

THE EARTH PEOPLE TECHNOLOGY USB-PLD DEVELOPMENT SYSTEM

The EPT USB/PLD development system provides an innovative method of developing and debugging the users microcontroller code. It can also provide a high speed data transfer mechanism between microcontroller and Host PC. The user's circuit board may be custom-built or an off-the shelf board (such as, for example, an Arduino open source prototyping platform) containing, typically, a USB connector and a microcontroller for which the user generates and loads appropriate code. The EPT USB/PLD development system provides a convenient, user-friendly method of devising and controlling code to test and debug the user's circuit board. The test code is loaded into a PLD (programmable logic device) on an EPT circuit board which connects to the user's board. The test code is generated and downloaded from a host Personal Computer (PC). The Hyper Serial Port software resides on the host PC and provides an interactive means of communicating with and controlling the EPT PLD code and thus the user's circuit board via the PC USB (universal serial bus). The EPT USB/PLD development system is a unique combination of proprietary hardware and software.

THE DEVELOPMENT SYSTEM

The Earth People Technology USB/PLD development system comprises model number EPT-570-AP-XX. The Hardware consists of a High Speed (480 Mb/s) USB to parallel (8 bit) bus and PLD. The software consists of support from HyperSerialPort in the form of Active Host. The firmware, Active Transfer Library, is used on the PLD to provide advanced functions for control and data transfer to/from the Arduino.

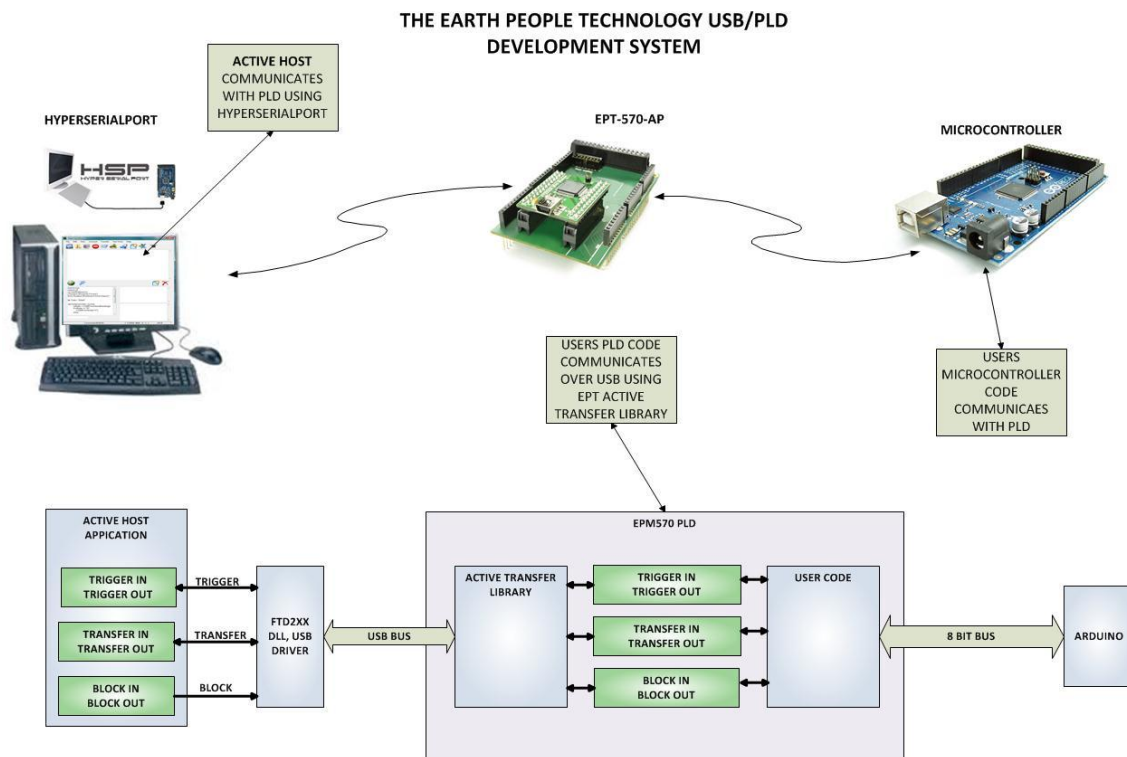
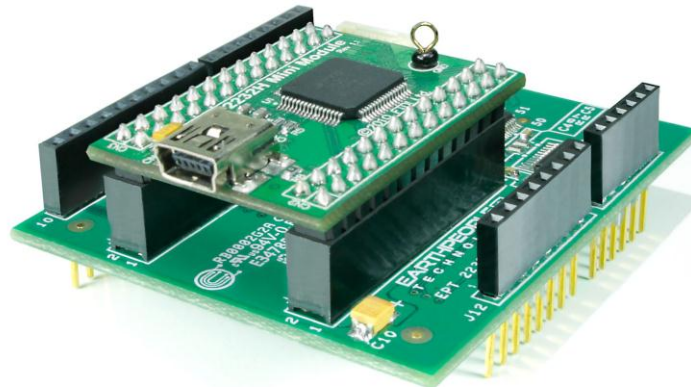


Figure 1-1 The Earth People Technology USB/PLD Development System

The user's microcontroller code is being developed to perform particular functions required by the user. The code is downloaded to the device using the hardware/software system provided as part of the microcontroller development system. The EPT-570-AP USB/PLD Development System consists of a board base onto which is plugged the FT2232H board. These boards comprise the hardware components of the EPT USB/PLD development system. The PLD allows users to write HDL code that will implement any digital logic circuit. The users HDL code is compiled and synthesized and packaged into a programming file. The packaged file is programmed into the PLD using the side A channel of the USB to Serial chip, FT2232H. The Hyper Serial Port contains a software GUI (graphical user interface) and USB I/O (input/output) communication software. The Hyper Serial Port is available as a free download at www.hyperserialport.com. The user does not need to interface with the USB Host Driver or any Windows drivers. They just need to include the appropriate functions. All of the libraries are included in HyperSerialPort.

EPT-570-AP Circuit BOARD

The EPT- 570-AP board is equipped with an Altera EPM570 PLD; which is programmed using the Altera Quartus II software. The PLD has 570 Logic Elements which is equivalent to 440 Macrocells.



An on board 66 MHz oscillator is used by the EPT-Active-Transfer-Library to provide data transfer rates of 8 Mega Bytes per second. The EPT-Active-Transfer-Library provides control communication between the objective device and the PLD. Data transfer during the objective device checkout between the PC and the PLD program is available via the Hyper Serial Port. The board also includes the following parts.

- Altera EPM570 in the TQFP 100 pin package
- 66 MHz oscillator for driving USB data transfers and users code
- Four 74LVC245 bidirectional voltage translator/bus transceiver
- 24 user Input/Outputs
- Four Green LED's accessible by the user
- Two PCB switches accessible by the user
- All connectors to stack into the Arduino Uno
- Two 13x2 connectors for accepting the FT2232H Mini Module.

Figure 3 contains an illustration of the EPT- 570-AP board.

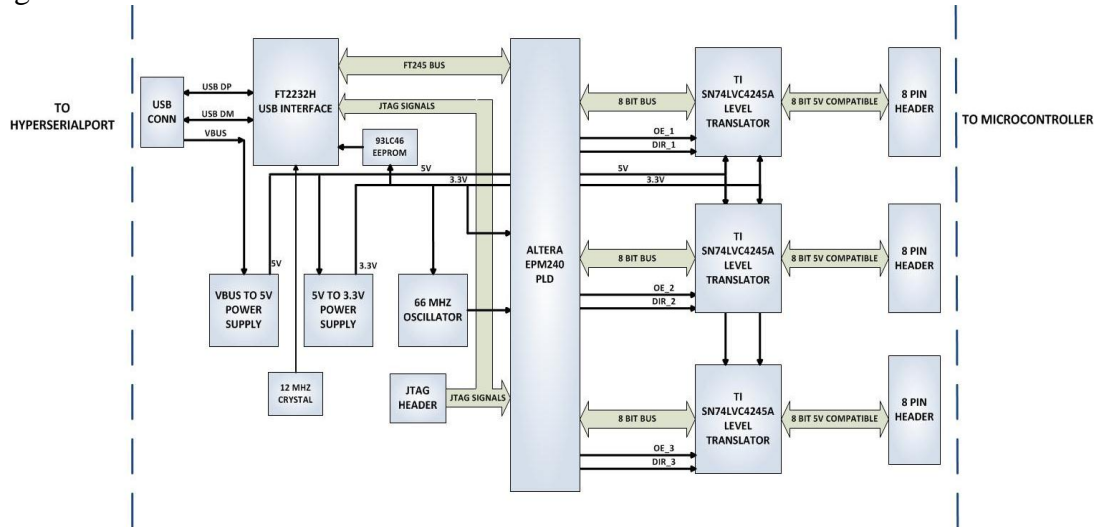
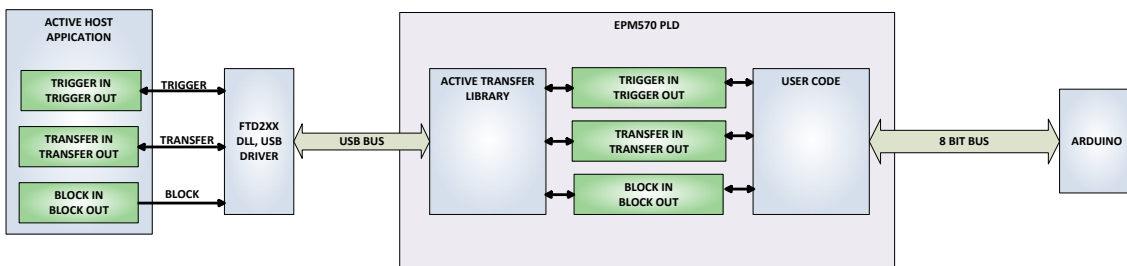


Figure 1-2 EPT-2232H-DB-02 Board Overview

The board includes several 5 Volt to 3.3 Volt level translators. This allows any 5 Volt microcontroller to connect directly to the PLD. The direction of the data transfers can be changed for each eight bit bus. This will allow users to perform data transfers from serial or parallel data buses into and out of the USB pipeline.

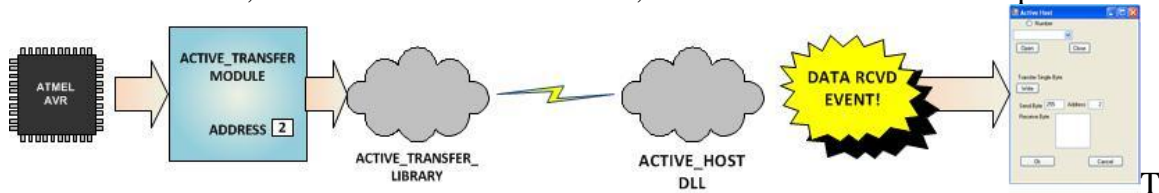
Active Host Application

HyperSerialPort has provided application software associated with the EPT USB/PLD development system. It is called Active Host and runs on the PC and is accessed through the HyperSerialPort software. The application is intended as a test platform for PLD to Active Transfer Library. However, due to the polling nature of the USB 2.0, Active Host can be used to transfer data to and from the Arduino. For the Host PC to receive data from the USB Device, it must periodically query the Device for any bytes it needs to transfer. If the Device reports back to the Host that it has bytes to transfer to the Host, the Active Host application will schedule a USB transfer to read the number of bytes into local memory. Since the polling of the Device occurs forever, the Arduino can write data into the PLD using one of the Active Transfer Library methods (Trigger, Byte Transfer, Block Transfer). Conversely, the Host PC can write to the Arduino using the Active Host at any time.



1.1.1 Active Host DLL

The Active_Host DLL is designed to transfer data from the PLD when it becomes available. The data will be stored into local memory of the PC, and an event will be triggered to inform the user code that data is available from the addressed module of the PLD. This method, from the user code on the PC, makes the data transfer transparent.



The data just appears in memory and the user code will direct the data to a textbox on the Windows Form.

The Active Host Library is contained in the dll. The user application will access the PLD by use of functions contained in the Active Host dll.