SPROG DCC

Home of *the* DCC Decoder Programmer

USB-LCC Interface Module for LCC®/OpenLCB™

SPROG DCC Ltd

Firmware v1.2

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Date	Revision	Comments
January 2024	1	Created
February 2024	1.1	Added known issues
April 2024	1.1.1	Added known issues Added USB latency timer setting
April 2024	1.2	Update for v1.4 firmware Numerous issues fixed

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

LCC® is a registered trademark of the NMRA

Contents

1 Introduction

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

1.1 Features

- USB interface for NMRA LCC and OpenLCB™
- Galvanic isolation between USB and LCC network
- Two bi-colour status LEDs
- Supported by JMRI
- Implements an LCC node
    - LCC bootloader for firmware upgrades
        - Via host or network
    - Two configurable LED functions via the CDI
- Dual RJ45 for network pass-through or terminator
- Uses standard FTDI drivers included with Windows, MacOS, Linux
- Host side is USB bus powered
- Network side is powered from LCC

Unlike generic USB-CAN interfaces, that may also be used for LCC, the USB-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 USB-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 5 V supply from the USB connector is used to power the remaining active circuitry on the USB-LCC.

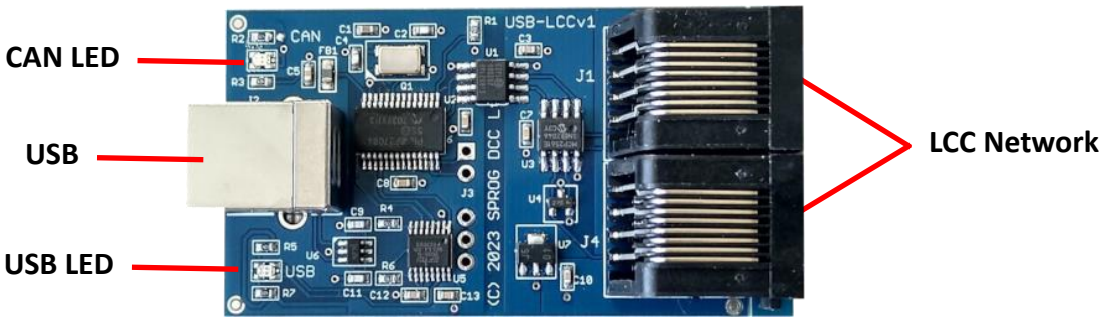
	Minimum (V)	Nominal (V)	Maximum (V)	
LCC Power	7.5	12	15	
USB		5 V		

2 Installation

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

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

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



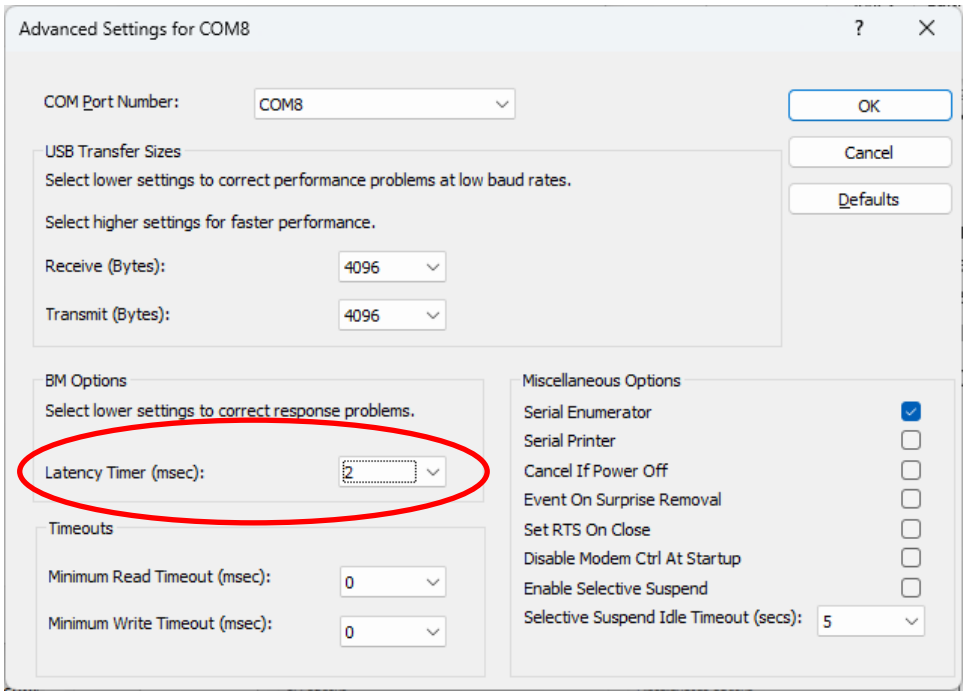
The USB LED indicates reception of messages from the host (red) and transmission of messages to the host (green).

The CAN LED is configurable via the CDI and defaults to LCC network activity (see **3.1.1 LED CONFIGURATION**).

2.1 USB Virtual COM Port Latency Timer

LCC messages vary in length may be much shorter than the 64-byte buffer used for USB communications by the host computer. To ensure the most efficient data transfer between the LCC network and the host, the latency timer in the USB-LCC USB interface should be set to a lower value than the default 16 ms. A value of 2 ms seems to be a good compromise.

On Windows hosts, use the advanced port settings for the assigned COM port



On Linux hosts, issue the following command from a shell

```
sudo sh -c 'echo 1 > /sys/bus/usb-serial/devices/ttyUSB0/latency_timer'
```


Maybe substituting ‘bash’ for ‘sh’ depending on your choice of shell.

3 Configuration

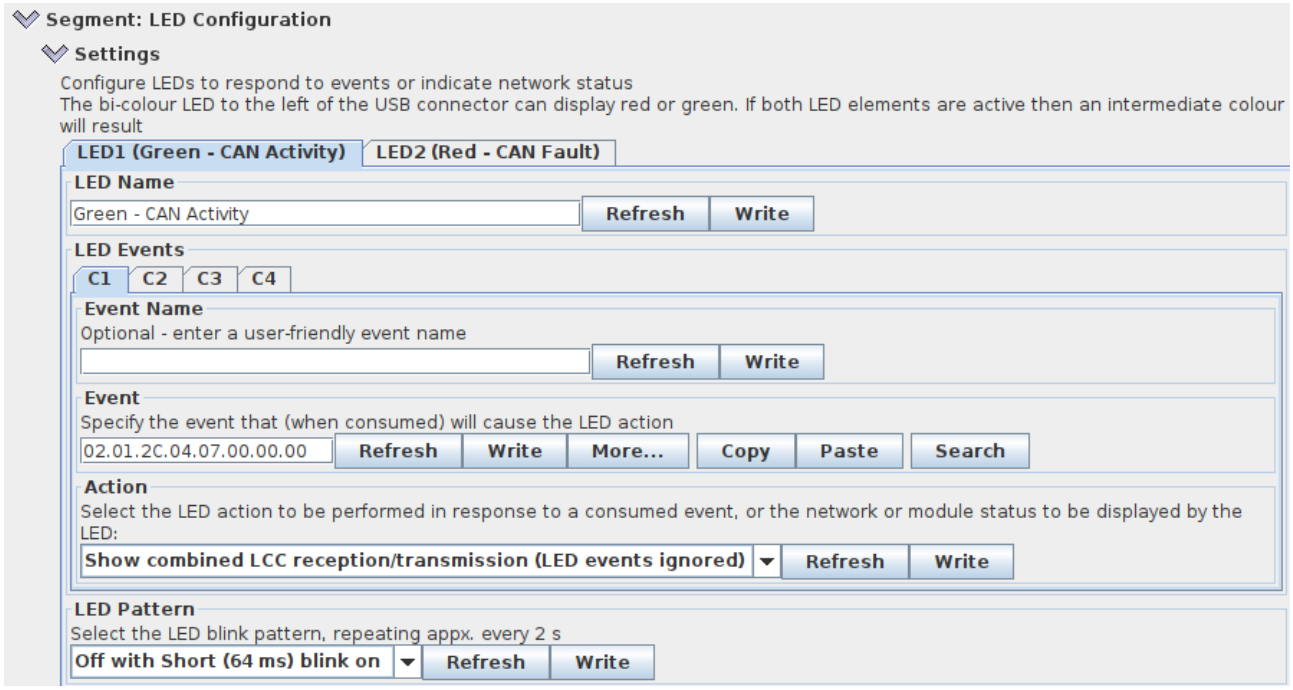
3.1 USB-LCC Configuration

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

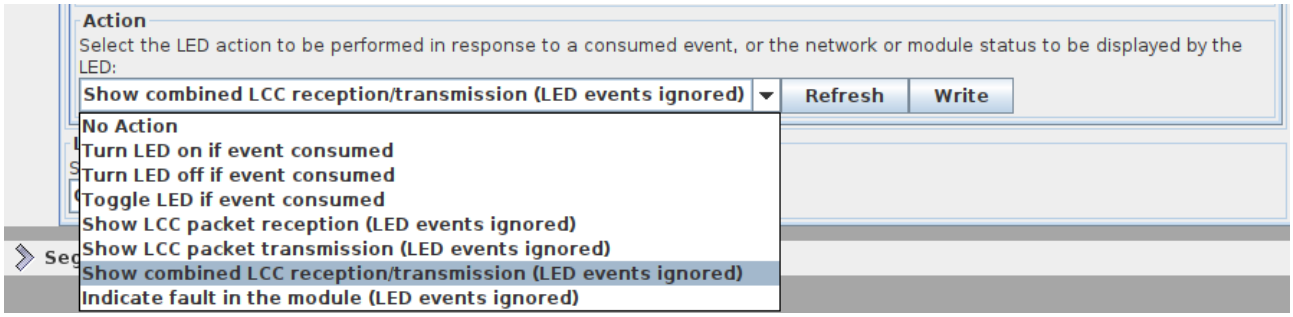
3.1.1 LED Configuration

See also **4 KNOWN ISSUES**

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



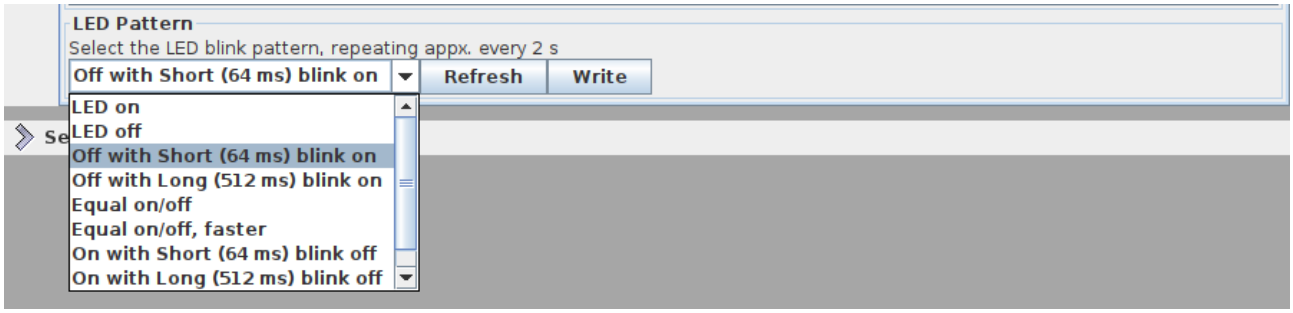
The CDI Action field controls the LED functions



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 reception (LED events ignored)	The LED blinks briefly on each LCC message received
Show LCC packet transmission (LED events ignored)	The LED blinks briefly on each LCC message sent by the USB-LCC
Show combined LCC reception/transmission (LED events ignored)	The LED blinks briefly for each LCC message sent or received
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)

4 Known Issues in This Release

4.1 No CDI Field For Setting the Custom LED Pattern

There is no CDI field to enter the data to be used with the LED Pattern “Use custom pattern” selection.

Will be fixed in a future firmware upgrade.

4.2 Missing LCC Power Logo on PCB legend

The PCB does not show the required power consumption from the LCC network.

Will be fixed in a future production batch.

4.3 LCC Node ID is Not Shown on the PCB

The PCB does not have space to note the LCC node ID.

Will be fixed in a future production batch.

5 Issues fixed in This Release

5.1 SNII response if buffer full uses wrong error code

Fixed.

5.2 CDI XML fails with strict parser

Fixed.

5.3 Accessing Configuration Memory

Memory space specified in the optional byte 6 of the memory read/write datagram is handled correctly.

5.4 Button Event Identification

Button events are identified as producer events.

5.5 ACDI Memory Space Layout

Format of the 251 (0xFB) and 252 (0xFC) memory spaces for ACDI are correct.

5.6 Memory Read Requests Flags

The Datagram Received OK message includes the reply pending flag.

6 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.