aTCA-81414PD

14U 14-Slot AdvancedTCA® Shelf

User's Manual



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Leading EDGE COMPUTING

Preface

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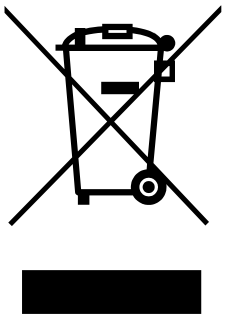
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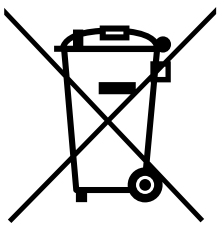
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Battery Labels (for products with battery)









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1 Safety

The intended audience of this User's Manual is system integrators and hardware/software engineers.

1.1 Safety Symbols used in this document

	**Hazardous voltage!** *This is the electrical hazard symbol. It indicates that there are dangerous voltages inside the Shelf.*

	**Caution!** *This is the user caution symbol. It indicates a condition where damage of the equipment or injury of the service personnel could occur. To reduce the risk of damage or injury, follow all steps or procedures as instructed.*

	**Risk of electrostatic discharge!** *The Shelf contains static sensitive devices. To prevent static damage you must wear an ESD wrist strap.*

1.2 General Safety Precautions

	**Warning!** *Voltages over 42 V_{AC} or 60 V_{DC} can be present in this equipment. As defined in the PICMG 3.0 Specification, this equipment is intended to be accessed, installed, and maintained by qualified and trained service personnel only.*

- Service personnel must know the necessary electrical safety, wiring and connection practices for installing this equipment.
- Install this equipment only in compliance with local and national electrical codes.
- For additional information about this equipment, see the PICMG 3.0 Specification (www.picmg.org).

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1.3 References and Architecture Specifications

- Pigeon Point Systems IPM Sentry Shelf-External Interface Reference (*www.pigeonpoint.com*)
- PICMG® 3.0 Revision 3.0 AdvancedTCA® Base Specification (*www.picmg.org*)

1.4 Product Definition

The aTCA-81414PD is a 14-Slot AdvancedTCA® Shelf with 40G backplane connectivity.

450 W high power:

- PEM redundant, 40G Dual Star backplane, bussed IPM interface, dedicated slots for two Shelf Managers.

1.5 Terms and Acronyms

Table 1: Terms and Acronyms

Term	Definition
ATCA	Advanced Telecom Computing Architecture
Backplane	Passive circuit board providing the connectors for the front boards. Power distribution, management and auxiliary signal connections are supported.
CDM	Shelf FRU Data Module
ECN	Engineering Change Notice
ESD	Electrostatic Discharge
ETSI	European Telecommunications Standards Institute
FRU	Field Replaceable Unit
IPMB	Intelligent Platform Management Bus
IPMC	Intelligent Platform Management Controller
IPMI	Intelligent Platform Management Interface
PCB	Printed Circuit Board
PEM	Power Entry Module
RTC	Real Time Clock
RTM	Rear Transition Module
Shelf	Enclosure containing subrack, backplane, boards, cooling devices, PEMs, and Fan Trays
VRTN	Voltage Return

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1.6 Hardware Platform

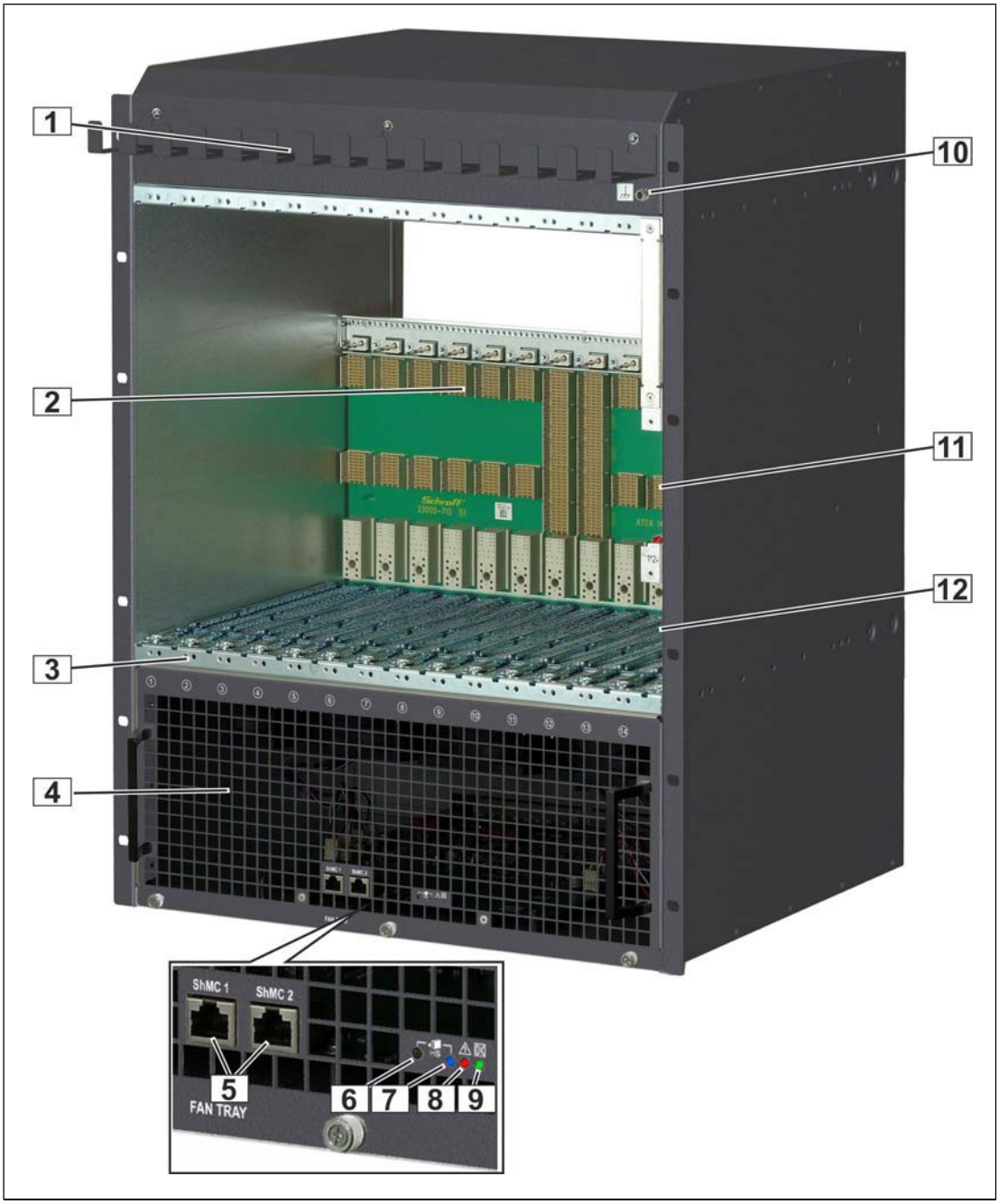
The Shelf is 14 U high and 19“ rack mountable. The chassis is designed for easy access of any Field Replaceable Units (FRU).

- Powder-coated 14U / 19“ chassis with front card cage for ATCA boards and rear card cage for ATCA RTM boards
- 14-slot 40G ATCA Dual Star Backplane, Dual Star Base Interface, bussed IPM interface, supporting 12x8 U node board slots and two 8 U hub slots
- Mounting brackets for 19“ racks and rear fixing point
- ESD Wrist Strap Terminals at the front and the rear
- Two dedicated Shelf Manager bays accepting Shelf Managers
- Front-pluggable, hot-swappable Fan Tray
- Air inlet filter with presence monitoring
- Rear-pluggable Power Entry Module (non-FRU)

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1.7 Shelf Front and Rear View

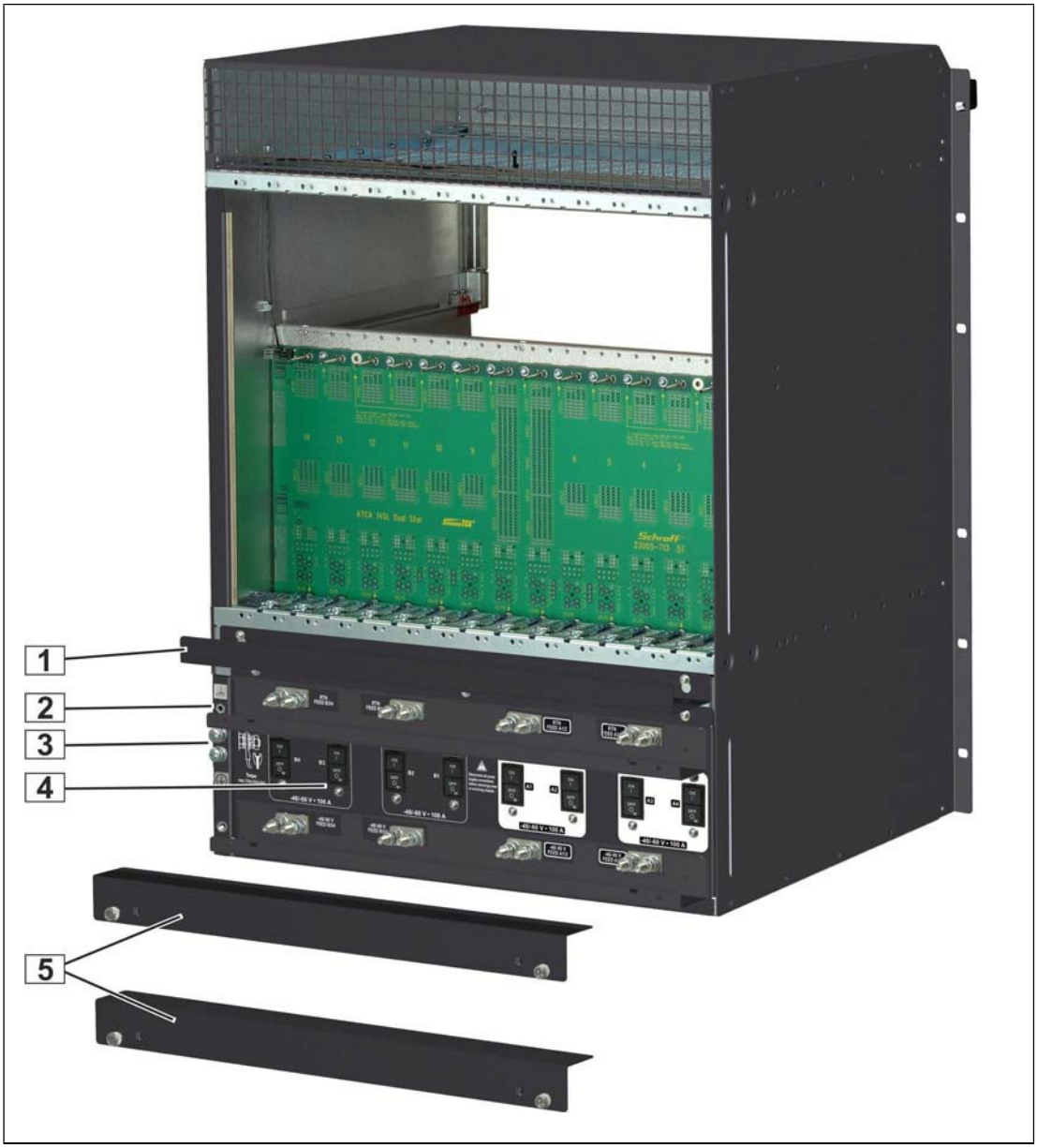
Figure 1: Shelf Front View



1	Cable Tray	7	Hot Swap LED
2	Backplane	8	Fan Tray Fault LED
3	Front Card Cage	9	Fan Tray OK LED
4	Fan Tray	10	ESD Wrist Strap Terminal
5	Serial Interfaces for ShMC	11	Slot for ShMC 1
6	Hot Swap Push Button	12	Slot for ShMC 2

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Figure 2: Shelf Rear View



1	Cable Tray	4	Power Input and Circuit Breakers
2	ESD Wrist Strap Terminal	5	Cover Power Input
3	Ground Terminal		

1.8 ESD Wrist Strap Terminals

	**Risk of electrostatic discharge!** *The Shelf contains static sensitive devices. To prevent static damage you must wear an ESD wrist strap.*

One ESD Wrist Strap Terminal is located at the Shelf‘s upper front side, one ESD Wrist Strap Terminal is located at the left rear side of the Shelf.

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2 ATCA Backplane

The 14-slot ATCA monolithic Backplane provides:

- 40 Gb/s connectivity (4 lanes with 10 Gb/s)
- 10 ATCA Node slots
- 2 ATCA Hub slots
- Two dedicated Shelf Manager slots
- PEM slot
- Fan Tray slot
- SEEPROMs

2.1 Interfaces

2.1.1 Base Interface

Logical slots 1 and 2 are the hub slots for the Dual Star Base Interface.

Base Interface Channel 1 (ShMC) of logical slot 1 and 2 is cross connected to both dedicated Shelf Manager slots on the ATCA Backplane.

2.1.2 Fabric Interface

The Fabric Interface is wired as Dual Star supporting four ports (8 pairs) per channel. See PICMG® 3.0 AdvancedTCA® Base Specification for details.

2.1.3 Synchronization Clock Interface

Six differential pairs of synchronization clocks are bused between all 14 ATCA slots and terminated at both ends with 80.6 Ohms between each differential pair.

2.1.4 Power Interface

Power distribution within the ATCA Backplane is divided into 4 Power Branches. This topology is used for safety reasons to keep the max. current per branch less than 50 A. Slots connected by update ports, are on separate power branches as well as both hub slots, the Shelf Manager slots and the Fan Trays.

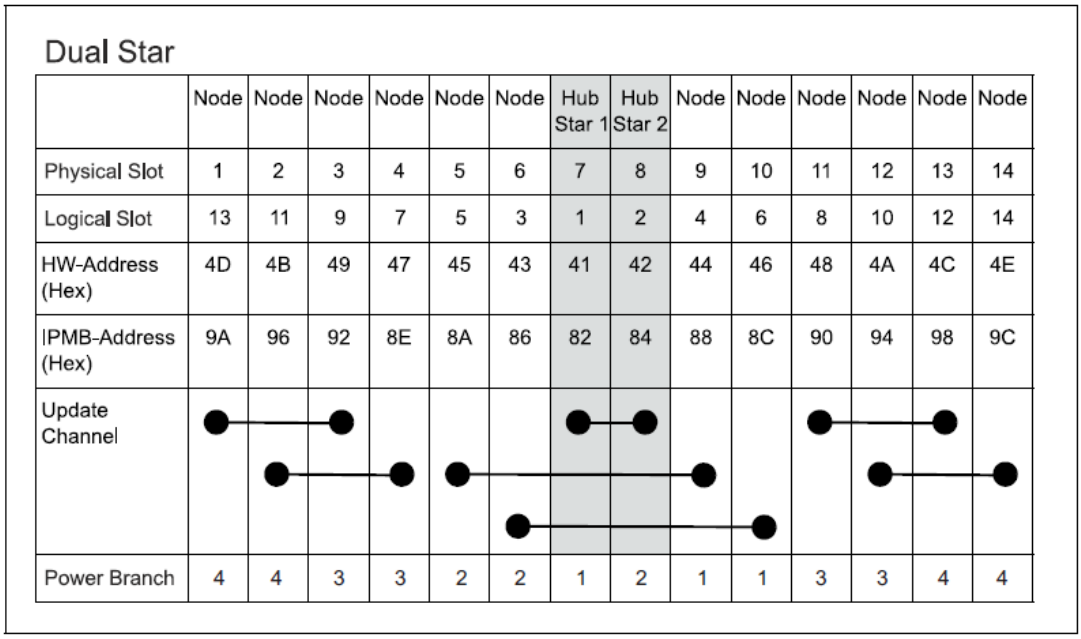
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2.1.5 Update Channel Interface

The Update Channels are wired between two redundant ATCA Backplane slots as 10 differential pairs.

The Update Channel is intended to pass information between two redundant ATCA Boards.

Figure 3: Update Channels



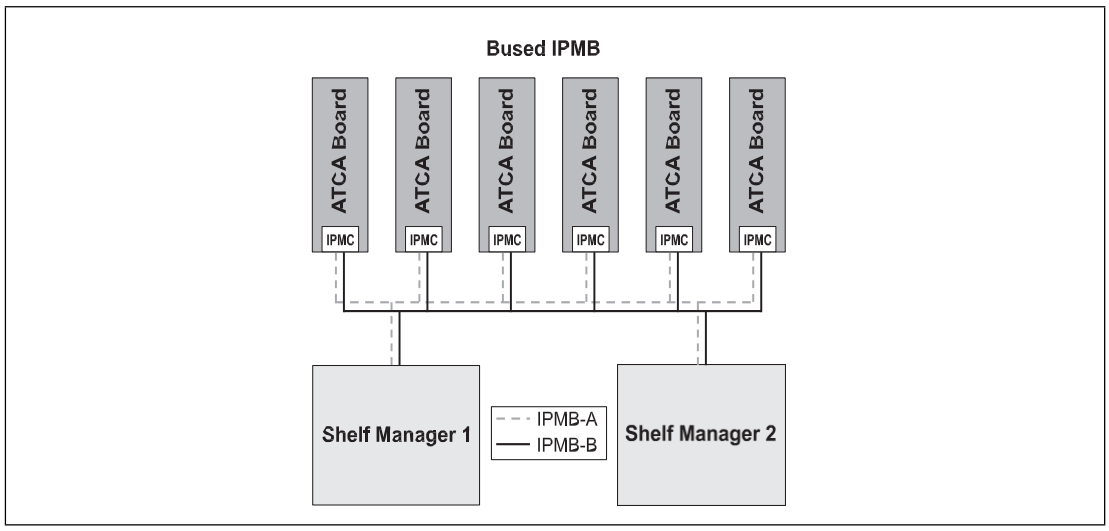
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2.2 Intelligent Platform Management Bus (IPMB)

The Shelf uses an Intelligent Platform Management Bus (IPMB) for management communications among all ATCA Boards, the Fan Trays and the Shelf Managers. The reliability of the IPMB is improved by the addition of a second IPMB, with the two IPMBs referenced as IPMB-A and IPMB-B.

IPMB-A and IPMB-B are routed to the ATCA slots in a bussed configuration.

Figure 4: IPMB



2.3 Shelf SEEPROM

The Shelf SEEPROM is a repository of the shelf-specific information, capabilities of the system and other user configurable options.

The SEEPROM contains as example:

- a list of which slots are connected together
- how the update channels are routed
- how many slots are in the system
- what the maximum power is to each slot
- the serial number of the Shelf
- the backplane topology etc.

The Shelf Managers use this information to provide functions such as electronic keying, controlling the power state of the system, etc.
The Shelf Managers cache the information that is stored in the SEEPROMs so that the SEEPROM is only needed when the Shelf Managers are first inserted or when the Shelf is first turned on.

The redundant SEEPROMs ensure that if one is corrupt or non-functional, the second can provide the necessary information. The Shelf Manager selects what set of information is correct and then synchronizes the two SEEPROMs from the internally cached copy of the SEEPROM information.

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2.3.1 Shelf SEEPROM Location

The SEEPROMs are located at the rear side of the backplane.

2.3.2 Shelf SEEPROMs I²C Addresses

The SEEPROMs have the same address but are on different I²C Channels!

CDM	I²C Channel	I²C Bus Address (7/8 bit)
SEEPROM1	Channel 1	0xa4/52
SEEPROM2	Channel 2	0xa4/52

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2.4 Shelf Manager Cross Connect

The ATCA Backplane provides cross connect traces between the Base Hubs and the Shelf Managers.

Figure 5: Shelf Manager Cross Connect

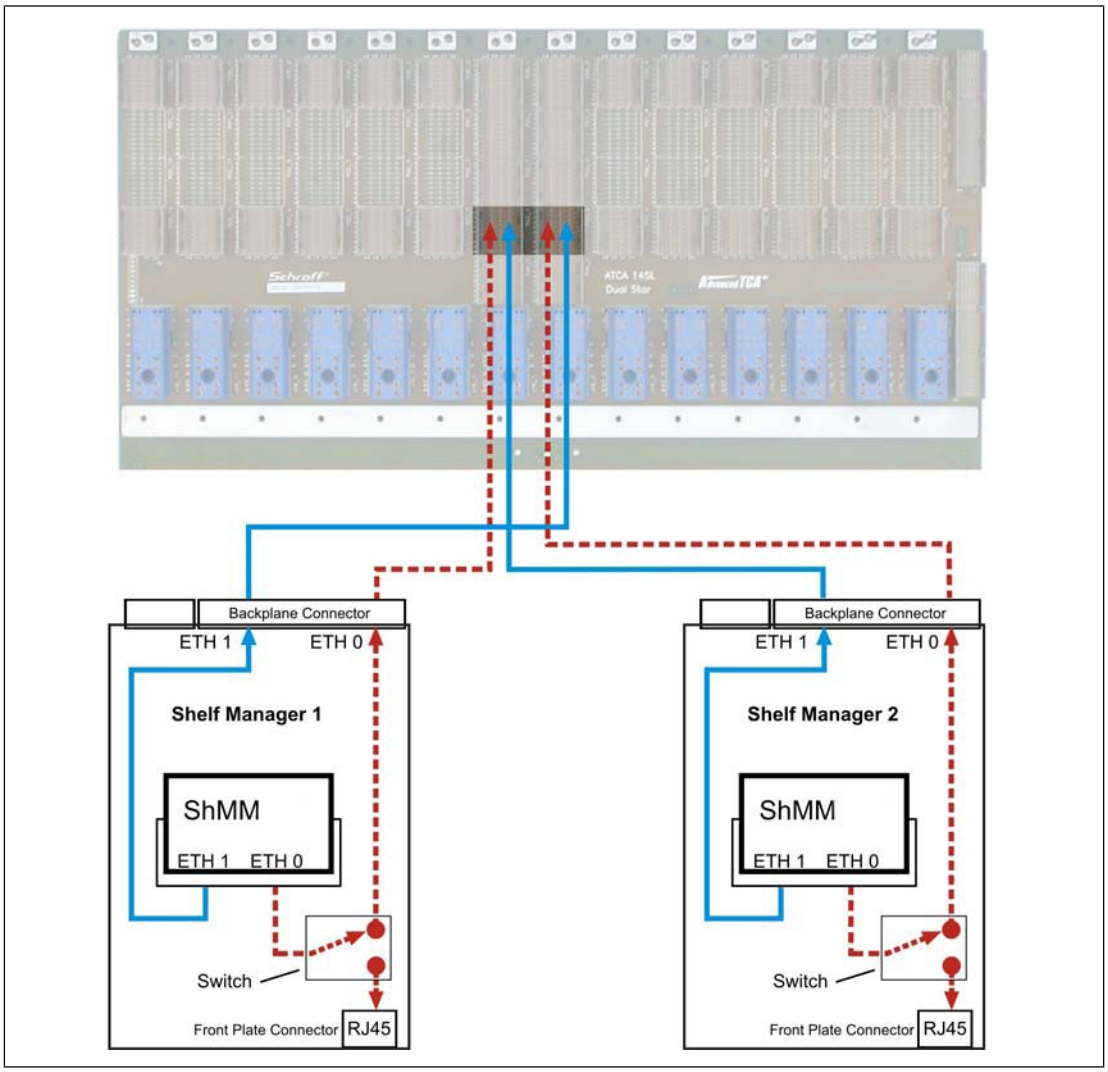


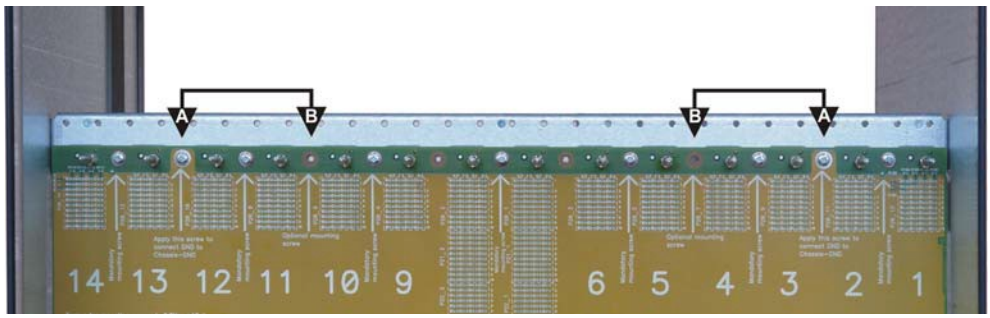
Table 2: Connector (P23) pin assignments for Shelf Manager Cross Connect

Row	Designation	ab		cd		ef		gh	
5	Shelf Manager Port with Shelf Manager Cross Connects	Tx1+	Tx1-	Rx1+	Rx1-	Tx2+	Tx2-	Rx2+	Rx2-
		Shelf Manager Cross Connect 1				Shelf Manager Cross Connect 2			

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2.5 Logic Ground

Figure 6: Logic Ground



The ATCA Backplane provides a mechanism to connect Logic Ground (GND) and Shelf Ground (Shelf_GND). You can connect/isolate Logic Ground by swapping two screws from position (A) to position (B).

- Screws at position (A): Logic Ground and Shelf Ground connected.
- Screws at position (B): Logic Ground and Shelf Ground isolated.

By default, Logic Ground and Shelf Ground are isolated.

Torque for the screws: 0.7 Nm +10%

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3 Air Filter

Figure 7: Air Filter



3.1 Introduction

The ATCA Shelf provides a replaceable air filter located on top of the fan tray. The filter element is an open cell polyurethane foam special coating to provide improved fire retardation and fungi resistance.

The filter meets the requirements of the Telcordia Technologies Generic Requirements GR- 78-CORE specification.

3.2 Air Filter Presence Switch

The air filter presence is detected by a sensor on the backplane. The signal is routed to the IPM controller of the fan tray.

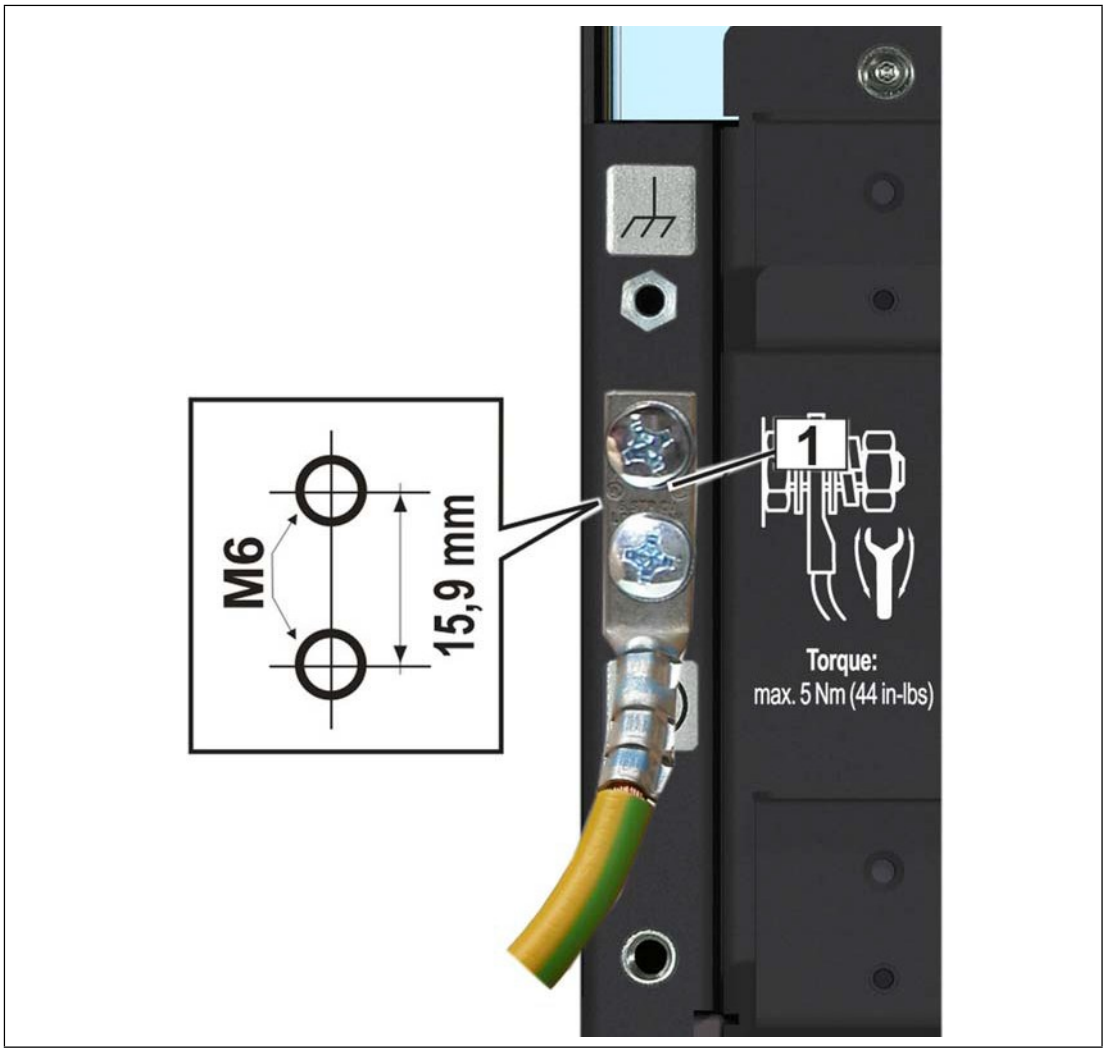
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4 Shelf Ground Connection

	**Hazardous voltage!** *Before powering-up the Shelf, make sure that the Shelf Ground terminals are connected to Protective Earth (PE) of the building.*

The ATCA Shelf provides a Shelf ground terminal at the left rear side. The Shelf ground terminal provides two threads (M6) with a 15.88 mm (5/8“) spacing between thread centers to connect a two hole lug Shelf ground terminal cable.

Figure 8: Shelf Ground Terminal



1 Ground Terminal

4.1 Specification for the Shelf Ground Connection Cable

Required wire size: #3 AWG or #2 AWG, maximum length 3 m.

Required terminals: Use only two hole lug terminals. (For example PANDUIT LCC2-14AHQ or LCD2-14AHQ with 45° angle)

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5 Fan Tray

5.1 Introduction

The Fan Tray is an intelligent FRU controlled by the ShMCs via IPMB.

The interchangeable Fan Tray is equipped with 8 high speed / high air flow fans controlled as a group by the IPM Controller in the Fan Tray.

The Fan Tray is locked into the Shelf with captive screws. A Hot Swap push button is used to provide hot-swap functionality.

The Fan Tray provides:

- A blue Hot Swap LED
- A red Fan Tray Fault LED
- A green Fan Tray OK LED
- A Hot Swap push button

The Fan Tray is controlled via an on-board IPM controller. The Shelf Manager performs management of the Fan Tray through the two independent bussed IPMB connections.

With optional on-blade shelf management, the circuit breaker status signals of the PEM and the SEEPROM on the backplane are connected to the internal I²C bus on the Fan Trays. The on-blade Shelf Manager has access to these components via the IPM controller of the Fan Trays.

The speed of each individual fan is monitored. If any of the fan speeds drops below the desired fan speed, a System Event Log (SEL) entry is logged by the Shelf Manager. The Shelf Manager then generates alerts and sets alarm conditions as necessary.

The system is designed to run indefinitely with any single fan failure. When one fan fails, all other fans are set to full speed.



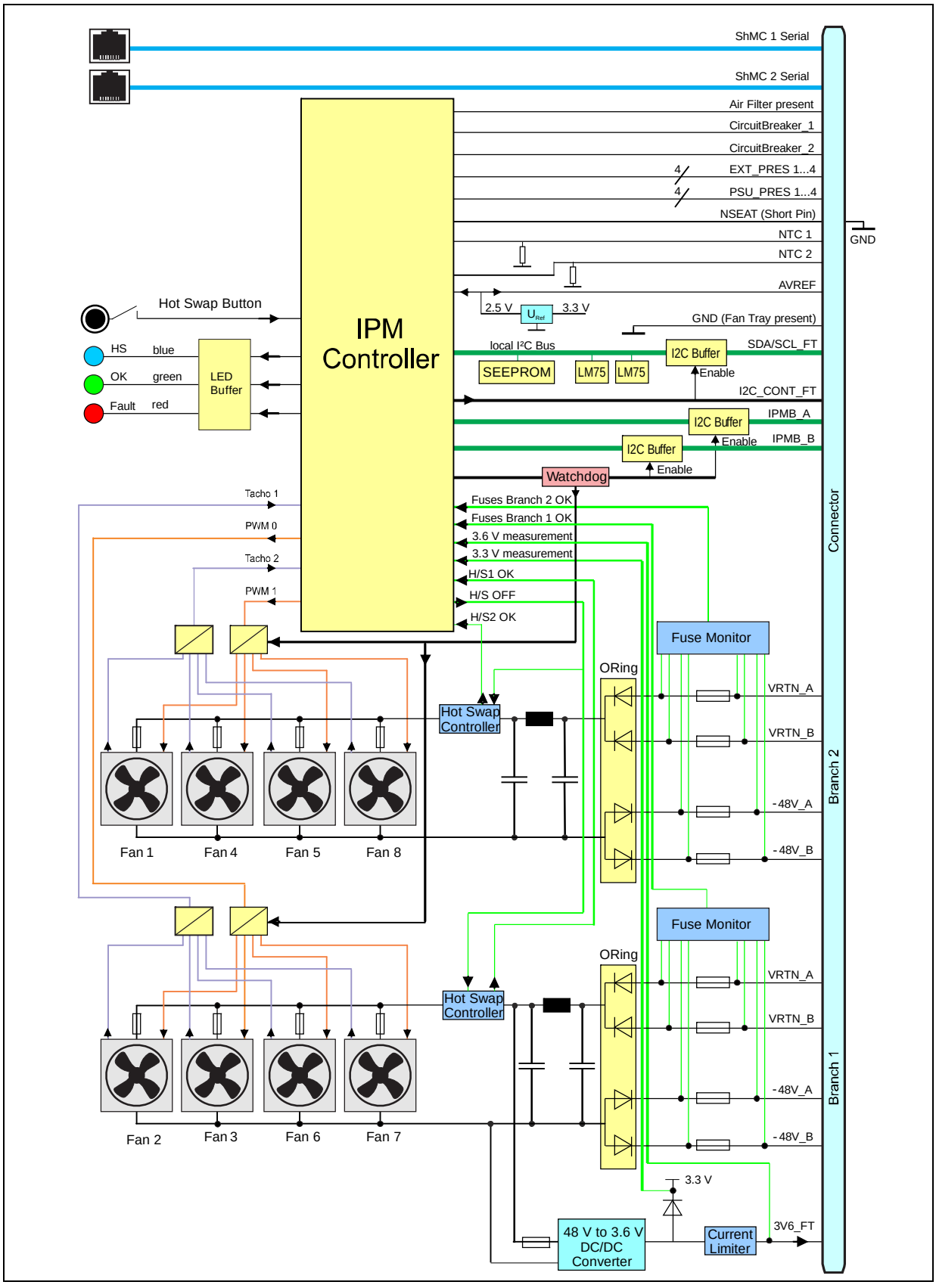
Caution!

The fan tray is not redundant. Depending on the operation temperature and the load state a fan tray swap must be carried out within a maximum of 30 seconds.

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5.2 Fan Tray Block Diagram

Figure 9: Fan Tray Block Diagram



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Figure 10: Fan Tray



5.3 Fan Tray Connectors and Indicators

The front panel includes a green Fan Tray OK LED, a red Fan Tray Fault LED, and a blue Hot Swap LED.

The Hot Swap push button indicates to the Shelf Managers that the Fan Tray is about to be removed. Its use is optional, but it is provided so that service personnel can be trained to look for a blue LED to be illuminated on any active component before removing it from the system. Once the operator pushes the Hot Swap button, the Shelf Manager is informed of the pending extraction. When the Shelf Manager feels it is “safe“ to remove the Fan Tray, the blue Hot Swap LED illuminates solid.

Table 3: LEDs on Fan Tray front panel

Color	Description	Status	Condition
Green	Fan Tray OK LED	Off	No Power to the Fan Tray
		Solid green	Normal Operation
Red	Fan Tray Fault LED	Solid red	Attention Status (error condition)
Blue	Hot Swap LED	Off	No Power to the Fan Tray, or not OK to extract the Fan Tray
		Short blink	Preparing for extraction
		Solid blue	Ready to remove

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5.4 RS-232 Serial Console Interfaces

The Fan Tray provides two RS-232 serial console connectors for Shelf Manager 1 and 2. The connectors are 8-pin RJ45 modular receptacles.

A full set of RS-232 signals, including modem control is provided.

Table 4: RS-232 Serial Console Interface Pin assignment

RJ45 Pin	RS-232 Signal	Type	Description
1	RTS	Out	Request To Send
2	DTR	Out	Data Terminal Ready
3	TxD	Out	Transmit Data
4	GND	---	Logic Ground
5	GND	---	Logic Ground
6	RxD	In	Receive Data
7	DSR	In	Data Set Ready
8	CTS	In	Clear To Send

The serial console default configuration is:

115200 baud

no parity

8 data

bits

1 stop bit

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6 Power

	**Hazardous voltage!** *Before working ensure that the power is removed from the power connection cables.*

The shelf supports low-power and high-power DC-Power Entry Modules (PEMs) with or without redundant inputs.

The pluggable DC Power Entry Module (PEM) is located at the rear bottom side of the Shelf. The PEM provides power terminals for 100 A power feeds. Each power feed consists of a –48 V_{DC} cable and its corresponding RTN cable.

The power filtering consists of filtered power terminals and a discrete line-filter for each power branch. The input voltage range for the Shelf is from -40 V_{DC} to -75 V_{DC}.

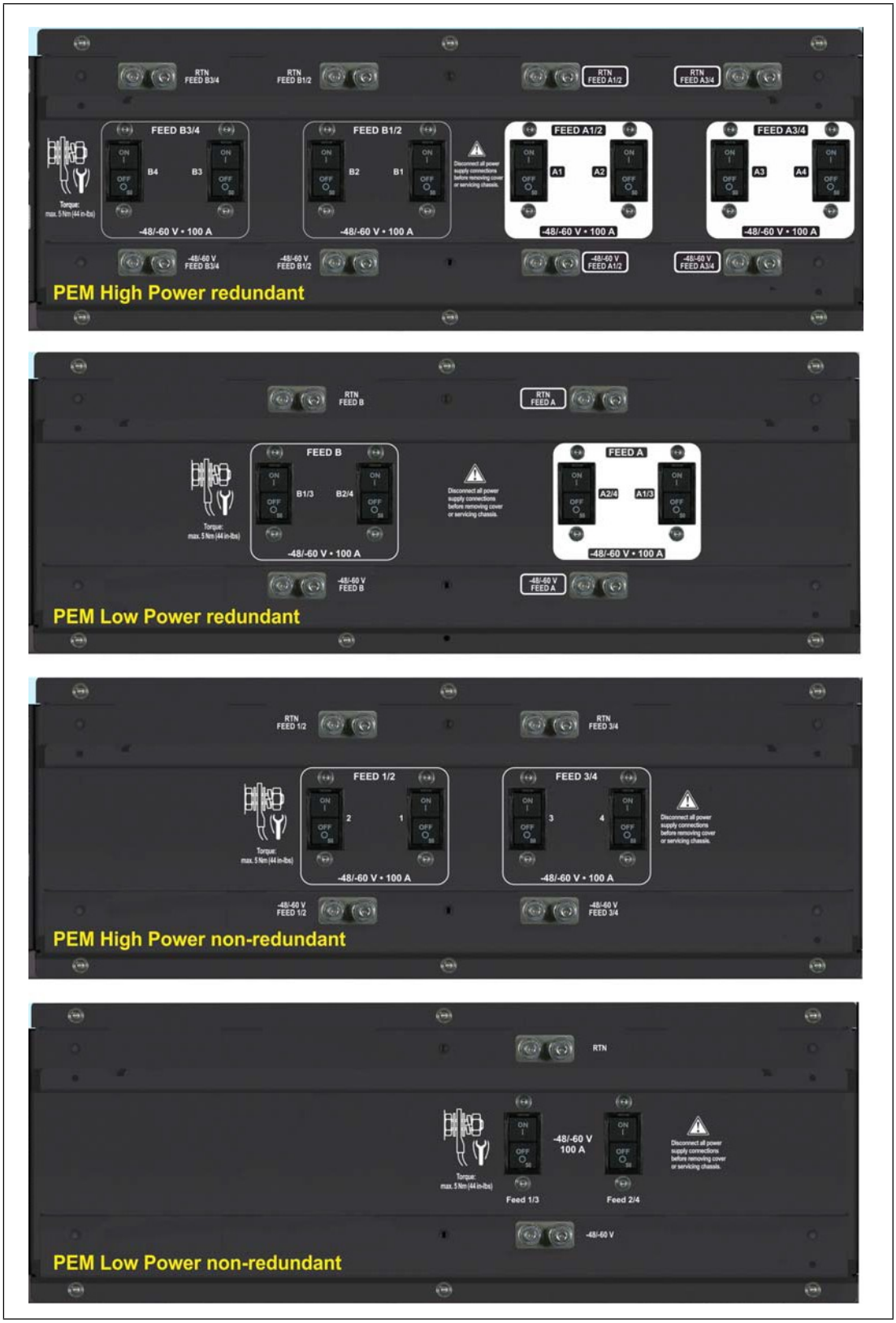
Overcurrent protection is provided by 100 A circuit breakers in the -48 VDC input lines. Power distribution within the PEM is divided into 4 power branches.

The System can be powered using a regular telecommunication power supply of -48/-60 V_{DC} with a V_{DC} return. The specified voltage range is from -40 V_{DC} to-75 V_{DC}. The Shelf supports redundant power inputs but the two inputs should be independently powered.

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6.1 PEM Overview

Figure 11: Available PEMs

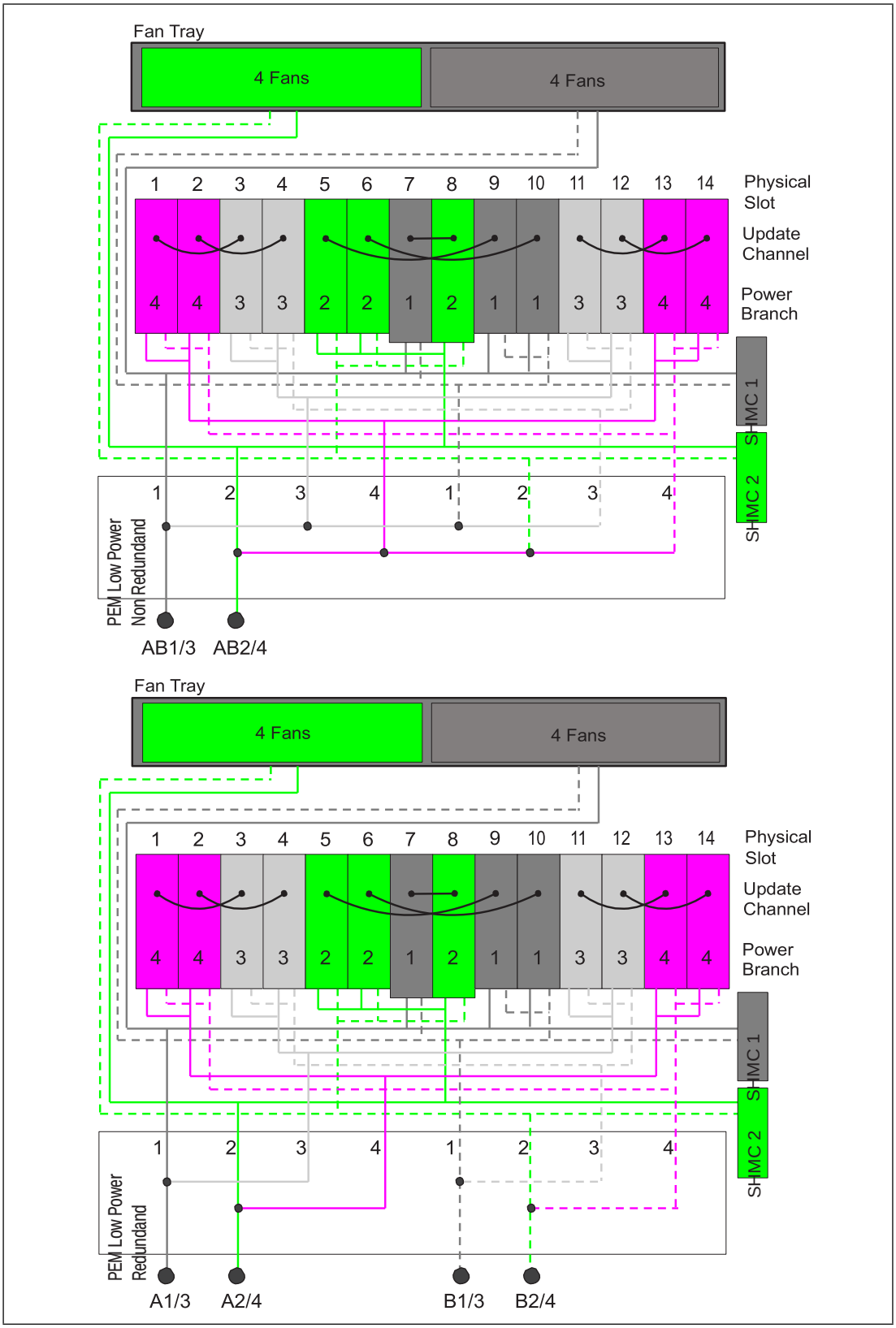


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6.1.1 Power Distribution

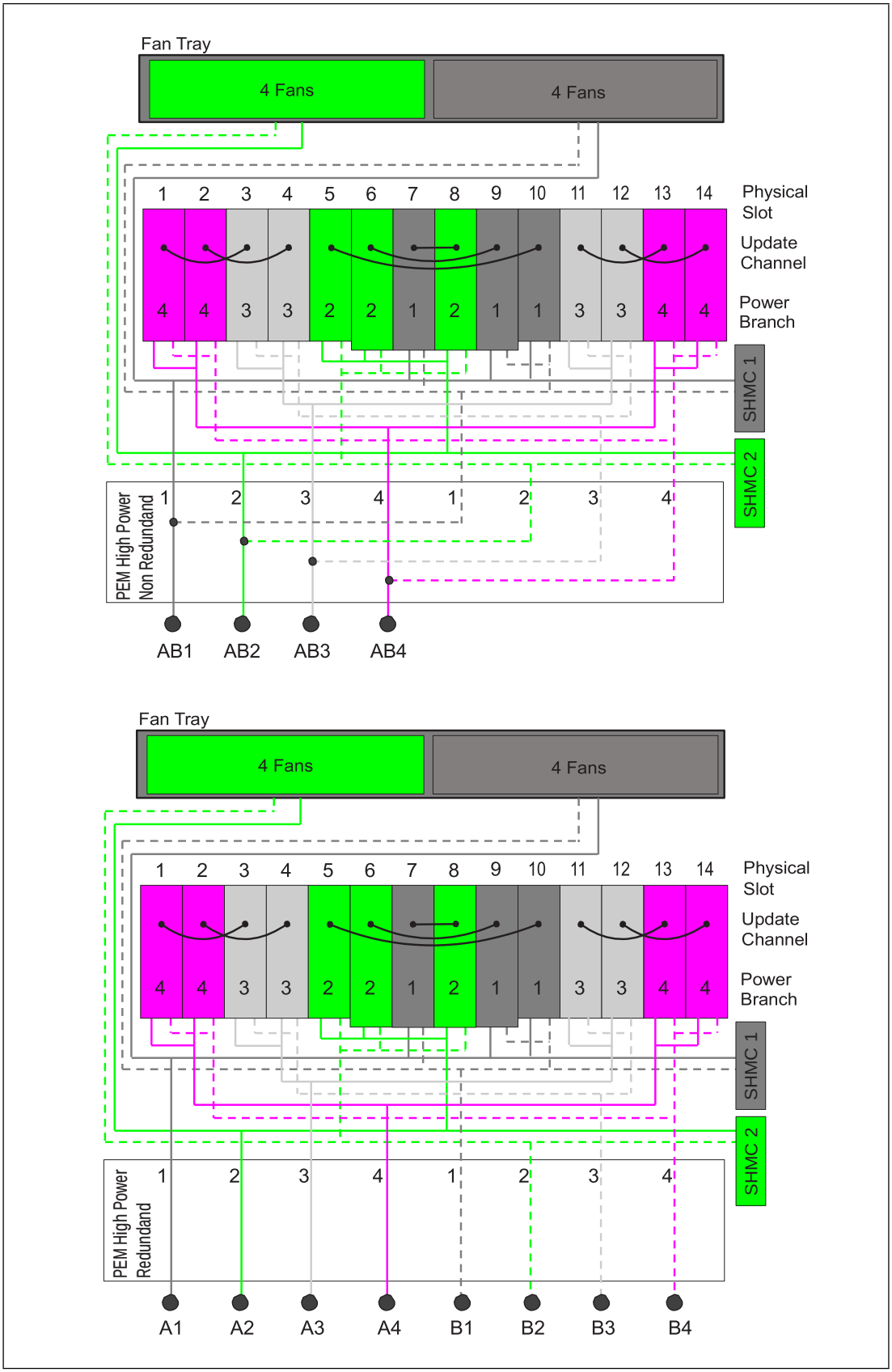
Power distribution within the Shelf originates from the PEM and powers all the blades, the Shelf Managers and the Fan Trays. The power is divided in 4 output branches towards the backplane.

Figure 12: Power Distribution Low Power PEMs



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Figure 13: Power Distribution High Power PEMs



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6.2 DC Specifications for the Power Cables

The PEM provides power terminals with M6 studs for the -48 V and the RTN feed. The stud spacing is 5/8“ (15.875 mm).



Caution!

The wiring methods and conductor sizes must be in compliance with local and national electrical codes and regulations.
The following wiring scenarios are only recommendations. The suggested wire size is for single conductors in free air with a temperature rating of 90 °C, based on the resp. tables of the National Electrical Code (NEC) or the Canadian Electrical Code (CEC).

Required cable size: #3 AWG, suitable for min. 90°C (194°F), maximum length = 3 m.

Recommended cable lug: Burndy YA2CL2NT14 or equivalent.

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7 Shelf Management

The aTCA-81414PD is designed to work with two redundant Shelf Managers in dedicated Shelf Manager slots.

Upon request a version with on-blade shelf management is available. With on-blade shelf management, the SEEPROMs on the backplane are connected to the internal I²C bus on the Fan Trays. The on-blade Shelf Manager has access to these components via the IPM controller of the Fan Trays.

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8 Technical Data

Table 5: Technical Data

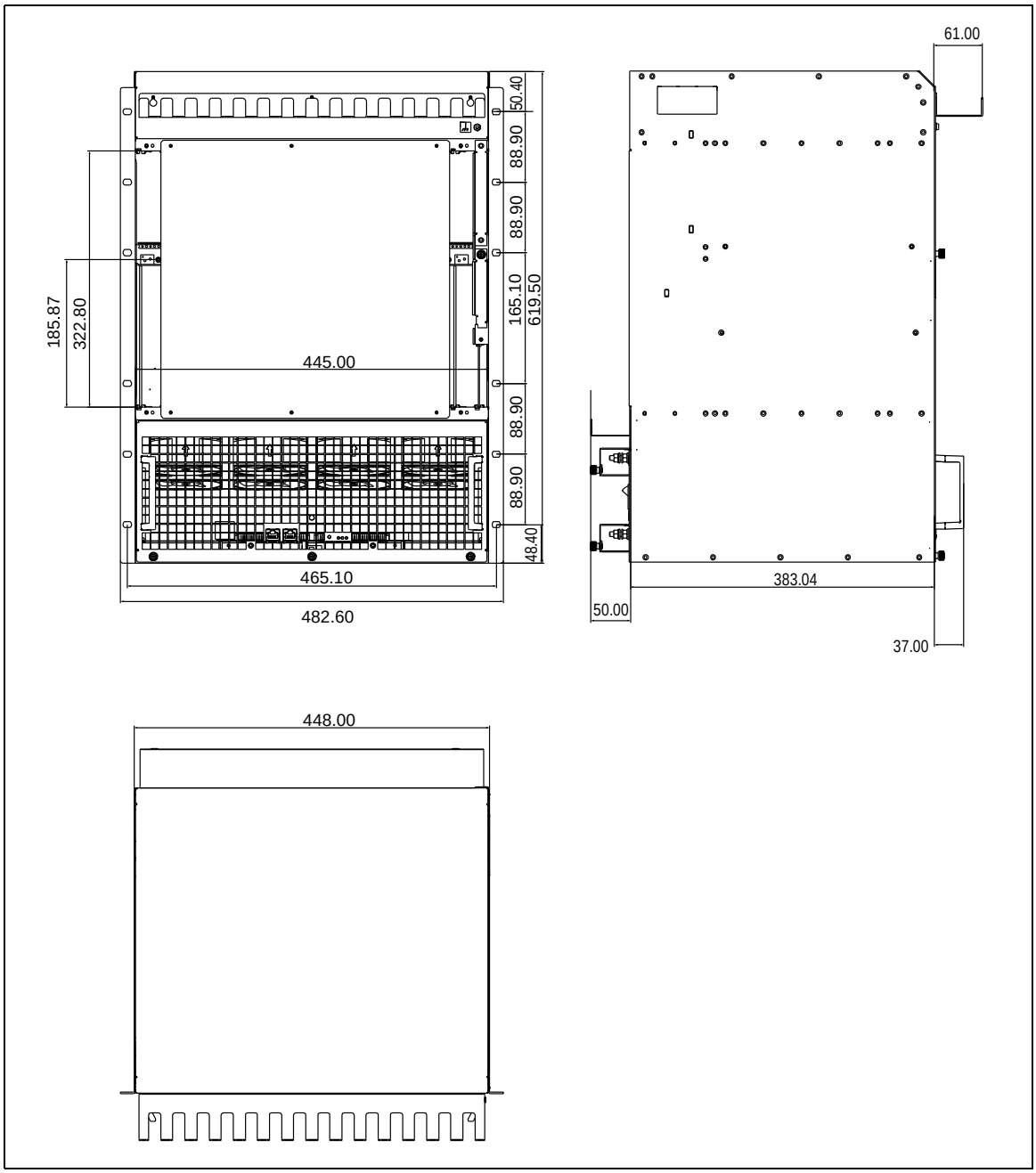
Physical Dimensions	
Height	14 U
Width	482.6 mm
Depth (with handles)	470 mm
Weight	
Net Weight	38 kg
Gross Weight (including packaging)	73 kg
Power DC	
Input voltage nom.	-48/-60 V_{DC}
Input voltage range	-40 V_{DC} to -75 V_{DC}
Input Power Protection	100 A
Cooling Capacity	
Front Boards	400 W / Board
RTM	50 W / Board
Environmental	
Ambient temperature (long term)	+5°C…+40°C (41°F to 104°F)
Ambient temperature (short term)	-5°C…+55°C (23°F to 131°F)
Humidity	+5%...+85%, no condensation
EMI	
Conducted Emissions	EN 55022 Class A
Radiated Emissions	EN 55022 Class A
Safety	
Protected Earth Test	EN50514, test current 25 A, resistance <100 mOhm
Hipot Test (DC system)	EN60950 -1000 V_{DC}

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8.1 Dimensions

All dimensions below are in mm.

Figure 14: Dimensions



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