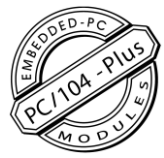

CPC505

6U Compact PCI CPU Module

User Manual

Rev. 001

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Table of Contents

List of Tables

List of Figures

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Safety requirements

This Fastwel Group's product is developed and tested for the purpose of ensuring compliance to the electric safety requirements. Its design provides long-term trouble-free operation. The service life of the product can be significantly reduced due to the improper handling during unpacking and installation. Therefore, in the interests of your safety and in order to ensure proper operation of the product, you should follow the recommendations below.

Notation Conventions

Warning, ESD Sensitive Device!

This symbol draws your attention to the information related to electro static sensitivity of your product and its components. To keep product safety and operability it is necessary to handle it with care and follow the ESD safety directions.

Warning! Hot surface!

This sign and inscription warns of the dangers associated with touching hot surfaces of the product.

Caution: Electric Shock!

This symbol warns about danger of electrical shock (> 60 V) when touching products or their parts. Failure to observe the indicated precautions and directions may expose your life to danger and may lead to damages to your product.

Warning!

Information marked by this symbol is essential for human and equipment safety. Read this information attentively, be watchful.

Note

This symbol and title marks important information to be read attentively for your own benefit.

General Safety Precautions

This product was developed for fault-free operation. Its design provides conformance to all related safety requirements. However, the life of this product can be seriously shortened by improper handling and incorrect operation. That is why it is necessary to follow general safety and operational instructions below.

Warning!

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

Caution: Electric Shock!

Before installing this product into a system and before installing other devices on it, always ensure that your mains power is switched off.

Always disconnect external power supply cables during all handling and maintenance operations with this module to avoid serious danger of electrical shock. This also applies to the other power supply cables.

Unpacking, Inspection and Handling

Please read the manual carefully before unpacking the module or mounting the device into your system. Keep in mind the following:

ESD Sensitive Device!

Electronic modules and their components are sensitive to static electricity. Even a non-perceptible by human being static discharge can be sufficient to destroy or degrade a component's operation! Therefore, all handling operations and inspections of this product must be performed with due care, in order to keep product integrity and operability:

- Do not leave the product without its protective packaging when it is not in use.
- If possible, always work with the products in a workplace that is protected against static electricity. If this is not possible, the user should remove static discharge from the user before touching the product with their hands or tool, which is best performed by touching the metal part of the of the system housing.
- It is especially important to take precautions when replacing expansion boards expansion boards, jumpers, etc. If the product has batteries to power the memory or real-time clock, do not place the board on conductive surfaces, such as antistatic mats or sponges. They may cause a short circuit and result in damage to the board. short-circuit and cause damage to the battery and the board's conductive circuits.

General rules for using the device

- The product must not be altered or modified in any way in order to maintain the warranty. Any unauthorized modifications and improvements other than those given in this manual or received from DOLOMANT Technical Support as a set of instructions for their execution will void the warranty.
- This device must only be installed and connected to systems that meet all necessary technical and climatic requirements. This also applies to the operating temperature range of the specific version of the board. The temperature limitations of the batteries installed on the board must also be taken into account.
- Follow the instructions in this manual only when carrying out all necessary installation and setup operations.
- Retain the original packaging for storing the product in the future or for transportation in case of warranty. In case it is necessary to transport or store the board, pack it in the same way as it was packed when you received it.
- This device must only be installed and connected to systems that meet all necessary technical and climatic requirements. This also applies to the operating temperature range of the specific version of the board. The temperature limitations of the batteries installed on the board must also be taken into account.

Three Year Warranty

Fastwel Co. Ltd. (Fastwel), warrants that its standard hardware products will be free from defects in materials and workmanship under normal use and service for the currently established warranty period. Fastwel's only responsibility under this warranty is, at its option, to replace or repair any defective component part of such products free of charge.

Fastwel neither assumes nor authorizes any other liability in connection with the sale, installation or use of its products. Fastwel shall have no liability for direct or consequential damages of any kind arising out of sale, delay in delivery, installation, or use of its products.

If a product should fail through Fastwel's fault during the warranty period, it will be repaired free of charge. For out of warranty repairs, the customer will be invoiced for repair charges at current standard labor and materials rates.

Warranty period for Fastwel products is 36 months since the date of purchase.

For custom-made products, the warranty period is 60 months from the date of sale (unless otherwise specified in the supply agreement).

The warranty set forth above does not extend to and shall not apply to:

1. Products, including software, which have been repaired or altered by other than Fastwel personnel, unless Buyer has properly altered or repaired the products in accordance with procedures previously approved in writing by Fastwel.
2. Products, which have been subject to power supply reversal, misuse, neglect, accident, or improper installation.

Returning a product for repair

1. Apply to Fastwel company or to any of the Fastwel's official representatives for the Product Return Authorization.
2. Attach a failure inspection report with a product to be returned in the form, accepted by customer, with a description of the failure circumstances and symptoms.
3. Carefully package the product in the antistatic bag, in which the product had been supplied. Failure to package in antistatic material will VOID all warranties. Then package the product in a safe container for shipping.
4. The customer pays for shipping the product to Fastwel or to an official Fastwel representative or dealer.

1 Introduction

1.1 System overview

The CompactPCI processor module (CPCI) presented in this User Manual supports the PCI architecture. This gives you the ability to work with a wide range of equipment. For information on the CompactPCI standard, please refer to the PCI and CompactPCI Standards Specifications. For more information on these standards and how to use them, please visit the PCI Industrial Computer Manufacturers Group (PICMG) website at: http://www.picmg.org/.

1.2 Module General Description

The CPC505 processor module is designed to provide customers with a highly integrated x86 platform solution in 6U CompactPCI format for use in real-time, production control, high-speed data acquisition and processing applications. The module is based on 9th generation Intel Xeon and Core processors with an integrated graphics engine.

The CPC505 uses the CM246 chipset, which has the latest set of interfaces, including PCI Express 3.0, SATA 3.0, USB 3.1, etc. The graphics engine integrated into the processor provides the module with great opportunities when working via DisplayPort, DVI-I, LVDS video interfaces.

Up to 32 GB of DDR4 RAM with ECC can be installed on the module.

The CPC505 supports one 64-bit 66 MHz CompactPCI interface. The board interacts with the bus CompactPCI through integrated bridge PCI-E <-> PCI.

One of the CPC505 features is support for the PICMG CompactPCI Packet Switching Backplane Specification version 2.16. Installed in a backplane that supports packet switching mode, the CPC505 can communicate via the two Gigabit Ethernet ports attached to it with other peripheral devices or with a main system card that also supports this mode.

Due to the stability of CPC505, the device can be used in all industrial applications. The components on which the CPC505 is based are carefully selected for their use in embedded systems and long-term availability on the market, making it an ideal device on which to build systems with a long lifecycle.

The CPC505 is compatible with operating systems such as Windows 10 and Debian 10.

2 Technical Specifications

2.1 Main technical characteristics

- **Intel Xeon E-2276ML 2.0GHZ 25W processor (Coffee Lake-H Refresh):**
  - 6 x cores Intel x64, 12 x threads;
  - 3 x graphics engines;
  - 12 MB cache;
- **Intel Core i3-9100HL 1.6GHZ 25W processor (Coffee Lake-H Refresh):**
  - 4 x cores Intel x64, 4 x threads;
  - 3 x graphics engines;
  - 6 MB cache;
- **RAM:**
  - DDR4-2666 SDRAM 32 GB, with ECC support;
  - Memory bus width 64 bit;
- **Video output**:
  - DVI-I interface (1920x1200@60Hz), routed to the front panel;
  - DisplayPort interface (4096x2304@60Hz), routed to the front panel;
  - DisplayPort interface (4096x2304@60Hz), routed to RIO;
  - LVDS interface (1920x1200@60Hz), routed to RIO;
  - Simultaneous operation of three interfaces is possible.
- **PCI bus**:
  - Routed to the CompactPCI J1/J2 connectors;
  - 64 bit /66 MHz;
  - Implemented on the PCIe->PCI-X PI7C9X130 bridge;
  - HotSwap support;
  - Operation in the peripheral slot (Non-transparent Bridge mode);
- **LPC bus**:
  - Routed to the P16 XMC connector;
  - Routed to RIO;
- **PCIe bus**:
  - PCIe Gen3 (up to 8GT/s), routed to the P15 XMC connector with support of the devices up to x8;
  - PCIe Gen2 (up to 5GT/s), routed to the CPCI J3/P3 connector, with support of the devices up to x4;
  - XMC is compatible with the ANSI/VITA 42.3 specification;
- **SMBus**:
  - Compatibility with the 2.0 specification;

- Rate up to 100 Kb/sec;

- **Flash BIOS**:
  - 2x128 Mb SPI-Flash;
  - Modifiable in the system.
- **FRAM**:
  - Capacity 32 KB;
  - Implemented on SPI bus;
- **Integrated SATA SSD**:
  - Capacity 32 GB;
  - Interface SATA III 6 Gb/sec;
- **Support of the drives of M.2 2280 standard (PCIe x4 Gen3)**;
- **SATA interface**:
  - One interface is routed to the P16 XMC connector;
  - One interface is used for the connection of integrated SSD;
  - Two interfaces are routed to RIO;
- **SPI interface**:
  - FRAM support;
  - Frequency up to 25 MHz;
- **4 x LAN 10/100/1000 Mb ports on PCIe x4 Gen2**:
  - Two channels are routed to RIO connector;
  - Two channels are routed to the P16 XMC connector;
  - Support of the PICMG 2.16 standard;
  - Intel® Ethernet Controller I350 is used;
- **2 x LAN 10/100/1000/2500 Mb ports on i225 controllers**:
  - Support of rates up to 2.5 Gb/sec. on 5e cat. cable;
- **USB ports**:
  - Support of USB 2.0 (480 Mb/sec), USB 3.0 (5 Gb/sec), USB 3.1 (10 Gb/sec);
  - Connection of up to 4 x devices via front panel connectors (USB 3.0);
  - 2 x interfaces USB 3.1 are routed to the P16 XMC connector;
  - 6 x USB 2.0 interfaces are routed to RIO;
- **Real Time Clock**:
  - Powered from the lithium battery CR2032 (3V);
- **Audio support**:
  - HD Audio interface is routed to the P16 XMC and RIO connectors;
- **COM port**:
  - The COM0 port is routed to the connector on the board, and a D-SUB plug can be installed in the XMC mezzanine front panel cutout if necessary. In this case using the XMC mezzanine is not possible;
- **Watchdog Timer**:
  - Internal, with program control possibility;
- **Hardware monitor**:

- Implemented via the PECI/SMBUS interfaces;
- Monitoring of three supply voltages;
- Monitoring of CPU temperature;
- Monitoring of PCB temperature;

- **Support of XMC/PMC expansion boards**:
  - Support of one PMC/XMC module;
  - PCI-X 64bit/133MHz bus is routed to the P1-P4 PMC connector (ANSI/VITA 39, PCI-X on PMC);
  - PMC I/O P4 is routed to RIO (PICMG 2.0);
  - PCIe x8 Gen3 bus is routed to the P15 XMC connector (ANSI/VITA 42.3, XMC PCI Express Protocol Standard);
- **Additional interfaces (1xSATA, 2xUSB, LPC, HD Audio, 2xEthernet) are routed to the P16 XMC connector**;
- **Indication**:
  - Board startup diagnostics LED/ Hot-Swap LED;
  - SATA drives access LED;
  - Two software-controlled LEDs (user LEDs);
- **Software compatibility**:
  - Linux Debian 10;
  - Astra Linux Special Edition, “Smolensk” release v1.5, v1.6;
  - Microsoft Windows 10 IoT Enterprise 64bit;
- **Power supply**:
  - The +5 V, +3.3 V supply voltages from the CPCI bus and their maximum permissible current consumption are shown in Table 2-1, Table 2-2;

Table 2-1 – Supply voltage of +5 V, +3.3 V from the CPCI bus

Voltage (V)	Minimum (V)	Maximum (V)
+5	4.75	5.25
+3.3	3.15	3.46

Table 2-2 – Maximum permissible consumption currents

Voltage, V	Minimum voltage, V	Maximum voltage, V	Maximum consumption current, A
+5	4.75	5.25	7
+3.3	3.1	3.5	3

Note:

Table 2-2 shows the maximum values of current consumption of the module when loaded with synthetic tests.

- **Operating temperature**:
  - Industrial version: from -40°C to +85°C;
- **Resistance to cyclic wet heat where there is a conformal coating**:

- At air temperature + (55±2) °C, relative humidity (93±3)%.;

- **Resistance to single shock/vibration**:
  - 30g/2g;
- **Module overall dimensions, range, mm**:
  - 266±0.5 × 212.5±1.5 × 20.8±0.2;
- **Weight, no more than**:
  - 0.700 kg;

2.2 Module versions

The module versions are specified in the Table 2-3.

Table 2-3 – Module versions

Item number	Version	Processor	Memory	Temperature range
1	CPC505-01	Intel Xeon E-2276ML 2.0 GHz 6C/12T 25W	32GB 2666 DDR4	-40…+85 °C
2	CPC505-02	Intel Core i3-9100HL 1.6 GHz 4C/4T 25W	16GB 2666 DDR4	-40…+85 °C

Description of the supplied configurations:

CPC505-01 – CPC505 CPU - Module, Intel Xeon E-2276ML 2.0 GHz, 6 x cores, 32 GB DDR4 SDRAM, from -40 °C to +85 °C;
CPC505-02 – CPC505 CPU - Module, Intel Core i3-9100HL 1.6 GHz, 4 x Cores, 16 GB DDR4 SDRAM, from - 40 °C to +85 °C;

Note:
The modules with conformal coating option have a “\COATED” caption added to the name when ordered.

2.3 Delivery checklist

The delivery checklist includes:

1 Module;

2 Installation kit IMES.467941.056 containing:

1) IMES.711141.007 rack - 1 pcs;

2) Screw DIN7985 M2x4-A2 - 1 pcs;

3) Screw DIN7985 M2x6-A2 - 1 pcs;

3 Packaging.

2.4 Packaging information

The CPC505 module is supplied in in a box 350x260x70 mm in size. The packed weight of the device is max. 1.050kg.

Note

Retain the anti-static packaging and consumer packaging of the module in its original condition until the end of the warranty period.

2.5 System expansion capabilities

The number of interfaces routed from the CPC505 module can be increased by

- installing the XMC/PMC expansion module;
- connecting the RIO587 module.

2.5.1 PMC/XMC modules

The PMC/XMC interface of the CPC505 board supports XMC/PMC expansion modules, which makes it possible to easily and flexibly adapt CPC505 to the requirements of different applications (see subparagraph **3.2.1 PMC/XMC Interface**). One possible expansion module is the MIC1901 (please, see **Annex B**).

2.5.2 Rear I/O expansion module RIO587

The RIO587 module expands functionality and I/O capabilities of the CPC505 when installed at the rear of the system chassis. See Annex A for a description of the RIO587 module.

2.6 System information

Table 2-4 – System information

Characteristics	Note
Operating in a system slot as a system master board (System Master)	The CPC505 module is designed to be used as a system master. As such, it can communicate with up to 7 peripheral boards via a 64-bit 33/66 MHz bus. At the same time, the CPC505 can also operate in a peripheral slot, in which case the CPC505 is connected to the PCI bus via a “non-transparent” bridge.
Operating in a peripheral system slot	When installed in the peripheral slot of the system, the CPC505 module is connected to the PCI bus through the “non-transparent” bridge. The CPC505 is powered by the backplane and can operate with a Rear I/O board as well as in packet switching mode (if that mode is supported by the system) with support for up to two Gigabit Ethernet channels.

Operating systems	CPC505 is compatible with the following operating systems: Linux Debian 10; Windows 10.

2.7 Appearance and arrangement of elements

2.7.1 Block diagram

Block diagram is shown in Figure 2-1.

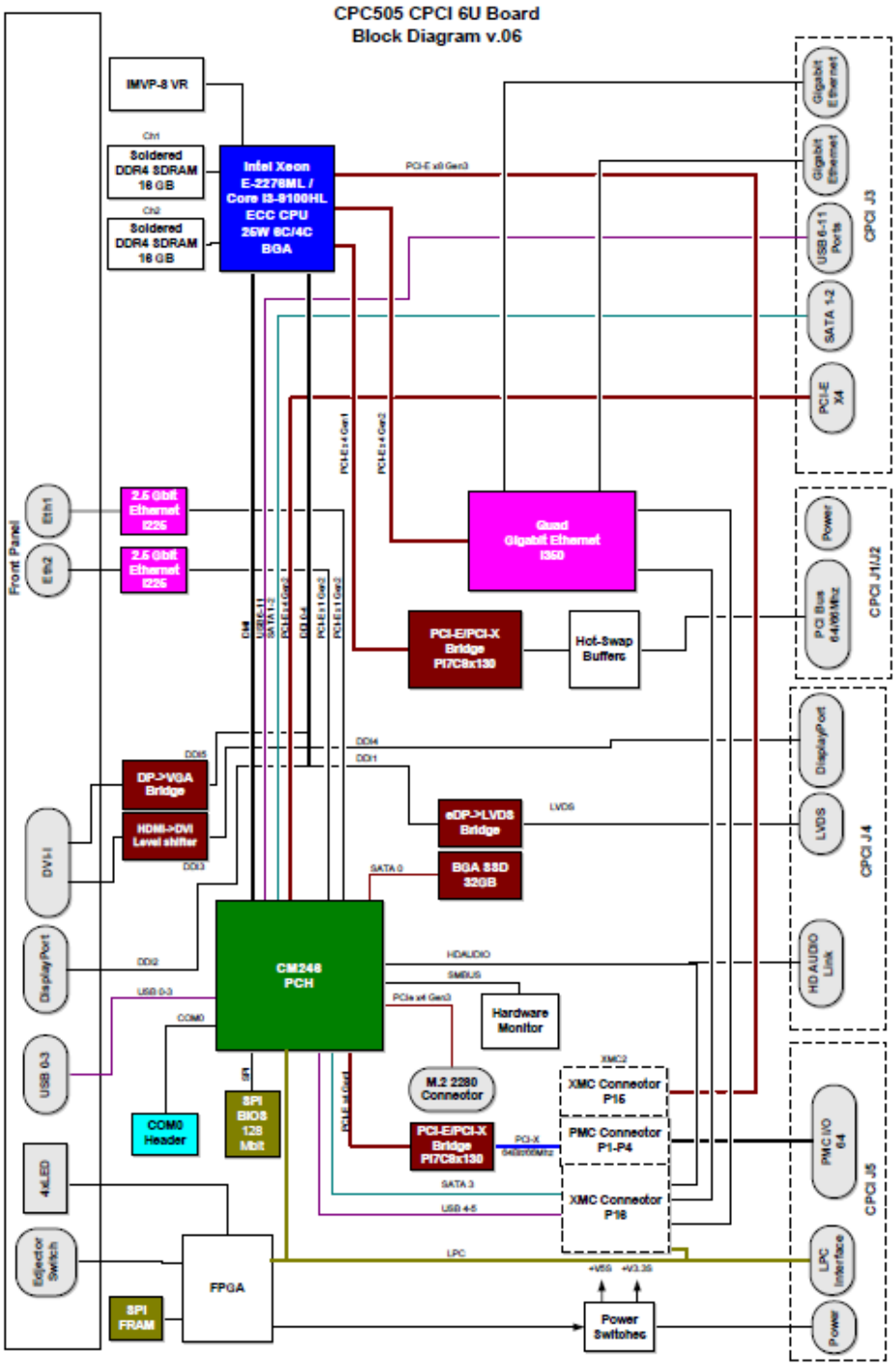


Figure 2-1 – Block diagram

2.7.2 Overall dimensions and arrangement of main components

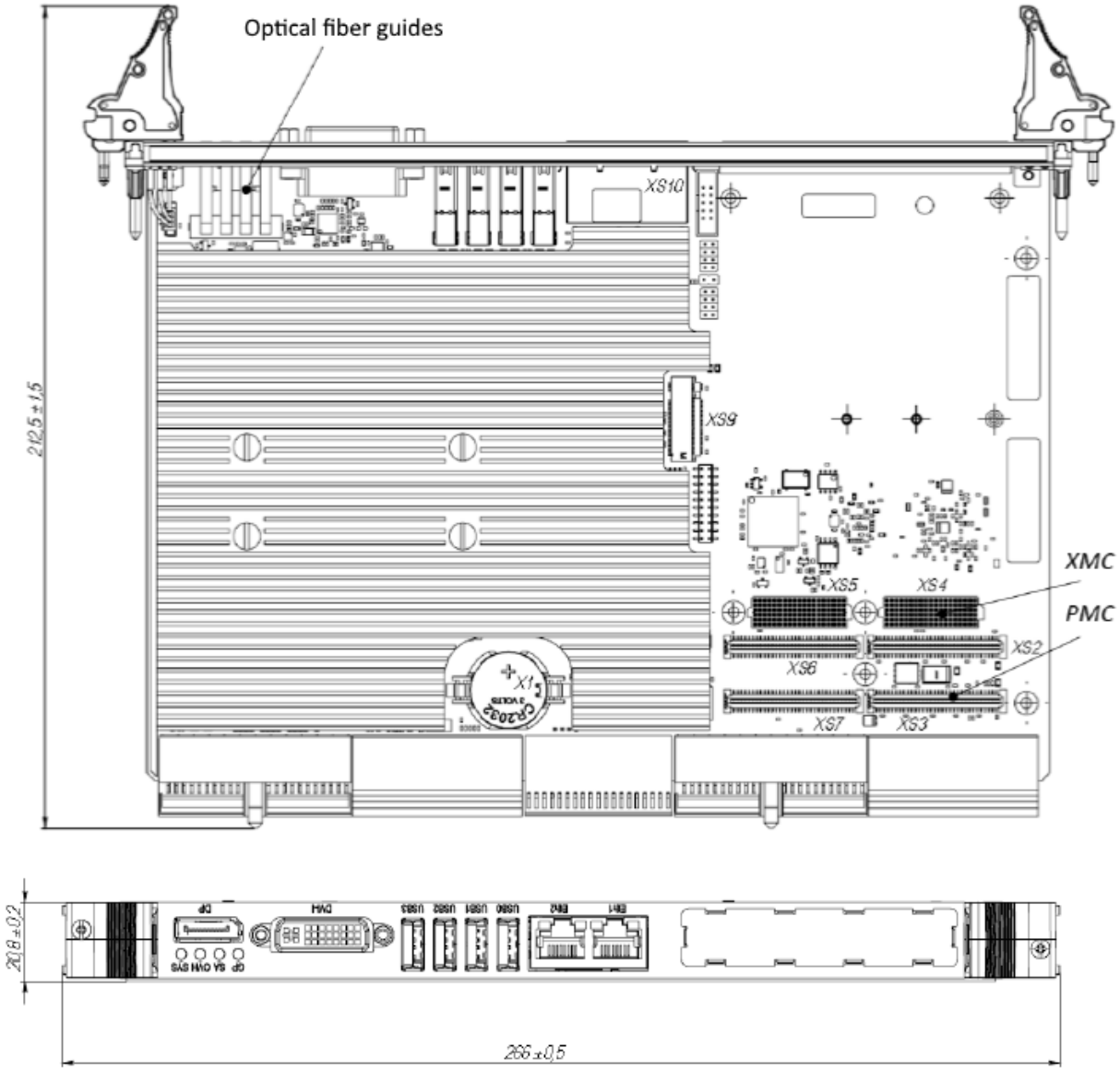


Figure 2-2 – Overall dimensions and location of main components of the device

3 Functional description

3.1 Features of operation of functional nodes

❍ **CPU Intel Xeon E-2276ML / Intel Core i3-9100HL**

64-bit Intel microprocessor, manufactured in accordance with the 14 nm process technology, with TDP of 25 W. Includes up to 6 improved 9th generation Intel Xeon / Core i3 cores, dual-channel 64-bit DDR4 SDRAM memory controller (up to 32 GB, 2666) with ECC support, advanced graphics subsystem with 2D/3D acceleration GT2, input/output subsystem PCI-Ex16 Gen3. State-of-the-art DDI high-speed graphics interfaces.

The processor is made in BGA1440 socket with a size of 42x28 mm.

❍ **PCH Intel CM246**

Highly integrated interface controller that includes standard peripherals of IBM PC AT platform and modern high-speed interfaces PCI-E Gen3, SATA 6Gps, USB 2.0/3.1. Implemented in the BGA874 enclosure.

❍ **DDR4 SDRAM**

The board can be equipped with (soldered) 36 x DDR4 2666 SDRAM chips with a total capacity of up to 32 GB. Operating mode is dual-channel with ECC support.

❍ **BIOS**

2 x 128 Mb SPI-Flash microchips are used to store the main (working) copy of the BIOS.

❍ **RTC, CMOS**

The real time clock is built into the PCH CM246. The clock functionality is ensured by a CR2032 lithium battery that is mounted on the board when the power supply is switched off. BIOS settings are stored in non-volatile FRAM.

❍ **SPI FRAM**

Non-volatile 32 KB memory (Ramtron, FM25L256, SPI) needed to store user data (used as a substitute for the standard non-volatile RAM). The manufacturer guarantees 100 trillion read/write cycles, which as a part of this application corresponds to ~340 years of operation (in case of continuous cyclic read/write procedure).

❍ **BGA SSD**

The board has a 32GB SATA III 6 Gbps SSD in a 16 x 20 mm Jedec MO-276 TFBGA enclosure.

❍ **Ethernet**

The module has 6 x integrated Gigabit Ethernet interfaces. 2 of them are routed to the P16 XMC connector, another 2 are routed to the backplane (PICMG 2.16). The XMC has an MDI link. The interfaces are implemented on a high-speed i350 server controller. Two of the interfaces are on the front panel and are based on the new Intel i225 adapter that supports transfer rates up to 2.5 Gb/s over the widely used cables of the 5e category.

- **USB 2.0**

The device has 6 x USB 2.0 channels, routed to RIO.

- **USB 3.0**

The board has 4 x USB 3.0 channels, routed to the type A USB of the front panel.

- **USB 3.1**

The board has 2 x USB 3.1 channels routed to the XMC.

- **SATA**

3 x interfaces for connecting the drives: 1 x interface is routed to the P16 XMC connector, 2 x interfaces are routed to the RIO connector.

- **M.2 2280**

The module supports M.2 2280 removable drives (PCI Express x4 Gen3 interface).

- **DVI-I**

Designed to connect analog VGA (1920x1200@60Hz) or digital DVI (1920x1200@60Hz) displays.

- **LVDS**

Supports panels up to 1920x1200@60Hz.

- **DisplayPort**

These interfaces are designed to connect digital displays up to 4096x2304@60Hz. One interface is on the front panel and another one is on the RIO.

- **PCI Express**

The PCIe Gen3 bus is routed to the P15 XMC connector in ANSI/VITA 42.3 standard. The interface allows you to connect XMC expansion modules with a set of x1, x2, x4, x8 links.
The PCIe x4 bus is on the CPCI J3/P3 connector.

❍ **PCI**

The PCI bus is implemented on a Pericom PI7C9X130 reversible bridge connected to the PCIe x4 bus. The following operating modes are supported: PCI 32bit/33MHz, PCI 64bit/66MHz. Both system and peripheral slots are supported.

❍ **SPI**

The interface is implemented in FPGA on the LPC bus. The FRAM chip (located on the board) is supported. The maximum clock frequency is 25 MHz.

❍ **Audio**

Support can be implemented through an RIO or an XMC module.

❍ **COM port**

The COM0 port with RS-232 signal levels is routed to the connector (IDC2-10) on the printed circuit board.

❍ **LED indication**

Diagnostic LEDs for startup, drive activity, and user activity are on the front panel. Diagnostic LED allows to distinguish 4 states of the board: power off, power on, BIOS startup, BIOS shutdown (OS startup). Drives activity indicator informs about the activity of SATA interfaces. Two programmable LEDs are for user's needs.

❍ **Watchdog**

Hardware reset timer is implemented in FPGA on LPC bus.

❍ **Power supply reset and monitoring**

The microprocessor reset signal is generated from the following sources:

- From supervisor at power on
- From Reset button
- From watchdog timer
- From Reset# signal of PCI bus (in the Slave mode).

❍ **Switches** (**Jumpers)**

There is a reset switch to default BIOS settings on the board.

3.2 Module interfaces

3.2.1 PMC/XMC interface

The top side of the device is equipped with the slots for the PMC/XMC expansion modules (see Figure 2-2).

The CPC505 supports one XMC/PMC expansion module:

▪ The 64-bit/133 MHz PCI-X bus is routed to the P1-P4 PMC connectors (ANSI/VITA 39, PCI-X on PMC);

▪ PMC I/O P4 is routed to RIO (PICMG 2.0);

▪ PCI-E x8 Gen3 bus is routed to the P15 XMC connector (ANSI/VITA 42.3, XMC PCI Express Protocol Standard);

▪ Additional interfaces (1xSATA, 2xUSB, LPC, HD-Audio, 2xEthernet, 2xUSB 3.0) are routed to the P16 XMC connector.

3.2.1.1 XMC interface

For XMC expansion module, the CPC505 board has XS4 (P15) and XS5 (P16) connectors.

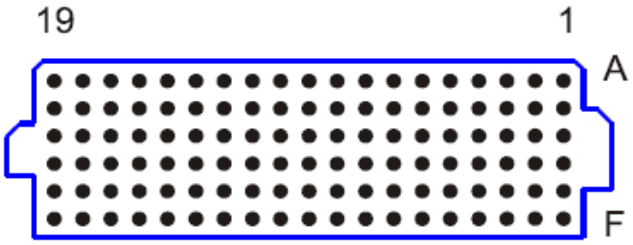


Figure 3-1 – XMC XS4 (P15) and XS5 (P16) connectors

The below tables show the pin assignments of the XMC connectors.

Table 3-1 – Assignment of XMC XS4 (P15) connector pins

P15						
Pin	**A**	**B**	**C**	**D**	**E**	**F**
1	RX0+	RX0-	+3.3V	RX1+	RX1-	+5V
2	GND	GND	NC	GND	GND	PCIRST#
3	RX2+	RX2-	+3.3V	RX3+	RX3-	+5V
4	GND	GND	NC	GND	GND	RSTO#
5	RX4+	RX4-	+3.3V	RX5+	RX5-	+5V
6	GND	GND	NC	GND	GND	+12V
7	RX6+	RX6-	+3.3V	RX7+	RX7-	+5V
8	GND	GND	NC	GND	GND	-12V
9	NC	NC	NC	NC	NC	+5V
10	GND	GND	NC	GND	GND	GA0
11	TX0+	TX0-	GA1	TX1+	TX1-	+5V

12	GND	GND	GND	GND	GND	PRSNT#
13	TX2+	TX2-	+3.3V_SBY	TX3+	TX3-	+5V
14	GND	GND	GA2	GND	GND	MSDA
15	TX4+	TX4-	NC	TX5+	TX5-	+5V
16	GND	GND	MVMRO	GND	GND	MSCL
17	TX6+	TX6-	NC	TX7+	TX7-	NC
18	GND	GND	NC	GND	GND	NC
19	CLK0+	CLK0-	NC	WAKE#	ROOT#	NC

Table 3-2 – Assignment of XMC XS5 (P16) connector pins

P16						
Pin	**A**	**B**	**C**	**D**	**E**	**F**
1	MDI_4_0-	MDI_4_0+	LED_2_0	NC	NC	+5V
2	GND	GND	LED_2_1	GND	GND	+5V
3	MDI_4_1-	MDI_4_1+	LED_2_2	NC	NC	+3.3V
4	GND	GND	LED_2_3	GND	GND	+3.3V
5	MDI_4_2-	MDI_4_2+	LED_3_0	SATA3_RX-	SATA3_RX+	LPC_AD0
6	GND	GND	LED_3_1	GND	GND	LPC_AD1
7	MDI_4_3-	MDI_4_3+	LED_3_2	SATA3_TX-	SATA3_TX+	LPC_AD2
8	GND	GND	LED_3_3	GND	GND	LPC_AD3
9	MDI_3_0-	MDI_3_0+	ACT_LED#	NC	NC	LPC_FRAME#
10	GND	GND	USB_OC45#	GND	GND	DRQ#0
11	MDI_3_1-	MDI_3_1+	HDA_DOCK_EN#	NC	NC	DRQ#1
12	GND	GND	HDA_DOCK_RST#	GND	GND	SERIRQ
13	MDI_3_2-	MDI_3_2+	HDA_BIT_CLK#	NC	NC	PCIRST#
14	GND	GND	HDA_SYNC	GND	GND	A20_GATE
15	MDI_3_3-	MDI_3_3+	HDA_SDOUT	NC	NC	LPC_CLK
16	GND	GND	HDA_RST#	GND	GND	RC_IN#
17	USB4-	USB4+	HDA_SDIN0	NC	NC	SIO_CLK
18	GND	GND	HDA_SDIN1	GND	GND	SUSCLK
19	USB5-	USB5+	HDA_SPKR	NC	NC	LPCBOOT

3.2.1.2 PMC interface

The PMC expansion modules are plugged into XS2 (P1), XS3 (P3), XS6 (P2) and XS7 (P4).

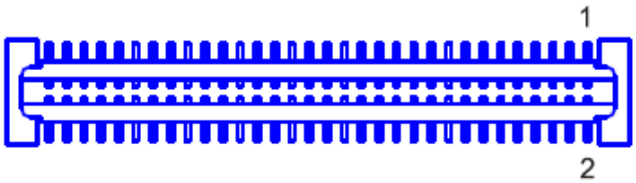


Figure 3-2 – The PMC XS2 (P1), XS3 (P3), XS6 (P2) and XS7 (P4) connectors

The PMC connectors are routed to the 64-bit PCI bus lines. The user-defined I/O signals are supported and also routed to the J5 CompactPCI connector.

The PMC interface complies with the IEEE-1386.1 specification, which defines an electrical PCI interface for Common Mezzanine Card (CMC) form factor cards. The CPC505 allows operation of

the 3.3V PCI PMC bus. In order to reduce consumption currents, PMC module support can be disabled in BIOS Setup.

Note:

The PMC I/O signals are routed to the J5 CompactPCI connector, whose pin assignments are described in this chapter below.

Assignment of PMC connector pins is specified in the Table 3-3.

Table 3-3 – Assignment of pins of the PMC XS2 (P1), XS3 (P3), XS6 (P2) and XS7 (P4) connectors

Number of XS2 (P1) pin	Function	Number ofXS6 (P2) pin	Function	Number of XS3 (P3) pin	Function	Number of XS7 (P4) pin	Function
P1_1	NC	P2_1	+12V	P3_1	NC	P4_1	PMC_I/O
P1_2	-12V	P2_2	NC	P3_2	GND	P4_2	PMC_I/O
P1_3	GND	P2_3	NC	P3_3	GND	P4_3	PMC_I/O
P1_4	INTD#	P2_4	NC	P3_4	C_BE7#	P4_4	PMC_I/O
P1_5	INTE#	P2_5	NC	P3_5	C_BE6#	P4_5	PMC_I/O
P1_6	INTF#	P2_6	GND	P3_6	C_BE5#	P4_6	PMC_I/O
P1_7	NC	P2_7	GND	P3_7	C_BE4#	P4_7	PMC_I/O
P1_8	VCC	P2_8	NC	P3_8	GND	P4_8	PMC_I/O
P1_9	INTG#	P2_9	NC	P3_9	VIO	P4_9	PMC_I/O
P1_10	NC	P2_10	NC	P3_10	PAR64	P4_10	PMC_I/O
P1_11	GND	P2_11	PULL_UP	P3_11	AD63	P4_11	PMC_I/O
P1_12	NC	P2_12	+3.3V	P3_12	AD62	P4_12	PMC_I/O
P1_13	PCICLK	P2_13	PCIRST#	P3_13	AD61	P4_13	PMC_I/O
P1_14	GND	P2_14	PULL_DOWN	P3_14	GND	P4_14	PMC_I/O
P1_15	GND	P2_15	+3.3V	P3_15	GND	P4_15	PMC_I/O
P1_16	GNT#	P2_16	PULL_DOWN	P3_16	AD60	P4_16	PMC_I/O
P1_17	REQ#	P2_17	PME#	P3_17	AD59	P4_17	PMC_I/O
P1_18	VCC	P2_18	GND	P3_18	AD58	P4_18	PMC_I/O
P1_19	VIO	P2_19	AD30	P3_19	AD57	P4_19	PMC_I/O
P1_20	AD31	P2_20	AD29	P3_20	GND	P4_20	PMC_I/O
P1_21	AD28	P2_21	GND	P3_21	VIO	P4_21	PMC_I/O
P1_22	AD27	P2_22	AD26	P3_22	AD56	P4_22	PMC_I/O
P1_23	AD25	P2_23	AD24	P3_23	AD55	P4_23	PMC_I/O
P1_24	GND	P2_24	+3.3V	P3_24	AD54	P4_24	PMC_I/O
P1_25	GND	P2_25	IDSEL(AD19)	P3_25	AD53	P4_25	PMC_I/O
P1_26	C_BE3#	P2_26	AD23	P3_26	GND	P4_26	PMC_I/O
P1_27	AD22	P2_27	+3.3V	P3_27	GND	P4_27	PMC_I/O
P1_28	AD21	P2_28	AD20	P3_28	AD52	P4_28	PMC_I/O
P1_29	AD19	P2_29	AD18	P3_29	AD51	P4_29	PMC_I/O
P1_30	VCC	P2_30	GND	P3_30	AD50	P4_30	PMC_I/O
P1_31	VIO	P2_31	AD16	P3_31	AD49	P4_31	PMC_I/O
P1_32	AD17	P2_32	C_BE2#	P3_32	GND	P4_32	PMC_I/O
P1_33	FRAME#	P2_33	GND	P3_33	GND	P4_33	PMC_I/O
P1_34	GND	P2_34	IDSELB(AD20)	P3_34	AD48	P4_34	PMC_I/O
P1_35	GND	P2_35	TRDY#	P3_35	AD47	P4_35	PMC_I/O
P1_36	IRDY#	P2_36	+3.3V	P3_36	AD46	P4_36	PMC_I/O
P1_37	DEVSEL#	P2_37	GND	P3_37	AD45	P4_37	PMC_I/O
P1_38	VCC	P2_38	STOP#	P3_38	GND	P4_38	PMC_I/O
P1_39	GND	P2_39	PERR#	P3_39	VIO	P4_39	PMC_I/O
P1_40	LOCK#	P2_40	GND	P3_40	AD44	P4_40	PMC_I/O
P1_41	SCL	P2_41	+3.3V	P3_41	AD43	P4_41	PMC_I/O
P1_42	SDA	P2_42	SERR#	P3_42	AD42	P4_42	PMC_I/O
P1_43	PAR	P2_43	C_BE1#	P3_43	AD41	P4_43	PMC_I/O
P1_44	GND	P2_44	GND	P3_44	GND	P4_44	PMC_I/O
P1_45	VIO	P2_45	AD14	P3_45	GND	P4_45	PMC_I/O
P1_46	AD15	P2_46	AD13	P3_46	AD40	P4_46	PMC_I/O
P1_47	AD12	P2_47	M66EN	P3_47	AD39	P4_47	PMC_I/O
P1_48	AD11	P2_48	AD10	P3_48	AD38	P4_48	PMC_I/O

P1_49	AD9	P2_49	AD8	P3_49	AD37	P4_49	PMC_I/O
P1_50	VCC	P2_50	+3.3V	P3_50	GND	P4_50	PMC_I/O
P1_51	GND	P2_51	AD7	P3_51	GND	P4_51	PMC_I/O
P1_52	C_BE0#	P2_52	NC	P3_52	AD36	P4_52	PMC_I/O
P1_53	AD6	P2_53	+3.3V	P3_53	AD35	P4_53	PMC_I/O
P1_54	AD5	P2_54	NC	P3_54	AD34	P4_54	PMC_I/O
P1_55	AD4	P2_55	NC	P3_55	AD33	P4_55	PMC_I/O
P1_56	GND	P2_56	GND	P3_56	GND	P4_56	PMC_I/O
P1_57	VIO	P2_57	NC	P3_57	VIO	P4_57	PMC_I/O
P1_58	AD3	P2_58	EREADY	P3_58	AD32	P4_58	PMC_I/O
P1_59	AD2	P2_59	GND	P3_59	NC	P4_59	PMC_I/O
P1_60	AD1	P2_60	RSTOUT#	P3_60	NC	P4_60	PMC_I/O
P1_61	AD0	P2_61	ACK64#	P3_61	NC	P4_61	PMC_I/O
P1_62	VCC	P2_62	+3.3V	P3_62	GND	P4_62	PMC_I/O
P1_63	GND	P2_63	GND	P3_63	GND	P4_63	PMC_I/O
P1_64	REQ64#	P2_64	NC	P3_64	NC	P4_64	PMC_I/O

3.2.2 M.2 interface

The XP5 connector (located on the top side of the CPC505 board, see Figure 2-2) allows an M.2 PCI Express drive to be installed on the CPC505 module. You can install the drive in conjunction with the PMC/XMC expansion module.

Table 3-4 – Assignment of the M.2 XP5 connector pins

XP5			
Pin	**Assignment**	**Pin**	**Assignment**
74	+3.3V	75	GND
72	+3.3V	73	GND
70	+3.3V	71	GND
68	NC	69	PEDET
Connector key M		67	NC
		Connector key M	
58	NC		
56	NC	57	GND
54	WAKE#	55	CLK+
52	CLKREQ#	53	CLK-
50	RST#	51	GND
48	NC	49	TX0+
46	NC	47	TX0-
44	NC	45	GND
42	NC	43	RX0+
40	NC	41	RX0-
38	NC	39	GND
36	NC	37	TX1+
34	NC	35	TX1-
32	NC	33	GND
30	NC	31	RX1+
28	NC	29	RX1-
26	NC	27	GND
24	NC	25	TX2+
22	NC	23	TX2-

20	NC	21	GND
18	+3.3V	19	RX2+
16	+3.3V	17	RX2-
14	+3.3V	15	GND
12	+3.3V	13	TX3+
10	NC	11	TX3-
8	NC	9	GND
6	NC	7	RX3+
4	+3.3V	5	RX3-
2	+3.3V	3	GND
		1	GND

Subparagraph 4.6 contains description of M.2 drive installation to the CPC505 module.

3.2.3 Connectors on the front panel of CPC505

3.2.3.1 USB interface

The CPC505 has 4 x USB 3.0 ports on the front panel (see Figure 2-2). Super-speed, high-speed, full-speed and low-speed modes are supported. USB 3.0 in super-speed mode can transfer data at up to 5 Gbps.

One USB peripheral device may be connected to each port. Use an external hub if necessary.

The USB power supply is protected by a 1.1 A auto fuse.

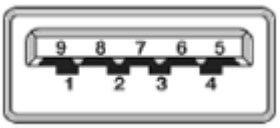


Figure 3-3 – USB connectors on the front panel of CPC505

Table 3-5 – Assignment of USB connectors pins on the front panel of the CPC505

Pin number	Circuit	Function
1	VCC	VCC signal
2	UV0-	Differential USB-
3	UV0+	Differential USB+
4	GND	GND signal
5	SSRX-	Super-speed RX+
6	SSRX+	Super-speed RX-
7	GND	GND signal
8	SSTX-	Super-speed TX+
9	SSTX+	Super-speed TX-

3.2.3.2 2.5 Gigabit Ethernet interface

The front panel of the CPC505 (see Figure 2-2) contains 2 x 10Base-T/100Base- TX/1000Base-T/2500Base-T Ethernet ports based on 2.5 Gigabit Ethernet i225 network controllers.

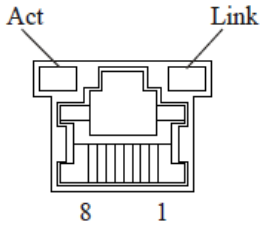


Figure 3-4 – Connector 2.5 Gigabit Ethernet

The interfaces provide automatic baud rate detection and switching between 10Base-T, 100Base-TX, and 1000Base-T modes, 2500Base-T. Using the BIOS setup program or a user program, both Ethernet channels can be disabled independently in order to free up system resources.

Table 3-6 – Assignment of the Gigabit Ethernet connector pins

Pin	10Base-T		100Base-TX		1000Base-T/2500Base-T	
	I/O	Signal	I/O	Signal	I/O	Signal
1	O	TX+	O	TX+	I/O	BI_DA+
2	O	TX–	O	TX–	I/O	BI_DA–
3	I	RX+	I	RX+	I/O	BI_DB+
4	–	–	–	–	I/O	BI_DC+
5	–	–	–	–	I/O	BI_DC–
6	I	RX–	I	RX–	I/O	BI_DB–
7	–	–	–	–	I/O	BI_DD+
8	–	–	–	–	I/O	BI_DD–

Ethernet Link Status LEDs

The green “Link” (line) LED is on when a line is connected.

The green “Act” (network activity) LED is on when the computer is receiving or sending packets through the RJ45 connector.

3.2.3.3 DVI-I connector

The DVI-I connector on the front panel of the CPC505 (see Figure 3-5) is intended to connect an analog VGA monitor (2048x1536@75Hz) or a digital DVI-D monitor (1920x1200@60Hz).

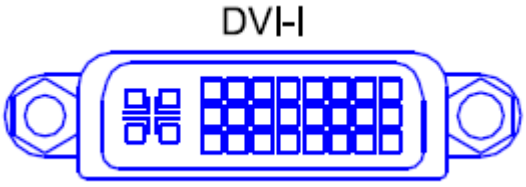


Figure 3-5 - DVI-I connector

Assignment of pins of the DVI connector is specified below:

Table 3-7 – Assignment of the XS5 connector pins (DVI) of the CPC505 module

XS5 (DVI)	
Pin	**Assignment**
1	DATA2-
2	DATA2+
3	GND
4	NC
5	NC
6	DDC_CLK
7	DDC_DAT
8	VSYNC
9	DATA1-
10	DATA1+
11	GND
12	NC
13	NC
14	+5V
15	GND
16	HP_DETECT
17	DATA0-
18	DATA0+
19	GND
20	NC
21	NC
22	GND
23	CLOCK+
24	CLOCK-
25	RED
26	GREEN
27	BLUE
28	HSYNC
29	GND

3.2.3.4 DisplayPort

The DisplayPort connector on the front panel of the CPC505 (see Figure 2-2) is designed to connect digital monitors with a resolution of up to 2560x1600@60Hz. The output also allows you to connect DVI-D monitors via a passive adapter.

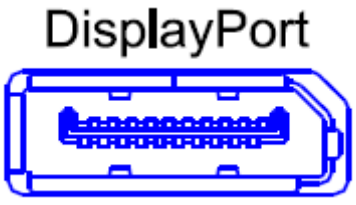


Fig. 3-6 – DisplayPort connector

Table 3-8 – Assignment of the XS6 DisplayPort connector pins of the CPC505 module

XS6 (DP)	
Pin	**Assignment**
1	LANE0+
2	GND
3	LANE0-
4	LANE1+
5	GND
6	LANE1-
7	LANE2+
8	GND
9	LANE2-
10	LANE3+
11	GND
12	LANE3-
13	AUX_EN#
14	CONFIG2
15	AUX+
16	GND
17	AUX-
18	HP_DETECT
19	GND
20	+3.3V

3.2.4 LED indicators on the front panel of the CPC505

The front panel of the CPC505 (see Figure 2-2) has LED indicators:

▪ Diagnostic indicator (SYS, two-color green/blue) to distinguish between 4 board states: power off, power on, BIOS start, BIOS completion (OS startup).

▪ Drive activity indicator (SA) informs about the activity of SATA interfaces.

▪ Software-controlled GP LED for user needs (two-color red/green), see subsection 3.4 SPI Controller / LEDs / GPIO.

▪ Overheat indicator (OVH).

Figure 3-7 – LED indicators on the front panel

State of the SYS LED is shown in the table below:

Table 3-9 – State of the SYS LED

SYS LED	State
Off	The power is not supplied to the module
Is on with blue	The power is supplied to the module, PCI bus is disabled, processor is stopped

Blinking with blue	The module is in the shutdown process
Blinking with green ~8 Hz	Processor is running for executing BIOS
Blinking with green ~1 Hz	Processor is executing the POST procedures
Is on with green	POST is completed, booting OS is executed

The SYS LED signalizes to the user that the CPC505 is malfunctioning (see subsection **7 Troubleshooting**).

3.2.5 CompactPCI interface

The CPC505 has a flexibly configurable CompactPCI interface. If the board is installed in a system slot, the PCIE-PCI bridge operates in PCI bus master mode, and if the card is installed in a peripheral slot, the bridge operates in “non-transparent” mode. If you don't need the CompactPCI bus support, you can switch it off in BIOS Setup to reduce current consumption.

3.2.5.1 Operation in the system slot (System Master)

While in the system slot, the CPC505 can communicate with all other CompactPCI boards via the Pericom PI7C9X130 PCIE-PCI 64-bit bridge, which operates at 33/66 MHz.

The module supports a maximum of 7 x CompactPCI devices via a passive backplane (for 33 MHz), in BUS Master mode 6 devices can be operated.

The module supports 3.3V and 5V PCI bus levels.

The module is fully compliant with the PCI Local Bus Specification Rev. 3.0.

3.2.5.2 Operation in the peripheral slot (Slave Mode)

In the peripheral slot, the bridge works in “non-transparent” mode, but there is a possibility of data exchange via PCI bus.

3.2.5.3 Packet Switching Backplane PICMG 2.16

Two Gigabit Ethernet ports are available on the XS11 (J3) connector of the CPC505 in accordance with the PICMG Packet Switching Backplane Specification PICMG 2.16, version 1.0. These two network nodes (Gigabit Ethernet 1 and 2) are connected in the chassis via a CompactPCI packet-switched backplane with specialized Fabric slots “A” and “B”, respectively.

These PICMG 2.16 features can be used in both system and peripheral slots.

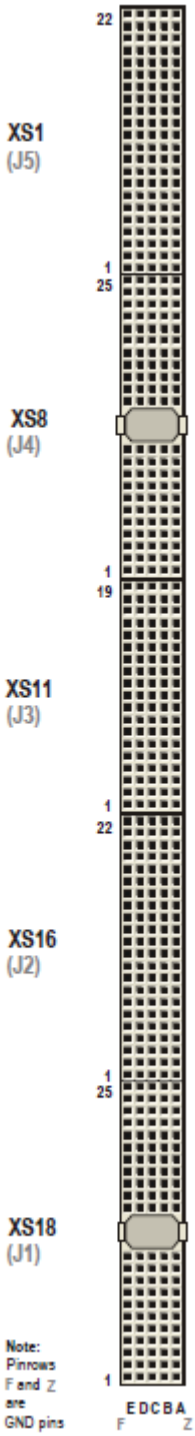
3.2.5.4 Switch in the handle

A microswitch is located in the bottom handle of the CPC505 front panel and is connected to the XP1 connector on the board. Opening the handle initiates the module shutdown procedure. Briefly pushing the microswitch causes the board to reset. The switch operation mode can be changed in the BIOS Setup.

3.2.5.5 Power supply mode LED (SYS)

The SYS LED on the front panel of the CPC505 (see Figure 2-2) is blue in color and is used to indicate the module's power supply mode. It is used to indicate that the shutdown process is complete and the board is ready to be removed from the slot, see Table 3-9 - SYS LED Status.

3.2.6 CompactPCI connectors



A complete set of CompactPCI connectors consists of five connectors from J1 to J5. They are assigned as follows:

- J1 and J2 - the 64-bit CompactPCI interface, including PCI bus signals, bus access organization, timing, and power.
- J3 ensures Rear I/O and PICMG 2.16 interface functions.
- J4 and J5 ensure additional Rear I/O interface functions.

The CPC505 module is designed in accordance with the CompactPCI bus architecture. The CompactPCI standard is electrically identical to the local PCI bus, however improvements have been made to such systems to allow them to be used in harsh industrial environments with an increased number of expansion slots.

Figure 3-8 – CompactPCI connectors (J1– J5 in accordance with the CompactPCI specification).

3.2.6.1 Color code designations of CompactPCI connectors

The CompactPCI connectors use guiding ears to ensure proper connection. To avoid wiring errors, color coding is also used for the various standard operating voltages. The color coding prevents 5V peripheral boards from mounting them into a socket operating at 3.3V and vice versa. Backplane connectors are always marked according to the signal voltage level (VIO).

The CPC505 is a 3.3V/5V signal level board.

Table 3-10 – Color code designations of connectors

Signal voltages	Color
3.3 V	Cadmium yellow
5 V	Bright blue
Universal board (5 V and 3.3 V)	No

3.2.6.2 Assignment of pins of the CompactPCI XS18 and XS16 connectors

The CPC505 is equipped with two CompactPCI bus connectors with a 2x 2 mm pin pitch - XS18 and XS16.

Table 3-11 – Assignment of pins of the CompactPCI XS18 (J1) system connector

XS18							
Pin	**Z**	**A**	**B**	**C**	**D**	**E**	**F**
25	GND	5V	REQ64#	ENUM#	3.3V	5V	GND
24	GND	AD[1]	5V	LNG_VIO	AD[0]	ACK64#	GND
23	GND	3.3V	AD[4]	AD[3]	LNG_5V	AD[2]	GND
22	GND	AD[7]	GND	LNG_3.3V	AD[6]	AD[5]	GND
21	GND	3.3V	AD[9]	AD[8]	M66EN	C/BE[0]#	GND
20	GND	AD[12]	GND	VIO	AD[11]	AD[10]	GND
19	GND	3.3V	AD[15]	AD[14]	LNG_GND	AD[13]	GND
18	GND	SERR#	GND	3.3V	PAR	C/BE[1]#	GND
17	GND	3.3V	IPMB_SCL	IPMB_SDA	LNG_GND	PERR#	GND
16	GND	DEVSEL#	GND	VIO	STOP#	LOCK#	GND
15	GND	3.3V	FRAME#	IRDY#	SHRT_GND	TRDY#	GND
14	GND						GND
13	GND						GND
12	GND						GND
11	GND	AD[18]	AD[17]	AD[16]	LNG_GND	C/BE[2]#	GND
10	GND	AD[21]	GND	3.3V	AD[20]	AD[19]	GND
9	GND	C/BE[3]#	SHRT_GND	AD[23]	LNG_GND	AD[22]	GND
8	GND	AD[26]	GND	VIO	AD[25]	AD[24]	GND
7	GND	AD[30]	AD[29]	AD[28]	LNG_GND	AD[27]	GND
6	GND	REQ0#	GND	LNG_3.3V	CLK0	AD[31]	GND

5	GND	BRSVP1A5	BRSVP1B5	RST#	LNG_GND	GNT0#	GND
4	GND	IPMB_PWR	HEALTHY#	LNG_VIO	INTP	INTS	GND
3	GND	INTA#	INTB#	INTC#	LNG_5V	INTD#	GND
2	GND	NC	5V	NC	NC	NC	GND
1	GND	5V	-12V	NC	+12V	5V	GND

Table 3-12 – Assignment of the pins of XS16 (J2) system connector of 64-bit CompactPCI bus

XS16							
Pins	**Z**	**A**	**B**	**C**	**D**	**E**	**F**
22	GND	GA4	GA3	GA2	GA1	GA0	GND
21	GND	CLK6	GND	RSV	RSV	RSV	GND
20	GND	CLK5	GND	RSV	GND	RSV	GND
19	GND	GND	GND	RSV	RSV	RSV	GND
18	GND	BRSVP2A18	BRSVP2B18	BRSVP2C18	GND	BRSVP2E18	GND
17	GND	BRSVP2A17	GND	PRST#	REQ6#	GNT6#	GND
16	GND	BRSVP2A16	BRSVP2B16	DEG#	GND	BRSVP2E16	GND
15	GND	BRSVP2A15	GND	FAL#	REQ5#	GNT5#	GND
14	GND	AD[35]	AD[34]	AD[33]	GND	AD[32]	GND
13	GND	AD[38]	GND	VIO	AD[37]	AD[36]	GND
12	GND	AD[42]	AD[41]	AD[40]	GND	AD[39]	GND
11	GND	AD[45]	GND	VIO	AD[44]	AD[43]	GND
10	GND	AD[49]	AD[48]	AD[47]	GND	AD[46]	GND
9	GND	AD[52]	GND	VIO	AD[51]	AD[50]	GND
8	GND	AD[56]	AD[55]	AD[54]	GND	AD[53]	GND
7	GND	AD[59]	GND	VIO	AD[58]	AD[57]	GND
6	GND	AD[63]	AD[62]	AD[61]	GND	AD[60]	GND
5	GND	C/BE[5]#	GND	VIO	C/BE[4]#	PAR64	GND
4	GND	VIO	BRSVP2B4	C/BE[7]#	GND	C/BE[6]#	GND
3	GND	CLK4	GND	GNT3#	REQ4#	GNT4#	GND
2	GND	CLK2	CLK3	SYSEN#	GNT2#	REQ3#	GND
1	GND	CLK1	GND	REQ1#	GNT1#	REQ2#	GND

3.2.6.3 CompactPCI XS11, XS8 and XS1 (J3-J5) I/O connectors and assignment of their pins

On the CPC505 part of the I/O signals are transferred via the XS11, XS8 and XS1 connectors. The board provides additional options for connecting peripheral I/O devices in compact special-purpose systems.

Using the Rear I/O board requires a special backplane. The CPC505 as well as its XS11, XS8, and XS1 connectors are compatible with all standard 6U CompactPCI backplanes with I/O capability via the corresponding system slot connectors.

The pin assignment of the XS11 connector (J3) corresponds to the PICMG 2.16 standard.

Table 3-13 – Assignment of XS11 (J3) connector pins of the CPC505

XS11						
Pin	**A**	**B**	**C**	**D**	**E**	**F**
1	GND	GND	+5V	GND	GND	GND
2	SATA0_RX+	SATA0_RX-	GND	SATA1_RX+	SATA1_RX-	GND
3	SATA0_TX+	SATA0_TX-	GND	SATA1_TX+	SATA1_TX-	GND
4	GND	GND	+5V	GND	GND	GND
5	PCIE_RX5+	PCIE_RX5-	GND	PCIE_RX6+	PCIE_RX6-	GND
6	PCIE_TX5+	PCIE_TX5-	GND	PCIE_TX6+	PCIE_TX6-	GND
7	PCIE_RX7+	PCIE_RX7-	GND	PCIE_RX8+	PCIE_RX8-	GND
8	PCIE_TX7+	PCIE_TX7-	GND	PCIE_TX8+	PCIE_TX8-	GND
9	PCIE_CLK-	PCIE_CLK+	GND	GND	GND	GND
10	GND	GND	USB_OC10_11#	USB8-	USB8+	GND
11	USB11-	USB11+	GND	USB9-	USB9+	GND
12	USB7-	USB7+	GND	USB10+	USB10-	GND
13	USB6+	USB6-	GND	USB_OC_6_7#	USB_OC_8_9#	GND
14	NC	NC	PCIERST#	NC	NC	GND
15	ETH2_1+	ETH2_1-	GND	ETH2_3+	ETH2_3-	GND
16	ETH2_0+	ETH2_0-	GND	ETH2_2+	ETH2_2-	GND
17	ETH1_1+	ETH1_1-	GND	ETH1_3+	ETH1_3-	GND
18	ETH1_0+	ETH1_0-	GND	ETH1_2+	ETH1_2-	GND
19	NC	NC	WAKE#	NC	NC	GND

Table 3-14 – Assignment of the XS8 (J4) connector pins of the CPC505

XS8						
Pin	**A**	**B**	**C**	**D**	**E**	**F**
1	GND	GND	DP_HPD	GND	GND	GND
2	DP_LANE3+	DP_LANE3-	GND	eDP_TX0-	eDP_TX0+	GND
3	DP_LANE2+	DP_LANE2-	GND	eDP_TX1-	eDP_TX1+	GND
4	DP_LANE1+	DP_LANE1-	GND	eDP_TX2-	eDP_TX2+	GND
5	DP_LANE0+	DP_LANE0-	GND	eDP_TX3-	eDP_TX3+	GND
6	DP_AUX-	DP_AUX+	GND	eDP_AUX-	eDP_AUX+	GND
7	DP_CTRL_CLK	DP_CTRL_DAT	GND	GND	GND	GND
8	GND	GND	eDP_HPD	LVDSB_CLK-	LVDSB_CLK+	GND
9	LVDSA_CLK-	LVDSA_CLK+	GND	LVDSB_D0-	LVDSB_D0+	GND
10	LVDSA_D0-	LVDSA_D0+	GND	LVDSB_D1-	LVDSB_D1+	GND
11	LVDSA_D1-	LVDSA_D1+	GND	LVDSB_D2-	LVDSB_D2+	GND
12						GND
13						GND
14						GND
15	LVDSA_D2-	LVDSA_D2+	GND	LVDSB_D3-	LVDSB_D3+	GND
16	LVDSA_D3-	LVDSA_D3+	GND	GND	GND	GND

17	GND	GND	BKLT_CTRL	CTRL_CLK	CTRL_DAT	GND
18	BKLT_EN	VDD_EN	GND	GND	GND	GND
19	LVDS_DDC_CLK	LVDS_DDC_DAT	GND	HAD_SDIN1	HDA_SPKR	GND
20	GND	GND	SDIN0	HAD_SDIN2	HDA_RST#	GND
21	HDA_SDOUT	HDA_SDIN3	GND	GND	GND	GND
22	HDA_BIT_CLK	HDA_SYNC	GND	GPIO0	GPIO3	GND
23	RIO_LED	RSTIN#	+5V	GPIO1	GPIO4	GND
24	GND	GND	+3.3V	GPIO2	GPIO5	GND
25	NC	LAN1_DISABLE#	LAN2_DISABLE#	GPIO6	GPIO7	GND

Table 3-15 – Assignment of the XS1 (J5) connector pins of the CPC505

XS1						
Pins	**A**	**B**	**C**	**D**	**E**	**F**
1	LPC_AD0	GND	+3.3V	GND	+5V_IN	GND
2	LPC_AD1	GND	+3.3V	GND	+5V_IN	GND
3	LPC_AD2	GND	+5V	GND	+5V_IN	GND
4	LPC_AD3	GND	+5V	GND	+5V_IN	GND
5	LPC_FRAME#	GND	SUSCLK	GND	+5V_IN	GND
6	DRQ0#	GND	SIOCLK	GND	+5V_IN	GND
7	DRQ1#	GND	A20GATE	GND	+5V_IN	GND
8	SERIRQ	GND	LPCCLK	GND	+5V_IN	GND
9	PCIRST#	GND	RCIN#	GND	+5V_IN	GND
10	+VI/O	PMC_IO63	PMC_IO62	PMC_IO61	PMC_IO60	GND
11	PMC_IO59	PMC_IO58	PMC_IO57	PMC_IO56	PMC_IO55	GND
12	PMC_IO54	PMC_IO53	PMC_IO52	PMC_IO51	PMC_IO50	GND
13	PMC_IO49	PMC_IO48	PMC_IO47	PMC_IO46	PMC_IO45	GND
14	PMC_IO44	PMC_IO43	PMC_IO42	PMC_IO41	PMC_IO40	GND
15	PMC_IO39	PMC_IO38	PMC_IO37	PMC_IO36	PMC_IO35	GND
16	PMC_IO34	PMC_IO33	PMC_IO32	PMC_IO31	PMC_IO30	GND
17	PMC_IO29	PMC_IO28	PMC_IO27	PMC_IO26	PMC_IO25	GND
18	PMC_IO24	PMC_IO23	PMC_IO22	PMC_IO21	PMC_IO20	GND
19	PMC_IO19	PMC_IO18	PMC_IO17	PMC_IO16	PMC_IO15	GND
20	PMC_IO14	PMC_IO13	PMC_IO12	PMC_IO11	PMC_IO10	GND
21	PMC_IO9	PMC_IO8	PMC_IO7	PMC_IO6	PMC_IO5	GND
22	PMC_IO4	PMC_IO3	PMC_IO2	PMC_IO1	PMC_IO0	GND

3.3 Timers

The module is equipped with the following types of timers:

■ **RTC or Real-Time Clock;**

The PCH includes a battery-powered real-time clock.

■ **Watchdog Timer**

The description is given below.

3.3.1 Watchdog Timer

The watchdog is implemented in the FPGA as an LPC bus device. Enabling the watchdog timer and selecting a hardware interrupt (IRQ) is performed in the BIOS Setup. The timer is operated through the registers in the I/O port area (I/O). The base register address (BASE) set by the BIOS is listed in the “Help” section of the BIOS Setup, to the right of the watchdog on/off item.

The watchdog timer consists of a 24-bit counter register [Timer Current Value Register], decrementable at 32.768 kHz, and an initial value register [Timer Initial Value Register]. When the Counter Current Value Register is zeroed either an interrupt or an auto reset of the board can occur (when the counter is zeroed twice). Trigger times from 0 to 512 seconds inclusive can be set with a pitch of 30.52μs.

By default the watchdog is disabled. Below is the formula for calculating the TWD time delay (μs) based on the decimal value in the register [Timer Initial Value Register] (KWD):

$TWD\ [\mu s] = K_{WD} * 10_6 / 2_{15}$

For example, a decimal value of KWD = 1 (000001h) corresponds to the operate delay time of 30.52μs, and a value of KWD = 16777215 (FFFFFFFh) corresponds to the delay time of 512 seconds.

The counter can be reset to its initial value in several ways:

1) By writing any number to the timer register [Timer Current Value Register].

2) By writing any number to port 80h (the mode is enabled in Bios Setup and operates only when cycles of addressing to port 80h to the LPC bus are translated)

When the counter register is zeroed for the first time, the TMF flag is set, for the second time - the STF flag.

Algorithm of operation with watchdog timer through the I/O registers:

1) Stop the counter decrement.

2) Write timeout value to the initial value registers.

3) Initialize the counter register by any of the reset methods (e.g. by writing any number to the counter register). In this case the timeout value from the initial value register is written to the counter register.

4) Run the counter for decrement and, if required, allow the automatic reset of the board.

5) Then with a period smaller than the timeout value, perform a regular reset of the counter (by any of the methods described above). If the counter is not reset during the first timeout interval, the TMF flag will be set and an interrupt will occur (if enabled), if the counter is not reset during the second timeout interval, the STF flag will be set and the second interrupt will occur (or the board will reboot if the reset was enabled).

3.3.2 Description of registers of the WDT controller

Timer Current Value Register [23:0]

Base+0h		
Bit	Name	Description
7:0	Timer_Current_Value[7:0]	Write/Read: Bits 7:0 of the counter current value
Base+1h		
Bit	Name	Description
7:0	Timer_Current_Value[15:8]	Write/Read: Bits 15:8 of the counter current value
Base+2h		
Bit	Name	Description
7:0	Timer_Current_Value[23:16]	Write/Read: Bits 23:16 of the counter current value

Timer Initial Value Register [23:0]

Base+3h		
Bit	Name	Description
7:0	Timer_Initial_Value[7:0]	Write/Read: Bits 7:0 of the counter initial value
Base+4h		
Bit	Name	Description
7:0	Timer_Initial_Value[15:8]	Write/Read: Bits 15:8 of the counter initial value
Base+5h		
Bit	Name	Description
7:0	Timer_Initial_Value[23:16]	Write/Read: Bits 23:16 of the counter initial value

Status Register

Base+6h		
Bit	Name	Description
7:3	-	Reserved

2	STF	Write/Read: Second timeout flag. The flag is to “1” if TMF=1. An interrupt occurs on this flag. If the board reset is enabled RSTE=1, a hardware reset occurs. It is reset by writing “1” to this digit.
1	-	Reserved
0	TMF	Write/Read: Timeout Flag. It is set to “1” when the timer counter is zeroed. This flag causes an interrupt to occur. Reset by writing “1” to this bit or writing to port 80h (if this mode is enabled).

Control Register

Base+7h		
Bit	Name	Description
7:2	-	Reserved
1	CNTE	Write/Read: Counter decrement 1 – enabled 0 – disabled
0	RSTE	Write/Read: Board reset by timeout 1 – reset is enabled 0 – reset is disabled

3.4 SPI/LEDs/GPIO controller

3.4.1 Description of the SPI controller registers

Table 3-16 – Registers of SPI controller

I/O port address	Type	HARD RESET	Configuration register
Base+0	R/W	00h	FRAM address value [7:0]
Base+1	R/W	00h	FRAM address value [14:8]
Base+2	R/W	00h	SPI data value [7:0]
Base+3	R/W	00h	SPI Control/Status register [7] – busy status [6] – last 1K fram lock status [5] – Reserved [4] - Reserved [3] – Reserved [2] – Reserved [1] – Reserved [0] – BURST mode
Base+4	R/W	00h	Reserved

Base+5	R/W	00h	RIO GPIO Direction [7:0] – GPIO Direction 0 – input 1 – output
Base+6	R/W	00h	RIO GPIO DATA [7:0] – GPIO DATA
Base+7	R/W	00h	User LEDs control [7:2] – Reserved [2] – RIO LED On/Off [1] – GREEN LED On/Off [0] – RED LED On/off

The controller automatically generates a sequence of access to the FRAM memory on the SPI bus (address from registers BASE+0, BASE+1, read/write mode and data - register BASE+2).
The last kilobyte of 32 KB is reserved to save the BIOS Setup settings. Bit <0> in the control register (Base + 3) enables automatic address increment mode when reading/writing the register of data (base + 2), after the end of the batch exchange it must be reset.

3.4.2 Programming SPI device

The work with FRAM is in the I/O area by addresses 310h-313h.

▪ Write the data byte (32h) to FRAM by the address (144h)

```
MOV DX, 310H
MOV AL, 44H
OUT DX, AL
MOV DX, 311H
MOV AL, 01H
OUT DX, AL
MOV DX, 312h
MOV AL, 32h
OUT DX,AL
```

▪ Reading data byte from FRAM by the address (101h)

```
MOV DX, 310H
MOV AL, 01H
OUT DX, AL
MOV DX, 311H
MOV AL, 10H
OUT DX, AL
MOV DX, 312h
IN AL,DX
```

▪ Reading a batch of three bytes of FRAM data starting from the address 208h

```
MOV DX, 310H
MOV AL, 08H
OUT DX, AL
```

```
MOV DX, 311H
MOV AL, 20H
OUT DX, AL
MOV DX,313h
MOV AL, 01H
OUT DX, AL ; enabling the batch mode
MOV DX, 312h
IN AL,DX ; reading data byte by the address 208h
…
IN AL,DX ; reading data byte by the address 209h
…
IN AL,DX ; reading data byte by the address 20Ah
…
MOV DX,313h
MOV AL, 00H
OUT DX, AL ; disabling the batch mode
```

3.4.3 FRAM memory with serial access

The module has a serial access FRAM memory chip on the SPI bus. This non-volatile memory is used to store BIOS settings and user data. Access to the chip is possible through the registers of the SPI controller (see subparagraph 3.4.1). The microchip size is 32 KB, the last Kbyte is reserved for storing service data and BIOS Setup settings (not accessible to the user).

3.5 Devices on the local SMBus

The SMBus (System Management Bus) provides system monitoring and configuration functions. The bus uses a two wire I_2C™ interface. Below is a table of SMBus device addresses:

Table 3-17 – Addresses of devices on SMBus

#	SMB Address	DEVICE
1	04CH	Temperature sensor memory
2	0A4H	2 SPD memory module
3	0A0H	1 SPD memory module
4	0C4H	PCI-E Bridge PMC
5	0C2H	PCI-E Bridge Compact PCI
6	02AH	PECI-SMBUS Bridge
7	02EH	LM87 Hardware monitor

3.6 Battery

The CPC505 uses one 3.0 V lithium battery to power the real-time clock.

3.7 SATA SSD

A 32GB high performance SATA SSD drive is installed on the module. The drive is connected to the SATA 3.0 interface. The drive can be disabled through the BIOS Setup settings.

4 Installation

The following rules, warnings, and procedures must be strictly followed in order to properly install the module and avoid damages to the device, system components, and personal injury.
The installation procedure for all peripheral device drivers installed on the module is described in the descriptions supplied with those devices. This User Manual also does not describe how to install operating systems. Please refer to the relevant materials or contact our tech support.

4.1 Safety requirements

When handling the CPC505, you should strictly follow the below safety requirements. The manufacturer FASTWEL GROUP is not responsible for any damage resulting from failure to comply with these requirements.

Caution!

Be careful when handling the device because the cooling heatsink can become very hot. Do not touch the heatsink when installing or removing the device.
In addition, do not place the device on any surface or in any container until both the device and the heatsink have cooled down to room temperature.

Attention!

Turn off the power of the CompactPCI system before inserting the device in a free slot. Failure to do so may result in damages to the system or the device.

Device sensitive to static electricity (ESD)!

The device contains elements that are sensitive to electrostatic discharges. Observe the following precautions to avoid damages to the device:

✓ Before touching the device, remove the static discharge from clothing, also remove the discharge from tools before use.

✓ Do not touch any electronic components or pins of connectors.

✓ If you work in a professional workplace with anti-static protection, do not neglect to use it.

4.2 CPC505 installation procedure

The following procedure applies to installing the CPC505 into the system. The removal procedure is given in other chapters.

To install the board into the system, follow the below procedure:

1. Make sure that the safety requirements listed in paragraph 4.1 are met.

Warning!

Failure to follow the below instructions may cause damages to the device and lead to system malfunctions.

2. Information on installing peripherals and I/O devices is provided in the appropriate subparagraphs of this chapter. Installation of the MIC1901 on the CPC505 is described in subparagraph B.9.3.

Warning!

All other operations should be performed carefully in order not to damage the CPC505 or any of the other boards in the system.

3. Perform the following steps to install the CPC505:

    1. Make sure that the power to the system is turned off.

Warning!

When performing the following operation, **do not apply force** while inserting the CPC505 into the backplane connector. Use the handles on the front panel to insert the module into the connector.

    2. Carefully place the module in the desired slot by sliding it along the guide rails until it touches the backplane connector.
    3. Using the two front panel handles, slide the CPC505 into the backplane connector. The module is inserted all the way in until the handles are snapped into place.
    4. Secure the two retaining screws on the front panel.
    5. Connect any required external interface cables to the module.
    6. Ensure that both the module and all connected cables are securely fastened.

4. The CPC505 is now ready for use. Refer to the documentation of the programs, devices and the system as a whole for further instructions.

4.3 Board removal procedure

In order to remove the board, perform the following operations:

1. Unblock the both handles on the front panel. Where the lower handle impacts the microswitch, this requires a very fine movements of the handle, see subparagraph **3.2.5.4 Switch in the handle**.

Note

The blue SYS LED should start blinking for a short period of time. What this means is that the system has detected the start of a “shutdown” operation and tells the operator that the module is waiting for the system programs to complete.

2. The SYS LED should light up permanently. You may then proceed with further removal of the module.
3. Turn off the power supply.
4. Disconnect all interface cables from the module.
5. Make sure that the safety requirements listed in chapter 4.1 are observed.

Pay special attention to the warning regarding the temperature of the heatsink!

Warning!

Perform the following operations with due care so as not to damage either the CPC505 or other system boards.

6. Unscrew the retaining screws on the front panel.

Warning!

When handling the module, be careful because the heatsink can get very hot. Do not touch the heatsink when replacing the board.

7. Using the front panel handles, extract the module from the backplane connector and carefully remove it from the system.

4.4 Installation of the CPC505 peripheral devices

A wide variety of peripherals can be connected to the CPC505, and installation methods vary widely. The following sections provide general installation guidelines only, not detailed algorithms.

4.4.1 Connection of USB devices

The CPC505 supports the use of any USB computer peripheral (e.g. keyboards, mice, printers etc.).

Note

All USB devices can be plugged and unplugged when the power supply of the devices and master system is ON.

4.4.2 Connecting devices to the Rear I/O Board

In order for the COM1-6 and Ethernet ports on the Rear I/O module to work properly, they must be configured for use through the Rear I/O module using the BIOS Setup program.

Any details concerning installation of the devices that operate via Rear I/O please refer to the relevant documentation.

4.5 Replacing the battery

In order to replace the lithium battery, use the same battery or the one recommended by the manufacturer for replacement. Suitable models include Renata, Panasonic BR2032, or other compatible models.

Important note:

Observe polarity when replacing the battery.

The battery should be replaced with an identical battery or the one recommended by the manufacturer.

Dispose of the used battery in accordance with established regulations.

The expected life of a 190mAh battery is approximately 5-6 years provided that it is operated 8 hours a day at 30°C. However, battery life is highly dependent on operating temperature and the amount of time the system is turned off.
It is recommended that the battery be replaced after 4-5 years of operation, without waiting for the end of its life.

4.6 Installation of M.2 SSD

An SSD M.2 SSD plugs into the XP5 slot. You can install the drive in conjunction with the PMC/XMC expansion module.
Use the screw provided with the installation kit in order to secure the 2280 size drive. You can also use the rack provided in this kit to install a drive of a smaller size (see subparagraph 2.3).

5 System setup

5.1 Resetting BIOS settings

The XP3 connector on the module (see Figure 2-2) is designed to reset the BIOS settings to the factory defaults if the system fails to boot (for example, due to an error in the BIOS setup or an incorrect password).

To reset the CPC505 module BIOS settings, the following steps should be performed:

1. Switch off the system power supply;
2. Install the jumper to the XP3 connector;
3. Turn on the module;
4. Wait until the BIOS information appears on the screen;
5. Turn off the module;
6. Remove the XP3 jumper.

5.2 Updating BIOS

BIOS is updated with the help of the utility ftp://ftp.prosoft.ru/pub/Hardware/Fastwel/CPx/CPC505/Software/BIOS/CPC505-02/DOS/FPT.zip.

Actions for updating BIOS:

1. Load MS-DOS
2. Run the command fpt.exe -F <bios image file name> -BIOS

6 AMI Aptio BIOS Setup

6.1 Starting and updating the BIOS Setup program

Your computer has an adapted version of the AptioTM TSE (Text Setup Environment) BIOS which is a standard system for IBM PC AT-compatible computers. It supports Intel® x86 and compatible processors, provides low-level support for processor, memory, and I/O subsystems.
With the BIOS Setup program you can change BIOS settings and control special modes of your computer. It allows you to change basic system setup parameters. These settings are stored in non-volatile memory.

6.1.1 Start of BIOS Setup

To start BIOS Setup program press the “F2” or <DEL> key on the keyboard or on the console PC keyboard (if you use Hyperterminal program as the terminal) during the POST (Power On Self Test) procedure to boot the system.
After pressing the “F2” key the menu of the BIOS Setup program appears with the active tab “Main”.

6.1.2 Navigation keys

Selection of the BIOS menu items is carried out by the keyboard using the following keys:

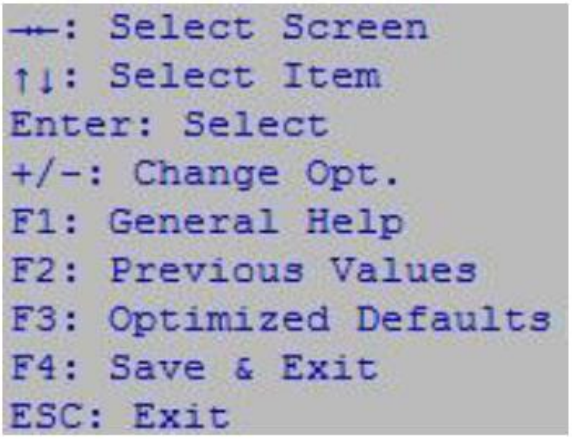


Figure 6-1 – Assignment of navigation keys

Key	Assignment
ENTER	The user can use the ENTER key to select a value for the option being edited or to move to a submenu.
→←	The “Left” and “Right” keys allow selecting the AptioTM TSE screen (used for moving through the tabs). For example, “Main”, “Advanced”, and so on.
↑↓	The “Up” and “Down” keys allow you to move to the submenu line (used for moving through the menu items).

+ −	The “+” and “-“ keys on the numeric keypad allow you to change any values in the selected menu item. For example, “Date” and “Time”.
Tab	The <Tab> key makes it possible to select the AptioTM TSE value field.
F1	This key calls the main help window.
F2	With this key the user can load the previous value into the TSE.
F3	With this key the user can load the optimal default settings into the TSE.
F4	This key enables the user to save the current settings and exit the TSE.
ESC	The <ESC> key allows the user to discard changes made and exit AptioTM TSE. Press the <ESC> key to exit AptioTM TSE without saving changes. The next screen will have the following message: Press <Enter> to discard changes and exit. Alternatively, you can use the arrow keys to select “Cancel” followed by pressing <Enter> to exit the menu item and return to the previous screen.
Function keys	When additional function keys are available they are displayed in the Help window according to their respective functions.

Note

This algorithm of menu operation also applies to all tabs of the BIOS Setup program.

6.1.3 BIOS update

BIOS update is carried out with the help of the Flash Programming Tool utility (which is available on the network file-servers of the manufacturer and the official distributor).

Actions for updating BIOS:

1. Boot MS-DOS;
2. Run the command fpt.exe -F <bios image file name> -BIOS.

6.2 Main

This BIOS Setup screen is the main screen upon entry. The menu on this tab adjusts the real time clock and date and switching-over of the menu tabs to set module settings, and displays information about the BIOS program.

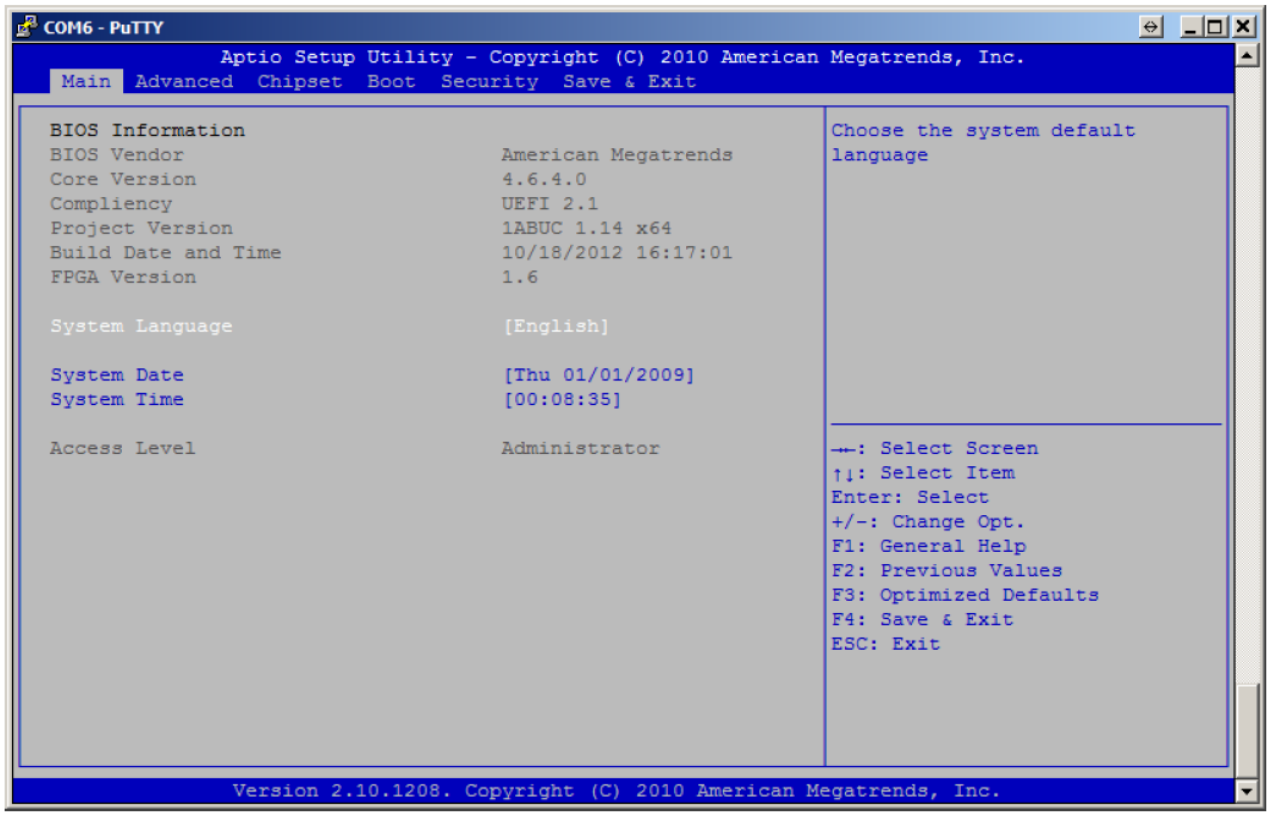


Figure 6-2 – Screen of the Main menu

Function	Purpose
Project Version	BIOS version
System Date	Date setting
System Time	Time setting

Note

The time is set in the 24-hour format.

7 Troubleshooting

Before contacting a service center, please read the troubleshooting information, since the problem may not be related to a malfunction of the device.

Table 7-1 - CPC505 fault causes and their troubleshooting

PROBLEM	CUASE	SOLUTION
The module does not start, SYS LED is off.	+5 V, +3.3V power supply voltages are missing.	Check the power supply voltages on the backplane.
	Module is not fully inserted in the backplane.	Make sure that the module is fully inserted in the backplane.
The module does not start, the blue SYS LED is on.	The extractor handle is not snapped or the button in the extractor handle is pressed.	Check the condition of the extractor handle.
	The module is not fully inserted in the backplane.	Make sure that the module is fully inserted in the backplane.
	Module is inserted in the peripheral slot and the RESET# signal is active on the PCI bus.	Verify that the module installed in the system slot is operational.
The board does not start, the SYS LED is blinking fast (~8 Hz) with green.	BIOS is missing or corrupted. The board is faulty.	Please, contact a service center.
The board doesn't start, the SYS LED is blinking slowly (~1 Hz), the board emits sounds.	The BIOS version failed to reach the boot call of the OS INT19H. The BIOS is corrupted.	Reset the BIOS Setup settings with the XP2 jumper. Please, contact a service center.

8 Power consumption

The CPC505 module is designed with due consideration of optimal power consumption and distribution. However, it is necessary to observe certain requirements which are essential for stability and reliability. The table below shows the maximum permissible supply line voltages, exceeding which could result in damages to the module. The power supplies with which the CPC505 will be used must be tested for compliance with these requirements.

The table provided defines the operating ranges of the various power supply voltages of the module. If the supply voltages are outside of these ranges, the functionality of the module cannot be guaranteed.

The backplane must provide optimum distribution of +3.3 V and +5 V supply voltages. Only backplanes with two voltage planes for each of the voltages are recommended.

The connections between the power supply lines and the backplane should provide minimum losses and guarantee stable performance. Long supply lines, conductors with small cross sections, and connections with high resistance should be avoided.

The modules should be supplied from an external DC power supply with the characteristics given in section 2.1:

9 Exposure to external factors

9.1 Temperature mode

If the CPC505 is operated under normal operating conditions with sufficient air circulation, the processor runs at maximum performance. In the case of non-optimal environmental conditions (high ambient temperature and lack of air circulation) the system continues to operate anyway, but with reduced processor performance due to the SpeedStep®. Only under critical circumstances where the processor is significantly overheated will an emergency shutdown occur, which prevents damages to the processor. The table below demonstrates dependence of processor frequency on temperature.

Table 9-1 - Processor frequency vs. temperature (for CPC505-01)

Module	Temperature (°C)	Forced ventilation	Processor frequency (MHz)
CPC505-01	+70(*)	~ 1.7 CFM	1800
	+85		~800

(*) –Maximum temperature at which there is no drop in CPU operating frequency. During measurements, the module can be installed in a CPCI 6U Schroff enclosure, using a baffle.

Note:

The results shown are derived from synthetic tests that provide maximum thermal design power (TDP).

When designing solutions based on the CPC505, the developer should consider the thermal performance of the overall system. A system enclosure that meets the heat dissipation requirements should be used. When making thermal calculations, the contribution of peripheral devices to the overall system heat dissipation should also be taken into account.

Peripheral devices, in turn, should have thermal performance corresponding to the operating temperature range of the board and the entire system.

Warning!!!

Since FASTWEL GROUP is not responsible for any consequences of emergency processor shutdown in case of overheating, system developers and end users are

strongly advised to make sure that the operating environment of the CPC505 meets the temperature requirements.

9.2 Operating conditions and MTBF

The device must be able to withstand the following climatic and mechanical actions:

Table 9–2 – Environmental exposure when operating CPC505

Type of impact	Parameter name	Parameter value	Document
Temperature change at up to 80% relative humidity, non-condensing	Low temperature	- 40°C	GOST 28209-89 (IEC 68-2-14-84)
	High temperature	+ 85°C	
Sinusoidal vibration	Range of frequencies (Hz)	10...500	GOST 28203-89 (IEC 68-2-6-82)
	Acceleration, g	2	
Single shocks	Peak acceleration, g	30	GOST 28213-89 (IEC 68-2-27-87)
Multiple shocks	Peak acceleration, g	10	GOST 28215-89 (IEC 68-2-29-87)
	Number of shocks	1000	

Modules are resistant to cyclic damp heat at ambient temperature of + (55±2) °C, relative humidity (93±3) % (with conformal coating: option \Coated) in accordance with GOST 28216-89 (IEC 68-2-30-82).
The MTBF (Mean Time Between Failure) of the CPC505 is at least 50,000 hours.

ANNEX A

RIO587 Rear I/O Module

A.1 Introduction

The RIO587 I/O module is designed for use with the CPC505 board (CompactPCI format, 6U form factor). The RIO587 ensures access to the CPC505 interfaces on J3 – J5 CPCI connectors when installed from the reverse side of the backplane.

One important advantage of this method of mounting the expansion board is that fewer or no cables can be connected to the motherboard, which makes it easier to install and remove the processor board from the system enclosure.

The module is implemented in the CPCI 6U RIO design in two versions: RIO587-01 (4HP height) and RIO587-02 (8HP height). Depending on the version, the set of interfaces displayed on the rear panel differs.

The RIO587 is compatible with the PICMG 2.0 Compact PCI r.3.0 standard. It is installed at the back of the system chassis opposite the CPC505 CPU card in the corresponding backplane slot.

A.2 RIO587 versions

The differences of the configurations delivered are summarized in the table:

Table A-1 – RIO587 versions

#	Version	Module height
1	RIO587-01	4HP
2	RIO587-02	8HP

Descriptions of the configurations delivered:

RIO587-01 - CPCI 6U RIO module with 4HP height and interfaces PS/2, RS-232, 2 x RS-485, 2 x USB2.0, 2 x 10/100/1000 Mb Ethernet, CFast, support of Innodisk SATADOM.

RIO587-02 - CPCI 6U RIO module with 8HP height and interfaces PS/2, 4 RS-232, 2 x RS-485, 2 x USB2.0, 2 x 10/100/1000 Mb Ethernet, CFast, HDD 2.5" SATA.

Table A-2 - RIO587 temperature range (industrial and commercial version)

Characteristics	Industrial version RIO587-0x-I	Commercial version RIO587-0x-C
Low temperature	- 40°C	0°C
High temperature	+ 85°C	+70°C

If the board has a conformal coating (\Coated option), the modules are resistant to cyclic damp heat at ambient temperature of + (55±2) °C, relative humidity (93±3)%.

The weight of the modules for the versions RIO587-01 and RIO587-02 is shown in the table below:

Table A-3 – Weight of the RIO587-01 and RIO587-02 modules

Module type	Weight in kg, no more than
RIO587-01	0,300
RIO587-02	0,350

A.3 RIO587 delivery checklist

The RIO587 I/O module includes the items listed below:

▪ RIO587 module;

▪ Jumpers (regardless of the module version):

− for pins XP13 and XP14 for connection of RS485 matching circuits - 2 pcs.

− for XP17 and XP18 pins (see subparagraphs A.9.2, A.9.3) - 2 pcs.

For RIO587-01 version (for fastening the Innodisk SATADOM flash drive):

▪ p/n RRSN-2750-12 Richco rack -1 pcs.

▪ DIN7985 screw M2.5 x16 -1 pcs.

▪ DIN934 nut M2.5 -1 pcs.

▪ DIN125 washer 2.5 -1 pcs.

▪ DIN6798A lock washer 2.5 -1 pcs.

For RIO587-02 version (for fastening the HDD 2.5”):

▪ IMES.469535.129 KIB587 board -1 pcs.

▪ IMES.715131.023-03 rack – 4 pcs.

▪ DIN7985 screws M3x6 – 4 pcs.

▪ DIN125 washers 3 – 4 pcs.

▪ DIN6798A lock washers 3 - 4 pcs.

Flash drive Innodisk SATADOM and HDD are purchased separately.

A.4 RIO587 packaging information

The RIO587 I/O module is delivered in a box with the size of 350x260x70 mm.

The boxed weight of the device:

▪ RIO587-01: no more than 700 g;

▪ RIO587-02: no more than 750 g.

Note

Keep the anti-static packaging and consumer packaging of the module in its original condition until the end of the warranty period.

A.5 Structure of I/O channels of RIO587

In RIO587-01 version, the rear panel is equipped with the following interfaces:

Table A-4 – Interfaces on rear panel of the RIO587-01 version

Interface	Quantity	Note
PS/2	1	Combined mouse/keyboard
USB 2.0	2	With support of HS, FS and LS speeds
Reset button	1	Reset (RST) button on the rear panel: Initiates a “cold restart” of the module (without turning off the power). Button is sunken which prevents accidental pressing; Can be pressed using a long thin object.
Isolated Reset	1	Pins 4, 9 of the XP7 (COM5) connector, insulation 500V
GP Led	1	For operation description, please see section 3.4
RS-232	1	COM1, up to 1.5 Mbaud
RS-485	2	Isolated, 500 V. up to 460 Kbaud (COM5, 6)
LAN 10/100/1000 Mb	2	Use 2 x PCI-E x1 Gen2 channels
DVI-D	1	Resolution up to 1920x1200@60 Hz

The top side of the module contains (see Figure A-4):

- CFast card slot (Compact Flash with SATA interface), SATA0 channel (XS5);
- SATA connector with Innodisk SATADOM support (Innodisk SATADOM is installed on the RIO587-01 module), SATA1 channel (XP15);
- Power supply connector for HDD (XS8 (for RIO587-02 version);
- LPT connector (BH-26) per flat ribbon cable - IDC-26 (XS11);
- 3 x RS-232 connectors (BH-10) on flat ribbon cable - IDC-10 (XP10-XP12);
- 2 x connectors TH-4M for additional +5V power supply to the CPC505 module;
- XP16 connector, to which the two-channel LVDS (XP16) is routed;
- BH-10 connector, to which GPIO0-GPIO7 lines and 3.3V power (XP5) are routed, see subsection 3.4 SPI Controller / LEDs / GPIO;
- PC Speaker (BF1).

The RIO587-02 module is provided with a mount for a 2.5” hard disk drive (to be purchased separately), which is connected to the SATA connector with a KIB587 adapter (included in the delivery checklist).

The RIO587-02 version has additional COM ports on the rear panel:

Table A-5 – Additional interfaces on the rear panel of the RIO587-02 version

Interface	Quantity	Note
RS-232	1	COM2, up to 1.5 Mbaud
RS-232	1	COM3, up to 1.5 Mbaud
RS-232	1	COM4, up to 1.5 Mbaud

A.6 Appearance and layout of RIO587 elements

The following figures are provided to help you identify components and understand their locations and functions.

A.6.1 Functional diagram of RIO587

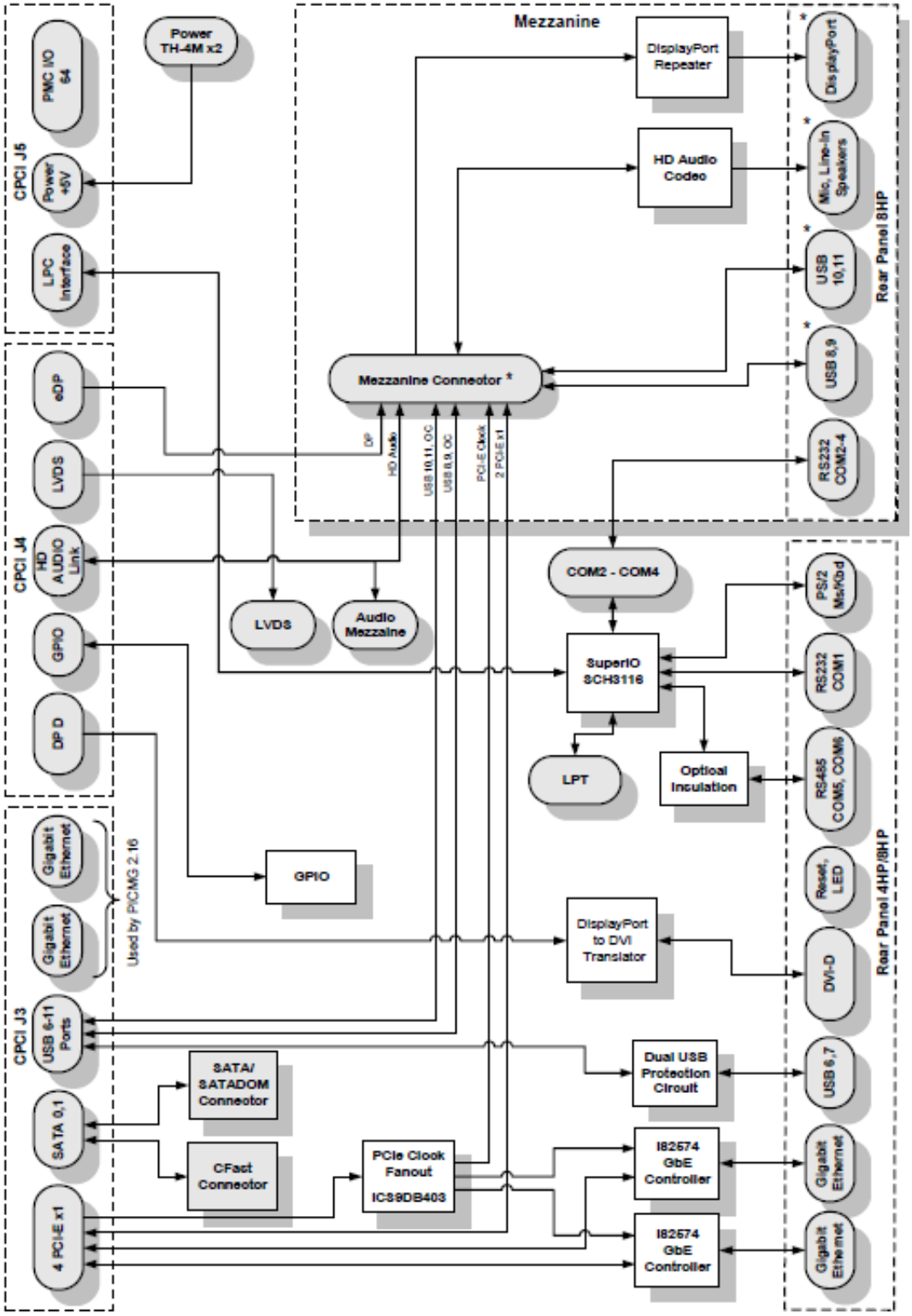


Figure A-1 – Block diagram of RIO587

** Support of this functionality is possible if a mezzanine connector is installed by the manufacturer on the RIO587-02 module and an additional expansion board is connected.*

Additional interfaces that can be routed to the mezzanine board connector (marked with an asterisk in the block diagram) are summarized in the table:

Table A-6 – Additional interfaces at mezzanine connection

Interface	Quantity	Note
PCI-Express 1x	2	Can be used on the mezzanine
USB 2.0	4	With support of the HS, FS and LS speeds
eDP	1	-
HD Audio	1	audio codec is installed on the mezzanine

A.6.2 Layout of RIO587 main components

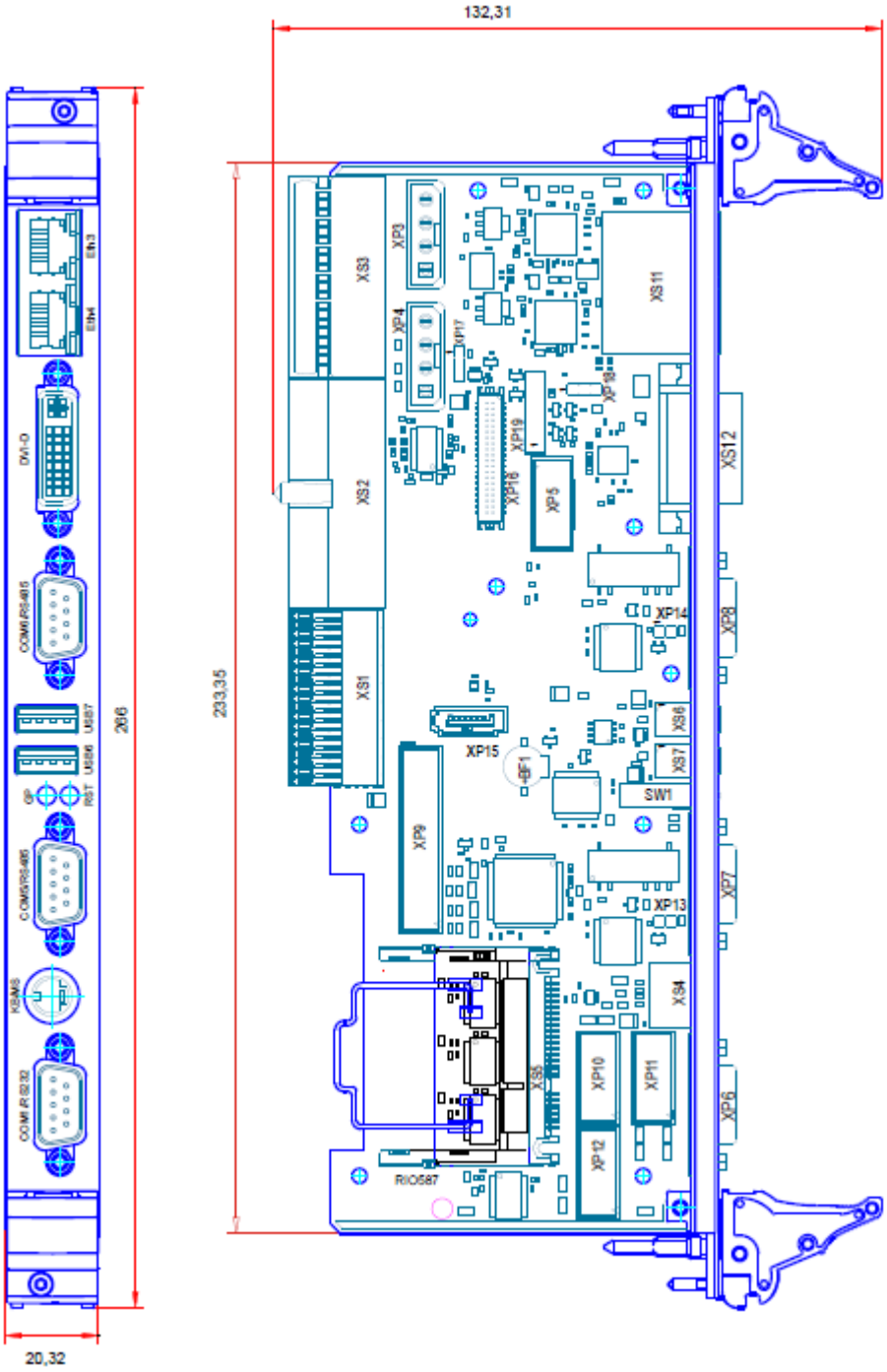


Figure A-2 - RIO587-01 (4HP height)

The appearance of the module versions may slightly differ from that shown in the figure.

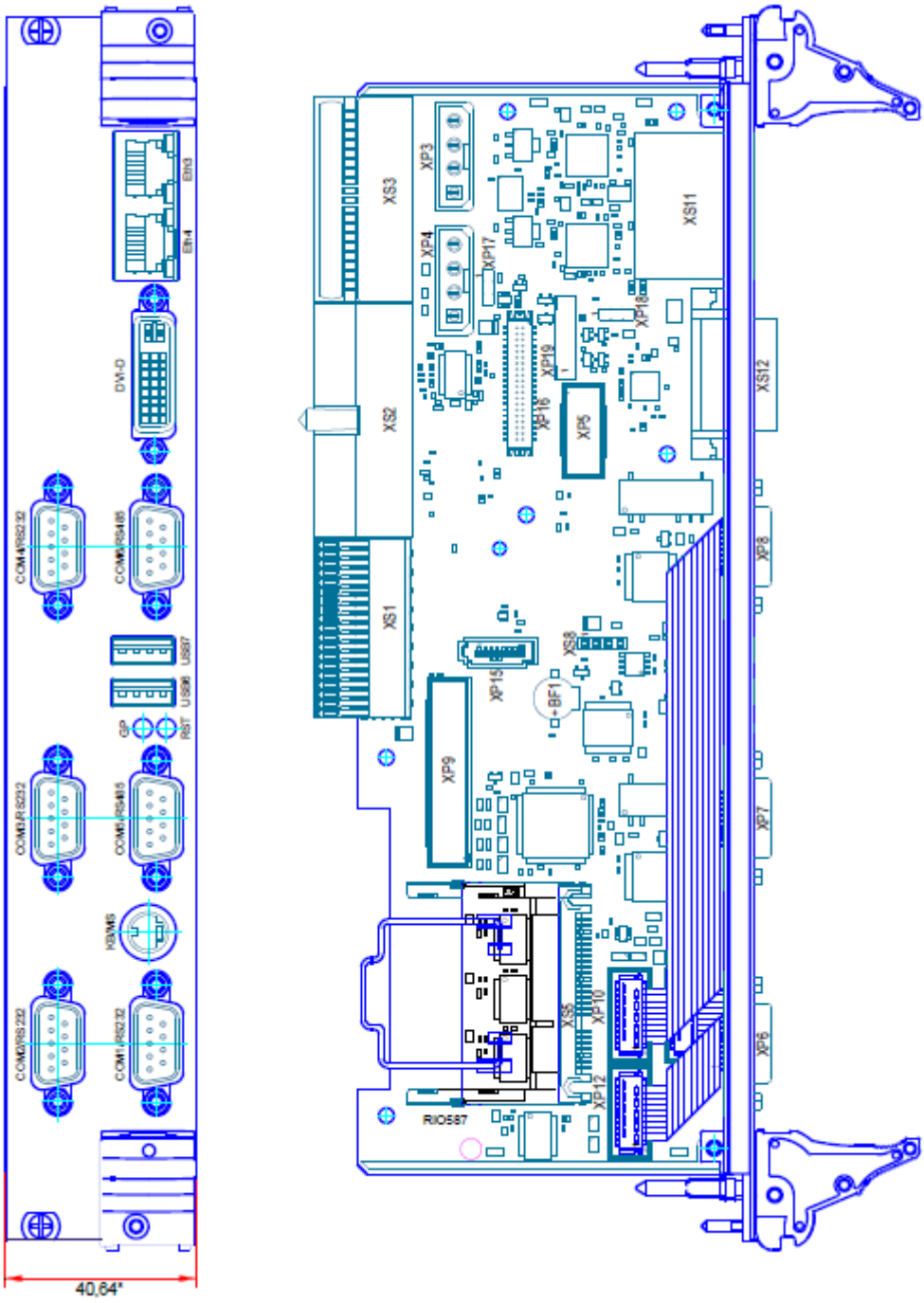


Figure A - 3 - RIO587-02 (8HP height)

The appearance of the module versions may slightly differ from that shown in the figure.

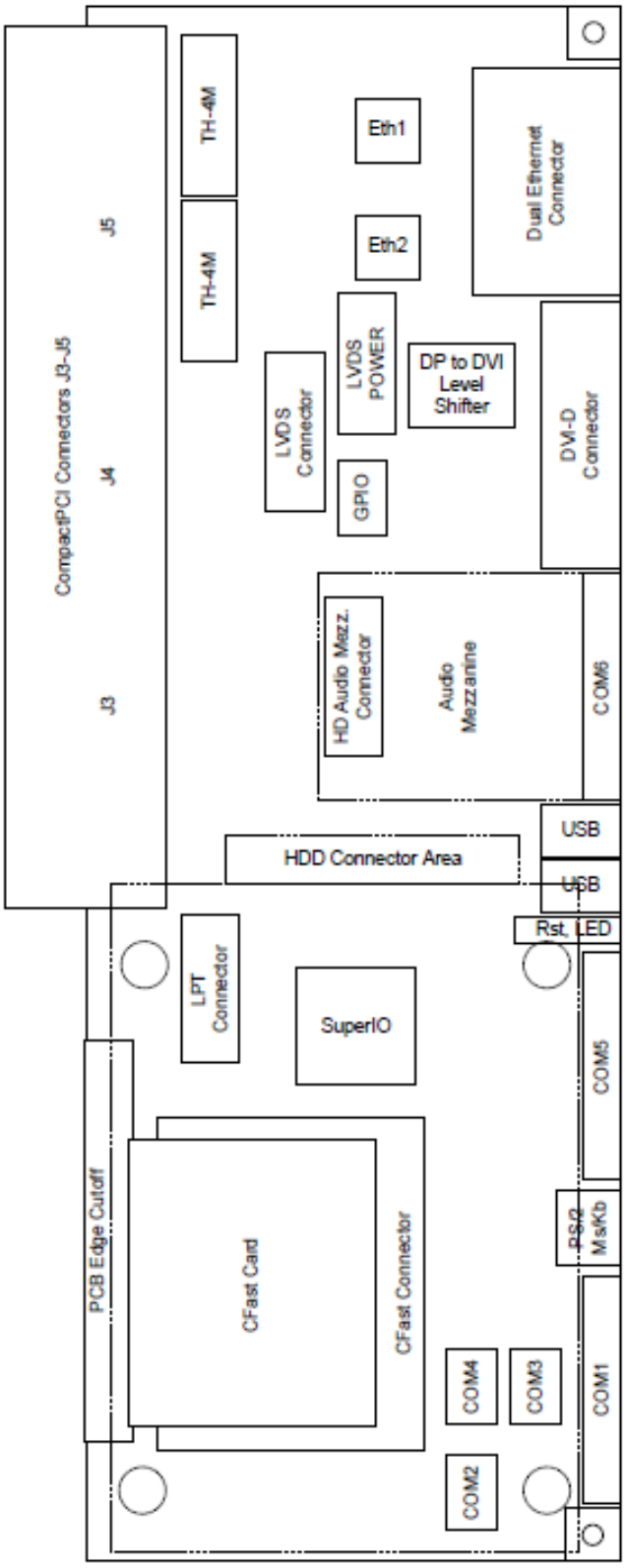


Figure A-4 – Designation of RIO587 key components on the top view

A.7 Features of operation of RIO587 functional nodes

■ SATA

2 x SATA interfaces for connecting drives, one routed to the CFast card connector, the other one to a standard SATA connector (XP15) with Innodisk SATADOM power support (Innodisk SATADOM is installed on the RIO587-01 module).

■ Ethernet

The RIO587 module has two Gigabit Ethernet interfaces connected via PCI-Express.

■ USB 2.0

The module has 2 x USB 2.0 channels on the back panel, another 4 channels can be routed to the mezzanine and used in the RIO587-02 version.

■ COM1 – COM6

COM1 is a 9-wire RS232 interface, routed to the standard DSUB-9 (XP6) connector of the rear panel.

COM2/COM3/COM4 are 9-wire RS232 interfaces, routed to BH-10 type XP10 - XP12 connectors with a pitch of 2.54 mm. Can be routed to the rear panel of the RIO587-02 version via a flat ribbon cable with IDC-10 connector.

COM5/COM6 - individually galvanically isolated RS485 interfaces, isolation voltage up to 500V. Automatic transmission control. Each port is routed to a standard rear panel DSUB-9 connector (XP7, XP8). RS485 matching circuits can be connected by using jumpers installed on the module, or by closing pins 2 and 7 of the connector.

Galvanically isolated Reset is routed to the pins 4 and 9 of the XP7 connector. Isolation is 500V.

■ LPT

Universal parallel port with support for SPP (PC-compatible printer port), ECP (Extended Capabilities Port) and EPP (Enhanced Parallel Port) modes. Terminal BH-26 (XS11) is available at a pitch of 2.54-mm.

■ DVI-D

Designed for connecting a digital display with a resolution up to 1920x1200@60Hz, routed to the rear panel.

■ LVDS

Port for connection of LVDS (ANSI/TIA/EIA-644 compliant) TFT matrix with maximum pixel rate of 112 Mpix/sec in single channel mode and 224 Mpix/sec in dual channel mode. Resolution up to 2560x1440@60Hz (dual-channel mode). Routed to the XP16 connector.

■ PS/2 Keyboard & Mouse

Used to connect a PS/2 keyboard and mouse to the PS/2 module. Connected to a standard PS/2 connector on the rear panel.

■ PCI-E

The PCI-E bus can be routed to the mezzanine connector for up to 2 x PCI-E devices in x1 mode (2.5 Gbit/s) in the RIO587-02 version.

■ GPIO interface

8 x lines. Routed to the board connector.

■ LED indication

The rear panel has a software-controlled LED, see subparagraph 3.4 SPI Controller / LEDs / GPIO. There are also LINK/ACT LEDs on each of the Ethernet channels.

A.8 RIO587 connectors

A.8.1 TH-4M connectors for feeding additional power to the CPC505

There are 2 x TH-4M connectors on the top side of the RIO587 to provide additional +5V power to the CPC505 module: XP3 and XP4.

Table A-7 – Assignment of pins of the TH-4M connectors (XP3 and XP4) for feeding power to the CPC505

Pin	Signal
1	+12V
2	GND
3	GND
4	+5V

A.8.2 PS/2 connector (XS4) for keyboard/mouse

On the rear panel of the RIO587 module there is a PS/2 (XS4) connector for keyboard/mouse.

Table A-8 – Assignment of pins of the PS/2 connector (XS4) for keyboard/mouse

Pin	Signal
1	KBD_DATA
2	MS_DATA
3	GND
4	+5V
5	KBD_CLK
6	MS_CLK

A.8.3 XP6 connector (COM1)

COM1 port (RS232) is routed to the XP6 connector on the rear panel of the RIO587 module.

Table A-9 – Assignment of the XP6 connector pins: COM1 port (RS232)

Pin	Signal
1	DCD
2	RXD
3	TXD
4	DTR
5	GND
6	DSR
7	RTS
8	CTS
9	RI

A.8.4 XS11 connectors (LPT)

On the top side of the RIO587 there is a LPT XS11 connector: IDC-26.

Table A-10 – Assignment of pins of the XS11 connector: LPT port (IDC-26)

Pin	Signal	Pin	Signal
1	STROBE#	2	AFD#
3	D0	4	ERR#
5	D1	6	INIT#
7	D2	8	SLCTIN#
9	D3	10	GND
11	D4	12	GND
13	D5	14	GND
15	D6	16	GND
17	D7	18	GND
19	ACK#	20	GND
21	BUSY	22	GND
23	PE	24	GND
25	SLCT	26	–

A.8.5 XP10-XP12 connectors (COM2-COM4)

The RS-232 ports (COM2/ COM3/ COM4) are routed to the XP10-XP12 (BH-10) connectors on top of the RIO587. COM2- COM4 are 9-wire RS232 interfaces. The ports can be routed to the rear panel in the RIO587-02 version using a flat ribbon cable with an IDC-10 connector.

Table A-11 – Assignment of pins of the XP10-XP12 connectors (COM2-COM4)

Pin	Signal
1	DCD
2	DSR
3	RXD
4	RTS
5	TXD
6	CTS
7	DTR
8	RI
9	GND
10	–

A.8.6 XP7/ XP8 connectors (COM5/COM6)

The RS485 ports (COM5/COM6) are routed to standard rear panel DSUB-9 connectors (XP7/ XP8).

The RS485 (COM5 and COM6) matching circuits can be connected by using jumpers XP13 and XP14 installed on the module, respectively, or by closing pins 2 and 7 of the XP7 and XP8 connectors.

Galvanically isolated Reset is routed to the XP7 connector pins 4 and 9. Isolation is 500 V.

Table A-12 – Assignment of pins of the XP7 connector (COM5, RS485)

Pin	Signal
1	A
2	TERM_A
3	–
4	ISOL_RST
5	ISOL_GND
6	B#
7	TERM_B
8	–
9	ISOL_RST#

Table A-13 – Assignment of pins of the XP8 connector (COM6, RS485)

Pin	Signal
1	A
2	TERM_A
3	–

4	–
5	ISOL_GND
6	B#
7	TERM_B
8	–
9	–

A.8.7 SATA interface

The standard XP15 connector offers a SATA interface with support of the Innodisk SATADOM power supply. In RIO587-02 version the user can connect a 2.5” HDD. XS8 - HDD power connector (see Figure A-3 - RIO587-02 (8HP height)).

Table A-14 – Assignment of the XP15 (SATA) connector pins

Pin	Signal
1	GND
2	A+
3	A–
4	GND
5	B–
6	B+
7	GND/ SATA_DOM +5V

Table A-15 – Assignment of the XS8 HDD

Pin	Signal
1	+5V_HDD
2	GND
3	GND
4	+3.3V

Installing a SATA flash drive (RIO587-01 version)

The Innodisk SATADOM is installed on the RIO587-01 version module (Innodisk SATADOM sold separately). The Innodisk SATADOM is fastened using the parts from the installation kit, see subparagraph A.3. The RIO587-01 module with the SATADOM drive installed is shown in Figure A-5. Install the SATA flash drive before mounting the RIO587-01 module to the CPC505 board.

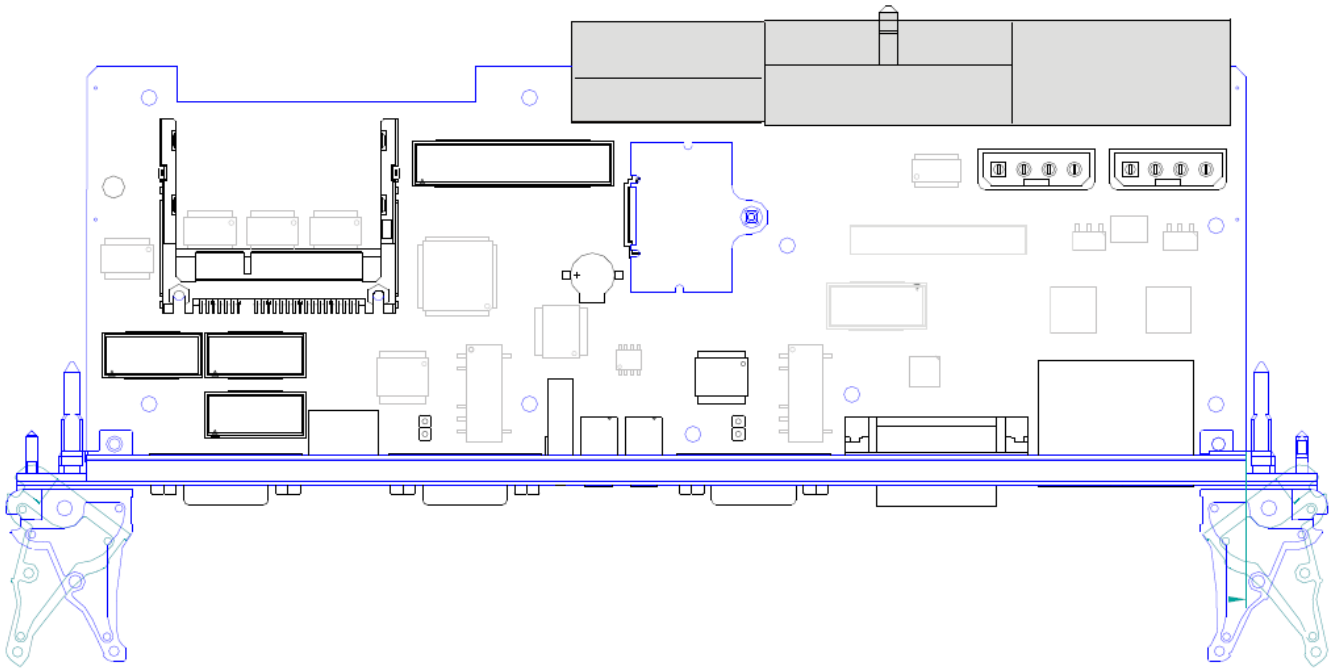


Figure A-5 - RIO587-01 with the mounted SATADOM drive

Warning!

Since the SATA connector supports the ability to power SATADOM modules through pin 7, please see Table A-14 - Assignment of the XP15 (SATA) connector pins, connecting and disconnecting standard SATA drives while the module is on can lead to module or power supply failures. Connecting and disconnecting standard SATA drives is allowed only when the module is turned off.

Warning!

Installing/removing SATADOM flash drive is allowed only when the module power is off.

Installing the HDD 2.5” HDD (RIO587-02 version)

RIO587-02 module with a 2.5” HDD installed is shown in Figure A-6. A set of installation kit is used for HDD mounting, see subparagraph A.3.

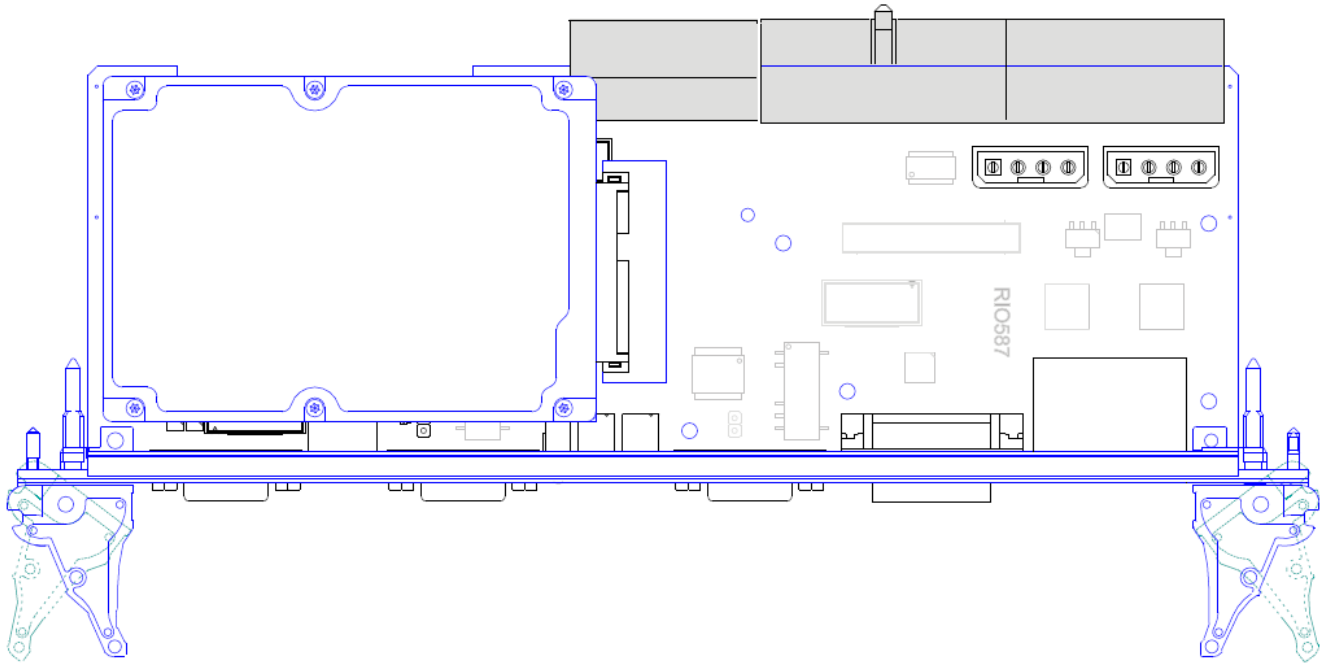


Figure A-6 - RIO587-02 with the installed HDD 2.5"

Attention!

Installation/removal of HDD 2.5” is allowed only when the module’s power supply is off.

Attention!

The hard disks with 12V power supply are not supported.

A.8.8 CFast card connector (XS5)

The tope side of the RIO587 has an XS5 connector for a CFast (Compact Flash with SATA interface) card.

Table A-16 – Assignment of the CFast (XS5) card connector pins

Pin	Signal
S7	GND
S6	A+
S5	A–
S4	GND

S3	B–
S2	B+
S1	GND
P1	CDI
P2	GND
P3	–
P4	–
P5	–
P6	–
P7	GND
P8	–
P9	–
P10	–
P11	–
P12	–
P13	+3.3V
P14	+3.3V
P15	GND
P16	GND
P17	CDO

A.8.9 XP5 connector (GPIO and 3.3V power)

The GPIO0-GPIO7 lines and the 3.3V power supply (XP5) are routed to the BH-10 connector. The GPIO lines are operated via the I/O ports described in subparagraph 3.4.

Table A-17 – Assignment of the XP5 connector pins (GPIO and 3.3V power supply)

Pin	Signal
1	+3.3V
2	GND
3	GPIO0
4	GPIO1
5	GPIO2
6	GPIO3
7	GPIO4
8	GPIO5
9	GPIO6
10	GPIO7

A.8.10 XP16 connector (LVDS)

Two-channel LVDS is routed to the XP16 connector.

Table A-18 – Assignment of the XP16 connector pins (LVDS)

Pin number	Function	Note
1	VCC	Voltage is selected with the XP17 jumper (see paragraph A.9.2)
2	VCC	Voltage is selected with the XP17 jumper (see paragraph A.9.2)
3	GND	
4	GND	
5	DDC_CLK	Level 3.3V
6	DDC_DAT	Level 3.3V
7	GND	
8	GND	
9	LVDSA_CLK	
10	LVDSA_CLK#	
11	GND	
12	GND	
13	LVDSA_DATA0	
14	LVDSA_DATA0#	
15	LVDSA_DATA1	
16	LVDSA_DATA1#	
17	GND	
18	GND	
19	LVDSA_DATA2	
20	LVDSA_DATA2#	
21	LVDSA_DATA3	
22	LVDSA_DATA3#	
23	GND	
24	GND	
25	LVDSB_DATA3#	
26	LVDSB_DATA3	
27	GND	
28	GND	
29	LVDSB_DATA2#	
30	LVDSB_DATA2	
31	LVDSB_DATA1#	
32	LVDSB_DATA1	
33	GND	
34	GND	
35	LVDSB_DATA0#	
36	LVDSB_DATA0	
37	LVDSB_CLK#	
38	LVDSB_CLK	
39	GND	
40	GND	

XP16 connector mating part: Hirose DF13-40DS-1.25C.

A.8.11 LCD panel backlight power connector

The XP19 connector is installed for power supply of the LCD panel backlight.

Table A-19 – Assignment of the XP19 connector pins (LCD panel backlight)

Pin number	Function	Note
1	VCC	Voltage is selected with the XP18 jumper (see paragraph A.9.3)
2	VCC	Voltage is selected with the XP18 jumper (see paragraph A.9.3)
3	GND	
4	GND	
5	BKL_EN	Level 5V
6	BKL_PWM	Level 5V
7	BKL_CLK	Level 5V
8	BKL_DAT	Level 5V

Mating part of the XP19 connector: JST PHR-8.

A.8.12 XS11 connector (Gigabit Ethernet)

There is a dual Gigabit Ethernet connector (XS11) on the rear panel of the RIO587 module. The pin assignment is described in subparagraph 3.2.3.2 Interface 2.5 Gigabit Ethernet.

A.9 Configuring and preparing the RIO587 module for operation

A.9.1 Connection of RS485 mating circuits

To connect the RS485 mating circuits on the RIO587 board the XP13 (for COM5 (XP7)) and XP14 (for COM6 (XP8)) double-pin switches must be closed. XP13 and XP14 are located near the COM5/ COM6 connectors). Upon delivery, the XP13 and XP14 switches are open.

The mating circuits of the COM5/COM6 ports are also connected by closing pins 2 and 7 of the XP7/ XP8 connectors respectively (see A.8.6 XP7/ XP8 (COM5/COM6) connectors).

A.9.2 Jumper XP17 – selecting power supply voltage for LCD panel matrix

The LCD panel matrix power supply voltage can be selected by setting the jumper on the XP17:

Pins 1-2 are closed: 3.3 V.

Pins 2-3 are closed: 5 V.

A.9.3 Jumper XP18 – selecting a power supply voltage for LCD panel backlight

The power supply voltage of the LCD panel backlight can be selected by setting the jumper on the XP18:

Pins 1-2 are closed: 5 V.

Pins 2-3 are closed: 12 V (the voltage must be additionally supplied via the XP3 or XP4 connectors (see subparagraph A.8.1)).

A.9.4 Reset on the rear panel

The Reset button (RST) on the rear panel of the RIO587 module initiates a “cold restart” of the module (without power shutdown of the module). The button is recessed to prevent accidental pressing (it can be pressed with a long thin object). The button is sunken which prevents accidental pressing (can be pressed using a long thin object).

A.9.5 Reset on pins 4 and 9 of the XP7 connector

The XP7 connector pins 4 and 9 have a galvanically isolated Reset. The isolation is 500 V.

A.9.6 Cooling system requirements

The board must operate within the stated temperature ranges with forced ventilation as part of the structure.

A.9.7 Power supply requirements for the RIO587

The power supply voltage +5 V, +3.3 V is supplied from the CPC505 module.

Table A- 20 – Power supply requirements for the RIO587

Voltage (V)	Minimum (V)	Maximum (V)
+5	4.75	5.25
+3.3	3.15	3.46

The current consumption of the modules (not including power supply to external circuits) does not exceed the values given in the table below.

Table A-21 – Current consumption of the modules

Module	Current consumption, A, no more than	
	+3.3 V	+5 V
RIO587	1.3	0.2

A.9.8 RIO587 module installation and removal

The RIO587 is installed on the back side of the system chassis opposite the CPC505 processor board in the corresponding backplane slot. Follow the rules listed in Section 4 when installing and removing the RIO587.

A.10 RIO587 operating conditions and MTBF

The device shall maintain its performance under climatic and mechanical conditions specified in the table:

Table A- 22 – Exposure of external factors during operation of the RIO587

Type of the exposure	Parameter name	Parameter value	Document
Temperature change	Low temperature	- 40°C (0°C)*	GOST 28209-89 (IEC 68-2-14-84)
	High temperature	+ 85°C (+70°C)*	
Sinusoidal vibration	Frequency range (Hz)	10…500	GOST 28203-89 (IEC 68-2-6-82)
	Acceleration, g	2	
Single shocks	Peak acceleration, g	30	GOST 28213-89 (IEC 68-2-27-87)
Multiple shocks	Peak acceleration, g	10	GOST 28215-89 (IEC 68-2-27-87)
	Number of shocks	1000	

**For commercial version.*

Modules are resistant to cyclic damp heat at ambient temperatures +(55± 2) °C, relative humidity (93±3)% (with conformal coating: option \Coated) in accordance with the GOST 28216-89 (IEC 68-2-30-82).

The average MTBF (mean time between failures) of the RIO587 module is not less than 350,000 hours.

ANNEX B

MIC1901 mezzanine module

B.1 Introduction

The MIC1901 mezzanine module is designed for being used in conjunction with the CPC505 CPU module to expand the basic functions of the CPU module. The MIC1901 is used in systems operated in harsh environments.

Software compatibility with OS:

- Windows 7 (Windows Embedded Standard 7);
- Linux 2.6;
- QNX 6.5.0 (upon request);

The MIC1901 module is installed directly on the CPC505 board in the corresponding XMC slot.

B.2 I/O Channel Structure of the MIC1901

The module is available in one MIC1901-01 version and allows the following interfaces:

Table B-1 – Interfaces on the front panel of the MIC1901 module

Interface	Quantity	Note
Audio	1	Mic and LineIn inputs, LineOut output
LAN 10/100/1000 Mb	2	Switchable on the CPC505 between the backplane and the XMC connector

On the bottom side of the module there is also a CFast card slot, a SATA3 channel and an XS8 connector (see Figure B-2 - Identification of the MIC1901 main components in the bottom view). Fastening of the card is included in the delivery checklist.

B.3 Temperature range of the MIC1901

The MIC1901 modules are resistant to changes in ambient temperature according to the table:

Table B-2 – Temperature range of the MIC1901

Characteristics	MIC1901-01
Low temperature	- 40°C
High temperature	+ 85°C

With a conformal coating (option \Coated), the modules are resistant to cyclic damp heat at ambient temperature of + (55± 2) °C, relative humidity (93±3)%.

B.4 Appearance of the MIC1901 and layout of main elements

The below figures are provided to help you identify components and understand their locations and functions.

B.4.1 Block diagram of MIC1901

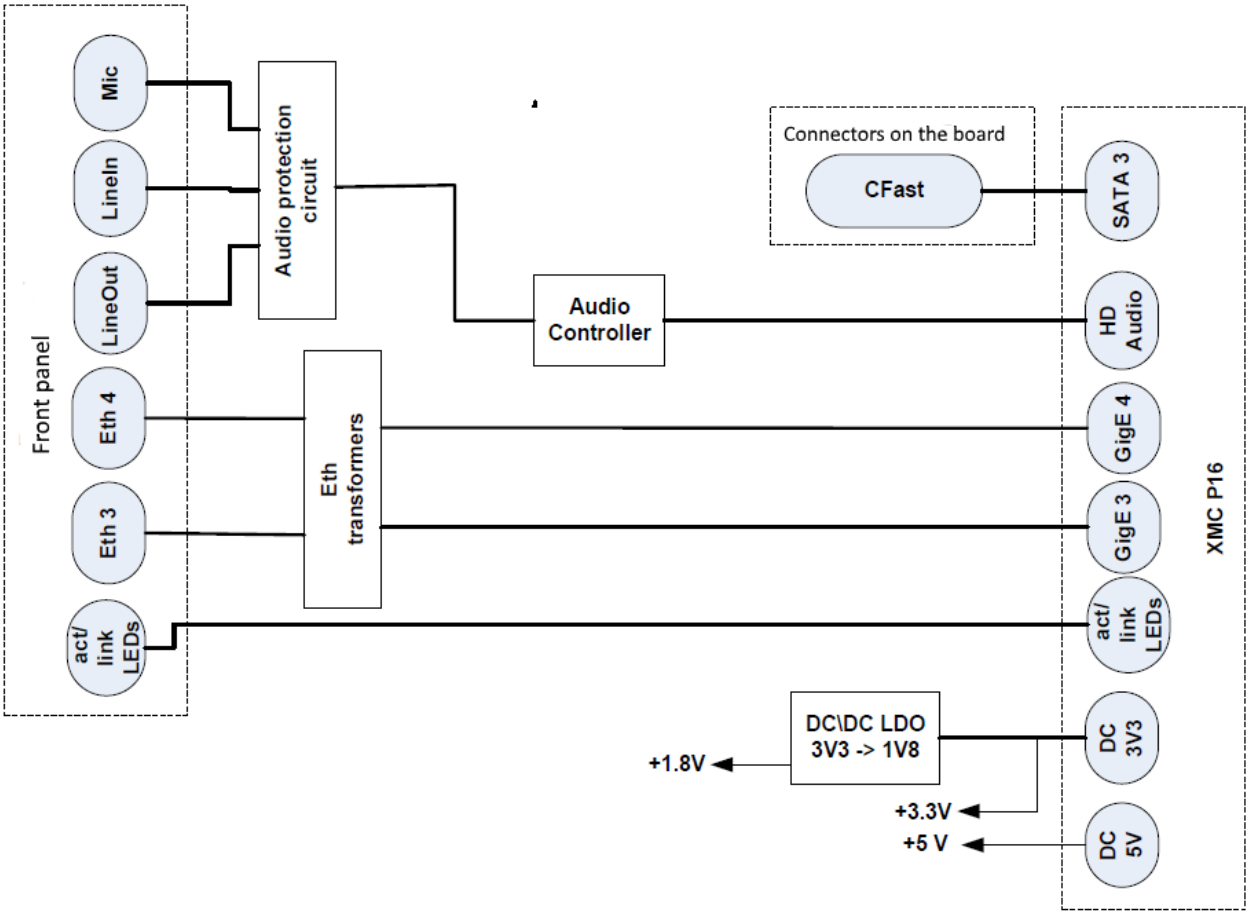


Figure B - 1 – Block diagram MIC1901

B.4.2 Layout of MIC1901 main components

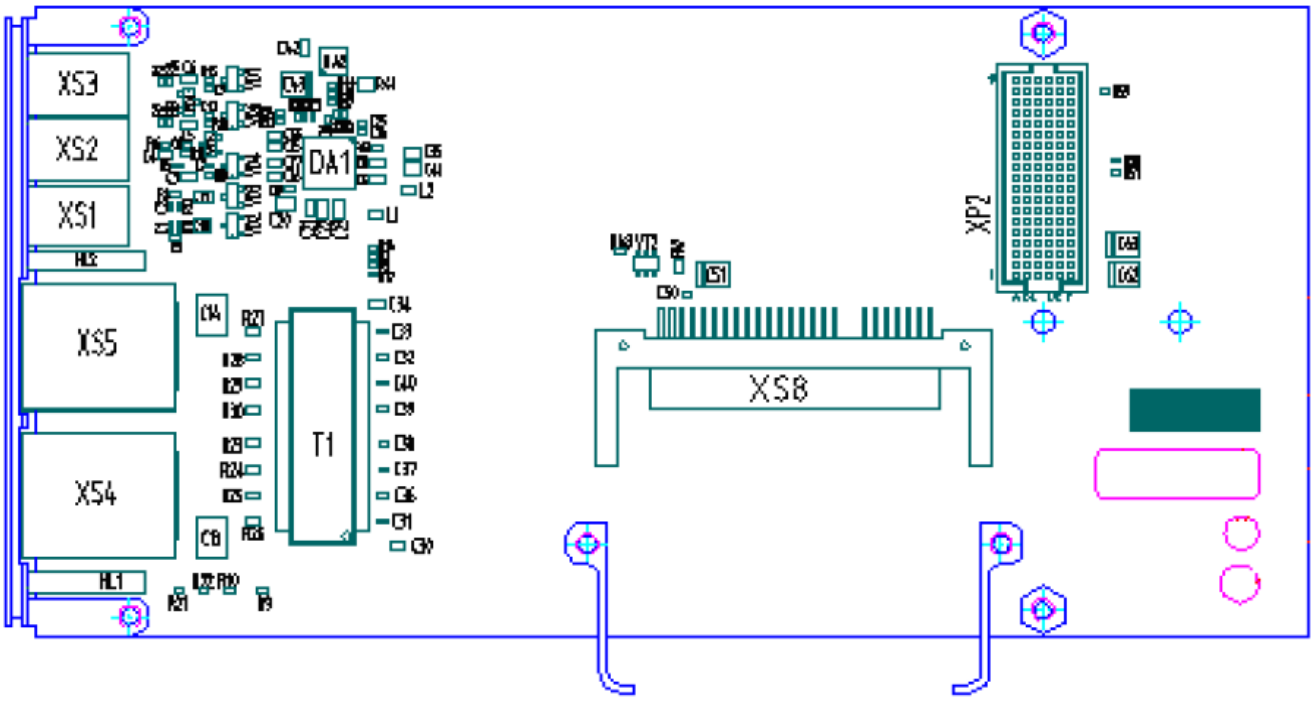


Figure B-2 – Designation of the MIC1901 main components in the bottom view

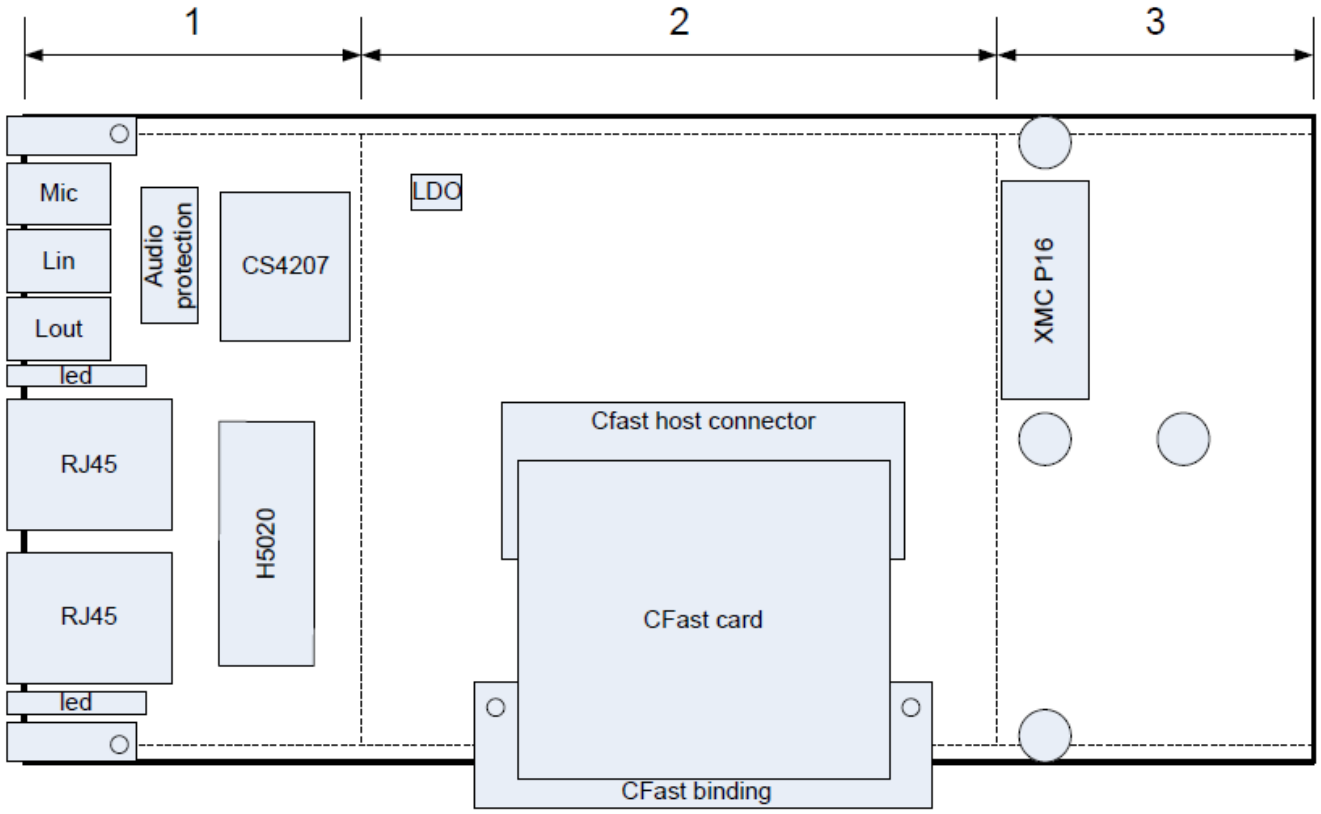


Figure B-3 – Layout of the MIC1901 main components on the bottom view

In area 1, the maximum height of the components is 9.5mm.

In area 2. the maximum height of the components is 4.7mm.

Area 3 is the area where the connectors are mounted.

B.4.3 Weight and dimensions и of the MIC1901

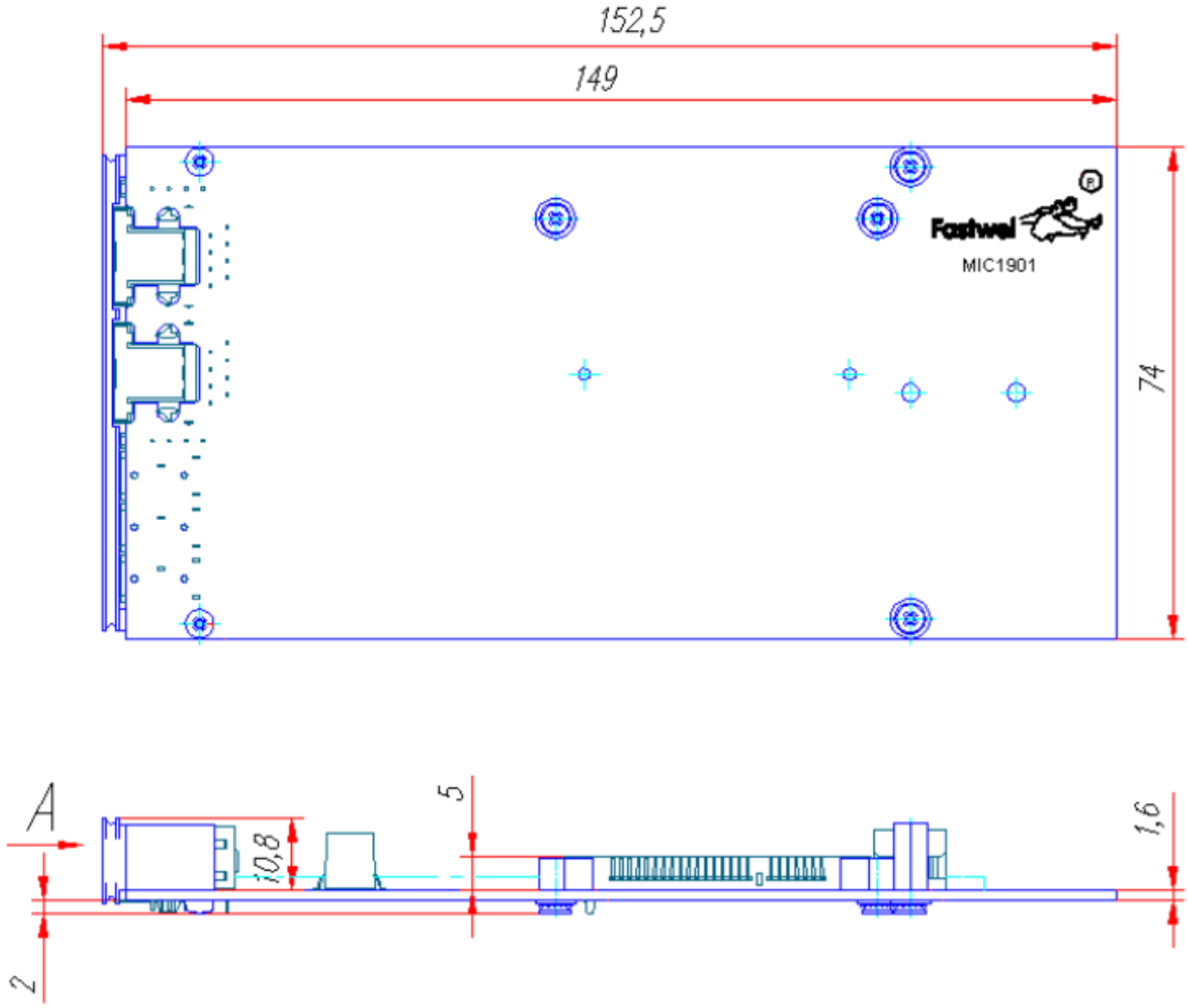


Figure B-4 - MIC1901: mounting and outside dimensions

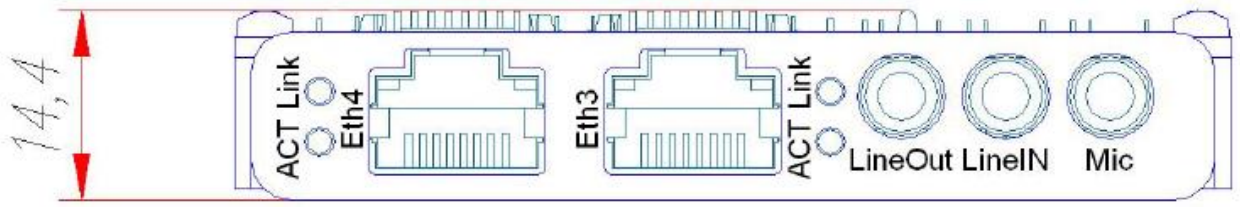


Figure B-5 - MIC1901: front panel with designation of connectors

Table B-3 - MIC1901: Overall dimensions

Assembly option	Overall dimensions, mm
With CFast holder	152.5 x 81.0 x 14.4
Without CFast holder	152.5 x 74.0 x 14.4

Device weight (without holder and drive): max. 0.080 kg.

B.5 Information on MIC1901 packaging

The MIC1901 is delivered in a box measuring 230x155x45 mm.

The weight of the packaged device is 0.250 kg.

Note

Please retain the anti-static packaging and customer packaging of the module in its original condition until the end of the warranty period.

B.6 Delivery checklist of the MIC1901

The MIC1901 module package includes the items listed below.

- IMES.467921.006 – Installation kit, 1 pcs:
  1. IMES.741522.006 – holder, 2 pcs.
  2. Screw M2,5x6 DIN965 (countersunk, for holder mounting) 2 pcs.
  3. Screw M2,5x6 DIN7985 (with semi-cylindrical head, for fastening the MIC1901 module to CPC505), 4 pcs.
  4. Washer DIN125-2,7-A2 (for mounting of the holder), 2 pcs.
  5. Lock washer DIN6798J-3,2-A2 (for mounting of the holder), 2 pcs.
- Packaging;

B.7 Specific performance features of the MIC1901 functional nodes

- HDAudio:

LineIN and Mic inputs and LineOut output are routed to the front panel.

- Gigabit Ethernet:

2 x ports are routed to the front panel, switchable on the CPC505 between the Switching Backplane PICMG2.16 and XMC slots.

- SATA interface:

Allows you to connect CFast drives over the SATA3 channel.

- LED indication

LINK/ACT LEDs on each of the Ethernet channels on the front panel.

B.8 Pinout charts of the MIC1901 connectors

B.8.1 XP2 connector (XMC P16)

The XMC P16 connector (XP2 on the MIC1901) is used to connect the module to the CPC505 board. The pin assignment is described in section 3.2.1.1 XMC interface.

B.8.2 Connector for CFast card (XS5)

The MIC1901 has a CFast card connector XS8 on the bottom side.

Table B-4 – Assignment of pins of the CFast (XS8) card connector

Pin	Signal	Pin	Signal
S7	GND	P6	–
S6	A+	P7	GND
S5	A–	P8	–
S4	GND	P9	–
S3	B–	P10	–
S2	B+	P11	–
S1	GND	P12	–
P1	CDI	P13	+3.3V
P2	GND	P14	+3.3V
P3	–	P15	GND
P4	–	P16	GND
P5	–	P17	CDO

B.8.3 Mic, LineIn, LineOut connectors (XS3)

The front panel is equipped with the 3.5” StereoJack (XS3) microphone and line inputs and a line output:

Table B-5 – Assignment of pins of the Mic, LineIn, LineOut connectors (XS3)

Pin	Signal
1	GND
2	Right Channel
3	Left Channel

B.8.4 Gigabit Ethernet connector (XS5, XS4)

The MIC1901 has Gigabit Ethernet connectors (XS5 and XS4) on the front panel. The pin assignment is described in section 3.2.3.2 Interface 2.5 Gigabit Ethernet.

B.9 Installation and preparation of the MIC1901 for operation

B.9.1 Cooling system requirements

The board shall operate within the stated temperature ranges with forced ventilation as part of the design.

B.9.2 Power supply requirements of the MIC1901

The +5 V, +3.3 V power supply voltage is supplied from the CPC505 module via the XMC P16 connector. The maximum rated power consumption without connected peripheral devices is shown in the table below.

Table B-6 – Power supply requirements of the MIC1901

Voltage (V)	Minimum (V)	Maximum (V)	Power supply current MAX (A)
+5 V	4.75	5.25	0.1
+3.3 V	3.135	3.46	0.1

B.9.3 Installing the MIC1901 to the CPC505

The MIC1901 is installed on the top side of the CPC505 board into the XMC P16 connector (labeled XP2 on the MIC1901 board). The pin assignment is described in subparagraph 3.2.1.1 XMC Interface. When installing and removing the MIC1901, follow the rules listed in paragraph 4.

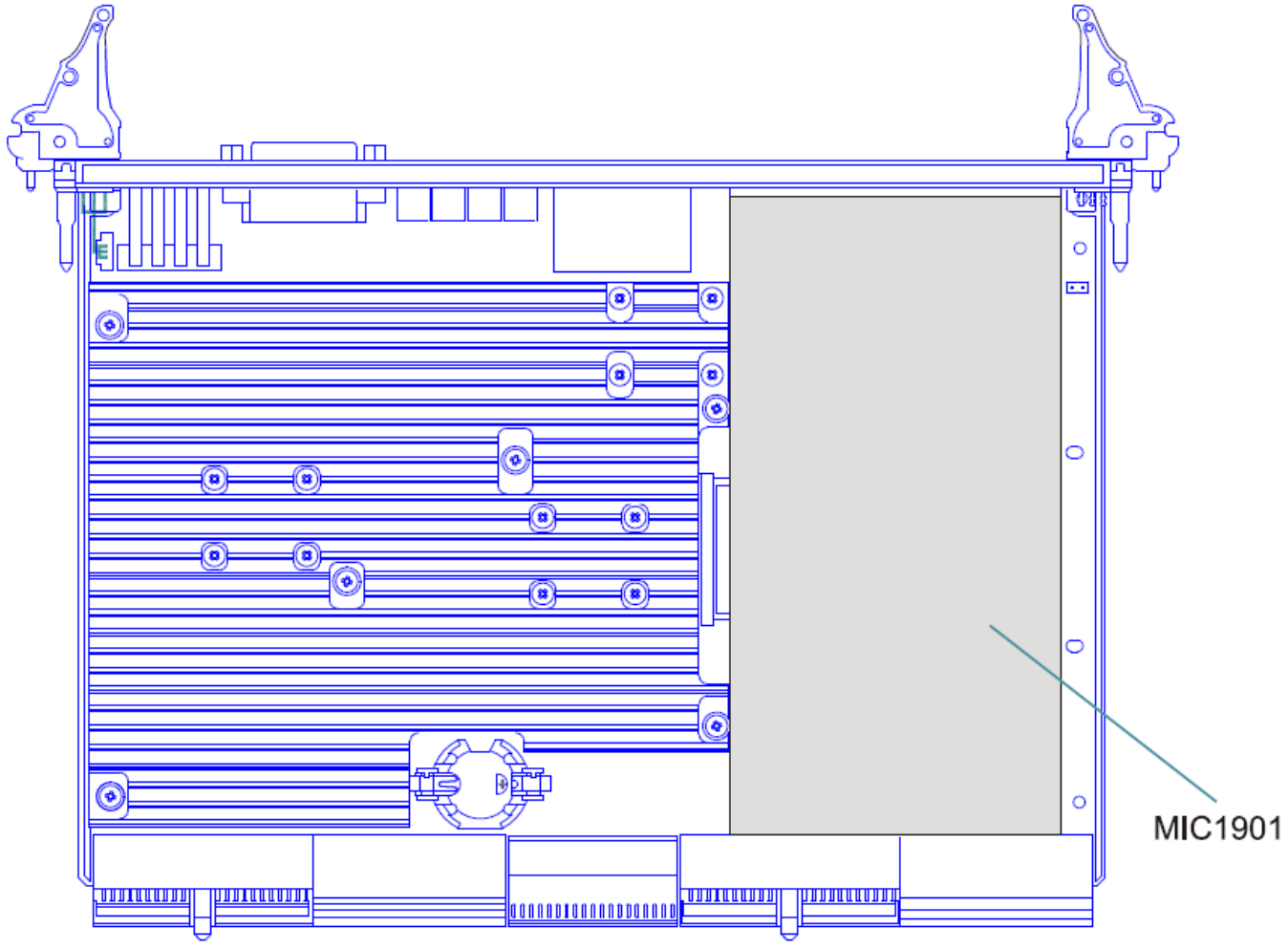


Figure B-6 - Schematic representation of the CPC505 with the MIC1901 installed

Before installing the MIC1901 on the CPC505 module, you must remove the plug from the front panel of the CPC505 (see Figure B-7) to allow access to the front panel connectors of the MIC1901 module.

Figure B-7 – View of the CPC505 front panel with the MIC1901 module installed

For fastening the MIC1901 module to the CPC505 (the racks are mounted to MIC1901 by the manufacturer) use the M2.5x6 DIN7985 screws (4 pcs.) with semi-cylindrical head from the delivery checklist (see subsection B.6).

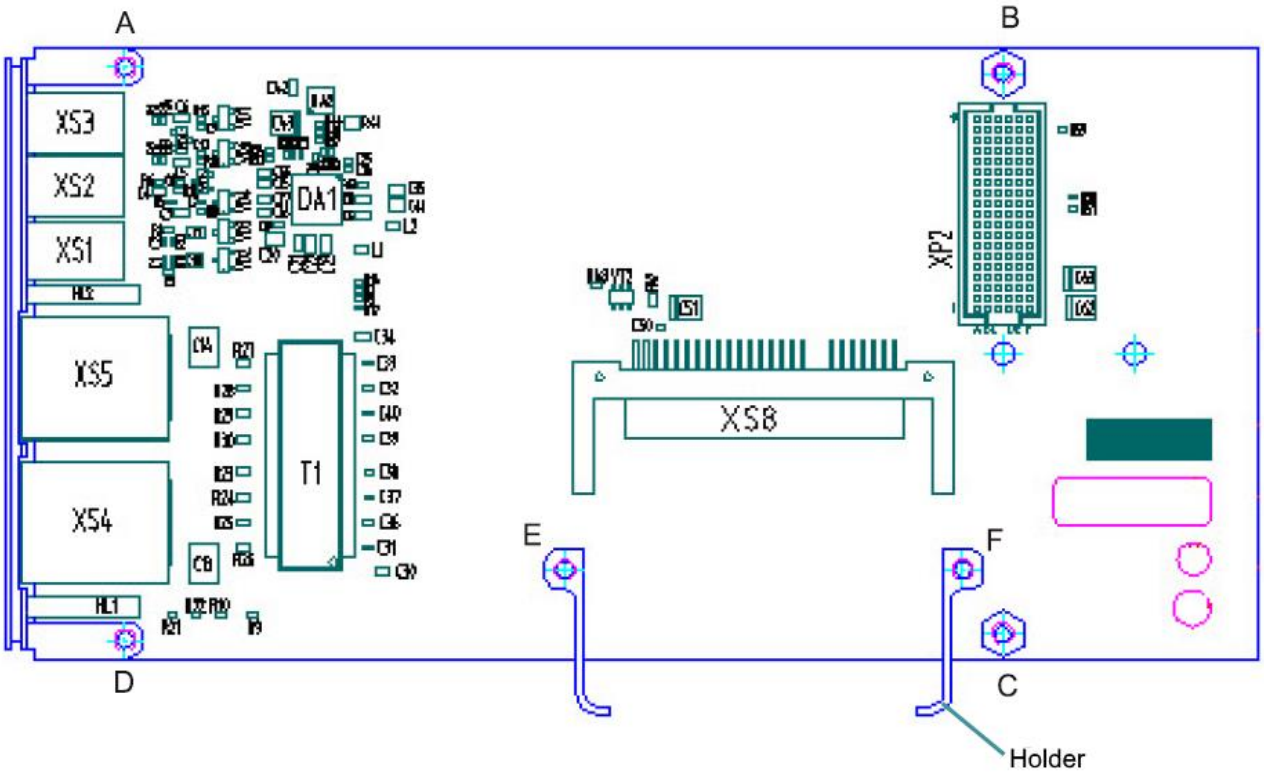


Figure B-8 - Designation of fixing positions on the MIC1901 (bottom view)

The figure shows positions A, B, C, D for mounting the MIC1901 module to the CPC505.

B.9.4 Mounting Memory Module Holders to MIC1901

The MIC1901 memory module holders (see Figure B - 8) are supplied with the MIC1901 (see sub-section B.6). You should mount the holders to the MIC1901 board according to B-9, positions E and F using countersunk head screws M2,5x6 DIN965 (2 pcs.), washers (washer 2.5 DIN125 (2 pcs.) and lock washer 3 DIN6798J (2 pcs.)). The screws and washers are also included in the MIC1901 delivery checklist.

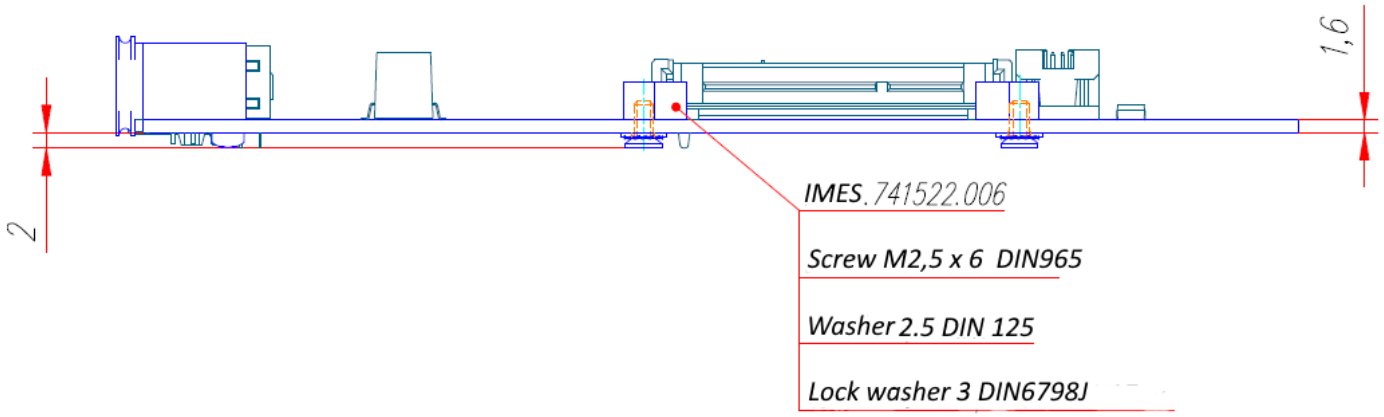


Figure B- 9 – Installation of holders to MIC1901

B.10 Operating Conditions of the MIC1901 and MTBF

The device must be able to operate under the following climatic and mechanical conditions:

Table B- 7 - MIC1901 operating conditions

Type of exposure	Parameter name	Parameter value	Document
Temperature change	Low temperature	- 40°C	GOST 28209-89 (IEC 68-2-14-84)
	High temperature	+ 85°C	
Sinusoidal vibration	Frequency range (Hz)	10…500	GOST 28203-89 (IEC 68-2-6-82)
	Acceleration, g	2	
Single shocks	Peak acceleration, g	30	GOST 28213-89 (IEC 68-2-27-87)
Multiple shocks	Peak acceleration, g	10	GOST 28215-89 (IEC 68-2-27-87)
	Number of shocks	1000	

The modules are resistant to cyclic damp heat at ambient temperature of + (55±2) °C, relative humidity (93±3)% (with conformal coating: \Coated option) in accordance with the GOST 28216-89 standard (IEC 68-2-30-82).

MTBF (Mean Time Between Failure) of the MIC1901 is min. 1,900,000 hours.

ANNEX C

Terms and abbreviations

Term	Definition
ACPI	Advanced Configuration and Power Interface
AGP	Accelerated Graphics Port
AGTL	Advanced Gunning Transceiver Logic
BIOS	Basic Input-Output System
BMC	Baseboard Management Controller
cPCI	CompactPCI
CRT-display	Cathode Ray Tube Display
DAC	Digital-Analog Converter
DDR SDRAM	Double Data Rate Synchronous Dynamic Random Access Memory
DMA	Direct Memory Access
DMI	Direct Media Interface
DVMT	Dynamic Video Memory Technology
ECC	Error Correction Code
ECP/EPP	Extended Capabilities Port / Enhanced Parallel Port

EEPROM	Electrically Erasable Programmable Read-Only Memory
EHCI	Enhanced Host Controller Interface (Universal Serial Bus specification)
EIDE	Enhanced Integrated Drive Electronics
EOS	Electrical Overstress
ESD	Electrostatically Sensitive Device
FDD	Floppy Disk Drive
FSB	Frequency System Bus
FWH	Firmware Hub
GMCH	Graphics and Memory Controller Hub
I2C™	Inter Intergrated Circuit
LCD	Liquid crystal display
LPC	Low Pin Count
LVDS	Low Voltage Differential Signal
NAND Flash	Not And (electronic logic gate)
MDI	Media Dependent Interface
PC	Personal Computer
PIO	Programmed Input/Output
PLCC	Plastic Leaded Chip Carrier
PM	Peripheral Management Controller

POST	Power On Self Test
PSB	Processor System Bus
PWM output	Pulse-Width Modulation
RAMDAC	Random Access Memory Digital-to-Analog Converter
Rear I/O Board	Rear Input-Output Board
RTC	Real Time Clock
SMB	System Management Bus
SMBus	System Management Bus
SODIMM	Small Outline Dual In-Line Memory Module
SoM	System on a module
SSD	Solid State Disk
TFT	Thin Film Transistor
TTL	Transistor-Transistor Logic
UART	Universal Asynchronous Receiver-Transmitter
UHCI	Universal Host Controller Interface
USB	Universal Serial Bus
UTP	Unshielded Twisted Pair

ANNEX:D DISCLAIMER

This Disclaimer contains special operating conditions of Fastwel in the following areas: intellectual property, warranty policy, conditions of the order and delivery.

1 INTELLECTUAL PRORETY

1.1 If any infraction, interference, improper use, illegitimate exploitation and/or violation of the industrial and/or intellectual property rights of any third party and/or property, exploitation during the use of Fastwel Embedded Module will take place – Fastwel does not guarantee to replace the materials, computer programs, procedures or equipment affected by the complaint and under no circumstances doesn't bear responsibility in any form for possible refusal in case of such a replacement.
1.2 Use of the Fastwel products as well as the objects of intellectual property containing in them, in the ways and for the purposes, not provided by the present user manual and datasheet isn't allowed without preliminary written approval of Fastwel.
1.3 Fastwel is not responsible for possible incidents and losses, related to the operation of end devices, in which the original Fastwel equipment is used.

2 WARRANTY POLICY

2.1 When the detected flaws in an element can be corrected without decreasing the foreseen technical features and functionality for it, User may demand Fastwel the urgent correction of the failures in additionally agreed period and an increasing of the period of the guarantee of the element equal as the time elapsed from the formal request to repair the failures, until the receipt of the repaired element. All costs associated to the correction of failures, included those of assembly, dismantle, transport, tests, etc, if they exist, shall be prosecuted according the Warranty Policy of Fastwel.

3 ORDER AND DELIVERY CONDITIONS

3.1 The general rule is that all Fastwel equipment prices are determined with due consideration of delivery under the EXW terms and conditions (Incoterms 2010). Delivery of the products under other terms and conditions should be preliminary agreed and stated in writing between the parties.
3.2 Unless otherwise expressly agreed with Fastwel, all the deliveries of Fastwel equipment will be carried out only after the official purchase order is obtained and provided that the ordered products have been prepaid in full. Other terms and conditions of cooperation should be made in writing.
3.3 Any delivery of Fastwel electronics is submitted with the right package in accordance with the current rules and standards in the Member States of the European Economic Area. The purchaser independently bears all risks regarding the compliance of package and marking of Fastwel products with legislation requirements being in effect at the place of purchased products destination (in the buyer's country). The specified condition excludes unequivocally any liability of Fastwel for possible non-compliance of package and marking of products with the requirements of legislation of the country of products destination.
3.4 In general, all components of the supply are properly protected with respect to freight, in order to avoid any damage to the supply, third parties, environmental damages or unrelated goods, as consequence of wrong packaging.
3.5 Each package unit is labeled on the exterior area with the indications of product's Part Number and Serial Number.
3.6 The support documents for the order should be made either in English or in Russian unless otherwise agreed between parties in writing.
3.7 Fastwel does not pay penalties and does not cover costs associated with delay in the delivery of the products caused by actions of the third parties, force-majeure etc. - Fastwel doesn't bear any responsibility for non-execution or inadequate execution of the obligations in a case when it is caused by actions of the third parties (for example producers or suppliers of accessories), force majeure etc.
3.8 Fastwel declares that independently and at any time without damage, it has an exclusive right to define and change functionality architecture, bill of materials of its products without any preliminary coordination and approvals of the third parties.

4 OTHER CONDITIONS

4.1 Fastwel has the obligation to respect the current Russian legislation (including, but not limited to environmental, labor, social laws) in each moment and to apply it to its embedded electronics considering all and each execution phase, that is to say, from the design until the commissioning and subsequent maintenance. In this regard Fastwel is not liable to the user or other persons in connection with possible changes of the company's rules (including, but not limited to warranty, ordering policy) caused by changes of the Russian legislation.
4.2 Unless otherwise expressly agreed in writing, Fastwel provides no training for assembly\installation\adjustment\operation of its equipment.