SAM1411

Installation and Use

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SMART™ Embedded Computing

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SMART Embedded Computing, Inc.

2900 S. Diablo Way, Suite 190

Tempe, Arizona 85282

USA

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About this Manual

Overview of Contents

This manual is intended for users qualified in electronics or electrical engineering. Users must have a working understanding of AdvancedTCA and telecommunications. This Installation and Use provides the information you need to install, access, and operate the shelf manager SAM1411.

This manual contains the following chapters and appendix:

About this Manual on page 11 lists all conventions and abbreviations used in this manual and outlines the revision history.

Safety Notes on page 17 describes the safety information.

Sicherheitshinweise on page 21 provides a German translation of the chapter "Safety Notes".

Chapter 1, Introduction on page 25 gives an overview of the product.

Chapter 2, Shelf Manager Hardware on page 29 provides detailed hardware information of the product.

Chapter 3, Controls, Indicators, and Connectors on page 35 describes external interfaces of the product, this includes connectors and LEDs.

Chapter 4, SAM1411 Installation on page 39 describes the installation prerequisites and procedures.

Chapter 5, Shelf Manager File System on page 45 provides information on persistent file support and use cases.

Chapter 6, Firmware Upgrade Facility on page 51 provides information on the software upgrade tools swupgrade.sh and fw_tool.

Chapter 7, U-Boot Commands on page 63 lists the U-Boot Commands.

Appendix A, Related Documentation on page 69 lists related documentation and specifications.

Abbreviations

This document uses the following abbreviations.

Abbreviation	Definition
AdvancedTCA	Advanced Telecommunications Computing Architecture
AMC	Advanced Mezzanine Card
ATCA	Advanced Telecommunications Computing Architecture
BT	Block Transfer
EMC	Electromagnetic Compatibility
EMI	Electromagnetic Immunity
EN	European Norm
ESD	Electrostatic Sensitive Device
FCC	Federal Communications Commission
FPGA	Field-Programmable Gate Array
FRU	Field Replacable Unit
HPI	Hardware Platform Interface
IEC	International Electric Code
IPMB	Intelligent Platform Management Bus
IPMC	Intelligent Platform Management Controller
IPMI	Intelligent Platform Management Interface
MMC	Mezzanine Management Controller
NEBS	Network Equipment Building System
OOS	Out-Of-Service
PCB	Printed Circuit Board
PEM	Power Entry Module
PICMG	PCI Industrial Computer Manufacturers Group
PMC	Peripheral Management Controller
RoHS	Restriction of the use of Certain Hazardous Substances
RTM	Rear Transition Module
SAF	Software Availability Forum
SDRAM	Synchronous Dynamic Random Access Memory

Abbreviation	Definition
SELV	Safety Extra Low Voltages
ShM	Shelf Manager
ShMC	Shelf Management Controller
TPE	Twisted Pair Ethernet

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. `Sample of Programming used in a table (9pt)`
`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
..	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
	Indicates a hot surface that could result in moderate or serious injury
	Indicates an electrical situation that could result in moderate injury or death
	Indicates that when working in an ESD environment care should be taken to use proper ESD practices
	No danger encountered, pay attention to important information

Summary of Changes

This manual has been revised and replaces all prior editions.

Part Number	Date	Description
6806800M91D	January 2020	Rebrand to SMART Embedded Computing template.
6806800M91C	July 2016	Removed declaration of conformity. Updated copyrights information.
6806800M91B	September 2014	Rebranded to Artesyn template.
6806800M91A	October 2011	Initial version

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.

SMART Embedded Computing 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 SMART EC representative.

The product has been designed to meet the standard industrial safety requirements. It must not be used except in its specific area of office telecommunication industry and industrial control.

Only personnel trained by SMART EC 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 SMART EC representative for service and repair to make sure that all safety features are maintained.

EMC

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. 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. Changes or modifications not expressly approved by SMART EC could void the user's authority to operate the equipment. Board products are tested in a representative system

to show compliance with the above mentioned requirements. A proper installation in a compliant system will maintain the required performance. Use only shielded cables when connecting peripherals to assure that appropriate radio frequency emissions compliance is maintained.

Installation

Before installing the board make sure the requirements listed in section "Board Exchange" are met.

Restricted access area - This board is only to be installed in a restricted access area.

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.

Damage of Circuits

Electrostatic discharge and incorrect board installation and removal can damage circuits or shorten their life.

Before touching the board or electronic components, make sure that you are working in an ESD-safe environment or wear ESD wrist straps.

Board Malfunctioning

Incorrect board installation and removal can result in board malfunctioning.

Make sure that the board is connected to the system backplane via all assembled connectors and that power is available on all zone 1 power pins

Damage of the Product

Incorrect installation of the product can cause damage of the product,

Only use handles when installing/removing the product to avoid damage/deformation to the face plate and/or PCB.

Damage of the Product and Additional Devices and Modules

Incorrect installation or removal of additional devices or modules may damage the product or the additional devices or modules.

Before installing or removing additional devices or modules, read the respective documentation.

Operation

Board Damage–Board Surface

High humidity and condensation on the board surface causes short circuits.

Do not operate the board outside the specified environmental limits. Make sure the board is completely dry and there is no moisture on any surface before applying power.

Board Overheating and Board Damage

Operating the board without forced air cooling may lead to board overheating and thus board damage.

When operating the board, make sure that forced air cooling is available in the shelf.

Injuries or Short Circuits–Board or Power Supply

In case the ORing diodes of the board fail, the board 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 injuries, always check that there is no more voltage on the line that has been disconnected before continuing your work.

Hot Swap

Installing the board into or removing it from a powered system not supporting hot swap or high availability causes board damage and data loss. Therefore, only install it in or remove it from a powered system if the system itself supports hot swap or high availability and if the system documentation explicitly includes guidelines.

RJ-45 Connector

The RJ-45 connector on the face plate must only be used for twisted-pair Ethernet (TPE) connections. Connecting a telephone to such a connector may destroy your telephone as well as your board. Therefore:

- Clearly mark TPE connectors near your working area as network connectors.
- Only connect TPE bushing of the system to safety extra low voltage (SELV) circuits.
- Make sure that the length of the electric cable connected to a TPE bushing does not exceed 100 m.

If you have further questions, ask your system administrator.

Replacement/Expansion

Only replace or expand components or system parts with those recommended by SMART Embedded Computing. Otherwise, you are fully responsible for the impact on EMC or any possible malfunction of the product.

Check the total power consumption of all components installed (see the technical specification of the respective components). Ensure that any individual output current of any source stays within its acceptable limits (see the technical specification of the respective source).

Environment

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

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 Produktes 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 Produkt zur Folge haben.

SMART Embedded Computing ist darauf bedacht, alle notwendigen Informationen zum Einbau und zum Umgang mit dem Produkt in diesem Handbuch bereit zu stellen. Da es sich jedoch 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 SMART EC.

Das System erfüllt die für die Industrie geforderten Sicherheitsvorschriften und darf ausschließlich für Anwendungen in der Telekommunikationsindustrie und im Zusammenhang mit Industriesteuerungen verwendet werden.

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Halten Sie sich von stromführenden Leitungen innerhalb des Produktes fern. Entfernen Sie auf keinen Fall Abdeckungen am Produkt. Nur werksseitig zugelassenes Wartungspersonal oder anderweitig qualifiziertes Wartungspersonal darf Abdeckungen entfernen, um Komponenten zu ersetzen oder andere Anpassungen vorzunehmen.

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

EMV

Das Produkt wurde in einem SMART EC Standardsystem getestet. Es erfüllt die für digitale Geräte der Klasse A gültigen Grenzwerte in einem solchen System gemäß den FCC-Richtlinien Abschnitt 15 bzw. EN 55022 Klasse A. Diese Grenzwerte sollen einen angemessenen Schutz vor Störstrahlung beim Betrieb des Produktes in Gewerbe- sowie Industriegebieten 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.

Wird das Produkt in einem Wohngebiet betrieben, so kann dies mit großer Wahrscheinlichkeit zu starken Störungen führen, welche dann auf Kosten des Produktanwenders beseitigt werden müssen. Änderungen oder Modifikationen am Produkt, welche ohne ausdrückliche Genehmigung von SMART Embedded Computing durchgeführt werden, können dazu führen, dass der Anwender die Genehmigung zum Betrieb des Produktes verliert. Boardprodukte werden in einem repräsentativen System getestet, um zu zeigen, dass das Board den oben aufgeführten EMV-Richtlinien entspricht. Eine ordnungsgemäße Installation in einem System, welches die EMV-Richtlinien erfüllt, stellt sicher, dass das Produkt gemäß den EMV-Richtlinien betrieben wird. Verwenden Sie nur abgeschirmte Kabel zum Anschluss von Zusatzmodulen. So ist sichergestellt, dass sich die Aussendung von Hochfrequenzstrahlung im Rahmen der erlaubten Grenzwerte bewegt.

Warnung! Dies ist eine Einrichtung der Klasse A. Diese Einrichtung kann im Wohnbereich Funkstörungen verursachen. In diesem Fall kann vom Betreiber verlangt werden, angemessene Maßnahmen durchzuführen.

Board Installation

Bevor Sie das Board in einem System installieren, überprüfen Sie, ob die im Kapitel "Board Exchange" aufgeführten Anforderungen erfüllt werden.

Bereich mit eingeschränktem Zugang - Installieren Sie das Board in ein System nur in Bereichen mit eingeschränktem Zugang.

Datenverlust

Ziehen Sie das Board im laufenden Betrieb heraus, obwohl die Hot-Swap LED noch nicht leuchtet, führt das zu Datenverlust.

Warten Sie deshalb bis die Hot-Swap LED blau leuchtet, bevor Sie das Board herausziehen.

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.

Fehlfunktion des Produktes

Fehlerhafter Ein- und Ausbau des Produktes kann zur Beschädigung des Produktes führen.

Stellen Sie deshalb sicher, dass das Produkt mit allen Steckern mit der Systembackplane verbunden ist und über alle Zone 1 Anschlüsse mit Spannung versorgt wird.

Beschädigung des Produktes

Fehlerhafte Installation des Produktes kann zu einer Beschädigung des Produktes führen.

Verwenden Sie die Handles, um das Produkt zu installieren/deinstallieren. Auf diese Weise vermeiden Sie, dass das Face Plate oder die Platine deformiert oder zerstört wird.

Beschädigung des Produktes und von Zusatzmodulen

Fehlerhafte Installation von Zusatzmodulen, kann zur Beschädigung des Produktes und der Zusatzmodule führen.

Lesen Sie daher vor der Installation von Zusatzmodulen die zugehörige Dokumentation.

Betrieb

Beschädigung des Boards

Hohe Luftfeuchtigkeit und Kondensat auf der Oberfläche des Boards können zu Kurzschlüssen führen.

Betreiben Sie das Board nur innerhalb der angegebenen Grenzwerte für die relative Luftfeuchtigkeit und Temperatur. Stellen Sie vor dem Einschalten des Stroms sicher, dass sich auf dem Board kein Kondensat befindet.

Überhitzung und Beschädigung des Boards

Betreiben Sie das Board ohne Zwangsbelüftung, kann das Board überhitzt und schließlich beschädigt werden.

Bevor Sie das Board betreiben, müssen Sie sicher stellen, dass das Shelf über eine Zwangskühlung verfügt.

Verletzungen oder Kurzschlüsse–Board oder Stromversorgung

Falls die ORing Dioden des Boards durchbrennen, kann das Board 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.

Hot Swap

Wenn Sie das Board im laufenden Betrieb in ein System, das weder Hot Swap noch High Availability unterstützt, installieren bzw. herausziehen, wird das Board beschädigt und es gehen Daten verloren. Installieren/entfernen Sie das Board nur im laufenden Betrieb, wenn das System Hot Swap oder High-Availability unterstützt und wenn die Systembeschreibung dies ausdrücklich erlaubt.

RJ-45 Stecker

Der RJ-45 Stecker auf der Frontblende darf nur für Twisted-Pair-Ethernet (TPE) Verbindungen verwendet werden. Beachten Sie, dass ein versehentliches Anschließen einer Telefonleitung an einen solchen TPE Stecker sowohl das Telefon als auch das Board zerstören kann. Beachten Sie deshalb die folgenden Hinweise:

- Kennzeichnen Sie TPE-Anschlüsse in der Nähe Ihres Arbeitsplatzes deutlich als Netzwerkanschlüsse.
- Schließen Sie an TPE-Buchsen ausschließlich SELV-Kreise (Sicherheitskleinspannungsstromkreise) an.
- Die Länge des mit dem Board verbundenen Twisted-Pair Ethernet-Kabels darf 100 m nicht überschreiten.

Falls Sie Fragen haben, wenden Sie sich bitte an Ihren Systemadministrator.

Austausch/Erweiterung

Verwenden Sie bei Austausch oder Erweiterung nur von SMART Embedded Computing empfohlene Komponenten und Systemteile. Andernfalls sind Sie für mögliche Auswirkungen auf EMV oder Fehlfunktionen des Produktes voll verantwortlich.

Überprüfen Sie die gesamte aufgenomme Leistung aller eingebauten Komponenten (siehe die technischen Daten der entsprechenden Komponente). Stellen Sie sicher, dass die Stromaufnahme jedes Verbrauchers innerhalb der zulässigen Grenzwerte liegt (siehe die technischen Daten des entsprechenden Verbrauchers).

Umweltschutz

Entsorgen Sie alte Batterien und/oder Produkte stets gemäß der in Ihrem Land gültigen Gesetzgebung und den Empfehlungen des Herstellers.

Introduction

1.1 Overview

The SAM1411 is a shelf manager board to be used in the AdvancedTCA systems. It plugs into a dedicated shelf management slot of an AdvancedTCA system. The SAM1411 performs the system monitoring, control, and management functions of the entire shelf. It provides management for up to 16 AdvancedTCA front blades, fans, power entry modules (PEMs), alarm modules, and shelf FRU info modules that are present in an AdvancedTCA system. It is designed for redundant operation in AdvancedTCA shelves. Two SAM1411 are deployed in one shelf. One takes over the role of active shelf manager and the other one acts as standby shelf manager, which is ready to take over in case of a failure of the active one. Redundant channels for heart beating and check pointing between the two SAM1411 are provided to support failover.

The shelf manager consists of hardware (payload and shelf management controller) and software.

For information of the software, refer to the *System Management Interface Based on HPI-B (Centellis 31kX/4100/2000/4410) User's Guide*.

The SAM1411 provides the following interfaces:

- MPC8306S PowerQUICC processor with embedded PowerPC core
- Atmel ATmega2560 (master) and ATmega168 (slave) micro-controllers
- 64/128MB SDRAM memory
- 64 MB boot and user flash
- Dual redundant IPMB interface
- Two 10/100 Mbps Ethernet ports to the rear connector
- One 10/100 Mbps Ethernet port to the face plate
- Two serial ports to the rear connector for heartbeat with the redundant SAM1411
- One serial port to the rear connector, for configuration and diagnostic purposes (routed to the Alarm Display Panel)
- 64 MB redundant boot and user flash for recovery
- SPI bus to MicroSD memory module for storage
- I2C to 512K EEPROM for OS environment variable data
- Telco Alarm connector to the faceplate
- Telco Alarm signals to the ADP LEDs
- Local Temperature Sensor

1.2 Standard Compliances

The SAM1411, when installed in a compliant chassis, meets the following standards:

Table 1-1 Standard Compliances

Standard	Description
UL 60950-1, EN 60950-1, IEC 60950-1 CAN/CSA C22.2 No 60950-1	Defines legal safety requirements
CISPR 22 CISPR 24 EN 55022 EN 55024 FCC Part 15 Industry Canada ICES-003 VCCI Japan AS/NZS CISPR 22 EN 300 386 NEBS Standard GR-1089 CORE	Defines legal EMC requirements on system level (predefined SMART Embedded Computing system)
ANSI/IPC-A610 Rev.C Class 2 ANSI/IPC-7711 ANSI/IPC-7721 ANSI-J-001...003	Defines manufacturing requirements
NEBS Standard GR-63-CORE ETSI EN 300 019 series	Defines environmental requirements
PICMG 3.0 R3.0	Defines mechanics, blade dimensions, power distribution, power and data connectors, and system management

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 (EU) 2015/863 (amending Annex II to Directive 2011/65/EU).

The shelf manager board SAM1411 can be operated from -5ºC up to +55ºC without forced cooling.

1.3 Ordering and Support Information

Table 1-2 shows the ordering information for the board. Refer to *Appendix A, Related Documentation* or consult your local SMART Embedded Computing sales representative for the availability of other variants.

For technical assistance, documentation, or to report product damage or shortages, contact your local SMART EC sales representative or visit *https://www.smartembedded.com/ec/support/*.

Table 1-2 Ordering Information

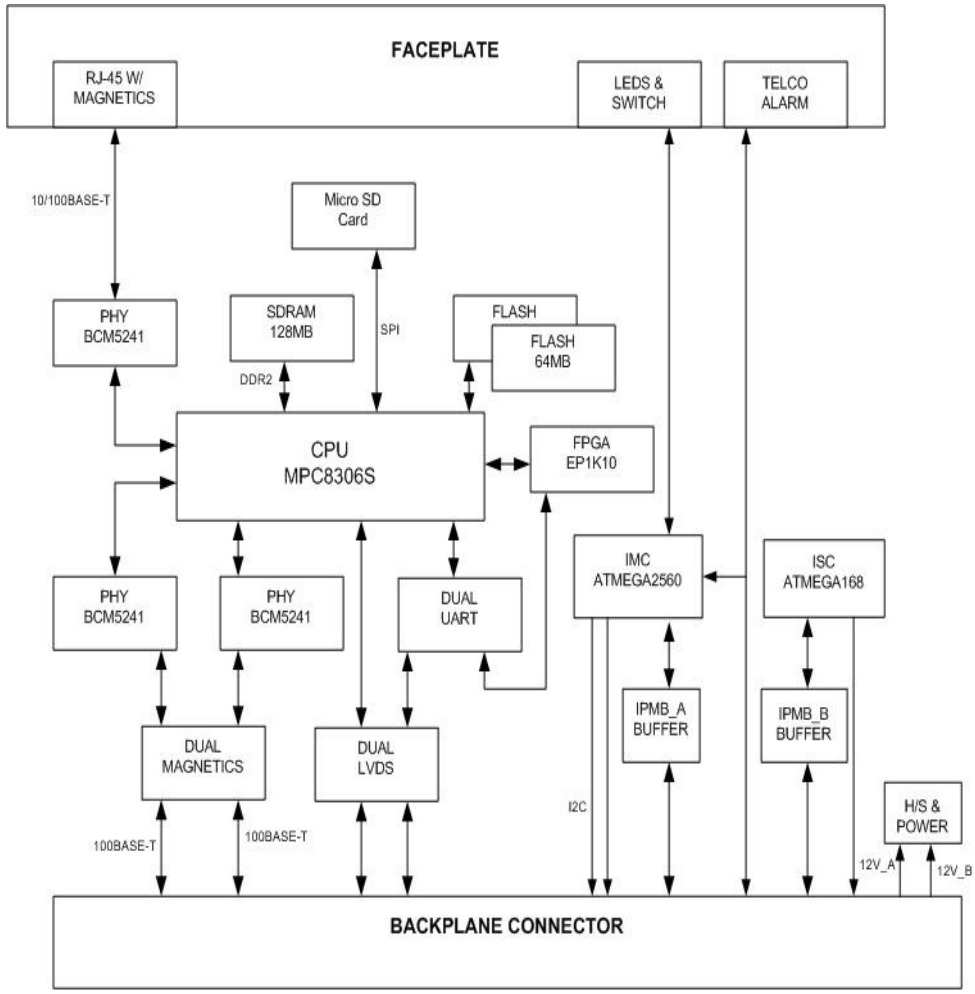
Order No.	Description
SAM1411	Shelf manager board used in AXP1411 systems

Shelf Manager Hardware

2.1 Overview

The SAM1411 is compliant to PICMG 3.0 R3.0 (AdvancedTCA). It is equipped with a backplane connector and is plugged into a 2U slot.

Figure 2-1 SAM1411 Block Diagram



The alignment pin offers a guiderail to the slot and a coding mechanism to ensure the installation of the board in the matching slot. It also prevents bent pins which may occur during installation.

The hardware consists of:

- Payload hardware section with
  - Ethernet interfaces to the backplane and to the face plate
  - Redundant connection between two shelf managers via backplane
  - Block transfer interface to the ShMC
- Shelf management controller section with
  - IPMB0-A and IPMB0-B interface to the backplane
  - Handle switch and status LED interface to the face plate
- Support logic for testing and debugging, as well as local and remote programming of all programmable devices on the board
- Power supply

2.2 Payload Hardware

The payload hardware on the shelf manager board is always powered when power supply is present. During power-on, the ShMC keeps the payload in a reset state.

The following interfaces are available:

- Three Ethernet interfaces
- Two redundancy interfaces (serial)
- Block transfer interface
- One diagnostic console interface (serial)

2.2.1 Ethernet Interfaces

The shelf manager board has three Ethernet ports which are available concurrently.

One 10/100 BaseT out-of-band interface is accessible via RJ45 connector at the face plate marked with "ETH". Link and activity status LEDs are integrated into the connector.

Two 10/100 BaseT interfaces are connected to the backplane connector at the pins Eth1-Hub Tx/Rx and Eth2-Hub Tx/Rx.

These interfaces are compliant with the PICMG 3.0 R3.0 specification (AdvancedTCA) for the base interface. These ports connect to the base interface of up to two AdvancedTCA switch boards in the hub slots of an AdvancedTCA shelf.

2.2.2 Redundancy Interfaces

The SAM1411 uses a private, redundant, high-speed, full duplex serial connection for heartbeating and data replication between the two shelf manager boards.

The redundancy interface is routed to the backplane via differential line LVDS transceivers. The physical interface of both channels are compliant with the PICMG 3.0 R3.0 (AdvancedTCA) specification for the update interface.

Each of the serial inputs of the redundancy interface triggers an interrupt to the PowerQUICC when the other shelf manager board:

- initiates a break-in condition on the serial line
- experiences a power failure
- goes in the reset state
- is extracted

2.2.3 Block Transfer Interface

The payload CPU is connected to the ShMC via a parallel interface with interrupt support called block transfer interface, implemented in an FPGA.

The block transfer (BT) interface is compliant with IPMI specification v1.5.

2.2.4 Console Interface

The SAM1411 provides one EIA-232 serial interface to the backplane, which is routed to the Alarm Display Panel (ADP) in the AXP1411 shelf. This interface can be used for configuration and diagnostic purposes. This interface is normally the console of the Payload Processor, but under software control, can provide access to the ShMC console.

2.3 Shelf Management Controller

The ShMC part is derived from SMART Embedded Computing's IPMC building block and consists of two coupled microcontrollers:

- IPMC Master Controller (IMC), based on ATmega2560
- IPMC Slave Controller (ISC), based on ATmega168

2.3.1 IPMB0 Interface

IPMB0-A is connected to the I^2C controller of the IMC and IPMB0-B is connected to the I^2C controller of the ISC of the ShMC. Both microcontrollers have their own I^2C controller and handle message transmission and reception independently, including bus error handling and bus arbitration.

Received messages sent from both the IMC and the ISC channels are collected by the IMC. The IMC dispatches messages, which have to be sent, either to its own I^2C interface or to the ISC for transmission.

2.3.2 IPMC Standard Functions

The standard functionality of the SMART Embedded Computing IPMC is available on the IPMC of the SAM1411. For more information, refer *SAM1411 Control via IPMI Programmer's Reference* Guide.

2.4 Power Supply

The SAM1411 is powered by dual redundant +12VDC feeds, one from each of the PEMs. This +12VDC is derived from the -48VDC feed to each PEM. Each of the two +12V feeds are separately fused with a 2A fuse.

The power supply is compliant with the requirements of the PICMG3.0 R3.0 (AdvancedTCA) specification. Each of the four power connections is separately fused. Fuse rating is 1A.

An EMI filter at the power input ensures conducted emission levels below EN 55022 class B.

2.4.1 On-board and External Supply

The SAM1411 has no provisions to switch off the power input. The board is powered when the power input to either PEM is in the operating range of -40.5V to -72V.

An on-board DC/DC-converter supplies all on-board circuitry, and provides 3.3V power supply to external circuits with a consumption of not more than 4.2W.

The board satisfies the standby power limit of 10W for AdvancedTCA FRUs, even when supplying 4W to external loads. Typical power consumption of the SAM1411 board is 2.3W.

2.4.2 Power Supply Holdup

The SAM1411 complies with the requirements for board level voltage transients as described in chapter 4.1.4.3. of PICMG 3.0 (AdvancedTCA) specification.

It satisfies the requirement of uninterrupted operation during a power failure of 5ms, while supplying 4W to external circuits.

2.5 Frame Ground and ESD

Frame ground connection is provided by the backplane connector FrameGND.

The face plate mounting holes of the board are connected to frame ground.

An ESD strip according to the AdvancedTCA specification PICMG 3.0 R3.0 for rear transition modules (RTMs) is provided at one edge of the PCB.

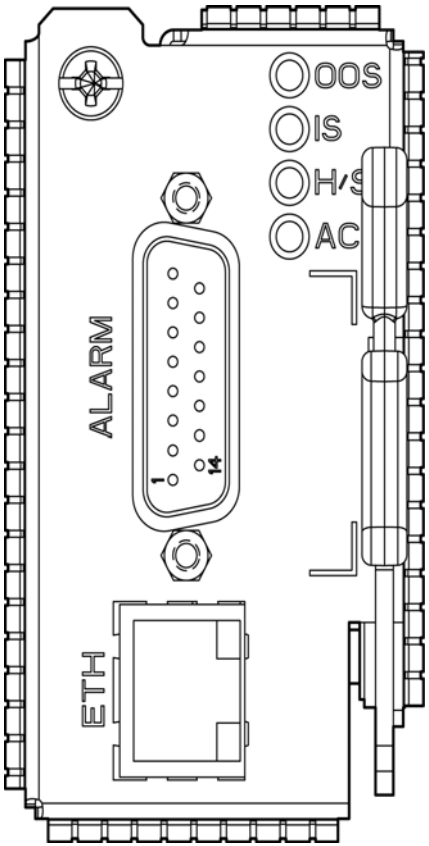
Controls, Indicators, and Connectors

3.1 Face Plate

The following figure shows the position of connectors and LEDs on the face plate of the board. The following are the faceplate connectors and indicators on the board:

- One 15-pin D-shell connector for the Telco Alarm cable
- One RJ-45 connector for the face plate Ethernet connector (with integrated Link and Activity LEDs)
- OOS/IS/ACT/HS LED status indicators

Figure 3-1 Face Plate



3.2 LEDs

The following table describes the LEDs that can be found on the face plate of the board. The OOS, I/S, ACT, and H/S LEDs can be controlled via IPMI. For more information, refer *SAM1411 Control via IPMI Programmer's Reference* Guide.

Table 3-1 Face Plate LEDs

LED	Color	Description
Failure (OOS) LED	Red	Red: The shelf manager board is out-of-service. Off: The shelf manager board is working properly.
Active (ACT) LED	Amber	Amber: The shelf manager board is active. Off: The shelf manager board is in standby mode.
Hot Swap (H/S)	Blue	Blue (steady): The shelf manager board is ready to be extracted. Blue (long blink): The board has been inserted or powered on and is beginning the integration process. The eject handle switch is closed. Blue (short blink): The eject handle switch is open or an extraction has been requested. The board is shutting down and transferring control of the shelf to the other shelf manager board. Off: The shelf manager board is not ready to be extracted. Do not remove the board during this state.
In Service (I/S) LED	Green	Green: The shelf manager board is working properly. Off: The shelf manager is not working properly or is initializing after power-up.
Link Status /Activity	Green	ON – Data link is active between the PHY and an external connection FLASHING – Data is being transferred
Speed	Amber	ON – 100Mb/s mode is selected OFF – 10Mb/s mode is selected

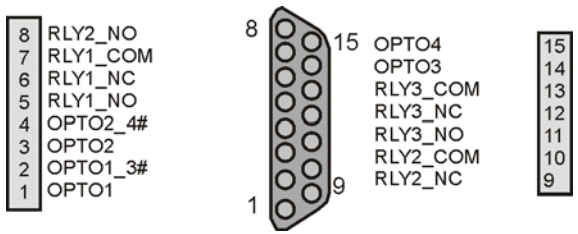
3.3 Ethernet Connector (Out-of-Band)

One 10/100 Mbps Ethernet port is provided via the Ethernet connector on the face plate. It allows external system managers to access the shelf manager.

3.4 Alarm Connector

The DB15 connector provides a means to report system alarm conditions to a higher level such as a system operator console. *Table 3-2* displays the pinout for the alarm I/O connector:

Figure 3-2 Alarm I/O Connector Pinout



The following table shows the description of the pins:

Table 3-2 Alarm Pin Description

Pin	Description
1	Minor Alarm Reset +
2	Minor Alarm Reset -
3	Major Alarm Reset +
4	Major Alarm Reset -
5	Critical Alarm - NO (Normally Open)
6	Critical Alarm - NC (Normally Closed)
7	Critical Alarm - COM (Common)
8	Minor Alarm - NO (Normally Open)
9	Minor Alarm - NC (Normally Closed)
10	Minor Alarm - COM (Common)
11	Major Alarm - NO (Normally Open)
12	Major Alarm - NC (Normally Closed)
13	Major Alarm - COM (Common)
14	Pwr Alarm - NO (Normally Open)
15	Pwr Alarm - COM (Common)

SAM1411 Installation

4.1 Overview

To install the SAM1411 into the AdvancedTCA system, follow these steps:

1. Unpack and inspect the board (See *Unpacking and Inspecting the Board on page 39*).
2. Make sure environmental and power requirements are met (See *Requirements on page 40*).
3. Install the blade (See *Installing and Removing the Board on page 43*).

4.2 Unpacking and Inspecting the Board

NOTICE

Board Damage

Touching the board or electronic components in a non-ESD protected environment causes component and board damage.

Before touching boards or electronic components, make sure that you are working in an ESD-safe environment or wear ESD wrist straps

Shipment Inspection

To inspect the shipment, perform the following steps:

1. Verify that you have received all items of your shipment:
   - SAM1411
   - Desiccant bag
2. Check for damage and report any damage or differences to the customer service.
3. Remove the desiccant bag delivered along with the board and dispose of it according to your country's legislation.

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

4.3 Requirements

Before you power up the board, calculate the power needed according to your system configuration.

4.3.1 Environmental Requirements

Make sure that the board, when operated in your particular system configuration, meets the environmental requirements specified in *Table 4-1 on page 40*.

Operating temperatures refer to the temperature of the air circulating around the board and not to the component temperature.

NOTICE

Board Damage

High humidity and condensation on the board surface causes short circuits.

Do not operate the board outside the specified environmental limits. Make sure the board is completely dry and there is no moisture on any surface before applying power.

Table 4-1 Environmental Requirements

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	-40ºC (-40°F) to +85ºC (+185°F)
Temp. change	±0.25ºC/min according to NEBS Standard GR-63-CORE	±0.25ºC/min
Relative humidity	5% to 90% non-condensing according to SMART Embedded Computing-internal environmental requirements	5% to 95% non-condensing according to SMART Embedded Computing-internal environmental requirements

Table 4-1 Environmental Requirements (continued)

Feature	Operating	Non-Operating (packed state)
Vibration (tested in target platform)	0.1g from 5 to 100Hz and back to 5Hz at a rate of 0.1 octave/minute.	5-20Hz at 0.01g^2/Hz 20-200Hz at -3.0dB/octave Random 5-20Hz at 1m^2/Sec^3 Random 20-200Hz at -3dB/octave
Shock	Half-sine, 11mSec, 30m/Sec^2	Blade level packaging Half-sine, 6mSec at 180m/Sec^2
Free fall	-	1.0 m (packaged) per ETSI 300 019-2-2 (Blade level packaging) 100 mm (unpackaged) per GR-63-CORE

4.3.2 Power Requirements

Make sure that the board is used in an AdvancedTCA shelf connected to -48VDC up to -60VDC (rated voltage), according to Telecommunication Network Voltage (TNV-2).

A TNV-2 circuit is a circuit whose normal operating voltages exceed the limits for a safety-extra-low-voltage (SELV) under normal operating conditions, and which is not subject to overvoltages from telecommunication networks.

On-board voltages are 12VDC, 3.3VDC, 2.5VDC, 1.0VDC, and 1.8VDC:

- 12VDC voltage is generated by the PEMs from the -48 VDC AdvancedTCA power by a DC/DC converter with galvanic isolation suitable for TNV-2 circuits.
- 3.3V, 2.5V, 1.0V, and 1.8V voltages are derived from the 12V input power.

Table 4-2 DC Board Power Requirements

Feature	Value
Rated Voltage	-48VDC to -60VDC US and Canada: -48VDC
Operating Voltage	-40.5VDC to -72VDC US and Canada: -40.5 to -60VDC
Input current	0.2A
SAM1411 power dissipation	10W (max.) including external load of 4W maximum

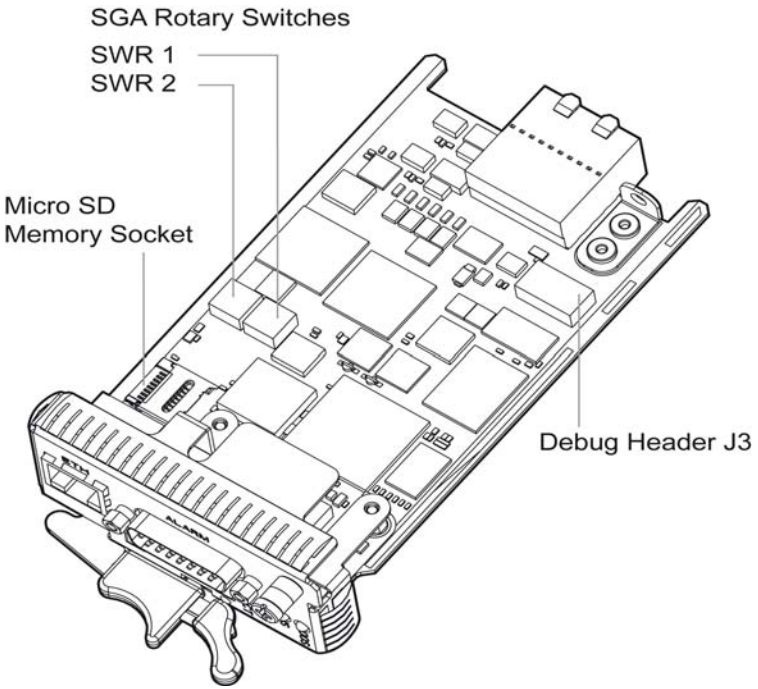
The board provides two independent power inputs according to the AdvancedTCA specification. Each input has to be equipped with an additional fuse of max 90A located either in the shelf where the board is installed or in the power entry module (PEM).

4.3.3 Rotary Switch Settings

The two rotary switches on the SAM1411 are used to set the SGA. The first byte of the shelf address of the shelf FRU information is automatically set to the SGA value.

S1 sets the lower nibble and S2 sets the upper nibble. Use a screwdriver to set the switches by turning them. A little arrow on the switch shows you the value to which the switch is set.

Figure 4-1 Rotary Switch Location



Two SAM1411 in the same shelf must always be set to the same SGA. Otherwise, the software detects that the FRU information in the two SAM1411s is different and stops the power-up process. The red LED blinks and the boards are not powered.

Two SAM1411 in different shelves must always be set to different SGAs. When set to the same address, both SAM1411 starts and network problems might occur.

4.4 Installing and Removing the Board

NOTICE

Board Damage

Touching the board or electronic components in a non-ESD protected environment causes component and board damage.

Before touching boards or electronic components, make sure that you are working in an ESD-safe environment or wear ESD wrist straps.

Since the backplane has no possibility to store the information (part number, serial number, and so on.) on the shelf, this information is stored on the board itself. The software on the board always updates this information on a newly inserted board.

Never exchange more than one of these FRUs (boards) at the same time to guarantee that the shelf information stays consistent and up to date.

The board must only be operated in a shelf that is properly grounded.

4.4.1 Installing the Board

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.

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 (see *Rotary Switch Settings on page 42*).
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 on.
8. Screw in the captive screw hand tight. The blue LED blinks.
9. Wait until the blue LED is OFF. This indicates that the board is activated.

4.4.2 Removing the Board

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 disregard the blue LED and thus skip the respective step.

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.

Shelf Manager File System

5.1 Overview

The root-file system includes all payload applications and configurations. It is stored as a compressed RAM disk on the flash and extracted into the RAM after the kernel has booted. All changes in the disk file system are lost after the shelf manager powers down.

To enable persistent file support, a separate journaling flash file system of type ext2 exists. This ext2 file system is mounted at startup on the `/usr/local` mount point. Any files stored in this directory are persistent.

5.1.1 Persistent File Support

To make files persistent that are usually located under the RAM disk root-file system, SMART Embedded Computing has implemented a persistent file mechanism. All files that are to be stored under the persistent file system instead of the RAM disk file system are listed in a persistent file map. The file map is stored with the following file path:
`/etc/persistentmap`

For each file that should be persistent, a separate line in the persistent map exists.

The following example shows the default persistent map of the shelf manager.

```
#
# Map of persistent files.
# This file is sourced during system startup.
# A file specified in the first row is replaced by a symbolic link that
# points to the file in the second row. If the file in the second row
# does not exist it is copied first.
#
# Copyright (c) 2011 Emerson Network Power - Embedded Computing, Inc.
#
#
# SYNTAX
# ------
# <source file on volatile media> <destination file on persistent media>
#

/etc/network.conf                /usr/local/etc/network.conf
/etc/rc.d/network.local          /usr/local/etc/rc.d/network.local
/etc/appl.conf                   /usr/local/etc/appl.conf
```

```
/opt/bladeservices/etc/bbs-hpib/bbs-hpib.conf      /usr/local/etc/bbs-
hpib/bbs-hpib.conf
/var/lib/bbs-hpib/uid_map        /usr/local/var/lib/bbs-hpib/uid_map
/etc/ntpd.conf                   /usr/local/etc/ntpd.conf
/var/lib/dhcp/dhcpd.leases       /usr/local/var/lib/dhcp/dhcpd.leases
/etc/dhcpd.conf                  /usr/local/etc/dhcpd.conf
```

Each line consists of two columns. The first column specifies the source file which is the file on the RAM disk file system. The second column specifies the destination file which is the file on the persistent file system.

At system startup, the shelf manager reads the persistent map and replaces each source file with a symbolic link to the destination file. If the destination file does not exist, then it is copied from the RAM disk file system to the persistent file system. The persistent map itself is also symlinked at startup from the RAM disk file system to the persistent file system. A default map is copied if it does not exists.

Using this approach, any file in the RAM disk file system, with the exception of `/etc/rc.d/rc.boot`, can be made persistent.

Replacing a regular file by a symbolic link is transparent to the applications on the shelf manager.

5.1.2 Use Cases

The following use cases are described in this section:

- How to make a file on the RAM disk file system persistent
- How to remove a file from the persistent file system
- How to rollback to the factory configuration

5.1.2.1 How to Make a File on the RAM Disk File System Persistent

1. Prepare for editing the persistent map.
   Either connect to the shelf manager via telnet and start "vi" to edit the persistent map on site or download the persistent map using ftp to your local workstation and load the file in your editor.
2. Add a new line at the end of the persistent map.
   The first entry of the line specifies a file on the RAM disk file system and the second line entry specifies the file on the persistent file system.

3. Save the changes.
   If you edit on site, exit the "vi" editor or otherwise, upload your modified file to the shelf manager using ftp.
4. Create the file on the persistent file system (Optional).
   This step allows you to install your own file on the persistent file system. If this step is omitted, the existing file on the RAM disk file system is copied automatically during system startup.
5. Reboot the system.
   After system reboot the file on the persistent media is used instead of the file on the RAM disk.

5.1.2.2 How to Remove a File from the Persistent File System

1. Prepare for editing the persistent map.
   Either connect to the shelf manager via telnet and start "vi" to edit the persistent map on site or download the persistent map with ftp to your local workstation and load the file in your editor.
2. Remove the line containing the desired file.
3. Save the changes.
   If you edit on site, exit the "vi" editor or otherwise upload the modified file to the shelf manager using ftp.
4. Remove the file on the persistent file system (optional).
   This step is optional because the shelf manager does not use the file on persistent media any longer.
5. Reboot the system.
   After system reboot, the file on the RAM disk is used.

5.1.2.3 How to Rollback Factory Configuration

1. Type the following command to delete all data on the persistent media:
   ```
   # cd /usr/local && rm -rf *
   ```
2. Reboot the system.

5.1.2.4 Persistent Log Files

All log files in `/var/log` directory are saved in the persistent file area. The `/var/log` directory is a symbolic link to `/usr/local/var/log`. On rebooting the Shelf Manager, all files stored in `/usr/local/var/log` are moved to `/usr/local/var/log.PREVIOUS`. This allows two separate set of log files to be saved - the current logs in `/usr/local/var/log` and the logs from the previous boot in `/usr/local/var/log.PREVIOUS`.

5.2 Log Files

There are three types of log files:

1. Linux log files
2. HPI log file (see *System Management Interface Based on HPI-B (Centellis CO 31kX/4100/2000) User's Guide*, chapter *HPI Logging Support*)
3. Supervisor log file

By default, the log file for supervisor logging is located at `/var/log/supervisor.log`.

You have the possibility to configure the supervisor logging by changing the configuration file located at `/usr/etc/supervisor/config/sv_config.xml`. This XML file allows you to change the following elements:

Element	Description	Possible Values
LogSeverity mask	Defines what information will be logged	Silent|Trace|Info|Notice|Warning|Error|Critical|Alert|Emergency|Everything
LogSink mask	Defines where the information will be logged	Stdout|Stderr|Logfile|Syslog
LogFile name	Location of the logfile	Default: /var/log/supervisor.log
LogFile size	Maximum logfile size	Default: 500KB

The IP addresses in the log file are dynamic. Only change the elements listed in the table above.

Example of the configuration file:

```
<SupervisorConfiguration>
   <Logging>
      <!-- possible severity values:

Silent|Trace|Debug|Info|Notice|Warning|Error|Critical|Alert|Emergency|Everything -->
      <LogSeverity mask="Info|Notice|Warning|Error|Critical|Alert|Emergency" />
      <!-- possible sink values:  Stdout|Stderr|Logfile|SysLog -->
      <LogSink mask="Logfile"/>
      <LogFile name="/var/log/supervisor.log" size="500"/>
   </Logging>
```

```
   <Supervisor msgPort="5566" queueLen="100" filePort="5568"
sendChunkSize="500"
    startWaitTime="100" restartWaitTime="1000" transitionMaxTime="20000"
switchWaitTime="30000"
     switchIgnoreTime="5000" tieBreak="8" localConnectOnly="0"
fileInterface="0.0.0.0"/>
  <!-- for file transfer using ppp interface fileInterface="@srcIpAddr1@"
-->

   <HeartBeater id="1" port="5567" type="UDP">
    <HeartBeaterGroup name="shmgr" id="1" >
     <HeartBeaterNode id="1" ipAddr="192.168.101.9" port="5567"
                      interval="400" warning="3" inaccessible="5" />
     <HeartBeaterNode id="2" ipAddr="192.168.102.9" port="5567"
                      interval="400" warning="3" inaccessible="5" />
    </HeartBeaterGroup>
   </HeartBeater>

</SupervisorConfiguration>
```

Firmware Upgrade Facility

6.1 Overview

The Firmware Upgrade Facility (FUF) provides a uniform way to upgrade firmware on SMART EC hub blades, node blades, and AMC modules. It consists of a Firmware Upgrade Command-line Utility (FCU), flash device drivers, and specially prepared firmware recovery image files.

The ATCA-SAM1411 ramdisk is upgraded using the flashcp utility instead of fcu.

6.2 Firmware Recovery Image Files

FCU supports specially prepared firmware recovery image (FRI) files as well as firmware images in the HPM.1 format. HPM.1 is a PICMG standard to upgrade IPMCs.

By default, the image files for the current hardware configurations are stored in `/opt/bladeservices/rom`.

The following image files are currently supported:

Filename	Description
sam1411-kernel.fri	Kernel image for ATCA-SAM1411
sam1411-cpu.fri	U-boot firmware image for ATCA-SAM1411
sam1411-dtb.fri	Device Tree Binary for ATCA-SAM1411

6.3 Backup Concept

When upgrading the U-Boot firmware, or Device Tree Binary image, or Linux kernel, FCU only writes into the current stand-by bank. After the upgrade, the stand-by bank must be marked for next use; this means it is executed after the next reboot.

6.4 fcu—Firmware Upgrade Command-Line Utility

Description

The Firmware Upgrade Command-line Utility (FCU) allows you to:

- Query the current versions of the firmware installed on the Shelf Manager and determine which firmware devices are active.
- Verify that a specified upgrade image is sound and compatible with the current hardware.
- Upgrade a firmware image.
- Mark a device to be used as the boot source on the next reset.

By default, the FCU binary executable is installed in `/opt/bladeservices/bin`. This directory has been added to the PATH environment variable.

The FCU verify and upgrade operations require specially prepared FRI files or HPM files (see *Firmware Recovery Image Files on page 51*).

Synopsis

```
fcu --help [-t<slave address>]
fcu --version
fcu -q [-d <device-id>] [-t<slave address>]
fcu -v -f <filename> [-t<slave address>]
fcu -u -f <filename> [-t<slave address>]
fcu -a -f <filename>
fcu -m -b <bank-letter> -d <device-id> [-t<slave address>]
fcu -s -f <filename>
fcu --activate -b <bank-letter> -d <device-id>
```

Parameters

`-a`
`--full-upgrade`

This option is a shortcut for performing the verify, upgrade, and mark operations. The file option `-f` is required. This option should not be combined with other operations.

`-r`
`--activate`

This command is available for IPMC devices and images which conform to the HPM.1 standard.

HPM.1 compliant IPMCs store a redundant set of firmware images which may have the states operational, rollback, or deferred. Using the `--activate` option, you can set the state of the addressed firmware bank to "operational". Unlike the `--mark` option, the `--activate` command does not affect the payload operation,

this means you can set a previously "rollback" firmware bank to "operational" without rebooting or resetting the payload. The target IPMC is immediately functional after switching to the new firmware.

You can obtain the current states of the firmware banks by using the `-q` command. The state appears as part of the bank name, for example: "B - Rollback".

`-b <bank-letter>`
`--bank=<bank-letter>`

Specifies a flash bank (for example, A or B), where `<bank-letter>` is the letter designating a specific bank. This option can be used with the mark or activate operation. Use the query option `-q` to list available banks.

`-d <device-id>`
`--device=<device-id>`

Specifies a target firmware device, where `<device-id>` is the name of the device. This option is used with the mark or query operations. Device ID values vary by hardware. You can display supported devices on a given blade by using `fcu --help`. Currently supported values are listed in the following table:

Device ID	Description
atca-sam1411-cpu	U-Boot firmware device for ATCA-SAM1411
atca-sam1411-dtb	Device Tree Binary device for ATCA-SAM1411
atca-sam1411-kernel	Kernel device of ATCA-SAM1411
atca-sam1411-rootfs	Root filesystem (ramdisk) device for ATCA-SAM1411
atca-sam1411-hpm.1-ipmc	IPMC firmware device

`-f <filename>`
`--file=<filename>`

Specifies the FRI file, where `<filename>` is the complete path and filename of the image file. This option is used with the verify and upgrade operations.

`--force`

This option allows the installation of images with non-matching part-number and part-revision FRU data fields. This option should be used with extreme caution because installing an incompatible image on a device may render it inoperable.

`--help`

Displays a brief message describing command usage. It also displays a list of the devices supported on the blade. This option is exclusive and should not be used with other options.

`-m`
`--mark`

Informs FCU to set the boot select so that on the next boot the specified firmware bank will be active. When mark is combined with the upgrade operation, there is \ no need to specify a bank; the bank just upgraded will be marked. Otherwise, you must specify a bank and a device.

Note that on the ATCA-SAM1411 the U-Boot, DTB, Kernel, and Ramdisk are coupled, this means when you mark a U-Boot image for the next reboot, the other corresponding images are automatically marked as well.

`-q`
`--query`

Informs FCU to return firmware information for a specific device (if used with `-d`) or information about all firmware devices. The query operation is exclusive and is not intended to be combined with other operations.

`-s`
`--show`

Shows detailed information about a specified file. The information shown includes, for example image type, version, manufacturer name, and so on. This command may be useful before a firmware upgrade to determine the version of a new image file.

`-t`
`--target`

This option is needed to specify the IPMC address if the operation is to be done on a remote IPMC. If you do not specify this option, the software tries to access the local IPMC. The `-t` option provides a possibility to perform the firmware upgrade on a different blade.

`-u`
`--upgrade`

Informs FCU to upgrade the currently inactive bank of the device specified by the target FRI file. The file option `-f` is required. The upgrade operation may be combined with the verify and mark operations.

`-v`
`--verify`

Informs FCU to verify the image file specified by the required `-f` option. This operation verifies that the specified file is sound and compatible with the current hardware. The verify operation may be combined with the upgrade and mark operations.

`--version`

Displays version information for the utility. This option is exclusive and should not be used with other options.

Usage

Some FCU options can be combined. Some options are exclusive. The following list describes the valid option combinations:

- --full-upgrade --file=<filename>
- --full-upgrade --file=<filename> --target=xxxxxx
- --help
- --mark --bank = <bank-letter> --device=<device-id>
- --query
- --query --device=<device-id>
- --show --file=<filename>
- --upgrade --file=<filename>
- --upgrade --mark --file=<filename>
- --upgrade --file=<filename> --target=xxxxxx
- --verify --file=<filename>
- --verify --upgrade --file=<filename>
- --activate --bank=<bankletter> --device=<deviceID>
- --verify --upgrade --mark --file=<filename>
- --version

Multi character options can be abbreviated so long as they are unique. For example, `--full` is equivalent to `--full-upgrade`. Typing `--ver` does not work since it matches both `--verify` and `--version`.

Single-character options can be combined without repeating the hyphen, as in these examples:

- `fcu –vf /opt/bladeservices/rom/<filename>`
- `fcu –q –d <device-id>`
- `fcu –q -t 0x90 <device-id>`
- `fcu –mb a –d <device-id>`

Options are not case-sensitive. For example, `--help` is equivalent to `--HeLp`. However, option arguments, such as filename and device ID, are case-sensitive.

When upgrading firmware, it is strongly recommended that you upgrade only one device at a time. While FCU performs many checks during upgrade to ensure success, if something goes wrong and both firmware banks become corrupted, the blade becomes inoperable.

6.5 Upgrading Firmware

This section describes recommended procedures for upgrading firmware devices.

6.5.1 Upgrading CPU Firmware

Upgrading CPU Firmware

Follow these steps to upgrade the CPU firmware (U-Boot):

1. Query the current and backup U-Boot firmware on the ATCA-SAM1411:
   # fcu -qd atca-sam1411-cpu
2. Show the version of the new U-Boot image:
   # fcu -s -f /opt/bladeservices/rom/sam1411-cpu.fri
3. If the U-Boot image is newer than the current version, upgrade the U-Boot firmware:
   # fcu -v -u -f /opt/bladeservices/rom/sam1411-cpu.fri
4. Query the device to ensure that the backup was upgraded:
   # fcu –qd atca-sam1411-cpu

6.5.2 Upgrading the Device-Tree Blob

Upgrading the Device-Tree Blob

Follow these steps to upgrade the device-tree blob:

1. Query the current and backup device-tree blob images.
   # fcu -q -d atca-sam1411-dtb
2. Show the version of the new device-tree blob:
   # fcu -s -f /opt/bladeservices/rom/sam1411-dtb.fri
3. If the device-tree-blob version in the release is newer than the current version installed, upgrade the device-tree blob.
   # fcu -v -u -f /opt/bladeservices/rom/sam1411-dtb.fri
4. Query the device to ensure that the backup was upgraded:
   # fcu -q -d atca-sam1411-dtb

6.5.3 Upgrading the Kernel

Upgrading the Kernel

Follow these steps to upgrade the kernel:

1. Query the current and backup kernel images.

   # fcu -q -d atca-sam1411-kernel

2. Show the version of the new kernel:

   # fcu -s -f /opt/bladeservices/rom/sam1411-kernel.fri

3. If the kernel version in the release is newer than the current version installed, upgrade the kernel.

   # fcu -v -u -f /opt/bladeservices/rom/sam1411-kernel.fri

4. Query the device to ensure that the backup was upgraded:

   # fcu -q -d atca-sam1411-kernel

6.5.4 Upgrading the Ramdisk

Upgrading the Ramdisk

The ramdisk cannot be updated with fcu. Instead, the flashcp utility is used to upgrade the ramdisk. The flashcp utility does not upgrade the backup bank, but it upgrades the currently selected bank. Also, the ramdisk must be copied to the ATCA-SAM1411 and placed into `/usr/local/` directory in order to upgrade due to the size of the ramdisk image.

To upgrade the ramdisk, follow these steps to change the selected bank. After the upgrade, change the selected bank again:

1. To see the currently selected bank, run fcu to query the U-Boot version. If "yes", next to "Marked for next use" in the example below indicates that bank A is the currently selected boot bank. The currently booted bank is shown with the tag "Firmware was booted from this bank".

```
fcu -q -d atca-sam1411-cpu
fcu version bbs 1.3.10 build 2.wrspne3.0
********************[[[[[REPORT BEGIN]]]]]********************
OPERATION : Query
RESULT    : SUCCESS
MESSAGE   : Device              : atca-sam1411-cpu
            Part number         : 0000E0
            Part revision       : C
```

```
                BANK                : A
                Firmware Name       : U-Boot
               Firmware Version    : U-Boot 2010.06.3 (Mar 14 2011
- 13:43:07) MPC83XX
                Marked for next use : yes
                Firmware was booted from this bank
                BANK                : B
                Firmware Name       : U-Boot
               Firmware Version    : U-Boot 2010.06.2 (Mar 01 2011
- 10:06:53) MPC83XX
                Marked for next use : no
********************[[[[[ REPORT END ]]]]]********************
```

2. Switch the selected bank to A or B:

   # fcu --mark --bank=A --device=atca-sam1411-cpu

   or

   # fcu --mark --bank=B --device=atca-sam1411-cpu

3. Upgrade the ramdisk using flashcp:

   # flashcp -v /usr/local/ramdisk.image.gz /dev/mtd4

4. Switch the selected bank back to A or B:

   # fcu --mark --bank=A --device=atca-sam1411-cpu

   or

   # fcu --mark --bank=B --device=atca-sam1411-cpu

5. Query the device to ensure that the backup was upgraded successfully:

   # fcu -q -d atca-sam1411-rootfs

6.5.5 Activating the Backup Boot Bank

After upgrading the backup boot bank with new U-Boot, device-tree blob, kernel, and ramdisk images, the backup boot bank must be marked as active for next boot and reboot the system.

Activating the Backup Boot Bank via FCU

1. To mark the backup boot bank, query which bank is "Marked for next use":

   # fcu -q -d atca-sam1411-cpu

2. Mark the backup boot bank for next use after the next reboot.

If Bank A is "Marked for next use", mark Bank 'B' for the next reboot.

```
# fcu -mb B -d atca-sam1411-cpu
```

If Bank B is "Marked for next use", mark Bank 'A' for the next reboot.

```
# fcu -mb A -d atca-sam1411-cpu
```

The `-mb` option allows you to select which boot bank to use at the next boot and is done through marking U-Boot. By extension, using the `-mb` option to mark U-boot also marks the device-tree blob, kernel, and ramdisk. All three must be at the desired version in the target bank while booting that bank.

3. Reboot the blade:

   ```
   # reboot
   ```

6.5.6 Upgrading IPMC Firmware

Upgrading IPMC Firmware

Follow these steps to upgrade the IPMC firmware. The IPMC firmware becomes active immediately after the successful upgrade.

1. Copy the IPMC firmware file to the ATCA-SAM1411 in the `/root` directory. The firmware file is not stored within the ramdisk.
2. Query the current IPMC firmware on the ATCA-SAM1411.

   ```
   # fcu -q -d atca-sam1411-ipmc
   ```
3. Show the version of the new IPMC image.

   ```
   # fcu -s -f /root/ATCA_sam1411-upgrade-<version>.hex
   ```
4. If the IPMC version in the release is newer than the current version installed, upgrade the IPMC firmware.

   ```
   # fcu -v -u -f /root/ATCA_sam1411-upgrade-<version>.hex
   ```
5. Query the IPMC to ensure the new version is installed and activated.

   ```
   # fcu -q -d atca-sam1411-ipmc
   ```

6.5.7 Example Upgrade Procedure

The following procedure should be used to upgrade to a new release of firmware/software on a pair of Shelf Managers.

In the procedure below, ShM A and ShM B reference the standby and active ShMs, respectively.

1. Copy the new `sam1411-cpu.fri`, `sam1411-dtb.fri`, `sam1411-kernel.fri`, and `ramdisk.image.gz` files to `/usr/local` on ShM A.
2. Copy `ATCA_sam1411-upgrade-<version>.hex` file to `/root` on ShM B.
3. On ShM A, upgrade U-Boot, Kernel, and DTB on the inactive bank using fcu.

   `fcu -vuf /usr/local/sam1411-cpu.fri`

   `fcu -vuf /usr/local/sam1411-dtb.fri`

   `fcu -vuf /usr/local/sam1411-kernel.fri`
4. On ShM A, check the currently marked boot bank.

   `fcu -q -d atca-sam1411-cpu`
5. On ShM A, swap boot banks to allow for ramdisk upgrade. Choose A or B based on the result of the previous step.

   `fcu --mark --bank=<A|B> --device=atca-sam1411-cpu`
6. On ShM A, program the ramdisk:

   `flashcp -v /usr/local/ramdisk.image.gz /dev/mtd4`
7. There may be changes to files normally stored in the persistent file area when upgrading. Refer to the *ATCA-SAM1411 Release Notes* for more information. If there are no files in the persistent file area that need to be saved across a reboot (that is, user specific files or changes to configuration files), the persistent file area can be cleared later (before rebooting the Shelf Manager).
8. Run fcu on ShM B to upgrade ShM As IPMI FW. Use IPMB address 0x10 for the Shelf Manager in the left slot and 0x12 for the right slot.

   `fcu -t 0x<10|12> -uvf /root/ATCA_sam1411-upgrade-<version>.hex`
9. After upgrade, ShM A does not reboot. If this is the second time through the upgrade procedure, and both ShMs are upgraded, skip to Step 12.
10. From ShM B, switchover the Shelf Managers:

    `sv_deactivate`
11. Repeat the above process to upgrade the other Shelf Manager and then continue to the next step.
12. After upgrade, clean out the upgrade files from both the Shelf Managers.

    `rm /root/ATCA_sam1411-upgrade-<version>.hex`

    `rm /usr/local/sam1411-cpu.fri`

    `rm /usr/local/sam1411-dtb.fri`

    `rm /usr/local/sam1411-kernel.fri`

    `rm /usr/local/ramdisk.image.gz`

13. Clear the persistent file area or verify that necessary changes are made according to the *ATCA-SAM1411 Release Notes*. Reboot both Shelf Managers by issuing the below command from the Linux command line:

    ```
    reboot
    ```

U-Boot Commands

7.1 Overview

The SAM1411 uses U-Boot version 2010.06 to initialize Linux on the PPC.

When power is applied to the SAM1411, U-Boot initializes the RAM and downloads the kernel image to memory. It also provides support for Ethernet protocols like TFTP, that makes it possible to download images from network servers. Before U-Boot starts decompressing the Linux kernel, you have a few seconds to pause the process and execute some of the commands that U-Boot provides to check or modify the system.

7.2 Commands

Table 7-1 U-Boot Commands

Command	Description
?	alias for help
as	assemble memory
askenv	Get environment variables from stdin
autoscr	Run script from memory
base	Print or set address offset
bdinfo	Print Board Info structure
boot	Boot default, that is, run bootcmd
bootd	Boot default, that is, run bootcmd
bootm	Boot application image from memory
bootp	Boot image via network using BootP/TFTP protocol
bootsel	select boot bank
break	set or clear a breakpoint
brginfo	Print Baud Rate Generator (BRG) registers
bt	Send IPMI commands over BT interface
carinfo	Print Clocks and Reset registers
chpart	change active partition
clocks	print clock configuration

Table 7-1 U-Boot Commands (continued)

Command	Description
cmp	Memory compare
coninfo	Print console devices and information
continue	continue from a breakpoint
cp	Memory copy
crc32	Checksum calculation
date	get/set/reset date & time
dhcp	Boot image via network using DHCP/TFTP protocol
dmainfo	Print SDMA/IDMA registers
ds	disassemble memory
echo	Echo args to console
editenv	edit environment variable
eeprom	EEPROM sub-system
erase	Erase FLASH memory
exit	exit script
ext2load	load binary file from a Ext2 filesystem
ext2ls	list files in a directory (default /)
false	do nothing, unsuccessfully
fatinfo	print information about filesystem
fatload	load binary file from a dos filesystem
fatls	list files in a directory (default /)
fccinfo	Print FCC registers
fdt	Flattened device tree utility commands
flinfo	Print FLASH memory information
fsinfo	print information about filesystems
fsload	load binary file from a filesystem image
go	Start application at address 'addr

Table 7-1 U-Boot Commands (continued)

Command	Description
help	print command description/usage
i2c	I2C sub-system
i2cinfo	Print I2C registers
iminfo	Print header information for application image
imls	List all images found in flash
imxtract	Extract a part of a multi-image
iopinfo	Print I/O Port registers
iopset	Set I/O Port registers
itest	Return true/false on integer compare
loadb	load binary file over serial line (kermit mode)
loads	Load S-Record file over serial line
loady	Load binary file over serial line (ymodem mode)
loop	Infinite loop on address range
ls	list files in a directory (default /)
mccinfo	Print MCC registers
md	Memory display
memcinfo	Print Memory Controller registers
mii	Mii utility commands
mm	Memory modify (auto-incrementing)
mmc	MMC sub system
mmc_spi	mmc_spi setup
mmcinfo	mmcinfo <dev num>-- display MMC info
mtdparts	define flash/nand partitions
mtest	Simple RAM read/write test
muxinfo	Print CPM Multiplexing registers
mw	Memory write (fill)

Table 7-1 U-Boot Commands (continued)

Command	Description
next	single step execution, stepping over subroutines
nfs	Boot image via network using NFS protocol
nm	Memory modify (constant address)
pbt	Run IPMI performance test
ping	Send ICMP ECHO_REQUEST to network host
printenv	Print environment variables
protect	Enable or disable FLASH write protection
qe	QUICC Engine commands
rarpboot	Boot image via network using RARP/TFTP protocol
rdump	Show registers
reginfo	Print register information
reset	Perform RESET of the CPU
run	Run commands in an environment variable
saveenv	Save environment variables to persistent storage
sccinfo	Print SCC registers
setenv	Set environment variables
setexpr	set environment variable as the result of eval expression
showvar	print local hushshell variables
siinfo	Print Serial Interface (SI) registers
sitinfo	Print System Integration Timers (SIT) registers
siuinfo	Print System Interface Unit (SIU) registers
sleep	Delay execution for some time
smcinfo	Print SMC registers
sntp	synchronize RTC via network
source	run script from memory
spiinfo	Print Serial Peripheral Interface (SPI) registers

Table 7-1 U-Boot Commands (continued)

Command	Description
step	single step execution
test	minimal test like /bin/sh
tftpboot	Boot image via network using TFTP protocol
true	do nothing, successfully
version	Print monitor version
where	Print the running stack

Related Documentation

A.1 SMART Embedded Computing Documentation

The documentation listed is referenced in this manual. Technical documentation can be found by using the Documentation Search at *https://www.smartembedded.com/ec/support/* or you can obtain electronic copies of SMART EC documentation by contacting your local sales representative.

Table A-1 SMART EC Documentation

Document Title	Publication Number
AXP1411 Data Sheet	AXP1411-DS
AXP1411 Installation and Use	6806800M93
System Management Interface Based on HPI-B (Centellis 31kX/4100/2000/4410) User's Guide	6806800D84
SAM1411 Control via IPMI Programmer's Reference Guide	6806800N05

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 Title
Intel *developer.intel.com/design/servers/ipmi*	Platform Management FRU Information Storage Definition v1.0 IPMI Specification v1.5
PICMG *picmg.org/specifications.stm*	PICMG® 3.0 Revision 3.0 AdvancedTCA TM Base Specification, March 24, 2008
Service Availability Forum	SAF Hardware Platform Interface, SAI-HPI-B.02.01 December 13, 2006

Related Documentation