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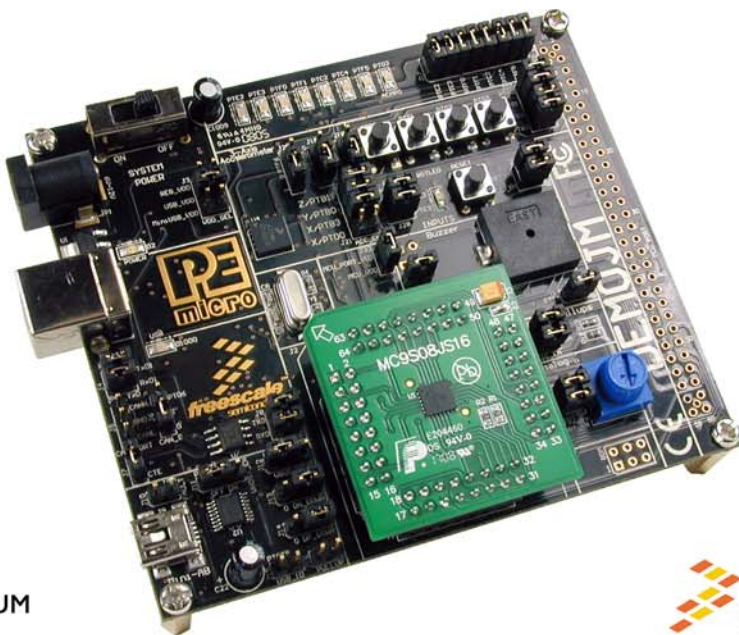
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PE micro

DEMO9S08JS16 User Manual



DEMO9S08JS16UM
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1 INTRODUCTION

1.1 Overview

The DEMO9S08JS16 is a low cost development system supporting Freescale MC9S08JS16 microcontrollers. It consists of a DEMOJM Base Board and a DC9S08JS16 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 DEMO9S08JS16 package includes the following items:

- DEMOJM Base Board with a DC9S08JS16 Daughter Card installed
- Getting Started DVD - Getting started with the series of microcontrollers
- USB A-to-B Cable
- Mini-AB USB Kit
- Quick Start Guide
- Freescale Warranty Card

1.3 Supported Devices

The DEMO9S08JS16 supports the following devices:

- MC9S08JS16CFK

1.4 Recommended Materials On The Getting Started DVD-ROM

- Freescale MC9S08JS16 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 and DC9S08JS16 Daughter Card, in a manner such as to prevent electrostatic discharge.

2 HARDWARE FEATURES

The DEMO9S08JS16 is a demonstration and development system for Freescale's MC9S08JS16 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 onboard 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 to 8VDC power supply input barrel connector

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

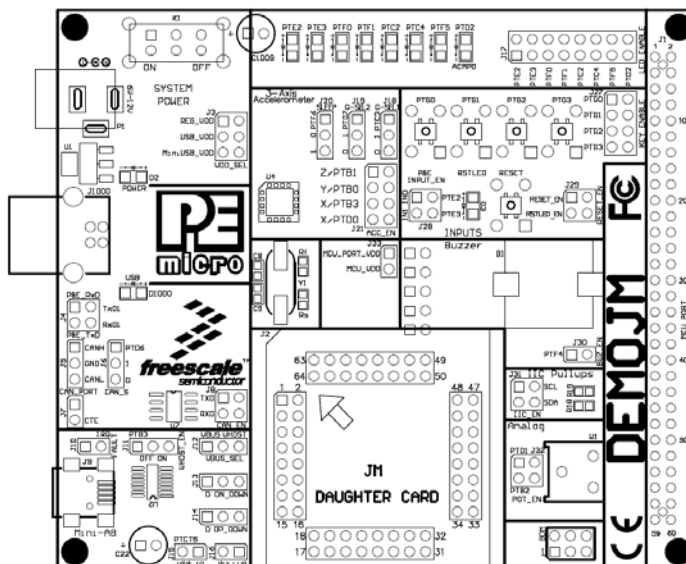


Figure 2-1: DEMOJM Top Component Placement

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 DEMO9S08JS16 Daughter Card Features

- Four (4) bottom-mounted asymmetrically positioned 8x2 female connectors to mate with the DEMOJM Base Board
- A top-mounted MC9S08JS16CFK chip
- Signals are mapped to the different modules to demonstrate different functions:
 - TxD (PTA7) and RxD (PTA6) are mapped to TxD1 (PTE0) and RxD1 (PTE1) of the DEMOJM 64Pin header
 - TPMCH0 (PTA0) and TPMCH1 (PTA5) are mapped to TPM1CH0 (PTE2) and TPM1CH1 (PTE3) on the DEMOJM 64Pin header
 - SPI Signals are mapped to SPI1 Signals on the DEMOJM 64 Pin header
 - BLMS (PTB3) is mapped to PTG0 (KBIP0) of the DEMOJM 64Pin header
 - KBIP1 (PTA1), KBIP6 (PTA6) and KBIP7 (PTA7) are mapped to PTG1/PTG2/PTG3 correspondingly

2.5 DEMOJM Board 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.

Note: The JS16 can only support USB device mode.

J13: PTA5 is used as GPIO.

J14: PTA4 is used as GPIO.

J21: JS16 has no ADC module.

J31: JS16 has no IIC module.

J32: JS16 has no ADC module.

Default Jumper Settings

JUMPERS	SETTINGS
J3	3&4
J4	ALL OFF
J6	2&3
J7	1&2
J8	1&2, 3&4
J10	OFF
J11	1&2
J12	1&2
J13	ALL OFF
J14	ALL OFF
J15	OFF
J16	OFF
J17	1&2, 3&4, 5&6, 7&8, 9&10, 11&12, 13&14, 15&16
J18	2&3
J19	2&3
J20	2&3
J21	ALL OFF
J24	1&2

Default Jumper Settings

J27	1&2, 3&4, 5&6, 7&8
J28	1&2, 3&4
J29	1&2, 3&4
J30	1&2
J31	ALL OFF
J32	ALL OFF
J33	1&2

2.6 Signal Mapping of DC9S08JS16 to MCU_PORT

Signal Mapping

PIN NUMBER	SIGNAL	PIN NUMBER	SIGNAL
1	VDD	2	PTB0/IRQ/TCLK
3	VSS	4	PTB1/~RESET
5	PTA7/KBIP7/TXD	6	PTB2/BKGD/MS
7	PTA6/KBIP6/RXD	8	VUSB33
9	PTB3/BLMS	10	PTB0/IRQ/TCLK
11	PTA1/KBIP1/MISO	12	PTB1/RESET
13	PTA0/KBIP0/ TPMCH0	14	PTB2/BKGD/MS
15	PTA5/KBIP5/ TPMCH1	16	PTB3/BLMS
17	PTA2/KBIP2/MOSI	18	PTB4/XTAL
19	PTA1/KBIP1/MISO	20	PTB5/EXTAL
21	PTA3/KBIP3/SPSCK	22	NC
23	PTA4/KBIP4/SS	24	NC
25	NC	26	NC
27	NC	28	NC
29	NC	30	PTA6/KBIP6/RXD
31	NC	32	PTA7/KBIP7/TXD
33	VREFH	34	NC
35	VREFL	36	NC

Signal Mapping

PIN NUMBER	SIGNAL	PIN NUMBER	SIGNAL
37	NC	38	NC
39	NC	40	NC
41	NC	42	PTB4/XTAL
43	NC	44	PTB5/EXTAL
45	NC	46	PTA0/KBIP0/TPMCH0
47	NC	48	PTA1/KBIP1/MISO
49	NC	50	PTA2/KBIP2/MOSI
51	NC	52	PTA3/KBIP3/SPSCK
53	NC	54	PTA4/KBIP4/SS
55	NC	56	PTA5/KBIP5/TPMCH1
57	NC	58	NC
59	NC	60	NC

3 GETTING STARTED WITH THE DEMO9S08JS16

The DEMO9S08JS16 is a low-cost board targeting quick microcontroller evaluation. . The board includes a power terminal to measure the ultra-low power consumption of Freescale's JM devices.

Please refer to the DEMO9S08JS16 Quick Start Guide and Labs for instructions on how to install software, connect the DEMO9S08JS16 to your PC, and run quick demonstrations.

4 SYSTEM SETUP

4.1 Overview

P&E's Embedded Multilink driver is required to operate the DEMO9S08JS16 using a PC. The Embedded Multilink driver should be installed with the CodeWarrior Development Studio software or from the DEMO9S08JS16 Resources in the Getting Started DVD-ROM before the PC is connected to the DEMO9S08JS16.

4.2 Operating System Requirements

The following are the resources required to run the CodeWarrior Development Studio and the DEMO9S08JS16:

- 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 DEMO9S08JS16 Resources in the DVD-ROM to access and install P&E resources for the DEMO9S08JS16. These materials are not required for operation. The DEMO9S08JS16 Resources in the Getting Started DVD-ROM contains the following support materials:

- DEMO9S08JS16 Embedded Multilink hardware interface driver
- DEMO9S08JS16 User Manual (this document)
- DEMOJM Base Board and Daughter Cards Schematics
- DEMO9S08JS16 Component Breakdown List
- P&E Embedded Multilink Toolkit PC Applications
- P&E Evaluation Software

- Links to Freescale documentation, P&E Discussion Forums, and DEMO9S08JS16 FAQs.

4.4 Quick Startup

Only a few steps are required to get the DEMO9S08JS16 up and running. Please reference the Quick Start Guide.

4.5 Hardware Setup

4.5.1 First-Time Connection

The DEMO9S08JS16 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:

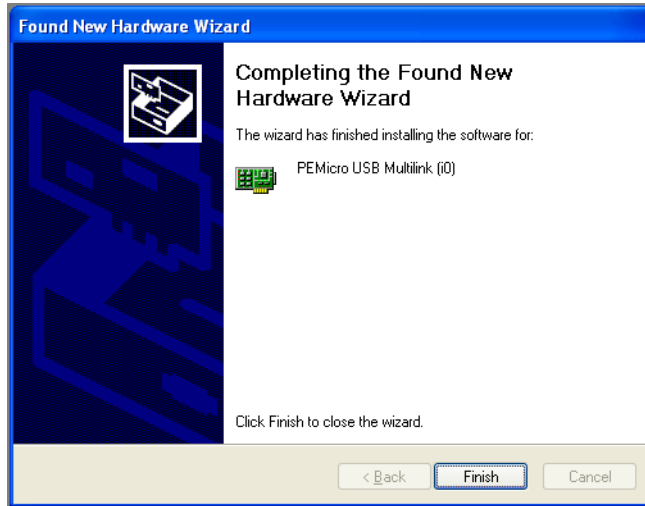


Figure 4-2: Found New Hardware Wizard Dialog (2 of 4)

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:

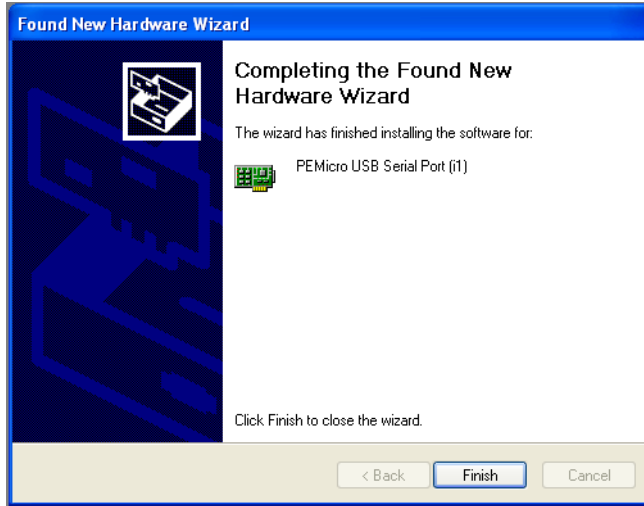


Figure 4-4: Found New Hardware Wizard Dialog (4 of 4)

Click the “Finish” button to exit the “Found New Hardware Wizard.”

If the DEMO9S08JS16 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 DEMO9S08JS16’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 DEMO9S08JS16.

5.2 Debug Mode

A host communicates with the DEMO9S08JS16 through the Embedded Multilink circuitry. Either the CodeWarrior Development Studio or P&E’s HCS08 software tools will work with the DEMO9S08JS16. Please refer to

Section 9 - DEMO9S08JS16 CODE DEVELOPMENT SOFTWARE for more information.

5.3 Run Mode

The DEMO9S08JS16'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 DEMO9S08JS16 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 DEMO9S08JS16 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.

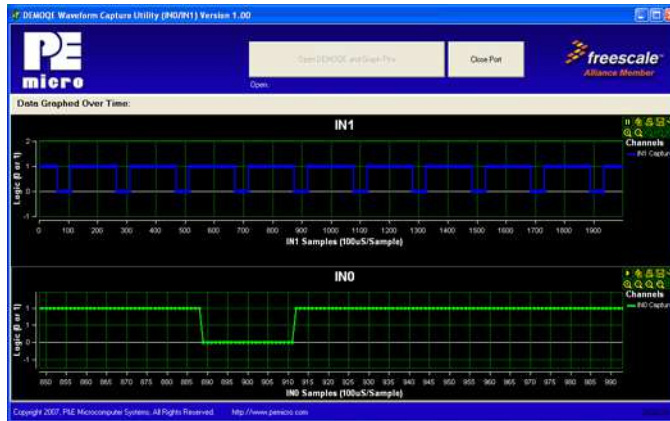


Figure 6-1: Logic Analyzer Application

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 DEMO9S08JS16, and may also be found at:

<http://www.pemicro.com/fixlinks/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.

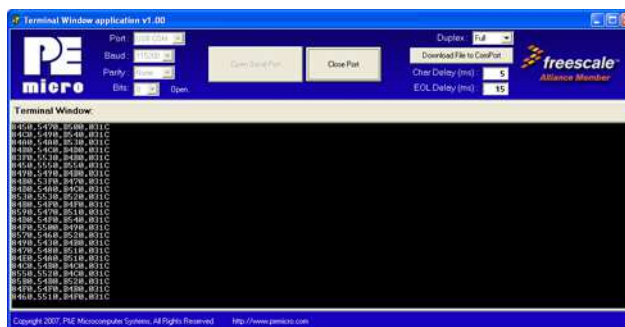


Figure 6-2: Terminal Application

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 DEMO9S08JS16, and may also be found at:

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

6.3 DEMO9S08JS16 Unsecure Application

This application allows secure 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 DEMO9S08JS16, and may also be found at:

<http://www.pemicro.com/fixlinks/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.

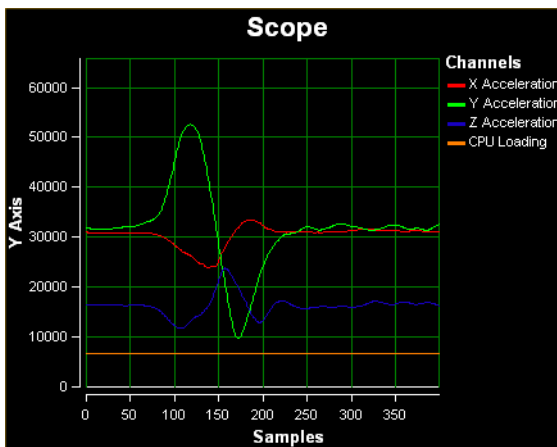


Figure 6-4: Accelerometer Demo Application

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 DEMO9S08JS16, 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 DEMO9S08JS16 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