

OSBDM/OSJTAG VIRTUAL SERIAL TOOLKIT RESOURCES

1 VIRTUAL SERIAL TOOLKIT PC APPLICATIONS

P&E provides several Windows PC-based applications which function with the OSJTAG design on the Freescale tower board. These applications are collectively referred to as the OSBDM/OSJTAG Virtual Serial Toolkit. The following applications are included in the toolkit:

1.1 Accelerometer Demo Application

This PC-based application will graph serial data output from the microcontroller-based serial accelerometer application. The graphed data includes the magnitude of the X, Y, and Z accelerometer signals, as well as the current processor loading. For this application to work properly, the *microcontroller-based* serial accelerometer application must be programmed into the microcontroller which is plugged into the tower board.

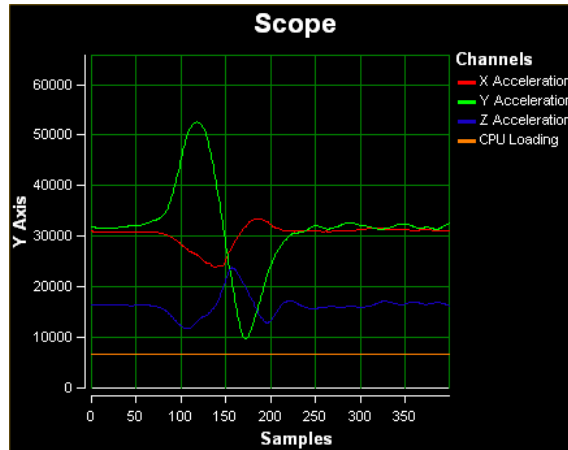


Figure 1-1: Accelerometer Demo Application

The data that is graphed may come from either the PC serial port or the virtual serial port on the tower board. The serial port of the microcontroller on the tower board is routed to either serial port hardware or the virtual COM port based upon jumper settings. The MCU UART pins should be connected to the OSBDM/OSJTAG serial input/output pins.

This PC-based application may be found at:

<http://www.pemicro.com/osbdm>

1.2 Firmware Updater

This utility allows you to update the OSJTAG firmware. P&E will soon release an archive of the latest OSJTAG hardware, software, and documentation.

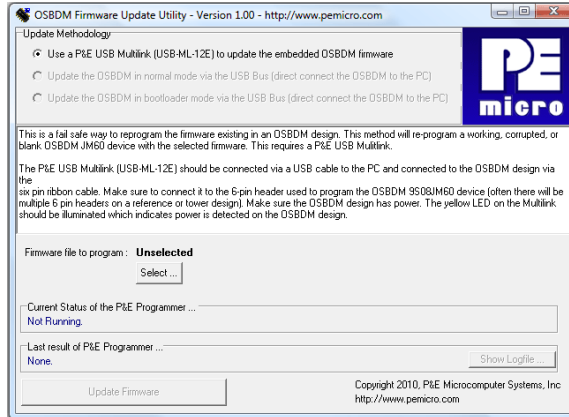


Figure 1-2: Firmware Updater Utility

This PC-based application may be found at:
<http://www.pemicro.com/osbdm>

1.3 Serial Re-Director

The Serial Re-Director utility allows serial traffic from the Embedded OSJTAG to be sent to and from a real or virtual serial port on the PC. This tool can be used in conjunction with a virtual serial driver to allow the tower board to communicate with your application via a real or virtual serial port.



Figure 1-3: Serial Re-Director Utility

This PC-based application may be found at:
<http://www.pemicro.com/osbdm>

1.4 Serial Grapher Application

This PC-based application is a more generalized version of the accelerometer demo application. It may be used with the microcontroller based serial accelerometer application or customer microcontroller code which transmits data in the correct format. The serial graphing utility allows incoming data on the PC serial port, or one of P&E's virtual serial ports, to be automatically graphed in time or displayed upon a series of bar graphs. The virtual serial port exists on certain P&E's embedded OSJTAG designs, including the tower board.

This PC-based application may be found at:

<http://www.pemicro.com/osbdm>

All data to be displayed must be in hexadecimal format. The data can be accepted and displayed either as incoming byte values (\$00-\$FF) or word values (\$0000-\$FFFF). The data format indicates whether the data is byte or word data. The graphical components automatically size their range depending upon the incoming data.

1.4.1 Visual Components

The Bar Graph has four separate bars A, B, C, and D. On each bar a percentage value is displayed which indicates the current value relative to the full range. A byte value of \$7F (max is \$FF) would show up as approximately 50% as would a word value of \$7FFF (max is \$FFFF). As can be seen in the data formatting section, all four bars must be written at the same time. The bars are shown here:

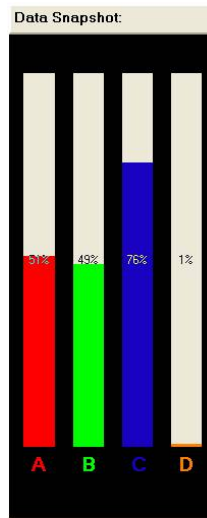


Figure 1-4: Serial Grapher Bar Graph

The graphing component shows four waveforms X, Y, Z, and W. The magnitude axis either has a range of \$00-\$FF (if byte values are incoming on the serial port) or \$0000-\$FFFF (if word values are incoming). Each new set of values which comes through the serial port is added to the far right side of the graph and the rest of the data values move to the left. The vertical axis displays the incoming data as the magnitude of each waveform, and the horizontal axis displays the number of samples. The graph has a limited size, so older samples will eventually fall off the left part of the graph. As can be seen in **Section 1.4.2 - Data Format**, each incoming data command affecting the graphing component must have new data for all four waveforms. An example graph is shown here:

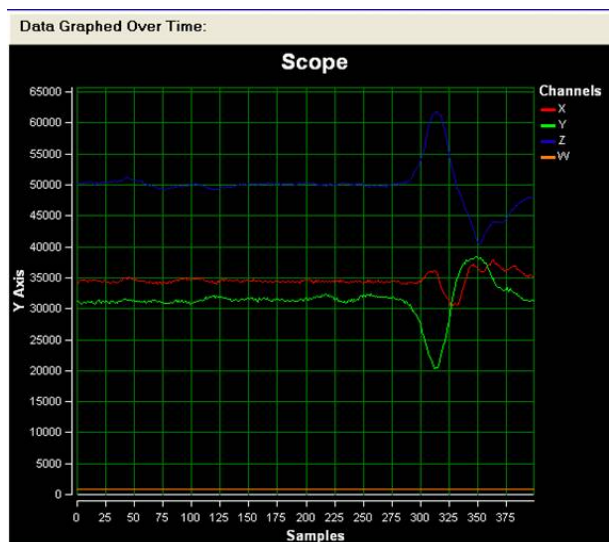


Figure 1-5: Serial Grapher Graphing Component

1.4.2 Data Format

The data format is broken into two sections depending upon whether the incoming data is in byte format or word format.

1.4.2.1 Byte Formatted Data

There are two commands which may be accepted. Both commands must end in the special characters # $\$0D$ and # $\$0A$ which are CR (carriage return) and LF (line feed). The accepted commands are:

WnnZnnYnnXnn

The nn values are 00-FF and correspond in order to the data displayed on the following graph lines: W, Z, Y, X.

AnnBnnCnnDnn

The nn values are 00-FF and correspond in order to the data displayed on the following bar graphs lines: A, B, C, D.

1.4.2.2 Word Formatted Data

There are three commands which may be accepted. All commands must end

in the special characters #0D and #0A which are CR (carriage return) and LF (line feed). The accepted commands are:

nnnn,nnnn,nnnn,nnnn

The nnnn values are 0000-FFFF and correspond in order to the data displayed on both the graph and bar graphs as follows: X/A, Y/B, Z/C, W/D.

nnnn:nnnn:nnnn:nnnn

The nnnn values are 0000-FFFF and correspond in order to the data displayed the graphing component as follows: X, Y, Z, W.

nnnn=nnnn=nnnn=nnnn

The nnnn values are 0000-FFFF and correspond in order to the data displayed on the bar graph component as follows: A, B, C, D.

1.5 Terminal Application

This PC-based application acts as a standard serial port terminal application on the PC. It works with standard serial ports as well as the virtual serial port on the tower board. The application includes settings to adjust the COM port number, baud rate, parity, and number of data bits. There is a button to take a file on the PC and transmit it out of the serial port. There are also delays which are automatically inserted in the transmission output to prevent overruns. It is recommended that these defaults not be changed.

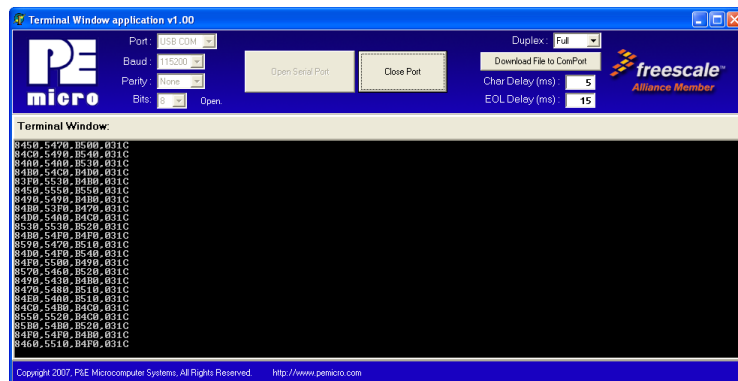


Figure 1-6: Terminal Application

The terminal window may be set for full duplex or half duplex. In full duplex

mode, only received characters are displayed in the terminal window. In half duplex mode, both transmitted and received characters are displayed.

This PC-based application may be found at:

<http://www.pemicro.com/osbdm>

2 TRANSITIONING TO YOUR OWN TARGET

Once you have finished working with the Freescale tower and are ready to build your own target, you will need a hardware tool to allow you to develop using your own board. P&E's USB Multilink Universal and P&E's Cyclone MAX offer two effective solutions, depending on your needs. Both work with Freescale's CodeWarrior as well as P&E software, and both provide a seamless transition to working with your own hardware.

The USB Multilink Universal is a development tool that is a much faster and more fully featured version of the Embedded OSBDM/OSJTAG circuitry on the Freescale tower card. It will enable you to debug your code and program it onto your target. The Cyclone MAX is a more versatile and robust development tool with advanced features and low- and high-volume production capabilities.

More information is available below to assist you in choosing the appropriate development tool for your needs.

2.1 Hardware Solutions At A Glance

The USB Multilink Universal offers an affordable and compact solution for your development needs, and allows debugging and programming to be accomplished simply and efficiently. Those doing rapid development will find the USB Multilink Universal easy to use and fully capable of fast-paced debugging and programming.

The Cyclone MAX is a more complete solution designed for both development and production. The Cyclone MAX features automated power switching, multiple communications interfaces (including USB, Ethernet, and Serial), stand-alone programming functionality, and many other advanced capabilities.

Below is an overview of the features and intended use of the USB Multilink Universal and Cyclone MAX.

2.1.1 USB Multilink Universal Key Features

- All-in-one support, including Freescale Kinetis ARM, HCS08, RS08, HC(S)12, ColdFire V1/+V1, ColdFire V2-4, Power 5xxx.
- Direct user control of target's execution
- Programming and debugging capabilities
- Read/write registers and memory values
- Compact and lightweight
- Communication via USB 2.0
- Supported by P&E software and Freescale's CodeWarrior

2.1.2 Cyclone MAX Key Features

- Advanced programming and debugging capabilities, including:
 - PC-Controlled and User-Controlled Stand-Alone Operation
 - Interactive Programming via Host PC
 - In-Circuit Debugging, Programming, and Testing
- Compatible with Freescale's Kinetis ARM, ColdFire V2-4, and Power 5xxx microcontroller families
- Communication via USB, Serial, and Ethernet Ports
- Multiple image storage
- LCD screen menu interface
- Supported by P&E software and Freescale's CodeWarrior

2.2 Working With P&E's USB Multilink Universal



Figure 2-1: P&E's USB Multilink Universal

2.2.1 Product Features & Implementation

P&E's USB Multilink Universal Interface connects your target to your PC and allows the PC access to the Background Debug Mode (BDM) on Freescale's Kinetis ARM, HCS08, RS08, HC(S)12, ColdFire V1/+V1, ColdFire V2-4, Power 5xxx microcontrollers. It connects between a USB port on a Windows 2000/XP/2003/Vista/7 machine and a standard 6-pin debug connector on the target.

By using the USB Multilink Universal Interface, the user can take advantage of the background debug mode to halt normal processor execution and use a PC to control the processor. The user can then directly control the target's execution, read/write registers and memory values, debug code on the processor, and program internal or external FLASH memory devices. The USB Multilink Universal enables you to debug, program, and test your code on your board.

2.2.2 Software

The USB Multilink Universal Interface works with Freescale's CodeWarrior, as well as P&E's in-circuit debuggers and flash programmers to allow debug and flash programming of the target processor.

2.3 Working With P&E's Cyclone MAX



Figure 2-2: P&E's Cyclone MAX

2.3.1 Product Features & Implementation

P&E's Cyclone MAX is an extremely flexible tool designed for debugging, testing, and in-circuit flash programming of Freescale's Kinetis ARM, ColdFire V2-4, and Power 5xxx microcontrollers. The Cyclone MAX connects your target to the PC via USB, Ethernet, or Serial Port and enables you to debug

your code, program, and test it on your board. After development is complete the Cyclone MAX can be used as a production tool on your manufacturing floor.

For production, the Cyclone MAX may be operated interactively via Windows-based programming applications as well as under batch or .dll commands from a PC. Once loaded with data by a PC it can be disconnected and operated manually in a stand-alone mode via the LCD menu and control buttons. The Cyclone MAX has over 7Mbytes of non-volatile memory, which allows the onboard storage of multiple programming images. When connected to a PC for programming or loading it can communicate via the ethernet, USB, or serial interfaces.

2.3.2 Software

The Cyclone MAX comes with intuitive configuration software and interactive programming software, as well as easy to use automated control software. The Cyclone MAX also functions as a full-featured debug interface, and is supported by Freescale's CodeWarrior as well as development software from P&E.

