DEMO9S08MP16 User Manual

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1 INTRODUCTION

1.1 Overview

The DEMO9S08MP16 is a low cost development system supporting Freescale MC9S08MP16 microcontrollers. P&E's Embedded Multilink circuitry on the DEMO9S08MP16 board allows the on-board processor connected to the DEMO9S08MP16 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 DEMO9S08MP16 package includes the following items:

- DEMO9S08MP16 Demonstration Board
- Getting Started DVD - Getting started with the series of microcontrollers
- USB A-to-B Cable
- Quick Start Guide
- Freescale Warranty Card

1.3 Supported Devices

The DEMO9S08MP16 supports the following devices:

- MC9S08MP16VLF

1.4 Recommended Materials On The Getting Started DVD-ROM

- Freescale MC9S08MP16 reference manual and datasheet
- DEMO9S08MP16 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 in a manner such as to prevent electrostatic discharge.

2   HARDWARE FEATURES

The DEMO9S08MP16 is a demonstration and development system for Freescale's MC9S08MP16 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 DEMO9S08MP16's Embedded Multilink circuitry.

Note: The DEMO board's onboard Embedded Multilink circuitry is intended to function with the onboard processor only. It cannot be used to communicate with other devices.

2.1   DEMO9S08MP16 Features

- On-board Logic Analyzer

- On-board Virtual Serial Port

- 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 (and power input source selector) w/ LED indicator

- A 6VDC power supply input barrel connector

- Power Input Selection Jumpers for selecting the input voltage source:

    - 5V from Embedded Multilink or LDO regulator

    - Power from APMOTOR Port which might be 5V or 3.3V

- RESET Push Button and LED indicator w/ Enable

- User Features:
  - Opto-coupler isolated RS232 physical interface and DB9 connector w/Enable
  - 6 LEDs driven by logic inverter 74AC04
  - 4 User LED's w/ Enable
  - 4 User Push Buttons w/ Enable
  - 1 Piezo Buzzer w/ Enable
  - 1 temperature sensor connected to differential signals w/Enable
  - 1 I/O signal slide switch
  - IIC Pullups w/ Enable
  - 15K Ohm multi-turn POT w/ Enable
- Specifications:
  - Board Size 3.5 x 4.0
  - Power Input:
    - USB Cable: 5VDC, 500mA max
    - DC Power Jack: 2.1/5.5mm barrel connector, 6VDC to Center Positive
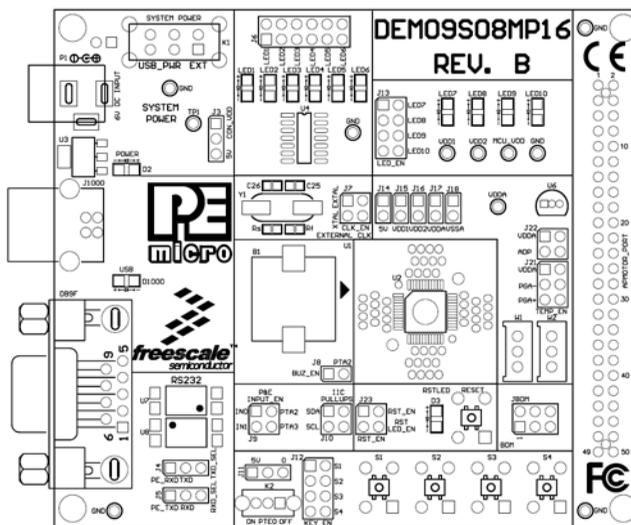
Figure 2-1: DEMO9S08MP16 Top Component Placement

2.2   On-Board Logic Analyzer

The DEMO9S08MP16 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 PTA2 and PTA3 signals on the DEMO9S08MP16 board by default via the J9 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 DEMO9S08MP16 board has a built-in virtual serial port which may be connected to the MP16 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 DEMO9S08MP16 virtual serial port or actual serial port hardware.

2.4 DEMO9S08MP16 Jumper/Connector Quick Reference

Default Jumper Settings

The following is a list of default jumper settings for DEMO9S08MP16 board. The settings listed indicate the "on" (or installed) position.

Default Jumper Settings

JUMPERS	SETTINGS
J3	2&4
J4	1&2
J5	1&2
J6	ALL ON
J7	ALL OFF
J8	ON
J9	1&2, 3&4
J10	1&2, 3&4
J11	2&3
J12	ALL ON
J13	ALL ON
J14	ON
J15	ON
J16	ON
J17	ON
J21	1&2, 3&4, 5&6
J22	1&2, 3&4
J23	1&2, 3&4

APMOTOR Port Connector Pinout

The following is the pinout for the APMOTOR connector on the DEMO9S08MP16 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: APMOTOR Port Connector Pinout

3 GETTING STARTED WITH THE DEMO9S08MP16

The DEMO9S08MP16 is a low-cost board targeting quick microcontroller evaluation. The board includes a power terminal to measure the ultra-low power consumption of the MP devices.

Please refer to the DEMO9S08MP16 Quick Start Guide and Labs for instructions on how to install software, connect the DEMO9S08MP16 to your

PC, and run quick demonstrations.

4 SYSTEM SETUP

4.1 Overview

P&E's Embedded Multilink driver is required to operate the DEMO9S08MP16 using a PC. The Embedded Multilink driver should be installed with the CodeWarrior Development Studio software or from the DEMO9S08MP16 Resources in the Getting Started DVD-ROM before the PC is connected to the DEMO9S08MP16.

4.2 Operating System Requirements

The following are the resources required to run the CodeWarrior Development Studio and the DEMO9S08MP16:

- 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 DEMO9S08MP16 Resources in the DVD-ROM to access and install P&E resources for the DEMO9S08MP16. These materials are not required for operation. The DEMO9S08MP16 Resources in the Getting Started DVD-ROM contains the following support materials:

- DEMO9S08MP16 Embedded Multilink hardware interface driver

- DEMO9S08MP16 User Manual (this document)
- DEMO9S08MP16 Board Schematics
- DEMO9S08MP16 Component Breakdown List
- P&E Embedded Multilink Toolkit PC Applications
- P&E Evaluation Software
- Links to Freescale documentation, P&E Discussion Forums, and DEMO9S08MP16 FAQs.

4.4   Quick Startup

Only a few steps are required to get the DEMO9S08MP16 up and running. Please reference the Quick Start Guide.

4.5   Hardware Setup

4.5.1   First-Time Connection

The DEMO9S08MP16 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 power switch for USB_PWR 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 DEMO9S08MP16 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:
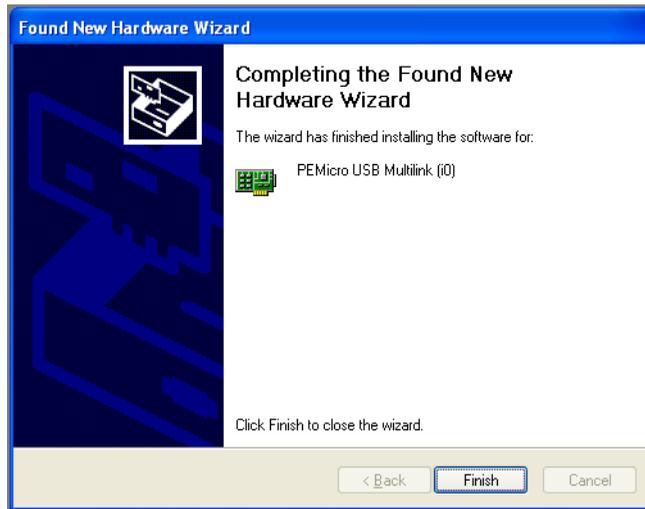
Figure 4-2: Found New Hardware Wizard Dialog (2 of 4)

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 DEMO9S08MP16 hardware interface driver is now properly installed on your system, the green USB LED on the DEMO9S08MP16 Base Board should be illuminated. In addition, if you turn on the system power of the DEMO9S08MP16 you will see the red Power LED illuminate.

5   OPERATING MODES

5.1   Overview

The DEMO9S08MP16'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 DEMO9S08MP16.

5.2   Debug Mode

A host communicates with the DEMO9S08MP16 through the Embedded Multilink circuitry. Either the CodeWarrior Development Studio or P&E's HCS08/CFV1 software tools will work with the DEMO9S08MP16. Please refer

to **Section 8 - DEMO9S08MP16 CODE DEVELOPMENT SOFTWARE** for more information.

5.3 Run Mode

The DEMO9S08MP16's rich component list empowers it to perform a variety of tasks. Once an application is developed, debugged, and programmed properly into the MP internal flash memory, it can run with or without connecting to a host.

5.4 External BDM Mode

The DEMO9S08MP16 has an optional BDM header for debugging and programming the on-board MP device using an external BDM hardware tool, such as P&E's USB Multilink or Cyclone PRO. Please refer to **Section 9 - TRANSITIONING TO YOUR OWN TARGET** for more information. A user can take advantage of this mode to develop a target-specific MP system and compare it with the DEMO9S08MP16 when necessary.

6 P&E EMBEDDED MULTILINK TOOLKIT PC APPLICATIONS

P&E provides several Windows PC-based applications which work with the DEMO9S08MP16 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 DEMO9S08MP16 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 PTA2 and PTA3 pins of the MCU by jumper J9. 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 DEMO9S08MP16 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 DEMO9S08MP16 evaluation board.

This PC-based application is included on the DVD-ROM that accompanies the DEMO9S08MP16, 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 DEMO9S08MP16 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 DEMO9S08MP16, and may also be found at:

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

6.3   DEMO9S08MP16 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 DEMO9S08MP16 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 DEMO9S08MP16, and may also be found at:

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

6.4   Serial Grapher Application

This PC-based application is a serial graphing utility that may be used with microcontroller code which transmits data in the correct format. It 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 DEMO9S08MP16 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 jumpers J4 and J5 are 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 DEMO9S08MP16 and may also be found at:

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

6.4.1 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:
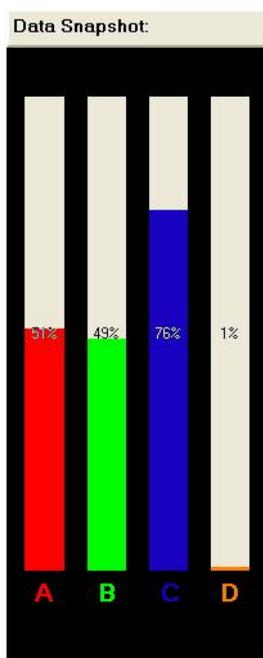
Figure 6-4: Serial Grapher Bar Graph

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 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:
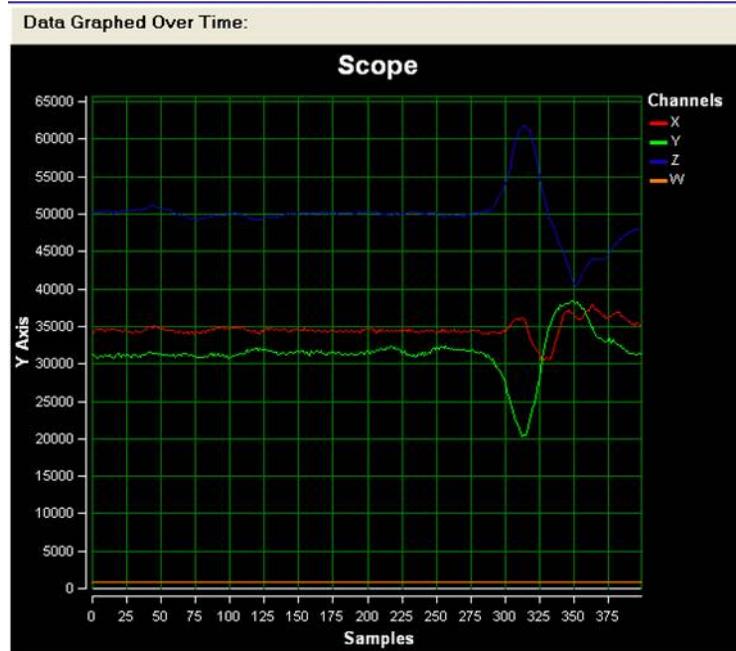
Figure 6-5: Serial Grapher Graphing Component

6.4.2   Data Format

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

6.4.2.1   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.

6.4.2.2   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.

7   JUMPER SETTINGS

7.1   System Power

7.1.1   J3 - Power Source Selection

The MP16 processor may obtain its power from the on-board regulator, USB port, or through APMOTOR_PORT J2. The on-board regulator obtains its input from a 2.1mm barrel connector and can regulate the output to 5V. The power switch K1 selects 5V from the on-board regulator or USB port. The J3 header further selects 5V from the power switch or from the APMOTOR connector. A jump wire may be used to connect TP1 and Pin 1 of the J3 header if the user wants to provide 5V to the APMOTOR connector.

Selects 5V to supply microcontroller VDD. This is the default setting.

Figure 7-1: VDD_SELECT Option Header (J3)

7.2   Virtual Serial Port

The DEMO9S08MP16 board has a built-in virtual serial port which may be connected to the MP16 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. It can be enabled or disabled by installing or removing the jumpers of J4 and J5.
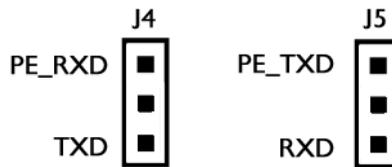
Figure 7-2: Virtual Serial Port Header (J4 and J5)

7.3   LED Display Port

The DEMO9S08MP16 has 6 LEDs connected to signals PTC0 to PTC5 via logic invertors 74AC04. They can be enabled or disabled by installing or removing the corresponding jumper, J16, in the LED_ENABLE header.

7.3.1   J6 - Enable Port for LED Display (driven by Logic Invertor 74AC04)
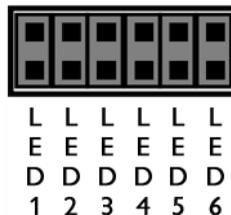
Enables all LED outputs. This is the default setting.

Figure 7-3: LED Display Enable Header LED_ENABLE (J6)

7.3.2   User LED Display Enable Port LED_EN

The DEMO9S08MP16 has implemented 4 user LEDs that connect to signals PTA4 to PTA7. they are enabled by header J13.

7.4 External Crystal Circuitry

The DEMO9S08MP16 design has incorporated an external crystal circuitry, but its components are not populaTED. The user may populate the components and use the jumpers in header J7 to connect the crystal circuitry to the processor.

7.5 Input and Reset Switches

The DEMO9S08MP16 has 4 switches that are connected to signals PTD4, PTD5, PTD6, and PTD7 respectively, and are enabled or disabled by the 4 corresponding jumpers KEY_ENABLE (J12).

The DEMO9S08MP16 has an option to connect two signals, PTA2 and PTA3, to the Embedded Multilink for signal processing. The two signals are connected or disconnected to IN0 or IN1 correspondingly via jumper P&E INPUT_EN (J9).

The DEMO9S08MP16 has one Reset switch and one Reset LED associated with it. These are enabled or disabled by the two corresponding jumper RESET_EN (J23).

7.5.1 J9 - P&E's Logic Analyzer Inputs IN0/IN1

The logic analyzer inputs are marked on one side of the J9 jumper. The inputs allow P&E's PC-based logic analyzer application to display these signals in real-time.

```
IN0  [■ ■]  PTA2
IN1  [■ ■]  PTA3
```

By installing both jumpers, the logic analyzer pins IN0 and IN1 will be connected to PTA2 and PTA3 respectively.

```
IN0  [■  ■]  PTA2
IN1  [■  ■]  PTA3
```
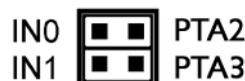
By removing these jumpers IN0 and IN1 will be unconnected. The user may connect these signals, via wires, to any other signals on the processor which they wish to view on the PC.

Figure 7-4: Jumper Settings for Input Signals to P&E's Embedded Multilink, P&E

INPUT_EN (J9)

7.5.2   J12 - Light Touch Switch Enable Jumper KEY_ENABLE
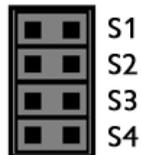
Enables the corresponding switch. Each jumper may be individually installed or removed. By default, all jumpers are installed to enable all the switches.

Figure 7-5: Jumper Settings for Light Touch Switches KEY_ENABLE (J12)

7.5.3   J11 - I/O Signal Slide Switch Voltage Level Setting

The DEMO9S08MP16 has connected an I/O signal (PTE0) to a slide switch (K2). Jumper J11 is used to select a voltage level of 5V or GND for the switch. when slide switch K2 is turned on, PTE) will be connected to the voltage level set by jumper J11. When the slide switch K2 is turned off, PTE0 is not connected and is floating.

Figure 7-6: I/O Signal Slide Switch Voltage Level Setting (J11)

7.5.4   J23 - Reset Switch Enable and Reset LED Display Enable Jumper RESET_EN

Enables the Reset Switch and the Reset LED Display. Each jumper may be individually installed or removed. This is the default setting.

Figure 7-7: Reset Switch and Reset LED enable Jumper (J23)

7.6 Buzzer

The DEMO9S08MP16 integrates a Piezo Transducer whose resonant frequency is 4.0 KHz. Jumper J8 connects to PTA2 to control this buzzer.

7.6.1 J8 - Buzzer enable jumper BUZ_EN

BUZ_EN ■ ■ PTA2

Enables Buzzer to be controlled by PTA2. This is the default setting.

Figure 7-8: Buzzer Enable Jumper Settings BUZ_EN (J8)

7.7 IIC Pull-up

The DEMO9S08MP16 provides external pull-up resistors for SCL and SDA lines, enabled by installing the corresponding jumpers on J10. By default both jumpers are installed.

7.7.1 J10 - IIC Pullup Enable Jumpers IIC_EN

SDA
SCL

Enables IIC external pullup. This is the default setting.

Figure 7-9: IIC External Pullup Enable IIC_EN (J10)

7.8 Analog Input Potentiometer

The DEMO9S08MP16 provides an easy access 5KOhm multi-turn potentiometer whose output may be connected to PTE4, enabled by J22, POT_EN.

7.8.1 J22 - Potentiometer Output Selection Jumpers POT_EN
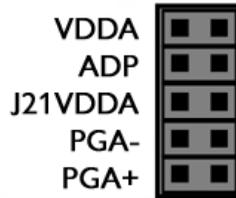
Selects the potentiometer output connection. By default they are both connected.

Figure 7-10: Potentiometer Output Selection Jumpers POT_EN (J22)

7.9 Optional Jumpers For Various VDD And VSS

The DEMO9S08MP16 provides 5 jumpers, J14 through J17, for different VDD and VSS connections on the bottom of the board. By defualt, they are all shorted with jumpers except J17, which is not populated and directly shorted by a zero Ohm resistor.

8 DEMO9S08MP16 CODE DEVELOPMENT SOFTWARE

The DEMO9S08MP16 includes P&E's Embedded Multilink circuitry, so no external hardware BDM tool is needed to debug and program the DEMO9S08MP16. A user only needs to connect the DEMO9S08MP16 to their PC to start developing code for it.

The DEMO9S08MP16 package comes with a special edition of Freescale's CodeWarrior studio. In addition, P&E's evaluation software for HCS08 and ColdFire® V1 is available in the DEMO9S08MP16 Resources section of the Getting Started DVD, or online at www.pemicro.com. A user may use either CodeWarrior or P&E software tools to develop code for the DEMO9S08MP16.

8.1 Using CodeWarrior With The DEMO9S08MP16

The CodeWarrior studio supports Freescale's HCS08 and ColdFire V1 devices. It offers C, C++, and assembly-level support, and provides debugging capabilities based on P&E's debug and programming technologies.

A programming or debug session with the project-based CodeWarrior IDE

may be launched by double-clicking on the project name (the format is *projectname.mcp*) from your file storage. Its tutorials, FAQs, and quick start guides are easy to follow and will allow you use pre-built templates to begin creating a new project in a short time. Codewarrior tutorials can be followed based on the instructions provided.

8.2 Using P&E Software With The DEMO9S08MP16

P&E offers software tools for Freescale's HCS08 and ColdFire V1 devices that can be used to develop code for the DEMO9S08MP16 board.

8.2.1 P&E Software Tools for HCS08 Microcontrollers

For Freescale's HCS08 devices, P&E offers an integrated development environment, which combines a command-line assembler, in-circuit debugger, and flash memory programmer. The assembler includes features such as a full string replacement macro, conditional assembly, include files, and more. The debugger supports both assembly and C source-level debugging. The programmer can program/reprogram both internal and external flash devices in-circuit.

8.2.2 P&E's Software Tools for ColdFire® V1 Microcontrollers

P&E offers an integrated development environment for Freescale's ColdFire V1 devices, which combines a GNU C compiler, in-circuit debugger, and flash memory programmer. The debugger supports both assembly and C source-level debugging. The programmer can program/reprogram both internal and external flash devices in-circuit.

9 TRANSITIONING TO YOUR OWN TARGET

Once you have finished working with the DEMO9S08MP16 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 and P&E's Cyclone PRO 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 is a development tool that is functionally comparable to the Embedded Multilink circuitry on the DEMO9S08MP16. It will enable you to debug your code and program it onto your target. The Cyclone PRO is a more

versatile and robust development tool with advanced features and production capabilities.

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

9.1 Hardware Solutions At A Glance

The USB Multilink 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 easy to use and fully capable of fast-paced debugging and programming.

The Cyclone PRO is a more complete solution designed for both development and production. The Cyclone PRO 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 and Cyclone PRO.

9.1.1 USB Multilink Key Features

- 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

9.1.2 Cyclone PRO 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 ColdFireV1, HCS08, RS08, and

HC(S)12(X) 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

9.2   Working With P&E's USB Multilink

Figure 9-1: P&E's USB Multilink (USB-ML-12 shown)

9.2.1   Product Features & Implementation

P&E's USB Multilink Interface (USB-ML-12) connects your target to your PC and allows the PC access to the Background Debug Mode (BDM) on Freescale's ColdFireV1, HCS08, RS08, and HC(S)12(X) microcontrollers. It connects between a USB port on a Windows 2000/XP/2003/Vista machine and a standard 6-pin debug connector on the target.

By using the USB Multilink 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 enables you to debug, program, and test your code on your board.

9.2.2   Software

The USB Multilink Interface works with Codewarrior as well as P&E's in-circuit debugger and flash programmer to allow debug and flash programming of the target processor. P&E's USB Multilink Development Packages come with the

USB Multilink Interface, as well as flash programming software, in-circuit debugging software, Windows IDE, and register file editor.

9.3 Working With P&E's Cyclone PRO

Figure 9-2: P&E's Cyclone PRO

9.3.1 Product Features & Implementation

P&E's Cyclone PRO is an extremely flexible tool designed for debugging, testing, and in-circuit flash programming of Freescale's ColdFireV1, HC08, HCS08, RS08, and HC(S)12(X) microcontrollers. The Cyclone PRO 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 PRO can be used as a production tool on your manufacturing floor.

For production, the Cyclone PRO 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 PRO has over 3Mbytes of non-volatile memory, which allows the on-board storage of multiple programming images. When connected to a PC for programming or loading it can communicate via the ethernet, USB, or serial interfaces.

9.3.2 Software

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

P&E.

P&E's Cyclone PRO is also available bundled with additional software as part of various Development Packages. In addition to the Cyclone PRO, these Development Packages include in-circuit debugging software, flash programming software, a Windows IDE, and register file editor.

10   TROUBLESHOOTING

10.1   DEMO9S08MP16 Is Undetected

Q: The connection assistant indicates that my DEMO9S08MP16 is undetected even though I have connected the hardware to my USB port. What should I do?

A: The connection assistant, which displays in either Codewarrior or P&E's development software, is a dialog which allows the user to connect to the DEMO9S08MP16 hardware. If this dialog indicates that the DEMO9S08MP16 hardware is not connected to the PC, the first step is to make sure that the DEMO9S08MP16 hardware is connected to the PC via a USB 2.0 high-speed cable. If it is connected, unplug and then plug in the USB cable on the DEMO9S08MP16 board and click refresh in the connection assistant. If the hardware still does not show up, try the following remedies:

(A) Re-Enable the USB driver

If you connected the DEMO9S08MP16 interface prior to the installation of P&E's Embedded Multilink drivers, Windows will not have been able to find the appropriate driver and may have disabled the device. The DEMO9S08MP16 board shows up in Window's device manager as a "P&E Multilink," since it contains P&E's Embedded Multilink circuitry. If you unplug and then plug in the device, Windows will automatically disable it even if you have installed the drivers. To force windows to try to load the driver again, perform the following steps while the DEMO9S08MP16 interface is connected to the computer:

1.   Open the Control Panel (Start Button->Settings->Control Panel)

2.   Double Click the "System" Icon

3.   Select the "Hardware" tab

4.   Click the "Device Manager" Button

5. The "P&E Multilink" device will be shown with an exclamation mark next to it. Double-click this device.

6. Click the "Reinstall Driver…" button and follow the dialog instructions to have Windows automatically install the driver.

(B) Re-Install the USB driver

If the Multilink device does not show up in the device manager, use the driver installation utility located in the DEMO9S08MP16 Resources on the DVD-ROM. After driver installation, unplug the DEMO9S08MP16 from the PC and reboot the PC. When the reboot has completed, connect the interface to the PC with the USB 2.0 cable. Run the software again to see if the interface is now detected.

If you have an error attempting to install the drivers, please view the installation troubleshooting FAQ on P&E's website at:

http://www.pemicro.com/faqs/faq_view.cfm?id=89.

(C) Test for installation of the USB driver files

To test the driver installation, use the driver test utility in the DEMO9S08MP16 Resources of the DVD-ROM to make sure all files were properly installed. This may give some indication of what the problem is.

(D) Using a USB Hub

The DEMO9S08MP16 is a high-power USB device. If a USB Hub is used, it must be a self-powered hub (i.e., with its own power supply). If the Hub is not self-powered the DEMO9S08MP16 will not work. In general, USB ports located directly on the PC are high-power (self-powered) ports.

10.2   CodeWarrior Installation Fails (WinDriver Error)

Q: When I try to install the Codewarrior or P&E software, installation fails with this message: "There are currently 2 open applications using WinDriver. Please close all applications and press Retry. To reload WinDriver, press Cancel and reboot." How do I solve this?

A: Some software applications on your PC are connected to the WinDriver system driver which manages P&E's USB connections. This system driver needs to be disabled for the installation to continue. Directions to disable Windriver are as follows:

In Windows Explorer, right-click on My Computer and select Properties from the drop-down menu.

1. Select the Hardware tab.

2. Click on the Device Manager button.

3. Select the "System Devices" in the Device Manager window.

4. Expand the tree index (+) for System Devices.

5. At the bottom of the System Devices list you should see the Win-Driver item.

6. Right-click on WinDriver and select Disable from the drop-down menu.

7. Click Yes/OK when the confirmation dialog appears.

WinDriver is now disabled and you should be able to complete the installation. After the installation finishes, you should re-enable the WinDriver system driver using the following steps:

In Windows Explorer, right-click on My Computer and select Properties from the drop-down menu.

1. Select the Hardware tab.

2. Click on the Device Manager button.

3. Select the "System Devices" in the Device Manager window.

4. Expand the tree index (+) for System Devices.

5. At the bottom of the System Devices list, you should see a WinDriver item.

6. Right-click on WinDriver and select Enable from the drop-down menu.

Reboot your PC after the installation finishes.

If you are unable to disable the WinDriver system driver in the above fashion, you can delete the file c:\windows\system32\windrvr6.sys and then reboot your machine. You should then re-run the installer and complete the procedure. Reboot your machine after the installation has finished.

Freescale Controller Continuum

68HC08/S08/RS08/(S)12(X) ColdFire® V1 ColdFire® V2/V3/V4 Power Architecture® ARM®

Cyclone PRO

Cyclone MAX

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Наши контакты:

Телефон: +7 812 627 14 35

Электронная почта: sales@st-electron.ru

Адрес: 198099, Санкт-Петербург, Промышленная ул, дом № 19, литера Н, помещение 100-Н Офис 331