RR-CirKits

Specializing in Affordable Electronics for Model Railroads

LocoBuffer-II

RS232 Serial to LocoNet® Interface

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User's Guide

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5.0 LocoNet Terminator

This device includes an optional 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 then it will supply the required termination power. If not, then the LocoBuffer-II must be operated in the Local Power mode and the Power input should be at least 12V as measured at the power supply jack.

To install the terminator, open the LocoBuffer-II case by inserting a screwdriver into the small slots on either side and carefully twisting until the case pops apart. The terminator is a small daughter board that has two transistors and two resistors. It plugs into the two sockets labeled “Term” near the center of the board. The terminator board plugs in with the notched end labeled “Term.” facing toward the RS-232 connector end of the LocoBuffer-II.

6.0 Warranty Information

We offer a one year guarantee on the LocoBuffer-II only. This device has no user serviceable parts. If a defect occurs, contact RR-CirKits at service@rr-cirkits.com for a RMA number. Opening the case to install the terminator will not affect your warranty.

7.0 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-II 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.

8.0 Contact Information

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Switch 6 allows the LocoBuffer-II firmware to be upgraded via a simple serial download (boot mode). This requires that Rev. 1.632 or later firmware has been previously loaded into the LocoBuffer-II PIC. Boot mode does not support the programming of a blank chip. The LocoBuffer-II is shipped with a PIC16F873A chip and firmware that is compatible with boot loading. The control program PICdownloader.exe should work on all Windows platforms, 95-XP. You will only need to select the COM-port and baud rate (19,200) once.

To update your firmware remove LocoBuffer power, flip Switch 6 to *on* and then apply power. **Don't change any other switch, only Switch 6 is used!** Leave Switches 4 and 5 in their normal position, which is *off*. There is no similarity between the two firmware update methods. The boot loader baud rate is fixed at 19,200 bps; LocoBuffer-II Switch 1 and 3 baud rate selections are ignored during boot loading, so you do not need to change them. Select LB1632.hex or the latest LocoBuffer-II upgrade file as the file to download. "EEPROM" should be unchecked. These settings are stored in a pic.INI file in the same directory as the PICdownloader.exe file, so the next time you use the program you will only need to hit Write(F4). Progress is shown in a bar graph and within 5 seconds you should have a working LocoBuffer-II update. After programming, the flashing red LocoNet® activity led acts as a reminder to flip **Switch 6 back to *off***. This will start the LocoBuffer-II immediately, with no extra reset needed.

This option replaces ICSP as the preferred method to upgrade your LocoBuffer-II should it ever become necessary. Boot Mode is compatible with all operating systems and does not require any special timing signals on the RS-232 control lines as did the ICSP mode.

Switches 7 and 8 control the internal power connections. The LocoBuffer-II is an optically isolated device. **Switches 7-8 *off* for isolated mode**. This means that there is normally no internal connection between the computer side and LocoNet® side of the device. The LocoNet® circuits are powered at all times from the Rail_Sync lines. (pins 1 and 6 of the LocoNet®) The RS-232 circuits and processor chips are normally powered from an external power supply. This should be an isolated power source such as a power adapter. In some cases it may be desirable to use alternate power options. If you switch both Switch 7 and 8 to their "Local Power" (*on*) positions, then the internal power circuits are connected together. If your LocoNet does not have sufficient Rail_Sync power available, then the power adapter will supply the internal LocoNet® circuits. Alternately, if you have sufficient Rail_Sync power (at least 30ma. at 8V) then you may power the entire LocoBuffer-II from the Rail_Sync power of the LocoNet®. This may be especially useful for Laptop users. Note, because the internal circuits are connected together in "Local Power" mode the opto isolation is rendered ineffective.

4.0 Opto Isolation

The LocoBuffer-II offers complete electrical isolation between the serial input and the LocoNet® input. This prevents any possible ground loop problems between the LocoNet® ground and the computer ground. For example, many systems are installed without properly grounding the boosters to power ground. With the original LocoBuffer the LocoNet® ground was tied directly to the serial cable ground. This provided a ground path from the power line through your computer and it's serial 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. If a desktop computer is not properly grounded this could put up to half of power line voltage on your RR.

We recommend that your boosters be grounded, that your desktop computer be grounded through a proper 3 wire cable, and that the two be isolated from each other via the LocoBuffer-II.

1.0 Features

- DB-9 serial RS-232 input
- DIP switch settings for all options
- Optical isolation (not in LocoNet® powered mode)
- Boot Loader upgrade
- MS-100, (16,457) 19,200, and 57,600 Baud speeds
- External power 9V-15V AC-DC
- Optionally powered from LocoNet® Rail_Sync lines
- Firmware compatible with original LocoBuffer created by John Jabour
- LocoNet® certified

2.0 Quick Start

- The default LocoBuffer-II options setting is 19,200 baud, all switches *off* (up). If your older software does not support 19,200 baud, most will support the Digitrsx MS-100 mode; all option switches set to o*ff* (up) except Switch 3 set o*n* (down).
- Connect your serial cable to the computer and to the LocoBuffer-II.
- Connect the power adapter to the LocoBuffer-II and plug it in. The lower green status indicator should illuminate.
- Connect the LocoNet® cable to your system. The upper green status indicator should illuminate, and the red status indicator should indicate LocoNet® activity.
- Set your software port settings to match the communications port and baud rate that you have selected. (large or busy systems may prefer to use 57,600 baud)
- You should now be able to control your Railroad from your software.

3.0 Connections and Indicators

The LocoBuffer-II has three connectors, three status indicators, and eight option switches.

3.1 Serial Port Connector

The computer connection is made using a DB-9 M-F serial extension cable to connect from the LocoBuffer-II to your computer:

Pin	Direction	Signal	Description
1	Input to PC	DCD	Data Carrier Detect (held low)
2	Input to PC	RXD	Received Data
3	Output from PC	TXD	Transmitted Data
4	Output from PC	DTR	Data Terminal Ready
5			Signal Ground
6	Input to PC	DSR	Data Set Ready
7	Output from PC	RTS	Request To Send
8	Input to PC	CTS	Clear To Send
9	NC	RI	Ring Indicator (not used)

3.2 LocoNet® Connector

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

Pinouts 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 Connector

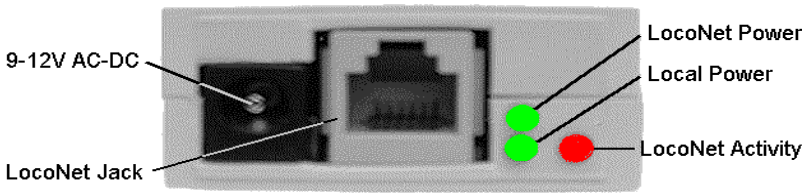
The LocoBuffer-II accepts either AC or DC power from a 9V to 12V external supply. The connector is a standard 2.1mm male coaxial jack that will accept most power adapter coaxial plugs. The external power connector normally powers the RS-232 interface and the internal processor portions of the circuit.

Option switches 7 and 8 (Local Power) are provided to allow power to be taken from the LocoNet Rail_Sync lines. Note that the power required from Rail_Sync is double the official limit of 15 ma. per device. You need to make sure that this does not cause a problem on your individual system. Also, using the "Local Power" option renders the optical isolation feature inoperative.

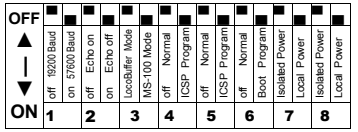
The LocoNet receiver and driver circuits normally receive power from the Rail_Sync lines. If your LocoNet system Rail_Sync lines do not have sufficient power to operate the LocoBuffer-II receiver and transmitter circuits, then you may switch to "Local Power" and supply power from an external power adapter. This renders the opto isolation feature inoperative.

3.4 Status Indicators

The LocoBuffer-II 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 external power source. The third red status indicator normally shows LocoNet activity. This indicator also blinks at the end of a boot load firmware upgrade when the boot loader process has completed.



3.5 Option Switch Settings



The default switch setting is all switches *off. (19,200, echo on, LocoBuffer mode, isolated)*

1. *Off* - 19,200 Baud in LocoBuffer mode. NA in MS-100 Mode.
   On - 57,600 Baud in LocoBuffer mode. NA in MS-100 Mode.
2. *Off* - RS-232 Echo On
   On - RS-232 Echo Off
3. *Off* - LocoBuffer mode. (speed set by SW-1)
   On - MS-100 compatible mode. (speed set to 16,457 Baud)
4. *Off* - Normal
   On - ICSP Program mode. Note: Currently requires PIC16F873 CPU chip.
5. *Off* - Normal
   On - ICSP Program mode. Note: Currently requires PIC16F873 CPU chip.
6. *Off* - Normal
   On - Boot Program mode.
7. *Off* - Isolated power. Requires external power input.
   On - Local power. Powered from LocoNet®. (30 ma.) No isolation.
8. *Off* - Isolated power. Requires external power input.
   On - Local power. Powered from LocoNet®. (30 ma.) No isolation.

Note: LocoBuffer-II must be powered down for switch setting changes to take effect.

Switches 1 - 5 are similar to the jumper settings of the original LocoBuffer.
Switches 6 - 8 support new functionality.

Bold indicates default setting.

Switch 1 selects the baud rate in LocoBuffer mode. It has no effect in MS100 mode. **Switch 1 *off*** selects 19,200 baud. Switch 1 *on* selects 57,600 baud.

Switch 2 selects the RS-232 echo mode: ***off* = echo on**, *on* = echo off.

Switch 3 selects between LocoBuffer mode and MS100 mode. **Switch 3 *off*** sets LocoBuffer mode. The baud rate is set by Switch 1. Switch 3 *on* sets MS100 mode. The baud rate is set to 16,457 baud to match software that only supports the MS100 baud rate.

Switches 4 and 5 allow programming in ICSP mode. These switches are provided for compatibility with the original LocoBuffer. They are not needed for LocoBuffer-II operation or firmware upgrades. **The PIC16F873A chip provided with the LocoBuffer-II is NOT compatible with previous LocoBuffer ICSP programs.** To use ICSP to program a blank chip provide your own PIC16F873 chip or modify the ICSP program to support the PIC16F873A chip. **Warning! Switches 4 and 5 must remain *off* at all times unless ICSP is desired or your LocoBuffer-II could become corrupted and cease operation!**