



PCI EXPRESS EXPANSION SYSTEM BOARDS, Rev. 2 and CABLES

No. PED8044 / PEU8039 / EC1 / EC3 Revision A

INSTALLATION GUIDE

Publication No. 8408044-011203



WARRANTY

The following is an abbreviated version of Trenton Systems' warranty policy for rackmount computer products. For a complete warranty statement, contact Trenton or visit our website at <http://www.trentonsystems.com/>.

All boards used in systems delivered by Trenton are covered under a pass-through warranty. For example, if Trenton manufactured PCIe expansion boards, embedded motherboards or PICMG 1.3 single board computers are used in the system then these boards will carry a five-year warranty. All other system sub-components including but not limited to power supplies, DVDs, CD-ROMS, etc. are covered under their original manufacturer's warranty. All systems built by Trenton are warranted against defects in material, workmanship and design for a period of one year from date of delivery. Repair or replacement products will be warranted for a period of three months from the date of shipment or for the remainder of the original warranty period for that particular product, whichever is longer. Any software or firmware that is delivered by Trenton will be warranted for a period of one year to perform in accordance with published specifications prepared, approved and issued by Trenton and/or the appropriate 3rd party vendor. Contact Trenton for the complete system warranty policy.

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To obtain an RMA number, call us at (800) 875-6031 or (770) 287-3100. We will need the following information:

- Return company address and contact
- Model name
- Serial number from chassis label
- Description of the failure

An RMA number will be issued. Mark the RMA number clearly on the outside of each box, include a failure report for each item and return the product(s) to our Gainesville, GA facility:

TRENTON Systems, Inc.
2350 Centennial Drive
Gainesville, GA 30504
Attn: Repair Department

Contact Trenton for our complete service and repair policy.

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Handling Precautions

WARNING: These boards include components which may be damaged by electrostatic discharge.

To protect your PCI Express expansion boards from electrostatic damage, be sure to observe the following precautions when handling or storing the board:

- Keep the target and host cards in the respective static-shielded bag until you are ready to perform your installation.
- Handle the board by their edges.
- Do not touch the edge connector I/O connector pins.
- Do not apply pressure or attach labels to the boards.
- Use a grounded wrist strap at your workstation or ground yourself frequently by touching the metal chassis of the system before handling any components. The system must be plugged into an outlet that is connected to an earth ground.
- Use antistatic padding on all work surfaces.
- Avoid static-inducing carpeted areas.

RECOMMENDED BOARD HANDLING PRECAUTIONS

The boards have components on both sides of the PCB. Some of these components are extremely small and subject to damage if a board is not handled properly. It is important for you to observe the following precautions when handling or storing the boards to prevent components from being damaged or broken off:

- Handle a board **only** by its edges.
- Store each board in its padded shipping material or in an anti-static board rack.
- Do not place an unprotected board on a flat surface.

Before You Begin

INTRODUCTION

It is important to be aware of the information listed below before installing your PCIe expansion cards into your host computer and the target PCIe expansion chassis. System performance may be affected by incorrect usage of these features.

TARGET SYSTEM POWER SOURCE

The target system or PCIe expansion chassis must have an ATX-style power supply. The power to the target system's backplane will be controlled by the host computer; however, the 5V Aux power line needs to be turned on or enabled within the PCIe expansion chassis. The host computer will initiate power to the target chassis through control of the target system's PSON power supply signal. This power control from the host occurs via the host and target cards connected together via the 1m or 3m PCIe expansion cable.

HOST CARD (PEU8039) INSTALLATION

The host or upstream card must be installed in an available x16 PCI Express option card slot on the host computer's backplane or motherboard. Use the proper board handling precautions stated earlier to install the PEU8039 into the host computer.

TARGET CARD (PED8044) INSTALLATION

The target or downstream card must be installed in the SHB slot of a PICMG 1.3 backplane located inside the target PCIe expansion chassis. Use the proper board handling precautions stated earlier to install the PED8044 into the PCIe expansion chassis.

x16 PCI EXPRESS EXPANSION CABLE

The x16 PCIe expansion cable is available in lengths of 1m (EXC1) or 3m (EXC3). The cable provides the physical pathway between host computer's PEU8039 host card and the PED8044 target card in the PCIe expansion system. Ensure that you use the proper cable length for the specific locations of your host and expansion systems. The cable must not be stretched or have extreme bends that may result in cable damage.

TARGET CARD (PED8044) BOARD REVISIONS

Revision 002 of the PED8044 target card uses two additional switch packs to allow pre-emphasis adjustment of the PCIe link signals. Revision 001 of the same card uses downstream link configuration straps for this adjustment. Pre-emphasis link tuning may prove useful in some installations to ensure the best host-to-expansion system communication performance possible.

Chapter 1 - Introduction & Overview

DESCRIPTION

This manual is written around the revision 2 versions of the PED8044 PCI Express expansion chassis target card and the PEU8039 host card. Figure 1 illustrates these two PCIe link expansion cards. The last three digits of a card's assembly number reflect the board revision level. Contact Trenton tech support if you have a revision 1 card for additional information.

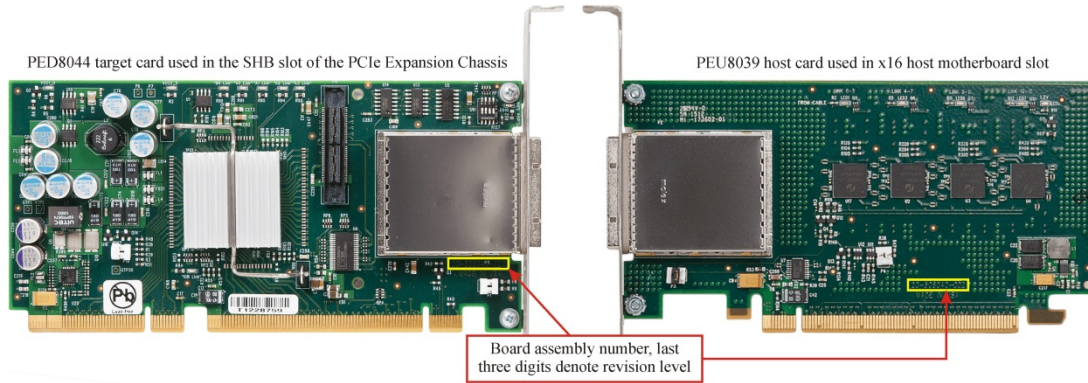


Figure 1




Trenton offers several PCIe Expansion Systems that utilize the PED8044 PCI Express Expansion chassis target card installed in the SHB slot of an industry standard, PICMG 1.3 backplane. The PED8044 connects via a x16, (1 or 3-meter cable) Trenton part number EXC1 or EC3, to a PEU8039 host card installed in any available x16 electrical/x16 mechanical slot on the host server. This connection is illustrated in Figure 2.



Figure 2

The typical connection (shown in Figure 2) delivers seamless PCI Express I/O expansion to any host server via a x16 PCIe 2.0 link between the PED8044 expansion chassis' target card and the host's PEU8039 card.

A Trenton Systems PCIe expansion chassis comes with the PED8044 installed in the backplane's SHB slot, a 1 or 3-meter x16 PCIe interconnect cable and the PEU8039 host card for installing in the end user's host server. If a host server is ordered from Trenton, the PEU8039 may also be pre-installed by Trenton Systems. The chart in Figure 3 illustrates three different PCIe expansion chassis available from Trenton Systems.

| Chassis | Description | Backplane Options |
|---|---|---|
|  | 3U, TTX3100 expansion supports 14-slot backplane options in a rackmount chassis that measures 19" x 5.2" x 20" | Trenton 14-slot PICMG 1.3 Backplanes – BPG8155, 2 x16, 3 x8 and 6 x4 PCIe 3.0*/2.0/1.1 plus 1 x4 PCIe2.0/1.1 BPG7087, 4 - x16 and 5 - x4 PCIe 2.0/1.1 BPX6620, 1 - x8 PCIe 1.1, 2 - 64-bit/133MHz and 8 - 64-bit/100MHz PCI-X BPG6615, 1 - x16 and 4 - x4 PCIe 1.1, 2 - 64-bit/100MHz and 4 - 64-bit/66MHz PCI-X BPX6610, 2 - x8 and 4 - x4 PCIe 1.1, 2 - 64-bit/100MHz and 4 - 64-bit/66MHz PCI-X BPX3/8, 2 - x8 PCIe 2.0/1.1, 4 - 64-bit/66MHz and 4 - 64-bit/33MHz PCI-X |
|  | 4U, TTX4100 expansion supports 14-slot backplane options in a rackmount chassis that measures 19" x 7" x 16.25" | Trenton 14-slot PICMG 1.3 Backplanes – BPG8155, 2 x16, 3 x8 and 6 x4 PCIe 3.0*/2.0/1.1 plus 1 x4 PCIe2.0/1.1 BPG7087, 4 - x16 and 5 - x4 PCIe 2.0/1.1 BPX6620, 1 - x8 PCIe 1.1, 2 - 64-bit/133MHz and 8 - 64-bit/100MHz PCI-X BPG6615, 1 - x16 and 4 - x4 PCIe 1.1, 2 - 64-bit/100MHz and 4 - 64-bit/66MHz PCI-X BPX6610, 2 - x8 and 4 - x4 PCIe 1.1, 2 - 64-bit/100MHz and 4 - 64-bit/66MHz PCI-X BPX3/8, 2 - x8 PCIe 2.0/1.1, 4 - 64-bit/66MHz and 4 - 64-bit/33MHz PCI-X |
|  | 5U, TTX5100 expansion supports 20-slot backplane options in a rackmount chassis that measures 19" x 8.75" x 18" | Trenton 20-slot PICMG 1.3 Backplanes – BPG8032, 17 - x16 and 1 - x4 PCIe 2.0/1.1 BPX6806, 4 - x8 and 13 - x4 PCIe 1.1 plus 1 - x4 PCIe 2.0/1.1 BPX6571, 1 - x8 and 1 - x4 PCIe 2.0/1.1 and 16 - 64-bit/66MHz PCI-X |

*Note: Backplane card slots will connect to PCIe 3.0 cards at the PCIe Gen3 data rate by virtue of the backplane's PCIe 3.0 switches. The PCIe data rate from the PCIe expansion target-to-host card will be at the x16 PCIe 2.0 data rate.

Figure 3

Figure 4 provides an inside look at the Trenton TTX3100 PCIe expansion chassis with the PED8044 installed in the SHB slot on the BPG7087 backplane.

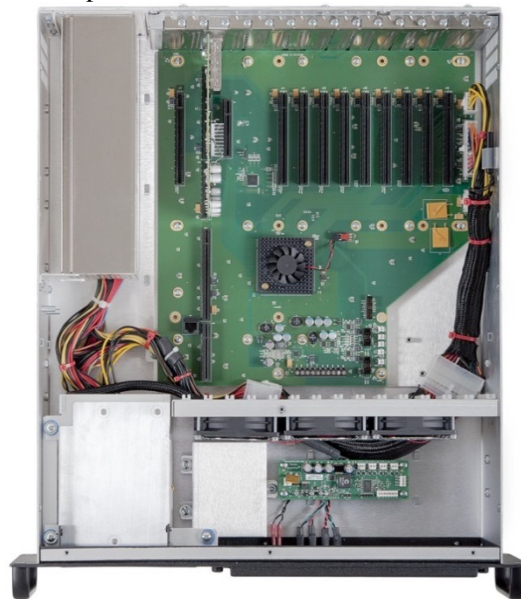


Figure 4

PACKING LIST – TTX3100 PCI EXPRESS EXPANSION SYSTEM

The packing list for Trenton PCIe expansion systems will vary slightly based on the customer order. Any PED8044 PCI Express expansion chassis target card or PEU8039 host card purchased separately will ship with just the card packed in a shipping box. Here's a typical packing list for the Trenton TTX3100 PCIe expansion system.

- TTX3100 PCIe expansion system with the PED8044 PCI Express expansion chassis target card installed
- One (1), 1-meter x16, PCIe 2.0 link expansion cable, EXC1*
- One (1), 10ft. (3.1m) AC power cord
- One (1), PEU8039 host card packed in a separate box

*Could be a 3-meter x16, PCIe 2.0 link expansion cable, EXC3

Chapter 2 - Physical Dimensions & Layout Drawings

LAYOUT DIMENSION DRAWING

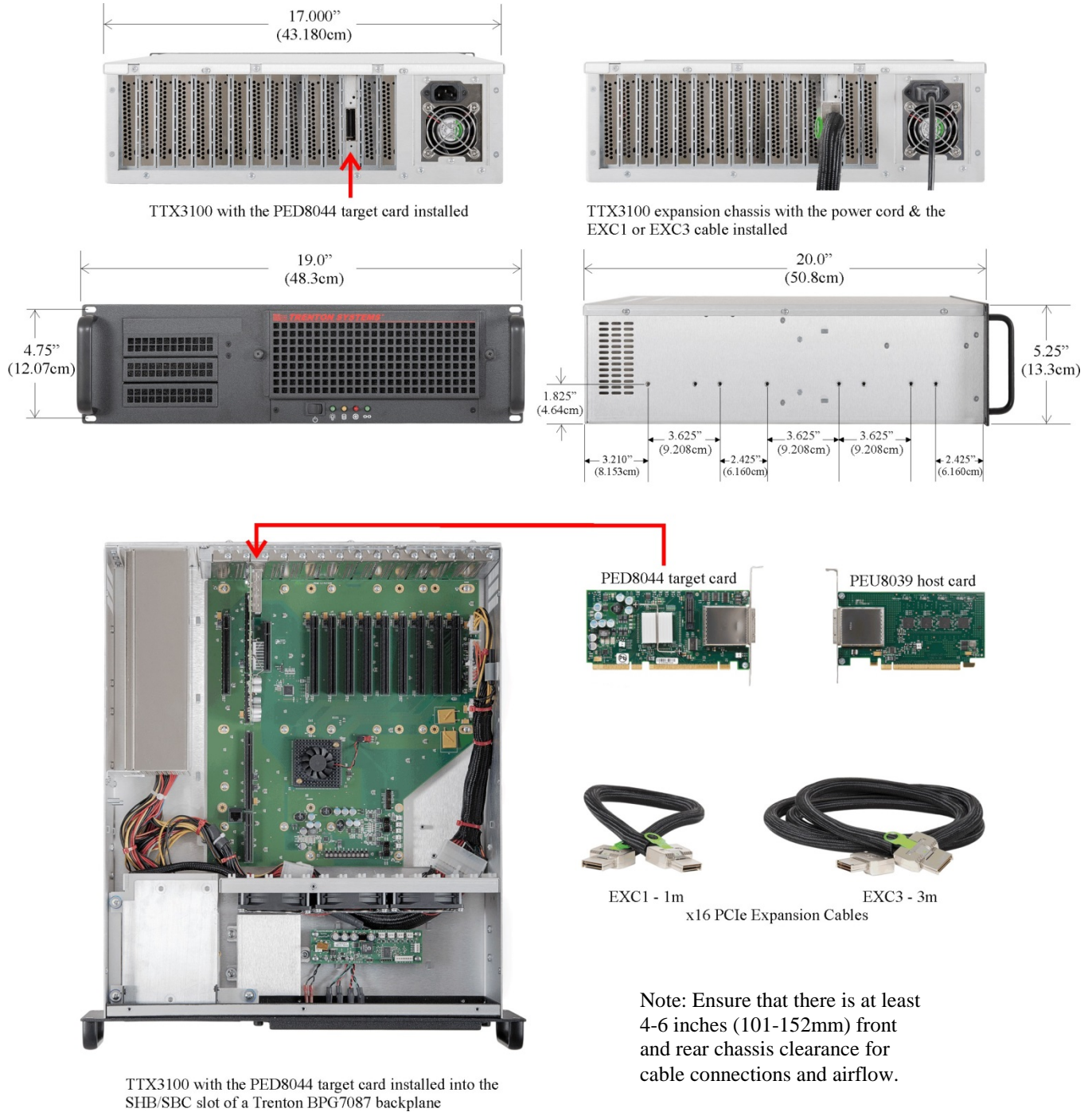


Figure 5

Chapter 3 - Installation Instructions

ENVIRONMENTAL CONSIDERATIONS – AIR FLOW

When installing the chassis, ensure that a minimum free air space is available around the system. The installation should have a minimum of 4-6 inches (101-152mm) behind the chassis and 1-3 inches (25-75mm) in front of the chassis. Any front cabinet doors or access aisles must accommodate a PCIe expansion chassis front chassis clearance of at least 4.0" (102mm) in order to provide proper cable clearances for any front panel I/O port connections and to gain access to the system air filter for maintenance. A chassis clearance of 0.5-1.5 inches (13-38mm) above the system is desirable. The computer is equipped with fans to help ensure proper cooling.

PCI EXPRESS EXPANSION CHASSIS LAYOUT - TTX3100 EXAMPLE

The following figures will be helpful in installing a PCIe expansion system.

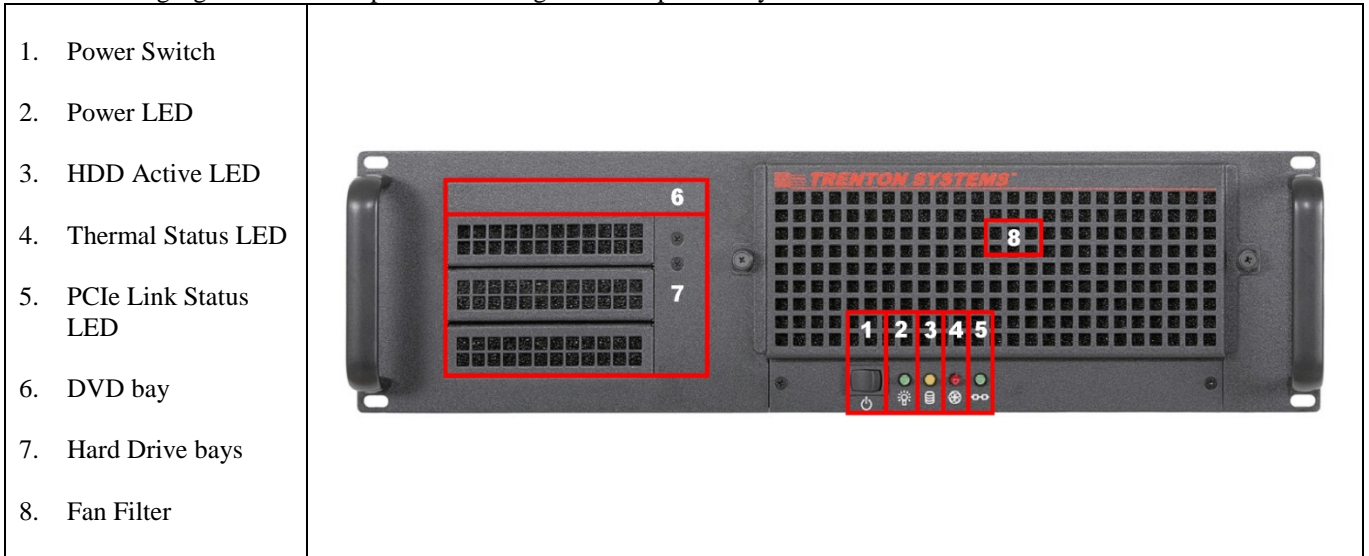


Figure 6 – TTX3100 PCIe Expansion System, Front View

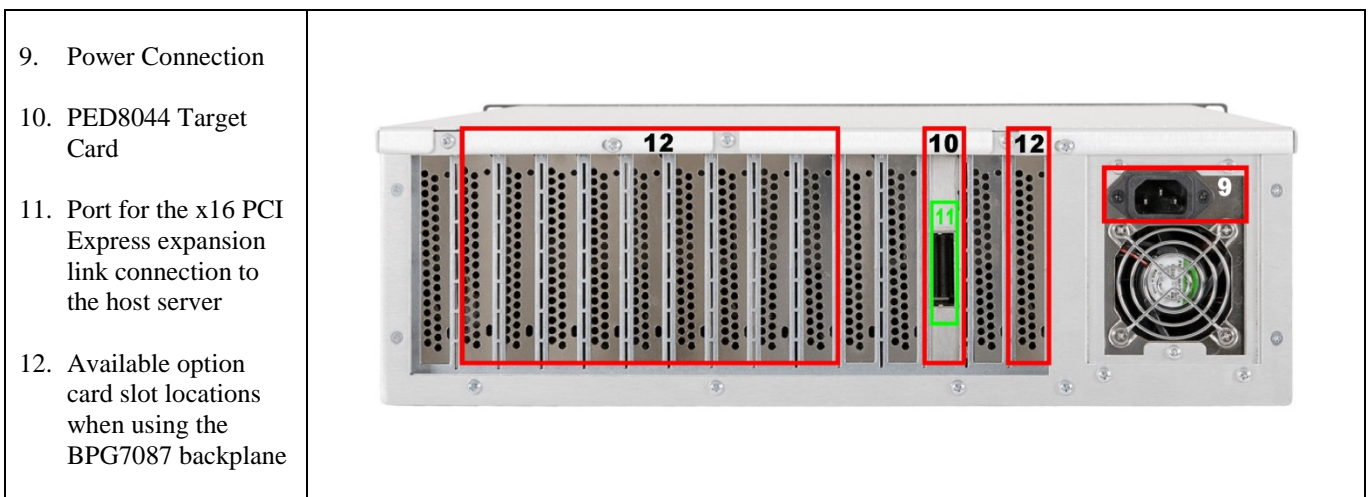


Figure 7 – TTX3100 PCIe Expansion System, Rear View

INSTALLING PCI EXPRESS EXPANSION HOST CARD – PEU8039

Refer to the Handling Precautions section of this manual and install the PEU8039 card in an available x16 PCI Express 2.0 card slot on the host server's motherboard. The right-hand side of Figure 2 in Chapter 1 illustrates a PEU8039 card installed in a 1U rackmount server.

INSTALLING PCI EXPRESS EXPANSION CHASSIS OPTION CARDS

Remove the top cover on the expansion chassis. Refer to Figure 5 and Figure 7 and install the option cards you need in the available backplane card slots illustrated in callout number 12 of Figure 7. Ensure that proper board handling techniques are used as outline in the Handling Precautions section of this manual. Replace the top cover before proceeding to the rack mounting step of the installation.

RACK MOUNTING

The PCIe expansion chassis can be installed in a rackmount cabinet that conforms to EIA standards for computer equipment with 19-inch wide panels. The cabinet must be tall enough to accommodate the computer's height and deep enough to accommodate the system's depth, while providing the proper clearances for air flow and cabling. A cabinet with a standard depth of 31.5 inches (800mm) should be sufficient; however, a rack with a non-standard depth dimension of at least 26 inches (660mm) will provide the suggested minimum front and rear chassis clearances needed for an installation.

The PCIe expansion chassis is designed to be supported in the cabinet with rack slides or placed on a cabinet shelf. The front flanges of the computer are designed to secure the PCIe expansion chassis to the rack cabinet's front mounting rails

RACKMOUNT INSTRUCTIONS

A) Elevated Operating Ambient - If installed in a closed or multi-unit rack assembly, the operating ambient temperature of the rack environment may be greater than room ambient. Therefore, consideration should be given to installing the equipment in an environment compatible with the maximum ambient temperature (T_{ma}) specified by the manufacturer.

B) Reduced Air Flow - Installation of the equipment in a rack should be such that the amount of air flow required for safe operation of the equipment is not compromised.

C) Mechanical Loading - Mounting of the equipment in the rack should be such that a hazardous condition is not achieved due to uneven mechanical loading.

D) Circuit Overloading - Consideration should be given to the connection of the equipment to the supply circuit and the effect that overloading of the circuits might have on over current protection and supply wiring. Appropriate consideration of equipment nameplate ratings should be used when addressing this concern.

E) Reliable Earthing - Reliable earthing of rack-mounted equipment should be maintained. Particular attention should be given to supply connections other than direct connections to the branch circuit (e.g. use of power strips).

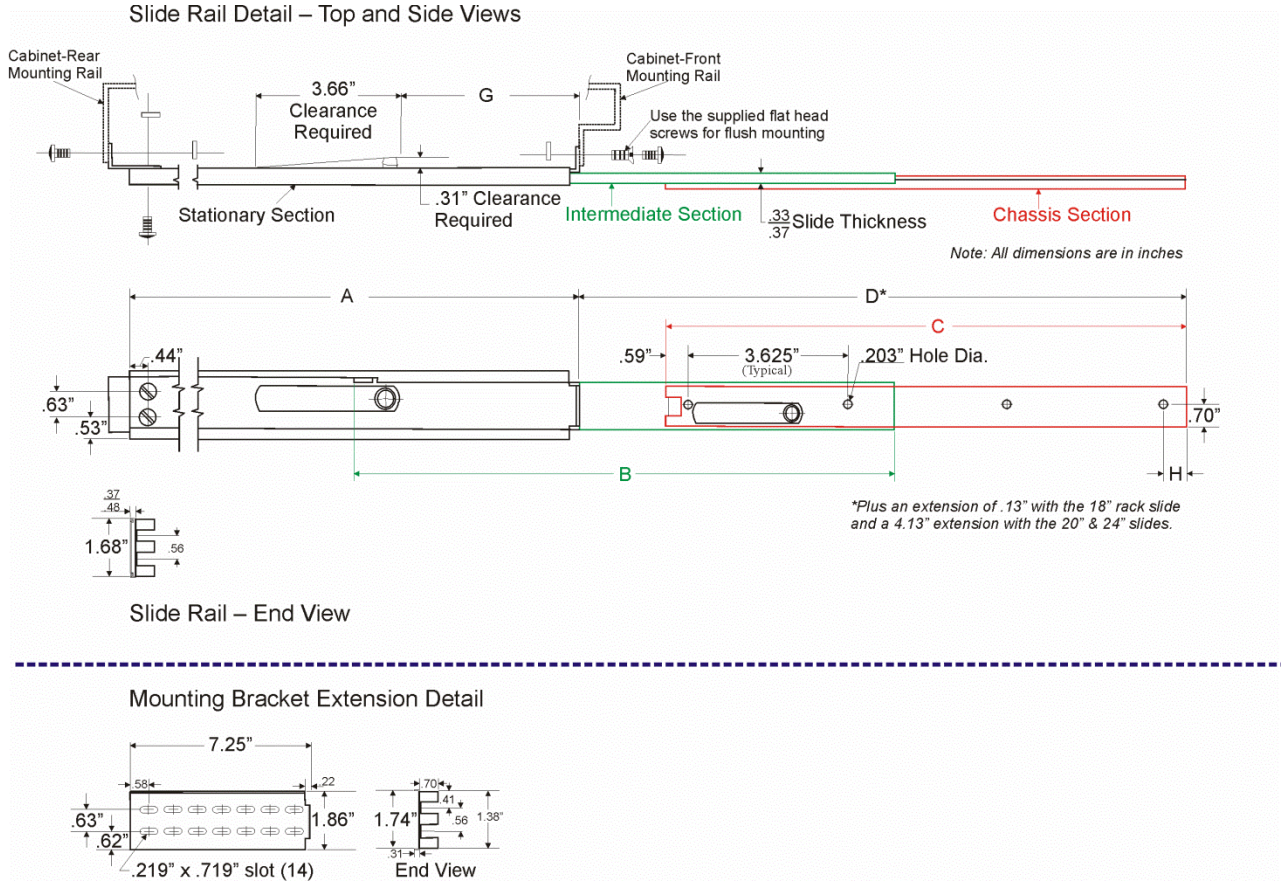
F) Chassis Access – Use in a RESTRICTED ACCESS LOCATION only.

NOTE: Only trained personnel shall install or operate this equipment

TRENTON RACK SLIDES

Trenton offers three different rack slide kits. The choice of rack slide kit is largely dependent on the component rack enclosure or transit case depth dimension and not so much on the chassis depth dimension. Most standard 19" component racks have a 30" depth dimension and each rack slide kit comes with two 7.25" adjustable mounting bracket extensions for use with the rack slides. That means that in most applications any one of the three available Trenton Systems slide rail kits will work in a standard 19" component rack. The table below provides suggestions on the optimum rack slide kit that could be used with a specific Trenton Systems rackmount computer. However, you may wish to use the longer slide kit with your specific installation.

| Trenton Systems Model Number | Chassis Height | Chassis Depth | Suggested Rack Slide Kit |
|------------------------------|----------------|---------------|--|
| TRC2002 | 2U | 18" | 198500001014-00 -- 18-24" Slide Rails w/Bracket, Solid Bearing |
| TRC2004 | 2U | 18" | 198500001014-00 -- 18-24" Slide Rails w/Bracket, Solid Bearing |
| TRC2005 | 2U | 18" | 198500001014-00 -- 18-24" Slide Rails w/Bracket, Solid Bearing |
| TVC2400 | 2U | 18" | 198500001014-00 -- 18-24" Slide Rails w/Bracket, Solid Bearing |
| TRC3001 | 3U | 20" | 198500001015-00 -- 20-26" Slide Rails w/Bracket, Solid Bearing |
| TTX3100 | 3U | 20" | 198500001015-00 -- 20-26" Slide Rails w/Bracket, Solid Bearing |
| TRC4011 | 4U | 20" | 198500001015-00 -- 20-26" Slide Rails w/Bracket, Solid Bearing |
| TRC4009 | 4U | 16.25" | 198500001014-00 -- 18-24" Slide Rails w/Bracket, Solid Bearing |
| TRC4008 | 4U | 20" | 198500001015-00 -- 20-26" Slide Rails w/Bracket, Solid Bearing |
| TRC4007 | 4U | 20" | 198500001015-00 -- 20-26" Slide Rails w/Bracket, Solid Bearing |
| TCS4501 | 4U | 20" | 198500001015-00 -- 20-26" Slide Rails w/Bracket, Solid Bearing |
| TVC4402 | 4U | 20" | 198500001015-00 -- 20-26" Slide Rails w/Bracket, Solid Bearing |
| TVC4403 | 4U | 20" | 198500001015-00 -- 20-26" Slide Rails w/Bracket, Solid Bearing |
| TVC4406 | 4U | 20" | 198500001015-00 -- 20-26" Slide Rails w/Bracket, Solid Bearing |
| TTX4100 | 4U | 16.25" | 198500001014-00 -- 18-24" Slide Rails w/Bracket, Solid Bearing |
| TTX4102 | 4U | 20" | 198500001015-00 -- 20-26" Slide Rails w/Bracket, Solid Bearing |
| TMS4702 | 4U | 22" | 198500001016-00 -- 24-30" Slide Rails w/Bracket, Solid Bearing |
| TMS4704 | 4U | 22" | 198500001016-00 -- 24-30" Slide Rails w/Bracket, Solid Bearing |
| TRC5006 | 5U | 23" | 198500001016-00 -- 24-30" Slide Rails w/Bracket, Solid Bearing |
| TRC5005 | 5U | 23" | 198500001016-00 -- 24-30" Slide Rails w/Bracket, Solid Bearing |
| TRC5004 | 5U | 18" | 198500001014-00 -- 18-24" Slide Rails w/Bracket, Solid Bearing |
| TRC5003 | 5U | 23" | 198500001016-00 -- 24-30" Slide Rails w/Bracket, Solid Bearing |
| TRC5002 | 5U | 18" | 198500001014-00 -- 18-24" Slide Rails w/Bracket, Solid Bearing |
| TRC5000 | 5U | 18" | 198500001014-00 -- 18-24" Slide Rails w/Bracket, Solid Bearing |
| TSS5203 | 5U | 24.5" | 198500001016-00 -- 24-30" Slide Rails w/Bracket, Solid Bearing |
| TVC5400 | 5U | 18" | 198500001014-00 -- 18-24" Slide Rails w/Bracket, Solid Bearing |
| TVC5401 | 5U | 23" | 198500001016-00 -- 24-30" Slide Rails w/Bracket, Solid Bearing |
| TTX5100 | 5U | 18" | 198500001014-00 -- 18-24" Slide Rails w/Bracket, Solid Bearing |
| TRC6001 | 6U | 20.1" | 198500001015-00 -- 20-26" Slide Rails w/Bracket, Solid Bearing |

SLIDE RAIL INSTALLATION – DIMENSIONAL INFORMATION**Rack Slide Dimension Details**

| Part Number | A | B | C | Dmin | Dmax | G | H | Load Capacity |
|-----------------|-------|-------|-------|-------|-------|------|------|---------------|
| 107500001060-00 | 18.00 | 13.25 | 12.63 | 15.00 | 19.00 | 4.31 | 1.16 | 90 LBS. |
| 107500001055-00 | 20.00 | 19.25 | 18.63 | 21.00 | 21.00 | 7.31 | 3.53 | 85 LBS. |
| 107500001057-00 | 24.00 | 19.25 | 18.63 | 21.00 | 25.00 | 7.31 | 3.53 | 85 LBS. |

Notes:

- 18-24" Slide Rails w/Bracket, Solid Bearing -- Part Number 198500001014-00
- Individual 18-24" rack slide part number – 107500001060-00
- 20-26" Slide Rails w/Bracket, Solid Bearing -- Part Number 198500001015-00
- Individual 20-26" rack slide part number – 107500001055-00
- 24-30" Slide Rails w/Bracket, Solid Bearing -- Part Number 198500001016-00
- Individual 24-30" rack slide part number – 107500001057-00
- Extension bracket (two are included in each kit) and have an individual part number of 107500001056-00
- Mounting screw hardware is included in each rack slide kit

SLIDE RAIL INSTALLATION INSTRUCTIONS

1. Remove slide rails from the box along with the rail frames, rack frame mounting extension brackets and the mounting hardware. Trenton slide rail kits include the following items.
 - 2, 18", 20" or 24" slide rails
 - 4, rail frames
 - 4, rack frame mounting extension brackets
 - 1, mounting hardware bag number S-047-0 includes:
 - 10 mounting rail to computer chassis screws
 - 1, mounting hardware bag number S-017-1 includes
 - 36 rail frame to 19" rack mounting screws
 - 10 nuts
 - 10 flat washer
2. Take one of the slide rails and slide the inside portion of the rail completely out until you hear an audible click.
3. On the inside of the rail, you will see a rail stop hook, push the hook up to release and detach the inside portion of the slide completely from the outside portion of the rack slide.
4. Set aside this inside portion of the rack slide. You will be mounting this part of the rack slide to a side of the computer chassis later in this procedure.
5. Repeat steps 3 and 4 for the other rack slide. (Refer to figure 1 as necessary)

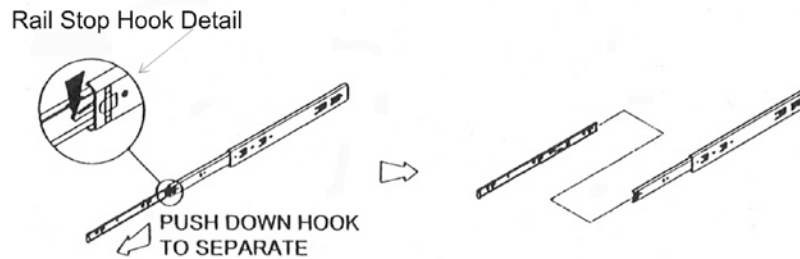


Figure 1 – Rail Stop Hook Detail

6. Using four mounting screws from hardware bag S-047-0, attach an inside rail to the left side of the computer chassis as shown in figure 2. Note – the rubber bumper on the inside rail slide needs to be facing toward the front of the computer and the cut-out portion of the rail release latch should be pointing downward indicating that the slide rail has been properly mounted to the correct side of the computer chassis.

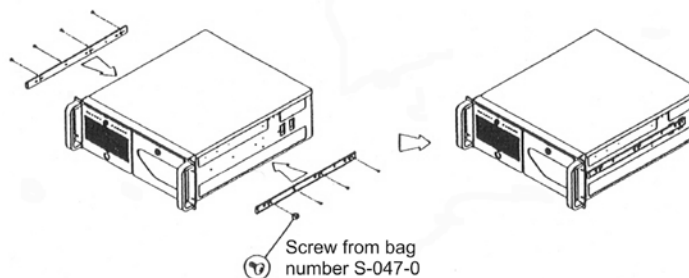


Figure 2 – Inside Rail Mounting Detail

7. Repeat step 6 for the right side on the computer and refer to figure 2 as necessary.
8. Standard 19" instrument racks have a wide variety of mounting hole types. Some mounting holes are threaded, but most of not, some mounting holes are located on side flanges rather than the front and back of the rack supports and finally some holes are round while others are rectangular. The following steps assume that your 19" instrument rack has round, non-threaded mounting holes for the slide rail frames. The optional rack frame mounting brackets accommodate the side flange

- rackmount hole placements. If your rack has other mounting hole types or placements, then you may need to consult with your rack supplier to obtain the correct slide rail mounting hardware.
9. The rubber bumper on the outside portion of slide rails are to be located toward the rear of the 19" rack.
 10. Refer to figure 3 and attach two rail frames each to the outside portion of both rack slides using the hardware in bag number S-107-1.

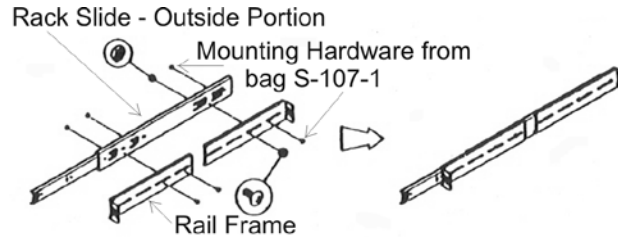


Figure 3 – Outside Rail and Frame Assembly

11. If the mounting holes are on the inside portions of your rackmount supports, then mount each assembly directly to the rack supports as shown in figure 4-A.

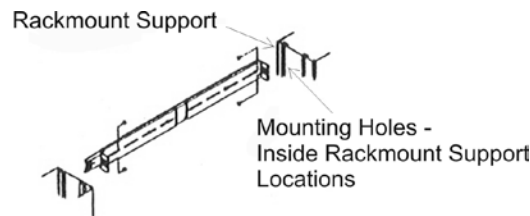


Figure 4A – Rail/Frame Mounting – Inside Rackmount Hole Locations

12. If the mounting holes are located on side flanges then you will need to use the optional rack frame mounting brackets.
13. Attach the optional brackets to the rack slides as shown in figure 4-B and attach the completed assembly to the rack supports.

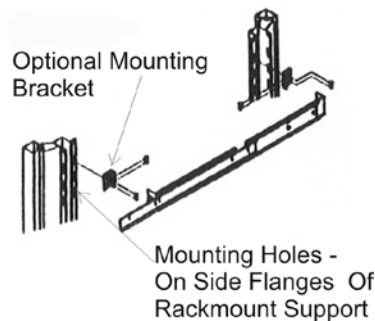


Figure 4B – Rail/Frame Mounting – Side Flange Rackmount Hole Locations

14. You will need to supply the hardware necessary to mount your completed rail and frame assemblies to the rackmount enclosure supports.
15. **CAUTION** – Ensure that when mounting the completed rail and frame assemblies to the 19" rack that the left and right assemblies are the same distance from the top or bottom of the rack. Failure to align the slide rails properly will result in the computer not being level inside the rack. If the slides are grossly misaligned then you may not be able to slide the chassis into the slide rails.
16. Refer to figure 5 and slide the chassis into the rails attached to the frame of the rackmount enclosure. (You should have another person help you lift and slide the chassis into the enclosure.)

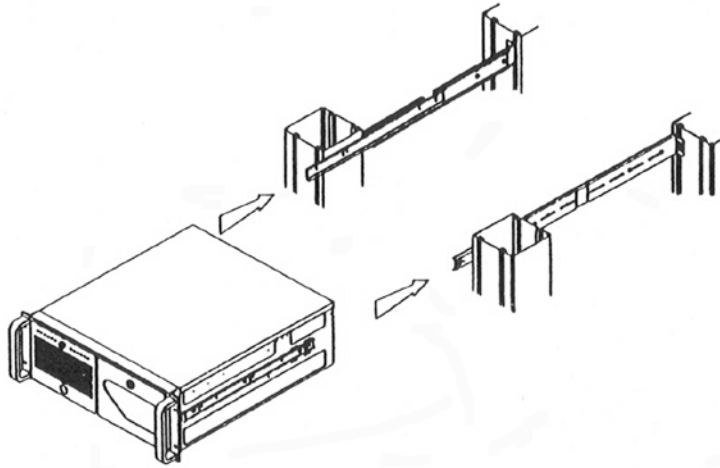


Figure 5 – Chassis Installation

17. You should hear and audible “click” when the rail stop hooks on the slide engage with the chassis stops inside the rails mounted to the enclosure supports.
18. Push up on the rail stop hooks and push the chassis completely into the enclosure.
19. Each Trenton System chassis has two through holes on each chassis-mounting flange. Use these holes to secure your chassis to the enclosure. (Note: The hardware used in this step is highly dependent on your enclosure type; therefore, Trenton does not provide the hardware for this step.)
20. Contact Trenton Systems if you require additional assistance.

CONNECTING AC POWER

The PCIe expansion chassis requires a single-phase power source providing 110-240VAC at 50 to 60Hz to the AC input power outlet located at the rear of the chassis. Power must be available at the three-pin AC input receptacle located on the supply at the rear of the system. An over-current protection device shall protect the power cord.

To connect AC power to the computer:

1. Establish a chassis to earth ground connection to the PCIe expansion chassis.



Figure 8 – Power Supply Connection

2. Connect the AC power cord to the AC receptacle.
3. Connect the plug end of the power cord into the main outlet.

NOTE: The maximum current limits for the +5V, +3.3V and +12V outputs from the system power supply are 32A, 32A and 65A respectively. The system’s power monitoring circuits will shut the system down if these maximum current limits are drawn from the power supply.

INSTALLING PCI EXPRESS EXPANSION CABLE

Refer to Figure 7 located in Chapter 3 when connecting the x16 PCIe 1-meter or 3-meter expansion cable. Insert the cable into the PED8044 board socket connector (callout number 11) on the back of the expansion chassis' PCIe target card. Connect the other end of the expansion cable to the socket on the PEU8039 host card that was previously installed in the host server. Ensure that both cable connectors lock into place.

Chapter 4 - Powering-Up The PCIe Expansion Chassis

HARDWARE OVERVIEW

As mentioned previously, the expansion system consists of an expansion chassis, two cards, a host server and a x16 PCI Express expansion cable assembly that connects the two cards, i.e. the expansion chassis and host server, together. This cable may be either 1m or 3m in length.

At this point the upstream card, also called the host or the Trenton PEU8039, should be inserted into a x16 PCIe peripheral card slot of the host server motherboard. Likewise the downstream, or target/Trenton PED8044, was inserted at the factory into the expansion chassis' SHB slot on the PICMG 1.3 backplane.

NOTE: If the target system is not a Trenton PCIe expansion chassis, then ensure that the target system has an ATX-style power supply at a minimum. An ATX power supply is required because the power to the target backplane will be controlled by the host. 5VAUX will be turned on by the host initiating power to the target through control of the supply's PSON signal.

After all cable connections are made; including the power cord on the PCIe expansion chassis, switch-on the power supply of the expansion chassis. Once the expansion chassis is energized, you may switch-on the power supply of the host system and start the upstream computer. Refer to Figure 6 and observe the power and link LEDs illuminate on the Trenton PCIe expansion system.

If the power LED is off, then ensure the expansion chassis power supply is connected, the power supply is switched ON and make sure that 5VAUX is on for the downstream backplane.* Make sure the host server is on and the expansion cable is firmly seated into the host card as well as the target card on the expansion chassis. Turn on the expansion chassis front panel switch and see if the expansion chassis comes on and stays on.

If the link LED is off then you will need to observe the detailed diagnostic LEDs on the target and host cards to determine why the expansion chassis is not linking to the host server.

***Note:** Observing the 5VAUX LED on the expansion chassis backplane will require opening the chassis. Power down the chassis, remove the expansion chassis' top cover and locate the backplane's 5V AUX LED. Re-apply power to the expansion and observe the status of the LED.

PCI EXPRESS LINK TUNING

PCI Express transmit and receive compliance eye diagrams were used extensively while designing the PEU8039 and PED8044 boards. These diagrams are useful in making sure that the PCI Express boards and PCIe over cable system itself is operating at optimum performance levels. Most PCIe expansion chassis installations should not require link tuning adjustments, but this capability is available on the PEU8039 host card in case it is needed.

The acceptable range of various link voltages and signal frequencies as they relate to timing jitter, amplitude noise and acceptable bit error rates are defined in the PCI Express specifications. The eye diagram in Figure 9 is an example of an acceptable eye diagram for a PCIe 2.0 x16 link being driven over a 3m long cable between a Trenton PEU8039 upstream/host card installed in a 1U HP server and a Trenton PED8044 downstream/target card installed in a BPG7087 backplane in a TTX3100. Notice the clear area around the diamond-shaped reference mask in Figure 9. This indicates proper peak-to-peak signal voltages at the desired signal frequency.

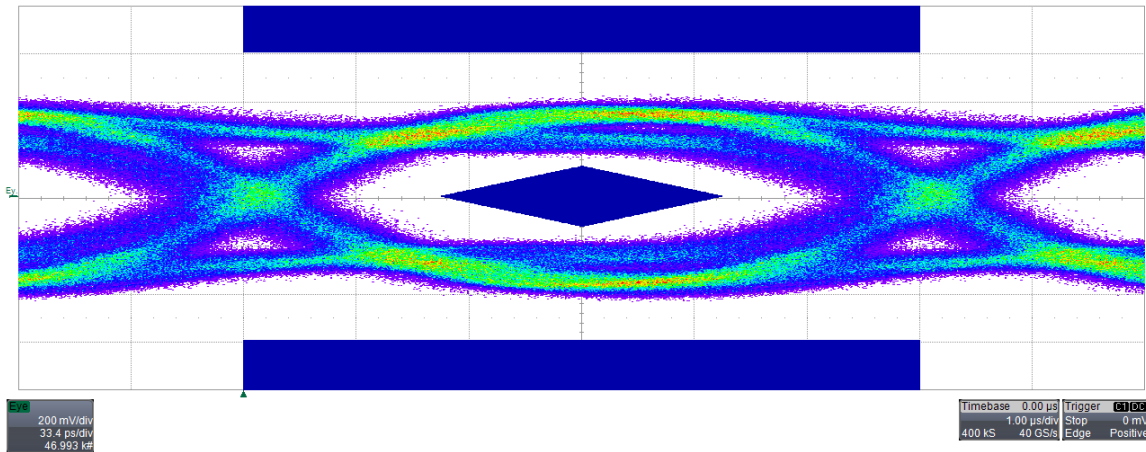


Figure 9

A less than optimum compliance eye indicates excessive signal loss and may result in a larger number of data packet errors and link retries resulting in an unacceptable bit error rate. Slower interface performance may also occur because the PCIe link may train down to a x1 link in order to establish communications. The link may also need to resend a lot of data packets thereby degrading overall interface performance. Pre-emphasis is a method for compensating for PCIe signal loss and Trenton builds this adjustment into the PCIe host card or PEU8039. Pre-emphasis places more emphasis on the transmit voltage signals in order to ensure robust host-to-target device communications over the length of the PCI Express cables.

The Rev 002 of the PEU8039 has two DIP switch packs located on the back of the card. These DIP switches are used for making any needed pre-emphasis adjustments to the PCIe x16 link signals. This can be helpful for “tuning” the link for its best performance in a given application. The DIP-switch default settings should be fine for most installation and are illustrated in Figure 9.

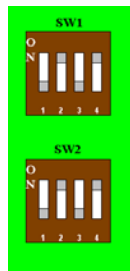


Figure 9

DOWNSTREAM PED8044 DIP SWITCH CONFIGURATION

When the PED8044 was installed in the expansion chassis backplane, the SW1-1 and SW1-2 positions of configuration switch were set to the ON positions and SW1-3 and SW1-4 are set to the OFF positions. The default settings for the SW2 DIP switches are all set to the OFF positions. These PED8044 default settings are illustrated in Figure 10. The physical locations of SW1 and SW2 are shown in Figure 12 and additional DIP switch information can be found in the silk-screen printing located on the back of the PED8044 card.

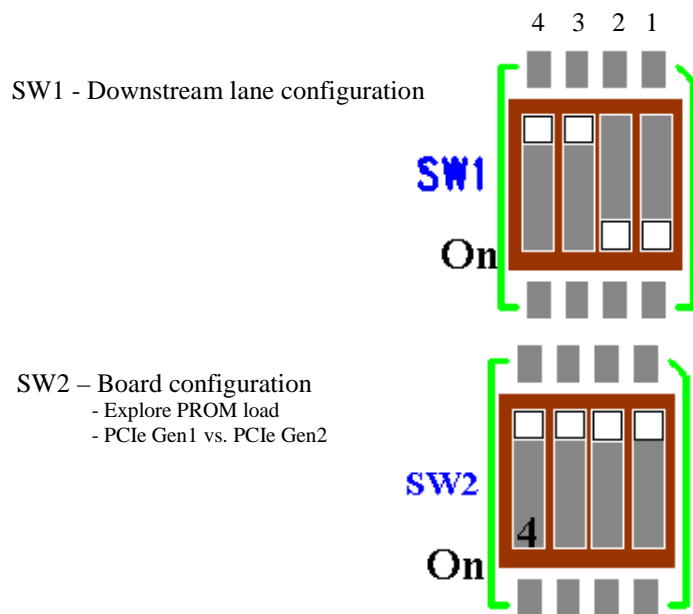


Figure 10

The PED8044 SW1 default DIP-switch settings read the backplane configuration straps to configure the downstream links accordingly. If the SW2-4 switch is set to the ON position, all of the PCIe links will be restricted to the PCI Express 1.1 link speed.

Chapter 5 - System Diagnostics & Troubleshooting

DETAILED DIAGNOSTIC LEDs

If the link LED on the downstream PED8044 card is off then you will need to observe the detailed diagnostic LEDs on the target and host cards to determine why the expansion chassis is not linking to the host server.

Several link status LEDs are built into the Trenton PEU8039 host server card and the PED8044 PCIe expansion chassis card to help trouble shoot any potential linking problems. Figure 11 and Figure 12 illustrate the diagnostic LEDs located on the PEU8039 host server card and the PED8044 PCIe expansion chassis card respectively.

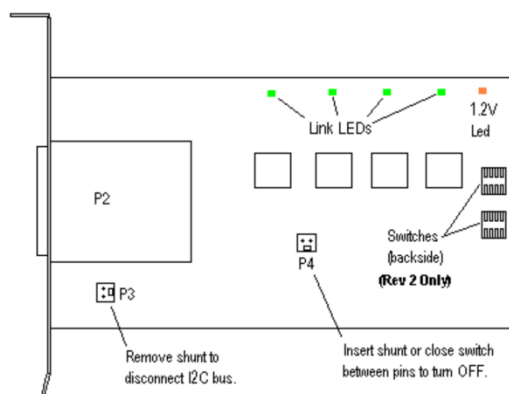


Figure 11 – PEU8039 Upstream Host Card

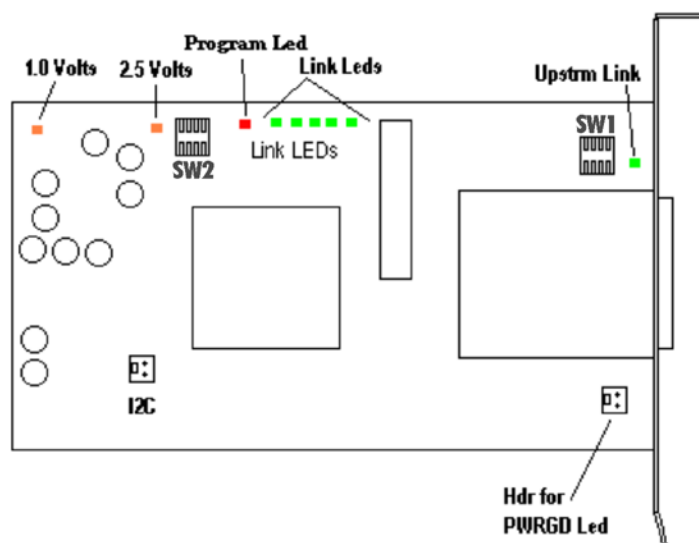


Figure 12 – PED8044 Downstream Target Card

After connecting the systems and properly applying power, the four PCIe link LEDs from the expansion side of the link and the 1.2V LED on the PEU8039 host card should be on solid. The four LEDs on the back of the card; i.e. the same side of the card as the Pre-Emphasis dip-switches, should also be full-on. These four LEDs come from the host side of the PCIe expansion link.

On the PED8044 expansion chassis card, the number of LEDs that are turned on will depend on the configuration of the backplane; however, you should always see the two voltage LEDs and the upstream link led turn on. The PCIe link LEDs on the PED8044 target card are arranged as shown in figure 13.



Figure 13

The silkscreen for the LEDs on the PED8044 expansion chassis card is offset. The table below aligns the silkscreen offset with the correct link function.

| Silkscreen LED Label | Link |
|----------------------|---|
| B0 | This indicates the status of the A0 PCIe link |
| A0 | This indicates the status of the B0 PCIe link |
| A1 | This indicates the status of the IOB PCIe link |
| A2 | This indicates the status of the A2 PCIe link |
| A3 | This indicates the status of the A3 PCIe link |

For example when the A0 target card link is operating at a PCIe 2.0 data rate and with a x16 link established, the LED under the B0 silkscreen marking will be full-on.

The LED link status LEDs of the PED8044 expansion chassis card have several different modes of operation depending on the speed and link-type established with the host server card. The table below defines the LED status conditions.

| LED Condition | PCIe Link Status |
|--|--|
| Off | Link Down |
| Full-On | Link is up and running at the 5.0GT/s (PCIe 2.0) data transfer rate and all PCIe lanes are up |
| Blinking – 0.5 seconds ON, 0.5 seconds OFF | Link is up and running at the 5.0GT/s (PCIe 2.0) data transfer rate, but reduced PCIe lanes are up |
| Blinking – 1.5 seconds ON, 0.5 seconds OFF | Link is up and running at the 2.5GT/s (PCIe 1.1) data transfer rate and all PCIe lanes are up |
| Blinking – 0.5 seconds ON, 1.5 seconds OFF | Link is up and running at the 2.5GT/s (PCIe 1.1) data transfer rate, but reduced PCIe lanes are up |

If the A0 link is a x16 link, then the A1-A3 LEDs will be off. This is an expected mode of operation.

Confirm that the upstream link LEDs* are on solid on the PEU8039 host server card. Confirm that the downstream link LEDs PED8044 expansion chassis card are on as expected.

***Including LED10. LED10 is the link status to the host system and this LED is visible through the peep-hole in the PED8044 I/O bracket.**

TROUBLESHOOTING – LINK SPEED

There are several reasons why the link LEDs may be blinking instead of being on solid. These reasons are listed in the table below.

| | Reason | Possible Remedy |
|----------|---|--|
| 1 | The PEU8039 host card is inserted into a x8 or x4 electrical slot on the host server motherboard. | Move the PED8039 to a motherboard slot with a x16 PCIe electrical interface. |
| 2 | The PEU8039 host card is being driven by a PCIe 1.1 source. | Move the PED8039 to a motherboard slot with a PCIe 2.0 electrical interface. |
| 3 | The PED8044 is connected to a x8 or x4 endpoint. | May be an expected mode of operation. Try connecting to a x16 endpoint. |
| 4 | The PED8044 is connected to a PCIe 1.1 endpoint. | May be an expected mode of operation. Try connecting to a PCIe 1.1 endpoint. |

TROUBLESHOOTING – TARGET CARD POWER & EEPROM PROGRAMMING

The PED8044 target card also has additional LEDs designed to assist in diagnosing potential power and backplane PCIe switch programming problems. There are two amber power LEDs for the 2.5v and 1.0v power levels. These two LEDs should be ON and solid green if the voltage levels from the power supply are in the acceptable range

There is also a red “program LED” that indicates if the EEPROM located on the PED8044 successfully programmed the PCIe switch on the backplane with the proper PCIe link parameters. If this LED is ON, it means that the EEPROM has not successfully programmed the PCIe switch. This may indicate a card seating issue with the PED8044, a defective backplane PCIe switch or a failure on the PED8044 card.

Once all the link test LED’s are in the correct and full-on mode of operation on the host and target cards this is your indication that the following operational parameters are in effect:

1. A good x16 PCI Express 2.0 link has been established between the PED8044 PCIe expansion chassis target card and the PEU8039 host card.
2. All PCIe 2.0 links to the expansion chassis backplane are functioning across all available PCIe lanes.

Chapter 6 - Replacing System Components

OPENING A TRENTON SYSTEMS PCI EXPRESS EXPANSION CHASSIS

A trained electronics technician may need to remove the top cover of the expansion chassis to install or remove the option cards.

NOTE: When installing cards into the expansion chassis you must ensure that the card installation does not result in non-conformance to the safety or EMC requirements for this product.

To open the expansion chassis:

1. Disconnect the AC power cord
 2. Remove the screws attaching the cover to the chassis. There are usually eight to twelve screws securing the top cover to the chassis and the exact number is based on your unique expansion chassis. There are typically three screws on the right and left-side of the chassis, two or three screws on the back of the chassis and from two to three screws on the top securing the cover to the chassis
 3. Slide the cover back slightly and lift it off the chassis
 4. Ensure you are properly grounded before installing or removing cards
 5. Remove the option card hold down bar to install or remove cards
-

NOTE: NEVER install or remove any card from a backplane if any +5V AUX / Standby LED is ON. First switch OFF the power supply unit and remove the AC power cord. Wait until the 5VAUX LED is observed in the OFF condition.

REPLACING COMPONENTS

The system fans and storage drives for the expansion are designed for easy access. Make sure you have a top chassis clearance of at least 6" (152mm) to remove or install system cards.

COOLING FANS

Depending on the expansion chassis model number; there are between two and four cooling fans in a Trenton Systems PCIe expansion chassis. The cooling fans are mounted along the top-front of the chassis. Typically, each fan is secured to a fan carrier and can be removed by loosening the two thumbscrews and lifting out the assembly. A connector on the fan carrier connects each fan to the +12V supply line of the chassis.

STORAGE DRIVES

The drive bays of the Trenton Systems PCIe expansion chassis support fixed-mount storage drives mounted to the drive bays to allow easy insertion and removal from the chassis. You will need to remove the top cover of the chassis in order to replace a fixed-mounted HDD or optical drive. The number of HDD's used is dependent on your specific system requirements. The HDD and optical media drive bays are located to the right of the power and reset switches found on the front panel.

Some HDD's may utilize a drive carrier. Drive carrier mounted HDD's are secured to the chassis with either a black slide catch or a thumbscrew. Either slide the black HDD catch to the left or loosen the HDD carrier thumbscrew to grasp the drive carrier handle and then pull out the carrier to remove. Once the carrier is removed, you may mount or remove the drive or drives as necessary.

AIR FILTER

As the system ages and depending on the installation you may need to periodically clean or replace the chassis air filter. The filter cleaning/replacement frequency is highly dependent on the installation environment, but should be done at least once a year. Loosen the thumbscrews located at the top of the front cover door or on either side of the filter guard and remove the filter located inside for cleaning or replacement.

POWER SUPPLIES

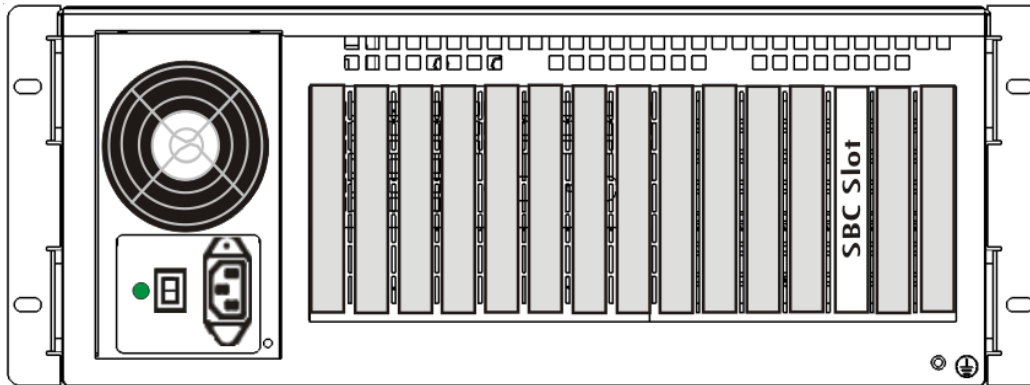
The PCIe expansion chassis may have either a fixed-mount, rear-mount removable or a rear-mount redundant power supply depending on the specific chassis configuration. The table below lists some of the available power supply options available with the expansion chassis.

| Expansion Chassis Model | Power Supply Type |
|-------------------------|---|
| TTX3100 | ATX/EPS, 1U 400W rear-mounted and removal |
| TTX3100 | ATX/EPS, 2U 650W rear-mounted and fixed |
| TTX4100 & TTX4102 | ATX/EPS, Single, 1500W rear-mounted and fixed |
| TTX4100 & TTX4102 | ATX, Mini-Redundant 500W rear-mounted |
| TTX5100 | ATX/EPS, 2-Micro-redundant, rear-mounted |

The power supply removal instructions are generic for most variations of either a fixed or removal expansion chassis power supply.

POWER SUPPLY - FIXED

A typical rear-mounted, fixed power supply option is shown in the figure below.

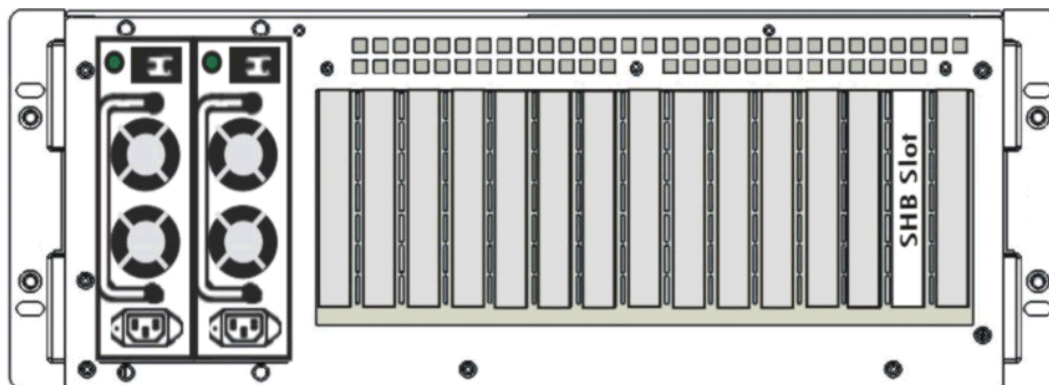


Rear View

A fixed, rear-mounted, power supply should only be removed and replaced by a trained electronics technician. Trenton Systems highly recommends this be done at the factory. Contact Trenton Technical Support for more information and RMA procedures.

POWER SUPPLY - REDUNDANT

The typical rear-mounted, redundant power supply option in the figure below.



NOTE: The two micro-redundant power supplies used in the TTX5100 expansion chassis are mounted horizontally and located in the rear-center of the chassis below the backplane section.

NOTE: The maximum current limits for the +5V, +3.3V and +12V outputs from the system power supply are 32A, 32A and 65A respectively. The system's power monitoring circuits will shut the system down if these maximum current limits are drawn from the power supply.

PREPARATION FOR SHIPMENT

The expansion chassis should always be removed from the rack cabinet if the unit must be shipped to another site. If possible, use the original shipping carton to ship the PCI express expansion chassis.

NOTE: Never ship an expansion chassis when it is mounted inside a rack; damage to the chassis and rack cabinet will likely result.

Reverse the installation steps in chapter three to remove the expansion chassis from the rack cabinet. Do not forget to remove the chassis' earth ground wire before attempting computer removal.

Chapter 7 - Chassis Specifications

ENVIRONMENTAL

| | |
|---------------------|-------------------------------|
| Temperature | |
| Operating | 5°C to 35°C typical |
| Storage | -20°C to 70°C |
| Cold Excursion Temp | -40°C for up to sixteen hours |
| Relative Humidity | 5% to 90%, non-condensing |

Specific operating temperature ranges for the expansion chassis may vary depending on the number of option cards and other system components installed.

ELECTRICAL

| | |
|-------------------|---|
| Line Voltage | 90-264VAC |
| Line Frequency | 50-60Hz |
| Power Consumption | 400W typical (application and specific expansion chassis configuration dependent) |

PHYSICAL

| | |
|---------------------------------------|---|
| TTX3100 | |
| Approximate Dimensions (W x H x D) | 19.0" x 5.24" x 20.0" 48.3cm x 13.34cm x 50.8cm |
| Net Weight | 23.4 lbs. (10.6 kg) (doesn't include option cards) |
| TTX4100 | |
| Approximate Dimensions (W x H x D) | 19.0" x 7.0" x 16.25" 48.3cm x 17.8cm x 41.3cm |
| Net Weight | 27.8 lbs. (12.6 kg) (doesn't include option cards) |
| TTX4102 | |
| Approximate Dimensions (W x H x D) | 19.0" x 7.0" x 20.0" 48.3cm x 17.8cm x 50.8cm |
| Net Weight | 28.4 lbs. (12.9 kg) (doesn't include option cards) |
| TTX5100 | |
| Approximate Dimensions (W x H x D) | 19.0" x 8.75" x 18.0" 48.3cm x 22.23cm x 45.72cm |
| Net Weight | 34.8 lbs. (15.8 kg) (doesn't include option cards) |