

3U 2-slot ATCA Shelf

User's Manual



Product Numbers:
11990-800/801/802/803

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1 Safety

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


1.1 Safety Symbols used in this document

	<p>Hazardous voltage!</p> <p><i>This is the electrical hazard symbol. It indicates that there are dangerous voltages inside the Shelf.</i></p>
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	<p>Caution!</p> <p><i>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.</i></p>
---	--

	<p>Danger of electrostatic discharge!</p> <p><i>The Shelf contains static sensitive devices. To prevent static damage you must wear an ESD wrist strap.</i></p>
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1.2 General Safety Precautions

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

- 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

- PICMG® 3.0 Revision 3.0 AdvancedTCA® Base Specification (www.picmg.com)

1.4 Product Definition

The Schroff 11990-800/801/802/803 are 3 U / 2 Slot AdvancedTCA 40G Shelves with enhanced per-slot power and cooling capability along with 40G backplane connectivity for fault tolerant/high availability applications.

Different versions are available:

11990-800: Base Interface in a NODE/NODE configuration, bussed IPMB

11990-801: Base Interface in a HUB/HUB configuration, bussed IPMB

11990-802: Base Interface in a NODE/NODE configuration, radial IPMB

11990-803: Base Interface in a HUB/HUB configuration, radial IPMB

1.5 Terms and Acronyms

Table 1: Terms and Acronyms

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

1.6 Hardware Platform

The Shelf is 3 U high and 19" rack mountable. The chassis is designed for easy access of any Field Replaceable Units (FRU).

- Powder-coated 3 U / 19" chassis with front card cage for ATCA boards and rear card cage for ATCA RTM boards
- 2 slot ATCA Backplane with 6 x interconnected Fabric Interface, Base Interface in HUB/ HUB or Node/Node configuration, bussed or radial IPMB interface, supporting two 8 U ATCA hub boards
- 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
- Two rear pluggable, hot swappable Fan Trays
- Front pluggable air filter that meets the requirements of the Telcordia GR-78-CORE specification.
- Bay for front pluggable Shelf Alarm Panel (SAP):
Provides Alarm Status LEDs, Telco Alarm interface and serial interfaces for the Shelf Managers
- Electrical power 450 W/slot
- Enhanced cooling capability with 400 W/Front Board and 50 W/RTM



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



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

1.7 Shelf Front and Rear View

Figure 1: Shelf Front View



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- | | |
|----------------------------|--------------------------------------|
| 1 ESD Wrist Strap Terminal | 7 Cover Power Input |
| 2 ShMC 1 (optional) | 8 Shelf Alarm Panel (SAP) (optional) |
| 3 ESD Wrist Strap Terminal | 9 ShMC 2 (optional) |
| 4 Circuit Breakers | 10 Air Filter |
| 5 Fan Tray 2 | 11 Fan Tray 1 |
| 6 Power Input | 12 Shelf Ground Terminal |

1.8 ESD Wrist Strap Terminals



Danger of electrostatic discharge!

The Shelf contains static sensitive devices. To prevent static damage you must wear an ESD wrist strap.

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

2 ATCA Backplane

The 2-slot ATCA monolithic Backplane is completely passive and is not field replaceable. The backplane provides 40 Gb/s connectivity (4 lanes with 10Gb/s) and 2 ATCA slots in a **Hub/Hub** or **NODE/NODE** configuration.

2.1 Logical to Physical Slot Mapping

The physical and logical slots are sequentially numbered from the lower to the upper slot.

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

Physical Slot #	Logical Slot #	HW-Address (Hex)	IPMB-Address (Hex)
2	2	42	84
1	1	41	82

2.2 Interfaces

2.2.1 Fabric Interface

All 15 Fabric Channels of slot 1 are routed to the respective Fabric Channels of slot 2.

2.2.2 Synchronization Clock Interface

6 pairs of synchronization clocks are bused between both ATCA slots and terminated at both ends.

2.2.3 Update Channel Interface

The Update Channels are wired between both ATCA slots. The Update Channel can be used to pass data or routing information between two redundant ATCA Boards.

2.2.4 Intelligent Platform Management Interface

The Shelf uses an Intelligent Platform Management Bus (IPMB) for management communications among all ATCA Boards. 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.

2.2.5 Base Interface

Node/Node configuration

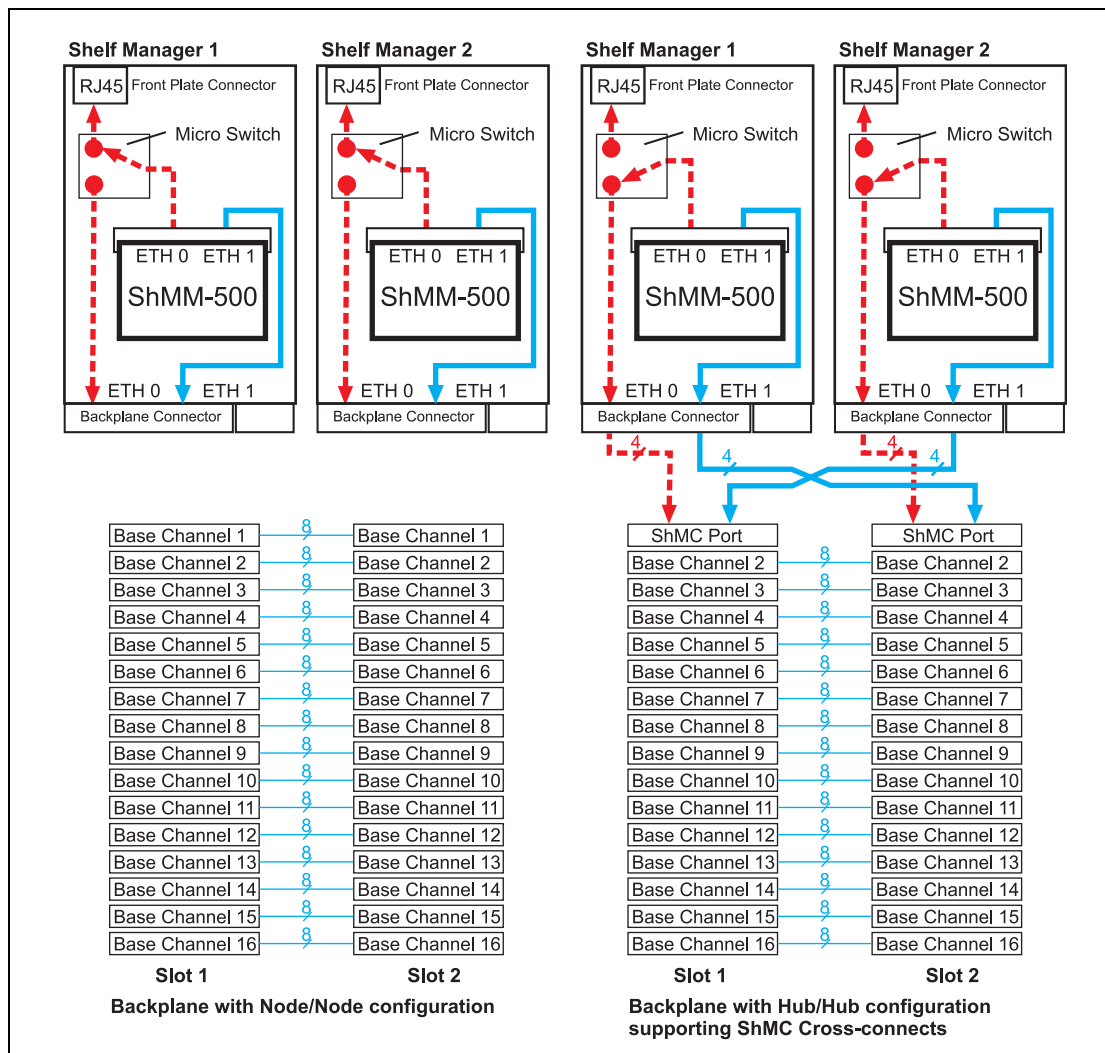
All 16 Base Channels of slot 1 are routed to the respective Base Channels of slot 2.

Hub/Hub configuration

All Base Channels 2 - 16 of slot 1 are routed to the respective Base Channels of slot 2.

Base Channel 1 (ShMC) of slot 1 and 2 is cross connected to both dedicated Shelf Manager slots.

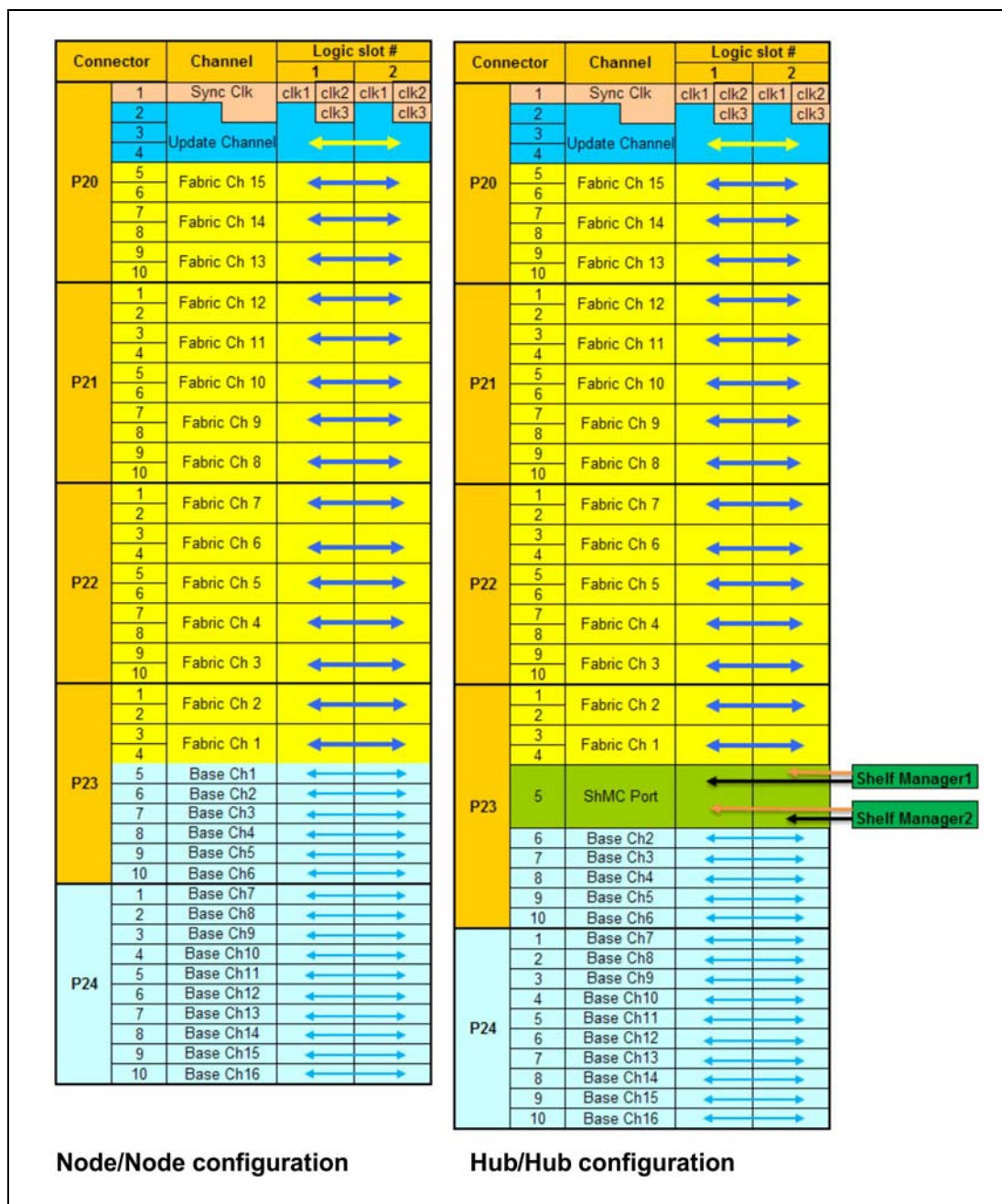
Figure 2: Base Channel routing



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2.2.6 [????????????????]

Figure 3: Backplane Topology



2.3 Shelf FRU SEEPROM

2 Shelf FRU SEEPROMS are located on the Backplane. The hardware address for these SEEPROMs is 0xA4.

The SEEPROMs are the repository of the shelf specific information capabilities of the system and other user configurable options. The SEEPROMs contain the 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, serial number of the shelf, backplane topology, etc. The Shelf Manager uses this information to provide functions such as electronic keying, controlling the power state of the system, etc.

The Shelf allows for 2 methods to access the chassis FRU data:

- An I²C connection from each Schroff Shelf Manager directly to the SEEPROMs on the backplane.
- SEEPROMs on the backplane exposed as a FRU of the Fan Tray for on-blade shelf management.

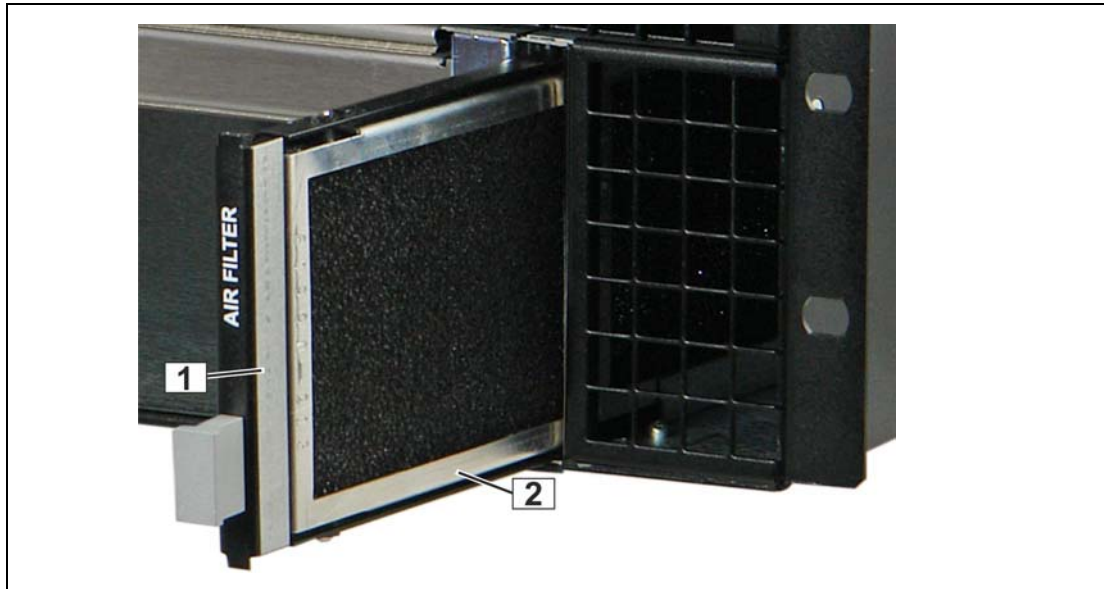
2.4 Logic Ground



The default factory assembly connects Logic Ground to Shelf Ground.

3 Air Filter

Figure 4: 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.

4 Shelf Ground Connection

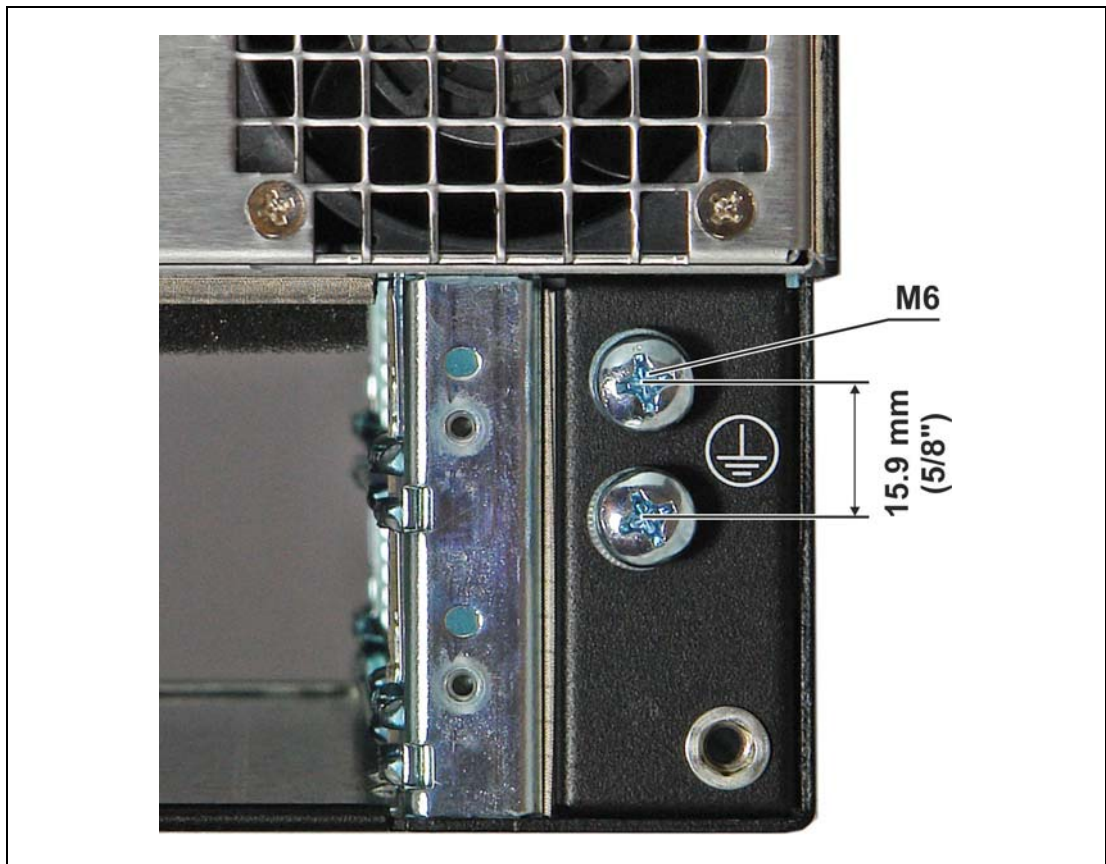


Hazardous voltage!

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

The ATCA Shelf provides a Shelf ground terminal at the left rear side. The Shelf ground terminal provides two threads (M6) with a 15.90 mm (5/8") spacing between thread centers to connect a two hole lug Shelf ground terminal cable.

Figure 5: Shelf Ground Terminal



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4.1 Specification for the Shelf Ground connection cable

Required wire size: #10 AWG maximum length 3 m.

Required terminals: Use only two hole lug terminals.

5 Fan Trays

5.1 Introduction

Two hot-swappable Fan Trays are arranged in a side to side configuration for maximum air flow.

Each Fan Tray contains 4 high air flow fans in a twin configuration controlled as a group by the controller inside the Fan Tray.

The Fan Tray is locked into the Shelf with a captive screw.

5.2 Fan Control

The Fan Controller located on the Fan Tray and has 2 operation modes:

1. Shelf Manager Mode

The tachometer signals from the Fan Trays are routed through the Backplane to the Shelf Manager slots. The active Shelf Manager monitors these signals and controls the speed via a PWM signal. The Shelf Manager can access an LM75 temperature sensor and FRU-Data EEPROM on the Fan Control Module and can control the red (Fail) LED via an I2C-bus.

Note: As soon as a Shelf Manager is plugged-in and becomes active, the Fan Controller switches automatically into the Shelf Manager mode. The Fan Trays can only be controlled by Schroff Shelf Managers by proprietary signals. The control via the I2C-bus is not possible.

2. Autonomous Mode

When no Shelf Manager is present, the fans are controlled by the fan controller in a Master-Slave configuration. The fan tray with the hardware address pin grounded becomes the master (fan tray 1) and controls the bus. The other fan tray acts as slave. Data exchange between the master and slave fan trays is done via the local I2C bus.

The master fan controller adjusts the fan speed according to the difference between the intake temperature and the outlet temperature. The intake temperature is determined by an NTC temperature sensor on the backplane, the outlet temperature by an NTC sensors located on the fan controller inside fan tray 1.

4 different temperature differences are user-selectable by a micro DIP-switch on the master fan controller, the default temperature difference is 20 K.

In Shelf manager mode, the I2C communication between the both fan trays is not active.

Control behaviour:

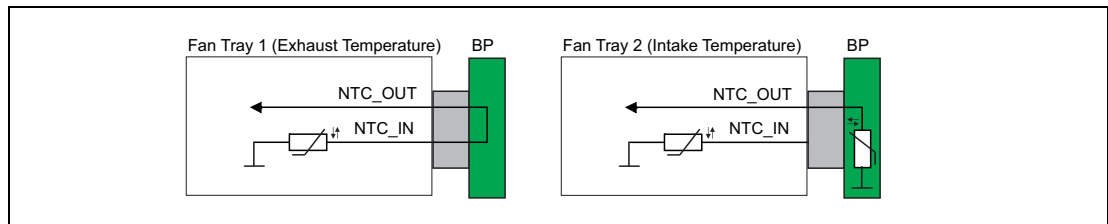
When the shelf is powered up, all fans are running with at 30% of the maximum speed. If the temperature difference is over selected value, the controller gradually increases the fan speed until the set temperature difference has been reached.

The controller monitors the fan speed. If a speed signal is lost the speed of all fans is set to maximum. If the I2C connection between the fan trays is lost, the fan speed is set to maximum.

The system is designed to run indefinitely with any single fan failure.

5.3 Fan Tray NTC Assignment

Figure 6: Fan Tray NTC Assignment

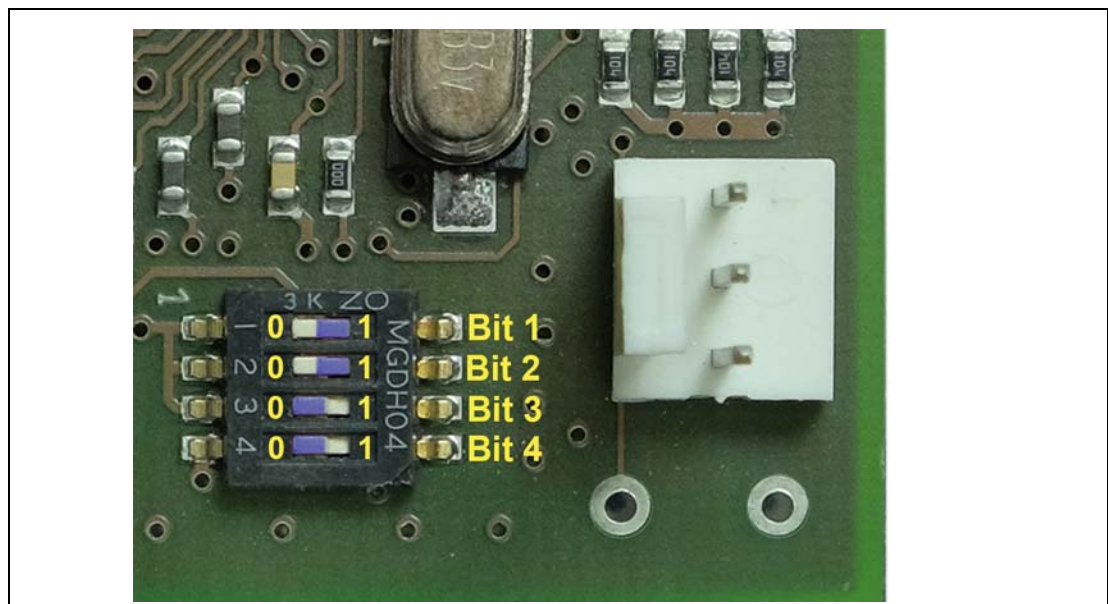


5.4 Fan Control DIP Switch Settings

A DIP switch on the fan controller of the master fan tray (fan tray 1) can be used to select 1 of 4 different temperature differences (fan curves). Other DIP switch settings are reserved for future use.

Fan Curve	ΔT [K]	Bit 1	Bit 1	Bit 3	Bit 4
0	5	0	0	0	0
1	10	1	0	0	0
2	15	0	1	0	0
3	20	1	1	0	0

Figure 7: DIP Switch



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5.5 Airflow

	Zone 1	Zone 2	Zone 3	Zone 4	RTM
Slot 1 [m³/h]	31,2	31,5	28	27,6	23,4
Slot 2 [m³/h]	31,9	32,2	28,9	28,1	23

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

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

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

5.6 Fan Tray Block Diagram

Figure 8: Fan Tray Block Diagram

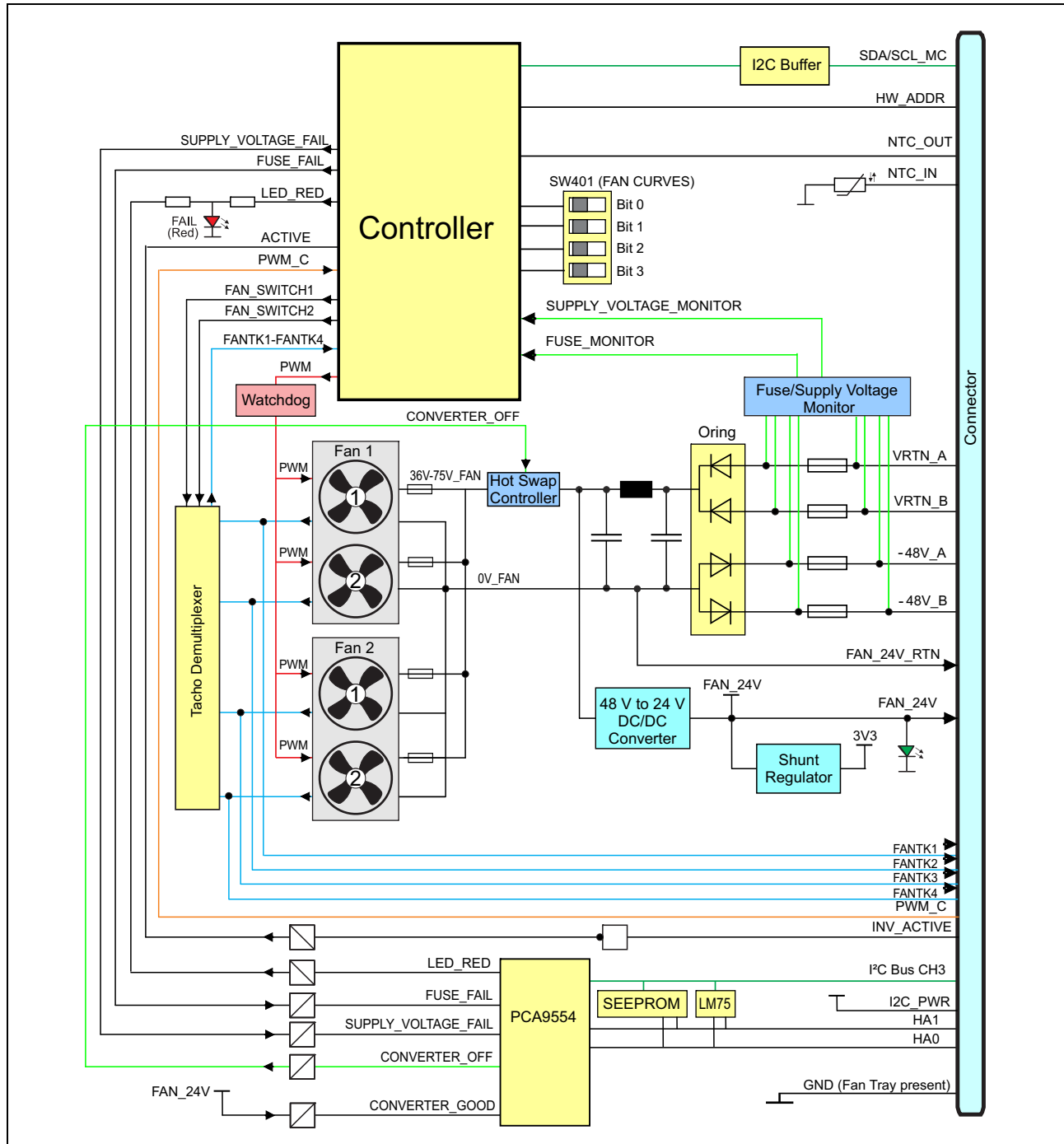
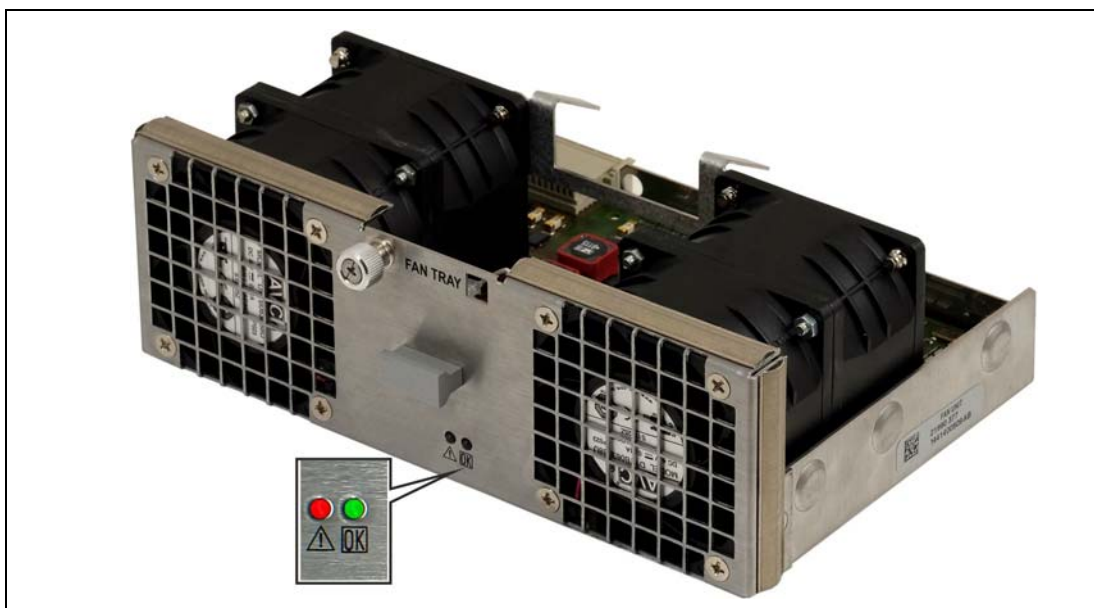


Figure 9: Fan Tray



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5.7 Fan Tray Connectors and Indicators

The front panel includes a green and red status LED.

Table 3: LEDs on Fan Tray front panel

Color	Description	Status	Condition
Green	OK LED	Off Solid green	No Power to the Fan Tray Normal Operation
Red		Solid red	Attention Status (error condition)

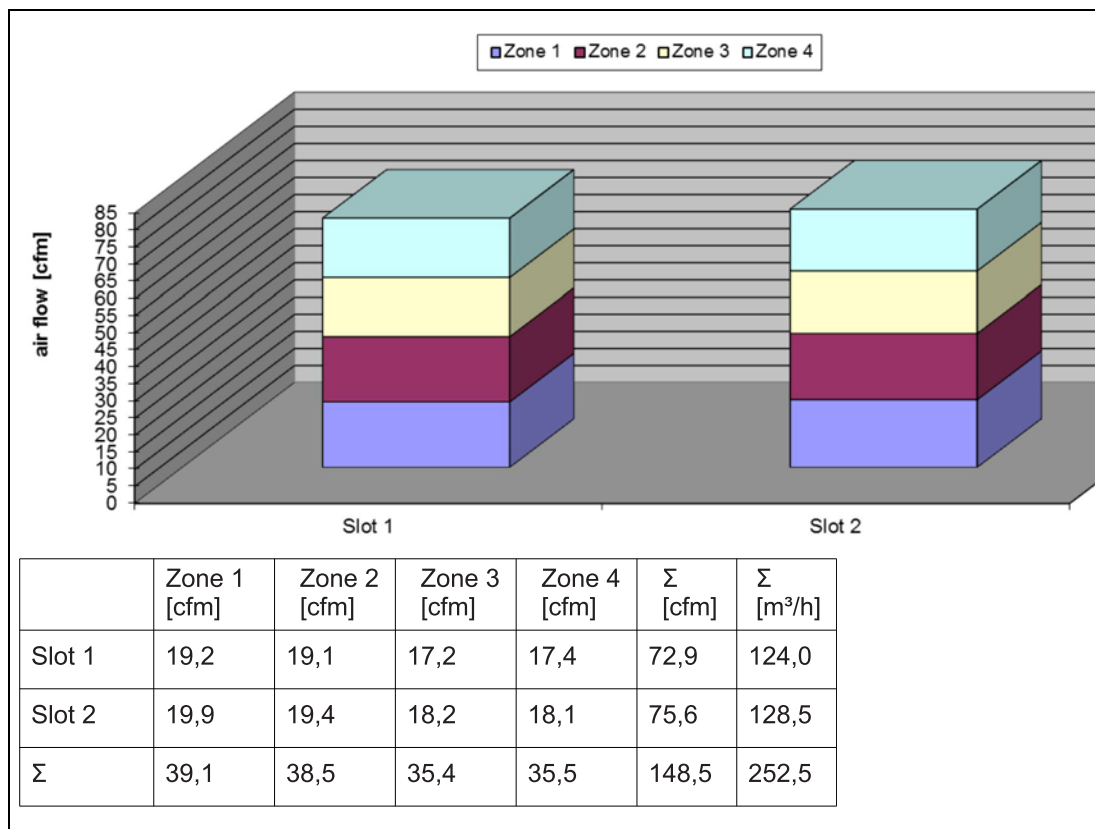
5.8 Airflow

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

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

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

Figure 10: Front Board Air Distribution



6 Power



Hazardous voltage!

Before working ensure that the power is removed from the power connection cables.



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

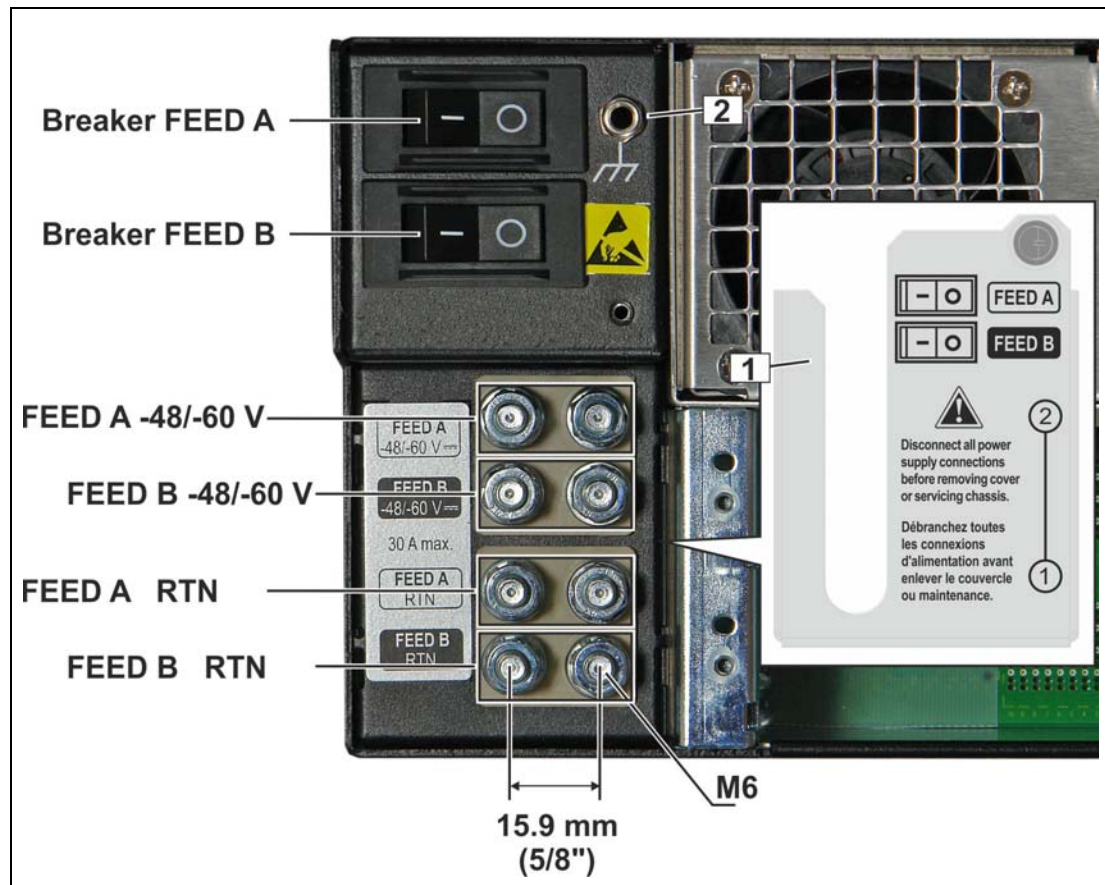
The Power Input is located at the left rear side of the Shelf. The power input provides power terminals for two 30 A power feeds. Each power feed consists of a -48 VDC cable and its corresponding return cable. The feed is protected by a 30 A fused switch.

The power filtering consists of filtered power terminals and discrete line-filters.

The input voltage range for the Shelf is from -40 V_{DC} to -75 V_{DC}.

6.1 Power Input

Figure 11: Power Input



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1 Cover Power Input

2 ESD Wrist Strap Terminal

6.2 Specification for the power connection cables

Required wire size: #10 AWG maximum length 3 m.

Required terminals: Use only two hole lug terminals.

7 Schroff Shelf Manager ACB-VI

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. 63972-331

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



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

21990-404 (Catalog Number with packaging)

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

The Shelf Manager has two main responsibilities:

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

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

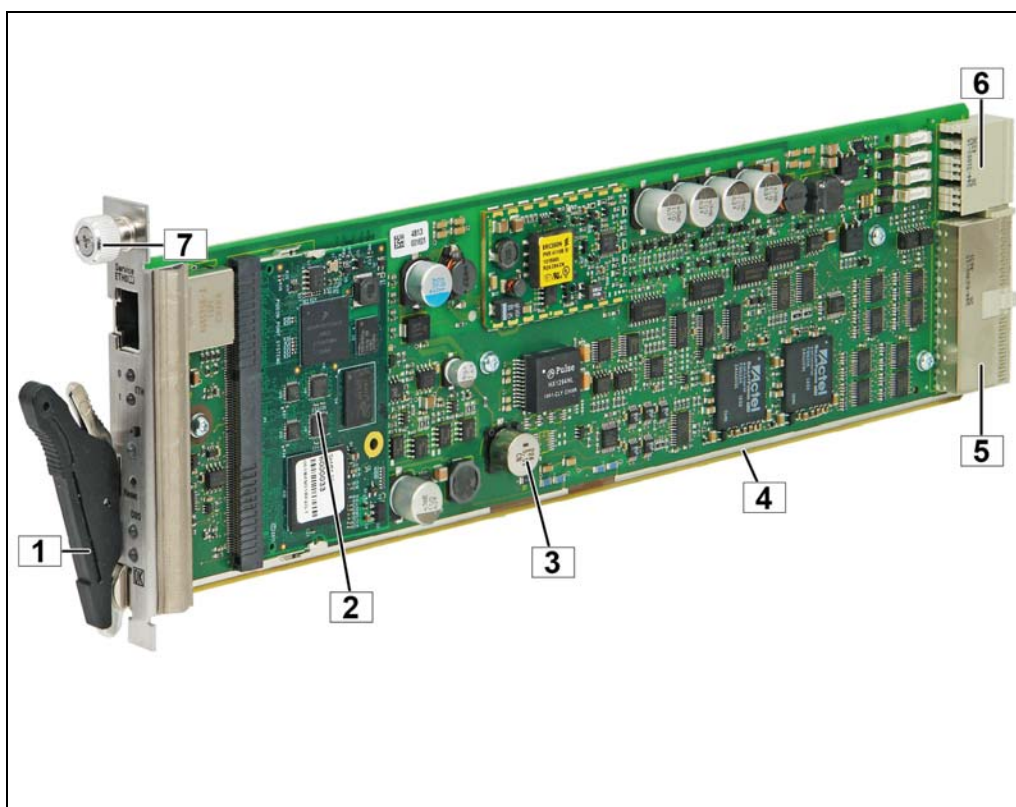
The Shelf management software runs on the Pigeon Point Shelf Management Mezzanine 700 (ShMM-700R), a compact 204-pin SO-DIMM form-factor module, installed on the ACB-VI carrier board.

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

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

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

Figure 12: Schroff Shelf Manager

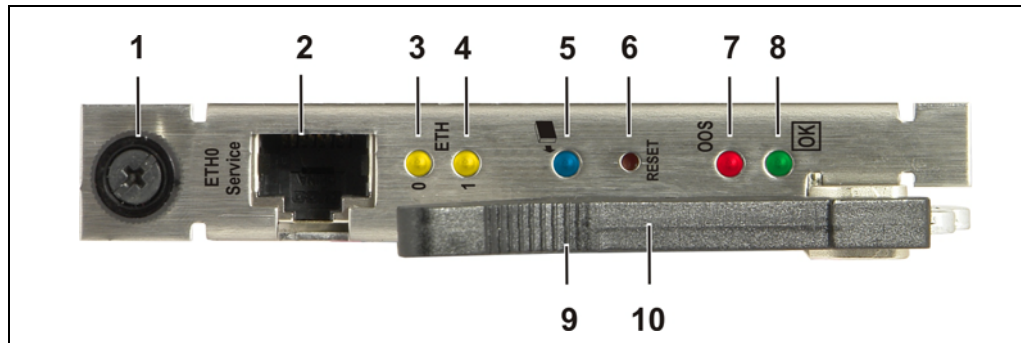


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- | | | | |
|---|----------------------|---|----------------------------|
| 1 | Extraction handle | 5 | Backplane Connector (X100) |
| 2 | ShMM-700R | 6 | Backplane Connector (X102) |
| 3 | RTC backup capacitor | 7 | Fixing screw |
| 4 | ACB-VI Carrier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

7.1 Front Panel Components

Figure 13: 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

7.2 Ethernet Interfaces

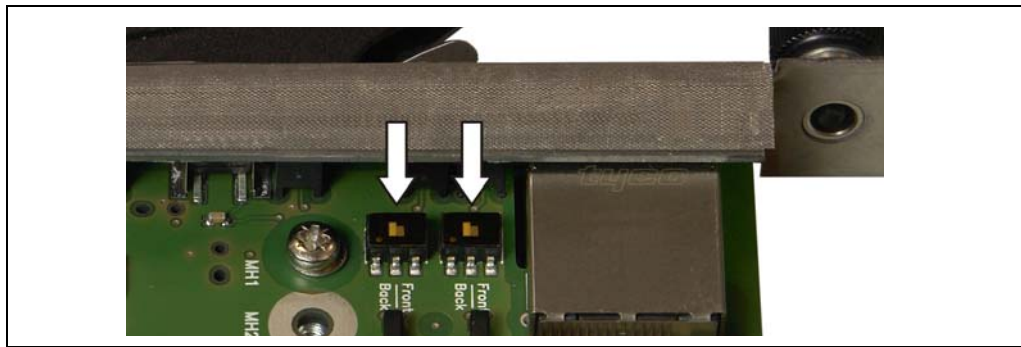
The front panel ETH0 Ethernet connector is intended for service use only or for debugging purposes in laboratory environment. The computer which is connected to this interface must be located nearby the shelf manager with an Ethernet cable that is not longer than 10 m.

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

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

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

Figure 14: ETH Switches shown in default position



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7.3 Shelf Manager RS-232 Console Serial Interface

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



The serial console default configuration is:

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

7.4 Front Panel RESET push button

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



Pushing the RESET button will reset the Shelf Manager

7.5 Hot Swap Interface

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

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

7.5.1 Hot Swap LED

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

Table 4: 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

7.6 Hardware Address

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

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

7.7 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.

7.7.1 Hardware Redundancy Interface

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

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

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

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

7.8 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!

7.8.1 Basic CLI Commands

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

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

```
clia setlanconfig channel ip value
```

Value represents the IP address in dotted decimal notation.

```
clia setlanconfig 1 ip 192.168.0.2
```

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

```
clia version
```

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

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

```
clia ipmc
```

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

```
clia board
```

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

```
clia sensor IPMI-address
```

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

```
clia sensor -t
```

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

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

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

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

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

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

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

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

```
clia sel
```

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

```
clia sel clear
```

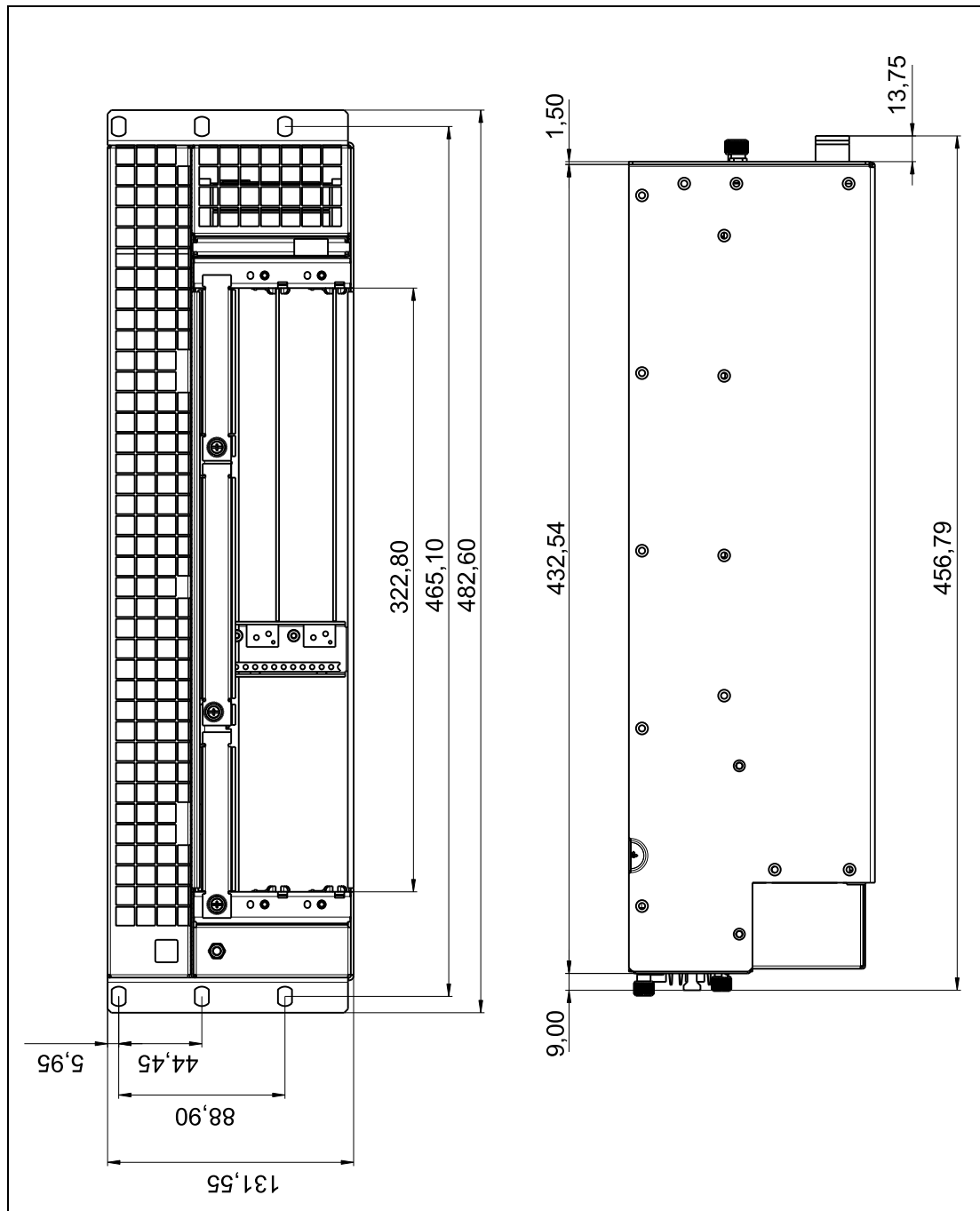
8 Technical Data

Table 5: Technical Data

Physical Dimensions	
Height	3 U
Width	482.6 mm
Depth (with handles)	457 mm
Weight	
w.o. packaging	approx. 12 kg
with packaging	approx. 14.6 kg
Power	
Input voltage nom.	-48/-60 V _{DC}
Input voltage range	-40 V _{DC} to -75 V _{DC}
Input Power Protection	30 A
Cooling Capacity	
Front Boards	400 W / Board*
RTM	50 W / Board*
	* $\Delta t = 12 \text{ K}$
Environmental	
Ambient temperature (long term)	+5°C...+40°C (41°F to 104°F)
Ambient temperature (short term)	-5°C...+55°C (23°F to 131°F)
Humidity	+5%...+85%, no condensation
EMI	
Conducted Emissions	EN 55022 Class A
Radiated Emissions	EN 55022 Class A
Safety	
Protected Earth Test	EN50514, test current 25 A, resistance <100 mOhm
Hipot Test (AC system)	EN50116 Mains Input primary - PE: 2200 V _{DC} -48 V/RTN - PE: 700 V _{DC}
Hipot Test (DC system)	EN60950 -1000 V _{DC}

8.2 Dimensions

Figure 15: Dimensions



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