

CP6940

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▶ CP6940 - USER GUIDE

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Revision History

Rev. Index	Brief Description of Changes	Date of Issue
1.00	First official version	2020-07-29
1.01	Added own block diagram and Port mapping for each variant Added Weights Some typos corrected Added information about I/O bandwidth Some minor extensions and additions	2021-02-01
1.02	Added information about Front port modes and corresponding examples Some corrections in chapter "Front Panel Elements" Changed chapter 4.5.2.1: IPMI Sensor List Added/removed oem sensors Added table for PICMG commands Changed chapter 4.5.2.3: Sensor Thresholds Added chapter 4.5.3: Health LED Some editorial changes	2023-01-30
1.03	remove copy image1 image2 command, supported only until GA 6.51 Added information in chapter „Thermal considerations“	2023-08-21

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Symbols

The following symbols may be used in this manual.

	DANGER indicates a hazardous situation which, if not avoided, will result in death or serious injury.
	WARNING indicates a hazardous situation which, if not avoided, could result in death or serious injury.
	CAUTION indicates a hazardous situation which, if not avoided, may result in minor or moderate injury.
	NOTICE indicates a property damage message.
	<p>Electric Shock!</p> <p>This symbol and title warn of hazards due to electrical shocks (> 60 V) when touching products or parts of them. Failure to observe the precautions indicated and/or prescribed by the law may endanger your life/health and/or result in damage to your material.</p> <p>Please refer also to the „High.Voltage Safety Instructions“ portion below in this section.</p>
	<p>ESD Sensitive Device!</p> <p>This symbol and title inform that the electronic boards and their components are sensitive to static electricity. Care must therefore be taken during all handling operations and inspections of this product in order to ensure product integrity at all times.</p>
	<p>HOT Surface!</p> <p>Do NOT touch! Allow to cool before servicing.</p>
	<p>This symbol indicates general information about the product and the user manual.</p> <p>This symbol also indicates detail information about the specific product configuration.</p>
	<p>This symbol precedes helpful hints and tips for daily use.</p>

For Your Safety

Your new Kontron product was developed and tested carefully to provide all features necessary to ensure its compliance with electrical safety requirements. It was also designed for a long fault-free life. However, the life expectancy of your product can be drastically reduced by improper treatment during unpacking and installation. Therefore, in the interest of your own safety and of the correct operation of your new Kontron product, you are requested to conform with the following guidelines.

High Voltage Safety Instructions

As a precaution and in case of danger, the power connector must be easily accessible. The power connector is the product's main disconnect device.



Warning

All operations on this product must be carried out by sufficiently skilled personnel only.



Electric Shock!

Before installing a non hot-swappable Kontron product into a system always ensure that your mains power is switched off. This also applies to the installation of piggybacks. Serious electrical shock hazards can exist during all installation, repair, and maintenance operations on this product. Therefore, always unplug the power cable and any other cables which provide external voltages before performing any work on this product.

Earth ground connection to vehicle's chassis or a central grounding point shall remain connected. The earth ground cable shall be the last cable to be disconnected or the first cable to be connected when performing installation or removal procedures on this product.

Special Handling and Unpacking Instruction



ESD Sensitive Device!

Electronic boards and their components are sensitive to static electricity. Therefore, care must be taken during all handling operations and inspections of this product, in order to ensure product integrity at all times.

Do not handle this product out of its protective enclosure while it is not used for operational purposes unless it is otherwise protected.

Whenever possible, unpack or pack this product only at EOS/ESD safe work stations. Where a safe work station is not guaranteed, it is important for the user to be electrically discharged before touching the product with his/her hands or tools. This is most easily done by touching a metal part of your system housing.

It is particularly important to observe standard anti-static precautions when changing piggybacks, ROM devices, jumper settings etc. If the product contains batteries for RTC or memory backup, ensure that the product is not placed on conductive surfaces, including anti-static plastics or sponges. They can cause short circuits and damage the batteries or conductive circuits on the product.

General Instructions on Usage

In order to maintain Kontron's product warranty, this product must not be altered or modified in any way. Changes or modifications to the product, that are not explicitly approved by Kontron and described in this User Guide or received from Kontron's Technical Support as a special handling instruction, will void your warranty.

This product should only be installed in or connected to systems that fulfill all necessary technical and specific environmental requirements. This also applies to the operational temperature range of the specific board version, that must not be exceeded. If batteries are present, their temperature restrictions must be taken into account.

In performing all necessary installation and application operations, only follow the instructions supplied by the present User Guide.

Keep all the original packaging material for future storage or warranty shipments. If it is necessary to store or ship the product then re-pack it in the same manner as it was delivered.

Special care is necessary when handling or unpacking the product. See Special Handling and Unpacking Instruction.

Environmental Protection Statement

This product has been manufactured to satisfy environmental protection requirements where possible. Many of the components used (structural parts, printed circuit boards, connectors, batteries, etc.) are capable of being recycled. Final disposal of this product after its service life must be accomplished in accordance with applicable country, state, or local laws or regulations.



Environmental protection is a high priority with Kontron.
Kontron follows the DEEE/WEEE directive
You are encouraged to return our products for proper disposal.

The Waste Electrical and Electronic Equipment (WEEE) Directive aims to:

Reduce waste arising from electrical and electronic equipment (EEE)

Make producers of EEE responsible for the environmental impact of their products, especially when the product become waste

Encourage separate collection and subsequent treatment, reuse, recovery, recycling and sound environmental disposal of EEE

Improve the environmental performance of all those involved during the lifecycle of EEE.

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1/ Introduction

This manual describes the features of the CP6940 board. The use of this User Guide implies a basic knowledge of PC hard- and software. This manual is focused on describing the special features and is not intended to be a standard PC textbook.

New users are recommended to study the short installation procedure stated in the following chapter before switching on the power.

Latest revision of this manual, datasheet, Bootloader, drivers and BSP's (Board Support Packages) can be downloaded from Kontron Web Page.

1.1 Product Overview

The CP6940 is a Standard Fabric 6U CompactPCI Gigabit Ethernet Switch with 24 channels compliant to PICMG 2.16.

The board is available in three variants:

- CP6940-RA-OC
Rugged optical/copper managed layer 2/3 Switch with 24 rear GbE,
Front uplinks (4x 1GBase-T RJ45, 4x 10G SFP+)
Layer 2/3 management
Ready for extended Temperature Range -40 to +70°C
- CP6940-RA-OC-P
200Gbps performance rugged optical/copper managed layer 2/3 Switch with 24x rear GbE,
Front uplinks (2x QSFP+ for 40G or 4 times 10G, 4x 10G SFP+, 2x 1G SFP)
Layer 2/3 management
Ready for extended Temperature Range -40 to +70°C
- CP6940-SA-OC-V
Value line optical/copper managed layer 2 Switch with 24 rear GbE,
Front uplinks (4x 1GBase-T RJ45, 2x 10G SFP+, 2x 1G SFP)
Layer 2 management
Standard Temperature Range 0 to +60°C

1.1.1 CP6940 Features

The board includes the following building blocks:

- Ethernet Infrastructure
- Unit Computer and Memory
- IPMI
- Power Supply

1.1.1.1 Ethernet Infrastructure

- Broadcom high port count integrated switch with 100-FX/1G/2.5G/5G/10G-Capable SerDes lanes
- BCM56174 with 28x 1GbE Ports (SGMII) and 12x 10GbE
- 4 MBytes packet buffer size
- Unit Computer manages Switch via PCIe Gen2 x1 (5Gbps)
- Up to 7x Broadcom BCM54140 10/100/1000Base-T Transceiver with SGMII Ports
- Up to 24x 10/100/1000Base-T via MII interface to backplane connector J5, J4 and J3
- Up to four 10/100/1000Base-T RJ45 connectors at the front panel
- BCM56174 Switch manages transceiver via MIIM Interface
- SFP+ and SFP transceiver are direct connected to the switch
- SFIs connect to SFP+ interfaces at the front panel
 - BSC Master I2C for SFP support
 - SPI FLASH programming interface
 - LED BUS controls the faceplate status LEDs
- I/O Bandwidth

Each of the switch interfaces is able to run at full wire speed regardless of the status of other interfaces. The switching fabric does not limit the throughput of the interfaces. The CP6940 is a non-blocking switch fabric with line rate switching.

The number of interfaces and the corresponding speed defines the maximum I/O bandwidth of each board variant:

- CP6940-RA-OC-P: 147Gb/s 2 x 40G + 4 x 10G + 2 x 1G + 24x 1G Backplane + 1 x 1G Unit computer
- CP6940-RA-OC: 69Gb/s 4 x 10G + 4 x 1Gb + 24x 1G Backplane + 1 x 1G Unit computer
- CP6940-SA-OC-V: 51Gb/s 4 x 1G + 2 x 10G + 2 x 1G + 24x 1G Backplane + 1 x 1G Unit computer

1.1.1.2 Unit Computer and System Memory

- NXP Layerscape LS1020 CPU running at 1200 MHz
- Used for switch provisioning and diagnostics
- 2 GBytes DDR3 RAM
- 4 GBytes eMMC (pSLC)
- 4 MBytes SPI FLASH Memory
- PCIe Management interface to BCM56174
- 10/100/1000Base-T Management Port via Copper PHY AR8031 connected to FP RJ45
- UART connects to CPLD
- I2C Interface and IFC Interface to CPLD
- NVRAM write protection
- NXP LS1020 supports JTAG Boundary Scan

1.1.1.3 IPMI

- NXP LPC2368 32-Bit Microcontroller
- PICMG 2.9 / IPMI 1.5 compliant
- Dual Image Support
- 2 MByte Flash (Boot Image)
- 64 kByte EEPROM (FRU)
- Board Voltage and current monitoring
- Board Temperature monitoring via I²C enabled sensors

1.1.1.4 Power Supply

- 5V and 3.3V only board, no 12V or -12V required
- IPMB_PWR used for 3.3V PM (generated by LDO)
- Hot Swap support
- 3V3 V stabilization
- Point of Load Converters for chip core voltages

1.1.1.5 Miscellaneous

- JTAG Boundary Scan support
- All parts are extended temperature range parts: -40°C to +70°C or better

1.1.2 General compliances

The Board is compatible to the following standards:

- PICMG® 2.0 R3.0 CompactPCI® Specification, as amended by ERN 2.0-3.0-002
- PICMG® 2.1 R2.0 CompactPCI® Hot Swap Specification
- PICMG® 2.9 R1.0 CompactPCI® System Management Specification
- PICMG® 2.16 R1.0 Sep. 5, 2005 Packet Switching Backplane Specification
- Intelligent Platform Management Interface Specification V1.5
- IEEE 802.3, 2008 section 3

1.2 Technical Specification

1.2.1 Power Requirements

Operating voltages are 5.0 Volt and 3.3 Volt.

The maximum power consumption is not more than 60W.

1.2.2 Mechanics

Compliant to PICMG® 2.0 6U/4HP (233.35 mm x 160 mm).

- Weight:
 - CP6940-1-RA-OC-P: 780 grams
 - CP6940-1-RA-OC: 771 grams
 - CP6940-1-SA-OC-V: 600 grams

1.2.3 Temperature

Compliant to IEC 60068-2-1 and IEC 60068-2-2.

- CP6940-RA-OC-P
 - Operation from -40° C to +70° C inlet air temperature
- CP6940-RA-OC
 - Operation from -40° C to +70° C inlet air temperature
- CP6940-SA-OC-V
 - Operation from 0° C to +60° C inlet air temperature

Required average inlet airflow should be around 400LFM (2 m/s) for the maximum cooling. Other thermal limitations may apply and are the responsibility of the system integrator.

Storage temperature range is -50°C to +105°C for all variants.

1.2.4 Humidity

The board is designed to meet the standard IEC 60068-2-78 operating 93% at 40°C (non-condensing).

1.2.5 Altitude

The boards are designed to meet the following requirements:

- Operating: 4000m (13123 ft)
- Non-Operating: 15000 m (49212 ft)

1.2.6 Vibration

NOTICE

If the CP6940 board is used in heavy shock and vibration environment, the hole system must withstand these requirements. This means the chassis, backplane and guiderails should be designed for harsh environment. Guide rails with wedge locks are recommend. The backplane has to be stiffened to avoid connector micro movement. It is also recommended to use connectors which are designed for a rugged environment.

The CP6940-SA-OC-V board is designed to meet the requirements according IEC60068-2-6:

- 10 Hz to 300 Hz, 2g acceleration
- 1 octave/min
- 10 cycles/axis, 3 directions [x, y, z]
- 5 Hz to 100 Hz PSD increasing at 3 dB/octave
- 100 Hz to 1000 Hz PSD = 0.04 g²/Hz
- 1000 Hz to 2000 Hz PSD decreasing at 6 dB/octave

The CP6940-RA-OC and CP6940-RA-OC-P boards are designed to meet the requirements according ANSI VITA 47 V2:

- withstand vibration for 1 hour per axis:
- 5 Hz to 100 Hz PSD increasing at 3 dB/octave
- 100 Hz to 1000 Hz PSD = 0.04 g²/Hz
- 1000 Hz to 2000 Hz PSD decreasing at 6 dB/octave

1.2.7 Shock

The CP6940-SA-OC-V board is designed to meet the requirements of the following standards:

- DIN/IEC 60068-2-27
 - Peak Acceleration: 30 g, Shock Duration: 9 ms half sine, Recovery Time: 5 s, Shock Count: 3/direction, 6 directions, total 18

1.2.8 Bump

All three CP6940 Boards are designed to meet the IEC 60068-2-29:

- Peak Acceleration: 15 g
- Shock Dur.: 11 ms half sine
- Shock Count: 500
- Recovery time: 1 s

1.2.9 Safety

The boards are designed to meet or meets the following requirements:

- UL 61010-1

The boards are designed to meet the following flammability requirement (as specified in Telcordia GR-63-CORE):

- UL 94V-0/1 with Oxygen index of 28% or greater material

1.2.10 Electromagnetic Compatibility

The boards are designed to meet or exceed class B limit of the following specifications/requirements (assuming an adequate system/chassis):

- FCC 47 CFR Part 15, Subpart B (USA)
- EN55032 (Europe)
- EN61000
- VCCI (Voluntary Japan Electromagnetic Compatibility requirement)

1.2.11 Reliability

Targeted MTBF

- CP6940-RA-OC and CP6940-SA-OC-V: 138,146h 30 °C
- CP6940-RA-OC-P: 140,823 h 30 °C

based on MIL-HDBK-217 FN2, Ground Benign, Controlled

1.2.12 WEEE

Compliant to:

- Directive 2002/96/EC: Waste electrical and electronic equipment

1.2.13 RoHS Compliance

Components and materials of the product must not contain lead, mercury, cadmium, hexavalent chromium, polybrominated biphenyls (PBB) or polybrominated diphenyl ethers (PBDE) according Directive 2011/65/EU.

1.2.14 Lead-free

The boards have to be completely lead-free concerning the production process and the components used.

1.3 Software Support

The following table contains information related to software supported by the CP6940

Table 1: CP6940 Software Specification

CP6940	SPECIFICATIONS
General	<ul style="list-style-type: none"> • Reliable field upgrades for all software components • Active and Backup boot images • Management via SNMP and Command Line Interface • System access via TELNET, SSH and serial line • Hot-Swap support (IPMI)
Ethernet/Bridging	<ul style="list-style-type: none"> • Static link aggregation (IEEE 802.3ad) • Classic and rapid spanning tree algorithms(IEEE 802.1D, IEEE 802.1w) • Multiple Spanning Tree (IEEE 802.5) • Quality Of Service on all ports (IEEE 802.1p) • Full Duplex operation and flow control on all ports (IEEE 802.3x) • Static MAC filtering • Port Authentication (IEEE 802.1X) • Auto negotiation of speeds and operational mode on all external copper GE interfaces as well as on all base fabric interfaces • Layer 2 multicast services using GARP/GMRP (IEEE 802.1p) • VLAN support including VLAN tagging (IEEE 802.3ac), dynamic VLAN registration with GARP/GVRP (IEEE 802.1Q) and Protocol based VLANs (IEEE 802.1v) • Double VLAN tagging • Port Mirroring
IP Routing	<ul style="list-style-type: none"> • Redundancy of routing functionality using a second switch hub board • IPv4 Forwarding on all base channels and connected uplink ports • Quality of service according to the DiffServ standards • ARP for all routable interfaces • ICMP for all routable interfaces • OSPF routing protocol version 2 • RIP routing protocol version 2 • VRRP (virtual router redundancy protocol) for transparent fail over of default routers • IGMP snooping
QoS	<ul style="list-style-type: none"> • CoS (Class of Service) • DiffServ (Differentiated Services) • ACL (Access Control List)
IP Multicast	<ul style="list-style-type: none"> • DVMRP • PIM-DM • PIM-SM • IGMP (Internet Group Message Protocol) v2 and v3 • IGMP Proxy

Table 1: CP6940 Software Specification (Continued)

CP6940	SPECIFICATIONS
Applications	<ul style="list-style-type: none"> • SNTP client for retrieving accurate time and date information • DHCP server • Onboard event management • Test and trace facilities • POST (power on self tests) diagnostics • Standards based SNMP implementation supporting SNMP v1, v2 and v3 for monitoring and management purposes • Persistent storage of configuration across restarts • Support for retrieving and installing multiple configurations • Support for startup configurations based on the cPCI SGA/GA (Shelf Geographical Address/Geographical Address), see CP6940 CLI Reference Manual, chapter „AutoInstall Commands“
Supported MIBS	<ul style="list-style-type: none"> • For a list of supported MIBs, see chapter “Supported MIBs” on page 41
Bootloader	<ul style="list-style-type: none"> • u-boot Version 2019-07 • POST • multi image support • reliable field upgradable • H/W protected • KCS interface to PM • serial console support
Operating System	<ul style="list-style-type: none"> • Buildroot Linux, with vanilla LTS kernel 5.x

2/ CP6940 Installation

The CP6940 has been designed for easy installation. However, the following standard precautions, installation procedures, and general information must be observed to ensure proper installation and to preclude damage to the board, other system components, or injury to personnel.

2.1 Safety Requirements

The following safety precautions must be observed when installing or operating the CP6940. Kontron assumes no responsibility for any damage resulting from failure to comply with these requirements.

CAUTION

Due care should be exercised when handling the board due to the fact that the heat sink can get very hot. Do not touch the heat sink when installing or removing the board.

In addition, the board should not be placed on any surface or in any form of storage container until such time as the board and heat sink have cooled down to room temperature.

CAUTION

Be careful when inserting or removing the CP6940. The SFP cages have sharp edges which might lead to injuries.



ESD Sensitive Device

The CP6940 board contains electrostatically sensitive devices. Please observe the necessary precautions to avoid damage to your board:

- Discharge your clothing before touching the assembly. Tools must be discharged before use.
 - When unpacking a static-sensitive component from its shipping carton, do not remove the component's antistatic packing material until you are ready to install the component in a computer. Just before unwrapping the antistatic packaging, be sure you are at an ESD workstation or grounded. This will discharge any static electricity that may have built up in your body.
 - When transporting a sensitive component, first place it in an antistatic container or packaging.
 - Handle all sensitive components at an ESD workstation. If possible, use antistatic floor pads and workbench pads.
 - Handle components and boards with care. Don't touch the components or contacts on a board. Hold a board by its edges or by its metal mounting bracket.
 - Do not handle or store system boards near strong electrostatic, electromagnetic, magnetic, or radioactive fields.
-

2.2 CP6940 Initial Installation Procedures

The following procedures are applicable only for the initial installation of the CP6940 in a system. Procedures for standard removal and hot swap operations are found in their respective chapters.

To perform an initial installation of the CP6940 in a system proceed as follows:

1. Ensure that the safety requirements indicated in chapter Safety Requirements are observed.

CAUTION

Failure to comply with the instruction below may cause damage to the board or result in improper system operation.

2. Ensure that the board is properly configured for operation in accordance with application requirements before installing. For information regarding the configuration of the CP6940 refer to the CLI Reference Manual.

CAUTION

Care must be taken when applying the procedures below to ensure that neither the CP6940 nor other system boards are physically damaged by the application of these procedures.

3. To install the CP6940 perform the following:
 - Ensure that no power is applied to the system before proceeding.
 - Carefully insert the board into the slot designated by the application requirements for the board until it makes contact with the backplane connectors.

CAUTION

DO NOT push the board into the backplane connectors. Use the ejector handles to seat the board into the backplane connectors.

- Using both ejector handles, engage the board with the backplane. When the ejector handles are locked, the board is engaged.
 - Fasten the front panel retaining screws.
 - Connect all external interfacing cables to the board as required.
 - Ensure that the board and all required interfacing cables are properly secured.
4. The CP6940 is now ready for operation.

2.3 Standard Removal Procedures

To remove the board proceed as follows:

1. Ensure that the safety requirements indicated in chapter Safety Requirements are observed.

CAUTION

Care must be taken when applying the procedures below to ensure that neither the CP6940 nor other system boards are physically damaged by the application of these procedures.

2. Ensure that no power is applied to the system before proceeding.
3. Disconnect any interfacing cables that may be connected to the board.
4. Unscrew the front panel retaining screws.

CAUTION

Due care should be exercised when handling the board due to the fact that the heat sink can get very hot. Do not touch the heat sink when installing or removing the board.

5. Disengage the board from the backplane by first unlocking the board ejection handles and then by pressing the handles as required until the board is disengaged.
6. After disengaging the board from the backplane, pull the board out of the slot.
7. Dispose of the board as required.

2.4 Software Installation

The CP6940 comes as a pre-installed system with all necessary OS, filesystem, drivers and applications factory-installed with default configurations.

Updating the Software with new operating system or applications or new versions is provided by a dedicated update mechanism, which is described in Chapter 4.

2.5 Quick Start

This section gives instructions for (initially) accessing the CLI (Command Line Interface) of the CP6940 using either in-band access via the ethernet fabric or the out-of-band management interfaces (serial port or Gigabit Ethernet) accessible from the front plate serial connector or via an appropriate RIO module. The CLI is required for configuring the GbE switch.

2.5.1 Out-of-Band CLI Access

The CLI can be accessed via serial port (using the front plate connector and provided adapter or an appropriate RIO module) or Gigabit Ethernet (via the front plate RJ45 connector).

2.5.1.1 Serial Port

The serial port is ready to use out-of-the-box without further configuration.

Port settings are:

- 115200 bps (serial speed might be different for customized board variants)
- 8 bit, no parity, 1 stop bit (8N1)
- no flow control

2.5.1.2 Gigabit Ethernet Serviceport

The Gigabit Ethernet serviceport on the CP6940 front plate has no IP address set by default, it is necessary to assign an IP address statically or enable dhcp on the serviceport. Because the required configuration steps are done in the CLI, an initial access using the serial port is required.

The procedure for assigning an IP address to the serviceport is described in the following. User input is printed in bold letters.

1. Connect to serial port on the front plate (using the Kontron DB9 adapter cable) or RIO module (using a RJ45 straight cable).
2. Ensure that the board is powered up.
3. Log in as admin and enter privileged mode by typing 'enable' (no passwords required by default).

```
User: admin
Password:
(Ethernet Fabric) >enable
Password:

(Ethernet Fabric) #
```

4. Set IP address and netmask. (see below for an example IP address setting)

```
(Ethernet Fabric) #serviceport ip 192.168.50.107 255.255.255.0
```

The GbE management interface is available from now on.

Alternatively, DHCP can be set for the serviceport

```
(Ethernet Fabric) #serviceport protocol dhcp
```

An IP address will be assigned to the serviceport by a DHCP server.

5. Save configuration using the 'write mem' command and confirm with 'y'

```
(Ethernet Fabric) #write mem
```

```
This operation may take a few minutes.
Management interfaces will not be available during this time.
```

```
Are you sure you want to save? (y/n) y
```

```
Config file 'current/startup-config' created successfully.
```

```
Configuration Saved!
```

```
(Ethernet Fabric) #
```

To access the CLI via Gigabit Ethernet serviceport, open a telnet connection to the configured IP address, port 23.

2.5.2 In-Band CLI Access

The GbE switch network port (in-band management access) on the CP6940 has no IP address set by default, it is necessary to assign an IP address either statically or by using DHCP to the network port. Because the required configuration steps are done in the CLI, an initial access using the serial port is required.

The procedure for assigning an IP address to the network port is described in the following. User input is printed in bold letters.

1. Connect to serial port on the front plate (using the Kontron DB9 adapter cable) or RIO module (using a RJ45 straight cable).
2. Ensure that the board is powered up.
3. Log in as admin and enter privileged mode by typing 'enable' (no passwords required by default).

```
User:admin
```

```
Password:
```

```
(Ethernet Fabric) >enable
```

```
Password:
```

```
(Ethernet Fabric) #
```

4. Set IP address, netmask and default gateway. (see below for an example IP address setting)

```
(Ethernet Fabric) #network parms 192.168.50.107 255.255.255.0 192.168.50.254
```

The GbE management interface is available from now on.

Alternatively, DHCP can be set for the network port

```
(Ethernet Fabric) #network protocol dhcp
```

An IP address will be given to the network port by a DHCP server.

5. Save configuration by using the 'write mem' command and confirm 'y'

```
(Ethernet Fabric) #write mem
```

```
This operation may take a few minutes.
Management interfaces will not be available during this time.
```

```
Are you sure you want to save? (y/n) y
```

```
Config file 'current/startup-config' created successfully.
```

```
Configuration Saved!
```

```
(Ethernet Fabric) #
```

It might make sense to separate the management network from the data path by setting appropriate VLANs. For additional information on the system configuration, refer to the CP6940 CLI Reference Manual.

2.5.2.1 Accessing the system using telnet or ssh

To access the system via telnet, the Telnet daemon has to be started (default: not started).

To access the Fastpath CLI via a telnet connection, use the command

```
telnet <IP-of-CP6940>
```

To access Linux via telnet, use the command

```
telnet <IP-of-CP6940> 2323
```

To access the system via ssh, the ssh daemon has to be running

To access the Fastpath CLI using ssh, use the command

```
ssh admin@<IP-of-CP6940>
```

To access Linux using ssh, use the command

```
ssh root@<IP-of-CP6940> -p 222
```

2.5.2.2 Example for SSH usage

The interactive SSH feature provides a mechanism to remotely execute commands on the switch using SSH.

The SSH server supports three types of user authentication methods and sends these authentication methods to the SSH client in the following predefined order:

- Public-key authentication method.
- Keyboard-interactive authentication method.
- Password authentication method.

Some commands must be executed on the switch to configure ssh handling and some commands are needed on the client to generate the ssh authorization public/private key pair, which is required to install the public key on the switch.

The following example shows how this feature can be used:

1. On the Linux host, generate the public/private key pair. There are many options to control how key are generated.

The following command generates a 2048-bit RSA key:

```
[localhost ~]# ssh-keygen -t rsa -b 2048
Generating public/private rsa key pair.
Enter file in which to save the key (/home/user/.ssh/id_rsa): /home/user/.ssh/id_rsa_CP6940
Enter passphrase (empty for no passphrase):
Enter same passphrase again:
Your identification has been saved in /home/user/.ssh/id_rsa_CP6940.
Your public key has been saved in /home/user/.ssh/id_rsa_CP6940.pub.
The key fingerprint is:
81:96:6d:3d:93:4b:a7:2e:37:bd:e9:6a:3e:5f:10:3d user@localhost
```

This generates the public and private key pair and puts the files inside specified directory

On the switch, make sure that host keys are configured and the ssh/scp services are configured.

```
(Ethernet Fabric)#
(Ethernet Fabric)#configure
(Ethernet Fabric) (Config)#crypto key generate rsa
(Ethernet Fabric) (Config)#exit
```

```
(Ethernet Fabric)#ip ssh server enable
(Ethernet Fabric)#ip ssh pubkey-auth
(Ethernet Fabric)#ip scp server enable
```

2. Verify ip ssh config:

```
(Ethernet Fabric)#show ip ssh

SSH Configuration

Administrative Mode: .....Enabled
SSH Port: .....22
Protocol Level: .....Version 2
SSH Sessions Currently Active: .....0
Max SSH Sessions Allowed: .....5
SSH Timeout (mins): .....5
Keys Present: .....DSA(1024) RSA(1024)
Key Generation In Progress: .....None
SSH Public Key Authentication Mode: .. Enabled
SCP server Administrative Mode: .....Enabled
```

3. Copy the public key that was generated on the linux client to the switch (192.168.170.26), still using password access.

In this sample, copy the public key created in /home/user/.ssh/id_rsa_CP6940.pub to the switch as client1.pub

```
[localhost ~]# scp ~/.ssh/id_rsa_CP6940.pub admin@192.168.170.26:client1.pub
The authenticity of host '192.168.170.26 (192.168.170.26)' can't be established.
RSA key fingerprint is f3:a4:24:f7:c1:77:c2:5b:3f:42:86:08:80:62:19:19.
Are you sure you want to continue connecting (yes/no)? yes
Warning: Permanently added '192.168.170.26' (RSA) to the list of known hosts.
admin@192.168.170.26's password:
id_rsa_CP6940.pub 100% 411 0.4KB/s 00:00
```

Switch console does report update of ssh user public key:

```
File transfer in progress. Management access will be blocked for the duration of the
transfer. Please wait...
SCP-REMOTE SSH user public key transfer starting...
Updating SSH User public key...
File transfer complete. Storing user SSH public key.
SSH user public key transfer operation completed successfully.
File transfer operation is complete. Management interfaces are released.
```

4. Configure the public key on the switch, assign key to a specific login user (access still via password).

```
[localhost ~]# ssh admin@192.168.170.26
admin@192.168.170.26's password:
(Ethernet Fabric)>enable
(Ethernet Fabric)#configure
(Ethernet Fabric) (Config)#username "admin" sshkey file client1.pub
```

One key file per user is supported.

5. Test the connection

Calling ssh with parameter -i defines which private key should be used on the client during authorization.

This could be also defined on a per-host basis inside ssh config files.

```
[localhost ~]# ssh -i ~/.ssh/id_rsa_CP6940 admin@192.168.170.26
(Ethernet Fabric)>enable
(Ethernet Fabric)#show board version
```

6. Allow execution of ssh remote commands.

For FW GA 6.50 and later, ssh must be authorized to execute remote commands.

e.g. ssh authorization list must be a list which does not request further authorization, but allows execution without asking Radius server.

```
(Ethernet Fabric)#configure
(Ethernet Fabric)(Config)#aaa authorization commands „noCmdAuthList” none
(Ethernet Fabric)(Config)#line ssh
(Ethernet Fabric)(Config-ssh)#authorization commands „noCmdAuthList”
(Ethernet Fabric)(Config-ssh)#exit
```

7. Test remote ssh commands from linux client system.

```
[localhost ~]# ssh -i ~/.ssh/id_rsa_CP6940 admin@192.168.170.26 "show board version"
```

2.5.3 Configuring user Accounts

With a new CP6940 product, the Passwords to access the board are set to default values.

- The default password for the Fastpath-user 'admin' is blank, no password
- The default password for the Linux-user 'root' is 'root'

To change the default passwords, follow the instructions below to gain more security in the system.

The passwords are dependent from the way of accessing the system. There are identical passwords with using serial connection, using telnet or ssh, both using out-of-band access via serviceport as well as in-band using one of the network ports.

2.5.3.1 Password Administration

- There are two possibilities to change the Fastpath User password

1. Change password in User EXEC mode

```
(Ethernet Fabric)>password
Enter old password:*****
Enter new password:*****
Confirm new password:*****
```

Password Changed!

```
(Ethernet Fabric)>
```

2. Change the password of any Fastpath user (if permission granted) in Global Config mode,

```
(Ethernet Fabric)(Config)#username admin password NewAdminPW
```

- There are two possibilities to change the Linux User password

1. In Fastpath Privilege Exec mode

```
(Ethernet Fabric)#set board root-password
```

```
Enter new password:*****
```

```
Confirm new password:*****
```

Password Changed!

```
(Ethernet Fabric)#
```

2. In Linux

```
# passwd
Changing password for root
New password:
Retype password:
passwd: password for root changed by root
#
```

For extended requirements with respect to user accounts, Radius and TACACS+ are supported to cover important features like authentication, authorisation and accounting.

Authentication itself basically determines if a user or entity is allowed access. This is usually defined by a user name and password. Authorization is to determine what the user is allowed to access and defines the level of access they have.

When a user is authenticated, and the server determines who they are, they can then assign them the correct level of access (authorization). However this is not mandatory to pass any authentication checks in order to progress to authorization. For example if a user is not authenticated, the server does not know who they are, but may still give them basic rights; for example guest access.

The third service is accounting, which is basically logging. It is able to log all actions for security reasons.

FASTPATH offers Radius and TACACS+ to be used for authentication purposes and make use of AAA. For additional information on secure login configuration, refer to chapter 2 the CP6940 CLI Reference Manual,

3/ Functional Description

This chapter describes the board specific items of the CP6940. The base board is a standard Fabric 6U CompactPCI Giga-bit Ethernet Switch with 24 channels.

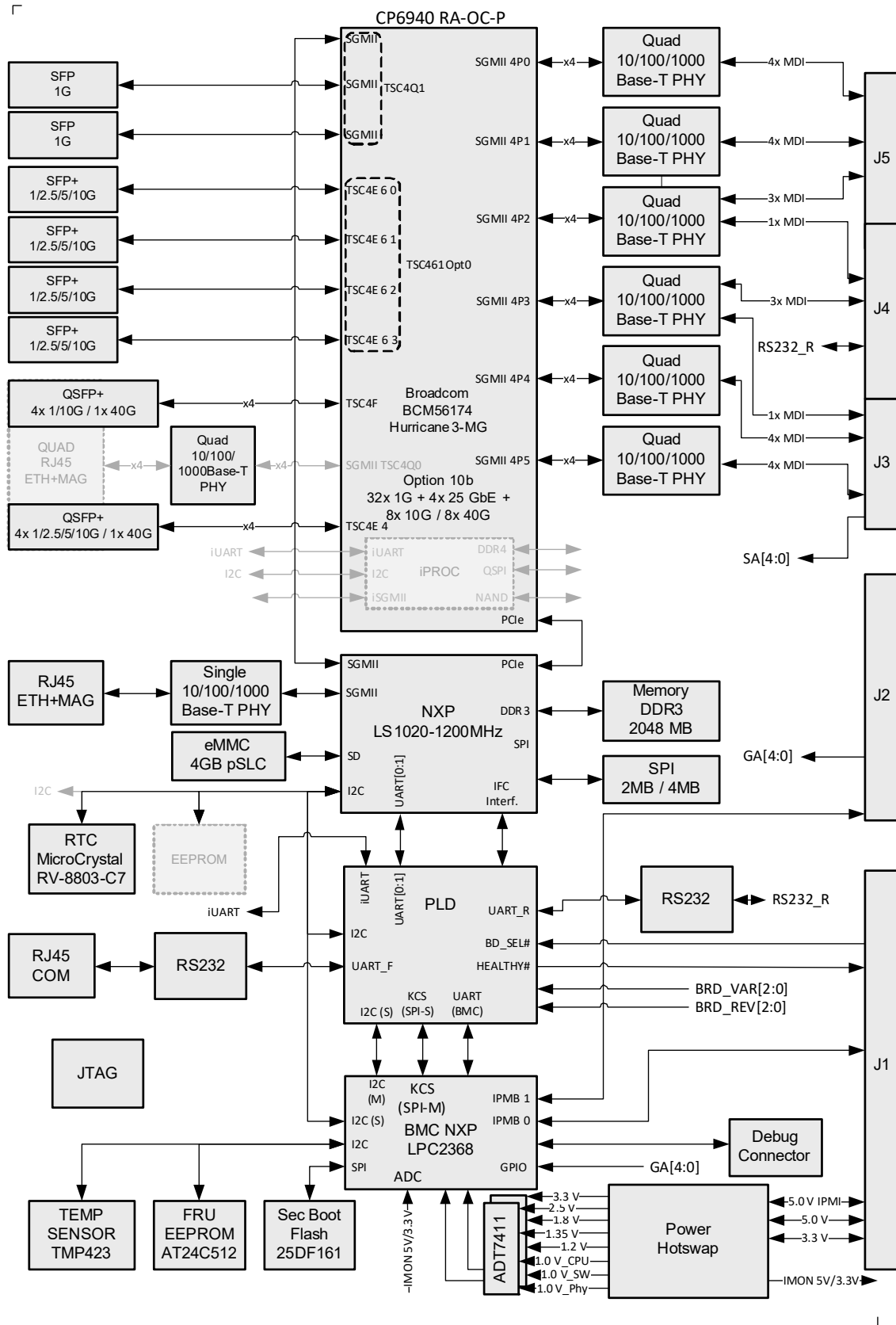


Figure 1: CP6940-RA-OC- P Functional Block Diagram

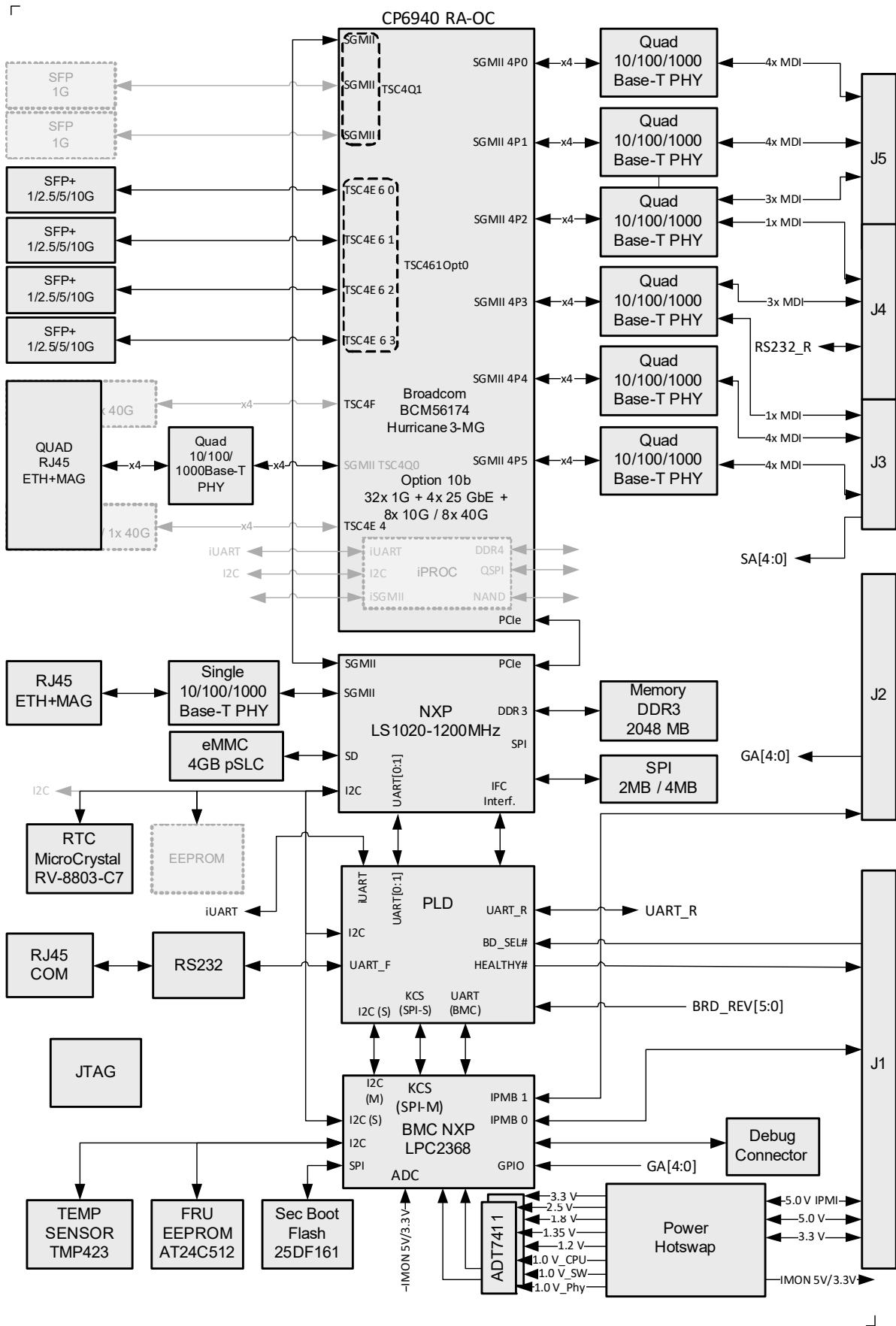


Figure 2: CP6940-RA-OC Functional Block Diagram

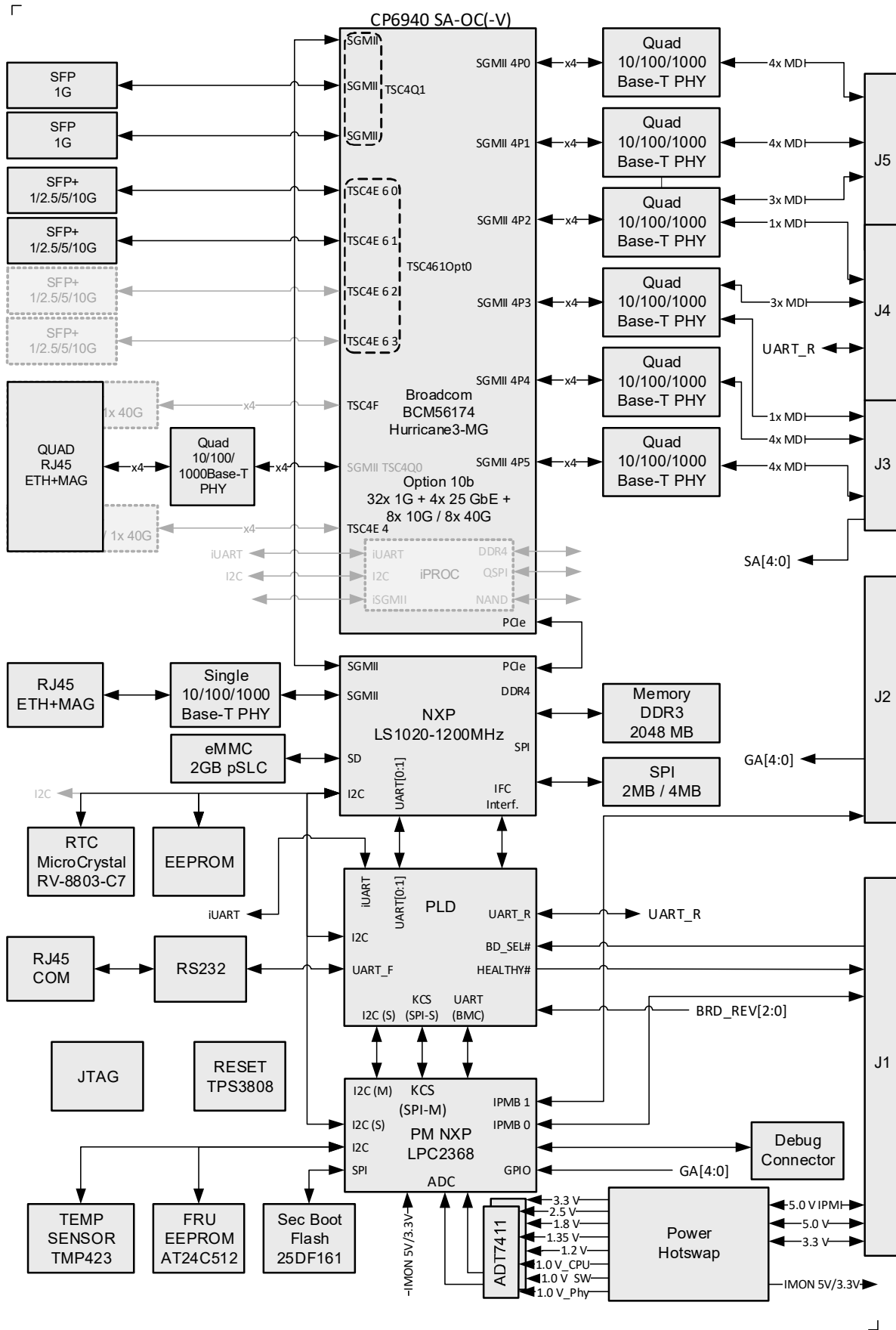


Figure 3: CP6940-SA-OC-V Functional Block Diagram

The board includes the following building blocks:

- Ethernet Infrastructure
- Unit Computer and Memory
- IPMI
- Power Supply

3.1 Ethernet Infrastructure

The fabric switch infrastructure includes:

- Broadcom high port count integrated switch with 100-FX/1G/2.5G/5G/10G-Capable SerDes lanes
- BCM56174 with 28x 1GbE Ports (SGMII) and 12x 10GbE
- Unit Computer manages Switch via PCIe Gen2 x1 (5Gbps)
- Up to 7x Broadcom BCM54140 10/100/1000Base-T Transceiver with SGMII Ports
- Up to 24x 10/100/1000Base-T via MII interface to backplane connector J5, J4 and J3
- Up to four 10/100/1000Base-T RJ45 connectors at the front panel
- BCM56174 Switch manages transceiver via MIIM Interface
- SFP+ and SFP transceiver are direct connected to the switch
 - SFIs connect to SFP+ interfaces at the front panel
 - BSC Master I2C for SFP support
 - SPI FLASH programming interface
- LED BUS controls the faceplate status LEDs
- Switch supports JTAG Boundary Scan

The ports of the switch are mapped as shown in the following tables.

Table 2: Ethernet Port Mapping CP6940-RA-OC-P

CLI	Interface	Speed Settings
0/1	FL 1	10/100/1000 Mbps
0/2	FL 2	10/100/1000 Mbps
0/3	FL 3	10/100/1000 Mbps
0/4	FL 4	10/100/1000 Mbps
0/5	FL 5	10/100/1000 Mbps
0/6	FL 6	10/100/1000 Mbps
0/7	FL 7	10/100/1000 Mbps
0/8	FL 8	10/100/1000 Mbps
0/9	FL 9	10/100/1000 Mbps
0/10	FL 10	10/100/1000 Mbps
0/11	FL 11	10/100/1000 Mbps
0/12	FL 12	10/100/1000 Mbps
0/13	FL 13	10/100/1000 Mbps
0/14	FL 14	10/100/1000 Mbps
0/15	FL 15	10/100/1000 Mbps
0/16	FL 16	10/100/1000 Mbps
0/17	FL 17	10/100/1000 Mbps
0/18	FL 18	10/100/1000 Mbps
0/19	FL 19	10/100/1000 Mbps
0/20	FL 20	10/100/1000 Mbps
0/21	FL 21	10/100/1000 Mbps
0/22	FL 22	10/100/1000 Mbps
0/23	FL 23	10/100/1000 Mbps
0/24	FL 24/Fx	10/100/1000 Mbps
0/25	UC	1000 Mbps
0/26	SFP 1	1000 Mbps
0/27	SFP 2	1000 Mbps
0/28	SFP+ 1	1 / 2.5 / 5 / 10Gbps, for SFP max. 1Gbps
0/29	SFP+ 2	1 / 2.5 / 5 / 10Gbps, for SFP max. 1Gbps
0/30	SFP+ 3	1 / 2.5 / 5 / 10Gbps, for RJ45 max. 1Gbps
0/31	SFP+ 4	1 / 2.5 / 5 / 10Gbps, for RJ45 max. 1Gbps
0/32	QSFP+1_0	10Gbps *
0/33	QSFP+1_1	10Gbps
0/34	QSFP+1_2	10Gbps
0/35	QSFP+1_3	10Gbps
0/36	QSFP+2_0	10Gbps *
0/37	QSFP+2_1	10Gbps
0/38	QSFP+2_2	10Gbps
0/39	QSFP+2_3	10Gbps

*: Could also be used in single port mode (1x40G) as QSFP+ interface, with the three following interfaces set to detached state

Table 3: Ethernet Port Mapping CP6940-RA-OC

CLI	Interface	Speed Settings
0/1	FL 1	10/100/1000 Mbps
0/2	FL 2	10/100/1000 Mbps
0/3	FL 3	10/100/1000 Mbps
0/4	FL 4	10/100/1000 Mbps
0/5	FL 5	10/100/1000 Mbps
0/6	FL 6	10/100/1000 Mbps
0/7	FL 7	10/100/1000 Mbps
0/8	FL 8	10/100/1000 Mbps
0/9	FL 9	10/100/1000 Mbps
0/10	FL 10	10/100/1000 Mbps
0/11	FL 11	10/100/1000 Mbps
0/12	FL 12	10/100/1000 Mbps
0/13	FL 13	10/100/1000 Mbps
0/14	FL 14	10/100/1000 Mbps
0/15	FL 15	10/100/1000 Mbps
0/16	FL 16	10/100/1000 Mbps
0/17	FL 17	10/100/1000 Mbps
0/18	FL 18	10/100/1000 Mbps
0/19	FL 19	10/100/1000 Mbps
0/20	FL 20	10/100/1000 Mbps
0/21	FL 21	10/100/1000 Mbps
0/22	FL 22	10/100/1000 Mbps
0/23	FL 23	10/100/1000 Mbps
0/24	FL 24/Fx	10/100/1000 Mbps
0/25	UC	1 000 Mbps
0/26	SFP+ 1	1 / 2.5 / 5 / 10Gbps, for SFP max. 1Gbps
0/27	SFP+ 2	1 / 2.5 / 5 / 10Gbps, for SFP max. 1Gbps
0/28	SFP+ 3	1 / 2.5 / 5 / 10Gbps, for SFP max. 1Gbps
0/29	SFP+ 4	1 / 2.5 / 5 / 10Gbps, for SFP max. 1Gbps
0/30	FP1	10/100/1000 Mbps
0/31	FP2	10/100/1000 Mbps
0/32	FP3	10/100/1000 Mbps
0/33	FP4	10/100/1000 Mbps

Table 4: Ethernet Port Mapping CP6940-SA-OC-V

CLI	Interface	Speed Settings
0/1	FL 1	10/100/1000 Mbps
0/2	FL 2	10/100/1000 Mbps
0/3	FL 3	10/100/1000 Mbps
0/4	FL 4	10/100/1000 Mbps
0/5	FL 5	10/100/1000 Mbps
0/6	FL 6	10/100/1000 Mbps
0/7	FL 7	10/100/1000 Mbps
0/8	FL 8	10/100/1000 Mbps
0/9	FL 9	10/100/1000 Mbps
0/10	FL 10	10/100/1000 Mbps
0/11	FL 11	10/100/1000 Mbps
0/12	FL 12	10/100/1000 Mbps
0/13	FL 13	10/100/1000 Mbps
0/14	FL 14	10/100/1000 Mbps
0/15	FL 15	10/100/1000 Mbps
0/16	FL 16	10/100/1000 Mbps
0/17	FL 17	10/100/1000 Mbps
0/18	FL 18	10/100/1000 Mbps
0/19	FL 19	10/100/1000 Mbps
0/20	FL 20	10/100/1000 Mbps
0/21	FL 21	10/100/1000 Mbps
0/22	FL 22	10/100/1000 Mbps
0/23	FL 23	10/100/1000 Mbps
0/24	FL 24/Fx	10/100/1000 Mbps
0/25	UC	1000 Mbps
0/26	SFP 1	1000 Mbps
0/27	SFP 2	1000 Mbps
0/28	SFP+ 1	1 / 2.5 / 5 / 10Gbps, for SFP max. 1Gbps
0/29	SFP+ 2	1 / 2.5 / 5 / 10Gbps, for SFP max. 1Gbps
0/30	FP1	10/100/1000 Mbps
0/31	FP2	10/100/1000 Mbps
0/32	FP3	10/100/1000 Mbps
0/33	FP4	10/100/1000 Mbps

3.2 Unit Computer and Memory

The Unit Computer controls the Ethernet infrastructure and hosts the management application. It is a NXP LS1020 with following features:

- 1200MHz core frequency
- PCIe management connection to Ethernet Switch
- GbE connections to front management port and Ethernet Switch (see UC Interface 0/25 in Port Map Tables)

The Unit Computer is equipped with following peripherals:

- 2 GBytes DDR3 RAM
- 4 GBytes eMMC (pSLC)
- 4 MBytes SPI FLASH Memory
- RTC Clock

3.3 IPMI

The CP6940 board supports an intelligent hardware management system, based on the Intelligent Platform Management Interface Specification 1.5. The hardware management system provides the ability to manage the power, cooling and interconnect needs of intelligent devices, to monitor events and to log events to a central repository intelligent FRU (Field Replaceable Unit).

The Peripheral Manager is a 32-bit microcontroller with on chip memory of 2 Mbyte Flash and 64 Kbyte EEPROM. It provides several I²C interfaces for access to sensors and IPMB busses. Board voltage, current and temperature monitoring are accomplished through internal and external sensors.

The following section provides a listing of all inputs to the IPMI subsystem for H/W supervision.

- Thermal, current and voltage Sensors
- Reset status of the Unit Computer
- Power Status, the PM reads all supply voltages and status signals for possible failure and value reporting
- SFP status and control signals
- CompactPCI Handle switch

The PM uses the following outputs to control the CP6940:

- Power and Reset control of the payload
- IPMB A and IPMB B support
- LED HEALTHY
- Unit Computer reset

The Peripheral Manager provides additional feature and is equipped with following peripherals:

- The FRU Data Flash device contains the CP6940 FRU information
- Internal watchdog monitoring PM operation
- The external watchdog is implemented in glue logic. The PM will be reset if its alive signal fails. The watchdog is disabled in case of a local update.
- CompactPCI IPMB-O interface

3.3.1 Voltage Sensors

The Peripheral Manager measure all voltages on the CP6940. The following table shows the all voltages used on the CP6940 and their recommended operating range.

Table 5: CP6940 Voltages and Operational ranges

Nominal Voltage	Maximim Operating Conditions	Description
5.0V	4.450V to 5.250V	5.0V IPMB_PWR
5.0V	4.450V to 5.250V	5.0V CPCI
3.3V	3.201V to 3.399V	3.3V CPCI
3.3V	3.201V to 3.399V	3.3V supply voltage CPLD
3.3V	3.201V to 3.399V	3.3V supply voltage BMC
3.3V	3.201V to 3.399V	3.3V supply voltage
1.8V	1.746V to 1.854V	1.8V supply voltage
1.35V	1.417V to 1.283V	1.35V supply voltage
1.2V	1.14V to 1.26V	1.2V supply voltage
1.0 V	0.97V to 1.03V	1.0V supply voltage LS1020
1.0 V	0.95 to 1.05V	1.0V Core supply voltage BCM54140X
1.0 V	0.95V to 1.05V	1.0V Analog supply voltage BCM54140
1.0 V	0.95V to 1.05V	1.0V Core supply voltage BCM56174
1.0 V	0.97V to 1.03V	1.0V Analog supply voltage BCM56174
0.675V	0.97V to 1.03V	0.675V VTT DDR3 RAM

3.3.2 Current sensors

The current of the backplane voltages can be measured by the Peripheral Manager internal A/D converters.

- V_5V_CPCI_CURRENT The measuring range is 5.6A.
- V_3V3_CPCI_CURRENT The measuring range is 10.2A

3.4 Board Interfaces

3.4.1 Front Panel Elements

3.4.1.1 CP6940-RA-OC-P

At the CP6940-RA-OC-P faceplate are two QSFP+ cages, four SFP+ ports, two SFP cages, the front RS232 and the management port accessible. Also, status LEDs for the front interfaces, the hot swap LED, LED1 and LED2 are visible. To activate or deactivate the board there are the Handle switch and the Reset switch mounted.

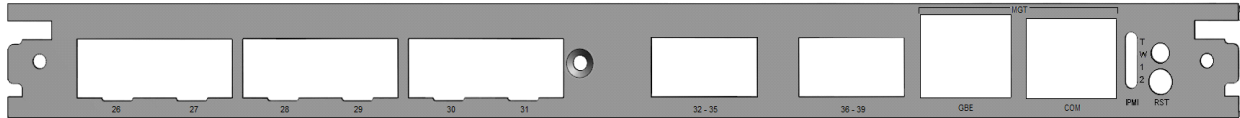


Figure 4: Front Panel of the CP6940-RA-OC-P

3.4.1.2 CP6940-RA-OC

At the CP6940-RA-OC faceplate are four SFP+ ports, the four front RJ45 ports, the front RS232 and the management port accessible. Also, status LEDs for the front interfaces, the hot swap LED, LED1 and LED2 are visible. To activate or deactivate the board there are the Handle switch and the Reset switch mounted.

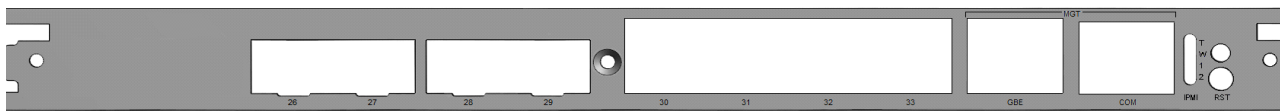


Figure 5: Front Panel of the CP6940-RA-OC

3.4.1.3 CP6940-SA-OC-V

At the CP6940-SA-OC-V faceplate are the two SFP+ cages, two SFP cages, the four front RJ45 ports, the front RS232 and the management port accessible. Also, status LEDs for the front interfaces, the hot swap LED, LED1 and LED2 are visible. To activate or deactivate the board there are the Handle switch and the Reset switch mounted.

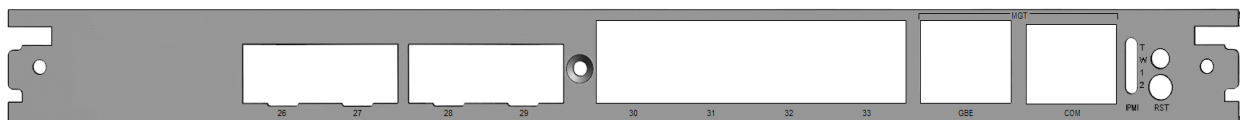


Figure 6: Front Panel of the CP6940-SA-OC-V

3.4.1.4 CP6940 Front Panel LEDs

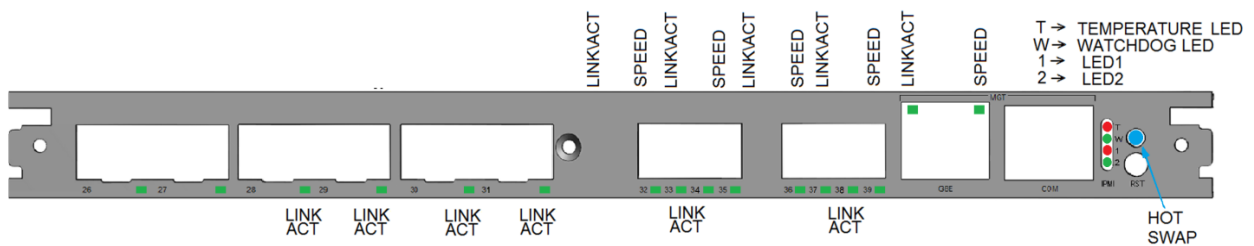


Figure 7: LED description CP6940-RA-OC-P

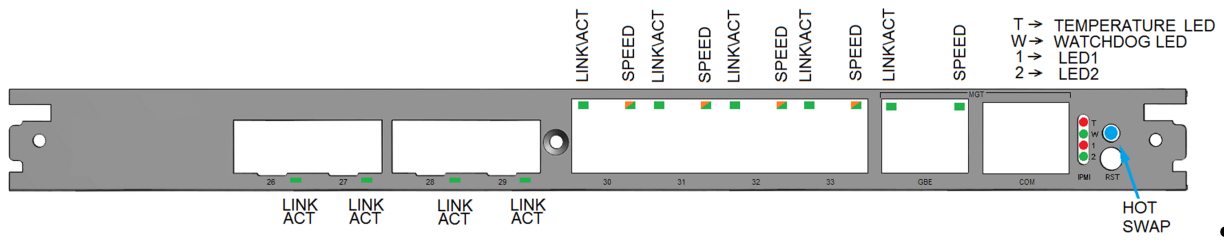


Figure 8: LED description CP6940-RA-OC/CP6940-SA-OC-V

3.4.1.5 Hot Swap LED (Blue LED)

- Off payload activated
- On ready for hot swap
- Blinking not specified yet

3.4.1.6 LED1 Alarm (red)

- Off all sensor values are within their specified range
- On one or more sensor values are out of their specified range
- Blinking not specified yet

3.4.1.7 LED2 Status (green)

- Off application deactivated
- On application ready
- Blinking not specified yet

3.4.1.8 SFP+ LEDs

- Off link down
- On link up but no activity
- Blinking link up and activity

3.4.1.9 SFP LEDs

- Off link down
- On link up but no activity
- Blinking link up and activity

3.4.1.10 QSFP LEDs

- Off link down
- On link up but no activity
- Blinking link up and activity

3.4.1.11 Front RJ45 status LEDs

Link/Activity: Green LED

- Off link down
- On link up but no activity
- Blinking link up and activity

Speed: Green/Amber LED

- Off 10Base-T
- On (amber) 100Base-Tx
- On (Green) 1000Base-T

3.4.1.12 CPU 10/100/1000Base-T Management port LEDs

Link/Activity: Green LED

- Off link down
- On link up but no activity
- Blinking link up and activity

Speed: Green/Amber LED

- Off 10Base-T
- On (amber) 100Base-Tx
- On (Green) 1000Base-T

3.4.1.13 CPLD healthy LED

The CPLD healthy LED indicates that all Voltages are in their specified range and the CPLD is out of reset.

- On CPLD is out of reset, but not all power rails are ready
- Off CPLD is in reset
- Blinking The CPLD is out of reset and all power rails are ready

3.4.2 Front Panel Switches

3.4.2.1 HANDLE SWITCH

A switch, actuated with the lower ejector handle of the board, is used to signal the inserting or impending extraction of the board.

3.4.2.2 RESET

A reset switch is provided being activated with an adequate tool (e.g. pencil). When the reset switch is pressed the board performs a power cycle to all devices including CPLD and BMC.

3.4.3 Ethernet Front Panel SFP/SFP+/QSFP Modes

The table below provides information about the modes the SFP/SFP+ and QSFP ports can be used.

SFP+ uplink ports provide support for SFP, SFP+, CopperSFP and direct attached (passive copper) cables. Dual speed SFP+ modules are supported in 10G modes only.

Table 6: SFP/SFP+/QSFP+ supported Modes

Slot/Uplink	Module	Supported Protocols
SFP	SFP	1000BASE-SX, 1000BASE-LX
	CopperSFP	1000BASE-T in media converter mode 10GBASE-T, 100BASE-TX, 1000BASE-T, in SGMII mode
	Direct Attached Copper	1GBASE-CX1
SFP+	SFP	1000BASE-SX, 1000BASE-LX
	SFP+	10GBASE-SR 10GBASE-LR 10GBASE-ER
	CopperSFP	1000BASE-T, in media converter mode 10BASE-T, 100BASE-TX, 1000BASE-T, in SGMII mode 2.5BASE-T, in media converter mode 5GBASE-T, in media converter mode 10GBASE-T, in media converter mode
	Direct Attached Copper	1000BASE-CX 10GBASE-CX1
QSFP+	QSFP+	4x 10GBASE-SR 4x 10GBASE-LR 4x 10GBASE-ER 40GBASE-SR4 40GBASE-LR4 40GBASE-ER4
	Direct Attached Copper	4x 1GBASE-KX 4x 10GBASE-CR 4x 10GBASE-KR 40GBASE-CR4 40GBASE-KR4

All ports support auto isolation and protocol auto configuration by default.

Find below some useful commands to handle SFP modul configuration.

Table 7: SFP configuration commands

CLI command	Description
show sfp all	Provides a configuration and status overview for all SFP/SFP ports.
show sfp [if]	Provides a detailed configuration and status overview for this SFP/SFP port.
show sfp [if] detail	Provides a detailed printout from the module's VPD, configuration and diagnostic facility.
[no] sfp auto-configure	Enables line interface protocol auto-configuration based on the modules VPD.
[no] sfp auto-isolate	Disable the switch's serdes transmitter if a module is not present.
sfp protocol <protocol>	Force the line interface protocol

3.4.3.1 Configuration examples

The capabilities for each SFP/SFP+/QSFP are basically set by the capabilities of the related interface. If a SFP is inserted the speed and auto-negotiation is set related to this capabilities.

Auto-Configure Mode

When using the "auto-configure" feature the ethernet compliance mode is read from the EEPROM of the SFP/SFP+/QSFP. Speed and auto-negotiation are then set to the read mode (as long as this is supported by the capabilities of the interface).

Without enabling the feature protocol is set to "Unknown":

```
(Ethernet Fabric)#show sfp all
```

Interf	PortMap Type	Port Present	Port Status	Link Status	Auto Isolate	Auto Config	Type	Protocol
...								
0/36	QSFP	Yes	Enable	Down	Enable	Disable		Unknown
...								

Configure auto-configure mode:

```
(Ethernet Fabric)#configure
(Ethernet Fabric) (Config)#interface 0/36
(Ethernet Fabric) (Interface 0/36)#sfp auto-configure
(Ethernet Fabric) (Interface 0/36)#exit
(Ethernet Fabric) (Config)#exit
```

```
(Ethernet Fabric)#show sfp all
```

Interf	PortMap Type	Port Present	Port Status	Link Status	Auto Isolate	Auto Config	Type	Protocol
...								
0/36	QSFP	Yes	Enable	Down	Enable	Enable	QSFP	40GBASE-SR4
...								

Now the protocol, read from the EEPROM Ethernet compliance information, is set and speed and auto-negotiation are set related to the mode:

```
(Ethernet Fabric)#show sfp all
```

Interf	PortMap Type	Port Present	Port Status	Link Status	Auto Isolate	Auto Config	Type	Protocol
...								
0/36	QSFP	Yes	Enable	Down	Enable	Enable	QSFP	40GBASE-SR4
...								

If the EEPROM indicates no ethernet mode or the indicated ethernet mode is not correct you may force an ethernet mode. The speed and auto-negotiation are then set related to the forced mode.

Without enabling "auto-configure" mode:

```
(Ethernet Fabric)#show sfp all
```

Interf	PortMap Type	Port Present	Port Status	Link Status	Auto Isolate	Auto Config	Type	Protocol
...								
0/28	SFP+	Yes	Enable	Up	Enable	Disable		Unknown
...								

Force an ethernet mode:

```
(Ethernet Fabric)#configure
(Ethernet Fabric) (Config)#interface 0/28
```

```
(Ethernet Fabric) (Interface 0/28)#sfp protocol 10GBASE-SR
(Ethernet Fabric) (Interface 0/28)#exit
(Ethernet Fabric) (Config)#exit
```

```
(Ethernet Fabric)#show sfp all
```

Interf	PortMap Type	Port Present	Port Status	Link Status	Auto Isolate	Auto Config	Type	Protocol
...								
0/28	SFP+	Yes	Enable	Up	Enable	Force		10GBASE-SR
...								

Clear the forced mode again:

```
(Ethernet Fabric)#configure
(Ethernet Fabric) (Config)#interface 0/28
(Ethernet Fabric) (Interface 0/28)#no sfp protocol
(Ethernet Fabric) (Interface 0/28)#exit
(Ethernet Fabric) (Config)#exit
```

Switch from 1x 40G to 4x 10G mode (for the QSFP)

Default for CP6940 QSFP port is 1x40G for the QSFP front-ports:

```
(Ethernet Fabric)#show sfp all
```

Interf	PortMap Type	Port Present	Port Status	Link Status	Auto Isolate	Auto Config	Type	Protocol
...								
0/36	QSFP	Yes	Enable	Down	Enable	Enable	QSFP	40GBASE-SR4
0/37	QSFP	Detach			Enable	Enable		Unknown
0/38	QSFP	Detach			Enable	Enable		Unknown
0/39	QSFP	Detach			Enable	Enable		Unknown

Switch to 4x 10G mode (Note, that you have to reboot the board for modification becoming effective):

```
(Ethernet Fabric)#configure
(Ethernet Fabric) (Config)#interface 0/36
(Ethernet Fabric) (Interface 0/36)#hardware profile portmode expand
To become effective please reboot the system.
(Ethernet Fabric) (Interface 0/36)#exit
(Ethernet Fabric) (Config)#exit
(Ethernet Fabric)#reload
```

...

After reload:

```
(Ethernet Fabric)#show sfp all
```

Interf	PortMap Type	Port Present	Port Status	Link Status	Auto Isolate	Auto Config	Type	Protocol
...								
0/36	QSFP	Yes	Enable	Down	Enable	Enable	QSFP	10GBASE-SR
0/37	QSFP	Yes	Enable	Down	Enable	Enable	QSFP	10GBASE-SR
0/38	QSFP	Yes	Enable	Down	Enable	Enable	QSFP	10GBASE-SR
0/39	QSFP	Yes	Enable	Down	Enable	Enable	QSFP	10GBASE-SR

Return to 1x 40G mode (Note, that you have to reboot the board for modification becoming effective):

```
(Ethernet Fabric)#configure
(Ethernet Fabric) (Config)#interface 0/36
(Ethernet Fabric) (Interface 0/36)#no hardware profile portmode expand
To become effective please reboot the system.
(Ethernet Fabric) (Interface 0/36)#exit
(Ethernet Fabric) (Config)#exit
(Ethernet Fabric)#reload
```

...

Switch to SGMII mode for copper SFP

Default mode is not SGMII, allowed speeds are 1G and 2.5G:

```
(Ethernet Fabric)#show port advertise
```

Intf	Type	Neg	Operational Link Advertisement
...			
0/26	Gigabit - Level	Enabled	2500f, 1000f
0/27	Gigabit - Level	Enabled	2500f, 1000f
...			

Change to SGMII mode (1000/100/10) (Note, that you have to reboot the board for modification becoming effective):

```
(Ethernet Fabric)#configure
(Ethernet Fabric) (Config)#interface 0/26
(Ethernet Fabric) (Interface 0/26)#hardware profile portmode copper-sfp
To become effective please reboot the system.
(Ethernet Fabric) (Interface 0/26)#exit
(Ethernet Fabric) (Config)#exit
```

```
(Ethernet Fabric)#reload
```

...

```
(Ethernet Fabric)#show port advertise
```

Intf	Type	Neg	Operational Link Advertisement
...			
0/26	Gigabit - Level	Enabled	1000f, 100f, 100h, 10f, 10h
0/27	Gigabit - Level	Enabled	2500f, 1000f
...			

Return to basic mode (Note, that you have to reboot the board for modification becoming effective):

```
(Ethernet Fabric)#configure
(Ethernet Fabric) (Config)#interface 0/26
(Ethernet Fabric) (Interface 0/26)#no hardware profile portmode copper-sfp
To become effective please reboot the system.
(Ethernet Fabric) (Interface 0/26)#exit
(Ethernet Fabric) (Config)#exit
(Ethernet Fabric)#reboot
```

...

3.4.4 Front Panel Port pinnings

3.4.4.1 SFP/SFP+ Uplink Ports

The SFPs uplink ports are according the Small Form-factor Pluggable (SFP) Transceiver MultiSource Agreement (MSA), Sept. 14th, 2000. The SFP connectors have the following pin assignment:

Table 8: SFP Uplink Port Pinout

PIN	Signal
1	GND
2	TX_FAULT
3	TX_DIS
4	MODDEF2 ¹⁾
5	MODDEF1 ¹⁾
6	MODDEF0 ¹⁾
7	R_SEL
8	LOS
9	GND ¹⁾
10	GND
11	GND
12	RD-
13	RD+
14	GND
15	3.3V RX
16	3.3V TX
17	GND
18	TD+
19	TD-
20	GND

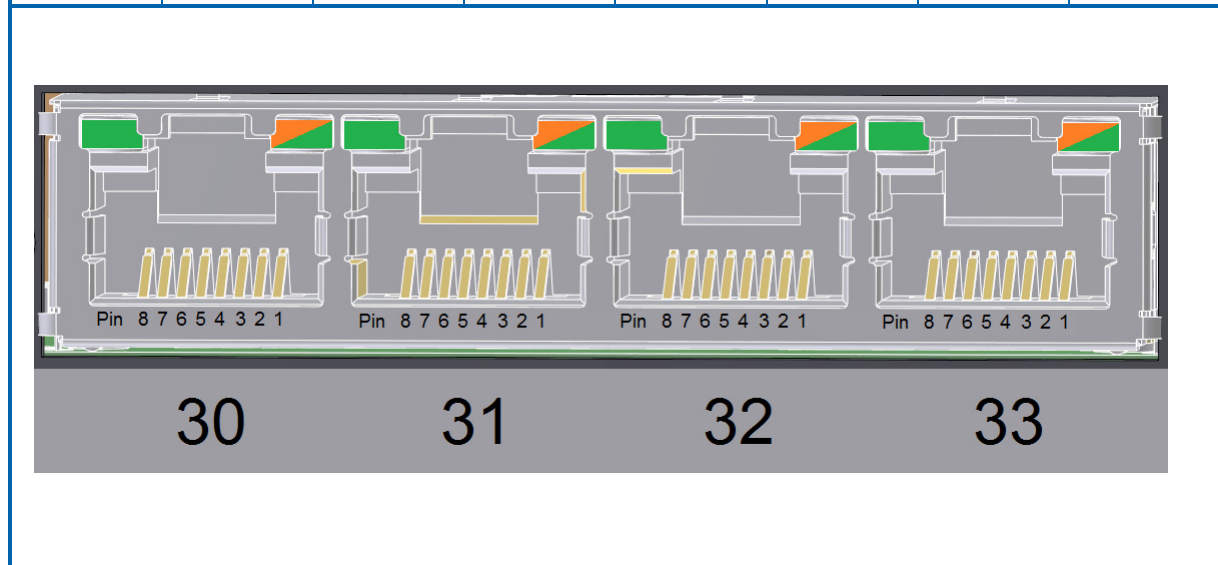
- 1) MODDEF2 is used as SFP+ SDA signal
 MODDEF1 is used as SFP+ SCL signal
 MODDEF0 is used as SFP+ PRESENT signal
 PIN9, GND is used as RATE2_SELECT

3.4.5 Front Panel Management Port RJ45

The standard RJ45 has the following Pin Assignment.

Table 9: Front RJ45 Ethernet Connector

Contact	MDI	Contact	MDI	Contact	MDI	Contact	MDI
30.1	BI_DA+	31.1	BI_DA+	32.1	BI_DA+	33.1	BI_DA+
30.2	BI_DA-	31.2	BI_DA-	32.2	BI_DA-	33.2	BI_DA-
30.3	BI_DB+	31.3	BI_DB+	32.3	BI_DB+	33.3	BI_DB+
30.4	BI_DC+	31.4	BI_DC+	32.4	BI_DC+	33.4	BI_DC+
30.5	BI_DC-	31.5	BI_DC-	32.5	BI_DC-	33.5	BI_DC-
30.6	BI_DB-	31.6	BI_DB-	32.6	BI_DB-	33.6	BI_DB-
30.7	BI_DD+	31.7	BI_DD+	32.7	BI_DD+	33.7	BI_DD+
30.8	BI_DD-	31.8	BI_DD-	32.8	BI_DD-	33.8	BI_DD-

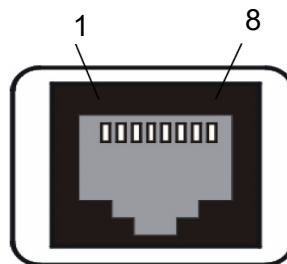


3.4.5.1 Front Panel RS232

The Front RS232 RJ45 has the following Pin Assignment

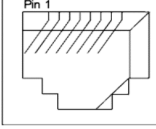
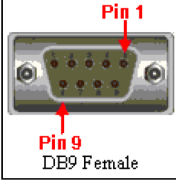
Table 10: Front RS232

Pin	Direction	Signal
1	OUT	RTS
2		DTR
3	OUT	TXD
4		GND
5		GND
6	IN	RXD
7		DSR
8	IN	CTS



Connection to the front RS232 port is established with a straight through Ethernet cable and a RJ45 (female) to SubD (female) adapter if required. The adapter is described below.

Table 11: Serial console terminal cable interface: RJ45 Female to DB9 Female

RJ45 Female	RJ45 Pin Number	Signal	Connected	Description	DB9 Pin Number	DB9 Female
 Front View	1	RTS	Y	Request To Send	8	 Front View
	2	DTR	Y	Data Terminal Ready	7	
	3	TXD	Y	Transmit	2	
	4	GND	N	Ground	-	
	5	GND	Y	Ground	5	
	6	RXD	Y	Receive	3	
	7	DSR	Y	Data Set Ready	4	
	8	CTS	N	Clear To Send	7	
	-	RI	N	Ring Indicator (Not Used)	9	
	-	DCD	N	Carrier Detect (Not Used)	1	

3.4.6 CompactPCI Connectors

The complete CompactPCI connector configuration comprises five connectors named J1 to J5. Their functions are as follows:

- J1, J2: management, IPMB and power, PCI is not supported
- J3, J4 and J5 have rear I/O interface functionality, providing GbE to the backplane or RIO module and an RS232 interface to a RIO module

The board supports signaling voltages V(I/O) of either 3.3 V or 5 V. No keying is required on J1 which designates universal V(I/O).

The CP6940 is compatible with all standard 6U CompactPCI passive backplanes with rear I/O support on the system slot. For accessing the GbE interfaces signals on connectors J3, J4 and J5 with a rear I/O module, a backplane with I/O support is necessary.

3.4.6.1 J1 Connector

- Power +3.3V, +5.0V, V(I/O)
- IPMB Power (+5.0V)
- IPMB 0
- Hot Swap

Table 12: Connector J1 Pinout

Pin	Row A	Row B	Row C	Row D	Row E	Row F
25	V_5V_CPCI	NC	NC	V_3V3_CPCI	V_5V_CPCI	GND
24	NC	V_5V_CPCI	V_IO_CPCI	NC	NC	GND
23	V_3V3_CPCI	NC	NC	V_5V_CPCI	NC	GND
22	NC	GND	V_3V3_CPCI	NC	NC	GND
21	V_3V3_CPCI	NC	NC	NC	NC	GND
20	NC	GND	V_IO_CPCI	NC	NC	GND
19	V_3V3_CPCI	NC	NC	GND	NC	GND
18	NC	GND	V_3V3_CPCI	NC	NC	GND
17	V_3V3_CPCI	IPMB0_SCL	IPMB0_SDA	GND	NC	GND
16	NC	GND	V_IO_CPCI	NC	NC	GND
15	V_3V3_CPCI	NC	NC	CPCI_BD_SEL#	NC	GND
14	Key Area					
13						
12						
11	NC	NC	NC	GND	NC	GND
10	NC	GND	V_3V3_CPCI	NC	NC	GND
9	NC	NC	NC	GND	NC	GND
8	NC	GND	V_IO_CPCI	NC	NC	GND
7	NC	NC	NC	GND	NC	GND
6	NC	NC	V_3V3_CPCI	NC	NC	GND
5	NC	NC	CPCI_PCI_RST#	GND	NC	GND
4	V_5V_IPMB_PWR	CPCI_HEALTHY#	V_IO_CPCI	NC	NC	GND
3	NC	NC	NC	V_5V_CPCI	NC	GND
2	NC	V_5V_CPCI	NC	NC	NC	GND
1	V_5V_CPCI	NC	NC	NC	V_5V_CPCI	GND

3.4.6.2 J2 Connector

- Geographical Address
- IPMB 1
- ALERT#

Table 13: Connector J2 Pinout

Pin	Row A	Row B	Row C	Row D	Row E	Row F
22	CPCI_GA[4]	CPCI_GA[3]	CPCI_GA[2]	CPCI_GA[1]	CPCI_GA[0]	GND
21	NC	NC	NC	NC	NC	GND
20	NC	NC	NC	NC	NC	GND
19	NC	NC	IPMB1_SDA	IPMB1_SCL	IPMB_ALERT#	GND
18	NC	NC	NC	NC	NC	GND
17	NC	NC	NC	NC	NC	GND
16	NC	NC	NC	NC	NC	GND
15	NC	NC	NC	NC	NC	GND
14	NC	NC	NC	NC	NC	GND
13	NC	NC	NC	NC	NC	GND
12	NC	NC	NC	NC	NC	GND
11	NC	NC	NC	NC	NC	GND
10	NC	NC	NC	NC	NC	GND
9	NC	NC	NC	NC	NC	GND
8	NC	NC	NC	NC	NC	GND
7	NC	NC	NC	NC	NC	GND
6	NC	NC	NC	NC	NC	GND
5	NC	NC	NC	NC	NC	GND
4	NC	NC	NC	NC	NC	GND
3	NC	NC	NC	NC	NC	GND
2	NC	NC	NC	NC	NC	GND
1	NC	NC	NC	NC	NC	GND

3.4.6.3 J3 Connector

- Link Port 1 to Link Port 8 (10/100/1000Base-T)
- Link Port f
- Shelf Geographical Address

Table 14: Connector J3 Pinout

Pin	Row A	Row B	Row C	Row D	Row E	Row F
19	CPCI_SA[4]	CPCI_SA[3]	CPCI_SA[2]	CPCI_SA[1]	CPCI_SA[0]	GND
18	FL_DA24_f+	FL_DA24_f-	GND	FL_DC24_f+	FL_DC24_f-	GND
17	FL_DB24_f+	FL_DB24_f-	GND	FL_DD24_f+	FL_DD24_f-	GND
16	FL_DA8+	FL_DA8-	GND	FL_DC8+	FL_DC8-	GND
15	FL_DB8+	FL_DB8-	GND	FL_DD8+	FL_DD8-	GND
14	FL_DA7+	FL_DA7-	GND	FL_DC7+	FL_DC7-	GND
13	FL_DB7+	FL_DB7-	GND	FL_DD7+	FL_DD7-	GND
12	FL_DA6+	FL_DA6-	GND	FL_DC6+	FL_DC6-	GND
11	FL_DB6+	FL_DB6-	GND	FL_DD6+	FL_DD6-	GND
10	FL_DA5+	FL_DA5-	GND	FL_DC5+	FL_DC5-	GND
9	FL_DB5+	FL_DB5-	GND	FL_DD5+	FL_DD5-	GND
8	FL_DA4+	FL_DA4-	GND	FL_DC4+	FL_DC4-	GND
7	FL_DB4+	FL_DB4-	GND	FL_DD4+	FL_DD4-	GND
6	FL_DA3+	FL_DA3-	GND	FL_DC3+	FL_DC3-	GND
5	FL_DB3+	FL_DB3-	GND	FL_DD3+	FL_DD3-	GND
4	FL_DA2+	FL_DA2-	GND	FL_DC2+	FL_DC2-	GND
3	FL_DB2+	FL_DB2-	GND	FL_DD2+	FL_DD2-	GND
2	FL_DA1+	FL_DA1-	GND	FL_DC1+	FL_DC1-	GND
1	FL_DB1+	FL_DB1-	GND	FL_DD1+	FL_DD1-	GND

3.4.6.4 J4 Connector

- RS232 Interface (RX/TX)

Table 15: Connector J4 Pinout

Pin	Row A	Row B	Row C	Row D	Row E	Row F
25	FL20_DA+	FL20_DA-	GND	FL20_DC+	FL20_DC-	GND
24	FL20_DB+	FL20_DB-	GND	FL20_DD+	FL20_DD-	GND
23	FL21_DA+	FL21_DA-	GND	FL21_DC+	FL21_DC-	GND
22	FL21_DB+	FL21_DB-	GND	FL21_DD+	FL21_DD-	GND
21	FL22_DA+	FL22_DA-	GND	FL22_DC+	FL22_DC-	GND
20	FL22_DB+	FL22_DB-	GND	FL22_DD+	FL22_DD-	GND
19	FL23_DA+	FL23_DA-	GND	FL23_DC+	FL23_DC-	GND
18	FL23_DB+	FL23_DB-	GND	FL23_DD+	FL23_DD-	GND
17	NC	NC		NC	NC	GND
16	NC	NC		NC	NC	GND
15	NC	NC		NC	NC	GND
14	Key Area / ocher-yellow peg (ID: 36215)					
13						
12						
11	NC	NC	NC	NC	NC	GND
10	NC	NC	NC	NC	NC	GND
9	NC	NC	GND	RTM_TXD#	RTM_RXD#	GND
8	NC	NC	NC	NC	NC	GND
7	NC	NC	NC	NC	NC	GND
6	NC	NC	NC	NC	NC	GND
5	NC	NC	NC	NC	NC	GND
4	NC	NC	NC	NC	NC	GND
3	NC	NC	NC	NC	NC	GND
2	NC	NC	NC	NC	NC	GND
1	V_5V_HS_RT-M_F	V_5V_HS_RT-M_F	NC	V_5V_HS_RT-M_F	V_5V_HS_RT-M_F	GND

The J4 connector provides the rear RS232 interface. The CP6940 distributes a 5V power supply rail to the RTM via J4. A 4A fuse protects the board from overcurrent or short circuit.

3.4.6.5 J5 Connector

- PICMG 2.16 Link Port 9 to Link Port 19 (10/100/1000Base-T)

Table 16: Connector J5 Pinout

Pin	Row A	Row B	Row C	Row D	Row E	Row F
22	FL_DA19+	FL_DA19-	GND	FL_DC19+	FL_DC19-	GND
21	FL_DB19+	FL_DB19-	GND	FL_DD19+	FL_DD19-	GND
20	FL_DA18+	FL_DA18-	GND	FL_DC18+	FL_DC18-	GND
19	FL_DB18+	FL_DB18-	GND	FL_DD18+	FL_DD18-	GND
18	FL_DA17+	FL_DA17-	GND	FL_DC17+	FL_DC17-	GND
17	FL_DB17+	FL_DB17-	GND	FL_DD17+	FL_DD17-	GND
16	FL_DA16+	FL_DA16-	GND	FL_DC16+	FL_DC16-	GND
15	FL_DB16+	FL_DB16-	GND	FL_DD16+	FL_DD16-	GND
14	FL_DA15+	FL_DA15-	GND	FL_DC15+	FL_DC15-	GND
13	FL_DB15+	FL_DB15-	GND	FL_DD15+	FL_DD15-	GND
12	FL_DA14+	FL_DA14-	GND	FL_DC14+	FL_DC14-	GND
11	FL_DB14+	FL_DB14-	GND	FL_DD14+	FL_DD14-	GND
10	FL_DA13+	FL_DA13-	GND	FL_DC13+	FL_DC13-	GND
9	FL_DB13+	FL_DB13-	GND	FL_DD13+	FL_DD13-	GND
8	FL_DA12+	FL_DA12-	GND	FL_DC12+	FL_DC12-	GND
7	FL_DB12+	FL_DB12-	GND	FL_DD12+	FL_DD12-	GND
6	FL_DA11+	FL_DA11-	GND	FL_DC11+	FL_DC11-	GND
5	FL_DB11+	FL_DB11-	GND	FL_DD11+	FL_DD11-	GND
4	FL_DA10+	FL_DA10-	GND	FL_DC10+	FL_DC10-	GND
3	FL_DB10+	FL_DB10-	GND	FL_DD10+	FL_DD10-	GND
2	FL_DA9+	FL_DA9-	GND	FL_DC9+	FL_DC9-	GND
1	FL_DB9+	FL_DB9-	GND	FL_DD9+	FL_DD9-	GND

4/ Software Description

Software on the CP6940 includes the following parts:

- Bootloader
- initrd (including rootFS, kernel)
- Application software (FASTPATH switching SW)
- IPMI Firmware

The Software accomplishes operation of the switching hardware and is therefore also referenced as firmware. It is pre-installed on the system and can only be updated by a dedicated update procedure. This manual describes bootloader, Linux rootfs/kernel and IPMI firmware, last chapter introduces the update procedures.

For additional information of system configuration using CLI commands refer to documentation "CP6940 CLI Reference Manual".

4.1 Supported RFCs

The Software supports the following standards and RFCs. Depending on the supported feature set (e.g. for the L2 only variant), some RFCs might not be supported.

4.1.1 Management

4.1.1.1 Core Features

- RFC 854: Telnet
- RFC 855: Telnet option specifications
- RFC 1155: SMI v1
- RFC 1157: SNMP
- RFC 1212: Concise MIB definitions
- RFC 1867: HTML/2.0 forms with file upload extensions
- RFC 1901: Community-based SNMP v2
- RFC 1908: Coexistence between SNMP v1 and SNMP v2
- RFC 2068: HTTP/1.1 protocol as updated by draft-ietf-http-v11-spec-rev-03
- RFC 2271: SNMP framework MIB
- RFC 2295: Transparent content negotiation
- RFC 2296: Remote variant selection; RSVP/1.0 state management cookies — draft-ietf-http-state-mgmt-05
- RFC 2576: Coexistence between SNMP v1, v2, and v3
- RFC 2578: SMI v2
- RFC 2579: Textual conventions for SMI v2
- RFC 2580: Conformance statements for SMI v2
- RFC 2616: HTTP/1.1
- RFC 3410: Introduction and Applicability Statements for Internet Standard Management Framework
- RFC 3411: An Architecture for Describing SNMP Management Frameworks
- RFC 3412: Message Processing and Dispatching
- RFC 3413: SNMP v3 Applications
- RFC 3414: User-Based Security Model for SNMP v3
- RFC 3415: View-based Access Control Model for SNMP
- RFC 3416: Version 2 of SNMP Protocol Operations for SNMP
- RFC 3417: Transport Mappings for SNMP
- RFC 3418: Management Information Base (MIB) for the Simple Network Management Protocol (SNMP)
- RFC 6020: A Data Modeling Language for NETCONF
- RFC 6022: YANG Module for NETCONF Monitoring
- RFC 6241: Network Configuration Protocol (NETCONF)

- RFC 6242: Using the NETCONF Protocol over Secure Shell (SSH)
- RFC 6415: Web Host Metadata
- RFC 6536: NETCONF Access Control Model
- RFC 7223: YANG Data Model for Interface Management
- RFC 7277: YANG Data Model for IP Management
- RFC 7317: YANG Data Model for System Management
- Configurable management VLAN
- SSL 3.0, TLS 1.0, TLS 1.1, and TLS 1.2:
 - RFC 2246: The TLS protocol, version 1.0
 - RFC 2818: HTTP over TLS
 - RFC 3268: AES cipher suites for Transport layer security
 - RFC 4346: The Transport Layer Security (TLS) Protocol Version 1.1
 - RFC 5246: The Transport Layer Security (TLS) Protocol Version 1.2
- SSH 2.0
 - RFC 4251: SSH protocol architecture
 - RFC 4252: SSH authentication protocol
 - RFC 4253: SSH transport layer protocol
 - RFC 4254: SSH connection protocol
 - RFC 4716: SECSH public key file format
 - RFC 4419: Diffie-Hellman group exchange for the SSH transport layer protocol
 - RFC 6668: SHA-2 Data Integrity Verification for the Secure Shell (SSH) Transport Layer Protocol
- HTML 4.0 specification, December 1997
- Java Plug-in 1.6.0_01 and Java Script 1.3
- RESTCONF: <https://tools.ietf.org/html/draft-ietf-netconf-restconf-04>
- draft-ietf-netmod-syslog-model-03
- draft-ietf-netconf-yang-library-00
- draft-ietf-httpauth-basicauth-update-03
- draft-ietf-netmod-yang-json-05
- broadcom-synce
- draft-jxl-tictoc-1588v2-yang-03
- Bonjour service
- Dual software images
- Management port access control
- Password management (history)
- Strong passwords
- RESTful APIs
- Management vis NetSNMP

4.1.1.2 Advanced Management Features

- Industry-standard CLI with the following features:
 - Scripting capability
 - Command completion
 - Context-sensitive help
- Optional user password encryption
- Multisession Telnet server
- Secure copy server
- Command authorization

- Port locator
- Dynamic/prescriptive topology map
- Management Access Control and Administration List

4.1.2 Switching

4.1.2.1 Core Features

- IEEE 801.1Qbb: Priority-based Flow Control
- IEEE 802.1AB: Link Layer Discovery Protocol (LLDP)
- IEEE 802.1ak: Virtual Bridged Local Area Networks - Amendment 07: Multiple Registration Protocol
- IEEE 802.1as: Timing and Synchronization for Time-Sensitive Applications in Bridged Local Area Networks
- IEEE 802.1D: Spanning tree compatibility
- IEEE 802.1p: Ethernet priority with user provisioning and mapping
- IEEE 802.1s: Multiple spanning tree compatibility
- IEEE 802.1Q: Virtual LANs with port-based VLANs
- IEEE 802.1Qat: Multiple Stream Reservation Protocol (MSRP)
- IEEE 802.1Qav: Forwarding and Queuing Enhancements for Time-Sensitive Streams
- IEEE 802.1v: Protocol-based VLANs
- IEEE 802.1X-2010: Port-based authentication and supplicant support
- IEEE 802.1w: Rapid spanning tree compatibility
- IEEE 802.3: 10Base-T
- IEEE 802.3u: 100Base-T
- IEEE 802.3ab: 1000Base-T
- IEEE 802.3ac: VLAN tagging
- IEEE 802.3ad: Link aggregation
- IEEE 802.3ae: 10GbE
- IEEE 802.3bj-CL91: Forward Error Correction (FEC)
- IEEE 802.3x: Flow control
- ANSI/TIA-1057: LLDP-Media Endpoint Discovery (MED)
- GARP: Generic Attribute Registration Protocol
- GMRP: Dynamic L2 multicast registration
- GVRP: Dynamic VLAN registration
- PVSTP: Per VLAN Spanning Tree Protocol
- PVRSTP: Per VLAN Rapid Spanning Tree Protocol
- VPC: Virtual Port Channel (MLAG)
- RFC 4541: Considerations for Internet Group Management Protocol (IGMP) and Multicast Listener Discovery (MLD) Snooping Switches
- RFC 5171: UniDirectional Link Detection (UDLD) Protocol

4.1.2.2 Additional Layer 2 Functionality

- ARP Guard
- Authentication, Authorization, and Accounting (AAA)
- Broadcast/Multicast/Unicast storm recovery
- Cut-through switching support
- DHCP Snooping (IPv4 and IPv6)
- Double VLAN/VMAN tagging
- Flow-based port mirroring
- IGMP and MLD Snooping Querier

- Independent VLAN Learning (IVL) support
- IPv6 classification APIs
- ISDP (CDP-interoperability)
- Jumbo Ethernet frames
- Multicast VLAN Registration (MVR)
- Port MAC locking
- VLAN MAC locking
- Port mirroring
- Protected ports
- RSPAN
- ERSPAN
- IP subnet-based VLANs
- MAC-based VLANs
- Static MAC filtering
- Voice VLANs
- Selectable LAG hashing algorithm
- IP source guard (IPv4 and IPv6)
- Dynamic ARP inspection
- MAC Authentication Bypass
- MGMD snooping SSM
- Switchport mode configuration
- Link Dependency
- IPv6 RA Guard (Stateless)
- STP features:
 - Root guard
 - BPDU guard
 - TCN guard
 - Loop guard
 - BPDU filter
 - BPDU flood
- MLAG — RPVST+
- L2 Loop Protection
- Link Debounce Feature
- Private VLANs
 - Isolated private VLAN trunk port
 - Promiscuous private VLAN trunk port

4.1.2.3 System Facilities

- Autoinstall
- Cable test
- CPU rate limiting
- Dynamic link detection
- DNS client
- Event and error logging facility
- Runtime and configuration download capability
- Events-based interface shutdown and recovery
- Friendly port naming

- Network and host DOS protection
- IP address conflict notification
- Email alerts
- PING utility
- XMODEM
- Traceroute utility
- Authentication Tiering
- FTP transfers using IPv4/IPv6
- Malicious code detection
- RFC 768:UDP
- RFC 783:TFTP
- RFC 791:IP
- RFC 792:ICMP
- RFC 793:TCP
- RFC 826:Ethernet ARP
- RFC 894:Transmission of IP Datagrams over Ethernet Networks
- RFC 896:Congestion Control in IP/TCP Networks
- RFC 951:BootP
- RFC 1034:Domain names (concepts and facilities)
- RFC 1035:Domain names (implementation and specification)
- RFC 1321:Message digest algorithm
- RFC 1534:Interoperability between BootP and DHCP
- RFC 2021: Remote Network Monitoring Management Information base v2
- RFC 2030:Simple Network Time Protocol (SNTP) v4 for IPv4, IPv6, and OSI
- RFC 2131:DHCP Client/Server
- RFC 2132:DHCP options and BootP vendor extensions
- RFC 2347:TFTP Option Extension
- RFC 2348:TFTP Blocksize Option
- RFC 2819: Remote Network Monitoring Management Information Base
- RFC 2830:TLS support for LDAP
- RFC 2865:RADIUS client
- RFC 2866:RADIUS accounting
- RFC 2868:RADIUS attributes for tunnel protocol support
- RFC 2869:RADIUS Extensions—Support for Extensible Authentication Protocol (EAP)
- RFC 3162: RADIUS and IPv6
- RFC 3164:BSD syslog protocol
- RFC 3580:802.1X RADIUS usage guidelines
- RFC 4511:LDAP protocol
- RFC 4515: Lightweight Directory Access Protocol (LDAP): String Representation of Search Filters
- RFC 5176:Dynamic Authorization Server (Disconnect-Request processing only)
- RFC 5424:Syslog protocol
- TACACS+: Client with support for IPv4 and IPv6 functionality
- sFlow Version 5 : Industry standard for sFlow implementation
- sFlow LAG Counters Structure : Standard to export LACP counters in the sFlow counter sample for a port that is a member of a LAG
- Dying Gasp notifications
- Tracking of LAG flaps

4.1.3 Routing

- ECMP
- ICMP Throttling
- Loopback interfaces
- Multinetting
- OSPF
- ARP and Proxy ARP
- RIP
- Route redistribution across RIP and OSPF
- Static routing
- VLAN and port-based routing
- VRRP
- UDP Relay/IP Helper
- Policy-Based Routing
- VRF-lite
- Bidirectional Forwarding Detection
- Algorithmic longest prefix match (ALPM)
- Configurable routing limits
- OSPF interface flap dampening/31 subnets
- Static routes on management interface
- OSPF LSA flooding reduction
- IP unnumbered interface
- Microsoft Network Load Balance (MS NLB)
- IP SLA
- RFC 1027: Using ARP to implement transparent subnet gateways (Proxy ARP)
- RFC 1256: ICMP router discovery messages
- RFC 1519: CIDR
- RFC 1765: OSPF database overflow
- RFC 1812: Requirements for IPv4 routers
- RFC 2082: RIP-2 MD5 authentication
- RFC 2131: DHCP relay
- RFC 2328: OSPFv2
- RFC 2370: The OSPF Opaque LSA Option
- RFC 2453: RIP v2
- RFC 3021: Using 31-Bit Prefixes on Point-to-Point Links
- RFC 3046: DHCP/BootP relay
- RFC 3101: The OSPF "Not So Stubby Area" (NSSA) option
- RFC 3137: OSPF Stub Router Advertisement
- RFC 3623: Graceful OSPF Restart
- RFC 3704: Ingress Filtering for Multihomed Networks
- RFC 3768: Virtual Router Redundancy Protocol (VRRP)
- RFC 5798: Virtual Router Redundancy Protocol (VRRP) Version 3 for IPv4 and IPv6
- RFC 5880: Bidirectional Forwarding Detection (BFD)
- RFC 5881: Bidirectional Forwarding Detection (BFD) for IPv4 and IPv6 (Single Hop)
- RFC 6860: Hiding Transit-Only networks in OSPF

4.1.4 IPv6 Routing

4.1.4.1 Core Features

- RFC 1981: Path MTU for IPv6
- RFC 2460: IPv6 protocol specification
- RFC 2464: IPv6 over Ethernet
- RFC 2711: IPv6 router alert
- RFC 3056: Connection of IPv6 Domains through IPv4 Clouds
- RFC 3306: Unicast prefix-based IPv6 multicast addresses
- RFC 3315: Dynamic Host Configuration Protocol for IPv6 (DHCPv6)
- RFC 3484: Default address selection for IPv6
- RFC 3493: Basic socket interface for IPv6
- RFC 3513: Addressing architecture for IPv6
- RFC 3542: Advanced sockets API for IPv6
- RFC 3587: IPv6 Global Unicast Address Format
- RFC 3633: IPv6 Prefix Options for Dynamic Host Configuration Protocol (DHCP) version 6
- RFC 3736: Stateless DHCPv6
- RFC 4213: Basic Transition Mechanisms for IPv6
- RFC 4291: Addressing Architecture for IPv6
- RFC 4443: ICMPv6
- RFC 4861: Neighbor discovery for IPv6
- RFC 4862: IPv6 stateless address autoconfiguration
- RFC 5187: OSPFv3 Graceful Restart
- RFC 5340: OSPF for IPv6
- RFC 5549: Advertising IPv4 Network Layer Reachability Information with an IPv6 Next Hop
- RFC 5798: Virtual Router Redundancy Protocol (VRRP) version 3
- RFC 5881: BFD for IPv4 and IPv6 (Single Hop)
- RFC 6164: Using 127-Bit IPv6 Prefixes on Inter-Router Links
- RFC 6583: Operational Neighbor Discovery Problems
- Dual IPv4/IPv6 TCP/IP Stack Operation
- ICMPv6 Throttling
- 6to4 automatic tunnels
- DNSv6
- IPv6 negative ARPs
- IPv6/127 support
- Stateful DHCPv6 server
- IPv6 server lists
- OSPFv3 stub router
- OSPFv3 LSA group pacing
- OSPFv3 timers throttle
- OSPFv3 bundle direct ACKs

4.1.5 Quality of Service

4.1.5.1 Differentiated Services (DiffServ)

- RFC 1858: Security Considerations for IP Fragment Filtering
- RFC 2474: Definition of the differentiated services field (DS Field) in the IPv4 and IPv6 headers
- RFC 2475: An architecture for differentiated services
- RFC 2597: Assured forwarding PHB group
- RFC 2697: Single-rate policing
- RFC 2698: A Two Rate Three Color Marker
- RFC 3246: An expedited forwarding PHB (Per-Hop Behavior)
- RFC 3260: New terminology and clarifications for DiffServ

4.1.5.2 Access Control Lists (ACL)

- Permit/deny actions for inbound or outbound IP (IPv4 and IPv6) traffic classification based on:
 - Type of service (ToS) or differentiated services (DS) DSCP field
 - Source IP address
 - Destination IP address
 - TCP/UDP source port
 - TCP/UDP destination port
 - IP protocol number
 - IPv6 flow label
- Permit/deny actions for inbound or outbound Layer-2 traffic classification based on:
 - Source MAC address
 - Destination MAC address
 - EtherType
 - VLAN identifier value or range (outer and/or inner VLAN tag)
 - IEEE 802.1p user priority (outer and/or inner VLAN tag)
- DiffServ and ACL actions:
 - Assign matching traffic flow to a specific queue
 - Specific port redirect or mirror (flow-based mirroring) matching traffic flow
 - Generate trap log entries containing rule hit counts

4.1.5.3 Class of Service

- Auto VoIP: Automatic VoIP Class of Service (CoS) settings
- Direct user configuration of the following:
 - IP DSCP to traffic class mapping
 - IP precedence to traffic class mapping
 - Interface trust mode: IEEE 802.1p, IP Precedence, IP DSCP, or untrusted
 - Interface traffic shaping rate
 - Minimum and maximum bandwidth per queue
 - Strict priority versus weighted (WRR/WFQ) scheduling per queue
 - Tail drop versus Weighted Random Early Detection (WRED) queue depth management

4.1.6 Multicast

4.1.6.1 Core Features

- RFC 1112: Host extensions for IP multicasting
- RFC 2236: Internet Group Management Protocol (IGMP) version 2
- RFC 2365: Administratively scoped IP multicast
- RFC 2710: Multicast Listener Discovery (MLD) for IPv6
- RFC 3376: Internet Group Management Protocol (IGMP), version 3
- RFC 3810: Multicast Listener Discovery Version 2 (MLDv2) for IPv6
- RFC 3973: Protocol Independent Multicast - Dense Mode (PIM-DM)
- RFC 4601: Protocol Independent Multicast - Sparse Mode (PIM-SM)
- Draft-ietf-idmr-dvmrp-v3-10: Distance Vector Multicast Routing Protocol (DVMRP)
- Draft-ietf-magma-igmp-proxy-06: IGMP/MLD-based multicast forwarding (IGMP/MLD proxying)
- Draft-ietf-magma-igmpv3-and-routing-05: IGMPv3/MLDv2 and multicast routing protocol interaction
- draft-ietf-pim-sm-bsr-05: Bootstrap Router (BSR) Mechanism for PIM
- draft-ietf-ssm-arch-05.txt - Source-Specific Multicast (SSM) for IP
- Static RP configuration
- MLD proxy
- IGMPv3 proxy
- IP multicast Traceroute
- Multihop RP

4.2 Supported MIBs

The Software supports the following MIBs.

4.2.1 Enterprise MIB

- Support for all managed objects not contained in standards based MIBs.

4.2.2 Switching MIBs

- RFC 1213: MIB-II
- RFC 1493: Bridge MIB
- RFC 1612: DNS Resolver MIB Extensions
- RFC 1643: Ethernet-like MIB
- RFC 2011: IP-MIB
- RFC 2233: Interfaces Group MIB using SMI v2
- RFC 2613: SMON MIB
- RFC 2618: RADIUS Authentication Client MIB
- RFC 2620: RADIUS Accounting MIB
- RFC 2674: Q-BRIDGE-MIB
- RFC 2737: Entity MIB version 2
- RFC 2819: RMON Groups 1,2,3, and 9
- RFC 2863: IF-MIB
- RFC 2925: Definitions of Managed Objects for Remote Ping, Traceroute, and Lookup Operations
- RFC 3273: RMON Groups 1,2 and 3
- RFC 3291: INET-ADDRESS-MIB
- RFC 3434: RMON Groups 1,2, and 3
- RFC 4022: TCP-MIB

- RFC 4113: UDP-MIB
- IEEE 802.1X MIB (IEEE 802.1-PAE-MIB 2004 Revision)
- IEEE 802.1AB: LLDP MIB
- ANSI/TIA-1057: LLDP-MED MIB
- FASTPATH Enterprise MIBs supporting Switching features

4.2.3 Routing MIBs

- RFC 1724: RIP v2 MIB Extension
- RFC 1850: OSPF MIB
- RFC 2096: IP Forwarding Table MIB
- RFC 2787: VRRP MIB
- RFC 3636: MAU MIB
- RFC 6527: Definitions of Managed Objects for the Virtual Router Redundancy Protocol Version 3 (VRRPv3)
- FASTPATH Enterprise MIB supporting Routing features

4.2.4 Multicast MIBs

- RFC 2932: IPv4 Multicast Routing MIB
- RFC 2933: Internet Group Management Protocol MIB
- RFC 5060: Protocol Independent Multicast MIB
- RFC 5519: Multicast Group Membership Discovery MIB
- draft-ietf-idmr-dvmrp-mib-11: Distance-Vector Multicast Routing Protocol (DVMRP) standard MIB
- draft-ietf-magma-mgmd-mib-05: Multicast Group Membership Discovery MIB
- draft-ietf-pim-bsr-mib-06: PIM Bootstrap Router MIB
- FASTPATH Enterprise MIB supporting Multicast features

4.2.5 IPv6 Routing MIBs

- RFC 2465: IPv6 MIB
- RFC 2466: ICMPv6 MIB
- RFC 3419: Transport Address MIB
- RFC 5643: OSPFv3 MIB

4.2.6 Quality of Service MIBs

- RFC 3289: Management Information Base for the Differentiated Services Architecture (read-only)
- Private MIBs supporting DiffServ, ACL, and CoS functionality

4.2.7 Kontron Private MIBs

For the CP6940, Kontron provides several MIBs in addition to the Standard MIBs (see "Supported MIBs" on page 61) that allows to use SNMP for configuration of:

- IPMI features
- extended Ethernet features
- Geographical Address
- extended management features

Kontron specific MIBs start with a "kex_". Here's a list of MIBs provided, including its content:

- kex_config
 - Set BSP startup services
 - Handle arbitrary config. files
 - DHCP Server packet manipulation
 - ACL Trap Sleep Time

- DHCP Client Identifier
- Delete File and extra-profile
- user-timer settings
- Selectable port map
- Error counters
 - Expandable port configuration
 - Watchdog configuration
 - Logging messages decode
- kex-debug
 - Debug information
- kex_ipmi
 - Basic IPMI features:
 - Sensor list
 - SEL entries
 - FRU entries
 - FRU-Device information
- kex_mgmt
 - Egress COS drop counter
 - Protection Port Groups
 - Advertise Speed
 - LAG multicast hashing
 - VLAN multicast flooding
 - Port multicast flooding
 - LAG unicast enhanced hashing
 - Send IGMP reports (proxy)
 - CPU load
 - Suppress MAC learning
 - Fast Reload
 - Memory Usage
 - L2 port bridge
 - Port blocking mode
 - BPDU forwarding
 - Egress COS drop counters
 - Set IP IGMP static entry
- kex_oem
 - Customer specific information
 - OEM serial number
 - OEM hardware part number
 - OEM software part number
 - OEM software configuration
- kex_phy
 - SFP/SFP+/QSFP information
 - Status (present), auto/isolate/auto-configuration mode, Ethernet protocol, LOS/Transmit-Fault
 - EEPROM content
 - Present trap

- kex_ref
 - basic Kontron Information
- kex_sensor
 - common sensor list (IPMI sensors, chip sensors, PHY sensors)
- kex_version
 - FASTPATH version
 - Chip information
 - Address information (GA/SGA address)
 - Board information (name, part-number, serial-number, manufacturer, MAC address)
 - Firmware version (e.g. PLD) and write protect status
 - System and IPMI release
- kex_file_integrity
 - file integrity configuration
- kex_ntp
 - NTP configuration

To use the MIBs, you must import the MIBs into the MIB browser. The MIBs are provided on demand for current releases. SNMP can also be used for updating System Software, IPMI FW and PLD.

4.3 Bootloader

On the CP6940 Ethernet Switch, the bootloader 'u-boot' (universal bootloader) is used. The bootloader initializes the main components of the system like Unit Computer, DDR3 RAM, serial lines etc. for operation and performs a power on self test (POST). After these steps have been finished, the bootloader loads and starts the linux OS stored on eMMC device.

Two instances of the bootloader stored on the system. One resides on eMMC and is the one used for normal operation. In case of failure or corruption of the normal operation bootloader, the failsafe bootloader that is stored on write protected SPI flash will start instead. This redundancy concept allows for recovery actions in case of failure.

4.3.1 Power On Self Test

4.3.1.1 Test Routines

Upon power on or system reset, the bootloader performs the following power on self tests (POST):

Table 17: POST tests

Test	Description
Serial	Onboard Unit Computer serial controller loopback test
I2C	Check for presence of onboard I2C devices
PCI Express	Check for PCI Express switch device presence
Serviceport	Onboard NXP LS1020 ethernet internal loopback test
Bootloader environment	Check for valid bootloader environment (CRC correct or both CRCs are 0xFFFFFFFF == not initialized)
VPD area	Check for valid VPD area (CRC is valid)
DDR RAM memory cells	Checkerboard standard test algorithm
KCS	KCS Interface communication

The POST result is stored in bootloader environment. It is passed to linux OS for further error handling purposes.

4.3.2 Bootloader Shell Options

The boot process can be interrupted by entering the bootstopkey phrase "stop". This will open a bootloader shell session. Entering "?" provides a list of possible built-in commands, "printenv" provides a list of current environment settings. The bootloader shell allows to customize boot options and system startup by changing some of its environment variables. A list of available environment variables and its description can be seen in the table below..

Table 18: Bootloader Environment Variables

Name	Type	Description
baudrate	Var	Serial line baudrate default: 115200
bootargs	Var	Default kernel arguments. (quiet postresult=0x\${postresult} \${vram_kinfo})
bootcmd	Script	This variable defines a command string that is automatically executed when the initial countdown is not interrupted. This command is only executed when the variable bootdelay is also defined!
bootdelay	Var	After reset, U-Boot will wait this number of seconds before it executes the contents of the bootcmd variable. During this time a countdown is printed, which can be interrupted by pressing any key. Set this variable to 0 boots without delay. Be careful: depending on the contents of your bootcmd variable, this can prevent you from entering interactive commands again forever! Set this variable to -1 to disable autoboot. default: 3 for boot monitor, 10 for boot write-protected boot firmware.
bootstopkey	Var	Defines the key phrase that the user needs to type to drop into the bootloader command line interface during startup. not set – use string "stop" as bootstop key phrase (default) <any> - use string <any> as bootstop key phrase
ethaddr	Auto	contains the default base MAC address of the board which is read from VPD area. If ethaddr environment variable is changed and stored using 'saveenv', this value will override VPD setting after board restart.
loadaddr	Var	Default load address for network transfers. This is used as a temporary storage for netbooting and firmware updates. default: 0x20000000
setbootargs	Script	This command is used before execution of the boot command to setup kernel command line properly with current post-result and vram_kinfo values

There are three different types of bootloader environment variables:

- **Script:** The variable is a set of consecutive (more simple) bootloader commands to perform a specific task. A bootloader environment script is executed using the 'run <script>' syntax.
- **Var:** The variable controls a specific behaviour of the bootloader startup sequence. E.g. the 'bootdelay' variable controls the time u-boot waits before execution of the bootcmd which normally loads and starts the linux kernel.
- **Auto:** The variable is automatically set during bootloader startup sequence.

It is possible to modify environment variables and start the pre-defined scripts from the bootloader shell. It is strongly discouraged to modify the pre-defined script variables. However, definition and execution of user-defined script variables can be done.

NOTICE

Meddling with the bootloader environment variables can affect significantly the startup sequence of the system and may cause the system to be un-bootable.

Bootloader environment variables can be modified and stored using the 'set'env and 'saveenv' bootloader CLI commands. Bootloader environment changes are stored in SPI flash sector.

The bootstopkey (key Phrase and delay) can be modified using the bootloader CLI, the bootstopkey phrase can also be modified by using the FASTPATH CLI, using the command „set bootstopkey [keyname <name>]“

Default delay is set to „3“. to change the delay e.g. to „8“, use the commands

```
setenv bootdelay 8
saveenv
```

Do not set the boodelay to „0“ to avoid the system to be stuck, see the table above for more information.

To disable the bootstopkey, use the command „setenv bootdelay -1; saveenv“ from the uboot CLI, or the command "no set bootstopkey" from the FASTPATH CLI.

4.4 Accessing the Linux shell

NOTICE

Changing the Linux filesystem and configurations can significantly affect system behavior and may cause the system to be un-usable.

There are two possibilities to access the Linux Shell:

1. With entering Ctrl-V in the Fastpath shell, the selection menu opens:

```
(Ethernet Fabric) #
Disconnected from FASTPATH console.
```

```
b - connect FASTPATH console
! - shell escape
r - reset system
```

```
select>
```

Use the exclamation mark to access the Linux Shell.

You will be asked for the root password, which is set by default to „root“

```
select> !
Password:
#
```

To leave the Linux shell, the command „exit“ has to be used.

```
# exit
```

```
b - connect FASTPATH console
! - shell escape
r - reset system
```

```
select>
```

2. Using the command "linuxsh" in the Fastpath-Prompt you will enter the linux Shell using a telnet session:

```
(Ethernet Fabric)#linuxsh
Trying 127.0.0.1...
```

```
Connected to 127.0.0.1
```

```
/ #
```

To leave the Linux shell, the command „exit“ has to be used.

```
/ # exit
```

```
Connection closed by foreign host.
(Ethernet Fabric)#
```

4.5 IPMI Firmware

The Switch Management Controller communicates with the onboard Module Management Controller (MMC) using the Keyboard Controller Style (KCS) interface. The bootloader is able to communicate with the MMC, e.g. for POST error logging purposes and fault resilient purposes.

The memory subsystem of the MMC consists of an integrated flash memory to hold the MMC operation code and integrated RAM for data. The field replaceable unit (FRU) inventory information is stored in the nonvolatile memory on an EEPROM connected via a local I2C interface to the MMC microcontroller. It is possible to store up to 4 Kbytes within the FRU inventory information. Communication over IPMB bus to the BMC ensures that 'post-mortem' logging information is available even if the main processor becomes disabled.

The onboard DC voltage, current, and temperature sensors are monitored by the MMC continuously. The MMC will log an event into the BMC's System Event Log (SEL) if any of the thresholds are exceeded.

To increase the reliability of the Board management subsystem, an external watchdog supervisor for the MMC is implemented. The MMC strobes the external watchdog within 800 millisecond intervals to ensure continuity of operation of the board's management subsystem. The MMC watchdog supervisor does not reset the payload power and the restart of the MMC will not affect the payload. The external watchdog supervisor is not configurable and must not be confused with the IPMI v1.5 watchdog timer commands.

This external watchdog of the MMC is implemented inside the PLD and is used to supervise the operational state of the MMC.

4.5.1 Supported IPMI Commands

4.5.1.1 Standard Commands

Part of the command list in IPMI specification 2.0

M = mandatory, O = optional

Table 19: Standard Commands

Command	IPMI 2.0 Spec. section	NetFn	CMD	Support on CP6940
Get Device ID	20.1	App	01h	M / Yes ^[1]
Cold Reset	20.2	App	02h	O / Yes
Get Self Test Results	20.4	App	04h	O / Yes
Manufacturing Test On	20.5	App	05h	O / Yes
Broadcast "Get Device ID"	20.9	App	01h	M / Yes
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

Table 19: Standard Commands (Continued)

Command	IPMI 2.0 Spec. section	NetFn	CMD	Support on CP6940
Set BMC Global Enables	22.1	App	2Eh	0 / Yes
Get BMC Global Enables	22.2	App	2Fh	0 / Yes
Clear Message Flags	22.3	App	30h	0 / Yes
Get Message Flags	22.4	App	31h	0 / Yes
Enable Message Channel Receive	22.5	App	32h	0 / Yes
Get Message	22.6	App	33h	0 / Yes
Send Message	22.7	App	34h	0 / Yes
Read Event Message Buffer	22.8	App	35h	0 / Yes
Get Channel Info	22.24	App	42h	0 / Yes
Get Chassis Capabilities	28.1	Chassis	00h	0 / Yes
Get Chassis Status	28.1	Chassis	01h	0 / Yes
Chassis Control	28.3	Chassis	02h	0 / Yes
Get POH Counter	28.14	Chassis	0Fh	0 / Yes
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
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
Set Sensor Hysteresis	35.6	S/E	24h	0 / Yes
Get Sensor Hysteresis	35.7	S/E	25h	0 / Yes
Set Sensor Threshold	35.8	S/E	26h	0 / Yes
Get Sensor Threshold	35.9	S/E	27h	0 / Yes
Set Sensor Event Enable	35.10	S/E	28h	0 / Yes
Get Sensor Event Enable	35.11	S/E	29h	0 / Yes
Get Sensor Reading	35.14	S/E	2Dh	M / Yes
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
Get SEL Info	31.2	Storage	40h	0 / Yes
Get SEL Allocation Info	31.3	Storage	41h	0 / Yes
Reserve SEL	31.4	Storage	42h	0 / Yes
Get SEL Entry	31.5	Storage	43h	0 / Yes
Add SEL Entry	31.6	Storage	44h	0 / Yes

Table 19: Standard Commands (Continued)

Command	IPMI 2.0 Spec. section	NetFn	CMD	Support on CP6940
Delete SEL Entry	31.8	Storage	46h	0 / Yes
Clear SEL	31.9	Storage	47h	0 / Yes
Get SEL Time	31.10	Storage	48h	0 / Yes
Set SEL Time	31.11	Storage	49h	0 / Yes

[1] Has oem extensions

Table 20: PICMG 3.0 Commands

Command name	Standard	NetFn	Code	Support on CP6940
Get Address Info	3-10	PICMG	00h	0 / Yes
Get OPIMG properties	3-11	PICMG	01h	0 / Yes
Get Shelf Address Info	3-11	PICMG	02h	0 / Yes

Table 21: HPM.1 Commands

Command name	Standard	Code	Support on CP6940
Get Target Upgrade Capabilities	HPM.1	2Eh	YES
Get Component Properties	HPM.1	2Fh	YES
Abort Firmware Upgrade	HPM.1	30h	YES
Initiate Upgrade Action	HPM.1	31h	YES
Upload Firmware Block	HPM.1	32h	YES
Finish Firmware Upload	HPM.1	33h	YES
Get Upgrade Status	HPM.1	34h	YES
Activate Firmware	HPM.1	35h	YES
Query Self-Test Results	HPM.1	36h	YES
Query Rollback Status	HPM.1	37h	YES
Initiate Manual Rollback	HPM.1	38h	YES

4.5.1.2 Kontron OEM Commands and Extensions

Table 22: Kontron OEM Commands

Command	NetFn	Code	Supported on CP6940
OemApSetNvParam	3Eh	05h	Yes
OemApFormatStorage	3Eh	09h	Yes
OemApRefreshExternUpdatedSensor	3Eh	02h	Yes
OemApSetManufacturingDate	3Eh	0Dh	Yes
OemApGetManufacturingDate	3Eh	0Eh	Yes
OemApGetReleaseInfo	3Eh	01h	Yes
OemApGetFirmwareCapabilities	3Eh	03h	Yes
OemApSetFirmwareCapabilities	30h	04h	Yes
OemApInitMemoryErase	3Eh	A0h	Yes

Get Device ID Command with OEM Extensions

	LUN	NetFn	CMD
GetDeviceID	3	App = 06h	01h

	Byte	Data Field
Request Data	-	-

	Byte	Data Field
Response Data	1	Completion Code
	2	Device ID, returned as 0Fh
	3	Device Revision [7] returned as 1 = device provides device SDRs [6..4] Reserved. Returned as 0. [3..0] Device Revision, binary encoded, returned as 0
	4	Firmware Revision [7] Device available. Returned as 0 (normal operation). [6..0] Major Firmware Revision, binary encoded, returned as 5
	5	Firmware Revision 2 Minor Firmware Revision, BCD encoded, returned as 24h
	6	IPMI Version 51h – IPMI version 1.5
	7	Additional Device Support [7] - 1b = device does implement chassis device support [6] - 0b = device does not implement bridge device support [5] - 1b = device generates event messages onto the IPMB [4] - 1b = device does not accepts event messages from the IPMB [3] - 1b = device implements a FRU device repository [2] - 1b = device does implement a SEL [1] - 0b = device does not implement a SDRR [0] - 1b = device implements sensors
	8 – 10	Manufacturer ID 15000 983A00h = Kontron
	11 – 12	Product ID 1705 6a9h = S1705
	13 - 16	Aux bytes reports firmware build time in Unix timestamp format

Example:

```
# ipmitool mc info
Device ID                : 16
Device Revision          : 0
Firmware Revision        : 1.07
IPMI Version             : 1.5
Manufacturer ID          : 15000
Manufacturer Name        : Kontron
Product ID               : 1705 (0x06a9)
Product Name             : Unknown (0x6A9)
Device Available         : yes
Provides Device SDRs    : yes
Additional Device Support :
  Sensor Device
  SEL Device
  FRU Inventory Device
  IPMB Event Receiver
  IPMB Event Generator
  Chassis Device
Aux Firmware Rev Info    :
  0x78
  0x7f
  0x5b
  0x63
```

OemApSetNvParam Command

	LUN	Code
oemApSetNvParam	3	05h

	Byte	Data Field
Request data	1	Pass Code 0: ~'K'
	2	Pass Code 1: ~'o'
	3	Pass Code 2: ~'n'
	4	Pass Code 3: ~'t'
	5	Command Flag: [7..2] reserved [1] 1=set values 0= get values [0] is cold reset required flag
	6	Operation Mode: [7..5] reserved [4] IPMB Mode: 1=redundant 0= non-redundant [3..1] reserved [0] Controller mode: 1=BMC mode 0=Satellite Mode
	7	KCS IRQ: default is 11h
Response data	1	Completion Code

OemApFormatStorage Command

This command re-formats the I2C EEPROM attached to the IPMC. This clears the FRU data storage, the SEL storage and resets the NV parameter database to the default values. This command also causes the MMC to reset.

	LUN	NetFn
OemApFormatStorage	3	09h

	Byte	Data Field
Request data	1	Pass Code 0: ~'K'
	2	Pass Code 1: ~'o'
	3	Pass Code 2: ~'n'
	4	Pass Code 3: ~'t'
Response data	1	Completion Code

OemApSetManufacturerDate Command

	LUN	Code
oemApSetManufacturerDate	3	0Dh

	Byte	Data Field
Request data	1	Pass Code 0: ~'K'
	2	Pass Code 1: ~'o'
	3	Pass Code 2: ~'n'
	4	Pass Code 3: ~'t'
	5 .. 7	Manufacturing Date
Response data	1	Completion Code

OemApGetManufacturerDate Command

	LUN	Code
oemApGetManufacturerDate	3	0Eh

	Byte	Data Field
Request data	1	Pass Code 0: ~'K'
	2	Pass Code 1: ~'o'
	3	Pass Code 2: ~'n'
	4	Pass Code 3: ~'t'
Response data	1	Completion Code
	2 .. 4	Manufacturing date

OemApGetReleaseInfo Command

This command returns firmware related release information.

	LUN	Code
oemApGetReleaseInfo	3	01h

	Byte	Data Field
Request data	1	Pass Code 0: ~'S'
	2	Pass Code 1: ~'1'
	3	Pass Code 2: ~'7'
	4	Pass Code 3: ~'0'
	5	Pass Code 4: ~'5'
	6	Read data count N
	7	Write data
	8	Write data mask

	Byte	Data Field
Response data	1	Completion Code
	2 .. 5	Release Code
	6 .. 13	Subrelease Release Code
	14 .. 21	Date Code

OemApRefreshExternUpdatedSensor Command

This command is used to update sensor values via the system interface.

	LUN	Code
oemApRefreshExternUpdatedSensor	3	02h

	Byte	Data Field
Request data	1	Pass Code 0: ~'K'
	2	Pass Code 1: ~'O'
	3	Pass Code 2: ~'n'
	4	Pass Code 3: ~'t'
	5 .. N	Externally Updated Sensor Values
Response data	1	Completion Code
	2..N	Read data

OemApGetFirmwareCapabilities Command

This command retrieves the firmware capabilities vector.

	LUN	Code
oemApGetFirmwareCapabilities	3	03h

	Byte	Data Field
Request data	1	Pass Code 0: ~'S'
	2	Pass Code 1: ~'1'
	3	Pass Code 2: ~'7'
	4	Pass Code 3: ~'0'
	5	Pass Code 4: ~'5'
Response data	1	Completion Code
	2 .. 19	Firmware capabilities vector

OemApSetFirmwareCapabilities Command

This command sets the firmware capabilities vector.

	LUN	Code
oemApSetFirmwareCapabilities	3	04h

	Byte	Data Field
Request data	1	Pass Code 0: ~'5'
	2	Pass Code 1: ~'1'
	3	Pass Code 2: ~'7'
	4	Pass Code 3: ~'0'
	5	Pass Code 4: ~'5'
	6 - 23	Firmware capabilities vector
Response data	1	Completion Code

OemApInitMemoryErase Command

This command initiates the memory erase process.

	LUN	Code
oemApInitMemoryErase Command	3	A0h

	Byte	Data Field
Request data	1	Pass Code 0: ~'5'
	2	Pass Code 1: ~'1'
	3	Pass Code 2: ~'7'
	4	Pass Code 3: ~'0'
	5	Pass Code 4: ~'5'
	6	Action: 00h: memory erase one time 01h: init memory erase (short term) 02h: init memory erase (long term)
Response data	1	Completion Code

4.5.2 Board Sensors

The Management Controller 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 thresholds, hysteresis, event generation capabilities, etc. that specify the sensor's behavior. Some fields of the sensor SDR are configurable through IPMI v1.5 command and are set to a built-in initial value.

Module sensors that have been implemented are listed in the sensor list in Table 4-7.

4.5.2.1 Sensor List

Please note that the IPMI tool 'ipmitool' displays for command 'ipmitool sdr list' the contents of the sensor data record repository (SDRR) of the whole rack if the SDRR is generated. The generation of the SDRR has always to be done new after adding or subtracting any board to or from the rack.

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

Table 23: Sensor List

SDR Record ID	Sensor Nr	Sensor ID	Sensor Type Code	Description
0	NA	CP6940		FRU Device Locator Record
1	0	Sxx: T_PCB	01h (Temperature)	Board thermal sensor
2	1	Sxx: T_CPU	01h (Temperature)	CPU thermal sensor
3	2	Sxx: T_OUTLET	01h (Temperature)	Outlet thermal sensor
4	3	Sxx: V_0V675_VTT	01h (Voltage)	Payload Voltage
5	4	Sxx: V_1V0_CPU	01h (Voltage)	CPU Voltage
6	5	Sxx: V_1V0_PHY_CORE	01h (Voltage)	Payload Voltage
7	6	Sxx: V_1V0_PHY_A	01h (Voltage)	Payload Voltage
8	7	Sxx: V_1V0_SW_CORE	01h (Voltage)	Payload Voltage
9	8	Sxx: V_1V0_SW_A	01h (Voltage)	Payload Voltage
10	9	Sxx: V_1V1	01h (Voltage)	Payload Voltage
11	10	Sxx: V_1V35	01h (Voltage)	Payload Voltage
12	11	Sxx: V_1V8	01h (Voltage)	Suspend Voltage
13	12	Sxx: V_3V3	01h (Voltage)	Suspend CPLD Voltage
14	13	Sxx: V_3V3_SUS	01h (Voltage)	Suspend Voltage
15	14	Sxx: V_3V3_CPCI	01h (Voltage)	CPCI Voltage
16	15	Sxx: V_5V0_SUS	01h (Voltage)	Suspend Voltage
17	16	Sxx: V_5V0_CPCI	01h (Voltage)	CPCI Voltage
18	17	Sxx: V_5V0_IPMB	01h (Voltage)	IPMB Voltage
19	18	Sxx: I_5V0_CPCI	03h (Current)	CPCI Current
20	19	Sxx: I_3V3_CPCI	03h (Current)	CPCI Current
21	20	Sxx: IPMB State	C3h	OEM IPMB link state
22	21	Sxx: MMC Reboot	24h	Platform Alert
23	22	Sxx: Ver change	2Bh	Firmware Version Change
24	23	Sxx: IniAgent Err		This sensor is only valid in BMC mode. When the controller is running in Peripheral mode this SDR record is masked and will not be returned
25	24	Sxx: IPMI Watchdog	23h	Watchdog 2
26	25	Sxx: Board Reset	CFh	
27	26	Sxx: POST Fail	0Fh	System Firmware POST Error
28	27	Sxx: Boot Fail	1Eh	Primary CPU boot failure
29	28	Sxx: SEL State		
30	29	Sxx: IPMI Info-1	C0h	OEM Firmware Info
31	30	Sxx: IPMI Info-2	C0h	OEM Firmware Info

Example

```

# ipmitool sensor
1: S01:T_PCB | 32.000 | degrees C | ok | na | na | na | 95.000 | 100.000 | 110.000
2: S01:T_CPU | 35.000 | degrees C | ok | na | na | na | 100.00 | 105.000 | 110.000
3: S01:T_OUTLET | 37.000 | degrees C | ok | na | na | na | 95.000 | 100.000 | 110.000
4: S01:V_0V675_VTT | 0.672 | Volts | ok | na | 0.641 | na | na | 0.708 | na
5: S01:V_1V0_CPU | 1.000 | Volts | ok | na | 0.970 | na | na | 1.034 | na
6: S01:V_1V0_PHY_CO | 1.021 | Volts | ok | na | 0.948 | na | na | 1.052 | na
7: S01:V_1V0_PHY_A | 1.021 | Volts | ok | na | 0.948 | na | na | 1.052 | na
8: S01:V_1V0_SW_COR | 1.004 | Volts | ok | na | 0.940 | na | na | 1.034 | na
9: S01:V_1V0_SW_A | 1.004 | Volts | ok | na | 0.970 | na | na | 1.034 | na
10: S01:V_1V1 | 1.139 | Volts | ok | na | 1.002 | na | na | 1.171 | na
11: S01:V_1V35 | 1.355 | Volts | ok | na | 1.282 | na | na | 1.411 | na
12: S01:V_1V8 | 1.809 | Volts | ok | na | 1.674 | na | na | 1.899 | na
13: S01:V_3V3 | 3.283 | Volts | ok | na | 3.197 | na | na | 3.413 | na
14: S01:V_3V3_SUS | 3.284 | Volts | ok | na | 3.146 | na | na | 3.643 | na
15: S01:V_3V3_CPCI | 3.283 | Volts | ok | na | 3.139 | na | na | 3.643 | na
16: S01:V_5V0_SUS | 4.685 | Volts | ok | na | 4.243 | na | na | 5.481 | na
17: S01:V_5V0_CPCI | 5.017 | Volts | ok | na | 4.486 | na | na | 5.481 | na
18: S01:V_5V0_IPMB | 5.198 | Volts | ok | na | 4.466 | na | na | 5.496 | na
19: S01:I_5V0_CPCI | 2.187 | Amps | ok | na | na | na | 4.998 | 5.424 | na
20: S01:I_3V3_CPCI | 2.706 | Amps | ok | na | na | na | 8.517 | 9.194 | na
21: S01:IPMB State | 0x11 | discrete | 0x0880 | na | na | na | na | na | na
22: S01:MMC Reboot | 0x0 | discrete | 0x0180 | na | na | na | na | na | na
23: S01:Ver change | 0x0 | discrete | 0x0080 | na | na | na | na | na | na
25: S01:IPMI Watchdo | 0x0 | discrete | 0x0080 | na | na | na | na | na | na
26: S01:Board Reset | 0x0 | discrete | 0x0180 | na | na | na | na | na | na
27: S01:POST Fail | 0x0 | discrete | 0x0080 | na | na | na | na | na | na
28: S01:Boot Fail | 0x0 | discrete | 0x0080 | na | na | na | na | na | na
29: S01:SEL State | 0x0 | discrete | 0x3080 | na | na | na | na | na | na
30: S01:IPMI Info-1 | 0x0 | discrete | 0x0080 | na | na | na | na | na | na
31: S01:IPMI Info-2 | 0x0 | discrete | 0x0080 | na | na | na | na | na | na

```

Please note, Numbering at the beginning of each line of the ipmitool sensors command output shows SDR Record IDs. Event data

4.5.2.2 OEM Sensors

OEM IPMB Link state (Type C3h)

Table 24: IPMB Link (Type C3h) Reading

	Offset	
Request data	1	Sensor Number
Response data	1	Completion Code
	2	Sensor Reading [7:4] – Reserved, ignore on read [3] – IPMB-L Override State 0b = override state, bus isolated 1b = local control state, MMC determines state of the bus [2:0] – IPMB-L Local State 0h = no failure, bus enabled 1h = unable to drive clock high 2h = unable to drive data high 3h = unable to drive clock low 4h = unable to drive data low 5h = clock low timeout 6h = under test (MMC is attempting to determine if it is causing a bus hang) 7h = undiagnosed communication failure
	3	Standard IPMI Byte. (See "Get Sensor Reading in the IPMI Specification")
	4	[7:2] – Reserved, read as zero [1] – 1b = IPMB-L enabled [0] – 1b = IPMB-L disabled
	5	80h – Ignore on read

Table 25: IPMB Link State (Type C3h) Event Message

	Offset	
Request data	1	Event Message Rev 04h
	2	Sensor Type F2h – Module Hot Swap
	3	Sensor Number
	4	[7] – Event Direction 1b = Deassertion 0b = Assertion [6-0] – Event Type 6Fh = Generic Availability
	5	Event Data 1 [7:4] – Ah = OEM code in Event Data 2 and 3 [3:0] – Offset 00h = IPMB-L disabled 01h = IPMB-L enabled All other values are reserved.
	6	Event Data 2 [7:0] Reserved, read as zero
	7	Event Data 3 [7:4] – Reserved, read as zero [3] – IPMB-L Override State 0b = override state, bus isolated 1b = local control state, MMC determines state of the bus [2:0] – IPMB-L Local Status 0h = no failure, bus enabled 1h = unable to drive clock high 2h = unable to drive data high 3h = unable to drive clock low 4h = unable to drive data low
Response data	1	Completion Code

MMC Reboot (Type 24h)

Table 26: MMC Reboot (Type 24h) Reading

	Offset	
Request data	1	Sensor Number
Response data	1	Completion Code
	2	Sensor Reading 00h – ignore on read
	3	Standard IPMI Byte. (See "Get Sensor Reading in the IPMI Specification)
	4	[7:2] – Reserved, read as zero [1] – 1b = MMC in Reset [0] – 1b = MMC out of Reset
	5	80h – Ignore on read

Table 27: MMC Reboot (Type 24h) Event Message

	Offset	
Request data	1	Event Message Rev 04h
	2	Sensor Type 24h – Platform Alert
	3	Sensor Number
	4	[7] – Event Direction 1b = Deassertion 0b = Assertion [6-0] – Event Type 03h = digital discrete
	5	Event Data 1 [7:4] – 0h = no data in Event Data 2 and 3 [3:0] – Offset 00h = MMC out of Reset 01h = MMC in Reset All other values are reserved.
	6	Event Data 2 FFh = not specified
	7	Event Data 3 FFh = not specified
Response data	1	Completion Code

SDR Configuration	Value	Description
Assertion Event Mask	02h	Offset 1 can generate an assertion event
Deassertion Event Mask	00h	Sensor cannot generate deassertion events

Board Reset Type CFh)**Table 28: Board reset (Type CFh)**

	Offset	
Request data	1	Event data 2: reset type 01h cold reset Event data 3: reset source 01h PLD watchdog 02h PLD timer 03h PLD register request 05h SW initiated 09h Reset Button 0Ah Power UP 0Ch IPMI command FFh unknown

Byte 3 of event data reports the reset source:

CP6940 IPMI FW v1.7

```

Switch CLI Reload          a10105
Linux reboot:              a10105
IPMI Chassis power off/on  a1010A
IPMI Chassis Power cycle   a1010A
IPMI Chassis Power reset   a1010C
Front Panel Reset          a10109
Rack Power On              2x a1010A

```

POST Fail (Type 0Fh)**Table 29: POST Fail (Type 0Fh) Reading**

	Offset	
Request data	1	Sensor Number
Response data	1	Completion Code
	2	Sensor Reading 00h – ignore on read
	3	Standard IPMI Byte. (See "Get Sensor Reading in the IPMI Specification)
	4	[7:1] – reserved, ignore on read [0] – 1b = System Firmware Error (POST Error)
	5	80h – ignore on read

Table 30: POST Fail (Type 0Fh) Event Message

	Offset	
Request data	1	Event Message Rev 04h
	2	Sensor Type 0Fh – System Firmware Progress (POST Error)
	3	Sensor Number
	4	[7] – Event Direction 1b = Deassertion 0b = Assertion [6-0] – Event Type 6Fh = sensor specific
	5	Event Data 1 [7:4] – 6h = OEM data in Event Data 2 and no data in Event Data 3 [3:0] – Offset 00h = System Firmware Error (POST Error) All other values are reserved.
	6	Event Data 2 Post Code (see)
	7	Event Data 3 unspecified
Response data	1	Completion Code

Boot Fail *(Sensor Type 1Eh)**Table 31: Boot Fail (Sensor Type 1Eh) Reading**

	Offset	
Request data	1	Sensor Number
Response data	1	Completion Code
	2	Sensor Reading 00h – ignore on read
	3	Standard IPMI Byte. (See "Get Sensor Reading in the IPMI Specification)
	4	[7:4] – reserved, ignore on read [3] – 1b = permanent boot failure, no more images to try [2] – 1b = activation of backup image, boot failure detected [1] – 1b = network boot error [0] – 1b = local boot error while executing from flash
	5	80h – ignore on read

Table 32: Boot Fail (Sensor Type 1Eh) Event Message

	Offset	
Request data	1	Event Message Rev 04h
	2	Sensor Type 1Eh – Boot Error *
	3	Sensor Number
	4	[7] – Event Direction 1b = Deassertion 0b = Assertion [6-0] – Event Type 6Fh = sensor specific
	5	Event Data 1 [7:4] – 80h = OEM data in Event Data 2 and no data in Event Data 3 [3:0] – Offset 00h = local boot error while executing from flash 01h = network boot error 02h = activation of backup image, boot failure detected 03h = permanent boot failure, no more images to try All other values are reserved.
	6	Event Data 2 01h = failed image is image 1 00h = failed image is image 0
	7	Event Data 3 FFh = not specified
Response data	1	Completion Code

* Standard sensor type from IPMI2.0 defined for x86 systems.Sensor Thresholds

Following tables show sensor thresholds for temperature, voltage and current sensors.

Table 33: Temperature Sensor Thresholds [°C]

SENSOR Number/ ID string	Lower critical	Lower non critical	Nominal	Upper non critical	Upper critical	Upper Non Recoverable
CP6940						
Sxx:T_PCB	n.a	n.a		95°C	100°C	110°C
Sxx:T_CPU	n.a	n.a		100°C	105°C	110°C
Sxx:T_OUTLET	n.a	n.a		95°C	100°C	110°C

Table 34: Voltage Sensor Thresholds [V]

SENSOR Number / ID string	Lower critical	Lower non critical	Nominal	Upper non critical	Upper critical
Sxx:V_0V675_VTT	0.6407V	n.a	0,675V	n.a	0.7081V
Sxx:V_1V0_CPU	0.9698V	n.a	1.0V	n.a	1.0344V
Sxx:V_1V0_PHY_CORE	0.9482V	n.a	1.0V	n.a	1.0516V
Sxx:V_1V0_PHY_A	0.9482V	n.a	1.0V	n.a	1.0516V
Sxx:V_1V0_SW_CORE	0.9396V	n.a	1.0V	n.a	1.0344V
Sxx:V_1V0_SW_A	0.9698V	n.a	1.0V	n.a	1.0344V
Sxx:V_1V1	1.0017V	n.a	1.1V	n.a	1.1713V
Sxx:V_1V35	1.2824V	n.a	1.35V	n.a	1.4112V
Sxx:V_1V8	1.674V	n.a	1.8V	n.a	1.899V
Sxx:V_3V3	3.1968V	n.a	3.3V	n.a	3.4128V
Sxx:V_3V3_SUS	3.1464V	n.a	3.3V	n.a	3.6432V
Sxx:V_3V3_CPCI	3.1392V	n.a	3.3V	n.a	3.6432V
Sxx:V_5V0_IPMB	4.4655V	n.a	5.0V	n.a	5.496V
Sxx:V_5V0_CPCI	4.5353V	n.a	5.0V	n.a	5.208V
Sxx:V_5V0_SUS	4.5353V	n.a	5.9V	n.a	5.208V

NOTICE

LNR (Lower Non Recoverable), LNC (Lower Non Critical), UCR (Upper Non Critical) and UNR (Upper Non Recoverable) values and values marked n.a. are not defined.

Table 35: Current Sensor Thresholds [I]

SENSOR Number / ID string	Lower critical	Lower non critical	Nominal	Upper non critical	Upper critical
Sxx:I_3V3_CPCI	NA	NA	NA	8.5172A	9.1938A
Sxx:I_5V0_CPCI	NA	NA	NA	4.9984A	5.4244 A

4.5.3 Health LED

The Health LED on the faceplate will lit when at least one of the sensors in the list below has an asserted state.

Table 36: Health LED behavior

Sensor ID String	Assertion State
Sxx:V_5V0_SUS	Critical and non-recoverable assertion state
Sxx:V_3V3_CPCI	Critical and non-recoverable assertion state
Sxx:V_3V3_SUS	Critical and non-recoverable assertion state
Sxx:V_3V3	Critical and non-recoverable assertion state
Sxx:V_1V8	Critical and non-recoverable assertion state
Sxx:V_1V35	Critical and non-recoverable assertion state
Sxx:V_1V1	Critical and non-recoverable assertion state
Sxx:V_1V0_SW_A0	Critical and non-recoverable assertion state
Sxx:V_1V0_SW_CORE	Critical and non-recoverable assertion state
Sxx:V_1V0_PHY_A	Critical and non-recoverable assertion state
Sxx:V_1V0_PHY_CORE	Critical and non-recoverable assertion state
Sxx:V_1V0_CPU	Critical and non-recoverable assertion state
Sxx:V_0V675_VTT	Critical and non-recoverable assertion state

4.5.4 Board FRU Information

This FRU information contains the IPMI defined Board and Product Information areas that hold the part number and serial number of the board.

4.5.4.1 Structure And Functionality

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

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 because there is no write protection. Damaging the FRU Information e.g. may confuse a shelf management software which uses the FRU data.

4.5.4.2 Board Specific FRU Data

Supported are the following FRU data areas and data fields (examples):

FRU Board Info Area

- Manufacturing date / time
- Board manufacturer: "KONTRON"
- Board Product Name: " S1705"
- Board Serial Number : "0123456789" *)
- Board Part Number: "xxxx-yyyy"
- FRU File ID: "FRU-S1705-00"

FRU Product Info Area

- Product manufacturer: "Kontron"
- Product Name: "CP6940"
- Product Version: "xxxx-yyyy"
- Product Serial Number: "0123456789" *)
- Asset Tag: "0000000000"
- FRU File ID : "FRU-S1705-00"

Example

```
# ipmitool fru
FRU Device Description      : Builtin FRU Device (ID 0)
Board Manufacturing date    : Thu Sep 26 13:37:00 2013
Board Manufacturer         : Kontron
Board Product              : S1705
Board Serial               : 0400223034
Board Part Number          : 1055-1103
Product Manufacturer       : Kontron

Product Name               : CP6940-RA-OC
Product Part Number        : 1055-2670
Product Version            : 01
Product Serial             : 0400223034
Product Asset Tag          : 0000000000
```

4.6 Software Administration

A running CP6940 system requires – after the bootloader has passed control to the kernel – the kernel itself, the root file system (initrd), the FASTPATH switching application and the IPMI firmware.

All parts of the Software running on the CP6940 (OS, applications, IPMI Firmware and CPLD Code) can be updated using dedicated functionality. The update of OS, applications and IPMI Firmware is field save to be able to recover to a stable system, in any case.

The system supports an on-board integrated 4GB SPI NOR flash (pSLC) and a 4GB eMMC Flash.

The SPI flash is used for failsave, write protected bootloader (for emergency board recovery), VPD data and environment data.

The eMMC flash contains the system images, including the bootloader used for normal board operation as well as the operating system and the FASTPATH switching application.

Table 37: On-board SPI NOR FLASH Partition Scheme

Linux Partition Name	Offset in Flash	Size [kB]	Name	Write Protection	Description
mtdd0	0	1C0000	bootloader	yes	failsave bootloader
mtdd1	1C0000	30000	reserved0	yes	Reserved for future use.
mtdd2	1F0000	10000	vpd	yes	
mtdd3	200000	1F0000	reserved1		Reserved for future use.
mtdd4	3F0000	10000	environment		

Table 38: On-board eMMC- FLASH Partition Scheme

Linux Partition Name	Size [kB]	Description
mmcblk0p1	1.369.559.040	system images
mmcblk0p2	510.496.768	volatile

A complete software release for the CP6940 consists of the two files (example package-names):

- "system-bridge.pkg" or "system-router.pkg" (depending on the board type)
- "ipmi-fw.pkg" (firmware package for the IPMI firmware)

In the following, the CLI commands to setup and copy System SW images and the CLI commands necessary to perform upgrades are described. As the commands are the very same for both system packages mentioned above, only the commands for the L3 (Router) version are described.

4.6.1 Failsave update

The system provides two image locations in the eMMC flash for two independent instances of the firmware. This allows recovery from the redundant system in case the update fails due to power loss or other reasons.

Firmware files are protected with checksums to allow detection of corrupted images. In case checksum failures are detected while booting e.g. image1, the system will reset and boot image2. In case image2 is corrupted too, the system will load the failsave bootloader from NOR flash.

4.6.2 Updating System Software

The CLI commands described below are executed in the privileged mode of the CLI hierarchy, which is entered by executing the 'enable' command. Please refer to the "CP6940 CLI Reference Manual" for more information regarding the CLI commands and how to use them.

Firmware update is only possible for the currently not used image, leaving the currently used image untouched during firmware update. This always keeps one known working image available.

A system update package (e.g. system-router.pkg) contains bootloader images, kernel and root file system including switch management application and an additional MD5 checksums for consistency check.

When performing a firmware update, the firmware package will be loaded from a remote TFTP server.

In the following description, instructions use a TFTP server with IP address 192.168.70.2.

3. Log in to the privileged exec mode of the CLI of the system
4. Prepare network access of the system, the update package "system-router.pkg" has to be available on the corresponding TFTP directory. CLI copy command supports a URL length of 160 chars, with a filename length of 64 chars.
5. Check, which image is currently used

```
(Ethernet Fabric) #show bootvar
```

```
image1 : System Firmware (routing)
image2 : none
```

image1	image2	current-active	next-active
ALPHA-1.01-20200210080617	<none>	image1	image1

6. Copy system package into the currently not used image location, in this example image2

```
(Ethernet Fabric) #copy tftp://192.168.170.2/CP6940_Alpha1.02/system-router.pkg image2
```

```
Mode.....TFTP
Set Server IP.....192.168.170.2
Path.....CP6940_Alpha1.02/
Filename.....system-router.pkg
Data Type.....Code
Destination Filename.....image2
```

Management access will be blocked for the duration of the transfer

Are you sure you want to start? (y/n) **y**

File transfer in progress. Management access will be blocked for the duration of the transfer. Please wait..

TFTP Code transfer starting...

Write image to flash starting...

File transfer operation completed successfully.

```
(Ethernet Fabric) #
```

7. Select image2 as new boot image

```
(Ethernet Fabric) #boot system image2
```

```
Activating image image2 ..
```

8. Check correct boot image for next time boot using the command 'show bootvar'

```
(Ethernet Fabric) #show bootvar
```

```
image1 : System Firmware (routing)
image2 : System Firmware (routing)
```

image1	image2	current-active	next-active
ALPHA-1.01-20200210080617	ALPHA-1.02-20200221145132	image1	image2

9. Restart the system, to get new firmware running

```
(Ethernet Fabric) #reload
```

Are you sure you would like to reset the system? (y/n)**y**

10. Verify that new firmware is running

```
(Ethernet Fabric) #show board version all
Product Information
  System description:      Kontron CP6940-RA-OC, ALPHA-1.02-20200221145132,
                          Linux 5.4.20
  Product name:           CP6940-RA-OC
  Product serial number:  0400578481
  Product part number:    1065-1258
  Product manufacturer:   Kontron
  Board name:             BG-CP6940-4S-4R-IX2
  Board serial number:    0400578481
  Board part number:      1066-5239
  Board manufacturer:     Kontron
  Fastpath version:       8.5.0.1-FastPath-Ent-esw-bcm535xx-kex-R-CLNT-AIQH

Hardware Information
  Broadcom silicon:       BCM56174_B0
  Processor CPU type:     ARMv7 Processor rev 5 (v7l)
  Processor clock:        n/a
  Jumper:                 none
  LEDuP version:         3

Updatable Components
  System:                 ALPHA-1.02-20200221145132
  Kernel:                 Linux 5.4.20
  SPL+FailSAFE Bootloader: ALPHA-1.02-20200221145132
  Module PLD:             v2-20200213100805
  IPMC:                   1.2 (2020-02-12 12:32:00)

FRU Information
  Board name:             BG-CP6940-4S-4R-IX2
  Board serial number:    0400578481
  Board part number:      1066-5239
  Product serial number:  0400578481
  Product part number:    1065-1258
```

An attempt to download already present firmware from external server to other image location is rejected with the following message:

```
"Firmware image already installed"
```

4.6.3 Updating IPMI Firmware

Updating the IPMI firmware is done with the "copy" command. If the flash process is interrupted or fails, the IPMC will automatically recover using the previously installed image.

The IPMI firmware package file is provided in .pkg format and is stored in the data/update directory of the release directory tree.

```
(Ethernet Fabric) #copy tftp://192.168.170.2/CP6940_Alpha1.02/ipmi-fw.pkg ipmi

Mode..... TFTP
Set Server IP..... 192.168.170.2
Path..... CP6940_Alpha1.02/
Filename..... ipmi-fw.pkg

Management access will be blocked for the duration of the transfer
Are you sure you want to start? (y/n) y

File transfer in progress. Management access will be blocked for the duration of the
transfer. Please wait ...
Write image to flash starting...

File transfer operation completed successfully.
```

(Ethernet Fabric) #

Verify that new IPMI code is running

(Ethernet Fabric) #**show board version all**

Product Information

System description: Kontron CP6940-SA-P, ALPHA-1.02-2020022114513, Linux 5.4.20
 Product name: CP6940-RA-OC
 Product serial number: 0400578481
 Product part number: 1065-1258
 Product manufacturer: Kontron
 Board name: BG-CP6940-4S-4R-IX2
 Board serial number: 0400578481
 Board part number: 1066-5239
 Board manufacturer: Kontron
 Fastpath version: 8.5.0.1-FastPath-Ent-esw-bcm535xx-kex-R-CLNT-AIQH

Hardware Information

Broadcom silicon: BCM56174_B0
 Processor CPU type: ARMv7 Processor rev 5 (v7l)
 Processor clock: n/a
 Jumper: none
 LEDuP version: 3

Updatable Components

System: ALPHA-1.02-20200221145132
 Kernel: Linux 5.4.20
 SPL+FailSAFE Bootloader: ALPHA-1.02-20200221145132
 Module PLD: v2-20200213100805
 IPMC : 1.4 (2020-03-27 11:53:02)

FRU Information

Board name: BG-CP6940-4S-4R-IX2
 Board serial number: 0400578481
 Board part number: 1066-5239
 Product serial number: 0400578481
 Product part number: 1065-1258

5/ Thermal Considerations

The CP6940 has some temperature sensors which ensure operation within the specified temperature limits. Sensor data is accessible via the Peripheral Manager. Although temperature sensing information is made available to the PM, the CP6940 itself does not provide any active means of temperature regulation.

The Switch device and all PHYs have internal temperature diodes. Their temperature values are stored in internal registers. Additional, there are two temperature sensors for the inlet/outlet air temperature available.

As long as the temperature values stay below their upper critical threshold, all components on the CP6940 are considered to be operated within their specified temperature range.

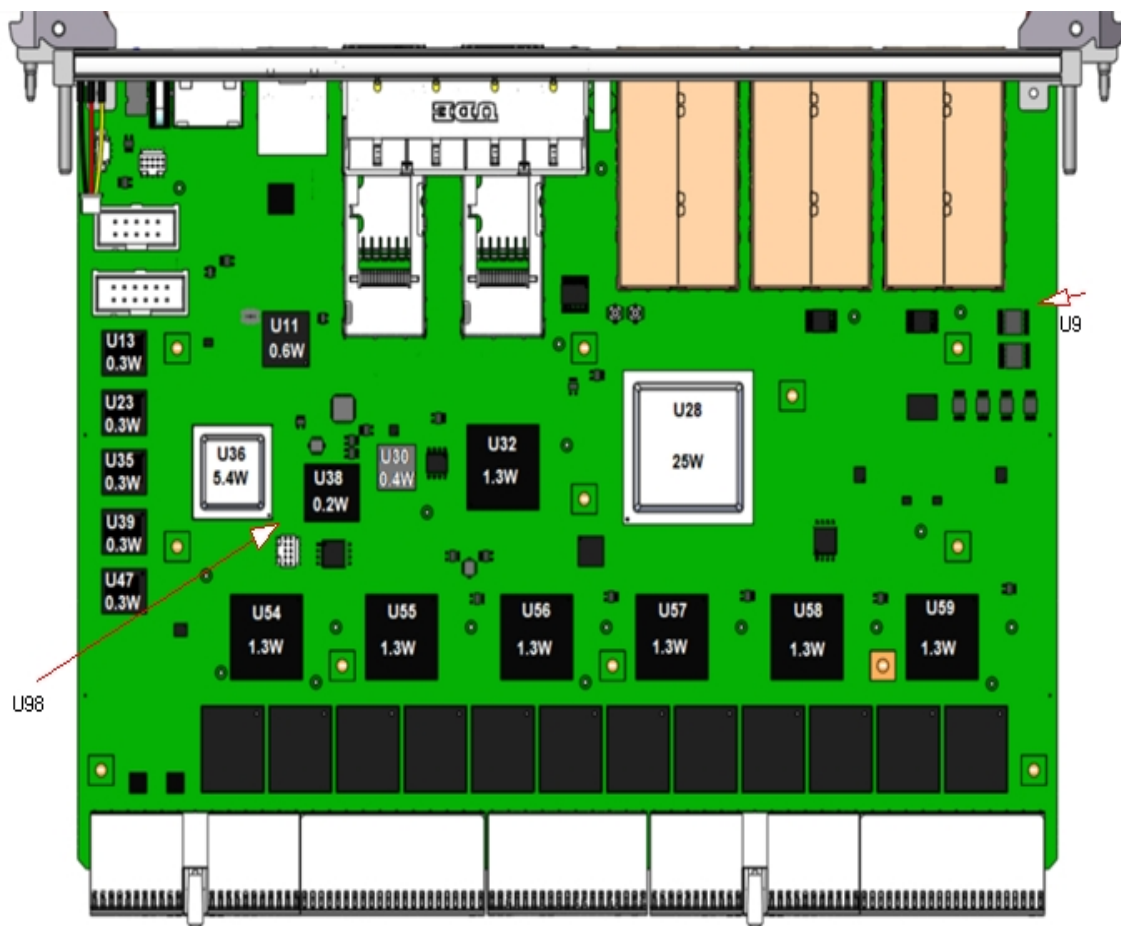


Figure 9: Position of Temperature Sensors, Top Side View

Below is an output of „#show board sensor all | include degrees“, formatted as table

Table 39: Sensor list

Slot/SDR record ID	Description	Measured temperature	Unit	Status	Chip reference	Comments
1/1	S02:T_PCB	35,000	degrees C	ok	U98	TMP411,placed on solder side
1/2	S02:T_CPU	39,000	degrees C	ok	U36	TMP411, measured via CPU internal diode
1/3	S02:T_OUTLET	36.000	degrees C	ok	U9	ADT7411, placed on component side
2/1	Switch On-Die Temp 1	42.900	degrees C	n/a	U28	
2/2	Switch On-Die Temp 2	42.400	degrees C	n/a	U28	

Table 39: Sensor list

Slot/SDR record ID	Description	Measured temperature	Unit	Status	Chip reference	Comments
2/3	Switch On-Die Temp 3	42.900	degrees C	n/a	U28	
2/4	Switch On-Die Temp 4	42.900	degrees C	n/a	U28	
2/5	Switch On-Die Temp 1 peak	45.900	degrees C	n/a	U28	
2/6	Switch On-Die Temp 2 peak	42.400	degrees C	n/a	U28	
2/7	Switch On-Die Temp 3 peak	42.900	degrees C	n/a	U28	
2/8	Switch On-Die Temp 4 peak	42.900	degrees C	n/a	U28	
2/9	Switch On-Die Temp average	42.775	degrees C	n/a	U28	
3/1	PHY On-Die Temp 1	43.900	degrees C	n/a	U55	
3/2	PHY On-Die Temp 2	42.900	degrees C	n/a	U54	
3/3	PHY On-Die Temp 3	46.400	degrees C	n/a	U57	
3/4	PHY On-Die Temp 4	44.900	degrees C	n/a	U56	
3/5	PHY On-Die Temp 5	44.900	degrees C	n/a	U59	
3/6	PHY On-Die Temp 6	46.900	degrees C	n/a	U58	
3/7	PHY On-Die Temp 7	46.900	degrees C	n/a	U32	only present on CP6940-SA-OC-V, CP6940-RA-OC
4/1	SFP 26 Temperature	0.000	degrees C	not present		if reported by inserted SFP module
4/3	SFP 27 Temperature	0.000	degrees C	not present		if reported by inserted SFP module
4/5	SFP 28 Temperature	0.000	degrees C	not present		if reported by inserted SFP module
4/7	SFP 29 Temperature	0.000	degrees C	not present		if reported by inserted SFP module
4/9	SFP 30 Temperature	0.000	degrees C	not present		if reported by inserted SFP module, only present on CP6940-RA-OC-P
4/11	SFP 31 Temperature	0.000	degrees C	not present		if reported by inserted SFP module, only present on CP6940-RA-OC-P
4/13	QSFP 32 Temperature	0.000	degrees C	not present		if reported by inserted QSFP module, only present on CP6940-RA-OC-P
4/15	QSFP 36 Temperature	0.000	degrees C	not present		if reported by inserted QSFP module, only present on CP6940-RA-OC-P
5/1	CPU Temperature	39.000	degrees C	n/a	U36	measured via CPU register

Slot 1 sensors are IPMI based sensors. IPMI is aware of sensor thresholds, see table Table 33 on page 84

Not all named components have sensors (e.g. u10, u11, u13, u30, ...) and will not be shown in sensor readings.

When developing applications using the CP6940, the system integrator must be aware of the overall system thermal requirements. A system chassis must be provided which satisfies these requirements.

Measurements proofed that following conditions (maximum ambient temperature under maximum load) are possible while all temperatures of on-board components stay below their critical thresholds...

Table 40: Simplified Thermal Recommendations

Device	Operation mode	Cooling	Maximum Temperature
CP6940-SA-OC-V	24x 1Gbps traffic rear Front: 4x 1GbBase-T RJ45, 2x 10 Gbe SFP+, 2x 1G SFP	Forced Air > 2m/s	0 to +60°C
CP6940-RA-OC	24x 1Gbps traffic rear Front: 4x 1GbBase-T RJ45, 4x 10G SFP+	Forced Air > 2m/s	-40 to +70°C
CP6940-RA-OC-P	24x 1Gbps traffic rear Front: 2x QSFP+ for 40G or 4 times 10G, 4x 10G SFP+, 2x 1G SFP	Forced Air > 2m/s	-40 to +70°C

Table 41: Max/Critical temperature values for marked parts in picture

Part ID (see picture)	Tj/Tc/Ta	Value	Source/Comment
U11	Tj	100°C	Datasheet
U13, U23, U35, U35, U39, U47	Tc Tj	95°C 100°C	Datasheet Micron TN-00-08: Thermal Applications
U28	Tj	110°C	Datasheet
U30	Tj	125°C	Datasheet
U32, U54, U55, U56, U58, U59	Tj Tj	110°C 125°C	Datasheet < 1000h over life time
U36	Tj	105°C	Datasheet
U38	Ta Tj	85°C 90°C	Datasheet Micron TN-00-08: Thermal Applications

The air flow has been measured in the middle of the slot with 50mm distance, see picture below.

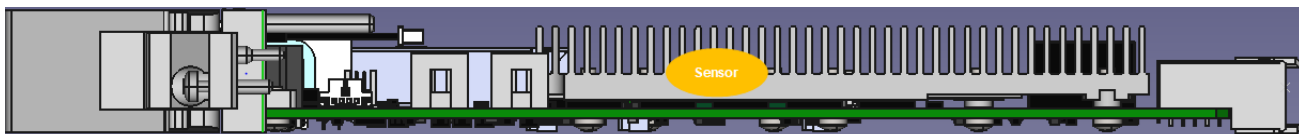


Figure 10: Position of Airflow Sensor

Further information for thermal simulation can be provided on request.

CAUTION

As Kontron assumes no responsibility for any damage to the CP6940 or other equipment resulting from overheating any of the components, it is highly recommended that system integrators as well as end users confirm that the operational environment of the CP6940 complies with the thermal considerations set forth in this document.

6/ Power Considerations

The power considerations presented in this chapter must be taken into account by system integrators when specifying the CP6940 system environment.

The CP6940 has been designed for optimal power input and distribution. Still it is necessary to observe certain criteria essential for application stability and reliability. The board is supplied by 3.3V and 5.0V from the backplane. All supply voltages from the backplane are enabled with a predefined ramp-up time. The inrush current is limited by Hot-Swap controllers.

The table below indicates the absolute maximum input voltage ratings that must not be exceeded. Power supplies to be used with the CP6940 should be carefully tested to ensure compliance with these ratings.

Power consumption: below 55 W.

Table 42: Maximum Input Power Voltage Limits

Voltage Rail	Operation Mode	Maximum Current
V_3V3_CPCI	24x 1Gbps traffic rear 2x QSFP+ for 40G, 4x 10G SFP+, 2x 1G SFP ports	8.00A
V_5V0_CPCI	24x 1Gbps traffic rear 2x QSFP+ for 40G, 4x 10G SFP+, 2x 1G SFPports	4.50A

5.0 V VIN +5%/-3%, designed for maximum load 5.50A (27.50W)

3.3 V VIN +5%/-3%, designed for maximum load 10.00A (33W)

6.1 Backplanes

Backplanes to be used with the CP6940 must be adequately specified. The backplane must provide optimal power distribution for the +3.3 V and +5 V power inputs. Input power connections to the backplane itself should be carefully specified to ensure a minimum of power loss and to guarantee operational stability. Long input lines, under-dimensioned cabling or bridges, high resistance connections, etc. must be avoided. It is recommended to use POSITRONIC or M-type connector backplanes and power supplies where possible.

Backplanes does not need any 12V supply.



About Kontron

Kontron, a global leader in embedded computing technology and trusted advisor in IoT, works closely with its customers, allowing them to focus on their core competencies by offering a complete and integrated portfolio of hardware, software and services designed to help them make the most of their applications.

With a significant percentage of employees in research and development, Kontron creates many of the standards that drive the world's embedded computing platforms; bringing to life numerous technologies and applications that touch millions of lives. The result is an accelerated time-to-market, reduced total-cost-of-ownership, product longevity and the best possible overall application with leading-edge, highest reliability embedded technology.

Kontron is a listed company. Its shares are traded in the Prime Standard segment of the Frankfurt Stock Exchange and on other exchanges under the symbol "KBC". For more information, please visit: <http://www.kontron.com/>

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