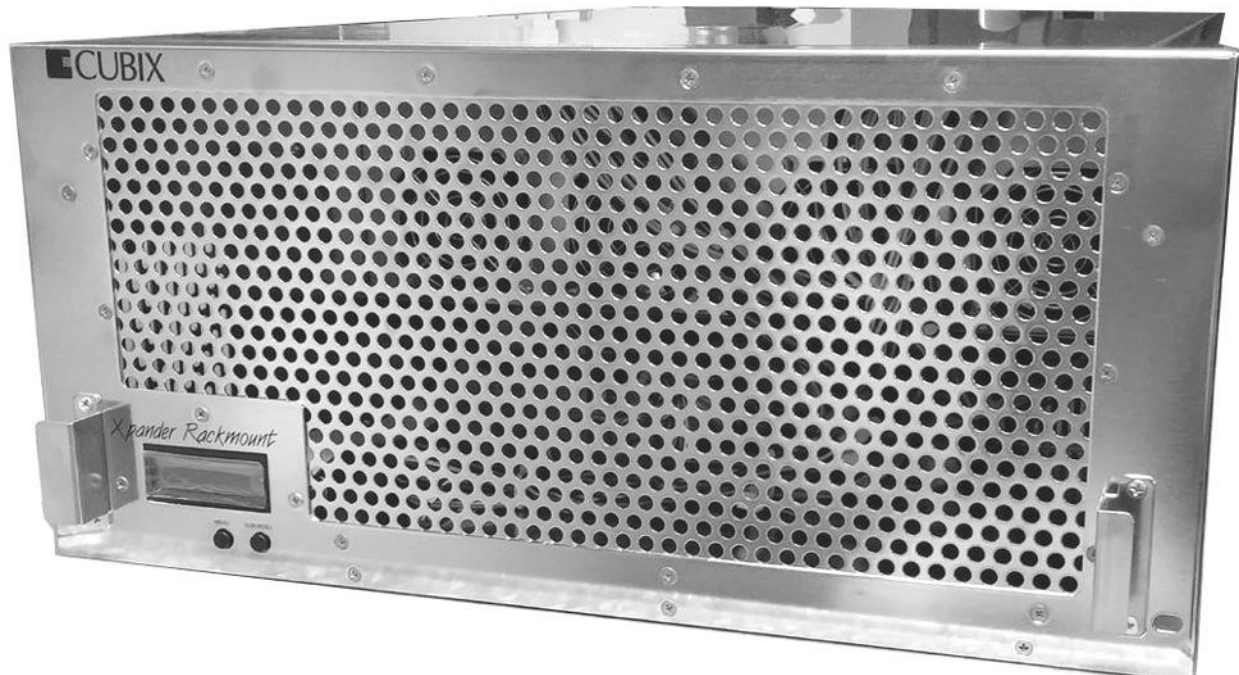




# CUBIX

## Xpander Rack Mount 8 5U Gen 3 with Redundant Power [Part # XPRMG3-81A5URP] – User Guide

Xpander Rack Mount 8 5U Gen 3 with Redundant Power (RP) supplies is a rack mount PCI Express (PCIe) expansion enclosure that enables connection of 8 double-wide graphics or other controllers with rear-connected auxiliary power cables to a host computer. Rack Mount 8 5U RPS supports graphical processing units (GPUs) with active cooling and rear- or top-connected auxiliary power cables. The host computer must have one PCIe x16 slot (preferably PCIe Gen 3.0) available for the host interface controller (HIC).

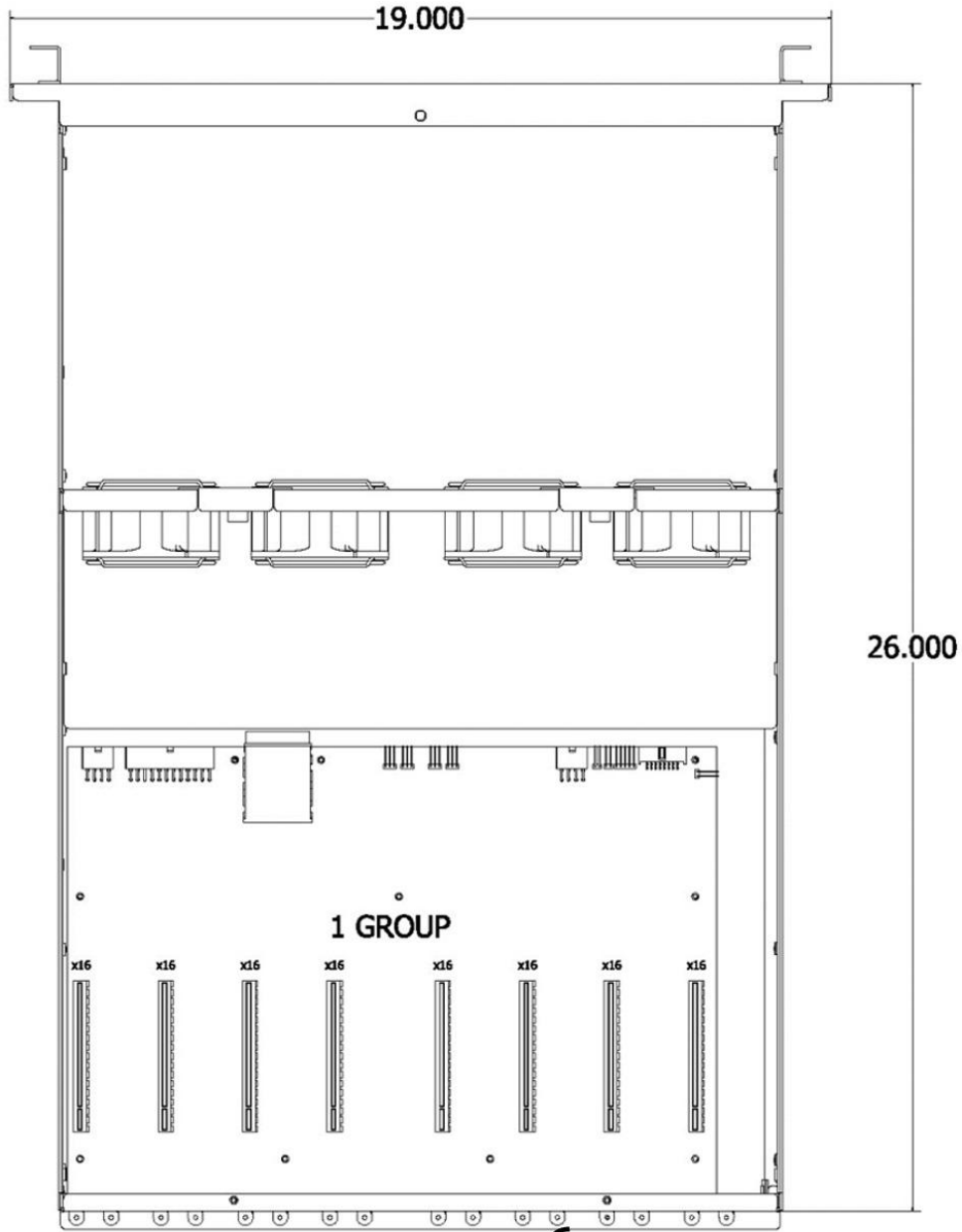


Rack Mount 8 5U RP provides one Main Interface Board (MIB) connected to a HIC in a host computer with a PCIe x16 cable. The MIB features eight PCIe x16 slots to support a total of eight double-wide GPUs like NVIDIA Quadro / GeForce GTX Series or AMD Firepro W9100 Series. Contact Cubix Customer Service ([customerservice@cubix.com](mailto:customerservice@cubix.com)) if you have questions.

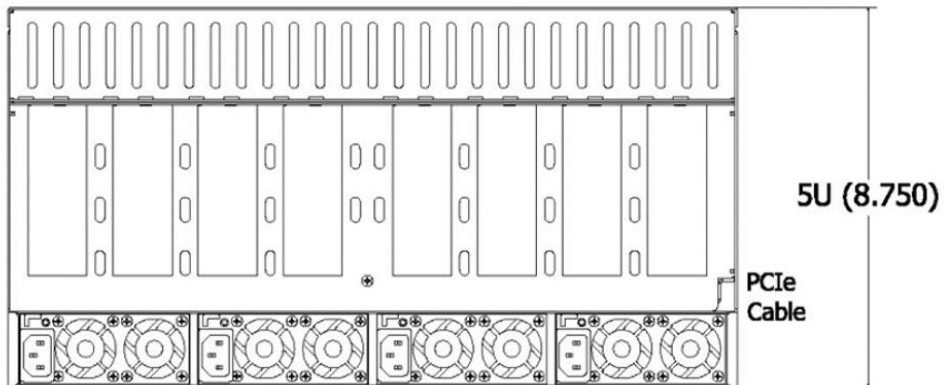
The MIB connects via a PCIe x16 cable to a single HIC in a host computer.

Rack Mount 8 provides one set of eight PCIe x16 slots for GPUs for use with high-performance computing (HPC) and other Compute Unified Device Architecture- (CUDA-) or OpenCL / OpenGL-enabled tasks. With 8 x Intel Xeon Phi coprocessors that feature active cooling, it supports parallel processing applications.

Cubix designed this Rackmount 8 with a single main board specifically for applications that require the fastest peer-to-peer (P2P) transfer rates possible. For example, Cubix has measured P2P transfer rates of 12.5GBytes/second simultaneously in both directions among 8 x NVIDIA GeForce GTX Series GPUs.



XPRMG3-81A5URP { Top View  
Rear View



## Xpander Rack Mount 8 5U RPS Technical Specifications

Expansion slots	PCI Express Generation 3.0 x16
Number of slots (std)	8 slots in 1 x MIB for a total of 8 slots
Form factor support	8 full-height, full-length, double-wide controllers or adapters in 1 MIB
Auxiliary power cable support	Rear-connected or top-connected auxiliary power cables 8 x sets of 6-pin + 8-pin (6P + 8P)
Connecting cable	External PCI Express cable
Connector type	x16, 136-pin
Length, standard	2.00meters (78.7inches or 6.6feet) total length
	1.16meters (45.6inches or 3.8feet) usable length
Connector duty cycle	250 mating cycles maximum per connector
PCIe x16 HIC	Install in a PCIe x16 slot of the host computer
PCIe Gen 3 slot in host	Provides a theoretical 128.0Gbps data transfer rate
PCIe Gen 2 slot in host	Provides a theoretical 80.0Gbps data transfer rate
PCIe Gen 1 slot in host	Provides a theoretical 40.0Gbps data transfer rate
Front panel LCD	Main menu = left button Sub-menu = right button (See detail on page 9.)
Cubix Corporation	MIB assembly and revision; management firmware revision
Power supply status	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 1 - 8 x16 transfer rate, theoretical	PCIe Gen 3.0Gbps x16 = 128.0Gbps
	PCIe Gen 25.0Gbps x16 = 80.0Gbps
	PCIe Gen 12.5Gbps x16 = 40.0Gbps
LCD panel backlight	Toggle on / off using right button
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 fans run at 112cfm (cubic feet per minute) maximum
Xpander power up	Fans are full on for 10s (seconds)
Fan speed, minimum	25C degrees
Fan speed, maximum	50C degrees
Fan speed, in range	25C degrees to 50C degrees in gradual, linear progression
AC power supply, 1 MIB	3,000W power with 3 + 1 hot-plug modules: each module provides auto-ranging 100 – 240VAC @ 15.0 – 7.5Amps
Auxiliary power cables	Standard: 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 (3,050meters)
Storage	50,000ft (15,240meters)
Dimensions	8.75" H x 19.00" W x 26.00" D (22.22cm H x 48.26cm W x 66.04cm D)
Weight	52.00lbs (24.50kg)
Warranty / period	Parts & labor return to manufacturer / 2 year
Ext. warranty period	Optional 3 years

## Included

Xpander Rackmount 8 includes four cooling fans, one 3,000W power supply with four redundant modules and four power cords as well as one 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 for the devices you install in Xpander.

## Quick Start without Detail

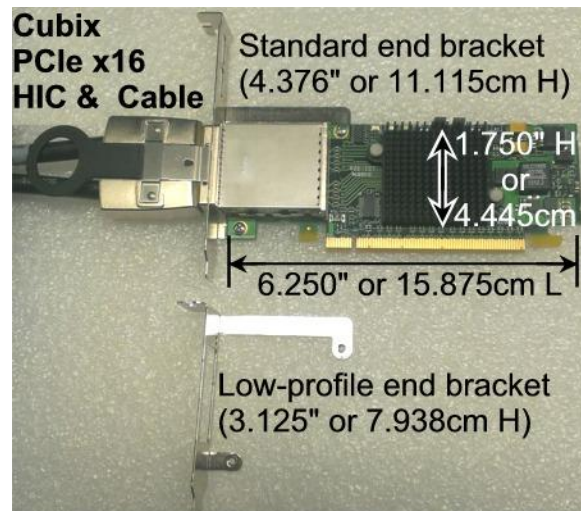
Install a GPU in the host system and install the device driver. Once you have verified operation, shut down, move the GPU to Xpander, install the HIC in the same slot within the host computer, connect Xpander to the HIC using the cable provided and connect power to Xpander Rackmount 8. Boot the host 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 one MIB with eight PCIe x16 slots. The MIB supports only one host computer.

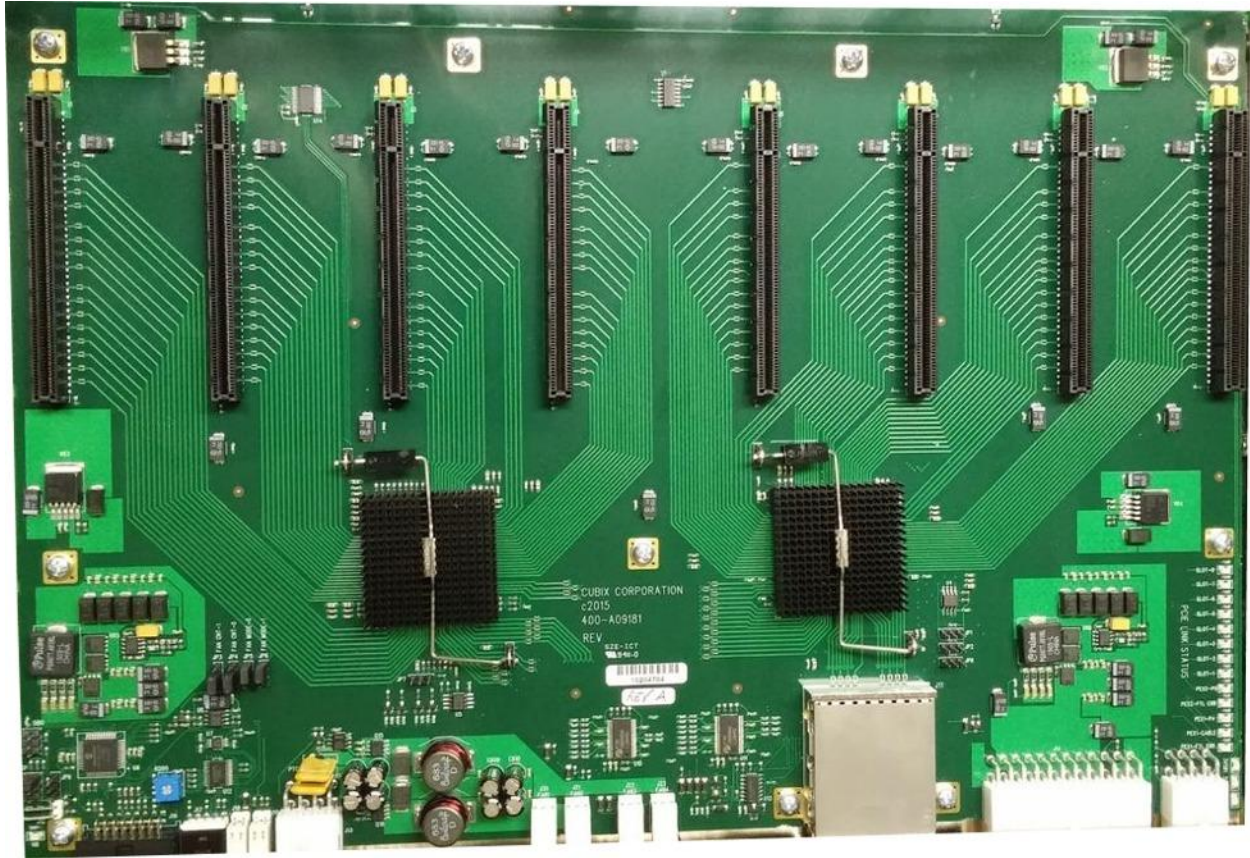
During this procedure, place the Rack Mount 8 enclosure on a stable surface. Use a Philips #2 screwdriver for this procedure. Make sure all AC power to Xpander is disconnected. Do not install graphics or other controllers until instructed to do so within this procedure.

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.



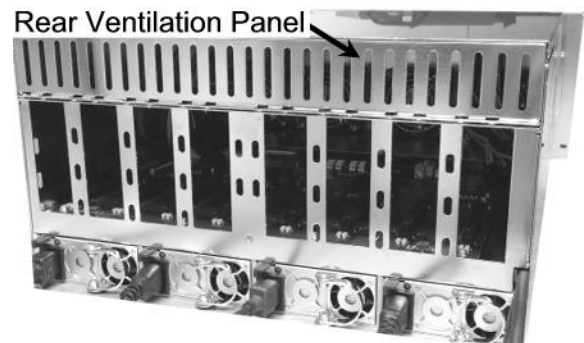
5. Connect a power cord to the receptacle in each of the four power supply modules at the Rack Mount 8 enclosure rear.
6. Power on the host computer. Rack Mount 8 enclosure also powers on.

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.
10. Remove the two screws at each end of the rear ventilation panel above the rear Input / Output (I/O) panel, remove the ventilation panel and set it aside temporarily. See the image with the rear ventilation panel at the right.
11. Remove the screws for holding down the PCIe card end brackets.



12. 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.

13. 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.
14. 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.
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**

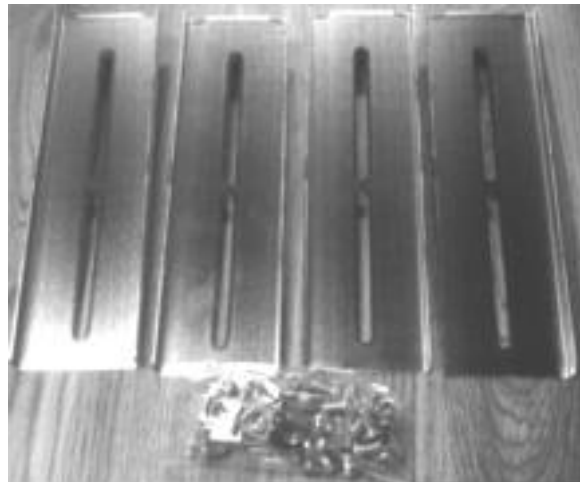
1. With Rack Mount 8 connected to the host computer and running, shut down the host computer normally.
2. With Rack Mount 8 connected to the host computer and powered down, switch on the connected host computer; both Xpander and host will boot.
3. To run the host PC without Xpander connected, power down 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.

### **Install Xpander in a Cabinet**

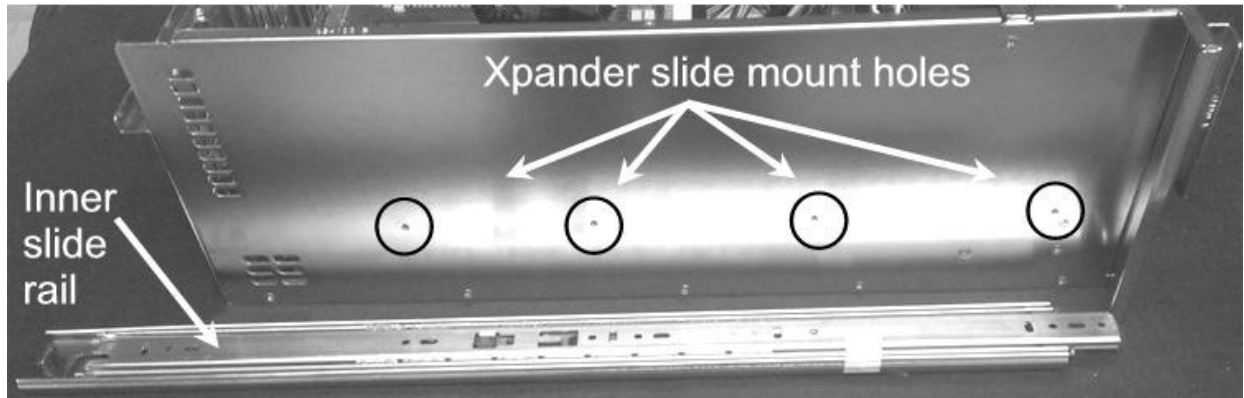
For this procedure, use a Philips #2 screwdriver, a flat-blade screwdriver and a 3/8" wrench or socket and drive. When lifting the Xpander into place, ask for assistance. Mount it close enough to the host computer so that the external PCIe cable will reach. Mount Xpander either immediately above or immediately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

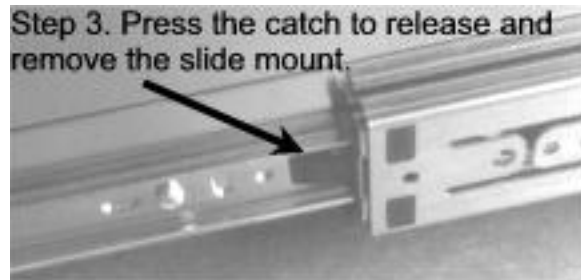
1. Shut down the host and Xpander normally and disconnect all data and power cables connected to Xpander.
2. Find in packaging the rackmount slide rails with a bag of 8 x mounting screws taped to one of the rails.



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



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.
12. Connect the PCIe x16 external cable to the HIC in the host computer.
13. Connect power to Xpander.

**Use this step if you need extender brackets for mounting in a 1000mm deep cabinet.**

1. Mount the extender bracket on the outer slide mount behind the front bracket (S32760 A). Mount the rear bracket (S32760 A) to the rear end of the extender bracket. Leave the nuts loose so you can slide the rear bracket along the extension bracket to



Attach the extender rail (S31096 A) on the outer slide mount behind the front bracket (S32760 A). Mount the rear bracket (S32760 A) on the extender rail. Leave the nuts snug but not tight so you can slide the rear bracket along the extension rail to fit in the cabinet.



mount on the cabinet's vertical rails and fit inside the cabinet. Check to make sure the mounting brackets and slide rails are level from front to rear before tightening the screws and nuts. Align the front of the slider with the front of the cabinet.

2. If you do not need the extender brackets, mount each of the two sliders into the front and rear mounting brackets (Part # S18500A) and slider assembly with the bolts and G-nuts provided in the packaging. Use the Philips #2 screwdriver and the 3/8" wrench or socket to secure snugly but not tightly each slider to the front and rear mounting brackets. Check to make sure the mounting brackets and slide rails are level from front to rear before tightening the screws and nuts. Align the front of the slider with the front of the cabinet.
3. Repeat the process for the other two front and two rear mounting brackets (as well as the extender bracket if needed) and slider assembly on the right side of the cabinet.
4. Check to make sure that the slide rails are level, both from front to back and from right to left. Once you're sure the slide rails are level, you're ready to tighten the mounting screws. See the image at the right.
5. Tightly secure the screws holding the sliders to the front and two rear mounting brackets on each side of the cabinet.
6. Extend the slide rails almost all the way out the front of the cabinet.
7. Lift the Rack Mount 8 enclosure, line it up carefully and slide it into place. Before lifting the Rack Mount 8 enclosure into place, ask for assistance.
8. Try sliding the Rack Mount 8 in and out slightly to make sure it moves freely.
9. Connect the AC power cords into the Rack Mount 8 rear receptacles.
10. Make sure the host computer(s) with the host adapters installed are powered down.
11. Connect the PCIe x16 external cables to the host adapters in the host computer(s).
12. Power up the host computer(s) with the host adapters installed.



**Step 8. Mount the slide rails on the mounting brackets (inside view).**

### **Access Xpander Rack Mount 8 Interior**

For this procedure, use a Philips #2 screwdriver. For accessing Rack Mount 8 to add, move or replace GPUs or other adapters, use the following procedure.

1. Shut down gracefully the host computer(s) connected to the MIB(s) you intend to access.
2. Remove the power cord(s) connected to the power supply modules.
3. Remove the secure screws holding the Rack Mount 8 in the cabinet.
4. Gently pull the Rack Mount 8 toward you a foot or so.
5. Remove the screws holding in place the Rack Mount 8 top cover, remove the top cover and set it aside.
6. Remove the two screws holding the ventilation panel in place above the I/O panel.

#### **Warning**

Before installing or removing cards in the Rack Mount 8, switch off AC power and wait for the 5V Standby LED to power off for the affected MIB.

7. Add, remove or replace the GPUs or other cards, making sure to seat each firmly in the slot, secure the end bracket screws and to connect aux power cables, if necessary.

#### **Warning**

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

8. Replace the Rack Mount 8 front top cover and replace the four screws (front, rear and one on each side) holding it in place.
9. Gently slide the Xpander Rack Mount 8 back in place.
10. Replace the secure screws holding the Rack Mount 8 in the cabinet.

### Front Panel LCD

Rackmount 8 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.

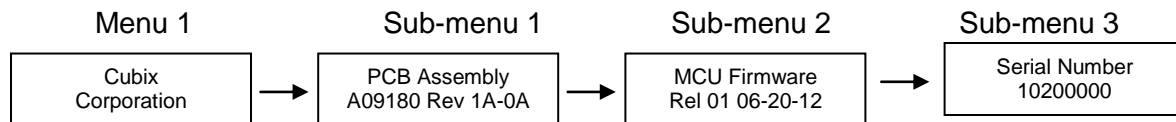


When you first connect power, Xpander comes up in standby mode. The LCD displays Cubix on the top line and Corporation on the bottom line. This is the Start menu. Access all other main menu items by pressing the left button for a MIB, the middle button for a menu selection and then the right button for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

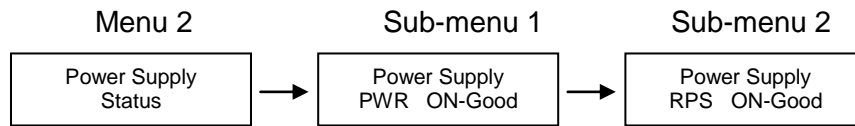
When a fault occurs, the LCD will jump to that fault and the LCD backlight will flash on / off. Press the left button to acknowledge the fault and the LCD will stop flashing and enable normal operation. The LCD will continue to display the fault at the applicable sub-menu until you clear the fault.

### Menu 1: Start Menu



- 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



Main Menu 2: Power Supply Status

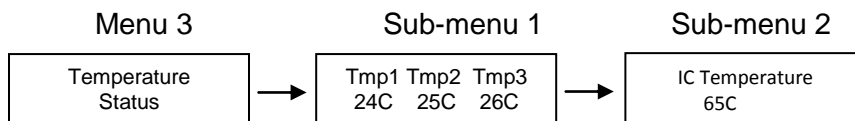
Sub-Menu 1: Main Power Status:

- 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



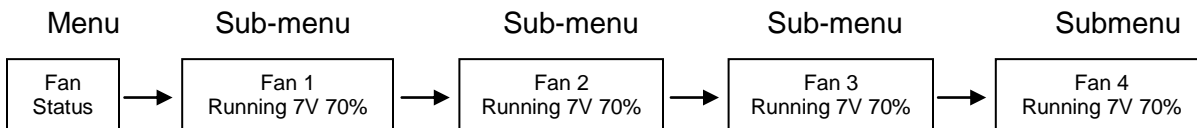
Menu 3: Temperature Status

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



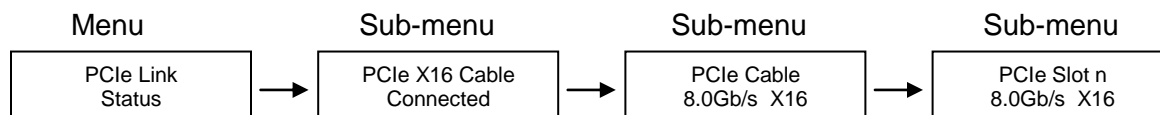
Menu 4: Fan Status

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 5: PCIe Link Status

Sub-Menu 1: Indicates x16 PCIe cable installation status

- Connected x16 cable is properly connected to the HIC

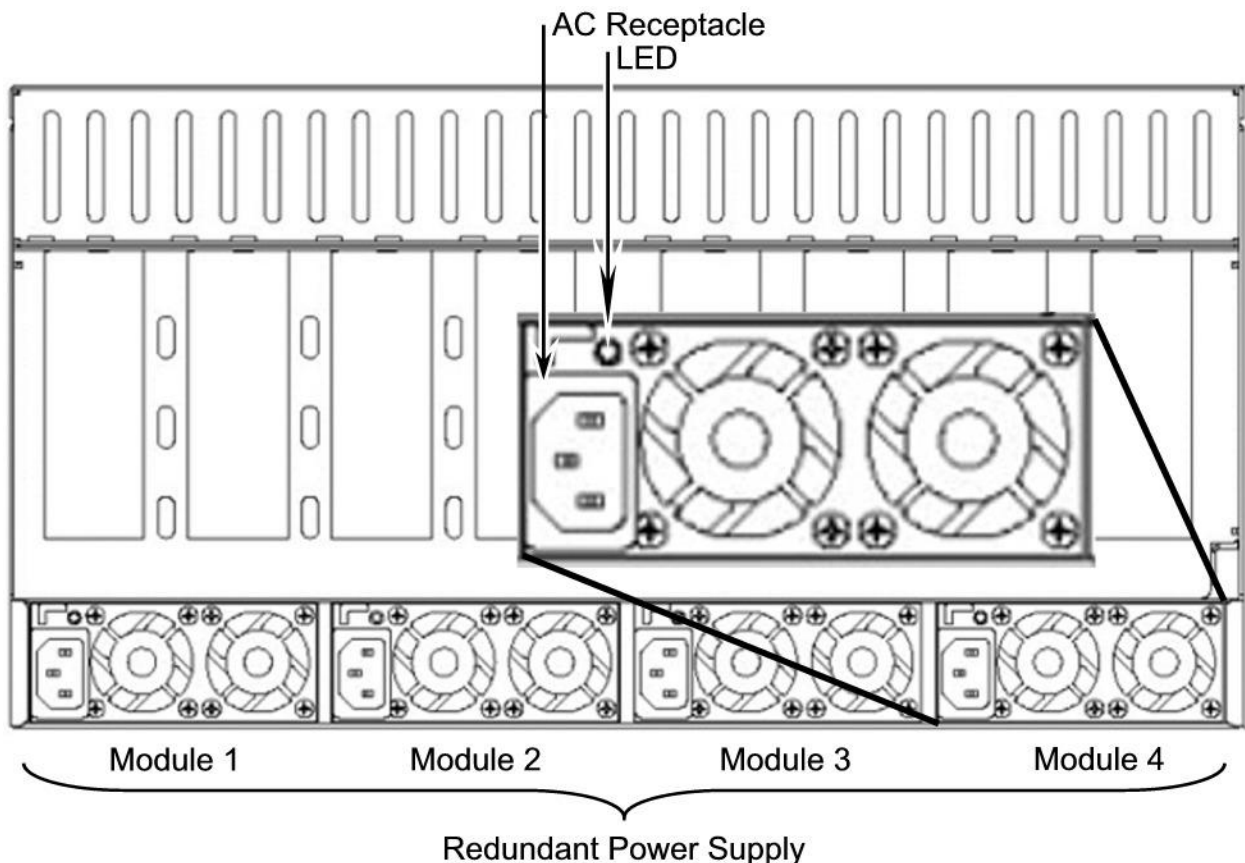
- NOT-Connected x16 cable is not properly connected to the HIC
- Sub-Menu 2: x16 PCIe cable link speed and link width. Speed and width depend on the host capability.
- Speed: 8.0Gb/s, 5.0Gb/s or 2.5Gb/s
  - Width: x1, x2, x4, x8, x16 and “NO Link” when the host did not successfully link or Xpander is in standby power.
- Sub-Menu 3-10: Link speed and link width for slots 1-6.
- Speed: 2.5Gb/s or 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.

### **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 Xpander from the HIC(s).

3. Remove the secure screws holding the Xpander in the cabinet.
4. Gently pull the Xpander toward you.
5. Lift Xpander 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, 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 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 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.