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DEMOJM User Manual

DEMOJMUM
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1 INTRODUCTION

1.1 Overview

The DEMOJM is a low cost development system supporting Freescale MC9S08JM60 and MCF51JM128 64LQFP microcontrollers. It consists of a DEMOJM Base Board, a DC9S08JM60 Daughter Card and a DC51JM128 Daughter Card. P&E's Embedded Multilink circuitry on the DEMOJM board allows the processor connected to the DEMOJM to be debugged and programmed via USB from a PC. In addition, the demo board can be powered using the USB bus.

1.2 Package Contents

The DEMOJM package includes the following items:

- DEMOJM Base Board with a DC9S08JM60 Daughter Card installed
- DC51JM128 Daughter Card
- Getting Started DVD - Getting started with the series of microcontrollers
- USB A-to-B Cable
- Mini-AB USB Kit
- USB Thumb Drive
- Quick Start Guide
- Freescale Warranty Card

1.3 Supported Devices

The DEMOJM supports the following devices:

- MC9S08JM60CLH

• MCF51JM128VLH

1.4   Recommended Materials On The Getting Started DVD-ROM

- Freescale MC9S08JM60 reference manual and datasheet
- Freescale MCF51JM128 reference manual and datasheet
- DEMOJM Base Board and Daughter Card schematic
- P&E Embedded Multilink Toolkit applications
- P&E Embedded Multilink driver installation guide and resources

1.5   Handling Precautions

Take care to handle the package contents, including the DEMOJM Base Board, DC9S08JM60 Daughter Card, and DC51JM128 Daughter Card, in a manner such as to prevent electrostatic discharge.

2   HARDWARE FEATURES

The DEMOJM is a demonstration and development system for Freescale's MC9S08JM60 and MCF51JM128 microcontrollers. Application development is quick and easy using P&E's Embedded Multilink circuitry and the included software tools and examples. An optional BDM port is provided to allow the use of an external BDM interface such as P&E's Cyclone PRO automated programmer or USB Multilink. The USB Multilink is functionally comparable to the DEMOJM's Embedded Multilink circuitry.

Note: The DEMO board's onboard Embedded Multilink circuitry is intended to function with the onbaord processor and any daughter cards that may be included. It cannot be used to communicate with other devices.

2.1   DEMOJM Base Board Features

- On-board Logic Analyzer
- On-board Virtual Serial Port
- Four (4) asymmetrically positioned 8x2 male connectors for interchangeable daughter cards
- P&E's Embedded Multilink circuitry populated on the underside

- SCI signals connected to P&E's Embedded Multilink through jumpers
- ON/OFF Power Switch w/ LED indicator
- A 6VDC - 8VDC power supply input barrel connector

Note: The DEMOJM board power connector is incorrectly labelled as 6-12VDC. Maximum voltage is 8VDC.

- Power Input Selection Jumpers for selecting the input voltage source:
    - Power Input from Embedded Multilink to LDO regulator
    - Power Input from DC Power Jack to LDO regulator
    - Power Input from Mini-AB connector
    - Power Input from MCU_PORT connector
- RESET Push Button and LED indicator w/ Enable
- User Features:
    - USB device mode and host mode support with Mini-AB USB connector
    - CAN Module w/Enable
    - 3-axis Accelerometer w/Enable
    - 8 User LED's w/ Enable
    - 4 User Push Buttons w/ Enable
    - 1 Piezo Buzzer w/ Enable
    - IIC Pullups w/ Enable
    - 10K Ohm POT w/ Enable
- Specifications:
    - Board Size 3.5 x 4.0
    - Daughter Card Size 1.4 x 1.5
    - Power Input:
        - USB Cable: 5VDC, 500mA max
        - DC Power Jack: 2.5/5.5mm barrel connector, 6VDC to 8VDC Center Positive

Note: The DEMOJM board power connector is incorrectly labelled as 6-12VDC

Maximum voltage is 8VDC.
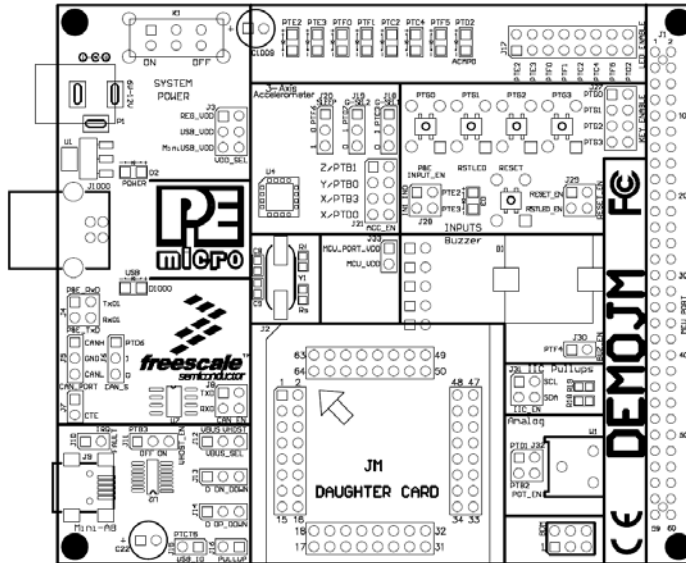
Figure 2-1: DEMOJM Top Component Placement

2.2   On-Board Logic Analyzer

The DEMOJM board has a built-in 2-channel logic analyzer which may be used to display captured data in real-time on a host PC. The logic analyzer channels (IN0/IN1) are connected to the PTE2 and PTE3 signals on the DEMOJM board by default via the J28 jumpers. The channels may be connected to any of the processor pins via wire jumpers (not included).

The Logic Analyzer Utility, included in the P&E Embedded Multilink Toolkit on the accompanying DVD-ROM, displays the logic analyzer signals on a PC.

2.3   On-Board Virtual USB Port

The DEMOJM board has a built-in virtual serial port which may be connected to the JM processor's SCI RXD/TXD. This allows certain PC applications to be able to connect in a serial fashion to the microcontroller without the actual use of serial port hardware.

The Terminal Window Utility, included in the P&E Embedded Multilink Toolkit on the accompanying DVD-ROM, is a generic serial port utility which works with the DEMOJM virtual serial port or actual serial port hardware.

2.4 DEMOJM Daughter Card Features

- Four (4) bottom-mounted asymmetrically positioned 8x2 female connectors to mate with the DEMOJM Base Board

- A top-mounted MC9S08JM60CLH or MCF51JM128VLH chip

2.5 DEMOJM Jumper/Connector Quick Reference

Default Jumper Settings

The following is a list of default jumper settings for DEMOJM board. The settings listed indicate the "on" (or installed) position.

Default Jumper Settings

JUMPERS	SETTINGS
J3	3&4
J4	1&2, 3&4
J6	2&3
J7	1&2
J8	1&2, 3&4
J11	1&2
J12	1&2
J13	2&3
J14	2&3
J17	ALL ON
J18	2&3

Default Jumper Settings

J19	2&3
J20	2&3
J21	1&2, 3&4, 5&6
J24	1&2
J27	1&2, 3&4, 5&6, 7&8
J28	1&2, 3&4
J29	1&2, 3&4
J30	1&2
J31	1&2 3&4
J32	1&2 3&4
J33	1&2

MCU Port Connector Pinout

The following is the pinout for the MCU Port connector on the DEMOJM board.

VDD	1	2	IRQ/TPMCLK
VSS	3	4	RESET
PTE0/TxD1	5	6	BKGD/MS
PTE1/RxD1	7	8	VUSB33
PTG0/KBIP0	9	10	PTB0/MISO2/ADP0
PTG1/KBIP1	11	12	PTB1/MOSI2/ADP1
PTE2/TPM1CH0	13	14	PTB2/SPSCK2/ADP2
PTE3/TPM1CH1	15	16	PTB3/SS2/ADP3
PTE5/MOSI1	17	18	PTB4/KBIP4/ADP4
PTE4/MISO1	19	20	PTB5/KBIP5/ADP5
PTE6/SPSCK1	21	22	PTB6/ADP6
PTE7/SS1	23	24	PTB7/ADP7
PTF0/TPM1CH2	25	26	PTC0/SCL
PTF1/TPM1CH3	27	28	PTC1/SDA
PTF2/TPM1CH4	29	30	PTG2/KBIP6
PTF3/TPM1CH5	31	32	PTG3/KBIP7_J1
VREFH	33	34	PTF4/TPM2CH0
VREFL	35	36	PTF5/TPM2CH1
PTD0/ADP8/ACMP+	37	38	PTC5/RxD2
PTD1/ADP9/ACMP-	39	40	PTC3/TxD2
PTD2/KBIP2/ACMPO	41	42	PTG4/XTAL
PTD3/KBIP3/ADP10	43	44	PTG5/EXTAL
PTD4/ADP11	45	46	PTA0
PTD5	47	48	PTA1
PTD6	49	50	PTA2
PTD7	51	52	PTA3
PTC2	53	54	PTA4
PTC4	55	56	PTA5
PTC6	57	58	PTF6
NC	59	60	PTF7

Figure 2-2: MCU Port Connector Pinout

3   GETTING STARTED WITH THE DEMOJM

The DEMOJM is a low-cost board targeting quick microcontroller evaluation. The board includes two plug-in daughter cards to demonstrate the ease of migration between the Flexis JM60, 8-bit S08 and Flexis JM128, 32-bit ColdFire V1 microcontrollers. The board also includes a power terminal to measure the ultra-low power consumption of the JM devices.

Please refer to the DEMOJM Quick Start Guide and Labs for instructions on how to install software, connect the DEMOJM to your PC, and run quick demonstrations.

4   SYSTEM SETUP

4.1   Overview

P&E's Embedded Multilink driver is required to operate the DEMOJM using a PC. The Embedded Multilink driver should be installed with the CodeWarrior Development Studio software or from the DEMOJM Resources in the Getting Started DVD-ROM before the PC is connected to the DEMOJM.

4.2   Operating System Requirements

The following are the resources required to run the CodeWarrior Development Studio and the DEMOJM:

- A PC-compatible system running Windows 2000, Windows XP, or Windows Vista
- 128MB of available system RAM, and 1GB of available hard disk space
- A DVD-ROM drive for software installation
- A USB port

4.3   Software Setup

4.3.1   Installing CodeWarrior Development Studio

To install the CodeWarrior Development Studio, follow the instructions on the DVD-ROM.

4.3.2   Installing P&E Resources

Use the DEMOJM Resources in the DVD-ROM to access and install P&E resources for the DEMOJM. These materials are not required for operation. The DEMOJM Resources in the Getting Started DVD-ROM contains the following support materials:

- DEMOJM Embedded Multilink hardware interface driver

- • DEMOJM User Manual (this document)
- • DEMOJM Base Board and Daughter Cards Schematics
- • DEMOJM Component Breakdown List
- • P&E Embedded Multilink Toolkit PC Applications
- • P&E Evaluation Software
- • Links to Freescale documentation, P&E Discussion Forums, and DEMOJM FAQs.

4.4   Quick Startup

Only a few steps are required to get the DEMOJM up and running. Please reference the Quick Start Guide.

4.5   Hardware Setup

4.5.1   First-Time Connection

The DEMOJM may be connected to a PC through a USB port. Connection steps are listed below in typical order:

1. Install the required software, as described in the previous section.

2. Make sure the jumper USB_VDD for VDD_SEL is installed.

3. Plug the USB cable A-M connector into a free USB port of the PC.

4. Plug the USB cable B-M connector into the USB connector on the DEMOJM Base Board.

5. The operating system will recognize P&E's Embedded Multilink circuitry and P&E's USB to Serial circuitry. Depending on the operating system, you may see the "Found New Hardware Wizard" dialog to assist you with software installation for "PEMicro USB Multilink (i0)." On Windows XP (SP2), the following dialog will appear:

Figure 4-1: Found New Hardware Wizard Dialog (1 of 4)

Select the "Install the software automatically (Recommended)" option and click the "Next" button.

6. Windows will install the driver files to your system. At the end of the installation, the following dialog box will appear:
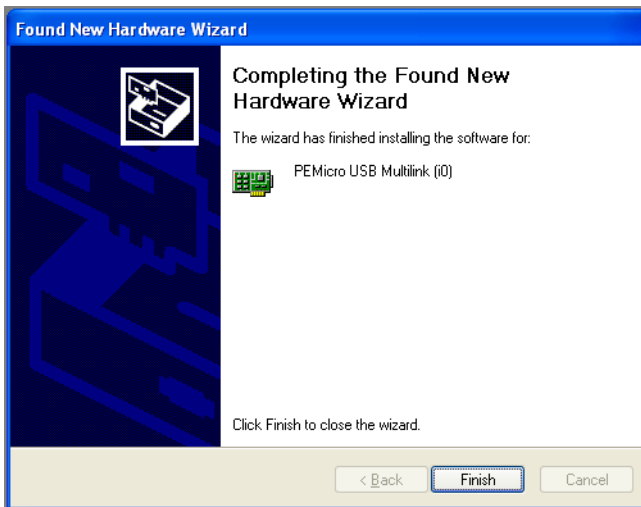
Figure 4-2: Found New Hardware Wizard Dialog (2 of 4)

Click the "Finish" button to exit the current "Found New Hardware Wizard".

7. Depending on the operating system, you may see the "Found New Hardware Wizard" dialog again to assist you with software installation for "PEMicro USB Serial Port (i1)." On Windows XP (SP2), the following dialog will appear:

Figure 4-3: Found New Hardware Wizard Dialog (3 of 4)

Select the "Install the software automatically (Recommended)" option and click the "Next" button.

8. Windows will install the driver files to your system. At the end of the installation, the following dialog box will appear:

Figure 4-4: Found New Hardware Wizard Dialog (4 of 4)

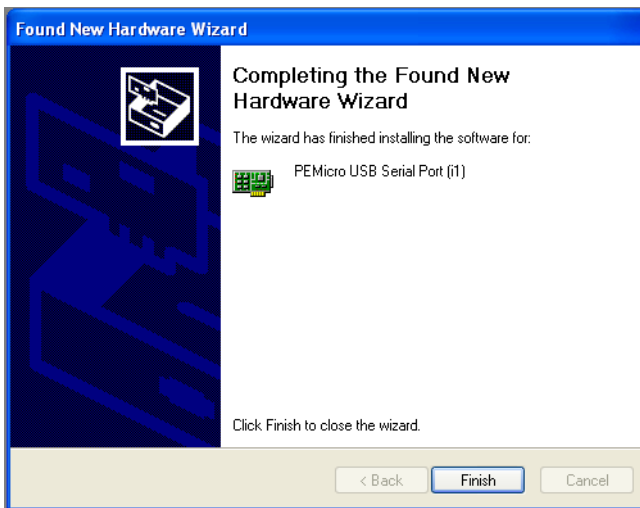Click the "Finish" button to exit the "Found New Hardware Wizard."

If the DEMOJM hardware interface driver is now properly installed on your system, the green USB LED on the DEMOJM Base Board should be illuminated. In addition, if you turn on the system power of the DEMOJM you will see the red Power LED illuminate.

5   OPERATING MODES

5.1   Overview

The DEMOJM's Embedded Multilink circuitry, featured hardware components, and optional external BDM header make it a versatile development tool. Below are some of the featured operating modes of the DEMOJM.

5.2   Debug Mode

A host communicates with the DEMOJM through the Embedded Multilink circuitry. Either the CodeWarrior Development Studio or P&E's HCS08/CFV1 software tools will work with the DEMOJM. Please refer to **Section 9 - DEMOJM CODE DEVELOPMENT SOFTWARE** for more information.

5.3 Run Mode

The DEMOJM's rich component list empowers it to perform a variety of tasks. Once an application is developed, debugged, and programmed properly into the JM internal flash memory, it can run with or without connecting to a host.

5.4 External BDM Mode

The DEMOJM has an optional BDM header for debugging and programming the on-board JM device using an external BDM hardware tool, such as P&E's USB Multilink or Cyclone PRO. Please refer to **Section 10 - TRANSITIONING TO YOUR OWN TARGET** for more information. A user can take advantage of this mode to develop a target-specific JM system and compare it with the DEMOJM when necessary.

6 P&E EMBEDDED MULTILINK TOOLKIT PC APPLICATIONS

P&E provides several Windows PC-based applications which work with the DEMOJM board. These applications are collectively referred to as the P&E Embedded Multilink Toolkit. The following applications are included in the toolkit:

6.1 Logic Analyzer Application

The DEMOJM board has a built-in two-channel logic analyzer. This analyzer allows the IN0 and IN1 signals to be captured by the PC and displayed for the user. The IN0 and IN1 signals may be connected to any of the MCU signals which the user would like to view. By default, they are connected to the PTE2 and PTE3 pins of the MCU by jumper J28. At the time of this release, the logic analyzer runs at a capture rate of 10khz.

Figure 6-1: Logic Analyzer Application

This PC-based application is used to display the logic analyzer data on the PC. The logic analyzer data is displayed in real-time and each waveform may be paused, zoomed, and printed.

To start using this application, please plug in a USB cable into the DEMOJM board. Once the USB and Power LEDs light up, indicating the proper enumeration on the USB port, click on the Open DEMO and Graph Pins button. The logic channel graphs should be reflecting data captured from the IO pins connected to the IN0 and IN1 header pins on the DEMOJM evaluation board.

If the microcontroller-based Logic Analyzer Application is programmed into the MCU, the IN0 channel will show the PWM output on pin PTE2, whose duty cycle is controlled by the potentiometer (W1). The IN1 channel shows the PWM output on channel PTE3.

This PC-based application is included on the DVD-ROM that accompanies the DEMOJM, and may also be found at:

http://www.pemicro.com/fixedlinks/demotoolkit.cfm.

6.2   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 DEMOJM 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 into the transmission output to prevent overruns. It is recommended that these defaults not be changed.
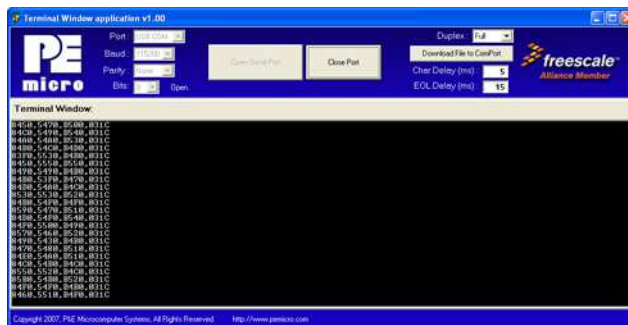
Figure 6-2: Terminal Application

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.

To start using this application, please choose COM or virtual USB COM settings from the drop down Port menu. This specifies the port on the evaluation board that will be used for serial data transmission. Please make sure that the jumpers on header J4 are set accordingly. Prior to starting serial data capture, please specify the Baud, Parity and Bits settings to reflect the parameters at which your serial communication interface is operating. Once your port settings are configured, please plug a USB or DB9 serial cable into the evaluation board and click on the Open Serial Port button.

This PC-based application is included on the DVD-ROM that accompanies the DEMOJM, and may also be found at:

http://www.pemicro.com/fixedlinks/demotoolkit.cfm.

6.3   DEMOJM Unsecure Application

This application allows secure CFV1 and HCS08 microcontrollers to be unsecured. The Unsecure application will erase a secure device to make it unsecure. This application works with the DEMOJM board as well as other user hardware connected to the PC via the USB Multilink or Cyclone PRO hardware interfaces.
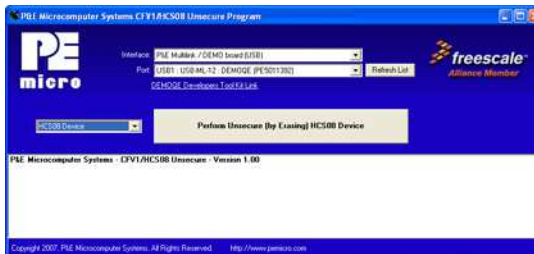
Figure 6-3: Unsecure Application

In order to unsecure a device with this application, please specify the hardware interface that you are using. If your P&E Multilink or Cyclone PRO is successfully detected, the name of a corresponding device will appear in the Port text box. Please select HCS08 or CFV1 from the Select Architecture drop down menu and press the Perform Unsecure button. The application will finish unsecuring and erasing the device shortly thereafter.

This PC-based application is included on the DVD-ROM that accompanies the DEMOJM, and may also be found at:

http://www.pemicro.com/fixedlinks/demotoolkit.cfm.

6.4   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 DEMOJM board.
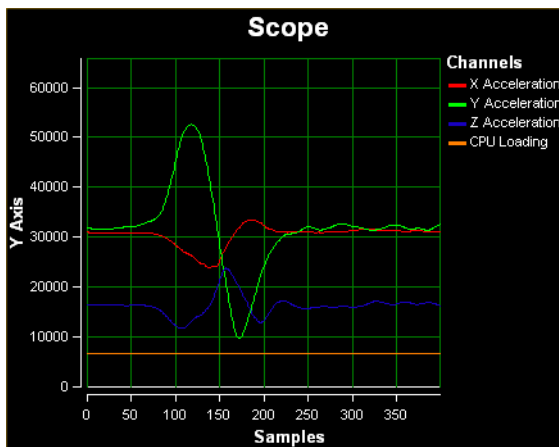
Figure 6-4: Accelerometer Demo Application

The data that is graphed may come from either the PC serial port or the virtual serial port on the DEMOJM board. The serial port of the microcontroller on the DEMOJM board is routed to the virtual COM port with the setting of jumper J4. To properly configure accelerometer and potentiometer resources on the DEMOJM evaluation board, please make sure that these headers are populated with jumpers in the following manner: J21 (Z/PTB1 -populated, Y/PTB0 –populated, Y/PTB3 -populated, X/PTD0 –unpopulated); J18 (set to 0); J19 (set to 0); J20 (set to 1); J32 (PTB2 –populated, PTD1 –populated).

To start using this application, please choose COM or virtual USB COM settings from the drop-down Port menu. By doing so, you are specifying the port on the evaluation board that will be used for transmitting captured accelerometer data via a COM or USB serial port. Please make sure that jumper J4 is set accordingly. Prior to starting serial data capture, please specify the Baud setting to reflect the parameter at which your serial communication interface is operating. Once your port settings are configured, please plug a USB or DB9 serial cable into the evaluation board and click on the Open Serial Port and Start Demo buttons. After the serial data is captured by the application you will see raw data in the Terminal Window. In the meantime, the Data Snapshot window will display the accelerometer and potentiometer data levels in the form of a bar graph. The graphing of data can be paused and the scale of the X and Y axes can be changed via a tool bar located in the top right corner of the Accelerometer Demo Application.

This PC-based application is included on the DVD-ROM that accompanies the DEMOJM, and may also be found at:

http://www.pemicro.com/fixedlinks/demotoolkit.cfm.

6.5 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 custom 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 as a series of bar graphs. The virtual serial port exists on several of P&E's Embedded Multilink designs including the DEMOJM board.

To start using this application, please choose COM or virtual USB COM settings from the drop-down Port menu. By doing so, you are specifying the port on the evaluation board that will be used for transmitting captured accelerometer data via a COM or USB serial port. Please make sure that jumper J4 is set accordingly. Prior to starting serial data capture, please specify the Baud setting to reflect the parameter at which your serial communication interface is operating. Once your port settings are configured, please plug a USB or DB9 serial cable into the evaluation board and click on the Open Serial Port and Start Demo buttons. The graphing of data can be paused and the scale of the X and Y axes can be changed via a tool bar located in the top right corner of the Serial Grapher Application.

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.

This PC-based application is included on the DVD-ROM that accompanies the DEMOJM and may also be found at:

http://www.pemicro.com/fixedlinks/demotoolkit.cfm.

6.5.1 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:
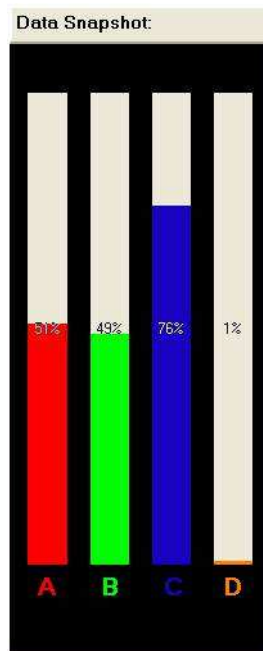
Figure 6-5: Serial Grapher Bar Graph

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 are moved 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 Data Format, each incoming data command affecting the graphing component must have new data for all four waveforms. An example graph is shown here:
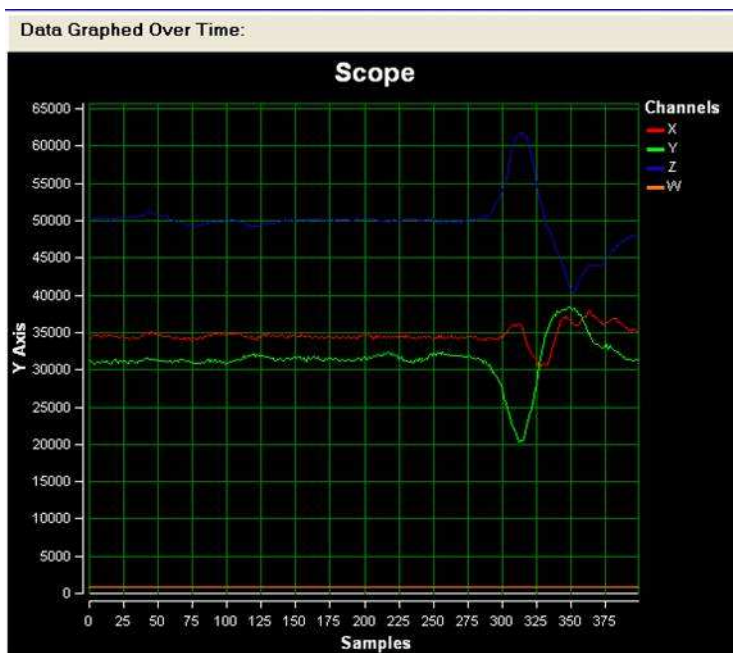
Figure 6-6: Serial Grapher Graphing Component

6.5.2 Data Format

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

6.5.2.1 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.