IAR Workbench for ARM:

P&E Interface Configuration & OSJTAG/Tower Troubleshooting Guide

May 2012

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Configuring IAR Embedded Workbench for ARM for a P&E Interface

This chapter contains the following sections:

- Options Dialog
- PE MICRO Settings

1.1 Options Dialog

The debugger settings may be configured to select a P&E Microcomputer Systems connection by using the Options dialog. The P&E hardware interfaces currently supported are: the OSJTAG interface embedded into Freescale Tower boards, the USB Multilink, Multilink Universal FX, Tracelink, and the Cyclone MAX. To open the Options dialog, you may either:

1. Select the desired project name in the Workspace area, select Project from the menu bar, and then choose Options from the drop-down list. Or,

2. Right-click the desired project name in the Workspace area and then choose Options from the right-click menu.

In the Category list on the left side of the Options dialog, select Debugger. Then, in the Setup tab to the right, choose PE Micro from the Driver drop-down menu.

Figure 1.1 Options Dialog – Opening PE Micro Settings
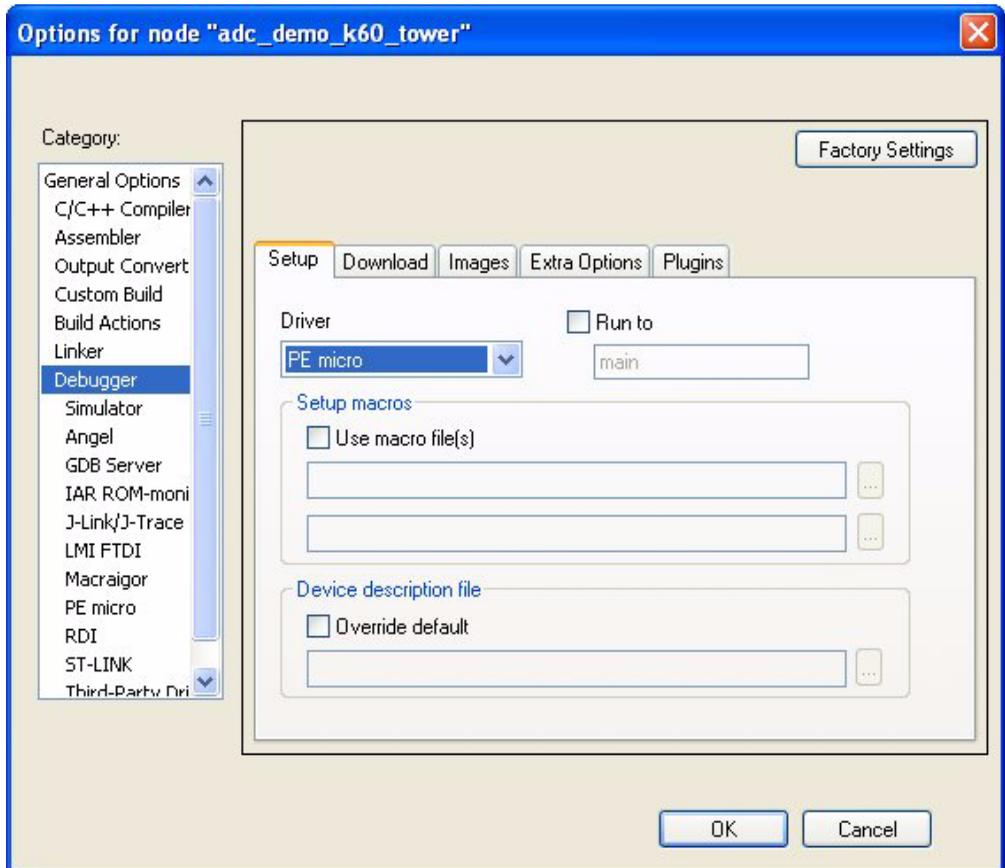
To make changes to the PE Micro settings, go to the Category list on the left side of the Options dialog and select PE Micro from the list under the Debugger category. This will display a Setup tab in the Options dialog that contains the PE Micro settings.

1.2 PE MICRO Settings

Figure 1.2 Options Dialog – Opening PE Micro Settings
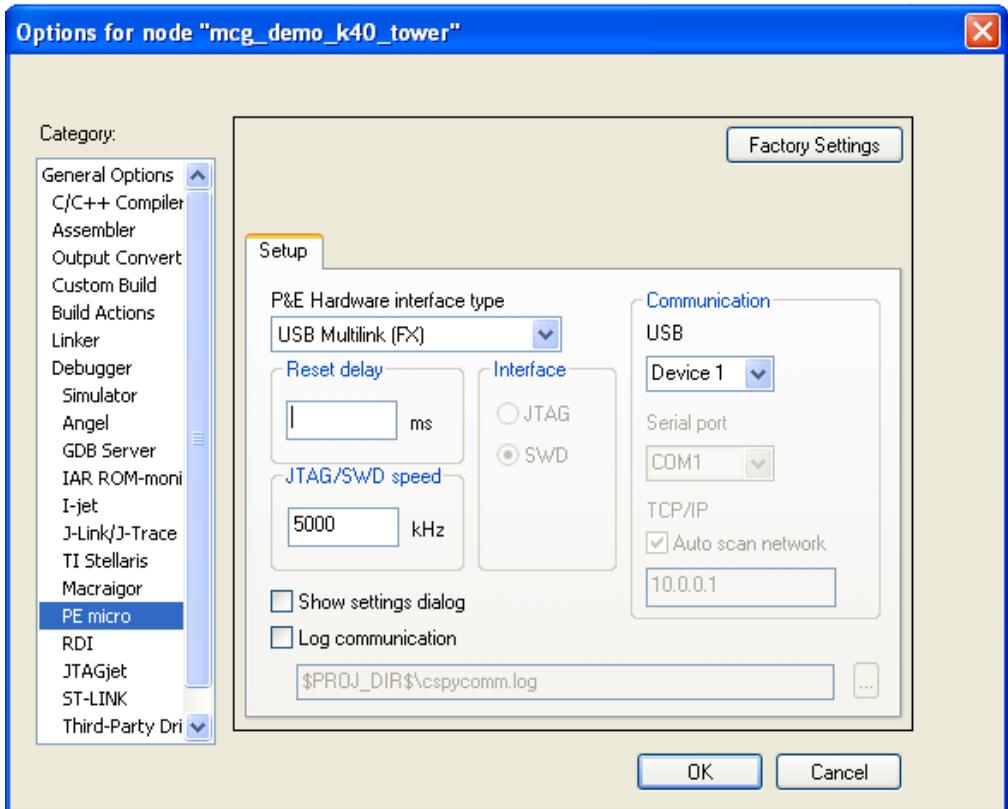
The following PE Micro settings are available in the Options dialog:

1.2.1 P&E Hardware Interface Type

Select the appropriate hardware interface type for the interface that you are using. The other available PE Micro settings will change depending on the specific hardware interface type that you choose. The options are:

- OSJTAG, USB Multilink Universal/FX
- Tracelink - USB

- Tracelink - Ethernet
- Cyclone – Serial
- Cyclone – USB
- Cyclone - Ethernet

1.2.2 Reset Delay

"Reset Delay" allows the user to set an additional delay in milliseconds in order to make sure that reset is recognized (0ms is the recommended setting).

1.2.3 JTAG Speed

"JTAG speed" allows the user to set the communications rate to the target.

- For the OSJTAG interface, the communications rate is fixed at several hundred KHz and may not be changed.
- For the USB Multilink interface, the communications rate may be set between 0-1,000 KHz (1,000 KHz is the recommended speed).
- For the Multilink Universal FX interface, the communications rate may be set between 0-25,000 KHz (5,000 KHz is the recommended speed).
- For the Tracelink interface, the communications rate may be set between 0-10,000 KHz (5,000 KHz is recommended).
- For any of the Cyclone interface types, the communications rate may be set between 0-10,000 KHz (5,000 KHz is recommended).

1.2.4 Communication

These settings allow you to select a specific hardware interface when one or more are available. The options will vary depending on the type of hardware interface that you are using.

- USB – Choose which USB device to use. Device 1 will almost always be the appropriate setting.
- Serial Port – Choose which Serial port to use. COM 1 will almost always be the appropriate setting.
- TCP/IP – To manually specify the IP address for your Cyclone hardware interface, un-check the "Auto scan network" box and type the IP address of the Cyclone into the box below. To auto-select the Cyclone hardware interface, check the "Auto scan network" box and the "Show Settings dialog" box to the left. When you exit the Options dialog and start debug, a PE Micro Connection Manager dialog will display all auto-detected Cyclone options (with your other settings pre-selected).

Figure 1.3 P&E Connections Manager
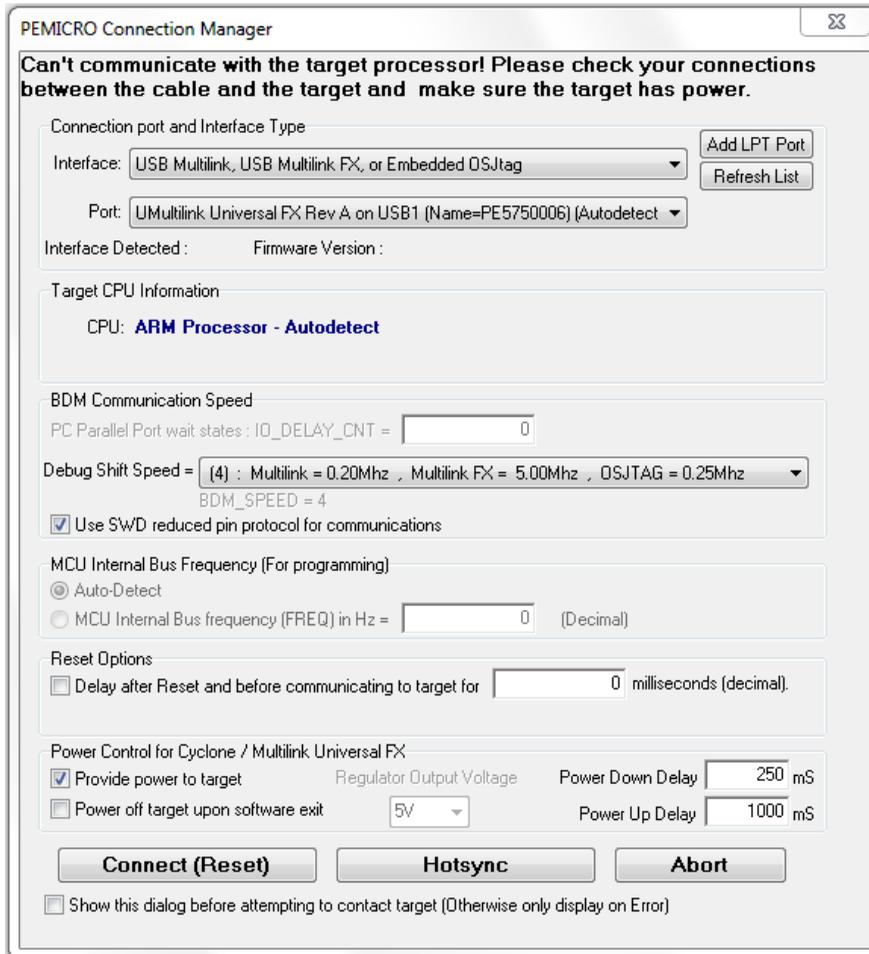
1.2.5 Show Settings Dialog

If this checkbox is checked, the P&E Connection Assistant will pop up whenever a debug session is launched, but before attempting to connect to the debug hardware. The Connection Assistant has many of the same settings as the Options dialog, but will allow the user to interactively select the hardware that will be used to connect. The Connection Assistant automatically displays the actual USB and Ethernet hardware that is currently detected. If this checkbox is left un-checked, the Connection Assistant will only pop up if a communication error is detected (default).

1.2.6 Log Communication

If this checkbox is checked, a log of communication details will be saved to the file path specified in the box below. Use the browse button to select the file that you wish to use to log the information. The default setting is un-checked.

1.2.7 Firmware Update

When connecting to a USB Multilink, Multilink Universal FX, Tracelink, or Cyclone hardware interface, the firmware of the unit will be updated automatically.

The process for updating the embedded OSJTAG firmware in a Freescale Tower card is an interactive one. When Workbench starts a debug session, it will automatically check the version of the OSJTAG firmware. If it needs to be updated, the following dialog will appear:

Figure 1.4 Confirmation Dialog

The user should unplug the Tower card from the PC and place a jumper on the 2-pin "JM60 Boot" header. For example, on the TWR-K40X256 board or the TWR-K60N512 board, a jumper should be placed on header J21. When the unit is plugged back into the PC, the user may need to wait for the drivers to properly install before continuing (first time update only). Once the driver installation is complete, or if the driver installation wizard does not appear, click OK.

At this point the firmware will automatically update.

Figure 1.5 Firmware Update Dialog

The user is then prompted to remove the jumper. Remove the jumper, unplug the Tower card from the PC, and then plug it back into the PC. Once this is done, click the Ok button to continue with the debug session. You will only need to update the firmware once.

Figure 1.6 Confirmation Dialog

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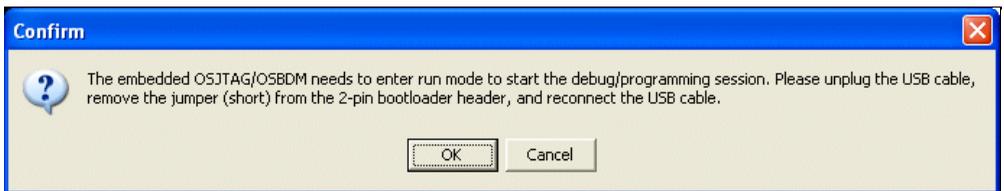
P&E OSJTAG/Tower Interface Troubleshooting

This chapter contains the following sections:

- OSBDM/OSJTAG In The Product Cycle
- Installing Windows OSBDM/OSJTAG and USB Drivers
- Firmware Update Utility
- Firmware Recovery Utility
- Firmware Information Utility
- Troubleshooting Debug Driver
- Troubleshooting Virtual Serial Driver
- Troubleshooting Bootloader Drivers

2.1 OSBDM/OSJTAG In The Product Cycle

IAR Workbench works with OSBDM/OSJTAG interfaces, as well as higher-end P&E interfaces such as the USB Multilink Universal, Cyclone PRO, and Cyclone MAX, which are useful in the development and production phases of the product cycle.

OSBDM/OSJTAG is ideal for the beginning of the product development cycle. Its cost-effective nature makes it well-suited to planning, analysis, and device evaluation. Many of Freescale's evaluation boards, including the Tower Boards pictured below, come with the Open Source BDM/JTAG design built-in, which requires just a USB connection to the PC. The main trade-off in using the Open Source BDM/JTAG is the performance and feature set limitations.

Figure 2.1 Evaluation Phase: OSBDM/OSJTAG Tower
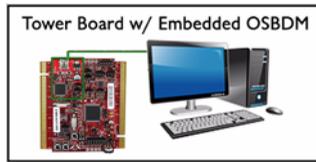
During the actual design phase, most companies will produce their own application-specific hardware. This hardware does not contain the OSBDM/OSJTAG circuitry and instead will include a very inexpensive debug connector. This debug connector will allow a hardware debug interface, such as P&E's USB Multilink Universal, to connect to and debug/program the board. This interface has a much higher performance and more robust feature set which is ideal for the development phase.

Figure 2.2 Development Phase: Debug Interface

For production/manufacturing, particularly at high volumes, a PC-based or stand-alone automated programmer, such as P&E's Cyclone PRO and Cyclone MAX, is recommended.

IAR Workbench will work seamlessly with these Cyclone programmers, as well as the USB Multilink Universal mentioned above.

Figure 2.3 Production Phase: Programming Hardware

2.2 Installing Windows OSBDM/OSJTAG and USB Drivers

The OSBDM/OSJTAG circuitry uses two different USB drivers on the PC, one for debug and the other for virtual serial. The debug driver is open source and is based upon the

libUSB. The virtual serial driver is based upon the Jungo USB driver and is not currently open source. One of the long term goals of the OSBDM/OSJTAG design is to move the virtual serial driver either to the libUSB driver or to use the custom CDC communications class to implement a serial port.

The IAR Embedded Workbench for ARM comes pre-installed with P&E drivers. If for some reason you require the latest version of these drivers, they may be downloaded from http://www.pemicro.com/osbdm. In the root install directory, the OSDLL can be found encase existing software packages need to be updated with this DLL.

The following procedure specifies how to install the Open Source BDM USB hardware drivers on the Windows operating system using the P&E installer. For this procedure, it is assumed that the Open Source BDM Windows USB driver package is already unpacked and being installed onto the development PC via the standalone installation of P&E hardware device drivers or when drivers are automatically installed as part of CodeWarrior 10.1 or a more recent layout installation.

When OSBDM/OSJTAG is connected to the PC for the first time, the Windows operating system will recognize a new composite USB device. Each OSBDM/OSJTAG interface running firmware version 29.00 or greater will enumerate two USB devices. The OSBDM/OSJTAG core device will enumerate as the primary USB device. At the same time, the virtual serial port will also be enumerated as a secondary USB device Figure 2.4 illustrates that the initial connection starts the Windows driver installation and displays the Windows New Hardware Wizard dialog box. Both OSBDM/OSJTAG and virtual serial port will enumerate as two different USB devices - therefore, each will have to be installed separately.

Figure 2.4 Found New Hardware Wizard

1. For this installation, select the **Install the software automatically** option and click **Next**.

2. This will initiate the installation of the Open Source BDM USB driver and DLL file, as shown in .

Figure 2.5 Driver Installation
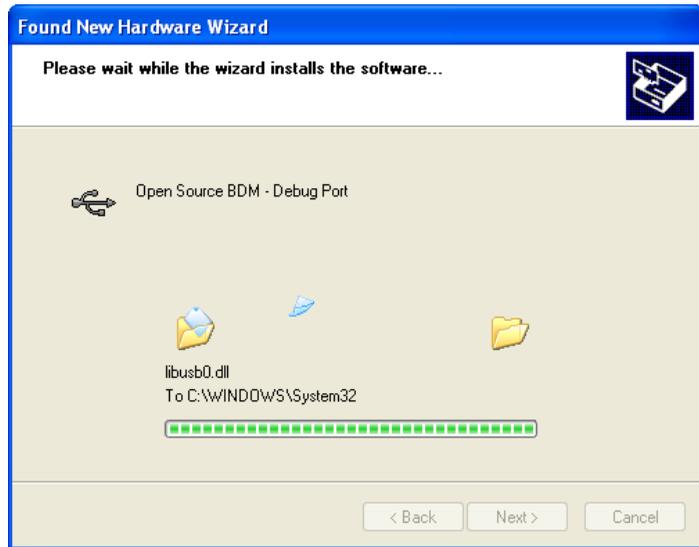
3. Once the installation procedure is completed, as shown in Figure 2.6, click **Finish**. Because of the plug-and-play nature of USB, a reboot of Windows is not required.

Figure 2.6 Finish Installation Open Source BDM Windows USB Drive

4. Once the OSBDM/OSJTAG Debug port is installed, repeat steps 1-3 when installing the Virtual Serial port. Once the OSBDM/OSJTAG Debug port and Virtual Serial port are installed correctly, the OSBDM/OSJTAG device will be ready to use.

2.3 Firmware Update Utility

P&E provides a firmware update utility which may be downloaded from http://www.pemicro.com/osbdm. This utility can be used to update the firmware automatically to the latest version (the default), or the user may specify a firmware update file or S19 to program into the OSBDM/OSJTAG 9S08JM60 processor. The following directions demonstrate a typical update scenario using this utility.

1. Run PEFirmwareUpdater.exe (See Figure 2.7)

2. From the drop box labeled "1. Select Hardware Type", select "OSBDM/OSJTAG – Embedded debug circuitry in Freescale Tower boards".

3. From the drop box labeled "2. Select Device", select the board that needs the firmware updated. If the device is not showing up, use the "Refresh list of devices" to repopulate the device list.

4. From the drop labeled "3. Select Architecture to Support", select the OSBDM/OSJTAG board design type. This field may be auto populated after selecting the device in step 3.

5. From the field "4. Firmware file selection", indicate the firmware version by either having the utility automatically select the firmware, or by manually selecting the firmware by clicking on the "Select" button. The version number is labeled without the decimal period. Example: Selecting *osbdmens_s08.3000* means the OSBDM/OSJTAG firmware version 30.00 for the HCS08 design type is selected.

6. Click on the "Update Firmware" button and follow the instructions to update the firmware.

Figure 2.7 PEFirmwareUpdater
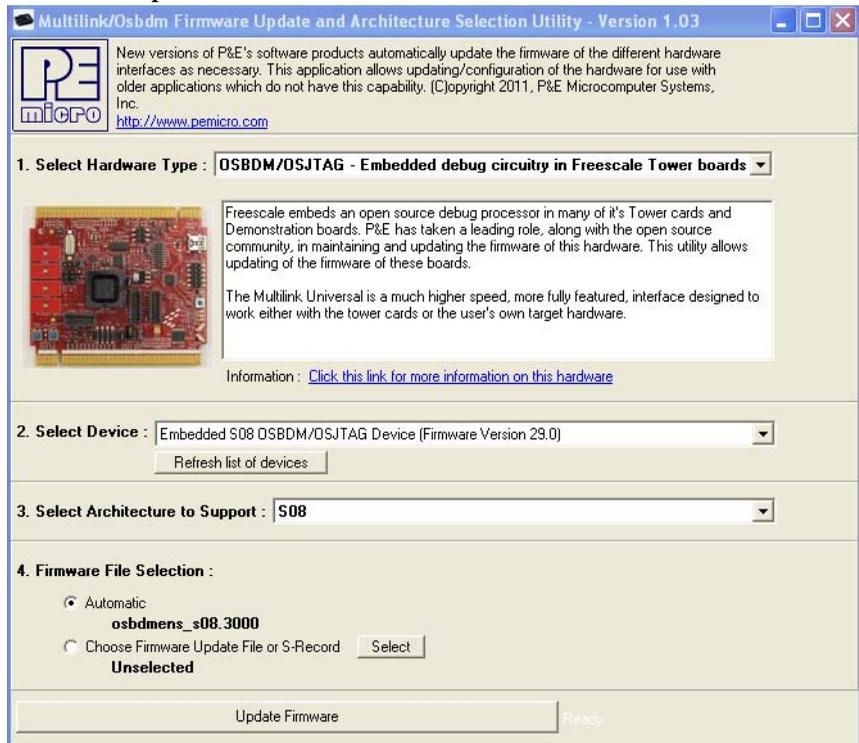
2.4 Firmware Recovery Utility

The firmware update utility described in the previous section requires that the OSBDM/OSJTAG hardware be booted into bootloader mode. If for any reason the firmware is corrupt to the point where it cannot boot into bootloader mode, P&E provides a Firmware Recovery Utility. This utility requires either a USB Multilink Universal or a USB-ML-12 Multilink in order to reprogram the OSBDM/OSJTAG circuitry via the 6-pin debug connector. This is a fail-safe way to reprogram the firmware in an existing OSBDM/OSJTAG design. This method will re-program a working, corrupted, or blank OSBDM/OSJTAG 9S08JM60 device with the selected firmware.

The P&E USB Multilink (USB-ML-12E) should be connected via a USB cable to the PC and connected to the OSBDM/OSJTAG design via the 6-pin ribbon cable. Make sure to connect it to the 6-pin header used to program the OSBDM/OSJTAG 9S08JM60 device (often there will be

multiple 6-pin headers on a reference or tower design). Make sure the OSBDM/OSJTAG design has power. The yellow LED on the Multilink should be illuminated which indicates power is detected on the OSBDM/OSJTAG design.

This utility may be downloaded from http://www.pemicro.com/osbdm. The following are typical steps to getting the firmware recovery utility to work:

1. Run the P&E Firmware Recovery Utility

2. Click the "Select" button and choose the firmware to be programming into the unit. Default firmware for each architecture configuration is included with the utility.

3. Click the "Update Firmware" button. A window should pop up that displays the status of the programming process, and when complete the Firmware Recovery Utility should indicate a positive result.

Figure 2.8 Firmware Recovery Utility
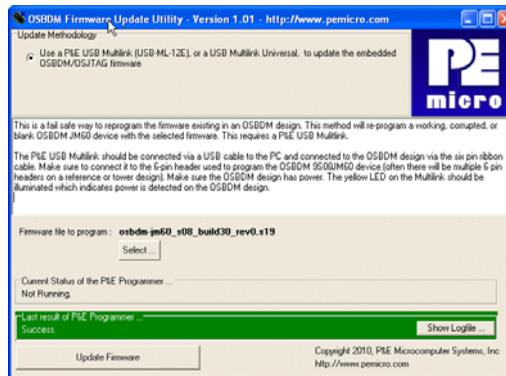
2.5 Firmware Information Utility

This utility will query the USB bus for any attached OSBDM/OSJTAG and USB Multilink devices. It will then display information about these devices, such as configuration and version number information. This is very useful to understand which USB devices are properly configured (driver-wise) and what their current state is. An image of the utility is shown here:

Figure 2.9 Firmware Information Utility
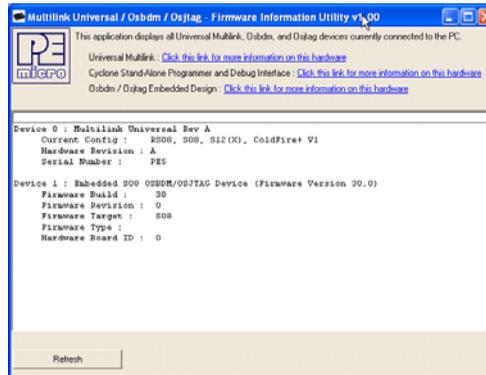
2.6 Troubleshooting Debug Driver

If you are having trouble connecting to an OSBDM/OSJTAG-based device, the first step is to verify in the Windows Device Manager that the OSBDM/OSJTAG device has enumerated properly. For example, on Windows XP the user would click the START button, select Control Panel, double click System, select the Hardware Tab, and click the Device Manager button.

Under the LibUSB-Win32 Devices, the OSBDM/OSJTAG device should be shown. If it is not, the user should follow these steps:

1. Install the latest drivers as per Installing Windows OSBDM/OSJTAG and USB Drivers.

2. Unplug and Replug the OSBDM/OSJTAG device. If it is shown with a yellow exclamation mark, select it, right mouse click, and select re-install driver.

3. See if the device is shown properly in the Windows Device Manager

4. If the device still does not show up in the Device Manager, place the OSBDM/OSJTAG device into bootloader mode and run the Firmware Update Utility as shown in Firmware Update Utility. Place the device backing into normal mode (remove IRQ jumper).

5. Unplug and Replug the OSBDM/OSJTAG device. If it is shown with a yellow exclamation mark, select it, right mouse click, and select re-install driver.

2.7 Troubleshooting Virtual Serial Driver

Before attempting to fix any virtual serial drivers, make sure that the device debug function shows up properly as detailed in Troubleshooting Debug Driver. Once this is

complete, refer to Figure 2.10 for an example of what the drivers should look like for both the debug and virtual serial functions.

If the Jungo tab does not show up, reinstall the drivers as detailed in Installing Windows OSBDM/OSJTAG and USB Drivers. If the PEMICRO USB Serial Port does not show up under the Jungo tab, select the OSBDM/OSJTAG device listed in the LibUSB-Win32 Devices list, right-click, and choose reinstall driver.

If the driver still does not show up, then most likely an older driver install is interfering with the OSBDM/OSJTAG Virtual Serial Port operation. Firmware version 27.00 began including the virtual serial interface in addition to the debug interface in the OSBDM/ OSJTAG USB Firmware. On some machines, since the USB device ID remained the same, Windows will not recognize the virtual serial port.

In firmware version 30.00, the USB device ID (PID) was changed so that Windows would always recognize both interfaces of the USB device. A corresponding change was made to the OSDLL to recognize both the older and new PID devices. The firmware is available in the P&E Firmware Update Utility in the "virtual_serial_fix" subdirectory. Run the Firmware Update Utility as detailed in Firmware Update Utility, but instead of selecting "Automatic" in the final stage, choose "Choose Firmware Update File or S-Record" and select one of the firmwares in the "virtual_serial_fix" subfolder. This should update the firmware to version 30.

After the OSBDM/OSJTAG Drivers are installed properly on the PC and/or after the target firmware has been successfully updated, the device manager will properly enumerate the virtual serial and the utilities will be able to use it. Refer to Firmware Update Utility for instructions on how to update the target's firmware.

The device manager should show the following devices (see Figure 2.10):

> Jungo -> PEMicro USB Serial Port (i1)
>
> Jungo -> WinDriver
>
> LibUSB-Win32 Devices -> Open Source BDM – Debug Port

Figure 2.10 Device Manager - Virtual Serial and Debug Ports Enumerated
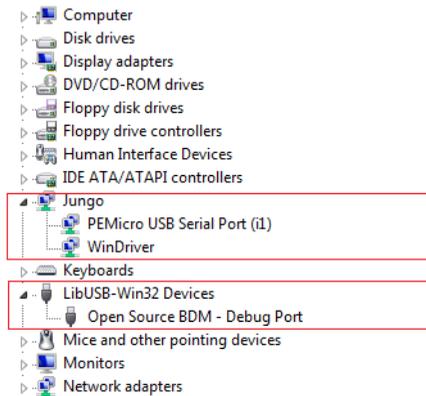
A problem may occur when the user is using an older version of the IAR Workbench for ARM (prior to 6.20) which relies on an older version of OSDLL (peosbdmv1.dll). The latest version of OSDLL is backwards API compatible with previous version. In the root directory of the firmware Update Utility install is both latest copies of OSDLL, which are identical to one another (osbdm-jm60.dll/peosbdmv1.dll).

If this occurs, both the Device manager in Windows and P&E's Firmware Information Utility will properly display the hardware, but older Workbench versions will not recognize it. In this case, the user should update the copy of the OSDLL (peosbdmv1.dll) in [IAR Workbench Install Dir]\arm\bin\pemicro with the version included in the firmware update utility root directory.

2.8 Troubleshooting Bootloader Drivers

Bootloader mode is a firmware mode that an OSBDM/OSJTAG design can be placed in to allow it to be updated. In newer software applications, such as CodeWarrior 10.1 or P&E's firmware update utility, you may be prompter to boot the device into bootloader mode in order to update the firmware. Entering bootloader mode is as simple as unplugging the USB cable from the OSBDM/OSJTAG design, placing a two pin jumper on the bootloader header (connecting IRQ to GND), and plugging the USB cable back in. If all goes well, the device will boot properly into bootloader mode.

If however, the update software doesn't recognize the USB device, there may be a driver issue on the PC. This is generally due to older utilities and drivers being installed on the PC. The simplest way to diagnose this is to open the Windows Device Manager. If the device appears under the "libUSB-Win32 devices" tab as "Open Source BDM - Bootloader Port", then all is well with the drivers. This is shown in .

If there is a previous driver installation from Freescale JM60 Demo Applications and the JM60 board is enumerated in bootloader, the device may be using older drivers and the device manager will look as shown in Figure 2.11 below.

Figure 2.11 Bootloader drivers after Freescale JM60 Demo Application
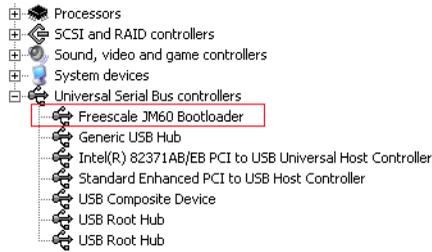
The first step is to install the drivers install on P&E's website at http://www.pemicro.com/osbdm to make sure the latest system drivers are installed on the machine. After installing the drivers and re-plugging the board in bootloader mode, the user will notice it is still using the Freescale JM60 Bootloader drivers (Figure 2.11), which makes it unrecognizable by applications (See Figure 2.12 and).

Figure 2.12 OSBDM/OSJTAG Bootloader drives NOT installed
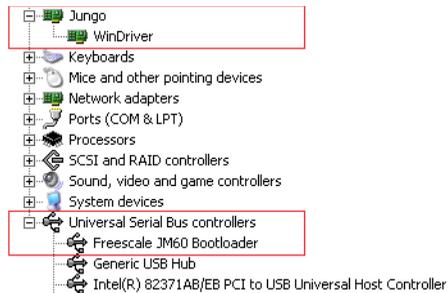
In order to get the OSBDM/OSJTAG Booloader to enumerate properly and be able to use the Firmware Update utility, the user will need to update the drivers by following the steps below:

1. On the device manager, right click on Freescale JM60 Bootloader and select "Update Driver..."

Figure 2.13 Step 1 - Select "Update Driver"

2. When prompted if Windows can connect to Windows Update to search for software, select "No, not this time" option and press Next.

Figure 2.14 Step 2 - Skip Software Search
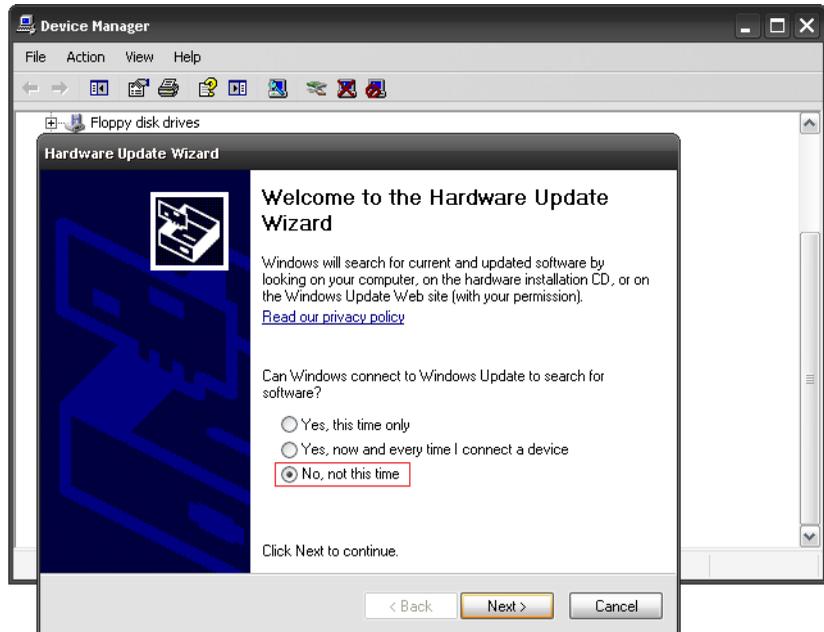
3. When asked "What do you want to the wizard to do?", select Install software automatically and press Next.

Figure 2.15 Step 3 - Select "Install Software Automatically"
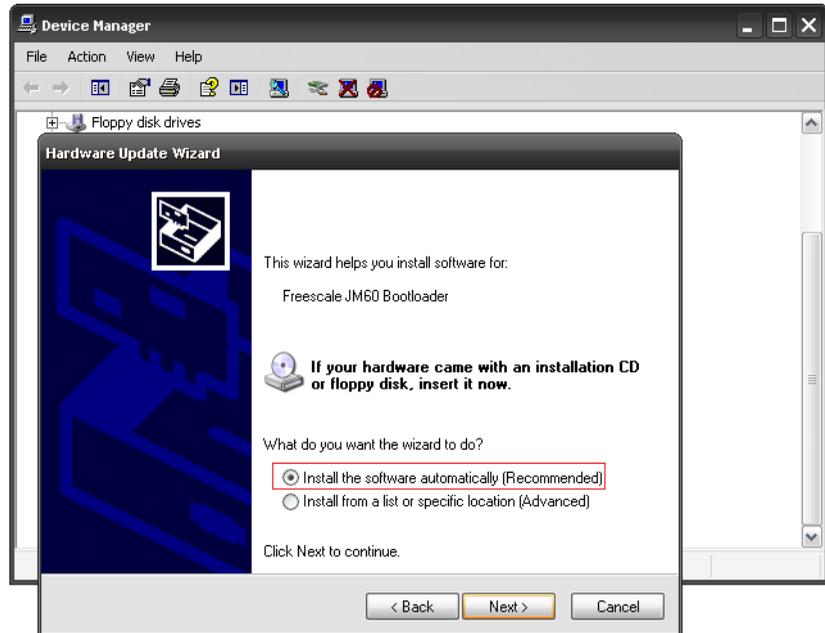
4. Complete the installation and the OSBDM/OSJTAG Bootloader drivers will be successfully updated to work with P&E applications.

Figure 2.16 Step 4 - Complete Installation
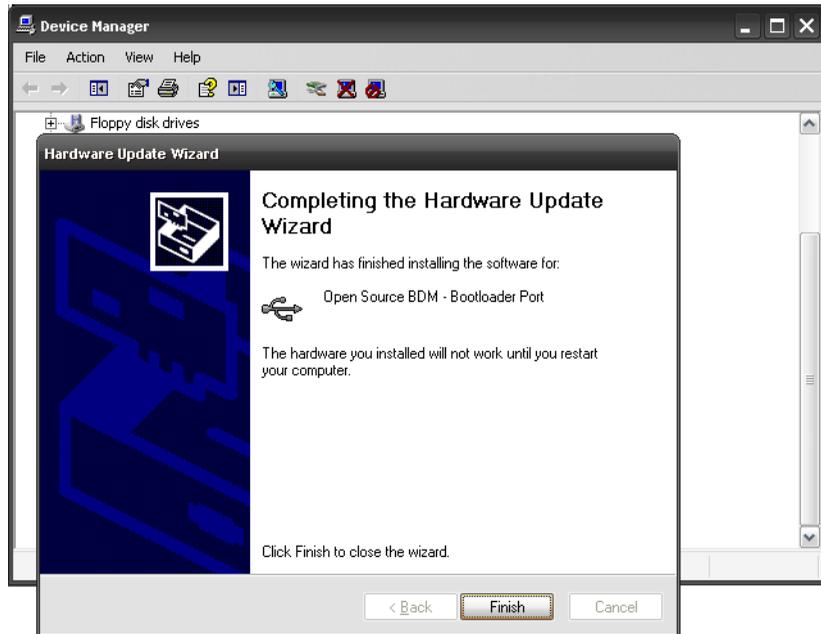
5. The device manager should now enumerate properly

Figure 2.17 Properly Enumerated Device Manager
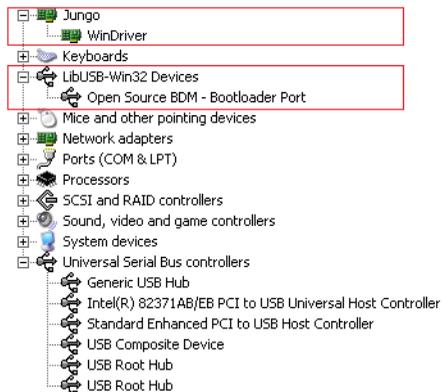
6. The firmware updater utility (or the update mechanism in many development tools) will now recognize the OSBDM/OSJTAG board in bootloader mode.

Figure 2.18 OSBDM/OSJTAG Boatloader Mode Recognized In Firmware Updater