CPC309

CPC309 Intel Atom D510-based SBC with StackPC expansion connector

User Manual

Rev. 0.1
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The product described in this manual is compliant with all related CE standards.

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0.1	Initial version	CPC1310	December 2013

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TRANSPORTATION, UNPACKING AND STORAGE

Transportation

The device should be transported in original manufacturer's separate packaging (transport packaging), which contains an individual antistatic bag and a cardboard box, in the closed transport (automobile, railway, air transportation in heated and pressurized compartments) in storage conditions 5 defined in the IEC 721-2-1 standard (GOST standard 15150-69) or in storage conditions 3 during sea transportation.

The packaged modules should be transported in accordance with the shipping rules, specified for this particular type of transport.

During handling and transportation operations, the packaged modules should not undergo sharp pounding, falls, shocks and exposure to atmospheric precipitation. The goods should be stored in a carrier vehicle in such a manner which will prevent their moving.

Unpacking

Prior to unpacking, after transportation at subzero temperature of ambient air the module(s) should be kept within 6 hours under storage conditions 1 defined in the IEC 721-2-1 standard (GOST standard 15150-69).

It is prohibited to place the packaged module close to the heat source, prior to unpacking.

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

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.

Storage

Module storage conditions for group 1 are defined in the IEC 721-2-1 standard (GOST standard 15150-69).

MANUFACTURER'S WARRANTY

Warranty Liabilities

The Manufacturer hereby guarantees the product conformity with the requirements of the 4013-025-72782511-09 technical conditions provided that the Consumer complies with the operating, storage, transportation and installation conditions and procedures, specified by the accompanying documents.
The Manufacturer hereby guarantees that the products supplied thereby are free from defects in workmanship and materials, provided operation and maintenance norms were observed during the currently established warranty period. The Manufacturer's obligation under this warranty is to repair or replace free of charge any defective electronic component being a part of a returned product.
Products that broke down through the Manufacturer's fault during the warranty period will be repaired free of charge. Otherwise the Consumer will be invoiced as per the current labor remuneration rates and expendable materials cost

Liability Limitation Right

The Manufacturer shall not be liable for the damage inflicted to the Consumer's property because of the product breakdown in the process of its utilization.

Warranty Period

The warranty period for the products made by Fastwel Group is 24 months since the sale date (unless otherwise provided by the supply contract).
The warranty period for the custom-made products is 36 months since the sale date (unless otherwise provided by the supply contract.

Limitation of warranty liabilities

The above warranty liabilities shall not be applied:
To the products (including software), which were repaired or were amended by the employees, that do not represent the manufacturer. Exceptions are the cases where the customer has made repairs or made amendments to the devices in the strict compliance with instructions, preliminary agreed and approved by the manufacturer in writing;
To the products, broken down due to unacceptable polarity reversal (to the opposite sign) of the power supply, improper operation, transportation, storage, installation, mounting or accident.

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 the Manufacturer, with a description of the failure circumstances and symptoms.
3. Place the product in the consumer packaging (antistatic bag) and cardboard box, in which the product had been supplied. Failure to package in antistatic material will VOID all warranties of the Customer on a unilateral basis.
4. The customer pays for shipping the product to Fastwel or to an official Fastwel representative or dealer

1. Introduction

1.1. Purpose

This User Manual (hereinafter referred to as the “Manual”) contains essential information on the device and its operation principle, which is required for commissioning, intended use and maintenance of CPC309 CPU Module (hereinafter referred to as the “Module”).

Note: This document represents the current version of 0.1 version of the Manual[1]).

The Module is a single-board computer of StackPC-PCI format and is designed for embedded applications requiring high performance and low power consumption.
The Module contains Compact Flash connector, 2x Ethernet channels, 8x USB ports, 2x Serial ATA ports, 2 x serial ports, 1x NAND Flash drive.

Module’s functionalities can be extended by connecting additional modules in StackPC, StackPC-PCI, PCI-104, PCIe/104, PCI/104-Express formats.
The module is supplied with pre-installed operating system (hereinafter referred to as the “OS”) FreeDOS[2]) and is compatible with the following OS: QNX 6.5, Windows XP (embedded), Linux 2.6.

The Manual contains instructions on proper and safe installation, start-up and configuration of the module, connection and interaction with extension modules or external devices.
The Manual also provides solutions to problems related to start-up, debugging and use of basic and utility software (hereinafter referred to as the Software).

For safe and correct use of the Module within the specified service life, it is required to previously read and understand this Manual.

Warning: Non-compliance with the safety requirements, application notes and operation guidelines, is prohibited![3])

Attention: Module contains components are sensitive to electrostatic discharge! 4)

Forbidden: Persons lacking adequate qualification and the required level of proficiency training CAN NOT operate, maintain and repair the modules! 5

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1) This graphics symbol (sign) will be used together with an explanatory word “Note” and text.
2) If the preinstalled operating system option is not ordered, please see Table 1-1 below.
3) The graphics symbol (safety sign according to the ISO 3864:1984) is used along with the warning word “WARNING” and warning text (according to the GOST 2.601-2006).
4) The graphics symbol (safety sign according to the ISO 3461-88, ISO 3864-84) will be used here along with the WARNING word and warning text (according to the GOST 2.601-2006).
5) The graphics symbol (safety sign according to the ISO 3461-88, ISO 3864-84) will be used here along with the WARNING word and warning text (according to the GOST 2.601-2006).

1.2 Versions, delivery checklist, ordering information

1.2.1 Versions, ordering information

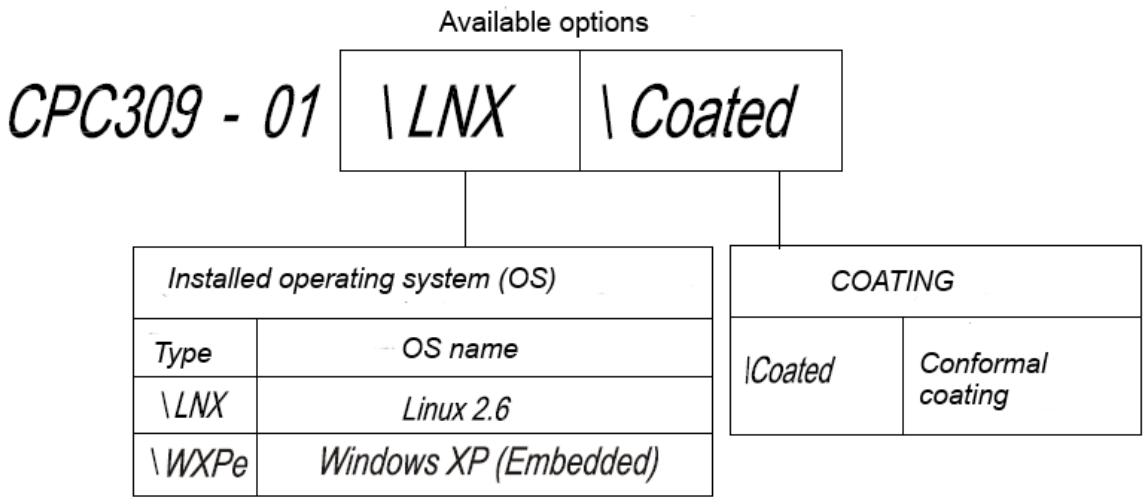
Module's versions and their part numbers (ordering information) are given in the table below:

Table. 1-1: Ordering information

Name	Условное обозначение	Ordering name	Note
CPC309 CPU Module	CPC309	CPC309-01	Intel Atom D510/2GB DDR2 RAM/ 4GB NAND Flash/ Compact Flash/ 2xSATA/ Digital IO/ 2x Ethernet/ 8x USB 2.0/ 2x RS232/ 2x TTL UART/ VGA/ LVDS.
		CPC309-xx\ LNX1)	Module's option with preinstalled Linux 2.6.
		CPC309-xx\ WXPe	Module's option with preinstalled Windows XP Embedded.
		CPC309-xx\ yy\ Coated2)	Module's option with conformal coating

1) Where xx – use of the module (01).
2) Where yy –OS (LNX, XPE) optionally preinstalled.

Fig. 1-1: Template for ordering of CPC309 CPU Module



1.2.2 Delivery checklist

Delivery checklist for all module versions is specified in the table below::

Table 1-2: Delivery checklist

Ordering name	Description
CPC309-01	CPC309 CPU Module
ACS00023-04	Adaptor cable (DB9M – IDC10) for the XP3, XP6 (COM1, COM2) connectors.
ACS00027-02	Adaptor cable (DB15F – IDC10) for connection of the VGA display to XP1 connector.
ACS00043	Adaptor cable for connection of the PS/2 keyboard and mouse to XP15 connector.
ACS00059	Power supply outlet with contacts, for XP25 power supply connector.
-	Jumper 2mm for XP9 and XP26 connectors (2 pcs).
-	-
-	Package

1.2.3 Additional accessories

Additional accessories for connection to the module are specified in the table below.

Table 1-3: Additional accessories

Ordering name	Description
ACS00031-01	ACS00031-01 Installation kit. The kit includes JST PHR-5 outlet and a set of SPH-002T-P0.5S contacts for the XP19 (Audio) connector of the module.
ACS00031-02	ACS00031-02 Installation kit. The kit includes JST PHR-6 outlet and a set of SPH-002T-P0.5S contacts for XP15 (KB/Mouse) connector of the module.
ACS00031-03	ACS00031-03 Installation kit. The kit includes JST PHR-2 outlet and a set of SPH-002T-P0.5S contacts for XP20 (Mic In) connector of the module.
ACS00037	ACS00037 Installation kit. The kit includes Hirose DF13-20DS-1.25C outlet and a set of DF13-2630SCF contacts for the XP8 (LVDS) connector of the module.
ACS00051	IDC2-10 cable – 2 x USBA for XP5 (USB) connector.
ACS00035-01	A set of heat-sink and mounting screws.

NOTE: ADDITIONAL ACCESSORIES FOR MODULE ARE NOT INCLUDED IN THE DELIVERY CHECKLIST AND COME AS AN OPTION.

2 TECHNICAL SPECIFICATION

2.1 Functional Structure of the Module

The module includes the following basic functional elements:
▪ Intel Atom D510 CPU:
– Two 32-x/64-x bit x86 core,
– SSE2, SSE3, SSSE3 support,
– Hyperthreading support,
– 64-bit memory bus,
– Level I cache - 32 Kbytes programs area, 24 Kbytes data area),
– Level II cache - 1 MB;
– Intel SpeedStep technology support (for N450);
▪ DDR2 SDRAM 667 MHz random access memory (soldered) - 2 GB;
▪ Flash BIOS:
– 16 Mbit,
– In-system modification possible;
▪ Two SATA storage interfaces: routed to Stack PC connector;
▪ NAND Flash storage (soldered and connected to the SATA interface) - 4 GB;
▪ CompactFlash connector:
– Type I / Type II devices support,
– UDMA mode support;
▪ Video controller:
– 2D/3D accelerator,
– video memory size (allocated from system memory) maximum 256 MB,
– Connectivity for LCD panels (LVDS 18-bit) with resolution not exceeding 1366 x 768 (60 Hz) and VGA interface monitors with resolution not exceeding 2048 x 1536 (60 Hz),
▪ Two 10/100/1000 Mb Ethernet controllers;
▪ USB ports:
– Up to eight devices,
– USB 1.1 and USB 2.0 specifications support
– Support of OS loading from USB media;
▪ Serial ports:
– COM1, COM2: RS 232, 9-wire (full) console input/output enabled, maximum data exchange rate of 115.2 Kbit/s,
▪ HD Audio controller;
– Linear stereo input/output,
– Microphone input;
▪ PS/2 keyboard and mouse port;
▪ Digital input/output port:
– 8 separately programmable input/output lines;
▪ Real time clock (RTC);
▪ CMOS+Serial FRAM (for system configuration storage);
▪ Two watchdog timers (WDTs):
– WDT1 - with a fixed timeout period - 1.6 s,
– WDT2 - with a programmable timeout period - from 1 to 255 minutes;
The module is software compatible with the following OS: FreeDOS, QNX 6.5, Windows XP (embedded), Linux 2.6.

2.2 Module Power Supply

Electric power supply of the module must meet the requirements cited in the table below. The module may be powered via the both power connector (XP25) and PC/104 bus connector. The module's maximum current consumption value is 2.9 A without considering the connected external devices.

Table 2-1: Required Power Source Parameters

Output voltage, V	Rated load current, A	Output buildup time to the +4.75 V level, ms
From +4.75 to +5.25	6	No more than 10

2.3 Operating Conditions

The module should be used under the following operating conditions:

– Operating temperature range – from -40 to + 85 °C1),
– The modules are resistant to ambient temperature changes within the specified temperature range, at the relative humidity up to 85%, without moisture condensation.

FORBIDDEN: TO USE THE MODULE AT AMBIENT TEMPERATURES EXCEEDING 70°C WITHOUT ACS00035-01 ACCESSORY OR ANOTHER HEAT REMOVAL DEVICE (SHOULD BE MADE IN ACCORDANCE WITH THE SECTION A) ATTACHED TO THE HEAT-SPREADING PLATA (ANOTHER RADIATOR, DEVICE ECNLOSURE, ETC.).

1) Value of the upper temperature limit (+ 85°C) is valid when using the module with ACS00035-01 accessory, or when using it as a part of the enclosure device with heat-removal from the heat-removal plate to the device's enclosure.

2.4 Mechanical Characteristics

The module has the following mechanical characteristics:

– Vibration resistance, acceleration amplitude - 5g max.

– Single shock resistance, peak acceleration - 100 g max.

– Multiple shock resistance, peak acceleration - 50 g max.

2.5 Weight and Size Characteristics

The weight and sizes values for various hardware versions of the module are shown in the table below:

Table 2-2: Module Weight and Sizes

Module	Weight, kg, max.	Packaged weight, in kg	Overall dimensions, mm, max.	Overall dimensions, box, mm.
CPC309	0,26 [1])	-	96,5 x 96,0 x 29,0	230x155x45
[1]) Without consideration of the weight of Compact Flash device				

The general sizes and interface dimensions of the module are shown on figures below.

Fig. 2-1: Sizes and interface dimensions of the module (top view)

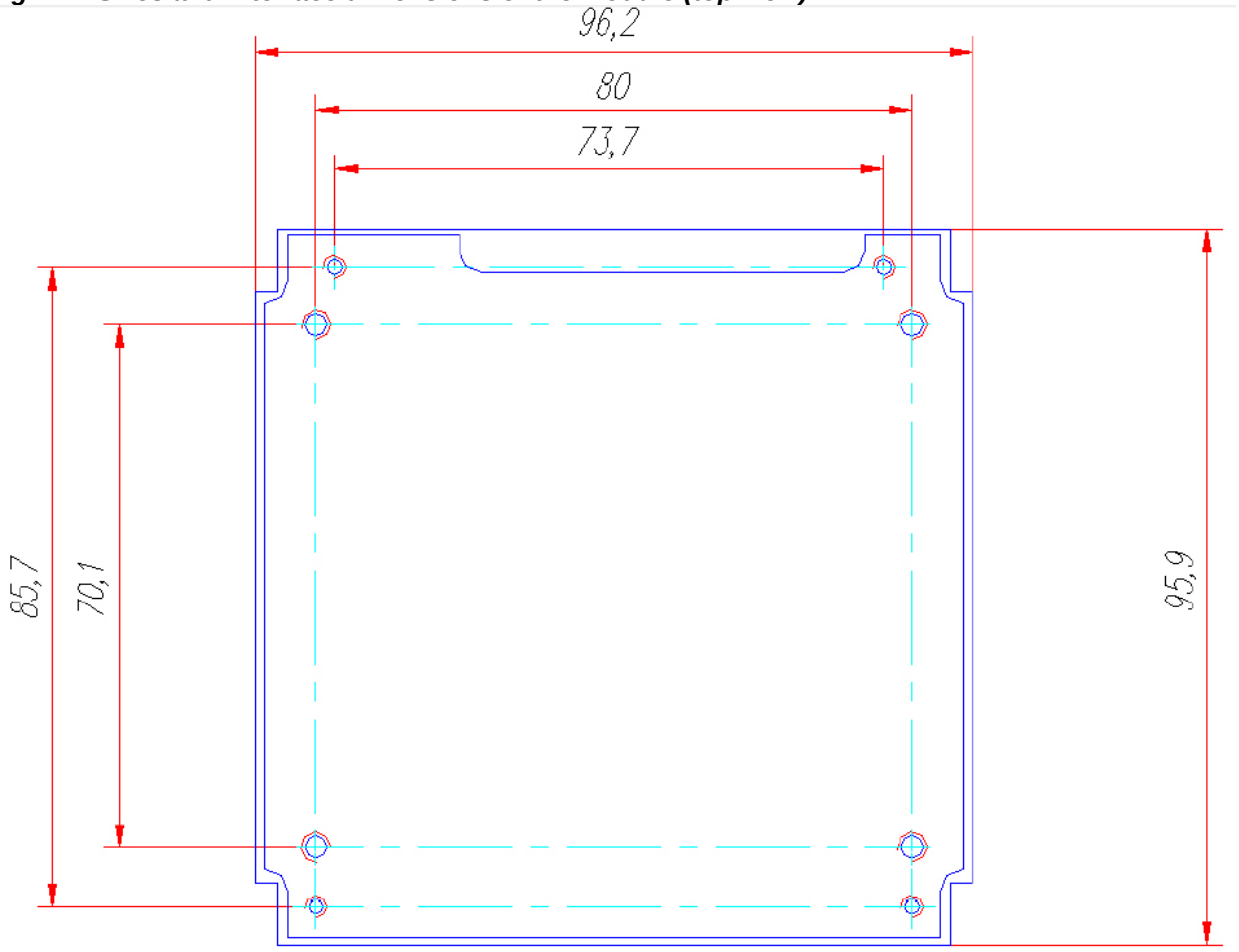
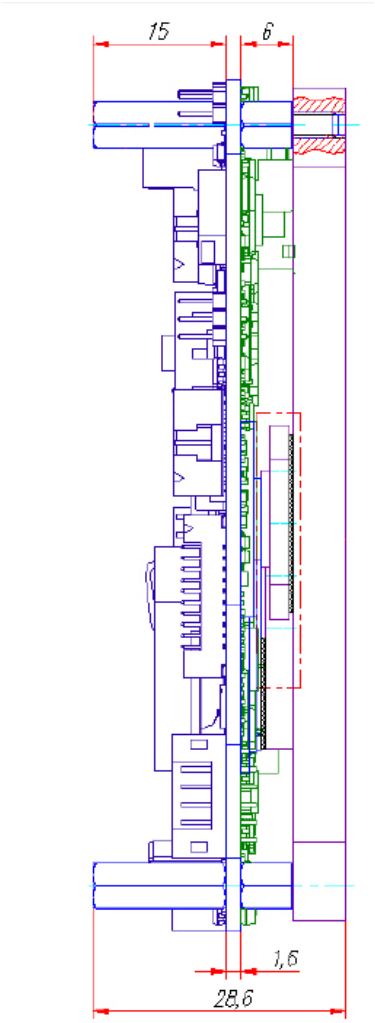


Fig. 2-2: Module overall dimensions (side view)



NOTE:
THE OVERALL DIMENSIONS ARE SHOWN IN VIEW OF THE PARTS PROTRUDING OVER THE STACK PC BOARD.

2.6 Mean Time Between Failures (MTBF)

The MTBF value for the module is 175 000 h.

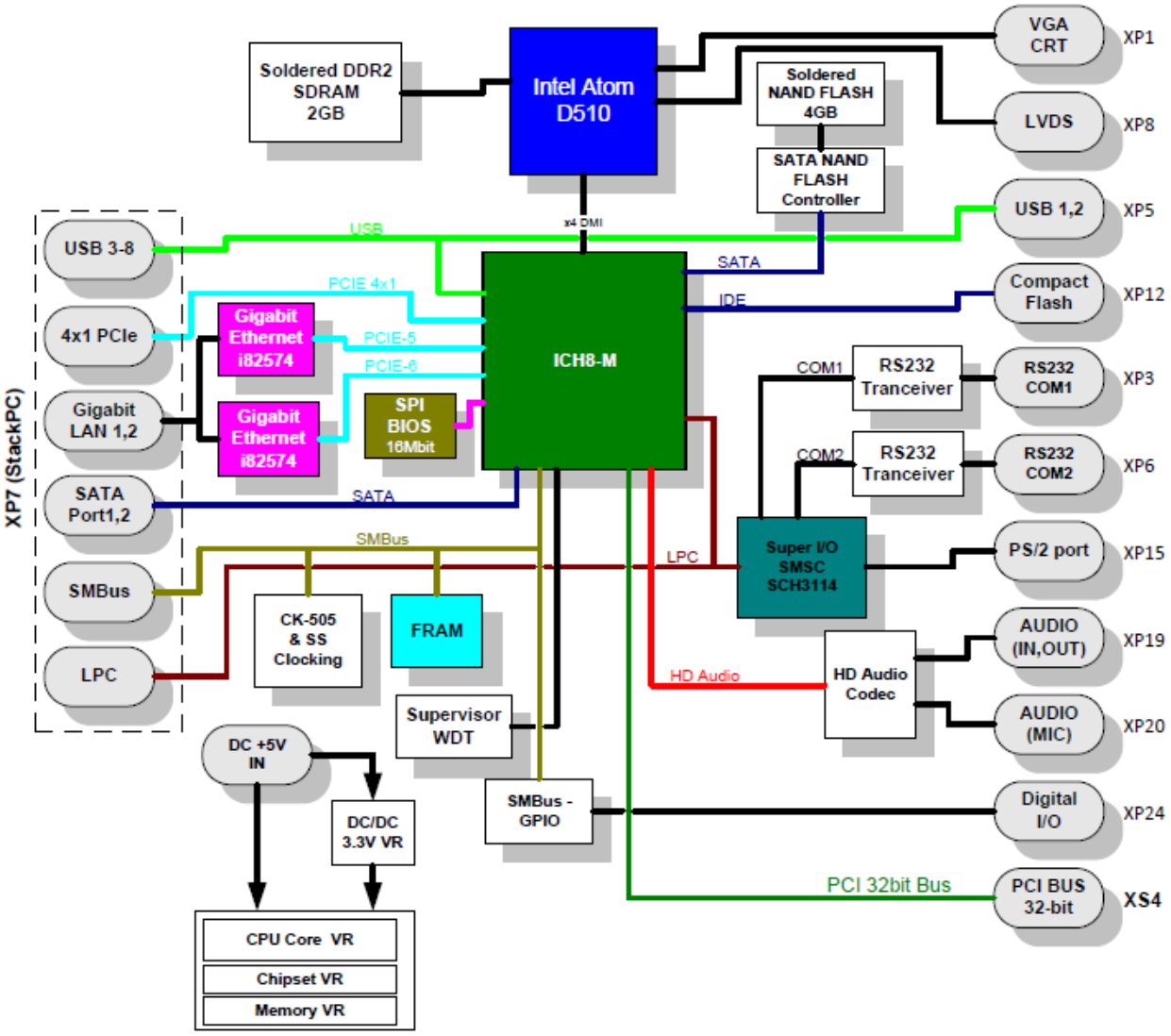
NOTE:
THIS MTBF VALUE HAS BEEN CALCULATED ACCORDING TO THE TELCORDIA ISSUE 1 CALCULATION MODEL, METHOD I CASE 3 CALCULATION PROCEDURE, FOR CONTINUOUS OPERATION ON EARTH UNDER THE CONDITIONS MEETING UKHL4 UNDER GOST 15150-69, AT THE AMBIENT TEMPERATURE OF + 30 °C.

3 MODULE STRUCTURE AND FUNCTIONING

3.1 Block Diagram of the Module

Block diagram of the module is shown below:

Fig. 3-1: Block diagram of the module



Block diagram of the module shows principal functional parts:

- Intel Atom D510 CPU;
-
- DDR2 SDRAM (2GB)
-
- Flash BIOS (16 Mb);

– NAND Flash data storage (4 GB);
– VGA monitor port **(XP1)**;
– LVDS interface connector for TFT panel connecting **(XP8)**;
– 2x SATA channels **(XP7)**;
– Compact Flash connector **(XP12)**;
– Two 10/100/1000 Mb Ethernet channels **(XP7)**;
– 8x USB 2.0 ports **(XP4 and XP5)**;
– COM1 (RS232) **(XP3)**, COM2 (RS 232) **(XP6)** serial ports;
– PS/2 keyboard and mouse port **(XP15)**;
– Digital input/output port **(XP24)**;
– HD sound controller with linear input/output and microphone connectors **(XP19 and XP20)**;
– 32x bit, 33 MHz PCI bus**(XS4)**;
– 4x channels of PCI Express X1 interface **(XS7);**
- Serial FRAM (for system configuration storage);
– 2x watchdog timers (WDTs).
Technical features of the module's principal functional parts are described in the Manual 2.1 subsection.

3.2 Location of Module’s Principal Components

The layout of the principal components, their respective connectors, as well as commutator bars for the component side (TOP) and the conductor side (BOTTOM) is shown on Fig. 3-2 and Fig. 3-3. accordingly.

The default positions of jumpers in the module commutator bars are also shown on Fig. 3-2, and jumpers installation into the module’s commutator bars by functions are shown in Section 5 CPC309 Configuration.

Fig. 3-2: Location of connectors and principal components on the top side

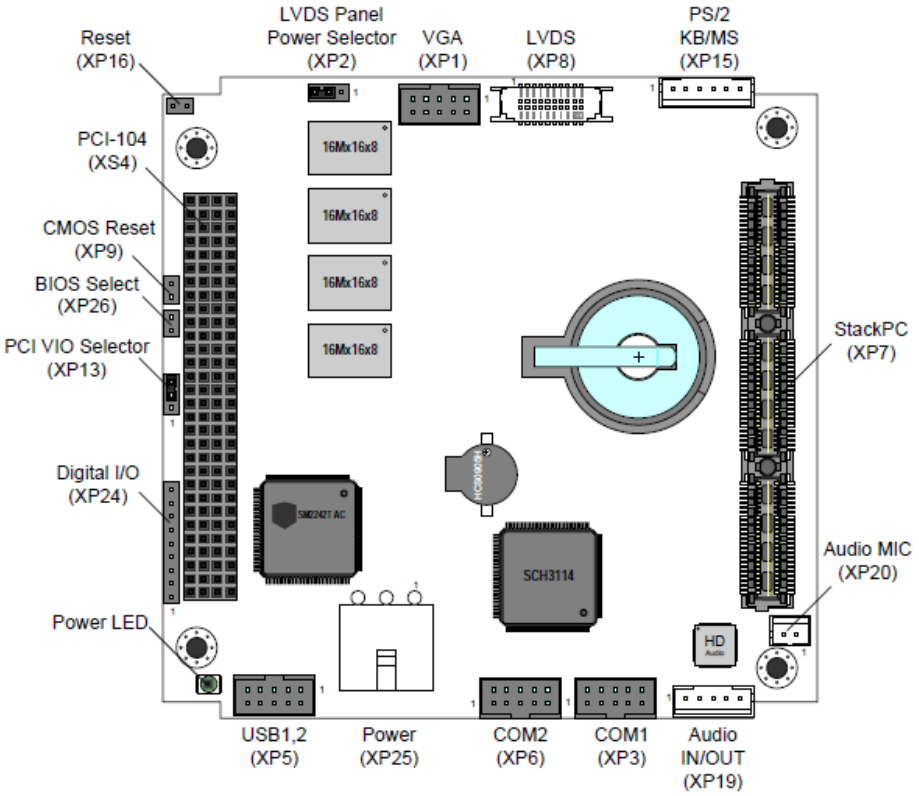
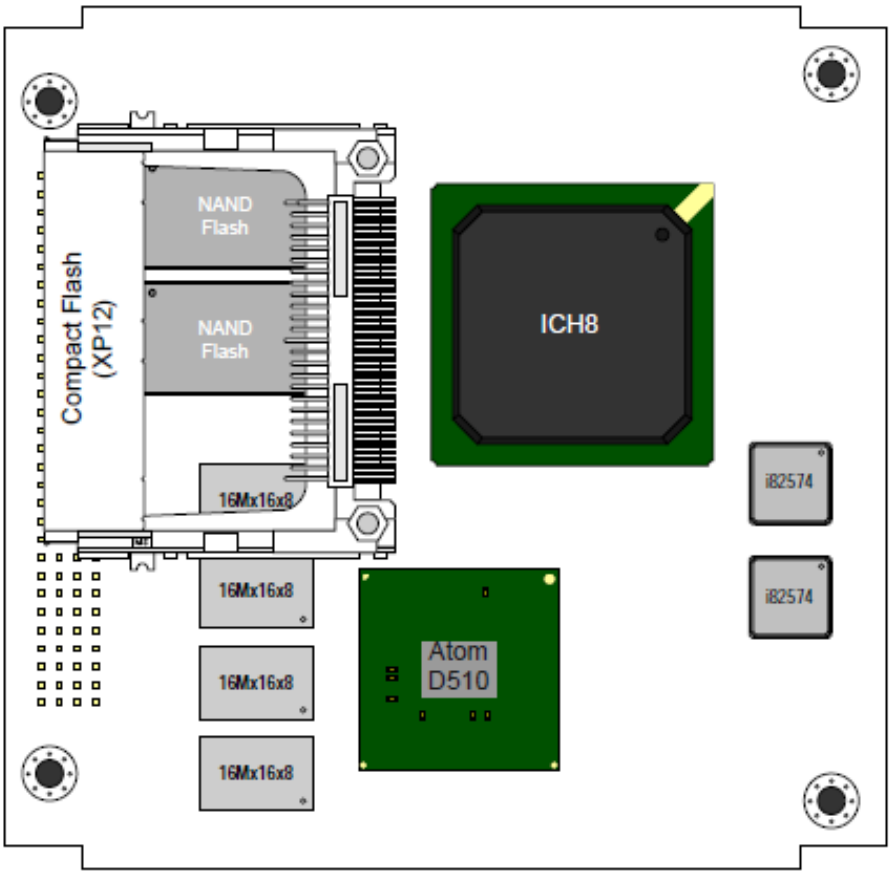


Fig. 3-3: Location of connectors and principal components on the bottom side



3.3 Features of functional parts

- **Intel Atom D510**
32-bit Intel Atom CPU with low power consumption (~10 W). The CPU represents a highly-integrated solution that combines the CPU core itself, as well as SDRAM/DDR2 controller and graphics card with 3D/2D acceleration.

- **ICH-8M**
High-Integrity interface controller, including standard periphery of IBM PC AT platform.

- **MEMORY**
The board is equipped with the soldered 2GB DDR2-667 RAM, not extendable.

- **BIOS**
BIOS uses Flash 16 Mb microchip based on SPI bus.

- **RTC, CMOS**
Real Time Clock integrated into ICH8. When power is off, RTC operation is provided by lithium battery, which is to be installed into the board. BIOS Setup settings are stored in FRAM.

- **FRAM**
Nonvolatile memory 64 Kb, may be used for storing user data and BIOS SETUP settings.

- **NAND Flash**
The board is equipped with the soldered NAND Flash microchips with a total volume of 4 GB. Placement of NAND Flash on SATA bus (SATA Flash Disk Controller is used) enables to increase operation speed and ensure compatibility with various OS. 2-channel NAND Flash operating mode.

- **Compact Flash**
The board makes it possible to use Compact Flash drive (type I / type II), for this purpose, the board has a relevant connector on the reverse side.

- **Ethernet**
2x PCIe Ethernet 10/100/1000 Mb controllers based on Intel i82574 microchip are used, the both channels are routed to the StackPC connector.

- **USB 2.0**
The board has 8x USB 2.0 channels: 2 channels are routed to IDC10 type connector with a pitch of 2 mm contact, 6 – to the StackPC connector.

- **COM1/COM2**
COM1/COM2 – 9- wire interface RS232. Each port is routed to IDC10 type connector with a contact pitch of 2 mm on the board.

- **PS/2 Keyboard & Mouse**
Designed for connection of PS/2 keyboard and mouse to the display, single-row direct 6-contact connector – 2mm pitch.

- **SATA**
Two interfaces for connection of SATA drives: the both channels are routed to the StackPC connector.

- **VGA, LVDS**
The ports are designed for the connection of VGA analog display and/or matrix with LVDS interface. 2-diplays configurations support is provided: clone/extended desktop.

- **Audio**
Support is implemented via Audio Codec HD Audio. The board is equipped with connectors, which have: line input signals, line output signals (5 contact connector with a pitch of 2mm), as well as microphone input (2-contact connector with a pitch of 2 mm).

- **Indication**
The board has a LED indicating module operating mode (module is switched on, StackPC error).
External LEDs can be connected via StackPC connector on the board, according to the specification.
Using StackPC extension module it is possible to connect the following LEDs: drive activities (CF_SATA_ACT), indication of connection and activity of LAN1 and LAN2 ports (LAN1_LINK_ACT, LAN2_LINK_ACT).

- **Watchdog**
The module has two watchdog timers, one (WDT1) is integrated into supervisor's microchip and has a fixed actuating range (1.6 sec), another one – into SIO microchip and has a programmable actuating range (up to 255 min).

- **Power reset and monitoring**
Microprocessor reset signal is generated from the following sources:
- from supervisor, at startup;
- from system reset connector;
- from watchdog timers.

- **Switches (jumpers)**
- The board is equipped with the switches having the following functionalities:
- Switch "LVDS Panel Power Selector" (XP2);
- Switch "PCI VIO Selector" (XP13);
- Switch CMOS Reset (XP9);
- Switch BIOS Select (XP26).

3.4 Interfaces and module connector

3.4.1 StackPC-PCI connectors

The module is equipped with the installed standard connectors in StackPC-PCI format, which enable connection of CPC309 to such devices as analog-to-digital converters, digital I/O modules etc. According to the StackPC specification (for a detailed description, please visit the website at: http://www.stackpc.org/), the module of such a forma includes StackPC and PCI-104 connectors, described below.

3.4.1.1 StackPC interface

Availability of StackPC makes it possible to connect CPC309 with additional extension modules (interfaces: 4x1 PCI-E, 6xUSB, 2xSATA, 2xEthernet, SMBUS, SPI, LPC).
Location of StackPC connector contacts is shown on Fig. 3-4. Purpose of the connector contacts is specified in Table. 3-1.

Fig. 3-4: StackPC connector (XP7)

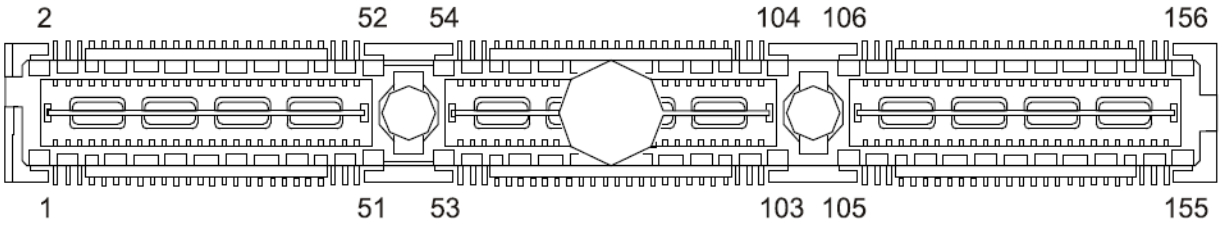


Table. 3-1: Purpose of StackPC connector contacts (XP7)

	Contact number	Signal		Signal	Contact number	
To the board edge	1	USB_OC#		PE_RST#	2	To the board center
	3	3.3V		3.3V	4	
	5	USB_5p		USB_4p	6	
	7	USB_5n		USB_4n	8	
	9	GND		GND	10	
	11	PEx1_1Tp		PEx1_0Tp	12	
	13	PEx1_1Tn		PEx1_0Tn	14	
	15	GND		GND	16	
	17	PEx1_2Tp		PEx1_3Tp	18	
	19	PEx1_2Tn		PEx1_3Tn	20	
	21	GND		GND	22	
	23	PEx1_1Rp		PEx1_0Rp	24	
	25	PEx1_1Rn	+5 V	PEx1_0Rn	26	
	27	GND		GND	28	
	29	PEx1_2Rp		PEx1_3Rp	30	
	31	PEx1_2Rn		PEx1_3Rn	32	
	33	GND		GND	34	
	35	PEx1_1Clkp		PEx1_0Clkp	36	
	37	PEx1_1Clkn		PEx1_0Clkn	38	
	39	5V_Always		5V_Always	40	
	41	PEx1_2Clkp		PEx1_3Clkp	42	
	43	PEx1_2Clkn		PEx1_3Clkn	44	
	45	GND		NC	46	
	47	SMB_DAT		NC	48	
	49	SMB_CLK		NC	50	
	51	SMB_ALERT		NC	52	
	53	STK0/WAKE#		STK1/ SATA_ACT#	54	
	55	Type_DETECT#		GND	56	
	57	ETH_0_MDI(0)p		NC	58	
	59	ETH_0_MDI(0)n		NC	60	
	61	GND		GND	62	
	63	ETH_1_MDI(0)p	+5 V	NC	64	
	65	ETH_1_MDI(0)n		NC	66	
	67	GND		GND	68	
	69	ETH_0_MDI(1)p		NC	70	
	71	ETH_0_MDI(1)n		NC	72	
	73	GND		GND	74	
	75	ETH_1_MDI(1)p		NC	76	

	77	ETH_1_MDI(1)n		NC	78
	79	**ETH_1_LINK_ACT#**		**ETH_0_LINK_ACT#**	80
	81	SATA_T1p		SATA_T0p	82
	83	SATA_T1n		SATA_T0n	84
	85	GND		GND	86
	87	USB2_2p		USB2_3p	88
	89	USB2_2n		USB2_3n	90
	91	GND		GND	92
	93	USB2_1p		USB2_0p	94
	95	USB2_1n		USB2_0n	96
	97	GND		GND	98
	99	ETH_1_CTREF		ETH_0_CTREF	100
	101	NC		NC	102
	103	NC		NC	104
	105	STK2		LPC_CLK	106
	107	NC		GND	108
	109	ETH_0_MDI(2)p		NC	110
	111	ETH_0_MDI(2)n		NC	112
	113	GND		GND	114
	115	ETH_1_MDI(2)p		NC	116
	117	ETH_1_MDI(2)n		NC	118
	119	GND		GND	120
	121	ETH_0_MDI(3)p		NC	122
	123	ETH_0_MDI(3)n		NC	124
	125	GND		GND	126
	127	ETH_1_MDI(3)p		NC	128
	129	ETH_1_MDI(3)n	+12 V	NC	130
	131	PE_PRSNT1#		PE_PRSNT0#	132
	133	SATA_R1p		SATA_R0p	134
	135	SATA_R1n		SATA_R0n	136
	137	GND		GND	138
	139	NC		NC	140
	141	NC		NC	142
	143	GND		GND	144
	145	LPC_AD0		LPC_DRQ#	146
	147	LPC_AD1		LPC_SERIRQ#	148
	149	GND		GND	150
	151	LPC_AD2		LPC_FRAME#	152
	153	LPC_AD3		***RTC_Battery***	154
	155	NC		NC	156

3.4.1.2 PCI-104 interface

PCI-104 interface uses 120-pin (30x4) connector XS4, located on the upper side of the board. It serves for the transfer of all the required signals of 32-bit PCI bus at the frequency of 33 MHz. Support of the four Bus Master devices is implemented.

The PCI-104 connector contacts are located as shown on the Figure below. Purpose of the connector contacts is specified in the Table 3-2: Purpose of PCI-104 (XS4) connector contacts.

Fig. 3-5: Contacts PCI-104 connector (XS4)

Table 3-2: Purpose of PCI-104 connector contacts (XS4)

Contact	Signal	Contact	Signal	Contact	Signal	Contact	Signal
A1	GND	A16	AD21	B1	RESERVED	B16	AD20
A2	VI/O	A17	+3.3V*	B2	AD02	B17	AD23
A3	AD05	A18	IDSEL0	B3	GND	B18	GND
A4	C/BE0#	A19	AD24	B4	AD07	B19	C/BE3#
A5	GND	A20	GND	B5	AD09	B20	AD26
A6	AD11	A21	AD29	B6	VI/O	B21	+5V
A7	AD14	A22	+5V	B7	AD13	B22	AD30
A8	+3.3V*	A23	REQ0#	B8	C/BE1#	B23	GND
A9	SERR#	A24	GND	B9	GND	B24	REQ2#
A10	GND	A25	GNT1#	B10	PERR#	B25	VI/O
A11	STOP#	A26	+5V	B11	+3.3V*	B26	CLK0
A12	+3.3V*	A27	CLK2	B12	TRDY#	B27	+5V
A13	FRAME#	A28	GND	B13	GND	B28	INTD#
A14	GND	A29	+12V	B14	AD16	B29	INTA#
A15	AD18	A30	-12V	B15	+3.3V*	B30	REQ3#
Contact	**Signal**	**Contact**	**Signal**	**Contact**	**Signal**	**Contact**	**Signal**
C1	+5V	C16	GND	D1	AD0	D16	AD19
C2	AD01	C17	AD22	D2	+5V	D17	+3.3V*
C3	AD04	C18	IDSEL1	D3	AD03	D18	IDSEL2
C4	GND	C19	VI/O	D4	AD06	D19	IDSEL3
C5	AD08	C20	AD25	D5	GND	D20	GND
C6	AD10	C21	AD28	D6	M66EN	D21	AD27
C7	GND	C22	GND	D7	AD12	D22	AD31
C8	AD15	C23	REQ1#	D8	+3.3V*	D23	VI/O
C9	RESERVED	C24	+5V	D9	PAR	D24	GNT0#
C10	+3.3V*	C25	GNT2#	D10	RESEVED	D25	GND
C11	/LOCK	C26	GND	D11	GND	D26	CLK1
C12	GND	C27	CLK3	D12	DEVSEL#	D27	GND
C13	IRDY#	C28	+5V	D13	+3.3V*	D28	RST#
C14	+3.3V*	C29	INTB#	D14	C/BE2#	D29	INTC#
C15	AD17	C30	GNT3#	D15	GND	D30	GND

"PCI VIO Selector" (XP13) switch is located on the top side of the board (near the XS4 connector, see Fig. 3-2: Location of the board and main components on the TOP side) and serves for choosing the right power supply voltage of PCI interface buffers of StackPCPCI, PCI-104, PCI\104-Express modules.
The following states of XP13 switch contacts are possible:
- Contacts 1-2 are closed – levels of PCI bus signals: +5 V;
- Contacts 2-3 are closed – levels of PCI bus signals: +3.3 V;
- All the contacts are open – signal levels are chosen on the power supply of PCI-104.

More detailed information on the XP13 switch is given in the subsection 5.1 Selection of the right supply voltage for buffers on PCI bus of the modules. Please turn your attention to the following note:

Note
If you use PCI-104 power supply, VIO voltage should be installed into the power supply module. In such a case, it is required to remove the jumper from VIO (XP13) switch: **all the contacts are open**.
If the power supply PCI-104 is not used, so the jumper on XP13 switch should be set to position 1-2 or 2-3, please see Fig. 5-1: Condition of contacts of the PCI VIO Selector (XP13) switch.

3.4.2 Graphics controller

Microprocessor Intel Atom D510 represents a high integrity solution, combining CPU core itself, as well as SDRAM/DDR2 controller and graphics adapter with 3D/2D acceleration.
This provides the module with a possibility of high-performance processing of 2D/3D graphics. Integrated graphics controller enables to work with a standard analog display, connected via VGA connector and/or with digital TFT panels via LVDS connector. Support of 2-display configuration is provided: clone/extended desktop.

3.4.2.1 VGA CRT interface

In order to connect analog display to CPC309, the top side of the board is equipped with 10-pin XP1 connector of IDC10 type, with a pitch of 2 mm.

Fig. 3-6: VGA CRT (XP1) connector

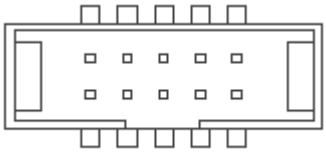


Table 3-3: Purpose of VGA (XP1) connector contacts

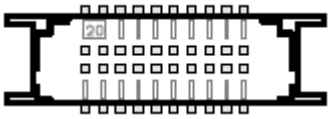
Contact	Signal	Contact	Signal
1	RED	6	GND
2	GND	7	HSYNC
3	GREEN	8	VSYNC
4	GND	9	–
5	BLUE	10	–

The display is connected using ACS00027-02 accessory from the delivery checklist, or using a self-made cable. Using 89947-710 LF (FCI) is recommended.

3.4.2.2 LVDS interface

The top side of the board is equipped with a 20-contact LVDS interface connector for the connection of digital TFT-panels for the wire crimp with a contact pitch of 1.25 mm.
Support of Single LVDS mode is provided, up to 18 bit/pix, frequency range 25-112 MHz.

Fig. 3-7: LVDS connector (XP8)



20-pin LVDS connector for digital TFT panel.

Table 3-4: Purpose of LVDS (XP8) connector contacts

Contact	Signal	Contact	Signal
1	+3.3V	11	TxOUT2+
2	+3.3V	12	TxOUT2-
3	TxOUT0+	13	GND
4	TxOUT0-	14	GND
5	GND	15	DDC_CLK
6	GND	16	DDC_DATA
7	TxOUT1+	17	GND
8	TxOUT1-	18	GND
9	GND	19	TxCLK+
10	GND	20	TxCLK-

During cable manufacturing it is recommended to use connector of DF13-20DS-1.25C (Hirose) type with DF13-2630SCF (Hirose) contacts, or ACS00037 accessory (see Table 1-3).

3.4.2.2.1. Switching supply voltage for digital TFT panel

Standard 3-pin XP2 switch designed for the selection of voltage for supply of the digital panel (see Fig. 3-2: Location of connectors and main components on the TOP side).

More detailed information on TFT panel supply voltage is given in subsection 5.2 Selection of TFT panel power supply.
If contacts 1-2 are closed – voltage of +3.3 V is carried to the digital panel.
If contacts 2-3 are closed – voltage of +5 V is carried.

Attention!
Pay close attention when you set power supply of the TFT panel! Improperly set supply voltage may cause the panel to break down. In order to clarify the exact power supply voltage of the TFT panel, please refer to the information provided by the panel manufacturer, or to the dealer which sold this panel.

3.4.3 Audio interface

The module is equipped with two Audio-connectors designed for wire crimp (support is implemented using Audio Codec HD Audio):
- with line input and line output signals (5-pin connector with a pitch of 2 mm XP19);
- with microphone input signals (2-pin connector with a pitch of 2 mm XP20);

Fig. 3-8: XP19 Audio connector

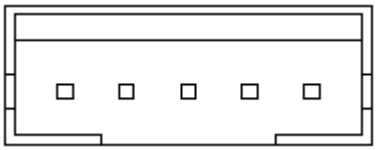
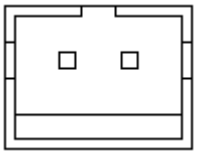


Fig. 3-9: XP 20 Audio connector



The below table demonstrates purposes of Audio connector contacts.

Table 3-5: Purpose of Audio connector contacts

Contact	Signal	Contact	Signal
	XP19 connector		XP20 connector
1	LIN_IN_L	1	MIC_IN
2	LIN_IN_R		
3	GND	2	GND
4	LIN_OUT_R		
5	LIN_OUT_L		

When manufacturing cable adapters for connection to XP19 and XP20 it is recommended to use the sockets of PHR-5 (JST) / PHR-2 (JST) type, accordingly designed for wire crimp with SPH-002T-P0.5S (JST) contacts, or ACS00031-01 and ACS00031-03 accessories (see Table 1-3).

3.4.4 Serial interfaces

The module has two serial ports: COM1 – COM2.

3.4.4.1 COM1 and COM2 ports

COM1 and COM2 ports are operating in the full (9-wire) RS 232 interface mode and have basic addresses (see Table 3-16) and interrupts (see Table 3-17) standard for PC/AT. COM1 port can be used for console input/output. For the connection with a remote console (PC in the terminal simulation mode with parameters of data exchange for COM port: 115200 bps, 8, N, 1) it is necessary to use connection via the null-modem cable[1)] and ACS00023-04 cable from the module delivery checklist to the connector of COM1 (XP3) port of the module. See subsection 1.2.2 Delivery checklist.

Attention!

When “Hyperteminal” program is used as a terminal, for proper presentation it is required to remove tick from the setting “Wrap lines that exceeded terminal width” in the ASCII program parameters settings.

Rate of exchange for COM1 and COM2 ports do not exceed – 115,2 Kb/s. Ports are software compatible with UART 16550 version.

COM1 and COM2 ports are routed to XP3 and XP6 connectors of IDC10 type, accordingly (with a pith of 2 mm). Information on the purpose of XP3, XP6 connector contacts for the connection to COM1, COM2 ports is given in Table 3-6.

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1) Standard cable is not included into the delivery checklist and additional accessories of the module, to be purchased separately.

Fig. 3-10: COM1/COM2 (XP3 u XP6) connectors

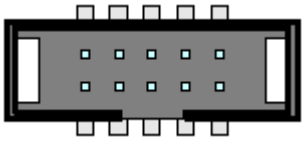


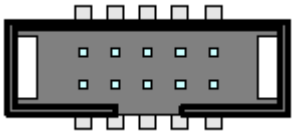
Table. 3-6: Purpose of COM1/COM2 (XP3 u XP6) contacts

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

3.4.5 USB Interfaces

The module has 8x USB 2.0 channels. 6x channels are routed the StackPC connector (see Table 3-1).
The rest 2 channels are routed to the IDC10 (XP5) type connector with a pin pitch of 2 mm. All the channels support USB 1.1 and USB 2.0 specifications, as well as support loading of OS from the USB drive.

Fig. 3-11: USB1-USB2 (XP5) connector



The table below contains information on the purposes of USB connector contacts.

Table 3-7: Purpose of USB1-USB2 (XP5) connector contacts

Contact	Signal	Contact	\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	–

When making of the interface cable for the connection to XP5 (IDC10) it is recommended to use ACS00051 accessory from the additional accessories (see Table 1-3).

3.4.6 Gigabit Ethernet interface

Two 10/100/1000 Mbit PCIe Ethernet controllers built on Intel i82574 microchip are used in the CPC309 module. Both channels are routed to the StackPC connector.
Interfaces ensure automatic detection of transmission speed and swapping between 10Base-T, 100Base-TX and 1000Base-T data transmission modes. Each of the two Ethernet channels may be independently disabled with the help of the BIOS Setup program or user software in order to release system resources.

3.4.7 SerialATA Interface

The module is equipped with two SATA interface channels with support of the data transmission rate up to 300 MB/s, the both channels are routed to Stack PC connector (see Table 3-1).

Attention!
Connection and disconnection of standard SATA drives with the module powered on, could lead to module or power supply breakdown. Connection and disconnection of standard SATA drives is available only on the module powered on!

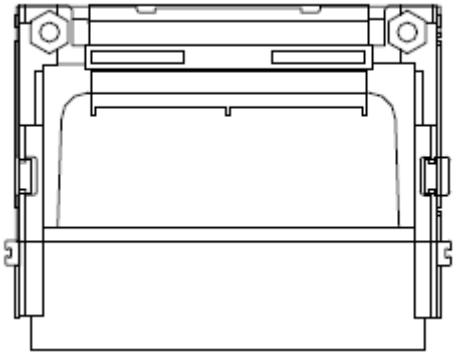
3.4.8 CompactFlash Connector

A flash memory card is a compact removable data storage device. To enable memory cards use as disc storage devices, a 50-pin CompactFlash (XP12) connector is installed on the bottom side of the CPC309 board:

– type I / type II devices support,

– UDMA mode support.

Fig. 3-12: CompactFlash XP12 connector



Attention!
When the module is used in a harsh environment, it is necessary to take additional measures related to fixing the device in the Compact Flash connector!
Purpose of CompactFlash connector contacts is specified in the table below.

Table 3-8: Purpose of CompactFlash (XP12) connector contacts

Contact number	Signal	Function	Input/Output
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	–	–
9	GND	–	–
10	GND	–	–
11	GND	–	–
12	GND	–	–
13	3.3 V	3.3 V power	–
14	A06	–	–
15	A05	–	–
16	A04	–	–
17	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	IOCS16	–	–
25	CD2	–	–
26	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	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	Master/Slave	Out
40	VS2	–	–
41	Reset	Reset	Out
42	IORDY	I/O ready	In
43	INPACK	DMA Request	Out
44	REG	DMA Acknowledge	–
45	ACTIVE	IDE Activity	–
46	PDIAG	DMA Mode Detect	–
47	D08	Data 08	In/Out
48	D09	Data 09	In/Out
49	D10	Data 10	In/Out
50	GND	–	–

3.4.9 PS/2 keyboard/mouse interface

In the module, PS/2 keyboard port and PS/2 mouse port are combined on a single connector and ensure opportunity of connection of input devices: PS/2 keyboard and PS/2 mouse. In terms of design, PS/2 keyboard and mouse represents a 6-outputs single-row connector with a pitch of 2 mm for the wire crimp (XP15). In order to connect PS/2 keyboard to the module it is recommended to use ACS00043 adapter cable (from the delivery checklist), in case if PS/2 mouse connection also required, it is recommended to use ACS00043 accessory jointly with Y-cable (to be purchased separately).
Where the cable is self-made, it is advised to use PHR-6 (JST) type socket for the wire crimp with SPH-002T-P0.5S (JST) contacts, or ACS00031-02 accessory (see Table 1-3).

Fig. 3-13: PS/2 (XP15) connector

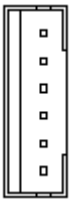


Table 3-9: Purpose of PS/2 (XP15) connector contacts

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

Note

Power supply source of the keyboard/mouse is protected with 500 mA. All signal lines have electromagnetic filtration.

3.4.10 Power supply connector

Electric supply of the module should correspond to the requirements specified in the Table 2-1. Power supply can be fed to the module both via (XP25) power supply connector, and via PCI-104 connector. Maximum value of module current consumption is 2,9 A, without consideration of the connected external devices.
Before operation, you should carefully read subsection 2.2 Module power supply.
For the connection of power supply via XP25 you need to use ACS00059 power supply socket with contacts (included into the delivery checklist, see Table 1-2).

Fig. 3-14: XP25 power supply connector

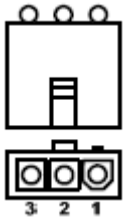


Table 3-10: Purpose of XP25 connector contacts

Contact	Signal
1	+5V
2	GND
3	GND

3.4.11 Digital I/O port

The digital I/O port has 8 separately programmed I/O lines. In the I/O mode, each line represents a “Push-pull” type output with the following parameters:

Table 3-11: Parameters of the line of digital I/O port in the output mode

Name	Description	Minimum value	Nominal value	Maximum value
I_{OL}	Low level output current	8 мА	14 мА	-
V_{OH}	High level output voltage	2,6В	3,3 В	-

In the input mode such a line has the following features:

Table 3-12: Parameters of the line of digital I/O port in the input mode

Name	Description	Minimum value	Nominal value	Maximum value
V_{IL}	Low level input voltage	- 0,5 V	-	+0,8 V
V_{IH}	High level input voltage	2 V	-	5,5 V
C_i	Input capacitance	-	5 pkF	10 pkF

Description of programming digital I/O port is given in the subsection 6.3.
Digital I/O port is routed to the single-row XP24 connector with a contact pitch of 2 mm on the top side of the board.

Fig. 3-15: Connector of XP24 digital I/O port

The first contact of XP24 connector is specified on Fig. 3-2: Location of connectors and main components on the TOP side. Description of contacts of digital I/O port connector is given in the table below.

Table 3-13: Purpose of XP24 digital I/O port connector contacts

Contact	Signal
1	DISCIO_0
2	DISCIO_1
3	DISCIO_2
4	DISCIO_3
5	DISCIO_4
6	DISCIO_5
7	DISCIO_6
8	DISCIO_7
9	GND

When manufacturing the cable, it is recommended to use 29305-008LF (FCI) socket for wire crimp with contacts 77138-01LF (FCI).

3.4.12 System reset connector

2-pin “Reset” (XP16) connector is designed for the connection of a button without being fixed in the depressed condition. Pressing on the button causes module system reset and restart of the system.

Fig.3-16: Reset XP16 connector

3.5 LEDs

CPC309 is equipped with one 2-color LED for indication of HL1 module operation mode (see Fig. 3-2). Their functional purposes of the LED is specified in the table below.

Table 3-14: Purpose of LED indicators

Name	Purpose	Function
HL1	Indicates module’s operating mode	Green– Normal operating module of the module (module is switched on) Red – StackPC error

Connection of external LEDs for indicating activity of the drives (Compact Flash, Nand Flash, SATA) as well as indication of network interfaces activity is provided. Connection is available via StackPC, signals: SATA_ACT#, ETH_0_LINK_ACT#, ETH_1_LINK_ACT# accordingly (see Table 3-1).

3.6 Watchdog timers

CPC309 enables connection of two watchdog timers, one (WDT1) is integrated into supervisor’s microchip and has a fixed actuating range (1.6 s), another one is integrated into the SIO microchip and has a programmed actuating range (from 1 s to 255 min).

Note

Description of watchdog timers programming is given in Section 6.

3.7 Module address space

3.7.1 Distribution of memory address space

Distribution of memory address space of the module is given in the table below:

Table 3-15: Distribution of memory address space

Range of addresses	Size	Description
00000h – 9FFFFh	640 KB	RAM
A0000h – BFFFFh	128 KB	Video memory
C0000h – C7FFFh	32 KB	BIOS video memory
C8000h – CBFFFh	16 KB	BIOS video memory
CC000h - CFFFFh	16 KB	Reserved
D0000h – D3FFFh	16 KB	Reserved
D4000h – D7FFFh	16 KB	Reserved
D8000h – DBFFFh	16 KB	Reserved
DC000h - DFFFFh	16 KB	Reserved
E0000h – EFFFFh	65 KB	BIOS POST
F0000h – FFFFFh	65 KB	ROM BIOS

3.7.2 Distribution of I/O address space of the module

Distribution of address space of the module is specified in the table below:

Table 3-16: Distribution of I/O address space

Range of addresses	Function	Note
0000h – 001Fh	DMA Master	
0020h – 0021h	PIC MASTER	
0022h – 003Fh	Reserved	
0040h – 005Fh	TIMER	
0060h – 006Fh	POST, Keyboard, Speaker, Shadow registers	
0070h – 007Fh	CMOS, NMI Mask control registers	
0081h – 008Fh	DMA page registers	
0090h – 009Fh	Reserved	
00A0h – 00BFh	PIC SLAVE	
00C0h – 00DFh	DMA slave	
00F0h – 00FEh	NUMERIC COPROCESSOR	
0100h – 01EFh	Reserved	
01F0h – 01F7h	PRIMARY IDE	
01F8h – 01FFh	Reserved	
0200h – 020Fh	Access to external LPC bus	
0210h – 02EFh	Reserved	
02E8h – 02EFh	Reserved	
02F0h – 02F7h	Reserved	
02F8h – 02FFh	COM2	
0300h – 031Fh	Acceess to external LPC bus	

Range of addresses	Function	Note
0320h – 0377h	Reserved	
0378h – 037Fh	Access to external LPC bus	
03B0h – 03DFh	VIDEO	
03E0h – 03E7h	Reserved	
03E8h – 03EFh	Reserved	
03F0h – 03F7h	Access to external LPC bus	
03F8h – 03FFh	COM1	
0400h – 04FFh	Reserved	
0500h – 057Fh	Super IO Runtime registers	
0580h – 0FFFh	Reserved	

3.7.3 Distribution of interrupt lines

Default interrupt requests are generated by devices, included into the module. The interrupt sources are shown in the table below. StackPC, StackPC-PCI, PCI-104, PCIe/104, PCI/104-Express extension modules may be used as alternative devices that form interrupt requests.

Table 3-17: Distribution of interrupt lines

Interrupt	Main purpose (default)	Alternative source
IRQ0	System timer	-
IRQ1	Keyboard	-
IRQ2	Interrupt 8259	-
IRQ3	COM2	IRQ3 line of extension module, connected to LPC bus
IRQ4	COM1	IRQ3 line of extension module, connected to LPC bus
IRQ5	Video/USB/Ethernet/PCI/PCIe	IRQ3 line of extension module, connected to LPC bus
IRQ6	-	IRQ3 line of extension module, connected to LPC bus
IRQ7	-	IRQ3 line of extension module, connected to LPC bus
IRQ8	RTC	-
IRQ9	ACPI	IRQ3 line of extension module, connected to LPC bus
IRQ10	USB/HD Audio/SATA/SMBus/PCI/PCIe	IRQ3 line of extension module, connected to LPC bus
IRQ11	USB/PCI/PCIe	IRQ3 line of extension module, connected to LPC bus
IRQ12	Mouse	-
IRQ13	Reserved for floating point unit	-
IRQ14	Compact Flash	-
IRQ15	-	

4 Installation of CPC309

It is necessary to strictly comply with the below rules, warnings and procedures in order to properly install the module, prevent damages of the device, system components, as well as injuries of associates.
Procedure of installing drivers of all peripheral devices installed, is specified in the descriptions, supplied with these drivers. This Manual also does not contain description of the operating systems installation procedures. Please refer to the documents, attached to the OS.

4.1 Safety requirements

When handling CPC309, you should strictly follow the below safety procedures.
Fastwel Group will not be responsible for any damages, occurred as a result of non-compliance with these requirements.

Careful!
When handling the module please be careful since the cooling heat-sink can be strongly heated. Do not touch it during installation or removal of the module.
In addition, the module can't be placed on any surface until it and heat-sink will not get cooled down to ambient temperature.

Attention!
Always switch off the power supply of the system before connection or disconnection of the module's power supply. Violation of this rule could pose danger to your health and life, as well as could lead to system or module damages.

The device is ESD sensitive!
Module contains elements, sensitive to ESDs. In order to prevent damages to the module, comply with the following safety measures:

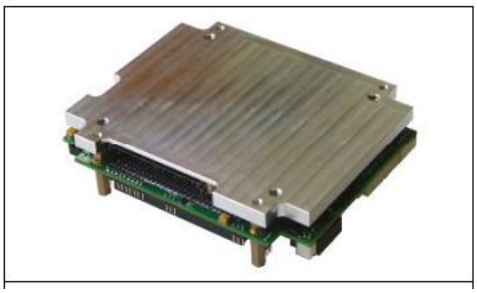
- Remove electrostatic charges from your clothes before you touch the module; remove the charges from instruments before you use them as well.
- Do not touch electronic components and connector contacts.
- Disconnect power cable before installing/dismantling PC/104-Plus extension module.

If you work at a professional workplace with antistatic protection, do not neglect the opportunity to use it.

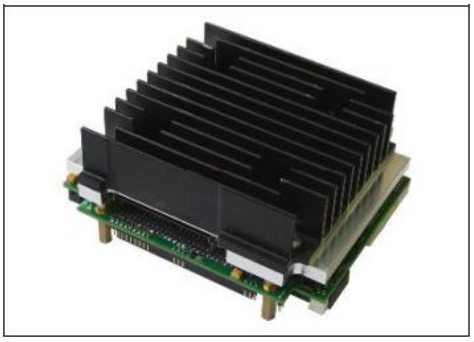
4.2 Possible Heat Removal Methods

The Appendix cites technical requirements the user must take into account while developing his own cooling system. Temperature should be controlled with the help of a thermal sensor. Heat removal methods are shown on the figure below.

Fig. 4-1: Heat removal methods



There is a heat sink installed on the bottom side of the CPC309 module. With such a configuration, it is possible to ensure heat dissipation by installing the module directly onto a body or a chassis (the body plays the role or a large radiator). Heat is removed from the CPC and the ICH8 microchip with the help of a heat sink and transferred to the PC/104 module body.



A ribbed radiator may be additionally installed onto the CPC309 module (ACS00035-01 from among additional accessories). The radiator is installed on the heat sink (with the help of thermal compound) and fastened with the screws supplied with the radiator.

Images on the figures may be slightly different from your module.

4.3 Procedure of CPC309 Installation

In order to install the CPC309 module into a system, follow the procedure described below:

1. Make sure that the safety requirements listed in Section 4.1 have been observed.

Attention!

Non-observance of the following instructions may cause damages to the module and incorrect operation of the system.

2. Before installing make sure that the module has been configured as per Section 5 (information about the CPC309 module configuration is provided in Section 5 of this Manual). Information about installing peripheral devices, expansion modules and input/output devices is provided in the respective paragraphs of Section 4.5 of this Manual.

3. For installing CPC309, the following actions should be performed:

- Before installing, make sure that the system power has been disconnected.

- Depending on the use, system configuration and temperature requirements, CPC309 is installed in a number of ways:

- For CPC309 module with the heat-spreader installed:
Secure the module on a flat surface (if the module is intended to operate in a system or is fastened to a chasses) by four screws. The installation dimensions are provided on Fig. 2 1: Overall and connection dimensions of the module.

- For CPC309 with and additional finned heatsink:
Fix the heatsink on the heat-spreader with four screws (using thermal compound supplied with the heatsink).
Fasten the module to the surface with the struts. Provide conditions for sufficient air cooling.

- Connect the required external interface cables and power supply cable to module's connectors. Make sure that CPC309 and all the cables are reliably fastened.

Now CPC309 is ready for operation. Use the documents supplied with the software, devices and the system as a whole to familiarize yourself with further actions.

 **Attention!**
Incorrect power on may lead to module breakdown.

 **Attention!**
When installing the CPC309 inside the sealed enclosure it is crucial to provide minimum thermal resistance between module's heat-spreader and heat-removing wall of the enclosure. This will prevent excessive heating of system components within the enclosure.

4.4 Module removal procedure

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

1. Make sure that the safety requirements listed in Section 4.1 have been observed. Particular attention is to be given to the warning related to the heat-sink temperature!

2. Before starting work, make sure that the system power has been disconnected.

3. Disconnect all interface cables from the module.

4. Unscrew the fastening screws. Do not touch the heat-sink because it can become very hot during operation.

5. Dispose of the module at your discretion. Do not put it into a box or a package until the module and the cooling heat-sink are cooled down to the ambient temperature.

4.5 Installing peripheral devices to CPC309

CPC309 enables connection of a large number of various peripherals; the methods of their installation can vary greatly. Therefore the below sections provide general installation instructions and not detailed algorithms. Detailed information about connecting external devices can be found in the documents attached to them.

4.5.1 Installation of CompactFlash memory cards

CompactFlash connector of CPC309 supports only the CompactFlash memory cards ATA type I/II with operating voltages of 3,3 V. Carefully slide a properly positioned card along the guides and press slightly, so that the contacts would enter the socket as far as they would go.

Attention!

Installing a CompactFlash with the power on can damage your system.

Note

It is recommended to use CompactFlash cards that were initialized and formatted on CPC309. CPC309 uses the LBA mode by default. Using CompactFlash cards that were initialized and formatted in another mode may result in incorrect operation of the module.

4.5.2 Battery replacement

Use Renata CR2032 lithium batteries as replacements.

The expected service life of a battery having 190 mAh capacity is approximately 5 years. However, the battery service life depends on the operating temperature and on the length of the time during which the system is powered off.

Note

It is recommended to replace the battery approximately in 4 years of operation without expecting its service life expiry.

Attention!

When you replace the battery, observe the right polarity. Replacing the battery, make sure that the polarity is correct ("+" is on the top).
The used batteries should be recycled in accordance with the established standards.

4.5.3 Installing StackPC extension modules

The extension modules are installed into the respective sockets. It is possible to install modules one above the other in order to obtain highly integrated control systems.
Read Section 3.4.1.

Attention!

The extension modules are to modules are to be installed with the power off.

Attention!

Please try not to bend or deform the CPC309 module board when installing the extension modules. Properly mate contacts and use necessary fastening parts.

Note

Before installing and operating StackPC-PCI, PCI-104, PCI/104-Express extension modules, it is required to select the voltage fed to the PCI interface input/output buffer (use the PCI VIO Selector (XP13). Read Section 5.1 “Selection of Buffers Power Voltage on the PCI Bus of Extension Modules” carefully.

5 Configuration of CPC309

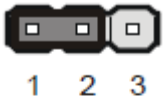
5.1 Selection of Buffers Power Voltage on the PCI Bus of Extension Modules

Before installing extension modules (StackPC-PCI, PCI-104, PCI/104-Express), one must select the PCI buffers power voltage with the help of XP13 switch (PCI VIO Selector).

Attention!
All operations are to be performed with the module power off.

The XP13 switch is located on the top side of the board, near the XS4 connector, see Fig. 3 2: Location of connectors and principal components on the TOP side (pay attention to the note at the end of that subsection).

Fig. 5-1: Status of the PCI VIO Selector (XP13) Switch Contacts



Contacts 1-2 closed – PCI bus signal levels: +5 V

Contacts 2-3 closed – PCI bus signal levels: +3.3 V

All contacts open - signal levels are selected at the PC-104 power source

Attention!
If you use a PC-104 power source, the VIO voltage must be set at the power source module. In this case you should remove the jumper from the VIO (XP13) selector switch: **all contacts are open**.

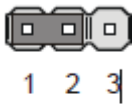
If the PC-104 power source is not used, the jumper on the XP13 selector switch must be set into the 1-2 or 2-3 position.

5.2 Selecting the Power Supplied to TFT Panel

TFT digital panel power supply is selected with the help of XP2 (LVDS Panel Power Selector) three-pin switch, see Fig. 3 2: Location of connectors and principal components on the TOP side.

The switch positions are explained below:

Fig. 5-2: TFT (XP2) Digital Panel Power Switch



Contacts 1-2 are closed - the digital panel is powered with +3.3 V voltage.

Contacts 2-3 are closed, - it is powered by +5 V voltage.

Attention!

Be very careful when selecting the TFT panel power voltage! Incorrect power voltage setting may make the panel inoperative. To define the exact value of the TFT panel power voltage, please look at the reference information provided by the panel manufacturer or inquire this information from the dealer, where such panel was bought.

5.3 Restoring Factory CMOS Settings (Clear CMOS)

In case the system fails to be loaded (e.g., because of incorrect BIOS configuration or incorrect password), the settings saved in the CMOS may be cleared with the help of CMOS Reset (XP9) switch, see Fig. 3 2: Location of connectors and principal components on the TOP side.

The CMOS Clearing sequence will be as follows:

1. Power off the system.

2. Close the CMOS Reset (XP9) switch with a jumper supplied with the module.

3. Power on the system.

4. Wait till BIOS data to appear on the monitor screen.

5. Power off the system.

6. Open the CMOS Reset (XP9) switch.

7. Power on the system.

8. Further loading will be performed with the factory CMOS settings.

9. Factory parameters will be saved in the Flash memory after the POST is over.

10. Start BIOS Setup if it is necessary to change the CMOS parameters.

5.4 BIOS Update

There is fwflash.exe utility, located at FTP server. This utility is intended for BIOS update within the module. In order to update BIOS, it is required to FreeDOS or MS DOS OS and start *fwflash.exe* utility with the parameters, e.g.:

Fwflash.exe \f 309xxx.rom

where 309xxx.rom – file name of the current BIOS version.

ATTENTION: FWFLASH.EXE UTILITY OPERATES ONLY UNDER MS DOS, FREEDOS OS!

ATTENTION: IF THERE ARE ANY ERROR MESSAGES RELATED TO BIOS MODIFICATION APPEAR ON THE SCREEN, IT IS REQUIRED TO START THE FWFLASH.EXE UTILITY (WITHOUT POWER OFF) AGAIN!

FORBIDDEN: TO RECORD BIOS FILES, EXCEPT FOR THOSE SPECIFIED FOR USE BY MANUFACTURER, AND INCLUDED INTO THE MODULE DELIVERY CHECKLIST AND AVAILABLE AT FILE SERVERS OF MANUFACTURER AND OFFICIAL DISTRIBUTOR!

6 CPC309 Programming

6.1 Work with WDT1 Watchdog Timer

After the module loading POST is over, the WDT watchdog timer is off. This timer can be controlled by the user with the help of GPIO outputs of the ICH8 chipset.

Two registers are available for that purpose in the I/O space; the table below specifies the purposes and addresses of those registers.

Table 6-1: WDT1 Watchdog Timer Control Registers

Address	Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
118Eh	reserved	WDT1_EN#	reserved	reserved	reserved	reserved	reserved	reserved
11B8h	reserved	WDT1_RES	reserved	reserved	reserved	reserved	reserved	reserved

Where:

– WDT1_EN# –watchdog timer activation bit (when recorded: “1”- WDT1 watchdog timer is on, “0” – WDT1 watchdog timer is off);

– WDT1_RES – watchdog timer resetting bit (the watchdog timer is reset when the status of this bit is changed);

ATTENTION: THE WATCHDOG TIMER OPERATION TIME IS FIXED; 1.6 SEC AFTER THE WDT1_EN BIT IS INSTALLED, THE WDT1 WATCHDOG TIMER WILL ACTUATE.

FORBIDDEN: ASSIGN ANY VALUES TO THE BITS DESIGNATED AS "RESERVED". THIS CAN DISRUPT THE MODULE FUNCTIONING.

6.2 Work with WDT2 Watchdog Timer

The WDT2 watchdog timer is located in the Super IO SMSC3114 microchip. It has more settings than the WDT1 watchdog timer. Four registers in the module input/output space are used for its configuring. The purposes and addresses of those registers are provided in the table below.

Table 6-2: WDT2 Watchdog Timer Control Registers

Name	Address	Description	
WDT2_TIMEOUT	565h	The register of setting the WDT2 watchdog timer operation time sensitivity	
		Bits[6:2]	reserved
		Bit [7]	«0» - time is counted in minutes «1» - time is counted in seconds
WDT2_VAL	566h	The register of setting the WDT2 watchdog timer operation time	
		Bits[7:0]	The respective time value is recorded into the register, e.g. 01h – operation time 1 minute or 1 second[1]; FFh – operation time 255 minutes or seconds When 00h value is recorded, the watchdog timer is switched off
WDT2_CFG	567h	WDT2 watchdog timer configuring register	
		Bit [0]	reserved
		Bit [1]	«0» - watchdog timer reset by keyboard interruption locked. «1» - watchdog timer may be reset by keyboard interruption.
		Bit [2]	«0» - watchdog timer reset by mouse interruption locked. «1» - watchdog timer may be reset by mouse interruption.
		Bit [3]	reserved
		Bits[7:4]	reserved (must be «0»)
WDT2_CTRL	568h	WDT2 watchdog timer control registers	
		Bit [0]	If read: «0» - watchdog timer count is performed «1» - watchdog timer count has been performed
		Bit [1]	reserved
		Bit [2]	If «1» is recorded, the watchdog timer count immediately ends (the watchdog timer operates)
		Bit [3]	«1» - watchdog timer count ends when a key is pushed on the keyboard «0» - the keyboard does not affect the watchdog timer operation
[1] Time is counted in seconds if bit[7] was set in register 565h			

6.3 Discrete Input/Output Port Programming

The discrete input/output port is implemented on the PCA9538 (NXP) input/output port microchip. This microchip is located on the SMBus bus and has the following address: E4h. The microchip has 4 registers for port control. The purposes of these registered are described below.

Register 0 - Input buffer register

This register is read-only; it reflects the status of the discrete input/output port channels.

Address	Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
00h	Input 7	Input 6	Input 5	Input 4	Input 3	Input 2	Input 1	Input 0

If any bit of this register has been set, the respective port channel has a high level, if the bit has been reset, the channel level is respectively low.

Register 1 - Output buffer register

This register is intended for setting the respective output levels of the discrete input/output port.

Address	Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
01h	Input 7	Input 6	Input 5	Input 4	Input 3	Input 2	Input 1	Input 0

If any bit of this register has been set, the respective port channel has a high level, if the bit has been reset, the channel level is respectively low.

By default, all the port bits are set.

Register 2 - Inversion register
Permits to invert the input buffer status.

Address	Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
02h	Input 7	Input 6	Input 5	Input 4	Input 3	Input 2	Input 1	Input 0

If any bit of this register has been set, the respective bit of the input buffer will be inverted, if the bit has been reset, there is no inversion.

By default, all the port bits are reset.

Register 3 - Configuration register.

This register is intended for setting the direction of each input/output port channel.

Address	Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
03h	Input 7	Input 6	Input 5	Input 4	Input 3	Input 2	Input 1	Input 0

If any bit of this register has been set, the respective port channel is configured as "input", if the bit has been reset, the channel is configured is "reset".
By default, all the port bits are set.

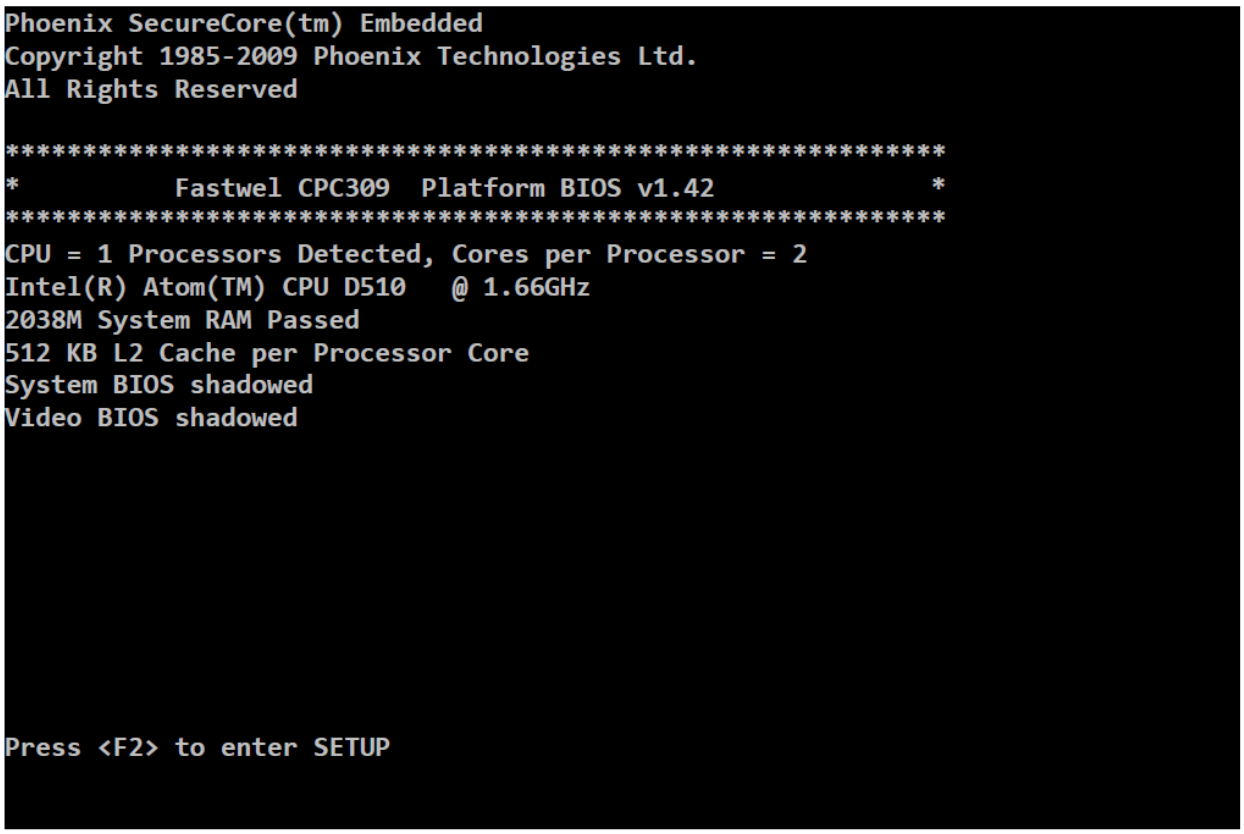
7 Phoenix® BIOS

Your computer is equipped with an adapted version of Phoenix® BIOS, which is a standard system for IBM PC AT compatible computers. It supports Intel®x86 and compatible processors, provides low-level support to the processor, memory and input/output subsystem.
With the help of the BIOS Setup software, you will be able to change BIOS parameters and to control special computer operation modes. It will make possible for you to change the basic parameters of the system setup. These parameters are stored in the FRAM non-volatile memory.

7.1 Starting BIOS Setup Software

To start the BIOS Setup software, one must press the F2 key on the keyboard or the console PC keyboard (if the Hyperterminal software is used as a terminal) during the POST (Power On Self Test) procedure. An example of a screen during the POST procedure performance is shown on the figure below.

Fig. 7-1: Screen during module loading (POST)

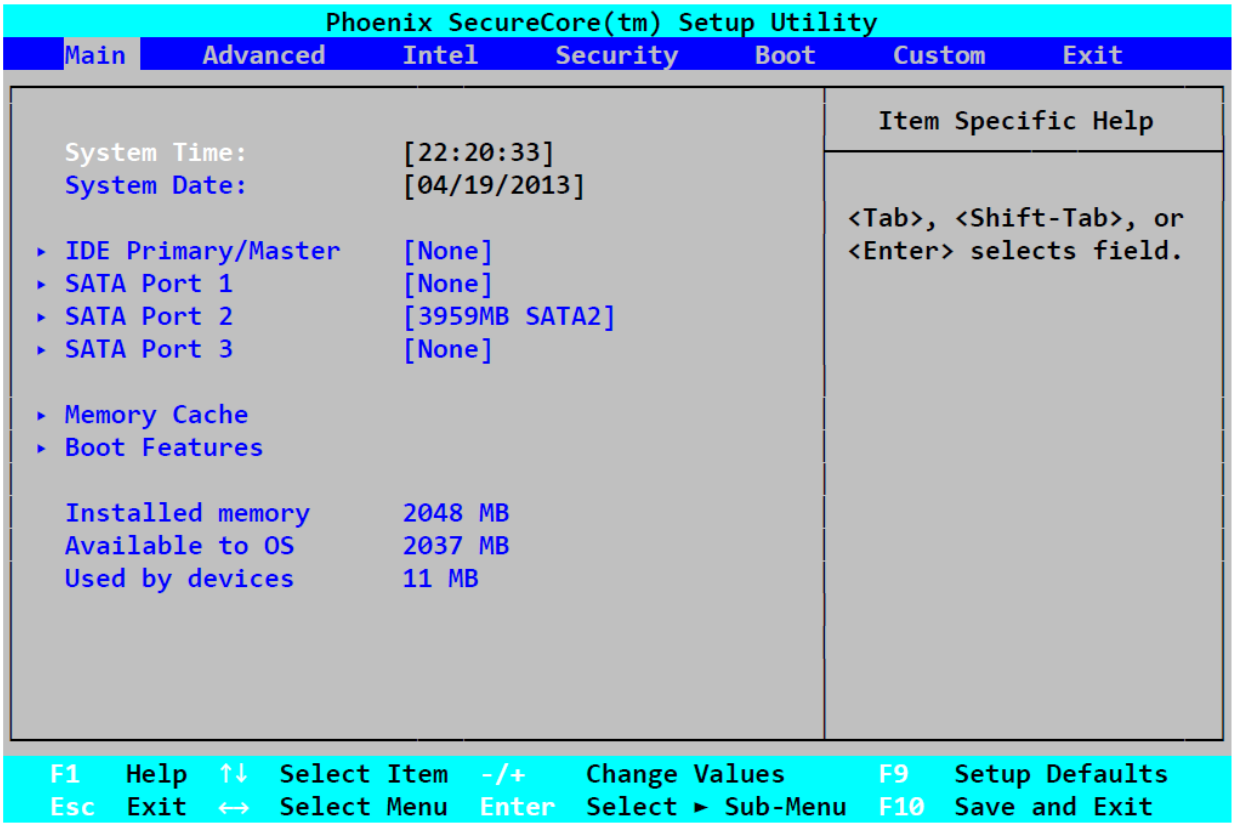


After the F2 key has been pressed, the BIOS Setup software menu will be shown with the tab "Main" being active.

7.2 Main

This is a generic tab of the BIOS Setup software appearing upon entry. In the menu of this tab, you can set system clock and date, set ATA/SATA devices parameters, control cache, set module start parameters. Data about the installed and available random access memory are also shown in this tab.

Fig. 7-2: "Main" Tab Menu Screen



Use "Up" and "Down" arrow keys to navigate through the menu. To navigate through the tabs, use the "Right" and "Left" arrow keys. Use the "Enter" key to enter setup submenus, and the "Escape" key to withdraw from setup submenus. Use the "+" and "-" keys of the numeric part of the keyboard to change any values in the chosen menu option.

Note

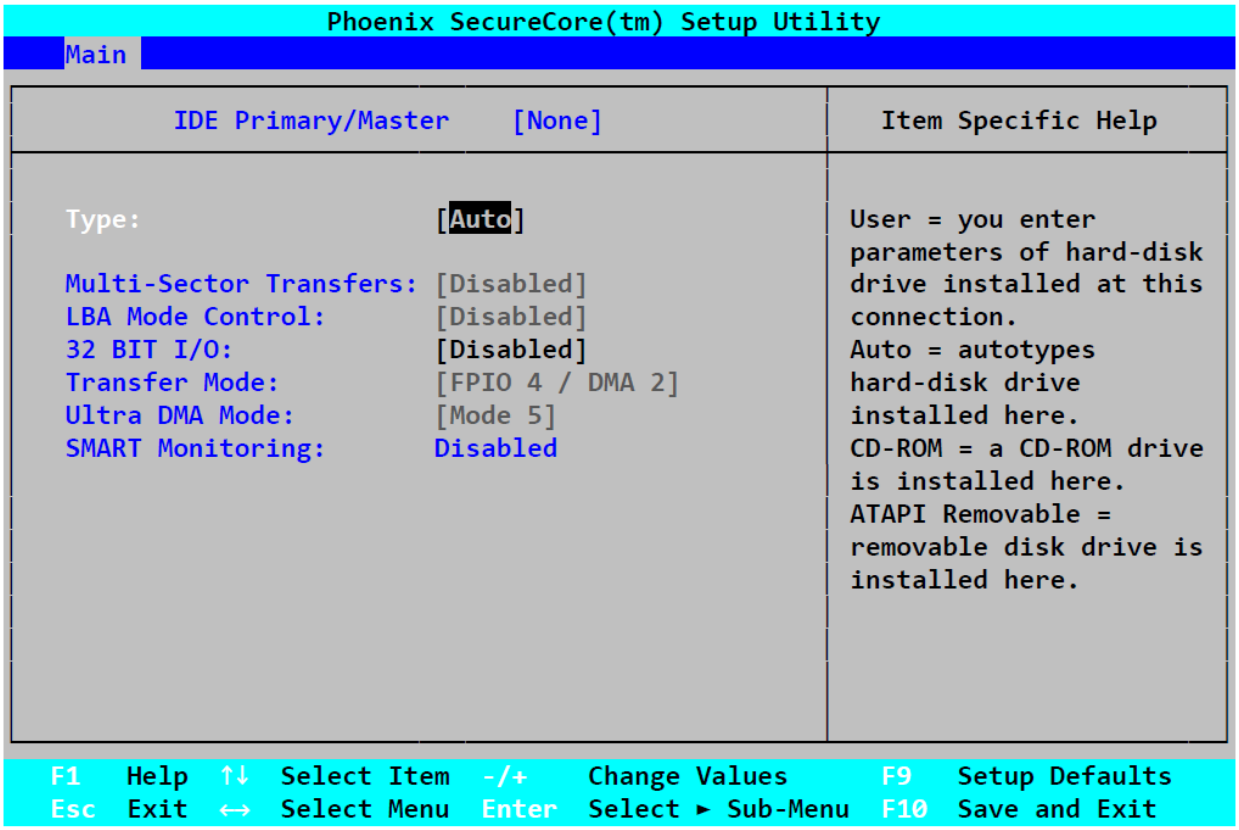
This menu working algorithm applies to all the other tabs of the Bios Setup software as well.

When choosing the settings of ATA/SATA devices, cache process, module boot parameters, new submenu screens become available.

7.2.1 IDE Primary/Master

This submenu sets the IDE storage parameters. The Compact Flash storage always acts as the IDE
Primary Master storage. The "IDE Primary/Master" submenu screen is shown on the figure below.

Fig. 7-3: "IDE Primary/Master" submenu screen



Where:

Type: storage type setting

[Auto] – the system chooses the storage type automatically
[None] – ATA storage disabled
[ATAPI Removable], **[IDE Removable]** – removable ATAPI, IDE devices
[CD-ROM] – CD-ROM drive
[Other ATAPI] – other devices
[User] –the ATA device parameters are entered by the user individually

Multi-Sector Transfers: multisector data transfer control
LBA Mode Control: control of the LBA mode
32 Bit I/O: controlling the 32-bit data transfer mode
Transfer Mode: choosing the data transfer mode (PIO, DMA)
Ultra DMA Mode: Ultra DMA mode selection
SMART Monitoring: S.M.A.R.T. mode selection

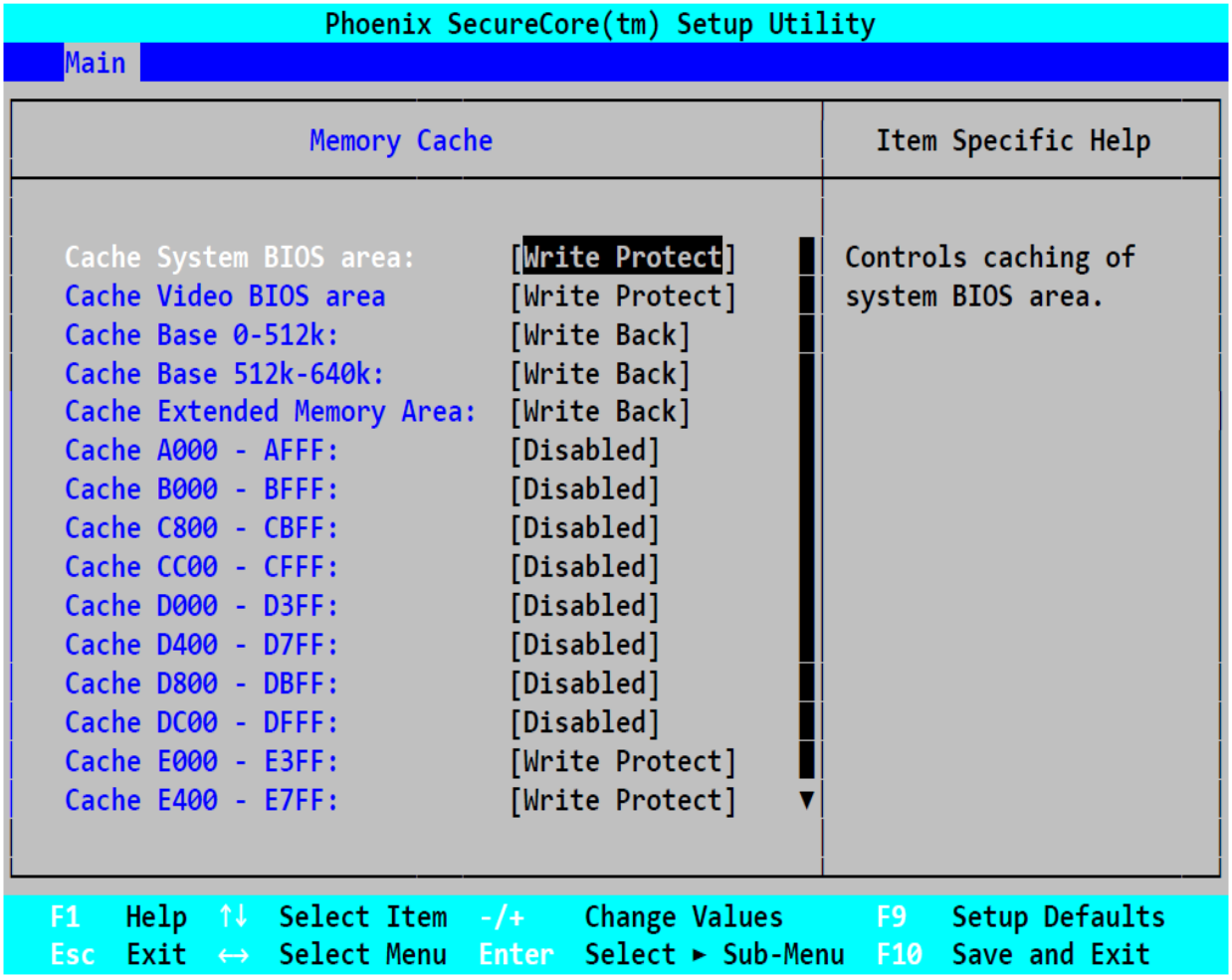
7.2.2 SATA Port 1 – Port 3

These submenus set the parameters of storages connected to the SATA bus, namely SATA Port
1, Port 3 - storages connected to xP7 and XP10 respectively, SATA Port 2 - a built-in Fastwel Flash Disk.
The settings of those submenus are similar to those of the "IDE Primary/Master" submenu.

7.2.3 Memory Cache

Submenu for control of the cache process of certain memory areas. It is shown on the figure below.

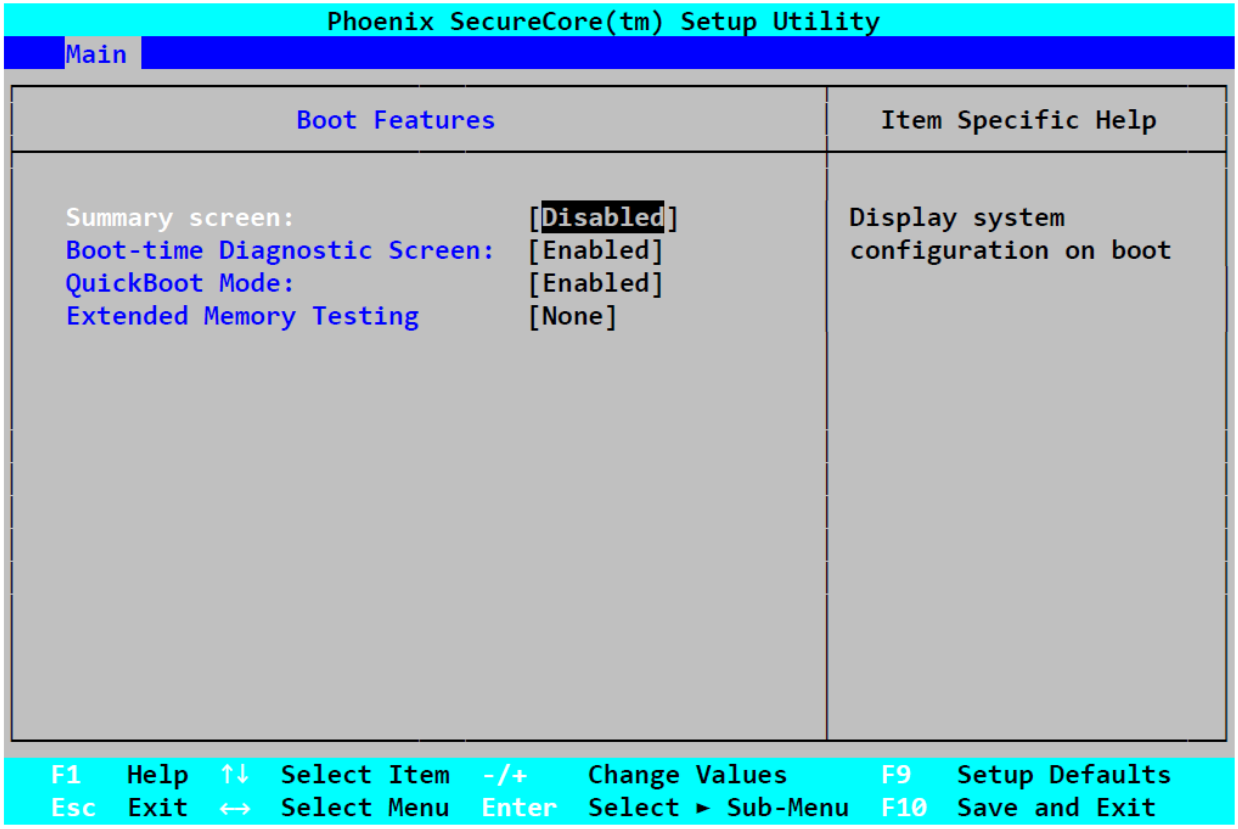
Fig. 7-4: "Memory Cache" submenu screen



7.2.4 Boot Features

Module boot parameters setting submenu. The screen is shown in the figure below.

Fig. 7-5: "Boot Features" submenu screen



Where:

Summary screen: displaying the system configuration when booting

Boot-time Diagnostic Screen: displaying diagnostic screen when booting

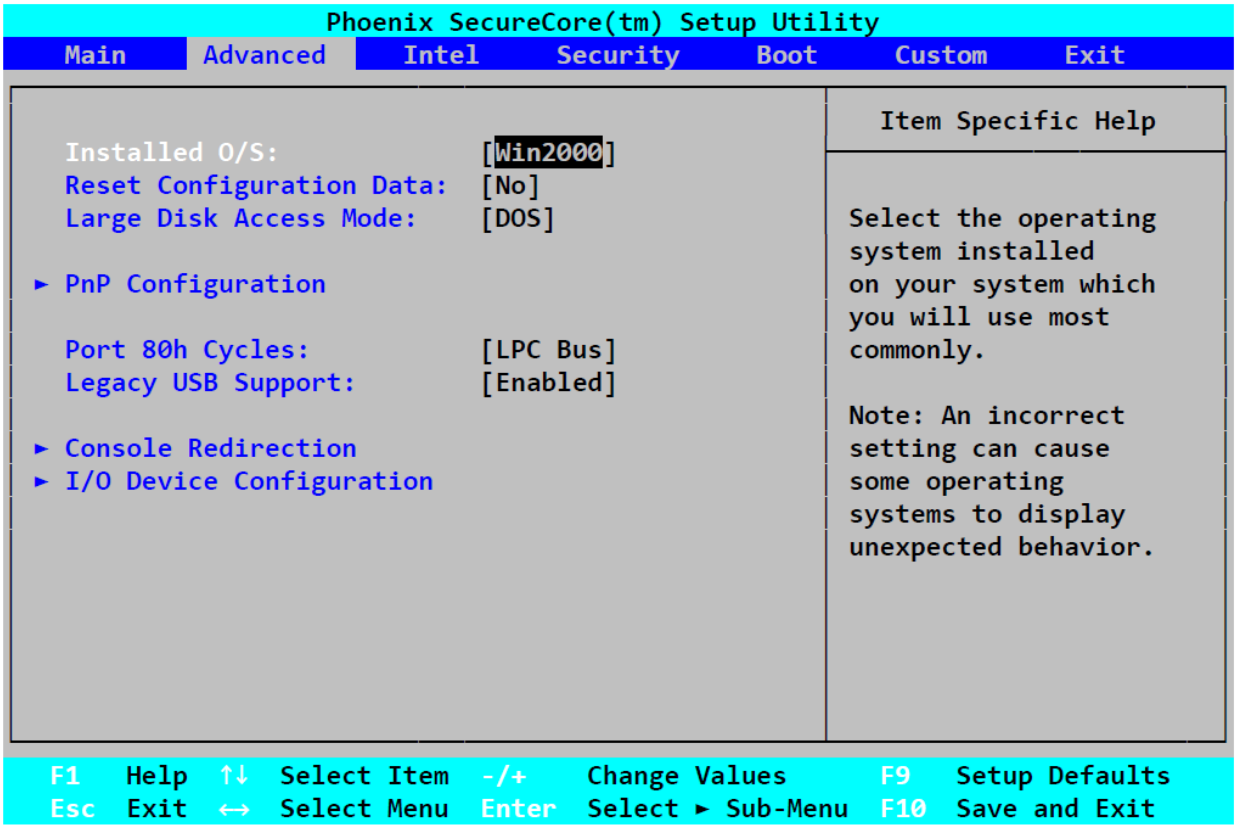
QuickBoot Mode: QuickBoot mode control (certain tests will be skipped during the module booting)

Extended Memory Testing: setting the type of extended memory test

7.3 Advanced

This tab is used for advanced module settings. The "Advanced" tab menu is shown on the figure below.

Fig. 7-6: "Advanced" Tab Menu Screen



Where:

Installed O/S: setting the type of operating system installed on the module

Reset Configuration Data: Extended System Configuration Data (ESCD) area reset control

Large Disk Access Mode: Large Disk Access mode choice

Port 80h Cycles: choosing the bus to transmit debugging data over the “80h” port

Legacy USB Support: USB devices support control at the BIOS level.

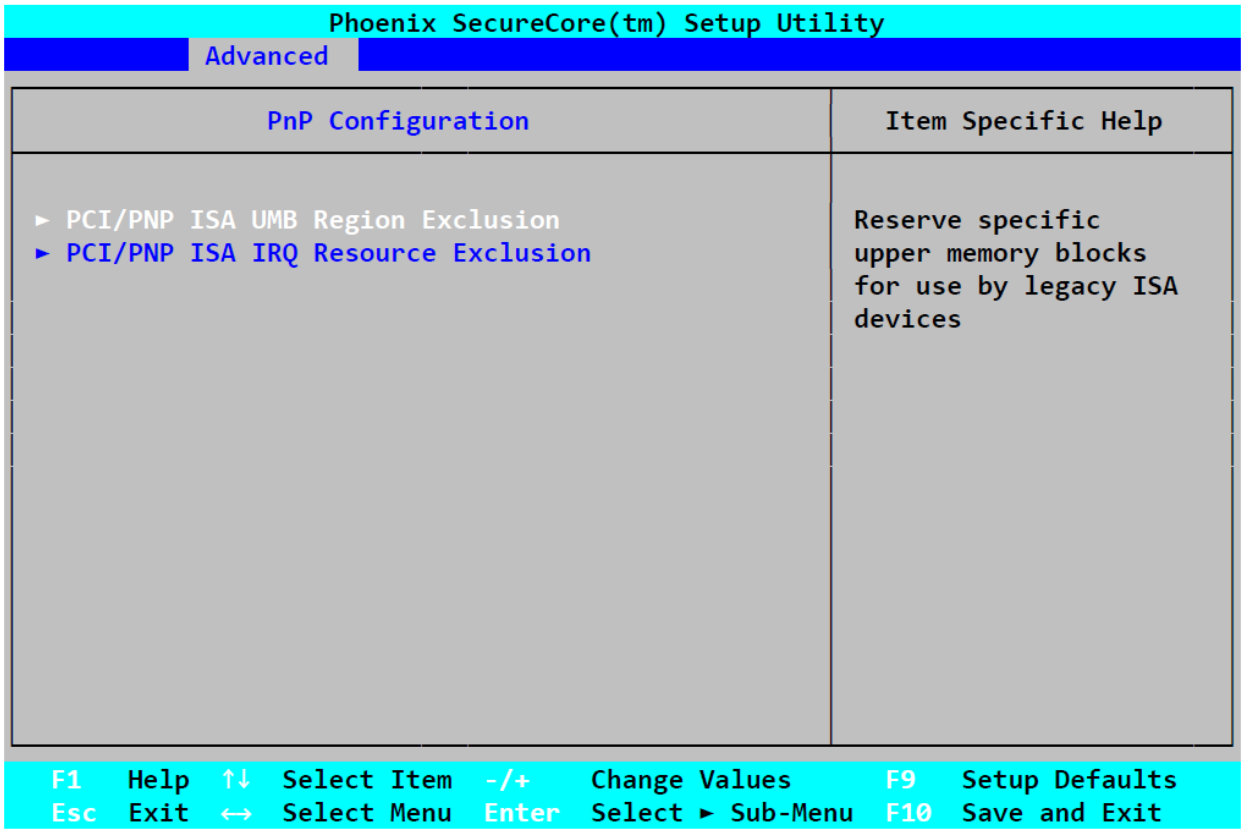
Some submenus for supplementary settings are available as well.

7.3.1 PnP Configuration

Submenu for setting the distribution of interruptions and memory among PCI- and ISA-devices.

The submenu screen is shown on the figure below.

Fig. 7-7: "PnP Configuration" submenu screen



Where:

PCI/PNP ISA UMB Region Exclusion
Submenu or reserving certain memory areas for the use by the ISA bus devices. When entering this submenu, several address ranges in the memory space will be displayed and it will be possible to set the [Available] of [Reserved] value for each range, where:

[Available] – the memory range is available for PCI devices

[Reserved] – the memory range is reserved for ISA bus.

PCI/PNP ISA IRQ Resource Exclusion
Submenu or reserving certain interruptions for the use by ISA bus devices. When entering this submenu, several interruption request lines will be displayed and it will be possible to set the [Available] of [Reserved] value for each range, where:

[Available] – the interruption is available for PCI and module built-in devices

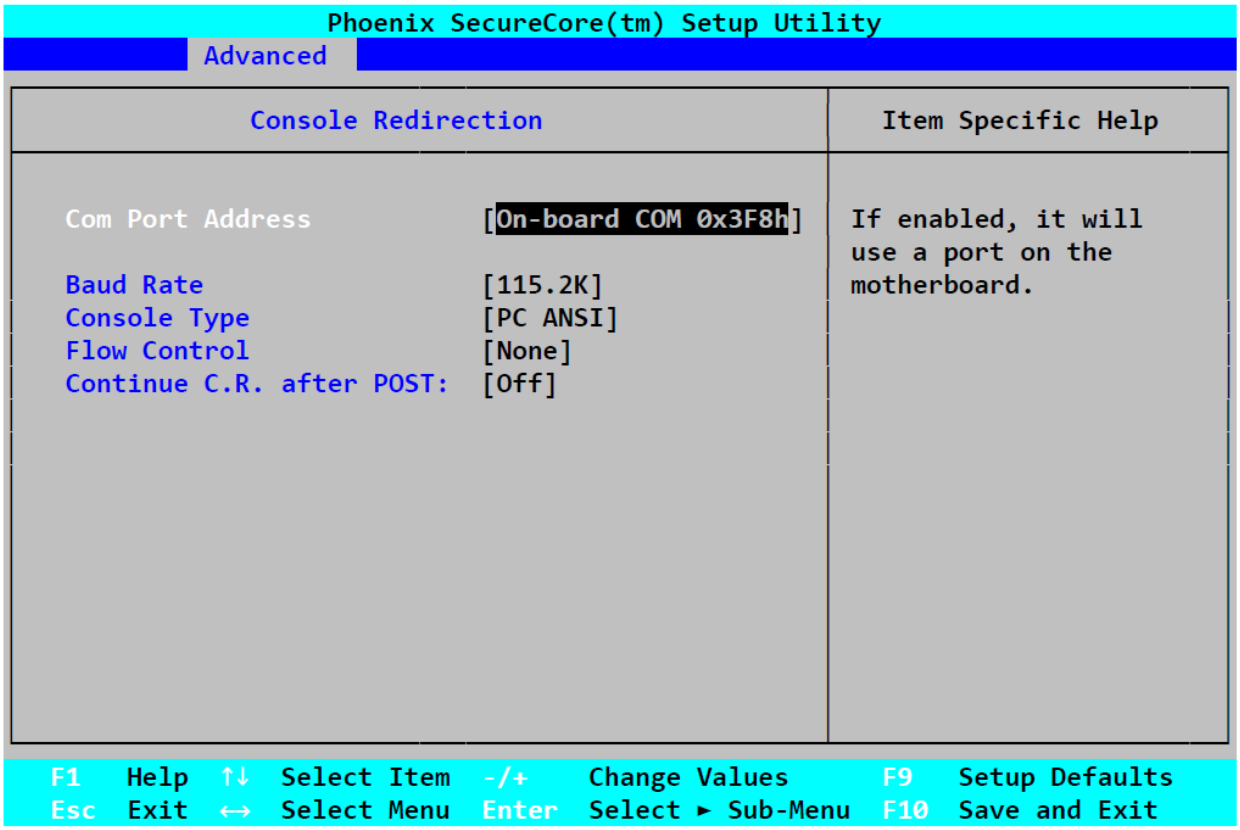
[Reserved] – the interruption is reserved for ISA bus.

7.3.2 Console Redirection

Submenu for setting the distribution of interruptions and memory among PCI- and ISA-devices.

The submenu screen is shown on the figure below.

Fig. 7-8: "Console Redirection " submenu screen



Where:

Com Port Address: - choosing a COM port for console redirection

[On-board COM 0x3F8h] – COM1
[[Disabled] – console redirection disabled

Baud Rate - data transfer speed when working with the console (300 – 115.2K)

Console Type – terminal type

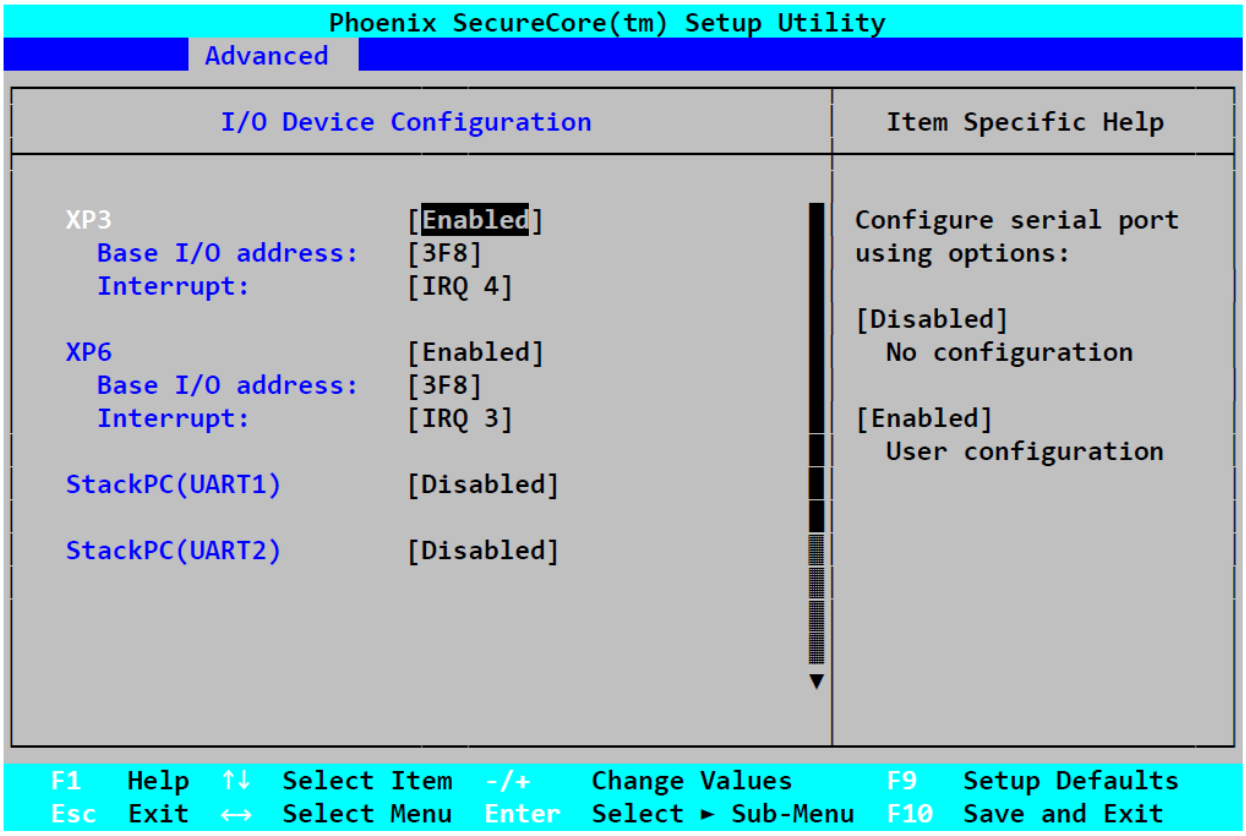
Flow Control – flow control setting

Continue C.R. after POST: - console redirection control after operating system loading

7.3.3 I/O Device Configuration

Input/output devices setting submenu. The submenu screen is shown on the figure below.

Fig. 7-9: "I/O Device Configuration" submenu screen



Where:

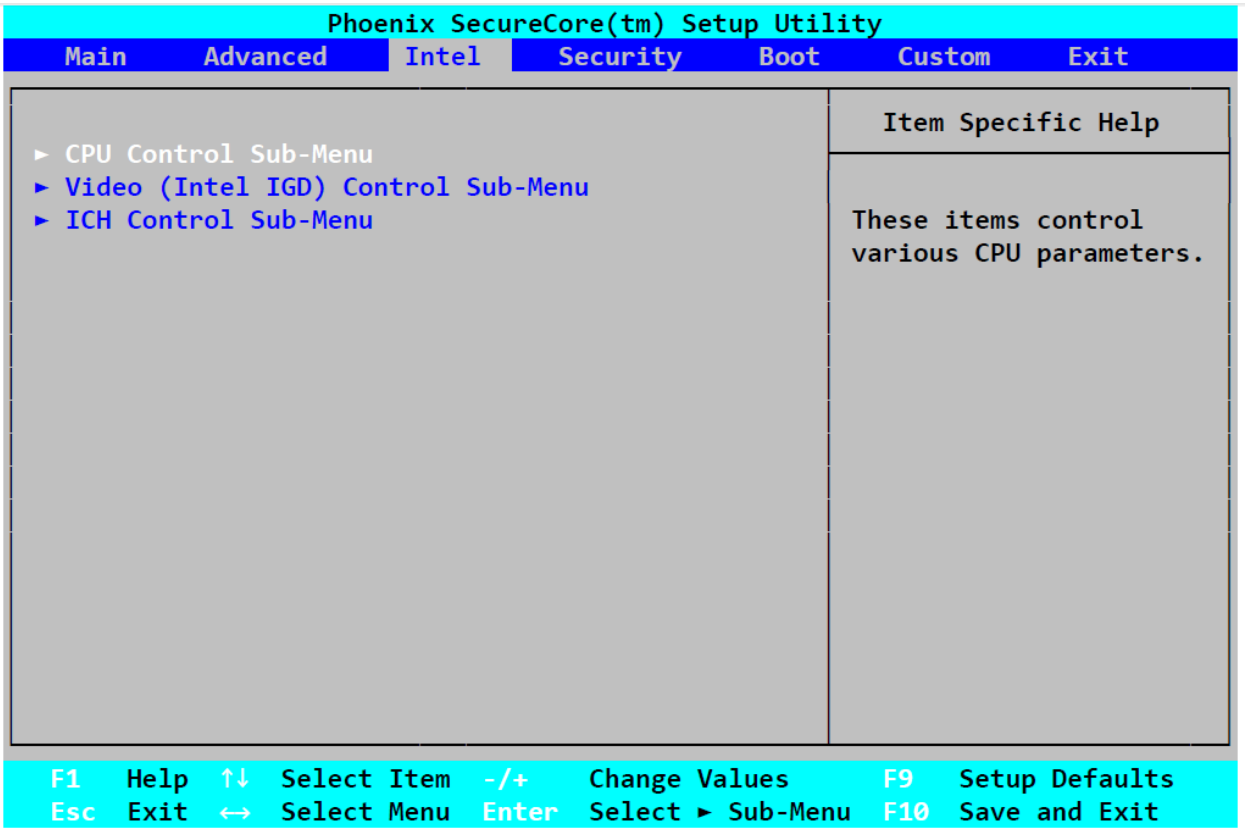
XP3, XP6– control of RS232 COM1, COM2 ports

7.4 Intel

This tab makes it possible to change Intel microprocessor and chipset settings.

The "Intel" tab menu is shown on the figure below.

Fig. 7-10: "Intel" Tab Menu Screen



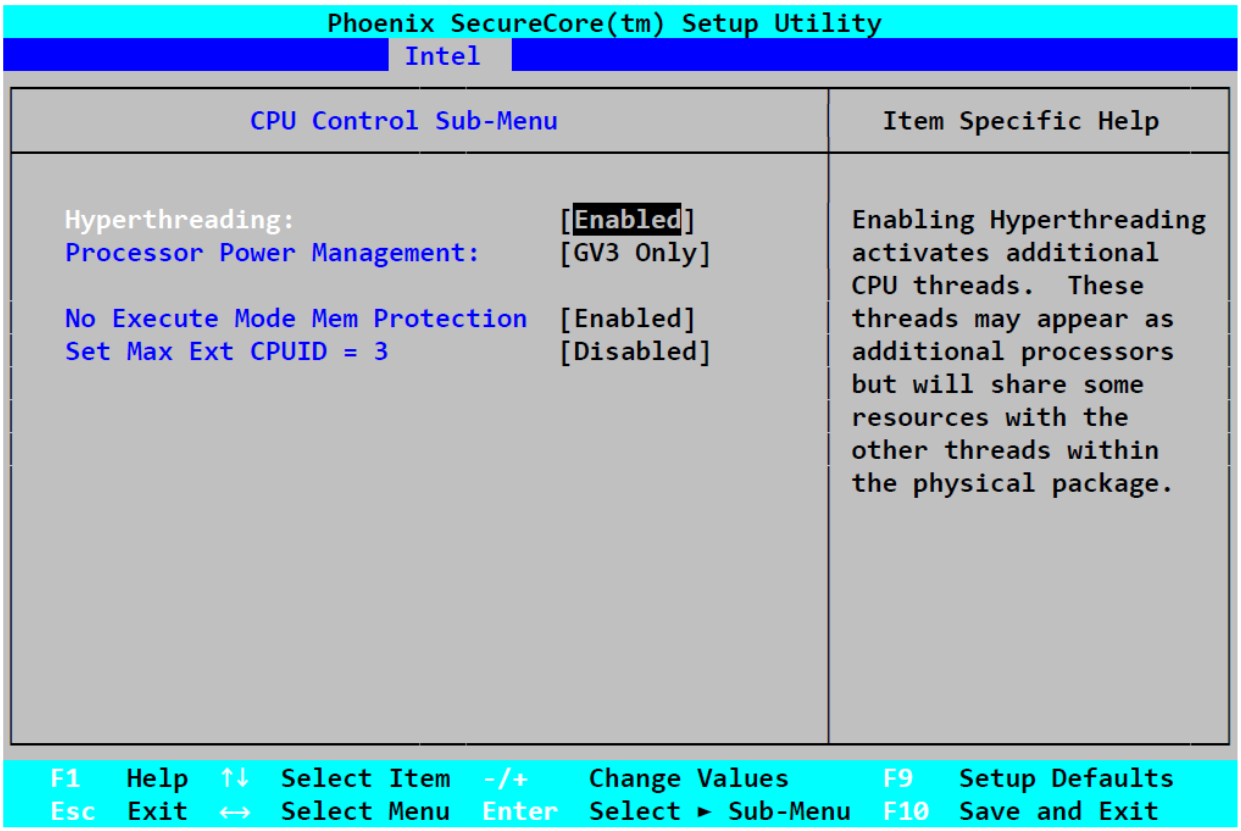
The menu of this tab has several additional submenus.

7.4.1 CPU Control Sub-Menu

The submenu of CPU parameters control.

The submenu screen is shown on the figure below.

Fig. 7-11: "CPU Control Sub-Menu" submenu screen



Where:

Hyperthreading: - control of the CPU Hyperthreading mode

Processor Power Management: - setting the central processor unit power supply control algorithm ("Power Management")

No Execute Mode Mem Protection – use the mechanism of memory areas protection against the code being implemented (Intel NX bit). Enabled by default.

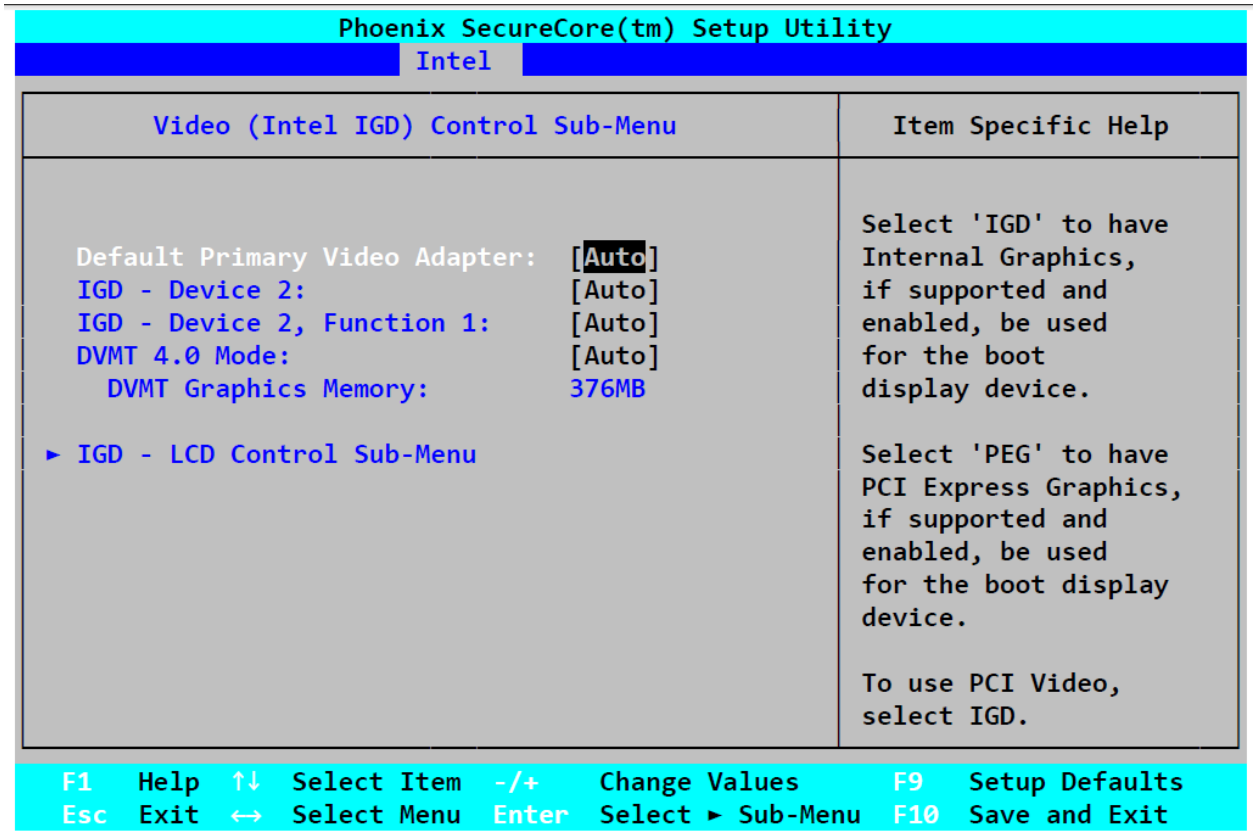
Set Max Ext CPUID = 3 – Setting the maximum value of microprocessor identifier (for supporting old operating systems)

7.4.2 Video (Intel IGD) Control Sub-Menu

Built-in video controller parameters control submenu.

The submenu screen is shown on the figure below.

Fig. 7-12: "Video (Intel IGD) Control Sub-Menu" submenu screen



Where:

Default Primary Video Adapter: selection of a primary video controller

[Auto] – automatic setting
[IGD] – built-in video controller
[PCI] – external PCI video controller

IGD - Device 2: controlling the built-in video controller

IGD - Device 2, Function 1: control of the LVDS output of the built-in video controller

DVMT 4.0 Mode: Dynamic video memory technology mode control

DVMT Graphics Memory: setting the memory volume allocated for the built-in video controller

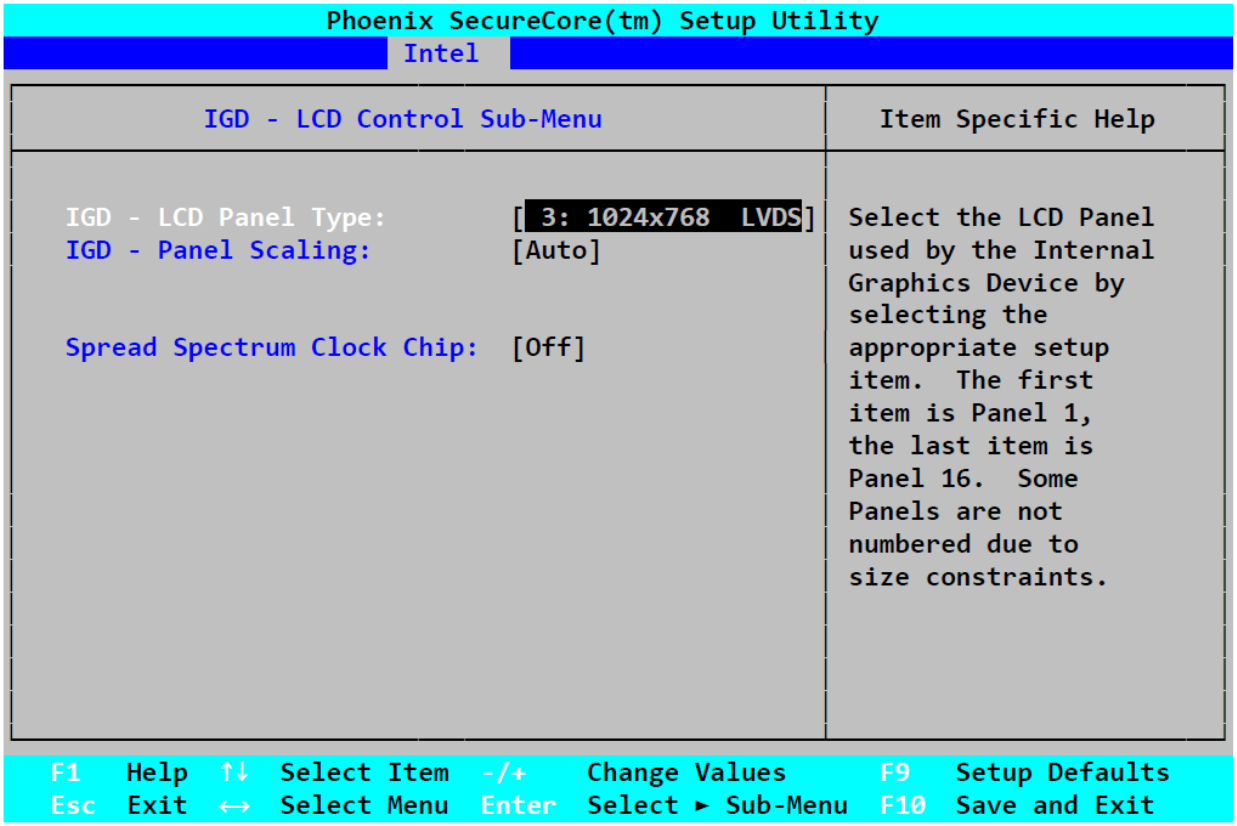
This submenu contains an additional submenu for setting parameters of the LCD, connected to the module via LVDS interface.

7.4.2.1 IGD – LCD Control Sub-Menu

Submenu for setting parameters of the LCD.

The submenu screen is shown on the figure below.

Fig. 7-13: "IGD – LCD Control Sub-Menu" submenu screen



Where:

IGD – LCD Control Sub-Menu: Choosing resolution of the connected LCD

IGD – Panel Scaling: control of the image scaling mode on the LCD

[Auto] – Automatic mode
[Force Scaling] – Force mode
[Off] – Scaling mode is off.

Spread Spectrum Clock Chip: control of the clock signal carrier modulation for LCD

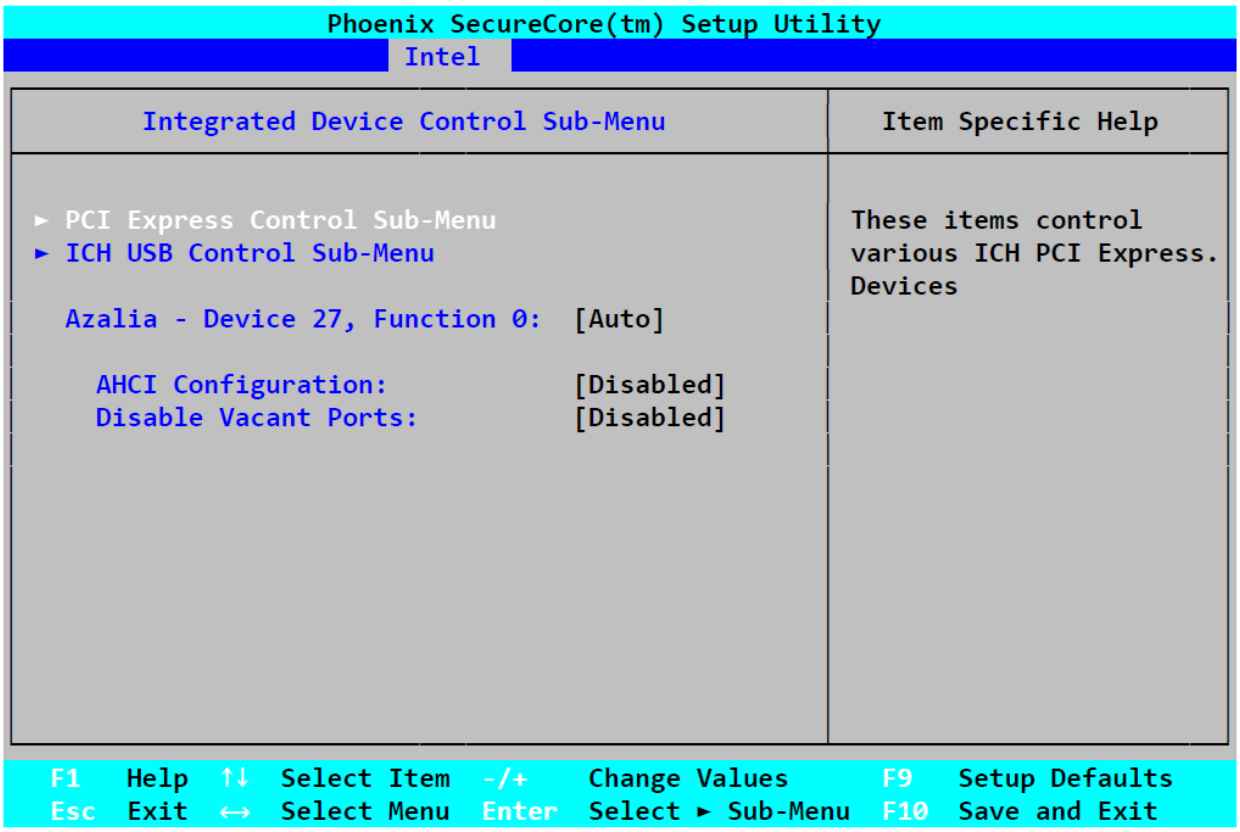
[Off] – Modulation is off
[Hardware] – Modulation control is carried out by hardware
[Software] – Modulation control is carried out by software (BIOS).

7.4.3 ICH Control Sub-Menu

The menu has a single submenu: “Integrated Device Control Sub-Menu” – used for controlling internal chipset controllers.

The submenu screen is shown on the figure below.

Fig. 7-14: "ICH Control SUB-Menu" submenu screen



Where:

PCI Express Control Sub-Menu: Control of PCI Express ports on module’s StackPC connector

Azalia - Device 27, Function 0: control of the "Azalia" built-in audio controller

AHCI Configuration: AHCI mode control for SATA devices

Disable Vacant Ports: control of vacant SATA ports automatic disabling.

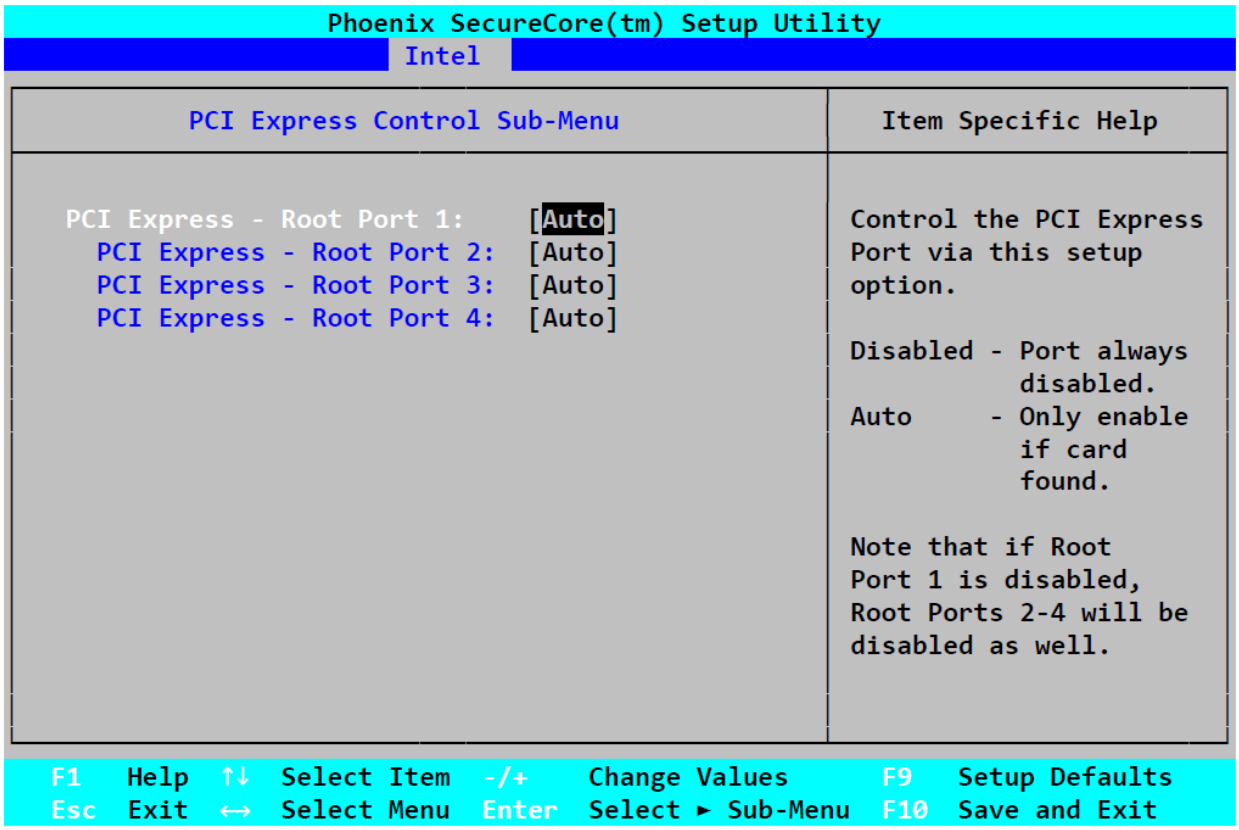
This submenu also contains several others.

7.4.3.1 PCI Express Control Sub-Menu

Submenu for controlling the PCI Express ports of the module.

The submenu screen is shown on the figure below.

Fig. 7- 15: "PCI Express Control SUB-Menu" submenu screen



Where:

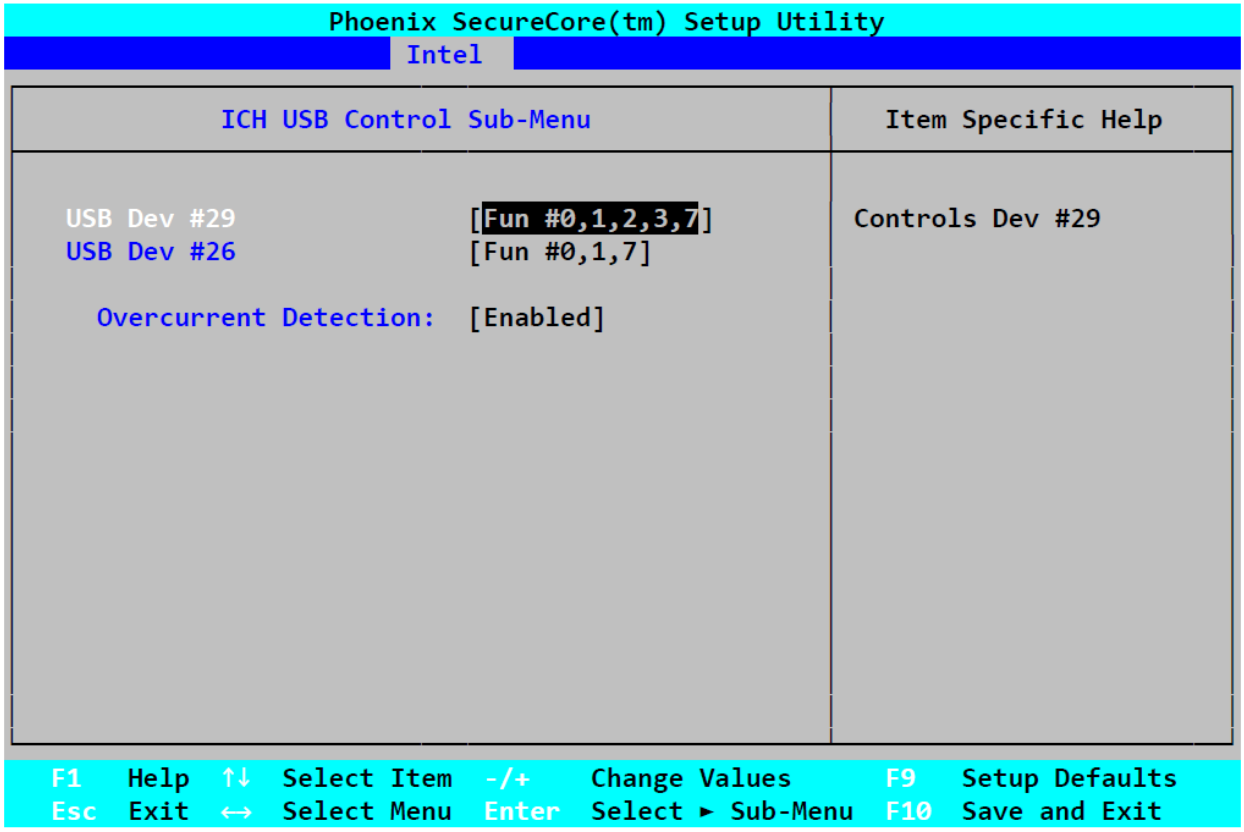
PCI Express – Root Port (1,2,3,4): Control of PCI Express port (port number corresponds to the stack slot number in StackPC)

7.4.3.2 ICH USB Control Sub-Menu

USB devices control submenu.

The submenu screen is shown on the figure below.

Fig. 7-16: "ICH USB Control Sub-Menu" submenu screen



Where:

USB Dev #29 , USB Dev #26: internal USB ports control

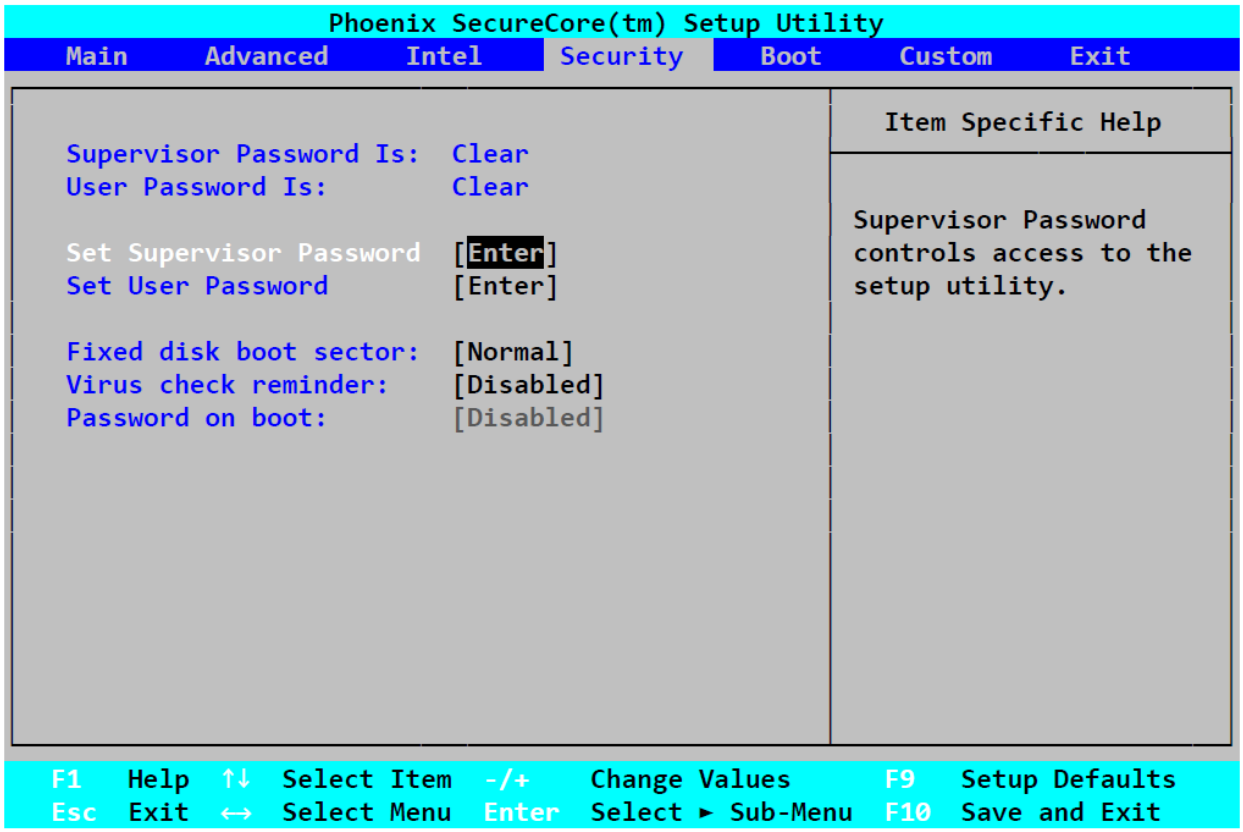
Overcurrent Detection: enabling interruption in case consumed current in one of the USB ports is exceeded

7.5 Security

This tab is intended for setting the module security functions.

The screen of this tab menu is shown on the figure below.

Fig. 7-17: "Security" Tab Menu Screen



Where:

Set Supervisor Password: setting BIOS Setup entry password

Set User Password: setting module start and BIOS Setup entry password

Fixed disk boot sector: write protection control for the hard disk boot sector

Virus check reminder: reminding the user about the necessity to check the system for viruses during the BIOS POST performance

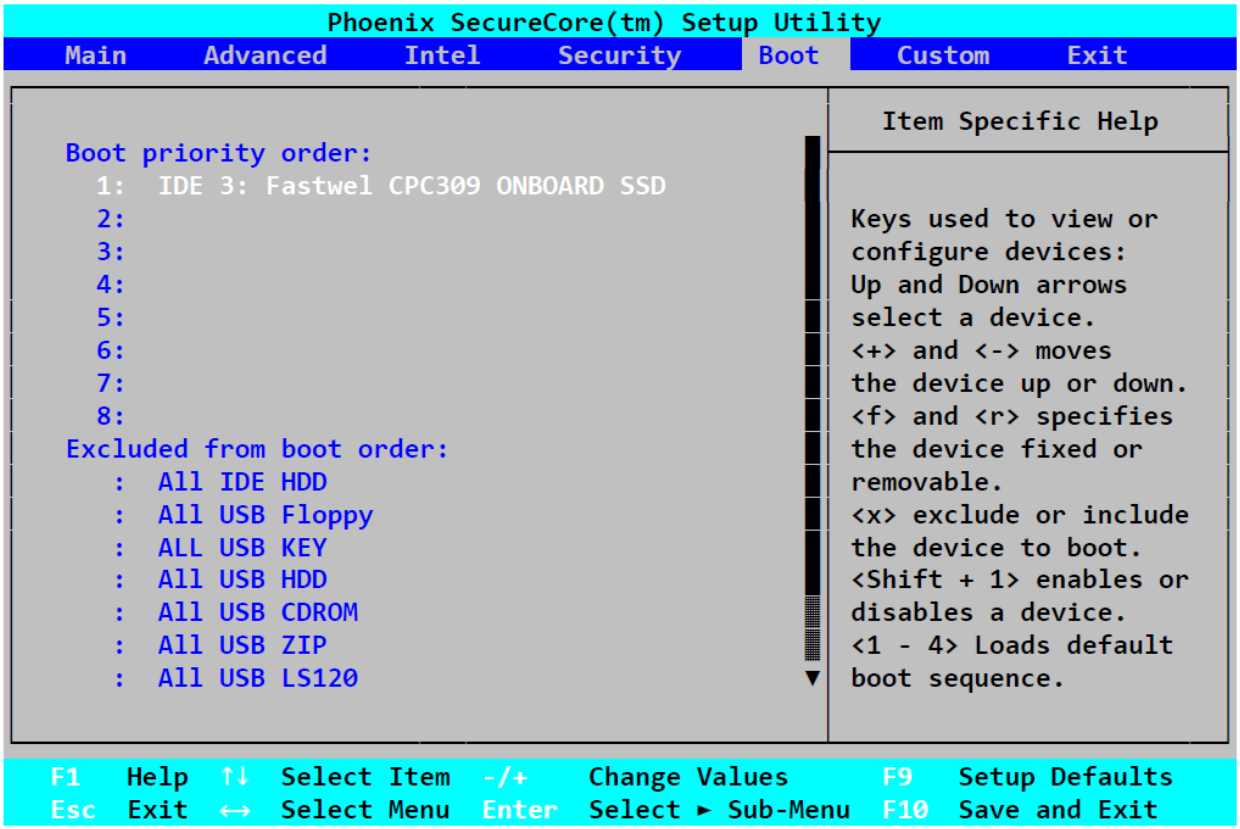
Password on boot: control of the password request during booting process (see **Set User Password**)

7.6 Boot

Tab for setting the module boot devices.

The screen of this tab menu is shown on the figure below.

Fig. 7-18: "Boot" Tab Menu Screen



Where:

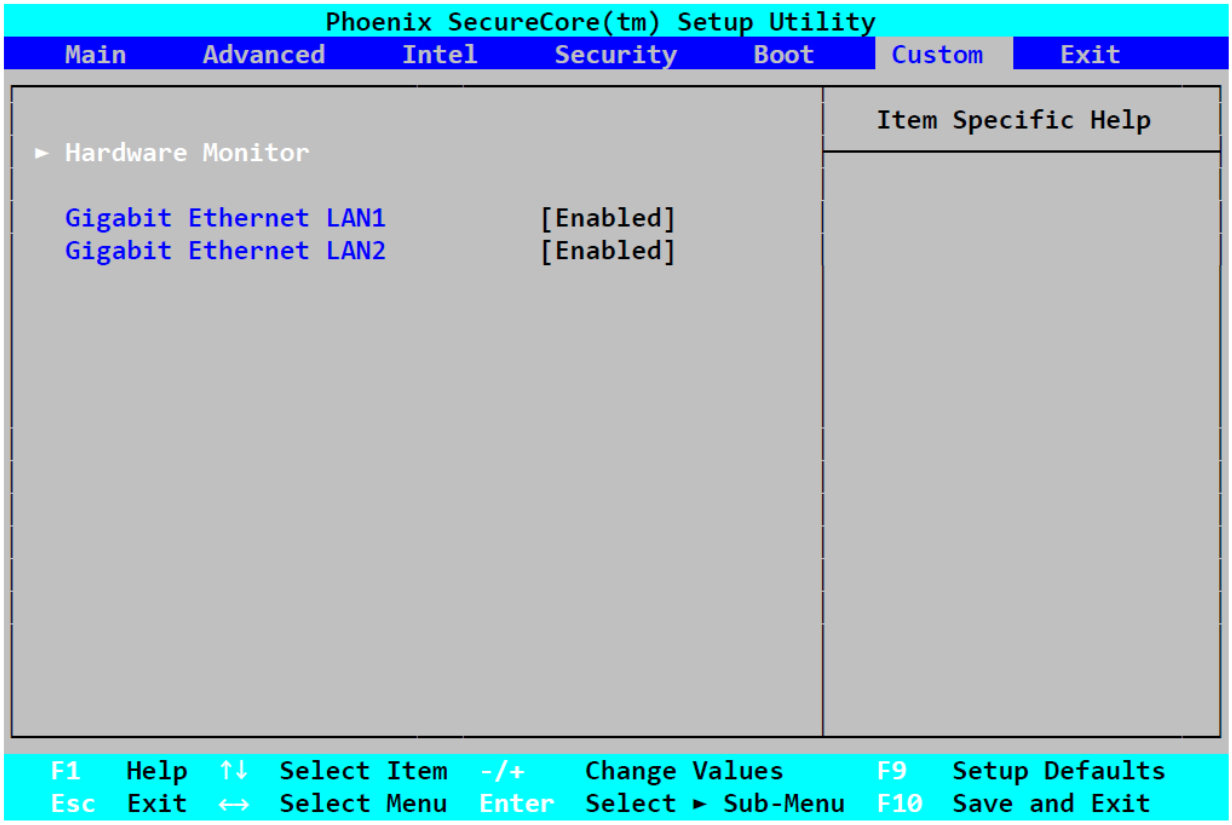
Boot priority order: setting the priority of module booting from the devices (choose the devices with arrow keys, navigate upward or downwards with "+" and "-" keys, select or deselect with "X" key).

7.7 Custom

Tab for custom module setting.

The screen of this tab menu is shown on the figure below.

Fig. 7-19: "Custom" Tab Menu Screen



Where:

Hardware Monitor: displaying the current hardware parameters

Gigabit Ethernet LAN1. LAN2: control of internal network controllers

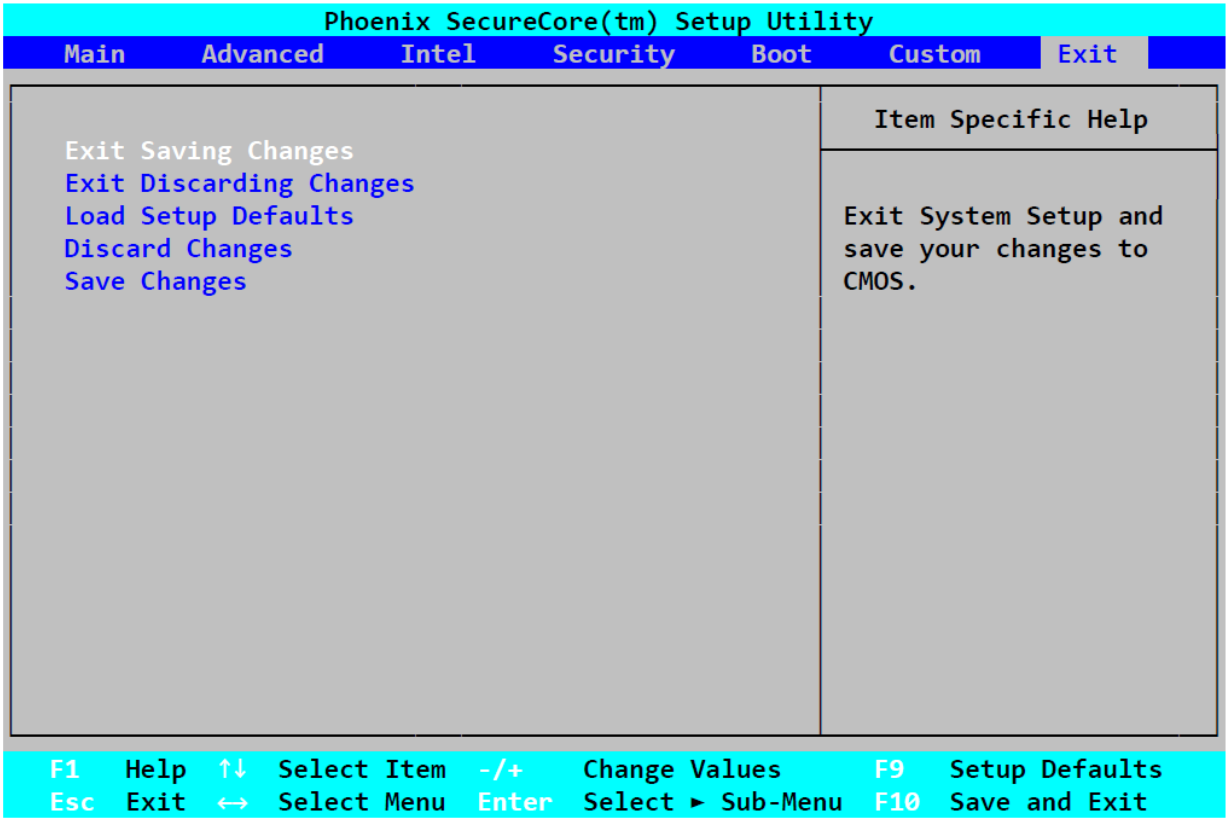
The "**Hardware Monitor**" submenu displaying the current hardware parameters is available in this menu as well.

7.8 Exit

The tab of BIOS Setup software exit parameters.

The screen of this tab menu is shown on the figure below.

Fig. 7-20: "Exit" Tab Menu Screen



Where:

Exit Saving Changes: exit from BIOS Setup with saving changes

Exit Discarding Changes: cancel changes and exit BIOS Setup

Load Setup Defaults: Load the default settings

Discard Changes: cancel the changes made after the BIOS Setup entry

Save Changes: Saving the changes.

Appendix A

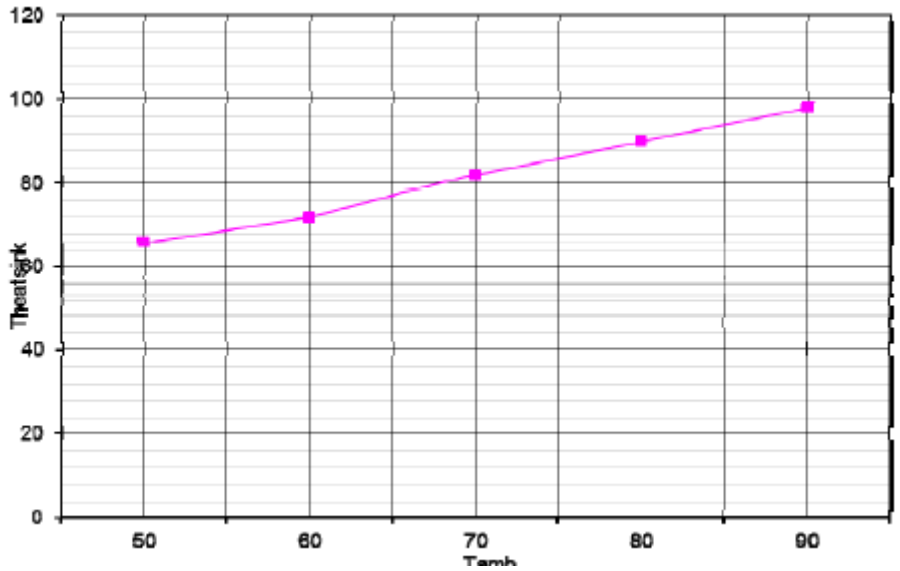
A Cooler Development Recommendations

This Appendix provides recommendations the user must take into account while developing his own cooling system. To enable the processor to work in the maximum capacity mode without switching to the reduced power consumption and temperature reduction mode, the heat-sink temperature should not exceed 85°C.

Therefore, if the cooler installed on the heat-sink supports temperature no higher than the specified threshold temperature values, CPU would operate in the maximum capacity mode.

The figure below shows a diagram of dependency of the heat-sink temperature from the ambient temperature when using a radiator (ACS00035-01 kit), see subsection 1.2.3 Additional Accessories.

Fig. A-1: Heat-sink temperature dependency from the ambient temperature when using a radiator (ACS00035-01 kit)



T heatsink – Heat sink temperature, °C;

Tamb - Ambient temperature, °C.