Atlas H15-44 and H16-44

By Ron Bearden

Warning: This is a challenging decoder install. There is a lot of room for error. You could burn something out with solder, cut a wrong trace, cross wire and create a short, burn out the decoder, or have a hard time trouble shooting. This project requires exacting precision.

In case you mess up and just want to start over, Replacement circuit board: Atlas 520009, list = $20

You will need:

- **M-series decoder (I use M-4 with thinner wires)**
- **replacement LEDs for the green and red lights,**
- **a mini file for cutting traces,**
- **an Xacto knife,**
- **and a soldering iron with a fine tip.**

Rationale

Installing a TCS hardwired decoder in an Atlas Fairbanks Morse H15/16-44 is tricky since the lightboard with the classification lights is so complex. But it can be done with only a 2-function TCS decoder like the M-1. I prefer the M-3 or M-4 since the decoder is a bit more advanced and the M-4 I had on hand had thinner wires.

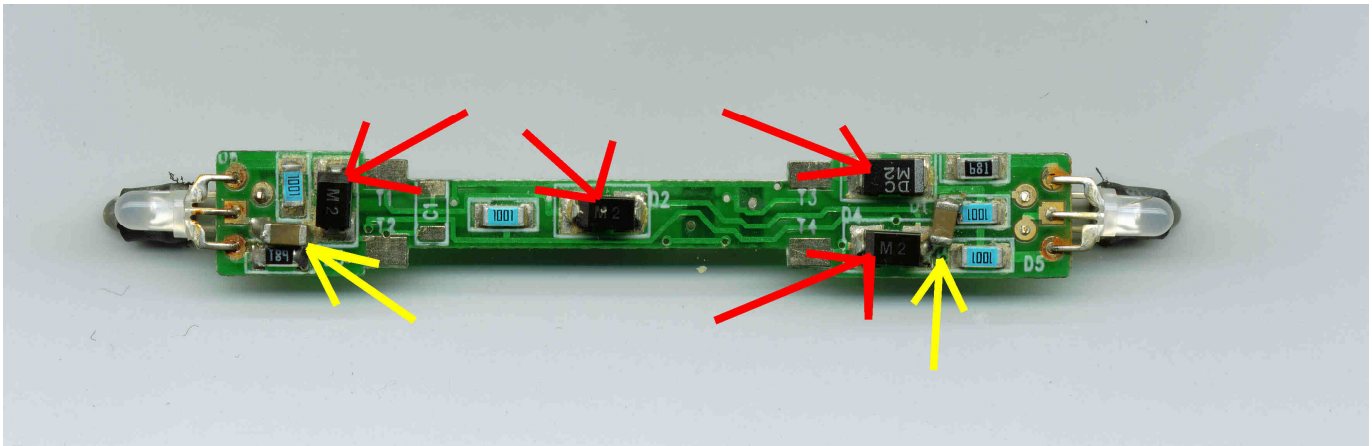
In a nutshell, at any given moment, there are three LEDs that are lit on this loco. Suppose the loco is set for forward. Then the front white LED is lit and the front green LED is lit for class lights. But a rear LED is lit for red class lights.

When you change direction to reverse, all those LEDs go out, and the following is lit: rear white LED, rear green class light, and front red class light. So since this always happens the same way, we can wire

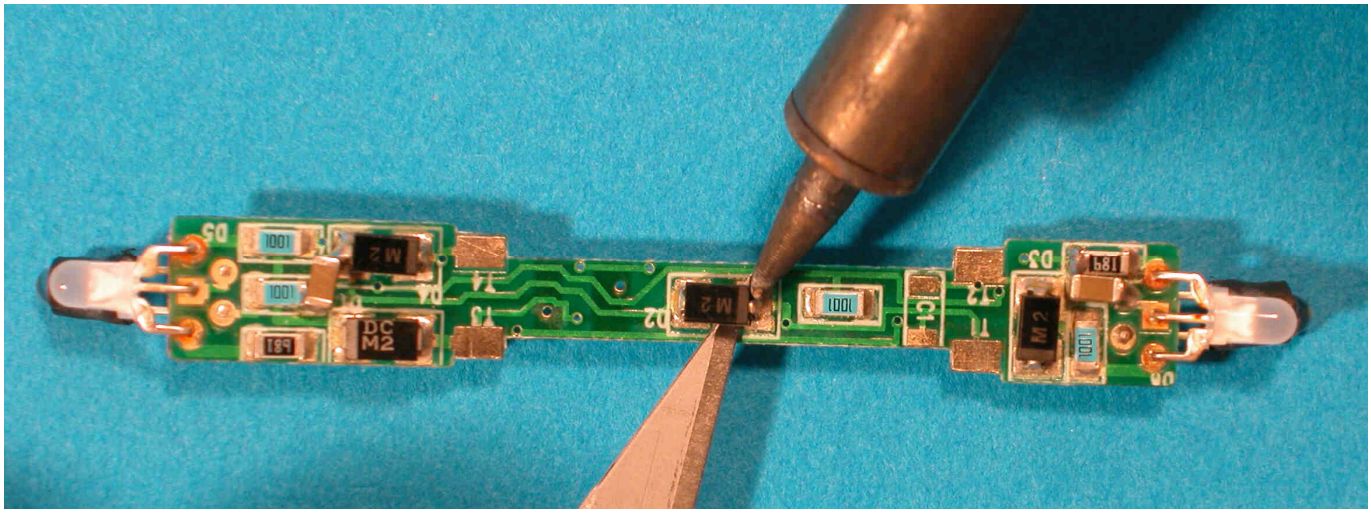
the decoder using only the white and yellow function wires to replicate the same actions. Each wire will always power three LEDs at a time. So as long as we are using correct resistor values, then we're OK since the output rating of the M-1 functions is plenty high enough.

Getting Ready

Now, as you look at the circuit board, it has three kinds of component soldered to it. There are four large black diodes (red), two small brown capacitors (yellow), and several flat resistors of varying sizes.



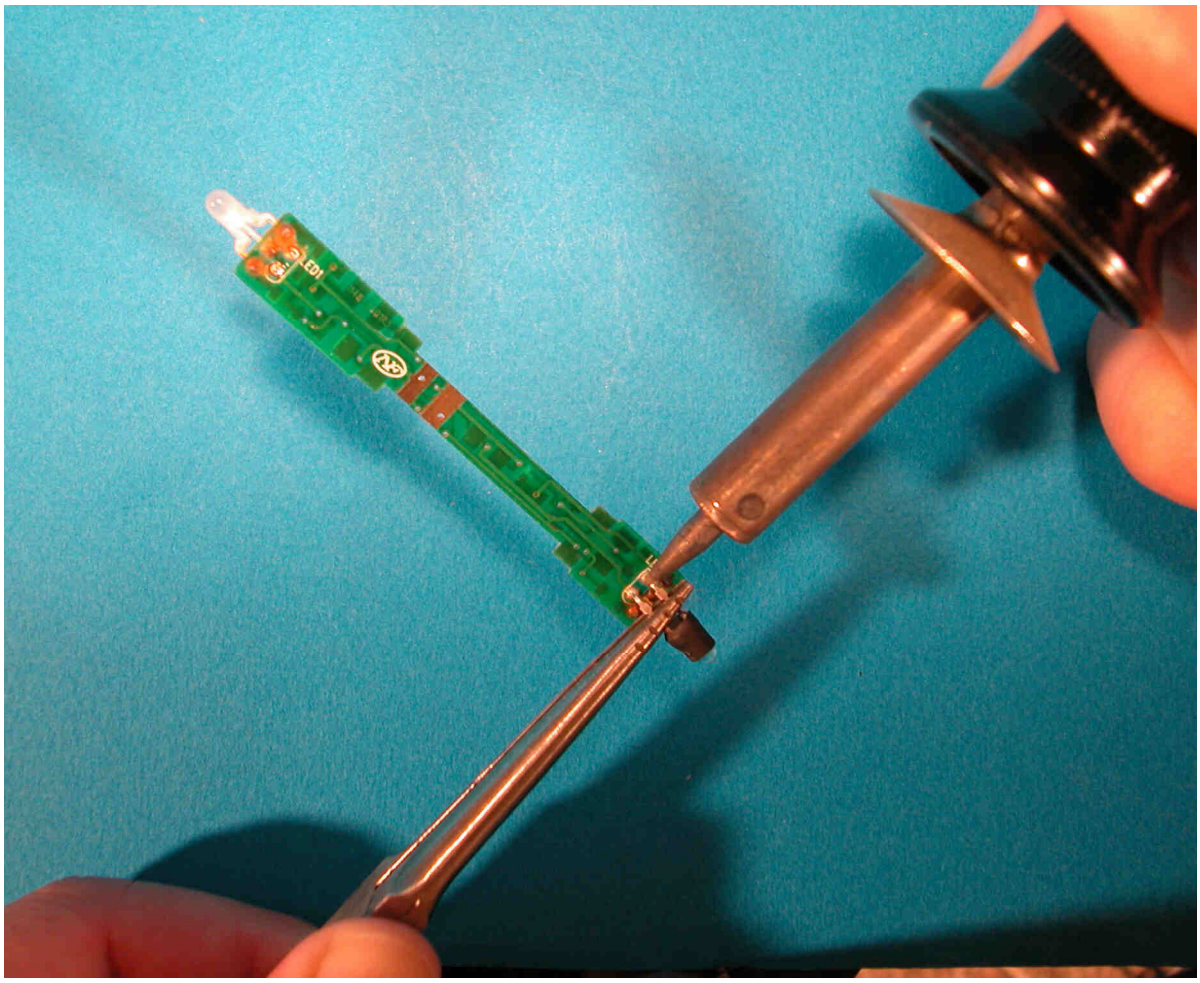
The first step is unsolder and remove the diodes and the capacitors. An Xacto knife for lifting the components is helpful.



Once those parts are removed, we have a problem. The way Atlas designed this light board, the **negative** trace is common to all LEDs. The LEDs themselves are 3-lead with the middle being the negative lead and the outer leads being positive. If you light one outer lead you get green, if you light the other you get red (and I guess if you could light both you'd get a yellowish color).

At any rate, here's our problem, the M-series decoder uses a "common" wire as well (the blue wire) for **all** functions, but it is **positive**! It is each function wire that "goes to ground" (negative). Therefore we have to re-wire the LEDs to use them for DCC operation.

Carefully unsolder the LEDs. You might want to remove the white LEDs first. I use a small pair of needle nose pliers to act as a heat sink and keep the heat away from the LED. We will re-use these white LEDs.

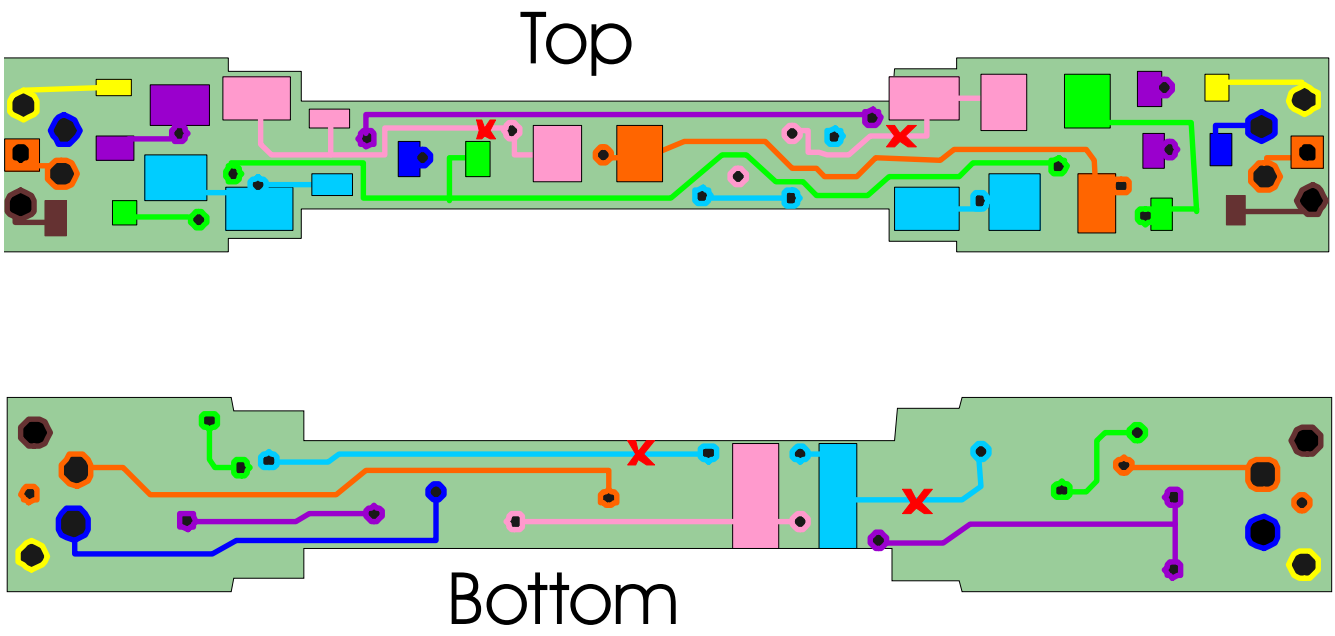


The 3-lead LED is a bit harder to get out. Try to get all the leads hot at the same time. You want to get the LEDs off without damaging the circuit board traces. We will not re-use these bi-color LEDs, so if you want to cut the LED off to make unsoldering the leads easier, do it.

OK, study the board and make sure that no solder jumps from one spot to another. If that is the case, then we are ready for modifications.

As in any decoder install, we have to isolate the motor so that no electricity from the frame gets to the motor tab pads. The drawing below shows all the electrical traces. It is color coded. All points that are the same color are "touching" electrically. The portions that touch the motor tabs are pink and light blue.

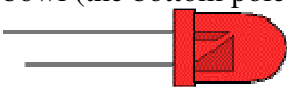
I spent hours and hours studying this board, and here is where I made my cuts. I used a mini file to cut the traces in two spots on the top of the board and two spots on the bottom. The trickiest cuts are on the top side. See my diagrams. **Be VERY careful not to cut a good trace! It takes a steady hand to make your gouges stay in one spot!**



Now, since this is such a complex board, I used an electrical meter to make sure the motor tab pads were isolated.

Next, re-install the white headlight LEDs. Now, the reason we unsoldered them is because we are changing the polarity. So on the headlights, we are placing the front LED on the rear and the rear LED on the front. The positive goes in the orange hole in drawing above and the negative goes in the blue hole.

How can you tell which pole on an LED is positive and which is negative? By looking at the internals. One lead goes up and simply makes a post straight up inside the LED lens (the upper pole on the drawing below). This one is the positive. The negative lead goes up and then moves sideways making a kind of bowl (the bottom pole in the drawing below).

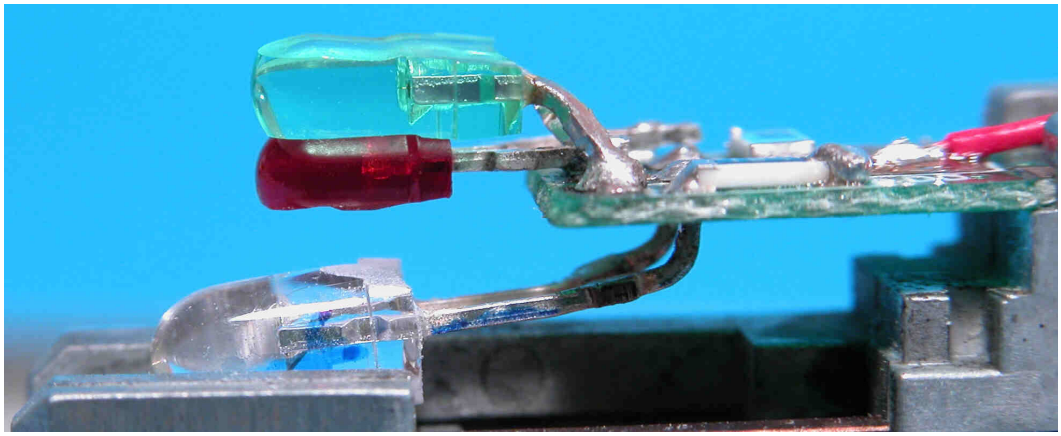


The two white headlight LEDs have posts bent in the opposite direction—so they only go one way and match the drawing. So find out which goes on each end and solder them in place with the leads coming up into the board from the bottom and the LED hanging down (the colored LEDs go on top).

If you want to have operating red and green running lights, then you need some more LEDs. You cannot re-use the bi-color LEDs that we unsoldered since they have the wrong polarity.

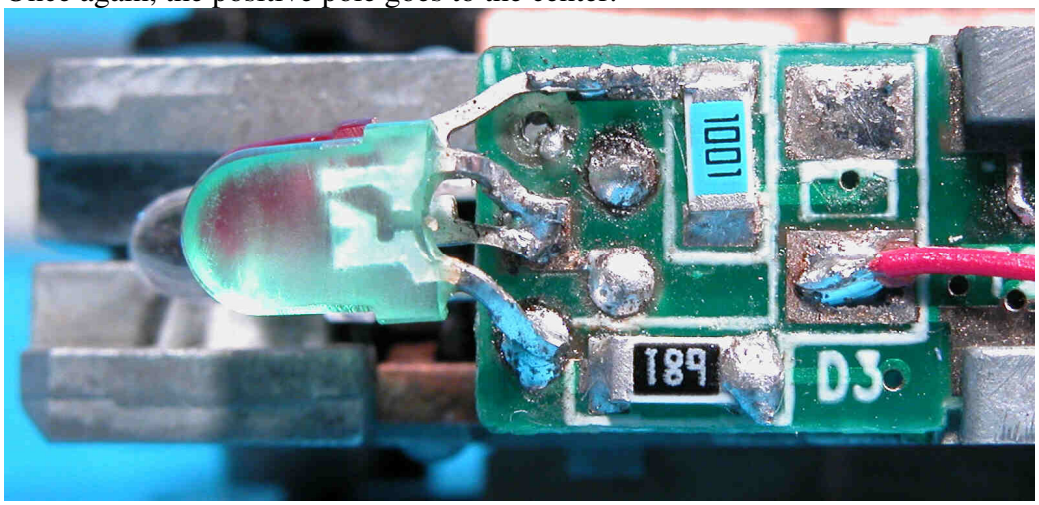
The easiest solution is to buy two bi-color LEDs (green and red) with three leads, with the *center* lead being the positive and the *outer* leads being the negatives. Radio Shack did not have them, so you'd have to buy or order some from an electronics supply house. If you had two of those, then you could just solder them to the board. You might have to experiment to see if the proper color comes on. If it is wrong, just unsolder and flip the LED.

Since I didn't have the proper bi-color LEDs, I just used two LEDs stacked on top of each other. I thinned them so they would not be so fat.

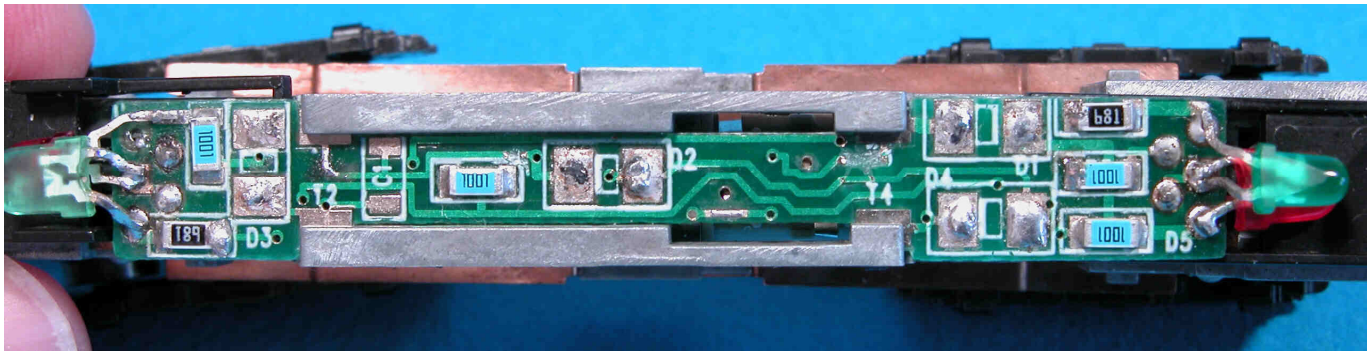


I then soldered the red flat on the board with the positive pole in the center of the three pads. Consult the drawing for the proper placement of the negative pole.

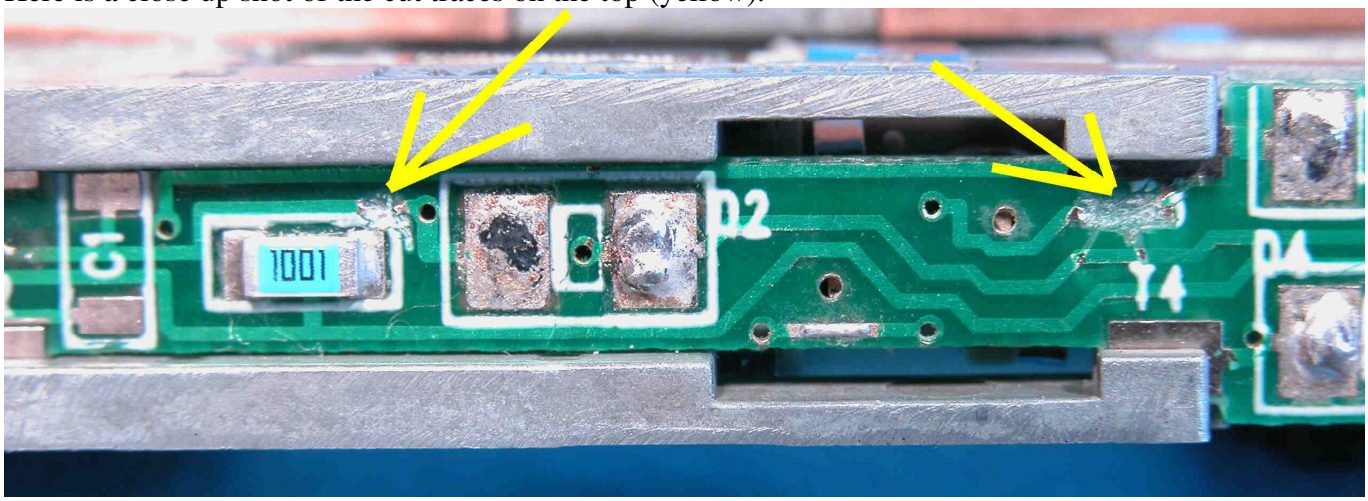
On the green LED, I bent the poles down a bit.
Once again, the positive pole goes to the center.



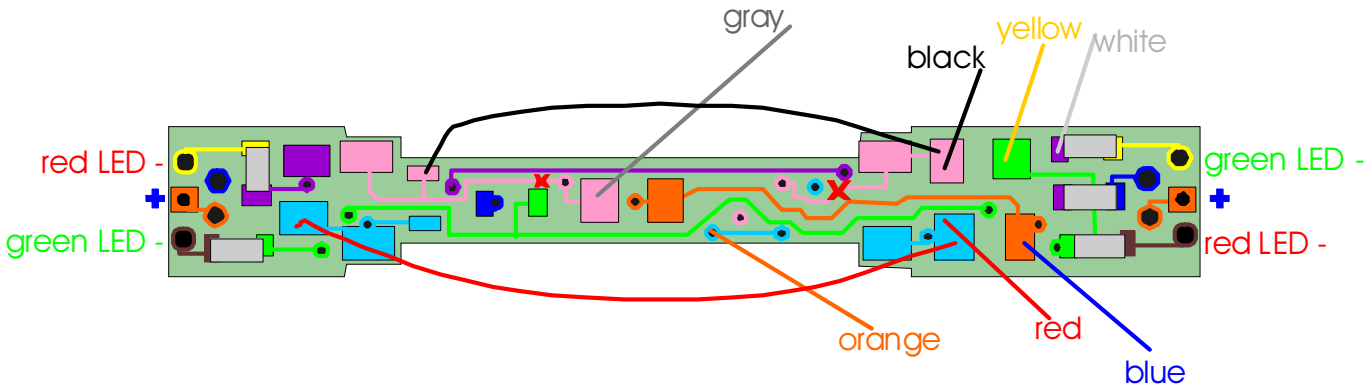
Now it is time to install the M-1 decoder. The hardest part is over. Install the board into the locomotive chassis.



Here is a close up shot of the cut traces on the top (yellow).

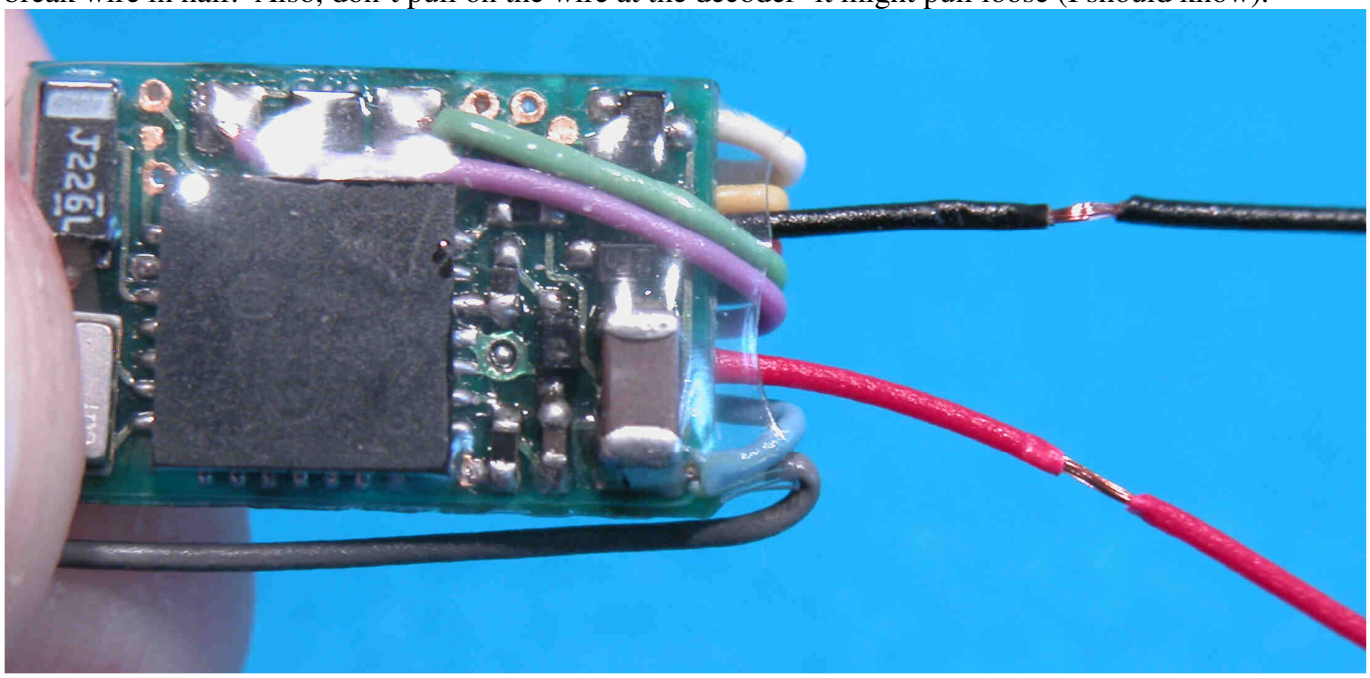


All of the spots where we removed a diode have left us with nice big soldering pads for decoder wires. See my drawing and refer to it for the wiring instructions below.

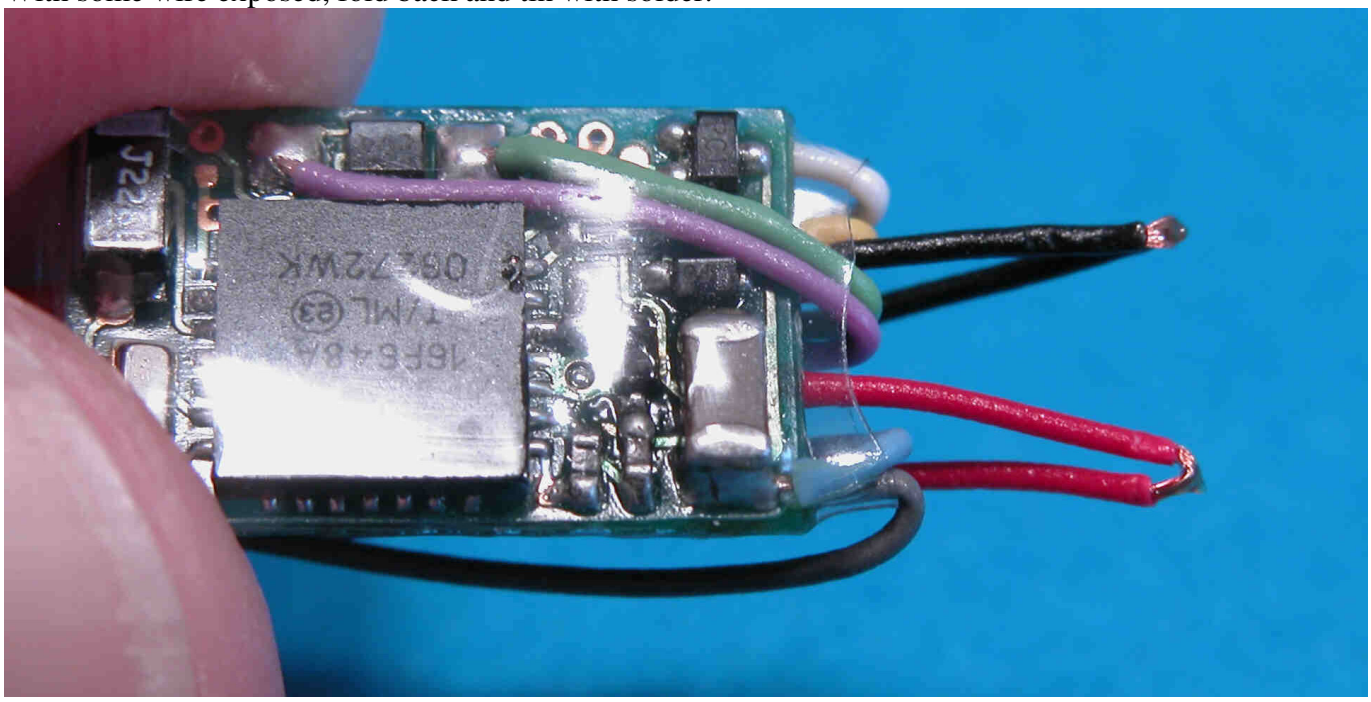


The trickiest spots to which to solder will be the orange wire and the white.

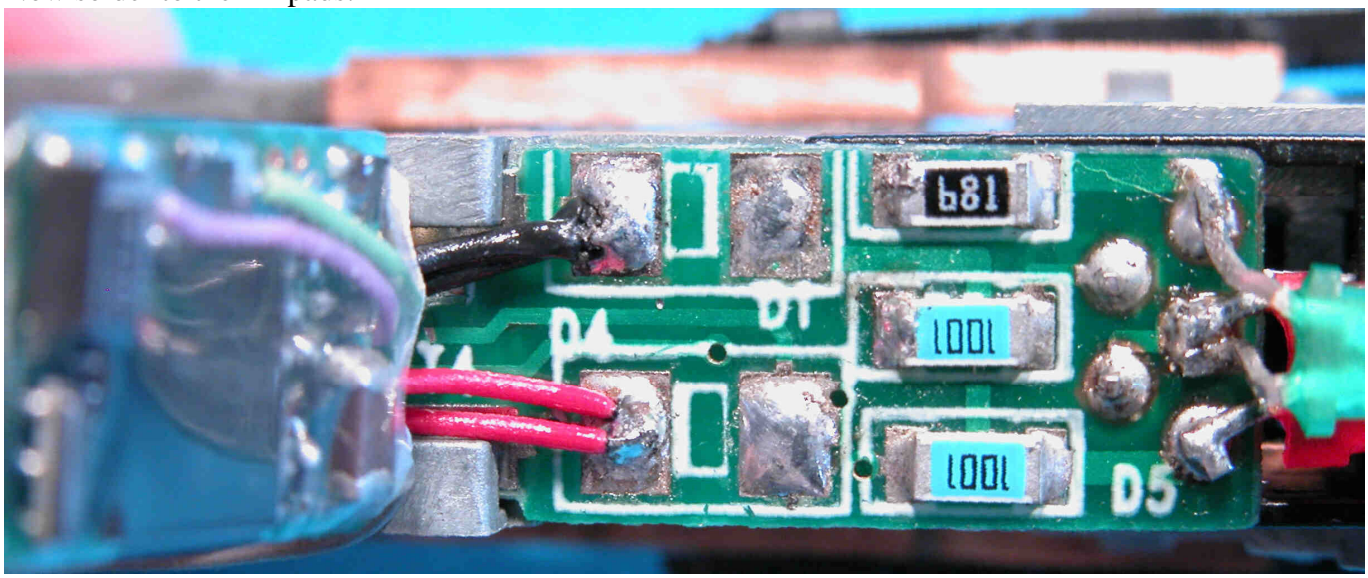
Pinch red and black wires to pull some insulation away fairly close to decoder. Be careful. Don't want to break wire in half. Also, don't pull on the wire at the decoder- it might pull loose (I should know).



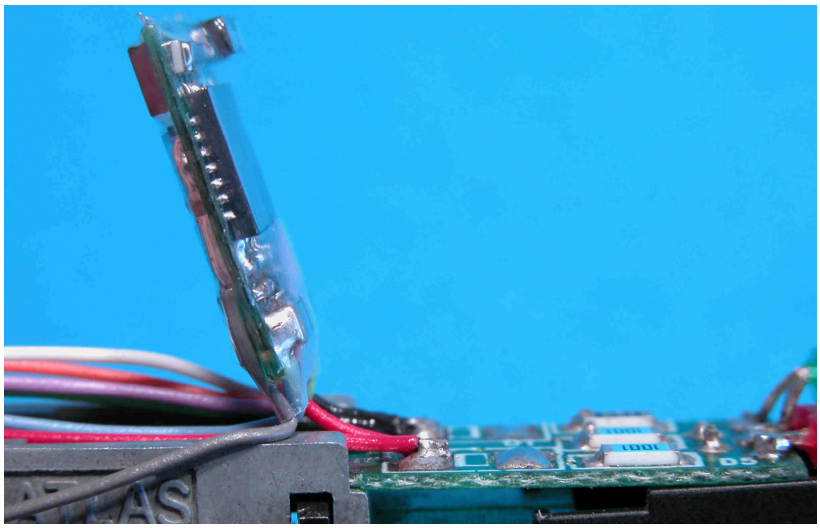
With some wire exposed, fold back and tin with solder.



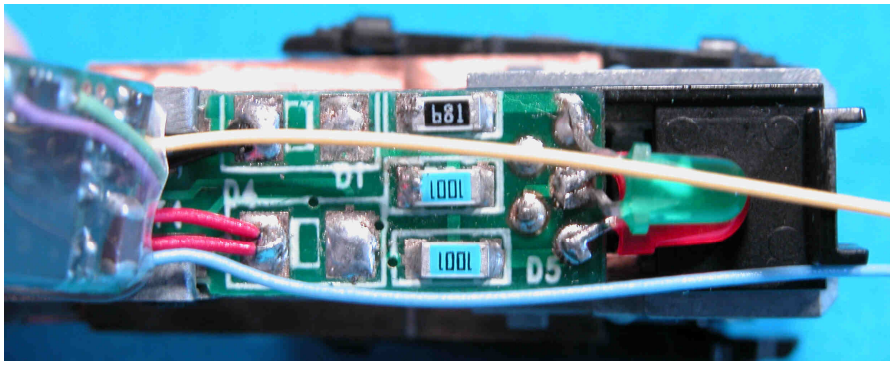
Now solder to the D4 pads.



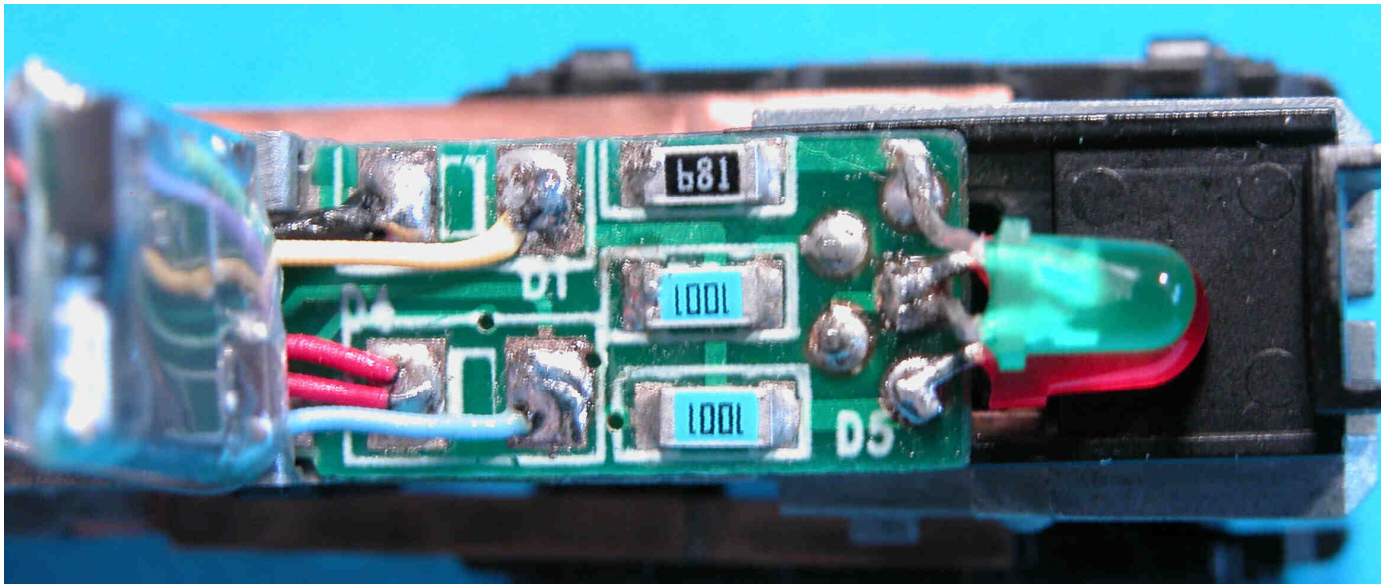
Here is a side view.



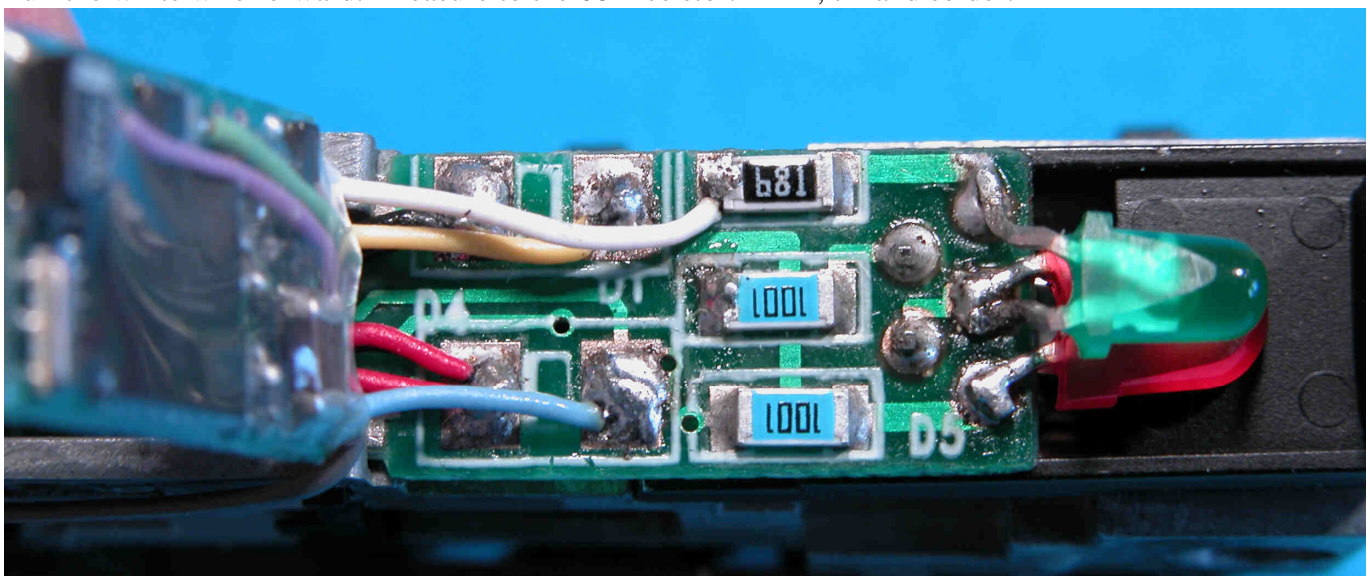
Pull the yellow and blue wires forward.



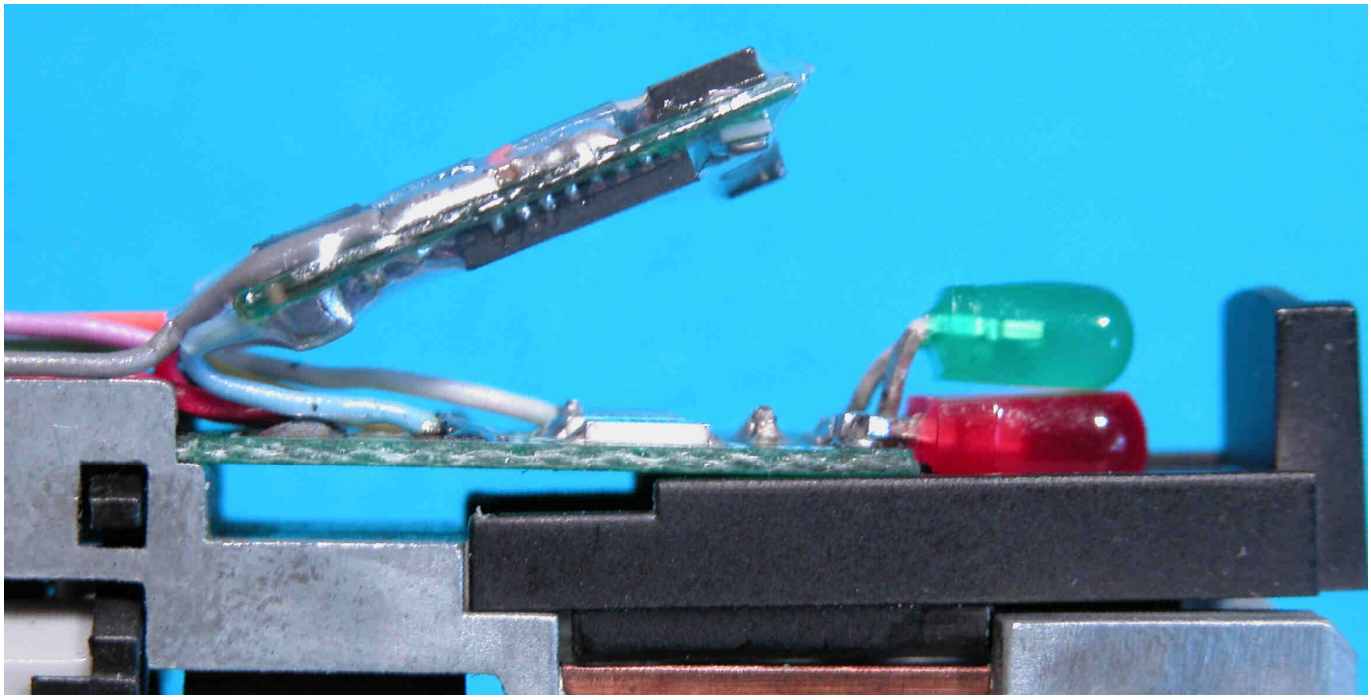
Measure to the D1 pad. Trim, tin and solder.



Pull the white wire forward. Measure to the 681 resistor. Trim, tin and solder.

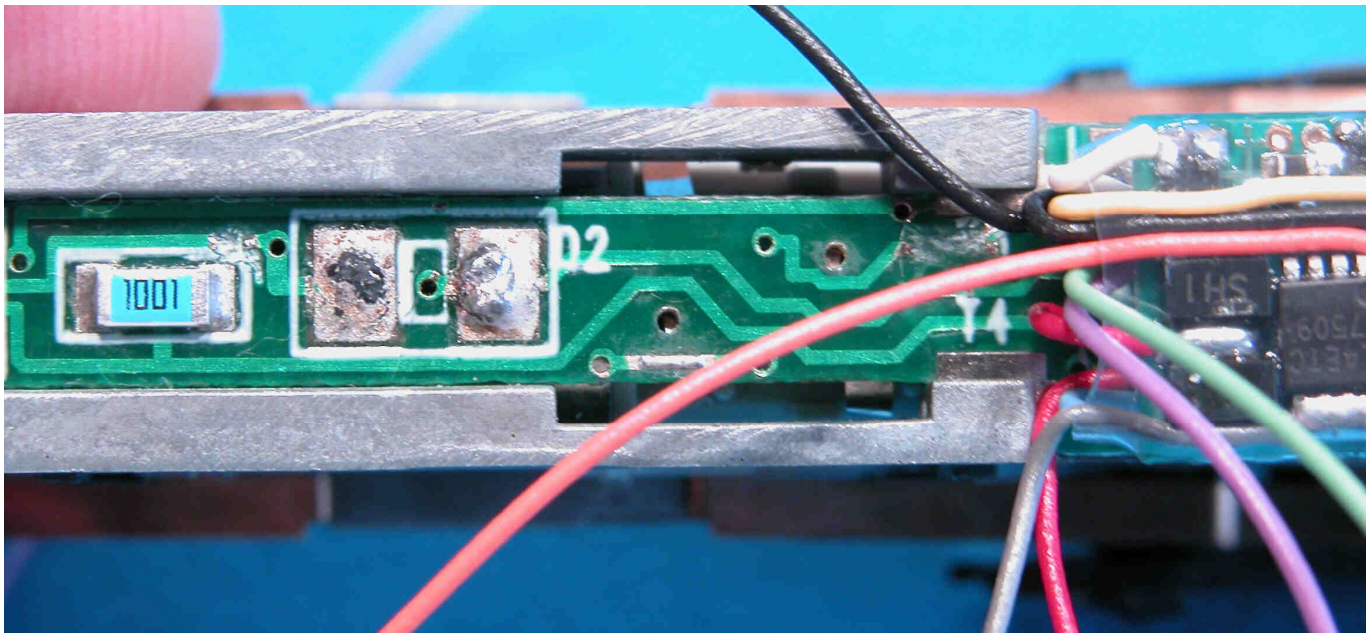


Fold decoder back over the wires you've been soldering.

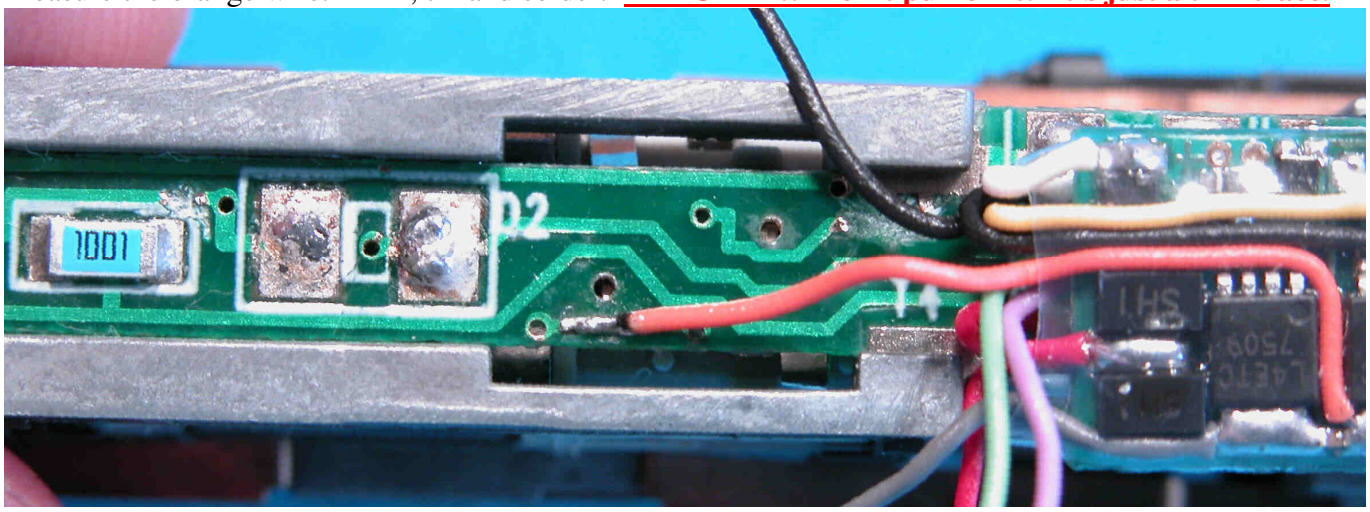


Now we are going to work on the other end.

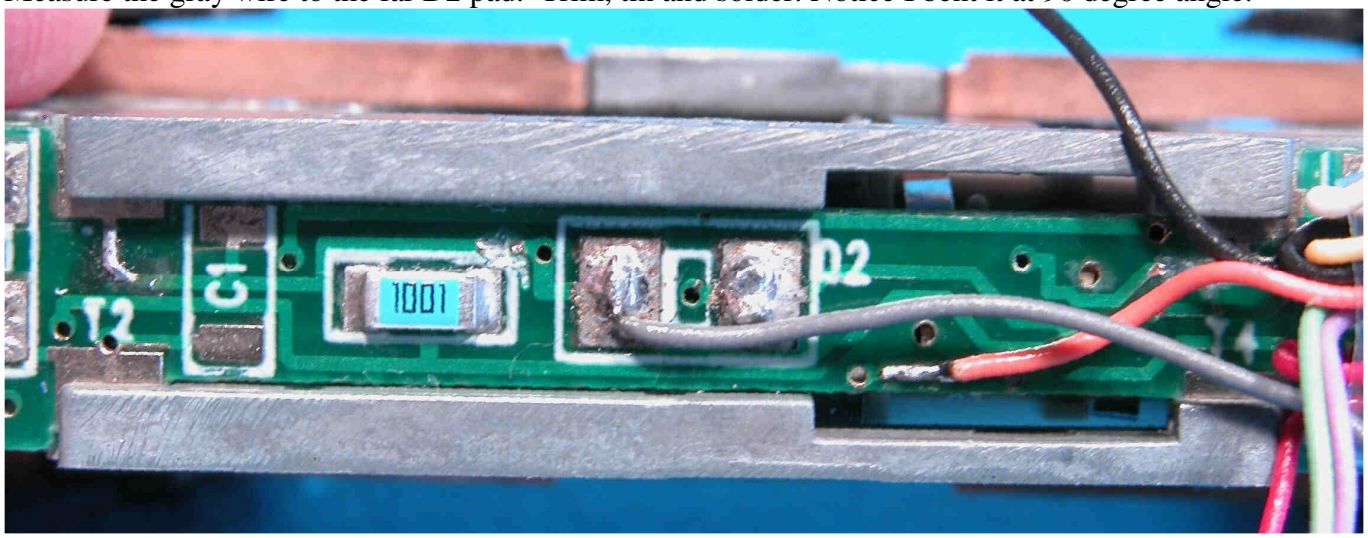
Pull the green and purple wires out of the way (if using an M-3 or M4).
Gently pull the red and gray wires out of the way (don't pull on the red wire too hard). Pull the black wire gently out of the way too. We are now going to work on the orange wire. Scrape the coating off of the trace. Flux and tin.



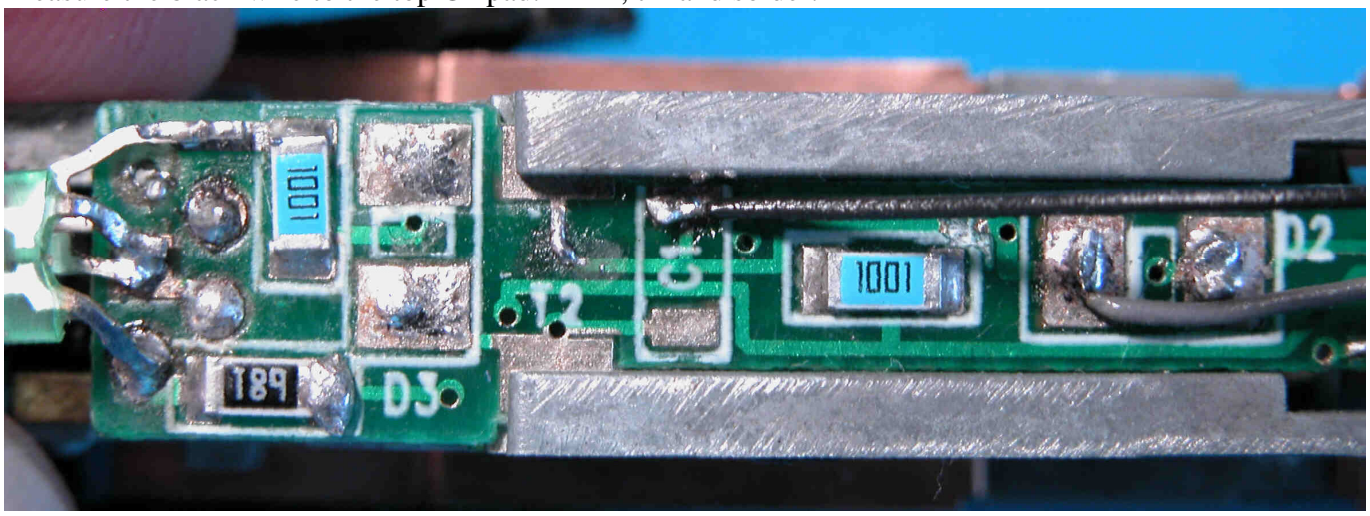
Measure the orange wire. Trim, tin and solder. **DELCATE!! Don't pull on it! It's just a thin trace.**



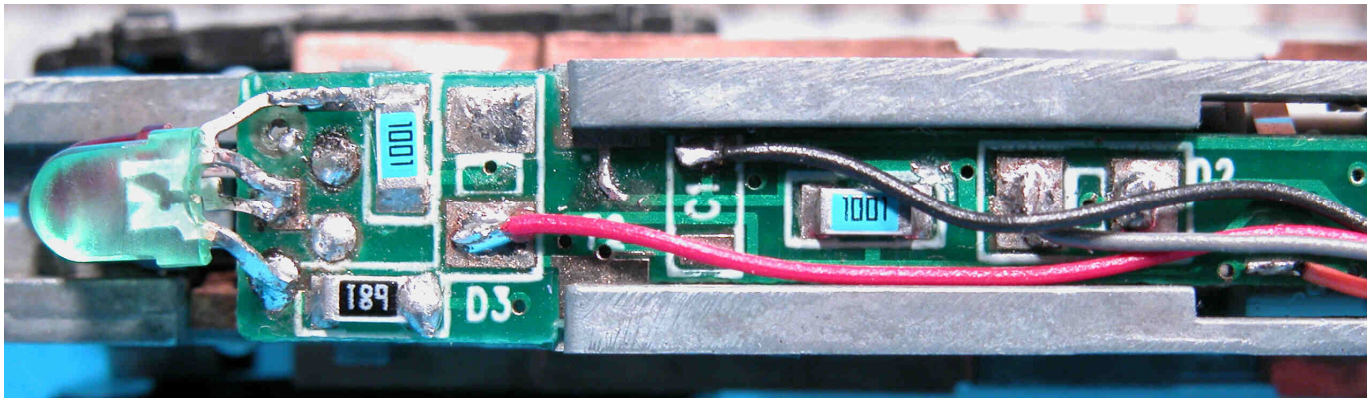
Measure the gray wire to the far D2 pad. Trim, tin and solder. Notice I bent it at 90 degree angle.



Measure the black wire to the top C1 pad. Trim, tin and solder.

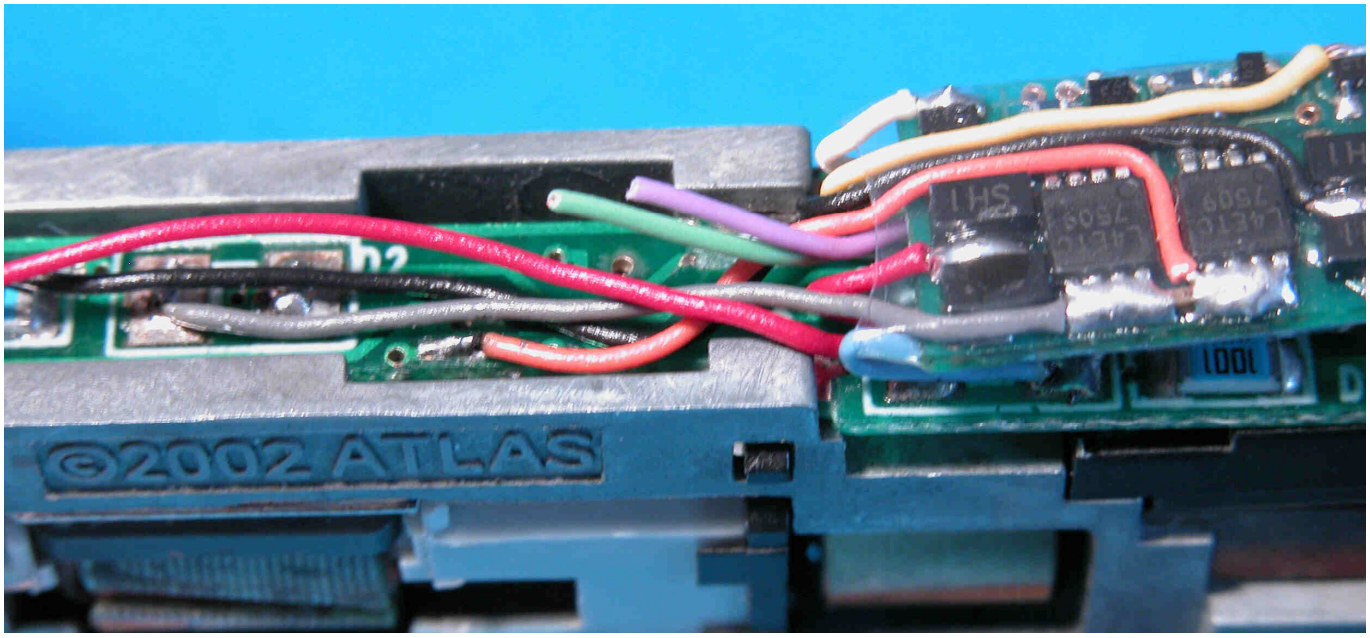


Measure the red wire to the bottom D3 pad. Trim, tin and solder. It's easy since the pad is so big.

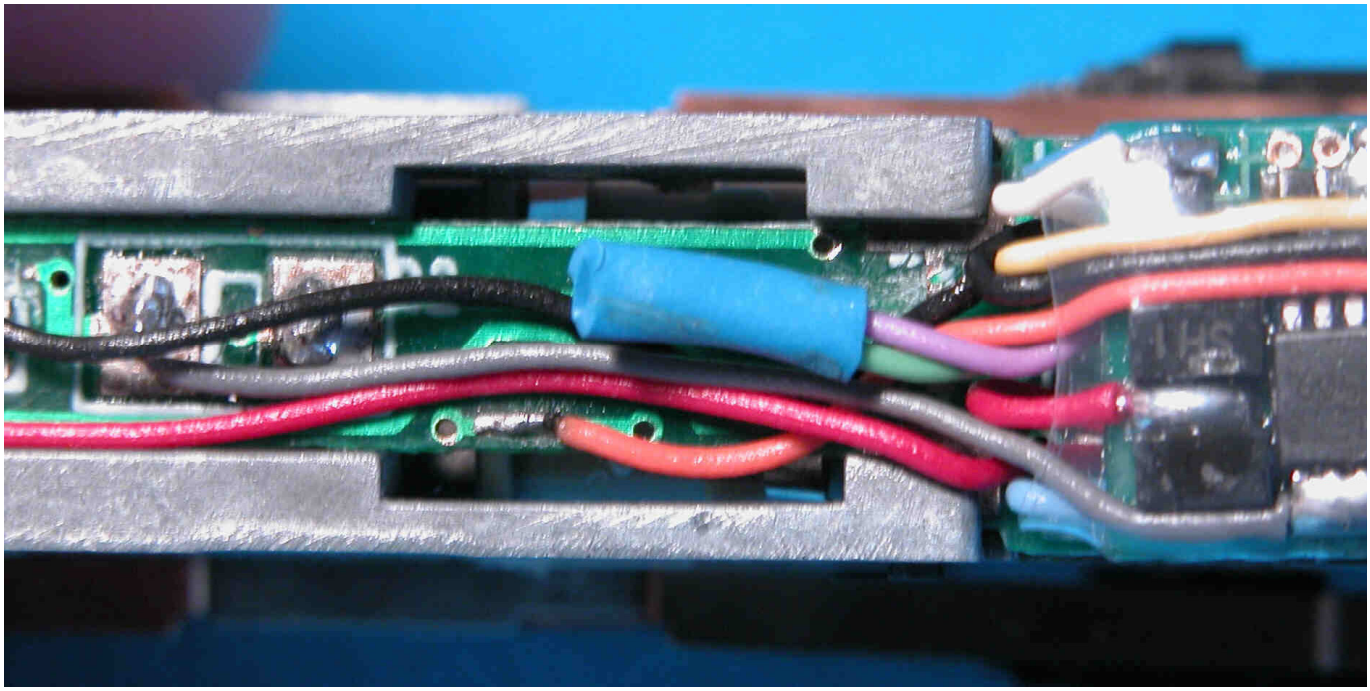


Should work! Take for a test run.

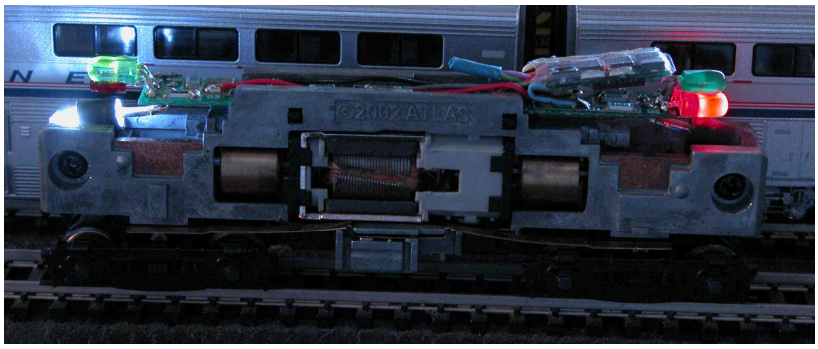
If you used an M-3 or M-4, trim the green and or purple wires back. Notice how I cut mine at different lengths.



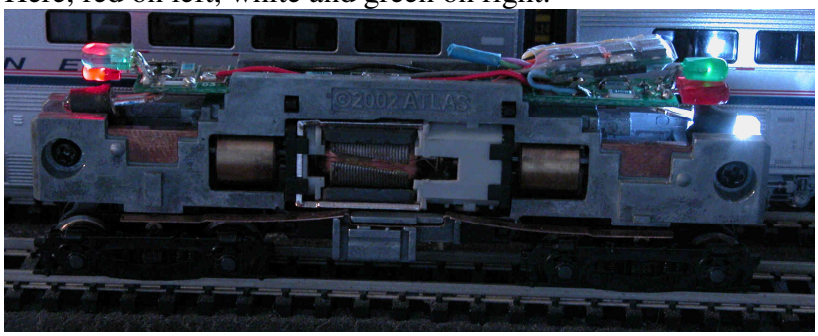
I then protected the ends with some shrink-wrap tubing.



If everything is wired correctly, then the white and the green LEDS on a given end should come on together. On the other end, the red should come one. Here, white and green on the left. Red on right.



Here, red on left, white and green on right.



Finished!