

# LocoBuffer-USB

USB 2.0 to LocoNet® Interface

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## User's Guide



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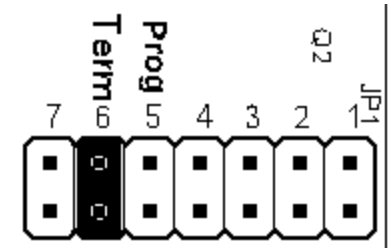
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## 7.0 LocoNet Terminator

This device includes a built in 15 ma. terminator for the LocoNet® bus. This can be used to provide the "Master" termination for a LocoNet® segment. If the LocoNet® Rail\_Sync power is at least 12V it will supply the required termination power.

The use of an external Rail Sync power supply such as provided by the various Digitrax UP panels may be required.

To enable the terminator, carefully snap open the case and install a jumper at position 6 of the option connector JP1 labeled "Term".



## 8.0 Warranty Information

We offer a one year warranty on the LocoBuffer-USB. This device contains no user serviceable parts. If a defect occurs, please contact RR-CirKits at: [service@rr-cirkits.com](mailto:service@rr-cirkits.com) for a replacement.

## 9.0 FCC Information

This device complies with part 15 of the FCC Rules. Operation is subject to the following two conditions:

1. This device may not cause harmful interference, and
2. this device must accept any interference received, including interference that may cause undesired operation.

Note: This equipment has been tested and found to comply with the limits for a Class B digital device, pursuant to part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference in a residential installation. This equipment generates, uses and can radiate radio frequency energy and, if not installed and used in accordance with the instructions, may cause harmful interference to radio communications. However, there is no guarantee that interference will not occur in a particular installation. If this equipment does cause harmful interference to radio or television reception, which can be determined by turning the equipment off and on, the user is encouraged to try to correct the interference by one or more of the following measures:

- Reorient or relocate the receiving antenna.
- Increase the separation between the equipment and receiver.
- Connect the equipment into an outlet on a circuit different from that to which the receiver is connected.
- Consult the dealer or an experienced radio/TV technician for help.

Any modifications to this device voids the user's authority to operate under and be in compliance with these regulations. The actual measured radiation from the LocoBuffer-USB is much lower than the maximum that is permitted by the FCC Rules, so it is unlikely that this device will cause any RFI problems.

## 6.0 Trouble shooting

### 6.1 Sanity Test

To perform a very basic LocoBuffer-USB sanity test perform the following steps:

1. Unplug the LocoNet® cable. Disable the internal LocoNet terminator if enabled. (remove any internal jumper at "Term")
2. Power up the LocoBuffer-USB by plugging it into the computer.
3. The lower green power LED should come on.
4. Plug in the LocoNet® cable. The upper green power LED should light.
5. Unplug the LocoNet® cable. The red activity light should blink briefly as the cable is removed.
6. Restore the termination jumper to it's original position if used.

If the lower green power LED does not light, be sure that the USB drivers have been properly installed. The LocoBuffer-USB does not power up until the drivers have properly enumerated. (installed and started up)

If the Rail Sync upper power LED does not light, or if the activity LED does not blink when you unplug the LocoNet® cable, be sure that your DCC command station is powered up, then check your LocoNet® wiring. To further test the LocoBuffer-USB you may also perform the following Loop Back test.

### 6.2 Loop Back Test

The LocoBuffer-USB input circuit and code actually reads from the unit's LocoNet® output jack, so if you send a character it should be seen on the input. This test uses the free software available from the JMRI project to watch the test commands. ([www.jmri.info](http://www.jmri.info))

Steps:

1. Open the JMRI LocoNet® Monitor window.
2. Using a throttle send a speed change to a locomotive.
3. The set speed commands should appear in the LocoNet® monitor window and the LocoBuffer-II activity LED should blink
4. Using JMRI send some commands (e.g. switch commands)
5. The commands should appear in the LocoNet® monitor window and the LocoBuffer-II activity LED should blink

If there is no activity light when throttle commands are sent, check the LocoNet® wiring. If there is no activity shown in the LocoNet® monitor window, check that you have LocoBuffer-USB selected in the JMRI preferences, or that you have LocoBuffer selected and are running at 57.6Kb. Check that you have the correct COM port selected.

## Overview

The LocoBuffer-USB USB to LocoNet® converter provides a simple and easy way to create a bridge/connectivity between the Universal Serial Bus (USB) and Digitrax LocoNet® bus. It may be connected at any convenient point on the LocoNet®.



## 1.0 Features

- USB Rev 1.1 and 2.0 compliant with type B input
- 96 bytes of data buffering in each direction
- LocoNet® certified
- Linux, Mac, Windows 98SE/ME/2K, XP/Vista Drivers
- VCP (Virtual Com Port) Drivers support the RS232 Serial interface in popular Model RR software
- Full optical isolation between LocoNet® and computer
- Automatically powers down with the host computer to conserve battery power on laptops
- Boot Loader allows firmware upgrades over USB connection
- 57,600 Baud speed with hardware flow control
- No External power adapter required  
Powered from LocoNet® and USB port



## 2.0 Quick Start

- The LocoBuffer-USB operates at 57.6K baud speed. If your older software does not support the LocoBuffer at 57.6Kb, check with your vendor for an upgrade.
- Connect the included USB cable to an unused USB port on your computer and to the LocoBuffer-USB. Your computer should detect the new unit and open a driver installation dialog.
- Install the correct drivers for your system from the included driver disk. E.g. for Windows choose *pc drivers*. For Windows XP go to <http://www.rr-cirkits.com/locobuffer-usb/XP-driver-install.html> for more information.
- The lower green status indicator should illuminate as soon as your drivers are installed and they recognize the LocoBuffer-USB.
- Connect the unit's LocoNet® jack to any point on your system's LocoNet®. The upper green status indicator should illuminate, and the red status indicator should now indicate all LocoNet® activity.
- Set your software's port settings to match the LocoBuffer-USB's communications port and the baud rate to 57,600 baud if required.
- You should now be able to control your Railroad from your software. See <http://www.rr-cirkits.com/faq> for further help.

## 3.0 Connections and Indicators

The LocoBuffer-USB has two connectors and three status indicators.

### 3.1 USB Connector

The computer connection is made using the provided USB type B extension cable to connect from the LocoBuffer-USB to your computer:

### 3.2 LocoNet® Connector

The LocoNet® connection is made to the LocoBuffer-USB via the provided cable connected to the RJ-12 (6 pin) modular jack. LocoNet® cables are wired straight through, not reversed like phone cables.

Pin outs for the RJ-12 connector:

Pin	Description	Color
1	Rail_Sync-	white
2	Signal Ground	black
3	LocoNet-	red
4	LocoNet+	green
5	Signal Ground	yellow
6	Rail_Sync+	blue

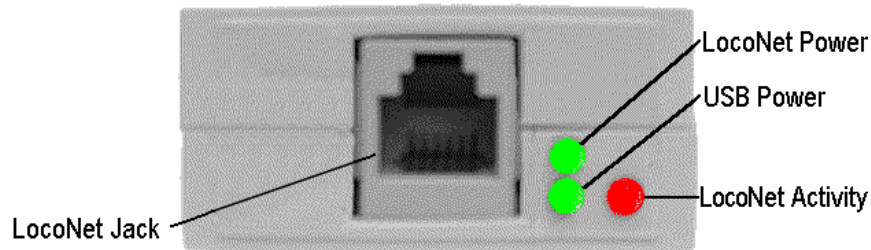
Pins 2 and 5, and pins 3 and 4 are connected together internally.

### 3.3 Power Connections

The LocoBuffer-USB does not use any external power source.

The LocoBuffer-USB processor is powered by the USB connector. It only draws power when the USB driver is active and the computer is not in suspend or sleep mode. This allows the LocoBuffer-USB to remain connected to a laptop computer and not drain the battery when the computer is in low power mode.

The LocoNet receiver and driver circuits receive their power from the Rail\_Sync lines and draw only a few milliamperes.



### 3.4 Status Indicators

The LocoBuffer-USB has three status indicators located next to the RJ-12 connector. The two green status indicators show the power status. The upper green indicator shows the power status of the LocoNet Rail-

Sync power input. The lower green indicator shows the power status of the USB connection. The third red status indicator normally shows LocoNet activity, and activity/error status during a boot loader firmware upgrade.

## 4.0 Boot Loader (For LocoBuffer-USB chip upgrades only)

If an update to your LocoBuffer-USB chip firmware is ever required, a program such as "Download Firmware" in JMRI version 1.7.5 or later will be required.

To enter Boot loader mode, unplug the LocoBuffer-USB, open the case, and place a jumper on position 5 labelled "**Prog**", (see 7.0) then plug it in. The red led will light steadily indicating the boot loader is now ready to accept messages from the JMRI Down loader. Start JMRI and select "LocoNet" then "Download Firmware". Select the latest LocoBuffer-USB upgrade and click "Read file" then "Download". The red led will blink each time it receives a data packet from the JMRI down loader. When programming is successful, the red led will extinguish automatically. Normal operation will resume when you remove the jumper.

### Error codes:

During boot loading, several possible error codes are shown by the red led:

- 1 blink: manufacturer code or product code mismatch;
- 2 blinks: hardware version mismatch;
- 3 blinks: hex file software version equal or lower;
- 4 blinks: unused (no LocoNet® data);
- 5 blinks: internal programming error detected.

Each of the above errors will halt the boot loader process. To recover from the first three error types, just cycle power to restart the device, correct the error, and then re-run the JMRI program. Nothing has been overwritten.

To recover from the last error type, it must be assumed that the firmware is in an undefined state, most probably damaged or incomplete. Retry the process as above. The down loader will not over write the boot code itself.

## 5.0 Optical Isolation

The LocoBuffer-USB provides complete electrical isolation between the computer and the LocoNet®. This prevents possible ground loop problems between the LocoNet® and computer. For example, many systems are installed without properly grounding the booster to power ground.

Some devices connect the LocoNet® ground directly to the USB cable ground. This provides a ground path from the power line through your computer and it's USB cable to the LocoNet® and then to the booster and all the railroad wiring. At best this indirect grounding causes electrical noise. At worst it could create a fault path via the small gage LocoNet® wiring to ground.

Properly ground your boosters and your desktop computer through a 3 wire cable, and isolate the two from each other via the LocoBuffer-USB.