# AXP640

Control via IPMI Programmer's Reference

P/N: 6806800N06D

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SMART™ Embedded Computing

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# About this Manual

## Overview of Contents

The information in this reference guide supports AXP640 platforms.

This guide provides FRU data and SDR for the AXP shelf.

The AXP640 DC PEMs and Fan Trays have an Intelligent Peripheral Management Controller (IPMC) which is fully compliant to the IPMI V1.5 specification. The AXP640 also contains Shelf Managers that are compliant to the IPMI v1.5 specification. The IPMCs and the Shelf Managers provide access to on-board Sensor Data Records (SDRs), Field Replaceable Unit (FRU) data, and furthermore contains an event generator. Within this document you find a description of:

- Supported IPMI commands
- FRU States
- SDRs
- FRU data

For the last two items in the list, the default values are given for reference purposes if you want to restore the factory values.

This manual is divided into the following chapters and appendices.

*Chapter 1, Supported IPMI Commands on page 15*, lists IPMI commands supported by the IPMC.

*Chapter 2, FRU Information and Sensor Data Records on page 33*, lists the PEM, FTM, and ShMM-1500R Shelf Manager FRU information, as well as sensors that are accessible via IPMI for AXP640 shelf.

*Chapter 3, OEM Sensors on page 119*, lists the additional OEM sensors that are accessible via IPMI for AXP640.

*Appendix A, Related Documentation on page 131*, lists publications for blade and software products used with the AXP640 platforms.

# Abbreviations

This document uses the following terms and abbreviations:

| Term | Definition |
|---|---|
| FRU | Field Replaceable Unit. A module or component which will typically be replaced in its entirety as part of a field service repair operation. |
| FTM | Fan Tray Module. An FRU that provides cooling to the shelf. |
| IPMB | Intelligent Platform Management Bus. Name for the architecture, protocol, and implementation of a special bus that interconnects the baseboard and chassis electronics and provides a communications media for system platform management information. The bus is built on $I^2C$ and provides a communications path between “management controllers” such as the BMC, FPC, and HSC. |
| LPMI | Local Peripheral Manager Interface. |
| LUN | Logical Unit Number. In the context of the Intelligent Platform Management Bus protocol, this is a subaddress that allows messages to be routed to different ‘logical units’ that reside behind the same $I^2C$ slave address. |
| PEM | Power Entry Module. An FRU that introduces power to the shelf. |
| SAM | Shelf Manager. An FRU that provides system management functions for shelf components. |
| SDR | Sensor Data Record. A data record that provides platform management sensor type, locations, event generation, and access information. |
| SEL | System Event Log. A non-volatile storage area and associated interfaces for storing system platform event information for later retrieval. |

# 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)` |

| Notation | Description |
|---|---|
| **`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 |
| .<br>.<br>. | 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 |
|  | 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 |

| Notation | Description |
|---|---|
|  | 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

See the table below for manual revisions and changes.

| Part Number | Date | Description |
|---|---|---|
| 6806800N06D | February 2021 | Rebranded to SMART EC. |
| 6806800N06C | April 2015 | Updated *Related Documentation on page 145.* |
| 6806800N06B | June 2014 | Re-branded to Artesyn |
| 6806800N06A | September 2011 | First Version |

# Supported IPMI Commands

## 1.1 Introduction

This chapter describes the commands supported by AXP640 series platforms. The command are categorized as:

- *Standard IPMI Commands*
- *PICMG 3.0 Commands*
- *Pigeon Point OEM Commands*

For more information on commands supported by the Shelf Manager, refer to the *Pigeon Point Shelf Manager User Guide*.

## 1.2 Standard IPMI Commands

The IPMCs on the Fan Trays and DC PEMs are fully compliant to the Intelligent Platform Management Interface v.1.5. This section provides information on which IPMI commands are supported.

### 1.2.1 Global IPMI Commands

The IPMCs support the following global IPMI commands.

*Table 1-1 Supported Global IPMI Commands*

| Command | NetFn (Request/Response) | CMD | Comments |
|---|---|---|---|
| Get Device ID | 0x06/0x07 | 0x01 | - |
| Get Self Test Result | 0x06/0x07 | 0x04 | - |

### 1.2.2 Firmware Upgrade Commands

SMART Embedded Computing offers three commands to upgrade the IPMC firmware which can be used to write an upgrade function:

- *Start Firmware Upgrade*
- *Continue Firmware Upgrade*
- *Finish Firmware Upgrade*

The firmware upgrade session has to start with the Start Firmware Upgrade command which makes the target IPMC enter the firmware upgrade mode. The firmware image is sent to the target IPMC in several parts with multiple Continue Firmware Upgrade commands. Each part can have the size of an IPMB message length. When the whole firmware image is on the target IPMC, the process has to be finished with the Finish Firmware Upgrade command. During the firmware upgrade mode, the SMART EC IPMC may only execute the Continue Firmware Upgrade and Get Device ID commands.

The following table shows the firmware upgrade commands together with their network function and command code.

*Table 1-2 Firmware Upgrade Commands*

| Command Name | NetFn (Request/Response) | CMD | Description |
|---|---|---|---|
| Start Firmware Upgrade | 0x08/0x09 | 0x1B | See *Start Firmware Upgrade on page 16* |
| Continue Firmware Upgrade | 0x08/0x09 | 0x1C | See *Continue Firmware Upgrade on page 17* |
| Finish Firmware Upgrade | 0x08/0x09 | 0x1E | See *Finish Firmware Upgrade on page 17* |

### 1.2.2.1 Start Firmware Upgrade

The Start Firmware Upgrade command puts the target IPMC into firmware upgrade mode. Only the Firmware Upgrade commands and the Get Device ID command are supported in firmware upgrade mode.

#### 1.2.2.1.1 Request Data

No request data needs to be provided for this command.

#### 1.2.2.1.2 Response Data

The following table lists the response data applicable to the Start Firmware Upgrade command.

*Table 1-3 Response Data of Start Firmware Upgrade*

| Byte | Data Field |
|---|---|
| 1 | Completion Code<br>0x00: Command executed successfully and target IPMC entered firmware upgrade mode<br>0x01..0xFF: Error, that means IPMC cannot enter into firmware upgrade mode |

#### 1.2.2.2 Continue Firmware Upgrade

The Continue Firmware Upgrade command writes a part of the firmware image to the target IPMC. It also checks file integrity and makes the target IPMC leave the firmware upgrade mode if an error occurs. If an error occurs, the whole firmware upgrade sequence must be repeated beginning from the Start Firmware Upgrade command and the whole firmware upgrade image must be retransmitted.

##### 1.2.2.2.1 Request Data

The following table lists the request data applicable to the Continue Firmware Upgrade command.

*Table 1-4 Request Data of Continue Firmware Upgrade*

| Byte | Data Field |
|---|---|
| 1..23 | Firmware content to be sent to the target IPMC.<br>The firmware image is an extended INTEL hex file.<br>The whole message length is defined by the maximum IPMB message length. |

##### 1.2.2.2.2 Response Data

The following table lists the response data of the Continue Firmware Upgrade command.

*Table 1-5 Response Data of Continue Firmware Upgrade*

| Byte | Data Field |
|---|---|
| 1 | Completion Code<br>0x00: Command executed successfully<br>0x1..0xFF: Error, that means the IPMC left the firmware upgrade mode |

#### 1.2.2.3 Finish Firmware Upgrade

The Finish Firmware Upgrade command makes the target IPMC leave the firmware upgrade mode.

##### 1.2.2.3.1 Request Data

The following table lists the request data applicable to the Finish Firmware Upgrade command.

*Table 1-6 Request Data of Finish Firmware Upgrade*

| Byte | Data Field |
|---|---|
| 1..23 | None |

#### 1.2.2.3.2 Response Data

The following table lists the response data applicable to the Finish Firmware Upgrade command.

*Table 1-7 Response Data of Finish Firmware Upgrade*

| Byte | Data Field |
|---|---|
| 1 | Completion Code<br>0: Command executed successfully<br>0x01..0xFF: Error |

## 1.2.3 BMC WatchDog Timer Commands

The IPMCs support the following BMC WatchDog Timer commands.

*Table 1-8 Supported BMC WatchDog Timer Commands*

| Command | NetFn R1/Rs | CMD | PEMs | FTMs |
|---|---|---|---|---|
| Reset Watchdog Timer | 0x06/0x07 | 0x22 | | |
| Set Watchdog Timer | 0x06/0x07 | 0x24 | | |
| Get Watchdog Timer | 0x06/0x07 | 0x25 | | |

## 1.2.4 BMC Device and Messaging Commands

The IPMC supports the following BMC device and messaging commands.

*Table 1-9 Supported BMC Device and Messaging Commands*

| Command | NetFn Rq/Rs | CMD | PEMs | FTMs |
|---|---|---|---|---|
| Set BMC Global Enables | 0x06/0x07 | 0x2E | | |
| Get BMC Global Enables | 0x06/0x07 | 0x2F | | |
| Clear Message Flags | 0x06/0x07 | 0x30 | | |
| Get Message Flags | 0x06/0x07 | 0x31 | | |
| Enable Message Channel Receive | 0x06/0x07 | 0x32 | | |
| Get Message | 0x06/0x07 | 0x33 | | |
| Send Message | 0x06/0x07 | 0x34 | | |
| Read Event Message Buffer | 0x06/0x07 | 0x35 | | |

*Table 1-9 Supported BMC Device and Messaging Commands (continued)*

| Command | NetFn Rq/Rs | CMD | PEMs | FTMs |
|---|---|---|---|---|
| Get BT Interface Capabilities | 0x06/0x07 | 0x36 | | |
| Get System GUID | 0x06/0x07 | 0x37 | | |
| Get Channel Authentication Capabilities | 0x06/0x07 | 0x38 | | |
| Get Session Challenge | 0x06/0x07 | 0x39 | | |
| Activate Session | 0x06/0x07 | 0x3A | | |
| Set Session Privilege Level | 0x06/0x07 | 0x3B | | |
| Close Session | 0x06/0x07 | 0x3C | | |
| Get Session Info | 0x06/0x07 | 0x3D | | |
| Get AuthCode | 0x06/0x07 | 0x3F | | |
| Set Channel Access | 0x06/0x07 | 0x40 | | |
| Get Channel Access | 0x06/0x07 | 0x41 | | |
| Get Channel Info Command | 0x06/0x07 | 0x42 | | |
| Set User Access Command | 0x06/0x07 | 0x43 | | |
| Get User Access Command | 0x06/0x07 | 0x44 | | |
| Set User Name | 0x06/0x07 | 0x45 | | |
| Get User Name Command | 0x06/0x07 | 0x46 | | |
| Set User Password Command | 0x06/0x07 | 0x47 | | |

## 1.2.5 Chassis Device Commands

The IPMC supports the following chassis device commands.

*Table 1-10 Supported Chassis Device Commands*

| Command | NetFn Rq/Rs | CMD | PEMs | FTMs |
|---|---|---|---|---|
| Get Chassis Capabilities | 0x00/0x01 | 0x00 | | |
| Get Chassis Status | 0x00/0x01 | 0x01 | | |
| Chassis Control | 0x00/0x01 | 0x02 | | |
| Set Chassis Capabilities | 0x00/0x01 | 0x05 | | |

*Table 1-10 Supported Chassis Device Commands (continued)*

| Command | NetFn Rq/Rs | CMD | PEMs | FTMs |
|---|---|---|---|---|
| Set System Boot Options | 0x00/0x01 | 0x08 | | |
| Get System Boot Options | 0x00/0x01 | 0x09 | | |

## 1.2.6 Event Commands

The IPMC supports the following event commands.

*Table 1-11 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 |
| Platform Event (a.k.a. Event Message) | 0x04/0x05 | 0x02 | | |

## 1.2.7 PEF and Alerting Commands

The IPMC supports the following PEF and alerting commands.

*Table 1-12 Supported PEF and Alerting Commands*

| Command | NetFn Rq/Rs | CMD | PEMs | FTMs |
|---|---|---|---|---|
| Get PEF Capabilities | 0x04/0x05 | 0x10 | | |
| Arm PEF Postpone Timer | 0x04/0x05 | 0x11 | | |
| Set PEF Configuration Parameters | 0x04/0x05 | 0x12 | | |
| Get PEF Configuration Parameters | 0x04/0x05 | 0x13 | | |
| Set Last Processed Event ID | 0x04/0x05 | 0x14 | | |
| Get Last Processed Event ID | 0x04/0x05 | 0x15 | | |
| Alert Immediate | 0x04/0x05 | 0x16 | | |
| PET Acknowledge | 0x04/0x05 | 0x17 | | |

## 1.2.8 Sensor Device Commands

The IPMCs support the following sensor device commands.

*Table 1-13 Supported Sensor Device Commands*

| Command | NetFn (Request/Response) | CMD | Comments |
|---|---|---|---|
| Get Device SDR Info | 0x04/0x05 | 0x20 | - |
| Get Device SDR | 0x04/0x05 | 0x21 | - |
| Reserve Device SDR Repository | 0x04/0x05 | 0x22 | - |
| Get Sensor Hysteresis | 0x04/0x05 | 0x25 | - |
| Set Sensor Threshold | 0x04/0x05 | 0x26 | Most of the threshold-based sensors have fixed thresholds. Before using this command, check whether threshold setting is supported by using the Get Device SDR command. |
| Get Sensor Threshold | 0x04/0x05 | 0x27 | - |
| Set Sensor Event Enable | 0x04/0x05 | 0x28 | - |
| Get Sensor Event Enable | 0x04/0x05 | 0x29 | - |
| Rearm Sensor Events | 0x04/0x05 | 0x2A | - |
| Get Sensor Event Status | 0x04/0x05 | 0x2B | - |
| Get Sensor Reading | 0x04/0x05 | 0x2D | - |
| Get Sensor Type | 0x04/0x05 | 0x2F | - |
| Set Event Receiver | 0x04/0x05 | 0x00 | - |
| Get Event Receiver | 0x04/0x05 | 0x01 | - |
| Platform Event | 0x04/0x05 | 0x02 | Any SMART EC IPMC works as event generator, i.e. it may issue the Platform Event command but the PSU cannot write events to the SEL repository and acknowledge them. |

## 1.2.9 FRU Inventory Commands

The IPMCs support the following FRU inventory commands.

*Table 1-14 Supported FRU Commands*

| Command | NetFn (Request/Response) | CMD | Comments |
|---|---|---|---|
| Get FRU Inventory Area Info | 0x0A/0x0B | 0x10 | - |
| Read FRU Data | 0x0A/0x0B | 0x11 | - |
| Write FRU Data | 0x0A/0x0B | 0x12 | - |

## 1.2.10 SDR Device Commands

The IPMC supports the following SDR device commands.

*Table 1-15 Supported SDR Device Commands*

| Command | NetFn Rq/Rs | CMD | PEMs | FTMs |
|---|---|---|---|---|
| Get SDR Repository Info | 0x0A/0x0B | 0x20 | | |
| Get SDR Repository Allocation Info | 0x0A/0x0B | 0x21 | | |
| Reserve SDR Repository | 0x0A/0x0B | 0x22 | | |
| Get SDR | 0x0A/0x0B | 0x23 | | |
| Add SDR | 0x0A/0x0B | 0x24 | | |
| Partial Add SDR | 0x0A/0x0B | 0x25 | | |
| Delete SDR | 0x0A/0x0B | 0x26 | | |
| Clear SDR Repository | 0x0A/0x0B | 0x27 | | |
| Get SDR Repository Time | 0x0A/0x0B | 0x28 | | |
| Set SDR Repository Time | 0x0A/0x0B | 0x29 | | |
| Enter SDR Repository Update Mode | 0x0A/0x0B | 0x2A | | |
| Enter SDR Repository Update Mode | 0x0A/0x0B | 0x2B | | |
| Run Initialization Agent | 0x0A/0x0B | 0x2C | | |

## 1.2.11 SEL Device Commands

The IPMC supports the following SEL device commands.

*Table 1-16 Supported SEL Commands*

| Command | NetFn Rq/Rs | CMD | PEMs | FTMs |
|---|---|---|---|---|
| Get SEL Info | 0x0A/0x0B | 0x40 | | |
| Get SEL Allocation Info | 0x0A/0x0B | 0x41 | | |
| Reserve SEL | 0x0A/0x0B | 0x42 | | |
| Get SEL Entry | 0x0A/0x0B | 0x43 | | |
| Add SEL Entry | 0x0A/0x0B | 0x44 | | |
| Partial Add SEL Entry | 0x0A/0x0B | 0x45 | | |
| Delete SEL Entry | 0x0A/0x0B | 0x46 | | |
| Clear SEL | 0x0A/0x0B | 0x47 | | |
| Get SEL Time | 0x0A/0x0B | 0x48 | | |
| Set SEL Time | 0x0A/0x0B | 0x49 | | |

## 1.2.12 LAN Device Commands

The IPMC supports the following LAN device commands.

*Table 1-17 Supported LAN Device Commands*

| Command | NetFn Rq/Rs | CMD | PEMs | FTMs |
|---|---|---|---|---|
| Set LAN Configuration Parameters | 0x0C/0x0D | 0x01 | | |
| Get LAN Configuration Parameters | 0x0C/0x0D | 0x02 | | |
| Suspend BMC ARPs | 0x0C/0x0D | 0x03 | | |
| Get IP UDP RMCP Status | 0x0C/0x0D | 0x04 | | |

### 1.2.13 Serial/Modem Device Commands

The IPMC supports the following serial/modem device commands.

*Table 1-18 Supported Serial/Modem Device Commands*

| Command | NetFn Rq/Rs | CMD | PEMs | FTMs |
|---|---|---|---|---|
| Set User Callback Options | 0x0C/0x0D | 0x1A | | |
| Get User Callback Options | 0x0C/0x0D | 0x1B | | |

## 1.3 PICMG 3.0 Commands

The SMART EC 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 1-19 Supported PICMG 3.0 Commands For Fan Trays*

| Command | NetFn (Request/Response) | CMD | Comments |
|---|---|---|---|
| Get PICMG Properties | 0x2C/0x2D | 0x00 | - |
| Get Address Info | 0x2C/0x2D | 0x01 | The Fan Tray only supports the short form with bytes 0 and 1 of the request data. |
| FRU Control | 0x2C/0x2D | 0x04 | The Fan Tray only supports the cold reset option. |
| Get FRU LED Properties | 0x2C/0x2D | 0x05 | - |
| Get FRU LED Color Capabilities | 0x2C/0x2D | 0x06 | - |
| Set FRU LED State | 0x2C/0x2D | 0x07 | - |
| Get FRU LED State | 0x2C/0x2D | 0x08 | - |
| Set IPMB State | 0x2C/0x2D | 0x09 | - |
| Set FRU Activation Policy | 0x2C/0x2D | 0x0A | - |
| Get FRU Activation Policy | 0x2C/0x2D | 0x0B | - |
| Set FRU Activation | 0x2C/0x2D | 0x0C | - |

*Table 1-19 Supported PICMG 3.0 Commands For Fan Trays (continued)*

| Command | NetFn (Request/Response) | CMD | Comments |
|---|---|---|---|
| Get Device Locator Record ID | 0x2C/0x2D | 0x0D | The SMART EC IPMCs support the standard PICMG 3.0 and the extended AMC command. |
| Set Fan Level | 0x2C/0x2D | 0x15 | - |
| Get Fan Level | 0x2C/0x2D | 0x16 | - |
| Get IPMB Link Info | 0x2C/0x2D | 0x18 | - |

*Table 1-20 Supported PICMG 3.0 Commands For DC PEM*

| Command | NetFn (Request/Response) | CMD | Comments |
|---|---|---|---|
| Get PICMG Properties | 0x2C/0x2D | 0x00 | - |
| Get Address Info | 0x2C/0x2D | 0x01 | The DC PEM only supports the short form with bytes 0 and 1 of the request data. |
| FRU Control | 0x2C/0x2D | 0x04 | The DC PEM only supports the cold reset option. |
| Get FRU LED Properties | 0x2C/0x2D | 0x05 | - |
| Get FRU LED Color Capabilities | 0x2C/0x2D | 0x06 | - |
| Set FRU LED State | 0x2C/0x2D | 0x07 | - |
| Get FRU LED State | 0x2C/0x2D | 0x08 | - |
| Set IPMB State | 0x2C/0x2D | 0x09 | - |
| Set FRU Activation Policy | 0x2C/0x2D | 0x0A | - |
| Get FRU Activation Policy | 0x2C/0x2D | 0x0B | - |
| Set FRU Activation | 0x2C/0x2D | 0x0C | - |

*Table 1-20 Supported PICMG 3.0 Commands For DC PEM*

| Command | NetFn (Request/Response) | CMD | Comments |
|---|---|---|---|
| Get Device Locator Record ID | 0x2C/0x2D | 0x0D | The SMART EC IPMCs support the standard PICMG 3.0 and the extended AMC 0.9x versions of this command. |
| Get IPMB Link Info | 0x2C/0x2D | 0x18 | - |

# 1.4 Pigeon Point OEM Commands

These commands can only be sent to the SMART EC AXP640 Shelf Manager. Sending these commands to other shelf managers or IPMCs results in error responses or undefined behavior.

The SAM supports these OEM IPMI commands that are not defined in the IPMI 1.5 or PICMG 3.0 specifications.

*Table 1-21 Pigeon Point OEM Command Summary*

| IPMI NetFn (Request/Response) | SMART EC OEM Command | IPMI Cmd |
|---|---|---|
| Get Shelf Configuration Record | 0x2E/0x2F | 0x01 |
| Shelf Manager Switchover | 0x2E/0x2F | 0x02 |
| Set FRU Extracted | 0x2E/0x2F | 0x03 |
| Subscribe for SEL Notifications | 0x2E/0x2F | 0x04 |
| Set Shelf FRU Record Data | 0x2E/0x2F | 0x05 |
| Get Cached Device SDR Info | 0x2E/0x2F | 0x06 |
| Get Cached Device SDR | 0x2E/0x2F | 0x07 |
| Reserve Cached Device SDR Repository | 0x2E/0x2F | 0x08 |

The following sections describe each OEM command and response in detail.

## 1.4.1 Get Shelf Configuration OEM Command

This command gets the shelf configuration for the AXP shelf.

*Table 1-22 Get Shelf Configuration Record (Cmd = 0x01)*

| | Byte | Data field |
|---|---|---|
| Request data | 1-3 | Pigeon Point Systems IANA Enterprise number, LSB first<br>0x0A, 0x40, 0x00 |
| | 4 | IANA enterprise number for the desired record, LSB first |
| | 5 | |
| | 6 | |
| | 7 | Record Type |
| | 8 | Record Number |
| | 9 | Offset within record |
| | 10 | Count of bytes to retrieve |
| Response data | 1 | Completion Code |
| | 2-4 | Pigeon Point Systems IANA Enterprise number, LSB first<br>0x0A, 0x40, 0x00 |
| | 5 | Requested bytes from the specified Shelf FRU record |
| | … | |
| | n | |

## 1.4.2 Shelf Manager Switchover

This command requests a SAM switchover.

*Table 1-23 Shelf Manager Switchover (Cmd = 0x02)*

| | Byte | Data field |
|---|---|---|
| Request data | 1-3 | Pigeon Point Systems IANA Enterprise number, LSB first<br>0x0A, 0x40, 0x00 |
| | 4 | Flags<br>0x00 Not Currently Supported<br>0x01 Switchover, and reboot the active Shelf Manager |

*Table 1-23 Shelf Manager Switchover (Cmd = 0x02) (continued)*

| | Byte | Data field |
|---|---|---|
| Response data | 1 | Completion Code |
| | 2 | 0x0A |
| | 3 | 0x40 |
| | 4 | 0x00 |

## 1.4.3 Set FRU Extracted

This command instructs the SAM to transition a FRU to the M0 (not installed) state.

*Table 1-24 Set FRU Extracted (Cmd = 0x03)*

| | Byte | Data field |
|---|---|---|
| Request data | 1-3 | Pigeon Point Systems IANA Enterprise number, LSB first<br>0x0A, 0x40, 0x00 |
| | 4 | IPMB address |
| | 5 | FRU Id |
| | 6 | Force option<br>0x00 Only extract specified FRU if it is in M7 state<br>0x01 Extract the specified FRU regardless of its current state |
| Response data | 1 | Completion Code |
| | 2 | Pigeon Point Systems IANA Enterprise number, LSB first |
| | 3 | 0x0A |
| | 4 | 0x40<br>0x00 |

### 1.4.4 Subscribe for SEL Notifications

This command is used by peers to request the Shelf Manager to send unsolicited events on an RMCP session.

*Table 1-25 Subscribe for SEL Notifications (Cmd = 0x04)*

| | Byte | Data field |
|---|---|---|
| Request data | 1-3 | Pigeon Point Systems IANA Enterprise number, LSB first<br>0x0A, 0x40, 0x00 |
| | 4 | 00: End subscription on this session<br>01: Begin subscription on this session |
| Response data | 1 | Completion Code |
| | 2-4 | Pigeon Point Systems IANA Enterprise number, LSB first<br>0x0A, 0x40, 0x00 |

### 1.4.5 Set Shelf FRU Record Data

This command is used to write data into the Shelf FRU Record.

*Table 1-26 Set Shelf FRU Record Data (Cmd = 0x05)*

| | Byte | Data field |
|---|---|---|
| Request data | 1-3 | Pigeon Point Systems IANA Enterprise number, LSB first<br>0x0A, 0x40, 0x00 |
| | 4 -6 | The IANA Enterprise number of the shelf, LSB first |
| | 7 | Record type |
| | 8 | Record number |
| | 9 | Offset |
| | 10 | Count. Number of bytes to follow |
| | 11-n | Data to write |
| Response data | 1 | Completion Code |
| | 2-4 | Pigeon Point Systems IANA Enterprise number, LSB first<br>0x0A, 0x40, 0x00 |
| | 5 | Count. Number of bytes written |

## 1.4.6 Get Cached Device SDR Info

This command is an analog to the IPMI **Get Device SDR Info** command for internal ShM SDR repository. It differs from the standard command only by the field in the request which points to the cached IPMC address.

*Table 1-27 Get Cached Device SDR Info (Cmd = 0x06)*

| | Byte | Data field |
|---|---|---|
| Request data | 1 | IPMB address of device to retrieve cached data |
| Response data | 1 | Completion Code |
| | 2 | LUN Sensors |
| | 3 | Flags |
| | 4-7 | Change indicator |

## 1.4.7 Get Cached Device SDR

This command is an analog to the IPMI **Get Device SDR** command for internal ShM SDR repository. It differs from the standard command only by the field in the request which points to the cached IPMC address.

*Table 1-28 Get Cached Device SDR (Cmd = 0x07)*

| | Byte | Data field |
|---|---|---|
| Request data | 1 | IPMB address of device to retrieve cached data |
| | 2 | Reservation ID |
| | 3 | Record ID |
| | 4 | Offset |
| | 5 | Number of bytes to read |
| Response data | 1 | Completion Code |
| | 2 | Next record ID |
| | 3-n | Data |

## 1.4.8 Reserve Cached Device SDR Repository

This command is an analog to the IPMI **Reserve Device SDR Repository** command for internal ShM SDR repository. It differs from the standard command only by the field in the request which points to the cached IPMC address.

*Table 1-29 Reserve Cached Device SDR Repository (Cmd = 0x08)*

| | Byte | Data field |
|---|---|---|
| Request data | 1 | IPMB address of device to retrieve cached data |
| Response data | 1 | Completion Code |
| | 2 | Reservation ID |

# FRU Information and Sensor Data Records

## 2.1 Introduction

This chapter introduces FRU information, e-keying, and sensor overviews data for each subcomponent of the AXP640 shelf. Information in this chapter also includes:

- *SAM640 Physical Shelf Manager*
- *SAM640 Active (Virtual) Shelf Manager*
- *Fan Tray Module*
- *Power Entry Module*

Subcomponents include the Power Entry Modules (PEMs), upper and lower Fan Tray Modules (FTMs), and the SAM640 Shelf Management Alarm Module (SAMs), both physical and active.

## 2.2 SAM640 Physical Shelf Manager

This section describes in detail the physical SAM Shelf Manager, FRU data, and sensors at IPMB addresses 0xFC and 0xFE.

### 2.2.1 SAM Physical FRU Information

The following section provides the FRU information for the physical SAM on the AXP640 shelf.

#### 2.2.1.1 Physical Shelf Manager FRU Data

Following is an example of FRU Data, actual data is entered at the time of manufacturing.

```
Common Header:    Format Version = 1
Internal Use Area:
    Version = 1
Board Info Area:
    Version     = 1
    Language Code           = 25
   Mfg Date/Time          = Oct 28 10:10:00 2010 (7796770 minutes since
1996)
    Board Manufacturer      = Pigeon Point Systems
```

```
    Board Product Name       = IPM Sentry ShMM-1500
    Board Serial Number      = 08000000
    Board Part Number        = 0106807F01C
    FRU Programmer File ID   = CENT640_SAM.inf
Product Info Area:
    Version     = 1
    Language Code            = 25
    Manufacturer Name        = Emerson
    Product Name             = SAM640
    Product Part / Model#    = 0106871J01A
    Product Version          = Rev 1.00
    Product Serial Number    = 1234567
    Asset Tag                =
    FRU Programmer File ID   = CENT640_SAM.inf
Multi Record Area:
    PICMG Board Point-to-Point Connectivity Record (ID=0x14)
        Version = 0
    Record Type              = 0xc0 OEM Defined Record
        Version = 2
    PPS IPMB Topology Record (ID=0x05)
        Version = 0
```


**Part number and revision may vary, and serial number/mfg name are per board. These fields should be preserved and never changed. Changing these fields may cause service/support troubles.**

## 2.2.2 E-Keying

The **physical** SAMs (IPMB 0xfc and 0xfe) each contain the following Point-to-Point Connectivity Record:

```
       PICMG Board Point-to-Point Connectivity Record (ID=0x14)
        Version = 0
    OEM GUID Count           = 0
    Link Descriptor:
        Link Grouping ID     = 0x00
        Link Type            = 0x01  PICMG 3.0 Base 10/100/1000 Base-T
        Link Type Extension  = 0x1 ShMC Cross-connect (two-pair)
        Link Designator      = 0x101 Channel1/BaseInterface/Ports0
    Link Descriptor:
```

```
Link Grouping ID     = 0x00
Link Type            = 0x01  PICMG 3.0 Base 10/100/1000 Base-T
Link Type Extension  = 0x1 ShMC Cross-connect (two-pair)
Link Designator      = 0x102 Channel2/BaseInterface/Ports0
```

## 2.2.3 Sensor Overview

The following table lists all IPMI sensors available on the physical SAM at IPMB addresses 0xFC and 0xFE.

*Table 2-1 Sensor Overview*

| Sensor No. | Sensor Name | Type | What does it measure? | Sensor Type | Availability |
|---|---|---|---|---|---|
| 0 | FRU 0 HOT_SWAP | Status | State of FRU | Discrete | Always |
| 1 | IPMB LINK | Status | State of IPMB link | Discrete | Always |
| 2 | Local Temp | Temperature | Internal ADM1024 | Analog | Always |
| 3 | -48V Fuse A | Status | A Feed FUSE | Discrete | Always |
| 4 | Vcc 3.3V | Voltage | Internal | Analog | Always |
| 5 | +3.3V to ADP | Voltage | Internal | Analog | Always |
| 6 | 3.3V_BP | Voltage | 3.3V Backplane supply | Analog | Always |
| 7 | -48V Fuse B | Status | B Feed FUSE | Discrete | Always |
| 8 | +1.8 Eth Switch | Voltage | Internal | Analog | Always |
| 9 | +1.2V FPGA | Voltage | Internal | Analog | Always |
| 10 | PEM 1 | Status | PEM 1 Presence | Discrete | Always |
| 11 | PEM 2 | Status | PEM 2 Presence | Discrete | Always |
| 12 | PEM 3 | Status | PEM 3 Presence | Discrete | Always |
| 13 | PEM 4 | Status | PEM 4 Presence | Discrete | Always |
| 14 | FanTray1 | Status | FanTray1 Presence | Discrete | Always |
| 15 | FanTray2 | Status | FanTray2 Presence | Discrete | Always |
| 16 | FanTray3 | Status | FanTray2 Presence | Discrete | Always |
| 17 | AXP Backplane ID | OEM | Shelf type and status (identifies AXP640) | Discrete | Always |

*Table 2-1 Sensor Overview (continued)*

| Sensor No. | Sensor Name | Type | What does it measure? | Sensor Type | Availability |
|---|---|---|---|---|---|
| 18 | Fault Event | OEM | Physical ShM Health | Discrete | Always |
| 16 | POST Results | Status | Management Subsystem Health | Discrete | Always |
| 20 | PSU Status | Status | PSU Status | Discrete | Always |
| 21 | PSU Alert | OEM | Feed A and Feed B monitor | Discrete | Always |
| 22<br>23<br>24<br>25 | 48VVoltage_PSU1<br>48VVoltage_PSU2<br>48VVoltage_PSU3<br>48VVOltage_PSU4 | Voltage (Volts) | AC PSU1 Voltage<br>AC PSU2 Voltage<br>AC PSU3 Voltage<br>AC PSU4 Voltage | Analog | On SAM @ IPMB 0xfc |
| 26<br>27<br>28<br>29 | 48VCurrent_PSU1<br>48VCurrent_PSU2<br>48VCurrent_PSU3<br>48VCurrent_PSU4 | Current (Amps) | AC PSU1 Current<br>AC PSU2 Current<br>AC PSU3 Current<br>AC PSU4 Current | Analog | On SAM @ IPMB 0xfc |
| 31 | Inlet Temp | Temperature | Inlet temperature | Analog | Always |
| 30 | FPGA Build Rev | OEM | Build Rev of firmware in SAM640 FPGA | Discrete | Always |
| 32 | Port Status | OEM | Status of physical Ethernet and serial links | Discrete | Always |
| 128 | CPLD Status | OEM | Master and Backup Shelf Manager State | Discrete | Always |
| 129 | Reboot Reason | OEM | Reason for last reboot of physical ShM | Discrete | Always |


**Sensor numbers of FPGA Build Rev, Port Status, Inlet Temp, PSU Status and PSU Alert sensors might not be same on SAMs.**

**The PSU voltage and PSU current sensors might not have a fixed sensor number as reflected in the above table.**

## 2.2.4 SAM Physical Shelf Manager Analog Sensors

The physical shelf managers at IPMB addresses 0xFC and 0xFE present the following analog sensors:

- *Voltage and Current Sensors*
- *Temperature Sensors*

The following tables describe the analog sensors available on the physical SAM.

### 2.2.4.1 Voltage and Current Sensors

The following table describes the analog voltage and amperage sensors on the physical SAM.

*Table 2-2 Sensor No. 4 Vcc +3.3V*

| Feature | Raw Value/Description | Interpreted Value |
|---|---|---|
| Sensor Name | Vcc 3.3V | |
| Sensor Type | 0x02 | Voltage |
| Class | 0x01 | Threshold |
| Sensor Owner LUN | 0x00 | |
| Entity ID | 0xF0 | PICMG Shelf Management Controller |
| Entity Instance | 0x60 | |
| Rearm mode | | Auto |
| Hysteresis support | | No |
| Threshold access support | | Readable/Settable |
| Event message control | | Entire Sensor only |
| Readable threshold mask, | | |
| Settable threshold mask (bytes 19, 20) | 0x12, 0x12 | Upper and Lower Critical Thresholds are Readable and Settable |
| Reading Type | | Unsigned |
| Lower critical threshold | 0x73 | 3.0245 Volts |
| Upper critical threshold | 0x88 | 3.5768 Volts |

*Table 2-3 Sensor No. 5 +3.3V to ADP*

| Feature | Raw Value/Description | Interpreted Value |
|---|---|---|
| Sensor Name | 3.3V to ADP | |
| Sensor Type | 0x02 | Voltage |
| Class | 0x01 | Threshold |
| Sensor Owner LUN | 0x00 | |
| Entity ID | 0xF0 | PICMG Shelf Management Controller |
| Entity Instance | 0x60 | |
| Rearm mode | | Auto |
| Hysteresis support | | No |
| Threshold access support | | Readable/Settable |
| Event message control | | Entire Sensor only |
| Readable threshold mask, | | |
| Settable threshold mask (bytes 19, 20) | 0x12, 0x12 | Upper and Lower Critical Thresholds are Readable and Settable |
| Reading Type | | Unsigned |
| Lower critical threshold | 0x70 | 3.1136 Volts |
| Upper critical threshold | 0x7D | 3.475 Volts |

*Table 2-4 Sensor No. 6 3.3V_BP*

| Feature | Raw Value/Description | Interpreted Value |
|---|---|---|
| Sensor Name | 3.3V_BP | |
| Type of measurement | | Voltage |
| Sensor Type | 0x02 | Voltage |
| Class | 0x01 | Threshold |
| Sensor Owner LUN | 0x00 | |

*Table 2-4 Sensor No. 6 3.3V_BP (continued)*

| Feature | Raw Value/Description | Interpreted Value |
|---|---|---|
| Entity ID | 0xF0 | PICMG Shelf Management Controller |
| Entity Instance | 0x60 | |
| Rearm mode | | Auto |
| Hysteresis support | | No |
| Threshold access support | | Readable/Settable |
| Event message control | | Entire Sensor only |
| Readable threshold mask, | | |
| Settable threshold mask (bytes 19, 20) | 0x12, 0x12 | Upper and Lower Critical Threshold is Readable and Settable |
| Reading Type | | Unsigned |
| Lower critical threshold | 0x26 | 2.356 Volts |
| Upper Critical threshold | 0x40 | 3.968 Volts |

*Table 2-5 Sensor No. 8 +1.8V Eth Switch*

| Feature | Raw Value/Description | Interpreted Value |
|---|---|---|
| Sensor Name | +1.8V Eth Switch | |
| Type of measurement | | Voltage |
| Sensor Type | 0x02 | Voltage |
| Class | 0x01 | Threshold |
| Sensor Owner LUN | 0x00 | |
| Entity ID | 0xF0 | PICMG Shelf Management Controller |
| Entity Instance | 0x60 | |
| Rearm mode | | Auto |
| Hysteresis support | | No |
| Threshold access support | | Readable/Settable |

*Table 2-5 Sensor No. 8 +1.8V Eth Switch (continued)*

| Feature | Raw Value/Description | Interpreted Value |
|---|---|---|
| Event message control | | Entire Sensor only |
| Readable threshold mask, | | |
| Settable threshold mask (bytes 19, 20) | 0x12, 0x12 | Upper and Lower Critical Threshold is Readable and Settable |
| Reading Type | | Unsigned |
| Lower critical threshold | 0xA5 | 1.617 Volts |
| Upper Critical threshold | 0xCA | 1.9796 Volts |

*Table 2-6 Sensor No. 9 +1.2V FPGA*

| Feature | Raw Value/Description | Interpreted Value |
|---|---|---|
| Sensor Name | +1.2V FPGA | |
| Type of measurement | | Voltage |
| Sensor Type | 0x02 | Voltage |
| Class | 0x01 | Threshold |
| Sensor Owner LUN | 0x00 | |
| Entity ID | 0xF0 | PICMG Shelf Management Controller |
| Entity Instance | 0x60 | |
| Rearm mode | | Auto |
| Hysteresis support | | No |
| Threshold access support | | Readable/Settable |
| Event message control | | Entire Sensor only |
| Readable threshold mask, | | |
| Settable threshold mask (bytes 19, 20) | 0x12, 0x12 | Upper and Lower Critical Threshold is Readable and Settable |
| Reading Type | | Unsigned |

*Table 2-6 Sensor No. 9 +1.2V FPGA (continued)*

| Feature | Raw Value/Description | Interpreted Value |
|---|---|---|
| Lower critical threshold | 0x6E | 1.078 Volts |
| Upper Critical threshold | 0x87 | 1.323 Volts |

*Table 2-7 Sensor No. X 48VVoltage_PSU1*

| Feature | Raw Value/Description | Interpreted Value |
|---|---|---|
| Sensor Name | 48VVoltage_PSU1 | |
| Type of measurement | Voltage | |
| Sensor Type | 0x02 | Voltage |
| Class | 0x01 | Threshold |
| Sensor Owner LUN | 0x00 | |
| Entity ID | 0xF0 | PICMG Shelf Management Controller |
| Entity Instance | 0x60 | |
| Rearm mode | | Auto |
| Hysteresis support | | No |
| Threshold access support | | Readable/Settable |
| Event message control | | Entire Sensor only |
| Readable threshold mask, Settable threshold mask (bytes 19, 20) | 0x3F, 0x3F | Upper Non Recoverable, Upper Critical, Upper Non Critical, Lower Non Critical, Lower Critical and Lower Non Recoverable thresholds are Readable and Settable |
| Reading Type | | Unsigned |
| Lower Non Recoverable | 0xB4 | 38 Volts |
| Lower Critical | 0xB5 | 40 Volts |
| Lower Non Critical threshold | 0xB8 | 44 Volts |
| Upper Non Critical threshold | 0xD4 | 72 Volts |

*Table 2-7 Sensor No. X 48VVoltage_PSU1 (continued)*

| Feature | Raw Value/Description | Interpreted Value |
|---|---|---|
| Upper Critical threshold | 0xD8 | 75 Volts |
| Upper Non Recoverable threshold | 0xDA | 76 Volts |

*Table 2-8 Sensor No. X 48VVoltage_PSU2*

| Feature | Raw Value/Description | Interpreted Value |
|---|---|---|
| Sensor Name | 48VVoltage_PSU2 | |
| Type of measurement | Voltage | |
| Sensor Type | 0x02 | Voltage |
| Class | 0x01 | Threshold |
| Sensor Owner LUN | 0x00 | |
| Entity ID | 0xF0 | PICMG Shelf Management Controller |
| Entity Instance | 0x60 | |
| Rearm mode | | Auto |
| Hysteresis support | | No |
| Threshold access support | | Readable/Settable |
| Event message control | | Entire Sensor only |
| Readable threshold mask, Settable threshold mask (bytes 19, 20) | 0x3F, 0x3F | Upper Non Recoverable, Upper Critical, Upper Non Critical, Lower Non Critical, Lower Critical and Lower Non Recoverable thresholds are Readable and Settable |
| Reading Type | | Unsigned |
| Upper Non Recoverable threshold | 0xDA | -38 Volts |
| Upper Critical threshold | 0xD8 | -40 Volts |
| Upper Non Critical threshold | 0xD4 | -44 Volts |

*Table 2-8 Sensor No. X 48VVoltage_PSU2 (continued)*

| Feature | Raw Value/Description | Interpreted Value |
|---|---|---|
| Lower Non Critical threshold | 0xB8 | -72 Volts |
| Lower Critical | 0xB5 | -75 Volts |
| Lower Non Recoverable | 0xB4 | -76 Volts |

*Table 2-9 Sensor No. X 48VVoltage_PSU3*

| Feature | Raw Value/Description | Interpreted Value |
|---|---|---|
| Sensor Name | 48VVoltage_PSU3 | |
| Type of measurement | Voltage | |
| Sensor Type | 0x02 | Voltage |
| Class | 0x01 | Threshold |
| Sensor Owner LUN | 0x00 | |
| Entity ID | 0xF0 | PICMG Shelf Management Controller |
| Entity Instance | 0x60 | |
| Rearm mode | | Auto |
| Hysteresis support | | No |
| Threshold access support | | Readable/Settable |
| Event message control | | Entire Sensor only |
| Readable threshold mask, Settable threshold mask (bytes 19, 20) | 0x3F, 0x3F | Upper Non Recoverable, Upper Critical, Upper Non Critical, Lower Non Critical, Lower Critical and Settable |
| Reading Type | | Unsigned |
| Upper Non Recoverable threshold | 0xDA | -38 Volts |
| Upper Critical threshold | 0xD8 | -40 Volts |
| Upper Non Critical threshold | 0xD4 | -44 Volts |
| Lower Non Critical threshold | 0xB8 | -72 Volts |

*Table 2-9 Sensor No. X 48VVoltage_PSU3 (continued)*

| Feature | Raw Value/Description | Interpreted Value |
|---|---|---|
| Lower Critical | 0xB5 | -75 Volts |
| Lower Non Recoverable | 0xB4 | -76 Volts |

*Table 2-10 Sensor No. X 48VVoltage_PSU4*

| Feature | Raw Value/Description | Interpreted Value |
|---|---|---|
| Sensor Name | 48VVoltage_PSU4 | |
| Type of measurement | Voltage | |
| Sensor Type | 0x02 | Voltage |
| Class | 0x01 | Threshold |
| Sensor Owner LUN | 0x00 | |
| Entity ID | 0xF0 | PICMG Shelf Management Controller |
| Entity Instance | 0x60 | |
| Rearm mode | | Auto |
| Hysteresis support | | No |
| Threshold access support | | Readable/Settable |
| Event message control | | Entire Sensor only |
| Readable threshold mask, Settable threshold mask (bytes 19, 20) | 0x3F, 0x3F | Upper Non Recoverable, Upper Critical, Upper Non Critical, Lower Non Critical, Lower Critical and, Lower Non Recoverable, thresholds are Readable and Settable |
| Reading Type | | Unsigned |
| Upper Non Recoverable threshold | 0xDA | -38 Volts |
| Upper Critical threshold | 0xD8 | -40 Volts |
| Upper Non Critical threshold | 0xD4 | -44 Volts |
| Lower Non Critical threshold | 0xB8 | -72 Volts |

*Table 2-10 Sensor No. X 48VVoltage_PSU4 (continued)*

| Feature | Raw Value/Description | Interpreted Value |
|---|---|---|
| Lower Critical | 0xB5 | -75 Volts |
| Lower Non Recoverable | 0xB4 | -76 Volts |

*Table 2-11 Sensor No. X 48VCurrent_PSU1*

| Feature | Raw Value/Description | Interpreted Value |
|---|---|---|
| Sensor Name | 48VCurrent_PSU1 | |
| Type of measurement | Current | |
| Sensor Type | 0x03 | Current |
| Class | 0x01 | Threshold |
| Sensor Owner LUN | 0x00 | |
| Entity ID | 0xF0 | PICMG Shelf Management Controller |
| Entity Instance | 0x60 | |
| Rearm mode | | Auto |
| Hysteresis support | | No |
| Threshold access support | | Readable/Settable |
| Event message control | | Entire Sensor only |
| Readable threshold mask, Settable threshold mask (bytes 19, 20) | 0x38, 0x38 | Upper Non Recoverable, Upper Critical and Upper Non Critical thresholds are Readable and Settable |
| Reading Type | | Unsigned |
| Upper Non Recoverable threshold | 0x41 | 65 Amps |
| Upper Critical threshold | 0x3e | 62 Amps |
| Upper Non Critical threshold | 0x3c | 60 Amps |

*Table 2-12 Sensor No. X 48VCurrent_PSU2*

| Feature | Raw Value/Description | Interpreted Value |
|---|---|---|
| Sensor Name | 48VCurrent_PSU2 | |
| Type of measurement | Current | |
| Sensor Type | 0x03 | Current |
| Class | 0x01 | Threshold |
| Sensor Owner LUN | 0x00 | |
| Entity ID | 0xF0 | PICMG Shelf Management Controller |
| Entity Instance | 0x60 | |
| Rearm mode | | Auto |
| Hysteresis support | | No |
| Threshold access support | | Readable/Settable |
| Event message control | | Entire Sensor only |
| Readable threshold mask, Settable threshold mask (bytes 19, 20) | 0x38, 0x38 | Upper Non Recoverable, Upper Critical and Upper Non Critical thresholds are Readable and Settable |
| Reading Type | | Unsigned |
| Upper Non Recoverable threshold | 0x41 | 65 Amps |
| Upper Critical threshold | 0x3e | 62 Amps |
| Upper Non Critical threshold | 0x3c | 60 Amps |

*Table 2-13 Sensor No. X 48VCurrent_PSU3*

| Feature | Raw Value/Description | Interpreted Value |
|---|---|---|
| Sensor Name | 48VCurrent_PSU3 | |
| Type of measurement | Current | |
| Sensor Type | 0x03 | Current |

*Table 2-13 Sensor No. X 48VCurrent_PSU3 (continued)*

| Feature | Raw Value/Description | Interpreted Value |
|---|---|---|
| Class | 0x01 | Threshold |
| Sensor Owner LUN | 0x00 | |
| Entity ID | 0xF0 | PICMG Shelf Management Controller |
| Entity Instance | 0x60 | |
| Rearm mode | | Auto |
| Hysteresis support | | No |
| Threshold access support | | Readable/Settable |
| Event message control | | Entire Sensor only |
| Readable threshold mask, Settable threshold mask (bytes 19, 20) | 0x38, 0x38 | Upper Non Recoverable, Upper Critical and Upper Non Critical thresholds are Readable and Settable |
| Reading Type | | Unsigned |
| Upper Non Recoverable threshold | 0x41 | 65 Amps |
| Upper Critical threshold | 0x3e | 62 Amps |
| Upper Non Critical threshold | 0x3c | 60 Amps |

*Table 2-14 48VCurrent_PSU4*

| Feature | Raw Value/Description | Interpreted Value |
|---|---|---|
| Sensor Name | 48VCurrent_PSU4 | |
| Type of measurement | Current | |
| Sensor Type | 0x03 | Current |
| Class | 0x01 | Threshold |
| Sensor Owner LUN | 0x00 | |
| Entity ID | 0xF0 | PICMG Shelf Management Controller |

*Table 2-14 48VCurrent_PSU4 (continued)*

| Feature | Raw Value/Description | Interpreted Value |
|---|---|---|
| Entity Instance | 0x60 | |
| Rearm mode | | Auto |
| Hysteresis support | | No |
| Threshold access support | | Readable/Settable |
| Event message control | | Entire Sensor only |
| Readable threshold mask, Settable threshold mask (bytes 19, 20) | 0x38, 0x38 | Upper Non Recoverable, Upper Critical and Upper Non Critical thresholds are Readable and Settable |
| Reading Type | | Unsigned |
| Upper Non Recoverable threshold | 0x41 | 65 Amps |
| Upper Critical threshold | 0x3e | 62 Amps |
| Upper Non Critical threshold | 0x3c | 60 Amps |

### 2.2.4.2 Temperature Sensors

The following tables describe the analog temperature sensors available on the physical SAM.

*Table 2-15 Sensor No. 2 Local Temp*

| Feature | Raw Value/Description | Interpreted Value |
|---|---|---|
| Sensor Name | Local Temp | |
| Sensor Type | 0x01 | Temperature |
| Class | 0x01 | Threshold |
| Sensor Owner LUN | 0x00 | |
| Entity ID | 0xF0 | PICMG Shelf Management Controller |
| Entity Instance | 0x60 | |
| Rearm mode | | Auto |
| Hysteresis support | | Readable and Settable |

*Table 2-15 Sensor No. 2 Local Temp (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) | 0x12, 0x12 | Upper Non-Critical, Critical and Non-Recoverable Thresholds are Readable and Settable |
| Reading Type | | Unsigned |
| Lower Critical Threshold | 0x00 | 0°C |
| Upper Critical Threshold | 0x3C | 60°C |

*Table 2-16 Inlet Temp sensor*

| Feature | Raw Value/Description | Interpreted Value |
|---|---|---|
| Sensor Name | Inlet Temp | |
| Sensor Type | 0x01 | Temperature |
| Class | 0x01 | Threshold |
| Sensor Owner LUN | 0x00 | |
| Entity ID | 0xF0 | PICMG Shelf Management Controller |
| Entity Instance | 0x60 | |
| Rearm mode | | Auto |
| Hysteresis support | | Readable and Settable |
| Threshold access support | | Readable/Settable |
| Event message control | | Entire Sensor only |
| Readable threshold mask,Settable threshold mask (bytes 19, 20 | 0x38, 0x38 | Upper Non-Critical, Critical and Non-Recoverable Thresholds are Readable and Settable |
| Reading Type | | Unsigned |

*Table 2-16 Inlet Temp sensor (continued)*

| Feature | Raw Value/Description | Interpreted Value |
|---|---|---|
| Upper Non Critical | 0x37 | 55°C |
| Upper Critical Threshold | 0x3C | 60°C |
| Upper Non Recoverable | 0x46 | 70°C |

## 2.2.5 SAM Module Discrete Sensors

The physical shelf managers at IPMB addresses 0xFC and 0xFE present the following discrete sensors:

- *Hot Swap Sensor*
- *IPMB Link Sensor*
- *PEM Sensors*
- *PSU Status*
- *PSU Alert*
- *Fuse Sensors*
- *Fan Tray Presence Sensors*
- *AXP Backplane ID Sensor*
- *Fault Event Sensor*
- *FPGA Build Rev Sensor*
- *Port Status Sensor*
- *CPLD State Sensor*
- *Reboot Reason Sensor*

### 2.2.5.1 Hot Swap Sensor

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

*Table 2-17 Sensor No. 0 FRU 0 HOT_SWAP*

| Feature | Raw Value/Description | Interpreted Value |
|---|---|---|
| Sensor Name | FRU 0 HOT_SWAP | |
| Type of Measurement | | Hot Swap State |
| Class | | Discrete |
| Event/Reading Type | 0x6F | Sensor-specific |

*Table 2-17 Sensor No. 0 FRU 0 HOT_SWAP (continued)*

| Feature | Raw Value/Description | Interpreted Value |
|---|---|---|
| Sensor Type | 0xF0 | Hot Swap |
| Sensor Owner LUN | 0x00 | |
| Entity ID | 0xF0 | PICMG Shelf Management Controller |
| Entity Instance | 0x60 | |
| Rearm mode | | Auto |
| Event message control | | Entire Sensor only |
| Assertion Event Mask (bytes 15, 16) | 0xFF, 0x00 | |
| Deassertion Event Mask (bytes 17,18) | 0x00, 0x00 | |
| Discrete Reading Mask (bytes 19, 20) | 0xFF, 0x00 | Supports 8 Successive States |
| Reading Definition | | According to PICMG 3.0 |

### 2.2.5.2 IPMB Link Sensor

The following table describes the discrete IPMB link sensor available on the physical SAM.

*Table 2-18 Sensor No. 1 IPMB Link*

| Feature | Raw Value/Description | Interpreted Value |
|---|---|---|
| Sensor Name | IPMB LINK | |
| Type of Measurement | | IPMB Link State |
| Class | | Discrete |
| Event/Reading Type | 0x6F | Sensor-specific |
| Sensor Type | 0xF1 | IPMB Link |
| Sensor Owner LUN | 0x00 | |
| Entity ID | 0xF0 | PICMG Shelf Management Controller |
| Entity Instance | 0x60 | |
| Rearm mode | | Auto |

*Table 2-18 Sensor No. 1 IPMB Link (continued)*

| Feature | Raw Value/Description | Interpreted Value |
|---|---|---|
| Event message control | | Entire Sensor only |
| Assertion Event Mask (bytes 15,16) | 0x0F, 0x00 | |
| Deassertion Event Mask (bytes 17,18) | 0x00, 0x00 | |
| Discrete Reading Mask (bytes 19, 20) | 0x0F, 0x00 | Supports 4 Successive States |
| Reading Definition | | According to PICMG 3.0 |

### 2.2.5.3 PEM Sensors

The following tables describe the discrete PEM sensors available on the physical SAM.

*Table 2-19 Sensor No. 10 PEM 1*

| Feature | Raw Value/Description | Interpreted Value |
|---|---|---|
| Sensor Name | PEM 1 | |
| Type of Measurement | | Presence |
| Class | | Discrete |
| Event/Reading Type | 0x25 | Entity Presence |
| Sensor Type | 0xF1 | IPMB Link |
| Sensor Owner LUN | 0x00 | |
| Entity ID | 0x15 | Power Management Board |
| Entity Instance | 0x00 | |
| Rearm mode | | Auto |
| Event message control | | Entire Sensor only |
| Assertion Event Mask (bytes 15,16) | 0x03, 0x00 | |
| Deassertion Event Mask (bytes 17,18) | 0x00, 0x00 | |
| Discrete Reading Mask (bytes 19, 20) | 0x03, 0x00 | Supports 2 Successive States |
| Reading Definition | | According to IPMI 1.5 |

*Table 2-20 Sensor No. 11 PEM 2*

| Feature | Raw Value/Description | Interpreted Value |
|---|---|---|
| Sensor Name | PEM 2 | |
| Type of Measurement | | Presence |
| Class | | Discrete |
| Event/Reading Type | 0x25 | Entity Presence |
| Sensor Type | 0xF1 | IPMB Link |
| Sensor Owner LUN | 0x00 | |
| Entity ID | 0x15 | Power Management Board |
| Entity Instance | 0x00 | |
| Rearm mode | | Auto |
| Event message control | | Entire Sensor only |
| Assertion Event Mask (bytes 15,16) | 0x03, 0x00 | |
| Deassertion Event Mask (bytes 17,18) | 0x00, 0x00 | |
| Discrete Reading Mask (bytes 19, 20) | 0x03, 0x00 | Supports 2 Successive States |
| Reading Definition | | According to IPMI 1.5 |

*Table 2-21 Sensor No. X PEM 3*

| Feature | Raw Value/Description | Interpreted Value |
|---|---|---|
| Sensor Name | PEM 3 | |
| Type of Measurement | | Presence |
| Class | | Discrete |
| Event/Reading Type | 0x6F | Discrete |
| Sensor Type | 0x25 | Entity Presence |
| Sensor Owner LUN | 0x00 | |

*Table 2-21 Sensor No. X PEM 3 (continued)*

| Feature | Raw Value/Description | Interpreted Value |
|---|---|---|
| Entity ID | 0x15 | Power Management Board |
| Entity Instance | 0x00 | |
| Rearm mode | | Auto |
| Event message control | | Entire Sensor only |
| Assertion Event Mask (bytes 15,16) | 0x03, 0x00 | |
| Deassertion Event Mask (bytes 17,18) | 0x00, 0x00 | |
| Discrete Reading Mask (bytes 19, 20) | 0x03, 0x00 | Supports 2 Successive States |
| Reading Definition | | According to IPMI 1.5 |

*Table 2-22 Sensor No. X PEM 4*

| Feature | Raw Value/Description | Interpreted Value |
|---|---|---|
| Sensor Name | PEM 4 | |
| Type of Measurement | | Presence |
| Class | | Discrete |
| Event/Reading Type | 0x6F | Discrete |
| Sensor Type | 0x25 | Entity Presence |
| Sensor Owner LUN | 0x00 | |
| Entity ID | 0x15 | Power Management Board |
| Entity Instance | 0x00 | |
| Rearm mode | | Auto |
| Event message control | | Entire Sensor only |
| Assertion Event Mask (bytes 15,16) | 0x03, 0x00 | |
| Deassertion Event Mask (bytes 17,18) | 0x00, 0x00 | |

*Table 2-22 Sensor No. X PEM 4 (continued)*

| Feature | Raw Value/Description | Interpreted Value |
|---|---|---|
| Discrete Reading Mask (bytes 19, 20) | 0x03, 0x00 | Supports 2 Successive States |
| Reading Definition | | According to IPMI 1.5 |

### 2.2.5.4 PSU Status

This section monitors the PSU status. For more information on this sensor, refer to *PSU Status on page 55*.

*Table 2-23 Sensor No. X PSU Status*

| Feature | Raw Value/Description | Interpreted Value |
|---|---|---|
| Sensor Name | PSU Status | |
| Type of measurement | | PSU Status |
| Sensor Type | 0xE4 | OEM-reserved |
| Class | | Discrete |
| Event/Reading Type | 0x6F | Discrete |
| Sensor Owner LUN | 0x00 | |
| Entity ID | 0xF0 | PICMG Shelf Management Controller |
| Entity Instance | 0x60 | |
| Rearm mode | | Auto |
| Assertion Event Mask (bytes 15,16) | 0x00 0xFF | |
| Deassertion Event Mask(bytes 17,18) | 0x00 0xFF | |
| Discrete Reading Mask (bytes 19, 20) | 0x00 0xFF | [7] 0b DC OK PSU 4<br>[6] 0b DC OK PSU 3<br>[5] 0b DC OK PSU 2<br>[4] 0b DC OK PSU 1<br>[3] 0b AC OK PSU 4<br>[2] 0b AC OK PSU 3<br>[1] 0b AC OK PSU 2<br>[0] 0b AC OK PSU 1 |
| Reading Definition | 0x00 | No Meaning |

### 2.2.5.5 PSU Alert

The following table describes the PSU Alert sensors available on the physical SAM. For more information, refer to *PSU Alert on page 56*.

*Table 2-24 Sensor No. X PSU Alert*

| Feature | Raw Value/Description | Interpreted Value |
|---|---|---|
| Sensor Name | PSU Alert | |
| Type of measurement | | Feed A or Feed B status change |
| Sensor Type | 0xE5 | OEM-reserved |
| Class | | Discrete |
| Event/Reading Type | 0x6F | Discrete |
| Sensor Owner LUN | 0x00 | |
| Entity ID | 0xF0 | PICMG Shelf Management Controller |
| Entity Instance | 0x60 | |
| Rearm mode | | Auto |
| Assertion Event Mask (bytes 15,16) | 0x00 0x0F | |
| Deassertion Event Mask(bytes 17,18) | 0x00 0x0F | |
| Discrete Reading Mask (bytes 19, 20) | 0x00 0x0F | |
| Reading Definition | | [7] 1b Alert on Feed B<br>[3] 1b Alert on Feed A |

### 2.2.5.6 Fuse Sensors

The following tables describe the discrete Fuse sensors available on the physical SAM. For more information, refer to *Fuse Sensors on page 56*.

*Table 2-25 Sensor No. X -48V Fuse A*

| Feature | Raw Value/Description | Interpreted Value |
|---|---|---|
| Sensor Name | -48V Fuse A | |
| Type of measurement | | Feed A Fuse Status |
| Sensor Type | 0xE6 | OEM-reserved |
| Class | | Discrete |

*Table 2-25 Sensor No. X -48V Fuse A (continued)*

| Feature | Raw Value/Description | Interpreted Value |
|---|---|---|
| Event/Reading Type | 0x6F | Discrete |
| Sensor Owner LUN | 0x00 | |
| Entity ID | 0xF0 | PICMG Shelf Management Controller |
| Entity Instance | 0x60 | |
| Rearm mode | | Auto |
| Assertion Event Mask (bytes 15,16) | 0x00 0x01 | |
| Deassertion Event Mask(bytes 17,18) | 0x00 0x01 | |
| Discrete Reading Mask (bytes 19, 20) | 0x00 0x01 | [0] 1b Feed A Fuse NOK<br>0b Feed A Fuse OK |
| Reading Definition | 0x00 | No Meaning |

*Table 2-26 Sensor No. X -48V Fuse B*

| Feature | Raw Value/Description | Interpreted Value |
|---|---|---|
| Sensor Name | -48V Fuse B | |
| Type of measurement | | Feed B Fuse Status |
| Sensor Type | 0xE6 | OEM-reserved |
| Class | | Discrete |
| Event/Reading Type | 0x6F | Discrete |
| Sensor Owner LUN | 0x00 | |
| Entity ID | 0xF0 | PICMG Shelf Management Controller |
| Entity Instance | 0x60 | |
| Rearm mode | | Auto |
| Assertion Event Mask (bytes 15,16) | 0x00 0x01 | |

*Table 2-26 Sensor No. X -48V Fuse B (continued)*

| Feature | Raw Value/Description | Interpreted Value |
|---|---|---|
| Deassertion Event Mask(bytes 17,18) | 0x00 0x01 | |
| Discrete Reading Mask (bytes 19, 20) | 0x00 0x01 | [0] 1b Feed A Fuse NOK<br>0b Feed A Fuse OK |
| Reading Definition | 0x00 | No Meaning |

### 2.2.5.7 Fan Tray Presence Sensors

The following tables describe the discrete Fan Tray Presence sensors available on the physical SAM.

*Table 2-27 Fan Tray1*

| Feature | Raw Value/Description | Interpreted Value |
|---|---|---|
| Sensor Name | Fan Tray1 | |
| Type of Measurement | | Presence |
| Class | | Discrete |
| Event/Reading Type | 0x6f | Entity Presence |
| Sensor Type | 0x25 | IPMB Link |
| Sensor Owner LUN | 0x00 | |
| Entity ID | 0x1E | Cooling Unit |
| Entity Instance | 0x00 | |
| Rearm mode | | Auto |
| Event message control | | Entire Sensor only |
| Assertion Event Mask (bytes 15,16) | 0x03, 0x00 | |
| Deassertion Event Mask (bytes 17,18) | 0x00, 0x00 | |
| Discrete Reading Mask (bytes 19, 20) | 0x03, 0x00 | Supports 2 Successive States |
| Reading Definition | | According to IPMI 1.5 |

*Table 2-28 Fan Tray2*

| Feature | Raw Value/Description | Interpreted Value |
|---|---|---|
| Sensor Name | Fan Tray2 | |
| Type of Measurement | | Presence |
| Class | | Discrete |
| Event/Reading Type | 0x6f | Entity Presence |
| Sensor Type | 0x25 | IPMB Link |
| Sensor Owner LUN | 0x00 | |
| Entity ID | 0x1E | Cooling Unit |
| Entity Instance | 0x00 | |
| Rearm mode | | Auto |
| Event message control | | Entire Sensor only |
| Assertion Event Mask (bytes 15,16) | 0x03, 0x00 | |
| Deassertion Event Mask (bytes 17,18) | 0x00, 0x00 | |
| Discrete Reading Mask (bytes 19, 20) | 0x03, 0x00 | Supports 2 Successive States |
| Reading Definition | | According to IPMI 1.5 |

*Table 2-29 Fan Tray3*

| Feature | Raw Value/Description | Interpreted Value |
|---|---|---|
| Sensor Name | Fan Tray3 | |
| Type of Measurement | | Presence |
| Class | | Discrete |
| Event/Reading Type | 0x6f | Entity Presence |
| Sensor Type | 0x25 | IPMB Link |
| Sensor Owner LUN | 0x00 | |

*Table 2-29 Fan Tray3 (continued)*

| Feature | Raw Value/Description | Interpreted Value |
|---|---|---|
| Entity ID | 0x1E | Cooling Unit |
| Entity Instance | 0x00 | |
| Rearm mode | | Auto |
| Event message control | | Entire Sensor only |
| Assertion Event Mask (bytes 15,16) | 0x03, 0x00 | |
| Deassertion Event Mask (bytes 17,18) | 0x00, 0x00 | |
| Discrete Reading Mask (bytes 19, 20) | 0x03, 0x00 | Supports 2 Successive States |
| Reading Definition | | According to IPMI 1.5 |

### 2.2.5.8 AXP Backplane ID Sensor

The following table describes the discrete AXP backplane ID sensor available on the physical SAM.

*Table 2-30 Sensor No. 14 AXP Backplane ID*

| Feature | Raw Value/Description | Interpreted Value |
|---|---|---|
| Sensor Name | AXP Backplane ID | |
| Type of Measurement | | Specifies Bus Type of the Backplane |
| Class | | Discrete |
| Event/Reading Type | 0x6F | Sensor-specific |
| Sensor Type | 0xDB | OEM-reserved |
| Sensor Owner LUN | 0x00 | |
| Entity ID | 0xF0 | PICMG Shelf Management Controller |
| Entity Instance | 0x60 | |
| Rearm mode | | Auto |
| Event message control | | Entire Sensor only |

*Table 2-30 Sensor No. 14 AXP Backplane ID (continued)*

| Feature | Raw Value/Description | Interpreted Value |
|---|---|---|
| Assertion Event Mask (bytes 15,16) | 0x01, 0x00 | |
| Deassertion Event Mask (bytes 17,18) | 0x00, 0x00 | |
| Discrete Reading Mask (bytes 19, 20) | 0x01, 0x00 | Supports 1 Successive State state 0: CRC error reported |
| Reading Definition | | According to SMART EC: 09: AXP640 |

For more detail on this sensor, refer to *AXP Backplane ID Sensor (SMART EC OEM) on page 121*.

### 2.2.5.9 Fault Event Sensor

The following table describes the discrete fault event sensor available on the physical SAM. For more information, refer to *ShM Fault Event Sensor (SMART EC OEM) on page 128*.

*Table 2-31 Sensor No. 15 Fault Event*

| Feature | Raw Value/Description | Interpreted Value |
|---|---|---|
| Sensor Name | Fault Event | |
| Type of Measurement | | Specifies that a serious fault has been detected by the Shelf Manager or that the Shelf Manager has rebooted. |
| Class | | Discrete |
| Event/Reading Type | 0x6F | Sensor-specific |
| Sensor Type | 0xDC | OEM-reserved |
| Sensor Owner LUN | 0x00 | |
| Entity ID | 0xF0 | PICMG Shelf Management Controller |
| Entity Instance | 0x60 | |
| Rearm mode | | Auto |
| Event message control | | Entire Sensor only |

*Table 2-31 Sensor No. 15 Fault Event (continued)*

| Feature | Raw Value/Description | Interpreted Value |
|---|---|---|
| Assertion Event Mask (bytes 15,16) | 0xff, 0x1f | |
| Deassertion Event Mask (bytes 17,18) | 0xff, 0x1f | |
| Discrete Reading Mask (bytes 19, 20) | 0xff, 0x1f | Supports 13 independent states:<br>State<br>Mask Meaning<br>----- ----------<br>0001: Switchover Initiated<br>0002: FPGA CRC Error<br>0004: PCI Bus Failure<br>0008: ADM1024 Unreadable<br>0010: Telco Alarm Unreadable<br>0020: FRU Presence Unrdbl<br>0040: Shelf ID Unreadable<br>0080: HW Addr Unreadable<br>0100: IPMB Locked<br>0200: No Redundancy Eth<br>0400: No Hub Backplane Eth<br>0800: Critical Voltage<br>1000: FruInfo EEPROM Fail |
| Reading Definition | 0x00 | No meaning |

### 2.2.5.10 FPGA Build Rev Sensor

The following table describes the discrete sensor which presents the build revision information on the firmware in the SAM640 FPGA.

*Table 2-32 Sensor No. 25 FPGA Build Rev*

| Feature | Raw Value/Description | Interpreted Value |
|---|---|---|
| Sensor Name | FPGA Build Rev | |
| Type of Measurement | | Reports firmware revision on SAM640 FPGA |
| Class | | Discrete |
| Event/Reading Type | 0x6F | Discrete |
| Sensor Type | 0xE1 | OEM-reserved |

*Table 2-32 Sensor No. 25 FPGA Build Rev (continued)*

| Feature | Raw Value/Description | Interpreted Value |
|---|---|---|
| Sensor Owner LUN | 0x00 | |
| Entity ID | 0xF0 | PICMG Shelf Management Controller |
| Entity Instance | 0x60 | |
| Rearm mode | | Auto |
| Event message control | | Entire Sensor only |
| Assertion Event Mask (bytes 15,16) | 0x00, 0x00 | No events generated |
| Deassertion Event Mask(bytes 17,18) | 0x00, 0x00 | |
| Discrete Reading Mask (bytes 19, 20) | 0x00, 0x00 | Supports 2 Successive States |
| Reading Definition | | According to SMART EC |

For more information on this sensor, refer to *FPGA Build Rev Sensor (SMART EC OEM) on page 127*.

### 2.2.5.11 Port Status Sensor

The following table describes the discrete sensor which presents status information about several physical ports and Ethernet interfaces on the SAM640. For more information on this sensor, refer to *Port Status Sensor (SMART EC OEM) on page 127*.

*Table 2-33 Sensor No. 25 Port Status*

| Feature | Raw Value/Description | Interpreted Value |
|---|---|---|
| Sensor Name | Port Status | |
| Type of Measurement | | Report port status |
| Class | | Discrete |
| Event/Reading Type | 0x6F | Discrete |
| Sensor Type | 0xE2 | OEM-reserved |
| Sensor Owner LUN | 0x00 | |
| Entity ID | 0xF0 | PICMG Shelf Management Controller |

*Table 2-33 Sensor No. 25 Port Status (continued)*

| Feature | Raw Value/Description | Interpreted Value |
|---|---|---|
| Entity Instance | 0x60 | |
| Rearm mode | | Auto |
| Event message control | | Entire Sensor only |
| Assertion Event Mask (bytes 15,16) | 0x03, 0x07 | |
| Deassertion Event Mask (bytes 17,18) | 0x03, 0x07 | |
| Discrete Reading Mask (bytes 19, 20) | 0x03, 0x07 | Supports 5 independent states:<br>State<br>Mask Description<br>----- ----------<br>0001: Serial Port 1 interSAM between FPGAs down<br>0002: Serial Port 2 interSAM between FPGAs down<br>0100: Ethernet link to local hub slot is down<br>0200: Ethernet link to remote hub slot is down<br>0400: Ethernet link to front panel is down |
| Reading Definition | 00 | No meaning |

### 2.2.5.12 CPLD State Sensor

The following table describes the discrete CPLD state sensor available on the physical SAM.

*Table 2-34 Sensor No. 128 CPLD State*

| Feature | Raw Value/Description | Interpreted Value |
|---|---|---|
| Sensor Name | CPLD State | |
| Type of Measurement | | States of the Master and Backup Shelf Managers |
| Class | | Discrete |
| Event/Reading Type | 0x6F | Sensor-specific |
| Sensor Type | 0xDE | OEM-reserved |

*Table 2-34 Sensor No. 128 CPLD State (continued)*

| Feature | Raw Value/Description | Interpreted Value |
|---|---|---|
| Sensor Owner LUN | 0x00 | |
| Entity ID | 0xF0 | PICMG Shelf Management Controller |
| Entity Instance | 0x60 | |
| Rearm mode | | Auto |
| Event message control | | Entire Sensor only |
| Assertion Event Mask (bytes 15,16) | 0x00, 0x00 | |
| Deassertion Event Mask (bytes 17,18) | 0x00, 0x00 | |
| Discrete Reading Mask (bytes 19, 20) | 0x00, 0x00 | Supports 12 States |
| Reading Definition | | According to SMART EC |

For more information on this sensor, refer to *CPLD State Sensor (SMART EC OEM) on page 128*.

### 2.2.5.13 Reboot Reason Sensor

The following table describes the Reboot Reason Sensor which indicates the reason that the SAM640 was last reset. For more information on this sensor, refer to *Reboot Reason Sensor (Pigeon Point OEM) on page 128*.

*Table 2-35 Sensor No. 129 Reboot Reason*

| Feature | Raw Value/Description | Interpreted Value |
|---|---|---|
| Sensor Name | Reboot Reason | |
| Type of Measurement | | Reports the reason the SAM was last rebooted |
| Class | | Discrete |
| Event/Reading Type | 0x6F | Discrete |
| Sensor Type | 0xDD | OEM-reserved |
| Sensor Owner LUN | 0x00 | |

*Table 2-35 Sensor No. 129 Reboot Reason (continued)*

| Feature | Raw Value/Description | Interpreted Value |
|---|---|---|
| Entity ID | 0xF0 | PICMG Shelf Management Controller |
| Entity Instance | 0x60 | |
| Rearm mode | | Auto |
| Event message control | | Entire Sensor only |
| Assertion Event Mask (bytes 15,16) | 0x00, 0x00 | |
| Deassertion Event Mask(bytes 17,18) | 0x00, 0x00 | |
| Discrete Reading Mask (bytes 19, 20) | 0xFF, 0xFF | Mask Meaning<br>----- ----------<br>0001: reboot reason unknown<br>0002: due to switchover<br>0004: forced switchover<br>0008: CLI cmd terminate<br>0010: loss of HEALTHY bit<br>0020: loss of ACTIVE bit<br>0040: redundancy link lost bur active SAM still active<br>0080: error at shelf manager startup<br>0100: ShMM hardware watchdog<br>0200: initiated by software (i.e. reboot command)<br>0400: ShMM power cycled |
| Reading Definition | | No meaning |

# 2.3 SAM640 Active (Virtual) Shelf Manager

This section describes in detail all available IPMI sensors of the active SAM640 at IPMB address 0x20.

## 2.3.1 FRU Information

There are four FRU IDs which the active SAM (at address 0x20) presents:

- FRU 0 – refers to the physical SAM640 card; it could be either FRU 0 of IPMB address 0xFC or FRU 0 of IPMB address 0xFE.
- FRU 1 and FRU 2 – both refer to FRU info stored in EEPROMs on the AXP640 chassis, describing the capabilities and connectivity of the Shelf Manager. Although these FRUs are stored redundantly in two different EEPROMs, their data should always be identical.
- FRU 254 – this is the *virtual* FRU number which refers to the common data stored in FRU 1 and FRU 2. When reading or writing shelf FRU information, you should always use FRU 254. Writing to FRU 254 causes a write to both FRU 1 and FRU 2 and keeps them identical.

The following listings show examples of the output obtained when retrieving FRU information using the CLIA tool of the active SAM.

#### 2.3.1.1 Active Shelf Manager FRU Data

```
# clia fruinfo 20 254
Pigeon Point Shelf Manager Command Line Interpreter
20: FRU # 254, FRU Info
Common Header:    Format Version = 1
Chassis Info Area:
    Version   = 1
    Chassis Type              = (2)
    Chassis Part Number       = 0106844J01A
    Chassis Serial Number     = 00001
Board Info Area:
    Version     = 1
    Language Code             = 25
   Mfg Date/Time           = Oct 28 10:10:00 2010 (7796770 minutes since
1996)
    Board Manufacturer        = Emerson
    Board Product Name        = AXP640-AC2-220VAC
    Board Serial Number       = 12345
    Board Part Number         = 0106845J01A
    FRU Programmer File ID    = CENT640_ShelfFru.inf
Product Info Area:
    Version     = 1
    Language Code             = 25
    Manufacturer Name         = Emerson
    Product Name              = Centellis 6640
    Product Part / Model#     = CENT-6640-R10
```

```
    Product Version          = Rev. 1.0
    Product Serial Number    = 00001
    Asset Tag                =
    FRU Programmer File ID   = CENT640_ShelfFru.inf
Multi Record Area:
    PICMG Shelf Manager IP Connection Record (ID=0x13)
        Version = 1
    Record Type              = Management Access Record
        Version = 2
    Sub-Record Type: Component Name (0x05)
    PICMG Address Table Record (ID=0x10)
        Version = 0
    PICMG Backplane Point-to-Point Connectivity Record (ID=0x04)
        Version = 0
    PICMG Backplane Point-to-Point Connectivity Record (ID=0x04)
        Version = 0
    PICMG Shelf Power Distribution Record (ID=0x11)
        Version = 0
    PICMG Radial IPMB-0 Link Mapping Record (ID=0x15)
        Version = 0
    PICMG Shelf Activation And Power Management Record (ID=0x12)
        Version = 1
```

#### 2.3.1.2 SAM640 Shelf Manager FRU Data

```
# clia fruinfo 20 0
Pigeon Point Shelf Manager Command Line Interpreter
20: FRU # 0, FRU Info
Common Header:    Format Version = 1
Board Info Area:
    Version     = 1
    Language Code            = 25
   Mfg Date/Time           = Mar 30 23:00:00 2003 (3810180 minutes since
1996)
    Board Manufacturer       = Pigeon Point Systems
    Board Product Name       = Pigeon Point Systems ShMM-1500
    Board Serial Number      = PPS0000000
    Board Part Number        = A
    FRU Programmer File ID   =
```

```
Product Info Area:
    Version     = 1
    Language Code            = 25
    Manufacturer Name        = Pigeon Point Systems
    Product Name             = Pigeon Point Systems Shelf Manager
    Product Part / Model#    = 000000
    Product Version          = Rev 1.00
    Product Serial Number    = PPS0000000
    Asset Tag                =
    FRU Programmer File ID   =
```

## 2.3.2 Active SAM640 Sensor Overview

The following table lists the discrete and analog sensors that reside on the active SAM.

*Table 2-36 Active SAM640 Sensor Overview*

| Sensor No. | Sensor Name | Type | What does it measure? | Sensor Type | Availability |
|---|---|---|---|---|---|
| 0 | FRU 0 HOT_SWAP | Status | State of FRU | Discrete | Always |
| 2 | FRU 1 HOT_SWAP | Status | State of FRU | Discrete | Always |
| 3 | FRU 2 HOT_SWAP | Status | State of FRU | Discrete | Always |
| 4 | SHM FAULT EVENT | Status | State of SHM | Discrete | Always |
| 5 | IPMB LINK 1 | Status | State of IPMB link | Discrete | Always |
| 6 | IPMB LINK 2 | Status | State of IPMB link | Discrete | Always |
| 7 | IPMB LINK 3 | Status | State of IPMB link | Discrete | Always |
| 8 | IPMB LINK 4 | Status | State of IPMB link | Discrete | Always |
| 9 | IPMB LINK 5 | Status | State of IPMB link | Discrete | Always |
| 10 | IPMB LINK 6 | Status | State of IPMB link | Discrete | Always |
| 11 | IPMB LINK 12 | Status | State of IPMB link | Discrete | Always |
| 12 | IPMB LINK 13 | Status | State of IPMB link | Discrete | Always |
| 13 | IPMB LINK 14 | Status | State of IPMB link | Discrete | Always |
| 14 | IPMB LINK 17 | Status | State of IPMB link | Discrete | Always |
| 15 | IPMB LINK 18 | Status | State of IPMB link | Discrete | Always |
| 25 | IPMB LINK 21 | Status | State of IPMB link | Discrete | Always |

*Table 2-36 Active SAM640 Sensor Overview (continued)*

| Sensor No. | Sensor Name | Type | What does it measure? | Sensor Type | Availability |
|---|---|---|---|---|---|
| 119 | TelcoAlarmInput | Status | State of input signals to TELCO alarms | Discrete | Always |
| 131 | Telco Alarms | Status | State of TELCO alarms | Discrete | Always |
| 132 | BMC Watchdog | Status | State of BMC Watchdog on active SAM | Discrete | Always |
| 133 | SYSTEM EVENT | Status | State of PEF actions, system reconfigured events, etc. | Discrete | Always |
| 135 | FT Oper. Status | Status | Redundancy capability of fan trays | Discrete | Always |
| 136 | Cooling State | Status | State of Cooling Management Subsystem | Discrete | Always |
| 137 | Fans State | Status | Fan tachometer health | Discrete | Always |
| 138 | SHM Redundancy | Status | Redundancy capability of Shelf Manager | Discrete | Always |
| 139 | Shelf Power | Watts | Computer shelf power consumption | Analog | Always |
| 140 | Shelf FRU Info | Status | shelf fru info status | Discrete | Always |

## 2.3.3 Active SAM640 Analog Sensor

The active SAM at IPMB address 0x20 presents the following analog sensor:

### 2.3.3.1 Shelf Power Sensor

The following table describes the Shelf Power Sensor available on the active SAM.

*Table 2-37 Sensor No. 139 Shelf Power*

| Feature | Raw Value/Description | Interpreted Value |
|---|---|---|
| Sensor Name | Shelf Power | |
| Sensor Type | 0x0b | "Other Units-based Sensor" (watts) |
| Class | 0x01 | Threshold |
| Sensor Owner LUN | 0x00 | |
| Entity ID | 0xF0 | PICMG Shelf Management Controller |
| Entity Instance | 0x01 | |
| Rearm mode | | Auto |
| Hysteresis support | | No |
| Threshold access support | | Readable/Settable |
| Event message control | | Entire Sensor only |
| Readable threshold mask | | |
| Settable threshold mask (bytes 19, 20) | 0x00, 0x00 | No events |
| Reading Type | | Unsigned |
| Lower critical threshold | | |
| Upper critical threshold | | |

The SAM computes the Shelf Power by polling the current and voltage sensors reported by the PEMs. Each PEM reports two feed voltage and current sensors. The SAM computes the total shelf power consumption via the following formula:

Shelf Power = (PEM_1_Feed_A_Current * PEM_1_FEED_A_Voltage) +
(PEM_1_Feed_B_Current * PEM_1_FEED_B_Voltage) +
(PEM_2_Feed_A_Current * PEM_2_FEED_A_Voltage) +
(PEM_2_Feed_B_Current * PEM_2_FEED_B_Voltage)

The sensor's raw value is a number in the range of 0-255. If this value is **r**, shelf wattage is computed by the following formula:

Shelf Power = 1100 + (30 * r)

The result is expressed in watts and is accurate to about ±30W. The computed value has a floor value of 1100W.

## 2.3.4 SAM Active Shelf Manager Discrete Sensors

The active shelf managers at IPMB address 0x20 present the following discrete sensors:

- *Hot Swap Sensors*
- *ShM Fault Event Sensor*
- *IPMB Link Sensors*
- *Telco Alarm Sensors*
- *BMC Watchdog Sensor*
- *System Event*
- *Cooling State Sensors*
- *ShM Redundancy Sensor*
- *Shelf FRU Info Sensor*

The following tables describe the discrete sensors available on the active SAM.

### 2.3.4.1 Hot Swap Sensors

The following table describes the discrete hot swap sensors available on the active SAM.

*Table 2-38 Sensor No. 0 (0x00) FRU 0 HOT_SWAP*

| Feature | Raw Value/Description | Interpreted Value |
|---|---|---|
| Sensor Name | FRU 0 HOT_SWAP | |
| Type of Measurement | | Hot swap state of FRU 0, describing the SAM640 |
| Class | | Discrete |
| Event/Reading Type | 0x6F | Sensor-specific |
| Sensor Type | 0xF0 | Hot Swap |
| Sensor Owner LUN | 0x00 | |
| Entity ID | 0xF0 | PICMG Shelf Management Controller |
| Entity Instance | 0x01 | |
| Rearm mode | | Auto |

*Table 2-38 Sensor No. 0 (0x00) FRU 0 HOT_SWAP (continued)*

| Feature | Raw Value/Description | Interpreted Value |
|---|---|---|
| Event message control | | Entire Sensor only |
| Assertion Event Mask (bytes 15,16) | 0xFF, 0x00 | |
| Deassertion Event Mask (bytes 17,18) | 0x00, 0x00 | |
| Discrete Reading Mask (bytes 19, 20) | 0xFF, 0x00 | Supports 8 Successive States |
| Reading Definition | | According to PICMG 3.0 |

*Table 2-39 Sensor No. 2 (0x02) FRU 1 HOT_SWAP*

| Feature | Raw Value/Description | Interpreted Value |
|---|---|---|
| Sensor Name | FRU 1 HOT_SWAP | |
| Type of Measurement | | Hot Swap State of FRU 1, describing the Shelf Manager |
| Class | | Discrete |
| Event/Reading Type | 0x6F | Sensor-specific |
| Sensor Type | 0xF0 | Hot Swap |
| Sensor Owner LUN | 0x00 | |
| Entity ID | 0xF2 | PICMG Shelf Management Controller |
| Entity Instance | 0x60 | |
| Rearm mode | | Auto |
| Event message control | | Entire Sensor only |
| Assertion Event Mask (bytes 15,16) | 0xFF, 0x00 | |
| Deassertion Event Mask (bytes 17,18) | 0x00, 0x00 | |
| Discrete Reading Mask (bytes 19, 20) | 0xFF, 0x00 | Supports 8 Successive States |
| Reading Definition | | According to PICMG 3.0 |

*Table 2-40 Sensor No. 3 (0x03) FRU 2 HOT_SWAP*

| Feature | Raw Value/Description | Interpreted Value |
|---|---|---|
| Sensor Name | FRU 2 HOT_SWAP | |
| Type of Measurement | | Hot Swap State of FRU 2, describing the Shelf Manager |
| Class | | Discrete |
| Event/Reading Type | 0x6F | Sensor-specific |
| Sensor Type | 0xF0 | Hot Swap |
| Sensor Owner LUN | 0x00 | |
| Entity ID | 0xF2 | PICMG Shelf Management Controller |
| Entity Instance | 0x61 | |
| Rearm mode | | Auto |
| Event message control | | Entire Sensor only |
| Assertion Event Mask (bytes 15,16) | 0xFF, 0x00 | |
| Deassertion Event Mask (bytes 17,18) | 0x00, 0x00 | |
| Discrete Reading Mask (bytes 19, 20) | 0xFF, 0x00 | Supports 8 Successive States |
| Reading Definition | | According to PICMG 3.0 |

### 2.3.4.2 ShM Fault Event Sensor

The following table describes the discrete ShM Fault Event sensor available on the active SAM.

*Table 2-41 Sensor No. 4 (0x04) Fault Event Sensor*

| Feature | Raw Value/Description | Interpreted Value |
|---|---|---|
| Sensor Name | Shm Fault Event | |
| Type of Measurement | | Status of various classes of software-discovered faults in the ShM |

*Table 2-41 Sensor No. 4 (0x04) Fault Event Sensor (continued)*

| Feature | Raw Value/Description | Interpreted Value |
|---|---|---|
| Class | | Discrete |
| Event/Reading Type | 0x6F | Sensor-specific |
| Sensor Type | 0xDE | OEM-reserved |
| Sensor Owner LUN | 0x00 | |
| Entity ID | 0xF0 | PICMG Shelf Management Controller |
| Entity Instance | 0x01 | |
| Rearm mode | | Auto |
| Event message control | | Entire Sensor only |
| Assertion Event Mask (bytes 15,16) | 0xFE, 0x01 | |
| Deassertion Event Mask (bytes 17,18) | 0xFE, 0x01 | |
| Discrete Reading Mask (bytes 19, 20) | 0xFE, 0x01 | Supports 8 Successive States |
| Reading Definition | | According to SMART EC |

For more information on this sensor, refer to *Fault Event Sensor (SMART EC OEM) on page 121*.

### 2.3.4.3 IPMB Link Sensors

Link sensors describe the status of links to the various controlled IPMCs. Their semantics are defined in PICMG 3.0. For the AXP product, the various Link sensors refer to the IPMB links via the following table:

*Table 2-42 Link-to-IPMC Mapping*

| Link | AXP640 |
|---|---|
| 1 | IPMB Addr 0x9A (Blade slot 1) |
| 2 | IPMB Addr 0x96 (Blade slot 2) |
| 3 | IPMB Addr 0x82 (Blade slot 3) |
| 4 | IPMB Addr 0x84 (Blade slot 4) |

*Table 2-42 Link-to-IPMC Mapping (continued)*

| Link | AXP640 |
|---|---|
| 5 | IPMB Addr 0x98 (Blade slot 5) |
| 6 | IPMB Addr 0x9c (Blade slot 6) |
| 12 | IPMB Addr 0x50 (FTM1) |
| 13 | IPMB Addr 0x52 (FTM2) |
| 14 | IPMB Addr 0x54 (FTM3) |
| 17 | IPMB Addr 0x66 (PEM 1) |
| 18 | IPMB Addr 0x68 (PEM 2) |
| 21 | IPMB Addr 0xFC/0xFF (other SAM) |

*Table 2-43 Sensor No. 5 IPMB LINK 1*

| Feature | Raw Value/Description | Interpreted Value |
|---|---|---|
| Sensor Name | IPMB LINK 1 | |
| Type of Measurement | | IPMB Link 1 State |
| Class | | Discrete |
| Event/Reading Type | 0x6F | Sensor-specific |
| Sensor Type | 0xF1 | IPMB Link |
| Sensor Owner LUN | 0x00 | |
| Entity ID | 0xF0 | PICMG Shelf Management Controller |
| Entity Instance | 0x01 | |
| Rearm mode | | Auto |
| Event message control | | Entire Sensor only |
| Assertion Event Mask (bytes 15,16) | 0x0F, 0x00 | |
| Deassertion Event Mask (bytes 17,18) | 0x00, 0x00 | |
| Discrete Reading Mask (bytes 19, 20) | 0x0F, 0x00 | Supports 4 Successive States |
| Reading Definition | | According to PICMG 3.0 |

*Table 2-44 Sensor No. 6 IPMB LINK 2*

| Feature | Raw Value/Description | Interpreted Value |
|---|---|---|
| Sensor Name | IPMB LINK 2 | |
| Type of Measurement | | IPMB Link 2 State |
| Class | | Discrete |
| Event/Reading Type | 0x6F | Sensor-specific |
| Sensor Type | 0xF1 | IPMB Link |
| Sensor Owner LUN | 0x00 | |
| Entity ID | 0xF0 | PICMG Shelf Management Controller |
| Entity Instance | 0x01 | |
| Rearm mode | | Auto |
| Event message control | | Entire Sensor only |
| Assertion Event Mask (bytes 15,16) | 0x0F, 0x00 | |
| Deassertion Event Mask (bytes 17,18) | 0x00, 0x00 | |
| Discrete Reading Mask (bytes 19, 20) | 0x0F, 0x00 | Supports 4 Successive States |
| Reading Definition | | According to PICMG 3.0 |

*Table 2-45 Sensor No. 8 IPMB LINK 4*

| Feature | Raw Value/Description | Interpreted Value |
|---|---|---|
| Sensor Name | IPMB LINK 4 | |
| Type of Measurement | | IPMB Link 4 State |
| Class | | Discrete |
| Event/Reading Type | 0x6F | Sensor-specific |
| Sensor Type | 0xF1 | IPMB Link |
| Sensor Owner LUN | 0x00 | |

*Table 2-45 Sensor No. 8 IPMB LINK 4 (continued)*

| Feature | Raw Value/Description | Interpreted Value |
|---|---|---|
| Entity ID | 0xF0 | PICMG Shelf Management Controller |
| Entity Instance | 0x01 | |
| Rearm mode | | Auto |
| Event message control | | Entire Sensor only |
| Assertion Event Mask (bytes 15,16) | 0x0F, 0x00 | |
| Deassertion Event Mask (bytes 17,18) | 0x00, 0x00 | |
| Discrete Reading Mask (bytes 19, 20) | 0x0F, 0x00 | Supports 4 Successive States |
| Reading Definition | | According to PICMG 3.0 |

*Table 2-46 Sensor No. 9 IPMB LINK 5*

| Feature | Raw Value/Description | Interpreted Value |
|---|---|---|
| Sensor Name | IPMB LINK 5 | |
| Type of Measurement | | IPMB Link 5 State |
| Class | | Discrete |
| Event/Reading Type | 0x6F | Sensor-specific |
| Sensor Type | 0xF1 | IPMB Link |
| Sensor Owner LUN | 0x00 | |
| Entity ID | 0xF0 | PICMG Shelf Management Controller |
| Entity Instance | 0x01 | |
| Rearm mode | | Auto |
| Event message control | | Entire Sensor only |
| Assertion Event Mask (bytes 15,16) | 0x0F, 0x00 | |

*Table 2-46 Sensor No. 9 IPMB LINK 5 (continued)*

| Feature | Raw Value/Description | Interpreted Value |
|---|---|---|
| Deassertion Event Mask (bytes 17,18) | 0x00, 0x00 | |
| Discrete Reading Mask (bytes 19, 20) | 0x0F, 0x00 | Supports 4 Successive States |
| Reading Definition | | According to PICMG 3.0 |

*Table 2-47 Sensor No. 10 IPMB LINK 6*

| Feature | Raw Value/Description | Interpreted Value |
|---|---|---|
| Sensor Name | IPMB LINK 6 | |
| Type of Measurement | | IPMB Link 6 State |
| Class | | Discrete |
| Event/Reading Type | 0x6F | Sensor-specific |
| Sensor Type | 0xF1 | IPMB Link |
| Sensor Owner LUN | 0x00 | |
| Entity ID | 0xF0 | PICMG Shelf Management Controller |
| Entity Instance | 0x01 | |
| Rearm mode | | Auto |
| Event message control | | Entire Sensor only |
| Assertion Event Mask (bytes 15,16) | 0x0F, 0x00 | |
| Deassertion Event Mask (bytes 17,18) | 0x00, 0x00 | |
| Discrete Reading Mask (bytes 19, 20) | 0x0F, 0x00 | Supports 4 Successive States |
| Reading Definition | | According to PICMG 3.0 |

*Table 2-48 Sensor No. 12 IPMB LINK 13*

| Feature | Raw Value/Description | Interpreted Value |
|---|---|---|
| Sensor Name | IPMB LINK 13 | |
| Type of Measurement | | IPMB Link 13 State |
| Class | | Discrete |
| Event/Reading Type | 0x6F | Sensor-specific |
| Sensor Type | 0xF1 | IPMB Link |
| Sensor Owner LUN | 0x00 | |
| Entity ID | 0xF0 | PICMG Shelf Management Controller |
| Entity Instance | 0x01 | |
| Rearm mode | | Auto |
| Event message control | | Entire Sensor only |
| Assertion Event Mask (bytes 15,16) | 0x0F, 0x00 | |
| Deassertion Event Mask (bytes 17,18) | 0x00, 0x00 | |
| Discrete Reading Mask (bytes 19, 20) | 0x0F, 0x00 | Supports 4 Successive States |
| Reading Definition | | According to PICMG 3.0 |

*Table 2-49 Sensor No. 13 IPMB LINK 14*

| Feature | Raw Value/Description | Interpreted Value |
|---|---|---|
| Sensor Name | IPMB LINK 14 | |
| Type of Measurement | | IPMB Link 14 State |
| Class | | Discrete |
| Event/Reading Type | 0x6F | Sensor-specific |
| Sensor Type | 0xF1 | IPMB Link |
| Sensor Owner LUN | 0x00 | |

*Table 2-49 Sensor No. 13 IPMB LINK 14 (continued)*

| Feature | Raw Value/Description | Interpreted Value |
|---|---|---|
| Entity ID | 0xF0 | PICMG Shelf Management Controller |
| Entity Instance | 0x01 | |
| Rearm mode | | Auto |
| Event message control | | Entire Sensor only |
| Assertion Event Mask (bytes 15,16) | 0x0F, 0x00 | |
| Deassertion Event Mask (bytes 17,18) | 0x00, 0x00 | |
| Discrete Reading Mask (bytes 19, 20) | 0x0F, 0x00 | Supports 4 Successive States |
| Reading Definition | | According to PICMG 3.0 |

*Table 2-50 Sensor No.14 IPMB LINK 17*

| Feature | Raw Value/Description | Interpreted Value |
|---|---|---|
| Sensor Name | IPMB LINK 17 | |
| Type of Measurement | | IPMB Link 17 State |
| Class | | Discrete |
| Event/Reading Type | 0x6F | Sensor-specific |
| Sensor Type | 0xF1 | IPMB Link |
| Sensor Owner LUN | 0x00 | |
| Entity ID | 0xF0 | PICMG Shelf Management Controller |
| Entity Instance | 0x01 | |
| Rearm mode | | Auto |
| Event message control | | Entire Sensor only |
| Assertion Event Mask (bytes 15,16) | 0x0F, 0x00 | |

*Table 2-50 Sensor No.14 IPMB LINK 17 (continued)*

| Feature | Raw Value/Description | Interpreted Value |
|---|---|---|
| Deassertion Event Mask (bytes 17,18) | 0x00, 0x00 | |
| Discrete Reading Mask (bytes 19, 20) | 0x0F, 0x00 | Supports 4 Successive States |
| Reading Definition | | According to PICMG 3.0 |

### 2.3.4.4 Telco Alarm Sensors

The following tables describe the discrete Telco alarm sensors available on the active SAM.

*Table 2-51 Sensor No. 119 TelcoAlarmInput*

| Feature | Raw Value/Description | Interpreted Value |
|---|---|---|
| Sensor Name | TelcoAlarmInput | |
| Type of Measurement | | Inputs to Teleco device |
| Class | | Discrete |
| Event/Reading Type | 0x6F | Sensor-specific |
| Sensor Type | 0xF4 | Telco Alarm |
| Sensor Owner LUN | 0x00 | |
| Entity ID | 0xF0 | PICMG Shelf Management Controller |
| Entity Instance | 0x01 | |
| Rearm mode | | Auto |
| Event message control | | Entire Sensor only |
| Assertion Event Mask (bytes 15,16) | 0x07, 0x00 | |
| Deassertion Event Mask (bytes 17,18) | 0x07, 0x00 | |
| Discrete Reading Mask (bytes 19, 20) | 0x07, 0x00 | Supports 3 States |
| Reading Definition | | According to Pigeon Point |

For more information about Telco Alarm, refer to *Telco Alarms (Pigeon Point OEM) on page 129*.

*Table 2-52 Sensor No. 131 (0x83) Telco Alarms*

| Feature | Raw Value/Description | Interpreted Value |
|---|---|---|
| Sensor Name | Telco Alarms | |
| Type of Measurement | | State of the Telco Alarms |
| Class | | Discrete |
| Event/Reading Type | 0x6F | Sensor-specific |
| Sensor Type | 0xDF | OEM-reserved |
| Sensor Owner LUN | 0x00 | |
| Entity ID | 0xF0 | PICMG Shelf Management Controller |
| Entity Instance | 0x01 | |
| Rearm mode | | Auto |
| Event message control | | Entire Sensor only |
| Assertion Event Mask (bytes 15,16) | 0x00, 0x00 | |
| Deassertion Event Mask (bytes 17,18) | 0x00, 0x00 | |
| Discrete Reading Mask (bytes 19, 20) | 0x07, 0x00 | OEM States |
| Reading Definition | | According to Pigeon Point |

### 2.3.4.5 BMC Watchdog Sensor

The following table describes the discrete BMC Watchdog sensor available on the active SAM.

*Table 2-53 Sensor No. 132 (0x84) BMC Watchdog*

| Feature | Raw Value/Description | Interpreted Value |
|---|---|---|
| Sensor Name | BMC Watchdog | |
| Type of Measurement | | State of the BMC Watchdog on the active SAM |
| Class | | Discrete |

*Table 2-53 Sensor No. 132 (0x84) BMC Watchdog (continued)*

| Feature | Raw Value/Description | Interpreted Value |
|---|---|---|
| Event/Reading Type | 0x6F | Sensor-specific |
| Sensor Type | 0x23 | IPMI Watchdog 2 |
| Sensor Owner LUN | 0x00 | |
| Entity ID | 0xF0 | PICMG Shelf Management Controller |
| Entity Instance | 0x01 | |
| Rearm mode | | Auto |
| Event message control | | Entire Sensor only |
| Assertion Event Mask (bytes 15,16) | 0x0F, 0x01 | |
| Deassertion Event Mask (bytes 17,18) | 0x00, 0x00 | |
| Discrete Reading Mask (bytes 19, 20) | 0x0F, 0x01 | Supports 5 States |
| Reading Definition | | According to IPMI 1.5 |

### 2.3.4.6 System Event

The following table describes the discrete system event sensor available on the active SAM.

*Table 2-54 Sensor No. 133 (0x85) System Event*

| Feature | Raw Value/Description | Interpreted Value |
|---|---|---|
| Sensor Name | System Event | |
| Type of Measurement | | Presence |
| Class | | Discrete |
| Event/Reading Type | 0x6F | Sensor-specific |
| Sensor Type | 0x12 | System Event |
| Sensor Owner LUN | 0x00 | |
| Entity ID | 0xF0 | PICMG Shelf Management Controller |

*Table 2-54 Sensor No. 133 (0x85) System Event (continued)*

| Feature | Raw Value/Description | Interpreted Value |
|---|---|---|
| Entity Instance | 0x01 | |
| Rearm mode | | Auto |
| Event message control | | Entire Sensor only |
| Assertion Event Mask (bytes 15,16) | 0x1F, 0x00 | |
| Deassertion Event Mask (bytes 17,18) | 0x00, 0x00 | |
| Discrete Reading Mask (bytes 19, 20) | 0x1F, 0x00 | Supports 5 Successive States |
| Reading Definition | | According to IPMI 1.5 |

### 2.3.4.7 Cooling State Sensors

The following table describes the discrete sensors available on the active SAM.

*Table 2-55 Sensor No. 135 FT Oper Status*

| Feature | Raw Value/Description | Interpreted Value |
|---|---|---|
| Sensor Name | FT Oper Status | |
| Type of Measurement | | Reports whether all trays defined in the address table are operational |
| Class | | Discrete |
| Event/Reading Type | 0x0B | Discrete, Redundancy |
| Sensor Type | 0x28 | Management Subsystem Health |
| Sensor Owner LUN | 0x00 | |
| Entity ID | 0xF0 | PICMG Shelf Management Controller |
| Entity Instance | 0x01 | |
| Rearm mode | | Auto |
| Event message control | | Entire Sensor only |

*Table 2-55 Sensor No. 135 FT Oper Status (continued)*

| Feature | Raw Value/Description | Interpreted Value |
|---|---|---|
| Assertion Event Mask (bytes 15,16) | 0x00, 0x00 | |
| Deassertion Event Mask (bytes 17,18) | 0x00, 0x00 | |
| Discrete Reading Mask (bytes 19, 20) | 0x03, 0x00 | Supports 2 States |
| Reading Definition | | According to Pigeon Point:<br>0x00: Full Redundancy = all fan trays defined in the Address Table are operational.<br>0x01: Redundancy Lost - some of the fan trays defined in the Address Table are missing or non-operational. |

*Table 2-56 Sensor No. 136 Cooling State*

| Feature | Raw Value/Description | Interpreted Value |
|---|---|---|
| Sensor Name | Cooling State | |
| Type of Measurement | | Reports Cooling Management state |
| Class | | Discrete |
| Event/Reading Type | 0x07 | Discrete, Severity |
| Sensor Type | 0x28 | Management Subsystem Health |
| Sensor Owner LUN | 0x00 | |
| Entity ID | 0xF0 | PICMG Shelf Management Controller |
| Entity Instance | 0x01 | |
| Rearm mode | | Auto |
| Event message control | | Entire Sensor only |
| Assertion Event Mask (bytes 15,16) | 0x00, 0x00 | |

*Table 2-56 Sensor No. 136 Cooling State (continued)*

| Feature | Raw Value/Description | Interpreted Value |
|---|---|---|
| Deassertion Event Mask (bytes 17,18) | 0x00, 0x00 | |
| Discrete Reading Mask (bytes 19, 20) | 0x7F, 0x00 | Supports 6 States |
| Reading Definition | | According to Pigeon Point:<br>0x00: Transition to OK. The coolng state is Normal.<br>0x01: Transition to Non-Critical. from OK. The cooling state is now Minor Alert. The previous cooling state was Normal.<br>0x02: Transition to Critical from less severe. The cooling state is now Major Alert The previous cooling state was either Normal or Minor Alert.<br>0x04: Transition to Non-Critical from more severe. The cooling state is now Minor Alert. The previous cooling state was either Major or Critical Alert.<br>0x05: Transition from Critical to Non-recoverable. The current cooling state is Major Alert. The previous cooling state was Critical Alert.<br>0x06: Transition to Non-recoverable. The current cooling state is now Critical Alert. |

*Table 2-57 Sensor No. 137 Fans State*

| Feature | Raw Value/Description | Interpreted Value |
|---|---|---|
| Sensor Name | Fans State | |
| Type of Measurement | | Reports Cooling Management state |
| Class | | Discrete |

*Table 2-57 Sensor No. 137 Fans State (continued)*

| Feature | Raw Value/Description | Interpreted Value |
|---|---|---|
| Event/Reading Type | 0x07 | Discrete, Severity |
| Sensor Type | 0x28 | Management Subsystem Health |
| Sensor Owner LUN | 0x00 | |
| Entity ID | 0xF0 | PICMG Shelf Management Controller |
| Entity Instance | 0x01 | |
| Rearm mode | | Auto |
| Event message control | | Entire Sensor only |
| Assertion Event Mask (bytes 15,16) | 0x00, 0x00 | |
| Deassertion Event Mask (bytes 17,18) | 0x00, 0x00 | |
| Discrete Reading Mask (bytes 19, 20) | 0x7F, 0x00 | Supports 6 States |

*Table 2-57 Sensor No. 137 Fans State (continued)*

| Feature | Raw Value/Description | Interpreted Value |
|---|---|---|
| Reading Definition | | According to Pigeon Point:<br>0x00: transition to OK. The fans state is Normal (no thresholds are crossed on fan tachometer sensors).<br>0x01: Transition to Non-Critical from OK. The fans state is now Minor Alert (non-critical thresholds are crossed for some tachometer sensors). The previous fans state was Normal.<br>0x02: Transition to Critical from less severe. The fans state is now Major Alert (critical thresholds are crossed for some tachometer sensors), the previous fans state was either Normal or Minor Alert<br>0x04: Transition to Non-Critical from more severe. The fans state is now Minor Alert. The previous fans state was either Major or Critical Alert (non-recoverable thresholds are crossed for some tachometer sensors).<br>0x05: Transition from Critical to Non-recoverable. The current fans state is Major Alert. The previous fans state was Critical Alert.<br>0x06: Transition to Non-recoverable. The current fans state is now Critical Alert. |

### 2.3.4.8 ShM Redundancy Sensor

The following table describes the ShM Redundancy sensor available on the active SAM.This sensor describes the system's current capability to affect a switchover.

*Table 2-58 Sensor No. 135 ShM Redundancy*

| Feature | Raw Value/Description | Interpreted Value |
|---|---|---|
| Sensor Name | ShM Redundancy | |
| Type of Measurement | | Reports the Shelf Manager is capable of redundant operation |
| Class | | Discrete |
| Event/Reading Type | 0x0B | Discrete, Redundancy |
| Sensor Type | 0x28 | Management Subsystem Health |
| Sensor Owner LUN | 0x00 | |
| Entity ID | 0xF0 | PICMG Shelf Management Controller |
| Entity Instance | 0x01 | |
| Rearm mode | | Auto |
| Event message control | | Entire Sensor only |
| Assertion Event Mask (bytes 15,16) | 0x07, 0x00 | |
| Deassertion Event Mask (bytes 17,18) | 0x00, 0x00 | |
| Discrete Reading Mask (bytes 19, 20) | 0x07, 0x00 | Supports 3 States:<br>0x0001: Manager fully redundant<br>0x0002: Redundancy lost. Active Shelf Manager has no backup<br>0x0004: Redundancy degraded. Active Shelf Manager has inactive backup |
| Reading Definition | | |

### 2.3.4.9 Shelf FRU Info Sensor

The following table describes the discrete shelf FRU info sensor available on the physical SAM. For more information on this sensor, refer to *Shelf FRU Info (SMART EC OEM) on page 125*.

*Table 2-59 Sensor No. 17 Shelf FRU*

| Feature | Raw Value/Description | Interpreted Value |
|---|---|---|
| Sensor Name | Shelf FRU Info | |
| Type of Measurement | | Basic validation of the Shelf FRU Info |
| Class | | Discrete |
| Event/Reading Type | 0x09 | 'digital' Discrete |
| Sensor Type | 0xDD | OEM-reserved |
| Sensor Owner LUN | 0x00 | |
| Entity ID | 0xF0 | PICMG Shelf Management Controller |
| Entity Instance | 0x60 | |
| Rearm mode | | Auto |
| Event message control | | Entire Sensor only |
| Assertion Event Mask (bytes 15,16) | 0x03, 0x00 | |
| Deassertion Event Mask(bytes 17,18) | 0x00, 0x00 | |
| Discrete Reading Mask (bytes 19, 20) | 0x03, 0x00 | Supports 2 Successive States |
| Reading Definition | | According to SMART EC |

For more information on this sensor, refer to *Shelf FRU Info (SMART EC OEM) on page 125*.

# 2.4 Fan Tray Module

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

## 2.4.1 FRU Information

This section provides FRU information for the Fan Tray module on the AXP640 shelf.

```
Common Header:    Format Version = 1
Board Info Area:
    Version     = 1
    Language Code            = 25
    Mfg Date/Time           = Jan  1 00:00:00 1996 (0 minutes since 1996)
    Board Manufacturer       = Emerson
    Board Product Name       = Centellis 640 Fan Tray Controller
    Board Serial Number      = XXXXXXX
    Board Part Number        = 0106873J01A
    FRU Programmer File ID   = CENT640_FT_upper.inf
Product Info Area:
    Version     = 1
    Language Code            = 25
    Manufacturer Name        = Emerson
    Product Name             = FTM640
    Product Part / Model#    = 0106857J01A
    Product Version          = Rev.1.00
    Product Serial Number    = XXXXXX
    Asset Tag                =
    FRU Programmer File ID   = CENT640_FT_upper.inf
Multi Record Area:
    Record Type              = 0xc0 OEM Defined Record
        Version = 2
    Manufacturer ID          = 0x0065CD EMERSON
    Record ID                = 0x00
```

## 2.4.2 Fan Tray Module Sensor Overview

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

*Table 2-60 Sensors Overview*

| Sensor Name | Sensor Type |
|---|---|
| Fan HotSwap | HotSwap 0xF0 |
| IPMB0 State | IPMB 0xF1 |
| FW Revision ISC | OEM 0xD6 |
| RPM Fan0 | Fan 0x04 |

*Table 2-60 Sensors Overview (continued)*

| Sensor Name | Sensor Type |
|---|---|
| Deviation Fan0 | OEM 0xD2 |
| Volt + 3.3A | Voltage 0x02 |
| Volt + 3.3B | Voltage 0x02 |
| Fuse A | OEM 0xD2 |
| Fuse B | OEM 0xD2 |
| Air Outlet Tem0 | Temperature 0x01 |
| Air Outlet Tem1 | Temperature 0x01 |

The following tables provide information about all IPMI sensors available on the Fan Tray Module.

*Table 2-61 Fan HotSwap*

| Feature | Value |
|---|---|
| LUN | 0 |
| Nr | 132 (0x84) |
| Sensor Type | HotSwap<br>0xF0 |
| Event Data Byte 1 | 0x00<br>0x02<br>0x04<br>0x08<br>0x10<br>0x20<br>0x40<br>0x80 |

*Table 2-61 Fan HotSwap (continued)*

| Feature | Value |
|---|---|
| Event Data Byte 2 | event cause:<br>0x00: Normal State Change<br>0x01: SHMC Commanded Change<br>0x02: Handle Switch Operator Change<br>0x03: FRU Programmatic Action<br>0x04: Communication Lost<br>0x05: Local Failure<br>0x06: Extraction Surprise change<br>0x07: Provided Info Change<br>0x08: Invalid HW Address<br>0x09: Unexpected Deactivation<br>0x0A: Surprise State Change |
| Event Data Byte 3 | FRU ID |
| Event Threshold Description | 0x00: M0<br>0x02: M1<br>0x04: M2<br>0x08: M3<br>0x10: M4<br>0x20: M5<br>0x40; M6<br>0x80: M7 |
| Event Reading Type | 0x6F: Sensor-specific discrete |

*Table 2-62 IPMB0 State*

| Feature | Value |
|---|---|
| LUN | 0 |
| Nr | 133 (0x85) |
| Sensor Type | IPMB<br>0xF1 |

*Table 2-62 IPMB0 State (continued)*

| Feature | Value |
|---|---|
| Event Data Byte 1 | [7:4] = Ah (OEM code in Event Data 2, OEM code in Event Data 3)<br>[3:0] = Offset<br>00h – IPMB-A disabled, IPMB-B disabled<br>01h – IPMB-A enabled, IPMB-B disabled<br>02h – IPMB-A disabled, IPMB-B enabled<br>03h – IPMB-A enabled, IPMP-B enabled |
| Event Data Byte 2 | [7:4] = Channel Number. For AdvancedTCA®, this will typically be 0h to indicate IPMB-0<br>[3:0] = Reserved |
| Event Data Byte 3 | [7] – IPMB B Override State<br>0b = Override state, bus isolated<br>1b = Local Control state – IPM Controller determines state of bus.<br>[6:4] = IPMB B Local Status<br>0h = No Failure. Bus enabled if no override in effect.<br>1h = Unable to drive clock HI<br>2h = Unable to drive data HI<br>3h = Unable to drive clock LO<br>4h = Unable to drive data LO<br>5h = Clock low timeout<br>6h = Under test (the IPM Controller is attempting to determine if it is causing a bus hang)<br>7h = Undiagnosed Communications Failure<br>[3] – IPMB A Override Status<br>0b = Override status, bus isolated<br>1b = Local Control state – IPM Controller determines state of bus.<br>[2:0] = IPMB A Local Status<br>0h = No Failure. Bus enabled if no override in effect.<br>1h = Unable to drive clock HI<br>2h = Unable to drive data HI<br>3h = Unable to drive clock LO<br>4h = Unable to drive data LO<br>5h = Clock low timeout<br>6h = Under test (the IPM Controller is attempting to determine if it is causing a bus hang)<br>7h = Undiagnosed Communications Failure |

*Table 2-62 IPMB0 State (continued)*

| Feature | Value |
|---|---|
| Event Threshold Description | 0x3 = IPMB A enabled, IPMB-B enabled<br>0x2 = IPMB A disabled, IPMB-B enabled<br>0x1 = IPMB-A enabled, IPMB-B disabled<br>0x0 = IPMB A disabled, IPMB-B disabled |
| Event Reading Type | 0x6F: Sensor-specific discrete |

*Table 2-63 FW Revision ISC*

| Feature | Value |
|---|---|
| LUN | 0 |
| Nr | 136 (0x86) |
| Sensor Type | OEM<br>0xD6 |
| Event Data Byte 1 | 0x0 |
| Event Data Byte 2 | |
| Event Data Byte 3 | |
| Event Threshold Description | 0x0: No events for this sensor. |
| Event Reading Type | 0x6F: Sensor-specific discrete |

*Table 2-64 RPM Fan0*

| Feature | Value |
|---|---|
| LUN | 0 |
| Nr | 0 (0x0) |
| Sensor Type | Fan<br>0x04 |
| Event Data Byte 1 | |
| Event Data Byte 2 | Reading |
| Event Data Byte 3 | |

*Table 2-64 RPM Fan0 (continued)*

| Feature | Value |
|---|---|
| Event Threshold Description | Lower non-recoverable, lower critical, and lower non-critical thresholds are readable and not settable. |
| Event Reading Type | 0x1: Threshold |

*Table 2-65 Deviation Fan0*

| Feature | Value |
|---|---|
| LUN | 0 |
| Nr | 1 (0x1) |
| Sensor Type | OEM<br>0xD2 |
| Event Data Byte 1 | |
| Event Data Byte 2 | Reading |
| Event Data Byte 3 | |
| Event Threshold Description | |
| Event Reading Type | 0x1: OEM |

*Table 2-66 Volt +3.3A*

| Feature | Value |
|---|---|
| LUN | 0 |
| Nr | 2 (0x2) |
| Sensor Type | Voltage 0x02 |
| Event Data Byte 1 | |
| Event Data Byte 2 | Reading |
| Event Data Byte 3 | |
| Event Threshold Description | Lower non-recoverable and upper non-recoverable thresholds are readable and not settable. |
| Event Reading Type | 0x1: Threshold |

*Table 2-67 Volt + 3.3B*

| Feature | Value |
|---|---|
| LUN | 0 |
| Nr | 3 (0x3) |
| Sensor Type | Voltage<br>0x02 |
| Event Data Byte 1 | |
| Event Data Byte 2 | Reading |
| Event Data Byte 3 | |
| Event Threshold Description | Lower non-recoverable and upper non-recoverable thresholds are readable and not settable. |
| Event Reading Type | 0x1: Threshold |

*Table 2-68 Fuse A*

| Feature | Value |
|---|---|
| LUN | 0 |
| Nr | 4 (0x4) |
| Sensor Type | OEM<br>0xD2 |
| Event Data Byte 1 | 0x0<br>0x1 |
| Event Data Byte 2 | Reading |
| Event Data Byte 3 | |
| Event Threshold Description | 0x0: -48v Feed A good<br>0x1: -48V Feed A bad |
| Event Reading Type | 0x6F: Sensor-specific discrete |

*Table 2-69 Fuse B*

| Feature | Value |
|---|---|
| LUN | 0 |
| Nr | 5 (0x5) |
| Sensor Type | OEM<br>0xD2 |
| Event Data Byte 1 | 0x0<br>0x1 |
| Event Data Byte 2 | Reading |
| Event Data Byte 3 | |
| Event Threshold Description | 0x0: -48v Feed B good<br>0x1: -48V Feed B bad |
| Event Reading Type | 0x6F: Sensor-specific discrete<br>0x6F: Sensor-specific discrete |

*Table 2-70 Air Outlet Tem0*

| Feature | Value |
|---|---|
| LUN | 1 |
| Nr | 0 (0x0) |
| Sensor Type | Temperature<br>0x01 |
| Event Data Byte 1 | |
| Event Data Byte 2 | Reading |
| Event Data Byte 3 | |
| Event Threshold Description | Upper non-recoverable, upper critical, upper non-critical, lower non-recoverable, lower critical, and lower non-critical thresholds are readable and not settable. |
| Event Reading Type | 0x1: Threshold |

*Table 2-71 Air Outlet Tem1*

| Feature | Value |
|---|---|
| LUN | 1 |
| Nr | 1 (0x1) |
| Sensor Type | Temperature<br>0x01 |
| Event Data Byte 1 | |
| Event Data Byte 2 | Reading |
| Event Data Byte 3 | |
| Event Threshold Description | Upper non-recoverable, upper critical, upper non-critical, lower non-recoverable, lower critical, and lower non-critical thresholds are readable and not settable. |
| Event Reading Type | 0x1: Threshold |

## 2.4.3 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

### 2.4.3.1 Voltage Sensors

The following sensors measure voltages of the FTM.

*Table 2-72 Sensor No. 2 Volt +3.3A*

| Feature | Raw Value/Description | Interpreted Value |
|---|---|---|
| Sensor Name | +3.3V | |
| Device | | |
| Sensor Type | 0x02 | Voltage |
| Class | 0x01 | Threshold |
| Sensor Owner LUN | 0x00 | |

*Table 2-72 Sensor No. 2 Volt +3.3A (continued)*

| Feature | Raw Value/Description | Interpreted Value |
|---|---|---|
| Entity ID | 0x1E | Fan Tray |
| Entity Instance | 0x60 | |
| Rearm mode | | Auto |
| Hysteresis support | | Readable/Settable |
| Threshold access support | | Not Settable |
| Event message control | | Entire Sensor only |
| Readable threshold mask, Settable threshold mask (bytes 19, 20) | 0x2400 | Upper and Lower Non-Critical, Critical and Non-Recoverable Thresholds are Readable and Settable |
| Reading Type | | Unsigned |
| Lower Non-Recoverable | 0x00 | 2.8000 Volts |
| Upper Non-Recoverable | 0xCB | 3.79064 Volts |

*Table 2-73 Sensor No. 3 Volt +3.3B*

| Feature | Raw Value/Description | Interpreted Value |
|---|---|---|
| Sensor Name | +3.3V | |
| Device | | |
| Sensor Type | 0x02 | Voltage |
| Class | 0x01 | Threshold |
| Sensor Owner LUN | 0x00 | |
| Entity ID | 0x1E | Fan Tray |
| Entity Instance | 0x60 | |
| Rearm mode | | Auto |
| Hysteresis support | | Readable/Settable |
| Threshold access support | | Not Readable |
| Event message control | | Entire Sensor Only |

*Table 2-73 Sensor No. 3 Volt +3.3B (continued)*

| Feature | Raw Value/Description | Interpreted Value |
|---|---|---|
| Readable threshold mask, Settable threshold mask (bytes 19, 20) | 0x2400 | Upper and Lower Non-Critical, Critical and Non-Recoverable Thresholds are Readable and Settable |
| Reading Type | | Unsigned |
| Lower Non-Recoverable | 0x00 | 2.8000 Volts |
| Upper Non-Recoverable | 0xCB | 3.79064 Volts |

### 2.4.3.2 Temperature Sensors

The following sensors measure temperatures of the FTM.

*Table 2-74 Sensor No. 0 Air Outlet Temperature 0*

| Feature | Raw Value/Description | Interpreted Value |
|---|---|---|
| Sensor Name | Air Outlet Tem0 | |
| Device | | |
| Sensor Type | 0x01 | Temperature |
| Class | 0x01 | Threshold |
| Sensor Owner LUN | 0x01 | |
| Entity ID | 0x1E | Fan Tray |
| Entity Instance | 0x60 | |
| Rearm mode | | Auto |
| Hysteresis support | | Readable/Settable |
| Threshold access support | | Not Settable |
| Event message control | | Entire Sensor only |
| Readable threshold mask, Settable threshold mask (bytes 19, 20) | 0x3F00 | Upper and Lower Non-Critical, Critical, Non-Recoverable Thresholds are Readable and Not Settable |
| Reading Type | 0x01 | Signed |
| Upper Non-Critical, Critical and Non-Recoverable thresholds | 0x37, 0x3C, 0x46 | (55, 60, 70) Degrees C |

*Table 2-74 Sensor No. 0 Air Outlet Temperature 0 (continued)*

| Feature | Raw Value/Description | Interpreted Value |
|---|---|---|
| Lower Non-Critical, Critical and Non-Recoverable | 0x05, 0x00, 0xFA | (5, 0, -6) Degrees C |

*Table 2-75 Sensor No. 1 Air Outlet Temperature 1*

| Feature | Raw Value/Description | Interpreted Value |
|---|---|---|
| Sensor Name | Air Outlet Tem1 | |
| Device | | |
| Sensor Type | 0x01 | Temperature |
| Class | 0x01 | Threshold |
| Sensor Owner LUN | 0x01 | |
| Entity ID | 0x1E | Fan Tray |
| Entity Instance | 0x60 | |
| Rearm mode | | Auto |
| Hysteresis support | | Readable/Settable |
| Threshold access support | | Not Settable |
| Event message control | | Entire Sensor only |
| Readable threshold mask, Settable threshold mask (bytes 19, 20) | 0x3F00 | Upper and Lower Non-Critical, Critical, Non-Recoverable Thresholds are Readable and Not Settable |
| Reading Type | 0x01 | Signed |
| Upper Non-Critical, Critical and Non-Recoverable thresholds | 0x37, 0x3C, 0x46 | (55, 60, 70) Degrees C |
| Lower Non-Critical, Critical and Non-Recoverable | 0x05, 0x00, 0xFA | (5, 0, -6) Degrees C |

### 2.4.3.3 Fan Speed Sensors

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

*Table 2-76 Sensor No. 0 RPM Fan 0*

| Feature | Raw Value/Description | Interpreted Value |
|---|---|---|
| Sensor Name | RPM Fan0 | |
| Device | | |
| Sensor Type | 0x04 | Fan |
| Class | 0x01 | Threshold |
| Sensor Owner LUN | 0x00 | |
| Entity ID | 0x1D | Cooling Unit |
| Entity Instance | 0x61 | |
| Rearm mode | | Auto |
| Hysteresis support | | Readable/Not Settable |
| Threshold access support | | Readable/Not Settable |
| Event message control | | Entire Sensor only |
| Readable threshold mask, Settable threshold mask (bytes 19, 20) | 0x0700 | Lower Non-Critical, Critical and Non-Recoverable are Readable and Not Settable |
| Reading Type | | Unsigned |
| Lower Non-Critical, Critical and Non-Recoverable thresholds | 0x11, 0x0D, 0x09 | (1013, 781, 549) RPM |

*Table 2-77 Sensor No. 1 Deviation Fan 0*

| Feature | Raw Value/Description | Interpreted Value |
|---|---|---|
| Sensor Name | Deviation Fan0 | |
| Device | | |
| Sensor Type | 0xD2 | OEM Misc. |
| Class | 0x01 | Threshold |
| Sensor Owner LUN | 0x00 | |

*Table 2-77 Sensor No. 1 Deviation Fan 0 (continued)*

| Feature | Raw Value/Description | Interpreted Value |
|---|---|---|
| Entity ID | 0x1D | Cooling Unit |
| Entity Instance | 0x61 | |
| Rearm mode | | Manual |
| Hysteresis support | | Readable/Not Settable |
| Threshold access support | | Not Readable/Not Settable |
| Event message control | | Entire Sensor only |
| Readable threshold mask, Settable threshold mask (bytes 19, 20) | 0x0000 | Upper and Lower Non-Critical, Critical and Non-Recoverable Thresholds are Not readable and Not settable |
| Reading Type | | Signed |

## 2.4.4 Fan Tray Module Discrete Sensors

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

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

### 2.4.4.1 Hot Swap Sensor

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

*Table 2-78 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 |

*Table 2-78 Sensor No. 0, Hot Swap (continued)*

| Feature | Raw Value/Description | Interpreted Value |
|---|---|---|
| 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 |

### 2.4.4.2 IPMB Link Sensor

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

*Table 2-79 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 |
| 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 |

*Table 2-79 Sensor No. 2, IPMB Physical (continued)*

| Feature | Raw Value/Description | Interpreted Value |
|---|---|---|
| Readable threshold mask, Settable threshold mask (bytes 19, 20) | | |
| Reading Type | | According to PICMG 3.0 |

### 2.4.4.3 OEM-Reserved Sensors

The following table describes the OEM-reserved sensors available on the FTM.

*Table 2-80 Sensor No. 4 Fuse 48V A*

| Feature | Raw Value/Description | Interpreted Value |
|---|---|---|
| Sensor Name | Fuse A | |
| Type of Measurement | | |
| Class | 0x03 | Discrete |
| Sensor Type | 0xD2 | OEM Misc. |
| Sensor Owner LUN | 0x00 | |
| Entity ID | 0x1E | Fan Tray |
| Entity Instance | 0x60 | |
| Rearm mode | | Auto |
| Event message control | | Entire Sensor only |
| Assertion Event Mask (bytes 15,16) | 0x01, 0x00 | |
| Deassertion Event Mask (bytes 17,18) | 0x01, 0x00 | |
| Discrete Reading Mask (bytes 19, 20) | 0x01, 0x00 | Supports 2 States |
| Reading Definition | | Assertion signals a fuse failure |

*Table 2-81 Sensor No. 5 Fuse 48V B*

| Feature | Raw Value/Description | Interpreted Value |
|---|---|---|
| Sensor Name | Fuse B | |
| Type of Measurement | | |
| Class | 0x03 | Discrete |
| Sensor Type | 0xD2 | OEM Misc. |
| Sensor Owner LUN | 0x00 | |
| Entity ID | 0x1E | Fan Tray |
| Entity Instance | 0x60 | |
| Rearm mode | | Auto |
| Event message control | | Entire Sensor only |
| Assertion Event Mask (bytes 15,16) | 0x01, 0x00 | |
| Deassertion Event Mask (bytes 17,18) | 0x01, 0x00 | |
| Discrete Reading Mask (bytes 19, 20) | 0x01, 0x00 | Supports 2 States |
| Reading Definition | | Assertion signals a fuse failure |

*Table 2-82 Sensor No. 136 FW Revision ISC*

| Feature | Raw Value/Description | Interpreted Value |
|---|---|---|
| Sensor Name | FW Revision ISC | |
| Type of Measurement | | |
| Class | 0x03 | Discrete |
| Sensor Type | 0xD6 | OEM Firmware Revision |
| Sensor Owner LUN | 0x00 | |
| Entity ID | 0x1E | |
| Entity Instance | 0x60 | |

*Table 2-82 Sensor No. 136 FW Revision ISC (continued)*

| Feature | Raw Value/Description | Interpreted Value |
|---|---|---|
| Rearm mode | | Auto |
| Event message control | | Entire Sensor only |
| Assertion Event Mask (bytes 15,16) | 0x00, 0x00 | |
| Deassertion Event Mask (bytes 17,18) | 0x00, 0x00 | |
| Discrete Reading Mask (bytes 19, 20) | 0xff, 0x7f | |
| Reading Definition | | Returns value of the ISC firmware revision |

*Table 2-83 Sensor No. 1 IPMC State*

| Feature | Raw Value/Description | Interpreted Value |
|---|---|---|
| Sensor Name | FAN IPMC | |
| Type of Measurement | | |
| Class | 0x03 | Discrete |
| Sensor Type | 0xD5 | OEM IPMC State |
| Sensor Owner LUN | 0x03 | |
| Entity ID | 0x1E | |
| Entity Instance | 0x60 | |
| Rearm mode | | Auto |
| Event message control | | Entire Sensor only |
| Assertion Event Mask (bytes 15,16) | 0x0F, 0x00 | |
| Deassertion Event Mask (bytes 17,18) | 0x00, 0x00 | |
| Discrete Reading Mask (bytes 19, 20) | 0x0F, 0x00 | Supports 2 States |
| Reading Definition | | IPMC State |

# 2.5 Power Entry Module

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

## 2.5.1 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 PEM1000 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           = Jan  1 00:00:00 1996 (0 minutes since 1996)
    Board Manufacturer       = Emerson
    Board Product Name       = Centellis 640 DC POWER ENTRY MODULE
    Board Serial Number      = 0000000
    Board Part Number        = 0106875J01B
    FRU Programmer File ID   = CENT640_PEM.inf
Product Info Area:
    Version     = 1
    Language Code            = 25
    Manufacturer Name        = Emerson
    Product Name             = PEM640
    Product Part / Model#    = 0106857K01B
    Product Version          = Rev.1.00
    Product Serial Number    = 000000
    Asset Tag                =
    FRU Programmer File ID   = CENT640_PEM.inf
Multi Record Area:
    Record Type              = 0xc0 OEM Defined Record
        Version = 2
    Manufacturer ID          = 0x0065CD EMERSON
    Record ID                = 0x00
```

## 2.5.2 Power Entry Module Sensor Overview

The following table lists all power entry analog and discrete sensors.

*Table 2-84 Sensors Overview*

| Sensor Name | Sensor Type |
|---|---|
| Volt + 3.3A | Voltage<br>0x02 |
| Volt + 3.3B | Voltage<br>0x02 |
| 48V DC Voltage Sensor | Voltage<br>0x02 |
| 48V DC Current Sensor | Current<br>0x03 |
| Air Outlet Tem0 | Temperature<br>0x01 |
| Air Outlet Tem1 | Temperature<br>0x01 |
| PEM HotSwap | HotSwap<br>0xF0 |
| IPMB0 State | IPMB<br>0xF1 |
| Fan Fuse | OEM<br>0xD2 |
| 48V Fuse | OEM<br>0xD2 |
| Circuit Breaker | OEM<br>0xD2 |

## 2.5.3 Power Entry Module Analog Sensor

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

*Table 2-85 Volt + 3.3A*

| Feature | Value |
|---|---|
| Sensor Type | Voltage 0x02 |
| Event Data Byte 1 | |
| Event Data Byte 2 | Reading |
| Event Data Byte 3 | |
| Event Threshold Despcription | Lower non-recoverable and upper non-recoverable thresholds are readable and not settable. |
| Event Reading Type | 0x1: Threshold |

*Table 2-86 Volt + 3.3B*

| Feature | Value |
|---|---|
| Sensor Type | Voltage<br>0x02 |
| Event Data Byte 1 | |
| Event Data Byte 2 | Reading |
| Event Data Byte 3 | |
| Event Threshold Despcription | Lower non-recoverable and upper non-recoverable thresholds are readable and not settable. |
| Event Reading Type | 0x1: Threshold |

*Table 2-87 48V DC Voltage Sensor*

| Feature | Value |
|---|---|
| Sensor Type | Voltage<br>0x02 |
| Event Data Byte 1 | |
| Event Data Byte 2 | Reading |

*Table 2-87 48V DC Voltage Sensor (continued)*

| Feature | Value |
|---|---|
| Event Data Byte 3 | |
| Event Threshold Despcription | Lower non-recoverable and upper non-recoverable thresholds are readable and not settable. |
| Event Reading Type | 0x1: Threshold |

*Table 2-88 48V DC Current Sensor*

| Feature | Value |
|---|---|
| Sensor Type | Current 0x03 |
| Event Data Byte 1 | |
| Event Data Byte 2 | Reading |
| Event Data Byte 3 | |
| Event Threshold Despcription | Lower non-recoverable and upper non-recoverable thresholds are readable and not settable. |
| Event Reading Type | 0x1: Threshold |

*Table 2-89 Air Outlet Tem0*

| Feature | Value |
|---|---|
| Sensor Type | Temperature<br>0x01 |
| Event Data Byte 1 | |
| Event Data Byte 2 | Reading |
| Event Data Byte 3 | |
| Event Threshold Despcription | Upper non-recoverable, upper critical, upper non-critical, lower non-recoverable, lower critical, and lower non-critical thresholds are readable and not settable. |
| Event Reading Type | 0x1: Threshold |

*Table 2-90 Air Outlet Tem1*

| Feature | Value |
|---|---|
| Sensor Type | Temperature<br>0x01 |
| Event Data Byte 1 | |
| Event Data Byte 2 | Reading |
| Event Data Byte 3 | |
| Event Threshold Despcription | Upper non-recoverable, upper critical, upper non-critical, lower non-recoverable, lower critical, and lower non-critical thresholds are readable and not settable. |
| Event Reading Type | 0x1: Threshold |

## 2.5.4 Power Entry Module Discrete Sensor

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

*Table 2-91 PEM HotSwap*

| Feature | Value |
|---|---|
| Sensor Type | HotSwap<br>0xF0 |
| Event Data Byte 1 | 0x00<br>0x02<br>0x04<br>0x08<br>0x10<br>0x20<br>0x40<br>0x80 |

*Table 2-91 PEM HotSwap (continued)*

| Feature | Value |
|---|---|
| Event Data Byte 2 | event cause:<br>0x00: Normal State Change<br>0x01: SHMC Commanded Change<br>0x02: Handle Switch Operator Change<br>0x03: Fru Programmatic Action<br>0x04: Communication Lost<br>0x05: Local Failure<br>0x06: Extraction Surprise change<br>0x07: Provided Info Change<br>0x08: Invalid HW Address<br>0x09: Unexpected Deactivation<br>0x0A: Surprise State Change |
| Event Data Byte 3 | FRU ID |
| Event Threshold Despcription | 0x00: M0<br>0x02: M1<br>0x04: M2<br>0x08: M3<br>0x10: M4<br>0x20: M5<br>0x40; M6<br>0x80: M7 |
| Event Reading Type | 0x6F: Sensor-specific discrete |

*Table 2-92 IPMB0 State*

| Feature | Value |
|---|---|
| Sensor Type | IPMB<br>0xF1 |
| Event Data Byte 1 | [7:4] = Ah (OEM code in Event Data 2, OEM code in Event Data 3)<br>[3:0] = Offset<br>00h – IPMB-A disabled, IPMB-B disabled<br>01h – IPMB-A enabled, IPMB-B disabled<br>02h – IPMB-A disabled, IPMB-B enabled<br>03h – IPMB-A enabled, IPMP-B enabled |

*Table 2-92 IPMB0 State (continued)*

| Feature | Value |
|---|---|
| Event Data Byte 2 | [7:4] = Channel Number. For AdvancedTCA®, this will typically be 0h to<br>indicate IPMB-0<br>[3:0] = Reserved |
| Event Data Byte 3 | [7] – IPMB B Override State<br>0b = Override state, bus isolated<br>1b = Local Control state – IPM Controller determines state of bus.<br>[6:4] = IPMB B Local Status<br>0h = No Failure. Bus enabled if no override in effect.<br>1h = Unable to drive clock HI<br>2h = Unable to drive data HI<br>3h = Unable to drive clock LO<br>4h = Unable to drive data LO<br>5h = Clock low timeout<br>6h = Under test (the IPM Controller is attempting to determine if it is<br>causing a bus hang)<br>7h = Undiagnosed Communications Failure<br>[3] – IPMB A Override Status<br>0b = Override status, bus isolated<br>1b = Local Control state – IPM Controller determines state of bus.<br>[2:0] = IPMB A Local Status<br>0h = No Failure. Bus enabled if no override in effect.<br>1h = Unable to drive clock HI<br>2h = Unable to drive data HI<br>3h = Unable to drive clock LO<br>4h = Unable to drive data LO<br>5h = Clock low timeout<br>6h = Under test (the IPM Controller is attempting to determine if it is<br>causing a bus hang)<br>7h = Undiagnosed Communications Failure |

*Table 2-92 IPMB0 State (continued)*

| Feature | Value |
|---|---|
| Event Threshold Despcription | 0x3 = IPMB A enabled, IPMB-B enabled<br>0x2 = IPMB A disabled, IPMB-B enabled<br>0x1 = IPMB-A enabled, IPMB-B disabled<br>0x0 = IPMB A disabled, IPMB-B disabled |
| Event Reading Type | 0x6F: Sensor-specific discrete |

*Table 2-93 Fan Fuse*

| Feature | Value |
|---|---|
| Sensor Type | OEM<br>0xD2 |
| Event Data Byte 1 | 0x0<br>0x1 |
| Event Data Byte 2 | Reading |
| Event Data Byte 3 | |
| Event Threshold Despcription | 0x0: -48v Feed A good<br>0x1: -48V Feed A bad |
| Event Reading Type | 0x6F: Sensor-specific discrete |

*Table 2-94 48V Fuse*

| Feature | Value |
|---|---|
| Sensor Type | OEM<br>0xD2 |
| Event Data Byte 1 | 0x0<br>0x1 |
| Event Data Byte 2 | Reading |
| Event Data Byte 3 | |
| Event Threshold Despcription | 0x0: -48v Feed A good<br>0x1: -48V Feed A bad |
| Event Reading Type | 0x6F: Sensor-specific discrete<br>0x6F: Sensor-specific discrete |

*Table 2-95 Circuit Breaker*

| Feature | Value |
|---|---|
| Sensor Type | OEM<br>0xD2 |
| Event Data Byte 1 | 0x0<br>0x1 |
| Event Data Byte 2 | Reading |
| Event Data Byte 3 | |
| Event Threshold Despcription | 0x0: -Circuit Breaker good<br>0x1: -Circuit Breaker bad |
| Event Reading Type | 0x6F: Sensor-specific discrete |

# OEM Sensors

## 3.1 OEM Sensors

This section describes the various OEM sensors provided by SMART EC and Pigeon Point Systems that are located on the SAM.

These sensors are added to provide additional capabilities to diagnose shelf conditions. For some sensors, events (posted to the SEL event log and sent via IPMI to subscribers such as the ATCA-F125) can be used to further refine diagnosis. When OEM sensors provide events, the event data is also described in the sections that follow.

Following are the sensors presented by the Physical SAM (IPMI Addresses 0xFC and 0XFE):

*Table 3-1 Sensors Overview*

| Sensor Name | Sensor Type | Owner |
|---|---|---|
| *PSU Status* | 0xE4 | SMART EC OEM |
| *PSU Alert* | 0xE5 | SMART EC OEM |
| *Fuse Sensors* | 0xE6 | SMART EC OEM |
| *AXP Backplane ID Sensor (SMART EC OEM)* | 0xDB | SMART EC OEM |
| *Fault Event Sensor (SMART EC OEM)* | 0xDC | SMART EC OEM |
| *POST Results Sensor (SMART EC OEM)* | | SMART EC OEM |
| *Shelf FRU Info (SMART EC OEM)* | 0xDD | SMART EC OEM |
| *Hot Swap Controller Status (SMART EC OEM)* | 0xF0 | SMART EC OEM |
| *FPGA Build Rev Sensor (SMART EC OEM)* | 0xE1 | SMART EC OEM |
| *Port Status Sensor (SMART EC OEM)* | 0xE2 | SMART EC OEM |
| *CPLD State Sensor (SMART EC OEM)* | 0xDE | SMART EC OEM |
| *Reboot Reason Sensor (Pigeon Point OEM)* | 0xDD | Pigeon Point OEM |

Following are the sensors presented by the Virtual Shelf Manager (IPMI Address 0x20):

*Table 3-2 Sensors on Virtual Shelf Manager*

| Sensor Name | Sensor Type | Owner |
|---|---|---|
| *ShM Fault Event Sensor (SMART EC OEM)* | 0xDE | SMART EC OEM |
| *Telco Alarms (Pigeon Point OEM)* | 0xF4 | Pigeon Point OEM |

### 3.1.1 PSU Status

This sensor allows the status of the System AC PSUs to be read.

- Sensor Reading - No meaning; always 0.
- Current State Mask

```
Bit 7 0      DC OK PSU 4
Bit 6 0      DC OK PSU 3
Bit 4 0      DC OK PSU 1
Bit 3 0      AC OK PSU 4
Bit 2 0      AC OK PSU 3
Bit 1 0      AC OK PSU 2
Bit 0 0      AC OK PSU 1
```

### 3.1.2 PSU Alert

This sensor monitors Failures on Feed A or Feed B raising an event in case of Feed failures over A or B.

- Sensor Reading

```
08:  Alert on Feed A
80:  Alert on Feed B
88:  Alert on Feed A and Feed B
```

- Current State Mask

```
8:  No status change
4:  Status change on Feed A
2:  Status change on Feed B
1: Status change on both Feeds
```

- Events:

  An event is generated upon status change of Feed A or Feed B with the event interpretation as below:

  Event Byte 1:

```
bits 7-4:  "1010"
bits 3-0:
  1:     Event sent for Feed A
  2:     Event sent for Feed B
  3:     Event sent for Feed A and Feed B
```

### 3.1.3 Fuse Sensors

The fuse sensors monitor the 48 V fuse lines.

- Sensor Reading - No meaning: always 0.
- Current State Mask

  `01: Fuse Status NOK`

  `00: Fuse Status OK`

### 3.1.4 AXP Backplane ID Sensor (SMART EC OEM)

This sensor reports the ID number of the IPMB backplane type. The AXP640 contain a readable value which reports a unique identifier of the backplane type. While the main purpose of this sensor is to report the unique ID of the backplane, it can also be used to determine if a SAM has connectivity problems to the backplane. This sensor is available on each physical ShMM controller.

- Sensor Reading - Unique identification number of the backplane

  `0x09: AXP640`
- Current State Mask:

  `0x00 = No failure reading ID`

  `0x01 = ECC check failed on read value`
- Events - No events are generated by this sensor.

### 3.1.5 Fault Event Sensor (SMART EC OEM)

This sensor reports the status of various software-detectable faults on the physical SAM and ShM cards. The presence of one of these faults typically indicates a failure of one or more components on the cards. When such a fault is detected, a bit in the State Mask in this sensor is raised, and an event is issued. Often, the data present in the event contains additional information as to the cause of the fault.

By default, if a fault is detected on an active ShM and there is a backup ShM available for duty, most of these faults cause the ShM to reboot (thus effecting a switchover to the backup ShM). The behavior of the ShM can be configured to not reboot by configuring the Severity of Fault Classes. (See the **clia faultcfg** command in clia application.)

Once a fault is detected, the bit remains on in the Fault Sensor State Mask until the fault is cleared. If cleared, a deassertion event is generated and the State Mask bit is also cleared.

- Sensor Reading - No meaning; always 0.
- Current State Mask - A bit-map of Fault Classes currently detected as active, according to the following table

*Table 3-3 Fault Event Active Fault Classes*

| State (Fault Class) | Bit Mask | Meaning | Comments |
|---|---|---|---|
| 0 | 0x0001 | Switchover Initiated | Event contains additional information regarding the cause of the switchover (see below). |
| 1 | 0x0002 | FPGA CRC Error | Indicates failure in SAM640 FPGA. Software attempts to clear the CRC error before rebooting. |
| 2 | 0x0004 | PCI Bus Failure | Inability to read a basic register. Event contains additional information regarding the specific failure. |
| 3 | 0x0008 | ADM1024 Unreadable | Event contains additional information. |
| 4 | 0x0010 | Telco Alarm Unreadable | Event contains additional information. |
| 5 | 0x0020 | FRU Presence Unreadable | Inability to read a basic register. |
| 6 | 0x0040 | Shelf ID Unreadable | Inability to read a basic register. |
| 7 | 0x0080 | HW Addr Unreadable | Inability to read a basic register. |
| 8 | 0x0100 | IPMB Locked | IPMB subsystem has failed. Event contains additional information. |
| 9 | 0x0200 | No Redundancy Ethernet | The Ethernet connection to the other ShM has failed. |
| 10 | 0x0400 | No Hub Backplane Ethernet | The Ethernet to the hub backplane (ATCA-F125s) has failed. Event contains additional information. |
| 11 | 0x0800 | Critical Voltage | One or more voltage sensors on the ShM are critical. Events (for this and voltage sensor) contain additional information. |
| 12 | 0x1000 | FruInfo EEPROM failure | EEPROM (either on the SAM or on the ADP) is unreadable or fail the CRC check. Event contains additional information. |

- Events - An event is generated on each transition for any Fault Class, either for transitioning **into** or **away from** a fault condition. For many Fault Classes, additional information is provided in the event to categorize the fault.

  Event Assertion flag: The assertion flag is set if any aspect of the Fault Class being reported is in a fault state. It is clear ("deasserted") if the Fault Class is transitioning into a non-fault state.

  Event Byte 1

  bits 7-4: "0110"

  bits 3-0: the Fault Class transitioning

  Event Byte 2

  bits 7-4: The severity of the fault condition (configurable by **clia faultcfg**)

  0000 – none (only on clearing/deassertion events)

  0001 – minor (reported, no action)

  0010 – major (system reboots only if active SHM with backup SHM available)

  0011 – critical (SHM reboots ~ 1 second following event)

  bits 3-0: "1111"

  Event Byte 3

  meaning depends on fault class, according to the following table:

*Table 3-4 Event Byte 3 Fault Class*

| Fault Class | Event Byte 3 |
|---|---|
| 0 | Defines cause of switchover:<br>0x00: **clia terminate** command<br>0x01: **clia switchover** command performed at local ShMM<br>0x02: **clia switchover** command performed at other ShMM<br>0x03: failed redundancy protocol (backup ShMM only)<br>0x04: active and backup ShMMs are reporting incompatible carriers<br>0x05: IPMC command |
| 1 | 0x01 |
| 2 | Bit-mask of sub-classes:<br>0x01: PCI Failure reading CRC Error register<br>0x02: PCI Failure reloading FPGA<br>0x04: PCI Failure reading FRU Presence |

*Table 3-4 Event Byte 3 Fault Class (continued)*

| Fault Class | Event Byte 3 |
|---|---|
| 3 | 0xFF: No I2C Device<br>Other: Register Address of unreadable ADM1024 register |
| 4 | Bit-mask of sub-classes:<br>0x01: Telco Alarm Relay Register unreadable<br>0x02: Telco Alarm LED Register unreadable<br>0x04: Telco Alarm Cutoff Register unreadable |
| 5 | 0x01 |
| 6 | 0x01 |
| 7 | Bit-mask of sub-classes:<br>0x01: Failure to read HA0<br>0x02: Failure to read HA1 |
| 8 | Bit-mask of sub-classes:<br>0x01: IPMB status register unreadable<br>0x02: All IPMBs report SDA stuck low<br>0x04: All IPMBs report SCL stuck low |
| 9 | 0x01 |
| 10 | Bit-mask of sub-classes:<br>0x01: eth interface (to Broadcom Switch) is ‘down’<br>0x02: Broadcom Switch reports memory test failure |
| 11 | Bit-mask of sub-classes:<br>0x01: 3.3V<br>0x02: 3.3V to ADP<br>0x04: Combined 12V<br>0x08: 1.8V Eth<br>0x10: 1.2V FPGA |
| 12 | Bit-mask of sub-classes:<br>0x01: Carrier Info EEPROM, Open File error<br>0x02: Carrier Info EEPROM, Read error<br>0x04: Carrier Info EEPROM, CRC error<br>0x08: Shelf Fru EEPROM 1 Access error<br>0x10: Shelf Fru EEPROM 1 CRC error<br>0x20: Shelf Fru EEPROM 2 Access error<br>0x40: Shelf Fru EEPROM 2 CRC error<br>0x80: Shelf FRU EEPROMs have different data |

## 3.1.6 POST Results Sensor (SMART EC OEM)

This sensor reports the results of the U-Boot POST tests. This sensor is available on each physical ShMM controller. POST results are reported in an 8-bit bit-field. Any bit that is set (set to 1) indicates that the respective POST failure occurred.

- Sensor Reading - POST State in a 8-bit value according to the following mask definition:

  ```
  Bit 7 - RTC
  Bit 6 - Watchdog
  Bit 5 - CRC
  Bit 4 - Ethernet
  Bit 3 - UART
  Bit 2 - I2C
  Bit 1 - Memory
  Bit 0 - IPMB
  ```

- Current State Mask:

  ```
  0x01 = POST Passed
  0x02 = POST Failed
  ```

- Events - Events are generated at shelf manager start up that will report failure events for each individual test that fails as follows:

  ```
  Event Data Byte 1 = 0x61
  Event Data Byte 2 = 0x3F
  POST Sensor Reading = Bit 0 (IPMB)
                        Bit 1 (Memory)
                        Bit 2 (I2C)
                        Bit 3 (UART)
                        Bit 4 (Ethernet)
                        Bit 5 (CRC)
                        Bit 6 (Watchdog)
                        Bit 7 (RTC)
  ```

## 3.1.7 Shelf FRU Info (SMART EC OEM)

This sensor reports the validity of the Shelf FRU Information. This sensor is available on Virtual Shelf Manager. The check it performs is basic checksum and length checks based on information of previous sections of the FRU area; and key bytes that are expected to have certain values.

- Sensor Reading0x00 (meaningless since discrete sensor reading)
- Current State Mask:

```
0x01 Shelf FRU Info not found (Disabled)
0x02 Shelf FRU Info found (Enabled)
```

- Events - Events are generated when the state of the FRU Info found state changes.

  Event Data Byte 1:

  ```
  0x01 Shelf FRU Info not found (Disabled)
  0x02 Shelf FRU Info found (Enabled)
  ```

  Event Data Byte 2

  0xFF (Unspecified)

  Event Data Byte 3

  0xFF (Unspecified)

## 3.1.8 Hot Swap Controller Status (SMART EC OEM)

These sensors provide a snapshot of the Status registers on the LTC4260 Hot Swap Controller devices on the SAM640. There are two LTC4260 devices, labeled “A” and “B” for the two power sources.

Some of the bits in this status register signify error conditions. When the state of an error-related bit changes, an event (either an “assertion” or “deassertion”) is generated on behalf of these sensors.

- Sensor Reading - No meaning; always 0.
- Current State Mask - A bit-map according to the following table.

| State | Bit Mask | Meaning | Error Related? |
|---|---|---|---|
| 0 | 0x0001 | Overvoltage | Y |
| 1 | 0x0002 | Undervoltage | Y |
| 2 | 0x0004 | Overcurrent | Y |
| 3 | 0x0008 | Power Bad | Y |
| 4 | 0x0010 | Board Present | N |
| 5 | 0x0020 | FET Short | Y |
| 6 | 0x0040 | GPIO Input | N |
| 7 | 0x0080 | FET On | N |

- Events - An event is generated on each transition for any error-related state change, either transitioning **into** or **away from** a fault condition. Event Byte data bits 2 and 3 are 0xFF (undefined).

## 3.1.9 FPGA Build Rev Sensor (SMART EC OEM)

The SAM640 contains a programmable FPGA which controls access to many devices, including IPMBs. This sensor provides Build Revision information on the firmware currently loaded into the SAM640's FPGA.

No events are generated on behalf of this sensor.

- Sensor Reading:

  bits 7:4 Major version number (BCD)
  bits 3:0: Minor version number (BCD)

- Current State Mask - No meaning, always 0

## 3.1.10 Port Status Sensor (SMART EC OEM)

This sensor provides information on port status (link up/down) on various auxiliary ports on the SAM.

In some cases ('Inter-SAM' Serial Port Status), the lack of a link (when the other ShM is present) could indicate a real problem. In other cases, the port status is informational (such as Front Panel Ethernet, which merely reports whether the Ethernet connector is connected).

- Sensor Reading - 0, no meaning
- Current State Mask - A bit-map according to the following table.

| State | Bit Mask | Meaning |
|---|---|---|
| 0 | 0x0001 | Inter-SAM Serial Link 1 Down |
| 1 | 0x0002 | Inter-SAM Serial Link 2 Down |
| 8 | 0x0100 | Local Hub Slot Ethernet Down |
| 9 | 0x0200 | Remote Hub Slot Ethernet Down |
| 10 | 0x0400 | Front Panel Ethernet Down |

- Events - An event is generated on each transition for any state bit, ("Asserted" for transitioning to link-down, "Deasserted" for transitioning to link-up). Event Byte data bits 2 and 3 are 0xFF (undefined).

## 3.1.11 CPLD State Sensor (SMART EC OEM)

This sensor provides information on the CPLD register contents. The CPLD register defines several status bits relating to redundancy-readiness of the system.

- Sensor Reading - correspond to bits 15-8 of the CPLD register
- Current State Mask - A bit-map according to the following table:

| State | Bit Mask | Meaning |
|---|---|---|
| 0 | 0x0001 | Active ShM with no backup |
| 1 | 0x0002 | Active ShM with backup |
| 2 | 0x0004 | Backup ShM |
| 4 | 0x0010 | Backup, No Remote Presence |
| 5 | 0x0020 | Backup, No Remote SWR |
| 6 | 0x0040 | Backup, Active Healthy |
| 7 | 0x0080 | Active, No Remote Presence |
| 8 | 0x0100 | Active, No Remote Healthy |
| 9 | 0x0200 | Active, No Active |
| 10 | 0x0400 | No Local Presence |
| 11 | 0x0800 | Active, No Backup Remote Healthy |
| 12 | 0x1000 | Active, No Backup Remote SWR |

- Events - An event is generated on each transition.

## 3.1.12 Reboot Reason Sensor (Pigeon Point OEM)

This sensor provides information on the reason that the SAM was last reset or rebooted.

For more information about Reboot Reason Sensor, refert to the *Reboot Reason Sensor section in the Pegion Point Shelf Manager User Guide*.

## 3.1.13 ShM Fault Event Sensor (SMART EC OEM)

This sensor reports the status of Fault Classes on the Active shelf. When the value is read it indicates the presence or absence of each fault class. Currently defined fault classes relate to the health of the FTMs in the shelf.

- Sensor Reading - This is a 2-byte bit mask of active fault conditions detected by the sensor. A '1' in any bit indicates the specified fault is active. Refer to the following table for fault classes.
- Current State Mask:
  `0x1FE - mask of possible fault event bits`
- Events - For FTM-related faults, an event is generated when any FTM transitions into or out of a fault condition. An event is flagged as an assertion event when at least one FTM exhibits the fault class. It is flagged as a deassertion event when no FTMs remain with the fault class.

| State (Fault Class) | Bit Mask | Meaning |
|---|---|---|
| 0 | 0x0001 | Not used |
| 1 | 0x0002 | Not used |
| 2 | 0x0004 | Not used on SAM640 |
| 3 | 0x0008 | Not used |
| 4 | 0x0010 | Not used |
| 5 | 0x0020 | Not used |
| 6 | 0x0040 | Not used |
| 7 | 0x0080 | One or more fan trays' speed sensors do not show significant increase when the active shelf manager increases the speed level to its maximum value as part of the Fan Tray Latent Fault Check algorithm. (PSOC LFC test) |
| 8 | 0x0100 | One or more fan trays' speed sensors do not return to a normal speed following the lowering of the speed level by the active shelf manager, as part of the Fan Tray Latent Fault Check algorithm. (PSOC test) |

## 3.1.14 Telco Alarms (Pigeon Point OEM)

The ShM implements the alarm generation mechanism as part of the platform event filtering (PEF) framework. An OEM action in PEF is implemented as alarm generation. The ShM implements the alarm sensor in its own sensor space.

The sensor type for this sensor is OEM specific, currently chosen to be DFh. The sensor is a discrete sensor with three states:

- State 0 reflects the presence of the Critical alarm
- State 1 reflects the presence of the Major alarm
- State 2 reflects the presence of the Minor alarm

Changes in the states of this sensor may be mapped to events using regular IPMI mechanisms.

Subsequently, platform event filtering may be used to specify actions, such as chassis reset or power cycle, that should be invoked for these events, or alerts to be sent to remote destinations (including the System Manager).

The alarm sensor is recorded in the device SDR repository maintained by the ShM. The command Re-Arm Sensor Events can be used by the ShM to clear active Major and Minor alarms.

The ShM tracks the current state of alarms and the alarm cutoff input line and modifies the state of alarm LEDs accordingly. When the alarm cutoff signal gets activated, the ShM stops generating the alarms to the external output, but maintains the alarm state internally. The alarm LED(s) is (are) left blinking during that time. When the alarm cutoff signal gets deactivated, the state of external outputs and LEDs is restored according to the current state of the alarms (Minor and Major alarms may still be cleared while alarm cutoff is active).

Alarm cutoff is deactivated automatically after a timeout defined as a configuration parameter (see PPS user guide for the Shmm 500 for more details about TELCO Alarms configuration parameters).

# 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 | Document Number |
|---|---|
| ATCA-F125 Installation and Use | 6806800J94 |
| Basic Blade Services Software on ATCA-F125 Programmer's Reference | 6806800L83 |

## 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*

| Document Title | Source |
|---|---|
| Pigeon Point Shelf Manager User Guide | |
| Pigeon Point Shelf Manager External Interface Reference | |
| **IPMI Specifications,** http://www.intel.com/design/servers/ipmi | |
| IPMI Spec v1.5, Document Revision 1.1, February 20, 2002 | Intel Corporation, Hewlett-Packard, DEC, NEC |
| IPMI v1.5 Addenda, Errata, and Clarifications, Addendum Document Revision 5, January 29, 2004 | Intel Corporation, Hewlett-Packard, DEC, NEC |
| Intelligent Platform Management Interface Specification v1.0, Document Revision 1.1, November 15 1999 | Intel Corporation, Hewlett-Packard, NEC, Dell |
| IPMI Implementer's Guide, Draft Version 0.7, September 16, 1998 | Intel Corporation |
| IPMI Platform Management FRU Information Storage Definition V1.0, September 27, 1999 | Intel Corporation |
| **PCI Industrial Manufacturers Group (PICMG)** http://www.picmg.com/ | |
| AdvancedTCA Base 3.0 Specification, Revision 2.0 | PICMG 3.0 R 2.0,Dated 03/18/05 |