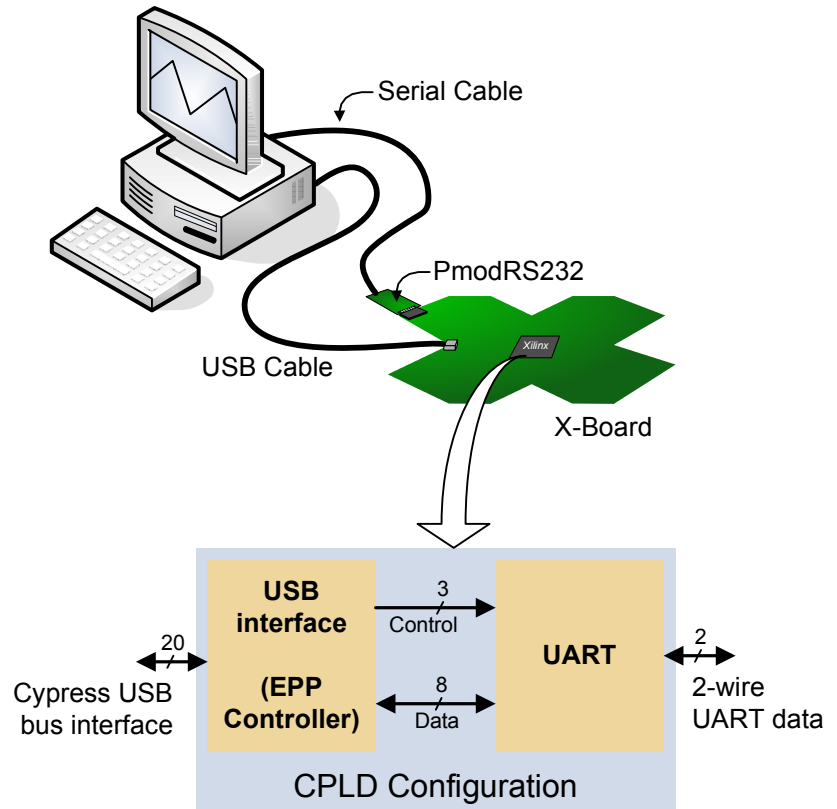


### Overview

This reference design demonstrates RS-232 serial communications using the X-Board and PModRS232. Data is sent between the X-board and a PC running Hyperterminal.

The X-board is a CPLD demonstration board based on a Xilinx CoolRunner-2 CPLD. The PModRS232 is a Digilent Peripheral Module board that contains an RS-232 level shifter.

Digilent's Adept software is used to program the reference design into the CPLD, and to move data from the X-board to the PC. Please refer to the Reference Manuals listed below for more detailed information.



### References

Digilent X-board Reference Manual and Schematic  
Digilent PModRS232 Reference Manual and Schematic  
Digilent Adept Reference Manual  
Xilinx CoolRunner-2 Data Sheet

### Set-up

This reference design requires a PC running the Xilinx ISE or WebPack tools and Hyperterminal, Digilent's Adept software, an X-board, and a Digilent PModRS232.

Set the clock frequency select jumper (J11) on the X-board to select 100KHz.

### Description

This reference design is composed of two major blocks: a USB interface that implements registers in the CPLD that Adept can read and write; and a stripped-down UART that can send and receive serial data to and from an RS-232 serial port. A simple 8-bit control bus, the Digilent asynchronous parallel



interface bus (based on the Enhanced Parallel Port, or EPP, specification), is used to move data internally between these two blocks.

The USB interface block works with firmware in the USB controller to implement 8-bit registers in the CPLD. Registers can be read from the Transport application that is available as a part of Digilent's freely available Adept software (alternatively, the API's available through Adept can be used to create custom applications to access CPLD registers). Register transfers are communicated between the USB interface block and the UART controller using Digilent's asynchronous parallel interface bus. Bus timings and signal definitions closely follow the EPP specification; please see application note AN0040 available at [www.digilentinc.com](http://www.digilentinc.com) for a detailed description of bus timing and control.

This reference design accepts data written to the X-board (using Transport) and sends the data out a serial port, and accepts data received from the serial port and displays it in Transport. A computer running Hyperterminal can be connected at the other end of a null-modem serial cable to serve as a data source and receiver. Hyperterminal settings are 9600 baud, 8 data bits, no parity, and 1 stop bit (these settings can all be changed by modifying the project source files). Data written to the address register in Transport (using any address box) will be sent out the serial port, and reading the corresponding data register in Transport will display the last-received serial byte in the data box.

To use the reference design "as is", build a project in the Xilinx tools using the VHDL and UCF files that are downloaded from the Digilent website as a part of this reference design. Attach the PModRS232 to the J1 port on the X-board, attach one end of a null-modem serial cable to the PModRS232, and attach the other end to a serial port on a PC (the same PC running Adept can be used). Start Hyperterminal on the PC, and enter the following settings: baud rate 9600, 8 data bits, no parity, and one stop bit. Enter any value in an address register and click the write button, and the data will be sent to the Hyperterminal window. Send a byte from Hyperterminal and hit the read button in Transport, and the sent byte will appear.

Note that user-written, custom applications can use X-Board serial communications by using the API's available as a part of Adept.

