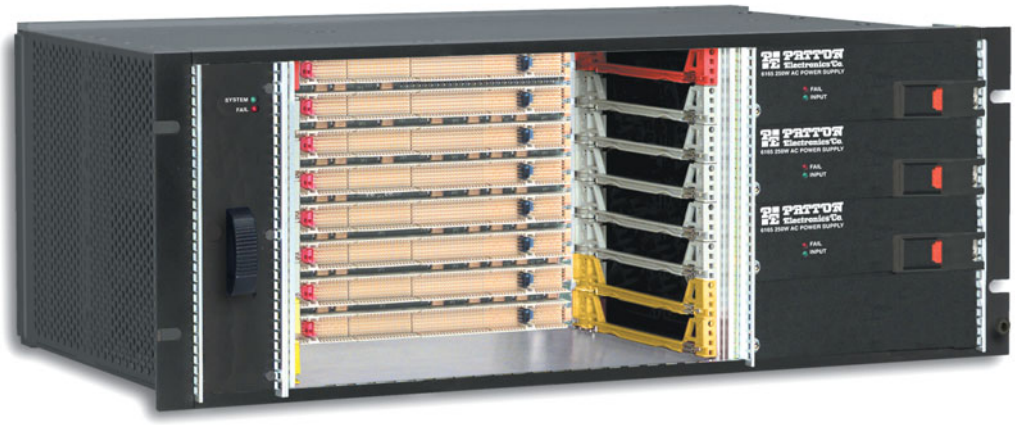
PATTON Electronics Co.

Model 6476
ForeFront FullPipe Chassis Assembly

User Guide



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Document Number: **12002U2-001 Rev. B**
Part Number: **07M6476**
Revised: **May 12, 2006**

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About this guide

This manual is a comprehensive hardware reference tool for the Patton Electronics 4U 6476 Redundant Backplane/Midplane and Chassis line of products.

Audience

This guide is intended for the following users:

- System developers installing and integrating the products into their systems
- Operators
- Installers
- Maintenance technicians

Structure

This guide contains the following chapters and appendices:

- Chapter 1, "Introduction" on page 14—provides an overview of the product, about Patton Electronics, warranty, and service information.
- Chapter 2, "Chassis specifications" on page 16—provides an overview of the chassis features.
- Chapter 3, "System Architecture" on page 26—provides an overview of CompactPCI specifications, as well as a more in-depth description of the product's features.
- Chapter 4, "Installation checklist" on page 34—provides a quick set-up checklist for installing the Model 6476.
- Chapter 5, "Maintenance" on page 39—provides a quick set-up checklist, tips for troubleshooting, warranty information, and where to get help.
- Appendix A, "Compliance information" on page 44—contains compliance information for the Model 6476
- Appendix B, "Glossary of Terms" on page 47—defines terms and acronyms used in this document.

For best results, read the contents of this guide *before* you install the enclosure.

Precautions

Notes, cautions, and warnings, which have the following meanings, are used throughout this guide to help you become aware of potential problems. ***Warnings*** are intended to prevent safety hazards that could result in personal injury. ***Cautions*** are intended to prevent situations that could result in property damage or impaired functioning.

Note A note presents additional information or interesting sidelights.

The alert symbol and IMPORTANT heading calls attention to important information.

The alert symbol and CAUTION heading indicate a potential hazard. Strictly follow the instructions to avoid property damage.

The shock hazard symbol and CAUTION heading indicate a potential electric shock hazard. Strictly follow the instructions to avoid property damage caused by electric shock.

This symbol and the CAUTION heading indicates a situation where damage to equipment can be caused by electrostatic discharge.

The alert symbol and WARNING heading indicate a potential safety hazard. Strictly follow the warning instructions to avoid personal injury.

The shock hazard symbol and WARNING heading indicate a potential electric shock hazard. Strictly follow the warning instructions to avoid injury caused by electric shock.

Safety when working with electricity

This device contains no user serviceable parts. The equipment shall be returned to Patton Electronics for repairs, or repaired by qualified service personnel.

Mains Voltage: Do not open the case when the power cord is attached. Disconnect the power supply cord before servicing. For systems without a power switch, line voltages are present within the power supply when the power cords are connected. The mains outlet that is utilized to power the devise shall be within 10 feet (3 meters) of the device, shall be easily accessible, and protected by a circuit breaker.

For AC powered units, ensure that the power cable used with this device meets all applicable standards for the country in which it is to be installed, and that it is connected to a wall outlet which has earth ground.

Hazardous network voltages are present in WAN ports regardless of whether power to the Smart-DTA is ON or OFF. To avoid electric shock, use caution when near WAN ports. When detaching cables, detach the end away from the ForeFront device first.

Do not work on the system or connect or disconnect cables during periods of lightning activity.

In accordance with the requirements of council directive 2002/96/EC on Waste of Electrical and Electronic Equipment (WEEE), ensure that at end-of-life you separate this product from other waste and scrap and deliver to the WEEE collection system in your country for recycling.

Style conventions used in this document

Tables contain information of a descriptive nature. For example, pin assignments or signal description.

Cross-references, figure titles, and table titles are hyperlinked. This means that if you have the on-line version of this document, you can click on the cross-reference and it will "jump" you to that reference within the document. This feature only works with references to sections/tables/figures within this document. References to other documents (for example, *PICMG 2.5 R1.0 CompactPCI Computer Telephony Specification*) are not hyperlinked.

The symbols "/" and "#" indicate signals that are active low.

Specific safety-related terms, traceable to certain safety regulatory agency requirements (i.e., IEC950 and harmonized derivative specifications) are used within this manual. Refer to the referenced document for a definition of these terms.

Typographical conventions used in this document

This section describes the typographical conventions and terms used in this guide.

General conventions

The procedures described in this manual use the following text conventions:

Table 1. General conventions

Convention	Meaning
Garamond blue type	Indicates a cross-reference hyperlink that points to a figure, graphic, table, or section heading. Clicking on the hyperlink jumps you to the reference. When you have finished reviewing the reference, click on the **Go to Previous View** button in the Adobe® Acrobat® Reader toolbar to return to your starting point.
Futura bold type	Indicates the names of menu bar options.
Italicized Futura type	Indicates the names of options on pull-down menus.
Futura type	Indicates the names of fields or windows.
Garamond bold type	Indicates the names of command buttons that execute an action.
< >	Angle brackets indicate function and keyboard keys, such as <SHIFT>, <CTRL>, <C>, and so on.
`Are you ready?`	All system messages and prompts appear in the `Courier` font as the system would display them.
`% dir *.*`	Bold Courier font indicates where the operator must type a response or command

Mouse conventions

The following conventions are used when describing mouse actions:

Table 2. Mouse conventions

Convention	Meaning
Left mouse button	This button refers to the primary or leftmost mouse button (unless you have changed the default configuration).
Right mouse button	This button refers the secondary or rightmost mouse button (unless you have changed the default configuration).
Point	This word means to move the mouse in such a way that the tip of the pointing arrow on the screen ends up resting at the desired location.
Click	Means to quickly press and release the left or right mouse button (as instructed in the procedure). Make sure you do not move the mouse pointer while clicking a mouse button.
Double-click	Means to press and release the same mouse button two times quickly
Drag	This word means to point the arrow and then hold down the left or right mouse button (as instructed in the procedure) as you move the mouse to a new location. When you have moved the mouse pointer to the desired location, you can release the mouse button.

Bibliography

The following publications are used in conjunction with this manual.

- ECTF H.110 (CT Bus) Specification (Revision 1.0)
- CompactPCI Hot Swap Specification—PICMG 2.12 (Revision 1.0)

- CompactPCI Specification—PICMG 2.0 (Revision 3.0)
- Keying of CompactPCI Boards and Backplanes Specification—PICMG 2.10 (Revision 1.0)
- UL60950, Safety of Information Technology Equipment, including Electrical Business Equipment
- IEC 61076-4-101 (1995-05), Specification for 2mm Connector System
- IEEE 1101.10, IEEE Standard for Additional Mechanical Specifications for Microcomputers using IEEE 1101.1 Equipment Practice

Chapter 1 Introduction

Chapter contents

Product features and benefits

Thank you for purchasing Patton Electronics Co. Model 6476 ForeFront FullPipe Chassis with CPCI 4U backplane/midplane. The Model 6476 FireFront FullPipe Chassis is a modular 6U x 19 inch rackmount sub-rack-type packaging system suitable for open bus architectures such as CPCI, or custom bus applications. The base unit is adaptable to a wide array of product configurations.

The product offers a low cost, turnkey solution for customers desiring eight 4U x 160mm slots (a full CPCI bus segment) in the least possible vertical rack space. The superior design also provides eight 3U x 160mm slots to mount up to four Power Supply Modules configured for external DC or AC power input.

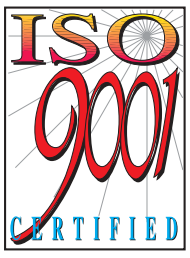
The rear of the chassis provides eight 6U x 80mm slots for CPCI transition modules. Cooling is provided by the specially designed model 6470-FT plug-in fan tray module.

The Model 6476 ForeFront FullPipe Chassis complies with the *PICMG 2.0 R3.0 CompactPCI Specification*, and *PICMG 2.5, ECTF H.110 (CT Bus) Specification* (Rev. 1.0), making it an excellent choice for redundant, fault tolerant applications

About Patton Electronics Company

Patton Electronics excels in the design, development and production of Embedded Data Communications and Telecommunications Platforms based on open system bus architecture standards (for example, CPCI and VME). These platforms form a significant part of the infrastructure for today's information technology revolution—including the emergence of new packet-based (IP) global communication networks.

Datacom/Telecom platforms require robust and reliable packaging solutions that address key technology issues, such as line density, thermal management, power distribution, scalability, and regulatory compliance. With an increasing number of applications demanding downtime measured in minutes rather than hours, special consideration has to be given to enclosure system functionality. Patton Electronics' full line of enclosure solutions are designed specifically to meet industry's stringent high availability requirements where redundant operation, quick accessibility and high reliability are essential. Patton has a broad engineering background in the development of these technologies for advanced circuit and packet-switched telecommunications systems running voice, data and video applications for commercial and government customers.



Patton offers a wide range of platforms consisting of standard rack/chassis, high speed backplane, power, thermal management, single board computer (SBC) and alarm/network interface products for commercial, voice/data communications, and government/military system applications. Patton Electronics is ISO-9001 certified.

Chapter 2 Chassis specifications

Chapter contents

4U CPCI subrack

The Model 6476 ForeFront FullPipe is a modular 4U x 19 inch rackmount subrack-type packaging system designed for the ForeFront CompactPCI open bus architecture. The rugged, rack-mounted chassis system is ideal for carrier-class, defense, industrial, enterprise, and commercial environments. The 6476 excels in its ease of access, superior cooling, and power distribution. The base unit is adaptable to a wide array of product configurations.

Product features include:

- ✔ Available in AC, DC, and mixed AC + DC power supply configurations
- ✔ Fully compatible with all Patton ForeFront modules
- ✔ EMI shielding on entire assembly, with continuous chassis ground
- ✔ Lightweight and durable cold-rolled steel construction, suitable for rugged environments
- ✔ Only 11.70 in. (29.80 cm) deep
- ✔ Standard powder coating finish
- ✔ Front mounting flanges for 19 in. rack mount environments

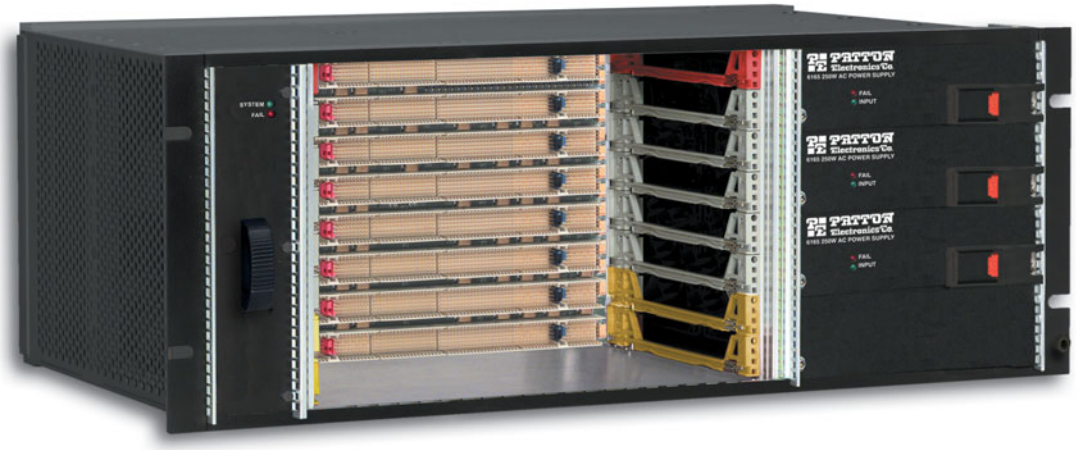


Figure 1. Model 6476

Description of chassis front side

There are eight 6U x 160mm slots (a full CPCI bus segment) at the front of the chassis (see figure 2). Front-entry ForeFront modules, in accordance with PICMG 2.0 CompactPCI specifications, are plugged into these slots.

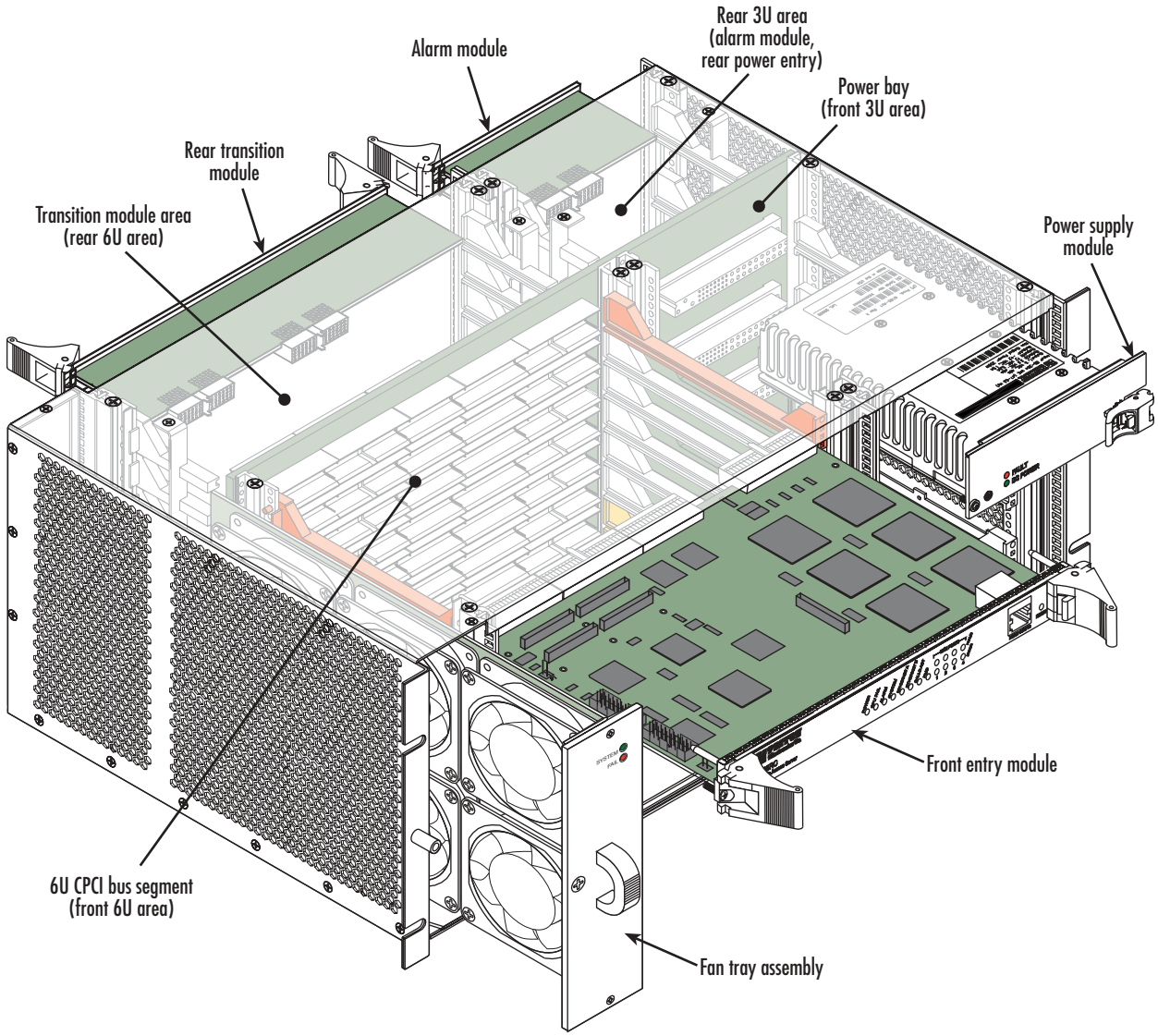


Figure 2. Model 6476 ForeFront FullPipe Chassis

The front of the chassis also provides four slots suitable for 3Ux8HP ForeFront power supplies, model 6160 (DC) or 6165 (AC). These devices are described more completely in the 6160/6165 Users Manual.

All slots provide 4HP module spacing and are on 0.80 in. centers (except for the power supply slots, which are offset 0.1" as per PICMG 2.11 standard). Card guides are molded plastic with metallic ESD contacts (see "Electrostatic discharge (ESD) protection" on page 21) per CompactPCI PICMG 2.0 R3.0 & IEEE 1101.10.

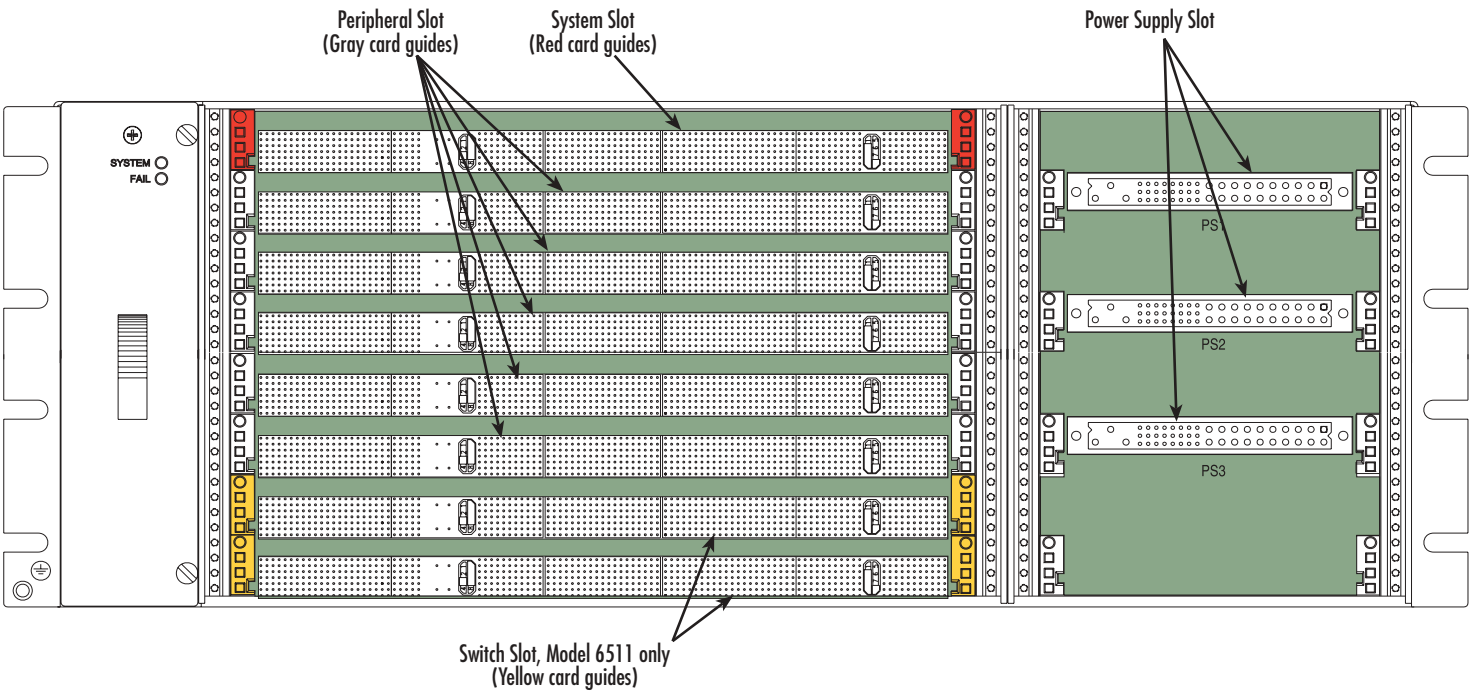


Figure 3. Front view of chassis

Description of chassis rear side

The rear of the chassis is divided into two areas:

- A set of eight 6U slots for ForeFront transition modules (see figure 2 on page 18). These modules typically contain cable connections for I/O interfaces such as T1/E1 trunks, optical fiber trunks, DSL lines, Ethernet, etc.
- A set of 3U slots allocated for the following uses (see figure 4 on page 20):
  - Power input modules—either Patton Model 6112/HOR (DC) or Patton Model 6117/HOR (AC) (see figure 5 on page 20). These modules provide power input to the power supplies in the front of the chassis (see figure 2 on page 18). Each input module provides input for two power supplies. The following configurations are possible:
    - Two DC input modules (supports up to 3DC supplies)
    - Two AC input modules (supports up to 3 AC supplies)
    - One AC, one DC input module (supports up to 2 DC and 1 AC supplies or up to 1 DC and 2 AC supplies)

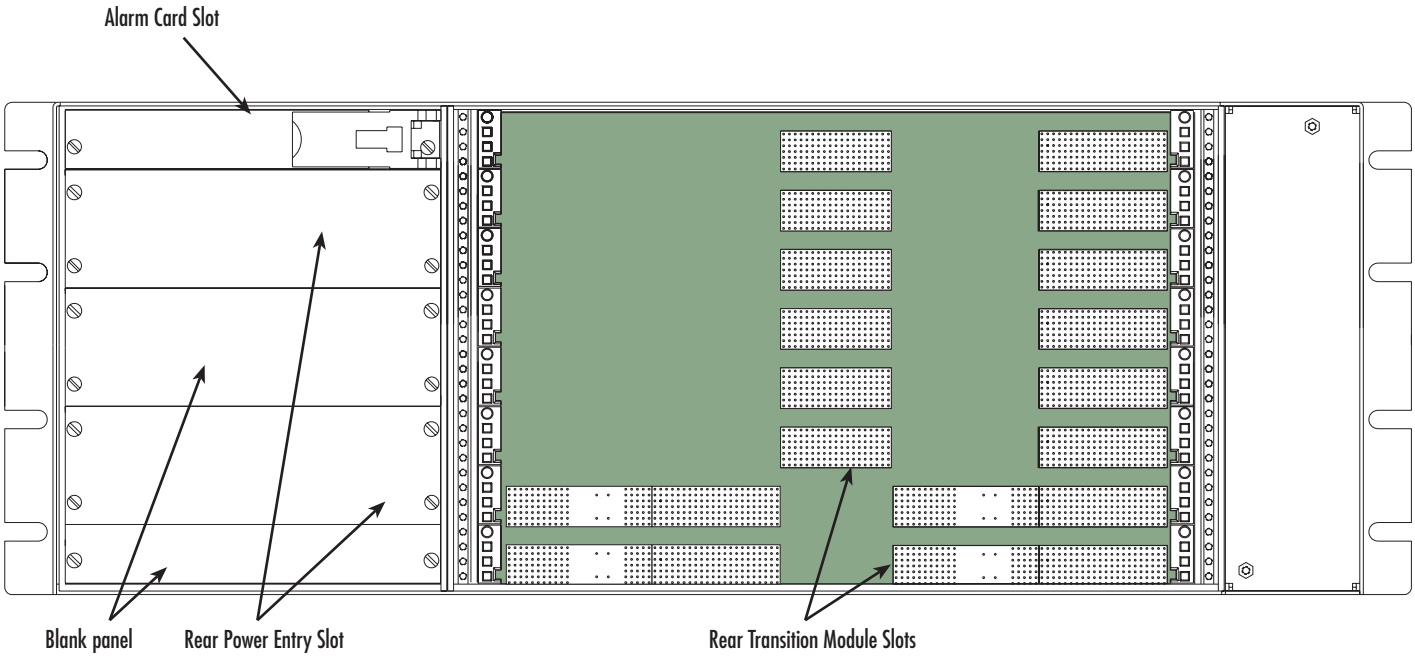


Figure 4. Rear view of chassis

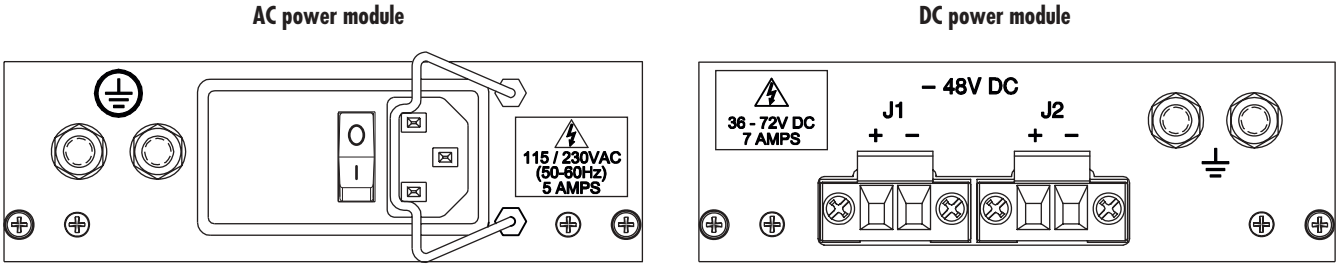


Figure 5. AC and DC rear power entry modules

Electromagnetic compatibility (EMC)

The Model 6476 ForeFront FullPipe is designed to provide the highest level of EMC performance—in terms of both interference and susceptibility. The chassis has the following design features to mitigate the effects of electromagnetic interference (EMI):

- All gaskets, contacts, and contact surfaces are electrically conductive.
- The mating surfaces of the EMC chassis and the EMC plug-in unit front panels and/or optional EMC filler panels are also conductive by use of gaskets/strips.
- All chassis and plug-in contact surfaces are connected to a common chassis ground.

Mating EMC gaskets and strips are used on the chassis, front panels of boards, and optional filler panels. An EMC gasket is attached to the bottom of the chassis (front view), and an EMC strip is attached to the top. Plug-in boards have the corresponding mates on the opposite side (see figure 6).

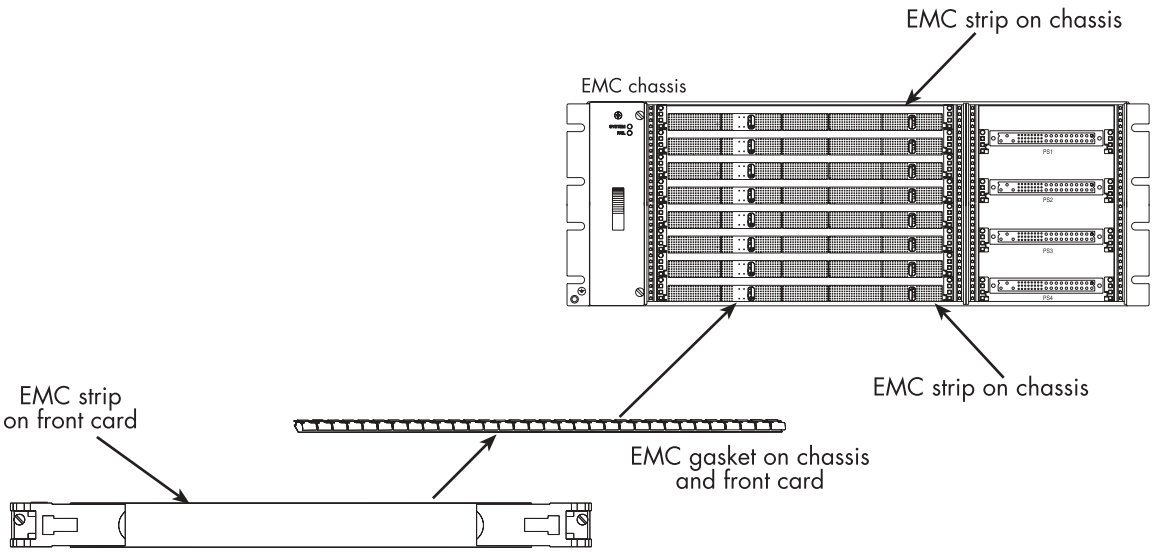


Figure 6. EMC strip and gasket on chassis and cards

The EMC strip on the left side of the board mates with the EMC gasket attached to the chassis when it is plugged into the first slot. Each board mates together with corresponding gaskets/strips.

In addition, all aluminum components of the subrack are surface treated and conductive. Top, bottom, sides and rear EMC covers provide mechanical protection and EMC shielding on the subrack. Retaining clips ensure conductive connection.

The chassis contains an optional frame ground to signal ground jumper. By default, in all ForeFront FullPipe products, this jumper is not installed. This means that frame ground (the electrical potential of the chassis shell itself and all panels, screws, etc. that are connected to it) is electrically isolated from the signal ground (the electrical potential corresponding to “0 volts” with respect to the power supplies and cards in the chassis). Patton Electronics recommends that this isolation be maintained, in order to improve the EMC characteristics of the system and the integrity of the two distinct grounds.

See the chapter on installation and maintenance for further information on the jumper settings.

Electrostatic discharge (ESD) protection

The 6476 ForeFront FullPipe chassis provides ESD protection in compliance with IEEE 1101.10. ESD contacts are embedded inside and in the front section of card guides for making early as possible contact with a discharge strip on one or both, the upper and/or lower edge of the plug-in board/module. Only the card guides located at the bottom rail of the chassis (right vertical rail for the 4U chassis), both front and rear (when there is a transition module present in the chassis), contain the ESD clips. The ESD clip in the card guide is connected to the Chassis GND (ground).

There is an alignment/ESD pin on the injector/ejector handle of boards (see figure 7).

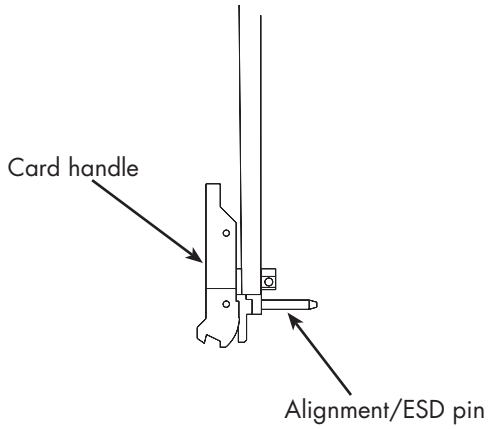


Figure 7. Alignment/ESD pin on card handle

The alignment pin does the following:

- Ensures that the connectors are correctly aligned before they engage
- Provides solid/protected keying
- Provides board ESD contact
- Ensures that the EMC gasket is properly aligned (see "Electromagnetic compatibility (EMC)" on page 20)
- Ensures that when the board is inserted in the card guide, an integrated ESD clip discharges ESD from the board to the right vertical rail chassis ground.

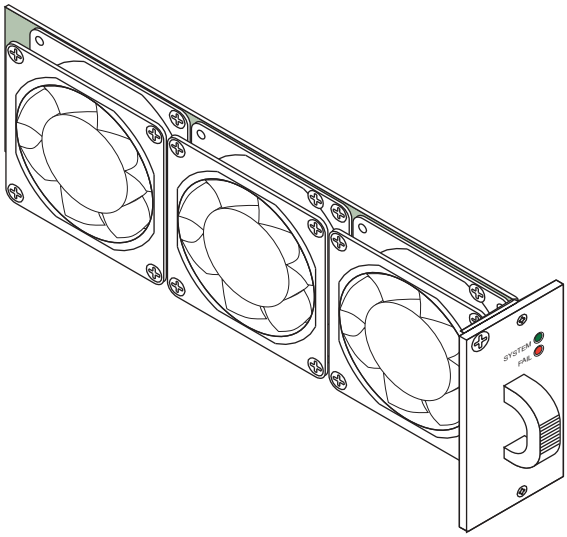


Figure 8. Model 6470-FT fan tray assembly

Fan tray assembly

Cooling is provided by the specially-designed, Patton Electronics Company, 6470-FT Plug-In Fan Tray Module (see figure 8). The unit utilizes six 12 VDC axial cooling fans which are positioned for optimum side-to-side air flow through the subrack.

The fan tray is hot-swappable for air filter replacement.

Table 3. Fan tray specifications

Item	Description
Physical	Height: 7 in. (17.78 cm) Width: 2.75 in. (6.98 cm) Depth: 11.13 in. (28.27 cm)
Power requirements	1.3 A at 12 VDC
Performance	42.5 CFM per fan (quantity: 3 fans)
Reliability	7,000 hours at 122°F (50°C)
Operating environment	32–122°F (0–50°C), 5–95% relative humidity, non-condensing
Fan tray model no.	6470-FT
Replacement air filter part no.	6570-AF-6 (6-pack)

Chassis system specifications

A list of the 4U model 6476 chassis materials specifications is provided in table 4.

Table 4. 4U chassis materials specifications

Item	Description
Physical	• Height—4U (7 in./17.78 cm) • Width—19 in. (standard EIA rack mount) • Depth—11.70 in. (29.70 cm)
DC interface	Rear DC interface panel includes dual ground lugs, -48V DC power interface for *N+N* redundant power operation.
AC interface	Rear AC interface panel includes: an IEC 320 AC inlet connector, ground lug, power fuses.
Slot configuration	• Front—6U x 160 mm slots, Qty: 8 • Rear—6U X 80 mm slots, Qty: 8 Slots are on 0.80 in. (2.0 cm) centers, except power slots are 1.6 in. (4.1 cm) center
Module keying and alignment	4HP module spacing, cardguide provides for keying and alignment pin in accordance with IEEE 1101.10, section 6
Card guides	Molded plastic with snap-in ESD contacts for plug-in module and injector/ejector handle alignment pin
Plug-in unit injector/ejector handles	Subrack dimensional format accepts modules with injector/ejector handles as specified in IEEE 1101.10, section 8
Operating environment	32–122°F (0–50°C), 5–95% relative humidity, non-condensing

Table 5. Power input and power supplies

Item	Description
Power input	DC: -48 VDC nominal (-36 to -75V) AC: 115 - 230 VAC, 50–60 HZ
Maximum current	DC: 7.0 A per power input AC: 5.0 A per power supply
Power supply fusing	DC: 250 V, 12.5 A, Slow blow (one fuse per PSU) AC: 250 V, 5 A, Slow blow (one fuse per PSU)

Power considerations

For DC systems:

- An approved external source must be rated a maximum of 75 VDC, 7.0 A and provide over current protection upstream of the equipment.
- An approved disconnect device with a minimum 3.0 mm contact separation must be provided upstream of the device and rated at least 75 VDC, 7.0 A and be located so it is accessible to the operator.
- This equipment shall be connected directly to the DC supply system bonding jumper from an earthing terminal bar or bus to which the DC supply system earthing electrode is connected.

- This equipment shall be located in the same immediate area as any other equipment that has a connection between the earthed conductor of the same DC supply circuit and the earthing conductor, and also the point of earthing of the DC system. The DC system shall not be earthed elsewhere.
- There shall be no switching or disconnecting devices in the earthed circuit conductor between the DC source and the point of connection of the earthing electrode conductor.

For AC systems: When used with AC supplies, the device must be connected to an earthed mains socket outlet.

Specifications

Table 6.

Power supply model	Power (watts)	Height (Profile)	Input voltage	+5V current	+3.3V current	+12V current	-12V current
6160 DC	250	3U	36–75 VDC	40A	40A	5.5A	2A
6165 AC	250	3U	90–264 VAC	40A	40A	5.5A	2A

Chapter 3 System Architecture

Chapter contents

Board front panels

CompactPCI boards provide a front panel interface that is consistent with Eurocard packaging and compliant with IEEE 1101.10 (EMC panels). Ejector/injector handles are used on the boards (see figure 9). Filler panels do not require handles.

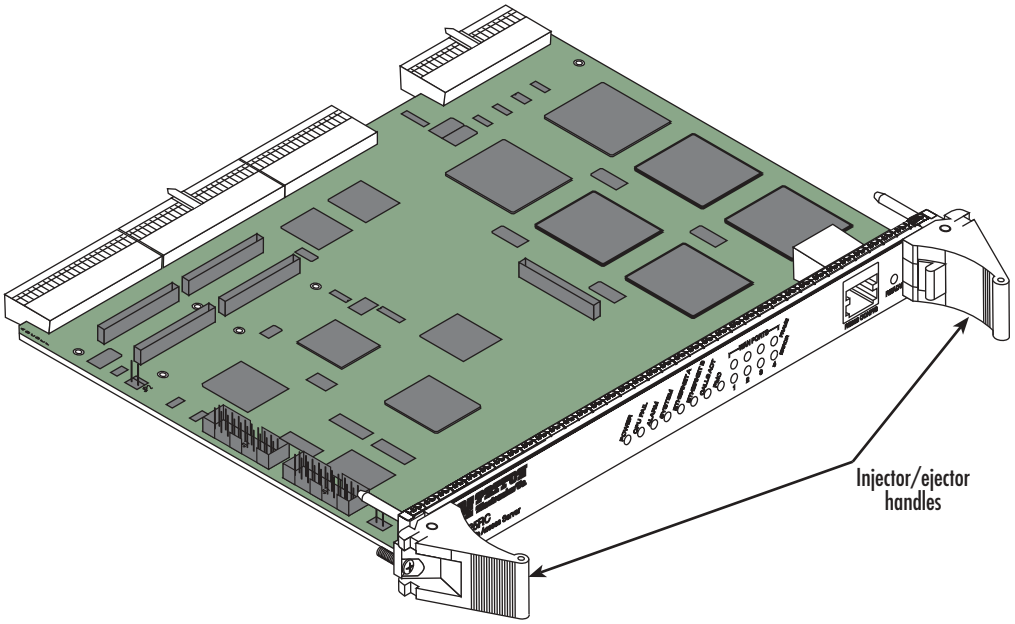


Figure 9. Front panel—6U front-entry card

Transition Boards

There are two types of boards:

- Front-entry boards (described in section “Board front panels”)
- Rear-entry boards for rear-panel I/O

The front-entry boards may route I/O through the backplane. Backplanes that enable rear I/O are called often midplanes because the legs of the backplane connector’s pins stick through the board to become pins for rear-panel interconnections. An illustration of the front-entry board and rear-panel I/O board interface with the backplane/midplane is shown in figure 10.

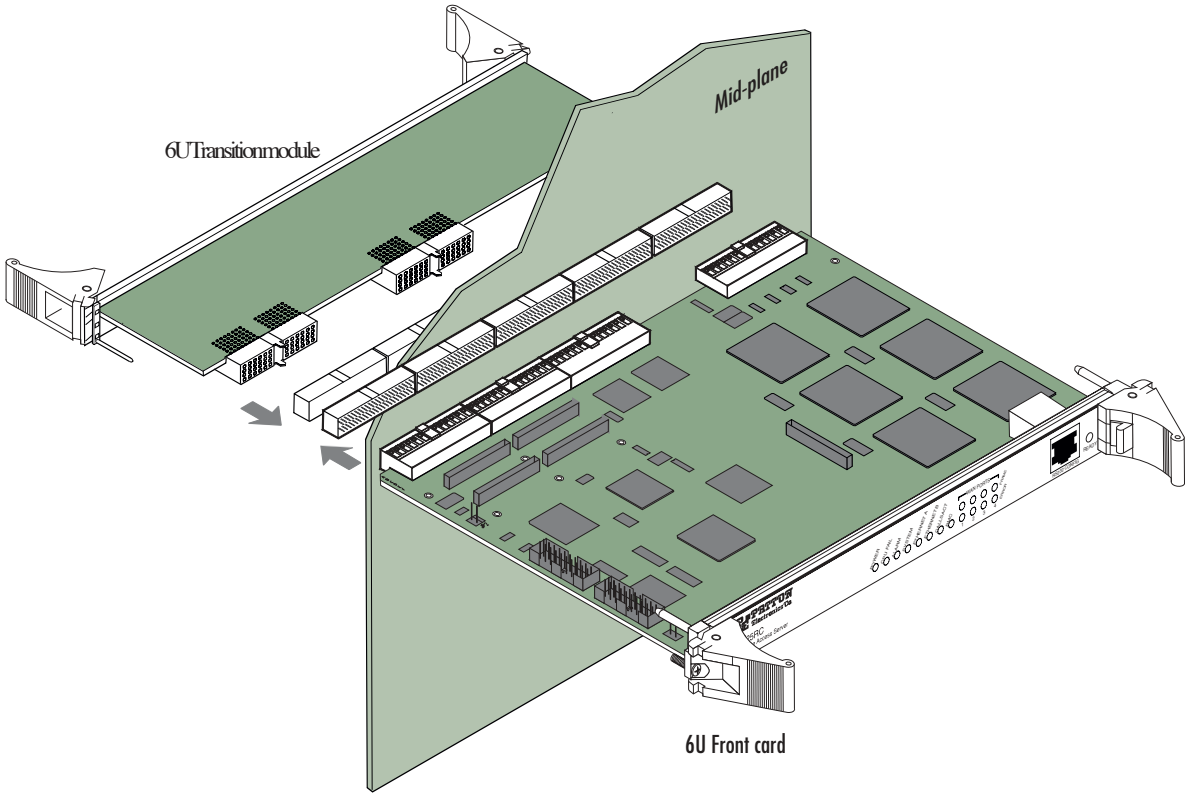


Figure 10. Front/rear boards and backplane interface

Rear-panel I/O boards are 6U in width and are 80mm in depth. The 4U chassis provides an 80mm transition module section. This section provides eight 6U x 80mm slots for cPCI transition modules.

All front-entry board features (handles, keying, alignment pin, EMC, etc.) are also utilized on the rear-entry boards. The rear-panel I/O transition boards are “in-line” with the front-entry boards. This means that the front panels of rear-panel I/O transition boards are reversed (mirrored) from the front boards. The top handles are on the bottom and vice versa. The slot keying holes and hole labels in both the card guides and front panels are upside down compared to the front boards and card guides.

The same connector pin labeling sequence is used on the rear I/O transition boards as on the front boards, with the position numbers going from bottom to top. This is a mirror image of the front board’s layout orientation. Using the same 1-for-1 pin mapping sequence eliminates confusion and I/O signal pin mapping problems. For example, pin A3 is the same on the front boards, on the rear I/O transition board, and on the backplane.

Rear-panel I/O transition boards may have active components in some applications. Power can be applied either through the I/O pins from the front board, or from the normal power and ground pins defined as part of the J1/P1 and J2/P2 connector pin assignments.

Pin and socket connectors

The connection between boards and backplane is through a two-piece, 2 mm connector. Backplanes use male (pin) connectors and plug-in boards use female (socket) connectors. This pin and socket connector offers greater reliability, particularly when subject to shock, vibration, or temperature variations.

These pin and socket connectors provide:

- Faster propagation times
- Reduced reflection at the bus/connector interface
- Lower noise
- Better impedance matching
- Higher mechanical stability

The connector is a 235-pin device, arranged in 47 rows of 5 pins, with a total of 220 pins (15 pins are lost to the keying area). The connector is shielded and devotes a large number of pins to ground. This reduces reflections, increases EMI immunity in noisy environments, and reduces ground bounce.

The fixed or male connector on the backplane is numbered P1-P5, starting at the bottom. The corresponding female connectors on the 6U cards are numbered J1–J5 from the bottom up (see figure 11).

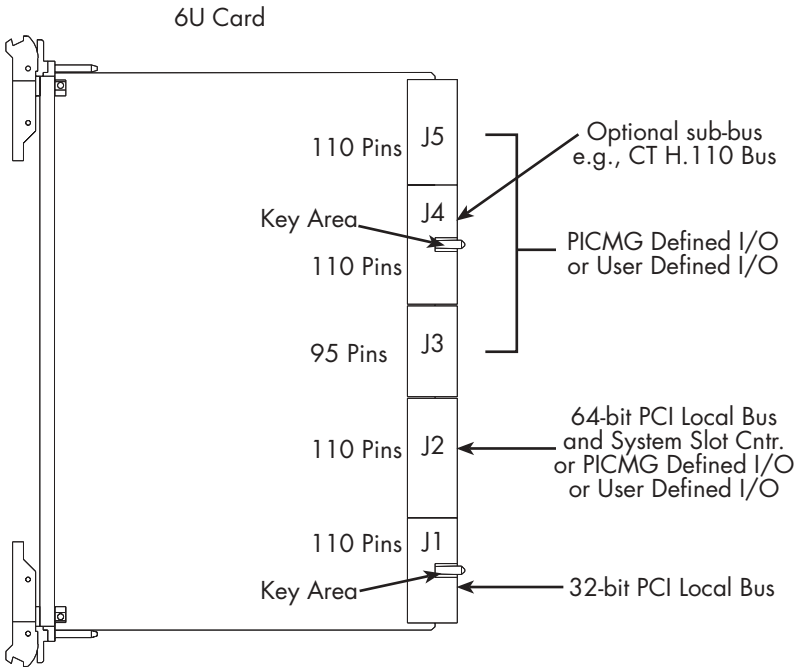


Figure 11. J1 through J5 connectors on the 6U card

3U and 6U cards use a single 220 pin connector for all power, ground, and all 32- and 64-bit PCI signals. This connector consists of two halves—the lower half (110 pins) is called J1/P1 and the upper half (also 110 pins) is called J2/P2. Twenty pins are reserved for future use. The connector is divided in J1/P1, a 25-row connector that includes voltage keying, and J2/P2, a 22-row connector without keying. The 4U card can have up to four additional connectors with a total of 315 pins, which can be used for a variety of purposes.

A system CPU uses J1 and J2, but 32-bit peripherals cards only need to use J1 for full CompactPCI functionality. J3 through J5 on 4U cards can be user-defined I/O. Optional buses, such as the CT H.110 bus, use the J4 position.

J1/P1 & J2/P2 connectors

The CompactPCI bus spans the J1/P1 & J2/P2 connectors, with 32-bit PCI implemented on J1/P1 and full 64-bit PCI implemented on J2/P2 on the Model 6476 Midplane. J1/P1 is always devoted to 32-bit PCI in CompactPCI systems, however, use of J2/P2 for 64-bit PCI can be optional. For instance, in a 3U system, J2/P2 may be defined for user I/O, or sub-buses like the CT H.110 bus. J2 is always used on system slot boards to provide arbitration and clock signals for peripheral boards.

J3/P3 through J5/P5 connector

J3/P3 through J5/P5 connectors, available only in 4U systems, are generally defined for user I/O. However, sub-bus interconnects (for example, CT H.110 bus) can be configured on the J4/P4 connector.

Reserved Pins

There are bused and non-bused reserved pins as noted below:

- The BRSVPxxx signals SHALL be bused between connectors and are reserved for future CompactPCI definition.
- The RSV signals are non-bused signals that SHALL be reserved for future CompactPCI definition.

Power Pins

The 4U Model 6476 Backplane/Midplane has a customer-selectable signaling environment. All connectors on the 4U Model 6476 Backplane/Midplane provide pins for +5V, +3.3V, +12V and -12V operating power. In addition, there are power pins labeled +V(I/O). The V(I/O) power pins on the connector are used to power the buffers on the peripheral boards, allowing a card to be designed to work in either interface. CompactPCI supports this dual-interface scheme by utilizing backplane connector keying.

Backplane Architecture

Patton Electronics Company, 4U Model 6476 Backplane/Midplane provides eight 6U board locations with 20.32 mm (0.8 inch) board center-to-center spacing. The 6U cards are stacked horizontally in the 4U model, however, the special design provides vertical convection cooling with the installed 6470-FT plug-in fan tray module.

There are also eight 3U x 160mm slots on the front right side, called the “Power Bay”, to mount Patton Power Supply Modules configured for external DC or AC power input, or other cPCI compatible power modules.

A rear view of the 4U Model 6476 is shown in figure 12.

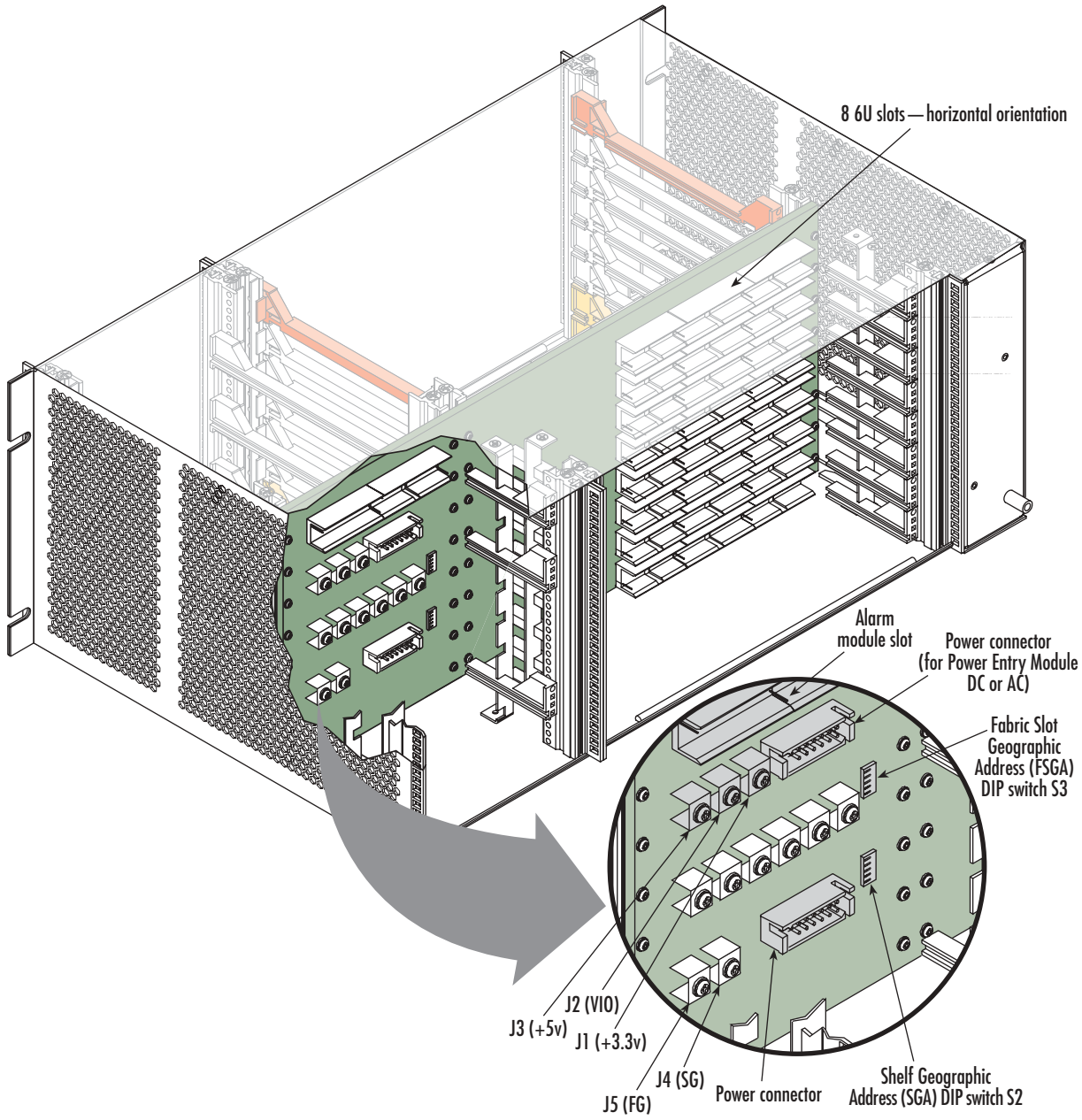


Figure 12. Rear view of chassis showing the midplane/backplane

There are two user-configurable straps and a DIP switch located in the rear 3U area of the chassis:

- **VIO signaling**—This strap (using J3, J4, and J5) sets the V I/O signaling voltage to 3.3 or 5 VDC. For all ForeFront applications, this should be set to 3.3v. Do not change it from this setting.
- **Frame ground/signal ground**—This strap (using J1 and J2) allows the user to electrically connect frame ground (FG) to signal ground (SG). By default, these signals are electrically isolated. Patton Electronics recommends that this configuration be maintained. However, in certain specific circumstances, users may wish to connect these two potentials by installing a jumper between J4 and J5.

- **Shelf Geographic Address (SGA)**—S2 is a DIP switch that enables the user to configure the shelf enumeration feature, used for multi-shelf CompactPCI systems. The SGA effectively becomes a chassis identification code, which is used to uniquely identify the chassis in a multi-chassis environment. This is currently not used in most ForeFront applications, as most cards/devices are uniquely identified by an IP address, which is manually configured for each device in the system.
- **Fabric Slot Geographical Address (FSGA)**—S3 is a DIP switch that enables the user to configure for a redundant shelf enumeration feature, used in multi-shelf CompactPCI systems. For redundancy, the user should configure this switch to the same address as that used for S2.

Backplane power distribution

Power is distributed in a CompactPCI system via the backplane. The backplane provides standard direct current (DC) supply voltages as specified in table 7 below

Table 7. Power specifications

Mnemonic	Description	Nominal Value	Tolerance
5 V	+5 VDC	5.0 V	±5%
3.3 V	+3.3 VDC	3.3 V	±5%
+12 V	+12 VDC	12.0 V	±5%
-12 V	-12 VDC	-12.0 V	±5%
GND	Ground		

External power connections

The chassis provides a rear DC interface panel with -48V DC power interfaces for *N+N* power operation and dual ground lugs, as shown in figure 5 on page 20. The connectors are described in table 8.

Table 8. Description of rear interface panel connectors

Item	Description
-48 VDC power terminal	DC rear-entry module accepts 36–75 VDC at 7.0 A max input via Phoenix connector. Polarity should be applied as marked (negative—top position, positive—bottom position). Each connector is independent and designed to power one 3U power suppply module. There are three connectors provided for *N+N* power operation.
AC power interface	The AC power interface accepts 115 - 230 VAC (50–60 Hz), 5 amp maximum (IEC 320 connector).
Ground lugs	The dual frame ground lugs must be used to connect the chassis to earth ground on DC interfaces. Failure to do this will cause excessive RF emissions and could possibly create a safety hazard. The double ground lug meets NEBS and will accept Amp part # 606209-1. NEBS requires a double lug on DC chassis to ensure that the ground connection will not rotate and become loose.

The dual frame ground lugs on DC interfaces must be used to connect the chassis to earth ground. Failure to do this will cause excessive RF emissions and could possibly create a safety hazard.

Hot-Swap Capability

Hot-swapping is the capability of removing and replacing components without turning off the system. Hot-swap capability is becoming increasingly important in systems requiring continuous operation at some level. Because boot times of many popular operating systems are long, the hot-swap capability is crucial for high-end PC servers, and even more so for telecommunication systems, such as base stations, where board-level exchanges must be made without any downtime. CompactPCI supports dynamic configuration to allow hot removal/insertion of boards without interrupting backplane transactions or disturbing DC voltages in the power system.

The hot-swap feature is implemented on the CPCI boards, not on the backplane. The backplane remains passive. Therefore, CompactPCI boards either are or are not hot-swappable.

Signal lines must be precharged to 1V before being plugged into the backplane to maintain ongoing bus transactions. Also, power must be ramped up or down in a controlled manner to allow the power supply to adjust to the change in load. The power supply, ground and signal pins on the connectors are staged to allow sequencing, so as to not disturb the operation of the surrounding boards in the bus. The three levels of sequencing are:

- Short pins for BD_SEL#
- Medium pins for signals
- Long pins for power/ground

The system uses two levels of sequencing so that power/ground is made first/broken last. The short pin (BD_SEL#) connection is made only when the board is firmly seated, which signals the control circuitry to power up any high-current devices. Conversely, BD_SEL# breaks first to provide early warning to the control circuitry.

Chapter 4 Installation checklist

Chapter contents

4U quick set-up checklist

The Model 6476 Mid-plane & Chassis can be easily configured according to your system requirements. Due to the broad application possibilities, the following checklist is provided as a quick set-up guideline.

1. **Connect frame ground/signal ground (FG/SG)**—You may opt to connect the FG/SG for EMC considerations and noise reduction, via power lugs, located at the rear, right-side of the backplane. The factory default is "no connect".
2. **Assign shelf address**—For multi-shelf systems, each sub-rack bus segment can be assigned a shelf address via the S2 and S3 DIP switches, located at the rear, left-side of the backplane (see section "Backplane Architecture" on page 30).
3. **Install 4U chassis on rack**—the chassis front mounting flanges should be securely fastened to the rack with screws.
4. **Install power supply modules**—For *N*+1 power operation, install up to three Patton power supply modules at the front of the chassis.
5. **Install cards**—Plug the system application card(s) in the 6U slot(s) at the front of the 4U chassis. Plug alarm card in the left-hand slot at the back of the chassis, and plug transition cards in remaining slots, if needed.

The interconnecting cables shall be acceptable for external use and shall be rated for the proper application with respect to voltage, current, anticipated temperature, flammability, and mechanical serviceability.

6. **Wire rear panel for power.**

Due to possible injuries to people and severe damage to objects caused by electric shock, always wire for power as the last step.

Power cable installation

This section describes installing the power and ground cables.

Installing the power cables—AC unit

This section describes installing the power cables into the IEC-320 connectors on the Model 6476 power supply. ***Do not connect the remaining end of the power cables to the power outlet at this time***. Do the following:

1. Install a power cable into an IEC-320 connector (see figure 13). The AC main socket outlet shall be within 3 meters of the equipment and shall be easily accessible.

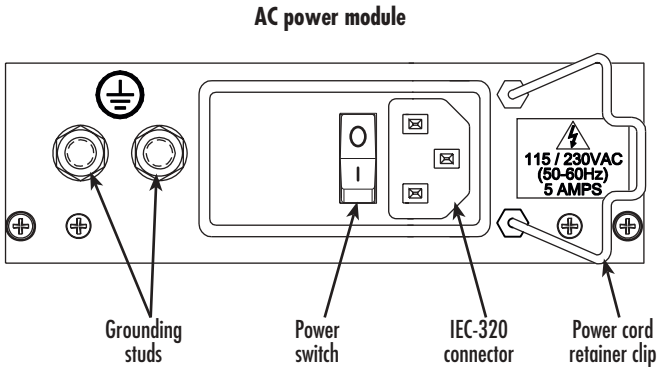


Figure 13. IEC-320 connector and grounding stud locations

WARNING

To avoid the risk of injury from electric shock, the power cords connected to the IEC-320 connectors must be grounded power cords.

2. Rotate the power cable retainer clip (see figure 13) so it secures the power cable plug in the IEC-320 connector.

Installing the power cables—DC unit

This section describes installing the power cables into the DC power input module. **Do not connect the remaining end of the power cables to the DC power source at this time.** The Model 6476 DC power supply module comes with two power input terminal blocks (J1 and J2). The Model 6476 can draw power from sources connected to either of these terminal blocks (inputs are *diode-ORed* and combined to provide for redundant power input). Although the power supply module is designed to operate normally with one power source, users may want to connect two independent power sources, one to each terminal block, to provide uninterrupted operation in the event of one source failure.

CAUTION

Use AWG 18 copper conductors for the DC supply.

1. Connect the earth ground of the DC source to the grounding stud on the Model 6476 chassis as described in section “Grounding the Model 6476—AC and DC units”.

2. Strip back the insulation on each of the supply wires approximately 1/4 inch.
3. Insert the stripped end of the positive lead into the "+DC input" of the terminal block. Tighten the screw until the power lead is firmly fastened. Repeat the procedure for the negative lead, using the "-DC input" of the terminal block. Make sure that there is no exposed wire.

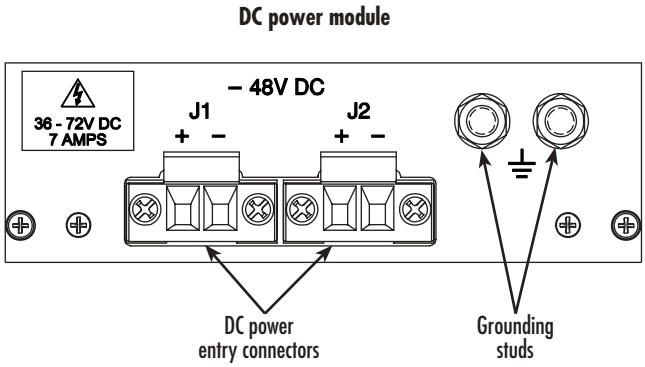


Figure 14. DC connector, -DC and +DC input view

4. Repeat steps 1 through 3 to install the remaining DC power connection.

Grounding the Model 6476—AC and DC units

Do the following:

1. Assemble a ground wire using #10 AWG wire with green-colored insulation and two ring terminals. Make the wire long enough to reach one of the following ground sources:
   - The building ground rod (generally located at the site's main service entrance)
   - A sprinkler system pipe
   - A cold-water pipe
   - Building structural steel

To avoid the risk of personal injury, the distance between ground and the equipment rack must not exceed the distance specified in either local electrical codes or the National Electrical Code.

2. Install the ground wire between the grounding studs (see figure 13 on page 36 for AC power entry, or figure 14 on page 37 for DC power entry) and the grounding source.

Changing the VI/O configuration jumper

The Model 6476 VI/O is factory configured for 3.3V. Do not change this setting when using ForeFront cards.

Optional Frame Ground/Signal Ground Connect

There are two headers, J4 and J5, located in the power bay area (see figure 12 on page 31). J4 corresponds to signal ground (SG) and J5 corresponds to frame ground (FG). These two headers provide an option to connect

FG and SG. The factory default is for FG and SG to not be connected. Depending on the environment, you can opt to connect the FG/SG for EMC considerations and noise reduction.

To connect FG to SG, do the following:

1. Locate J4 and J5 at the bottom of the power bay area (see figure 12 on page 31).
2. Use a Phillips screwdriver to loosen the screws on both headers.
3. Connect a jumper between J4 and J5 (see figure 15), then secure it with the Phillips head screws.

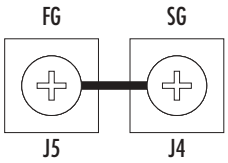


Figure 15. Frame ground connected to signal ground

Chapter 5 Maintenance

Chapter contents

Preventive Maintenance

Cleaning the fan filter

Periodically clean the filter on the Fan Tray Assembly. The frequency of cleaning depends on the environmental conditions of where your equipment is located. Clean filter with a mild detergent and water, then air-dry, or you can use compressed air. It should be completely dry before reuse.

Spare filters (part no. 6470-AF-6) are available from Patton Electronics Company.

Troubleshooting

System won't power up

If the green LED on the power supply module does not light up, you should: remove the power supply module from the chassis, then plug it back in, making sure it is seated properly. If the green LED still does not illuminae, verify that the polarity is wired correctly at the back of the chassis.

If the green LED lights up on the power supply module, but the system still isn't powering-up, then the module may be faulty and should be returned to the manufacturer.

Chapter 6 Contacting Patton for assistance

Chapter contents

Introduction

This chapter contains the following information:

- "Contact information"—describes how to contact Patton technical support for assistance.
- "Warranty Service and Returned Merchandise Authorizations (RMAs)"—contains information about the RAS warranty and obtaining a return merchandise authorization (RMA).

Contact information

Patton Electronics offers a wide array of free technical services. If you have questions about any of our other products we recommend you begin your search for answers by using our technical knowledge base. Here, we have gathered together many of the more commonly asked questions and compiled them into a searchable database to help you quickly solve your problems.

Patton support headquarters in the USA

- Online support—available at **http://www.patton.com**
- E-mail support—e-mail sent to **support@patton.com** will be answered within 1 business day
- Telephone support—standard telephone support is available 5 days a week, from 8:00am to 5:00pm EST (1300 to 2200 UTC/GMT)—by calling **+1 (301) 975-1007**
- Fax—+1 (253) 663-5693

Alternate Patton support for Europe, Middle East, and Africa (EMEA)

- Online support—available at **http://www.patton-inalp.com**
- E-mail support—email sent to **support@patton-inalp.com** will be answered within 1 day
- Telephone support—standard telephone support is available five days a week—from 8:00 am to 5:00 pm CET (0900 to 1800 UTC/GMT)—by calling +41 (0)31 985 25 55
- Fax—+41 (0)31 985 25 26

Warranty Service and Returned Merchandise Authorizations (RMAs)

Patton Electronics is an ISO-9001 certified manufacturer and our products are carefully tested before shipment. All of our products are backed by a comprehensive warranty program.

> **Note** If you purchased your equipment from a Patton Electronics reseller, ask your reseller how you should proceed with warranty service. It is often more convenient for you to work with your local reseller to obtain a replacement. Patton services our products no matter how you acquired them.

Warranty coverage

Our products are under warranty to be free from defects, and we will, at our option, repair or replace the product should it fail within one year from the first date of shipment. Our warranty is limited to defects in workmanship or materials, and does not cover customer damage, lightning or power surge damage, abuse, or unauthorized modification.

Out-of-warranty service

Patton services what we sell, no matter how you acquired it, including malfunctioning products that are no longer under warranty. Our products have a flat fee for repairs. Units damaged by lightning or other catastrophes may require replacement.

Returns for credit

Customer satisfaction is important to us, therefore any product may be returned with authorization within 30 days from the shipment date for a full credit of the purchase price. If you have ordered the wrong equipment or you are dissatisfied in any way, please contact us to request an RMA number to accept your return. Patton is not responsible for equipment returned without a Return Authorization.

Return for credit policy

- Less than 30 days: No Charge. Your credit will be issued upon receipt and inspection of the equipment.
- 30 to 60 days: We will add a 20% restocking charge (crediting your account with 80% of the purchase price).
- Over 60 days: Products will be accepted for repairs only.

RMA numbers

RMA numbers are required for all product returns. You can obtain an RMA by doing one of the following:

- Completing a request on the RMA Request page in the *Support* section at **www.patton.com**
- By calling **+1 (301) 975-1000** and speaking to a Technical Support Engineer
- By sending an e-mail to **returns@patton.com**

All returned units must have the RMA number clearly visible on the outside of the shipping container. Please use the original packing material that the device came in or pack the unit securely to avoid damage during shipping.

Shipping instructions

The RMA number should be clearly visible on the address label. Our shipping address is as follows:

Patton Electronics Company
RMA#: xxxx
7622 Rickenbacker Dr.
Gaithersburg, MD 20879-4773 USA

Patton will ship the equipment back to you in the same manner you ship it to us. Patton will pay the return shipping costs.

Appendix A **Compliance information**

Chapter contents

Radio and TV Interference (FCC Part 15)

This equipment generates and uses radio frequency energy, and if not installed and used properly-that is, in strict accordance with the manufacturer's instructions-may cause interference to radio and television reception. This equipment has been tested and found to comply with the limits for a Class A computing device in accordance with the specifications in Subpart B of Part 15 of FCC rules, which are designed to provide reasonable protection from such interference in a commercial installation. However, there is no guarantee that interference will not occur in a particular installation. If the equipment causes interference to radio or television reception, which can be determined by disconnecting the cables, try to correct the interference by one or more of the following measures: moving the computing equipment away from the receiver, re-orienting the receiving antenna, and/or plugging the receiving equipment into a different AC outlet (such that the computing equipment and receiver are on different branches).

In order to comply with UL60950 leakage current requirements, it is recommended that the AC inputs be supplied from separate and isolated sources.

EC Declaration of Conformity

We certify that the apparatus identified in this document conforms to the requirements of Council Directive 1999/5/EC on the approximation of the laws of the member states relating to Radio and Telecommunication Terminal Equipment and the mutual recognition of their conformity.

The safety advice in the documentation accompanying this product shall be obeyed. The conformity to the above directive is indicated by the **CE** sign on the device.

FCC Part 68 (ACTA) Statement

This equipment complies with Part 68 of FCC rules and the requirements adopted by ACTA. On the bottom side of this equipment is a label that contains-among other information-a product identifier in the format US: **AAAEQ##TXXXX**. If requested, this number must be provided to the telephone company.

The method used to connect this equipment to the premises wiring and telephone network must comply with the applicable FCC Part 68 rules and requirements adopted by the ACTA.

If this equipment causes harm to the telephone network, the telephone company will notify you in advance that temporary discontinuance of service may be required. But if advance notice isn't practical, the telephone company will notify the customer as soon as possible. Also, you will be advised of your right to file a complaint with the FCC if you believe it is necessary.

The telephone company may make changes in its facilities, equipment, operations or procedures that could affect the operation of the equipment. If this happens the telephone company will provide advance notice in order for you to make necessary modifications to maintain uninterrupted service.

If trouble is experienced with this equipment, for repair or warranty information, please contact our company. If the equipment is causing harm to the telephone network, the telephone company may request that you disconnect the equipment until the problem is resolved.

Connection to party line service is subject to state tariffs. Contact the state public utility commission, public service commission or corporation commission for information.

Industry Canada Notice

This equipment meets the applicable Industry Canada Terminal Equipment Technical Specifications. This is confirmed by the registration number. The abbreviation, IC, before the registration number signifies that registration was performed based on a Declaration of Conformity indicating that Industry Canada technical specifications were met. It does not imply that Industry Canada approved the equipment.

This Declaration of Conformity means that the equipment meets certain telecommunications network protective, operational and safety requirements. The Department does not guarantee the equipment will operate to the user's satisfaction. Before installing this equipment, users should ensure that it is permissible to be connected to the facilities of the local telecommunications company. The equipment must also be installed using an acceptable method of connection. In some cases, the company's inside wiring associated with a single line individual service may be extended by means of a certified connector assembly (telephone extension cord). The customer should be aware that compliance with the above condition may not prevent degradation of service in some situations. Repairs to some certified equipment should be made by an authorized maintenance facility designated by the supplier. Any repairs or alterations made by the user to this equipment, or equipment malfunctions, may give the telecommunications company cause to request the user to disconnect the equipment. Users should ensure for their own protection that the ground connections of the power utility, telephone lines and internal metallic water pipe system, are connected together. This protection may be particularly important in rural areas.

Users should not attempt to establish or modify ground connections themselves, instead they should contact the appropriate electric inspection authority or electrician.

Appendix B **Glossary of Terms**

Chapter contents

C

CFM
Cubic feet per minute—A measurement of how much air is moved through a fan.

CSA
Canadian Standards Association—Organization which operates a listing service for electrical and electronic materials and equipment. It is the body that establishes telephone equipment (and other) standards for use in Canada.

CT
Computer Telephony—is the adding of computer intelligence to the making, receiving, and managing of telephone calls.

D

Dual Redundant
An environment containing two power supplies, with fault tolerance such that one power supply may fail and the system will continue to operate.

E

ECTF
Enterprise Computer Telephony Forum—A non-profit corporation formed to focus on the technical challenges of interoperability among Computer Telephony Integration (CTI) products.

EIA
Electronics Industry Association—Trade organization of manufacturers which sets standards for use of its member companies.

EMC
Electromagnetic Compatibility—Is the ability of equipment or systems to be used in their intended environment within designed efficiency levels without causing or receiving degradation due to unintentional EMI.

EMI
Electromagnetic Interference—any electromagnetic interference, periodic or random, narrow or broadband, which may have a disturbing influence on devices exposed to it.

EN
European Norms—Prefix assigned to documents adopted by the CE designating required standards (for example, EN 60950 is the safety specification (equivalent to UL 1950)).

Enumeration
The action taken by the Host to poll the configuration spaces of the PCI devices and allocate (deallocate) the necessary resources (memory and/or I/O address space, interrupts, software drivers).

ESD
Electrostatic Discharge—Discharge of a static charge on a surface or body through a conductive path to ground. Can be damaging to integrated circuits.

Eurocard
A series of mechanical board form factor sizes for rack-based systems.

H

Hot-Swap
The capability of removing and replacing components without turning off the system. Hot-swap capability is increasingly important in systems used for applications such as telecommunications, which require that the system be operational at some level continuously.

HP
Horizontal Positioning—A unit of measurement used for the width of CPCI cards/modules. 1 HP = 0.2” wide

I

IDE
Integrated Drive Electronics—a hard disk drive standard interface for PCs.

IEC
International Electrotechnical Committee

IEEE
Institute of Electrical and Electronics Engineers

IN/C
Insulation No Connect—required for safety agency insulation requirements.

ISA
Industry Standard Architecture—A specification by which Personal Computers (PCs) add boards.

K

Keying
A mechanical means of polarizing connectors in order to prevent similar connectors from being mated. This is necessary when 2 or more similar connectors must be connected to a backplane which requires that the board being connected is unique for a particular slot.

N

N+1 Redundant
An environment containing more than two power supplies, where the power supplies typically current share, with fault tolerance such that one power supply may fail and the system will continue to operate.

NEBS
Network Equipment Building Standards—Defines a rigid and extensive set of performance, quality, environmental and safety requirements developed by Bellcore, the R&D and standards organization owned by the seven regional Bell operating companies (RBOC's).

NP
Not Populated—pins within connector that must not be populated due to safety requirements.

P

PCI
Peripheral Component Interconnect. A specification for defining between logic components. Typically used for interconnecting high-speed, PC-compatible chipset components. The PCI specification is issued through the PCI Special Interest Group (PCI SIG).

PCI SIG
Peripheral Component Interconnect Special Interest Group

PICMG
PCI Industrial Computers Manufacturers Group—a consortium of industrial computer product vendors who develop specifications for PCI-based systems and boards for use in industrial computing applications.

Platform
Describes the system environment, including the backplane and related enclosure.

S

SELV
Safety Extra Low Voltage—a term generally defined by the regulatory agencies as the highest voltage that can be contacted by a person and not cause injury. It is often specifically defined as 30 VAC or 42.4 VDC.

S-HAZ
Secondary Hazardous—any voltage within a system that is greater than 60VDC (42.4VAC-peak), NOT meeting the requirements for a LIMITED CURRENT CIRCUIT, or for a TNV CIRCUIT. Typical ringing voltage is considered SECONDARY HAZARDOUS unless it is current limited. Raw ringing is considered SECONDARY HAZARDOUS. (Refer to IEC950 or PICMG 2.5 R1.0 CompactPCI, Computer Telephony Specification for information.)

Shroud
A male connector body designed to fit over the extended tails of a long tail connector which allows a female connector to be mated from the rear side for midplane or rear I/O applications.

T

TDM
Time Division Multiplex—A technique for transmitting a number of separate data, voice and/or video signals simultaneously over one communications medium by quickly interleaving a piece of each signal one after another.

TNV
Telephone Network Voltages—any voltage present on the telephone network side of the isolation device on any device (for example, board) that connects to the telephone network.

U

U
An EIA unit of measurement equal to 1.75 in. (4.45 cm) for equipment racks.

W

Warm-Swap
An environment supporting removal and insertion of power supplies while under power, wherein the power supply is disabled during insertion and removal, avoiding the need for the connectors to make and break high current connections while under load.