Effective
5 Slot ATCA DC Shelf User Manual

May 2007 **Revision**

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Asis may make changes to the specifications and/or product descriptions at any time, without notice.

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Contact Information

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To order the product described in this document and related systems and componen contact an ASIS representative at:

Israel Headquarters

3 Galgalei Haplada St.

Kfar Saba, ISRAEL 44422

Telephone: **+972-73-233-6633**

Fax: **+972-73-233-6634**

E-mail: sales@asis-pro.com

North America Headquarters

11067 Caminito Arcada

San Diego, CA, 92131 USA

Telephone: 858 776-1421

E-mail: salesna@asis-pro.com

See the ASIS web site at http://www.asis-pro.com .

Safety Instructions

This symbol indicates potential safety hazards regarding product operation or maintenance to operator or service personnel.

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General Safety Practices

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

- Always use caution when handling/operating the board. Only qualified, experienced, authorized electronics service personnel should access the interior of the equipment. The power supplies produce high voltages and energy hazards, which can cause bodily harm.
- 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 component removal and replacement in sequence.

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Power

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

Turning off the system power switch does not remove power to components.
Make sure the work environment is grounded, and use a grounding wrist strap when handling the product.

ESD Safety Practices

Many components described in this document can be damaged by *electrostatic discharge (ESD)*. Follow the precautions described here and before specific procedures in the document to protect static-sensitive components from ESD-related damage.
Static electricity can harm system boards. Perform service at an ESD workstation and follow proper ESD procedure to reduce the risk of damage to components. ASIS strongl encourages you to follow proper ESD procedure, which can include wrist straps and smocks, 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, u antistatic floor pads and workbench pads.
- Handle components and boards with care. Don't touch the componen or contacts on a board. Hold a board by its edges or by its metal moun bracket.
- Do not handle or store system boards near strong electrostatic, electromagnetic, magnetic, or radioactive fields.

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Operating Environment¶
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Revision History

Number	Date	Comments	Author
1.0.0	May 2007	Initial release	Yossi Kuzi

About this Document

This document provides technical information for the 5-Slot ATCA DC Shelf .

It is intended for technical staff tasked with installing, setting up and configuring the system, and providing troubleshooting assistance and servicing.

Related Documents

For information on the Shelf Manager, see the ASIS Shelf Manager Board user manu

Instructions relating to software installation and documentation for application softw development for this platform are available in the Shelf Manager External Interface Reference Manual.

For Asis product information and additional resources, please visit the Asis website a **http://www.asis-pro.com**.

Downloads (manuals, release notes, software, etc.) are available via the Technical Support Library at **http://www.asis-pro.com.**

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

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2	**Understanding the Shelf Components**	Describes the shelf and its components, including the boards installed in the shelf: Backplane, Power Entry Module, Shelf ID Boards. Describes the cooling capabilities of the shelf.	Pg. 14
3	**Installing the Shelf**	Procedures and precautions involved in product installation	Pg. 29
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5	**System Specifications**	Detailed quantitative information about the system's dimensions and operational parameters, operation limitations, certification and standard compliance	Pg. 42

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Style Conventions

Verdana	Regular text.
Arial Bold	Commands, keys and other parts of the user interface.
Arial Italics	Names of classes, methods, arguments, exceptions, properties, etc. Also used for special terms, the first time they appear.
`Monospace`	Text displayed on the LCD or on a computer attached to the product.
	**Notes,** which offer an additional explanation or a hint on how to overcome a common problem.
	**Warnings**, which indicate potential safety hazards regarding product operation or maintenance to operator or service personnel.

1 Introduction

This chapter includes a summary of the Asis shelf product line and a brief overview c
Effective 5-Slot ATCA DC Shelf. For acronyms used in this document see Section 5.3

1.1 Overview of ASIS Shelf Products

As for ATCA Shelf , ASIS offers two product families :

- **Effective** - for cost-sensitive, yet demanding applications .
- **Perform -** for top-of-the line solutions, for environments in which high levels of performance, availability and reliability are mandatory.

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1.2 ATCA DC Shelf

The Effective Series 5-Slot ATCA DC Shelf offers the reliability and availability of the grade standards in a cost-Effective package, where maximum possible performance (backplane interconnect bandwidth, power levels and thermal capabilities) is provide low-cost shelf.

It incorporates the latest technologies available to reduce its price while maintaining performance and reliability. The system offers optional redundancy for power input a management functions. All shelf assemblies are designed using Field-Replaceable Ur (FRUs), thus enabling easy and fast field maintenance with minimum or no downtim

In addition, an ASIS cable-holder frame can be fitted to both side-mounting flanges shelf.

The DC version uniquely offers greater cost Effectiveness in its ability to carry 5 slot 4U Horizontal chassis, while maintaining the ATCA requirements.

The Effective 5-Slot ATCA DC Shelf complies with FCC, and CE certification, and it is designed to comply with UL, NEBS Level-3 and ETSI.

It is fully complies to AdvancedTCA, PICMG 3.0 R2.0, and IPMI v 1.5.

See Section 5.2 for detailed system specifications.

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NEBS Level-3 and ETSI¶
IPMI v 1.5.¶
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2 Understanding the Shelf Components

This chapter summarizes the functional features of the Effective 5-Slot ATCA DC Shelf and describes in further detail each of the components as well as the shelf system cooling mechanism.
The system was designed to withstand extreme conditions (to meet rigid Telco requirements). It is designed to incorporate Field-Replaceable Units (FRUs), and is fully field-serviceable.

2.1 Platform Components

A typical platform consists of the following key components:

- **19-inch rack mount shelf** — Base hardware element of the platform which holds all the components together.
- **Card cage** — Portion of the shelf that holds the modules that are plug into the backplane. Mechanically compliant with all aspects of PICMG 3
- **Backplane** — Supports one to five third-party ATCA-compliant front boards, and the complementary rear transition module (RTM). The backplane provides full-mesh Fabric interface, and direct mating to the PEMs and to the redundant Shelf Manager board.
- **2 DC Power-Entry Modules (PEMs)** — 2 redundant and hot-swappa -48 VDC PEMs: Supply system power to the shelf and its components.
- **Fan tray** - Hot-swappable, provides side to side cooling, and is design to provide N+1 fan redundancy cooling to components on the front an rear of the shelf.
- **Air filter tray** — Keeps the airflow free of dust and particles.
- **Blank Panels** — For air flow management.
- **Shelf ID Board** — Two E²prom's that contain the shelf ID.
- **Cable management** - Holders for Front cable management .

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2.1.1 Shelf and Boards

Figure 1 shows the block diagram of the shelf and *figures 2* and *3* show front and rear views the shelf with key components highlighted.

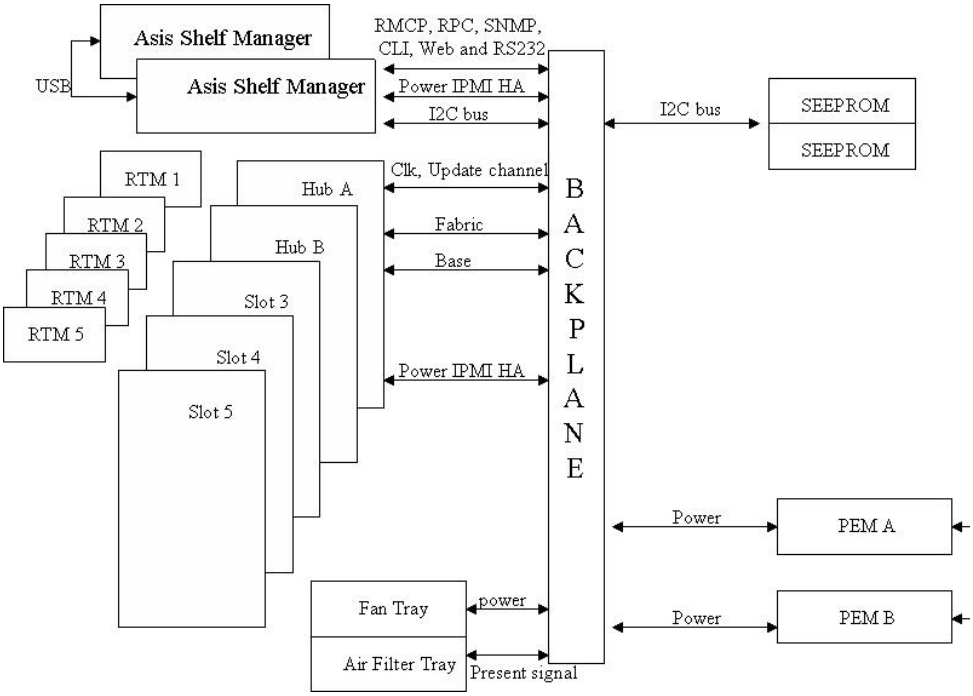

Figure 1 – Shelf Block Diagram

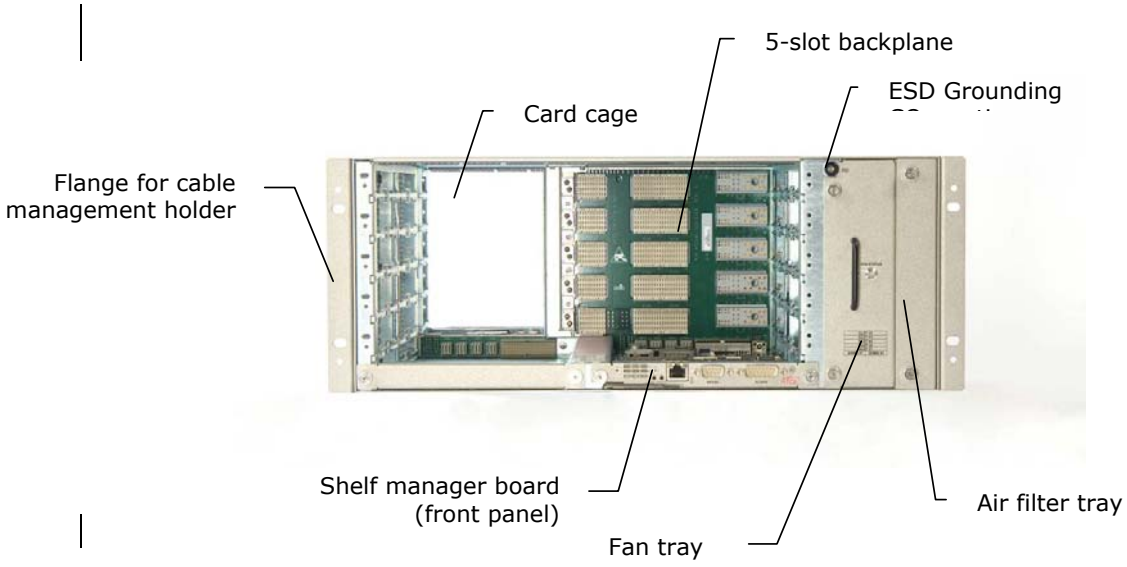

Figure 2 – Shelf Front View

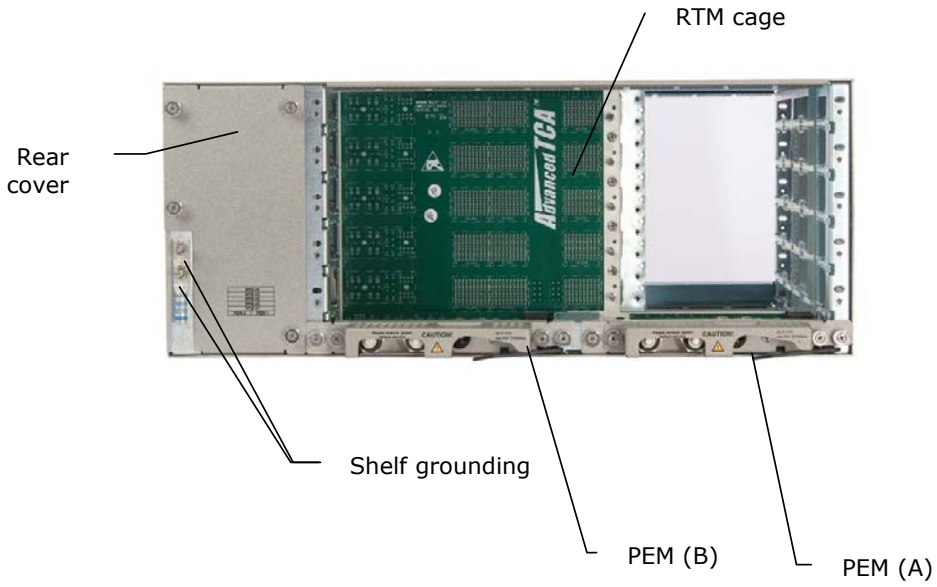

Figure 3 – Shelf Rear View

Figure 4 illustrates the use of cable holders:

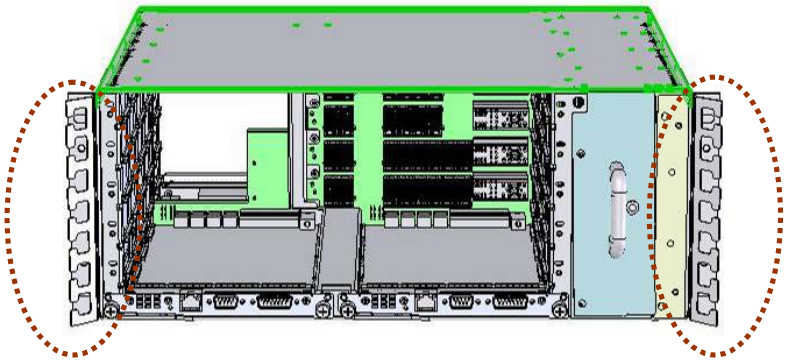

Figure 4 – Shelf Chassis with Cable Holders

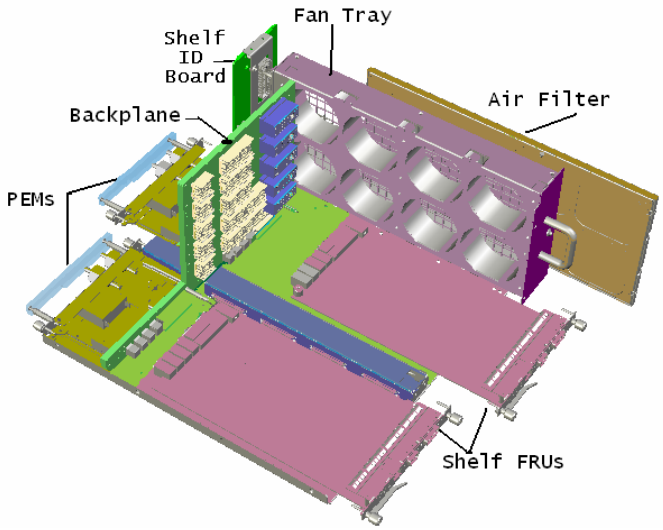

Figure 5 - Shelf Component Positioning

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In order to increase ASIS Effective 5 slot ATCA DC Shelf reliability, and to simplify th shelf's format, only one of the boards installed in the Shelf has logic circuits in it. All boards and FRU's are passive.

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Only the backplane is a fixed board. Remaining boards are removable:

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Fixed Board

- Backplane

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Removable Boards

- PEM – Power-Entry module
- Shelf Management – Shelf manager board (for further details please s the ASIS Shelf Manager Board User Manual).
- Shelf ID: this board hosts two E²PROMs that contain data about the s such as serial number and manufacturer – and about the board's setu such as shelf thermal budget and slot population.

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2.1.2 Card Cage

The shelf's card cage is composed of:

- the backplane
- right and left guide rails to hold the modules that plug into the backp

The card cage supports five 8U front boards, and five 8U RTMs.

The guide rails in the card cage incorporate *electrostatic discharge (ESD)* clips.

2.1.3 Backplane

Features

The ATCA PICMG 3.0-compliant backplane provides interconnectivity between the FRU the shelf manager board. It conforms to the *PICMG 3.0 R2.0 AdvancedTCA Base Specification*. Backplane features include:

- Five slots
- Fabric interface with full mesh interconnect
- The Fabric Interface grid consists of eight differential pairs per channel
  The Base Interface grid consists of four differential pairs per channel
- Dual-star Ethernet signalling environment on the Base interface
- Bussed IPMI (radial IPMI available upon request)
- Two hub slots
- Hub slots are slots 1&2
- update channel between slots 1&2 and 3&4.
- 10, 100 and 1000 BASE-T dual star Base Interconnect capability. Upda
  channel interfaces for active and standby synchronization, and mesh topology handling up to 5Gbps per differential pair.
- Connection capacity for up to five third-party ATCA-compliant front boards, as well as to the redundant Shelf Manager board
  and Power Entry Modules.
- Full compliance with AdvancedTCA™ electrical and mechanical specifications (Basic backplane topology is "full mesh".)
- Interconnect for system power for five slots.
- Base Interface Channel 1 (Shelf manager) of Logical Slot 1 is routed to left dedicated Shelf Manager slot on the ATCA Backplane. Base Interfac Channel 2 (Shelf manager) of Logical Slot 2 is routed to the right dedicated Shelf Manager slot on the ATCA Backplane.

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There are no active components on the backplane, and no removable or serviceable p on the backplane board.

The backplane has two functionally-distinct parts: right and center-left:

- Right backplane (consists of Zone 1 connectors) – dual-power connections, which means the power connections from the two PEMs a independently supplied to each module plugged into the backplane. Th modules also include fuses that protect the backplane power connectio from an electrical short on a module.

- Center left backplane (consists of Zone 2 connectors) – connectivity f the Base, Fabric, and update-channel interface. This portion supports full-mesh topology for both the Base and the Fabric interfaces.

Update-Channel Connections

The update channels are backplane connections between pairs of modules that oper redundant basis. Application software can use the update channel for redundancy int or to provide a direct connection that bypasses the (indirect) fabric interface.
If you configure a pair of modules to use the update channel for redundancy support must insert the two modules into slots linked by an update channel.

Each update channel consists of 10 differential-pair connections. If an update chann connects two modules that are not identical, the Shelf Manager disables the update between them.

Base connection

The Base channels are backplane physical connections witch is comprised of four diff signal pairs each between front cards that operate on a redundant basis

Fabric connection

The Fabric Interface allocates signal pairs differently than the Base Interface.
A Fabric Channel is comprised of two rows of signal pairs for a total of eight signal p per Channel. Thus, each connector supports up to five Channels available for Board Board connectivity. A Channel may also be viewed as being comprised of four 2-pair Ports.

Full Mesh

Mesh topologies provide a direct data path (i.e., Channel) to/from each Board in the as shown in Figure 6, "Mesh topology." In a system consisting of n Slots, there are r Channel from each Slot to all other Slots. That is n x (n–1)/2 Channel in total. A Full Backplane requires a larger number of Backplane trace routes and connector pins pe than the Star configuration but offers several advantages such as system scalability, system redundancy, and physical efficiency. In a Mesh configuration, the Fabric Inte capacity grows with each Board added. For example, a system comprised of 16 Slots capable of delivering a total raw aggregate system bandwidth of 2.4 Tbps, assuming Channel connections among all Slots at a signal rate of 2.5 Gbps per Port (full duple Multiple redundant connections among Boards enable highly reliable systems with gr degradation fault tolerance. Mesh configurations do not utilize a central switch fabric Slots can be used for data forwarding and processing resources, which makes maxin use of the physical system capacity. Another advantage of the Full Mesh topology is reduced startup cost for partially equipped systems. Since the fabric capacity grows you add Boards, there is no need to invest in expensive central fabrics that could ha great deal of unused capacity in lightly loaded systems, improving the economics of (here assuming, that the Star architecture would be based on a higher bandwidth in technology than the compared Mesh architecture). Further, all Slots are identical, wh eases installation and serviceability of the system.
Mesh Backplanes inherently support Star configurations since Hub Boards may be in into Logical Slots 1 & 2 and Node Boards may be installed into all remaining Slots ju done in a Dual Star Backplane.

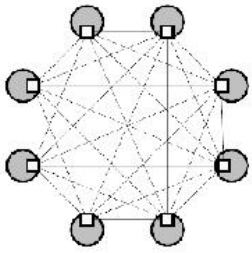

Figure 6 – full mesh topology

Synchronization Clock Interface

The backplane supports a set of synchronization clock buses that can exchange synchronization timing information. This synchronization can be used for system-wide intersystem synchronization purposes, which are important in some applications, such those involving synchronous time division multiplex (TDM).

Row #	Interface	Px20 Connector Pairs								
		ab		cd		ef		gh		
1	Clks	CLK1A+	CLK1A-	CLK1B+	CLK1B-	CLK2A+	CLK2A-	CLK2B+		
2	Update channel & Clks	Tx4(UP)+	Tx4(UP)-	Rx4(UP)+	Rx4(UP)-	CLK3A+	CLK3A-	CLK3B+		
3		Tx2(UP)+	Tx2(UP)-	Rx2(UP)+	Rx2(UP)-	Tx3(UP)+	Tx3(UP)-	Rx3(UP)+		
4		Tx0(UP)+	Tx0(UP)-	Rx0(UP)+	Rx0(UP)-	Tx1(UP)+	Tx1(UP)-	Rx1(UP)+		
The update channels are routed to adjacent slots. Slot 1 connects to Slot 2, and Slot 3 connects to Slot 4.										

Figure 7 – Synchronization clock and update channel pin assignments

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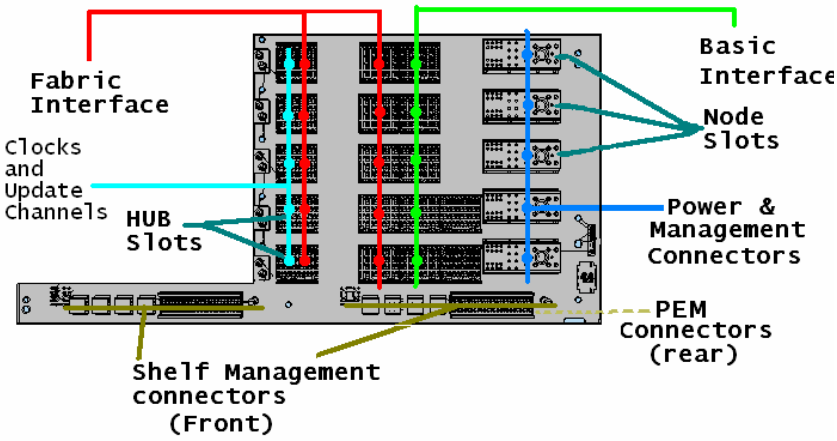

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Figure 8 - Backplane Layout

2.1.4 Module Slot Identification

The shelf is compliant with PICMG 3.0 R2.0, and accepts modules compliant with thi
standard.
Figure 9 illustrates the locations of the module slot allocations when viewed from the
The physical and the logical slot allocations are the same for this shelf: the slots are
numbered 1 to 5 from bottom to top.

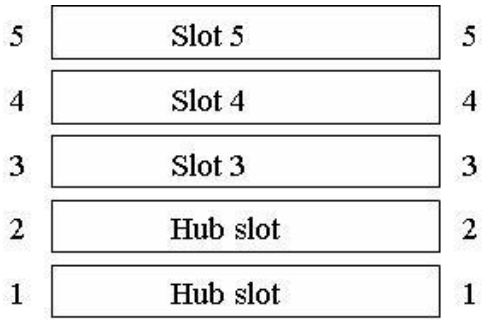

Figure 9 – Slot Allocations

The following table shows the hardware addresses in relation to the slot numbers an
addresses. Slots are shown in the same order as they appear in the shelf: slot 2 abo
1.

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Slot Number	Hardware Address (8 bit format)	Hardware Address (7 bit format)
5	8Ah	45h
4	88h	44h
3	86h	43h
2	84h	42h
1	82h	41h

Figure 10 - Shelf Addressing

2.1.5 Power-Entry Modules (PEMs)

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The Power-Entry Modules (PEMs) provide power filtering and over-current protection
5-Slot ATCA DC Shelf. Each PEM is located on a tray that slides directly into the backp
Each PEM (see Figure 11) provides a -48 VDC/-60 VDC input filter, and is capable of
supplying 100% of shelf power. Each PEM can supply 50 Amps of current.
The dual redundant EMC filtered power feeds provide filtering for conducted emissions

Figure 11 – Power Entry Module

Redundancy

In typical installations the –48 VDC feeds are independent of each other so that if one
fails to supply adequate power, the other feed continues to supply power through a si
PEM. See Figure 12.

Deleted: of the shelf in front view

The first feed (-48V A) is sourced from PEM-A (left side). The second feed (-48V B) is
sourced from PEM-B (right side of the shelf). Both feeds are individually routed to eac
the FRUs. The FRUs isolate the two sources to allow for redundancy.

If one PEM fails, the other PEM can provide all the power needed by the platform. Th
are hot-swappable FRUs, so a failed PEM can be replaced without disrupting the plat
operation.

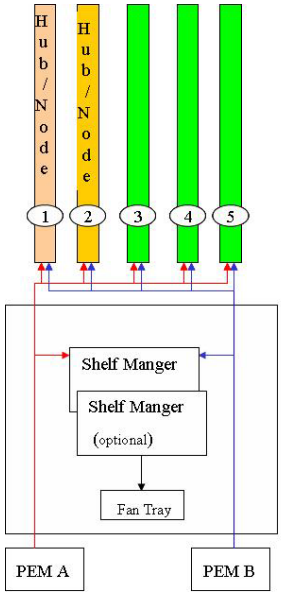

Figure 12 – PEM Distribution of Power on Shelf

Each PEM conditions DC power in a manner that filters electrical noise. The filtering
the platform from noise on the power feeds, and protects the power feeds from elec
noise generated inside the platform.
The -48V power feeds provide power to the backplane connector for all the modules
additional FRU inputs. A single PEM is capable of supplying 200 Watts of power to ea
module slot.

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Grounding Requirements and Power Input

When connecting ground and power cables to the shelf, follow instructions in
beginning of this document.

A readily-accessible disconnect device must be incorporated into the building's wirin
between the shelf's PEM input terminals and the power source. The installed breaker
determined by the voltage of the nominal input.
The supply circuit should be capable of delivering the equipment nameplate ratings
-48V@20A or -60V@20A.
The frame-ground cable must be a high-quality return and safety cable, no smaller t
#10 AWG stranded for -48V.
The PEMs are hot-swappable, which means a PEM can be inserted or removed from
backplane while the system is operating. The remaining installed PEM continues to p
the shelf.

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2.1.6 Fan Tray

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The fan tray is a closed module containing eight 80x80mm fans that supply air volum velocity for cooling the high-density/high-performance computing environment. The c power of the eight fans can dissipate the heat generated by up to five front boards ar complementary RTMs.

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More than 200W for front board and 20W for RTM, per slot is supported.
Six of the fans are dedicated to cooling the front side of the shelf, while two are share between the front side boards and the rear RTM's.
The fan tray is designed with N + 1 redundancy to meet the cooling requirements of a shelf.

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In case of single fan failure, the remaining fans provide the required cooling to dissipa heat generated by the occupied slots.

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It is recommended to replace the fan tray as soon as possible.

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The fan tray is factory-mounted in the Effective 5-Slot ATCA DC Shelf. It is easily replaceable, and can be replaced while the shelf is operating.
For more on shelf cooling, see Section 2.2.

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Figure 13 – Fan Tray

2.1.7 Air Filter Tray

A NEBS-GR63-compatible air filter comes installed on the ASIS Effective 5 slot ATCA I Shelf. The filter is field-serviceable, and can be extracted for periodic field maintenan

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for field replacement.
The filter is easily accessible from front right side of the card cage. A shelf-based micı switch detects the installed filter and reports its presence to the Shelf Manager.
For instructions on air-filter maintenance, see Section 4.1.2.

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Figure 14 – Air filter tray

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2.1.8 Blank Panels with/without air baffles

Compliance with ATCA's temperature specifications requires a steady air flow in the
To insure a steady air flow, either the ASIS Effective 5 slot ATCA DC Shelf must be f
populated, or a blank panel, available from ASIS, must be equipped to fill every emp
The "blank panel" is designed to emulate the air flow restriction in a standard card, t
ensuring the required conditions for proper cooling.
Three types of airflow-management panels are available for the empty slots on the s
These include panels specifically designed for:

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- blank front module panels, with/without air baffle;
- blank RTM panels;
- an empty shelf-manager panel slot.

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Figure 15 - Blank Board Panel and Blank RTM Panel

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2.1.9 Shelf ID Board

A shelf ID board containing two redundant field replaceable E²PROM chips is housed ir
rear of the Effective 5 slot ATCA DC Shelf.
The E²PROMs store product and manufacturer information such as shelf serial number
number, backplane routing assignment, and shelf heat budget.

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When the Shelf Manager board boots up, it compares the information stored in the tw
E²PROMs:

- If E²PROM data coincides, it is loaded and saved in the Shelf manager Board, and the shelf initializes.
- In case of a mismatch, the data on the E²PROMs is compared with the saved configuration in the Shelf manager Board:
  - If the saved configuration matches one of the E²PROMs it is assume to be the right one and it is stored in both E²PROMs.
  - If the three configurations are all different, the Shelf manager boar will not boot up.

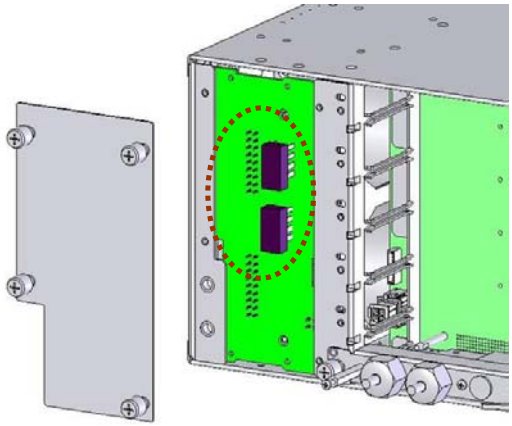

Figure 16 - Shelf ID Board with two E²PROMs (rear cover removed)

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2.1.10 Holder for Cable Management (Optional)

A cable holder frame can be fitted to both side mounting flanges of the shelf.

Cables attached to the cable management holder must be allowed to move fre
Insure that a service loop of minimal required length is maintained.

2.2 Shelf Cooling

2.2.1 Overview

ASIS Effective 5 slot ATCA DC Shelf complies with all the cooling requirements speci
PICMG V3.x specifications.
The cooling system consists of eight high-performance fans. The air comes in from t
side and exits through the left side of the shelf. The fault-tolerant design is optimize
airflow of up to 200W per module.

2.2.2 Fan Tray Design

ASIS Effective 5 slot ATCA DC Shelf ventilation is achieved by eight 80mmx80mm fa
installed in the fan tray. The fans provide for n+1 redundancy.

Figure 17 - Fan Tray

The fan tray connects directly to the backplane, where it plugs into power and contr
connectors. The fan tray unit is front-serviceable, and can be easily replaced without
In order to minimize possible failures, fan tray does not contain any active electronic
components. The shelf manager fully controls the fans speed based on the temperat
across the chassis.

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2.2.3 Performance

The eight fans supply air volume and velocity for cooling the high-density/high-perfo
computing environment. The cooling power of the fans can dissipate the heat genera
up to five front boards and complementary RTMs. At least 200W per front board and
for RTM per slot is supported.

The system maintains its cooling performance even in case of a single fan failure. In
this case, the green LED of the fan tray will turn red, so that it will be easier to find t
failing tray and replace it.

Refrain from clogging air input and exhaust during chassis operation.

Deleted: Ensure that the air entering the shelf remains within the specified maximum temperature limit. If the air temperature exceeds the specified maximum, and the fan tray operating at full speed is unable to maintain the FRUs within their recommended temperature limits, the platform could begin to reduce the thermal load, which could reduce platform performance. This response to excessive temperatures protects the modules from physical damage caused by overheating.¶
If the surrounding temperature exceeds the non-operating temperature limit, the platform could shut down system modules in order to reduce thermal load.¶

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2.2.4 Fan Speed

When the shelf initialize, the fans start at full speed, only after the Shelf Manager finis it's boot, it decide, according to the temperature algorithm to reduce the fans speed. time it reduces the fans speed by 7%.

When a fan tray is inserted into the shelf, (ex: replacement after a malfunction) all th start at full speed and then decrease by steps of 7% , Under normal operating conditi room temperature, the fans run at 21% of full speed. The lower speed reduces the ac noise and increases the longevity of the fans. The Shelf Manager controls the fans thr PWM (pulse-width modulation) method.

The speed of each individual fan is monitored by the Shelf Manager thru discrete char the speed of any of the fans drops below the desired fan speed, the other fans will sp up to compensate. The Shelf Manager logs such events in its system event log (SEL) fault condition. If this occurs, replace the fan tray as soon as possible to restore fault tolerance and redundancy.

3 Installing the Shelf

This chapter provides you with instructions on how to prepare the Effective 5-Slot ATCA DC Shelf for use.
You will be performing some or all of the following setup tasks:

- Site Planning
- Checking Package Contents
- Rack Mounting
- PEM Installation
- Shelf Power-Up
- Third-part Card Insertion

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Before installing the Effective 5-Slot ATCA DC Shelf, you should be aware what cables will be needed for equipment and power, and whether they w be connected in the front or rear of the shelf.

3.1 Tools Required

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

- Standard Philips screwdriver set
- Wrench
- ESD grounding bracelet.

All the modules in the Effective 5-Slot ATCA DC Shelf are field-replaceable units (FRI requiring no special tools for mounting other than those mentioned above.

3.2 Site Planning

Only qualified personnel should be involved with this installation procedure.

The Effective 5-Slot ATCA DC Shelf can be installed either on a standard 19" rack or desk-top unit. All sides of the shelf should be easily accessible.
The prerequisites for setting up the Effective 5-Slot ATCA DC Shelf for use in your fa involves:

- If a rack is used, it should be properly grounded.
- A readily accessible disconnect device must be incorporated into the building's wiring between the shelf's PEM input terminals and the pow source.

- The disconnect device rating required is determined by the nominal inp voltage.
- To ensure sufficient airflow for the individual blades in the shelf, allow least two inches of clearance at the side air inlets and outlets.

3.3 Checking Package Contents

The following items are included in the Effective 5-Slot ATCA DC Shelf package. Check all items in the package are intact.

Use of equipment damaged during delivery could prevent proper functioning o Shelf and/or cause permanent damage to it. Check all pins, screws and other components before using any of the package contents.

- Shelf chassis with backplane
- Fan tray
- Air filter tray
- One or two Power-entry modules (based on what was ordered)
- One or two cable-management holders (based on what was ordered)

3.4 Installation Steps

The following overall procedure is described more in detail in the sections below:

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1. Install the Cable-management tray holder (optional).
2. Mount the chassis in the rack with four screws.
3. Connect the chassis to the site ground with a ground cable.
4. Insert a Shelf Manager board into the right shelf manager slot.
5. Insert the PEMs

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6. Connect the PEMs to -48VDC supply.
7. Power up the chassis by switching the PEM's circuit breakers on.
8. Insert front & rear FRU cards

3.5 Rack Mounting

You will need four M6x10 (or longer) screws to mount the chassis on the rack.
Before you begin:

- Verify that the transient operating temperature in the area of the rack does not exceed the 55°C maximum.
- Confirm the rack is stable so that the weight of the shelf does not caus to tip over.

➔ **To mount the shelf on the rack:**

- Insert the Effective 5-Slot ATCA DC Shelf chassis on the 19" rack, securing it by fastening the four mounting screws.

The shelf should be level, and not positioned at an angle in the rack, an rack's doors should be able to close.

3.5.1 Shelf Grounding

Connect rear grounding screws on the rear left side to insure that the shelf is proper grounded.

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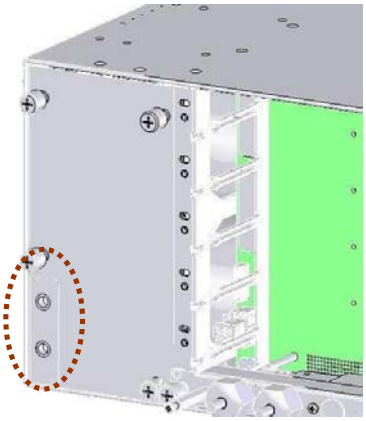

Figure 18 - Rear grounding screws

3.5.2 Installer Grounding

Any person involved in handling the shelf or card installation or replacement required to wear an ESD grounding device.

One grounding sockets can be found on the shelf:

- an ESD grounding socket in the front of the shelf

Field Code Changed

Figure 19 - Front ESD Socket

3.6 PEM Installation

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

Field Code Changed

Figure 20 – Effective 5 slot ATCA DC PEM

1. With the module fastening clip open, slid the module into the slot until it plugs int backplane connector. Lock the clip in place when the module is plugged in, and fa two tumble screws on the front side of the panel.
2. Remove the protection cover by releasing the two tumble screws on the front side the panel.
3. Connect the power cable ends to the positive and negative poles (the hexagonal b on the PEM front side): the positive wire should be connected to the right pole, an negative to the left pole.

   Recommended cable specifications (6mm ring cable terminals):

   - **Positive** wire: 48V – 45A 10AWG red wire 300/600V insulation - WEICO 10AV 3210-2
   - **Negative** wire: 48V – 45A 10AWG black wire 300/600V insulation - WEICO 10AWG 3210-0
4. Make sure the power wires are firmly fastened to their poles.
5. Replace the protection cover.

3.7 Shelf Power-Up

➔ **To power up the shelf:**

1. Connect one PEM to a -48V source.
2. Set the circuit breaker to the **ON** position. In case of overload, the circuit breaker trip.

Deleted: *In this case the PEM card should be replaced*

3. If applicable, connect the second PEM to a power source, and follow the previous steps for the second PEM.

Deleted: Switch the PEM circuit breakers to **OFF** again.¶

4. The shelf manager initial the fans to max velocity & when finishing the booting

process it reduces the fans speed according to the temperature it gets from all the sensors of The shelf.

5. The initial status of the Leds on the shelf is red, only after finishing booting the shel manager they turn green when it finishes all the internal tests.

3.8 Third-part Card Insertion

Third-party cards must be ATCA-compliant.
Third-party cards should be inserted only after the installation, power-up and testing procedures of the 5-Slot ATCA DC Shelf have been completed.
Insert Third-party cards according to the manufacturer's instructions, making sure tl properly-positioned in their slots and are secured to their respective connectors.
When an application card is inserted and powered up, the blue LED should turns on light steady for 10-30 seconds (depending on the card type). After that time, the blu should blink for about 10 seconds, and then go off.
Each third-party card must provide a hot-swap LED. This LED can be in one of the fo states:

Indicator State	Indication
Off	The card is not ready for removal or disconnection from the shelf
Blue	The card is ready for removal or disconnection from the shelf
Blinking slowly	The card is activating itself
Blinking quickly	Brief deactivation has been requested

4 Maintenance And Troubleshooting

This chapter includes instructions regarding:

- Performing Periodic Maintenance
- Handling Electromagnetic Interference
- Extracting Modules
- Handling Alarms
- LED Functions: Application-Defined LEDs

LED	Status	Meaning
A	Green/ red/ bi-color	As defined by application
B	Green	As defined by application
C	Amber	As defined by application

- Hot-Swapping FRUs
- Resetting The System
- Troubleshooting.

As required by the ATCA standard, the 5-Slot ATCA DC Shelf applies a fully hot-swapp approach. Assuming redundancy has been provided for (i.e., two shelf manager boarc and two PEMs), all of the shelf assemblies can be field-replaced with no interruption t normal function.
Visual alarms provide clear indication of trouble for easy problem isolation.

Malfunctions can be responded quickly and easily, as no field repair is necessary. Fail modules can be easily extracted and replaced with no tools or with a minimal set of t

4.1 Performing Periodic Maintenance

This section provides procedural instructions on servicing or replacing shelf componer Maintenance of the 5-Slot ATCA DC Shelf involves the following tasks:

- Fan Tray Visual Inspection
- Air Filter Cleaning And Replacement.

For instructions on mounting the shelf in a rack, see Section 3.5 and the instructions provided by the rack's manufacturer.

4.1.1 Fan Tray Visual Inspection

The fan trays should be checked periodically for any visible damage that could prever disrupt normal fan operation.
See Section 0 for instructions on replacing a fan tray.

4.1.2 Air Filter Cleaning And Replacement

The air filter should be checked regularly. If environmental conditions are good, it m enough to extract the filter and vacuum clean it. Otherwise it might be necessary to it.
The air filter can be ordered separately (i.e., without the metal tray).
Air filter cleaning must be performed in a different location from where the shelf is p The air filter can be extracted without interrupting power. Release the two tumble sc on the front side of the air filter unit and extract the unit by pulling the two tumble s

4.2 Handling Electromagnetic Interference

The shelf emits electromagnetic waves that may interfere with nearby equipment. Conversely, nearby electronic equipment may emit electromagnetic waves that inter with the shelf. The EMC, EMI, and RFI specifications of the shelf and all nearby equip should be considered when choosing the placement of the platform and surrounding equipment.
In the shelf and most other equipment, the use of filler panels in otherwise unoccupi slots is necessary to keep the product's emissions within their specified limits.

- Install front and rear filler panels into any empty slots.
- Do not use blank faceplates in place of fillers.
- Keep slots populated with active modules directly next to each other fillers directly adjacent to the outermost active modules.
- If the shelf experiences unexpected and intermittent data errors, care consider the possibility of electromagnetic interference from nearby equipment as a possible source of the problem.

Deleted: , leaving no empty slots in the final shelf configuration.

Identifying and measuring errors caused by electromagnetic interference can be cha and may require the assistance of engineering personnel with experience in this field If your system configuration does not populate all front slots with active blades, you fill those empty slots with additional blades or slot flow blocker blades to maintain sy airflow and electromagnetic shielding integrity.
Filler panels can be ordered separately.

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4.3 Extracting Modules

4.3.1 Third party board Extraction/insertion

➔ **To extract an ATCA-compliant third party board:**

1. Pull the board's insertion lever slightly.
   The de-activation sequence begins.
2. After the board's blue led lights steady, pull out the board's insertion lever.
3. Pull out the board.

➔ **To insert an ATCA-compliant third party board:**

1. Push the board inside the shelf , make sure it is in the correct gliding rails.

The activation sequence begins.

2. After the board blue led is off , the board should be active , if not please refer to t manufacturer manual.

4.3.2 Power Entry Module Extraction/insertion

If PEM redundancy is implemented, one of the PEMs can be extracted without stoppin service.

➔ **To extract a PEM:**

1. Turn off the circuit Breaker.
2. Turn off power to the PEM from the power supply.
3. Remove the protection cover.
4. Disconnect the power cables.
5. Fully pull out the module's insertion lever.
6. Pull out the module.

➔ **To insert a new PEM:**

1. Push in the module inside carefully .
2. Reconnect the power cables.
3. Reconnect the protection cover , screw back the two thumbscrews .
4. Turn on the power to the PEM.
5. Turn on the circuit Breaker.
6. Check if the Shelf manager recognized the PEM. (please refer to the shelf manage user manual)

4.3.3 Fan Tray Replacement

The shelf should be used only with a fully-operational fan tray. A malfunctioning fan t should be replaced immediately, in order to prevent thermal damage to the installed application cards.

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Use care when handling the fan trays, and do not handle them from the connectors. Improper handling of the fan trays could cause damage to the connector pins.

Do not handle a fan tray while the fans are operating.

➔ **To replace the fan tray:**

1. Without interrupting power, release the two tumble screws on the front side of th tray.
2. Extract the tray by pulling at the handle, as shown at the next page:

Figure 21 – Extracting a Fan Tray

3. Insert the replaceable fan tray unit.

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3. Push each of the two thumbscrews in and tighten.

4.3.4 E²PROM Replacement

E²PROMs are generally installed and handled only in the factory. Follow the procedu below in the rare case that it becomes necessary to field replace the E²PROMs.

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➔ **To replace an E²PROM:**

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Field Code Changed
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1. Without shutting down the system, remove the rear panel, near the two chassis grounding screws, by unscrewing the four tumble screws.
2. With the correct tool such as PLCC extractor or equal, carefully remove the E²PR (U1, U3 or both) from the board.
3. Insert the new E²PROM (U1, U3) into place. make sure it is inserted to the socke the correct manner.
4. Refasten the rear panel using the four tumble screws.

4.4 Handling Alarms

Both visual indicators and software alarms are provided.

4.4.1 Visual Alarms

Nine LEDs at the front of the Shelf Manager card provide visual alarms.

LED Functions: General LEDs

LED	Status	Meaning
ACT	Green	Shelf manager board active
	Red	Shelf manager board failure
	Blink	Shelf manager board inactive
PWR	Green	Local voltage supply on Shelf manager board
	Off	Local voltage failure
HS (hot swap)	Steady Blue	Shelf manager board powering up or ready for extraction
	Blinking blue	Shelf manager board hot swap process
	Off	Shelf manager board operating

LED Functions: Telco Alarm LEDs

LED	Status	Meaning
CRT (Critical)	Off	Normal operation
	Red	System alarm event
MJR (Major)	Off	Normal operation
	Red	System alarm event
MNR (Minor)	Off	Normal operation
	Red	System alarm event

Upon completion of boot-up, LEDs will display as follows:

General LEDs		Telco Alarm LEDs	Application Defined LEDs
ACT	return to normal state	OFF	OFF
PWR	Remains ON		
HS	Lights steady blue for a few seconds, then begins blinking, then goes off after a few blinks		

4.4.2 Software Alarms

The ASIS 5-Slot ATCA DC Shelf supports software alarms according to *PICMG 3.0 Specifications*. Please refer to these specifications for a detailed description.

LED Functions: Application-Defined LEDs

LED	Status	Meaning
A	Green/ red/ bi-color	As defined by application
B	Green	As defined by application
C	Amber	As defined by application

4.5 Hot-Swapping FRUs

Deleted: — including integrated circuits, laser units, relays, and powered mezzanine modules —

All the active components in the platform are mounted on (or housed in) field-replac units (FRUs) that you can easily remove and replace. The subrack, backplane, and o non-FRUs do not contain active components.

All FRUs are hot-swappable: you can remove and insert a FRU without shutting dow other shelf component. Hot swapping facilitates planned maintenance activities and replacement.

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The platform includes front-panel LEDs and a Telco alarm, which can be configured t activate when a hardware or software failure occurs. If an external alarm system is connected to the platform, it will also be activated for the alarm condition. The alarm an operator or technician to replace a failed FRU or perform some other maintenanc operation.

The following procedures are to be used when modules are hot-swapped.

➔ **To remove a module:**

1. Partially open the module's right ejector latch to activate the module's hot-swap switch.

The module's IPMC sends to the Shelf Manager a request to deactivate, and the b hot swap LED blinks at a fast rate.

2. The Shelf Manager determines whether the module can be extracted. If it can, the Shelf Manager grants permission to the IPMC.
3. The IPMC disables the interfaces that are controlled by electronic keying, and shut down the module's operations. It then notifies the Shelf Manager the deactivation complete. The blue LED remains lit.
4. Extract the module.
5. The Shelf Manager reclaims the module's power budget. Also, as part of electronic keying, the Shelf Manager disables—on other modules—the interfaces that are on shared with the deactivated module.

Deleted: When a module is powered up, the sequence is similar to the one below, excluding ejector-latch activity.¶

To insert a module:¶

1. After the IPMC powers up and the blue hot-swap LED is lit, close both ejector latches. ¶
2. Push each thumbscrew in and tighten.¶

The following sequence occurs:¶

3. IPMC announces the module's presence to the (active) Shelf Manager, and the blue LED blinks at a slow rate.¶
4. The Shelf Manager queries the IPMC, builds a sensor data record (SDR) repository, and begins periodically monitoring the presence of the module.¶
5. The Shelf Manager activates the module, and the module acknowledges activation.¶
6. The Shelf Manager determines the power and cooling budget, and sets the module's power level.¶
7. The Shelf Manager, based on electronic keying, enables compatible backplane ports.¶
8. The module notifies the Shelf Manager that it is active, and the blue hot-swap LED turns off.¶
9. The Shelf Manager continues to periodically monitor the presence of the module.¶

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4.6 Resetting The System

One or both of the following reset options should be used if the shelf manager card is responding. (The second step should be performed only if the first one has not solved problem.)

1. Press the Reset button on the Shelf Manager card front panel.
2. Extract the Shelf Manager card from the chassis (in case of one Shelf Manager ca installed), and re-insert it.

4.7 Troubleshooting

The following table summarizes potential problems and recommended solutions.

Problem	Probable cause	Solution
shelf manager does not boot up properly: One or more of the LEDs fails to light during boot-up. The LEDs fail to return to their status as described in Section 4.4.1, above. The blue LED does not blink.	shelf manager is not in fully inserted in the cage. shelf manager malfunction.	Check that the shelf manager board is properly inserted in the cage; Verify that the ejector cli is closed. Replace the shelf manager.
Fans fail to operate at power up	fan tray is not in fully inserted in the cage. shelf manager is not in fully inserted in the cage. Shelf manager board malfunction.	Replace fan tray. Replace the shelf manager.
Fan speed does not decrease after boot-up is completed	Shelf manager board malfunction.	Replace the shelf manager.
Fan tray LED is lit red	One or more of the fans are not working. Logic malfunction.	Pull the fan tray slightly out for few seconds until all fans stop spinning, and re-insert it. Replace fan tray. Replace shelf manager following this sequence: Insert a second shelf manager i the redundant slot; Issue a switchover command tc switch shelf control from the current shelf manager to the redundant one.
Circuit Breaker trips off	Chassis power trouble.	Remove all third-party and shel manager to isolate the malfunction. Replace Power Entry Module.
Boot sequence does not complete, and the blue LED continues to blink after the Shelf managercard has been replaced and all relevant monitor commands have been performed	One of the Backplane's connectors is damaged. One of the cage units, or the ATCA board, does not fit properly in the cage.	Replace E²PROMs. if you have not yet done so; Replace chassis.

5 System Specifications

This chapter documents the product's standards certification, and physical and other technical specification parameters.

5.1 Certification

The 5-Slot ATCA DC Shelf is targeted for NEBS level-3 and UL. It complies with the following:

- CE and FCC certification.
- Advanced TCA, PICMG 3.x
- IPMI v 1.5.

Deleted: <#>NEBS Level-3 and ETSI¶

5.2 Technical Data

The following table presents technical specifications for each of the product elements.

Category	Property	Description/ Value
Physical		
	Number of slots	5 slot 8Ux280mm, front blades; 5 slot 80mm, RTMs
	Dimensions	177.8 mm (4U)"H x 448mm (17.637")W (19" rack mount) x413.4mm (16.275")Depth not including handles & cable holders
	EMI	EMI gasketing and hardware spacing to support FCC part B
	Weight	17Kg
	Compliance	PICMG 3.0 R.2.0
	Temperature	Humidity : 5% to 95%, non-condensed Storage Temperature: -40° to +70° Celsius Operating Temperature: 5° to +55° Celsius
	Other	Front and rear ESD jack Front rack flanges Front cable management tray

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Category	Property	Description/ Value
Accessibility		
	Front	Shelf Manager, Fan Tray, Front boards, Air Filter Tray
	Rear	PEMs, RTMs
Backplane		
	Bus architecture	Up to five third-party ATCA-compliant front boards, full mesh, dual redundant Shelf manager boards, bussed IPMB (radial by request).
	Signal bandwidth rating	Supports up to 5Gbps per differential pair.
	Base interface	Base channel interconnect between two ATCA slots, wi support for 10/100/1000 BASE-T Ethernet; base channel 1 is allocated to Shelf manager (Shelf Management Controller)
	Fabric interface	Fabric channel interconnect between two ATCA slots; Replicated fabric channel upon request.
	Hub slots	2 logical slots 1 & 2;
	Update channels	Update channel between slots 1&2 and 3&4
Power		
	DC input (Nominal)	-48 VDC/-60 VDC; one feed per PEM (A or B), designe to carry 25Amp
	Redundancy	Dual redundant PEM modules, each capable of supplying 100% of shelf power
	EMC filtering	Dual redundant EMC filtered power feeds; PEMs provide common-mode and differential-mode filtering for conducted emissions, reducing differential-t common-mode conversion.

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Technical Data

Category	Property	Description/ Value
Cooling		
	Number of fans	Front hot-pluggable fan tray with 8, N+1, axial fans for front and RTM slots
	Redundancy	N+1 (i.e., any one fan can fail with no service degradatio
	Fan speed	Variable speed under shelf manager control
	Cooling capacity	up to 200 Watt per front board, 20W per RTM slot - temp. rise: <9[C]
Alarm I/O		
	Electrical/Mechanical Placement	Dual redundant Alarm I/O Modules accessible from front chassis
	Alarm I/O interfaces	15-pin DA-15P connector. Supports 4 outputs (Major, Minor, Critical, Power) and 2 inputs (Major & Minor Reset)
Regulatory		
	Safety	Designed to meet UL, TUV requirements
	CE & FCC	Complies with CE & FCC part 15 requirements
	Environment	Designed to be Compatible with NEBS level-3 and ETSI
Other		
	Shelf identity	Configuration board with on-board EEPROM stores shelf serial number, part number, backplane routing assignments, shelf heat budget and other data.
	Removable top cover	Available

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5.3 Acronyms Used in this Manual

Acronym	Meaning
ATCA	Advanced Telecom Computing Architecture
FRU	Field-Replaceable Unit
HS	Hot swap
PEM	Power Entry Module
IPMB	Intelligent Platform-Management Bus
IPMI	Intelligent Platform-Management Interface
RTM	Rear Transmission Module
NEBS	Network Equipment-Building Systems
Shelf manager	Shelf Manager Board
ETSI	European Telecommunications Standards Institute
ANSI	American National Standards Institute
CE	"Conformité Européene" ("European Conformity")
FCC	Federal Communications Commission
UL	Underwriters Laboratories - safety standards
CFM	Cubic Feet per Minute – Airflow measurement unit

Operating Environment

Temperature	Storage temperature: -40°C to +705°C.????? Operating temperature: 0°C to +55°C.
Humidity	-5% to 95% (non condensed).
Vibration	Severe vibration can damage components לא הייתי כותב את זה????.
Air	The air surrounding the product should be dust-free and should not contain corrosive gasses or other materials that could adversely effect the product.