CPB909

CPU MODULE

User Manual

Revision 0.2

May 2017

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

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General Board Operation Rules

- To keep the warranty, the product should not be altered or revised in any way. Any alterations or improvements not authorized by Fastwel LLC, except for those specified in this document or obtained from the technical support department of Fastwel LLC as a set of instructions for their implementation, cancel the warranty.
- This device should be installed and connected only to the systems, meeting all the necessary technical and climatic requirements.
  This above is also true of the operating temperature range of a particular version of the board.
- While performing all the required operations for installation and adjustment, please follow the instructions specified only in this document.
- Keep the original package for subsequent storage of the device and transportation in the warranty event. If it is necessary to transport or store the board, please pack it the same way as it was packed upon delivery.
- Exercise special care when unpacking and handling the device. Act in accordance with the instructions given in the paragraph above.

TRANSPORTATION, UNPACKING AND STORAGE

Transportation

The module should be transported in a separate packaging box (transport packaging) of the manufacturing facility, which consists of 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 GOST standard 15150-69 (IEC 721-2-1 standard) or in storage conditions 3 during sea transportation.

It is possible to transport modules, packaged in individual antistatic packages, in multiple packaging (transport packaging) of the manufacturing facility.

The packaged modules should be transported in accordance with the shipping rules, operating with 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 packaged modules should be stored in a carrier vehicle in such a manner which will prevent their moving.

Unpacking

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

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

While unpacking, it is required to comply with all safety precautions, which ensure its safety, as well as marketable condition of consumer packaging of the manufacturing company.

At the time of unpacking it is required to check the module that it has no external mechanical damages after transportation.

Storage

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

MANUFACTURER'S WAARRANTY

Warranty Liabilities

- The Manufacturer hereby guarantees the product conformity with the requirements of the ТУ 4013-006-52415667-05 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 LLC is 36 months since the sale date (unless otherwise provided by the supply contract).

- The warranty period for the custom-made products is 60 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. Carefully package the product in the antistatic bag, in which the product had been supplied. Failure to package in antistatic material will VOID all warranties. Then package the product in a safe container for shipping.
4. The customer pays for shipping the product to Fastwel or to an official Fastwel representative or dealer

1 INTRODUCTION

1.1 Purpose

This User Manual (hereinafter referred to as the User Manual) is designed for providing you with valuable information on the device, principle of operation and other data, required for commissioning, intended use and maintenance of CPB909 CPU Module (hereinafter referred to as the “module”).

The module is 3.5” single-board computer and is designed for embedded applications that require high-performance and low power consumption.
Module contains: CFast connector, 2x Ethernet channels, 7x USB ports, 1x Serial ATA port, 8x serial ports, NAND Flash drive.
Extension of module’s functional capabilities is possible when connecting additional modules of StackPC, StackPC-PCI, PCI-104, PCIe/104, PCI/104- Express formats.
The module is supplied with the installed operating system (hereinafter referred to as the OS) FreeDOS 2) and is compatible with the following ones: QNX 6.5, Windows Embedded Standart 7, Linux 2.6.
The User Manual contains guidelines for proper and safe installation, module switching-in and configuring, connection and interaction with extension modules or external devices.
The manual also covers issues related to running, debussing and use of programs from among base and service software (hereinafter referred to as the ‘”software”).
For safe and proper operation of the module within the specified life period, it is necessary to previously read and understand the contents of this User Manual.

WARNING: USING THE MODULE WITHOUT OBSERVING SAFETY REQUIREMENTS, OPERATION AND APPLICATION NOTES IS NOT ALLOWED! 3)

ATTENTION: MODULE CONTAINS COMPONENTS, SENSITIVE TO ELECTROSTATIC DISCHARGE! 4)

PROHIBITED: TO OPERATE, MAINTAIN AND PERFORM REPAIRS OF THE MODULE BY PERSONS WHO LACK PROPER QUALIFICATION AND TRAINING! 5)

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2) If no particular OS pre-installation options have been ordered, see table 1-1 below.
3) From this point on in text, graphic character (safety sign as per the GOST R standard 12.4.026-2001) is used together with the warning term “WARNING” and warning text (as per the GOST standard T 2.601-2006).
4) From this point on in text, graphic character (safety sign as per the GOST R standard 12.4.026-2001) is used together with the warning term “ATTENTION” and warning text (as per the GOST standard 2.601-2006).

1.2 Versions, delivery checklist, ordering information

1.2.1 Versions, ordering information

Module versions and their ordering names (ordering information) are specified in the table and in the figure below:

Table 1-1: Ordering information

Name	Reference name	Ordering name	Note
CPB909 CPU Module	CPB909	CPB909-01[1)]	Intel Atom E3845 /4GB DDR3 RAM ECC/ 16GB NAND Flash/ CFast/ SATA/ Discrete IO/ 2x Ethernet/ 6x USB 2.0/ 1xUSB 3.0/ 4x RS232/ 4x RS422/485/ VGA/ DisplayPort/ 2xLVDS
		CPB909-02[2)]	Intel Atom E3825 /2GB DDR3 RAM ECC/ 4GB NAND Flash/ CFast/ SATA/ Discrete IO/ 2x Ethernet/ 6x USB 2.0/ 1xUSB 3.0/ 4x RS232/ 4x RS422/485/ VGA/ DisplayPort/ 2xLVDS
		CPB909-xx\Coated[3)]	Conformal coating option

[1)] Module contains a complete set of integrated interfaces and functional elements.
[2)] Module differs from CPB909-01 by the installed 2-core CPU Intel Atom E3825, RAM 2GB, and NAND Flash 4GB.
[3)] Where xx – module's version (01, 02).

1.2.2 Delivery checklist

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

Table 1-2: Delivery checklist

Ordering name	Decimal number	Description
CPB909-01, CPB909-02	IMES.467444.078, IMES.467444.078-01	CPB909 CPU Module
-	-	-
-	-	Packaging

1.2.3 Additional accessories

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

---

5) From this point on in text, graphic character (safety sign as per the GOST R standard 12.4.026-2001) is used together with a warning term "PROHIBITED" and warning text (as per the GOST standard 2.601-2006).

Table 1-3: Additional accessories

Ordering name	Description
ACS00031-01	Installation kit ACS00031-01. The kit contains JST PHR-5 socket and a set of contacts SPH-002T-P0.5S for connection to XP7, XP9, XP11, XP12 and XP14 (COM3 – COM6, Audio) of the module
ACS00031-02	Installation kit ACS00031-02. The kit contains JST PHR-6 socket and a set of contacts SPH-002T-P0.5S for connection to XP2 (KB/Mouse) of the module
ACS00031-03	Installation kit ACS00031-03. The kit contains JST PHR-2 and a set of contacts SPH-002T-P0.5S for connection to XP8, XP13, XP18 (Ext BAT, Mic In, Opto Reset) of the module
ACS00023-04	Cable adapter for connection to COM2 (DB9M – IDC10)
ACS00027-02	Cable adapter for connection of VGA display (DB15F – IDC10)
ACS00043	Cable adapter for connection of PS/2 keyboard and mouse

NOTE: ADDITIONAL ACCESSORIES FOR CONNECTION TO THE MODULE ARE NOT INCLUDED INTO THE SCOPE OF DELIVERY AND ARE OFFERED AS AN OPTION.

2 Specifications

2.1 Functional structure

The module's structure includes main functional elements:

• CPU: Intel Atom E3845[1] or Intel Atom E3825[2]:

– 4x 32-/64 -bit x86 cores (for E3845),

– 2x 32-/64-bit x86 cores (for E3825),

– 64-bit memory bus,

– L1 cache:– 32 KB for program area, 24 KB for data area),

– L2 cache: – 1 MB,

– SSE4.1, SSE4.2 support,

– Support of Intel SpeedStep;

• DDR3 SDRAM 1066 MHz with ECC (soldered on board) – 4 GB (for CPB909-01);

• DDR3 SDRAM 1066 MHz with ECC (soldered on board) – 2 GB (for CPB909-02);

• Flash BIOS:

– 64 Mb,

– Modifiable within the system;

• Interface SATA (switched to CFast connector), routed to StackPC connector:

– Support of SATA II specification;

• NAND Flash drive (soldered and connected to SATA interface) – 16 GB (for CPB909-01):

– Support of SATA II specification; I

• NAND Flash drive (soldered and connected to SATA interface) – 4 GB (for CPB909-02):

– Support of SATA II specification;

• Connector for CFast (switched to SATA interface):

– Support of SATA II specification;

• MicroSD drive (support of MicroSDHC, MicroSDXC);

• PCI bus:

– Support of v.3.0 specification,

– 32-bit/33MHz,

– Connection of up to 4x bus master devices;

• PCI-E bus:

– Support of v.2.0 specification,

– Connection of up to 5x devices in x1 mode (5Gb/sec),

– Support Mini PCI Express card;

• LPC bus:

---

1) Installed in CPB909-01

2) Installed in CPB909-02

– Support of v.1.1 specification;

• SMBUS:

– Support of v.2.0 specification,

– Rate of up to 100Kb/sec;

• Video controller:

– 2D/3D accelerator,

– VGA output (resolution of up to 2560x1600, 60Hz),

– DisplayPort (resolution of up to 2560x1600, 60Hz),

– 2x LVDS ports (one port is switched with DisplayPort interface), resolution up to 1920x1200, 60Hz, 18/24 bit;

• 2x Ethernet controllers 10/100/1000 Mb;

• USB ports:

– Connection of up to 7x devices,

– Support of USB 1.1 specification, USB 2.0, USB3.0 (one port),

– Support of OS booting from USB;

• Serial ports:

– COM1, COM2: RS 232, 9-wires (full), with possibility of console I/O, with data exchange rate of no more than – 115,2 Kb/sec,

– COM3 – COM6: RS 422/485, with galvanic isolation (breakdown voltage of 500 V), with data exchange rate of no more than – 921 Kb/sec,

– COM7, COM8 TTL UART (TX/RX/RTS) up to 3,6 Mb/sec;

• HD Audio controller:

– Linear stereo I/O,

– Input for MIC connection;

• PS/2 keyboard and mouse port;

• Digital I/O port:

– 16 separately programmed I/O lines;

• Opto-isolated input of external reset/interrupt:

– Insulation breakdown voltage – 500 V;

• Real-Time-Clock (RTC);

• Serial FRAM (for storing user configuration);

• Two watchdog timers (WDT):

– WDT1 – with fixed actuation interval – 1,6 sec,

– WDT2 – With programmed actuation interval – from 1 sec to 255 min.;

Module is software-compatible with OS: FreeDOS, QNX 6.5, Windows Embedded Standard 7, Linux 2.6.

2.2 Power supply

Module's power supply should correspond to the requirements, specified in the table below. The module can be fed with power via a power supply connector (XP6). Maximum consumption current value of the module is 3,9 A for CPB909-01 and 2,8 A for CPB909-02, without considering connected external devices.

Table 2-1: Requirements to power source parameters

Output voltage, V	Rated load current, A	Output voltage buildup time to the level of +4,75 V, ms
From +4,75 to +5,25	6	No more than 10

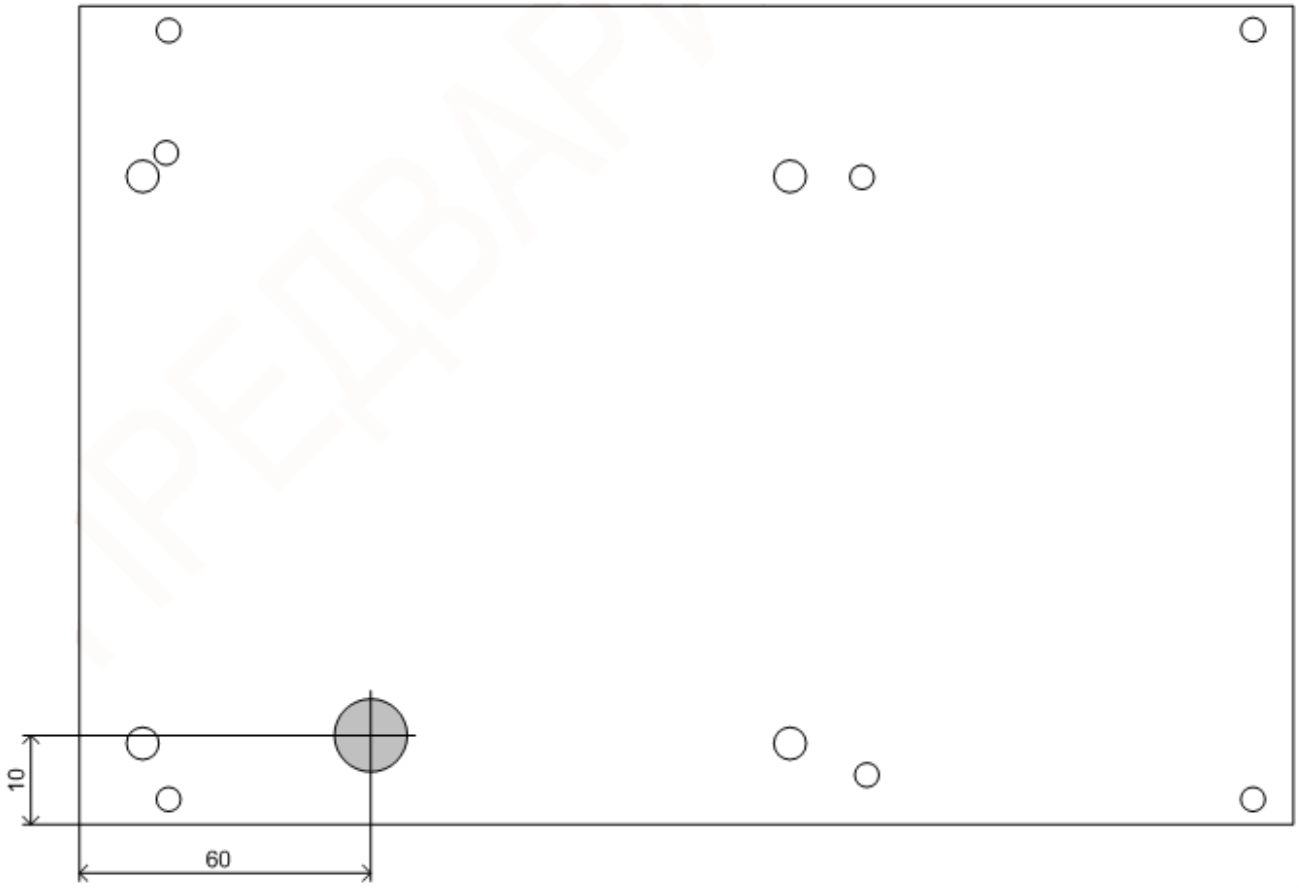
PROHIBITED: TO RESTART THE MODULE LESS THAN 5 SECONDS AFTER ITS SHUTDOWN.

2.3 Operation conditions

Module should be used under the following operation conditions:
– Operating temperature range – from - 40 to + 85 °C, in this case the temperature on the heat-spreader should not exceed the value of +90°C. The plate temperature is ensured by device form-factor, in which this module is used. Temperature control in this board is carried out at the point, specified in Figure 2-1.

– Modules are resistant to changes of ambient temperatures within the specified temperature range, with the relative humidity of up to 80% without condensation.

Fig. Ошибка! Текст указанного стиля в документе отсутствует.**-1: Location of the area for measuring of the heat-spreader temperature**



2.4 Mechanical features

The module corresponds to the following mechanical features:

– Vibration resistance, acceleration amplitude, no more than – 5g,

– Single shock resistance, peak acceleration is no more than – 100 g,

– Multiple shock resistance, peak acceleration is no more than – 50 g.

2.5 Module dimensions

Weight and size values for module's versions are specified in the table below:

Table 2-2: Weight and size of the module

Module	Weight in kg, no more than	Packed weight, in kg	Overall dimensions, in mm, no more than	Box overall dimensions, in mm
CPB909	0,5	-	113,2 x 149,7 x 28,6	230x155x45

General overall and connecting dimensions of the module are shown in figures below.

2.6 MTBF

MTBF value for this module: 130 000 hours

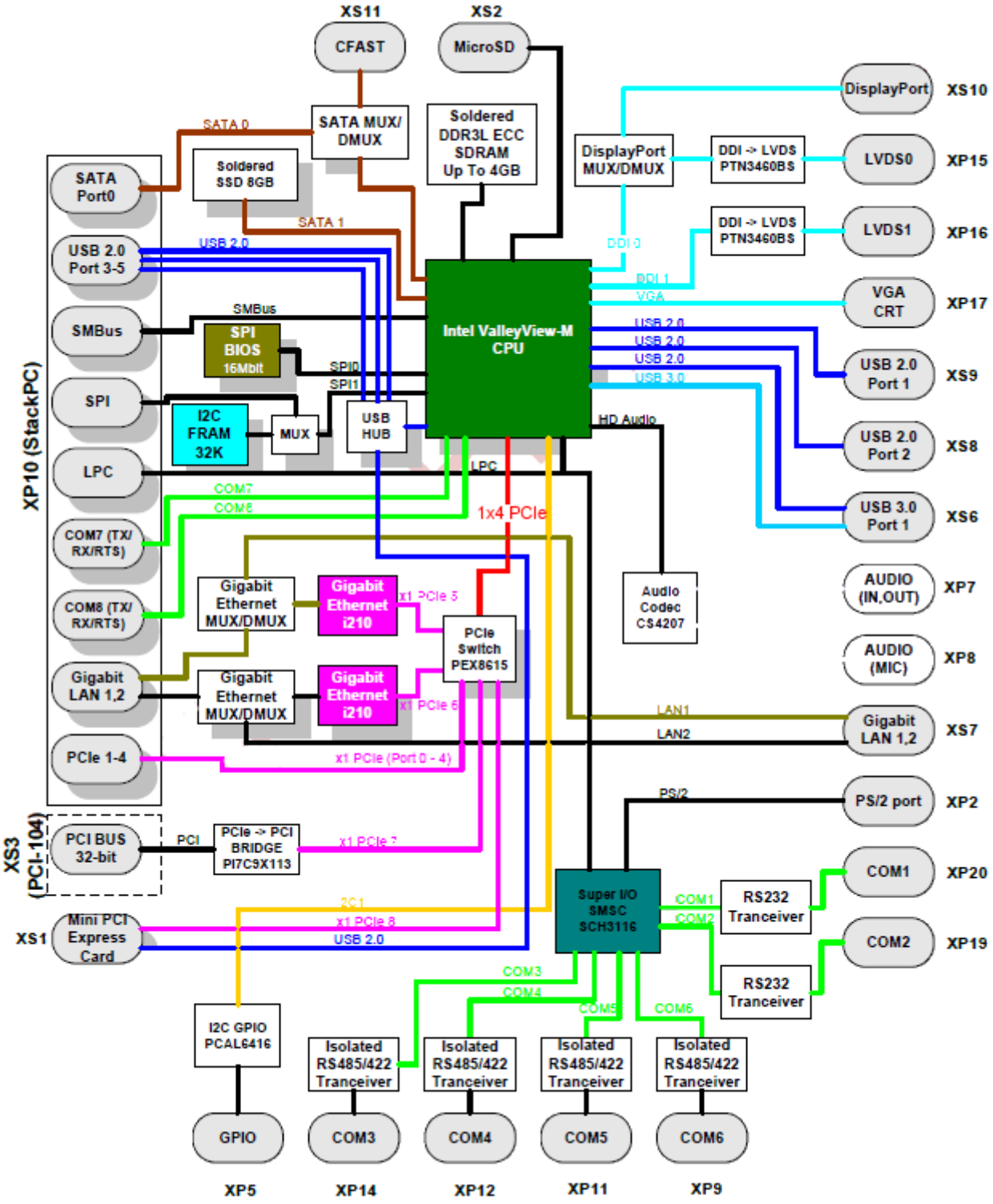
Note: THIS MTBF VALUE IS CALCULATED USING THE TELCORDIA ISSUE 1 MODEL, CALCULATION METHOD I CASE 3, DESIGNED FOR CONTINUOUS OPERATION IN CASE OF THE GROUND_BASED DEPLOYMENT UNDER THE CONDITIONS CORRESPONDING TO THE "MODERATELY COLD CLIMATE 4" IN ACCORDANCE WITH THE GOST STANDARD 15150-69, AT AMBIENT TEMPERATURE + 30 °C.

3 Structure and operation

3.1 Module's block diagram

Module's block diagram is shown in the figure below:

Fig. 3-1: Module block diagram



The module' block diagram shows main functional units:
– Intel Atom E3845 or Intel Atom E3825 CPU (depending on module's version);
– DDR3 SDRAM (up to 4 GB);
– Flash BIOS (64 Mb);
– NAND Flash drive (8 GB);
– VGA display port **(XP17)**;
– DisplayPort **(XS10)**;
– Connectors for TFT panels with LVDS interface **(XP15, XP16)**;
– Connector for CFast drive **(XS11)**;
– Connector for MicroSD drive **(XS2)**;
– Two Ethernet 10/100/1000 Mb channels **(XS7)**;
– 6x USB 2.0 ports **(XS9, XS8, XP10)**;
– 1x USB 3.0 port **(XS6)**;
– Serial ports COM1 (RS232) **(XP20)**, COM2 (RS 232) **(XP19),** COM3 (RS422/285) **(XP14)**, COM4 (RS 422/485) **(XP12)**, COM5 (RS422/285) **(XP11)**, COM6 (RS 422/485) **(XP9)**, COM7, COM8 (TTL UART) **(XP10)**;
–PS/2 keyboard/mouse port **(XP2)**;
– Digital I/O port **(XP5)**;
– HD audio controller with linear I/O and MIC connectors **(XP7 и XP8)**;
– StackPC connector **(XP10)**;
– PCI-104 connector PCI bus 32 bit 33 MHz **(XS3)**;
– Serial FRAM (for storing user configuration).

Technical features of main functional units of the module are specified in subsection 2.1 of this Manual.

3.2 Location of module's main components

Location of main components, their corresponding connectors, as well as commutator bars from the side of components (TOP) and from the assembly side (BOTTOM) of the module is shown in Fig. 3-2 and Fig. 3-3.
Location of jumpers in commutator bars of the module is also by default shown in Fig. 3-2, and information on installation of jumpers in module's commutator bars based on their functions is shown in Section 5 **CPB909 configuration**.

Fig. 3-2: Location of connectors and main components on the TOP side

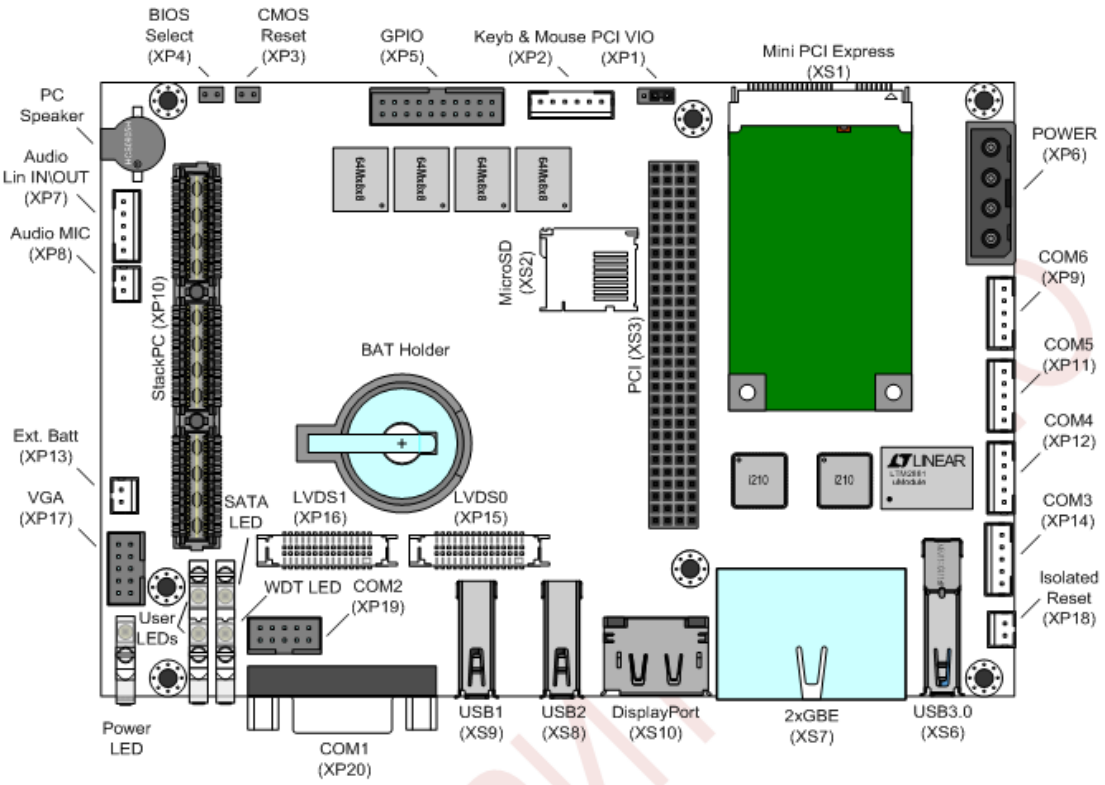
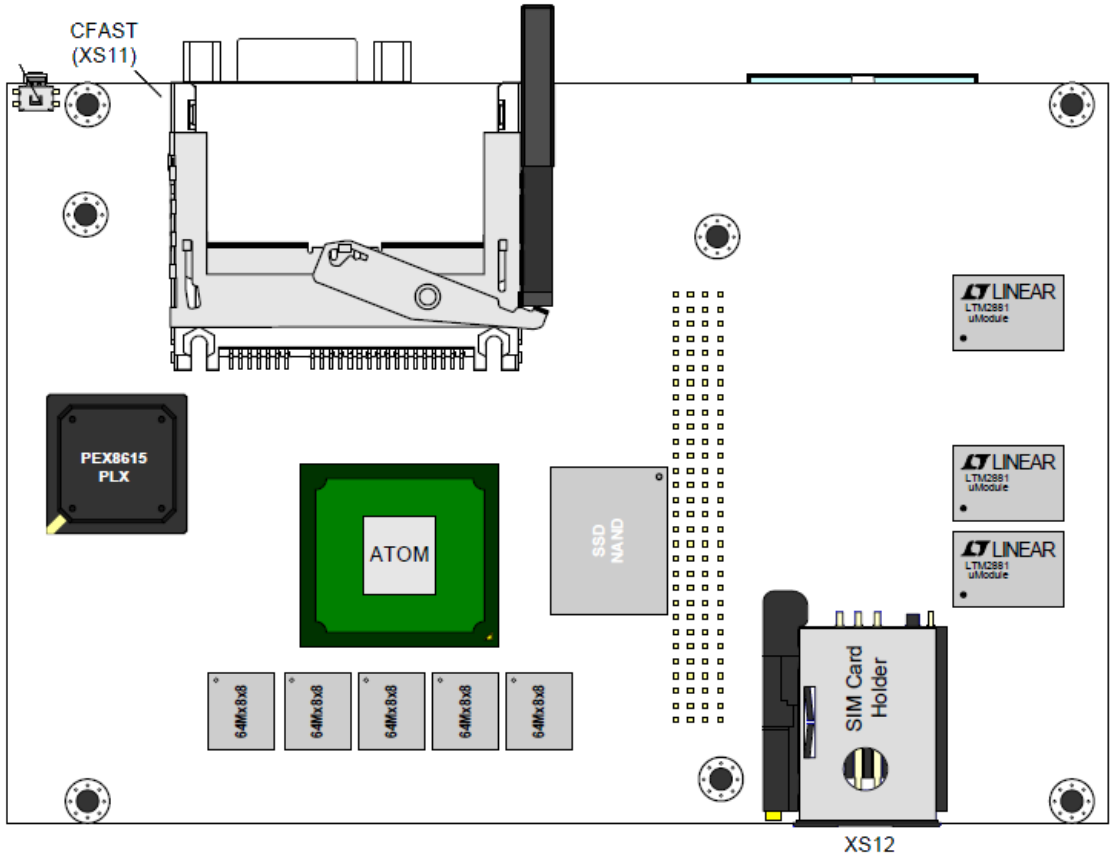


Fig. 3-3: Location of connectors and main components on the BOTTOM side



3.3 Aspects of functional units operation

- **Intel Atom E38xx**

32-bit Intel CPU: manufactured at 22 nm, with low power consumption (TDP <6 W for 2 core CPU and <10 W for 4 core CPU); industrial operating temperature range (-40 … +85ºC).

Represents a single-chip solution that combines up to 4x improved Intel Atom cores, 64-bit memory controller DDR3L SDRAM (up to 4 GB, 1066/1333) with ECC support, modern graphics system with 2D/3D acceleration Gen7 (video processor frequency up to 700 MHz), I/O subsystem (PCI-E, USB, SATA) and a standard hardware support of the platform (RTC, UART, Timers, GPIO etc.). Video coding hardware support (MPEG-2 / H.263 / H.264) as well as hardware acceleration of video decoding (H.264 / MPEG2 / MPEG4 / VC1 / WMV9) has been implemented in the CPU.

The CPU is implemented in the FCBGA-1170 enclosure, 25 x 27 mm, 0.6 mm ball pitch.

DDR3L SDRAM

9 DDR3L1066/1333 SDRAM with a total volume of up to 4 GB are installed (soldered) on the board. Operation mode – single-channel, with ECC support.

BIOS

For storing main (working) copy of BIOS, SPI-Flash 64 Mbit microchip is used. BIOS booting from LPC bus is supported (via StackPC connector).

RTC, CMOS

Real-Time Clock is integrated into the CPU. When the power is switched off, RTC operability is ensured by lithium battery, installed into the board. CMOS settings are stored in the SPI Flash non-volatile memory.

SPI FRAM

The module has the installed non-volatile memory 32 Kbyte (Ramtron, FM25V02), this memory can be used for storing user data.

PCI-E 2.0 ports

StackPC connector has 4x PCI-E Gen2 ports routed to it, with a bandwidth of up to 5Gb/sec. In addition, 1x PCI-E port is also routed to Mini PCI Express connector.

SATA ports

1x SATA port (this port is switched with the CFast drive connector) is routed to StackPC connector. SATA I, SATA II specifications (up to 3 Gbit/s) are supported.

NAND Flash Disk

The module is equipped with the installed NAND Flash Disk drive connected to SATA interface (SATA II is supported). Data transfer rate reached up to 116 MB/sec (read) and up to 70MB/sec. (write). This drive's volume depends on the module's version (16GB for CPB909-01, 4 GB for CPB909-02).

CFast

The module is equipped with the connector for CFast drive (SATA II is supported). This connector is switched with the SATA port, which is routed to StackPC connector.

USB 2.0 port

Module's connectors (Type A, StackPC, Mini PCI Express) have 6x USB 2.0 ports routed to them, equipped with the short-circuit protection.

USB 3.0 port

Type A connector has 1x USB 3.0 port (Super Speed) routed to it, which also supports USB 2.0 specification (High Speed).

Gbit Ethernet ports

The module is equipped with 2 Gbit Ethernet channels. It uses external controllers Gigabit Ethernet I210 connected both to the RG-45 connector and to the StackPC connector (switching is carried out in the BIOS SETUP).

COM1, COM2 ports

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

COM3 – COM6 ports

COM3-COM6 – galvanic isolated RS422/485, isolation voltage up to 500V.

Transmitter is controlled in automatic mode. Each port is routed to the straight 5-contact connector with a pitch of 2 mm. Matching resistors of interfaces (RS422/485) can be connected in BIOS SETUP.

COM7, COM8 ports

COM7/COM8 – 3-wire (TX/RX/RTS) RS232 interface (TTL level). Routed to the StackPC connector.

PS/2 Keyboard & Mouse

Designed for connection of PS/2-keyboard and mouse to the module, single-row straight 6-contact connector with a pitch of 2 mm is used.

Video ports

The ports are designed for the connection of analog or digital monitor with VGA or DisplayPort interfaces, as well as for the connection of matrix with LVDS interface. Two-monitor configurations are supported: clone/extended desktop..

Audio port

The support is implemented via Audio Codec HD Audio. The board has installed connectors with signals: linear input, linear output (5-contact connector with a pitch of 2 mm), as well as microphone input (2-contact connector with a pitch of 2 mm).

GPIO port (16x input/output channels)

I2C GPIO microchip is used, generation of event interrupts at input is supported.

Watchdog

The module has two watchdog timers, one (WDT1) of them is integrated into the supervisor's microchip and has a fixed actuation interval (1.6 sec), another one is integrated into the SIO microchip and has a programmable actuation interval (up to 255 min).

Indication

The module is equipped with LEDs for indication of module's operation mode (module is ON, SLEEP mode, StackPC error), indication of SATA drives activity, two controlled use LEDs, as well as LEDs for state indication and connection activity over LAN.

Reset and power supply monitoring

CPU reset signals is generated from the following sources:

From supervisor by switching on the power supply;

From the "Reset" button;

From watchdog timers;

From the external signal of isolated reset.

Switches (jumpers)

The module has switches of the following functionality:

Switch "PCI VIO Selector" (XP1);

Switch "CMOS Reset" (XP3);

Switch "BIOS select" (XP4).

3.4 Interfaces and connectors of module

3.4.1 StackPC-PCI connectors

The module is equipped with standard connectors of StackPC-PCI format, which are used for connecting CPB909 with such devices as analog-to-digital converters, digital I/O modules etc. According to StackPC specification (detailed description is given at: http://www.stackpc.org/), module of such a format includes StackPC and PCI-104 connectors, described below.

3.4.1.1 StackPC interface

Availability of StackPC connector makes it possible to connect additional extension modules to CPB909 (interfaces 4x1 PCI-E, 3xUSB, 1xSATA, 2xEthernet, SMBUS, SPI, LPC, 2xUART). Location of StackPC connector contacts is shown in Fig. 3-4. Purpose of the contacts is specified in Table 3-1.

Fig. 3-4: StackPC connector (XP10)

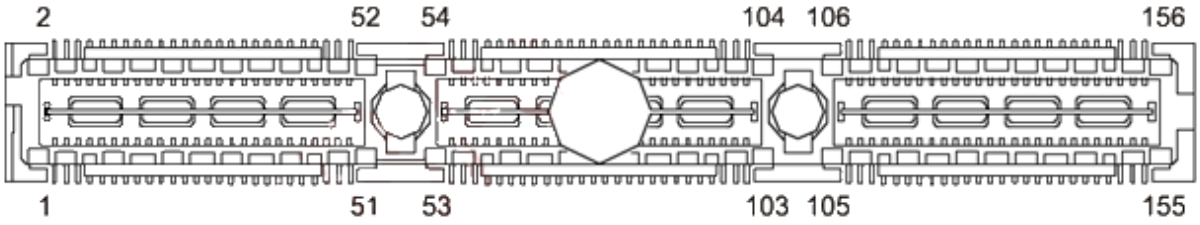


Table 3-1: Purpose of StackPC connector's contacts (XP10)

	Contact number	Signal		Signal	Contact number	
To the edge of the board	1	USB_OC#	+5 V	PE_RST#	2	To the center of the board
	3	3.3V*		3.3V*	4	
	5	USB_1p		USB_0p	6	
	7	USB_1n		USB_0n	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		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		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#	+5 V	ETH_0_LINK_ACT#	80
	81	SATA_T1p		SATA_T0p	82
	83	SATA_T1n		SATA_T0n	84
	85	GND		GND	86
	87	NC		USB2_3p	88
	89	NC		USB2_3n	90
	91	GND		GND	92
	93	NC		NC	94
	95	NC		NC	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	NC	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	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	COM4 (TX)	COM3 (TX)	140	
	141	COM4 (RX)	COM3 (RX)	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	COM4 (RTS)	COM3 (RTS)	156	
	*** Load current - no more than 500 mA**				

3.4.1.2 PCI-104 interface

PCI-104 interface uses 120-pin (30x4) XS3 connector, located on the upper part of the board. The connector serves for transferring all required signals of 32-bit PCI bus on a frequency of 33 MHz. 4 Bus Master devices are supported.
Layout of contacts of PCI-104 connector is shown in the figure below. Purpose of connector's contacts is specified in Table 3-2: Purpose of PCI-104 connector contacts (XS3).

Fig. 3-5: Contacts of PCI-104 connector (XS3)

Table 3-2: Purpose of PCI-104 connector contacts (XS3)

Contact	Signal	Contact	Signal	Contact	Signal	Contact	Signal
A1	GND	A16	AD21	B1	NC	B16	AD20
A2	VI/O	A17	NC	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	NC	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	NC	B26	CLK0
A12	NC	A27	CLK2	B12	TRDY#	D27	+5V
A13	FRAME#	A28	GND	B13	GND	B28	INTD#
A14	GND	A29	NC	B14	AD16	B29	INTA#
A15	AD18	A30	NC	B15	NC	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	NC
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	NC	D21	AD27
C7	GND	C22	GND	D7	AD12	D22	AD31
C8	AD15	C23	REQ1#	D8	NC	D23	VI/O
C9	NC	C24	+5V	D9	PAR	D24	GNT0#
C10	NC	C25	GNT2#	D10	PME#	D25	GND
C11	/LOCK	C26	GND	D11	GND	D26	CLK1
C12	GND	C27	CLK3	D12	DEVSEL#	D27	GND
C13	IRDY#	C28	+5V	D13	NC	D28	RST#
C14	NC	C29	INTB#	D14	C/BE2#	D29	INTC#
C15	AD17	C30	GNT3#	D15	GND	D30	GND
NC – not connected							

“PCI VIO” switch (XP1) is located in the upper part of the board (near XS3 connector, see Fig. 3-2: Location of connectors and main components on the TOP side) and serves for choosing power supply voltage of PCI interface’s buffers of StackPC-PCI, PCI-104, PCI\104-Express modules.

The following contacts states of XP1 switch are possible:

- Contacts 1-2 are locked – PCI bus signals levels: +5 V;
- Contacts 2-3 – PCI bus signals levels: +3.3 V.

The more detailed description of XP1 is given in subsection 5.1 Selecting power supply of the buffers on PCI bus of PC/104-Plus modules. Please note the following:

Note
Jumper from XP1 switch must be installed in position 1-2 or 2-3, see Fig. 5-1: State of contacts of PCI VIO switch (XP1).

3.4.2 Mini PCI Express connector

The module supports Mini PCI Express extension cards, for this purpose it has a relevant XS1 connector on it. The cards with both PCI Express and USB 2.0 interfaces are supported. The form-factor of the extension cards should correspond to the Full-Mini Card format, installation of cards in Half-Mini Card format is allowed using the special-purpose adapter in order to ensure that the card is properly fastened on the module. Location of Mini PCI Express connector contacts is shown in the figure below. Purpose of connector's contacts is shown in the Table 3 3: Purpose of Mini PCI Express connector contacts (XS1).

Fig. 3 6: Contacts of Mini PCI Express connector (XS1)

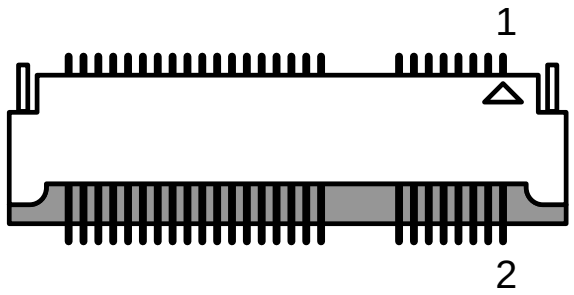


Table Ошибка! Текст указанного стиля в документе отсутствует.**-1: Purpose of Mini PCI Express connector contacts (XS1)**

Signal	Contact	Contact	Signal
WAKE#	1	2	+3.3V
NC	3	4	**GND**
NC	5	6	+1.5V
CLKREQ#	7	8	UIM_PWR
GND	9	10	UIM_DATA
PCIE_CLK_N	11	12	UIM_CLK
PCIE_CLK_P	13	14	UIM_RESET
GND	15	16	UIM_VPP
NC	17	18	**GND**
NC	19	20	WAN_DISABLE#
GND	21	22	PCIE_RESET#
PCIE_RX_N	23	24	+3.3V
PCIE_RX_P	25	26	**GND**
GND	27	28	+1.5V
GND	29	30	SMB_CLK
PCIE_TX_N	31	32	SMB_DATA
PCIE_TX_P	33	34	**GND**
GND	35	36	USB_DN
GND	37	38	USB_DP
+3.3V	39	40	**GND**
+3.3V	41	42	NC
GND	43	44	NC
NC	45	46	NC
NC	47	48	+1.5V
NC	49	50	**GND**
NC	51	52	+3.3V

In order to support card modems of GSM, 3G, LTE and other standards, the reverse side of the module (under XS1 Mini PCI Express connector) is equipped with a connector holder for SIM-cards (XS12).

3.4.3 Graphics controller

Intel Atom CPU is a highly integrated solution, combining the CPU core itself, as well as SDRAM/DDR3 controller and graphics adapter with 3D/2D acceleration.
Due to this controller, the module has a high-performance 2D/3D graphics processing. The embedded graphics controller allows a direct operation with both a standard analog monitor, connected via VGA (XP17) on the board, and a standard digital display, connected via DisplayPort (XS10) on the board. It is also possible to connect digital TFT panels via LVDS connectors. Support of two-display configurations is ensured: clone/extended desktop.

3.4.3.1 VGA CRT interface

For connection of the analog display to CPB909, the upper side of the board is equipped with 10-contact XP17 connector of IDC10 type with a pitch of 2 mm.

Fig. 3-7: VGA CRT connector (XP17)

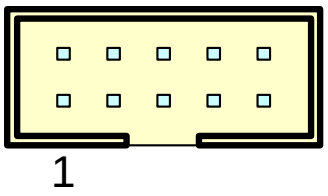


Table 3-4: Purpose of VGA connector contacts (XP17)

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

Display is connected using the ACS00027-02 accessory from the kit of additional accessories (see Table 1-3), or a proprietary manufactured cable. It is recommended to use 89947-710 LF (FCI) socket.

3.4.3.2 DisplayPort interface

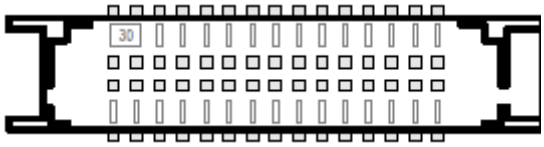
Table 3-5: Purpose of DisplayPort connector contacts (XS10)

Contact	Signal	Contact	Signal
1	LANE0_P	11	GND
2	GND	12	LANE3_N
3	LANE0_N	13	CONFIG1
4	LANE1_P	14	CONFIG2
5	GND	15	AUX_P
6	LANE1_N	16	GND
7	LANE2_P	17	AUX_N
8	GND	18	HOT_PLUG
9	LANE2_N	19	RETURN
10	LANE3_P	20	PWR

3.4.3.3LVDS interface

The top side of the board is equipped with 2x 30-contact connectors of LVDS interface designed for the connection of digital TFT-panels wire crimping with a contact pitch of 1.25 mm. Support of Single/Dual LVDS modes, 18/24 bit/pixel is ensured.

Fig. 3-8: LVDS connectors (XP15, XP16)



30-pin LVDS connector for digital TFT panel.

Table 3-6: Purpose of LVDS connector contacts (XP15, XP16)

Contact	Signal	Contact	Signal
1	BKLT_EN	16	O_TxOUT3+
2	BKLT_CTRL	17	DDC_DATA
3	SV_+3.3V	18	DDC_CLK
4	GND	19	E_TxOUT0-
5	O_TxCLK+	20	E_TxOUT0+
6	O_TxCLK-	21	E_TxOUT1-
7	SV_+3.3V	22	E_TxOUT1+
8	GND	23	E_TxOUT2-
9	O_TxOUT0-	24	E_TxOUT2+
10	O_TxOUT0+	25	E_TxOUT3-
11	O_TxOUT1-	26	E_TxOUT3+
12	O_TxOUT1+	27	+3.3V
13	O_TxOUT2-	28	GND
14	O_TxOUT2+	29	E_TxCLK+
15	O_TxOUT3-	30	E_TxCLK-

During cable manufacturing, it is recommended to use connector of DF13-30DS-1.25C (Hirose) type with DF13-2630SCF (Hirose) contacts.

3.4.4 Audio interface

The module is equipped two Audio-connectors for wire crimping (support is implemented via Audio Codec HD Audio):

- with linear input and linear output signals (5-contact connector with a pitch of 2 mm XP7);
- with microphone input signals (2-contact connector with a pitch of 2 mm XP8);

Fig. 3-9: Audio-connector XP7

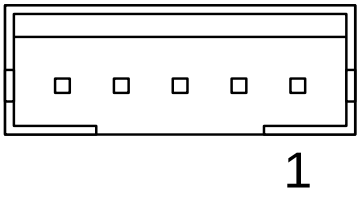
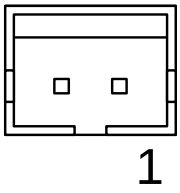


Fig. 3-10: Audio-connector XP8



The table below specifies the purpose of Audio-connector contacts.

Table 3-7: Purpose of Audio-connector contacts

Contact	Signal XP7 connector	Contact	Signal XP8 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 XP7 and XP8 it is recommended to use sockets of PHR-5 (JST) / PHR-2 (JST) type accordingly, for crimping wires with contacts SPH-002T-P0.5S (JST), or ACS00031-01 and ACS00031-03 accessories accordingly (see Table 1-3).

3.4.5 Serial interfaces

The module is equipped with eight serial ports: COM1 – COM8.

3.4.5.1 COM1 and COM2 ports

COM1 and COM2 ports are functioning in the full (9-wire) RS 232-interface mode and have basic addresses and interrupts standard for PC/AT. The ports can also be used for console I/O. In this case, a number of the used COM-port for the connection of a remote console to: COM1 (XP20), COM2 (XP19) is selected by means of the relevant adjustment made in the BIOS SETUP of the module.

Rate of data exchange for COM1 and COM2 ports is no more than – 115,2 Kb/sec. The ports are program-compatible with UART 16550 version.

COM1 port is routed to the 9-contact DSUB (XP20) connector, COM2 port is routed to the XP19 connector of IDC10 type (with a pitch of 2 mm). Purpose of XP20 and XP19 connector contacts for the connection to COM1, COM2 ports is specified in Table 3-8 and Table 3-9.

Figure 3-11: Connectors COM1/COM2 (XP20 and XP19)

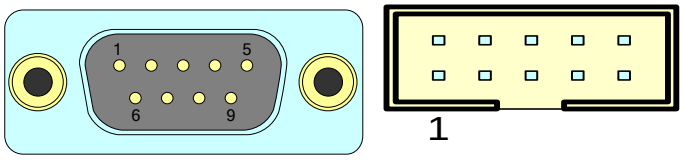


Table 3-8: Purpose of COM1 (XP20) connector contacts

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

Table 3-9: Purpose of COM2 (XP19) connector 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

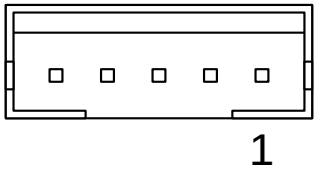
With XP19 (IDC10) connector, it is also recommended to use the accessory ACS00040-01 from among the additional accessories (see Table 1-3).

3.4.5.2 COM3 – COM6 ports

Serial ports: COM3 – COM6 are designed for operation in modes of RS 422/485 interfaces and ensure galvanic isolations (optoisolation with breakdown voltage of 500 V). The ports have addresses and interrupts standard for PC/AT. The data exchange rate is no more than 230 Kb/sec. In RS485 mode, control of the receivers is carried out automatically. Each port can operate either with a continuously switched-on receiver (ECHO mode), or with a receiver switched off at the time of data transfer.

Deactivation of the ECHO mode as well as control of connecting consistent resistors 120 Ohm (terminators) for each single port is carried out using the SETUP BIOS program.
Each port is routed to a direct 5-pin connector with a pitch of 2 mm.

Fig. 3-12: Connectors of COM3 – COM6 ports (XP14, XP12, XP11 и XP9)



The purpose of connectors' contacts is specified below.

Table 3-10: Purpose of contacts of COM3 and COM4 connectors (XP14, XP12, XP11 и XP9)

Contact	Signal	Contact	Signal
1	TX+	4	RX-
2	TX-	5	GND
3	RX+	-	-

Schematic diagrams, which clarify the structure of RS 422 and RS 485 interfaces, are shown in Fig. 3-13 and Fig. 3-14.

"Point-to-point" connection of two devices using RS 422 interfaces is shown in Fig. 3-13. Terminator is installed on receiver's side (along the RX+ and RX- lines). Combination of several devices using RS 485 interface is shown in Fig. 3-14. The terminator is installed only in the devices connected to line ends.

Fig. 3-13 Point-to-point connection of two devices using RS 422 interface

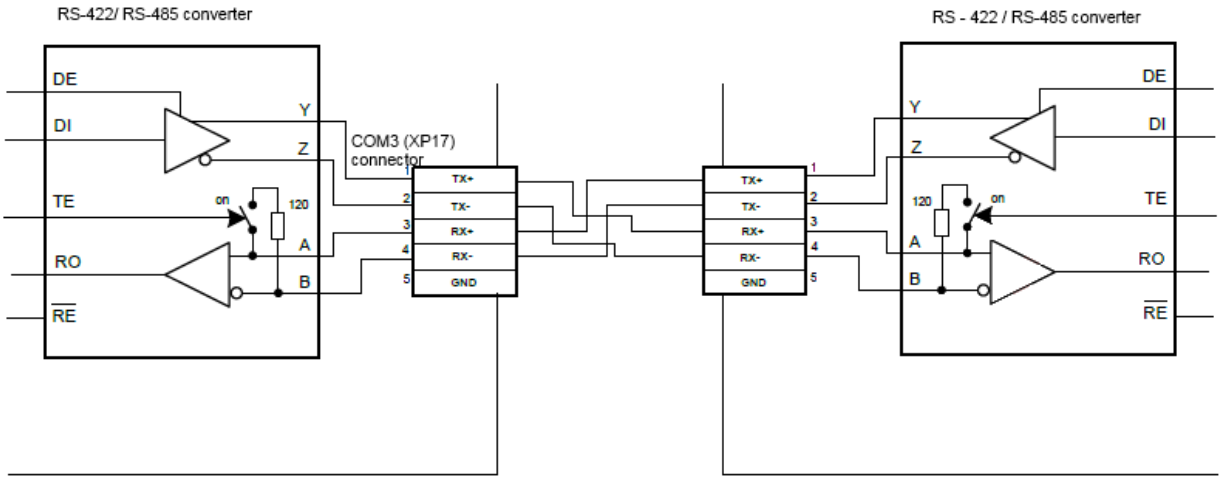
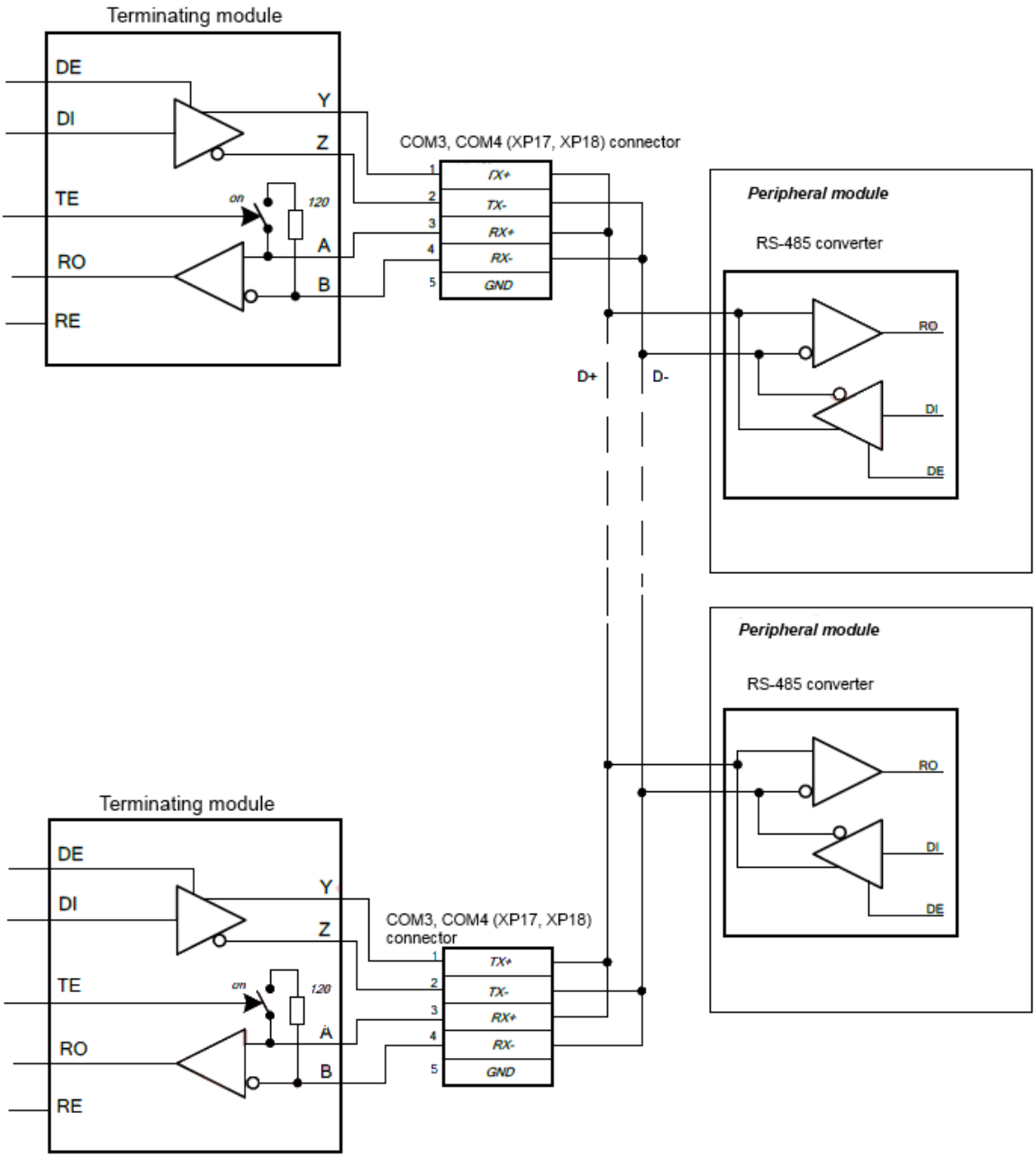


Fig. 3-14: Combining several devices via RS 485 interface



When manufacturing cable adapters for XP14, XP12, XP11 and XP9 connectors, it is recommended to use a socket of PHR-5 (JST) type for crimping wires with SPH-002T-P0.5S (JST) contacts, or ACS00031-01 accessory (see Table 1-3).

3.4.6 COM7 and COM8 ports

COM7 and COM8 ports have 3 signal interfaces UART: RX, TX, RTS with a logic level of TTL 3.3V.
Maximum data exchange rate is up to 3.6 Mb/sec. The ports are software compatible with UART 16550.

3.4.7 USB interfaces

The module is equipped with 6x USB 2.0 channels and 1x USB 3.0 channel. 3 channels are routed to the StackPC connector (see Table 3 1), 2 channels are routed to standard Type A connectors (XS8 and XS9), one channel is routed for support of Mini PCI Express modules. USB 3.0 channel is routed to a standard Type A connector (XS6), corresponding to USB 3.0 specification. All the channels support booting OS from a USB carrier.
The tables below demonstrate the purpose of USB connectors contacts.

Table 3-11: Purpose of USB1, USB2 (XS9, XS8) connectors contacts

Contact	Signal	Contact	Signal
1	USB1_+5V	6	USB2_DAT_P
2	USB2_+5V	7	USB1_GND
3	USB1_DAT_N	8	USB2_GND
4	USB2_DAT_N	9	–
5	USB1_DAT_P	10	–

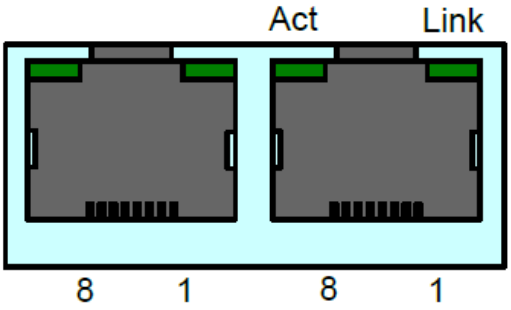
Table 3-12: Purpose of USB3.0 (XS6) connectors contacts

Contact	Signal	Contact	Signal
1	+5V	6	SSRX_P
2	DAT_N	7	GND
3	DAT_P	8	SSTX_N
4	GND	9	SSTX_P
5	SSRX_N	10	–

3.4.6 Gigabit Ethernet interface

The module has two ports 10Base-T/100Base-TX/1000Base-T Ethernet, based on Intel® Ethernet Controllers i210. Architecture of the controllers is optimized for reaching high performance at minimum power consumption. Controllers connected to the systems using high performance PCI-E bus. Intel® i210 architecture includes independent send/receive queues for limiting traffic over PCI E bus, as well as PCI-E interface, which maximizes the use of packages for efficient bus load.
Interfaces are routed to a standard double RJ-45 (XS7) connector, as well as can be switched to StackPC connector (XP10).

Fig. 3-15: Gigabit Ethernet connector (XS7)



Interfaces ensure automatic determination of exchange rate and switching among the data transfer modes 10Base-T, 100Base-TX and 1000Base-T. Using the BIOS adjustment program or user program, each of the two Ethernet channels can be switched off independently in order to release system resources.

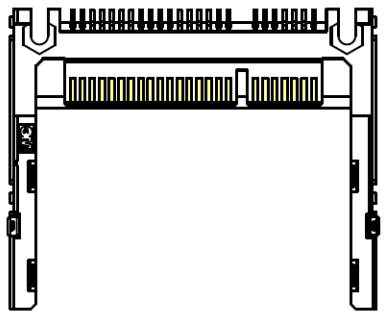
Table 3-13: Purpose of contacts of Gigabit Ethernet connector (XS7)

Contact	Signal	
	1GB	10/100 Mb
1	BI_DA_P	TX_D_P
2	BI_DA_N	TX_D_N
3	BI_DB_P	RX_D_P
4	BI_DC_P	-
5	BI_DC_N	-
6	BI_DB_N	RX_D_N
7	BI_DD_P	-
8	BI_DD_N	-

3.4.9 CFast connector

The flash memory card is a compact removable device designed for storing information. For using the memory cards as disc storage units, the lower part of CPB909 is equipped with a CFast pin connector (XS11):

Fig. 3-16: CFast XS11 connector



Attention!

When using the module in harsh environments, additional measures for fixing CFast device in the connector are required!

Purpose of CompactFlash connector's contacts is specified in the table below.

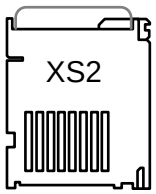
Table 3-14: Purpose of CFast connector's contacts (XS11)

Contact	Signal	Contact	Signal
P1	CDI	S1	GND
P2	GND	S2	B_P
P3	NC	S3	B_N
P4	NC	S4	GND
P5	NC	S5	A_N
P6	NC	S6	A_P
P7	GND	S7	GND
P8	LED	-	-
P9	LED	-	-
P10	IO	-	-
P11	IO	-	-
P12	IO	-	-
P13	+3.3 V	-	-
P14	+3.3 V	-	-
P15	GND	-	-
P16	GND	-	-
P17	CDO	-	-

3.4.10 MicroSD connector

The MicroSD flash memory card is a compact removable device for storing information. In order to use the memory card as a disk drive, the top side of the board is equipped with MicroSD (XS2) connector. The external view of the connector with the installed memory card is shown below:

Fig. 3 17: MicroSD XS2 connector



3.4.11 PS/2 keyboard/mouse interface

In the module, PS/2 keyboard and PS/2 mouse ports are combined in a single connector and ensure possibility of connecting input devices: PS/2 keyboard and PS/2 mouse. In terms ode design, PS/2 keyboard and mouse port represents 6-output single row connector with a pitch of 2 mm for crimping (XP2). For connection to PS/2 keyboard to the module, use of ACS00043 cable adapter (included into additional kit) is recommended, if PS/2 mouse connection is also required we recommend using ACS00043 together with Y-cable (offered as an option).

When a proprietary made cable is used, we recommend either use PHR-6 (JST) socket for crimping the wires with contacts SPH-002T-P0.5S (JST), or ACS00031-02 accessory (see Table 1-3).

Fig. 3-18: PS/2 connector (XP2)

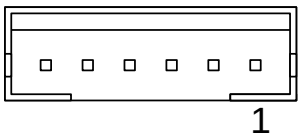


Table 3-15: Purpose of PS/2 connector contacts (XP15)

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

Note
Keyboard/mouse power supply source is protected with a fuse of 500 mA. All signals lines have electromagnetic filtration.

3.4.12 Power supply connector

Module's power supply should comply with the requirements specified in Table 2-1.
The power supply is carried out via power supply connector (XP6)

Fig. 3-19: XP6 power supply connector

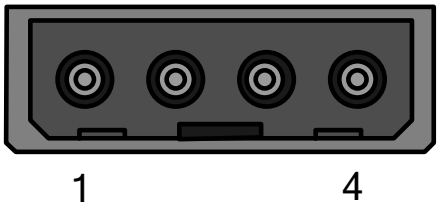


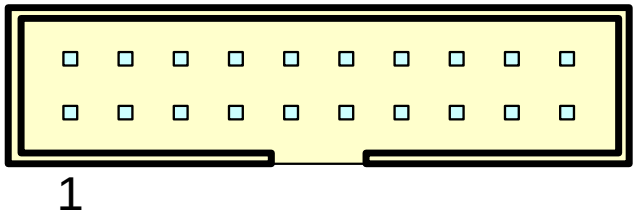
Table 3-16: Purpose of XP25 power connector's contacts

Contact	Signal
1	NC
2	GND
3	GND
4	+5V

3.4.13 Digital I/O port

The digital I/O port has 16 separately programmed I/O lines. In the output mode, each line can be programmed either to the “Push-pull” or “Open Drain” mode.
Digital I/O port is routed to XP5 connector of IDC20 type (with a pitch of 2 mm) in the upper part of the board.

Fig. 3-20: Connector of XP5 digital I/O port



Purpose of the digital I/O port connector is specified in the table below.

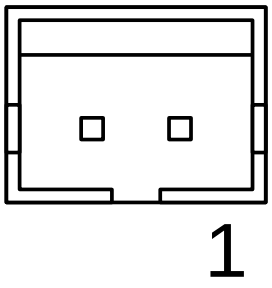
Table 3-17: Purpose of contacts of XP5 digital I/O port connector

Contact	Signal	Contact	Signal
1	IO_0	11	IO_10
2	IO_1	12	IO_11
3	IO_2	13	IO_12
4	IO_3	14	IO_13
5	IO_4	15	IO_14
6	IO_5	16	IO_15
7	IO_6	17	+3.3V
8	IO_7	18	+3.3V
9	IO_8	19	GND
10	IO_9	20	GND

3.4.14 Optoisolated external reset input

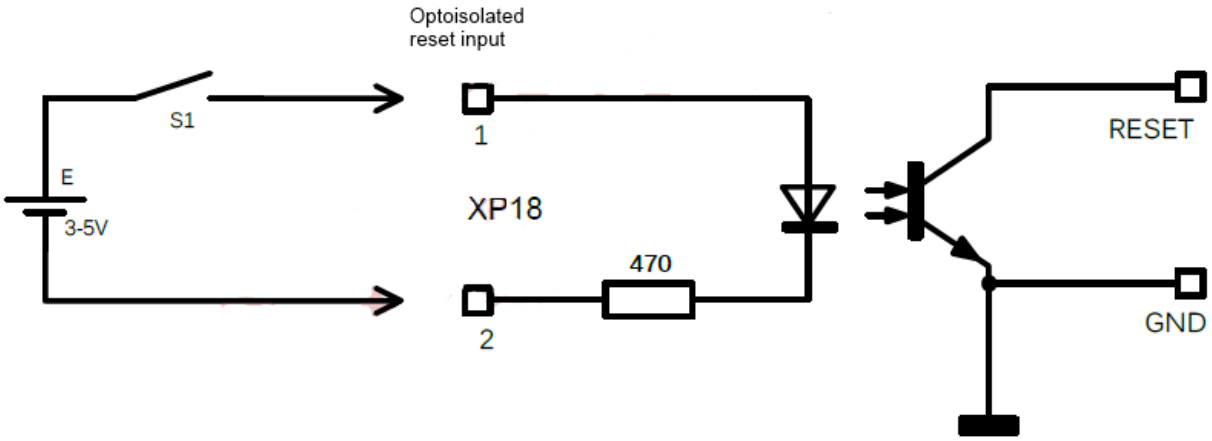
Module's optoisolated digital input is routed to a separated connector, designed for the connection of remote (external) RESET devices and ensures galvanic isolation (optoisolation with a breakdown voltage of 500 V) when connecting relevant devices to the module.
In terms of its design, the optoisolated digital input represents Isolated Reset (XP18) two-pin plug with a pitch of 2 mm.

Fig. 3-21: Optoisolated external reset input XP18



A fragment of a schematic diagram for implementation of module's digital input optical isolation is shown in the figure below:

Fig. 3-22: Diagram for implementation of module's digital input optical isolation



When manufacturing the cable, it is recommended to use PHR-2 socket (JST) for crimping the wires with SPH-002T-P0.5S (JST) contacts, or ACS00031-03 accessory (see Table 1-3).

3.5 LEDs

CPB909 is equipped with 5 LED indicators. Their functional purpose is specified in the table below. Two software-controlled LEDs are designed for user needs.

Fig. 3-23: Location of LEDs on CPB909

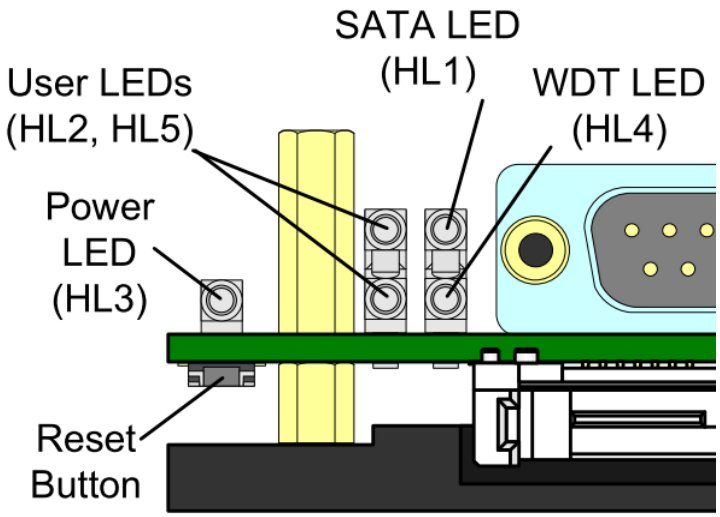


Table 3-18: Purpose of LEDs

Name	Purpose	Functions
HL3 (green, red, orange)	Power supply LED	Green – power supply is activated Red – error of StackPC stack Orange – module is in sleep mode
HL1 (red)	LED of SATA drives activity	
HL4 (yellow)	LED for operation of one of watchdog timers	Watchdog timer actuation
HL5 green	User LEDs	
HL2 yellow		

3.6 Watchdog timers

In CPB909 there are two watchdog timers, one (WDT1) is integrated into supervisor's microchip and has a fixed actuation interval (1.6 sec), the other one is integrated into SIO microchip and has a programmed actuation interval (from 1 sec to 255 min).

3.7 Module address space

3.7.1 Allocation of memory address space

Allocation of memory address space is given in the table below:

Table Ошибка! Текст указанного стиля в документе отсутствует.**-2: Allocation of memory address space**

Range of addresses	Size	Description
00000h – 9FFFFh	640 KB	Main 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 Allocation of module's I/O address space

Allocation of module's I/O address space is given in the table below:

Table Ошибка! Текст указанного стиля в документе отсутствует.**-3: Allocation 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 the external LPC bus	
0210h – 02EFh	Reserved	
02E8h – 02EFh	COM4	
02F0h – 02F7h	Reserved	
02F8h – 02FFh	COM2	

Range of addresses	Function	Note
0300h – 031Fh	Access to the external LPC bus	
0320h – 0377h	Reserved	
0378h – 037Fh	Access to the external LPC bus	
03B0h – 03DFh	VIDEO	
03E0h – 03E7h	Reserved	
03E8h – 03EFh	COM3	
03F0h – 03F7h	Access to the external LPC bus	
03F8h – 03FFh	COM1	
0400h – 04FFh	Reserved	
0500h – 057Fh	Super IO Runtime registers	
0580h – 0FFFh	Reserved	

4 Installation of CPB909

You should strictly observe the below rules, warnings and procedures in order to properly install the module, avoid damages to the device, system components as well as injuries of the staff.

Installation procedure of the drivers of all the peripheral devices mounted to the module, is given in the descriptions, provided with these drivers. This User Manual also has no description of the procedure of operating systems installation. Please see the documentation attached to the operating system.

4.1. Safety requirements

When handling the CPB909 board, you should strictly follow the below safety requirements. Fastwel Group is not responsible for any damages occurred as the result of these requirements.

Careful!

Be careful when handling the module, since the heat-spreading plate becomes too hot. Do not touch it during module's installation or removal.

In addition, the module should not be placed on any surface or in any container until temperature of the both module and plate will go down to the ambient temperature.

Attention!

Always turn off the power supply of the system before connection and disconnection of the power supply cable. Violation of this rule can pose a threat to your life and health, as well lead to system and module damages.

Electrostatic Sensitive Device (ESD)!

The module contains elements, sensitive to the effects of electrostatic charges. In order to prevent module damages, the following safety precautions should be observed:

- Before touching the module, remove the static charge from your clothes as well as remove the charge from the tools prior to the use.
- Do not touch the electronic components and contact connectors.
- Disconnect the power supply cable prior to the installation/ removal of extension modules.

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

4.2 Heat removal

The module is equipped with a heat-spreading plate, which removes heat from the CPU and microchip of PCI-Express bridge. Under conditions of module's operation at elevated ambient temperatures, temperature on the heat-spreading plate could reach 90°C and more. In order to prevent this, it is required to remove heat from the plate by device's external cooling system where this module is used.

The Annex A contains technical recommendations, which should be considered during the development of the proprietary cooling system. The temperature should be controlled using the temperature-sensing element.

There are two options of heat removal from heat-spreading plate:

1. Heat removal using the air-cooler installed on the plate and fastened by six M4 screws. In this case it is recommended to use thermal grease. The module itself with its racks is fastened by seven M3 screws to unit's structure, where this module should be installed.
2. Heat removal using the device's enclosure, where module is installed (the enclosure fulfils the function of the large heatsink). In this case the module is fastened to the enclosure of the heat-spreading plate using six M4 screws.

4.3 Module installation procedure

In order to install the module into the system, please follow the below operational procedure:

1. Please make sure that safety requirements have been observed listed in section 0.

Attention!

Non-compliance with this instruction could result in module's damages and improper system operation.

2. Prior to installation please make sure that the module is configured in accordance with Section **Ошибка! Источник ссылки не найден.**. Information on installation of peripheral devices, extension modules and I/O devices is given in the relevant paragraphs of Section **Ошибка! Источник ссылки не найден.** of this User Manual.

3. To install the module, the following actions should be performed:

   Prior to installation please make sure that the system power supply is off.

   Depending on the application, system configuration, temperature requirements install the module according to the fastening methods described in Section **Ошибка! Источник ссылки не найден.**.

   Ensure conditions for sufficient air cooling.

   Connect the required external interface cables and power cable to module's connectors. Please make sure that the module and all the cables are properly fixed.

Now the module is ready for operation. Use the documentation for programs, devices and to the system in general to know what to do next.

Attention!

Improper power-on could damage the module.

Attention!

When the module is installed inside a sealed enclosure it is especially important to ensure minimum heat resistance between the module's heat-spreading plate and heat-removal wall of the enclosure. This will prevent system components inside the enclosure from excessive heating.

4.4 Module removal procedure

In order to remove the module, the following operations should be performed:

1. Make sure that all safety precautions listed in Section 0 have been complied with. Particular attention should be given to the warning related to temperature of the heatsink!
2. Prior to operations please make sure that the system power supply is off.
3. Disconnect all the interface cables from the module.
4. Remove the fastening screws. Do not touch the heatsink, since it could get too hot during operation.
5. Handle the module as you think fit. Do not put it in a box or container till the module and container reach ambient temperature.

4.5 Installation of peripheral devices

The module enables to connect a large amount of various peripheral devices to it, which installation methods can differ sufficiently. Therefore, in further sections there are general instructions for installation instead of detailed algorithms. The detailed information on connection of external devices can be found in the attached documents.

4.5.1 Installation of CFast cards

Carefully push the properly positioned memory card along the guiderails into the XS11 connector and slightly press on it to let the contacts come to it to the full.

Attention!

Installation of the CFast card when the power is on can damage the system

Note

It is recommended to use the CFast cards, preset and formatted on CPB909.

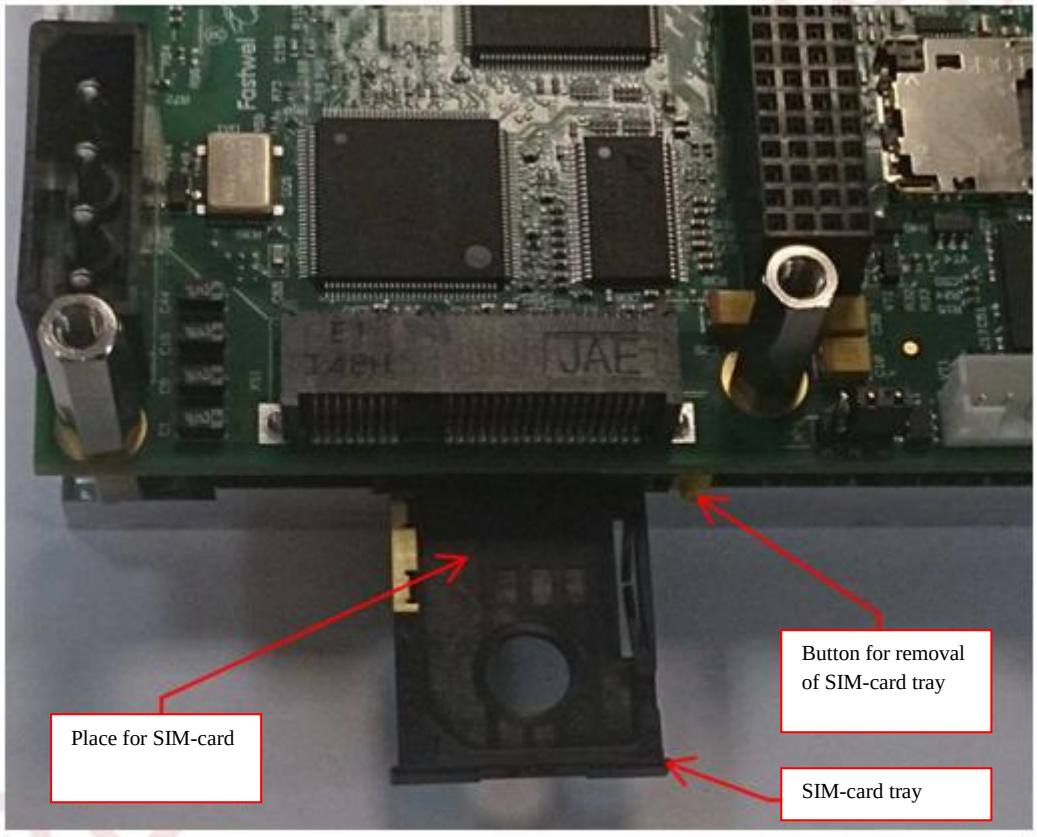
In order to remove the memory card, press the special-purpose pushbutton close to the XS11 connector.

4.5.2 Installation of MicroSD memory cards

4.5.3 Installation of SIM-cards

On the reverse side of module's board there is a holding connector for SIM card (XS12). The figure shows the holding connector.

Fig. Ошибка! Текст указанного стиля в документе отсутствует.**-2: Holding connector for SIM-cards (XS12)**



In order to install the SIM card, it is required to remove the SIM-card tray from the connector, pressing the special-purpose button (see Fig. 4-1), place the SIM card in the tray (with contacts faced down) and push the tray together SIM-card to the holding connector up to the full.

In order to remove the SIM-card, it is required to repeat the above procedure with SIM-card removal from the removed tray.

Attention!

All operations with SIM-card should be performed only with module power supply off.

4.5.4 Battery change

In order to change the lithium battery, use Renata CR2032.

The expected time of battery operation with a capacity of 190 mA·h is approximately 5 years. However, battery life service depends on operating temperature, as well as on the time during which the system is off.

Note

It is recommended to replace the battery every 4 years, prior to the end of its life.

Attention!

Observe polarity when during battery replacement, make sure the polarity is properly chosen (**"+" is at the top**).

Utilize the used battery in accordance with the established regulations.

4.5.5 Installation of StackPC extension etc.

The extension modules are installed into the relevant connectors. The modules can be installed in sequence (except for Mini PCI-Express modules) for receipt of highly-integrated control systems. Prior to installation, read section **Ошибка! Источник ссылки не найден.**.

Attention!

The extension modules are installed when the power supply is off.

Attention!

During installation of extension modules, the contacts should be matched properly and use the required fastening devices.

Note

Prior to installation and operation of StackPC-PCI, PCI-104, PCI/104-Express extension modules it is required to choose the voltage fed to the I/O buffer of PCI interface (PCI VIO Selector switch is used (XP13). Thoroughly read section **Ошибка! Источник ссылки не найден. Ошибка! Источник ссылки не найден.** modules.

5 CPB909 configuration

5.1 Selection of power supply voltage for the buffers on PCI bus for PC/104-Plus modules

Prior to installation of PC/104-Plus extension modules it is required to choose power supply voltage of PCI bus buffers by XP1 switch (PCI VIO).

Attention!
All the actions should be performed when the module's power supply is switched off.

The XP1 switch is located in the upper part of the board, see Fig. 3-2: Location of connectors and main components on the TOP side (pay attention to a note in the end of this subsection).

Fig. 5-1: State of contacts of PCI VIO switch (XP1)

Closed contacts 1-2 – PCI bus signal levels: +5 V

Closed contacts 2-3 – PCI bus signal levels: +3.3 V

Attention!
Jumper on XP1 switch should be installed in 1-2 or 2-3 positions.

5.2 Return to CMOS factory settings (Clear CMOS)

If the system fails to boot (e.g. due to misconfiguration of BIOS or invalid password), the settings parameters saved in CMOS, can be cleared using CMOS Reset switch (XP3), see Fig. 3-2: Location of connectors and main components on the TOP side.

CMOS reset sequence:

1. Turn off the power supply.
2. Close the CMOS Reset (XP3) switch by a jumper included into the module's delivery checklist.
3. Turn on the power supply.

4. Turn off the power supply.
5. Disconnect the switch CMOS Reset (XP3).
6. Turn on the power supply.
7. Further loading is carried out using CMOS factory settings.
8. The factory setting will be saved in Flash-memory upon POST completion.
9. If it is required to change CMOS parameters, start BIOS Setup.

5.3 BIOS update

BIOS is updated using Flash Programming Tool utility (written on the disk from among the delivery checklist, is available on file servers of manufacturer and official distributor), which is launch from EFI Shell console.

- **Action for updating BIOS:**

1. Copy EFI64 utility to the root directory of USB drive.
2. Copy file with the new BIOS to EFI64 catalog.
3. Connect USB drive to CPB909 module.
4. In BIOS SETUP select the menu "Save & Exit -> Launch EFI Shell from filesystem device".
5. In command line type the following:

```
fs0:
cd efi64
fpt64.efi -f <file name>
```

6. Wait for update completion and show "FPT Operation Passed" on the screen.
7. Restart the system.

WHEN THERE ARE BIOS UPGRADE ERROR MESSAGES SHOWN ON THE SCREEN IT IS REQUIRED TO REPEATEDLY START EFI64 UTILITY ON THE SCREEN (WITHOUT MODULE'S POWER OFF)!

WRITE BIOS FILES, EXCEPT FOR THOSE SPECIFIED FOR USE BY MAUFACTURER, INCLUDED INTO THE DELIVERY CHECKLIST OF THE MODULE OR AVAILABLE ON NETWORK FILE SERVERS OF MANUFACTURER AND OFFICIAL DISTRIBUTOR!

6. CPB909 programming

6.1 Operations with digital I/O port

Digital I/O port has 16 separately programmed I/O lines. In output mode each line can be programmed either into the Push-pull or Open Drain mode. Description and example of the programming are specified in BSP description of the relevant OS, supporting this port.

6.2 Operations with watchdog timers

The module has two watchdog timers. One (WDT1) is installed into the supervisor microchip and has a fixed actuation interval (1.6 sec), the other one (WDT2) is installed in the Super IO SMSC3116 microchip and has a programmed actuating interval (from 1 sec up to 255 min). Descriptions and examples of watchdog timers programming are shown in BSP description of the relevant OS, which supports them. For configuration and control of WDT2 watchdog timer, register in module's I/O space can be used, the below table contains the purpose and addresses of these registers

Table Ошибка! Текст указанного стиля в документе отсутствует.**-1: Control registers for WDT2 watchdog timers**

Name	Address	Description	
WDT2_TIMEOUT	A65h	Register for configuring resolution capability of WDT2 watchdog timer actuation time	
		Bits [6:2]	Reserved
		Bit [7]	"0" – time is counted in minutes "1" - time is counted in seconds
WDT2_VAL	A66h	Register for setting actuation time of WDT2 watchdog timer	
		Bits [7:0]	The relevant time value is written to the register, e.g.: 01h – actuation time is either 1 minute or second[1);] FFh –actuation time is either 255 minutes or seconds When the 00h value is written the watchdog timer is switched off
WDT2_CFG	A67h	Register for setting the WDT2 watchdog timer	
		Bit[0]	Reserved
		Bit[1]	"0" – disables to reset the watchdog timer from keyboard interrupt "1" –watchdog timer can be reset from keyboard interrupt
		Bit[2]	"0" – disables to reset the watchdog timer from mouse interrupt "1» - watchdog timer can be reset from mouse interrupt
		Bit[3]	Reserved
		Bits[7:4]	Reserved (should be "0")
WDT2_CTRL	A68h	Register for WDT2 watchdog timer control	
		Bit[0]	By reading: "0" – counting of the watchdog timer is carried out "1" – watchdog timer's counting was performed
		Bit[1]	Reserved
		Bit[2]	By writing "1" - immediately, the counting of the watchdog timer is finished (watchdog timer's actuation is carried out)
		Bit[3]	"1" – watchdog timer's counting is finished by pressing the keyboard button "0" – keyboard does not depend on operation of the watchdog timer
[1)] Time is counted in seconds, if bit [7] is set in register A65h			

7 BIOS

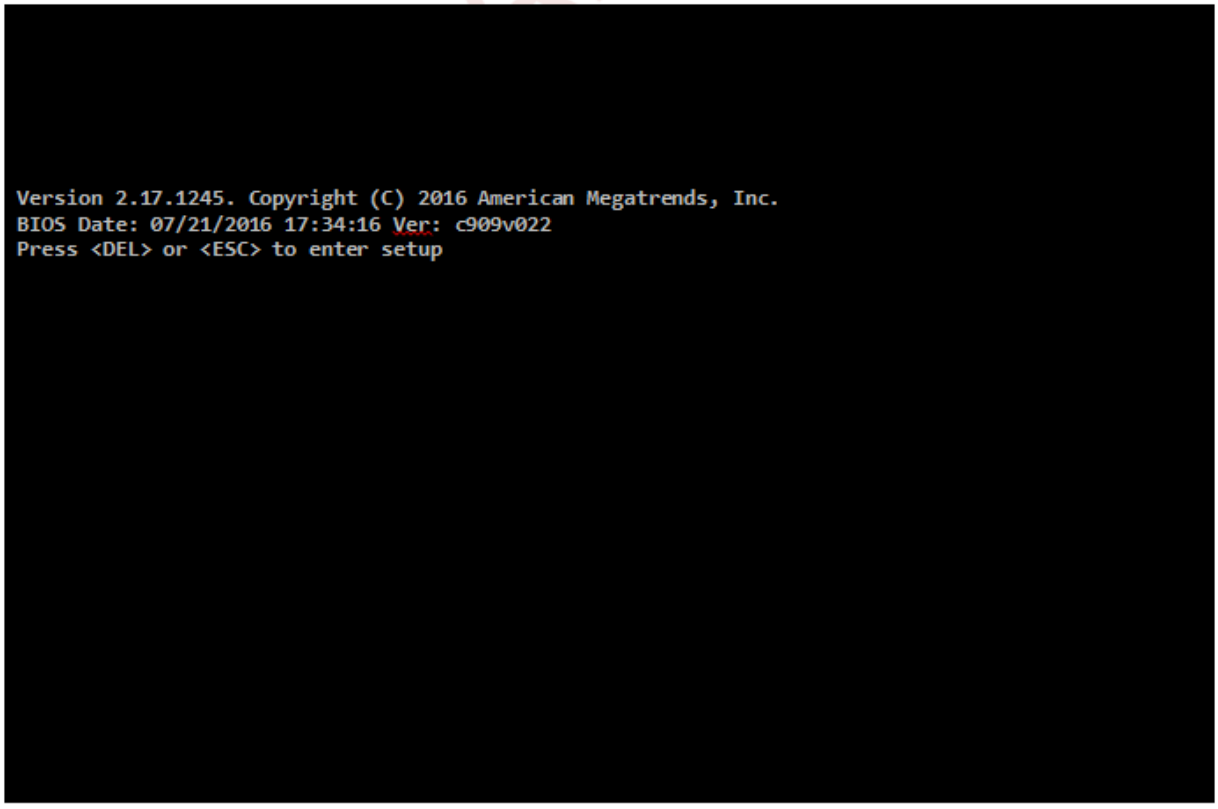
The module has an adapted version of AMI® BIOS, which is a standard system for IBM PC AT-compatible computers. It supports Intel®x86 CPUs and CPUs compatible with them, ensures a low-level support for CPU, memory and I/O subsystems.

By using the BIOS Setup program you can change BIOS parameters and control special-purpose operation modes of the module. It makes it possible for you to change the main system setting parameters.

7.1 Accessing BIOS SETUP

In order to enter the BIOS Setup you need to press Del or ESC button on keyboard during system booting at the time of the POST (Power On Self-Test) procedure. Example of the screen during the POST procedure is shown in figure below.

Fig. Ошибка! Текст указанного стиля в документе отсутствует.**-3: Screen during the POST procedure**

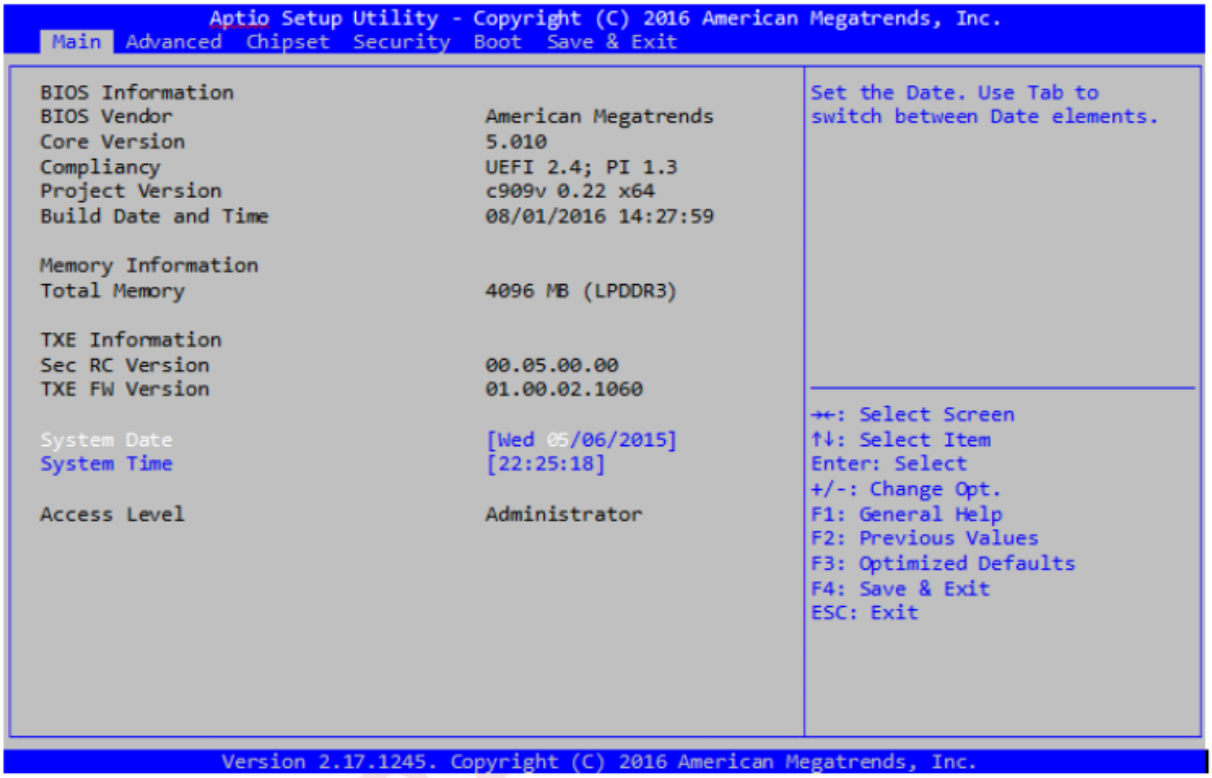


After pressing DEL or ESC button, menu of the BIOS Setup program with an active Main tab will appear.

7.2 Main

This BIOS Setup tab is a title tab during entering. In this tab you can enter information on the version and date of BIOS release, on the size of RAM installed in the module etc., as well as current time and date.

Fig. Ошибка! Текст указанного стиля в документе отсутствует.**-4: Screen of the "Main" menu tab**



In order to move between menu items use the cursor control keys "Up", "Down". For moving between the menu items: use cursor keys "Left", "Right". In order to enter the setup submenu use "Enter" key, to exit the setting submenu use the "Escape" key. In order to change any values in the selected menu item, use the "+" and "-" keys on the digital section of keyboard.

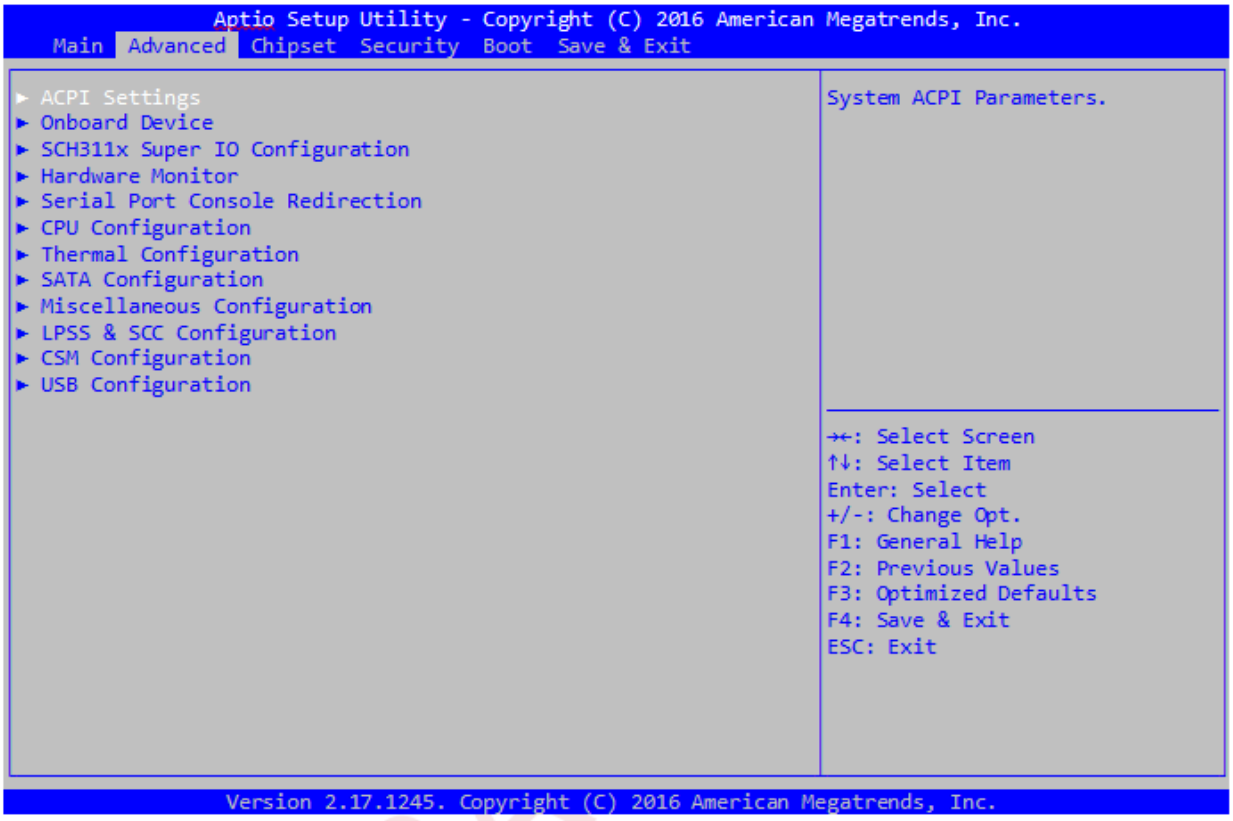
Note

This algorithm of menu operation applies to all other tabs of BIOS Setup programs.

7.3 Advanced

This tab is used for additional module's settings. The figure below shows the screen of the "Advanced" menu tab.

Fig. Ошибка! Текст указанного стиля в документе отсутствует.**-5: Screen of the "Advanced" menu tab**

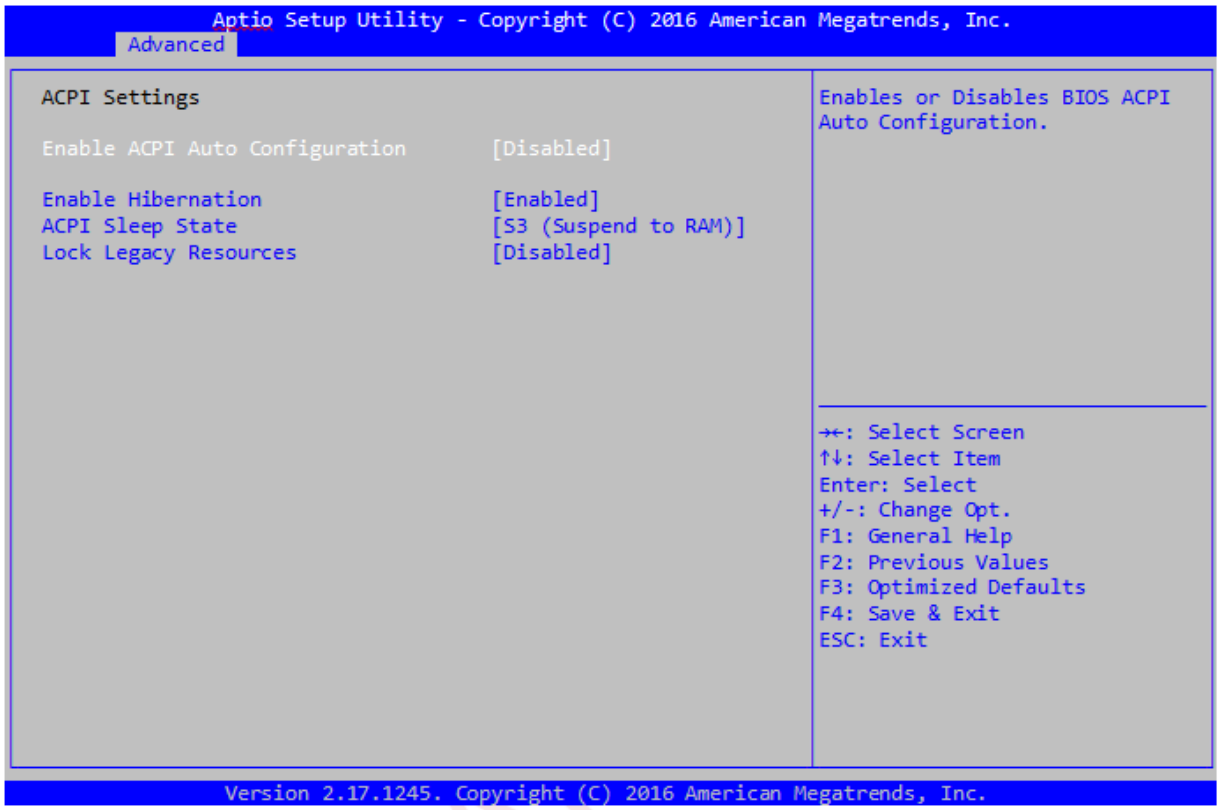


This tab has available submenus for additional settings.

7.3.1 ACPI Settings

Submenu of ACPI parameters settings. The submenu is shown in the figure below.

Fig. Ошибка! Текст указанного стиля в документе отсутствует.**-6: Screen of "ACPI Settings" submenu**



Where:

Enable ACPI Auto Conf – Submenu for actuation of ACPI automatic configuration.
[Disabled] – ACPI automatic configuration is disabled.
[Enabled] – ACPI automatic configuration is enabled.

Enable Hibernation – Submenu for enabling the module to pass to the hibernation mode.
[Enabled] – Passing to the Hibernation mode is enabled.
[Disabled] – Passing to the Hibernation mode is disabled.

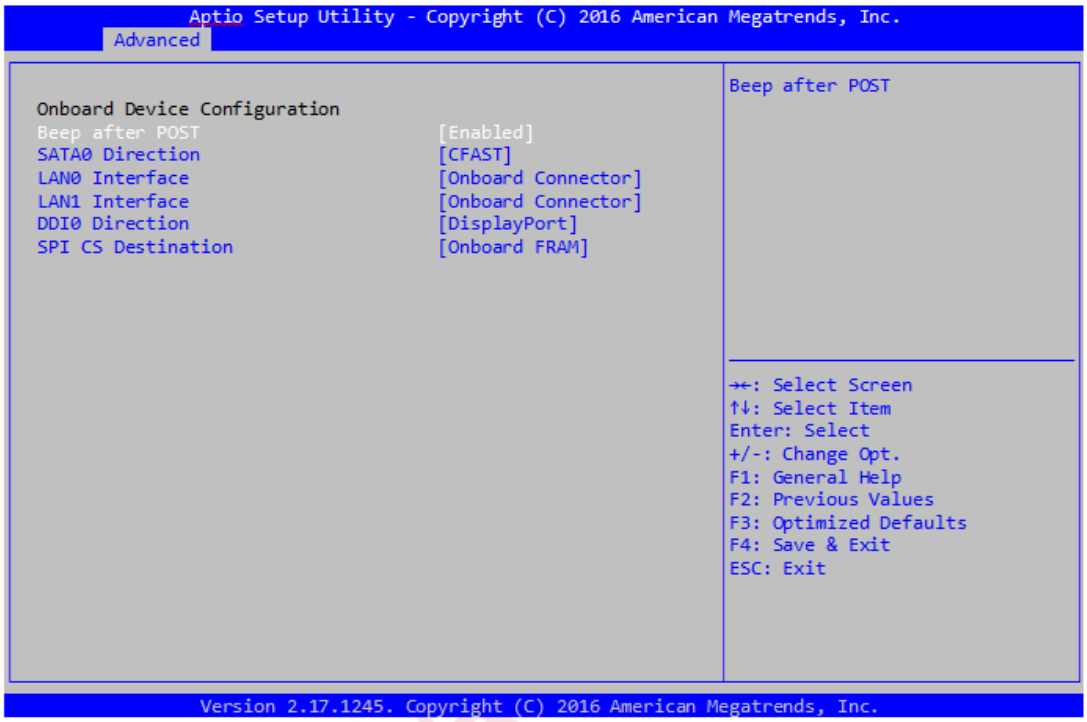
ACPI Sleep State – Submenu of enabling passing the module to hibernation mode.
[S3 (Suspend to RAM)] – Passing to the hibernation mode (S3) is enabled.
[Disabled] – Passing to the hibernation mode is disabled.

Lock Legacy Resources – Locking allocation of system resources.
[Enabled] – Fixed.
[Disabled] – Unblock.

7.3.2 Onboard Device Configuration

Submenu of setting parameters of additional devices, integrated into the module. The submenu is shown in the figure below.

Fig. Ошибка! Текст указанного стиля в документе отсутствует.**-7: Screen of the "Onboard Device Configuration" submenu**



Where:

Beep after POST – Submenu of buzzer's activation indicating completion of the POST procedure and transfer of the control to operating system.

[Enabled] – Buzzer is ON.

[Disabled] – Buzzer is OFF.

SATA0 Direction – Submenu of switching the SATA0 channel operation mode.

[CFAST] – SATA0 channel is connected to XS11 (CFAST) connector.

[SATA0] – SATA0 channel is connected to circuits SATA_T0, SATA_R0 of XP10 (StackPC) connector.

LAN0 Interface – Submenu of LAN0 (Ethernet) interface control.

[Onboard Connector] – LAN0 interface is connected to XS7 connector.

[StackPC Connector] – LAN0 interface is connected to XR10 connector (StackPC).

[Disabled] – LAN0 interface is ON.

LAN1 Interface – Submenu of LAN1 (Ethernet) interface control.

[Onboard Connector] – LAN1 interface is connected to the XS7 connector.

[StackPC Connector] – LAN1 interface is connected to the XR10 (StackPC) connector.

[Disabled] – LAN1 interface is ON.

DDI Direction – Submenu of control of DDI1 digital video interface.

[DisplayPort] – DDI1 interface is connected to the XS10 (DisplayPort) connector.

[LVDS0] – DDI1 interface is connected to the XP15 (LVDS0) connector.

SPI CS Destination – Submenu for control of CS (Chipselect) signal of SPI interface.

[Onboard FRAM] – CS is used by the soldered FRAM memory.

[StackPC SPI_SS0] – CS is connected to the SPI_SS0# circuit of XP10 (CS0 on StackPC) connector.

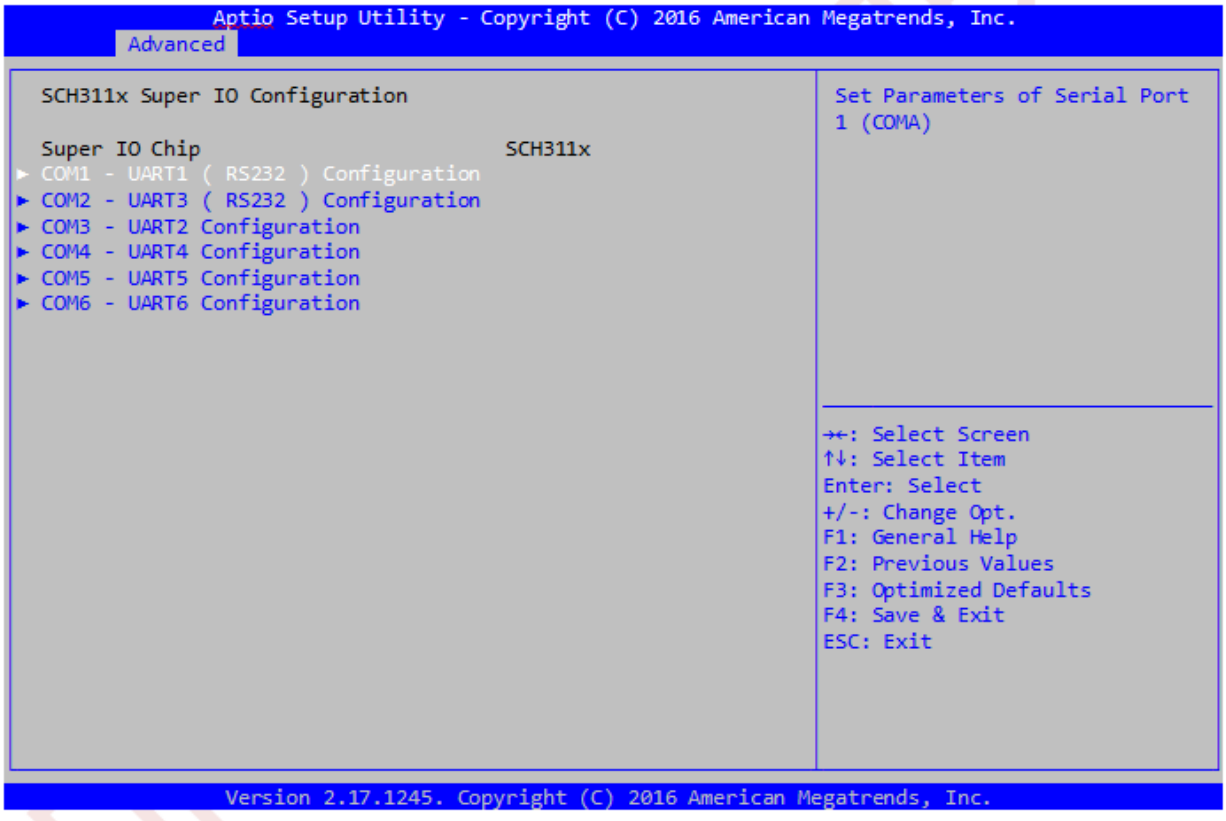
[StackPC SPI_SS1] – CS is connected to the SPI_SS1# circuit of XP10 (CS1 on StackPC) connector.

[StackPC SPI_SS2] – CS is connected to the SPI_SS2# circuit of XP10 (CS2 on StackPC) connector.

7.3.3 SCH311x Super IO Configuration

Submenu of parameters configuration of UART (COM1, COM2, COM3, COM4, COM5, COM6) serial interfaces of Super IO SCH3116 microchip. Submenu screen is shown in the figure below.

Fig. Ошибка! Текст указанного стиля в документе отсутствует.**-8: Screen of the "SCH3114x Super IO Configuration" submenu**



Where:

COM1 – UART1 (RS232) Configuration – Submenu for UART1 (RS232) port configuration. It enables/disables the port, information on the assigned base address, interrupt request lines is displayed.

COM2 – UART3 (RS232) Configuration – Submenu for UART3 (RS232) port configuration. It enables/disables the port, information on the assigned base address, interrupt request lines is displayed

COM3 – UART2 Configuration – Submenu for UART2 (RS422/485) port configuration. It enables/disables the port, enables/disables "terminator", enables/disables the ECHO mode, information on the assigned base address, interrupt request lines is displayed.

COM4 – UART4 Configuration – Submenu for UART4 (RS422/485) port configuration. It enables/disables the port, enables/disables “terminator”, enables/disables the ECHO mode, information on the assigned base address, interrupt request lines is displayed.

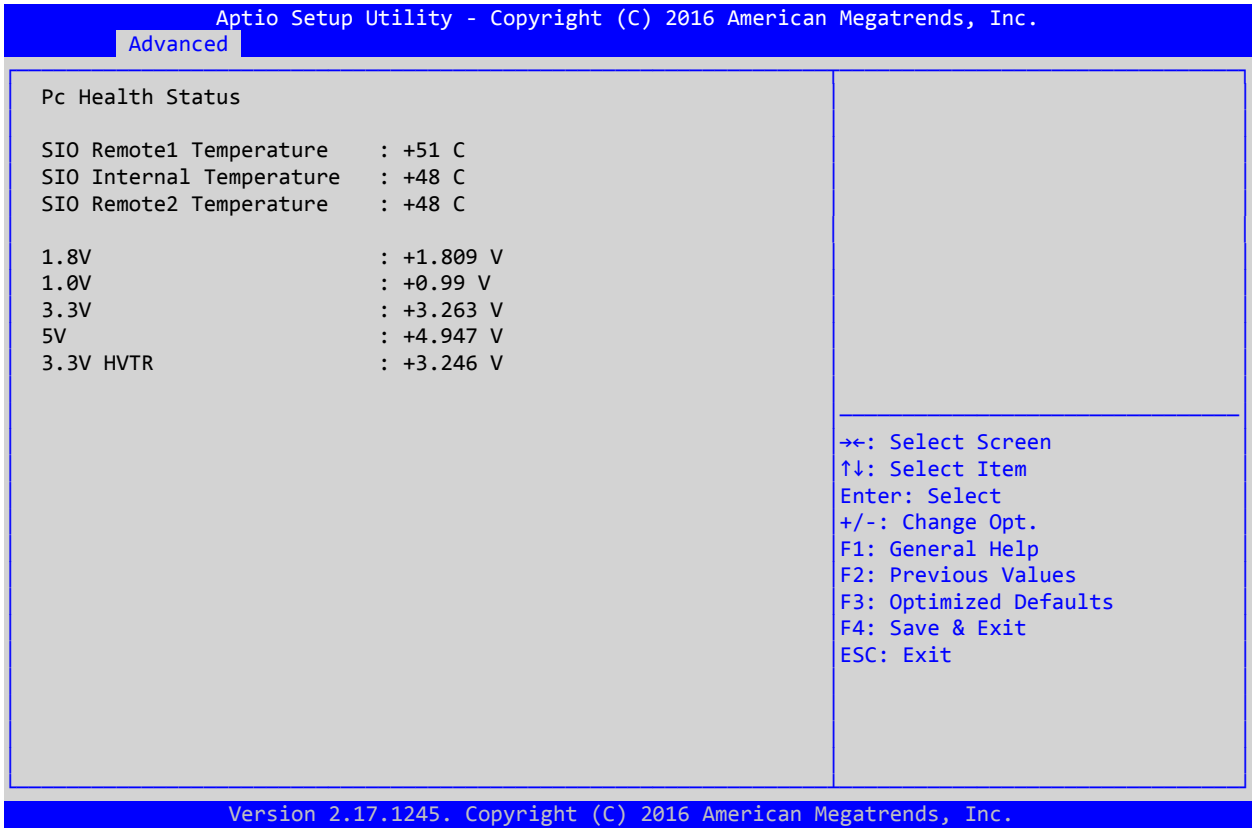
COM5 – UART5 Configuration – Submenu for UART5 (RS422/485) port configuration. It enables/disables the port, enables/disables “terminator”, enables/disables the ECHO mode, information on the assigned base address, interrupt request lines is displayed.

COM6 – UART6 Configuration – Submenu for UART6 (RS422/485) port configuration. It enables/disables the port, enables/disables “terminator”, enables/disables the ECHO mode, information on the assigned base address, interrupt request lines is displayed.

7.3.4 Hardware Monitor

Submenu for displaying system state information.

Fig. Ошибка! Текст указанного стиля в документе отсутствует.**-9: Screen of the “Hardware Monitor” submenu**

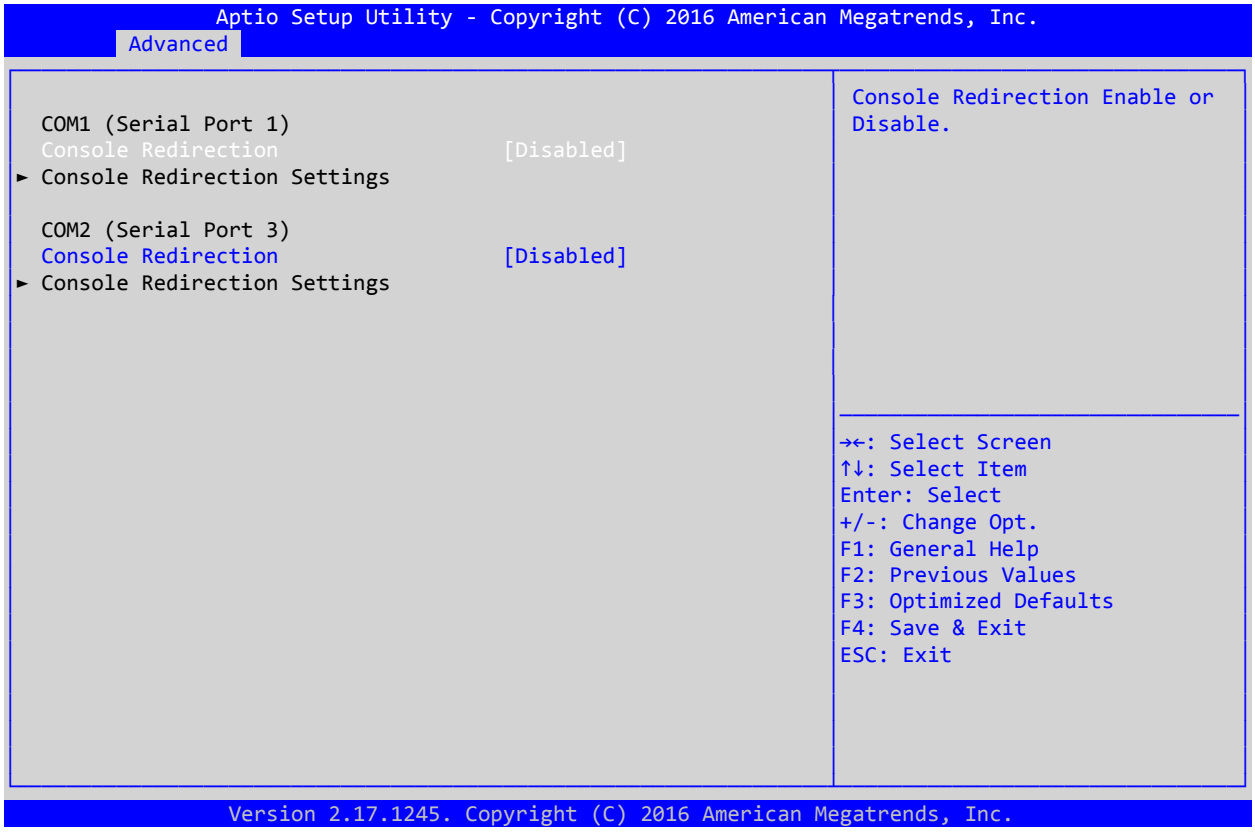


This submenu shows information on temperatures of PCB under CPU (Remote 1), PCB in the RAM area (Remote 2), PCB in the Super IO SCH3116 (Internal) microchip area. It also shows information on the voltage levels of key nodes.

7.3.5 Serial Port Console Redirection

Configuration submenu and console I/O actuation via serial ports COM1, COM3. The submenu is shown in the figure below.

Fig. Ошибка! Текст указанного стиля в документе отсутствует.**-10: Screen of the "Serial Port Console Redirection" submenu**



Where:

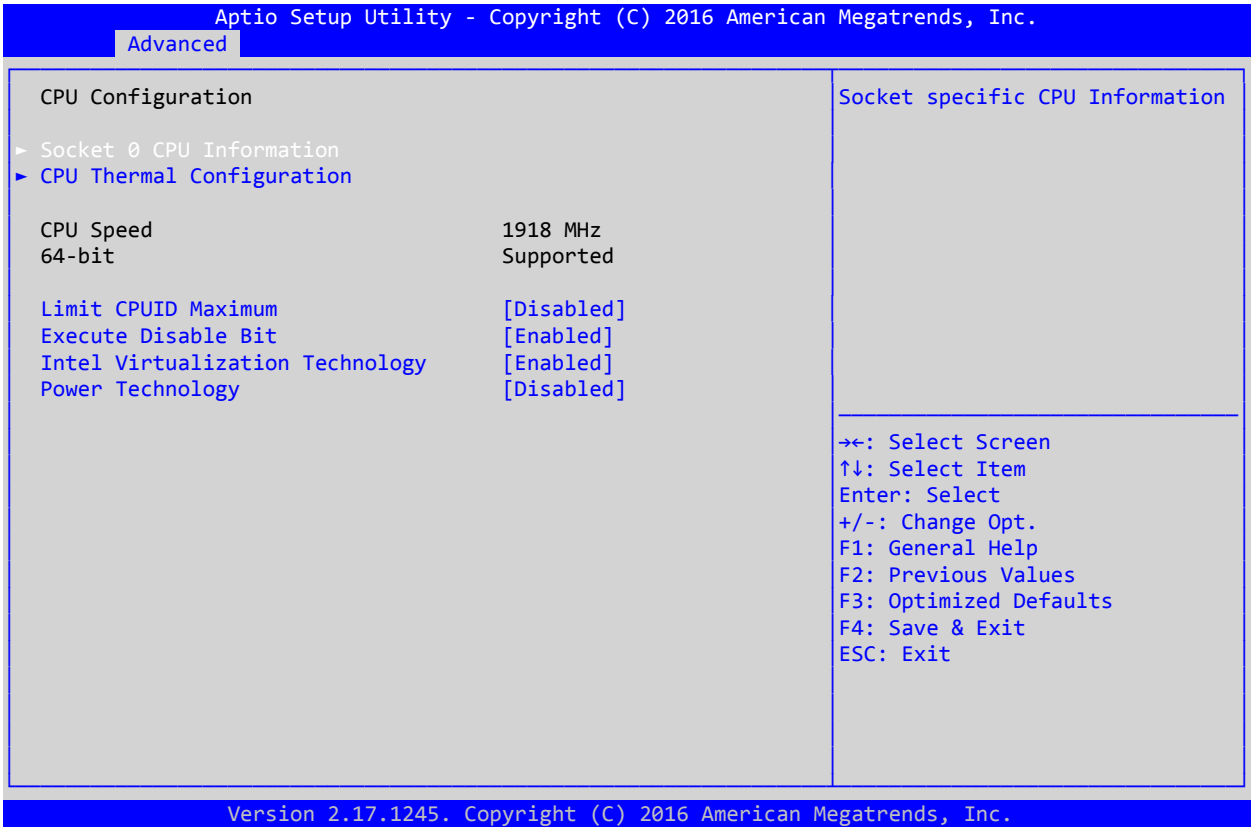
COM1 (Serial Port 1) – Submenu for activation and control of console I/O via COM1 serial port. At activation (Console redirection "Enabled"), submenu "**Console redirection Settings**" becomes available, where parameters of the console I/O terminal are configured.

COM2 (Serial Port3) – Submenu for activation and control of console I/O via COM2 serial port. At activation (Console redirection "Enabled"), submenu "**Console redirection Settings**" becomes available, where parameters of the console I/O terminal are configured.

7.3.6 CPU Configuration

Submenu for configuration of CPU parameters. This submenu is shown in the figure below.

Fig. Ошибка! Текст указанного стиля в документе отсутствует.**-11: Screen of the "Serial Port Console Redirection" submenu**



Where:

Socket 0 CPU Information – Submenu for displaying information on the CPU installed into the module.

CPU Thermal Configuration – Submenu for the connection of CPU digital temperature sensor.

Limit CPUID Maximum – Setting the maximum value of CPU identifier (for support of legacy operating systems):

[Enabled] – ON.

[Disabled] – OFF (Using Windows XP and older OS).

Execute Disable Bit – Control of the program code executing from data region:

[Enabled] – Prohibition is ON.

[Disabled] – Prohibition is OFF.

Intel Virtualization Technology – Activation of the virtualization technology (for hardware support of virtual machines):

[Enabled] – ON.

[Disabled] – OFF.

Power Technology – Configuration of CPU power saving functions:

[Disabled] – Power saving functions are OFF.

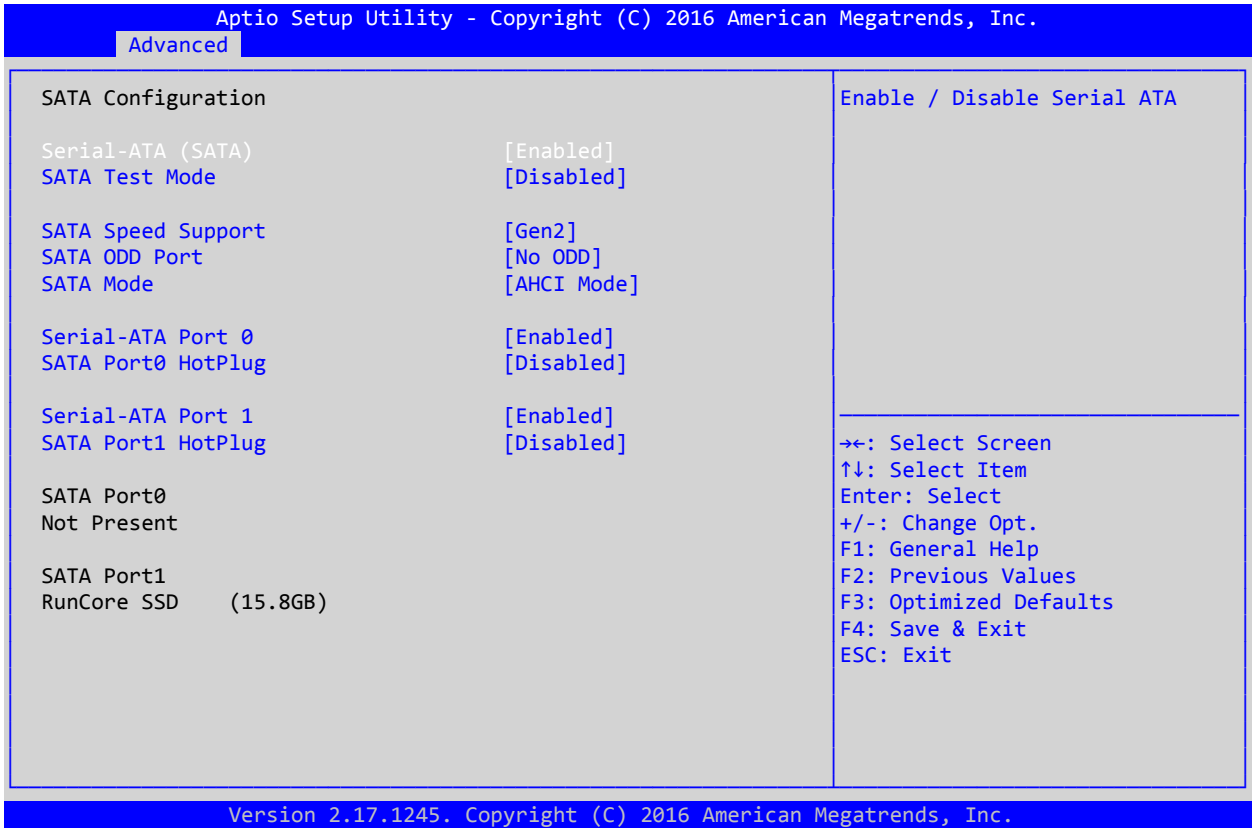
[Energy Efficient] – Maximum power saving mode.

[Custom] – Manual configuration of the power saving mode.

7.3.7 SATA Configuration

Submenu of SATA interface configuration. This submenu shows information on the connected SATA devices, as well as has separate configurations available. This submenu is shown in the figure below.

Fig. Ошибка! Текст указанного стиля в документе отсутствует.**-12: Screen of the "SATA Configuration" submenu**



Where:

Serial-ATA (SATA) – Enabling/disabling SATA controller:
[Enabled] – ON.
[Disabled] – OFF.

SATA Speed Support – Selection of SATA interface specification:
[GEN1] – Specification SATA Revision 1.0 (speed up to 1.5Gb/sec).
[GEN2] – Specification SATA Revision 2.0 (speed up to 3.0Gb/sec).

SATA ODD Port – Selection of SATA port to which disk drive on optical carrier (CD/DVD-ROM) is connected:
[No ODD] – Disk drive is not connected.
[Port0 ODD] – Disk drive is connected to the Port0 port.
[Port1 ODD] – Disk drive is connected to the Port1 port.

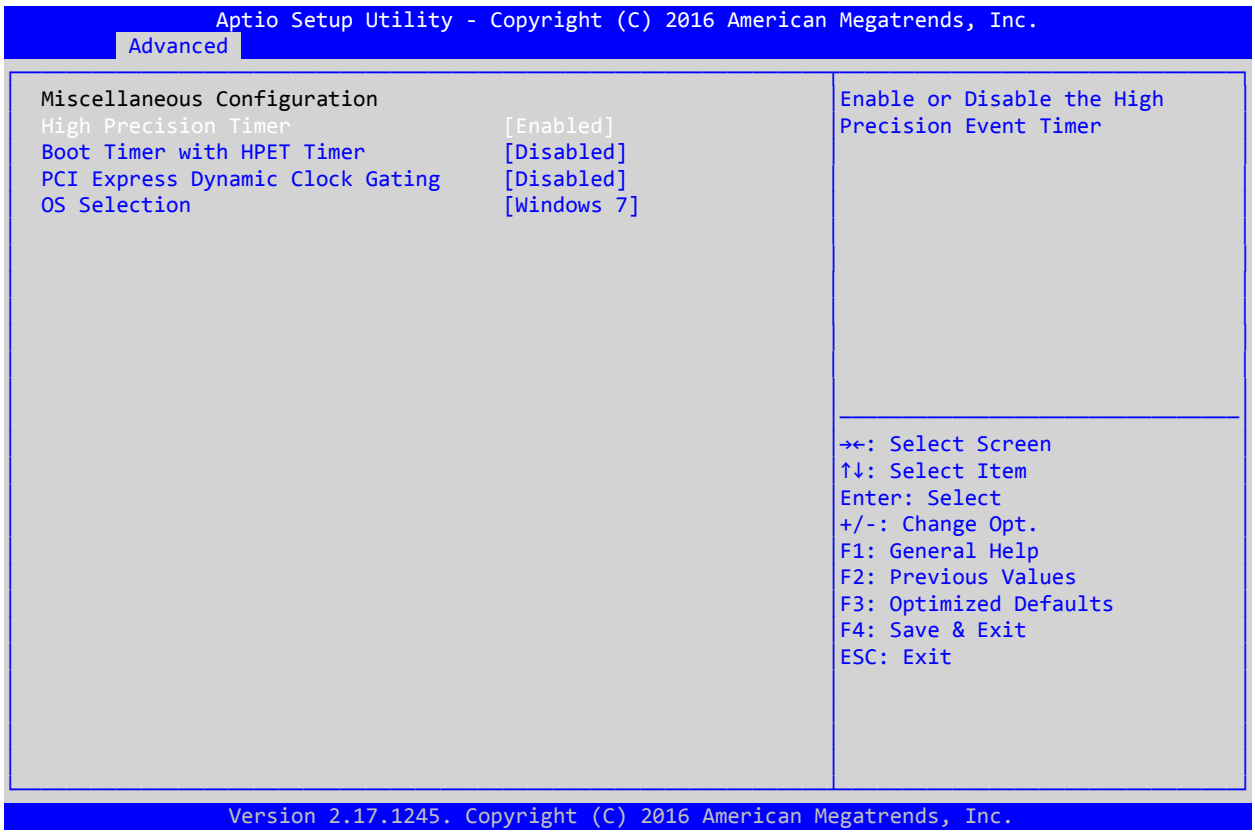
SATA Mode – SATA controller operation mode:
[AHCI Mode] – AHCI mode is ON.
[IDE Mode] – IDE emulation mode is ON.

For each port there is a separate On/Off "**Serial-ATA Port 0,1**" and On/Off of the Hot Swap mode of the device "**SATA Port0,1 HotPlug**" are available.

7.3.8 Miscellaneous Configuration

Submenu for miscellaneous configuration. The submenu is shown in the figure below.

Fig. Ошибка! Текст указанного стиля в документе отсутствует.**-13: Screen of the "Miscellaneous Configuration" submenu**



Where:

High Precision Timer – Enables/Disables high precision timer:

[Enabled] – Timer is ON.

[Disabled] – Timer is OFF.

Boot Timer with HPET Timer – Enables/Disables of the launch time count by HPET timer:

[Enabled] – ON.

[Disabled] – OFF.

PCI Express Dynamic Clock Gating – Enables/Disables clocking signal in the unused PCI Express circuits:

[Enabled] – ON.

[Disabled] – OFF.

OS Selection – Selection of OS type for booting:

[Windows 7] – Selection of Microsoft Windows 7.

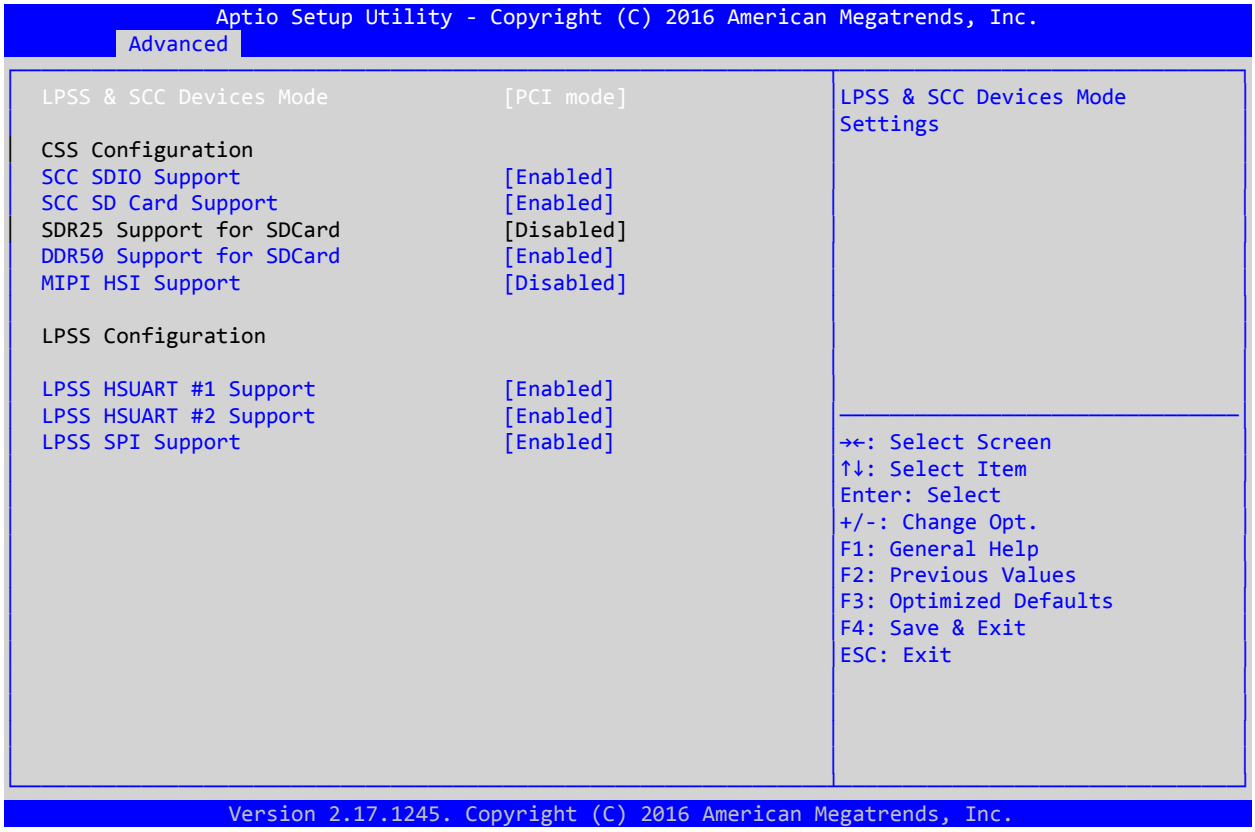
[Windows 8.X] – Microsoft Windows 8 or 8.1 is selected.

[Android] – OS Android is selected.

7.3.9 LPSS & SCC Configuration

Submenu for configuration of serial interfaces subsystem and storage system (High speed UART, I2C, SPI, MicroSD). This submenu is shown in the figure below.

Fig. Ошибка! Текст указанного стиля в документе отсутствует.**-14: Screen of the "LPSS & SCC Configuration" submenu**



Where:

LPSS & SCC Devices Mode – Mode of subsystems operation:
[PCI Mode] – PCI mode (as PCI device).
[ACPI Mode] – ACPI mode.

SDR25 Support for SDCard – Enables/Disables SDR25 mode support:
[Enabled] – ON.
[Disabled] – OFF.

DDR50 Support for SDCard – Enables/Disables DDR50 mode support:
[Enabled] – ON.
[Disabled] – OFF.

MIPI HSI Support – Enables/Disables HSI high-speed mode:
[Enabled] – ON.
[Disabled] – OFF.

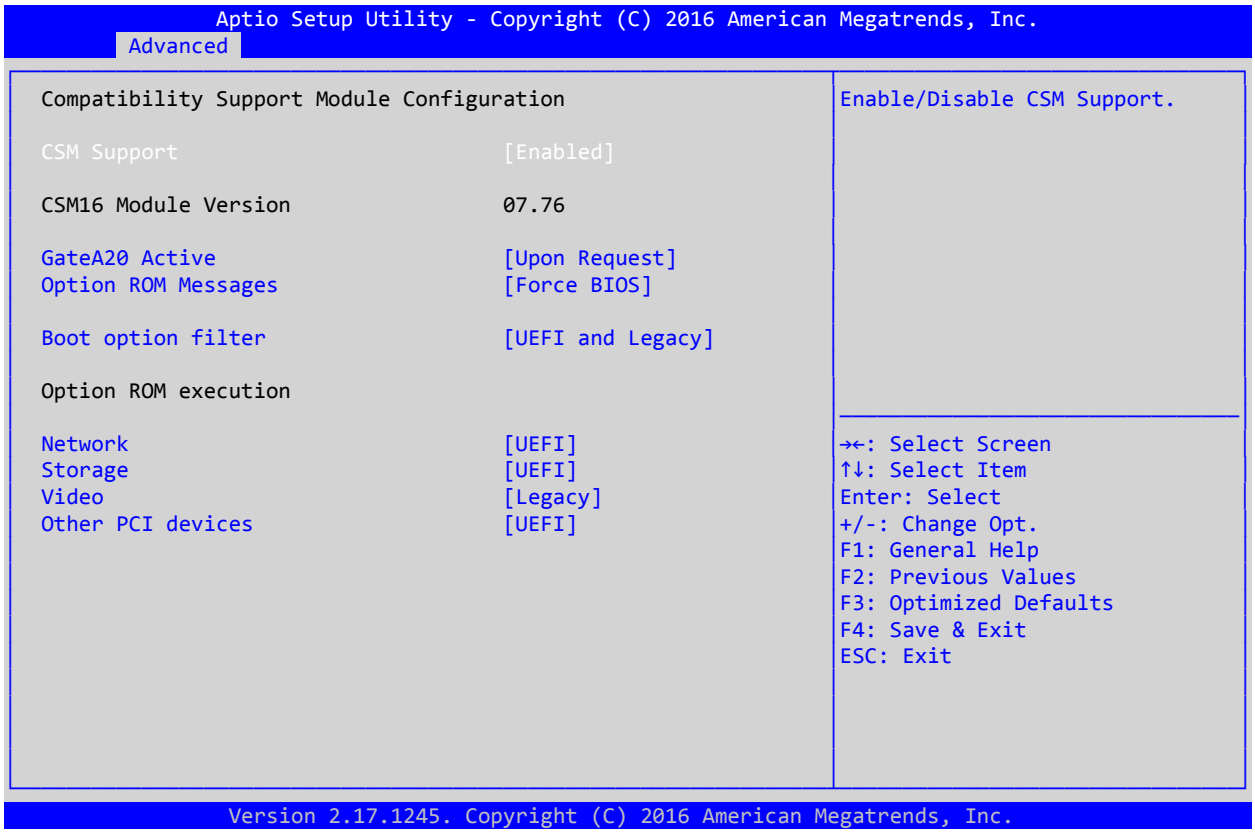
LPSS HSUART #1,2 Support – Enables/Disables High Speed UART interfaces:
[Enabled] – ON.
[Disabled] – OFF.

LPSS SPI Support – Enables/Disables SPI interface

7.3.10 CSM Configuration

Submenu for configuration of the Compatibility Support Module.
The submenu is used for booting of legacy operating systems and interaction with the old integrated software. This submenu is shown in the figure below.

Fig. Ошибка! Текст указанного стиля в документе отсутствует.**-15: Screen of the "CSM Configuration" submenu**



Where:

CSM Support – Enables/Disables CSM:
[Enabled] – ON.
[Disabled] – OFF.

GateA20 Active –Control of A20 gate:
[Upon Request] – The gate can be switched by means of BIOS.
[Always] – The gate is constantly on.

Option ROM Messages –Mode for displaying Option ROM:
[Force BIOS] – Output of Option ROM information is ON.
[Keep Current] – Output of Option ROM is OFF.

Boot option filter – Boot mode filter:
[UEFI and Legacy] – Support of the both UEFI booting and Legacy.
[Legacy only] – Support of Legacy booting only.
[UEFI only] – Support of UEFI booting only.

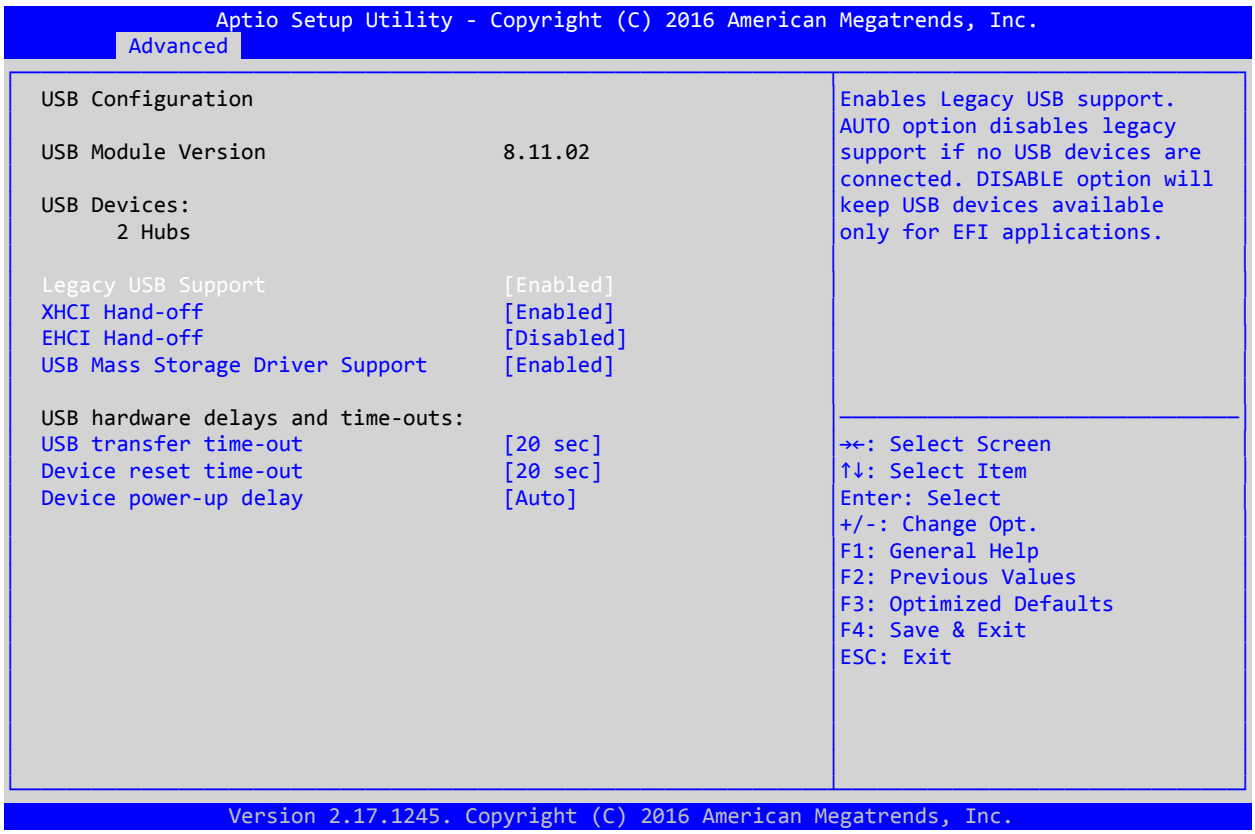
Further, **Option ROM execution** modes configurations from various devices (**Network** – network controllers, **Storage** – data storage controllers, **Video** – video controllers, **Other PCI devices**) are shown. Configuration is available for every single device:
[Do not launch] – Do not launch Option ROM for this type of devices.
[UEFI] – Launch Option ROM for this type of devices in the UEFI mode.

[Legacy] – Launch Option ROM for this type of devices in the Legacy mode.

7.3.11 USB Configuration

Submenu of USB configuration. This submenu is shown in the figure below.

Fig. Ошибка! Текст указанного стиля в документе отсутствует.**-16: Screen of the "USB Configuration" submenu**



Where:

Legacy USB Support – Enables/Disables support of USB devices by means of BIOS:
[Enabled] – ON.
[Disabled] – OFF.
[Auto] – Switched on automatically, if necessary.

XHCI Hand-off – Enables/Disables prohibition of BIOS transfer of control by XHCI to operating system:
[Upon Request] – The gate can be switched off by means of BIOS.
[Always] – The gate is always on.

Option ROM Messages –Display of Option ROM mode:
[Force BIOS] – Output of Option ROM information is ON.
[Keep Current] – Output of Option ROM information is OFF.

Boot option filter – Boot mode filter:
[UEFI and Legacy] – Support of both UEFI boot and Legacy boot.
[Legacy only] – Support of Legacy boot only.
[UEFI only] – Support of UEFI boot only.

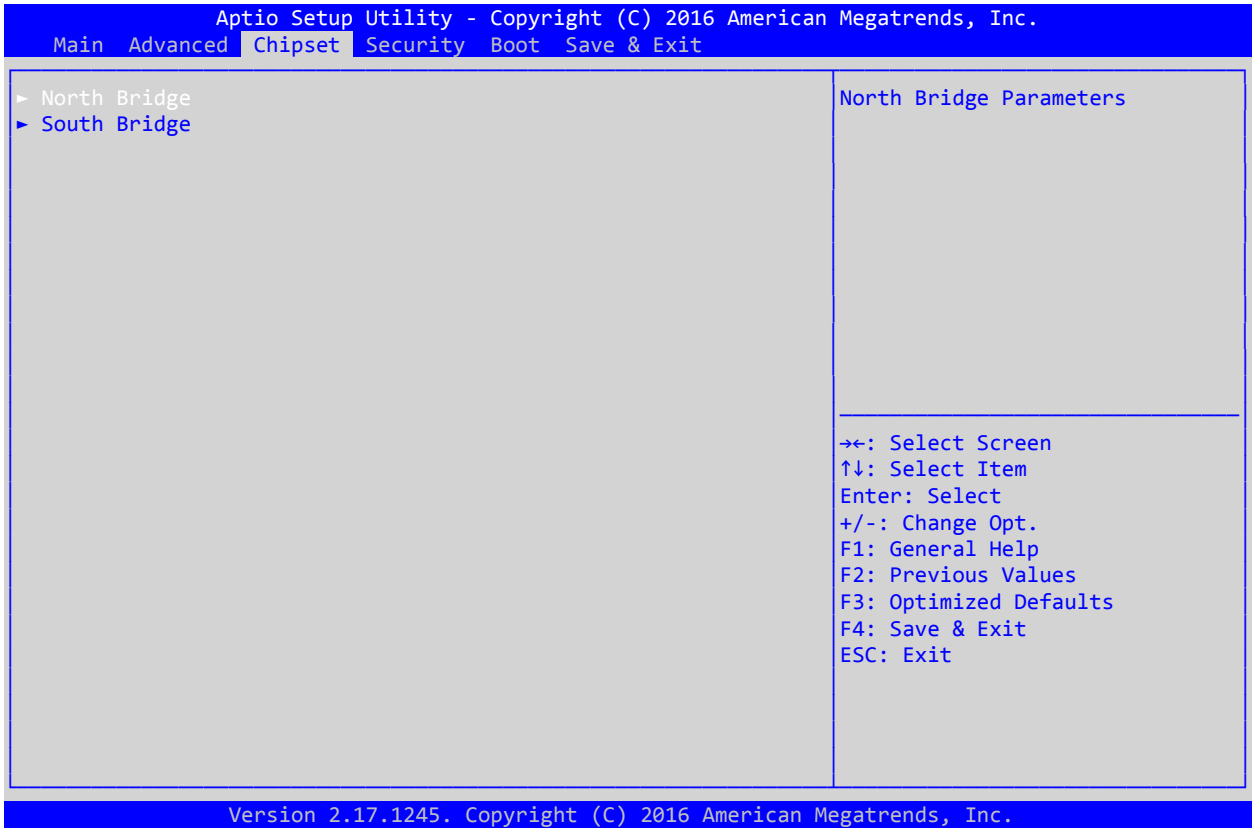
Further, **Option ROM execution** modes configurations from various devices (**Network** – network controllers, **Storage** – data storage controllers, **Video** – video controllers, **Other PCI devices**) are shown. Configuration is available for every single device:
[Do not launch] – Do not launch Option ROM for this type of devices.
[UEFI] – Launch Option ROM for this type of devices in the UEFI mode.

[Legacy] – Launch Option ROM for this type of devices in the Legacy mode.

7.4 Chipset

This tab is used for the configuration of the north and south bridges integrated into the CPU. The figure below shows the Chipset tab menu.

Fig. Ошибка! Текст указанного стиля в документе отсутствует.**-17: Screen of the "Chipset" tab menu**

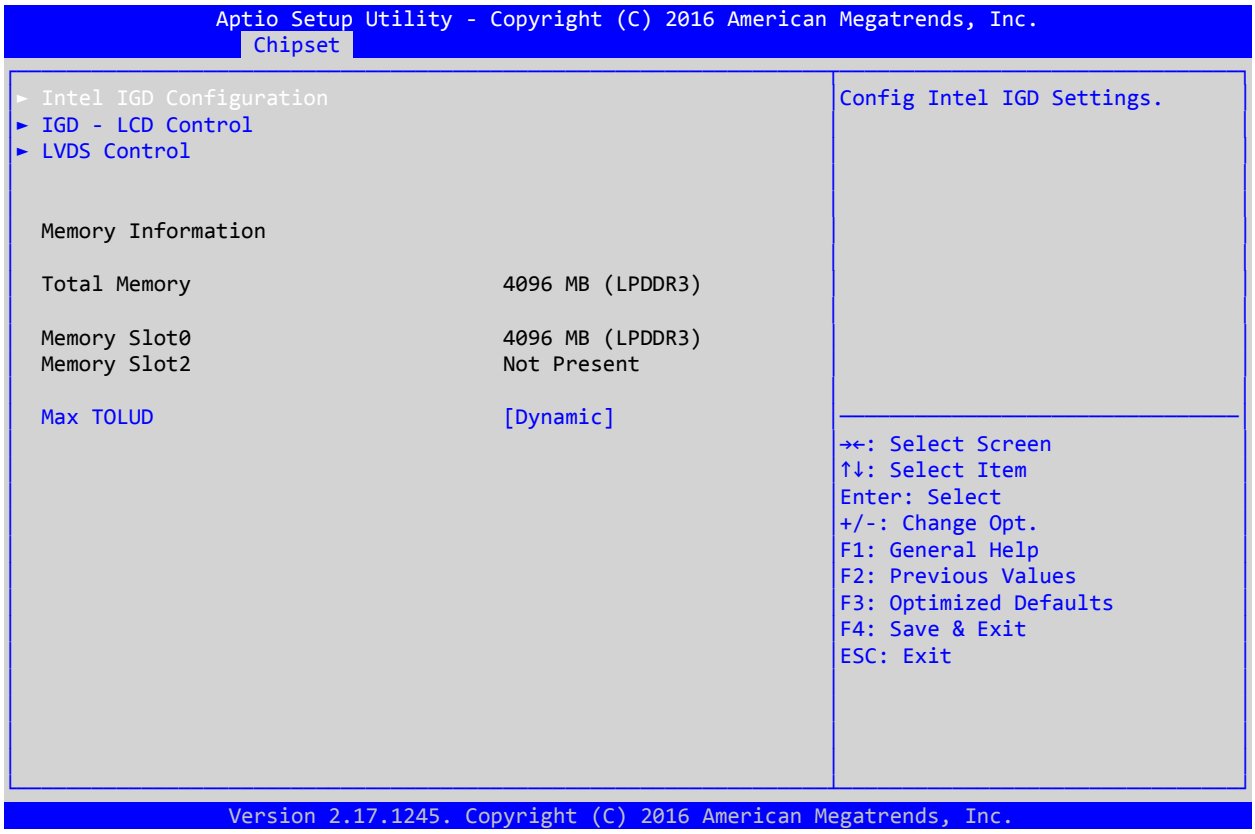


Menu of this tab has two additional submenus: configuration of the North Bridge and South Bridge.

7.4.1 North Bridge

This submenu is used for configuration of the North Bridge, as well as output of information on the installed RAM. This submenu is shown in the figure below.

Fig. Ошибка! Текст указанного стиля в документе отсутствует.**-18: Screen of the "North Bridge" submenu**



Where:

Intel IGD Configuration – Calls submenu for configuration of the integrated Intel video display adapter (see subsection 0).

LVDS Control – Calls submenu for configuration of LVDS panels connection to XP15, XP16 (see subsection 0).

Max TOLUD – Installation of maximum upper physical memory for the use (the upper is assigned for PCI devices and Video):

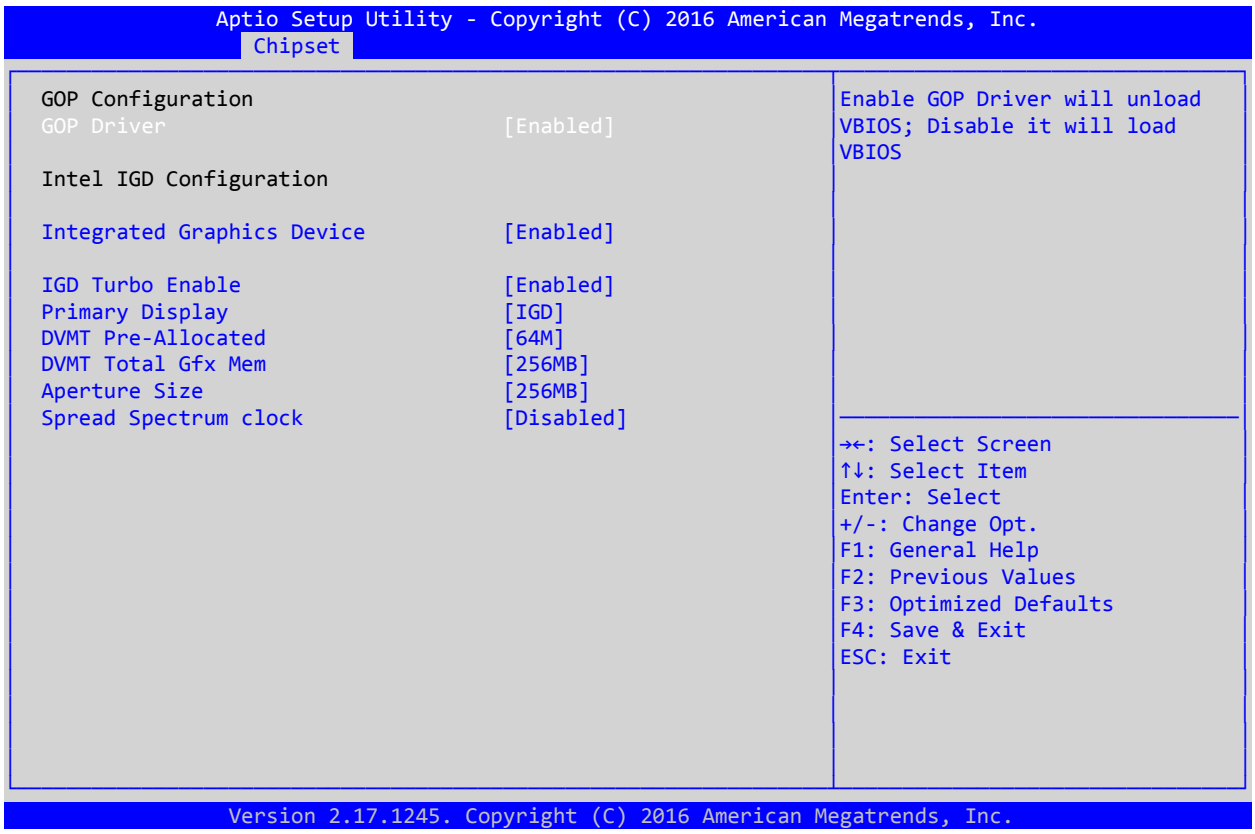
[Dynamic] – TOLUD value is set automatically, depending on the memory volume occupied by external PCI devices and Video.

[2 GB … 3 GB] – Setting the TOLUD value manually.

7.4.1.1 Intel IGD Configuration

This submenu is used for configuration of the integrated Intel video adapter. This submenu is shown in the figure below.

Fig. Ошибка! Текст указанного стиля в документе отсутствует.**-19: Screen of the "Intel IGD Configuration" submenu**



Where:

GOP Driver – Enables/Disables boot of GOP driver instead of VBIOS at system start:
[Enabled] – Boot of GOP driver.
[Disabled] – Boot of VBIOS.

Integrated Graphics Device – Enables/Disables IGD:
[Enabled] – IGD is ON.
[Disabled] – IGD is OFF.

IGD Turbo Enable – Enables/Disables Turbo Mode (maximum frequency) of IGD:
[Enabled] – Turbo Mode is ON.
[Disabled] – Turbo Mode is OFF.

Primary Display – Selection of video adapter "by default":
[Auto] – Selected automatically.
[IGD] – IGD is selected.
[PCIe] – External video adapter on PCI Express bus is selected.

DVMT Pre-Allocated – Configuration of the fixed allocated video memory size from RAM for IGD:
[64M … 512M] – Selection of video memory size.

DVMT Total Gfx Mem – Configuration of maximum dynamically allocated size of video memory from RAM:

[128MB, 256MB, Max] – Selection of 128 MB, 256 MB, maximum size of RAM.

Aperture Size – Configuration of the size of video memory size, allocated for textures:

[128MB … 512MB] – Selection of video memory size.

Spread Spectrum clock – Enables / Disables the mode of reducing the level of EMI from integrated IGD:

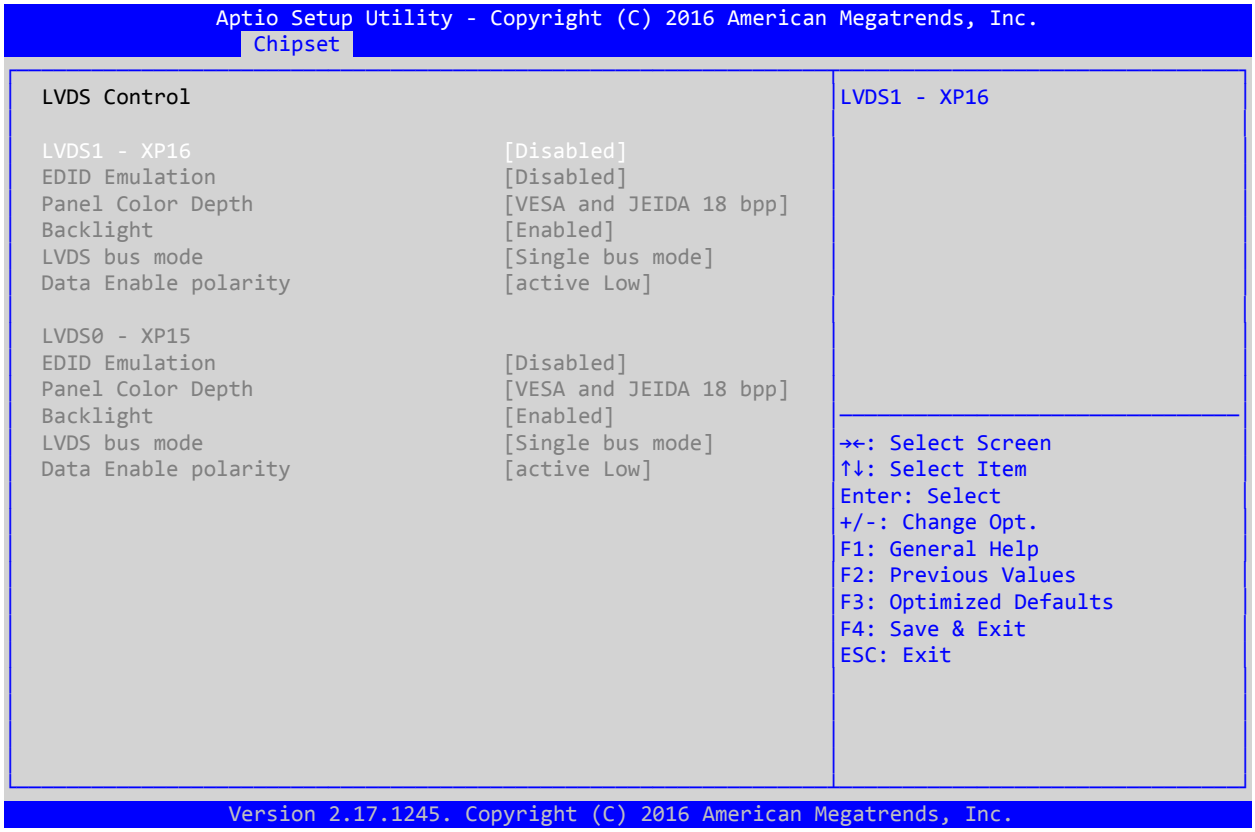
[Enabled] – ON.

[Disabled] – OFF.

7.4.1.2 LVDS Control

This submenu is used for configuration of LVDS panels connection to XP15, XP16. This submenu is shown in the figure below.

Fig. Ошибка! Текст указанного стиля в документе отсутствует.**-20: Screen of the "LVDS Control" submenu**



Connection of LVDS panels to XP15, XP16 is configured separately and has an equal array of settings.

Configuration of LVDS panel connection to XP16 becomes available when "LVDS1 – XP16" menu item is set to the "Enabled" position.

Configuration of LVDS panel connection to XP15 becomes available when "**DDI0 Direction**" in menu "**Advanced\Onboard device**" is set to the "**LVDS0**" position.

Below is the description of the set of configurations for connection of LVDS panels to XP15, XP16, where:

EDID Emulation – Enables and configures emulation of EDID:
[Disabled] – OFF.

Panel Color Depth – Configuration of the amount of bits of the connected panel:
[VESA 24 bpp] – The connected panel has 24 bits according to the VESA standard.
[JEIDA 24 bpp] – The connected panel has 24 bits according to the JEIDA standard.
[VESA and JEIDA 18 bpp] – The connected panel has 18 bits.

LVDS bus mode – Operation mode of LVDS bus:
[Single bus mode] – Single bus mode.
[Dual bus mode] – Dual bus mode.

Data Enable polarity – Specifies polarity of signal synchronization (HSYNC, VSYNC):
[active Low] – Active “0”.
[active High] – Active “1”.

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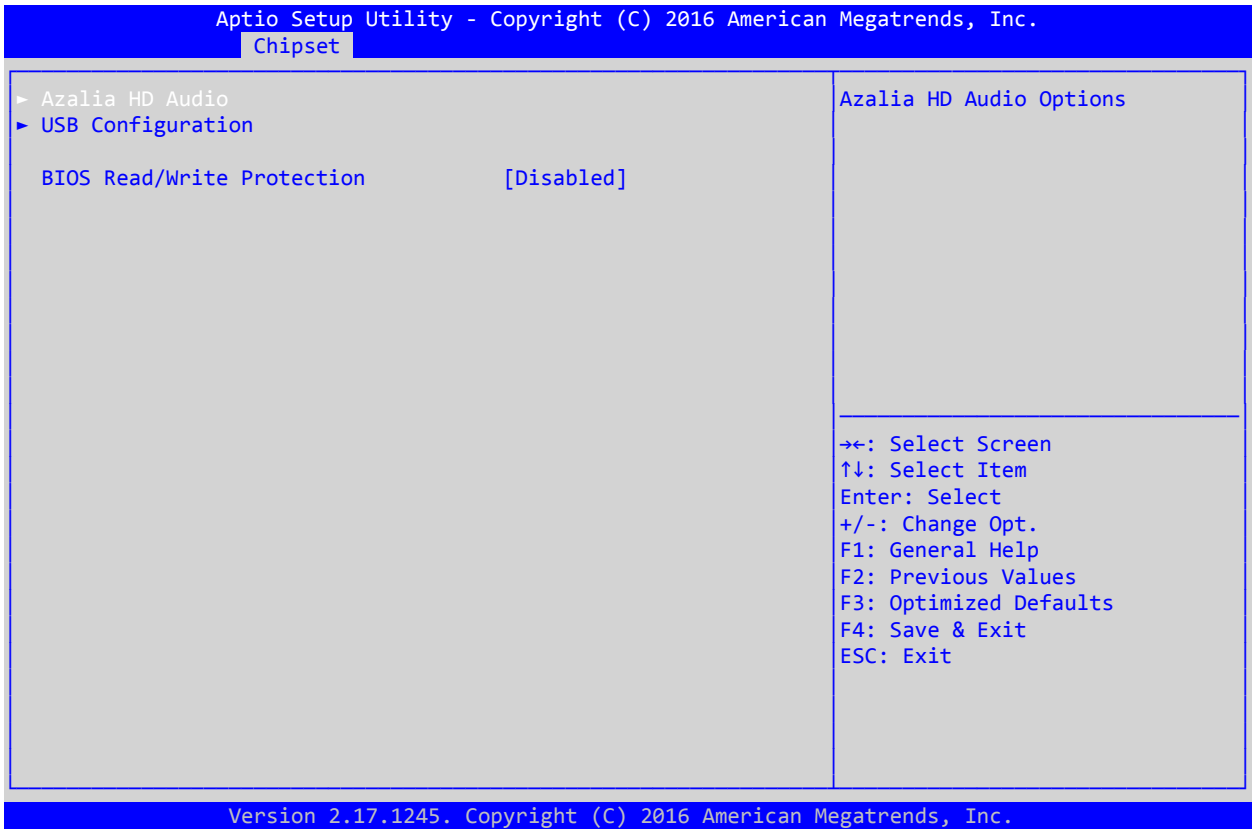
7.4.2 South Bridge

Submenu for configuration of the South Bridge. This submenu is shown in the figure below.

Fig. Ошибка! Текст указанного стиля в документе отсутствует.**-21: Screen of the "South Bridge" submenu**



Where:

Azalia HD Audio – Calls submenu for configuration of the integrated Azalia audio controller (see subsection 0).

USB Configuration – Calls submenu for configuration of USB controller (see subsection 0).

BIOS Read/Write Protection – Enables/Disables of the BIOS SPI area protection:

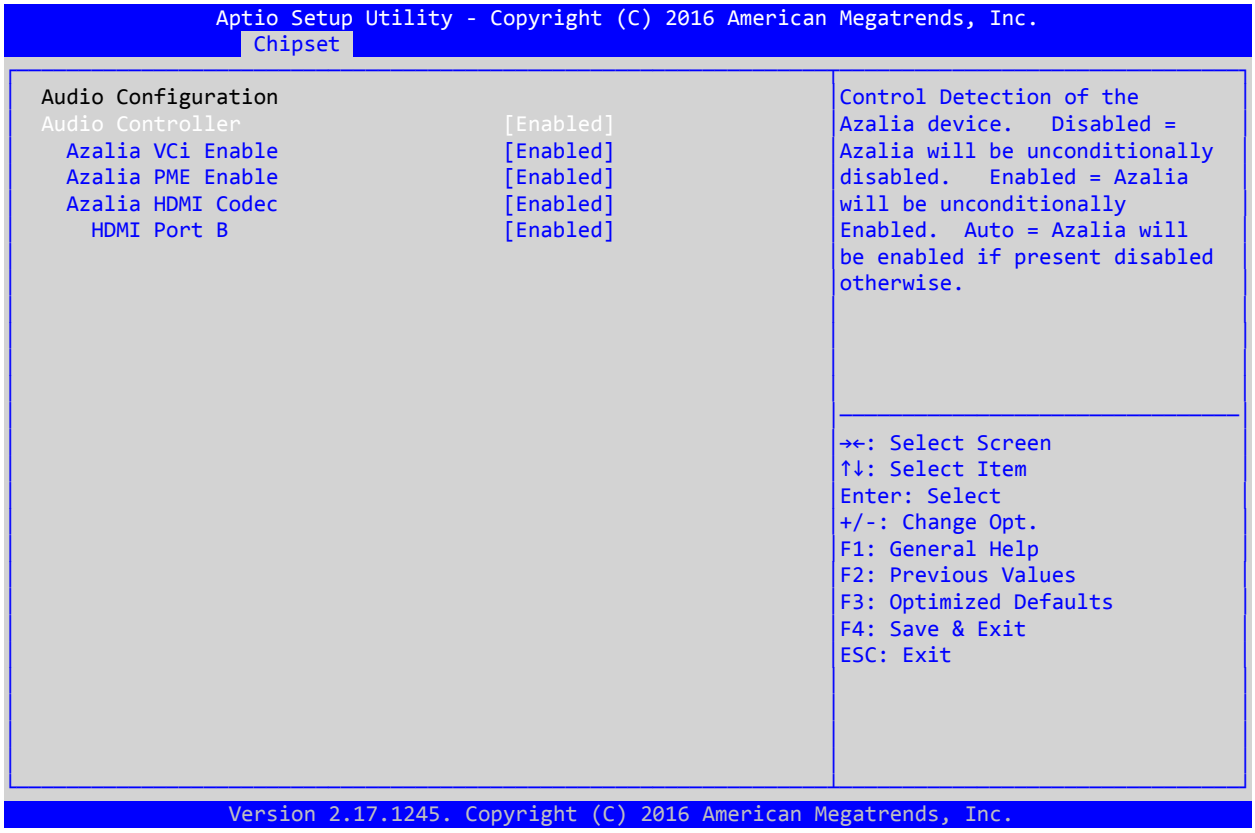
[Enabled] – Protection is ON.

[Disabled] – Protection is OFF.

7.4.2.1 Azalia HD Audio

This submenu is sued for configuration of Azalia integrated audio controller. This submenu is shown in the figure below.

Fig. Ошибка! Текст указанного стиля в документе отсутствует.**-22: Screen of the "Azalia HD Audio" submenu**



Where:

Audio Controller – Enables/Disables integrated audio controller:

[Enabled] – Audio controller is ON.

[Disabled] – Audio controller is OFF.

Azalia HDMI Codec – Enables/Disables audio transfer via digital display interface (DisplayPort):

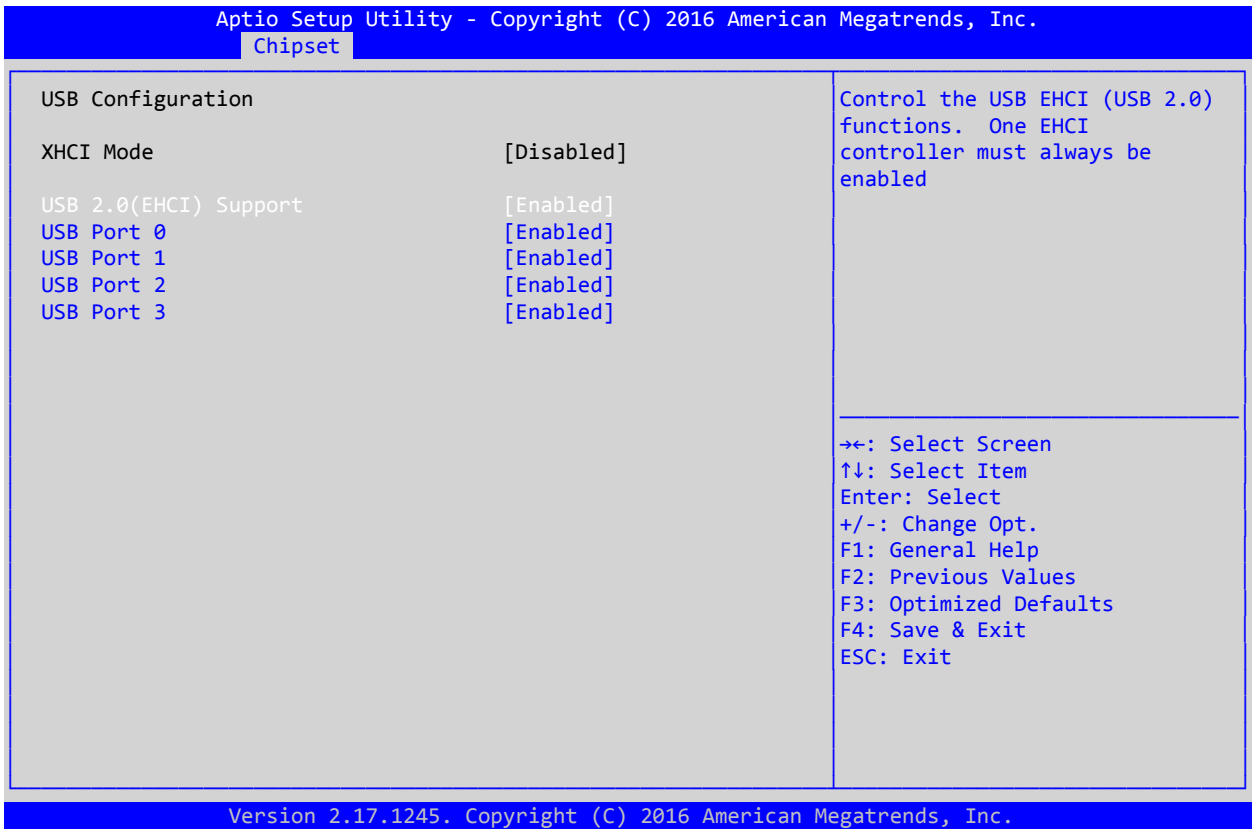
[Enabled] – ON.

[Disabled] – OFF.

7.4.2.2 USB Configuration

This submenu is used for configuration of USB controller. This submenu is shown in the figure below.

Fig. Ошибка! Текст указанного стиля в документе отсутствует.**-23: Screen of the "USB Configuration" submenu**



Where:

XHCI Mode – Enables/Disables XHCI controller (available with the EHCI controller is switched off):

[Enabled] – XHCI controller is on.

[Disabled] – XHCI controller is off.

USB 2.0(EHCI) Support – Enables/Disables EHCI controller (available with the XHCI controller is switched off):

[Enabled] – XHCI controller is on.

[Disabled] – XHCI controller is off.

USB Port 0 – Enables/Disables USB Port 0 (XS9 connector):

[Enabled] – USB Port 0 is on.

[Disabled] – USB Port 0 is off.

USB Port 1 – Enables/Disables USB Port 0 (XS8 connector):

[Enabled] – USB Port 1 is on.

[Disabled] – USB Port 1 is off.

USB Port 2 – Enables/Disables USB Port 2 (USB2.0 mode in XS6 connector):

[Enabled] – USB Port 2 is on.

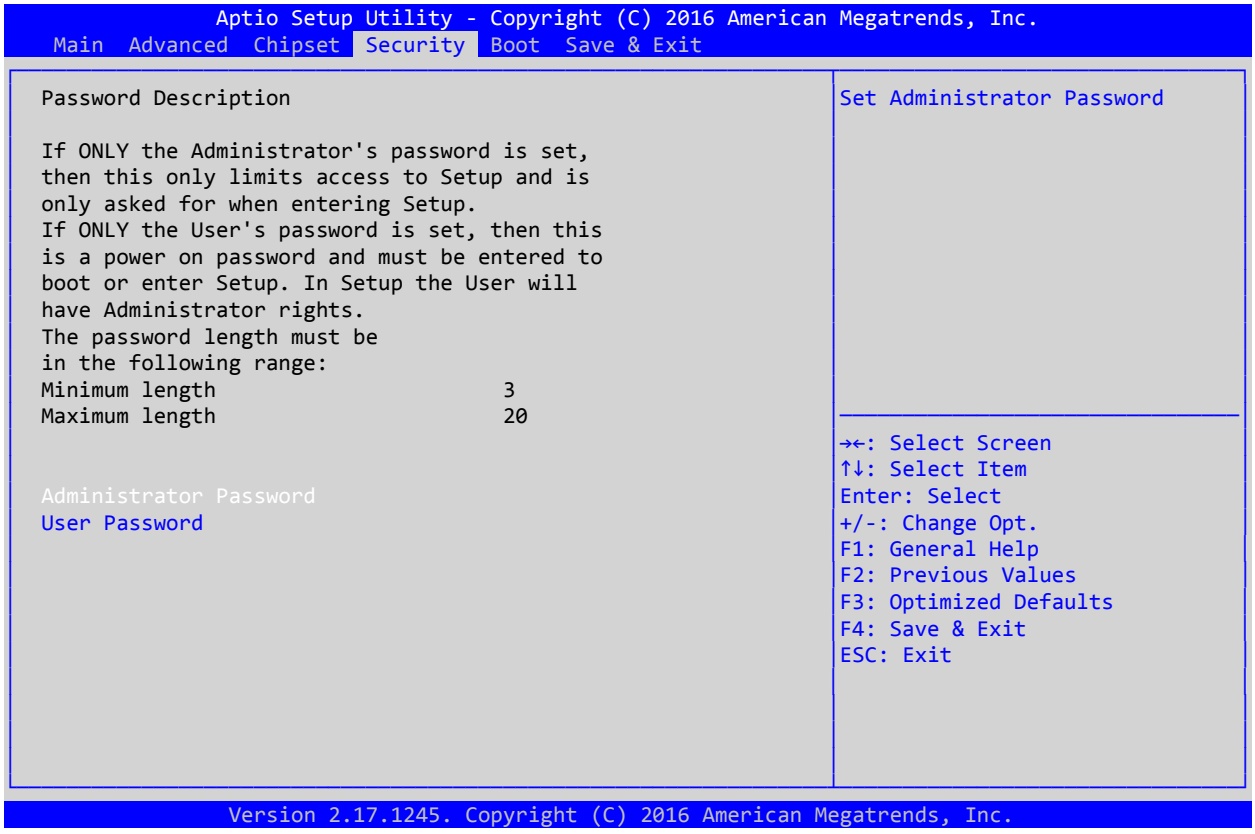
[Disabled] – USB Port 2 is off.

USB Port 3 – Enables/Disables USB Port 3 (USB on StackPC and MiniPCIe):
[Enabled] – USB Port 3 is on.
[Disabled] – USB Port 3 is off.

7.5 Security

This tab is designed for configuration of module's protection functions. The menu of this tab is shown in the figure below.

Fig. Ошибка! Текст указанного стиля в документе отсутствует.**-24: Screen of the "Security" menu tab**



Where:

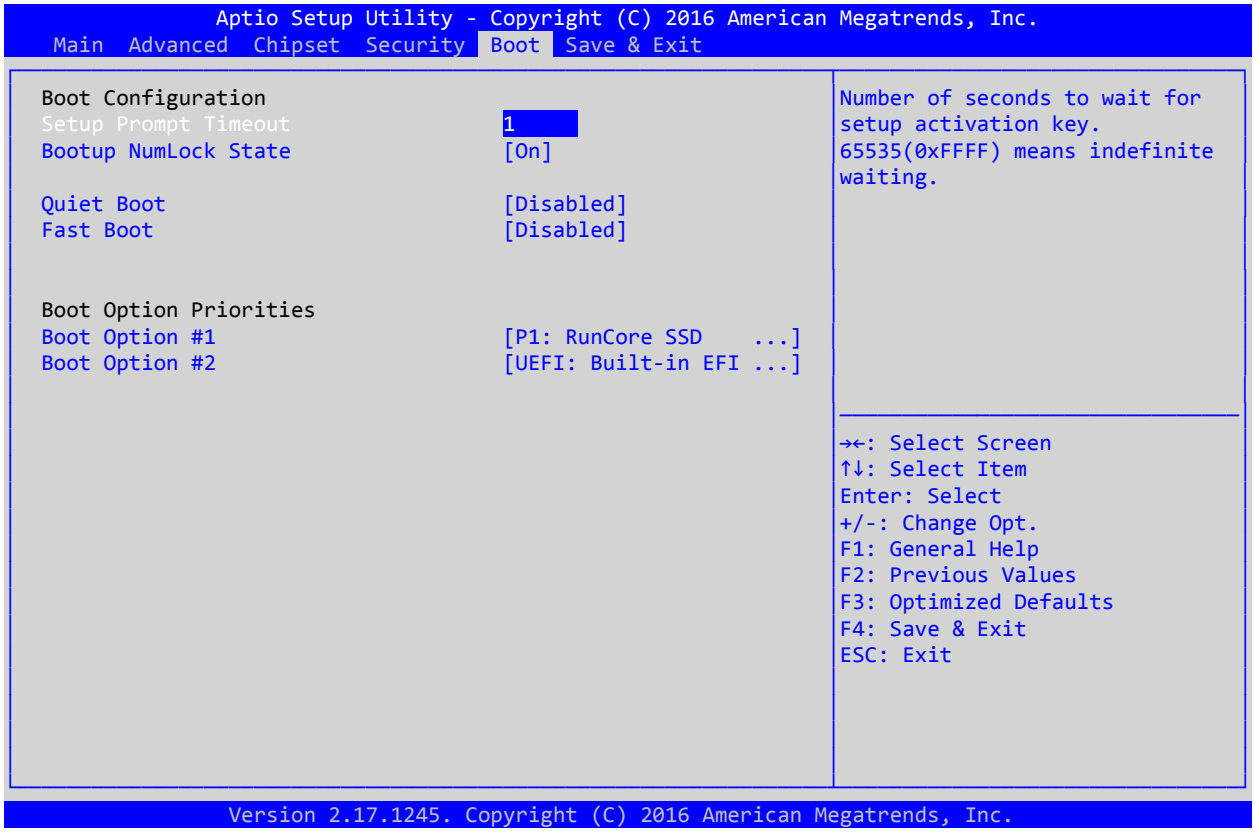
Administrator Password: setting password for entry to BIOS Setup with Administrator permission.

User Password: setting password for start of OS and entry to BIOS Setup with user permission.

7.6 Boot

Tab for configuration of booting mode and module boot devices. The menu of this tab is shown in the figure below.

Fig. Ошибка! Текст указанного стиля в документе отсутствует.**-25: Screen of the "Boot" menu tab**



Where:

Setup Promt Timeout: Configuration of timeout (in seconds) for displaying invitation to enter BIOS SETUP.

Bootup NumLock State: Installation of the "NumLock" LED on keyboard "by default" at start.

[On] – LED is on.
[Off] – LED is off.

Quiet Boot: Enables/Disables of "silent" boot mode, without displaying BIOS information.

[Enabled] – ON.
[Disabled] – OFF.

Fast Boot: Enables/Disables fast boot mode, with initialization of minimum number of devices.

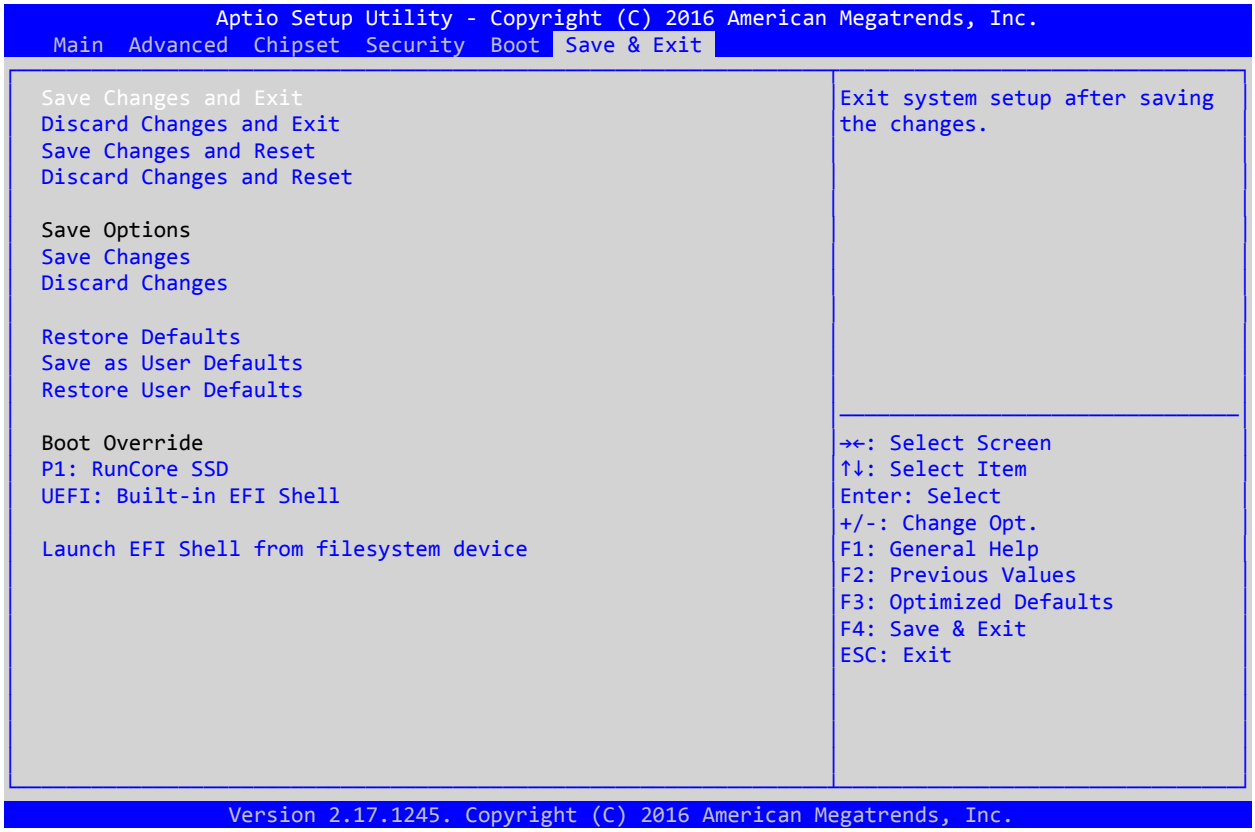
[Enabled] – ON.
[Disabled] – OFF.

Boot Option Priorities: This submenu is used for OS boot from devices (P1: Runcore SSD – integrated data storage device Onboard NAND Flash).

7.7 Save & Exit

Tab of parameters for exit the BIOS Setup program. The menu of this tab is shown in the figure below.

Fig. Ошибка! Текст указанного стиля в документе отсутствует.**-26: Screen of the "Save & Exit" menu tab**



Where:

Save Changes and Exit: Exit from BIOS Setup with the changes saved
Discard Changes and Exit: Discard changes and exit from BIOS Setup
Save Changes and Reset: Save changes and restart
Discard Changes and Exit: Discard changes and restart

Save Changes: Save changes
Discard Changes: Discard changes

Restore Defaults: Boot settings made by manufacturer by default.
Save as User Defaults: Save changes as user defaults
Restore User Defaults: Boot user defaults

BOOT Override: This menu is used for compulsory selection of the device for immediate OS boot

Launch EFI Shell from filesystem device: Launch of EFI console

ANNEX B DISCLAIMER

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

1 INTELLECTUAL PRORETY

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

2 WARRANTY POLICY

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

3 ORDER AND DELIVERY CONDITIONS

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

4 OTHER CONDITIONS

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