TRENTON Technology Inc.
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Application Note: Connecting to USB Headers on Trenton PICMG® 1.3 Backplanes & System Host Boards (SHBs)

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Introduction

This application note explains how to connect three basic types of USB cables from the USB I/O plate connectors to the USB headers on Trenton's PICMG® 1.3 backplanes and system host boards (SHBs). Trenton USB I/O plate cables (part numbers 5642-000 and 5642-001) each have a secured 8-pin USB header connector for connecting to Trenton backplanes and SHBs. Other commercially available USB I/O plate cable assemblies have a combination of 8-pin and 10-pin USB header connectors that may or may not be secured or keyed. Below is an overview of three different USB headers that are used on three different USB I/O plate cable assemblies. The following application note includes an explanation of how to properly connect each type of USB I/O plate cable assembly to a Trenton PICMG 1.3 backplane or SHB.

USB I/O Cable Assemblies

Figure 1 illustrates three common USB I/O plate cable assemblies. Assembly A in Figure 1 shows the Trenton version, in which a 10-position/8-pin USB header connector is used to plug into the USB header connections. Assembly B illustrates an off-the-shelf assembly that uses a 10-position/10-pin header connector, and Assembly C shows another commercially available assembly which uses a 10-position/9-pin header in which one of the chassis ground pin positions is blocked.

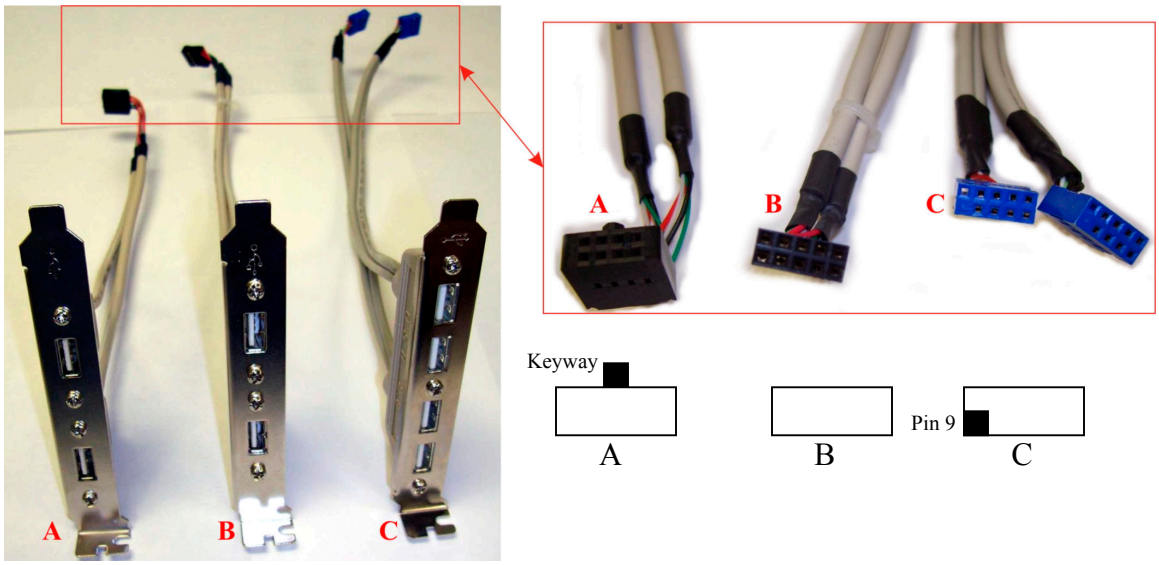

Figure 1

There are four basic USB connections needed for any USB port: +5V, USBn-, USBn+ and signal ground, where the letter "n" indicates port number. These two connections are for the plus and minus data signal lines. Sometimes two additional chassis ground pins are included, which accounts for the variation between 10-pin and 8-pin USB header designs. Most USB devices do not have these two additional chassis ground pin connections, which usually are not needed in typical system applications.

Of the three header connection variations shown in Figure 1, the Trenton connector (cable header A) is the only one with a keyway. This keyway helps ensure that a secure USB connection is made to the Trenton backplane or SHB. Commercially available USB I/O plate cable assemblies usually do not provide this keyway, as shown in examples B and C of Figure 1.

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Trenton SHB and Backplane USB Header Connectors

Before connecting the USB cable to the Trenton SHB or backplane, we need to review the header connector orientation of Pin 1 inside a USB on-board header. On all Trenton single board computers (SBCs), system host boards and backplanes, the location of Pin 1 of any on-board connector can be found by turning over the board and looking for the square solder pad of the connector in question. Some boards provide a silk-screen indication of Pin 1 on the board's topside. However, the silk-screen indicator of Pin 1 is not present on many of Trenton SBCs and SHBs due to component density. Figure 2 illustrates the location of Pin 1 on the USB on-board header for the Trenton SLT board (Model No. 6515).

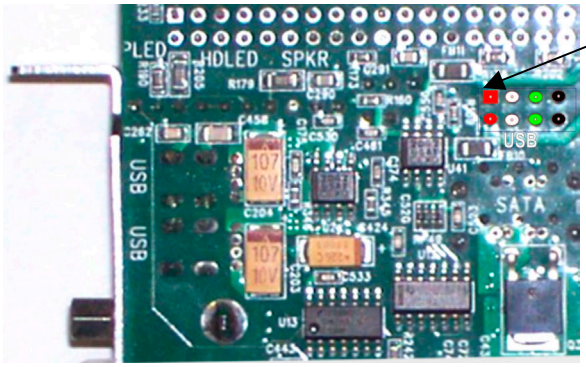

Figure 2

Usually Pin 1 on a Trenton board is located toward the I/O plate side of the SBC, SHB or backplane. Looking for the square solder pad will help locate Pin 1 of any on-board connector. The board layout drawings in the technical manuals and the on-line layout drawings in the Jumpers, Connectors and Memory section of the Trenton Technical Support web page at www.trentontechnology.com/support/ also illustrate Pin 1 for the various connectors used on Trenton boards.

Connecting to the USB Header

Now that we have determined the location of Pin 1 in the board's USB header, it's time to connect the USB cable from the I/O plate assembly. Figure 3 illustrates a successful USB connection to a Trenton PICMG 1.3 backplane. The colors shown in the header diagram illustrate the colors of the wires in the Trenton cable and in the two off-the-shelf cables.

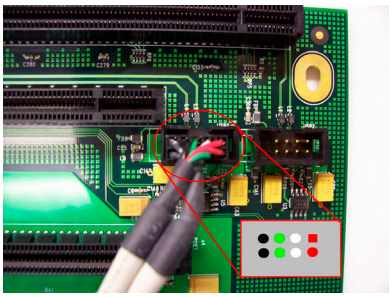

Figure 3

Red indicates Pin 1 in Figure 3 and in all three of the cable examples shown above in Figure 1. We have found that the USB connector color code is fairly consistent from vendor to vendor, but variations are always possible. You'll need to double-check your specific cable's specifications, because there is no universally accepted USB wiring standard for USB I/O plate cable assemblies. It is critical that Pin 1 of the cable matches up to Pin 1 of the board header, because an incorrect match can damage the backplane, the SHB and the external USB device(s).

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Connecting to the USB Header – Trenton Cable, Assembly A

The left side of Figure 4 shows the Trenton USB cable and the associated backplane header connector. After Pin 1 has been located, the USB header is plugged in as shown on the right side of Figure 4.

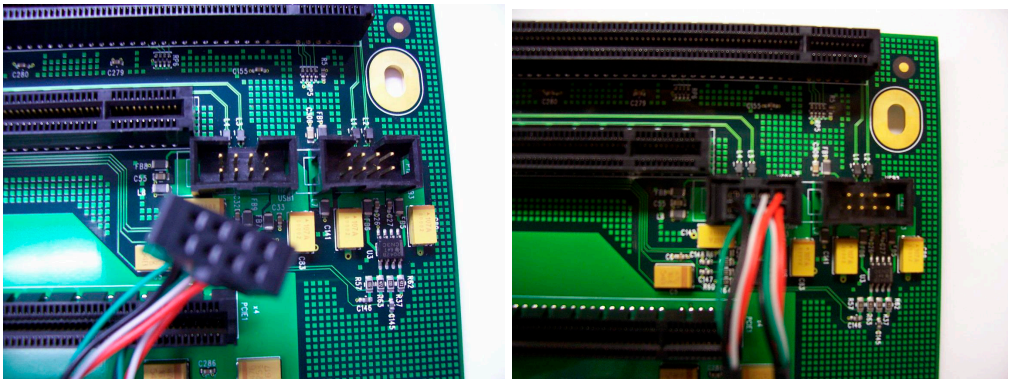

Figure 4

As mentioned previously, the Trenton header is keyed to ensure a secured USB connection. The keyed header connector prevents a Trenton USB cable from being connected backward on a Trenton SHB or backplane.

Connecting to the USB Header – 10-Position/10-Pin Assembly, Assembly B

The left side of Figure 5 shows Assembly B, which is the off-the-shelf assembly that uses a 10-position/10-pin header connector. After Pin 1 has been located, the USB header is plugged in as shown on the right side of Figure 5. Caution must be used to ensure that Pin 1 of the cable is aligned and properly connected to Pin 1 of the USB header of the SHB or backplane.

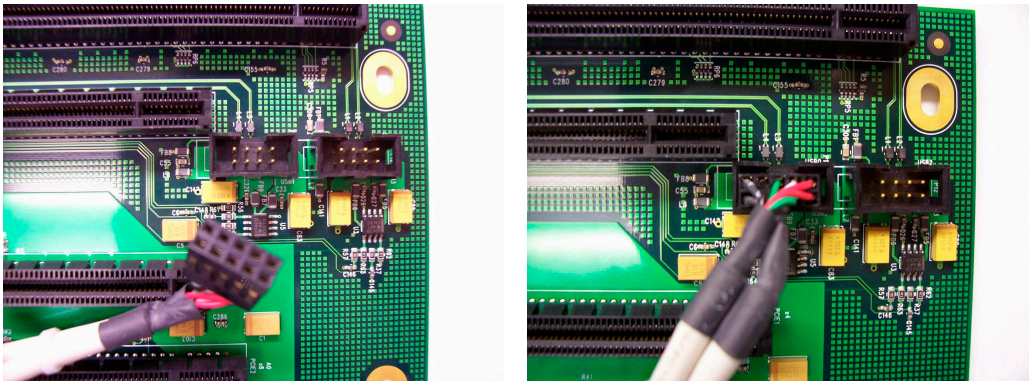

Figure 5

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Connecting to the USB Header – 10-Position/9-Pin Assembly, Assembly C

The left side of Figure 6 shows Assembly C, which is the off-the-shelf assembly that uses a 10-position/9-pin header in which one of the chassis ground pin positions is blocked. After Pin 1 has been located, the USB header is plugged in as shown on the right side of Figure 6. Blocking Pin 9 in this header connector prevents the cable from being plugged in backward. However, caution still must be used to ensure that Pin 1 of the cable is aligned properly to prevent on-board header damage.

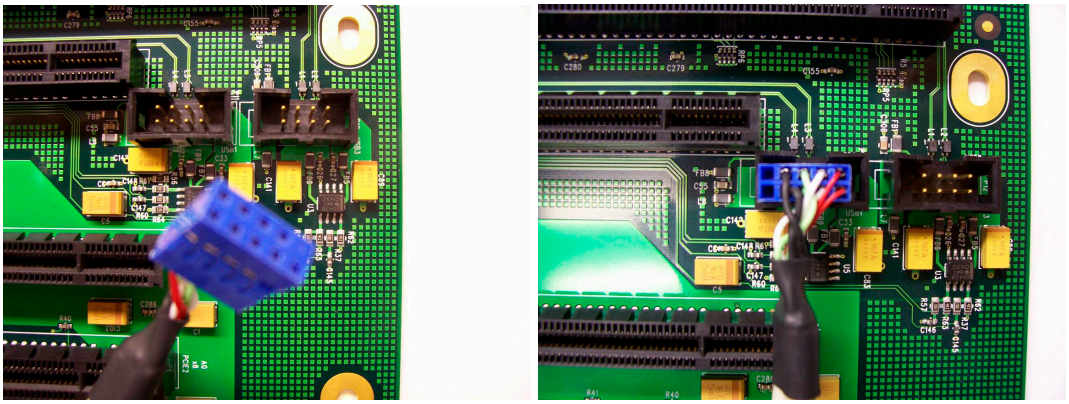

Figure 6

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Conclusion

There are a wide variety of USB cable options. Unfortunately, there is no universally accepted standard for on-board USB headers or USB I/O plate cable assemblies. Trenton PICMG 1.3 backplanes and SHBs standardize on the 8-pin header connector format. This application note is provided to ensure that proper USB cable connections are made to a Trenton PICMG 1.3 backplane and system host board when using a non-Trenton USB I/O plate cable assembly.