A FIRST TIME DECODER INSTALLATION: A SATISFYING AND EDUCATIONAL EXPERIENCE!

Article summary:

This article describes my first decoder installation having never attempted doing this before. The target locomotive was from my current fleet of older DC locomotives, using a SoundTraxx Economi PNP decoder, and finally installed into an Atlas/Kato C424 locomotive, and programming and running it with an MRC Tech 6 6.0 Sound Controller. I also replaced the light board with front and rear LEDs. MRC and SoundTraxx are two of my favourite companies. There were some issues making the experience challenging, very educational, and enjoyable!

Decoder install notes

It is important to match decoder size and type to an appropriate size locomotive.

You tube video URL: https://m.youtube.com/watch? v=g2PdDbWXHSw&autoplay=1 (Probably a newer model Kato SD 40-2 and that already had a decoder in it.)

Another good instructional video: http://youtu.be/bN2xIkYtzq0 Theses might be useful too: you tube channel tommie022481

Motor leads -- Bottom lead off motor (grey) is negative Top lead off motor (Orange) is positive + Glue speaker to chassis if you can and not the shell to stop reverberation. Seal the speaker enclosure in a baffle to enhance sound.

Note about LED's ? 3mm 12 – 22 volts Long leg = +
Short leg = - . Add 1K ohm 1/4 watt protective resistor to negative lead

Additional supplies:

Fine tip soldering iron, resin flux, heat shrink tubing,(3/64 and 3/32) AWG 30 wire colour coded 1K 1/4 watt resistors Extra hands Double sided tape foam tape Resin flux paste and resin core solder.

Choose the correct size speaker:

The inside cavity of the Kato SD 40–2 measures only 18 mm and the width of the SoundTraxx oval speaker I had, #810115, measures 20 mm, by 35 mm x 6 mm. 1 W, 8 ohms, frequency response is 500–12 kHz. If I install the decoder into this Kato engine I will need to get a smaller oval speaker. The locomotive uses micro surface mount LEDs one at the rear and one arising from the centre of the light board directed forwards.

The Kato lightboard measures 1.5 cm wide and the SoundTraxx Econami PNP measures approximately 1.6 cm wide.

Suggest using the SoundTraxx 810113 oval speaker. 35mm x 16mm Oval Speaker 810113 $14.50
This small oval speaker is ideal for narrow hood diesels.
Dimensions: 35mm x 16mm x 8mm(D)
Frequency Response: 250Hz - 13kHz

Peak Power: 2 Watts
Impedance: 8 Ohms
Order from SoundTraxx:

I chose to use the SoundTraxx Econami PNP decoder and set out to find a locomotive in my fleet with enough space. It is of course an easier task to choose the locomotive first and then find a decoder to fit! (Provided it has the sounds and features you want.)

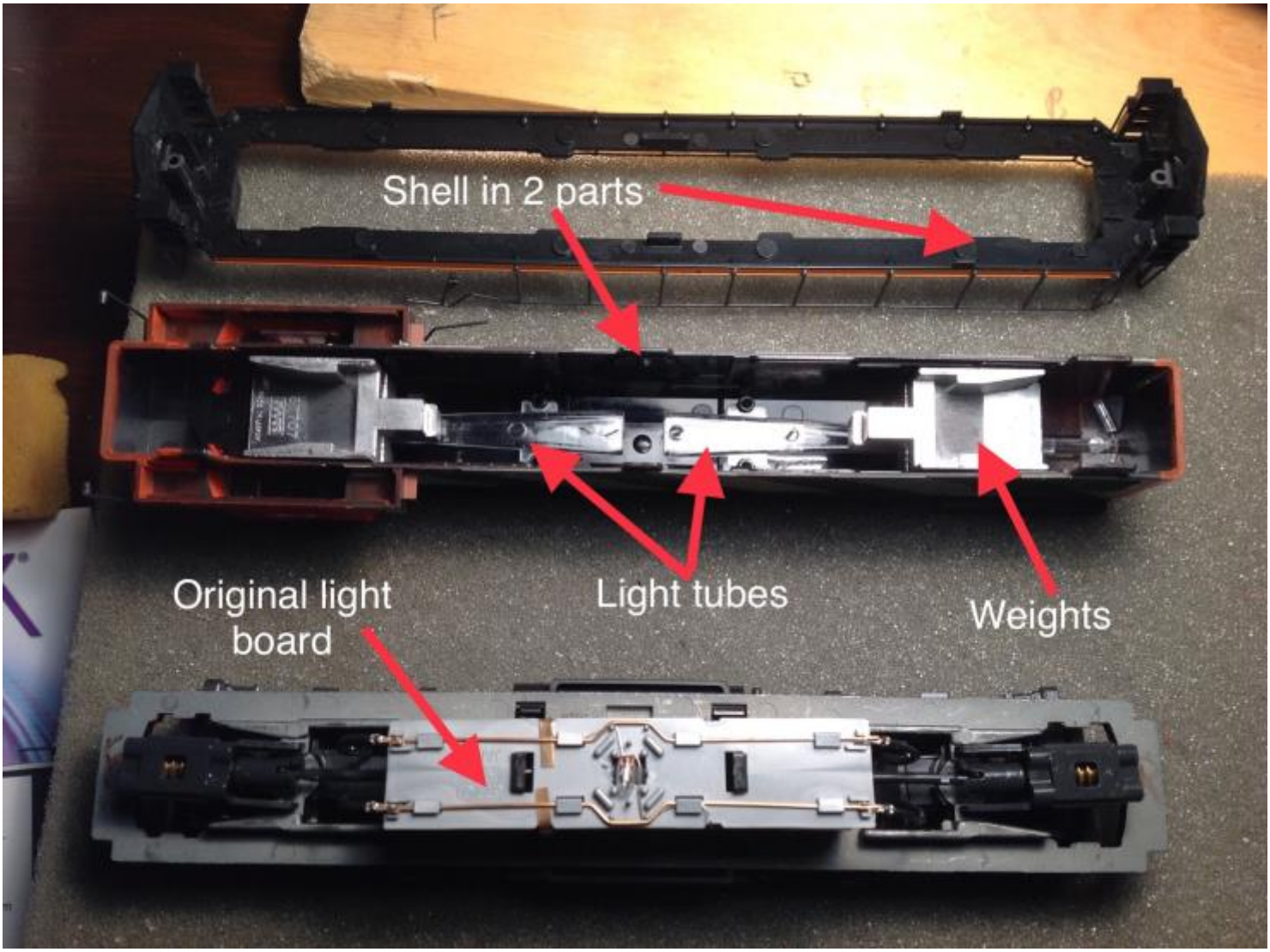
The Kato SD40-2 locomotive appeared to be a dubious proposition for putting the ECO PNP decoder in because the vertical copper pick up leads for the right and left rail pick ups would be at risk if the contact points were soldered. This model also has an eight pin plug included (surprise what you find when you look under the hood) and therefore a better choice for this particular locomotive would be the ECO200 sound decoder with the wire harness replaced by the eight pin to nine pin adaptor plug.
The Kato HO SD40-2 Original model (Older version)

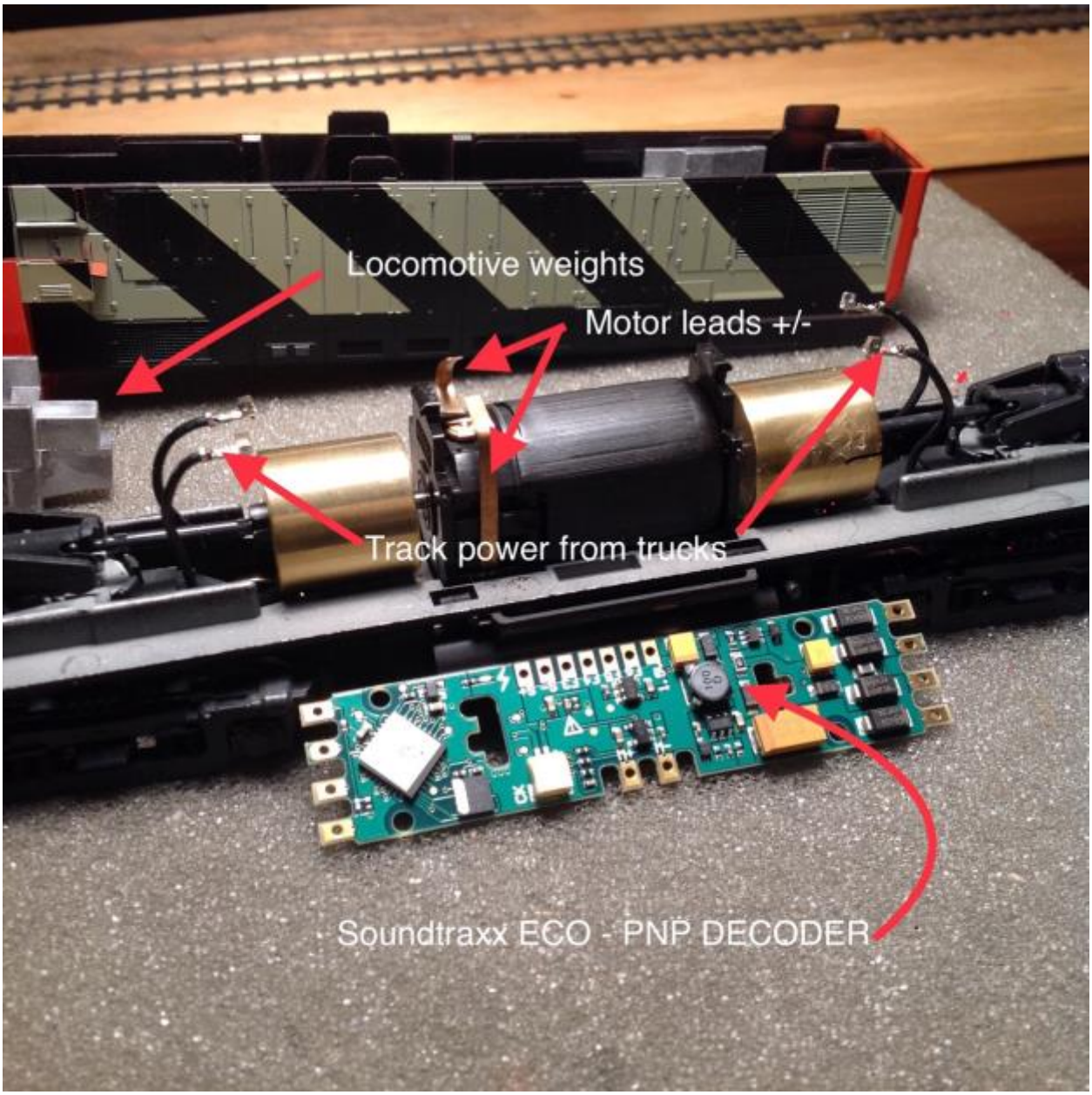
I considered using my LifeLike GP 9 locomotives but the ECO PNP was too long to fit in the recessed slot and therefore an ECO200 or DH160Lo might also be appropriate? Note that when removing the coupler gearboxes on these Locos the gearboxes have to be pulled medially from within the locomotive rather than out externally.

My next locomotive for consideration is the Atlas/Kato C424 CN number 3205.

The completed project

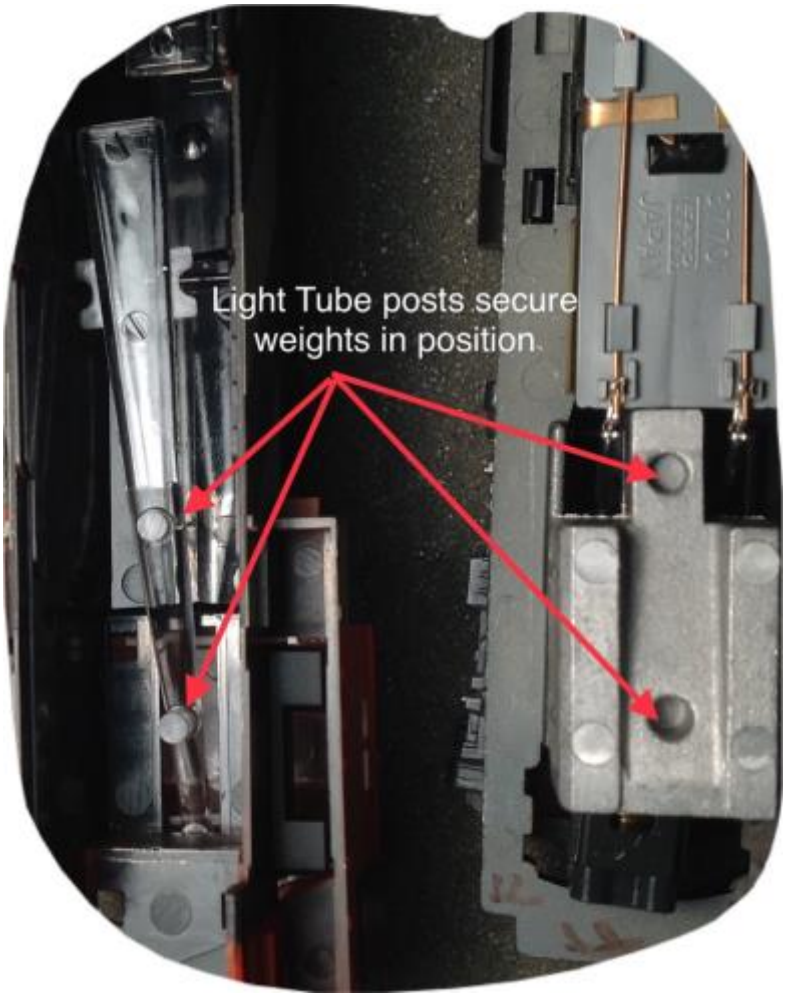
Notice original light board and copper motor leads in the C424





After original light board removed: (to be replaced with the SoundTraxx Econami PNP board.)

The cab slides back on to the main body aligning the bottom edges of the cab with the small elevated ridges on the side of the body. Removing the cabin house allows taking out and cutting the light pipe at the end of the support for the weight so that the LED will fit into the space.
Note the light pipes (see photos below) which also support and anchor the weights in the long hood. These will require modification to properly place the LED headlight and rear light.

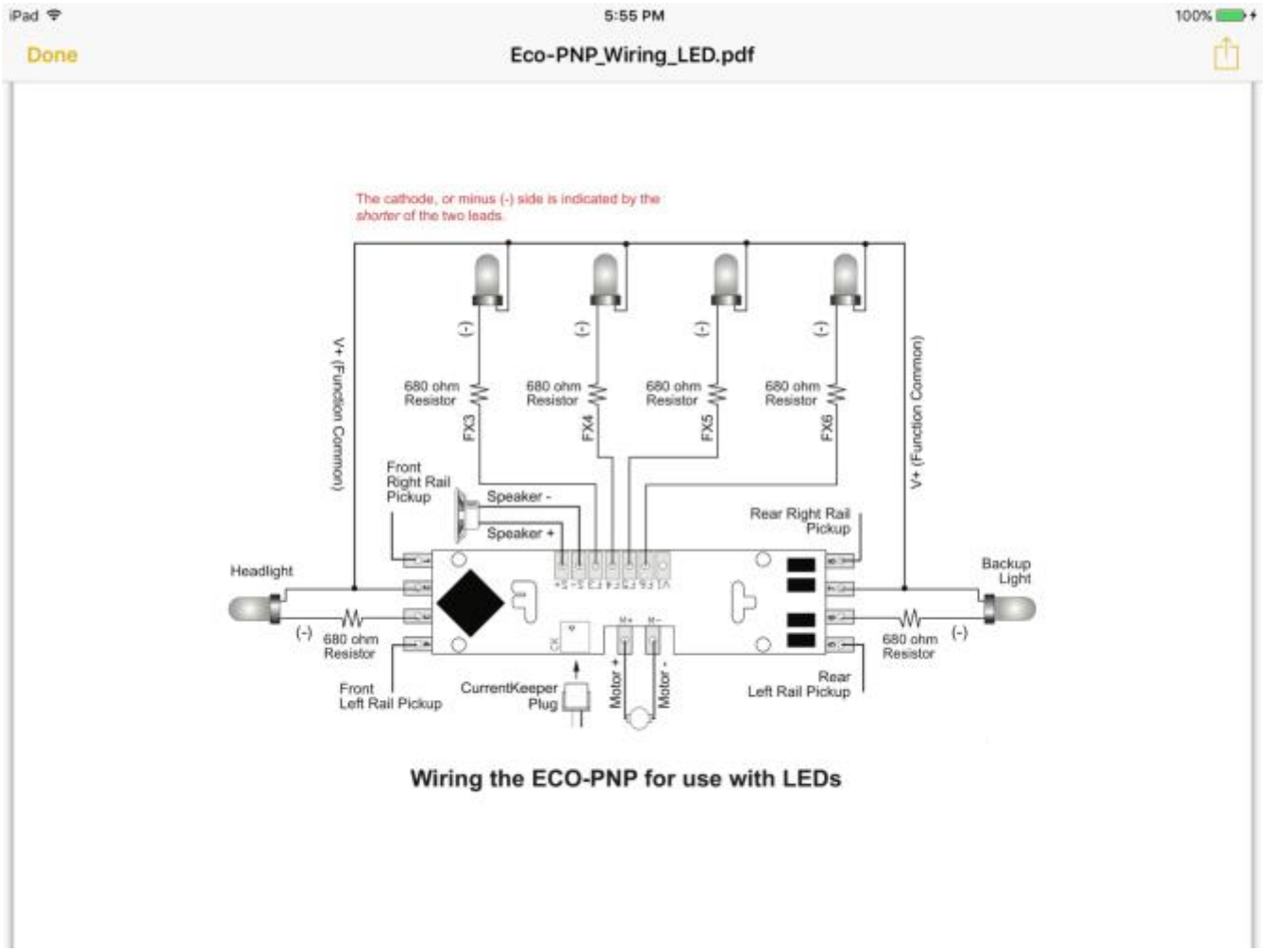


The light Tube posts anchor the weights in place and therefore the light tubes need to be retained.

Colour codes for DCC wiring

To wire up your own harness, here are the NMRA colours that should be connected to the appropriate pins. Be careful of the pin orientation! (See diagram previous page)

The Wiring Schematic for ECO-PNP DECODER Courtesy of Soundtraxx



After placing SoundTraxx Economi PNP board on the native mounts..The light pipes require modification to allow placing of the LED headlight and rear light.

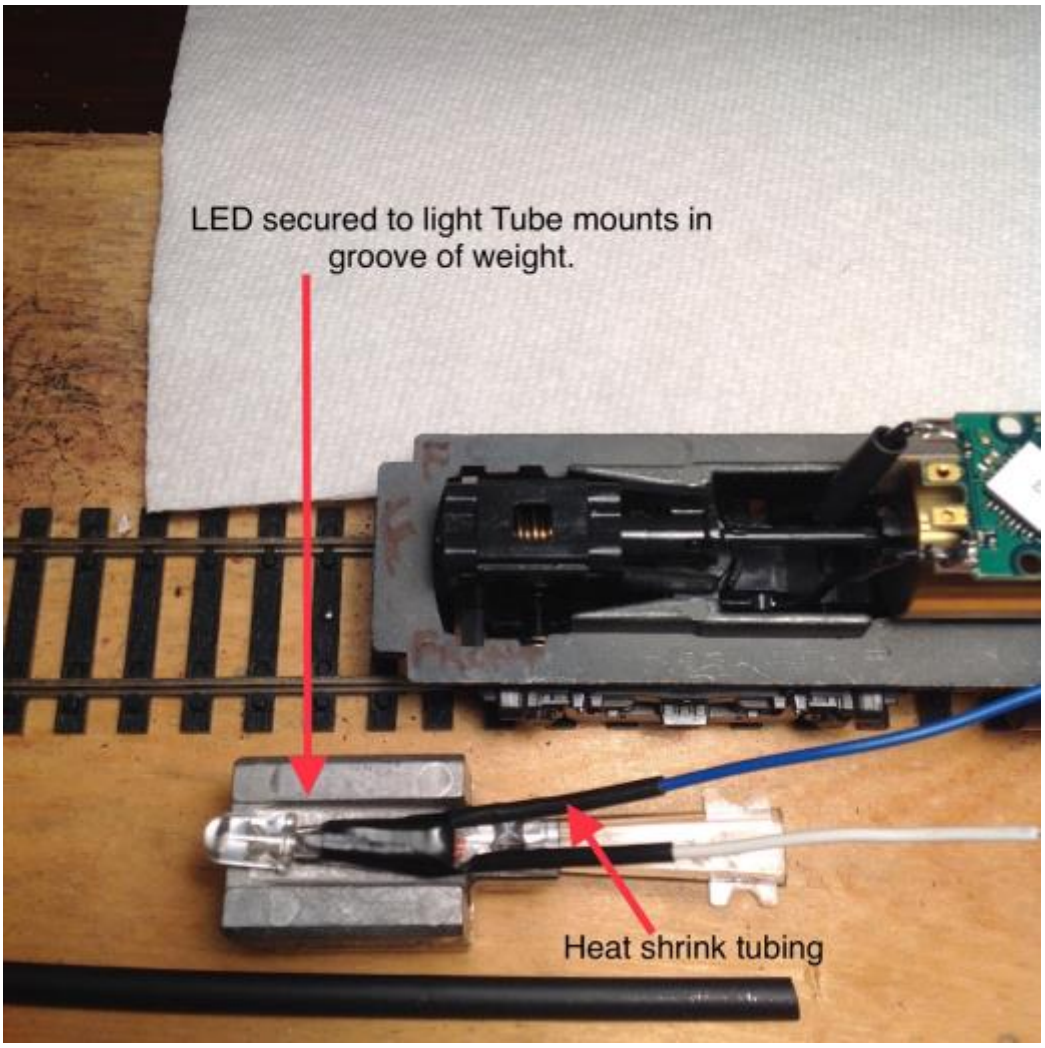
Cut out a section of the front LED light pipe just beyond the anchor 'post' that secures the light pipe to the weight, so the LED will fit between the end of the light pipe and the wide 'V' shaped light diffuser at the front of the cab for the headlight and number board signs. Attach the LED to the end of the revised light pipe by sawing grooves in the side of the light pipe to accommodate the LED leads, and after soldering the 1K ohm 1/4 watt protective resistors to the negative LED lead, the LED can then be

Cut medial ends of the light bar at approximately the red line shown in photo

secured to the light pipe with electrical tape. Use Kapton tape if you have it. The following photos show some of the steps taken to accomplish this.

The medial ends of the light pipes need to be cut sparing the side tabs which anchor the pipe to the loco casing, to allow support for but not to interfere with the speaker (SoundTraxx Mini Oval 16 mm wide 2watt 8 ohm) which is installed facing down under the roof of the middle of the long hood. Note the Headlight LED mounted on the end of the pipe after making grooves in the sides of the pipe for the LED leads. The rear LED is mounted in a similar fashion.

The front LED light bar assembly

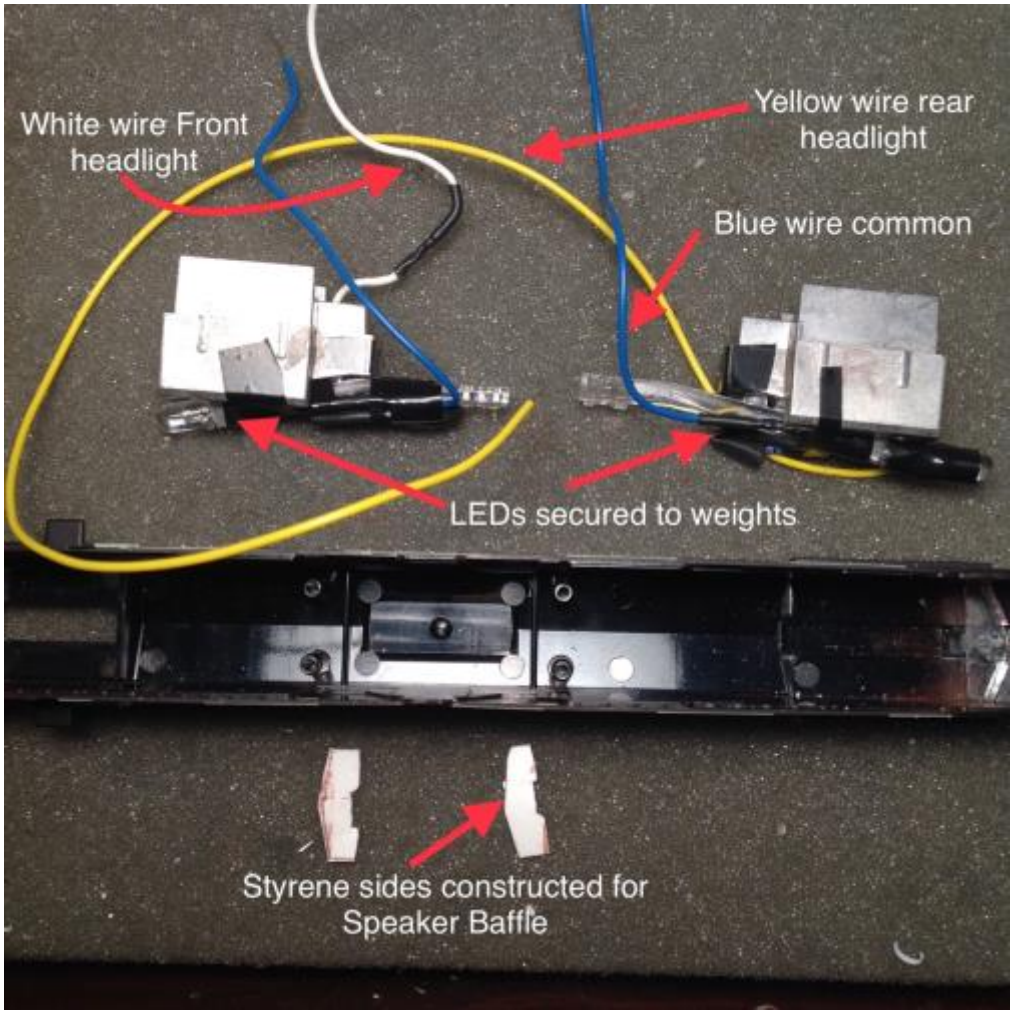


The front LED light pipe and weight assembly with protective resistor on negative LED lead

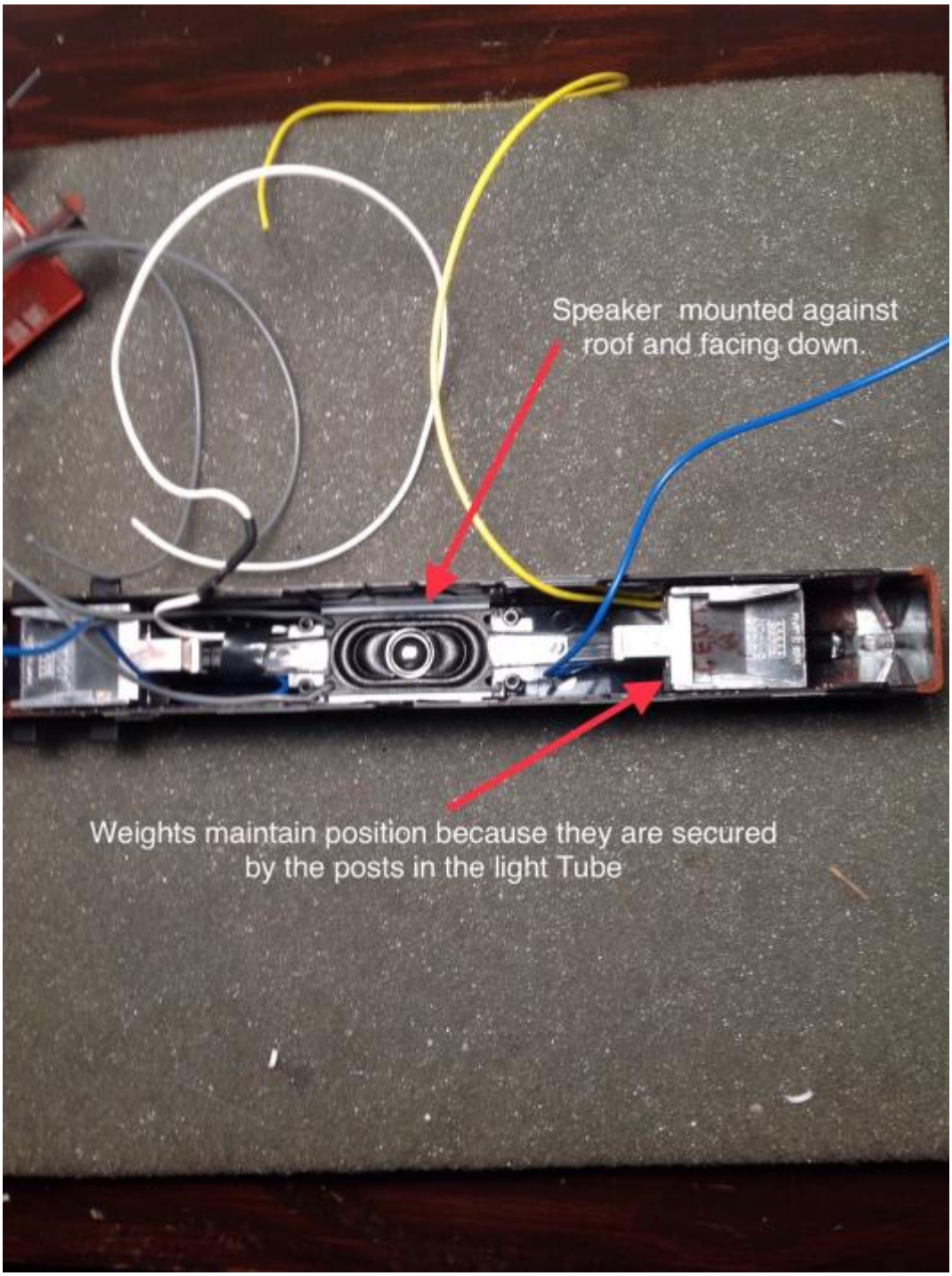
Note white wire connects to white front headlight lead of decoder and Blue wire to common blue lead.

Attach 1K ohm 1/4 watt resistors and use heat shrink tubing to cover solder joints and tape LED leads into grooves sawed into sides of the plastic light pipe assembly. Alternatively you could glue the light pipe unit with LED and resistor into the top of the shell leaving long enough wire leads to reach the decoder solder pads for the appropriate light connections, allowing the shell enough leeway re wires to be removed and set aside the chassis for future repairs. Anchoring the light pipe in the correct position will insure the weights will be secure inside the shell when reassembled. Prior to gluing the light pipes the speaker enclosure and speaker need to be added. I personally found it best to build the light pipe LED assemblies and 'mount' them in their proper positions on the motor chassis assembly prior to replacing the shell. See the photos below showing various steps in this process.

Below are the weight and LED assemblies for the front (white wire) and rear (yellow wire) lights assembled including 1K 1/4 watt resistor on cathode ' - ' side with leads protected in heat shrink tubing. Avoid covering the resistor with the shrink wrap if you can to prevent overheating. (Probably not an issue with this circuit and 1/4 watt resistor?) Note the front and rear baffle wall pieces for creating the styrene baffle for the speaker enclosure. Use cyanoacrylate to glue baffle pieces to hood shell roof.



Weight and LED assemblies for the front (white wire) and rear (yellow wire) lights



The speaker is in place secured by the ends of the revised light bars.

The weight and lightpipe assemblies placed on chassis prior to replacing shell.

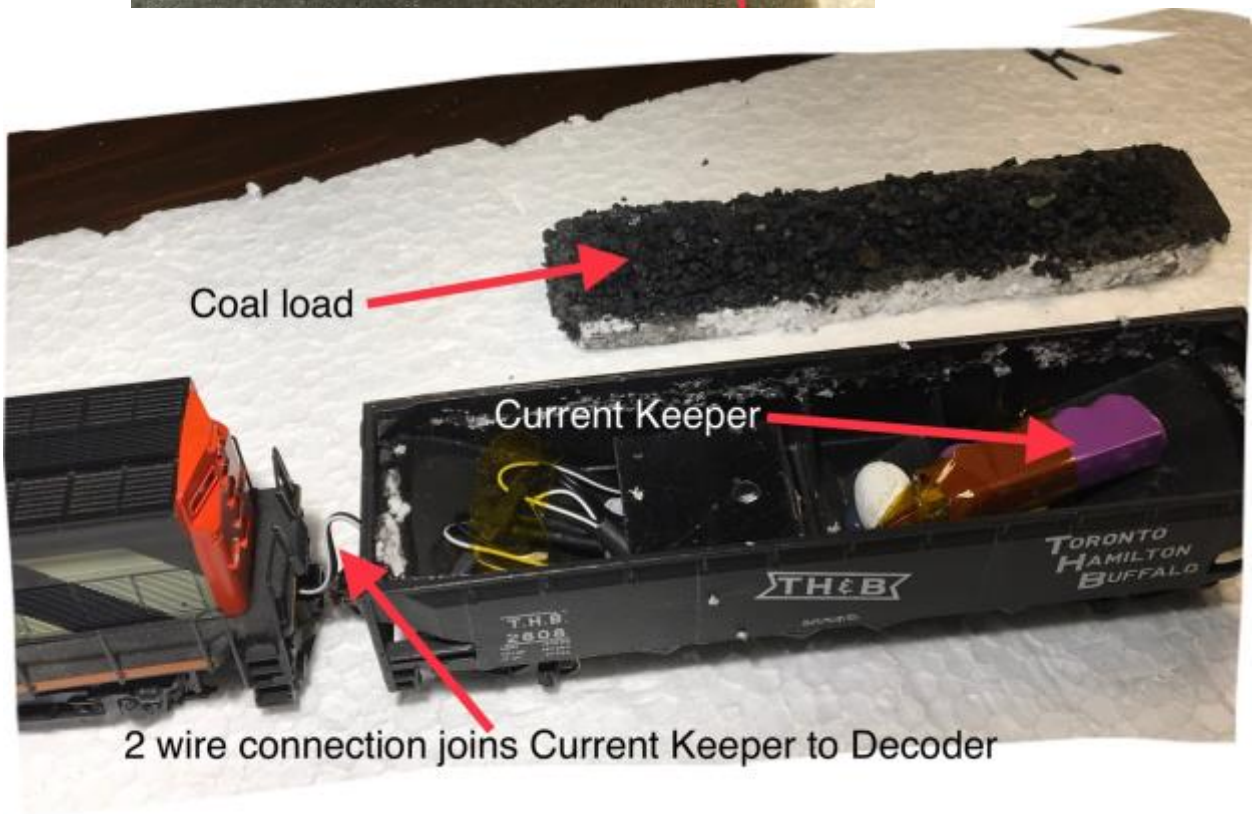
Speaker installed (photo above) with its wires (grey in this case but SoundTraxx uses purple wires to identify its speakers on pre wired decoders) and secured by the medial ends of the light bars. Notice the styrene pieces placed between the speaker and wall of the hood shell on right and left sides to complete the speaker baffle enclosure. Use silicone caulking to fill any gaps to ensure sound proofing of the baffle.

Notice the grey speaker wires coming out through the holes in the speaker enclosure.

I actually found it easier to put the weight and LED assemblies on the locomotive chassis prior to replacing the shell. (This allowed shortening up some of the wires as space was really tight). Just make sure the front LED fits into the cab prior to closing. Space seemed to be so tight that only one side of the shell close tabs engaged but this did not seem to matter. It might be possible to gain more space by completely removing the plastic lightpipe bars (which also hold the weights in position) but I thought this would lessen the stability of the weights in the enclosure during everyday use. I could not make enough room for a 'Current Keeper'. One possibility would be to put the current keeper in a separate freight car behind the loco. However, on my railroad I did not find the current keeper to be necessary.

Adding a Keep Alive (Soundtraxx Current Keeper)

There is no room in the shell to place a Current Keeper. My solution to this problem was to put a Current Keeper in a gondola car, and have this freight car tethered to the locomotive using a 2 pin wire connector. The obvious disadvantage of course is always having to have the same freight car following this locomotive, but the benefit gain of not having any power disruptions to the decoder outweighs any visual consequence. The photo below shows my locomotive accompanied by its permanent friend.



Adding a Current Keeper

Programming decoder using MRC Tech6 6.0 Sound Controller

A Tech 6 sound controller only programs in OPS mode, up to six primary (short) addresses from 1 to 6 and cannot be used for long addressing. Soundtaxx decoders need to be in long addressing mode in order to change short addresses in OPS mode on the main track, and therefore a Tech 6 Sound Controller will not change the primary address default of 3 on the SoundTraxx decoder to other addresses from 1 to 6. Therefore to program the address of the decoder you have to use a proper DCC system on a programming track and then after the primary address is changed from 3 to another address from 1 to , these decoders will run fine and can program other CV's using the Tech 6 Sound Controller. Apparently according to MRC the Tech 6 will change primary addresses of other brands of decoders using the mains ops mode? Out of interest some of the theory behind setting bits on CVs in this situation follows:

Programming CV's Setting CV 1 to a value from 1 to 127 will determine the primary address.

Default Value: 3 The decoder processes all valid instruction packets addressed with the value contained in CV 1 when bit 5 of CV 29 (Configuration Data 1) is set to 0.

Setting CV 1 to a new value will automatically set CV 19 (Consist Address) to 0 and set bit 5 of CV 29 to 0.

Bit 5 of CV 29 must be set to 1 in order for the value of CV 1 to be changed in Operations Mode. Setting bit 5 of CV 29 back to 0 will then allow the decoder to recognize the new primary (short) address.

Related CVs: CV 17-18 (Extended Address) CV 19 (Consist Address) CV 29 (Configuration Data 1)

CV 29:

Bit 7 and 6 are reserved not set (0) weighted values of 128 and 64.

Bit 5 determines what type of addressing is active in the decoder. If bit 5 is set (weight value = 32) the extended (long) address is used. If not set (= 0) short addressing is enabled. Setting CV 1 to a new value will automatically set CV 19 (Consist Address) to 0 and set bit 5 of CV 29 to 0.

Bit 4 enables a speed table. (Weight value = 16) Bit 3 enables bi-directional communication. This bit should be cleared if system does not support bi-directional communication. Bit 2 sets power source conversion. Set to 1 (weight = 4) to let decoder respond to DC. Automatic conversion can be risky if decoder sees power prior to a DCC packet being sent and thus thinking its on a DC system and will take off! Therefore best left unset.

Bit 1 is a holdover from old days when decoders used 14 speed steps. If DCC system is using 28 or 128 speed steps set this bit to 1 (weight = 2) Bit 0 controls locomotive direction. If set (weight = I) polarity of orange and grey motor wire leads is reversed. Should be set to zero unless desiring to reverse an engine default direction such as using long hood forward in a locomotive consist.

Therefore put a value of 50 into CV 29 to enable long address or a value of 18 to enable short address.

NMRA standards do not allow changing the current active address type. (Using Main Ops mode..not sure if on a programming track?) If using Short address 3 you cannot change the short address for example from 3 to 1, only the long address can be changed. If you currently are running on a Short address, you can't change the Short address only the Long. If the Long address is active (bit 5 of CV 29 set to 1) then only the Short address can be changed but the Tech 6 sound controller does not allow work with Long addressing and therefore is unable to change the Short address in CV 1, because after setting bit 5 of CV 29 to 1 enabling long addressing the Tech 6 no longer knows what locomotive it's talking to given that it does not recognize long addressing and thus cannot change CV 1 to 1. Also in this situation, Tech 6 will not allow you to talk to the locomotive even to change whistle bells and lights. Fortunately address 3 can be restored, returning control of the decoder by using shift 9,9 on the Tech 6 to reset the decoder to address 3. The only way to change the original default address on the SoundTraxx locomotive decoder is to do it with a true DCC system on a programming track and then following this Tech 6 will work as advertised. (Set CV 29 to 18 and set CV 1 to 1 or whatever primary address is required).

A review in Railroad Model Craftsman has this to say about the Tech 6 2.0:
“As on the Blackbox, the Tech 6 Sound Controller 2.0 operating in the “Dual” mode depends on the locomotive motor / sound decoder’s address being set to address 03. This is the address set at the factory, so is not a problem for basic operation. If a locomotive has been programmed to a different address, the Sound Controller can reset it to address 03 by simply pressing pushbuttons Shift, 9, 9. However, doing this resets ALL of the decoder CVs to their factory values. DCC operators who have programmed different bells and whistles or motor curves will want to reset the address using their DCC system to avoid losing these other CV values.

Another new feature of the Sound Controller is the capability to program any CV on the locomotive decoder. When in the “Dual” operating mode, this programming feature is activated just the same way that the voltage and momentum settings were made in the “Standard” mode. Instead of just selecting functions 2, 3, 4, or 5, the operator selects the desired CV listed in the data for the locomotive decoder, and instead of using just a 32 step range of values, uses a 32 or 256 or other range as appropriate for the decoder being programmed.”

Programming CVs with any DCC system is an easy task, made even easier if you also have Decoder Pro software available. Get information from the Soundtraxx User Guides and Technical Reference Manuals.

Converting older (or new) DC locomotives to DCC by adding sound decoders is a fascinating new dimension of our hobby, adding even more challenges, interest and enjoyment!

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