» User Guide «

IPMI Firmware User Guide

for the

CP6002

CPU Board

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1. Introduction

1.1 Terminology and Acronym Definitions

The following table provides descriptions for terms and acronyms used in this guide. The descriptions are derived primarily from the IPMI specifications.

Table 1: Terminology and Acronym Definitions

TERM or ACRONYM	DESCRIPTION
BMC	Baseboard Management Controller In a compact CPCI chassis, there can be only one BMC present. The BMC administrates the SEL and the SDRR for the complete system. The BMC is connected to the other boards in the shelf via a dedicated bus (IPMB-0). The CP6002 management controller can be set in SMC mode and in BMC mode by an IPMI OEM command. The factory setting is SMC.
BSP	Board Support Package
FRU	Field Replaceable Unit Every board is a FRU. The FRU data contains information about the board such as the part number and the serial number. See PICMG Specification 2.9 for complete details on the FRU data structure. The free Linux tool ‘ipmitool’ can be used to update or to display the FRU data
FWH	Firmware Hub Memory location where a complete EFI BIOS code is stored.
I^2C	Inter-Integrated Circuit
IPMB	Intelligent Platform Management Bus The dedicated I2C management bus where the BMC and the SMCs communicate.
IPMB-0	Intelligent Platform Management Bus which connects all SMCs with the BMC or a Shelf Manager.
IPMI	Intelligent Platform Management Interface
KCS	Keyboard Controller Style (Interface) This is the IPMI mandatory interface on the host system (payload) to communicate with the BMC.
MP	Management Power. This powers the BMC or SMC controller.
PICMG	PCI Industrial Computer Manufacturer Group
PWR	Payload Power. This powers the host side of the board where the application software runs. It is granted by the BMC or SMC after all prerequisites are met. prerequisites are a closed handle switch, power on the backplane etc.

Table 1: Terminology and Acronym Definitions

TERM or ACRONYM	DESCRIPTION
SDR	Sensor Data Record This is the IPMI data structure that defines a sensor.
SDRR	Sensor Data Record Repository Is the device in the BMC where all SDRs of the chassis' boards are administrated. A free Linux utility named 'ipmitool' makes a full chassis discovery and fills the SDRR with the SDRs being found. The factory default repository contains only the local board's SDRs.
SEL	System Event Log Is the device in the BMC where all the events in the chassis which are reported are administrated. If an event occurs on any board, the sensor event is sent through the IPMB bus to the BMC which additionally stores its own events as well.
SMBIOS	System Management BIOS
SMC	Satellite Management Controller In a compact PCI chassis, there can be many SMCs. Each SMC is connected to the BMC via a dedicated bus (IPMB-0). The CP6002 management controller can be set in SMC mode and in BMC mode by an IPMI OEM command. The factory setting is SMC.
SMS	System Management Software (designed to run under the OS)

1.2 Related Publications

The following publications contain information relating to this product.

Table 2: Related Publications

PRODUCT	PUBLICATION
IPMI	IPMI Specification V2.0 (without LAN support)
IPMI	IPMI- Platform Management FRU Information Storage Definition v1.0, Document Revision 1.1
IPMI	Addenda, Errata, and Clarifications document revision 4 for IPMI v2.0 rev 1.0 specification
IPMI	Intelligent Platform Management Bus Communications Protocol Specification v1.0 Document Revision 1.0, November 1999
IPMI	IPMB v1.0 Address Allocation Document Revision 1.0, September 1998
PICMG	CompactPCI System Management Specification PICMG 2.9 Rev. 1.0
CP6002	CP6002 User Guide, ID: 1036-6431, Rev. 3.0 CP6002 uEFI BIOS User Guide, ID: 1039-1612, Rev. 2.0
CP6002	CP6002 Linux Board Support Package
IPMI Tools	'ipmitool' documentation: http://ipmitool.sourceforge.net
IPMI Tools	OpenIPMI documentation: http://www.openipmi.sourceforge.net

1.3 IPMI Overview

This product fully supports the Intelligent Platform Management Interface (IPMI v2.0, without LAN support) and PICMG 2.9 R1.0 specifications. All of its IPMI functionality operates under an autonomous management controller even if the board is held in reset or power down by a management card within a system designed for High Availability such as XL-VHDS or XL-LP42.

While the CP6002 IPMI implementation is fully compliant to IPMI v2.0 and should work with any System Management Software that respects this specification, it has been designed to be easily integrated with the Service Availability Forum-Hardware Platform Interface (SAF-HPI) specification.

More information about Service Availability can be found on the following Web site:

http://www.saforum.org/home

IPMI is an extensible and open standard that defines autonomous system monitoring. It is autonomous because every management controller within a compact PCI chassis monitors its own sensors and sends critical events through a dedicated bus to a Baseboard Management Controller (BMC) that logs it into a non-volatile System Event Log (SEL). The CP6002 IPMI implementation includes a device SDR repository module that allows the user's System Management Software (SMS) to detect all system components and to build a database of all management controller sensors.

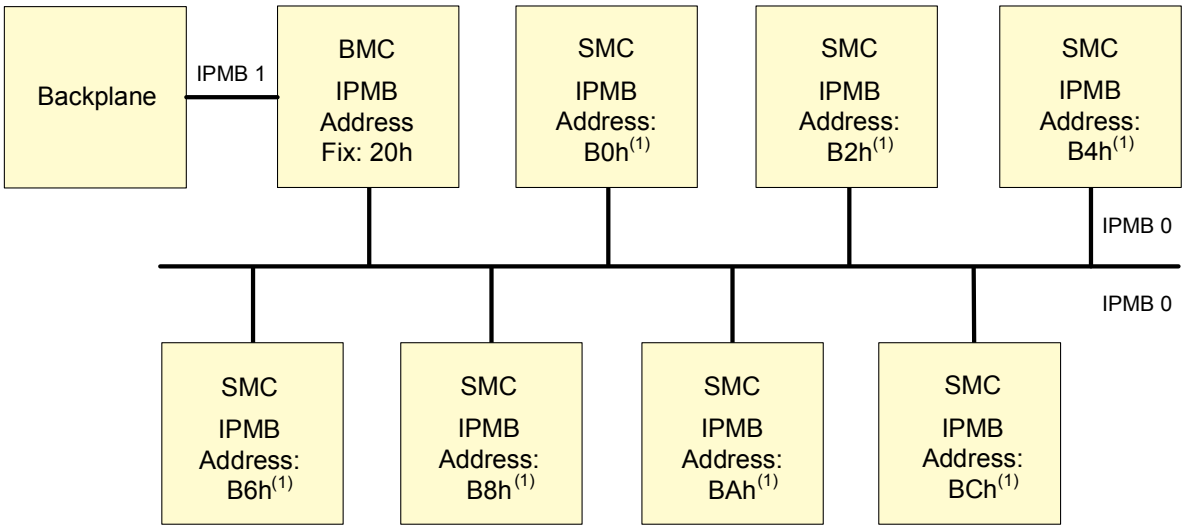
For further information concerning IPMI refer to the following Web site:

http://www.intel.com/design/servers/ipmi/

2. IPMI Setup

2.1 IPMI in a Compact PCI Chassis

Kontron's IPMI implementation in the CompactPCI environment is compliant with the PICMG 2.9 R1.0 specification. This specification defines the pinout of the J1 and J2 CompactPCI connectors as well as the addressing scheme. There should be only one BMC in the chassis, or at least on the IPMB segment. The BMC may reside either on an CP6002, or on an external system management card, or in a shelf management controller (ShMC). The specification allows all of these variants. As a BMC in the system slot, the CP6002 supports dual-ported IPMB (IPMB-0 to the SMCs and IPMB-1 to the external segments via the CompactPCI backplane connector in accordance with PICMG 2.9).



(1) IPMB address for SMC is determined via the location of the slot in the chassis

To use the IPMI resources in a rack requires an initial setup for IPMI operation. The following actions must first be performed to achieve operable IPMI functionality.

2.2 IPMI Setup for the CP6002

Initially the default configuration for the IPMI Management Controller of the CP6002 is:

- IRQ = none
- MODE = SMC
- IPMB = single-ported.

If this is the required configuration, no further action is required. If the configuration must be modified, either the uEFI shell command “kipmi” or one of the open tools “ipmitool” or “ipmicmd” may be used to modify the configuration as required.

To use the “kipmi” command, refer to the CP6002 uEFI BIOS User Guide. When EFI stores the configuration, it creates an ‘IPMI Device Information Record’ entry in the SMBIOS table. This record contains information about (among others):

- Type of the supported interface (KCS style)
- Selected interrupt (10, 11 or none).

This information is required by the CP6002 payload’s IPMI OS kernel drivers for Linux during their loading time. After the loading, most available IPMI communications tools which access the IPMI controller via IPMI OS drivers should work (e.g. ‘ipmicmd’, ‘ipmitool’, etc.).

Now it is possible to use such a tool to issue the “Set Firmware Parameters” OEM IPMI command to modify the configuration again. Changing the interrupt number always requires an EFI restart for a correct set up of the SMBIOS table.

2.3 IPMI Setup for the Rack

For a working IPMI configuration the SDRR of the BMC must be filled with all sensor data records of all IPMI controllers in the rack. After every system start the BMC uses the SDRR to initialize all sensors of all boards. The SDRR setup must be done by a management tool e.g. the open Linux tool ‘ipmitool’. The command then is:

```
ipmitool sdr fill sensors
```

This will only work if the IPMI controller of the BMC is addressed. This addressing is the default if the ‘ipmitool’ is running on the payload side of the board where the BMC is residing.

3. Board Management Controller Hardware

On the CP6002 CPU board, the BMC is implemented using the NXP ARM7 microcontroller with 512 kB of internal flash and 56 kB of RAM.

An external 64 kB serial EEPROM chip is used for firmware private data and for FRU Inventory storage. An additional external 4 MB serial SPI-Flash is used for redundant firmware image storage.

The Board Management Controller implements a local Keyboard Controller Style (KCS) Interface with interrupt support for communication with system side management software and the uEFI BIOS. The IPMB bus is used for interconnection with the BMC or Shelf Manager.

The Board Management Controller provides access to various board sensors which permit the monitoring of:

- System power voltages: 5V (PWR), 3.3V, IPMI 5V, 12V, MMC supply 4.7V
- Temperatures: CPU die, graphic die, PCH, and one board temperature
- Power Good, IPMB-0 link, board reset, post code, boot error, CPU States (processor hot, thermal trip, …), IPMB-L state, Health error, IPMI watchdog etc.

4. BMC Firmware

4.1 Key Features

The following are key features of the CP6002 BMC Firmware:

- Compliant with IPMI specification 2.0 (without LAN support)
- Compliant with PICMG 2.9 specification
- Firmware designed and specially made for compact PCI implementation and easy integration with SAF-HPI
- KCS SMS interface with interrupt support
- Dual-port IPMB support
- Out-of-band management and monitoring using IPMB interface permits access to sensors regardless of the board's CPU state
- Sensor thresholds fully configurable
- Sensor names prefixed with identification of owner (BMC without slot number or SMC with slot number)
- Complete IPMI watchdog functionality
- Complete SEL, SDR repository and FRU functionality on BMC
- Complete FRU functionality
- Master Write-Read I2C support for external I2C devices communications (FRU, EEPROM, FAN)
- Two IPMI controller firmware banks allow an automatic backup. This allows manual and automatic firmware image roll-back (in case of upgrade failure).

- The downloading of a new firmware image does not break currently running firmware or payload activities
- Firmware bank management is done by the open tool ‘ipmitool’ function ‘fwum’ which can update the firmware in the field
- Firmware fully customizable via OEM IPMI commands to satisfy customer requirements
- FRU data can be updated in the field by the open tool ‘ipmitool’ function ‘fru write’
- Interoperable with other IPMI solutions

OEM board supervision and control extensions such as boot device flash selection and firmware boot order configuration.

- Automatic switching to an alternative EFI image after having detected an inoperable EFI
- “Graceful Shut Down” support
- Handle switch and blue Hot Swap LED operation
- The I0 and I1 LEDs indicate operational status of the IPMI Firmware
- The board's write protection feature for non-volatile memories is supported. These memories are:
  - I2C EEPROM for FRU data and parameters
  - SPI FLASH memory for firmware banks

4.2 Firmware Code

4.2.1 Structure and Functionality

The IPMI controller firmware code is organized into boot code and operational code, both of which are stored in a flash module. Upon an IPMI controller reset, the IPMI controller first executes the boot code which does:

- A self test to verify the status of the Management Controller's hardware including its memory
- Performs a checksum of the operational code

After successful verification of the operational code checksum, the firmware will execute the operational code. Only the operational code is upgradable in-the-field.

4.2.2 Firmware Upgrade

Firmware upgrading is only possible when write protection is not set.

The standard way to upgrade the IPMI controller's operational code is to use the open tool ‘ipmitool’ together with an image file.

‘ipmitool’ allows the downloading (‘ipmitool fwum download …’) and activation (‘ipmitool fwum upgrade’) of the new operational code and saves an existing one. The rollback to the formerly running operational code is possible as well (‘ipmitool fwum rollback’). The status command (‘ipmitool fwum status’) displays what firmware is stored and in what state it is (‘last known good’ = running, ‘previous good’ = running before upgrade).

All IPMI interfaces which are offered by ‘ipmitool’ except LAN are usable for the upgrade. This allows local upgrade and remote upgrade. Please note that the KCS interface is only usable with a powered payload.

Files which contain an image of operational code have the firmware ID "B340" and the string "FWUM" in its name.

During the download process the currently running operational code is still operating in a normal way until the upgrade command is issued. During the upgrade start, the IPMI controller is off line for about 20 seconds while the boot code re-organizes the firmware storage. Afterwards the new operational code is started. If the new operational code doesn't operate properly (e.g. hangs up) the boot code will perform an automatic rollback to the last working operational code and start this again.

4.2.3 Firmware / Module Identification

There are two ways to verify by means of IPMI that a Management Controller resides on a CP6002.

Invoking the IPMI command “Get Device ID” returns among other information the following data:

- Manufacturer ID = 3A98h (Kontron IANA ID)
- Product ID = B340 for the firmware
- Firmware Revision in bytes 4:5 - depends on the core version of the running firmware.
- The SDR revision in byte 13 (OEM part of the response) is a sub-revision of the firmware revision. It is unique for all versions of the board's firmware.
- The Device ID String which can be found by reading the Management Controller Device Locator Record (SDR Type 12h) contains the string "BMC:x ... x". For example, invoking the ipmitool command 'ipmitool sdr list mcloc' will return the Device ID Strings of all available boards. If the CP6002 is a BMC, this string will be displayed without change. If the CP6002 is an SMC, then the string will be changed into "Sxx: x ... x" where xx is the slot number where the board is residing, e.g. "S09: x ... x".

4.3 The Payload Boot Process

When the CP6002's payload starts, the first code to be executed is the EFI. There are two Flash devices, numbered 0 and 1, which may contain different EFI code. Which one of them will be utilized from the next boot process on is defined by one of two ways:

- The contents of a user (payload) writeable register (refer to the CP6002 User Guide) defines which Boot Flash to use. This is the primary selection.
- The firmware's parameter EEPROM contains a parameter whose value is used to determine whether or not to invert the primary selection register's contents when the Management Controller's firmware selects the Boot Flash. For this the Management Controller sets or resets a control signal which does or does not invert the Boot Flash selection.

4.3.1 Boot Flash Selection by Writing to a Board Register

Refer to the CP6002 User Guide for further information concerning Boot Flash selection using a board register setting.

4.3.2 Boot Flash Selection by OEM IPMI Command

The OEM IPMI command “Set Control State” specifies whether or not the Management Controller is to invert the register based Flash selection from the next boot process on. The Management Controller stores this requirement in a parameter in the EEPROM.

4.3.3 Automatic Boot Flash Selection During the Boot Process

After each payload reset the Management Controller selects the Boot Flash by applying the related EEPROM parameter.

Physically the Management Controller sets or resets a signal line. Afterwards it waits for a special message from the EFI. This message contains the checksum report, i.e. it indicates the validity of the Boot Flash's checksum.

If the checksum is wrong or the message is not received within 60 seconds, then the currently used EFI Flash is assumed to contain an invalid or a corrupted image. In this case, the Management Controller toggles the parameter value in the EEPROM and issues a “Boot Error (Invalid boot sector) event” by setting the appropriate sensor value (sensor 'FWHx Boot Err'. x = 0..1). x is simply the value of the parameter in EEPROM and not the absolute number of the used Boot Flash. Afterwards it causes a payload off-on cycle and continues as described at the beginning of this chapter.

When a timeout error is recognized and the count of boot errors exceeds 2, or when a checksum error is recognized and the count of boot errors exceeds 4 the Management Controller makes no further attempt to reset/restart the payload. Only at the next power off/on of the CP6002, will the Management Controller again attempt to start the payload.

4.4 OS Boot Order Selection by OEM IPMI

Normally the EFI will apply the OS boot order which was selected in the EFI menu “Boot/Boot Option Priorities”. But there is another alternative boot order which is stored in the Management Controller's non-volatile memory. This boot order can be set and read by IPMI OEM commands. At payload start the Management Controller writes it into a register where the EFI can read it. If this Management Controller's boot order has a non-zero value the EFI will use it instead of its own boot order.

5. Communication Between the Management Controller and EFI

For communication between EFI and the Management Controller there is a “private” KCS interface. During the boot process the EFI sends the following IPMI commands to the Management Controller:

- An OEM command which reports a good or a bad checksum.
- A Standard IPMI command “Set Watchdog Timer” to stop a possibly running IPMI watchdog timer.
- A Standard IPMI command “Set SEL Time” to set the event log time to the time which is kept by the RTC.
- The OEM IPMI command “Set Firmware Parameters” with some parameters which for example sets the Management Controller to a BMC or a SMC as selected in the EFI shell.
- A Standard IPMI command “Set ACPI Power State” to set the state “ACPI legacy on”
- Etc.

6. Hot Swap and Shut Down

6.1 Hot Swap Handle and Hot Swap (Blue) LED

The blue Hot Swap LED (HS LED) of an inserted board in a powered rack is normally used to indicate the board's operational status so as to facilitate hot-swapping of the board:

- **ON**

  The payload is inactive and may be:

  - Activated by closing the Hot Swap Handle, or
  - The board may be extracted. The “M-state” is 1.

    An exception is the case when payload power is off e.g. after a shut down via an IPMI chassis command and the handle is still closed. Here the M-state is 4. To show the operator that the payload power is off, the blue LED will be on in spite of the closed handle.

- **BLINKING**

  Changing from active state to inactive state or vice versa.

  Don't extract the board now. The “M-state” is 2, 5 or 6.

- **OFF**

  The payload is active.

  Don't extract the board now. Normally the extraction is impossible because the handle is closed and locked. The “M-state” is 3 or 4.

Normally the logical states “active” and “inactive” of a payload are identical to the physical states “handle open” and “handle closed” or “payload power off” and “payload power on”.

If, however, power is switched on or off using IPMI chassis commands or the payload is shut down by the OS, then the position of the Hot Swap Handle and the power state may become asynchronous. In this case the blue LED is switched on indicating that the payload power is switched off although the handle is closed. Such actions are not part of the Hot Swap process and are governed by their own functionality which is not within the scope of this document.

6.2 The Hot Swap and Shut Down Processes

Hot Swap as defined here, is the purposely initiated process to remove and replace an active board in a powered system. To accomplish this requires that the hot swap process provide for an orderly transition of the payload from the active to inactive state and vice versa. This is necessary to preclude improper system operation and possible loss of data. The CP6002 has all the necessary features including hardware and IPMI software to support hot swapping. On the software side, however, not all available OS’s support hot swapping, not even partially. Three possible cases for hot swapping based on OS capabilities are described as follows.

Case 1: Involves an OS which does not support ACPI

After payload power on, the starting EFI will inform the Management Controller by sending the IPMI command “Set ACPI Power State / Set Legacy on”. This means that a Hot Swap (opening of the closed handle) shall immediately lead to payload power off by the Management controller.

In this event, the application/operator is responsible for the termination of all payload processes prior to initiating removal/replacement of the board to avoid improper operation or loss of data.

Case 2: Involves an OS which emulates ACPI support

An OS which does not really support ACPI, such as VxWorks, is able to obtain “Graceful Shut Down” support from the Management Controller by performing in the following way.

After start up, such an OS must manipulate the chip set in a way that prevents an immediate power off when the “power button” is logically activated.

Then it must send the IPMI command “Set ACPI Power State / S0/G0 working” to the Management Controller to enable this to process later on an “S3/G2 soft off” command.

During application operation the system must cyclically read the “Hot Swap Sensor” (sensor #0) using the IPMI command “Get Sensor Reading”. This allows the tracking of the board's state. After the board has once reached “M-state” 4 (sensor reading is 10h) the leaving of this announces that the handle was opened. Now the time has come to terminate all processes.

After all critical processes have been terminated, the OS must send the IPMI command “Set ACPI Power State / S3/G2 soft off” to the Management Controller which will set the power off immediately.

Case 3: Involves an OS which supports ACPI

When an OS is started which supports ACPI, the IPMI command “Set ACPI Power State / S0/G0 working” is sent to the Management Controller. This indicates that the OS has reprogrammed the chip set in such a manner that a “power button” signal does not lead to an immediate power off but only causes an event that can be detected by the OS.

When the handle is opened, the Management Controller asserts the “power button” signal to notify the OS. The OS then shuts down all processes and afterwards causes the transmission of the IPMI command “Set ACPI Power State / S3/G2 soft off” to the Management Controller which then switches the power off.

7. Setting of the SEL time

The Management Controller does not have its own hardware real time clock. Therefore after startup, restart or upgrade of the Management Controller, its software clock first must be supplied with the current time. The Management Controller uses the time when handling event messages which otherwise will have an out-of-date time stamp.

Every time when the EFI starts up, it supplies the Management Controller with the payload's current real time clock time.

It is a problem with restarts of the Management Controller without a following EFI startup. Because, during restart the Management Controller's time gets lost and it must be set again by issuing the IPMI command “Set SEL Time”. This may be done by application software on the payload side via the KCS interface or by a remote Management Controller via the IPMB-0.

8. XMC Card Support

The presence or absence of XMC card(s) is reported by sensors “XMC present” and “XMC-2 pres” (refer to sensor description).

If an XMC card is present the card's FRU data EEPROM is readable/writable. The size of the EEPROM must be smaller or equal to 256 bytes, because of 8-bit EEPROM addressing. Note that XMC FRU size is always reported as 256 bytes and writing to locations that are higher than the real capacity should be avoided.

The FRU data of the XMC can be read under Linux with:

- ipmitool fru print 1
- ipmitool fru print 2 (on boards with two XMCs)

9. Supported IPMI and ATCA Commands

9.1 Standard IPMI Commands

Part of the command list in IPMI specification 2.0

M = mandatory, O = optional

Table 3: Standard IPMI Commands

COMMAND	IPMI 2.0 SPEC. SECTION	NETFN	CMD	KONTRON SUPPORT ON BMC
IPM DEVICE "GLOBAL" COMMANDS				M
Get Device ID	20.1	App	01h	M / Yes [1]
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 / Yes
Get ACPI Power State	20.7	App	07h	O / Yes
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
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

Table 3: Standard IPMI Commands

COMMAND	IPMI 2.0 SPEC. SECTION	NETFN	CMD	KONTRON SUPPORT ON BMC
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 / No
Get System GUID	22.14	App	37h	O / No
Get Channel Authentication Capabilities	22.13	App	38h	O / No
Get Session Challenge	22.15	App	39h	O / No
Activate Session	22.17	App	3Ah	O / No
Set Session Privilege Level	22.18	App	3Bh	O / No
Close Session	22.19	App	3Ch	O / No
Get Session Info	22.20	App	3Dh	O / No
Get AuthCode	22.21	App	3Fh	O / No
Set Channel Access	22.22	App	40h	O / No
Get Channel Access	22.23	App	41h	O / No
Get Channel Info	22.24	App	42h	O / Yes
Set User Access	22.26	App	43h	O / No
Get User Access	22.27	App	44h	O / No
Set User Name	22.28	App	45h	O / No
Get User Name	22.29	App	46h	O / No
Set User Password	22.30	App	47h	O / No
Activate Payload	24.1	App	48h	O / No
Deactivate Payload	24.2	App	49h	O / No
Get Payload Activation Status	24.4	App	4Ah	O / No
Get Payload Instance Info	24.5	App	4Bh	O / No
Set User Payload Access	24.6	App	4Ch	O / No
Get User Payload Access	24.7	App	4Dh	O / No

Table 3: Standard IPMI Commands

COMMAND	IPMI 2.0 SPEC. SECTION	NETFN	CMD	KONTRON SUPPORT ON BMC
Get Channel Payload Support	24.8	App	4Eh	O / No
Get Channel Payload Version	24.9	App	4Fh	O / No
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 / No
Set Channel Security Keys	22.25	App	56h	O / No
Get System Interface Capabilities	22.9	App	57h	O / No
CHASSIS DEVICE COMMANDS				O
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 / Yes
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 [2]
EVENT COMMANDS				M
Set Event Receiver	29.1	S/E	00h	M / Yes
Get Event Receiver	29.2	S/E	01h	M / Yes
Platform Event (a.k.a. “Event Message”)	29.3	S/E	02h	M / Yes

Table 3: Standard IPMI Commands

COMMAND	IPMI 2.0 SPEC. SECTION	NETFN	CMD	KONTRON SUPPORT ON BMC
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
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

Table 3: Standard IPMI Commands

COMMAND	IPMI 2.0 SPEC. SECTION	NETFN	CMD	KONTRON SUPPORT ON BMC
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 / Yes
Get SDR Repository Allocation Info	33.10	Storage	21h	O / Yes
Reserve SDR Repository	33.11	Storage	22h	O / Yes
Get SDR	33.12	Storage	23h	O / Yes
Add SDR	33.13	Storage	24h	O / Yes
Partial Add SDR	33.14	Storage	25h	O / Yes
Delete SDR	33.15	Storage	26h	O / Yes
Clear SDR Repository	33.16	Storage	27h	O / Yes
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 / Yes
SEL DEVICE COMMANDS				O
Get SEL Info	40.2	Storage	40h	O / Yes
Get SEL Allocation Info	40.3	Storage	41h	O / Yes
Reserve SEL	40.4	Storage	42h	O / Yes
Get SEL Entry	40.5	Storage	43h	O / Yes
Add SEL Entry	40.6	Storage	44h	O / Yes
Partial Add SEL Entry	40.7	Storage	45h	O / No

Table 3: Standard IPMI Commands

COMMAND	IPMI 2.0 SPEC. SECTION	NETFN	CMD	KONTRON SUPPORT ON BMC
Delete SEL Entry	40.8	Storage	46h	O / Yes
Clear SEL	40.9	Storage	47h	O / Yes
Get SEL Time	40.10	Storage	48h	O / Yes
Set SEL Time	40.11	Storage	49h	O / Yes
Get Auxiliary Log Status	40.12	Storage	5Ah	O / No
Set Auxiliary Log Status	40.13	Storage	5Bh	O / No
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 / No
Set SOL Configuration Parameters	26.2	Transport	21h	O / No
Get SOL Configuration Parameters	26.3	Transport	22h	O / No

[1] Has OEM extensions. Please refer to 10.1, Get Device ID Command with OEM Extensions

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

9.2 AdvancedTCA and AMC Commands

Part of the command list in PICMG 3.0 R 2.0 AdvancedTCA Base Specification and the PICMG AMC.0 Advanced Mezzanine Card Specification, R 1.0,

M = mandatory, O = optional

Table 4: AdvancedTCA and AMC Commands

COMMAND	PICMG 3.0 SPEC. TABLE	NETFN	CMD	KONTRON SUPPORT ON MMC
AdvancedTCA				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	N/A
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

Table 4: AdvancedTCA and AMC Commands

COMMAND	PICMG 3.0 SPEC. TABLE	NETFN	CMD	KONTRON SUPPORT ON MMC
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

10. OEM Commands and Command Extensions

10.1 Get Device ID Command with OEM Extensions

The IPMI specification defines four optional bytes in the response to 'Get Device ID'. The response bytes [13:16] hold the 'Auxiliary Firmware Revision Information'.

Table 5: Get Device ID Command with OEM Extensions

COMMAND	LUN	NetFn	CMD
Get Device ID command with OEM extensions	00h	App = 06h	01h
REQUEST DATA			
Byte	Data Field		
-	-		
RESPONSE DATA			
Byte	Data Field		
1	Completion Code		
2:12	Regular Get Device ID Command response fields		
13	Release number of the management controller firmware: 10h for R10, 11h for R11, ... Release number 1... of the IPMI controller firmware. The open ipmi tool ‘ipmitool’ displays this as ‘SDR’ in the response to the command ‘ipmitool fwum status’.		
14	Module Geographical Address (slot number): 1 ... = Module in chassis slot 1...		
15	Reserved		
16	Reserved		

10.2 Set Firmware Parameters

This command permits the selection of interrupts to be used during KCS communication.

Please note that parameters which are set while the board is write protected are only valid until the next IPMI firmware reset.

Table 6: Set Firmware Parameters

COMMAND	LUN	NetFn	CMD
Set Firmware Parameters	03h	OEM = 3Eh	05h
REQUEST DATA			
Byte	Data Field		
1	Reserved B4h		
2	Reserved 90h		
3	Reserved 91h		
4	Reserved 8Bh		
5	Cmd Flags [6:2] Reserved [1] 0b = get only, 1b = set parameters [0] 0b = do not reset, 1b = reset Management Controller after setting parameters		
6	Operating Modes [7:5] Reserved [4] 0b = IPMB dual-ported, 1b = IPMB single-ported (default) [3:1] Reserved [0] 0b = BMC, 1b = SMC		
7	IRQ number FFh = do not use interrupts 0Ah = use IRQ10 0Bh = use IRQ11 Any other values = Reserved		
RESPONSE DATA			
Byte	Data Field		
1	Completion code		
2	Cmd flags		
3	Operating modes		
4	IRQ number		

10.3 Set Control State (Firmware Hub, Boot Order)

Please note that parameters which are set while the board is write protected are only valid until the next IPMI firmware reset.

Table 7: Set Control State

COMMAND	LUN	NetFn	CMD
Set Control State (Firmware Hub/EFI Flash, Boot Order)	00h	OEM = 3Eh	20h
REQUEST DATA			
Byte	Data Field		
1	Control ID: 00h: EFI Flash selection 9Dh: EFI Boot Order Configuration		
2	**Control State for EFI Flash selection:** (These settings are stored in EEPROM and applied (to logic) each time the IPMI controller detects power-on) 00h = EFI Flash selection is not inverted 01h = EFI Flash selection is logically inverted Please note that this selection will be automatically toggled by the IPMI controller during a failing boot process. Other payload sided settings may additionally modify this selection. **Control State for BIOS Boot Order Configuration:** (These settings are stored in EEPROM and applied (to logic) each time the IPMI controller detects power-on) 00h .. 07h = Selected EFI Boot Order Configuration. 00h selects the default Boot Order which is selected in the EFI menu. **EFI Boot Order Configuration:** 00h = Boot order is according to EFI setup (default) 01h = Next boot device is: Floppy 02h = Next boot device is: HDD 03h = Next boot device is: CD 04h = Next boot device is: Network 05h = Next boot device is: USB Floppy 06h = Next boot device is: USB HDD 07h = Next boot device is: USB CDROM		
RESPONSE DATA			
Byte	Data Field		
1	Completion Code		

10.4 Get Control State (Firmware Hub, Boot Order)

Table 8: Get Control State

COMMAND	LUN	NetFn	CMD
Get Control State (Firmware Hub/EFI Flash, Boot Order)	00h	OEM = 3Eh	21h
REQUEST DATA			
Byte	Data Field		
1	Control ID: 00h = EFI Flash selection 9Dh = EFI Boot Order Configuration		
RESPONSE DATA			
Byte	Data Field		
1	Completion Code		
4	Current Control State (see 10.3, Set Control State) 00h .. 01h for control ID = EFI Flash Select 00h .. FFh for control ID = EFI Boot Order Configuration		

11. Sensors Implemented on the CP6002

The sensor name (ID string) has a name prefix which is ‘NNN:’ in the lists below. When reading the sensor name after module insertion this prefix becomes automatically adapted to the role (BMC or SMC) and the physical position (slot number) of the module in a rack. If the module's Management Controller is set up as a BMC the prefix will be ‘BMC:’ independent of the slot where it resides. If the module's Management Controller is set up as a SMC the prefix will be ‘Sxx:’ where xx is the slot number (e.g. 09).

The sensor number is the number which identifies the sensor e.g. when using the IPMI command ‘Get Sensor Reading’. Please note that ‘ipmitool’ accepts sensor numbers in decimal (e.g. ‘10’) or hexadecimal (e.g. ‘0xa’) notation.

The IPMI tool ‘ipmitool’ displays for the command ‘ipmitool sdr list’ the contents of the sensor data record repository (SDRR) of the whole rack if the SDRR has been generated. The generation of the SDRR has always to be redone after adding or removing a board from the rack. Refer to chapter 2.3, IPMI Setup for the Rack for further information.

11.1 Sensor List

For OEM (Kontron) specific sensor types and codes in the following table please refer to chapter 11.3.

Table 9: Sensor List

SENSOR Number / ID string	SENSOR TYPE (CODE) / EVENT/READING TYPE (CODE)	Ass. Mask / Deass. Mask / Reading Mask	DESCRIPTION	LED I1on error / Reading Mask
0h / NNN:Hot Swap	ATCA/CTCA Hot Swap (F0h) / Sensor-specific (6Fh)	001Fh / 0000h / 001Fh	Hot swap sensor	N
1h / NNN:Temp CPU	Temperature (01h) / Threshold (01h)	1A81h / 7A81h / 3939h	CPU die temperature	Y / 0F3Ch
2h / NNN:Temp PCH	Temperature (01h) / Threshold (01h)	0A80h / 7A80h / 3838h	Temp Chipset	Y / 0F3Ch
3h / NNN:Temp Graphic	Temperature (01h) / Threshold (01h)	1A81h / 7A81h / 3939h	Temp Graphic	Y / 0F3Ch
4h / NNN:Temp Board 1	Temperature (01h) / Threshold (01h)	7A95h / 7A95h / 3F3Fh	Temp Board 1	Y / 0F3Ch
5h / NNN:Pwr Good	Power supply (08h) / OEM (73h)	0000h / 0000h / 400Fh	Status of all power lines	N
6h / NNN:Pwr Good Evt	Power supply (08h) / OEM (73h)	0180h / 7180h / 3838h	Power fail events for all power lines	Y / 402Fh
7h / NNN:Board 3.3V	Voltage (02h) / Threshold (01h)	2204h / 2204h / 1212h	Board 3.3V supply	Y / 0F3Ch
8h / NNN:Board 5VIPMI	Voltage (02h) / Threshold (01h)	2204h / 2204h / 1212h	Management Power (MP) 5V	Y / 0F3Ch
9h / NNN:Board 5.0V	Voltage (02h) / Threshold (01h)	2204h / 2204h / 1212h	Board 5V supply	Y / 0F3Ch
Ah / NNN:Board 12V	Voltage (02h) / Threshold (01h)	2204h / 2204h / 1212h	Board 12V supply	Y / 0F3Ch

Table 9: Sensor List

SENSOR Number / ID string	SENSOR TYPE (CODE) / EVENT/READING TYPE (CODE)	Ass. Mask / Deass. Mask / Reading Mask	DESCRIPTION	LED I1on error / Reading Mask
Bh / NNN:IPMB 5V	Voltage (02h) / Threshold (01h)	2204h / 2204h / 1212h	IPMB 5V supply	N
Ch / NNN:Fan1 Speed	Fan (04h) / Threshold (01h)	0000h / 0000h / 1B1Bh	Speed [rpm] Fan 1	N
Dh / NNN:Fan2 Speed	Fan (04h) / Threshold (01h)	0000h / 0000h / 1B1Bh	Speed [rpm] Fan 2	N
Eh / NNN:Last Reset	OEM (CFh) / 'digital' Discrete (03h)	0002h / 0000h / 0003h	Board reset event	N
Fh / NNN:Slot System	Entity presence (25h) / Sensor-specific (6Fh)	0000h / 0000h / 0003h	Board is in System Slot (SYSEN)	N
10h / NNN:PCI Present	Entity presence (25h) / Sensor-specific (6Fh)	0000h / 0000h / 0003h	Board is selected (BDSEL) and in system slot (SYSEN)	N
11h / NNN:CTCA chassis	Entity presence (25h) / Sensor-specific (6Fh)	0000h / 0000h / 0003h	Value is always 1	N
12h / NNN:Board PwrOff	Power supply (08h) / 'digital' Discrete (03h)	0000h / 0000h / 0003h		N
13h / NNN:IPMI WD	Watchdog2 (23h) / Sensor-specific (6Fh)	010Fh / 0000h / 010Fh	IPMI Watchdog	Y / 010Fh
14h / NNN:IPMB State	IPMB status change (F1h) / Sensor-specific (6Fh)	000Fh / 0000h / 000Fh	IPMB-0 state (refer to PICMG 3.0 Rev 2.0, 3.8.4.1)	N
15h / NNN:ACPI State	System ACPI Power State (022h) / Sensor-specific (6Fh)	7FFFh / 0000h / 7FFFh	System ACPI Power State	N
16h / NNN:Health Error	Platform Alert (24h) / 'digital' Discrete (03h)	0000h / 0000h / 0003h	Aggregates states (power, temperatures etc.). Visualization by the Health LED.	N
17h / NNN:CPU 0 Status	Processor (07h) / Sensor-specific (6Fh)	0463h / 0400h / 04E3h	CPU status. Offset 0ah: "Processor Automatically Throttled"	Y / 0402h
18h / NNN:POST Value	POST value OEM (C6h) / Sensor-specific (6Fh)	4000h / 0000h / 40FFh	POST code value (port 80h)	N
19h / NNN:FWH0 BootErr	Boot error (1Eh) / Sensor-specific (6Fh)	0008h / 0008h / 0008h	Firmware Hub 0 (Boot Flash 0) boot error	Y / 0008h
1Ah / NNN:FWH1 BootErr	Boot error (1Eh) / Sensor-specific (6Fh)	0008h / 0008h / 0008h	Firmware Hub 1 (Boot Flash 1) boot error	Y / 0008h
1Bh / NNN:XMC present	Entity Presence (25h) / Sensor-specific (6Fh)	0000h / 0000h / 0003h	Presence of XMC-A board	N
1Ch / NNN:XMC-2 pres	Entity Presence (25h) / Sensor-specific (6Fh)	0000h / 0000h / 0003h	Presence of XMC-B board	N
1Dh / NNN:Pwr Denied	Platform Alert (24h) / 'digital' Discrete (03h)	0002h / 0002h / 0003h	1 = o.k., no alert, power not denied	N
1Eh / NNN:FRU Agent	OEM FRU Agent (C5h) / Discrete (0Ah)	0140h / 0000h / 0147h	FRU Initialization Agent state	Y / 0140h

Table 9: Sensor List

SENSOR Number / ID string	SENSOR TYPE (CODE) / EVENT/READING TYPE (CODE)	Ass. Mask / Deass. Mask / Reading Mask	DESCRIPTION	LED I1on error / Reading Mask
1Fh / NNN:IPMC Storage	Management Subsystem Health (28h) / Sensor-specific (6Fh)	0002h / 0000h / 0003h	IPMI controller storage access error	Y / 0002h
20h / NNN:IpmC Reboot	Platform Alert (24h) / 'digital' Discrete (03h)	0002h / 0000h / 0003h	2 = Management controller is (re-)booting	N
21h / NNN:SEL State	Event Logging Disabled (10h) / Sensor-specific (6Fh)	003Ch / 0000h / 003Ch	State of event logging	N
22h / NNN:IPMI Info-1	OEM Firmware Info 1 (C0h) / OEM (70h)	0003h / 0000h / 7FFFh	For internal use only	N
23h / NNN:IPMI Info-2	OEM Firmware Info 2 (C0h) / OEM (71h)	0003h / 0000h / 7FFFh	For internal use only	N
24h / NNN:IniAgent Err	Initialization Agent (C2h) / 'digital' Discrete (03h)	0002h / 0000h / 0003h	Initialization Agent error status. Used on BMC only. 1 = error free	N
25h / NNN:Board Rev	OEM Board Revision (CEh)/ Sensor-specific (6Fh)	0000h / 0000h / 7FFFh	Board revision information	N

11.2 Sensor Thresholds

The CP6002 CPU module is available for two different operating temperature ranges. For each operating temperature range, standard and extended (E2), a set of temperature thresholds for the sensors is defined. The thresholds defined in Table 10 are the same for both temperature ranges except for sensor 04h. The far right column indicates the thresholds for the E2 range for the sensor 04h.

Table 11 provides voltage sensor thresholds.

Table 10: Thresholds - Standard and E2 Temperature Range

Sensor Number / ID string	01h / NNN:Temp CPU	02h / NNN:Temp PCH	03h / NNN:Temp Graphic	04h / NNN:Temp Board	(E2 RANGE) 04h / NNN:Temp Board
Upper non-recoverable	115 °C	116 °C	110 °C	95 °C	95 °C
Upper critical	105 °C	111 °C	100 °C	90 °C	90 °C
Upper non critical	95 °C	101 °C	90 °C	85 °C	85 °C
Normal max	90 °C	96 °C	85 °C	75 °C	75 °C
Nominal	80 °C	86 °C	75 °C	65 °C	65 °C
Normal min	3 °C	3 °C	3 °C	0 °C	- 40 °C
Lower non-critical	1 °C	n.a.	1 °C	- 1 °C	- 41 °C
Lower critical	n.a.	n.a.	n.a.	- 3 °C	- 43 °C
Lower non-recoverable	n.a.	n.a.	n.a.	- 5 °C	- 45 °C

Table 11: Voltage Sensor Thresholds

Sensor Number / ID string	07h / NNN:Board 3.3V	08h / NNN:Board 5VIPMI	09h / NNN:Board 5.0V	0Ah / NNN:Board 12V	0Bh / NNN:IPMB 5V
Upper non-recoverable	n.a.	n.a.	n.a.	n.a.	n.a.
Upper critical	3.503 V	5.004 V	5.310 V	12.715 V	5.310 V
Upper non critical	n.a.	n.a.	n.a.	n.a.	n.a.
Normal max	3.460 V	4.938 V	5.245 V	12.598 V	5.245 V
Nominal	3.302 V	4.697 V	5.007 V	12.012 V	5.007 V
Normal min	3.202 V	4.455 V	4.769 V	11.426 V	4.769 V
Lower non-critical	n.a.	n.a.	n.a.	n.a.	n.a.
Lower critical	3.173 V	4.389 V	4.704 V	11.309 V	4.704 V
Lower non-recoverable	n.a.	n.a.	n.a.	n.a.	n.a.

11.3 OEM Event/Reading Types

OEM (Kontron) specific sensor types and codes are presented in the following table.

Table 12: 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
Initialization Agent (C2h)	03h ('digital' Discrete)	Offsets / events: 0: Initialization O.K. 1: Initialization Error
FRU Agent (C5h)	0Ah (Discrete)	FRU initialization agent, using a standard reading type.
Post Value (C6h)	6Fh (sensor type specific)	Error is detected if the POST code is != 0 and doesn't change for a defined amount of time. In case of no error: Bits [7:0] = POST code (payload Port 80h) In case of error: Bits [15:0] = 4000h Data2 = POST code, low nibble Data3 = POST code, high nibble
Firmware Upgrade Manager (C7h)	6Fh (sensor type specific)	Offsets / events: 0 : First Boot after upgrade 1 : First Boot after rollback (error) 2 : First Boot after errors (watchdog) 3 : First Boot after manual rollback 4..7 : Reserved 8 : Firmware Watchdog Bite, reset occurred
Board Reset (CFh)	03h ('digital' Discrete)	Data 2 contains the reset type: ...WARM = 0 ...COLD = 1 ...FORCED_COLD = 2 ...SOFT_RESET = 3 ...MAX = 4 Data 3 contains the reset source: ...IPMI_WATCHDOG = 0 ...IPMI_COMMAND = 1 ...PROC_INT_CHECKSTOP = 2 ...PROC_INT_RST = 3 ...RESET_BUTTON = 4 ...POWER_UP = 5 ...LEG_INITIAL_WATCHDOG = 6 ...LEG_PROG_WATCHDOG = 7 ...SOFTWARE_INITIATED = 8 ...SETUP_RESET = 9 ...UNKNOWN = 0xFF

Table 12: OEM Event/Reading Types

OEM SENSOR TYPE (CODE)	OEM EVENT/READING TYPE (CODE)	DESCRIPTION	
e.g. for Power Good / Power Good Event	73h	Sensor-specific Offset	Event
		0h	HS fault#
		1h	HS early fault#
		2h	DEG#
		3h	FAL#
		4h	n.a.
		5h	n.a.
		6h	n.a.
		7h	n.a.
		8h	n.a.
		9h	n.a.
		Ah	n.a.
		Bh	n.a.
		Ch	n.a.
		Dh	n.a.
		Eh	vccMainGood
Board revision (CEh)	6Fh (sensor type specific)	Bits [7:0] = Board Revision number This corresponds to Board and PLD Revision register described in CP6002 board manual.	

12. FRU Data

12.1 Structure and Functionality

The Management Controller provides 4 kB non-volatile storage space for FRU information.

Please refer to Related Publications: IPMI- Platform Management FRU Information Storage Definition v1.0, Document Revision 1.1 which defines the structure of FRU data.

Full low-level access to read or write a module's FRU Information is provided by regular IPMI FRU Device commands. Care must be taken when writing FRU information directly using standard IPMI commands because there is no write protection. Invalid FRU information may disturb a shelf management software which uses the FRU data.

To avoid this situation there is a Kontron Linux tool 'frum', which permits displaying and partial modification of FRU data. For example, the 'frum' tool makes it easy to modify Product Info Area fields like Product Version or Product Serial Number.

12.2 Board Specific FRU Data

Supported are the following FRU data areas and data fields:

FRU Board Info Area

- Manufacturing date / time
- Board manufacturer (C7): “Kontron”
- Board Product Name (C6): “CP6002”
- Board Serial Number (CF): “123456789012345” 1)
- Board Part Number (C9): “123456789” 1)
- FRU File ID (C7): “STD_R10”

FRU Product Info Area

- Product manufacturer (C7): “Kontron”
- Product Name (C6): “CP6002”
- Product Part Number (C2): “00” 1)
- Product Version (D9): “000000000000000000000000” 2)
- Product Serial Number (D9): “000000000000000000000000” 2)
- Asset Tag (D9): “_____” 2)
- FRU File ID (C7): “STD_R10”
- CustomData (D5): “MAC=CC:CC:CC:CC:CC:CC” 1)

1) Field will be modified during the manufacturing process

2) Field is free for user. Please note that changes need special care (checksums).

12.3 Downloading the FRU Data

Normally a download of the FRU data is not required because the module is supplied with it before shipping.

But if needed the standard way to download FRU information to the module is to use the open tool ‘ipmitool’ for the download of an image file (e.g. ‘ipmitool fru write 0 <file name>’).

All IPMI interfaces which are offered by ‘ipmitool’ are usable. This allows local upgrade or remote upgrade. Please note that the KCS interface is only usable on a powered payload.

Please note that the writing of FRU data while the board is write protected will have no effect.

13. OS Support / Tools

13.1 Linux Tools

OpenIPMI - KCS driver

Normally all drivers and kernel modules needed for communication between the payload sided software and the Management Controller 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.

IPMI Tool

Another very useful all-in-one tool is ‘ipmitool’ (http://ipmitool.sourceforge.net). It provides a user friendly interface to many IPMI features and extensions, for example, to get sensor readings, change sensor thresholds or to access other Management Controllers via IPMB. Before ‘ipmitool’ can be used the OpenIPMI driver, mentioned above, must be loaded too.

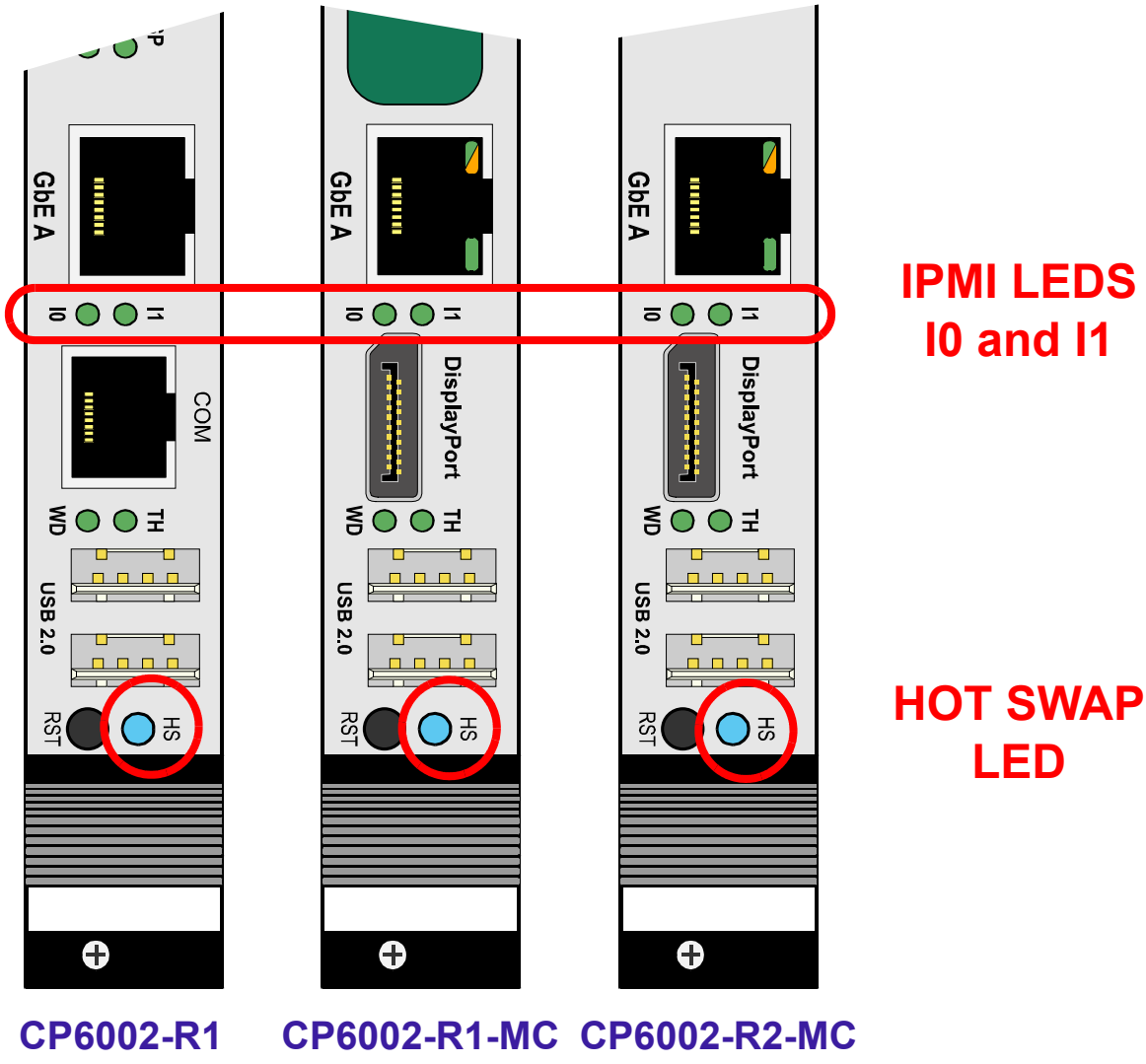
13.2 OS Support - Board Support Packages

For information on the operating systems supported with the CP6002, please refer to the CP6002’s data sheet. Please visit “http://www.kontron.com” to download the data sheet. Please also have a look at the download section for the latest versions of Board Support Packages or Firmware Updates.

For further information concerning IPMI, refer to the BSP documentation for the respective OS.

14. IPMI Module Management LEDs

There are three IPMI Module Management LEDs on the front panel of the CP6002. The following figure illustrates the location of the LEDs.



The following table describes the functioning of the Module Management LEDs.

Table 13: Module Management LEDs Function

LED	COLOR	STATE	NORMAL MODE	OVERRIDE MODE selectable by user or SMS/SMM
LED I0	green	off	IPMI Controller operating	By user: • Only lamp test
		slow blinking	IPMI Controller request attention of the SMS/SMM	
		fast blinking	Send/receive data through the IPMB bus	
		on steady	IPMI Controller not operating	
LED I1	green	off	IPMI Controller not operating	By user: • Only lamp test
		slow blinking	IPMI Controller heart beat	
		fast blinking	Send/receive data through the KCS interface	
		on steady	Health error detected	
HS LED (Hot Swap LED)	blue	off	Module is in normal operation (do not extract the module)	By SMS/SMM: • On • Off • Slow/Fast Blinking By user: • Only lamp test
		blinking	Module hot swap in progress; module not ready for extraction	
		on	a) Module ready for hot swap extraction, or b) Module has just been inserted in a powered system	