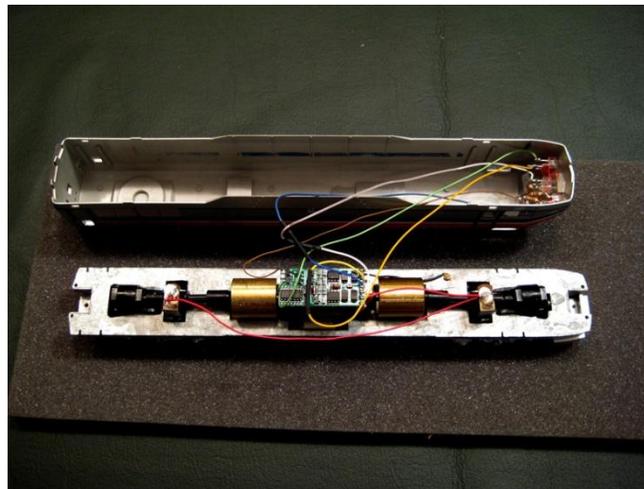


Section 3E and 3J NMRA Achievement Program Electrical Engineer

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This covers the installation of a DCC decoder in an Athearn non plug and play locomotive (#14) and then the addition of effects lighting (#23).

During installation of a Digital Command Control (DCC) decoder, in a blue box Athearn locomotive that is not a plug and play, it is necessary to define two locations to pick-up the track power. The red wire connects to the rail on the Engineer's side of locomotive. The black wire connects to the rail on the fireman's side. On these Athearn locomotives the right (red) wheels connect to the tabs that connect to the top of the motor by way of a metal strip that connects to the tabs on the trucks. I removed the metal strip and soldered red wires to the truck's tabs.



For the left side pickup, which is connected via the trucks to the frame, I install a brass bolt. The bolt should be installed into frame in an area that is accessible but does not interfere with the operation of the locomotive. I drilled and tapped a hole for a 0 -80 bolt and install the black wire to the bolt and tighten it down. This work should be done on a clean frame, no motor or trucks see below.



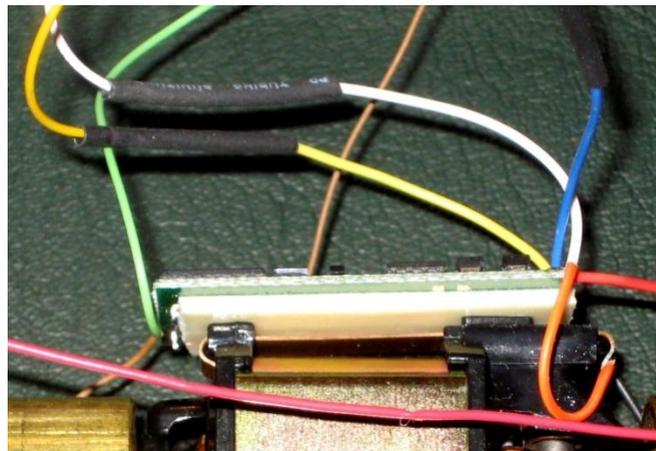
I next removed the brass clip, that holds the spring and brush which transfers the current to the commutator, on the bottom of the motor, being careful not to lose the spring and brush. I removed the two tabs that are punched out of the brass that make contact with the frame. This can be done by

cutting the tabs off and filling the clip smooth or you may press the tabs back into the clip but make sure it is smooth and flat. Connect a gray wire to this clip at the top front. To insure there is no possible short to the frame I installed a small piece of insulation before reinstalling the motor.



With these wires connected, red to the right rail, black to the left rail, gray to the bottom, I then added the orange wire to the top of the motor brass clip. At this point the locomotive may be tested on the program track for shorts.

I attach the decoder to the top of the motor with two sided foam tape.



The next step is to connect the headlights. In most of my early conversions I installed 14.5 volt grain of wheat lamps in a brass tube behind the plastic lenses. The white wire is connected to the front headlight and the yellow to the rear headlight. The blue wire is common to all functions. Remember the output is at track voltage; do not blow out low voltage lighting or LEDs. Note the heat shrink tubing over the soldering joints to prevent shorts.

With the lights connected a normal installation may be tested and then the locomotive is ready for programming. Program the Locomotives number into the long address and set the start voltage. Then set the acceleration and deceleration value. I use 10 for acceleration and 5 for deceleration.

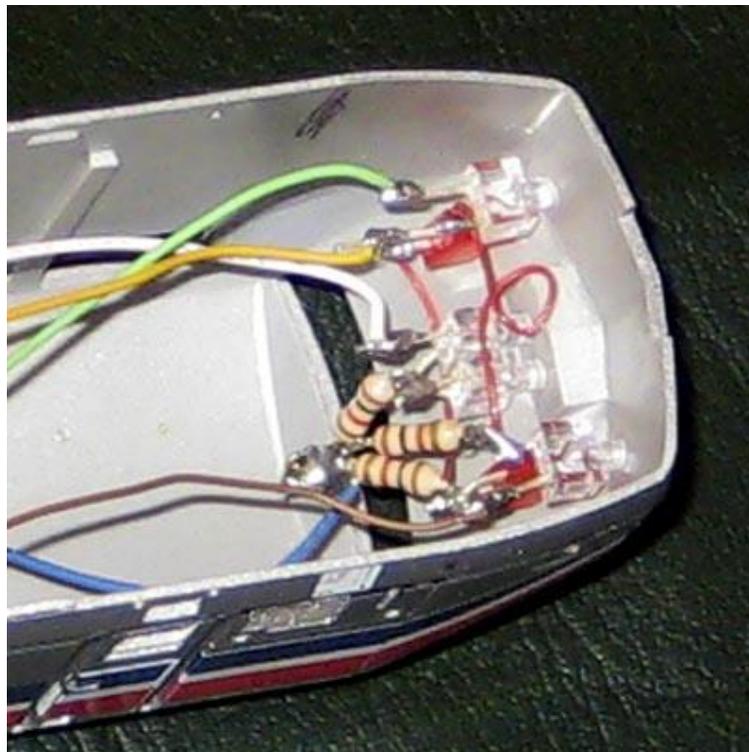
Programming is part of the installation and if you are able to bump the start or have EMF feedback it is important to program these as well.

It is important to note that Athearn frames are connected to the left rail or fireman's side rail. If you MU two of these locomotives and have metal couplers they will short when back to back. A plastic coupler will solve this problem. This is true even if you connect the wires to the trucks and do not use the frame for connection to the DCC board the frame is still hot with the left rail current.

The special installation of dual headlights, operating ditch lights and marker lights that show red when in the push of push/pull operations

I installed sub-miniature LEDs for headlights, red marker lights, and white ditch lights. Four lines, white, yellow, green, and brown, official color is purple but it came out brown in the photos, are used. Mapping the functions and the effects (FX) to the correct connections and then restricting the current for the LEDs is necessary for the operation to work. The LEDs used in this HO locomotive were made with small 3 mm lenses and have a rectangular base. In the case of the headlights and the marker lights these were wired in parallel. The ditch lights each have a dedicated wire and a common return to their resistor.

In this photo we see the white lead is connected to the 2 main headlights, the yellow wire is connected to the marker/ classification lights and the green and brown wires are connected to the ditch lights. All LEDs are then connected to their current limiting 1K resistors and then to the common blue wire.



The programming includes selecting the FX configuration for each output and assigning the appropriate value to the associated Configuration Variable (CV) for function mapping.

CV 33 is for Function (F) 0 Fwd (Headlight White wire) is assigned a value of 1

CV 34 is for F0 Rev (rear Headlight Yellow wire) is assigned the value of 2

CV 36 controls the Ditch lights and has outputs 3 and 4 assigned with a value of 12

Next program the FX CVs for outputs 1 thru 4

CV 120 for F0 Fwd (Headlight White wire) is assigned a value of 1, for forward, plus 128 for an LED =129

CV 121 for F0 Rev (used for the marker lights) is assigned the value of 2, for reverse, plus 128 for an LED =130

CV 122 and CV 123 control the Ditch lights these get set for forward 1 +60 for ditch lights +128 for LEDs

This programs the FX so that the headlights and the ditch lights operate in the forward direction and the marker lights are available for backing in push / pull operations.

With these Athearn blue box locomotives you can also add Rotary Beacons on the roof using 1.5 volt lamps or LEDs with resistors to limit the current flow. The beacon program value is 12. It is common is to use the green wire (Function 3 which is CV 122) and add 128 if you use an LED.

You will also find that in the DCC ready locomotives the beacon is connected to the headlight and does not flash. This may be rewired for Function 3 control by rewiring the lamp. (Remember the resistor or you will get one flash)



