

## Installation of NCE P2KSR Mobile Decoder into Bachmann GP9 CN4497:

Installation date: June 9 2018

This small GP9 diesel locomotive by Bachmann does not contain the highest quality motor nor top of the line gear sets, but it does have ample room for a mobile decoder. Given that there is only limited room for an additional speaker and current maintaining capacitors, and given the less than optimum quality of the motor and gear set the situation lent itself to a cheaper decoder installation.. that being a simple mobile decoder which can cost as low as \$30. It just so happened that I had on hand a left over NCE P2KSR mobile decoder that is specifically intended by design to be installed into a Lifelike or Walters Proto2000 EMD GP38-2 diesel locomotive. I did install one of these into a P2K GP38-2 (see article on my web site titled....), but instead decided to put a Soundtraxx TSU1100 Sound decoder into the second GP38-2 I owned. (See article ...on my web site). This is why I had this specific decoder available and decided to use it in the standard issue Bachmann GP9. The NCE P2KSR Decoder has excellent motor tuning abilities and would considerably enhance the drive characteristics of my old GP9. However, there are some adaptations that have to be made. The NCE P2KSR Decoder is designed to directly plug into the 8 pin female plug as supplied in the P2K GP38-2. My installation of a TSU-1100 Sound Decoder into the P2K GP38-2 did not require the 8 pin plug which I salvaged for this project.



## Removing the shell:

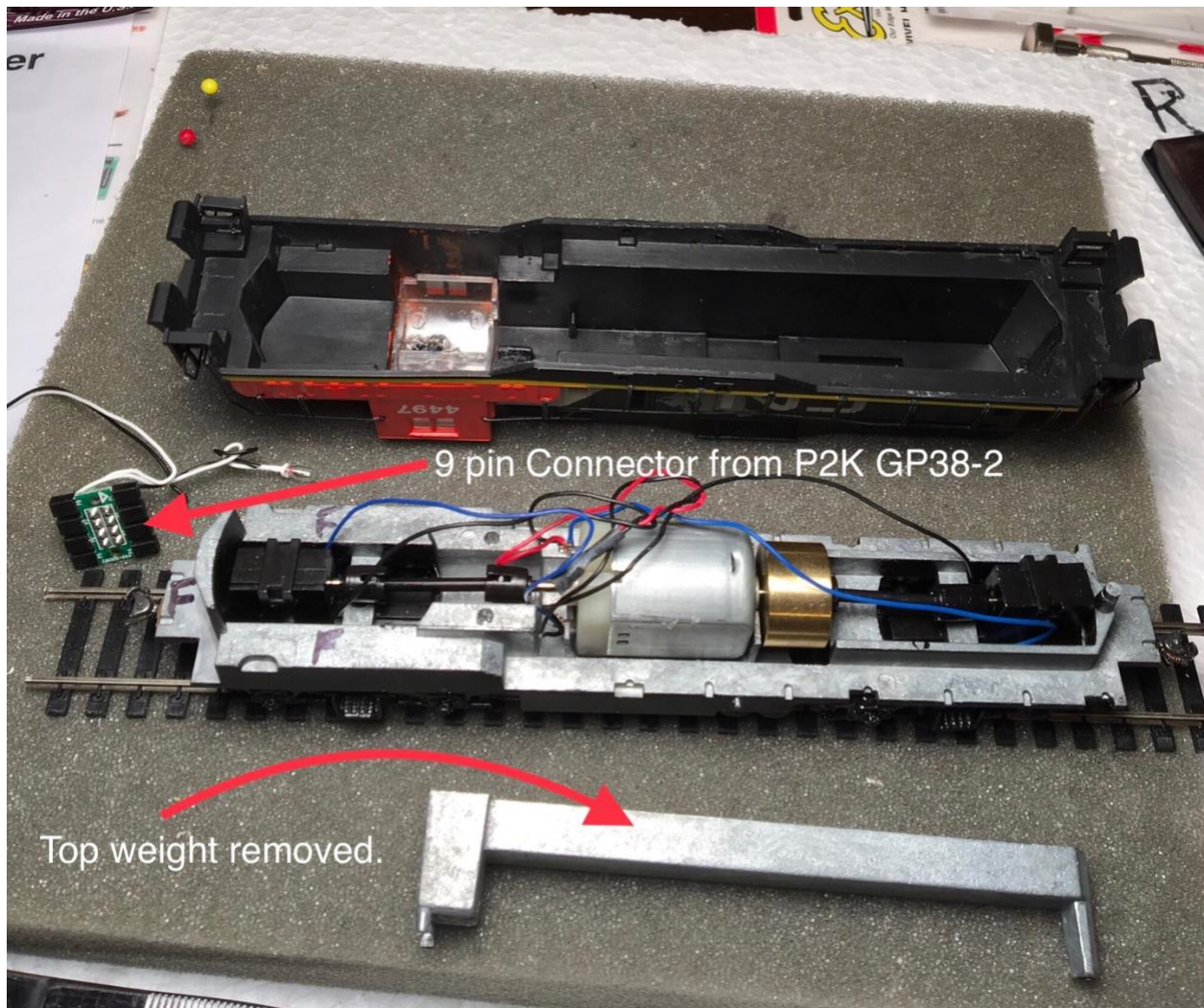
Removing the shell is a simple matter of releasing the tabs one on each side located bottom middle of the gas tank.

The wires in the original GP9 locomotive are not colour-coded according to NMRA conventions and you will notice that right side track pickups at front and rear have blue and black wires arising from opposite sides. The wires to the front headlight are black and red, bearing no relation to proper DCC convention for wire colour coding. Therefore disregard the colours of the wires and ensure that right side track pickup wires connect to the proper pin location on the 8 pin connector and so on.



After removing shell

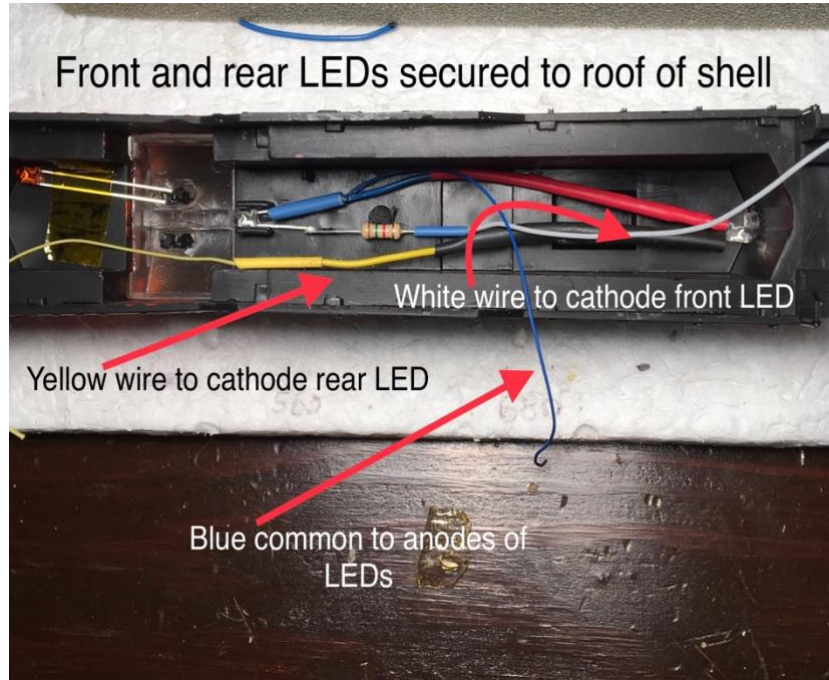
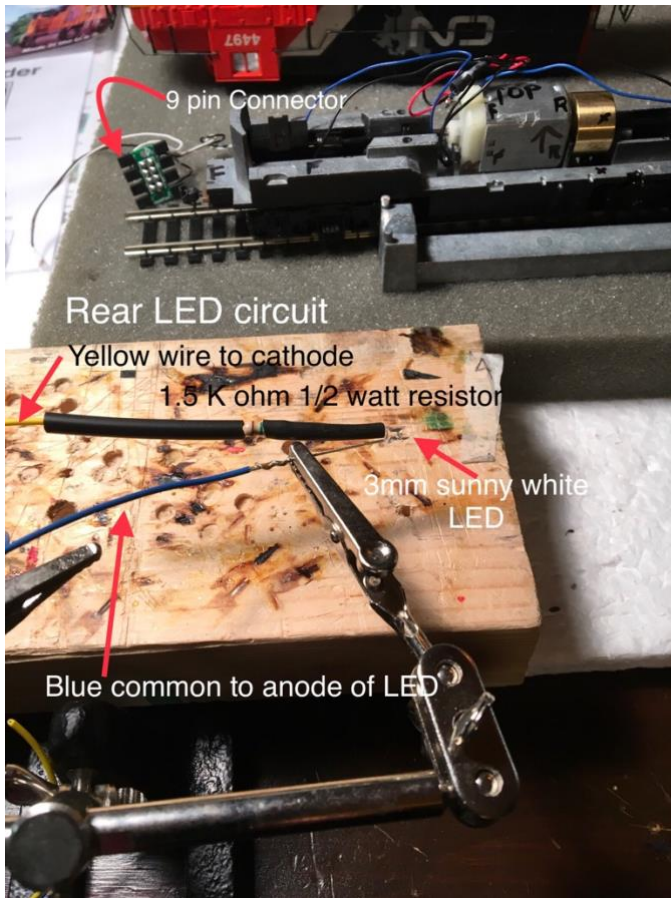




### After removing the top weight

I replaced the front incandescent headlight with a Sunny-white 3mm LED and added a rear headlight, which the original did not have, with another Sunny -white LED. Create front and rear LED light circuits with white wire and 1.5K Ohm resistor connected to the cathode of the LED, and similarly a yellow wire and 1.5K Ohm resistor connected to cathode of rear LED. Heat shrink tubing can be used to insulate the bare wires from the metal of the lead weights after assembly.

## Front and rear Headlight circuits installed in shell



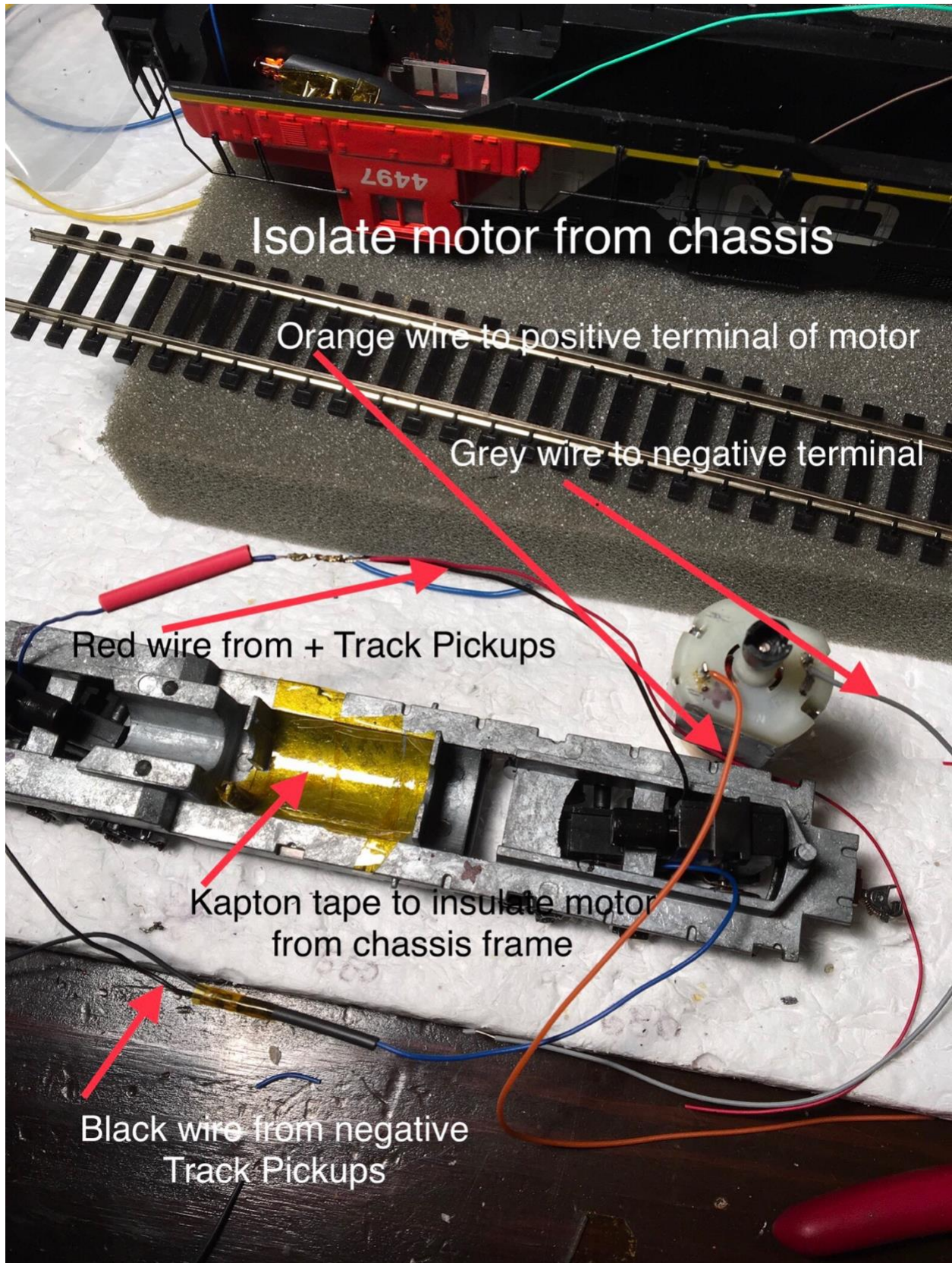
### Preparing the motor:

Be sure the motor is completely isolated from the metal chassis. I used Kapton tape for this purpose.

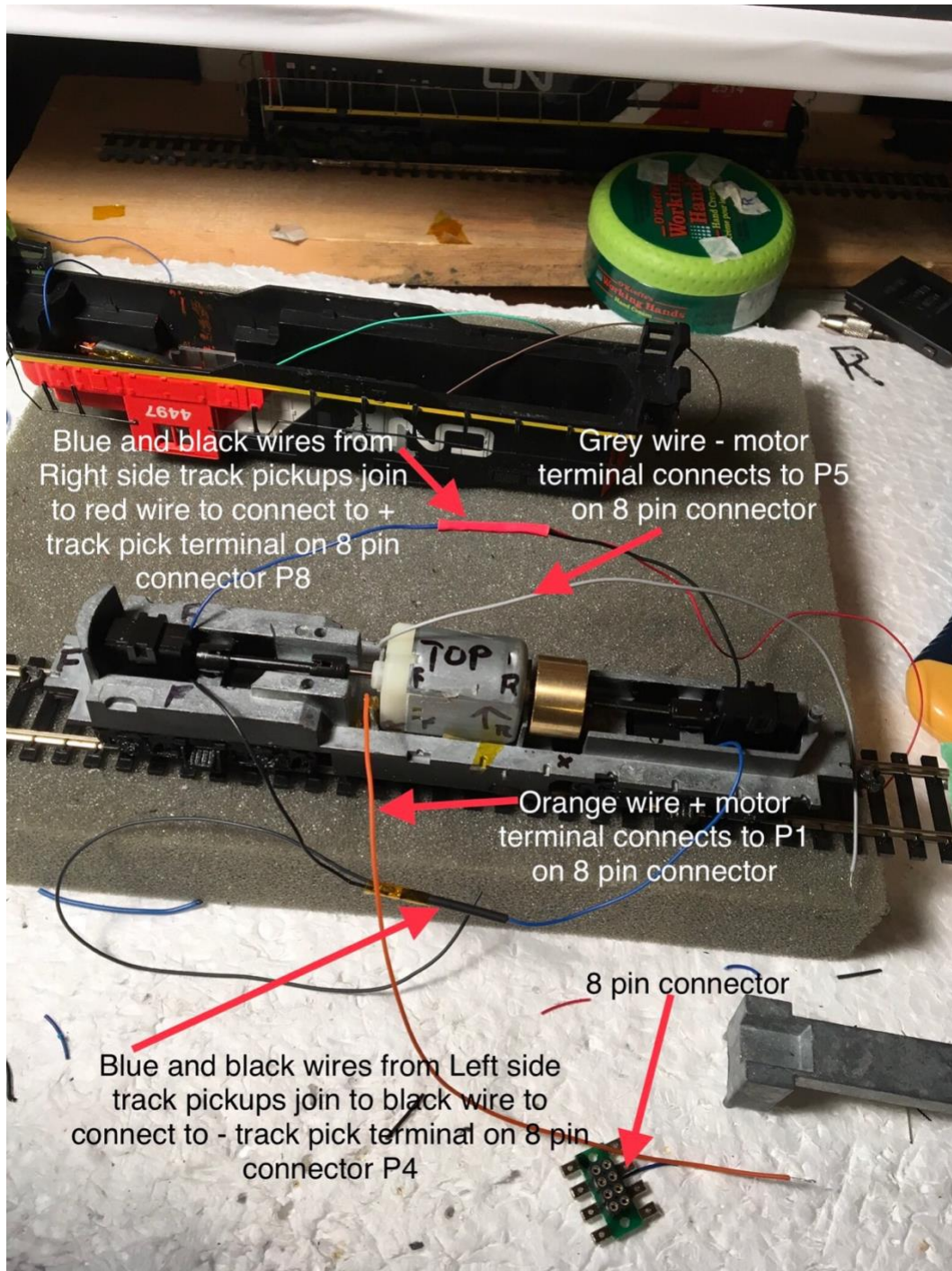
(See photo of motor and use of Kapton tape on chassis to isolate the motor ... Page 5)

The polarity of the motor terminals is not clearly marked so be sure you observe which are the positive and negative terminals by examining which terminal connected to the right and left tracks on the original connections. (NMRA convention defines the right track when in forward motion is the positive track). The way the motor was inserted in this locomotive I found the positive terminal to be at the bottom and the negative terminal at the top. Solder an orange wire to the positive motor terminal and a grey wire to the negative motor terminal. These will connect to pins P1 and P5 on the 8 pin plug. See the 8 Pin Plug connection diagram and the schematic wiring diagrams from NCE that follow.





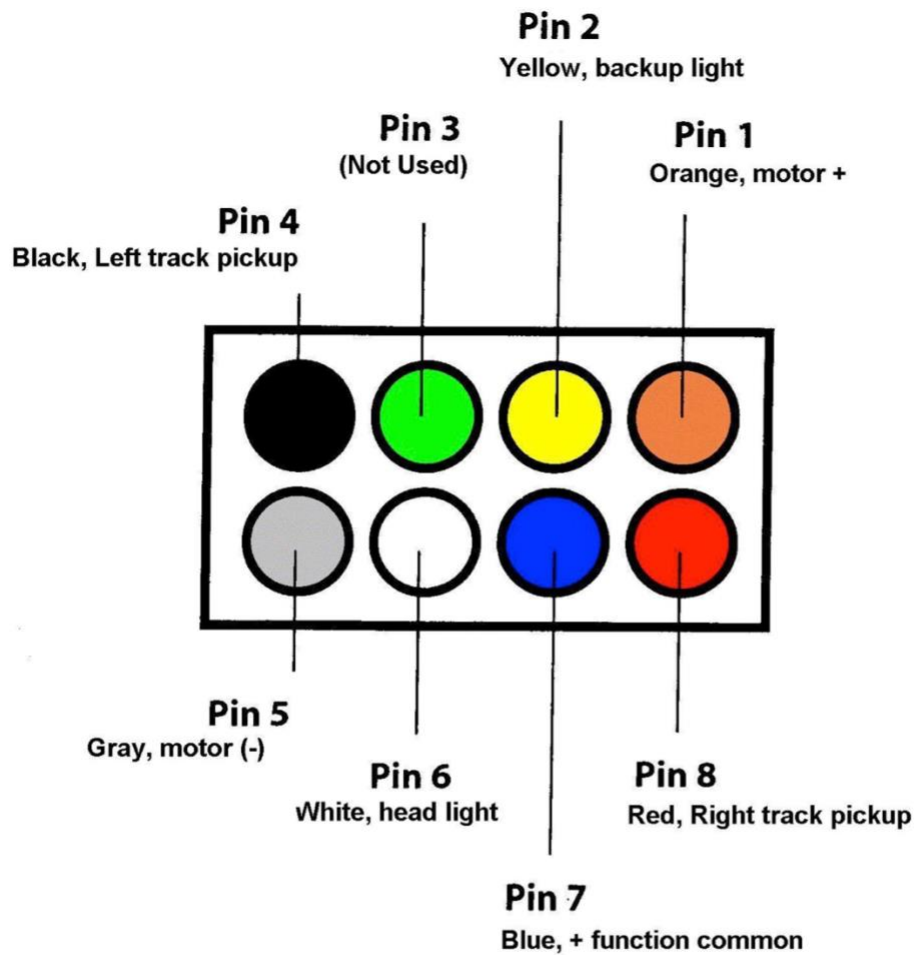




### Track Pickups and motor wire connections

Notice that on the right side (positive) track pickups front blue and the rear black wires join, and will connect to P8 terminal on the 8 pin plug. Use a red wire for this connection. Similarly on the left side, (negative) track pick up wires, front black and rear blue wires will join and connect to P4. Use a black wire to make this connection. See the wiring schematic diagrams below.

## NMRA 8 PIN PLUG CONNECTOR



### NMRA 8-pin Connector Pin-out Viewed from wire side

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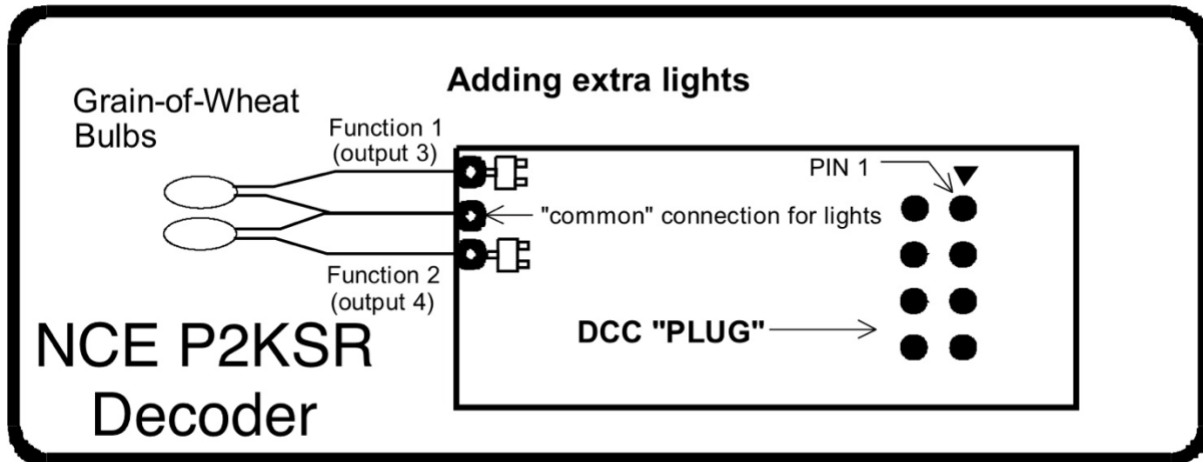
An orange wire will connect to P1 the positive motor lead and join to the positive motor terminal at the bottom of the motor.

A grey wire representing the negative motor lead will connect to P5 and join to the negative motor terminal at the top of the motor. (Usually DCC conforming set ups have the positive motor terminal on top).

#### Ditch light assembly:

Create ditch lights using 3 mm sunny white or yellow LED bulbs and 1500 ohm ½ watt resistors using brown wire for output 3 and green wire for output 4 and these will connect to function 1 and function 2 solder points/terminals on the decoder board. Use a common wire (blue) to connect to

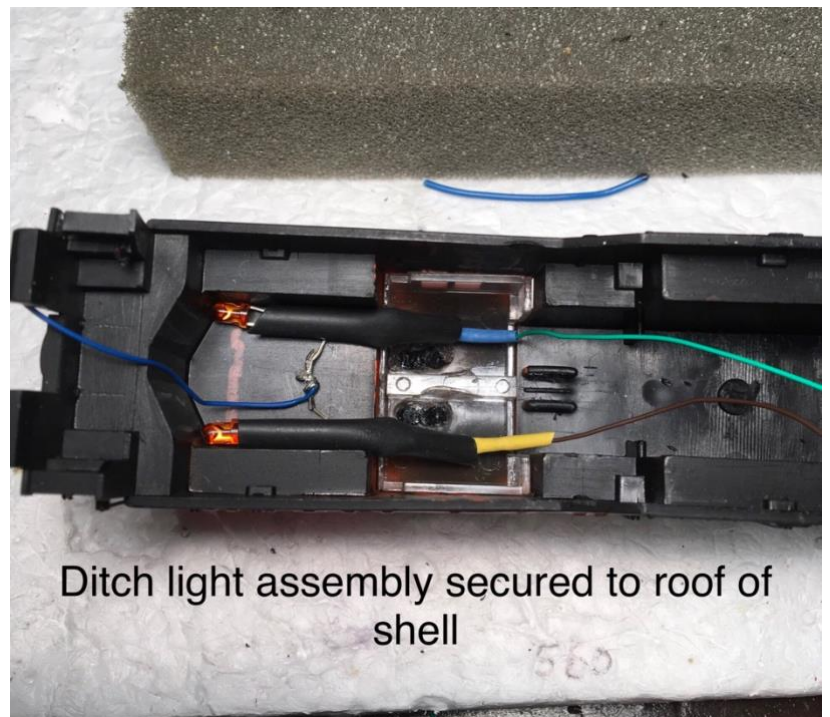
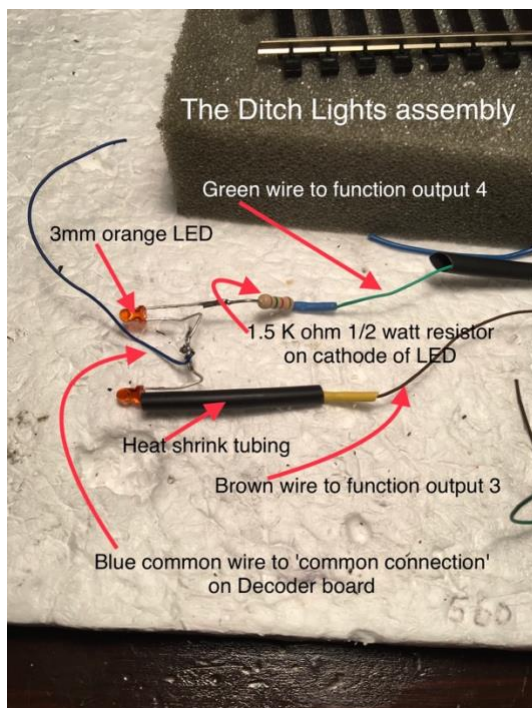
common solder point for lights labelled "common" connection for lights on the "adding extra lights" diagram at the top left of the decoder board. See NCE wiring schematic.



**NCE wiring diagram for the NCE P2KSR mobile decoder**

Drill holes for the ditch lights just below the roof of the front low hood at the moulded impressions of the front ditch lights.

**Photo of Ditch light assembly inserted into shell**





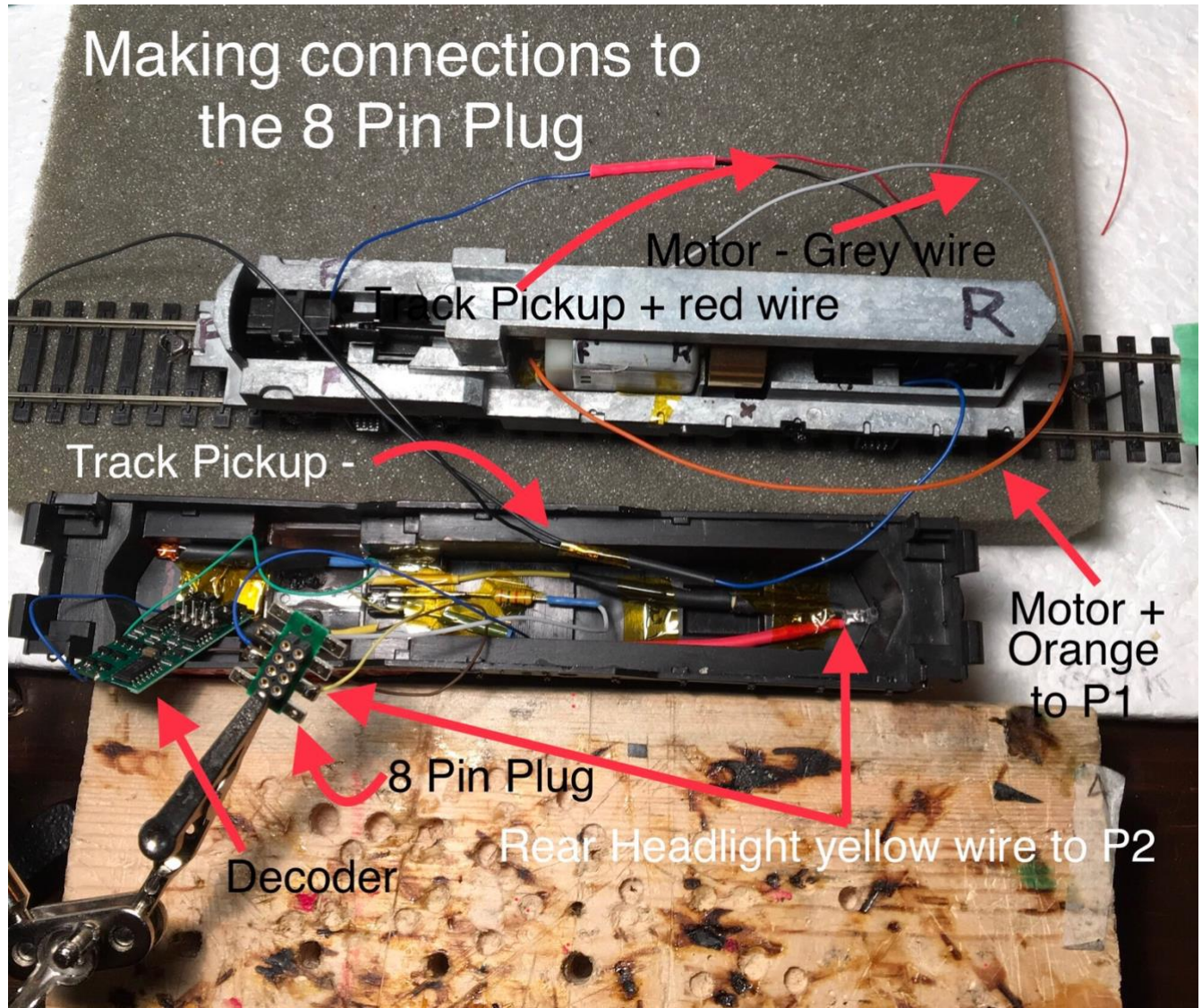
The decoder board and 8 pin connector assembly will reside towards the front of the Shell or in the cab in order to clear the top lead weight. Allow enough length of the wire connecting leads to facilitate this positioning.



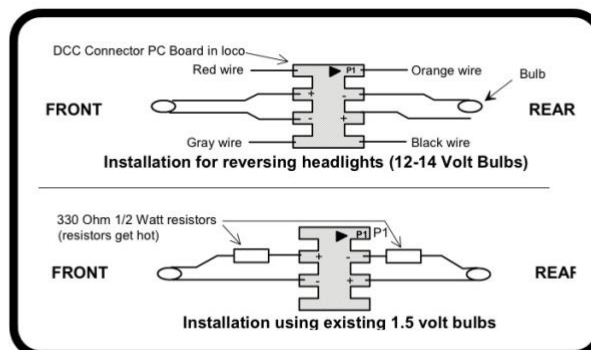
Photo of Decoder board and additional LED connections for Ditch Lights



## Decoder board and 8 pin Connector final assembly



8 Pin Plug connections  
(Courtesy NCE)



### Recommended Lighting:

If you use LEDs we recommend a 1K ohm 1/4 Watt series resistor in each function lead

- Miniatronics #12-310-05 Yellow Glo White LEDs.
- Richmond Controls (or equivalent) Golden White LEDs.
- Miniatronics #18-712-10 (12v) or #18-014-10 (14v) incandescent bulbs



After soldering all the connections to the 8 Pin Plug, the Plug is inserted onto the male component of the 8 pin connector on the decoder board. Place the decoder board such that the 8 pin connector occupies the space in the cab. If everything fits we are all done!



### **Programming CVs:**

Now it's time to program some CVs. This NCE mobile decoder has great capabilities when it comes to fine tuning a motor. There are complete instructions for adjusting motor torque and start voltages etc. In the NCE documentation. If you are purchasing this decoder from NCE be sure to get the latest version (3.5), as the new one has 5 function outputs. The decoder described in this article only has 4 function outputs. I have used front and rear headlights (function outputs 1 and 2) and have used function outputs 3 and 4 for the Ditch Lights (activated with Function buttons 1 and 2).

My current CV settings are as follows. These are programmed using an NCE PH Pro 5 Amp command station with a wireless Pro Cab.

### **CN4497 NCE P2KSR Decoder.**

Install date: June 10 2018

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

Date: June 10 2018

Setting CVs

Short address = 3

Long Address = 4497

CV 65 = Kick start (0?)

CV 2 = changed to 15 on June 10 2018 (was ?)

128 speed steps

Manufacturer = 11

Dir Mode

Decoder version = 35

Active Address Long

Short Address = 3

Dir bit = norm

SPD STEP = 28

DC Mode No

Standard Speed Table

Active Address Long

CV2 = 30 (start voltage) ... now 30 (June 10 2018) needs 20 for pulling cars on Y2 track 11! Not a very powerful motor! Typical range 0-35

CV 6 mid voltage 128

CV 5 Max Voltage 255. (192 3/4 max voltage)

Momentum 3/9 via NCE Momentum button 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.

CV 3 Accelerate = 40 now 56 now 40

CV 4 Deceleration rate = 20 now 28 .. now 20 (June 10 2018)

Have not set up Kick start yet.

CV 116 ... 4. (Kick rate) .... Now 2 (June 10 2018) 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?

CV 117 ... (25) .. now 30 (June 10 2018) (Kick strength) yes as read on program track manually. Tried 25 but jerky start so back to 35 which works fine. Necessary for lower voltage tracks such as Y2 track 13 and 11. Useful range 0-50

Stopped here June 10 2018.

Summary of loco tuning CVs: as of June 10 2018: These CVs changed on Oct 16 2018 to facilitate running on turntable. Solution seems to be to put Momentum CVs to 1 out of 9. Also use speed increase fast (10) steps to avoid stall on turntable.

CV2 = 10 (Date: Oct16) was 15 now back to 10 because otherwise stalls on turntable ??? Check CV 2 maybe should be back to 15? Still stalling on turntable! Oct 7 2019

CV 116 = 3 (Date: Oct16) was 2 now back to 3 because otherwise stalls on turntable \*\*\* Oct 7 2019 set to 2 but is again stalling on turntable. So I put it on track 4! Maybe need to set back to 3?

CV 117 = 35

CV 3 = 40 now 8

CV 4 = 20 now 4

Changed momentum to 1 out of 9 to facilitate using turntable (Date: Oct 16)



CV 95 ... 130.. (Reverse trim) loco seemed to run faster in reverse than in forward?  
CV 95 changed to 2 Oct 7 2019

The motor in this locomotive is unfortunately not very powerful and has some trouble navigating the turntable in yard 2 and has more difficulty with its inertia starts on lower voltage tracks such as yard 2 tracks 11 and 13.

The next day June 11 2018 the loco performed well. It managed to exit Yard 2 roundhouse Track #5 onto turntable ok. Have not changed any of the settings as listed above.

**Ditchlights:**

CV 36 = 12 (F2 mapping CV) Outputs 3 and 4 now controlled by F2

CV 122 = 48 Output 3 light effect is now Type 2 Ditchlight (alternating flash off after horn F2 is deactivated).

CV 123 = 52 Output 4 light effect is now Type 2 Ditchlight (alternating flash off after horn F2 is deactivated).

CV 118 = 20 (5 seconds) Amount of hold time ditchlights remain activated after F2 is deactivated. Ditchlights act independently of headlights. Manual says they are dependant on Headlight being on. See page 4 of NCE P2KSR manual.

CN4497 has trouble stalling at first turnout to upper siding on Block 8 Ogden Point. So also does sound car caboose. ..? Need to electrify the frog? (I did)

Date: Dec 14 2019

Adjusting CVs for smoother start.

This loco has not got the optimum motor inside. It needs PWM for control.

I have been playing with CVs 2, 116, 117, and momentum

Current settings are:(Dec 14 2019)

CV 2 = 5 !

CV 116 = 1 (Kick rate ... allowed values are 1 to 6. Value of 1 provides a kick continuously. I believe the previous value of 2 allowed the motor to stall on initial start up. Once this engine starts running it seems fine!)

CV 117 = 30. (Kick strength)

Momentum is still 3/9 (NCE)

CV 3 = 24

CV 4 = 12

Starts and stops are still abrupt!

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