IPMI Firmware User Guide

for the

AM4010

Module

Manual ID: 36363, Rev. Index 1.1
Firmware: SK-IPMI-AM4010, EKS Idx 0101
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Kontron Modular Computers GmbH may be contacted via the following:

MAILING ADDRESS

Kontron Modular Computers GmbH

Sudetenstraße 7

D - 87600 Kaufbeuren Germany

TELEPHONE AND E-MAIL

+49 (0) 800-SALESKONTRON

sales@kontron.com

For further information about other Kontron products, please visit our Internet web site: www.kontron.com

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4. Introduction

4.1 Acronym Definitions

AMC	Advanced Mezzanine Card
BSP	Board Support Package
DMI	Desktop Management Interface
FRU	Field Replaceable Unit
FWH	Firmware Hub
I^2C	Inter-Integrated Circuit
IPMB	Intelligent Platform Management Bus
IPMB-0	AdvancedTCA shelf-level IPMB
IPMB-L	Local, on-carrier IPMB that links the carrier IPMC with the MMCs of installed modules
IPMC	Intelligent Platform Management Controller located on AMC carrier
IPMI	Intelligent Platform Management Interface
IOL	IPMI over LAN. An MMC is accessed via LAN, not IPMB
KCS	Keyboard Controller Style
MMC	Module Management Controller – an IPMI controller located on the AMC module
MP	Management Power
PICMG	PCI Industrial Computer Manufacturer Group
PWR	Payload Power
SDR	Sensor Data Record
SDRR	Sensor Data Record Repository
SEL	System Event Log
SMBIOS	System Management BIOS
SMS	System Management Software (designed to run under the OS)
SOL	Serial over LAN. A serial interface is redirected by LAN using the RMCP+ protocol.

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4.2 Related Documentation

IPMI specifications: (http://www.intel.com/design/servers/ipmi/spec.htm)

- IPMI-Intelligent Platform Management Interface Specification. Second Generation v2.0, February 12, 2004 (part)
- [2] IPMI- Platform Management FRU Information Storage Definition v1.0, Document Revision 1.1, September 1999

PICMG specifications: http://www.picmg.org

- PICMG® AMC.0 R1.0 - Advanced Mezzanine Card Base Specification
- PICMG® AMC.1 R1.0 - PCI Express and Advanced Switching on AdvancedMC
- PICMG® AMC.2 R1.0 – AMC Gigabit Ethernet/10 Gigabit XAUI Ethernet

Open tool's documentation

- [1] Ipmitool documentation: http://ipmitool.sourceforge.net
- OpenIPMI documentation: http://www.openipmi.sourceforge.net

Kontron manuals and specifications: http://www.kontron.com/

- AM4010 User's Guide
- [3] AM4010 Linux Board Support Package

As a hot-swappable field replaceable unit (FRU), the AM4010 follows the stringent carrier grade RASM feature set, namely - Reliability, Availability, Serviceability, Maintainability.

Built in accordance to the AMC.0 specification, the AM4010 is also AMC.1 and AMC.2 compliant and is easily managed via IPMI v1.5/v2.0.

As with every Advanced Mezzanine Card (AMC) the AM4010 is equipped with a Module Management Controller (MMC).

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5. Introduction

5.1 IPMI in AdvancedMC / AdvancedTCA Environment

The Module Management Controller is a crucial component of any AMC module. Besides acting as a regular IPMI management controller (sensor monitoring, event logging, etc.), it also provides an interface to all necessary data related to module power requirements and implemented interfaces (E-Keying). Further, it plays an active role in the module hot swap state management. The carrier IPMI Controller (IPMC) communicates with the MMC using the local IPMB (IPMB-L) bus. In an ATCA/AMC environment, it is the IPMC that actually turns on/off module (payload) power. However, before the IPMC enables the module payload power, various criteria must be satisfied by both the carrier and the module, including power requirements and capabilities, matching interfaces, current module hot swap state, and any other special conditions as specified by the Shelf Manager policy.

5.2 The Module Management Controller Hardware

On the AM4010 module, the MMC is implemented using the Renesas H8S/2166 controller with 512 kB of internal flash and 40 kB of RAM. An additional 1 MB serial EEPROM chip provides redundant firmware image storage. A separate 32 kB serial EEPROM chip is used for firmware private data and 4 kB FRU Inventory storage.

The MMC circuit implements two local Keyboard Style Interfaces (KCS) with interrupt support for communication with system side management software and the IPMB-L bus for interconnection with the IPMC.

IPMI over LAN (IOL) is supported by two Ethernet channels.

The MMC implements a wide range of sensors that permit the monitoring of:

- main power voltages: +12V (PWR), +5V, +3.3V, +3.3V (MP), +1.5V, +1.8V, +0.9V (DDR)
- temperatures: CPU die, MCH die, board inlet and outlet near CPU, board inlet and outlet near MCH
- Power Good, LAN links, IPMB link, NMI and SMI lines, board reset, post code, boot error, processor hot (>100 °C), IPMB-L state, Health error, IPMI watchdog etc.

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6. MMC Firmware

6.1 Key Features

- compliant with the related IPMI and PICMG® specifications (refer to 4.2, Related Documentation)
- firmware designed and specially made for AdvancedMC environments
- supports two KCS interfaces with interrupt support
- supports the local IPMB (IPMB-L) interface
- out of band management and monitoring using IPMB-L interface permits access to sensors regardless of module CPU state
- sensor thresholds fully configurable
- sensor names prefixed with AMC module Bay ID (A1…4, B1…4)
- Usable in µTCA slots 1…12. Sensor names for slots 9…12 are prefixed with R9…R12
- complete IPMI watchdog functionality
- complete FRU functionality (refer to 6.7)
- firmware can be updated in the field (refer to 6.4.2)
- two firmware banks implemented, firmware bank management is done by the open tool ipmitool (function fwum) [1] (refer to 6.4.1)
- downloading new firmware image does not break currently running firmware activities (refer to 6.4.2).
- manual and automatic firmware image roll-back (in case of upgrade failure). Refer to 6.4.2.
- firmware customizable per BIOS menu or per OEM IPMI commands (refer to 6.5)
- interoperable with other AMC, ATCA, or IPMI solutions
- OEM board supervision and control extensions such as firmware hub select and boot order configuration (refer to 6.2.2)
- BIOS supervisor and automated switch to recover image from second firmware hub (refer to 6.10)
- Serial over LAN (SOL, refer to 6.12.5) support
- IPMI over LAN (IOL, refer to 6.12.4) support
- Graceful shutdown support (refer to 6.11)
- “Health” LED shows heartbeat and pulses if a KCS interface is active. The “out-of-service” (OOS) LED pulses when IPMB-L is active (refer to 7).
- If the carrier supplies an external clock 3 the module will use it. Otherwise the module will use the internal PCIe clock (refer to 6.9).

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6.2 Supported IPMI Commands

6.2.1 Standard commands

Part of the command list in IPMI specification 2.0

M = mandatory, O = optional

	IPMI 2.0 Spec. section	NetFn	CMD	Kontron support On MMC
IPM Device "Global" Commands				**M**
Get Device ID	20.1	App	01h	M / **Yes [3]**
Cold Reset	20.2	App	02h	O / **Yes**
Warm Reset	20.3	App	03h	O / No
Get Self Test Results	20.4	App	04h	O / **Yes**
Manufacturing Test On	20.5	App	05h	O / No
Set ACPI Power State	20.6	App	06h	O / No
Get ACPI Power State	20.7	App	07h	O / No
Get Device GUID	20.8	App	08h	O / No
Broadcast "Get Device ID"	20.9	App	01h	M / **Yes**
BMC Watchdog Timer Commands				**O**
Reset Watchdog Timer	27.5	App	22h	O / **Yes**
Set Watchdog Timer	27.6	App	24h	O / **Yes**
Get Watchdog Timer	27.7	App	25h	O / **Yes**

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BMC Device and Messaging Commands				**O**
Set BMC Global Enables	22.1	App	2Eh	O / **Yes**
Get BMC Global Enables	22.2	App	2Fh	O / **Yes**
Clear Message Flags	22.3	App	30h	O / **Yes**
Get Message Flags	22.4	App	31h	O / **Yes**
Enable Message Channel Receive	22.5	App	32h	O / **Yes**
Get Message	22.6	App	33h	O / **Yes**
Send Message	22.7	App	34h	O / **Yes**
Read Event Message Buffer	22.8	App	35h	O / **Yes**
Get BT Interface Capabilities	22.9	App	36h	O / **Yes**
Get System GUID	22.14	App	37h	O / No
Get Channel Authentication Capabilities	22.13	App	38h	O / **Yes**
Get Session Challenge	22.15	App	39h	O / **Yes**
Activate Session	22.17	App	3Ah	O / **Yes**
Set Session Privilege Level	22.18	App	3Bh	O / **Yes**
Close Session	22.19	App	3Ch	O / **Yes**
Get Session Info	22.20	App	3Dh	O / **Yes**
Get AuthCode	22.21	App	3Fh	O / No
Set Channel Access	22.22	App	40h	O / **Yes**
Get Channel Access	22.23	App	41h	O / **Yes**
Get Channel Info	22.24	App	42h	O / **Yes**
Set User Access	22.26	App	43h	O / **Yes**
Get User Access	22.27	App	44h	O / **Yes**
Set User Name	22.28	App	45h	O / **Yes**
Get User Name	22.29	App	46h	O / **Yes**
Set User Password	22.30	App	47h	O / **Yes**
Activate Payload	24.1	App	48h	O / **Yes**
Deactivate Payload	24.2	App	49h	O / **Yes**
Get Payload Activation Status	24.4	App	4Ah	O / **Yes**
Get Payload Instance Info	24.5	App	4Bh	O / **Yes**
Set User Payload Access	24.6	App	4Ch	O / **Yes**
Get User Payload Access	24.7	App	4Dh	O / **Yes**
Get Channel Payload Support	24.8	App	4Eh	O / **Yes**
Get Channel Payload Version	24.9	App	4Fh	O / **Yes**
Get Channel OEM Payload Info	24.10	App	50h	O / No
Master Write-Read	22.11	App	52h	O / **Yes**
Get Channel Cipher Suits	22.15	App	54h	O / No
Suspend/Resume Payload Encryption	24.3	App	55h	O / **Yes**
Set Channel Security Keys	22.25	App	56h	O / No
Get System Interface Capabilities	22.9	App	57h	O / No

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Chassis Device Commands				**O / Yes**
Get Chassis Capabilities	28.1	Chassis	00h	O / **Yes**
Get Chassis Status	28.2	Chassis	01h	O / **Yes**
Chassis Control	28.3	Chassis	02h	O / No
Chassis Reset	28.4	Chassis	03h	O / No
Chassis Identify	28.5	Chassis	04h	O / No
Set Chassis Capabilities	28.7	Chassis	05h	O / No
Set Power Restore Policy	28.8	Chassis	06h	O / No
Get System Restart Cause	28.11	Chassis	07h	O / No
Set System Boot Options	28.12	Chassis	08h	O / No
Get System Boot Options	28.13	Chassis	09h	O / No
Get POH Counter	28.14	Chassis	0Fh	O / **Yes [1]**
Event Commands				**M**
Set Event Receiver	29.1	S/E	01h	M / **Yes**
Get Event Receiver	29.2	S/E	02h	M / **Yes**
Platform Event (a.k.a. “Event Message”)	29.3	S/E	03h	M / **Yes**
PEF and Alerting Commands				**O**
Get PEF Capabilities	30.1	S/E	10h	O / No
Arm PEF Postpone Timer	30.2	S/E	11h	O / No
Set PEF Configuration Parameters	30.3	S/E	12h	O / No
Get PEF Configuration Parameters	30.4	S/E	13h	O / No
Set Last Processed Event ID	30.5	S/E	14h	O / No
Get Last Processed Event ID	30.6	S/E	15h	O / No
Alert Immediate	30.7	S/E	16h	O / No
PET Acknowledge	30.8	S/E	17h	O / No

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Sensor Device Commands				**M**
Get Device SDR Info	35.2	S/E	20h	M / **Yes**
Get Device SDR	35.3	S/E	21h	M / **Yes**
Reserve Device SDR Repository	35.4	S/E	22h	M / **Yes**
Get Sensor Reading Factors	35.5	S/E	23h	O / No
Set Sensor Hysteresis	35.6	S/E	24h	O / **Yes**
Get Sensor Hysteresis	35.7	S/E	25h	O / **Yes**
Set Sensor Threshold	35.8	S/E	26h	O / **Yes**
Get Sensor Threshold	35.9	S/E	27h	O / **Yes**
Set Sensor Event Enable	35.10	S/E	28h	O / **Yes**
Get Sensor Event Enable	35.11	S/E	29h	O / **Yes**
Re-arm Sensor Events	35.12	S/E	2Ah	O / No
Get Sensor Event Status	35.13	S/E	2Bh	O / No
Get Sensor Reading	35.14	S/E	2Dh	M / **Yes**
Set Sensor Type	35.15	S/E	2Eh	O / No
Get Sensor Type	35.16	S/E	2Fh	O / No
FRU Device Commands				**M**
Get FRU Inventory Area Info	34.1	Storage	10h	M / **Yes**
Read FRU Data	34.2	Storage	11h	M / **Yes**
Write FRU Data	34.3	Storage	12h	M / **Yes**
SDR Device Commands				**O**
Get SDR Repository Info	33.9	Storage	20h	O / No
Get SDR Repository Allocation Info	33.10	Storage	21h	O / No
Reserve SDR Repository	33.11	Storage	22h	O / No
Get SDR	33.12	Storage	23h	O / No
Add SDR	33.13	Storage	24h	O / No
Partial Add SDR	33.14	Storage	25h	O / No
Delete SDR	33.15	Storage	26h	O / No
Clear SDR Repository	33.16	Storage	27h	O / No
Get SDR Repository Time	33.17	Storage	28h	O / No
Set SDR Repository Time	33.18	Storage	29h	O / No
Enter SDR Repository Update Mode	33.19	Storage	2Ah	O / No
Exit SDR Repository Update Mode	33.20	Storage	2Bh	O / No
Run Initialization Agent	33.21	Storage	2Ch	O / No

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SEL Device Commands				**O**
Get SEL Info	40.2	Storage	40h	O / No
Get SEL Allocation Info	40.3	Storage	41h	O / No
Reserve SEL	40.4	Storage	42h	O / No
Get SEL Entry	40.5	Storage	43h	O / No
Add SEL Entry	40.6	Storage	44h	O / No
Partial Add SEL Entry	40.7	Storage	45h	O / No
Delete SEL Entry	40.8	Storage	46h	O / No
Clear SEL	40.9	Storage	47h	O / No
Get SEL Time	40.10	Storage	48h	O / No
Set SEL Time	40.11	Storage	49h	O / No
Get Auxiliary Log Status	40.12	Storage	5Ah	O / No
Set Auxiliary Log Status	40.13	Storage	5Bh	O / No
LAN Device Commands				**O**
Set LAN Configuration Parameters	23.1	Transport	01h	O / **Yes**
Get LAN Configuration Parameters	23.2	Transport	02h	O / No
Suspend BMC ARPs	23.3	Transport	03h	O / **Yes**
Get IP/UDP/RMCP Statistics	23.4	Transport	04h	O / **Yes**
Serial/Modem Device Commands				**O**
Set Serial/Modem Configuration	25.1	Transport	10h	O / No
Get Serial/Modem Configuration	25.2	Transport	11h	O / No
Set Serial/Modem Mux	25.3	Transport	12h	O / No
Get TAP Response Codes	25.4	Transport	13h	O / No
Set PPP UDP Proxy Transmit Data	25.5	Transport	14h	O / No
Get PPP UDP Proxy Transmit Data	25.6	Transport	15h	O / No
Send PPP UDP Proxy Packet	25.7	Transport	16h	O / No
Get PPP UDP Proxy Receive Data	25.8	Transport	17h	O / No
Serial/Modem Connection Active	25.9	Transport	18h	O / No
Callback	25.10	Transport	19h	O / No
Set User Callback Options	25.11	Transport	1Ah	O / No
Get User Callback Options	25.12	Transport	1Bh	O / No
SOL Activating	26.1	Transport	20h	O / **Yes**
Get SOL Configuration Parameters	26.2	Transport	21h	O / **Yes**
Set SOL Configuration Parameters	26.3	Transport	22h	O / **Yes**

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Bridge Management Commands (ICMB)				**O**
Get Bridge State	[ICMB]	Bridge	00h	O / No
Set Bridge State	[ICMB]	Bridge	01h	O / No
Get ICMB Address	[ICMB]	Bridge	02h	O / No
Set ICMB Address	[ICMB]	Bridge	03h	O / No
Set Bridge Proxy Address	[ICMB]	Bridge	04h	O / No
Get Bridge Statistics	[ICMB]	Bridge	05h	O / No
Get ICMB Capabilities	[ICMB]	Bridge	06h	O / No
Clear Bridge Statistics	[ICMB]	Bridge	08h	O / No
Get Bridge Proxy Address	[ICMB]	Bridge	09h	O / No
Get ICMB Connector Info	[ICMB]	Bridge	0Ah	O / No
Get ICMB Connection ID	[ICMB]	Bridge	0Bh	O / No
Send ICMB Connection ID	[ICMB]	Bridge	0Ch	O / No
Discovery Commands (ICMB)				**O**
Prepare For Discovery	[ICMB]	Bridge	10h	O / No
Get Addresses	[ICMB]	Bridge	11h	O / No
Set Discovered	[ICMB]	Bridge	12h	O / No
Get Chassis Device ID	[ICMB]	Bridge	13h	O / No
Set Chassis Device ID	[ICMB]	Bridge	14h	O / No
Bridging Commands (ICMB)				**O**
Bridge Request	[ICMB]	Bridge	20h	O / No
Bridge Message	[ICMB]	Bridge	21h	O / No
Event Commands (ICMB)				**O**
Get Event Count	[ICMB]	Bridge	30h	O / No
Set Event Destination	[ICMB]	Bridge	31h	O / No
Set Event Reception State	[ICMB]	Bridge	32h	O / No
Send ICMB Event Message	[ICMB]	Bridge	33h	O / No
Get Event Destination	[ICMB]	Bridge	34h	O / No
Get Event Reception State	[ICMB]	Bridge	35h	O / No
OEM Commands for Bridge NetFn				**O**
OEM Commands	[ICMB]	Bridge	C0h-FEh	O / No
Other Bridge Commands				**O**
Error Report	[ICMB]	Bridge	FFh	O / No

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AdvancedTCA®[10]	PICMG® 3.0 Table			**M**
Get PICMG Properties	3-9	PICMG	00h	M / **Yes**
Get Address Info	3-8	PICMG	01h	N/A
Get Shelf Address Info	3-13	PICMG	02h	N/A
Set Shelf Address Info	3-14	PICMG	03h	N/A
FRU Control	3-22	PICMG	04h	M / **Yes [2]**
Get FRU LED Properties	3-24	PICMG	05h	M / **Yes**
Get LED Color Capabilities	3-25	PICMG	06h	M / **Yes**
Set FRU LED State	3-26	PICMG	07h	M / **Yes**
Get FRU LED State	3-27	PICMG	08h	M / **Yes**
Set IPMB State	3-51	PICMG	09h	N/A
Set FRU Activation Policy	3-17	PICMG	0Ah	N/A
Get FRU Activation Policy	3-18	PICMG	0Bh	N/A
Set FRU Activation	3-16	PICMG	0Ch	N/A
Get Device Locator Record ID	3-29	PICMG	0Dh	M / **Yes**
Set Port State	3-41	PICMG	0Eh	N/A
Get Port State	3-42	PICMG	0Fh	N/A
Compute Power Properties	3-60	PICMG	10h	N/A
Set Power Level	3-62	PICMG	11h	N/A
Get Power Level	3-61	PICMG	12h	N/A
Renegotiate Power	3-66	PICMG	13h	N/A
Get Fan Speed Properties	3-63	PICMG	14h	N/A
Set Fan Level	3-65	PICMG	15h	N/A
Get Fan Level	3-64	PICMG	16h	N/A
Bused Resource	3-44	PICMG	17h	N/A
Get IPMB Link Info	3-49	PICMG	18h	N/A
AMC	AMC.0 Table			
Set AMC Port State	Table 3-27	PICMG	19h	O / **Yes**
Get AMC Port State	Table 3-28	PICMG	20h	O / **Yes**

[1] Response byte 2: hours, byte 3: minutes after module start. Bytes 4..6: void

[2] Request byte 3: = only 04h (quiesced) implemented.

[3] Has oem extensions. Please refer to 6.2.2.1, Get Device ID command with OEM extensions

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6.2.2 OEM Commands and Extensions

6.2.2.1 Get Device ID command with OEM extensions

	LUN	NetFn	CMD
Get Device ID command with OEM extensions	00h	App = 06h	01h

	Byte	Data Field
Request Data	-	-
Response Data	1	Completion Code
	2:12	Regular Get Device ID Command response fields
	13	Release index (e.g. 101 denotes release index 1.01) Please note: Some tools offer this as “SDR version”.
	14	Module Geographical Address (site number): 1 … 8 = Module in AMC bay A1, A2 ,A3, A4, B1, B2, B3, B4 or in µTCA slot 1 … 8 with bus addresses 72h, 74h, 76h, 78h, 7ah, 7ch, 7eh, 80h 9 …12 = Module in µTCA slot 9 … 12 with bus addresses 82h, 84h, 86h,88h 0, > 12 = Module position is not in range. The IPMB-L bus is switched off (ref. to 8.3).
	15	Reserved
	16	Reserved

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6.2.2.2 Set Firmware Parameters

The command below permits the selection of interrupts to be used during KCS communication. The value of FFh instructs MMC not to drive the interrupt request line at all, while the value of 07h forces it to use the ISA style IRQ7 line. Please refer to chapter 6.5 of this manual for further details regarding MMC configuration.

	LUN	NetFn	CMD
Set Firmware Parameters	03h	OEM = 3Eh	05h

	Byte	Data Field
Request data	1	Reserved B4h
	2	Reserved 90h
	3	Reserved 91h
	4	Reserved 8Bh
	5	Cmd Flags [6:2] Reserved [1] 0b = get only [0] 0b = do not reset
	6	Operating Modes [7:5] Reserved [4] Reserved [3:1] Reserved [0] Reserved (=1b)
	7	IRQ number FFh = do not use interrupts 0Ah = use IRQ10 0Bh = use IRQ11 Any other values Reserved.
Response data	1	Completion code
	2	Cmd Flags
	3	Operating Modes
	4	IRQ number

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6.2.2.3 Set Control State (Firmware Hub, Boot Order)

	LUN	NetFn	CMD
Set Control State (Firmware Hub, Boot Order)	00h	OEM = 3Eh	20h

	Byte	Data Field
Request data	1	Control ID 00h: Firmware Hub Flash Select 9Dh: Boot Order Configuration
	2	Control State (refer to AM4010 User Guide) 00h .. 01h for control ID = Firmware Hub Flash Select 00h .. FFh for control ID = Boot Order Configuration. (These settings are stored in EEPROM and applied (to logic) each time the MMC detects power-on) 00h: No override, boot as usual 01h: Next boot device is: Floppy 02h: Next boot device is: HDD 03h: Next boot device is: CD 04h: Next boot device is: Network
Response data	1	Completion code

6.2.2.4 Get Control State (Firmware Hub, Boot Order)

	LUN	NetFn	CMD
Get Control State (Firmware Hub, Boot Order)	00h	OEM = 3Eh	21h

	Byte	Data Field
Request data	1	Control ID 00h Firmware Hub Flash Select 9Dh Boot Order Configuration
Response data	1	Completion code
	4	Control State (refer to AM4010 User Guide) 00h .. 01h for control ID = Firmware Hub Flash Select 00h .. FFh for control ID = Boot Order Configuration

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6.2.2.5 OEM Module Quiescence Feedback

Overview

Please refer to 6.11, Hot Swap.

If the OS doesn't fully support ACPI this command provides support to control a graceful shut down of the AM4010. There is a Graceful Reboot and Shutdown Daemon (grnsd) for Linux included in the newest Linux BSPs being offered by Kontron. It works as being described in the following (refer to "Usage for a self written shut down daemon" below).

If ACPI is fully supported this command can be used to set a timeout time for the case that the ACPI means (ACPI daemon etc.) are unable to shut down the system in time. As a default value at system start this time is set to 0 (endless wait).

Usage for a self written shut down daemon

This command normally is used by a shut down daemon in a non ACPI supporting software environment. If a timeout time has to be set to avoid an endless waiting for the sleep state the daemon calls this command after system start with the "set quiesce wait timeout" bit set and the "Quiesce wait timeout" time <> 0. Afterwards the daemon calls this command cyclically with the "OS daemon present" bit set. When the MMC gets a FRU Control (Quiesce) request from the carrier (e.g. during a Hot Swap sequence) it sets the "quiesce request (FRU Control)" bit in its command response. After the daemon sees this bit set in the response it should shut down the system. After having set the "quiesce request (FRU Control)" bit the MMC starts the timeout timer (if a timeout time was defined) and monitors the sleep signal line to recognize the sleep state which should be caused by the shut down. When the MMC detects the sleep state (signal) or it receives a command with the "quiescence acknowledge" bit set or the timeout timer has expired, the MMC sends a "Module Hot Swap event" message to the carrier, and in the following the payload power will be switched off.

If no daemon is announced as present

If no command call announces that a daemon is present, the MMC automatically uses the default timeout time 0 (endless wait) during the Hot Swap process. But if the timeout time was set to a value 1…255 by this time will be used in any case while waiting for the sleep state (signal).

	LUN	NetFn	CMD
OEM Module Quiescence Feedback	00h	OEM = 3Eh	40h

	Byte	Data Field
Request data	1	Control bits: [7] - 1b = set quiesce wait timeout [6] - 1b = quiescence acknowledge (OS ready) [5] - 1b = OS daemon present [4:0] Reserved

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	2	Quiesce wait timeout [sec] a) An OS daemon is present (refer to bits above): This is the maximum time from the moment on that the MMC receives FRU Control (Quiesce) request until it sends back the appropriate Module Hot Swap event message. b) No OS daemon is present (refer to bits above): This is the maximum time from the moment on that the MMC receives FRU Control (Quiesce) request until it sends back the appropriate Module Hot Swap event message. If sleep state is recognized before timeout then the Module Hot Swap event message will be sent immediately. If the time is set to 0 (default after reset) then the Module Hot Swap event message will only be sent after recognition of sleep state (signal).
Response data	1	Completion code: 00h
	2	Control bits: [7] - Reserved [6] - 1b = quiescence acknowledge (OS ready) [5] - 1b = OS daemon present [4] - 1b = quiesce request (FRU Control) [3] - Reserved [2] - 1b = graceful reboot request (FRU Control) [1] - 1b = quiescence reached (MMC acknowledge) [0] - 1b = module hot swap switch opened
	3	Quiesce wait timeout (valid only if OS daemon present = 1)

Settings changed with this command are volatile (in particular quiesce timeout and OS daemon present). Bits [6:5] are always settable, but once the quiesce request comes they cannot be cleared until quiescence state is entered and exited.

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6.3 Sensors Implemented on the AM4010

The MMC includes many sensors for voltage or temperature monitoring and various others for pass/fail type signal monitoring.

Every sensor is associated with a Sensor Data Record (SDR). Sensor Data Records contain information about the sensors identification such as sensor type, sensor name, sensor unit. SDRs also contain the configuration of a specific sensor such as threshold/hystheresis, event generation capabilities that specifies sensor behavior. Some field of the sensor SDR are configurable through IPMI v1.5 command and are set to built-in initial value. Finally one field which is the sensor owner must reflect the module addresses that allow the AMC Carrier to identify the owner of the SDR when it is scanned from the module management controller and merged within the AMC Carrier Device SDR repository.

From IPMI perspective, the MMC is set up as a satellite management controller (SMC). It does support sensor devices, and uses the IPMI static sensor population feature of IPMI v1.5. All SDRs can be queried using Device SDR commands to the MMC.

The sensor name in its SDR has a name prefix which after module insertion is automatically adapted to the physical position of the module in a carrier or in a µTCA chassis. The format of this prefix is

- in AMC bay 1…8 or µTCA slot 1…8: ‘A1:’, ‘A2:’, ‘A3:’, ‘A4:’, ‘B1:’, ‘B2:’, ‘B3:’, ‘B4:’.
- in µTCA slot 9…12: ‘R9:’, ‘Ra:’, ‘Rb:’, ‘Rc:’.

Please note that in the case that the module is installed elsewhere, then the IPMB-L address of the module is unknown and the interface is off.

Module sensors that have been implemented are listed in the sensor list below.

6.3.1 Sensor List

For OEM (Kontron) specific sensor types and codes in the following table please refer to chapter 6.3.2.

SENSOR NAME	SENSOR TYPE (CODE) / EVENT/READING TYPE (CODE)	Ass. Mask / Deass. Mask / Reading Mask	DESCRIPTION	Causes red Health LED on error
IPMI Info-1	OEM Firmware Info 1 (C0h) / OEM (70h)	0003h / 0000h / 7FFFFh	For internal use only	N
IPMI Info-2	OEM Firmware Info 2 (C0h) / OEM (71h)	0003h / 0000h / 7FFFFh	For internal use only	N
IPMI Watchdog	Watch dog (23h) / Sensor-specific	010Fh / 0000h / 010Fh	Watchdog 2	Y
FRU Agent	OEM (C5h) / Discrete (0Ah)	0140h / 0000h / 0147h	FRU agent	N

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ModuleHotSwap	OEM (F2h) / Sensor-specific	0007h / 0000h / 0007h	Hot swap sensor	N
IPMBL State	OEM (C3h) / Sensor-specific	000Fh / 0000h / 000Fh	State of IPMB-L bus	N
Storage Err	Management subsystem health (28h) / Sensor-specific	0002h / 0000h	Storage error	N
Board Reset	OEM (C4h) / Sensor-specific	04DEh / 0000h	Board reset event	Y
Board 3.3V	Voltage (02h) / Threshold (01h)	2204h / 2204h / 1212h	Board 3.3V supply	Y
Board 3.3vIPM	Voltage (02h) / Threshold (01h)	2204h / 2204h / 1212h	AMC Management Power (MP) 3.3V	Y
Board 12.0v	Voltage (02h) / Threshold (01h)	2204h / 2204h / 1212h	AMC Payload Power (PWR) 12V	Y
Board 1.8V	Voltage (02h) / Threshold (01h)	2204h / 2204h / 1212h	Board 1.8V supply	Y
Board Vtt0.9V	Voltage (02h) / Threshold (01h)	2204h / 2204h / 1212h	DDR termination supply	Y
Board 5.0V	Voltage (02h) / Threshold (01h)	2204h / 2204h / 1212h	Board 5V supply	Y
Board 1.5V	Voltage (02h) / Threshold (01h)	2204h / 2204h / 1212h	Board 1.5V supply	Y
Temp CPU	Temperature (01h) / Threshold (01h)	0280h / 3280h / 1818h	CPU die temperature	Y
Temp MCH	Temperature (01h) / Threshold (01h)	0280h / 3280h / 1818h	MCH die temperature	Y
Temp CPU In	Temperature (01h) / Threshold (01h)	0280h / 3280h / 1818h	Inlet temperature near CPU	Y
Temp AMC Out	Temperature (01h) / Threshold (01h)	0280h / 3280h / 1818h	Outlet temperature near AMC connector	Y
Temp AMC In	Temperature (01h) / Threshold (01h)	0280h / 3280h / 1818h	Inlet temperature near AMC connector	Y
Temp CPU Out	Temperature (01h) / Threshold (01h)	0280h / 3280h / 1818h	Outlet temperature near CPU	Y
CPU status	Processor (07h) / Sensor-specific (6Fh)	0002h / 0002h / 0002h	CPU thermal alarm sensor	N

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POST Value	OEM Post Value (C6h) / OEM (78h)	0000h / 0000h / 00FFh	POST Value (from host I/O port 80h)	N
FWH0 Boot Err	Boot Error (1Eh) / Sensor-specific	0008h / 0008h / 0008h	Firmware Hub 0 boot error	Y
FWH1 Boot Err	Boot Error (1Eh) / Sensor-specific	0008h / 0008h / 0008h	Firmware Hub 1 boot error	Y
Pwr Good	Power supply (08h) / OEM (77h)	0000h / 0000h / 18B7h	Statuses of all power lines	N
Pwr Good Evt	Power supply (08h) / OEM (77h)	0000h / 18B7h / 18B7h	Power fail events for all power lines	Y
Board NMI	Critical interrupt (13h) / Digital discrete (03h)	0002h / 0000h / 0003h	CPU NMI signal	N
SMI Timeout	Critical interrupt (13h) / Digital discrete (03h)	0002h / 0000h / 0003h	Time out during SMI processing	N
Lan Front0 Lk	LAN (27h) / Sensor-specific	0000h / 0000h / 0003h	LAN Front link status or LAN port 8 status (if supported by the module)	N
Lan Front1 Lk	LAN (27h) / Sensor-specific	0000h / 0000h / 0003h	LAN port 9 status (if supported by the module)	N
Lan AMC0 Link	LAN (27h) / Sensor-specific	0000h / 0000h / 0003h	LAN port 0 status	N
Lan AMC1 Link	LAN (27h) / Sensor-specific	0000h / 0000h / 0003h	LAN port 1 status	N
Health Error	Platform Alert (24h) / Digital discrete (03h)	0000h / 0000h / 0003h	Aggregate states (power, temperatures etc.). Visualization by the Health LED.	Y
MMC Reboot	Platform Alert (24h) / Digital discrete (03h)	0002h / 0000h / 0003h	MMC reboot active state. Is asserted during boot time.	N
Ver change	Version change (2Bh) / Digital discrete (03h)	0002h / 0000h / 0003h	Version change	N
Proc hot>100C	OEM (CFh) / Digital discrete (03h)	0002h / 0000h / 0003h	Monitors the CPU's "Processor Hot" signal (> 100 C)	N

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6.3.2 OEM Event / Reading Types

OEM SENSOR TYPE (CODE)	OEM EVENT/READING TYPE (CODE)	DESCRIPTION	
Firmware Info 1 (C0h)	70h	Internal Diagnostic Data	
Firmware Info 2 (C0h)	71h	Internal Diagnostic Data	
Board Reset (C4h)	6Fh (sensor type specific)	Sensor-specific Offset	Event
		00h	Reserved
		01h	HwPowerReset
		02h	PCIReset
		03h	HwWatchDogReset
		04h	SoftReset
		05h	Reserved
		06h	ColdReset
		07h	IPMICommand
		08h	Reserved
		09h	Reserved
		0Ah	BMCWatchdog
IPMBL State (C3h)	6Fh (sensor type specific)	Sensor discrete State	Meaning
		08h	IPMB-L running
		others	IPMB-L not running
Post Value (C6h)	6Fh (sensor type specific)	Sensor discrete State	Meaning
		Bits [7:0]	Post Value (read from host I/O port 80h)
		Bits [15:8]	Reserved

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i.e. for Power Good / Power Good Event	77h	Sensor-specific Offset	Event
		0h	12V good
		1h	5V good
		2h	3V3 good
		3h	Reserved
		4h	1V8 good
		5h	1V5 good
		6h	Reserved
		7h	vccCore good
		8h	Reserved
		9h	1V1 good
		Ah	Reserved
		Bh	3V3IPMI good
		Ch	0V9 good
Hot swap sensor (F2h)	6Fh (sensor type specific)	Sensor-specific Offset	Event
		00h	Handle close
		01h	Handle open
		02h	Quiesced

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6.4 Firmware Code

6.4.1 Structure and functionality

MMC firmware code is organized into boot code and operational code, both of which are stored in a flash module. Upon an MMC reset, the MMC executes the boot code and performs the following:
1- Self test to verify the status of its hardware and memory.
2- Performs a checksum of the operational code.
3- Communicates with the Firmware Upgrade Manager (FWUM) in order to inform the MC watchdog that the actual MMC firmware is suitable for execution. Upon successful verification of the operational code checksum, the firmware will jump to the operational code.

Operational code is upgradeable in-the-field.

6.4.2 Firmware Upgrade

The standard way to upgrade the MMC's operational code is to use the open tool 'ipmitool' [1] together with an image file. Ipmitool allows the downloading ('ipmitool download …') and activation ('ipmitool upgrade') of the new operational code and saves an existing one. The rollback to the formerly running operational code is possible as well ('ipmitool rollback')..

All IPMI interfaces which are offered by ipmitool are usable (KCS interface, IPMB bus, LAN). This allows local upgrade or remote upgrade.

Files which contain an image of operational code have the module type (AM4010) and the string "FWUM" in its name.

During the download process the currently running operational code operates as usual until the upgrade command is issued. During the upgrade process the MMC is off line for about 45 seconds when the boot code is re-organizing the firmware storage and afterwards starts the new operational code. If this doesn't succeed after a time out the boot code performs an automatic rollback to the last working operational code.

6.5 Firmware Configuration

For software that uses the local KCS connection to the MMC, it may be may be more favorable to set up interrupt based KCS communications. This may help to speed up data exchange via KCS considerably. By default, the MMC does not generate interrupts to the local CPU at all. The best way to change this is to use the IPMI menu in BIOS (Advanced -> IPMI 1.5 Configuration -> KCS-SMS IRQ). Possible options are: IRQ10, IRQ11 or disabled (default setting).

Another method of interrupt configuration is to do it 'manually' executing an 'OEM Set Firmware Parameters Command' (refer to 6.2.2.2, Set Firmware Parameters.

It is strongly recommended to make changes in this area with the help of the BIOS. The BIOS code creates an 'IPMI Device Information Record (Type 38h)' entry in the SMBIOS Table. The information provided there includes: IPMI specification revision (v1.5), type of supported interface (KCS), its base address (CA2h) and interrupt number for it (10, 11 or none), and the IPMB address of the controller (depending on the module slot/bay). Some of this information may be needed by software drivers or applications, for example the Linux OpenIPMI driver looks for the SMBIOS IPMI entry while detecting system interfaces and it

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does make usage of the interrupt number provided there. Making changes ‘manually’ leaves SMBIOS IPMI entry with not-up-to-date values until next reboot.

6.6 Firmware / Module Identification

There are two ways to determine via IPMI that a MMC resides on an AM4010.

1. The response on the IPMI command “Get Device ID” offers among others the the following response data:
   - Manufacturer ID = 3A98h (Kontron IANA ID)
   - Device ID = 04h (H8S2166)
   - Product ID = 4010
   - Firmware Revision - depends on running firmware.
2. The Device ID String which can be found by reading the the Management Controller Device Locator Record (SDR Type 12h) contains the string “AM4010”. For a module being placed in bay B3 the Device ID String will be “B3: AM4010”.

6.7 FRU Information

6.7.1 Structure and functionality

The MMC provides 4 kB non-volatile storage space for FRU information. Some of the data stored there, like Module Current Requirements record or E-Keying information (refer to AMC.0 specification for details), are mandatory for module functionality in the ATCA/AMC environment. Refer to [2] Platform Management FRU Information Storage Definition document for details).

Please note that missing FRU information will prevent the AMC module from being accepted by the carrier controller during the Hot Swap process and the module will get no payload power.

Full low level access to read or write a module’s FRU Information is provided by regular IPMI FRU Device commands. Please be careful when writing FRU information directly using standard IPMI commands. Damaging the FRU Information may lead to a non working payload.

To avoid this danger there exists a Kontron Linux tool ‘frum’ (refer to section 12.2), which allows to display and partially modify FRU data. E.g. the ‘frum’ tool makes it easy to modify Product Info Area fields (like Product Version or Product Serial Number).

6.7.2 Download

Normally the user needs not download the FRU information because the module is shipped with the data which describes best the module capabilities and requirements. Remember that FRU information might be damaged by a write access to the IPMI FRU Device using standard IPMI commands.

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If needed the standard way to download FRU information to the module is to use the open tool ‘ipmitool’ [1] for the download of an image file. Ipmitool allows the downloading (‘ipmitool fru write …’). The rollback to the formerly running operational code is possible as well (‘ipmitool rollback’).

All IPMI interfaces which are offered by ipmitool are usable (KCS interface, IPMB bus, LAN). This allows local upgrade or remote upgrade. Note that the KCS interface is only usable on a powered payload.

6.8 E-Keying

E-Keying has been defined in the AMC.0 R1.0 Specification to prevent module damage, prevent misoperation, and verify bay connection compatibility. The FRU data contains the AMC point-to-point connectivity record as described in Section 3.9.2 of the AMC.0 R1.0 specification. The Set/Get AMC Port State IPMI commands defined by the AMC.0 specification are used by the carrier for either granting or rejecting the E-keys.

6.9 PCI Express Clock Source

The PCI-E reference clock may be generated locally by the module (default configuration) or acquired via the AMC connector (common/external reference clock). The standard FRU E-Keying data for the AM4010 contains an AMC Link Descriptor for the PCI-E clock. If an external clock is available the carrier’s IPMC provides it by a “Set AMC Port State” command. The appropriate control signal is latched by the on-board FPGA during payload power on and cannot be changed until payload power off.

The common reference clock provided by the carrier may be slightly modulated (Spread Spectrum Clock - SSC). Standard FRU E-Keying data for AM4010 contains two AMC Link Descriptors for the PCI-E channel, describing how the module works with non-SSC or with SSC. The carrier’s IPMC makes this selection during E-keying by “Set AMC Port State” commands“. The clock selection will be latched by the on-board FPGA during payload power on and can’t be changed until payload power off.

6.10 BIOS Supervisory and Automated Firmware Hub Switch

After each payload reset, the MMC expects a special message from the BIOS i.e. the BIOS checksum report. If the checksum (computed by the BIOS boot block) is incorrect or the message itself is not available within 15 seconds after payload reset, then the currently used firmware hub is assumed to contain an invalid or a corrupted BIOS image. In this case an automatic switch to another firmware hub is done and another reset is initiated and the “Boot Error (Invalid boot sector) event” for the failing firmware hub is generated. Refer to 6.3.1, sensors ‘FWHx Boot Err’. x = 0..1 .

6.11 Hot Swap

As a hot-swappable field replaceable unit (FRU), the AM4010 also follows the same stringent carrier grade RASM feature set, namely - Reliability, Availability, Serviceability, Maintainability. When offered in combination with AdvancedTCA platforms, TEM (Telecom Equipment Manufacturers) clients literally conserve valuable system AdvancedTCA system slots. The AM010 supports **Full Hot Swap** capability as per PICMG 3.0. It can be removed from or installed in the system while it is on (without powering-down the system). Please refer to the PICMG 3.0 specification for additional details.

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During Hot Swap of a working module the payload side has to be shut down automatically on command of the MMC and the end of shut down has to be signalled back to the MMC. Because the AM4010 supports ACPI, an OS on payload side which supports this too makes shut down very easy. If the OS doesn't support ACPI there is a special method to be used.

Method 1. The payload OS supports ACPI

Requirements:

- ACPI support must be enabled in the BIOS menu.
- The ACPI daemon must be active.
- An ACPI power button event must result in a sleep state.

Part of the Hot Swap 0peration sequence to be processed by MMC and OS:

- On command of the carrier controller the MMC simulates the pressing and release of the "power button" to force an ACPI event.
- The ACPI daemon detects this ACPI event and initiates the shut down of the payload software system.
- At the end of shut down the payload hardware system reports the sleep state to the MMC by setting the appropriate signal line.
- The MMC detects the sleep state and reports this to the carrier controller so that the Hot Swap processing can be continued and finished.

By default the MMC waits endless for the sleep state. If an endless wait shall be avoided in each case it is possible to set a timeout time after which the system will be switched off unconditionally. For the setting of the timeout refer to 6.2.2.5, OEM Module Quiescence Feedback.

Method 2. The payload OS does not support ACPI

Requirements:

- At system start on payload side the Kontron shutdown daemon 'grnsd' has to be started. It is included in the Linux board support packages for the AM4010 (refer to [3]). This daemon communicates cyclically with the MMC for the exchange of states, commands and acknowledges. For this it uses the "OEM Module Quiescence Feedback" command. Refer to 6.2.2.5. In principle it plays the same role as the ACPI daemon of method 1, above.

Part of the Hot Swap 0peration sequence to be processed by MMC and OS:

- On command of the carrier controller the MMC sets a "shut down request" flag.
- The grnsd daemon recognizes this request in the response to its cyclical "OEM Module Quiescence Feedback" command and initiates the shut down of the payload software system.
- At the end of the shut down process the grnsd daemon informs the MMC by setting the appropriate flag when calling the "OEM Module Quiescence Feedback" command.
- The MMC reports this to the carrier controller so that the Hot Swap processing can be continued and finished.

By default the MMC waits endless for this information. If an endless wait shall be avoided in each case it is possible to set a timeout time after which the system will be switched off unconditionally. For the setting of the timeout refer to 6.2.2.5, OEM Module Quiescence Feedback.

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6.12 LAN functions

6.12.1 Overview

The two Ethernet channels which reside on port 0 (channel 0) and port 1 (channel 1) at the AMC Fabric Interface can – in parallel to their 'normal' use - be used for the following special purposes:

- IPMI over LAN (IOL)
- Serial over LAN

Common for both kinds of communication is the use of the RMCP/RMCP+ for the packing of the data to be transferred. On Ethernet the port 623 is used for transfers with this protocol.

While IOL serves to transport IPMI commands and their responses the SOL serves to transport any serial data. In each case the MMC serves as a protocol encoder and decoder. Please note that IOL is able to use both RMCP and RMCP+ protocols. SOL works only with the RMCP+ protocol.

6.12.2 Setting up the Ethernet channel

There are two methods to prepare the MMC's SOL and IOL LAN parameters for the two possible Ethernet channels:

- During the BIOS setup
- By use of the open tool 'ipmitool' or IPMI commands

The setup methods are compatible i.e. both methods show the parameters which are set by the other one.

The setup is separate for both channels. When the MAC addresses are set the ones which are programmed into the hardware have to be re-used. This is a restriction. The IP addresses being used by 'normal' payload use and IOL/SOL use may differ but need not differ as long as the RMCP port 623 is not used in parallel.

6.12.2.1 Setup by BIOS menu

The BIOS setup menu "Advanced>IPMI 1.5 Configuration>Set LAN Configuration" offers the setting of some LAN parameters for both channels (1, 2). After this setup IOL is not yet ready for use. Refer to 6.12.2.2, Setup by ipmitool or IPMI commands.

6.12.2.2 Setup by ipmitool or IPMI commands

The open tool ipmitool offers commands for the setup of the two Ethernet channels. All possible options are showed by issuing

```
ipmitool lan set
```

If ipmitool is not usable the LAN parameters can be set by using the generic IPMI commands which are defined for this.

To enable the LAN support after parameter setup this command has to be issued:

```
ipmitool lan set access on
```

6.12.3 Setup of user and password

The open tool ipmitool offers commands for the listing and manipulation of user accounts for channel 1 and 2. An overview can be obtained by putting in

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Ipmitool user

The predefined users for a channel can be listed by the command

Ipmitool user <channel 1, 2>.

The AM4010 has for every channel these predefinitions in non volatile memory:

```
ID  Name             Callin  Link Auth  IPMI Msg   Channel Priv Limit
1                    false   true       true       USER
2   admin            false   true       true       ADMINISTRATOR
```

Please note that admin's password is preset with 'kontron'.
Changed users and passwords stay valid after payload power off.

6.12.4 IPMI over LAN (IOL)

IPMI over LAN is used for to communicate with an IPMI controller as e.g. the AM4010's MMC via LAN using the RMCP or RMCP+ protocol. The data which is transferred are IPMI commands and the responses to them.

The open tool 'ipmitool' can serve as a control program and user interface for this. ipmitool allows to issue generic IPMI commands as e.g.:

ipmitool -I lanplus -H 192.168.3.189 -U admin -P admin raw 6 1

or to call complex functions like 'mc .info':

ipmitool -I lanplus -H 192.168.3.189 -U admin -P admin mc info

This uses many generic IPMI commands to get all needed information.

6.12.5 Serial over LAN (SOL)

Serial over LAN connects the **COM1** or **/dev/ttyS0** respectively of the AM4010's payload side to an Ethernet channel. The MMC resides between this serial interface and one of the Ethernet channels. It serves as an encoder and a decoder for the used RMCP+ protocol and controls the data stream. Outside the AM4010 e.g. the open tool ipmitool can be used to drive the SOL session i.e. it offers a console function to communicate via Ethernet with the AM4010's serial interface.

The serial interface can be used as a connection to

1) a user program on the AM4010 payload
2) the BIOS console redirection function. Refer to the BIOS setup menu "Advanced>Console Redirection". There the serial parameters for this purpose can be set. Please note that after BIOS start, the OS gets active in most cases (except e.g. DOS) and the console redirection stops working because the OS doesn't use BIOS functions to drive the console.
3) a Linux login console. This can be activated after payload start e.g. by the command
   `getty` –h 115200 /dev/ttyS0
4) etc.

SOL supports and requires serial hardware handshake. This should be activated for the serial port. Otherwise transmitted data might get lost. In any case the same serial parameters for the used payload side serial interface and the MMC's serial interface have to be used. The parameters for the MMC's serial interface can be set by the "ipmitool sol set …" command. Calling "ipmitool sol set" shows all options that can be set.

Other commands which are possible are showed when issuing "ipmitool sol help".

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6.13 OS Support / Tools

6.13.1 DOS

There is a low-level DOS command line tool provided by Intel that allows hex-formatted IPMI commands to be sent to the management controller via KCS interface. The IPMI Command Test Tool can be found at: http://www.intel.com/design/servers/ipmi/tools.htm

6.13.2 Linux

Normally all drivers and kernel modules needed for communication between the payload sided software and the MMC firmware via the KCS interface come with the distribution. Newest sources can be downloaded from http://openipmi.sourceforge.net. There may be downloaded the OpenIPMI project as well. The OpenIPMI library package includes some applications and the needed libraries. One of the applications is 'ipmicmd' which makes it possible to send and receive raw IPMI sequences; another, the 'ipmi_ui', provides a higher level interface and thus it does not require deep IPMI knowledge from the user side.

Another very useful all-in-one tool is the ipmitool (http://ipmitool.sourceforge.net). It provides a user friendly interface to many IPMI features and extensions, for example to PICMG LED control and Kontron FWUM.

There is a Kontron Modular Computers' IPMI ToolKit which contains some tools for the customer for the monitoring and the maintenance of some IPMI functionalities.

The following command line tools are included in the IPMI ToolKit:

- frum: display and modification of FRU data
- temptool: selection, display, and storage of temperature and voltage sensor values

All these tools are OpenIPMI based. This toolkit is available on the "AMC Kit CD". If this CD was not shipped with your module then please contact our support (support@kontron-modular.com).

Please refer to the manual "MAN_LIN_IPMI_TOOLKIT_0103.pdf" being included in the package.

6.13.3 Windows

Intel provides KCS reference drivers for Windows and the IPMI Conformance Test Suite (ICTS), they are available at the following address:
http://www.intel.com/design/servers/ipmi/tools.htm

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7. IPMI Communication LEDs

There are three IPMI communication LEDs on the face plate.

LED 0
Color: Blue
Position: Bottom right
Labeled: ./.
Meaning: Indicates the Hot Swap state of the inserted and powered module.
Meaning: On: Module may be extracted.
Blinking: Hot Swap active, don't extract
Off: Module in normal operation. Don't extract.
Index in "Get/Set LED State" commands: 0

LED 1
Color: Red
Position: Top left
Labeled: by a crossed out plus sign
Meaning: Indicates the "Out Of Service" state of the powered module.
Behavior: Solid red = module out of service
Off = module powered/running
Pulsing red = Traffic on the IPMB-L bus
Index in "Get/Set LED State" commands: 1

LED 2
Color: Green / red
Position: Top right
Labeled: by a plus sign Meaning: Indicates the "Health" state of a running/powered module.
Behavior: Blinking slow: Module MMC is running, showing its heart beat.
Pulsing: The KCS interface is active.
Solid: Module MMC not running or firmware is a non heart beat version (version dependent, standard is heart beat).
Off: Module MMC not running.
Is green: No health error detected (refer to sensor "Health Error ", 6.3.1).
Is red: Health error detected.
Index in "Get/Set LED State" commands: 2

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