## Atlas RS-3 Decoder Install

My Atlas RS-3 is Canadian National #1812 and is a very nice running locomotive on DC. However, I'm running DCC so I needed it more functional.

My decoder brand of choice is TCS, with their "goof-proof" warranty and their "dithering" function for ulta-low speed crawl. In this instance I happened to have on-hand a TCS M3 decoder, which has motor control and 3 functions for things such as lights. I'd only be needing two of the functions but the third is there in case I want to put a strobe light on the roof.

0. As always, you'll have to figure out how to disassemble the locomotive. I always hate this part, especially on a new unit I don't have any experience with. However, if you have the parts sheet, this can give you a good idea of what you're in for. Make sure you note the orientation of the trucks, motor and any other parts that might care about which direction they're pointed. A special note on the motor is to make sure you mark which way is up and front. You need to end up with the bare frame halves so that you carve away the bits you don't need.

1. The next thing to do is mark the frame for the areas to be filed or cut off. I use a fine-tipped permanent marker for this job. This takes a while as I need to consider how much room there is for the decoder, the wires, lights and so on. I'll also want to avoid any moving parts.
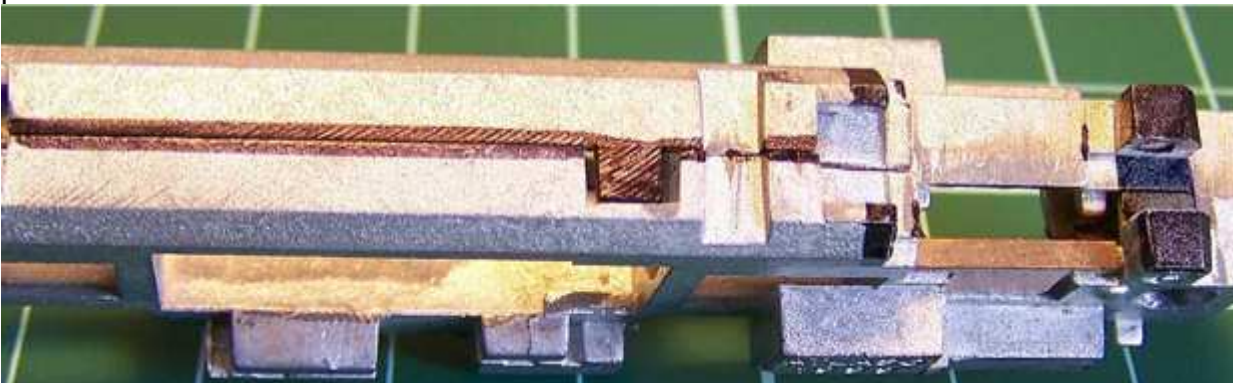
In this case, I'm putting the decoder in the <u>short hood end</u> of the locomotive, which I will call the <u>front</u>. I chose this end as the motor brushes are nearest that end. The idea is to make sure the decoder fits within the confines of the frame edges -- flush with the sides and top of the frame so that it will fit inside the shell. So, from right to left:

1. remove slightly more than half the height of the posts where the LED sits
2. remove some height between these posts as we'll need additional clearance so that the LED will fit underneath the decoder
3. remove about half of the clips where the light board mounts
4. remove material down the center to provide a V-groove for wires for the other light and for the motor and track feed wires
5. remove the tab that sits above the top motor brush to allow motor wires to feed through

2. One of the trickiest parts of this installation was the front LED, which I had to make fit underneath the decoder in as near to its original position as possible.

1. mark the positive lead on the LED. In this case, it is the one connected to the resistor.
2. unsolder the LED and resistor from the light board
3. file the LED as flat as you dare, parallel to the lead wires. You have to be careful here as the business portion of the LED is flared inside the epoxy housing. I did this under a strong light, stopping often to inspect the results. Don't go too far or you'll release the magic smoke and the LED will be light emitting no more!
4. clip the LED and resistor leads nice and short, perhaps 3mm
5. solder the resistor to the positive lead of the LED, which you marked earlier

3. The next thing I did was prepare the motor for wiring. In brief:

1. remove the motor's brush caps so that you can solder wires to them. Be careful not to lose the brush and tiny spring that are underneath. Note the position of each brush.
2. I filed an angle off of the front corner of one side of the motor housing in order to make room to route the bottom wire to the bottom brush. <u>See the image below</u>, where there's an orange wire going next to the motor. For extra measure, you might want to file a little off the adjoining location of the frame
3. Use a fine-tipped screwdriver to slide the frame-to-motor contacts off of the brush caps
4. Clip the orange and gray wires on the decoder to the proper length and solder them to the edge of each brush cap, ensure the most possible clearance. *NOTE: I found that the clearance for the top of the motor was extremely tight, so I ended up filing a little more off the frame in the spot as well.*

4. The next step is to solder the <u>black</u> and <u>red</u> power supply wires for the decoder, one on each side of the frame.

1. It can be a trying process to solder directly to the frame as the frame will soak up all the heat from your iron unless it's high wattage. However, I chose this method as I didn't want to run any more wire than necessary.

2. Another, easier, method is to run the black and red wires up to the other end of the locomotive and solder them to the contact pads on the other light board. (See step 6(b), below, for modifying the rear light board to isolate it from the frame.)

5. Reassemble the frame, with motor, bushings, etc. Watch the wires to ensure they're not pinched!

Lower motor wire routing

Carefully flattened LED
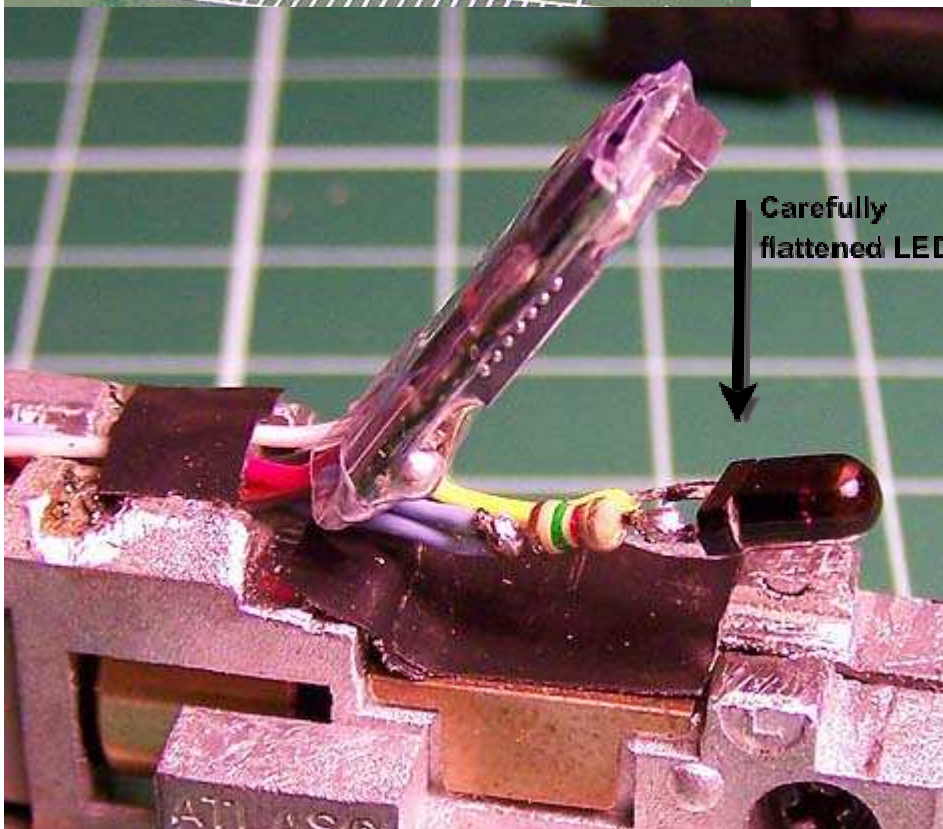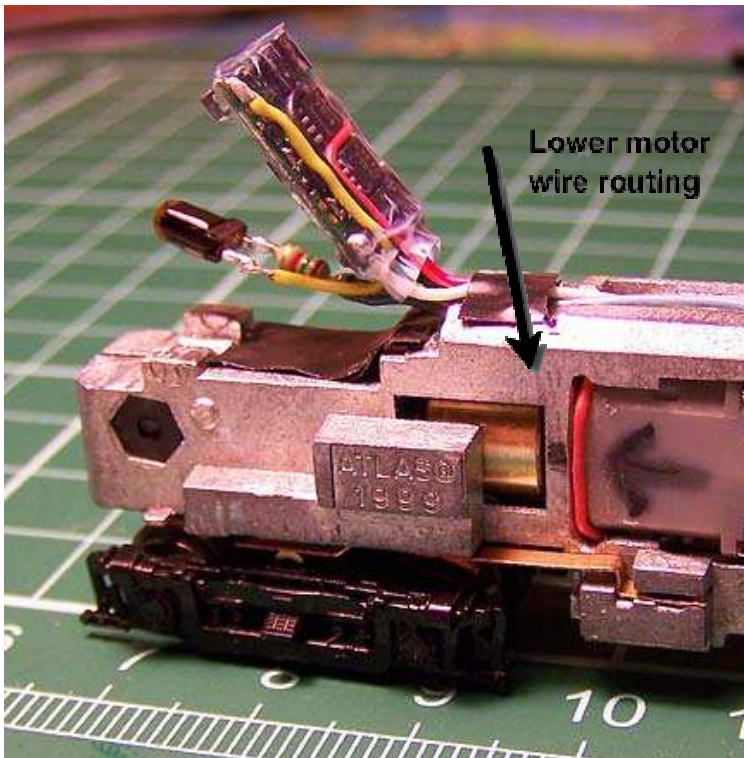
6. Solder the lighting function wires to the LEDs.
   1. Front light: I put a piece of tape under the modified LED to keep it from shorting out. I also blacked out the sides and bottom of the LED with a marker, in an attempt to replace the shrink tubing that was on the original.
   2. (b) Rear light: You'll have to cut the traces on the unmodified LED light board we're still using, as shown in the diagram below. *Note:* The pads which touch the frame are the alternate location for the red and black decoder power wires.

Cut traces
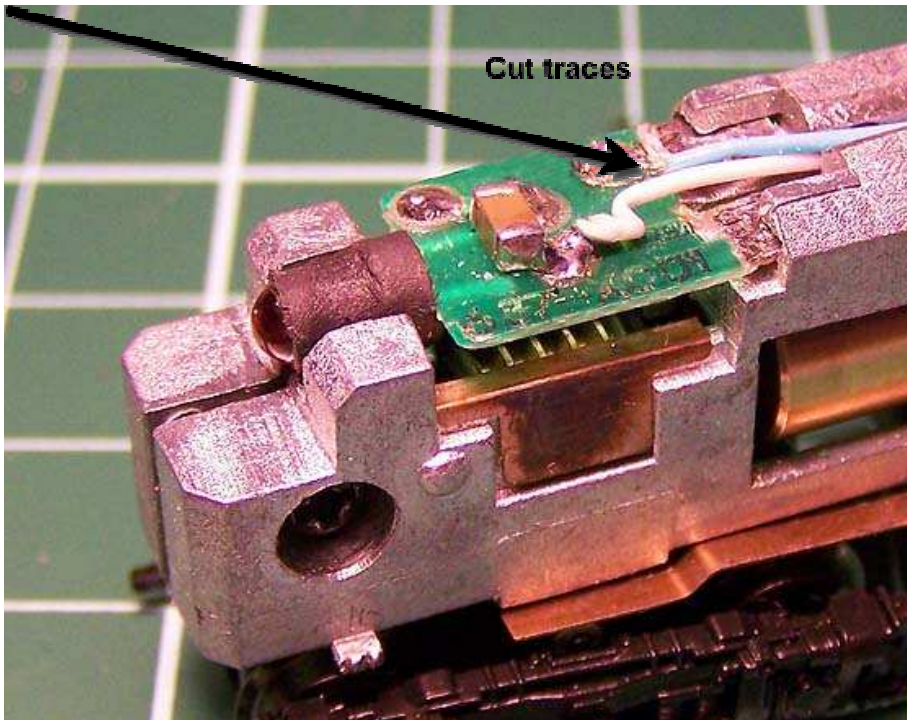
7. Test the decoder installation.
   1. Use tiny, bitty, little blobs of super glue (CA) to fasten the modified LED and decoder in place to keep them from flopping around thereafter. (You may want to remove them later, which is why I say not to use too much.) Make sure the decoder fits within the confines of the frame edges -- flush with the sides and top of the frame.
   2. Check for continuity to the frame, checking all connections against both sides. There should <u>not</u> be any contact with any connection except for the red and black decoder power wires. A short to the frame will likely result in a fried decoder.
   3. Set the locomotive on a DCC-powered track and choose address "03", which is the factory setting. Check forward, reverse and lighting functions. If anything doesn't work or the DCC system shorts out, turn off the power immediately and double-check all connections.
   4. If the engine runs in the opposite direction than expected or the lights light in the opposite direction than expected, you can correct these using decoder settings rather than having to rewire anything!

8. Reassemble the locomotive shell onto the frame and enjoy!