LCC Fast Clock

User's Guide

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1. Introduction

Thank you for purchasing a *Logic Rail Technologies* product. The LCC Fast Clock (LCC-FC) provides fast clock time keeping and display capability as part of the NMRA Layout Command Control standard. The LCC-FC has the following features:

- Large (0.8”), easy-to-read, red LED digits
- Configurable 12 or 24 hour time format, PM indicator, flashing colon, and more!
- “Triggering” for up to 1440 unique, time-based LCC events (one per fast minute in a 24 hour day)
- Two LCC bus jacks for connecting the LCC-FC to other LCC-FC modules or any other LCC device
- Pre-mounted faceplate

1.1 Package Contents

This package includes the following items:

- Fast clock module with pre-mounted faceplate
- 2 ft. LCC cable
- User Guide

1.2 Power Requirements

The LCC-FC will operate from 9-13.5VAC or 12-18.5VDC and draws a maximum current of 150mA (0.15A). It can be powered from the LCC bus or from a suitable wall transformer such as our WT12DC. See section 3 for more details! When using a wall transformer take care when plugging into an available AC outlet. **Caution:** children under the age of 14 should not be allowed to do this without adult supervision! Electrocution and death could occur! The plug end of the wall transformer must be female with dimensions 2.1mm ID and 5.5mm OD.

2. Quick Start Guide

The LCC-FC is ready for installation. You should be able to have it up and running on the LCC bus in a matter of seconds (*real* time seconds, not *fast* time seconds!). You'll be able to use the module's pushbuttons for most settings and can use JMRI PanelPro for advanced features. Follow these simple steps:

1. Make sure that the LCC-FC power source is OFF.
2. Plug either end of an LCC cable into either of the LCC jacks on the rear of the LCC-FC module. Make sure you hear the connector "click."
3. Plug the other end of the LCC cable into any other LCC device. If this LCC-FC module is the last one in the "chain" make sure you install an LCC bus terminator into the other (open) LCC jack on the LCC-FC module.
4. Refer to Section 4 for power methods then move on to the next step.
5. Turn on the power source.
6. The LCC-FC display will light up and begin operating. Refer to Section 5 for instructions on using the LCC-FC pushbuttons to configure various settings or Section 6 for instructions on using JMRI PanelPro for all configuration settings.

3. Choosing a Fast Rate

There is no right or wrong fast rate value to use. It can vary from scale to scale and user to user. If you want to operate your railroad "by the clock", some points to keep in mind are:

the distance between stations or towns; the longer the distance, the lower the fast rate can be.
switching time; it doesn't make sense to choose a high fast rate if your switching crew is totally overwhelmed by the clock and they can't enjoy their work!
train speeds; the faster you run your trains, the faster you'll need to run the clock in order to make distances appear longer.
average operating session length; if you expect to complete an entire day's work in a three hour operating session, then you should choose a fast rate of around 8.

For a detailed discussion of fast clocks and their usage consult the book How to Operate Your Model Railroad by Bruce A. Chubb. You may want to try operating your layout a few times with different fast rates to assess which is most fitting. Typically, most modelers choose a fast rate between 2 and 6.

4. Power methods

The LCC-FC can be powered in 3 different ways.

- Bus power: the LCC-FC will take power FROM the LCC bus
- Self-power: an external wall transformer plugs into the LCC-FC and provides power TO the LCC bus
- Local power: an external wall transformer plugs into the LCC-FC but does NOT provide power TO the LCC bus

There is a three-pin jumper block (with the designation JP1) on the back of the LCC-FC module near the lower left corner; there is text above the jumper block which reads LCC BUS PWR. There is a two-pin jumper block (with the designation JP2) on the back of the LCC-FC module to the left of the LCC bus jacks. The position of the blue shorting plugs on these jumper blocks determines which power method is being used.

Power method	**JP1 shorting plug**	**JP2 shorting plug**
Bus power	Cover left & center	Cover both pins
Self-power	Cover center & right	Only cover one pin
Local power	Only cover one pin	Cover both pins

For the cases where only one pin is covered we recommend installing the blue shorting plug on any one of the pins on that jumper block so that you don't lose the shorting plug!

5. Local Configuration Settings

The local configuration setting mode uses the LCC-FC's four front panel pushbuttons (keys) as well as the display. Some of the settings are "volatile" which means that they are only in effect while the LCC-FC has power. Other settings are "non-volatile" or persistent which means they will stay in effect even after power is turned off then on again. The functions are summarized as follows:

Menu Press this key to enter the local configuration setting mode. Press it again at any time to return to the current time mode.

⬆ Press this key to advance ahead to the next menu choice. When changing values (e.g. fast rate) this key will increment the value. When entering a time (current time, initial time) pressing this key will advance the Hours value.

⬇ Press this key to retreat back to the previous menu choice. When changing values (e.g. fast rate) this key will decrement the value. When entering a time (current time, initial time) pressing this key will advance the Minutes value.

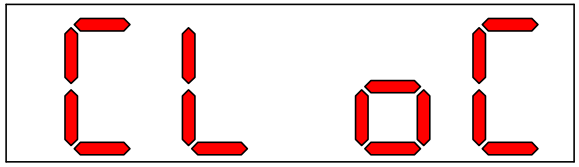
Enter Press this key to select the menu item currently displayed. When editing values pressing this key will accept the change.

When you press the **Menu** key for the first time the display will change from the current time to "cLoc". Pressing the ⬆ key will move to the next menu item; pressing the ⬇ key will move to the previous menu item. Pressing the **Menu** key again at any time will return the display to the current time. Please note that while in the local configuration setting mode the clock is still running (if the fast rate is not 0 and the clock is not paused).

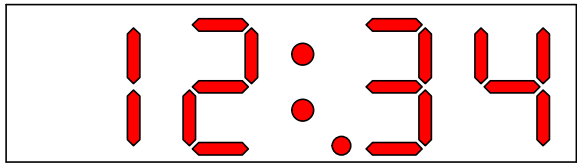
The menu items are presented in the following order:

Display	Parameter to Edit	Volatile or Persistent?
CLoC	Current Time	Volatile
rAtE	Fast Rate	Persistent
Init	Initial/Default Time	Persistent
HrFo	Hour Format	Persistent
GEn	Generator function	Persistent
PonP	Power On Paused	Persistent
rSt	Reset	Volatile

5.1 Current Time ("CLoC")



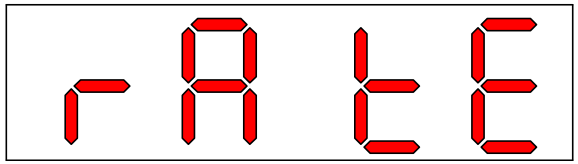
The current time can be changed by pressing the **Enter** key when the display shows "CLoC". The current time will be shown and the decimal point to the left of the tens of minutes digit will be illuminated. The PM indicator will only be illuminated if you've chosen the 12 hour time format and the current time is PM! For example, if the current time is 12:34 the display will look like this:



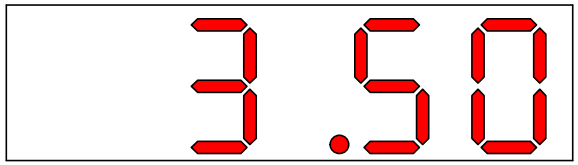
Change the hours by pressing the ⬆ key; the hours will increment from the current setting up to 23 (or 11pm) and then "wrap-around" to 00 (or 12am). Change the minutes by pressing the ⬇ key; the minutes will increment from the current setting up to 59 and then "wrap-around" to 00. If you change

your mind and don't wish to change the current time, simply press the **Menu** key; the display will return to the current time (adjusted for any fast time minutes elapsed while in this setting mode). Once you are satisfied with the new time press the **Enter** key; the display will then show "CLoC" again. At this point pressing the **Menu** key will change the display to the new current time.

5.2 Fast Rate ("rAtE")



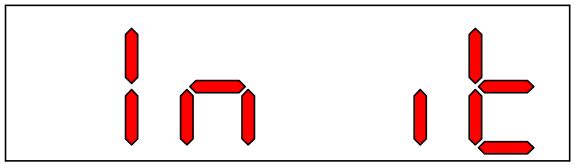
The fast rate can be changed by pressing the **Enter** key when the display shows "rAtE". The current fast rate will be shown. For example, if the current fast rate is 3.5 to 1 the display will show:



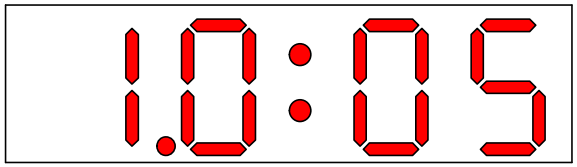
You can increase the fast rate in increments of 0.5 by pressing the ⬆ key; the fast rate will increment to a maximum of 12.00 and then "wrap around" to 0.50. You can decrease the fast rate in decrements of 0.5 by pressing the ⬇ key; the fast rate will decrement down to a minimum of 0.50 and then "wrap around" to 12.00. If you change your mind and don't wish to change the fast rate, simply press the **Menu** key; the display will return to the current time (adjusted for any fast time minutes elapsed while in this setting mode). Once you are satisfied with the new fast rate press the **Enter** key; the display will then show "rAtE" again. The new fast rate will be in effect and stored in non-volatile memory as well. At this point pressing the **Menu** key will change the display to the current time (adjusted for any fast

time minutes elapsed while in this setting mode). **NOTE: The fast rate setting range and granularity is limited when using the local pushbuttons and display; a broader range of values is offered when using JMRI PanelPro.**

5.3 Initial/Default Time ("Init")

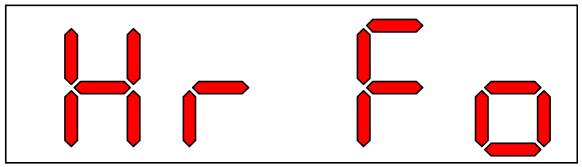


The initial (default upon power up) time can be changed by pressing the **Enter** key when the display shows "Init". The existing initial time will be shown and the decimal point to the lower left of the units of hours digit will be illuminated. For example, if the existing initial time is 10:05 the display will look like this:

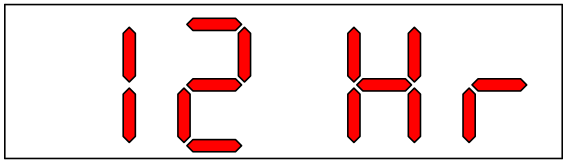


Change the hours by pressing the ⬆ key; the hours will increment from the current setting up to 23 (or 11pm) and then "wrap-around" to 00 (or 12am). Change the minutes by pressing the ⬇ key; the minutes will increment from the current setting up to 59 and then "wrap-around" to 00. If you change your mind and don't wish to change the initial time, simply press the **Menu** key; the display will return to the current time (adjusted for any fast time minutes elapsed while in this setting mode). Once you are satisfied with the new initial time press the **Enter** key; the display will then show "Init" again. At this point pressing the **Menu** key will change the display to the current time.

5.4 Hour Format (“HrFo”)

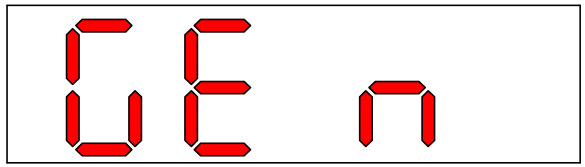


You can select either 12 or 24 hour format when the time is displayed. To change the hour format press the **Enter** key when the display shows “HrFo”. The currently selected hour format will be shown. For example, if the current format is 12 hour the display will look like this:

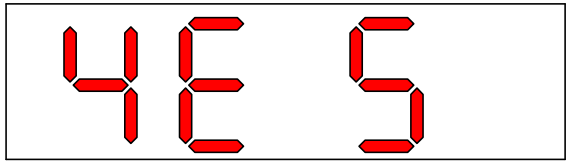


You can toggle the hour format by pressing either the ⬆ key or the ⬇ key. If you change your mind and don’t wish to change the hour format, simply press the **Menu** key; the display will return to the current time (adjusted for any fast time minutes elapsed while in this setting mode). Once you are satisfied with your hour format selection press the **Enter** key; the display will then show “HrFo” again. At this point pressing the **Menu** key will change the display to the current time.

5.5 Clock Generator selection (“GEn”)

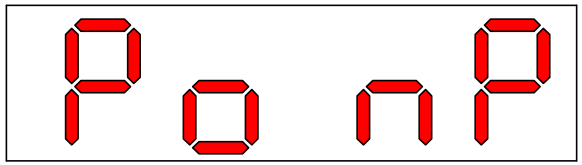


LCC Fast Clock modules can be defined as having one of two roles: Generator (or Master) and Consumer (or Slave). You must only configure **one** LCC Fast Clock as the Generator. The Generator is responsible for being the master time keeper. It also transmits the LCC Event IDs for any LCC consumer devices which have defined time-based LCC events (see Section 6). The factory default role for the LCC-FC is as a Generator. To change this module’s role press the **Enter** key when the display shows “GEn”. If the module is currently configured as a Generator the display will look like this:

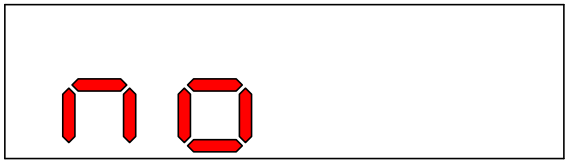


You can toggle the LCC-FC Generator role (Yes or No) by pressing either the ⬆ key or the ⬇ key. If you change your mind and don’t wish to change the role, simply press the **Menu** key; the display will return to the current time (adjusted for any fast time minutes elapsed while in this setting mode). Once you are satisfied with the role configuration press the **Enter** key; the display will then show “GEn” again. At this point pressing the **Menu** key will change the display to the current time.

5.6 Power-on Pause (“PonP”)

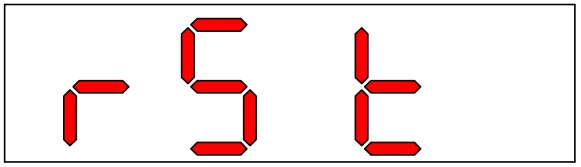


The LCC-FC module configured as the Generator can also be configured to have the clock paused when power is first turned on. The factory default is for the clock to begin running as soon as power is applied (Power-on Pause is disabled). You may wish to enable this feature if you want your operating crew to have a little extra time before an operating session starts. The Power-on Pause configuration can be changed by pressing the **Enter** key when the display shows “PonP”. If the module is currently configured with this feature disabled the display will look like this:



You can toggle this setting (Yes/Enabled or No/Disabled) by pressing either the ⬆ key or the ⬇ key. If you change your mind and don’t wish to change this setting, simply press the **Menu** key; the display will return to the current time (adjusted for any fast time minutes elapsed while in this setting mode). Once you are satisfied with the setting press the **Enter** key; the display will then show “PonP” again. At this point pressing the **Menu** key will change the display to the current time.

5.7 Reset (“rSt”)



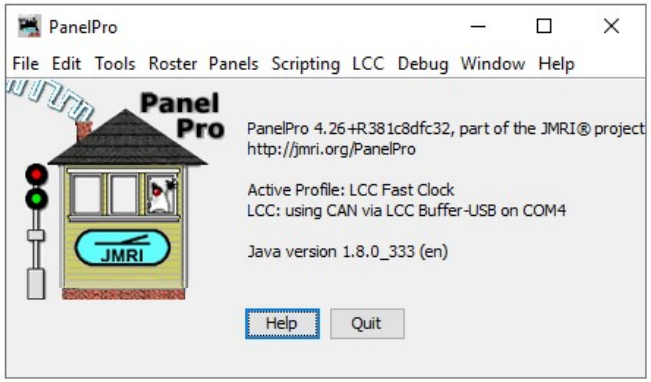
When “rSt” is displayed you can reset the time to the initial time (as described in section 5.3) by pressing the **Enter** key. Note that this action is only carried out if this LCC-FC module is configured as the Generator (see section 5.5).

Pressing the **Menu** key will change the display to the current time (adjusted for any fast time minutes elapsed while in this setting mode). If the **Menu** key is pressed before the **Enter** key is pressed then no reset action is taken.

6. Using JMRI PanelPro with the LCC-FC

The power of LCC is really apparent when you utilize JMRI (Java Model Railroad Interface). This User Guide assumes you are familiar with JMRI and PanelPro. There are MANY online resources and tutorials to guide you through the JMRI installation process and familiarizing yourself with its PanelPro application. Start by going to https://www.jmri.org/.

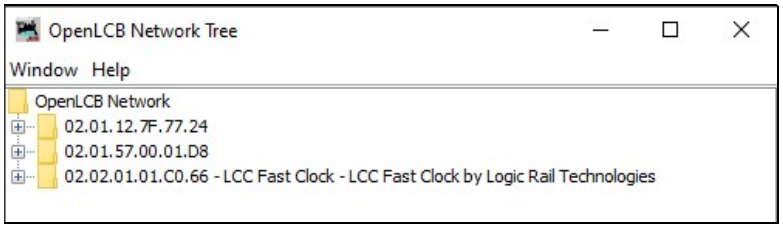
Once you have PanelPro running and connected to the LCC bus through a device such as the LCC Buffer-USB from RR-CirKits (https://www.rr-cirkits.com/) then you're ready to discover all the cool things you can do with your LCC-FC and other LCC devices.



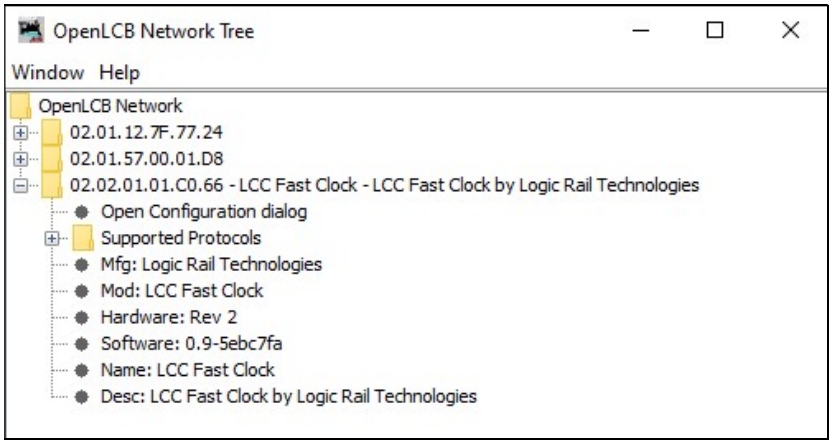
From the PanelPro main window click on LCC then click on Configure Nodes. A new window will open showing the OpenLCB Network Tree.

6.1 OpenLCB Network Tree

In the OpenLCB Network Tree you will find your LCC-FC module (or modules if you have more than one).



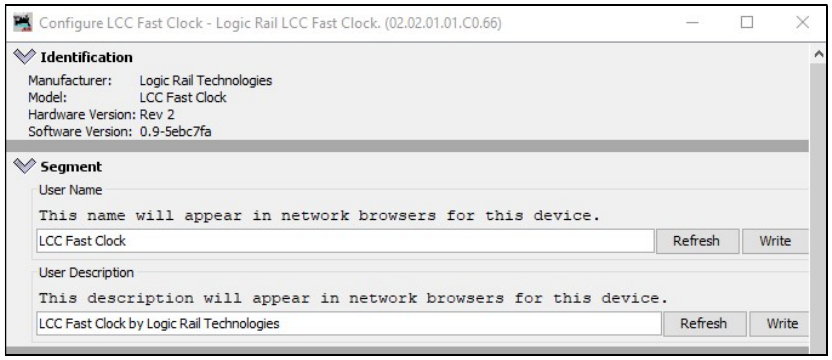
Click on the + symbol next to the LCC Fast Clock folder to expand it.



Now click on Open Configuration dialog which will launch another window.

6.2 LCC-FC Identification and Naming

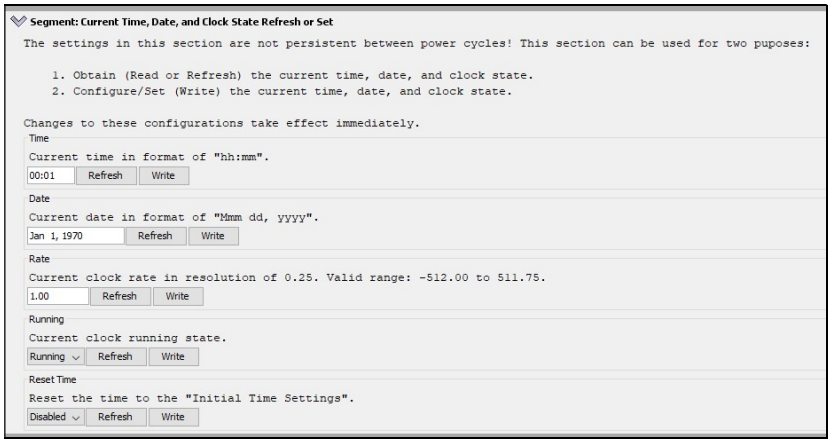
The first part of the Configuration dialog (commonly called the CDI) is the device identification information and the naming options. In the first part you will find the hardware version and current module software (firmware) version.



In Segment section you will find entries for the User Name and User Description. You can change these values if you wish. For example, if you have the LCC-FC mounted at a dispatcher's desk you may want to name it accordingly.

6.3 Setting the time, date, fast rate, etc.

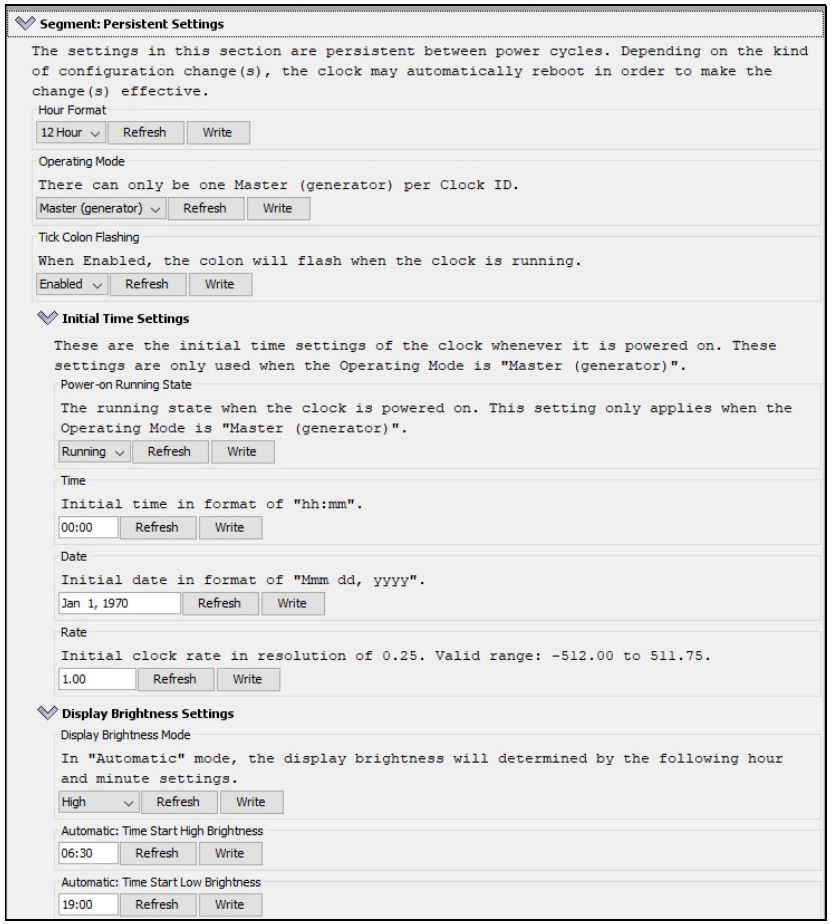
The next part of the CDI allows you to set the current time, current date, current fast rate, and the clock running state. It also allows you to reset the current time to the clock's initial (default) time. As noted in this segment these settings are not retained once power is removed!



Changing any of the values in this segment is straightforward. If you click on the Refresh button it will update the information currently set in the LCC-FC. If you make a change then click on the Write button the change will take effect immediately.

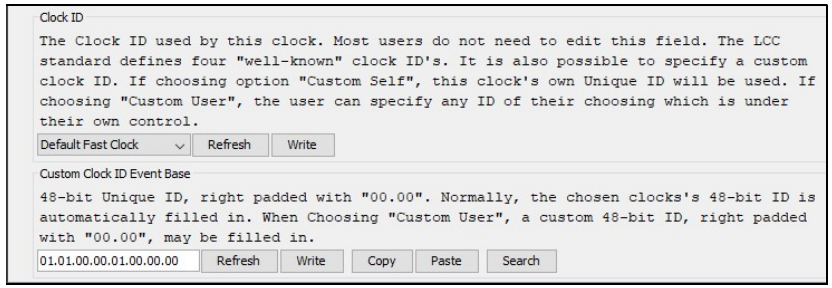
6.4 Persistent Settings (part 1)

In this part of the CDI you can change settings which are retained (persistent) across power cycles. These settings only apply to this LCC-FC module; if you have more than one LCC-FC you will have to configure it/them separately. In this section you can set the hour format (12/24), assign this LCC-FC module's role as Generator (master) or Consumer (slave), enable the colon to flash when the clock is running, and set the Initial (default) time settings to be used when the LCC-FC powers up. The display brightness can also be set here.



6.5 Persistent Settings (part 2)

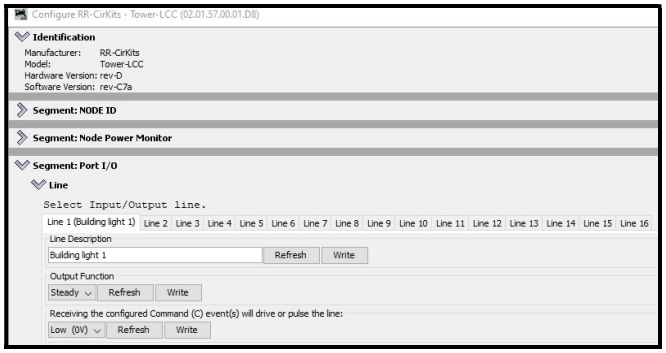
In the bottom part of the Persistent Settings segment you can set this LCC-FC module's Clock ID and Custom Clock ID Event Base. Descriptions of these settings is provided in the dialog. The Custom Clock ID Event Base will be utilized if you create time-based LCC event "triggers." An example is turning a building light on and off at certain times. An example can be found in Section 6.6.



6.6 On/Off Event Control Example

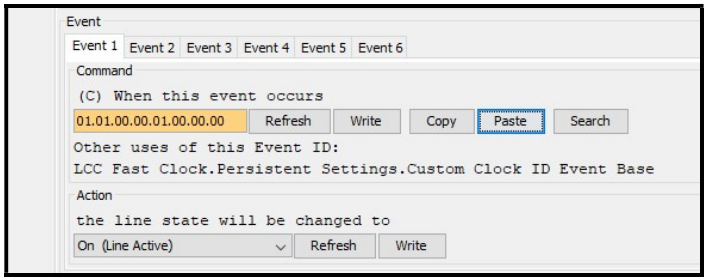
Besides keeping and displaying time the really cool capability of the LCC Fast Clock is to trigger on/off events such as turning your layout's accessory lights (buildings, streets, etc) on and off. In the example described here we'll use the Tower-LCC board from from RR-CirKits (https://www.rr-cirkits.com/). We'll assume you already have familiarity with the product and know how to access the Port I/O section of that board's CDI in JMRI PanelPro. For this example let's assume that you want to turn that board's Line 1 output ON at 7:30 pm and turn that same output OFF at 11:15 pm. Make sure you have the Tower-LCC's CDI open and the LCC Fast Clock's CDI open.

In the Tower-LCC's CDI go to the Port I/O segment and select Line 1. You may wish to give it a name in the Line Description field. In this example we called it "Building light 1." Next, we defined this Output Function to be Steady and drive the line Low. Make sure you click on Write when you make these selections/entries. You'll see the results of these first actions below.



Next, scroll down to the Event section in this segment. Make sure Event 1 is selected.

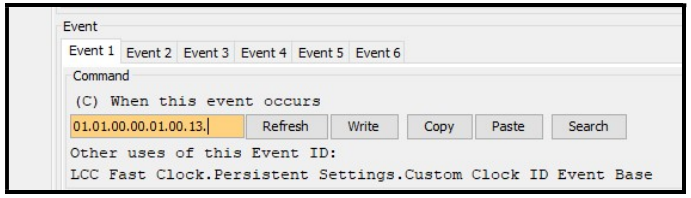
Next, flip over to the LCC Fast Clock's CDI and scroll down to the bottom of the Persistent Settings segment. As described in Section 6.5 in this User's Guide you'll see a field described as Custom Clock ID Event Base. This first 6 parts (bytes) of this field are assigned to events triggered by the LCC Fast Clock. Click the "Copy" button to the right of that field value. Then, go back to the Tower-LCC's CDI and under the Command section click the "Paste" button to the right. It will look something like this when you do:



Notice that there is now a reference to the LCC Fast Clock! Do NOT click on the "Write" button yet! You will need to determine the values for the last two parts (bytes) in this Event ID field. Remember that we want the output to turn ON at 7:30 pm. The second to last byte on the right is the hours entry (Byte 6). Using the look-up table below you'll see that the value for 7 pm is 13.

Hour	Byte 6 value	Hour	Byte 6 value
12 am	00	12 pm	0C
1 am	01	1 pm	0D
2 am	02	2 pm	0E
3 am	03	3 pm	0F
4 am	04	4 pm	10
5 am	05	5 pm	11
6 am	06	6 pm	12
7 am	07	7 pm	13
8 am	08	8 pm	14
9 am	09	9 pm	15
10 am	0A	10 pm	16
11 am	0B	11 pm	17

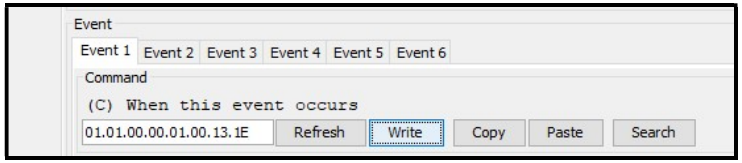
Click on the far right end of the Event ID field past the last two 00 digits. Then use your backspace key to delete the last two 00 digits then type in 13. Again, do NOT click on the “Write” button yet!



Now you need to determine the value for the last byte which is the minutes entry (Byte 7). In our example we need the value for 30 minutes. Using the look-up table below you’ll see that the value is 1E.

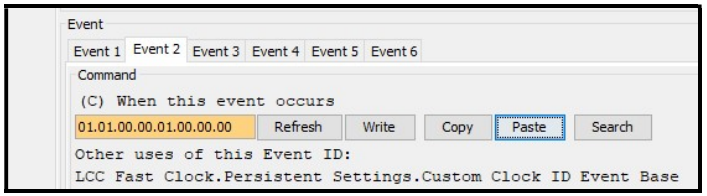
Minute	Byte 7 value	Minute	Byte 7 value	Minute	Byte 7 value	Minute	Byte 7 value
00	00	16	10	32	20	48	30
01	01	17	11	33	21	49	31
02	02	18	12	34	22	50	32
03	03	19	13	35	23	51	33
04	04	20	14	36	24	52	34
05	05	21	15	37	25	53	35
06	06	22	16	38	26	54	36
07	07	23	17	39	27	55	37
08	08	24	18	40	28	56	38
09	09	25	19	41	29	57	39
10	0A	26	1A	42	2A	58	3A
11	0B	27	1B	43	2B	59	3B
12	0C	28	1C	44	2C		
13	0D	29	1D	45	2D		
14	0E	30	1E	46	2E		
15	0F	31	1F	47	2F		

Type in 1E and NOW click on the “Write” button! The result will look like this:

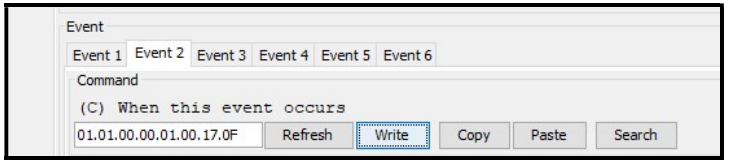


In the Action section you want to select On (Line Active) and click on the “Write” button.

Next you need to configure the OFF event. In the Event section click on Event 2 tab. As before, go to the LCC Fast Clock CDI and click on “Copy” next to the Custom Clock ID Event Base value. Return to the Tower-LCC CDI and click the “Paste” button next to the Command Event ID field. It will now look like this:



Remember we want this output to turn OFF at 11:15 pm. As you did for the ON event use the Hours and Minutes look-up tables to determine the values for Byte 6 and Byte 7. For Byte 6 (hours) the value for 11 pm is 17. For Byte 7 (minutes) the value for 15 minutes is 0F. Enter those values and click on the “Write” button. The result will look like this:



In the Action section you want to select Off (Line Inactive) and click on the “Write” button. At the bottom of the Tower-LCC CDI click on the “Save Changes” button. Finally, in the same section click on the “More…” button and select “Reboot.” The Tower-LCC board will reboot and during that process the LCC

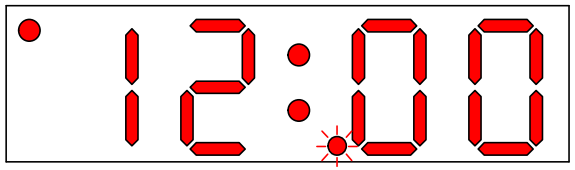
Fast Clock will “see” that two events have been defined. It will in turn send out the associated Event IDs on the LCC bus at the defined times!

Note that the LCC Fast Clock stores these events in a table or log in its “volatile” memory. This means that they are retained until power is removed or it is rebooted. The next time the LCC bus powers up the LCC Fast Clock will rebuild its event table based on messages it sees from consumer devices (such as the Tower-LCC).

7. Pausing the clock

While the clock is running and the current time is displayed you can pause the clock by pressing the ⬇ key on the LCC-FC module configured as the Generator (not on a module configured as a Consumer!).

When the clock is paused the decimal point to the left of the tens of minutes digit indicator will flash on all LCC-FC modules and the colon will stop flashing (if you enabled it to flash). For example, if the current time is 12pm and you pause the clock the display will look like this:

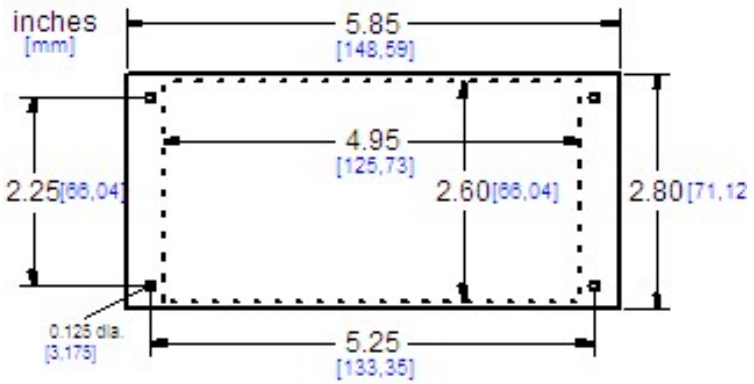


The clock is also paused when the Generator module is first powered on (if the Power-on Pause option is set; see section 5.6).

To resume the clock simply press the ⬆ key on the Generator. The decimal point will stop flashing and the colon will resume flashing (if you enabled it to flash).

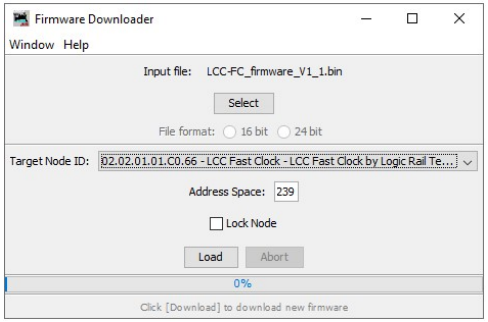
8. Mounting the LCC-FC

The LCC-FC faceplate is predrilled in four places for 4-40 mounting screws or bolts. Do NOT enlarge the holes – you may damage the module! You can mount the LCC-FC in the fascia of your layout or control panel by cutting out a hole that is 4.95” x 2.6”. You’ll need a depth clearance of 1.5”. This is illustrated in the diagram below.



9. Updating the firmware

Any updates to the LCC-FC firmware will be posted on our website. You will update the firmware via the LCC bus. From the JMRI PanelPro main window click on LCC then click on Firmware Update. Select the firmware update file (downloaded from our website) then select the LCC-FC module you wish to update. Click on Load to perform the update.



10. Warranty and Repair

10.1 Warranty

This product is warranted to be free from defects in materials or workmanship for a period of one year from the date of purchase. The product must be returned to Logic Rail Technologies in satisfactory condition. This warranty covers all defects incurred during normal use of this product. This warranty is void under the following conditions:

1. If damage to the product results from mishandling, abuse or exceeding input power limits.
2. If the product has been altered in any way not previously authorized or approved by Logic Rail Technologies.

Requests for warranty service must include a dated proof of purchase, a written description of the problem, and return shipping and handling ($10.00 inside U.S./$20.00 outside U.S. - U.S. funds only). Except as written above, no other warranty or guarantee, either expressed or implied by any other person, firm or corporation, applies to this product.

Logic Rail Technologies reserves the right to make changes in design and specifications, and/or to make additions or improvements in its products without imposing any obligations upon itself to install these changes, additions or improvements on products previously manufactured.

10.2 Repair

The LCC-FC contains no end-user serviceable parts. If you believe your LCC-FC needs repair please contact Logic Rail Technologies prior to returning it. Logic Rail Technologies reserves the right to repair or replace a defective product. Products that have voided the warranty or are out of warranty will be repaired at fair and reasonable rates.

11. Technical Support

Please contact us via phone or email:

Phone: (281) 251-5813
email: info@logicrailtech.com

You may also want to subscribe to and monitor the Layout Command Control user group on groups.io (https://groups.io/g/layoutcommandcontrol/).