

# ***RR-CirKits, Inc.***

---

*Affordable Electronics for Model Railroads*

***Installation Guide***

***Revision-c***

## ***LocoBuffer-USB Rev-0***

***USB 2.0 to LocoNet<sup>®</sup> Interface***

This PDF is designed to be read on screen, two pages at a time. If you want to print a copy, your PDF viewer should have an option for printing two pages on one sheet of paper, but you may need to start with page 2 to get it to print facing pages correctly. (Print this cover page separately.)

# Copyright

---

This document is Copyright © December 2019 by **RR-CirKits, Inc.**. You may distribute it under the terms of either the GNU General Public License, version 3 or later (<http://www.gnu.org/licenses/gpl.html>), or the Creative Commons Attribution License (<http://creativecommons.org/licenses/by/3.0/>), version 3.0 or later.

All trademarks within this guide belong to their legitimate owners.

## Authors

Dick Bronson

## Feedback

Please direct any comments or suggestions about this document to:

[dick@rr-cirkits.com](mailto:dick@rr-cirkits.com)

## Contact Information

RR-CirKits, Inc.  
7918 Royal Ct.  
Waxhaw, NC 28173  
USA

<http://www.rr-cirkits.com>  
[sales@rr-cirkits.com](mailto:sales@rr-cirkits.com)  
[service@rr-cirkits.com](mailto:service@rr-cirkits.com)  
1-704-843-3769  
Fax: 1-704-243-4310

## Publication date and software version

Published December 2019. Based on LocoBuffer-USB User's Guide.

---

**WARNING:** This product contains a chemical known to the state of California to cause cancer, birth defects or other reproductive harm. Do not ingest.

---

*You can download an editable version of this document from  
<http://www.rr-cirkits.com/manuals/LB-USB-manual-Rev-o.odt>*

# Contents

Copyright.....	2
Overview.....	4
1.0 Features.....	4
2.0 Getting Started.....	5
3.0 Connections and Indicators.....	5
3.1 USB Connector.....	5
3.2 Power Connections.....	5
3.3 LocoNet® Bus Connector.....	6
3.4 Status Indicators.....	6
4.0 Boot Loader (Used for LocoBuffer-USB firmware upgrades only).....	7
5.0 Digital Isolation.....	7
6.0 Changes since Rev-n.....	7
7.0 Trouble shooting.....	8
7.1 Basic Sanity Test.....	8
7.2 Activity Test.....	8
7.3 JMRI Connection Test.....	8
8.0 Warranty Information.....	8
9.0 FCC Information.....	9

RR-CirKits, Inc.  
7918 Royal Ct.  
Waxhaw, NC 28173  
USA

<http://www.rr-cirkits.com>  
sales@rr-cirkits.com  
service@rr-cirkits.com  
1-704-843-3769  
Fax: 1-704-243-4310

# Overview

---

The LocoBuffer-USB Rev-o LocoNet® interface provides a simple and easy way to connect between a LocoNet® bus and the layout. The LocoBuffer-USB Rev-o may be connected at any convenient point on the LocoNet®

LocoNet® is a registered trademark of Digitrax. [www.digitrax.com](http://www.digitrax.com)



*LocoBuffer-USB Rev-o*

## 1.0 Features

---

- USB Rev 1.1 and 2.0 compliant with type B input
- 96 bytes of data buffering in each direction
- Digitrax LocoNet® certified
- Linux, Mac, Windows XP / Vista / Windows 7, 8,10  
32/64 bit Drivers
- VCP (Virtual Com Port) Drivers support the RS232  
Serial interface used by popular Model RR software
- 2,500 VAC digital 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 interface speed with hardware flow control
- Compact size with no power adapter required (1-1/2" x 2-1/4" x 3/4")



## 2.0 Getting Started

---

- The LocoBuffer-USB operates at 57.6K baud speed.
- 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. (Mac, Windows 8 users see below)
- Windows users with Internet service to their RR computer should allow Windows Update to search for software automatically. Windows 7 will locate the drivers automatically. Two drivers will install. One appears under *USB*, the other under *Ports COM & LPT*.
- Windows 8 and Windows 10 users must manually install the drivers for your system from the included driver disk. See: <http://www.rr-cirkits.com/locobuffer-usb/Windows 10 install.pdf> for more info.
- Mac users choose the 'IMAC' folder and run the included .dmg file.
- The right hand green status indicator should illuminate as soon as your drivers are installed and they recognize the LocoBuffer-USB.
- Connect the unit's LocoNet<sup>®</sup> jack to any point on your system's LocoNet<sup>®</sup>. The left hand green status indicator should illuminate, and the red activity indicator should now indicate all LocoNet<sup>®</sup> activity.
- Set your software's settings to match the communications port.
- You should now be able to control your Railroad from your software.

## 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 Power Connections

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

The LocoBuffer-USB Rev-o 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 Rev-o to remain connected to a laptop computer and not drain the battery when the computer is in low power mode.

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

### 3.3 LocoNet® Bus 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

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

### 3.4 Status Indicators

The LocoBuffer-USB has three status indicators located either side of the RJ-12 connector. The two green status indicators each show power status. The left hand green indicator shows the power status of the LocoNet® Rail-Sync power input. The right hand green indicator shows the power status of the USB connection. The red status indicator normally flashes to show any LocoNet® activity. It also shows any activity/error status during a boot loader firmware upgrade.



*LocoBuffer-USB Rev-n Status indicators*

## **4.0 Boot Loader** (Used for LocoBuffer-USB firmware upgrades only)

---

The LocoBuffer-USB is designed to be field upgradable, but due to clock speed and other differences between hardware versions, not all firmware will match all hardware.

If an update to your LocoBuffer-USB Rev-o firmware is ever required, a program such as "Download Firmware" in JMRI version 4.14 or later will be required, and specific instructions will be posted on the RR-CirKits web site, [www.rr-cirkits.com](http://www.rr-cirkits.com).

### **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

## **5.0 Digital Isolation**

---

The LocoBuffer-USB provides 2,500 VAC electrical isolation between the computer and the LocoNet® by using a high speed digital isolator. This prevents possible ground loop problems between the LocoNet® and your computer. For example, many systems are installed without properly grounding the booster to power ground.

Some interface devices connect the LocoNet® ground directly to the USB cable ground. This provides a ground path from the power line through your computer and its 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 gauge LocoNet® wiring to ground.

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

## **6.0 Changes since Rev-n**

---

The LocoBuffer-USB rev-o has a modified driver circuit that intentionally slows down the turn on transition of the output drive. This reduces the amount of ringing on the un-terminated LocoNet bus.

## 7.0 Trouble shooting

---

### 7.1 Basic Sanity Test

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

1. Unplug the LocoNet<sup>®</sup> cable.
2. Power up the LocoBuffer-USB by plugging it into the computer.
3. The right hand green power LED should come on.
4. Plug in the LocoNet<sup>®</sup> cable. The left hand green power LED should light.
5. Unplug the LocoNet<sup>®</sup> cable. The red activity light should blink very briefly as the cable is removed.

### 7.2 Activity Test

The right hand green power LED will not come on unless some driver connection is made from your computer. Unfortunately for our trouble shooting, there are normally two drivers installed, and the LED will light once the first one is in place. No light usually means that there is no driver installed, but a green light does not guarantee the drivers are OK.

The LocoBuffer-USB's input circuit and code sends data directly to the unit's processor, so if both green power LEDs are on and you send any command on the LocoNet<sup>®</sup> it should immediately be seen on the red activity LED. The simplest test is to observe the red activity LED while sending commands to a Locomotive from a hand held throttle. This test does not rely on any correct port settings.

If there is activity at the LocoBuffer-USB red LED, but there is no activity shown in the LocoNet<sup>®</sup> monitor window, check that you have the correct interface selected in the JMRI preferences, (LocoBuffer-USB) and that you have the correct COM port selected.

### 7.3 JMRI Connection Test

Open the JMRI drop down in JMRI. Select the 4<sup>th</sup> item, Monitor LocoNet Stats.. It should show the version number of the unit's firmware and the number of breaks and errors since the last time the unit was powered up. If it does, then everything is setup correctly and the unit is working properly. If it shows empty boxes and says 'Raw data' then something is amiss in the driver install and configuration, the JMRI settings, or possibly the LocoBuffer-USB itself.

## 8.0 Warranty Information

---

We offer a one year warranty on the LocoBuffer-USB Rev-o. 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.

RR-CirKits, Inc.  
7918 Royal Ct.  
Waxhaw, NC 28173  
USA

<http://www.rr-cirkits.com>  
sales@rr-cirkits.com  
service@rr-cirkits.com  
1-704-843-3769  
Fax: 1-704-243-4310