Embedded Computing for
Business-Critical Continuity™

AXP 1410

Installation and Use

P/N: 6806800H70D

October 2010

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Network Power

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Overview of Contents

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- Chapter 2, *Site Preparation,* on page 35, provides general information such as unpacking the system, requirements, dimensions and weight.
- Chapter 3, *System Installation, on page 45* describes how to install, power up and power down the system.
- Chapter 4, *FRU Installation,* on page 61 describes how to install field replaceable units, such as boards, power entry modules or fans.
- Chapter 5, *Configuring and Operating the System,* on page 79 gives information on network management, software, accessing system components, and power and cooling subsystems.
- Chapter 6, *Supported IPMI Commands,* on page 119 lists standard, PICMG, and Emerson-specific IPMI commands.
- Chapter 7, *FRU Information and Sensor Data Records,* on page 123 lists FRU information and SDRs of PEMs and FTMs.
- Chapter 8, *Shelf Management Alarm Module,* on page 171 describes the shelf management alarm module.
- Appendix A, *Related Documentation,* on page 191 lists relevant documentation and specifications.
- *Safety Notes* on page 193 lists all safety notes relevant for this system.
- *Sicherheitshinweise* on page 205 is a German translation of the safety notes chapter.

Abbreviations

This document uses the following abbreviations:

Abbreviation	Definition
ACO	Alarm Cut-Off
ADP	Alarm Display Panel
AMC	Alarm Management Controller
ANSI	American National Standards Institute
ARP	Address Resolution Protocol
AWG	American Wire Gauge
BBS	Basic Blade Services
CISPR	Comité Internationale Spécial des Perturbations Radioelectrotechnique
CLI	Command Line Interface
CO	Central Office
CSA	Canadian Standards Association
DHCP	Dynamic Host Configuration Protocol
ECC	Error Correcting Code
EMC	Electromagnetic Compatibility
EMI	Electromagnetic Interference
EMV	Elektromagnetische Verträglichkeit
ESD	Electrostatic Discharge
ETS	European Telecom Standard
ETSI	European Telecommunication Standards Institute
FAE	Field Application Engineer
FCC	Federal Communications Commission
FCU	Firmware Upgrade Utility
FPGA	Field Programmable Gate Array
FRU	Field Replaceable Unit

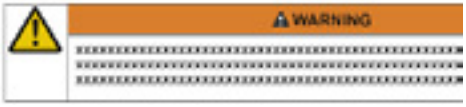
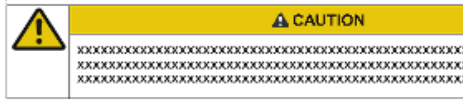
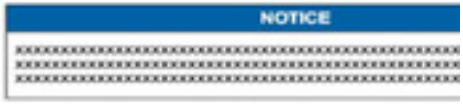
Abbreviation	Definition
FTM	Fan Tray Module
FUMI	Firmware Update Management Instrument
GA	General Availability
GPIO	General Purpose Input/Output
GND	Ground
HPI	Hardware Platform Interface
HRI	Hardware Redundancy Interface
I^2C	Inter-integrated Circuit
I/O	Input/Output
ID	Identifier
IEC	International Electrotechnical Commission
IEEE	Institute of Electrical and Electronics Engineers
IP	Internet Protocol
IPM	Intelligent Platform Management
IPMB	Intelligent Platform Management Bus
IPMC	Intelligent Platform Management Controller
IPMI	Intelligent Platform Management Interface
IS	In Service
LED	Light Emitting Diode
LUN	Logical Units
NEBS	Network Equipment Building System
NetFn	Network function (code)
OEM	Original Equipment Manufacturer
OOS	Out Of Service
PCI	Peripheral Component Interconnect (bus)
PE	Primary Earth
PEM	Power Entry Module
PICMG	PCI Industrial Computer Manufacturers Group

Abbreviation	Definition
PN	Part Number
RFI	Radio Frequency Interference
RFS	Root File System
RMCP	Remote Management Control Protocol
ROM	Read Only Memory
RTM	Rear Transition Module
RoHS	Directive on the restriction of the use of certain hazardous substances in electrical and electronic equipment
S/N	Serial Number
SA	Shelf Address
SAM	Shelf Management Alarm Module
SDR	Sensor Data Record
SELV	Safety Extra Low Voltage
SGA	Shelf Geographical Address
ShMC	Shelf Management Controller
ShMM	Shelf Management Mezzanine Module
SNMP	Simple Network Management Protocol
SOC	System On a Chip
SSH	Secure Shell
TBD	To Be Defined
TDM	Time-Division Multiplexing
TNV	Telephone Network Voltage
TPE	Twisted-Pair Ethernet
UL	Underwriters Laboratory
VCCI	Voluntary Control Council for Interference
VDC	DC Voltage
VLAN	Virtual Local Area Network

Conventions

The following table describes the conventions used throughout this manual.

Notation	Description
0x00000000	Typical notation for hexadecimal numbers (digits are 0 through F), for example used for addresses and offsets
0b0000	Same for binary numbers (digits are 0 and 1)
bold	Used to emphasize a word
`Screen`	Used for on-screen output and code related elements or commands in body text
`Courier + Bold`	Used to characterize user input and to separate it from system output
Reference	Used for references and for table and figure descriptions
File > Exit	Notation for selecting a submenu
<text>	Notation for variables and keys
[text]	Notation for software buttons to click on the screen and parameter description
...	Repeated item for example node 1, node 2, ..., node 12
. . .	Omission of information from example/command that is not necessary at the time being
..	Ranges, for example: 0..4 means one of the integers 0,1,2,3, and 4 (used in registers)
|	Logical OR

Notation	Description
	Indicates a hazardous situation which, if not avoided, could result in death or serious injury
	Indicates a hazardous situation which, if not avoided, may result in minor or moderate injury
	Indicates a property damage message
	No danger encountered. Pay attention to important information

Summary of Changes

This manual has been revised and replaces all prior editions.

Part Number	Publication Date	Description
6806800H70A	April 2009	First edition
6806800H70B	July 2009	Second edition
6806800H70C	July 2010	Removed F120 support Updated sections 5.2, Network Management and 5.3, Accessing System Components Corrected FTM Temperature Sensor tables Centellis 4410 is renamed to AXP 1410
6806800H70D	October 2010	Added Chapter 8, *Shelf Management Alarm Module*, on page 171.

Comments and Suggestions

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In "Area of Interest" select "Technical Documentation". Be sure to include the title, part number, and revision of the manual and tell us how you used it.

1.1 Description

The AXP 1410 system is a high availability AdvancedTCA (Advanced Telecom Computing Architecture) system. The *PICMG 3.X AdvancedTCA Specifications* define components for high-performance services solutions. It is an architecture for highly-available and scalable high-speed interconnect technologies.

A high-availability system consists of software and redundant hardware to ensure five-nines (99,999%) uptime. This means that a system is unavailable for no more than 5.26 minutes per year.

Your system is equipped with the following components

- Dual star backplane with base and fabric interface providing connector interfaces for power distribution, input/output connectivity between front blades and mechanical alignment and support
- Subrack providing attachment points for backplane, alignment, support and mechanical engagement for insertion and extraction of front blades and RTMs
- Two Emerson SAM1410 shelf manager boards with integrated alarm boards
  Each AdvancedTCA blade and Field Replaceable Unit (FRU) provides connections to the shelf manager through an Intelligent Platform Management Bus (IPMB).
- 12 node slots which can be equipped with AdvancedTCA blades
- Two hub slots which can be equipped with AdvancedTCA hub blades
- 14 slots at the system's rear side which can be populated with 14 RTMs
  These RTM connections provide user-defined input and output connectivity to the corresponding front blades.
- Two DC hot swappable 2N+1 redundant Power Entry Modules (PEM)
- Fan Tray Modules (FTM)
- Alarm Display Panel (ADP) for telco alarms located on the front of the chassis

- Air filter
- ESD wrist strap sockets and grounding studs

Figure 1-1 System Front View

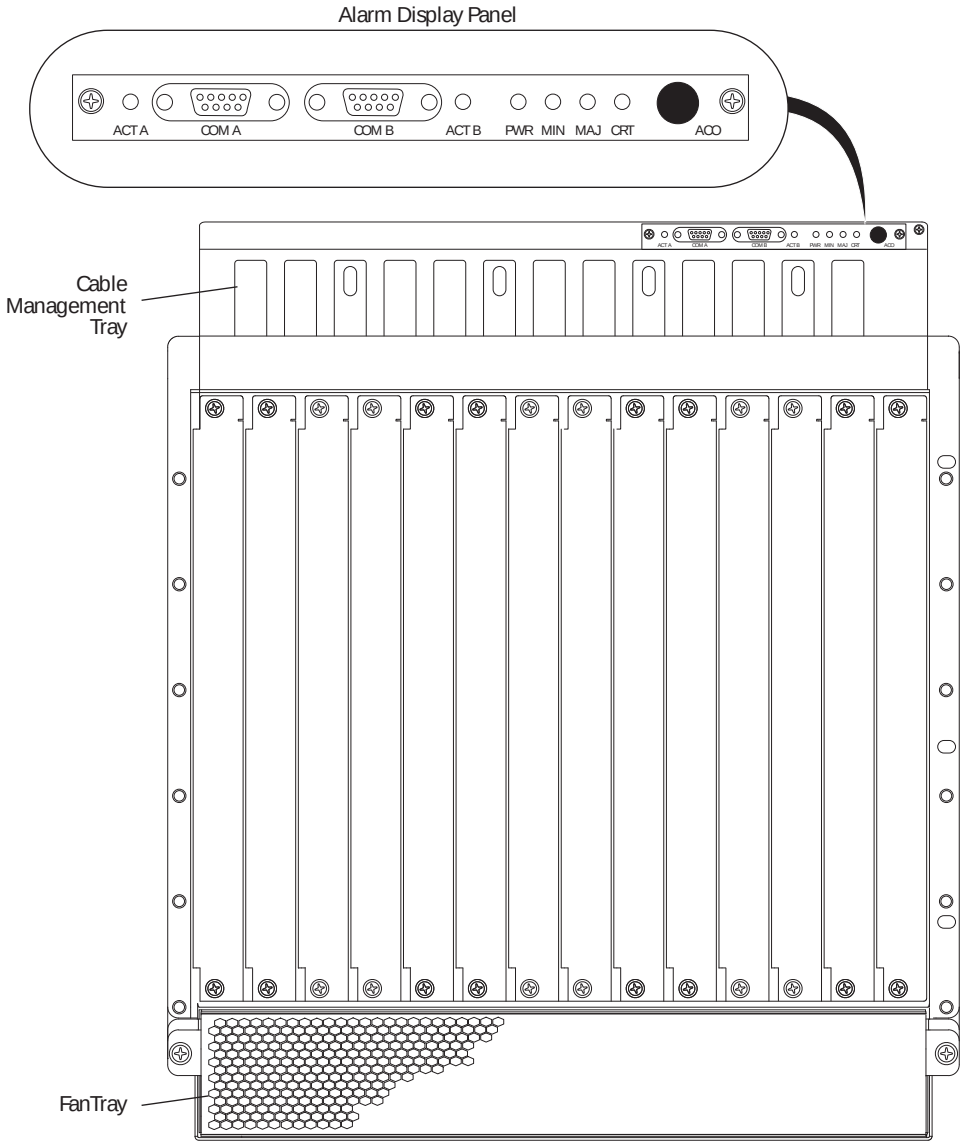
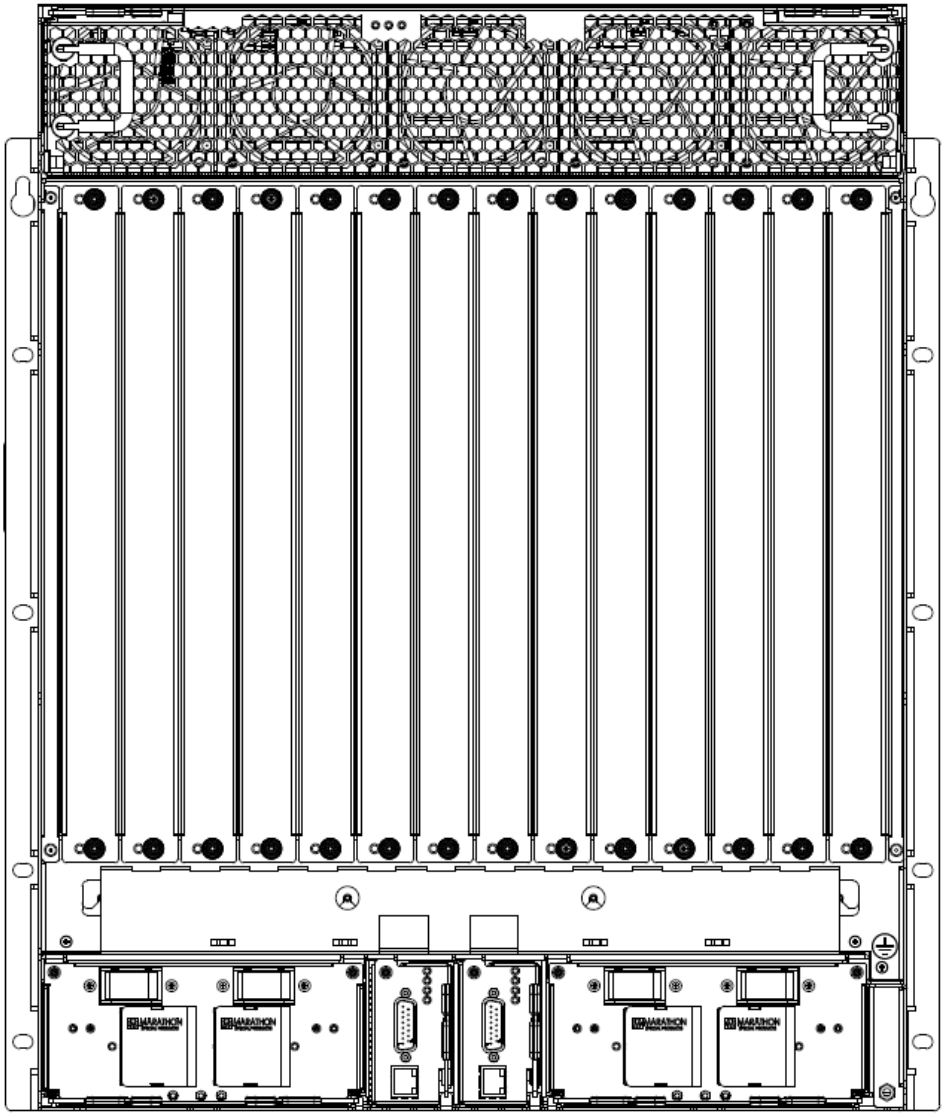


Figure 1-2 System Rear View



1.1.1 Shelf

The AXP 1410 shelf consists of a formed 13U sheet metal card cage with structure and support for the backplane, PEMs, FTMs, SAMs, and 14 card slots. Figure 1-1 on page 24 provides a front view of the shelf, Figure 1-2 on page 25 provides a rear view of the shelf.

The enclosure mounts in a 19" rack or optional EIA 23" rack. Mounting holes for bezel brackets are provided, which allows the use of power supply or card cage (customer designed) bezels.

1.1.2 Backplane

The backplane is fully compliant with the *PICMG 3.0 R2.0 Specification* and it has been designed with the following features:

- Two hub slots
- 12 node slots
- 14-slot fabric interface with dual star interconnect
- Base interface with dual star interconnect
- Base interface to the shelf manager slots
- Update interface between physical adjacent slots
- Bused IPMB-0 connections
- Synchronization clock buses

1.1.3 Shelf Manager

The shelf manager SAM1410 is designed to be used in AdvancedTCA systems. It is the central management unit of the shelf. Its purpose is to monitor, control and assure proper operation of the shelf and all other components of the AdvancedTCA shelf.

It reports anomalies and errors and takes corrective actions if required (for example, increase the speed of the fans). The SAM1410 has access to detailed inventory information as well as sensor status information of the shelf and all components of the shelf.

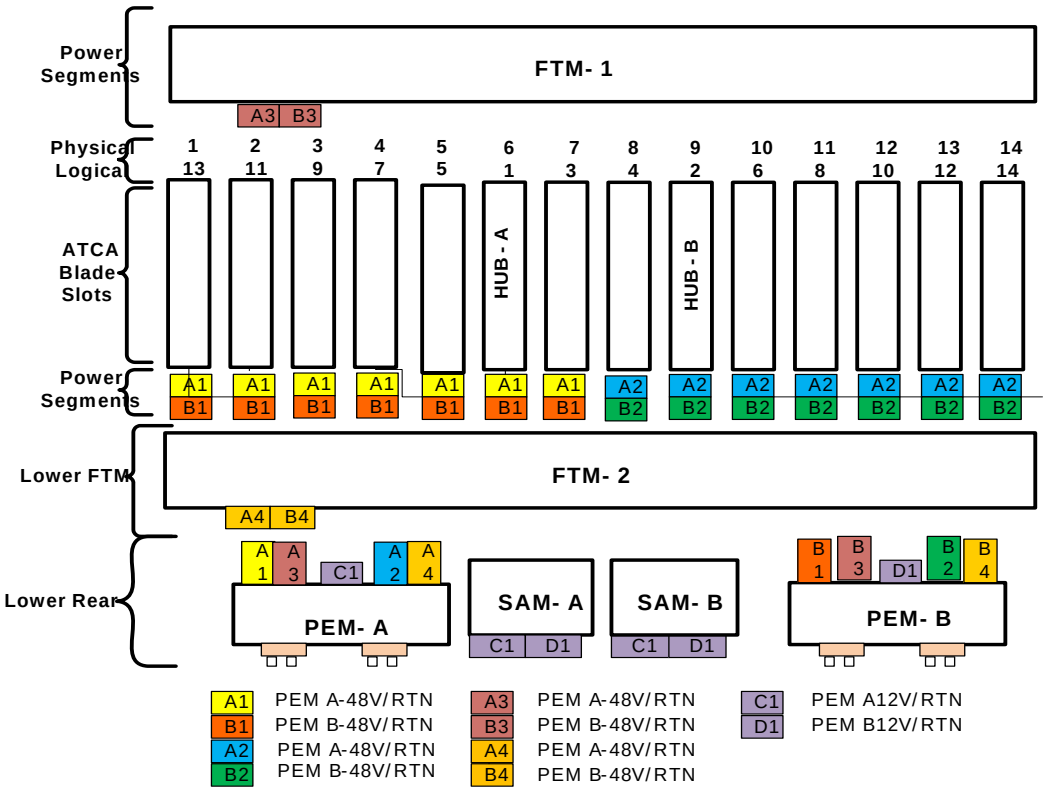
The SAM1410 is fully compliant to the shelf management functions as specified in the *PICMG 3.0 R2.0 Specification*.

For a detailed description refer to the *SAM1410 Installation and Use* and the *System Management Interface Based on HPI-B (Centellis CO 31kX/4100/2000/4410)*.

1.1.4 Blades

The backplane in a AXP 1410 system provides 12 node slots. They are located to the left and to the right of the two hub slots in the middle.

Figure 1-3 Slot Distribution



The node slots can be equipped with AdvancedTCA blades. Emerson provides several high-performance, single slot, hot-swappable node blades.

1.1.5 Hub Slots

The hub slots are configured as option 9 dual star PICMG 3.0 base interface and PICMG 3.1 10Gb fabric interface.

1.1.6 Rear Transition Modules

The AdvancedTCA blades can be connected to Rear Transition Modules (RTM) to provide easy access to I/O signals through the zone 3 connector defined by the AdvancedTCA specification.

The Emerson RTMs can be used as rear expansion boards for node blades and for the switch to access the different interfaces on an AdvancedTCA blade through the RTM face plate.

1.1.7 Power Entry Modules

The Power Entry Module (PEM) is a Field Replaceable Unit (FRU) and can be replaced while the system is on, but the power for the PEM being replaced (PEM A or PEM B) must be shut down at the external source. Replacement can take place in under 30 minutes by a trained service person.

The PEMs are accessible from the rear of the shelf and connect to the PEM connectors on the backplane. A removable plastic housing covers the power feeds and returns to prevent accidental shorting. The PEM also features an injector/ejector handle that provides the hot swap mechanism for signalling the state of the PEM prior to removal.

The PEMs are hot-swappable and will not cause a fault when one is removed for replacement. Two PEMs are required to support 2N+1 redundancy. If your system is configured for redundant operation using two power feeds, they operate in load sharing where the total load is equal to or less than what one power feed can provide.

1.1.8 Fan Tray Modules

The AXP 1410 supports two fan trays in a push/pull configuration. Each fan tray contains five dual counter rotating fans. The lower fan tray is accessible from the front of the chassis and contains the replaceable air filter. The upper fan tray is located in the rear of the chassis.

1.1.9 Fan Filter

The fan filter is installed in the lower fan tray.

1.2 Standard Compliances

The product meets the following standards:

Table 1-1 Standard Compliances

Standard	Description
PICMG3.0 R2.0,	Defines mechanics, board dimensions, power distribution, power and data connectors, and system management.
UL 60950-1 EN 60950-1 IEC 60950-1 CAN/CSA C22.2 No 60950-1	Safety Requirements (legal)
CISPR 22 CISPR 24 EN 55022 EN 55024 EN 300386 FCC Part 15 Industry Canada ICES-003	EMC requirements (legal) on system level (predefined Emerson system)
NEBS Standard GR-63-CORE NEBS Standard GR-1089-CORE ETSI EN 300 019 series ETSI ETS 300 753	The product has been designed to meet these environmental requirements.
ETSI EN 300 132-2	Power requirements
Directive 2002/95/EC	The product has been designed to meet the directive on the Restriction of the use of certain Hazardous Substances in electrical and electronic equipment (RoHS).

The product has been designed to meet the directive on the Restriction of the use of certain Hazardous Substances in electrical and electronic equipment (RoHS) Directive 2002/95/EC.

WEEE Compliance

4363 0205

To satisfy the requirements for marking electrical and electronic equipment in accordance with article 11 (2) of Directive 2002/96/EC, Waste from Electrical and Electronic Equipment (WEEE), Emerson includes a crossed-out bin symbol on all standard and noncustom chassis product. This marking fulfills the requirement set out by WEEE that a producer of an electrical or electronic appliance that bears their trade name and is put on the European Union market after 13 August 2005, places a clearly identifiable mark on the equipment and that this mark signifies that equipment is to be reprocessed or recycled using authorized recyclers and processes. This minimizes the disposal of unsorted municipal waste, achieves a high level of separate collection of WEEE, and ensures the environmentally sound disposal of electrical and electronic equipment placed on the market after 13 August 2005. To dispose of equipment marked with the WEEE symbol, Emerson has contracted with certified companies that can reprocess this equipment per European Union requirements. Please visit the Emerson web site or contact your Emerson representative to find out who to contact and how to dispose of the equipment.

1.3 Ordering Information

When ordering variants or spare parts for your system, use the order numbers given on the following pages. To make sure that you are ordering spare parts that can be used with your system, check the system identification label placed at the rear side of the system to find information about the system variant, its order number and revision.

As of the printing date of this manual, the AXP 1410 Installation and Use supports the system models listed below. Consult your local sales representative for ordering information on spare parts not listed.

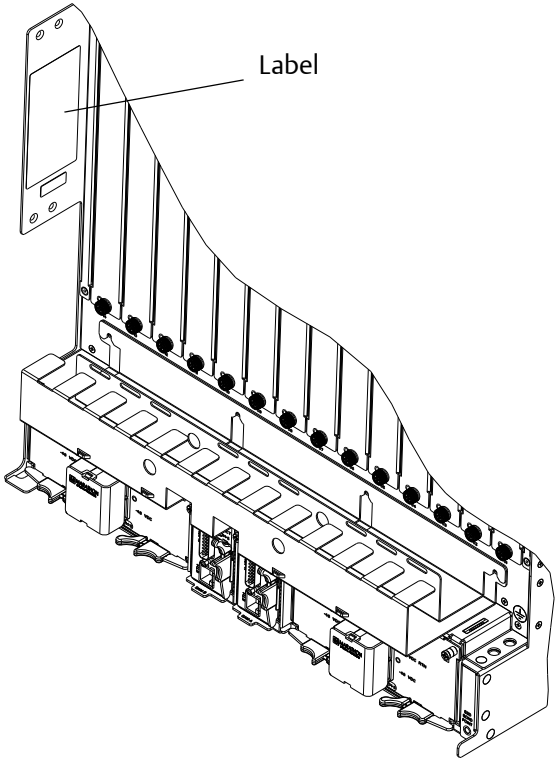
Table 1-2 Order Numbers

Order Number	Description
AXP1410	AdvancedTCA shelf - 14 slot, 19", 13U - 10G backplane
UFT-1440	Upper fan tray module for AXP1440 shelf
LFT-1440	Lower fan tray module for AXP1440 shelf
SAM1410	Shelf manager for AXP1410 shelf
PEM1620	Power entry module for AXP1620 and AXP1440
AXP-F-FILL-PANEL-F	Blank filler panel, AXP1620 & AXP1440 - front
AXP-R-FILL-PANEL-F	Blank filler panel, AXP1620 & AXP1440 - rear

1.4 Product Identification

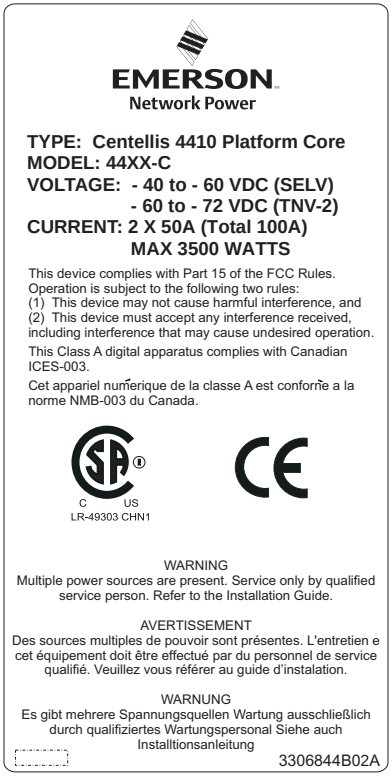
You can find the system label at the back of the system on the left.

Figure 1-4 System Label Location



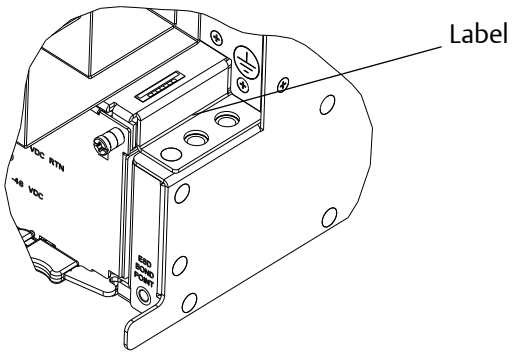
The following figure shows a sample label. The actual label on your product may vary in content.

Figure 1-5 System Label Example



The label with the serial number is located at the back of the system on the right.

Figure 1-6 Serial Number Location



The following figure shows a sample serial number label.

Figure 1-7 Serial Number Label Example

2.1 Overview

The following sections help you to prepare system installation:

Section	Gives Information On
Site Planning Considerations	This section includes information on unpacking and inspecting the system, requirements, technical data, and other information you need to know before you start system installation.
Site Planning Checklists	This section provides checklists for site preparation.

2.2 Site Planning Considerations

This section provides information to prepare the site and the shelf for installation.

2.2.1 Receiving and Unpacking the System

NOTICE

Damage of Circuits
Electrostatic discharge and incorrect module installation and removal can damage circuits or shorten their life.
Before touching the module or electronic components, make sure that you are working in an ESD-safe environment.

Shipment Inspection

To inspect the shipment perform the following steps:

1. Verify that you have received all items of your shipment.
   Compare the shipment thoroughly with the delivery note.
2. Visually inspect the shelf to ensure that all of the connector pins are straight, shrouds are properly seated, screws are tight, etc..

3. Check the rails for proper alignment.
4. Check that the air filter is properly installed.
5. Check that the cable connections are secure and properly fitted.
6. Check the EMI gaskets for damage.
7. Check the items listed above for damage and report any damage or differences to the customer service at www.emersonnetworkpower.com/embeddedcomputing.
8. Tighten loose screws before proceeding.
9. Remove the desiccant bags delivered together with the system and dispose of them according to your country's legislation.

The product is thoroughly inspected before shipment. If any damage occurred during transportation or any items are missing, please contact our customer's service immediately.

2.2.2 Site and Installation Planning

Planning basic site and installation requirements you have to consider the following issues:

1. Is adequate power for the AXP 1410 system available?
2. Can the system be positioned in a way that -48 to -60V DC power source is easy to reach?
3. Are racks with sufficient space to install the system available?
4. Is suitable equipment available to lift the system into the rack?
5. Is there enough space to run a system console terminal? Is the cable long enough to reach the system?
6. Are the inlet and outlet of the fans and therefore the airflow not blocked?

2.3 Requirements

Before and during system installation and operation, you always have to ensure that the requirements listed in the following sections are met.

2.3.1 Environmental Requirements

To ensure proper function of the system, make sure that the environment in which the system is to be used fulfills the environmental requirements.

The environmental values must be tested and proven in the planned system configuration, that means the delivered system and other third-party products you want to integrate.

Operating temperatures refer to the temperature of the air circulating at the air intake of the system and not to component temperatures.

Some of the climatic values may exceed the specification of some system components (for example hard disks). As Emerson cannot guarantee the functionality of third party products that are handled or operated out of their specifications, the environmental conditions may be limited to the specifications of these components.

The following table lists the environmental requirements.

Table 2-1 Environmental Conditions

Feature	Operating	Non-Operating (packed state)
Temperature	+5ºC (41°F) to +40ºC (104°F) (normal operation) according to NEBS standard GR-63-CORE -5°C (23°F) to +55°C (131°F) (exceptional operation) according to NEBS standard GR-63-CORE	-40°C (-40°F) to +70°C (158°F)
Temp. change	+/-0.25°C/min according to NEBS standard GR-63-CORE	+/-0.25°C/min
Relative humidity	5% to 90% non-condensing according to Emerson-internal environmental requirements	5% to 95% non-condensing according to Emerson-internal environmental requirements

Table 2-1 Environmental Conditions (continued)

Feature	Operating	Non-Operating (packed state)
Shock	Half-sine, 11 ms, 30 m/s^2	Blade level packaging Half-sine, 6 ms at 180 m/s^2
Vibration (tested in target platform)	0.1g from 5 Hz to 100 Hz and back to 5 Hz at a rate of 0.1 octave/minute	5-20 Hz at 0.01 g^2/Hz 20-200 Hz at -3.0 dB/octave Random 5-20 Hz at $1m^2/s^3$ Random 20-200 Hz at -3 dB/octave
Free fall	-	300mm (11.8 in) (packaged) 25mm (1 in) (unpackaged) per GR-63-CORE fully populated system
Noise	ETSI ETS 300 753 (October 1997) Telecommunication equipment rooms (attended): 7.2 bel Measurement of "declared A-weight sound power level" All values are applicable to normal operating conditions (~23°C). NEBS GR-63-CORE, Issue 3 Telecommunication equipment rooms (attended): 78 dB Measurement of "declared A-weight sound power level" All values are applicable to normal operating conditions (~27°C).	-

- **The ambient temperature around the shelf and the air inlet temperature must not exceed 55°C (131°F).**
- **The AXP 1410 system regulates the fan speed based on the temperature sensors present in the system. The fan speed is adjusted to the lowest speed which still keeps the evaluated temperature readings below or at their respective "upper non-critical threshold". Hence, the fan speed depends on the ambient temperature, blade design, temperature threshold settings, and system configuration.**

2.3.2 Power Requirements

Make sure that a suitable -40.0 to -72 VDC power source is within reach of the system. Two power entry modules (PEMs) can be installed in the system.

⚠ WARNING

Personal Injury or System Damage
The system is supplied by a TNV-2 voltage. This voltage is considered hazardous. Make sure that the external power supply meets the relevant safety standards. Ensure that TNV-2 is separated from dangerous voltages (mains) through double or reinforced insulation.

Table 2-2 System Power Requirements

Feature	Value
Voltage and input current	Voltage: -40 to 60 VDC (SELV) -60 to -72 VDC (TNV-2) Current: 80 X 2 (160 A Total)
Chassis idle power	170 W
Chassis maximum power	870 W

When installing additional blades or modules, make sure that the power consumption of all installed modules does not exceed the system's maximum power dissipation.

2.4 Dimensions and Weight

The table below lists the dimensions and weight of the shelf and system components.

The maximum weight of the system must not exceed 80 kg.

Table 2-3 Dimensions and Weight of System and Components

Component	Dimensions w x h x d in mm	Weight in kg
Shelf, including two fan trays, two PEMs, and an air filter	497 x 573 x 544	39.6
PEM	164 x 73 x 155	1.5
Upper fan tray module	491 x 87 x 227	4
Lower fan tray module	491 x 119 x 331	6.1

2.5 Mounting Options

You can simply operate the system on your desk or you can install it in a EIA 23" rack, or mount it in a 600mmx600mm ETSI frame relay..

⚠ CAUTION

Personal Injury or System Damage
The system is heavy and if you carry it on your own you can hurt your back.
To prevent injury, keep your back straight and have two people lift the system or use additional lifting equipment.

Personal or System Damage
Unstable system installation in a rack can cause the rack to topple over.
Therefore, if your system is the only one in the rack, make sure to mount the system in the lowest part of the rack. If other systems are installed in one rack, start with the heaviest component at the bottom.
If the rack is equipped with stabilizing devices, make sure that they are installed and extended so that the rack is secure. Then proceed to mount or service the system.

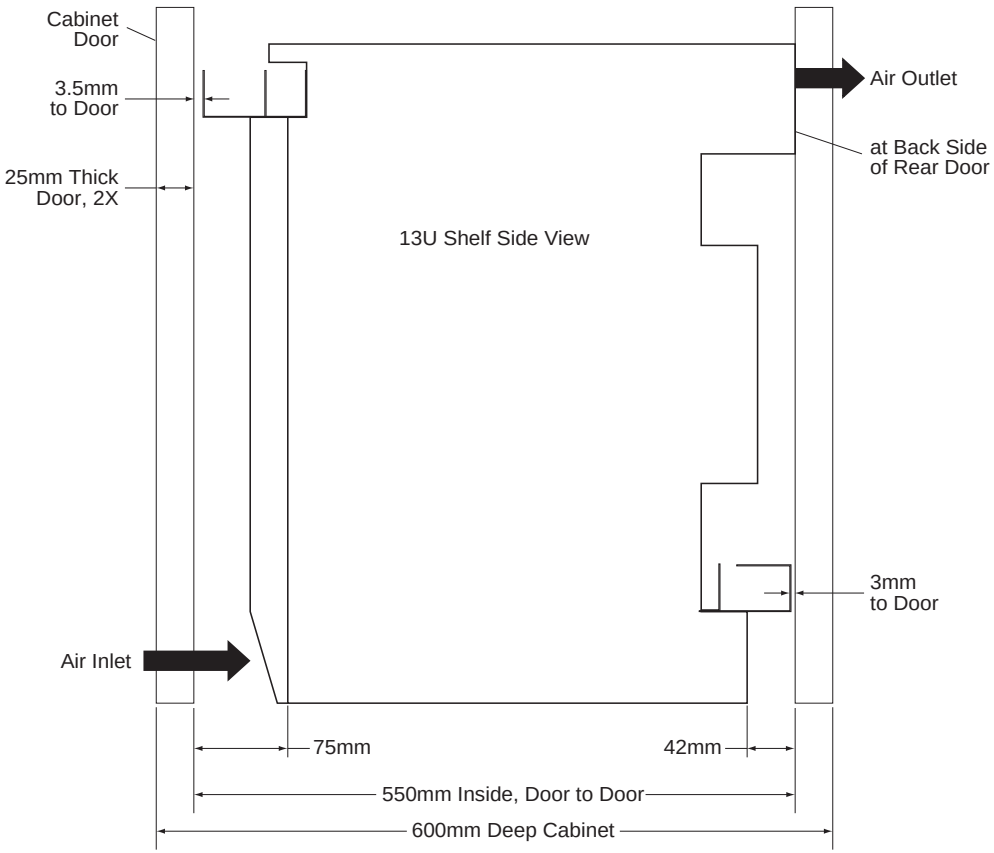
NOTICE

During the course of handling, shipping, and assembly, pins, shrouds and mounting screws, fans and other items can become loose or damaged.
Do not operate a damaged shelf, this can cause damage to devices that interfere with it.

Grounding
To ensure the system is properly grounded, each of the system's parts contact the EMI gasket. The system contains gaskets at the shelf and module level.
The shelf is also fitted with ESD contacts. Please take care for proper ESD protection of the operator.

You have to keep the following conditions when installing the system into a 600 mm (23.62 inch) deep rack. The physical dimensions in the figure below are in millimeters.

Figure 2-1 Rack Mounting Dimensions

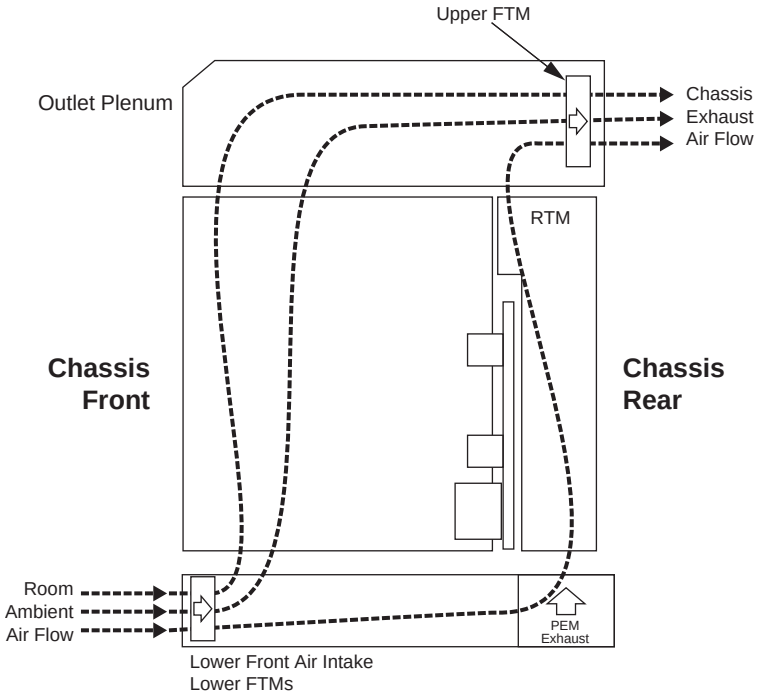


2.6 Cooling Considerations

The AXP 1410 provides fault tolerant cooling to front-mounted AdvancedTCA blades and to rear transition modules based on two hot swappable intelligent fan trays with five fans per tray.

Fan trays are mounted in the shelf top. The figure below shows the general airflow for the system.

Figure 2-2 Shelf Airflow



The Cooling subsystem is compliant to CP-TA B.4. The cooling system provides for greater than 40 CFM for the front blade and 5.0 CFM for the RTM.

The actual cooling performance depends on the slot population and the heat sink design of installed blades and should be validated based on the used configuration.

The cooling subsystem is designed to provide 31.1 CFM in the front and presence of any single cooling failure.

2.7 Acoustic Noise Control

The system can generate a lot of acoustic noise. This system has a built-in noise control due to the fan speed control. If the system is installed in an environment where the noise may be harmful to personnel being exposed to the noise during extended time periods, additional protective measures should be considered.

System Installation

3.1 Overview

The following sections help you to start up and maintain the system:

Step	Description
Before installation	This section provides information about the requirements, unpacking and inspecting the delivery and the type label location.
Installation	This section provides information about how to mount the system into a rack and how to ground the system.
Removal	This section provides information on how to power down the system and remove it from a rack.

3.2 Before Installation

This section provides the following information:

- Type label location
- Requirements
- Tools you will need

3.2.1 Requirements

The power input cables must have a minimum cross section of 21 mm^2, AWG 4.

3.2.2 Tools You will Need

Before you start the installation, make sure that you have all the necessary equipment at hand.

Usage	Equipment
General	Philipps head screwdriver #1
	Torque Wrenches (7, 8, 10 mm or 0.28, 0.31, 0.39 inch)
	Large and small socket screwdriver
	Large, medium and small Philipps screwdrivers
	Nut driver with 7/16 mm socket
	Multimeter
	Front mounting brackets for an EIA 23'' frame (shipped with AXP 1410)
	AdvancedTCA PEM service Kit, PN 67068008A01 (shipped with AXP 1410)
	Right-angle cable lug kit, PN 6706808A01 (shipped with AXP 1410)
	Antistatic mat
Shelf	Transport equipment: Hand truck or forklift/pallet truck Lifting equipment for installation
PEM	Power Feed Cables
System Access	Crossover cable Twisted pair Ethernet cable

3.3 Installation

This section provides the information and instructions needed to mount a system in a rack.

Observe the following general safety notes when installing your system:

NOTICE

- Restricted access area - The system is only to be installed in a restricted access area.
- Installation codes - This unit must be installed in accordance with the National Electrical Code, Articles 110.16, 110.17, and 110.18 and the Canadian Electrical Code, Section 12.
- Conductor ampacity - According to UL 60950, Annex NAE (NEC Article 645-5(a)), the branch-circuit conductors supply must have an ampacity of not less than 125% of the total connected load. Per NEC Article 310.15 and Table 310.16, the minimum American Wire Gauge (AWG) has to be selected.
- Overcurrent protection - A readily accessible listed branch-circuit overcurrent protective device must be incorporated into the building wiring.

Emerson is not responsible for regulatory compliance or malfunction of any user-modified product.

NOTICE

System Damage
Environmental contamination can impair system operation.
Locate the system in a stable area free of movement and free of dust, smoke, and electrostatic discharge (ESD). Make sure, that the temperature does not exceed the operating temperature given in the environmental requirements in this manual and allow room for proper air cooling.

System Overheating
Improper cooling leads to blade damage.
To ensure proper cooling always operate the system in a horizontal position. Furthermore, keep clear at least 6 cm adjacent to the cooling vents on the chassis front and back side.

3.3.1 Installing the System in a Rack

The following procedure describes how to install the system in a rack.

Use power input cables with a cross section (minimum) of 21mm^2, AWG 4.

⚠ CAUTION

Personal or System Damage
The system is heavy and if you carry it on your own you can hurt your back. To prevent injury, keep your back straight and have two people to lift the system or use additional lifting equipment.

Personal or System Damage
Unstable system installation in a rack can cause the rack to topple over.
Therefore, if your system is the only one in the rack, make sure to mount the system in the lowest part of the rack. If other systems are installed in one rack, start with the heaviest component at the bottom.
If the rack is equipped with stabilizing devices, make sure that they are installed and extended so that the rack is secure. Then proceed to mount or service the system.

NOTICE

System Damage
During the course of handling, shipping, and assembly, pins, shrouds and mounting screws, fans and other items can become loose or damaged.
Do not operate a damaged shelf, this can cause damage to devices that interfere with it.

Grounding
To ensure the system is properly grounded, each of the system's parts contact the EMI gasket. The system contains gaskets at the shelf and module level.
The shelf is also fitted with ESD contacts. Please take care for proper ESD protection of the operator.

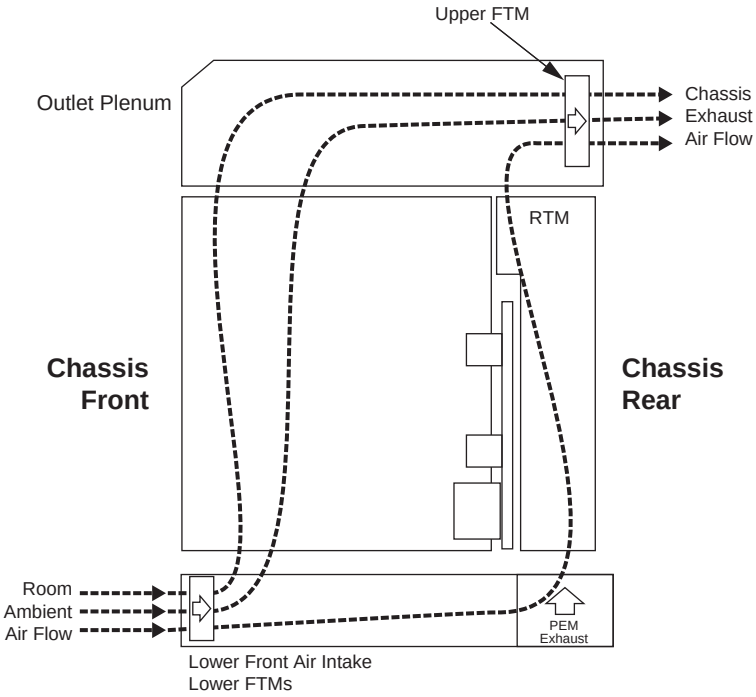
Installation in a 19" Rack

To install a system in a 19" rack, proceed as follows:

1. Insert the system into a standard 19" ANSI rack.
2. Fasten the system to the rack via the mounting brackets using eight bolts or screws (minimum 6 mm (0.24 inch) in diameter) on the left side and eight on the right side of the system.
3. Make sure that the system has been located in a place with room temperature for at least 24 hours before powering it up.

You have to keep the following conditions when installing the system into an at least 600 mm (23.62 inch) deep rack. The physical dimensions in the figure below are in millimeters. Please ensure that 60% of the rack's rear is open.

Figure 3-1 Rack Mounting Dimensions



Installation in a 23'' EIA Rack/Cabinet

Front mounting brackets are required to attach the shelf to an EIA 23" frame.

1. Locate the standard mounting hole and slot locations on the front mounting flanges on the AXP 1410 shelf.
2. Fasten the mounting brackets to the back side of the front chassis flanges using M6 screws x 12mm at each of the 5 locations.

3. Be sure to mount the shelf with metal screws or bolts that give a good electrical connection between the screws or bolts and the mounting surface.
4. Tighten all screws using a torque setting of 35.5 to 38.5 inch-pounds.

NOTICE

Failure to observe proper grounding practices may cause a variety of noise, electrostatic discharge, and RFI (Radio Frequency Interference) problems.

Installation in a 600 mm ETSI Rack/Cabinet

The shelf mounts directly from the integrated flange on the front of the shelf.

1. Locate the standard mounting hole and slot locations on the front integrated mounting flanges on the AXP 1410 shelf.
2. Fasten the mounting brackets to the back side of the front chassis flanges using M6 screws x 12mm at each of the 5 locations.
3. Be sure to mount the shelf with metal screws or bolts that give a good electrical connection between the screws or bolts and the mounting surface.
4. Tighten all screws using a torque setting of 35.5 to 38.5 inch-pounds.

NOTICE

Failure to observe proper grounding practices may cause a variety of noise, electrostatic discharge, and RFI (Radio Frequency Interference) problems.

3.3.2 Connecting the Cables

3.3.2.1 DC Power Cable

Power is introduced to the shelf via redundant DC PEMs. The recommended power cable is an 4 AWG gauge that meets the specifications for this shelf. There are four lugs for each PEM. Two are straight and the other two are custom offset lugs. The end that connects to the external DC power source should be equipped with an 8mm terminal.

NOTICE

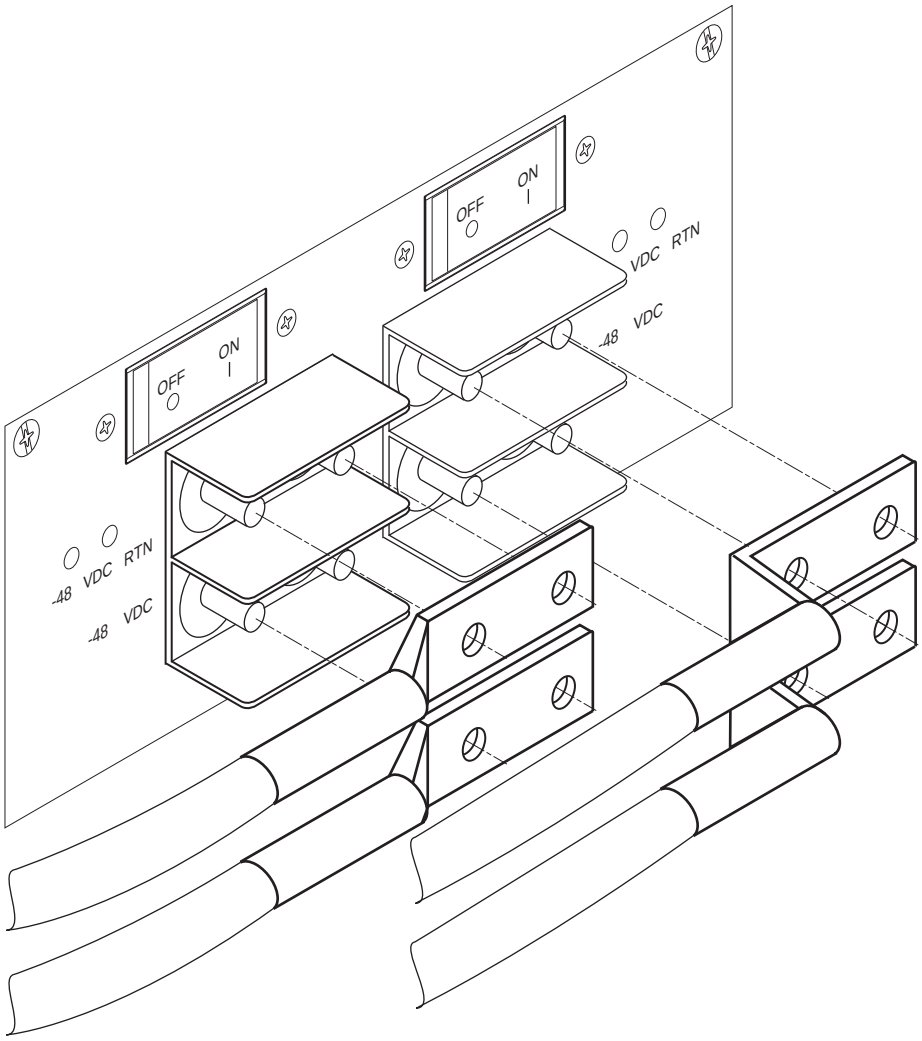
Always check with your local building authorities for wire sizing requirements for your environment.
The installation must comply with the 1993 National Electric Code (NEC) and other applicable codes.
The DC power inputs must only be attached to approved Telephone Network Voltage (TNV) or SELV (Safety Extra Low Voltage) branch circuits. Branch circuits must comply with all requirements called for in these safety standards: IEC 60950, EN 60950, CAN/CSA-C22.2 No. 60950. Attaching inputs to non-TNV/SELV approved power sources will cause the system to fail compliance with safety regulations.
The ground wire must be connected to a reliable earth ground connection to comply with Class 1 Equipment requirements.

⚠ WARNING

Multiple power sources are present.
Service only by qualified service personnel.
Mehrfache Energiequellen.
Handhabung nur durch geschultes Personal.
Des sources multiples de pouvoir sont présentes.
L'entretien de cet équipement doit être effectué par du personnel de service qualifié.

Wire	Signal
Earth Ground	PE GND (Primary Earth Ground)
Input power	-48VDC nominal to -60VDC
Return	-48VDC RETURN

Figure 3-2 DC Power Connection Detail



3.3.2.2 Power Cable Termination

Custom lugs are used with large gauge wires for up to 80 AMPs DC (4 AWG) when connecting to the PEM. These are shipped with the product.The lugs are angled to allow the cables to be dressed below the cable management tray, thus protecting the circuit breakers from accidental tripping.

Terminating this lug is identical to terminating standard lugs. To minimize shorting of the terminals, the lugs must be insulated according to the following illustration.

NOTICE

Heat shrink should be placed as close to the hole as possible (0.15") apart. The heat shrink tube should be cut approximately at a 30° angle.

3.3.2.3 Connecting the Cables to the PEM

In a redundant configuration, each PEM must be connected to a separate DC power source. Power is introduced to each PEM's terminal block on the front of the module (power input cable and return cable). The lugs provide secure contact for the cable and prevent the power cables from rotating. A plastic housing covers the power feeds and returns and is attached with one screw. Refer to Figure 3-2 for detail.

⚠ CAUTION

To cable a dual breaker DC system, read all cautions and warnings, properly ground the equipment by following the procedure in *Grounding the System* on page 56, and follow these steps. This procedure assumes that the PEMs are preinstalled in the shelf.

Procedure

Have the following tools on hand before you begin these steps: standard Phillips screwdriver, nut driver, torque wrench, multimeter, and lug kit.

1. Locate the target power input cable's terminals at the branch circuit or power distribution unit. Open the external circuit breakers that provide DC feed power to the PEM.
2. Lock and tagout the circuit breakers on the branch circuit or power distribution unit.

⚠ WARNING

Cables may or may not be preinstalled at the branch circuit or power distribution unit.
If the DC power cables are not connected to the branch circuit or power distribution unit, connect the power cables to the PEMs before connecting the DC power cables to the external power source.
If the DC power cables are connected to the branch circuit or power distribution unit, a qualified service person must confirm that the power to the cables is terminated (off) before continuing the steps to attach the cables to the PEMs.
In either case, use a multimeter to check the PEM end of the terminals to confirm there is no power present.

3. Using the appropriate tool, carefully remove the plastic covering over the terminal blocks.
4. Confirm that there is no power to the PEM lug bolts. Using a multimeter, measure between the two lugs and then measure between the chassis ground and each lug. If the DC potential is 3.0VDC or less, then power is not present.
5. Attach the DC power cables (input and return) to the dual lug bolts on each PEM.
6. Using a torque wrench, tighten the nuts with a recommended torque setting of 35.5 to 38.5 inch-pounds. Make sure all DC leads are fastened securely.
7. Replace the plastic cover over the terminal blocks.
8. Verify that the circuit breakers are in the ON position.

9. Break the tagout or lockout seals on the branch circuit or power distribution unit.

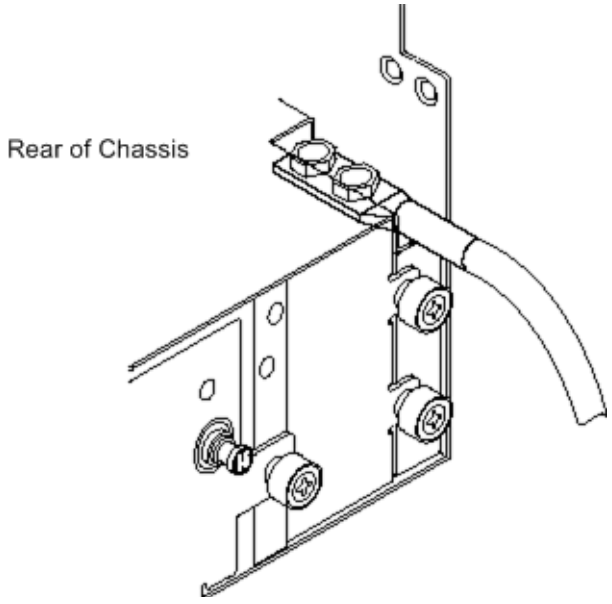
10. Apply power by closing the branch circuit or power distribution unit.
    The OOS indicator LED will glow solid red and the other LEDs will go dark. The OOS will not go dark and the IS indicator LED will not illuminate until the external power circuit breakers are closed.

11. Verify that all FRU LEDs illuminate and the PEM's IS LED is green, and the OOS LED is dark.

3.3.3 Grounding the System

Use a 2 AWG wire with a 2-hole copper lug and connect directly to the earth ground point located on the right side of the back of the shelf; connect the other end of the wire to a reliable earth ground. Use the torque setting required by the connector supplier. The 2-hole lug prevents rotation of the lug and ensures a permanent bonding of ground to the shelf.

Figure 3-3 Grounding Lugs



The AXP 1410 shelf was tested in the default configuration of logic ground and shelf ground connected and does not connect -48VDC Return with Shelf Ground. The system has been tested in the default configuration and complies with safety and regulatory standards. As a compliant AdvancedTCA shelf, the AXP 1410 allows system integrator at their own discretion to remove the mechanism which connects Logic Ground to Shelf Ground and install the mechanism that connects -48VDC Return to Shelf Ground. If the system integrator exercises the option of removing the connections from Logic Ground to Shelf Ground or adds the connection between -48VDC Return and Shelf Ground, the responsibility for maintaining compliance to CSA (C/US)/VDE safety requirements and EMI/RFI emission limits rests entirely with the system integrator and installer.

3.3.4 Powering Up the System

With the installation cabled up, you are ready to apply power to the system.

⚠ WARNING

Cover all open module slots and put all approved filler panels in place before turning on power. This is necessary to properly cool the chassis and to avoid electrical shock and other possible hazards. Slot covers and panels must remain in place during system operation.

Procedure

Follow these steps to power up the system:

1. Push the PEM circuit breakers to the ON position.
2. Verify that all FRU LEDs illuminate and the PEM's In Service LED is green. The system executes its normal start-up routine and is then ready to use.

3.4 Powering Down the System

Procedure

Follow these steps to shut down your AXP 1410.

1. Shut down all software operations and the operating system. For shelves with independently running segments, each segment must be shut down.
2. Turn each circuit breaker on the front of PEM A and PEM B to the OFF position.

⚠ CAUTION

Step 2 removes the input power from the slots in the AXP 1410 shelf only. It does not remove power to the PEMs. To remove power to these components, refer to the next step.

3. Disable the DC power at each of the external sources (branch circuit or power distribution unit) for both PEM A and PEM B.
4. This completely removes power from the shelf and its subassemblies.

3.5 Emergency Power Off

Procedure

Read this caution and follow the next steps if it is necessary to remove power during an emergency situation.

⚠ CAUTION

Following this procedure will result in a loss of data and may cause damage to chassis components in a running platform. Use this method only when normal shutdown procedures cannot be followed.

1. Turn each circuit breaker on the front of PEM A and PEM B to the OFF position.
2. Disable the DC power at the external sources (branch circuit or power distribution unit) for PEM A and PEM B).

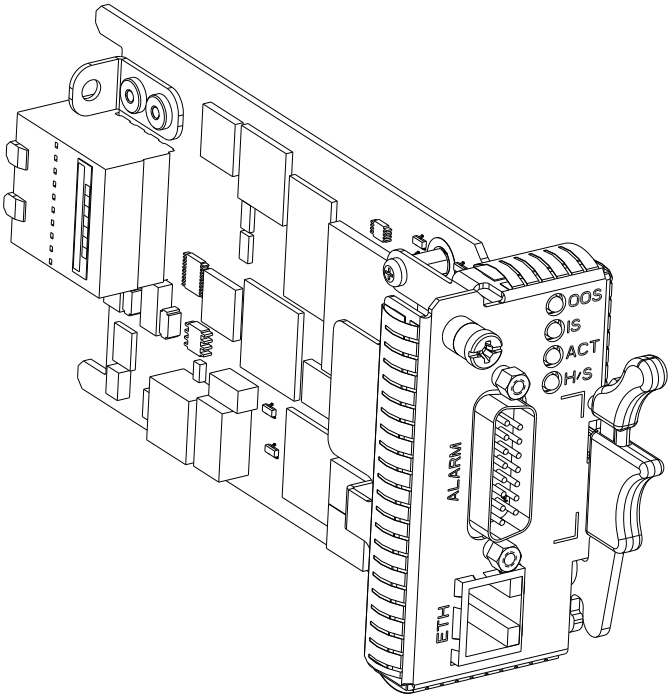
4.1 Installing and Removing Node Blades and RTMs

Refer to the respective blade or RTM documentation for installation and removal procedures.

4.2 Installing and Removing the Shelf Manager Board

The following figure shows the SAM1410 shelf manager board.

Figure 4-1 SAM1410 Overview



NOTICE

Damage of Circuits
Electrostatic discharge and incorrect blade installation and removal can damage circuits or shorten their life.
Before touching the blade or electronic components, make sure that you are working in an ESD-safe environment.

If the shelf contains only one shelf manager board you have to power down the shelf before exchanging the board.

4.2.1 Installing the Board

To install the board into an AdvancedTCA shelf, proceed as follows.

Installation Procedure

The following procedure describes the installation of the board. It assumes that your system is powered. If your system is unpowered, you can disregard the blue LED and thus skip the respective step. In this case it is a purely mechanical installation.

1. Put on an ESD wrist strap.
2. Connect the strap to the shelf by attaching the front or rear ESD jack.
3. Set the rotary switches according to your needs.
4. Insert the module into the shelf by placing the top and bottom edges of the board in the card guides of the shelf. Ensure that the guiding module of shelf and board are aligned properly. The alignment pin facilitates the insertion and prevents bent pins.
5. Slide the module into the shelf.
6. Rotate the ejector handle upward until it snaps into place.
7. Wait until the blue LED is illuminated.
8. Screw in the captive screw hand tight.
   The blue LED blinks.
9. Wait until the blue LED is switched OFF.
   The switched off blue LED indicates that the board is activated.

4.2.2 Removing the Board

This section describes how to remove the board from an AdvancedTCA system.

Removal Procedure

The following procedure describes how to remove the board from a system. It assumes that the system is powered. If the system is unpowered, you can disregards the blue LED and thus skip the respective step. In that case it is a purely mechanical procedure.

1. Put on an ESD wrist strap.
2. Connect the strap to the shelf by attaching the front or rear ESD jack.
3. Unlatch the ejector handle by lifting up the center sliding portion of the handle, then rotate the handle slightly (about 15 degrees).
   The blue LED blinks indicating that the module power down process is ongoing.
4. Wait until the blue LED is illuminated permanently.

NOTICE

Data Loss
Removing the board with the blue LED still blinking causes data loss.
Wait until the blue LED is permanently illuminated, before removing the board.

5. Press the handle down to its fully-open position (about 90 degrees).
   The board should start to move out of the chassis. Do not force it. If the SAM does not move, it means the captive screw is not fully unscrewed. Unscrew until loose and rotate the ejector handle down.
6. Remove the module from the shelf.

4.3 Replacing Power Entry Modules

The AXP 1410 supports two Power Entry Modules (PEMs). Since the shelf is equipped with a redundant power distribution system, the removal of a single PEM does not interrupt system operation. PEMs are accessible from the rear of the shelf. Each PEM has EMI gaskets on all sides of the module that provide EMI shielding.

The following instructions describe how to replace a power entry module. For further information on power entry modules, refer to *Power Entry Module (PEM)* on page 102.

4.3.1 Tools You Will Need

- Multimeter
- Standard #2 Phillips-head screwdriver
- 7/16" Torque wrench
- Nut driver (torque nut to 50 in. lbs.)
- AXP 1410 DC Power Installation Kit, PN 6706822A01 (shipped with AXP 1410)

4.3.2 Removing the PEM

When replacing a PEM, make sure you have a replacement PEM available. Replacement can take place in under 30 minutes by a qualified service person. PEMs are accessible from the rear of the shelf.

Replacing one PEM is done while the other PEM is in operation. Having the PEM located in the shelf is critical to maintaining proper airflow and cooling of the shelf. Steps in which a PEM is removed from a slot and reinserted should be completed within 3 minutes to maintain the shelf within safe operating temperatures.

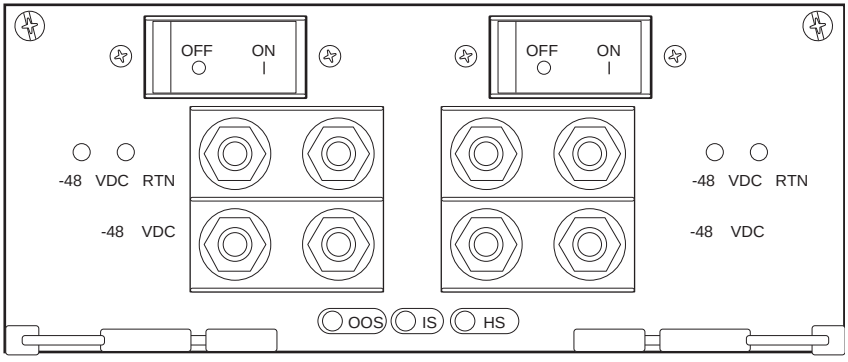
CAUTION

Read all cautions and warnings, and ensure the equipment is properly grounded by reviewing the procedure in *Grounding the System* on page 56, and follow these steps. The PEM has multiple power sources. This procedure should be followed precisely to ensure the PEM is isolated from all power sources before removing the PEM from the shelf, or removing the plastic terminal block lug cover.
This procedure assumes that the redundant PEMs are powered on in the shelf.

Removal Procedure

To remove a PEM follow the steps.

1. Locate the target power input cable's terminals at the branch circuit or power distribution unit. Open the external circuit breakers that provide DC feed power to the PEM you are replacing.



2. Lock and tagout the circuit breakers on the branch circuit or power distribution unit.

3. Using the appropriate tool, loosen the chassis retention screws on each side of the PEM.
4. Open the ejector latches. This will signal the switch to deactivate the hot swap signal. Watch for the Blue LED to go solid and steady, signalling that it is ready to remove.
5. Open the ejector handles completely. You will feel the PEM disconnect from the backplane.
6. Pull the module straight out from the rail guides, about 3 inches.
7. With the PEM in place and before removing the terminal block lug cover, screw a standoff/lockout screw extension onto the retaining screws located on each side of the PEM. Align the threaded end of the standoff/lockout screw extension with the screw holes on each side of the shelf and securely tighten to lock the PEM approximately 2 inches out of the shelf.
8. Using the appropriate tool, carefully remove the terminal block cover (plastic covering) over the terminal block. The terminal block cover is attached to the terminal block by two tabs with slots in the cover that insert into embossments in the terminal block wall. To remove the cover, press the upper wall of the terminal block wall downward and slip a flat-bladed screwdriver between the cover and the terminal block wall and pry the cover tab up to relieve it from the embossment in the terminal block wall. Once the upper cover tab is free from the terminal block embossment, the cover should rotate downward and free itself from the lower embossment.

NOTICE

If the multimeter indicates there is still power present and power cannot be removed from the terminals, the entire shelf must be powered down to perform the PEM replacement.

9. Confirm that there is no power to the PEM lug bolts. Using a multimeter, measure between the two lugs and then measure between the chassis ground and each lug. If the DC potential is 3.0VDC or less, then power is not present.

10. Remove the DC power cable from the dual lug bolts on the PEM you are replacing, being careful to place the two cables so they cannot short to each other or to other conductors.

11. Loosen the standoff/lockout screw extensions and remove the PEM from the slot by pulling straight out of the rail guides.

12. Remove the standoff/lockout screw extensions and put them aside to use when installing the new PEM.

4.3.3 Installing the PEM

Replacing one PEM is done while the other PEM is in operation. Having the PEM located in the shelf is critical to maintaining proper airflow and cooling of the shelf. Steps in which a PEM is removed from a slot and reinserted should be completed within 3 minutes to maintain the shelf within safe operating temperatures.

⚠ CAUTION

Read all cautions and warnings, and ensure the equipment is properly grounded by reviewing the procedure in *Grounding the System* on page 56, and follow these steps. The PEM has multiple power sources. This procedure should be followed precisely to ensure the PEM is isolated from all power sources before removing the PEM from the shelf, or removing the plastic terminal block lug cover.
This procedure assumes that the redundant PEMs are powered on in the shelf.

Installation Procedure

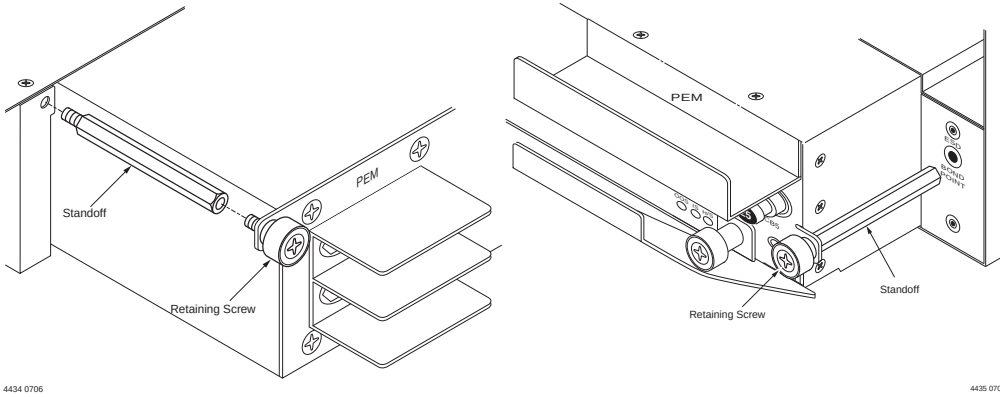
To install a PEM, proceed as follows:

1. Screw a standoff/lockout screw extension onto the retaining screws located on each side of the replacement PEM.
2. Align the back end of the replacement PEM with the rail guides in the empty PEM slot and slide the PEM into the slot.

NOTICE

System Damage
Insufficient cooling can damage the system.
Lock the replacement PEM into the slot within 3 minutes to maintain the proper cooling properties of the shelf.

3. Align the threaded end of the standoff/lockout screw extension with the screw holes on each side of the shelf and securely tighten to lock the PEM approximately 2 inches out of the shelf.



Lock the replacement PEM into the slot within 3 minutes to maintain the proper cooling properties of the shelf.

4. Loosen the PEM ejector handle captive screw and pull the PEM ejector handle to the full open position.

⚠ WARNING

Personal Damage
If the DC power cables are connected to the branch circuit or power distribution unit, a qualified service person must confirm that the power to the cables is terminated (off) before continuing the steps to attach the cables to the PEMs.

5. Remove the plastic covering over the terminal block.
6. Verify that the lock and tagout on the branch circuit or power distribution unit is still intact to ensure the system is in a safe state.

7. Attach the DC power cable to the dual lug bolts on the PEM (power -48VDC input and Return) and tighten the nuts with a recommended torque setting of 35.5 to 38.5 inch-pounds. Make sure all DC leads are fastened securely.

8. Replace the plastic cover over the terminal blocks.

9. Remove the standoff/lockout screw extensions.

10. Gently press the PEM into the slot until the ejector handle engages and then press the ejector handle to the closed position to seat the PEM into the backplane. The OOS indicator LED will glow solid red and the other LEDs will go dark. The OOS will not go dark and the IS indicator LED will not illuminate until the external circuit breakers are closed.

11. Tighten the two retention screws located at each side of the PEM using the appropriate tool. Begin with the left-side fastener to prevent the PEM from shifting and causing possible cross-threading of the fastener. The recommended torque setting is 5 inch-pounds.

12. Tighten the ejector handle captive screw to 3 inch-pounds and observe the HS LED begin to blink and then turn off.

⚠ WARNING

Personal and System Damage
Open module slots can lead to insufficient cooling and electrical shock and other possible hazards.
Cover all open module slots and put all panels in place before turning on power. Keep slot covers and panels in place during system operation.

13. Break the tagout or lockout seals on the branch circuit or power distribution unit.

14. Apply power by closing the branch circuit or power distribution circuit breaker to the shelf.

15. Verify that all FRU LEDs illuminate and the PEM's IS LED is green and the OOS LED is dark.

4.4 Installing Fan Tray Modules

To prevent system damage, the operator must replace the fans within the recommended service interval shown in the following table to prevent a decline in shelf operability. Make sure the replacement FTM is available for exchange and ready to install.

Service Interval for 1 FTM	Temperature Range
Not recommended	40-55°C
Four hours	40°C maximum

When a fan is taken out of operation, the system manager will compensate for the loss by increasing the speed of the remaining fans. Please read the following caution before replacing any of the FTMs.

⚠ CAUTION

Fans may continue to rotate after power is removed. Be careful to keep fingers away from the bottom of the FTM enclosure.

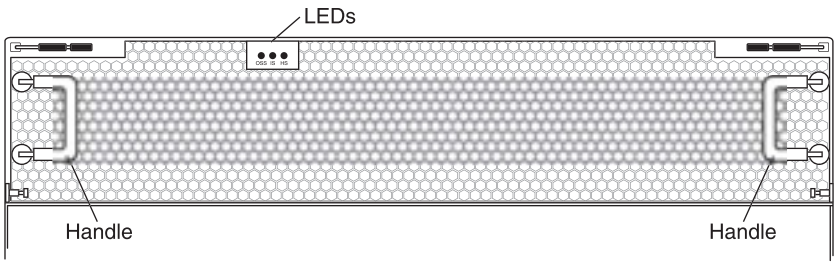
4.4.1 Removing the Upper FTM

Removal Procedure

Follow these steps and refer to the figures to remove the upper fan tray module from the shelf.

1. Loosen the retention screw to the chassis

Figure 4-2 Upper Rear FTM Ejector Handles and LEDs



2. Pull the ejector handle outward to a slightly open position to disengage the hot swap switch.
   Watch for the blue LED to blink. When the blinking stops and the LED remains a solid blue, the FTM is ready to be removed.
3. Open the ejector handle to a full open position.
4. Using the handle on the front of the FTM, slowly pull the FTM out of the shelf, while supporting the bottom of the module with the palm of your hand.

⚠ CAUTION

The module is heavy; hold it securely.

4.4.2 Installing the Upper FTM

Installation Procedure

Have the correct FTM available and follow these steps to install the upper fan tray module.

1. While supporting the FTM, align the FTM carefully into the fan slot in the shelf and slowly slide the FTM until the ejector handles engage; fully close the handles.
   The FTM is connected when the assembly is firmly seated in the upper backplane connector and the hot swap handle moves to the closed position.
2. Tighten the chassis retention screw to secure the FTM. The recommended torque settings is 5 inch-pounds.
   When the blue LED turns off, the fan is operating.

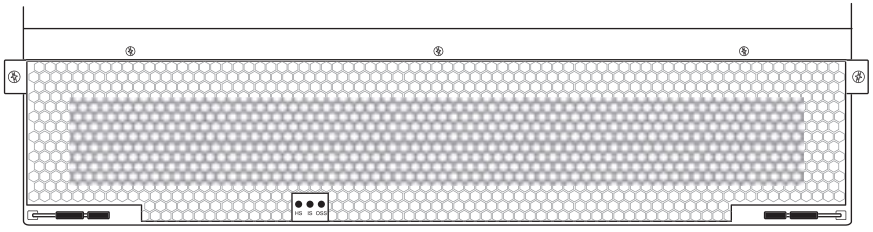
4.4.3 Removing the Lower FTM

Removal Procedure

Follow these steps and refer to the figure to remove the lower front fan tray module from the shelf.

1. Using a Phillips screwdriver, loosen the two chassis retention screws.

Figure 4-3 Lower Front FTM Ejector Handles and LEDs



2. Open the ejector handle and wait for the blue LED to go solid and steady. This indicates that the FTM is ready to be removed.

3. Open the ejector handle to a full open position.
4. Using the ejector handle on the front of the FTM, slowly pull the FTM out of the shelf, while supporting the bottom of the module with the palm of your hand.

⚠ CAUTION

The module is heavy; hold it securely.

4.4.4 Installing the Lower FTM

Installation Procedure

Have the correct FTM available and follow these steps to install the upper fan tray module.

1. While supporting the FTM, align the FTM carefully into the fan slot in the shelf and slowly slide the FTM until the ejector handles engage; fully close the handles.
   The FTM is connected when the assembly is firmly seated in the upper backplane connector and the hot swap handle moves to the closed position.
2. Tighten the chassis retention screw to secure the FTM. The recommended torque settings is 5 inch-pounds.
   When the blue LED turns off, the fan is operating.

4.5 Installing a Fan Filter

Your replacement fan filter consists of a filter media for the lower Fan Tray Module. The fan filter housing is kept in place by two tabs located on the inner left-side in front of the stationary metal frame.

Air filters should be checked occasionally to make sure they are not obstructed or damaged. Visually inspect filters for tears or rips. Do not reinstall a torn filter as it will be ineffective in trapping particulates and will interrupt air flow distribution. To maintain safety certification, use only Emerson approved fan filters. You can order replacement fan filters by contacting your Emerson sales representative.

Replacement Procedure

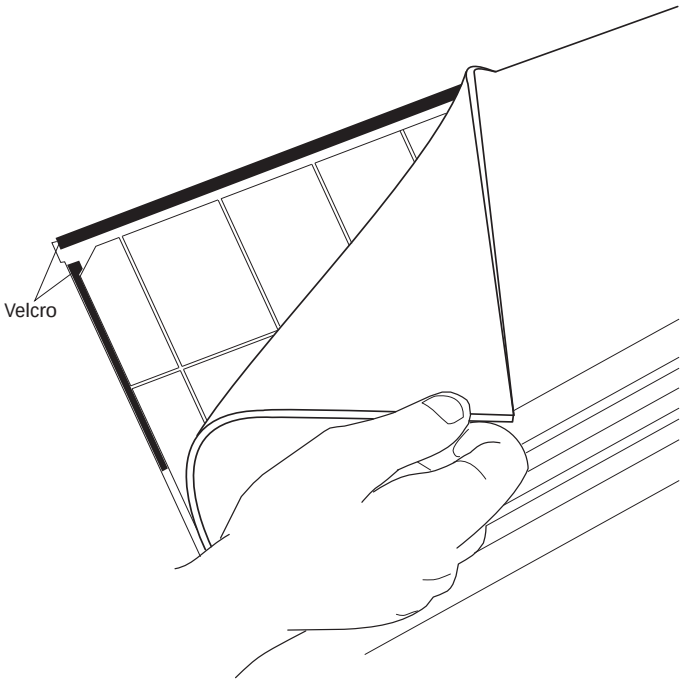
To replace the fan filter for a lower FTM, refer to *Removing the Lower FTM* and follow these steps to replace a fan filter. Please have your replacement fan filter available before starting this procedure.

1. With the FTM removed and placed on a solid surface, position the FTM with the front facing you.
2. Using your fingers, rotate the filter frame away from the housing using the two tabs on the right and left sides of the filter frame.
3. Rotate the vane assembly out of the way to expose the lower portion of the air filter.
4. Insert the replacement fan filter by positioning the filter onto the velcro edges and form into place.

NOTICE

Any particulates that fall into the fan tray module during the air filter replacement must be cleaned out (vacuumed) from the fan tray prior to re-installing the fan tray into the chassis.

Figure 4-4 Position of the Fan Filter



5. Lower the vane assembly and rotate the filter bracket into place.
6. Reinstall the lower FTM using the procedure described in *Installing the Lower FTM*.

5.1 Overview

The following sections provide information that you need after you have successfully installed the hardware.

Section	Description
Network Management on page 79	This section contains information on VLAN configuration, slot numbering, IPMB and hardware addresses, and IP addresses of SAM1410.
Accessing System Components on page 99	This section contains information on which component can be accessed via which interface and where you can find additional documentation.
Software on page 100	This section contains information on which software is installed on the system components and what tools can be used for software upgrades.
Power Entry Module (PEM) on page 102	This section contains information on power supplies.
Fan Tray Modules on page 104	This section contains information on fans.
Redundancy on page 106	This section contains information on cold standby, dual star network topology and actions of shelf manager and system manager during switchover, takeover, failover, insertion, and extraction.
Blade Insertion and Extraction on page 116	This section contains information about the steps carried out by the software when a blade is inserted or supposed to be extracted.

The information in the following subsections assumes that you have set the shelf address on both shelf manager boards to the same value via the rotary switches.

5.2 Network Management

Before accessing the system components, you need to be aware of various network addresses. The following subsections describe the default addresses and how they can be changed.

5.2.1 Default VLAN Configuration

The AXP 1410 system provides four network planes. They are, base network a and b and fabric network a and b. The following figures show the VLAN configuration.

Figure 5-1 Switch Management Fabric Interface Bridge Configuration

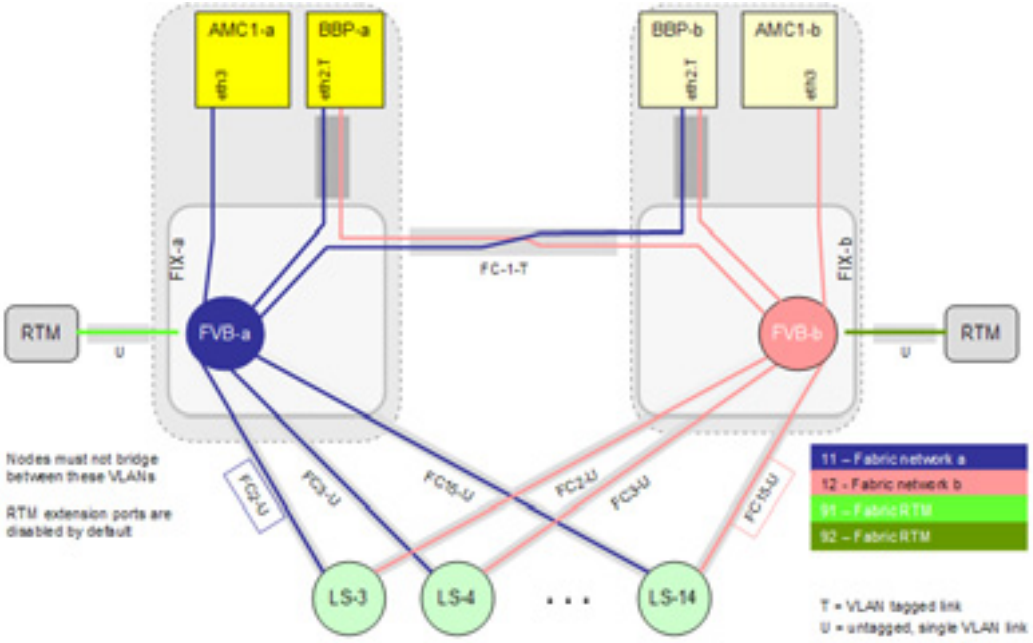
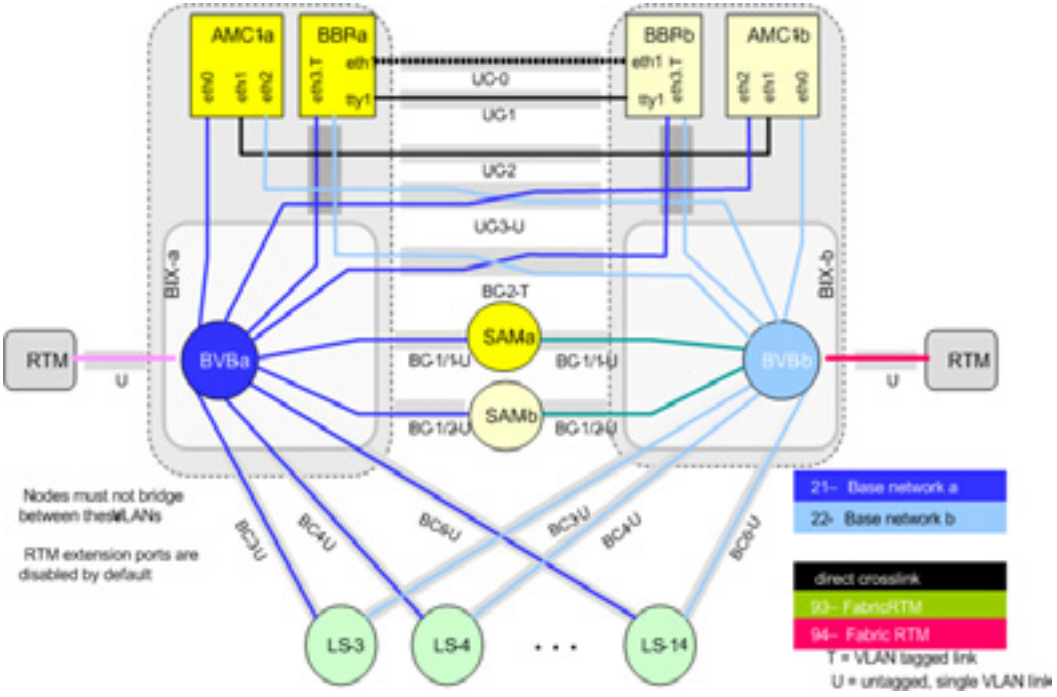


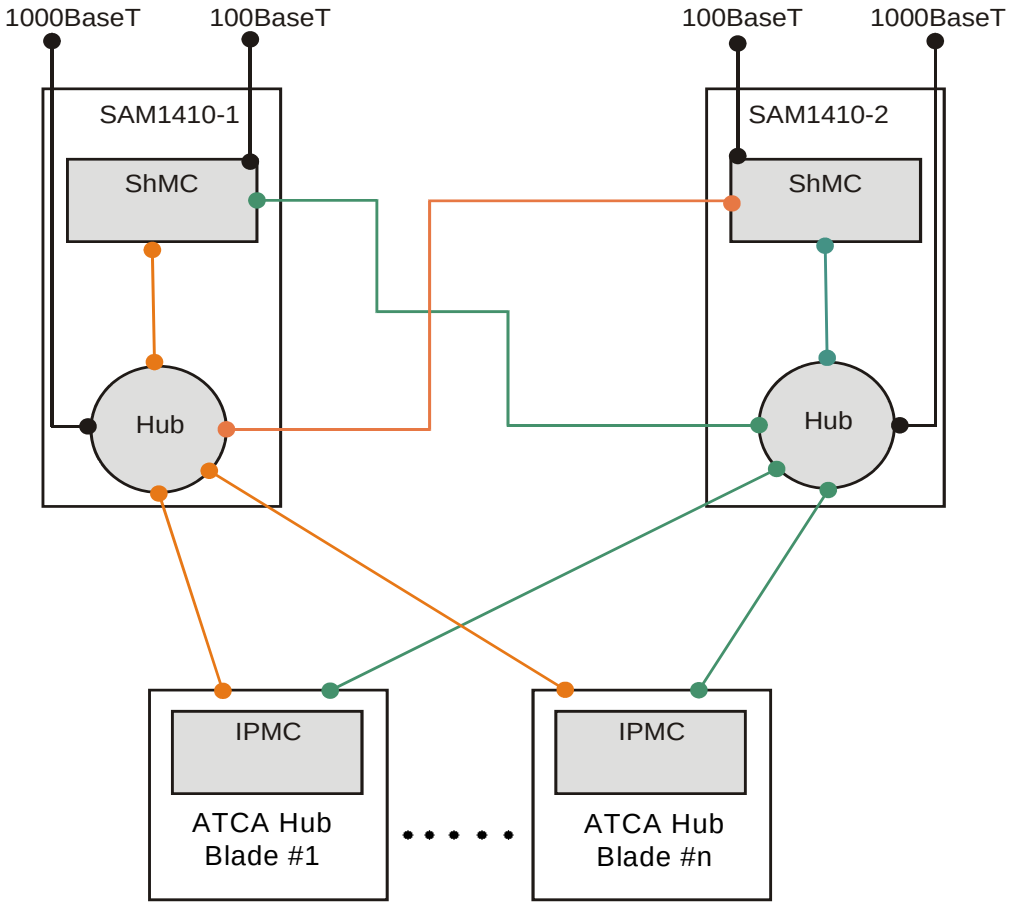
Figure 5-2 Switch Management Base Interface Bridge Configuration



5.2.2 Slot Numbers and Slot Addresses

The system provides a dual star network topology, that means each AdvancedTCA blade is connected to the SAM1410-1 and to the SAM1410-2 with one base interface channel.

Figure 5-3 Dual Star Topology



The physical address describes the physical location of an FRU in the shelf. This location is required when an operator has to handle an FRU, for example, exchange the AdvancedTCA blade #2. The physical address and the physical slot number are identical for AdvancedTCA blades. The physical addresses of other FRUs like PEMs and fans identify the type of the FRU and a particular FRU of that type.

Physical slot number 1 is assigned for lower slot and the physical slot number 2 is assigned for upper slot. For each slots, the shelf FRU ROM provides the mapping between physical slot numbers and logical slot numbers.

Every slot has a unique logical slot number. These logical slot numbers are used to determine the channel mapping between the slots according to the *AdvancedTCA specification PICMG 3.0, chapter 6.5.6*.

The following table shows the physical and logical slot numbering between IPMB addresses and hardware addresses in your system.

Table 5-1 Slot Numbering and Slot Addresses

Device#	Hardware Address	IPMB Address	Logical Slot Number	Physical Slot Number
SAM1410 1	8	10	-	-
SAM1410 2	9	12	-	-
PEM 1	1B	66	-	-
PEM 2	1C	68	-	-
Rear Fan Tray	2C	56	-	-
Front Fan Tray	2E	58	-	-
-	41	82	1	6
-	42	84	2	9
-	43	86	3	7
-	44	88	4	8
-	45	8A	5	5
-	46	8C	6	10
-	47	8E	7	4
-	48	90	8	11

Table 5-1 Slot Numbering and Slot Addresses (continued)

Device#	Hardware Address	IPMB Address	Logical Slot Number	Physical Slot Number
-	49	92	9	3
-	4A	94	10	12
-	4B	96	11	2
-	4C	98	12	13
-	4D	9A	13	1
-	4E	9C	14	14

5.2.3 Shelf Geographical Address

The shelf geographical address (SGA) is used to calculate the shelf manager IP addresses on the out-of-band interface, refer *Out-of-Band Interface* on page 88. Therefore, changing the shelf geographical address also changes the shelf manager IP address.

5.2.3.1 Setting the Shelf Geographical Address

Set the shelf geographical address during the system installation via a network connection.

The change of shelf address, shelf IP address and FRU activation order takes effect after a reboot of the system.

Setting the Shelf Geographical Address

To set the shelf geographical address, proceed as follows:

1. Log in to the active shelf manager.
2. Change the shelf geographical address:
   `# hpishaddr -b "<new shelf geographical address>"`
   Where `<new shelf geographical address>` must be two hexadecimal digits with no leading "0x".

Example: Changing the shelf geographical address to 7:

```
# hpishaddr -b "07"
```

3. Reboot the shelf (switch the power off and on again).
   The SAM1410 boards will come up with changed IP addresses.

5.2.3.2 Shelf Manager Replacement Scenarios

This subsection describes different scenarios of replacing the shelf manager and determining the shelf FRU information.

Replacement during normal operation

If a SAM1410 is replaced during normal operation, the shelf FRU information on the replaced SAM1410 is updated upon insertion. The shelf FRU information remains valid.

Replacement during shelf power-off with a spare SAM1410

If a SAM1410 is replaced with a spare SAM1410 which has not been used before, the Shelf FRU Validation tool will recognize the default shelf FRU information and update it with the system's shelf FRU information after next power-up. The shelf FRU information remains valid.

Replacement during shelf power-off with a already used SAM1410

If a SAM1410 is replaced with an already used SAM1410, the valid shelf FRU information can not be determined after next power-up. The shelf geographical address will be set to the emergency address 251.

If the shelf geographical address cannot be determined, HPI will not start.

To get a valid shelf FRU information, log in to one SAM1410 via telnet or SSH and use the command **`shelf_fru_validation`** with option **`-p`** to specify which shelf FRU information is correct. Afterwards, reboot the shelf.

Example: Declare shelf FRU information of local shelf manager valid:

```
# shelf_fru_validation -w -p M1
```

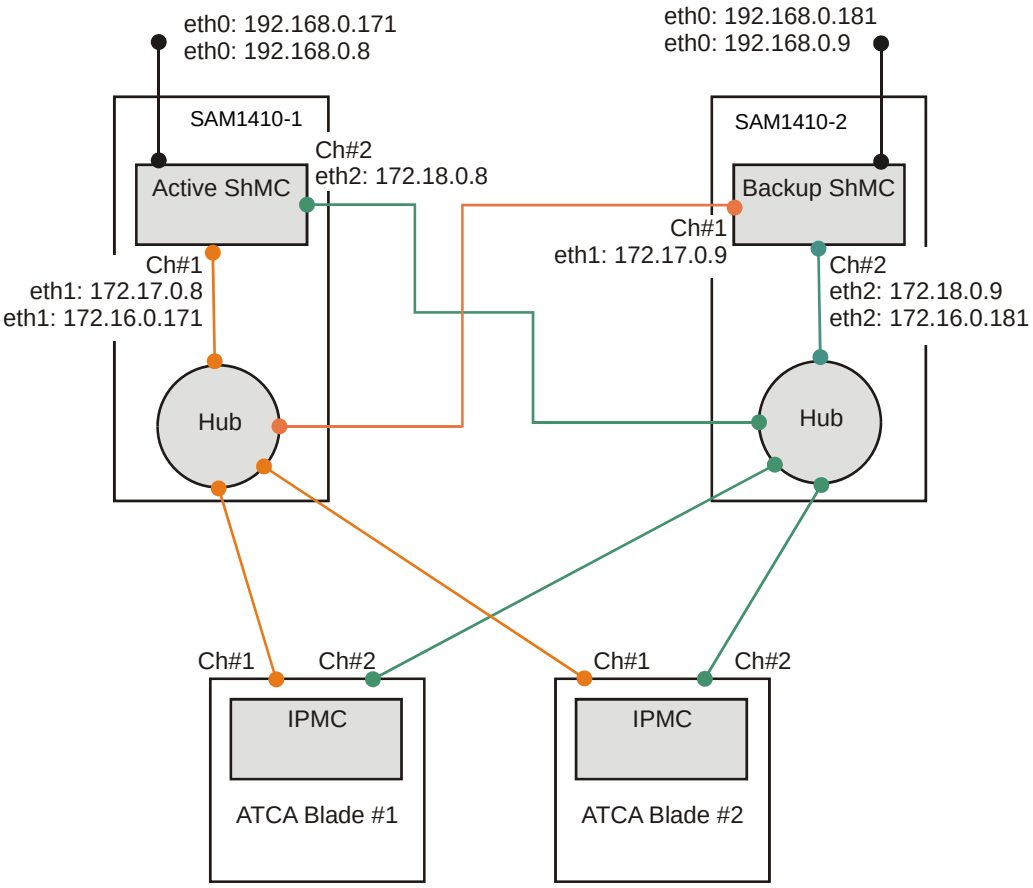
5.2.4 IP Addresses

The following subsections describe the IP addresses of the shelf manager. There are no pre-defined IP addresses for the node blades.

The shelf manager has three network interfaces: One on the front panel, one to its own hub and one to the hub of the other SAM1410. The shelf manager sets up these interfaces based on the information found in the shelf manager IP connection record of the shelf FRU information.

The figure below shows an example of the shelf manager IP addresses with Shelf IP Connectivity Record #2. Orange color shows BASE1 and green shows BASE2. The IP addresses are described in more detail in the subsections that follow.

Figure 5-4 IP Addresses



The shelf manager can be accessed either via the physical IP or the virtual IP address. The physical IP address remains the same on each shelf manager when the shelf managers switch their active and standby roles. The virtual IP address is moved from the former active to the former standby shelf manager when they change their roles.

Abbreviations used are as follows:

Abbreviation	Description
IP<n>	n-th shelf manager IP connection record
IP<n>_<m>	m-th octet of the IP address of the n-th shelf manager IP connection record
SGA	shelf geographical address, i.e. first byte of shelf address record
HW	shelf manager hardware address

5.2.4.1 Out-of-Band Interface

The IP addresses of the shelf manager out-of-band interface (labeled MGMT ETH) is created from the information in the first shelf manager IP connection record. It must be different for different shelves. Therefore, the shelf geographical address is used as third octet of the IP address. The same address scheme is used for all netmasks found in the first IP connection record. All addresses assigned to the out-of-band interface are in the same network.

Physical IP Address on Out-of-Band Interface

Netmask of IP1	Physical IP Address	Default Value
255.0.0.0	<IP1_1>.<IP1_2>.<SGA>.<HW>	192.168.0.8, 192.168.0.9
255.255.0.0		
255.255.255.0		

Virtual Active IP Address on Out-of-Band Interface

Netmask of IP1	Virtual Active IP Address	Default Value
255.0.0.0	<IP1_1>.<IP1_2>.<SGA>.171	192.168.0.171
255.255.0.0		
255.255.255.0		

Virtual Standby IP Address on Out-of-Band Interface

Netmask of IP1	Virtual Standby IP Address	Default Value
255.0.0.0	<IP1_1>.<IP1_2>.<SGA>.181	192.168.0.181
255.255.0.0		
255.255.255.0		

To avoid an address conflict between out-of-band and backplane interfaces, 100 is added to the third octet of all out-of-band interface IP addresses, if any of them would be equal to one of the backplane addresses otherwise.

Changing the Shelf Manager Virtual IP Address for the Out-of-Band Interface

To change the Shelf Manager Virtual IP address:

- Modify the first two octets of the shelf IP connectivity Record #1
  or
- Change the shelf address
  or
- Modify the first two octets of the shelf IP connectivity Record #1 and also change the shelf address

Refer *Setting the Shelf Geographical Address* on page 84, to see how you can change the shelf address.

1. Change the first two octets of the IP address using the `hpiship` tool located on the shelf manager. Use the option `-h` for help.
2. Change the third octet of the IP address by changing the shelf address.

If the third octet of the IP address is changed using hpiship, it is temporary and will be changed automatically on the next reboot to match the shelf address.

3. Reboot the system for the changes to take effect.

Example #1:

Print current IP address settings and change out-of-band address:

```
*Print current IP address settings

shm9s8:~ # hpiship

29 {ADVANCEDTCA_CHASSIS,9} Shelf Resource

4097 Shelf Manager IP Address 0

IP : 192.168.9.171

Gateway: 192.168.9.0

Submask: 255.255.255.0

8449 Shelf Manager IP Address 1

IP : 172.16.9.171

Gateway: 172.16.0.170

Submask: 255.255.0.0

*Change out-of-band-address:

shm9s8:~ #  hpiship -n 4097 -i 200.200.0.0
```

Example #2:

Print current shelf address and shelf entity path setting and change shelf address and shelf entity path settings:

```
*print current Shelf Address and Shelf Entity Path setting:

shm9s8:~ #hpishaddr

shelf address type=BINARY, length=20: 09 00 00 00 00 00 00 00 00 00
00 00 00 00 00 00 00 00 00 00

shelf id: 9

shelf entity-path: {ADVANCEDTCA_CHASSIS,9}
```

```
*change Shelf Address and Shelf Entity Path setting:

shm9s8:~ # hpishaddr -b "0700000000000000000000000000000000000000"

07 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 --

shelf address: 7

shelf entity-path: {ADVANCEDTCA_CHASSIS,7}
```

5.2.4.2 Backplane Interfaces

The IP address of the shelf manager backplane interfaces are created from the information in the second IP connection record. Since these addresses are reachable through the hub from outside the shelf, they must be different for different shelves. Therefore, the shelf geographical address is used as third octet of the IP address. To allow for different network setups, different network address schemes are used depending on the netmask found in the shelf manager IP connection record.

The schemes are based on the following rules:

- Use different IP networks for interface 1, interface 2 and virtual address.
- In class A and class B networks, use shelf geographical address as third octet.
- Use shelf manager hardware address as fourth octet.

Physical IP Address on Backplane Interface 1

Netmask of IP2	Physical IP Address	Default Value
255.0.0.0	<IP2_1 + 1>.<IP2_2>.<SGA>.<HW>	172.17.0.8, 172.17.0.9
255.255.0.0	<IP2_1>.<IP2_2 + 1>.<SGA>.<HW>	
255.255.255.0	<IP2_1>.<IP2_2>.<IP2_3 + 1>.<HW>	

Physical IP Address on Backplane Interface 2

Netmask of IP2	Physical IP Address	Default Value
255.0.0.0	<IP2_1 + 2>.<IP2_2>.<SGA>.<HW>	172.18.0.8, 172.18.0.9
255.255.0.0	<IP2_1>.<IP2_2 + 2>.<SGA>.<HW>	
255.255.255.0	<IP2_1>.<IP2_2>.<IP2_3 + 2>.<HW>	

The following virtual IP addresses are assigned to shelf manager slot 8 / backplane interface 1 and shelf manager slot 9 / backplane interface 2.

Virtual Active IP Address on Backplane Interfaces

Netmask of IP2	Virtual Active IP Address	Default Value
255.0.0.0	<IP2_1>.<IP2_2>.<SGA>.171	172.16.0.171
255.255.0.0	<IP2_1>.<IP2_2>.<SGA>.171	
255.255.255.0	<IP2_1>.<IP2_2>.<IP2_3>.171	

Virtual Standby IP Address on Backplane Interfaces

Netmask of IP2	Virtual Standby IP Address	Default Value
255.0.0.0	<IP2_1>.<IP2_2>.<SGA>.181	172.16.0.181
255.255.0.0	<IP2_1>.<IP2_2>.<SGA>.181	
255.255.255.0	<IP2_1>.<IP2_2>.<IP2_3>.181	

Changing the Shelf Manager Virtual IP Address for the Backplane Interface

To change the Shelf Manager Virtual IP address:

- Modify the first two octets of the shelf IP connectivity Record #2
  or
- Change the shelf address
  or
- Modify the first two octets of the shelf IP connectivity Record #2 and also change the shelf address

Refer to *Setting the Shelf Geographical Address* on page 84 to see how you can change the shelf address.

1. Change the first two octets of the IP address using the `hpiship` tool located on the shelf manager. Use the option `-h` for help.
2. Change the third octet of the IP address by changing the shelf address.

If the third octet of the IP address is changed using hpiship, it is temporary and will be changed automatically on the next reboot to match the shelf address.

3. Reboot the system for the changes to take effect.

Example:

Print current IP address settings and change out-of-band address:

```
*Print current IP address settings
shm9s8:~ # hpiship
29 {ADVANCEDTCA_CHASSIS,9} Shelf Resource
4097 Shelf Manager IP Address 0
IP : 192.168.9.171
Gateway: 192.168.9.0
Submask: 255.255.255.0
8449 Shelf Manager IP Address 1
IP : 172.16.9.171
Gateway: 172.16.0.170
Submask: 255.255.0.0
*Change backplane address:
```

```
shm9s8:~ # hpiship -n 8449 -i 200.200.0.0
```

5.2.4.3 Configuration File

By default, the shelf manager automatically reads the shelf IP connectivity record and calculates IP addresses based on the described scheme.

Alternatively the shelf configuration for SGA and IP may be configured using the network configuration file.

The network configuration of the SAM1410 can be modified by settings available in `/etc/network.conf`. The `/etc/network.conf` file is part of the persistent file system by default, so any changes are automatically saved across a reboot.

- **Shelf Address**

  The Shelf Address can be read through IPMI or it can be defined as a different value by using the SA variable.
  Use `auto` to read the value via IPMI or define the desired Shelf Address.

  ```
  SA=auto
  ```

- **Slot Number**

  The slot number of the Shelf Manager is read via IPMI unless the SLOT variable is used to override the value. Use `auto` to read the value via IPMI or define the desired slot number. The `REM_SLOT` variable is the slot number of the other Shelf Manager.

  ```
  SLOT=auto

  REM_SLOT=auto
  ```

- **Out-of-band Network Configuration**

  The front panel ethernet interface can be configured automatically using the Shelf Address (default), using DHCP, or by specifying a static IP address.

  Use the following parameters to the `OOB_MODE` variable to define the out-of-band interface configuration.

  none - Do not configure the interface

auto - Automatic configuration of the interface
dhcp - Use DHCP to obtain an IP address
static - Use OOB_IPADDR and OOB_NETMASK to configure the interface

```
OOB_MODE=auto
```

– Static Configuration of the Out-of-band Network Interface

If using the `static` parameter to configure the out-of-band interface, specify the desired IP address and netmask using the following variables:

```
OOB_IPADDR=
OOB_NETMASK=
```

- **Backplane Network Configuration**

The backplane ethernet interfaces can be configured automatically using the Shelf Address (default), using DHCP, or by specifying a static IP address.

Use the following parameters to the BP_A_MODE and BP_B_MODE variables to define the interface configurations for backplane interfaces 1 and 2.

none - Do not configure the interface
auto - Automatic configuration of the interface
dhcp - Use DHCP to obtain an IP address
static - Use other parameters to configure the interface

```
BP_A_MODE=auto
BP_B_MODE=auto
```

– Static Configuration of the Backplane Network Interface

If using the `static` parameter to configure the backplane interfaces, specify the desired IP addresses and netmasks using the following variables:

```
BP_A_IPADDR=
BP_A_NETMASK=
BP_B_IPADDR=
BP_B_NETMASK=
```

- **Backplane Virtual Interface**

The backplane virtual application interface can be configured automatically using the Shelf Address (default) or by specifying a static IP address.

Use the following parameters to the BP_APPL_MODE variable to define the configurations for backplane virtual interface.

none - Do not configure the interface
auto - Automatic configuration of the interface
static - Use other parameters to configure the interface
BP_APPL_MODE=auto

– Static Configuration of the Backplane Virtual Interface

  If using the static parameter to configure the backplane virtual interface, specify the desired IP addresses and netmask using the following variables:

  BP_V_ACT_APPL_IPADDR=
  BP_V_STB_APPL_IPADDR=
  BP_V_APPL_NETMASK=

- **DHCP Client Configuration**

The DHCP client configuration file located in /etc/dhclient.conf can be automatically configured with a predetermined DHCP client identifier. This feature can be enabled by changing the DHCLIENT_GEN option to auto. This causes the DHCP client host statement to be appended at each boot, and the dhclient.conf file should not be a part of the persistent file system in this scenario.

DHCLIENT_GEN=auto

- **Enabling the DHCP Server**

A DHCP server can be started on the out-of-band or backplane interfaces. To enable the server, specify "yes" to any combination of the following variables:

OOB_DHCP_SERVER=

BP_A_DHCP_SERVER=

```
BP_B_DHCP_SERVER=
```

- **Backplane Bonding Mode**

  The backplane interfaces can be a part of a bonding interface if the `BP_BOND_MODE` variable is set to either `dhcp` or `static`. The bonding interface is named `bond0`.

  Use the following parameters to the `BP_BOND_MODE` variable to define the configuration for backplane bonding mode.

  none - Do not configure the bonding interface (default)
  dhcp - Obtain an IP address for the interface via DHCP
  static - Use other parameters to configure the interface

  ```
  BP_BOND_MODE=none
  ```

  – Static Configuration of the Backplane Bonding Interface

    If using the `static` parameter to configure the backplane bonding interface, specify the desired IP address and netmask using the following variables:

    ```
    BP_BOND_IPADDR=
    BP_BOND_NETMASK=
    ```

- **Default Route (Gateway)**

  A default route can be configured using the `GATEWAY_MODE` variable.

  Use the following parameters to the `GATEWAY_MODE` variable to define the configuration for the route.

  none - Do not configure the default route
  auto - Automatic configuration of the router
  static - Use other parameters to configure the router

  ```
  GATEWAY_MODE=auto
  ```

  – Static Configuration of the Default Route

    If using the `static` parameter to configure the default route, specify the desired router IP address using the following variable:

```
GATEWAY=
```

- **Heartbeat Addresses**

  The ppp0 and ppp1 serial links are used for the heartbeat interfaces between Shelf Managers. The addresses can be modified by changing the values associated with `HB1_BASE` and `HB2_BASE`.

  ```
  HB1_BASE=192.168.101.0
  HB2_BASE=192.168.102.0
  ```

The last octet is obtained from the SLOT value, so only the first three octets are configurable.

- **Switch Slot IP Addresses**

  The C2000 shelf does not use the `SWITCH_SLOT_IPADDR` variable.

5.2.5 Restoring Factory Settings

Once changed, you cannot restore the factory settings.

Lost or forgotten IPs mean that you cannot access the SAM1410 anymore.

5.3 Accessing System Components

All system components are delivered with the software installed. If you want to upgrade or need to reinstall the software on these system components, you can use the interfaces of the SAM1410 to access the consoles and command line interfaces of the different system components.

The SAM1410 can be reached through telnet and through SSH.

user name: root

password: root

The shelf geographical address (SGA) is set during the system installation via a network connection (see section *Setting the Shelf Geographical Address* on page 84). The default shelf geographical address is 0.

The SAM1410 stores the shelf FRU data and the SGA persistently.

Access via the face plate interface:

SAM1410	IP Address
Left SAM1410	192.168.<SGA>.8
Right SAM1410	192.168.<SGA>.9
Active SAM1410	192.168.<SGA>.171
Standby SAM1410	192.168.<SGA>.181

Access via base interface channel 1:

SAM1410	IP Address
Left SAM1410	172.17.<SGA>.8
Right SAM1410	172.17.<SGA>.9
Active SAM1410	172.16.<SGA>.171
Standby SAM1410	172.16.<SGA>.181

Access via base interface channel 2:

SAM1410	IP Address
Left SAM1410	172.18.<SGA>.8
Right SAM1410	172.18.<SGA>.9
Active SAM1410	172.16.<SGA>.171
Standby SAM1410	172.16.<SGA>.181

For further information on the IP addresses of the SAM1410, refer *IP Addresses* on page 86.

5.4 Software

System components are delivered with the software installed.

Table 5-2 Software Available on System Components

Component	Software
SAM1410	IPMC firmware Boot loader (Uboot) Linux kernel Initial ram disk
Fan trays	IPMI firmware
PEM	IPMI firmware

5.4.1 Installation

All system components are delivered with the software installed.

In case you need to reinstall the software on the SAM-1410, PEM or fan trays refer to SAM1410 *Installation and Use* Manual.

5.4.2 Upgrade

The procedures and tools for software upgrades differ depending on what component needs to be upgraded. Available tools for firmware upgrades are:

- FUMI: part of HPI-B included in BBS
- fw_tool: integrated in the SAM1410 root file system
- swupgrade: integrated in the SAM1410 root file system

The following table shows which tools you can use and where you can find a description of how to do it.

Emerson recommends to always use FUMI if available.

Table 5-3 Available Software Upgrade Tools

Procedure	Tool	Document/Chapter
SAM1410 firmware upgrade	FUMI	*System Management Interface Based on HPI-B (Centellis 31kX /4100/2000/4410) User's Guide* Chapter: Using the Firmware Update Management Instrument
	fw_tool	*SAM1410 Installation and Use* Chapter: Software Upgrade
SAM1410 payload upgrade	FUMI	*System Management Interface Based on HPI-B (Centellis 31kX /4100/2000/4410) User's Guide* Chapter: Using the Firmware Update Management Instrument
	swupgrade	*SAM1410 Installation and Use* Chapter: Software Upgrade

Table 5-3 Available Software Upgrade Tools (continued)

Procedure	Tool	Document/Chapter
Fan tray firmware upgrade	FUMI	*System Management Interface Based on HPI-B (Centellis 31kX/4100/2000/4410) User's Guide* Chapter: Using the Firmware Update Management Instrument
	fw_tool	*SAM1410 Installation and Use* Chapter: Software Upgrade
PEM IPMI firmware upgrade	FUMI	*System Management Interface Based on HPI-B (Centellis 31kX /4100/2000/4410) User's Guide* Chapter: Using the Firmware Update Management Instrument
	fw_tool	*SAM1410 Installation and Use* Chapter: Software Upgrade

Please refer to the *Release Notes* to find out about software dependencies.

5.5 Power Entry Module (PEM)

This section discusses the operations of the Power Entry Module.

5.5.1 Description

The AXP 1410 has PICMG 3.0 compliant, dual PEMs and is rated for normal -48VDC to -60VDC. The PEMs plug directly into the midplane and deliver power to the backplane. Each input is rated for 80 amps. The two 80 amp feeds each power eight AdvancedTCA slots and the upper and lower FTMs. Each PEM also generates a separate +12V for redundant powering of the SAMs. This voltage is distributed to each of these modules across the backplane.

Power conversion for the SAMs and PEMs consists of two 66 watt, +48VDC to +12VDC converters which distribute dual power busses of +12VDC to separate parts of the system. The +12VDC outputs are provided on the backplane connector to the rest of the shelf. Power is redundant via the secondary PEM.

⚠ WARNING

Removing power to these components cannot be accomplished by turning the PEM's circuit breakers to the OFF position. The PEMs remain powered until the -48VDC power to each PEM is removed. Make sure you disconnect the power at the external source before removing the PEM from the shelf.

Power is introduced to the PEM using a DC power cable attached to the terminal blocks on the front of the module (power input cable and return cable). The terminal block consists of a dual stud connection which prevents the power cables from rotating and provides secure contacts for the cable lug. There is a plastic cover that protects the cable connections.

NOTICE

The DC power inputs must only be attached to approved Telephone Network Voltage (TNV-2) or Safety Extra Low Voltage (SELV) branch circuits. Branch circuits must comply with all requirements called for in these safety standards: IEC 60950, EN 60950, CAN/CSA-C22.2 No. 60950. Attaching inputs to non-TNV-2/SELV approved power sources will cause the system to fail compliance with safety regulations.

5.5.2 IPMC Circuitry

Each PEM is capable of monitoring voltage and circuit breaker status. The PEMs are loaded with the AdvancedTCA IPMC firmware. Preprogrammed FRU and Sensor Data Record (SDR) information reside on the PEM and is accessible from the SAM via the IPMB ports of the PEM. In addition, the IPMC monitoring functions include digital inputs to detect circuit breaker trips,

voltage sensors to detect backplane voltages, current sensors to detect current to the backplane, and on-board circuitry to detect failures on the PEM. The PEMs are managed by the Sentry Shelf Management software. Refer to Chapter 7, *FRU Information and Sensor Data Records,* on page 123.

Table 5-4 PEM IPMB Addresses

Description	IPMB Address
PEM A	0x66
PEM B	0x68

Figure 1-3 on page 27 provides a conceptual view of the connections between the PEMs, backplane, FTMs, and SAMs.

5.6 Fan Tray Modules

This section discusses the operation of the Fan Tray Modules (FTMs) of the AXP 1410.

5.6.1 Description

The FTMs are loaded with AdvancedTCA IPMC firmware. The fans are controlled as a group via the IPMI-based interfaces (IPMB) to the SAM. The IPMI interface is used for reporting faults, events, and status.The shelf manager software performs management of the FTM via the IPMB bus.The IPMC circuit provides temperature sensors for monitoring the temperatures of the FTM board components and for monitoring the inlet and outlet air temperature of the shelf. For further information, refer to Chapter 7, *FRU Information and Sensor Data Records,* on page 123

The upper FTM receives its signal and power connections from the backplane via a FTM distribution board. A fan interconnect board connects the backplane to the FTM distribution board. The FTMs are powered from -48VDC from the backplane. The lower FTM receives its signal and power connections from the AdvancedTCA backplane. Only the lower FTM has an air filter frame and filter in the module.

The FTMs have variable speed fan control, which is dependent on the temperature readings in the shelf. Airflow rates can vary depending on the fan speed and payload. Fan speed levels are controlled from the SAM via the IPM shelf management software. The fan speed levels change automatically based on temperature sensors. If any FRU exceeds the upper non-recoverable threshold, it is powered down.

The FTM has an ejector handle that interfaces with a mechanical switch to signal the software for hot swap. The handle and captive screws lock the FTM securely into the shelf. Each FTM is equipped with three status LEDs on the face plate. For removal and installation procedures for the FTMs, refer to Chapter 4, *FRU Installation*.

In the event of a Fan/Filter Out-of-Service alarm, first check the fan filters (only on the lower FTMs) to make sure the airflow is not obstructed.

5.6.2 Cooling Budget

The shelf cooling is designed to operate with the following temperature rises across the shelf. This allows cards with these dissipations to operate with commercial grade components, 70°C ambient temperature typical.

Table 5-5 Cooling Budget

Ambient Temperature	Temperature Rise
25°C	Delta T = 20° C
40°C	Delta T = 15° C
55°C	Delta T = 10° C

The following guidelines can assist in determining the cause of the cooling failure. Also refer to *Environmental Requirements* on page 37 for important information regarding ambient temperature requirements during servicing. If a cooling failure occurs, the failure may be caused by a failed fan or possibly a clogged filter. Check the filter first before replacing the FTM.

For further information of nonrecoverable temperature events, refer to Chapter 7, *FRU Information and Sensor Data Records,* on page 123.

5.6.3 IPMC Circuitry

Preprogrammed FRU and SDR information reside on the FTMs and is accessible from the SAM via the I^2C bus. FRU information can be found in the Chapter 7, *FRU Information and Sensor Data Records*, on page 123.

5.7 Redundancy

The following sections outline the interaction between redundant shelf managers and redundant hub blades. This interaction is not described within the *AdvancedTCA Specification PICMG 3.0*. The following sections also describe redundancy scenarios with redundant shelf managers and system managers.

5.7.1 Cold Standby

In AXP 1410 systems the shelf managers work in redundancy mode, this means that the HPI daemon runs on the active shelf manager and is started on the former stand-by shelf manager once it has become the active one.

When a former standby shelf manager becomes active the following steps are carried out:

- Removal of the ShMC IPMI address from the former active shelf manager
- Assignment of the ShMC IPMI address to the local IPMC
- Assignment of the active virtual IP address
- Sending a gratuitous address resolution protocol (ARP) (broadcast to update arp caches)
- Starting the HPI daemon which performs HPI resource discovery for all resources of the AdvancedTCA shelf
- Storing of the resource IDs which were assigned to the former active shelf manager. Thus, it is possible to reassign these IDs when the session is reestablished.
- Closing of all open HPI sessions on the client's side. They have to be reestablished. Any blocking HPI calls have to be avoided (for example, saHpiGetEvent) and calls with timeouts have to be used instead.

5.7.1.1 Heartbeat

The shelf managers use two private interfaces to heartbeat each other. The heartbeat interval is configured to 400 ms and the partner is considered inactive when no responses are received after five retries within 2 seconds.

5.7.1.2 Data Replication

During redundant operation, the active shelf manager synchronizes the shelf FRU information with the standby shelf manager every time it is modified (for example, shelf address shelf IP address, shelf manager controlled activation, allowance for FRU activation readiness, FRU activation order).

The change of shelf address, shelf IP address and FRU activation order takes effect after a reboot of the system, i.e. for the running software to start using the newly updated Shelf FRU contents. Since this requires that both shelf managers are extracted and reinserted or the system is power-cycled, only perform these kind of changes during the equipment set-up and not in normal operation.

For the SAM1410, the power on sequence (FRU activation order) can be changed at runtime using HPI controls defined by the *HPI-to-AdvancedTCA Mapping Specification* **(FRU Power On Sequence Control and FRU Power On Sequence Commit Control).**

While the shelf manager is inserted, the active shelf manager synchronizes the shelf FRU information with the newly inserted shelf manager.

The active shelf manager replicates HPI resource IDs on the standby shelf manager during redundant operation and during shelf manager insertion.

5.7.1.3 HPI Interface

The HPI interface for the Redundancy Sensor and the Heartbeat Sensor is implemented as described in the *HPI-to-AdvancedTCA Mapping Specification*.

5.7.2 System Start-Up Behavior and Dependencies

Once the system is powered on, the shelf manager and the hub blade need to connect and communicate which blades are active. The following section describes the start-up of a shelf manager, a hub blade and a system manager. A system manager is not part of a AXP 1410 system and has to be developed by the user.

5.7.2.1 Shelf Manager

The shelf manager which becomes active at system start up is dependent on the status of the partner switch blade. It detects whether a hub blade is present and whether the hub blade's ejector handles are closed. Then it negotiates its own active/standby role with its partner ShMC.

The following table shows which shelf manager becomes active or standby depending on which hub blades are present in the shelf.

Table 5-6 Start up Dependencies of the Shelf Manager and the Hub Blade

Left Hub Blade	Right Hub Blade	Left Shelf Manager	Right Shelf Manager
-	-	a	s
-	p	s	a
p	-	a	s
p	p	a	s
-	h	s	a
h	-	a	s
h	h	a	s
p	h	a	s
h	p	s	a

p: Hub blade present
h: Hub blade ejector handles are open
-: Hub blade not present
a: Shelf manager active
s: Shelf manager standby

5.7.2.2 Hub Blade

Hub blades are associated with a shelf manager. Hub 1 with SAM-A and hub 2 with SAM-B.

5.7.2.3 System Manager

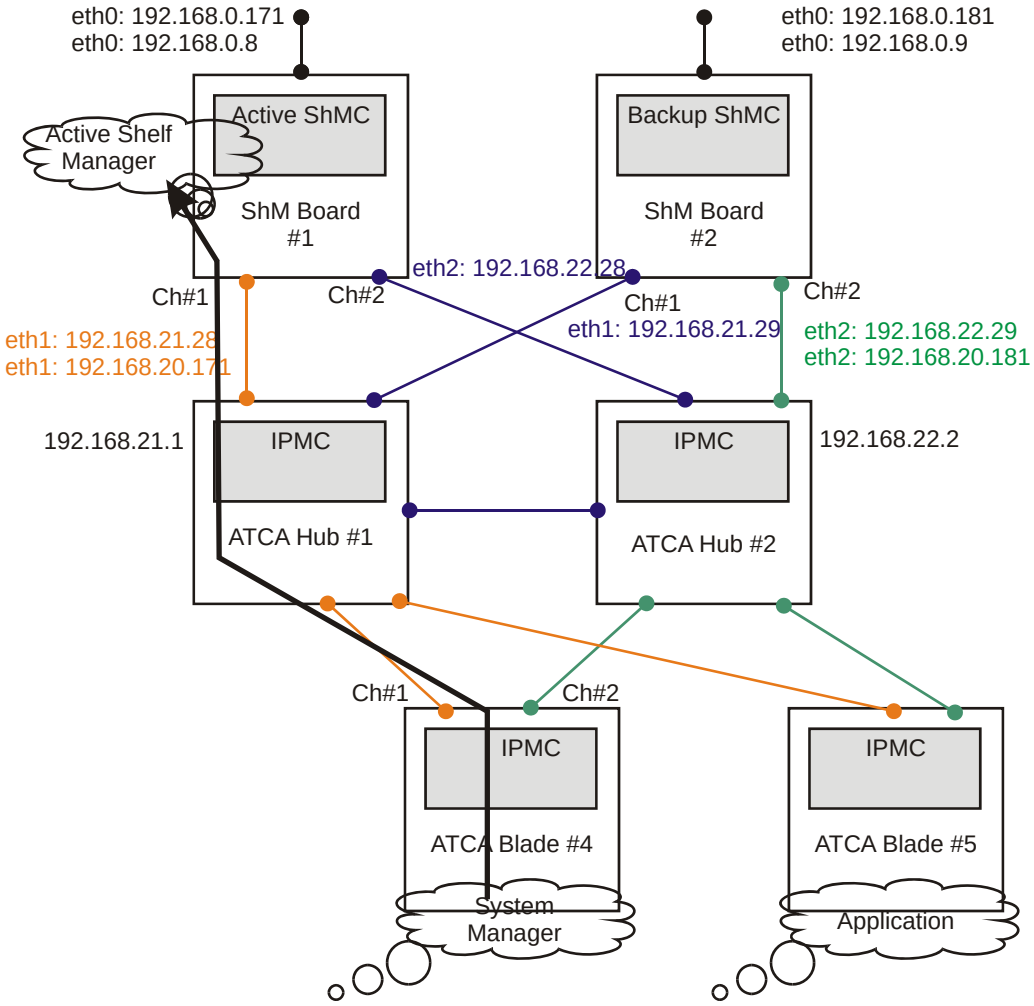
If the system manager accesses the active shelf manager via the backplane Ethernet interfaces it may use virtual IP Plane and active virtual IP address 192.168.20.171 of the shelf manager.

To detect where the active shelf manager is located the system manager can use the following techniques:

- Inside the AdvancedTCA shelf
  The system manager pings via both Ethernet interfaces to the active virtual IP address of the shelf manager to identify in which slot the active shelf manager is located.
- Inside the AdvancedTCA shelf
  The system manager uses IPMI commands to identify in which slot the active shelf manager is located:
  - The **`Get Address Info`** command to IPMB address 0x20 (in its 1-byte-request data variant) to get the hardware address of the shelf manager.
  - Read the 'Backplane Point-to-Point Connectivity' record of FRU ID 254 of the shelf manager for the base interface and analyze the shelf manager's interface connection to the hub blade.
  - Check whether the correspondent hub blade is present and active (M4 or M5 state). The system manager knows that the base channel #1 of the AdvancedTCA front blade is connected to the Hub #1 and the base channel #2 of the AdvancedTCA front blade is connected to the Hub #2, and assigns the virtual IP address to the proper interface.
- Outside the AdvancedTCA shelf with interlinks between the hub blades
  The system manager pings via its own active IP address to the active virtual IP address of the shelf manager.

The figure below assumes that the shelf address is 0. Green color shows BASE1 and orange shows BASE2. The arrows show the packet routing.

Figure 5-5 System Start-Up



5.7.3 Redundancy Operations

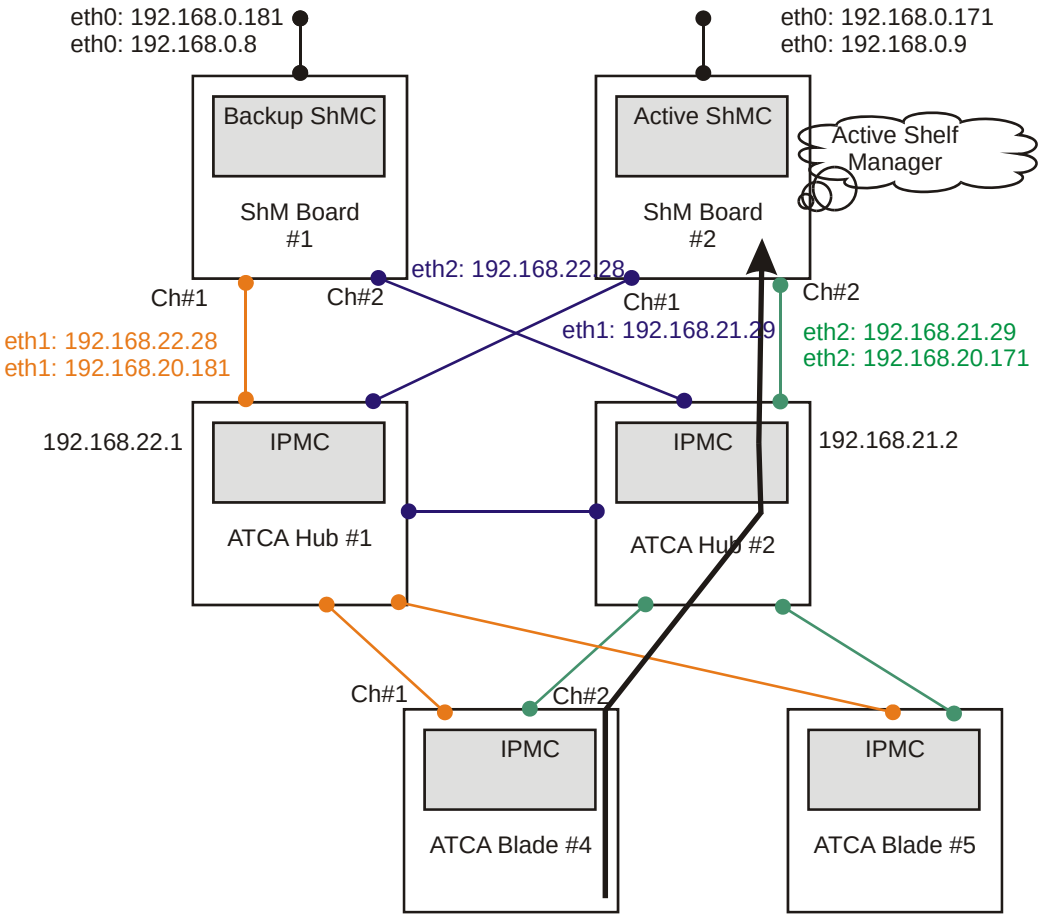
This section describes what happens during shelf manager switchover, takeover, failover, and when a shelf manager is inserted or extracted.

5.7.3.1 Shelf Manager Switchover

During a switchover, the active and the standby shelf manager change their roles. The system manager initiates and controls this process on the active shelf manager. A switchover is, for example, necessary when the active shelf manager needs to be extracted. Since only the standby shelf manager can be extracted, a switchover needs to take place.

The figure below assumes that the shelf address is 0. Green color shows BASE1 and orange shows BASE2. The arrows show the packet routing.

Figure 5-6 Shelf Manager Switchover



The system manager performs the following tasks:

1. Checks whether it can reach the standby shelf manager
2. Initiates a switchover on the active shelf manager using an HPI control
3. Closes the HPI session

4. If necessary, moves its own active virtual IP address to another interface
5. Reestablishes the HPI session to the active shelf manager with **saHpiSessionOpen**
6. Waits in **saHpiResourcesDiscover** until the active shelf manager discovers all resources

5.7.3.2 Shelf Manager Takeover

Takeover is a process to switch the active and the standby roles of the shelf manager boards. The system manager initiates and controls this process on the standby shelf manager.

The system manager performs the following steps:

1. Initiates a takeover on the standby shelf manager by running the script: **sv_activate**
2. Closes the HPI session
3. Moves its own active virtual IP address to the other interface
4. Reestablishes the HPI session to the active shelf manager with **saHpiSessionOpen**
5. Waits in **saHpiResourcesDiscover** until the active shelf manager will discover all resources

5.7.3.3 Shelf Manager Failover

Failover is a process when the standby shelf manager becomes the active one because the active shelf manager fails.

The reasons for the shelf manager failover can be:

- Communication failure between the two shelf managers
- Unexpected removal of the active shelf manager
- Software failure of the active shelf manager
- Failure of the switch through which the virtual IP address is routed

The system manager detects a failover because of timeouts of the HPI calls. The system manager actions depend on network topology.

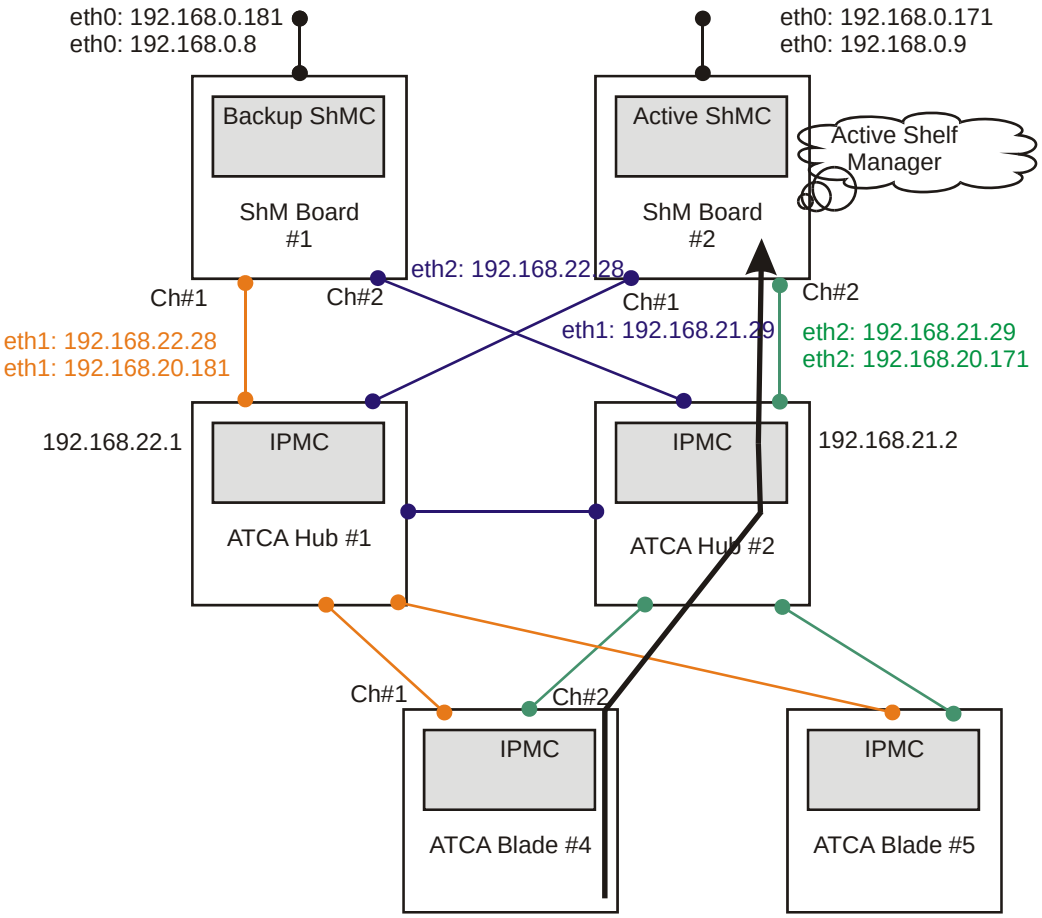
The system manager performs the following steps:

1. Closes the HPI session
2. Moves its own active virtual IP address to the other interface
3. Reestablishes the HPI session to the active shelf manager with **`saHpiSessionOpen`**
4. Waits in **`saHpiResourcesDiscover`** until the active shelf manager discovers all resources.

If a shelf manager failover occurs in a system with IP planes that are connected with one interlink (between two hubs or between external switches), the system manager can reach the active shelf manager via the interlink. An IP plane failover is not needed and the connection to the applications via the same interface as before is kept. If the virtual IP address of the shelf manager is used, a plane failover is necessary.

The figure below assumes that the shelf address is 0. Green color shows BASE1 and orange shows BASE2. The arrows show the packet routing.

Figure 5-7 Link Failover after Active Shelf Manager Failover



5.7.3.4 Shelf Manager Insertion

When a new shelf manager board is inserted into the system, it always becomes the standby shelf manager. The shelf manager that is already in the system keeps the active role.

The active shelf manager synchronizes the shelf FRU information with the shelf FRU information of the newly inserted shelf manager board. The active shelf manager sends HPI events from the redundancy sensor (redundancy regains).

The system manager detects a shelf manager board insertion while receiving hot swap events and later HPI redundancy event sensor. The system manager reads the HPI redundancy sensor to retrieve the shelf manager redundancy status.

5.7.3.5 Shelf Manager Extraction

Extraction is a redundant operation when the shelf manager board leaves the cluster and can be safely extracted. It is a planned operation initiated by the system manager. It is only possible to extract the standby shelf manager. If you want to extract the active shelf manager, a switchover has to take place so that the active shelf manager becomes standby and can then be extracted.

To power down the standby shelf manager board the system manager performs the following steps:

1. Reads the HPI redundancy sensor to detect which physical shelf manager board is active
2. Powers down the standby shelf manager board
3. Receives HPI redundancy event sensor (redundancy lost)
4. Receives HPI hot swap event
5. Reads the HPI redundancy sensor to retrieve the shelf manager redundancy status

The active shelf manager deactivates the standby shelf manager board under the control of the system manager. It can be safely extracted afterwards.

The active shelf manager sends an HPI redundancy event (redundancy lost) to the system manager.

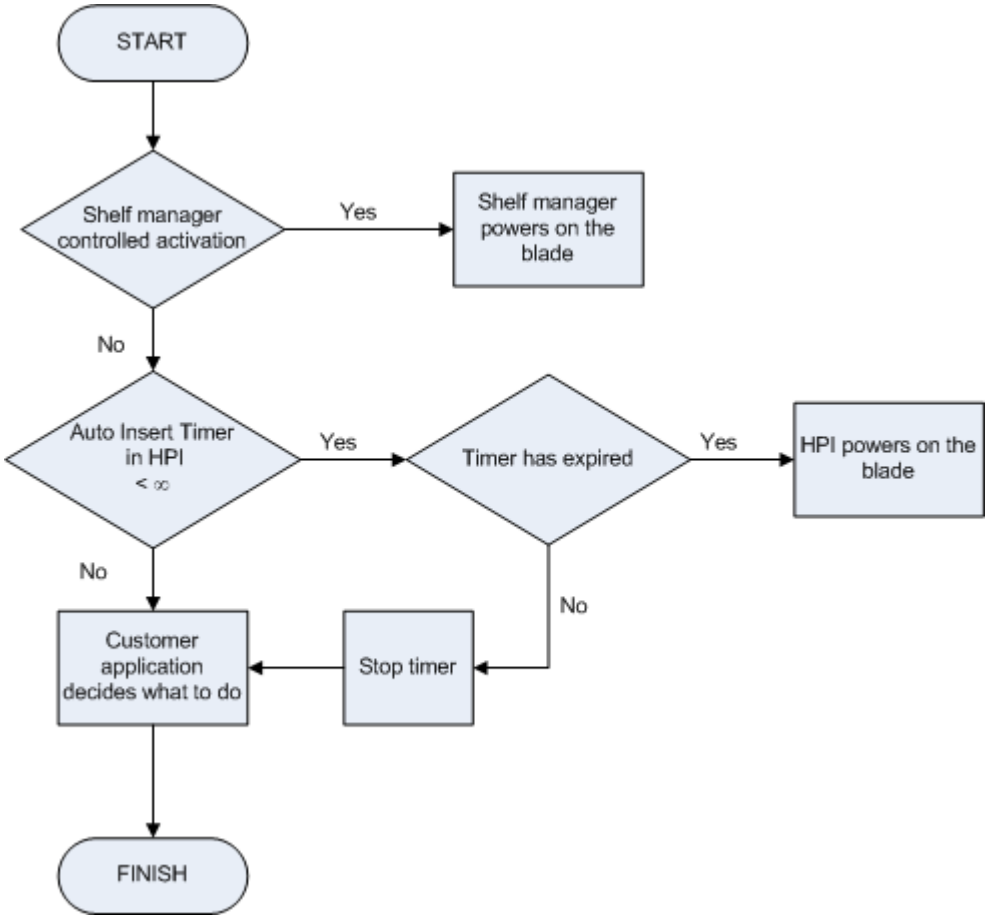
5.8 Blade Insertion and Extraction

This section describes the steps that are carried out by the software when a blade is inserted or supposed to be extracted.

5.8.1 Power-On After Blade Insertion

The default for each slot is that when a blade is inserted it is automatically switched on by the shelf manager. To change this, you need to change the shelf FRU information. The default for the Auto Insert Timer in HPI is 60 s.

Figure 5-8 Blade Power-On After Insertion

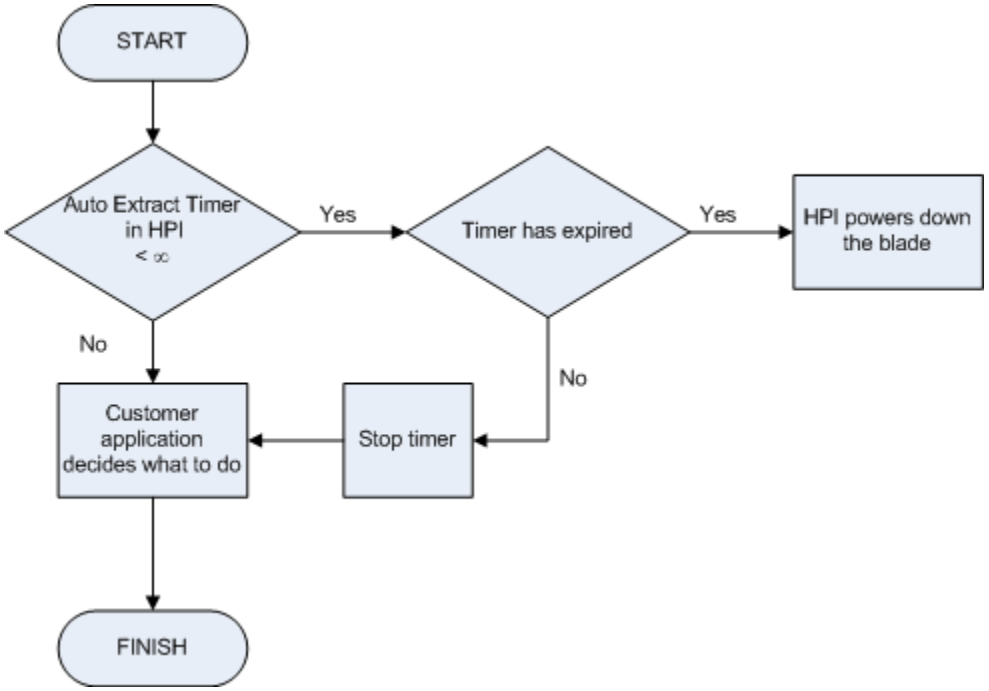


5.8.2 Power-Down Before Blade Extraction

When a blade is supposed to be extracted, it needs to be powered down first. As soon as the blade has reached M6, an IPMI command is sent that tells the payload that the blade will be powered down. The payload then has time to carry out all necessary steps. The blade is powered down afterwards.

It may take a long time before the payload has finished carrying out all necessary steps and the blade can be powered down.

Figure 5-9 Blade Power-Down Before Extraction



Supported IPMI Commands

6.1 Introduction

This chapter describes the different commands supported by the AXP 1410 series platforms. Command categories are as follows:

- *Standard IPMI Commands*
- *PICMG 3.0 Commands*

6.2 Standard IPMI Commands

The IPMC is fully compliant to the Intelligent Platform Management Interface v.1.5. This section provides information on which IPMI commands are supported on PEMs and fans. Table entries marked with an “X” indicate which FRU supports a listed command. IPMI information for blades can be found in the respective blade documentation.

6.2.1 Global IPMI Commands

The IPMC supports the following global IPMI commands.

Table 6-1 Supported Global IPMI Commands

NetFn Rq/Rs	Command	CMD	PEMs	FTMs
Get Device ID	0x06/0x07	0x01	X	X

6.2.2 Event Commands

The IPMC supports the following event commands.

Table 6-2 Supported Event Commands

Command	NetFn Rq/Rs	CMD	PEMs	FTMs
Set Event Receiver	0x04/0x05	0x00	X	X
Get Event Receiver	0x04/0x05	0x01	X	X

6.2.3 Sensor Device Commands

The IPMC supports the following sensor device commands.

Table 6-3 Supported Sensor Device Commands

Command	NetFn Rq/Rs	CMD	PEMs	FTMs
Get Device SDR Info	0x04/0x05	0x20	X	X
Get Device SDR	0x04/0x05	0x21	X	X
Reserve Device SDR Repository	0x04/0x05	0x22	X	X
Get Sensor Reading Factors	0x04/0x05	0x23	X	X
Set Sensor Hysteresis	0x04/0x05	0x24	X	X
Get Sensor Hysteresis	0x04/0x05	0x25	X	X
Set Sensor Threshold	0x04/0x05	0x26	X	X
Get Sensor Threshold	0x04/0x05	0x27	X	X
Set Sensor Event Enable	0x04/0x05	0x28	X	X
Get Sensor Event Enable	0x04/0x05	0x29	X	X
Get Sensor Event Status	0x04/0x05	0x2b	X	X
Get Sensor Reading	0x04/0x05	0x2d	X	X
Get Sensor Type	0x04/0x05	0x2f	X	X

6.2.4 FRU Device Commands

The IPMC supports the following FRU device commands.

Table 6-4 Supported FRU Commands

Command	NetFn Rq/Rs	CMD	PEMs	FTMs
Get FRU Inventory Area Info	0x0A/0x0B	0x10	X	X
Read FRU Data	0x0A/0x0B	0x11	X	X
Write FRU Data	0x0A/0x0B	0x12	X	X

6.3 PICMG 3.0 Commands

The Emerson IPMC is a fully compliant AdvancedTCA Intelligent Platform Management Controller. For example, it supports all required and mandatory AdvancedTCA commands as defined in the PICMG 3.0 specification.

Table 6-5 Supported PICMG 3.0 Commands

Command	NetFn Rq/Rs	CMD	PEMs	FTMs
Get PICMG Properties	0x2C/0x2D	0x00	X	X
Get Address Info	0x2C/0x2D	0x01	X	X
FRU Control	0x2C/0x2D	0x04	X	X
Get FRU LED Properties	0x2C/0x2D	0x05	X	X
Get LED Color Capabilities	0x2C/0x2D	0x06	X	X
Set FRU LED State	0x2C/0x2D	0x07	X	X
Get FRU LED State	0x2C/0x2D	0x08	X	X
Set IPMB State	0x2C/0x2D	0x09	X	X
Set FRU Activation Policy	0x2C/0x2D	0x0A	X	X
Get FRU Activation Policy	0x2C/0x2D	0x0B	X	X
Set FRU Activation	0x2C/0x2D	0x0C	X	X
Get Device Locator Record ID	0x2C/0x2D	0x0D	X	X
Compute Power Properties	0x2C/0x2D	0x10	X	X
Set Power Level	0x2C/0x2D	0x11	X	X
Get Power Level	0x2C/0x2D	0x12	X	X
Get Fan Speed Properties	0x2C/0x2D	0x14		X
Set Fan Level	0x2C/0x2D	0x15		X
Get Fan Level	0x2C/0x2D	0x16		X
Set FRU Extracted	0x2C/0x2D	0x3A	X	X

FRU Information and Sensor Data Records

7.1 Introduction

This chapter introduces FRU information, e-keying, sensor overviews, and power configuration data for PEMs and upper and lower fan tray module of the AXP 1410 system. Information in this chapter includes:

- *Fan Tray Module Sensor Data Records*
- *Power Entry Module Sensor Data Records*

7.2 Fan Tray Module Sensor Data Records

This section describes in detail all available IPMI sensors of the Fan Tray Module.

7.2.1 Fan Tray Module Sensor Overview

The following table lists all IPMI sensors available on the Fan Tray Module.

Table 7-1 IPMI Sensors on the Fan Tray Module

Sensor No.	Sensor Name	Type of Measurement	What does it measure?	Sensor Type	Availability
0	Hot Swap	Status	State of FRU	Discrete	Always
1	Version Change	Version change	OEM Version Use	Discrete	Always
2	IPMB Link		State of IPMB link	Discrete	Always
3	+12V A_MON	Voltage	Fan 12V source A	Threshold	Always
4	+12V B_MON	Voltage	Fan 12V source B	Threshold	Always
5	+3.3V	Voltage	3.3V output	Threshold	Always
6	+5V A_MON	Voltage	5V source A	Thresholdd	Always
7	+5V B_MON	Voltage	5V source B	Threshold	Always
8	Fan 1	Fan	Fan Unit 1 Inlet Fan RPM	Threshold	Always
9	Fan 2	Fan	Fan Unit 2 Inlet Fan RPM	Threshold	Always
10	Fan 3	Fan	Fan Unit 3 Inlet Fan RPM	Threshold	Always
11	Fan 4	Fan	Fan Unit 4 Inlet Fan RPM	Threshold	Always

Table 7-1 IPMI Sensors on the Fan Tray Module (continued)

Sensor No.	Sensor Name	Type of Measurement	What does it measure?	Sensor Type	Availability
12	Fan 5	Fan	Fan Unit 5 Inlet Fan RPM	Threshold	Always
13	Fan 6	Fan	Fan Unit 6 Inlet Fan RPM	Threshold	Always
14	Fan 1 Outlet	Fan	Fan Unit 1 Outlet Fan RPM	Threshold	Always
15	Fan 2 Outlet	Fan	Fan Unit 2 Outlet Fan RPM	Threshold	Always
16	Fan 3 Outlet	Fan	Fan Unit 3 Outlet Fan RPM	Threshold	Always
17	Fan 4 Outlet	Fan	Fan Unit 4 Outlet Fan RPM	Threshold	Always
18	Fan 5 Outlet	Fan	Fan Unit 5 Outlet Fan RPM	Threshold	Always
19	Fan 6 Outlet	Fan	Fan Unit 6 Outlet Fan RPM	Threshold	Always
20	FanFault Z1F1	OEM-reserved	Zone 1 Fan Unit 1 Controller Fault State	Discrete	Always
21	FanFault Z1F2	OEM-reserved	Zone 1 Fan Unit 2 Controller Fault State	Discrete	Always
22	FanFault Z1F3	OEM-reserved	Zone 1 Fan Unit 3 Controller Fault State	Discrete	Always
23	FanFault Z2F1	OEM-reserved	Zone 2 Fan Unit 1 Controller Fault State	Discrete	Always
24	FanFault Z2F2	OEM-reserved	Zone 2 Fan Unit 2 Controller Fault State	Discrete	Always
25	FanFault Z2F3	OEM-reserved	Zone 2 Fan Unit 3 Controller Fault State	Discrete	Always
26	FuseFail 48VA1	OEM-reserved	48V Feed A Zone 1 Fuse Failure Flag	Discrete	Always
27	FuseFail 48VA2	OEM-reserved	48V Feed A Zone 2 Fuse Failure Flag	Discrete	Always
28	FuseFail 48VB1	OEM-reserved	48V Feed B Zone 1 Fuse Failure Flag	Discrete	Always
29	FuseFail 48VB2	OEM-reserved	48V Feed B Zone 2 Fuse Failure Flag	Discrete	Always
30	FTM Temp 1	Temperature	Fan Tray Module Temperature Sensor 1	Threshold	Always

Table 7-1 IPMI Sensors on the Fan Tray Module (continued)

Sensor No.	Sensor Name	Type of Measurement	What does it measure?	Sensor Type	Availability
31	FTM Temp 2	Temperature	Fan Tray Module Temperature Sensor 2	Threshold	Always
32	FTM Temp 3	Temperature	Fan Tray Module Temperature Sensor 3	Threshold	Always
33	FTM Temp 4	Temperature	Fan Tray Module Temperature Sensor 4	Threshold	Always
34	FTM Temp 5	Temperature	Fan Tray Module Temperature Sensor 5	Threshold	Always
35	FTM Temp 6	Temperature	Fan Tray Module Temperature Sensor 6	Threshold	Always

7.2.2 Fan Tray Module Analog Sensors

The analog sensors available on the FTM can be divided into the following three categories:

- *Voltage Sensors*
- *Temperature Sensors*
- *Fan Speed Sensors*

7.2.2.1 Voltage Sensors

The following sensors measure voltages of the FTM.

Table 7-2 Sensor No. 3 +12V A_MON

Feature	Raw Value/Description	Interpreted Value
Sensor Name	+12V A_MON	
Device		
Sensor Type	0x02	Voltage
Class	0x01	Threshold
Sensor Owner LUN	0x00	

Table 7-2 Sensor No. 3 +12V A_MON (continued)

Feature	Raw Value/Description	Interpreted Value
Entity ID	0x0A	Power Supply
Entity Instance	0x60	
Rearm mode		Auto
Hysteresis support		Readable/Settable
Threshold access support		Readable/Settable
Event message control		Entire Sensor only
Readable threshold mask, Settable threshold mask (bytes 19, 20)	0x3F3F	Upper and Lower Non-Critical, Critical and Non-Recoverable Thresholds are Readable and Settable
Reading Type		Unsigned
Lower Non-Critical, Critical and Non-Recoverable thresholds	0xDB, 0xDA, 0xD9	(11.8260, 11.7720, 11.7180) Volts
Upper Non-Critical, Critical and Non-Recoverable thresholds	0xF7, 0xF9, 0xFA	(13.3380, 13.4460, 13.5) Volts

Table 7-3 Sensor No. 4 +12V B_MON

Feature	Raw Value/Description	Interpreted Value
Sensor Name	+12V B_MON	
Device		
Sensor Type	0x02	Voltage
Class	0x01	Threshold
Sensor Owner LUN	0x00	
Entity ID	0x0A	Power Supply
Entity Instance	0x60	
Rearm mode		Auto
Hysteresis support		Readable/Settable
Threshold access support		Readable/Settable
Event message control		Entire Sensor only

Table 7-3 Sensor No. 4 +12V B_MON (continued)

Feature	Raw Value/Description	Interpreted Value
Readable threshold mask, Settable threshold mask (bytes 19, 20)	0x3F3F	Upper and Lower Non-Critical, Critical and Non-Recoverable Thresholds are Readable and Settable
Reading Type		Unsigned
Lower Non-Critical, Critical and Non-Recoverable thresholds	0xDB, 0xDA, 0xD9	(11.8260, 11.7720, 11.7180) Volts
Upper Non-Critical, Critical and Non-Recoverable thresholds	0xF7, 0xF9, 0xFA	(13.3380, 13.4460, 13.5) Volts

Table 7-4 Sensor No. 5 +3.3V

Feature	Raw Value/Description	Interpreted Value
Sensor Name	+3.3V	
Device		
Sensor Type	0x02	Voltage
Class	0x01	Threshold
Sensor Owner LUN	0x00	
Entity ID	0x0A	Power Supply
Entity Instance	0x60	
Rearm mode		Auto
Hysteresis support		Readable/Settable
Threshold access support		Readable/Settable
Event message control		Entire Sensor only
Readable threshold mask, Settable threshold mask (bytes 19, 20)	0x3F3F	Upper and Lower Non-Critical, Critical and Non-Recoverable Thresholds are Readable and Settable
Reading Type		Unsigned
Lower Non-Critical, Critical and Non-Recoverable thresholds	0xD8, 0xD4, 0xD1	(3.1104, 3.0528, 3,0096) Volts
Upper Non-Critical, Critical and Non-Recoverable thresholds	0xF4, 0xF7, 0xFA	(3.5136, 3.5568, 3.6) Volts

Table 7-5 Sensor No. 6 +5V A_MON

Feature	Raw Value/Description	Interpreted Value
Sensor Name	+5V A_MON	
Device		
Sensor Type	0x02	Voltage
Class	0x01	Threshold
Sensor Owner LUN	0x00	
Entity ID	0x0A	Power Supply
Entity Instance	0x60	
Rearm mode		Auto
Hysteresis support		Readable/Settable
Threshold access support		Readable/Settable
Event message control		Entire Sensor only
Readable threshold mask, Settable threshold mask (bytes 19, 20)	0x3F3F	Upper and Lower Non-Critical, Critical and Non-Recoverable Thresholds are Readable and Settable
Reading Type		Unsigned
Lower Non-Critical, Critical and Non-Recoverable thresholds	0xDF, 0xD5, 0xC8	(4.8168, 4.6008, 4.3200) Volts
Upper Non-Critical, Critical and Non-Recoverable thresholds	0xF1, 0xF6, 0xFA	(5.2056, 5.3136, 5.4) Volts

Table 7-6 Sensor No. 7 +5V B_MON

Feature	Raw Value/Description	Interpreted Value
Sensor Name	+5V B_MON	
Device		
Sensor Type	0x02	Voltage
Class	0x01	Threshold
Sensor Owner LUN	0x00	
Entity ID	0x0A	Power Supply

Table 7-6 Sensor No. 7 +5V B_MON (continued)

Feature	Raw Value/Description	Interpreted Value
Entity Instance	0x60	
Rearm mode		Auto
Hysteresis support		Readable/Settable
Threshold access support		Readable/Settable
Event message control		Entire Sensor only
Readable threshold mask, Settable threshold mask (bytes 19, 20)	0x3F3F	Upper and Lower Non-Critical, Critical and Non-Recoverable Thresholds are Readable and Settable
Reading Type		Unsigned
Lower Non-Critical, Critical and Non-Recoverable thresholds	0xDF, 0xD5, 0xC8	(4.8168, 4.6008, 4.3200) Volts
Upper Non-Critical, Critical and Non-Recoverable thresholds	0xF1, 0xF6, 0xFA	(5.2056, 5.3136, 5.4) Volts

7.2.2.2 Temperature Sensors

The following sensors measure temperatures of the FTM.

Table 7-7 Sensor No. 30 FTM Temp 1

Feature	Raw Value/Description	Interpreted Value
Sensor Name	FTM Temp 1	
Device		
Sensor Type	0x01	Temperature
Class	0x01	Threshold
Sensor Owner LUN	0x00	
Entity ID	0x0A	
Entity Instance	0x60	
Rearm mode		Auto
Hysteresis support		Readable/Settable

Table 7-7 Sensor No. 30 FTM Temp 1 (continued)

Feature	Raw Value/Description	Interpreted Value
Threshold access support		Readable/Settable
Event message control		Entire Sensor only
Readable threshold mask, Settable threshold mask (bytes 19, 20)	0x3838	Critical and Non-Recoverable Thresholds are Readable and Settable
Reading Type		Unsigned
Critical and Non-Recoverable thresholds	0x2D, 0x35, 0x3F	(57, 67) Degrees C

Table 7-8 Sensor No. 31 FTM Temp 2

Feature	Raw Value/Description	Interpreted Value
Sensor Name	FTM Temp 2	
Device		
Sensor Type	0x01	Temperature
Class	0x01	Threshold
Sensor Owner LUN	0x00	
Entity ID	0x0A	
Entity Instance	0x60	
Rearm mode		Auto
Hysteresis support		Readable/Settable
Threshold access support		Readable/Settable
Event message control		Entire Sensor only
Readable threshold mask, Settable threshold mask (bytes 19, 20)	0x3838	Critical and Non-Recoverable Thresholds are Readable and Settable
Reading Type		Unsigned
Critical and Non-Recoverable thresholds	0x2D, 0x35, 0x3F	(57, 67) Degrees C

Table 7-9 Sensor No. 32 FTM Temp 3

Feature	Raw Value/Description	Interpreted Value
Sensor Name	FTM Temp 3	
Device		
Sensor Type	0x01	Temperature
Class	0x01	Threshold
Sensor Owner LUN	0x00	
Entity ID	0x0A	
Entity Instance	0x60	
Rearm mode		Auto
Hysteresis support		Readable/Settable
Threshold access support		Readable/Settable
Event message control		Entire Sensor only
Readable threshold mask, Settable threshold mask (bytes 19, 20)	0x3838	Critical and Non-Recoverable Thresholds are Readable and Settable
Reading Type		Unsigned
Critical and Non-Recoverable thresholds	0x2D, 0x35, 0x3F	(57, 67) Degrees C

Table 7-10 Sensor No. 33 FTM Temp 4

Feature	Raw Value/Description	Interpreted Value
Sensor Name	FTM Temp 4	
Device		
Sensor Type	0x01	Temperature
Class	0x01	Threshold
Sensor Owner LUN	0x00	
Entity ID	0x0A	
Entity Instance	0x60	
Rearm mode		Auto

Table 7-10 Sensor No. 33 FTM Temp 4 (continued)

Feature	Raw Value/Description	Interpreted Value
Hysteresis support		Readable/Settable
Threshold access support		Readable/Settable
Event message control		Entire Sensor only
Readable threshold mask, Settable threshold mask (bytes 19, 20)	0x3838	Critical and Non-Recoverable Thresholds are Readable and Settable
Reading Type		Unsigned
Critical and Non-Recoverable thresholds	0x2D, 0x35, 0x3F	(57, 67) Degrees C

Table 7-11 Sensor No. 34 FTM Temp 5

Feature	Raw Value/Description	Interpreted Value
Sensor Name	FTM Temp 5	
Device		
Sensor Type	0x01	Temperature
Class	0x01	Threshold
Sensor Owner LUN	0x00	
Entity ID	0x0A	
Entity Instance	0x60	
Rearm mode		Auto
Hysteresis support		Readable/Settable
Threshold access support		Readable/Settable
Event message control		Entire Sensor only
Readable threshold mask, Settable threshold mask (bytes 19, 20)	0x3838	Critical and Non-Recoverable Thresholds are Readable and Settable
Reading Type		Unsigned
Critical and Non-Recoverable thresholds	0x2D, 0x35, 0x3F	(57, 67) Degrees C

Table 7-12 Sensor No. 35 FTM Temp 6

Feature	Raw Value/Description	Interpreted Value
Sensor Name	FTM Temp 6	
Device		
Sensor Type	0x01	Temperature
Class	0x01	Threshold
Sensor Owner LUN	0x00	
Entity ID	0x0A	
Entity Instance	0x60	
Rearm mode		Auto
Hysteresis support		Readable/Settable
Threshold access support		Readable/Settable
Event message control		Entire Sensor only
Readable threshold mask, Settable threshold mask (bytes 19, 20)	0x3838	Critical and Non-Recoverable Thresholds are Readable and Settable
Reading Type		Unsigned
Critical and Non-Recoverable thresholds	0x2D, 0x35, 0x3F	(57, 67) Degrees C

7.2.2.3 Fan Speed Sensors

The following sensors measure the speed of the fans of the FTM.

Table 7-13 Sensor No. 8 Fan 1

Feature	Raw Value/Description	Interpreted Value
Sensor Name	Fan 1	
Device		
Sensor Type	0x04	Fan
Class	0x01	Threshold
Sensor Owner LUN	0x00	

Table 7-13 Sensor No. 8 Fan 1 (continued)

Feature	Raw Value/Description	Interpreted Value
Entity ID	0x1D	Cooling Unit
Entity Instance	0x63	
Rearm mode		Auto
Hysteresis support		Readable/Settable
Threshold access support		Readable/Settable
Event message control		Entire Sensor only
Readable threshold mask, Settable threshold mask (bytes 19, 20)	0x3F3F	Upper and Lower Non-Critical, Critical and Non-Recoverable Thresholds are Readable and Settable
Reading Type		Unsigned
Lower Non-Critical, Critical and Non-Recoverable thresholds	0x24, 0x24, 0x24	(1224, 1228, 1224) RPM
Upper Non-Critical, Critical and Non-Recoverable thresholds	0xCE, 0xE6, 0xF2	(7004, 7820, 8228) RPM

Table 7-14 Sensor No. 9 Fan 2

Feature	Raw Value/Description	Interpreted Value
Sensor Name	Fan 2	
Device		
Sensor Type	0x04	Fan
Class	0x01	Threshold
Sensor Owner LUN	0x00	
Entity ID	0x1D	Cooling Unit
Entity Instance	0x63	
Rearm mode		Auto
Hysteresis support		Readable/Settable
Threshold access support		Readable/Settable
Event message control		Entire Sensor only

Table 7-14 Sensor No. 9 Fan 2 (continued)

Feature	Raw Value/Description	Interpreted Value
Readable threshold mask, Settable threshold mask (bytes 19, 20)	0x3F3F	Upper and Lower Non-Critical, Critical and Non-Recoverable Thresholds are Readable and Settable
Reading Type		Unsigned
Lower Non-Critical, Critical and Non-Recoverable thresholds	0x24, 0x24, 0x24	(1224, 1228, 1224) RPM
Upper Non-Critical, Critical and Non-Recoverable thresholds	0xCE, 0xE6, 0xF2	(7004, 7820, 8228) RPM

Table 7-15 Sensor No. 10 Fan 3

Feature	Raw Value/Description	Interpreted Value
Sensor Name	Fan 3	
Device		
Sensor Type	0x04	Fan
Class	0x01	Threshold
Sensor Owner LUN	0x00	
Entity ID	0x1D	Cooling Unit
Entity Instance	0x63	
Rearm mode		Auto
Hysteresis support		Readable/Settable
Threshold access support		Readable/Settable
Event message control		Entire Sensor only
Readable threshold mask, Settable threshold mask (bytes 19, 20)	0x3F3F	Upper and Lower Non-Critical, Critical and Non-Recoverable Thresholds are Readable and Settable
Reading Type		Unsigned
Lower Non-Critical, Critical and Non-Recoverable thresholds	0x24, 0x24, 0x24	(1224, 1228, 1224) RPM
Upper Non-Critical, Critical and Non-Recoverable thresholds	0xCE, 0xE6, 0xF2	(7004, 7820, 8228) RPM

Table 7-16 Sensor No. 11 Fan 4

Feature	Raw Value/Description	Interpreted Value
Sensor Name	Fan 4	
Device		
Sensor Type	0x04	Fan
Class	0x01	Threshold
Sensor Owner LUN	0x00	
Entity ID	0x1D	Cooling Unit
Entity Instance	0x63	
Rearm mode		Auto
Hysteresis support		Readable/Settable
Threshold access support		Readable/Settable
Event message control		Entire Sensor only
Readable threshold mask, Settable threshold mask (bytes 19, 20)	0x3F3F	Upper and Lower Non-Critical, Critical and Non-Recoverable Thresholds are Readable and Settable
Reading Type		Unsigned
Lower Non-Critical, Critical and Non-Recoverable thresholds	0x24, 0x24, 0x24	(1224, 1228, 1224) RPM
Upper Non-Critical, Critical and Non-Recoverable thresholds	0xCE, 0xE6, 0xF2	(7004, 7820, 8228) RPM

Table 7-17 Sensor No. 12 Fan 5

Feature	Raw Value/Description	Interpreted Value
Sensor Name	Fan 5	
Device		
Sensor Type	0x04	Fan
Class	0x01	Threshold
Sensor Owner LUN	0x00	
Entity ID	0x1D	Cooling Unit

Table 7-17 Sensor No. 12 Fan 5 (continued)

Feature	Raw Value/Description	Interpreted Value
Entity Instance	0x63	
Rearm mode		Auto
Hysteresis support		Readable/Settable
Threshold access support		Readable/Settable
Event message control		Entire Sensor only
Readable threshold mask, Settable threshold mask (bytes 19, 20)	0x3F3F	Upper and Lower Non-Critical, Critical and Non-Recoverable Thresholds are Readable and Settable
Reading Type		Unsigned
Lower Non-Critical, Critical and Non-Recoverable thresholds	0x24, 0x24, 0x24	(1224, 1228, 1224) RPM
Upper Non-Critical, Critical and Non-Recoverable thresholds	0xCE, 0xE6, 0xF2	(7004, 7820, 8228) RPM

Table 7-18 Sensor No. 13 Fan 6

Feature	Raw Value/Description	Interpreted Value
Sensor Name	Fan 6	
Device		
Sensor Type	0x04	Fan
Class	0x01	Threshold
Sensor Owner LUN	0x00	
Entity ID	0x1D	Cooling Unit
Entity Instance	0x63	
Rearm mode		Auto
Hysteresis support		Readable/Settable
Threshold access support		Readable/Settable
Event message control		Entire Sensor only

Table 7-18 Sensor No. 13 Fan 6 (continued)

Feature	Raw Value/Description	Interpreted Value
Readable threshold mask, Settable threshold mask (bytes 19, 20)	0x3F3F	Upper and Lower Non-Critical, Critical and Non-Recoverable Thresholds are Readable and Settable
Reading Type		Unsigned
Lower Non-Critical, Critical and Non-Recoverable thresholds	0x24, 0x24, 0x24	(1224, 1228, 1224) RPM
Upper Non-Critical, Critical and Non-Recoverable thresholds	0xCE, 0xE6, 0xF2	(7004, 7820, 8228) RPM

Table 7-19 Sensor No. 14 Fan 1 Outlet

Feature	Raw Value/Description	Interpreted Value
Sensor Name	Fan 1 Outlet	
Device		
Sensor Type	0x04	Fan
Class	0x01	Threshold
Sensor Owner LUN	0x00	
Entity ID	0x1D	Cooling Unit
Entity Instance	0x63	
Rearm mode		Auto
Hysteresis support		Readable/Settable
Threshold access support		Readable/Settable
Event message control		Entire Sensor only
Readable threshold mask, Settable threshold mask (bytes 19, 20)	0x3F3F	Upper and Lower Non-Critical, Critical and Non-Recoverable Thresholds are Readable and Settable
Reading Type		Unsigned
Lower Non-Critical, Critical and Non-Recoverable thresholds	0x24, 0x24, 0x24	(902, 902, 902) RPM
Upper Non-Critical, Critical and Non-Recoverable thresholds	0xCE, 0xE6, 0xF2	(5588, 5610, 5610) RPM

Table 7-20 Sensor No. 15 Fan 2 Outlet

Feature	Raw Value/Description	Interpreted Value
Sensor Name	Fan 2 Outlet	
Device		
Sensor Type	0x04	Fan
Class	0x01	Threshold
Sensor Owner LUN	0x00	
Entity ID	0x1D	Cooling Unit
Entity Instance	0x63	
Rearm mode		Auto
Hysteresis support		Readable/Settable
Threshold access support		Readable/Settable
Event message control		Entire Sensor only
Readable threshold mask, Settable threshold mask (bytes 19, 20)	0x3F3F	Upper and Lower Non-Critical, Critical and Non-Recoverable Thresholds are Readable and Settable
Reading Type		Unsigned
Lower Non-Critical, Critical and Non-Recoverable thresholds	0x24, 0x24, 0x24	(902, 902, 902) RPM
Upper Non-Critical, Critical and Non-Recoverable thresholds	0xCE, 0xE6, 0xF2	(5588, 5610, 5610) RPM

Table 7-21 Sensor No. 16 Fan 3 Outlet

Feature	Raw Value/Description	Interpreted Value
Sensor Name	Fan 3 Outlet	
Device		
Sensor Type	0x04	Fan
Class	0x01	Threshold
Sensor Owner LUN	0x00	
Entity ID	0x1D	Cooling Unit

Table 7-21 Sensor No. 16 Fan 3 Outlet (continued)

Feature	Raw Value/Description	Interpreted Value
Entity Instance	0x63	
Rearm mode		Auto
Hysteresis support		Readable/Settable
Threshold access support		Readable/Settable
Event message control		Entire Sensor only
Readable threshold mask, Settable threshold mask (bytes 19, 20)	0x3F3F	Upper and Lower Non-Critical, Critical and Non-Recoverable Thresholds are Readable and Settable
Reading Type		Unsigned
Lower Non-Critical, Critical and Non-Recoverable thresholds	0x24, 0x24, 0x24	(902, 902, 902) RPM
Upper Non-Critical, Critical and Non-Recoverable thresholds	0xCE, 0xE6, 0xF2	(5588, 5610, 5610) RPM

Table 7-22 Sensor No. 17 Fan 4 Outlet

Feature	Raw Value/Description	Interpreted Value
Sensor Name	Fan 4 Outlet	
Device		
Sensor Type	0x04	Fan
Class	0x01	Threshold
Sensor Owner LUN	0x00	
Entity ID	0x1D	Cooling Unit
Entity Instance	0x63	
Rearm mode		Auto
Hysteresis support		Readable/Settable
Threshold access support		Readable/Settable
Event message control		Entire Sensor only

Table 7-22 Sensor No. 17 Fan 4 Outlet (continued)

Feature	Raw Value/Description	Interpreted Value
Readable threshold mask, Settable threshold mask (bytes 19, 20)	0x3F3F	Upper and Lower Non-Critical, Critical and Non-Recoverable Thresholds are Readable and Settable
Reading Type		Unsigned
Lower Non-Critical, Critical and Non-Recoverable thresholds	0x24, 0x24, 0x24	(902, 902, 902) RPM
Upper Non-Critical, Critical and Non-Recoverable thresholds	0xCE, 0xE6, 0xF2	(5588, 5610, 5610) RPM

Table 7-23 Sensor No. 18 Fan 5 Outlet

Feature	Raw Value/Description	Interpreted Value
Sensor Name	Fan 5 Outlet	
Device		
Sensor Type	0x04	Fan
Class	0x01	Threshold
Sensor Owner LUN	0x00	
Entity ID	0x1D	Cooling Unit
Entity Instance	0x63	
Rearm mode		Auto
Hysteresis support		Readable/Settable
Threshold access support		Readable/Settable
Event message control		Entire Sensor only
Readable threshold mask, Settable threshold mask (bytes 19, 20)	0x3F3F	Upper and Lower Non-Critical, Critical and Non-Recoverable Thresholds are Readable and Settable
Reading Type		Unsigned
Lower Non-Critical, Critical and Non-Recoverable thresholds	0x24, 0x24, 0x24	(902, 902, 902) RPM
Upper Non-Critical, Critical and Non-Recoverable thresholds	0xCE, 0xE6, 0xF2	(5588, 5610, 5610) RPM

Table 7-24 Sensor No. 19 Fan 6 Outlet

Feature	Raw Value/Description	Interpreted Value
Sensor Name	Fan 6 Outlet	
Device		
Sensor Type	0x04	Fan
Class	0x01	Threshold
Sensor Owner LUN	0x00	
Entity ID	0x1D	Cooling Unit
Entity Instance	0x63	
Rearm mode		Auto
Hysteresis support		Readable/Settable
Threshold access support		Readable/Settable
Event message control		Entire Sensor only
Readable threshold mask, Settable threshold mask (bytes 19, 20)	0x3F3F	Upper and Lower Non-Critical, Critical and Non-Recoverable Thresholds are Readable and Settable
Reading Type		Unsigned
Lower Non-Critical, Critical and Non-Recoverable thresholds	0x24, 0x24, 0x24	(902, 902, 902) RPM
Upper Non-Critical, Critical and Non-Recoverable thresholds	0xCE, 0xE6, 0xF2	(5588, 5610, 5610) RPM

7.2.3 Fan Tray Module Discrete Sensors

The following tables describe these discrete sensors available on the FTM:

- *Hot Swap Sensor*
- *IPMB Link Sensor*
- *Reserved Sensor*
- *OEM-Reserved Sensors*

7.2.3.1 Hot Swap Sensor

The following table describes the discrete hot swap sensor available on the FTM.

Table 7-25 Sensor No. 0, Hot Swap

Feature	Raw Value/Description	Interpreted Value
Sensor Name	Hot Swap	
Device		
Sensor Type	0xF0	Hot Swap
Class	0x6F	Discrete
Sensor Owner LUN	0x00	
Entity ID	0x1E	Power Supply
Entity Instance	0x60	
Rearm Mode		Auto
Hysteresis support		
Threshold access support		
Event Message Control		Entire Sensor Only
Readable threshold mask, Settable threshold mask (bytes 19, 20)	0x00FF	
Reading Type		According to PICMG 3.0

7.2.3.2 IPMB Link Sensor

The following table describes the IPMB link sensor on the FTMs.

Table 7-26 Sensor No. 2, IPMB Physical

Feature	Raw Value/Description	Interpreted Value
Sensor Name	IPMB Physical	
Type of Measurement		IPMB Link State
Class	0x6F	Discrete
Event/Reading Type	0x6F	Sensor-specific

Table 7-26 Sensor No. 2, IPMB Physical (continued)

Feature	Raw Value/Description	Interpreted Value
Sensor Type	0xF1	IPMB Link
Sensor Owner LUN	0x00	
Entity ID	0x1E	
Entity Instance	0x60	
Rearm Mode		Auto
Hysteresis support		
Threshold access support		
Event Message Control		Entire Sensor Only
Readable threshold mask, Settable threshold mask (bytes 19, 20)		
Reading Type		According to PICMG 3.0

7.2.3.3 Reserved Sensor

The following table describes the reserved sensor available on the FTM.

Table 7-27 Sensor No. 1 Version change

Feature	Raw Value/Description	Interpreted Value
Sensor Name	Version change	
Type of Measurement		
Class	0x6F	Discrete
Sensor Type	0x2B	Reserved
Sensor Owner LUN	0x00	
Entity ID	0x03	
Entity Instance	0x60	
Rearm mode		Auto
Event message control		Entire Sensor only

Table 7-27 Sensor No. 1 Version change (continued)

Feature	Raw Value/Description	Interpreted Value
Assertion Event Mask (bytes 15,16)	0x00FF	
Deassertion Event Mask (bytes 17,18)	0x0000	
Discrete Reading Mask (bytes 19, 20)	0x00FF	Supports 2 States
Reading Definition		According to Pigeon Point

7.2.3.4 OEM-Reserved Sensors

The following table describes the OEM-reserved sensors available on the FTM. The format of Sensors 20 through 25 is FanFault Z**x**F**y**, where **x** is the Zone number, and **y** is the Fan Unit number. The format of Sensors 26 to 29 is FuseFail 48V**xy**, where **x** is Feed A or B, and **y** is Input 1 or 2.

Table 7-28 Sensor No. 20 FanFault Z1F1

Feature	Raw Value/Description	Interpreted Value
Sensor Name	FanFault Z1F1	
Type of Measurement		
Class	0x03	Discrete
Sensor Type	0xC0	OEM-reserved
Sensor Owner LUN	0x00	
Entity ID	0x0A	
Entity Instance	0x60	
Rearm mode		Auto
Event message control		Entire Sensor only

Table 7-28 Sensor No. 20 FanFault Z1F1 (continued)

Feature	Raw Value/Description	Interpreted Value
Assertion Event Mask (bytes 15,16)	0x02, 0x00	
Deassertion Event Mask (bytes 17,18)	0x02, 0x00	
Discrete Reading Mask (bytes 19, 20)	0x03, 0x00	Supports 2 States
Reading Definition		Assertion signals a fan controller fault

Table 7-29 Sensor No. 21 FanFault Z1F2

Feature	Raw Value/Description	Interpreted Value
Sensor Name	FanFault Z1F2	
Type of Measurement		
Class	0x03	Discrete
Sensor Type	0xC0	OEM-reserved
Sensor Owner LUN	0x00	
Entity ID	0x0A	
Entity Instance	0x60	
Rearm mode		Auto
Event message control		Entire Sensor only
Assertion Event Mask (bytes 15,16)	0x02, 0x00	
Deassertion Event Mask (bytes 17,18)	0x02, 0x00	
Discrete Reading Mask (bytes 19, 20)	0x03, 0x00	Supports 2 States
Reading Definition		Assertion signals a fan controller fault

Table 7-30 Sensor No. 22 FanFault Z1F3

Feature	Raw Value/Description	Interpreted Value
Sensor Name	FanFault Z1F3	
Type of Measurement		
Class	0x03	Discrete
Sensor Type	0xC0	OEM-reserved
Sensor Owner LUN	0x00	
Entity ID	0x0A	
Entity Instance	0x60	
Rearm mode		Auto
Event message control		Entire Sensor only
Assertion Event Mask (bytes 15,16)	0x02, 0x00	
Deassertion Event Mask (bytes 17,18)	0x02, 0x00	
Discrete Reading Mask (bytes 19, 20)	0x03, 0x00	Supports 2 States
Reading Definition		Assertion signals a fan controller fault

Table 7-31 Sensor No. 23 FanFault Z2F1

Feature	Raw Value/Description	Interpreted Value
Sensor Name	FanFault Z2F1	
Type of Measurement		
Class	0x03	Discrete
Sensor Type	0xC0	OEM-reserved
Sensor Owner LUN	0x00	
Entity ID	0x0A	
Entity Instance	0x60	
Rearm mode		Auto
Event message control		Entire Sensor only

Table 7-31 Sensor No. 23 FanFault Z2F1 (continued)

Feature	Raw Value/Description	Interpreted Value
Assertion Event Mask (bytes 15,16)	0x02, 0x00	
Deassertion Event Mask (bytes 17,18)	0x02, 0x00	
Discrete Reading Mask (bytes 19, 20)	0x03, 0x00	Supports 2 States
Reading Definition		Assertion signals a fan controller fault

Table 7-32 Sensor No. 24 FanFault Z2F2

Feature	Raw Value/Description	Interpreted Value
Sensor Name	FanFault Z2F2	
Type of Measurement		
Class	0x03	Discrete
Sensor Type	0xC0	OEM-reserved
Sensor Owner LUN	0x00	
Entity ID	0x0A	
Entity Instance	0x60	
Rearm mode		Auto
Event message control		Entire Sensor only
Assertion Event Mask (bytes 15,16)	0x02, 0x00	
Deassertion Event Mask (bytes 17,18)	0x02, 0x00	
Discrete Reading Mask (bytes 19, 20)	0x03, 0x00	Supports 2 States
Reading Definition		Assertion signals a fan controller fault

Table 7-33 Sensor No. 25 FanFault Z2F3

Feature	Raw Value/Description	Interpreted Value
Sensor Name	FanFault Z2F3	
Type of Measurement		
Class	0x03	Discrete
Sensor Type	0xC0	OEM-reserved
Sensor Owner LUN	0x00	
Entity ID	0x0A	
Entity Instance	0x60	
Rearm mode		Auto
Event message control		Entire Sensor only
Assertion Event Mask (bytes 15,16)	0x02, 0x00	
Deassertion Event Mask (bytes 17,18)	0x02, 0x00	
Discrete Reading Mask (bytes 19, 20)	0x03, 0x00	Supports 2 States
Reading Definition		Assertion signals a fan controller fault

Table 7-34 Sensor No. 26 FuseFail 48VA1

Feature	Raw Value/Description	Interpreted Value
Sensor Name	FuseFail 48VA1	
Type of Measurement		
Class	0x03	Discrete
Sensor Type	0xC0	OEM-reserved
Sensor Owner LUN	0x00	
Entity ID	0x0A	
Entity Instance	0x60	
Rearm mode		Auto
Event message control		Entire Sensor only

Table 7-34 Sensor No. 26 FuseFail 48VA1 (continued)

Feature	Raw Value/Description	Interpreted Value
Assertion Event Mask (bytes 15,16)	0x02, 0x00	
Deassertion Event Mask (bytes 17,18)	0x02, 0x00	
Discrete Reading Mask (bytes 19, 20)	0x03, 0x00	Supports 2 States
Reading Definition		Assertion signals a fuse failure

Table 7-35 Sensor No. 27 FuseFail 48VA2

Feature	Raw Value/Description	Interpreted Value
Sensor Name	FuseFail 48VA2	
Type of Measurement		
Class	0x03	Discrete
Sensor Type	0xC0	OEM-reserved
Sensor Owner LUN	0x00	
Entity ID	0x0A	
Entity Instance	0x60	
Rearm mode		Auto
Event message control		Entire Sensor only
Assertion Event Mask (bytes 15,16)	0x02, 0x00	
Deassertion Event Mask (bytes 17,18)	0x02, 0x00	
Discrete Reading Mask (bytes 19, 20)	0x03, 0x00	Supports 2 States
Reading Definition		Assertion signals a fuse failure

Table 7-36 Sensor No. 28 FuseFail 48VB1

Feature	Raw Value/Description	Interpreted Value
Sensor Name	FuseFail 48VB1	
Type of Measurement		
Class	0x03	Discrete
Sensor Type	0xC0	OEM-reserved
Sensor Owner LUN	0x00	
Entity ID	0x0A	
Entity Instance	0x60	
Rearm mode		Auto
Event message control		Entire Sensor only
Assertion Event Mask (bytes 15,16)	0x02, 0x00	
Deassertion Event Mask (bytes 17,18)	0x02, 0x00	
Discrete Reading Mask (bytes 19, 20)	0x03, 0x00	Supports 2 States
Reading Definition		Assertion signals a fuse failure

Table 7-37 Sensor No. 29 FuseFail 48VB2

Feature	Raw Value/Description	Interpreted Value
Sensor Name	FuseFail 48VB2	
Type of Measurement		
Class	0x03	Discrete
Sensor Type	0xC0	OEM-reserved
Sensor Owner LUN	0x00	
Entity ID	0x0A	
Entity Instance	0x60	
Rearm mode		Auto
Event message control		Entire Sensor only

Table 7-37 Sensor No. 29 FuseFail 48VB2 (continued)

Feature	Raw Value/Description	Interpreted Value
Assertion Event Mask (bytes 15,16)	0x02, 0x00	
Deassertion Event Mask (bytes 17,18)	0x02, 0x00	
Discrete Reading Mask (bytes 19, 20)	0x03, 0x00	Supports 2 States
Reading Definition		Assertion signals a fuse failure

7.3 Power Entry Module Sensor Data Records

This section describes in detail all available IPMI sensors of the Power Entry Module.

7.3.1 PEM FRU Information

There are two PEMs; one at IPMB address 0x66 and another at IPMB address 0x68. The main FRU (FRU 0) contains the FRU information of the PEM and it is the same for both PEMs (except for the serial number). FRU 1 contains the FRU information that the active SAM caches as FRU 254 of IPMB address 0x20.

The FRU 0 information in a PEM4000 is represented in the next table.

```
Pigeon Point Shelf Manager Command Line Interpreter

66: FRU # 0, FRU Info

Common Header:    Format Version = 1

Board Info Area:

    Version     = 1

    Language Code            = 25

    Mfg Date/Time            = Jun  1 00:00:00 2005 (4952160 minutes
    since 1996)

    Board Manufacturer       = Emerson Network Power, Embedded Computing
```

```
        Board Product Name       = Centellis 4000 Power Entry Module
        Board Serial Number      = XXXXXXX 7 digit Board S/N)
        Board Part Number        = 0106831D01C
        FRU Programmer File ID   = CENT4000_PEM.inf
    Product Info Area:
        Version     = 1
        Language Code            = 25
        Manufacturer Name        = Emerson Network Power, Embedded Coputing
        Product Name             = PEM4000
        Product Part / Model#    = 0106823D01C
        Product Version          = Rev. 1.00
        Product Serial Number    = XXXXXX (6 digit assembly S/N)
        Asset Tag                =
        FRU Programmer File ID   = CENT4000_PEM.inf
```

7.3.2 E-Keying

The Power Entry Module does not have e-keyed backplane interfaces, and as a result the FRU information for the PEM does not contain a PICMG Point-to-Point Connectivity Record.

7.3.3 Power Configuration

The next table describes the power configuration for the PEMs.

Table 7-38 Power Configuration for PEMs

Item	Value	Description
Dynamic power reconfiguration support	No	Possibility to change FRU power consumption without switching it off, according to AdvancedTCA
Dynamic power configuration	No	Are the power draw levels fixed or these may vary if additional components are hot inserted or onboard component power consumption is changing dynamically
Number of power draw levels	1	The amount of possible power levels, normally 1
Early power draw levels, watt	0.1	Complete early power level including IPMC
Steady state power draw levels, watt	0.1	Complete steady power consumption including IPMC
Transition from early to steady levels in seconds	0	How long does board consume early power. Early power is normally bigger than steady power

7.3.4 Power Entry Module Sensor Overview

The following table lists all IPMI sensors available on the Power Entry Module.

Table 7-39 IPMI Sensors on the PEM

Sensor No.	Sensor Name	Type of Measurement	What does it measure?	Sensor Type	Availability
0	Hot Swap	Status	State of FRU	Discrete	Always
1	IPMB Physical	Status	State of IPMB link	Discrete	Always
2	+3.3V	Voltage		Analog	Always
3	+12V Measure	Voltage		Analog	Always
4	+5V Measure	Voltage		Analog	Always
5	+12V CC	Voltage			

Table 7-39 IPMI Sensors on the PEM (continued)

Sensor No.	Sensor Name	Type of Measurement	What does it measure?	Sensor Type	Availability
6	CB 1	Status	Circuit Breaker fuse state	OEM-reserved	Always
7	CB 2	Status	Circuit Breaker fuse state	OEM-reserved	Always
8	FUSE 1	Status	Hardware fuse	OEM-reserved	Always
9	FUSE 2	Status	Hardware fuse	OEM-reserved	Always
10	FUSE 3	Status	Hardware fuse	OEM-reserved	Always
11	FUSE 4	Status	Hardware fuse	Analog	Always
12	LM73 Temp	Temperature		Analog	Always
13	48.0V FEED_1	Voltage		Analog	Always
14	48.0V FEED_2	Voltage		Analog	Always
15	PEM LFC Status	Management Subsystem Shelf			
16	Current Measure1	Current		Analog	Always
17	Current Measure2	Current		Analog	Always

7.3.5 Power Entry Module Analog Sensors

The analog sensors available on the PEM can be divided into the following three categories:

- *Voltage Sensors*
- *Current Sensors*
- *Temperature Sensor*

7.3.5.1 Voltage Sensors

The following sensors measure voltages of the PEM.

Table 7-40 Sensor No. 2 +3.3V

Feature	Raw Value/Description	Interpreted Value
Sensor Name	+3.3V	
Device		
Sensor Type	0x02	Voltage
Class	0x01	Threshold
Sensor Owner LUN	0x00	
Entity ID	0x0A	Power Supply
Entity Instance	0x60	
Rearm mode		Auto
Hysteresis support		Readable/Settable
Threshold access support		Readable/Settable
Event message control		Entire Sensor only
Readable threshold mask, Settable threshold mask (bytes 19, 20)	0x3F, 0x3F	Upper and Lower Non-Critical, Critical and Non-Recoverable Thresholds are Readable and Settable
Reading Type		Unsigned
Lower Non-Critical, Critical and Non-Recoverable thresholds	0xD8, 0xD4, 0xD1	(3.1104, 3.0528, 3.0096) Volts
Upper Non-Critical, Critical and Non-Recoverable thresholds	0xF4, 0xF7, 0xFA	(3.5136, 3.5568, 3.6) Volts

Table 7-41 Sensor No. 3 +12V Measure

Feature	Raw Value/Description	Interpreted Value
Sensor Name	+12V Measure	
Device		
Sensor Type	0x02	Voltage
Class	0x01	Threshold
Sensor Owner LUN	0x00	
Entity ID	0x0A	Power Supply
Entity Instance	0x60	
Rearm mode		Auto
Hysteresis support		Readable/Settable
Threshold access support		Readable/Settable
Event message control		Entire Sensor only
Readable threshold mask, Settable threshold mask (bytes 19, 20)	0x3F3F	Upper and Lower Non-Critical, Critical and Non-Recoverable Thresholds are Readable and Settable
Reading Type		Unsigned
Lower Non-Critical, Critical and Non-Recoverable thresholds	0xD4, 0xCA, 0xC1	(11.024, 10.504, 10.036) Volts
Upper Non-Critical, Critical and Non-Recoverable thresholds	0xFA, 0xFF, 0xFF	(13, 13.26, 13.26) Volts

Table 7-42 Sensor No. 4 +5V Measure

Feature	Raw Value/Description	Interpreted Value
Sensor Name	+5V Measure	
Device		
Sensor Type	0x02	Voltage
Class	0x01	Threshold
Sensor Owner LUN	0x00	
Entity ID	0x0A	Power Supply

Table 7-42 Sensor No. 4 +5V Measure (continued)

Feature	Raw Value/Description	Interpreted Value
Entity Instance	0x60	
Rearm mode		Auto
Hysteresis support		Readable/Settable
Threshold access support		Readable/Settable
Event message control		Entire Sensor only
Readable threshold mask, Settable threshold mask (bytes 19, 20)	0x3F3F	Upper and Lower Non-Critical, Critical and Non-Recoverable Thresholds are Readable and Settable
Reading Type		Unsigned
Lower Non-Critical, Critical and Non-Recoverable thresholds	0xDF, 0xDA, 0xD1	(4.8168, 4.7088, 4.5144) Volts
Upper Non-Critical, Critical and Non-Recoverable thresholds	0xF6, 0xFA, 0xFF	(5.3136, 5.4, 5.508) Volts

Table 7-43 Sensor No. 5 +12V CC

Feature	Raw Value/Description	Interpreted Value
Sensor Name	+12V CC	
Device		
Sensor Type	0x02	Voltage
Class	0x01	Threshold
Sensor Owner LUN	0x00	
Entity ID	0x0A	Power Supply
Entity Instance	0x60	
Rearm mode		Auto
Hysteresis support		Readable/Settable
Threshold access support		Readable/Settable
Event message control		Entire Sensor only

Table 7-43 Sensor No. 5 +12V CC (continued)

Feature	Raw Value/Description	Interpreted Value
Readable threshold mask, Settable threshold mask (bytes 19, 20)	0x3F3F	Upper and Lower Non-Critical, Critical and Non-Recoverable Thresholds are Readable and Settable
Reading Type		Unsigned
Lower Non-Critical, Critical and Non-Recoverable thresholds	0xD4, 0xCA, 0xC1	(11.024, 10.504, 10.036) Volts
Upper Non-Critical, Critical and Non-Recoverable thresholds	0xFA, 0xFF, 0xFF	(13, 13.26, 13.26) Volts

Table 7-44 Sensor No. 13, 48.0V FEED_1

Feature	Raw Value/Description	Interpreted Value
Sensor Name	48.0V FEED_1	
Device		
Sensor Type	0x02	Voltage
Class	0x01	Threshold
Sensor Owner LUN	0x00	
Entity ID	0x0A	Power Supply
Entity Instance	0x60	
Rearm mode		Auto
Hysteresis support		Readable/Settable
Threshold access support		Readable/Settable
Event message control		Entire Sensor only
Readable threshold mask, Settable threshold mask (bytes 19, 20)	0x3F3F	Upper and Lower Non-Critical, Critical and Non-Recoverable Thresholds are Readable and Settable
Reading Type		Unsigned
Lower Non-Critical, Critical and Non-Recoverable thresholds	0x84, 0x77, 0x71	(42.24, 38.08, 36.16) Volts
Upper Non-Critical, Critical and Non-Recoverable thresholds	0xE1, 0xEB, 0xEE	(72, 75.20, 76.16) Volts

Table 7-45 Sensor No. 14, 48.0V FEED_2

Feature	Raw Value/Description	Interpreted Value
Sensor Name	48.0V FEED_2	
Device		
Sensor Type	0x02	Voltage
Class	0x01	Threshold
Sensor Owner LUN	0x00	
Entity ID	0x0A	Power Supply
Entity Instance	0x60	
Rearm mode		Auto
Hysteresis support		Readable/Settable
Threshold access support		Readable/Settable
Event message control		Entire Sensor only
Readable threshold mask, Settable threshold mask (bytes 19, 20)	0x3F3F	Upper and Lower Non-Critical, Critical and Non-Recoverable Thresholds are Readable and Settable
Reading Type		Unsigned
Lower Non-Critical, Critical and Non-Recoverable thresholds	0x84, 0x77, 0x71	(42.24, 38.08, 36.16) Volts
Upper Non-Critical, Critical and Non-Recoverable thresholds	0xE1, 0xEB, 0xEE	(72, 75.20, 76.16) Volts

7.3.5.2 Current Sensors

The following table describes the sensors that measures the +12V current on the PEM.

Table 7-46 Sensor No. 15 Current Measure1

Feature	Raw Value/Description	Interpreted Value
Sensor Name	Current Measure1	
Device		
Sensor Type	0x03	Current
Class	0x01	Threshold
Sensor Owner LUN	0x00	
Entity ID	0x0A	Power Supply
Entity Instance	0x60	
Rearm mode		Auto
Hysteresis support		Readable/Settable
Threshold access support		Readable/Settable
Event message control		Entire Sensor only
Readable threshold mask, Settable threshold mask (bytes 19, 20)	0x3838	Upper Non-Critical, Critical and Non-Recoverable Thresholds are Readable and Settable
Reading Type		Unsigned
Upper Non-Critical, Critical and Non-Recoverable thresholds	0xB4, 0xB8, 0xBE	(75, 77, 80) Amps

Table 7-47 Sensor No. 16 Current Measure2

Feature	Raw Value/Description	Interpreted Value
Sensor Name	Current Measure2	
Device		
Sensor Type	0x03	Current
Class	0x01	Threshold
Sensor Owner LUN	0x00	

Table 7-47 Sensor No. 16 Current Measure2 (continued)

Feature	Raw Value/Description	Interpreted Value
Entity ID	0x0A	Power Supply
Entity Instance	0x60	
Rearm mode		Auto
Hysteresis support		Readable/Settable
Threshold access support		Readable/Settable
Event message control		Entire Sensor only
Readable threshold mask, Settable threshold mask (bytes 19, 20)	0x3838	Upper Non-Critical, Critical and Non-Recoverable Thresholds are Readable and Settable
Reading Type		Unsigned
Upper Non-Critical, Critical and Non-Recoverable thresholds	0xB4, 0xB8, 0xBE	(75, 77, 80) Amps

7.3.5.3 Temperature Sensor

The following tables describe the temperature sensor available on the PEMs.

Table 7-48 Sensor No. 12 LM73 Temp

Feature	Raw Value/Description	Interpreted Value
Sensor Name	LM73 Temp	
Device		
Sensor Type	0x01	Temperature
Class	0x01	Threshold
Sensor Owner LUN	0x00	
Entity ID	0x0A	Power Supply
Entity Instance	0x60	
Rearm mode		Auto
Hysteresis support		Readable/Settable
Threshold access support		Readable/Settable

Table 7-48 Sensor No. 12 LM73 Temp (continued)

Feature	Raw Value/Description	Interpreted Value
Event message control		Entire Sensor only
Readable threshold mask, Settable threshold mask (bytes 19, 20)	0x3838	Upper Non-Critical, Critical and Non-Recoverable Thresholds are Readable and Settable
Reading Type		Unsigned
Upper Non-Critical, Critical and Non-Recoverable thresholds	0x17, 0x23, 0x2E	(40.48, 61.60, 80.96) degrees C

7.3.6 Power Entry Module Discrete Sensors

The following tables describe these discrete sensors available on the PEM:

- *Hot Swap Sensor*
- *IPMB Link Sensor*
- *Circuit Breaker State Sensors*

7.3.6.1 Hot Swap Sensor

The following table describes the discrete hot swap sensor available on the PEM.

Table 7-49 Sensor No. 0, Hot Swap

Feature	Raw Value/Description	Interpreted Value
Sensor Name	Hot Swap	
Device		
Sensor Type	0xF0	Hot Swap
Class	0x6F	Discrete
Sensor Owner LUN	0x00	
Entity ID	0x0A	Power Supply
Entity Instance	0x60	
Rearm Mode		Auto

Table 7-49 Sensor No. 0, Hot Swap (continued)

Feature	Raw Value/Description	Interpreted Value
Hysteresis support		
Threshold access support		
Event Message Control		Entire Sensor Only
Readable threshold mask, Settable threshold mask (bytes 19, 20)		
Reading Type		According to PICMG 3.0
Lower Non-Critical, Critical and Non-Recoverable thresholds	0x84, 0x77, 0x71	(42.24, 38.08, 36.16) Volts
Upper Non-Critical, Critical and Non-Recoverable thresholds	0xE1, 0xEB, 0xEE	(72, 75.20, 76.16) Volts

7.3.6.2 IPMB Link Sensor

The following table describes the IPMB link sensor on the PEMs.

Table 7-50 Sensor No. 1, IPMB Physical

Feature	Raw Value/Description	Interpreted Value
Sensor Name	IPMB Physical	
Type of Measurement		IPMB Link State
Class	0x6F	Discrete
Event/Reading Type	0x6F	Sensor-specific
Sensor Type	0xF1	IPMB Link
Sensor Owner LUN	0x00	
Entity ID	0x0A	
Entity Instance	0x60	
Rearm Mode		Auto
Hysteresis support		

Table 7-50 Sensor No. 1, IPMB Physical (continued)

Feature	Raw Value/Description	Interpreted Value
Threshold access support		
Event Message Control		Entire Sensor Only
Readable threshold mask, Settable threshold mask (bytes 19, 20)		
Reading Type		According to PICMG 3.0

7.3.6.3 Circuit Breaker State Sensors

The following tables describe the OEM circuit breaker state sensors available on the PEM.

Table 7-51 Sensor No. 5, CB 1

Feature	Raw Value/Description	Interpreted Value
Sensor Name	CB 1	
Type of Measurement		Monitors if the circuit breaker has been opened.l
Class		Discrete
Event/Reading Type	0x03	Digital Discrete
Sensor Type	0xC0	OEM-reserved
Sensor Owner LUN	0x00	
Entity ID	0x0A	Power Supply
Entity Instance	0x60	
Rearm Mode		Auto
Event Message Control		Entire Sensor only

Table 7-51 Sensor No. 5, CB 1 (continued)

Feature	Raw Value/Description	Interpreted Value
Assertion Event Mask (byte 15, 16)	0x02, 0x00	
Deassertion Event Mask (byte 17, 18)	0x02, 0x00	
Discrete Reading Mask (byte 19, 20)	0x03, 0x00	Supports 2 States
Reading Definition		According to Pigeon Point

Table 7-52 Sensor No. 6 CB 2

Feature	Raw Value/Description	Interpreted Value
Sensor Name	CB 2	
Type of Measurement		Monitors if the circuit breaker has been opened.l
Class		Discrete
Event/Reading Type	0x03	Digital Discrete
Sensor Type	0xC0	OEM-reserved
Sensor Owner LUN	0x00	
Entity ID	0x0A	Power Supply
Entity Instance		
Rearm Mode		Auto
Event Message Control		Discrete State Event Enable/Disable
Assertion Event Mask (byte 15, 16)	0x02, 0x00	State Deasserted State Asserted
Deassertion Event Mask (byte 17, 18)	0x02, 0x00	State Deasserted State Asserted
Discrete Reading Mask (byte 19, 20)	0x03, 0x00	Supports 2 Successive States
Reading Definition		According to IPMI 1.5

Table 7-53 Sensor No. 7 CB 3

Feature	Raw Value/Description	Interpreted Value
Sensor Name	CB 3	
Type of Measurement		Monitors if the Circuit Breaker has been opened.
Class		Discrete
Event/Reading Type	0x03	'digital' Discrete
Sensor Type	0xC0	OEM-reserved
Sensor Owner LUN	0x00	
Entity ID	0x0A	Power Supply
Entity Instance	0x60	
Rearm mode		Auto
Event message control		Entire Sensor only
Assertion Event Mask (bytes 15,16)	0x02, 0x00	
Deassertion Event Mask (bytes 17,18)	0x02, 0x00	
Discrete Reading Mask (bytes 19, 20)	0x03, 0x00	Supports 2 States
Reading Definition		According to Pigeon Point

Table 7-54 Sensor No. 8 CB 4

Feature	Raw Value/Description	Interpreted Value
Sensor Name	CB 4	
Type of Measurement		Monitors if the Circuit Breaker has been opened.
Class		Discrete
Event/Reading Type	0x03	'digital' Discrete
Sensor Type	0xC0	OEM-reserved
Sensor Owner LUN	0x00	

Table 7-54 Sensor No. 8 CB 4 (continued)

Feature	Raw Value/Description	Interpreted Value
Entity ID	0x0A	Power Supply
Entity Instance	0x60	
Rearm mode		Auto
Event message control		Entire Sensor only
Assertion Event Mask (bytes 15,16)	0x02, 0x00	
Deassertion Event Mask (bytes 17,18)	0x02, 0x00	
Discrete Reading Mask (bytes 19, 20)	0x03, 0x00	Supports 2 States
Reading Definition		According to Pigeon Point

Table 7-55 Sensor No. 9 CB 5

Feature	Raw Value/Description	Interpreted Value
Sensor Name	CB 5	
Type of Measurement		Monitors if the Circuit Breaker has been opened.
Class		Discrete
Event/Reading Type	0x03	'digital' Discrete
Sensor Type	0xC0	OEM-reserved
Sensor Owner LUN	0x00	
Entity ID	0x0A	Power Supply
Entity Instance	0x60	
Rearm mode		Auto
Event message control		Entire Sensor only

Table 7-55 Sensor No. 9 CB 5 (continued)

Feature	Raw Value/Description	Interpreted Value
Assertion Event Mask (bytes 15,16)	0x02, 0x00	
Deassertion Event Mask (bytes 17,18)	0x02, 0x00	
Discrete Reading Mask (bytes 19, 20)	0x03, 0x00	Supports 2 States
Reading Definition		According to Pigeon Point

Chapter 8

Shelf Management Alarm Module

8.1 Overview

This chapter describes the AdvancedTCA Shelf Management Alarm Module, hereafter known as the SAM, which consists of the Shelf Management Controller (ShMC) and the Shelf Management Mezzanine Module (ShMM) which installs on the carrier blade. Two SAMs are installed into two dedicated shelf manager slots located at the bottom-rear of the AXP1410 16-Slot Shelf. The SAM is hot swappable and the connectors are accessible through the face plate.

You will find the following information in this chapter:

- *Features*
- *SAM Diagram and Face Plate Layout*
- *Functional Description*
- *Hardware Monitoring and Control*
- *Telco Alarm Functionality*
- *Hot Swap Interface*
- *Power*
- *SAM Software*

The SAM supports redundant operation by automatic switchover between two SAMs. When two SAMs are present in a shelf, one acts as the Active SAM and the other acts as a Standby SAM. They share signals across the AdvancedTCA backplane that allow them to coordinate their redundant operations. The SAM provides access to the IPMCs for the Power Entry Module (PEM) and the two fan trays through the IPMB. The SAMs use IPM Sentry Shelf Manager software for system management. Refer to *SAM Software* on page 188 for further information.

The SAM also provides these operations for the AXP1410 shelf:

- Control for the activation/deactivation of AdvancedTCA blades
- Handles E-Keying
- Control of Power Management
- Monitoring of overall system and blade level health
- Logging for critical system events

- Support for the Command Line Interface (CLI) to access shelf information for:
  - Shelf blade population
  - List of sensors and sensor values
  - Sensor threshold settings
  - System events
  - Shelf health
- Control of chassis cooling management (fan levels)

8.2 Features

The SAM is based on the Pigeon Point Systems ShMM-1500R and Freescale MPC8343 System On a Chip (SOC).

The following lists the features of the SAM.

- High density, small (92 mm x 50.8 mm) form-factor
- Fully compliant with the Restriction of Hazardous Substances (RoHS) directive
- I/O interfaces available on a Tyco 220-pin 0.5 mm Free Height receptacle
- 64, or 128 MBytes of DDR SDRAM with Error Correcting Code (ECC) support
- 266 or 400 MHz PowerPC superscalar RISC core with MMU and caches (32K/32K with parity)
- 32 or 64 MBytes of Flash
- Hardware support for a reliable upgrade of software images in Flash
- Dual IPMB with IPMB buffer controls for hot insertion and removal onto a live backplane
- Dual serial interface at RS232 or CMOS levels (one port with modem control)
- Dual 10/100Mbit Ethernet using the integrated 802.3 controllers buffered by external onboard

  PHY layer devices
- FPGA device on the PCI bus used to implement IPMB-0, the Shelf Manager-oriented

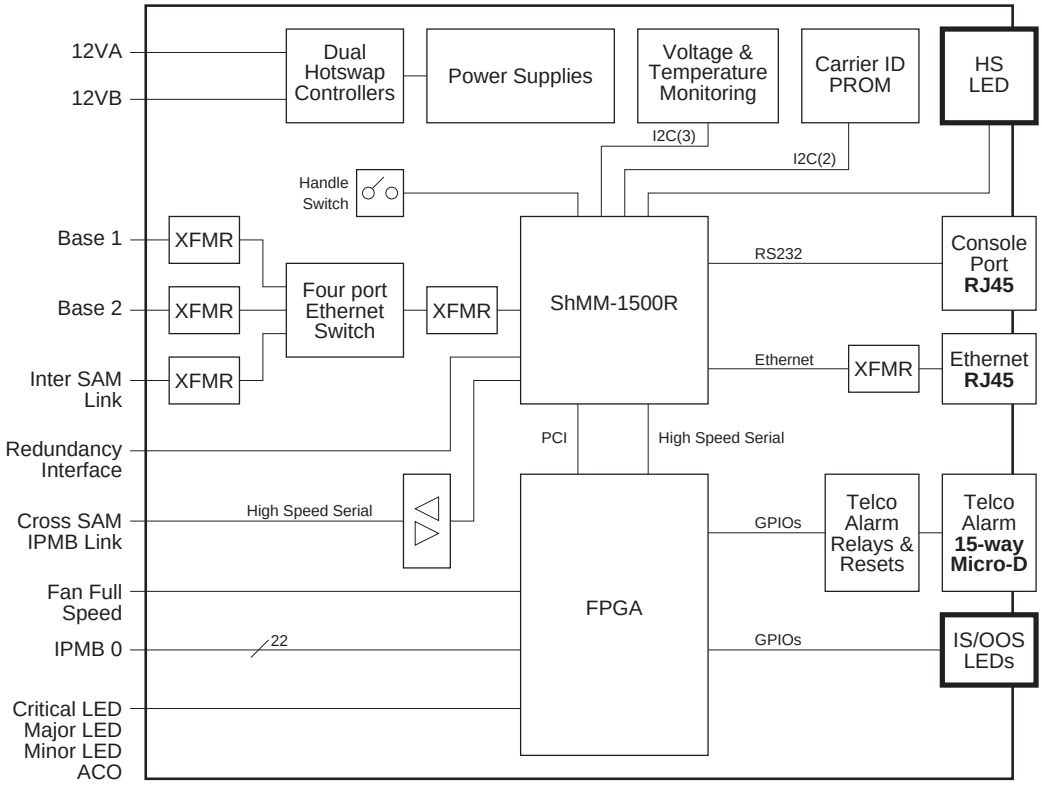
interfaces for hardware redundancy, hot swap and carrier ID, plus the ATCA Watchdog and a high-speed serial interface for an alternate software redundancy interface between peer ShMM-1500Rs.

- Three general-purpose I^2C interfaces (one with limitations) for access to on-carrier devices, such as hardware monitors and the Telco Alarm interface
- RTC, backed by on-carrier battery
- User SEEPROM
- External interrupt inputs
- User GPIO
- SPI interface as an extension interface for on-carrier devices
- PCI interface as an extension interface for on-carrier devices
- On-carrier PLD interface
- JTAG interface for software debug and manufacturing

8.3 SAM Diagram and Face Plate Layout

Figure 8-1 shows a block diagram of the overall SAM architecture and Figure 8-2 on page 175 shows the face plate layout.

Figure 8-1 Block Diagram of SAM

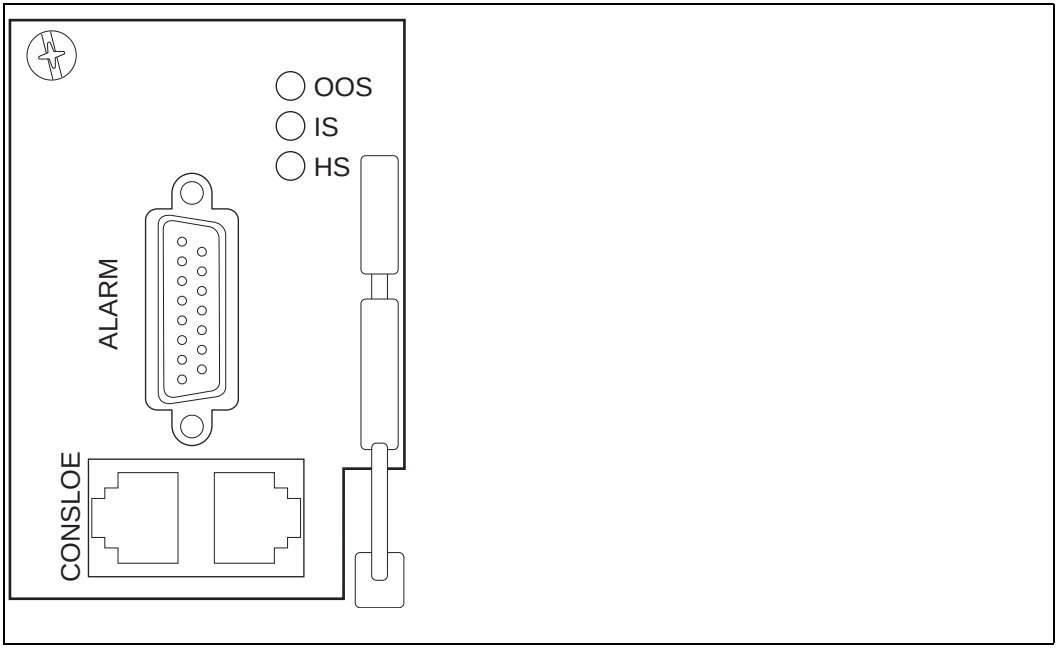


The SAM has these interfaces:

- Four 10/100Base-T Ethernet links
  - One link to each system controller and switching blade (2)
  - One link to the redundant SAM
  - One link to the face plate
- One Ethernet link, failover management status signals, and one IPMB branch or segment to the other SAM
- Radial IPMB links for up to 20 modules (16 blades, 2 fan trays, and 2 PEMs)
- Face plate interfaces that include 10/100Base-T Ethernet, RS232 serial console, and Telco alarm interface with connector
- Interface to ADP panel for Telco Alarm indicators and serial console port

The SAM provides the face plate LEDs listed in the following table. More detail on the LEDs is provided in the following sections.

Figure 8-2 SAM Face Plate



8.4 Functional Description

The SAM has a high-density 220 pin socket for the shelf management mezzanine (ShMM) device and front-panel connectors for the serial console, Ethernet, and Telco alarm signals of the mezzanine. The dual-IPMB interface from the mezzanine is connected to the dual IPMBs in the backplane.

The SAM includes several on-board devices that enable different aspects of shelf management based on the shelf management mezzanine. These facilities include I^2C-based hardware monitoring/control and GPIO expander devices.

8.4.1 IPMB Connectivity

The IPMB is a dual radial topology. Each IPMC in the shelf connects to both SAMs for a redundant IPMB.

8.4.2 RS-232 Serial Interface

The SAM provides an RS-232 interface on the face plate connector using an RJ-45 connector. The connector is routed to the serial port of the shelf manager mezzanine.The default baud rate is 9600, 8, N, 1. Pin assignments for this connector are:

Table 8-1 RJ-45 Serial Port Connector

Pin	Signal	Direction
1	DSR	Input
2	DCD	Input
3	DTR	Output
4	GND	
5	RXD	Input
6	TXD	Output
7	CTS	Input
8	RTS	Output

Table 8-2 Alarm Display Panel (ADP) Serial Port Connector

Pin	Signal	Direction
1	No Connect	
2	RXD	Input
3	TXD	Output
4	No Connect	
5	SigGnd	
6	No Connect	
7	No Connect	
8	No Connect	
9	No Connect	

8.4.3 Master-Only I^2C Bus

The SAM provides a number of I^2C devices using the master-only I^2C bus of the shelf manager mezzanine. The master-only I^2C bus is used internally on the mezzanine for the real-time clock and EEPROM devices. Additional I^2C devices connected to the bus on the SAM are used for the following functions:

- System hardware monitoring and control
- GPIO extension, for various purposes

8.4.4 Shelf FRU SEEPROM

The SAM provides access to the SEEPROMS on the Alarm Display Panel (ADP) through the master-only I^2C. Information stored on the ADP contains Emerson OEM records that enable the SAM to self-configure for the AXP1410 shelf.

8.4.5 SAM LEDs

The SAM provides the LEDs listed in the following table. More detail on the LEDs is provided in the following sections. Also refer to Figure 8-2 on page 175 for SAM face plate LED locations and to Figure 1-1 on page 24 for the ADP teleco LED locations.

Table 8-3 SAM LEDs

LED	Type	Location
Teleco	Critical alarm (CRIT) Major alarm (MAJ) Minor alarm (MIN)	Alarm Display Panel
Power	Power indicator	Alarm Display Panel
In Service	In Service (IS)	SAM face plate
Out of Service	Out of Service (OOS)	SAM face plate
Hot Swap	Hot swap ready (HS)	SAM face plate

8.4.5.1 Hot Swap LED

The SAM provides a blue hot swap LED. This LED indicates when it is safe to remove the SAM from a live shelf.

Table 8-4 Hot Swap LED States

State	Condition
Off	The SAM is not ready to be removed/disconnected from the shelf
Blue	The SAM is ready to be removed/disconnected from the shelf
Long-blink	The SAM is activating itself
Short-blink	Deactivation has been requested

The software running on the shelf manager mezzanine is responsible for turning the LED on/off using the GPIOs on the ShMC.

8.4.5.2 SAM/ADP Status LEDs

Status is shown using an LED on the SAM face plate and ADP. The illumination state of the LED is normally controlled by the GPIO on the SAM. The following tables describe the LED states.

Table 8-5 SAM LED Status Indicators

SAM Face Plate LED	LED Color	State	State/Condition
IS (In Service)	Green	On	Active, power good
OOS (Out of Service)	Red	On	Failed
HS (How Swap)	Blue	On	Remove OK

Table 8-6 ADP LED Status Indicators

Alarm Display Panel LED	LED Color	State	State/Condition
Critical alarm (CRT)	Red	On	Active
Major alarm (MAJ)	Red	On	Active
Minor Alarm (MIN)	Yellow	On	Active
Power (PWR)	Green	On	Power Present

8.5 Management and Control

This section gives a general description of the role of the on-board I^2C devices and how management, control, and redundancy is handled by the SAM.

8.5.1 Hardware Monitoring and Control

The hardware monitoring and control functions implemented by the AXP1410 are provided by the on-board I^2C-based devices.

8.5.1.1 Voltage Sensors

On-board sensors provide the following power supply voltages. All voltage sensors are implemented using the ADM1024 device on the master-only I^2C bus. System management software running on the SAM is responsible for reacting to an event when an interrupt is triggered by the ADM1024 device.

8.5.1.2 Temperature Monitoring

An on-board temperature sensor is available on the SAM. This sensor is implemented through the ADM1024.

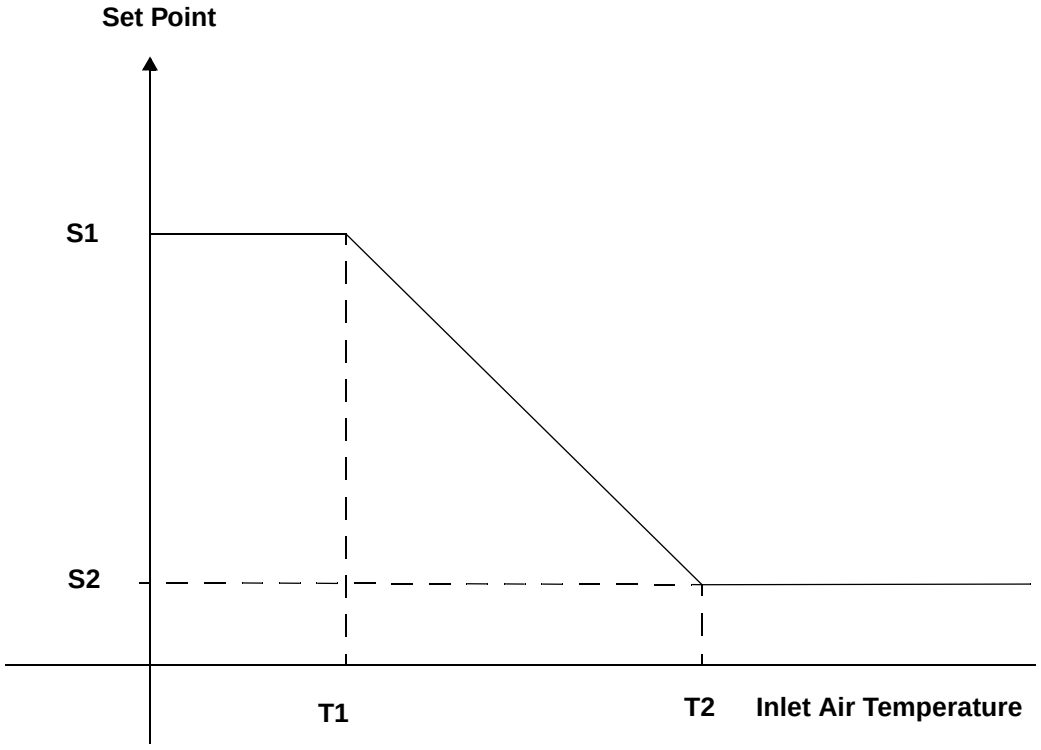
8.5.1.3 Fan Speed and Control

All fan speed and fan voltage sensors are exposed on the active SAM.

The FTMs have 110 fan speed settings. The SAM uses a proprietary cooling algorithm to automatically adjust the fan speed to cool the chassis based on sensor data from the blades as well as inlet and outlet sensors on the FTMs. The minimum fan speed is 1.

In normal operating conditions, the cooling algorithm adjusts the fan speed based on the ambient air temperature as measured at the inlet fans to maintain a **deltaT** value (calculated to be the rise in air temperature measured at the inlet and outlet fan sensors) based on the inlet air temperature value. The lower the ambient temperature, the higher the rise in temperature allowed.

The **deltaT** set point is calculated as follows:



For ambient air temperatures at or below 25°C (default T1), the deltaT set point is set to 20°C (default S1). For ambient air temperatures at or above 55°C (default T2), the deltaT set point is set to 10°C (default S2). For ambient air temperatures between T1 and T2, the deltaT set point is calculated using the following algorithm:

$$S1 + \frac{S2 - S1}{T2 - T1} (T_{inlet} - T1)$$

Using the above algorithm, at 40°C ambient, the cooling algorithm adjusts the fan speeds to maintain a deltaT rise in temperature at 15°C.

Table 8-7 Cooling Budget

Ambient Temperature	Temperature Rise
25°C	Delta T = 20° C
40°C	Delta T = 15° C
55°C	Delta T = 10° C

The values for S1, S2, T1, and T2 are configurable.

In abnormal operating conditions; that is, when a blade thermal sensor is approaching or crossed its upper non-critical threshold, the SAM automatically adjusts the fan speeds to a point where all the blade thermal sensors are just below their upper non-critical threshold (minus a user configurable offset).

The dynamic minimum fan level is not used.

Each fan tray has six fan units and each fan unit has an inlet and outlet fan. Fan speeds for all level settings are summarized in the next table.

Fan Level	Speed in RPMs
1	1800 Inlet, 1100 Outlet +/-10%
10	2600 Inlet, 1500 Outlet +/-10%
20	3200 Inlet, 2000 Outlet +/-8%
30	3900 Inlet, 2400 Outlet +/-8%
40	4500 Inlet, 2900 Outlet +/-5%
50	5100 Inlet, 3300 Outlet +/-5%
60	5800 Inlet, 3700 Outlet +/-5%
70	6400 Inlet, 4200 Outlet +/-5%
80	7000 Inlet, 4500 Outlet +/-5%
90	7600 Inlet, 5000 Outlet +/-5%
100	8000 Inlet, 5200 Outlet +/-5%

8.5.2 Redundancy Control

The ShMM-1500R supports redundant operation with automatic switchover using a redundant ShMM-1500R. In a configuration where two ShMM-1500Rs are present, one acts as the active shelf manager and the other as a standby. Both ShMM-1500Rs monitor each other, and either can trigger a switchover if necessary.

The ShMM-1500R provides a number of hardware redundancy signals on the CN1 connector. The HRI is implemented using the FPGA device.

8.5.2.1 Hardware Redundancy Interface

The hardware redundancy signals of the ShMM-1500R are implemented as follows:

- Cross connected ShMM-1500R present input (PRES_R#) and output (PRES_L#)
- Cross connected ShMM-1500R status 0 input (SHMM_STATUS0_R) and output (SHMM_STATUS0_L)
- Cross connected redundant ShMM-1500R status 1 input (SHMM_STATUS1_R) and output (SHMM_STATUS1_L)
- Active output (ACTIVE#) that can be used on the ShMM-1500R carrier to enable interfaces that must be exclusively driven by the active ShMM-1500R
- Bi-color status LED

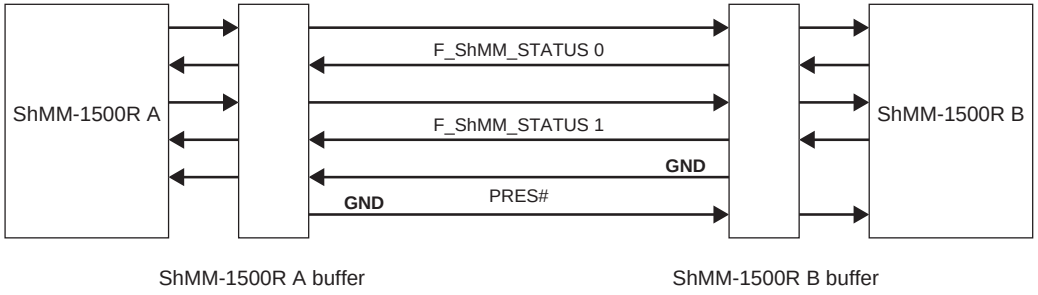
Note that the ACTIVE# signal is intended for use on a carrier and is not connected directly to the peer-ShMM through the backplane. The cross-connected ShMM-1500R status signals are asynchronous serial bit streams that are transmitted to the peer-ShMM by the FPGA and communicate the following information: Health status, Switchover Requests, PRES_R state, Active state, watchdog timer status, parity and other TBD data. An identical copy of the bit stream is also sent on the redundant ShMM-1500R status signal. This information is used by the FPGA to ensure that only one of the two connected ShMM-1500Rs goes into active mode at a time. Figure 8-3 on page 184 shows the HRI of the ShMM-1500R.

As shown in the figure, the ShMM-1500R HRI incorporates a hot-swap buffer (IDT QuickSwitch), which isolates the interface from the peer ShMM prior to FPGA configuration or when the ShMM-1500R is powered down. The QuickSwitch device is guaranteed to be disabled (open) when unpowered and does not have a low impedance path from any of the signal pins

to the power or ground rails. Hence, the device prevents an unpowered ShMM-1500R from loading down the HRI of the peer ShMM-1500R. It also prevents a carrier from detecting the ACTIVE# output as a zero; that is, active, during a ShMM-1500R power cycle or a ShMM-1500R power supply failure.

The FPGA device contains a built-in CRC error checker for detecting soft errors in the configuration data. When a CRC error is detected the signal LATCH_CRC_ERROR is set active by the ShMM-1500R CRC error detection circuit, which immediately sets the ShMM_STATUS[0:1]_L and ACTIVE# signals high. The peer ShMM-1500R, if it is not already active upon detecting the loss of the status serial bit streams, becomes the active ShMM-1500R.

Figure 8-3 SAM HRI Interconnection



The HRI also includes 13 test points for in-service monitoring of the hardware redundancy signals and for out-of-service diagnostics, enabling the ShMM-1500R to isolate failures on the HRI to a single carrier +ShMM-1500R pair.

8.5.2.2 HRI Protocol

In the redundant configuration, the two ShMM-1500R boards communicate through the HRI by exchanging data packets. The HRI continues to be operational in case of a single interconnection failure and is able to detect a double failure. The HRI has a redundant communication path, using four signals. In the case of a single wire permanent failure (the signal gets stuck high, low or breaks), data packets continue to be transmitted through the redundant communication path. A short between two of these four signals is considered a double failure.

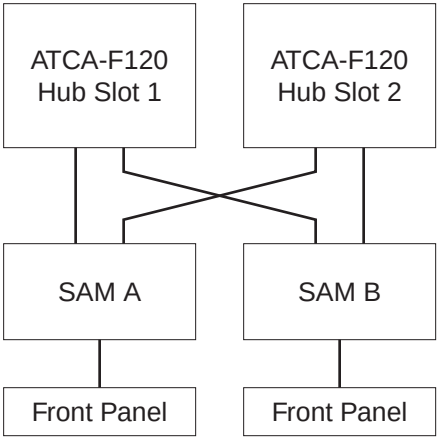
8.5.2.3 Ethernet Signals

The SAMs implement a four-port 10/100Base-T Ethernet switch. The SAM's 10/100Base-T links to each of the system controller/switching blades in logical hub slots 1 and 2.The backplane has a cross-connect between each hub slot and the other SAM, as shown in the following figure. The shelf manager's carrier card has the following:

- Port to ShMM-1500R
- Port to BC1 (ATCA-F120)
- Port to BC2 (ATCA-F120)
- Port to other SAM

The shelf manager mezzanine has a port to the face plate (eth0) and a port to the SAM (eth1). The backplane has cross-connects between each hub slot and other SAM.

Figure 8-4 Interhub Slot and Shelf Manager Connectivity



8.5.3 Switchover Signals

A switchover takes place when the Standby SAM determines that the Active SAM is no longer operational. The signs of this are:

- The REMOTE_HEALTHY or REMOTE_PRESENT changes to FALSE. This indicates that the peer SAM is no longer healthy or present
- The TCP connection between the Active and the Standby SAMS closes. The keep alive time-out parameter for this connection is set to 1 second to recognize a malfunction of the Active SAM as quickly as possible. In this case the Standby SAM waits for 3 seconds and then checks the state of the REMOTE_HEALTHY to make sure the connection is broken due to a failure of the Active SAM and not due to a communication failure.
  If the Standby SAM detects that the Active SAM is still healthy it doesn't perform the switchover but instead reboots itself. After the reboot it makes a second attempt to initialize as a backup and will continue until either it succeeds in establishing the connection with the Active SAM or it detects that the Active SAM is no longer healthy. If it detects that it isn't healthy it will initialize as the Active SAM.
- When the Active SAM receives a switchover command from the Standby SAM and agrees to switchover, it closes the TCP connection, clears the LOCAL_HEALTHY bit and exits the program which indicates the switchover to the Standby SAM.
  If the Standby SAM decides that a switchover should take place it closes the TCP connection and exits this function. Activate callbacks are called for all facilities and the SAM starts to work in active mode, with no backup. At this moment the SAM sets the LOCAL_SWITCHOVER bit, requesting the hardware to recognize it as the Active SAM. In response, the hardware must set the ACTIVE bit. When the formerly active SAM restarts it successfully establishes the connection with the current SAM and starts to operate in the backup mode.

8.6 Telco Alarm Functionality

The SAM provides Telco alarm functionality with the following components:

- Telco alarm cutoff push button
- DB15 Telco alarm contacts
- Telco alarm LEDs

8.6.1 Telco Alarm Cutoff Push Button

The SAM provides a Telco alarm cutoff function with the front-panel push button switch located on the ADP. This push button activates the alarm cutoff (ACO) state. When ACO is activated, the active alarm LED blinks and all of the alarm relays are deactivated. This button does not clear alarms. Refer to Figure 8-2 on page 175 for the location of the alarm cutoff push button switch.

8.6.2 Telco Alarm LEDs

These LEDs are used to indicate the presence of the critical, major, and minor alarms. When a LED is lit, the respective alarm is active. A blinking LED signals an alarm cut-off state which is initiated by pressing the alarm cut-off button when an alarm is active.

8.6.3 Telco Alarm Interface

The SAM provides a front-panel alarm connector, which is a standard DB-15 connector with the following pin assignments:

Table 8-8 Hot Swap Interface Pin Out

Pin	Description
1	Minor Alarm Reset +
2	Minor Alarm Reset -
3	Major Alarm Reset +
4	Major Alarm Reset -
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

Table 8-8 Hot Swap Interface Pin Out (continued)

Pin	Description
13	Major Alarm - COM
14	Pwr Alarm - NO
15	Pwr Alarm - COM

8.7 Hot Swap Interface

The SAM provides a hot swap interface allowing the SAM to be replaced without powering down the shelf. The hot swap interface is implemented using the shelf manager mezzanine CPLD device. The interface is composed of three components:

- Injector/Ejector handle switch
- Presence signal indicating that the SAM is fully seated in its backplane connector
- HS LED to indicate safe to remove state

8.8 Power

The SAM uses dual +12V power feeds, one from each PEM. Hot swap circuitry ensures correct operation when a SAM is inserted into or removed from a live system.

8.9 SAM Software

The software that runs on the shelf manager is described in detail in the *Pigeon Point Systems IPM Sentry Shelf Manager User Guide*, which provides an introduction to shelf management, the shelf manager, and the shelf management mezzanine. Also available is the *Pigeon Point Systems IPM Sentry Shelf-External Interface Reference* which describes the command line, web, SNMP (Simple Network Management Protocol), and RMCP (Remote Management Control Protocol) interfaces. Refer to Appendix A, *Related Documentation* for more information on these publications.

8.9.1 imls Utility

A utility called imls is available on the SAM. It can be used to list all firmware images present in flash. Note that the Shelf Manager flash is divided into two banks. Each bank contains a set of three separate firmware images:

- U-Boot
- RFS
- Kernel images

When the rupgrade_tool utility is used to perform a reliable firmware upgrade operation on the Shelf Manager, the flash bank that is currently not active is programmed with the new images, the processor is reset, and the newly programmed flash bank is selected.

If the new firmware fails to load or execute properly, the Shelf Manager automatically resets and reverts to the previous flash bank. Selection of the bank to be used for booting is not a configurable option at run-time.

The following text shows sample output obtained by running imls at the Shelf Manager Linux prompt. Note that the first three images listed reflect the currently active flash bank contents, and the next set of three images is contained within the other flash bank.

```
# imls
/dev/mtdblock3:
Image Name:   U-Boot 1.1.4 for shmm1500 board
Created:      Fri Jun  6 14:51:44 2008
Image Type:   PowerPC Linux Firmware (uncompressed)
Data Size:    212992 Bytes = 208.00 kB = 0.20 MB
Load Address: 0xF0000000
Entry Point:  0x00000000

/dev/mtdblock2:
Image Name:   Linux-2.4.25
Created:      Fri Jun  6 14:59:00 2008
Image Type:   PowerPC Linux Kernel Image (gzip compressed)
Data Size:    793193 Bytes = 774.60 kB = 0.76 MB
Load Address: 0x00000000
Entry Point:  0x00000000
```

```
/dev/mtdblock4:
Image Name:   shelfman 4.0.0 build 21
Created:      Fri Jun  6 15:07:27 2008
Image Type:   PowerPC Linux RAMDisk Image (gzip compressed)
Data Size:    5398657 Bytes = 5272.13 kB = 5.15 MB
Load Address: 0x00000000
Entry Point:  0x00000000

/dev/mtdblock8:
Image Name:   U-Boot 1.1.4 for shmm1500 board
Created:      Thu Mar 27 21:27:47 2008
Image Type:   PowerPC Linux Firmware (uncompressed)
Data Size:    212992 Bytes = 208.00 kB = 0.20 MB
Load Address: 0xF0000000
Entry Point:  0x00000000

/dev/mtdblock7:
Image Name:   Linux-2.4.25
Created:      Thu Mar 27 21:33:51 2008
Image Type:   PowerPC Linux Kernel Image (gzip compressed)
Data Size:    793096 Bytes = 774.51 kB = 0.76 MB
Load Address: 0x00000000
Entry Point:  0x00000000

/dev/mtdblock9:
Image Name:   sentry.shmm1500 RFS Ramdisk Imag
Created:      Thu Mar 27 21:41:21 2008
Image Type:   PowerPC Linux RAMDisk Image (gzip compressed)
Data Size:    5429028 Bytes = 5301.79 kB = 5.18 MB
Load Address: 0x00000000
Entry Point:  0x00000000
#
```

From the sample output, it is possible to see the compilation dates of the U-Boot, RFS, and Kernel images for both the active and nonactive firmware banks. Compilation times will never be identical for all three images, but should be relatively close to each other.

Related Documentation

A.1 Emerson Embedded Communications Computing Documents

The Emerson Network Power - Embedded Computing publications listed below are referenced in this manual. You can obtain electronic copies of Emerson Network Power - Embedded Computing publications by contacting your local Emerson sales office. For documentation of final released (GA) products, you can also visit the following website: http://www.emersonnetworkpowerembeddedcomputing.com > Solution Services > Technical Documentation Search. This site provides the most up-to-date copies of Emerson Network Power - Embedded Computing product documentation.

Table A-1 Emerson Network Power - Embedded Computing Publications

Document Title	Publication Number
Centellis 4410 Document Collection	6806800J59
ATCA-F120 Installation and Use	6806800D06
ATCA-F120: Control via IPMI Programmer's Reference	6806800D18
System Management Interface Based on HPI-B (Centellis 31kX/4100/2000/4410) User's Guide	6806800D84
SAM1410 Installation and Use	6806800H53

A.2 Related Specifications

For additional information, refer to the following table for related specifications. As an additional help, a source for the listed document is provided. Please note that, while these sources have been verified, the information is subject to change without notice.

Table A-2 Related Specifications

Organization	Document
IEEE http://standards.ieee.org/catalog/	
IEEE Standard for Local Area Networks: Carrier Sense Multiple Access with Collision Detection (CSMA/CD) Access Method and Physical Layer Specifications Institute of Electrical and Electronics Engineers, Inc.	IEEE 802.3 March 2002
IEEE Amendment 1: Media Access Control parameters, Physical Layers, and Management Parameters for 10Gb/s Operation	IEEE 802.3ae August 2002
Intel developer.intel.com/design/servers/ipmi	IPMI Specification v1.5
PCI Industrial Manufacturers Group (PICMG) http://www.picmg.com/	
PICMG 3.0 AdvancedTCA Base Specification R1.0	PICMG 3.0 R 1.0 December 30, 2002
PICMG 3.0 AdvancedTCA Base Specification R2.0	PICMG 3.0, R2.0
PICMG 3.1 AdvancedTCA Ethernet/Fibre Channel, Revision 1.0	PICMG 3.1 R1.0 January 22, 2003
PICMG 3.0 ECN 3.0-1.0-001	January 21, 2004 ECN 3.0, 1.0-001

Safety Notes

This section provides warnings that precede potentially dangerous procedures throughout this manual. Instructions contained in the warnings must be followed during all phases of operation, service, and repair of this equipment. You should also employ all other safety precautions necessary for the operation of the equipment in your operating environment. Failure to comply with these precautions or with specific warnings elsewhere in this manual could result in personal injury or damage to the equipment.

Emerson intends to provide all necessary information to install and handle the product in this manual. Because of the complexity of this product and its various uses, we do not guarantee that the given information is complete. If you need additional information, ask your Emerson representative.

The product has been designed to meet the standard industrial safety requirements. It must only be used in its specific area of office telecommunication industry, industrial control, and development. It must not be used in safety critical components, life supporting devices or on aircraft.

Only personnel trained by Emerson or persons qualified in electronics or electrical engineering are authorized to install, remove or maintain the product. The information given in this manual is meant to complete the knowledge of a specialist and must not be used as replacement for qualified personnel.

Keep away from live circuits inside the equipment. Operating personnel must not remove equipment covers. Only factory authorized service personnel or other qualified service personnel may remove equipment covers for internal subassembly or component replacement or any internal adjustment.

Do not install substitute parts or perform any unauthorized modification of the equipment or the warranty may be voided. Contact your local Emerson representative for service and repair to make sure that all safety features are maintained.

System Installation

System Damage
To avoid system damage verify that the system environment meets the environmental and power requirements given in this manual before installing the system.

Before you begin to set up and cable your new system, consider these guidelines:

- Restricted access area: Install the system only in a restricted access area.
- Installation codes: This unit must be installed in accordance with the National Electrical Code, Articles 11016, 11017, and 11018 and the Canadian Electrical Code, Section 12.a
- Overcurrent protection: A readily accessible listed branch circuit overcurrent protective device must be incorporated into the building wiring. For appropriate AWG rating of the overcurrent protection device see NEC Table 31016 and other national regulations.
- The protective bonding conductor depends on your power distribution topology. Make sure that you use an appropriate protective bonding conductor regarding the rating of the branch circuit protection.
- Install the system safely. Make sure that cables and cords are out of the way.
- Make sure that the set-up is comfortable for users.

System Damage
Environmental contamination can impair system operation. Locate the system in a stable area free of excess movement and jarring and free of dust, smoke, and electrostatic discharge (ESD).
Make sure that the temperature does not exceed the operating temperature given in the environmental requirements in this manual and allow room for proper air flow for cooling.

System Damage
The power inputs must only be attached to approved Telephone Network Voltage (TNV-2) or Safety Extra Low Voltage (SELV) branch circuits.
Attaching inputs to non-TNV-2/SELV approved power sources will cause the system to fail compliance with safety regulations.

Personal Injury or System Damage
The system is supplied by a TNV-2 voltage. This voltage is considered hazardous.
Make sure that the external power supply meets the relevant safety standards.

Personal Injury or System Damage
A top-heavy rack can tip, causing damage to equipment and injury to personnel.
If your system is the only one in the rack, make sure to mount the system in the lowest part of the rack. If several systems are installed in one rack, start with the heaviest component at the bottom. If the rack is equipped with stabilizing devices, make sure that they are installed and extended so that the rack is secure. Then proceed to mount or service the system.

Personal Injury or System Damage
Avoid personal injury or system damage by preventing accidental dropping of the system. Use the appropriate equipment to safely lift and mount the system.

Personal Injury
The system is heavy.
To avoid muscle strain or back injury use lifting aids and proper lifting techniques when removing or replacing the system.

Operation

System Overheating
Cooling Vents
Improper cooling can lead to blade and system damage and may void the manufacturer's warranty.
To ensure proper cooling and undisturbed airflow through the system always operate the system in a horizontal position. Do not obstruct the ventilation openings at the top, sides and back of the system. Keep the fresh air intake at the bottom-front side of the chassis completely clear. Make sure that the fresh air supply is not mixed with hot exhaust from other devices.
To ensure proper air flow within the system make sure that all slots are populated with either blades, filler blades, or dummy blades.

System Overheating
If you reduce the fan speed the system temperature will rise.
Constantly control the system temperature once you have reduced the fan speed. While operating the system make sure the environmental and power requirements are met.

System Damage or Injury
Covers and Panels
Failure to operate the system without covering vacant slots will void the manufacturer's warranty.
Do not operate the system with open module slots. For optimal cooling of the system and associated payload and to prevent electric shock, cover all open module slots and put all panels in place before turning on power. Slot covers and panels must remain in place during system operation.

System Damage
Air Filter
Air contamination can pollute the air filter and obstruct the air intake of the system which may cause system overheating and blade or system component damage.
Air filters should be cleaned at least every 90 days or sooner, depending on the conditions of the central office environment. Because central offices vary in physical location and cleanliness, check your air filters every week after you first install your system. In a dusty environment, a filter may need cleaning more often than a filter in a cleaner environment. Check the filters frequently until you have a good idea of how often it needs cleaning. Based on your findings, establish a regular cleaning schedule and keep a log to record the date of each filter cleaning or replacement.

System Damage
High humidity and condensation on surfaces cause short circuits.
Do not operate the system outside the specified environmental limits. Make sure the system is completely dry and there is no moisture on any surface before applying power.

Personal Injury
High leakage current can be hazardous and cause injury.
Locate the caution label near the grounding studs (may vary from system to system) and make an earth ground connection before connecting the PEM.

System Malfunction
Prior to the PEM exchange the operating voltage conditions of the system should be made optimal.
To ensure uninterrupted service during PEM exchange, the input voltage should be kept at nominal -48 V to -60 VDC.

Injury or Short Circuits
Blade or Power Supply
In case the ORing diodes of the product fail, the product may trigger a short circuit between input line A and input line B so that line A remains powered even if it is disconnected from the power supply circuit (and vice versa).
To avoid damage or injury, always check that there is no more voltage on the line that has been disconnected before continuing your work.

Personal Injury
At the system's rear there are sharp pins which can cause injury.
Be careful when handling the system.

Grounding

Electric Shock
Power Cable
To minimize shock hazard, the system chassis and enclosure must be connected to an electrical ground. Failure to observe proper grounding practices may cause a variety of noise, electrostatic discharge, and radio frequency interference problems.

Damage of Circuits
Electrostatic discharge and incorrect product installation and removal can damage circuits or shorten their life.
Before touching the product or electronic components, make sure that you are working in an ESD-safe environment.

Serious Injury or Death
This product operates with dangerous voltages that can cause injury or death.
To prevent serious injury or death from dangerous voltages use extreme caution when handling, testing, and adjusting this equipment and its components.

The following paragraphs are not translated to German because they are only part of the UL/CSA 60950-1 (section 3.2.1, Annex NAA) standard, not of the European version EN60950-1. Hiltrud, August, 6th, 2008

This equipment is designed to permit the connection of the earthed conductor of the DC supply circuit to the earthing conductor at the equipment. If this connection is made, all of the following conditions must be met:

- This equipment shall be connected directly to the DC supply system earthing electrode conductor or to a bonding jumper from an earthing terminal bar or bus to which the DC supply system earthing electrode conductor is connected.
- This equipment shall be located in the same immediate area (such as, adjacent cabinets) as any other equipment that has a connection between the earthed conductor of the same DC supply circuit and the earthing conductor, and also the point of earthing of the DC system. The DC system shall not be earthed elsewhere.
- The DC supply source shall be located within the same premises as this equipment.
- Switching or disconnecting devices shall not be in the earthed circuit conductor between the DC source and the point of connection of the earthing electrode conductor.

French translation: Cet appareil est conçu pour permettre le raccordement du conducteur relié à la terre du circuit d'alimentation c.c. au conducteur de terre de l'appareil. Pour ce raccordement, toutes les conditions suivantes doivent être respectées:

- Ce matériel doit être raccordé directement au conducteur de la prise de terre du circuit d'alimentation c.c. ou à une tresse de mise à la masse reliée à une barre omnibus de terre laquelle est raccordée à l'électrode de terre du circuit d'alimentation c.c.
- Les appareils dont les conducteurs de terre respectifs sont raccordés au conducteur de terre du même circuit d'alimentation c.c. doivent être installés à proximité les uns des autres (p.ex., dans des armoires adjacentes) et à proximité de la prise de terre du circuit d'alimentation c.c. Le circuit d'alimentation c.c. ne doit comporter aucune autre prise de terre.
- La source d'alimentation du circuit c.c. doit être située dans la même pièce que le matériel. - Il ne doit y avoir aucun dispositif de commutation ou de sectionnement entre le point de raccordement au conducteur de la source d'alimentation c.c. et le point de raccordement à la prise de terre.

Connectors and Cabling

System Damage
RJ-45 connectors on some products are either twisted-pair Ethernet (TPE) or E1/T1/J1 network interfaces. Connecting an E1/T1/J1 line to an Ethernet connector may damage your system.

- Make sure that TPE connectors near your working area are clearly marked as network connectors.
- Verify that the length of an electric cable connected to a TPE bushing does not exceed 100 m.
- Make sure the TPE bushing of the system is connected only to safety extra low voltage circuits (SELV circuits).
- If in doubt, ask your system administrator.

Personal Injury
Cables that are not installed securely can cause injuries due to entanglement or tripping.
To avoid injury make sure cables are securely installed. Never change the system's cabling as delivered by Emerson. The cabling should follow existing cable paths using existing or similar cable fastenings. Check proper function of the system after cabling extensions.

System Malfunction or Damage
Accidental removal of the power cable while the system is operating might impact system operation or cause damage.
To avoid an accidental removal of the power cable during system operation make sure that the power cable is properly fixed to the chassis or the rack.

Personal Injury
To avoid electric shock make sure that contacts and cables of the system cannot be touched while the system is operating.
If in doubt concerning cabling, ask your local Emerson representative.

Expansion and FRU Exchange

System Overload
To avoid system overload check the total power consumption of all components installed. Make sure that any individual output current of any component stays within its acceptable limits. See the technical specification of the respective component.

Loss of Safety and EMC Compliance
By using additional plug-in products it may be possible that the system is no longer compliant to safety and EMC regulations. The system integrator must make sure that the compliancy is guaranteed.

System Damage Tempe
To avoid system damage the fan replacement must be done within the 1-minute recommended service interval.
Make sure the replacement FTM is available and ready to install.

System Damage Munich
Running the system longer than 30 seconds with less than three fans damages the system.
If you exchange a fan (three remaining operating fans) ensure that the exchange procedure is finished within 30 seconds.

System Damage
A torn filter is ineffective in trapping particulates and will interrupt air flow distribution.
Before returning a filter to service, visually inspect it for tears or rips that may have occurred during cleaning. Do not reinstall a torn filter. You may order replacement fan filters by contacting your Emerson sales representative.

System Damage and Personal Injury
Fans may continue to rotate after power is removed. When exchanging a fan, rotating blades in the fan may be exposed.
To prevent injury keep fingers and tools away from rotating blades in the fan.

System Alarm
Bouncing the FTM during insertion may cause an alarm condition in the system.
Insert the FTM with a single, steady motion and do not force the module into the slot.

Pin Damage
Forcing the FTM into the system may damage connector pins.
To avoid crushing or bending the connector pins, back the module out and insert it again if it hangs during insertion.

System Damage
Replacement of a PEM must be executed according to the recommended service interval of xx minutes and be performed by a skilled service technician.

Personal Injury
To avoid electric shock verify that the system is powered off and that all power sources are disconnected before servicing any components internal to the system.

Couper l'alimentation avant l'entretien et le depannage.
For important grounding information for a DC power source, read the instructions in "cross reference".

Personal Injury
Hot PEMs may cause injury.
Allow the PEM to cool before servicing.

Personal Injury
Removing power from the PEMs cannot be accomplished by pulling the PEM's circuit breakers to the OFF position. The PEMs remain powered until the -48 VDC power to each PEM is completely removed.
Make sure you disconnect the power at the external source and allow the capacitors in the power supply to discharge (1 minute) before removing the PEM from the chassis.

Personal Injury
Hazardous energy levels may be present inside the enclosure.
To prevent serious injury or death from dangerous voltages, do not touch any of the exposed leads or terminals inside the enclosure. Only properly trained service personnel should remove or install power supplies.

System Alarm
Bouncing the PEM during insertion may cause an alarm condition in the system.
Insert the PEM with a single, steady motion and do not force the module into the slot.

Pin Damage
Forcing the PEM into the system may damage connector pins.
To avoid crushing or bending the connector pins, back the module out and insert it again if it hangs during insertion.

Laser

Personal Injury
If a label with the words CLASS 1 LASER PRODUCT is affixed to the back of your system, the unit is equipped with a laser device. These devices contain a laser diode that produces invisible laser radiation harmful to the eyes.
Performing adjustments or procedures other than those specified in this manual may result in hazardous radiation exposure. Do not look into the optical lens at any time.

Environment

Environmental
Always dispose of used products according to your country's legislation and manufacturer's instructions.

EMC

FCC Class A
This equipment has been tested and found to comply with the limits for a Class A digital device, pursuant to Part 15 of the FCC Rules, EN55022. These limits are designed to provide reasonable protection against harmful interference when the equipment is operated in a commercial environment. This equipment generates, uses, and can radiate radio frequency energy and, if not installed and used in accordance with the instruction manual, may cause harmful interference to radio communications.
Operation of this equipment in a residential area is likely to cause harmful interference in which case the user will be required to correct the interference at his own expense.
To ensure EMC protection use only shielded cables when connecting peripherals to assure that appropriate radio frequency emissions compliance is maintained. Installed blades must have the face plates installed and all vacant slots in the shelf must be covered.
Changes or modifications not expressly approved by Emerson could void the user's authority to operate the equipment.
A AXP 1410 that is shipped as a spare, replacement chassis, or an unconfigured system will not have filler panels installed. It is the responsibility of the customer to ensure that all open slots are filled with payload blades, rear transition modules (RTMs), or approved filler panels in order to be compliant with the safety/EMC regulatory markings.

VCCI

This is a Class A product based on the standard of the Voluntary Control Council for Interference by Information Technology Interference (VCCI). If this equipment is used in a domestic environment, radio disturbance may arise. When such trouble occurs, the user may be required to take corrective actions.

Sicherheitshinweise

Dieses Kapitel enthält Hinweise, die potentiell gefährlichen Prozeduren innerhalb dieses Handbuchs vorrangestellt sind. Beachten Sie unbedingt in allen Phasen des Betriebs, der Wartung und der Reparatur des Systems die Anweisungen, die diesen Hinweisen enthalten sind. Sie sollten außerdem alle anderen Vorsichtsmaßnahmen treffen, die für den Betrieb des Systems innerhalb Ihrer Betriebsumgebung notwendig sind. Wenn Sie diese Vorsichtsmaßnahmen oder Sicherheitshinweise, die an anderer Stelle diese Handbuchs enthalten sind, nicht beachten, kann das Verletzungen oder Schäden am System zur Folge haben.

Emerson ist darauf bedacht, alle notwendigen Informationen zum Einbau und zum Umgang mit dem System in diesem Handbuch bereit zu stellen. Da es sich jedoch bei dem System um ein komplexes Produkt mit vielfältigen Einsatzmöglichkeiten handelt, können wir die Vollständigkeit der im Handbuch enthaltenen Informationen nicht garantieren. Falls Sie weitere Informationen benötigen sollten, wenden Sie sich bitte an die für Sie zuständige Geschäftsstelle von Emerson.

Das Produkt erfüllt die für die Industrie geforderten Sicherheitsvorschriften und darf ausschließlich für Anwendungen in der Telekommunikationsindustrie, im Zusammenhang mit Industriesteuerungen und in der Entwicklung verwendet werden. Es darf nicht in sicherheitskritischen Anwendungen, lebenserhaltenden Geräten oder in Flugzeugen verwendet werden.

Einbau, Wartung und Betrieb dürfen nur von durch Emerson ausgebildetem oder im Bereich Elektronik oder Elektrotechnik qualifiziertem Personal durchgeführt werden. Die in diesem Handbuch enthaltenen Informationen dienen ausschließlich dazu, das Wissen von Fachpersonal zu ergänzen, können dieses jedoch nicht ersetzen.

Halten Sie sich von stromführenden Leitungen innerhalb des Systems fern. Entfernen Sie auf keinen Fall die Systemabdeckung. Nur werksseitig zugelassenes Wartungspersonal oder anderweitig qualifiziertes Wartungspersonal darf die Systemabdeckung entfernen, um Systemkomponenten zu ersetzen oder andere Anpassungen vorzunehmen.

Installieren Sie keine Ersatzteile oder führen Sie keine unerlaubten Veränderungen am System durch, sonst verfällt die Garantie. Wenden Sie sich für Wartung oder Reparatur bitte an die für Sie zuständige Geschäftsstelle von Emerson. So stellen Sie sicher, dass alle sicherheitsrelevanten Aspekte beachtet werden.

System Installation

Beschädigung des Systems
Bitte beachten Sie, dass die im Handbuch angegebenen Voraussetzungen erfüllt sein müssen, bevor Sie das System installieren.
Beachten Sie folgende allgemeinen Sicherheitshinweise bei der Installation des Systems:

- Bereich mit eingeschränktem Zugang - Installieren Sie das System nur in Bereichen mit eingeschränktem Zugang.
- Installationsrichtlinien: Dieses System muss gemäß folgender Richtlinien installiert werden: National Electrical Code, Artikel 11016, 11017 und 11018 und Canadian Electrical Code, Abschnitt 12.a
- Überstrom Schutzeinrichtung - Eine leicht zugängliche Trennvorrichtung muss in der Gebäudeverkabelung eingebaut sein. Einen angemessenen AWG (American Wire Gauge - amerikanische Norm für Drahtquerschnitte) Wert der Überstrom Schutzeinrichtung können Sie der NEC (National Electrical Code) Tabelle 31016 oder anderen nationalen Regelwerken entnehmen.
- Der Erdungsleiter ist abhängig von der Spannungsverteilungstopologie innerhalb Ihrer Anlage. Stellen Sie sicher, dass Sie einen angemessenen Erdungsleiter gemäß der Auslegung des Zugangsleitungsschutzes verwenden.
- Bauen Sie das System sicher ein. Stellen Sie sicher, dass Kabel und Leitungen nicht im Weg sind.
- Stellen Sie sicher, dass der Systemaufbau anwenderfreundlich ist.

Beschädigung des Systems
Verschmutzungen der Systemumgebung können den reibungslosen Systembetrieb beeinträchtigen.
Betreiben Sie das System an einem erschütterungsfreien Ort, an dem weder Staub, Rauch noch elektrostatische Entladungen auftreten. Stellen Sie außerdem sicher, dass die klimatischen Bedingungen, die in diesem Handbuch spezifiziert sind, eingehalten werden und ausreichend Platz für eine angemessene Kühlung vorhanden ist.

Beschädigung des Systems
Die Gleichspannungseingänge des Systems dürfen ausschließlich an zugelassene Telekommunikationsnetzspannungen (TNV-2) oder Sicherheits-Kleinspannungs-Stromkreise (SELV) angeschlossen werden.
Wenn Sie das System an andere Stromkreise als TNV-2/SELV Stromkreise anschließen, verfällt die Sicherheitszulassung.

Verletzungsgefahr und Beschädigung des Systems
Das System ist an eine TNV-2 Spannungsquelle angeschlossen. Diese Spannung kann gefährlich sein.
Stellen Sie deshalb sicher, dass die externe Spannungsversorgung den entsprechenden Sicherheitsstandards entspricht.

Verletzungsgefahr und Beschädigung des Systems
Wenn die Gewichte im Schaltschrank ungleich verteilt sind, kann der Schaltschrank umkippen und Schäden am System oder Verletzungen verursachen.
Bauen Sie das System deshalb ganz unten im Schrank ein, wenn es das einzige System im Schrank ist. Wenn mehrere Systeme in einen Schrank eingebaut werden sollen, platzieren Sie das schwerste System ganz unten und die leichteren weiter oben. Falls der Schaltschrank mit Kippsicherungen ausgestattet ist, stellen Sie sicher, dass diese auch installiert und ausgefahren sind, um einen sicheren Stand des Schranks zu gewährleisten. Beginnen Sie erst danach mit dem Einbau oder der Wartung des Systems.

Verletzungsgefahr und Beschädigung des Systems
Verhindern Sie ein unbeabsichtigtes Herunterfallen des Systems, das Verletzungen oder Beschädigungen am System zur Folge haben kann.
Benutzen Sie zum Heben und Einbauen des Systems geeignete Hilfsmittel.

Verletzungsgefahr
Das System ist schwer.
Benutzen Sie deshalb zum Ausbau oder Ersetzen des Systems geeignete Hebevorrichtungen. So vermeiden Sie Muskelzerrungen oder Rückenschäden.

Betrieb

Überhitzung des Systems
Lüftungsöffnungen
Unzureichende Lüftung kann Schäden an Blades und am System verursachen und die Herstellergarantie ungültig werden lassen.
Um eine ausreichende Lüftung zu gewährleisten, stellen Sie sicher, dass das System während des Betriebs waagerecht steht. Halten Sie die Lüftungsschlitze an der Oberseite, der Rückseite und den Seiten des Systems frei. Halten Sie die Frischluftzufuhröffnung an der unteren Vorderseite des Systems völlig frei und stellen Sie sicher, dass sich die Frischluft nicht mit der Abluft von anderen Systemen mischt.
Um eine ungestörte Luftzirkulation zu gewährleisten, stellen Sie sicher, dass alle Steckplätze mit Blades oder Platzhalter Blades belegt sind.

Überhitzung des Systems
Wenn Sie die Geschwindigkeit der Lüfter reduzieren, steigt die Systemtemperatur an.
In diesem Fall müssen Sie die Systemtemperatur über die Sensoren der Lüftermodule regeln.
Stellen Sie während des Betriebs sicher, dass die Bedingungen, die im Handbuch beschrieben sind, eingehalten werden.

Beschädigung des Systems oder Verletzungsgefahr
Abdeckungen
Falls Sie das System betreiben, ohne die freien Steckplätze abzudecken, verfällt die Herstellergarantie.
Nehmen Sie das System nur in Betrieb, wenn alle Steckplätze abgedeckt sind. Damit gewährleisten Sie eine optimale Kühlung für das System und vermeiden die Gefahr von Stromschlägen. Alle Abdeckungen müssen während des Systembetriebs an Ort und Stelle bleiben.

Beschädigung des Systems
Luftfilter

Verunreinigungen in der Luft können den Luftfilter verschmutzen und so die Luftzufuhr des Systems beeinträchtigen. Das kann zur Überhitzung des Systems und zu Schäden an Systemteilen führen.
Luftfilter sollten mindestens alle 90 Tage ausgewechselt werden. Je nach Umgebungsbedingen kann dies auch früher nötig sein. Da die Verhältnisse in Vermittlungsstellen sehr unterschiedlich sein können, sollten Sie die Luftfilter nach der Erstinstallation des Systems jede Woche kontrollieren. In einer staubigen Umgebung muss ein Filter gegebenenfalls öfter gereinigt werden als in einer sauberen Umgebung. Prüfen Sie den Filter regelmäßig bis Sie eine Vorstellung davon haben, wie oft der Filter gereinigt werden muss. Erstellen Sie aufgrund Ihrer Beobachtungen einen Reinigungsplan und protokollieren Sie jede Reinigung oder jeden Austausch des Filters.

Beschädigung des Systems
Hohe Luftfeuchtigkeit und Kondensat auf den Oberflächen der Produkte kann zu Kurzschlüssen führen.
Betreiben Sie die Produkte nur innerhalb der angegebenen Grenzwerte für die relative Luftfeuchtigkeit und Temperatur und stellen Sie vor dem Einschalten des Stroms sicher, dass sich auf den Produkten kein Kondensat befindet.

Verletzungsgefahr
Hoher Ableitstrom ist gefährlich und kann Verletzungen verursachen.
Suchen Sie das Warnschild in der Nähe der Erdungsbolzen (kann von System zu System unterschiedlich sein) und stellen Sie eine Erdungsverbindung her, bevor Sie die PEMs anschließen.

Störung des Systembetriebs
Bevor Sie die PEMs austauschen, sollten Sie die Betriebsspannung des Systems optimieren. Stellen Sie Eingansspannung auf einen Nennwert von -48 V bis -60 VDC ein, um einen uneingeschränkten Systembetrieb während des PEM Austauschs zu gewährleisten.

Verletzungen oder Kurzschlüsse
Blade oder Stromversorgung

Falls die ORing Dioden des Produktes durchbrennen, kann das Produkt einen Kurzschluss zwischen den Eingangsleitungen A und B verursachen. In diesem Fall ist Leitung A immer noch unter Spannung, auch wenn sie vom Versorgungskreislauf getrennt ist (und umgekehrt). Prüfen Sie deshalb immer, ob die Leitung spannungsfrei ist, bevor Sie Ihre Arbeit fortsetzen, um Schäden oder Verletzungen zu vermeiden.

Verletzungsgefahr
An der Rückseite des Systems befinden sich spitze Stifte, an denen Sie sich verletzen können. Seien Sie vorsichtig beim Umgang mit dem System.

Erdung

Stromschlaggefahr
Stromkabel
Erden Sie das Systemchassis, um das Risiko eines Stromschlags so gering wie möglich zu halten. Falls Sie das System nicht ordungsgemäß erden, kann dies außerdem zu vielfältigen Störgeräuschen, eletrostatischen Entladungen und Interferenzen im Hochfrequenzbereich führen.

Beschädigung von Schaltkreisen
Elektrostatische Entladung und unsachgemäßer Ein- und Ausbau des Produktes kann Schaltkreise beschädigen oder ihre Lebensdauer verkürzen.
Bevor Sie das Produkt oder elektronische Komponenten berühren, vergewissern Sie sich, daß Sie in einem ESD-geschützten Bereich arbeiten.

Schwere Verletzungen oder Tod
Dieses Produkt wird mit gefährlichen Spannungen betrieben, die schwere Verletzungen oder Tod verursachen können.
Gehen Sie deshalb extrem vorsichtig vor, wenn Sie mit dem System oder seinen Komponenten umgehen, es testen oder anpassen.

Stecker und Verkabelung

Beschädigung des Systems
Bei den RJ-45 Steckern, die sich auf einigen Produkten befinden, handelt es sich entweder um Twisted-Pair-Ethernet (TPE) oder um E1/T1/J1-Stecker. Beachten Sie, dass ein versehentliches Anschließen einer E1/T1/J1 Leitung an einen TPE-Stecker Ihr System zerstören kann.

- Kennzeichnen Sie deshalb TPE-Anschlüsse in der Nähe Ihres Arbeitsplatzes deutlich als Netzwerkanschlüsse.
- Stellen Sie sicher, dass die Länge eines mit Ihrem Systems verbundenen TPE-Kabels 100 m nicht überschreitet.
- Das System darf über die TPE Stecker nur mit einem Sicherheits-Kleinspannungs-Stromkreis (SELV) verbunden werden.
- Bei Fragen wenden Sie sich an Ihren Systemverwalter.

Verletzungsgefahr
Kabel, die nicht sicher angebracht sind, können zu Stolperfallen werden und Verletzungen verursachen.
Stellen Sie sicher, dass die Kabel sicher installiert sind, um Verletzungen zu vermeiden. Verändern Sie nie die von Emerson ausgelieferte Verkabelung des Systems. Stellen Sie sicher, dass die Verkabelung schon existierenden Kabelführungen folgt und bestehende oder ähnliche Befestigungen verwendet. Überprüfen Sie nach der Erweiterung der Verkabelung, ob das System ordnungsgemäß arbeitet.

Beschädigung des Systems
Ein versehentliches Entfernen des Netzkabels während des Betriebs kann den Systembetrieb beeinträchtigen oder Schäden am System verursachen.
Schließen Sie ein versehentliches Entfernen des Netzkabels während des Betriebs aus, indem Sie es am Chassis oder am Rack befestigen.

Verletzungsgefahr
Schließen Sie in jedem Fall aus, dass Personen durch einen elektrischen Schlag verletzt werden können, indem Sie sicherstellen, dass Kontakte und Kabel des Systems während des Betriebs nicht berührt werden können.
Falls Sie Fragen bezüglich der Verkabelung haben, wenden Sie sich an die für Sie zuständige Geschäftsstelle von Emerson.

Erweiterungen und FRU Austausch

Systemüberlastung
Verhindern Sie eine Systemüberlastung, indem Sie die gesamte aufgenommene Leistung aller eingebauten Komponenten, also z.B. der installierten Blades und Laufwerke (siehe die technischen Daten der entsprechenden Komponente) überprüfen. Stellen Sie sicher, dass der Ausgangsstrom jedes Verbrauchers innerhalb der zulässigen Grenzwerte liegt.

Verlust der Sicherheits- und EMV-Zulassung
Wenn Sie zusätzliche Produkte installieren, können Sicherheits- und EMV-Richtlinien verletzt werden. Der Systemintegrator ist für die Einhaltung dieser Richtlinien verantwortlich.

Beschädigung des Systems Tempe
Tauschen Sie den Lüfter innerhalb des vorgeschiebenen Wartungszeitraums von 1 Minute aus. So vermeiden Sie Beschädigung des Systems.
Stellen Sie sicher, dass der Ersatzlüfter für den Austausch bereit ist.

Beschädigung des Systems Munich
Wird das System länger als 30 Sekunden mit weniger als drei Lüftermodulen betrieben, kann das System beschädigt werden.
Wenn Sie ein Lüftermodul austasuchen, stellen Sie sicher, dass der Austauschprozess innerhalb dieser Zeit abgeschlossen ist.

Beschädigung des Systems
Ein beschädigter Filter kann Schwebstoffe nur ungenügend ausfiltern und den Luftstrom beeinträchtigen.
Prüfen Sie einen gereinigten Filter auf Risse bevor Sie ihn wieder in Betrieb nehmen. Bauen Sie keine beschädigten Filter in das System ein. Sie können Ersatzfilter bei der für Sie zuständigen Geschäftsstelle von Emerson bestellen.

Beschädigung des Systems und Verletzungsgefahr
Lüfterschaufeln können sich noch bewegen, nachdem der Strom abgestellt ist. Wenn Sie die Lüfterschublade aus dem Chassis ziehen, werden die Lüfterschaufeln freigelegt.
Sie können verletzt werden, wenn Sie Werkzeuge oder Finger in rotierende Lüfter einführen. Achten Sie deshalb beim Austausch der Lüfterschublade auf die rotierenden Lüfterschaufeln. Berühren Sie die Lüfterschaufeln erst, wenn diese still stehen.

Systemalarm
Falls Sie die Lüfterschublade während des Einbaus verkanten, kann dies einen Systemalarm auslösen.
Installieren Sie die Lüfterschublade mit einer fließenden Bewegung und wenden Sie dabei keine Gewalt an.

Schäden an Steckern
Wenn Sie die Lüfterschublade mit Gewalt installieren, können die Anschlussstifte in den Steckern beschädigt werden.
Falls sich die Lüfterschublade während der Installation verkantet, ziehen Sie die Lüfterschublade wieder heraus und führen Sie sie erneut ein. So vermeiden Sie Schäden an den Anschlussstiften in den Steckern.

Beschädigung des Systems
Tauschen Sie die PEMs innerhalb des vorgegebenen Wartungszeitraums von xy Minuten aus. Der Austausch muss von erfahrenem Wartungspersonal durchgeführt werden.

Verletzungsgefahr
Stellen Sie sicher, dass das System abgeschaltet und von allen Stromversorungen getrennt ist, bevor Sie Systemkomponenten warten. So vermeiden Sie die Gefahr von Stromschlägen.
Lesen Sie den Abschnitt "Querverweis" für weitere wichtige Informationen bezüglich Erdung von Gleichstromsystemem.

Verletzungsgefahr
Sie können sich an heissen PEMs verletzen.
Lassen Sie die PEMs abkühlen, bevor Sie mit bloßen Händen herausziehen.

Verletzungsgefahr
Sie können die PEMs nicht allein dadurch spannungsfrei schalten, dass Sie den Trennungsschalter an den PEMs in die OFF Stellung stellen. Die PEMs bleiben unter Spannung, bis die -48 V Spannung von jedem PEM vollständig entfernt ist.
Stellen Sie deshalb sicher, dass Sie die Spannung an der externen Spannungsversorgung ausschalten. Warten Sie außerdem eine Minute, bis die Kondensatoren im PEMs entladen sind, bevor Sie die PEMs aus dem Chassis entfernen.

Verletzungsgefahr
Innerhalb des Gehäuses gibt es gefährliche Spannungen.
Berühren Sie keine Anschlüsse innerhalb des Gehäuses, um ernsthafte Verletzungen oder Tod durch Stromschlag zu vermeiden. PEMs dürfen nur von ausgebildetem Wartungspersonal ein- oder ausgebaut werden.

Systemalarm
Falls Sie ein PEM während des Einbaus verkanten, kann dies einen Systemalarm auslösen.
Installieren Sie ein PEM mit einer fließenden Bewegung und wenden Sie dabei keine Gewalt an.

Schäden an Steckern
Wenn Sie ein PEM mit Gewalt installieren, können die Anschlussstifte in den Steckern beschädigt werden.
Falls sich ein PEM während der Installation verkantet, ziehen Sie das PEM wieder heraus und führen Sie sie erneut ein. So vermeiden Sie Schäden an den Anschlussstiften in den Steckern.

Laser

Verletzungsgefahr
Wenn sich an der Rückseite Ihres Systems ein Aufkleber mit der Aufschrift CLASS 1 LASER PRODUCT befindet, beeinhaltet das System ein Bauteil mit einem Laser. Solche Bauteile enthalten Laserdioden, die unsichtbare und für die Augen schädliche Laserstrahlen abgeben. Falls Sie sich nicht an die Anweisung in diesem Handbuch halten, kann dies zu gefährlichen Strahlungsbelastungen führen. Schauen Sie niemals direkt in den Laserstrahl.

Umweltschutz

Umweltschutz
Entsorgen Sie alte Produkte gemäß der in Ihrem Land gültigen Gesetzgebung und den Empfehlungen des Herstellers.

EMV

FCC Class A
Das Produkt wurde getestet und erfüllt die für digitale Geräte der Klasse A gültigen Grenzwerte gemäß den FCC-Richtlinien Abschnitt 15 bzw. EN 55022 Klasse A. Diese Grenzwerte sollen einen angemessenen Schutz vor Störstrahlung beim Betrieb des Produkts in Geschäfts-, Gewerbe- sowie Industriebereichen gewährleisten. Das Produkt arbeitet im Hochfrequenzbereich und erzeugt Störstrahlung. Bei unsachgemäßem Einbau und anderem als in diesem Handbuch beschriebenen Betrieb können Störungen im Hochfrequenzbereich auftreten.
Diese Einrichtung kann im Wohnbereich Funkstörungen verursachen; in diesem Fall kann vom Betreiber verlangt werden, angemessene Maßnahmen durchzuführen und dafür aufzukommen.
Benutzen Sie zum Anschließen von Peripheriegeräten ausschließlich abgeschirmte Kabel. So stellen Sie sicher, dass ausreichend Schutz vor Störstrahlung vorhanden ist. Die Blades müssen mit der Frontblende installiert und alle freien Steckplätze müssen mit Blindblenden abgedeckt sein.

Änderungen, die nicht ausdrücklich von Emerson erlaubt sind, können Ihr Recht das System zu betreiben zunichte machen.
Ein AXP 1410, das als Ersatzteil, Austauschchassis oder unkonfiguriertes System ausgeliefert wird, enthält keine Platzhalter-Boards. Es liegt in der Kundenverantwortung sicherzustellen, dass alle leeren Steckplätze mit Boards, RTMs oder zugelassenen Platzhalter-Boards belegt sind, um die Sicherheits- und EMC-Vorschriften zu erfüllen.

VCCI

Das Produkt ist eine Einrichtung der Klasse A gemäß dem Standard des Voluntary Control Council for Interference von Information Technology Interference (VCCI). Wird das Produkt in Wohngegenden betrieben, können Störungen im Hochfrequenzbereich auftreten. In einem solchen Fall ist der Benutzer verpflichtet, entsprechende Gegenmaßnahmen zu ergreifen.

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