Schroff®

AdvancedTCA®

14 slot ATCA Shelf

including 40G Backplane

User's Manual

Product Numbers:

11596-150
11596-151
11596-152
11596-153

Doc-No: 63972-278

Revision: R1.1, November 2011

Pentair
Technical Products

Rev.	Date updated	Change
R1.0	March 30, 2010	Initial Release
R1.1	November 2011	Chapter 7.9, 7.10, 7.11 added

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The details in this manual have been carefully compiled and checked - supported by certified Quality Management System to EN ISO 9001/2000

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 60 VDC 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 in a telecommunication environment.
- 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

- Pigeon Point Systems IPM Sentry Shelf-External Interface Reference (*www.pigeonpoint.com*)
- PICMG® 3.0 R3.0 AdvancedTCA® Base Specification (*www.picmg.com*)
- Schroff Shelf Manager User‘s Manual, Order-no. 63972-243

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

1.4 Product definition

The Schroff 11596-15x is a 13 U / 14 Slot ATCA 40G Shelf with enhanced cooling capability along with 25G or 40G backplane connectivity.

- Product Number 11596-150: Dual Star **40G** Backplane, bused IPMB
- Product Number 11596-151: Dual Star **40G** Backplane, radial IPMB
- Product Number 11596-152: Full Mesh **25G** Backplane, bused IPMB
- Product Number 11596-153: Full Mesh **25G** Backplane, radial IPMB

The Schroff 11596-15x is designed to work with two redundant Schroff ShMM-ACB-V Shelf Managers, at least one Shelf Manager is needed for a working System.

Shelf Manager with bused IPMB: 21596-291 (Product Number)
21596-300 (Catalog Number with packaging)

Shelf Manager with radial IPMB: 21596-292 (Product Number)
21596-301 (Catalog Number with packaging)

The Shelf Managers are not included with the Shelf

1.5 Terms and Acronyms

Table 1: Terms and Acronyms

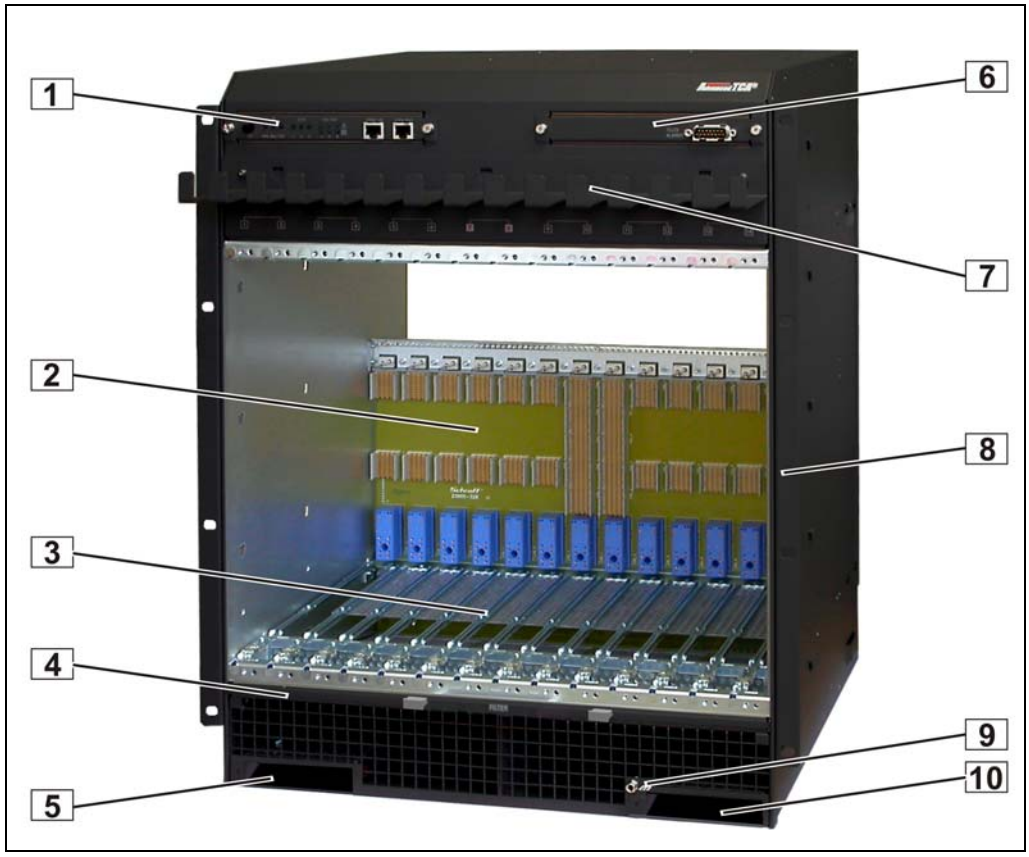
Term	Definition
ATCA	Advanced Telecom Computing Architecture
Backplane	Passive circuit board providing the connectors for the front boards. Power distribution, management and auxiliary signal connections are supported
CDM	Chassis Data Module
Chassis	Enclosure containing subrack, Backplane, boards, cooling devices, PEMs, same as Shelf
CMM	Chassis Management Module, same as Shelf Manager
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	See Chassis
VRTN	Voltage Return

2 Hardware Platform

- Removable mounting brackets for 19“ cabinets
- ESD Wrist Strap Terminals at the front and the rear
- 14 slot ATCA 40G Backplane with Full Mesh or Dual Star Fabric Interface, Dual Star Base Interface and bused or radial IPMB interface, supporting twelve 8 U node board slots and two 8 U hub slots
- 2 dedicated Shelf Manager slots accepting Schroff ShMM-ACB-V Shelf Managers
- Enhanced cooling capability:
  255 W per slot (t_a = 55 °C, Δt = 10 K with CP-TA boards)
  380 W per slot (t_a = 40 °C, Δt = 15 K with CP-TA boards)
- 3 Hot Swap Fan Trays, rear pluggable
- Air inlet filter including air filter presence sensor
- Front pluggable Shelf Alarm Panel (SAP): Provides Telco Alarm interface
- Front pluggable Shelf Alarm Display (SAD): Provides Alarm Status LEDs, Fan Tray Alarm LEDs and serial interfaces for the Shelf Managers
- Rear pluggable dual redundant Power Entry Modules (PEM). Each PEM providing connection of 4x25 A power feeds

2.1 Shelf Front and Rear View

Figure 1: Shelf Front View



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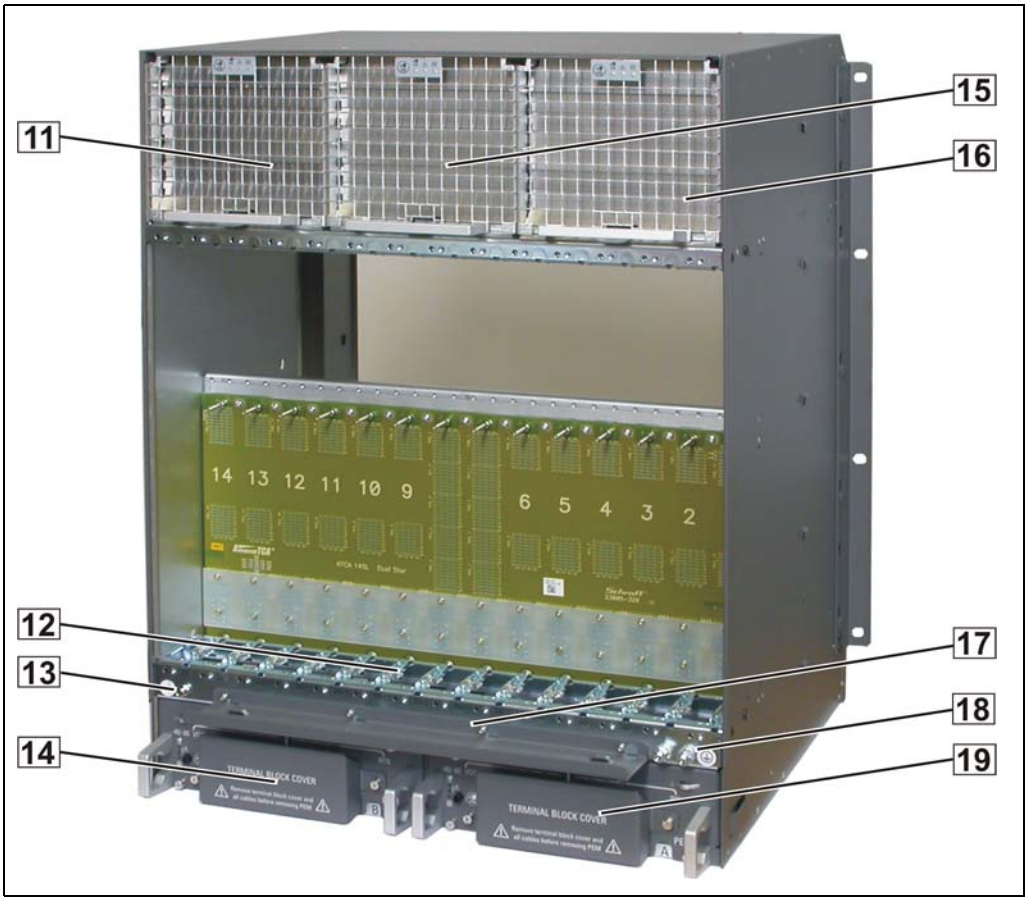
1	Shelf Alarm Display (SAD)	6	Shelf Alarm Panel (SAP)
2	ATCA 14-Slot Backplane	7	Front Cable Tray
3	Front Card Cage	8	Removable Mounting Bracket
4	Air Filter Tray	9	Front ESD Wrist Strap Terminal
5	Slot for Shelf Manger 1	10	Slot for Shelf Manager 2

Figure 2: Shelf Rear View



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11	Fan Tray #2	16	Fan Tray #0
12	Rear Card Cage	17	Rear Cable Tray
13	Rear ESD Wrist Strap Terminal	18	Shelf Ground Terminal (M6 studs)
14	Power Entry Module B (PEM B)	19	Power Entry Module A (PEM A)
15	Fan Tray #1		

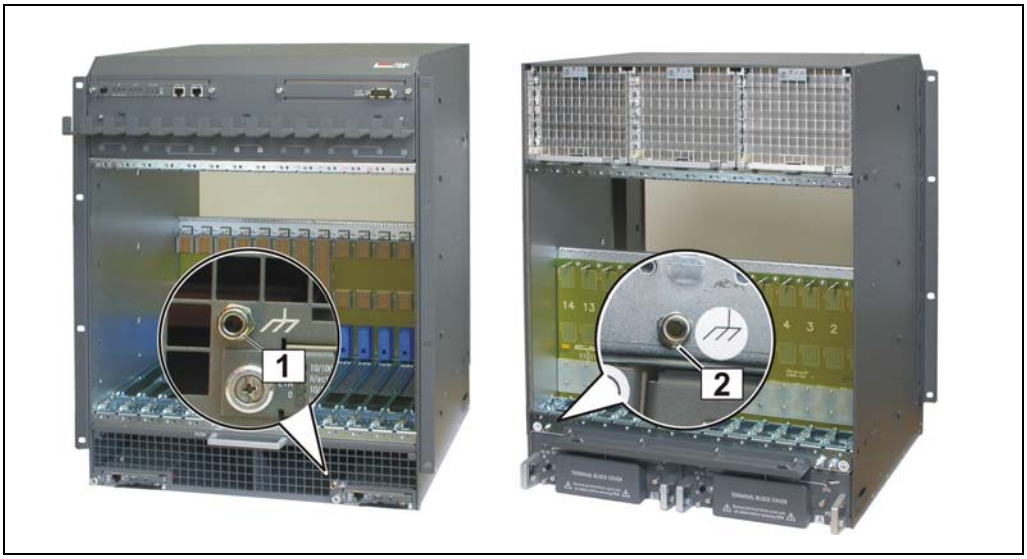
2.2 ESD Wrist Strap Terminals

Danger of electrostatic discharge!

Static electricity can harm delicate components inside the Shelf. You must wear an ESD wrist strap before exchanging any part or electric component!

Two ESD Wrist Strap Terminals (4 mm banana jacks) are located at the lower front and rear side of the Shelf.

Figure 3: ESD Wrist Strap Terminals



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1 Front ESD Wrist Strap Terminal

2 Rear ESD Wrist Strap Terminal

3 ATCA Backplane

The 14-slot ATCA monolithic Backplane provides:

- 25 Gb/s connectivity (4 lanes with 6,25 Gb/s) (Full Mesh BP)
- 40 Gb/s connectivity (4 lanes with 10 Gb/s) (Dual Star BP)
- 12 ATCA Node slots
- Two ATCA Hub slots
- Two dedicated Shelf Manager slots
- Two Power Entry Module (PEM) slots
- Two slots for the Chassis Data Modules (CDM)

3.1 Logical to Physical Slot Mapping

The physical slots are sequentially numbered from left to right. The logical slots are mapped to the physical slots according to Table 2.

Table 2: 14-Slot ATCA Backplane physical to logical slot mapping

	Node	Node	Node	Node	Node	Node	Hub Slot	Hub Slot	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	4CA	4E
IPMB-Address (Hex)	9A	96	92	8E	8A	86	82	84	88	8C	90	94	98	9C
Update Channel	●	●	●	●	●	●	●	●	●	●	●	●	●	●
Power Domain	1	2	1	2	1	2	1	3	4	3	4	3	4	3

3.2 Interfaces

3.2.1 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.

3.2.2 Fabric Interface

The Fabric Interface in the ATCA Backplane is wired as:

- Full Mesh supporting 4 ports per Channel, interconnecting each ATCA slot (Product Number: 11596-152/153)
- Dual Star, supporting four ports per channel (Product Number: 11596-150/151)

See PICMG® 3.0 AdvancedTCA® Base Specification for details.

3.2.3 Synchronization Clock Interface

6 differential pairs of synchronization clocks are bused between all 14 ATCA slots and terminated at both ends with 80.5 Ohms between each differential pair.

3.2.4 Update Channel Interface

The Update Channels are wired between two redundant ATCA Backplane slots as 10 differential pairs with 100 Ohms impedance. (See Table 2 in this Chapter)

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

The Update Channel assignment is printed on the frontside of the Shelf.

3.2.5 Power Interface

Power distribution within the ATCA Backplane is divided into four Power Branches. This topology is used for safety reasons to keep the max. current per fuse less the 30 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.

3.3 Dedicated Shelf Manager Slots

The front accessible Shelf Manager slots accept Schroff ShMM-ACB-V Shelf Managers and are wired to:

- IPMB-A and IPMB-B (I^2C-bus)
- Base Interface Channel 1 (ShMC) of the Base Interface Hub slots, supporting Shelf Manager Cross Connect (10/100 Base T Ethernet)
- Fan Tray connectors
- PEM A and PEM B connector

The dedicated Shelf Manager slots also have interconnected signals that allow the Shelf Managers to run in a redundant configuration.

3.3.1 Intelligent Platform Management Interface

The Shelf uses an Intelligent Platform Management Bus (IPMB) for management communications among all ATCA Boards 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 bused configuration
  (Product Number: 11596-150/152)
- a radial configuration
  (Product Number: 11596-151/153)

Figure 4: Bused IPMB

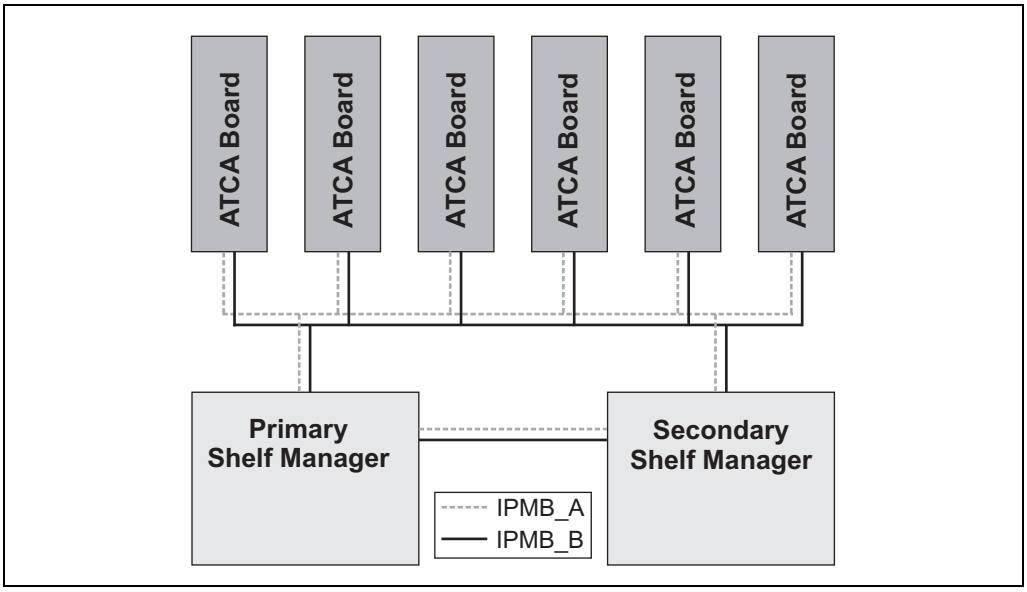

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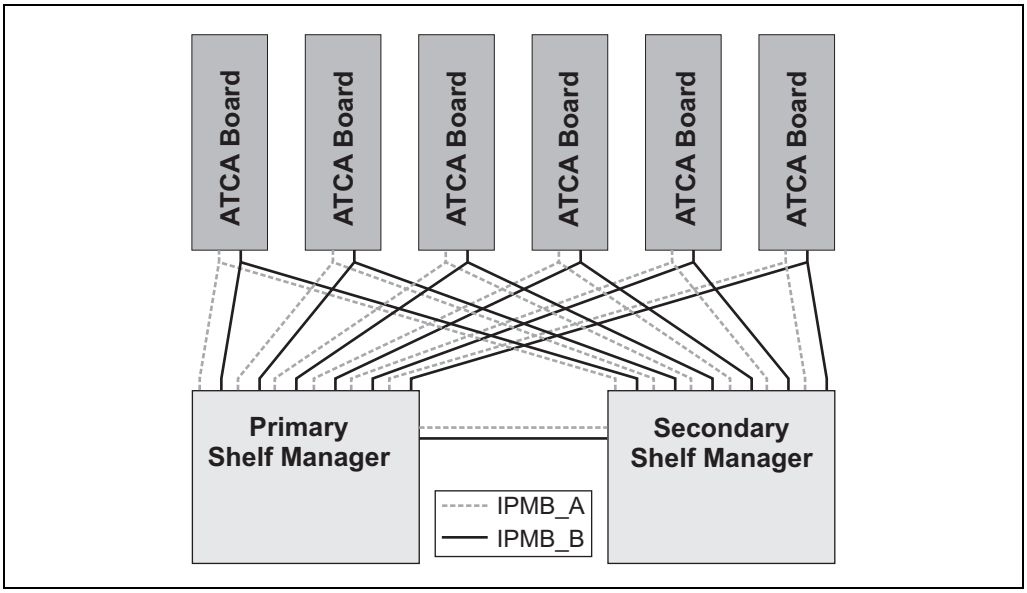
Figure 5: Radial IPMB



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3.4 Non-ATCA Connectors on the ATCA Backplane

Figure 6: ATCA Backplane front connectors

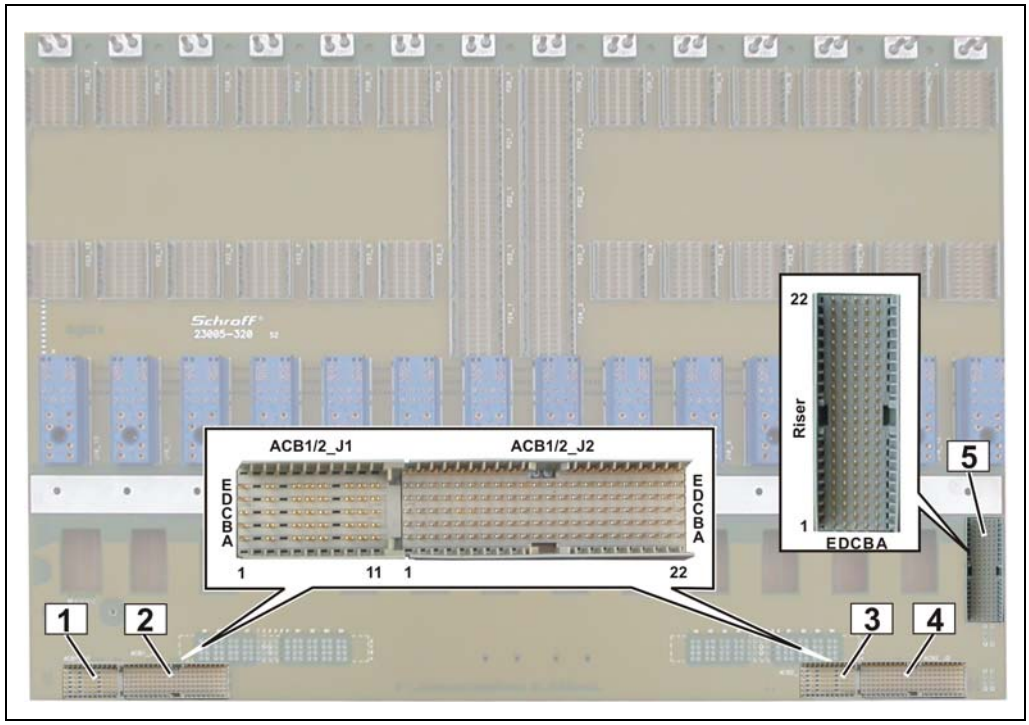

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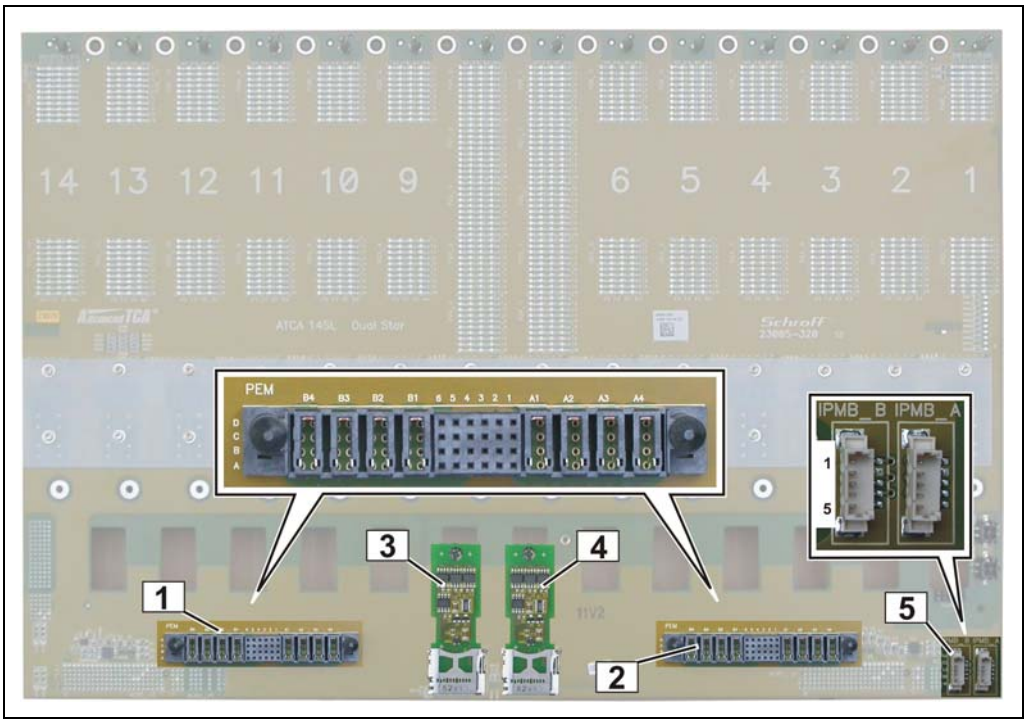
Table 3: ATCA Backplane front connectors

#	Name	Type	Designation
1	ACB1_J1	HardMetric C11	Backplane Connector (J1) Shelf Manager 1 (left)
2	ACB1_J2	HardMetric AB22	Backplane Connector (J2) Shelf Manager 1 (left)
3	ACB2_J1	HardMetric C11	Backplane Connector (J1) Shelf Manager 2 (right)
4	ACB2_J2	HardMetric AB22	Backplane Connector (J2) Shelf Manager 2 (right)
5	Riser	HardMetric AB22	Backplane Connector Riser Board to Horizontal Board

3.4.1 Shelf Manager Backplane Connectors

For pin assignment see *Chapter 11.15, "Shelf Manager Front Panel and Backplane connectors"*.

Figure 7: ATCA Backplane rear connectors



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1	PEM B Backplane Connector	4	Chassis Data Module 1 (CDM 1)
2	PEM A Backplane Connector	5	IPMB-A and IPMB-B Connectors
3	Chassis Data Module 2 (CDM 2)		

3.4.2 PEM Backplane Connectors

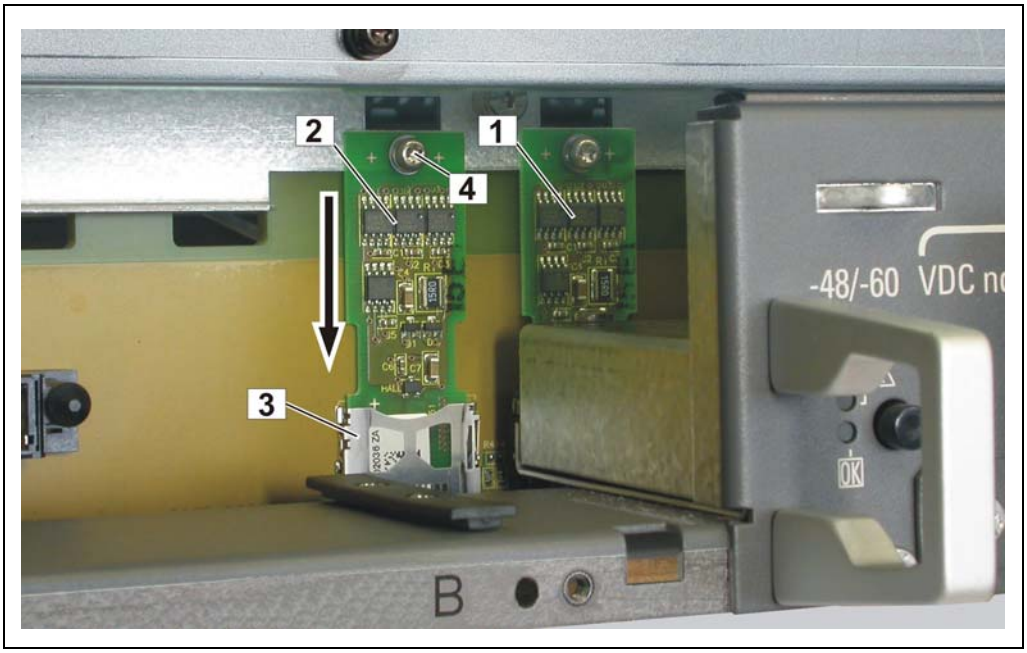
For pin assignment see *Chapter 9.8, "PEM Connectors"*.

3.5 Chassis Data Modules (CDM)

The Chassis Data Module (CDM) is a carrier board for:

- The FRU SEEPROM (24LC256)
- 3 temperature sensors (LM75)
- A Hall Effect sensor (Air filter presence)

Figure 8: Chassis Data Modules (CDM)



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1	CDM 1	3	Slot
2	CDM 2	4	Fixing screw

Both CDMs are pluggable modules and located on the rear side of the ATCA Backplane. The modules can be accessed after removing the respective Power Entry Module (PEM).

Warning!

Before removing a PEM, make sure that all Power Feeds of the other PEM are fully functional.

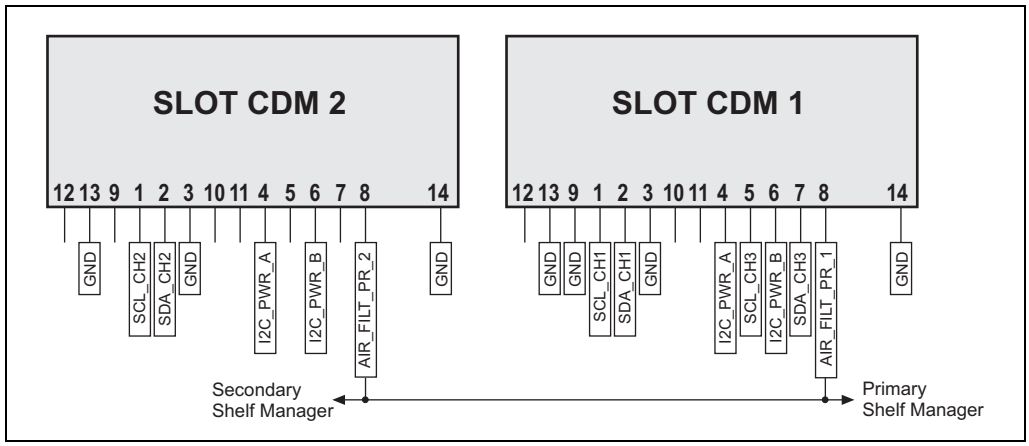
Remove a CDM:

After removing the fixing screw, push the CDM in direction of the arrow to release the locking mechanism in the CDM slot.

Table 4: Chassis Data Module I²C addresses

CDM	Channel	I²C-bus address
CDM 1, SEEPROM	Channel 1	0xa4 / 52
CDM 2, SEEPROM	Channel 2	0xa4 / 52
CDM 1, LM75 (left)	Channel 3	0x98 / 4c
CDM 1, LM75 (center)	Channel 3	0x9a / 4d
CDM 1, LM75 (right)	Channel 3	0x9c / 4e

Figure 9: CDM Slot Pin Assignment



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3.5.1 IPMB-A Connector (Assembly Option)

Connector IPMB-A is wired to the IPMB-A bus and is not assembled by default.

Table 5: IPMB-A Connector

Pin#	Signal name	Description
1	SCL_A13	IPMB-A, Serial clock
2	GND	Logic Ground
3	SDA_A13	IPMB-A, Serial Data
4	I2C_PWR_A	3,3 VDC power supply for Shelf I²C-bus devices

3.5.2 IPMB-B Connector (Assembly Option)

Connector IPMB-B is wired to the IPMB-B bus and is not assembled by default.

Table 6: IPMB-B Connector

Pin#	Signal name	Description
1	SCL_B13	IPMB-B, Serial clock
2	GND	Logic Ground
3	SDA_B13	IPMB-B, Serial Data
4	I2C_PWR_B	3,3 VDC power supply for Shelf I²C-bus devices

3.6 Shelf Manager Cross Connect

The ATCA Backplane provides cross connect traces between the Base Hubs and the Shelf Managers according to PICMG Engineering Change Notice ECN 3.0-2.0-001. This ECN adds an option for dual 10/100 Base-T links from each Base Hub to both dedicated Shelf Manager slots.

Figure 10: Shelf Manager Cross Connect

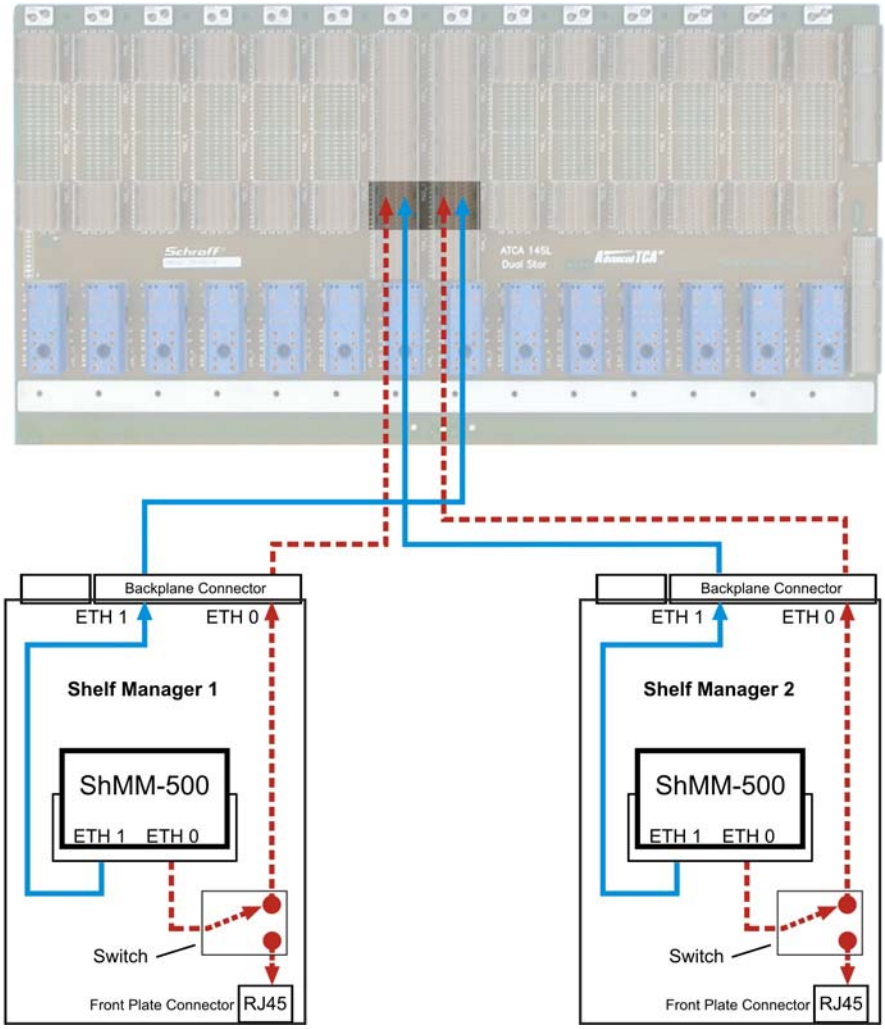

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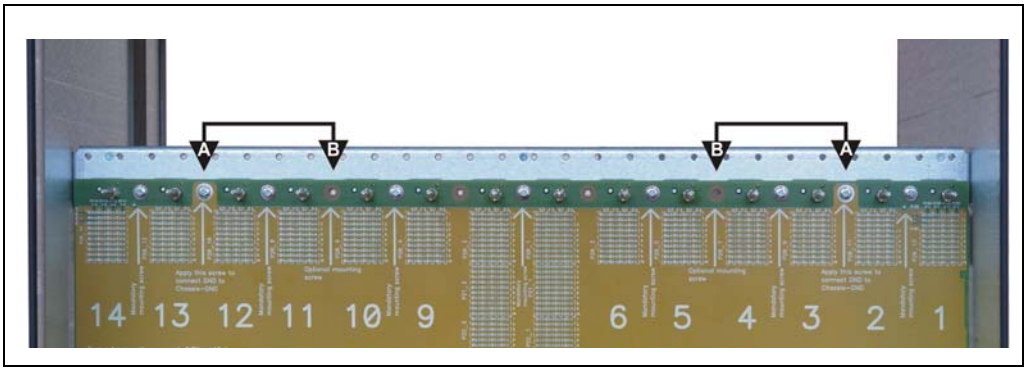
Table 7: Connector (P23) pin assignments for Shelf Manager Cross Connect

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			

3.7 Logic Ground (GND) and Shelf Ground (Shelf_GND)

Figure 11: Logic Ground/Shelf Ground Connection



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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).

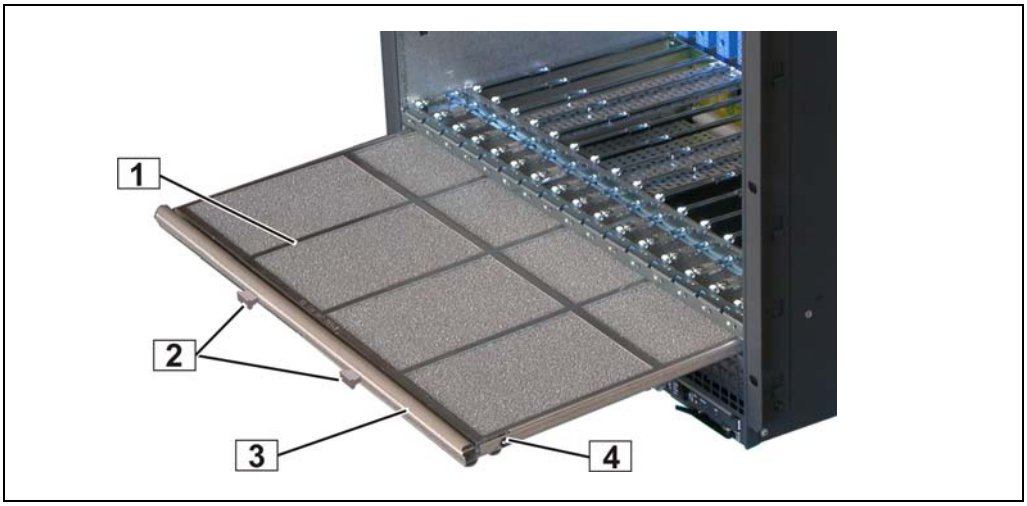
- Screws at position (A): Logic Ground and Shelf Ground connected.
- Screws at position (B): Logic Ground and Shelf Ground isolated.

Torque for the Screws: 0.7 Nm +10%

Logic Ground and Shelf Ground is not connected by default.

4 Air Filter

Figure 12: Air Filter



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1	Filter Element	3	Filter Tray
2	Handles	4	Spring mounted ball lock

4.1 Introduction

The ATCA Shelf provides a front replaceable air filter.

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

4.2 Air Filter Replacement

The air filter tray can be removed by pulling the air filter's handle. To re-install, push the air filter tray into the guide rails at each side of the shelf until the spring mounted ball lock engage.

When installing the air filter, the filter element must be in top position

4.3 Air Filter Presence Sensor

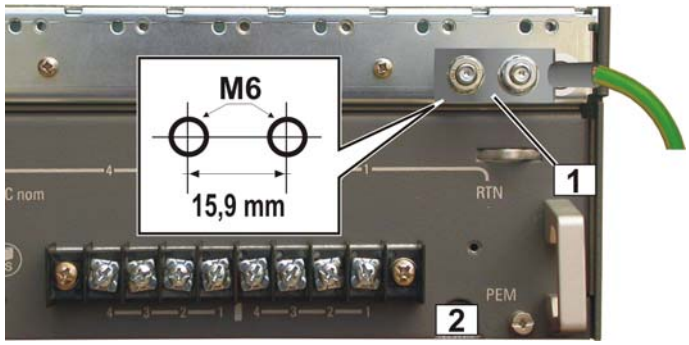
The air filter presence is detected by a Hall effect sensor located on the Chassis Data Module (CDM). The Hall effect sensor is activated by a magnet mounted at the rear side of the air filter metal frame.

5 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 right rear bottom side. The Shelf ground terminal provides two M6 studs to connect a double-lug Shelf ground terminal cable.

Figure 13: Shelf ground terminal



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1	Shelf Ground Terminal	2	PEM A

Please note, that in a typical telecom environment, the VRTN path of the -48 V supply is grounded to Protective Earth (PE) of the building.

5.1 Specification for the Shelf Ground connection cable

Required wire size: AWG6

Required terminals: Use only double lug terminals with 45° angle tongue.

Example for terminal:

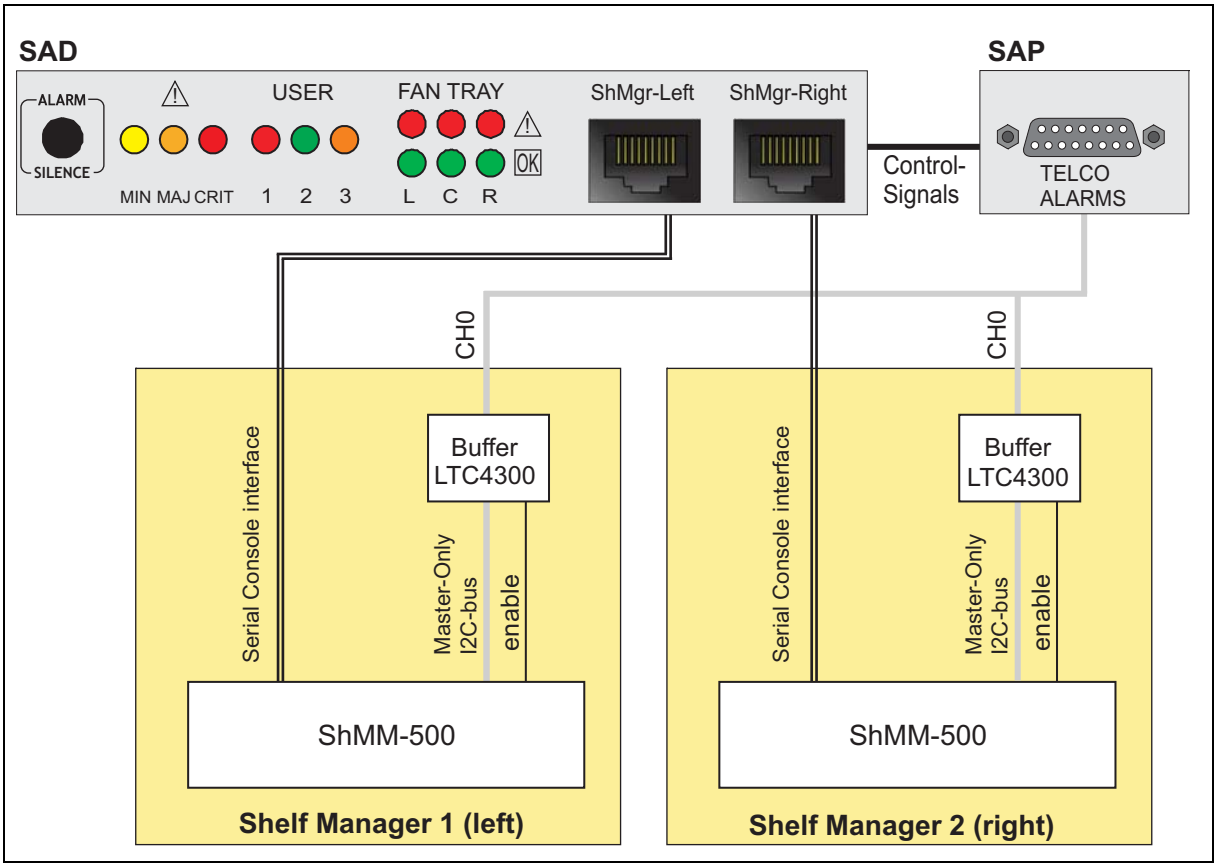
PANDUIT part no. **LCD6-14AH-L**, or **Thomas&Betts** part no. **54205UF**

See catalogs at www.panduit.com and www.tnb.com.

6 Shelf Alarm Panel and Shelf Alarm Display

Some Shelf Manager I/O functionalities have been moved to separate boards called Shelf Alarm Panel (SAP) and Shelf Alarm Display (SAD).

Figure 14: Connection between Shelf Manager and SAP



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6.1 Shelf Alarm Panel (SAP)

The Shelf Alarm Panel (SAP) is located at the right front top side of the Shelf. It provides the Telco Alarm connector (DB15-male). The I²C-bus devices on the SAP are connected to the Master-Only I²C-bus of both Shelf Managers. Only the active Shelf Manager has access to the SAP.

Figure 15: Shelf Alarm Panel (SAP)

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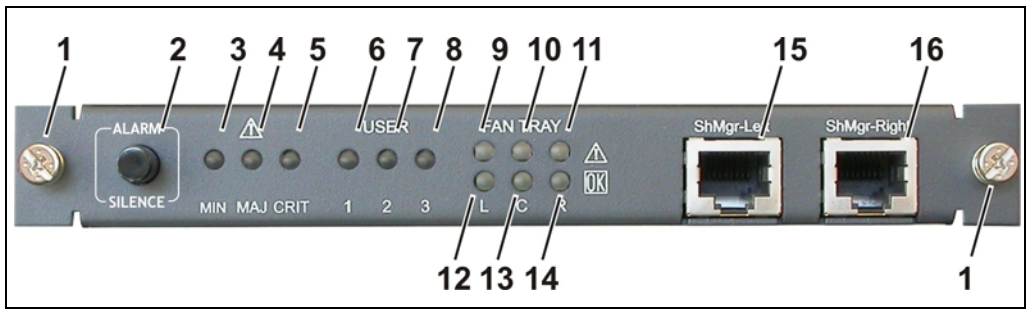
1	Shelf Alarm Panel (SAP)	3	Fixing screw
2	Telco Alarm Connector (DB15-male)		

6.2 Shelf Alarm Display (SAD)

The Shelf Alarm Display (SAD) is a user interface and located at the left front top of the Shelf. It provides:

- 3 Shelf Alarm LEDs (MINOR, MAJOR, CRITICAL)
- 3 User-definable LEDs (USER1, USER2, USER3)
- 3 Fan Tray Alarm LEDs (Left, Center, Right)
- 3 Fan Tray OK LEDs (Left, Center, Right)
- The Alarm Silence push button
- 2 serial console interfaces for both Shelf Managers (RJ45 connectors)

Figure 16: Shelf Alarm Display



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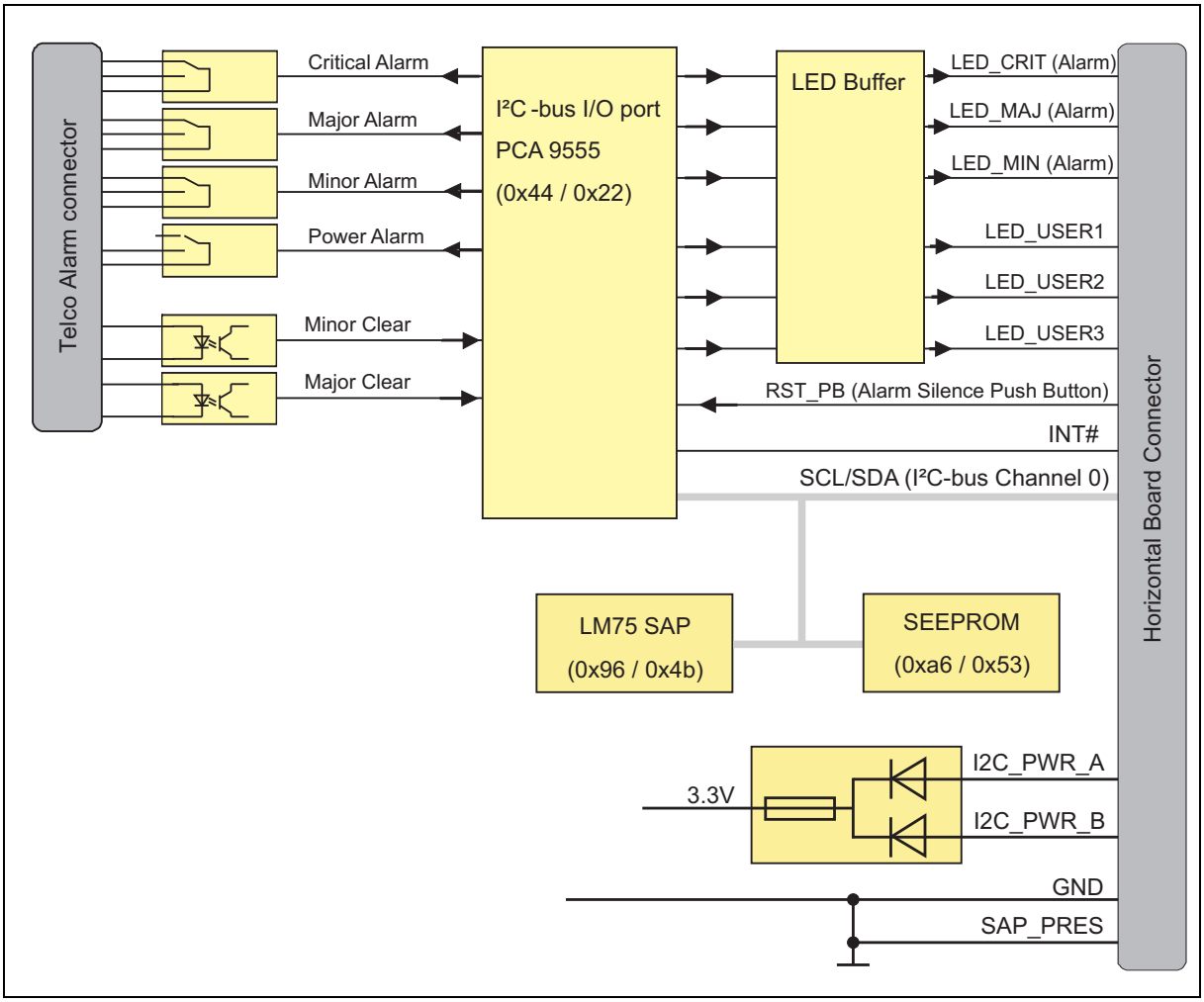
1	Fixing screw	9	LED Fan Tray Left Alarm (red)
2	Alarm Silence push button	10	LED Fan Tray Center Alarm (red)
3	LED Min. Alarm (yellow)	11	LED Fan Tray Right Alarm (red)
4	LED Maj. Alarm (amber)	12	LED Fan Tray Left OK (green)
5	LED Crit. Alarm (red)	13	LED Fan Tray Center OK (green)
6	User definable LED 1 (red)	14	LED Fan Tray Right OK (green)
7	User definable LED 2 (green)	15	Serial Console Interface Shelf Manager 1 (Left)
8	User definable LED 3 (amber)	16	Serial Console Interface Shelf Manager 2 (Right)

6.2.1 User definable LEDs

The LEDs USER (1, 2, 3) are user definable and connected to the I²C-bus I/O port of the PCA 9555 on the SAP.

6.3 Shelf Alarm Panel (SAP) Block Diagram

Figure 17: SAP Block Diagram



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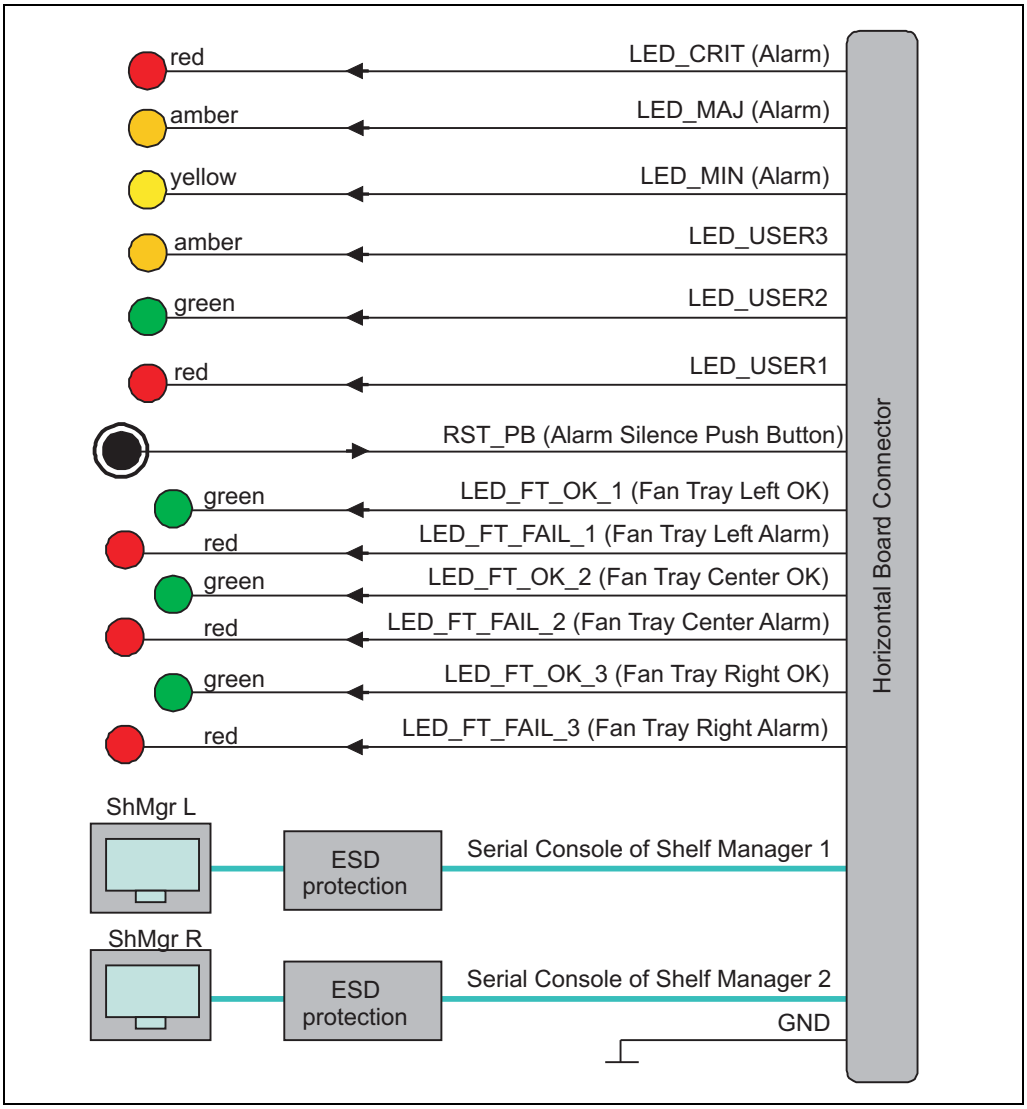
6.4 Shelf Alarm Display (SAD) Block Diagram

Figure 18: Shelf Alarm Display Block Diagram



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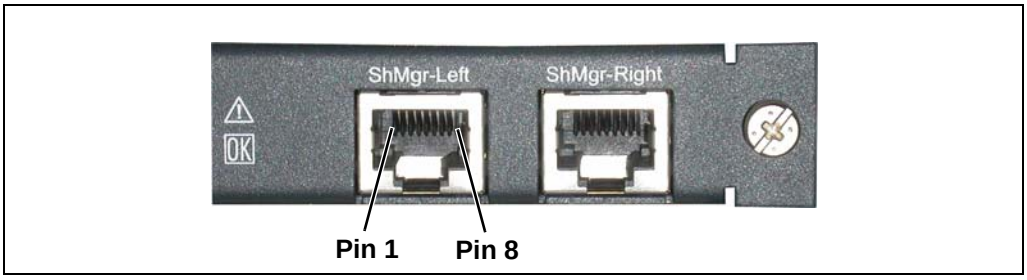
6.5 RS-232 Serial Console Interfaces on Shelf Alarm Display

Figure 19: RS-232 Serial Console Interfaces on Shelf Alarm Display



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The Shelf Alarm Display 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. The serial interface is implemented on the ShMM-500.

The serial console default configuration is:

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

Table 8: RS-232 Serial Console Interface Pin assignment

RJ45 Pin	RS-232 Signal	ShMM-500 Signal	Type	Description
1	RTS	RTS	Out	Request To Send
2	DTR	DTR	Out	Data Terminal Ready
3	TxD	TXD0	Out	Transmit Data
4	GND	GND	---	Logic Ground
5	GND	GND	---	Logic Ground
6	RxD	RXD0	In	Receive Data
7	DSR	DSR	In	Data Set Ready
8	CTS	CTS	In	Clear To Send

6.6 SAP Telco Alarms

6.6.1 Telco Alarm Interface

The SAP provides a Telco Alarm interface on the DB15-male connector. Three relay outputs are used for remote alarm distribution, reflecting the state of the three Alarm LEDs. The relays are capable of carrying 72 VDC or 1 A with a max. rating of 30 VA.

6.6.2 Telco Alarm LEDs

The Shelf Alarm Panel provides the Telco Alarm LEDs. These LEDs indicate presence of Critical, Major and Minor alarms as follows:

Table 9: Telco Alarm LEDs

State	Description
Off	No alarm active
On	Alarm active
Flashing	Alarm active, but silenced

6.6.3 Alarm Silence Push Button

The Alarm Silence push button on the Shelf Alarm Panel faceplate deactivates the alarm relays. During the time Alarm Silence is activated, the Alarm LEDs flash. By pressing the Alarm Silence push button a second time, the alarm relays are reactivated and the Alarm LEDs are solid.

*The **Alarm Silence** push button only activates the Alarm Silence state, but does not reset the alarms. If the silence interval (default 600 s) is exceeded without resolving the alarms, the alarms will be re-initiated.*

6.6.4 Alarm Reset

Hardware Reset:

Two relay inputs at the DB15 connector are used to reset the Minor and Major alarm state.

The reset inputs accept timed pulse inputs for clearing Minor and Major alarm states. Reset is accomplished by asserting a voltage differential from 3.3 VDC to 72 VDC for between 200 ms and 300 ms. The acceptance voltage range is from 0 to 48 VDC continuous (handles up to 60 VDC at a 50% duty cycle). The current drawn by a reset input does not exceed 12 mA.

There is no hardware reset (reset input) for the Critical Alarm state.

Software Reset:

The RMCP and CLI functions can be used to set and reset the Telco Alarms (incl. Critical Alarm). See the Pigeon Point Shelf Manager External Interface Reference for more information.

6.7 SAP and SAD Connectors

6.7.1 SAP Telco Alarm Connector (DB15-male)

Figure 20: Telco Alarm Connector (DB15-male)

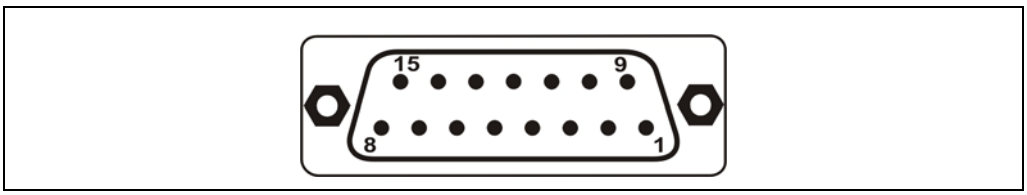

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Table 10: Telco Alarm Connector Pin Assignment

Pin	Name	Description
1	AMIR+	MinorReset+
2	AMIR-	MinorReset-
3	AMAR+	MajorReset+
4	AMAR-	MajorReset-
5	ACNO	CriticalAlarm - NO
6	ACNC	CriticalAlarm - NC
7	ACCOM	CriticalAlarm - COM
8	AMINO	MinorAlarm – NO
9	AMINC	MinorAlarm – NC
10	AMINCOM	MinorAlarm – COM
11	AMANO	MajorAlarm – NO
12	AMANC	MajorAlarm – NC
13	AMACOM	MajorAlarm – COM
14	APRCO	PwrAlarm – NO
15	APRCOM	PwrAlarm - COM
Shield	Shelf-GND	Shelf Ground

6.7.2 Shelf Alarm Display Horizontal Board Connector

Figure 21: Shelf Alarm Display Horizontal Board Connector

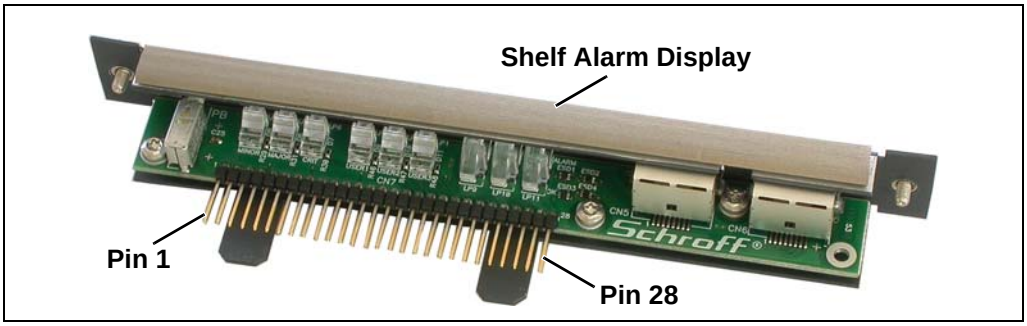

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Table 11: Shelf Alarm Display Horizontal Board Connector Pin Assignment

Pin	Signal Name	Description
1	GND	Ground
2	GND	Ground
3	GND	Ground
4	RXD0_ACB1	Receive Data to Shelf Manager 1
5	RXD0_ACB2	Receive Data to Shelf Manager 2
6	TXD0_ACB1	Transmit Data from Shelf Manager 1
7	TXD0_ACB2	Transmit Data from Shelf Manager 2
8	DSR_ACB1	Data Set Ready to Shelf Manager 1
9	DSR_ACB2	Data Set Ready to Shelf Manager 2
10	DTR_ACB1	Data Terminal Ready from Shelf Manager 1
11	DTR_ACB2	Data Terminal Ready from Shelf Manager 2
12	CTS_ACB1	Clear To Send from Shelf Manager 1
13	CTS_ACB2	Clear To Send from Shelf Manager 2
14	RTS_ACB1	Request To Send to Shelf Manager 1
15	RTS_ACB2	Request To Send to Shelf Manager 2
16	LED_MIN	Signal to Minor Alarm LED
17	LED_MAJ	Signal to Major Alarm LED
18	LED_CRIT	Signal to Critical Alarm LED
19	LED_USER1	Signal to User Definable LED1
20	LED_USER2	Signal to User Definable LED2
21	LED_USER3	Signal to User Definable LED2
22	RST_PB	Signal from Alarm Silence Push Button
23	LED_FT_FAIL_1	Signal to Fan Tray Left Alarm LED
24	LED_FT_FAIL_2	Signal to Fan Tray Center Alarm LED
25	LED_FT_FAIL_3	Signal to Fan Tray Right Alarm LED
26	LED_FT_OK_1	Signal to Fan Tray Left OK LED
27	LED_FT_OK_2	Signal to Fan Tray Center OK LED
28	LED_FT_OK_3	Signal to Fan Tray Left OK LED

6.7.3 Shelf Alarm Panel Horizontal Board Connector

Figure 22: Shelf Alarm Panel Horizontal Board Connector

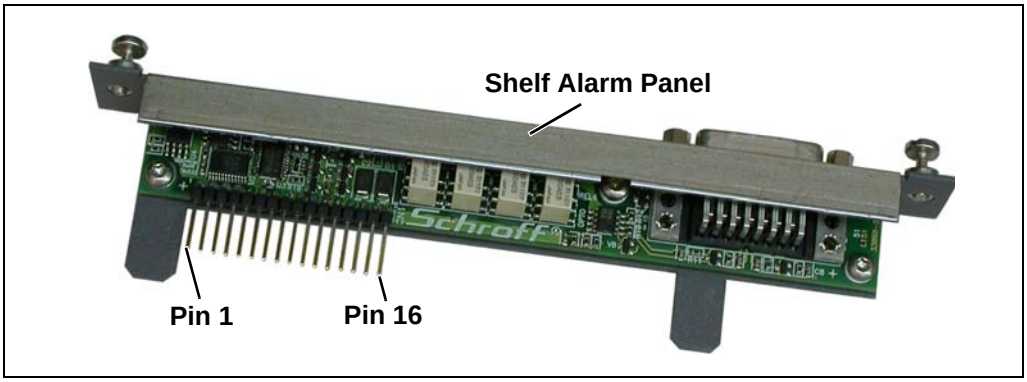

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Table 12: Shelf Alarm Panel Horizontal Board Connector Pin Assignment

Pin	Signal Name	Description
1	LED_USER1	Signal to User Definable LED1 on Shelf Alarm Display
2	LED_USER2	Signal to User Definable LED2 on Shelf Alarm Display
3	LED_USER3	Signal to User Definable LED3 on Shelf Alarm Display
4	LED_MIN	Signal to Minor Alarm LED on Shelf Alarm Display
5	LED_MAJ	Signal to Major Alarm LED on Shelf Alarm Display
6	LED_CRIT	Signal to Critical Alarm LED on Shelf Alarm Display
7	RST_PB	Signal from Alarm Silence Push Button on Shelf Alarm Display
8	GND	Ground
9	SCL_CH0	Serial Clock Master-Only I²C-Bus Channel 0
10	SDA_CH0	Serial Data Master-Only I²C-Bus Channel 0
11	GND	Ground
12	SAP_PRES (GND)	SAP Presence signal (Grounded on SAP)
13	INT#	External Interrupt Request (Master-Only I²C-Bus)
14	GND	Ground
15	I2C_PWR_B	3,3 VDC power supply for Shelf I²C-bus devices
16	I2C_PWR_A	3,3 VDC power supply for Shelf I²C-bus devices

6.8 SAP SEEPROM

The SAP SEEPROM is connected to the Master-Only I²C-bus and is a Microchip 24LC256 device.

6.9 SAP Temperature Sensor

The LM75 temperature sensor measuring the board temperature is located on the SAP PCB. The temperature sensor is connected to the Master-Only I²C-bus.

6.10 SAP I²C Addresses

Table 13: SAP I²C Addresses

LM75	SEEPROM	PCA9555
0x96/0x4b	0xa6/0x53	0x44/0x22

6.11 SAP PCA9555

The PCA9555 device:

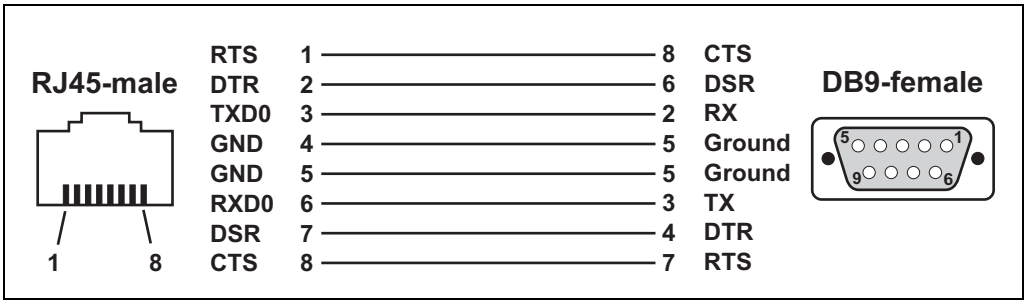
- controls the status of the LEDs at the Shelf Alarm Display
- reads the status of the Telco Alarm push button (RST)
- controls the Telco Alarm relays

Table 14: SAP PCA9555 Device Function

PCA9555 I/O pins	Function	State
0.0	Power Alarm to telco relays output	1 = relays powered
0.1	Minor Alarm to telco relays output	1 = relays powered
0.2	Major Alarm to telco relays output	1 = relays powered
0.3	Critical Alarm to telco relays output	1 = relays powered
0.4	N/C	Pulled High
0.5	LED_MIN (Minor alarm LED) output	1 = On
0.6	LED_MAJ (Major alarm LED) output	1 = On
0.7	LED_CRIT (Critical alarm LED) output	1 = On
1.0	Alarm cutoff push button input	0 = push button pushed
1.1	Minor Clear input	0 = voltage applied to input pins
1.2	Major Clear input	0 = voltage applied to input pins
1.3	N/C	Pulled High
1.4	N/C	Pulled High
1.5	LED_USER3 output	1 = On
1.6	LED_USER2 output	1 = On
1.7	LED_USER1 output	1 = On

6.12 SAP Console Cable for the Shelf Manager Serial Interface

Figure 23: RJ45 to DB9 Serial Console Cable



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The connectors are shown with the cables pointing away.

The serial console default configuration is:

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

The serial console cable is not included with the Shelf.

Order No.: 23204-187

7 Fan Trays

7.1 Introduction

The 14 Slot ATCA Shelf contains three hot-swappable Fan Trays. The Fan Trays are plugged-in at the upper rear side of the Shelf and can be removed by lifting the retention lever.

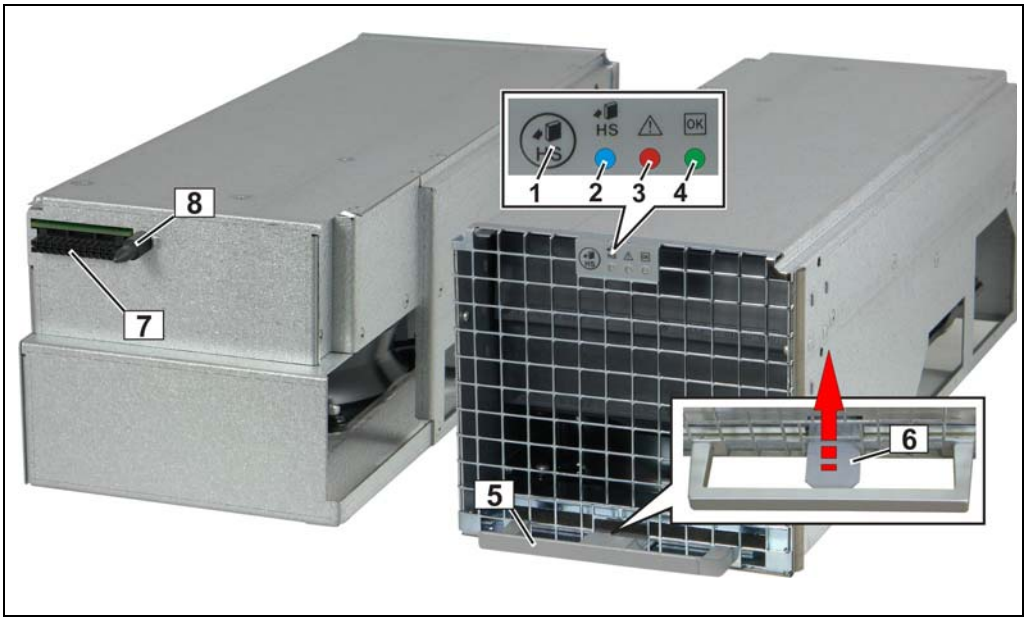
Each Fan Tray contains two fans for cooling the front boards and the RTM section of the Shelf. The cooling of the RTM section is provided by guiding air through cutouts in the ATCA Backplane.

The fan speeds are monitored by tachometer signals sent from the Fan Trays to the Shelf Manager. The Shelf Manager regulates the fan speed with a DC voltage.

The display module at 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

Figure 24: Fan Tray, Front and Rear View



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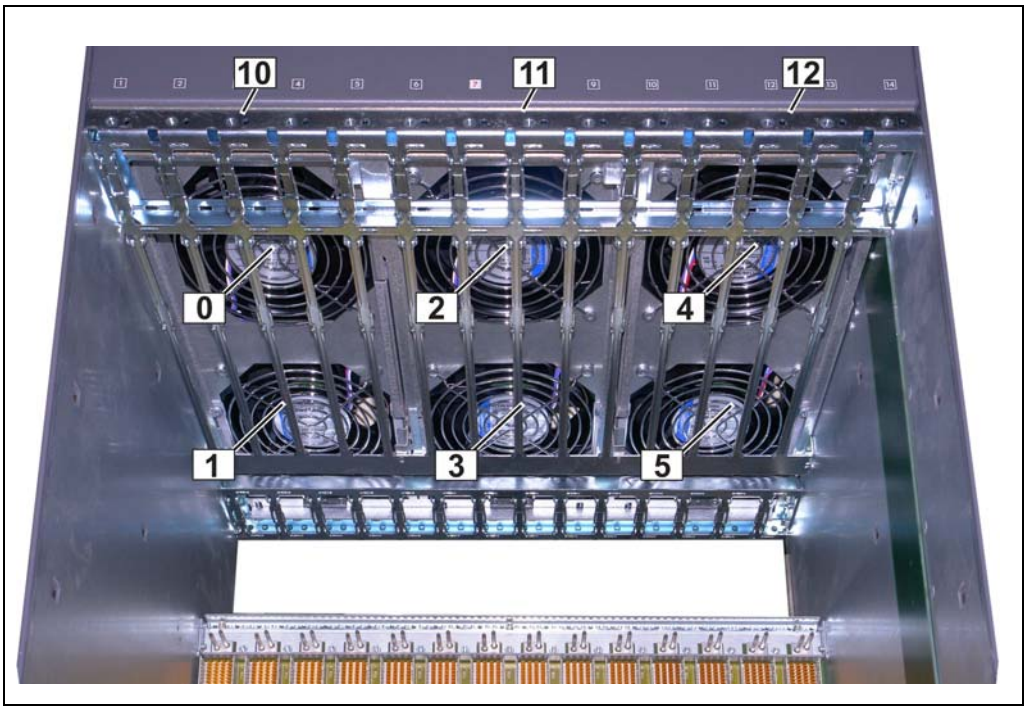
1	Hot Swap push button	5	Extraction handle
2	Hot Swap LED (blue)	6	Retention lever
3	Fan Tray Alarm LED (red)	7	Horizontal Board connector
4	Fan Tray OK LED (green)	8	Guiding Pin

Figure 25: Fan Tray Numbering



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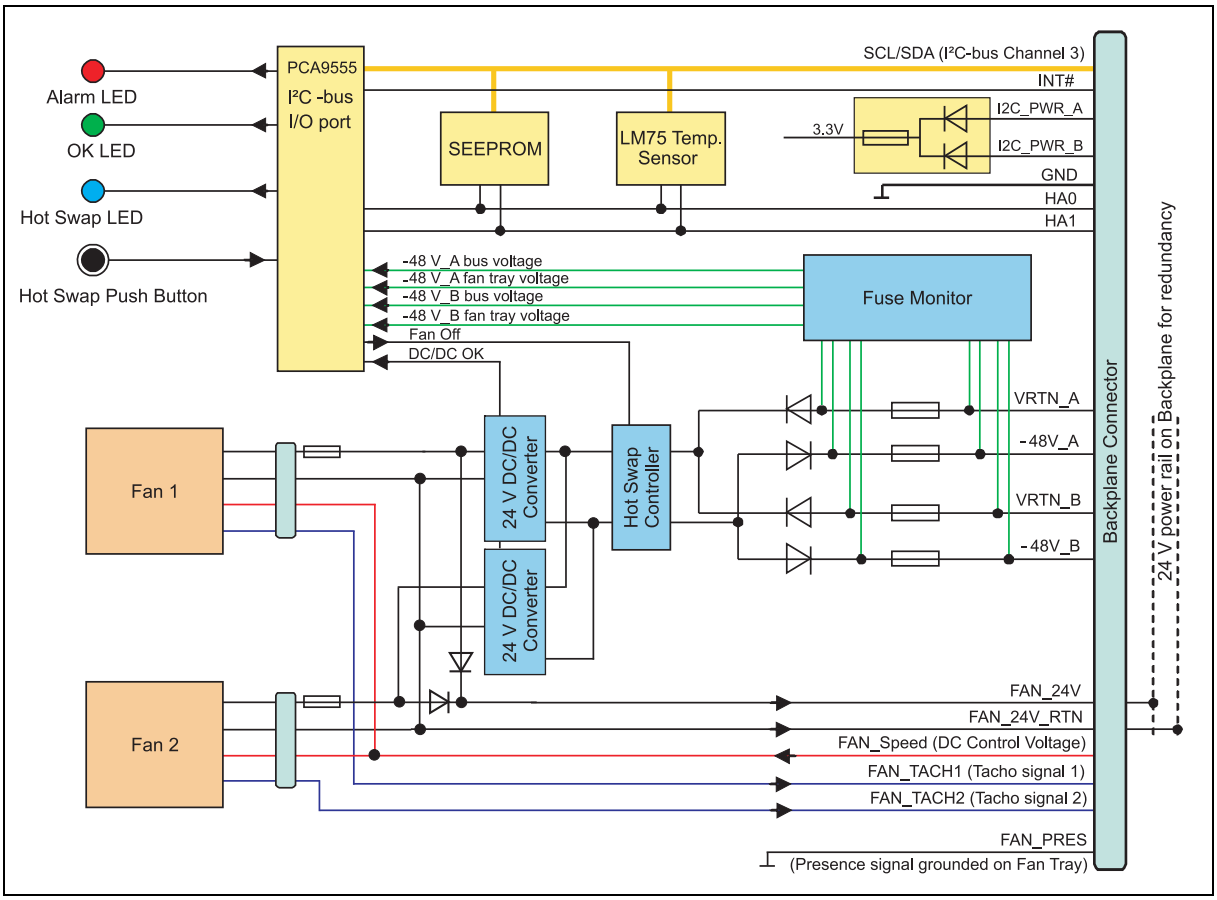
0	Fan #0		
1	Fan #1		
2	Fan #2		
3	Fan #3	10	Fan Tray #0 (left)
4	Fan #4	11	Fan Tray #1 (center)
5	Fan #5	12	Fan Tray #2 (right)

7.2 Fan Tray Block Diagram

Figure 26: Fan Tray Block Diagram



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7.3 Fan Tray Signals

The Fan Tray provides signals for:

- Supply Voltage monitoring
- Switching off the fans
- Status of the 24 V DC/DC converter

These signals are controlled by the PCA9555 I²C device on the Fan Tray PCB. The Shelf Manager has access to these signals via the Master-Only I²C-bus.

Table 15: Fan Tray Signals

Signal	description
-48 V_A bus voltage	Indicates the presence of the –48V_A / VRTN_A at the Horizontal Board Connector
-48 V_A fan tray voltage	Indicates the presence of the –48V_A / VRTN_A after the fan tray's mains fuse
-48 V_B bus voltage	Indicates the presence of the –48V_B / VRTN_B at the Horizontal Board Connector
-48 V_B fan tray voltage	Indicates the presence of the –48V_B / VRTN_B after the fan tray's main fuse
DC/DC OK	Indicates the proper functioning of the DC/DC converter which generate the 24 V voltage supply for the fans and the optical-isolation devices on the Shelf Manager
Fan Off	Turns off the fans

7.4 Fan Tray Temperature Sensor

The temperature sensors (LM75) in the Fan Trays measure the exhaust temperatures of the Shelf. The temperature sensors are connected to Channel 3 of the Master-Only I²C-bus.

I²C-bus addresses see *Table 18*.

7.5 Fan Tray control board SEEPROM

The SEEPROM (Microchip 24LC256) on the Fan Tray control board stores the FRU data and is connected to Channel 3 of the Master-Only I²C-bus.

I²C-bus addresses see *Table 18*.

7.6 Fan Tray Connectors and Indicators

Table 16: LEDs on Fan Tray control panel

Color	Description
blue	Hot Swap LED
red	Alarm LED
green	Fan Tray OK LED

Figure 27: Fan Tray Backplane connector

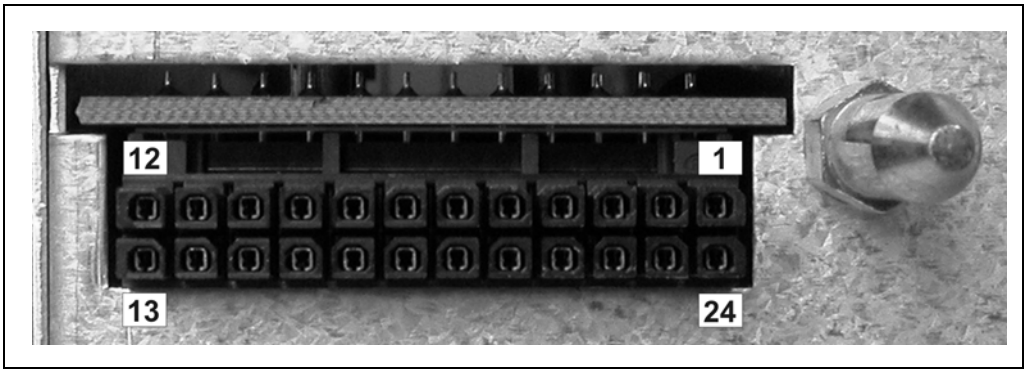

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Table 17: Fan Tray Backplane connector pin assignment

Pin #	Signal	Pin #	Signal
1	I2C_PWR_A	13	GND
2	I2C_PWR_B	14	FAN_PRES
3	SCL_CH3	15	HA0
4	SDA_CH3	16	HA1
5	LED_FT_FAIL	17	INT#
6	LED_FT_OK	18	
7		19	VRTN_B
8		20	VRTN_A
9	FAN_TACH2	21	-48V_B
10	FAN_TACH1	22	-48V_A
11	FAN_Speed	23	FAN_24V_RTN
12		24	FAN_24V

7.7 Fan Tray I²C Addresses

Geographic address pins (HA0, HA1) at the Fan Tray Horizontal Board connector determine the I²C addresses of the devices.

Table 18: Fan Tray I²C addresses

Fan Tray Location (front view)	SEEPROM	LM75	PCA9555
#0 (Left)	0xa8/0x54	0x90/0x48	0x48/0x24
#1 (Center)	0xaa/0x55	0x92/0x49	0x4a/0x25
#2 (Right)	0xac/0x56	0x94/0x4a	0x4c/0x26

The addresses are shown in 8 bit/7 bit format.

7.8 Fan Tray I/O Device

The Fan Tray I/O device (PCA9555):

- controls the status of the LEDs
- reads the status of the Hot Swap push button
- reads the status of the DC/DC converter for the 24 VDC fan power supply
- can enable the Hot Swap controller to switch off the fans

Table 19: Fan Tray PCA9555 pin assignment

PCA9555 I/O pins	Function	State
0.0	-48V_A bus voltage	0 = Voltage OK
0.1	-48V_A fan tray voltage	0 = Voltage OK
0.2	-48V_B bus voltage	0 = Voltage OK
0.3	-48V_B fan tray voltage	0 = Voltage OK
0.4	24 VDC OK	0 = Voltage OK
0.5	FAN OFF	0 = Fans switched off
0.6	N/C	Pulled high
0.7	N/C	Pulled high
1.0	N/C	Pulled high
1.1	N/C	Pulled high
1.2	N/C	Pulled high
1.3	Green LED (OK)	1 = On
1.4	Hot swap push button switch	1 = not pushed, 0 = pushed
1.5	Red LED (Alarm)	1 = On
1.6	N/C	Pulled high
1.7	Blue LED (Hot swap)	1 = On

Configuration registers 6 and 7 in the PCA9555 control the direction of the I/O pins. Normally a 0xdf is written to register 6 and a 0x17 is written to register 7. This will make all pins to inputs except for 0.5, 1.7, 1.6, 1.5 and 1.3. Configuration registers 4 and 5 in the PCA9555 control the inversion of the I/O pins. Normally a 0x00 is written to register 4 and 5. This will make the polarity of all of the pins the same as the bits in the registers.

7.9 Cooling Capacity

The cooling capacity can be calculated with:

$$\dot{V} = \frac{\dot{Q}}{\Delta t \times \rho \times c}$$

Where

ρ = Air density (Standard Air 1.2 kg/m³)

c = Air specific heat (1005 Ws/kg)

$\dot{V}$ = Volumetric Airflow Rate (m³/h)

$\dot{Q}$ = Heat Transfer Rate (Cooling Capacity) (W)

Δt = Temperature rise along the airflow path (°C)

With the Air density and specific heat as a constant, the formula is simplyfied to:

$$\dot{V} = 3 \times \frac{\dot{Q}}{\Delta t} \quad \text{and} \quad \dot{Q} = \frac{\dot{V} \times \Delta t}{3}$$

7.10 Front Board Air Distribution

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

Figure 28: Front Board Air Distribution

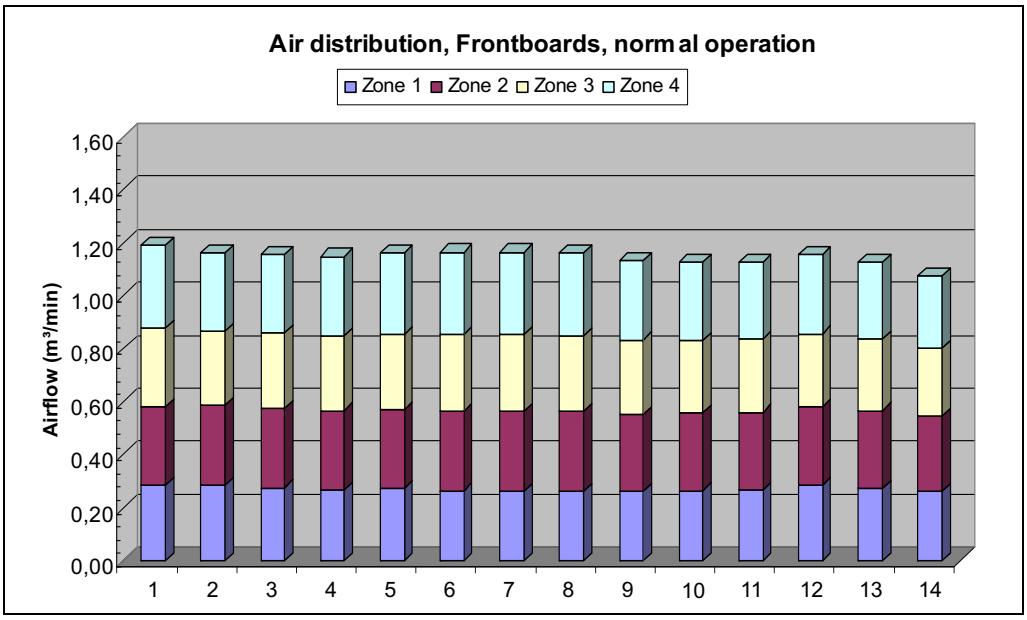


Table 20: Airflow and calculated cooling capacity front slots

	Zone1 [m³/min]	Zone2 [m³/min]	Zone3 [m³/min]	Zone4 [m³/min]	Σ [m³/min]	Σ [m³/h]	Σ CFM	Cooling Capacity Δt=10K	Cooling Capacity Δt=12K	CP-TA Cat.
Slot 1	0,28	0,3	0,29	0,32	1,19	71,58	42,11	240 W	288 W	>B4
Slot 2	0,29	0,3	0,28	0,29	1,16	69,64	40,97	234 W	280 W	>B4
Slot 3	0,28	0,3	0,28	0,3	1,15	69,3	40,76	233 W	279 W	>B4
Slot 4	0,27	0,3	0,28	0,3	1,15	68,91	40,54	232 W	278 W	>B4
Slot 5	0,27	0,3	0,29	0,31	1,16	69,79	41,05	234 W	281 W	>B4
Slot 6	0,27	0,3	0,29	0,31	1,17	69,98	41,17	235 W	282W	>B4
Slot 7	0,26	0,3	0,29	0,31	1,17	69,97	41,16	235 W	282 W	>B4
Slot 8	0,26	0,3	0,29	0,31	1,16	69,65	40,97	234 W	280 W	>B4
Slot 9	0,26	0,29	0,28	0,3	1,13	68,07	40,04	229 W	274 W	B4
Slot 10	0,27	0,29	0,28	0,29	1,13	67,61	39,77	227 W	272 W	B4
Slot 11	0,27	0,29	0,27	0,29	1,13	67,72	39,84	227 W	273 W	B4
Slot 12	0,28	0,29	0,28	0,3	1,15	69,3	40,76	233 W	279 W	>B4
Slot 13	0,27	0,29	0,27	0,29	1,13	67,61	39,77	227 W	272 W	B4
Slot 14	0,26	0,28	0,26	0,27	1,08	64,55	37,97	217 W	260 W	B3
Σ	3,8	4,14	3,93	4,19	16,06	963,67	566,87	3234 W	3880 W	

7.11 Rear Board Air Distribution

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

- Rear board pressure drop: 24 Pa at 0.14 m³/min

Figure 29: Rear Board Air Distribution

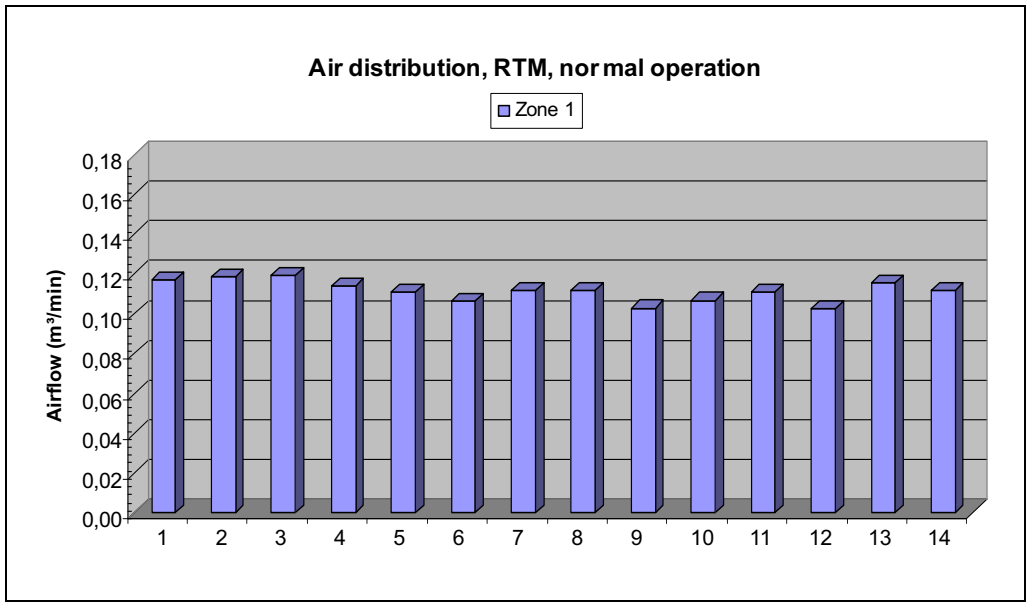
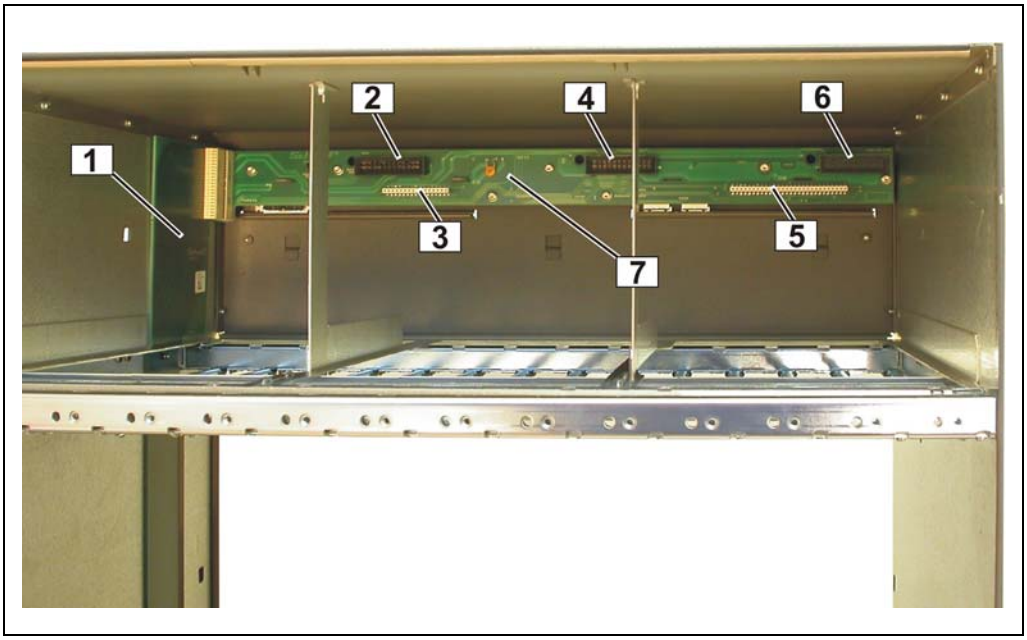


Table 21: Airflow and calculated cooling capacity rear slots

	Zone1 [m³/min]	Zone1[m³/h]	Zone1 CFM	Cooling Capacity Δt=10K	Cooling Capacity Δt=12K	CP-TA Cat.
Slot 1	0,12	7,02	4,13	24 W	28 W	B3
Slot 2	0,12	7,13	4,19	24 W	29 W	B3
Slot 3	0,12	7,18	4,22	24 W	29 W	B3
Slot 4	0,11	6,84	4,02	23 W	28 W	B2
Slot 5	0,11	6,65	3,91	22 W	27 W	B2
Slot 6	0,11	6,39	3,76	21 W	26 W	B2
Slot 7	0,11	6,7	3,94	22 W	27 W	B2
Slot 8	0,11	6,72	3,95	23 W	27 W	B2
Slot 9	0,1	6,18	3,63	21 W	25 W	B1
Slot 10	0,11	6,41	3,77	22 W	26 W	B2
Slot 11	0,11	6,67	3,92	22 W	27 W	B2
Slot 12	0,1	6,18	3,63	21 W	25 W	B1
Slot 13	0,12	6,93	4,08	23 W	28 W	B3
Slot 14	0,11	6,71	3,95	23 W	27 W	B2
Σ	1,56	93,69	55,11	314 W	377 W	

8 Horizontal Board

Figure 30: Horizontal Board



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1	Riser Board	5	Connector SAD
2	Connector Fan Tray #2	6	Connector Fan Tray #0
3	Connector SAP	7	Horizontal Board
4	Connector Fan Tray #1		

The Horizontal Board (7) is located behind the Fan Trays at the top of the Shelf. The Horizontal Board provides the connectors for the Fan Trays (2, 4, 6), the SAP (3) and the SAD (5).

The signals from the Fan Trays, the SAP and the SAD are routed through the Riser Board (1) to the ATCA Backplane.

9 Power Entry Module (PEM)

Hazardous voltage!

Before working ensure that the power is removed from the power connection cables. When the system is powered on, do NOT touch the power terminals.

Warning!

Although there are fuses in the power entry circuit of the Shelf, the power lines must be protected on rack level with 30 A breakers.

The Shelf can be powered using a regular telecommunication power supply of -48/-60 VDC with a VDC return. The specified voltage range is from -40.5 VDC to -72 VDC.The Shelf supports redundant power supplies but the two supplies should be independently powered.

9.1 Introduction

Two pluggable redundant Power Entry Modules (PEMs) are located at the rear bottom side of the Shelf. Each PEM provides power terminals for four 25 A power feeds. Each power feed consists of a –48 VDC cable and its corresponding return cable and is protected by a 30 A fuse.
Each of the four power feeds supplies power to a separate part of the ATCA Backplane. This topology is used for safety reasons to keep the max. current per fuse less the 30 A. The segmentation is shown in *Chapter 9.3, "Power Branches"*.

The power filtering consists of filtered power terminals and a discrete line-filter for each power input.

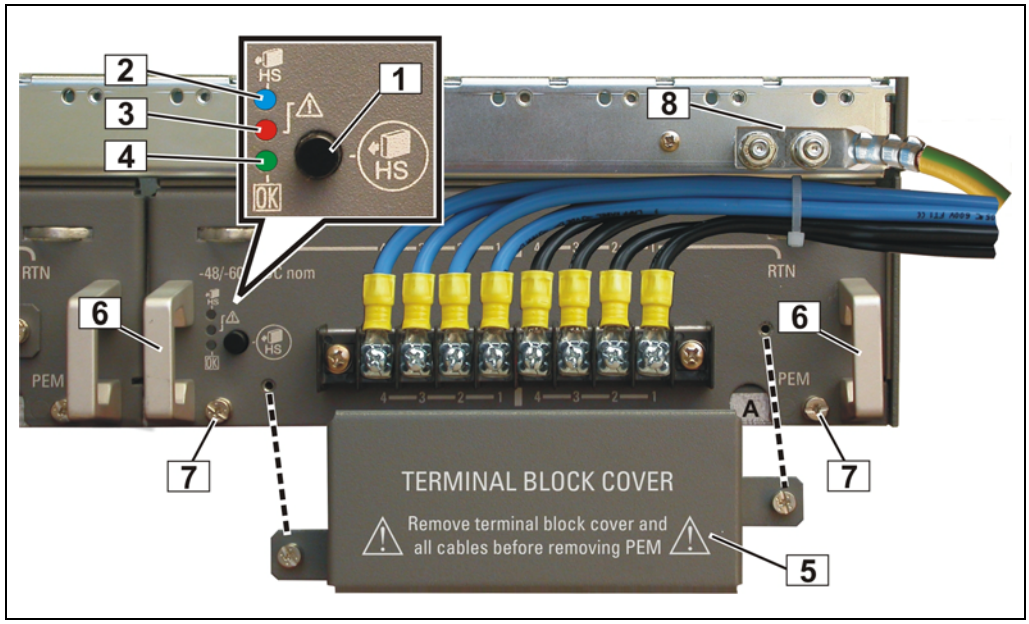
The input voltage range for the Shelf is from -40.5 VDC to -72 VDC.

To indicate the presence of the PEM, a PEM presence signal is grounded by the PEM.

A Blue Hot Swap LED and a Hot Swap Push Button provide Hot Swap functionality. A red (power failure) and a green (OK) LED provide status indication.

9.2 PEM Components

Figure 31: PEM components



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1	Hot Swap push button	5	Power Terminal cover
2	Hot Swap LED (blue)	6	Handle
3	PEM Alarm LED (red)	7	PEM fixing screws
4	PEM OK LED (green)	8	Shelf Ground Connection

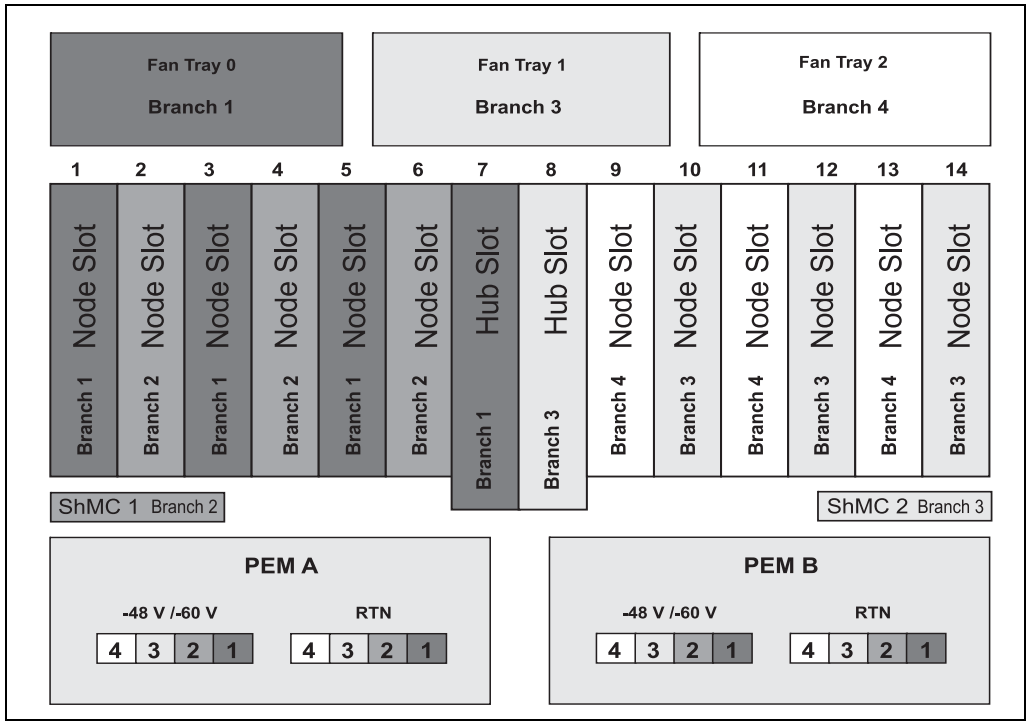
Table 22: PEM Input Power Terminal

Terminal -48/-60 VDC#	Designation	Terminal RTN#	Designation
1	Power Input Feed 1	1	Return Voltage Feed 1
2	Power Input Feed 2	2	Return Voltage Feed 2
3	Power Input Feed 3	3	Return Voltage Feed 3
4	Power Input Feed 4	4	Return Voltage Feed 4

9.3 Power Branches

The Backplane‘s power supply is divided into four power branches. Each of the PEM’s four power branches supplies power to a group of slots and a Fan Tray or Shelf Manager. This topology is used to keep the max. current per feed less then 25 A. The max. per slot power is limited by the minimum input voltage (40.5 V) and maximum current (25 A) per power branch.

Figure 32: Power distribution of the four Power Branches within the Shelf



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9.4 Slot Power Calculation

Each branch supplies power to group of slots and/or a Fan Tray or a Shelf Manager (See Figure 30).
The Shelf Manager calculates the maximum branch power by the minimum expected operating voltage (default 40.5 V) and the maximum branch current (25 A) stored in the Shelf‘s FRU file.
With the default settings the available branch power is calculated with 1012.5 W.

Example Branch 4: Branch 4 supplies power to slot 9,11,13 and Fan Tray 2. With the maximum current (25 A) and the minimum supply voltage (40.5 V), each power branch delivers 1012.5 W. The power consumption of the Fan Tray is 160 W (150 + 10), so the remaining power for 3 slots is 852,5 W, i.e. 284 W per slot on average. Because the Shelf Manager reserves 10 W for the for the IPMC on each FRU, the actual remaining slot power is 274 W.

Example Branch 3: Branch 3 supplies power to slot 8,10,12,14, Fan Tray 1 and ShMC 2. With the maximum current (25 A) and the minimum supply voltage (40.5 V), each power branch delivers 1012.5 W. The power consumption of the

Fan Tray is 160 W, the Shelf Manager is 20 W (10 + 10) so the remaining power for 3 slots is 832,5 W, i.e. 208 W per slot on average. Because the Shelf Manager reserves 10 W for the for the IPMC on each FRU, the actual remaining slot power is 198 W.

If the Shelf is operated in an environment that allows a higher minimum voltage, the user can alter the settings for the minimum expected operating voltage in the FRU file to gain a higher branch power.

The power capability per slot is set to 200 W in the Shelf‘s FRU file by default. If you want to use a board with more then 200 W, you must must modify the slot‘s power capability.

If the joint power capability of all ATCA boards assigned to a branch is greater than the calculated branch power, the Shelf Manager will not power-on all boards. (The last plugged-in or the last in the power-up sequence.)

Table 23: Branch Power Capability

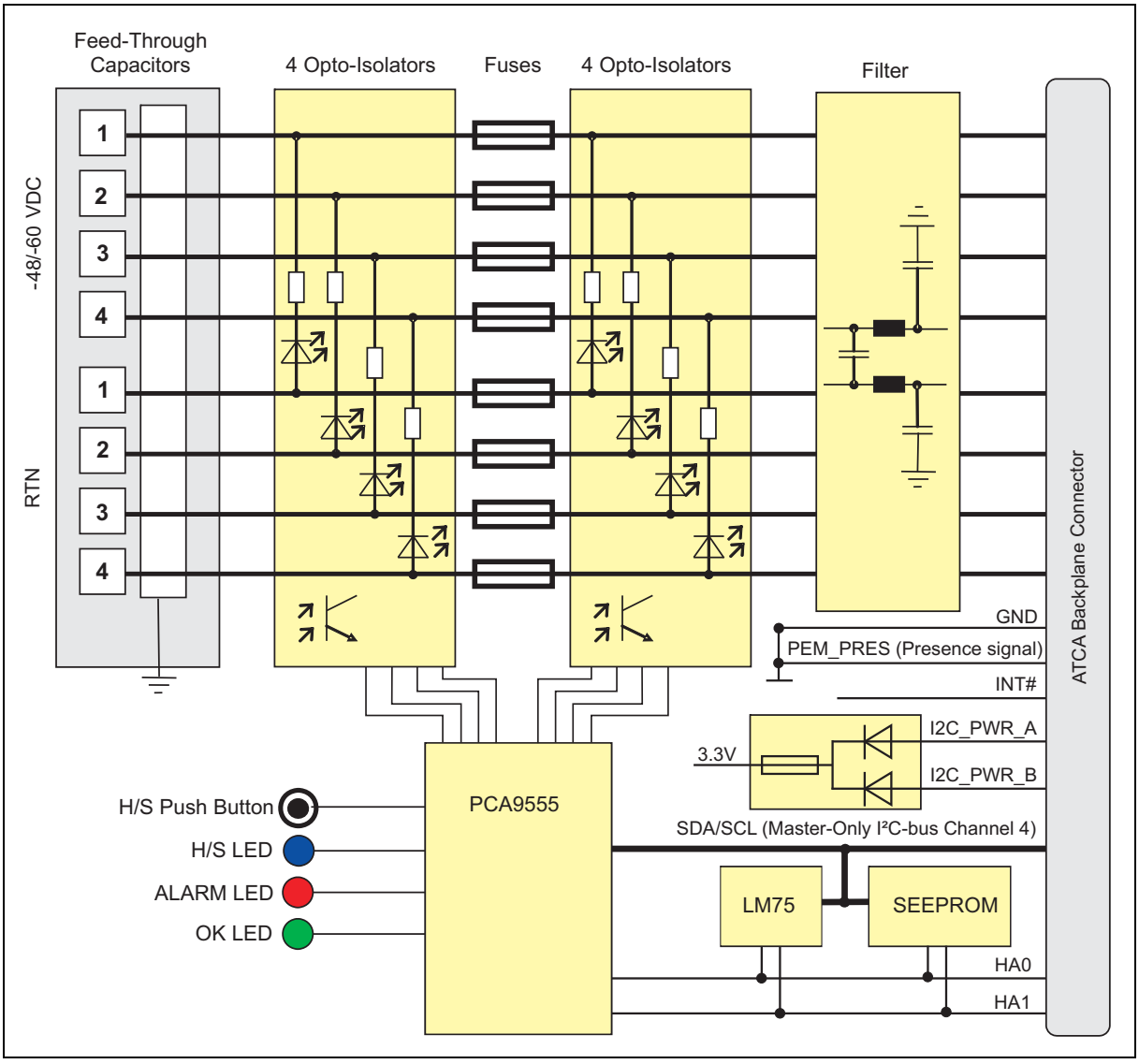
Input Voltage	Max. Current/ Branch	Max. Power/ Branch	Power FT and ShMC	Slot Power (Slot 1,3,5,7)	Slot Power (Slot 2,4,6)	Slot Power (Slot 8,10,12,14)	Slot Power (Slot 9,11,13)
40.5 V	25 A	1012.5 W	180 W	203 W	320 W	198 W	274 W
44 V	25 A	1100 W	180 W	235 W	350 W	230 W	303 W
48 V	25 A	1200 W	180 W	260 W	383 W	255 W	363 W
54 V	25 A	1350 W	180 W	297 W	433 W	292 W	386 W
57 V	25 A	1425 W	180 W	316 W	458 W	311 W	411 W

Note: You can modify the power capability of a FRU with the following CLI command: `clia shelf PwrCapability [hw-addr] [FRU-ID] [Power]`

For more information refer to the Pigeon Point Shelf Manager External Interface Reference Manual (www.pigeonpoint.com).

9.5 PEM Block Diagram

Figure 33: PEM Block Diagram



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9.6 PEM I²C-bus addresses

Geographic address pins (HA0, HA1) on the PEM Backplane connector determine the I²C addresses of the devices. The I²C devices on the PEMs are connected to channel 4 of the Master-Only I²C-bus of the Shelf Managers.

Table 24: PEM I²C-bus addresses

PEM Location	SEEPROM	LM75	PCA9555
PEM A (Right, view from rear)	0xa8/54	0x98/4c	0x48/24
PEM B (Left, view from rear)	0xaa/55	0x9a/4d	0x4a/25

9.7 PEM I/O Device

The PEM I/O device (PCA9555):

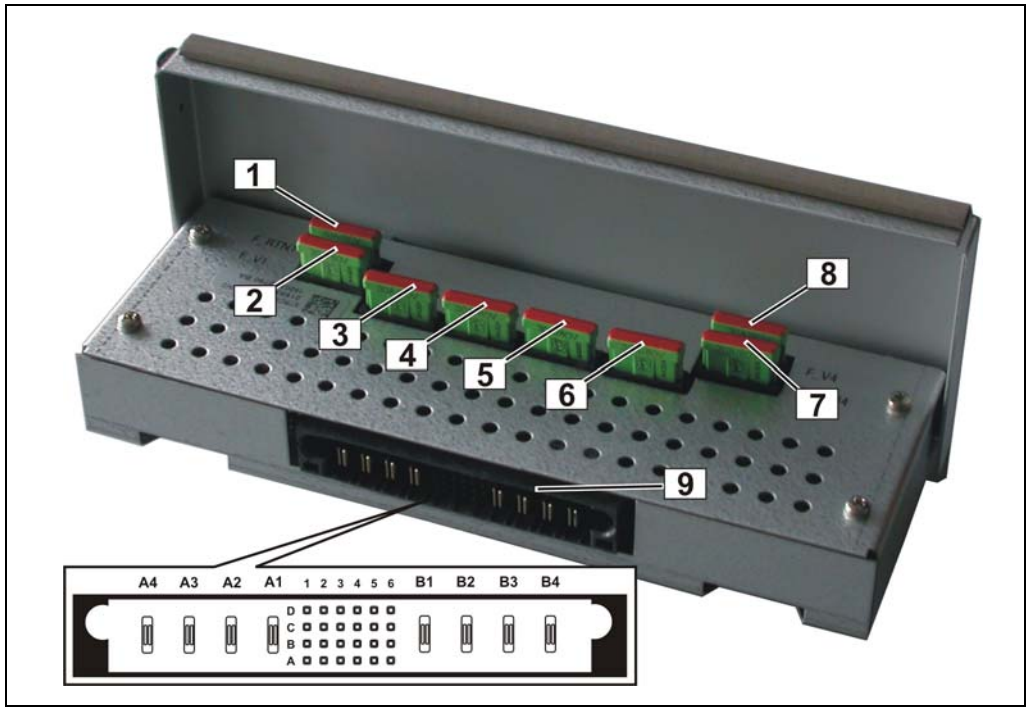
- controls the status of the LEDs
- reads the status of the Hot Swap push button
- reads the status of the -48 VDC inputs

Table 25: PEM PCA 9555 pin assignment

PCA9555 I/O pin	Function	State
0.0	Power Input 2 present	-48 V present = 0 -48 V absent = 1 (3.3V)
0.1	Power Input 2 after the fuse present	-48 V present = 0 -48 V absent = 1 (3.3V)
0.2	Power Input 1 present	-48 V present = 0 -48 V absent = 1 (3.3V)
0.3	Power Input 1 after the fuse present	-48 V present = 0 -48 V absent = 1 (3.3V)
0.4	N/C	Pulled High
0.5	N/C	Pulled High
0.6	Power Input 4 present	-48 V present = 0 -48 V absent = 1 (3.3V)
0.7	Power Input 4 after the fuse present	-48 V present = 0 -48 V absent = 1 (3.3V)
1.0	Power Input 3 present	-48 V present = 0 -48 V absent = 1 (3.3V)
1.1	Power Input 3 after the fuse present	-48 V present = 0 -48 V absent = 1 (3.3V)
1.2	N/C	Pulled High
1.3	Green LED	1=on
1.4	Hot Swap Push-button switch	1=not pushed, 0=pushed
1.5	Red LED	1=on
1.6	N/C	Pulled High
1.7	Blue LED	1=on

9.8 PEM Connectors

Figure 34: PEM Backplane Connector



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1	30 A Fuse VRTN_1 (F101)	6	30 A Fuse -48V_3 (F302)
2	30 A Fuse -48V_1 (F102)	7	30 A Fuse VRTN_4 (F401)
3	30 A Fuse VRTN_2 (F201)	8	30 A Fuse -48V_4 (F402)
4	30 A Fuse VRTN_3 (F301)	9	PEM Backplane Connector
5	30 A Fuse -48V_2 (F202)		

Table 26: PEM Backplane connector power contacts

A4	A3	A2	A1	B1	B2	B3	B4
-48 V_1	VRTN_1	-48 V_2	VRTN_2	-48 V_3	VRTN_3	-48 V_4	VRTN_4

Table 27: PEM Backplane connector signal contacts

Pin #	1	2	3	4	5	6
D		INT#	PEM_PRES			
C		HA0	HA1			
B		SCL_CH4	GND			
A		SDA_CH4	I2C_PWR_A	I2C_PWR_B		

9.9 Specification for the power connection cables

Required wire size:

Diameter 6 mm² resp. AWG10

max. length 2.5 to 3.0 m

suitable for 30 A at 50° C ambient temperature.

Required terminals:

Use ring terminals for screw M4 or UNC 8-32.

Max. outside diameter is 9.3 mm.

10 Distribution of the Master-Only I²C Bus

The master-only I²C bus is used internally on the ShMM-500 for the RTC and SEEPROM devices. The ACB-V carrier board also has a number of onboard I²C devices connected to the master-only I²C bus. These devices read the slot's hardware address, communicate with the System Management controllers ADM1024/1026 and monitor the presence signals from the PEMs and Fan Trays.

The master-only I²C bus is fed to a 4-channel switch (PCA9545) and then routed through the backplane connector to:

- the Shelf FRU SEEPROMs on the CDMs (Channel 1 and 2)
- the exhaust temperature sensors on the Fan Trays (Channel 3)
- the intake temperature sensors on the CDM1 (Channel 3)
- the PEMs (Channel 4)

The master only I²C-bus is also buffered and then routed to the SAP (Channel 0). The 'Active' signal of the ShMM-500 is used to enable the I²C switch and the buffer, so that only the active Shelf Manager has access to the Shelf I²C-bus devices.

Figure 35: Distribution of the Master-Only I²C-bus

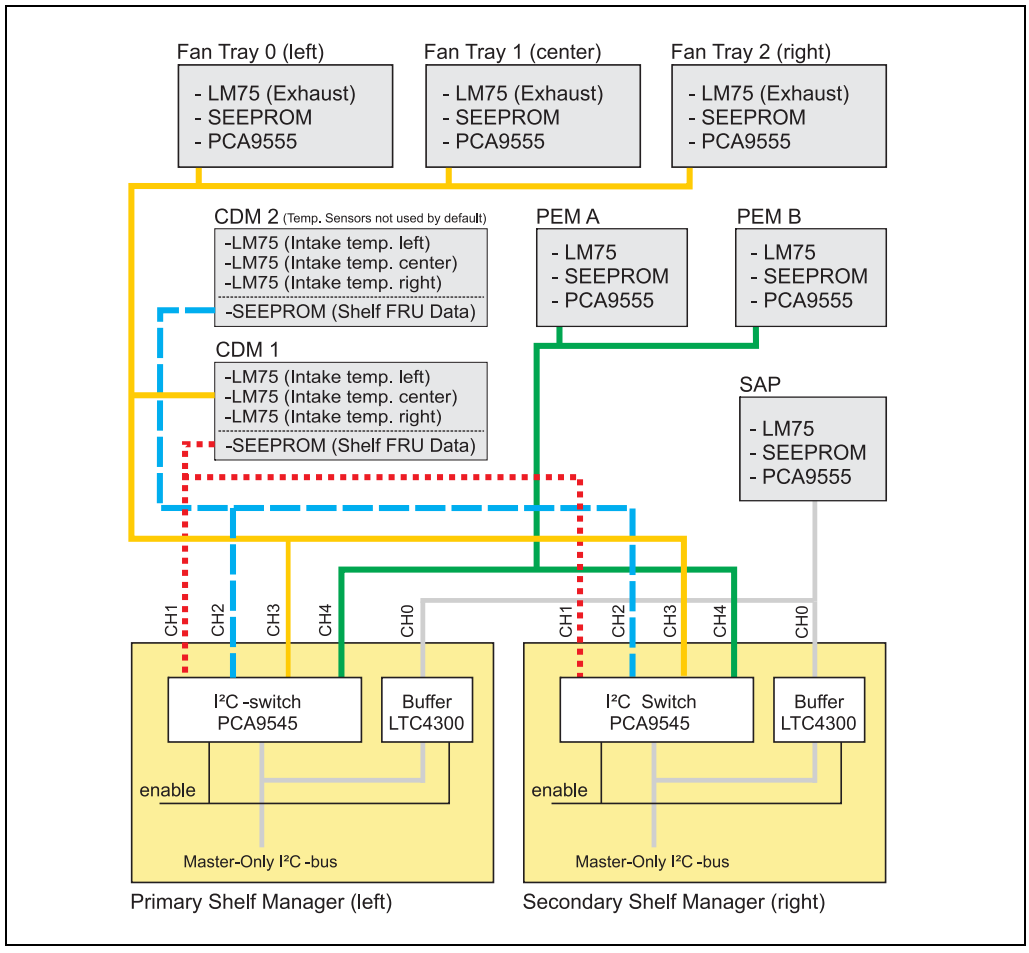

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Table 28: I²C-bus addresses of the Shelf

I²C addr.	ShMM	ACB-IV	SAP (CH 0)	CH 1	CH 2	CH 3	CH 4
0x44 / 22			PCA9555 Telco Alarms				
0x46 / 23		PCA9554 HW-Addr					
0x48 / 24						PCA9555 Fan Tray 0 (left)	PCA9555 PEM A
0x4a / 25						PCA9555 Fan Tray 1 (center)	PCA9555 PEM B
0x4c / 26						PCA9555 Fan Tray 2 (right)	
0x58 / 2C		ADM1024					
0x5c / 2E		ADM1026					
0x90 / 48						LM75 exhaust temp. left	
0x92 / 49						LM75 exhaust temp. center	
0x94 / 4a						LM75 exhaust temp. right	
0x96 / 4b			LM75 SAP temperature				
0x98 / 4c						LM75 intake temp. (left)	LM75 PEM A
0x9a / 4d						LM75 intake temp. (center)	LM75 PEM B
0x9c / 4e						LM75 intake temp. (right)	
0xa0 / 50	SEEPROM						
0xa4 / 52				SEEPROM CDM 1	SEEPROM CDM 2		
0xa6 / 53			SEEPROM SAP				
0xa8 / 54						SEEPROM Fan Tray 0 (left)	SEEPROM PEM A
0xaa / 55						SEEPROM Fan Tray 1 (center)	SEEPROM PEM B
0xac / 56						SEEPROM Fan Tray 2 (right)	
0xe0 / 70		PCA9545 I²C-bus switch					
0xe8 / 74		PCA9539 radial IPMB enable					
0xea / 75		PCA9539 radial IPMB enable					
0xee / 77		PCA9539 radial IPMB enable + GPIO					
0xd0 / 68	RTC DS1337						

11 Shelf Managers

This Chapter describes 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. 63972-243

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

Shelf Manager with bused IPMB: 21596-291 (Product Number)
21596-300 (Catalog Number with packaging)

Shelf Manager with radial IPMB: 21596-292 (Product Number)
21596-301 (Catalog Number with packaging)

The Shelf Managers are not included with the Shelf

11.1 Introduction

The Schroff Shelf Manager ACB-V 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:

1 Manage/track the FRU population and common infrastructure of a Shelf, especially the power, cooling and interconnect resources and their usage.

2 Enable the overall System Manager to join in that management/tracking through the System Manager Interface, which is typically implemented over Ethernet.

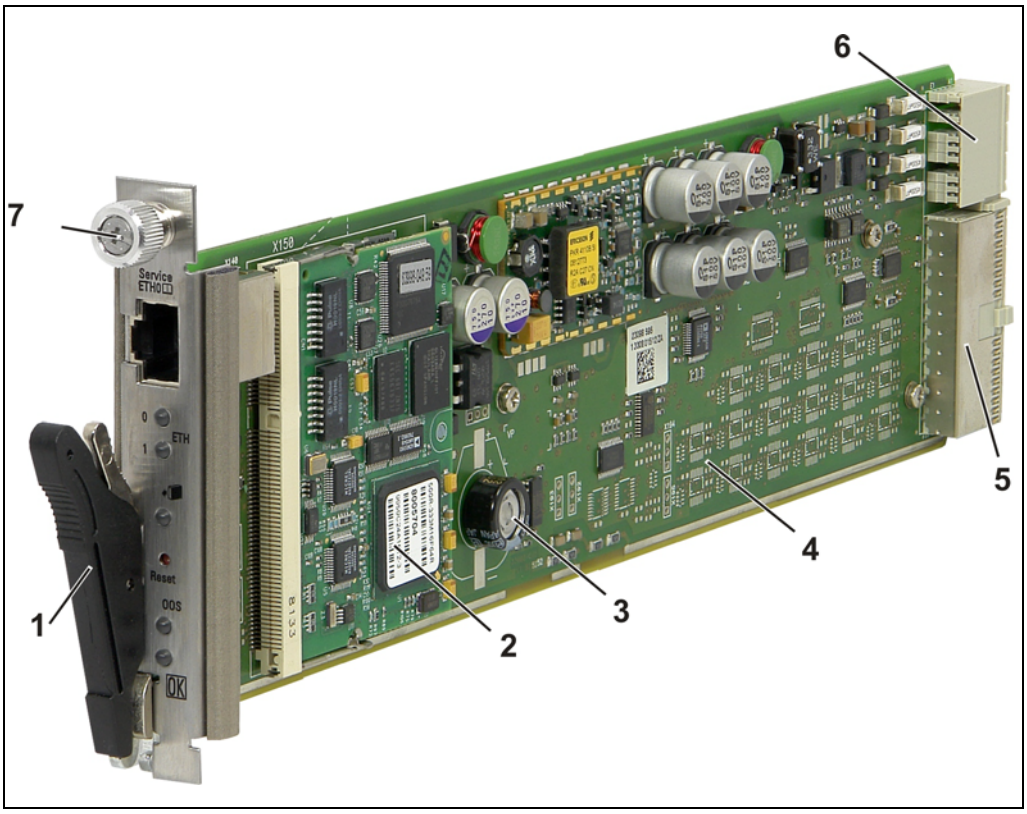
The Shelf management based on the Pigeon Point Shelf management solution for AdvancedTCA products.
The Shelf management software executes on the Pigeon Point **Sh**elf **M**anagement **M**ezzanine **500** (**ShMM-500**), a compact SO-DIMM form-factor module, installed on the ACB-V carrier board.
The ACB-V carrier board includes several on-board devices that enable different aspects of Shelf management based on the ShMM-500. These facilities include I²C-based hardware monitoring/control and GPIO expander devices.

The ACB-V provides the Fan Controller for up to 9 Fans and individual Ethernet connections to both Base Hubs (ShMC cross connect), according to PICMG Engineering Change Notice ECN 3.0-2.0-001

The Shelf Manager also provides an IPMB interface for the non-intelligent FRUs in a Schroff Shelf. The Shelf Manager communicate with the non-intelligent FRUs over I²C busses and expose the sensors for these FRUs at IPMB address 0x20.

To maximize availability, the Schroff ATCA Shelves are designed to work with two redundant Schroff ShMM-ACB-V Shelf Managers.

Figure 36: Schroff Shelf Manager



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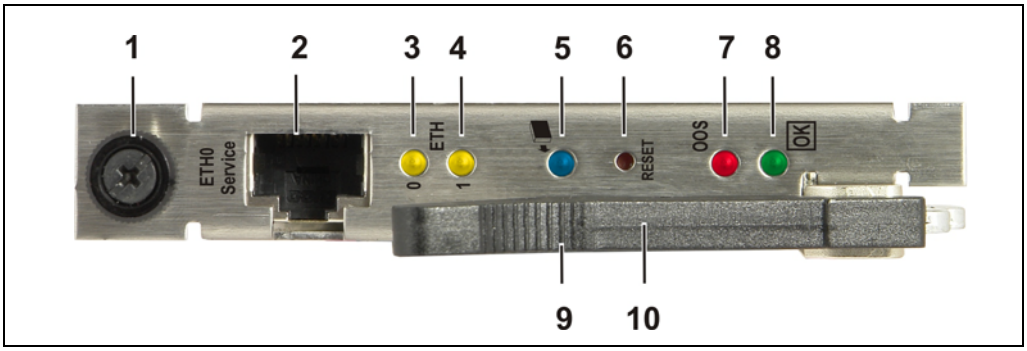
1	Extraction handle	5	Backplane Connector (J2)
2	ShMM-500	6	Backplane Connector (J1)
3	RTC Backup Capacitor	7	Fixing screw
4	ACB-V Carrier Board		

11.2 Front Panel Components

Figure 37: 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

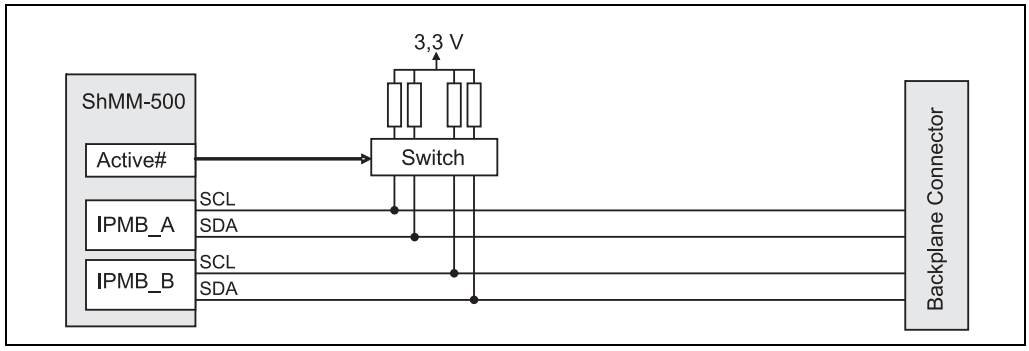
11.3 Bused IPMB Interface

Only Shelf Managers with Product Number: 21596-291 for Shelves 11596-150/152

The ShMM-500 provides two IPMBs. The IPMB-A and IPMB-B from the ShMM-500 are routed directly to the Backplane connector. The ATCA Backplane buses the two IPMBs to the ATCA boards.

The Active# signal of the ShMM-500 is used to switch on/off the pull-up resistors of the IPMBs.

Figure 38: Block diagram bused IPMB



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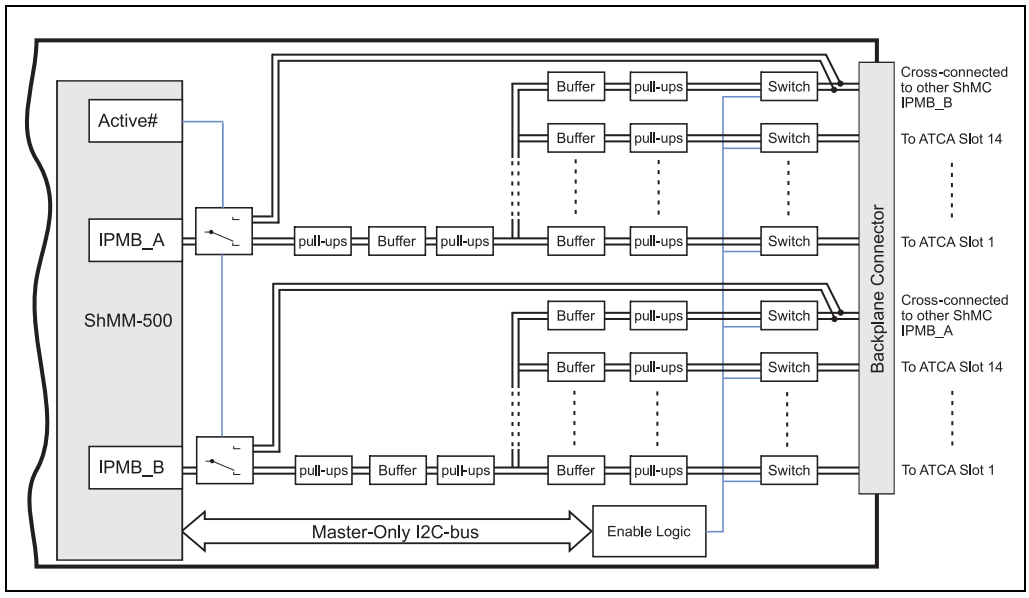
11.4 Radial IPMB Interface

Only Shelf Managers with Product Number: 21596-292 for Shelves 11596-151/153

The IPMB-A and IPMB-B buses from the ShMM-500 are routed through IPMB buffers and switches to the Backplane connector J2. The ATCA Backplane connects the individual IPMBs to the ATCA boards.

Figure 39: Block diagram radial IPMB



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11.4.1 Radial IPMB Enables

If installed, the ShMM-ACB-V implements the FET enables for the radial IPMB with three Philips PCA9555 16-bit GPIO port devices. See the table below for the enable bit to IPMB channel mapping.

Table 29: Radial IPMB enable-bit to IPMB-channel mapping

To Backplane Logical slot	IPMB-Channel	Enable Signal	I2C I/O Port on PCA9555	IPMB Port	J2 Pin
	CROSS A	EN10	U11 0x42 I/O 0.2	CROSS_SCL-SDA_A	C20-D20
	CROSS B	EN25	U07 0x40 I/O 1.4	CROSS_SCL-SDA_B	A18-A17
Slot 1	Channel A	EN33	U13 0x4e I/O 1.0	SCL-SDA_A01_R	C13-A13
Slot 2	Channel A	EN04	U07 0x40 I/O 0.0	SCL-SDA_A02_R	E22-D22
Slot 3	Channel A	EN13	U11 0x42 I/O 0.1	SCL-SDA_A03_R	A12-A11
Slot 4	Channel A	EN12	U11 0x42 I/O 0.4	SCL-SDA_A04_R	C16-B16
Slot 5	Channel A	EN14	U11 0x42 I/O 0.0	SCL-SDA_A05_R	C12-B12
Slot 6	Channel A	EN08	U07 0x40 I/O 1.3	SCL-SDA_A06_R	E14-D14
Slot 7	Channel A	EN07	U07 0x40 I/O 1.2	SCL-SDA_A07_R	C14-B14
Slot 8	Channel A	EN05	U07 0x40 I/O 1.0	SCL-SDA_A08_R	E12-D12
Slot 9	Channel A	EN11	U11 0x42 I/O 0.5	SCL-SDA_A09_R	A16-A15
Slot 10	Channel A	EN06	U07 0x40 I/O 1.1	SCL-SDA_A10_R	E13-D13
Slot 11	Channel A	EN02	U07 0x40 I/O 1.7	SCL-SDA_A11_R	C18-B18
Slot 12	Channel A	EN03	U07 0x40 I/O 0.1	SCL-SDA_A12_R	C22-B22
Slot 13	Channel A	EN09	U11 0x42 I/O 0.3	SCL-SDA_A13_R	B19-A19
Slot 14	Channel A	EN01	U07 0x40 I/O 1.6	SCL-SDA_A14_R	E18-D18
Slot 15	Channel A	EN15	U11 0x42 I/O 1.6	SCL-SDA_A15_R	C9-D9
Slot 16	Channel A	EN16	U11 0x42 I/O 1.7	SCL-SDA_A16_R	D10-C10
Slot 1	Channel B	EN29	U07 0x40 I/O 0.5	SCL-SDA_B01_R	B20-A20
Slot 2	Channel B	EN30	U07 0x40 I/O 0.4	SCL-SDA_B02_R	E21-D21
Slot 3	Channel B	EN21	U11 0x42 I/O 1.3	SCL-SDA_B03_R	C11-B11
Slot 4	Channel B	EN28	U07 0x40 I/O 0.6	SCL-SDA_B04_R	E17-D17
Slot 5	Channel B	EN31	U07 0x40 I/O 0.3	SCL-SDA_B05_R	C21-B21
Slot 6	Channel B	EN27	U07 0x40 I/O 0.7	SCL-SDA_B06_R	E16-D16
Slot 7	Channel B	EN34	U13 0x4e I/O 1.1	SCL-SDA_B07_R	A14-B13
Slot 8	Channel B	EN22	U11 0x42 I/O 1.2	SCL-SDA_B08_R	E11-D11
Slot 9	Channel B	EN24	U11 0x42 I/O 0.6	SCL-SDA_B09_R	E20-E19
Slot 10	Channel B	EN18	U11 0x42 I/O 1.1	SCL-SDA_B10_R	E15-D15
Slot 11	Channel B	EN26	U07 0x40 I/O 1.5	SCL-SDA_B11_R	C17-B17
Slot 12	Channel B	EN23	U11 0x42 I/O 0.7	SCL-SDA_B12_R	C19-D19
Slot 13	Channel B	EN32	U07 0x40 I/O 0.2	SCL-SDA_B13_R	A22-A21
Slot 14	Channel B	EN17	U11 0x42 I/O 1.0	SCL-SDA_B14_R	C15-B15
Slot 15	Channel B	EN19	U11 0x42 I/O 1.4	SCL-SDA_B15_R	A9-B9
Slot 16	Channel B	EN20	U11 0x42 I/O 1.5	SCL-SDA_B16_R	B10-A10

11.5 Ethernet Channels

The Shelf Manager provides two 10/100 Ethernet interfaces. The first Ethernet channel (ETH0) is routed either to the RJ45 connector on the front panel or to the ATCA Backplane connector J2 (default setting). The routing depends on the settings of the rocker switches S101 and S102. The ATCA Backplane routes ETH0 from the connector J2 to the ShMC port on the corresponding Base Interface Hub board. The second Ethernet channel (ETH1) is routed to the other Base Interface Hub board (ShMC Cross Connect). Both Ethernet ports support 10 Mb (10BASE-T) and 100 Mb (100BASE-TX) connections.

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 10m. 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-switch) and the backplane connector going to the hub board base interface (“Back”-position of the rocker-switch).

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

Figure 40: Switches S101 and S102 shown in default position

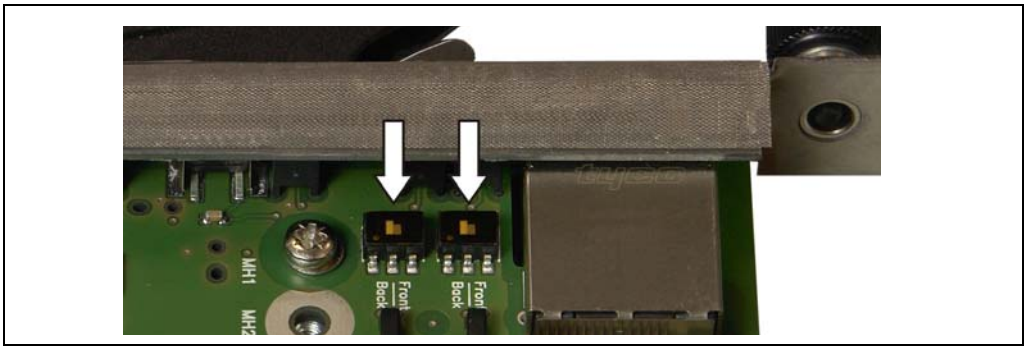

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Figure 41: Shelf Manager Cross Connect

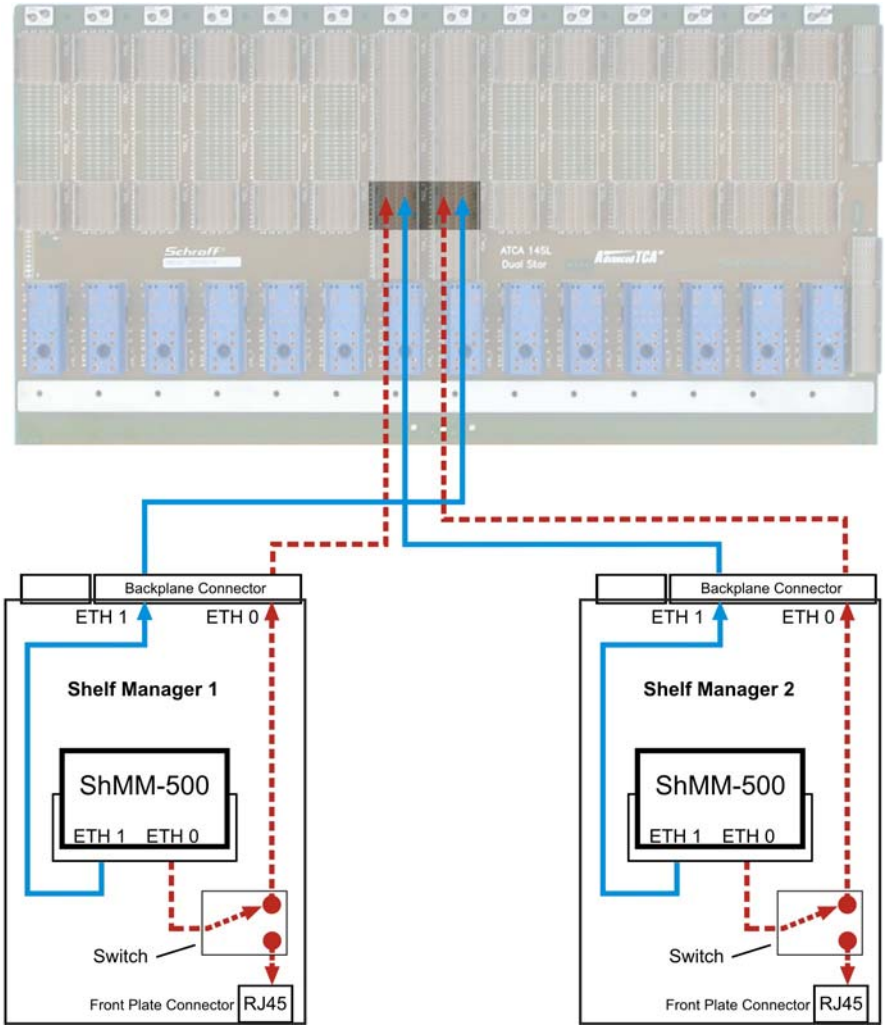

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Table 30: Connector (P23) pin assignment for Shelf Manager Cross Connect

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			

11.6 Shelf Manager RS-232 Console Serial Interface

A serial interface is implemented on the ShMM-500.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 Shelf Alarm Panel.

The serial console default configuration is:

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

11.7 Front Panel RESET push button

The Shelf Manager provides a RESET push button on the front panel. It is connected to the ShMM-500's /MR signal.

Pushing the RESET button will reset the Shelf Manager

11.8 Fan Control

The Shelf Manager provides fan control functionality through the ADM1024/ 1026 system management controllers.

The fan speed is controlled by a 75 Hz PWM signal generated on the ADM1026. The PWM output from the ADM1026 is buffered and enabled by the ShMM-500's ACTIVE# signal so that only the active Shelf Manager controls the fan speed. The PWM signal is opto-isolated and routed to the backplane connector. For voltage-regulated Fans the Shelf Manager provides a converter that converts the PWM signal into a DC-voltage of 0 V to 10 V, referenced to the ground level of the Fan Tray electronics (FAN_24V_RTN), which is also available on the backplane connector.

The tachometer signals from the Fan Trays are routed through the backplane connector opto-isolated to the digital inputs of the ADM1026.

Three digital inputs to the ADM1026 (FANP0..2/GPIO9..GPIO11) are used to detect the presence of the Fan Trays. The Fan Tray grounds the signal to indicate that it is installed.

11.9 Hot Swap Interface

The Shelf Manager provides a Hot Swap interface allowing the Shelf Manager to be replaced without powering down the Shelf. The Hot Swap interface is implemented using the on-ShMM-500 CPLD device. 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

11.9.1 Hot Swap Switch

The injector/ejector micro-switch provides an input (HS_LATCH) to the ShMM-500 CPLD, which is responsible for taking appropriate hardware actions as well as signaling the condition to the software.

Micro-Switch	HS_LATCH Signal	HSL Bit in the CPLD	Condition
Open	High	0	Handle opened
Closed	Low	1	Handle closed

11.9.2 Board Presence

Each Shelf Manager grounds the PRES_1# input signal of the other Shelf Manager when installed into the ATCA Backplane. This signal is responsible for taking appropriate hardware action as well as signaling the condition to the software.

11.9.3 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.

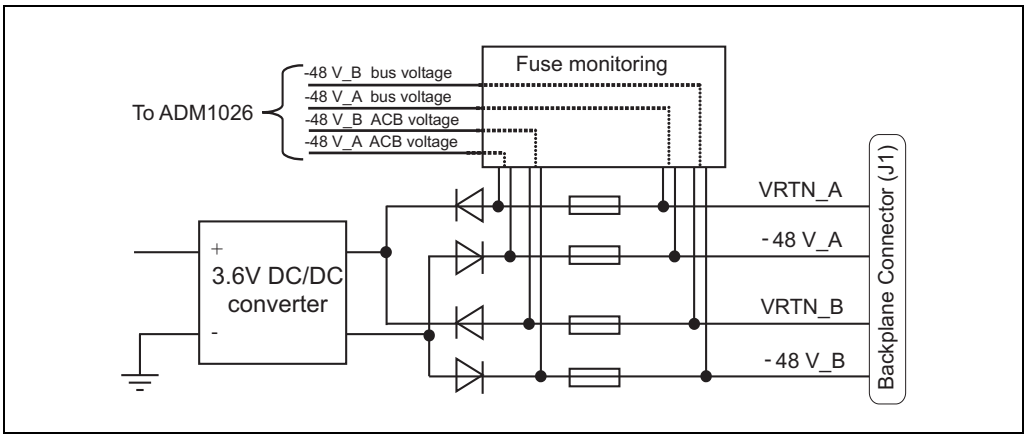
Table 31: Hot Swap LED

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

11.10 Input Voltage and Fuse Monitoring

To detect a missing supply voltage as well as a blown fuse the Shelf Manager provides voltage monitoring and control functions. The -48 VDC input voltage before and behind the fuses are connected to the ADM1026 chip through optical-isolation devices.

Figure 42: Input Voltage and Fuse Monitoring



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Signal	description
-48 V_A bus voltage	Indicates the presence of the –48 V_A / VRTN_A at the backplane connector (J1). This signal is connected to pin 46 of the ADM1026
-48 V_A ACB voltage	Indicates the presence of the –48 V_A / VRTN_A behind the Shelf Manager's mains fuse. This signal is connected to pin 44 of the ADM1026
-48 V_B bus voltage	Indicates the presence of the –48 V_B / VRTN_B at the backplane connector (J1). This signal is connected to pin 45 of the ADM1026
-48 V_B ACB voltage	Indicates the presence of the –48 V_B / VRTN_B behind the Shelf Manager's mains fuse. This signal is connected to pin 43 of the ADM1026

11.11 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.
Primary Shelf Manager (upper)	0x08	0x10
Secondary Shelf Manager (lower)	0x09	0x12

11.12 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.

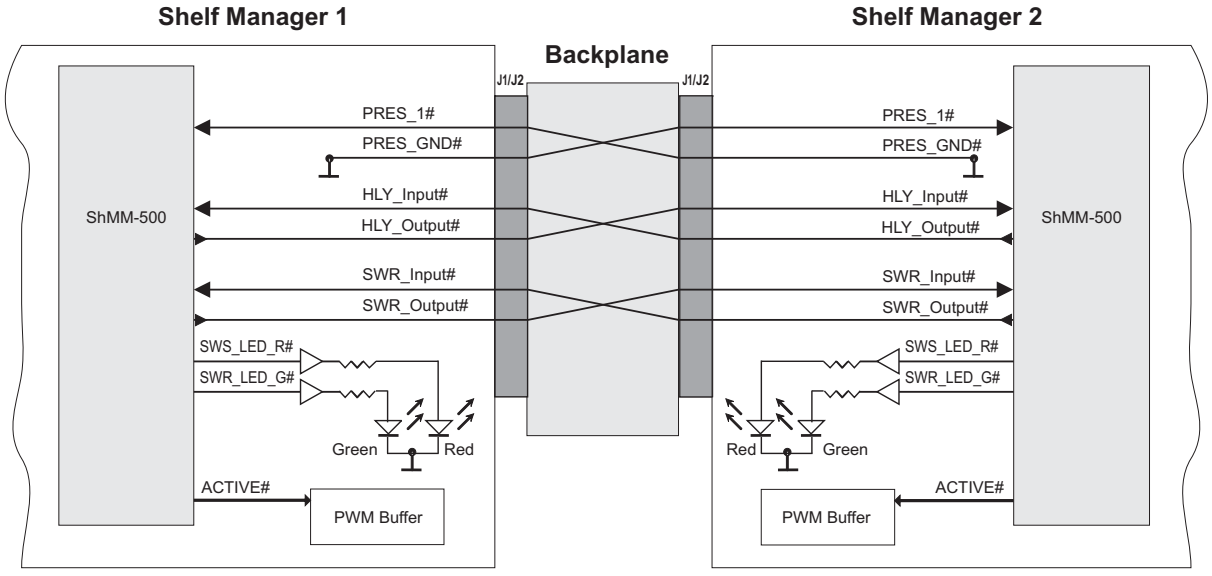
11.12.1 Hardware Redundancy Interface

The hardware redundancy interfaces of the Shelf Managers are as follows:

- Cross connected Shelf Manager present input (PRES_1#) and output (PRES_GND#)
- Cross connected Shelf Manager health input (HLY_Input#) and output (HLY_Output#)
- Cross connected negotiation input (SWR_Input#) and output (SWR_Output#)
- Active output from the ShMM-500 (ACTIVE#) that is used by the Shelf Manager to enable interfaces that must be exclusively driven by the active Shelf Manager, specifically PWM and fan tachometer buffers
- Two status LEDs using the SWS_LED_G# (Green) and SWS_LED_R# (Red) signals
- The PRES_1# signal is grounded on the redundant Shelf Manager. This indicates both Shelf Managers the presence of the other.

The figure below shows the hardware redundancy interface of the Shelf Manager.

Figure 43: Shelf Manager redundancy control



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11.13 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!

11.13.1 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
  ```

11.14 Firmware Update

The Shelf Management software is stored in the FLASH memory on the ShMM-500. The software is:

U-boot
sentry.kernel
sentry.rfs

The U-boot program is usually permanent and allows the user to configure the software and network environment of the ShMM-500 and install new software from a network server. Sentry.kernel is the ShMM-500's Linux kernel and sentry.rfs is the ShMM-500's root file system.

A detailed instruction on how to reprogram the Shelf Manager is distributed with each new Firmware release.

11.15 Shelf Manager Front Panel and Backplane connectors

Table 32: Front Panel 10/100 Ethernet Service Connector

Pin #	Ethernet Signal
1	TX+
2	TX-
3	RX+
4, 5	n.c.
6	RX-
7, 8	n.c.

Figure 44: Backplane Connectors

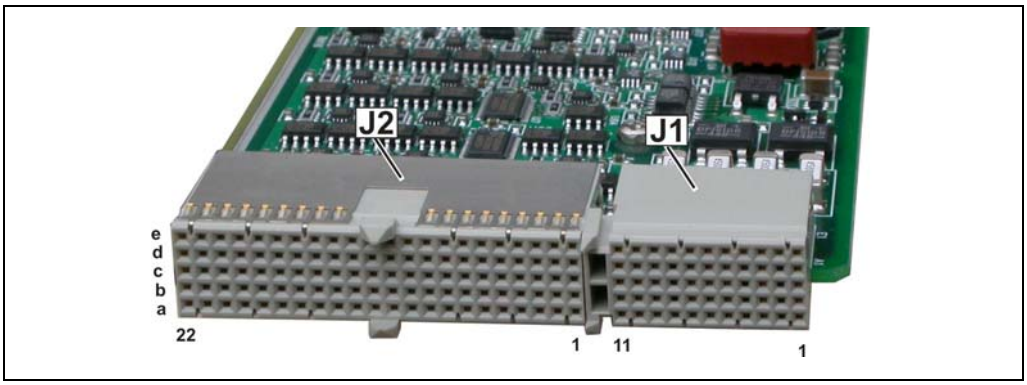

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Table 33: Pin Staging (PS)

Pin#	length
A	**8.25 mm**
B	**9.75 mm**
C	**11.25 mm**

The Pin Staging (PS) is the length of the Pins of the connector at the Backplane not at the Shelf manager.

Table 34: Backplane Signal Connector (J1) pin assignment

	a	PS	b	PS	c	PS	d	PS	e	PS
1	-48 V_A	**B**	VRTN_A	**B**	NC	**B**	-48 V_B	**B**	VRTN_B	**B**
2	-		-		-		-		-	
3	SHELF_GND	**B**	SHELF_GND	**B**	SHELF_GND	**B**	SHELF_GND	**B**	SHELF_GND	**B**
4	-		-		-		-		-	
5	FAN_TACH0	**A**	FAN_TACH1	**A**	FAN_TACH2	**A**	FAN_TACH3	**A**	FAN_TACH4	**A**
6	FAN_TACH5	**A**	FAN_TACH6	**A**	FAN_TACH7	**A**	FAN_TACH8	**A**	PWM_C	**A**
7	FAN_SPEED	**A**	NC	**A**	FAN_24V	**A**	FAN_24V_RTN	**A**	PWM_E	**A**
8	-		-		-		-		-	
9	PEM_PRES_A	**A**	SAP_PRES	**A**	SWR_Input#	**A**	HLY_Input#	**A**	SWR_Output#	**A**
10	TX+	**A**	TX-	**A**	HS_EN	**A**	HLY_Output#	**A**	HA7	**A**
11	AIR_FILT_PR	**A**	PEM_PRES_B	**A**	RX+	**A**	RX-	**A**	PRES_1#	**A**

Table 35: Backplane Signal Connector (J2) pin assignment (Radial IPMB)

	a	PS	b	PS	c	PS	d	PS	e	PS	f	PS
1	FAN_PRES0	A	TXD0	A	TXD1	A	FAN_PRES2	A	INT#	A	GND	C
2	FAN_PRES1	A	DTR	A	Pres_GND	A	CI	A	DSR	A		C
3	CD	A	RTS	A	RXD1	A	HA[0]	A	CTS	A	GND	C
4	RXD0	A	SDA_CH1	A	INV_ACTIVE	A	SDA_CH0	A	GND	A		C
5	SCL_CH1	A	SCL_CH0	A	RI	A	GND	A	SDA_CH3	A	GND	C
6	S1_TX+	A	S1_TX-	A	GND	B	S2_TX+	A	S2_TX-	A		C
7	S1_RX+	A	S1_RX-	A	GND	B	S2_RX+	A	S2_RX-	A	GND	C
8	SDA_CH4	A	SCL_CH4	A	SCL_CH3	A	SCL_CH2	A	I2C_PWR_B	A		C
9	IPMB_SCL_B15	A	IPMB_SDA_B15	A	IPMB_SCL_A15	A	IPMB_SDA_A15	A	SDA_CH2	A	GND	C
10	IPMB_SDA_B16	A	IPMB_SCL_B16	A	IPMB_SDA_A16	A	IPMB_SCL_A16	A	I2C_PWR_A	A		
11	IPMB_SDA_A3	A	IPMB_SDA_B3	A	IPMB_SCL_B3	A	IPMB_SDA_B8	A	IPMB_SCL_B8	A	GND	
12	IPMB_SCL_A3	A	IPMB_SDA_A5	A	IPMB_SCL_A5	A	IPMB_SDA_A8	A	IPMB_SCL_A8	A		
13	IPMB_SDA_A1	A	IPMB_SDA_B7	A	IPMB_SCL_A1	A	IPMB_SDA_A10	A	IPMB_SCL_A10	A	GND	
14	IPMB_SCL_B7	A	IPMB_SDA_A7	A	IPMB_SCL_A7	A	IPMB_SDA_A6	A	IPMB_SCL_A6	A		C
15	IPMB_SDA_A9	A	IPMB_SDA_B14	A	IPMB_SCL_B14	A	IPMB_SDA_B10	A	IPMB_SCL_B10	A	GND	C
16	IPMB_SCL_A9	A	IPMB_SDA_A4	A	IPMB_SCL_A4	A	IPMB_SDA_B6	A	IPMB_SCL_B6	A		C
17	CROSS_SDA_B	A	IPMB_SDA_B11	A	IPMB_SCL_B11	A	IPMB_SDA_B4	A	IPMB_SCL_B4	A	GND	C
18	CROSS_SCL_B	A	IPMB_SDA_A11	A	IPMB_SCL_A11	A	IPMB_SDA_A14	A	IPMB_SCL_A14	A		C
19	IPMB_SDA_A13	A	IPMB_SCL_A13	A	IPMB_SCL_B12	A	IPMB_SDA_B12	A	IPMB_SDA_B9	A	GND	C
20	IPMB_SDA_B1	A	IPMB_SCL_B1	A	CROSS_SCL_A	A	CROSS_SDA_A	A	IPMB_SCL_B9	A		C
21	IPMB_SDA_B13	A	IPMB_SDA_B5	A	IPMB_SCL_B5	A	IPMB_SDA_B2	A	IPMB_SCL_B2	A	GND	C
22	IPMB_SCL_B13	A	IPMB_SDA_A12	A	IPMB_SCL_A12	A	IPMB_SDA_A2	A	IPMB_SCL_A2	A		C

Table 36: Backplane Signal Connector (J2) pin assignment (Bused IPMB)

	a	PS	b	PS	c	PS	d	PS	e	PS	f	PS
1	FAN_PRES0	A	TXD0	A	TXD1	A	FAN_PRES2	A	INT#	A	GND	C
2	FAN_PRES1	A	DTR	A	Pres_GND	A	CI	A	DSR	A		C
3	CD	A	RTS	A	RXD1	A	HA[0]	A	CTS	A	GND	C
4	RXD0	A	SDA_CH1	A	INV_ACTIVE	A	SDA_CH0	A	GND	A		C
5	SCL_CH1	A	SCL_CH0	A	RI	A	GND	A	SDA_CH3	A	GND	C
6	S1_TX+	A	S1_TX-	A	GND	B	S2_TX+	A	S2_TX-	A		C
7	S1_RX+	A	S1_RX-	A	GND	B	S2_RX+	A	S2_RX-	A	GND	C
8	SDA_CH4	A	SCL_CH4	A	SCL_CH3	A	SCL_CH2	A	I2C_PWR_B	A		C
9		A		A		A		A	SDA_CH2	A	GND	C
10		A		A		A		A	I2C_PWR_A	A		
11		A		A		A		A		A	GND	
12		A		A		A		A		A		
13		A		A		A		A		A	GND	
14		A		A		A		A		A		C
15		A	IPMB_SDA_B	A	IPMB_SCL_B	A		A		A	GND	C
16		A		A		A		A		A		C
17	CROSS_SDA_B	A		A		A		A		A	GND	C
18	CROSS_SCL_B	A		A		A	IPMB_SDA_A	A	IPMB_SCL_A	A		C
19		A		A		A	I	A		A	GND	C
20		A		A	CROSS_SCL_A	A	CROSS_SDA_A	A		A		C
21		A		A		A		A		A	GND	C
22		A		A		A		A		A		C

Table 37: Backplane connector (J1) and (J2) pin description

-48V_A	-48 VDC supply A
-48V_B	-48 VDC supply B
AIR_FILT_PR	Air filter presence (grounded by air filter presence switch to detect a missing air filter)
CD	Serial Interface 1 Carrier Detect
CI	Chassis Intrusion signal of ADM1026
CROSS_SCL_A	Serial Clock of IPMB-A, cross-connected on Backplane to serial clock of IPMB-B of other Shelf Manager
CROSS_SCL_B	Serial Clock of IPMB-B, cross-connected on Backplane to serial clock of IPMB-A of other Shelf Manager
CROSS_SDA_A	Serial Data of IPMB-A, cross-connected on Backplane to serial data of IPMB-B of other Shelf Manager
CROSS_SDA_B	Serial Data of IPMB-B, cross-connected on Backplane to serial data of IPMB-A of other Shelf Manager
CTS	Serial Interface 1 Clear To Send
DSR	Serial Interface 1 Data Set Ready
DTR	Serial Interface 1 Data Terminal Ready
FAN_24V	Auxiliary 24 VDC (max. 100 mA) generated on Fan Trays (Voltage supply for opto-couplers on Shelf Manager)
FAN_24V_RTN	Return path (Ground reference) for the auxiliary 24 VDC, generated on Fan Trays, used also as reference ground for the fan control voltage
FAN_PRES[0...2]	Fan Tray present (grounded on Fan Tray when present)
FAN_SPEED	DC for Fan Speed Control (0 V to 10 V, 10 mA)
FAN_TACH[0...8]	Tachometer signals from Fan Trays
GND	logic ground
HA[0]	Hardware address of Shelf Manager - grounded: Shelf Manager IPMI address is 0x10 - open: Shelf Manager IPMI address is 0x12
HA7	Hardware address of Shelf Manager - grounded: Shelf Manager IPMI address is 0x10 - open: Shelf Manager IPMI address is 0x12
HLY_Input#	Health input Shelf Manager (proprietary signal cross-connected on Backplane to HLY_Output of other Shelf Manager)
HLY_Output#	Health output Shelf Manager (proprietary signal cross-connected on Back-plane to HLY_Input of other Shelf Manager)
HS_EN	Tells the Shelf Manager that it is plugged in (Grounded on Backplane)
I2C_PWR_A	3.6 V (max. 500 mA) generated on Shelf Manager, redundant path A for Shelf I^2C-devices on Fan Trays, PEMs and SAP
I2C_PWR_B	3.6 V (max. 500 mA) generated on Shelf Manager, redundant path B for Shelf I^2C-devices on Fan Trays, PEMs and SAP
INT#	External Interrupt request (Master Only I^2C-bus)
INV_ACTIVE	This ShMM is in active mode (inverted signal of ShMM)
IPMB_SCL_A_[1...16]	Serial Clock, IPMB-A
IPMB_SCL_B_[1...16]	Serial Clock, IPMB-B
IPMB_SDA_A_[1...16]	Serial Data, IPMB-A
IPMB_SDA_B_[1...16]	Serial Data, IPMB-B

NC	not connected
PEM_PRES_[A, B]	PEM [A, B] presence signal (grounded on PEM when present)
PRES_1#	Shelf Manager board presence signal (proprietary signal cross-connected on Backplane to PRES_GND of other Shelf Manager)
PRES_GND#	Shelf Manager presence ground (proprietary signal cross-connected on Backplane to PRES_1# of other Shelf Manager)
PWM_C	Opto isolated PWM signal for fan speed control, collector U_{CE0} = max. 70 V, I_{max} = 2 mA
PWM_E	Opto isolated PWM signal for fan speed control, emitter, connected to FAN_24V_RTN on Backplane
RI	Serial Interface 1 Ring Indication
RTS	Serial Interface 1 Request To Send
RX(+-)	Ethernet interface (ETH1) to Hub-Slot (ShMC cross connect)
RXD0	Serial Interface 1 Receive Data
RXD1	Serial Interface 2 Receive Data (not used in Schroff Shelves)
S1_RX(+-)	Ethernet interface (ETH0)
S1_TX(+-)	Ethernet interface (ETH0)
S2_RX(+-)	USB interface, cross-connected on Backplane to S2_TX(+-) of other Shelf Manager
S2_TX(+-)	USB interface, cross-connected on Backplane to S2_RX(+-) of other Shelf Manager
SAP_PRES	Presence signal of SAP (Grounded on SAP when present)
SCL_CH0	Master Only-I^2C-bus Channel 0 to SAP
SCL_CH1	Master-Only I^2C-bus Channel 1
SCL_CH2	Master-Only I^2C-bus Channel 2
SCL_CH3	Master-Only I^2C-bus Channel 3
SCL_CH4	Master-Only I^2C-bus Channel 4
SDA_CH0	Master Only-I^2C-bus Channel 0 to SAP
SDA_CH1	Master-Only I^2C-bus Channel 1
SDA_CH2	Master-Only I^2C-bus Channel 2
SDA_CH3	Master-Only I^2C-bus Channel 3
SDA_CH4	Master-Only I^2C-bus Channel 4
SHELF_GND	Shelf Ground
SWR_Input#	Switchover signal from the other Shelf Manager (proprietary signal cross-connected on Backplane to SWR_Output of other Shelf Manager)
SWR_Output#	Switchover signal to the other Shelf Manager (proprietary signal cross-connected on Backplane to SWR_Input of other Shelf Manager)
TX(+-)	Ethernet interface (ETH1)
TXD0	Serial interface 1 Transmit Data
TXD1	Serial interface 2 Transmit Data (not used in Schroff Shelves)
VRTN_A	Voltage return supply A
VRTN_B	Voltage return supply B

12 Technical Data

Table 38: Technical Data

Physical Dimensions	
Height	571.6 mm
Width	482.6 mm
Depth	506.54 mm (with cable trays)
Weight	
Shipping weight completely assembled with packaging	45 Kg
Shelf weight (w/o fan tray and w/o PEMs)	19 Kg
Shelf weight completely assembled	30.6 Kg
Power	
Input voltage	-40.5 VDC …. -72 VDC
Input Power	25 A per power feed (total 4 x Feed A and 4 x Feed B)
Overcurrent Protection	30 A Fuses on PEM
Cooling Capacity	
Front Boards	>233 W / Board
RTM	>22 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 B
Radiated Emissions	EN 55022 Class B
Safety	
Protected Earth Test	EN60950-1, test current 25 A, resistance <100mOhm
Hipot Test	EN60950-1, 1000 V

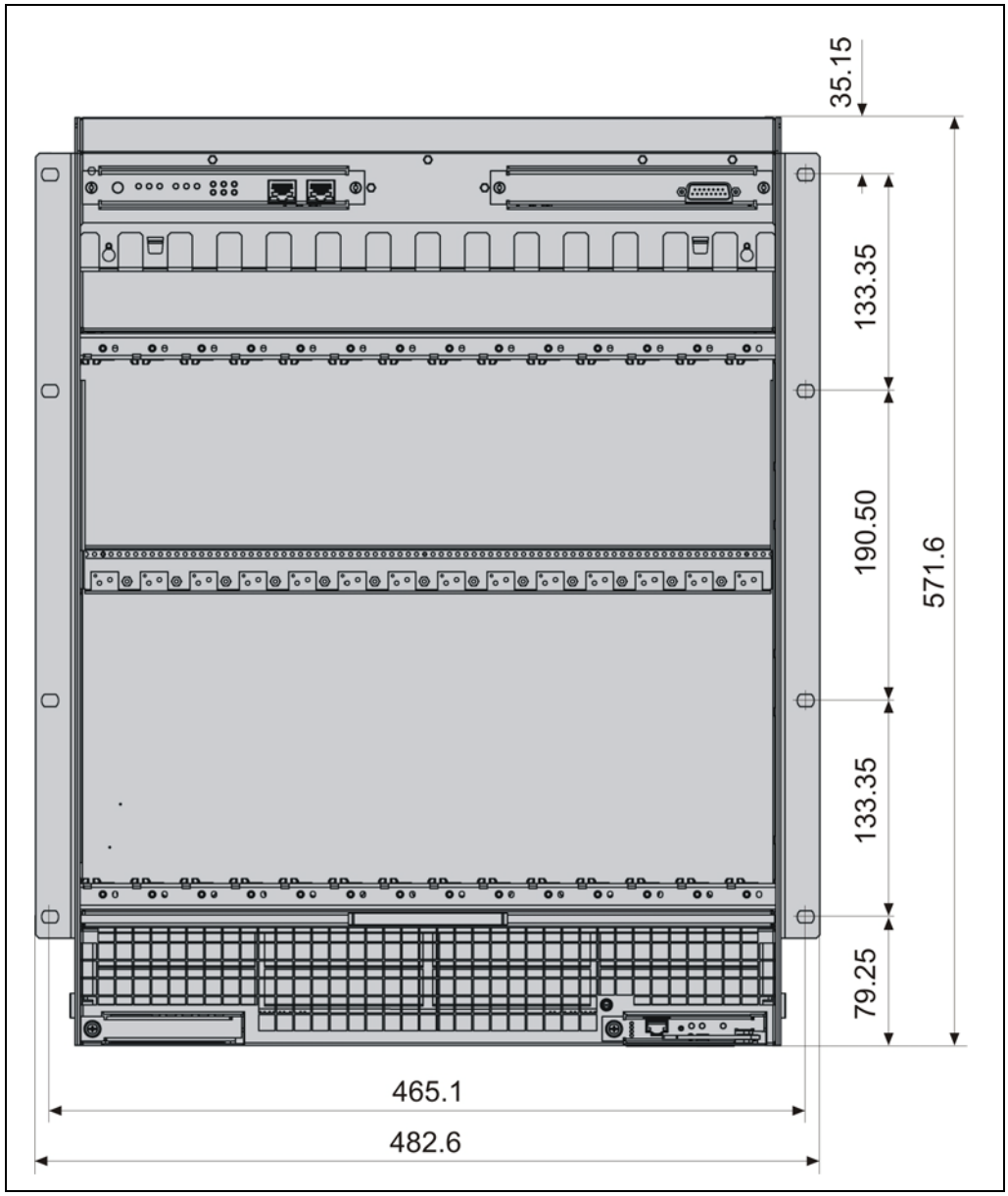
12.1 Part Numbers

Table 39: Part Numbers

Number	Part
11596-150	14-Slot ATCA Shelf, Dual Star Backplane, bused IPMB
11596-151	14-Slot ATCA Shelf, Dual Star Backplane, radial IPMB
11596-152	14-Slot ATCA Shelf, Full Mesh Backplane, bused IPMB
11596-153	14-Slot ATCA Shelf, Full Mesh Backplane, radial IPMB
21596-300	Shelf Manager ShMM-ACB-V with bused IPMB
21593-301	Shelf Manager ShMM-ACB-V with radial IPMB
21990-023	Replacement Fan Tray
21596-020	Replacement PEM
21191-207	Fuse 30 A/80 V for PEM (10 pcs)
21596-138	Air Filter Element
21596-012	Filler Panel (stainless steel) for empty Shelf Manager slot
21591-079	Filler Panel (stainless steel) with airflow buffle for empty front slots
21596-008	Filler Panel (Aluminium profile) with airflow buffle for empty front slots
21591-107	Filler Panel (stainless steel) with airflow buffle for empty RTM slots
21591-099	Filler Panel (Aluminium profile) with airflow buffle for empty RTM slots
21596-023	Chassis Data Module (CDM)
21596-026	Shelf Alarm Display (SAD)
21596-140	Shelf Alarm Panel (SAP)

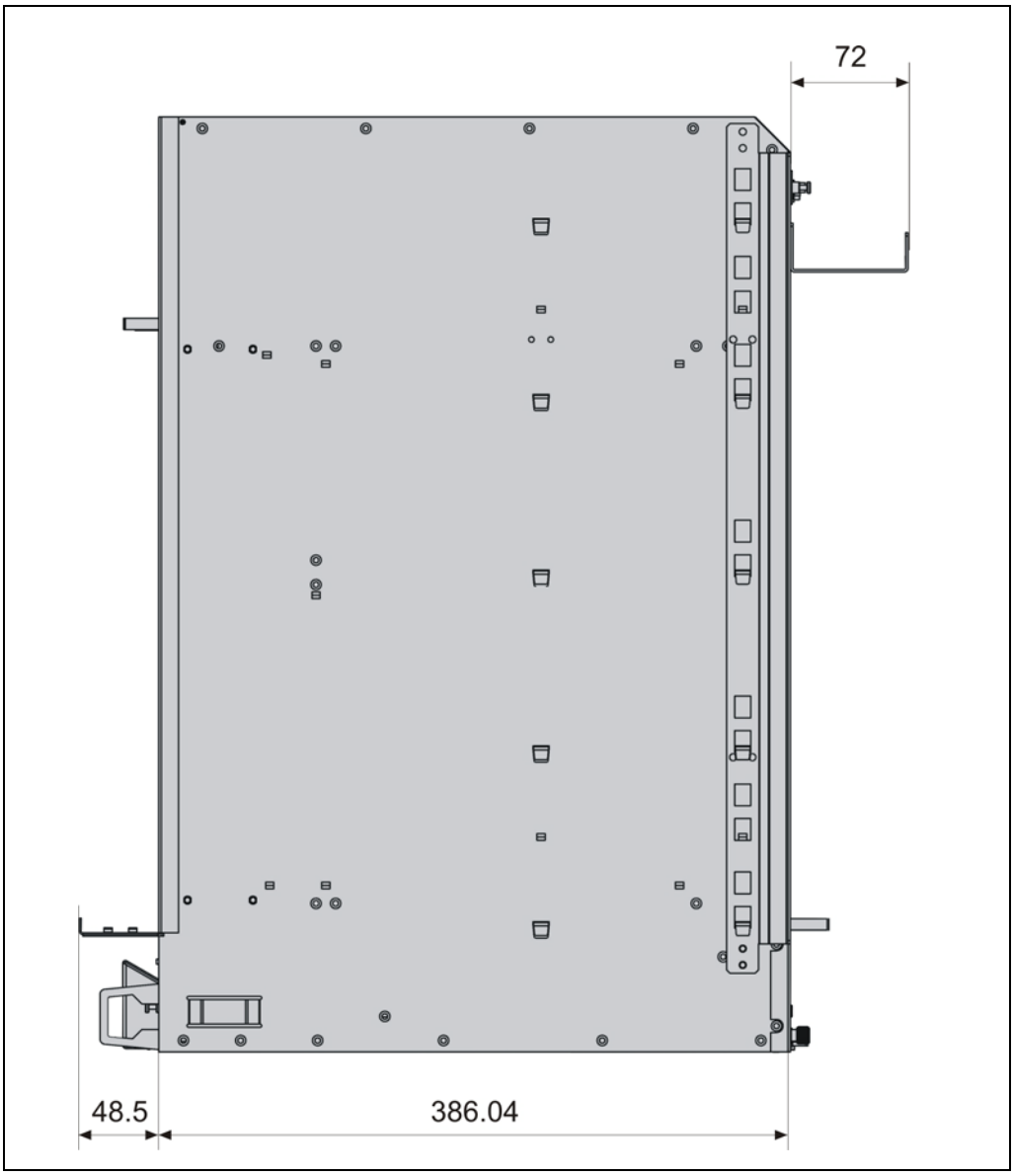
12.2 Shelf Mechanical Dimensions

Figure 45: Shelf dimensions, front view



All dimensions are in millimeters (mm).

Figure 46: Shelf dimensions, side view



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All dimensions are in millimeters (mm).

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