



Model TrainTM TECHNOLOGY

16 Port DCC LED Scene Controller - LSC IIa USER MANUAL FOR DCC OPERATION



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INTRODUCTION

This manual explains how to configure and control the LED Scene Controller (LSC II) directly from your DCC system. If you have an LSC II with a keypad you can choose one of the preprogrammed Special Effect (FX) animations using the keypad. With the DCC control connection you can fine tune many of those settings. You may also configure specific variables (Configuration Variables) via the keypad. For example, you can adjust the blink speed of both the on and off timing with settings from 1-100 each whereas the preprogrammed settings are pre-set.

Here are the special effect categories for reference.

- Adjust each LED for individual “brightness”
- Flickering
- Blinking with individual pin on/off speeds
- Rotating Beacon (simulation)
- MARS simulation
- Fade on and off (timing adjustable to 18 hours)
- Random on/off with adjustable pace (all pins or one pin)
- Step, Chase, Race – each LED on/off in sequence
- Alternate 2-pin Flashing
- TV Simulation (use 2,3 or 4 LEDs)
- Arc Welding
- Lighting

** Some speed settings apply to all LEDs whereas blinking and brightness settings apply individually to each LED (they can be different). If you have multiple boards with the same DCC address but you program them separately, they will perform based on the board specific configuration.*

You can configure and control the LSC II from your NMRA DCC system. That also means you can use jmri (www.jmri.org) or Railroad Automation (RRAuto.com) software.

TO ALLOW THE BOARD TO READ CVs from your DCC System or JMRI, THE POWER SWITCH MUST BE IN THE OFF (LEFT) position.

To configure the LSC II you only need to connect to DCC IN. You do not need to have the power adapter plugged in. The BLUE light will be OFF.

You can use the commands described here to program the LSC II remotely.

I designed and developed this board so that anyone who can run a DCC locomotive can easily, quickly and inexpensively add LED lighting effects to their layout. Many people have wired their layout and run sophisticated software application that automate the running of the trains. However, most people are not about to start learning "C" and compiling software and building circuit boards. They want something that they can just hook up to run their LED lighting. That is what we built.

**All the settings are saved as CV's or configuration variables. They are saved even when the power goes out. If you like, you can customize the board by setting the configuration variables in Ops Mode via your DCC system. The CV's are listed at the end of this manual.*

The LSC II is a customized, purpose-built circuit that has been pre-programmed, so you don't have to.

NOTE: *Digitrax user must operate the speed control with the train direction FORWARD. NCE and other operate the speed control with the direction in REVERSE.*

Overview of operations

Your board comes configured as address 3 per NMRA® standards and it behaves similarly to an engine decoder otherwise known as a “multi-function” decoder. There are two ways to change the board address:

1. Connect the board to a programming track and set the Address CV (#2) to whatever address you like. Long and Short addresses work just as they do with locomotive decoders.
2. Connect the board to the main line DCC power and use the built-in programming mode to set an address that borrow from the switch addresses. This is highly dependent upon the make and model of your DCC system. For example, the Digitrax® DT400 goes to 999 but the DT500 can reach to 2044. Above that you will need to use the programming track.

The board has four “modes” of operation:

1. Connected to a DCC line the LSC II can operate in:

Operator Mode. In this mode each pin can be turned On or Off, Fade On and Off or Random to On and Random to Off. There is also an ALL on/off option.

Configuration Mode (F1). In this mode individual LED and board level setting can be configured and saved. (Note: all the settings can also be activated by setting CV's (configuration variables) using the programming track.

Animation Mode (F5). In this mode the simulation of Blinking, Flashing, Always On and Random On/OFF and TV Simulation on each pin of the board (based on your configuration) is activated.

2. Non DCC Powered Mode. (this is cool)

DCC Track power is precious, particularly if you have a big layout or are part of a club. To accommodate the requirement to have accessories run off non-DCC sources we have built that capability into the board.

Once you have decided what you want each of the 16 pins on the board to do and you have configured the board via your DCC hand controller or Ops mode, you can unplug it from the DCC line and plug in a standard 12-18V AC or DC 1A or more power supply. After about 5 seconds (configurable) the board will determine that it has power but no DCC signal. At that point it will automatically kick into Animation Mode just like F5 above.

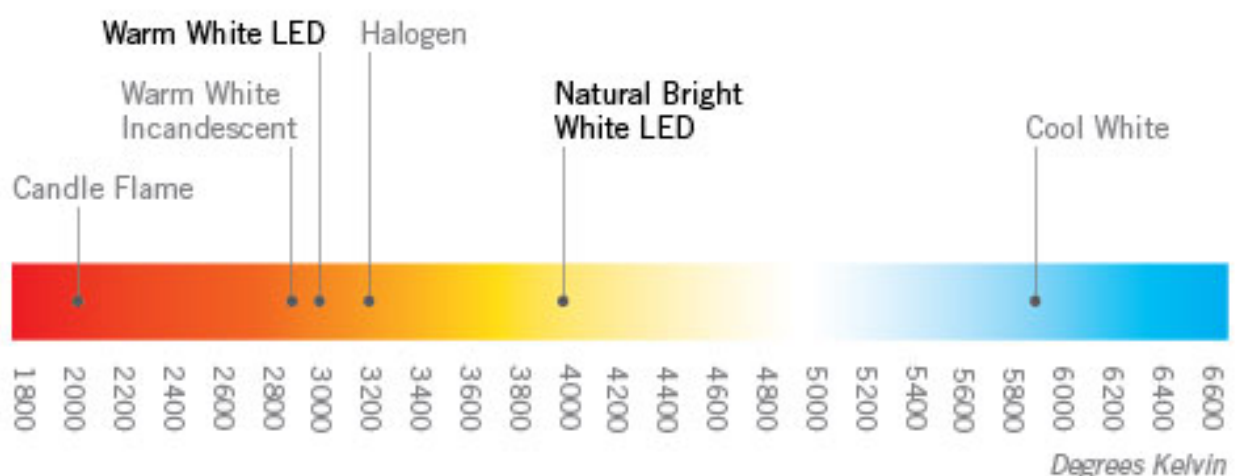
There are two versions of the LSC II controller. The standard version and the MICRO board (2" x 1.25"). The MICRO board gives you the option of powering the LEDs from DCC power. The standard board requires an external power supply.

The LSC II Controller can support either 3-12V LEDs and can be run from the DCC system or in parallel with it without drawing off DCC current.

With DCC and/or a 12-18V supply, the output voltage of the LSC II at each pin is designed for LOW voltage SMD (Surface Mount Device) LEDs typically in the 1.8 to 3.3v range. We'll call these 3VDC LEDs. We supply LED "chips" that have the LEDs already soldered onto a convenient mounting board. These SMD LED chips are also available pre-wired from Amazon® and EBAY®. They are very inexpensive which is why we use them. We don't think many people are willing to pay ~\$4/LED – ours cost less than half that. We believe that if the LED's are inexpensive and

can be connected in less than 10 minutes people will actually light their layout!

One thing to note about SMD LEDs, they are very sensitive to heat from say, a soldering iron. They melt very easily. That is why we solder the LEDs onto the “chip” board for you. You can buy these from us wired or un-wired and you can solder the wires onto the “chip” yourself. It’s easy. We have 4 white “colors” available labeled with “K” (Kelvin) to indicate the “temperature” of the light. They don’t actually get hot, but light is measured by its temperature. For example, there is “warm” white and “cool” white. The lower the value the more yellow it will be, whereas a higher value will have a bluer color. We also have a TV Sim “chip” that has a blue and white LED and an RGB “chip” for a Color TV Sim – or anything else you can dream up. Below is a color chart for your reference:



Note: Everyone knows that the blue part of flame is hotter than the orange part. With that in mind I can see that the blue area of the above chart should be “hotter” and have a higher degree Kelvin associated with it. Then why is it called “cool” and the cooler part down near 3000k called warm? We found out that it is described by the way it **looks** that makes it “cool”, not the physics. Just thought you might like to know. Confusing, but we’re stuck with it.

There are other LEDs that are available online and from train scenery manufactures and suppliers that operate on 12VDC. The LSC II can operate with either 3V or 12V LEDs. These are compatible with plug-in LED products from other companies. Any LED product that has the JST-type plug will plug into the board and will have ALL the same features and controls as the LEDs you connect directly to our Controller. 12V prewired LEDs with mounting boards are available on Amazon and eBay in case you want to go that route.

The LSC II is designed to power 12V LED's. Plug in any 12-18VAC/DC power adapter or the power supply that came with your unit. When you do, the board will come alive and the blue LED will light. For use with 3V LEDs like the "chips" we sell, we recommend a 12-18VDC supply.

NOTE: This board has a DCC Auto-sensing circuit. If there is power to the board but NO DCC signal – either because you didn't connect it or the DCC system is off – after 5 seconds the board will switch into Animation Mode (discussed further below). The default Mode setting for all ports is ON. You can change that in the configuration process.

1. Plug in wired LEDs into the sockets labelled P1-16
2. Press F0 ON to test that all LED pins light.

A few things to keep in mind:

We will be using the function keys and the speed control of the DCC hand controller to set the configuration of the LED controller board. This causes a few weird behaviors in particular with the speed control switching from one mode to another. My advice is to go slow and follow the steps one by one. Additionally, there will be a few sequences where you might get stuck. In that case, turn off all the function keys and use F0 to turn All the LEDs on and off. This doesn't do anything more than confirm that the board is working and that you are back at the start.

We primarily use the Digitrax system for the reason that we can "see" the status of the first 12 function keys on the main controller. NCE systems only show the first 6 so you have to toggle the EPXN key to check the status of others. The ESU controller shows the function keys but the current firmware doesn't allow you to show the function number. Instead they want you to assign icons – but there are not enough, and I can't remember what icon is what number. As crazy as that is, they say that they are going to fix it in a future version.

PIN behavior description and options

Each pin is assigned a MODE. The default Mode is On [1]. 1 is the value of the CV that you store for that pin to make it exhibit a special effect when in Operation, Animation or Non-DCC modes.

Each pin can be assigned only ONE behavior at a time. Of course, you can change that behavior anytime. In fact, one of the by-products of how we use the function keys and throttle of the DCC controller is that you can both control the board (the LED scene) AND configure the board via software such as Railroad

Automation or jmri without disconnecting the board from the layout or using the programming “track”.

To change the configuration of a pin you have to stop Animation mode (F5 OFF) and then make sure all other function keys are also off. This is explained further in this manual.

The pin behaviors and their CV values:

Value	Behavior	Notes:	Animation
0	disabled	No output on this pin during animation.	No
1	Always on	On during animation; ignore Random	Yes
2	Flicker	Simulates oil lamp or fire	Yes
3	Blink	Blink speed On/Off configured for each pin	Yes
4	Beacon	Simulates a rotating beacon	Yes
5	Fade	Fade on and off to a timed cycle	Yes
6	Random	Default mode	Yes
7	Step	Sequentially turn LEDs On/Off with F0	Yes
8	Flashing	Use to create alternate pin Flashing	Yes
9	TV Sim	Simulate a TV (using Blue & White LEDs)	Yes
10	MARS	Simulate a MARS style light.	Yes
13,14,15	Arc Welder	13,14,15 – different time gaps between cycles.	Yes
16,17,18	Lightning	16,17,18 – different time gaps between cycles	Yes

The Mode CV addresses are [112- 127]. Pin #1 is 112, Pin#2 is 113, etc.

Operator Mode versus Animation Mode

There are two operating modes that the controller can execute. **Operator Mode** allows you to turn on and off any LED pin by pressing its corresponding Function key +10. That means that hitting F11 will turn pin #1 on and off. F12 will turn pin #2 on and off, and so forth. Nothing happens unless you tell it to do something by selecting a function key. This is different from Animation mode whereby your configuration of the pins will cause them to behave accordingly just by pressing F5 (Animate On).

If you use software to control your layout and if it supports controlling Function keys, then you can control the LED Scene Control board using software – which is one of the several ways we control the animation on our demo layout.

There are also a few animations that are possible to activate in Operator mode. See the chart below:

The available Functions in Operator Mode (F1 OFF) are:

Function Key	Behavior	Comments
F0	All Pins On/Off	Also used to check everything works.
F4	Adjust all Pin Bright level	Forces all pins to same Dim level; use F2 to save
F8	Alternate pin Flashing	Overrides individual mode setting; all pins
F9	Activate Fade on all pins	Use F0 to turn the lights on and off with fade
F11-F26	Turn on Pin**	For pin 1, add 10 = F11. Pin 16 = F26

Use of Function Keys

Function Keys are used to both configure the board and to control its operation. Therefore, keeping track of which functions are on and off is important to keep things running smoothly. The F1 key is used to switch into Configuration mode. When F1 is On, the other function keys will behave differently than when it's Off.

F2 has a special role and since it is configured 99.9% of the time as a momentary Horn, we will use it to the SAVE configuration options. You press the F2 key when you want to save something and then the LEDs will flash to tell you it worked. If the LED's don't flash, something is not right.

F2 is also used to send the board into Address Configuration mode. This is a little trick we designed into our LED light boards

for passenger cars and we implemented it here as well. I was never a fan of having to move my trains to a programming track to change their configuration. Instead, with some minor limitation we invented a way to change the address of a board while it is connected to the live DCC track – without impacting or changing any other decoder on the layout. Check out the Address Programming section but for now, just note that F2 is “special”.

The LSC II uses Function F0 through F12 to configure and control the pins on the board. The current NMRA® specification calls for support of function keys to 29 – which all controllers don't have on the primary panel. How you get to functions above 12 depends on the controller. Digitrax DT400 and below cannot access above F12. DT402 and above do have a way by using a combination of the FUNC key with either a 1 or a 2. With software application running the show this isn't a problem.

Since we make use of F0-F12 for control of the board we had to put the individual pin control for on and off starting at F11. Just add 10 to the pin you want to control. Pin 1 is F11 (1 +10). Pin 16 is F26 (20+6) using the extended function commands. After I got the LSC II prototype board working and configured, I discovered that I never needed to control above F12 – but I did add a way to do it from the primary keyboard even if your controller can't access above Function 12. Look up the Mimic option in the chart for an explanation.

Use of the Speed Control

We primarily use the Digitrax® system so there will be some variation with your system when it comes to how the speed controller behaves. We do support NCE and ESU and any other NMRA compliant DCC system. And while we have been testing the controller with as many different systems as we could, we are sure there will be a few hardware configurations we haven't seen yet. If you have an issue like this, please contact us so we can update the design to support you.

If there is anything that will confuse you as you configure the controller it will be the behavior of the speed control. After a LOT of consideration, we decided that putting more functionality and flexibility into the controller was more important than super simple. Here is why you might get confused as we did the first time.

We give you the option to configure each pin individually. The way you select a pin to configure is with the speed controller. Press F1 and then turn the **speed** dial to any value between 1 and 16. As long as no other function keys are on, the LEDs connected to each pin will light. If you select 8 on the speed control, pin 8 will light. (consider our LED test board to simplify setup)

If you are a Digitrax user you will notice a slight idiosyncrasy when you turn the speed controller. Occasionally you may feel two "clicks" of the dial when the LED only moved by one. This is because the range of speed is 0-127 (128 speed steps) but the dial on the hand controller is only two digits to represent 0-100%, not the actual internal speed step. Actually, it only goes to 99 on the Digitrax system. That means each click is 1.28 not an even 1. So, we have to do some math to make sure that when the dial says "5" – it really is 5 on the inside.

Since we also support the NCE Power Cab and others, we had to figure out a way to easily control this behavior and determine if you have the full 128 Speed steps or the simulated 0-99% for Digitrax.

DIGITRAX SPEED CONTROL – Set the LOCO Direction to FORWARD.

NCE and all OTHERS – Set the LOCO Direction to REVERSE.

That part is simple. If you dial a value above 16 no LEDs will light. Likewise, if you choose zero. Now that you have pin 8 dialed in, press F4. This is the key to activate adjusting the LED brightness. The moment you press F4, the LED on that pin will light to a value of 8 – since that is where the speed dial was when you selected pin 8. It will be fairly dim. Now adjust the speed control to brighten the LED. You can go all the way to 99! Is that the brightness you want for that pin? Ok, then press F2 – SAVE. The LED on pin 8 will flash a few times letting you know that it saved your brightness setting. Done. Right? Ok, now turn F4 OFF – this deactivates the brightness adjustment mode. What happened – no LED's are lit and pin 8 LED went off! Yep, because the SPEED control is still set at 99 or whatever your last setting was if it is above 16.

If you now dial the speed control back to 8, the LED will go back on and you will see the new, adjusted and probably a brighter setting for pin 8. Now you can use the speed dial to pick another pin and adjust its brightness and other configurations and so on.

If you followed that then you are all set! You can only pick a pin from 1-16 but you will use speed controller to adjust for **Values** that are usually above that. This will occur for each instance where you want to set the Mode, adjust the Brightness setting or change the speed of Blinking for individual pins. This will not happen when you set the speed for Flashing, Fade, Random or

Step since those are board-specific and affect all pins identically. We usually set the brightness to between 25 and 50. Above 50 isn't necessary because your eyes can't distinguish the difference.

Setting the LSC II Address

The LSC II default address is 3. If your board is acting flaky or you can't remember the board address, you might need to resort to a RESET. There are two methods. The first is to set CV8 to 1 via the programming track – if you have to resort to that. By the way, this method does NOT reset your configurations of the pins. If you need to flush the pin settings use the next method.

The other way is as follows:

RESET (LSC II with CASE): Refer to the KEYPAD manual.

RESET – press and hold the reset button on the controller board for approximately 5 seconds until the LED light – Then RELEASE the button. After 5 seconds ALL the LEDS that are connected to pins will flash a few times. When the LEDs go out, your board will be back to factory defaults. We recommend that you power down the board for 5 seconds (just unplug the power) and then restart it. Everything should be back to normal and the address for the boards is back to 3.

As mentioned, you can always use the programming track methods, otherwise known as DCC Ops mode - to program the address. In that case, the pin configurations will not be set back to defaults.

Setting the Scene Controller board Address with F2

1. Connect the board to a DCC layout and turn the power on.

2. Turn OFF all function keys.
3. Press and hold F2 for ~ 5 seconds. NCE use the HORN button.
4. Wait for ALL the LED's connected to the board to flash
5. The board is now waiting for a SWITCH address.
6. Press the SWITCH key on your controller or ACCY for NCE.
7. Select a switch number (1-2044 based on your system)
8. Press either Close or Thrown (1 or 2 – it doesn't matter). The LEDs will stop blinking.
9. Press EXIT to exit the switch mode and return to normal operations.

That's it. Now select the "Loco" for the address you just programmed into the board. Press F0 to test that it works by lighting all the LEDs.

If you chose an address for your board that is ALSO the address of a switch on your layout – don't panic! Although the switch was thrown or closed when you hit C or T on your hand controller – it did nothing else on your layout nor did it change the switch control address. (That is unless you somehow put your switch controller into to "address setting" mode at the same time. That is not easy to do so we don't' expect it to occur too often.)

For convenience, I use addresses for my LSC II that start at 1,000. That way I won't confuse myself with the layout switches. With 2044 possible addresses, why would anyone need to do anything else with the programming track?

CONFIGURATION

Configuration Activation Function Keys:

Function Key	Behavior	Comments
Speed Dial	Select Pin 1-16 and enter Values 1-99	When NO other function keys are on, the selected LED for that pin will light.
F1	Enter Configuration Mode	
F2	Save Configuration	If the value is valid, the pin(s) will flash
F3	Switch to MODE select	See chart for MODE options
F4	Adjust Pin Dim level	Adjust selected Pin brightness level with speed dial.
F5	Activate Animation	
F6	Random (all pins)	Use the speed dial to adjust these settings. Since these apply to all pins, no pin will be lit. A successful save will cause all the pins to flash.
F7	Step speed (all pins)	
F8	Flashing speed (all pins)	
F10	Adjust Pin Blinking Rate	
		Use F0 to switch between the On time and OFF time.

Pin MODE Configuration values*:

Value	Behavior	Notes:	Animation
0	disabled	No output on this pin during animation.	Yes
1	Always on	On during animation; ignore Random	Yes
2	Flickering	Simulate an oil lamp or fire	Yes
3	Blink	Blink speed On/Off configured for each pin	Yes
4	Beacon	Simulates a rotating beacon	Yes
5	Fade	Fade on and off to a timed cycle or one time	Yes
6	Random	Default mode	Yes
7	Step	Sequentially turn LEDs On/Off with F0	Yes
8	Flashing	Use to create alternate pin Flashing	Yes
9	TV Sim	Simulate a TV (2-4 pins required)	Yes
10	MARS	Simulate a MARS-style light	Yes
13,14,15	Arc Welder	13,14,15 – different time gaps between cycles.	Yes
16,17,18	Lightning	16,17,18 – different time gaps between cycles.	Yes

- Table repeated for convenience

1.0 Behavior of the “MODE” of a pin for Animation

Each of the 16 pins on the LSC II can be set to behave differently for the purpose of Animation Mode F5. When F5 is activated, the Mode setting of that pin directs its behavior with a few the exceptions that will be mentioned. The Mode can be set via the configuration mode F1 and F9 explained in the next section. There are 10 modes that will activate for the animation:

	Mode Value
• Always off	0
• Always on	1
• Flicker	2
• Blink	3
• Beacon	4
• Fade	5
• Random	6
• Step	7
• Alternate Pin Flashing	8
• TV Simulation	9
• MARS	10
• Arc Welder	13,14,15
• Lightning	16,17,18
• Relay (Digital 5V signal)	99

The speed of Fade, Blink (time ON and time Off) for each pin can be adjusted separately.

The speed of Beacon, Random, Step and Flashing can be adjusted but that setting affects all pins equally.

Flickering and TV simulation are not configurable.

Blink - a single LED pin at its configured speed On/Off.

Beacon – the LED will fade up and down and flash briefly at the highest point of the fade cycle.

Random – turns LED pins on and off randomly. When in Operations mode – F10 - the F6 controls whether the lights sequence “spools” up or down. In other words, the sequence will randomly turn the lights On/Off to about 80% (default) of the pins being On at any one time when F6 is on. After the lights have been randomly on, turning F6 OFF will randomly shut off the lights until they (the pins with Random set = 6) are all off. The other Modes will continue to operate.

In non-DCC connected mode the default for F6 is On – which means the LEDs will keep randomly repeating.

Flashing – alternate flashes any Odd/ Even pins.

TV Simulation – randomly turns one or more LED pins on at varying light levels to simulate the changing scenes on a TV. An RGB LED “chip” is available to simulate a color TV. This requires four (4) LED pins – three for the RGB LEDs and one for a white (6500k) LED chip. For black and white TV simulation a single Blue and White TV “chip” is recommended. To make this work best you will want to adjust the bright level of each of the pins so that one color doesn’t overwhelm the other.

Very likely you will want to adjust the light levels down so that the varying brightness that occurs randomly can be seen.

MARS – fades the pin up and down with a brief flash every onther cycle.

Arc Welding – a random cycle of flashing with brief pauses – three settings are available that determine the length of time between cycles – or how fast the worker is working.

Lightning - as series of flashes with periodic sub-flashes - a random cycle of flashing with brief pauses – three settings are available that determine the length of time between cycles.

STEPS TO CONFIGURE THE CONTROLLER

1.1 Setting the Pin MODE [F1] [F3]

- a) All Functions Keys OFF
- b) F1 [On] - enter configuration mode
- c) Select LED pin by using the speed dial (1-16) – Pin will light.
- d) F3 [On] - disables pin select mode; now select the MODE (0-12) with the speed control.
- e) F2 [Press Once] – selected pin LEDs will flash to confirm SAVE of new bright level for pin.
- f) F3 [Off] – Exit Mode Select adjustment; now in pin select mode.

This is where I mentioned you might get confused if the LED is not lit. Check the speed dial – is it between 1 and 16?

- g) Use the speed dial to select another pin to adjust OR,
- h) F1 [Off] Exit pin configuration mode.

1.2 Configure ALL LEDs Bright Level [F4]

- a) All Function keys OFF
- b) F0 [On] – all LEDs should be lit
- c) F4 [On] - LEDs will dim to the setting on the speed dial.
- d) Adjust the speed dial 0-100% to your liking.
- e) F2 [Press Once] – all LEDs will flash to confirm SAVE.
- f) F4 [Off]

Note: This is the only configuration that can be made without using F1.

1.1 Configure a single LED pin Bright Level [F1] [F4]

- i) All Functions Keys OFF
- j) F1 [On] - enter configuration mode
- k) Select LED pin by using the speed dial (1-16) – Pin will light.
- l) F4 [On] - disables pin select mode; now adjust the brightness with the speed control.
- m) F2 [Press Once] – selected pin LEDs will flash to confirm SAVE of new bright level for pin.
- n) F4 [Off] – Exit brightness adjustment; now in pin select mode.

This is where I mentioned you might get confused if the LED is not lit. Check the speed dial – is it between 1 and 16?

**** Make sure your speed DIRECTION is set: Forward for Digitrax and Reverse for all others.**

- o) Use the speed dial to select another pin to adjust OR,
- p) F1 [Off] Exit pin configuration mode.
- q) Test the selected pin by pressing the function key for that pin:
F11 = pin 1, F12 = pin 2, F13 = pin 3, etc.
- r) OR, F0 will turn on all pins and you can evaluate the pin that you configured.

1.2 Adjust Individual Pin Blink Speed [F1] [F10]

Each of the 16 pins can be set to blink, and each can blink on and off a different rate. When you use F10 below to activate the adjustment of the blink rate, the MODE setting for the pin may or may not be set to Blink. In fact, the default for all pins is Random(6). However, when you press F2 to SAVE any adjusted blink rate, the controller will also set that pin's MODE setting to

Blink (3). It assumes that is what you want to do so that when you activate Animation with F10 – the pin will, in fact, blink.

If you don't save the Blink settings with F2, the controller will abandon your adjustments and use whatever the set MODE setting is – which may not be Blink(3)

- a) All Functions Keys OFF
- b) F1 [On] - enter configuration mode.
- c) Select LED pin by using the speed dial (1-16) – Pin will light.
- d) F10 [On] – Pin will start blinking at the existing saved setting which could be the system default. Since F0 is Off, the blink rate you will adjust first is the OFF time. Use the speed dial to increase the time the LED is off.
- e) F0 [On] – Adjust the time for the LED to be on.

** F0 Toggles between controlling the ON time and the OFF time.

- f) Use the speed dial to adjust the time the LED is on.
- g) F2 – Press once to save the settings. All the LEDs will flash to confirm the setting was saved.
- h) F10 [Off] – turn off adjusting the LED blink timing. If you still have F1 on, you will need to adjust the speed dial to get back in range 1-16 for any of the LEDs to light.

Note: if you turn F10 Off before you save the new settings, the pin will revert back to the system stored settings.

A good way to test this new setting is to press F5 On to activate the Animation mode.

1.4 Set the Fade Mode/Speed on individual pins

Set the pin to MODE = 5 to turn this pin to Fade on and off on a cycle. We use this to have the street lights go on and off for example. To adjust the time you will need to change the CV's for the time ON and the Time OFF for this pin. The CV's for blink time on and off and Fade mode timing are the same so. The Mode setting determines what FX the pin will exhibit.

The CV for Fade time On are 160-175. Pin one is 160, pin 2 is 161, ect.

The CV for Fade time OFF are 176-191, Pin one OFF time is CV 176, pin two is 177, etc.

The default time multiplier is 10 seconds. So, a CV value of 2 will result in a fade time On or Off of 20 seconds.

The time multiplier CV is 117. You can set this to a max of 255 and you can set the time On or Off to 255 which would result in a time On or Off of 65,025 seconds. That is 1,084 minutes or about 18 hours!

A characteristic of the fade behavior is that the number of "steps" that the fade will execute is directly related to the brightness – which can be set individually for each pin. That means that the pins will fade up and down at different apparent rates based on how many "steps" it has to take to get to or from the bright level. A pin set at bright level 25 will finish sooner than a pin set at 50 or 99.

Finally, the amount of light that the LED emits at 25%, 50% and 99% is not linear. It follows a curve which has the effect of making the fade more apparent between a bright setting of 10% and 20% than between 50% and 99%. It's just the way the LEDs work and how our eye perceive it. You can speed this up or slow this down with CV 116 which is at a default of 25. You can increase it or decrease it but know that this CV affects ALL fade

operations for all pins. Therefore, if the brightness level is different for different pins the Fade Speed CV 116 will affect all of them. To get the same fade speed among pins, adjust the brightness to match.

1.5 Adjust the Random Delay – All Pins - [F1] [F6]

The Random behavior affects any pin where Mode = 6. However, pins that have been individually turned on by a function key [F11-26] will stay lit and will be skipped until they are “manually” turned off via the function keys. If you want your animation to turn on certain LEDs and keep them On, set their MODE to 1 (always on). Mode 1 only activates during F5 – animation.

You can activate Random while NOT in Animation Mode by using F6. In this way the other animations such as always on, blink, flashing and TV will not activate. Only LED pins set to Random will activate.

In Animation Mode and DCC connected, once you turn F6 on and at least one LED has come on, the controller knows this. Then what happens when you turn F6 Off is that the controller will keep behaving randomly but it will turn the LED's off until eventually they are all extinguished, again, except for those you manual turned on with function F11, F12 ~ F26.

The Random delay setting has the effect of stretching out the pace of the “randomness”. Since the whole behavior is random including the timing, we can't tell you exactly by “how much”. The default setting is 5 so if you change that to 50, for example, it will really stretch the timing – which is what you might want. 5 is the setting where it changes enough to keep the scene interesting.

During Animation mode roughly 85% of the LEDs will be on. You can change this by setting CV 116 to a number lower than 60 (default) so that for example, only 20% of the LEDs are on at a time.

- a) All Functions Keys OFF
- b) F1 [On] - enter configuration mode.
- c) F6 [On] – activate Random delay control – nothing visible will happen.
- d) Adjust the speed control to increase or decrease the value of the delay setting for all pins. 5 is the default and 1 is the minimum. If you try to set it to 0 pressing F2 will not flash – meaning that it did not save the value.
- e) F2 – Press once to save the settings. All the LEDs will flash to confirm the setting was saved.
- f) F6 [Off] – Exit setting Random delay
- g) F1 [Off] – Exit Configuration mode.

1.6 Adjust the Step Speed – All Pins - [F1] [F7]

The Step mode is not obvious. Imaging a night watchman inside a building going room by room to turn the lights on or off. How many steps does he take between each action of hitting the switch? Thus, was born Step mode. What happened though is that I set the Step speed very low to test the prototype controllers and ended up with a chase sequence – very fast. Use it however you like. Step is a behavior that affects all pins simultaneously, it overrides any individual pin setting and is only available in Operator mode. F7 does not function without F0. Since F0 overrides F10 animation you can't mix the F7 behavior with other effects.

- a) All Functions Keys OFF

- b) F1 [On] - enter configuration mode.
- c) F7 [On] – activate Step speed control – nothing visible will happen.
- d) Adjust the speed control to increase or decrease the value of the step speed setting for all pins. 10 is the default and 1 is the minimum. If you try to set it to 0 pressing F2 will not flash – meaning that it did not save the value.
- e) F2 – Press once to save the settings. All the LEDs will flash to confirm the setting was saved.
- f) F7 [Off] – Exit setting Step speed
- g) F1 [Off] – Exit Configuration mode.

1.7 Adjust the Flashing Speed – ALL – [F1] [F8]

Flashing mode blinks alternate Pins on and off so that you can use any combination of odd/even pins, not necessarily adjacent to each other, to create an alternate flashing mode. You could also use only odd or even pins to give a group of LEDs a synchronized blink. Use this Flashing speed adjustment to set the speed. Flashing uses evenly spaced timing of On/Off which is different than using Blink where the On and Off times can be different.

- h) All Functions Keys OFF
- i) F1 [On] - enter configuration mode.
- j) F8 [On] – activate Step speed control – nothing visible will happen.
- k) Adjust the speed control to increase or decrease the value of the step speed setting for all pins. 10 is the default and 5 is the minimum. If you try to set it to below 5, pressing F2 will not flash – meaning that it did not save the value.

- l) F2 – Press once to save the settings. All the LEDs will flash to confirm the setting was saved.
- m) F8 [Off] – Exit setting Step speed
- n) F1 [Off] – Exit Configuration mode.

Configure Mimic Mode - F11 & F12 MODE [F1] [F3]

Mimic mode was born out of a sudden discovery at a local HO club that the Digitrax DT400 and other older DCC systems did not have an easy way to access the extended function keys above 12. Yikes! I had been using the DT500 which handles this nicely. Further researched showed that all controllers have at least the ability to activate functions F0 to F12.

Therefore, for use when in Operator mode only, Mimic mode allows you to configure LED pins 3-16 to “mimic” either F11 or F12, LED pins 1 and 2 respectively. The mimic function will only perform two behaviors: On/Off and Fade. When you turn on F11, any pin configured to mimic it will turn on or off. If LED pin 1 or 2 is configured to Fade (5), then the pins set to mimic will also fade on and off. LED pins set to mimic WILL respond to the Random behavior in Animation mode. That is UNLESS they are Fade to ON. On by a function key overrides the Random behavior. The LED will stay on, mimicking the function key F11 or F12. When either of these is Off or Fade to OFF, the Random behavior will pick up these pins again and they will join the animation. I know that might

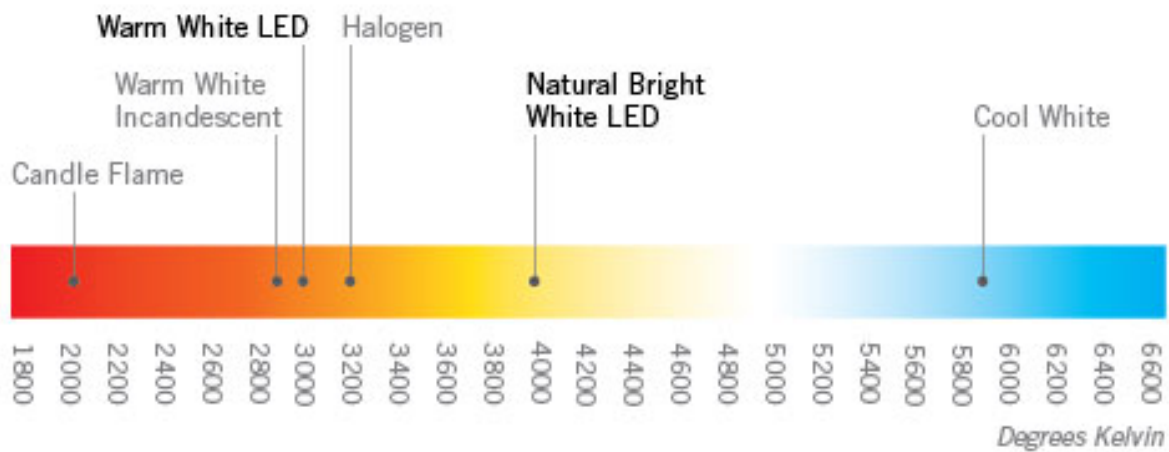
sound complicated, but it should make it easier for folks with older DCC controllers to control their LSC II.

Mode Adjustments Available via CV's Only:

Since function keys F2 and F4 have other special uses, the flicker and beacon speeds can only be changed via programming their designated CV values.

LED “chips” are available in the following colors:

- 2000K
- 3000K
- 5000K
- 6500K
- TV Sim (Blue & White)
- TV Sim (RGB)





OPERATOR INSTANT-FX FUNCTION KEYS

Function Key	Behavior	Comments
F0	All pins On/Off	Overrides all functions, except when F1 is on.
F4	Adjust All Pin Brightness	With F0 -forces all pins to the same bright level, use F2 to save
F5	Activate Animation	Turns on the system to animate as per settings.
F6	Random	Random On/Off. F6 OFF after having been on will turn off LEDs at Random till none.
F7	Step mode	Pins On/Off in sequence. Use with F0 to activate
F8	Alternate Flashing	All pins flash alternately odd/ even.
F11-26	Turn on individual pin	Add 10 to Function key number : pin 1 is F11, Pin 16 is F26

CONFIGURATION MODE FUNCTIONS & SPEED CONTROL

Function Key	Use & Behavior	Comments	Default
F0	Switch On/Off time for Flashing	Used with F3 Blink speed setting to switch from On time to Off time	
F1	Enter Configuration Mode	Use F1 to activate Configuration mode, Animation will stop.	
F2	Save Settings	Push once to save. LEDs will blink to confirm a valid settings was saved.	
F3	Switch to MODE select	With F3 On, use the speed control to select a pin MODE number.	
F4	Adjust pin Brightness level	Use the speed dial to adjust thses settings. Since these apply to all pins, no pins will be lit. A succesful save will be indicated by all the pins flashing when you press F2.	20
F5	Adjust Fade speed		2
F6	Random speed		10
F7	Step speed		5
F8	Alternate Flashing Speed		3
F10	Adjust pin Blink time On & Off	Use F0 to choose On or Off Time. If FO is OFF, then OFF time for LED.	

MODE CONFIGURATION VALUES [F3]

Value	Behavior	Notes:	Animation
0	Pin disabled	No output on this pin during Animation.	
1	Always On	Pin will turn On during animation & ignore Random	
2	Flickering	Flickering to simulate an oil lamp or a fire	
3	Blink	The pin will blink On and Off at the configured speed for each pin	
4	Rotating Beacon	Simulate a rotating beacon.	
5	Fade	Operator Mode only. Use the pins function key to activate	
6	Random	Default mode	
7	Step	Sequentially turn LEDs on/Off. Activate with F0	
8	Flashing	Alternate equal time On/Off Flashing.	
9	TV Simulator	Simulate B&W or Color TV. 2 pins for B&W, 4 for color	
10	Mars beacon Simulation	Simulates a MARS style headlight	
13,14,15	Arc Welding simulation	Random flashing bright, 3 speed of delay between work.	
16,17,18	Lightning Simulation	Random Flash, then smaller flashes, 3 time delays	
99	RELAY	Sets the output voltage to Logic 5V, must be triggered from DCC.	

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LED Scene Controller II - MASTER CV LIST

Description	CV #	Default	Type	Min	Max	Comments
Board Address	2	3MMRA		1	System	Support for short and long addresses
DCC Time Out time (no DCC Signal)	112	5Seconds		1	255	Auto switch to Animation
LED Light level for each port	128-143	10Percent		0	99	
Mode (Behavior) Setting for each Port	144-159	1Integer		0	19	
Time ON (Used for Blink and Fade)	160-175	10Integer		1	255	
Time OFF (Used for Blink and Fade)	176-191	10Integer		1	255	
Timer ON or OFF	192-207	1Integer		0	1	
DCC timeout	112	5Seconds		5	255	time to wait after no DCC
Flicker Random time range Lower	113	40x100 Milli second		10	255	Random value between ranges
Flicker Random time range Upper	114	80x100 Milli second		10	255	Random value between ranges
Beacon "rotation" speed	115	40x100 Milli second		10	255	Time to ramp up/down LED light
Fade Speed	116	25x100 Milli second		10	255	Dependent upon light level setting
Fade Time increment in Seconds	117	10x10 Seconds		10	255	Multiplier to Time On/Off CV160-191
Random Delay	118	25x100 Milli second		1	255	time between apparent changes
Random Percent On	119	60Percentage		10	80	Control mostly On or mostly Off
Random - One Pin On/Off	120	0Integer		0	1	Random on one pin at a time
Random Mode Fade	121	0Integer		0	1	Activate Fade on Random Ports
Step Delay	122	10x100 Milli second		5	255	Time between each port LED on
Step Type	123	0Integer		0	20	Normal, 1-Chase, 2-Race
Flash (Alternating Pins) Speed	124	15x100 Milli second		5	255	Flashing of alternating Pins
Lightning Delay	125	1Integer		1	255	Minutes
Blink ON duration (16 Ports)	160-177	5x 10 Milli seconds		1	255	Individual Port Settings
Blink OFF duration (16 Ports)	176-191	10x 10 Milli seconds		1	255	Individual Port Settings

0	Disabled
1	Always On
2	Flicker
3	Blink
4	Beacon
5	Fade
6	Random
7	Step
8	Flashing
9	TV Simulation
10	Mars
11	Mimic F11
12	Mimic F12
13	Arc Welding 1
14	Arc Welding 2
15	Arc Welding 3
16	Lightning 1
17	Lightning 2
18	Lightning 3

A word about SLOTS.

Not technically a power issue, it is still worth mentioning something about **Slots**. All DCC systems have a certain number of slots that they maintain – one slot per loco. The LSC II uses the same slots that engines use. Therefore, you have to be thoughtful about how to allocate slots to the lighting animation and the locos.

What seems to work best is to configure each controller separately by giving it a “fresh” address out of the box. I use 88 as a habit. Then I connect the building, streetlights, etc. and begin the configuration. Once I am satisfied with how it looks and runs, I use the BUILT-IN Addressing mode to change it to match the group of other controllers I previously installed – without disconnecting or moving it or them from the layout!

Let’s say my group of existing controllers are all address 500. When I change the new controller from 88 to 500 – it just “joins the group” so to speak. Then I dial in 500 and hit F10 (Activate Animation) and all the controllers and their associated LEDs do their thing. I have roughly a dozen groups of controllers on my layout but my DCC system has 400 slots – more than enough!



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