MaXum450/ MaXum460/ MaXum500/ MaXum550 14-Slot ATCA AC/DC Shelf User Manual

Doc No.: DOC00056
Rev: 1.5

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Preface

Always keep this manual close to relevant maintenance workstations and reference it prior to and during maintenance activities including any required testing.

Applicable Documents

For Asis product information and additional resources, please visit the Asis website at www.asis-pro.com.

Downloads (manuals, release notes, software, etc.) are available via the Technical Support Library product links at www.asis-pro.com (for registered customers).

Information about PICMG (PCI Industrial Computer Manufacturers Group) and the ATCA standard may be accessed on the PICMG Web site at www.picmg.com.

Revision History

Revision	Date	Content	Author
1.0	February 2014	Initial version	Boaz Bar Ilan
1.1	April 2014	Software section	Boaz Bar Ilan
1.2	June 2014	AC power	Boaz Bar-Ilan
1.3	February 2015	Software updates	Boaz Bar-Ilan
1.4	September 2015	Power diagrams updates	Boaz Bar-Ilan
1.5	May 2016	SW recovery after unsuccessful upgrade	Boaz Bar-Ilan

Terms and Acronyms

Acronym	Meaning
ANSI	American National Standards Institute
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
CE	"Conformité Européenne" ("European Conformity")
Chassis	Enclosure containing subrack, backplane, boards, cooling devices, PEMs. Same as Shelf
CFM	Cubic Feet per Minute – airflow measurement unit
ETSI	European Telecommunications Standards Institute
FCC	Federal Communications Commission
FRU	Field Replaceable Unit
FT	Fan Tray
HS	Hot swap
IPMB	Intelligent Platform Management Bus
IPMC	Intelligent Platform Management Controller
IPMI	Intelligent Platform Management Interface
NEBS	Network Equipment Building Systems
NRTL	Nationally Recognized Testing Laboratories
PEM	Power Entry Module
PS, PSU	Power Supply Unit
RTM	Rear Transmission Module
ShMC	Shelf Management Controller, synonymous with Shelf Manager
Shelf	See Chassis
UL	Underwriters Laboratories- safety standards

Before You Begin

Before you begin using this product, or any installation or service operation, please read the following safety information:

Attention to these warnings helps prevent personal injuries and damage to the products.

It is your responsibility to use the product in an appropriate manner.

This product must not be used in any way that may cause personal injury or property damage.

You are responsible if the product is used for any intention other than its designated purpose or in disregard of Asis Ltd. instructions. Asis Ltd. shall assume no responsibility for such use of the product.

The product is used for its designated purpose if it is used in accordance with its product documentation and within its performance limits.

Using the product requires technical skills and a basic knowledge of English. It is therefore essential that only skilled and specialized staff or thoroughly trained personnel with the required skills be allowed to use the product.

Keep the basic safety instructions and the product documentation in a safe place and pass them on to the subsequent users.

Applicable local or national safety regulations and rules for the prevention of accidents must be observed in all work performed.

Tags and Their Meaning

The following indicators are used in the product documentation in order to warn the reader about risks and dangers:

Indicates a hazardous situation, which, if not avoided, will result in death or serious injury.

Indicates the possibility of incorrect operation, which can result in damage to the product.

Indicates a hazardous situation involving electricity, which, if not avoided, can result in death or serious injury.

Indicates a hazardous situation involving Electrostatic Discharge (ESD), which, if not avoided, can result in damage to the product.

Indicates that components or equipment is heavy and care should be taken to avoid lifting incorrectly. More than one technician is required to lift and carry this equipment. Incorrect lifting can be dangerous to the personnel lifting and may result in dropping and damaging the components or equipment.

Indicates a hazardous situation involving touching a moving fan, which, if not avoided, can result in serious injury.

Indicates that information related to grounding is provided.

Indicates that information related to safety or system proper information is provided.

Table of Contents

1 Safety Overview

1.1 Safety Conditions of Acceptability

- This equipment is considered Class I product.
- This equipment has been evaluated for use in a Pollution Degree 2 environment.
- This equipment has been evaluated for use in a 50°C (122°F) ambient temperature (AC Version) and in an 55 °C (131°F) (DC Version)
- Mains supply cord set used to connect the equipment to AC supply mains must be of an approved type acceptable by the authorities in the country where the equipment is deployed.
- Boards/blades installed in the shelf card cage are to be of a separately approved type, provided with basic insulation (input to operator accessible connectors and input to conductive parts).

1.2 General Safety Practices

Keep personnel away from live circuits! Only trained personnel may open or remove components, remove equipment covers for internal subassembly, replace components, or any internal adjustment.

Only qualified, trained, and authorized electronics service personnel may access the interior of the equipment.

In the event of an equipment malfunction, all repairs must be performed either by an Asis technician or by an authorized agent. It is the customer responsibility to report the need for service to Asis or to one of its authorized agents. For service information, contact Asis customer support.

Never turn on any equipment when there is evidence of fire, exposure to water, or structural damage.

Before handling the product, read the instructions and safety guidelines on the following pages to prevent damage to the product and to ensure your own personal safety.

Use extreme caution when installing or removing components. Refer to the installation instructions in this document for precautions and procedures. If you have any questions, please contact ASIS Technical Support.

Always follow the procedural instructions for the removal and replacement of components in sequence.

Remove all metal jewelry before servicing the system. Metal jewelry may inadvertently be caught on a component and cause an electrical short, which may result in shelf outage and possible physical injury.

Never push objects of any kind through openings in the equipment as they may touch dangerous voltage points or short components, resulting in fire or electric shock.

Beware Electrical shock hazard!

The power supplies produce high voltage and energy hazards, which can cause death or serious injury. In any case, do not open the power supply case. **Under certain conditions, dangerous voltages may exist even with the power cords are disconnected.**

Before any attempt to service the device, be sure that the device is electrically isolated.

System control, equipment and electronic controllers are connected to hazardous line voltages.

When servicing the system, extreme care should be taken to protect against shock.

High voltages are present inside the shelf when the unit's power is plugged into an electrical outlet. Turn off system power source, turn off the power supplies and then disconnect the power cord from its source before removing the shelf cover.

Turning off the circuit breakers do not remove power to components.

Do not connect or disconnect any cables or perform installation, maintenance, or reconfiguration of this shelf during an electrical storm.

Caution

This unit has more than one power supply cord.

Disconnect power supply cords before servicing to avoid electric shock.

Many components described in this document can be damaged by Electrostatic Discharge (ESD). Follow the precautions described here and before specific procedures detailed in the document to protect static-sensitive components from ESD-related damage.

Static electricity can harm system components. Perform service at an ESD workstation and follow proper ESD procedure to reduce the risk of damage to components. Asis strongly encourages you to follow proper ESD procedure, which can include wrist straps, when servicing equipment.

Take the following steps to prevent damage from Electrostatic Discharge (ESD):

When unpacking a static-sensitive component from its shipping carton, do not remove the component's antistatic packing material until you are ready to install the component in the system. Just before unwrapping the antistatic packaging, be sure you are at an ESD workstation or grounded. This will discharge any static electricity that may have built up in your body.

When transporting a sensitive component, first place it in an antistatic container or packaging.

Handle all sensitive components at an ESD workstation. If possible, use antistatic floor pads and workbench pads.

Handle components and boards with care. Do not touch the components or contacts on a board. Hold a board by its edges or by its metal mounting bracket.

Do not handle or store system boards near strong electrostatic, electromagnetic, magnetic, or radioactive fields.

2 About the Shelf

The 14-Slot ATCA AC/DC Shelf hosts up to 14 application blades and 14 RTMs in a 13U to 18U height chassis. The shelf is 19" rack mounted and complies with the Advanced Telecommunications Computing Architecture – PICMG3.0 standard. It is designed to meet NEBS and ETSI standards and is UL and CE certified. The shelf is intended for high availability and high reliability applications, such as telecom and internet communications, and incorporates Field Replaceable Units (FRUs), thus enabling easy and fast field maintenance with minimum or no downtime. Its backplane has various fabric connectivity optimized for performance at 10Gbps per pair and 40Gbps per channel, including full mesh, dual star and DDS.

The shelf is evaluated as Information Technology Equipment (ITE) and may be installed in central offices, telecommunication centers, offices, computer rooms, and similar commercial type locations. It incorporates the latest technologies available to reduce its price while maintaining performance and reliability. The shelf offers redundancy for power input and management functions and is designed to withstand extreme conditions and to meet rigid Telco requirements. An Asis cable-holder frame is fitted to both the top and bottom mounting flanges of the shelf, to allow for neat placement of cables attached to the shelf or any of the components it contains.

The shelf is available in AC and DC configurations, 100-240VAC or -48/-60 VDC. It contains redundant hot swappable IPMI v1.5 Shelf Manager boards based on Pigeon Point ShMM Sentry 700 or Sentry 500. The shelf is available in the following configurations:

DC Configurations

- 13U, 14U or 16U including 2 PEMs, each with a rating of -48/-60 VDC, five feeds per PEM, designed to carry up to 250Amp. Each PEM supports the full chassis load, providing power redundancy to each other.

AC Configurations

- 14U (13U+1U) - up to five 1600W or four 2500W redundant and hot swappable power supplies for N+1 redundancy

- 15U (13U+1U+1U) - up to ten 1600W or eight 2500W redundant and hot swappable power supplies for N+N redundancy
- 15U (14U+1U) - up to five 1600W or four 2500W redundant and hot swappable power supplies for N+1 redundancy
- 16U (14U+1U+1U) - up to ten 1600W or eight 2500W redundant and hot swappable power supplies for N+N redundancy
- 18U (16U+1U+1U) - up to eight 2500W redundant and hot swappable power supplies for N+N redundancy

2.1 Shelf Components

The key components of the shelf are shown in the diagram below.

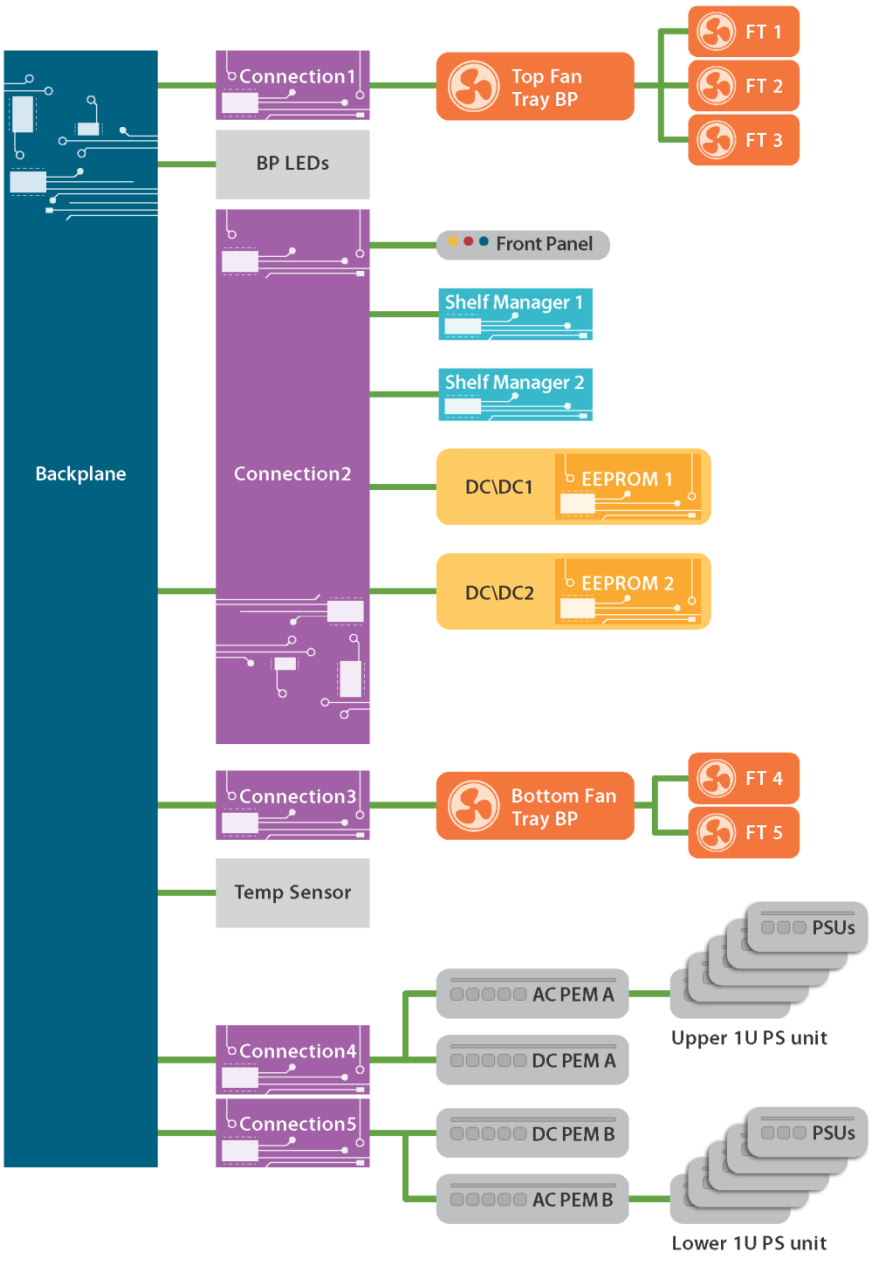


Figure 1: Shelf Block Diagram

Any system contains either DC PEMs or AC PEMs + PSUs, but not both DC and AC components. All MaXum systems contain 3 top fan trays. In addition, MaXum500 and MaXum550 contain 2 bottom fan trays (in one physical tray).

2.1.1 Shelf Front View - DC Configuration

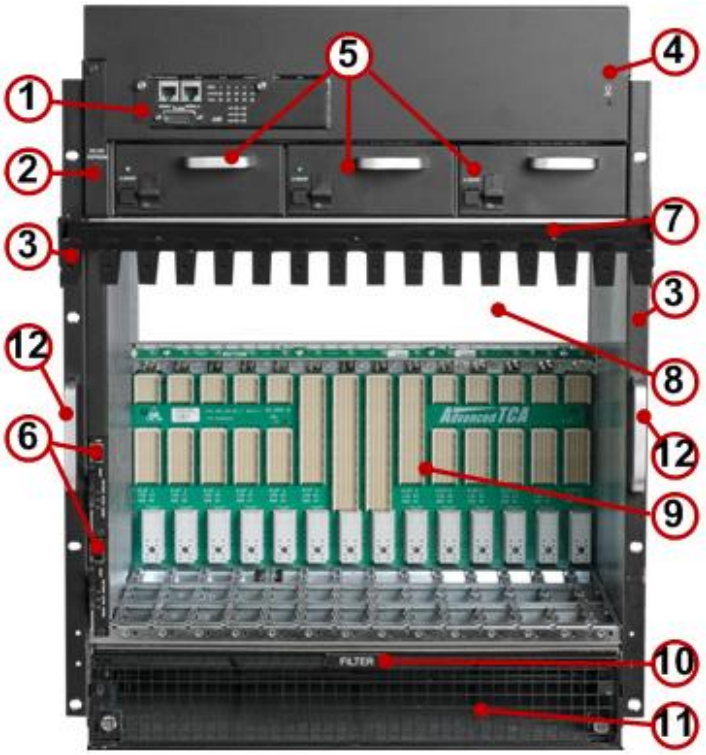


Figure 2: Shelf Front Components - DC Configuration

Table 1: Shelf Front Components - Shared by All Configurations

#	Component	Description
1	Front Panel	Serial and alarm ports and indication LEDs
2	DC2DC	Two DC voltage supplies and shelf EEPROM boards reside behind a cover.
3	Mounting Flange	Right and Left mounting flanges with handles
4	ESD terminal	Front ESD wrist strap terminal.
5	Fan trays	Three top and single bottom fan trays provide front to back bottom to top air flow. The bottom fan tray is installed only in push-pull configurations.
6	Shelf managers	Two shelf managers, controlling and managing the shelf.
7	Cable holder	Allows for neat placement of cables attached to the shelf or any of the components it contains
8	Card cage	Portion of the shelf that holds the application blades.
9	Backplane	Supports up to 14 ATCA-compliant front boards, and the complementary rear

#	Component	Description
		transition modules (RTM).
10	Air filter tray	Keeps the airflow free of dust and particles.
11	Grill panel	Grill panel allows for air intake. This is the location of the optional lower fan tray
12	Handles	Shelf carrying handles

2.1.2 Shelf Rear View – DC Configuration

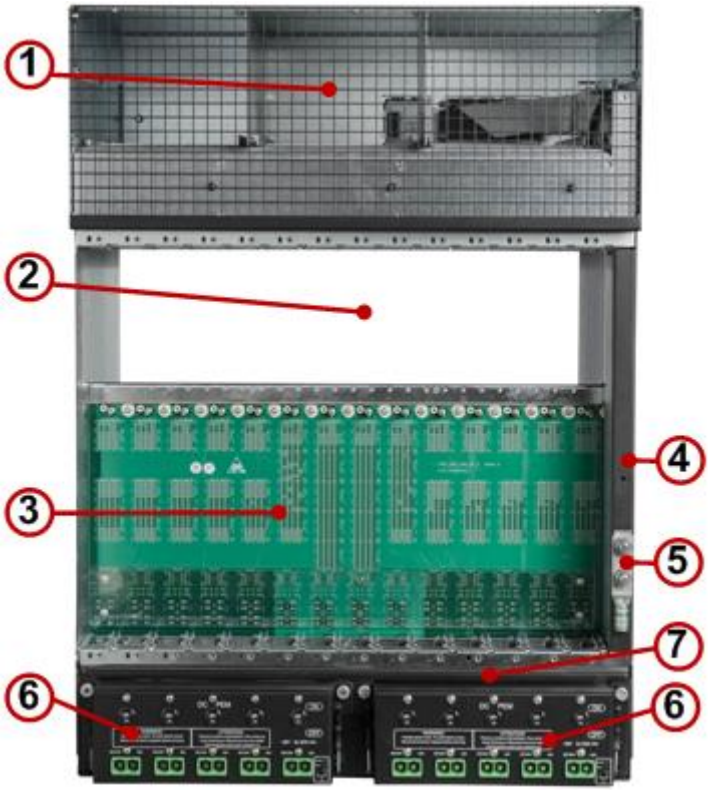


Figure 3: Shelf Rear Components – DC Configuration

Table 2: Shelf Rear Components – DC Configuration

#	Component	Description
1	Grill Panel	Grill panel allows for air exhaust.
2	Card cage	Portion of the shelf that holds the RTMs.
3	Backplane	Supports up to 14 ATCA-compliant rear transition modules (RTM).
4	ESD terminal	Rear ESD wrist strap terminal.
5	Grounding point	Allows shelf grounding to the rack.

#	Component	Description
6	DC Power Entry Modules (PEM)	Two redundant-48/-60 VDC PEMs: supply system power to the shelf and its components.
7	Rear cable holder	Rear cable holder

2.1.3 Shelf Front View - AC Configuration

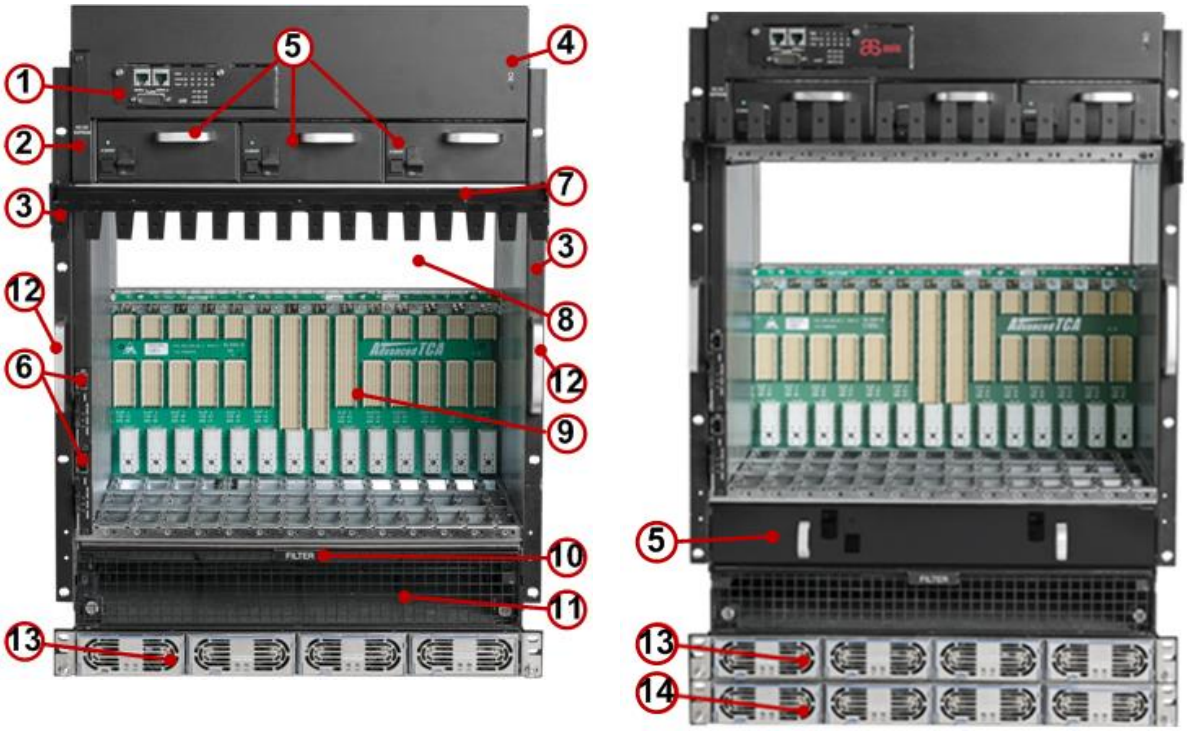


Figure 4: Shelf Front Components - AC Configuration

Table 3: Shelf AC Configuration

#	Component	Description
1	Front Panel	Serial and alarm ports and indication LEDs
2	DC2DC	Two DC voltage supplies and shelf EEPROM boards reside behind a cover.
3	Mounting Flange	Right and Left mounting flanges
4	ESD terminal	Front ESD wrist strap terminal.
5	Fan trays	Three top and one bottom fan trays provide front to back and bottom to top air flow. The bottom fan tray is optional.

#	Component	Description
6	Shelf managers	Two shelf managers, controlling and managing the shelf.
7	Cable holder	Allows for neat placement of cables attached to the shelf or any of the components it contains
8	Card cage	Portion of the shelf that holds the application blades.
9	Backplane	Supports up to 14 ATCA-compliant front boards, and the complementary rear transition modules (RTM).
10	Air filter tray	Keeps the airflow free of dust and particles.
11	Grill panel	Grill panel allows for air intake. This is the location of the optional lower fan tray
12	Handles	Shelf carrying handles
13	Power Supplies	1U of four or five power supplies.
14	Power Supplies	Optional 1U of four or five power supplies for a total of eight or ten power supplies.

2.1.1 Shelf Rear View – AC Configuration

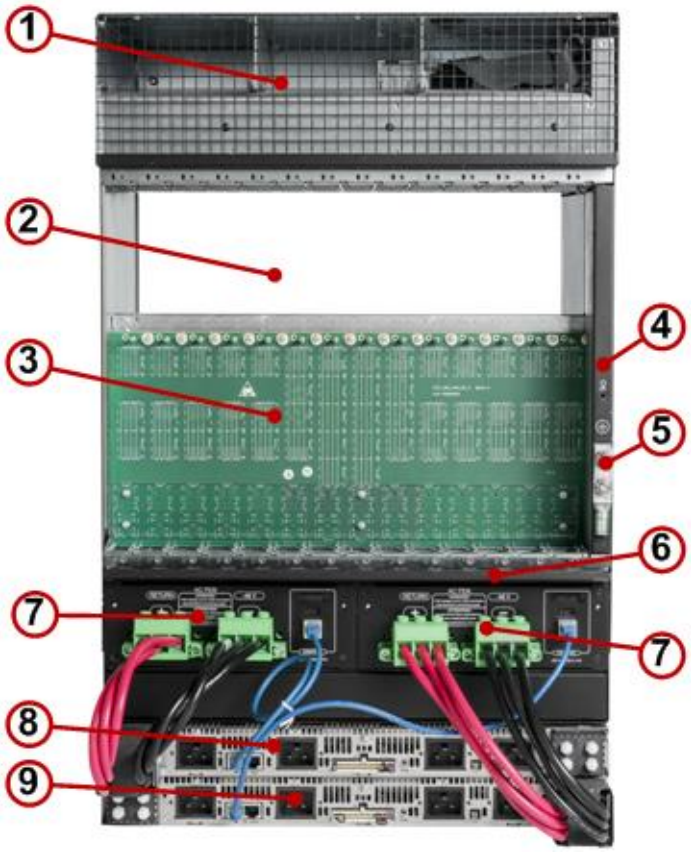


Figure 5: Shelf Rear Components – AC Configuration

Table 4: Shelf Rear Components – AC Configuration

#	Component	Description
1	Grill Panel	Grill panel allows for air exhaust.
2	Card cage	Portion of the shelf that holds the RTMs.
3	Backplane	Supports up to 14 ATCA-compliant rear transition modules (RTM).
4	ESD terminal	Rear ESD wrist strap terminal.
5	Grounding point	Allows shelf grounding to the rack.
6	Rear cable holder	Rear cable holder
7	AC Power Entry Module (PEM)	Two redundant-AC PEMs each with a range of -48 VDC up to 250 AMP: They facilitate the supply system power to the shelf and its components.
8/9	Power Supplies	1U AC Line Inputs: Each Up to 4x 2500W

2.2 Shelf Environmental Requirements

The typical operation temperature and humidity range for the Asis shelf are detailed in the table below.

Table 5: Temperature and Humidity Range

Temperature ▪ **Operating (up to 1800m)** ▪ **Short-term** ▪ **Short-term with fan failure**	 5^0C to 40^0C (41^0F to 104^0F) -5^0C to 55^0C (23^0F to 122^0F) -5^0C to 40^0C (23^0F to 104^0F)
Rate of temperature change	30°C/hr (54°F/hr)
Relative Humidity ▪ **Operating** ▪ **Short-term**	 5%-85% 5% to 90%, but not to exceed 0.024kg water/kg of dry air

The normal environment of a computer room has an ambient temperature of 20 to 25 °C (68 to 77 °F) and relative humidity of 30-50% during normal operation. Lower temperatures result in better performance and longer MTBF of the equipment.

These temperatures apply to the temperature of the air along the length of the cabinet front door. All cabinets draw in ambient air for cooling from the front and discharge heated exhaust air from the rear. There must be sufficient clearance between the Asis shelf and any other systems that may exhaust warm air to allow sufficient cooling.

Proper room cooling is vital for the safe and correct operation of the shelf.
The site cooling system must have adequate capacity for cooling the room. The airflow in the room must be so designed to prevent recirculation of hot air.
Improper room cooling design can result in “environment overload” air temperature gradients causing reduced reliability, component failure, and data loss or system shutdown.

2.3 Card Cage

The shelf’s card cage consists of:

- The backplane.
- Top and bottom guide rails to hold the front and rear boards that plug into the backplane.

- Temperature sensor.

The card cage supports up to 14 8U front boards (blades) and 14 8U rear transition module (RTM) boards.

2.3.1 Backplane

The AdvancedTCA™ compliant backplane, interfaces with up to 14 8U ATCA-compliant front boards and the complementary RTMs and provides interconnectivity between all of the shelf's components.

There are no active components on the backplane and no removable or serviceable parts.

Additional backplane features include:

- Fabric interface with dual-star, dual-dual star and full mesh interconnect.
- Base interface with dual-star interconnect
- The two or four middle slots serve as the hub slots – physical slots 7-8 or 6-9
- Dual redundant bussed IPMI support.

Table 6: Backplane Slot Mapping

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

2.4 Shelf Manager

The shelf includes two front-accessible, redundant, hot-swappable IPMI Shelf Managers based on Pigeon Point ShMM Sentry 700 or 500. The shelf manager board controls and manages the shelf: It controls the fans speed, monitors temperatures across the shelf, manages the hot swap insertion and extraction of modules and boards, as well as various additional tasks.

The Shelf Manager contains a Real-Time Clock (RTC) for keeping the date and time. A Supercap is used as a chargeable backup power source for the RTC, and it will keep the RTC data alive for at least 24 hours.

Figure 6: Shelf Manager Board

2.4.1 Shelf Management Panel

The diagram and table below detail the connection ports and LED indicators of the shelf manager panel.

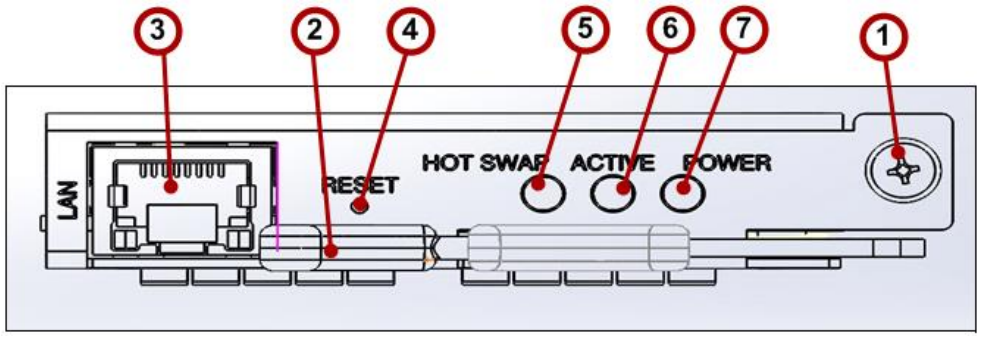


Figure 7: Shelf Manager Board – Front Panel

Table 7: Shelf Manager Board – Front Panel

#	Component	Description	
1	Locking captive screw	Used for securing the shelf manager board inside the shelf	
2	Extraction latch	Used for extraction & insertion of the board from the shelf	
3	ETH port	Ethernet communication, RJ-45 connector. The following is indicated by the Ethernet connector LED's: Green – Line activity Yellow – 100Mbs	
4	Reset button	Resets the shelf manager	
5	Hot swap LED	Steady Blue	Shelf manager is powering up or ready for extraction
		Blinking blue	Shelf manager hot swap process
		OFF	Shelf manager is operating
6	Active LED	Green	Shelf manager is active
		Red	Shelf manager failure
		Green blink	Shelf manager is in standby mode
7	Power LED	Green	voltage supply to Shelf manager is good
		OFF	voltage failure

2.4.2 Ethernet Connection

The Shelf manager contains on-board Dip switches (jumpers) marked SW1. Dip switch1 determines where the Ethernet connection resides.

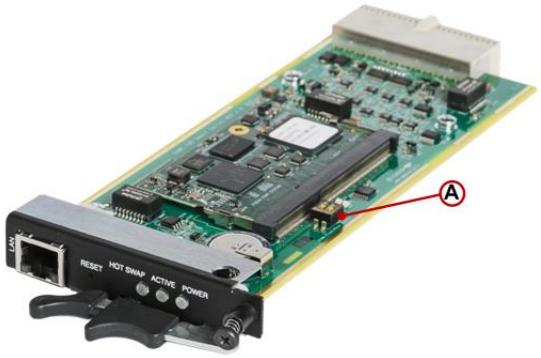


Figure 8: Dip Switch Location on the Shelf Manager Board

Table 8: Dip Switch Options

#	On	Off
Dip switch1	Ethernet connected to rear (backplane)	Ethernet connected to shelf front panel
Dip switch 2	NA	NA

2.4.3 Ethernet Connector

The Ethernet connector is a standard RJ45-8 jack with the following pin-out definition:

Table 9: Ethernet Connector Details

Pin	Signal Name	Description
1	Tx+ D1	Transmit Data+
2	Tx- D1	Transmit Data-
3	Rx+ D2	Receive Data+
4	BI+ D3	Bi-directional+
5	BI- D3	Bi-directional-
6	Rx- D2	Receive Data-
7	BI+ D4	Bi-directional+
8	BI- D4	Bi-directional-

The following is indicated by the Ethernet connector LED's:

- Green – Line activity
- Yellow – 100Mbs

2.5 AC Power Configuration

Power is provided to the shelf via field replaceable and hot swappable 100 VAC to 240 VAC power supplies (PSUs).

There are two types of power supplies and each unit provides the following output power:

- 1600W in 220VAC / 208VAC, 1200W in 110VAC
- 2500W in 220VAC / 208VAC, 1500W in 110VAC

Figure 9: ATCA Power Supply

The number of power supplies needed is calculated based on the actual load of the blades while taking into account redundancy requirements.
The calculations below apply to 208-230 VAC supply. For 110VAC supply: replace 1600W by 1200W and 2500W by 1500W. 208VAC is the recommended setup for the USA and Canada.
In any case power for single blade is not to exceed 600 watt.
A few false log alarms may be created by inserting a PS.

Table 10: Power Distribution

Power Source	Total Available Power	Chassis Power Consumption	Available Payload Power
DC	2000W per segment (40V; 50A)	Fan tray: 300W Shelf managers: <5W	1700W per segment
Lambda 1600W PS	1600*n	Fan tray: 300W	3 FT units: [(1600*n) – 900]W 5 FT units: [(1600*n) – 1500]W
Lambda	2500*n	Fan tray: 300W	3 FT units:

Power Source	Total Available Power	Chassis Power Consumption	Available Payload Power
2500W PS		Shelf managers: <5W	[(2500*n) – 900]W 5 FT units: [(2500*n) - 1500]W

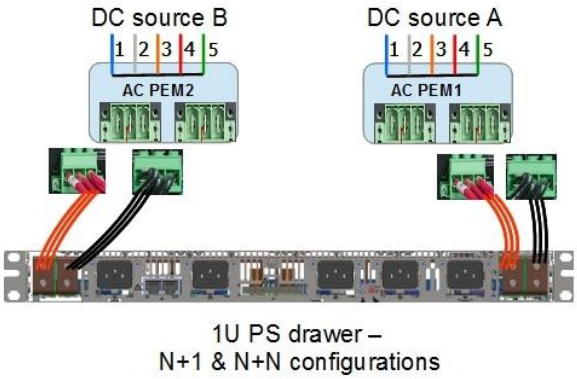
Figure 10: AC Power Supply Panel

Table 11: AC Power supply Panel

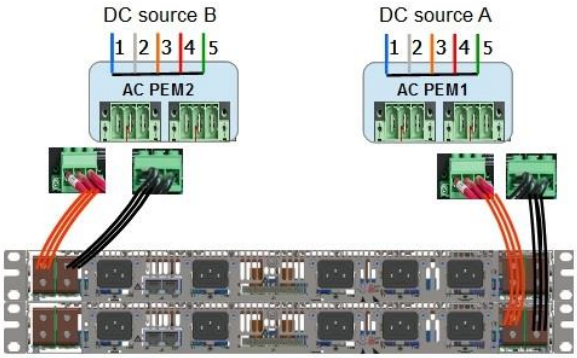
#	Component	Description
1	Handle	Used for holding the PS during insertion and extraction.
2	Extraction latch	Holds the PS in place. Pull up to extract the PS
3	AC LED	Green indicates AC power supply is OK. OFF indicates no AC power .
4	DC LED	Green indicates DC power supply is OK. Red indicates DC power failure.

2.5.1 Shelf's AC Power Distribution

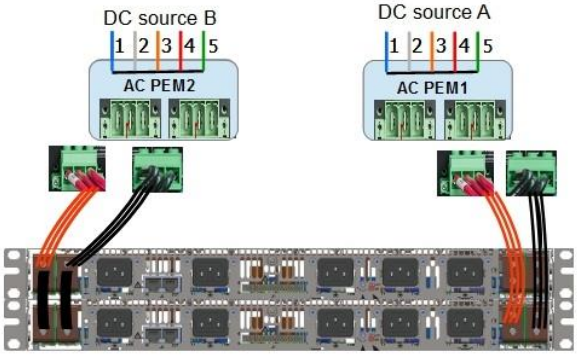
The diagrams below show the Shelf's AC Power Distribution.



1U PS drawer –
N+1 & N+N configurations



2x PS drawers –
N+N configuration



2x PS drawers –
N+1 configuration

Figure 11: AC Power Distribution

2.5.2 AC PEM

The power from the PSUs to the shelf is provided via two field replaceable AC PEM units, each with a rating of -48 VDC up to 250 AMP. Each PEM is capable of supplying 100% of shelf power and the two-PEM configuration provides full power redundancy.

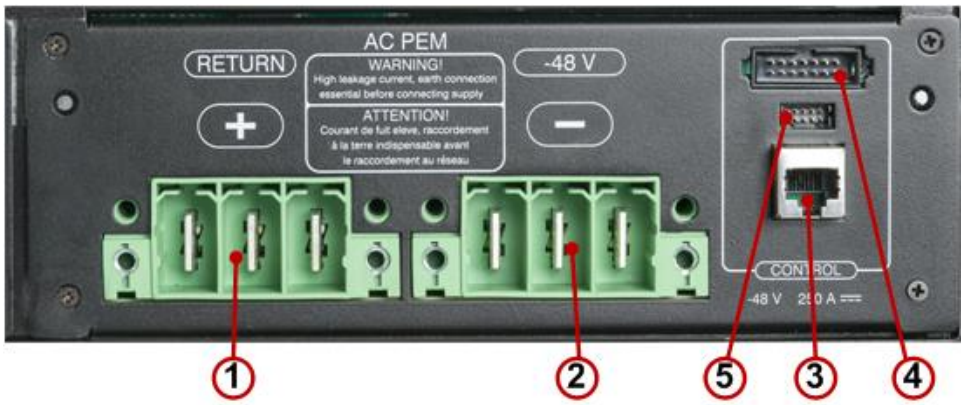


Figure 12: The AC PEM

Table 12: AC PEM – Front Panel

#	Component	Description
1	Terminal blocks	(+) RETURN terminal blocks with pluggable connectors.
2	Terminal blocks	(-) -48V terminal blocks with pluggable connectors.
3	Control communication with power supplies	for the TDK Lambda units
4		for a future type
5		for a future type

The image below shows an assembled shelf with two AC PEM units with 1 x 2500W PS units (N+N configuration):

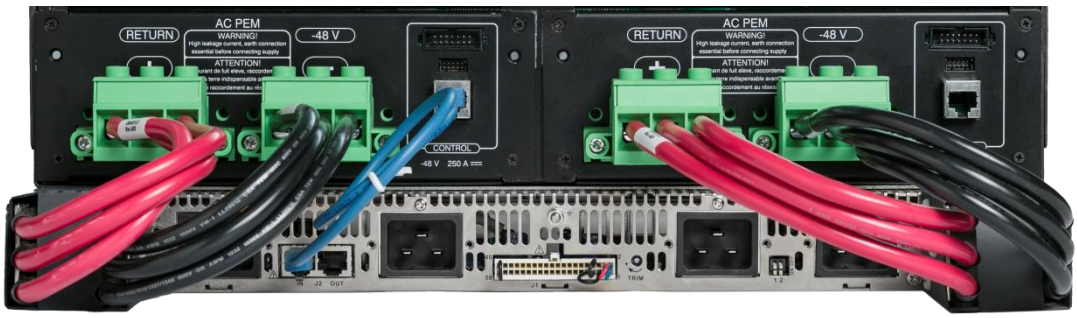


Figure 13: The AC PEM Connections to the AC Power Inlets

2.5.3 AC Power Supply Unit

There are two types of AC power configurations:

- 1600W configuration
- 2500W configuration

The images below show the PS units' rear panel:

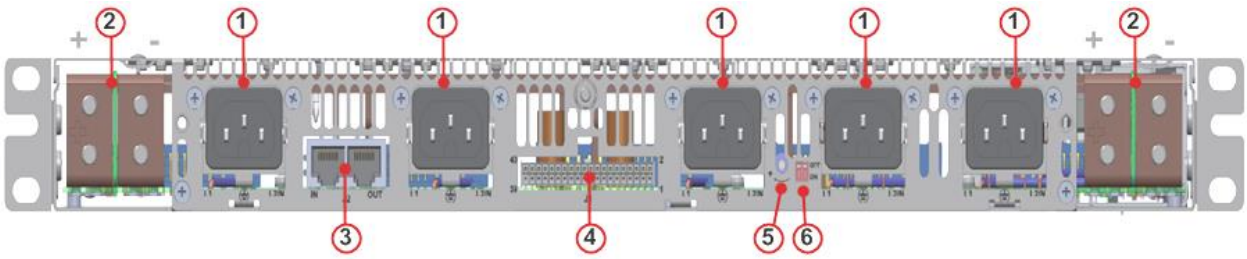


Figure 14: PS Units' Rear Panel - 1600W Configuration

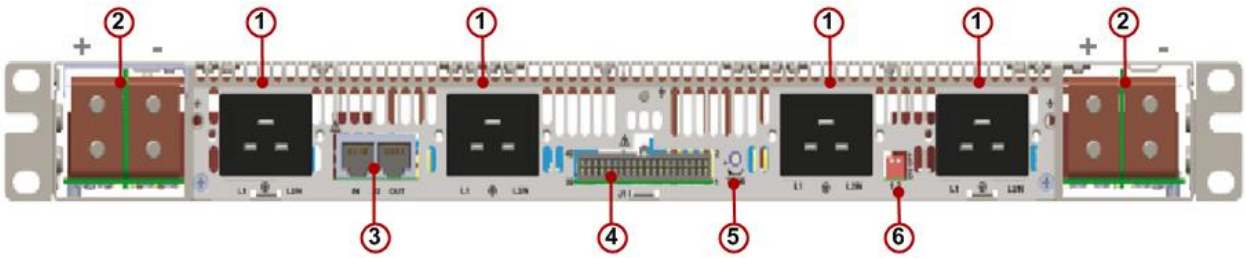


Figure 15: PS Units' Rear Panel - 2500W Configuration

Table 13: PS Units' Rear Panel Details

#	Description
1	AC Line Inputs: Up to 4x 2500W or 5x 1600W
2	Output Bus Bars +/-
3	J2 RJ45 Conenctors
4	J1 Control Plug
5	Adjustment Trimmer (not used)
6	Address Selection Dip Switch

The J1 Jumpers

The diagram below show the position of the J1 Jumpers.

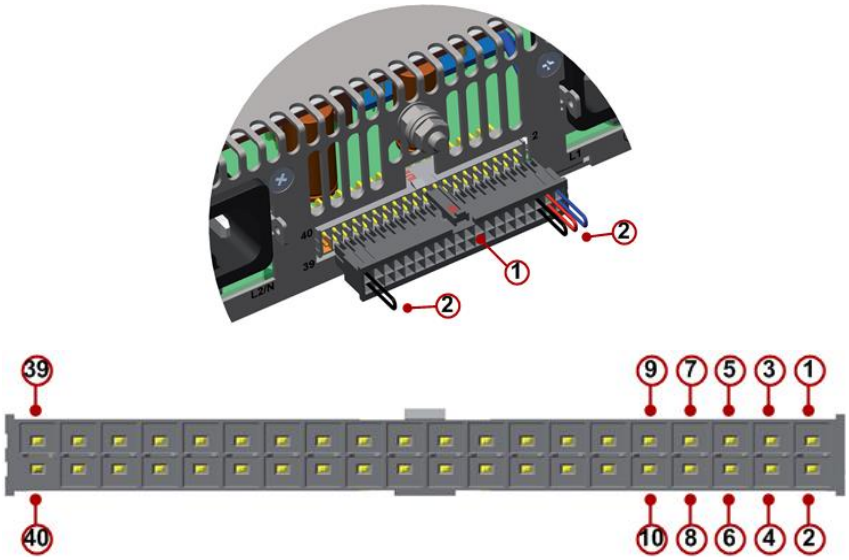


Figure 16: J1 Pin Allocations

The table below displays the J1 Jumpers according to AC Power Inlet configuration.

Table 14: J1 Jumpers Pin Allocation per Configuration

Configuration	Jumpers
1600W	1-2 3-4 5-8 39-40
2500W	1-2 3-4 5-9 7-8 39-40

The Voltage Key

The Voltage key on the top panel of the 1U PS unit is set to 48V.

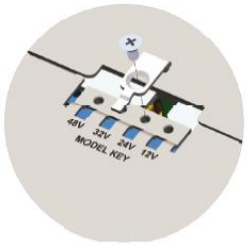


Figure 17: The Voltage Key on the Top Panel of the PS Unit

Address Selection Dip Switch

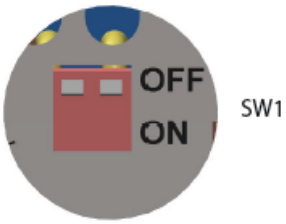


Figure 18: Address Selection Dip Switch

Table 15: Address Selection per Configuration

Configuration	SW1 (both positions)
1600W & 2500W N+1 & N+N Single unit	On
1600W & 2500W N+1 2 units	Upper unit: on Lower unit: off
1600W & 2500W N+N 2 units	Upper unit: on Lower unit: on

2.6 DC Power Configuration

The DC power configuration consists of two field replaceable Power Entry Modules (PEMs), each with a rating of -48/-60 VDC up to 250 AMP. Each PEM is capable of supplying 100% of shelf power and the two-PEM configuration provides full power redundancy. The PEMs provide EMC power filtering and over-current protection to the shelf.

The customer has to provide a mains DC power source that includes batteries and branch circuit breaker of 50A per terminal block. Each PEM contains five terminal blocks and each terminal block provides the power feed of a chassis segment components.

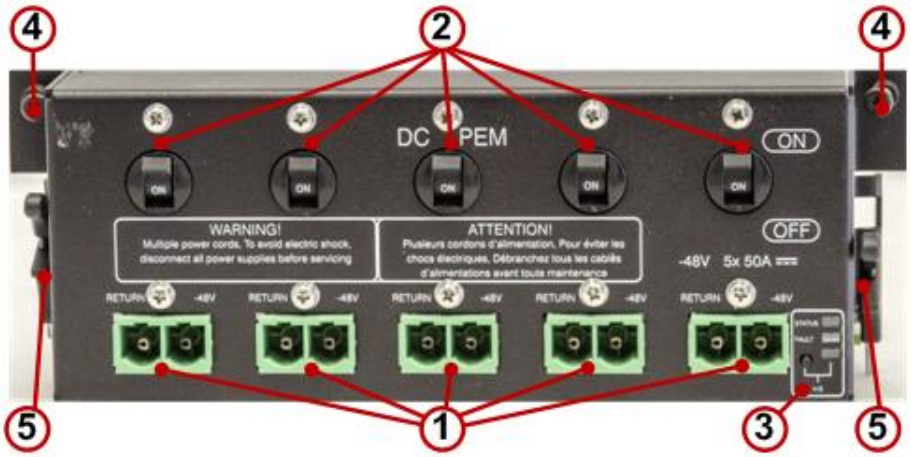


Figure 19: DC PEM – Front Panel

Table 16: DC PEM – Front Panel

#	Component	Description
1	Terminal blocks	(+) and (-) 48/60 VDC terminal blocks with pluggable connectors.
2	Circuit breakers	Five circuit breakers, 50A each.
3	LEDs	Provide visual indications regarding the PEM status
4	Locking captive screw	Used for securing the PEM inside the shelf.
5	Extraction latch	Used for extraction of the PEM.

The PEM has three LED indicators as detailed in the table below.

Table 17: DC PEM LEDs Functions

LED	Status	Description
Status	Green / Red	Normally green: all components are functioning normally. When red, reports PEM failure; a component is experiencing a malfunction.
Fault	Green / Red	Normally green; all five segments are functioning normally. When red, there is no -48VDC in at least one segment
HS	Steady Blue	PEM is powering up or ready for extraction.
	OFF	PEM is operating.

2.6.1 Shelf's DC Power Distribution

The diagram below shows the shelf's power distribution.

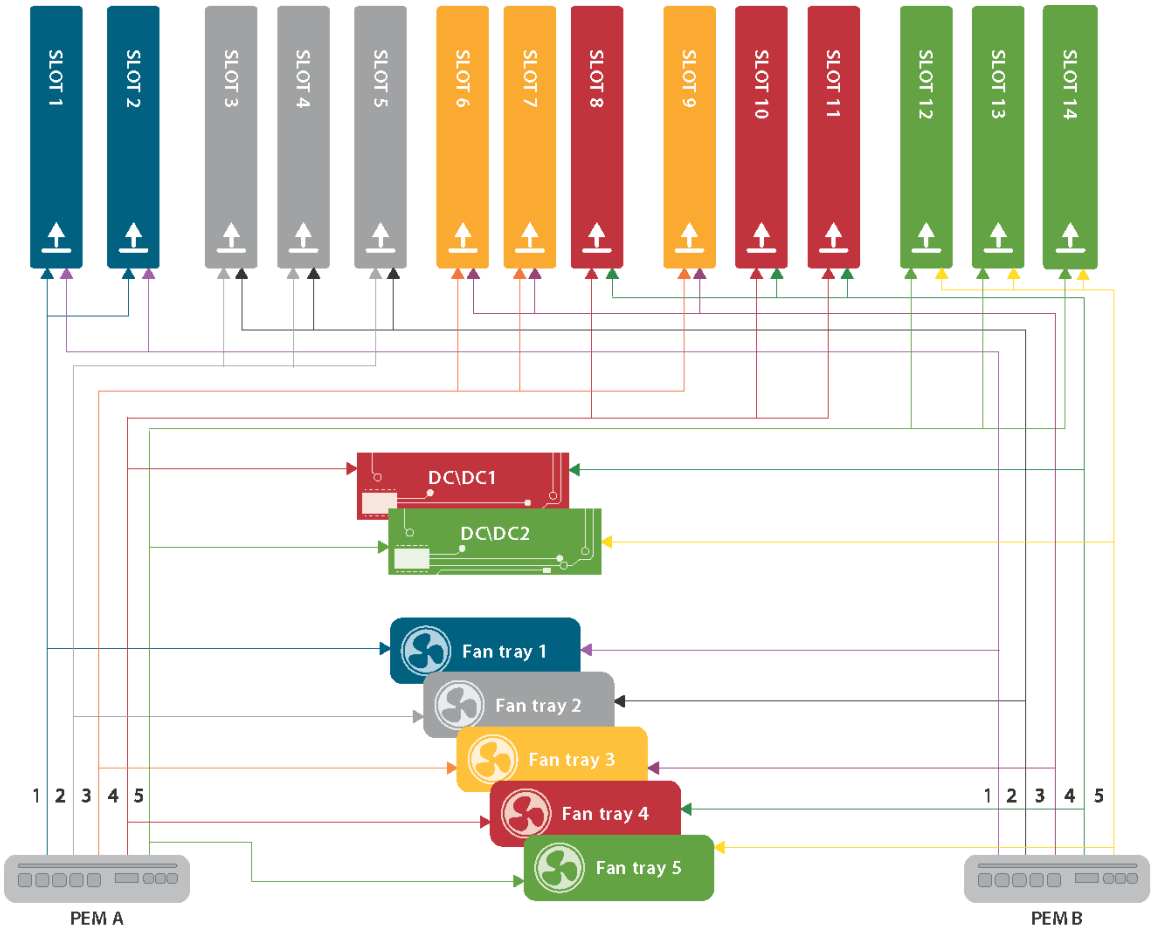


Figure 20: DC Power Distribution

2.7 Shelf Front Panel

Serial and alarm ports, as well as16 LED indicators are located on the shelf's front panel. The front panel receives 5V DC supply from both shelf manager boards (via its A and B ports).

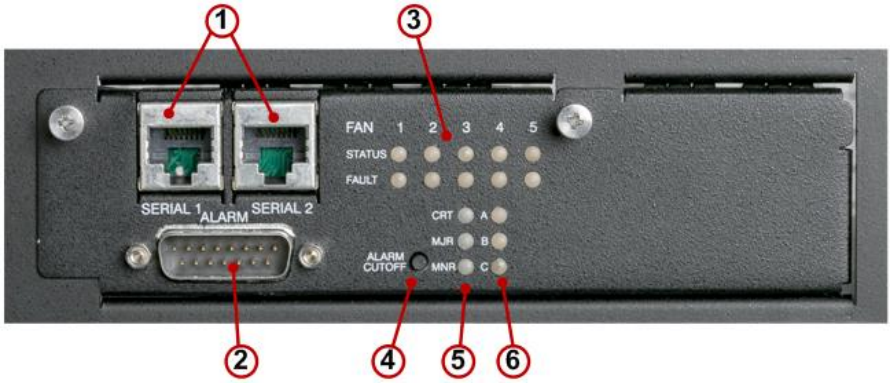


Figure 21: Chassis Front Panel

Table 18: Shelf Front Panel Details

#	Component	Status	Description
1	Serial ports		For serial connection to the 2 shelf managers
2	Alarm port		For connecting the Telco Alarm signals
3	Fan LED indicators		
	Status	Green / Red	The Status LED is normally green, indicating that all fan tray components are functioning normally. When red, it reports that a fan tray is faulty - no communication with the shelf manager or that fan rotation speed is below its lower threshold. The LEDs of non-existent fan, including extracted fans, are off.
	Fault	Green / Red	The Fault LED is normally green, indicating that the -48V sources A & B are functioning normally. When red, it reports that either -48V source A or B is faulty. For systems with just 3 fan trays LEDs 4 & 5 are off. The LEDs of a missing or extracted fan tray stay off while the Major alarm turns on.
4	Cutoff button		Cutoffs the alarm relays and blinks the alarm LEDs for 10 minutes
5	Telco Alarm LEDs		
	CRT (Critical)	OFF / Red	Normally off. When red, it reports System alarm critical event.
	MJR (Major)	OFF / Red	Normally off. When red, it reports System alarm major event.

#	Component	Status	Description
	MNR (Minor)	OFF / Red	Normally off. When red, it reports System alarm minor event.
6	User defined LEDs		
	A	Green / Red	As defined by application
	B		
	C		

2.7.1 Telco Alarm Connector

The Telco Alarm Connector is a standard DB-15 connector with the following pin definition.

Table 19: Signal Pins

Pin	Signal Name
1	Minor Reset Plus
2	Minor Reset Minus
3	Major Reset Plus
4	Major Reset Minus
5	Critical Alarm -NO
6	Critical Alarm -NC
7	Critical Alarm -COM
8	Minor Alarm – NO
9	Minor Alarm – NC
10	Minor Alarm – COM
11	Major Alarm – NO
12	Major Alarm – NC
13	Major Alarm – COM
14	Power Alarm – NO
15	Power Alarm -COM

2.7.2 Serial RS232 (Console) Connector

The Serial RS232 (Console) port is a standard RJ45-8 port with the following pin-out definition

Table 20: Serial RZ232 Signal Pins

Pin	Signal Name	Description
1	RTS1	Request To Send
2	DTR1	Data Terminal Ready
3	TxD	Transmit Data
4	GND	Signal ground
5	GND	Signal Ground
6	RxD	Receive Data
7	DSR1	Data Set Ready
8	CTS1	Clear To Send

2.8 Fan Trays

The shelf incorporates up to four hot-swappable fan trays, front bottom to back top cooling. The upper pull fan trays contain nine fans for front and RTM cooling and the lower optional push fan tray contains six fans for front blades.

Figure 22: One of the 3 Top Fan Trays

Figure 23: Bottom Fan Tray

The shelf manager fully controls the fans speed based on temperature that sensed across the shelf and has 15 levels of fan speed to adjust as needed.

Cooling ability is maintained in the case of a single fan failure, since the remaining fans provide the required cooling to dissipate the heat generated by the occupied slots. A faulty fan is to be replaced as soon as possible.

Figure 24: Top Fan Tray Panel

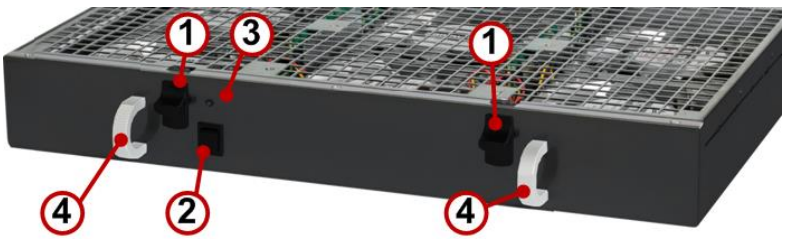


Figure 25: Bottom Fan Tray Panel (optional)

The fan tray panel is detailed in the figure and table below.

Table 21: Fan Tray – Front panel

#	Component	Description	
1	Release mechanism	Pressing this latch releases the fan tray, allowing it to be pulled out Top Fan tray: Upward release Bottom Fan Tray: Downward release	
2	Hot-swap switch	Hot-swap switch puts the fan tray in hot-swap mode and triggers a Major alarm	
3	Hot swap LED	Steady Blue: the fan tray is powering up or ready for extraction	
		Blinking blue	Fan tray in hot swap process
		OFF	Fan tray is operating
4	Handles	Secure the fan tray inside the shelf and enable easy extraction of the unit	

2.9 Air Filter Tray

A shelf-based micro-switch detects the installed filter and reports its presence to the shelf manager.

Figure 26: Air Filter Tray

The air filter must be cleaned periodically. Cleaning frequency depends on how dusty the chassis environment is. It is recommended that the air filter be cleaned once every three months and replaced every year.

2.10 Blank Panels

Compliance with ATCA's specifications requires a steady airflow in the shelf. To insure a steady airflow, either the shelf must be fully populated or a blank filler panel must be installed to fill all front and rear empty slots.

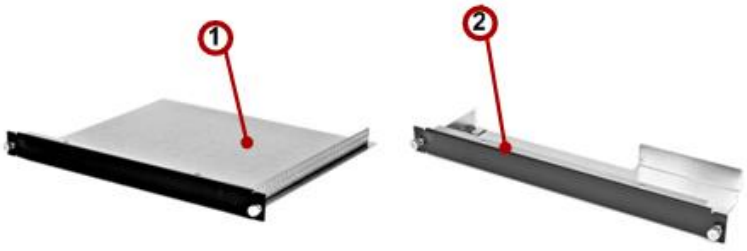


Figure 27: Blank Board Panel and Blank RTM Panel

Table 22: Blank Board Panel and Blank RTM Panel

#	Component	Description
1	Blank board panel	Blank board front module panels, with air baffle.
2	Blank RTM panel	Blank RTM panels, with air baffle.

2.11 DC2DC

The two redundant hot-swappable DC2DC boards are located behind a cover at the front upper left side of the shelf. They provide the +5V DC power for all digital components of the shelf, mainly the shelf managers.

Each DC2DC board hosts a hot swappable EEPROM board. The EEPROMs store product and manufacturer information such as shelf serial number, part number, backplane routing assignment, and shelf heat budget.

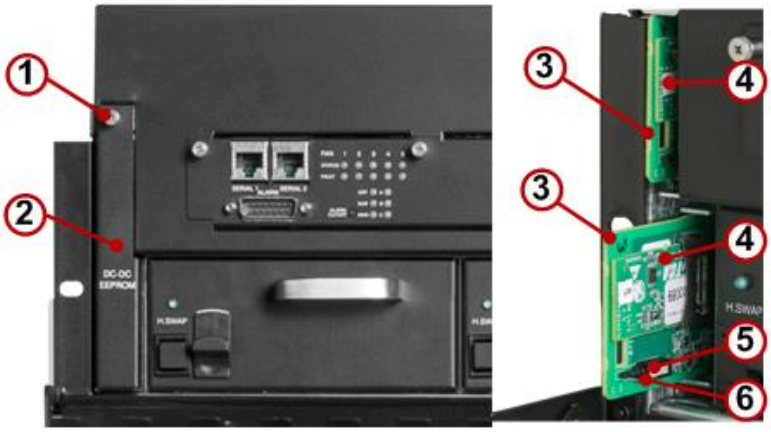


Figure 28: DC2DC Converter/ EEPROM Boards

Table 23: DC2DC

#	Component	Description	
1	Screw	Screw holds the panel closed.	
2	Cover	A panel covers the DC2DC boards and attached EEPROMs	
3	DC2DC	Two DC2DC FRUs	
4	EEPROMs	Two EEPROM sub-assemblies	
5	Status LED	green: voltage is OK, red: voltage failure (above or below threshold)	
6	Hot swap LEDs	Steady Blue	DC2DC is powering up or ready for extraction
		Blinking blue	DC2DC hot swap process
		OFF	DC2DC is operating

When the shelf manager board boots up, it compares the information stored in the two EEPROMs:

- If EEPROM data coincides, it is saved in the shelf manager board (once) and the shelf initializes.
- In case of a mismatch, the data on the EEPROMs is compared with the last saved copy in the shelf manager board: if the saved copy matches one of the EEPROMs, it is assumed to be the right one and it is stored in the other EEPROM.
- If the three configurations are all different, the shelf manager board does not boot up.
- The shelf manager may boot up with just one EEPROM as well.

2.12 Cable Management

The shelf incorporates a cable holder frame on the top front just above the card.

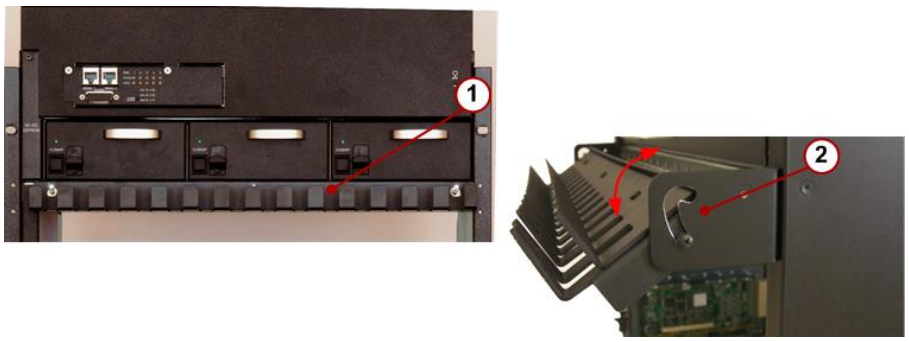


Figure 29: Cable Holder Frame

Table 24: Cable Holder Frame

#	Version
1	Cable holder frame
2	Shows how the Cable frame is adjustable

3 Installing the Shelf

Installing the shelf and preparation for its usage is comprised of some or all of the following tasks:

- Site planning.
- Checking package contents.
- Installation overview.
- Rack mounting.
- Inserting the front and rear boards into the shelf.
- Shelf power-up.

Due to the danger of introducing additional hazards, do not install substitute parts or perform any unauthorized modification of the shelf.

Before installing the shelf, note which cables are to be needed for equipment and power, and whether they are to be connected in the front or rear of the shelf.

3.1 Installation Requirements

The shelf has to be installed according to the national electrical codes in your country. For North America, equipment must be installed in accordance to the US National Electrical Code (NEC) Articles 110–6, 110–17, and 110–18, and the Canadian Electrical Code (CEC), Sections 2-202 and 2-308.

To install the shelf in a standard 19" rack, the following tools are required:

- Standard Philips screwdriver set.
- ESD Wrist Strap.

3.2 Site Planning

Select a location for the shelf that provides adequate room for operating and servicing.

Choose a site that is:

- Clean and free of airborne particles (other than normal room dust).
- Well-ventilated and away from sources of heat including direct sunlight.
- Away from sources of vibration or physical shock.
- Isolated from strong electromagnetic fields produced by electrical devices.
- In regions that are susceptible to electrical storms, we recommend you plug your system into a surge suppressor.
- For AC systems, provide properly grounded wall outlets and branch circuit breaker of 16A for each of the power supplies.
- For DC systems, provide mains DC power system that includes for each PEM an external battery and five branch circuit breakers of 50A each.
- Provided with sufficient space to access and replace the power supply modules, fan tray, front and rear boards.
- Provided with sufficient space at the front and sides of the cage to enable free airflow to cool the boards and power supplies.

Only qualified personnel should be involved with this installation procedure.

3.2.1 Preventing Electromagnetic Interference

The shelf emits electromagnetic waves that may interfere with nearby equipment. Conversely, nearby electronic equipment may emit electromagnetic waves that interfere with the shelf.

To prevent such interferences:

- The EMC specifications of the shelf and all nearby equipment should be considered when choosing the placement of the shelf and surrounding equipment.
- In the shelf and most other equipment, the use of filler panels in unoccupied slots is necessary to keep the product's emissions within their specified limits.
- If the shelf experiences unexpected and intermittent data errors, carefully consider the possibility of electromagnetic interference from nearby equipment as a possible source of the problem.

3.2.2 Preparing for Rack Installation

The shelf is to be installed in a standard 19" rack. All sides of the shelf must be easily accessible.

To maintain proper cooling, the equipment rack must provide sufficient airflow to the front and rear of the shelf. The rack must also include ventilation sufficient to provide exhaust of a maximum of 6300W or 21500 BTUs (British Thermal Units) per hour for the shelf.

The prerequisites for setting up the shelf for use in the facility involve:

- The rack should be properly earthed.
- To ensure sufficient airflow for the boards, allow at least four inches of clearance at the air inlets and outlets.

3.3 Checking Package Contents

Check that all items listed below and verify that they are intact:

- Shelf
- Shelf management boards
- Fan trays
- Air filter tray
- Power-Entry Modules (DC Configuration) or
- Power supplies and AC PEMs (AC Configuration)
- Cable-management holders

Use of equipment damaged during delivery could prevent proper functioning of the Shelf and/or cause permanent damage to it. Check for visual damage to the package and all its content before using any component.

3.4 Installation Overview

The phases of the Shelf installation are listed below.

1. Mount the shelf in the rack.
2. Connect the shelf to earth.
3. Wear an ESD wristband and connect it to an ESD point on the shelf.
4. Insert front and rear boards.
5. Connect the shelf to its power source.
    - For AC power, connect the AC power cords.
    - For DC power, connect the PEMs to the mains DC power system.
6. Power up the shelf.

3.5 Mounting the Shelf on the Rack

The' shelf is provided with mounting flanges on either side of the front of the chassis, appropriate for standard 19-inch racks.

Prior for rack mounting:

- Confirm the rack is stable so that the weight of the shelf does not cause it to tip over.
- Rack mounting is to be carried out by at least two technicians.
- Eight M6x10 screws are needed to mount the shelf on the rack.

The shelf is heavy - it weighs up to 46Kg (101 lbs).
Three technicians are required to lift and carry the shelf safely.

➲ To mount the shelf on the rack:

1. Install L-shaped support brackets on the rack.
2. Grasp the handles on either side of the shelf and the back of the shelf as well as on the base of the shelf (this requires three people, one on each side of the packaging, grasping the handle and base on that side). Lift it and fit it onto the **L** brackets in the rack.

   The shelf must be leveled and not positioned at an angle in the rack. Rack's doors must be able to be closed.
3. While the two people are holding the shelf in place, a third person fastens the shelf to the rack rails using eight screws (not provided), four on each side of the chassis or as appropriate for your rack type.

3.6 Mounting the Cable Management

The Cable Management package contains the two Cable Management parts (1), two mounting brackets (2), and four screws plus nuts (3).

Figure 30: Cable Management Bracket Package Contents

➲ Mount the Cable Management bracket:

1. Connect the small cable holder to the large holder with 3 screws to form a double-row holder.
2. Connect a screw on each side of the cable holder to serve later as the rotation pivot.

Figure 31: Fastening the Mounting Bracket

3. Using an appropriate screwdriver, fasten a cable mounting bracket (2) to the shelf mounting flange with two screws and nuts. There are right and left mounting brackets and their orientation is: the fold pointing toward the middle of the shelf to form a 7-shaped pivot guide.

Figure 32: Mounting Brackets and cable management location

4. Repeat on the other shelf side but leave this bracket slightly loose.
5. Wedge the cable manager horizontally between the two mounting brackets, making sure the pivots are in place on both side.
6. Tighten the loose mounting bracket.

3.7 Earthing the Shelf

The shelf includes a two-hole earthing lug, Panduit LCD1-38D-E. 1 AWG grounding cable is to be used with this lug.

Grounding design must comply with the country or local electrical codes.

In the United States, grounding must comply with Article 250 of the NEC unless superseded by local codes.

An earthing connection is essential before connecting the power supply.

There must be an uninterruptable safety earth ground from the main power source to the shelf. Whenever it is likely that the protection has been impaired, disconnect the power cord until the ground has been restored.

To avoid the potential for an electrical shock hazard, the safety-grounding conductor must be determined based on the feed current rating and cable length.

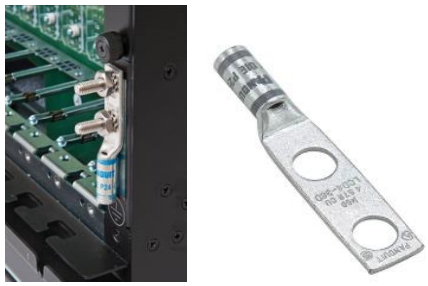


Figure 33: Rear Grounding Screws

➲ To connect the earthing:

1. On the rear of the shelf, locate the earthing connection on the right.
2. Using the appropriate wrench, unfasten the two nuts and remove the lug.
3. Crimp the 1 AWG wire to the lug.
4. Return the lug to its place on the rear-right of the shelf and refasten the nuts. The maximum application Torque of the nuts is 35 lbf-in. (4 N·m).
5. Connect the ground wire to the appropriate ground connection to the building's earthing system.

3.8 ESD Safety Requirements

Electronic components on printed circuit boards are extremely sensitive to static electricity. Normal amounts of static electricity generated by clothing can damage electronic equipment. To reduce the risk of damage due to electrostatic discharge when installing or servicing electronic equipment, use anti-static grounding straps and mats.

The shelf contains two (ESD) grounding sockets, one at the front of the shelf and one in the rear of the shelf. Persons involved in the shelf installation must wear an ESD Wrist Strap and attached to one of these grounding sockets.

Any person involved in handling the shelf or board installation or replacement is required to wear an ESD Wrist Strap,

➲ To prepare ESD protection:

1. Locate the ESD grounding sockets on the shelf.
2. Attach a wrist strap for electrostatic discharge (ESD) and connect it to an ESD grounding sockets on the shelf using a banana plug or an alligator clip.

3.9 Electrical Connections

This shelf is supplied with either AC or DC power.

For AC power configurations, the power outlets to be utilized must contain a third connection for grounding.

An electrical outlet that is not correctly wired could place hazardous voltage on the metal parts of the system or the devices that attach to the system. It is the responsibility of the Customer to ensure that the outlet is correctly wired and grounded to prevent an electrical shock.

Ensure the building's power circuit breakers are turned off BEFORE you connect the system's power cord(s) to the building power.

Overloading a branch circuit is potentially a fire hazard and a shock hazard under certain conditions. To avoid these hazards, ensure that the shelf current consumption do not exceed branch circuit protection requirements.

Refer to the information that is provided in this document or the power-rating label on the shelf. The input voltage range and power rating are marked the shelf by a label on the side of the shelf. Ensure that the voltages and frequency rating of the power receptacle match the electrical rating label on the equipment.

3.9.1 Connecting DC Power

Each PEM contains five terminal blocks. Each terminal block covers the power feed of a segment of the shelf and its components.

For the DC power cables, use red and black 6 AWG cables to connect to the terminal block pluggable connectors. The connectors are Phoenix Contact PC 16/ 2-ST-10,16 (1967375).

For power redundancy, connect the two PEMs to two separate power sources.

The two power sources have to be disconnected one from the other, to prevent excessive EMC radiation due to imbalance of the incoming and outgoing currents of each PEM. Specifically, do not connect the two PEMs to the same power source and do not connect the Return lines of the two PEMs.

While the power cables are being connected to the PEM, the power source and the PEM's circuit breakers must be OFF.

Figure 34: Connection DC Terminal Blocks

➲ To connect DC power:

1. Set the branch circuit breakers at the mains to the Off position.

2. On each PEM, set all of the circuit breakers to the Off position.
3. Using a wire cutter, strip the ends of the red and black 6 AWG wire leads to be attached – stripping length is 7.5mm.
4. Using an appropriate screwdriver, insert the stripped end of the red (+) 6 AWG wire lead into the leftmost contact and tighten the screw clamp. Repeat for the black (-) wire lead into the rightmost contact.
5. Plug the terminal connector into its terminal block socket on the PEM.
6. Repeat for the remaining terminal blocks.
7. Set the branch circuit breakers at the mains to the On position.
8. Using a voltmeter, verify that the polarity and the range are correct.
9. On each PEM, set all of the circuit breakers to the On position.

3.9.2 Connecting AC Power

The AC PEMs are installed in the chassis at the factory.

Figure 35: The AC PEM Connections

The DC power cables from the PS drawer Output Bus Bars are connected to the AC PEM units: the + side of the PS drawer to the Return of the AC PEM, and the minus (–) side of the PS drawer to the -48V of the AC PEM. See section 2.5.1 ***Shelf's AC Power*** Distribution on page.29.

One PS drawer – N+1 or N+N configuration: each side of the PS drawer is connected to one AC PEM. The communication cable (I^2C) is connected from AC PEM1 Control connector to the PS drawer J2 Input connector (both are RJ45 connectors). A configuration with one AC PEM is possible.

Two PS drawers– N+N configuration: each PS drawer is connected to one AC PEM. The communication cables (I^2C) are connected from each AC PEM Control connector to the PS drawers J2 Input connectors (all are RJ45 connectors).

Two PS units – N+1 configuration: one side of the PS drawers are connected one to the other and the other side of each PS drawer to a PEM. The communication cable (I^2C) is connected from AC PEM1 Control connector to the top PS drawer J2 Input connector and another cable connects the top PS drawer J2 Output connector to the bottom drawer J2 Input connector (all are RJ45 connectors). A configuration with one AC PEM is possible.

Table 1: AC PEM/Power Supply Configurations

Configuration	PS Unit	AC PEM	Cable Color
1 PS unit	+ right side – Right side + left side – left side	RETURN PEM A -48V PEM A RETURN PEM B -48V PEM B	Red Black Red black
N+N – 2 PS units	+ right side top PS unit – Right side top PS unit + left side bottom PS unit – left side bottom PS unit	RETURN PEM A -48V PEM A RETURN PEM B -48V PEM B	Red Black Red black
N+1 – 2 PS units	+ right side top PS unit – Right side top PS unit + left side bottom PS unit – left side bottom PS unit	RETURN PEM A -48V PEM A + left side top PS unit – left side top PS unit	Red Black Red black

3.9.3 AC Power Cables

For power cables with 1600W units, use a C15 type connector with a 16Amp cable for 115V power, and 10 Amp for 208-230V power.

For power cables with 2500W units, use a C19 type connector with a 16Amp cable for 115V power and 208-230V power.

➲ To connect an AC power cable:

1. Check that the circuit breaker at the mains is off.
2. Insert an AC power cable into each AC power inlet on the rear-bottom of the shelf.

3.10 Inserting Front and Rear Boards

Follow the manufacturer's instructions for inserting front and rear RTM boards.

➲ To insert the front and rear boards:

- Insert Third-party boards according to the manufacturer's instructions, making sure they are properly positioned in their slots and are secured to their respective connectors.

Third-party boards must be ATCA-compliant.
Third-party boards should be inserted only after the installation, power-up and testing procedures of the shelf have been completed.

3.11 Shelf Power-Up

For AC power, share the power cables among more than one electrical phase to ensure the supply of power should one phase fail.

➲ To power up the shelf:

1. At the mains, set the branch circuit breakers to the On position.
2. Wait up to one minute for the shelf to stabilize.
3. Check that the LEDs on the front panel and on each shelf component appear in normal mode.

3.12 Setting the Real Time Clock

For information on setting the Real Time Clock,: see Section 5.6 ***Setting the Real Time Clock (RTC)*** on page 75.

4 Maintenance

Caution

This unit has more than one power supply cord.

Disconnect the appropriate power supply cords before servicing to avoid electric shock as per the requirements of each procedure.

The covers on the product and the latches locking components in place are to be closed at all times except for service by trained service personnel. All covers must be returned to their locations and latches locked at the conclusion of the service operation.

This section provides general guidelines for performing preventive and corrective maintenance on the shelf.

Any person involved in handling the shelf or board installation or replacement is required to wear an ESD wrist strap. For more information, see section 3.8 ***ESD Safety Requirements*** on page 49.

4.1 Resetting the Shelf

If for any reason the shelf manager board is not responding, you can use the shelf reset options.

➲ **To reset the shelf:**

1. On the Shelf Manager front panel, press the Reset button, Or
2. Extract the active shelf manager board from the shelf, and re-insert it.

4.2 Replacing Components

Extracting any component from the shelf, either FRU or blade, may cause air leakage and reduce the shelf cooling effectiveness.
Extracting a fan tray reduces the cooling power of the shelf.
Consequently, it is mandatory to insert the replacement component as soon as possible.

4.3 Cleaning and Replacing the Air Filter

The air filter must be checked regularly to ensure media durability and eliminate residual dust build-up that can cause airflow resistance. The air filter must be cleaned every three to six months. Regardless, the air filter must be replaced every two years.

➲ To clean or replace the air filter:

1. Grasp the handle labeled Filter (1) and pull the air filter out (2).
2. Replace with a new air filter or clean the air filter with slightly compressed air, vacuum, or rinsed with clean water.
3. If a degreaser is required, use only a mild detergent, such as, dishwashing liquid. Avoid using harsh solvents or cleaning agents.
4. Allow the filter to dry.
5. Locate the direction-indicator arrow on the edge of the replacement air filter and position the air filter correctly.
6. On the shelf front, filter holder, inset the air filter into the slot and slide it in.

4.4 Replacing the DC Power Entry Module (PEM)

If DC PEM redundancy is implemented, one of the DC PEMs may be extracted and replaced without stopping service.

While the power cables are being connected to the DC PEM, the power source and the DC PEM's circuit breakers must be OFF.

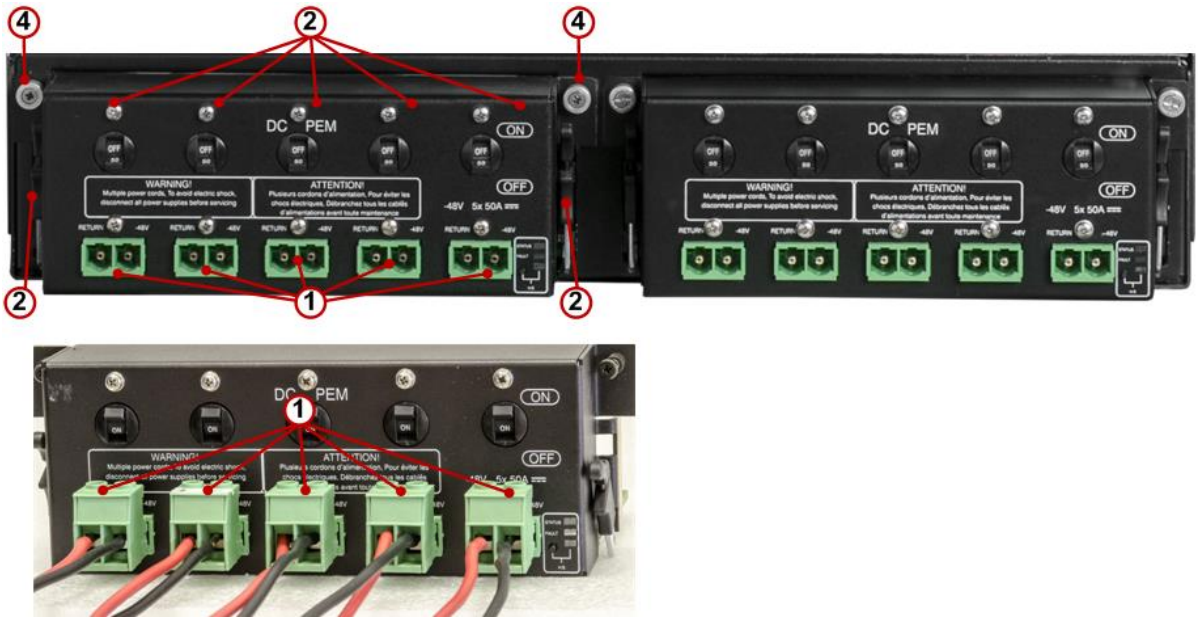


Figure 36: DC PEM

4.4.1 Removing the DC PEM

While following the directions in this section, refer to the figure above.

➲ To extract the DC PEM:

1. Set its branch circuit breaker at the mains to the Off position.
2. On the DC PEM to be replaced, set all of the circuit breakers (1) to the Off position.
3. Remove each of the terminal block connectors (2).
4. Release two captive screws (3).

5. Open the two extraction latches (4) simultaneously.
6. Pull out the DC PEM.

4.4.2 Inserting the DC PEM

While following the directions in this section, refer to Figure 36 above.

➲ To install the DC PEM:

1. Slide the replacement DC PEM into the slot until it plugs into the backplane connector.
2. Close the extraction latches (4)
3. Fasten two captive screws (3) on the front side of the panel.
4. Plug in each of the terminal block connectors (2) into their respective terminal block sockets.
5. Set all of the circuit breakers (1) to the On position.
6. Set the branch circuit breaker at the mains to the On position.
7. Verify that the DC PEM's LEDs are appropriate for normal operation.

4.5 Replacing the AC Power Entry Module (PEM)

If AC PEM redundancy is implemented, one of the AC PEMs may be extracted and replaced without

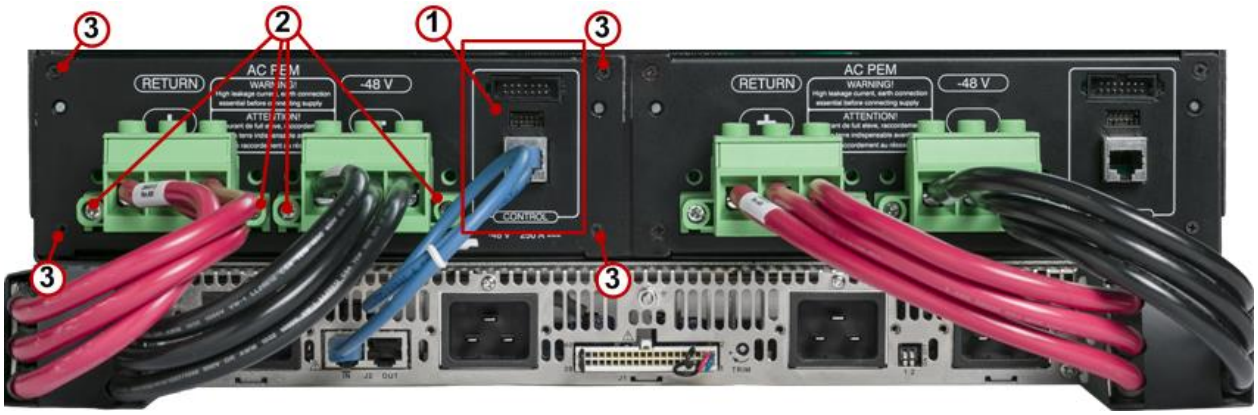


Figure 37: Removing the AC PEM 1

Figure 38: Removing the AC PEM 2

4.5.1 Removing the AC PEM

While following the directions in this section, refer to the figures above.

➲ To extract the AC PEM:

1. On the AC PEM to be replaced, disconnect any PS communication cables (1).
2. Unscrew (2) and remove each of the terminal block connectors.
3. Unfasten the four screws (3) holding the AC PEM in place.
4. Pull out the AC PEM.

4.5.2 Inserting the AC PEM

While following the directions in this section, refer to the figures above.

➲ To install the AC PEM:

1. Slide the replacement AC PEM into the slot until it plugs into the backplane connector.
2. Fasten four screws (3) on the front side of the panel.
3. Plug in each of the terminal block connectors (2) into their respective terminal block sockets and fasten the screws on the sides.
4. Connect any PS communication cables (1) that were previously connected.

4.6 Replacing a Shelf Manager Board

In the event that a shelf manager board needs to be replaced, it is a hot-swappable field replaceable unit.

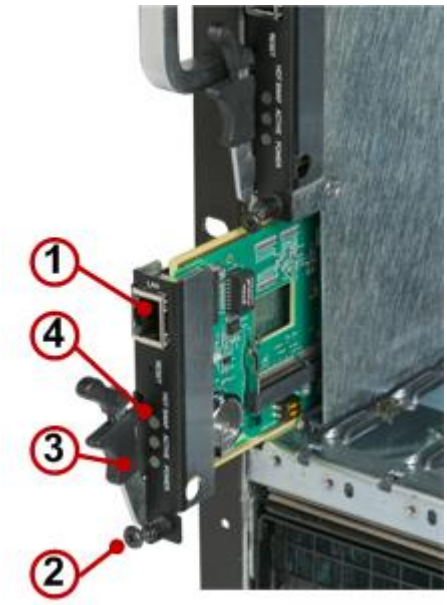


Figure 39: Shelf Manager Board Replacement

4.6.1 Removing a Shelf Manager Board

Follow the directions in this section using the figure above.

➲ **To extract a shelf manager board:**

1. If attached, remove the Ethernet cable (1).
2. Release the captive screw (2) and partially open the extraction latch (3).

The latch is not an ejector. Do not bend it too far to the left. Doing so can damage the latch.

3. Wait until the HS blue LED (4) lights steady.
4. Using the extraction latch (3), pull out the shelf manager out.

4.6.2 Inserting Shelf Manager Board

Follow the directions in this section using the figure above.

➲ **To insert a shelf manager board:**

1. With the shelf manager board extraction latch (3) open, slide it into the slot until it plugs into the backplane connector.
2. Lock the extraction latch (3) in place.
3. Fasten the captive screw (2).
4. The shelf manager's LEDs illuminate for a period of few seconds. The blue LED (4) starts to blink until the shelf manager confirms that its checksum is identical to that of the EEPROM. The ACT and PWR LEDs illuminate green. Verify that the LEDs appear as in normal operation.
5. Reattach the Ethernet cable if needed.

4.7 Replacing a Fan Tray

A malfunctioning fan tray should be replaced immediately, in order to prevent thermal damage to the installed application boards.

Use care when extracting a fan tray – the fans may still be rotating after the fan tray is extracted.

4.7.1 Replacing a Top Fan Tray

While following the directions in this section, refer to the figure below.

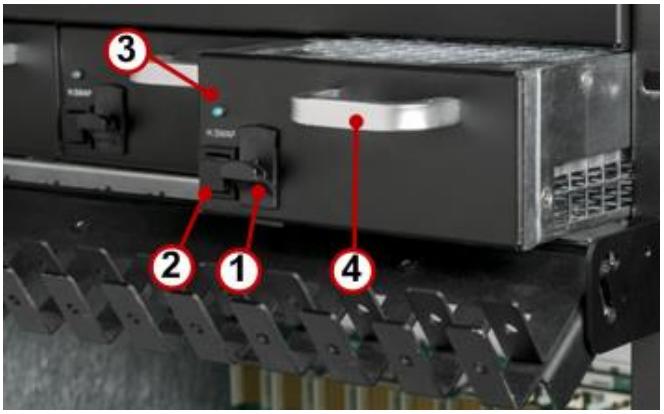


Figure 40: Top Fan Tray Replacement

➲ To replace the top fan tray:

1. Rotate the cable manager downward away from the fan tray.
2. Press hot-swap switch (2) and wait for LED (3) to turn blue.

Take care not to catch you fingers between the fan tray and the cable manager.

3. With one hand, press up on the lever (1) and with the other hand, grasp the handle and pull the fan tray slightly out. The fan tray LED turns off.
4. Wait for the fans to stop in full (could take several seconds).
5. Pull the fan tray all the way straight out.
6. Insert the replacement fan tray in straight, pushing it forward all the way.
7. Verify that the fan tray is secured to the backplane.
8. Its status LED (1) illuminates Red for a few seconds and then turns green. Verify that that LED is green.

4.7.2 Replacing a Bottom Fan Tray

The bottom fan tray is optional. If it is included, while following the directions in this section, refer to the figure below.

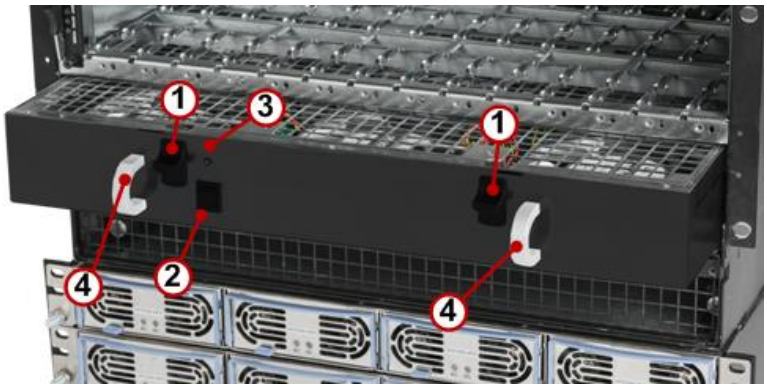


Figure 41: Bottom Fan Tray Replacement

➲ To replace the bottom fan tray:

1. Press hot-swap switch (2) and wait for LED (3) to turn blue.
2. With each hand, press down on the lever (1), grasp the handle and pull the fan tray slightly out.
3. Wait for the fans to stop in full (could take a few seconds).
4. Pull the fan tray all the way straight out.
5. Insert the replacement fan tray in straight, pushing it forward all the way.
6. Verify that the fan tray is secured to the backplane.
7. Verify that the status LED (1) illuminates Red for a few seconds and then turns green.

4.8 Replacing a DC2DC Board

Each of the two hot-swappable DC2DC Boards resides in the top - left of the shelf, behind covers.

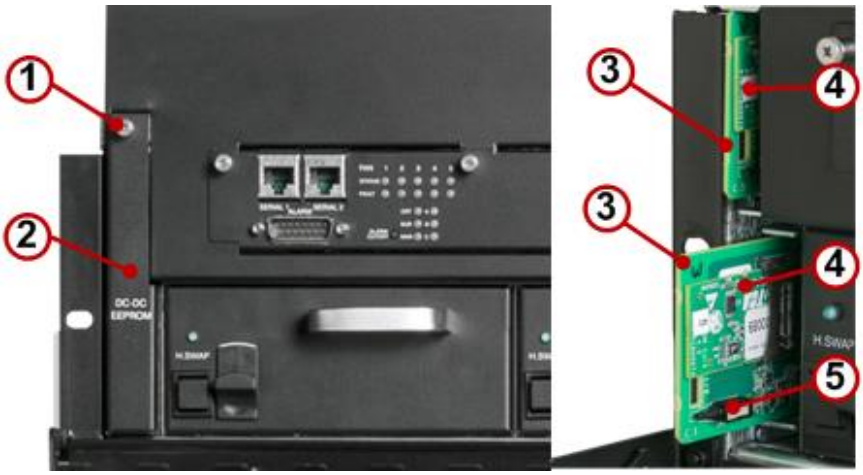


Figure 42: DC2DC Replacement

➲ To replace a DC2DC Board:

1. Using an appropriate screwdriver, unfasten the screw (1) at the top of the panel covering the DC2DC / EEPROM component and remove the pane (2).
2. Pull out the faulty DC2DC board (3) with your fingers to make it pop out of its socket.
3. Insert the replacement DC2DC board (3) and press all the way into its socket.
4. Return the panel (2) and using an appropriate screwdriver fasten the screw (1).

4.9 Replacing an EEPROM Board

Each of the two hot-swappable EEPROM boards resides on a DC2DC board.

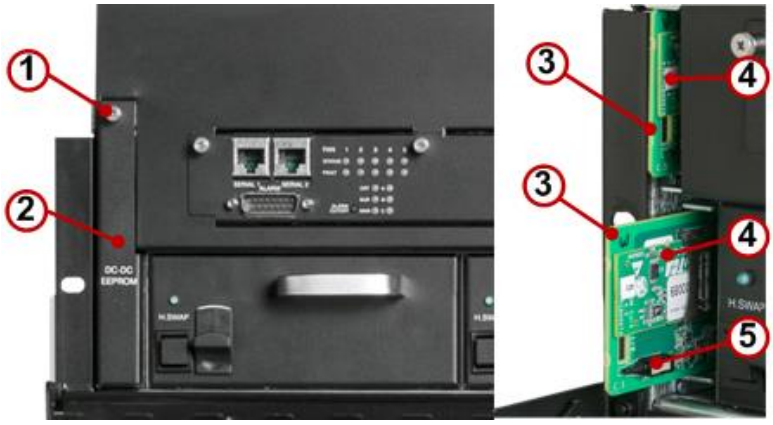


Figure 43: EEPROM Replacement

➲ To replace an EEPROM board:

1. Using an appropriate screwdriver, unfasten the screw (1) at the top of the panel covering the DC2DC / EEPROM component and remove the panel (2).
2. Press the side of the faulty EEPROM chip (4) with your finger to make it pop out of its socket and pull it out.
3. Insert the replacement EEPROM chip (4) and press it with your finger. It inserts into the socket.
4. Return the panel (2) and using an appropriate screwdriver fasten the screw (1).

4.10 Replacing the Front Panel

Figure 44: Front Panel Replacement

➲ **To replace the front panel:**

1. Disconnect any cable (1) attached to the front panel.
2. Using an appropriate screwdriver, unfasten the screws (2) at the top of the panel.
3. Carefully pull out the front panel and disconnect the IDE cable (3) connected to the back pf the front panel.
4. Remove the front panel.
5. Position the replacement front panel leaning on the bottom of the opening and connect the IDE cable (3).
6. Insert the front panel into its place and using an appropriate screwdriver, fasten the screws (2) to secure the front panel in place.
7. Reconnect any cable (1) that had been attached to the front panel.

4.11 Replacing the Temperature Sensor

The temperature sensor card is connects to the backplane and is located just under the fifth blade's bottom guide rail. The temperature sensor card is hot swappable.

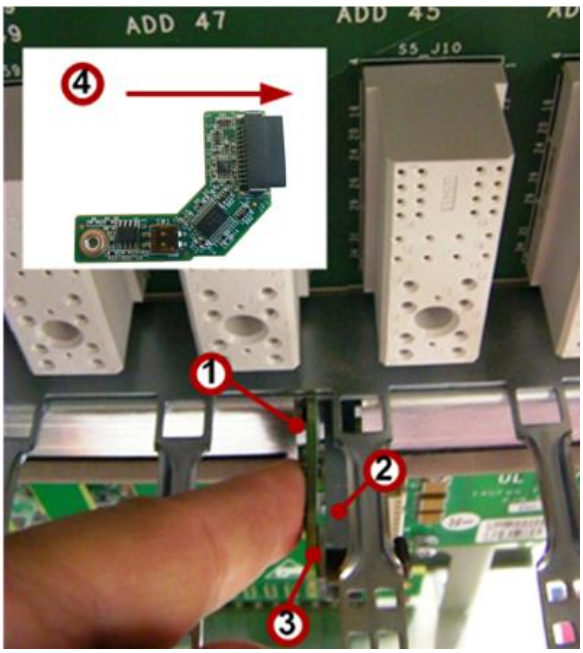


Figure 45: Temperature Sensor Card Replacement

➲ To replace a temperature sensor card:

1. From the front of the shelf, remove the blades from the fourth and fifth slots from the left. The temperature sensor card is located just under the fifth bottom guide rail.
2. To remove the temperature sensor card, carefully grasp it and pull toward you. Use the guide (2) to help you slide it out straight toward you.
3. To insert a temperature sensor card, position the card with the connector down (4).
4. Slide the card (3) into its socket (1) using your finger and the guide (2) until it engages the connector.

5 Shelf Manager Software

This section details various shelf manager software functions.

5.1 Shelf Manager Software Upgrade

Before you upgrade the shelf manager software, verify the Dip Switch settings, IP addresses and IP connection parameters.

There are two steps for the software upgrade:

- Loading the new version using **rupgrade_tool**
- Configuring the chassis using **install.sh**.

5.1.1 Verify Dip Switch Settings

The shelf manager includes a Dip Switch.The Dip Switch settings much be verified before you upgrade the software.

➲ **To verify the Dip Switch settings:**

On both shelf manager boards, set Dip switch 1 to Off to connect Ethernet (Eth0) via the shelf front panel.

5.1.2 Communication

For IP communication, on the shelf manager panel, connect the Ethernet cable to the Eth socket.

The chassis is shipped with these default IP addresses:

ipaddr=192.168.0.2

ip1addr=192.168.1.2

serverip=192.168.0.7

gatewayip=192.168.0.1

For serial communication: connect an RS232 serial cable of up to three meters to the corresponding Front Panel RJ45 connector. The connection setup is **115200,8,N,1**.

5.1.3 Preparing the Shelf Manager Upgrade File

➲ To prepare the Shelf Manager Upgrade File:

1. Create a directory on your PC (for example c:\asisver)
2. Extract the version zip file to that directory.

5.1.4 Verify Chassis EEPROM Content

➲ To verify the chassis EEPROM content:

1. Rewrite the 2 EEPROMs content by # **clia shelf info_force_update**

   The following message is returned:

   Pigeon Point Shelf Manager Command Line Interpreter

   Starting the Shelf FRU Info source device update

2. Run clia fruinfo 20 1 & clia fruinfo 20 2
3. In case you receive a legible readout from each of the two commands, such as follows - continue with the software upgrade:

   Pigeon Point Shelf Manager Command Line Interpreter

   20: FRU # 2, FRU Info

   Common Header: Format Version = 1

   Internal Use Area:

   Version = 1

   Chassis Info Area:

   Version = 1

   If you receive an error message from any one of the two commands, do not continue the upgrade process and consult Customer Support .

5.1.5 Performing the Software Upgrade

➲ To upgrade without a Linux server:

1. Log in to the ShMM-700 and make sure you have an operational network interface; configure it if necessary:

   User name: root

   Password : <blank>

   # ifconfig eth0

   eth0 ... inet addr:192.168.0.2 Bcast:192.168.0.255 ...

   # ifconfig eth0 192.168.0.3

2. Open PC FTP client, such as WinSCP, and connect to the ShMM using the shelf manager IP address in the Host name field:

   User name: root

   Password: <blank>

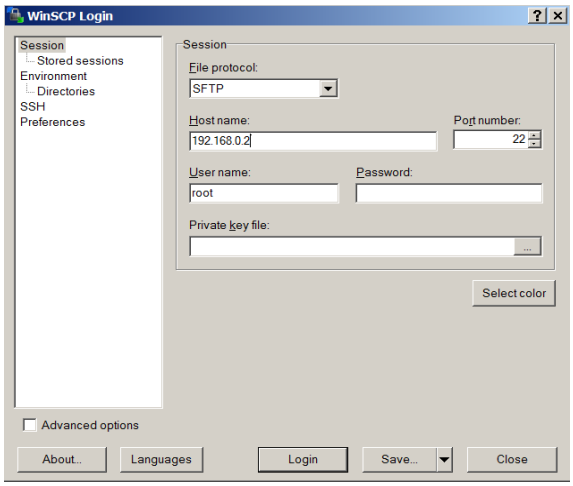


Figure 46: Typical WinSCP login Screen

3. Copy the following 5 files from the directory, /asisver/SSH/, (see the section, *Performing the Software Upgrade* above) to **/tmp** directory on the ShMM.

   sentry.shmm700.app

   sentry.shmm700.hpm

   sentry.shmm700.kernel

   sentry.shmm700.rfs

sentry.shmm700.u-boot

4. On the terminal emulation utility, execute the following commands:

   cd /tmp
   clia terminate
   setenv custcnf C00013
   setenv rc2 /etc/rc.0000-14
   rupgrade --erase-all --base *file:///tmp/*sentry.shmm700. -k kernel -r rfs -a app

   5. After the chassis reboots, check the new version using the command **clia version** and place a sticker with the version number on ShMM.

➲ To upgrade with a Linux server:

1. Unzip and copy the files from the SSH directory to the TFTP/FTP/SCP/HTTP server in your network
2. Log in to the ShMM-700 and make sure you have an operational network interface; configure it if necessary. For example:
   ifconfig eth0 192.168.0.3
3. Invoke the rupgrade utility on the Shelf Manager.

If images are located at the TFTP server root:

rupgrade --erase-all --base tftp://192.168.0.7/sentry.shmm700. -k kernel -r rfs -a app

For a FTP, SCP or HTTP server, change the firmware location base to:

FTP: --base ftp://username:password@192.168.0.7/sentry.shmm700

SCP: --base scp://username@192.168.0.7/sentry.shmm700

HTTP: --base http://192.168.0.7/sentry.shmm700

5.1.6 Configuring the Chassis

➲ To configure the chassis:

1. In the terminal emulator utility run: **install.sh**.

   The process ends with following message:

   >>> Press ENTER to reboot, ^C to abort

2. To reboot the shelf manager and complete the upgrade process, press **ENTER**.

5.1.7 Restoring the Previous Version

To restore the previous version run: **rupgrade_tool -sR --hook=flip**

5.1.8 Recovery after unsuccessful upgrade

In case an upgrade fails and the shelf manager becomes inoperative, the process to restart the upgrade process:

i. For ShMM500 run the following commands:
eeprom write 80400000 0 1800
reset

Halt the board operation in the U-boot stage by pressing any keyboard key and run:

saveenv
setenv flash_reset y
saveenv
boot

ii. For ShMM700 run the following commands:
sf probe 2:0
sf erase 100000 80000
reset

Halt the board operation in the U-boot stage by pressing any keyboard key and run:

saveenv
setenv flash_reset y
saveenv
boot

5.2 Accessing the Shelf Manager

5.2.1 Accessing the Shelf Manager's Linux OS

Log in to Linux using the following access:

User: root

Pass: <Blank> no password; just press **Enter**

5.2.2 Connecting via Serial Port

By default, the serial port is defined as **115200 kbps** and **8-N-1**.

To set a new baud rate: **setenv baudrate 9600**

setenv console ttySP0,9600n8

5.2.3 Connecting via Ethernet Port

Check to see if you are interacting with the active Shelf Manager, which has a steady green LED while the backup shelf manager's LED blinks.

To check basic data transfer: **ping <IP address>**

Test physical link between the shelf manager and hub slot: **iftest eth0 / iftest eth1**

The printout will be

Examining "eth0" interface... "eth0" link is UP or

Examining "eth1" interface... "eth1" link is DOWN

5.3 IP Configuration

The table below displays the IP configuration commands.

Table 1: IP Configuration Commands

Command	Results
Ifconfig	prints the configuration
Clia getlanconfig 1 3	prints the shelf manager eth0 address
Clia setlanconfig 1 3 <IP address>	sets the IP address of SM eth0
Clia setlanconfig 2 3 <IP address>	sets the IP address of SM eth1
Clia setlanconfig 1 6 <IP address>	sets the subnet mask of SM eth0
Clia setlanconfig 2 6 <IP address>	sets the subnet mask of SM eth1

5.4 Chassis EEPROM Parameters

To read Chassis EEPROM content, use the command **clia fruinfo 20 1**

5.4.1 Repairing Specific Chassis EEPROM Fields

Use **patch_fru_info** to repair specific EEPROM fields.

➲ **To repair specific Chassis EEPROM fields:**

- To change the serial number of the chassis: **patch_fru_info 20 1 p SerialNumber 1412345123**

  patch_fru_info<fru_id>i|c|b|p|n<n|field><value>
  Field names:
  Internal section: Text Hex
  Chassis section: PartNumber SerialNumber
  Board section: Manufacturer ProductName SerialNumber PartNumber FRUFileID MfgDate
  Product section: Manufacturer ProductName PartModelNumber Version SerialNumber AssetTag FRUFileID
  Multi section: IP Gateway Netmask IP2 Gateway2 Netmask2

5.4.2 Restoring EEPROM Content

The system includes three identical non-volatile copies of the chassis EEPROM content: two physical EEPROM chips (1 & 2) and a copy in the Flash memory (254). During the bootup process,

the system compares their values and completes the boot process successfully with (at least) two identical copies. In case one copy is different than the other two, the system tries to restore its value.

The following procedure manually restores the content of EEPROM #2:

clia frudatar 20 1 /var/bin/filename.bin // write the EEprom1 content into a file
clia frudataw 20 2 /var/bin/filename.bin // write the file to EEprom2

5.5 Fan Controls

5.5.1 Minimal Fan Level

The range of the fan's operating level is 3-15.

➲ To change the fan's minimal operating level:

- For a temporary solution (is not retained after reboot), use the command:

  clia minfanlevel n where n= 3 to 15

- For a permanent solution that holds after a reboot:

  In the file **/etc/shelfman.conf.asis** change the value **MIN_FAN_LEVEL** to **n.**
  Power cycle the chassis or log off the (single) shelf manager.

5.5.2 Fan Rotation Speed Control

➲ To set the fan's rotation speed:

- To set cooling mode to manual:

  Clia setfanpolicy 20 fru# disable fru#: 7-9 (upper), 10-11 (lower);
  Clia setfanlevel 20 fru# n n: 3-15
  or
  Clia setfanlevel all n

➲ To revert to the auto cooling mode:

- **Clia setfanpolicy 20 fru# enable**

➲ **To reduce the fan's rotation speed to its lowest possible value as defined by the fan vendor:**

- **Clia setfanlevel 20 fru# 254**

5.5.3 Fan Debug Commands

Display fans state: **Clia fans**

Display fan's rotation speed in RPM: **Clia sensordata 20 | grep RPM**

5.6 Setting the Real Time Clock (RTC)

To set the RTC on the SM, use the following commands:

Date MMDDhhmmYYYY:

hwclock –w

Where **MMDDhhmmYYYY:**

MM - Month

DD - Day

hh - Hour (using 24 hour notation)

mm - Minute

YYYY - Year

For example:

date 042916282013 sets the RTC to Sat Apr 29 16:28:00 UTC 2013

5.7 Debug

For reporting any issue, you are asked to generate a log file, version details, Telco alarm status, and alarm event status. These reports are then sent to Asis Tech Support.

➲ **To report an issue:**

1. run: **/etc/summary - t**he **debug.log** file is created in **/tmp/ directory**.
2. To print the version details, use the command: **Clia version**
3. To print the Telco alarm status, use the command: **Clia alarm**
4. To print the last alarm event details, use the command: **Clia alarminfo**
5. email the **debug.log** file to Asis Tech Support.

5.8 Power On / Activation

In the default settings of the Shelf Activation And Power Management record, the entry for IPMC 84h (HW 42h) is after IPMC 82h (HW 41h) and this is their power activation order.

You can set a five-second delay after IPMC 82h FRUs activation using the command:

clia shelf pwrdelay 41 0xfe 50

After the chassis power cycle, the shelf manager powers up 82h while 84h stays in the M3 state and powers up after the 5-second delay. In addition, when any IPMCs are started shortly after 82h at runtime, there is 5-second delay before this IPMC gets power.

5.9 SNMP

If you are using SNMP, you must translate the sensor parameters from LUN and Sensor ID to SNMP OID.

The translation is by the following calculation:

(Sensor ID) + 256 x (LUN)

Example:

For sensor **155 LUN 1: 155+ 1x256=411**

5.10 Chassis Backlight

The LEDs are off as the default settings. You can turn the chassis backlight on using the Turn off/on command.

To turn the chassis backlight on: **clia setsensordata 20 0:249 assertion 2**

To turn the chassis backlight off: **clia setsensordata 20 0:249 assertion 1**

5.11 Ethernet Connections and Cross Connect

Each shelf manager has three NICs: Eth0, eth1 and usb.

- **Eth0** may be used for front connection through the front panel or through the backplane to the hubs.
- **Eth1** is used through the backplane to the hubs
- **USB0** is used for communication between the shelf managers as a redundancy interface.

The IP of each NIC must be from a different subnet.

The shelf manager is configured with active/backup instances to maximize availability. The figure below shows how both instances are accessible to the System Manager, with only the active instance interacting at any given time. Similarly, only the active instance communicates over IPMB-0 with the IPM Controller population in the shelf. The two instances communicate over TCP/IP, with the active instance posting incremental state updates to the backup ShMMs using USB connection between the ShMMs. As a result, the backup can quickly step into the active role if necessary.

There are three cross-connected signals between the two shelf managers:

- **Presence:** each shelf manager knows whether the other is present in the shelf.
- **Health:** each SM knows whether the other considers itself *healthy*.
- **Switchover:** the backup SM can force a switchover if necessary.

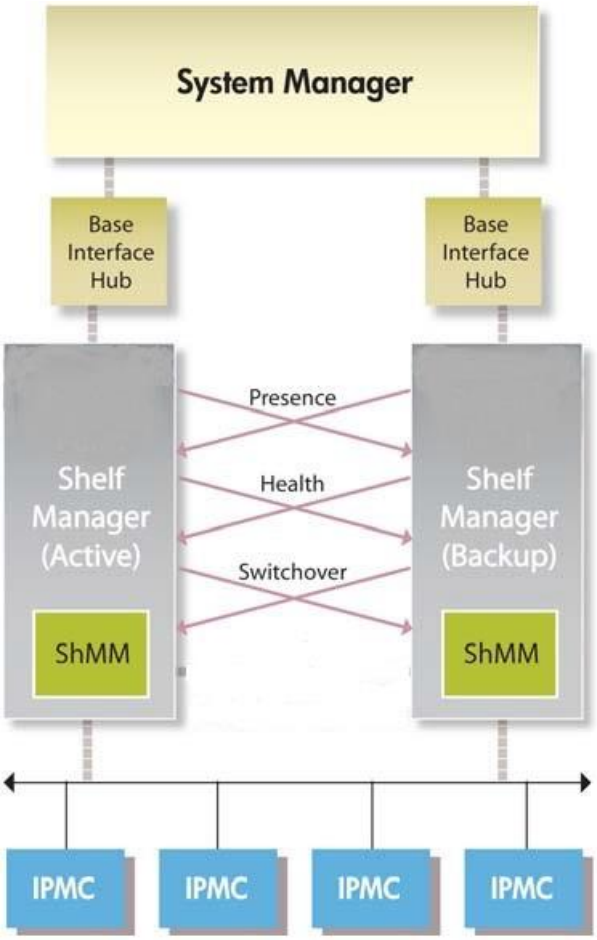


Figure 46: Shelf Manager Cross Connection Diagram

Cross-connect allows both shelf managers to be connected with both hubs using the Base Interface and allows either hubs or SMs to switchover independently, if necessary.

The Cross-connect is implemented as follows:

ETH0 of SM1 (0x10) is connected to hub1 base port 1:1, and ETH1 is connected to hub2 base port 1:2.

ETH0 of SM2 (0x12) is connected to hub2 base port 1:1, and ETH1 is connected to base hub1 port 1:2.

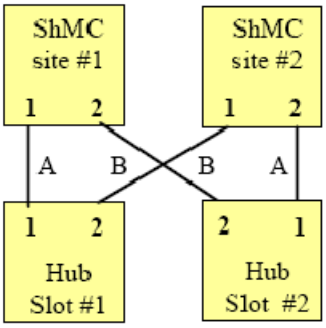


Figure 47: ShMC Cross Connection Diagram

5.11.1 IP Addresses Swap

The following scenario helps us understand the behavior of the IP address swap.

Suppose ETH0 of the active shelf manager has IP address A and ETH1 has address B. After switchover, ETH0 of the backup shelf manager receives address A and ETH1 address B. The problem of this situation is that ETH0 connects to another slot.

Suppose that ETH0 of the active shelf manger (SM1) has IP address **X** and ETH1 has address **Y**. Consequently, HUB1 interacts with the shelf manger by using IP address **X**.

After switchover, both of the Ethernet adapters of the incoming Active shelf manager (SM2) inherit their IP addresses from the previous Active shelf manager (SM1). Since the HUB1 interacts with SM2 by using the ETH1 interface, it must switch to IP address **Y**.

In order to prevent this situation, the parameter, SWAPPED_CROSS_CONNECTS, must be set to TRUE.

In this case, after switchover, the IP address A of the ETH0 interface of previously Active shelf manager is attached to the ETH1 interface of the incoming Active shelf manager (previously Backup) and the HUB1 continues using **X** address.

The USB interface as a communication link between the 2 SMs is a must for Cross-connect and without it, the shelf manager boots endlessly.

5.12 Shelf Cooling

The Shelf Manager manages shelf cooling by controlling the speed of the fans in the fan tray(s) according to PICMG 3.0 specification. The Shelf Manager monitors temperature sensors in the shelf in 5 sec poll interval and reacts appropriately when the temperature exceeds the specified thresholds. The Shelf Manager keeps track of the population of Fan Tray devices in the system, distinguishing them during initial IPM controller enumeration and during subsequent hot insertions.

The goal of the cooling management strategy is to hold the level of the fans as low as possible, but at the same time keep the shelf in the normal cooling state with no temperature sensors crossing their upper thresholds. To achieve that, an adaptive approach is used.

In normal mode the shelf manager periodically reduces the fan speed by one level (in 30 seconds intervals) until the fan speed reaches the minimum fan level or the shelf goes to abnormal mode (with at least one of the temperature sensors reporting one of its upper thresholds crossed).

The shelf manager attempts to minimize the fan level and prevent thermal alerts by adaptively choosing the lowest possible fan level that allows the shelf to avoid thermal alerts:

- 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, 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. 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. 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.

The shelf manager changes the minimum fan level over time to prevent oscillations of the shelf between normal and abnormal cooling mode. When the shelf transitions from normal to abnormal cooling mode, this means that the current fan level is insufficient for effective cooling of the shelf. In that case, the shelf manager dynamically changes the minimum fan level to the current level + 1, so that next time in normal mode the shelf manager does not try to decrease the fan level so low.

After the shelf stays in normal cooling mode at a stable fan level for a substantial period of time (specified as a configuration parameter NORMAL_STABLE_TIME, with a default of 1 hour), the minimum fan level is decreased by one and the current fan level is allowed to drop to the new minimum. If the thermal load in the shelf has decreased, the shelf continues to operate at the reduced fan level. Otherwise, the shelf transitions to the abnormal cooling state and the fan level converge to a new stable value after several oscillations.

The figure below illustrates the behavior of the above cooling algorithm in finding a stable fan level in real shelf, in the presence of a substantial thermal load in the shelf. The configuration parameter NORMAL_STABLE_TIME is set to 30 minutes. The graph presents the fan speed changes over a period of 70 minutes.

The fan speed is initially lowered to 3. This causes a thermal alert, and increase in fan speed until the temperature is stabilized. Subsequently the fan speed is reduced and the level stabilizes at 4. After 30 minutes, the level is lowered to 3, which again causes a thermal alert, an increase in fan speed, with subsequent reductions, and the fan level again stabilizes at 4.

In addition, the fan level is set to the maximum for all fans in the following situations:

- Missing fan tray
- Fan tachometer sensor has a major or critical threshold crossed (a fan is stopped or rotates too slowly).

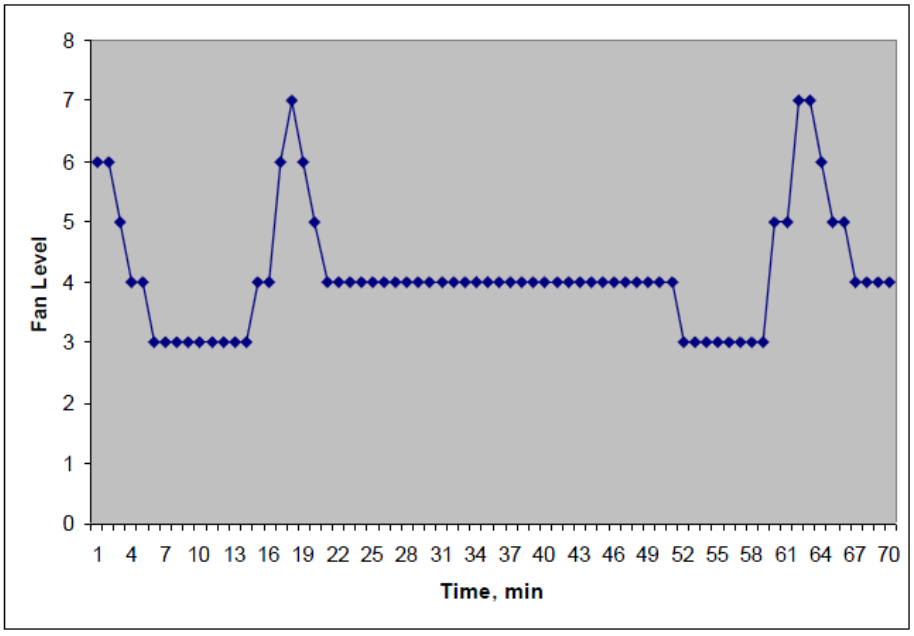


Figure 48: Cooling Algorithm Behavior

5.13 Shelf Power Management

The shelf manager performs power management of the shelf in accordance with the section 3.9 of the PICMG 3.0 specification.

During shelf initialization and when an FRU is hot inserted the shelf manager performs a power negotiation sequence for each FRU / blade and turns their power on. In this process, the shelf manager compares the FRU power requirement with the Maximum FRU Power value specified for its slot and calculates its impact on the available power of the segment. If the shelf power budgeting limitations are not met, the shelf manager leaves the FRU in state M3 (Activation in process) or powers down that FRU.

6 Debugging & Troubleshooting

6.1 Debugging

As a first step to any issue debugging:

Run the Summary script on the Active shelf manager:

. /etc/summary

Email the debug.log file that is created in the /tmp**/** directory.

The Active shelf manager has its Active LED lit in green, while the backup shelf manager has a blinking green Active LED.

To verify that you are interacting with the active Shelf Manager, use the cpld command and look for Active in the output of the command:

cpld

CPLD word: xxxx

:

2000h – Active

Clia version prints the version details

Clia alarm prints the current alarm status

Clia alarminfo prints the last alarm event details

6.2 Basic Log Analysis

To read the Debug logs, which are long text docs, you are advised to use utilities such as Notepad++.

6.2.1 System Error Log

Towards the end of the Summary log file, the System Event Log (SEL) is listed. A typical error message looks like:

0x00F6: Event: at Dec 18 19:37:43 2013; from:(0x9a,0,0); sensor:(0x01,12); event:0x1(asserted): "Upper Non-Critical", Threshold: 0x2d, Reading: 0x2d

In this case on Dec 18 19:37:43 sensor #12 of board 9a reported a threshold crossing with a value of 2d (Hexa; =45).

In other parts of the log, you can find the following info regarding this event:

Sensor #12 of board 9a is the air intake temperature sensor, its current value is 38^0C and its Upper Non-Critical threshold is 45^0C:

9a: LUN: 0, Sensor # 12 ("Temp Air Intake")

Type: Threshold (0x01), "Temperature" (0x01)
Belongs to entity (0x03, 0x60): FRU # 0
Status: 0xc0
All event messages enabled from this sensor
Sensor scanning enabled
Initial update completed
Raw data: 38 (0x26)
Processed data: 38.000000 degrees C
Status: 0x00

9a: LUN: 0, Sensor # 12 ("Temp Air Intake")
Type: Threshold (0x01), "Temperature" (0x01)
Lower Non-Critical Threshold, Raw Data: 0x05 ; Processed data: 5.000000 degrees C
Lower Critical Threshold, Raw Data: 0x01 ; Processed data: 1.000000 degrees C

Lower Non-Recoverable Threshold, Raw Data: 0xfb ; Processed data: -5.000000 degrees C

Upper Non-Critical Threshold, Raw Data: 0x2d ; Processed data: 45.000000 degrees C

Upper Critical Threshold, Raw Data: 0x37 ; Processed data: 55.000000 degrees C

Upper Non-Recoverable Threshold, Raw Data: 0x46 ; Processed data: 70.000000 degrees C

After the events log the system messages are displayed. Error messages have the following format:

Mar 17 19:54:01 shmm500 daemon.err shelfman[374]: Failed to read EEPROM #0 data byte

The main parts of the Summary log are:

Table 2: Summary Log Sections

Log section	Info
Shelfman version	Software and hardware versions
Shelfman status	Active/Backup shelf manager status
Board Information	Blade list
Detailed FRU Information	FRU status
Sensor Data	Sensor status
Sensor Thresholds	Sensor thresholds
Chassis Info Area	Chassis P/N and S/N
System Event Log	System events
System messages	System messages

6.2.2 FRU ATCA State

The table below lists the FRU ATCA states.

Table 3: FRU ATCA States

Code	FRU ATCA states
M0	Not Installed
M1	Inactive
M2	Activation Request
M3	Activation in Progress

Code	FRU ATCA states
M4	FRU Active
M5	Deactivation Request
M6	Deactivation in Progress
M7	Communication Lost

6.3 FRU IDs

The diagrams below indicate the FRU IDs.

DC Chassis **Front view** **AC Chassis**

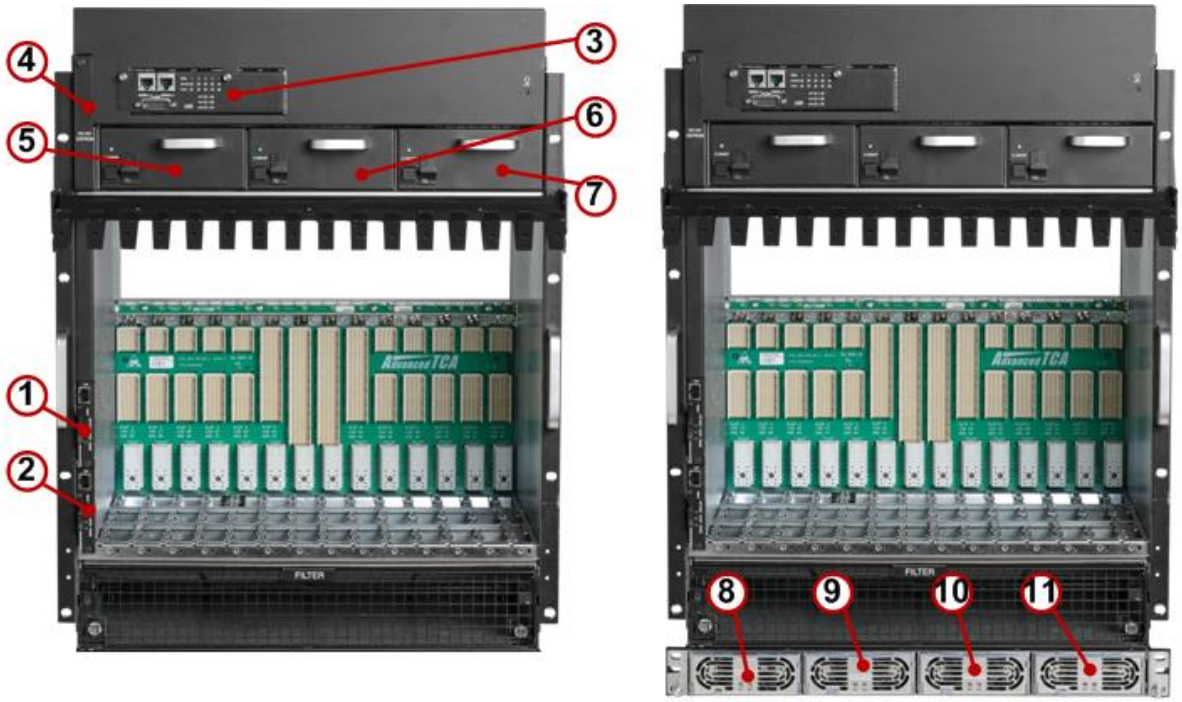


Figure 49: Front Shelf FRUs

Table 4: FRU ID Key Front View

#	Item	FRU ID
1	Shelf manager	10 (top)
2	Shelf manager	12 (bottom)
3	Front Panel	20 22
4	Behind the Front Panel:	

#	Item	FRU ID
	DC2DC/EEPROM1 DC2DC/EEPROM2	20 5 / 20 1 (bottom) 20 6 / 20 2 (top)
5	Fan Tray 1	20 7
6	Fan Tray 2	20 8
7	Fan Tray 3	20 9
	Fan Tray 4 (optional) Fan Tray 5 (optional)	20 10 (both in bottom FT) 20 11
8	Power Suppy #1	20 12
9	Power Suppy #2	20 13
10	Power Suppy #3	20 14
11	Power Suppy #4	20 15 (up to 20 21 with 10 PSUs)

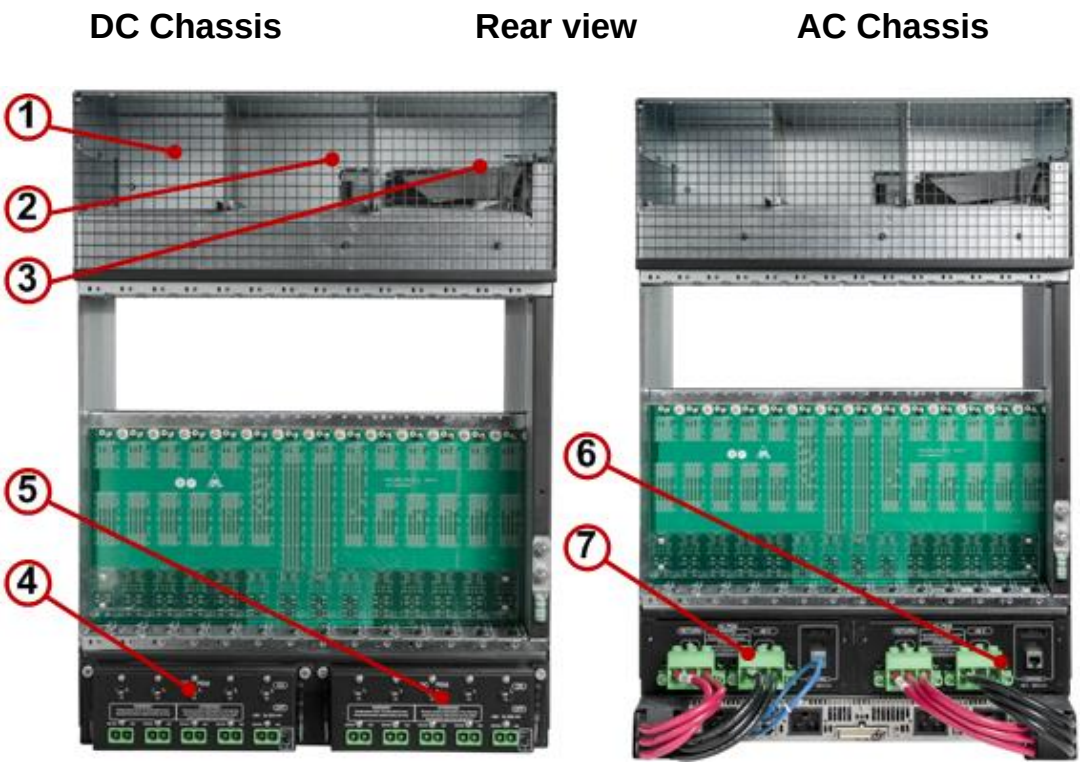


Figure 50: Rear Shelf FRUs

Table 5: FRU ID Key Rear View

#	Item	FRU ID
1	Fan Tray 3	20 9
2	Fan Tray 2	20 8
3	Fan Tray 1	20 7
4	DC PEM1	20 3
5	DC PEM2	20 4
6	AC PEM1	20 23
7	AC PEM2	20 24

6.4 Alarm State

Below is a table containing the Telco alarms and their states.

Table 6: Telco alarms

Category	Telco alarm	Alarm source
Shelf	Minor (non-critical)	Temperature: shelf (Inlet), shelf manager (Top & Bottom), PEM, DC2DC, fan tray
	Major (critical)	Temperature: shelf (Inlet), shelf manager (Top & Bottom), PEM, DC2DC, fan tray Presence: DC2DC, fan tray Fan speed (low RPM)
	Critical (non-recoverable)	Temperature: shelf (Inlet), shelf manager (Top & Bottom), PEM, DC2DC, fan tray
Blades	Minor (non-critical)	Per blades' definition
	Major (critical)	Per blades' definition
	Critical (non-recoverable)	Per blades' definition

6.4.1 Fans

The shelf manager commands all fans to rotate at their maximum speed in the following cases:

- One or more fans are missing
- One or more fans rotate below their lower speed threshold
- One or more temperature sensors are above their critical threshold (Major alarm)
- One or more temperature sensors are above their non-critical threshold and the cooling algorithm steps the fan rotation speed up until it reaches its maximum while the alarm condition is still on

7 Regulatory and Certification Information

The shelf holds certifications and complies with a comprehensive list of regulations.

Some regulation tests may have to be repeated for the system level. System level regulation approvals are the integrator responsibility and Asis offers support for it.

7.1 Safety Compliance

The self complies with the following safety requirements:

- UL60950-1 / CSA 60950-1 (USA / Canada)
- EN60950-1 (Europe)
- IEC60950-1 (International), CB Certificate & Report including all group and country deviations
- Low Voltage Directive 2006/95/CE (Europe)

7.2 EMC Compliance

The shelf has been tested and verified to comply with the following electromagnetic compatibility (EMC) regulations:

- FCC Part 15 Class A / ICES-003 - Emissions (USA/Canada)
- CISPR 22 & CISPR 24 - Emissions (International)
- EN55022 - Emissions (Europe)
- EN55024 - Immunity (Europe)
- EN61000-3-2 - Harmonics (Europe)
- EN61000-3-3 - Voltage Flicker (Europe)
- EMC Directive 2004/108/EC (Europe)

7.3 Additional Certifications

The shelf holds hold certifications for the following:

- CE Declaration of Conformity (Europe)
- ROHS compliant - Directive 2011/65/EU
- Reach compliant
- In process of Conflict Minerals certification

8 Technical Specifications

This section details the technical specifications for each of the shelf's elements.

Category or Property	Description/Value
Physical	
Number of slots	14 slot 8Ux280mm (11 inches), front boards 14 slot 8Ux80mm (3.15 inches), RTMs
Dimensions	Height- 665mm (26.2 inches) (15U) /620mm (24.4 inches) (14U); up to 18U Width- 19" rack mounted Depth- 385.6 mm (15.2 inches) Not including handles, latches and cable holders
Weight	DC configuration- 37Kg (73 lbs) (Including PEMs, Fans, two shelf managers). AC 15U configuration- 47Kg (96 lbs) (Including 5 PS units).
Other	Front and rear ESD jack
	Front rack flanges
Compliance	PICMG 3.0 R.2.0
Environmental	
Temperature: ▪ Operating ▪ Short-term ▪ Short-term with fan failure	 5^0C to 40^0C (41^0F to 104^0F) -5^0C to 55^0C (23^0F to 122^0F) -5^0C to 40^0C (23^0F to 104^0F)
Storage Temperature:	-40°C to 70°C (-40°F to 158°F)
Humidity	5% to 95%, non-condensed
Accessibility	
Front	Shelf Managers, front blades, air filter, top and bottom cable management, AC power supplies, DC2DC boards & fan trays.
Rear	PEMs, RTMs, cable management.
Backplane	
Base interface	Dual star bus, with support for 10/100/1000 BASE-T Ethernet; base channel 1 is allocated to Shelf Manager board
Fabric interface	Full Mesh, Dual Star and Dual Dual Star connectivity; 40Gbps per channel

Category or Property	Description/Value
Node Slots	Twelve slots 1-6, 9-14 in Dual-star / Ten slots 1-5, 10-14 in Dual Dual-star
Hub slots	Two logical slots 7 & 8 in Dual-star / four slots 6-9 in Dual Dual-star
Update channels	Physical slot 1-2, 3-4, 5-6, 7-8, 9-10, 11-12, 13-14
IPMB support	Dual redundant bussed IPMB, full IPMB support with Asis shelf manager
Power	
AC Power Supply	Up to ten 1600W or eight 2500W front accessible, redundant, self-cooled, hot swappable power supplies with IPMI support
DC input	-48 VDC/-60 VDC; five feeds per PEM (A & B), designed to carry 250Amp
Redundancy	Dual redundant PEM modules, each capable of supplying 100% of shelf power N+1 & N+N AC power supplies
EMC filtering	Dual redundant EMC filtered power feeds PEMs provide common-mode and differential-mode filtering for conducted emissions, reducing differential-to-common-mode conversion
Cooling	
Cooling Mechanism	Push – pull, front bottom to back top cooling. Three upper pull trays for front and RTM cooling and lower push tray for front blades Pull, front bottom to back top cooling. Three upper trays for front and RTM cooling
Fans	Up to 15 fans with 300 CFM each for maximal pressurized cooling
Redundancy	N+1 (i.e., any one fan can fail with no service degradation)
Fan speed	Variable speed under shelf manager control
Air filter	Front washable field replaceable NEBS GR63 compatible air filter
Front Panel	
Display	Nine LEDs to indicate chassis status, fans status, Telco alarm and user-defined status
Telco Alarm	Control of external alarms (see below)
Interfaces	Serial link for the shelf manager, Telco alarms
Shelf Management	
Shelf Manager	Two front accessible, redundant, hot-swappable IPMI Shelf Managers based on Pigeon Point ShMM Sentry 500 or 700.
Managed IPMI Peripherals	Shelf EEPROM, AC power supply, Fan Tray, PEM, Air filter, Alarm panel
Protocol Support	Multiple management interfaces supported: RMCP, RPC, SNMP, CLI and OpenHPI

Category or Property	Description/Value
Interface	10/100 Base-T Ethernet and serial link (via the front panel)
Software Upgrades	Software version is remotely upgradable
IPM Sensor Entries	Fan speed, temperature, voltage, presence
Alarm I/O	
Telco Alarm	Alarm I/O on shelf front panel
Electrical/Mechanical	Front accessible via micro D- type 15 pin connector.
Alarm I/O interfaces	Supports 4 outputs (Minor, Major, Critical, Power), 2 inputs (Major reset & Minor reset) and 1 pushbutton (Alarm Cutoff). Alarm relays with a maximum rating of 60VDC/1A or 30VAC