RB12 Datasheet

Feb 16, 2006, Revision 1.00

The RB12 provides a convenient interface to industry standard I/O modules, allowing electricians, engineers, and other qualified individuals, to interface a LabJack with high voltages/currents. Logic buffers are used to provide the 10-15 mA needed for each typical I/O module, so that the current is provided by the 5 volt supply rather than the logic control lines.
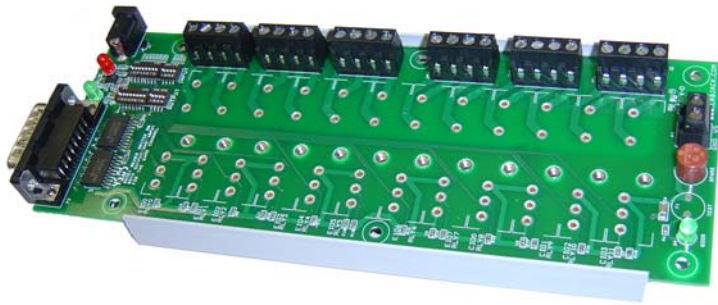

Figure 1: The RB12 without I/O modules (as shipped).

The RB12 relay board connects to the DB15 connector on the LabJack UE9 or U3, using the EIO/CIO digital I/O lines to control or read industry standard digital I/O modules. The RB12 is designed to connect directly to the LabJack, but can also connect via a 15-line 1:1 male-female cable (such as the C7MFG-1506G-ND from digikey.com, not included or required).

The green LED on the RB12 is directly powered by the 5-volt supply (Vs) from the LabJack, so it should be lit whenever the RB12 is connected to a powered LabJack. The red LED is powered directly by the external power supply (not included or required).

Power Supply

The RB12 can be powered from the LabJack through the DB15, or from an external 5-volt supply on power jack P1. If both the LabJack and external supply are connected at the same time (both green and red LEDs on), the external supply will provide power. In most cases the RB12 can simply be powered by the LabJack, but there are various reasons why powering from an external supply, rather than the LabJack, might be desirable. For example, most I/O modules use 10-15 mA, and thus 12 of them would use 120-150 mA total. In most cases a LabJack can provide this power without problem, but if 12 of the 70G-IDC5S module (Isupply = 41 mA) were used, the total power required by the RB12 could be over 500 mA which is a problem for most LabJacks.

If an external supply is used, it should be regulated with a nominal voltage of 5.0 volts. This is generally provided by a wall-wart or wall-transformer type of supply. A supply capable of 500 mA or more is recommended. The power jack connector is 2.1 x 5.5 mm, center positive.

Towards the bottom of the RB12 is a 2-position screw terminal (P3) with GND and Vs. This is designed as an output connection to provide the user access to the 5 volt supply.

If the RB12 is powered by an external supply, always maintain valid control signals (EIO/CIO) for all output I/O modules. For instance, if the RB12 is powered by a wall-wart, but there is nothing connected to the DB15, the state of output modules is undefined and might vary, but is likely to be enabled.

Output/Input Configuration

The RB12 can be used with output or input types of digital I/O modules. There are 4 banks of DIP switches used to configure whether each of the 12 channels is for output or input. When the switches in the S1 and S2 banks are put in the ON position, those lines are configured for output I/O modules. When the switches in the S3 and S4 banks are put in the ON position, those lines are configured for input I/O modules. To avoid uncertain behavior, do not turn on output and input switches for the same line at the same time.

All output modules are controlled with negative logic. That means the LabJack control line (EIO/CIO) must be driven to output-low to enable the I/O module. With the control line driven to output-high, or set to input and pulled high, the I/O module will be disabled. Input modules use normal logic, such that a true input will cause the LabJack EIO/CIO line to read high.
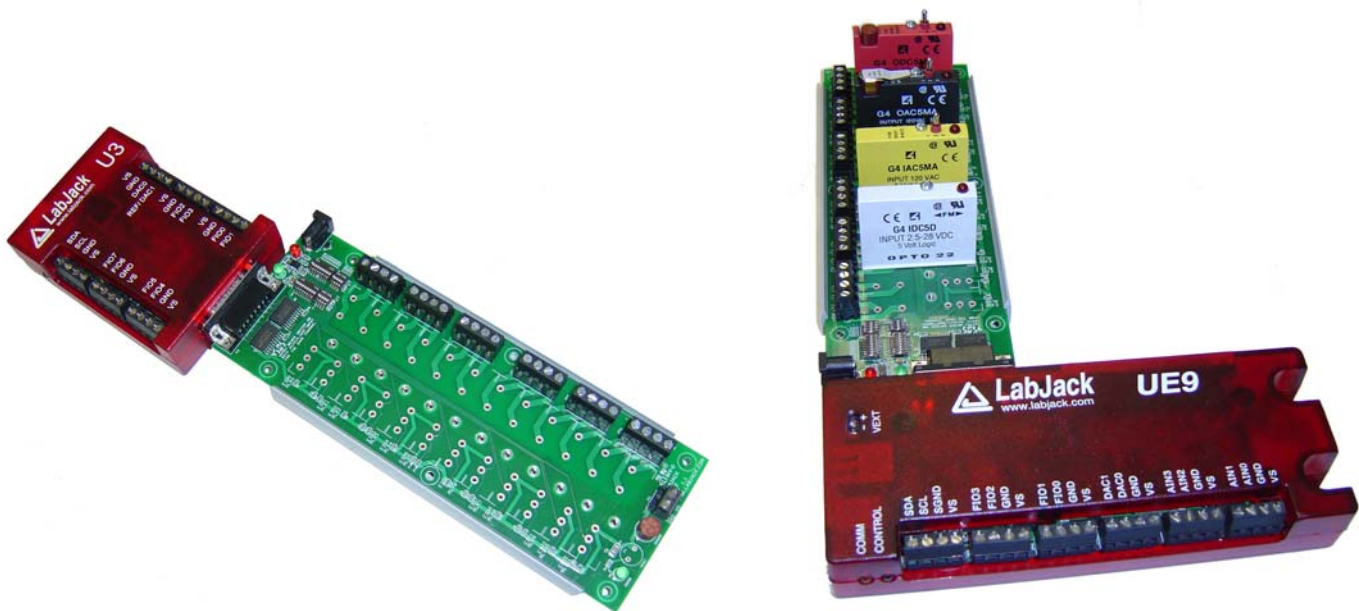

Figure 2: RB12 connected to U3, and RB12 w/ modules connected to UE9.

I/O Modules

For more information specifically about the various I/O modules, see the documentation from the manufacturer. One such manufacturer is Opto22, and as of this writing, the Opto22 "Generation 4 Digital I/O Family Data Book" is dated April 2004 and available at the following URL:

http://www.opto22.com/documents/0727_G4_Digital_IO_Data_Book.pdf

Pages 33-49 of this data book cover the available modules, including typical wiring diagrams. The following table maps the I/O modules pin numbers 1-5 (as shown in the Opto22 data book) to their respective RB12 connections:

I/O Module	RB12
1	Rn+ screw terminal
2	Rn- screw terminal
3	Vs (~5 volts)
4	4.7 kΩ pull-up to Vs and EIOn/CIOn (buffered for output, direct connection for input)
5	GND

When configured for output, the control line (EIO/CIO) from the LabJack connects to a logic buffer which then connects to pin 4 of the I/O module. When the control line is high, the buffer output is in a high-

impedance state. When the control line is low, the buffer output is connected to ground with the ability to sink up to 24 mA.

When configured for input, the control line (EIO/CIO) from the LabJack connects directly to pin 4 of the I/O module.

The RB12 includes a spare fuse. There is also a fuse tester socket where if a fuse is installed the "GOOD" green LED will light. The spare fuse holder and tester on the RB12 are designed for the TR5 fuse used by Opto22 (Digikey part number WK3062BK).

The RB12 is designed to accept G4 series digital I/O modules from Opto22, and compatible modules from other manufacturers such as the G5 series from Grayhill. Opto22 modules are available from opto22.com, alliedelec.com, and newark.com. Grayhill modules are available from digikey.com.

AC Output:
G4OAC5A   (Opto22, 24-240 VAC Output @ 3 A)
G4OAC5AMA   (Opto22, 24-240 VAC Output @ 3 A, Manual Override)
70G-OAC5A   (Grayhill, 24-280 VAC Output @ 3.5 A)
70G-OAC5AMA   (Grayhill, 24-280 VAC Output @ 3.5 A, Manual Override)

DC Output:
G4ODC5   (Opto22, 5-60 VDC Output @ 3 A)
G4ODC5MA   (Opto22, 5-60 VDC Output @ 3 A, Manual Override)
G4ODC5A   (Opto22, 5-200 VDC Output @ 1 A)
70G-ODC5   (Opto22, 3-60 VDC Output @ 3.5 A)
70G-ODC5MA   (Opto22, 3-60 VDC Output @ 3.5 A, Manual Override)
70G-ODC5A   (Opto22, 4-200 VDC Output @ ? A)

Dry Contact Output:
G4ODC5R   (Opto22, Mechanical Relay Output)
70G-ODC5R   (Grayhill, Mechanical Relay Output)

AC Input:
G4IAC5   (Opto22, 90-140 VAC Input)
G4IAC5MA   (Opto22, 90-140 VAC Input, Manual Override)
G4IAC5A   (Opto22, 180-280 VAC Input)
70G-IAC5   (Grayhill, 90-140 VAC Input)
70G-IAC5A   (Grayhill, 180-280 VAC Input)

DC Input:
G4IDC5D   (Opto22, 2.5-28 VDC Input)
G4IDC5   (Opto22, 10-32 VDC Input)
G4IDC5MA   (Opto22, 10-32 VDC Input, Manual Override)
G4IDC5G   (Opto22, 35-60 VDC Input)
70G-IDC5   (Grayhill, 3-32 VDC Input)

Dry Contact Input (Switch Input):

G4IDC5-SW   (Opto22, Switch Input, Isupply = Unknown)
70G-IDC5S   (Grayhill, Switch Input, Isupply = 41 mA)

(1.5195, 7.741)

(2.95, 8.0)

(0.2075, 7.741)

15-pin male D-sub, 0.318"

P1

Power Jack

P2

S2

S4

(0.225, 6.9)

(2.725, 6.9)

S1

S3

OUTPUT

INPUT

EIO0
RLY0

R0-
R0+
R1-
R1+

EIO1
RLY1

EIO2
RLY2

R2-
R2+
R3-
R3+

EIO3
RLY3

EIO4
RLY4

R4-
R4+
R5-
R5+

EIO5
RLY5

(0.225, 3.6)

(2.725, 3.6)

EIO6
RLY6

R6-
R6+
R7-
R7+

EIO7
RLY7

EIO8
RLY8

R8-
R8+
R9-
R9+

EIO9
RLY9

EIO10
RLY10

R10-
R10+
R11-
R11+

EIO11
RLY11

(0.225, 0.3)

P3

LabJack
RB12
REV 1.1

(2.725, 0.3)

GOOD   TEST   SPARE   GND VS

(0,0)