

## **Install an NCE SW9-SR mobile Decoder into an P2K SW1500 switcher.**

CN 7035 EMD SW1500 Switcher:



The PROTO 2000 SW1500 switcher by Walters, formerly LifeLike, is a very versatile and smooth running locomotive, even in DC mode. DCC really makes it shine. The limited space under the shell makes it very challenging to add a DCC Decoder. NCE makes a mobile Decoder (non sound) specifically designed to fit in this switcher's shell.

It might be possible to put a mini speaker in the cab, but it would still be a challenge to put a sound decoder and keep alive capacitor in the shell. However, it is worth noting that the manufacturer of this locomotive (LifeLike) did have the forethought to make a removable section of the lead weight at the front to allow space for a small decoder. This section attaches to the main body of the weights by two screws. If attempting a sound decoder installation, and you are using the optional space provided by removing a section of the front weight for the Sound decoder, and a keep alive current capacitor is deemed necessary, it could be placed in a freight car behind the switcher, and connected with a 2-wire micro-connector. This freight car would then be tethered to this switcher whenever using the keep alive. Another option, should a keep alive be deemed necessary, and you are just installing the NCE mobile Decoder (non sound), is to place the keep alive capacitor in the space provided by removing this front section of the lead weight.

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NCE's solution to limited space is the NCE SW9-SR mobile Decoder that replaces the original PCB light



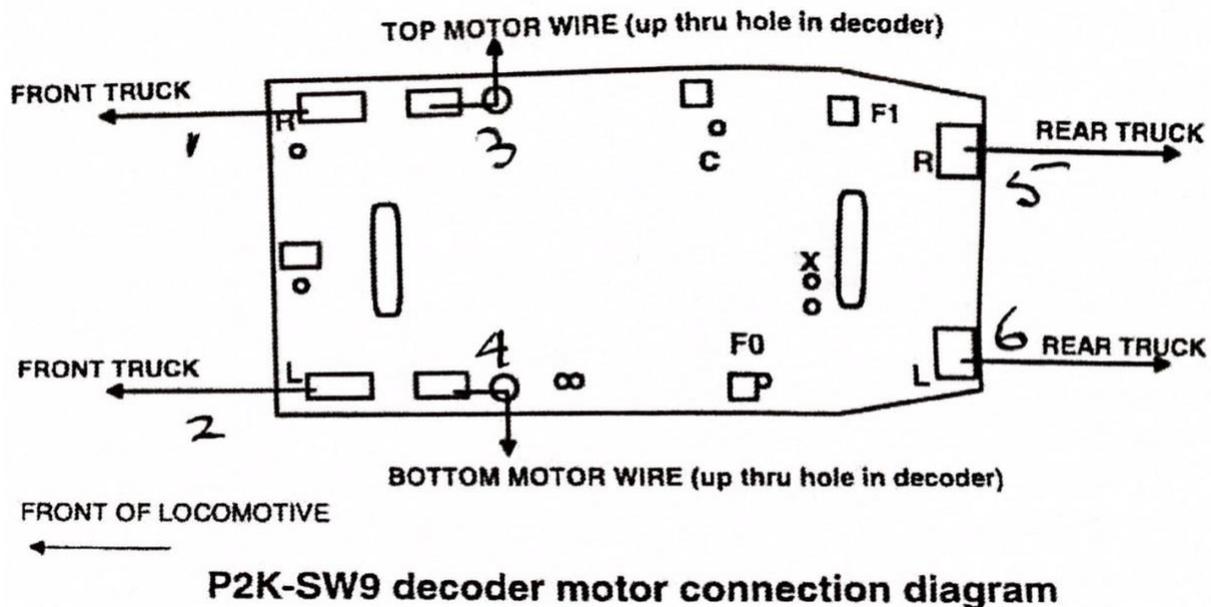
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board that sits on top of the motor.

I found that at least on my layout, thanks to good design of the P2K EMD SW1500 switcher, and the well engineered circuitry of NCE's decoder, that I did not require a keep alive capacitor. You will see in my article that I pre-wired wire leads for the attachment of a keep alive later should my needs change.

The most difficult part of this project is removing the shell from the chassis of the switcher. See instructions included with the P2K locomotive switcher. Remove both front and rear gear boxes/couplers first. Basically there are five tabs, 4 on the sides and 1 on the back of the shell that need to be pressed in, in order to release the shell. Press on the most forward ones first and slightly lift the front of the hood then press on the rear side tabs. Move the shell forward slightly to release the rear tab and lift up the shell. The running boards come off with the shell. Try grasping the chassis itself when lifting up the shell.

Circuit schematic as supplied by NCE:

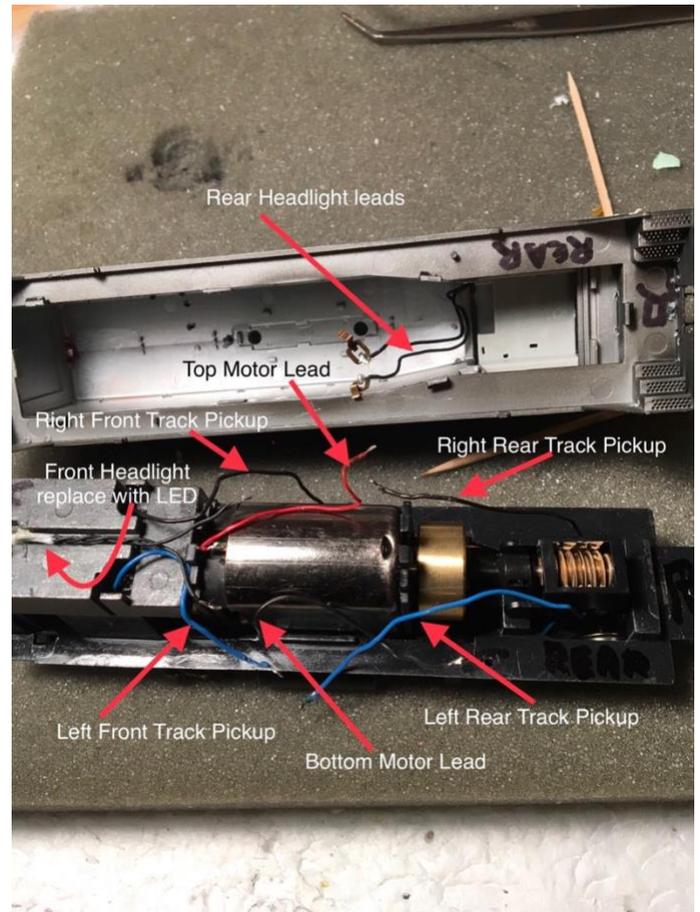
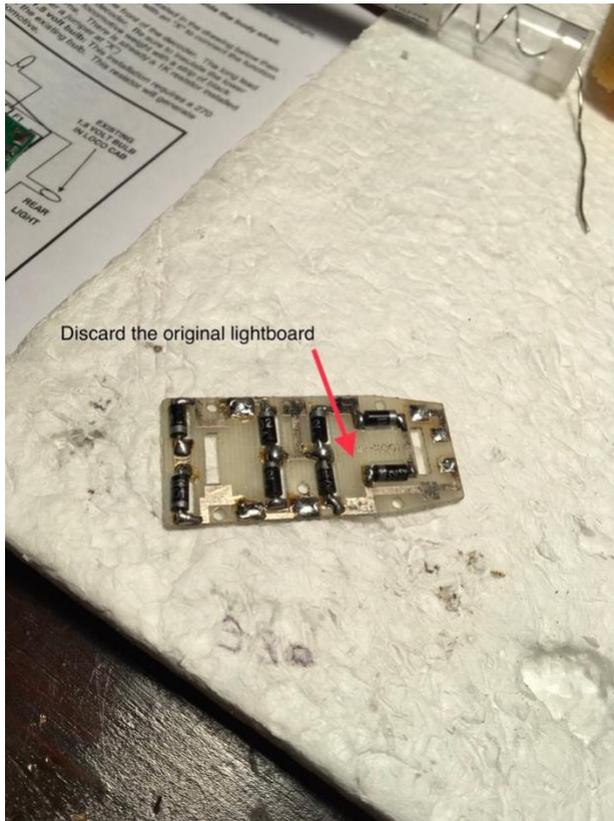




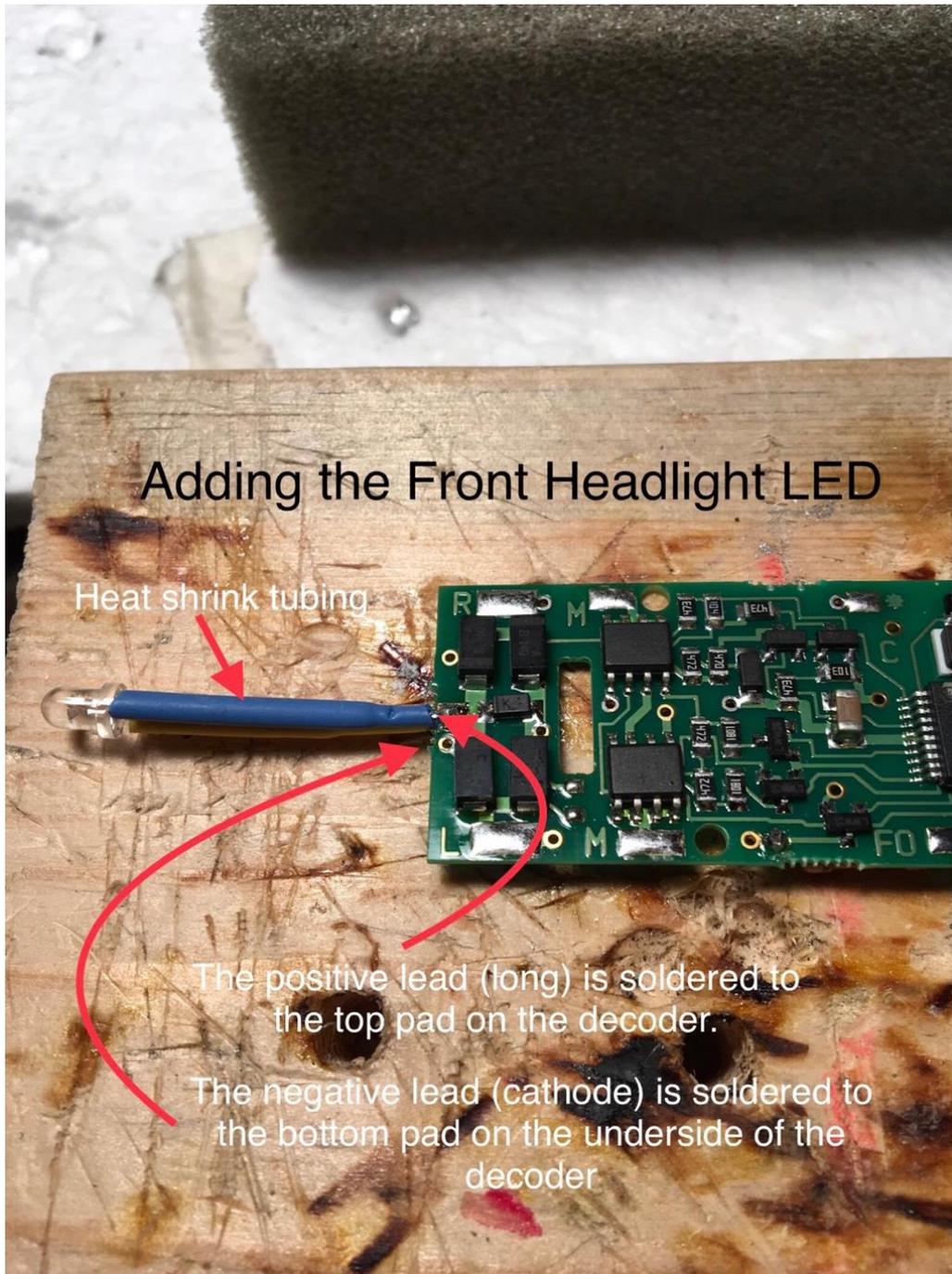
It was easy to disconnect the wires just by touching the solder iron tip to the solder pads.

Next remove all wires that are soldered to the original printed circuit board. I just touched the solder iron tip to the solder pads and the wires came off easily.

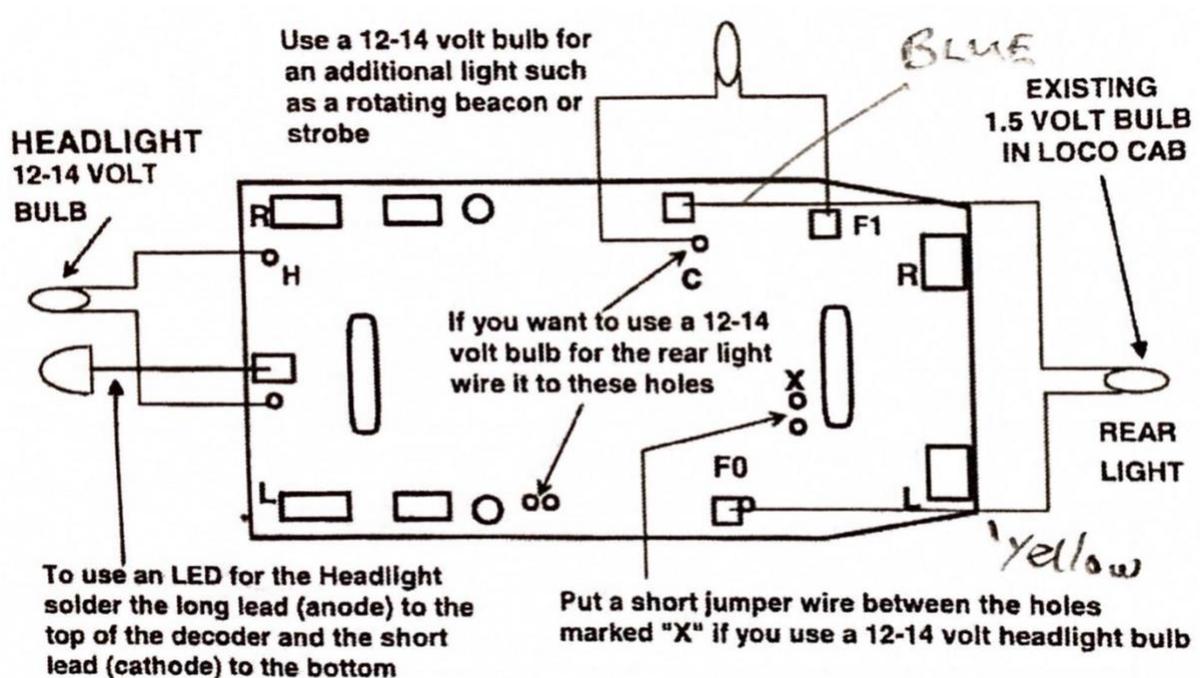
This is what you see after removing the light board. (On tablet double tap image to enlarge)



I chose to replace the original 1.5 volt front headlight mini bulb with a sunny white 3mm LED, and to retain the original 1.5 volt mini bulb in the rear light, as suggested by NCE. If replacing the front headlight with a 3 mm sunny white LED, a resistor is not required as a 1K current limiting resistor is already included by NCE on the decoder board. Use heat shrink tubing to insulate the leads from the chassis. Solder the anode (long) lead of the LED, to the top solder pad and the cathode lead (short) to the bottom pad as indicated in the NCE instructions. The downside of retaining the original 1.5 mini bulb for the rear headlight is that it is not very bright. NCE puts a 100 ohm resistor in the circuit and only feeds the bulb 1/2 wave voltage so as to not generate too much heat, but in the end this does not give a very bright light.



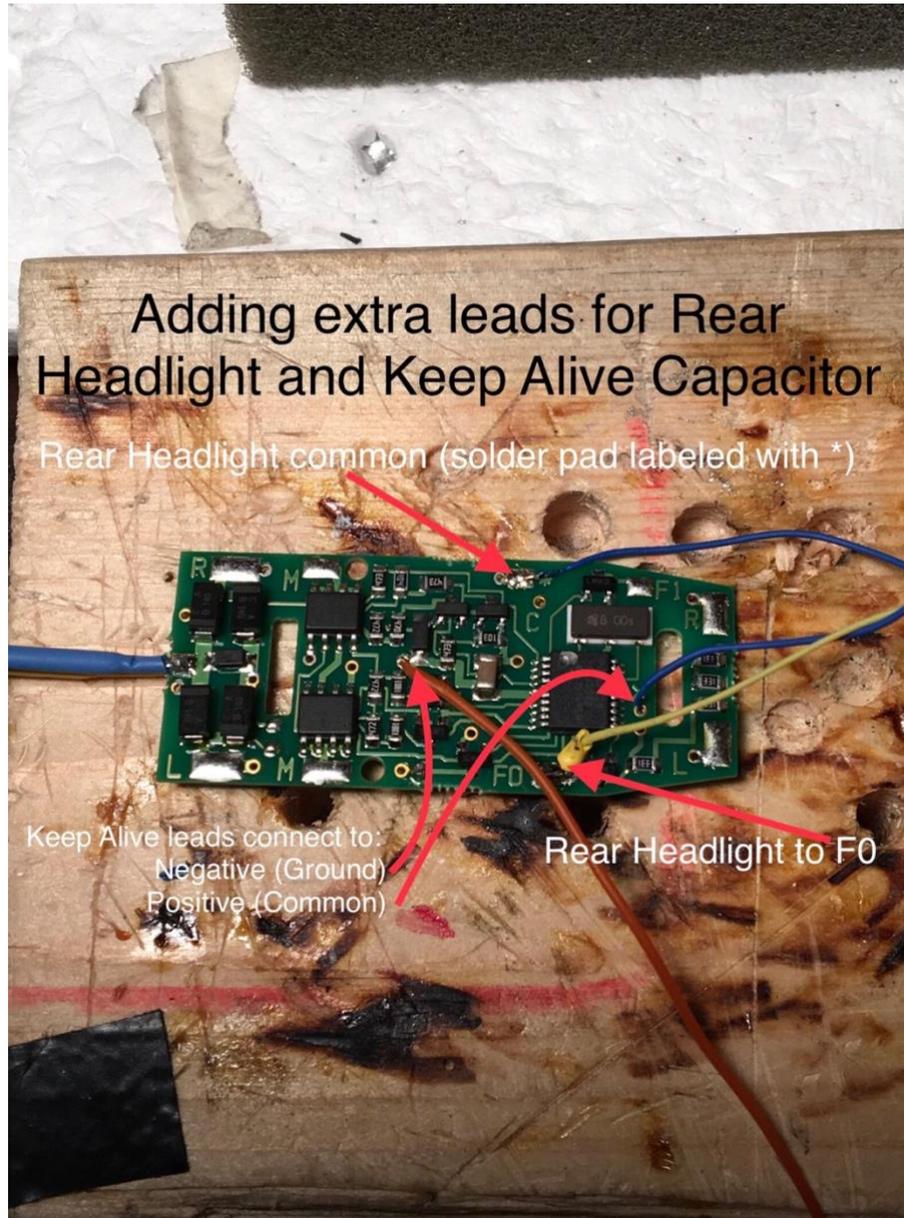
Circuit schematic for lights as supplied by NCE:



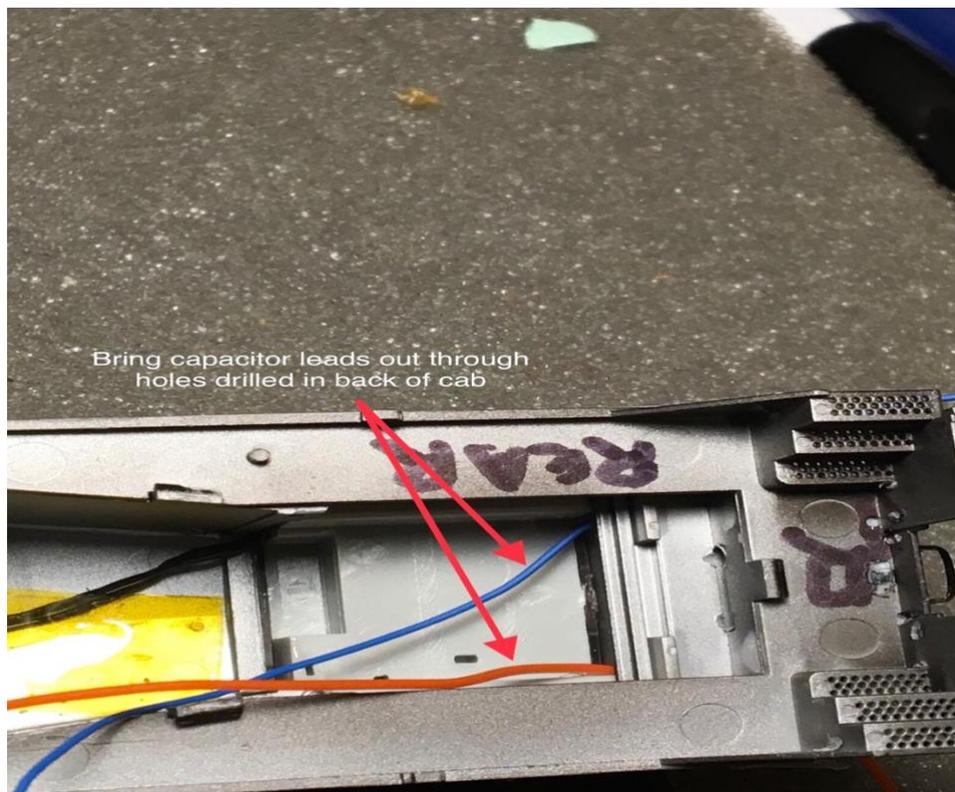
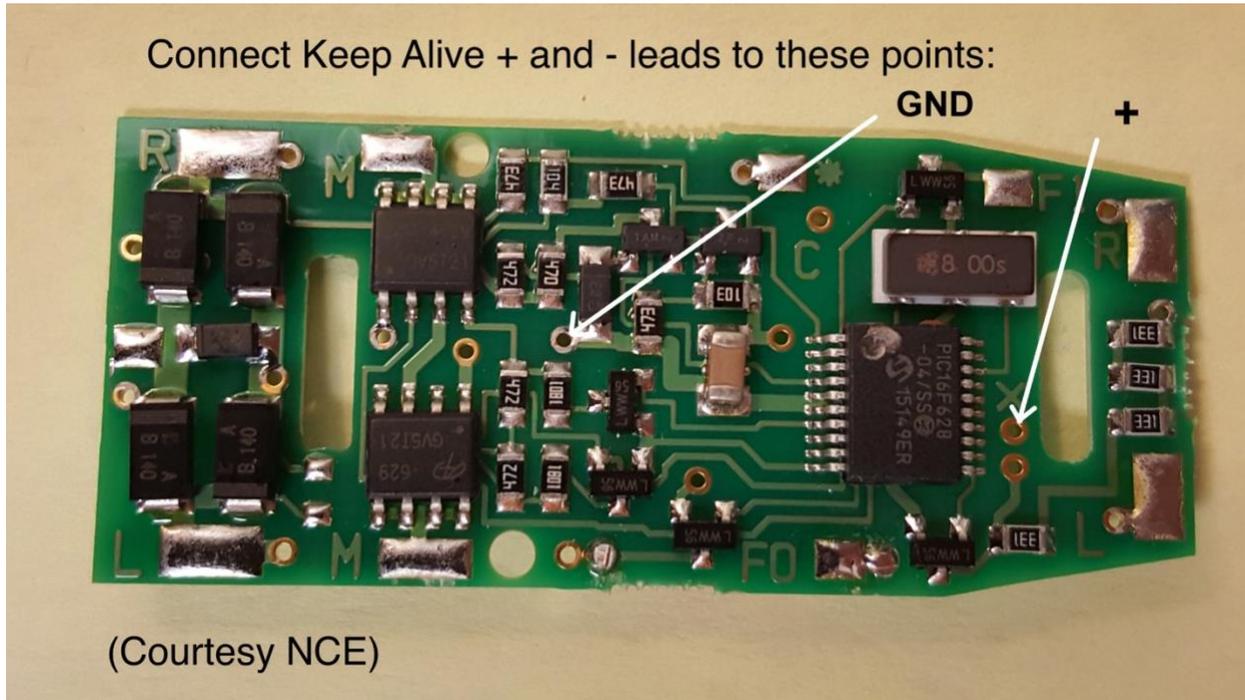
Should you choose to use a white 3mm LED for the rear light, I assume you could connect it to the 12-14 volt connections as indicated in NCE's circuit diagram above. Note the LED is rated at about 3.5 volts so a current limiting resistor would need to be connected to the cathode lead of the rear LED. NCE supplies a pre-wired 1K resistor for the front headlight LED, but I do not believe this applies to the rear light. I did not use an LED for the rear light and chose to stick with the original existing 1.5 volt bulb in the loco cab, for the simple convenience of not having to take the cab apart to access the rear bulb. NCE has also supplied connections for an additional output 3, for a 12-14 volt bulb such as a rotating beacon or strobe, controlled by Function 1. ( See above). If using an LED for this, you also would require a 1K current limiting resistor. The space required for the additional resistors could be problematic, as the space under the shell of the SW1500 is very limited, which of course is the reason to use NCE's specially designed decoder for the SW9 in the first place.

I next proceeded to add leads for the rear light to provide enough wire slack to facilitate easy removal of the shell for future servicing. In addition, as a precautionary measure, I added leads for the addition of a keep alive or No Halt capacitor, that I would place in a freight car behind the switcher should future

needs require. So far, I have not found the current maintaining capacitor to be necessary.



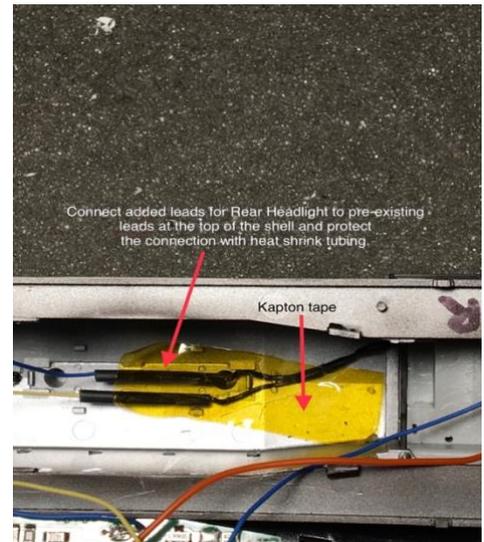
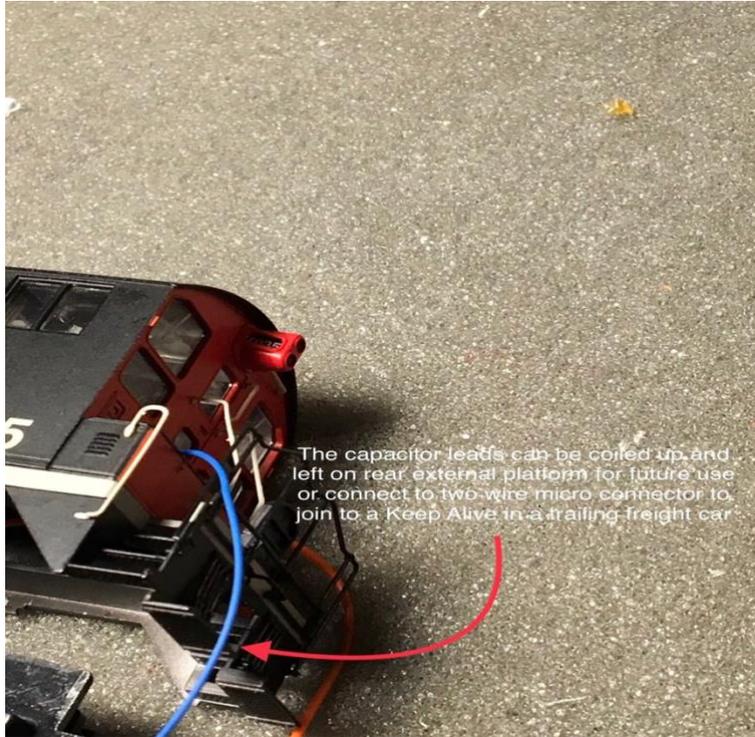
The photo below was provided by NCE to demonstrate where to make the positive and negative connections for a keep alive capacitor:



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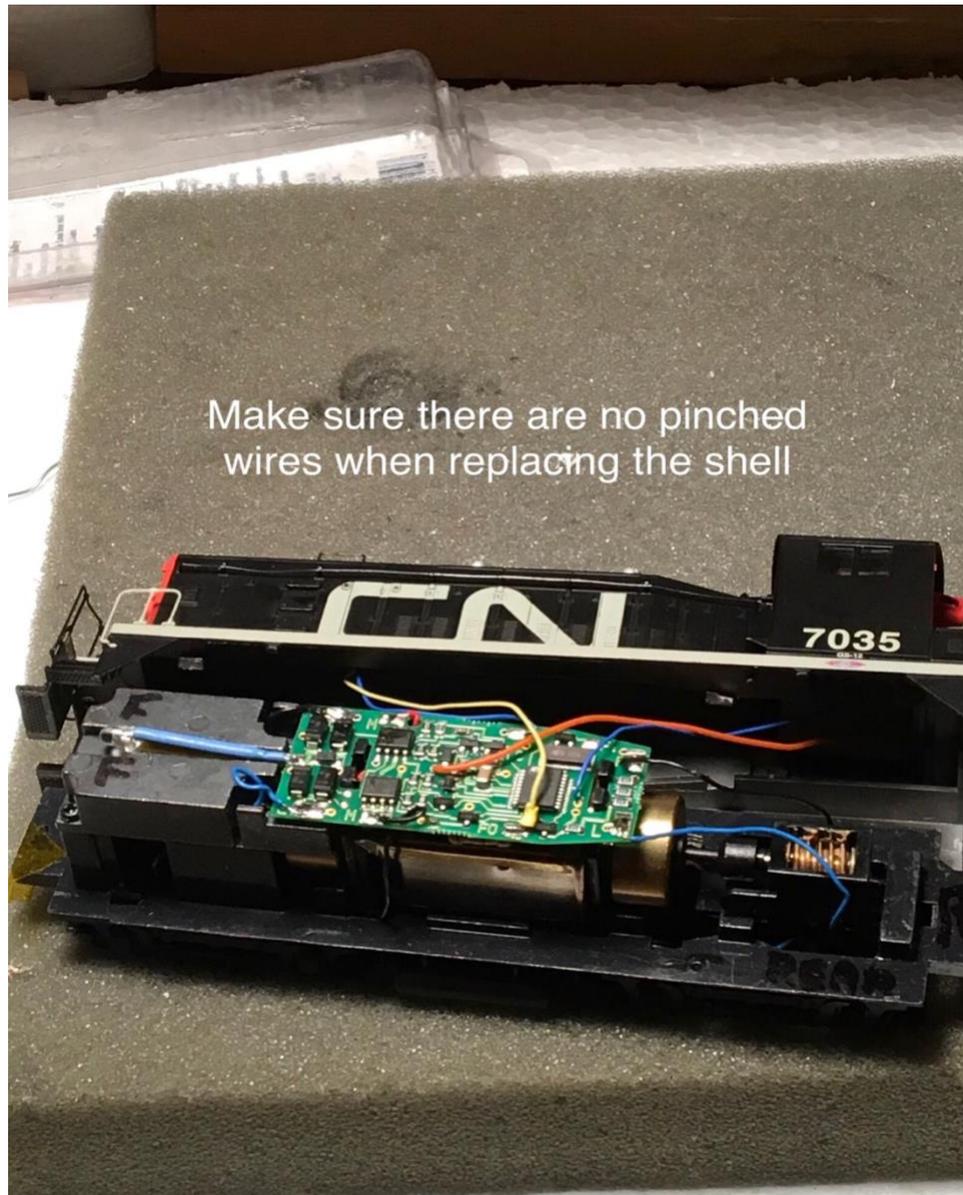
I drilled holes in the back wall of the cab to bring these leads out. They can be connected to a 2 Wire micro-connector to join to the keep alive capacitor in the freight car.

Should you not use the keep alive option immediately just coil the wires up and place them on the exterior rear platform of the Switcher.



The extra length of wire for the rear light is connected to the pre-existing wires in the top of the shell and the joins protected with heat shrink tubing and secured with Kapton tape

Now let's see if we get the shell back on?



I also repeated this project using a second SW1500 Switcher. The second time around only took 3 to 4 hours, .... easily completed in an evening!

Practise definitely makes things go faster!



**Now let's program some CVs!**

NCE's mobile decoders have great options for motor control, including Torque Compensation and Kick Rate. This in combination with LifeLike/Walters Proto2000 design makes for a very smooth running and satisfying fun to use switcher. The Yard crew has never been happier!

The following is information taken directly from the NCE decoder instructions.

Info from NCE P2K SR 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.

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**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. 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. If you set Vstart larger than 0 you'll 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 .

As an example, here are the settings I use on my SW1500 Switcher, CN7035 NCE SW9-SR Decoder.  
Install date: Feb 1 and Feb 2 2018.

The DCC Command Station I use is the NCE PH PRO 5 Amp and Pro Cab.

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

Date: Feb 2 2018

Setting CVs

Short address = 3

Long Address = 7035 (your road number)

CV 2 = changed to 15 on Feb 3 2018 (was 10)

128 speed steps

Manufacturer = 11

Dir Mode

Decoder version = 35

Active Address Long

Short Address = 3

Dir bit = norm

DC Mode No

Standard Speed Table

CV2 = 15 (Start voltage)  
CV 6 Mid voltage 128  
CV 5 Max Voltage 255. (192 is 3/4 max voltage)

Momentum 3/9 via NCE Momentum button.  
CV 3 Acceleration Rate = 24  
CV 4 Deceleration Rate = 12

**Torque control CVs:**

CV 116 ... 4. (Kick rate)  
CV 117 ... 25 (Kick strength)  
CV 95 ... 2 .. (Reverse trim)

These CVs of course may require different settings on another locomotive as each motor may have different characteristics. However these values worked well on my layout on both of my P2K SW1500 switchers.

Doug Dyer  
Victoria BC  
Date: Feb 7 2018



CN Spiritwood Subdivision