Schroff®

AdvancedTCA®

AdvancedTCA Shelf, 6-slot

User's Manual

Product Number:

11596-160

11596-161

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Pentair
Technical Products

Rev.	Date updated	Change
D1.2	26.09.09	Draft Release
D1.3	28.09.09	Minor corrections
D1.4F	07.07.2010	Manual updated, Max. ambient temperature and supply voltage temporarily limited
R1.0	19.10.2010	Initial release

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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.
- 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*)
- Pigeon Point Systems Shelf Manager User Guide (*www.pigeonpoint.com*)
- PICMG® 3.0 Revision 3.0 AdvancedTCA® Base Specification (*www.picmg.com*)

1.4 Product Definition

The Schroff 11596-16x are 6 Slot AdvancedTCA Shelves for fault tolerant/high availability applications.

- Product Number 11596-160: Replicated Mesh Backplane, bused IPMB
- Product Number 11596-161: Replicated Mesh Backplane, radial IPMB

The Schroff 11596-16x are designed to work with two redundant Schroff ShMM-ACB-V Shelf Managers and a Schroff Shelf Alarm Panel (SAP), 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
PSU	Power Suppy Unit
RTC	Real Time Clock
RTM	Rear Transition Module
SAP	Shelf Alarm Panel
Shelf	See Chassis
U	Unit of vertical pitch. 1 U = 1.75 inches = 44.45 mm
VRTN	Voltage Return

1.6 Hardware Platform

- Compliant to PICMG 3.0 Revision 3.0 ATCA Base Specification
- Galvanized 5 U / 19“ chassis with front card cage for ATCA boards and rear card cage for ATCA RTM boards
- 6 slot ATCA Backplane with replicated Mesh Fabric Interface, Dual Star Base Interface and bused or radial IPM interface, supporting four 8 U node board slots and two 8 U hub slots
- Mounting brackets for 19“ racks and rear fixing points
- ESD Wrist Strap Terminals at the front and the rear
- Two dedicated Shelf Manager bays accepting Schroff Shelf Managers
- Push-Pull Fan Tray arrangement provides optimized cooling for ATCA blades with fault tolerant capability
- Two front pluggable, hot swappable Fan Trays
- Air inlet filter with presence monitoring
- Bay for front pluggable Shelf Alarm Panel (SAP):
  Provides Alarm Status LEDs, Telco Alarm interface and serial interfaces for the Shelf Managers
- Two -48/-60 VDC hot swappable Power Entry Modules (PEMs) for redundancy
- Cooling and electrical capacity up to 350 W/slot

1.7 Shelf Front and Rear View

Figure 1: Shelf Front View

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1	Shelf Alarm Panel (SAP)	5	Slot for Shelf Manager 2
2	Shelf Manager 1	6	Air Filter
3	Fan Tray 1	7	Fan Tray 2
4	ESD Wrist Strap Terminal		

Figure 2: Shelf Rear View

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1	PEM B	4	Rear fixing points
2	ESD Wrist Strap Terminal	5	Shelf FRU EEPROMS
3	Ground Terminal	6	PEM A

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 6-slot ATCA monolithic Backplane provides:

- Four ATCA Node slots
- Two ATCA Hub slots
- Two dedicated Shelf Manager slots
- Two PEM slots
- One Shelf Alarm Panel (SAP) slot
- Two Fan Tray slots

2.1 Logical to Physical Slot Mapping

The physical and logical slots are sequentially numbered from the lower to the upper side of the Shelf.

Table 2: 6-Slot ATCA Backplane physical to logical slot mapping

	Physical Slot	Logical Slot	HW-Address (Hex)	IPMB-Address (Hex)	Update Channel Routing
Node	6	6	46	8C	
Node	5	5	45	8A	
Node	4	4	44	88	
Node	3	3	43	86	
Hub Slot	2	2	42	84	
Hub Slot	1	1	41	82	

2.2 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 (as per PICMG 3.0 R2.0: ECN 3.0-2.0-001). See *Chapter 2.9, "Shelf Manager Cross Connect"* for details.

Table 3: Base Interface Interconnections

Connector	Base Ch.	Logical Slot					
		1	2	3	4	5	6
P23	1	ShMC	ShMC	1-3	1-4	1-5	1-6
P23	2	2-2	1-2	2-3	2-4	2-5	2-6
P23	3	3-1	3-2				
P23	4	4-1	4-2				
P23	5	5-1	5-2				
P23	6	6-1	6-2				

2.3 Fabric Interface

The Fabric Interface in the ATCA Backplane is routed as triple replicated Full Mesh with 3 Channels (24 differential pairs total), interconnecting each ATCA slot. See PICMG® 3.0 AdvancedTCA® Base Specification for details.

Table 4: 6 Slot Triple Replicated Mesh Fabric Interconnections

Connector	Fabric Channel	Logical Slot						
		1	2	3	4	5	6	
P20	15	6-11	6-12	6-13	6-14	6-15	5-15	MESH 3
P20	14	5-11	5-12	5-13	5-14	4-14	4-15	
P20	13	4-11	4-12	4-13	3-13	3-14	3-15	
P21	12	3-11	3-12	2-12	2-13	2-14	2-15	
P21	11	2-11	1-11	1-12	1-13	1-14	1-15	
P21	10	6-6	6-7	6-8	6-9	6-10	5-10	MESH 2
P21	9	5-6	5-7	5-8	5-9	4-9	4-10	
P21	8	4-6	4-7	4-8	3-8	3-9	3-10	
P22	7	3-6	3-7	2-7	2-8	2-9	2-10	
P22	6	2-6	1-6	1-7	1-8	1-9	1-10	
P22	5	6-1	6-2	6-3	6-4	6-5	5-5	MESH 1
P22	4	5-1	5-2	5-3	5-4	4-4	4-5	
P22	3	4-1	4-2	4-3	3-3	3-4	3-5	
P23	2	3-1	3-2	2-2	2-3	2-4	2-5	
P23	1	2-1	1-1	1-2	1-3	1-4	1-5	

2.4 Synchronization Clocks

6 differential pairs of synchronization clocks are bused between all 8 ATCA slots and terminated at both ends with 80.6 Ohms between each differential pair.

2.5 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*)

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

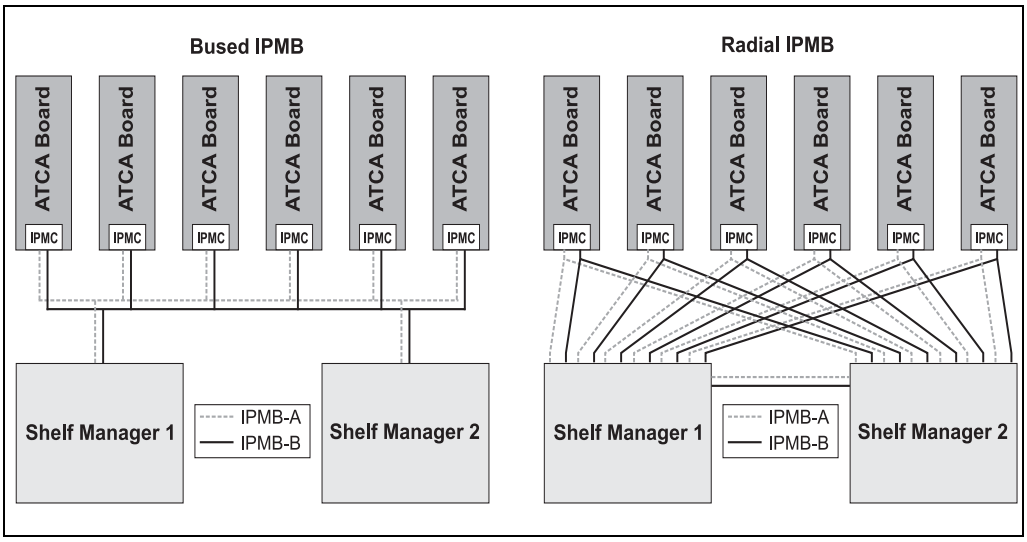
2.6 Intelligent Platform Management Bus (IPMB)

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: 11596-160)
- a radial configuration
  (Product Number: 11596-161)

Figure 3: Bused and radial IPMB



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2.7 Shelf Manager Backplane Connectors

The front accessible Shelf Manager slots accept Schroff ACB-V Shelf Managers. The Backplane Connectors are wired to:

- IPMB-A and IPMB-B (I2C) to the ATCA blades.
- Base Interface cross connections to the Hub Slots
- Presence connections to the SAP, Fan Trays and PEMs
- RS-232 connections to SAP
- Dedicated I2C to Shelf SEEPROMs

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

2.7.1 Fan Tray Connectors

For pin assignment see *Chapter 6.2, "Fan Tray Connectors and Indicators"*.

2.7.2 SAP Connector

For pin assignment see *Chapter 5.11, "Shelf Alarm Panel Backplane Connector"*.

2.8 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.

2.8.1 Shelf SEEPROM Location

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

2.8.2 Shelf SEEPROMs I²C addresses

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

CDM	I²C-Channel	I²C-bus address
SEEPROM1	Channel 1	0xa4
SEEPROM2	Channel 2	0xa4

2.9 Shelf Manager Cross Connect

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

Figure 4: Shelf Manager Cross Connect

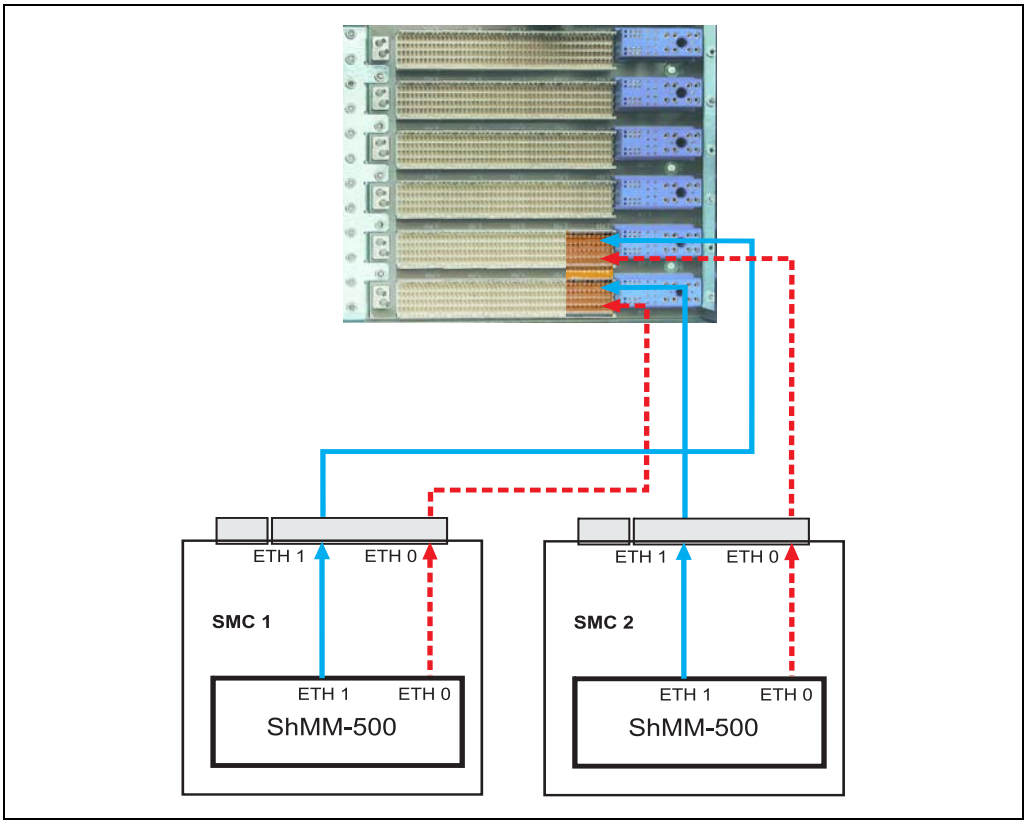

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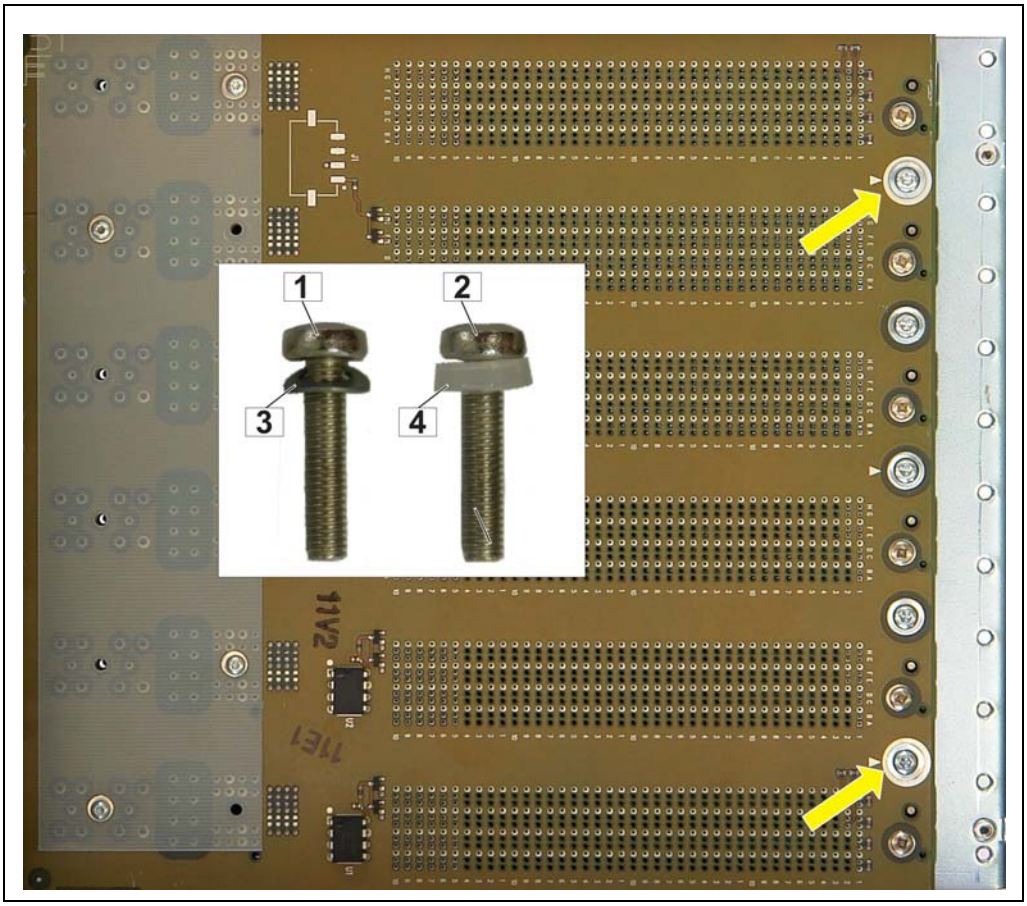
Table 5: Connector (P23) pin assignments for Shelf Manager Cross Connect

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			

2.10 Logic Ground

Figure 5: Logic Ground



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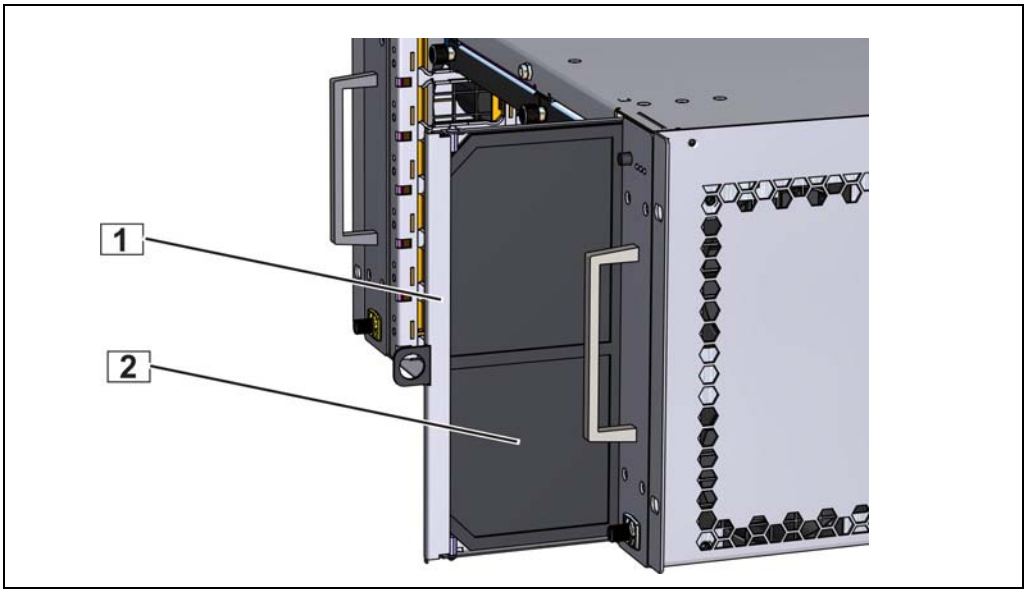
The ATCA Backplane provides a mechanism to connect Logic Ground and Shelf Ground.
To connect Logic Ground and Shelf Ground the mounting screws at the positions marked by arrows must have metallic washers (3) instead of isolating plastic washers (4).

By default, Logic Ground and Shelf Ground is isolated, the chassis is shipped with the mounting screws with plastic washers at the marked positions.

3 Air Filter

Figure 6: Air Filter



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1 Air Filter Tray *2 Filter Element*

3.1 Introduction

The ATCA Shelf provides a front replaceable air filter. 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

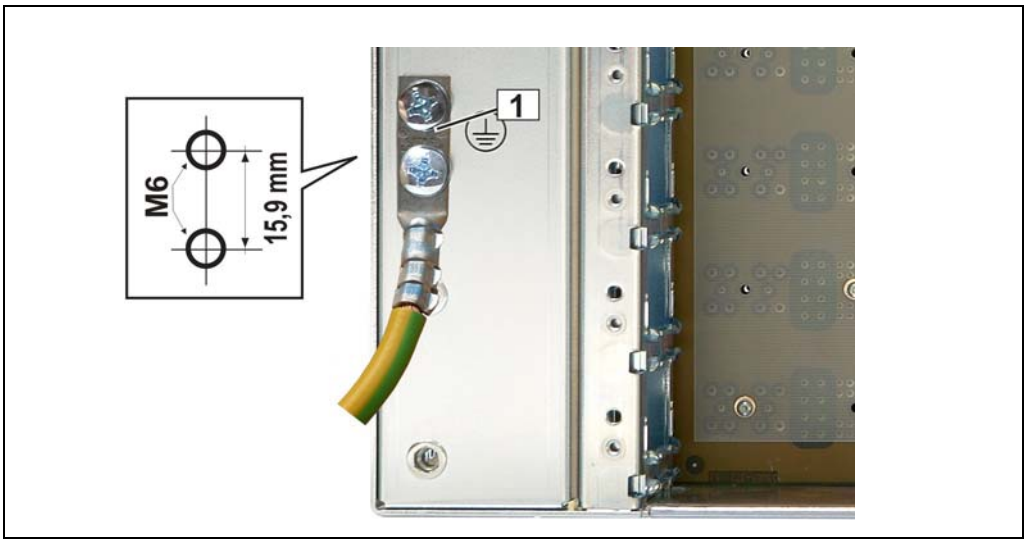
The air filter presence is detected by an reed sensor on the backplane. The signal is routed to the Shelf Managers.

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 upper 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 7: Shelf Ground Terminal



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1 Ground Terminal

4.1 Specification for the Shelf Ground connection cable

Required wire size: AWG8

Required terminals: Use only two hole lug terminals.

5 Shelf Alarm Panel

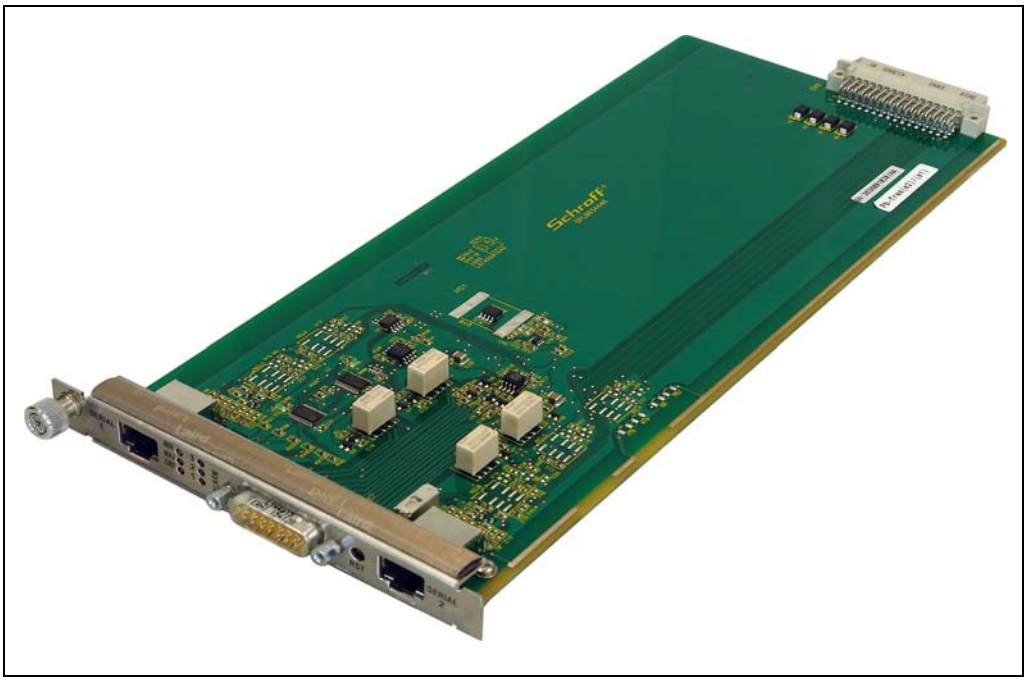
5.1 Introduction

Some I/O functions of the Schroff ACB-V Shelf Manager have been moved to a separate board called Shelf Alarm Panel (SAP). The Shelf Alarm Panel is a FRU and provides:

- 3 Telco Alarm LEDs (MINOR, MAJOR, CRITICAL)
- 3 User definable LEDs
- The Telco Alarm connector (DB15-male)
- The Alarm Silence Push Button
- Serial console interfaces for Schroff Shelf Managers (RJ45 connectors)
- Temperature sensor (LM75)
- SEEPROM for FRU information

The SAP is connected to the Schroff ACB-V Shelf Manager by a I²C connection, the signals from the serial connectors are routed directly to serial console interface on the Shelf Manager.

Figure 8: SAP



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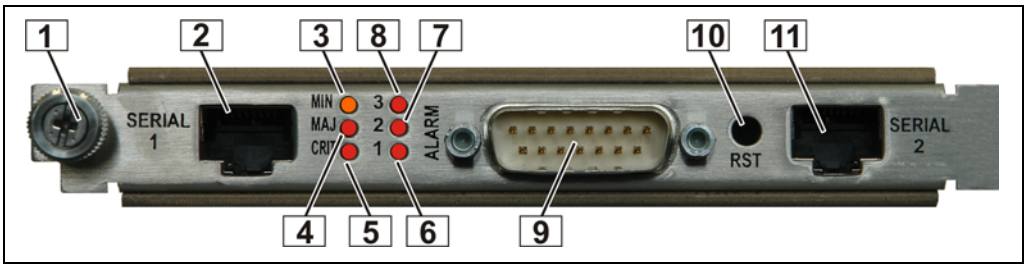
5.2 SAP Front Panel

Figure 9: Front Panel SAP



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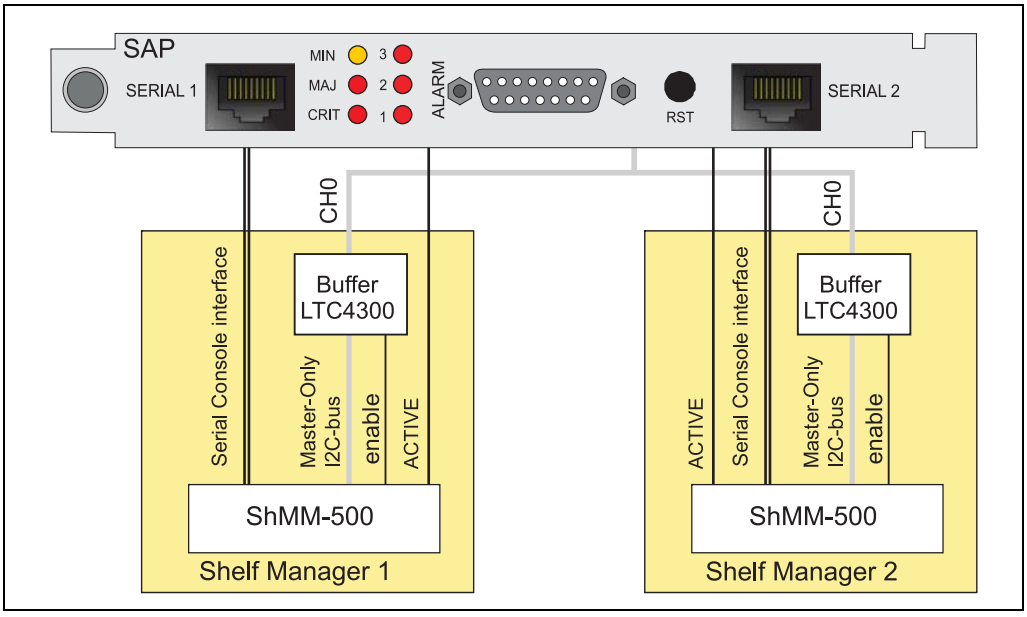
1	***Fixing screw***	***7***	***LED USER 2***
2	***Serial Interface for Shelf Manager 1***	***8***	***LED USER 3***
3	***LED Minor Alarm (amber)***	***9***	***Telco Alarm Connector***
4	***LED Major Alarm (red)***	***10***	***Alarm Silence button***
5	***LED Critical Alarm (red)***	***11***	***Serial Interface for Shelf Manager 2***
6	***LED USER 1***		

Figure 10: Connection between Shelf Manager and SAP



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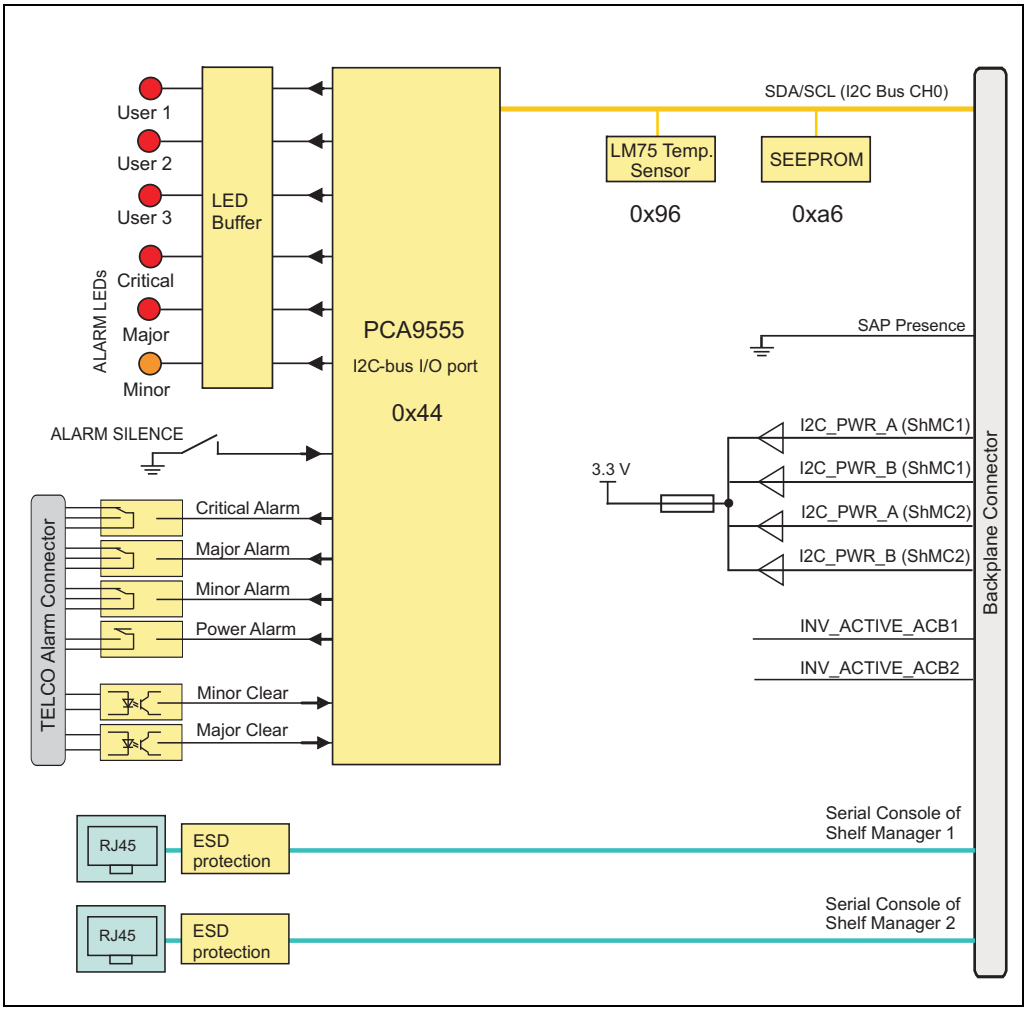
5.3 SAP Block Diagram

Figure 11: SAP Block Diagram



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5.4 SAP SEEPROM

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

5.5 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.

5.6 SAP PCA9555

The PCA9555 device:

- controls the status of the LEDs
- reads the status of the Telco Alarm Cutoff push button (CLEAR)
- controls the Telco Alarm relays

Table 6: 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

5.7 SAP I²C Addresses

Table 7: SAP I²C Addresses

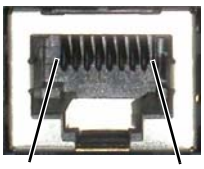
LM75	SEEPROM	PCA9555
0x96/0x4b	0xa6/0x53	0x44/0x22

5.8 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.

5.9 RS-232 Serial Console Interfaces on SAP

Figure 12: RS-232 Serial Console Interface on Shelf Alarm Display



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The SAP provides two RS-232 serial console connector (SERIAL 1 and 2) 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 Schroff Shelf Manager.

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

5.10 SAP Console Cable for the Shelf Manger Serial Interface

Figure 13: RJ45 to DB9 Serial Console Cable

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The connectors are shown with the cables pointing away.

Serial Console Cable sold separately,Schroff Catalog-No: 23204-187

5.11 Shelf Alarm Panel Backplane Connector

Figure 14: Shelf Alarm Panel Backplane Connector

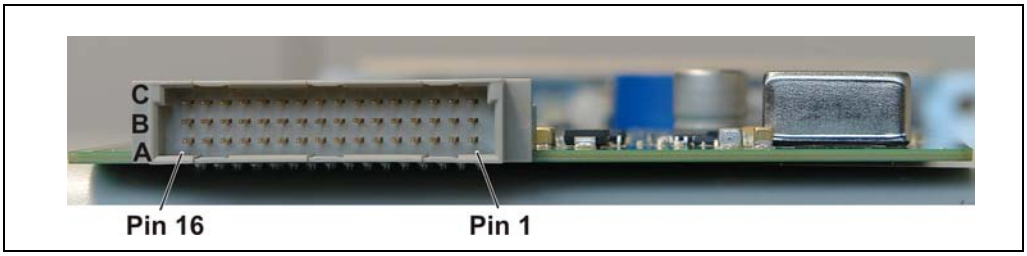

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Table 9: Shelf Alarm Panel Backplane Connector Pin Assignment

	SAP ATCA Backplane Connector					
Pin	**A**	**Description**	**B**	**Description**	**C**	**Description**
1	-48V_A	-48 V Feed A	-48V_B	-48 V Feed B		
2					VRTN_A	Voltage return Feed A
3					VRTN_B	Voltage return Feed B
4						
5			I2C_PWR_A (1)	3.6 V from Shelf Manager 1	I2C_PWR_B (1)	3.6 V from Shelf Manager 1
6	GND	Ground	GND	Ground	I2C_PWR_A (2)	3.6 V from Shelf Manager 2
7	SDA_CH0	Data I²C-bus Channel 0	GND	Ground	I2C_PWR_B (2)	3.6 V from Shelf Manager 2
8	SCL_CH0	Clock I²C-bus Channel 0	INT		GND	
9	INV_ACTIVE_ACB2	Active signal from Shelf Manager 2	RXD0_ACB1	Receive Data Shelf Manager 1	RXD0_ACB2	Receive Data Shelf Manager 2
10	DSR_ACB1	Data Set Ready Shelf Manager 1	DTR_ACB1	Data Terminal Ready Shelf Manager 1	DSR_ACB2	Data Set Ready Shelf Manager 2
11	CD_ACB2	Carrier Detect Shelf Manager 2	DTR_ACB2	Data Terminal Ready Shelf Manager 2	CD_ACB1	Carrier Detect Shelf Manager 1
12	CTS_ACB1	Clear To Send Shelf Manager 1	CTS_ACB2	Clear To Send Shelf Manager 2	RTS_ACB1	Request To Send Shelf Manager 1
13	TXD0_ACB2	Transmit Data Shelf Manager 2	TXD0_ACB1	Transmit Data Shelf Manager 1		
14			RTS_ACB2	Request To Send Shelf Manager 2		
15	SAP_PRES	SAP Presence signal to Shelf Manager				
16	INV_ACTIVE_ACB1	Active signal from Shelf Manager 1			SHELF_GND	Shelf Ground

5.12 SAP Telco Alarms

5.12.1 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.

5.12.2 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 10: Telco Alarm LEDs

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

5.12.3 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.*

5.12.4 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.

5.12.5 Telco Alarm Connector (DB15-male)

Figure 15: Telco Alarm Connector (DB15-male)

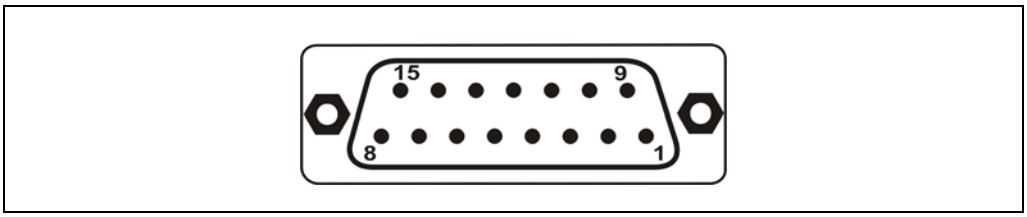

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Table 11: Telco Alarm Connector Pin Assignment

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 Fan Trays

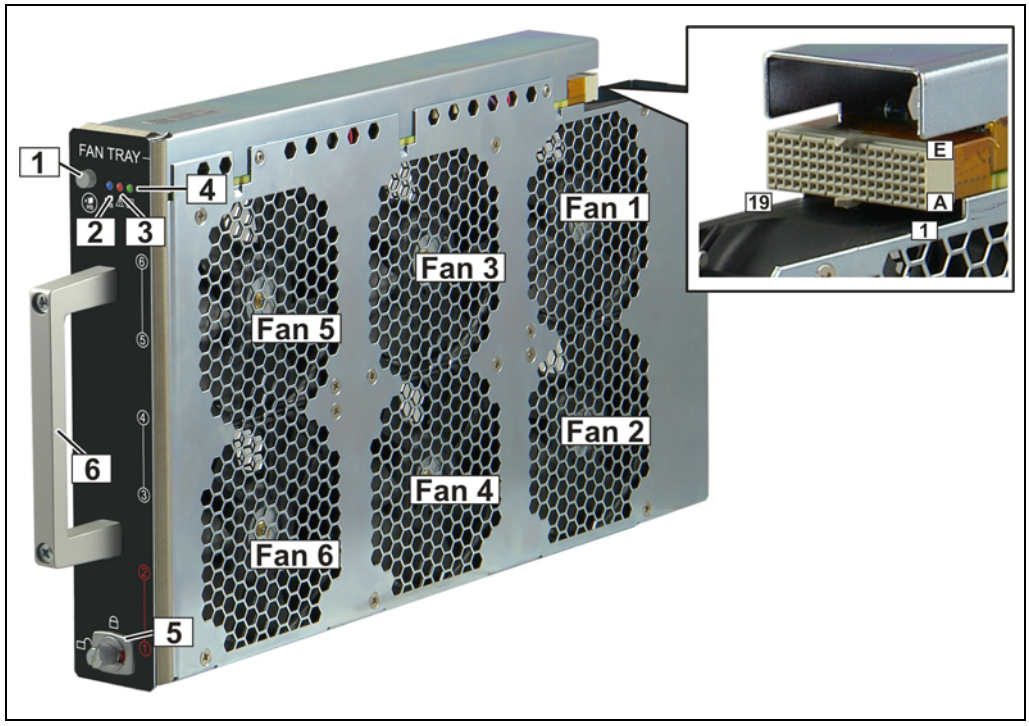
6.1 Introduction

The 6 Slot ATCA Shelf contains two hot-swappable Fan Trays arranged in a side to side configuration for maximum air flow. The Fan Trays are locked into the Shelf by a mini compression latch with indicator. A hot-swap push button is used to provide hot-swap functionality.

The Fan Trays are non-intelligent FRUs, monitored and controlled by the Shelf Managers through proprietary I²C connections.

The system is designed to run indefinitely with any single fan failure. When one fan fails, all other fans are increased to full speed. The Fan Tray has sufficient cooling capacity to keep the Shelf cooled with a single fan failure.

Figure 16: Fan Tray



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1	Hot Swap Push Button	5	Mini Compression Latch
2	Hot Swap LED (blue)	6	Handle
3	Fan Tray Fault LED (red)		
4	Fan Tray OK LED (green)		

6.2 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 12: LEDs on Fan Tray front panel

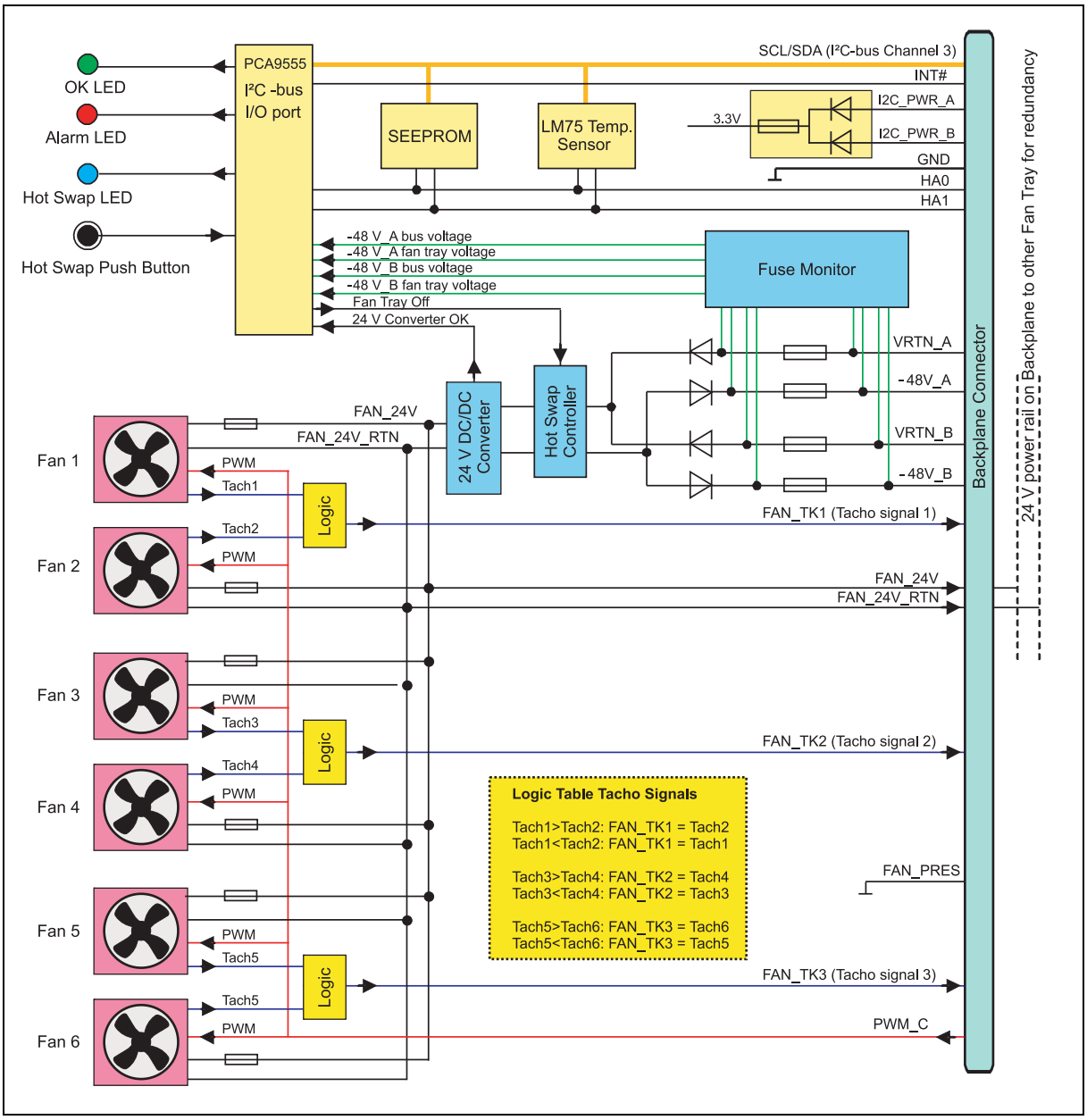
Color	Description	Status	Condition
Green	OK LED	Off	No Power to the Fan Tray
		Solid green	Normal Operation
Red		Solid red	Attention Status (error condition)
Blue	Hot Swap LED	Off	No Power to the Fan Tray or not OK to extract Fan Tray
		Short blink	Preparing for extraction
		Solid blue	Ready to remove

Table 13: Fan Tray Signal Connector pin assignment

Pin #	Signal	Pin #	Signa	Pin #	Signal	Pin #	Signal	Pin #	Signal
A1	VRTN B	B1	VRTN B	C1	VRTN B	D1	VRTN B	E1	VRTN B
A2		B2		C2		D2		E2	
A3	VRTN A	B3	VRTN A	C3	VRTN A	D3	VRTN A	E3	VRTN A
A4		B4		C4		D4		E4	
A5	-48V B	B5	-48V B	C5	-48V B	D5	-48V B	E5	-48V B)
A6		B6		C6		D6		E6	
A7	-48V A	B7	-48V A	C7	-48V A	D7	-48V A	E7	-48V A
A8		B8		C8		D8		E8	
A9	FAN 24 V	B9	FAN 24 V	C9	FAN 24 V RTN	D9	FAN SPEED	E9	PWM_C
A10		B10		C10		D10		E10	
A11	FAN 24 V RTN	B11	FAN TK1	C11	FAN TK2	D11	FAN TK3	E11	FAN TK4
A12		B12		C12		D12		E12	
A13	GND-D	B13	GND-D	C13	GND-D	D13	HA 0	E13	GND (FT_PRES)
A14	GND-D	B14	NSEAT	C14		D14	HA 1	E14	AIR FILT PR
A15	GND-D	B15	INT#	C15	INV_ACTIVE1	D15	INV_ACTIVE2	E15	PEM PRES
A16		B16		C16		D16		E16	
A17	SCL_FT_LOCAL	B17	I2C_PWR_A	C17	SCL_CH3	D17	SCL_A14_R	E17	SCL_B14_R
A18	SDA_FT_LOCAL	B18	I2C_PWR_B	C18	SDA_CH3	D18	SDA_A14_R	E18	SDA_B14_R
A19	GND-D	B19	GND-D	C19	GND-D	D19	GND-D	E19	GND-D

6.3 Fan Tray Block Diagram

Figure 17: Fan Tray Block Diagram



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6.4 Fan Tray Signals

The Fan Tray provides signals for:

- Voltage monitoring
- Status of the Hot Swap Controller
- Fan Speed
- Temperature

These signals are controlled by the Shelf Manager via the I²C bus and propietary signals.

6.5 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 14: Fan Tray PCA9555 pin assignment

I/O pins	Function	State
0.0	-48A bus voltage	0 = Voltage OK
0.1	-48A fan tray voltage	0 = Voltage OK
0.2	-48B bus voltage	0 = Voltage OK
0.3	-48B fan tray voltage	0 = Voltage OK
0.4	24 V converter OK	0 = Voltage OK
0.5	Fan Tray 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.

6.6 Fan Tray Temperature Sensor

The temperature sensors (LM75) in the Fan Trays measure the input and exhaust temperatures of the Shelf.

6.7 Fan Tray Addresses

Geographic address pins (HA0, HA1) at the Fan Tray Backplane connector determine the hardware addresses of the devices.

Table 15:

Fan Tray Location	SEEPROM	LM75	PCA9555
#1 (Left)	0xa8/0x54	0x98/0x4c	0x48/0x24
#2 (Right)	0xac/0x56	0x9c/0x4e	0x4c/0x26

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

7 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.

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 -60 VDC.The Shelf supports redundant power supplies but the two supplies should be independently powered.

7.1 Introduction

Two pluggable redundant Power Entry Modules (PEMs) are located at the rear top side of the Shelf. Each PEM provides power terminals for two 30 A power feeds. Each power feed consists of a –48 VDC cable and its corresponding return cable.

The two feeds (Feed A1 and A2, Feed B1 and B2) and protected by a 30 A fused switches.
Each of the two power feeds supplies power to a hub slots, two node slots a Fan Tray and a Shelf Manager. This topology is used for safety reasons to keep the max. current per feed less the 30 A. The segmentation is shown in *Chapter 7.3, "PEM Power Branches"*.

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

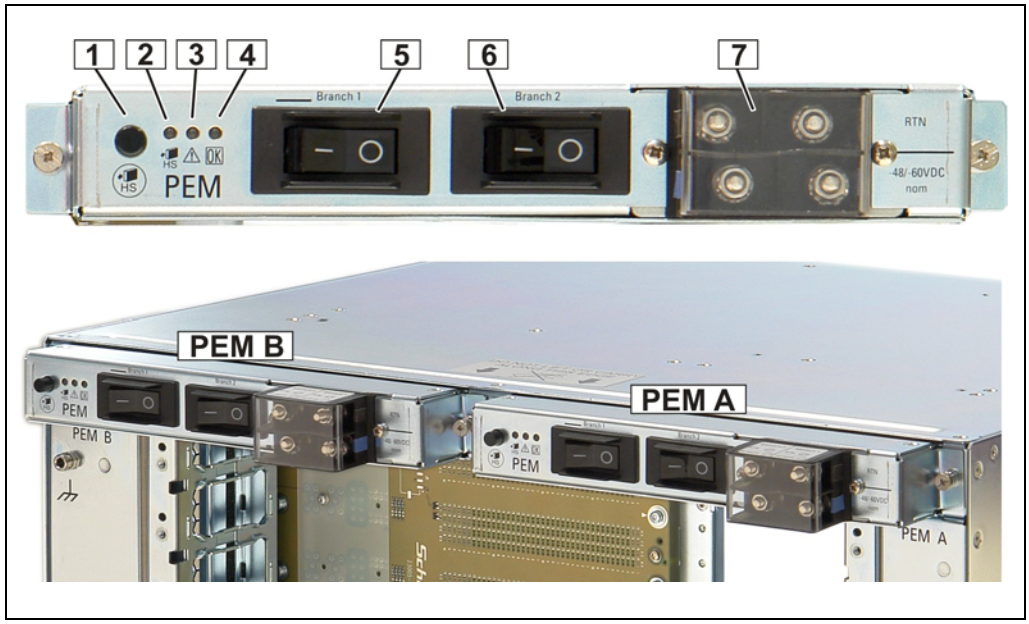
The input voltage range for the Shelf is from -40.5 VDC to -60 VDC.

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.

7.2 PEM Components

Figure 18: PEM components



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1	Hot Swap push button	5	Fused Switch Branch1
2	Hot Swap LED (blue)	6	Fused Switch Branch 2
3	PEM Alarm LED (red)	7	Power Terminal
4	PEM OK LED (green)		

7.3 PEM Power Branches

The ATCA Backplane is divided into two Power branches. Each of the PEM's two power feeds supplies power to a group of slots and a Fan Tray and a Shelf Manager. This topology is used to keep the max. current per branch less than 30 A.

Figure 19: Power distribution of the two Power Branchs within the Shelf

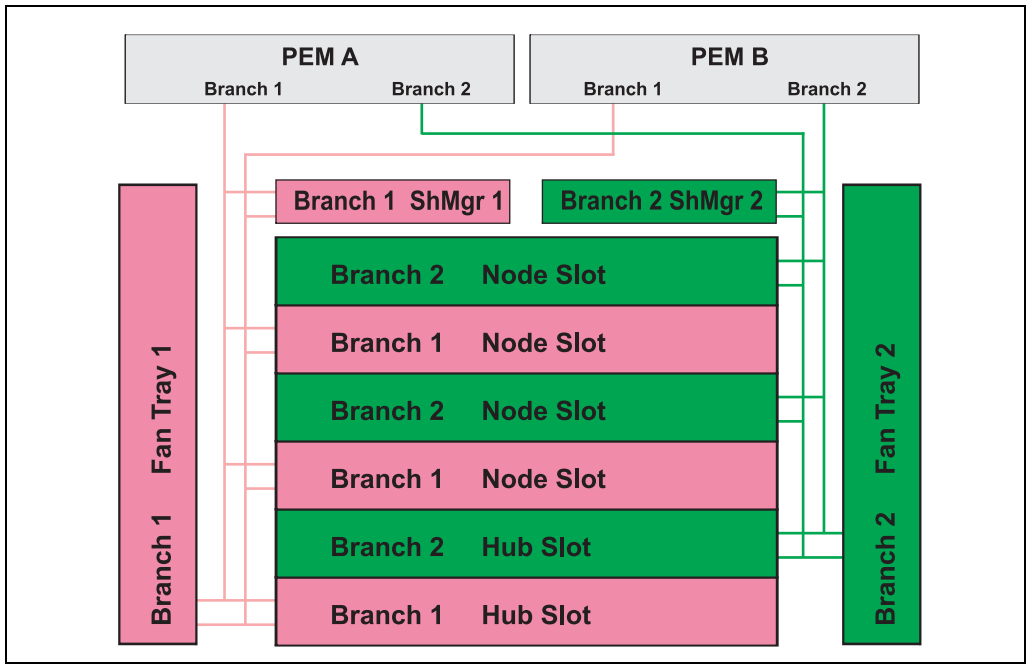

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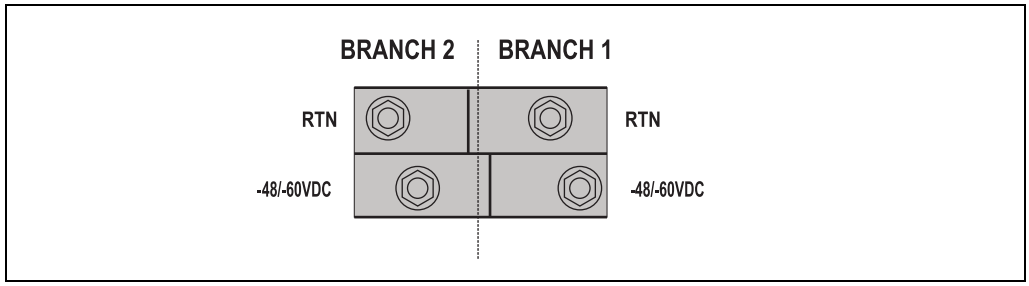
Figure 20: Terminal block power connection



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7.4 Slot Power Calculation

Each branch supplies power to a Fan Tray, a Shelf Manager and a group of 3 slots.
The Shelf Manager calculates the maximum branch power by the minimum expected operating voltage (default 40.5 V) and the maximum branch current (30 A) stored in the Shelf‘s FRU file.
With the default settings the available branch power is calculated with 1215 W. With the power consumption of the Fan Tray and Shelf Manger is about 180 W, the remaing power for the 3 ATCA boards is 1035 W. Because the Shelf Manager reserves 10 W for the for the IPMC on each FRU, the actual remaining branch power is 1005W.

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 300 W in the Shelf‘s FRU file by default. If you want to use a board with more then 300 W, you must must modify the slot‘s power capability.

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

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.)

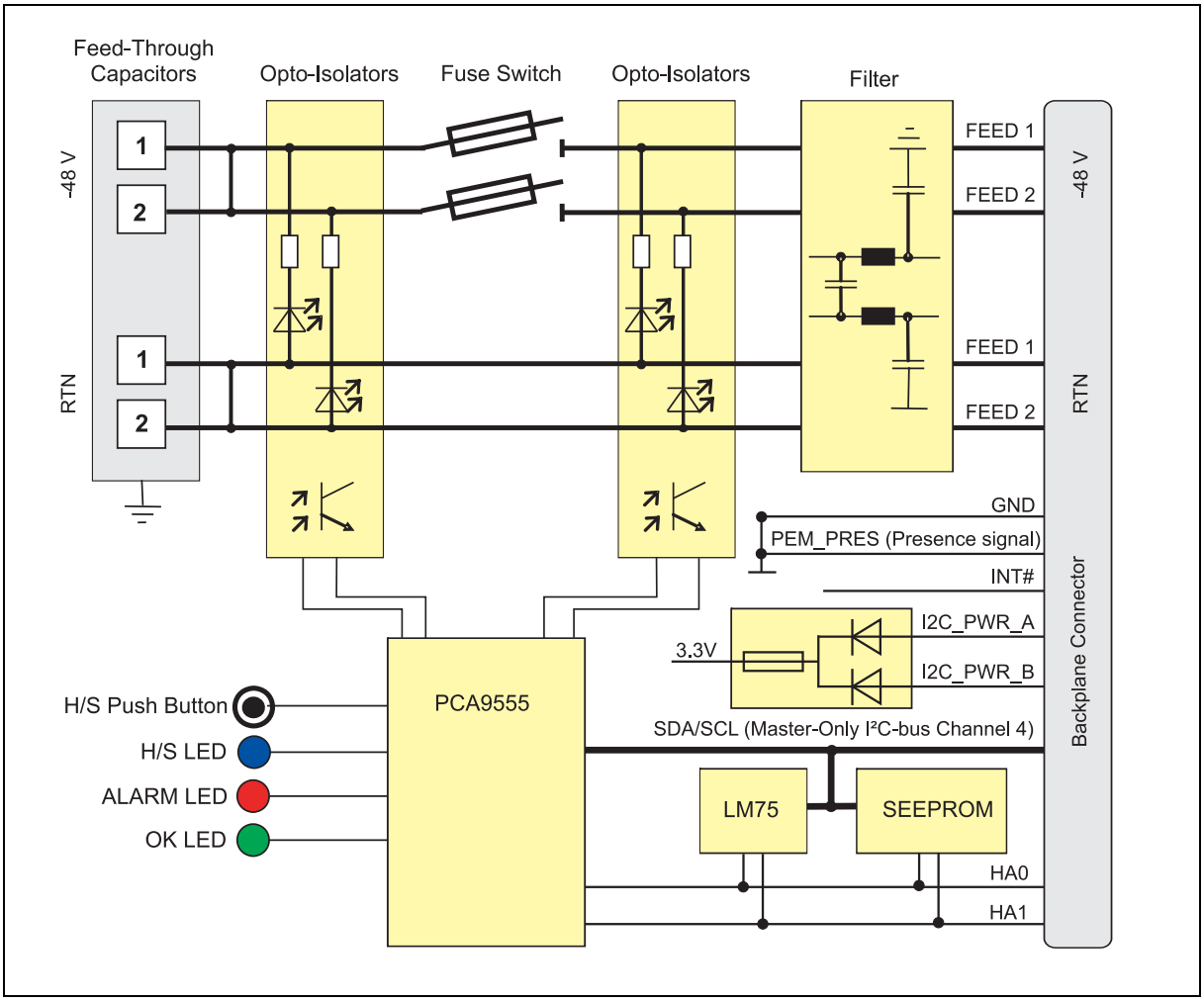
Table 16: Branch Power Capability

Input Voltage	Max. Current/ Branch	Max. Power/ Branch	Power FT and ShMC	Slot Power (for 3 Slots)	Slot Power (average)	Max. Current/Slot	Max. Power/ single Slot
40.5 V	30 A	1215 W	180 W	1005 W	335 W	10.1	409.1
48 V	30 A	1440 W	180 W	1230 W	410 W	10.1	484.8
54 V	30 A	1620 W	180 W	1410 W	470 W	10.1	545.4

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

7.5 PEM Block Diagram

Figure 21: PEM Block Diagram



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7.6 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 17: 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

7.7 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 18: PEM PCA 9555 pin assignment

PCA9555 I/O pin	Function	State
0.0	Power Input 2 at Backplane connector 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 at Backplane connector 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	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	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

7.8 PEM Connectors

Figure 22: PEM Backplane Connector

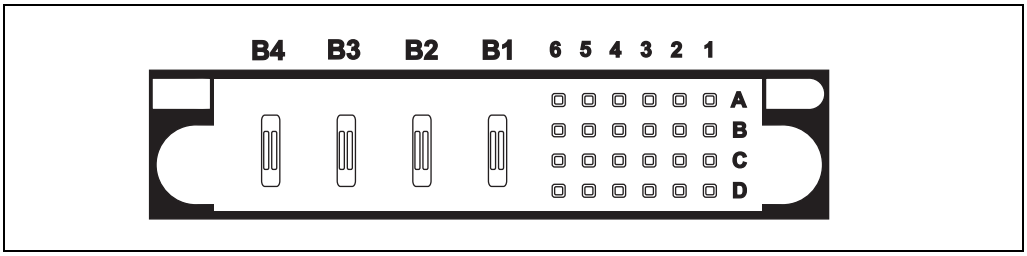

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Table 19: PEM Backplane connector power contacts

B1	B2	B3	B4
-48 V Feed 1	VRTN Feed 1	-48 V Feed 2	VRTN Feed 2

Table 20: PEM Backplane connector signal contacts

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

7.9 Specification for the power connection cables

Required wire size:

Diameter AWG6 when using one-hole lugs for screw M4

Diameter AWG3 when using two-hole lugs for screw M4

max. length 2.5 to 3.0 m

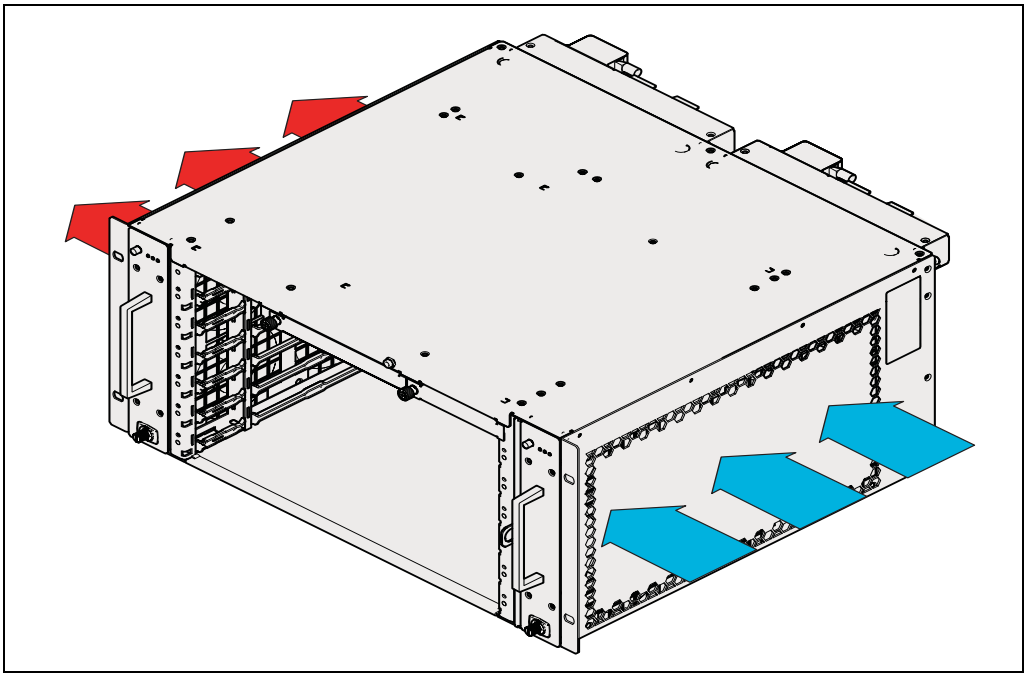
suitable for 60 A at 50° C ambient temperature.

8 Thermals

8.1 System Airflow Path

The Schroff 6 slot ATCA Shelf provides an airflow using two Fan Trays, one at each side of the Blade subrack. Each Fan Tray has 6 fans moving air from the right side to the left side of the Shelf in a push-pull arrangement. This arrangement provides excellent airflow as well as fault tolerance in the unlikely event of a fan failure.

Figure 23: General airflow path for the 5 U/ 6 slot ATCA Shelf



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8.2 Cooling Capacity

The maximum system airflow (all fans at full speed) is 719 m³/h (422 CFM).

The airflow is measured with with front and RTM test boards
(Front board impedance = 37 Pa pressure drop at 50 m³/h (30 CFM),
RTM board impedance = 24.9 Pa at 8.4 m³/h (5 CFM)

The maximum average per slot cooling capacity is:

- 390 W with Δt = 10 K
- 600 W with Δt = 15 K

9 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

9.1 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.

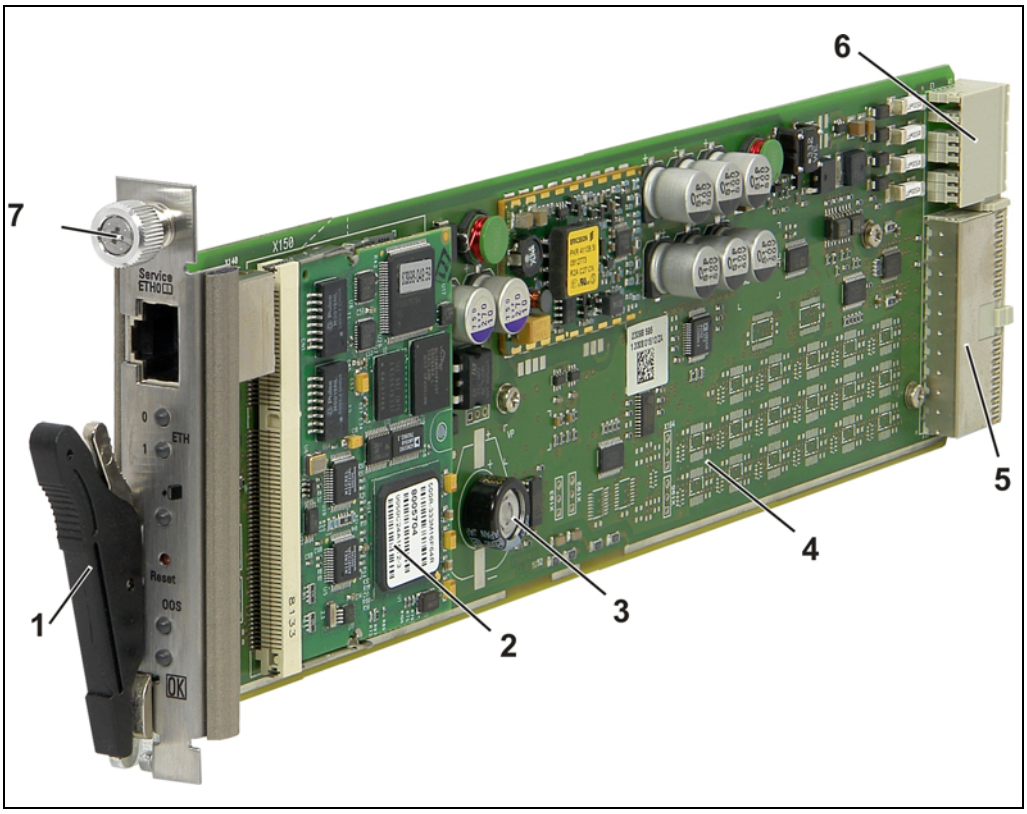
The Shelf management based on the Pigeon Point Shelf management solution for AdvancedTCA products.
The Shelf management software executes on the Pigeon Point **Sh**elf **M**anagement **M**ezzanine **500** (**ShMM-500**), a compact SO-DIMM form-factor module, installed on the ACB-V carrier board.
The 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).

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 24: Schroff Shelf Manager



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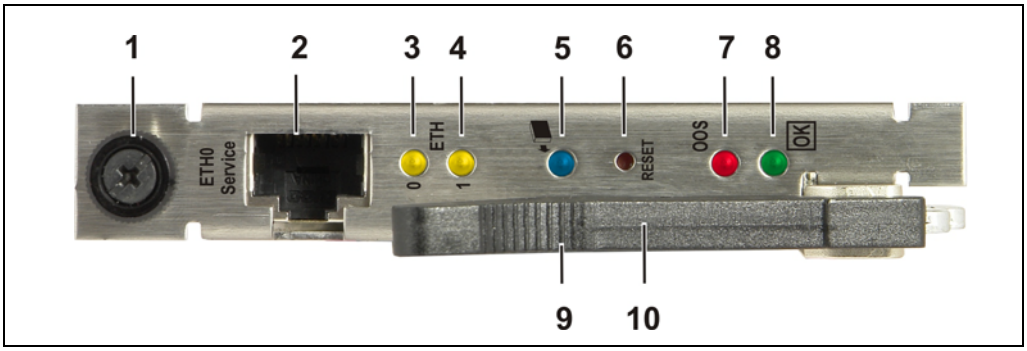
1	Extraction handle	5	Backplane Connector (J2)
2	ShMM-500	6	Backplane Connector (J1)
3	RTC Backup Capacitor	7	Fixing screw
4	ACB-V Carrier Board		

9.2 Front Panel Components

Figure 25: 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

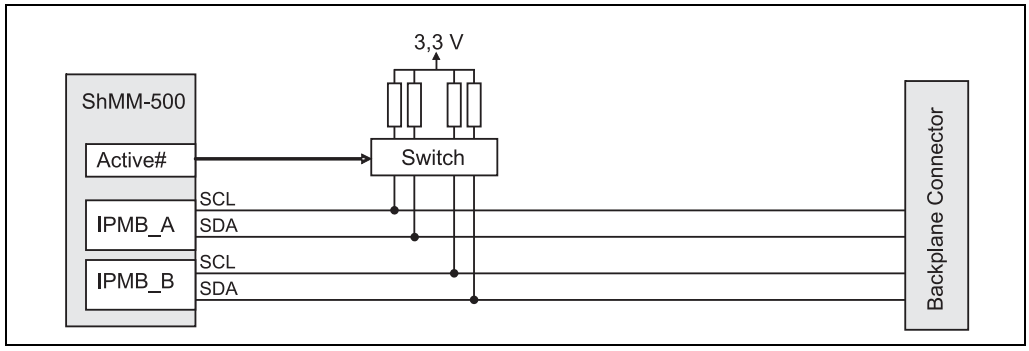
9.3 Bused IPMB Interface

Only Shelf Managers with Product Number: 21596-291 for Shelves 11596-160

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 26: Block diagram bused IPMB



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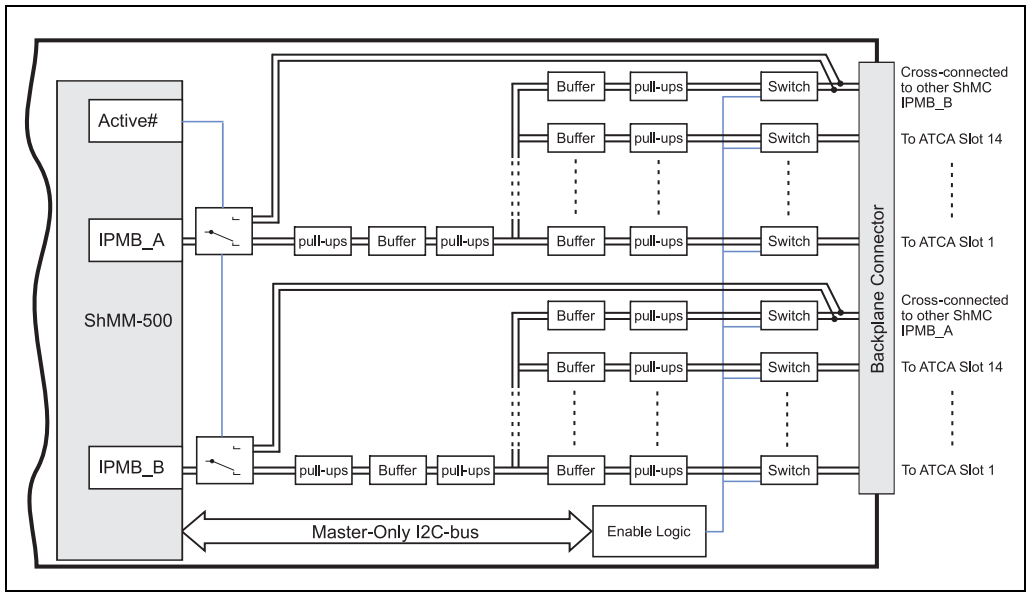
9.4 Radial IPMB Interface

Only Shelf Managers with Product Number: 21596-292 for Shelves 11596-161

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 27: Block diagram radial IPMB



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9.5 Ethernet Channels

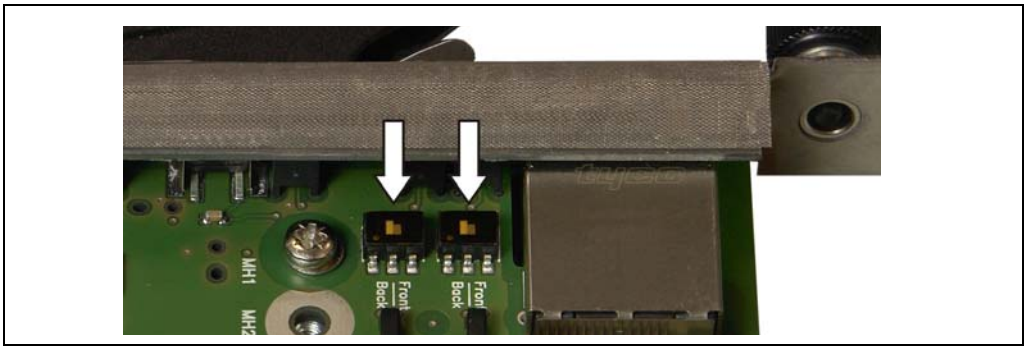
The Shelf Manager provides two 10/100 Ethernet interfaces. The first Ethernet channel (ETH0) is routed either to the RJ45 connector on the front panel or to the ATCA Backplane connector J2 (default setting). The routing depends on the settings of the rocker switches S101 and S102. The ATCA Backplane 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 28: Switches S101 and S102 shown in default position



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9.6 Master-Only I²C Bus

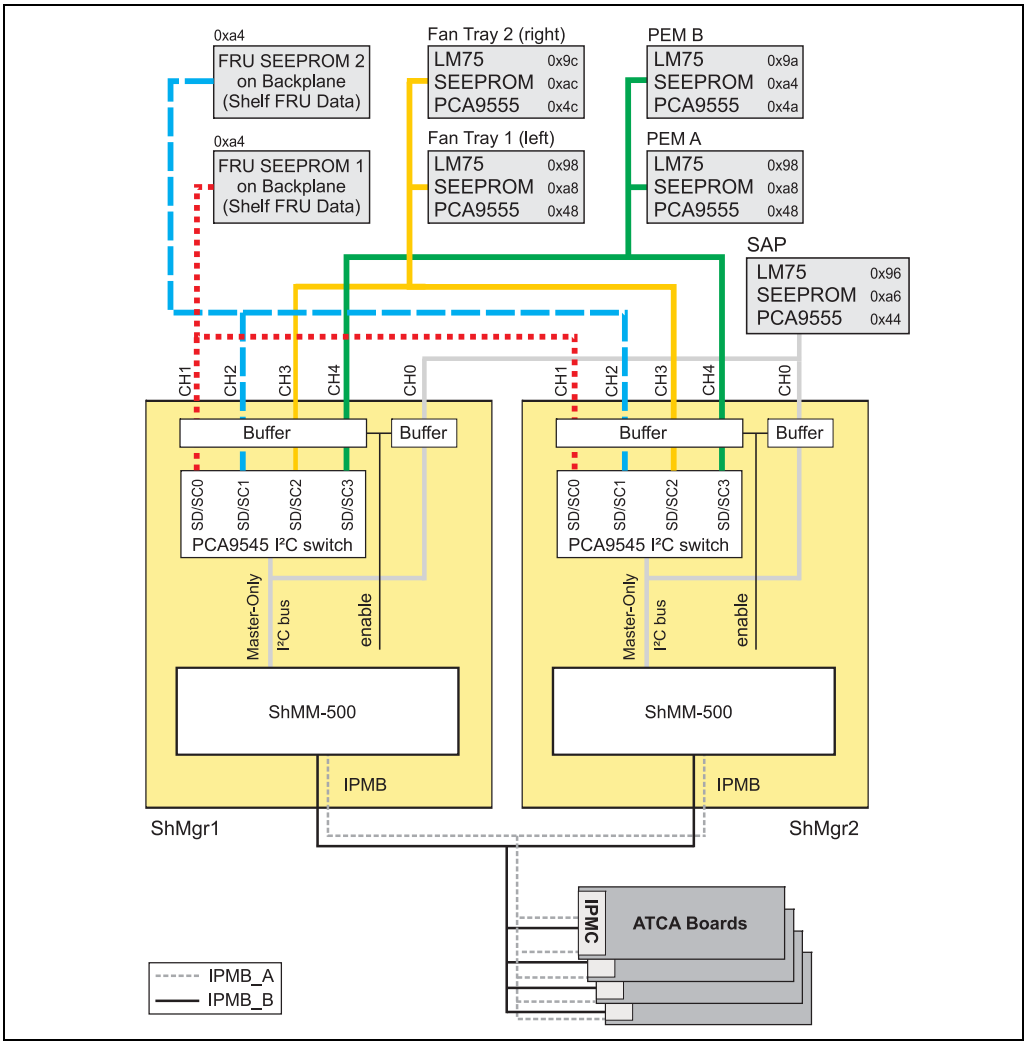
The master-only I²C bus is used internally on the ShMM-500 for the RTC and SEEPROM devices. The Shelf Manager also has a number of onboard I²C devices connected to the master-only I²C bus. These devices read the slot's hardware address, communicate with the System Management controllers ADM1024/1026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

The master-only I²C bus is fed to a 4-channel switch and then routed to:

- the Shelf FRU SEEPROMs (Channel 1 and 2)
- the Fan Trays (Channel 3)
- the PEMs (Channel 4)

The master only I²C-bus is also buffered by a LTC4300 device and then routed to the SAP.The 'Active' signal of the ShMM-500 is used to enable the LTC4300 buffers, so that only the active Shelf Manager has access to the Shelf I²C-bus devices.

Figure 29: Master-Only I²C-bus



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9.7 Shelf Manager Cross Connect

The ATCA Backplane provides cross connect traces between the Base Hubs and the Shelf Managers according to PICMG 3.0 Base specification.

Figure 30: Shelf Manager Cross Connect

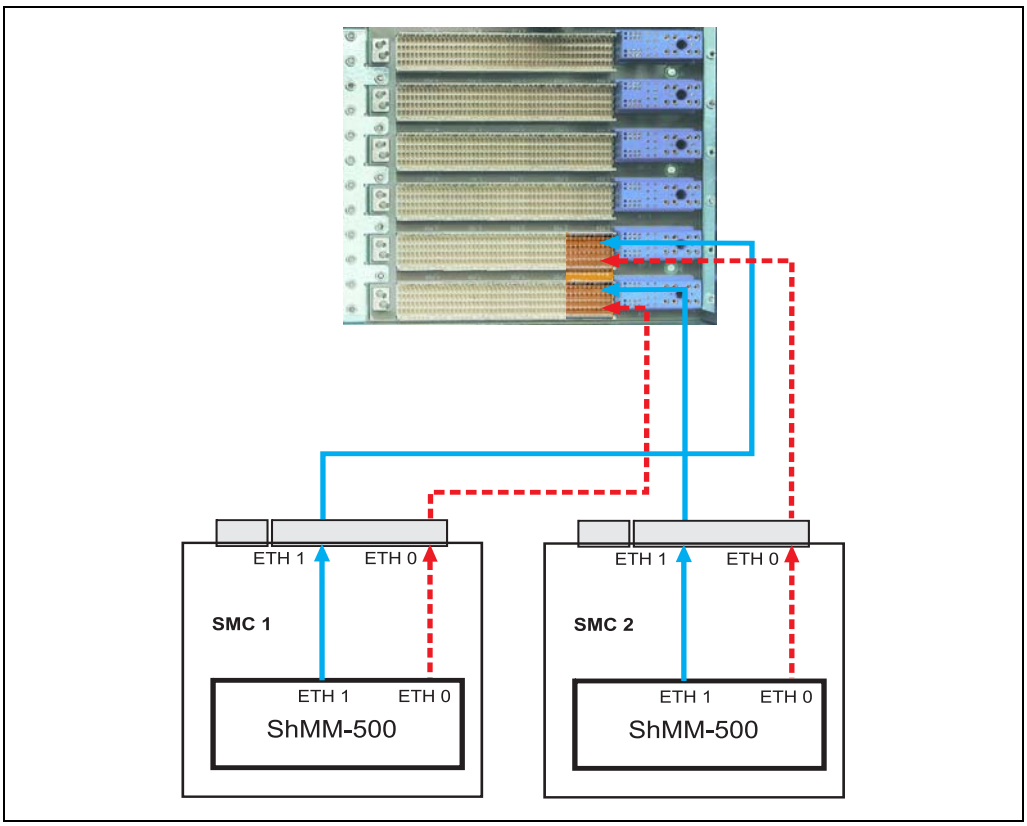

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Table 21: Connector (P23) pin assignment for Shelf Manager Cross Connect

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			

9.8 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*

9.9 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

9.10 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.

9.11 Cooling Management Strategy

The cooling management strategy described below is part of the Pigeon Point Shelf Manager User Guide © by Pigeon Point Systems®.

The default cooling management has the following features:

- zoned cooling is supported; the Shelf Fan Geography Record from the Shelf FRU Information is used to define cooling zones.
- in the normal cooling state (that is, when no thermal thresholds on any sensors are crossed), the Shelf Manager attempts to minimize the fan level, but at the same time prevent thermal alerts. It does that by adaptively choosing the lowest possible fan level that allows the shelf to avoid thermal alerts, for each fan, taking cooling zones into account.
- In the minor alert cooling state (non-critical thermal thresholds are crossed for one or more sensors) the Shelf Manager periodically increases the fan level for the fans that serve the cooling zone(s) where those thresholds have been crossed, until the fan level reaches its maximum or the thermal condition goes away.
- In the major alert cooling state (critical thermal thresholds are crossed for one or more sensors) the Shelf Manager sets the fan level to the maximum for the fans that serve the cooling zone(s) where those thresholds have been crossed. In addition, if the thermal condition is caused by a specific FRU, and the FRU supports power levels lower than the current one, the Shelf Manager reduces power consumption of the FRU by assigning it the next lower power level.
- In the critical alert cooling state (non-recoverable thermal thresholds are crossed for one or more sensors) the Shelf Manager sets the fan level to maximum for the fans that serve the cooling zone(s) where those thresholds have been crossed. In addition, if the thermal condition is caused by a specific FRU, the FRU is powered down. If the thermal alert is caused by a shelf-wide temperature sensor, all FRUs are powered down, as prescribed by the PICMG 3.0 specification.
- In addition, a fan management strategy is implemented that sets the fan level to the maximum for all fans in the cooling zone in the following cases:
  - If one or more fans are missing in the shelf, based on the fan population specified in the Address Table in the Shelf FRU Information, all fan trays are set to maximum.
  - If one or more of the fan tachometer sensors have a major or critical threshold crossed (a fan is stopped or rotates too slowly), all fan trays are set to maximum speed.

9.12 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

9.12.1 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

9.12.2 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.

9.12.3 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.

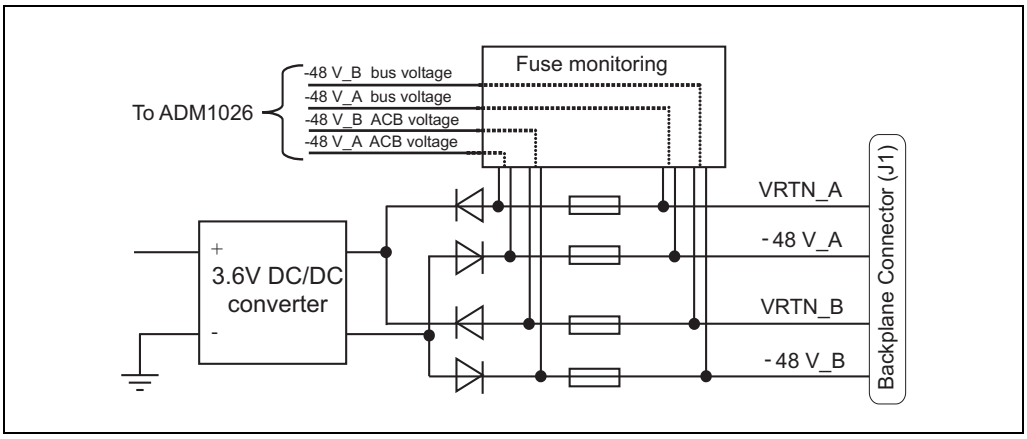
Table 22: Hot Swap LED

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

9.13 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 31: 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

9.14 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

9.15 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.

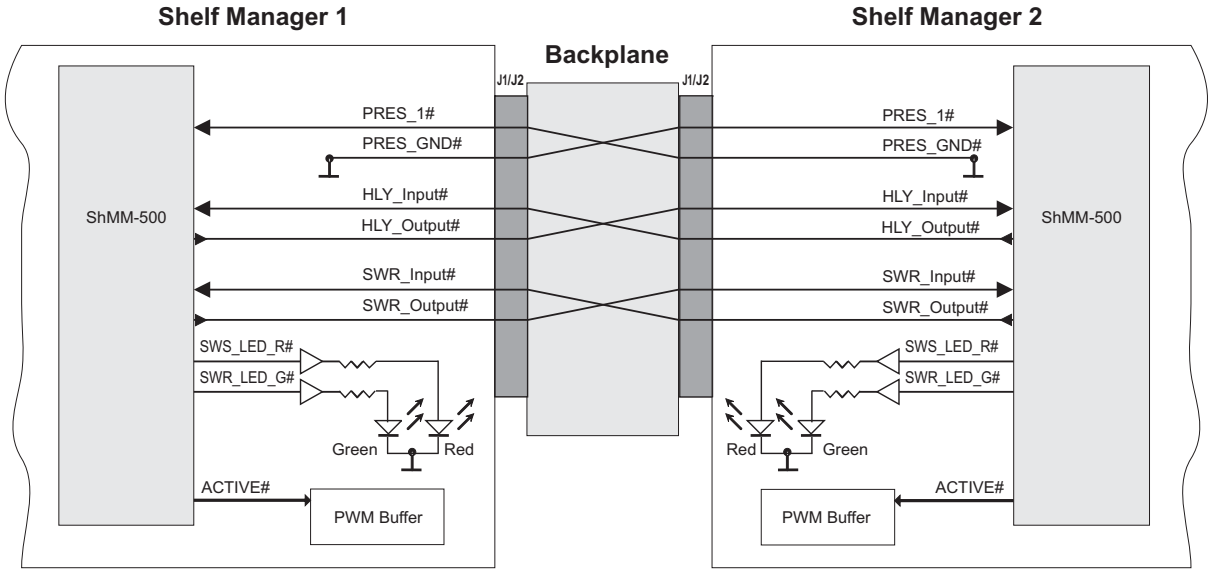
9.15.1 Hardware Redundancy Interface

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 32: Shelf Manager redundancy control



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9.16 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 datas you have to connect to the active Shelf Manager!

9.16.1 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`

9.17 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.

9.18 Shelf Manager Front Panel and Backplane connectors

Table 23: 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 33: Backplane Connectors

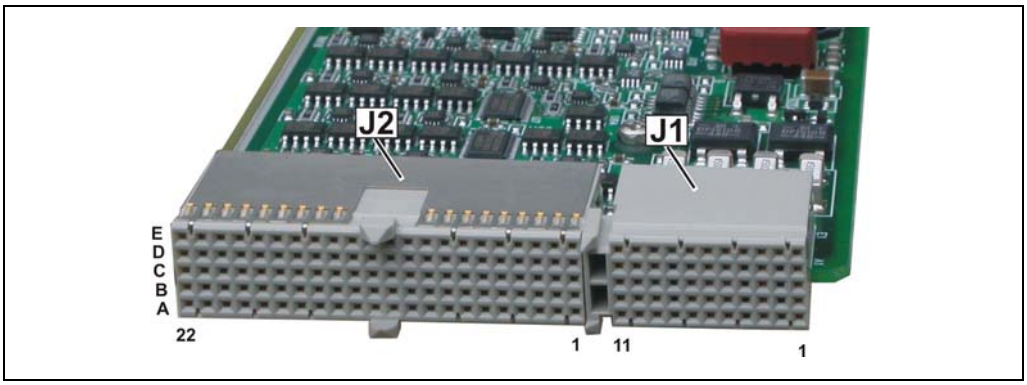

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Table 24: Pin Staging (PS)

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 25: 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 26: Backplane Signal Connector 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 27: Backplane Signal Connector 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 28: 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

10 Technical Data

Table 29: Technical Data

Physical Dimensions	
Height	5 U
Width	482.6 mm
Depth (with handles)	464 mm
Weight	
Shipping weight completely assembled with packaging	20 Kg
Shelf weight completely assembled	15 Kg
Power	
Input voltage	-40.5 VDC …. -72 VDC
Input Power	60 A per power feed (Feed A and Feed B)
Overcurrent Protection	30 A Fused Switches on PEM
Cooling Capacity	
Front Boards	>300 W / Board
RTM	30 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

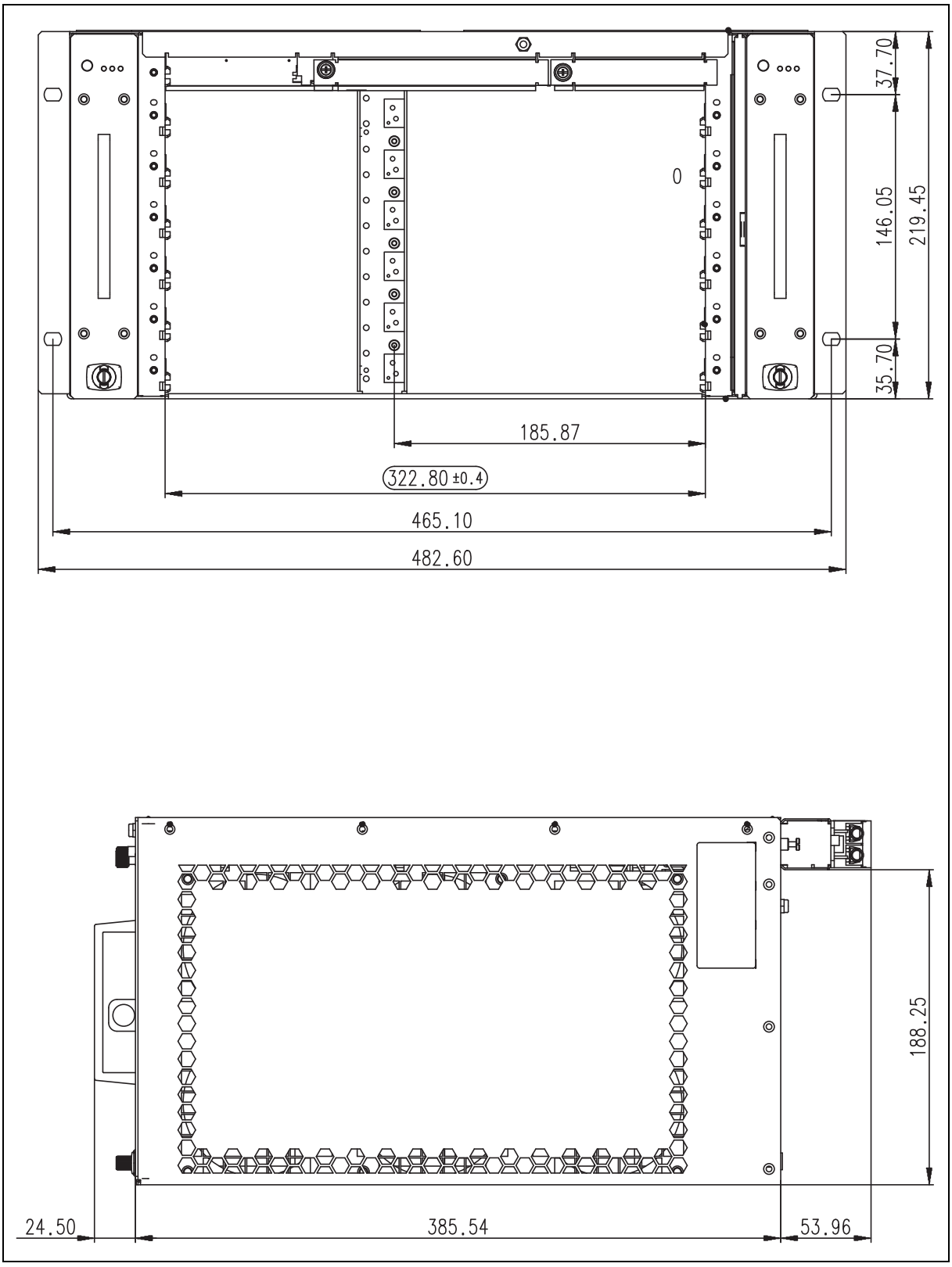
10.1 Part Numbers

Table 30: Part Numbers

Number	Part
11596-160	6-Slot ATCA Shelf, Replicated Mesh Backplane, bused IPMB
11596-161	6-Slot ATCA Shelf, Replicated Mesh Backplane, radial IPMB
21596-300	Shelf Manager ShMM-ACB-V with bused IPMB
21596-301	Shelf Manager ShMM-ACB-V with radial IPMB
21990-057	Replacement Fan Tray
21990-058	Replacement PEM
21990-059	Air Filter Element
21596-077	Shelf Alarm Panel (SAP)
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
21591-099	Filler Panel (stainless steel) with airflow buffle for empty RTM slots
21591-107	Filler Panel (Aluminium profile) with airflow buffle for empty RTM slots

10.2 Dimensions

Figure 34: Dimensions



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