Xpander Rackmount 8 5URP24 User Guide

Front and Rear View

Overview

Xpander Rack Mount 8 5URP24 (XPRM8G3-5URP24) with Redundant Power (RP) supplies and support for 24 x hot-plug drives is a rack mount PCI Express (PCIe) expansion enclosure that enables connection of 8 double-wide PCIe Gen 3 x16 graphics or other controllers with rear- or top-connected auxiliary power cables to one or two host computers. XPRM8G3-5URP24 supports graphical processing units (GPUs) with active cooling and rear- or top-connected auxiliary power cables. The host computer must have one or two PCIe x16 slot (preferably PCIe Gen 3.0) available for the host interface controllers (HICs). Cubix designed XPRM8G3-5URP24 to work with Host Engine 5URP24 (HE5URP24) as a system.

XPRM8G3-5URP24 provides two Main Interface Boards (MIBs) connected to two HICs in one host computer or connected to one HIC in each of two host computers with a PCIe x16 cable. Each MIB features four PCIe x16 slots to support a total of eight double-wide GPUs such as NVIDIA Quadro or GeForce GTX Series as well as AMD Firepro W9100. Contact Cubix Customer Service (customerservice@cubix.com) if you have questions.

XPRM8G3-5URP24 provides two sets of four PCIe x16 (for a total of eight) slots for GPUs for use with high-performance computing (HPC) and other Compute Unified Device Architecture-(CUDA-) or OpenCL / OpenGL-enabled applications. Rack Mount 8 also supports other PCIe adapters with multiple Input / Output (IO) ports such as network adapters, RAID controllers, USB 3.0 or high-definition (HD) audio.

To support the 24 x hot-plug Serial-Attached SCSI (SAS with 12Gbits / second or 12Gbps transfer rate) 2.5" SSDs or 3.5" hard-disk drives (HDDs) requires 1 x 24-port or 2 x 12-port SAS (12Gbps) RAID controller(s) in one or two of the 8 x slots. Supporting the 24 x SAS drives means Xpander will support only 6 – 7 x GPUs. Each RAID controller port connects to a 4-port SAS backplane with a 1.0meter SFF-8643 mini-SAS to SFF-8643 mini-SAS HD cable, and in turn, each 4-port SAS backplane connects to 4 x SAS HDDs for a total of 24 x HDDs in each XPRM8G3-5URP24 chassis. When combined with the 24 x HDDs in HE5URP24, the two chassis form a system with 48 x SAS HDDs. The total storage capacity is 48TBytes to 672TBytes, or 0.672PBytes, of direct-attached storage.

Each HE5URP24 and XPRM8G3-5URP24 also features a power supply with 3 + 1 hot-plug, redundant power modules and 4 x hot-plug cooling fans. Each is also rack-mountable with a tool-less access top cover.

Xpander Rack Mount 8 5U RPS Technical Specifications

Expansion slots	PCI Express Generation 3.0 x16
Number of slots (std)	4 slots in each of 2 x MIBs for a total of 8 slots
Form factor support	8 full-height, full-length, double-wide controllers or adapters in 2 x MIBs
Connecting cables	2 x external PCI Express cables
Connector type	x16, 136-pin
Length, total	2.00meters (78.7inches or 6.6feet)
Length, external	MIB 1: 1.4m (54.5 inches or 4.5feet MIB 2: 1.4m (53.5inches or 4.6feet)
Connector duty cycle	250 mating cycles maximum per connector
PCIe x16 HICs (2)	Install each HIC in a PCIe x16 slot of the host computer
PCIe Gen 3 slot in host	Provides a theoretical 128.0Gbps data transfer rate
Front panel LCD	Main menu = left button Sub-menu = right button (See detail on page 10.)
Cubix Corporation	MIB assembly and revision; management firmware revision
Power supply status	Redundant power
Temperature status	3 sensor readouts in degrees Centigrade (C) per MIB
Front sensor location	1 per MIB near cooling fans
Rear sensor location	2 per MIB near input / output (I/O) exhaust panel
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 1 - 8 x16 transfer rate, theoretical	PCIe Gen 3.0Gbps x16 = 128.0Gbps
LCD panel backlight	Toggle on / off using right button
Storage devices	Serial-Attached SCSI (SAS), direct-attached with 24-port RAID controller
SSD Maximum Devices	24
Drive Format	2.5-inch (63.5mm) SSD 3.5-inch (88.5mm) SSD
Transfer Rate / Connection	12.0Gbit/second (12Gbps) / SAS / 1.0meter mini-SAS HD SFF-8643
Capacity, TB	14, 12, 10, 8, 6, 4, 2, 1, 0.5 Maximum 336TB with all drives operating
RAID configuration	0, 1, 5, 6 or 10 hardware with 24-port RAID controller
Rear panel	Power supply module input receptacles
Adapter ports	If available, on installed controllers or adapters
Receptacle 1-4	1 x AC receptacle for each power supply module
Cooling Fans	4
Maximum air flow each	178 cubic feet / minute (cfm)
Remove / Replace	Hot-plug
AC Power Supply	One single-phase, auto-ranging, 100-240VAC, 45-24Amps, 50/60Hz with 3 + 1 x 1,280Watt redundant modules; total output power is not to exceed 3,840Watts
Auxiliary power cables	8 x sets of 6-pin + 8-pin (6P + 8P)
Operating environment	0° to 30° Celsius (32° to 86° Fahrenheit) temperature 5% to 80% non-condensing humidity
Altitude	Maximum
Operating	10,000ft (3,05meters)
Storage	50,000ft (15,24meters)
Dimensions	8.75" H x 19.00" W x 28.00" D (22.22cm H x 48.26cm W x 71.12cm D)
Weight	56.00lbs (24.50kg)
Warranty / period	Parts & labor return to manufacturer / 2 year
Ext. warranty period	Optional 3 years

Included
XPRM8G3-5URP24 includes 4 x hot-plug cooling fans, a 3,840Watt power supply, with 3 + 1 hot-plug, redundant modules and 4 x power cords as well as two MIBs, two PCIe x16 HICs and two external, 2meter PCIe x16 cables. It also includes 24 x hot-plug SAS (12Gbps transfer rate) 3.5" HDD or 2.5" SSD trays. It does not include installation media because Xpander installation requires no driver or other software. The only drivers you install are for the devices you install in Xpander.
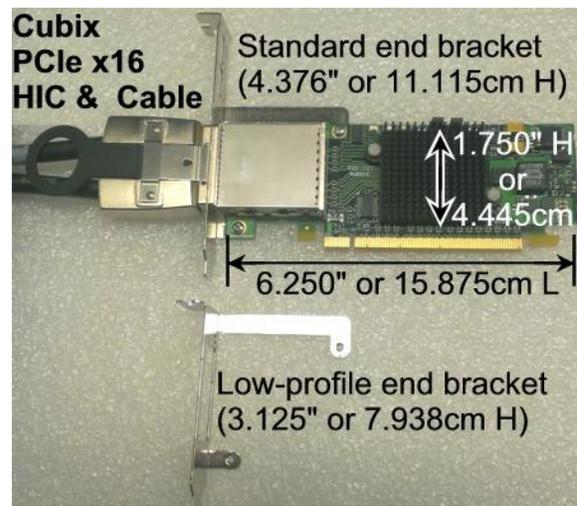
Quick Start without Detail
Install a GPU in the host system and install the device driver. Once you have verified operation, shut down, move the GPU to Xpander, install the HIC in the same slot within the host computer, connect Xpander to the HIC using the cable provided and connect power to Xpander Rackmount 8. 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 / Installation / Test Procedure with Detail
Each Rack Mount 8 provides two MIBs with four slots for a total of eight PCIe x16 slots. The MIB supports either one or two host computers.

During this procedure, place the Rack Mount 8 enclosure on a stable surface. Use a Philips #2 screwdriver for this procedure. Make sure all AC power to Xpander is disconnected. Do not install graphics or other controllers until instructed to do so within this procedure.

1. Switch off AC power from the host computer. Leave the power cord to the host connected.
2. Install the standard x16 HIC in a PCIe x16 slot within the host computer. Preferably, the HIC should be in a PCIe Gen 3.0 x16 slot.
3. Connect the external PCIe cable from its MIB inside the Rack Mount 8 enclosure to the HIC port. Make sure the connector snaps into place within the HIC port as shown in the illustration at the right. Cubix includes a low-profile end bracket for the HIC, if required.
4. Remove the screws holding in place the Rack Mount 8 top cover and remove the top cover.

Cubix PCIe x16 HIC & Cable
Standard end bracket (4.376" or 11.115cm H)
1.750" H or 4.445cm
6.250" or 15.875cm L
Low-profile end bracket (3.125" or 7.938cm H)

5. Connect a power cord to the receptacle in each of the four power supply modules at the Rack Mount 8 enclosure rear.
6. Power on the host computer. Rack Mount 8 enclosure also powers on.

7. Confirm that the PEX1 -Cable Link LED lights green for the MIB inside the Rack Mount 8 enclosure.
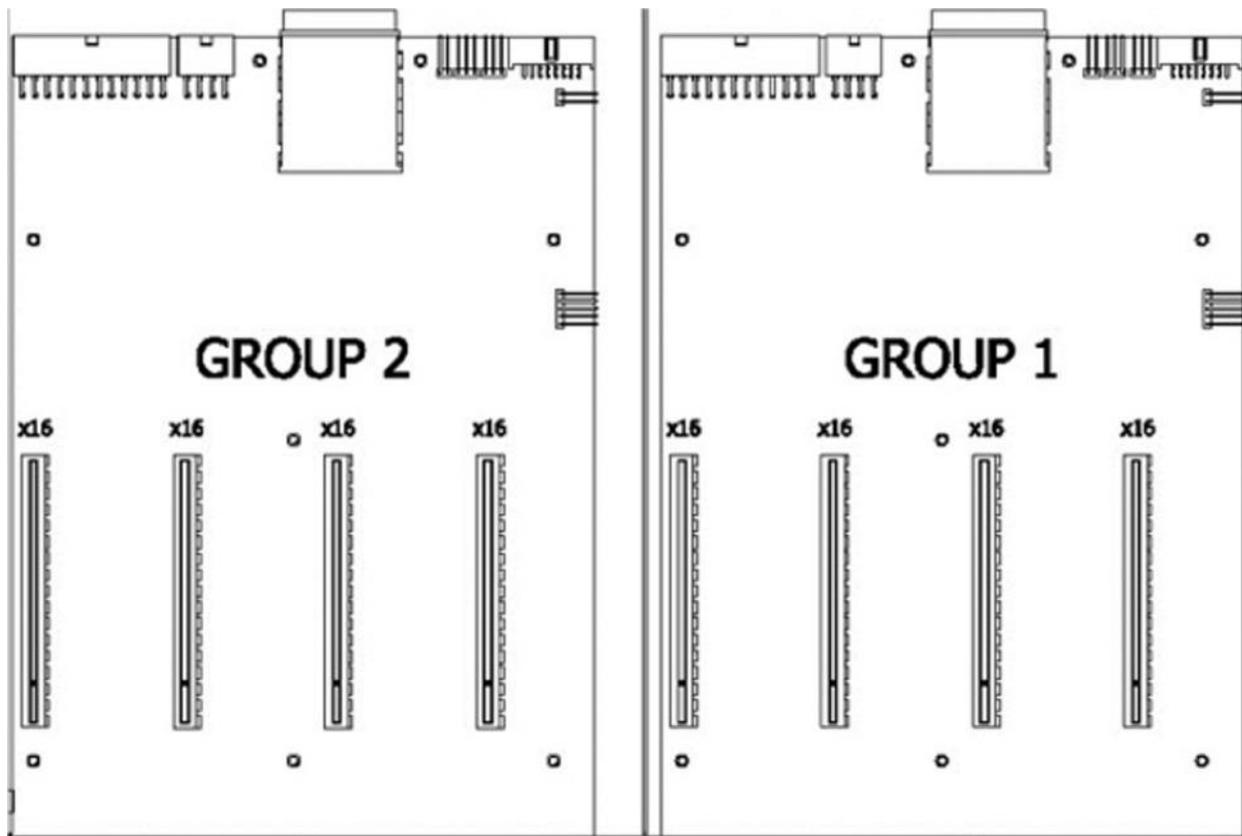
Xpander MIB is functioning properly once the PEX1-Cable LED lights green. Proceed to the next step to install adapters.

8. Switch off AC power to the host computer. Leave the power cords and the external PCIe cables to the host computer connected.
9. Disconnect AC power from Xpander MIB or main board in which you plan to install the GPUs.
10. Remove the screws for holding down the PCIe card end brackets.
11. Install the graphics or other controller(s) in the Rack Mount 8 PCIe slot(s) and secure each with the screws provided in the top of the I/O panel.

Warning
Before installing or removing cards in the Xpander Rack Mount 8, remove AC power and wait for the 5V Standby LED to power off.

12. Connect PCIe auxiliary (aux) power cables. The power supply with redundant modules inside Rack Mount 8 enclosure provides eight sets of aux power connectors including 6P + 8P (6-pin and 8-pin) connectors. See the image at the right.
13. Make sure blank end brackets (L-brackets) are installed for each slot without an accelerator.

Warning
Make sure that blank end brackets (L-brackets) are installed for each slot that has no PCIe card. Blank end brackets are required to assure proper cooling of the GPUs.

14. Replace the ventilation panel and tighten the two screws holding it in place. See the image on the previous page.
15. Connect GPU video port(s), if present, to monitors. This step is especially important for Linux, because X Windows will crash 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 M6000"
    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 17.
16. Power up the computer(s) and the Rack Mount 8 to confirm that the appropriate slot link LEDs are lit green, which confirms that you have installed a controller correctly in each slot. Refer to the appropriate image above to identify slot LEDs.
17. Confirm that your operating system (OS) has detected the new controller(s). For instance, in a PC running Microsoft® Windows®, check Windows Device Manager. Within Windows, you can also run GPU-Z, a utility available for free download here. In a PC running Linux, run the following:

```
root# > XFree86 –scanpci
```

Read more about scanpci here.
18. Connect power to Xpander and boot up the host computer.Install the appropriate graphics or other controller driver(s) using the vendor's procedure: *e.g.*, NVIDIA Quadro / GeForce GTX Series or AMD Firepro W9100.
19. Replace the Rack Mount 8 front top covers and replace the screws holding it in place.

Warning
Replace the cover as soon as possible to allow for proper cooling. Do not run Rack Mount 8 without the cover for more than a few minutes.

Normal Power On/Off Procedure

1. With Rack Mount 8 connected to the host computer and running, shut down the host computer normally.
2. With Rack Mount 8 connected to the host computer and powered down, switch on the connected host computer; both Xpander and host will boot.
3. To run the host PC without Xpander connected, power down the host, remove power from Xpander and boot the host. When you are ready to run Xpander again, power down the host, connect power to Xpander and boot the host.
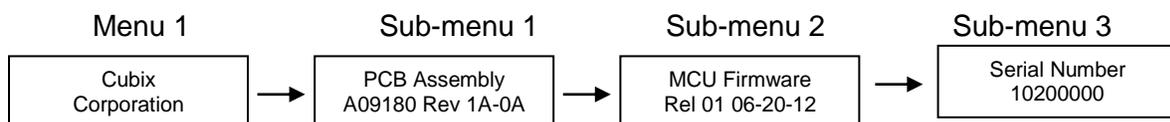
Front Panel LCD

Rackmount 8 front panel LCD provides enclosure details and status. Beneath the LCD are three buttons: left button scrolls through MIBs, middle button scrolls through the 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 for a MIB, the middle button for a menu selection and then the right button for a sub-menu selection.

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 confirms that 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.

Menu 1: Start Menu

Menu 1		Sub-menu 1		Sub-menu 2		Sub-menu 3
Cubix Corporation	→	PCB Assembly A09180 Rev 1A-0A	→	MCU Firmware Rel 01 06-20-12	→	Serial Number 10200000

Main menu 1:   Cubix Corporation

Sub-menu 1:   PCB Assembly
- Board Number
- EEPROM Revision
- Board Revision

Sub-menu 2:   MCU Firmware
- Release Number
- Release Date

Sub-menu 3:   PCB Serial Number

Menu 2: Power Supply Status

Menu 2	Sub-menu 1	Sub-menu 2
Power Supply Status	→ Power Supply PWR ON-Good	→ Power Supply RPS ON-Good
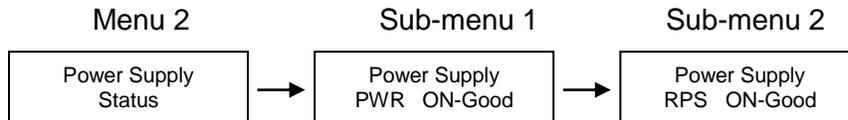
Main Menu 2:   Power Supply Status
Sub-Menu 1:   Main Power Status:
- PWR Standby = Main power is off; system is in standby
- PWR ON-Good = Main power is on; +3.3V, +5V, +12, -12V are within spec.
- PWR ON-FAULT = Main power is on; +3.3V, +5V, +12V, or -12V is out of spec.

Sub-Menu 2: Optional redundant power supply (RPS) status
- RPS Standby   = Main Power is off, System is in standby
- RPS ON-Good   = Main Power is on, power supply/modules are working
- RPS ON-FAULT   = Main Power is on, power supply/module has failed

Menu 3: Temperature Status

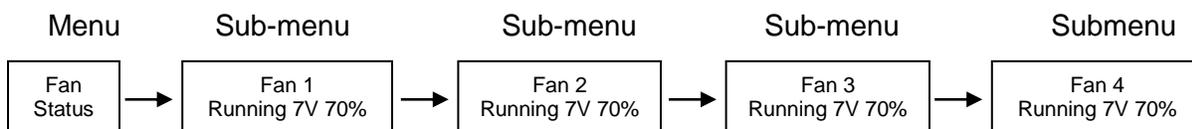| Menu 3	Sub-menu 1	Sub-menu 2
Temperature Status	→ Tmp1 Tmp2 Tmp3 24C 25C 26C	→ IC Temperature 65C
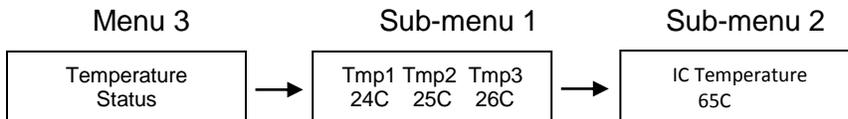
Menu 3: Temperature Status
Sub-Menu 1: Display the temperature of the 3 temperature sensors in degrees Celsius.
Note: If a temperature sensor fails, FLT (fault) appears under the failed sensor.
Sub-Menu 2: Bridge (left), Bridge (right) IC Temperature (Range: 20C-125C, ---C when power is off)

Menu 4: Fan Status

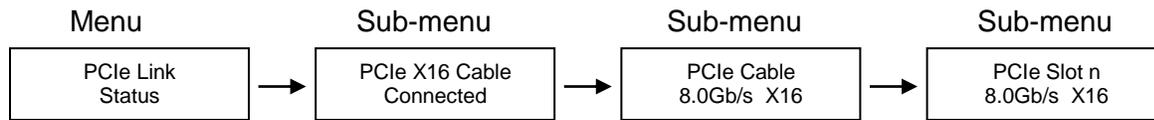| Menu	Sub-menu	Sub-menu	Sub-menu	Submenu
Fan Status	→ Fan 1 Running 7V 70%	→ Fan 2 Running 7V 70%	→ Fan 3 Running 7V 70%	→ Fan 4 Running 7V 70%

Menu 4: Fan Status
Sub-Menu 1-4: 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 (%).
- FAULT is 12V at 100%; fan fault: fan voltage is set to full on.
- NO FAN is aaV at pp%; Xpander can be configured with 1, 2 , 3, or 4 fans. No fan means fan is not installed.

Menu 5: PCIe Link Status

Menu	Sub-menu	Sub-menu	Sub-menu
PCIe Link Status	PCIe X16 Cable Connected	PCIe Cable 8.0Gb/s X16	PCIe Slot n 8.0Gb/s X16

Menu 5: PCIe Link Status
Sub-Menu 1: 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 2: 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 3-6: Link speed and link width for slots 1-4.
- Speed: 2.5Gb/s, 5.0Gb/s or 8.0Gb/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.

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. For both JP7 and JP8, pin 1 is farthest from the board edge and pin 3 is closest to the board edge.

Fan Profile	JP7	JP8	*Tmax	*Tmin
Performance Mode	1-2	1-2	55C	20C
Quiet Mode	1-2	2-3	65C	30C
High Performance Mode	2-3	1-2	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

Fan Profile Guidelines. GPU Mode supports 4 x double-wide GPUs like NVIDIA Quadro or GTX Series. High-Performance Mode supports 2 – 3 double-wide GPUs. Performance Mode supports 2 x double-wide GPUs. Quiet Mode supports 1 x double-wide GPU or 4 x single-wide GPUs. See Technical Specifications on page 2.

Replace a Power Supply Module
All power supply modules show a steady green LED when operating normally. A module with a red LED is either disconnected from power or has a fault. Check that the power cord is firmly seated. If an LED remains red, replace the module.

Shipping Procedure
Before shipping Xpander, remove any installed graphics or other controller(s) using the following procedure:
1. Switch off the host computer connected to Xpander.
2. Disconnect power from Xpander.
3. Disconnect Xpander from the HIC(s).

4. Remove the secure screws holding the Xpander in the cabinet.
5. Gently pull the Xpander toward you.
6. Lift Xpander down from the cabinet and set it on a stable surface.

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

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

Warning
Remove GPUs or other adapters before shipping Xpander.

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

Troubleshooting

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 1 slot or a PCIe x8 (electrical) slot. If your HIC is PCIe x8, you installed it in a Gen 1 slot. The HIC operates at full bandwidth when installed in a PCIe Gen 2 slot.

Issue: Slot LED inside Xpander does not light green.
Resolution: Shut down the OS gracefully, power down Xpander and reseat 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 reseat 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: Press the MIB button momentarily to identify the MIB with the fault. 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: Press the MIB button momentarily to identify the MIB with the fault. Acknowledge the 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 MIB Select 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: Select the appropriate MIB using the MIB Select (left) button. 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.