

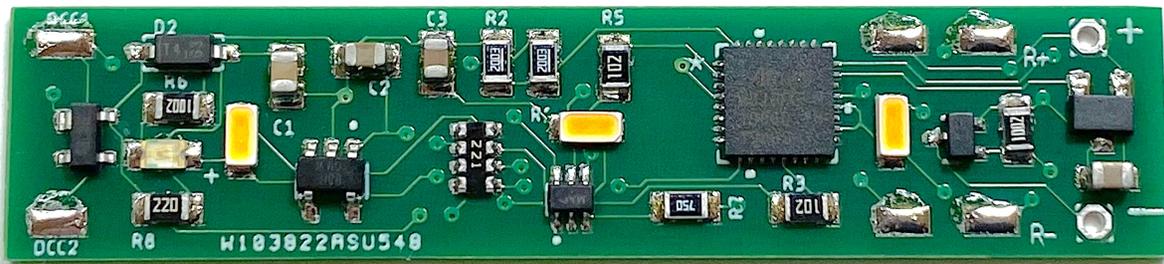


Model Train™ TECHNOLOGY

CABOOSE CAR LIGHTING with DCC DECODER OPERATIONS MANUAL

- SERIES II -

Version 1.7



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The Caboose LED light boards (with DCC Decoder) has 3 built-in LEDs and two pads (AUX) to connect two additional LEDs that are typically used for red end-of-car lighting. The Decoder has a Microprocessor (MCU) and the board behaves like an engine decoder (NMRA Multi-Function Decoder) using the function keys and speed control for brightness adjustments and address setting. Typical current draw @ 50% brightness (recommended) is ~10-30ma. All LED light boards have capacitors and circuitry to reduce flicker and to maximize keeping the system alive.

As per NMRA standards, the board default address is 3.

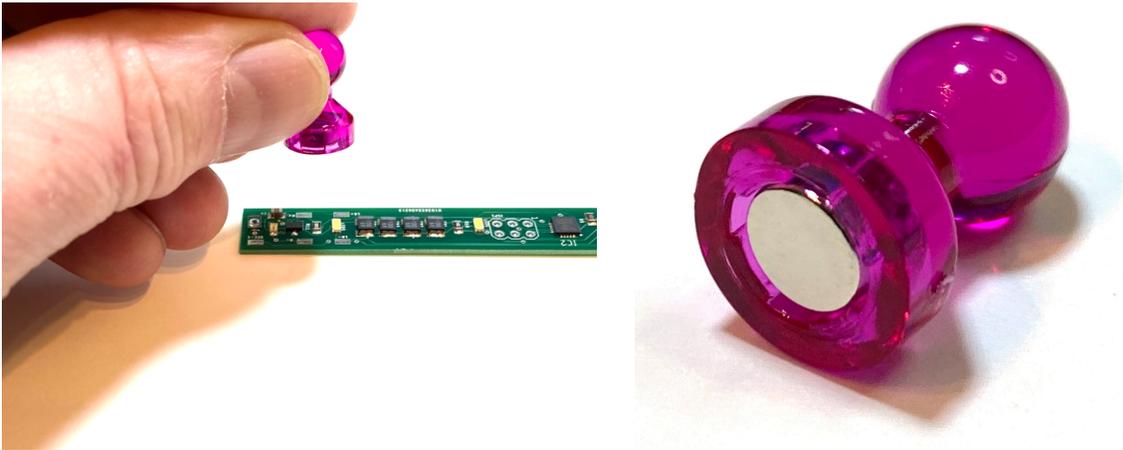
You can set the address to anything that your DCC system supports (short and long addresses).

RESET

If you get lost, stuck, can't remember your board's address or just want to start over then follow these steps. You don't need to do this with a new board it's already ready to go:

1. Connect you board to you DCC main power supply. Make sure you are not connected to the programming lines. This works with the main track power.
2. As part of our ongoing inventive spirit, we recently we began including a solid-state (non-mechanical) magnetic sensor on the board instead of a push button switch. This allows you to use a small magnet to trigger the reset from the OUTSIDE of the car once the board is installed. Now, you don't have to take the car apart in the rare case that you need to perform a reset.

3. That is what that funny looking refrigerator magnet is for! Simply hold the magnet above the board about 2" max for 5-8 seconds. Once the light blinks once, move the magnet away to let the board complete it's reset cycle (4 flashes confirm it is done).



4. The lights will come on momentarily, turn off for about 5 seconds and then flash when the reset is complete. After the lights go out, wait about 2 seconds. The board address will be reset to Address 3 and the default brightness values will be reset to ~40%.

OPERATIONS:

FUNCTION KEYS F0-F4

- F0 Turn on the lights to the default brightness. If this is a new board, or you performed a RESET, the brightness will be 50%
- F1 Force the brightness of the Main Lights to 100% regardless of the default setting. This has no effect on the AUX lights.

- F2 This is the momentary push button (HORN) and is used for two operations:
- PUSH ONCE to SAVE the default brightness for the MAIN LEDs and AUX LEDs.
 - PRESS and HOLD for 10 seconds to set the DECODER BOARD ADDRESS while the car is on the main track. This is a cool feature we added that avoids having to move the car to a programming track! (see below)
- F3 Turns ON/OFF the AUX lights
- F4 ACTIVATE the speed throttle to adjust the brightness of the lights. If you move the speed control very fast there might be a slight delay in the LED response/adjustment. Fooling around you might spin up and down quickly for example. Once you stop though, the board will catch up.
- F5 Activates the Ramp Up/Down Fade function for the main lights. Instead of instant on/off, the LEDs will dim up and down.
- F6 Activates the flashing mode of the Rear LEDs. In some cases when you turn flashing off, the Red LED may stay off even though F3 is on. This is an artifact of the flashing mode. Simply cycle F3 OFF and then ON to restore the RED on. F7 has to be Off.
- F7 Activates the flickering mode of the Rear LEDs. F4 and F6 have to be Off.
- F8 Activates the flickering mode of the MAIN LEDs. F4 has to be OFF

SAVING THE BRIGHTNESS LEVELS:

F2 works in conjunction with F4 (which activates the SPEED THROTTLE) to set the brightness of either or both the main LED's and the Read End lights.

The way it works: Press F2 ONCE to save the displayed LED brightness.

NOTE: NCE DCC – USE the HORN button instead of F2. The HORN button is configured as a momentary switch while the #2 button on the controller is a toggle – On and Off. Otherwise, if you accidentally press the HORN without another function key ON, the board will immediately enter Address Programming mode. If this happens, just remove the track power for 10 seconds and the board will resume normal mode and all your settings are retained.

FURTHER: NCE DCC. - Set CV61 = 1. This is necessary to synchronize the pulsing count so that when you press the horn it doesn't immediately enter address programming mode. See Chart.

Step-by-step:

Set your DCC Throttle to match the address of the board just as you would to select an engine decoder. (remember, default is 3). Turn ON the light(s) you want to control/ adjust. You can set the MAIN lights and the AUX light bright separately OR together. If they are BOTH on when you press F2 (SAVE), the SAME brightness will be saved for both. If you want different light levels for the MAIN and AUX lights, then SAVE one first, and then turn it off, then turn on the other, adjust its brightness and then press F2 to save the setting for that light.

SET THE DECODER BOARD ADDRESS (without the programming track!)

Using this method, you can set the light board to an any address between 1 and 2048. (the range of switch addresses)

Turn OFF both F0 and F3 lights. The board will not enter programming mode if either is ON.

PRESS AND HOLD F2 (NCE: HORN, not F2) for 10 seconds to put the board in ADDRESS PROGRAMMING MODE.

IF YOU HAVE AN NCE SYSTEM or other system where F2 is NOT momentary, use the HORN function key – which is Momentary, otherwise the board will enter programming immediately.

(This can be done anywhere on the layout but the power to the track must be ON. This will NOT affect any Multifunction Decoder (Engine) on the layout.

After roughly 8 seconds the board lights will blink (~ 1 time a second). This tells you that the board is ready to accept a new address.

For this to work you must have the throttle set to the CURRENT board address and you are able to control the lights On/Off from the throttle. If not, either reset the board back to Address 3 or set your DCC throttle to the assigned board address.

Using the SWITCH function on your throttle, select the new address you want to program – then press either CLOSED or THROWN. The lights will go out indicating the new address has been saved. Using your throttle, EXIT switch mode and set the throttle (Loco) number of the

new address you just programmed. Then use F0 and F3 to test for correct operations – the lights go on!

- This process has no effect on any engine decoder (Multifunction) on the layout.
- This will NOT reprogram any of your switches (UNLESS you simultaneously put your Accessory Decoder into programming mode – We’re not sure why anyone would do that?)
- If you use an address that is already assigned to a SWITCH – don't worry! When you press CLOSED/THROWN you will hear that switch operate but only for that one instance of programming this decoder. Thereafter the decoder knows it's not a switch and will ignore any switch commands and likewise, your switch will ignore commands sent to this board. Pretty clever!

To ABORT this Address Setting mode, simply rock the car off the rails so that power is interrupted for 2-3 seconds, then roll the car back on the track.

THE OLD FASHION WAY (CLASSIC DECODER ADDRESS PROGRAMMING)

This LED Light Board can be programmed using any standard NMRA DCC compliant system. We can't give you every combination of steps here because of the wide variety of manufacturers since each has its own specifications and limits. For example, NMRA extended addressing can go to 10,000+ but the Digitrax® throttle only allows up to 9983.

As you would with your engine decoder, hook up the light board (or put the car with it installed on the programming track) and program as you normally would. CV8: is RESET. This is a good thing to remember.

When in “native” DCC programming mode this LED Light Board will both Short and Long addresses. Just bear in mind not to set it to an address that your DCC system and hand controller do not support.

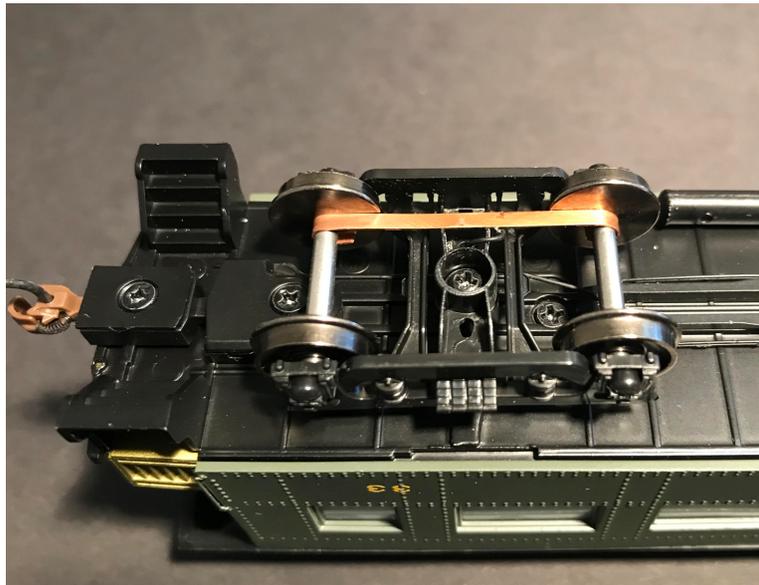
From time to time we stumble across occasional strange behavior in mixed system environments. For the most reliable (and we think) simple operation, use the built-in in address programming mode (not programming tracks) and work your addressed to be organized within the 2044 address limit.

PERFORMANCE and INSTALLATION

The Caboose LED Light Boards are designed to operate visually best at about 50% brightness. On my layout I run at about 30%. That is, the best visual effect for the train cars is 30-50%. The circuit will still protect the LEDs if you operate at 100%. However, if you decide to build a really long train all with lighted cars the cumulative effect of the current drain will affect other action (engines) on the layout. For planning purposes, 10-30ma (milliamp) or less per car is about average. We design the board so you *could* run the lights brighter but for both appearance and current drain it's better to run at half or less rated capacity.

The N Scale Caboose board will safely operate at HO voltages up to about 16V. It should NOT be operated at G scale voltages of 18-20v. We have other boards that are designed for O and G scale.

For all other cars that are not pre-configured with electrical pickups, we recommend our “floating” brass strips. A single 1mm or 2mm piece of brass is wrapped around each axle of the truck at either end of the car. Then, a 36AWG stranded wire (supplied) is soldered to the brass and connects to the DCC1 and DCC2 on the board. The reason we call this “floating” is that it is NOT fastened to the truck. This allows it to shift with the movement of the axle and doesn’t bind the wheel. ALL the other types we tried required you to fasten their metal contact to the truck with a screw or by glue. This tends to put extra pressure on the wheel or axle and causes it to pinch inside the truck wheel holder. It also adds friction that cause the car not to roll freely.



The width of the board is 11.5mm. It’s perfectly ok to sand down the edge of the board up to a total of about 1mm. Use your good judgement on this. The underside of the board is ground (GND), and

you can see that it starts a little bit away from the edge of the board. I know it's hard to see but wiggle the board under a light to see the reflective difference. Consider up the edge of the GND a safe zone for filing and sanding. I use a piece of 100 grit paper on a flat surface and slide the edge of the board over it. The PCB material is fairly soft so don't go overboard!

That's it! Have fun and please send us feedback or special requests.

Support@ModelTrainTechnology.com

Text or call: 407-242-5436



CONFIGURATION VARIABLES (CV) CHART

CV	Behavior	Comments
47	Saved Default Brightness for Main LEDS	Use F0 On, F4 On to activate "Speed" control and F2 to save. Valid value 1-127
48	Saved Default Brightness for REAR LEDS	Use F3 On, F4 On to activate "Speed" control and F2 to save. Valid value 1-127
49	Fade speed interval	Set via CV only
50	RESERVED	
51	F3-sync	Makes AUX pads follow MAINS only. Off=0, On = any non-zero number
52	AUTO-ON	Set to "1", ALWAYS turn on at Power Up regardless of F0 setting. NCE® needs this set to =1
53	Auto-On for AUX pads	0=Off, 1=On, 2-Flicker, 3-blink
54	Fade On/Off	Sets default 0=Off, 1=On
55	Always ON (MAIN)	Light is on regardless of DCC commands.
56	Always ON (AUX)	Light is on regardless of DCC commands.
61	Set for NCE DCC	Adjust the F2 delay for address programming.
7	READ ONLY - Software Version	FYI - in case we need to know which board you have.

Programming on the Main (DCC)

Almost all DCC systems have a way to send “write only” commands to decoders. This is called Ops Mode for Digitrax and Programming on the Main in NCE – speak. This provides a way to set the MTT Light board CV’s without moving the car to a programming track.

ANY TIME you write CV’s directly you will need to reboot the board so it can read the new settings. Simply rocking the car off its wheels for 5-10 seconds will do this. The time difference is based on which board you have and how many SuperCaps™ are installed. Turn the lights on and then rock the car (or remove it from the track) and wait until all the LEDs are completely off, count to 3 and then replace the car on the track.

When would you need this? If you set CV55 an CV56 to have the lights always on, the only way to regain control using DCC is to the CV’s back to zero (0), then reboot the board as just described.

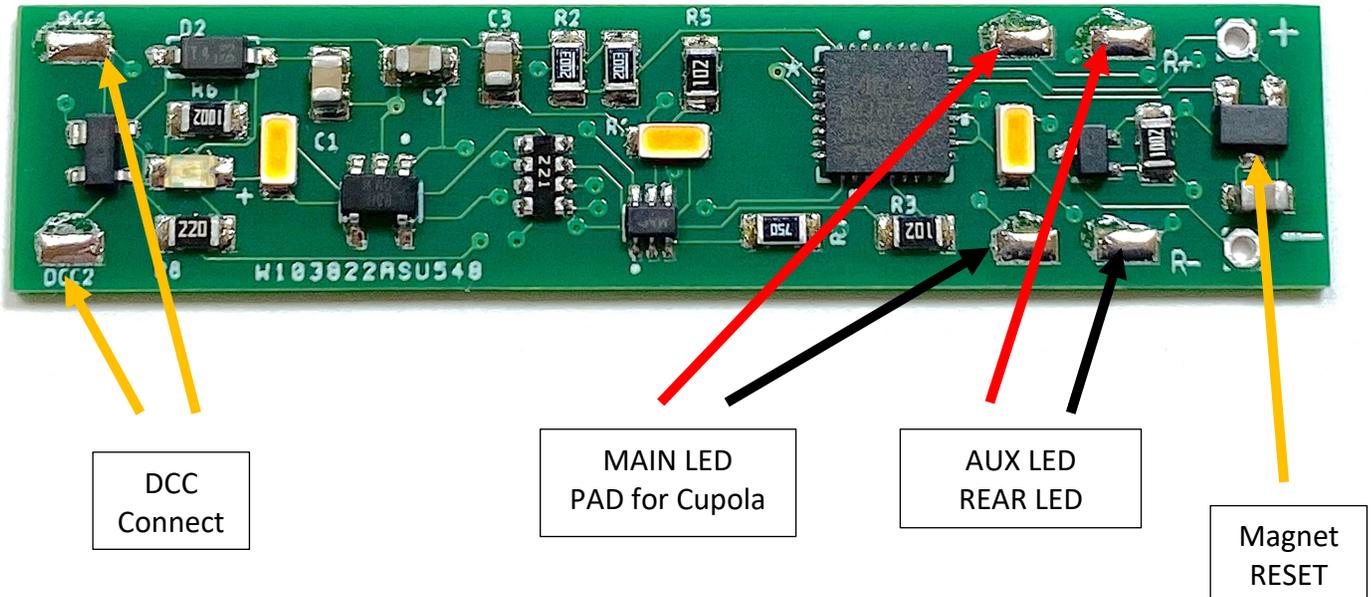
CV Direct Programming (programming track)

The MTT LED light boards can read and write CV’s directly using your DCC programming track. To make this work properly you must do two things:

1. CV’s 52,53, 55 and 56 must be set to zero. These are all “auto-on” features meant to override some aspects of DCC signaling – and thus they confuse the CV read/write function.
2. Have the car off the track for 20 seconds to allow the SuperCaps™ to completely discharge.

If on the first attempt to read a CV while on the programming mode/track, just try again. Once in a while there might a very small residual in the capacitors. The first read will usually clear this.

LED Caboose Light Board Installation Guide



Notes:

Feel free to paint over the Blue board mounted LED with black paint. You will not harm the board or its functions.

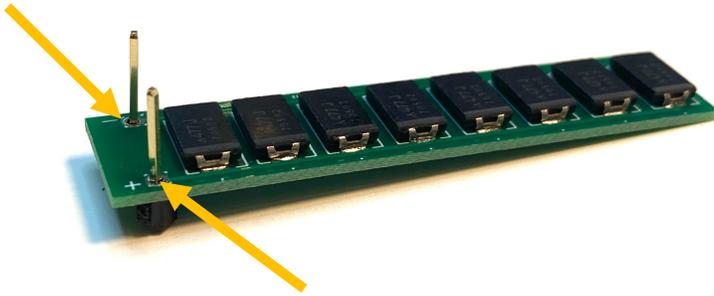
You can connect ONE extra 3.2V LED to the MAINs via the PAD provided.

The two solder pads at the RESET end of the board will support two 1.8-3.3v LEDs.

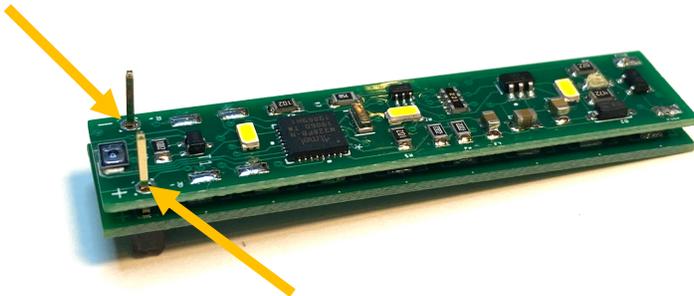
To RESET the board, hold the jewel magnet over the RESET Magnet sensor for ~3 seconds until the lights come on, then off, then will blink when finished.

There are two Solder HOLES for our SuperCap™ board. See SuperCap™ instructions for more information.

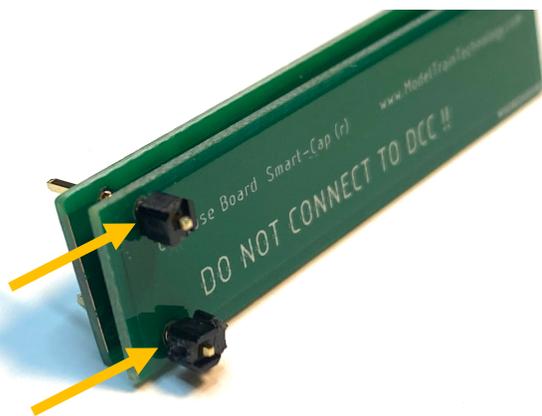
SuperCap™ Installation



Solder the pins onto the SuperCap first – caps facing UP. Try to make the pins straight but perfect isn't necessary. Keep the "foot" on the pin while doing this.



Stack the caboose board on top and solder the pins on the top. Using this method the polarity will be matched properly. Solder one pin first, check the alignment, and then solder the second pin.



Slide off the plastic feet and clip the pin on the bottom of the SuperCap board and on the top of the caboose board.

DO NOT CONNECT SUPERCAPS™ BOARD TO DCC

The SuperCap™ board is designed to work ONLY with Series II LED Lightboard from Model Train Technology. (Caboose Board v3.1a and later) They will not work directly attached to DCC or to any other decoder system.

Most so called “keep alive” after-market products interfere with the proper operation of DCC CV read and write operations. By integrating the SuperCap™ technology into our board design the CV functions of DCC will still work.

When you move a car with our light board and SuperCap attached to a programming track, wait approximately 20 seconds before reading or writing CV's. This allows the board circuitry to fully discharge the capacitors. The capacitors recharge once the car is set back on the track and the lights are turned on.



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