14U 14-slot ATCA Shelf

User‘s Manual

Product Numbers:

11990-900/901/902/903

Doc-No: 63972-344_R1.1

March 2018

R1.0	March 2018	rebranded

Impressum:

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The details in this manual have been carefully compiled and checked.

The company cannot accept any liability for errors or misprints. The company reserves the right to amendments of technical specifications due to further development and improvement of products.

Table of Contents

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.*

	**Danger 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, to be 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.com*).

1.3 References and Architecture Specifications

- User Manual Shelf Manager ACB-VI, order-no.: 63972-331
- Pigeon Point Systems IPM Sentry Shelf-External Interface Reference (*www.pigeonpoint.com*)
- PICMG® 3.0 Revision 3.0 AdvancedTCA® Base Specification (*www.picmg.com*)

1.4 Product Definition

The Schroff 11990-90x are 14 Slot AdvancedTCA 40G Shelves with 40G backplane connectivity. Different versions are available:

250 W low power:

- **11990-900:** PEM 250 W **non** redundant, 40G Dual Star backplane, bussed IPM interface, dedicated slots for two Schroff ACB-VI Shelf Managers.
- **11990-901:** PEM 250 W redundant, 40G Dual Star backplane, bussed IPM interface, dedicated slots for two Schroff ACB-VI Shelf Managers.

450 W high power:

- **11990-902:** PEM 450 W **non** redundant, 40G **Dual-Dual** Star backplane, bussed IPM interface, dedicated slots for two Schroff ACB-VI Shelf Managers.
- **11990-903:** PEM 450 W redundant, 40G **Dual-Dual** Star backplane, bussed IPM interface, dedicated slots for two Schroff ACB-VI 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

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).

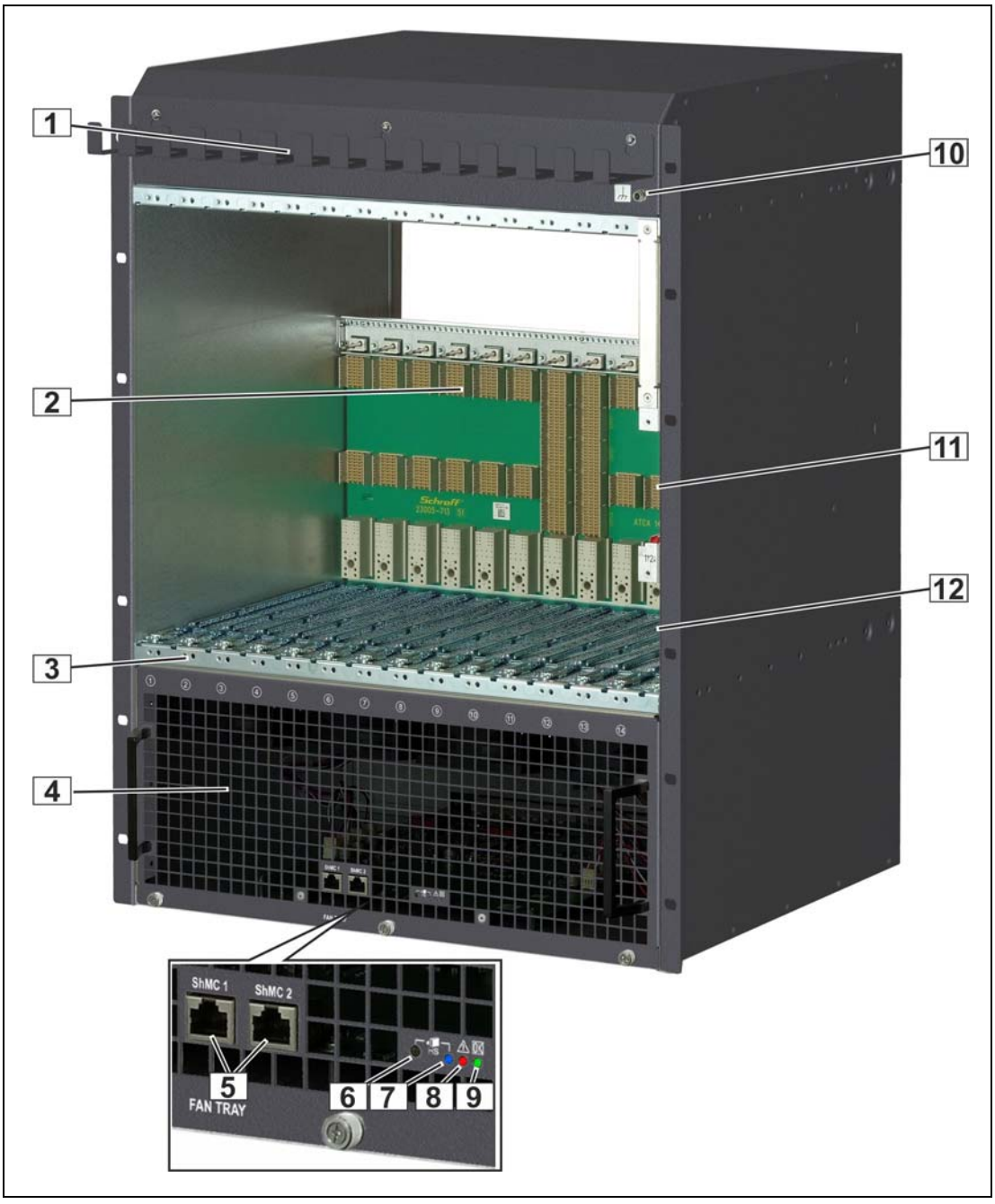
- Powder-coated 14 U / 19“ chassis with front card cage for ATCA boards and rear card cage for ATCA RTM boards
- 14 slot 40G ATCA Dual or Dual-Dual Star Backplane , Dual Star Base Interface, bussed IPM interface, supporting 12x8 U node board slots and two 8 U hub slots
- Mounting brackets for 19“ racks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

The torque of all FRU (Fan Tray, Air Filter, PEM, PEM cover) fixing screws is 0.7 Nm (6.2 in-lbs)

All pictures in this manual may differ from the latest series.

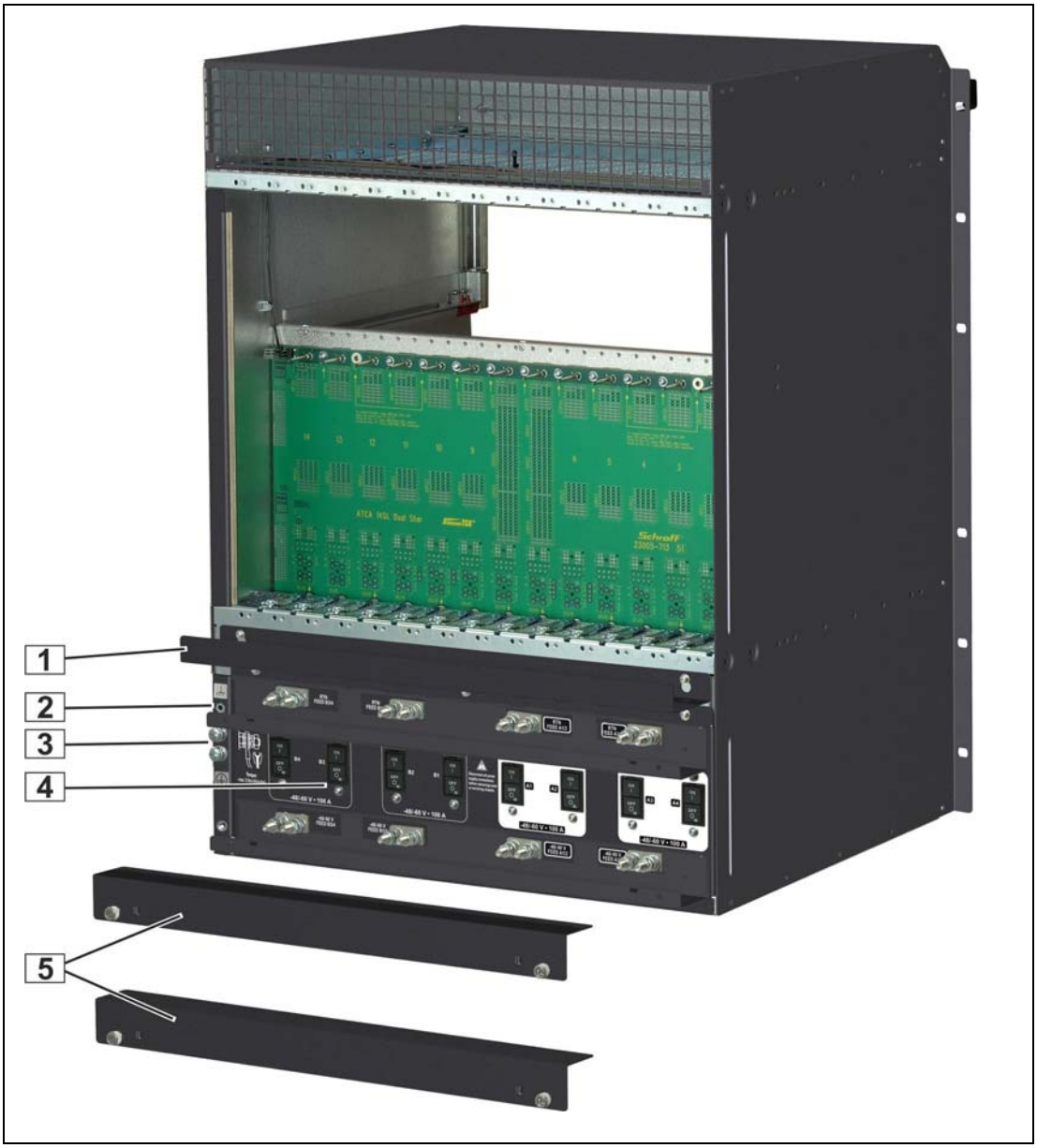
1.7 Shelf Front and Rear View

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

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

	**Danger 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.

2 ATCA Backplane

The 14-slot ATCA monolithic Backplane provides:

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

Depening on the system configuration, the Fabric Interface is wired as Dual Star or Dual-Dual Star, supporting four ports (8 pairs) per channel.

The Dual-Dual Star Backplane is capable of supporting two distinct and redundant switching fabrics.

Node boards supporting the Dual-Dual Star Topology have four Channels connected to two sets of redundant Hub Boards. The second set of Hub Boards, installed in Logical Slots 3 and 4, serve Channels 3 and 4 of Fabric Interfaces of the Node Boards.

See PICMG® 3.0 AdvancedTCA® Base Specification for details.

2.1.3 Synchronization Clock Interface

6 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 the 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.

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

Dual Star

	Node	Node	Node	Node	Node	Node	Hub Star 1	Hub Star 2	Node	Node	Node	Node	Node	Node
Physical Slot	1	2	3	4	5	6	7	8	9	10	11	12	13	14
Logical Slot	13	11	9	7	5	3	1	2	4	6	8	10	12	14
HW-Address (Hex)	4D	4B	49	47	45	43	41	42	44	46	48	4A	4C	4E
IPMB-Address (Hex)	9A	96	92	8E	8A	86	82	84	88	8C	90	94	98	9C
Update Channel														
Power Branch	4	4	3	3	2	2	1	2	1	1	3	3	4	4

Dual Dual Star

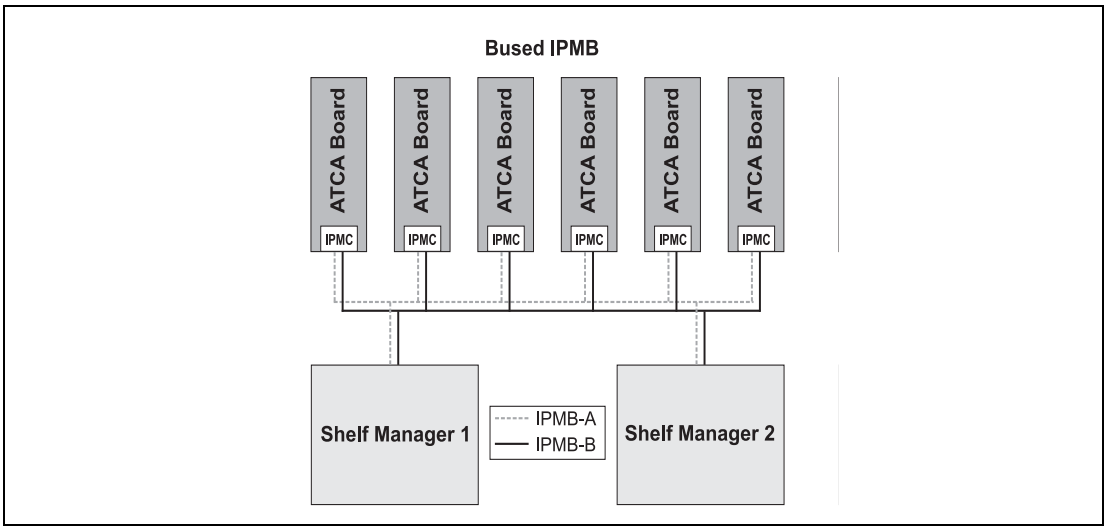
	Node	Node	Node	Node	Node	Hub Star 3	Hub Star 1	Hub Star 2	Hub Star 4	Node	Node	Node	Node	Node
Physical Slot	1	2	3	4	5	6	7	8	9	10	11	12	13	14
Logical Slot	13	11	9	7	5	3	1	2	4	6	8	10	12	14
HW-Address (Hex)	4D	4B	49	47	45	43	41	42	44	46	48	4A	4C	4E
IPMB-Address (Hex)	9A	96	92	8E	8A	86	82	84	88	8C	90	94	98	9C
Update Channel														
Power Branch	4	4	3	3	2	2	1	2	1	1	3	3	4	4

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



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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.

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

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

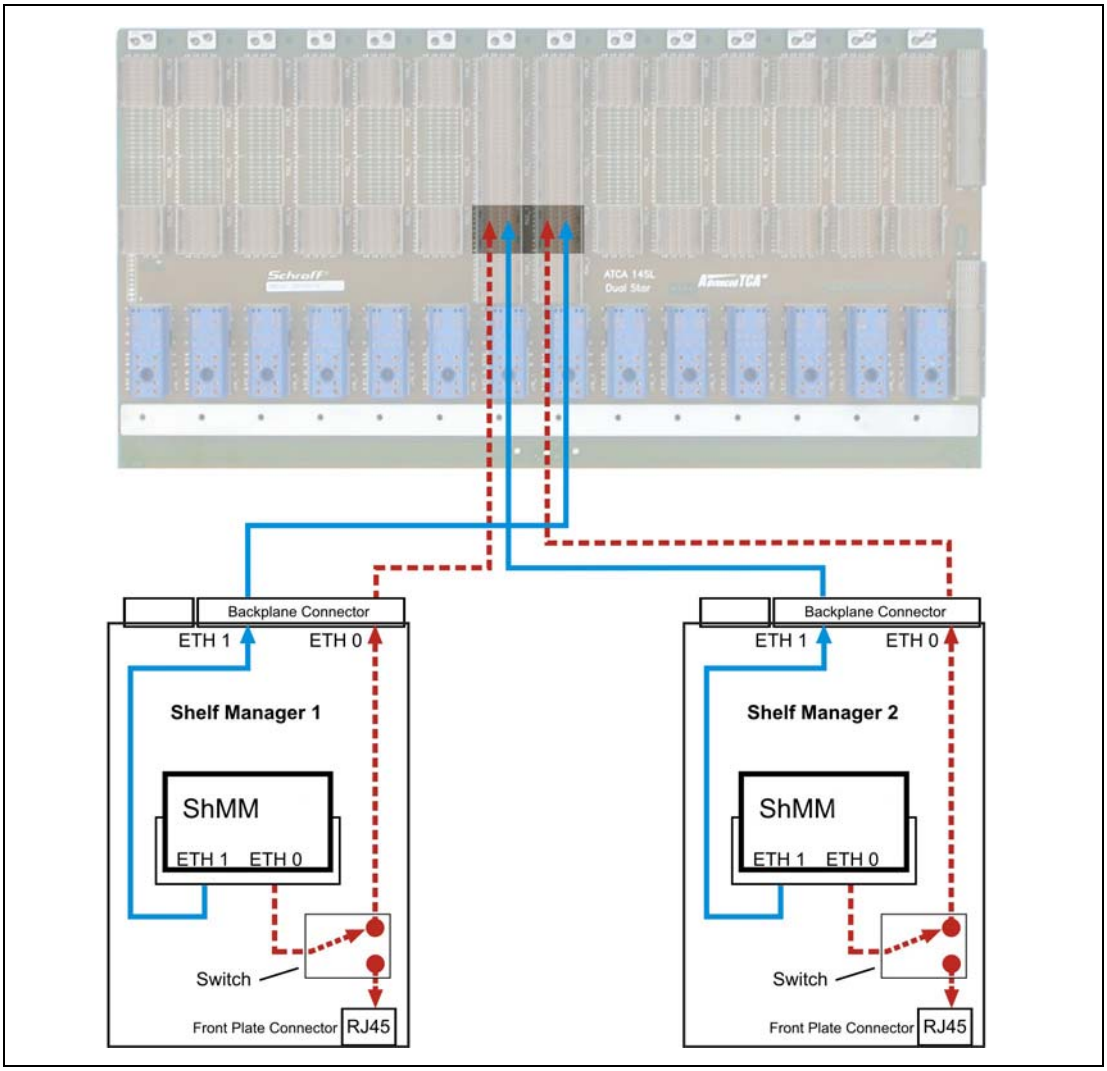

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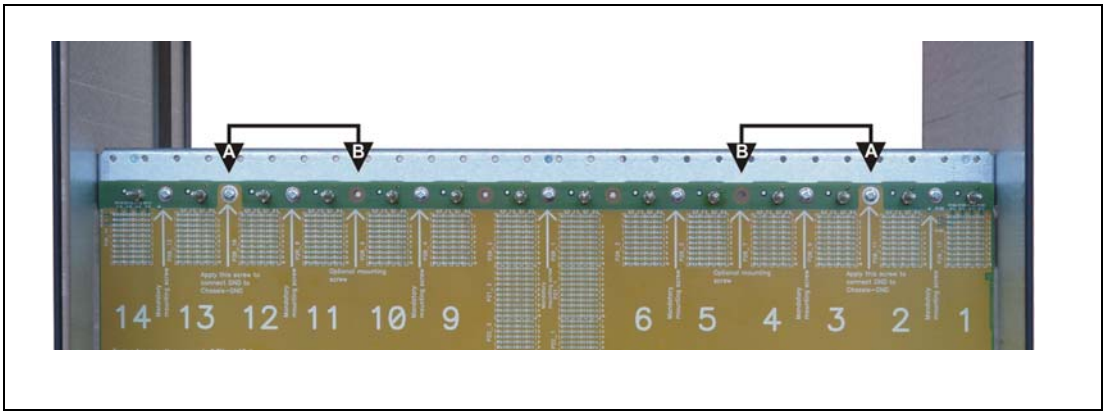
Table 2: Connector (P23) pin assignments for Shelf Manager Cross Connect

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			

2.5 Logic Ground

Figure 6: Logic Ground



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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 is isolated.

Torque for the screws: 0.7 Nm +10%

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

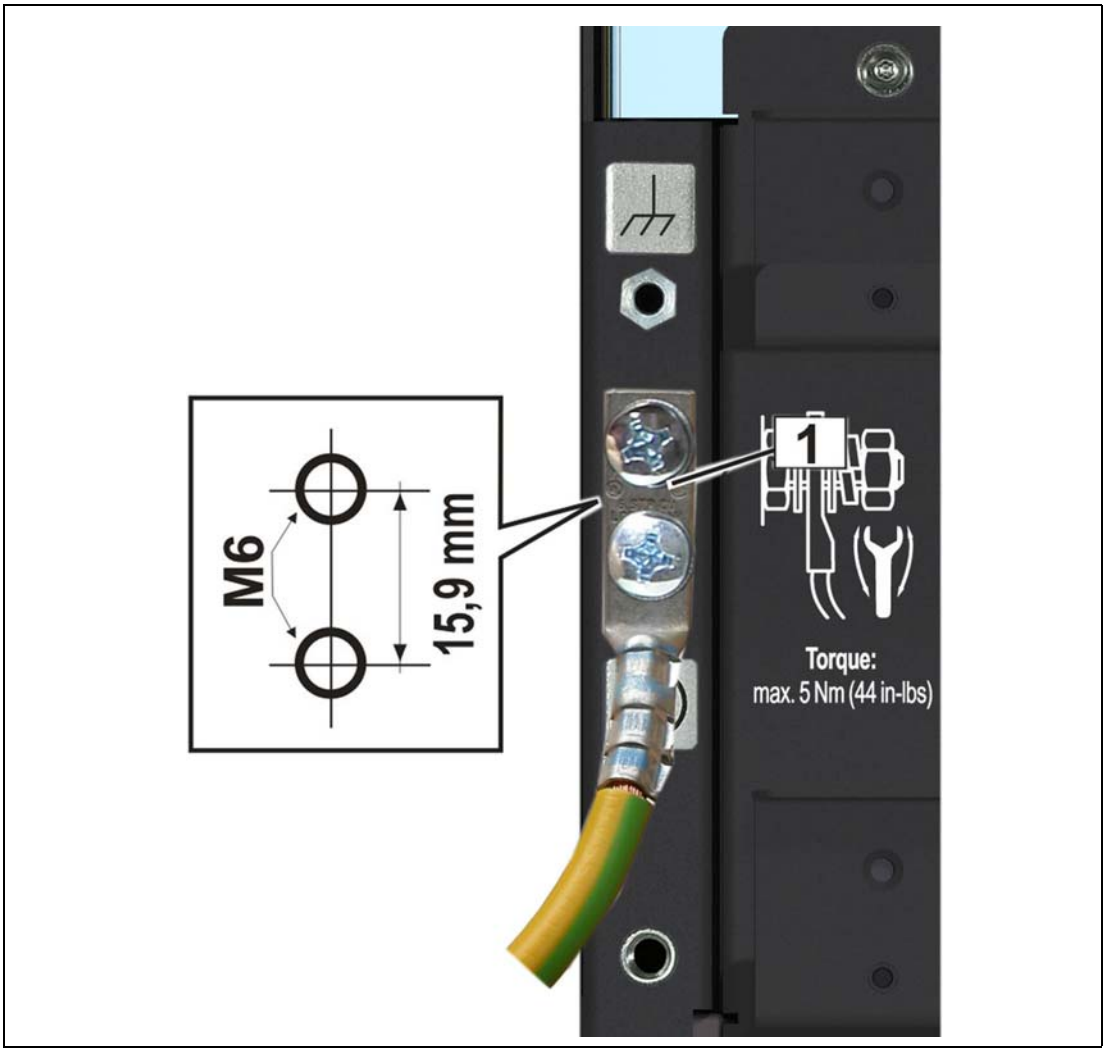
The air filter presence is detected by a sensor on the backplane. The signal is routed to the IPM controller of the fan tray.

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)

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 Alarm 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 I^2C 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.*

5.2 Fan Tray Block Diagram

Figure 9: Fan Tray Block Diagram

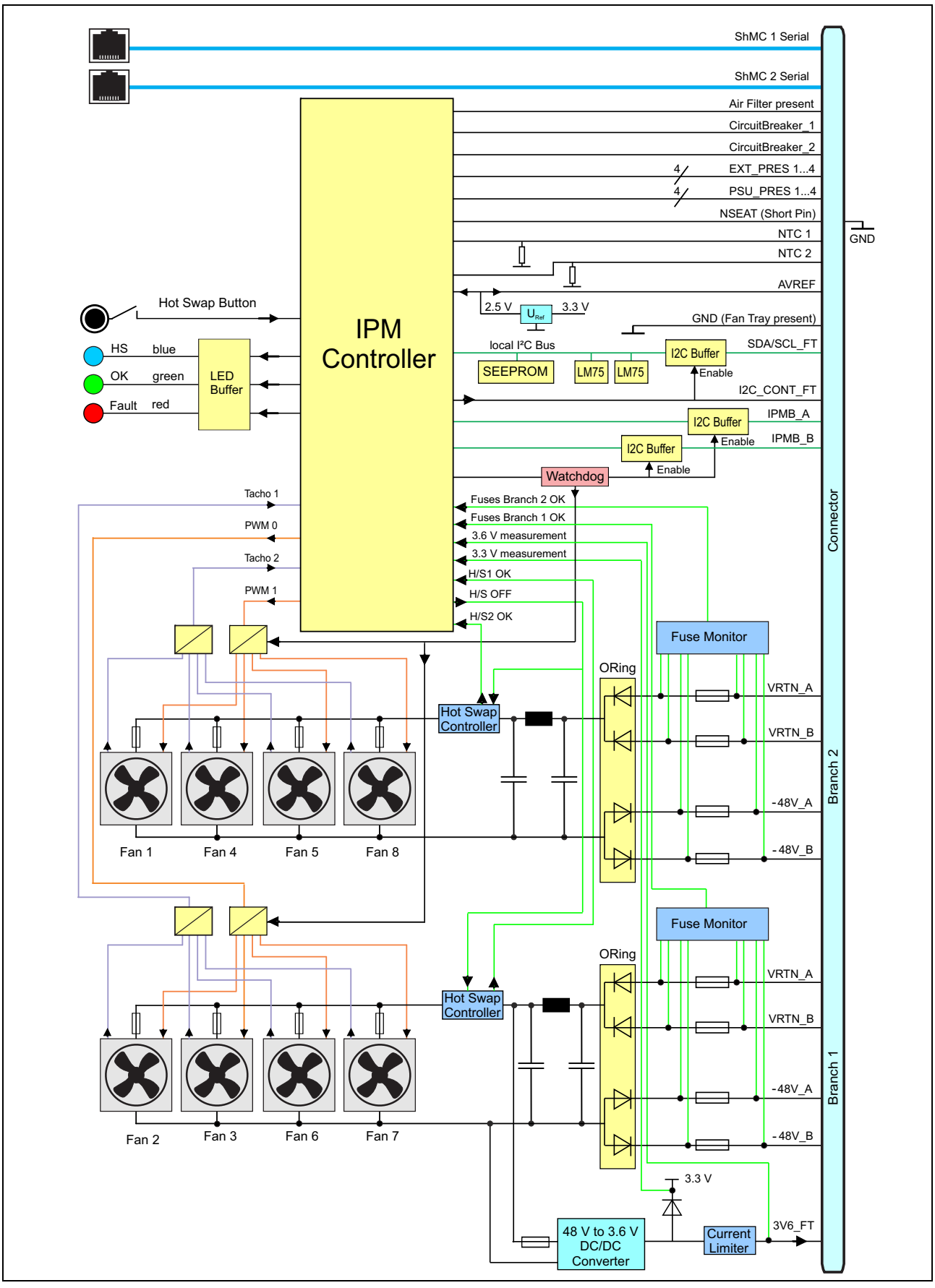
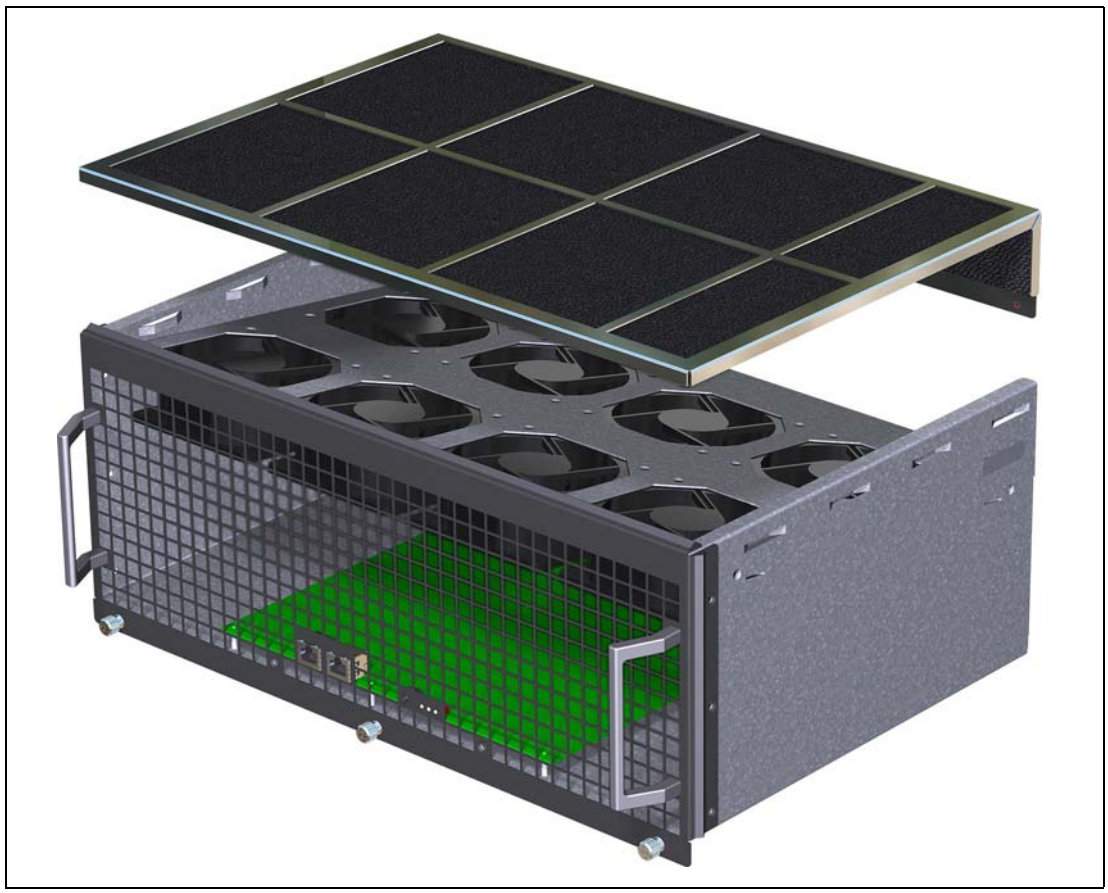


Figure 10: Fan Tray



5.3 Fan Tray Connectors and Indicators

The front panel includes a green and red status 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	OK LED	Off	No Power to the Fan Tray
		Solid green	Normal Operation
Red		Solid red	Attention Status (error condition)
Blue	Hot Swap LED	Off	No Power to the Fan Tray or not OK to extract Fan Tray
		Short blink	Preparing for extraction
		Solid blue	Ready to remove

5.4 Fan Control

The Fan Tray‘s on-board IPM controller has 2 operation modes:

Shelf Manager Mode:
The Shelf Manager performs management of the Fan Tray through the two independent bussed IPMB connections.

Autonomous Mode:
When the connection to the Shelf Manager is lost, or the Shelf Manger is absent, the fan controller takes over the fan control after 65 seconds.

4 different control behaviours are user-selectable by a DIP-switch located at the fan tray‘s rear side.

(1) Full speed
Fan level is set to maximum (15)

(2) Outlet temperature based control
The fan level depends on the reading of the NTC sensor above the card cage and the selected curve

(3) Intake temperature based control
The fan level depends on the reading of the LM75 temperature on the fan tray PCB and the selected curve

(4) Differential temperature based control
The fan controller adjusts the fan speed according to the difference between the intake temperature and the outlet temperature. The intake temperature is determined by an LM75 temperature sensor on the an tray PCB, the outlet temperature by an NTC sensors located above the card cage

Figure 11: DIP Switch

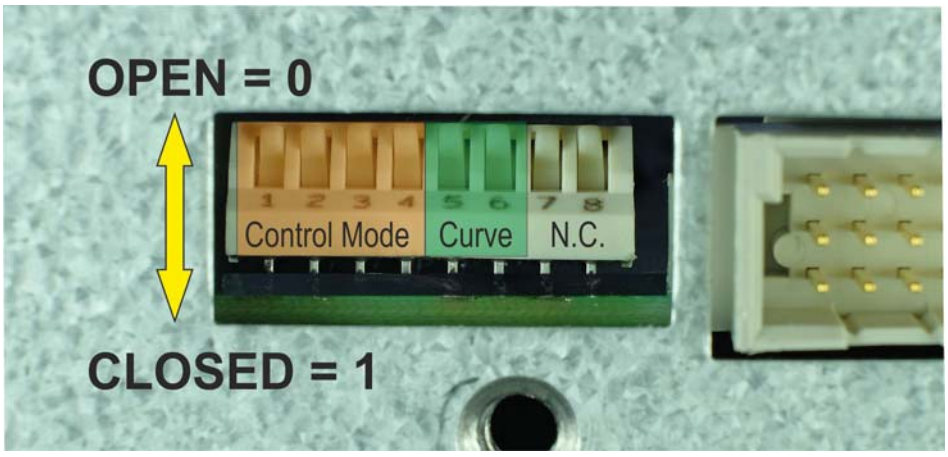
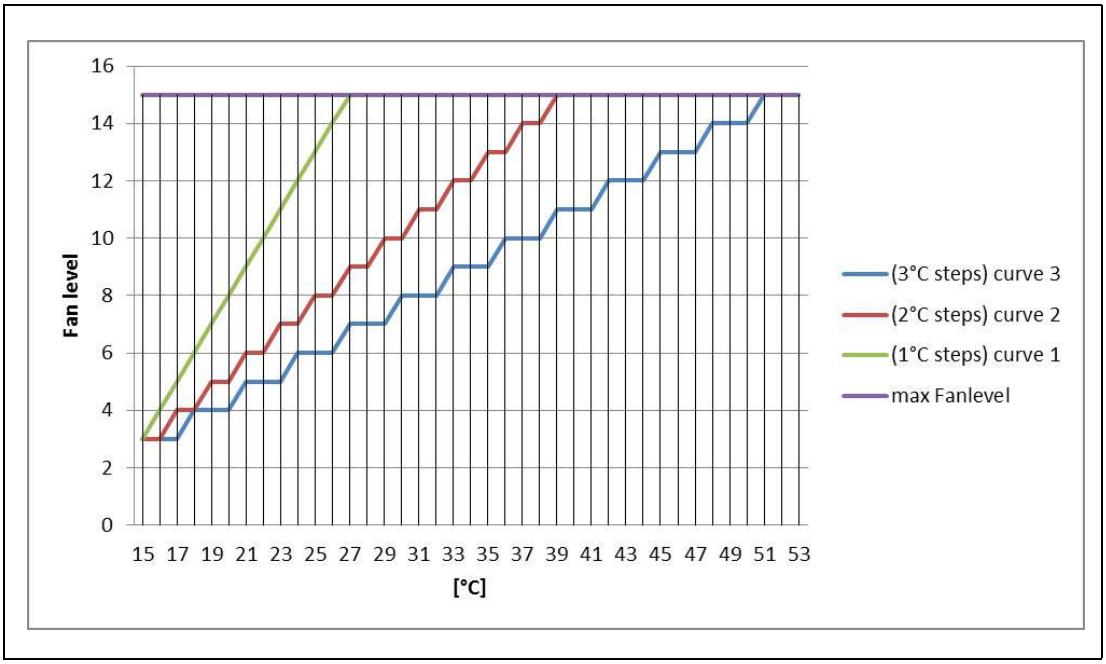


Table 4: DIP Switch Settings

Switch No						Control Mode
1	2	3	4	5	6	
0	0	0	0	0	0	Full Speed
1	0	0	0	0	0	Full Speed
1	1	1	1	1	1	Full Speed
0	1	0	0	1	0	Outlet Temperature Curve 2
0	1	0	0	0	1	Outlet Temperature Curve 3
0	1	0	0	0	0	Outlet Temperature Curve 1
0	1	0	0	1	1	Outlet Temperature Curve 1
0	0	1	0	1	0	Intake Temperature curve 2
0	0	1	0	0	1	Intake Temperature curve 3
0	0	1	0	0	0	Intake Temperature curve 1
0	0	1	0	1	1	Intake Temperature curve 1
0	0	0	1	1	0	Differential Temperature ΔT = 20 K
0	0	0	1	0	1	Differential Temperature ΔT = 25 K
0	0	0	1	0	0	Differential Temperature ΔT = 10 K
0	0	0	1	1	1	Differential Temperature ΔT = 10 K

Figure 12: Curves Fan Control



5.5 Airflow

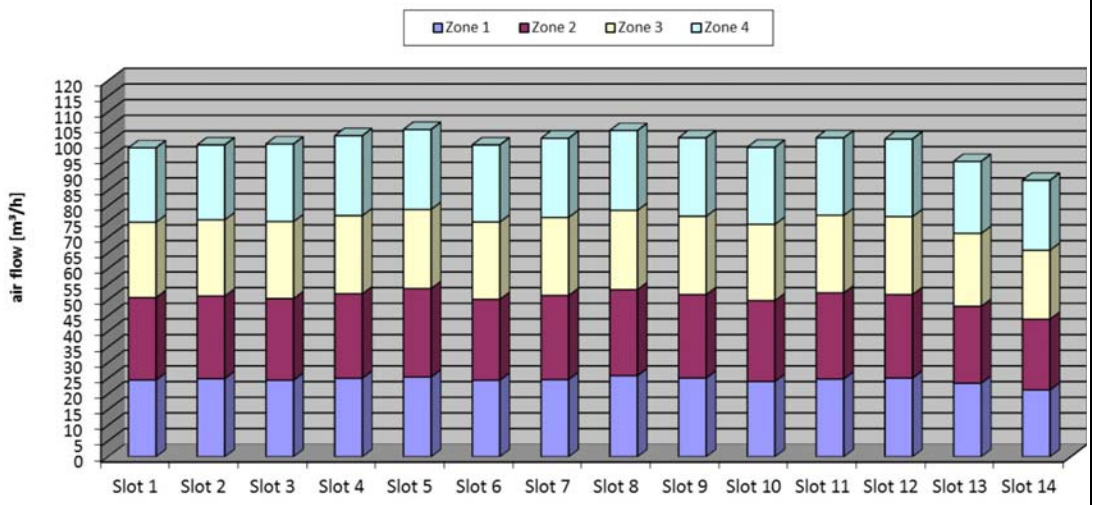
To match the higher electrical power of the systems 11990-902/903, these systems are equipped with more powerfull fans.

The airflow is measured with impedance boards acc. to the PICMG 3.0 R3.0 specification.

Front board pressure drop: 37 Pa at 0,85 m³/min

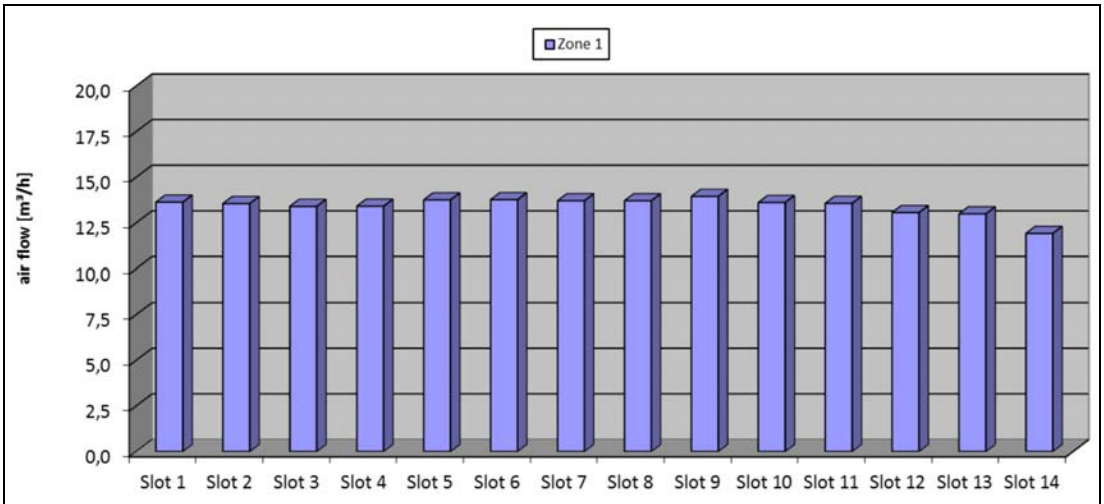
Rear board pressure drop: 24 Pa at 0,14 m³/min

Figure 13: 11990-900/901 Front Board Air Distribution



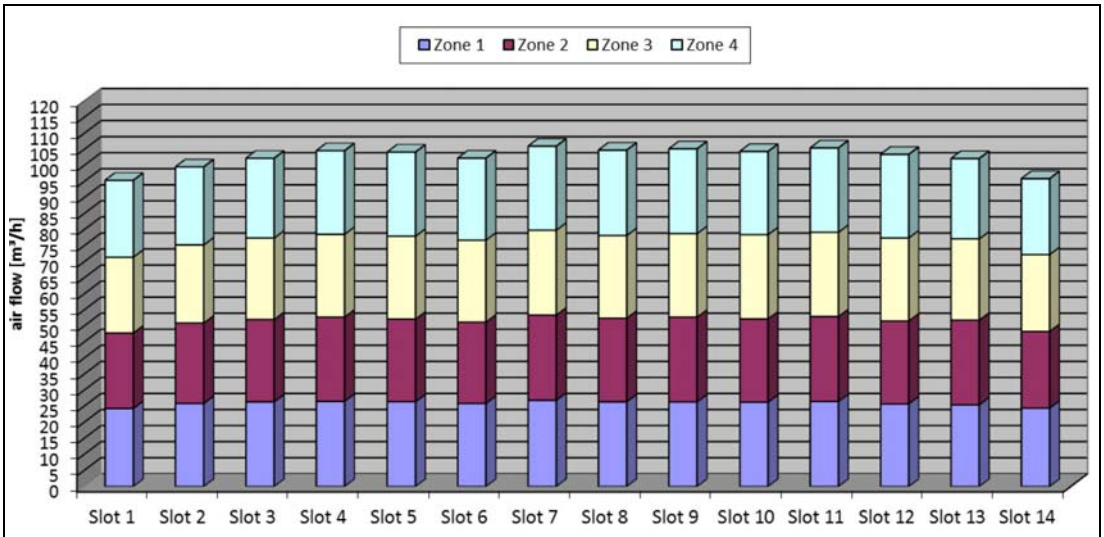
	Zone 1 [m³/h]	Zone 2 [m³/h]	Zone 3 [m³/h]	Zone 4 [m³/h]	**Σ [m³/h]**	**Σ [cfm]**
Slot 1	24,5	26,3	24,1	23,7	**98,6**	**58,0**
Slot 2	24,9	26,4	24,3	23,9	**99,5**	**58,5**
Slot 3	24,4	26,0	24,6	24,7	**99,8**	**58,7**
Slot 4	25,1	26,9	25,0	25,5	**102,5**	**60,3**
Slot 5	25,5	28,2	25,3	25,5	**104,5**	**61,4**
Slot 6	24,5	25,8	24,7	24,6	**99,5**	**58,5**
Slot 7	24,7	26,8	24,9	25,2	**101,6**	**59,8**
Slot 8	25,9	27,5	25,3	25,5	**104,1**	**61,2**
Slot 9	25,1	26,7	25,0	25,0	**101,8**	**59,9**
Slot 10	24,0	25,8	24,4	24,6	**98,8**	**58,1**
Slot 11	24,8	27,5	24,7	24,7	**101,8**	**59,9**
Slot 12	25,1	26,6	24,9	24,8	**101,4**	**59,7**
Slot 13	23,5	24,5	23,3	23,0	**94,3**	**55,5**
Slot 14	21,3	22,6	22,0	22,3	**88,2**	**51,9**
Σ	**343,4**	**367,5**	**342,5**	**343,1**	**1396,4**	**821,4**

Figure 14: 11990-900/901 Rear Board Air Distribution



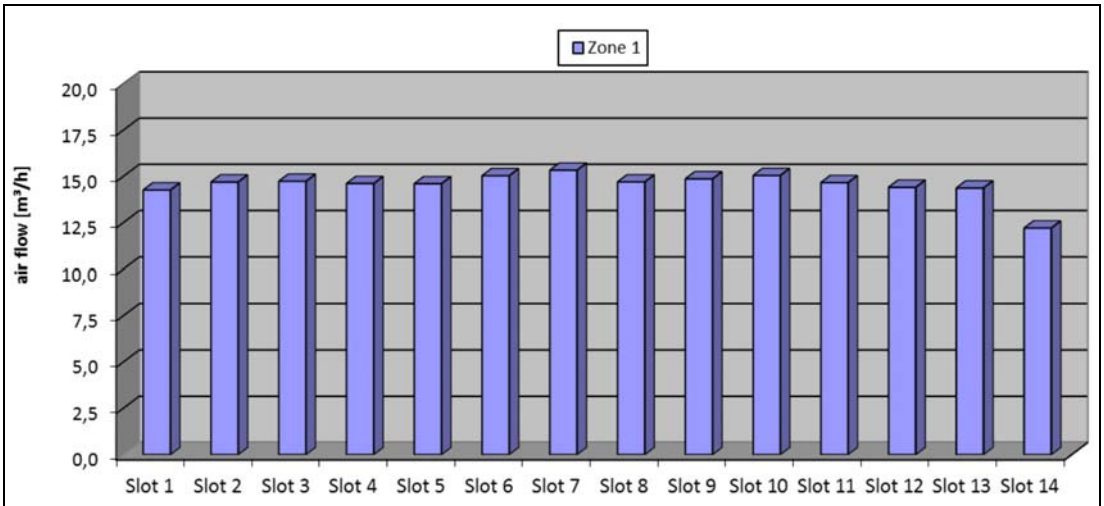
	Zone 1 [m³/h]	Σ [m³/h]	Σ [cfm]
Slot 1	13,6	**13,6**	**8,0**
Slot 2	13,6	**13,6**	**8,0**
Slot 3	13,4	**13,4**	**7,9**
Slot 4	13,4	**13,4**	**7,9**
Slot 5	13,8	**13,8**	**8,1**
Slot 6	13,8	**13,8**	**8,1**
Slot 7	13,7	**13,7**	**8,1**
Slot 8	13,7	**13,7**	**8,1**
Slot 9	14,0	**14,0**	**8,2**
Slot 10	13,6	**13,6**	**8,0**
Slot 11	13,6	**13,6**	**8,0**
Slot 12	13,1	**13,1**	**7,7**
Slot 13	13,0	**13,0**	**7,6**
Slot 14	11,9	**11,9**	**7,0**
Σ	188,1	**188,1**	**110,6**

Figure 15: 11990-902/903 Front Board Air Distribution



	Zone 1 [m³/h]	Zone 2 [m³/h]	Zone 3 [m³/h]	Zone 4 [m³/h]	**∑ [m³/h]**	**∑ [cfm]**
Slot 1	24,3	23,5	23,6	23,9	**95,4**	**56,1**
Slot 2	25,9	25,0	24,4	24,3	**99,6**	**58,6**
Slot 3	26,4	25,6	25,4	24,8	**102,3**	**60,2**
Slot 4	26,5	26,2	25,8	26,0	**104,6**	**61,5**
Slot 5	26,4	25,7	25,8	26,2	**104,2**	**61,3**
Slot 6	25,9	25,3	25,5	25,5	**102,3**	**60,2**
Slot 7	26,9	26,5	26,4	26,2	**106,0**	**62,4**
Slot 8	26,4	26,0	25,8	26,6	**104,8**	**61,6**
Slot 9	26,4	26,4	26,0	26,4	**105,2**	**61,9**
Slot 10	26,3	25,9	26,3	25,9	**104,4**	**61,4**
Slot 11	26,5	26,5	26,2	26,3	**105,5**	**62,0**
Slot 12	25,8	25,8	25,9	26,0	**103,5**	**60,9**
Slot 13	25,5	26,4	25,3	25,0	**102,2**	**60,1**
Slot 14	24,4	23,9	23,9	23,6	**95,9**	**56,4**
∑	**363,5**	**358,8**	**356,3**	**356,9**	**1435,6**	**844,5**

Figure 16: 11990-902/903 Rear Board Air Distribution



	Zone 1 [m³/h]	**∑ [m³/h]**	**∑ [cfm]**
Slot 1	14,3	**14,3**	**8,4**
Slot 2	14,7	**14,7**	**8,7**
Slot 3	14,7	**14,7**	**8,7**
Slot 4	14,6	**14,6**	**8,6**
Slot 5	14,6	**14,6**	**8,6**
Slot 6	15,0	**15,0**	**8,8**
Slot 7	15,3	**15,3**	**9,0**
Slot 8	14,7	**14,7**	**8,7**
Slot 9	14,9	**14,9**	**8,8**
Slot 10	15,1	**15,1**	**8,9**
Slot 11	14,7	**14,7**	**8,6**
Slot 12	14,4	**14,4**	**8,5**
Slot 13	14,4	**14,4**	**8,5**
Slot 14	12,2	**12,2**	**7,2**
∑	203,7	**203,7**	**119,8**

5.6 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 5: 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

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}.

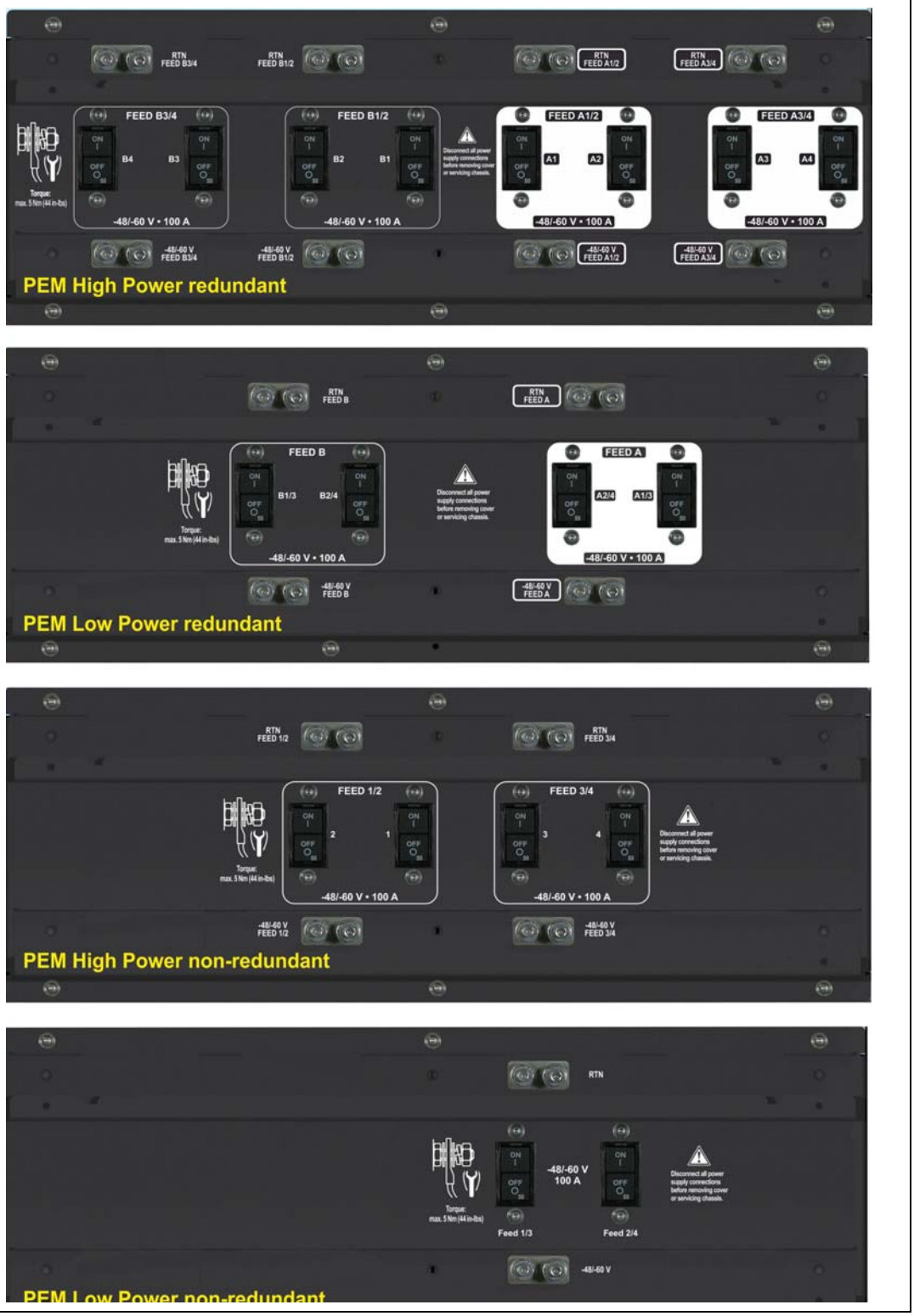
Overcurrent protection is provided by 100 A circuit breakers in the -48 VDC input lines.

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.

6.1 PEM Overview

Figure 17: 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 18: Power Distribution Low Power PEMs

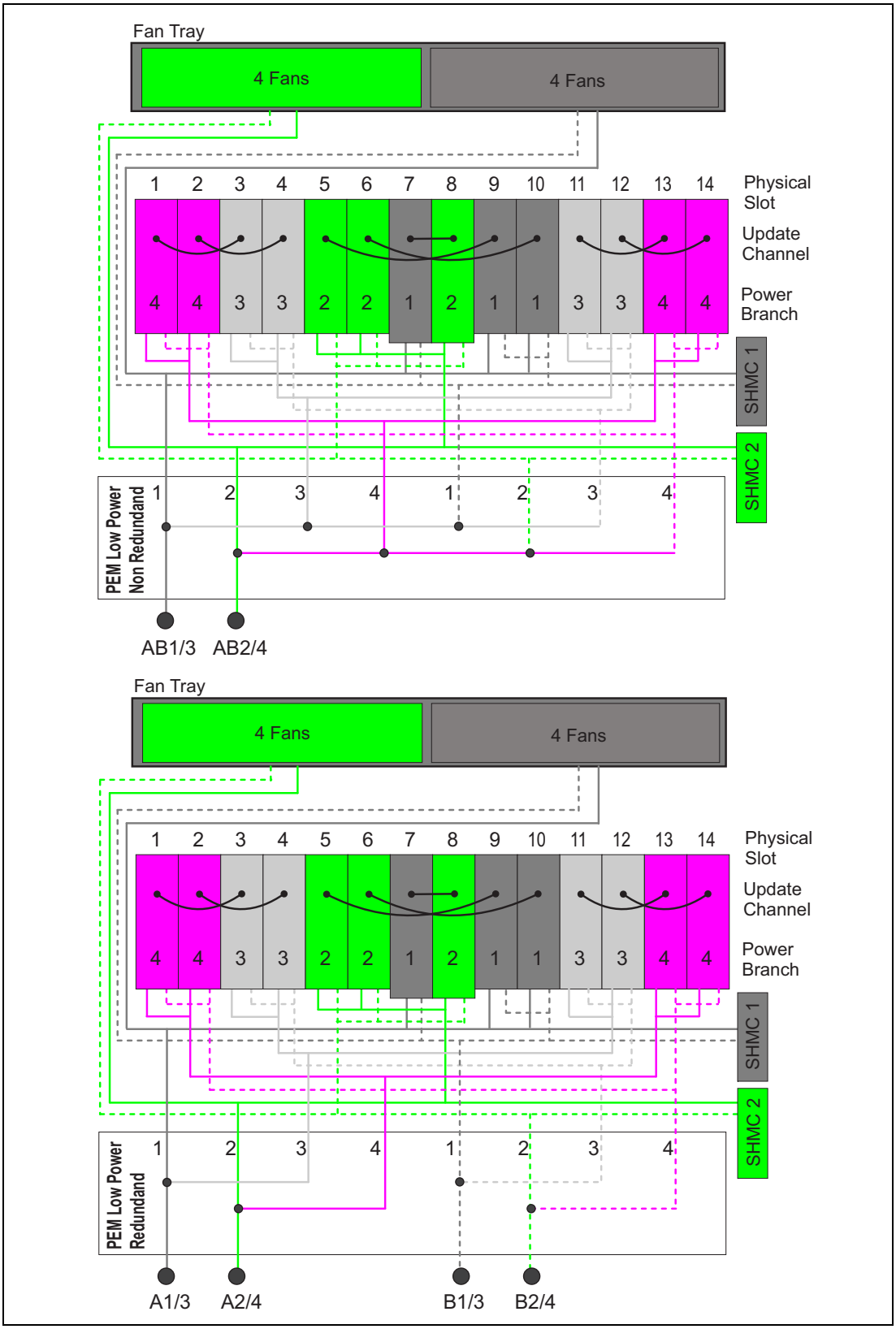
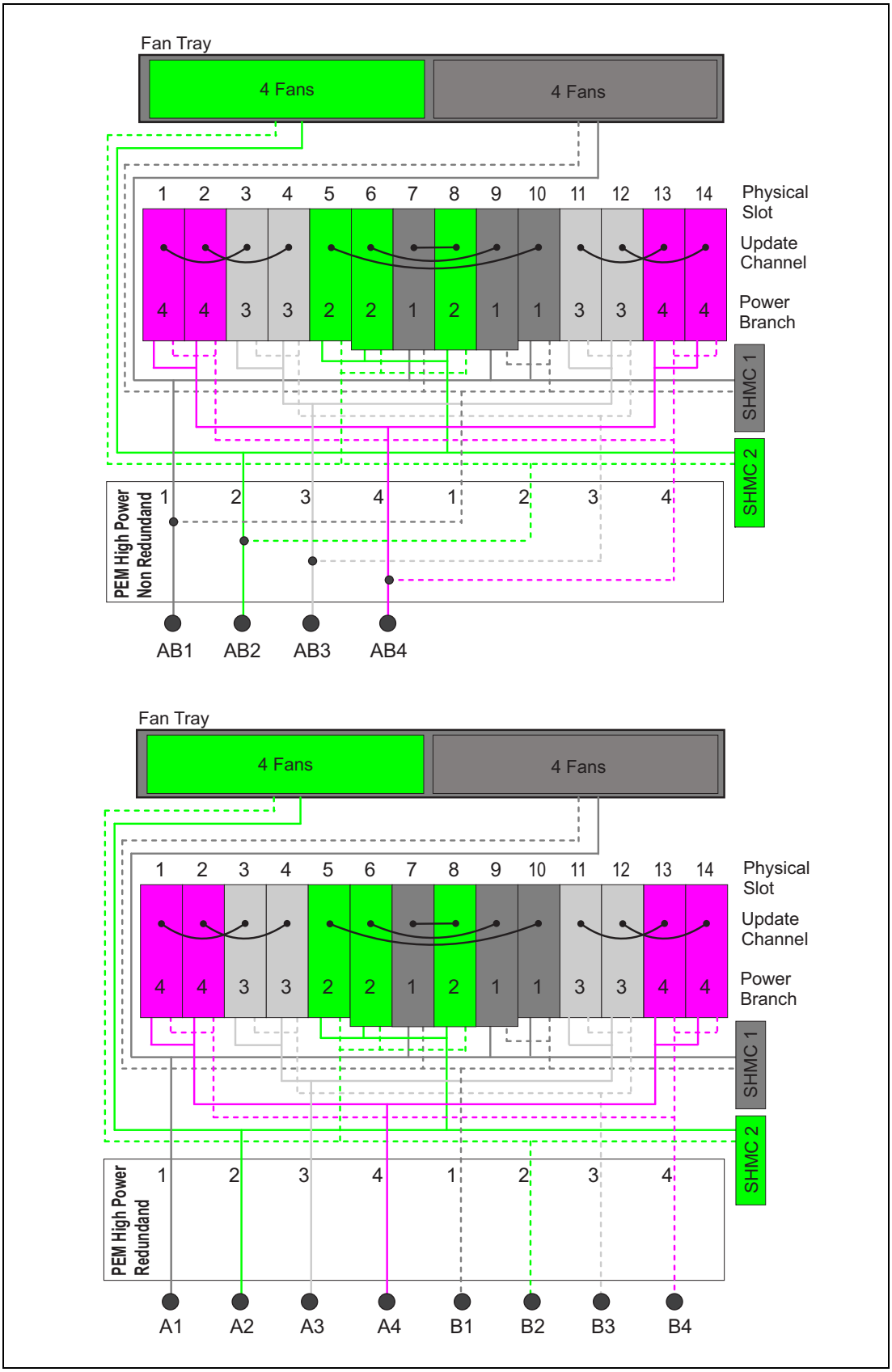


Figure 19: Power Distribution High Power PEMs



6.2 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.

7 Shelf Management

The Schroff ATCA Shelves are designed for on-blade shelf management or with two redundant Schroff Shelf Managers ACB-VI in dedicated Shelf Manager slots.

The Shelf FRU SEEPROMs on the backplane are connected to the internal I²C bus on the Fan Tray. The Shelf Manager has access to these components via the IPM controller of the Fan Tray.

When using the Schroff Shelf Manager ACB-VI, the Shelf Manager's configuration script must be changed from:

`rc.acb6-HPDL`

to:

`rc.acb6-ONBLADE`

Command:

`setenv rc2/etc/rc.acb6-ONBLADE`

8 Schroff Shelf Manager ACB-VI

These Chapters describe the Shelf Manager hardware. For explicit software documentation see:

- Pigeon Point Shelf Manager User Guide
- Pigeon Point Shelf Manager External Interface Reference
- Schroff Shelf Manager User's Manual, Order-no. 63972-331

The documentation is available for registered users at www.schroff.biz

Shelf Manager with bused IPMB: 21990-401 (Product Number)

21990-404 (Catalog Number with packaging)

The Schroff Shelf Manager ACB-VI is a 78 mm x 280 mm board that fits into a dedicated Shelf Manager slot in a Schroff ATCA Shelf.

The Shelf Manager has two main responsibilities:

- Manage/track the FRU population and common infrastructure of a Shelf, especially the power, cooling and interconnect resources and their usage.
- Enable an external System Manager to join in management/tracking through the System Manager Interface, which is typically implemented over Ethernet.

The Shelf management is based on the Pigeon Point Shelf management solution for AdvancedTCA products.

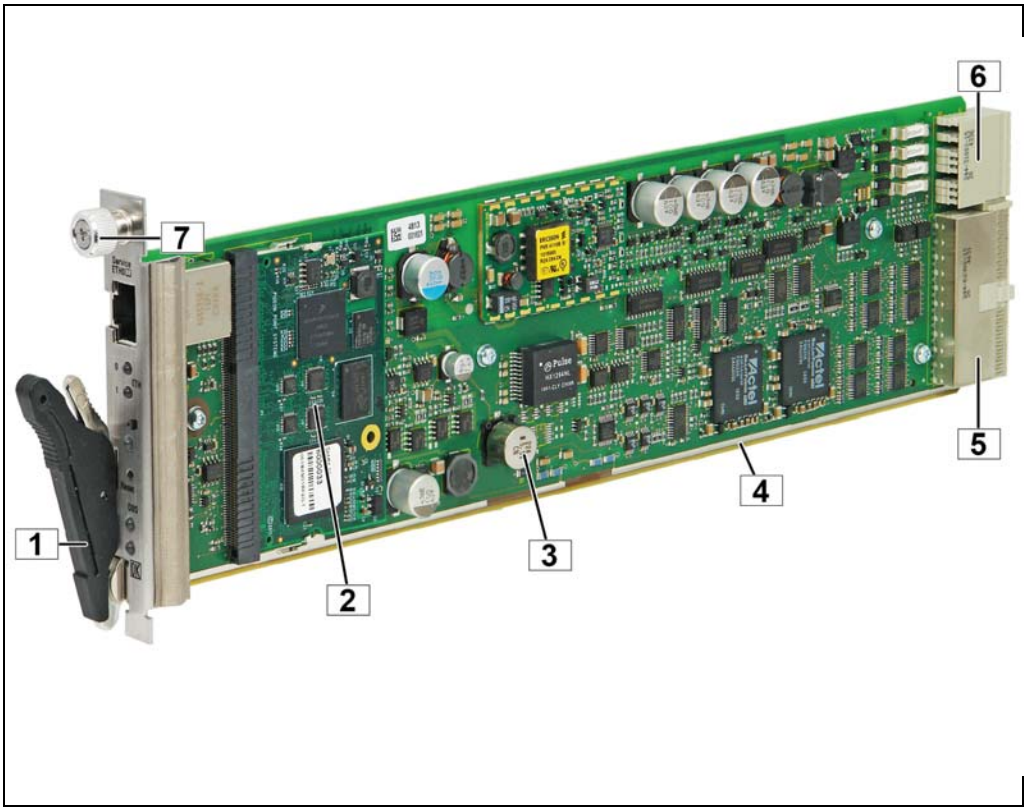
The Shelf management software runs on the Pigeon Point Shelf Management Mezzanine 700 (ShMM-700R), a compact 204-pin SO-DIMM form-factor module, installed on the ACB-VI carrier board.

The ACB-VI carrier board includes several on-board devices that enable different aspects of Shelf management based on the ShMM-700R. These facilities include I²C-based hardware monitoring/control and GPIO expander devices.

The ACB-VI also provides the Fan Controller for up to 9 Fans and individual Ethernet connections to both Base Hubs (ShMC cross connect).

The Shelf Manager communicates inside the Shelf with IPM controllers over the Intelligent Platform Management Bus (IPMB). The Shelf Manager also provides an IPMB interface for the non-intelligent FRUs in a Schroff Shelf. The Shelf Manager communicates with the non-intelligent FRUs over I²C busses and expose the sensors for these FRUs at IPMB address 0x20.

Figure 20: Schroff Shelf Manager



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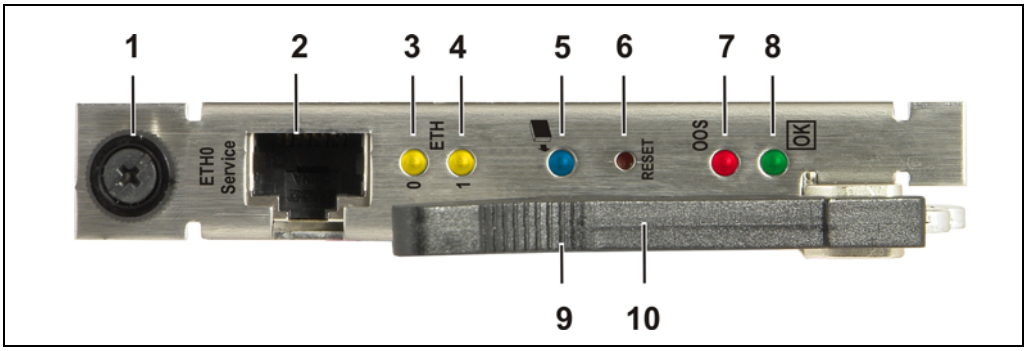
1	Extraction handle	5	Backplane Connector (X100)
2	ShMM-700R	6	Backplane Connector (X102)
3	RTC backup capacitor	7	Fixing screw
4	ACB-VI Carrier Board		

8.1 Front Panel Components

Figure 21: Shelf Manager Front Panel Components



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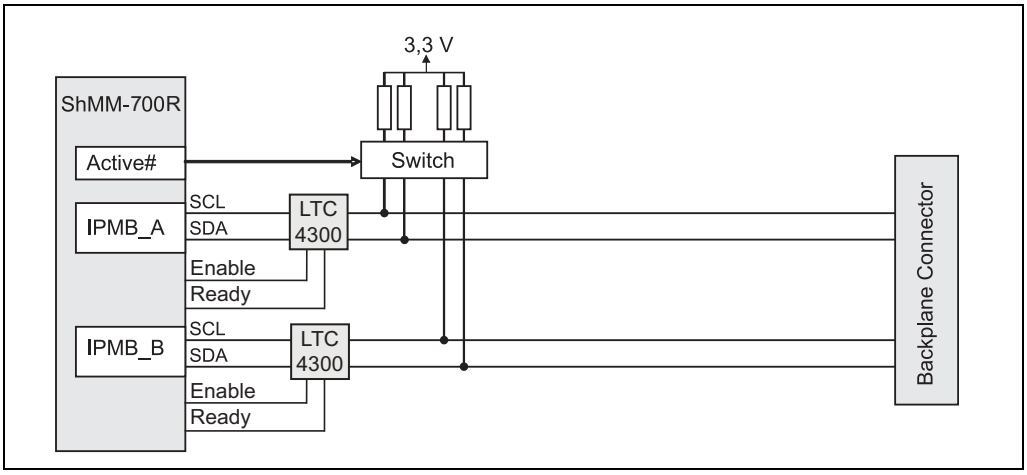
1	Fixing screw	6	RESET push button
2	ETH 0 Ethernet Service Connector (RJ45)	7	Shelf Manager Status LED (red) - Red = Out of Service (OOS)
3	ETH 0 Link/Activity LED (yellow) - On = Link - Off = No Link - Blinking = Activity	8	Shelf Manager Status LED (green) - Solid Green = in Service, active Shelf Manager - Blinking = in Service, Backup Shelf Manager
4	ETH 1 Link/Activity LED (yellow) - On = Link - Off = No Link - Blinking = Activity	9	Hot Swap Switch - Activated by extraction handle
5	Hot Swap LED (blue) - Solid Blue = ready to remove - Blinking = Hot Swap is requested - Off = No Hot Swap possible	10	Extraction handle

8.2 Bused IPMB Interface

The ShMM-700R provides two IPMBs. The IPMB-A and IPMB-B from the ShMM-700R are routed to the Backplane connector through I2c buffers. The ATCA Backplane buses the two IPMBs to the ATCA boards.

The Active# signal of the ShMM-700R is used to switch on/off the pull-up resistors of the IPMBs.

Figure 22: Block diagram bused IPMB



8.3 Ethernet Interfaces

The front panel ETH0 Ethernet connector is intended for service use only or for debugging purposes in laboratory environment. The computer which is connected to this interface must be located nearby the shelf manager with an Ethernet cable that is not longer than 10 m.

The front panel Ethernet connector MUST NOT be connected to a Telecommunication Network Circuit that leaves the building.

The ETH0 interface of the shelf manager can manually be switched between the front panel RJ45 connector (“Front”-position of the rocker-switches) and the backplane connector going to the hub board base interface (“Back”-position of the rocker-switches).

The ATCA specification requires a base channel interface between the shelf manager and the Hub board. The ETH0 rocker-switches MUST be in “Back”-position in normal operation of the shelf manager in an ATCA-shelf.

Figure 23: ETH Switches shown in default position

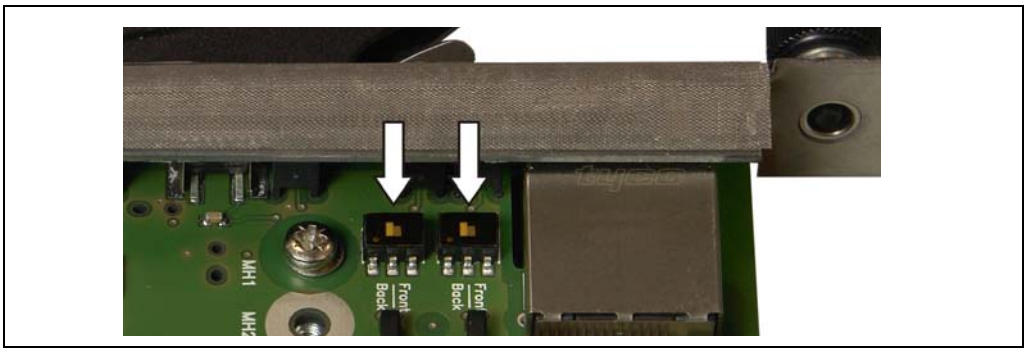


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Figure 24: Shelf Manager Cross Connect

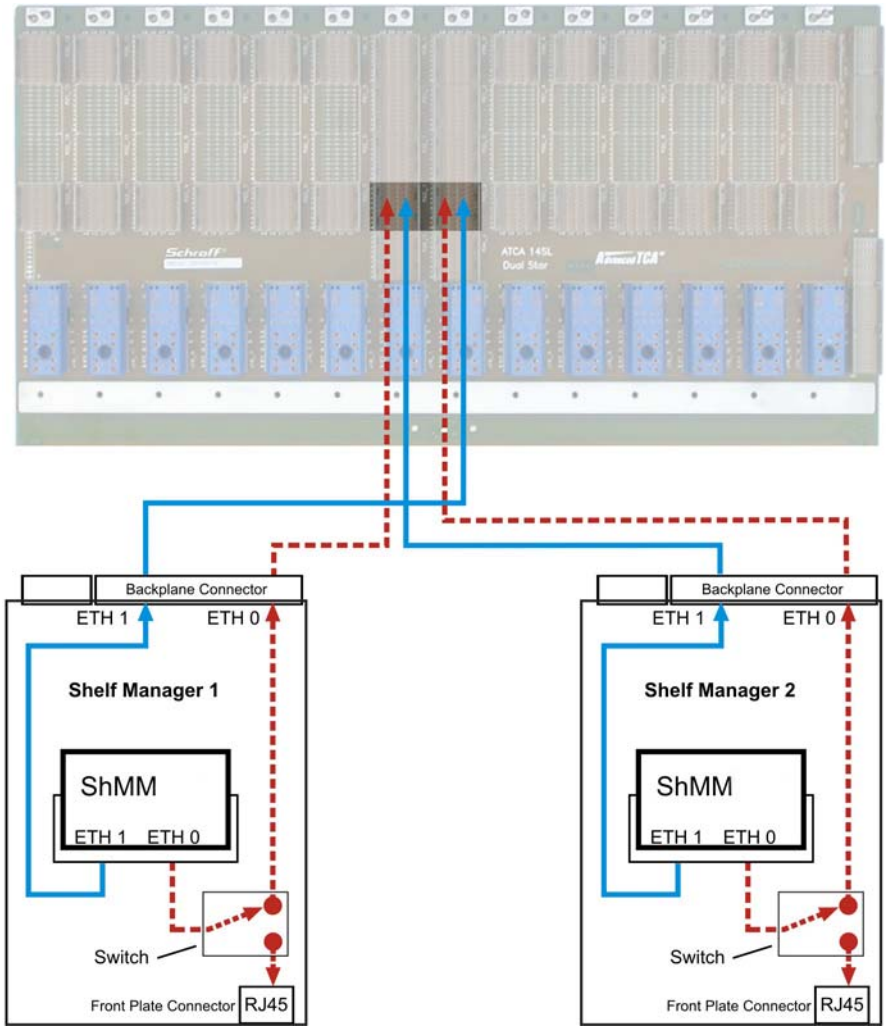

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Table 6: Connector (P23) pin assignment for Shelf Manager Cross Connect

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			

8.4 Shelf Manager RS-232 Console Serial Interface

The Shelf Manager provides an RS-232 console interface that provides a full set of RS-232 signals, including modem control. These signals are routed through the Shelf Manager backplane connector to a RJ45 connector on the front panel of the lower Fan Tray.

The serial console default configuration is:

- *115200 baud*
- *no parity*
- *8 data bits*
- *1 stop bit*

8.5 Front Panel RESET push button

The Shelf Manager provides a RESET push button on the front panel. It is connected to the ShMM-700's MRST_IN# signal.

Pushing the RESET button will reset the Shelf Manager

8.6 Hot Swap Interface

The Shelf Manager provides a Hot Swap interface allowing the Shelf Manager to be replaced without powering down the Shelf. The interface is composed of three components:

- Hot Swap switch at injector/ejector handle
- Presence signal indicating that the Shelf Manager is fully seated in its backplane connector
- Hot Swap LED

8.6.1 Hot Swap LED

The Shelf Manager provides a a blue Hot Swap LED. The LED indicates when it is safe to "remove" the Shelf Manager from a powered Shelf.

Table 7: Hot Swap LED

LED State	Condition
Off	The Shelf Manager is not ready to be removed/disconnected from the Shelf
Solid Blue	The Shelf Manager is ready to be removed/disconnected from the Shelf
Long-blink	The Shelf Manager is activating itself
Short-blink	Deactivation has been requested

8.7 Hardware Address

The Shelf Manager reads the hardware address and parity bit from the backplane connector of the Dedicated Shelf Manager slot. Geographic address pins (HA[0], HA7) at the Backplane connector determine bit 0 and bit 7, bit 1...6 are hardware-coded on the Shelf Manager PCB.

	HW-Addr.	IPMB-Addr.	HA[0]	HA7
Shelf Manager 1	0x08	0x10	GND	GND
Shelf Manager 2	0x09	0x12	n.c.	n.c.

8.8 Redundancy Control

The Shelf Manager supports redundant operation with automatic switchover using redundant Shelf Managers. In a configuration where two Shelf Manager are present, one acts as the active Shelf Manager and the other as a standby. The Shelf Managers monitor each other and either can trigger a switchover if necessary.

8.8.1 Hardware Redundancy Interface

The two Shelf Manager communicate over the TCP/IP based Software Redundancy Interface (SRI) which is implemented via a pair of USB links between the ShMM-700Rs. The active instance posts incremental state updates to the backup via this interface. As a result, the backup can quickly step into the active role if necessary.

The Hardware Redundancy Interface (HRI) between the two Shelf Manager instances enables the exchange of hardware level ShMM-700R state information, including the following:

- Presence: each Shelf Manager instance knows whether the other instance is present in the shelf.
- Health: each instance knows whether the other instance considers itself „healthy“.
- Switchover: the backup instance can force a switchover if necessary.

The ACB-VI Hardware Redundancy Interface supports the upgrade from ACB-V to ACB-VI in an ATCA System without interruption. For details see the firmware release note.

8.9 Command Line Interface (CLI)

The Command Line Interface (CLI) connects to and communicates with the IPM-devices of the Shelf, the boards, and the Shelf Manager.
The CLI is an IPMI-based library of commands, service personnel or system administrators can access the CLI through Telnet, SSH, or the Shelf Managers serial port on the SAP.
With the CLI, users can access information about the current system status including sensor values, threshold settings etc.
Users can also access and modify Shelf- and Shelf Manager configurations, perform actions on a FRU a.e. set fan speeds etc.

The default user account is "root" and there is no password.
The default IP address of the primary Shelf Manager is 192.168.0.2

To access all sensor data you have to connect to the active Shelf Manager!

8.9.1 Basic CLI Commands

Service personnel can read system information, FRU information and sensor datas with the following basic commands. For a full list of all CLI commands refer to the Pigeon Point Shelf Manager External Interface Reference Manual.

- **Change IP address of the primary Shelf Manager:**

  `clia setlanconfig` *`channel`* `ip` *`value`*

Value represents the IP address in dotted decimal notation.

```
clia setlanconfig 1 ip 192.168.0.2
```

- **Display the Shelf Managers firmware version:**

```
clia version
```

Info: To get a complete list of all information just type in "`version`".

- **List all IPM Controllers in a Shelf:**

```
clia ipmc
```

- **List all boards in the Shelf:**

```
clia board
```

- **List all sensors on a board:**

  `clia sensor` *`IPMI-address`*

- **List only sensors which are outside of established thresholds:**

```
clia sensor -t
```

- **Get data (value) from a sensor on a board:**

  `clia sensordata` *`IPMI-address sensor-number`*

- **Display the FRU information in a board:**

  `clia fruinfo` *`IPMI-address FRU-id`*

- **Change the speed for a Fan Tray:**

  ```
  clia setfanlevel IPMI-address Fru-id speed
  ```

Info: The value for the speed is from 0 to 15.

- **Display the contents of the System Event Log (SEL):**

  ```
  clia sel
  ```

- **Clear the System Event Log (SEL):**

  ```
  clia sel clear
  ```

8.10 Sensor Table

IPMC	Nr.	LUN	Name	Type-Code		Event/Reading Type-Code		Description
10	0	0	FRU 0 HOT_SWAP	Hot Swap	0xf0	Discrete	0x6f	This sensor returns the hot-swap states for FRU 0.
10	1	0	IPMB LINK	IPMB Link	0xf1	Discrete	0x6f	This sensor returns the IPMB link state.
10	2	0	Local Temp	Temperature	0x01	Threshold	0x01	This sensor measures the local temperature.
10	3	0	3V3_local	Voltage	0x02	Threshold	0x01	This sensor measures the local 3.3 V voltage in volts.
10	4	0	I2C_PWR_B	Voltage	0x02	Threshold	0x01	This sensor measures the 3.3 V power supply B voltage supplied to I2C devices in volts.
10	5	0	I2C_PWR_A	Voltage	0x02	Threshold	0x01	This sensor measures the 3.3 V power supply A voltage supplied to I2C devices in volts.
10	6	0	VBAT	Voltage	0x02	Threshold	0x01	This sensor measures the voltage of the hold-up capacitor on the local shelf manager in volts.
10	16	0	-48A Bus voltage	Entity Presence	0x25	Discrete	0x6f	This sensor indicates the presence of the -48 V_A at the shelf manager backplane connector.
10	17	0	-48B Bus voltage	Entity Presence	0x25	Discrete	0x6f	This sensor indicates the presence of the -48 V_B at the shelf manager backplane connector.
10	18	0	-48A ACB voltage	Entity Presence	0x25	Discrete	0x6f	This sensor indicates the presence of the -48 V_A behind the shelf manager's main fuse.
10	19	0	-48B ACB voltage	Entity Presence	0x25	Discrete	0x6f	This sensor indicates the presence of the -48 V_B behind the shelf manager's main fuse.
10	20	0	20V AUX	Entity Presence	0x25	Discrete	0x6f	This sensor indicates the presence of 20 V aux voltage on shelf manager.
10	21	0	-48A ACB Fuse	Entity Presence	0x25	Discrete	0x6f	This sensor indicates the state of -48 V_A input fuse on the shelf manager.
10	22	0	-48B ACB Fuse	Entity Presence	0x25	Discrete	0x6f	This sensor indicates the state of -48 V_B input fuse on the shelf manager.
10	128	0	CPLD State	OEM reserved	0xde	Discrete	0x6f	This sensor indicates the high-level redundancy state of the ShMM, along with the state of the low-level redun-dancy bits exposed by the CPLD, and redun-dancy-related exceptional conditions in the CPLD, if any.
10	129	0	Reboot Reason	OEM reserved	0xdd	Discrete	0x6f	This sensor indicates the reason for the last reboot.
							0x6f	
12	0	0	FRU 0 HOT_SWAP	Hot Swap	0xf0	Discrete	0x6f	This sensor returns the hot-swap states for FRU 0.
12	1	0	IPMB LINK	IPMB Link	0xf1	Discrete	0x6f	This sensor returns the IPMB link state.
12	2	0	Local Temp	Temperature	0x01	Threshold	0x01	This sensor measures the local temperature.
12	3	0	3V3_local	Voltage	0x02	Threshold	0x01	This sensor measures the local 3.3 V voltage in volts.
12	4	0	I2C_PWR_B	Voltage	0x02	Threshold	0x01	This sensor measures the 3.3 V power supply B voltage supplied to I2C devices in volts.
12	5	0	I2C_PWR_A	Voltage	0x02	Threshold	0x01	This sensor measures the 3.3 V power supply A voltage supplied to I2C devices in volts.
12	6	0	VBAT	Voltage	0x02	Threshold	0x01	This sensor measures the voltage of the hold-up capacitor on the local shelf manager in volts.
12	16	0	-48A Bus voltage	Entity Presence	0x25	Discrete	0x6f	This sensor indicates the presence of the -48 V_A at the shelf manager backplane connector.
12	17	0	-48B Bus voltage	Entity Presence	0x25	Discrete	0x6f	This sensor indicates the presence of the -48 V_B at the shelf manager backplane connector.
12	18	0	-48A ACB voltage	Entity Presence	0x25	Discrete	0x6f	This sensor indicates the presence of the -48 V_A behind the shelf manager's main fuse.
12	19	0	-48B ACB voltage	Entity Presence	0x25	Discrete	0x6f	This sensor indicates the presence of the -48 V_B behind the shelf manager's main fuse.
12	20	0	20V AUX	Entity Presence	0x25	Discrete	0x6f	This sensor indicates the presence of 20 V aux voltage on shelf manager.
12	21	0	-48A ACB Fuse	Entity Presence	0x25	Discrete	0x6f	This sensor indicates the state of -48 V_A input fuse on the shelf manager.
12	22	0	-48B ACB Fuse	Entity Presence	0x25	Discrete	0x6f	This sensor indicates the state of -48 V_B input fuse on the shelf manager.
12	128	0	CPLD State	OEM reserved	0xde	Discrete	0x6f	This sensor indicates the high-level redundancy state of the ShMM, along with the state of the low-level redun-dancy bits exposed by the CPLD, and redun-dancy-related exceptional conditions in the CPLD, if any.
12	129	0	Reboot Reason	OEM reserved	0xdd	Discrete	0x6f	This sensor indicates the reason for the last reboot.

IPMC	Nr.	LUN	Name	Type-Code		Event/Reading Type-Code		Description
20	0	0	FRU 0 HOT_SWAP	Hot Swap	0xf0	Discrete	0x6f	This sensor returns the hot-swap states for FRU 0.
20	0	3	HPI Sys Event	OEM reserved	0xdb	Discrete	0x6f	The purpose is to enhance the interaction between the shelf manager and Pigeon Point HPI implementa-tions: IntegralHPI and Pigeon Point OpenHPI. This sensor sends IPMI events in a special format to signal HPI implementa-tions that changes have occurred within the shelf man-ager.
20	1	0	IPMB LINK	IPMB Link	0xf1	Discrete	0x6f	This sensor returns the IPMB link state. (Only bussed IPM Bus)
20	119	0	TelcoAlarmInput	TELCO Alarm Input	0xf4	Discrete	0x6f	Telco alarm input sensor.
20	131	0	TELCO Alarms	OEM reserved	0xdf	Discrete	0x6f	This sensor indicates the presence of critical, major and minor alarm .
20	132	0	BMC Watchdog	Watchdog 2	0x23	Discrete	0x6f	BMC watchdog sensor.
20	133	0	SYSTEM EVENT	System Event	0x12	Discrete	0x6f	System event sensor.
20	135	0	FT Oper.Status	Management Subsyst. Health	0x28	Discrete	0x0b	This sensor monitors if all the fan trays are operational or if some fan trays is not operation.
20	136	0	Cooling State	Management Subsyst. Health	0x28	Discrete	0x07	This sensor monitors the cooling status.
20	137	0	Fans State	Management Subsyst. Health	0x28	Discrete	0x07	This sensor monitors the fan status.
20	138	0	SHM Redundancy	Management Subsyst. Health	0x28	Discrete	0x0b	This sensor monitors the shelf manager redundancy sta-tus.
5a = Fan Tray								
5a	0	0	HOT SWAP	Hot Swap	0xf0	Discrete	0x6f	This sensor returns the fan tray hot-swap states.
5a	1	0	ShelfFRU Hot Swap	Hot Swap	0xf0	Discrete	0x6f	This sensor returns the Shelf FRU SEEPROM 1 hot-swap states.
5a	2	0	ShelfFRU 2 HotSw	Hot Swap	0xf0	Discrete	0x6f	This sensor returns the Shelf FRU SEEPROM 2 hot-swap states.
5a	3	0	Version Change	reserved	0x2b	Discrete	0x6f	This sensor indicates a hardware or software change.
5a	4	0	IPMB Physical	IPMB Link	0xf1	Discrete	0x6f	This sensor returns the IPMB link state.
5a	5	0	FT +3.3V	Voltage	0x02	Threshold	0x01	This sensor measures the local 3.3 V voltage in volts.
5a	6	0	FT +3.6V External	Voltage	0x02	Threshold	0x01	This sensor measures the external 3.6 V voltage in volts.
5a	7	0	NTC TEMP	Temperature	0x01	Threshold	0x01	This sensor measures the temperature.of the NTC sensor above the card cage (outlet temperature)
5a	8	0	FT Temp 1 uC	Temperature	0x01	Threshold	0x01	This sensor measures fan tray PCB temperature.
5a	9	0	FT Temp 2 IN	Temperature	0x01	Threshold	0x01	This sensor measures the intake temperature.
5a	10	0	Fan Tach. 1	Fan	0x04	Threshold	0x01	This sensor indicates the speed of the fan 1 (RPM).
5a	11	0	Fan Tach. 2	Fan	0x04	Threshold	0x01	This sensor indicates the speed of the fan 2 (RPM).
5a	12	0	Fan Tach. 3	Fan	0x04	Threshold	0x01	This sensor indicates the speed of the fan 3 (RPM).
5a	13	0	Fan Tach. 4	Fan	0x04	Threshold	0x01	This sensor indicates the speed of the fan 4 (RPM).
5a	14	0	Fan Tach. 5	Fan	0x04	Threshold	0x01	This sensor indicates the speed of the fan 5 (RPM).
5a	15	0	Fan Tach. 6	Fan	0x04	Threshold	0x01	This sensor indicates the speed of the fan 6 (RPM).
5a	16	0	Fan Tach. 7	Fan	0x04	Threshold	0x01	This sensor indicates the speed of the fan 7 (RPM).
5a	17	0	Fan Tach. 8	Fan	0x04	Threshold	0x01	This sensor indicates the speed of the fan 8 (RPM).
5a	18	0	Air Filter	OEM reserved	0xc0	Discrete	0x08	This sensor checks the presence of the air filter.
5a	19	0	FT -48V B2	OEM reserved	0xc0	Discrete	0x08	This sensor indicates the presence of the –48 V_B2 at the fan tray connector.
5a	20	0	FT -48V B2 Fused	OEM reserved	0xc0	Discrete	0x08	This sensor indicates the presence of the –48 V_B2 after fan tray's main fuse.
5a	21	0	FT -48V A2	OEM reserved	0xc0	Discrete	0x08	This sensor indicates the presence of the –48 V_A2 at the fan tray connector.
5a	22	0	FT -48V A2 Fused	OEM reserved	0xc0	Discrete	0x08	This sensor indicates the presence of the –48 V_A2 after fan tray's main fuse.
5a	23	0	FT -48V B1	OEM reserved	0xc0	Discrete	0x08	This sensor indicates the presence of the –48 V_B1 at the fan tray connector.
5a	24	0	FT -48V B1 Fused	OEM reserved	0xc0	Discrete	0x08	This sensor indicates the presence of the –48 V_B1 after fan tray's main fuse.
5a	25	0	FT -48V A1	OEM reserved	0xc0	Discrete	0x08	This sensor indicates the presence of the –48 V_A1 at the fan tray connector.

IPMC	Nr.	LUN	Name	Type-Code		Event/Reading Type-Code		Description
5a	26	0	FT -48V A1 Fused	OEM reserved	0xc0	Discrete	0x08	This sensor indicates the presence of the –48 V_A1 after fan tray's main fuse.
5a	27	0	CircuitBreaker 1	OEM reserved	0xc0	Discrete	0x08	This sensor indicates the presence of the PEM circuit breaker 1 (or group of circuit breakers, depending on PEM).
5a	28	0	CircuitBreaker 2	OEM reserved	0xc0	Discrete	0x08	This sensor indicates the presence of the PEM circuit breaker 2 (or group of circuit breakers, depending on PEM).
5a	29	0	PSU1 present	OEM reserved	0xc0	Discrete	0x08	Reserved for future applications
5a	30	0	PSU2 present	OEM reserved	0xc0	Discrete	0x08	Reserved for future applications
5a	31	0	PSU3 present	OEM reserved	0xc0	Discrete	0x08	Reserved for future applications
5a	32	0	PSU4 present	OEM reserved	0xc0	Discrete	0x08	Reserved for future applications

Table 8: Circuit Breaker assignment

	11990-900	11990-901	11990-902	11990-903
Circuit Breaker 1	Feed 2/4	Feed A 1/3 or 2/4	Feed 3 or 4	Feed A1 or A2 or A3 or A4
Circuit Breaker 2	Feed 1/3	Feed A 1/3 or 2/4	Feed 2 or 1	Feed B1 or B2 or B3 or B4

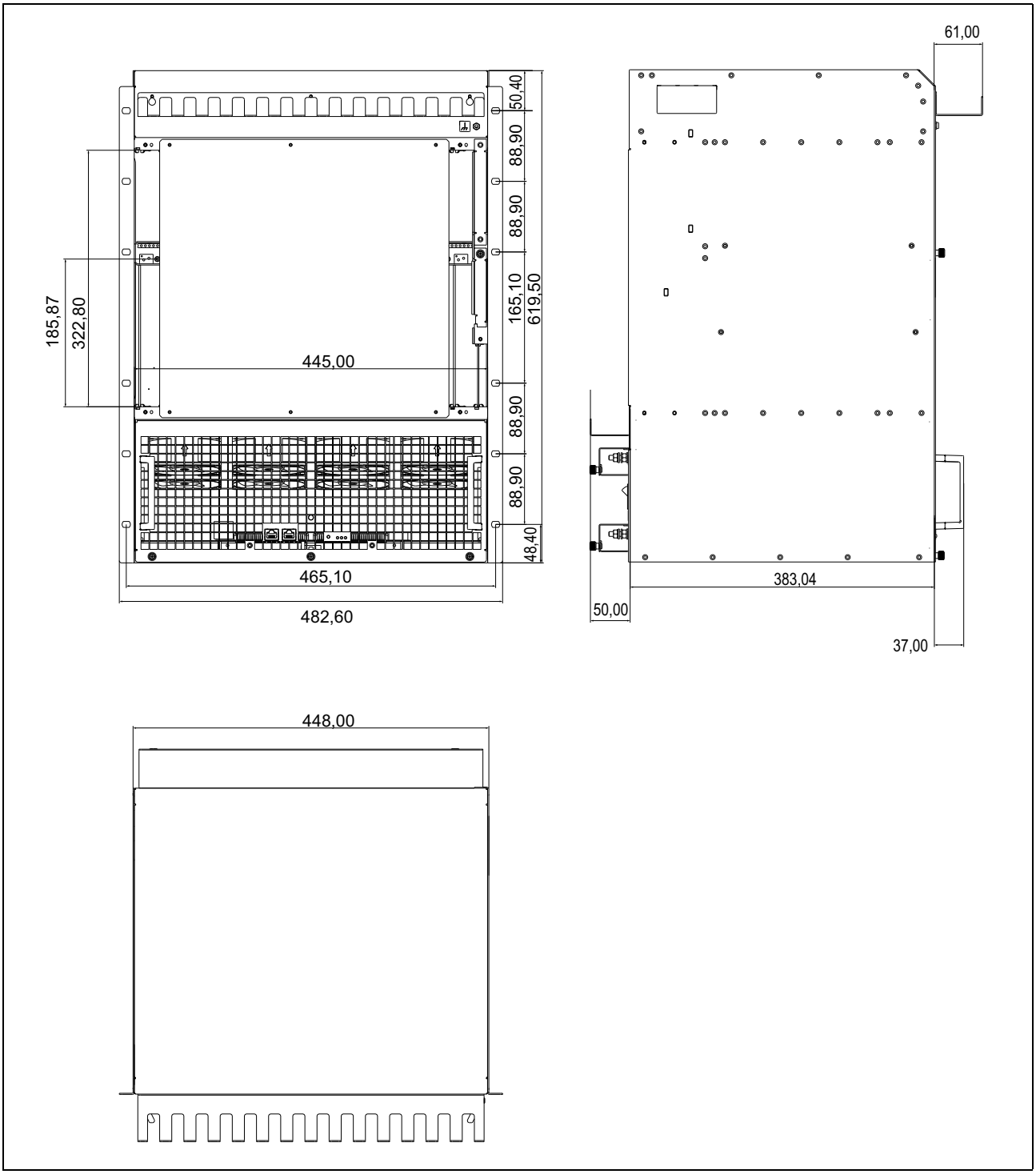
9 Technical Data

Table 9: Technical Data

Physical Dimensions	
Height	14 U
Width	482.6 mm
Depth (with handles)	470 mm
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	up to 400 W / Board
RTM	up to 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}

9.1 Dimensions

Figure 25: Dimensions



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