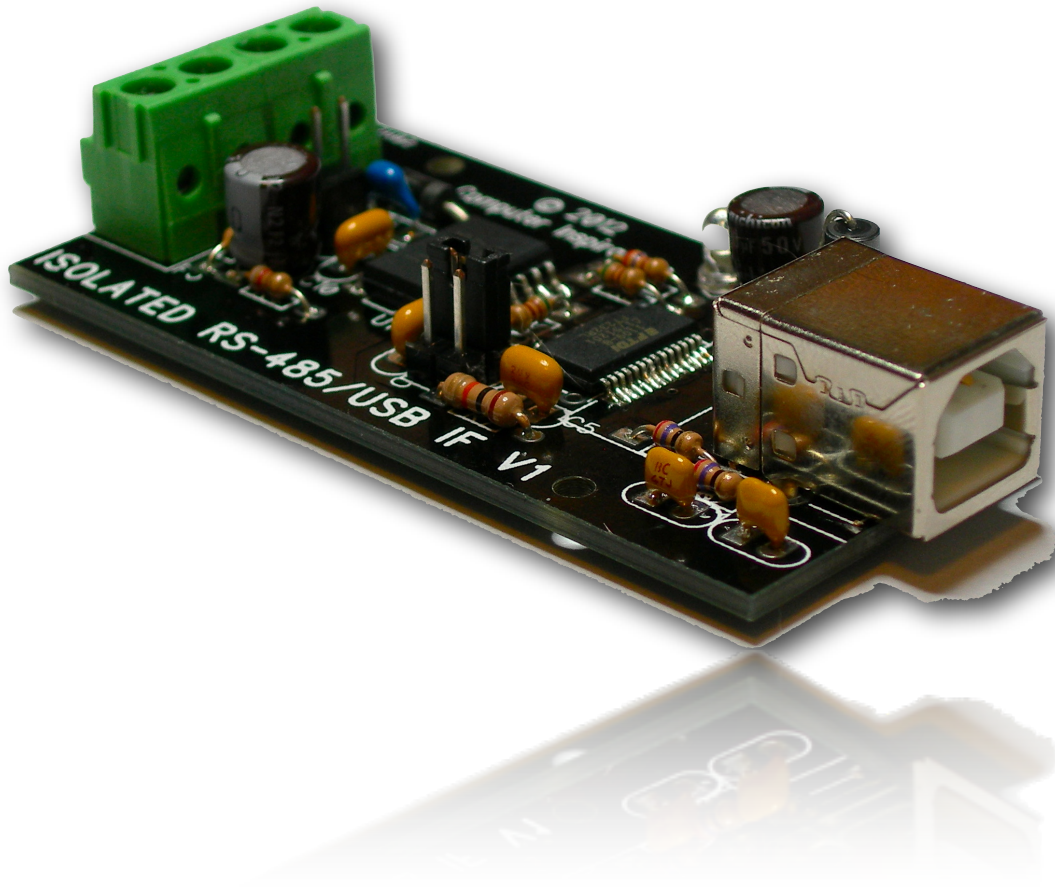


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ISOLATED RS-485 / USB INTERFACE



ASSEMBLY INSTRUCTIONS & TECHNICAL MANUAL

Sunday, 12 August 2012

Isolated RS-485 / USB Interface

Assembly Instructions & Technical Manual

Description

The Isolated RS-485 to USB Interface provides a galvanically isolated RS-485 bus interface to a computer USB port. A type B female USB connector mounted on the interface board can be connected to a host computer running Mac OS X or Windows 7 using a standard USB printer cable. The RS-485 side requires an isolated +9V to +12V wall wart-style power supply. The interface provides the following:

- ➔ Virtual serial port using standard USB drivers pre-installed in most operating systems;
- ➔ Half-duplex RS-485 interface with automatic receive/transmit switching;
- ➔ Galvanically isolated from the host computer to eliminate potential ground loops;
- ➔ On-board 120 ohm termination via a jumper;
- ➔ Receive/transmit LED indicator to show transmission status;
- ➔ Reverse polarity protection on RS-485 power supply with built-in 5V regulator;
- ➔ Built-in EMI protection for the USB interface.

Hardware Overview

The Isolated RS-485 to USB Interface hardware consists of the following elements:

- ➔ IL3185 providing a half-duplex RS-485 transceiver with 2500 V_{RMS} isolation and up to 5 Mbps data rate;
- ➔ FT232RL USB UART with integrated 1024 bit EEPROM, internal clock generation, 128 byte receive and 256 byte transmit buffers, and up to 3 Mbaud data rates;
- ➔ MC78L05ACL 5V linear regulator to power the RS-485 circuitry;
- ➔ 1N4001 reverse polarity protection diode for RS-485 power supply;
- ➔ 120 ohm RS-485 bus termination that can be enabled/disabled by installing/removing jumper J3;
- ➔ Receive/transmit LED showing the communication status;
- ➔ RS-485 bus and power connections use rugged screw terminals that allow quick connect/disconnect of wires from the controller.

For more details about the hardware, please refer to the [Technical Description](#).



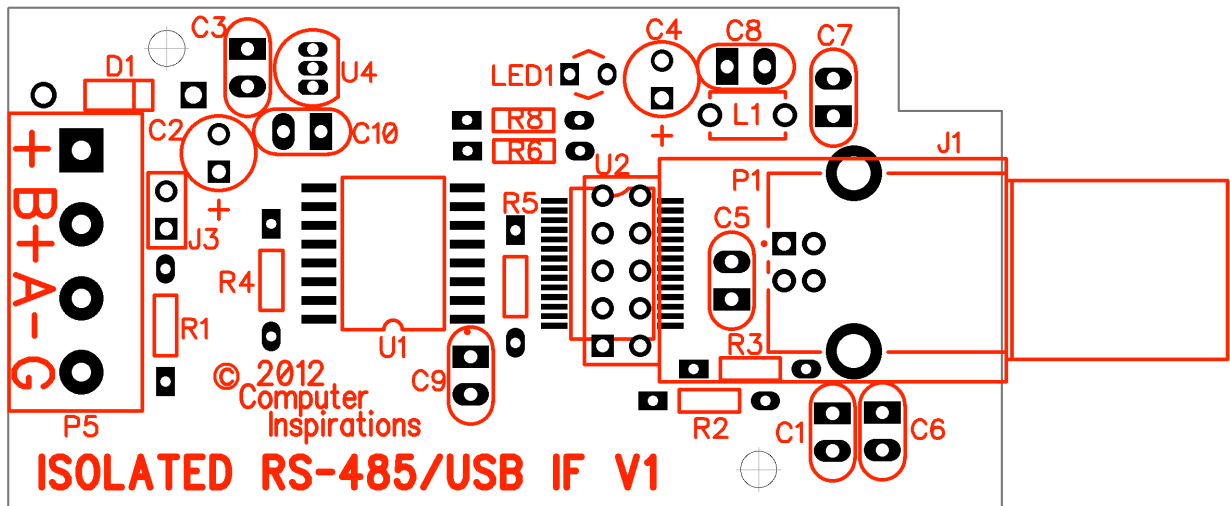
Assembling the Isolated RS-485/USB Interface

Please verify that your kit contains the following parts:

1. 2 – 47 pF ceramic capacitors
2. 2 – 10 μ F 16V electrolytic capacitors
3. 1 – 2.2 μ F 16V ceramic capacitor
4. 5 – 0.1 μ F ceramic capacitors
5. 1 – 1N4001 rectifier diode
6. 1 – 2-pin 0.1" jumper terminal (and a 2-pin shunt to install on the jumper terminal)
7. 1 – Bead core (EXC-ELSA39 or equivalent)
8. 1 – USB right-angle female type B PCB-mount connector
9. 1 – 4-pin terminal block connector with 5mm pin spacing
10. 1 – 120 Ω $\frac{1}{4}$ W resistor
11. 2 – 27 Ω $\frac{1}{4}$ W resistors
12. 1 – 820 Ω $\frac{1}{4}$ W resistor
13. 2 – 510 Ω $\frac{1}{4}$ W resistors
14. 1 – 270 Ω $\frac{1}{4}$ W resistor
15. 1 – 3mm yellow LED
16. 1 – IL3185 RS-485 isolated transceiver IC with SO-16 pins
17. 1 – FT232RL USB to UART IC with SSOP-28 pins
18. 1 – MC78L05ACLP 5V regulator IC
19. 1 – Isolated RS-485/USB Interface PCB

Assemble and solder these parts in the following order (refer to PCB component locations below):

- 1 – FT232RL USB to UART IC in location U2. (**Important: notch/dot goes to the top as shown.**)
- 1 – IL3185 RS-485 transceiver IC in location U1. (**Important: notch/dot goes to the bottom as shown.**)
- 1 – 120 Ω resistor in location R1.
- 2 – 27 Ω resistors in locations R2 and R3.
- 1 – 820 Ω resistor in location R4.
- 2 – 510 Ω resistors in locations R5 and R6.
- 1 – 270 Ω resistor in location R8.
- 2 – 47 pF ceramic capacitors in locations C1 and C6.
- 1 – 2.2 μ F 16V ceramic capacitor in location C3.
- 5 – 0.1 μ F ceramic capacitors in locations C5, C7 to C10.
- 1 – 1N4001 rectifier diode in location D1.
- 1 – 3mm yellow LED in location LED1 (**Important: the longer lead goes in the square pad.**)
- 2 – 10 μ F 16V electrolytic capacitors in locations C2 and C4 (**Important: the '+' lead goes to the square pad.**)
- 1 – 2-pin 0.1" jumper terminal in location J3.
- 1 – MC78L05ACLP 5V regulator IC in location U4 (**Important: the flat side goes to the right as shown.**)
- 1 – Bead core in location L1 (bend one lead across the body to form an inverted 'V').
- 1 – USB right-angle female type B PCB-mount connector in location P1.
- 1 – 4-pin terminal block connector in location P5 with the open end facing out to the left.



Operational Instructions

Connect a printer-style USB cable to the Isolated RS-485 to USB Interface connector P1. Connect an isolated wall wart +12V power supply to pin 1 (+12V) and pin 4 (GND) of connector P5. Connect the RS-485 bus to pins 2 and 3. The negative bus connection (A-) connects to pin 3 while the positive bus connection (B+) connects to pin 2. Note: Most manufacturer's data sheets incorrectly label the '+' bus pins of their ICs as 'A'.

Connect the wall wart power supply to an outlet and plug the USB cable to your computer. The drivers should be automatically installed for both Windows and Mac OS X. If not, you can find the drivers here: www.ftdichip.com/Drivers/VCP.htm. Once the device driver is installed, an FTDI serial communication port should be listed with the device drivers. In windows the device name is typically something like COM5: while on Mac OS X it will be something like *usbserial-A400ABG3*.

You should now be able to use a standard terminal emulator like *HyperTerminal* on **Windows** or *CoolTerm* on **Mac OS X** to communicate with external devices on the RS-485 bus. Just select the correct device and port speed/bits/parity (depending on your externally-connected RS-485 device) and connect. The LED on the Isolated RS-485 to USB Interface should flash momentarily when data is sent out from the computer.

Alternatively, you can use any software that can connect to a serial port. Just select the correct port using the software and set up the serial parameters.

This hardware has been tested with Mac OS X 10.8 (Mountain Lion) and Windows 7.

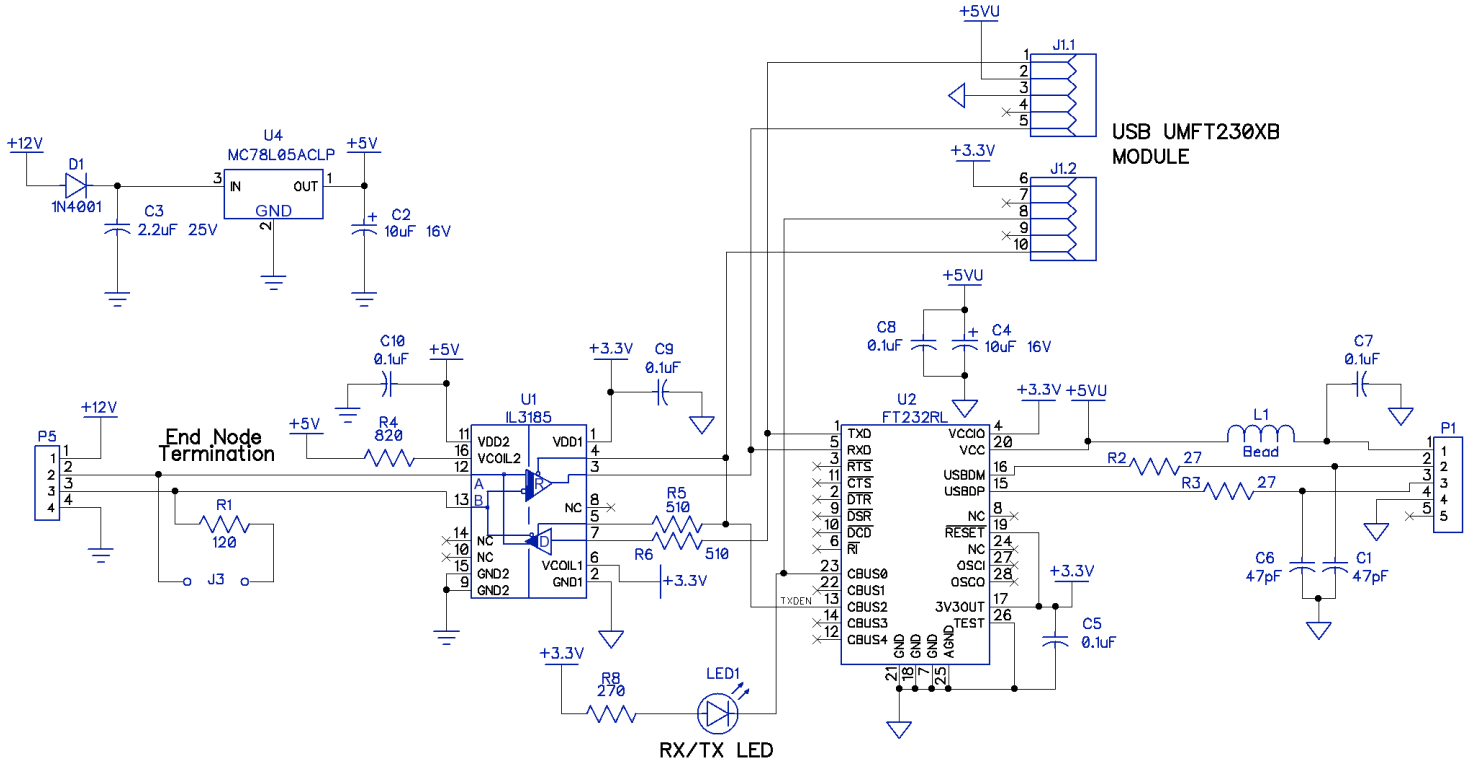
Mounting in an Enclosure

The Isolated RS-485 to USB Interface has been designed to mount in a Hammond enclosure (1551KTBU) which is available directly from Digi-Key or Mouser. Several holes will need to be cut in the enclosure for the USB connector and the RS-485 connections and power cable. The PCB is mounted using two #2 x 3/16" self-tapping screws which are also available from Digi-Key.

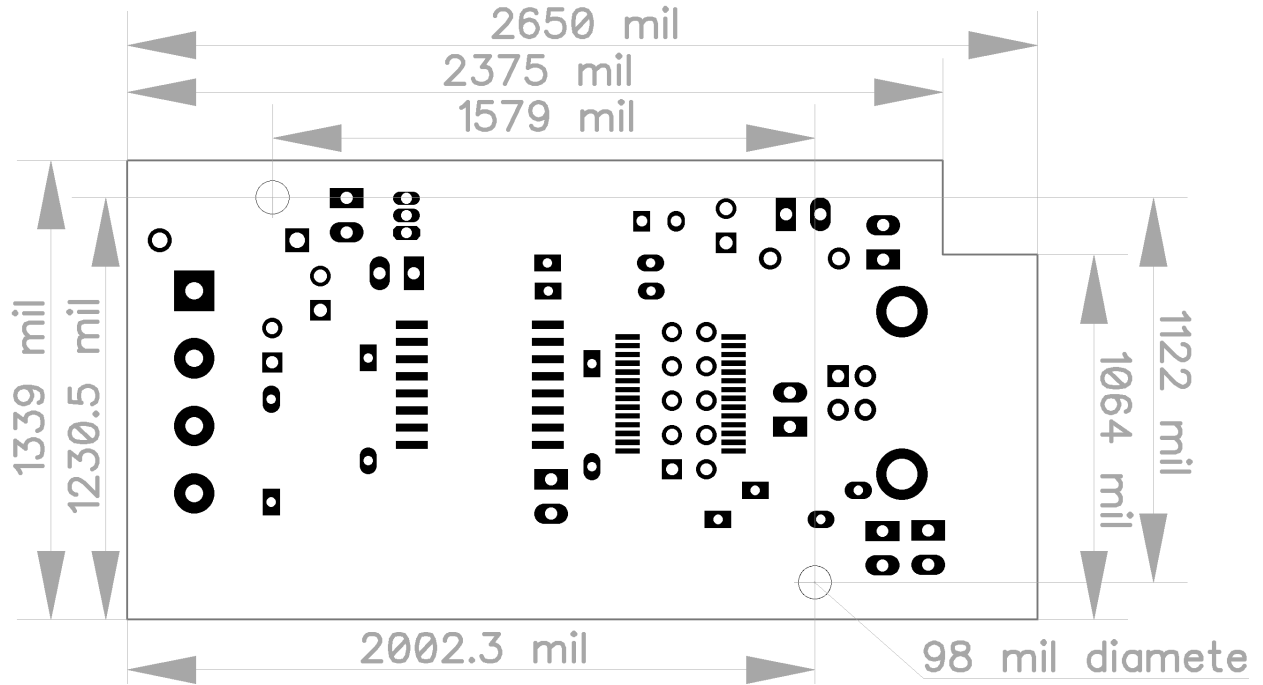


Technical Description

The circuit diagram below shows the Isolated RS-485 to USB Interface schematic and PCB outline.



Schematic of the Isolated RS-485 to USB Interface



Mechanical Dimensions of the Isolated RS-485 to USB Interface