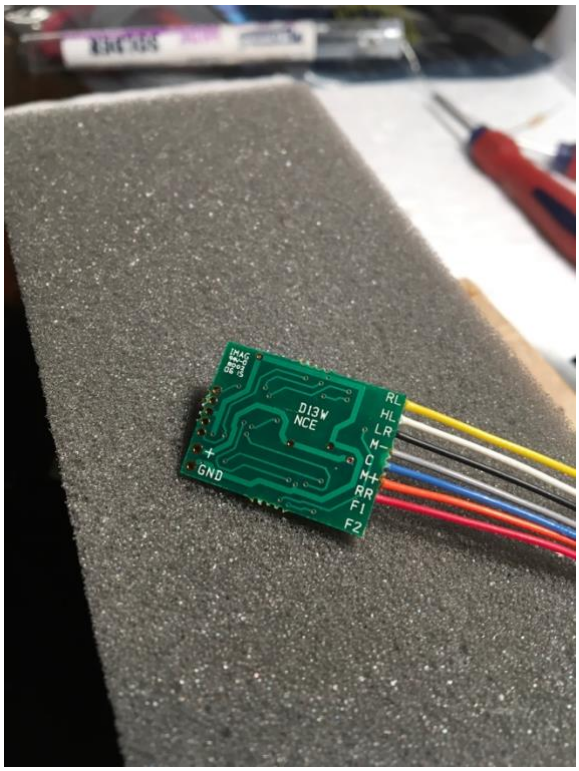
Installation of an NCE D13W Mobile Decoder into a LifeLike GP9 Diesel Locomotive

Date: Feb 5 2019

The early LifeLike GP9 Diesel models were always known to be good value products. They went through various stages of 'DCC Readiness', the later ones even had an 8 pin wiring harness. The particular model I have used for this installation was middle of the road when it comes to being 'DCC Ready'. There was no pre-wired harness, but the PC light board did have 8 solder pads for wiring an 8 lead decoder, and the location on the traces on the board that need to be 'cut' for converting to DCC are clearly marked with an 'X'. The front and rear headlights are 1.5 Volt mini bulbs (incandescent).

So for the installation of the NCE D13W decoder the first issue becomes 'keep the original light board or start from 'scratch' and discard the light board?'. Given I was going to replace the headlights with LEDs, and current limiting resistors would need to be added, I like many others before me, decided to discard the light board, and install the decoder from scratch. Space limitations required this to be a pretty basic installation, with no extra light effects. I like adding ditch lights or rotary beacons, but for this project only the front and rear headlights are active.

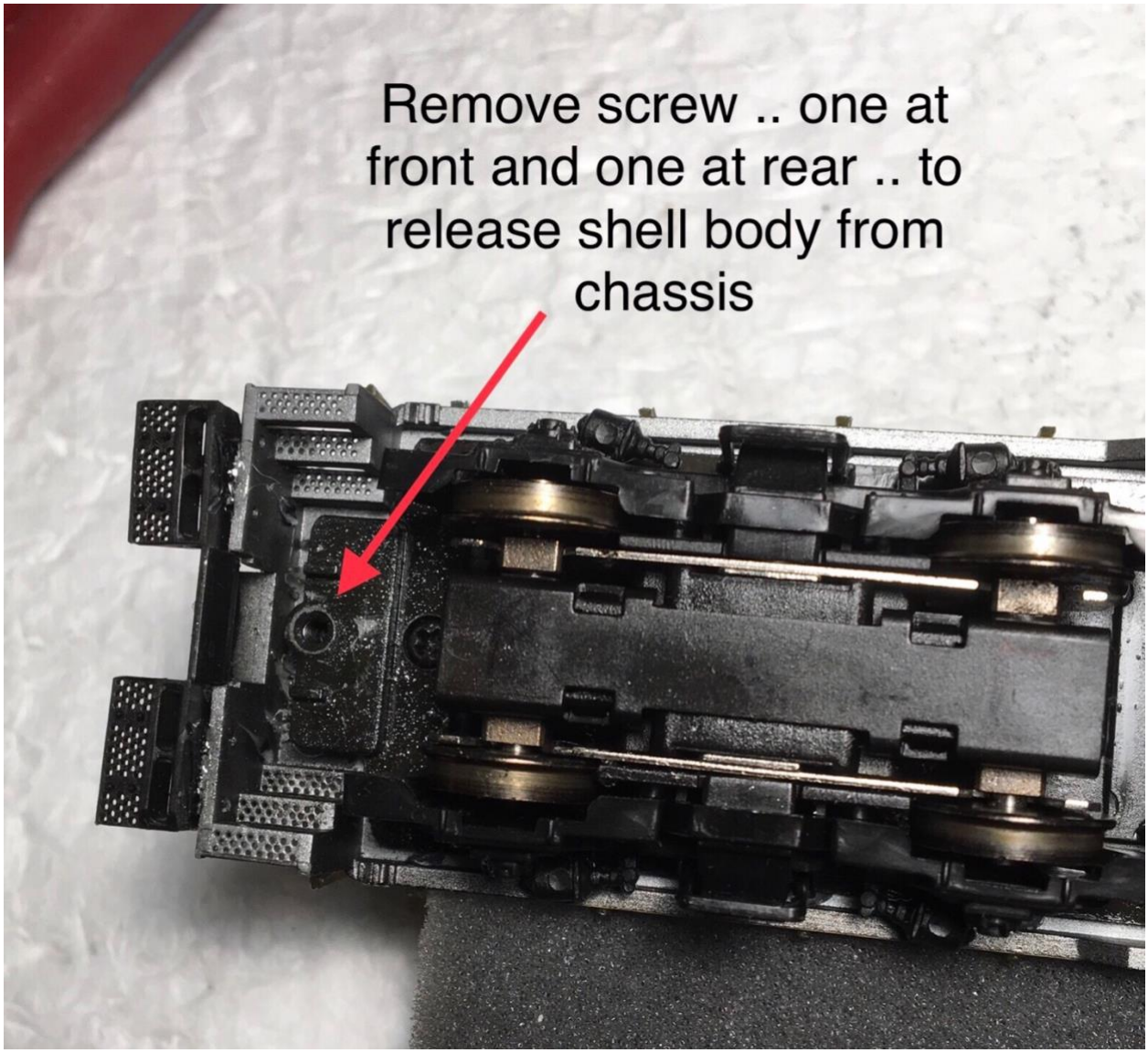


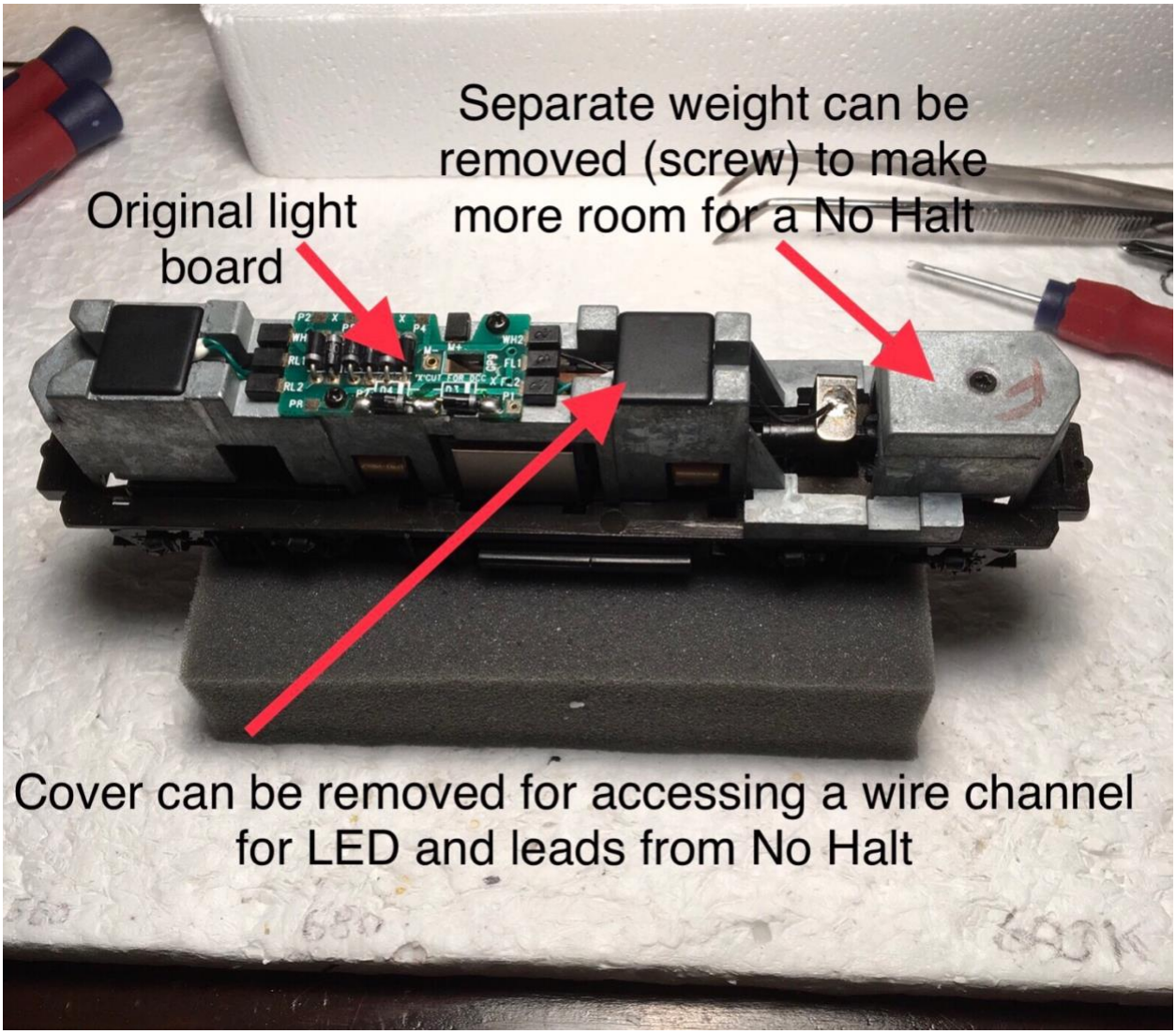
The NCE D13W Mobile Decoder

Here is the parts list:
NCE D13W Mobile Decoder
NCE No Halt Keep Alive capacitors (Small)
2 - 5 mm 3.5 Volt Sunny White LEDs
2 Surface Mount 1.8K 1/8 watt resistors or 2 1.5K ¼ watt resistors

30 AWG coloured wire
Heat Shrink tubing
Kapton tape, Solder, flux

Getting the shell off is not difficult. To get access to two screws that secure the shell to the chassis I found it necessary to remove the coupler gear boxes by pulling them ‘into’ the model rather than pulling them out. Be very careful to not damage the delicate front step on both front and rear ends of the model. After removing the two screws, one at the front and one at the rear, there are ‘tabs’ on each side that have to be gently released, and then gently pull up on the shell body to lift from the chassis.

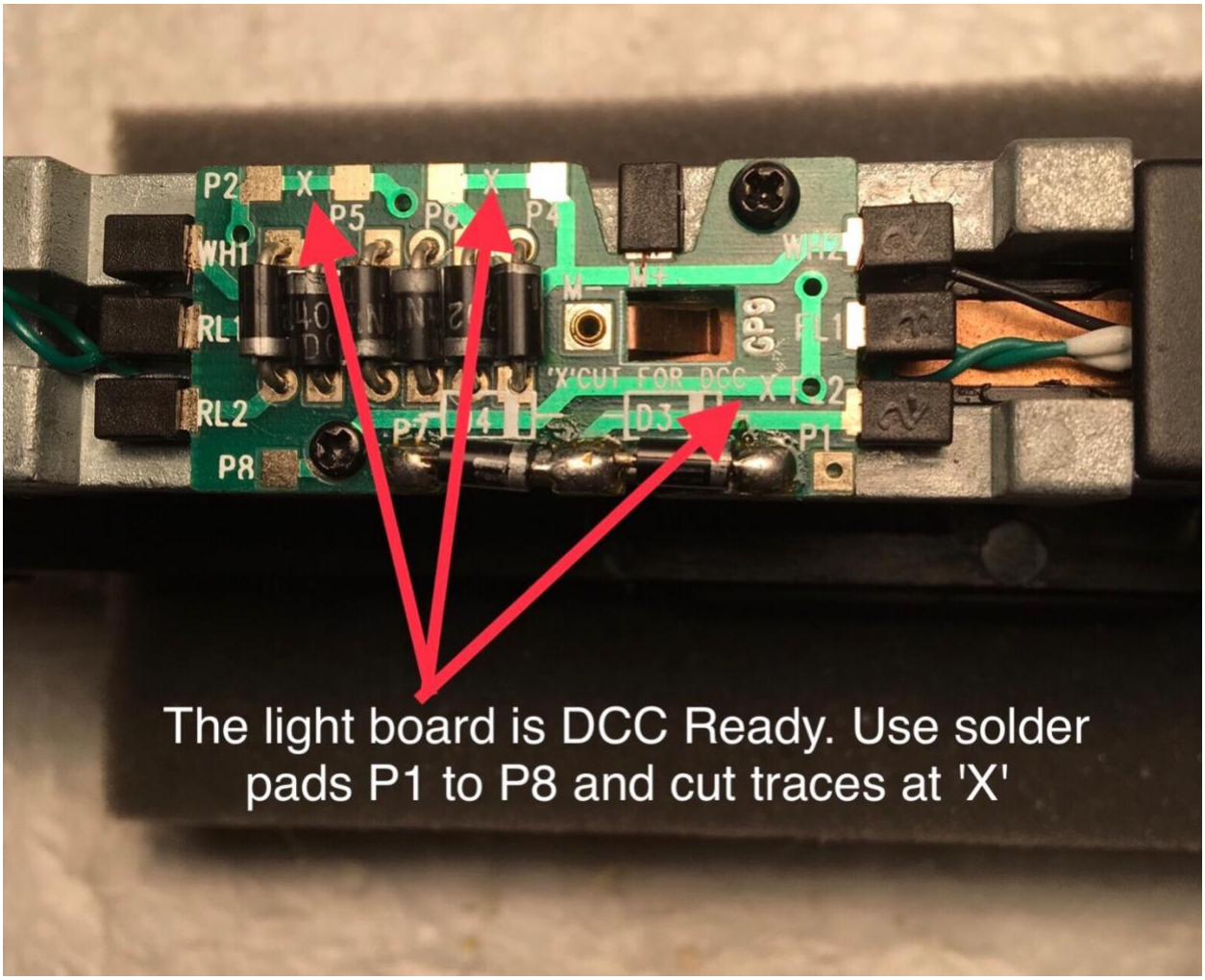




This is what you see after removing the shell.

The separate weight at the front is secured by a single screw. I removed this to make more room for the NCE No Halt. It is possible that a thinner Keep Alive could fit here without removing the weight? I think it would also be possible to install a sound decoder instead of a mobile decoder if using a very small flat mini speaker and applying it to the underside of the roof towards the rear of the shell?

I elected to make this a pretty simple installation, using only the front and rear function outputs for headlights. Replacing the 1.5 volt mini bulbs and light board however, does necessitate using current limiting resistors.
Note that the original light board is sort of 'DCC Ready', and has solder pads and labelled locations for cutting traces for DCC conversion. I thought it to be just as easy to discard the light board and convert from scratch. Be sure to keep the screws that secure the light board as one is needed for making the positive track pick up connection.



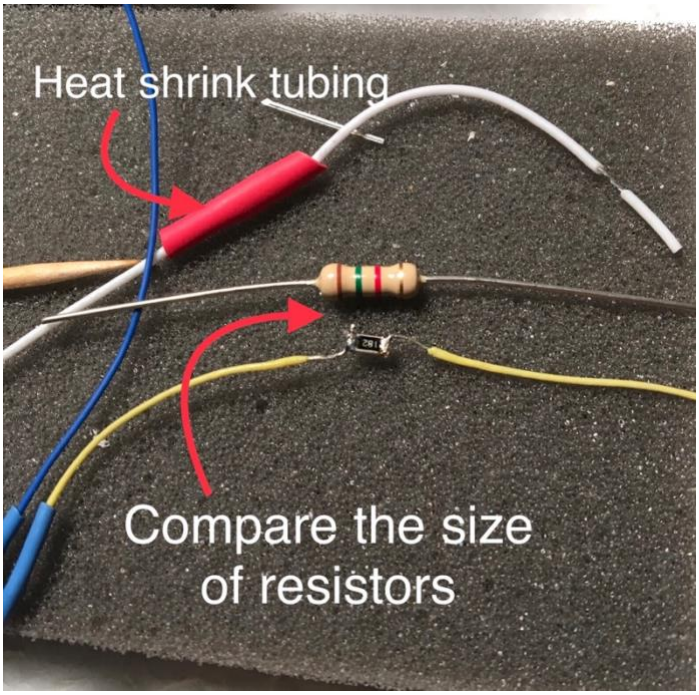
The original DC light board is sort of 'DCC Ready'

In my continuing search for space saving techniques this project experiments with using Surface Mount resistors. The ones I had on hand are 1.8K ohm, 1/8 watt SMD resistors. Normally I would use a 1.2 or 1.5 K ½ watt resistor for my Decoder installations, ¼ watt probably reflecting most common general usage. Electronics formulas for current value assessment etc. indicate that for normal DCC voltages the 1/8 watt resistor greater than 1K ohm should work. (Thank you Mark Gurries and others for helpful advice on the forums!)

Have a look at the comparison photos of the 1.5 K ½ watt resistor that I usually use, and the Surface Mount 1.8K 1/8 watt resistor I used in this project. By the time you add shrink wrap there might not be that much saving in space. However, if using 5 or more LEDs in an installation and mounting the resistors on a platform you could save a bit of precious space!

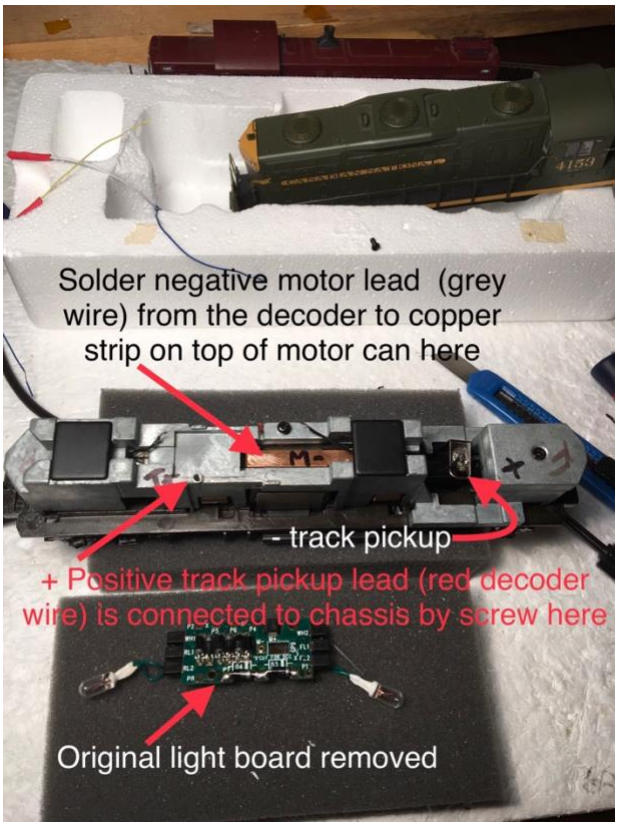
(See some of my previous articles on my web site for an illustration of this, using a tongue depressor to mount the collection of resistors)

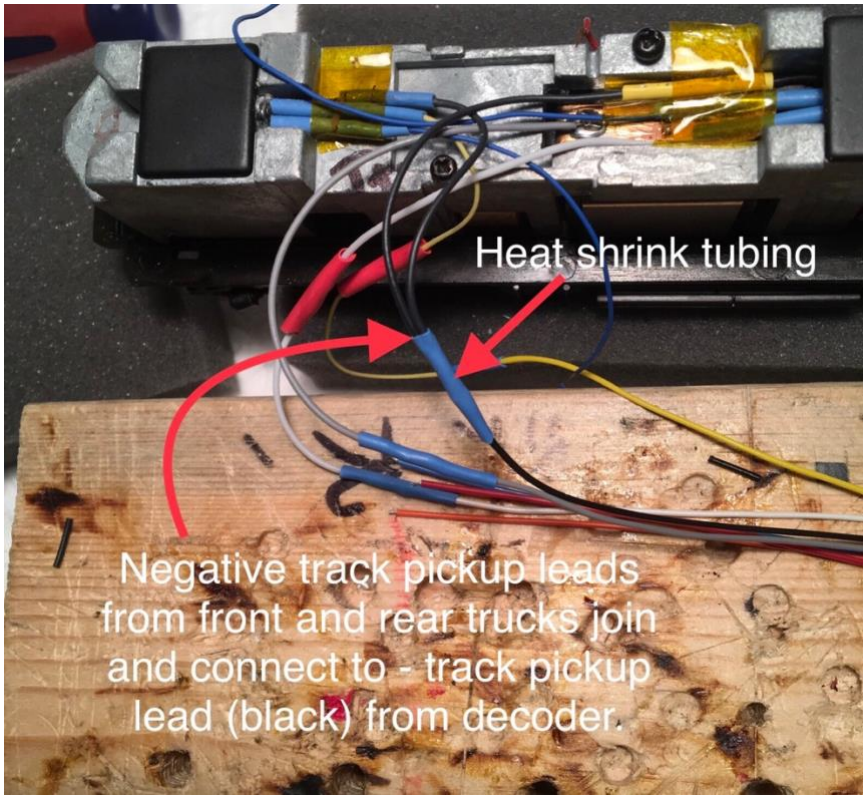
Compare the size of resistors



Good manual dexterity is required for solder connections

Note the connections for the negative motor lead and the positive track pickup are somewhat unique. The connection to the negative motor lead is made by soldering a grey wire to the copper strip on top of the motor can, which is revealed after removal of the light board. The right rail pickup occurs via the wheels and truck bolster's direct connection to the chassis. Therefore the decoder's right rail (red wire) positive track pickup lead connects to the chassis! (See photo)

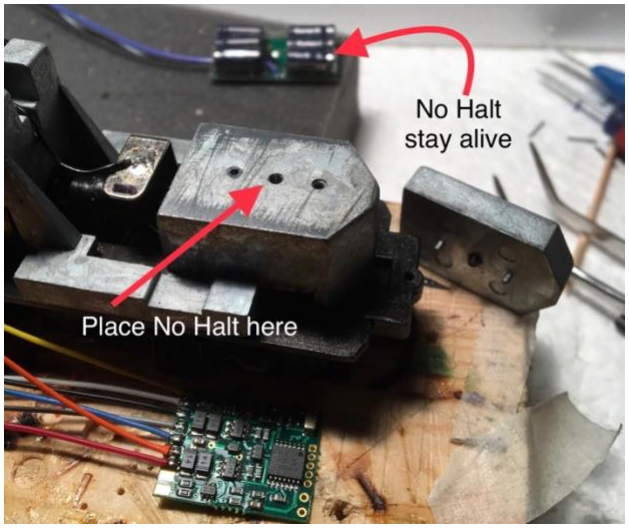




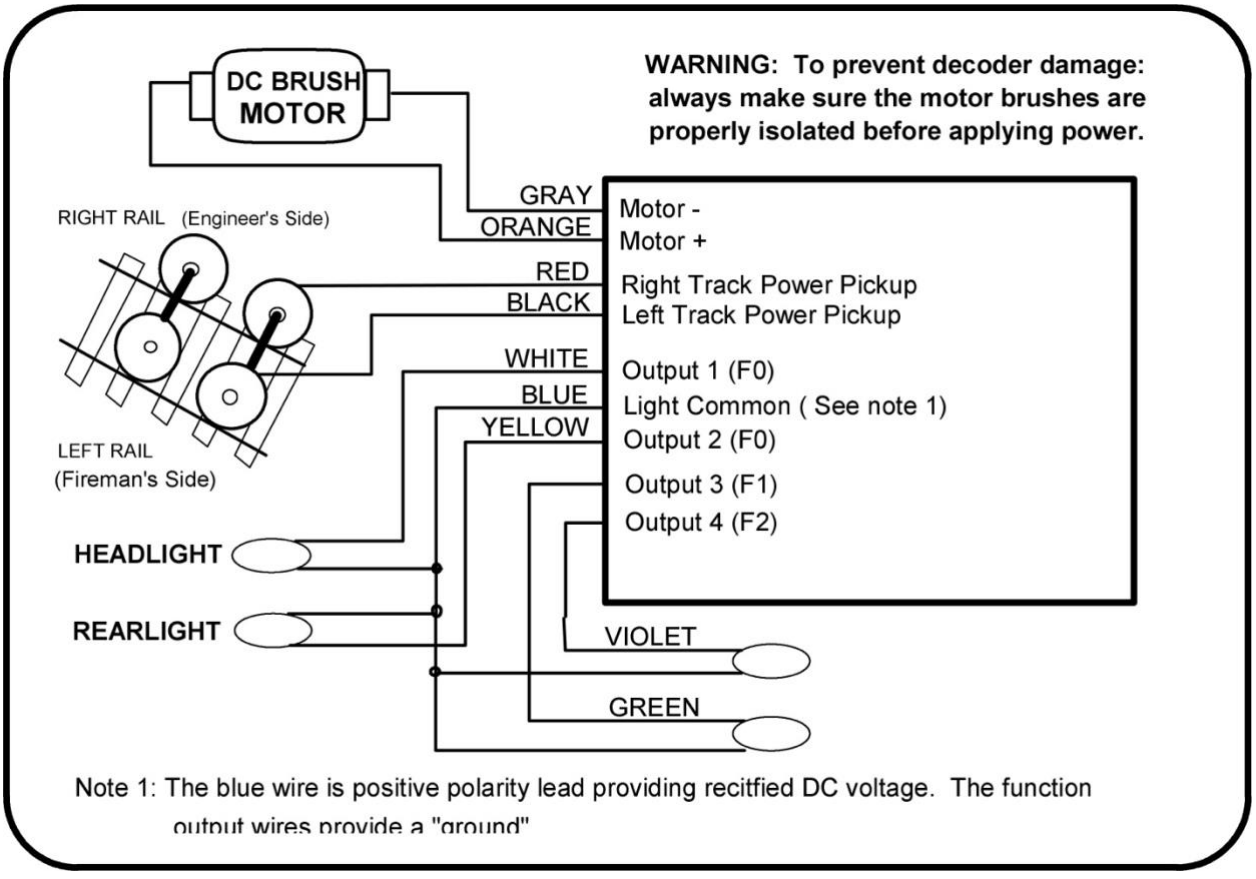
+ track pickup and – motor lead connections are somewhat unique

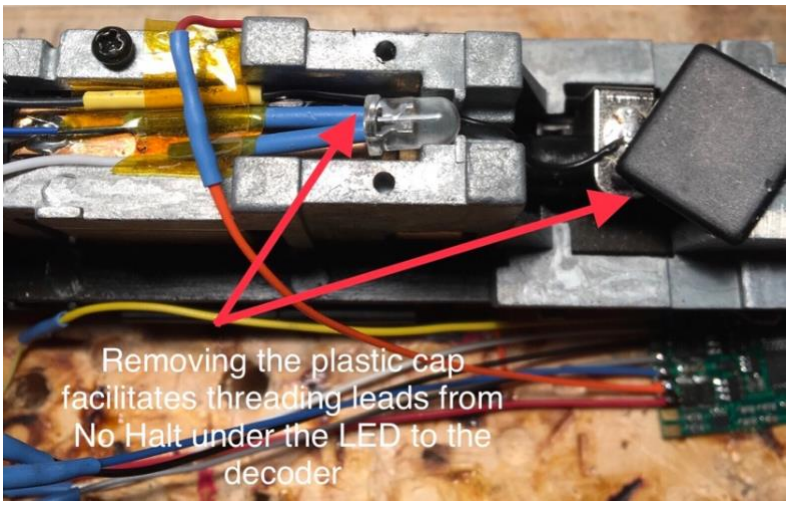
The red + track pickup lead is connected to one of the screws that originally secured the light board to the chassis. It is also important to electrically isolate the bottom surface of the decoder from the chassis by applying Kapton tape to the top of the chassis and/or the bottom surface of the decoder.

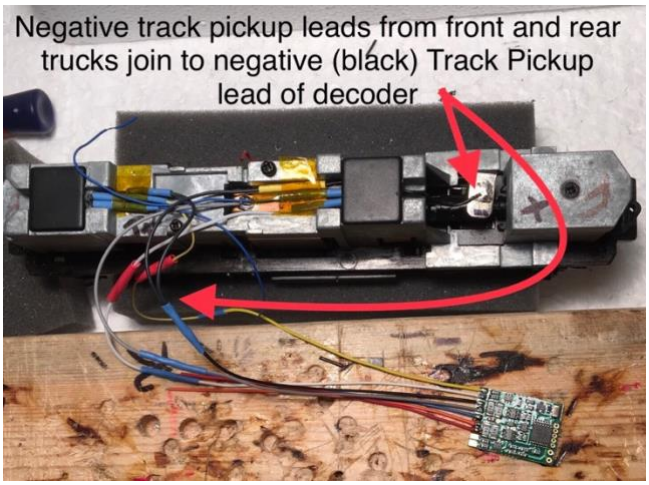
Making room for the No Halt stay alive capacitors



The schematic wiring diagram as supplied by NCE



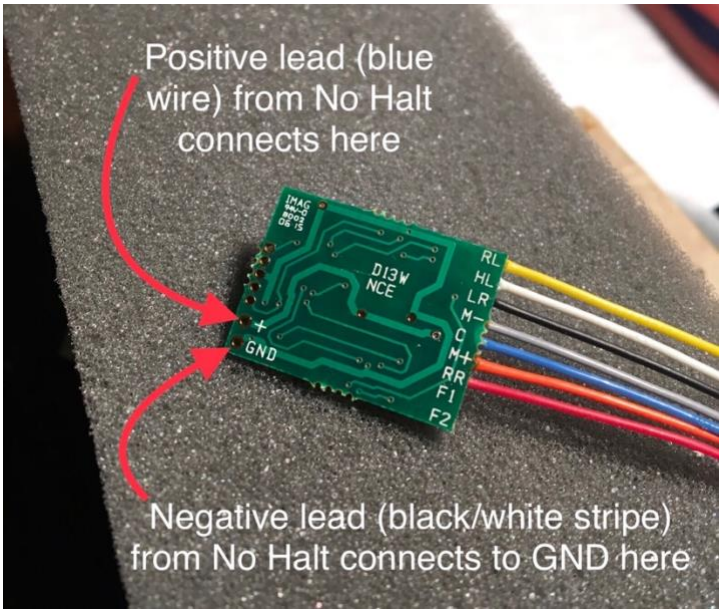




Thread leads from No Halt past LED **Negative Track Pickup leads join decoder**

The No Halt stay alive.

NCE calls their stay alive capacitors a ‘No Halt’. This provides about 2 to 6 seconds of continuous power to compensate for dead electrical spots on the layout such as frogs, dirty track, etc. The No Halt connections are made by soldering the blue (common + anode lead of the Stay Alive to the + solder terminal on the decoder board labelled ”+” and the negative lead from the No Halt is soldered to the GND (ground) connection on the decoder board marked ‘GND’. Note the F1 and F2 connection terminals. I did not use these on this installation, but this

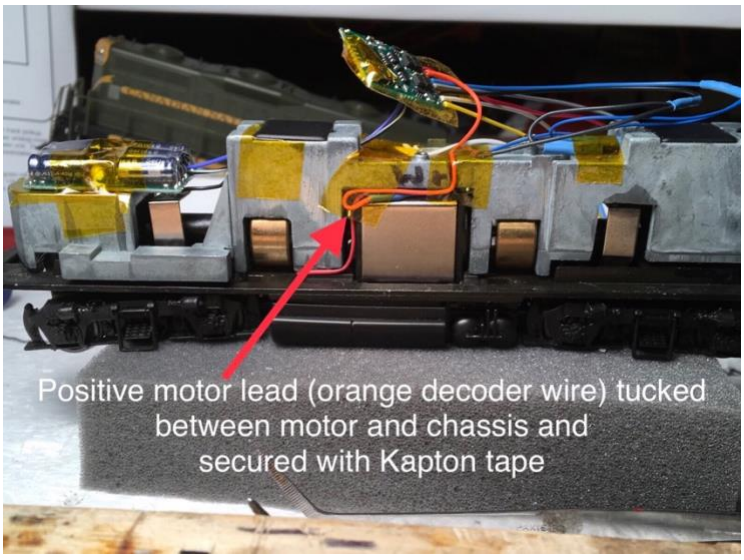


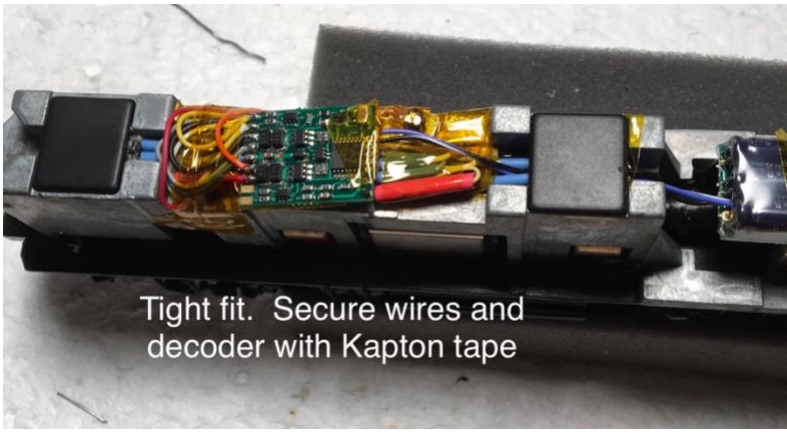
is where you connect LEDs activated by Function 1 and 2. Uses include Ditch Lights or cabin lights etc. See some of my previous Decoder installation articles on my web site for examples and set up of ditch lights.

From NCE web site: “The NCE “No Halt” modules are used in situations where power pickup of the locomotive is a problem due to dirty track, unwired or insulated sections of track or just plain old poor pick up of the locomotive itself. The small No Halt module will supply from 2-6 seconds of loco power, perfect for crawling over dead frogs or dirty track..”
They caution not to use with a DCC track voltage over 15 Volts.

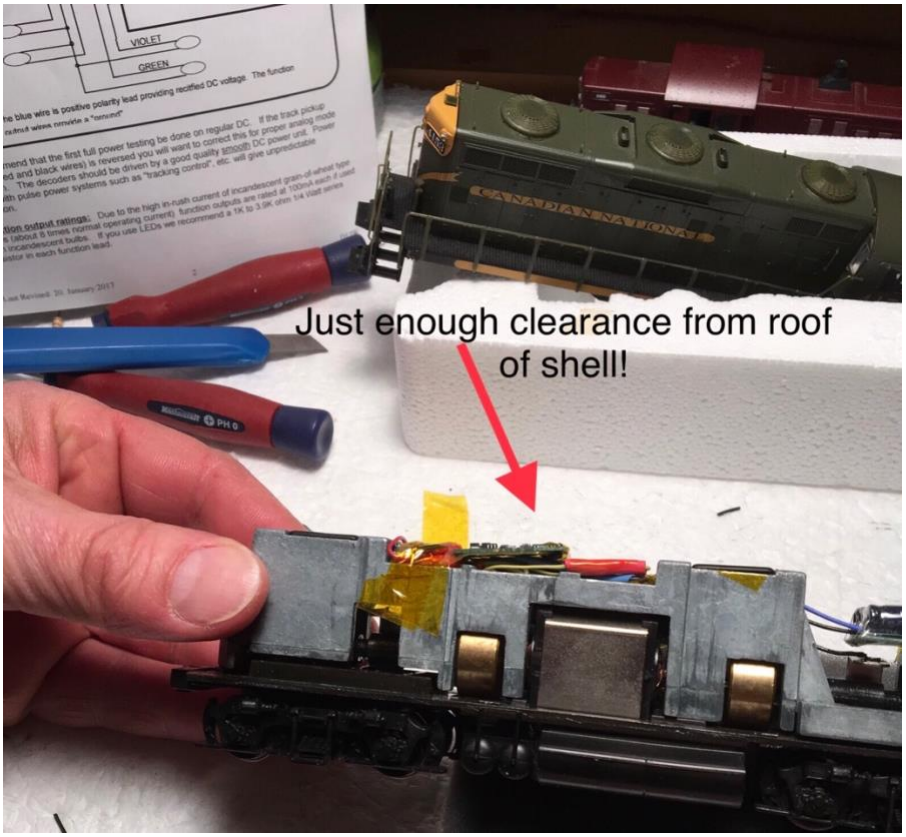
The No Halt Stay Alive from NCE

Even when using 30 AWG wire getting the components in is still a tight fit!





The shell went back on with room to spare. I think it would be quite feasible to attempt a sound decoder installation in this LifeLike GP9, provided you used a flat mini speaker at the rear, secured to the underside of the roof.



Let's program some CVs!

I use an NCE PH Pro 5 Amp Command Station with a Power Pro Radio Cab. This task of course can also be handily accomplished using Decoder Pro.

Setting up CVs
Date:Feb 5 2019
CN4153 GP9 NCE D13W Decoder.
Install date: Feb 5 2019

CV30 Set this CV to 2 on the programming track and the decoder will reset to factory settings.

Setting CVs
Short address = 3
Long Address = 4153

128 speed steps

Manufacturer = 11
Dir Mode
Decoder version = 38
Active Address Long 4153
Short Address = 3
Dir bit = norm
SPD STEP = 28
DC Mode No
Standard Speed Table
Active Address Long

CV2 = start voltage (Typical range 0-35). CV2= 15 = does not work
30 works..lower to 20 just barely works … so try 25
(Date: Feb 5 2019)
CV 6 mid voltage 128
CV 5 Max Voltage 255. (192 3/4 max voltage)

Momentum 3/9 via NCE Momentum button (range of 0 to 9) puts values of 24 and 12 into CVs 3 and 4. 5/9 puts values of 40 and 20 into CVs 3 and 4. 7/9 gives 56 and 28. 9/9 gives 72 and 36 in CVs 3 and 4. Entering '0' turns momentum off.
Just so you know: For those using momentum with consists….
If a consist is active when MOMENTUM is pressed the button will do nothing unless "CONSIST MOMENTUM" is enabled (factory default) in the SET CMD STA menu. Momentum commands will be sent to a limit of 6 locos per Advanced consist.

CV 3 Accelerate = 40 now 56 now 40 now 56 Date: Feb 5 2019)
CV 4 Deceleration rate = 20 now 28 .. now 20 (Feb 5 2019)

CV 116 ... 4. (**Kick rate**) as of Feb 5 2019 CV 116=2
Increase frequency from 4 to 2..increasing kick rate to value 2 works much better!
.... Range is 0-6. value of 1 applies kicks continuously.The smaller the number the more often the motor gets a brief voltage 'kick'. Factory default is 0 (off)
Kick Depth = 25 ? Is this Kick Strength CV 117? Range = 1 - 50
CV 117 ... (25) .. or 30
increase from 25 to 30 ..25 or 30 both work..leave at 35 Feb 5 2019
now 30 tried 35 (sticking on curve) now 35 Feb 5 2019

Summary (CV values as of Feb 5 2019)

CV 2 = 25
CV 6 = 128
CV 5 = 255

CV 116 = 2. kick frequency
CV 117 = 35. kick strength. (Range is 1 to 50)

Momentum is off while testing Motor Control CVs

Momentum: 2/9 (The Momentum button on the Pro Cab Throttle sets momentum CVs in a range from 0 to 9)
CV 3 = 16
CV 4 = 8

CV 95 = 0 Currently = Default (0) (Reverse trim)

Here is how NCE describes the Motor Control CVs. (From the NCE D13W Decoder manual.)

Start Voltage - CV2 (Vstart):
This is the amount of voltage sent to the motor when first starting up. We set CV2 so the locomotive is almost able to maintain movement at speed step 1. We then use CV116 and 117 to apply enough torque compensation to keep it turning on speed step 1. Typical values for CV2 are in the range of 0-35.
Torque compensation kick rate - CV116:
How frequently the motor is 'kicked' at slow speed. Typical adjustment is 2 to 4. The smaller the number the more often the motor gets a brief voltage 'kick'. Factory default is 0 (off). A value of 1 applies kicks continuously. The maximum practical value is about 6.
Torque compensation kick strength - CV117:

How hard the motor is 'kicked' at slow speed. Typical adjustment is 4 to 25 The larger the number the more voltage is applied in each 'kick'. The strength of these kicks fade out ratiometrically as speed is increased providing a smooth transition to normal motor operation. Factory default is 0 (off), usable range 0-50.

Vmax - CV5: If your locomotive runs too fast you can use CV5 to lower its maximum speed. Setting CV5 to 255 uses the maximum possible voltage to run the motor when full speed is requested. Set CV5 to a smaller value to reduce the top speed. A value of 128 will yield approximately ½ full voltage to the motor at top speed. 192 will provide about ¾ full voltage. All speeds from the middle speed step to the maximum will be proportionally reduced (see diagram). If CV5 is set to 0 the decoder will use 255 for maximum speed. Always make sure CV5 is greater than CV6 to avoid erratic operation.

Vmid - CV6: CV6 determines how the motor responds through its middle speed ranges to advancement of the throttle. If you set CV6 lower than half the maximum speed you'll have smaller increases in motor speed through the lower speed ranges. Then, as you hit the upper speed ranges there will be larger increases between speed steps. In the diagram below you can see this best illustrated by the 'customized' line. If you set Vstart larger than 0 you'll will most likely want to raise Vmid so a reasonable slope is maintained in the 'speed curve'. If CV6 is set to 0 the decoder will use 127 as the value. If you use high values in CV117 you will want to increase CV6 by a proportional amount to keep a smooth acceleration curve.

Reverse trim (also forward trim) - CV95:

Values from 1-127 make decoder run faster in reverse than forward. 1 is one speed step faster in reverse, 2 is two steps faster, etc.

Values from 129-255 make decoder run faster in forward than reverse. 129 is one speed step faster in forward, 130 is 2 speed steps faster, etc. 0 and 128 add nothing to either direction.

In the process of this decoder installation and fine tuning of my locomotive, I came across some maintenance issues which might apply to other readers.

Maintenance issues for CN4153: (Date: March 31 2019) LifeLike GP9 locomotive.

Jerky movement at speed step 1. I increased Start Voltage CV 2 from 25 to 30. On examining the driver axel gears, a split axel gear is found in the rear wheel set of rear truck and in the rear axel gear of front truck..not as severe. I reinforced these 'splits' with Cyanoacrylate (crazy) glue. (This is a known issue with LifeLike Proto 2000 locomotives manufactured prior to 2005. Replacement driver wheel sets can be purchased). Note that the driver wheel gear covers have a semi-circular groove to clear the axel gears on both sides, so I had to smooth out the CA glue 'bump' I created when gluing the splits in the plastic axel gears. When trying running on track a new issue had developed, in that the rear truck constantly derailed. On analyzing I conclude that the square metal bearings have to be placed 'laterally' against the inside of the backs of the driver wheels, and the plastic axel gear covers (I think) are designed to hold these in place in the square grooves in the electrical pickup conductor plates..all designed to keep the wheel axels from 'binding' when running on the track, and insuring good electrical pickup....all a delicate balance, so I recommend you try not to mess with it!

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