CPC108

MicroPC
AMD Geode LX 800 Based
Processor Module

User Manual

Rev. 001 E

February 2009

Product Title: CPC108
Document name: CPC108 User Manual
Manual version: 001 E
Ref. doc. v.: 1.2 R (467444.010)

Revision Record

Rev. Index	Brief Description of Changes	Board Index	Date of Issue
001	Initial version	CPC108	February 2009

Contact Information

	Fastwel Co. Ltd		Fastwel Corporation US
Address:	108 Profsoyuznaya st., Moscow 117437, Russian Federation		45 Main Street, Suite 319 Brooklyn, New York 11201 USA
Tel.:	+7 (495) 232-1681		+1 (718) 554-3686
Fax:	+7 (495) 232-1654		+1 (718) 797-0600
		Toll free:	+1 (877) 787-8443 (1-877-RURUGGED)
E-mail:	info@fastwel.com		info@fastwelcorp.com
Web:	http://www.fastwel.com/		

Table of Contents

List of Tables

List of Figures

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 Faswel 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

This document presents general information on CPC108 processor module, the details of its proper and safe installation, configuration and operation. The issues of external devices connection are also considered.

1.1 Module Introduction

CPC108 is a compact yet fully x86-compatible SBC in MicroPC format based on AMD Geode LX800 CPU and AMD CS5536 I/O companion, designed for fanless operation in harsh environments. Key system components, such as processor, 256 MB of system memory, and 64 MB solid-state disk are soldered on board, providing high shock and vibration stability and increased efficiency of protective conformal coating. High system reliability and availability are ensured by two independent watchdog timers, reserved BIOS, and optoisolated remote reset capability.

CPC108 offers wide choice of standard PC interfaces on-board, such as Fast Ethernet, FDD/LPT port, four COM and four USB ports, PS/2 mouse and keyboard ports, and audio interface. Video controller sharing up to 60 MB of memory with system supports CRT monitors with resolutions up to 1920×1440, and EL, TFT and DSTN flat panels with resolutions up to 1600×1200. Supported color depth is 18 bit via TFT interface, and 24 bit via LVDS interface.

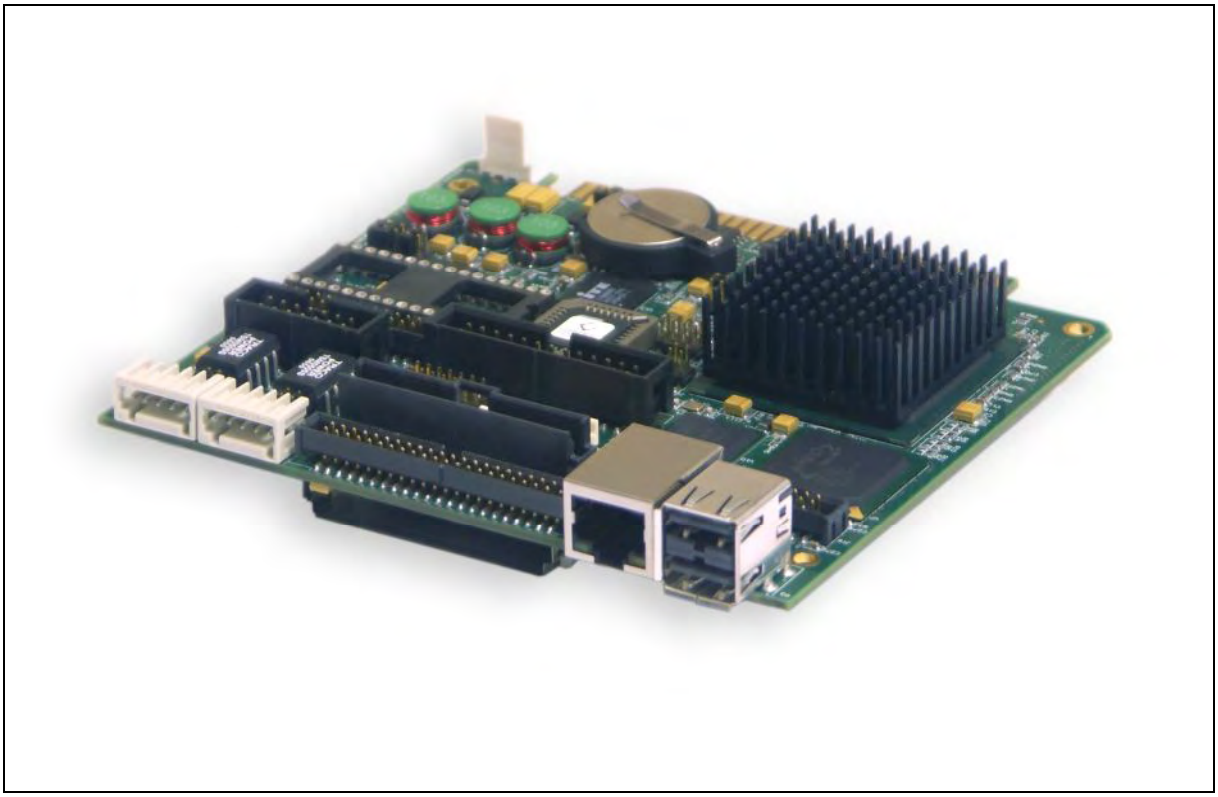
Moreover, the board has two isolated CAN field bus channels available, allowing to control a real time distributed system. CPC108 can serve either as a master module controlling two CAN network segments, or as a slave device in data acquisition and processing systems operating in industrial temperature range from –40°C to +85°C.

Isolated CAN channels, graphics and audio ports, keyboard and mouse ports as well as isolated reset are available through separately mounted interface expansion modules adding flexibility in system design.

CPC108 consumes only 5.5 W, does not require forced cooling. Low heat dissipation allows using CPC108 in closed and hermetically sealed cabinets. It can operate either independently, or together with expansion modules connected via 16-bit ISA bus.

Compatibility with most widespread operating systems, such as Windows XP Embedded, CE5, QNX 4.25, 6.3x, RTOS32, FDOS, and Linux makes system development process faster.

Figure 1.1: CPC108 Module Appearance



The appearance may vary for different versions of the module.

1.2 CPC108 Versions

At the present time the CPC108 module is manufactured in three versions differing in interface capabilities.

Table 1.1: CPC108 Versions

Version	Decimal ID	LVDS	Dual CAN	Ethernet
CPC10801	467444.010	+	+	+
CPC10802	467444.010-01	–	+	–
CPC10803	467444.010-02	–	–	+

1.3 Delivery Checklist

Table 1.2: CPC108 Supplied Set

Code	Decimal ID	Description
CPC10801 CPC10802 CPC10803	467444.010 467444.010-01 467444.010-02	CPC108 processor module
ACS00023	685611.082	DB9F to IDC10 adapter cable for connection to COM1 or COM2 ports
ACS00010	685611.051	Cable for connection of 2.5" HDD to 44-contact header
CDM02	469535.023	Adapter module for connection of 3.5" HDD or CD-ROM drive
KIB981	421459.981	Interface expansion module for connection of TFT panel, VGA monitor, PS/2 keyboard and mouse, audio devices
ACS00015	685611.023	Cable for connection of KIB981 interface expansion module to CPC108
–	733-105	Sockets with WAGO terminal blocks for RS 422/485 connection

Code	Decimal ID	Description
–	467369.009	CD ROM with documentation and service software
		Antistatic bag and consumer carton box

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.

1.4 Additional Accessories

Peripheral devices are attached to the module directly or via additional accessories and cables listed in the following table. Additional accessories are not supplied with the processor module, are ordered separately.

Table 1.3: CPC108 Additional Accessories

Name	Decimal Code	Description
ACS00011	685611.021	IDC26 to DB25 adapter cable for connection to LPT
CDM01	469535.030	Adapter module for FDD connection
ACS00002	685611.016-04	IDC26 – IDC26 cable for FDD connection via CDM01 adapter module
KIB985	421459.985	Interface expansion module for connection of CAN, PS/2 keyboard and mouse, and external optoisolated reset
ACS00013	685611.016-01	Cable for connection of KIB985 to the CPC108 processor module
1700060202	–	PS/2 adapter cable for simultaneous connection of keyboard and mouse (Y-cable)
–	–	Null-modem cable for connection of a remote console to COM1 or COM2 via ACS00023 adapter cable

1.5 Supplementary Information

1.5.1 Related Documents

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

Table 1.4: Related Publications

Product	Publication
CompactFlash cards	CF+ and CompactFlash Specification Revision 1.4
Processor	AMD Geode™ LX Processor Reference Schematic AMD Geode™ LX Processors Data Book AMD Geode™ CS5536 Companion Device Preliminary Data Book AMD Geode™ LX Processor and CS5535/CS5536 Companion Devices Layout Recommendations
Super I/O	Winbond W83627 SuperIO Data sheet

2 Technical Specifications

2.1 General

- CPU: AMD Geode LX800 500 MHz
  - 32-bit x86/x87 compatible
  - 64-bit coprocessor
  - 64-bit memory bus
  - 64 KB L1, 128 KB L2 cache
  - Integrated FPU supports the Intel MMX™ and AMD 3DNow!™ Technology instruction sets
- System memory
  - 256 MB soldered SDRAM
  - DDR333
- Flash BIOS
  - 2x512 KB, reserved
  - In-system modification
- Solid-state disks
  - 64 MB NAND flash soldered on board
  - DOC socket: 28- or 32-contact chips support
  - CompactFlash type II in socket
- IDE channel
  - Compact Flash Type I/II socket on board (bottom side)
  - Support for up to two UltraDMA-100 IDE devices (via a 10 cm cable)
- FDD
  - Floppy disk interface
- Parallel port
  - SPP/ECP/EPP compatible. Header, shared with FDD controller
- Serial ports
  - Four serial ports
  - High speed NS16C550 compatible
  - COM1, COM2: RS232, complete, 9 wires, up to 115.2 Kb/s
  - COM3, COM4: RS422/485, isolated, up to 115.2 Kb/s
- CAN (except CPC10803)
  - Two optoisolated CAN ports
  - Available via KIB985 module
- USB
  - Four USB 2.0 channels
  - Two Type A connectors, two channels available via IDC10 connector
  - Device mode support (not available for BIOS version 1.2)
- Ethernet (except CPC10802)
  - One Fast Ethernet port 10/100 Mb/s
  - On-board RJ-45 connector

- Video controller
  - 2D accelerator
  - Video memory 60 MB shared with system
  - LCD (TFT or DSTN) panels support, resolution up to 1024x768 at 60 Hz
  - Analog display support,
    resolution 1600×1200 at 100 Hz, 1920×1440 at 85 Hz, 32-bit
  - LVDS interface (CPC10801 only)
  - 18-bit color via TFT interface, 24-bit color via LVDS
- Audio
  - AC'97 compatible audio controller
  - Line in, Line out, Microphone in
- Watchdog timers
  - One programmable watchdog timer
  - One built-in watchdog timer with fixed timeout period
  - LED indication
- Safety
  - System configuration settings stored in CMOS+SFRAM
  - Optoisolated remote Reset input (through KIB985)
- RTC
  - On-board real time clock with Li battery
- PS/2
  - PS/2 keyboard and mouse interface
- Software Support:
  - General Software® BIOS
  - DOS, QNX® 4.25 and 6.3x, Windows CE5, XPe, RTOS32, Linux®

2.2 Power Requirements

The module is powered by an external DC power source providing the following characteristics:

- Voltage: +5 V ±5% (from +4.75 V to +5.25 V)
- Consumption current (without external devices): 1.3 A

The power can also be supplied via ISA bus.

2.3 Environmental

- Operating temperature range: -40°C to +85°C
- Relative humidity: 5% to 95% at 25°C, noncondensing
- Storage temperature: -55°C to +90°C

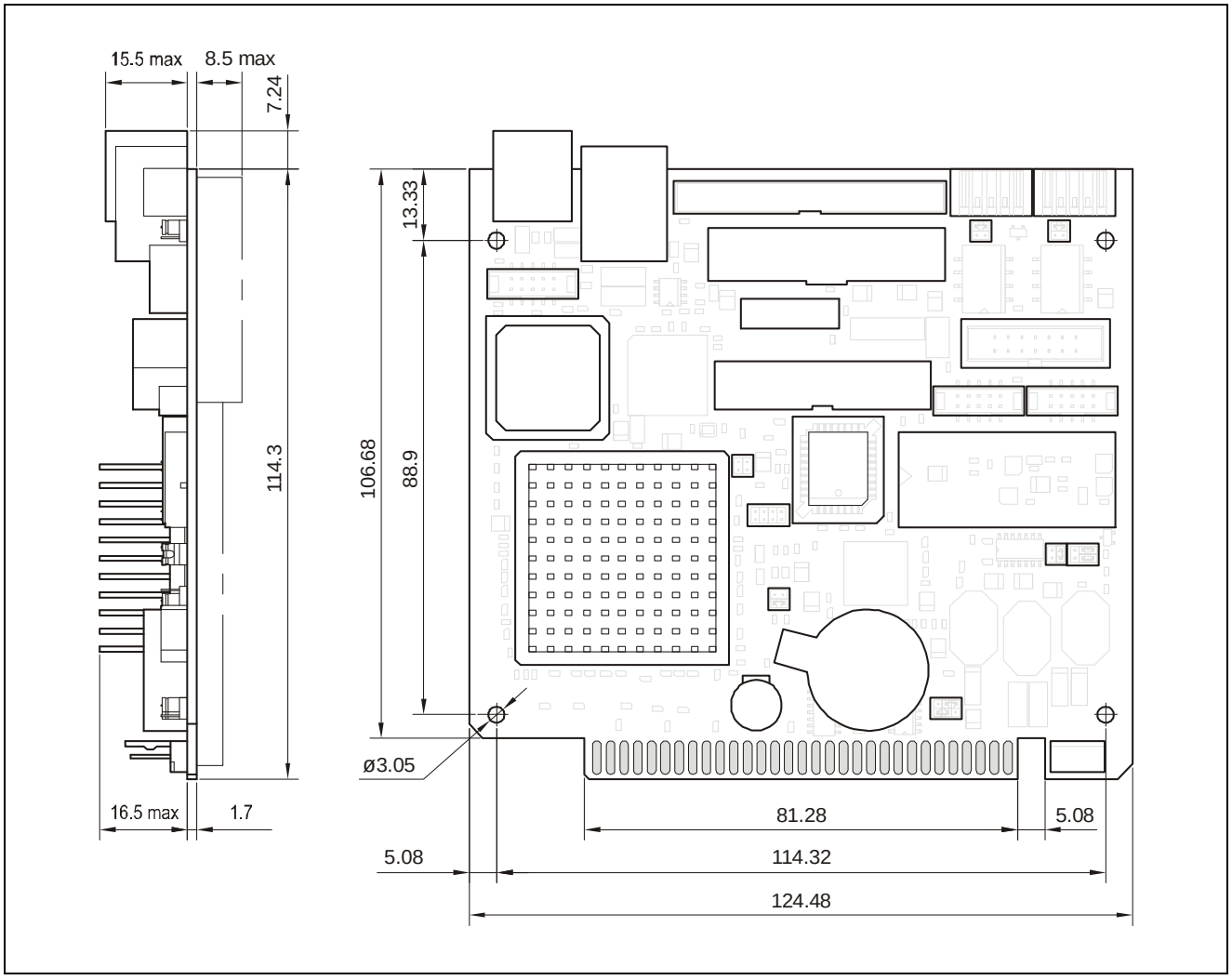
2.4 Mechanical

- Vibration – 5g;
- Single shock, peak acceleration – 100 g;
- Multiple shock, peak acceleration – 50 g.

2.5 Dimensions and Weight

- Dimensions, not more: 124.5 × 121.6 × 26.7 mm (4.90” × 4.79” × 1.05”)
  (see also figure below for mounting dimensions)
- Weight, not more: 0.160 kg
  (without CompactFlash card)

Figure 2.1: CPC108: Overall and Mounting Dimensions



2.6 MTBF

- MTBF for CPC108 is 180000 hours.

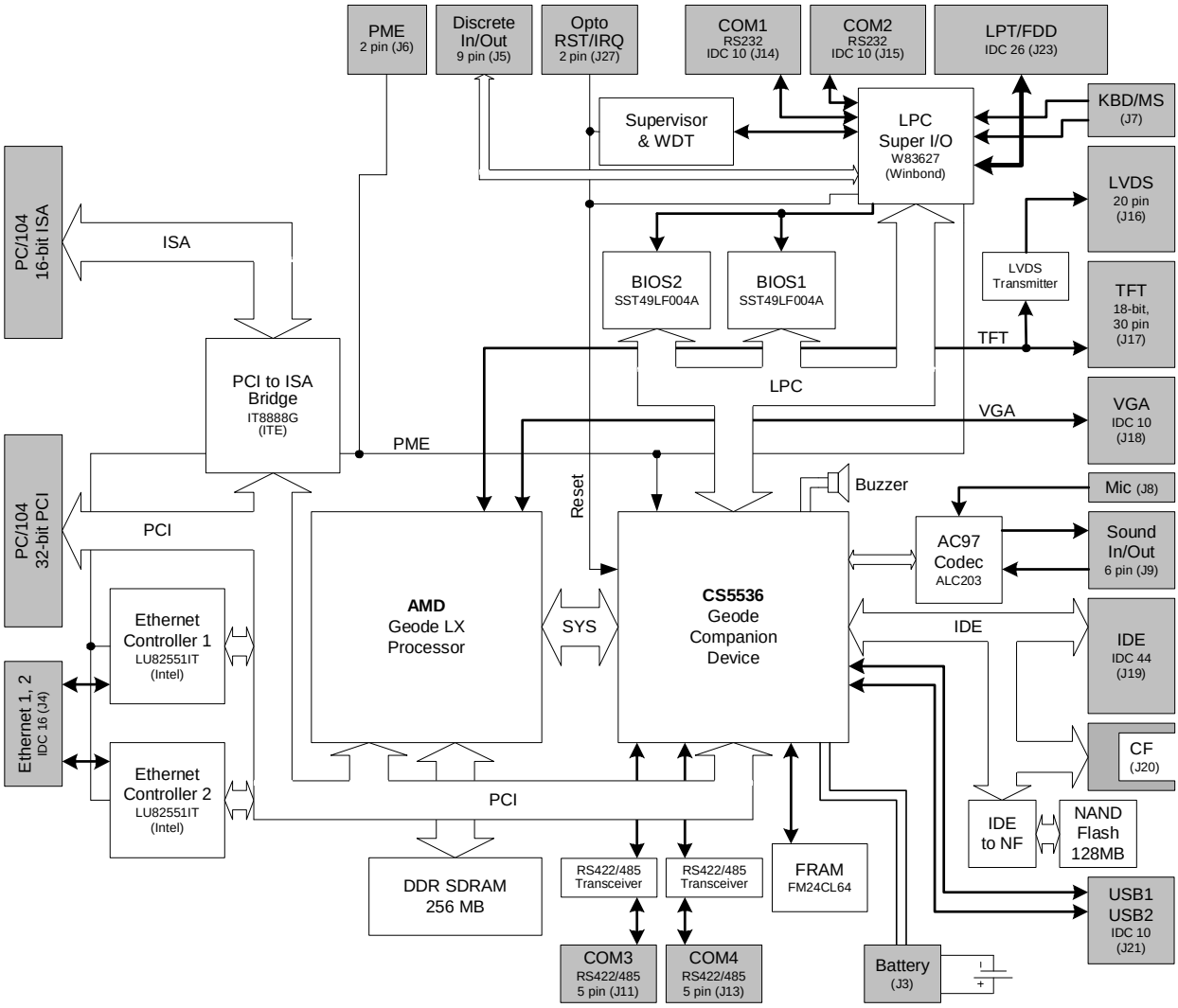
  The value is calculated according to: Telcordia Issue 1 model, Method I Case 3, for continuous operation at a surface location, at normal environmental conditions (Russian State Standard GOST 15150-69, "UHL4" climatic parameters) and at ambient temperature 30℃.

3 Functional Description

3.1 Structure and Layout

Functional diagram of the CPC108 module is shown in Figure 3.1.

Figure 3.1: CPC108 Block Diagram



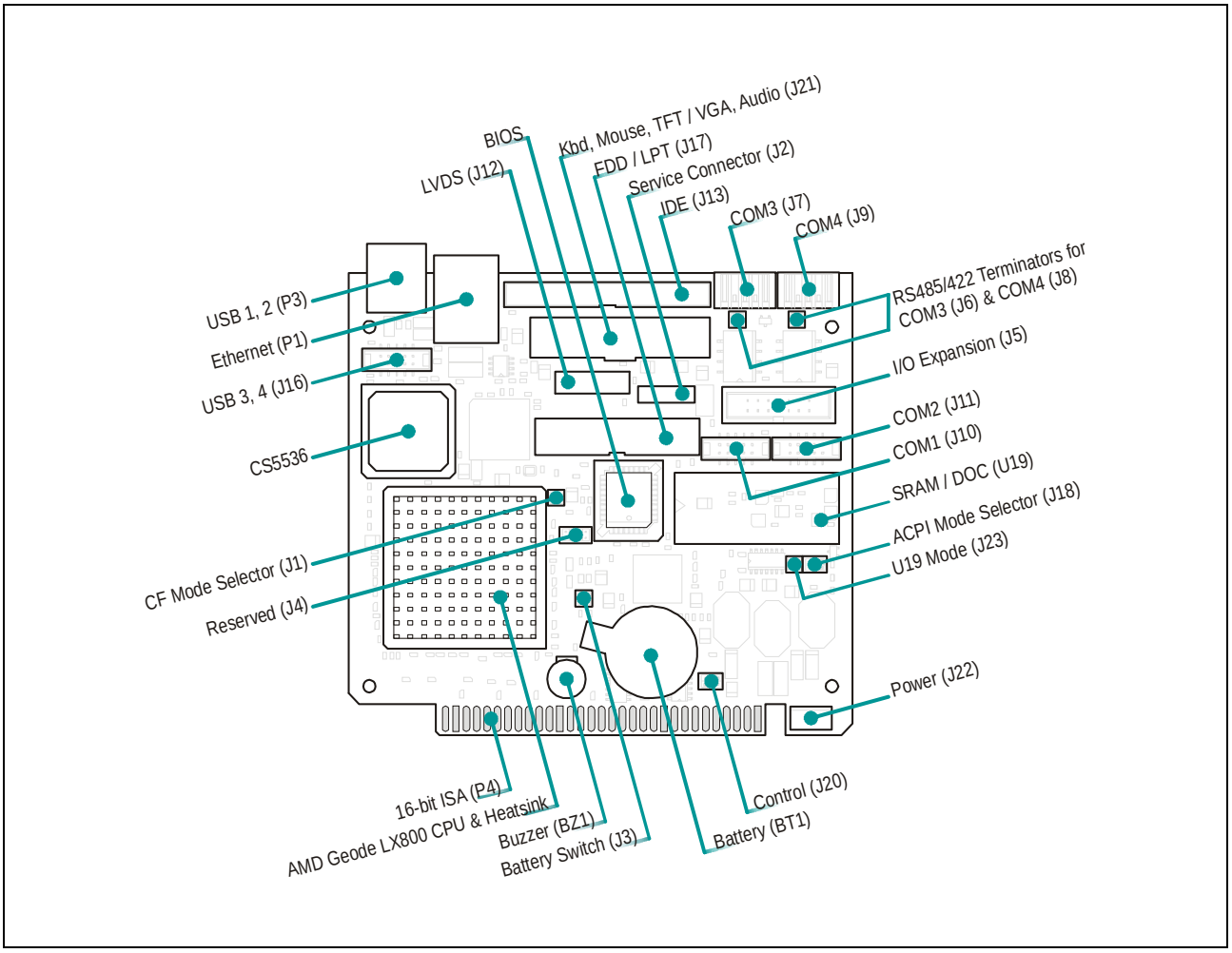
CPC108 includes the following main functional units:

- AMD Geode LX 800 500 MHz microprocessor, including 32-bit x86 core, 64-bit coprocessor, 64-bit SDRAM memory bus;
- 256 MB soldered DDR SDRAM system memory;
- Flash memory based reserved BIOS, in-system modification;
- Onboard flash-disk, 64 MB;
- IDE port with support for two UltraDMA/100 devices;
- CompactFlash port;
- Disk-on-Chip socket
- Integrated graphics controller:
  - Video memory up to 60 MB, shared with system;
  - LCD (TFT or DSTN) panels support, resolution up to 1024×768;
  - Analog RGB display support;
  - LVDS interface (only for CPC10801)
- Fast Ethernet channel 10/100 Mbit/s (except CPC10802);
- Four USB 2.0 channels;
- Serial ports:
  - COM1, COM2: RS232, full control, maximum exchange rate – 115.2 Kbit/s;
  - COM3, COM4: RS422/RS485, isolated, up to 115.2 Kbit/s;
- Two optoisolated CAN ports (except CPC10803)
- Two watchdog timers;
- CMOS+SFRAM for BIOS configuration storage;
- Real time clock with Li battery backup;
- PS/2 keyboard/mouse port;
- FDD/LPT shared header. Universal parallel port supports EPP and ECP modes;
- AC'97 audio controller
- Optoisolated remote Reset

Some interfaces are available only via interface expansion modules: KIB981 (TFT, VGA, PS/2 mouse and keyboard, audio: Line In, Line Out, Mic In) and KIB985 (two CAN channels, isolated remote reset, PS/2 mouse and keyboard). KIB981 and KIB985 modules description can be found in sections 3.3 and 3.4 respectively.

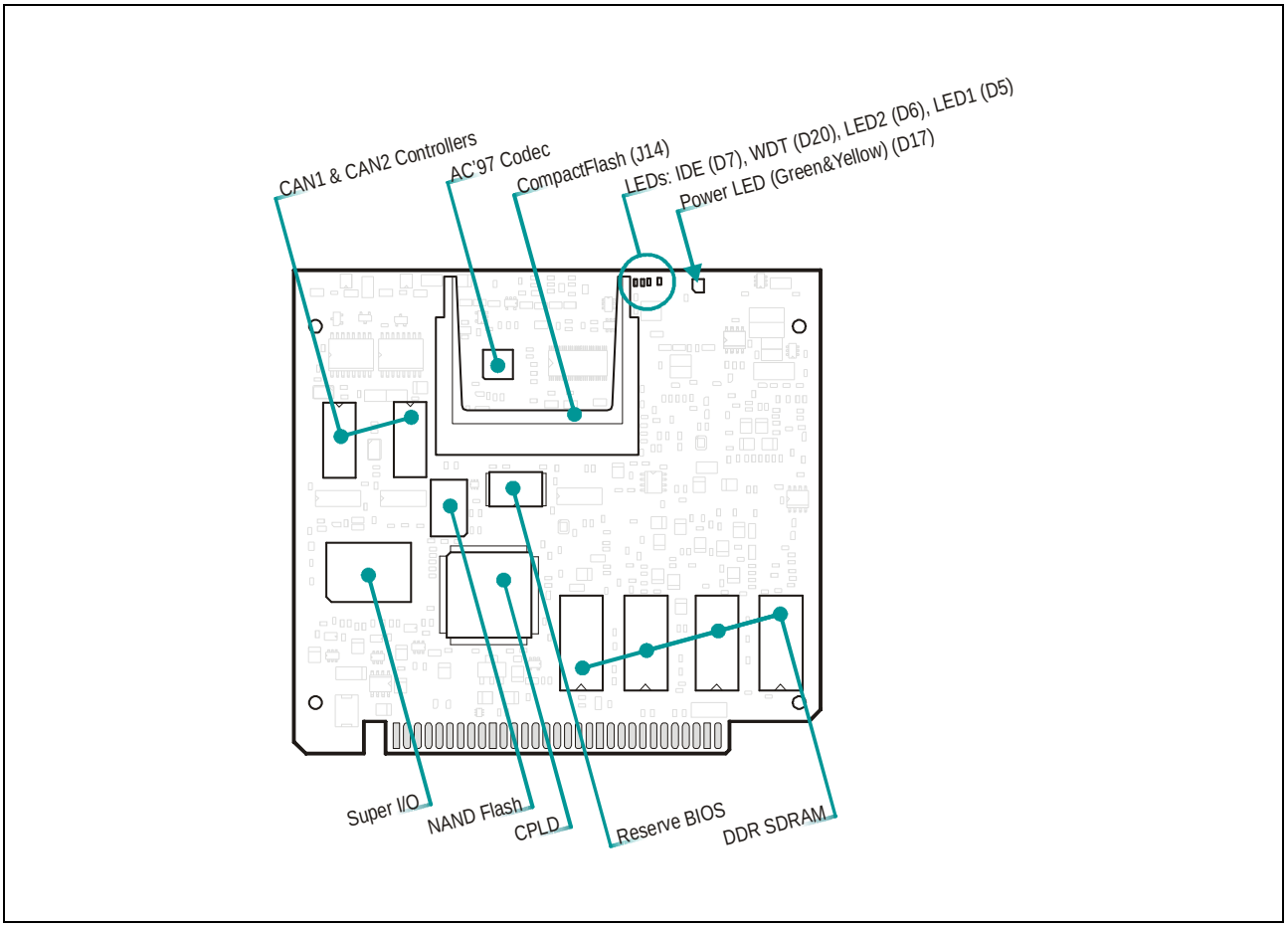
Layouts of main CPC108 components and connectors on top and bottom sides are presented in Figures 3.2 and 3.3 respectively.

Figure 3.2: Top Side: Connectors and Main Components Layout



The layout may slightly differ for various versions of the board.

Figure 3.3: Bottom Side: Connectors and Main Components Layout



The layout may slightly differ for various versions of the board.

3.2 Functional Description

3.2.1 Microprocessor

The module is based on AMD Geode LX800 microprocessor with 1.8W typical power consumption at 500 MHz, maximum power 3.6W (TDP). The processor includes 32-bit x86 core, 64-bit coprocessor and 64-bit DDR memory bus up to 400 MHz, graphics and video controller with VGA monitors and LCD panels simultaneous operation support. FPU of the processor supports MMX™ and AMD 3DNow!™ technology instruction sets. The CPU is complemented with AMD Geode CS5536 companion device providing support for numerous I/O functions including IDE, USB, audio, and power management interfaces.

3.2.2 SDRAM Memory

Four DDR 333 SDRAM memory chips are soldered on the bottom side of the PCB. Total memory size is 256 MB.

3.2.3 Reserved Flash BIOS

The CPC108 takes advantage of flash-memory based BIOS. Two Flash BIOS chips storage capacity is 512 KB each. The main (working) copy of BIOS occupies 512 KB on a chip in PLCC32 panel. Reserve BIOS copy is stored on a soldered chip and is used for emergency boot. Switching between the main and reserve BIOS copies is performed automatically.

It is possible to upgrade the main copy of BIOS in-system. It is done with the help of **fwflash.exe** program. The procedure is described in section 6.3. Reserve BIOS can not be upgraded.

3.2.4 NAND Flash

The capacity of the on-board NAND flash memory chip is 64 MB. It can be used as a bootable disk or can be disabled in BIOS Setup.

FAT16 file system is supported at BIOS level and can be used in MS DOS or FDOS operating systems. To use it in other operating systems, it is necessary to install appropriate driver. The drivers for RTOS32, Windows CE5.0, Windows XPe, Linux 2.6 are supplied with the CPC108 on the compact disk (subject to change).

3.2.5 CompactFlash Socket

CompactFlash Type I/II cards can be connected to J14 socket on the bottom side of CPC108. The device in this socket shares Primary channel with other IDE devices. When CompactFlash socket is populated, only one IDE device can be connected to CPC108. CompactFlash device can operate as Master or Slave and can be designated as bootable device. The pinout of the J14 socket is presented in the following table.

Note!

If CPC108 is used in rugged environment, additional fastening of the CF card is strongly recommended.

Table 3.1: J14 CompactFlash Socket Pinout

Pin #	Function	Pin #	Function
1	GND	26	/CD1
2	D03	27	D11
3	D04	28	D12
4	D05	29	D13
5	D06	30	D14
6	D07	31	D15
7	/CS0	32	/CS1
8	A10 (NC)	33	/VS1
9	/ATA SEL	34	/IORD
10	A09 (NC)	35	/IOWR
11	A08 (NC)	36	/WE
12	A07 (NC)	37	INTRQ
13	VCC (+5V)	38	VCC (+5V)
14	A06 (NC)	39	/CSEL
15	A05 (NC)	40	/VS2
16	A04 (NC)	41	/RESET
17	A03 (NC)	42	IORDY
18	A02	43	/INPACK
19	A01	44	/REG
20	A00	45	/DASP
21	D00	46	/PDIAG
22	D01	47	D08
23	D02	48	D09
24	/IOCS16	49	D10
25	/CD2	50	GND

Note: (NC) indicates that this contact is not connected to the module's circuits.
This table is subject to future amenments.

3.2.6 Disk-on-Chip and Additional Memory Modules

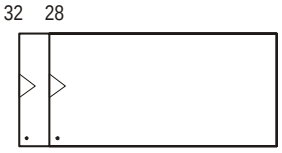
The CPC108 module is equipped with the 32-contact DOC socket U19, which can accept 32- or 28-pin chips, as well as SRAM (5V) or FRAM nonvolatile memory modules.

Note!

FRAM chips are not supported by BIOS version 1.2

J23 jumper switch allows to select DOC socket operation mode: “closed 1-2” position corresponds to 28-contact chip, “closed 3-4” – to 32-contact chip.

Figure 3.4: Installation of 32- and 28-contact Chips in DOC Socket



When DOC socket is used, it is necessary to set the “Onboard Disk on Chip” parameter to “Enabled” in “Basic CMOS Configuration” section of BIOS Setup utility.

U19 socket contacts designation for connecton of DOC or additional memory modules is presented in the table below.

Table 3.2: U19 DOC Socket Pinout

Pin #	Function	Pin #	Function
1	ISA_A18	17	ISA_D3
2	ISA_A16	18	ISA_D4
3	DOC_A15/AUX_A14	19	ISA_D5
4	ISA_A12	20	ISA_D6
5	ISA_A7	21	ISA_D7
6	ISA_A6	22	CE#
7	ISA_A5	23	ISA_SA10
8	ISA_A4	24	OE#
9	ISA_A3	25	ISA_SA11
10	ISA_A2	26	ISA_SA9
11	ISA_A1	27	ISA_SA8
12	ISA_A0	28	ISA_SA13
13	ISA_D0	29	DOC_A14/AUX_WE#
14	ISA_D1	30	ISA_A17/VCC
15	ISA_D2	31	DOC_WE#/AUX_A15
16	GND	32	VCC

DOC modules are supported at BIOS level and can be used in MS DOS or FDOS operating systems. To use it in other operating systems, it is necessary to install appropriate driver. The drivers for RTOS32, Windows CE5.0, Windows XPe, Linux 2.6 are supplied with the CPC108 on the compact disk.

SRAM/FRAM memory chips are accessed within address range C0000h to DDFFFh (see table 3.21). Recommended address range – C8000h to D7FFFh (64 KB). For large capacity memory chips the page addressing is used (64 KB pages within C8000h to D7FFFh address range) with page selector at 20Fh address of input-output port (see 20Eh and 20Fh ports description in the table 3.23). Maximum capacity of the memory chips – 512 KB. Recommended memory chips models are listed in the table below.

Table 3.3: Recommended Nonvolatile Memory Chips Models

Model	Manufacturer	Description
DS1225AB/AD	Maxim	8 KB x 8, 28 contacts, 5 V
DS1230AB/Y		32 KB x 8, 28 contacts, 5 V
DS1245AB/Y		128 KB x 8, 32 contacts, 5 V
DS1249AB/Y		256 KB x 8, 32 contacts, 5 V
DS1250AB/Y		512 KB x 8, 32 contacts, 5 V

3.2.7 Video Controller and Connection of Monitors

The module utilizes graphics controller integrated in Geode LX CPU with the following main features:

- Video memory size up to 60 MB shared with system;
- Supported resolution up to 1024×768 at 60 Hz for TFT or DSTN LCD-panels at 9, 12 or 18 bpp, for LVDS panels – at 24 bpp;
- VGA RGB monitors support, resolution up to 1024×768 at 100 Hz, up to 1920×1440 at 85 Hz, 32-bit;

Different types of monitors together with audio devices, PS/2 keyboard and mouse are connected to CPC108 via connectors of KIB981 interface expansion module. KIB981 is connected to to J21 header of CPC108 using the ACS00015 (685611.023) 60-thread cable supplied with the processor module. The table below shows J21 header pinout. Detailed description of KIB981 module can be found in section 3.3 of this Manual.

Table 3.4: J21 Header Pinout

Pin#	Signal	Pin#	Signal	Pin#	Signal
1	KBD DATA	21	DRGB15 (G5)	41	VGA_BLUE
2	+5V	22	GND	42	GND
3	KBD CLK	23	DRGB18 (R0)	43	VGA_GREEN
4	MOUSE CLK	24	DRGB19 (R1)	44	GND
5	GND	25	DRGB20 (R2)	45	VGA_SDA
6	MOUSE DATA	26	DRGB21 (R3)	46	VGA_HSYNC
7	+5V	27	DRGB22 (R4)	47	VGA_VSYNC
8	+5V	28	DRGB23 (R5)	48	VGA_SCL
9	DRGB2 (B0)	29	GND	49	GND
10	DRGB3 (B1)	30	DOTCLK	50	VCC_AUD
11	DRGB4 (B2)	31	GND	51	LINE_OUT_L

Pin#	Signal	Pin#	Signal	Pin#	Signal
12	DRGB5 (B3)	32	DISPEN	52	GND_AUD
13	DRGB6 (B4)	33	GND	53	LINE_OUT_R
14	DRGB7 (B5)	34	HSYNC	54	GND_AUD
15	GND	35	–	55	LINE_IN_L
16	DRGB10 (G0)	36	VSYNC	56	GND_AUD
17	DRGB11 (G1)	37	VDDEN	57	LINE_IN_R
18	DRGB12 (G2)	38	GND	58	GND_AUD
19	DRGB13 (G3)	39	VGA_RED	59	MIC_IN
20	DRGB14 (G4)	40	GND	60	GND_AUD

LCD panels with one channel LVDS interface are connected directly to J12 header (Hirose DF13-20DP-1.25V) of CPC108. Recommended mating connector of an interface cable is Hirose DF13-20DS-1.25C with contacts Hirose DF13-2630SCF. The following table presents the J12 pinout.

Table 3.5: LVDS: J12 Connector Pinout

Pin #	Signal	Pin #	Signal
1	VDD_EN	11	TxOUT2+
2	DISPEN	12	TxOUT2-
3	TxOUT0+	13	GND
4	TxOUT0-	14	GND
5	GND	15	TxOUT3+
6	GND	16	TxOUT3-
7	TxOUT1+	17	GND
8	TxOUT1-	18	GND
9	GND	19	TxCLK+
10	GND	20	TxCLK-

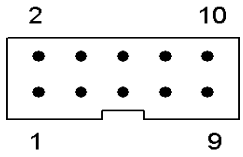
3.2.8 Fast Ethernet Interface

The CPC108 has one 10Base-TX/100Base-TX Ethernet channel provided by Intel LU82551IT controller. Ethernet port is available via one standard RJ-45 connector (P1, see Figure 4.2), its pinout conforms to IEEE 802.3 Ethernet specification.

3.2.9 USB Interface

The module is equipped with four USB 2.0 host ports. Each channel has a separate power control circuit. One USB device may be connected to each port. Two USB ports are available through standard Type A connectors (P3) and two ports – via the IDC10 2 mm pitch header J16.

Figure 3.5: IDC10 Pins Numbering



Recommended mating connector of an interface ribbon cable is Leotronics 2040-3102.

The pinout of the J16 onboard IDC10 connector is presented in the table below.

Table 3.6: J16 IDC10 Connector Pinout

Pin Number	Signal	Pin Number	Signal
1	USB1_+5V	6	USB2_DAT+
2	USB2_+5V	7	USB1_GND
3	USB1_DAT-	8	USB2_GND
4	USB2_DAT-	9	–
5	USB1_DAT+	10	USB_ID

3.2.10 UIDE Interface

J13 connector of CPC108 (Figure 4.2) allows connection of two UDMA-100 compatible devices (master and slave) to the primary IDE channel when CompactFlash socket (J14) is not populated. J13 connector is a 44-pin 2 mm pitch header. Its pinout is shown in the following table.
UDMA-100 is supported with a 10 cm cable only. To enable UDMA-100 mode, set the «Custom Configuration» - «IDE cable type» parameter to «80-wire» in BIOS Setup utility.

Table 3.7: J19 HDD Connector Pinout

Pin#	Signal	Pin#	Signal	Pin#	Signal	Pin#	Signal
1	/RESET	12	DD12	23	/IOW	34	–
2	GND	13	DD2	24	GND	35	DA0
3	DD7	14	DD13	25	/IOR	36	DA2
4	DD8	15	DD1	26	GND	37	/CS1
5	DD6	16	DD14	27	/IOCHRDY	38	/CS3
6	DD9	17	DD0	28	GND	39	DASP
7	DD5	18	DD15	29	/DACK	40	GND
8	DD10	19	GND	30	GND	41	+5V
9	DD4	20	–	31	IRQ	42	+5V
10	DD11	21	DRQ	32	/CS16	43	GND
11	DD3	22	GND	33	DA1	44	–

The ACS00010 FC44 cable supplied with CPC108 allows direct connection of a 2.5" HDD to the J13 connector. Other IDE devices (3.5" HDD, CD-ROM) having 40-contact 2.5 mm pitch connector can be connected to CPC108 via the CDM02 (469535.023) adapter. This adapter is connected directly to the 40-pin contact connector of the IDE device, and with the ACS00010 FC44 cable is connected to CPC108 J13 connector. For custom cables it is recommended to use Leotronics 2040-3442 mating connector.

3.2.11 FDD/LPT Port

J17 is a 26-pin IDC connector shared by LPT and FDD ports. Switching between LPT and FDD ports is performed in BIOS Setup. LPT port of CPC108 supports EPP and ECP operation modes. ECP is the default mode.

LPT uses IRQ7 interrupt line, IRQ6 is assigned to FDD port. Interrupts from these ports can be disabled and switched for use by ISA bus devices in BIOS Setup program.

A floppy disk drive is connected to J17 header via the 26-thread ACS00002 (685611.016-04) cable and CDM01 (469535.030) transition module, which is installed directly on 34-pin FDD connector.

A printer can be connected using ACS00011 (685611.021).

The table below describes pin assignments of J17 connector.

Table 3.8: LPT/FDD J17 Connector Pinout

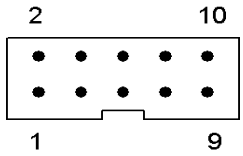
Pin #	LPT1 Signals	FDD Signals
1	/STB	–
2	/AFD	DRVDEN
3	PD0	/INDEX
4	/ERROR	/HEAD
5	PD1	/TRACK
6	/INIT	/DIR
7	PD2	/WP
8	/SLCTIN	/STEP
9	PD3	/RDATA
10	GND	GND
11	PD4	/DSKCHG
12	GND	GND
13	PD5	–
14	GND	GND
15	PD6	/MOA
16	GND	GND
17	PD7	/DSA
18	GND	GND
19	/ACK	/DSB
20	GND	GND
21	BUSY	/MOB
22	GND	GND
23	PE	/WD
24	GND	GND
25	SLCT	/WE
26	+5V	+5V

3.2.12 Serial Ports

The CPC108 is furnished with four serial ports COM1 – COM4.

3.2.12.1 COM1 and COM2 (RS232)

Figure 3.6: IDC10 Pins Numbering



COM1 and COM2 ports have standard PC AT base addresses. They are routed to J10 and J11 IDC10 connectors (2 mm pitch) respectively and operate as full function 9-wire RS232 interfaces with maximum transfer rate of 115.2 Kb/s. They are fully compatible with UART16550.

Both COM1 and COM2 ports can be used for communication with a remote PC. For console operation and file exchange a null-modem cable is needed. COM1 is used for this purpose by default.

The following table shows pins designation for J10 and J11 headers.

Table 3.9: J10 and J11 Pin Assignments

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

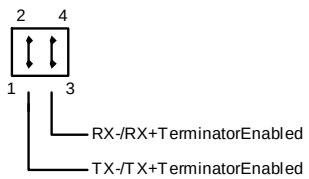
Recommended mating connector for J10 and J11 is Leotronics 2040-3102 ribbon cable socket.

3.2.12.2 COM3 and COM4 (RS-485/RS-422)

COM3 and COM4 ports allow data transmission rates up to 115.2 Kb/s and support RS-422/ RS-485 interfaces. These two ports are routed to J7 and J9 WAGO one-row 5-pin on-board connectors. These ports are optoisolated, breakdown voltage is not less than 500 V.

The jumpers of the J6 (for COM3) and J8 (for COM4) pinpads connect terminators to RS-485/RS-422 signal lines. The pins of these pinpads have identical designation shown in the following figure.

Figure 3.7: J6 and J8 Pinpads



To use COM3 or COM4 ports in RS-422 or RS-485 mode, do the following:

- Set jumpers on the pinpad corresponding to the port;
- Initialize the port by software

Figure below shows two modules connected in RS-422 mode. The jumper connecting terminator is set on receive lines only (lines RX+ and RX-). In RS-485 mode the terminators are connected only on devices at the ends of the line (on the next figure). The terminators' resistance is 120 Ohm. Complete description of other jumpers can be found in section 7.1.

Figure 3.8: Point-to-Point Connection of Two Modules in RS-422 Mode

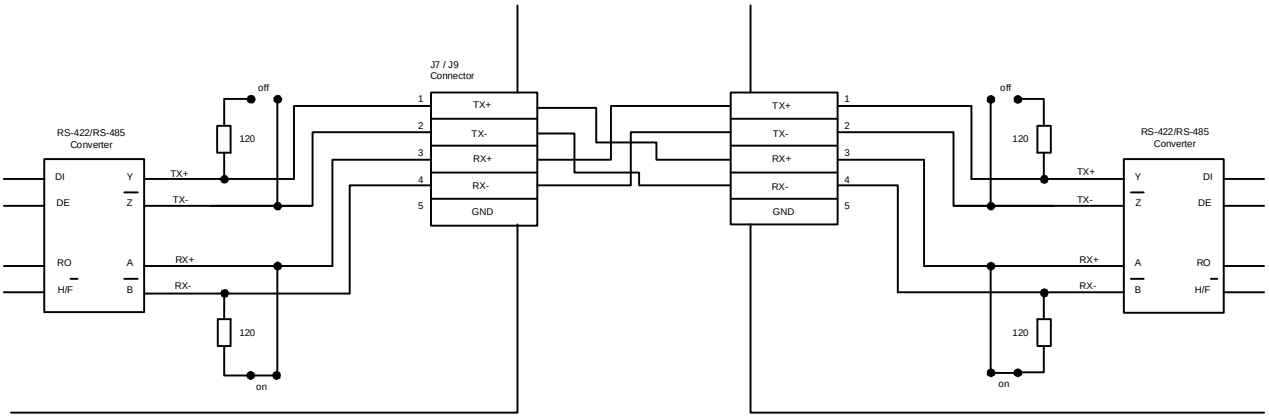
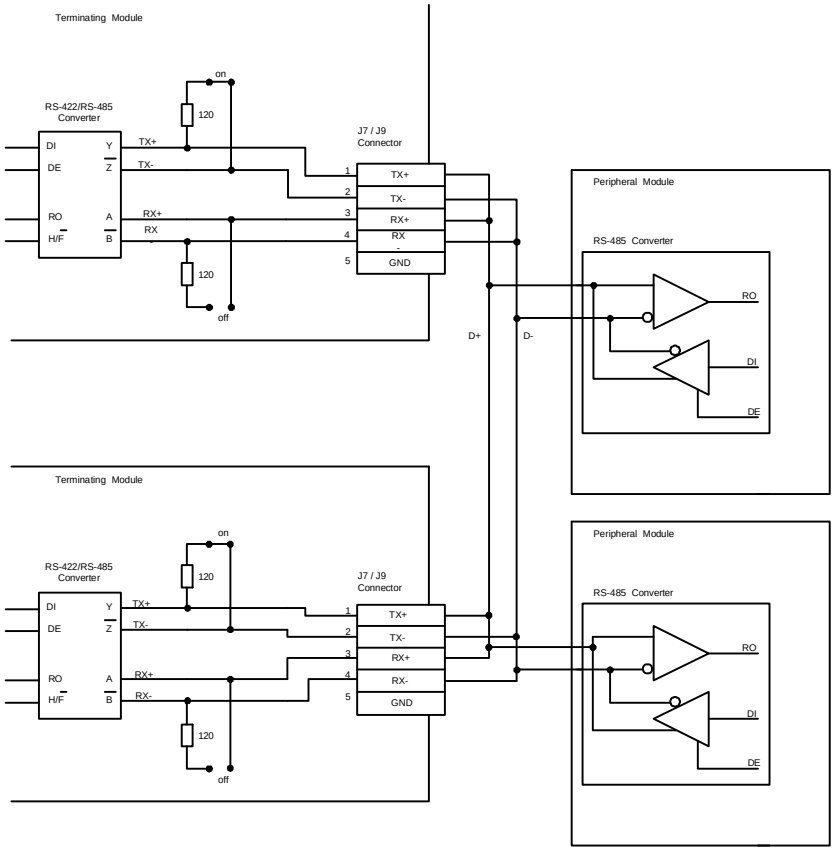


Figure 3.9: Connection of Several Devices in RS-485 Mode



3.2.13 RTC and Serial FRAM

The module is equipped with a standard Real Time Clock with the onboard 3 V battery backup. To connect the battery close contacts 1 and 2 on the J3 pinpad, to disconnect – close contacts 3 and 4. For long-term storage of the CPC108 module it is recommended to disconnect RTC battery by closing 3 and 4 contacts of J3 pinpad or by removing the battery from the holder.

Serial FRAM is non-volatile memory with I^2C serial interface. It serves as a back-up storage for BIOS Setup parameters and for restoration of the CMOS memory if an error is detected. Thus, the processor module can operate without a battery (disconnected or removed). When the power is disconnected, system setup parameters are stored in SFRAM, except current time and date settings.

In case of operating system crash and if BIOS Setup program can not be started, BIOS settings can be reset using *cmos_rst.com* program. It is started under MS DOS 6.22 on a remote PC connected to switched off CPC108 module with a null-modem cable and ACS00023 (685611.082) adapter cable via COM1 port. After this procedure, BIOS settings are reset to default ones on module's power-up. The procedure is described in section 6.2 of this Manual.

3.2.14 ACPI Mode Selector (J18)

J18 pinpad is used for selection of ACPI mode. The following table explains the available options.

Table 3.10: J18 Pinpad Description

Closed Contacts	Description
[1-3], [2-4]	Automatic power sources management enabled, including switching to power saving Sleep mode. Only for operating systems with ACPI support.
[3-5], [4-6]	In this position the CPU does not control power sources.

3.2.15 ISA Bus

Being a MicroPC module, CPC108 has 8-bit ISA bus routed to 62-contact edge connector P4. Row A is located on the top side of the module, row B – on the bottom side. P4 contacts designation is presented in the table below.

Table 3.11: P4 ISA Connector Pinout

Contact	Signal	In / Out	Contact	Signal	In / Out
A1	/IOCHK	–	B1	GND	Power
A2	SD7	In / Out	B2	RESET	Out
A3	SD6	In / Out	B3	+5V	Power
A4	SD5	In / Out	B4	IRQ9	In
A5	SD4	In / Out	B5	-5V	Power
A6	SD3	In / Out	B6	DRQ2	In
A7	SD2	In / Out	B7	-12V	Power
A8	SD1	In / Out	B8	0WS	In
A9	SD0	In / Out	B9	+12V	Power
A10	IOCHRDY	In	B10	GND	Power
A11	AEN	Out	B11	/SMEMW	Out
A12	SA19	Out	B12	/SMEMR	Out
A13	SA18	Out	B13	/IOW	Out
A14	SA17	Out	B14	/IOR	Out
A15	SA16	Out	B15	/DACK3	Out
A16	SA15	Out	B16	DRQ3	In
A17	SA14	Out	B17	/DACK1	Out
A18	SA13	Out	B18	DRQ1	In
A19	SA12	Out	B19	/REFRESH	Out
A20	SA11	Out	B20	BCLK	Out
A21	SA10	Out	B21	IRQ7	In
A22	SA9	Out	B22	IRQ6	In
A23	SA8	Out	B23	IRQ5	In
A24	SA7	Out	B24	IRQ4	In
A25	SA6	Out	B25	IRQ3	In
A26	SA5	Out	B26	/DACK2	Out
A27	SA4	Out	B27	TC	Out
A28	SA3	Out	B28	BALE	Out
A29	SA2	Out	B29	+5V	Power
A30	SA1	Out	B30	OSC	Out
A31	SA0	Out	B31	GND	Power

"Power" – The module receives power via these contacts being installed into a MicroPC crate.

3.2.16 Diagnostic LEDs

CPC108 has five diagnostic LEDs (D7, D20, D6, D5, D17 – in the order presented in Figure 3.3) on the bottom side of the module. The following table describes the function of these LEDs.

Table 3.12: CPC108 Diagnostic LEDs Function

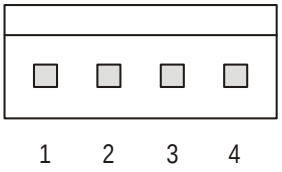
LED	Color	Function
D7	Orange	IDE activity
D20	Yellow	Processor reset by WDT. This LED lights up when the processor was reset on WDT timeout expiry. It should not lit during normal operation.
D6	Green	User LED 2
D5	Green	User LED 1
D17	Green/Yellow	Power LED. Green – normal operation mode, yellow – Sleep mode.

User LEDs D5 and D6 are controlled via 20Eh port bits. Description of I/O ports can be found in Table 3.23. Samples of user LEDs programming are presented in subsection 5.9.3 of this Manual.

3.2.17 Power Supply Connector

If CPC108 is installed in a MicroPC crate, the power (+5V, -5V, +12V, -12V) is supplied to the module via the P4 ISA connector (row B).

Figure 3.10: J22 Power Connector



If CPC108 is used as a stand-alone module, the power (+5V ±5%) is supplied via the dedicated J22 onboard connector.

The following table gives J22 contacts' assignments.

Table 3.13: J22 Power Connector Pinout

Pin	Assignment
1	+5 V
2	GND
3	GND
4	NC

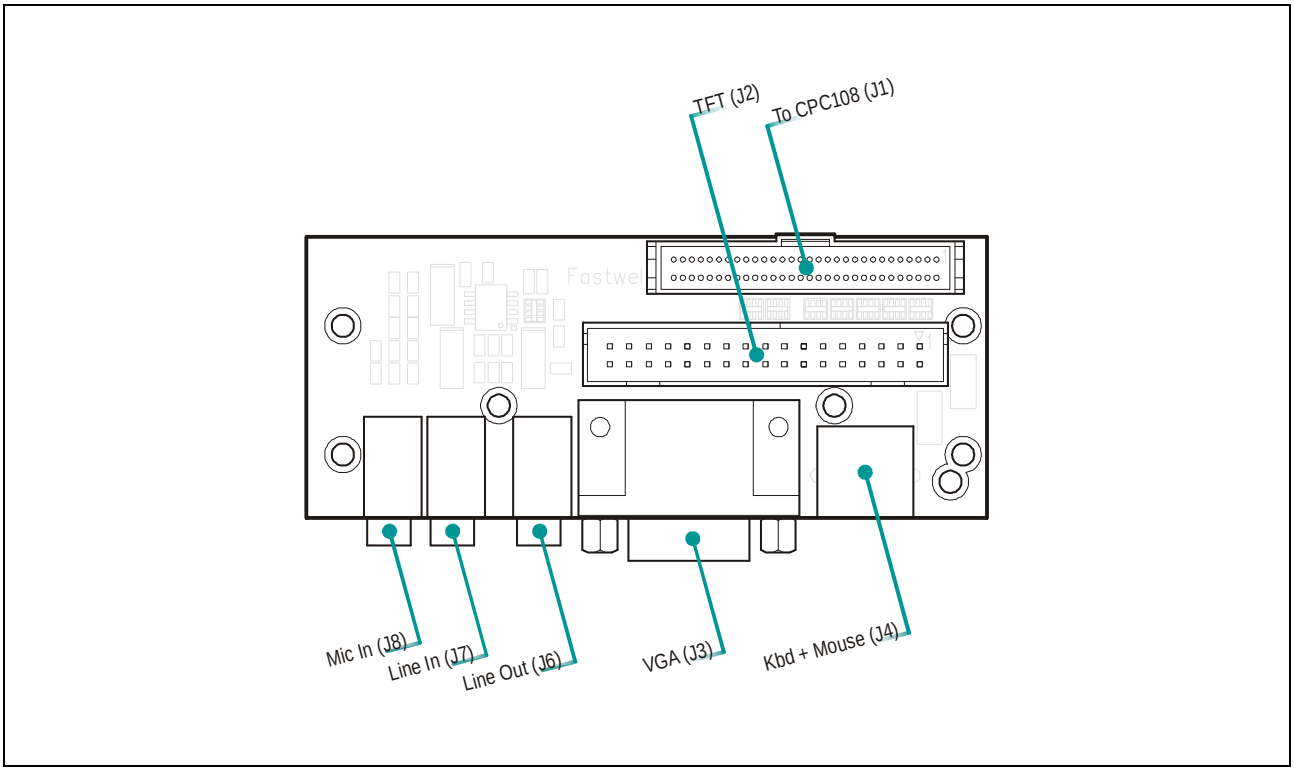
In stand-alone operation mode the power voltage monitoring is enabled. Depending on jumper position on the J20 pinpad, when the +5 V voltage is reduced below 4.75 V either the module reset occurs (J20 contacts 2 and 4 closed) or Power Failure flag is set (J20 4-6 closed). See also 20Ch I/O port (FPGA) description, table 3.23.

For operation of the module (without external devises) the power supply unit should provide 2 ... 2.5 A consumption current. When building a system, it is necessary to take into account the external devices (HDD, CDROM drive) total consumption current.

3.3 KIB981 Interface Expansion Module

KIB981 (421459.981) is used to connect a number of devices to CPC108 – TFT panels, VGA monitors, PS/2 keyboard and mouse, audio devices. 60-thread ACS00015 (685611.023) cable supplied with the processor module is used to connect J1 header at KIB981 and J21 header at CPC108 (table 3.4). Connectors layout of KIB981 is presented below.

Figure 3.11: KIB981: Connectors Layout



3.3.1 Connection of TFT Panels and VGA Monitors

J2 header of KIB981 is used for connection of different types of TFT panels. Its pinout is presented in the table below.

Table 3.14: KIB981: J2 TFT Connector Pinout

Pin#	Signal	Pin#	Signal
1	GND	18	DRGB15 (G5)
2	DOT_CLK	19	GND
3	HSYNC	20	DRGB2 (B0)
4	VSYNC	21	DRGB3 (B1)
5	GND	22	DRGB4 (B2)
6	DRGB18 (R0)	23	DRGB5 (B3)
7	DRGB19 (R1)	24	DRGB6 (B4)
8	DRGB20 (R2)	25	DRGB7 (B5)
9	DRGB21 (R3)	26	GND
10	DRGB22 (R4)	27	DISPEN
11	DRGB23 (R5)	28	+5V
12	GND	29	+5V
13	DRGB10 (G0)	30	–
14	DRGB11 (G1)	31	–
15	DRGB12 (G2)	32	–
16	DRGB13 (G3)	33	–
17	DRGB14 (G4)	34	–

VGA monitors are connected to J3 standard 15-contact D-Sub connector of KIB981. Its pinout is presented in the table below.

Table 3.15: KIB981: J3 VGA Connector Pinout

Pin#	Signal	Pin#	Signal	Pin#	Signal
1	VGA_RED	6	GND	11	–
2	VGA_GREEN	7	GND	12	VGA_SDA
3	VGA_BLUE	8	GND	13	VGA_HSYNC
4	–	9	–	14	VGA_VSYNC
5	GND	10	–	15	VGA_SCL

3.3.2 Connection of PS/2 Keyboard and Mouse

J4 is a standard 6-contact PS/2 connector located on KIB981 interface expansion module. It allows connection of PS/2 keyboard and mouse. For simultaneous connection of PS/2 devices use separately ordered “Y-cable” adaptor (1700060202). J4 pinout is shown in the table below.

Table 3.16: KIB981: J4 PS/2 Connector Pinout

Pin#	Signal	Pin#	Signal	Pin#	Signal
1	KBD DATA	3	GND	5	KBD CLK
2	MOUSE DATA	4	+5V	6	MOUSE CLK

3.3.3 Connection of Audio Devices

CPC108 has AC'97 compatible audio controller supporting 16-bit sound synthesis and OPL3 mode emulation. KIB981 interface module bears three audio connectors – stereo line out (J6), stereo line in (J7), and microphone input (J8).

Figure 3.12: KIB981: Audio Connector

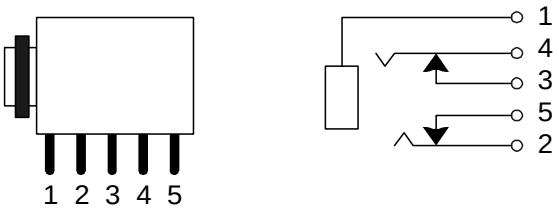


Table 3.17: KIB981: J6, J7, J8 Audio Connectors Pinout

Pin#	J6 Signal	J7 Signal	J8 Signal
1	GNDA	GNDA	GNDA
2	OUTL	LIN_IN_L	MIC_IN
3	–	GNDA	–
4	OUTR	LIN_IN_R	–
5	–	GNDA	–

3.4 KIB985 Interface Expansion Module

KIB985 (421459.985) interface expansion module allows connection of two CAN channels, PS/2 keyboard and mouse, and external remote reset source. J1 header at KIB985 (table 3.18 below) and J5 header at CPC108 are connected with the 14-thread ACS00013 (685611.016-01) cable. KIB985 module and ACS00013 cable are not supplied with the processor module, they are ordered separately. The figure below shows layout of KIB985.

Figure 3.13: KIB985: Connectors Layout

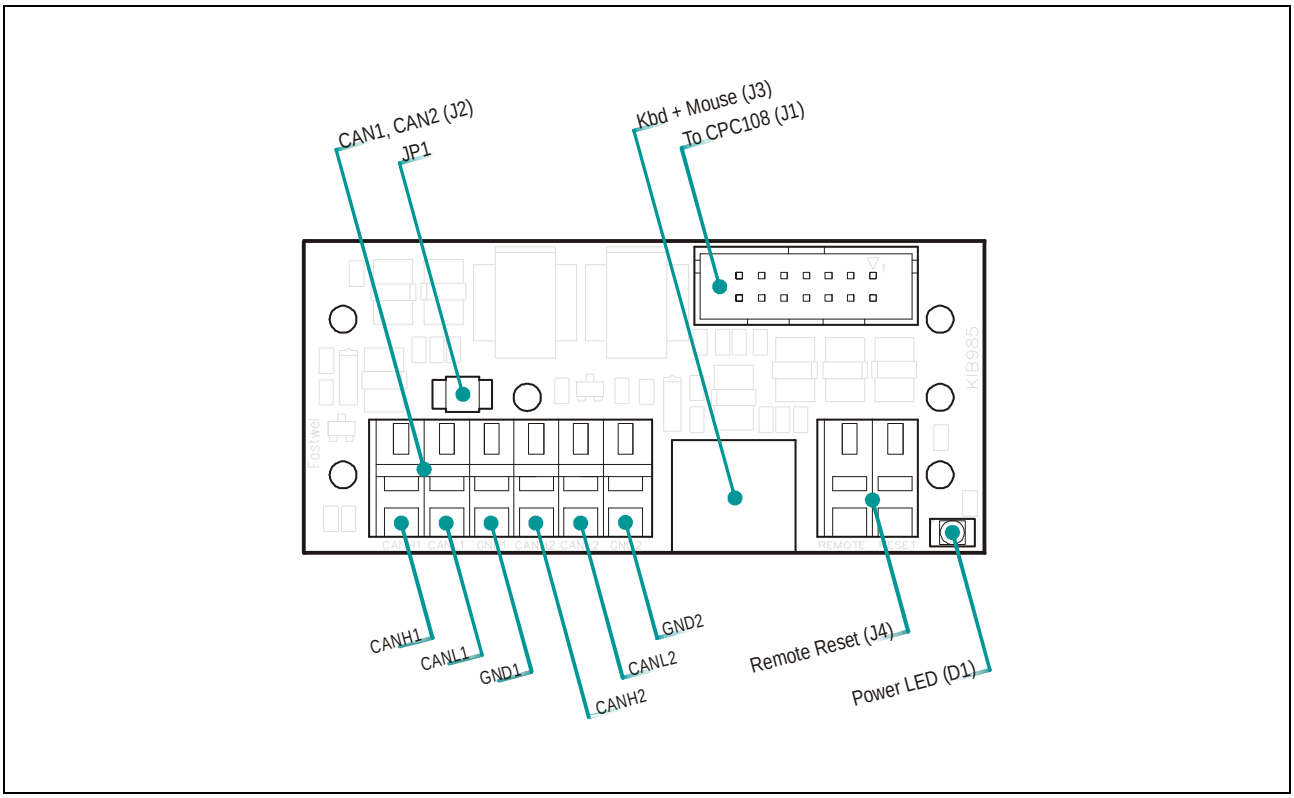


Table 3.18: KIB985: J1 Connector Pinout

Pin#	Signal	Pin#	Signal
1	–	8	MOUSE CLK
2	GND	9	–
3	OPT_RESET	10	GND
4	+5V	11	CAN1 TX
5	KBD DAT	12	CAN2 TX
6	KBD CLK	13	CAN1 RX
7	MOUSE DAT	14	CAN2 RX

3.4.1 Connection of CAN Channels

CPC108 is equipped with two SJA1000 CAN 2.0b compatible controllers providing two independent CAN channels. These CAN controllers support software reset. The controllers' resources are listed in the table below.

Table 3.19: Resources of CAN1 and CAN2 Controllers

CAN1 Controller	CAN2 Controller	Description
DF000h – DF0FFh	DF200h – DF2FFh	Control area addresses
DF100h – DF1FFh	DF300h – DF3FFh	Reset area addresses. The CAN controller is reset on accessing addresses within this area.
IRQ10	IRQ11	Interrupt lines

Two independent CAN channels are connected to CPC108 via J2 terminal block mounted on KIB985 interface module. 1000 V optoisolation of CAN ports is realized on KIB985.

120 ohm pull-down resistors are connected independently to CAN channels by closing contacts on JP1 pinpad of KIB985: closed 1-2 for CAN1, closed 3-4 for CAN2.

Table 3.20: KIB985: J2 CAN Connector Pinout

Pin#	Signal	Pin#	Signal
1	CAN1+	4	CAN2+
2	CAN1-	5	CAN2-
3	GND1	6	GND2

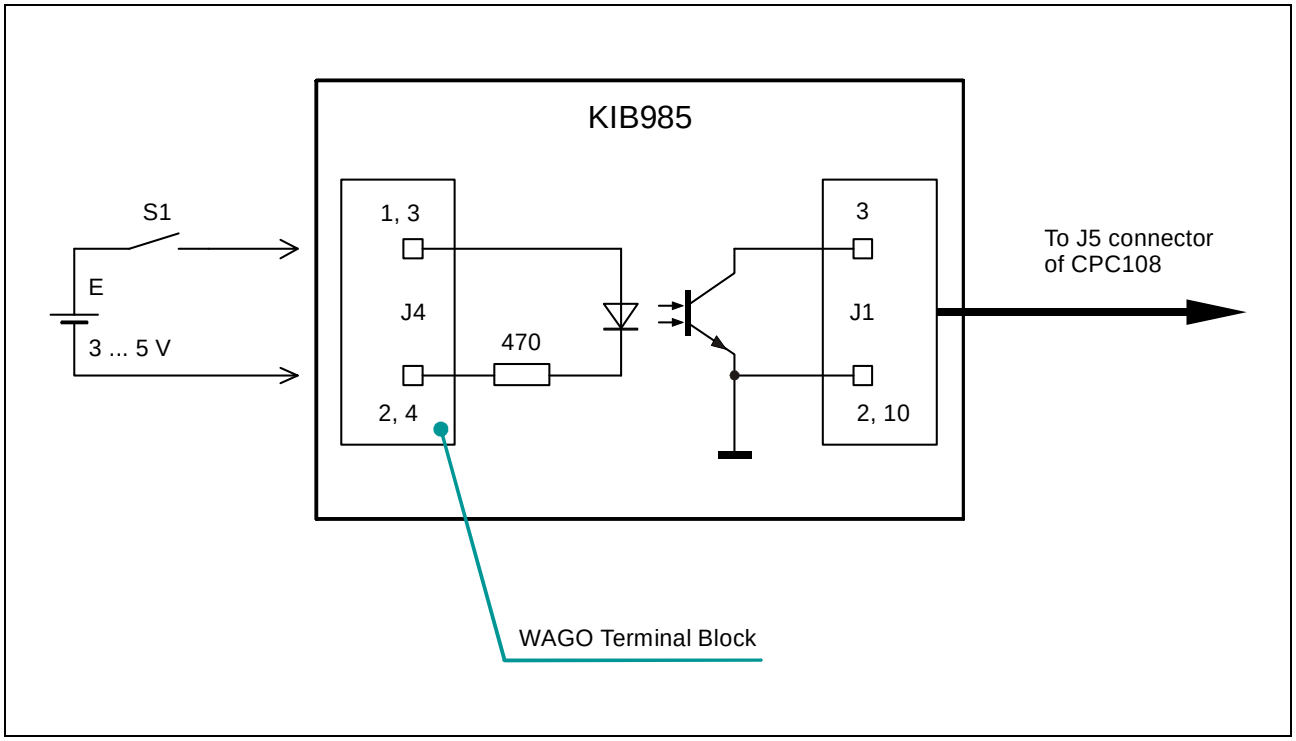
3.4.2 Connection of PS/2 Keyboard and Mouse

J3 is a standard 6-contact PS/2 connector located on KIB985 interface module. It allows connection of PS/2 keyboard and mouse. For simultaneous connection of PS/2 devices use separately ordered "Y-cable" adaptor (1700060202). J3 pinout is identical to the one of J4 connector of KIB981 module (see table 3.16 above).

3.4.3 Optoisolated Remote Reset

The remote reset source is connected to CPC108 via J4 connector of KIB985. Optoisolation of remote reset input is realized on KIB985 as illustrated by the following circuit diagram.

Figure 3.14: KIB985: Reset Input Optoisolation



The discrete input is enabled by closing contacts 1 and 3 of the J20 pinpad at CPC108.

3.5 Address Mapping

3.5.1 Memory Addressing

Table 3.21: Memory Address Mapping

Address Range	Size	Description
00000h – 09FFFh	640 KB	System memory
A0000h – BFFFFh	128 KB	Video memory
C0000h – C7FFFh	32 KB	Display BIOS memory / external bus memory or additional memory in U19 socket
C8000h – D7FFFh	64 KB	External bus memory or additional memory in U19 socket
D8000h – DBFFFh	16 KB	DOC or additional memory in U19 socket
DF000h – DF1FFh	512 B	CAN1
DF200h – DF3FFh	512 B	CAN2
E0000h – FFFFFh	128 KB	System BIOS area
100000h – XXXXXXXh	255 MB	Extended system memory. Upper address area is allocated for use as video memory depending on BIOS setting (see section 5.5)
XXXXXXXh – FFFFFFFh		
FFFFFFFFh – 10007FFFFh	512 KB	ROM BIOS

3.5.2 I/O Addressing

Table 3.22: I/O Address Space

Address Range	Function	Note
0000h – 001Fh	DMA1	–
0020h – 0021h	PIC Master	–
0022h – 0023h	LX Configuration	–
0028h – 002Fh	Local Bus	–
0040h – 005Fh	Timer	–
0060h – 006Fh	POST, Keyboard shadow registers	–
0070h – 007Fh	CMOS, NMI Mask Control Registers	–
0080h – 009Fh	DMA Page Registers	–
00A0h – 00BFh	Slave PIC	–
00C0h – 00DFh	DMA2	–
00F0h – 00FFh	Numeric Coprocessor	–
0100h – 016Fh	External ISA bus	External bus access
0170h – 0177h	Reserved	–
0180h – 01EFh	External ISA bus	External bus access
01F0h – 01F7h	Primary IDE	–
0200h – 020Bh	External ISA bus	External bus access
020Ch – 020Fh	CPC108 control registers	See Table 3.23
0210h – 026Fh	External ISA bus	External bus access
0270h – 027Fh	Reserved	–
0280h – 02E7h	External ISA bus	External bus access
02E8h – 02EFh	COM4	RS422/485
02F8h – 02FFh	COM2	RS232
0300h – 0301h	CPC108 FFD	See Table 3.23
0302h – 036Fh	External ISA bus	External bus access
0370h – 0377h	Reserved	–
0378h – 037Fh	LPT1	–
0380h – 03AFh	Reserved	–
03B0h – 03DFh	Video	–
03E8h – 03EFh	COM3	RS422/485
03F0h – 03F5h	FDD controller	–
03F6h	Reserved	–
03F7h	FDD controller	–
03F8h – 03FFh	COM1	RS232
0400h – FFFFh	External ISA bus	External bus access
0CF8h – 0CFFh	Host PCI controller configuration registers	–

System I/O ports (FPGA) within ranges from 020Ch to 020Fh and from 0300h to 0301h are non-standard and are used for the module resource management. They are described in the following table.

Attention!

System I/O ports description is intended for system programmers use only!

User application programs are not allowed to address these ranges!

Note!

Cell shadowing in the following table marks values after power up.

Table 3.23: System I/O Ports (FPGA)

Port (hex)	Bit	Read	Write	Value	Comment
20C	0	Yes	Yes	0	WDT off
				1	WDT on. WDT is reset by reading port 20C
	1	Yes	No	0	WDT trigger indicator bit: 0 – No one WDT triggered, 1 – At least one WDT triggered
				1	
	2	Yes	Yes	0	This bit resets the WDT trigger indicator bit to “0”. Reset is done on 0 → 1 transition front
				1	
	3	Yes	No	0	SV_PFO# signal: Power failure
				1	SV_PFO# signal: Power in normal state
	4	No	No	–	–
	5	No	No	–	–
	6	No	No	–	–
	7	No	No	–	–
20E	0	Yes	Yes	0	USER_LED1 – on
				1	USER_LED1 – off
	1	Yes	Yes	0	USER_LED2 – on
				1	USER_LED2 – off
	2	Yes	Yes	0	External ISA bus A18… A16 address lines control (U19 DOC/SRAM socket): 0 – Address lines are controlled by ISA bus, 1 – Address lines are controlled by port 20F selector (bits 6 ... 4)
				1	
	3	No	No	–	–
	4	No	No	–	–
	5	No	No	–	–
	6	No	No	–	–
	7	No	No	–	–

Port (hex)	Bit	Read	Write	Value	Comment
20F	0	Yes	No	0	“Main BIOS copy in use” indicator
				1	Reserve BIOS copy in use after triggering of WDT.
	1	No	No	–	–
	2	No	No	–	–
	3	Yes	Yes	0	Additional memory (SRAM) or Disk On Chip in U19 socket access control bit: 0 – Access to additional memory disabled (only Disk On Chip is accessible) 1 – Access to additional memory enabled; it is available within range from C8000 to DDFFF (88 KB)
				1	
	4	Yes	Yes	0	U19 socket memory page (64 KB) selector
				1	
	5	Yes	Yes	0	
				1	
	6	Yes	Yes	0	
				1	
	7	No	No	–	–
300	0	Yes	Yes	0	NAND flash: read/write data, write address, write commands
				1	
	1	Yes	Yes	0	
				1	
	2	Yes	Yes	0	
				1	
	3	Yes	Yes	0	
				1	
	4	Yes	Yes	0	
				1	
	5	Yes	Yes	0	
				1	
	6	Yes	Yes	0	
				1	
	7	Yes	Yes	0	
				1	
301	0	Yes	No	0	–
	1	Yes	No	0	–
	2	Yes	No	0	FL_RB line status reading (NAND Flash availability status): 0 – NAND Flash is not ready for the next operation, 1 – NAND Flash is ready for the next operation
				1	
	3	Yes	Yes	0	/CE NAND Flash line set to 0 (NAND Flash selection)
				1	/CE NAND Flash line set to 1
	4	Yes	Yes	0	/WP NAND Flash line set to 0 (write/erase operations disabled)
				1	/WP NAND Flash line set to 1 (write/erase operations enabled)
	5	Yes	No	0	Reserved. Permanent logic “0”
	6	Yes	Yes	0	ALE NAND Flash line set to 0
				1	ALE NAND Flash line set to 1
	7	Yes	Yes	0	CLE NAND Flash line set to 0
				1	CLE NAND Flash line set to 1

3.5.3 Interrupt Settings

By default, interrupt requests are generated by the devices belonging to the CPC108 module. Among the alternative interrupt generating devices are: expansion modules on ISA system bus or optoisolated Reset input.

Table below presents interrupt settings. Interrupt request configuration is performed in BIOS Setup.

Table 3.24: Interrupt Settings

IRQ	Default Source	Alternative Source
IRQ0	System timer	–
IRQ1	Keyboard	–
IRQ2	8259 cascaded interrupt	–
IRQ3	COM2	IRQ3 line of external ISA bus
IRQ4	COM1	IRQ4 line of external ISA bus
IRQ5	Ethernet / USB / Audio	–
IRQ6	FDD	IRQ6 line of external ISA bus
IRQ7	LPT	IRQ7 line of external ISA bus
IRQ8	RTC	–
IRQ9	Ethernet / USB / Audio	–
IRQ10	CAN1	IRQ3 line of external ISA bus
IRQ11	CAN2	IRQ4 line of external ISA bus
IRQ12	Mouse	–
IRQ13	Reserved for math. coprocessor	–
IRQ14	HDD, CompactFlash	–
IRQ15	COM3, COM4	–

3.5.4 DMA Channels

Table 3.25: DMA Request Map

DMA Channel	Main Function	Alternative Source
0	Reserved	–
1	LPT	DRQ1 line of external ISA bus
2	FDD	–
3	DRQ3 line of external ISA bus	–
4	Slave controller	–
5	–	–
6	–	–
7	–	–

4 External Connections

The following precautions must be observed to ensure proper installation and to avoid damage to the module, other system components, or harm to personnel.

4.1 Safety Regulations

The following safety regulations must be observed when installing or operating the module. 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.

ESD Sensitive Equipment!

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

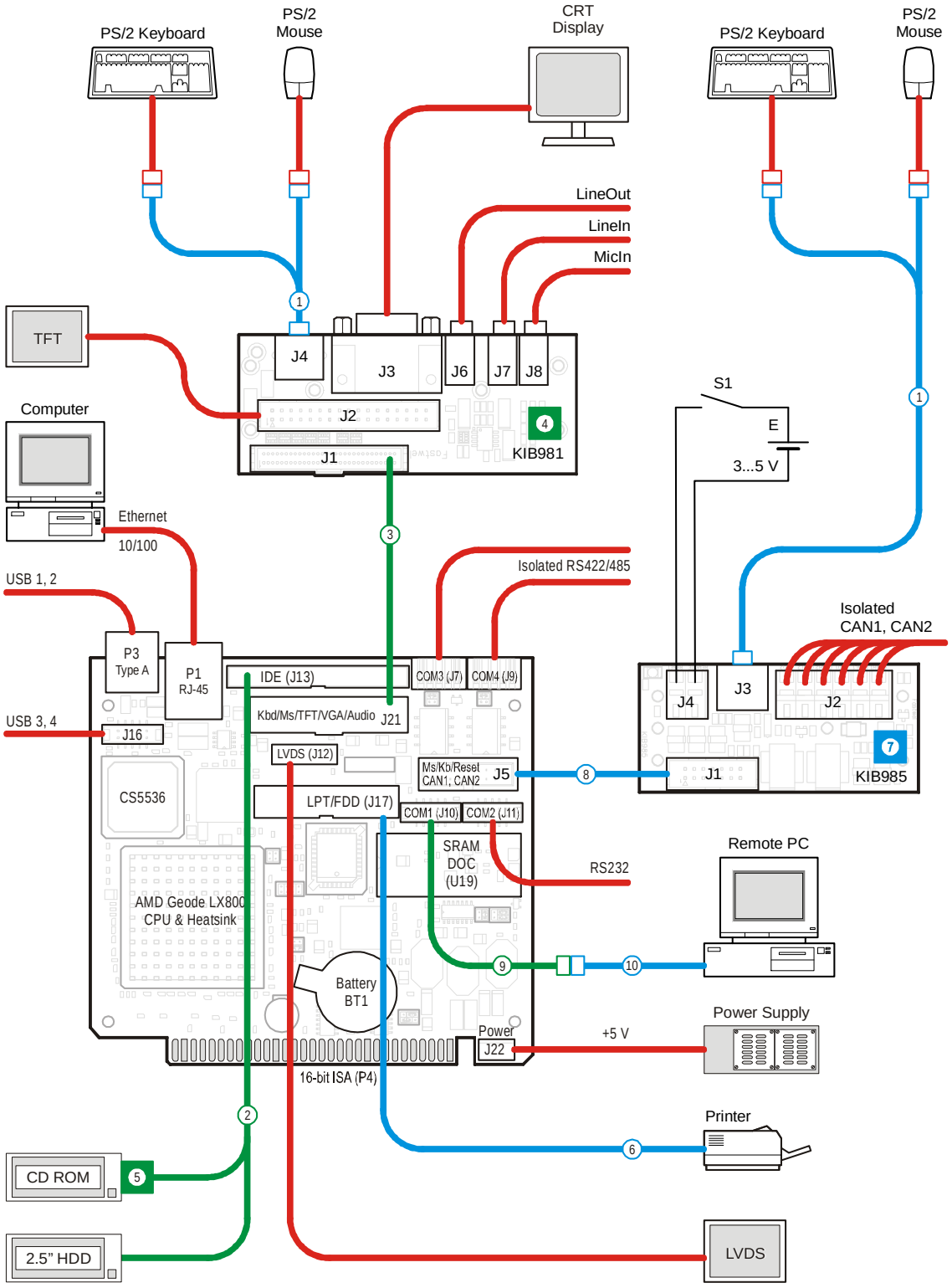
- Use grounding equipment, if working at an anti-static workbench. Otherwise, discharge yourself and the tools in use before touching the sensitive equipment.
- Try to avoid touching contacts, leads and components.

Extra caution should be taken in cold and dry weather.

4.2 Connection of Peripheral Devices

External devices are connected to CPC108 directly or via KIB981 and KIB985 interface expansion modules. Please, see the legend and explanations on the next page.

Figure 4.1: External Devices Connection



Legend:

– Supplied with CPC108

– Ordered separately (additional accessories)

– Third party hardware

1 – PS/2 adaptor cable (Y-cable)

2 – Cable for connection of 2.5" HDD to 44-contact header (681611.051)

3 – Cable for connection of KIB981 interface expansion module to CPC108 (ACS00015)

4 – KIB981 interface expansion module

5 – CDM02 adapter module for connection of 3.5" HDD or CD-ROM drive

6 – IDC26 to DB25 adapter cable for connection to LPT (ACS00011)

7 – KIB985 interface expansion module

8 – Cable for connection of KIB985 to the CPC108 processor module (ACS00013)

9 – DB9F to IDC10 adapter cable for connection to COM1 or COM2 ports (ACS00023)

10 – Null-modem cable

The following devices are necessary to put the module into operation:

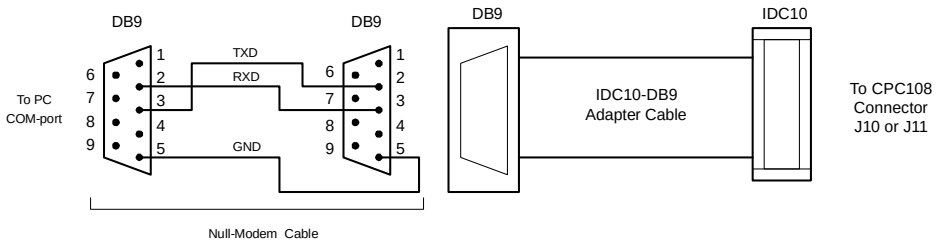
- Power supply unit with +5 V and not less than 2 A (2.5 A) output to be connected to J22 power connector in case of standalone operation of CPC108. For checkout and adjustment purposes the AT or ATX power supply units are recommended. If the module is intended for operation in a MicroPC crate, the system power supply must provide the required consumption current.
- The following devices may be connected to the module to serve as a display unit:
  - Monitor of a remote PC (console operation) connected via DB9F – IDC10 adapter cable and a null-modem cable to J10 (J11) connector;
  - SVGA monitor directly connected to VGA connector of KIB981 interface expansion module;
  - LCD panel connected to J12 connector (LVDS) of CPC108 or TFT panel connected via KIB981 module;
- Y-cable allowing to connect a mouse and a keyboard to the PS/2 connector of either KIB981 or KIB985 interface expansion modules.

The module is shipped with disconnected RTC battery (contacts 3-4 closed on the J3 pinpad). Before starting the operation of CPC108, it is necessary to connect the battery by closing contacts 1-2 on the J3 pinpad.

The module is supplied with preinstalled FDOS 6.22 operating system (MS DOS 6.22 compatible). The operating system is loaded from the on-board NAND Flash memory. Operating system on this flash-disk is supplemented with service utilities. FAT16 file system is supported at BIOS level and can be used with MS DOS or FDOS. Other operating systems will require installation of an appropriate driver. The CD supplied with CPC108 contains the drivers for RTOS32, Windows CE 5.0, Windows XPe, and Linux 2.6 operating systems.

To connect a remote PC to CPC108 for console operation use the IDC10 – DB9F adapter cable (ACS00023) and a null-modem cable. The ACS00023 adapter cable is connected to J10 or J11 connector at CPC108, the null-modem cable is connected to the COM-port of the remote PC.

Figure 4.2: Cables Connection for Console Operation



The Hyperterminal program running on the PC to support console operation should have the following settings:

Transfer rate – 115200 bit/s
Data bits – 8
Stop bits – 1
Parity check – Off

4.2.1 CompactFlash Cards Installation

CompactFlash socket of CPC108 (J14) supports 5 V CompactFlash ATA type I/II cards. Carefully slide in the correctly oriented card and gently press to engage the contacts completely.

Note:

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

CompactFlash socket description can be found in Subsection 3.2.5.

4.2.2 USB Devices Connection

CPC108 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. Direct USB devices connection is possible via J16 onboard header (two ports) or through standard Type A sockets (P3).

4.2.3 Battery Replacement

The lithium battery must be replaced with the battery of the same type.

The expected life of a 190 mAh battery 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...

I 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.

Dispose of used batteries according to the local regulations.

4.3 Software Installation

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.

5 General Software® BIOS

The General Software® BIOS in CPC108 is an adapted version of a standard BIOS for IBM PC AT-compatible personal computers equipped with Intel®x86 and compatible processors. BIOS provides low-level support for the central processing, memory, and I/O system units.

5.1 BIOS Setup Program. Introduction

With the BIOS Setup program, you can modify BIOS settings and control special features of the 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.

5.2 Main Menu

To start the BIOS Setup program switch on the power or restart the system. By default the startup screen looks like this:

```
General Software Embedded BIOS (R) 2000 Revision 5.3
Copyright (C) 2005 General Software, Inc. All rights reserved
Fastwel adaptation for board CPC108. Revision 1.2
Copyright (C) 2007 Fastwel Co., Ltd.

Hit <Del> if you want to run SETUP.

00000640K Low Memory
00244736K Ext Memory

Fastwel Flash Disk (FFD) Version 3.5
Copyright (C) 1999-2007 Fastwel, Inc.
FDOS Version 6.22
Copyright (C) 2000, 2001 Fastwel, Inc.
C:\>
```

To start BIOS Setup, press "Del" key on a keyboard while the message

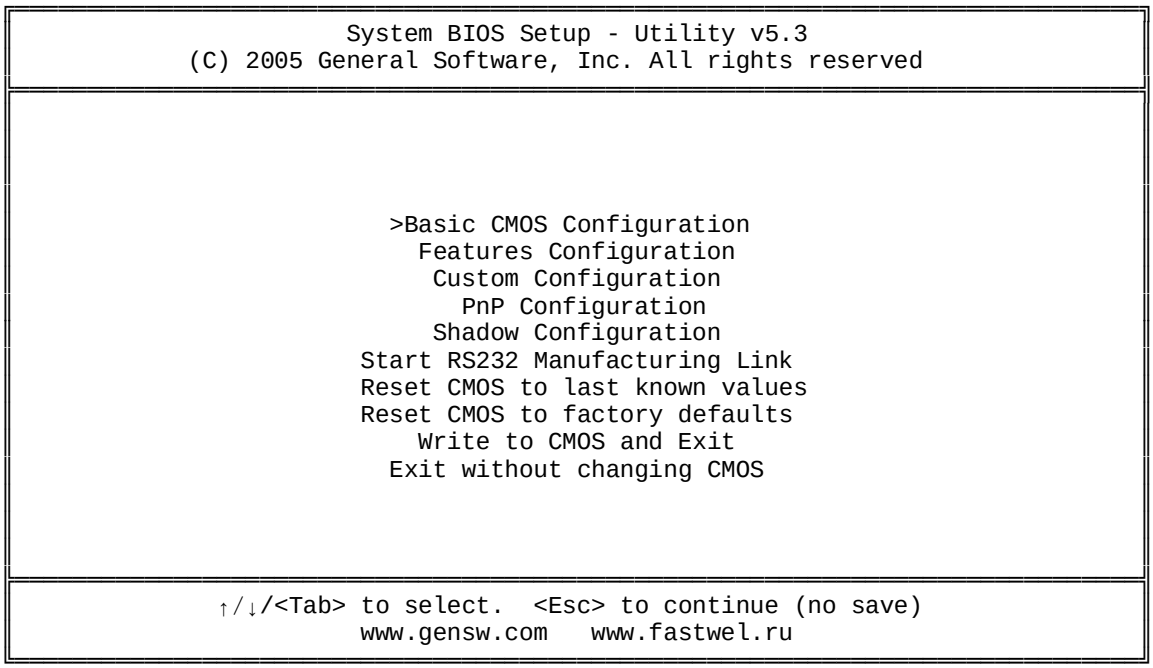
"Hit <Del> if you want to run SETUP"

is seen on the screen. This will lead you to the Main Menu screen, shown in Figure below.

Attention!

In remote console mode the BIOS Setup utility is started by using «ctrl+c» combination on the keyboard of a remote PC.

Figure 5.1: Main Menu Screen Image



The Main Menu items and their functions are described in the table below.

Table 5.1: Main Menu Items

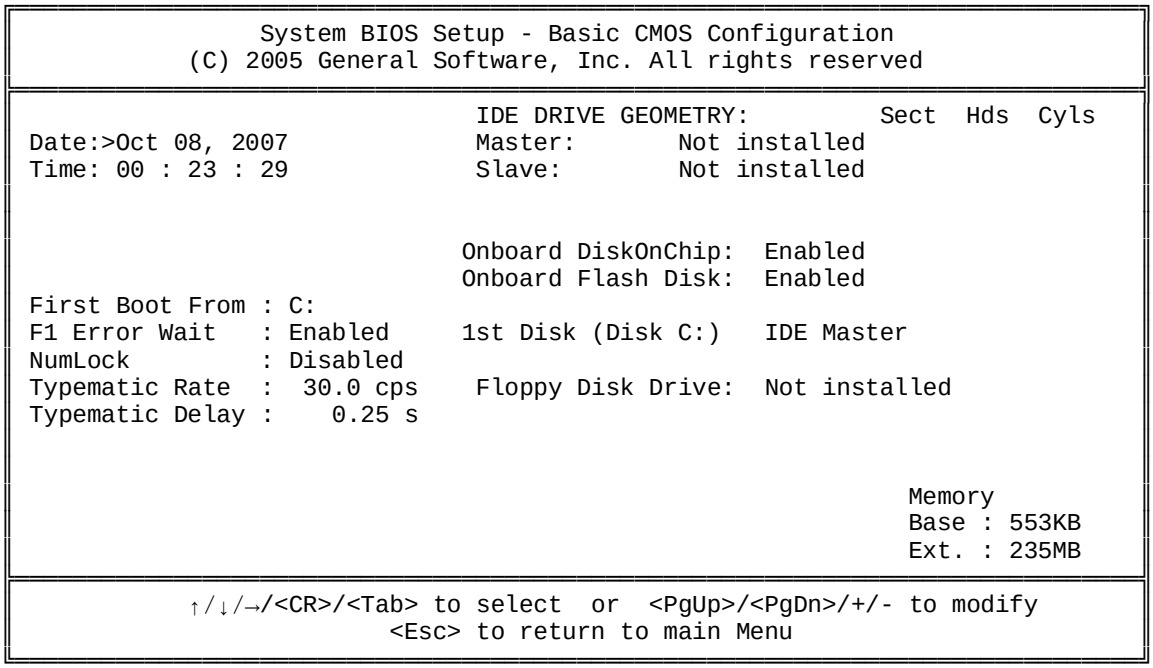
Menu Item	Purpose
Basic CMOS Configuration	This item lead you to the menu which allows you to setup the main system parameters, such as System date and time; Disk drives types definition and letter assignments, Boot sequence and others.
Features Configuration	This item allows to set such system features as Ultra DMA mode, ACPI support, and boot options.
Custom Configuration	This item opens a menu screen, where you can setup DMA and interrupt levels, I/O ports base addresses, select console I/O devices, set video memory size, LCD panel parameters, adjust CPU and system memory settings. The screen also provides important system information, such as CPU, system memory, and PCI frequencies, CPU and system chipset versions.
PnP Configuration	This menu item gives you access to Plug-and-Play related IRQ and DMA settings.
Shadow Configuration	Shadow memory configuration item allows you to select BIOS extensions memory blocks to copy into RAM on module initialization.
Start RS232 Manufacturing Link	This menu item starts the service mode, which allows to explore the disk drives of the CPC108 from a remote PC using a RS232 link between the module and a remote PC (see section 5.8.1).
Reset CMOS to last known values	This menu command allows you to reset the BIOS configuration parameters to the values, with which the system has switched on last time, and continue with BIOS Setup.
Reset CMOS to factory defaults	This command allows you to reset the BIOS configuration parameters to the values set by the manufacturer.
Write to CMOS and Exit	This command lets you write the configuration parameters into CMOS memory and exit BIOS Setup.
Exit without changing CMOS	This command allows you to exit the Setup program without writing any possible changes into the CMOS memory, thus keeping intact the previously saved configuration.

Use "Up" and "Down" cursor keys or <Tab> key to move between menu items. <Enter> selects the item and allows to proceed with the command or opens the submenu screen.

5.3 Basic CMOS configuration

On selection of this Main menu item the following screen is shown:

Figure 5.2: Basic CMOS Configuration Screen Image



Use arrow keys, <Tab> key and <Enter> to move between items and for selection. <PgUp>, <PgDn>, <+> or <-> are used to change the selected parameter (<Space> in console operation). <Esc> – to return to the Main Menu.

The following table presents explanations on "Basic CMOS Configuration" menu screen

Table 5.2: Basic CMOS Configuration Menu Items

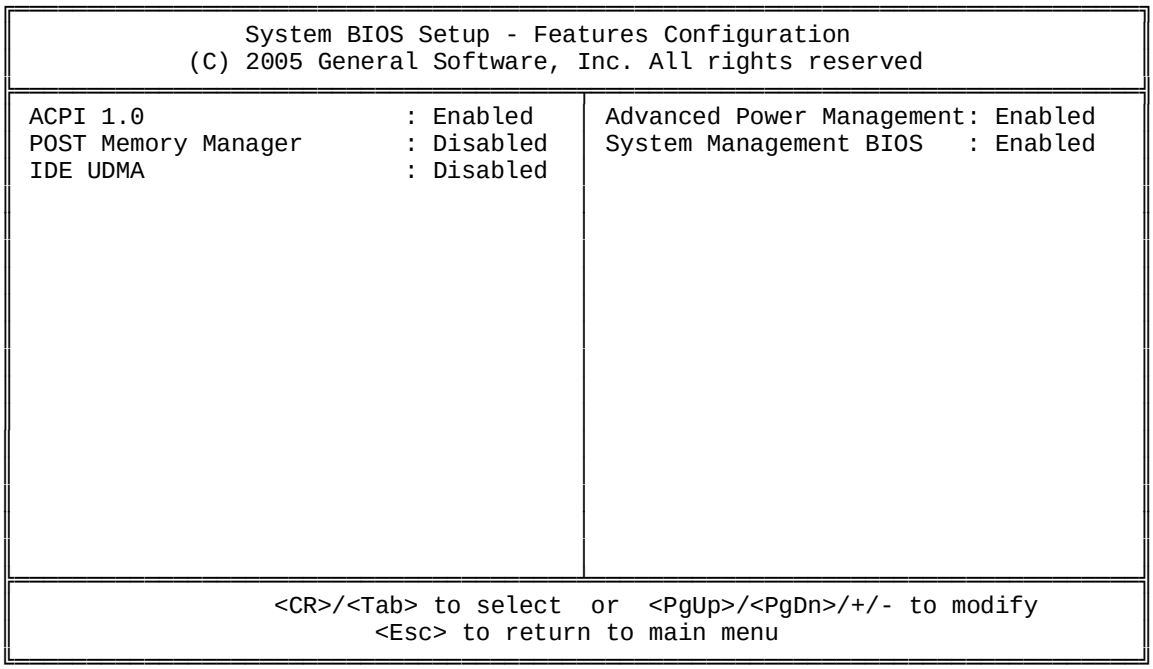
Menu Item	Function
Date Time	These items allow you to set system date and time.
First Boot From	Selection of disk name to boot from first. Choice set: A:, C:, CDROM:
F1 Error Wait	Enables or disables waiting for pressing of <F1> key on error
NumLock	Allows to control the numeric keypad state after boot Enabled – NumLock On; Disabled – NumLock Off
Typematic Rate	Keyboard: autorepeat rate setting in characters per second (2...30)
Typematic Delay	Sets typematic delay of the keyboard in seconds (0.25...1)
Onboard DiskOnChip	Enables or disables the use of a DiskOnChip (DOC) installed in U19 socket. The item is not available, if DOC is not installed in the socket.
Onboard Flash Disk	Enables or disables the onboard flash disk (64 MB)

Menu Item	Function
IDE DRIVE GEOMETRY: Master Slave	IDE disk drive geometry selection for Primary Master (Master) and Primary Slave (Slave). Options: Not installed – disk drive not connected; User Type – user selects custom parameters; Autoconfig, Normal – automatic geometry detection without disk parameters translation; Autoconfig, LBA – automatic geometry detection with translation of disk parameters into linear address; Autoconfig, Large – disk parameters translation us1ing Phoenix algorithm; CDROM – CDROM drive installed
1st Disk (Disk C:)	Selection of a disk drive to assign "C:" Choice set: IDE Master; IDE Slave; On Board Flash Disk Onboard DiskOnChip (available if DOC is installed in U19)
Floppy Disk Drive	FDD (Floppy 0) type selection. Options: Not Installed – FDD is not connected 360 KB, 5.25"; 1.2 MB, 5.25"; 720 KB, 3.5"; 1.44 MB, 3.5"; 2.88 MB, 3.5"
Memory: Base: Ext:	Indication of Base and Extended memory size available for applications

5.4 Features Configuration

Features Configuration menu screen is shown on the following figure:

Figure 5.3: Features Configuration Menu Screen



Features Configuration menu items are described in the table below.

Table 5.3: Features Configuration Menu Items

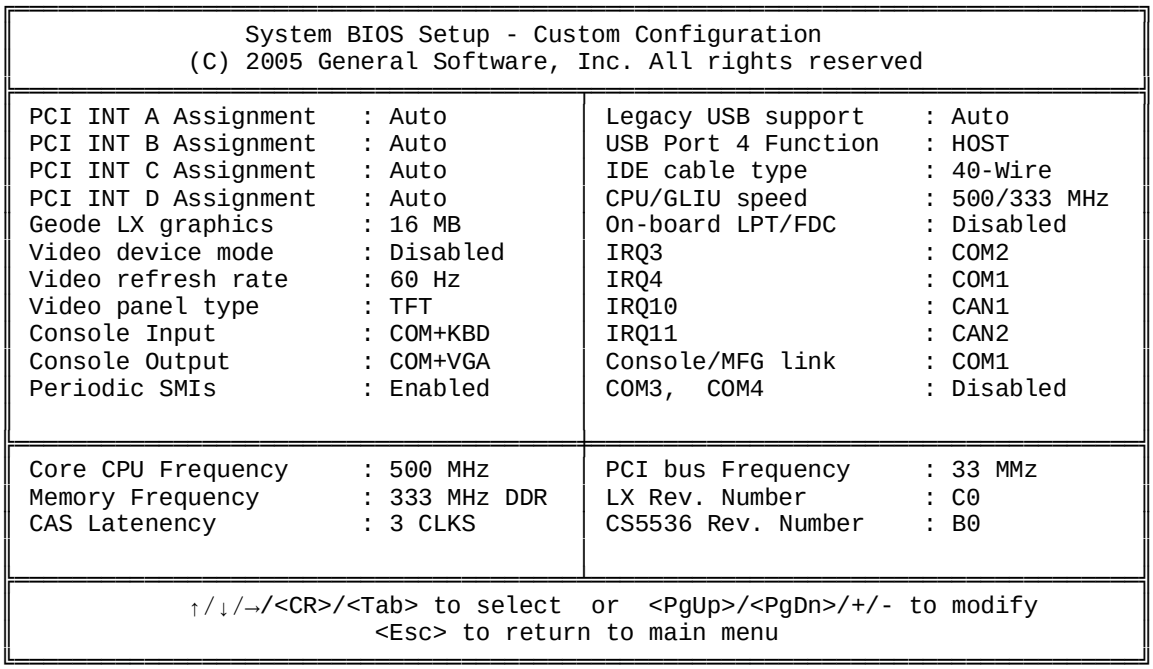
Menu Item	Options	Description
ACPI 1.0	Enabled Disabled	ACPI features support (for OS Windows, Linux)
POST Memory Manager	Disabled Enabled	POST procedures skipped POST enabled
IDE UDMA	Disabled Enabled	Enables/disables UltraDMA mode for Primary IDE channel
Advanced Power Management	Enabled Disabled	APM support (advanced power supply units management)
System Management BIOS	Enabled Disabled	Access to manufacturer and current system information (for testing software)

Remember! Wrong or incorrect settings may lead to abnormal system performance.
To correct possible errors, restart the BIOS Setup program and restore manufacturer's settings by selection of “Reset CMOS to factory defaults” command in Main menu.

5.5 Custom Configuration

Custom Configuration menu screen is shown on the following figure:

Figure 5.4: Custom Configuration Menu Screen



Custom Configuration menu items are described in the table below.

Table 5.4: Custom Configuration Menu Items

Menu Item	Options	Description
PCI INT A Assignment, PCI INT B Assignment, PCI INT C Assignment, PCI INT D Assignment	Auto, IRQ5, IRQ9	Interrupt assignment for PCI devices using INT A, INT B, INT C, and INT D lines: Automatic interrupt assignment, IRQ5 or IRQ9
Geode LX Graphics	4...60 Disabled	System memory size intended for use by CPU graphics core, MB; CPU graphics subsystem is switched off
Video device mode	Disabled 320x240, 640x480, 800x600, 1024x768	LCD panel is not used; Resolution of the LCD panel in use.
Video refresh rate	60, 70, 75, 85, 100	LCD panel video refresh rate, Hz
Video panel type	TFT, LVDS	LCD panel interface
Console Input	 COM KBD	Console input (INT 16h BIOS) options: Input via COM (default); the number of COM-port is selected in «Custom Configuration» => «Console/MFG link» Input via PS/2 keyboard port;

Menu Item	Options	Description
	COM+KBD	Input via PS/2 keyboard port and COM-port. Terminal setting should be: 115200, n, 8, 1
Console Output	 COM VGA COM+VGA	Console output (INT 10h BIOS) options: Output to COM (default); the number of COM-port is selected in «Custom Configuration» => «Console/MFG link» Output to video-controller; Output to COM and video-controller. Transmission parameters: 115200, n, 8, 1
Periodic SMIs	Enabled, Disabled	Enables/disables periodic SMI generation
Legacy USB support	Enabled, Disabled, Auto	Legasy USB devices support
USB Port 4 Function	HOST, DEVICE, Disabled	USB port 4 operates in Host Mode; USB port 4 operates in Device Mode, not supported in BIOS version 1.2; USB port 4 disabled
IDE cable type	40-wire, 80-wire	IDE cable type selection: 40 (44) or 80-wire (for UDMA/100) cable
CPU/GLIU speed	300/266, 333/333, 400/266, 400/333, 500/333, 500/400	Microprocessor / GeodeLink™ Interface Unit operating frequency selection
On-board LPT/FDC	FDC LPT Disabled	J17 connector device selection. When "Disabled" is selected, the LPT and FDD address ranges can be used by other interface devices.
IRQ3	COM2, ISA IRQ3	IRQ3 interrupt source selection
IRQ4	COM1, ISA IRQ4	IRQ4 interrupt source selection
IRQ10	CAN1, ISA IRQ3	IRQ10 interrupt source selection
IRQ11	CAN2, ISA IRQ4	IRQ11 interrupt source selection
Console/MFG link	COM1, COM2	Serial port number selection for operation in the console or Manufacturing Link modes.
COM3, COM4	Enabled, Disabled	COM3 and COM4 serial ports control. ⚠ For BIOS version 1.2 it is necessary to disable COM3 and COM4 ports when using the operating systems with ACPI support (Windows, Linux).

Menu Item	Options	Description
System information area		
Core CPU Frequency		Displays current microprocessor core frequency in MHz
Memory Frequency		Displays the system memory frequency in MHz
CAS Latency		Displays the memory timing parameter
PCI bus Frequency		PCI bus operating frequency
LX Rev. Number		Microprocessor revision number
CS5536 Rev. Number		CS5536 I/O Companion revision number

Remember! Wrong or incorrect settings may lead to abnormal system performance.
To correct possible errors, restart the BIOS Setup program and restore manufacturer's settings by selection of “Reset CMOS to factory defaults” command in the Main menu.

5.6 PnP Configuration

This BIOS Setup section provides access to Plug-and-Play related IRQ and DMA assignments. The menu screen is shown in the figure below.

Figure 5.5: Plug-n-Play Configuration Menu Screen Image

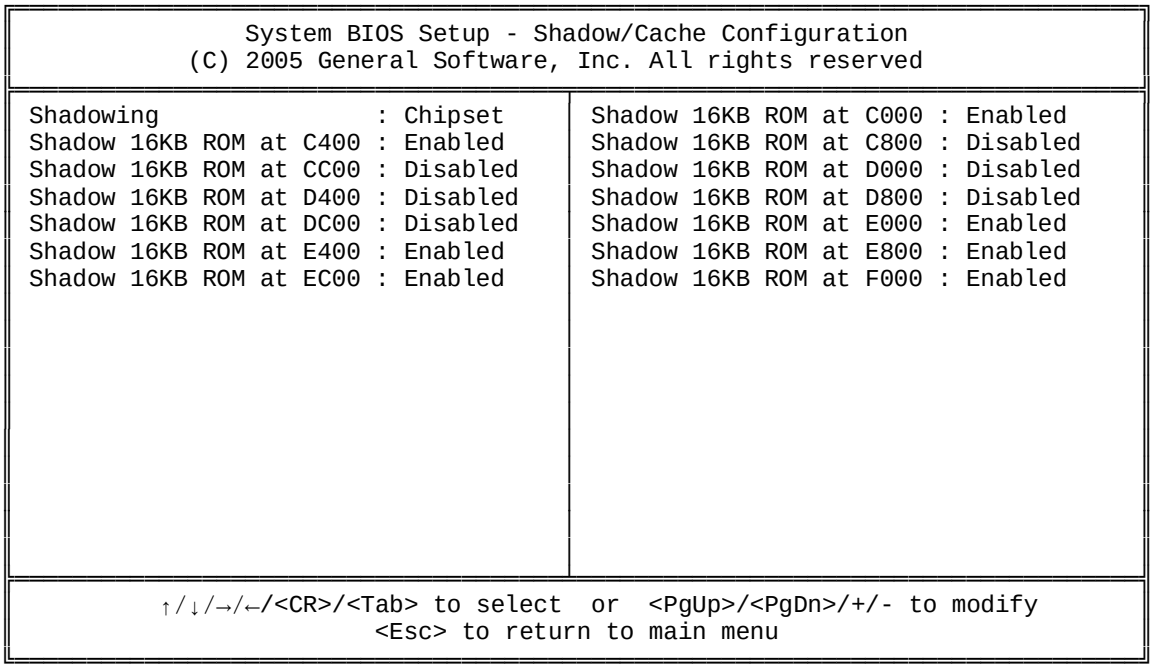
```
                System BIOS Setup - Plug-n-Play Configuration
            (C) 2005 General Software, Inc. All rights reserved

Enable PnP Support        :>Enabled     Enable PnP O/S           : Enabled

Assign IRQ0 to PnP        : Disabled    Assign IRQ8 to PnP       : Disabled
Assign IRQ1 to PnP        : Enabled     Assign IRQ9 to PnP       : Disabled
Assign IRQ2 to PnP        : Enabled     Assign IRQ10 to PnP      : Disabled
Assign IRQ3 to PnP        : Enabled     Assign IRQ11 to PnP      : Enabled
Assign IRQ4 to PnP        : Disabled    Assign IRQ12 to PnP      : Enabled
Assign IRQ5 to PnP        : Enabled     Assign IRQ13 to PnP      : Enabled
Assign IRQ6 to PnP        : Disabled    Assign IRQ14 to PnP      : Enabled
Assign IRQ7 to PnP        : Disabled    Assign IRQ15 to PnP      : Enabled

Assign DMA0 to PnP        : Disabled    Assign DMA4 to PnP       : Enabled
Assign DMA1 to PnP        : Disabled    Assign DMA5 to PnP       : Enabled
Assign DMA2 to PnP        : Disabled    Assign DMA6 to PnP       : Disabled
Assign DMA3 to PnP        : Enabled     Assign DMA7 to PnP       : Enabled

          ↑/↓/→/←/<CR>/<Tab> to select  or  <PgUp>/<PgDn>/+/- to modify
                          <Esc> to return to main menu
```

All items allow to choose between the two options – “Enabled” or “Disabled”. Use arrow keys, <Tab> key and <Enter> to move between items and for selection. <PgUp>, <PgDn>, <+> or <-> are used to change the selected parameter, <Esc> – to return to the Main Menu.

5.7 Shadow Configuration

The figure below presents the Shadow Configuration menu screen.

Figure 5.6: Shadow Configuration Menu Screen Image



The «Shadowing» parameter can be either «Chipset» or «None». All other items allow to choose between the two options – “Enabled” or “Disabled”. Use arrow keys, <Tab> key and <Enter> to move between items and for selection. <PgUp>, <PgDn>, <+> or <-> are used to change the selected parameter, <Esc> – to return to the Main Menu.

If "Enabled" is selected, Shadow Configuration menu items allow to copy extension modules' BIOS into operating memory by 16 KB blocks on initialization of the processor module.

5.8 The Rest Main Menu Commands

5.8.1 Start RS232 Manufacturing Link

Manufacturing Link mode allows to mofify the flash-based BIOS of the CPC108 module (with *fwflash.exe* utility) or to exchange files between the module and a remote PC via RS232 link. To exchange files the driver *remdisk.sys* should be loaded into PC memory, it is described in section 6.4 of this document; *fwflash.exe* utility operation is described in section 6.3. The COM port number for operations in Manufacturing Link mode is set by «Console/MFG link» parameter in «Custom Configuration» (see section 5.5 of this Manual).

5.8.2 Reset CMOS to Last Known Values

If you changed your mind and decided not to write the changes you have made in BIOS Setup program and have not yet saved the values in CMOS memory, you may select this command to return to the last saved parameters (i.e. to those with which the system was successfully booted last time) and continue with BIOS Setup.

On selection of this command the following message appears:

```
Reset CMOS to last known values? (Y/N):
```

Pressing “Y” resets the parameters in CMOS memory and returns you to the Main menu,
“N” – returns you to the Main menu without making any changes.

5.8.3 Reset CMOS to Factory Defaults

To reset the BIOS parameters to the values defined by the manufacturer, select this Main menu command. The program responds with this message:

```
Reset CMOS to factory defaults? (Y/N):
```

Pressing “Y” resets the values stored in CMOS to the factory defaults and returns you to the Main menu, “N” returns you to the Main menu without changing anything.

5.8.4 Write to CMOS and Exit

After making your changes on the BIOS Setup menus, always select "Write to CMOS and Exit" to store the selections displayed in the menus in CMOS (short for "battery-backed CMOS RAM") a special section of nonvolatile memory that stays on after you power down your system. The next time you boot your computer, the BIOS configures your system according to the Setup parameters stored in CMOS memory.

On selection of this Main menu command, the program displays this message:

```
Save changes and exit? (Y/N):
```

If you choose “Y”, the program saves the BIOS Setup parameters to CMOS, exits BIOS Setup and reboots the system. “N” returns you to the Main menu without making any changes.

During boot up, General Software® BIOS attempts to load and use the values stored in CMOS. If system does not boot with those values, reboot and press <Del> to enter BIOS Setup. In Setup, you can try to change the parameters that caused the boot failure or get the Factory Default Values.

5.8.5 Exit without Changing CMOS

Use this option to exit Setup without storing in CMOS any changes you may have made. The previous parameters remain in effect.

The program displays this message:

```
Exit without changing CMOS? (Y/N):
```

“Y” confirms exiting without saving any changes, closes Setup and reboots the system,
“N” – returns you to the Main menu without making any changes.

5.9 Extended BIOS Functions

5.9.1 ADM706 Supervisor Chip-Based Watchdog Timer Control

After completion of POST (Power On Self Test) ADM706 Supervisor chip-based watchdog timer is disabled. User can control this WDT in one of the two ways:

- Using INT 17H BIOS extension;
- Using 20Ch input/output register.

Attention!

For correct programming of the SuperIO W83627HG based watchdog timer, please, refer to the SuperIO datasheet (*W83627.pdf*) on the CD supplied with the module.

5.9.1.1 Using INT 17H BIOS Extension to Control the Watchdog Timer

	Input/Output	Assembler Code

WDT enable	Input: AH DFh
	AL 01h
	DX FFFFh
	Output: No
		mov ax, 0FD01h
		mov dx, 0FFFFh
		int 17h

WDT disable	Input: AH DFh
	AL 03h
	DX FFFFh
	Output: No
		mov ax, 0FD03h
		mov dx, 0FFFFh
		int 17h

WDT strobing	Input: AH DFh
	AL 02h
	DX FFFFh
	Output: No
		mov ax, 0FD02h
		mov dx, 0FFFFh
		int 17h

WDT status request	Input: AH DFh
	AL 04h
	DX FFFFh
	Output: AL 0/1
	"0" – WDT not triggered
	"1" – WDT triggered
		mov ax, 0FD04h
		mov dx, 0FFFFh
		int 17h

5.9.1.2 WDT Control using 20Ch Input/Output Register

To enable WDT, write "1" to 20Ch. C code sample:

```
outportb (0x20C, 1);
```

To disable the WDT, write "0" to 20Ch:

```
outportb (0x20C, 0);
```

To strobe the WDT, read from 20Ch:

```
inportb (0x20C);
```

5.9.2 SMI Control

It is possible to temporarily disable SMI, for example, for manipulations with precise timing diagrams. User can control SMI using INT 17H BIOS extension.

	Input/Output	Assembler Code

SMI disable	Input: AX D000h
	DX FFFFh
	Output: No
		mov ax, 0D000h
		mov dx, 0FFFFh
		int 17h

SMI enable	Input: AX D001h
	DX FFFFh
	Output: No
		mov ax, 0D001h
		mov dx, 0FFFFh
		int 17h

5.9.3 User LEDs Control

USER_LED1 and USER_LED2 user LEDs are switched on and off by writing logical 0 or 1 respectively to bits 0 and 1 of the 20Eh system input-output port (FPGA) accordingly (see Table 3.23). Sample LED control program code fragments are given below.

```
outport(0x20E, (inport(0x20E)|0x01)); //Switch USER_LED1 on
outport(0x20E, (inport(0x20E)^0x01)); //Switch USER_LED1 off
outport(0x20E, (inport(0x20E)|0x02)); //Switch USER_LED2 on
outport(0x20E, (inport(0x20E)^0x02)); //Switch USER_LED2 off
```

5.9.4 RS 422/485 Transmitters Control (Ports COM3, COM4)

Ports COM3 and COM4 RS 422/485 transmitters are controlled via GPIO5 and GPIO6 channels of CS5536 companion. To switch RS 422/485 transmitters on and off it is necessary to set these channels to logical “1” or “0” respectively.

Please, find the GPIO control functions program code fragments below.

```
//Function: void gpio_low_out_en(BYTE gpio_num)
//Purpose: Sets the given GPIO to output mode
//Parameters: gpio_num – GPIO number
//---------------------------------------------------------------------
void gpio_low_out_en(BYTE gpio_num)
{
  DWORD val;
  val = inpd(gpio_ba+4);
  val|=(((DWORD)1)<<gpio_num);
  val&=(~(((DWORD)1)<<(gpio_num+16)));
  outpd(gpio_ba+4,val);
}

//Function: void gpio_low_set_value(BYTE gpio_num,BOOL value)
//Purpose: Switches GPIO with specified number on/off
//Parameters:  gpio_num - GPIO number
//---------------------------------------------------------------------
void gpio_low_set_value(BYTE gpio_num,BOOL value)
{
  DWORD val;
  val = inpd(gpio_ba);
```

```
    if(value)
    {
      val|=(((DWORD)1)<<gpio_num);
      val&=(~(((DWORD)1)<<(gpio_num+16)));
    }
    else
    {
      val&=(~(((DWORD)1)<<gpio_num));
      val|=(((DWORD)1)<<(gpio_num+16));
    }
    outpd(gpio_ba,val);
  }
```

For the above program code samples, the parameter `gpio_ba` should be described this way:

```
UINT gpio_ba=0xF000;
```

Attention!

When developing applications using COM3 and COM4 ports, remember, that these ports use 03E8h and 02E8h addresses respectively and IRQ15 interrupt.

6 Basic Software

6.1 Supplied Software

The module is supplied ready for operation with the pre-installed FDOS 6.22 operating system compatible with MS DOS 6.22. FDOS and some service utilities (FWFLASH) are located at the on-board flash-disk.

FAT16 file system is supported by BIOS, so MS DOS or FDOS operating systems can be run with no additional software. To use the module with other operating systems, the appropriate drivers should be installed. The compact disk supplied with the module contains necessary service software utilities (such as CMOS_RST, FWFLASH) and drivers (remdisk.sys and others) including the drivers necessary to run the supported operating systems.

6.2 Reset CMOS to Factory Defaults from a Remote PC

If current BIOS parameters do not provide normal operation of the module, and the BIOS Setup program can not be started to change incorrect settings, use CMOS_RST (*cmos_rst.com*) software utility, which allows to reset the BIOS setup parameters stored in CMOS memory to factory defaults from a remote PC. To do so, follow the procedure below.

1. Connect COM1 port (J10) of the switched off CPC108 to a PC COM port with a null-modem cable and ACS00023 (685611.082) adapter cable;
2. Start *cmos_rst.com* on a remote PC using MS DOS with the parameter:

   `CMOS_RST.COM COM2`

   where COM2 is a name of a PC COM port, to which the module is connected. The following message is displayed on the PC monitor:

```
Remote CMOS Reset  Version 2.1  Copyright (C) 2000, 2005 Fastwel Inc.
sending "reset" sequence through COM2. press a key to abort ;
```

3. Switch on the module power. The PC monitor should display the following message:

   `“Reset acknowledged”`

BIOS Setup parameters are now reset to factory defaults. Now you can start BIOS Setup utility on the module to make necessary settings.

6.3 BIOS Upgrade with FWFLASH Utility

The CPC108 has two Flash BIOS chips with storage capacity of 512 KB each. The main (working) copy of BIOS occupies 512 KB on a chip in PLCC32 panel. Reserve BIOS copy is stored on a soldered chip and is used for emergency boot.

It is possible to upgrade the main copy of BIOS in-system. It is done with the help of ***fwflash.exe*** utility program, which is located on the onboard flash-disk and on the CD supplied with the module. Reserve BIOS can not be upgraded.

This utility can be run both on the module itself, and at a remote PC in console operation mode. For example, to run this utility on the module, enter the following :

```
fwflash.exe biosXXX.bin
```

where `biosXXX.bin` – BIOS image binary file name.

BIOS can be upgraded via RS232 (COM1, COM2) serial port in console operation mode. To do so, connect COM ports of the module and of a remote PC with null-modem cable and ACS00023 (685611.082) adapter cable, enable the RS232 Manufacturing Link mode in BIOS Setup, and run fwflash.exe utility at a remote PC with the following parameters:

```
fwflash.exe biosXXX.bin 1
```

where `biosXXX.bin` – BIOS image binary file name

`1` – PC COM port number (COM1)

The message "`Mission complete`" indicates that the process is successfully finished.

Note!

fwflash.exe is a software utility operating under MS DOS or FDOS operating systems only.

Important!

If an error message appears during or after the BIOS upgrade, run the FWFLASH utility once again with the module power switched on. Do not switch the power off!

It is possible to abort the FWFLASH operation by pressing <Esc> at PC keyboard only before the first BIOS file segment (64 KB) is transmitted.

Important!

It is not allowed to use BIOS files other than explicitly specified by Fastwel as suitable for this purpose.

6.4 Manufacturing Link Mode

Manufacturing Link mode allows to exchange files between the module and a remote PC via RS232 link. The COM port number for operations in Manufacturing Link mode is set by «Console/MFG link» parameter in «Custom Configuration» (see section 5.5 of this Manual).

To exchange files the driver *remdisk.sys* should be loaded into PC memory. In this case the disk drives of the CPC108 become available at the PC as logical units. The config.sys initialization string for loading *remdisk.sys* into PC memory should look like this:

```
DEVICE= C:\remdisk.sys COMn XXXX
```

where:

COMn – PC COM port number – COM1 (default) , COM2;
XXXX – Data transfer rate – 9600 or 115200 (default) Mbit/s

After initialization of the driver *remdisk.sys* and selection of “Start RS232 Manufacturing Link” command in BIOS Setup, a new logical device “D:” appears at the PC, corresponding to C: drive of the module.

Manufacturing Link mode can also be used for formatting of the CPC108 disks and transferring of MS DOS or FDOS 6.22 operating systems.

To format a CPC108 disk and to transfer MS DOS operating system:

1) Boot a PC with the operating system, which is to be transferred onto a CPC108 disk, and start the Manufacturing link mode at the module;
2) On the PC enter the command

   ```
   FORMAT Z: /S
   ```

   where
   Z: is a CPC108 drive name,
   /s – operating system transfer option.
3) Wait until the message "`System transferred`" appears.

To format a CPC108 disk and to transfer FDOS 6.22 operating system:

1) Establish a connection between CPC108 and a PC in Manufacturing Link mode;
2) If Windows is running on the PC, enter the following command

   ```
   LOCK Z:
   ```

   where `Z:` stands for a CPC108 disk name
3) From FDOS system directory (file attributes “System” and “Hidden” removed) on the PC enter the next command

   ```
   SYS Z: /F:. /C
   ```

   where
   Z: is a CPC108 drive name,
   /F:. – FDOS 6.22 operating system files transfer option;
   /C – *command.com* transfer option
4) Wait until the messages "`System transferred`" and "`COMMAND.COM transferred`" appear.

7 Appendices

7.1 Jumper Settings by Function

Table 7.1: Jumper Settings by Function

Function	Jumper	Short Description
Compact Flash mode	J1: [1-2]	Reserved
	J1: [3-4]	Compact Flash in “Master” mode
	J1: [3-4] (open)	Compact Flash in “Slave” mode
RTC battery connection	J3: [1-2]	The battery is connected
	J3: [3-4]	The battery is disconnected
–	J4	Not used
COM3 Terminator	J6: [1-2]	Enable terminator between TX+ и TX- lines of COM3 port in RS422 mode or between D+ and D- lines of COM3 port in RS485 mode
	J6: [3-4]	Enable terminator between RX+ and RX- lines of COM3 port in RS422 mode
COM4 Terminator	J8: [1-2]	Enable terminator between TX+ and TX- lines of COM4 port in RS422 mode or between D+ and D- lines of COM4 port in RS485 mode
	J8: [3-4]	Enable terminator between RX+ and RX- lines of COM4 port in RS422 mode
Power source management	J18: [1-3], [2-4]	Automatic power sources management enabled, including switching to power saving Sleep mode. Only for operating systems with ACPI support.
	J18: [3-5], [4-6]	In this position the CPU does not control power sources
Service functions	J20: [1-3]	Optoisolated Reset enabled
	J20: [3-5]	Not used
	J20: [2-4]	Reboot on power voltage drop below 4.75 V
	J20: [4-6]	Power Failure flag is set on power voltage drop below 4.75 V
DOC socket chip type selection	J23: [1-2]	DOC socket (U19) is set for 28-pin chip
	J23: [3-4]	DOC socket (U19) is set for 32-pin chip