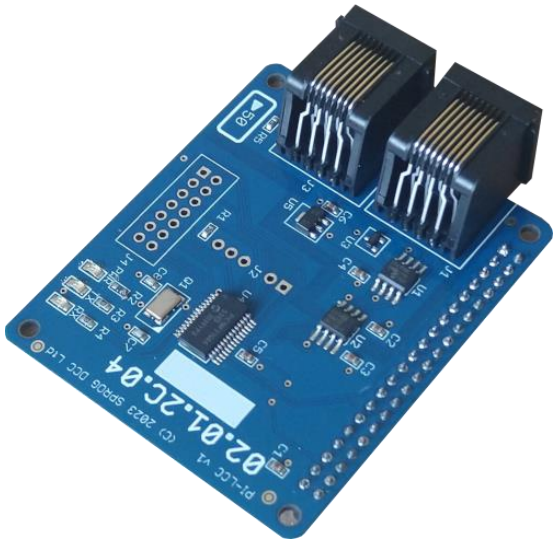
PI-LCC Interface Module
for LCC®/OpenLCB™
SPROG DCC Ltd



Firmware v1.3

Hardware v1 and v1.1

Version 1.3.1 May 2024

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Date	Revision	Comments
February 2024	1	Created
February 2024	1.1	Added known issues
April 2024	1.1.1	Added known issues
April 2024	1.2	Update for new firmware version Numerous issues fixed
May 2024	1.3	Maintenance release, no material changes
May 2024	1.3.1	Update for hardware v1.1 Added Firmware Update section

Unless otherwise notes references in this document to LCC apply equally to OpenLCB, and vice-versa.

LCC® is a registered trademark of the NMRA

OpenLCB™ is a trademark of the OpenLCB Group

Contents

1 Introduction

The PI-LCC allows easy connection between a Raspberry-Pi computer and an LCC/OpenLCB network. The PI-LCC is supported by JMRI (Java model Railroad Interface).

1.1 Features

- Raspberry Pi Interface for NMRA LCC and OpenLCB™
- Galvanic isolation between USB and LCC network
- Four status LEDs
- Supported by JMRI
- Implements an LCC node
    - LCC bootloader for firmware upgrades
        - Via host or network
    - Configurable functions on two of the status LEDs
- Dual RJ45 for network pass-through or terminator
- Network side is powered from LCC

Unlike generic USB-CAN interfaces, that may also be used for LCC, the PI-LCC implements a true LCC node with its own CDI (Configuration Description Information). The bootloader allows the node firmware be updated via the USB or LCC network connections.

1.2 Electrical Specification

The Pi-LCC draws a small current (50 mA max.) from the LCC PWR_POS/PWR_NEG conductors in the LCC network cable and will operate properly with a supply voltage of 7.5 V to 15 V.

The R-Pi 3.3 V supply from the GPIO connector is used to power the remaining active circuitry on the PI-LCC.

	Minimum (V)	**Nominal (V)**	**Maximum (V)**	
LCC Power	7.5	12	15	
R-Pi		3.3 V		Sourced form R-Pi GPIO connector

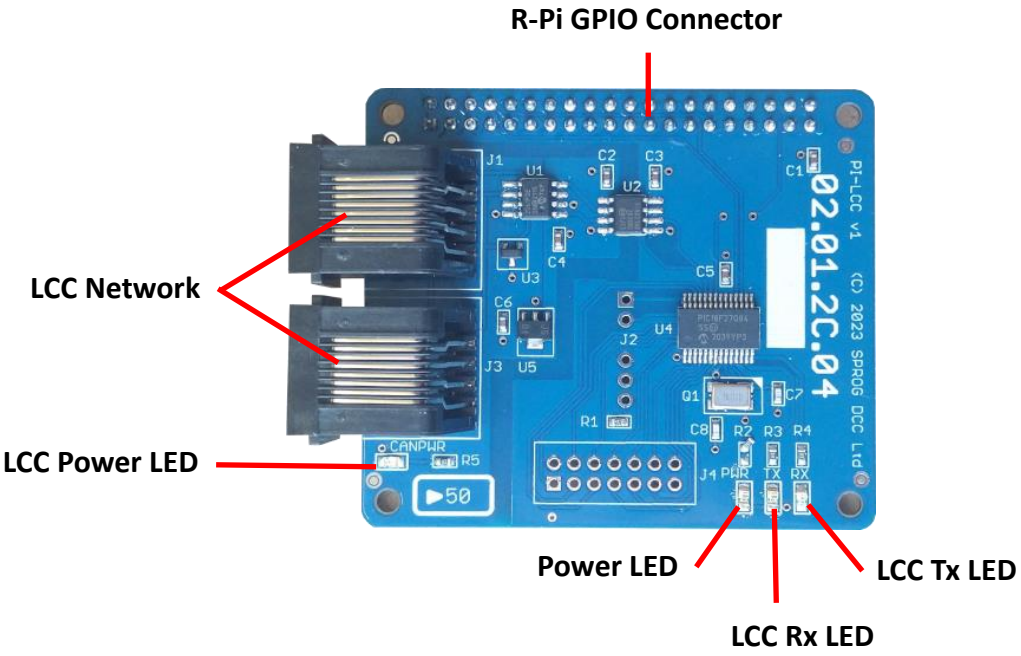
2 Installation

There are no jumper links or other configuration required to use the PI-LCC.

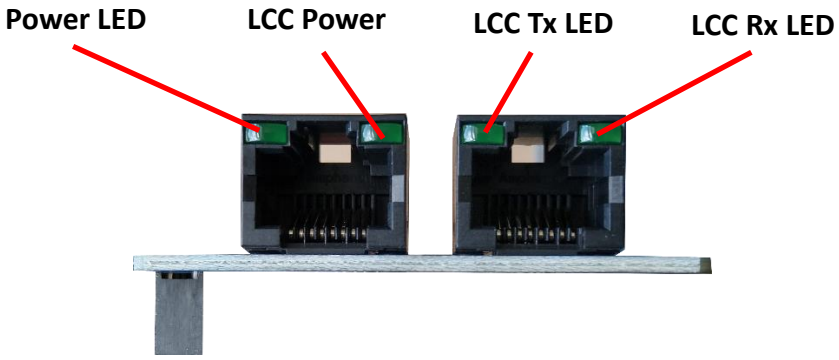
Power for the LCC interface must be available on the LCC network cable(s).

The Pi-LCC can be connected anywhere along the LCC network, subject to the usual LCC cabling requirements (e.g., daisy chain connections, correctly terminated).

On v1 hardware, a number of discrete LEDs show the status of the node:



On v1.1 hardware, the status lEDs are integrated into the LCC network connectors:



The LCC Power LED indicates the presence of power from the LCC network.

The Power LED indicates the presence of power from the R-Pi GPIO connector.

The remaining two LEDs are configurable via the CDI and default to LCC network activity (see **3.1.1 LED CONFIGURATION**).

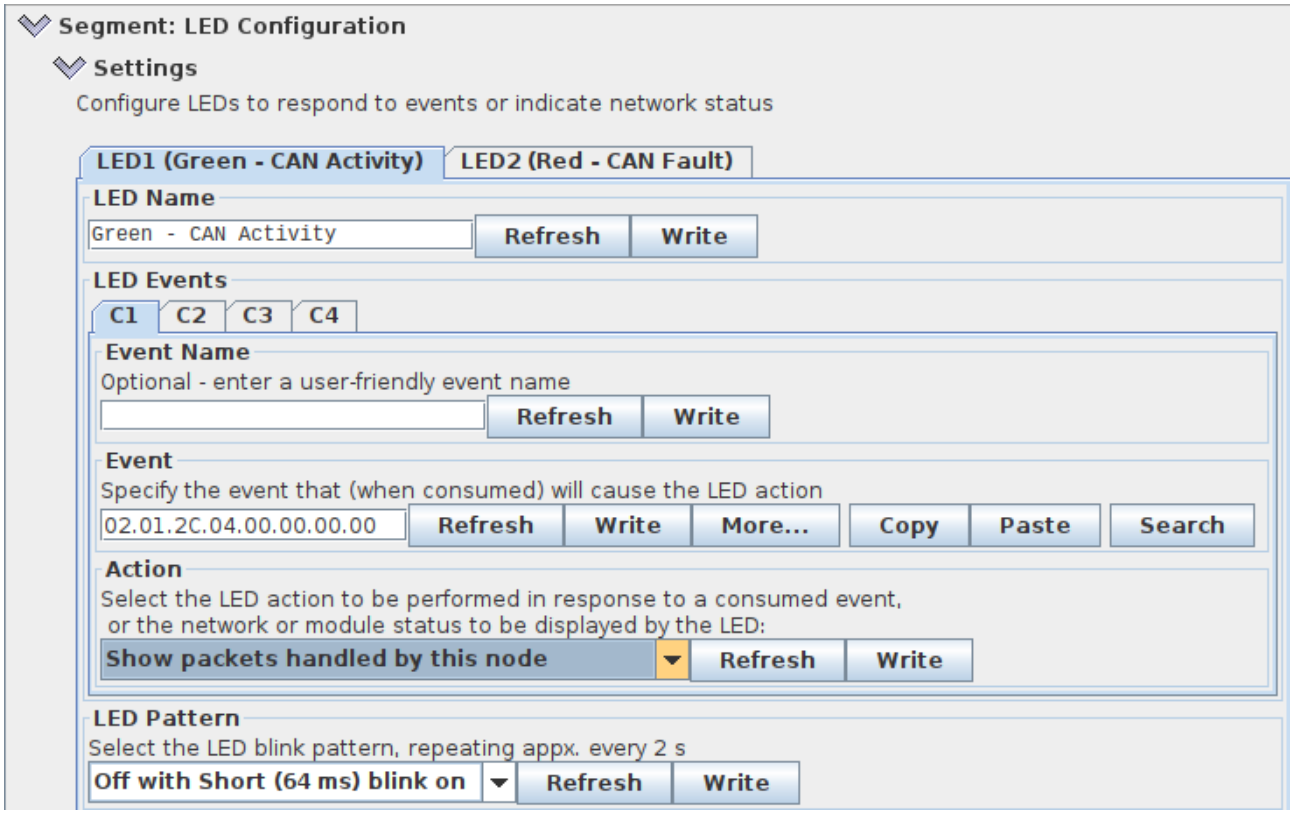
3 Configuration

3.1 PI-LCC Configuration

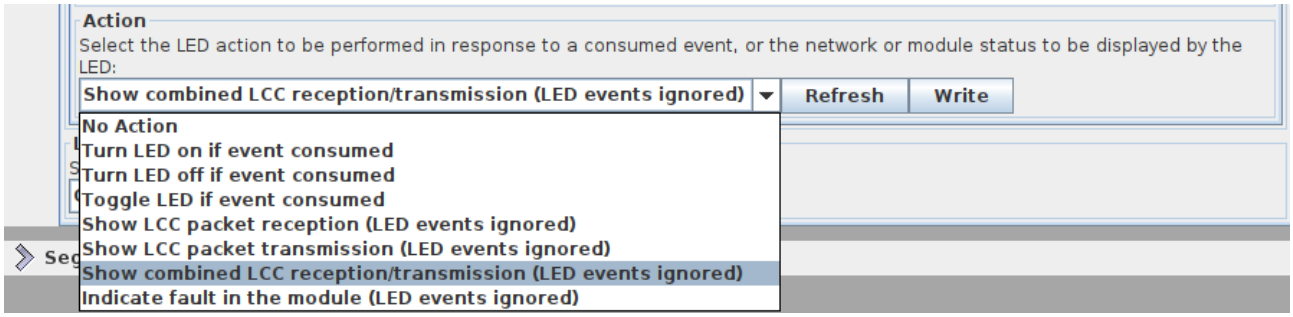
The PI-LCC configuration is self-describing via the CDI (Configuration Description Information) and may be configured with suitable software tools such as JMRI.

3.1.1 LED Configuration

Two of the status LEDs are configurable via the CDI. Each LED is controlled by up to four consumer events or internal status.



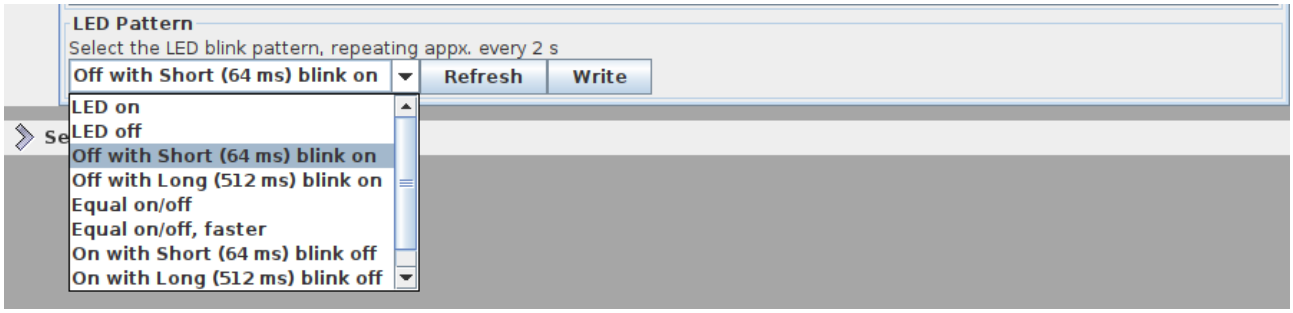
The CDI Action field controls the LED functions



LED Action	LED function
No Action	LED remains off
Turn LED on if event consumed	The LED displays the selected pattern
Turn LED off if event consumed	The LED turns off
Toggle LED if event consumed	The LED toggles between off and displaying the selected pattern
Show LCC packet	The LED blinks briefly on each LCC message received
Show LCC packet	The LED blinks briefly on each LCC message sent by the PI-LCC
Show combined LCC reception/transmission	The LED blinks briefly for each LCC message sent or received
Show packets handled by this node	The LED blinks briefly for a received message that is processed by the node (e.g. an event is consumed)
Indicate fault in the module (LED events ignored)	The LED indicates an error in the module (more details TBD)

The LED Pattern CDI field controls the way the LED is illuminated

There is one pattern setting available per LED. The LED displays the selected patter when turned on (or toggled from off to on) by a consumed event.



(One additional selection not shown – Use custom pattern)

3.2 Raspberry Pi Configuration

3.2.1 R-Pi 4 and earlier

When setting up your Raspberry Pi to use JMRI and the PI-LCC we strongly recommend you follow the procedure for setting up the R-Pi UART in our Pi-SPROG family documentation. This can be found in the downloads section of our website, specifically https://www.sprog-dcc.co.uk/downloads/linux/pi-sprog-pi4-wifi/pi-sprog-wifi-2023-05-03-5.4.pdf in the two sections “Get UART Overlays” and “UART Setup”.

This will swap the UARTs so that the full featured UART is used for communicating with the Pi-LCC

3.2.2 R-Pi 5

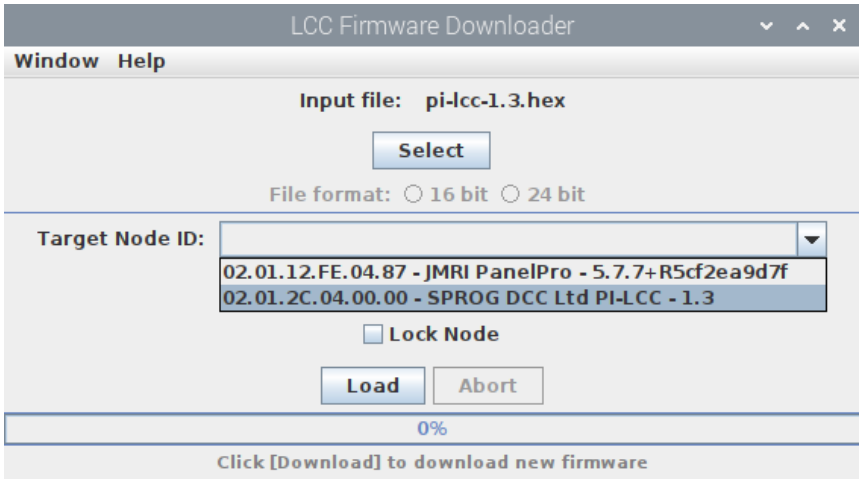
The R-Pi 5 with the Bookworm release of Raspberry Pi OS is much easier to configure and just needs the Serial port to be enabled in the R-Pi configuration tool. Full instruction are on the document linked from the LCC Info section of our website, specifically https://www.sprog-dcc.co.uk/downloads/linux/pi5/pi-lcc-wifi-2023-12-05-arm64-5.7.1.pdf.

4 Firmware Updates

The PI-LCC supports firmware updates using the JMRI LCC Firmware Update tool.

Firmware updates will be announced on the SPROG DCC Ltd website and the new firmware file will be available for download.

Select the .hex file, select the target node ID and clisk the load button.



The PI-LCC will reboot when the firmware update is complete.

NOTE: It is recommended that you create a backup of the PI-LCC configuration using the node configuration tool. Occasionally it may be necessary to release firmware updates that “break” the configuration. If this is the case, it will be noted on the firmware download page. The old configuration can be restored, from the backup, after the firmware update is completed

5 Links to Further Information

SPROG DCC Ltd website https://www.sprog-dcc.co.uk For all our products and support.

SPROG DCC Ltd Official YouTube Channel https://www.youtube.com/@sprogdcc

OpenLCB group https://openlcb.org The group behind the OpenLCB/LCC standards.

NMRA LCC standards page https://www.nmra.org/lcc The LCC standards adopted by the NMRA.

OpenLCB discussion group https://groups.io/g/openlcb/topics Discussion of OpenLCB topics, more developer focussed.

The NMRA's LCC user group https://groups.io/g/layoutcommandcontrol/topics a good starting point for asking questions of other LCC users.

JMRI users https://groups.io/g/jmriusers/topics JMRI software topics.

JMRI website https://www.jmri.org Download the latest JMRI releases and access support pages.

Book: Introduction to Layout Command Control https://www.amazon.co.uk/Introduction-Layout-Command-Control-Practical/dp/0988825902 focussed on RR-Cirkits products but the concepts are applicable to any LCC hardware.