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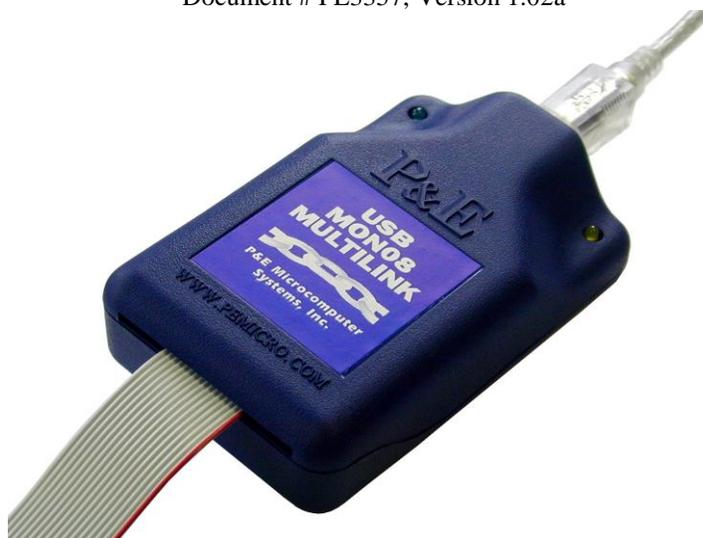
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USB-ML-MON08

Rev D

Technical Summary

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1.0 Introduction

The USB-ML-MON08 is an interface cable whose purpose is to allow debug and programming of 68HC08 devices via the MON08 debug port. The USB-ML-MON08 connects the target to the PC running Windows XP/2000/2003/Vista/7 via a standard USB port. The USB-ML-MON08 works with 2V, 3V, and 5V targets with an internal bus frequency in the range of 1MHz to 8MHz. The USB-ML-MON08 automatically detects target bus frequency via the communications line and sets communications baud rate. The interface will optionally provide either 2,3, or 5V power @ 125mA to the target via Pin 15 of the MON08 header. The interface will optionally provide a 7.5MHz or 3.75MHz clock signal at target VDD level to overdrive target crystal and RC clock circuitry.

By using the USB-ML-MON08, the user can take advantage of the monitor 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 FLASH.

2.0 Usage of the USB-ML-MON08 Interface

The USB-ML-MON08 is an interface cable whose purpose is to allow debug and programming of 68HC08 devices via the MON08 debug port. The pinout of the MON08 debug port is:

PIN 1	- NC	GND	- PIN 2
PIN 3	- NC	RST	- PIN 4
PIN 5	- NC	IRQ	- PIN 6
PIN 7	- NC	MON4	- PIN 8
PIN 9	- NC	MON5	- PIN10
PIN11	- NC	MON6	- PIN12
PIN13	- OSC	MON7	- PIN14
PIN15	- Vout	MON8	- PIN16

The MON4-MON8 signals refer to specific port pins on the target processor, and are different for various HC08 devices. P&E's Software will give the exact pinout for each HC08 device. Please note that NC designates that these pins are reserved for P&E use, so do not connect any signal to these lines. **Please note that the GND and Vout interface outputs are in opposite corners of the connector, so make sure to not plug the cable in backwards or you may damage the interface.** Also note that depending upon the HC08 device selected in software, voltage as high as 9v may be driven on the IRQ and RESET lines by the interface.

The USB-ML-MON08 provides a 7.5 MHz or 3.75MHz clock signal at target VDD level to Pin 13 of the MON08 Connector. The user may use this clock signal to overdrive the target RC or crystal circuitry. If this signal is not used, just leave Pin 13 of the target MON08 header unconnected. Please note that if the target already uses a clock oscillator, the USB-ML-MON08 will NOT be able to overdrive it. The clock should have sufficient drive to be used with a target system even if the target system has an RC circuit or crystal connected to the OSC1 pin of the processor. If the user does not want to use this option, they should not connect to pin 13 of the MON08 connector.

The USB-ML-MON08 provides the necessary VTST high voltage to either IRQ or RST or both according to the microcontroller specification. The supply of current available to provide high voltage is limited. If the user connects the RST line to a device (such as a reset chip) which does not support VTST voltage levels (8V), such a device may drag down VTST to a level where the HC08 device will not enter monitor mode. If the target will not enter monitor mode, measure the IRQ signal after the entry attempt and verify that the voltage on this line is > 7.5V. This is not a potential issue on devices where we do not drive high voltage on reset, such as the KX, GT, QT, QY, and EY families.

The PC software can be configured to have the USB-ML-MON08 drive 2V, 3V, or 5V power to the target on Pin 15 of the MON08 connector. This power is limited to a current of 125mA. This option is set by the "device power" option in the connection dialog. If the user does not want to use this option, they should not connect to pin 15 of the MON08 connector.

The Multilink interface derives its power from the USB port.

The USB-ML-MON08 has a female type B USB connector. Use a Type A to Type B USB extension cable to connect the interface to the PC.

The USB-ML-MON08 is a USB device. If a USB HUB is used, it must be a self-powered hub (i.e. with its own power supply). By default, the USB protocol used is 2.0.

There are two LEDs which protrude through the housing of the USB-ML-MON08 interface. The Blue LED indicates that the Multilink interface is powered and running. The Yellow LED indicates that power is being driven onto pin 15 of the debug connector by the P&E interface.

The 16-pin ribbon cable, which allows connection to the target debug connector, is fixed within the Multilink housing. The pin 1 is denoted by the red stripe running down the ribbon cable. The proper orientation of this ribbon cable is shown in the following picture.



3.0 Driver Installation on Windows XP/2000/2003/Vista/7

Before connecting the USB MON08 MULTILINK to the PC, the appropriate drivers need to be installed on the PC. These drivers are automatically installed when installing Freescale's CodeWarrior or any of P&E's recent HC08 development packages. If you have installed a recent version of these then the instructions for manual installation that follow are not necessary. However, Windows 7 users who are installing software distributed before December 28, 2009 will need to obtain the latest version of the drivers and install them manually. A copy of the driver installation program may be downloaded from the "Downloads" section of P&E's "Support Center" located at <http://www.pemicro.com>. If you are using third-party software, make sure you have a version which supports the USB MON08 MULTILINK Rev. D interface. Once you have obtained the latest version of the driver installation program, please use the instructions below to manually install the drivers.

When the cable is plugged in, the operating system should indicate that it has found a driver for the attached "USB MON08 Multilink". Follow the instructions in the "Found New Hardware Wizard" dialog for having Windows automatically install the driver.

If you connected the Multilink interface prior to installing the drivers, Windows will not have been able to find the appropriate driver and may have disabled the device. If you unplug the device and then plug it in again, Windows will automatically disable it even if you have installed the drivers. To force Windows to attempt to load the driver again, perform the following steps while the USB MON08 MULTILINK interface is plugged into the computer:

1. Open the Control Panel: Start Button [->Settings] ->Control Panel. (You will not need to select "Settings" on Vista and Windows 7).
2. Double Click the "System" Icon. (Windows 7: "System and Security")
3. Select the "Hardware" Tab. (Windows 7: "Hardware and Sound", Windows Vista: skip this step)
4. Click the "Device Manager" Button. (Windows 7: "Devices and Printers -> Device Manager")

5. The “USB-ML-MON08 Rev. D” device will be shown with an exclamation point 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. (Windows 7: First click the “Driver” tab, then select “Update Driver...”)
7. If the hardware still has a yellow exclamation mark next to it, right click on it and select uninstall. The USB Multilink should disappear from the list. Unplug the USB Multilink and then plug it into the PC again. A new Hardware Found dialog will pop up; follow the dialog instructions and have Windows automatically install the driver.

4.0 Using a USB Hub

The USB-ML-MON08 is a USB device which is powered from the USB bus. It requires that if a USB hub is used, it must be a self-powered hub, as opposed to deriving its power from the PC. It must be able to supply 500mA per port. P&E has made a powered hub available as an accessory, which has been tested with the USB-ML-MON08. Details may be found at <http://www.pemicro.com>.

5.0 Connecting to the target

The following is the proper connection sequence to connect the PC to the target system via the USB-ML-MON08 interface:

- 1) Make sure that the USB-ML-MON08 is not connected to either the target or the PC.
- 2) Connect the Multilink to the target via its ribbon cable. Make sure that the ribbon cable is plugged into the target with the proper orientation. Failure to orient the ribbon cable properly may result in damage to the USB-ML-MON08 when it is powered by the USB. The pin 1 is denoted by the red stripe running down the ribbon cable.
- 3) Connect the Multilink to the PC via a USB extension cable. The Blue LED on the Multilink should become lit after the drivers are automatically installed.
- 4) Run any of P&E’s development software. When the USB-ML-MON08 attempts to contact the target, the yellow LED on the Multilink should become lit.

6.0 Interface Libraries

One of the products P&E produces is a set of interface libraries which allows the user to directly control the USB-ML-MON08 from any Windows Development environment which can interact with a DLL. The interface libraries come with examples for controlling the Multilink interface from Microsoft Visual C as well as Borland Delphi. Details of the libraries for the 68HC08 (MON08) may be found at [P&E’s HC08 Product Page](#).

7.0 Firmware Updates

The latest version of the firmware for the Multilink interface is included in P&E software development kits. When the debugger or programmer is run, if it detects that the Multilink interface firmware needs to be updated, it will ask the user’s permission to do this. If given, the update happens automatically.

Alternately, the latest version of the firmware may be downloaded from the “Firmware Updates” section of the “Support Center” located at <http://www.pemicro.com>.