



CUBIX

Xpander Rackmount Elite Gen 3.0 User Guide

Xpander Rackmount Elite is a 4U rackmount PCI Express (PCIe) expansion enclosure that enables connection of graphics or other controllers to a host computer. The host computer must have a PCIe x16 expansion slot available for the host interface controller (HIC). Connect the HIC in the host computer to one Elite enclosure, which provides eight PCIe slots as follows:

- 4 double-wide PCIe Gen 3 x16 electrical slots for GPUs
- 2 single-wide PCIe Gen 3 x8 electrical slots for cards such as video capture
- 2 single-wide PCIe x4 mechanical slots with electrical power only, no PCIe data

See front view at right.

For example, use NVIDIA Compute Unified Device Architecture (CUDA) -enabled GPUs such as four Quadro K6000 / M6000 / P6000 (when available) for rendering or high-performance computing (HPC). You can also

install two video capture cards such as NVIDIA or BlackMagic Design DeckLink, a video display card and a video synchronization card as in the rear view at right.



Xpander Rack Mount Elite Technical Specifications

Expansion slots	PCI Express Gen 3
Number of slots	8 slots with electrical power and 6 with PCIe data support
PCIe x16 slots	4 x16 mechanical / electrical slots
PCIe x8 slots	2 x16 mechanical / x8 electrical slots
PCIe x4 slots	2 x4 slots with electrical power but no PCIe data support
Form factor support	8 full-length, full-height controllers
Double-wide	4 PCIe x16 GPUs
Single-wide	2 PCIe x8 cards
Single-wide	2 PCIe x4 cards electrical power but no PCIe data support
Connecting cable	External PCIe x16, 136-pin cable
Length	2.00meters (78.74inches or 6.56feet)
Connector duty cycle	250 mating cycles maximum per connector
PCIe x16 HIC	Host interface controller, install in a PCIe x16 slot
PCIe Gen 3 slot	Provides a theoretical 128Gbps data transfer rate
Front panel LCD	Main menu = left button; sub-menu = right button (See detail on page 7.)
Cubix Corporation	MIB assembly and revision; management firmware revision
Power supply status	Standard main power; optional redundant power
Temperature status	3 sensor readouts in degrees Centigrade (C)
Fan status	Fan status, voltage percent (%) speed
PCIe link status	x16 cable connected; 8.0Gbps, 5.0Gbps or 2.5Gbps x16 link speed
x16 cable	Connected or not connected status

Slot 3 - 6 x16 transfer rate, theoretical	PCIe Gen 3, 8.0Gbps x16 = 128.0Gbits/second
Slot 1 - 2 x8 transfer rate, theoretical	PCIe Gen 3, 8.0Gbps x8 = 64.0 Gbits/second
LCD panel backlight	Toggle on / off using right button
Rear panel	Power input receptacle and PCIe cables
Cooling fan modes	3 fans each run at 112cfm (cubic feet per minute) maximum
Performance	Maximum 55C – Minimum 20C
Quiet	Maximum 65C – Minimum 30C
High Performance	Maximum 40C – Minimum 5C
GPU (See Note below.)	Maximum 80C / 40C – Minimum 45C / 5C
AC power supply	Single-phase, auto-ranging, 100-240VAC, 10-5Amps, 50/60Hz; total output power is not to exceed 1,500Watts
Standard version	Single-phase, auto-ranging, 100 - 240VAC, 15-7Amps, 50/60Hz; total output power is not to exceed 1,500Watts
High-power option	Single-phase, auto-ranging, 115 - 240VAC, 17-10Amps, 50/60Hz; total output power is not to exceed 1,600Watts
Standard aux power	4 sets of connectors, each with 8pins + 6pins
Optional aux power	4 sets of connectors, each with 8pins + 8pins
Operating environment	0° to 30° Celsius (32° to 86° Fahrenheit) temperature 5% to 80% non-condensing humidity
Dimensions (4U)	7.00" H x 19.00" W x 21.50" D (17.78cm H x 48.26cm W x 54.61cm D)
Weight	18.60lbs (8.44kg) with x16 cable, power cable and no GPUs
Warranty / period	Parts & labor return to manufacturer / 2 year
Ext. warranty period	Optional 3 rd year
<i>Note: See Fan Speed Control (page 10). Max GPU temp = 80C; if no GPU is found, max = 40C (using on-board temp sensors) Min GPU temp = 45C; if no GPU is found, min = 5C (using on-board temp sensors) GPUs supported: NVIDIA Quadro K6000, M6000 and P6000</i>	

Included

Xpander Rackmount Elite includes four cooling fans, a 1,500W power supply and a power cord as well as Main Interface Board (MIB), one PCIe x16 HIC and one external PCIe x16 cable. It does not include installation media because installation requires no driver or other software. The only drivers you install are those for the devices you install in the unit.

Quick Start without Detail

Install a GPU in the host system and install device drivers. Once you have verified operation, shut down, move the GPU to Xpander, install the HIC in the same slot within the host computer, connect Xpander to the HIC using the cable provided, connect power to Xpander Rackmount Elite. Boot the host computer. If the host operating system (OS) is plug-n-play, the OS detects the GPUs and loads device drivers.

Start-up / Test Procedure with Detail

Check your host computer motherboard vendor's Website for device driver and firmware updates, especially those that may affect multiple GPUs.

During this procedure, place the Xpander Rackmount Elite on a stable surface. Use a Philips #2 screwdriver. Do not install graphics or other controllers until instructed to do so. Cubix recommends that you do not install the first Xpander Rackmount Elite enclosure in the rack mount cabinet until you have finished.

1. Remove AC power to the host computer and to Xpander.
2. Install the x16 HIC in a PCIe x16 slot within the host computer. In Apple® Mac Pro, install the x16 HIC in PCIe slot 2.
3. Remove the screws holding the top cover, remove it and set it aside.
4. Connect the external PCIe cable coming from the Xpander Rackmount Elite into the HIC in the host computer. Make sure the cable connector seats firmly in the HIC port. You will feel the cable connector click into place. See the image of a properly-seated connector in an Apple Mac Pro at the right.
5. Connect a power cord to the receptacle at the enclosure rear.

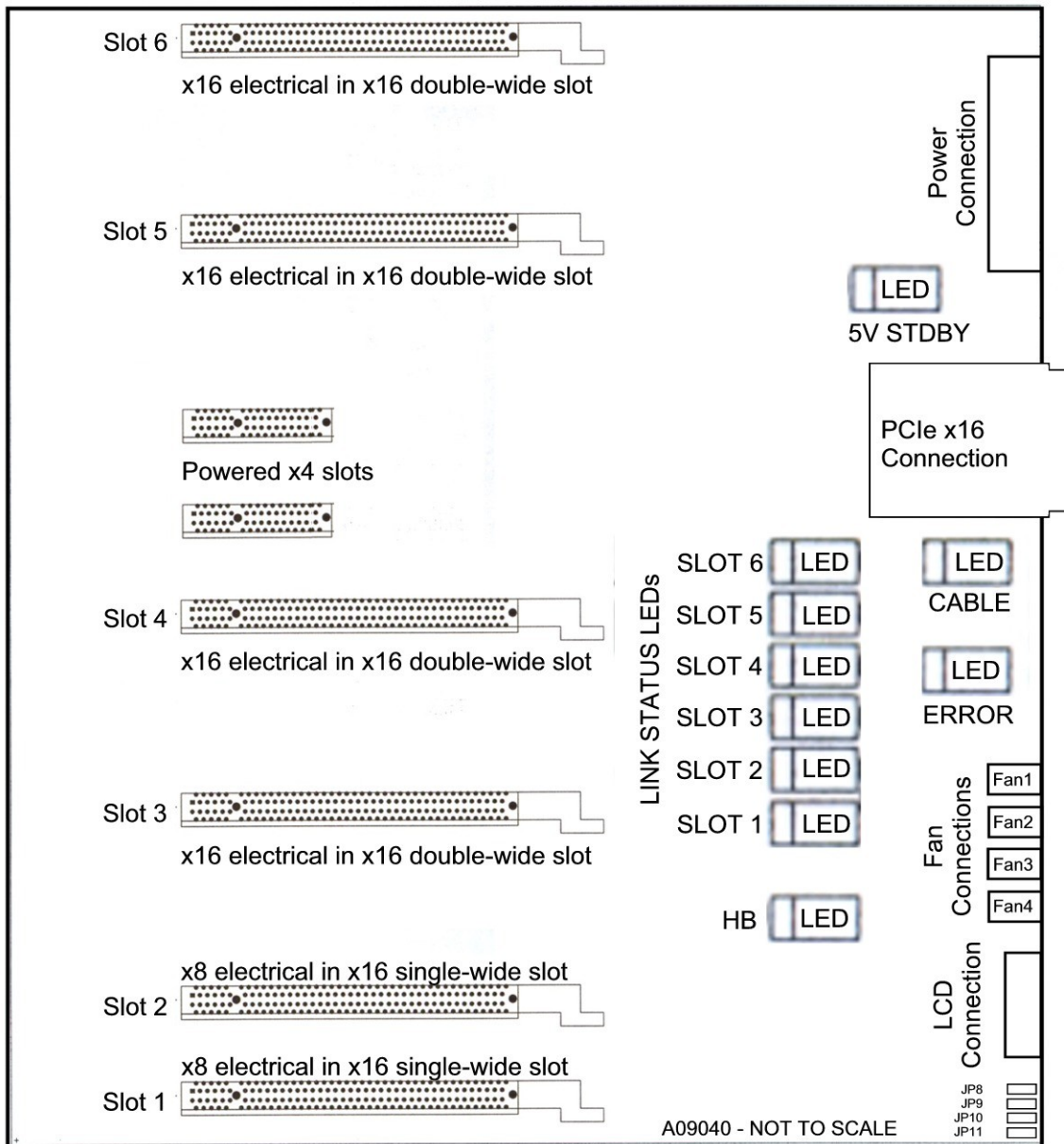


6. Check the connection LED near the HIC L-bracket in the host. If you have properly seated the HIC in the host PCIe slot, you will see the LED near the HIC L-bracket light steady green. See the image at the right.
7. Power on the host computer. Xpander Rackmount Elite also powers on. If you have properly seated the HIC in the host PCIe slot, you will see the 8 LEDs at the top edge of the HIC light steady green.



8 steady green LEDs on the HIC

- Confirm that exterior Link OK LED, the HIC Link LED, the interior Cable LED are lit green and the unit fans are spinning.



Xpander is functioning properly once the Cable LED lights green.

- Shut down the host computer. Leave connected the external PCIe cable.
- Remove the power cord and top cover from Xpander.

Warning

Before installing or removing cards in Xpander Rackmount Elite, switch off AC power and wait for the 5V Standby LED to power off.

11. Typically, install GPUs in the four double-wide slots numbered 6 through 9. Install other adapters—such as NVIDIA SDI capture, BlackMagic DeckLink or Red Rocket cards—in the two single-wide slots numbered 1 and 2. Install other cards, like the NVIDIA display card, in the unnumbered x4 slots, which provide electrical power but no PCIe data.
12. Install the appropriate graphics or other controller driver(s) using the vendor's procedure. Apple Mac OS X 10.7.x (Lion) and 10.8.x (Mountain Lion) may not support natively all NVIDIA® GPU products (e.g., GeForce™ GTX 580 / 680 or Quadro 5000 / 6000).
13. Connect PCIe auxiliary power cables to the GPUs. Aux power connectors are located at the rear of each GPU or other PCIe adapter if it has any. Each Rackmount Elite provides four sets of aux power connectors with 8Pin + 6Pin (8P + 6P). See the image of auxiliary power connectors at the right. Optional 8P + 8P aux power connectors are available.
14. Repeat these steps for the other GPU or GPUs or other PCIe adapters that you install within Xpander Rackmount Elite.
15. Connect GPU video port(s), if needed, to monitors. This step is especially important for Linux, because X Windows crashes if you have not connected video ports to monitors. If you cannot connect monitors to installed GPU video ports, you can edit the Device section of /etc/X11/xorg.conf to define which GPU X Windows should use as the primary display device. For example:



```

Section "Device"
    Identifier      "Device0"
    Driver          "nvidia"
    VendorName     "NVIDIA Corporation"
    BoardName      "Quadro 5000"
    BusID          "PCI:8:0:0"
EndSection

```

To determine the BusID for the GPU you wish to use as the primary display, run the scanpci tool discussed in Step 18.

16. Power up Xpander.
17. Power up the host computer.
18. Confirm that the appropriate slot link LEDs are lit green, which confirms that you have installed the controller(s) correctly in each slot.
19. Confirm that your operating system (OS) has detected the new controller(s).
 - In Microsoft® Windows®, check Windows Device Manager. To confirm, run GPU-Z, a utility available for free download [here](#).
 - In Apple Mac Pro, run the System Profiler and look for GPUs under Graphics/Displays. To open System Profiler, choose Apple Menu > About This Mac, and then click More Info.
 - In Linux, run the following: `root# > XFree86 -scanpci`

Read more about scanpci [here](#).
20. Replace the Xpander top cover and the screws.

Warning

Replace the cover as soon as possible to allow for proper cooling. Do not run Xpander without the cover for more than a few minutes.

Normal Power On/Off Procedure

1. With Xpander connected to the host computer and running, power down the host computer normally. The host computer and the Xpander will both power down into standby mode.
2. With Xpander connected to the host computer and with power connected to both, switch on the host computer; both will boot.

Install Xpander in a Cabinet

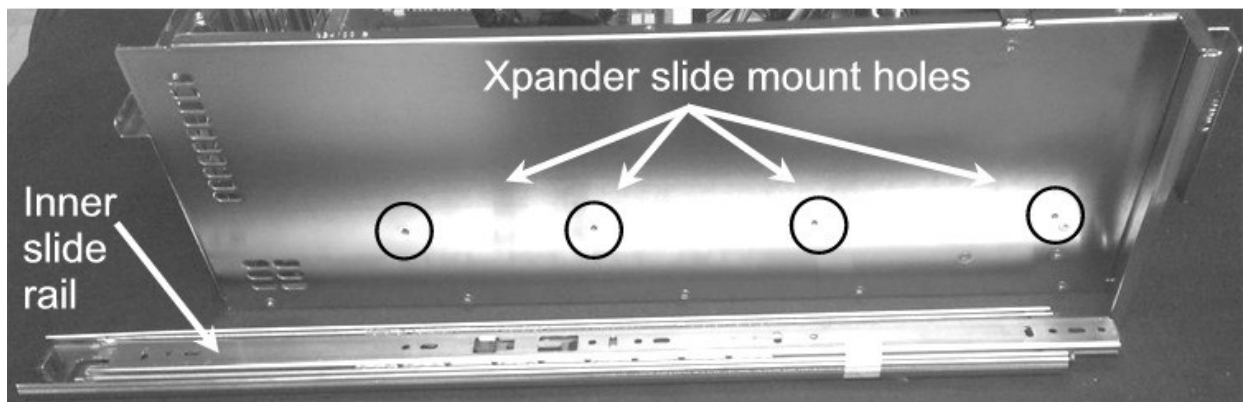
For this procedure, use a Philips #2 screwdriver, a flat-blade screwdriver and a 3/8" wrench or socket and drive. When lifting the Xpander into place, ask for assistance. Mount it close enough to the host computer so that the external PCIe cable will reach. Mount Xpander either immediately above or immediately below the host computer(s) in the cabinet.

Within packaging, you will find four brackets that mount within the four corners of your rack mount cabinet, screws, nuts and G-nuts for use in mounting Xpander within a cabinet. See the image at the right.

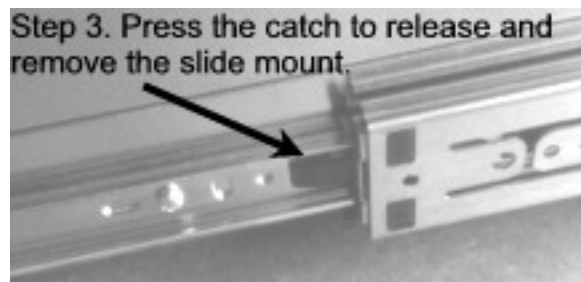


Cubix ships the mounting brackets, G-nuts and screws within the package.

1. Shut down the host and Xpander normally and disconnect all data and power cables connected to Xpander.
2. Find in packaging the rackmount slide rails with a bag of 8 x mounting screws taped to one of the rails.



3. Remove the inner slide rail, or slide mount, from the outer rail and mount it to Xpander using the Xpander slide mounting holes. To release each outer slide mount, slide it toward the rear of the enclosure until it stops. Press the catch to release and remove the outer slide mount as you can see in the image at the right.
4. Determine where to mount the Xpander slide mounts in your cabinet.



5. Mount the front and rear mounting brackets (Part # S32760A) to each slider assembly with the bolts and nuts provided in the packaging.
6. Repeat the process for the other front and two rear mounting brackets and slider assembly.
7. Tightly secure the screws holding the sliders to the front and two rear mounting brackets on each side of the cabinet.
8. Check the two rails on each side and check from front to rear to make sure that you have mounted the rails so that they are level within the cabinet.
9. Lift the Xpander, line up the inside slider with the slider assembly mounted in your cabinet and carefully slide it into place.

Warning

Before lifting Xpander into place, ask for assistance.

10. Try sliding the Xpander in and out slightly to make sure it moves freely.
11. Secure Xpander into place within the cabinet using the front-panel screws provided. Use the Philips #2 screwdriver.
12. Connect the PCIe x16 external cable to the HIC in the host computer.
13. Connect power to Xpander.

Access the Xpander Interior

For this procedure, use a Philips #2 screwdriver. For accessing Xpander to add, move or replace GPUs or other adapters, use the following procedure.

1. Shut down gracefully the host computer connected to Xpander. Disconnect power from Xpander.
2. Remove the secure screws holding Xpander in the cabinet.
3. Gently pull the Xpander toward you.
4. Remove the screws holding the Xpander front top cover, remove it and set it aside.
5. Make sure the 5V standby (STDBY) power LED in Xpander is off. See the image page 4.
6. Remove and replace the GPUs or other PCIe cards and secure them with screws provided.
7. Connect PCIe auxiliary (aux) power cables to each of the GPUs. Xpander Rackmount Elite provides two sets of aux power connectors: one 8-pin and one 6-pin (8P + 6P) connector. See the image at the right.
8. Replace the Xpander top cover.
9. Gently slide the Xpander back in the rackmount cabinet.
10. Replace the secure screws holding the Xpander in the cabinet.



Front Panel LCD

Xpander Rackmount Elite front panel LCD provides enclosure details and status. Beneath the LCD are two buttons: left button scrolls through main-menu items and right button scrolls through sub-menu items.

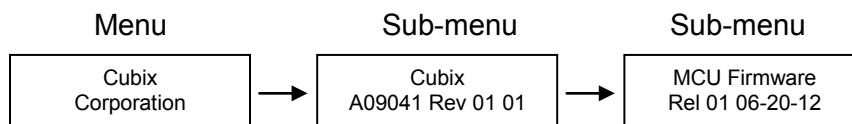
When you first connect power, Xpander comes up in standby mode. The LCD displays Cubix on the top line and Corporation on the bottom line. This is the Start menu. Access all other main menu items by pressing the left button.

The upper right corner of the LCD shows a flashing asterisk *. This indicates that the on-board Micro-Controller Unit (MCU) is running properly. If the asterisk is not flashing or the LCD is not responding, reset the MCU by pressing and holding the left button for 3 seconds while Xpander is running. A corresponding HB (for heartbeat) LED on the MIB also shows the MCU is working.



When a fault occurs, the LCD will jump to that fault and the LCD backlight will flash on / off. Press the left button to acknowledge the fault and the LCD will stop flashing and enable normal operation. The LCD will continue to display the fault at the applicable sub-menu until you clear the fault.

Start Menu



Main menu: Cubix Corporation

Sub-menu: PCB Assembly

- Board Number
- EEPROM Revision
- Board Revision

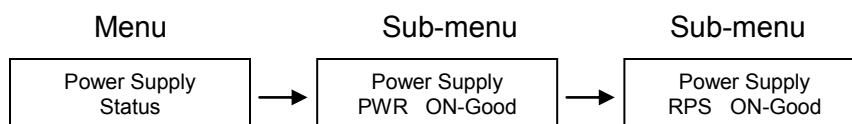
Sub-menu: PCB Assembly

- Serial Number

Sub-menu: MCU Firmware

- Release Number
- Release Date

Power Supply Status



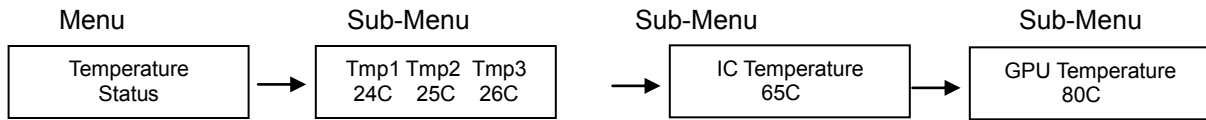
Menu: Power Supply Status

Sub-Menu: Power Supply Status:

- PWR Standby = Main power is off; system is in standby
- PWR ON-Good = Main power is on; +3.3V, +5V, +12, -12V are within spec.

- PWR ON-FAULT = Main power is on; +3.3V, +5V, +12V, or -12V is out of spec.
- Sub-Menu: Optional redundant power supply (RPS) status
- RPS Standby
 - RPS ON-Good
 - RPS ON-FAULT

Temperature Status



Menu 3: Temperature Status

Sub-Menu 1: Display the temperature of the 3 temperature sensors in degree Celsius.

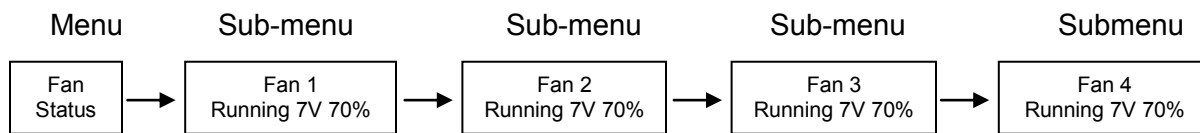
In the event of a temperature sensor failure, "FLT" is displayed under the failed sensor.

Sub-Menu 2: PEX876 IC Temperature (Range: 20C-125C, --C when power is off)

Sub-Menu 3: GPU (highest GPU temp of the installed Xpander GPUs, ---C when power is off)

Note: Sub-Menu 3 appears only if configured for GPU Mode (refer to JP7, JP8 shunt settings)

Fan Status



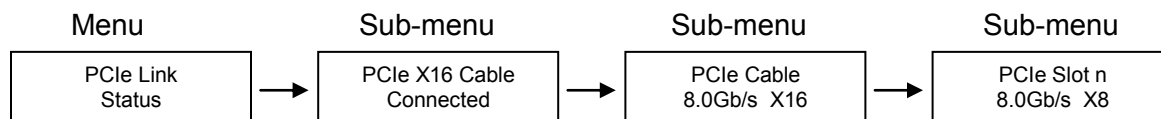
Menu: Fan Status

Sub-Menu: Indicates fan status for fans 1-4

Note: Fan speed is controlled by adjusting fan voltage based on sensed system temperature. Fan voltage adjusts from 6V min (25deg C or lower) at 50% to 12V max (50deg C or higher) at 100%. Fan voltage is the same for all fans.

- PWR OFF is 0V at 00%; system is in standby.
- Running aaV at pp%; fan is good; aa = fan voltage and pp = fan power percent (%).
- STOPPED is 12V at 100%; fan fault: fan voltage is set to full on.
- No fan is aaV at pp%; no fan means fan is not installed.
- Xpander RackMount-Elite has three fans installed: Fan 1, Fan 2, Fan 3.
- Note: See Fan Speed Control settings below.

PCIe Link Status



Menu: PCIe Link Status

Sub-Menu: Indicates x16 PCIe cable installation status

- Connected x16 cable is properly connected to the HIC
- NOT-Connected x16 cable is not properly connected to the HIC

Sub-Menu: x16 PCIe cable link speed and link width. Speed and width depend on the host capability.

- Speed: 8.0Gb/s, 5.0Gb/s or 2.5Gb/s
- Width: x1, x2, x4, x8, x16 and "NO Link" when the host did not successfully link or Xpander is in standby power.

Sub-Menu: Link speed and link width for slots 1-6.

- Speed: 8.0Gb/s, 5.0Gb/s or 2.5Gb/s

- Slot 1-2 width: x1, x2, x4, x8, and “NO Link” when the slot is empty, unsuccessful link, or Xpander is in standby power.
- Slot 3-6 width: x1, x2, x4, x8, x16, and “NO Link” when the slot is empty, unsuccessful link, or Xpander is in standby power

LCD Backlight Control

Press right switch to toggle the LCD backlight On/Off.

Fan Speed Control

Shunts JP7 and JP8 are used to change the fan profile to reduce fan noise.

Fan Profile	JP8	JP7	*Tmax	*Tmin
Performance Mode	1-2	1-2	55C	20C
Quiet Mode	1-2	2-3	65C	30C
High Performance Mode	2-3	x	40C	5C
**GPU Mode	2-3	2-3	80C/40C	45C/5C

* Tmax - Fan Voltage ~12V, Tmin - Fan Voltage ~6V

**GPU Mode: Tmax: GPU temp = 80C, if no GPU is found Tmax = 40C (on-board temp sensors)

Tmin: GPU temp = 45C, if no GPU is found Tmin = 5C (on-board temp sensors)

GPUs supported: Quadro K6000, M6000 and P6000

Shipping Procedure

Before shipping Xpander Rackmount Elite, remove any installed graphics or other controller(s) using the following procedure:

1. Switch off the host computer connected to Xpander.
2. Disconnect GPU Xpander Rackmount Elite from the HIC(s).
3. Remove the secure screws holding the Xpander Rackmount Elite in the cabinet.
4. Gently pull the Xpander Rackmount Elite toward you.
5. Lift Xpander Rackmount Elite down from the cabinet and set it on a stable surface.

Warning

Before lifting Xpander out of a cabinet, ask for assistance.

6. Remove the screws holding Xpander top cover, remove it and set it aside.
7. Remove the graphics or other controllers and pack them in the original packaging.

Warning

Remove GPUs or other adapters before shipping Xpander.

8. Replace the hold-down brackets and tighten the captured screws.
9. Pack the graphics cards or other controllers within the boxes in which you received them.
10. Replace the Xpander Rackmount Elite front top cover, replace the screws and remove the power cords.
11. Remove the two outer slide mounts by sliding each out until it stops. Press the catch to release and remove the outer slide mount.
12. Remove the two slide mounts from the Xpander sides.
13. Store all of the screws, nuts and G-nuts in the plastic bag included. Tape the bag to the rails and wrap the rails together.
14. Remove the HIC(s) from the host computer.

15. Within the original packaging, pack the Xpander Rackmount Elite, the power cords, the HIC(s) and the boxed graphics cards. Include a copy of these instructions.

Troubleshooting Procedure

- Issue:** The front-panel LCD asterisk does not flash.
Resolution: Reset the LCD's MCU by pressing and holding the left button for 3 seconds while Xpander is running.
- Issue:** The HB LED inside Xpander flashes green.
Resolution: This is normal; it indicates that the on-board MCU is running properly.
- Issue:** Cable LED inside Xpander does not light green.
Resolution: Check the following:
- Confirm that the HIC is firmly seated in a PCIe slot within the host computer.
 - Confirm that the cable connector is firmly seated HIC connector port.
- Issue:** Cable LED inside Xpander flashes green even though I have a PCIe x16 HIC and cable.
Resolution: The internal Cable LED should light steady green. If the Cable LED flashes, it is transferring data at a reduced bandwidth because you installed the PCIe x16 HIC in a Gen 2 or Gen 1 slot or a PCIe x8 (electrical) slot. The HIC operates at full bandwidth when installed in a PCIe Gen 3 slot.
- Issue:** Slot LED inside Xpander does not light green.
Resolution: Shut down the OS gracefully, power down Xpander and reseal the GPUs in each PCIe slot. Make sure that you seat each GPU firmly in its slot and that you connect all aux power connectors firmly.
- Issue:** Slot LED inside Xpander flashes green even though I installed a PCIe x16 Gen 3 GPU or card.
Resolution: Slot LEDs should light steady green. If they are flashing, it may be because the GPUs in the slots do not have a processing load. Apply a processing load on the GPUs. If the slot LEDs still flash green, check the vendor's link for a driver update.
- Issue:** All Cable and Slot LEDs are lit green but your OS does not detect the GPUs.
Resolution: Shut down the OS gracefully, power down Xpander and reseal the GPUs in each PCIe slot. Make sure that you seat each GPU firmly in its slot and that you connect all aux power connectors firmly.
- Issue:** The front-panel LCD screen backlight is flashing on/off, which indicates a fault.
Resolution: Acknowledge the fault by pressing the Menu button, which will stop the LCD flashing and the LCD will remain at the fault.
- Issue:** After acknowledging a fault, the front-panel LCD screen backlight continues flashing on/off, which indicates two or more faults. If multiple faults have occurred, when you acknowledge the first fault, the LCD will jump to the next fault and the LCD backlight will once again flash on/off. This continues until you clear all faults.

Resolution: Acknowledge each fault by pressing the Menu button, which will either stop the LCD flashing and the LCD will remain at the fault, or the LCD will jump to the next fault and the LCD backlight will once again flash on/off.

Issue: The front-panel LCD screen either does not respond or is blank even though Xpander is operating.

Resolution: Press and hold the Menu button to reset the Micro-Controller Unit (MCU).

Issue: The front-panel LCD screen either does not respond or is blank for a particular MIB even though Xpander and the MIB are both operating.

Resolution: Press and hold the Menu (middle) button for 3 seconds to reset the Micro-Controller Unit (MCU). If the Xpander is running, the Xpander fans will turn on full speed for 10 seconds and then slow down to the operating speed set by the MIB local temperatures.