CPC600

6U VME
Intel Pentium M Based
Processor Module

User Manual

Rev. 004b E

September 2014

The product described in this manual is compliant to all related CE standards.

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001	Preliminary version	CPC600, RIO680	July 2006
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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!

This sign marks warnings about hot surfaces. The surface of the heatsink and some components can get very hot during operation. Take due care when handling, avoid touching hot surfaces!

Caution: Electric Shock!

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

Warning!

When handling this product, special care must be taken not to hit the heatsink (if installed) against another rigid object. Also, be careful not to drop the product, since this may cause damage to the heatsink, CPU or other sensitive components as well.

Please, keep in mind that any physical damage to this product is not covered under warranty.

Note:

This product is guaranteed to operate within the published temperature ranges and relevant conditions. However, prolonged operation near the maximum temperature is not recommended by Fastwel or by electronic chip manufacturers due to thermal stress related failure mechanisms. These mechanisms are common to all silicon devices, they can reduce the MTBF of the product by increasing the failure probability. Prolonged operation at the lower limits of the temperature ranges has no limitations.

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.

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:

- Preferably, unpack or pack this product only at EOS/ESD safe workplaces. Otherwise, it is important to be electrically discharged before touching the product. This can be done by touching a metal part of your system case with your hand or tool. It is particularly important to observe anti-static precautions when setting jumpers or replacing components.
- If the product contains batteries for RTC or memory back-up, ensure that the module is not placed on conductive surfaces, including anti-static mats or sponges. This can cause short-circuit and result in damage to the battery and other components.
- Store this product in its protective packaging while it is not used for operational purposes.

Unpacking

The product is carefully packed in an antistatic bag and in a carton box to protect it against possible damage and harmful influence during shipping. Unpack the product indoors only at a temperature not less than +15°C and relative humidity not more than 70%. Please note, that if the product was exposed to the temperatures below 0°C for a long time, it is necessary to keep it at normal conditions for at least 24 hours before unpacking. Do not keep the product close to a heat source.

Following ESD precautions, carefully take the product out of the shipping carton box. Proper handling of the product is critical to ensure correct operation and long-term reliability. When unpacking the product, and whenever handling it thereafter, be sure to hold the module preferably by the front panel, card edges or ejector handles. Avoid touching the components and connectors.

Retain all original packaging at least until the warranty period is over. You may need it for shipments or for storage of the product.

Initial Inspection

Although the product is carefully packaged, it is still possible that shipping damages may occur. Careful inspection of the shipping carton can reveal evidence of damage or rough handling. Should you notice that the package is damaged, please notify the shipping service and the manufacturer as soon as possible. Retain the damaged packing material for inspection.

After unpacking the product, you should inspect it for visible damage that could have occurred during shipping or unpacking. If damage is observed (usually in the form of bent component leads or loose socketed components), contact Fastwel's official distributor from which you have purchased the product for additional instructions. Depending on the severity of the damage, the product may even need to be returned to the factory for repair. DO NOT apply power to the product if it has visible damage. Doing so may cause further, possibly irreparable damage, as well as result in a fire or electric shock hazard.

If the product contains socketed components, they should be inspected to make sure they are seated fully in their sockets.

Handling

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

In order to keep Fastwel's warranty, you must not change or modify this product in any way, other than specifically approved by Fastwel or described in this manual.

Technical characteristics of the systems in which this product is installed, such as operating temperature ranges and power supply parameters, should conform to the requirements stated by this document.

Retain all the original packaging, you will need it to pack the product for shipping in warranty cases or for safe storage. Please, pack the product for transportation in the way it was packed by the supplier.

When handling the product, please, remember that the module, its components and connectors require delicate care. Always keep in mind the ESD sensitivity of the product.

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.

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 Overview

The product described in this Manual is a 6U VME processor module CPC600. To get the details about the VME, a wide spread standard used in embedded industrial systems, please refer to VME specifications. The Internet sites of VITA (The VMEbus International Trade Association, http:\\www.vita.com) and VMEbus Systems publication (http://www.vmebus-systems.com/) provide comprehensive and up-to-date information on VME-related specifications and applications.

CPC600 is based on Intel Pentium M or Celeron M processors in the μFCPGA478 or μFCBGA479 packages operating at various processor speeds and a Processor Side Bus (PSB) running at 400 MHz. The Intel Pentium M processor core with integrated 64 KB L1 and up to 2048 KB L2 cache provides its unique performance to power consumption ratio. The CPC600 utilizes the chipset including Intel 82855GME GMCH and 6300ESB ICH.

The board supports PC2700 DDR SDRAM memory modules with ECC: 1 GB of soldered memory and up to 1 GB in 200-pin SODIMM socket.

System features include up to four Gigabit Ethernet ports on PCI-X bus and a built-in Intel 2D/3D Graphics accelerator with up to 64 MB memory shared with system for enhanced graphics performance with VGA CRT-display and with TFT LVDS interfaces. LVDS interface is routed to the P0 VME connector for future use via a rear I/O module; it is not realized on the current version of RIO680 rear I/O board.

The board employs Tundra Tsi148™, the PCI-X to VME bridge developed by Tundra Semiconductor Corporation. It provides PCI-X-to-VME 2eSST performance levels, being the highest bandwidth bridge of this type available. At the same time it is backward compatible with older standards.

The CPC600 comes with the following PC interfaces including: six USB 2.0 ports, three COM ports, two EIDE ATA100 interfaces, one CompactFlash Type I socket, one Floppy port, one parallel port, two SATA channels, and, moreover, three standard VME connectors P0, P1, and P2 at the rear side of the card. Please refer to *CPC600 Versions* section and to *Rear I/O Interfaces* subsection for details on interfaces available on different versions.

CPC600 employs thoroughly selected components for embedded industrial systems to ensure their long term availability.

The board supports QNX 4.25, 3.3; Linux® 2.4.31, and FastwelDOS (MS DOS compatible) operating systems.

Some of the CPC600's features are:

- Intel® Pentium® M or Celeron® M processors
- Up to 2 MB L2 on-die cache running at CPU speed
- Chipset: 82855GME GMCH and 6300ESB ICH
- 400 MHz processor system bus
- PC2700 (DDR333) DDR SDRAM memory with ECC:
  - 1 GB of soldered memory
  - Up to 1 GB memory module in 200-pin SODIMM socket
- VMEbus
  - ANSI/VITA 1, VME64
  - ANSI/VITA 1.1, VME64 Extensions
  - ANSI/VITA 1.5, 2eSST
- Integrated 3D high performance VGA controller
  - 64 MB memory shared with system
  - CRT-displays support with resolutions of up to 2048 x 1536 pixels at 16 bits and 75 Hz
  - LVDS interface support via rear I/O (not available on the current version of RIO680)
- Up to four Gigabit Ethernet interfaces (via PCI-X bus): 10Base-T, 100Base-TX, and 1000Base-T (*)
- Two EIDE Ultra ATA/100 channels
- Two SATA channels (*)
- Onboard CompactFlash Type I socket
- Three serial ports (*)
- Up to six USB 2.0 ports (*)
- PS/2 keyboard and mouse interface (*)
- Floppy disk interface (*)
- Parallel port (*)
- Hardware monitor (LM82)
- Watchdog timer
- Additional counters and timers integrated in the ICH
- Real-time clock with battery backup
- 1 MB on-board FWH
- 4HP, 6U VME form-factor
- Rear I/O capability (for CPC600-01 and -02)
- 64-bit PMC modules support (ANSI/VITA 35-200) with PMC I/O mapping to VME P2
- Passive or active heatsink solution
- Phoenix® BIOS

(*) – Please refer to CPC600 Versions section and to Rear I/O Interfaces subsection for details.

1.2 CPC600 Versions

At the present time, the module is offered in flexible configuration. The options include different processors, the size of SODIMM system memory, and other options described in this section.

All variants are available in two versions, for industrial (-40°C to +85°C) and for commercial (0°C to +70°C) temperature ranges. Other configuration options are available upon request.

The customer can choose necessary configuration options using the following template:

1	–	2	–	3	–	4	–	5	\	6

1 Basic product name:

CPC600

2 Version:

Features	Versions			
	01	02	03	04
Heatsink(*)	Standard	Reduced	Standard	Reduced
2.5" HDD connector	–	+	–	+
VME P0 connector	+	+	–	–
Rear I/O module capability	+	+	–	–
Rear VGA output	+	+	–	–
Rear EIDE availability	+	+	–	–
Gigabit Ethernet channels	4	4	2	2
SATA channels	2	2	–	–
Serial ports	3	3	1	1
USB ports	6	6	4	4
PS/2 interface	+	+	–	–
FDD interface	+	+	–	–
Parallel port	+	+	–	–
Please, refer to Rear I/O Interfaces subsection for details. *(*) Standard: 776 cm^2; reduced: 317 cm^2*				

3 Processor:

P1.4	Pentium M 1.4 GHz, 2 MB L2 cache, 400 MHz FSB
P1.8	Pentium M 1.8 GHz, 2 MB L2 cache, 400 MHz FSB
C1.0	ULV Celeron M 1.0 GHz, 512 KB L2 cache, 400 MHz FSB

4 Soldered system memory:

RAM1024	1024 MB soldered DDR SDRAM

5 Operating temperature range:

I	Industrial, -40°C to +85°C
C	Commercial, 0°C to +70°C

6 Other options:

SODIMM memory module

\SODIMM512	512 MB DDR SDRAM SODIMM, industrial
\SODIMM512C	512 MB DDR SDRAM SODIMM, commercial
\SODIMM1024	1024 MB DDR SDRAM SODIMM, industrial
\SODIMM1024C	1024 MB DDR SDRAM SODIMM, commercial
\SODIMM1024ECC-I	1024 MB DDR SDRAM SODIMM with ECC, industrial
\SODIMM1024ECC-C	1024 MB DDR SDRAM SODIMM with ECC, commercial

CompactFlash module

\CF128	128 MB CompactFlash card, industrial
\CF256	256 MB CompactFlash card, industrial
\CF256C	256 MB CompactFlash card, commercial
\CF512	512 MB CompactFlash card, industrial
\CF512C	512 MB CompactFlash card, commercial
\CF1024	1024 MB CompactFlash card, industrial
\CF1024C	1024 MB CompactFlash card, commercial
\CF2G	2 GB CompactFlash card, industrial
\CF2GC	2 GB CompactFlash card, commercial
\CF4G	4 GB CompactFlash card, industrial
\CF4GC	4 GB CompactFlash card, commercial
\CF8GC	8 GB CompactFlash card, commercial
\CF16GC	16 GB CompactFlash card, commercial

1.8" disk drive installed

\HDD20S	1.8" hard disk drive installed, 20 GB

2.5" disk drive (for CPC600-02 and -04 only):

\HDD20	2.5" hard disk drive, 20 GB
\FFD2048	2.5" Flash Disk, 2048 MB

Coating

\COATED	Protective coating

Cooling fan (for CPC600-02 and -04 only)

\COOLER	Cooling fan with mounting kit

Operating system *(subject to change, apply for details)*

\QNX	QNX 4.25
\LNX	Linux 2.4.31
\FDOS	FastwelDOS

Example:

CPC600 – 02 – P1.4 – RAM1024 – C \SODIMM512C \CF128 \HDD20S \FFD2048 \COATED \LNX

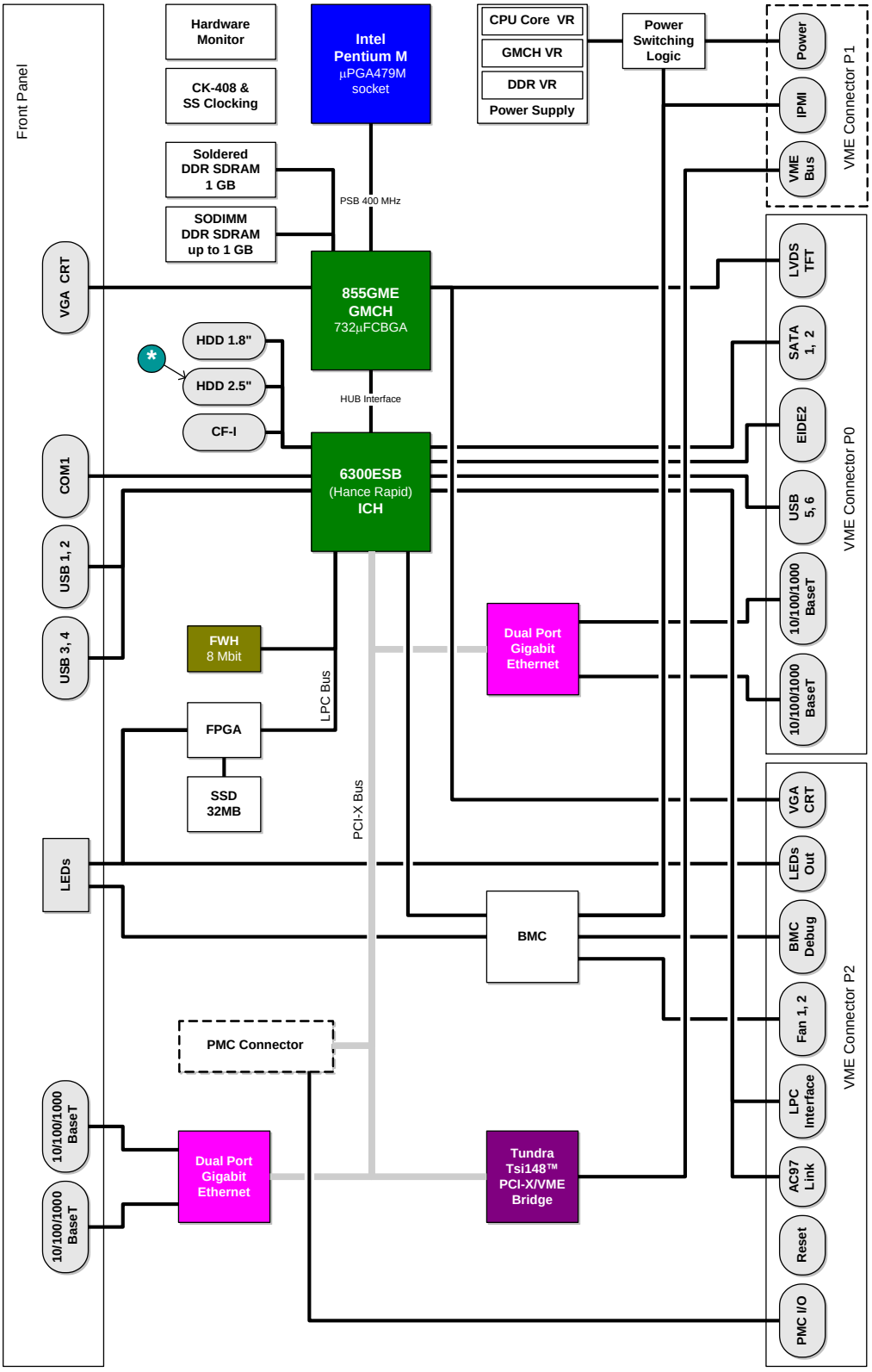
6U VME Pentium M SBC, FFD 32 MB, VGA, 4x Gigabit Ethernet
Reduced heatsink, 2.5" HDD connector
Pentium M 1.4 GHz, 400 MHz FSB
1024 MB soldered DDR SDRAM
Commercial operating temperature range, 0°C to +70°C
512 MB DDR SDRAM SODIMM, commercial range
128 MB CompactFlash card
1.8" hard disk drive 20 GB installed
2.5" Flash disk 2048 MB
Protective coating
Linux 2.4.31

1.3 CPC600 Diagrams

The diagrams in this section give visual information about the CPC600 module design, its appearance, connectors and components layout. The diagrams may not reflect insignificant differences between the CPC600 versions.

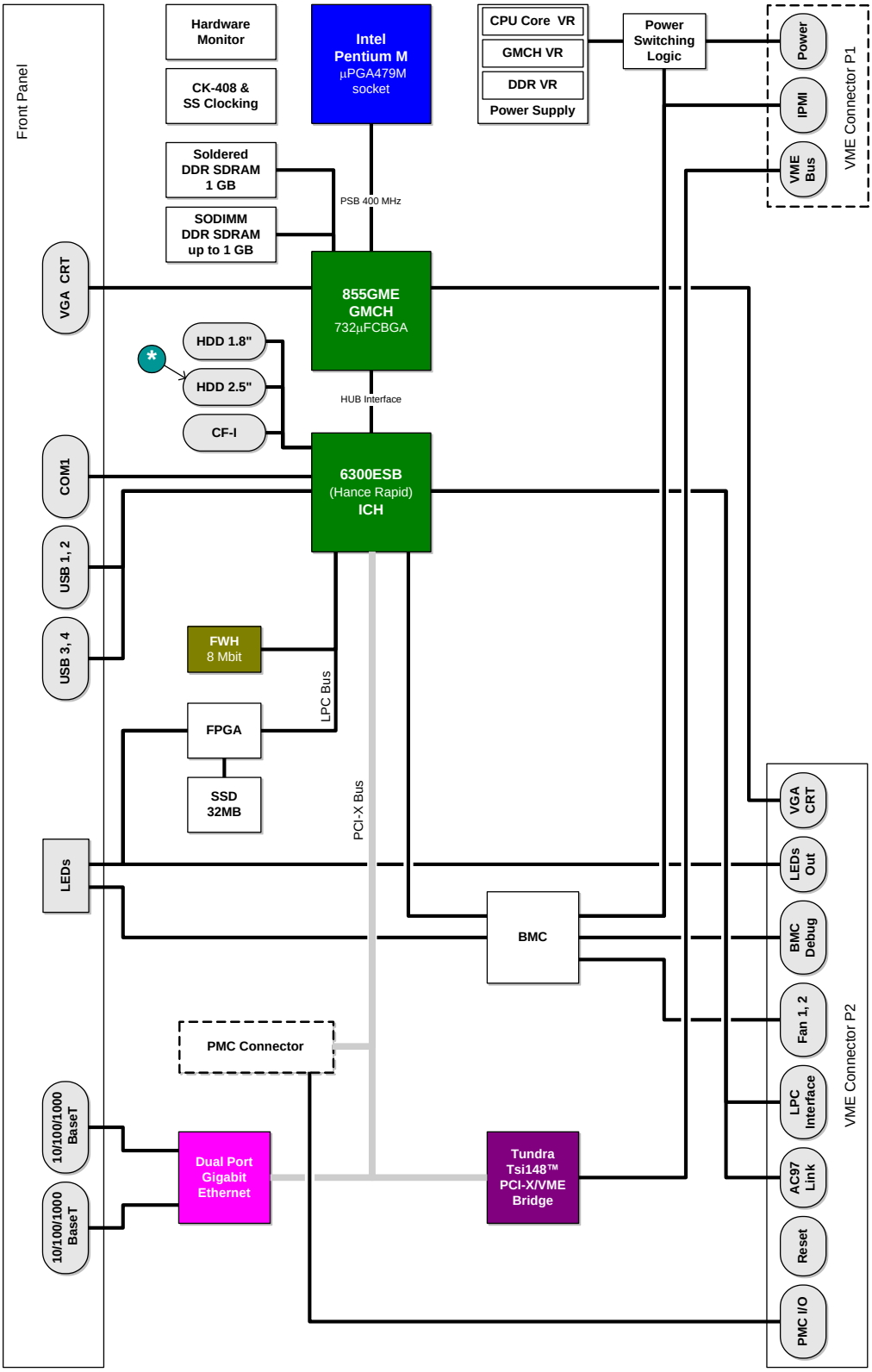
1.3.1 Block Diagram

Figure 1-1: CPC600 Block Diagram: Versions 01, 02



(*) – For version 02 only.

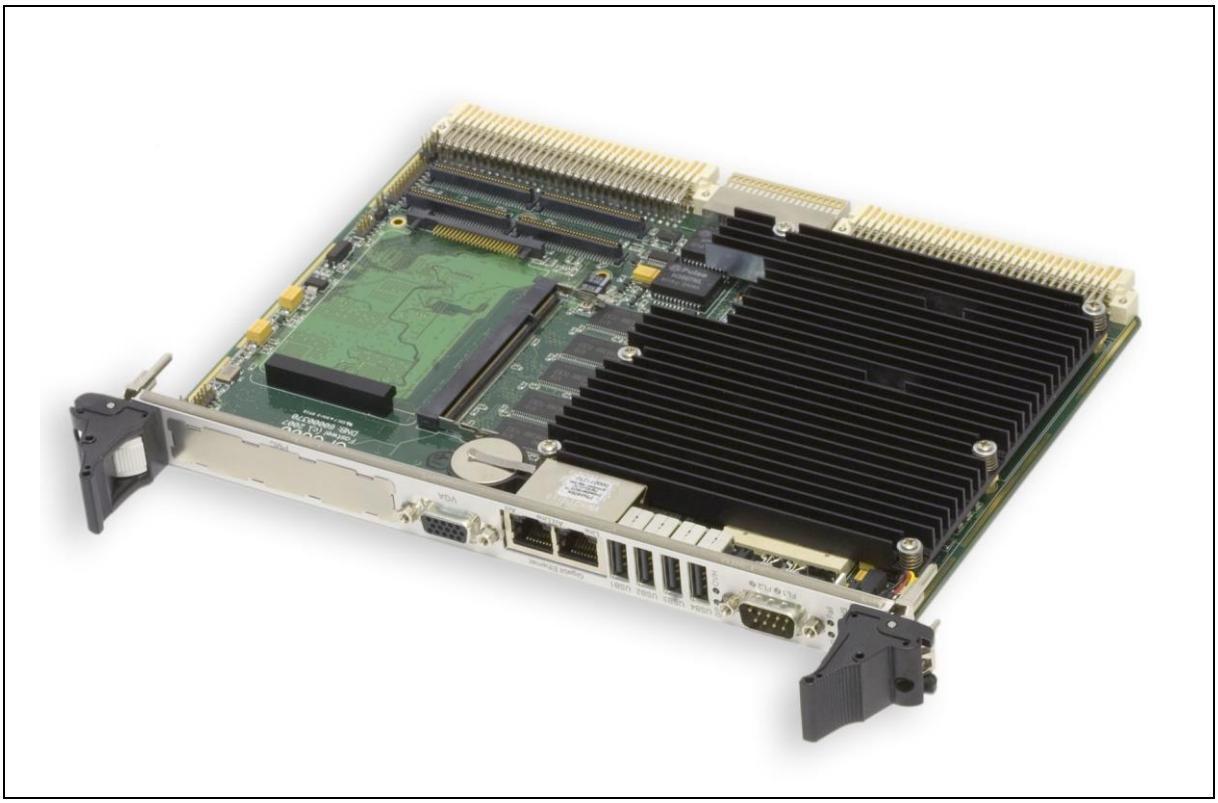
Figure 1-2: CPC600 Block Diagram: Versions 03, 04



(*) – For version 04 only.

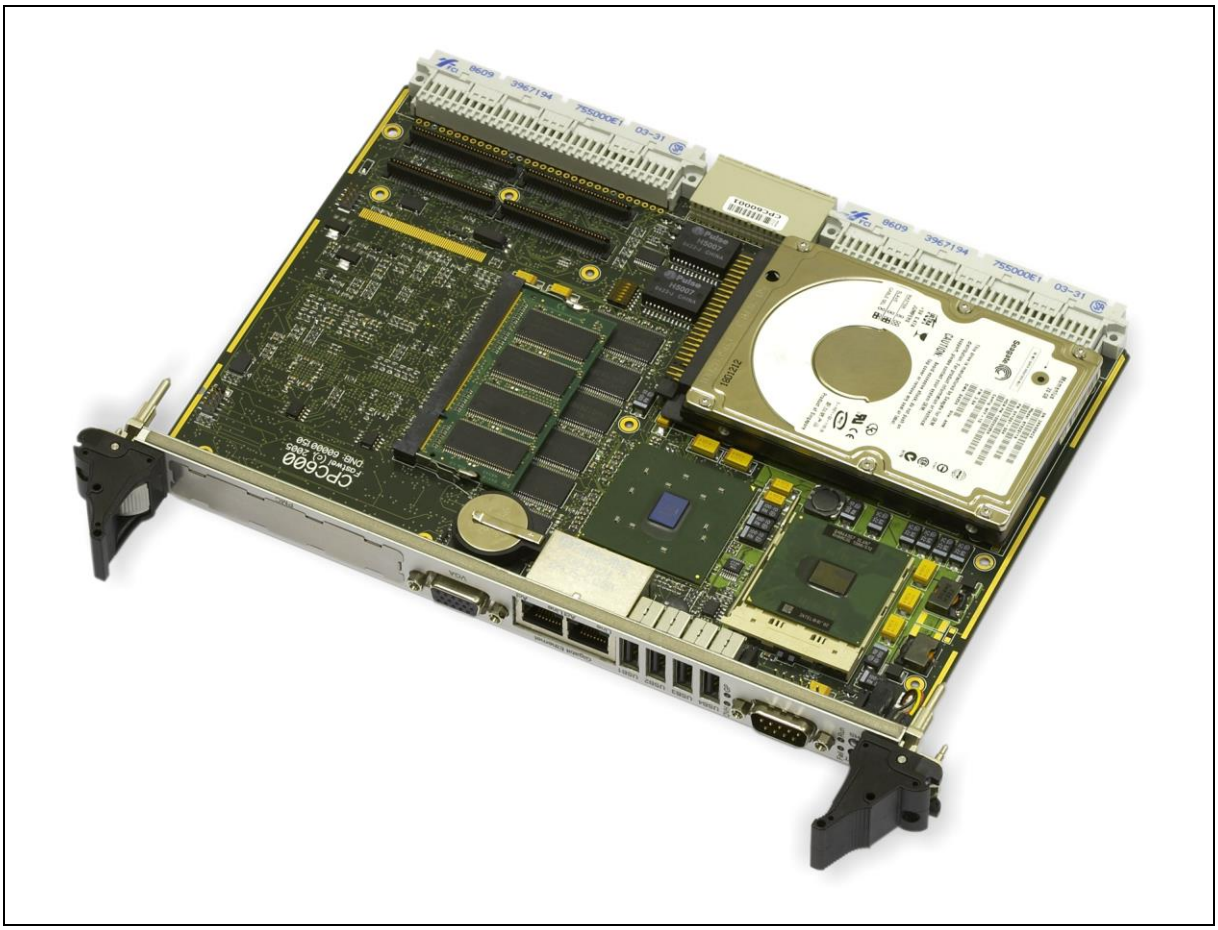
1.3.2 Module Appearance

Figure 1-3: CPC600-01 Module Appearance



The appearance may vary for different versions of the module.
This illustration presents CPC600-01.

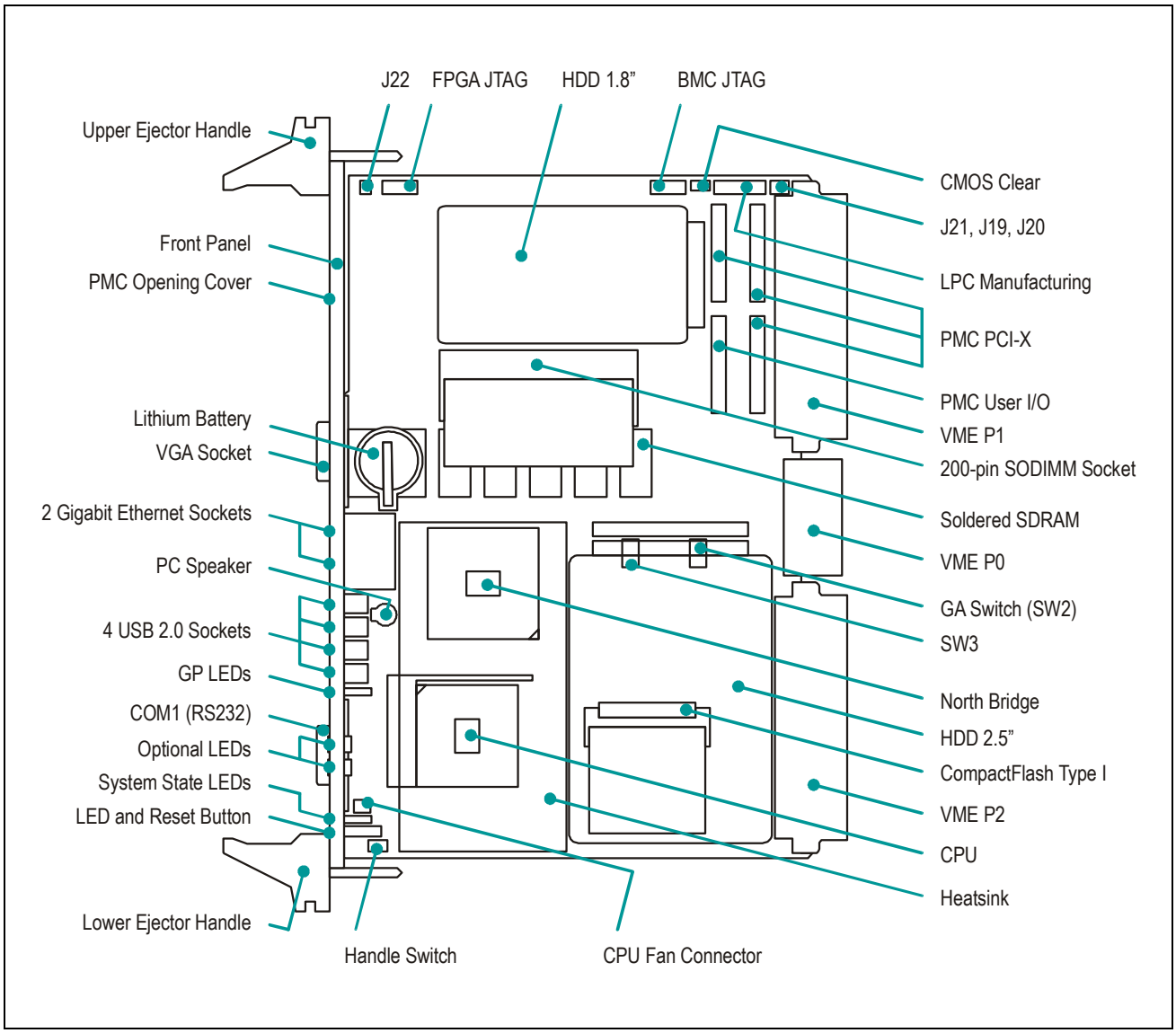
Figure 1-4: CPC600-02 Module Appearance



The appearance may vary for different versions of the module.
This illustration presents CPC600-02. The reduced heatsink is not shown.

1.3.3 Module Layout

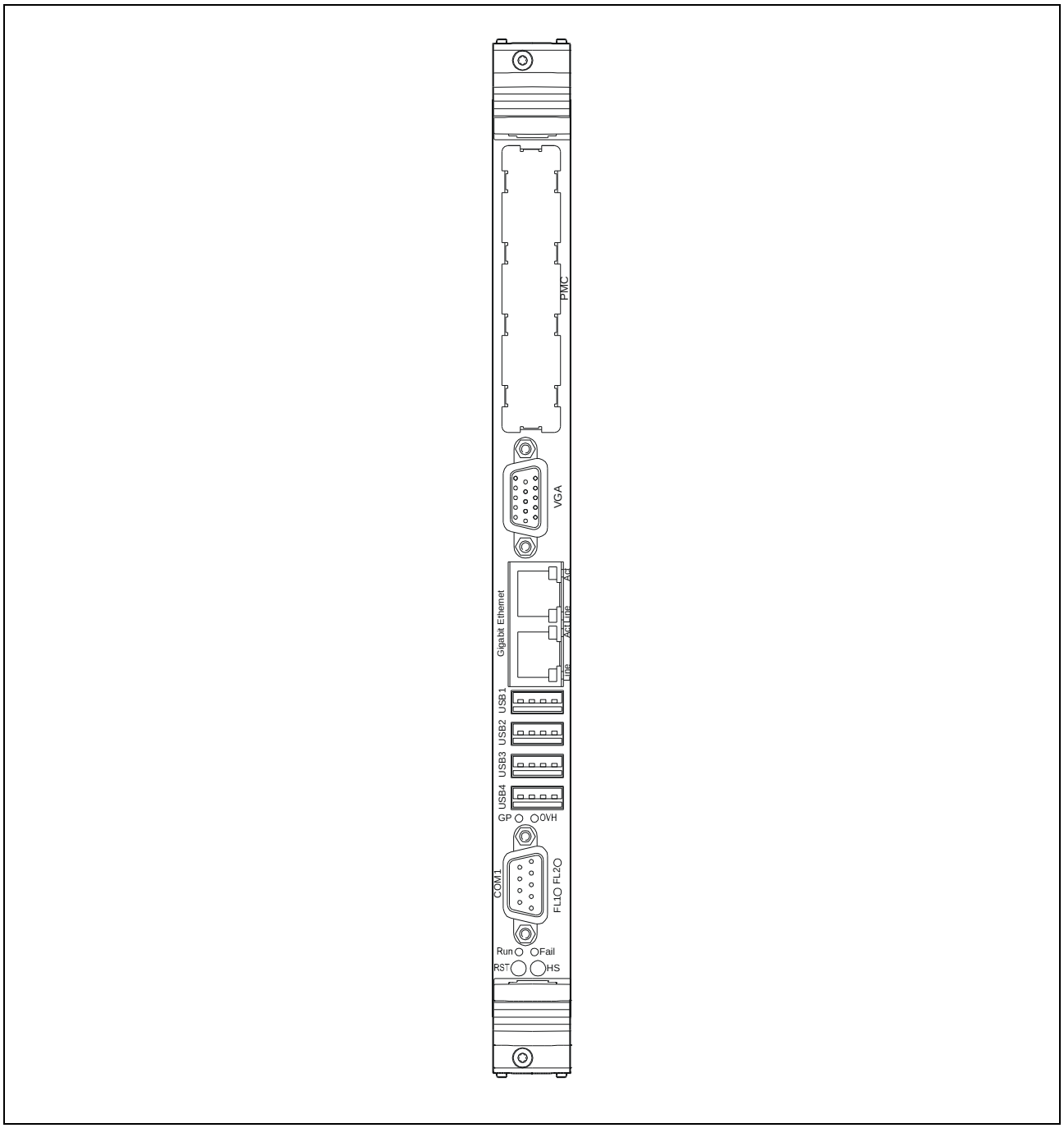
Figure 1-5: CPC600 Module Layout



The layout may slightly differ for various versions of the module.
The complete set of IPMI and LiveInsertion features will be implemented in future.

1.3.4 Front Panel

Figure 1-6: CPC600 4HP Front Panel



The appearance may slightly differ for various versions of the module.

1.4 Technical Characteristics

1.4.1 Processor, Memory and Chipset

CPU

The CPC600 supports the following Intel processors:

Pentium® M 1.8

- Up to 1.8 GHz
- Up to 2 MB L2 on-die cache
- 400 MHz PSB
- Supports SpeedStep® III for low power mode

Low Voltage Pentium® M 1.4

- Up to 1.4 GHz
- Up to 2 MB L2 on-die cache
- 400 MHz PSB
- Supports SpeedStep® III for low power mode

Ultra Low Voltage Celeron® M 1.0

- Up to 1.0 GHz
- 512 KB L2 on-die cache
- 400 MHz PSB

Memory

Main memory:

- 1 GB of soldered DDR SDRAM memory, ECC support(*)
- Up to 1 GB of DDR SDRAM memory in 200-pin SODIMM socket
- Memory frequency: 333 MHz (PC2700)

(*) Only if the SODIMM socket is populated with ECC-capable module

Flash memory:

- One 256 byte EEPROM for storing user data
- 32 MB solid-state disk (NAND flash memory) with Fastwel file system

Chipset

Intel® 82855GME Graphics and Memory Controller Hub (GMCH)

- Support for a single Pentium M family microprocessor
- 64-bit AGTL/AGTL+ based PSB interface at 400 MHz
- 64-bit System Memory interface, optimized for DDR SDRAM memory operating at 333 MHz with additional 8-bits for ECC
- Integrated 2D/3D Graphics and H/W Motion Compensation Engines
- Integrated DAC, 350 MHz

Intel® 6300ESB I/O Controller Hub (ICH)

- PCI Rev. 2.2 compliant with support for 33 MHz/32-bit PCI bus
- Enhanced DMA controller, interrupt controller, and timer
- Integrated IDE controller Ultra ATA100
- USB 2.0 host interface
- PCI-X 64-bit interface
- Serial ATA controller
- AC'97 audio interface

- System Management Bus
- Power management logic support
- Low Pin Count (LPC) interface
- Firmware Hub (FWH) interface support
- Additional timers

1.4.2 Interfaces

PMC Modules Support

- Compliant with ANSI/VITA 1, VME64 and ANSI/VITA 1.1, VME64 Extensions
- 3.3 V PMC modules are supported, 5 V – are not supported
- Supported PMC modules:

Bus	Bus Width, bit	
	32	64
PCI-X 33 MHz	+	+
PCI-X 66 MHz	+	+
PCI 33 MHz	+	+
PCI 66 MHz	+	+ (*)

Note:

(*) – Will operate in PCI 33 MHz 64 bit mode. J22 jumper is used for switching PCI-X bus frequency to 33 MHz

PCI-X / VME Bus Bridge

- Fully compliant with the 2eSST and VME64 Extension standards
- PCI-X 64-bit / 66 MHz interface

As a VMEbus System Controller Tsi148 supports the following:

- VMEbus Arbiter with three modes of programmable arbitration: PRI, RRS and SGL
- IACK Daisy-Chain Driver
- SYSRESET Driver for a global system reset
- Global VMEbus Timer
- 16 MHz System Clock Driver

The Tsi148's VME Master can generate:

- A16, A24, A32, and A64 addressing modes
- D8, D16, and D32 Single Cycle Transaction; D16, D32 Block Transaction; D64 Multiple Block Transaction; D64 2eVME and D64 2eSST data transfer modes

The Tsi148 VME Slave can accept most of the addressing and data transfer modes prescribed by the VME64, VME64x, and 2eSST specifications:

- A16, A24, A32, and A64 addressing modes
- D8, D16, and D32 Single Cycle Transaction; D8, D16, D32 Block Transaction; D64 Multiple Block Transaction; D64 2eVME and D64 2eSST data transfer modes

VME Bus Interface

- Compliant with VME64 and VME 64x.

Serial Ports

COM3 and COM4 (available via RIO680):

- COM3 – RS-232, 9-pin D-sub connector on the front panel. Optoisolated.
- COM4 – RS-485, 9-pin D-sub connector on the front panel. Optoisolated.
- 16C550 compatible UARTs

COM1 (available via CPC600 front panel):

- Limited functionality (see section 2.3.2)

USB Interface

Up to six USB 2.0 ports supporting UHCI and EHCI:

- Four USB type A connectors on the CPC600 front panel
- Two connectors on RIO680

Parallel Port

Multi-Mode™ parallel port, SPP/ECP/EPP compatible

- Standard Mode IBM PC/XT, PC/AT, and PS/2 compatible bidirectional parallel port
- Available via RIO680 only

Gigabit Ethernet

Four 10/100/1000 Mb/s Gigabit Ethernet interfaces based on two Intel 82546GB Ethernet PCI-X bus controllers.

- Two RJ45 connectors on CPC600 front panel, two available via rear I/O module
- Automatic mode recognition
- Automatic cabling configuration recognition
- Cabling requirement: Category 5, UTP, four-pair cabling

VGA interface

Built-in Intel 2D/3D high performance graphics accelerator

- 15-pin D-sub VGA CRT-display connector on CPC600 front panel
- Supported resolutions up to 2048 x 1536, 16 bit at 75 Hz refresh rate
- Hardware motion compensation for software MPEG2 and MPEG4 decoding
- Video memory up to 64 MB shared with system
- VGA signals are also available via rear I/O module
- LVDS routed to the P0 VME connector (not available on the current version of RIO680)

Keyboard and Mouse

Super I/O support for a PS/2 keyboard and mouse:

- Available via 6-pin connector at RIO680
- Mouse and keyboard simultaneous connection is possible via Y-cable

Mass Storage

EIDE Ultra ATA/100/66/33

- Two channels, one channel is used by a 2.5” HDD and CompactFlash, another one is used by optional 1.8” HDD and is routed to Rear I/O
- 50-pin 2.0 mm female connector for mounting a 2.5" disk drive onboard the CPC600 (for versions -02 and -04)
- 44-pin header for mounting a 1.8" disk drive onboard the CPC600

Serial ATA interface

- Two Serial ATA channels are routed to the Rear I/O

Fastwel Flash Disk® (FFD)

- 32 MB NAND Flash disk

CompactFlash:

- CompactFlash type I on-board socket (true IDE mode), type II CompactFlash cards are not supported

Floppy Disk:

- Available via RIO680
- Supports 5.25 or 3.5 inch floppy drives
- 1.44 or 2.88 MB 3.5 inch floppy disks

1.4.3 Control and Monitoring

Thermal Management

Processor is protected from overheating by:

- Internal processor temperature control unit, which initiates CPU shut down
- Processor die temperature monitor
- Custom designed heatsinks
- Additional fan

Temperature Monitor

LM82 hardware monitor is used for supervision of the on-die CPU temperature and the board surface temperature

LEDs

System status:

- OVH: Overheating
- GP (green): General purpose programmable
- Fail (red): System inactive/failure
- Run (green): System running
- HS (blue): Power mode indication
- FL1, FL2 (dual color): Special pupose LEDs
- LEDs output to Rear I/O

Gigabit Ethernet status:

- Line (green): Line connected
- Act (green): Network activity

Reset Input

Reset sources include a recessed button on CPC600 front panel and an opto-isolated reset connector located on the RIO680 rear I/O module front panel

1.4.4 General

Mechanical

6U, 4HP, VME form-factor

Dimensions: 233.35 × 160 × 20.32 mm

Module weight: 0.6 kg

Power Supply

8 A @ 5 V; 0.1 A @ 12 V *

* *One fan used*
See Chapter 6 for details on supply voltages and power supply requirements

Temperature Ranges

Operational:	CPC600xx-I	-40°C ... +85°C
	CPC600xx-C	0°C ... +70°C
Storage:		-55°C ... +95°C

Humidity

5% to 95% RH, non-condensing

Battery

3.0 V lithium battery for RTC in a battery holder. Use PANASONIC BR2032 or compatible

MTBF

MTBF for CPC600 is 85000 hours

The value is calculated according to: Telcordia Issue 1 model, Method I Case 3, for continuous operation at a surface location, at normal environmental conditions (Russian State Standard GOST 15150-69, "UHL4" climatic parameters) and at ambient temperature 30°C.

1.4.5 Software

BIOS

Flash memory based enhanced Phoenix® BIOS has the following features:

- BIOS boot support for USB keyboards
- Software enable/disable function for the Rear I/O, Ethernet, and COM ports configuration
- Plug&Play capability

Operating Systems

Supported operating systems *(subject to change, apply for details)*:

- QNX 4.25, 6.3
- Linux 2.4.31
- FastwelDOS (MS DOS compatible)

1.5 Delivery Checklist

The CPC600 supplied set includes:

1. CPC600 processor module
2. 2.5” hard drive mounting kit (*)
   a. HDD 2.5" adapter frame
   b. Four M3x8 screws DIN7985
3. Cooling fan (*)
4. Fan mounting kit (*)
   a. Four fan stud spacers
   b. Four M3x10 screws DIN7985
   c. Four M3 retaining washers DIN6798 A
5. CompactFlash card with operating system
6. CD-ROM with documentation and service software
7. Antistatic bag
8. Consumer carton box

(*) - For CPC600-02 and -04 only, if ordered

Note:

Keep the antistatic bag and the original package at least until the warranty period is over. It can be used for future storage or warranty shipments.

1.6 System Expansion

The CPC600 interface capabilities can be expanded by installation of RIO680 Rear I/O module and/or using standard 64-bit PMC modules.

The RIO680 6U Rear I/O module expands I/O capabilities of the CPC600. It is installed from the back of the system crate in line with the processor module.

RIO680 has the following interfaces and connectors:

- VME bus connectors P2 and P0
- Two opto-isolated serial ports – D-Sub connectors on the front panel
- Two USB 2.0 ports (Type A front panel connectors)
- Analog RGB connector (front panel)
- Two Gigabit Ethernet connectors (front panel)
- Two SerialATA connectors on board
- EIDE interface (on-board connector)
- FDD port (on-board connector)
- AC'97-compatible audio controller with Phones, MicIn and LineIn connectors on the front panel; AuxIn, CD In, LineOut and PC speaker connectors on board
- One LPT on-board header for connection of a PC-compatible printer or other devices with parallel interface
- 6-pin PS/2 keyboard/mouse front panel connector
- Five 3-pin external fan on-board connectors
- Opto-isolated remote Reset front panel connector
- LEDs on the front panel

The detailed description of RIO680 module can be found in Chapter 7 in this document.

2 Detailed Description

2.1 Processor, Memory and Chipset

2.1.1 Processor

The CPC600 CPU module is based on the Intel® Pentium® M (Celeron M) processor in the μFCPGA478 or μFCBGA479 packages operating at various frequencies.

Intel® Pentium® M processor combines high performance and low power consumption. Its enhanced performance characteristics are provided by a newly designed processor core with an integrated 64 KB L1 (32 KB instruction cache and 32 KB write-back data cache) and 2048 KB L2 cache.

The Intel® Pentium® M processor supports the Intel SpeedStep® enhanced technology to control power consumption and processor die temperature by switching the processor core voltage and frequency between several modes without resetting the system.

Important performance features of the Intel Pentium M processor also include

- Intel® Architecture with Dynamic Execution
- Data Prefetch Logic
- L2 cache memory with Advanced Transfer Cache Architecture
- Streaming SIMD extensions 2 (SSE2)
- 400 MHz, source-synchronous FSB
- Support for MMX™ technology and Internet Streaming SIMD instructions

2.1.2 System Memory

Total capacity of the soldered DDR SDRAM chips is 1 GB. Soldered memory is ECC compatible. Moreover, up to 1 GB of DDR SDRAM memory can be installed in a 200-pin SODIMM socket. Options include memory modules with ECC and without it. When non-ECC memory module is installed in SODIMM socket, all on-board system memory operates in non-ECC mode. All installed memory should be DDR333 (PC2700) compliant.

2.1.3 Chipset

The Intel® 855GME chipset consists of the following devices:

- 82855GME Graphics and Memory Controller Hub (GMCH) with Accelerated Hub Architecture (AHA) bus
- 6300ESB ICH (I/O Controller Hub) with AHA bus
- Firmware Hub (FWH)

The GMCH provides interface for the microprocessor, the memory bus, the AGP 4x bus in the case of an external graphics controller (not used in CPC600), and includes a high performance graphics accelerator. ICH is a centralized controller for I/O peripherals of the board, such as the PCI, PCI-X, USB 2.0, EIDE, SATA and AUDIO ports. The 1 MB Firmware Hub (FWH) is used as the non-volatile storage for BIOS.

North Bridge

The 855GME Graphics and Memory Controller Hub (GMCH) provides interfaces with the central processor, with the DDR SDRAM system memory, and interface to high performance internal graphics or for an external VGA controller. It also provides a hub link interface to the ICH.

The 855GME is optimized for the Intel® Pentium® M family of microprocessors. The chipset supports a PSB frequency of 400 MHz with AGTL+ signaling. For single processor systems the single ended AGTL termination is supported. It supports 32-bit addressing for using up to 4 GB memory address space. The 855GME includes a system memory controller with a 64-bit interface with ECC. The chipset supports up to PC2700 DDR SDRAMs for use as system memory.

When running in internal graphics mode, high performance video capabilities of the 855GME are supported by a 2D/3D graphics accelerator and H/W Motion Compensation engines for software MPEG2 decoding. The internal graphics controller allows connection of a standard CRT display.

South Bridge

The 6300ESB is a multifunctional I/O Controller Hub that provides the interface to the PCI Bus and such PC interfaces, as UltraDMA 100/66/33, COM ports, USB 2.0 host interface, LPC interface, FWH Flash BIOS interface, SATA, PCI-X and an AC'97 digital audio. The ICH communicates with the host controller directly via a dedicated hub link interface.

I/O Controller Hub features are:

- PCI 2.2 interface with eight IRQ inputs (*)
- Bus Master EIDE controller UltraDMA 100/66/33
- SATA interface (two channels)
- COM port controller
- Two USB controllers with up to four USB 1.1 or 2.0 ports
- Hub interface with 855GME
- LPC interface
- AC'97 2.1 interface
- PCI-X interface for communication with 82546GB Gigabit Ethernet controller
- RTC controller
- Additional timer

(*) Not used in CPC600/

2.2 Internal Peripherals

The following internal peripherals are available on the CPC600 module:

2.2.1 Flash Memory

There are four flash devices available - one is used for the BIOS storage, one is a NAND flash memory (SSD) device, one is a CompactFlash card in the socket and one is FRAM memory storage for user data.

2.2.1.1 Solid-State Disk (SSD)

The CPC600 has an on-board solid-state disk (up to 32 MB of NAND flash-memory) with Fastwel file system for storing user programs and data.

2.2.1.2 CompactFlash

The CPC600 has a standard Compact Flash type I socket, which can accept CompactFlash memory card for use as a disk drive.

2.2.1.3 FRAM Storage for User Data

32 KB Fast FRAM (Ferroelectric Random-Access Memory) installed on the module can be used as a nonvolatile storage for critical user data.

2.2.2 Timers

CPC600 is equipped with the following timers:

- **RTC – Real-Time Clock**

The ICH contains a MC146818A-compatible real-time clock. The RTC includes 256 bytes of battery-backed CMOS RAM. The RTC features include timekeeping with alarm function and 100-year calendar, as well as programmable periodic interrupt. A coin-cell battery powers the real-time clock and CMOS memory.

- **Counter/Timer**

Three 8254-type counters/timers are available on the CPC600.

- **Additional Timer**

The ICH includes an additional programmable timer, which prevents system hang-ups during start-ups. After the first time-out period is over, it generates the SMI# signal, which starts the software hang-up recovery subroutine. If the second timeout ends, the "Reset" signal is issued to recover the system from the hardware hang-up state.

- **Watchdog Timer**

The watchdog timer eliminates system hang-ups both during the start-up process (for example, in case of mistakes in BIOS, when the additional timer is not able to restart the system) and during normal operation. The timeout period is set in BIOS Setup program. On the expiry of the timeout period the watchdog timer issues the "Reset" signal.

2.2.3 Watchdog Timer

CPLD XILINX XC3S200 is used to control the watchdog timer. 24-bit WD CPLD register is used to program the watchdog timeout period. It is possible to set the timeout period from 0 to 512 seconds with increments of 30.52 μs by changing the value in this register.

By default, without prior initialization, the watchdog timeout period is set to maximum that is 512 seconds. The equation below can be used to calculate the timeout T_{WD} in μs as a function of the decimal value in the WD register (K_{WD}):

$$T_{WD}\,[\mu s] = K_{WD} * 10^6 / 2^{15}$$

For example, decimal value "1" of K_{WD} (000001h) corresponds to the timeout of 30.52 μs, and K_{WD} = 16777215 (FFFFFFh) – 512 seconds.

Watchdog timer can be strobed by the following operations:

- Writing any value to Timer Current Value Register
- Writing any value to the port 80h; this mode can be enabled in Timer Init Register
- Writing to or reading from addresses of Windows 1&2. Base addresses of the Windows are defined in Window Base Address register; address mask is defined in Windows 1&2 Address Mask register; the mode can be enabled in Timer Init Register. The size of the Windows can be from 1 to 16 bytes depending on the value in the Mask register.

2.2.3.1 Access to Watchdog Registers

The unit's configuration is based on Plug-and-Play architecture. Access to watchdog registers is available via standard I/O registers (index and data) in configuration mode.

Port	Address	Function
CONFIG PORT	302h	Write
INDEX PORT	302h	Read/Write
DATA PORT	303h	Read/Write

2.2.3.2 Configuration Mode

To enter the configuration mode write <46h><57h> key to CONFIG PORT. To exit the configuration mode write <57h><46h> key to CONFIG PORT. INDEX and DATA ports are available in configuration mode only.

2.2.3.3 Watchdog Timer Programming

The procedures of watchdog programming is described below:

- Enter configuration mode

```
MOV   DX, 302H
MOV   AL, 46H
OUT   DX, AL
MOV   AL, 57H
OUT   DX, AL
```

- Write to LDN register a logic device number (watchdog timer has logical number 1)

```
MOV   DX, 302H
MOV   AL, 7
OUT   DX, AL
MOV   DX, 303H
MOV   AL, 1
OUT   DX, AL
```

- Watchdog timer registers are available for read and write now.
  For example, to read status register 3eh and to write the value from it back:

```
MOV   DX, 302H
MOV   AL, 3EH
OUT   DX, AL
MOV   DX, 303H
IN    AL, DX
OUT   DX, AL
```

- To exit configuration mode:

```
MOV   DX, 302H
MOV   AL, 57H
OUT   DX, AL
MOV   AL, 46H
OUT   DX, AL
```

2.2.3.4 Global Configuration Registers

Index	Type	Hard Reset	Configuration Register
7h	R/W	01h	Logical Device Number

Logical Device Number register (index 7h)

Index = 7h		
Bit	**Name**	**Description**
7:0	LDN	Write/Read: Writing to this register selects logical device.

2.2.3.5 Logical Device 1 (WDT) Configuration Registers

Index	I/O Port Address	Type	Hard Reset	Configuration Register
30h	-	R/W		Activate
38h	Base+0	R/W		Timer current value [7:0]
39h	Base+1	R/W		Timer current value [15:8]
3ah	Base+2	R/W		Timer current value [23:16]
3bh	Base+3	R/W	00h	Timer initial value [7:0]
3ch	Base+4	R/W	40h	Timer initial value [15:8]
3dh	Base+5	R/W	00h	Timer initial value [23:16]
3eh	Base+6	R/W	00h	Status register
3fh	Base+7	R/W	03h	Control register
60h	-	R/W		Base[15:8] - I/O port base address bits [15:8]
61h	-	R/W		Base[7:3] - I/O port base address bits [7:3] Base[2:0] – must be 0;
70h	-	R/W	00h	Primary interrupt select
F0h	-	R/W	00h	Reserved
F1h	-	R/W	00h	Timer Init Register
F2h	-	R/W	00h	Window 1 base address bits [7:0]
F3h	-	R/W	00h	Window 1 base address bits [15:8]
F4h	-	R/W	00h	Window 2 base address bits [7:0]
F5h	-	R/W	00h	Window 2 base address bits [15:8]
F6h	-	R/W	FFh	Window 1 Mask bits [7:4] Window 2 Mask bits [3:0]

Activate register

Index = 30h		
Bit	**Name**	**Description**
7:1	-	Not used
0	Activate	Write/Read: 1 – Current logical device enabled 0 – Current logical device disabled

I/O Port Base Address registers

Index = 60h		
Bit	**Name**	**Description**
7:0	I/O_Base_Adress [15:8]	Write/Read: Current logical device base address bits 15:8
Index = 61h		
Bit	**Name**	**Description**
7:0	I/O_Base_Adress [7:0]	Write/Read: Current logical device base address bits 7:0

Primary Interrupt Select register

Index = 70h		
Bit	**Name**	**Description**
7:4	–	Not used
3:0	Interrupt_select	Write/Read: 00h – Interrupt disabled 01h – IRQ1 02h – SMI 03h – IRQ3 04h – IRQ4 05h – IRQ5 06h – IRQ6 07h – IRQ7 08h – IRQ8 09h – IRQ9 0ah – IRQ10 0bh – IRQ11 0ch – IRQ12 0dh – IRQ13 0eh – IRQ14 0fh – IRQ15

Timer Init register

Index = F1h		
Bit	**Name**	**Description**
7:5	–	Not used
4	P80E	Write/Read: Strobe watchdog on write to port 80h 1 – Enabled 0 – Disabled
3	WND2_WR_EN	Write/Read: Strobe watchdog on write cycle to Window 2 1 – Enabled 0 – Disabled
2	WND2_RD_EN	Write/Read: Strobe watchdog on read cycle from Window 2 1 – Enabled 0 – Disabled
1	WND1_WR_EN	Write/Read: Strobe watchdog on write cycle to Window 1 1 – Enabled 0 – Disabled
0	WND1_RD_EN	Write/Read: Strobe watchdog on read cycle from Window 1 1 – Enabled 0 – Disabled

Window 1 Port Base Address registers

Index = F2h		
Bit	**Name**	**Description**
7:0	Window1_Base_Adress[7:0]	Write/Read: Window1 base adress bits 7:0
Index = F3h		
Bit	**Name**	**Description**
7:0	Window1_Base_Adress[15:8]	Write/Read: Window1 base adress bits 15:8

Window 2 Port Base Address registers

Index = F4h		
Bit	**Name**	**Description**
7:0	Window2_Base_Adress[7:0]	Write/Read: Window2 base adress bits 7:0
Index = F5h		
Bit	**Name**	**Description**
7:0	Window2_Base_Adress[15:8]	Write/Read: Window2 base adress bits 15:8

Windows 1&2 Address Mask register

Index = F6h		
Bit	**Name**	**Description**
7:4	Window1_MASK[3:0]	Write/Read: Window1 address mask bits 3:0
3:0	Window2_MASK[3:0]	Write/Read: Window2 address mask bits 3:0

2.2.3.6 WDT Controller I/O Registers

Timer Current Value register [23:0]

Base+0h		
Bit	**Name**	**Description**
7:0	Timer_Current_Value[7:0]	Write/Read: Watchdog Current Value bits 7:0
Base+1h		
Bit	**Name**	**Description**
7:0	Timer_Current_Value[15:8]	Write/Read: Watchdog Current Value bits 15:8
Base+2h		
Bit	**Name**	**Description**
7:0	Timer_Current_Value[23:16]	Write/Read: Watchdog Current Value bits 23:16

Timer Initial Value register [23:0]

Base+3h		
Bit	**Name**	**Description**
7:0	Timer_Initial_Value[7:0]	Write/Read: Watchdog Initial Value bits 7:0
Base+4h		
Bit	**Name**	**Description**
7:0	Timer_Initial_Value[15:8]	Write/Read: Watchdog Initial Value bits 15:8
Base+5h		
Bit	**Name**	**Description**
7:0	Timer_Initial_Value[23:16]	Write/Read: Watchdog Initial Value bits 23:16

Status register

Base+6h		
Bit	**Name**	**Description**
7:3	–	Reserved
2	STM	Write/Read: Second timeout flag. It is set to 1 if TMF=1 and RSTE=1. Cleared by writing “1” to this bit.
1	SME	Read: SMI generation on timeout flag. It is set to “1” if SMI mode is selected in Interrupt Select register (index 70h).
0	TMF	Write/Read: Timeout flag. It is set to “1” when the timer counter is decremented to 0. Upon setting of this flag an interrupt is generated. It is cleared by writing “1” to this bit or by writing to port 80h or when Windows 1 or 2 are accessed (in case the respective modes are enabled).

Control register

Base+7h		
Bit	**Name**	**Description**
7:2	–	Reserved
1	CNTE	Write/Read: Counter of the watchdog timer 1 – Enabled 0 – Disabled
0	RSTE	Write/Read: Reset on timeout 1 – Enabled 0 – Disabled

2.2.4 Local SMBus Devices

The CPC600 incorporates a System Management Bus to access several system monitoring and control devices via a two-wire I^{2}C™ bus interface. The following table presents functions and addresses of onboard SMBus devices.

Table 2-1: SMBus Devices

№	SMB Address	Device
1	0D2H	ICS950201 System clock generator
2	0D4H	TFT Suspend CLK Generator ICS91718
3	0A0H	SPD EEPROM Module
5	0AEH	256 Bytes User EEPROM

Serial EEPROM

There is serial EEPROM installed on CPC600. This nonvolatile memory is used for storage of user data.

2.2.5 Reset

Reset sources include Reset button on CPC600 front panel, an external one which can be connected to the optoisolated connector on the RIO680 front panel, and VME backplane reset input (PRST; effective unless CPC600 is in master slot). The CPC600 responds to Reset input by initializing local peripherals.

2.2.6 Battery

The CPC600 utilizes a 3.0 V lithium battery for the RTC and CMOS memory backup. Use PANASONIC BR2032 or compatible.

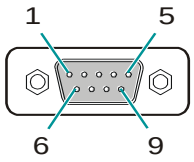
2.3 Module Interfaces

2.3.1 Keyboard/Mouse Interface

The keyboard controller is located on RIO680 expansion module. PS/2 port is available via a standard 6-contact MiniDIN connector on RIO680 front panel. Mouse and keyboard can be connected simultaneously using Y-cable supplied with RIO680.

2.3.2 Serial Interface

Figure 2-1: D-Sub Serial Connector



COM1 interface is available via the 9-pin D-sub connector on the CPC600 front panel.

According to "Intel 6300ESB I/O Controller HUB (ICH) Specification update", it has limited functionality due to unexpected behavior of serial port interrupt enable register.

Below is an abstract from this document:

2. Behavior of Serial Port Interrupt Enable Register

Problem: The Serial Port Interrupt Enable Register (IER) bit 1 [3f9h] (Transmit Data request Interrupt Enable) will not change status if the bit has been set previously.

Implication: Will not cause an interrupt if the register bit has been set already. This hinders the serial ports from being fully 100 percent 16550 compatible.

Workaround: Customers may be able to implement a BIOS workaround to clear out the bit IER bit 1 to '0' before programing the bit to '1'.

Status: No fix.

Therefore, the integrated into South Bridge serial ports are compatible with the standard UART 16550, except the following registers:

1. Changed bits 4 and 5 designation in IER (Interrupt Enable Register).
2. Changed bits 6 and 7 designation in FCR (FIFO Control Register).

The detailed description of the registers can be found in "Intel® 6300ESB I/O Controller Hub Datasheet. February 2004", p.p. 667-671.

COM2 is used to communicate with BMC.

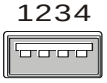
COM3 and COM4 optoisolated serial ports are available as 9-pin D-Sub connectors on the RIO680 front panel. They are fully compatible with the 16550 controller and include a complete set of handshaking and modem control signals, maskable interrupt generation and data transfer of up to 460.8 Kb/s.

Table 2-2: COM1 Serial Port Connector (CPC600 Front Panel)

Pin	RS232	Pin	RS232
1	DCD	6	DSR
2	RXD	7	RTS
3	TXD	8	CTS
4	DTR	9	RIN
5	GND	–	–

2.3.3 USB Interfaces

Figure 2-2: USB1 to USB4 Connectors Contacts



The CPC600 supports six USB 2.0 ports, they are available via four standard A-type USB sockets on CPC600 front panel and two sockets on on the front panel of the RIO680 Rear I/O module.

All six ports support high-speed, full-speed, and low-speed operation. Hi-speed USB 2.0 supports data transfer rate of up to 480 Mb/s. One USB device may be connected to each port. To connect more than six USB devices use an external hub. The USB power supply is protected by a self-resettable 500 mA fuse.

The CPC600 has four 4-pin standard USB connectors (USB1, USB2, USB3 and USB4) on the front panel with the following pinouts:

Table 2-3: USB1 to USB4 Pinouts (CPC600 Front Panel)

Pin Number	Signal	Function	In/Out
1	VCC	VCC signal	–
2	UV0-	Differential USB-	–
3	UV0+	Differential USB+	–
4	GND	GND signal	–

2.3.4 Graphics Controller

A highly integrated 2D/3D graphics accelerator is included in the 855GME chipset. The internal graphics controller provides interfaces to a standard analog monitor (VGA connector on CPC600 front panel) or/and to a digital TFT panel with LVDS interface. The LVDS interface is routed to the backplane via P0 VME connector.

Integrated 2D/3D Graphics features:

- Resolutions up to 1600×1200 at 100 Hz, 1920×1440 at 85 Hz and 2048×1536 at 75 Hz.
- 3D Setup and Render Engine
- 3D Graphics Rasterization Enhancements
- High Quality Texture Engine
- Full 2D hardware acceleration
- Intel® 855GME DVMT graphics core
- Intelligent Memory Management
- Integrated 350 MHz DAC

2.3.4.1 DVM Technology

The 855GME chipset supports the Dynamic Video Memory Technology (DVMT). This technology provides use of all available memory in the most efficient way for maximum graphics performance. DVMT dynamically responds to requests from applications allocating the required amount of video memory. The Intel® 855GME graphics driver is allowed to request up to 64 MB of system memory. When not needed by the graphics subsystem, the memory is freed up for other applications. Thus, memory usage is balanced for optimal graphics and system memory performance.

To support legacy VGA devices the internal video-controller needs at least 1 MB of system memory. Thus, the reported system memory size is always 1 MB less than available amount of physical memory.

2.3.4.2 Supported Resolutions

The integrated 350 MHz RAMDAC of the 855GME chipset allows direct connection of a progressive scan analog monitor with a resolution of up to 2048 × 1536 at 75 Hz. The supported resolution depends on the color depth and on the vertical scanning frequency, as illustrated in the table below.

Table 2-4: Supported Display Modes

Display Mode	Color Resolution vs. Vertical Frequency											
	8-bit Indexed				16- bit				32- bit			
	60	75	85	100	60	75	85	100	60	75	85	100
640 × 480	×	×	×	×	×	×	×	×	×	×	×	×
800 × 600	×	×	×	×	×	×	×	×	×	×	×	×
1024 × 768	×	×	×	×	×	×	×	×	×	×	×	×
1280 × 1024	×	×	×	×	×	×	×	×	×	×	×	×
1600 × 1200	×	×	×	×	×	×	×	×	×	×	×	×
1920 × 1440	×	×	×		×	×	×		×	×	×	
2048 × 1536	×	×			×	×			×	×		

2.3.4.3 CRT Interface and Connector

The 15-pin female D-Sub connector on CPC600 front panel is used to connect a CRT monitor to the CPC600 module. Another VGA connector is located on RIO680 front panel (See Chapter 7).

Table 2-5: CPC600: SVGA Front Panel Connector Pinout

Pin Number	Signal	Function	In/Out
1	Red	Red video signal output	Out
2	Green	Green video signal output	Out
3	Blue	Blue video signal output	Out
9	VCC	Power +5V 200 mA	Out
12	DDCdata	I^2C™ data	In/Out
13	Hsync	Horizontal sync.	TTL out
14	Vsync	Vertical sync.	TTL out
15	DDCclk	I^2C™ clock	Out
5, 6, 7, 8	GND	Signal ground	–
4, 10, 11	Free	–	–

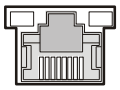
2.3.5 Parallel Port Interface

Standard parallel port (IEEE1284, SPP/ECP/EPP) is available only on RIO680 Rear I/O module.

2.3.6 Gigabit Ethernet

The CPC600 board includes four 10Base-T/100Base-TX/1000Base-T Ethernet ports based on two Intel® 82546GB dual port Gigabit Ethernet PCI-X Bus controllers. The Intel® 82546GB Gigabit Ethernet controller architecture combines high performance and low power consumption. The controller's features include independent transmit and receive queues to limit PCI-X bus traffic, and a PCI-X interface providing efficient bus utilization by increased use of bursts.

Figure 2-3: Gigabit Ethernet Connectors



8 1

Each of the two CPC600 front panel Ethernet connectors is realized as an RJ45 connector for twisted-pair cabling.

Two more Gigabit Ethernet channels are routed to P0 VME connector and are available via the RIO680 Rear I/O board.

The interfaces provide auto-detection and switching between 10Base-T, 100Base-TX and 1000Base-T operation modes. Each of the pair Ethernet channels (CPC600 or RIO680 pairs) may be disabled via the BIOS Setup or user software utility to free up system resources.

Table 2-6: Gigabit Ethernet Connectors Pinouts

Pin	10Base-T		100Base-TX		1000Base-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–

MDI / Standard Ethernet Cable

Integrated Ethernet LEDs

Green: Line: This LED indicates network connection. The LED lights up when the line is connected.

Green: Act: this LED monitors network activity. The LED lights up when network packets are sent or received through the RJ45 port. When this LED is not lit, it means that the computer is not sending or receiving network data.

2.3.7 CompactFlash Socket

To enable usage of CF memory cards CPC600 has a CompactFlash Type I socket on board. CF removable mass storage devices are fully compatible with 16-bit ATA/ATAPI-4 IDE interface with DMA support.

CompactFlash socket is connected to the primary EIDE channel at the current version of CPC600.

Table 2-7: CompactFlash Socket Pinout

Pin Number	Signal	Function	In/Out
1	GND	Ground signal	–
2	D03	Data 3	In/Out
3	D04	Data 4	In/Out
4	D05	Data 5	In/Out
5	D06	Data 6	In/Out
6	D07	Data 7	In/Out
7	IDE_CS0	Chip select 0	Out
8	GND (A10)	–	–
9	GND (ATASEL)	–	–
10	GND (A09)	–	–
11	GND (A08)	–	–
12	GND (A07)	–	–
13	3.3 V	3.3 V power	–
14	GND (A06)	–	–
15	GND (A05)	–	–
16	GND (A04)	–	–
17	GND (A03)	–	–
18	A02	Address 2	Out
19	A01	Address 1	Out
20	A00	Address 0	Out
21	D00	Data 0	In/Out
22	D01	Data 1	In/Out
23	D02	Data 2	In/Out
24	NC (IOCS16)	–	–
25	NC (CD2)	–	–
26	NC (CD1)	–	–
27	D11	Data 11	In/Out
28	D12	Data 12	In/Out
29	D13	Data 13	In/Out
30	D14	Data 14	In/Out
31	D15	Data 15	In/Out
32	IDE_CS1	Chip select 1	Out
33	NC (VS1)	–	–
34	DIOR	I/O read	Out
35	DIOW	I/O write	Out
36	3.3 V (WE)	3.3 V power	–
37	INTRQ	Interrupt	In
38	3.3 V	3.3 V power	–
39	CSEL (GND pull-up)	Master/Slave	Out
40	NC (VS2)	–	–
41	Reset	Reset	Out
42	IORDY	I/O ready	In
43	INPACK	Acknowledge	Out
44	3.3 V (REG)	3.3 V power	–
45	NC (ACTIVE)	–	–
46	NC (PDIAG)	–	–
47	D08	Data 08	In/Out
48	D09	Data 09	In/Out
49	D10	Data 10	In/Out
50	GND	–	–

2.3.8 EIDE Interface

The EIDE interface supports several operation modes: PIO mode, 8237-type DMA mode, Ultra DMA, ATA-66 and ATA-100 modes. In PIO mode the central processor controls the data transfers. In all the DMA modes the CPU is not engaged in data transfer. DMA modes are similar to each other, but differ in data transfer protocols details and DMA clock frequency, thus providing different transfer rates. The module's chipset ATA-100 logic can provide transfer rates of up to 100 MB/sec (read) and up to 88 MB/sec (write).

Current version of CPC600 supports two EIDE channels. Primary channel is used by onboard HDD 2.5" (50-contact 2-row on-board connector), and by CompactFlash card. Secondary channel is used by onboard HDD 1.8” and is also routed to VME connector. Secondary channel is also available via a standard 40-pin IDC connector located at the RIO680 module. Simutaneous operation of 1.8" HDD at CPC600 and an external HDD connected to RIO680 IDE connector requires use of a special cable supplied with RIO680 module. Pinout of RIO680 IDE connector can be found in Appendix A (Table A-6).

Note...

ATA-66 and ATA-100 work at higher frequencies and require a cable, which has additional grounding wires to reduce reflections, noise, and inductive effects. This cable also supports all legacy IDE drives.

The blue end of the ATA-100 cable must be connected to the main board, the gray connector to the UltraDMA/100 slave device and the black connector to the UltraDMA/100 master device.

Table 2-8: Pinout of the EIDE Connector for 2.5” HDD

Pin Number	Signal	Pin Number	Signal
1	A	26	NC
2	B	27	IDEDRQ
3	C	28	GND
4	D	29	IOW #
5	NC	30	GND
6	NC	31	IOR #
7	IDERESET #	32	GND
8	GND	33	IOCHRDY #
9	HD7	34	GND
10	HD8	35	IDEDACKA #
11	HD6	36	GND
12	HD9	37	IDEIRQ
13	HD5	38	NC
14	HD10	39	A1
15	HD4	40	ATA66
16	HD11	41	A0
17	HD3	42	A2
18	HD12	43	HCS0
19	HD2	44	HCS1
20	HD13	45	LED #
21	HD1	46	GND
22	HD14	47	VCC
23	HD0	48	VCC
24	HD15	49	GND
25	GND	50	NC

Table 2-9: Pinout of the EIDE Connector for 1.8” HDD

Pin Number	Signal	Pin Number	Signal
1	RESET#	23	IOWR#
2	GND	24	GND
3	D7	25	IORD#
4	D8	26	GND
5	D6	27	IORDY
6	D9	28	CSEL#
7	D5	29	DACK#
8	D10	30	GND
9	D4	31	INTRQ
10	D11	32	IOCS16#
11	D3	33	A1
12	D12	34	PDIAG#
13	D2	35	A0
14	D13	36	A2
15	D1	37	CS0#
16	D14	38	CS1#
17	D0	39	DASP#
18	D15	40	GND
19	GND	41	+3_3V
20	NC	42	+3_3V
21	REQ	43	GND
22	GND	44	RSVD

2.3.9 Floppy Drive Interface

The onboard floppy disk controller supports either 5.25 inch or 3.5 inch (1.44 or 2.88 MB) floppy disks. The floppy disk port is only available on RIO680 Rear I/O module (see Chapter 7).

2.3.10 LED Indicators

There are a number of LED indicators on the front panel of CPC600. The upper green (GP) is a general purpose programmable indicator, the red one (OVH) indicates overheating. Another set below the COM port is used for system state indication. The red one (Fail) is lit in case of failure (system inactive), the green one (Run) indicates that the system is running.

The blue LED next to the Reset button (HS) is used to indicate the current power mode.

Dual-color FL1 and FL2 LEDs are located along the COM port connector on the front panel. They are used for special purposes in the current version of the module.

2.3.11 BMC Controller

CPC600 is equipped with Baseboard Management Controller (BMC) based on Pigeon Point BMR-AVR-cPCI solutions operating in PICMG 2.1 compatible mode. BMC provides power management, thermal sensors data acquisition and processing, and fans control. BMC can be accessed via COM2 in terminal mode according to IPMI 1.5 standard at 19200 baud. IPMI channel is realized using I2C interface and can be connected to appropriate backplane signals by setting J19, J20, and J21 jumpers. For more information please refer to BMR-AVR-cPCI documentation and IPMI 1.5 specifications.

2.3.12 PMC Interface

For flexible and easy expansion four onboard PMC connectors are available. The connectors #1, #2 and #3 provide the signals for the 64-bit PCI-X Bus. User defined I/O signals are also supported via the PMC connector #4.

This interface has been designed to comply with the IEEEP1386.1 specification which defines a PCI electrical interface for the CMC (Common Mezzanine Card) form factor. The CPC600 provides for 3.3 V PMC PCI signaling environment.

Note:

The PMC rear I/O signals from connector #4 are routed to VME connector P2, whose pinout is described later in this chapter.

Note:

PMC modules can be installed only as an alternative to the 1.8” HDD.

PMC connector pinouts follow on next page.

Table 2-10: PMC Connectors 1 to 4 Pinouts

Pin #	Function	Pin #	Function	Pin #	Function	Pin #	Function
P1_1	TCK	P2_1	+12V	P3_1	NC	P4_1	PMC_I/O
P1_2	-12V	P2_2	TRST#	P3_2	GND	P4_2	PMC_I/O
P1_3	GND	P2_3	TMS	P3_3	GND	P4_3	PMC_I/O
P1_4	INTD#	P2_4	TDO	P3_4	C_BE7#	P4_4	PMC_I/O
P1_5	INTE#	P2_5	TDI	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

2.3.13 VME Bus Connectors

The CPC600 is designed for a VME bus architecture. The module is equipped with standard P1 and P2 VME connectors; P0 connector is mounted on versions CPC600-01 and -02.

Table 2-11: VME Bus Connector P0 Pinout

Pin	A	B	C	D	E	F
1	NC	NC	NC	NC	NC	GND
2	+Txa_LPa_DA+	-Txa_LPa_DA-	GND	LPa_DC+	LPa_DC-	GND
3	+Rxa_LPa_DB+	-Rxa_LPa_DB-	GND	LPa_DD+	LPa_DD-	GND
4	+Txb_LPb_DA+	-Txb_LPb_DA-	GND	LPb_DC+	LPb_DC-	GND
5	+Rxb_LPb_DB+	-Rxb_LPb_DB-	GND	LPb_DD+	LPb_DD-	GND
6	NC	NC	NC	NC	NC	GND
7	IDE_D0	IDE_D4	IDE_D8	IDE_D12	LVDS_CLKM	GND
8	IDE_D1	IDE_D5	IDE_D9	IDE_D13	LVDS_CLKP	GND
9	IDE_D2	IDE_D6	IDE_D10	IDE_D14	I/O	GND
10	IDE_D3	IDE_D7	IDE_D11	IDE_D15	SATA_RXN0	GND
11	IDE_RST#	IDE_REQ#	IDE_IOWR#	IDE_A0	SATA_RXP0	GND
12	IDE_IRQ	IDE_ACK#	IDE_IORD#	IDE_A1	SATA_TXN0	GND
13	IDE_CS1#	IDE_IORDY	IDE_CS3#	IDE_A2	SATA_TXP0	GND
14	IDE_ATADETECT	LVDS_M1	LVDS_M2	LVDS_M3	SATA_RXN1	GND
15	LVDS_M0	LVDS_P1	LVDS_P2	LVDS_P3	SATA_RXP1	GND
16	LVDS_P0	LVDS_VDDEN	I/O	I/O	SATA_TXN1	GND
17	LVDS_BKLEN	RSVD	I/O	I/O	SATA_TXP1	GND
18	USB_A-	RSVD	I/O	I/O	I/O	GND
19	USB_A+	USB_OC#	I/O	I/O	I/O	GND

Table 2-12: VME Bus Connector P1 Pinout

Pin	A	B	C	D	Z
1	D00	BBSY	D08	VPC	MPR
2	D01	BCLR	D09	GND	GND
3	D02	ACFAIL	D10	0	MCLK
4	D03	BG0IN	D11	0	GND
5	D04	BG0OUT	D12	RSV_U	MSD
6	D05	BG1IN	D13	0	GND
7	D06	BG1OUT	D14	0	MMD
8	D07	BG2IN	D15	RSV_U	GND
9	GND	BG2OUT	GND	GAP	MCTL
10	SYSCLK	BG3IN	SYSFAIL	GA0	GND
11	GND	BG3OUT	BERR	GA1	RESP
12	DS1	BR0	SYSRESET	+3.3V	GND
13	DS0	BR1	LWORD	GA2	RSV_B
14	WRITE	BR2	AM5	+3.3V	GND
15	GND	BR3	A23	GA3	RSV_B
16	DTACK	AM0	A22	+3.3V	GND
17	GND	AM1	A21	GA4	RSV_B
18	AS	AM2	A20	+3.3V	GND
19	GND	AM3	A19	SMB_SCL	RSV_B
20	IACK	GND	A18	+3.3V	GND
21	IACKIN	SERA/IPMB_SCL	A17	SMB_SDA	RSV_B
22	IACKOUT	SERB/IPMB_SDA	A16	+3.3V	GND
23	AM4	GND	A15	SMB_ALERT#	RSV_B
24	A07	IRQ7	A14	+3.3V	GND
25	A06	IRQ6	A13	RSV_B	RSV_B
26	A05	IRQ5	A12	+3.3V	GND
27	A04	IRQ4	A11	LI/I	RSV_B
28	A03	IRQ3	A10	+3.3V	GND
29	A02	IRQ2	A09	LI/O	RSV_B
30	A01	IRQ1	A08	+3.3V	GND
31	-12V	+5VSTDBY	+12V	GND	RSV_B
32	+5V	+5V	+5V	VPC	GND

Table 2-13: VME Bus Connector P2 Pinout

Pin	A	B	C	D	Z
1	PMC_P4_2	+5V	PMC_P4_1	FAN_CTRL1	VGA_RED
2	PMC_P4_4	GND	PMC_P4_3	FAN_CTRL2	GND
3	PMC_P4_6	RETRY	PMC_P4_5	FAN_CTRL3	VGA_GREEN
4	PMC_P4_8	A24	PMC_P4_7	FAN_TACH1	GND
5	PMC_P4_10	A25	PMC_P4_9	FAN_TACH2	VGA_BLUE
6	PMC_P4_12	A26	PMC_P4_11	FAN_TACH3	GND
7	PMC_P4_14	A27	PMC_P4_13	AVR_DB_RXD#	VGA_HSYNC
8	PMC_P4_16	A28	PMC_P4_15	AVR_DB_TXD#	GND
9	PMC_P4_18	A29	PMC_P4_17	LPC_AD0	VGA_VSYNC
10	PMC_P4_20	A30	PMC_P4_19	LPC_AD1	GND
11	PMC_P4_22	A31	PMC_P4_21	LPC_AD2	AC_RST#
12	PMC_P4_24	GND	PMC_P4_23	LPC_AD3	GND
13	PMC_P4_26	+5V	PMC_P4_25	LPC_FRAME#	AC_BITCLK
14	PMC_P4_28	D16	PMC_P4_27	LPC_DRQ#	GND
15	PMC_P4_30	D17	PMC_P4_29	LPC_PD#	AC_SDATAIN_0
16	PMC_P4_32	D18	PMC_P4_31	LPC_RST#	GND
17	PMC_P4_34	D19	PMC_P4_33	LPC_SERIRQ	AC_SDATAIN_1
18	PMC_P4_36	D20	PMC_P4_35	LPC_PME#	GND
19	PMC_P4_38	D21	PMC_P4_37	LPC_33M_CLK	AC_SDATAIN_2
20	PMC_P4_40	D22	PMC_P4_39	LPC_14M_CLK	GND
21	PMC_P4_42	D23	PMC_P4_41	LPC_32K_CLK	AC_SDATAOUT
22	PMC_P4_44	GND	PMC_P4_43	IO_KBRST#	GND
23	PMC_P4_46	D24	PMC_P4_45	IO_A20GATE#	AC_SYNC
24	PMC_P4_48	D25	PMC_P4_47	+3_3V	GND
25	PMC_P4_50	D26	PMC_P4_49	+3_3V	SPEAKER
26	PMC_P4_52	D27	PMC_P4_51	+3_3V	GND
27	PMC_P4_54	D28	PMC_P4_53	+5V	SYS_RESET#
28	PMC_P4_56	D29	PMC_P4_55	+5V	GND
29	PMC_P4_58	D30	PMC_P4_57	+5V	GP_LED1
30	PMC_P4_60	D31	PMC_P4_59	+12V	GND
31	PMC_P4_62	GND	PMC_P4_61	GND	GP_LED2
32	PMC_P4_64	+5V	PMC_P4_63	VPC	GND

2.3.13.1 Rear I/O Interfaces

Rear I/O interfaces are available only if RIO680 Rear I/O module is installed.

VGA CRT Interface

The VGA signals are available on both CPC600 and RIO680 front panels. In this configuration, both interfaces are active. The 75 ohm termination resistors for the red, green and blue video signals are installed on the CPC600.

Note:

Both VGA ports are electrically identical and not separated. Do not connect devices to both CPC600 and RIO680 VGA connectors at the same time.

Gigabit Ethernet Interface

Two Gigabit Ethernet ports are available on RIO680 front panel via RJ45 connectors.

COM3 and COM4 Serial Interfaces

The serial ports are opto-isolated. COM3 port complies with the RS232 standard, and COM4 – with RS-485 standard.

USB Interface

Two of the six USB 2.0 connectors, USB5 and USB6, are located on RIO680 front panel.

SATA Interface

RIO680 bears two on-board SATA connectors for attachment of external SerialATA HDDs with the exchange rate of up to 150 MB/s.

EIDE Interface

RIO680 has an on-board EIDE connector for attachment of external EIDE devices.

LPT Interface

The standard IDC on-board connector enables connection of parallel interface devices.

FDD Interface

An external floppy disk drive can be attached to RIO680 on-board FDD connector.

FAN Connectors

There are 5 standard 3-pin headers for connection of external 12 V cooling fans on the RIO680 board.

Audio Interface

The following standard connectors are located on RIO680 front panel: Phones, MicIn, LineIn. Moreover, RIO680 has four on-board audio connectors – CD In, Aux In and Line Out, and a PC speaker connector.

PS/2 Keyboard/Mouse Interface

The RIO680 6-pin front panel connector allows connecton of a PS/2 keyboard and/or mouse.

Opto-isolated Reset

The RIO680 front panel connector "Isolated Reset" is intended to accept the Reset signal from a remote source.

Please see Chapter 7 for detailed description of Rear I/O interfaces.

3 Installation

The CPC600 is easy to install. However, it is necessary to follow the procedures and safety regulations below to install the module correctly without damage to the hardware, or harm to personnel.

The installation of the peripheral drivers is described in the accompanying information files. For details on installation of an operating system, please refer to the relevant software documentation.

3.1 Safety Regulations

The following safety regulations must be observed when installing or operating the CPC600. Fastwel assumes no responsibility for any damage resulting from infringement of these rules.

Warning!

When handling or operating the module, special attention should be paid to the heatsink, because it can get very hot during operation. Do not touch the heatsink when installing or removing the module.

Moreover, the module should not be placed on any surface or in any kind of package until the module and its heatsink have cooled down to ambient temperature.

Caution!

If your module does not allow hotswapping, switch off the system power before installing the module in a free slot. Disregarding this requirement could be harmful for your life or health and can damage the module or entire system.

ESD Sensitive Equipment!

This product comprises electrostatically sensitive components. Please follow the ESD safety instructions to ensure module's operability and reliability:

- Use grounding equipment, if working at an anti-static workbench. Otherwise, discharge yourself and the tools in use before touching the sensitive equipment.
- Try to avoid touching contacts, leads and components.

Extra caution should be taken in cold and dry weather.

3.2 Installation Procedure

To install CPC600 in a system, follow the instructions below.

1. Keep to the safety regulations of the Section 3.1 when performing the following operations.

Warning!

Failure to accomplish the following instruction may damage the module or result in incorrect system operation.

2. Ensure that the module configuration corresponds to the application requirements before installing. For information regarding the configuration of the CPC600, refer to Chapter 4. For the installation of CPC600 specific peripheral devices and I/O devices refer to the appropriate sections in Chapter 3. For details on installation of expansion modules, refer to respective appendices.

Warning!

Do not install CPC600 in a non-system slot if the slot #1 is not populated with a VME bus system controller. This can damage the module and the backplane.

3. To install the CPC600:

    1. Make sure that no power is connected to the system.
    2. Avoiding contact with other modules of the system, carefully insert the module into the chosen slot until it contacts the backplane connectors. Do not apply force pushing the module into the backplane connectors.
    3. Using the front panel handles, engage the module with the backplane. The module is completely engaged, when the ejector handles are locked.
    4. Fix the module with two front panel retaining screws.
    5. Connect the required external interfacing cables to the module's connectors and make sure that the module and all connected cables are properly fixed.

The CPC600 is now ready for operation. Please, refer to appropriate software, application, and system manuals to get further instructions.

3.3 Removal Procedure

To remove the module from the system case do the following:

1. When performing the next actions, keep to safety regulations of the Section 3.1.
   Pay special attention to the temperature of the heatsink!
2. Ensure that the system power is switched off before proceeding.
3. Disconnect all cables that may be connected to the module.
4. Unscrew the front panel retaining screws.
5. Unlock the module ejection handles by pressing the integrated buttons, and then press on the handles until the module connectors are disconnected from the backplane.
6. Carefully pull the module out of the slot. Do not touch the heatsink, since it can get very hot during operation.
7. Dispose of the module at your discretion. The module should not be placed on any surface or in any form of package until the board and the heatsink have cooled down to room temperature.

3.4 Peripheral Devices Installation

A lot of peripheral devices can be connected to the CPC600. Their installation procedures differ significantly. Therefore the following sections provide mainly general guidelines regarding installation of peripheral devices.

The details on external devices connection can be found in documentation supplied with these devices.

3.4.1 USB Devices Installation

The CPC600 can accept Plug&Play connection of USB 2.0 computer peripheral devices (printers, keyboards, mice, etc.) All USB devices may be connected or disconnected while the host power is on.

3.4.2 CompactFlash Cards Installation

CompactFlash socket of CPC600 supports any 3.3 V or 5 V CompactFlash ATA type I cards.

Note:

Connection of the CompactFlash cards while the power is on may damage your system.

Note:

It is recommended to use CompactFlash-cards, which has been initialized and formatted in this module.
By default, CPC600 utilizes LBA mode. Utilization of CompactFlash cards, which has been initialized and formatted in another mode, may lead to errors in operation of the module.

3.4.3 Battery Replacement

The lithium battery must be replaced with Panasonic BR2032 or a battery with similar characteristics.

The expected life of a 190 mAh battery (Panasonic BR2032) is about 5 years. However, this typical value may vary because battery life depends on the operating temperature and the shutdown time of the system in which the battery is installed.

Note...

It is recommended to replace the battery after approximately 4 years to be sure it is operational.

Important:

Replacing the battery, make sure the polarity is correct ("+" up).

Dispose of used batteries according to the local regulations.

4 Configuration

4.1 Jumper Switches

Figure 4-1: Jumper Switches

J18, J19, J20, J21, and J22 jumper switches are located on-board.

4.1.1 Clear CMOS Jumper Description

If the system does not boot (due to, for example, the wrong BIOS configuration or incorrect password) the settings stored in CMOS may be cleared using jumper “Clear CMOS” (J18).

Procedure for clearing CMOS settings:

1. Switch off the system power
2. Set the “Clear CMOS” jumper into the closed position
3. Wait for at least 10 seconds. CMOS setting are reset to factory defaults
4. Set the “Clear CMOS” jumper back to the open position
5. Switch the power on
6. Configure the system using the BIOS Setup program

4.1.2 Other Jumpers

J22 jumper switch in closed position sets PCI-X frequency to 33 MHz. This action is necessary to provide full-function operation of all PCI-X bus devices while PMC module operating in 64-bit/66 MHz mode is installed (due to Intel 6300ESB PCI-X bridge limitations).

Setting J19, J20, and J21 jumper swtches to closed position connects BMC I2C bus to the backplane.

4.2 SW2 and SW3 DIP Switches

SW2 is a GA switch. It is used to manually set the module's geographical address when used with all backplanes except VME64X. The backplane type is detected by presence of +3.3 V.

Position	Description
[1-5]	Module's geographical address digits [0..4] On = "0" Off = "1" E.g. for the module installed in a master slot (1st), the following combination should be set: 1st switch position - "ON", others (2-5) - "OFF
[6]	Enables manual geographical address setting On = Manual GA setting using switches 1-5 enabled Off = GA automatic detection

SW3 DIP switch is used to configure Tundra Tsi148 bridge. For details, please refer to "VMEbus Power-up Options" in section 5.4.2 of the bridge description.

Position	Description
[1]	SFAILEN_RV
[2]	SFAILAI_AC
[3]	ASIDEN
[4]	GSIDEN
[5-6]	Bridge operation mode settings (SCONEN#, SCONDIS#): 5-Off, 6-Off – Automatic system controller detection 5-On, 6-Off – System controller mode enable 5-Off, 6-On – System controller mode disable 5-On, 6-On – Forbidden combination

Both switches are supplied in "Off" position.

4.3 Interrupts Handling

Interrupt handling of the CPC600 module corresponds to the standard AT IRQ mapping (8259 IRQ controller integrated in the chipset). The functions of the interrupts described below are the default ones, but can be modified via the BIOS Setup.

Table 4-1: Interrupt Settings

IRQ	Priority	Standard Function
IRQ0	1	System Timer
IRQ1	2	Keyboard Controller
IRQ2	–	Second IRQ controller input (IRQ8-IRQ15)
IRQ3	11	COM2
IRQ4	12	COM1, COM3
IRQ5	13	Reserved
IRQ6	14	Floppy Disk Controller
IRQ7	15	LPT
IRQ8	3	System RTC
IRQ9	4	PCI or ACPI
IRQ10	5	PCI or COM ports
IRQ11	6	PCI
IRQ12	7	PCI or PS/2 mouse
IRQ13	8	Coprocessor error
IRQ14	9	Primary IDE channel
IRQ15	10	Secondary IDE channel
NMI	–	Reserved

4.3.1 On-board PCI Interrupts

The ICH handles up to 8 PCI interrupt inputs. The table below describes the connected to these PIRQs PCI devices and their functions.

Table 4-2: PCI Interrupt Routing

ICH IRQ Input	PCI Device	Internal ICH Function
PIRQA	CPCI IRQA	USB 1.0 controller #1
PIRQB	CPCI IRQB	AC97 + MODEM + SMBUS
PIRQC	CPCI IRQC	Storage (IDE/SATA) native mode
PIRQD	CPCI IRQD	USB 1.0 controller #2
PIRQE	Gigabit Ethernet	Free
PIRQF	Free	Free
PIRQG	Free	Free
PIRQH	Security	USB 2.0 controller

The details can be found in the ICH technical documentation.

4.4 Memory Maps

The CPC600 module employs the standard AT ISA memory mapping. The details of memory mapping are presented in the following subsections.

4.4.1 First Megabyte Memory Map

The following table shows the memory map for the first megabyte:

Table 4-3: First Megabyte Memory Map

Memory Address Range	Size	Function
0xE0000 – 0xFFFFF	128 k	BIOS implemented in FWH Reset vector 0xFFFF0
0xD0000 – 0xDFFFF	64 k	Free
0xCC000 – 0xCFFFF	16 k	Free
0xC0000 – 0xCC800	48 k	VGA card BIOS
0xA0000 – 0xBFFFF	128 k	Normally used as video RAM according to: CGA: 0xB8000-0xBFFFF Monochrome: 0xB0000-0xB7FFF EGA/VGA: 0xA0000-0xAFFFF
0x00000 – 0x9FFFF	640 k	DOS memory space

4.4.2 I/O Addresses

The following table presents the I/O memory mapping:

Table 4-4: I/O Address Map

Address	Device
000,00F	DMA controller #1
020,02D	Interrupt controller #1
040,043	Timer
060,064	Keyboard interface
070,077	RTC port
080,09F	DMA page register
0A0,0BD	Interrupt controller #2
0C0,0DF	DMA controller #2
0F0,0FF	Math coprocessor
170,17F	Secondary hard disk
1F0,1FF	Primary hard disk
2F8,2FF	Serial port COM2
376	SATA channel #1
3F6	SATA channel #2
378,37F	Parallel printer port LPT1
3E8,3EF	Serial port COM3
3F0,3F7	Floppy Disk
3F8,3FF	Serial port COM1

5 Phoenix® BIOS Setup

5.1 Introduction

The Phoenix® BIOS in your computer is an adapted version of a standard BIOS for IBM PC AT-compatible personal computers equipped with Intel®x86 and compatible processors. The BIOS provides low-level support for the central processing, memory, and I/O system units.

With the help of BIOS Setup program, you can modify the BIOS configuration parameters and control the special features of your module. The Setup program offers a convenient menu interface to modify basic system configuration settings and switching between the subsystems operation modes. These settings are stored in a dedicated battery-backed memory, CMOS RAM, that keeps the information when the power is switched off.

To start the Phoenix BIOS Setup utility turn on or reboot your system. PhoenixBIOS displays this message:

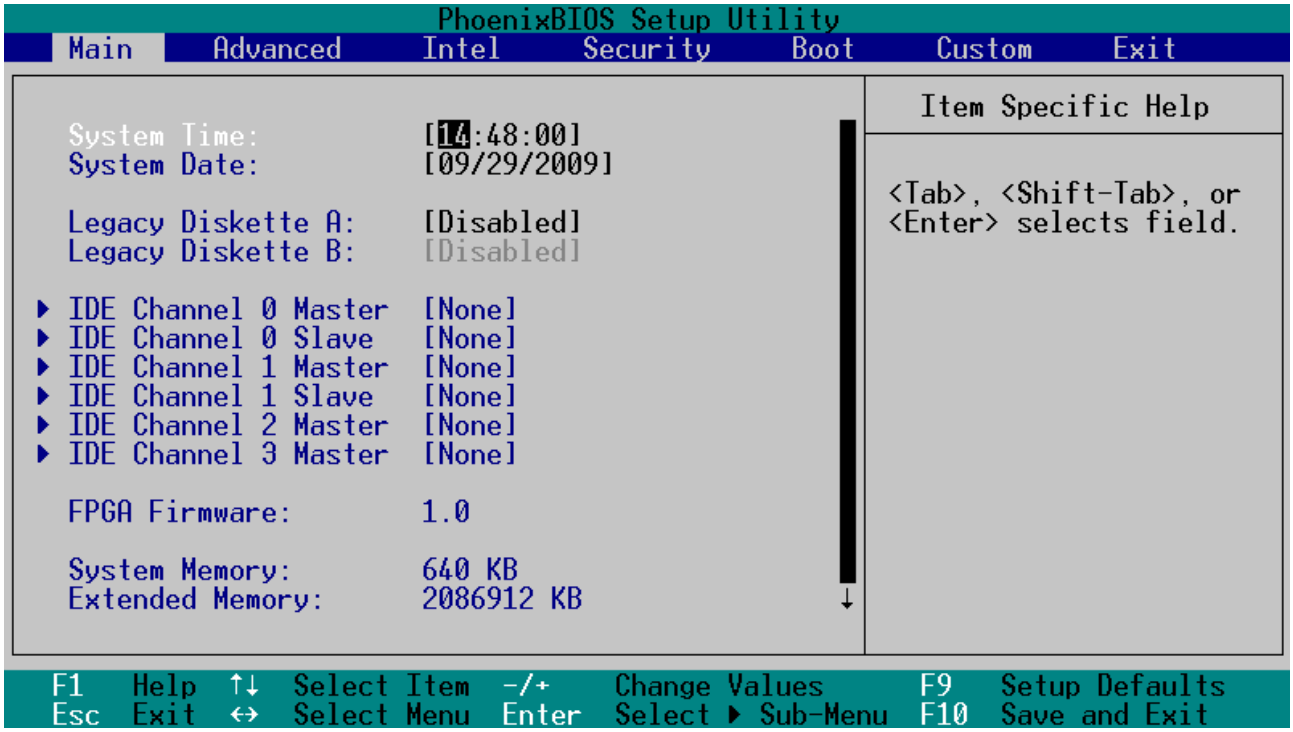
```
Press <F2> to enter SETUP
```

Pressing <F2> lets you enter the Setup utility. The first screen is the Main Menu.

5.2 Main Menu

The Main Menu screen is shown below.

Figure 5-1: Main Menu - Screen Display



The following subsections explain the purpose of main functional areas of the screen and give description of the fields.

5.2.1 Menu Bar

Menu Bar at the top of the window lists these selections:

Table 5-1: The Menu Bar

Menu	Purpose
Main	Basic system configuration
Advanced	Use to set the Advanced Features available on your system's chipset
Intel	Intel chipset-specific parameters
Security	Configuration of system security settings
Boot	Boot sequence configuration
Custom	Configuration of special board features
Exit	Exits the current menu

Use the left and right (←, →) arrow keys to make a selection.

For a description on exiting the Main Menu, see "Exit Menu" section below.

5.2.2 Legend Bar

The legend bar at the bottom of the screen lists the keys to navigate within menu system, to make your selections or exit the current menu. The following table describes the legend keys and their functions.

Table 5-2: Legend Bar

Key	Function
<F1> or <Alt-H>	General Help window (See below)
<Esc>	Exit this menu.
← or → arrow keys	Select a different menu
↑ or ↓ arrow keys	Move cursor up and down
<Tab> or <Shift-Tab>	Cycle cursor between the fields
<Home> or <End>	Move cursor to top or bottom of window
<PgUp> or <PgDn>	Move cursor to next or previous page
<F5> or <->	Select the next lower value for the field
<F6> or <+> or <Space>	Select the next higher value for the field
<F9>	Load the Default Configuration values for the complete BIOS
<F10>	Save and exit
<Enter>	Execute command or select ► Submenu
<Alt-R>	Refresh screen

To select an item, use the arrow keys to move the cursor to the field you want. Then use the plus-and-minus value keys to select a value for that field. The Save Values command in the Exit Menu save the values currently displayed in all the menus.

A pointer ► marks all submenus. To display a submenu, use the arrow keys to move the cursor to the submenu you want, and then press <Enter>.

To get the on-line help about the details of BIOS Setup program operation, please apply to the screen tips and the integrated help system.

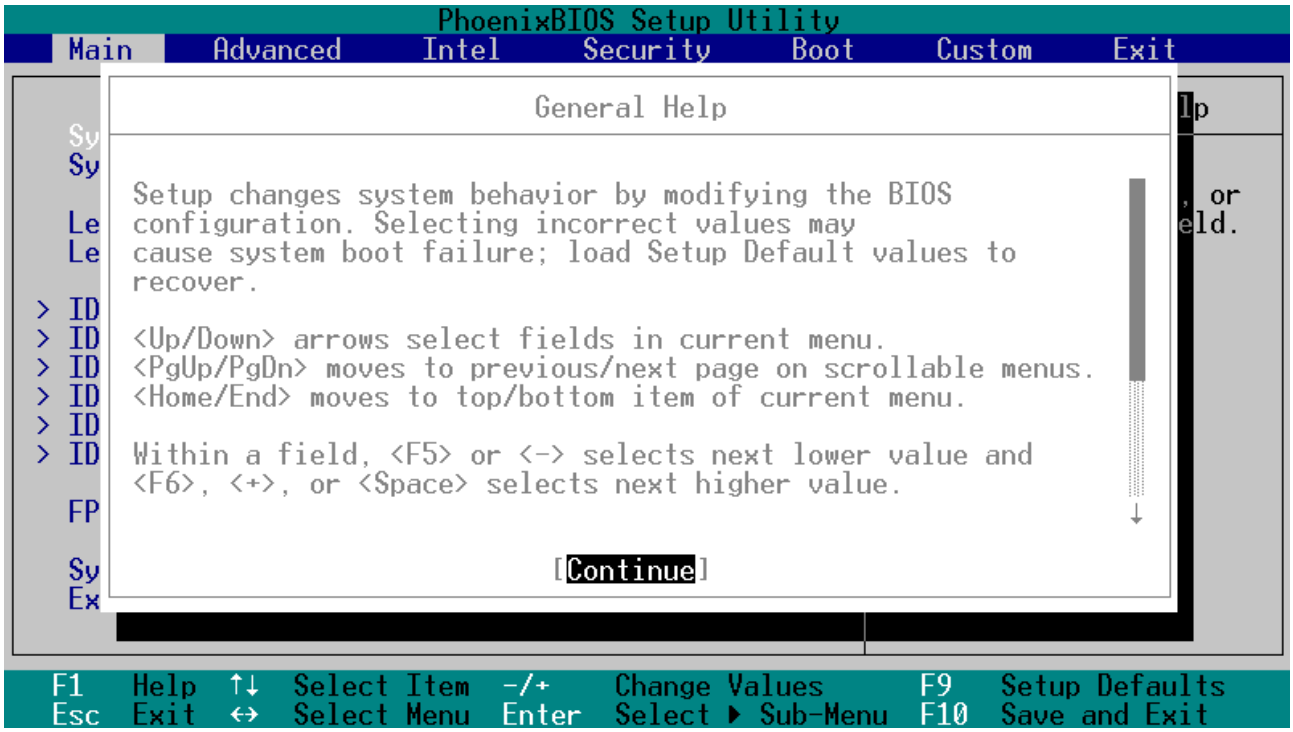
5.2.3 Item Specific Help Window

The help window on the right side of each menu screen displays the field-specific help text, it updates as you move the cursor from field to field.

5.2.4 General Help Window

Pressing <F1> or <Alt-H> on any menu brings up the General Help window that describes the legend keys and their functions.

Figure 5-2: General Help Window



The scroll bar on the right of any window indicates that there is more than one page of information in the window. Use <PgUp> and <PgDn> to display all the pages. Pressing <Home> and <End> displays the first and last page. Pressing <Enter> displays each page and then exits the window.

Press <Esc> to exit the window.

5.2.5 Main Menu Selections

Main Menu screen offers possibility to set system time and date, to enter type, specifications, and control options for the devices connected to IDE channels. Additionally, this menu screen gives information on the amount of the detected main and extended system memory, and allows to set system response to POST errors.

Warning!

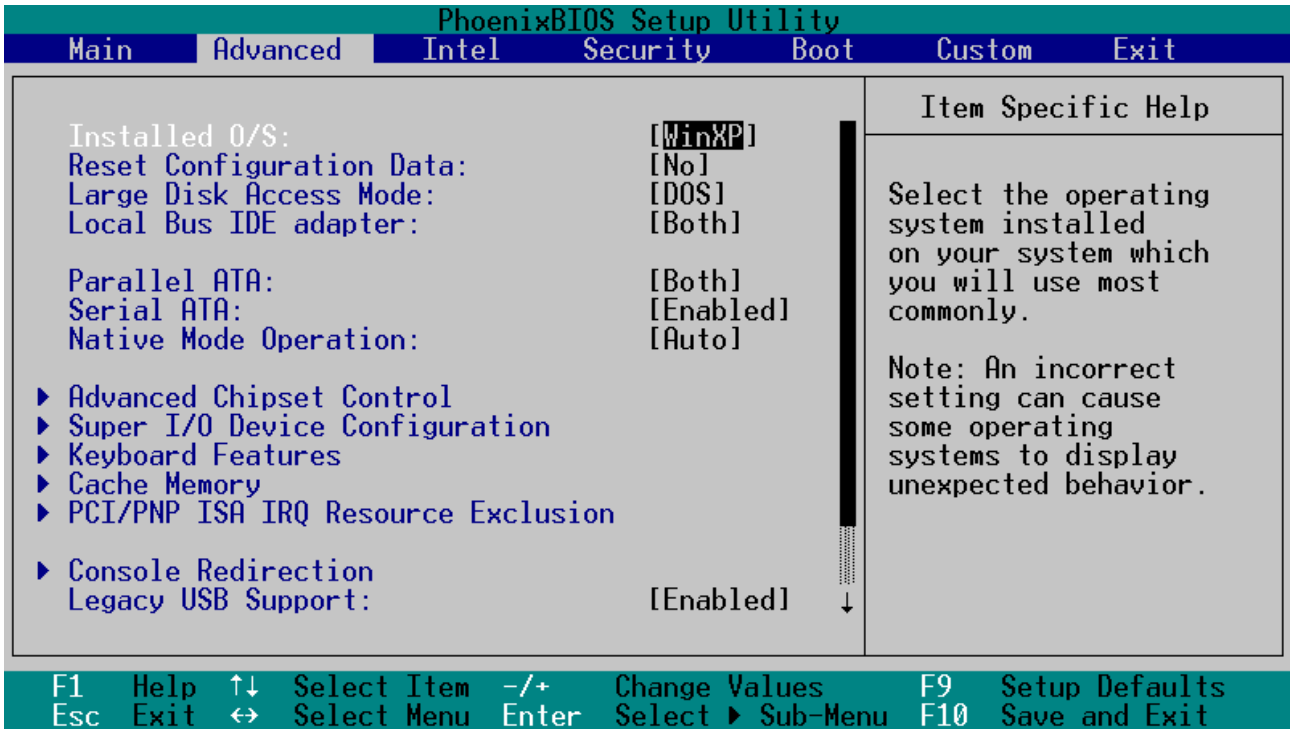
Incorrect settings can cause your system to malfunction.

To correct mistakes, return to Setup and restore the Setup Defaults with <F9> and re-enter the correct parameters.

5.3 Advanced Menu

The Advanced Menu screen is shown below.

Figure 5-3: Advanced Menu - Screen Display



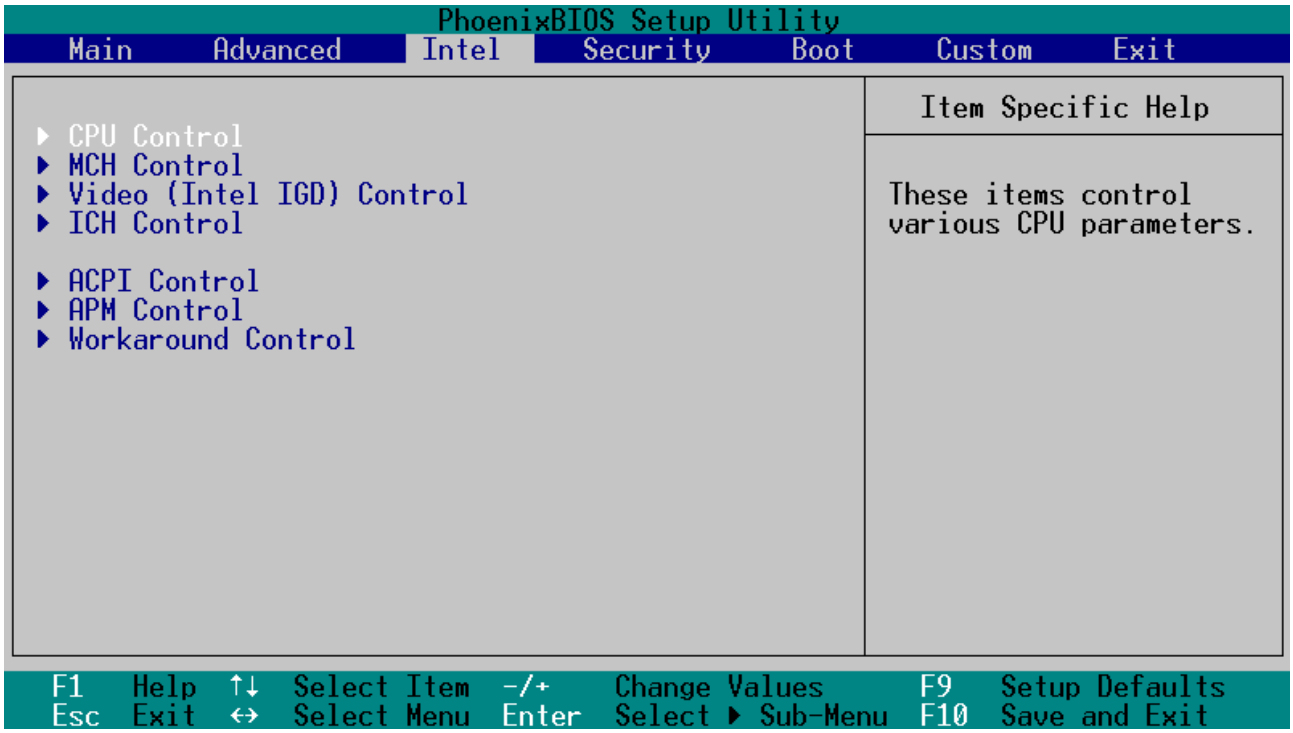
This menu screen gives access to advanced system configuration parameters. Submenus allow setting thermal and power control options, configuring serial and parallel ports, adjusting keyboard behavior, enabling cache memory use for various system components, and reserving IRQs for legacy ISA devices.

Remember, that incorrect settings can cause your system to malfunction.

5.4 Intel Menu

The Intel menu screen offers a number of submenus containing chipset-specific control fields.

Figure 5-4: Intel Menu - Screen Display

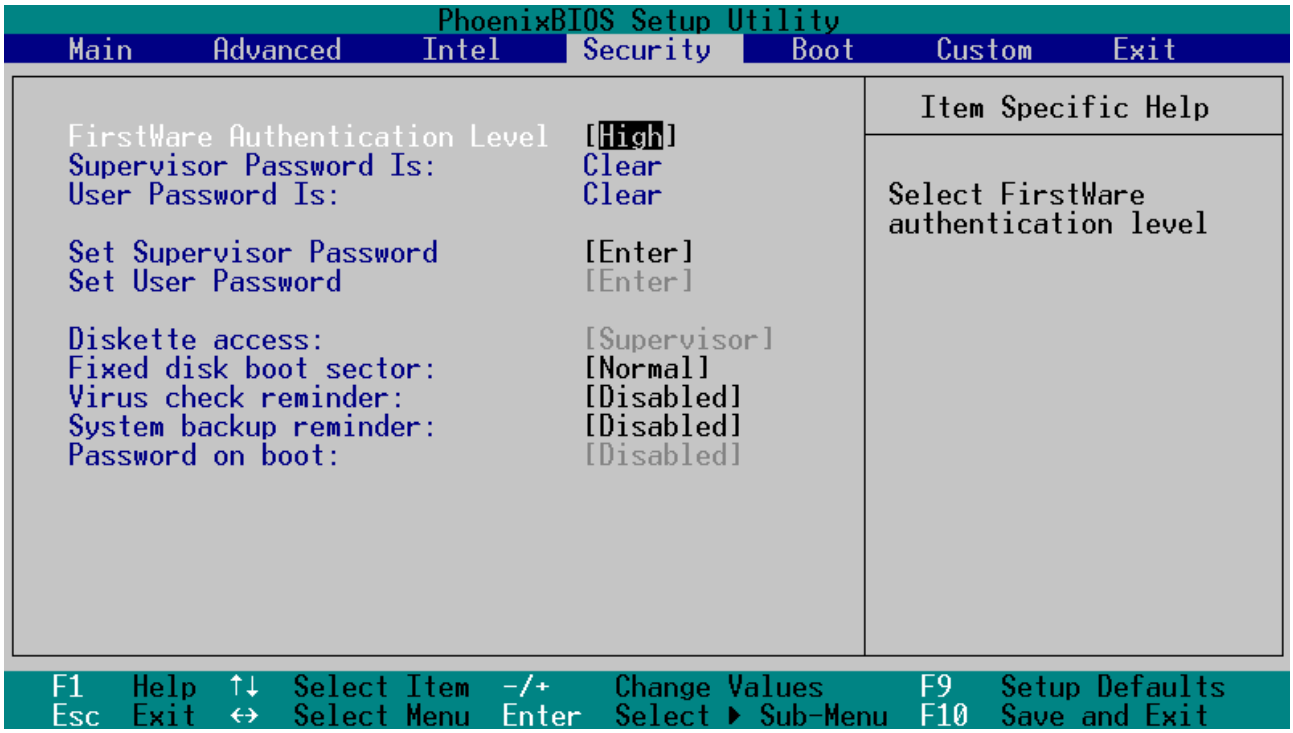


CPU power and thermal management, MCH and ICH control options, integrated graphics controller parameters, as well as ACPI and APM control – all these features are available via submenus on this screen.

5.5 Security Menu

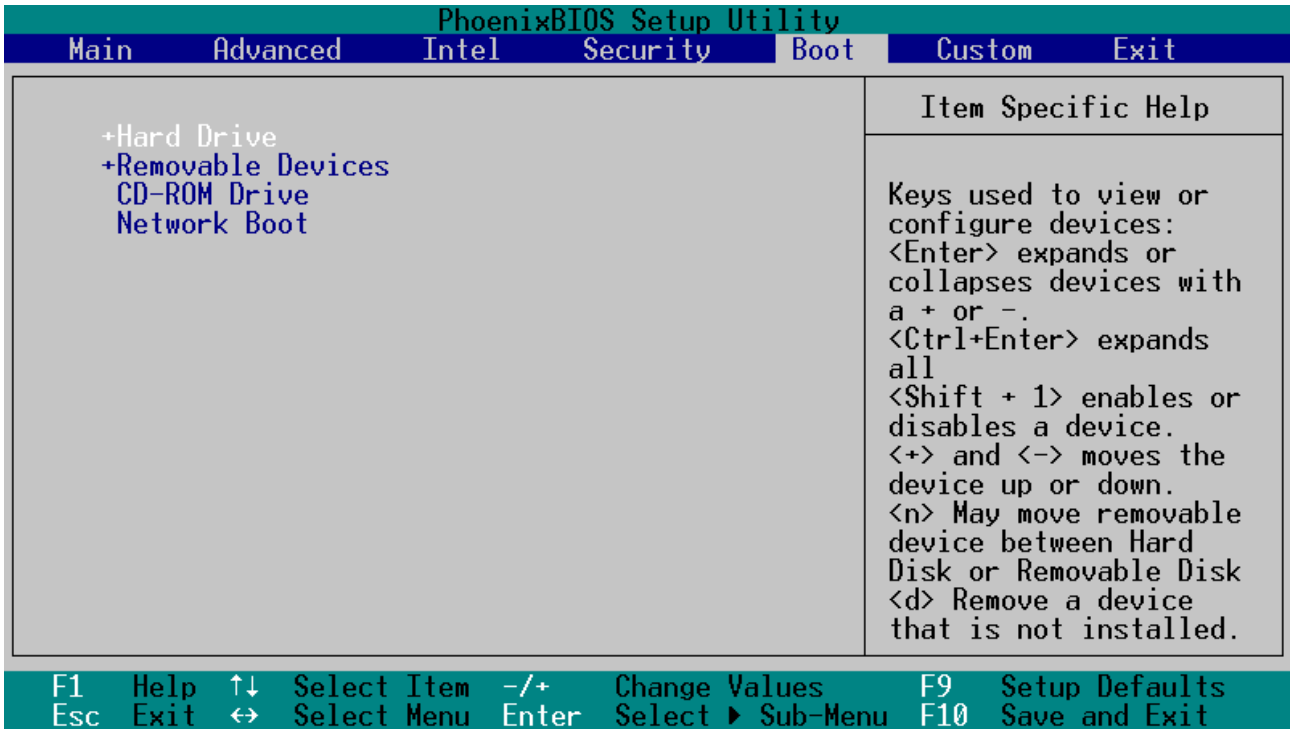
Various system security settings, such as supervisor password and other access control parameters, are collected at this menu screen.

Figure 5-5: Security Menu - Screen Display



5.6 Boot Menu

Figure 5-6: Boot Menu - Screen Display



After you turn on your computer, it will attempt to load the operating system from the chosen device. If it cannot find the operating system on that device, it will attempt to load it from one or more other devices in the order specified in the Boot Menu. Boot devices (i.e., with access to an operating system) can include: hard drives, floppy drives, CD ROMs, removable devices (e.g., Iomega Zip drives), and network cards.

Use the keys described in Item Specific Help to arrange devices in order to specify the priority of the devices from which the BIOS will attempt to boot the operating system.

5.6.1 Boot Details

Booting without a Monitor, Keyboard or Mouse

To boot without a monitor, keyboard or mouse set the item "POST Errors" to "Disabled" at the page "Main" in PhoenixBIOS Setup program. This setting is a default one.

Note!

If the module was booted without a connected monitor, the display will be empty, even if a monitor is connected later during operation. To get the correct display output it is necessary to reboot the module with a connected monitor. This is a Intel VideoBIOS particularity.

Booting from USB

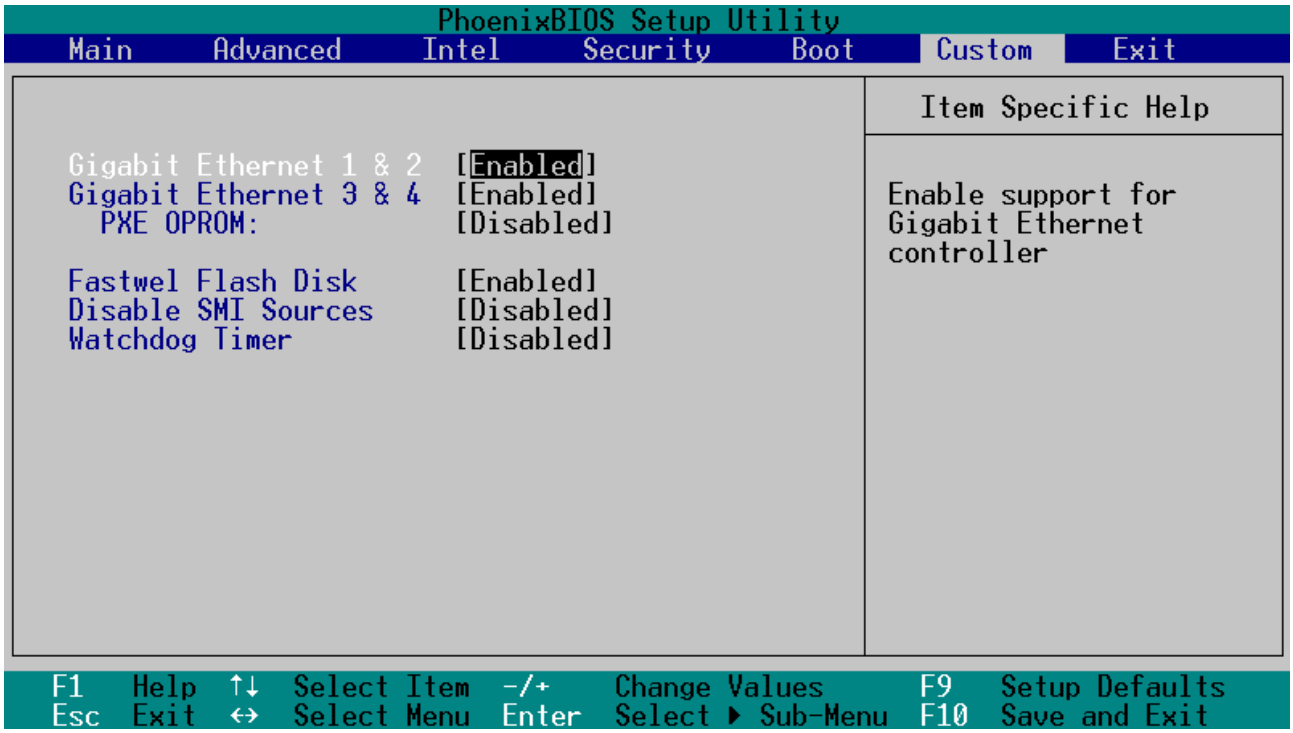
To boot from a device connected to USB:

- Connect the device to boot from to a USB port. The appropriate USB controller should be enabled;
- Enter the PhoenixBIOS Setup program;
- Find this USB device at the "Boot" page and use «+» «–» buttons to move it in order to change its boot priority;
- Save changes and reboot the module.

5.7 Custom Menu

Selecting "Custom" from menu bar on the Main Menu displays a menu shown below.

Figure 5-7: Custom Menu - Screen Display



This menu screen provides possibility to control several product-specific features, including Gigabit Ethernet channels, Fastwel flash disk, SMI sources, and watchdog timer.

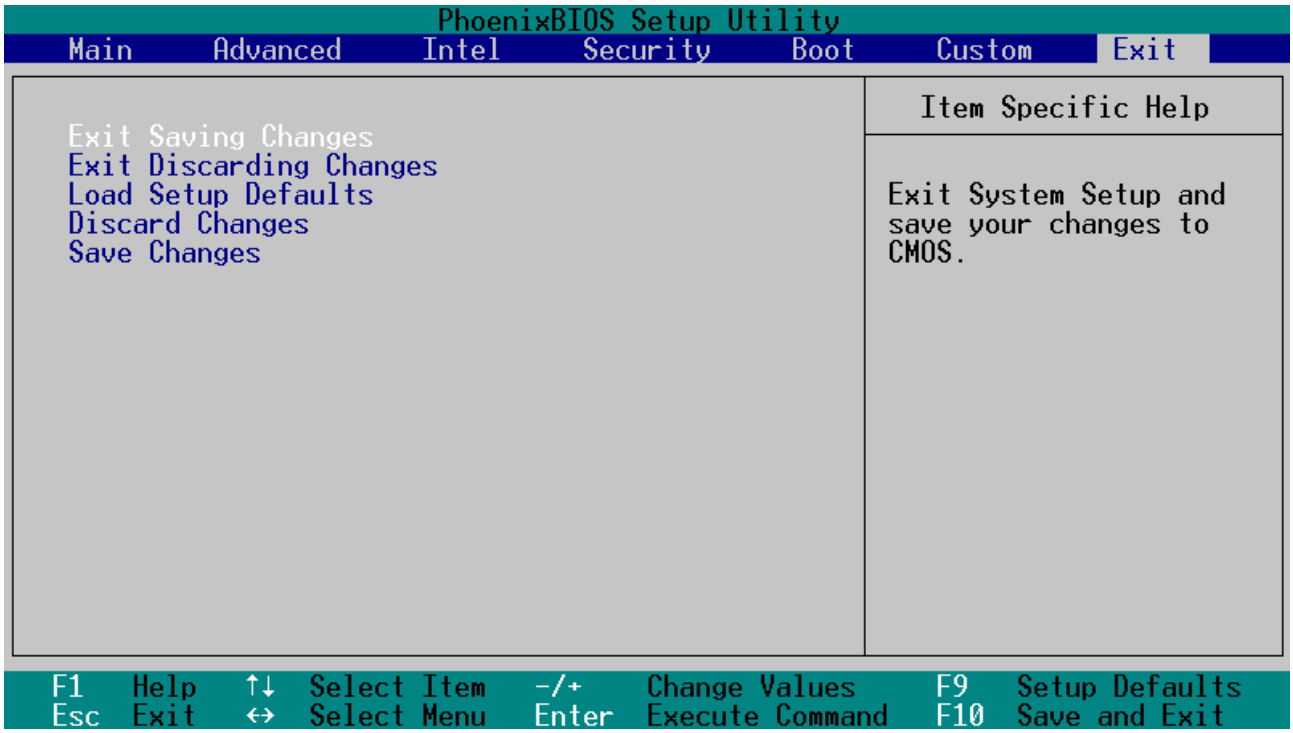
Table 5-1: Custom Menu Options

Menu Item	Function
Gigabit Ethernet 1 & 2	Enables Gigabit Ethernet controller for channels 1 and 2 (CPC600 front panel sockets)
Gigabit Ethernet 3 & 4	Enables Gigabit Ethernet controller for channels 3 and 4 (RIO680 rear I/O module front panel sockets)
PXE OPROM	Enables the Preboot Execution Environment Option ROM allowing to boot via a network interface
Fastwel Flash Disk	Enables support for the onboard Fastwel Flash Disk
Disable SMI Sources	"Disabled" will remove all SMI sources in the ICH SMI_EN register. It is needed for realtime OS (e.g. QNX).
Watchdog Timer	Enables the watchdog timer and sets its operation mode: Disabled — The WDT is off Enabled For BIOS — The WDT is enabled during BIOS POST only Enabled For Boot — The WDT is on when an operating system is running Enabled — The WDT is always on
Watchdog Timer Timeout	Allows setting the watchdog timer timeout to 500 ms, 1 s, 2 s, 5 s, 10 s, 30 s, 1 min, 2 min, 5 min, 10 min, 15 min

5.8 Exit Menu

Selecting "Exit" from menu bar on the Main Menu or pressing <Esc> at any Main Menu screen displays the following menu.

Figure 5-8: Exit Menu - Screen Display



Note that <Esc> does not exit this menu. You must select one of the items from the menu to exit. Here you can select whether or not to save changes made to BIOS parameters during the current session to CMOS memory and exit BIOS Setup utility.

6 Thermal and Power Issues

6.1 Temperature Control

Intensive operation of Intel Pentium M processor in harsh environment requires a special technology to keep the processor's die temperature within allowed limits. The following sections provide system integrators with the information, which will help to meet thermal requirements when developing systems based on CPC600.

6.1.1 Passive Regulation

The thermal management concept of CPC600 module includes four separate but correlated functions. Their main purpose is to protect the processor from overheating and reduce its power consumption. Dedicated thermal control subsystem allows the processor to operate within safe temperature range without the need for special software or interrupt handling.

The four thermal protection functions provided by the processor are:

1. **Thermal Throttling**: The Pentium M internal thermal monitor controls the temperature of the processor. The internal temperature sensor is located near the hottest area of the processor die. Each processor is individually adjusted at the factory to compensate the potential manufacturing variations of its characteristics. To reduce the processor power dissipation the internal thermal monitor switches the processor core clock on and off with a duty cycle factor of 50%.
2. The Intel® Pentium® M processor supports the Intel **SpeedStep**® enhanced technology. It allows to switch the processor core voltage and frequency between several modes from High Frequency Mode to Low Frequency Mode without resetting the system. For example, the processor operating at 1.6 GHz and 1.484 V (HFM) can be switched down to 600 MHz and 0.956 V (LFM), thus reducing the processor power consumption approx. by a factor of 4.
3. **Thermtrip** function is always on to protect the processor in any event. In case of a serious cooling subsystem failure, the processor will automatically shut down when the die temperature has reached approximately 125°C. Once Thermtrip is activated, the system does not return to the normal operation mode automatically, it is necessary to reset the BIOS settings and to cold restart the system. The BIOS settings can be reset by lifting the contact plate of the battery holder for a period of more than 5 seconds.
4. **External thermal monitor** (LM82) gathers information about the processor and board surface temperatures from two sensors. This information may then be requested by a program to undertake the appropriate actions.

Recommendations

Generally, there is no need to enable the Thermal Management functions if the module is operated in a optimally designed environment with sufficient air flow. However, to guarantee a stable system in unsteady industrial environment, both the internal and the external thermal monitors should be enabled. These two monitors protect the processor and the whole system against overheating.

Note:

Thermal Management functions should be disabled when performing Benchmarks and performance tests, otherwise the results will be incorrect due to the power reduction processes influence.

6.1.2 Active Regulation

To provide controlled active heat dissipation CPC600 is equipped with a specially designed heatsink. Together with a system chassis with adjustable forced air flow capability this provides a basis for reliable and steady operation. Forced air flow of sufficient volume is vital for high performance processors operating in high temperature environments.

As an option the processor module can be equipped with a large size heatsink, mounted instead of the 2.5” hard disk on versions CPC600-01 and -03.

When developing applications using the CPC600, the system integrator must take into account the overall system thermal requirements. System chassis must satisfy these requirements. When performing thermal calculations for certain application, the developer must consider the contribution of peripherals to be used with the CPC600 to the total heat emission. These devices must also be capable to operate at the temperatures within the system operating range, especially those, which are attached directly to the CPC600 processor module.

Warning!!!

Since Fastwel does not assume responsibility for any damage to the CPC600 module or other system parts resulting from overheating of the central processor, it is important to ensure that the CPC600 operational environment parameters conform to the thermal requirements described in this Manual.

6.2 System Power

The Intel Pentium M processor family require special characteristics of the power supply unit and the backplane.

The CPC600 module itself has been designed to provide best possible power supply for each system unit. However, in order to guarantee reliable and faultless operation the following requirements must be taken into account. Absolute maximum input voltages presented in the table below must not be exceeded to guarantee that the CPC600 is not damaged. The ranges for the different input power voltages, within which the module is functional, are also presented.

Table 6-1: DC Input Voltage Ranges and Limits

Power Voltage, V	Maximum Permitted Value, V	Absolute Limits, V	Recommended Range, V
+5	+5.5	4.9 to 5.25	5.0 to 5.25
+12	+14.0	11.4 to 12.6	–
-12	-14.0	-11.4 to -12.6	–

Power supplies to be used with the CPC600 should comply with these requirements.

Only backplanes which have two power layers for each of the +3.3V and the +5V supply voltage are recommended for CPC600. Input power connections to the backplane itself should provide minimum power loss. Avoid using long input lines, low carrying capacity cables, high resistance connections.

To select the appropriate system power supply, it is necessary to consider the CPC600 own power consumption (about 35 watts), the consumption of the remaining system components, possible variations of power consumption during operation (e.g. due to temperature changes) and some reserve. Taking all this into account, it is recommended to use a 150 watt power supply. If possible, power supplies with voltage sensing should be used. This may require an appropriate backplane.

Table 6-2: Some CPC600 Components Power Consumption

System Modules		Power Consumption
Keyboard	(5 V)	100 mW
DDR SDRAM SODIMM PC2700 1 GB	(2.5 V)	5 W
CompactFlash card	(3.3 V)	100 to 300 mW

7 RIO680 Rear I/O Module

7.1 Introduction

RIO680 Rear I/O modules have been designed for use with the Fastwel CPC600 6U VME processor module. These Rear I/O modules expand I/O functionality of the CPC600 being plugged in from the back of the system into the appropriate backplane connectors in line with the CPU module. Processor module can work with only one Rear I/O module at a time.

A particular advantage of the rear I/O capability is that there is no or less cabling on the CPU module which makes it much easier to remove the processor module from the rack.

7.1.1 Specifications

Power Consumption:

0.1 A @ +3.3 V; 0.1 A @ +5 V; 0.3 A @ +12 V (without external devices)

Dimensions of the 6U rear I/O modules:

233.35 x 80 x 20.32 mm (6U rear I/O card size)

7.1.2 Rear I/O Module Versions

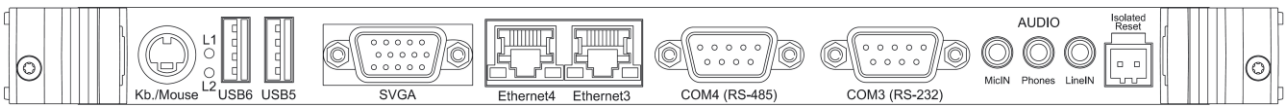
At the present time RIO680 Rear I/O module is available in two versions, differing in the operating temperature range:

Table 7-1: Rear I/O Modules Versions

Version	Operating Temperature Range
RIO68001-I	-40 … +85°C
RIO68001-C	0 … +70°C

7.2 Front Panel

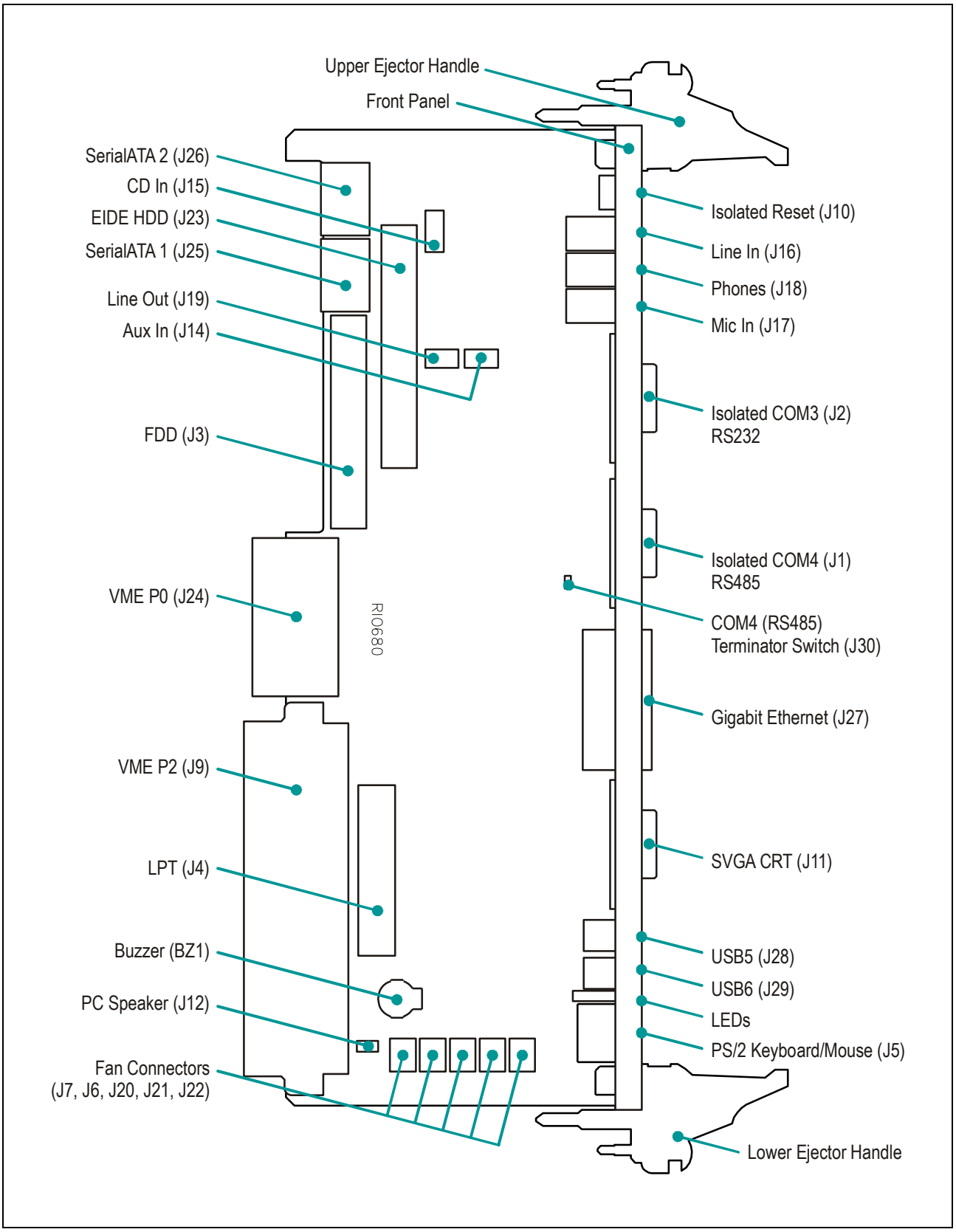
Figure 7-1: RIO680 Front Panel



The design of the front panel may slightly differ for various versions of the module.

7.3 RIO680 Rear I/O Module Layout

Figure 7-2: RIO680 Module Layout (Top)



The components and connectors layout may slightly differ for various versions of the module.

7.4 RIO680 Delivery Checklist

The RIO680 supplied set includes:

1. RIO680 Rear I/O module
2. Special IDE HDD ribbon cable, 80-threads
3. FDD ribbon cable, 34-threads
4. SerialATA angle data cable
5. SerialATA power cable
6. PS/2 Y-cable
7. Antistatic bag
8. Consumer package

Note:

Keep the antistatic bag and the original package at least until the warranty period is over. It can be used for future storage or warranty shipments.

7.5 RIO680 Module Interfaces

The following sections present information on RIO680 interfaces.

7.5.1 Overview of Modules Interfaces

7.5.1.1 Front Panel Interfaces

Interfaces available via the front panel:

- Isolated Reset socket
- Audio connectors: MicIN, Phones, LineIN (3.5 mm standard sockets)
- COM3 interface (RS232), 9-pin D-Sub connector
- COM4 interface (RS485), 9-pin D-Sub connector
- Two Gigabit Ethernet ports, RJ45 sockets
- VGA-CRT interface, 15-contact female high-density D-Sub connector
- Two USB 2.0 ports, type A 4-contact sockets
- L1 and L2 programmable LEDs
- PS/2 connector for mouse and/or keyboard, 6-pin MiniDIN

7.5.1.2 Onboard Interfaces and Connectors

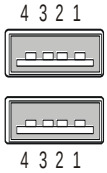
Interfaces, accessible via RIO680 onboard connectors:

- VME specification 6U rear I/O on J9 (P2) and J24 (P0)
- 2 Serial ATA interfaces via standard connectors
- Floppy disk interface via the 34-pin 2.54 mm IDC connector
- EIDE interface via the 40-pin 2.54 mm IDC connector
- LPT-Interface via the 26-pin 2.54 mm IDC connector
- Audio interface (AuxIn, LineOut – 3-pin connectors; CD In – 4-pin connector)
- PC speaker connector (2-pin connector)
- Fan power connectors (3-pin)
- Buzzer

7.5.2 Detailed Description of Interfaces

7.5.2.1 USB Interfaces

Figure 7-3: USB Connectors J28 and J29



There are two identical USB 2.0 interfaces on the RIO680 module, each with a maximum transfer rate of 480 Mbps, provided for connecting USB peripheral devices. One USB device may be connected to each port. To connect more than two USB devices to the module an external hub is required.

Note:

Some USB devices may operate via the Rear I/O connectors in USB 1.1 mode.

Table 7-2: USB Connectors J28 and J29 Pinouts

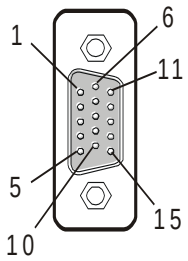
Pin Number	Name	Function	In/Out
1	VCC	VCC signal	–
2	UV0 -	Differential USB -	In/Out
3	UV0+	Differential USB+	In/Out
4	GND	GND signal	–

Note:

The maximum current for each USB port is limited to the amount of 0.5 A by the module's circuitry. All signal lines are EMI-filtered.

7.5.2.2 VGA-CRT Interface

Figure 7-4: D-Sub VGA-CRT Connector J11



The 15-contact female connector J11 is used to connect a VGA analog monitor to the RIO680 Rear I/O module.

Table 7-3: VGA Connector J11 Pinout

Pin #	Signal	Function	In/Out
1	Red	Red video signal output	Out
2	Green	Green video signal output	Out
3	Blue	Blue video signal output	Out
9	VCC	Power +5V 500 mA, fuse protection	Out
12	DDCdata	I^2C™ data	In/Out
13	Hsync	Horizontal sync. TTL	Out
14	Vsync	Vertical sync. TTL	Out
15	DDCclk	I^2C™ clock	Out
5, 6, 7, 8	GND	GND Signal	–
4, 10, 11	Free	–	–

Note:

The VGA signals are available on both rear I/O and front I/O. In this configuration both interfaces are active.

Both VGA ports are not electrically separated. Plug-n-Play capability is supported at the CPC600 and is not supported at the RIO680.

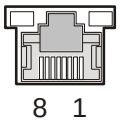
Do not connect devices to both connectors (front I/O and rear I/O) at the same time.

The VCC power line is protected by a 500 mA fuse.

7.5.2.3 Gigabit Ethernet Interface

The CPC600 board supports four 10Base-T/100Base-TX/1000Base-T Ethernet ports based on two Intel® 82546GB dual port Gigabit Ethernet PCI-X Bus controllers. Two of these ports are available at the RIO680 front panel.

Figure 7-5: Gigabit Ethernet Connectors



Each of the two RIO680 front panel Ethernet connectors is realized as an RJ45 connector for twisted-pair cabling.

The interfaces provide auto-detection and switching between 10Base-T, 100Base-TX and 1000Base-T operation modes. Each of the pair Ethernet channels (CPC600 or RIO680 pairs) may be disabled via the BIOS Setup or user software utility to free up system resources.

Table 7-4: Gigabit Ethernet Connectors Pinouts

Pin	10Base-T		100Base-TX		1000Base-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–

MDI / Standard Ethernet Cable

Integrated Ethernet LEDs

Ethernet LEDs are optional. Some versions of RIO680 may be equipped with RJ45 connectors without integrated LEDs.

Green: Line: This LED indicates network connection. The LED lights up when the line is connected.

Green: Act: this LED monitors network activity. The LED lights up when network packets are sent or received through the RJ45 port. When this LED is not lit, it means that the computer is not sending or receiving network data.

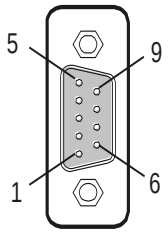
7.5.2.4 Serial Port Interfaces

The serial port isolated interfaces COM3 (J2) and COM4 (J1) are located on the front panel of RIO680 as 9-pin D-sub connectors.

COM3 is PC-compatible RS-232 serial port with 5 V charge-pump technology with no need for a +12 V and -12 V supply. This COM port is fully compatible with the 16550 controller, includes a complete set of handshaking and modem control signals, maskable interrupt generation and data transfer rate of up to 230.4 Kbps.

COM4 is RS-485 serial port with half-duplex interface and the data transfer rate of 460.8 Kbps.

Figure 7-6: D-Sub Serial Connectors J1 and J2



The COM3 and COM4 interfaces use the 9-pin D-sub connectors on the front panel. Serial connectors' pinouts are presented in the tables below.

The following table gives the pinout of the 9-pin D-sub connectors COM3 and COM4.

Table 7-5: Serial Port Connectors J2 (COM3) and J1 (COM4) Pinout

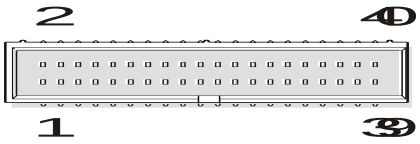
Pin	RS485 (COM4)	RS232 (COM3) (Standard PC)
1	+TRXD	DCD
2	NC	RXD
3	NC	TXD
4	NC	DTR
5	GND	GND
6	–TRXD	DSR
7	NC	RTS
8	NC	CTS
9	NC	RIN

Note:

The RS485 interface (COM4) provide for support of up to 256 network segments. In case the module is supposed to serve as a terminal network device, it is necessary to install a jumper on J30 jumper switch.

7.5.2.5 EIDE Port

Figure 7-7: J23 HDD Connector



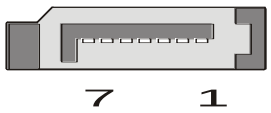
There is a standard AT HDD 40-pin IDC connector mounted on the RIO680 board. It is possible to connect both secondary master and secondary slave devices to this EIDE channel. Maximum IDE cable length is 50 cm. The pinout of the standard AT HDD connector is shown in the table below.

Table 7-6: Pinout of AT Standard Secondary EIDE Connector

Pin	Signal	Function	In/Out
1	IDERESET	Reset HD	Out
2	GND	Ground signal	–
3	HD7	HD data 7	In/Out
4	HD8	HD data 8	In/Out
5	HD6	HD data 6	In/Out
6	HD9	HD data 9	In/Out
7	HD5	HD data 5	In/Out
8	HD10	HD data 10	In/Out
9	HD4	HD data 4	In/Out
10	HD11	HD data 11	In/Out
11	HD3	HD data 3	In/Out
12	HD12	HD data 12	In/Out
13	HD2	HD data 2	In/Out
14	HD13	HD data 13	In/Out
15	HD1	HD data 1	In/Out
16	HD14	HD data 14	In/Out
17	HD0	HD data 0	In/Out
18	HD15	HD data 15	In/Out
19	GND	Ground signal	–
20	NC	–	–
21	IDEDRQ	DMA request	In
22	GND	Ground signal	–
23	IOW	I/O write	Out
24	GND	Ground signal	–
25	IOR	I/O read	Out
26	GND	Ground signal	–
27	IOCHRDY	I/O channel ready	In
28	GND	Ground signal	–
29	IDEDACK	DMA Ack	Out
30	GND	Ground signal	–
31	IDEIRQ	Interrupt request	In
32	NC	–	–
33	A1	Address 1	Out
34	NC	–	–
35	A0	Address 0	Out
36	A2	Address 2	Out
37	HCS0	HD select 0	Out
38	HCS1	HD select 1	Out
39	NC	–	–
40	GND	Ground signal	–

7.5.2.6 Serial ATA Ports

Figure 7-8: SATA Connector



SerialATA drives can be attached to J25 (SATA#1) and J26 (SATA#2) connectors. The connectors' pinout is presented in the table below.

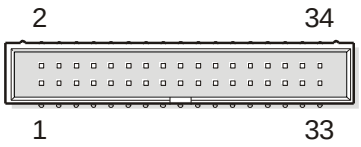
Table 7-7: J25 and J26 SATA Connectors Pinout

Contact Number	Function
1	GND
2	TXP
3	TXN
4	GND
5	RXN
6	RXP
7	GND

It is recommended to use a 45 cm cable for connection of SerialATA drives.

7.5.2.7 Floppy Drive Interface

Figure 7-9: FDD (J3) Connector



RIO680 is provided with a standard FDD 2-row 34-pin male on-board connector (J3), which accepts connection of up to two floppy drives.

Warning!

Pay attention to the correct connection of the floppy drive cable. Please, note that cable inversion will lead to continuous operation of the floppy drive, that may damage the diskette in it.

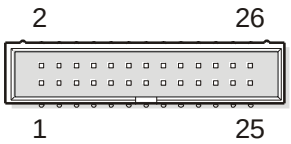
Table 7-8: Floppy Drive Connector J3 Pinout

Pin Number	Signal	Function	In/Out
2	SELECT0	Density Select 0	Out
4	NC	-	-
6	SELECT1	Density Select 1	Out
8	INDEX	Index pulse	In
10	MOTEN1	Motor 1 enable	Out
12	DRVSEL2	Driver select 2	Out

Pin Number	Signal	Function	In/Out
14	DRVSEL1	Driver select 1	Out
16	MOTEN2	Motor 2 enable	Out
18	DIRECTION	Step direction	Out
20	STEP	Step pulse	Out
22	WRDATA	Write data	Out
24	WREN	Write enable	Out
26	TRACK0	Track 0 signal	In
28	WRPROT	Write protect	In
30	RDDATA	Read data	In
32	HEADSEL	Head select	Out
34	DSKCHG	Disk change	In
Odd Numbers	GND	Ground signal	-

7.5.2.8 LPT Interface

Figure 7-10: LPT (J4) Connector



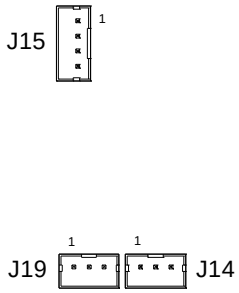
The LPT interface is available through the J4 26-pin on-board connector (2.54 mm pitch). To use a standard parallel port device, a special adapter cable is necessary.

Table 7-9: LPT Interface Connector J4 Pinout

Pin	Signal	In/Out	Pin	Signal	In/Out
1	STROBE	Out	14	GND	–
2	AUTOFD	Out	15	PD6	In/Out
3	PD0	In/Out	16	GND	–
4	ERROR	In	17	PD7	In/Out
5	PD1	In/Out	18	GND	–
6	INIT	Out	19	ACK	In
7	PD2	In/Out	20	GND	–
8	SLCTIN	Out	21	BUSY	In
9	PD3	In/Out	22	GND	–
10	GND	–	23	PE	In
11	PD4	In/Out	24	GND	–
12	GND	–	25	SLCT	In
13	PD5	In/Out	26	GND	–

7.5.2.9 Audio Interface and PC Speaker Connector

Figure 7-11: On-board Audio Connectors



On the RIO680 module audio interface is available via three on-board pinrow connectors (J14, J15 and J19), and three front panel connectors (J16, J17 and J18), which are standard 3.5 mm audio jacks. Information on these connectors is collected in the following tables.

Table 7-10: RIO680 Audio Interface Connectors

Name	Location	Designation
Phones (J18)	Front panel	Output to headphones
Mic In (J17)	Front panel	Input from microphone
Line In (J16)	Front panel	Line input
Aux In (J14)	Board	Auxiliary line input, 3 pins
CD In (J15)	Board	Input from CD drive, 4 pins
Line Out (J19)	Board	Line output, 3 pins

Table 7-11: Onboard Audio Connectors J14, J15 and J19 Pinouts

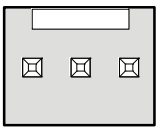
J14		J15		J19	
Pin	**Function**	**Pin**	**Function**	**Pin**	**Function**
1	AUX_IN_R	1	CD_IN_R	1	LINE_OUT_R
2	GNDA	2	CD_IN_COMM	2	GNDA
3	AUX_IN_L	3	CD_IN_COMM	3	LINE_OUT_L
–	–	4	CD_IN_L	–	–

Figure 7-12: PC Speaker Connector

RIO680 modules also have an on-board 2-pin PC-speaker connector (J12). If the polarity of the speaker matters, please, connect "–" of the speaker to the contact #1 of the J12.

7.5.2.10 Fan Control Interface

Figure 7-13: Fan Connector



Fan control connectors (J7, J6, J20, J21, and J22) are located on board of RIO680 module. Fans connected to J6 and J7 connectors are controlled via Super I/O chip located on RIO680. Fans connected to J20, J21, and J22 connectors are controlled by CPC600 ICH logic.

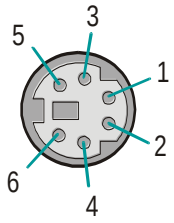
All of them have the following pinout:

Table 7-12: Fan Connectors Pinout

Pin	Function
1	GND
2	PWM_OUT
3	TACH_IN

7.5.2.11 Keyboard/Mouse Interface

Figure 7-14: Keyboard/Mouse Connector J5



The PC/AT standard keyboard/mouse connector J5 is a PS/2-type 6-pin shielded mini-DIN connector. Both devices can be connected simultaneously using the Y-cable supplied with the module.

Designation of this connector's contacts is described in the table below:

Table 7-13: Keyboard/Mouse Connector J5 Pinout

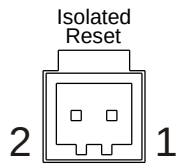
Pin Number	Name	Function	In/Out
1	KDATA	Keyboard data	In/Out
2	MDATA	Mouse data	In/Out
3	GND	GND signal	–
4	VCC	VCC signal	–
5	KCLK	Keyboard clock	Out
6	MCLK	Mouse clock	Out

Note:

The keyboard/mouse power supply unit is protected by a 500 mA fuse. All signal lines are EMI-filtered.

7.5.2.12 Isolated Reset

Figure 7-15: Isolated Reset Connector J10



Isolated Reset connector is available at the RIO680 front panel. The connector type is Wago 734-162 (counterpart Wago 734-102). CPC600 is reset by closing contacts of this connector.

Contact 1 is connected to GND; contact 2 is connected to Reset# signal.

7.5.2.13 VME Bus Connectors

RIO680 module is equipped with J24 (P0) and J9 (P2) VME bus connectors.

VME Connectors J24 and J9 Pinouts

The RIO680 module is provided with two female rear I/O connectors J24 and J9. For reference regarding similar connectors of the CPC600, please refer to Chapter 2, "Detailed Description" of this Manual.

Table 7-14: Backplane J24 (P0) Pin Definitions

Pin	A	B	C	D	E	F
1	–	–	–	–	–	GND
2	+Txa_LPa_DA+	-Txa_LPa_DA-	GND	LPa_DC+	LPa_DC-	GND
3	+Rxa_LPa_DB+	-Rxa_LPa_DB-	GND	LPa_DD+	LPa_DD-	GND
4	+Txb_LPb_DA+	-Txb_LPb_DA-	GND	LPb_DC+	LPb_DC-	GND
5	+Rxb_LPb_DB+	-Rxb_LPb_DB-	GND	LPb_DD+	LPb_DD-	GND
6	–	–	–	–	–	GND
7	IDE_D0	IDE_D4	IDE_D8	IDE_D12	–	GND
8	IDE_D1	IDE_D5	IDE_D9	IDE_D13	–	GND
9	IDE_D2	IDE_D6	IDE_D10	IDE_D14	–	GND
10	IDE_D3	IDE_D7	IDE_D11	IDE_D15	SATA_RXN0	GND
11	IDE_RST#	IDE_REQ#	IDE_IOWR#	IDE_A0	SATA_RXP0	GND
12	IDE_IRQ	IDE_ACK#	IDE_IORD#	IDE_A1	SATA_TXN0	GND
13	IDE_CS1#	IDE_IORDY	IDE_CS3#	IDE_A2	SATA_TXP0	GND
14	IDE_ATADETECT	–	–	–	SATA_RXN1	GND
15	–	–	–	–	SATA_RXP1	GND
16	–	–	–	–	SATA_TXN1	GND
17	–	–	–	–	SATA_TXP1	GND
18	USB_A-	–	–	–	–	GND
19	USB_A+	USB_OC#	–	–	–	GND

Table 7-15: Backplane J9 (P2) Pin Definitions

Pin	A	B	C	D	Z
1	PMC_P4_2	+5V	PMC_P4_1	FAN_CTRL1	VGA_RED
2	PMC_P4_4	GND	PMC_P4_3	FAN_CTRL2	GND
3	PMC_P4_6	RETRY	PMC_P4_5	FAN_CTRL3	VGA_GREEN
4	PMC_P4_8	A24	PMC_P4_7	FAN_TACH1	GND
5	PMC_P4_10	A25	PMC_P4_9	FAN_TACH2	VGA_BLUE
6	PMC_P4_12	A26	PMC_P4_11	FAN_TACH3	GND
7	PMC_P4_14	A27	PMC_P4_13	AVR_DB_RXD#	VGA_HSYNC
8	PMC_P4_16	A28	PMC_P4_15	AVR_DB_TXD#	GND
9	PMC_P4_18	A29	PMC_P4_17	LPC_AD0	VGA_VSYNC
10	PMC_P4_20	A30	PMC_P4_19	LPC_AD1	GND
11	PMC_P4_22	A31	PMC_P4_21	LPC_AD2	AC_RST#
12	PMC_P4_24	GND	PMC_P4_23	LPC_AD3	GND
13	PMC_P4_26	+5V	PMC_P4_25	LPC_FRAME#	AC_BITCLK
14	PMC_P4_28	D16	PMC_P4_27	LPC_DRQ#	GND
15	PMC_P4_30	D17	PMC_P4_29	LPC_PD#	AC_SDATAIN_0
16	PMC_P4_32	D18	PMC_P4_31	LPC_RST#	GND
17	PMC_P4_34	D19	PMC_P4_33	LPC_SERIRQ	AC_SDATAIN_1
18	PMC_P4_36	D20	PMC_P4_35	LPC_PME#	GND
19	PMC_P4_38	D21	PMC_P4_37	LPC_33M_CLK	AC_SDATAIN_2
20	PMC_P4_40	D22	PMC_P4_39	LPC_14M_CLK	GND
21	PMC_P4_42	D23	PMC_P4_41	LPC_32K_CLK	AC_SDATAOUT
22	PMC_P4_44	GND	PMC_P4_43	IO_KBRST#	GND
23	PMC_P4_46	D24	PMC_P4_45	IO_A20GATE#	AC_SYNC
24	PMC_P4_48	D25	PMC_P4_47	+3_3V	GND
25	PMC_P4_50	D26	PMC_P4_49	+3_3V	SPEAKER
26	PMC_P4_52	D27	PMC_P4_51	+3_3V	GND
27	PMC_P4_54	D28	PMC_P4_53	+5V	SYS_RESET#
28	PMC_P4_56	D29	PMC_P4_55	+5V	GND
29	PMC_P4_58	D30	PMC_P4_57	+5V	GP_LED1
30	PMC_P4_60	D31	PMC_P4_59	+12V	GND
31	PMC_P4_62	GND	PMC_P4_61	GND	GP_LED2
32	PMC_P4_64	+5V	PMC_P4_63	VPC	GND

♦ ♦ ♦

8 Supplementary Information

8.1 Related Standards and Specifications

The Fastwel's VME modules comply with the requirements of the following standards:

Table 8-1: Related Standards

Type	Standard	Test Parameters
CE: Emission	EN50081-1	–
CE: Immission	EN61000-6-2	–
CE: Electrical safety	EN60950	–
Mechanical dimensions	IEEE 1101.10	–
Vibration (sinusoidal)	IEC60068-2-6-82; Fc	3 g / 10-500 Hz / 10 (acceleration / frequency range / test cycles per axis)
Permanent shock	IEC60068-2-29-87; Eb	30 g / 11 ms / 1000±10 / 1 s (peak acceleration / shock duration half sine / number of shocks / recovery time)
Single shock	IEC60068-2-27-87; Ea	50 g / 9 ms / 18 / 3 s (peak acceleration / shock duration / number of shocks / recovery time in seconds)

Important...

Some versions of the module may have the test results differing from the ones presented in the above table. For more information please contact Fastwel's official representatives.

Information related to this product and its components can be found in the following specifications:

Table 8-2: Related Specifications

Product	Specification
VME Systems and Boards	ANSI/VITA 1, VME64 ANSI/VITA 1.1, VME64 Extensions ANSI/VITA 31.1, Gigabit Ethernet on VME64x ANSI/VITA 35, PMC-P4 Pin Out Mapping to VME ANSI/VITA 1.5, 2eSST ANSI/VITA 39, PCI-X on PMC and Processor PMC
CompactFlash Cards	CF+ and CompactFlash Specification Revision 1.4

9 Useful Abbreviations, Acronyms and Short-cuts

Abbreviation	Meaning
BMC	Baseboard Management Controller
PM	Peripheral Management Controller
FRAM	Ferroelectric Random-Access Memory Nonvolatile memory for data storage
IPMI	Intelligent Platform Management Interface
IPMB	Intelligent Platform Management Bus
I^2C™	Inter Integrated Circuit Two-thread serial protocol, used in SMB and IPMI
KCS interface	Keyboard Controller Style interface Interface for communication between control software and BMC, similar to a keyboard controller interface
BT interface	Block Transfer interface Block transfer interface for communication between control software and BMC
DDR SDRAM	Double Data Rate Synchronous Dynamic Random Access Memory
SODIMM	Small Outline Dual In-Line Memory Module
ECC	Error Correction Code Data error correction technology used in memory modules
FWH	Firmware Hub Nonvolatile memory chip, part of Intel chipset, used for main and reserve BIOS copies in CPC600
GMCH	Graphics and Memory Controller Hub
DAC	Digital-Analog Converter
USB	Universal Serial Bus
LPC	Low Pin Count External devices communication interface
SMB	System Management Bus
UART	Universal Asynchronous Receiver-Transmitter
UHCI	Universal Host Controller Interface USB Host Controller Interface
EHCI	Enhanced Host Controller Interface (Universal Serial Bus specification)
UTP	Unshielded Twisted Pair
CRT-display	Cathode Ray Tube Display
PMC	PCI (Peripheral Component Interconnect) Mezzanine Card
CMC	Common Mezzanine Card
LVDS	Low Voltage Differential Signal Digital monitors communication specification
RTC	Real Time Clock
BIOS	Basic Input-Output System
PC	Personal Computer
PICMG	PCI Industrial Computer Manufacturers Group
AHA	Accelerated Hub Architecture GMCH and ICH communication bus specification
AGP	Accelerated Graphics Port
AGTL	Advanced Gunning Transceiver Logic PSB (Processor Side Bus) signal exchange specification
SMBus	System Management Bus
EEPROM	Electrically Erasable Programmable Read-Only Memory

Abbreviation	Meaning
NAND Flash	Not And (electronic logic gate) Flash memory specification
SSD	Solid State Disk
PLCC	Plastic Leaded Chip Carrier
RAMDAC	Random Access Memory Digital-to-Analog Converter
DAC	Digital-to-Analog Converter
DVMT	Dynamic Video Memory Technology
TTL	Transistor-Transistor Logic
ECP/EPP	Extended Capabilities Port / Enhanced Parallel Port Parallel port specifications
FDD	Floppy Disk Drive
EIDE	Enhanced Integrated Drive Electronics Mass storage devices interface
DMA	Direct Memory Access
PIO	Programmed Input/Output EIDE: Directly processor controlled data exchange
Rear I/O Board	Rear Input-Output Board Auxiliary interface board, which is connected to the VME backplane rear connectors
PWM output	Pulse-Width Modulation Cooling fan control technique
ESD	Electrostatically Sensitive Device Electrostatic Discharge
ACPI	Advanced Configuration and Power Interface
POST	Power On Self Test
VME	Versatile Module Eurocard (IEEE 1014) Industrial automation systems standard
EOS	Electrical Overstress
MDI	Media Dependent Interface Interface with connection type automatical detection

10 Repair of CPC 600 malfunctions

Table 9-1: Possible malfunctions of CPC600 and their repair methods

Malfunction	Cause	Repair
The board fails to start, LEDs are off.	Lack of suppy voltage: +5 V, +12 V.	To verify supply voltages on the mezzanine board.
The board fails to start, “Fail” LED is on, “FL1” and “FL2” LEDs are flashing in sequence.	CPC600 failed to obtain geographical address from the mezzanine board. The mezzanine board does not support VME64X standard or the mezzanine board has no supply voltage +3.3 V.	а) If the mezzanine board supports VME64X standard – make sure that the board is supplied with +3.3 V. б) If the mezzanine board does not support VME64X standard – it is required to manually determine geographical address of the board (slot number) by a group of SW2 switches. (the 6th switch has to be placed in “ON” position, using switches 1-5 set the slot number in the binary number system). See subparagraph 4.2.1.
	CPC600 is configured as system controller in which case the slot geographical interface is not the first one.	а) If there is no VME system controller make sure that CPC600 is installed in the master-slot. б) Make sure that board’s geographical address corresponds to the number of slot in which the board is installed (If the address is set manually via SW2 switch – see subparagraph 4.2.1.).
	Lack of supply voltage on +5VSTDBY on the mezzanine board (For older CPC600 versions).	Make sure that the mezzanine board is supplied with +5VSTDBY. (The voltage +5 V cacan be supplied to +5VSTDBY contact).
The board fails to start, “Fail” and “HS” LEDs are ON.	a) The lower fixing handle is not lacthed or the module is not installed in the frame to the full.	To latch the lower fixing handle, make sure that the module is installed into the frame to the full.
	b) Module has malfunctions.	Plese contact the service center
The board fails to start, “Fail” LED is ON.	Module has malfunctions.	Please contact the service center.