sessions. Furthermore these batteries are now inexpensive and can be held in a compact holder that easily fits into the floor of the Car.
Installing the red LED in the rear wall of the car was also a simple approach as all wiring could be maintained internally . This however is not prototypical.
Here are the steps used in the project.

Components One HO Freight rolling stock such as a Reefer , Caboose, Wagon etc.
* One 3mm Red Flasher LED. The rate of Flash is around 70 Flashes/second.
One 3Volt Lithium Battery CR 2025 or 2032. I used in my test a Lithium CR2025 purchased at the Dollar Store (2 batteries for $1).
* One Lithium Battery holder
* One 100ohm Resistor
* One Slide switch ON/OFF
* 5 inches dual 28 AWG red/black wire
* 2 inches Heat Shrink Tubing

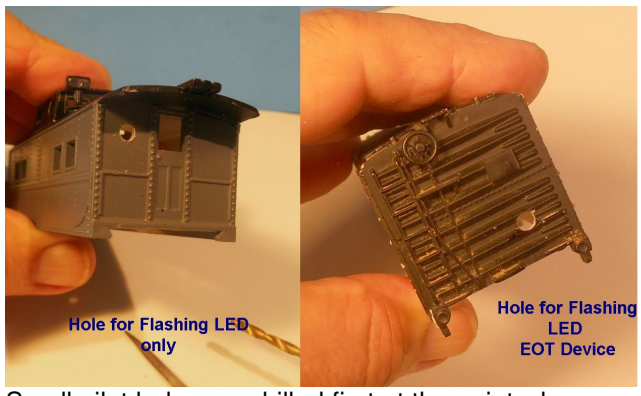
Also needed are a soldering iron, flux and solder, drill bits (1/8 5/32"), slow speed or hand drill, round file, hacksaw, Super Glue (Cyanoacrylate) and Blu Tack Adhesive Putty used to secure parts.



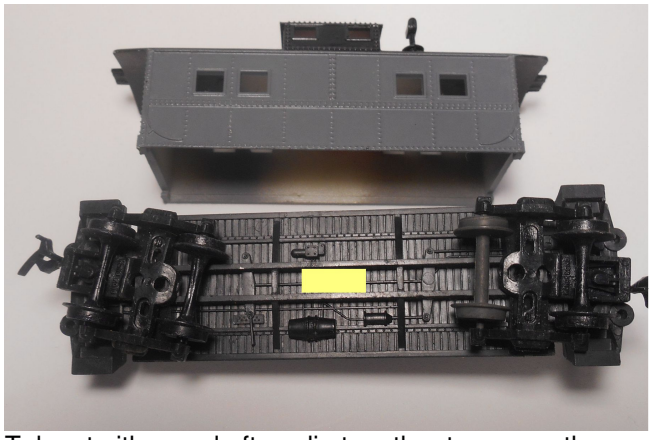
*** A kit containing the components marked with the (*) can be ordered at the website www.modeltrainsounds.com** (Also includes the EOT Housing shown)

Part A Installing Flashing LED in Rear Wall

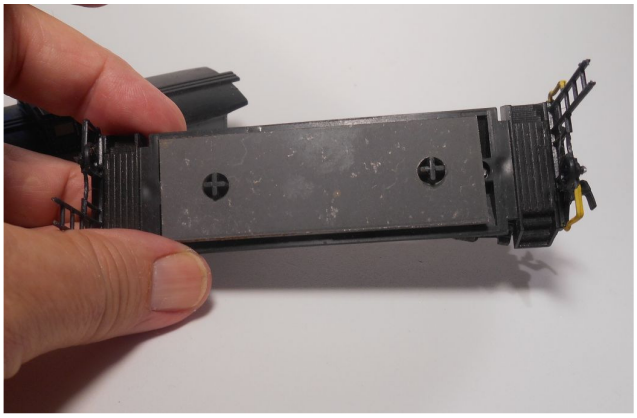
HO Scale Bachman Steel Caboose and a Boxcar are used here as examples. Only the flashing LED will be used on the caboose.
To drill a hole in the rear wall use a hand drill or slow speed drill. Start with a small pilot hole.



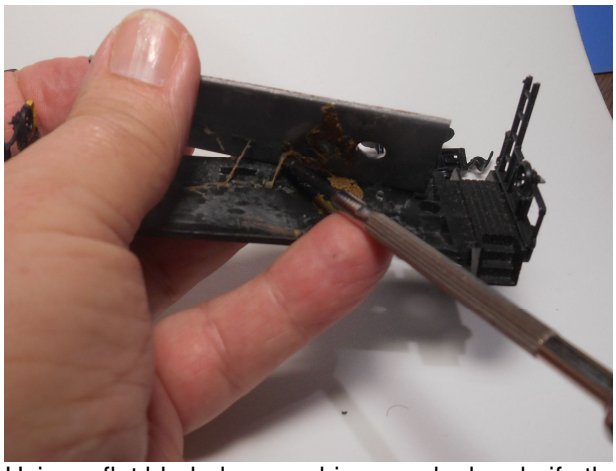
Small pilot holes are drilled first at the point where the Light is to be placed. For the Flashing LED only use 7/64" bit then ream the hole with a round file to snugly fit the LED. This avoids gluing. For the EOT device use a 5/32" bit to pass LED thru the hole.



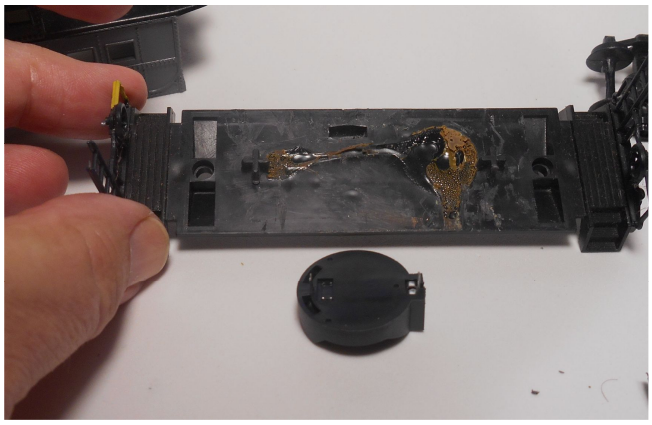
Tabs at either end often clip together to secure the body to the chassis. Disassembled, The yellow area marks the site for the slide switch installation.



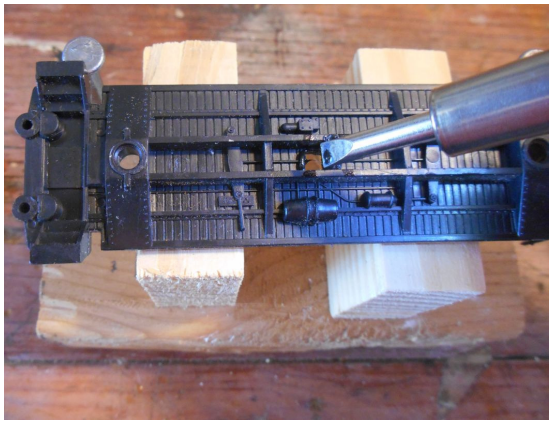
A metal plate used as a weight has been glued to the floor of the Caboose. This must be carefully pried off. It will be reused.



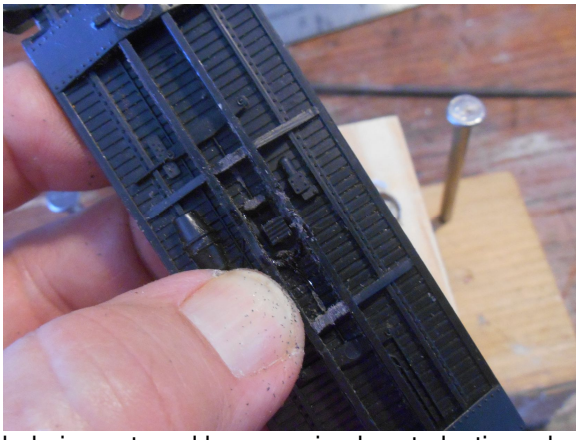
Using a flat bladed screw driver, scalpel or knife the glue was gently released and the metal plate removed.



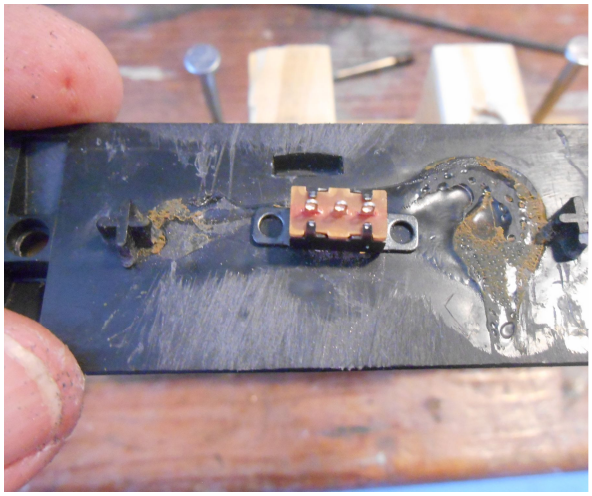
The old glue was sanded flat so that the slide switch and battery holder can be attached.



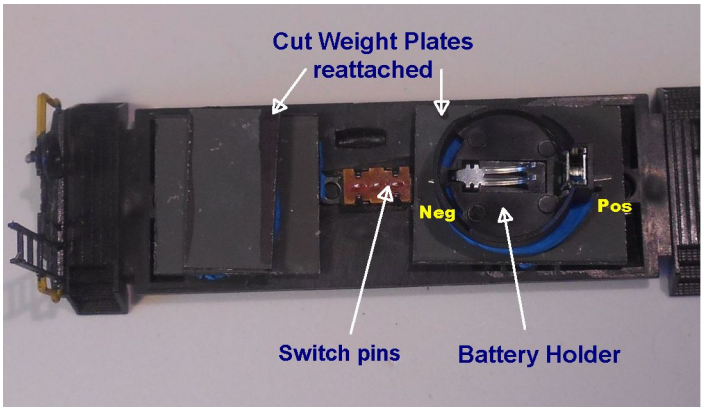
A rectangular hole approximately 3/8" long and 3/16" wide is made using a hot solder iron. Do this in a ventilated area as burning plastic fumes will be given off. A square blade solder tip is used here but a round tip and file will work.



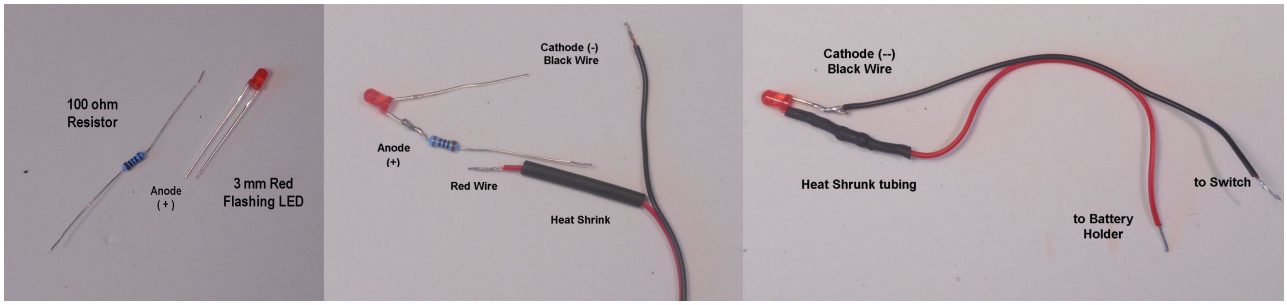
The hole is neatened by removing burnt plastic and squared off with a file This hole will accommodate the slide of the switch which should be able to move ON and OFF freely before gluing in place.



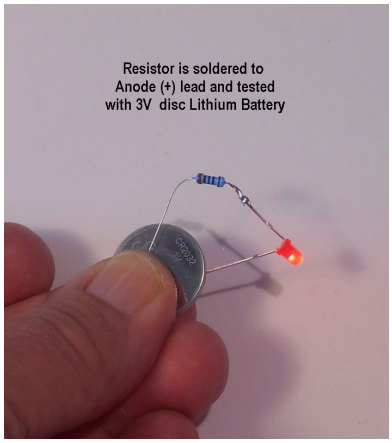
The switch is glued into place using CA - Super Glue (Cyanoacrolate). The weight plate is cut with a hacksaw so as to accommodate the switch.



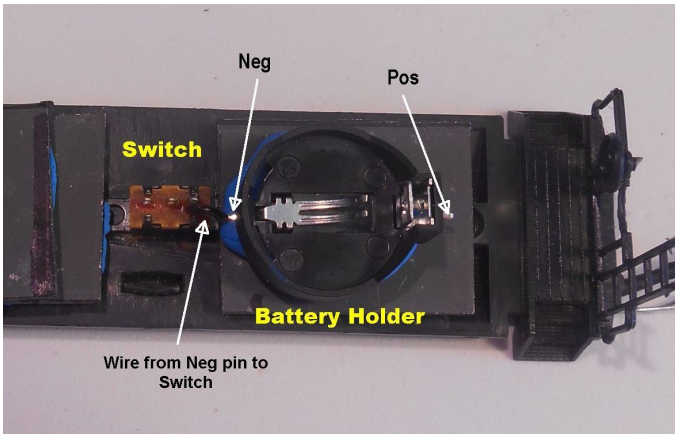
The weights are reattached with Blu Tack putty or CA. The battery holder is seated on the plate with putty. The putty acts as insulation. The pins on the holder are flattened and the negative terminal is set near the switch.



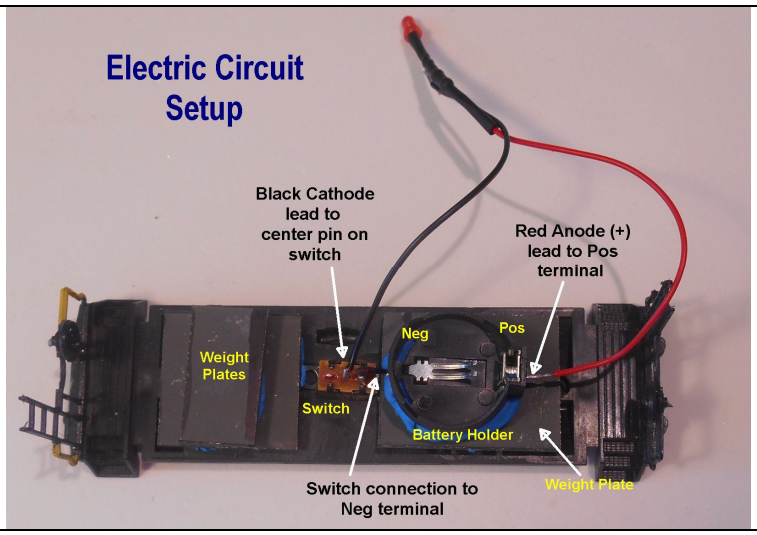
The lighting circuit : The 100 ohm Resistor is wrapped around the longer Anode lead of the LED and soldered. The Red wire is stripped, tinned. About 1.5" of heat shrink tube is threaded over this Red wire end and the wire is soldered to the resistor. Any free ends are snipped off. The heat tube is moved back over the resistor and solder joints and heat shrunk using a hot gun or hair dryer. This helps avoid ant short circuit from wires touching. The Black wire is soldered to the shorter Cathode lead of the LED.



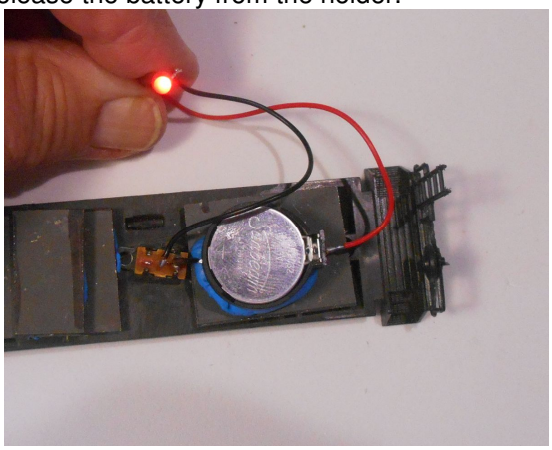
Once the resistor is attached the circuit can be tested using the 3V Lithium battery by holding the Anode lead to the side marked with the Positive symbol and the other Cathode lead to the other side of the battery. The LED should flash.



A short piece of the black wire is soldered between the Negative pin of the Battery holder and the closest end pin of the switch.



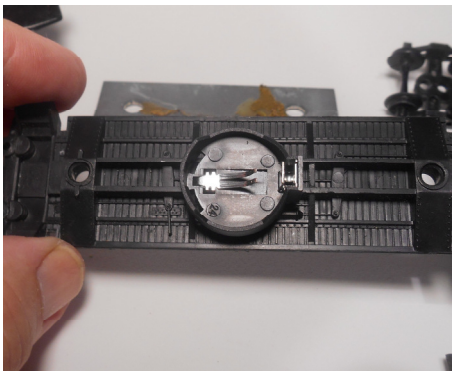
The Black Cathode lead is soldered to the center pin of the switch and the Red Anode (+) lead is tinned and soldered to the Positive pin of the battery holder. This pin has a spring clip that when squeezed together will release the battery from the holder.



The Battery is inserted and the switch tested

If the LED is used alone the LED is inserted in to the hole in the wall of the cab. If the EOT device is used, the LED is passed through the hole and inserted into the hole of the EOT so that it completely fits within the hole. the hole on one side of the device is slightly larger for this purpose.
After testing it should be glued into place with CA. The cabin is reassembled and ready for the track.

Part B: Have the Battery exposed for easy changing



This project requires a large round hole to be made in the floor of the chassis to accommodate the battery holder. This holder is inverted to expose the battery for easier replacement without requiring the disassembling the cab from the chassis. This project is not for the timid.

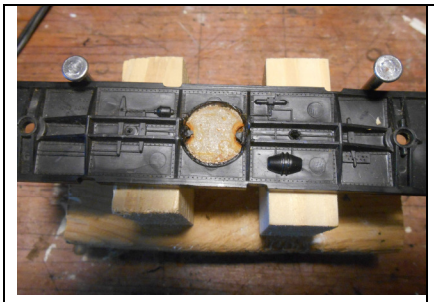
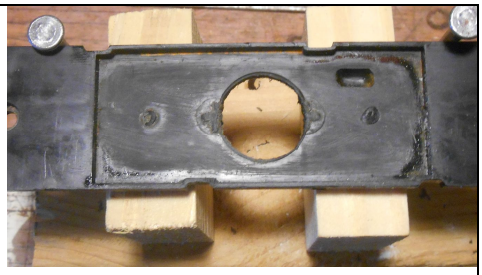
I have experimented with several options as to how the hole can be made. Having used a hot iron (right photo) to make a hole in a toner printer cartridge and noting that this method gave a nice clean cut in the thick plastic I thought that this might be an option. Unfortunately the diameter of the cut is 5/8ths " while the battery holder has a diameter of 7/8ths".

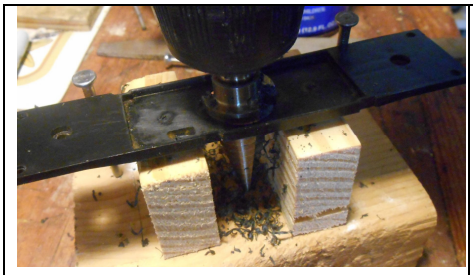
I found that 3/4 " copper pipe has an outer diameter of exactly 7/8ths but no cap exists with this diameter. It was necessary to fashion a cap from a short piece of this 3/4" copper tube and turn this into a cap to be attached to the hot iron. This homemade cutter is attached to the iron heated and can be used to cut the 7/8" hole.

Another approach was to use the toner iron, since these are readily available, to create the hole and then use a reaming step cutter drill bit to expand the hole to 7/8th". The drill bit used was exactly 7/8" at the widest diameter. I used this method here.

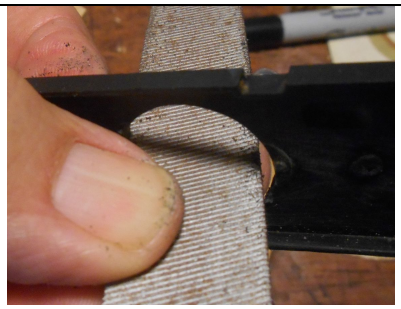
The initial 5/8th cut with the hot iron was made with the weight plate still on the chassis. This gave support to the cutting. and made the cut easier.

The weight plate was then removed and the floor cleaned of old glue and rust.

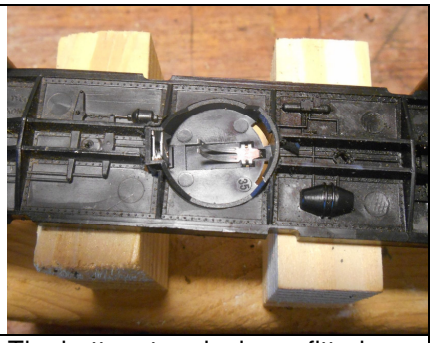
		
5/8" hole cut with hot iron cutter. Here the metal plate was left on for support.	Plastic sprues were snipped and the floor cleaned of the rust and glue debris..	The floor was smoothed with sandpaper. Now showing a clean 5/8" diameter hole.



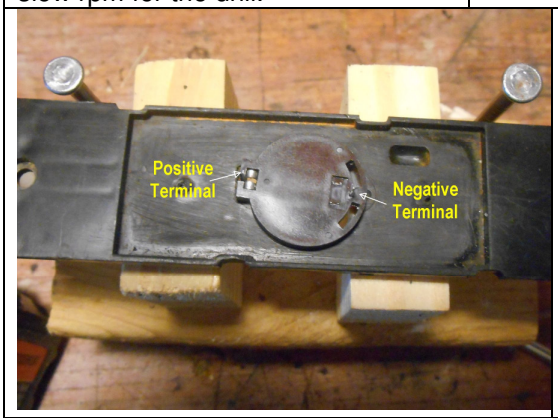
The hole was widened to 7/8' diameter using the step cut drill bit. This should be done with care at slow rpm for the drill.



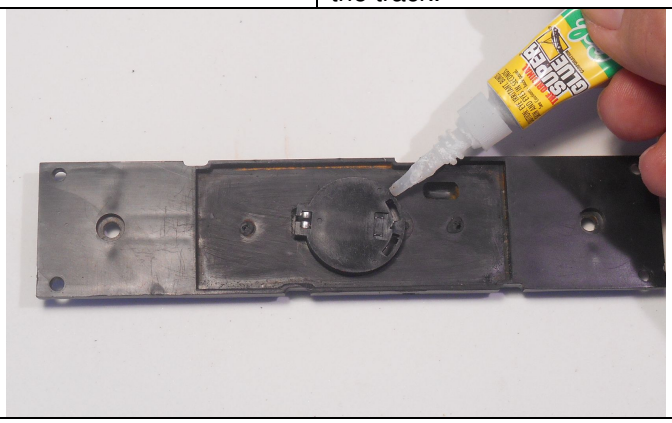
A flat file was used the cut out the end for the Positive terminal of the battery holder



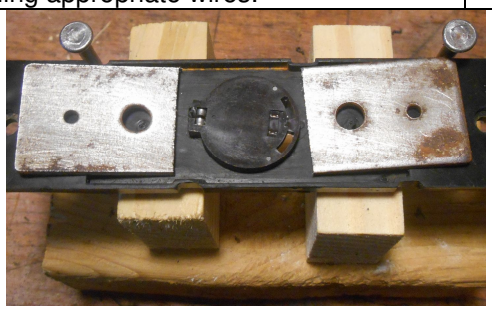
The battery terminal was fitted into the opening with the battery holder side facing down toward the track.



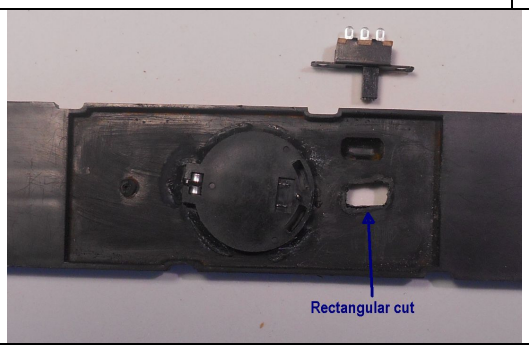
The topside shows the battery holder Positive (left) and Negative terminals for attaching appropriate wires.



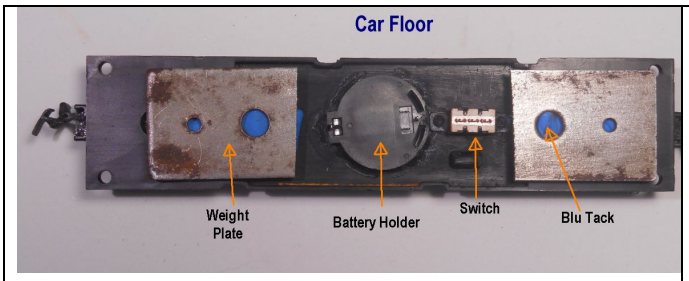
The battery holder can now be glued in place with CA (Super Glue). Allow to seal in about 10 minutes.



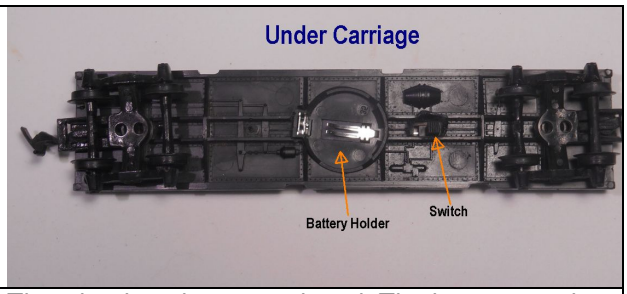
The metal weight plate is cut in two and will be reattached using Blu Tack adhesive or CA glue.



The 3/8" rectangular hole is cut with a hot solder iron and the switch glued into place with CA glue..



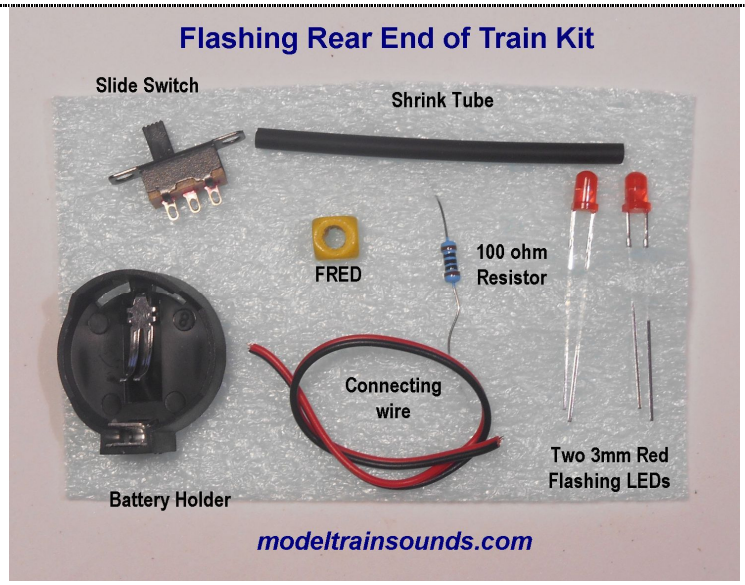
The slide switch and battery holder are glued in and the weights are replaced held in place by Blu Tack. The lighting circuit is soldered to the appropriate pins as described above.



The wheel trucks are replaced. The battery can be inserted into the holder, held in by clips. The chassis is now ready for the positioning of the LED and reattaching of the cabin.

Finished Caboose

Finished Box Car with EOT Device



- 2 Red Flashing 3mm LEDs. (2 are included in case of a mistake in installation)
- 100 ohm Resistor
- 3V Lithium Battery Holder
- Slide Switch
- Connecting Wires (5")
- Heat Shrink tubing (2")
- End of Train LED holder
- Instruction Sheet.

cc Robert Wilkins 12/2017