

P2K Walthers SW1500 Switcher and TSU-1100 decoder installation



The Proto2000 SW1200/1500 switcher sold by Walthers and LifeLike before it, is an ideal candidate for installation of a SoundTraxx Tsunami2 TSU-1100 sound decoder. The motor and gear drive in these switchers are exceptionally smooth running, particularly at low speeds. In combination with the SoundTraxx Tsunami2 decoder with its hyper-drive motor control, and realistic sound effects and lighting functions, this model provides a very accurate representation of the prototype. Installing a sound decoder into the confined space of a EMD SW1500 switcher's shell is a real challenge, but the return is worth all the effort. To date, this particular installation for me, has been the most taxing, but also the most rewarding decoder install I have done. The Tsunami2 TSU-1100 decoder is chosen for this

project because of its small size, and because it comes with an optional capacitor that has barely enough keep-alive capability (only 250 uFD capacitance), but enough to get the job done! The bigger payoff is its small size allows it to fit into a very tight space! The 4 function outputs of the TSU-1100 allowed me to have front and rear headlights, a cabin light for the control panel, and still have the capability of a fourth LED circuit to run a rotary beacon or Ditchlights.

The Parts List:

SoundTraxx Tsunami2 TSU-1100 Sound decoder
(With included capacitor)

If purchased separately...[Tsunami 220µF Replacement Capacitor](#)

810128 \$0.95

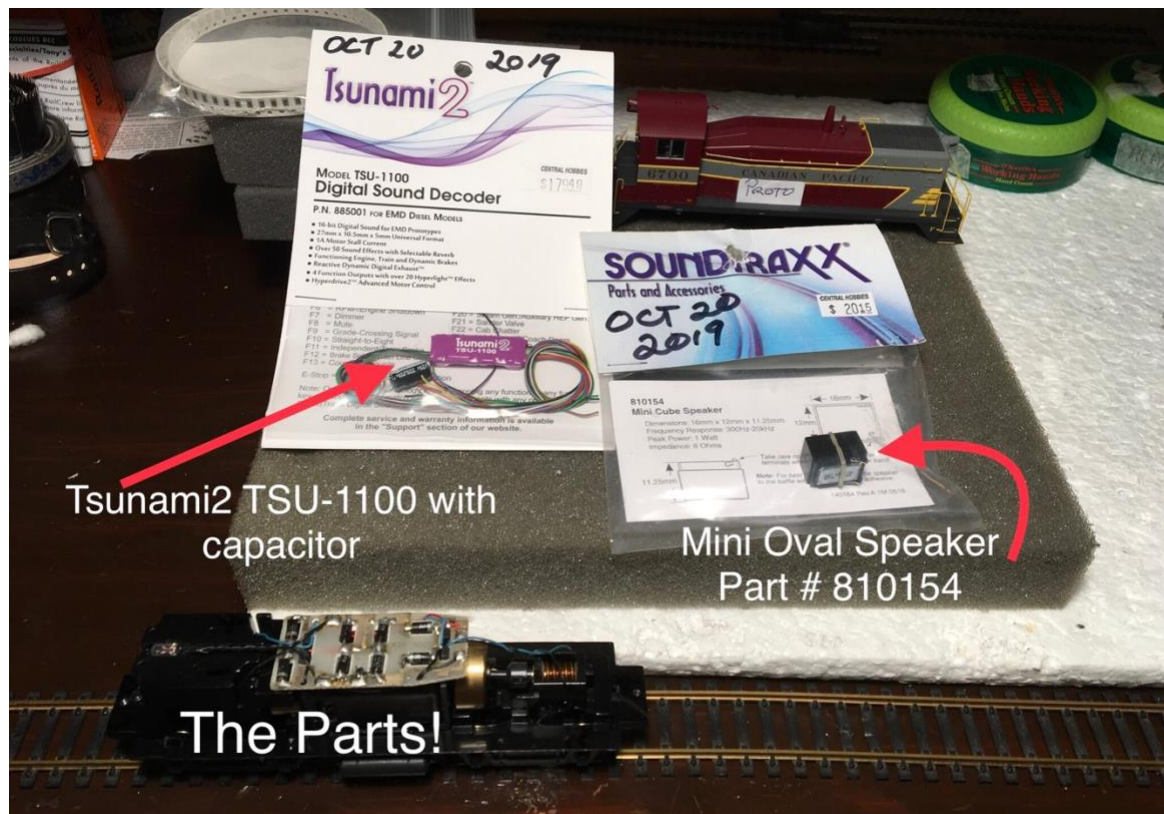
This 220µF capacitor helps keep power to the decoder during momentary power losses. For use with decoders that use an external capacitor assembly, such as the TSU-1100 or ECO-100.

Note that there is a good article in the June 2019 issue of MRH online magazine on [making your own Keep-Alives](#).

Speaker: SoundTraxx Mini Cube Speaker –
Mini Cube Oval Speaker/Baffle

810154 \$14.95

[Mini Cube Speaker](#)



Tsunami2 TSU-1100 with capacitor

Mini Oval Speaker
Part # 810154

The Parts!

Note: Since the time I did this installation, SoundTraxx has released a smaller sized version of its Current Keeper which might fit into this shell?

This tiny speaker comes with a properly proportioned speaker enclosure and provides great results for space-constrained models!

Dimensions: 16 x 12 x 11.3mm(D)

Frequency Response: 300Hz - 20kHz

Peak Power: 1 Watt

Impedance: 8 Ohms

Note that this is a different speaker than their Mini Cube2 speaker.

SoundTraxx recommends this speaker (Mini Cube) be used as two speakers connected in series, (16 ohms impedance) if using with a Tsunami2 – 2200 Decoder, but makes no mention of two speakers in series when recommending this speaker for use with the Tsunami2 – 1100. ([See their comments on their web site](#)). I assume the difference is that the TSU-2200 decoder has 2 watts of audio output versus 1 watt for the TSU- 1100 Decoder. I found the single Mini Cube speaker used with the TSU- 1100 decoder worked very well with ample volume and great sound.

2 - 5mm 3.5 volt sunny white LEDs

1 - 5mm 3.5 volt red LED (if adding a rotary beacon)

1 - 3 mm amber LED

3 – 1.5K ohm 1/4 watt resistors

(1.8K ohm SMD Surface Mount resistors save space if you have access to these SMD resistors)

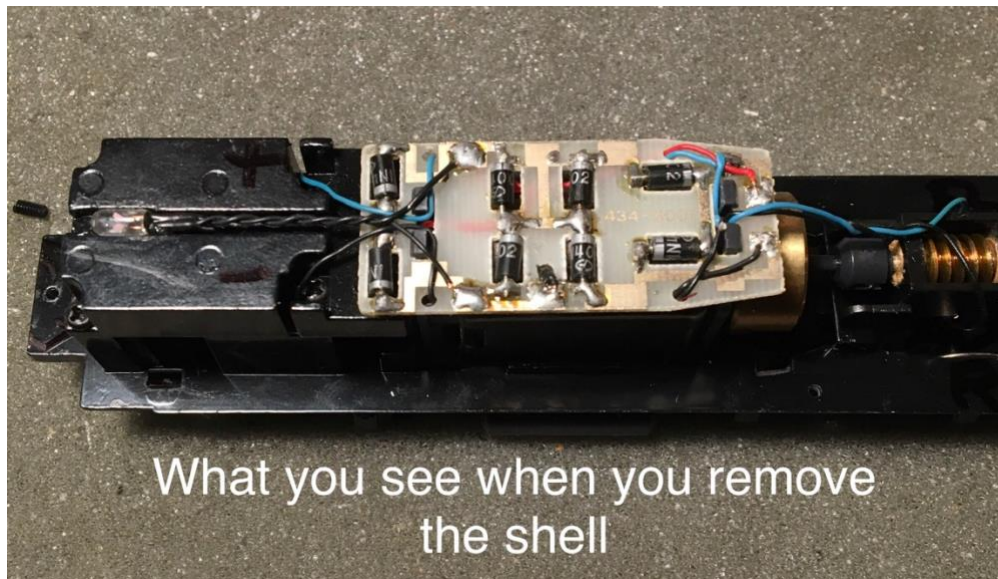
Kapton tape

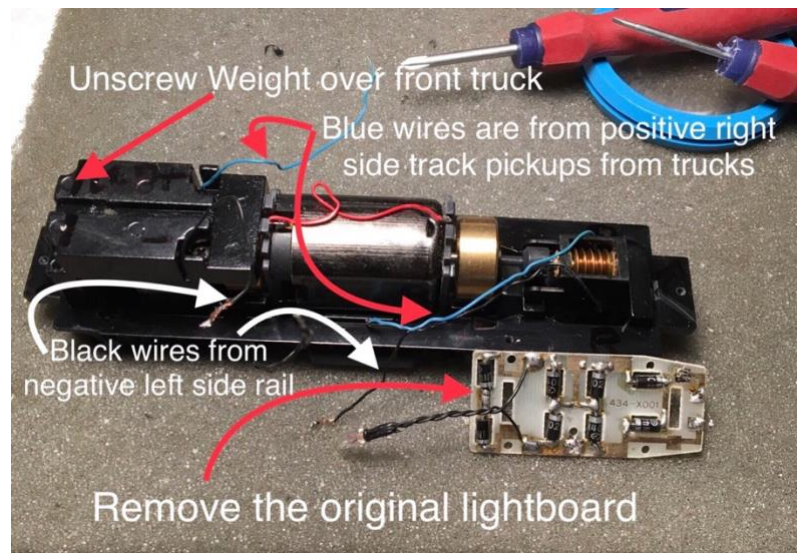
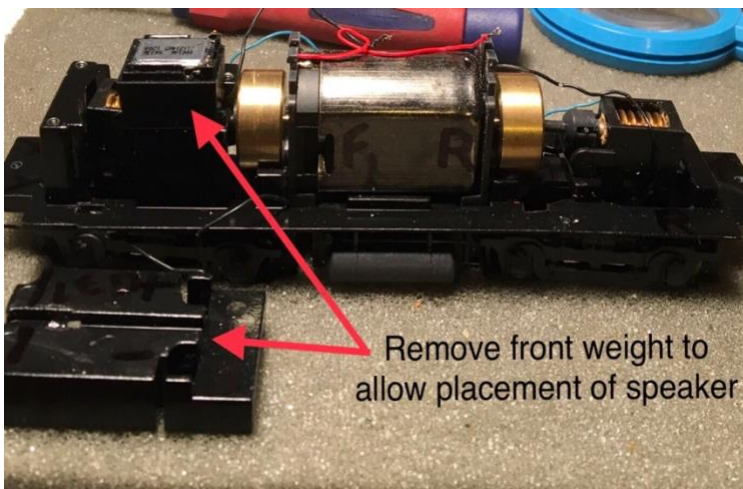
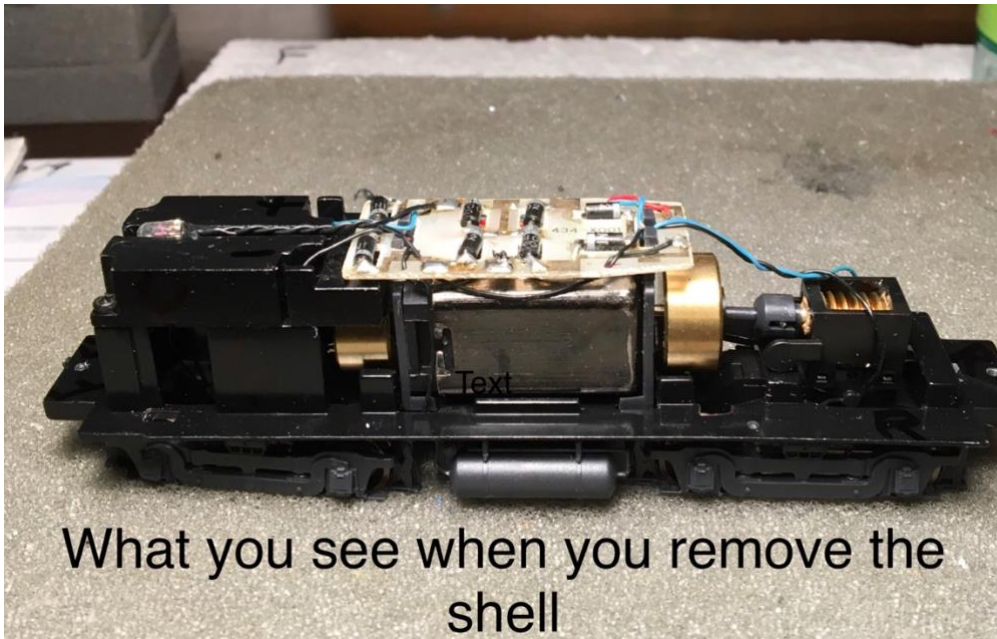
30 AWG coloured wire

Heat shrink tubing

To remove the shell, first remove the front and rear couplers and gear boxes. Press on the 4 side tabs and one at the rear to carefully jostle the shell up and away from the frame.

What you see when you remove the shell:

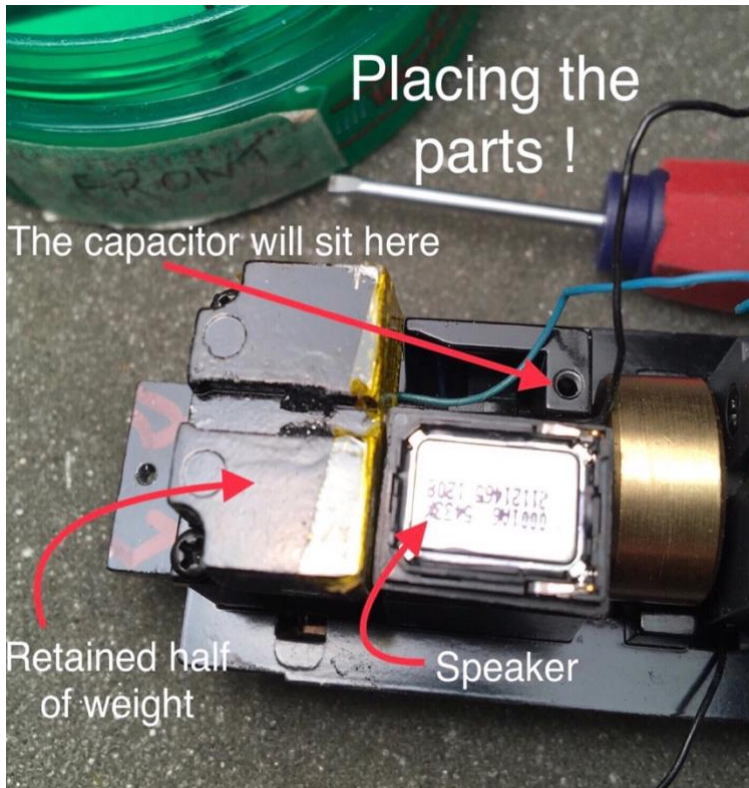




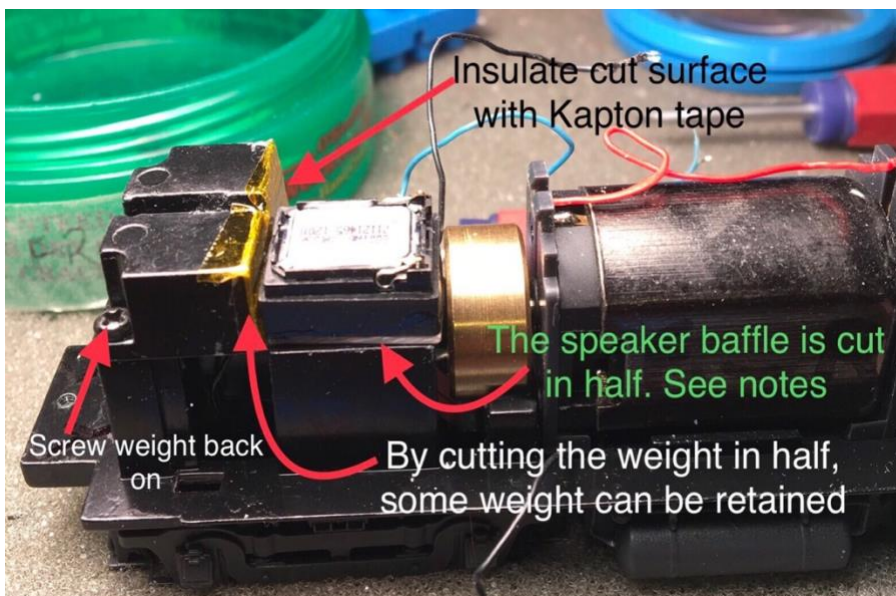
The original light board is also removed and discarded. Now is a good time to assess where best to place the parts?

There were several versions of this switcher manufactured over the years since LifeLike's first release. If you are lucky you will have one of the later versions which has a removable weight at the front of the chassis. Remove this weight and saw in half with a hack saw to make room for the speaker and capacitor.

In the interests of accommodating parts in limited space, the speaker baffle (which comes with the SoundTraxx mini cube speaker) needs to be cut in half (depth-wise).. The sawed ends of the weight are covered with Kapton tape to insulate from inadvertent contact with wire connections, in aid of preventing shorts.



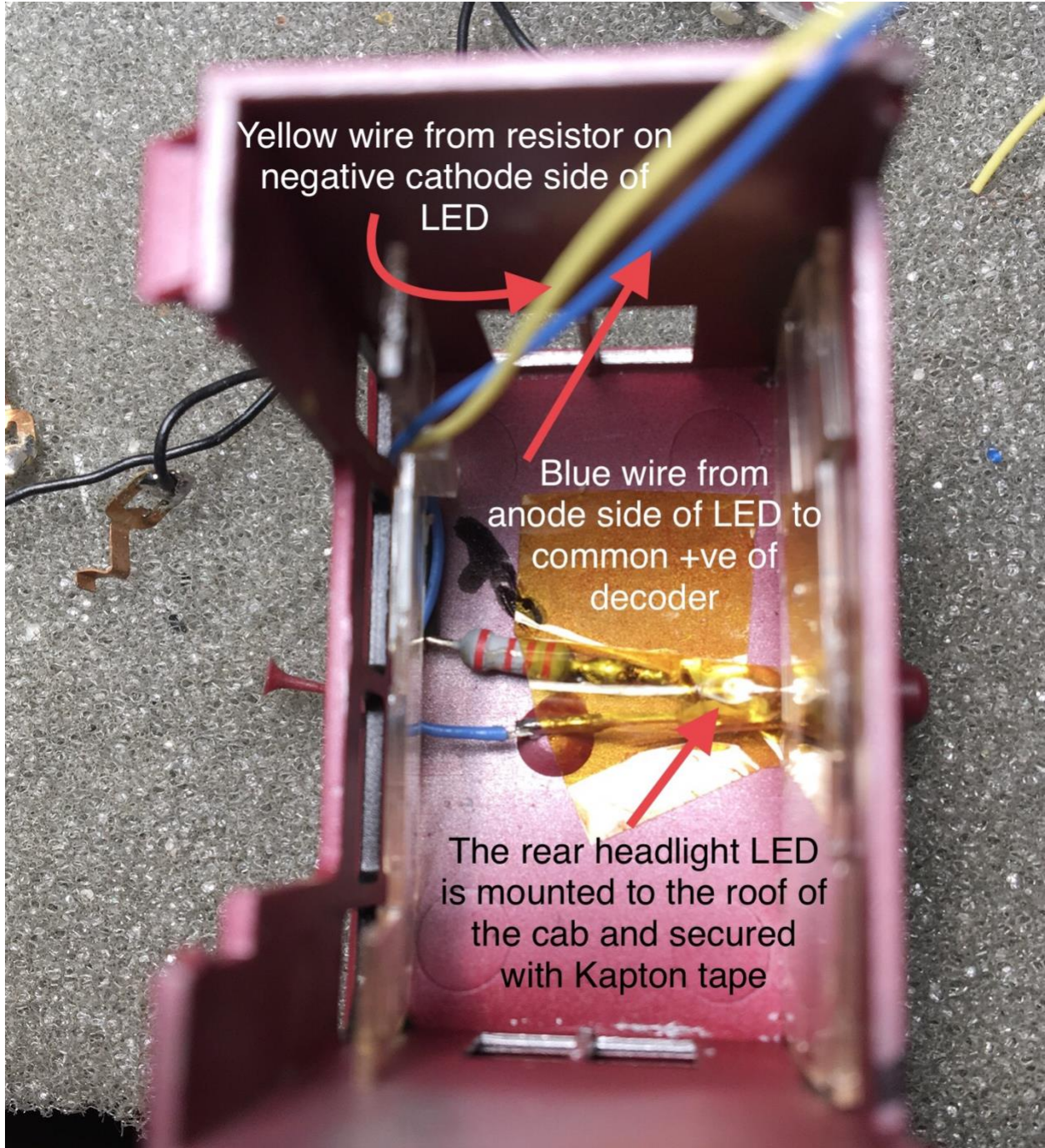
There are several options for parts placement, including putting a Current Keeper 2 (a smaller version of SoundTraxx's original Current Keeper), in the roof of the cab. If you are willing to sacrifice the cabin and engineer, a lot of space can be gained in the cab by the removal of these items. I found placing the speaker and the provided small capacitor up front over the front truck to be the most satisfactory arrangement. The decoder itself fits nicely on top of the can motor.



I next prepared the cab for installation of the rear LED headlight, and an LED placed in the cab to light up the instrument panel. Removal of the cab from the main shell requires patience so as not to damage the delicate hand-rails etc.



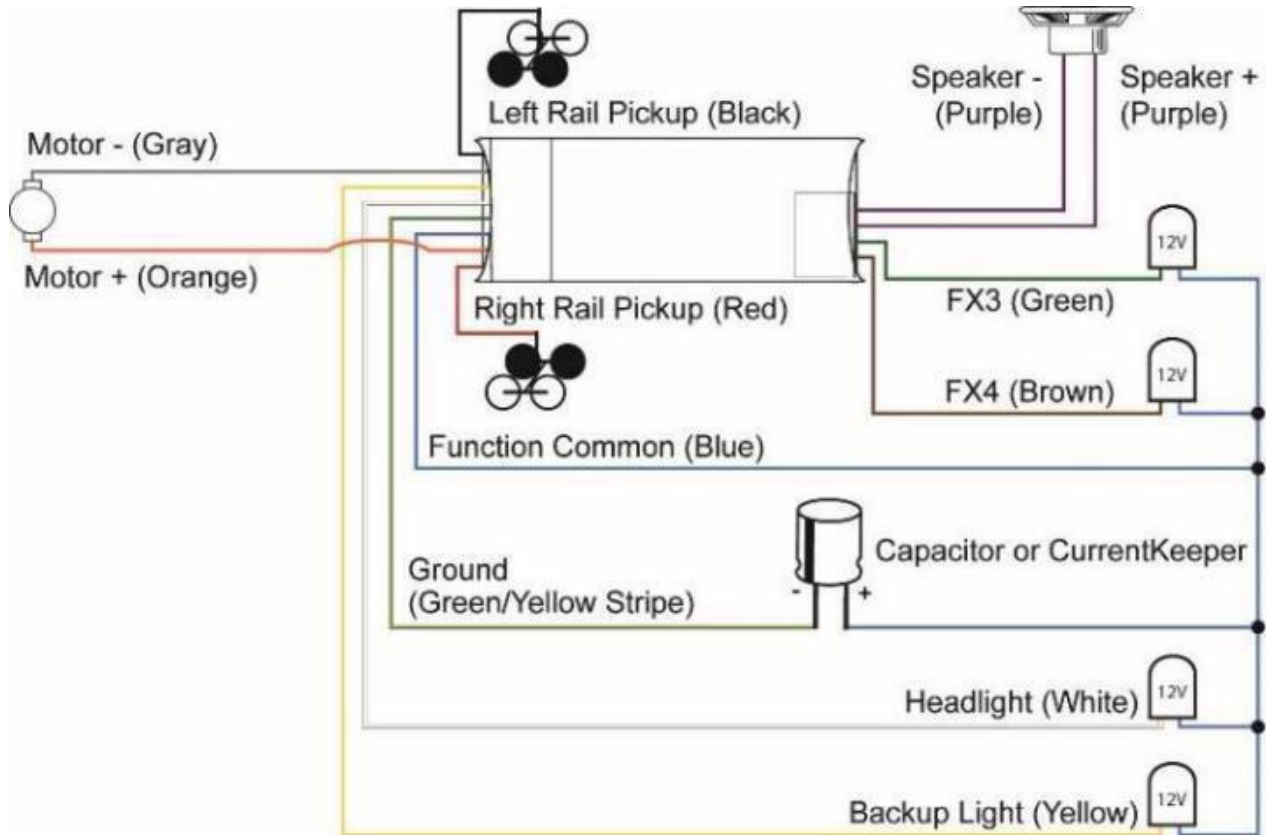
The clear plastic window structure has to be removed. Remember the order in which you remove these parts to make replacing them easier! If you wish to install a rotary beacon in the center of the cab roof see the links below to one of my previous articles describing how I did this.



Each LED requires a current limiting resistor on the cathode negative lead of the LED. I normally use 1.5K ohm ½ watt resistors in most installations I have done. There is never any worry about heat dissipation with a ½ watt resistor, but the downside is size versus space! I used a ¼ watt resistor in the roof of the

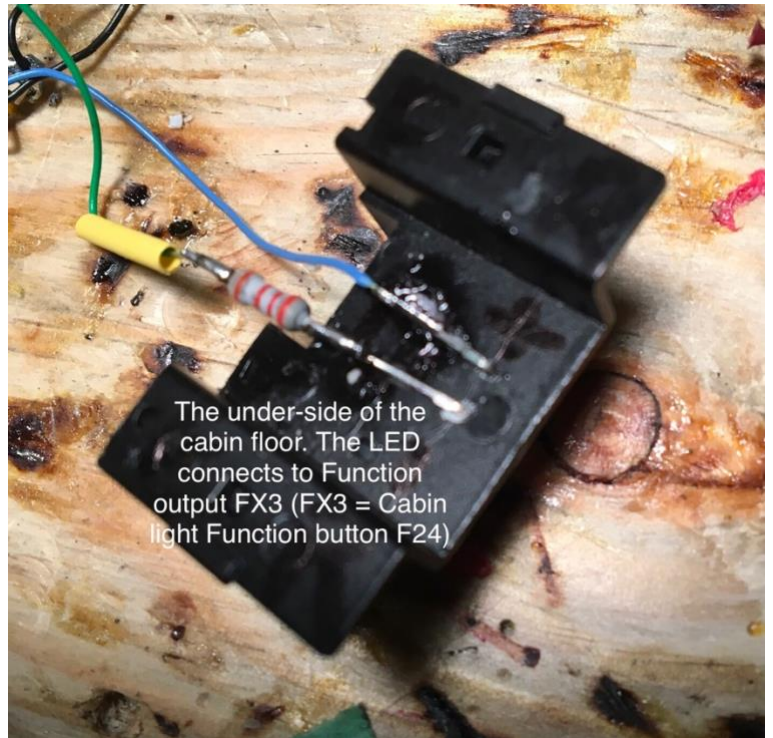
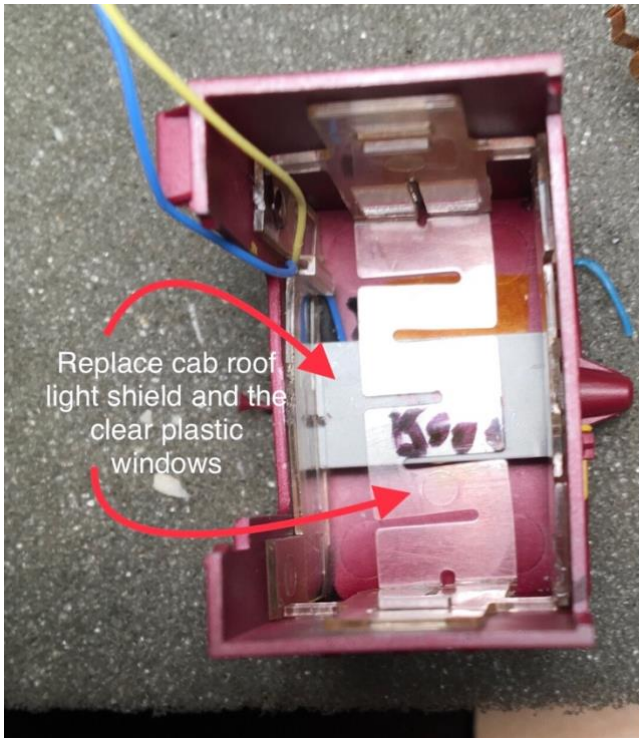
cab simply for reasons of space constraints. I have used SMD 1.8 K Ohm resistors in the past, and these, although more difficult to work with, really save space. See my article entitled [Atlas MP15 DC Switcher Tsunami2 2200 PNP BCH151](#). For anyone interested in using one of the function outputs for a rotary beacon, you can read how I do mine including CV settings in my article titled [‘Installing a Tsunami2 PNP SoundTraxx Decoder into an Alco RS3 HO locomotive’](#), or the article titled [‘SoundTraxx Tsunami2-1100 Decoder installed in a Bachmann GP40 HO Diesel .. CN 5075’](#). These are all on [my web site](#).

The wiring schematic as supplied by [SoundTraxx](#):

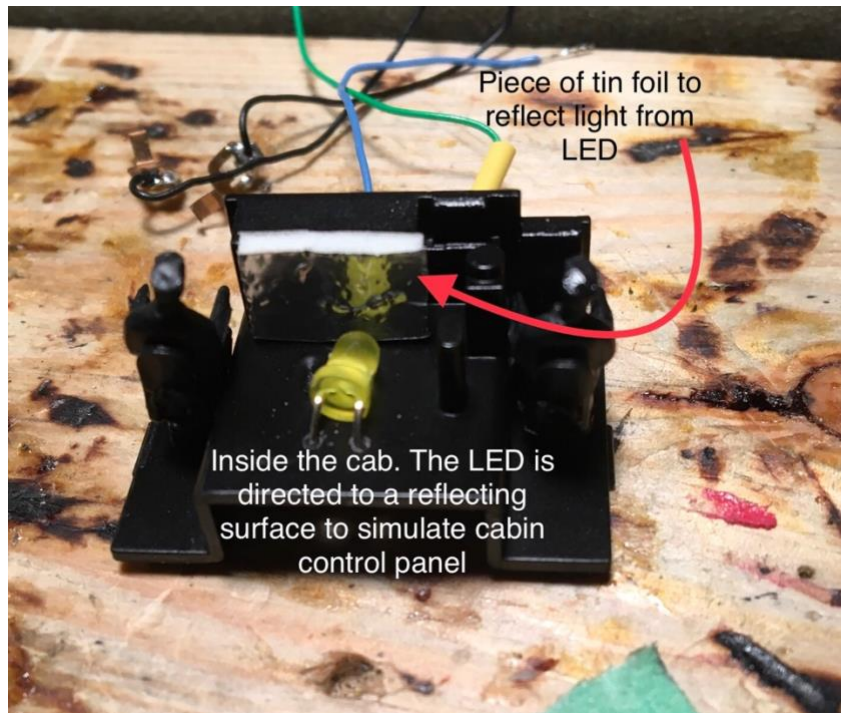


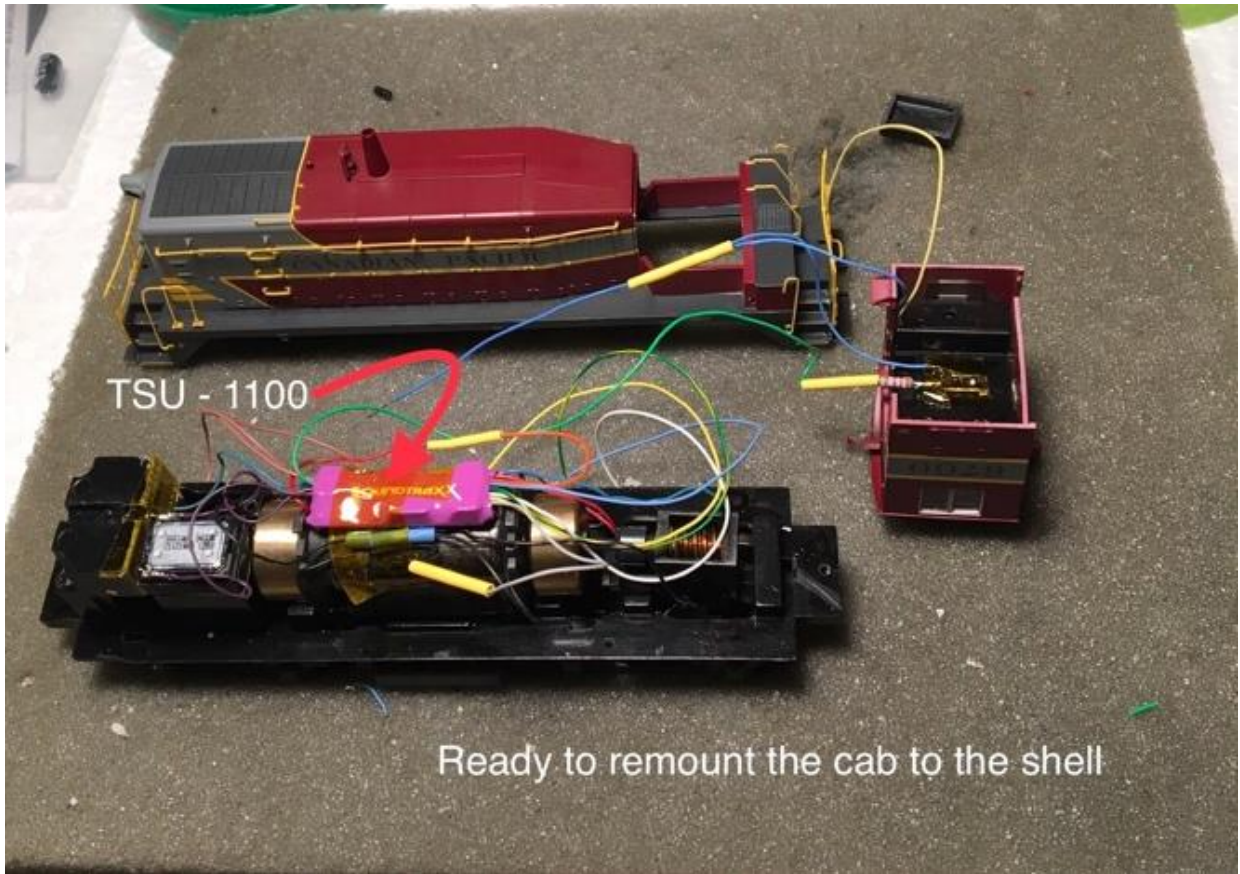
WIRING SCHEMATIC FOR SOUNDTRAXX TSUNAMI2 TSU-1100 SOUND DECODER

Of course, given that there are four function outputs, I could have chosen to include a rotary beacon on this project as well, but the prototype I am modeling did not have a Western-Cullen Rotary beacon, so I saved myself some work! An amber yellow LED may be a better choice for the cabin light and instrument panel, but use a white LED if that's what you have available. Care needs to be taken in replacing the cabin windows and the cabin floor. These parts are fragile!

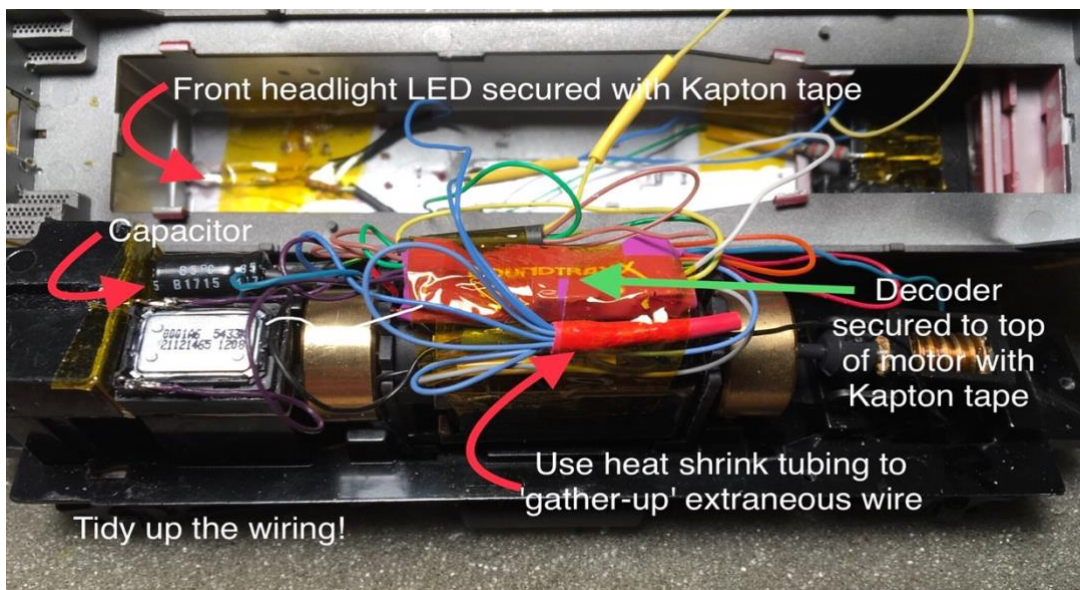


I used a piece of tin foil on the front wall of the cabin and reflected the light off it to simulate a lit control panel.

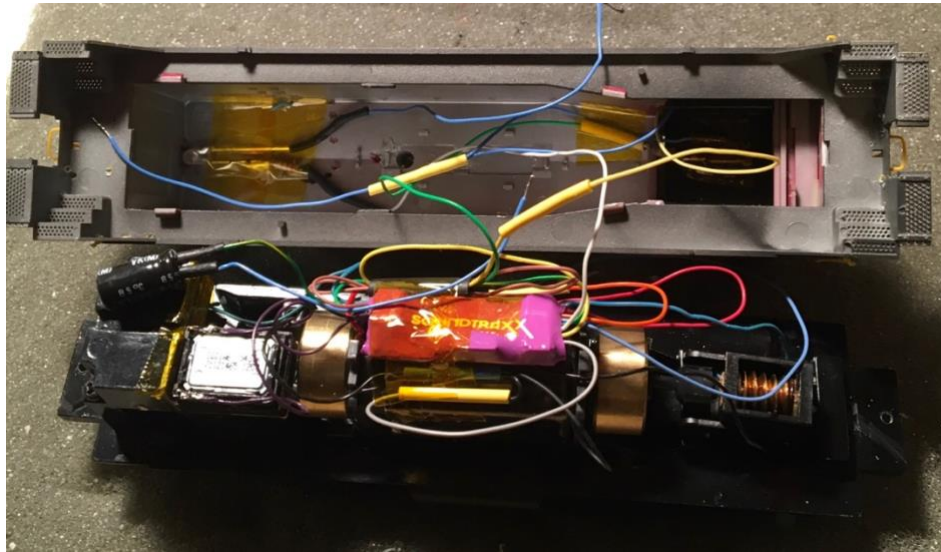




It is a good idea to use heat shrink tubing and Kapton tape where necessary to protect against electrical shorts. Heat shrink tubing is also useful for tunneling wiring and making the installation tidier and more compact. One of the slickest decoder installations I have witnessed is done by George Bogatiuk III, and the people from SoundTraxx, and in my opinion, everyone should watch this You Tube video to see how real professionals install decoders! George is a great teacher. The link is [here](#). SoundTraxx has a [whole series of videos on the YT channel](#), including the informative Webinar Series (14 videos total).



See the wiring schematic from SoundTraxx on page 8 for making electrical connections.



Ready to put the shell back on!

It was a tight fit but everything can squeeze in under the shell. Be very careful not to pinch any wires when putting the shell back on to the chassis.

Time to program some CVs!



This little switcher really responds well to the excellent motor control provided by a SoundTraxx Tsunami2 decoder. When you get all the CVs fine tuned, you will be amply rewarded for all your installation efforts. The CV values I have entered here and the information provided are all derived from the excellent Tsunami2 User Guides which are available online from the SoundTraxx website.

The DCC Command Station I use to do my CV programming is the NCE Power Pro 5 Amp using the ProCab R throttle. Note that on this system indexed CVs must be written to CVs on the main track (Programming on Main or POM), and not on the program track. Reference to this will be seen through out the following discussion. Note also this restriction does not apply to NCE's Power Cab. Other DCC systems will be different so follow the programming instructions from your command station's manufacturer. The CV settings below reflect my personal tastes, and you will want to experiment to find the best settings for your particular situation. I use both Decoder Pro and manual direct CV programming for fine tuning my CV settings. Many people prefer to just use Decoder Pro, but I find manual programming of the CVs is a great learning tool, giving a greater understanding of what the CVs are all about. Be sure to study the SoundTraxx Tsunami2 user guides...they are great teachers.

CP 6700 SW1200 Switcher - Tsunami2 1100 TSU-1100

Install Date: June 7 2020

. CVs programmed Jun 7 2020

(CV 128 factory Value 192 changed to 175 range 0-255.)

Adjust the Master Volume Level

CV 128 (Master Volume) is used to adjust the volume level of all enabled sound effects, i.e., all mixer channels. Values from 0 to 255 may be programmed into CV 128 to set the volume level from 0% to 100%. Default = 192 Changed to 175 Jun 7 2020

Manufacture: 141

Decoder version: 071

Address: Long 6700 Short 3 Long address activated

DC mode disabled

Set up Config:

Direction bit = normal

Speed steps equal 28

Speed table standard

CV 2 Start Voltage 0

CV 6 Mid voltage 128

CV 5 Max Voltage 255

Acceleration 75

Deceleration 75

CV 114: Engine Exhaust Control

CV 114 is used to adjust the auto-notching sensitivity level, enable engine interlock, enable auto-start, and select from four dynamic braking modes.

(Default value = 39)

Set to 47 for calibrating DDE

Calibrating DDE.

CVs 2.503 and 2.504 are already set to 60 and 150 as was the case with the Atlas MP15DC Switcher. These might be factory default settings?

Currently CV 2.511 = 10 (throttle sensitivity) and CV 2.512 = 16 (Date June 9 2020).
Now CV 2.512 = 64 June 9 2020

Note: You can not program indexed CVs on the programming track with PH Pro 5 Amp. Must use Program on Main!

See Tsunami2 User Guide page 53

If you are using the Pro Cab to read any CV in the range [257-1024](#) (this happens to include the indexed CVs since they are in the range 257-512, but is unrelated to indexing per se), you can safely press ENTER ****provided**** you do not change the displayed value.!

From Soundtraxx forums.

There are two types of DDE and one is already active on the TSU 2: From Justin at Soundtraxx :

Note from Tech Support at SoundTraxx:

"There are two types of Dynamic Digital Exhaust on our products, Active and Passive. By default, only the Passive DDE is enabled. The active DDE uses the motor feedback and the Passive DDE uses your command station's speed step setting. (Throttle). To disable it program CV2.511 = 0."

So, as is, the TSU 2 produces a DDE effect (passive) as a default feature.

CV 114: Engine Exhaust Control

CV 114 = 47 (39)...at 39 lost momentum and DDE..reset to 47 and momentum is back. .?
(Default value = 39)
Set to 47 for calibrating DDE. Done Jun 7 2020

CV 32 = 2
CV 512 = 16
Calibrate CVs 503 and 504 = 255 ... see note above
Calibration on CP6700 done June 9 2020.

After calibration JMRI reads these values to be Load Offset CV 2.503 =15, Load Slope = 173. (June 9 2020)

CV 512 and CV 511 set to 255 Date: May 3 2019
CV 2.507 = 255 Default Value = 0 (Prime Mover) (0) Note at 0 there was no DDE sound effect.
Setting at 255 produced lots of DDE sound effect! (-12db) See Tech Reference Manual pg 125. Date: May 4 2019

Adjusting DDE Volume Limits

CV 2.507 (DDE Prime Mover Low Volume Limit) is used to determine the maximum volume decrease of the prime mover sound effect when the motor is operating at low speeds. CV 2.508 (DDE Prime Mover High Volume Limit) is used to determine the maximum amplification level of the prime mover sound effect when the motor is operating at high speeds. The prime mover low and high volume limits are added to the volume level in CV 131 (Prime Mover Primary Mixer Channel). Increase and decrease prime mover volume limits with CVs 2.507 and 2.508 to set the engine's maximum power level.

Entering a value from 0 to 255 into CV 2.507 will add -0dB to -12dB to the prime mover volume level in CV 131 and set the DDE prime mover low volume limit. Entering a value from 0 to 255 into CV 2.508 will add +0dB to +12dB to the prime mover volume level in CV 131 and set the DDE prime mover high volume limit.

CV 2.508 = 255 Default Value = 255

Adjusting DDE Time Constants

CV 2.509 (DDE Attack Time Constant) and CV 2.510 (DDE Release Time Constant) are used to determine how quickly the DDE processor reacts to changes in load and speed. CV 2.509 determines the duration of time that elapses from when the decoder receives a new throttle command (or senses a change in load) to the time the DDE processor begins to reshape the audio signal. CV 2.510 determines the duration of time that elapses between changes in the way the DDE processor reshapes the audio signal based upon increasing or decreasing throttle commands or changes in load.

Entering a value from 1 to 255 into CVs 2.509 and 2.510 will adjust the DDE attack and release time constants from minimum to maximum. Entering a value of 0 into CVs 2.509 and 2.510 will set both DDE time constants to an "instant" response.

CV 2.509 = 215 Default Value = 215. (Time) 0=instant response

CV 2.510 = 215 Default Value = 215

CV 2.511 = 255 Default Value = 10. (Throttle Sensitivity)

(a value of 0 into CV 2.511 will disable DDE throttle sensing)

CV 2.512 = 255 Default Value = 0. (Load Sensitivity)

Left CVs 2.511 and 2.512 = 255 as this seems to sound best. Date:

Entering a value of 0 into CV 2.512 will disable DDE load sensing and sound effects will not be modified when the motor is impeded. Setting CV 2.512 to 255 indicates that the prime mover sound effect will be most sensitive to changes in motor load.

Reading these CVs from factory settings:

CV 114 = 39 (factory default)

CV 32 = 1 (Index page number)

Set CV 32 to 2 to read CVs 2.xxx (page 2)

CV 512 = 0 Factory default. (Load sensitivity)

CV 512 changed to 16 ... then 128 .. then 64 .. 32. Best at and set to 64 June 9 2020

CV 511 = 10 Throttle sensitivity..left at default 10

CV 503 = 60. This was the default value from factory Jun 7 2020

CV 504 = 150 This was the default value from factory Jun 7 2020

After calibration JMRI reads these values to be Load Offset =15, Load Slope = 173. (June 9 2020)

CV 507 = 0 (Low volume limit ..max volume decrease at low speed)

CV 508 = 255 (High volume limit .. max volume increase at high speed)

CV 509 = 215

CV 510 = 215

CVs 507,508,509,510 left at default values June 9 2020.

CV 217 (Moto Control Register) Auto Stop and Back EMF Enable: Value from factory = 10

Motor control CVs not yet adjusted:
Current value of CV 211 = 180 .. default factory setting !
Current value of CV 212 = 255

Independent Brake CV settings as below Date: June 9 2020

CV 117- 140 (manual suggests 178) Independent

CV 118- 100 **Train Brake**. Manual suggests value of 100 for more gradual braking rate for Train Brake.

Turning on F12, the brake select function, (to turn ON the Train Brake) will cycle the air compressor to simulate charging the train line

CV 116 - 140 **Dynamic Brake**.

to apply brakes to maintain speed, apply dynamic brakes with the dynamic brake function (F4 by default).

Manual suggests value of 60 for a gradual braking rate. applying dynamic brakes will not bring the locomotive to a stop.

Note: When consisting with active momentum and braking rates, ensure the values of CVs 3, 4, 116, 117, and 118 are the same for all units.

Function mapping Changed Dimmer to F11 and Braking to F7 on June 9 2020

Used Decoder Pro to **change function button 7 from Dimmer to Independent or Train Brake for locomotive CP 6700**. Used Function Mapping Screen. These CVs are **indexed (CV 1.273)** so **have to use Program on Main because NCE PH Pro 5 Amp with Pro Cab does not allow writing to indexed CVs on the Programming track**. So before going to the CP 6700 file, change Decoder Pro to Program on Main. Note also that the toggle switch for program track versus programming on main for the Hillside siding has to be thrown to program on main.(main power bus). NOTE: NEVER CROSS ONTO HILLSIDE SIDING TRACK (*insert name of your program track siding*) FROM MAIN WITH THE PROGRAM TRACK TOGGLE SWITCH SET TO (UP) (PROGRAM TRACK)....because this can send main DCC power to the Command Stations Program track output connector as the loco crosses the insulator gaps, and fry your Command Station!!! This problem can be corrected using an isolating section approaching your program track. (Above note applies to NCE PH PRO command station).

Enabling Automatic Effects

(no auto effects enabled on EN102)

1. Ensure CV 31 is set to a value of 16.
2. Enter a value of 1 into CV 32.
3. Access CVs 385-512 from your command station and refer to the descriptions and CV values below to enable automatic effects

CV 1.407: Forward Whistle Signal (2 short blasts) Default: 0?

1 = Effect active when moving in forward direction

CV 1.407 = 1 June 9 2020

CV 1.408 Reverse whistle signal

Set bit 1 of CV 1.408 to 1 by adding 2 to CV 1.408 which will turn on the reverse whistle signal (3 short blasts) when loco starts up in reverse.

CV 1.408 = 2 June 9 2020

CV 1.409: Stop Whistle Signal.

CV 1.409 = 12 June 9 2020

Set these CVs to 0 to disable auto effects.

CV 1.409: Stop Whistle Signal. Default: 0

Added value of 12 to the Stop whistle signal to set bit 2 FWDS Forward-Standing (add value of 4) and set bit 3 REVS Reverse-Standing on by adding value of 8 so total value put in CV 1.409 = 12, to have Stop whistle blow automatically on stopping either from forward or reverse

Motor control CVs (June 9;2020)

CV 209 = 48. (Default) Kp Coefficient

CV 210 = 16...try 25 or 30? (25) Ki Coefficient affects DDE. No effect change. Original =16

CV 211 = ? (default)(Slow Speed Compensation) Low Speed compensation

setting CV 211 to the lowest value that will still improve low-speed operation. Default Value = 180.
CV 211=180 (Date: June 9 2020)

CV 215 = 150 .. June 9 2020 (Back EMF Reference Voltage Default = 150) ...for track voltage of 12 Volts..check this ()?

Left at default value 150 June 9 2020

(CV 215: BEMF Reference Voltage)

CV 216: (Motor Speed-Step Deadband)

CV 216 = 0

CV 217 = 10 (BEMF Enable - Auto-Stop Enable)

CV 218 and 219 = 15

JMRI

Motor recovery speed = 204

Setting Engine Recovery Speed

CV 10: EMF Feedback Cutout CV 119: Max Engine Recovery Speed CV 209: PID Kp Parameter CV 210: PID Ki Parameter CV 211: Low-Speed Compensation CV 212: BEMF Feedback Intensity CV 215: BEMF Reference Voltage CV 216: Motor Speed-Step Deadband CV 217: Motor Control Register CV 220: Constant Brake Distance

Use CV 119 (Max Engine Recovery Speed) to designate the speed the motor will resume after momentary power losses. The recovery speed can be determined as a fixed speed step (absolute limiting) or a fraction of the throttle setting (proportional limiting).

The prime mover will start at speed-step 0 after power losses when CV 119 is set to a value of 0 or 128. CV 119 is set to a value of 204 by default. Entering a value from 1 to 127 will designate the recovery speed as a fixed speed step from 1 to 127 (absolute limiting). If the recovery speed step in CV 119 is greater than the last speed step before power loss, the decoder will resume the throttle setting being received by the command station.

Motor Control sample aperture time = (0-15)=6
Back EMF FEEDBACK Intensity =255
Back EMF Reference voltage =150
BEMF Cutout = (0-127 or 128-255) = 0

Clickety - clack volume (CV 153) lowered from 150 to 100 in JMRI June 9 2020

Mapping Effects to the Emergency Stop Button

Tsunami2 Diesel User Guide page 57.

Any effect can be mapped to the emergency stop button with CVs 1.385-1.512. Follow the steps below to map an effect to the emergency stop button:

1. Ensure CV 31 is set to a value of 16.
2. Enter a value of 1 into CV 32. (To access indexed CVs on page 1)
3. Enter a value of 16 into CVs 385-512 to map the corresponding effect to the emergency stop button.

CV 1.433: Couple CV 1.434: Uncouple

CV 1.433 = 16..enables coupler on E-Stop. (June 10 2020)

Note: Mapping a function to the E-Stop button will not change the Emergency Stop functionality. It will still stop the motor regardless of the effect that has been mapped to it.

To use this, I suggest you stop at the freight car using brake F7, then after this while loco at standing still SS 0, press the E-Stop button for the coupler effect, then move forward via SS 10. I think if CV 1.434 = 16, the next E-Stop button press sounds the uncoupling sound? (Toggles between couple and uncouple I think?)

New CV Changes

CN 6700. Date: June 13 2020

Master Volume CV 128:

Current .. 175 Changed to: 150

Air Horn 220 (Default) .. changed to 200

These changes were made in aid of reducing sound distortion. SoundTraxx Mini Cube speaker and TSU-1100.

Doug Dyer Victoria BC



CN Spiritwood Subdivision