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# Technical Summary for
## DSC Multilink, Rev. A (PART# DSC-MULTILINK)

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**DSC Multilink**

## 1    Introduction

The DSC Multilink is a debug interface which accelerates the debug and flash programming process, saving valuable development time. The Multilink provides access to the debug modes of NXP's DSC MCUs by allowing communications between the target device and a laptop/PC. The Multilink connects the target's standard debug header to the laptop/PC's USB port.

## 2    Firmware Updates

A utility called *PEFirmwareConfig.exe* can be used to manually update the Multilink firmware. This application is included with the "USB Multilink Resources Install" which can be downloaded from the pemicro.com Support tab, the Multilink product page, or directly from the link below:

   http://www.pemicro.com/downloads/download_file.cfm?download_id=346

## 3    Debug Headers

The 14-pin header that is used to connect to NXP DSC targets is located inside the Multilink unit and is labeled Port A; the Multilink case should easily flip open to reveal the headers. The Ports A header is dual-row with a .100" pitch. The pin-out for this connection is shown below.

**DSC Multilink Pinout - Port A**

| Please note: | PORT A - JTAG/ONCE |
| --- | --- |
| Overlined text indicates an active low signal. | DSC |

| | |
| --- | --- |
| Pin 1: TDI | Pin 2: GND |
| Pin 3: TDO | Pin 4: GND |
| Pin 5: TCK | Pin 6: GND |
| Pin 7: NC | Pin 8: KEY |
| Pin 9: $\overline{\text{RESET}}$ | Pin 10: TMS |
| Pin 11: TVCC | Pin 12: GND |
| Pin 13: NC | Pin 14: JCOMP/$\overline{\text{TRST}}$ |

The user can take advantage of debug modes to halt normal processor execution and use a computer 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.

## 4 Usage

The user connects a ribbon cable between the DSC target's debug header and Port A on the Multilink. The location of Port A is shown in the figure below. Do not attempt to use multiple ports at once, as this may damage both the target processors as well as the Multilink.
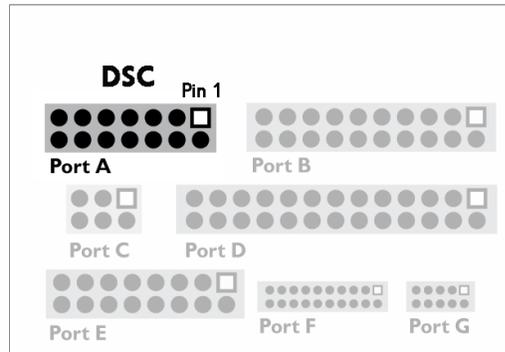


**Port A Header Location (Pin 1 Highlighted)**

The DSC Multilink interface will work with targets whose processor power supply is in the range of 1.8V to 5V. Use a Type A to Type B male-to-male USB cable to connect the interface to the PC.

There are two LEDs on the Multilink interface. The blue LED indicates that the interface is powered and running. The yellow LED indicates that target power has been detected.

**Note:** To avoid improper connections, the red stripe of the ribbon cable should always be oriented towards Pin 1, both on the Multilink port and the target processor header. In the Header Location figure above, Pin 1 is indicated by a white square.

The DSC Multilink 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 USB 2.0.

## 5 Driver Installation

Before connecting the DSC Multilink to the PC, the appropriate drivers need to be installed on the PC. The Multilink drivers are supported on Windows XP, 2000, 2003, Vista, 7, 8, 10, and 11. These drivers are automatically installed with NXP's CodeWarrior or any of PEmicro's recent software 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 PEmicro's "Support Center" located at http://www.pemicro.com. If you are using third-party software, make sure you have a version which supports your specific interface (DSC Multilink). 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 interface. 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 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 Multilink 2.0" 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 Multilink should disappear from the list. Unplug the 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.

## 6    Connecting To The Target

The following is the proper connection sequence to connect the PC to the target system via the Multilink interface:

1. Make sure the target power is OFF and the DSC Multilink is not connected to either the target or the PC

2. Open the Multilink and connect a ribbon cable from the correct Multilink port to the target. Make sure that the ribbon cable is plugged into the target with the proper orientation. PIN 1 is indicated by a 1 next to the port.

3. Connect the Multilink to the PC via a USB cable. The Blue LED on the Multilink should illuminate.

4. Turn the target power on. The Yellow LED on the Multilink should illuminate.

Before disconnecting the setup, turn the target power off.

## 7    Troubleshooting - Startup Reset Sequence

Note that if the DSC Multilink does not enter debug mode, the program issues the error message "Cannot enter background mode." If you receive this message you should check your hardware with a scope, logic analyzer or logic probe. First check for power on, then check to make sure the processor oscillator is running. Finally, look for the startup sequence for your microprocessor that is listed below.

**Port A –  JTAG/ONCE – DSC**

a. RESET (Pin-9) is driven low (to processor).
b. Activity appears on TCK (Pin-5), TDI (Pin-1) and TDO (Pin-3). (PC software instructs the processor to enable debug mode).
c. RESET (Pin-9) is released by the interface and will go high.
d. Activity appears on TCK (Pin-5), TDI (Pin-1) and TDO (Pin-3). (Debug activity).

## 8    Interface Libraries

PEmicro produces a set of interface libraries which allow the user to directly control the DSC Multilink 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. More details can be found on the UNIT Interface Libraries page on the PEmicro website:

http://www.pemicro.com/products/product_processor.cfm?category=9

## 9    Third Party IDEs & Other Compatible Software

The DSC Multilink is supported by recent versions of NXP's CodeWarrior as well as PEmicro software applications. Information on compatible PEmicro software can be found in the "Products" section of PEmicro's website: pemicro.com.

## 10    Transition To Production Programming

The DSC Multilink is intended for development and is not designed to accommodate the demands of production programming. However, PEmicro's Cyclone LC and Cyclone FX programmers are specifically engineered to withstand the rigors of a production environment and will provide a seamless transition from the Multilink. In addition, the Cyclone FX offers an expanded feature set which includes faster communications, larger storage, expandable storage, enhanced security including SAP image encryption and programming restrictions, and expansion ports. More information is available online at: pemicro.com/cyclone.

**Cyclone LC programmer**