16 Port LED Lighting Controller 5

Version 1.1b

INTRODUCTION

This documentation is not comprehensive. Instead, we opted to create many short video snippets that cover all the operational aspects of the LLC-5. Doing so is faster and, in many ways, and easier to understand than a lot of words. These video snippets are located on our website under TECHNICAL, PRODUCT DOCUMENTATION.
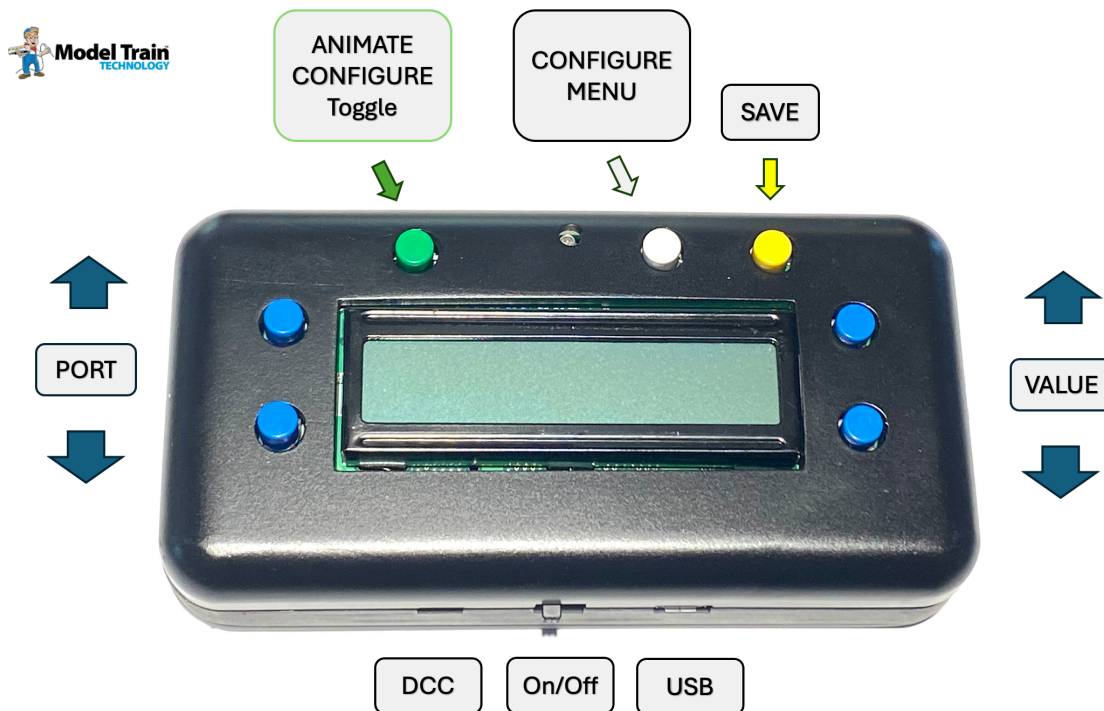
OVERVIEW

The LED Lighting Controller 5 (LLC-5) is a powerful but simple-to-use LED animation Lighting Controller. You should be able to navigate and configure all the features and function after only a few minutes of experimenting and following the videos.

The LLC-5 has up to 3A capacity depending on the AC Adapter/Power Supply. The MICRO-5 has a 2Amp limit.

In practice, it is not necessary and not recommended to run LEDs beyond even 50% because the human eye can't tell the difference in brightness. Further, the scene controller is meant to add individual lighting elements rather than light large areas.

Each pin can operate separately, or multiple pins can be "coordinated" to create other effects. For example, the alternate flashing mode allows any two adjacent pins to, you guessed it, alternate flash. If you set all 16 pins to this mode, you have a marquee lighting effect. This one controller can run the police lights, a crossing gate, multiple random on off ports, a rotating beacon, fade streetlights on and off and show a TV simulation in a building – all at the same time!

Additionally, if you have a DCC Command System for running your trains, you can connect the LLC-5 and control (turn on

and off) any combination of those effects from your hand controller.

A common challenge with using LEDs is deciding what voltage and resistor value to use so as not to burn them out. To solve this the LLC-5 includes built-in resistor in addition to allowing you to control the effective output voltage by setting the maximum brightness. This allows you to mix and match 3.3v and 12v LED on the same LLC-5 .

We've enclosed the LLC-5 inside a sleek case and designed the base of the unit with matching bracket (sold separately) that allows you to snap the unit in place anywhere around your layout. 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 all, one or groups of pins with up to 18 hour timer.
- 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 (3 timings)
- Lightning (3 timings)

** 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.

The LLC-5 has a DCC onboard decoder. With this release of the LLC-5 we have added triggers that can be activated by your DCC system. Setting Triggers and Trigger timeouts is discussed at the end of this manual.

When you connect the LLC-5 to DCC it only utilized the digital signal for control. The power for the LEDs comes exclusively through the power adapter, not from your DCC system.

POWERING the LLC-5 (12-18V DC up to 2Amps)

The LLC-5 requires an external power supply to operate. If you connect DCC as the main power source to the LLC-5 it will only read the digital signal, which is only a few milliamps, and will not draw current to power the LEDs. This is great for Club setting where keep track and accessory power separate is a requirement.

FUNCTIONS:

To switch between Animation mode and Configuration mode, push and hold button the LEFT TOP Animation On/Off button for about 1 second and release. Pushing this button toggles back and forth between these two modes. The LLC-5 will not react to a very quick push. If your push is too long the LLC-5

will switch back and forth. After a few tries you will get the hang of it.

To change the port number, push the Up or Down blue buttons on the left side top of the LLC-5.

To configure a Port to behavior with a specific special effect, select the port number then select the behavior but push the right-side blue buttons up and down.

Press the <mark>SAVE</mark> button once to save this to the LLC-5 .   The digits will blink indicating a successful save. The setting is saved even when power is turned off or disconnected.

You can change the setting as many times as you want.

Remember to press Save.

To see the behavior, switch back to Animation mode.

ADJUSTING THE LED BRIGHTNESS:

To adjust the brightness of any Port, switch the LLC-5 into Configuration mode. Navigate to the port you want to adjust. The number on the right now indicates the brightness level 0-99% of the port that is selected. Push the right-side blue Up and Down buttons to adjust the brightness up or down.

3.3V and 12V settings

The LLC-5 is configured so that a 100% brightness setting is ~14VDC. This is a few volts higher than 12V which is maximum for the Woodland Scenic Roomette® products as well as other 12V LEDs. The <mark>default</mark> brightness of all the ports is set at 10%. This is the MAXIMUM value for 3.3V LEDs with an 18V power source.   In this way if you plug in only 3.3V LEDs when you start up you won't have any problems. And then you can adjust them as you need.

<mark>It is possible to burn out 3.3V LEDs very quickly by applying excess current above the 50% setting. We opted to give you this flexibility so that you can mix and match 3V and 12V LEDs on the same LLC-5 . Please use this wisely.</mark>

Press the **SAVE** button to save the new setting. If you don't press Save and you change ports or switch modes, the LLC-5 will revert to the previously saved setting.

The buttons have a "fast" mode. If you hold the key down for 2-5 seconds, the rate of change roughly doubles.

CONNECTING LEDs

The LLC-5 has 16 Ports, labeled counterclockwise as viewed from the top of the LLC-5 . You can use the ports in any order.

CONFIGUREING THE LLC-5 for Special Effects

We suggest you start with some basic setting so you can quickly become familiar with how the LLC-5 works.

Some FX work with several ports in unison. Step, Chase, Race and TV sim work this way by design. But you can also mix effects on different ports. For example, you might use an Arc Welding FX with a flicker effect on a red LED to simulate the hot metal.

On one of our displays we have a HO police car that we kit bashed from Woodland Scenic. We connect the headlights, rear lights and the top Red beacon to three different LLC-5 ports and three different effects.

Step, Chase and Race require a group of adjacent pins to make sense. The effect will turn each light on in sequence with a small timing gap between them.

- The MARS effect uses the Beacon Timing. Therefore, to set the speed of the MARS effect, set the PORT to the Beacon setting that corresponds to the desired speed. Save it. Then change the Port FX to Mars.

- Fade – Fade timing is by default in 10 second increments. This can be increased or decrease via CV #127. The range is 1-255. The duration of the ON time and OFF time are set via the keypad or CV's. (see the chart). The range is 1 to 255. Thus with 255 set to a port ON and the seconds increment set to 255 you can have a timer that is 65,025 second or 18 hours long! That is extreme but this wide range allows you to set

your layout animation to turn the lights on and off to a 24-hour cycle. For example, ON for 12 hours and then OFF for 12 hours, or On for 18 hours and OFF for 6. The LLC-5 does not have a real time clock (RTC) so it's only counting seconds from when the device is powered and animation is activated. It doesn't know what time of day it is.

- Welding 1,2 and 3 use different time gaps between activity. 1 is the shortest and 3 is the longest. Combine these on different Ports so that one activity FX is the white-hot arcing and the longer period could be a RED led meant to show the red-Hot arcing.

- Lighting – setting them Mode to 16 follows the value in CV 125 which is a 1-minute delay by default. Lighting 17 divides this by ½ and Lighting18 doubles the value.

- The Step FX turns on and off LEDs in sequence starting at Port 1 (if it is set to a 7 series) through to 16. It will skip Ports that are not set to a 7 series 71-79)

  o The Race sequence repeats by starting at 1

  o The Chase sequence repeats by going backward from 16, then forward at 1, so back and forth.

  o Each LLC-5 can either Race or Chase but not both simultaneously.

- DCC Signal Scan is the amount of time that the LLC-5 waits after power on to switch into animation mode if it does not detect a DCC Signal. You can select ANY Port since it affects the entire device, select the value for the delay option and press SAVE. The previous FX behavior for that Port will NOT change.

  To see the effect, you must switch OFF the LLC-5. After it's start up cycle you will be able to detect a change in time that it takes to start the animations – assuming you are not connected to DCC. If you are connected to DCC, you must press F5 (Animation ON/OFF) to activate the device animation.

- TV Simulation works with a White and Blue LED on separate Ports or in Color with a 3 separate Ports connected to an RGB (Red-Green-Blue) LED. The LED type is common Anode. (You can buy the proper RGB LED chip from our store.) The different settings are meant to simulate different types of TV activity. It's not perfect but it is effective, nonetheless. You can mix the FX on each color line if you want. This effect is a Random-on-Random effect so it may be very difficult to track the differences.

USING SWITCHES TO SIMULTATE TRIGGERS

The LLC-5 will let you set triggers so that a port only displays when its trigger is tripped or "active". You can assign any valid switch address within the 16 addresses starting with the first address set for the LSC-IIa. By default, your LLC-5 is set

the address 3. That means that all the switch addresses from 3 to 18 are available to assign to ANY of the LLC-5 ports. By doing so you can have one or more ports by triggers simultaneously and you can have multiple LLC-5 on the layout react in parallel.

When trigger #1 is tripped, the trigger will stay activated as long as the switch is Thrown (ON). After the switch is Closed (OFF) the port lights will continue to Animate for 5 seconds and then turn off. The trigger Timeout STARTS after the detector is OFF.

You can change the duration of the Trigger Timeout as described below.

Trigger Timeout Settings

Trigger Timeout is the amount of time that Animation continues AFTER a detector has stopped detecting – by whatever means you have set up.

When you activate a trigger, the trigger stays on for five seconds by default. Then the trigger shuts off. The trigger will stay on until the switch is turn off, and then for five seconds more. You can shorten or lengthen the amount of time that the trigger stays active after the sensor has stopped. The shortest time is immediately, the longest time is 255 seconds (4 ½ minutes).

To change the Trigger Timeout, set the CV values 224-231 to correspond to the port you want it to activate.

WRITING CVs WITH THE KEYPAD

See the video for a demo and explanation

SETTING THE DCC ADDRESS OF THE LLC-5 a

1. Press the Green button to enter configuration mode.
2. Press the WHITE button to scroll through the options to reach the DCC address..

To change the address, press the RIGHTSIDE blue buttons up and down.

** holding down the up or down button will speed up the changing of the numbers. Holding longer will put the scrolling into hyper speed scrolling. Release to stop.

Press the yellow SAVE button to save the new address.

If you are using Multi-Function decoder mode, remember to change the loco address on your DCC Hand controller to the new address you assigned. For Accessory mode it doesn't matter since you will be using SWITCH commands.

In Accessory mode the address of the *LLC-5* is always the first Trigger.

Reading the Serial Number and Product version

Using the configuration mode, navigate to the Serial Number and Product Version.

Software Updates and new functionality.

We are constantly receiving feedback from customers about new features and we add them as we can and seem appropriate. That means that your LLC-5 will have "old" software a week after we ship. Therefore, here is our upgrade policy:

We will upgrade your software on the LLC-5 for two year FREE of charge, less shipping. Simply send us the device and we will return it with the latest and greatest. Order the upgrade shipping kit on our website and then send the device to the address listed. In the future you will be able to update the software from your computer.

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We use open source software and adhere to the GNU licenses.

We have Patents Pending for our products.

LED Lighting Controller 5 - GLOBAL CV LIST

Description	CV #	Default	Type	Min	Max	Comments
Default MODE for RESET	112	0	integer	1	16	sets all ports to this value on reset.
BOOT UP delay	113	5	seconds	5	255	wait time after no DCC signal when connected
Flicker Random time range Lower	114	40	x100 Milli second	10	255	Random value between ranges
Flicker Random time range Upper	115	80	x100 Milli second	10	255	Random value between ranges
Fade Speed	116	25	x100 Milli second	10	255	Dependent upon light level setting
Fade Tme Mutiplier	117	10	10 Seconds	10	255	Multiplier to Time On/Off CV160-191
Random Delay	118	25	x100 Milli second	1	255	time between apparent changes
Random Percent On	119	60	Percentage	10	80	Control mostly On or mostly Off
Random - One Pin On/Off	120	0	Integer	0	1	Random on one pin at a time
Random Mode Fade	121	0	Integer	0	1	Activate Fade on Random Ports
Step Delay	122	10	x100 Milli second	5	255	Time between each port LED on
Step Type	123	0	Integer	0	2	0-Normal, 1-Chase, 2-Race
Flash (Alternating Pins) Speed	124	15	x100 Milli second	5	255	Flashing of alternating Pins
Lightning Delay	125	1	Integer	1	255	Minutes

PORT Configuration Variable Address Map

	CV Range	Value	PORT NUMBER 1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
LED light level	128-143	0-99	128	129	130	131	132	133	134	135	136	137	138	139	140	141	142	143
Animation Mode	144-159	0-18	144	145	146	147	148	149	150	151	152	153	154	155	156	157	158	159
Time On (Blink,Fade)	160-177	0-255	160	161	162	163	164	165	166	167	168	169	170	171	172	173	174	175
Time Off (Blink,Fade)	176-191	0-255	176	177	178	179	180	181	182	183	184	185	186	187	188	189	190	191
Timer On	192-207	0,1	192	193	194	195	196	197	198	199	200	201	202	203	204	205	206	207
Trigger Port assignment	208-215	0-16	208	209	210	211	212	213	214	215	216	217	218	219	220	221	222	223
Tigger Timeout	224-239	0-255	224	225	226	227	228	229	230	231	232	233	234	235	236	237	238	239
Beacon Speed	240-255	0-255	240	241	242	243	244	245	246	247	248	249	250	251	252	253	254	255

Disabled	0
Always On	1
Flicker	2
Blink	3
Beacon	4
Fade	5
Random	6
Step	7
Flashing	8
TV Simulation	9

Mars	10
Arc Welding 1	11
Arc Welding 2	12
Arc Welding 3	13
Lightning 1	14
Lightning 2	15
Lightning 3	16
TBD	
TBD	

CONFIGURATION OPTIONS

1 - MODE
2 - LIGHT OUTPUT
3 - CV CONFIGURATION
4 - TRIGGERS
5 - DCC ADDRESS
6 - RESET
7 - DEVICE INFO

ONE YEAR **MANUFACTURER WARRANTY**: We warrants this **product** to be free from defects in workmanship and materials, under normal residential use and conditions, for a period of one (1) year for the original invoice date. Shipping and handling fees are to be paid for by the customer.

LIMITATION OF LIABILITY. UNDER NO CIRCUMSTANCE SHALL COMPANY OR ITS AFFILIATES, PARTNERS, SUPPLIERS OR LICENSORS BE LIABLE FOR ANY INDIRECT , INCIDENTAL, CONSEQUENCIAL, SPECIAL OR EXEMPLARY DAMAGES ARRISING OUT OF OR IN CONNECTION WITH YOUR USE, OR INABILITY TO USE THE PRODUCT, WHETHER OR NOT THE DAMAGES WERE FORESEEABLE AND WHETHER OR NOT COMPANY WAS ADVISED OF THE POSSIBLITY OF SUCH DAMAGES. WITHOUT LIMITING THE GENERALITY OF THE FOREGOING, COMPANY'S AGGREGATE LIABILITY TO YOU SHALL NOT EXCEED THE AMOUNT OF THE PRODUCT. THE FOREGOING LIMITATION WILL APPLY EVEN IF THE ABOVE STATED REMEDY FAILS OF ITS ESSENTIAL PURPOSE.

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