



# CPC152

## MicroPC Vortex86DX™ 600 MHz

### CPU Module

# User Manual

Version 1.05

December 2015



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

Document name: CPC152 User Manual  
 Manual version: 1.05  
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## Revision Record

| Rev. Index | Brief Description   | Product Index | Date          |
|------------|---|---------------|---------------|
| 0.01       | <u>Item number: 687263.045 v.1.0</u><br>Initial version of User Manual CPC152   | CPC152        | July 2013     |
| 1.00       | <u>Item number: 687263.045 v.1.1</u><br><a href="#">Section 2.8</a> "Description of internal registers": description of control registers / interrupt state is added by new information, description of control register of page access to NV SRAM 128KB<br><a href="#">Section 1.6</a> "Location of components and external view of CPC152" – was updated in accordance with the new version of item number.<br><a href="#">Section 3.1.4</a> "Switching of Power Fail signals, watchdog timer actuation, remote reset to the line of CPU hardware reset" – purpose of X9 jumper has been adjusted.  | CPC152        | December 2013 |
| 1.01       | <u>Item number: 687263.045 v.1.1</u><br><a href="#">Section 1.10.22</a> "Audio port" – recommendation for switching jumpers on KIB98102 interface module has been adjusted.<br>New <a href="#">Section 2.8.3</a> "Register of interrupts state of ISA bus controller".<br><a href="#">Section 2.8.5</a> "Registers of interrupts control of ISA bus controller" – purpose of interrupt control bits has been changed.<br><a href="#">Section 5.3</a> "PCI/ PnP (Additional PCI plug and play settings)" – table of additional settings description has been supplemented by a section, connected to the SYSTEM_EVENT.<br><a href="#">Section 1.10.8</a> "IDE (XP16) port" is supplemented with recommendations for the connection of external IDE devices and a table of possible combinations of external and internal IDE (Master/Slave) devices.<br><a href="#">Section 5</a> "Basic Input/Output System (BIOS)" is supplemented with new information in accordance with the changes in the new module's version (subsections are added with the description of purpose of interrupt line integrated devices). | CPC152        | April 2014    |
| 1.02       | <a href="#">Section 1.6</a> "Location of components and CPC152 external view" – scheme with the location of module's major components has been updated.   | CPC152        | April 2014    |
| 1.03       | <a href="#">Section 1.9</a> "Additional equipment" – obsolete devices were deleted from the list.   | CPC152        | April 2014    |
| 1.04       | <a href="#">Section 1.9</a> "Additional equipment" has been added with Compact Flash MIC23012 (64 GB).<br><a href="#">Section 1.10.7</a> "Compact Flash (XP1)" has been added with a table of compatibility with Compact Flash MIC230xx modules.  | CPC152        | June 2014     |
| 1.05       | Compliance assessment   | CPC152        | December 2015 |

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|   |    |
|---|----|
| Contents  | 3  |
| Contents .....  | 3  |
| List of tables.....   | 5  |
| List of figures.....  | 6  |
| Trademarks.....   | 7  |
| Ownership rights.....   | 7  |
| NOTATIONS.....  | 8  |
| Safety requirements.....  | 9  |
| General Board Operation Rules.....  | 10 |
| The Manufacturer's Guarantees.....  | 10 |
| <b>SECTION 1</b> .....  | 12 |
| <b>1 BRIEF DESCRIPTION</b> .....  | 13 |
| 1.1 Device purpose.....   | 13 |
| 1.2 General information.....  | 13 |
| 1.3 Connection to module.....   | 17 |
| 1.4 Module power supply.....  | 17 |
| 1.5 Block diagram of CPC152.....  | 18 |
| 1.6 Location of components and external view of CPC152.....                   | 19 |
| 1.7 Versions.....   | 21 |
| 1.8 Delivery checklist.....   | 21 |
| 1.9 Additional accessories.....   | 21 |
| 1.10 Constituent parts of CPC152.....   | 23 |
| <b>SECTION 2</b> .....  | 39 |
| <b>2 TECHNICAL INFORMATION</b> .....  | 40 |
| 2.1 General technical specifications of CPC152.....                           | 40 |
| 2.2 Allocation of hardware interrupts.....                                    | 43 |
| 2.3 Channels of DMA module.....   | 44 |
| 2.4 I/O address space.....  | 44 |
| 2.5 Memory address space.....   | 47 |
| 2.6 Use of GPIO ports of CPU.....   | 47 |
| 2.7 WDT0, WDT1 watchdog timers.....   | 49 |
| 2.8 Description of internal registers.....                                    | 54 |
| 2.9 Table of module connector contacts.....                                   | 58 |
| <b>SECTION 3</b> .....  | 68 |
| <b>3 INSTALLATION AND CONFIGURATION</b> .....                                 | 69 |
| 3.1 Installation of module switches.....                                      | 70 |
| 3.2 Configuration of module's parameters (BIOS SETUP).....                    | 73 |
| <b>SECTION 4</b> .....  | 74 |
| <b>4 INTENDED USE OF CPC152</b> .....   | 75 |
| 4.1 Basic software.....   | 75 |
| 4.2 Setting connection between PC and CPC152.....                             | 75 |
| 4.3 Module operation wit AT-keyboard and CRT-display/TFT-panel.....           | 75 |
| 4.4 Loading files with FTRANS.EXE program.....                                | 76 |
| 4.5 Interface BIOS SOC Vortex86DX for reading serial number, MAC-address..... | 76 |
| 4.6 Interface BIOS SOC Vortex86DX for reading/writing to FRAM.....            | 77 |
| 4.7 Service utility programs.....   | 78 |
| <b>SECTION 5</b> .....  | 79 |
| <b>5 BASIC INPUT/OUTPUT SYSTEM (BIOS)</b> .....                               | 80 |
| 5.1 Main.....   | 82 |
| 5.2 Advanced (additional settings).....                                       | 83 |
| 5.3 PCI/ PnP (additional settings of PCI plug and play).....                  | 92 |

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|  |  |     |
|--|--|-----|
| 5.4  | Boot (Boot modes).....   | 95  |
| 5.5  | Security.....  | 98  |
| 5.6  | Chipset (integrated devices).....  | 99  |
| 5.7  | Exit.....  | 108 |
| <b>SECTION 6</b> .....                             |  | 109 |
| <b>TRANSPORTATION, UNPACKING AND STORAGE</b> ..... |  | 110 |
| <b>ANNEXES</b> .....                               |  | 111 |
| A  | <i>Tables of contacts for connecting displays</i> .....                  | 112 |
| B  | <i>Frequently asked questions related to programming of CPC152</i> ..... | 113 |
| C  | <i>Terms, abbreviations and acronyms</i> .....                           | 114 |
| D  | <i>Disclaimer</i> .....  | 117 |

## List of tables

|             |   |    |
|-------------|---|----|
| Table 1 1:  | Requirements to parameters of the power supply source.....  | 18 |
| Table 1 2:  | Table of available combinations of IDE devices with MIC230xx.....   | 26 |
| Table 1 3:  | Table of allowable combinations of IDE devices.....   | 27 |
| Table 1 4:  | Frequency divider values for serial ports.....  | 29 |
| Table 1 5:  | Purpose of CPC152 LEDs.....   | 36 |
| Table 2 1:  | Requirements for power supply of CPC152.....  | 40 |
| Table 2 2:  | Characteristics of digital inputs-outputs (GPIO).....   | 40 |
| Table 2 3:  | Characteristics of serial ports.....  | 41 |
| Table 2 4:  | Characteristics of USB, LAN ports.....  | 41 |
| Table 2 5:  | IDE port characteristics.....   | 41 |
| Table 2 6:  | Characteristics of integrated temperature, pressure, acceleration sensors.....                                  | 41 |
| Table 2 7:  | Environmental conditions.....   | 42 |
| Table 2 8:  | Mechanical characteristics.....   | 42 |
| Table 2 9:  | Addresses of hardware interrupts.....   | 43 |
| Table 2 10: | Channels of DMA module.....   | 44 |
| Table 2 11: | Allocation of the I/O address space.....  | 44 |
| Table 2 12: | Internal I/O addresses.....   | 46 |
| Table 2 13: | Memory devices addresses.....   | 47 |
| Table 2 14: | GPIO control registers.....   | 47 |
| Table 2 15: | Purpose of GPIO ports.....  | 48 |
| Table 2 16: | WDT0 restart register.....  | 49 |
| Table 2 17: | Index register of WDT0 address port.....  | 49 |
| Table 2 18: | Data register of WDT0 port.....   | 49 |
| Table 2 19: | Control register of WDT0 timer.....   | 50 |
| Table 2 20: | Register of WDT0 event selection.....   | 50 |
| Table 2 21: | CNT0 register of WDT0 timer value.....  | 50 |
| Table 2 22: | CNT1 register of WDT0 timer value.....  | 51 |
| Table 2 23: | CNT2 register of WDT0 timer value.....  | 51 |
| Table 2 24: | Register of WDT0 timer condition.....   | 51 |
| Table 2 25: | WDT1 restart register.....  | 52 |
| Table 2 26: | Control register of WDT1 timer.....   | 52 |
| Table 2 27: | Register of WDT1 event selection.....   | 52 |
| Table 2 28: | CNT0 register of WDT1 timer value.....  | 53 |
| Table 2 29: | CNT1 register of WDT1 timer value.....  | 53 |
| Table 2 30: | CNT2 register of WDT1 timer value.....  | 53 |
| Table 2 31: | Register of WDT1 timer condition.....   | 53 |
| Table 2 32: | Purpose of XP1 connector contacts: Compact Flash.....   | 58 |
| Table 2 33: | Purpose of XP2 connector contacts: IDE port.....  | 59 |
| Table 2 34: | Purpose of XP3 connector contacts: COM1 (RS-422/485).....   | 59 |
| Table 2 35: | Purpose of XP4 connector contacts: COM2 (RS-422/485).....   | 59 |
| Table 2 36: | Purpose of XP5 connector contacts: LPT port.....  | 60 |
| Table 2 37: | Purpose of XP6, XP7 connector contacts: COM3, COM4.....   | 60 |
| Table 2 38: | Purpose of XP8 connector contacts: PS/2 port of keyboard/mouse.....   | 60 |
| Table 2 39: | Purpose of XP10 connector contacts.....   | 61 |
| Table 2 40: | Purpose of XP14 connector contacts: buzzer.....   | 61 |
| Table 2 41: | Purpose of XP15 connector contacts: KIB98102 (VGA,TFT,AUDIO,KB,MS).....   | 62 |
| Table 2 42: | Purpose of XP16 connector contacts: KIB98201 (IDE,LPTTFT,AUDIO,KB,MS).....                                      | 63 |
| Table 2 43: | Purpose of XP17, XP18 connector contacts: ports of isolated remote reset / interrupt.....                       | 64 |
| Table 2 44: | Purpose of XP20 connector contacts: module power supply.....  | 64 |
| Table 2 45: | Purpose of XP21 connector contacts: USB2/3 ports.....   | 64 |
| Table 2 46: | Purpose of XS4 connector contacts: PC/104 (ISA 8/16 bit) lines A, B.....  | 65 |
| Table 2 47: | Purpose of XS4 connector contacts: PC/104 (ISA 8/16 bit) lines C, D.....  | 66 |
| Table 2 48: | Purpose of XS6 connector contacts: MicroPC (ISA 8 bit).....   | 67 |
| Table 3 1:  | Purpose of switched for module configuration.....   | 70 |
| Table 3 2:  | Switching to BIOS booting from the main / standby source.....   | 70 |
| Table 3 3:  | Purpose of IDE integrated devices: Master or Slave.....   | 71 |
| Table 3 4:  | Selection of power supply voltage for LCD panel (connection via KIB98102, XP15).....                            | 71 |
| Table 3 5:  | Switching of Power Fail signals, watchdog timer actuation, remote access to the line of CPU hardware reset..... | 71 |
| Table 3 6:  | Binding and matching of COM1 port (RS-422/485).....   | 72 |
| Table 3 7:  | Selection of COM1 port operation mode (RS-422/485).....   | 72 |
| Table 3 8:  | Binding and matching of COM2 lines (RS-422/485).....  | 72 |
| Table 3 9:  | Selection of COM2 port operation mode (RS-422/485).....   | 72 |
| Table 3 10: | Setting the voltage level of remote reset actuation (XP17).....   | 73 |
| Table 3 11: | Connection of integrated nonvolatile RAM.....   | 73 |
| Table 5 1:  | Description of "Main" menu.....   | 82 |
| Table 5 2:  | Description of "Advanced" menu (additional settings).....   | 83 |
| Table 5 3:  | Description of "CPU Configuration" menu.....  | 84 |
| Table 5 4:  | Description of "IDE Configuration" menu (IDE controller configuration).....                                     | 85 |
| Table 5 5:  | Description of "Primary IDE Master" menu.....   | 86 |
| Table 5 6:  | "Remote Access Configuration" menu description (Console I/O settings).....                                      | 88 |
| Table 5 7:  | Description of "USB Configuration" menu (Configuration of USB ports).....                                       | 90 |
| Table 5 8:  | Description of "USB Mass Storage Device Configuration" menu (Configuration of USB drive).....                   | 91 |
| Table 5 9:  | Description of "PCI/ PnP" menu (additional settings of PCI Plug and Play).....                                  | 93 |
| Table 5 10: | Description of the "Boot" menu (boot modes).....  | 95 |

|             |  |     |
|-------------|--|-----|
| Table 5 11: | Description of the "Boot Settings Configuration" menu.....                       | 96  |
| Table 5 12: | Description of "Security" menu.....  | 98  |
| Table 5 13: | Description of "Chipset" menu (integrated devices).....                          | 99  |
| Table 5 14: | Description of "SouthBridge Configuration" menu (SouthBridge Configuration)..... | 100 |
| Table 5 15: | Description of "NorthBridge Configuration" menu.....                             | 101 |
| Table 5 16: | Description of "ISA Configuration" menu (ISA configuration).....                 | 102 |
| Table 5 17: | Description of "Serial/Parallel Port Configuration" menu.....                    | 103 |
| Table 5 18: | Description of "WatchDog Configuration" menu.....                                | 105 |
| Table 5 19: | Description of "GPIO Configuration" menu.....                                    | 106 |
| Table 5 20: | Description of "NV SRAM Configuration" menu.....                                 | 107 |
| Table 5 21: | Description of "Exit" menu.....  | 108 |
| Table A 1:  | Table of cable contact for connection of 4 bit STN EL-displays to LPT port.....  | 112 |

### List of figures

|            |   |     |
|------------|---|-----|
| Fig. 1 1:  | Block diagram of CPC152.....  | 18  |
| Fig. 1 2:  | External view of CPC152.....  | 19  |
| Fig. 1 3:  | Location of primary components of CPC152.....   | 20  |
| Fig. 1 4:  | .....Numbering of XP10 connector contacts.....  | 28  |
| Fig. 1 5:  | Output stages of RS -422/485 ports of CPC152.....   | 30  |
| Fig. 1 6:  | Connection of modules via RS-485 interface.....   | 31  |
| Fig. 1 7:  | Connection of modules via RS-422 interface.....   | 31  |
| Fig. 1 8:  | Numbering of contacts of XP3, XP4 connectors.....   | 31  |
| Fig. 1 9:  | Numbering of contacts of XP6 and XP7 connectors.....  | 32  |
| Fig. 1 10: | Numbering of XP8 connector contacts.....  | 32  |
| Fig. 1 11: | Numbering of XP21 connector's contacts.....   | 33  |
| Fig. 1 12: | Numbering of XP5 connectors contacts.....   | 33  |
| Fig. 1-1:  | Numbering of XP22 connector contacts.....   | 34  |
| Fig. 1 14: | Numbering of XP17, XP18 connectors contacts.....  | 35  |
| Fig. 1 15: | Numbering of contacts of XS4 connector a) top view of the module, b) bottom view of the module with personal organizer, installed on the connector..... | 35  |
| Fig. 1 16: | External view of XP15 connector.....  | 38  |
| Fig. 1 17: | External view of XP16 connector.....  | 38  |
| Fig. 3 1:  | Diagram of CPC152 module connection to backplane.....   | 69  |
| Fig. 3 2:  | Conventional view of installation and connection of extension modules in PC/104 format.....   | 69  |
| Fig. 5 1:  | Screen view during module booting process (POST).....   | 80  |
| Fig. 5 2:  | Menu of boot device selection.....  | 81  |
| Fig. 5 3:  | Screen of "Main" menu.....  | 82  |
| Fig. 5 4:  | Screen of "Advanced" menu.....  | 83  |
| Fig. 5 5:  | Screen of "CPU Configuration" menu.....   | 84  |
| Fig. 5 6:  | Screen of "IDE Configuration" menu.....   | 85  |
| Fig. 5 7:  | Screen "Primary IDE Master" menu.....   | 86  |
| Fig. 5 8:  | Screen of "Remote Access Configuration" menu.....   | 88  |
| Fig. 5 9:  | Screen of "USB Configuration" menu.....   | 90  |
| Fig. 5 10: | Screen of the "USB Mass Storage Device Configuration" menu.....   | 91  |
| Fig. 5 11: | Screen of "PCI/ PnP" menu.....  | 92  |
| Fig. 5 12: | Screen of "PCI/ PnP" menu (continued).....  | 93  |
| Fig. 5 13: | Screen of "Boot" menu.....  | 95  |
| Fig. 5 14: | Screen of "Boot Settings Configuration" menu.....   | 96  |
| Fig. 5 15: | Screen of "Security" menu.....  | 98  |
| Fig. 5 16: | Screen of "Chipset" menu.....   | 99  |
| Fig. 5 17: | Screen of "SouthBridge Configuration" menu.....   | 100 |
| Fig. 5 18: | Screen of "Onboard Devices" menu.....   | 101 |
| Fig. 5 19: | Screen of "ISA Configuration" menu.....   | 102 |
| Fig. 5 20: | Screen of "Serial/Parallel Port Configuration" menu.....  | 103 |
| Fig. 5 21: | Screen of "WatchDog Configuration" menu.....  | 105 |
| Fig. 5 22: | Screen of "GPIO Configuration" menu.....  | 106 |
| Fig. 5 23: | Screen of "NV SRAM Configuration" menu.....   | 107 |
| Fig. 5 24: | Screen of "Exit" menu.....  | 108 |

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Fastwel welcomes suggestions, remarks and proposals regarding the form and the content of this Manual.

This manual contains technical description, regulations, directions and recommendations for installation, setting and operation of CPC152 CPU module, manufactured by Fastwel.

CPC152 CPU module is designed for the use as part of various integrated systems, which require a combination of high performance and a low level of heat power released and power consumption, operation within an extended temperature range (-40...+85°C), as well as compatibility of applications with x86 architecture of CPUs. CPC152 is implemented in MicroPC format and is compatible with the majority of peripheral modules and power sources, supplied by various manufacturers.

The document is designed for developers of distributed control and data acquisition systems, for IT administrators and engineers in industrial automation area.

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This sign and caption warn you about the dangers, related to electric discharges ( $> 60 \text{ V}$ ) when touching a product or any parts thereof. Failure to observe safety measures, mentioned or prescribed by the regulations, may expose your life or health to danger, as well as may lead to product damages. See also the section, devoted to operation with a high voltage, specified below.



### Attention! Device, sensitive to static electricity!

This sign and caption indicate that electronic boards and their components are sensitive to static electricity. This is why it is required to exercise caution when handling this device and at the time of inspections, in order to guarantee integrity and working capacity of the device. See also Section, devoted to the directions for handling with the board and unpacking, specified below.



### Attention! Hot surface!

This sign and caption warn us of a danger, related to touching hot surfaces, containing within the device.



### Attention!

This sign is designed to make you consider those aspects of the User Manual, which incomplete understanding or failure to follow could endanger your health or result in damages of the equipment.



### Note

This sign is used to mark the parts of the text, which should be read thoroughly.



## Safety requirements

This product is designed and tested for the purpose of ensuring compliance with the electric safety requirements. Its design guarantees long-term failsafe operation. Life cycle of the device can be sufficiently reduced due to improper handling during unpacking and installation. Therefore, for your own safety and in order to ensure the proper operation of the device, you should observe the below recommendations.

### High-voltage safe handling rules



#### Attention!

All works with this device should be performed only by employees which have sufficient skills for these types of works.



#### Attention, high voltage!

Before installing the board into the system make sure that the mains supply is off. This also applies to installation of extension boards.

During installation, repairs and maintenance of the device, there is a serious risk of electric shock, this is why you should always unplug the power cord from the socket during carrying out of works. This also applies to other feeder cables.

### BOARD HANDLING INSTRUCTIONS



#### Device, sensitive to static electricity!

Electronic boards and their components are sensible to static electricity. This is why you should give special attention to handling with these devices in order to ensure their integrity and working efficiency.

Do not leave the board without protective packaging, when it is not operated.

When applicable, always operate the board at the workplace equipped with protection against static electricity. If it is impossible, the user should remove a static discharge before touching the device by hand or using tools. The best way to do it is touch a metal part of system enclosure.

Crucially, the safety precautions should be observed during operations related to the replacement of jumpers etc. If the device is equipped with batteries for power supply of memory or real-time clock, do not put the board onto current conducting surfaces, such as antistatic mats or sponges. They could cause short circuit and lead to damages of battery and board conducting circuits.

## General Board Operation Rules

- To preserve the manufacturer's guarantee, the product must not be reworked or altered in any way. Any alterations and improvements not authorized by Fastwel Group Co. Ltd company, except those described in this Manual or obtained from the Fastwel Group Co. Ltd technical support service in the form of a set of instructions describing their performance cancel the guarantee.
- This device must be only installed into and connected to systems meeting all necessary technical and climatic requirements. This relates to the operating temperatures range of the specific board design version. The temperature limitations of the batteries installed on the board should be taken into account as well.
- Please follow only the instructions of this Manual while performing all necessary installation and configuring operations.
- Keep original package to store the product in the future or to transport it in case of a guarantee event. Should it become necessary to transport or store the board, pack it in the same way it was packed upon receipt.
- Take particular care during handling the product and its unpacking. Act in accordance with the instructions of the above section and Chapter 6 6. TRANSPORTATION, UNPACKING

## AND STORAGE.

## The Manufacturer's Guarantees

### Guarantee Liabilities

The Manufacturer hereby guarantees the product conformity with the requirements of TU 4013-004-52415667-05 specifications, provided the Consumer abides by the conditions of operation, transportation, storage, installation and assembly established by the accompanying documents.

The Manufacturer hereby guarantees that the products supply thereby are free from defects in workmanship and materials, provided operation and maintenance norms were observed during the currently established guarantee period. The Manufacturer's obligation under this guarantee 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 guarantee 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.

### Guarantee Period

The guarantee period for the products made by the manufacturer company is 36 months since the sale date (unless otherwise provided by the supply contract).

The guarantee period for the products made to special order is 60 months since the sale date (unless otherwise provided by the supply contract).

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

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

**Returning a product for repair**

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

# **SECTION 1**

## **BRIEF DESCRIPTION**

# 1 BRIEF DESCRIPTION

## 1.1 Device purpose

CPC152 CPU Module is a high-integrity solution based on x86 platform in MicroPC format, designed for use in real-time management, manufacturing control as well as data collection and processing systems. The module can operate in an independent or slave mode.

Connection of primary I/O devices (VGA displays, TFT-panels, AT-keyboards and other handling equipment, audio devices, printers USB devices) makes it possible to use the CPC152 CPU Module in the systems attended by operator. For storing data it is possible to use both an integrated drive and external USB and IDE devices.

In addition to the standard MicroPC extension bus (ISA 8-bit), the module is equipped with PC/104 bus (ISA 8/16-bit), which makes it possible to connect extra extension modules to CPC152.

CPC152 can be connected to RS-232, RS-422/485, Ethernet networks, which enables to use the module in distributed I/O and data processing systems.

## 1.2 General information

- CPU: Vortex86DX™ 600MHz
  - 32 bit x86 core
  - 16 bit memory bus
  - L1 Cache (32 KB)
  - L2 Cache (256 KB)
  - System bus frequency 333 MHz
- RAM:
  - soldered DDR2 SDRAM 256 MB
- Flash-drive:
  - PATA NAND Flash controller with integrated system of ECC control and wear
  - 2 GB NAND Flash (SLC) <sup>1</sup>
- FLASH BIOS:
  - 256 KB modifiable within the system and back-up copy
  - Automatic switching to the backup copy in case of error when booting the primary copy
- Integrated nonvolatile memory:
  - Internal memory 256 byte
  - 8 KB FRAM (SPI), used for storing configuration, calibration factors of sensors
  - 128 KB SRAM (ISA)  
Consumption current from 3 V battery, when the power is OFF: 4 mA <sup>2</sup>  
consumption current from 3V battery when the power is ON: 2 mA <sup>3</sup>

<sup>1</sup> Available volume of integrated drive: 1.8 GB

<sup>2</sup> Standardized value under normal conditions (humidity from 5 to 95%, +25°C).

<sup>3</sup> Standardized value under normal conditions (humidity from 5 to 95%, +25°C).

- Extension buses:
  - MicroPC (ISA 8-bit, 8/16 MHz)
  - PC/104 (ISA 8/16-bit, 8/16 MHz)
- Connector for Compact Flash:
  - Support of Type 1 / 2 modules
  - support of PIO, DMA, UDMA modes
- Port of HDD connection:
  - 1x Primary channel
  - Connection up to 2x devices
  - Support of Ultra-DMA 100
- Port LAN 10/100 Mb:
  - Standard RJ45 connector with LED indication
  - Insulation from the system: 500 V
- USB ports (host):
  - Support of USB 1.1, USB 2.0 (HS, FS, LS)
  - Connection up to 4-x devices
  - Standard connector 2x USB Type A
- Video subsystem:
  - Video controller with 2D accelerator
  - Volume of video memory: 16 MB DDR
  - Independent connection of 2x displays
  - Port for the connection of RGB display with resolution up to 1920x1440, 32 bit color
  - Port for the connection of TFT-panels with resolution of up to 1920x1440, 18 bit color
  - Connection of display via a separate VGA (connector XP2, IDC2-10) port.
  - Connection of the display via a standard connector DSUB15F using KIB98102 interface board
- Audio port:
  - Linear stereo input/output:
  - Input for MIC connection (mono)
- Universal parallel port with support of SPP, EPP, ECP modes
  - Connection via a separate IDC-26
  - Connection of devices via standard DSUB-25 connector, using KIB98201 interface board
- Serial ports:
  - COM1: isolated RS-422/485 (individual insulation form the system: 500 V)
  - COM2: isolated RS-422/485 (individual insulation form the system: 500 V)
  - automatic (hardware) control of information transfer direction for RS-422/485 ports
  - COM3: RS-232 (9-wore, full set of signals)
  - COM4: RS-232 (9-wore, full set of signals)
  - exchange rate via RS-232 up to 250 KB/sec
  - exchange rate via RS-422 / RS-485: up to 750 KB/sec <sup>4</sup>
  - ESD protection: 15 kW (IEC1000-4-2)

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<sup>4</sup> Exchange rate via serial ports is defined by a frequency divider register value.

- GPIO port:
  - 8x lines (compatible with 5 V)
  - GPIO\_P2[7:0] CPU port is used
  - Maximum output load capacity: 16 mA
  - compatibility with 5 V level
  - using the port for control of servo drives (PWM)
  - ability to use the port in the mode of compatibility with 8051
- PS/2 keyboard and mouse port
- Watchdog timers:
  - two watchdog timers, integrated into CPU, with a programmable event and actuation interval of 30.5 microseconds...512 seconds
  - One watchdog timer, integrated into the power supply supervisor, with a fixed actuation interval of 1.6 seconds
- Real-time clock
  - Consumption current when the power is OFF: 2 mA<sup>5</sup>
- Integrated lithium battery of 3 V (CR2032, standardized capacity 180...220 mA•h)
- Opto-isolated reset / interrupt
  - Potential-free contact
  - Voltage 3...15 V, 10...30 V
- Generation of interrupt / reset in case power supply voltage is lower than 4.65 V
- PC buzzer
- Temperature sensor (LM92, - 55 ...+ 125° C)
- Digital accelerometer (measuring acceleration via 3 axes)
- Digital barometer (measuring pressure from 50 to 115 KPa)
- Compatibility with operating systems:<sup>6</sup>
  - FreeDOS, Microsoft™ MS-DOS® 6.22
  - Linux 2.6
  - Microsoft™ Windows CE 5
  - Microsoft™ Windows XP Embedded
  - QNX 4.25, QNX 6.5x
- Console ports: COM3/4 and/or VGA/TFT and/or Keyboard
- Extension buses:
  - ISA 8 bit (MicroPC)
  - ISA 8/16 bit (PC/104)
- Power supply voltage: +5 V ± 5%
- Consumed current (without external devices):
  - no more than 0.85 A @ 5 V (at +25°C)

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<sup>5</sup> Standardized value under normal conditions (humidity from 5 to 95%, +25°C).

<sup>6</sup> By default, the module is supplied with preinstalled FreeDOS.

- Operating temperature range: from - 40 to + 85° C
- Modules storage conditions 1 in accordance with GOST 15150-69
- Humidity: up to 95%, at +25°C without condensation
- Resistance to multiple shocks: 50g
- Vibration resistance: 5g
- MTBF: No less than 160 000 hours
- Dimensions: 125.0 × 123.0 × 27.0 mm (no more than)
- Module weight: No more than 140 g (without CompactFlash card)



## 1.3 Connection to module

Below is a standardized list of interface boards and devices, which could be connected to CPC152:

- Devices with Ethernet 10 / 100 Mb/sec interface
- RS-232 compatible devices
- RS-422 / RS-485 multiuser networks
- Compact Flash type 1 / 2
- 2.5" and 3.5" HDD (PATA interface, via KIB98201)
- USB devices, types 1.1 and 2.0 (Full-speed, High-speed), including devices of USB Mass Storage Device type
- Floppy Disc Drive (only USB port)
- Keyboard, mouse controller (ports PS/2, USB)
- LCD panels (digital RGB), via KIB98102 or via XP2 connector
- VGA displays and TFT-panels (analog RGB)
- Audio devices (via KIB98102)
- PC-compatible printer (ports USB, LPT)
- Other modules in MicroPC (ISA 8 bit) and PC/104 (ISA 8/16 bit) formats - graphics cards, additional memory cards, digital / analog I/O modules, communication/special-purpose modules etc.
- Isolated reset / interrupt signal

## 1.4 Module power supply

Module's electric power supply should correspond to the requirements, specified in the table 1-1. Module is supplied with power via MicroPC and PC/104 connectors.

In addition, for transferring power supply voltage from an external source there is additional XP20 power supply connector (4- pin connector Molex 22-27-2041). As a mating part, it is recommended to use 22-01-2047 (Molex) connector – 1 pcs., contacts 08-52-0101 (Molex) – 4 pcs. The kit, containing socket and contacts for the connection of power supply via additional connector – ACS00039.

Power supply source should provide starting current, specified in the table below, depending on module's version. It is also permissible to use a power supply source with a current limitation mode of no less than 2.0 A. When choosing the power supply source, consideration should be given to the starting current of CPC152 and consumption current of extension modules and other devices connected to the ports of CPC152.

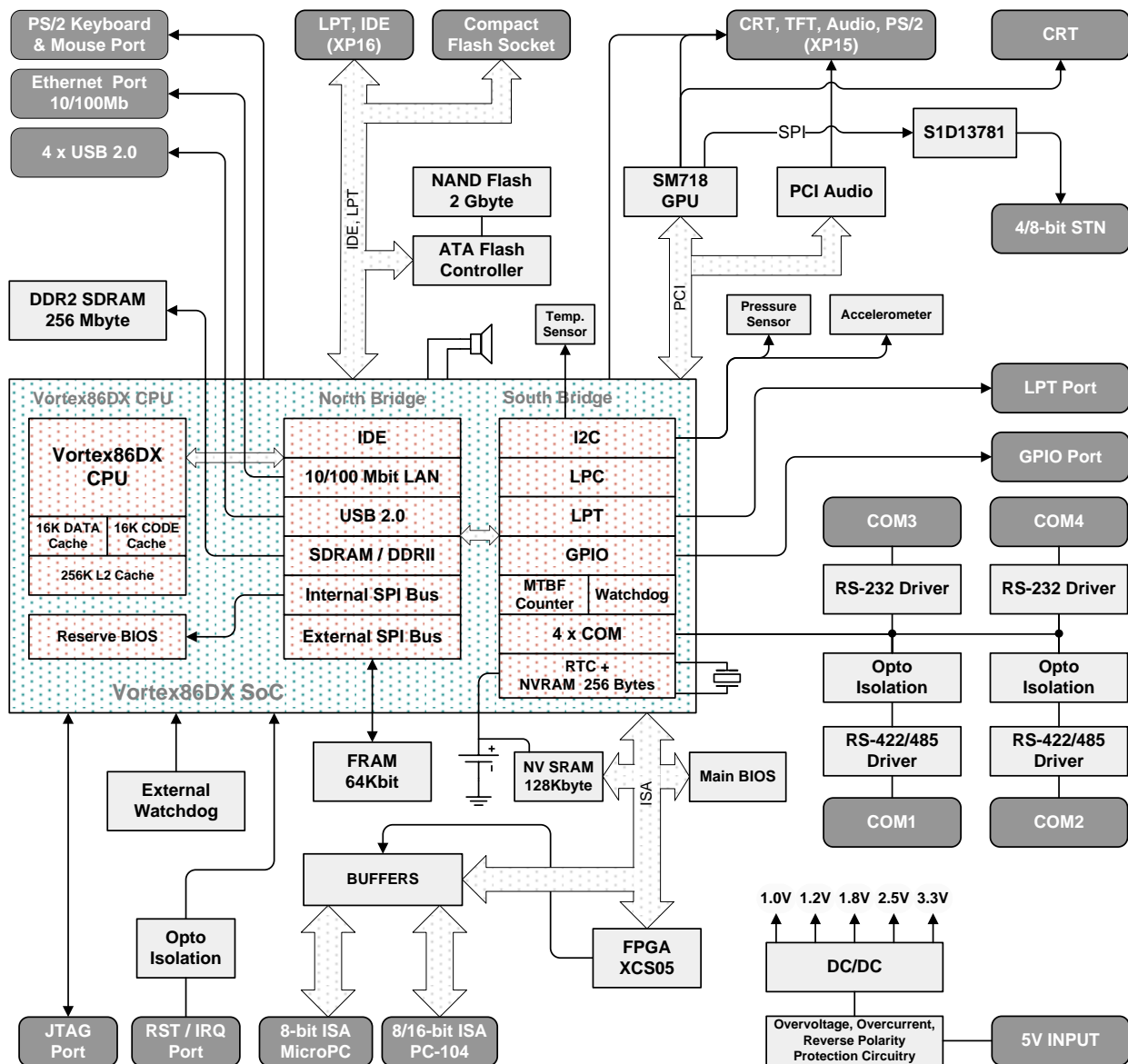
The module is equipped with a "soft" start mechanism, enabling to reduce the maximum value of starting current during the voltage supply. Module's start delay after voltage supply amounts to 200 msec approx. (no more than). Additional measures should be taken, in order to provide particular level on lines of I/O ports within a period of 200 msec after power supply.

Table 1-1: Requirements to parameters of the power supply source

| Version   | Power supply voltage, V | Operating range of power supply voltages, V | Load current, A | Starting current, A |
|-----------|-------------------------|---|-----------------|---------------------|
| CPC152-01 | +5                      | from +4.75 to +5.25                         | 2.0             | 2.5                 |

## 1.5 Block diagram of CPC152

Fig. 1-1: Block diagram of CPC152



### 1.6 Location of components and external view of CPC152

Fig. 1-2: External view of CPC152

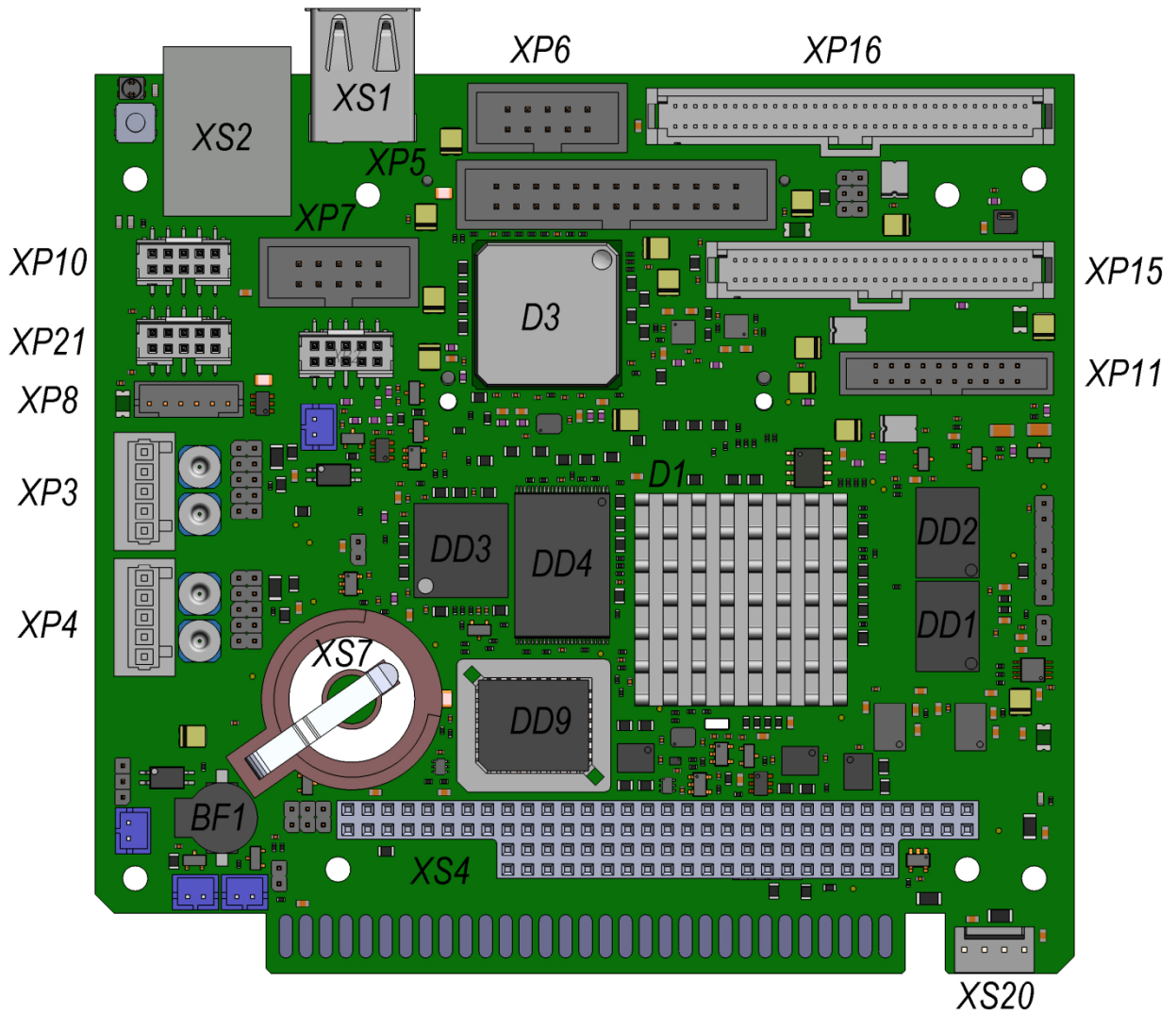
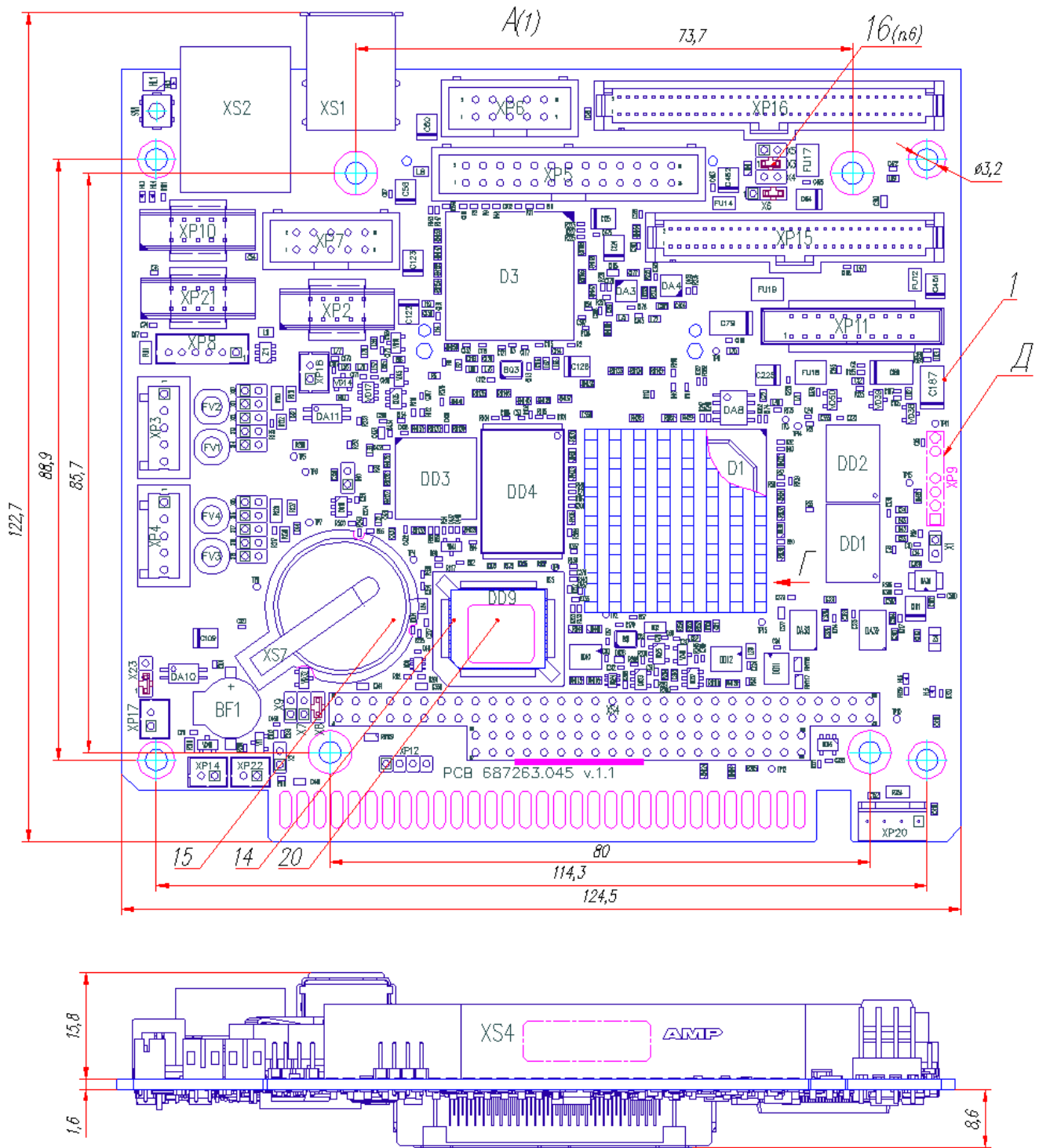


Fig. 1-3: Location of primary components of CPC152



Purposes of module's connectors are described in section 1.9 Integral parts of CPC152 and in section 2.9 Tables of module's connectors contacts.

Purpose of X1...X40 switches is given in section 3.1 Setting module's switches.

## 1.7 Versions

CPC152 is supplied as one version:

**CPC152-01** – CPU Module CPC152 (MicroPC), Vortex86DX 600 MHz, 256 MW DDR2 SDRAM, GPU SM718 (16 MB DDR), 2 GB FFD, NV SRAM 128 KB, Compact Flash socket, 4 x USB 2.0, Ethernet 10/100 Mbps, 2 x RS-232, 2 x RS-422/485 (isolated, with lightning protection); acceleration, pressure and temperature sensors.

### Additional options for CPC152-01:

| Preinstalled operating system |                     |
|-------------------------------|---------------------|
| WCE                           | Windows CE 5.0      |
| LNx                           | Linux 2.6           |
| WXPe                          | Windows XP Embedded |

| Coating |                   |
|---------|-------------------|
| COATED  | Conformal coating |

\* Information on possibility of pre-installing QNX operating system is provided upon special request.

## 1.8 Delivery checklist

Standard delivery checklist for CPC152 includes:

1. CPC152 Module;
2. Cable adapter ACS00005-01 (port RS-232, IDC-10 / DB9M, length 180 mm);
3. Cable adapter ACS00027-02 (port VGA, IDC2-10 / D-SUB 15F, length 180 mm);
4. Removable part of the terminal block WAGO 733-105 (port RS-422/485), 2 pcs.;
5. Set of jumpers (step 2);
6. Package.

## 1.9 Additional accessories

**KIB98102** Interface board (Audio, VGA, TFT, PS/2)

**KIB98201** Interface board (2.5" HDD, 3.5" HDD, LPT)

**ACS00015** cable adapter for KIB98102 (length 300 mm)

**ACS00015-01** cable adapter for KIB98102 (length 120 mm)

**ACS00015-02** cable adapter for KIB98102 (length 140 mm)

**ACS00015-03** cable adapter for KIB98102 (length 500 mm)

**ACS00016** cable adapter for KIB98201 (length 300 mm)

**ACS00016-01** cable adapter for KIB98201 (length 120 mm)

**ACS00016-02** cable adapter for KIB98201 (length 140 mm)

**ACS00016-03** cable adapter for KIB98201 (length 500 mm)

**ACS00005** cable adapter IDC-10 / D-SUB 9M (port RS-232, length 1800 mm)

**ACS00005-01** cable adapter IDC-10 / D-SUB 9M (port RS-232, length 180 mm)

**ACS00006** cable adapter IDC-10 / D-SUB 9F (port RS-232, length 1800 mm)

|                    |   |
|--------------------|---|
| <b>ACS00010</b>    | FC44 – 2.5" HDD, connecting cable   |
| <b>ACS00027-02</b> | cable IDC2-10 / D-SUB 15F (port VGA, length 180 mm)   |
| <b>ACS00042</b>    | null modem cable 1.8 m  |
| <b>ACS00043</b>    | cable adapter PS/2 (PHR-6 / MiniDIN-6F)   |
| <b>ACS00051-01</b> | cable adapter 2x USB Type A Female (2x USB ports)   |
| <b>ACS00058</b>    | kit of Li battery 3 V with PHR-2 connector (length 40 mm)   |
| <b>ACS00031-02</b> | PHR-6 socket with contacts (port PS/2)  |
| <b>ACS00031-03</b> | PHR-2 socket with contacts (RESET, PC-Speaker, VBAT ports)  |
| <b>ACS00039</b>    | Molex 22-01-2045 socket with contacts (additional power supply connector)   |
| <b>ACS00064</b>    | connector for ribbon cable 89947-710LF (VGA, GPIO, USB ports)   |
| <b>ACS00064-01</b> | connector for cable 10073599-020LF, FCI with contacts (VGA, GPIO, USB ports)  |
| <b>ICC19001</b>    | ISA-8 mounting frame MicroPC, 4 slots   |
| <b>ICC19101</b>    | ISA-8 mounting frame MicroPC, 8 slots   |
| <b>ICC19201</b>    | ISA-8 mounting frame MicroPC, 12 slots  |
| <b>ICC19301</b>    | ISA-8 mounting frame MicroPC, 3 slots, desk-mounted   |
| <b>ICC19401</b>    | ISA-8 mounting frame MicroPC, 6 slots, wall-mounted   |
| <b>PS151-01</b>    | Power supply source: 5V/6A, 12V/1.6A, 3.3V/3A, isolation input/output 1500V, control system, UPS function   |
| <b>AIC324-01</b>   | Analog digital input/output module AIC324 PC104 analog-to-digital converter 16bit/32 channels/250kHz/±10V... ±0.625V, Digital-to-analog converter 16bit/6µs/4 channels/±10V ... ±2.5V, 24 digital inputs/outputs, timer 32/16 bit, -40...+85C                 |
| <b>AIC324-02</b>   | Analog digital input/output module AIC324 PC104 analog-to-digital converter 16bit/32 channels/250kHz/±10V... ±0.625V, Digital-to-analog converter 16bit/6µs/4 channels/±10V ... ±2.5V, 24 digital inputs/outputs, timer 32/16 bit, -40...+85C, high precision |
| <b>MIC23003</b>    | CompactFlash drive, 128 MB, -40°C..+85°C  |
| <b>MIC23004</b>    | CompactFlash drive, 256 MB, -40°C..+85°C  |
| <b>MIC23005</b>    | CompactFlash drive, 512 MB, -40°C..+85°C  |
| <b>MIC23006</b>    | CompactFlash drive, 1 GB, -40°C..+85°C  |
| <b>MIC23007</b>    | CompactFlash drive, 2 GB, -40°C..+85°C  |
| <b>MIC23008</b>    | CompactFlash drive, 4 GB, -40°C..+85°C  |
| <b>MIC23009</b>    | CompactFlash drive, 8 GB, -40°C..+85°C  |
| <b>MIC23010</b>    | CompactFlash drive, 16 GB, -40°C..+85°C   |
| <b>MIC23011</b>    | CompactFlash drive, 32 GB, -40°C..+85°C   |
| <b>MIC23012</b>    | CompactFlash drive, 64 GB, -40°C..+85°C   |

List of additional accessories on Fastwel ftp-server:

<ftp://ftp.prosoft.ru/pub/Hardware/Fastwel/ACSx/>

## 1.10 Constituent parts of CPC152

### 1.10.1 CPU

CPC152 module is based on x86-compatible 32-bit Vortex86DX CPU with low power consumption and manufactured using 90 nm technology. CPU clock frequency is 600 MHz. A more detailed information on the CPU, as well as latest versions of drivers and system-level software can be found at manufacturer's website: <http://www.dmp.com.tw/tech/vortex86dx/>.

### 1.10.2 Supervisor and watchdog timer

The CPU module contains power supply supervisor (microchip which monitors module's power supply voltage), as well as 3 hardware watchdog timers: 2 watchdog timers integrated into the CPU (WDT0, WDT1) and 1 external, integrated into power supply supervisor (WDT2). Supervisor generates RESET hardware signal when the power supply voltage "3.3V" drops lower than 3.08 V, as well as NMI signal / interrupt / hardware reset at the reduction of principal power supply voltage "5V" lower than level of 4.65 V, which enables to save user data in the nonvolatile RAM, if necessary. Permission for NMI generation during the reduction of power supply voltage lower than the level of 4.65 V is provided within the **SYSTEM BIOS SETUP** (see. [Section 3.2 Module parameters configuration](#)).

Watchdog timers can be used to avoid software hangups:

- Actuation of **WDT0, WDT1 watchdog timers** is performed when there are no software confirmations within **30.5  $\mu$ s... 512 sec**. Internal watchdog timer is launched in **the SYSTEM BIOS SETUP**. Actuation of internal watchdog timers is carried out **without generation of RESET hardware signal**.
- Actuation of **WDT2 watchdog timer** is carried out when there are no software confirmations within 1.6 sec approximately (within the whole temperature range: from 1.0 sec to 2.25 sec). **External watchdog timer WDT2 has been launched after power ON or reset**. Actuation of an external watchdog timer **is carried out with generation of RESET hardware signal**. WDT2 is switched off when the control is transferred to operating system. In case of jumper is installed, which enables automatic switching to BIOS back-up copy, then in case of an error during BIOS code execution, an automatic system reset and system boot from back-up copy will be carried out. In this case, BIOS Setup settings will be reset to default settings.



#### Attention!

For CPC152, using an external watchdog timer WDT2 in application programs, it is required to turn OFF an automatic switching to the BIOS back-up copy (see [Section 3.1.9 "Switching to BIOS booting from the primary/reserve source"](#)).

### 1.10.3 Random Access Memory (RAM)

As system memory, the module uses dynamic memory DDR2 SDRAM with a total volume of 256 MB. Bus operation frequency: 333 MHz.

No memory extension module is to be installed.

#### 1.10.4 Nonvolatile memory (NV SRAM)

The module is equipped with integrated nonvolatile memory 256 byte for storage of configuration data (CMOS), recorded by **SETUP** program integrated into BIOS.

In addition, the use of integrated FRAM 64 KB or static nonvolatile memory of 128 KB is possible.

Line "GPCS0\_" of address decoder integrated into CPU is used for accessing static nonvolatile memory. For work with nonvolatile RAM it is required to install the relevant option in BIOS Setup settings, as well as install respective jumpers.

Access to the nonvolatile RAM – page-oriented, page size of 16 KB (page-oriented access to NV SRAM – in CPC152 modules, starting from version 1.1). The pages are switched by recording page numbers to I/O register, see. [Section 2.8.5 Control register of page-oriented access to NV SRAM 128KB.](#)

Base window address is selected in BIOS Setup settings (by default: D8000h). (see. [Section 5.6.2.5 "NV SRAM Configuration"](#)).



#### **Attention!**

For using nonvolatile RAM it is required to install X40 switch.

#### 1.10.5 Read-only memory (FLASH BIOS)

In order to store Basic Input/Output System (hereinafter referred to as the BIOS), the module uses FLASH-memory microchip of 512 KB. It is also possible to boot from the BIOS backup copy, stored in the internal Flash-memory, integrated into Vortex86DX CPU microchip.

The module stores two BIOS copies – primary and backup copy.

CPC152 are equipped with a mechanism of automatic switching to BIOS backup copy. By turning the power ON, the module will be booted from primary BIOS copy. If an external watchdog is actuated, which is integrated into ADM706T power supply supervisor microchip, the module will be rebooted with a BIOS backup copy (for automatic reboot, it is required to install X8 jumper). If X8 jumper is not installed, the boot from the backup copy will be carried out only after manual hardware reset of the module (reset button or remote reset port).

If you want to boot only from the primary BIOS copy, it is required to install X1 jumper. If X1 jumper is installed, the module will not be switched to BIOS backup copy.

X1 jumper should also be installed if there is watchdog timer, WDT2 is used in the user program in order to avoid software failures with an automatic reboot of CPU at the end of a timeout of 1 sec. Flag of WDT2 watchdog timer actuation is available regarding reading of GPIO1[0] line: '0' – watchdog timer has been actuated, '1' – watchdog timer has not been actuated (flag value is snapped with a trigger and can be reset by recording '0' to the GPIO1[1] port and a further record '1'). This way enables to control the reason of hardware reset in case of watchdog timer actuation, even after reboot of the CPU.

In case of further actuations of the WDT2 external watchdog timer, the module will also reboot from the backup BIOS copy. Booting can be resumed from the main copy using one of the following three methods:

- By using a relevant item in BIOS Setup settings;
- By installing GPIO\_P3[7] line in '0';
- By turning OFF and turning ON of module's power supply.



Indication of watchdog timer actuation and indication of booting from the main BIOS copy is carried out using HL4 LED.

Hardware reset is indicated by HL3 LED.

### 1.10.6 FLASH-drive

CPC152 modules are equipped with Flash-memory microchip, using NAND (SLC) technology. It can be used as the boot drive, can be turned OFF in BIOS SETUP settings or by the jumper. For accessing to NAND Flash, IDE controller with integrated error correction and wear adjustment systems will be used, and it is connected to IDE interface of CPU (Primary Channel).



#### Attention!

Volume of integrated drive in CPC152 – 2 GB (available volume – 1.8 GB).



#### Attention!

In case of joint use of Compact Flash module and integrated FLASH-drive, as well as if only integrated FLASH-drive (without additional accessories connected to IDE ports) is used, it is recommended to set operation mode of the integrated FLASH-drive to "Primary Master" (using the group of jumpers X3 and X4, see Section [3.1.11 Purpose of integrated IDE devices](#)).

Compact Flash cards of 1/2 types and external devices with IDE interface can be used as additional drive memory.

Selection of operation mode of Compact Flash and soldered FLASH-drive (Primary Master / Slave) is carried out using jumpers.

Integrated Flash-drive is connected to IDE-controller, integrated into the CPU. In this case, its operation could require a standard IDE driver.

### 1.10.7 Compact Flash (XP1)

The Compact Flash (CF type I / II) device can be connected to the module via XP1 (N7E50-M516RB-50, 3M) and uses the same channel ("Primary") that is used with UIDE interface. In this case, if it is used, connection of only one IDE device is possible. Compact Flash device, as a storage, can be operated in "Master" / "Slave" modes, as well as it can be used as a boot drive.



#### Attention!

USING THE MODULE UNDER SEVERE OPERATING CONDITIONS IT IS REQUIRED TO TAKE FURTHER MEASURES FOR FIXING THE COMPACT FLASH INTO THE CONNECTOR

Table 1-2: Table of available combinations of IDE devices with MIC230xx

| Capacity of CompactFlash →    | MIC23003<br>128MB | MIC23004<br>256MB | MIC23005<br>512MB | MIC23006<br>1GB | MIC23007<br>2GB | MIC23008<br>4GB | MIC23009<br>8GB | MIC23010<br>16GB | MIC23011<br>32GB | MIC23012<br>64GB |
|-------------------------------|-------------------|-------------------|-------------------|-----------------|-----------------|-----------------|-----------------|------------------|------------------|------------------|
| ↓ Configuration ↓             |                   |                   |                   |                 |                 |                 |                 |                  |                  |                  |
| NAND – master<br>CF – slave   | +                 | +                 | +                 | +               | +               | +               | +               | +                | +                | +                |
| NAND – slave<br>CF – master   | +                 | +                 | +                 | +               | +               | +               | +               | +                | +                | +                |
| Only<br>CF – master           | +                 | +                 | +                 | +               | +               | +               | +               | +                | +                | +                |
| Only<br>CF – slave            | +                 | +                 | +                 | +               | +               | +               | +               | +                | +                | +                |
| HDD - master<br>CF – slave    | -                 | -                 | -                 | -               | -               | -               | -               | -                | -                | -                |
| HDD – slave<br>CF – master    | -                 | -                 | -                 | -               | +               | +               | +               | +                | +                | +                |
| CD/DVD – slave<br>CF – master | -                 | -                 | -                 | -               | -               | -               | -               | -                | -                | -                |
| CD/DVD – master<br>CF – slave | +                 | +                 | +                 | +               | +               | +               | +               | +                | +                | +                |

### 1.10.8 IDE port (XP16)

Two "HDDs" with IDE interface can be connected to the module via KIB98201 interface board (connector XP16 of CPC152) and use the "Primary" channel for operation in "Master" / "Slave" modes.

In case of using two external devices, the Compact Flash should be preliminary disconnected from XP1 connector, and the integrated FLASH-drive is disconnected using the respective jumpers – see section [Setting module's switches](#). IDE interface supports UDMA/100 mode (cable length during connection should not exceed 0,1 m).

2,5" HDD devices are connected to J2 of KIB98201 interface board (not included into the delivery checklist, to be purchased separately) using the ACS00010 cable (not included into the delivery checklist, to be purchased separately). Other HDD types (3,5") and CD/DVD write and read devices, having 40-pin connector (with a pitch of 2,5 mm), are connected to the module, to J1 of KIB98201 interface board, using the standard IDE cable.

Using other types of cables, it is recommended for connection to use cables with connectors of 2040-3442 (Leotronics) or IDC2-44 types (socket 44 pins for the ribbon, with a pitch of 1 mm).



#### Attention!

When connecting Compact Flash modules to IDE port using IDE–Compact Flash adapters, it is permissible to use only Compact Flash modules, supporting UDMA-5 and higher modes (e.g. MIC230 modules with a volume from 2 GB and more).

Using other Compact Flash cards could result in damage of CPC152 module (damage of integrated FLASH-drive) and would not be

considered as warranty case (caused by various voltage levels on signal IDE lines for various Compact Flash modules).

For Compact Flash modules, installed into XP1 connector (located on CPC152 module) there are no such limitations.



### Attention!

When connecting such external devices as HDDs or CD/DVD reading device to IDE port with the use of KIB98201 interface board, it is permitted to use a cable with a length not exceeding 140 mm (ACS00016-01 or ACS00016-02), available IDE cable length from KIB98201 to an external device – no more than 100 mm.

When connecting two external devices, it is allowed to use a standard IDE cable (in this case the FLASH-drive should be turned OFF, and Compact Flash module should be removed from the XP1 connector).

Available combinations for the connection of internal and external IDE devices are specified in the table below.

Table 1-3: Table of allowable combinations of IDE devices

|                      | FLASH-drive Slave | Compact Flash Slave | HDD Slave | CD/DVD Drive Slave |
|----------------------|-------------------|---------------------|-----------|--------------------|
| FLASH-drive Master   |                   | +                   | +         | -                  |
| Compact Flash Master | +                 |                     | -         | -                  |
| HDD Master           | -                 | +                   |           | +                  |
| CD/DVD Drive Master  | +                 | +                   | +         |                    |

### 1.10.9 GPIO port (XP10)

GPIO port is implemented on the basis of GPIO\_P2[7:0] port of Vortex86DX CPU. Port lines are tolerant to the voltage level 5V. Each port line can be configured as input or output

Modes of using the GPIO port:

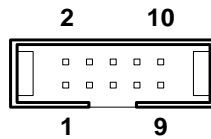
- Digital I/O port
- Control of servo drives (PWM signal)
- Mode of compatibility with 8051

In order to ensure the certainty of state of GPIO port lines, after power is ON it is recommended to use a dedicated line of power supply voltage (+5VEXT, output #9 of XP10 connector) for feeding the logical circuitry, connected to the GPIO port, as well as using a binding to high (+5V) or ground (GND) levels immediately in the devices connected to the port. When connecting external devices, common wire (connector XP10, output 10) connection is obligatory.

GPIO port is routed to the XP10 connector (98424-G52-10LF, FCI).

For manufacturing cable for GPIO port, it is recommended to use the 10-pin socket for ribbon cable with a pitch of 1 mm: 89947-710LF (FCI).

Fig. 1-4: Numbering of XP10 connector contacts



#### 1.10.10 Serial ports COM1/ 2/ 3/ 4 (XP3, XP4, XP6, XP7)

CPC152 has 4 asynchronous serial ports

- COM1 (XP3 connector), COM2 (XP4 connector) – RS-422/485 (4- / 2-wire power on)
- COM3 (XP6 connector), COM4 (XP7 connector) – RS-232 (full 9-wire interface).

Exchange rate via serial ports can be set in the BIOS Setup settings. Exchange rate is defined by the value of CPU frequency divider register. Divider's value is calculated by the formula:

$$\text{DIV} = F / (16 \cdot \text{BR}), \quad \text{BR} = F / (\text{DIV} \cdot 16)$$

- F - frequency of internal generator [MHz] (1.8432 or 24);
- DIV - divider's value (for F = 1.8432 MHz - minimum value DIV = 1; for F = 24 MHz - minimum value DIV = 2);
- BR - required speed of exchange, [bit/sec].



#### Attention!

The receiver tolerates deviation of the exchange speed value by 3.0% to the lesser side and by 2.5% to the greater side

The table below contains frequency divider's values for a number of exchange speeds using an internal generator: 8432 MHz and 24 MHz:

Table 1-4: Frequency divider values for serial ports

| Exchange speed,<br>bit/sec | F=1.8432 MHz |          | F=24 MHz |          |
|----------------------------|--------------|----------|----------|----------|
|                            | Divider      | Error, % | Divider  | Error, % |
| 50                         | 2304         | 0.000    | 30000    | 0.000    |
| 75                         | 1536         | 0.000    | 20000    | +0.002   |
| 110                        | 1047         | -0.026   | 13636    | 0.000    |
| 150                        | 768          | 0.000    | 10000    | 0.000    |
| 300                        | 384          | 0.000    | 5000     | 0.000    |
| 600                        | 192          | 0.000    | 2500     | 0.000    |
| 1,200                      | 96           | 0.000    | 1250     | 0.000    |
| 1,800                      | 64           | 0.000    | 833      | +0.040   |
| 2,000                      | 58           | +0.69    | 750      | 0.000    |
| 2,400                      | 48           | 0.00     | 625      | 0.000    |
| 3,600                      | 32           | 0.00     | 417      | -0.079   |
| 4,800                      | 24           | 0.00     | 312      | +0.160   |
| 7,200                      | 16           | 0.00     | 208      | +0.160   |
| 9,600                      | 12           | 0.00     | 156      | +0.160   |
| 19,200                     | 6            | 0.00     | 78       | +0.160   |
| 38,400                     | 3            | 0.00     | 39       | +0.160   |
| 57,600                     | 2            | 0.00     | 26       | +0.160   |
| 115,200                    | 1            | 0.00     | 13       | +0.160   |
| 250,000                    | –            | –        | 6        | 0.000    |
| 256,000                    | –            | –        | 6        | -2.340   |
| 375,000                    | –            | –        | 4        | 0.000    |
| 500,000                    | –            | –        | 3        | 0.000    |
| 750,000                    | –            | –        | 2        | 0.000    |

#### 1.10.10.1 COM1 / COM2 (RS-422/485)

COM1 and COM2 ports operate in the RS-422/485 mode and ensure galvanic isolation of up to 500 V (each port is equipped with individual isolation from the system). Maximum data exchange speed – 115 2000 bit/sec. The ports are routed to one row WAGO 733-335 connectors with 5 outputs.

As transmitter-receivers, integral solutions based on LTM2881IV-5 (Linear Technology).are used

Through installation of X10 jumpers ... X14 (COM1), X15 ... X19 (COM2) consistent circuits will be connected to signaling lines of RS-422 or RS-485 interfaces and operation mode will be set.



**Attention!**

For proper operation of transmitter-receivers RS-422/485, in multi-terminal networks it is required to install line terminators for 120 Ohm using relevant jumpers at two the most remote network nodes, as well as biasing resistors for 680 Ohm (on one or two of the most remote network nodes).

Depending on the default configuration, each port contains lightning protection circuits, based on self-recovering fuses and gas discharge elements. The port also contains protection circuits against pulse interference on the basis of TVS-diodes. Diagram of output stages of COM1 port is specified below (COM2 port has a similar circuit design).

**Fig. 1-5: Output stages of RS -422/485 ports of CPC152**

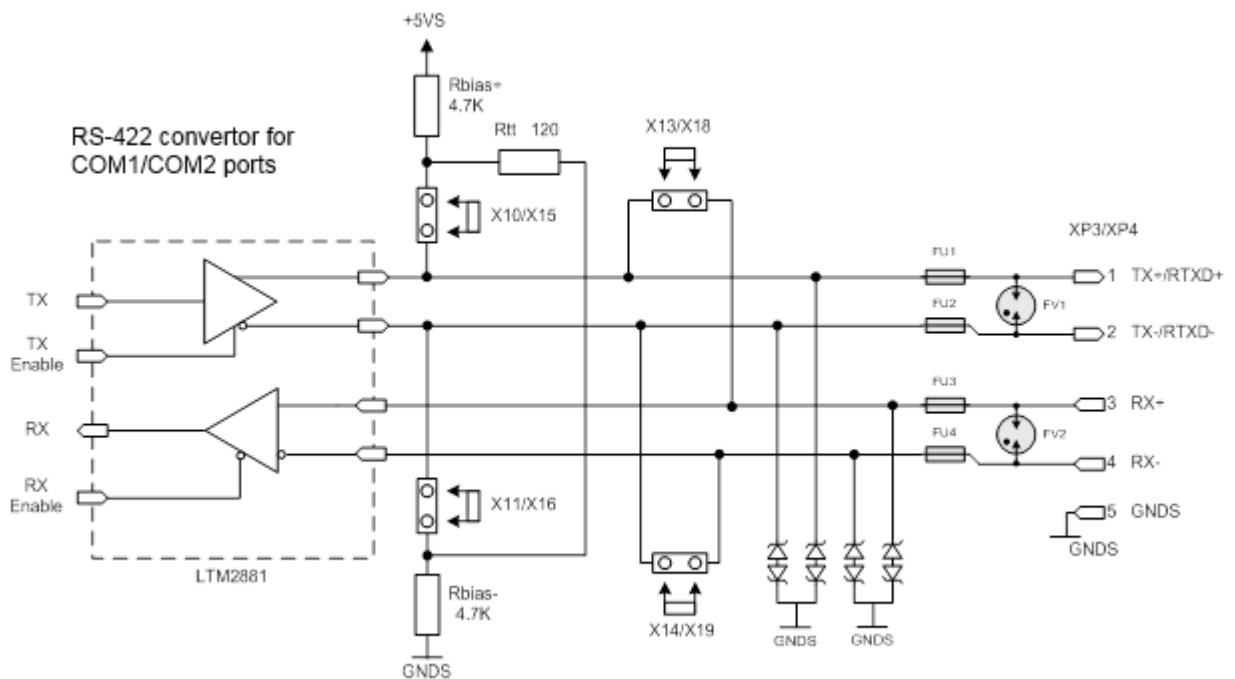


Fig. 1-6: Connection of modules via RS-485 interface

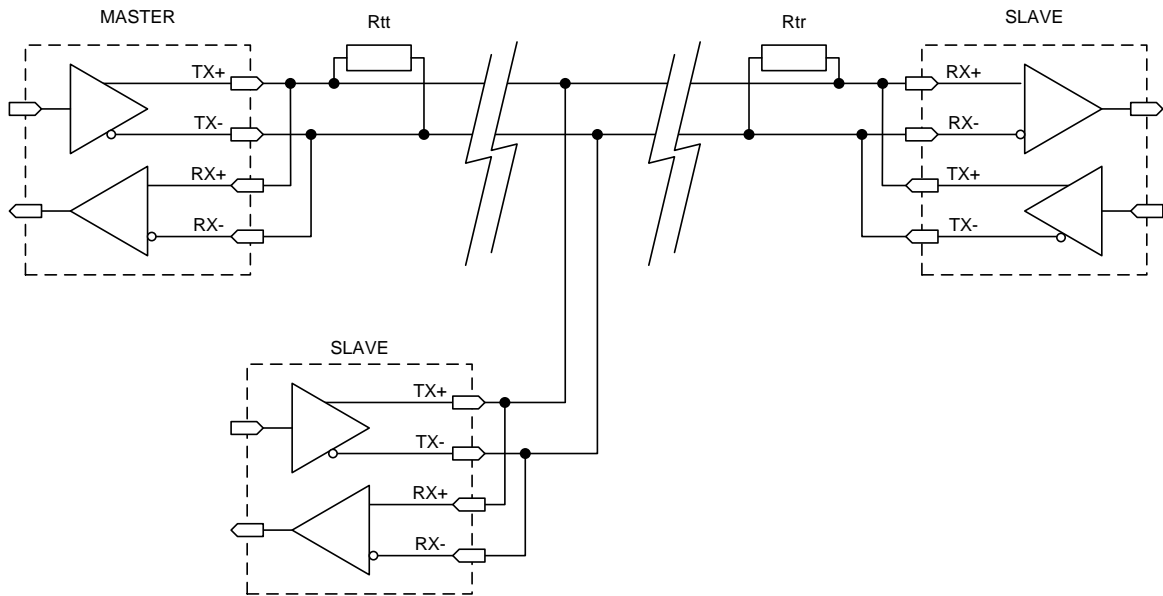
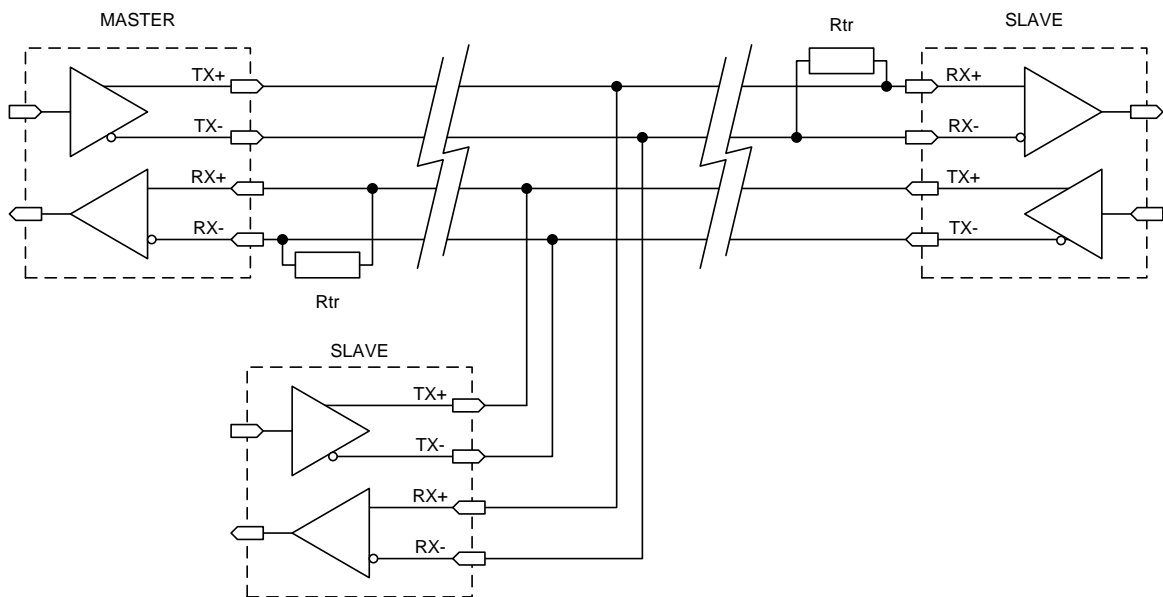
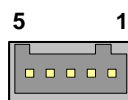


Fig. 1-7: Connection of modules via RS-422 interface



For manufacturing the cable it is required to use a removable part of WAGO 733-105 terminal block and shielded twisted pair.

Fig. 1-8: Numbering of contacts of XP3, XP4 connectors



### 1.10.10.2 COM3 / COM4 (RS-232)

COM3 and COM4 ports operate in the full 9-wire mode of RS-232 interface and have standard basic addresses for PC/AT. Integral solutions based on ADM3311EARU (Analog Devices) are used as transceivers.

The both ports can be used for console input/output and loading of files. For connection with PC, used as hyperterminal, the null-modem cable is required. *COM3 port is used by default.*

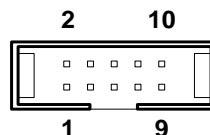
Maximum speed of data transfer for COM3 and COM4 is 115.2 Kb/sec. The ports are fully software compatible with UART 16550 version.

COM3 and COM4 ports are routed to XP6 and XP7 connectors respectively, IDC10 2.54mm (5104338-1, AMP).

For connection to COM3 and COM4 ports, ACS00005-01 cable (1 pcs. included into the delivery checklist) is used.

For proprietary manufactured cable it is recommended to use 10-pin socket for the ribbon cable with a pitch of 1.27 mm: 1-215919-0 (AMP).

**Fig. 1-9:           Numbering of contacts of XP6 and XP7 connectors**

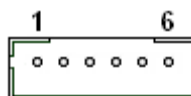


### 1.10.11 PS/2 keyboard and mouse pointing device (XP8)

Interface for the connection of PS/2-keyboard and mouse is routed to the 6-pin XP8 connector.

PS/2 keyboard or mouse can be connected via ACS00043 adapter cable. For proprietary manufacturing of the adapter cable it is recommended to use PHR-6 (JST) socket with contacts SPH-002T-P0.5S (JST). For connection of both keyboard and mouse, it is required to additionally use a standard Y-cable.

**Fig. 1-10:           Numbering of XP8 connector contacts**



Additional PS/2 keyboard or mouse can be connected to the standard MiniDIN-6F, located on the KIB98201 interface board (J4). For connection of both keyboard and mouse, it is required to additionally use a standard Y-cable.

### 1.10.12 USB ports (XS1, XP21)

The module has 4 USB Host ports with support of USB 1.1 and USB 2.0 specifications.

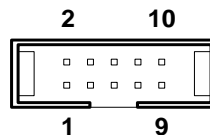
In terms of design, the USB ports represent a dual XS1 connector of USB-A type, installed on the brink of module's board and a vertical two row 10-pin XP21 connector of IDC2-10 type with a pitch of 2 mm (98424-G52-10LF, FCI). In this case, two channels USB0 / USB1 are routed to the standard XS1 connector, two others USB2 / USB3 – to XP21 connector.



Each pair of channels has an individual power scheme. Purpose of XP1 (USB-A) connector's contacts corresponds to the one set by USB specification. Purpose of XP21 (IDC2-10) connector's contacts is specified in the relevant table.

Connection of USB devices to USB2/USB3 ports is available through the adapter cable ACS00051. For proprietary manufacturing of the cable for USB2 / USB3 ports it is recommended to use 10-pin socket to the ribbon cable with a pitch of 1 mm - 89947-710LF (FCI).

Fig. 1-11: Numbering of XP21 connector's contacts



### 1.10.13 LAN 10/100 Mb port (XS2)

The module has one LAN port with the exchange speed of – 10 / 100 Mb/sec and is implemented on the basis of LAN 10/100 Mb controller integrated into the CPU.

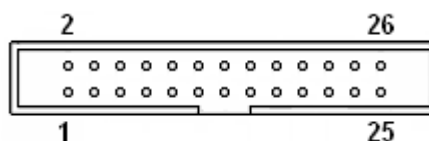
LAN channel is routed to the standard XS2 connector of RJ-45 type, installed on the verge of module's board. Purpose of connector's contacts corresponds to the one set by the standard IEEE 802.3 Ethernet specification.

### 1.10.14 LPT parallel port (XP5)

Universal parallel port with support of SPP (PC-compatible printer port), EPP (Extended Capabilities Port), ECP (Enhanced Parallel Port) modes. The interface is routed to the connector of IDC type, pitch of 2.54 mm, 26 pins (5104338-6, AMP).

For cable manufacturing it is recommended to use the 26-pin socket to the ribbon cable with a pitch of 1.27 mm – 2-215919-6, AMP.

Fig. 1-12: Numbering of XP5 connectors contacts



In addition, LPT port is routed to the XP16 for the connection of LPT devices to the DSUB-25F connector (J5) on KIB98201 interface board.

### 1.10.15 RTC, SPI FRAM, lithium battery

CPC152 module is equipped with AT-compatible real-time clock with the lithium battery installed (XS7 socket).

The expected (standardized) operating time of the battery at turned-off or lacking integrated circuit of non-volatile RAM of 128 KB - approx. 10 years<sup>7</sup>. However, the service life of the battery depends on operating temperature as well as on the length of the period within which the system is off.

<sup>7</sup> Under normal conditions (humidity from 5 to 95%, +25°C).

**Important note:**

It is recommended to replace the battery in about 4 years of service, not waiting for the end of its service life.

**Important note:**

During battery replacement, polarity should be observed (+ above).

The used batteries should be utilized in accordance with the established standards.

FRAM nonvolatile memory with a serial SPI interface is designed for saving the SETUP BIOS copy and recovery of RTC memory state in case of an error, as well as for storing gauge coefficients of analog-to-digital converter/digital-to-analog converter. User has also access to free FRAM cells. Access is provided via INT 17H BIOS function. Memory volume available to the user amounts to 7 KB.

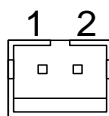
Switching to the main voltage of 3.3 V instead of battery voltage when the power supply is on, ensures additional resource economy of the installed lithium battery.

For use of CPC152 modules with conformal coating, there is a possibility of connecting an external battery. For this purpose, an additional XP22 connector (ACS00058, a set of Li battery of 3V with PHR-2 connector, length of 40 mm) is provided. For proprietary manufacturing of the cable it is recommended to use PHR-2 (JST) socket with SPH-002T-P0.5S (JST) contacts.

**Important note:**

If an external battery is connected to the additional XP22 connector, it is required to remove the Li batter from XS7 socket. During installation, polarity should be observed ("+" corresponds to the first contact of the connector).

**Fig. 1-13:      Numbering of XP22 connector contacts**



### 1.10.16 Port of isolated remote reset / interrupt (XP17, XP18)

When connecting to the XP18 contacts of an external button / potential-free contact, it is possible to generate an external reset or interrupt signal, isolated from the system (500 V).

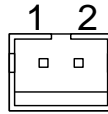
In order to receive the reset signal using XP18 connector, it is required to close the contacts of XP18 / 1 and XP18 / 2 connectors, where XP18 / 2 is directly connected with GNDS1 circuit (common wire/ground of isolated RS-422/485 interface, COM1).

For receipt of reset signal, using XP17 connector, it is required to feed the voltage to contacts of XP17 / 1 and XP17 / 2 connectors, depending on the installed X23 jumper – 3...15 V or 10...30 V.

The reset / interrupt signal is generated via or from the sources, connected to XP17, XP18. Connectors are isolated from each other.

For manufacturing of the cable it is required to use the PHR-2 (JST) socket with SPH-002T-P0.5S (JST) contacts.

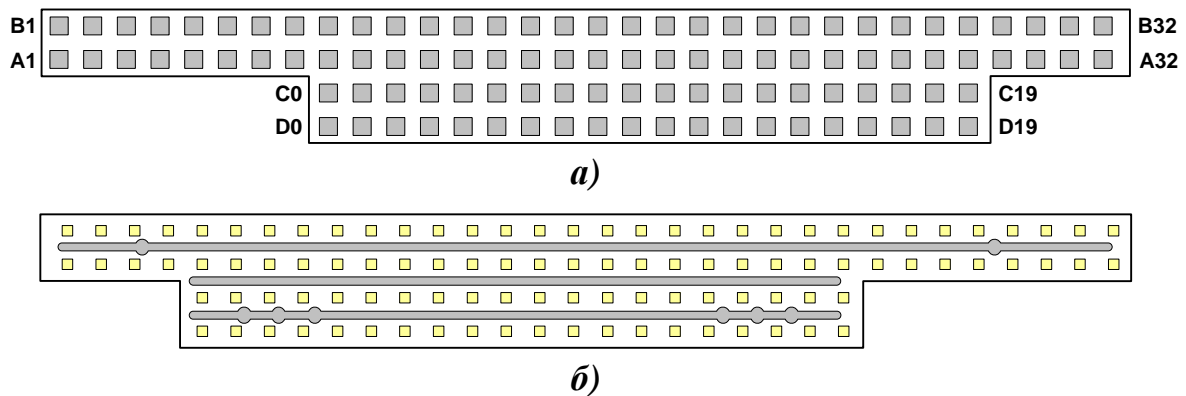
Fig. 1-14: Numbering of XP17, XP18 connectors contacts



### 1.10.17 PC/104 extension bus (ISA 8/16 bit)

PC/104 (XS4) connector is designed for installation of extension modules in PC/104 format to the module. It is possible to install no more than 4 PC/104 extension modules.

Fig. 1-15: Numbering of contacts of XS4 connector a) top view of the module, b) bottom view of the module with personal organizer, installed on the connector



### 1.10.18 MicroPC extension bus (ISA 8 bit)

Edge connector MicroPC (XS6) is designed for installation of CPC152 into MicroPC mounting frame and for extension of system functionality by way of installing extension modules in MicroPC format into the frame. It is possible to install no more than 8 extension modules in MicroPC format.



#### Attention!

Connection of FDDs in MicroPC format is not supported (however, connection of an external drive to the USB port).

### 1.10.19 Diagnostic LEDs

For indication of various conditions, the module is equipped with separately located LEDs, as well as 2 LEDs, integrated into the XS2 connector. The LEDs are installed from TOP side. Purpose of module's LEDs is specified in the table.

Table 1-5: Purpose of CPC152 LEDs

| LED       | Function  |
|-----------|---|
| HL1       | Two-color user LED (red / green)                            |
| HL2       | Activity of IDE-devices (green)                             |
| HL3       | Indication of module's hardware reset (green)               |
| HL4       | Indication of watchdog timer actuation (red)                |
| HL5       | Indication of module's power supply (green)                 |
| XS2 / HL6 | LED of network interface controller activity (green)        |
| XS2 / HL7 | LED of network interface controller operation mode (yellow) |

HL1 LED is controlled via recording to the integrated circuit register FPGA (input/output space, ISA bus).

### 1.10.20 JTAG port (XP9)

JTAG (XP9) connector is used during module production and represents a process connector.

### 1.10.21 Acceleration, pressure and temperature sensors

As acceleration sensor, a capacitance integrated sensor MMA8451Q (Freescale) is used. With resolution of 8/14 bit this sensor enables to measure acceleration via three axes, vibrations in ranges 2/4/8 g, determine a slope angle, free fall, ripples and shocks.

The module also includes a digital integrated pressure sensor MPL115A2 (Freescale), which enables to measure pressure in the range from 50 to 115 kPa (standard measurement accuracy amounts to 1 kPa in the operating temperature range from -20 to +85°C).

Additionally, the module is equipped with temperature sensor LM92CIM (National Semiconductor), which enables to measure temperature on module's surface with resolution of 12 bit (+ sign) in the range from -55 to +125°C. The sensor is located in the Vortex86DX CPU area.

Acceleration, pressure and temperature sensors are connected to I2C bus of the CPU. Measurement area is not rated, the standard error is defined by characteristics, stated by sensors manufacturer.

In order to use the sensors as measuring sensors it is required to perform their calibration testing (system of calibration factors storage maybe arranged on the basis of FRAM nonvolatile memory, which main principles of operation are specified in [Section 4.6 "Interface BIOS SOC Vortex86DX for read/write in FRAM"](#)).

### 1.10.22 Audio port

Audio port in CPC152 module is implemented on the basis of integrated circuit CMI8738MX (Cmedia), including a sound controller and 16-bit audio codec.

Codec is compatible with SBPRO™ version.

the set of audio ports includes: LINE-IN (Stereo), LINE-OUT (STEREO) and MIC (MONO).

Audio ports are routed to the XP15 connector. Connection of devices is possible via KIB98102 interface board, on which these interfaces are routed to the standard "Audio Jack" type connectors.



### Attention!

For proper operation of Audio ports it is required to remove the jumpers XP1[1-2], XP2[1-2] and install jumpers XP3[1-2], XP4[2-3] on interface board KIB98102.

Use of KIB98101 is not recommended, since KIB98101 does not provide compatibility with a number of TFT-panels and does not ensure an accurate playback/record of sound.

### 1.10.23 Video port (Analog RGB and TFT)

Video subsystem of CPC152 is implemented on the basis of SM718KE160000-AB video processor. Video controller with 2D accelerator function has the following technical characteristics and capacities:

- Volume of integrated video memory – 16 MB DDR;
- Possibility of connecting LCD (TFT) panels with TFT interfaces and resolution of no more than 1920 x 1440 (60 Hz), color depth of no more than 18 bit;
- Possibility of connecting RGB (VGA) displays with resolution of no more than 1920 x 1440 (75 Hz, 32 bit).

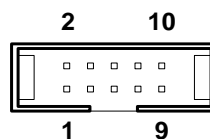
TFT and Analog RGB ports are routed to the XP15 connector. Connection of devices is possible via KIB98102 interface board, on which these interfaces are routed to IDC-34 (TFT) and DSUB-15F (Analog RGB) connectors.

Using the X6 jumper on CPC152 makes it possible to select the power supply voltage of TFT-panel (+3.3 / +5 V).

An additional XP2 connector (98424-G52-10LF, FCI) is also provided for the connection of display or TFT-panel to the Analog RGB port by a separate cable to XP2 connector without the use of KIB98102 interface board. For the connection, ACS00027-02 cable will be required (not included into the Delivery Checklist, to be purchased as an option).

For proprietary manufacturing of the cable it is recommended to use the 10 pin socket to the ribbon cable with a pitch of 1 mm - 89947-710LF (FCI).

#### Numbering of XP2 connector contacts

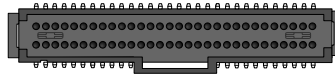


### 1.10.24 XP15, XP16 extension ports

For connection of such devices as TFT-panel, VGA-display, PS/2 mouse and keyboard in CPC152 module, an extension in the shape of XP15 connector (5-104068-6, AMP) is provided. This extension is designed for connection to CPC152 module of KIB98102 interface board. Connection to KIB98102 is carried out by cables ACS00015 (300 mm), ACS00015-02 (120 mm), ACS00015-03 (140 mm) or ACS00015-02 (500 mm).

For proprietary manufacturing of the cable for connection to the KIB98102 interface board it is recommended to use a 60-pin socket 1-111196-2 (AMP) with a pitch of 1.27 mm and a ribbon cable 57013-3 (AMP).

Fig. 1-16: External view of XP15 connector

**Attention!**

It is not recommended to use KIB98101 interface board jointly with the CPC152 CPU Module.

While connecting KIB98101 interface board instead of KIB98102 to CPC152, there are the following limitations:

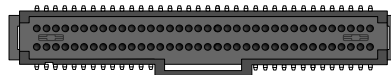
- Power supply of the TFT-panel is possible only by a +5 V level (it is required to choose +5V power supply voltage using the X6 jumper), proper operation of TFT-panel in this case is not guaranteed;
- Limited functionality of Audio port (lack of electret microphones support, additional noises in LINE\_IN, LINE\_OUT channels).

For the connection of such devices as HDD 2.5", HDD 3.5", LPT in CPC152 module, an extension in the form of XP16 connector is provided. This extension is designed for the connection of KIB98201 interface board.

Connection to KIB98102 is carried out by cables ACS00016 (300 mm), ACS00016-02 (120 mm), ACS00016-03 (140 mm) or ACS00016-02 (500 mm).

For proprietary manufacturing of the cable for connection to the KIB98201 interface board it is recommended to use a 72-pin socket 1-111196-4 (AMP) with a pitch of 1.27 mm and a ribbon cable 1-57013-2 (AMP).

Fig. 1-17: External view of XP16 connector



## **SECTION 2**

# **TECHNICAL INFORMATION**

## 2 TECHNICAL INFORMATION

### 2.1 General technical specifications of CPC152

Table 2-1: Requirements for power supply of CPC152

| Requirements for power supply  |                                  |
|--|----------------------------------|
| Power supply voltage   | +5 V $\pm$ 5%; 12 V <sup>8</sup> |
| Module current consumption over +5 V (without external devices, at +25°C), no more than:   |                                  |
| CPC152-01  | 0.85 A                           |
| Maximum available consumption current over external circuits, minimum value for the whole operating temperature range (is limited by the installed short-circuit protection system): |                                  |
| +5V_EXTU1 (XS1: port USB1, +5V)  | 500 mA @ +5 V                    |
| +5V_EXTU2 (XS1: port USB2, +5V)  | 500 mA @ +5 V                    |
| +5V_EXTP (XP5: LPT port)   | 500 mA @ +5 V                    |
| +5V_EXTR (XP6, XP7: COM3/COM4 ports)   | 500 mA @ +5 V                    |
| +5V_EXTK (XP8: PS/2 keyboard/mouse port)   | 500 mA @ +5 V                    |
| +5V_EXTM (XP15: connection to KIB98102, PS/2 port)   | 500 mA @ +5 V                    |
| VCC_EXTF (XP15: connection to KIB98102, TFT port)  | 500 mA @ +3.3/+5 V               |
| +5V_EXTD (XP15: connection to KIB98201)  | 1500 mA @ +5 V                   |
| +5V_EXTL (XP14: PC-buzzer port; XP10: GPIO port)   | 500 mA @ +5 V                    |
| +5V_EXTU3 (XP21: port USB3, +5V)   | 500 mA @ +5 V                    |
| +5V_EXTU4 (XP21: port USB4, +5V)   | 500 mA @ +5 V                    |
| Maximum available total consumed current (with due consideration of internal and external circuits)  | 5.5 A                            |

Table 2-2: Characteristics of digital inputs-outputs (GPIO)

| Digital inputs-outputs                                  |               |
|---|---------------|
| Input voltage Log. "0"                                  | max. 0.8 V    |
| Input voltage Log. "1"                                  | min. 2.0 V    |
| Output voltage Log. "0" (at a current of 5 mA)          | max. 0.4 V    |
| Output voltage Log. "1" (at a current of 2 mA)          | min. 2.4 V    |
| Load-carrying capacity of Log."0"/ Log."1" (TTL-levels) | 16.0 / 4.0 mA |

<sup>8</sup> Required only for illumination of LCD panels



Table 2-3: Characteristics of serial ports

| Serial ports  |                         |
|---|-------------------------|
| Maximum exchange speed over RS-232                    | 250 Kb/sec <sup>9</sup> |
| Maximum exchange speed over RS-422/485                | 750 Kb/sec              |
| Voltage of RS-422/485 ports isolation from the system | 500V                    |
| ESD protection  | 15 kW (IEC1000-4-2)     |

Table 2-4: Characteristics of USB, LAN ports

| USB, LAN ports                         |  |
|--|--|
| Type of USB ports                      | USB Host   |
| Type of supported USB devices          | 1.1, 2.0   |
| Exchange speed over LAN port           | 10 / 100 Mb/sec  |
| LED activity indication of LAN channel | green LED – activity,<br>yellow LED – operation mode<br>(full - / half-duplex) |
| LAN port isolation                     | 500V   |

Table 2-5: IDE port characteristics

| IDE port                               |                                   |
|--|-----------------------------------|
| Volume of integrated FLASH-drive       | 1 GB                              |
| Supported types of Compact Flash cards | 1 / 2                             |
| Supported IDE-device operation modes   | up to Ultra-DMA 100 <sup>10</sup> |
| Number of IDE devices                  | up to 2 devices                   |

Table 2-6: Characteristics of integrated temperature, pressure, acceleration sensors

| Temperature sensor   |   |
|--|---|
| Temperature measurement range                              | -55...+125°C (complementary code with a sign)                           |
| Type of sensor used  | LM92CIM (National Semiconductor)  |
| Rated absolute temperature measurement error <sup>11</sup> | ± 0.5°C (+10...+50°C)<br>± 1.0°C (-10...+85°C)<br>± 2.0°C (-40...+85°C) |
| Resolution   | 12 bit + sign   |
| Price of the least significant digit value                 | 0.0625°C  |
| Conversion time  | up to 1000 ms   |

<sup>9</sup> Exchange speed over serial ports is defined by the value of frequency divider register, in the BIOS Setup settings, maximum standard frequency – 115200 Kb/sec.

<sup>10</sup> Setting of UltraDMA-5 mode is only possible if the integrated drive is solely active and this drive is set as Primary Master, and other devices are not connected to IDE interface.

<sup>11</sup> relative error is not rated, data specified in the table are guaranteed by sensor manufacturer and are not verified during the tests

| Pressure sensor                            |   |
|--|---|
| Measurement range                          | 50...115 kPa  |
| Type of sensor used                        | MPL115A2 (Freescale)  |
| Rated absolute pressure measurement error  | $\pm 1.0$ kPa (-20...+85°C)                                 |
| Resolution                                 | 10 bit  |
| Price of the least significant digit value | 0.15 kPa  |
| Conversion time                            | up to 3 ms  |
| Acceleration sensor                        |   |
| Measurement ranges                         | $\pm 2g / \pm 4g / \pm 8g$<br>(additional code with a sign) |
| Type of sensor used                        | MMA8451Q (Freescale)  |
| Resolution                                 | 14 bit + sign   |

Table 2-7: Environmental conditions

| Environmental conditions    |   |
|-----------------------------|---|
| Operating temperature range | -40...+85 °C  |
| Storage temperature         | Modules storage conditions 1 in accordance with GOST 15150-69 |
| Humidity                    | up to 95% at +25 °C without condensation                      |

Table 2-8: Mechanical characteristics

| Mechanical characteristics       |                              |
|----------------------------------|------------------------------|
| Vibration resistance             | 5 g (acceleration amplitude) |
| Resistance to single shocks      | 100 g (peak acceleration)    |
| Resistance to multiple shocks    | 50 g (peak acceleration)     |
| Dimensions, no more than         | 125.0 × 123.0 × 27.0 mm      |
| Weight, no more than             | 140 g                        |
| MTBF, no less than <sup>12</sup> | 160 000 hours                |

<sup>12</sup> MTBF values are calculated using the Telcordia Issue 1 computation model (Method I Case 3 calculation technique) for continuous operation in case of the ground-based placement under the conditions, corresponding to the climatic category "Moderately Cold Climate 4" according to the GOST 15150-69, at ambient temperature of + 30°C.

## 2.2 Allocation of hardware interrupts

Table 2-9: Addresses of hardware interrupts

| #     | Default source  | Alternative sources  |
|-------|---|--|
| NMI   | –   | <ul style="list-style-type: none"> <li>▪ Internal WDT</li> <li>▪ SYSTEM EVENT *</li> <li>▪ External ISA – devices (IOCHCK#)</li> </ul> |
| IRQ0  | <i>Reserved (system timer)</i>  | –  |
| IRQ1  | PS/2 Keyboard   | –  |
| IRQ2  | <i>Reserved (cascading)</i>   | –  |
| IRQ3  | COM2 (RS-422/485) / COM4 (RS-232)                                       | <ul style="list-style-type: none"> <li>▪ External ISA – devices (IRQ3)</li> </ul>  |
| IRQ4  | COM2 (RS-422/485) / COM3 (RS-232)                                       | <ul style="list-style-type: none"> <li>▪ External ISA – devices (IRQ4)</li> </ul>  |
| IRQ5  | LPT port  | <ul style="list-style-type: none"> <li>▪ USB controller</li> <li>▪ External ISA – devices (IRQ5)</li> </ul>                            |
| IRQ6  | USB controller*   | <ul style="list-style-type: none"> <li>▪ External ISA – devices</li> <li>▪ Internal WDT</li> </ul>                                     |
| IRQ7  | –<br>(see <a href="#">Registers of control / interrupts condition</a> ) | <ul style="list-style-type: none"> <li>▪ External ISA – devices (IRQ7)</li> <li>▪ SYSTEM EVENT ***</li> <li>▪ Internal WDT</li> </ul>  |
| IRQ8  | RTC (Real Time Clock )  | –  |
| IRQ9  | External ISA – devices (IRQ9)   | –  |
| IRQ10 | External ISA – devices (IRQ10)  | –  |
| IRQ11 | –<br>(see <a href="#">Registers of control / interrupts condition</a> ) | <ul style="list-style-type: none"> <li>▪ External ISA – devices (IRQ11)</li> </ul>   |
| IRQ12 | PS/2 Mouse**  | <ul style="list-style-type: none"> <li>▪ USB controller</li> <li>▪ External ISA – devices (IRQ12)</li> </ul>                           |
| IRQ13 | <i>Reserved (support of coprocessor)</i>                                | –  |
| IRQ14 | Primary IDE (HDD, Compact Flash, ...)                                   | <ul style="list-style-type: none"> <li>▪ External ISA – devices (IRQ14)</li> </ul>   |
| IRQ15 | LAN controller  | <ul style="list-style-type: none"> <li>▪ SYSTEM EVENT ***</li> <li>▪ External ISA – devices (IRQ15)</li> </ul>                         |

\* USB controller by default occupies IRQ6 interrupt line. If the LPT port is switched off in the BIOS Setup settings, the USB controller occupies IRQ5 line.

\*\* Use of alternative sources is possible only when switching off the PS/2 Mouse support in BIOS Setup settings (see "Boot -> Boot Settings Configuration", parameter "PS/2 Mouse Support").

\*\*\* The following sources are combined over "or" inside the FPGA and can be switched to the input of relevant interrupt by way of recording to the respective FPGA control register (hereinafter referred to as the "SYSTEM EVENT").

- PFO (power supply +5V reduction lower than the level of 4.65 V)
- External WDT
- External optoisolated input

## 2.3 Channels of DMA module

Table 2-10: Channels of DMA module

| #    | Source                      |
|------|-----------------------------|
| DRQ0 | –                           |
| DRQ1 | LPT/ External ISA – devices |
| DRQ2 | External ISA – devices      |
| DRQ3 | External ISA – devices      |
| DRQ5 | External ISA – devices      |
| DRQ6 | External ISA – devices      |
| DRQ7 | External ISA – devices      |

## 2.4 I/O address space

Table 2-11: Allocation of the I/O address space

| Address       | Function                         | Notes                  |
|---------------|----------------------------------|------------------------|
| 0000h – 001Fh | 8237 DMA Controller #1           | –                      |
| 0020h – 0021h | 8259 Master Interrupt Controller | –                      |
| 0022h – 0023h | Indirect Access                  | WDT0                   |
| 0024h – 002Dh | ISA bus                          | Access to external bus |
| 002Eh – 002Fh | Reserved                         | Not available          |
| 0030h – 003Fh | ISA bus                          | Access to external bus |
| 0040h – 0043h | 8253 Programmable Timer          | –                      |
| 0044h – 0047h | ISA bus                          | Access to external bus |
| 0048h – 004Bh | Reserved                         | Not available          |
| 004Eh – 005Fh | ISA bus                          | Access to external bus |
| 0060h – 0064h | 8042 Keyboard Controller         | –                      |
| 0065h         | WDT0                             | –                      |
| 0066h         | ISA bus                          | Access to external bus |
| 0067h – 006Dh | WDT1                             | –                      |
| 006Eh – 006Fh | ISA bus                          | Access to external bus |
| 0070h – 007Fh | RTC, NMI Mask Register           | –                      |
| 0080h – 009Fh | DMA Page Registers               | –                      |
| 00A0h – 00B1h | 8259 Slave Interrupt Controller  | –                      |
| 00B2h – 00BFh | ISA bus                          | Access to external bus |
| 00C0h – 00DFh | 8237 DMA Controller #2           | –                      |
| 00E0h – 01EFh | ISA bus                          | Access to external bus |

| Address   | Function                                       | Notes  |
|---|--|--|
| 01F0h – 01F8h                                   | Primary IDE Controller                         | –  |
| 01F9h – 0277h                                   | ISA bus  | Access to external bus   |
| 0278h – 027Fh                                   | LPT port                                       | (possible value)   |
| 0280h – 028Fh                                   | Internal control registers                     | I/O ports of matrix keyboard, LEDs, analog I/O, internal control registers (PLD XCS05) |
| 0290h – 029Fh<br>02A0h – 02AFh<br>02B0h – 02BFh | -  | -  |
| 02C0h – 02E7h                                   | ISA bus  | Access to external bus   |
| 02E8h – 02EFh                                   | COM2   | (possible value)   |
| 02F0h – 02F7h                                   | ISA bus  | Access to external bus   |
| 02F8h – 02FFh                                   | COM4   | (possible value)   |
| 0300h – 0377h                                   | ISA bus  | Access to external bus   |
| 0378h – 037Fh                                   | LPT port                                       | (possible value)   |
| 0380h – 03AFh                                   | ISA bus  | Access to external bus   |
| 03B0h – 03BBh                                   | MDA Adapter                                    | (possible value)   |
| 03BCh – 03BFh                                   | LPT port                                       | (possible value)   |
| 03C0h – 03CFh                                   | EGA, VGA Adapter                               | (possible value)   |
| 03D0h – 03DFh                                   | CGA Adapter                                    | (possible value)   |
| 03E0h – 03E7h                                   | ISA bus  | Access to external bus   |
| 03E8h – 03EFh                                   | COM1   | (possible value)   |
| 03F0h – 03F7h                                   | Floppy Controller #1                           | (possible value)   |
| 03F8h – 03FFh                                   | COM3   | (possible value)   |
| 0400h – 04CFh                                   | ISA bus  | Access to external bus   |
| 04D0h – 04D1h                                   | Reserved                                       | Not available  |
| 04D2h – 0777h                                   | ISA bus  | Access to external bus   |
| 0778h – 077Fh                                   | Reserved                                       | Not available  |
| 0780h – 0CF7h                                   | ISA bus  | Access to external bus   |
| 0CF8h – 0CFFh                                   | Configuration registers of host PCI controller | –  |
| 0D00h – EDFFh                                   | ISA bus  | Access to external bus   |
| EE00h – EF3Fh                                   | Reserved                                       | Not available  |
| EF40h – FBFFh                                   | ISA bus  | Access to external bus   |
| FC00h – FC0Dh                                   | Reserved                                       | Not available  |
| FC0Eh – FFEFh                                   | ISA bus  | Access to external bus   |
| FFF0h – FFFFh                                   | Reserved                                       | Not available  |

Table 2-12: Internal I/O addresses

| Address          | Port  | Notes  |
|------------------|---|--|
| BA+00h           | BA*   | Setting a base address of internal PLD registers<br><b>(BA=0280h by default)</b>   |
| BA+01h           | Port of LEDs control  | Program control of LEDs  |
| BA+02h<br>BA+03h | -   |  |
| BA+04h           | -   |  |
| BA+05h           | Port of control of NMI / IRQ interrupt sources                            | Port of interrupts control over NMI / IRQ line of CPU (External WDT, Power Fail, SYSTEM EVENT, ISA\$IIOCHK#)   |
| BA+06h<br>BA+07h | Port of control of IRQ7,11,12,15 interrupt sources<br>Port of ISA control | Port of IRQ7,11,12,15 interrupts control of CPU (sets the source over interrupt lines of CPU: ISA\$IRQx, SYSTEM EVENT).<br>Activation / Deactivation of ISA bus buffers. |
| BA+08h – BA+0Bh  | -   |  |
| BA+0Ch<br>BA+0Dh | -   |  |
| BA+0Eh           | Number of PLD XCS05 firmware version                                      | Codes from "00" to "255"   |
| BA+0Fh           | -   |  |

\* see register description "*Port of base address (BA) control*".

## 2.5 Memory address space

Table 2-13: Memory devices addresses

| Address        | Device      | Notes  |
|----------------|-------------|--|
| 00000 – 9FFFFh | DOS         | DOS Area 640 Kbyte                             |
| A0000 – BFFFFh | VGA         | Video memory space 128 Kbyte                   |
| C0000 – C7FFFh | VGA BIOS    | VGA BIOS 32 Kbyte                              |
| D8000 – DFFFFh | NV SRAM *   | Non-volatile RAM 128Kbyte (page access, 16 KB) |
| E0000 – EFFFFh | System BIOS | Extended System BIOS area 64 KB (16 KB x 4)    |
| F0000 – FFFFFh | System BIOS | System BIOS area 64 KB                         |

| Address                   | Device    | Notes                                   |
|---------------------------|-----------|---|
| 10 0000 – MEMORY TOP **   | DRAM      | DDR2 SDRAM                              |
| MEMORY TOP ** – FFE0 0000 | PCI       | PCI                                     |
| FFE0 0000 – FFFF FFFFh    | High BIOS | High BIOS Area 2 Mbytes (mapped to PCI) |

\* Number of current page of non-volatile RAM is software selectable via I/O port (BA+0x0C).

\*\* Volume of installed memory DDR2 SDRAM - 256 Mbyte.

## 2.6 Use of GPIO ports of CPU

Vortex86DX microchip is equipped with 4x I/O GPIO (General Purpose Input Output) ports, available for the user via internal microchip registers. Each port represents 8x I/O lines, each of these lines can be set as an input or output by programming the registers of the relevant port.

For operation with GPIO ports, by two 8-bit registers per port will be used – data register and direction register. Each data register bit is matched with the relevant circuit on the board: Bit 0 corresponds to the line of 0 port (GPIO\_Px0), bit 7 corresponds to the line of 7 port (GPIO\_Px7) etc. Each bit of the direction register is matched with the respective circuit on the board. Bit 0 corresponds to the line of 0 port (GPIO\_Px0), bit 7 corresponds to the line of 7 port (GPIO\_Px7) etc.

Table 2-14: GPIO control registers

|                    | GPIO_P0 | GPIO_P1 | GPIO_P2 | GPIO_P3 | Description                                 |
|--------------------|---------|---------|---------|---------|---|
| Data register      | 78h     | 79h     | 7Ah     | 7Bh     |   |
| Direction register | 98h     | 99h     | 9Ah     | 9Bh     | 0: Line is an input<br>1: Line is an output |

Purpose of the used GPIO ports is specified in the table below.

Table 2-15: Purpose of GPIO ports

| Line of I/O port | Direction of I/O line | Description  |
|------------------|-----------------------|--|
| GPIO_P0[2:0]     | input / output        | Reserved.<br>Lines used for configuring PLD.   |
| GPIO_P0[3]       | input                 | Interrupt input from temperature and accelerometer sensor. Active level: 1.  |
| GPIO_P0[4]       | input                 | Reserved.<br>Lines used for configuring PLD.   |
| GPIO_P0[5]       | input / output        | deactivation of video processor, switching to power saving mode.   |
| GPIO_P0[6]       | input                 | Reserved.<br>Lines used for configuring PLD.   |
| GPIO_P0[7]       | input / output        | Reset of external watchdog timer (changing the output state to the contrary restarts the WDT2 watchdog timer).   |
| GPIO_P1[0]       | input                 | Activation flag of WDT2 external watchdog timer:<br>0 – actuation was performed (booting from backup BIOS copy),<br>1 – actuation was not performed (booting from the main BIOS copy),                                     |
| GPIO_P1[1]       | input / output        | Reserved (logics of switching to backup BIOS copy).  |
| GPIO_P1[2]       | input                 | Actuation of protection of USB ports power supply.<br>0 – actuation was performed,<br>1 – actuation was not performed,   |
| GPIO_P1[3]       | input                 | Error / malfunction in operation of one of the RS-422/485 transceivers (COM1/COM2).<br>0 – there was no malfunction,<br>1 – there was a malfunction.   |
| GPIO_P1[4]       | output                | Connection of 120 Ohm terminator to A/B lines of COM1 port (RS-422/485)<br>0 – 120 Ohm terminator is not connected,<br>1 – 120 Ohm terminator is not connected.  |
| GPIO_P1[5]       | output                | Connection of 120 Ohm terminator to A/B lines of COM2 port (RS-422/485)<br>0 – 120 Ohm terminator is not connected,<br>1 – 120 Ohm terminator is not connected.  |
| GPIO_P1[6]       | input / output        | When setting the GPIO_P16 port to the output - permit of operation of WDT2 watchdog timer, integrated into the power supply supervisor.<br>0 – WDT2 watchdog timer is prohibited,<br>1 – WDT2 watchdog timer is permitted. |
| GPIO_P1[7]       | input                 | Control of the integrated FLASH-drive.<br>0 – is deactivated<br>1 – is activated<br>Line control only via BIOS Setup.<br>GPIO line control only via CPU registers is not permitted!  |
| GPIO_P2[7:0]     | input / output        | GPOI port, lines are routed to the XP10 connector.<br>The lines are configured as "input" by default.  |
| GPIO_P3[3:0]     | -                     | Reserved (SPI FRAM interface).   |
| GPIO_P3[5:4]     | -                     | Reserved (I <sup>2</sup> C interface).   |
| GPIO_P3[6]       | input                 | Lithium battery condition: 3 V:<br>0 – battery needs to be replaced,<br>1 – battery is in proper operating condition.  |
| GPIO_P3[7]       | input / output        | Reset of trigger condition of WDT2 watchdog timer, module restart.<br>The line is configured as "input" by default.  |



## 2.7 WDT0, WDT1 watchdog timers

Microchip of the Vortex86DX CPU is equipped with two adjustable hardware watchdog timers.

Access to registers of WDT0 timer is carried out via 65h port and 22h ports (Index address register) and 23h (Data register). For accessing registers, it is required to write the port address to the 22h port, which data reading and/or writing is carried out via 23h port. Tables 2-20...2-28 contain detailed description of control registers of WDT0 watchdog timer.

Access to the registers of WDT1 timer is carried out via 67h – 6Dh ports. The tables below 2-29...2-35 contain detailed description of control registers of WDT1 watchdog timer.

**Table 2-16 WDT0 restart register**

| Address | Action  | Bits     |   |   |   |   |   |   |   |
|---------|---------|----------|---|---|---|---|---|---|---|
|         |         | 7        | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| 65h     | Writing | RST_WDT0 |   |   |   |   |   |   |   |
|         | Reading | -        | - | - | - | - | - | - | - |

Any writing to this port will lead to the restart of WDT0 timer.

**Table 2-17 Index register of WDT0 address port**

| Address | Action  | Bits          |   |   |   |   |   |   |   |
|---------|---------|---------------|---|---|---|---|---|---|---|
|         |         | 7             | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| 22h     | Writing | ADDR_REG_WDT0 |   |   |   |   |   |   |   |
|         | Reading | -             | - | - | - | - | - | - | - |

ADDR\_REG\_WDT0. Indicates address of the selected register of WDT0 watchdog timer for accessing via 23h data register.

**Table 2-18 Data register of WDT0 port**

| Address | Action  | Bits            |   |   |   |   |   |   |   |
|---------|---------|-----------------|---|---|---|---|---|---|---|
|         |         | 7               | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| 23h     | Writing | WRDATA_REG_WDT0 |   |   |   |   |   |   |   |
|         | Reading | WRDATA_REG_WDT0 |   |   |   |   |   |   |   |

WRDATA\_REG\_WDT0. Contains data for writing to the internal register of WDT0 timer, which address is specified in the ADDR\_REG\_WDT0 field of 22h index register address.

WRDATA\_REG\_WDT0. Contains data when reading from the internal register of WDT0 timer, which address is specified in the ADDR\_REG\_WDT0 field of 22h index register address.

Table 2-19 Control register of WDT0 timer

| Address<br>(in 22h<br>address<br>register) | Action  | Bits (in 23h data register) |         |   |   |   |   |   |   |
|--|---------|-----------------------------|---------|---|---|---|---|---|---|
|  |         | 7                           | 6       | 5 | 4 | 3 | 2 | 1 | 0 |
| 37h<br>(40h)                               | Writing | -                           | WDT0_WE | - | - | - | - | - | - |
|  | Reading | -                           | WDT0_WE | - | - | - | - | - | - |

WDT0\_WE. Permission of WDT0 watchdog timer operation.  
 1 – permitted (default value);  
 0 – prohibited.

Table 2-20 Register of WDT0 event selection

| Address<br>(in 22h<br>address<br>register) | Action  | Bits (in 23h data register) |   |   |   |   |   |   |   |
|--|---------|-----------------------------|---|---|---|---|---|---|---|
|  |         | 7                           | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| 38h<br>(D0h)                               | Writing | WDT0_SSEL                   |   |   |   |   |   |   |   |
|  | Reading |                             |   |   |   |   |   |   |   |

WDT0\_SSEL. Selection of the event upon completion of WDT0 timer count.

- 0000 – reserved;
- 0001 – IRQ[3];
- 0010 – IRQ[4];
- 0011 – IRQ[5];
- 0100 – IRQ[6];
- 0101 – IRQ[7];
- 0110 – IRQ[9];
- 0111 – IRQ[10];
- 1000 – IRQ[11];
- 1001 – IRQ[12];
- 1010 – IRQ[14];
- 1011 – IRQ[15];
- 1100 – NMI;
- 1101 – module restart (default value);
- 1110 – reserved;
- 1111 – reserved.

Table 2-21 CNT0 register of WDT0 timer value

| Address<br>(in 22h address<br>register) | Action  | Bits (in 23h data register) |   |   |   |   |   |   |   |
|---|---------|-----------------------------|---|---|---|---|---|---|---|
|   |         | 7                           | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| 39h<br>(00h)                            | Writing | WDT0_CNT0                   |   |   |   |   |   |   |   |
|   | Reading | WDT0_CNT0                   |   |   |   |   |   |   |   |

WDT0\_CNT0. Bits [7:0] of WDT0\_CNT counter [23:0] of WDT0 timer. The counter has a resolution of 30.5  $\mu$ s

Table 2-22 CNT1 register of WDT0 timer value

| Address<br>(in 22h<br>address<br>register) | Action  | Bits (in 23h data register) |   |   |   |   |   |   |   |
|--|---------|-----------------------------|---|---|---|---|---|---|---|
|  |         | 7                           | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| 3Ah<br>(00h)                               | Writing | WDT0_CNT1                   |   |   |   |   |   |   |   |
|  | Reading | WDT0_CNT1                   |   |   |   |   |   |   |   |

WDT0\_CNT1. Bits [15:8] of WDT0\_CNT counter [23:0] of WDT0 timer. The counter has a resolution of 30.5  $\mu$ s

Table 2-23 CNT2 register of WDT0 timer value

| Address<br>(in 22h<br>address<br>register) | Action  | Bits (in 23h data register) |   |   |   |   |   |   |   |
|--|---------|-----------------------------|---|---|---|---|---|---|---|
|  |         | 7                           | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| 3Bh<br>(20h)                               | Writing | WDT0_CNT2                   |   |   |   |   |   |   |   |
|  | Reading | WDT0_CNT2                   |   |   |   |   |   |   |   |

WDT0\_CNT2. Bits [23:16] of WDT0\_CNT counter [23:0] of WDT0 timer. The counter has a resolution of 30.5  $\mu$ s

Table 2-24 Register of WDT0 timer condition

| Address<br>(in 22h<br>address<br>register) | Action  | Bits (in 23h data register) |            |   |   |   |   |   |   |
|--|---------|-----------------------------|------------|---|---|---|---|---|---|
|  |         | 7                           | 6          | 5 | 4 | 3 | 2 | 1 | 0 |
| 3Ch<br>(00h)                               | Writing | WDT0_WDTF                   | WDT0_WDTRL | - | - | - | - | - | - |
|  | Reading | WDT0_WDTF                   | -          | - | - | - | - | - | - |

WDT0\_WDTF. Flag of WDT0 timer actuation.

- 1 – there was a timer actuation (record "1" into this bit resets the flag);
- 0 – there was no timer actuation.

WDT0\_WDTRL. WDT0 timer restart.

- 1 – Reboot of WDT0\_CNT counter;
- 0 – This value is not allowed to be written.

Table 2-25 WDT1 restart register

| Address | Action  | Bits     |   |   |   |   |   |   |   |
|---------|---------|----------|---|---|---|---|---|---|---|
|         |         | 7        | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| 67h     | Writing | RST_WDT1 |   |   |   |   |   |   |   |
|         | Reading | -        | - | - | - | - | - | - | - |

Any writing to this port will lead to the restart of WDT1 timer.

Table 2-26 Control register of WDT1 timer

| Address      | Action  | Bits |         |   |   |   |   |   |   |
|--------------|---------|------|---------|---|---|---|---|---|---|
|              |         | 7    | 6       | 5 | 4 | 3 | 2 | 1 | 0 |
| 68h<br>(00h) | Writing | -    | WDT1_WE | - | - | - | - | - | - |
|              | Reading | -    | WDT1_WE | - | - | - | - | - | - |

WDT1\_WE. Permission of WDT1 watchdog timer operation.

- 1 – permitted;
- 0 – prohibited (default value);

Table 2-27 Register of WDT1 event selection

| Address      | Action  | Bits      |   |   |   |   |   |   |   |
|--------------|---------|-----------|---|---|---|---|---|---|---|
|              |         | 7         | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| 69h<br>(00h) | Writing | WDT1_SSEL |   |   |   | - | - | - | - |
|              | Reading | -         | - | - | - | - | - | - | - |

WDT1\_SSEL. Selection of the event upon completion of WDT1 timer count.

- 0000 – reserved (default value);
- 0001 – IRQ[3];
- 0010 – IRQ[4];
- 0011 – IRQ[5];
- 0100 – IRQ[6];
- 0101 – IRQ[7];
- 0110 – IRQ[9];
- 0111 – IRQ[10];
- 1000 – IRQ[11];
- 1001 – IRQ[12];
- 1010 – IRQ[14];
- 1011 – IRQ[15];
- 1100 – NMI;
- 1101 – module reboot;
- 1110 – reserved;
- 1111 – reserved.

Table 2-28 CNT0 register of WDT1 timer value

| Address      | Action  | Bits      |   |   |   |   |   |   |   |
|--------------|---------|-----------|---|---|---|---|---|---|---|
|              |         | 7         | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| 6Ah<br>(00h) | Writing | WDT1_CNT0 |   |   |   |   |   |   |   |
|              | Reading | WDT1_CNT0 |   |   |   |   |   |   |   |

WDT1\_CNT0. Bits [7:0] of WDT1\_CNT counter [23:0] of WDT1 timer. The counter has a resolution of 30.5  $\mu$ s

Table 2-29 CNT1 register of WDT1 timer value

| Address      | Action  | Bits      |   |   |   |   |   |   |   |
|--------------|---------|-----------|---|---|---|---|---|---|---|
|              |         | 7         | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| 6Bh<br>(00h) | Writing | WDT1_CNT1 |   |   |   |   |   |   |   |
|              | Reading | WDT1_CNT1 |   |   |   |   |   |   |   |

WDT1\_CNT1. Bits [15:8] of WDT1\_CNT counter [23:0] of WDT1 timer. The counter has a resolution of 30.5  $\mu$ s

Table 2-30 CNT2 register of WDT1 timer value

| Address      | Action  | Bits      |   |   |   |   |   |   |   |
|--------------|---------|-----------|---|---|---|---|---|---|---|
|              |         | 7         | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| 6Ch<br>(00h) | Writing | WDT1_CNT2 |   |   |   |   |   |   |   |
|              | Reading | WDT1_CNT2 |   |   |   |   |   |   |   |

WDT1\_CNT2. Bits [23:16] of WDT1\_CNT counter [23:0] of WDT1 timer. The counter has a resolution of 30.5  $\mu$ s

Table 2-31 Register of WDT1 timer condition

| Address      | Action  | Bits      |   |   |   |   |   |   |   |
|--------------|---------|-----------|---|---|---|---|---|---|---|
|              |         | 7         | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| 6Dh<br>(00h) | Writing | WDT1_WDTF | - | - | - | - | - | - | - |
|              | Reading | WDT1_WDTF | - | - | - | - | - | - | - |

WDT1\_WDTF. Flag of WDT1 timer actuation.

1 – there was a timer actuation (record "1" into this bit resets the flag);

0 – there was no timer actuation.

## 2.8 Description of internal registers

### 2.8.1 Register of base address (BA) control

Used for setting the base address for module's internal registers.

| Address | Action  | Bits |   |     |     |     |     |   |   |
|---------|---------|------|---|-----|-----|-----|-----|---|---|
|         |         | 7    | 6 | 5   | 4   | 3   | 2   | 1 | 0 |
| BA+00h  | Writing | -    | - | BA9 | BA8 | BA7 | BA6 | - | - |
| BA+00h  | Reading | 0    | 0 | BA9 | BA8 | BA7 | BA6 | 0 | 0 |

BA[9:6] Enables to set the Base Address of module's internal control registers or address segment in I/O area, where these registers will be available for the system. If the address bits of ISA\_SA bus [9:6] match with the BA bits [9:6], internal registers will be addressed in read/write cycles in the I/O area.

**BA value (after power on or hardware reset) by default = 0280h.**

For example, in order to set BA=0300h, it is required to write 30h into the port. **Bit 5 and 4 of the base address (BA) always are written as equal to '0'.**

### 2.8.2 Control / LED condition register

Enables a program control of two LED oscillators, as well as read their current condition.

| Address | Action  | Bits |   |   |   |   |   |       |       |
|---------|---------|------|---|---|---|---|---|-------|-------|
|         |         | 7    | 6 | 5 | 4 | 3 | 2 | 1     | 0     |
| BA+01h  | Writing | -    | - | - | - | - | - | LEDR  | LEDG  |
| BA+01h  | Reading | -    | - | - | - | - | - | SLEDR | SLEDG |

LEDG Green LED control. Write '1' - actuation of LED indicator, write '0' - deactivation.

LEDR Red LED control. Write '1' - actuation of LED indicator, write '0' - deactivation.

SLEDG Green LED condition. '1' - activated, '0' – deactivated (by default).

SLEDR Red LED condition. '1' - activated, '0' – deactivated (by default).

### 2.8.3 Interrupts condition register of ISA bus controller

Enables / prohibits to use external signals when generating an interrupt of NMI CPU, "SYSTEM EVENT" signal during writing to the port. The port also enables to determine a hardware source of NMI and "SYSTEM EVENT".

| Address | Action  | Bits |          |          |          |          |         |         |         |
|---------|---------|------|----------|----------|----------|----------|---------|---------|---------|
|         |         | 7    | 6        | 5        | 4        | 3        | 2       | 1       | 0       |
| BA+02h  | Writing | -    | IRQ15_EN | IRQ12_EN | IRQ11_EN | IRQ10_EN | IRQ7_EN | IRQ4_EN | IRQ3_EN |
| BA+02h  | Reading | -    | IRQ15_ST | IRQ12_ST | IRQ11_ST | IRQ10_ST | IRQ7_ST | IRQ4_ST | IRQ3_ST |

IRQx\_ST Event flag on IRQx interrupt line of ISA bus controller of CPU. '1' – there was an interrupt, '0' – there was no interrupt.

IRQx\_EN Reset / permission of setting a flag of IRQx interrupt. Permit – '1', prohibit – '0' (by default, after power on or reset).

**Attention!**

After each interrupt generation on 'IRQx' events it is required to reset a relevant 'IRQx\_EN' interrupt flag by consecutive writing of '0', and then '1' into the relevant bit of interrupt permission. If this is not done, there will be no further settings of event flags.

## 2.8.4 Register of control / system interrupts condition

Enables / prohibits to use external signals when generating an interrupt of NMI CPU, "SYSTEM EVENT" signal during writing to the port. The port also enables to determine a hardware source of NMI and "SYSTEM EVENT".

| Address | Action  | Bits     |        |        |        |   |   |           |        |
|---------|---------|----------|--------|--------|--------|---|---|-----------|--------|
|         |         | 7        | 6      | 5      | 4      | 3 | 2 | 1         | 0      |
| BA+05h  | Writing | IOCHK_EN | PFO_EN | WDO_EN | EXT_EN | - | - | SE_NMI_EN | NMI_EN |
| BA+05h  | Reading | IOCHK    | PFO    | WDO    | EXT    | - | - | SE_NMI_EN | NMI_EN |

|           |   |
|-----------|---|
| IOCHK_EN  | <u>Switching 'ISA_IOCHK#' to the line of NMI CPU.</u> Permit – '1', prohibit – '0'.   |
| PFO_EN    | <u>Switching 'Power Fail' to the line 'SYSTEM EVENT'.</u> Permit – '1', prohibit – '0'.   |
| WDO_EN    | <u>Switching 'WatchDog Timeout' to the line 'SYSTEM EVENT'.</u> Permit – '1', prohibit – '0'.   |
| EXT_EN    | <u>Switching 'RMTRES' to the line 'SYSTEM EVENT'.</u> Permit – '1', prohibit – '0'.   |
| SE_NMI_EN | <u>Switching 'SYSTEM EVENT' to the line of NMI CPU.</u> Permit – '1', prohibit – '0'.   |
| NMI_EN    | <u>Permit generation of NMI.</u> Generation of events interrupt of NMI CPU from 'ISA_IOCHK#' or "SYSTEM EVENT" – during writing '1'; prohibition – during writing '0' (in this case, the hardware line NMI has: 'Z'-condition). |
| IOCHK     | <u>'ISA_IOCHK#' indicator</u> - '1': active level of 'ISA_IOCHK#' signal.   |
| PFO       | <u>'POWER FAIL' indicator</u> - '1': reduction of input power supply "+5V" lower than the level of 4.65 V   |
| WDO       | <u>'WATCHDOG Timeout' indicator</u> - '1': actuation of the watchdog timer (WDT2) integrated into the supervisor.   |
| EXT       | <u>'RMTRES' indicator</u> - '1': external source of reset/interrupt (XP17-XP18).  |

**Attention!**

"SYSTEM EVENT" is generated over "or" from the following sources:

- "Power Fail" (reduction of power supply voltage value down to the level of 4.65 V),
- "WatchDog Timeout" (actuation of the external watchdog timer),
- "RMTRES" (external source of reset / interrupt XP17 / XP18).

Signal of NMI CPU is generated over "or" from the "SYSTEM EVENT" and "ISA\_IOCHK" sources.

**Attention!**

After each interrupt generation on "ISA IOCHK#", "POWER FAIL", "WATCHDOG Timeout", "RMTRES" events it is required to reset a relevant interrupt flag by consecutive writing of '0', and then '1' into the relevant bit of interrupt permission. If this is not done, there will be no further generation of interrupts from this port.

E.g., after generation of interrupt over 'RMTRES' event, in the interrupt handler it is required to first reset the 'EXT\_EN' flag in '0', and then set it into '1'.

## 2.8.5 Register of interrupts control of ISA bus controller

Sets the source of interrupts on lines IRQ3, IRQ4, IRQ7, IRQ10, IRQ11, IRQ12, IRQ15 of the CPU. Each line makes it possible to independently connect ISA bus interrupts (IRQ3, IRQ4, IRQ7, IRQ10, IRQ11, IRQ12, IRQ15), as well as the "SYSTEM EVENT" (external source of interrupts, Power Fail event, actuation of watchdog timer).

The port is also used for activation/deactivation of buffer elements of ISA bus.

| Address | Action     | Bits        |   |             |   |             |   |            |      |
|---------|------------|-------------|---|-------------|---|-------------|---|------------|------|
|         |            | 7           | 6 | 5           | 4 | 3           | 2 | 1          | 0    |
| BA+06h  | write/read | i15SEL[1:0] |   | i12SEL[1:0] |   | i11SEL[1:0] |   | i7SEL[1:0] |      |
| BA+07h  | write/read | i3SEL[1:0]  |   | i4SEL[1:0]  |   | i10SEL[1:0] |   | -          | ISAE |

i15SEL[1:0] Code of IRQ15 line selector. Possible options: ISA\$IRQ15 (b'00, by default); ISA\$IRQ7 (b'01); ISA\$IRQ3 (b'10); "SYSTEM EVENT" (b'11).

i12SEL[1:0] Code of IRQ12 line selector. Possible options: ISA\$IRQ12 (b'00, by default); ISA\$IRQ3 (b'01); ISA\$IRQ4 (b'10); "SYSTEM EVENT" (b'11).

i11SEL[1:0] Code of IRQ11 line selector. Possible options: ISA\$IRQ11 (b'00, by default) ; ISA\$IRQ7 (b'01); ISA\$IRQ4 (b'10); "SYSTEM EVENT" (b'11).

i7SEL[1:0] Code of IRQ7 line selector. Possible options: ISA\$IRQ7 (b'00, by default) ; RSVD (b'01); RSVD (b'10); "SYSTEM EVENT" (b'11).

i3SEL[1:0] Code of IRQ3 line selector. Possible options: ISA\$IRQ3 (b'00, by default) ; RSVD (b'01); RSVD (b'10); ISA\$IRQ3 (b'11).

i4SEL[1:0] Code of IRQ4 line selector. Possible options: ISA\$IRQ4 (b'00, by default) ; RSVD (b'01); RSVD (b'10); ISA\$IRQ4 (b'11).

i10SEL[1:0] Code of IRQ10 line selector. Possible options: ISA\$IRQ10 (b'00, by default) ; ISA\$IRQ7 (b'01); ISA\$IRQ3 (b'10); "SYSTEM EVENT" (b'11).

ISAE Control of buffer elements of ISA bus. '0': deactivated (outputs in 'Z'-condition). '1': buffer elements of ISA bus are activated (by default during power on or reset). If buffer elements are deactivated, no devices on external ISA bus will be available!

\* RSVD – Reserved.



## 2.8.6 Control register of page access to NV SRAM 128 KB

Enables a program control of NV SRAM active page number.

| Address | Action  | Bits |   |   |   |   |      |      |      |
|---------|---------|------|---|---|---|---|------|------|------|
|         |         | 7    | 6 | 5 | 4 | 3 | 2    | 1    | 0    |
| BA+0Ch  | Writing | -    | - | - | - | - | BNK2 | BNK1 | BNK0 |
| BA+0Ch  | Reading | -    | - | - | - | - | BNK2 | BNK1 | BNK0 |

BNK[2:0] SRAM active page number. Page size: 16 KB. Base window address is selected in BIOS Setup settings (by default: D8000h).

## 2.8.7 Code register of XCS05 version

Code of the version number of XCS05 matrix diagram is available over reading via byte port with BA+0Eh address.

| Address | Action  | Bits   |   |   |   |        |   |   |   |
|---------|---------|--------|---|---|---|--------|---|---|---|
|         |         | 7      | 6 | 5 | 4 | 3      | 2 | 1 | 0 |
| BA+0Eh  | Reading | Ver_05 |   |   |   | Rev_05 |   |   |   |
| BA+0Fh  | Reading | -      |   |   |   | -      |   |   |   |

Ver\_05 – numeric code of the version number of XCS05 matrix diagram;

Rev\_05 – numeric code of the revision number of XCS05 matrix diagram.

## 2.9 Table of module connector contacts <sup>13</sup>

### 2.9.1 Table of XP1 connector contacts: Compact Flash

Table 2-32: Purpose of XP1 connector contacts: Compact Flash

| XP2: N7E50-M516RB-50 (3M) |            |           |            |
|---------------------------|------------|-----------|------------|
| Contact #                 | Function   | Contact # | Function   |
| 1                         | GND        | 2         | D3         |
| 3                         | D4         | 4         | D5         |
| 5                         | D6         | 6         | D7         |
| 7                         | CS0#       | 8         | A10        |
| 9                         | ATA_SEL#   | 10        | A9         |
| 11                        | A8         | 12        | A7         |
| 13                        | VCC (3.3V) | 14        | A6         |
| 15                        | A5         | 16        | A4         |
| 17                        | A3         | 18        | A2         |
| 19                        | A1         | 20        | A0         |
| 21                        | D0         | 22        | D1         |
| 23                        | D2         | 24        | IOCS16#    |
| 25                        | CD2#       | 26        | CD1#       |
| 27                        | D11        | 28        | D12        |
| 29                        | D13        | 30        | D14        |
| 31                        | D15        | 32        | CS1#       |
| 33                        | VS1#       | 34        | IORD#      |
| 35                        | IOWR#      | 36        | WE#        |
| 37                        | INTRQ#     | 38        | VCC (3.3V) |
| 39                        | CSEL#      | 40        | -          |
| 41                        | RESET#     | 42        | IORDY      |
| 43                        | INPACK#    | 44        | REG#       |
| 45                        | DASP#      | 46        | PDIAG#     |
| 47                        | D8         | 48        | D9         |
| 49                        | D10        | 50        | GND        |

<sup>13</sup> From this point on: symbol # in the name of the signal - active level of log. "0".

## 2.9.2 Table of XP2 connector contacts: Analog RGB port

Table 2-33: Purpose of XP2 connector contacts: IDE port

| XP2: 98424-G52-10LF, FCI |          |           |          |
|--------------------------|----------|-----------|----------|
| Contact #                | Function | Contact # | Function |
| 1                        | RED      | 2         | GND      |
| 3                        | GREEN    | 4         | GND      |
| 5                        | BLUE     | 6         | GND      |
| 7                        | HSYNC    | 8         | VSYNC    |
| 9                        | DDC_SCL  | 10        | DDC_SDA  |

## 2.9.3 Table of XP3, XP4 connectors contacts: COM1, COM2 (RS-422/485)

Table 2-34: Purpose of XP3 connector contacts: COM1 (RS-422/485)

| XP3: 733-335 (WAGO), 5 contacts, pitch of 2.5 mm |                     |            |
|--|---------------------|------------|
| Contact #  | Function 1          | Function 2 |
| 1  | TX+                 | RTXD+      |
| 2  | TX-                 | RTXD-      |
| 3  | RX+                 | -          |
| 4  | RX-                 | -          |
| 5  | GNDS1 <sup>14</sup> |            |

Table 2-35: Purpose of XP4 connector contacts: COM2 (RS-422/485)

| XP4: 733-335 (WAGO), 5 contacts, pitch of 2.5 mm |                     |            |
|--|---------------------|------------|
| Contact #  | Function 1          | Function 2 |
| 1  | TX+                 | RTXD+      |
| 2  | TX-                 | RTXD-      |
| 3  | RX+                 | -          |
| 4  | RX-                 | -          |
| 5  | GNDS2 <sup>15</sup> |            |

<sup>14</sup> Ground, isolated from the system (isolation from the system: 500 V).

<sup>15</sup> Ground, isolated from the system (isolation from the system: 500 V).

## 2.9.4 Table of XP5 connector contacts: LPT port

Table 2-36: Purpose of XP5 connector contacts: LPT port

| XP5: IDC-26 2.54 mm (5104338-6, AMP) |          |           |          |
|--------------------------------------|----------|-----------|----------|
| Contact #                            | Function | Contact # | Function |
| 1                                    | STB#     | 2         | AFD#     |
| 3                                    | PD0      | 4         | ERR#     |
| 5                                    | PD1      | 6         | INIT#    |
| 7                                    | PD2      | 8         | SLCTIN#  |
| 9                                    | PD3      | 10        | GND      |
| 11                                   | PD4      | 12        | GND      |
| 13                                   | PD5      | 14        | GND      |
| 15                                   | PD6      | 16        | GND      |
| 17                                   | PD7      | 18        | GND      |
| 19                                   | ACK#     | 20        | GND      |
| 21                                   | BUSY     | 22        | GND      |
| 23                                   | PE       | 24        | GND      |
| 25                                   | SLCT#    | 26        | +5V_EXTP |

## 2.9.5 Table of XP6, XP7 connectors contacts: COM3, COM4 (RS-232)

Table 2-37: Purpose of XP6, XP7 connector contacts: COM3, COM4

| XP6, XP7: IDC-10, pitch of 2.54 mm (5104338-1, AMP) |          |           |          |
|---|----------|-----------|----------|
| Contact #   | Function | Contact # | Function |
| 1   | DCD#     | 2         | DSR#     |
| 3   | RXD      | 4         | RTS#     |
| 5   | TXD      | 6         | CTS#     |
| 7   | DTR#     | 8         | RI#      |
| 9   | GND      | 10        | +5V_EXTR |

## 2.9.6 Table of XP8 connector contacts: PS/2 port of keyboard / mouse

Table 2-38: Purpose of XP8 connector contacts: PS/2 port of keyboard/mouse

| XP3: B 5B-PH-KL (JST), 5 contacts, pitch of 2 mm |          |
|--|----------|
| Contact #  | Function |
| 1  | KBD_CLK  |
| 2  | KBD_DAT  |
| 3  | MS_CLK   |
| 4  | GND      |
| 5  | +5V_EXTK |
| 6  | MS_DAT   |

## 2.9.7 Table of XP10 connector contacts: GPIO port

Table 2-39: Purpose of XP10 connector contacts

| XP10: 98424-G52-10LF, FCI |          |           |          |
|---------------------------|----------|-----------|----------|
| Contact #                 | Function | Contact # | Function |
| 1                         | GPIO[0]  | 2         | GPIO[1]  |
| 3                         | GPIO[2]  | 4         | GPIO[3]  |
| 5                         | GPIO[4]  | 6         | GPIO[5]  |
| 7                         | GPIO[6]  | 8         | GPIO[7]  |
| 9                         | +5VEXT   | 10        | GND      |

## 2.9.8 Table of XP14 connector contacts: buzzer

Table 2-40: Purpose of XP14 connector contacts: buzzer

| XP14: B 2B-PH-KL (JST), pitch of 2 mm |          |
|---------------------------------------|----------|
| Contact #                             | Function |
| 1                                     | +5V_EXTL |
| 2                                     | SPK_DRV  |

## 2.9.9 Table of XP15 connector contacts: connection to KIB98102 (VGA,TFT,AUDIO,KB,MS)

Table 2-41: Purpose of XP15 connector contacts: KIB98102 (VGA,TFT,AUDIO,KB,MS)

| XP15: IDC60 1.27 mm (5-104068-6, AMP) |           |                    |  |           |           |                     |
|---------------------------------------|-----------|--------------------|--|-----------|-----------|---------------------|
| Contact #                             | Function  | Description        |  | Contact # | Function  | Description         |
| 1                                     | KB_DAT    | Data, KBD          |  | 2         | +5V_EXTM  | Power supply (PS/2) |
| 3                                     | KB_CLK    | Clock, KBD         |  | 4         | MS_CLK    | Data, MOUSE         |
| 5                                     | GND       | Power supply       |  | 6         | MS_DAT    | Clock, MOUSE        |
| 7                                     | +3.3/+5V  | Power supply (TFT) |  | 8         | +3.3/+5V  | Power supply (TFT)  |
| 9                                     | FP_BLUE0  | Data, TFT          |  | 10        | FP_BLUE1  | Data, TFT           |
| 11                                    | FP_BLUE2  | Data, TFT          |  | 12        | FP_BLUE3  | Data, TFT           |
| 13                                    | FP_BLUE4  | Data, TFT          |  | 14        | FP_BLUE5  | Data, TFT           |
| 15                                    | GND       | Power supply       |  | 16        | FP_GREEN0 | Data, TFT           |
| 17                                    | FP_GREEN1 | Data, TFT          |  | 18        | FP_GREEN2 | Data, TFT           |
| 19                                    | FP_GREEN3 | Data, TFT          |  | 20        | FP_GREEN4 | Data, TFT           |
| 21                                    | FP_GREEN5 | Data, TFT          |  | 22        | GND       | Power supply        |
| 23                                    | FP_RED0   | Data, TFT          |  | 24        | FP_RED1   | Data, TFT           |
| 25                                    | FP_RED2   | Data, TFT          |  | 26        | FP_RED3   | Data, TFT           |
| 27                                    | FP_RED4   | Data, TFT          |  | 28        | FP_RED5   | Data, TFT           |
| 29                                    | GND       | Power supply       |  | 30        | FP_CLK    | Clock, TFT          |
| 31                                    | GND       | Power supply       |  | 32        | FP_DISPEN | Control, TFT        |
| 33                                    | GND       | Power supply       |  | 34        | FP_HSYNC  | Control, TFT        |
| 35                                    | FP_BKTLEN | Control, TFT       |  | 36        | FP_VSYNC  | Control, TFT        |
| 37                                    | FP_VDDEN  | Control, TFT       |  | 38        | GND       | Power supply        |
| 39                                    | CRT_RED   | Data, VGA          |  | 40        | GND       | Power supply        |
| 41                                    | CRT_BLUE  | Data, VGA          |  | 42        | GND       | Power supply        |
| 43                                    | CRT_GREEN | Data, VGA          |  | 44        | GND       | Power supply        |
| 45                                    | DDC_SDA   | Service, VGA       |  | 46        | CRT_HSYNC | Control, VGA        |
| 47                                    | CRT_VSYNC | Control, VGA       |  | 48        | DDC_SCL   | Service, VGA        |
| 49                                    | GND       | Power supply       |  | 50        | VCCA      | Power supply, Audio |
| 51                                    | LINEOUT_L | Audio              |  | 52        | GND       | Power supply, Audio |
| 53                                    | LINEOUT_R | Audio              |  | 54        | GND       | Power supply, Audio |
| 55                                    | LINEIN_L  | Audio              |  | 56        | GND       | Power supply, Audio |
| 57                                    | LINEIN_R  | Audio              |  | 58        | GND       | Power supply, Audio |
| 59                                    | MICIN     | Audio              |  | 60        | GND       | Power supply, Audio |

## 2.9.10 Table of XP16 connector contacts: connection to KIB98201 (IDE, LPT)

Table 2-42: Purpose of XP16 connector contacts: KIB98201 (IDE,LPTTFT,AUDIO,KB,MS)

| XP15: IDC72 1.27 mm (6-104068-5, AMP) |            |              |  |           |           |              |
|---------------------------------------|------------|--------------|--|-----------|-----------|--------------|
| Contact #                             | Function   | Description  |  | Contact # | Function  | Description  |
| 1                                     | RxD        | Data, COM9   |  | 2         | –         |              |
| 3                                     | TxD        | Data, COM9   |  | 4         | +5VEXTD   | Power supply |
| 5                                     | LPT_STB#   | Control, LPT |  | 6         | LPT_AFD#  | Control, LPT |
| 7                                     | LPT_D0     | Data, LPT    |  | 8         | LPT_ERR#  | Control, LPT |
| 9                                     | LPT_D1     | Data, LPT    |  | 10        | LPT_INIT# | Control, LPT |
| 11                                    | LPT_D2     | Data, LPT    |  | 12        | LPT_SLIN# | Control, LPT |
| 13                                    | LPT_D3     | Data, LPT    |  | 14        | GND       | Power supply |
| 15                                    | LPT_D4     | Data, LPT    |  | 16        | LPT_D5    | Data, LPT    |
| 17                                    | LPT_D6     | Data, LPT    |  | 18        | LPT_D7    | Data, LPT    |
| 19                                    | GND        | Power supply |  | 20        | LPT_ACK#  | Control, LPT |
| 21                                    | LPT_BUSY   | Control, LPT |  | 22        | LPT_PE    | Control, LPT |
| 23                                    | LPT_SLCT#  | Control, LPT |  | 24        | GND       | Power supply |
| 25                                    | –          |              |  | 26        | –         |              |
| 27                                    | –          |              |  | 28        | –         |              |
| 29                                    | –          |              |  | 30        | –         |              |
| 31                                    | –          |              |  | 32        | –         |              |
| 33                                    | –          |              |  | 34        | –         |              |
| 35                                    | –          |              |  | 36        | –         |              |
| 37                                    | GND        | Power supply |  | 38        | IDE_RST#  | Control, IDE |
| 39                                    | GND        | Power supply |  | 40        | IDE_D[7]  | Data, IDE    |
| 41                                    | IDE_D[8]   | Data, IDE    |  | 42        | IDE_D[6]  | Data, IDE    |
| 43                                    | IDE_D[9]   | Data, IDE    |  | 44        | IDE_D[5]  | Data, IDE    |
| 45                                    | IDE_D[10]  | Data, IDE    |  | 46        | IDE_D[4]  | Data, IDE    |
| 47                                    | IDE_D[11]  | Data, IDE    |  | 48        | GND       | Power supply |
| 49                                    | IDE_D[3]   | Data, IDE    |  | 50        | IDE_D[12] | Data, IDE    |
| 51                                    | IDE_D[2]   | Data, IDE    |  | 52        | IDE_D[13] | Data, IDE    |
| 53                                    | IDE_D[1]   | Data, IDE    |  | 54        | IDE_D[14] | Data, IDE    |
| 55                                    | IDE_D[0]   | Data, IDE    |  | 56        | IDE_D[15] | Data, IDE    |
| 57                                    | GND        | Power supply |  | 58        | IDE_DRQ#  | Control, IDE |
| 59                                    | IDE_IOW#   | Control, IDE |  | 60        | GND       | Power supply |
| 61                                    | IDE_IOR#   | Control, IDE |  | 62        | GND       | Power supply |
| 63                                    | IDE_IORDY# | Control, IDE |  | 64        | IDE_DACK# | Control, IDE |
| 65                                    | IDE_INT#   | Control, IDE |  | 66        | IDE_BA[1] | Control, IDE |
| 67                                    | IDE_BA[0]  | Control, IDE |  | 68        | IDE_BA[2] | Control, IDE |
| 69                                    | IDE_CS0#   | Control, IDE |  | 70        | IDE_CS1#  | Control, IDE |
| 71                                    | +5VEXTD    | Power supply |  | 72        | +5VEXTD   | Power supply |

### 2.9.11 Table of XP17-XP18 connector contacts: remote reset / interrupt

Table 2-43: Purpose of XP17, XP18 connector contacts: ports of isolated remote reset / interrupt

| XP17: B 2B-PH-KL (JST), pitch of 2 mm |          |
|---------------------------------------|----------|
| Contact #                             | Function |
| 1                                     | RMTRES+  |
| 2                                     | RMTRES-  |

| XP18: B 2B-PH-KL (JST), pitch of 2 mm |          |
|---------------------------------------|----------|
| Contact #                             | Function |
| 1                                     | RMTRES   |
| 2                                     | GNDS1    |

### 2.9.12 Table of XP20 connector contacts: module power supply

Table 2-44: Purpose of XP20 connector contacts: module power supply

| XP20: 22-27-2041, pitch of 2.54 mm (Molex) |          |
|--|----------|
| Contact #                                  | Function |
| 1  | +12V     |
| 2  | GND      |
| 3  | GND      |
| 4  | +5V      |

### 2.9.13 Table of XP21 connector contacts: USB2/3 ports

Table 2-45: Purpose of XP21 connector contacts: USB2/3 ports

| XP21: IDC10, pitch of 2 mm (98424-G52-10LF, FCI) |             |               |           |             |               |
|--|-------------|---------------|-----------|-------------|---------------|
| Contact #  | Purpose     | Configuration | Contact # | Purpose     | Configuration |
| 1  | +5 V @ 0.5A | Power supply  | 2         | +5 V @ 0.5A | Power supply  |
| 3  | D-          | Data          | 4         | D-          | Data          |
| 5  | D+          | Data          | 6         | D+          | Data          |
| 7  | GND         | Power supply  | 8         | GND         | Power supply  |
| 9  | -           |               | 10        | -           |               |



## 2.9.14 Table of XS4 connector contacts: PC/104 (ISA 8/16 bit)

Table 2-46: Purpose of XS4 connector contacts: PC/104 (ISA 8/16 bit) lines A, B

| XS4: Connector of PC/104 bus extension (2x32 + 2x20 contacts), lines A, B |         |               |           |         |               |
|---|---------|---------------|-----------|---------|---------------|
| Contact #   | Purpose | Configuration | Contact # | Purpose | Configuration |
| A1  | IOCHK#  | Input         | B1        | GND     | Power supply  |
| A2  | SD7     | Input/Output  | B2        | RESET   | Output        |
| A3  | SD6     | Input/Output  | B3        | +5V     | Input         |
| A4  | SD5     | Input/Output  | B4        | IRQ9    | Input         |
| A5  | SD4     | Input/Output  | B5        | -       |               |
| A6  | SD3     | Input/Output  | B6        | DRQ2    | Input         |
| A7  | SD2     | Input/Output  | B7        | -12V    | Power supply  |
| A8  | SD1     | Input/Output  | B8        | OWS#    | Input         |
| A9  | SD0     | Input/Output  | B9        | +12V    | Power supply  |
| A10   | IOCHRDY | Input         | B10       | GND     | Power supply  |
| A11   | AEN     | Output        | B11       | SMEMW#  | Output        |
| A12   | SA19    | Output        | B12       | SMEMR#  | Output        |
| A13   | SA18    | Output        | B13       | IOW#    | Output        |
| A14   | SA17    | Output        | B14       | IOR#    | Output        |
| A15   | SA16    | Output        | B15       | DACK3#  | Output        |
| A16   | SA15    | Output        | B16       | DRQ3    | Input         |
| A17   | SA14    | Output        | B17       | DACK1#  | Output        |
| A18   | SA13    | Output        | B18       | DRQ1    | Input         |
| A19   | SA12    | Output        | B19       | DACK0#  | Output        |
| A20   | SA11    | Output        | B20       | BCLK    | Output        |
| A21   | SA10    | Output        | B21       | IRQ7    | Input         |
| A22   | SA9     | Output        | B22       | IRQ6    | Input         |
| A23   | SA8     | Output        | B23       | IRQ5    | Input         |
| A24   | SA7     | Output        | B24       | IRQ4    | Input         |
| A25   | SA6     | Output        | B25       | IRQ3    | Input         |
| A26   | SA5     | Output        | B26       | DACK2#  | Output        |
| A27   | SA4     | Output        | B27       | TC      | Output        |
| A28   | SA3     | Output        | B28       | BALE#   | Output        |
| A29   | SA2     | Output        | B29       | +5V     | Power supply  |
| A30   | SA1     | Output        | B30       | OSC     | Output        |
| A31   | SA0     | Output        | B31       | GND     | Power supply  |
| A32   | GND     | Power supply  | B32       | GND     | Power supply  |

Table 2-47: Purpose of XS4 connector contacts: PC/104 (ISA 8/16 bit) lines C, D

| XS4: Connector of PC/104 bus extension (2x32 + 2x20 contacts), lines C, D |         |               |           |          |               |
|---|---------|---------------|-----------|----------|---------------|
| Contact #   | Purpose | Configuration | Contact # | Purpose  | Configuration |
| C0  | GND     | Power supply  | D0        | GND      | Power supply  |
| C1  | SBHE#   | Output        | D1        | MEMCS16# | Input         |
| C2  | LA23    | Output        | D2        | IOCS16#  | Input         |
| C3  | LA22    | Output        | D3        | IRQ10    | Input         |
| C4  | LA21    | Output        | D4        | IRQ11    | Input         |
| C5  | LA20    | Output        | D5        | IRQ12    | Input         |
| C6  | LA19    | Output        | D6        | IRQ15    | Input         |
| C7  | LA18    | Output        | D7        | IRQ14    | Input         |
| C8  | LA17    | Output        | D8        | DACK0#   | Output        |
| C9  | MEMR#   | Output        | D9        | DRQ0     | Input         |
| C10   | MEMW#   | Output        | D10       | DACK5#   | Output        |
| C11   | SD8     | Input/Output  | D11       | DRQ5     | Input         |
| C12   | SD9     | Input/Output  | D12       | DACK6#   | Output        |
| C13   | SD10    | Input/Output  | D13       | DRQ6     | Input         |
| C14   | SD11    | Input/Output  | D14       | DACK7#   | Output        |
| C15   | SD12    | Input/Output  | D15       | DRQ7     | Input         |
| C16   | SD13    | Input/Output  | D16       | +5V      | Power supply  |
| C17   | SD14    | Input/Output  | D17       | -        |               |
| C18   | SD15    | Input/Output  | D18       | GND      | Power supply  |
| C19   | -       |               | D19       | GND      | Power supply  |

## 2.9.15 Table of XS6 connector contacts: MicroPC ISA 8 bit

Table 2-48: Purpose of XS6 connector contacts: MicroPC (ISA 8 bit)

| XS6: Edge connector of MicroPC bus extension (2x31 contacts) |         |               |           |         |               |
|--|---------|---------------|-----------|---------|---------------|
| Contact #  | Purpose | Configuration | Contact # | Purpose | Configuration |
| A1   | IOCHK#  | Input         | B1        | GND     | Power supply  |
| A2   | SD7     | Input/Output  | B2        | RESET   | Output        |
| A3   | SD6     | Input/Output  | B3        | +5V     | Input         |
| A4   | SD5     | Input/Output  | B4        | IRQ9    | Input         |
| A5   | SD4     | Input/Output  | B5        | -       |               |
| A6   | SD3     | Input/Output  | B6        | DRQ2    | Input         |
| A7   | SD2     | Input/Output  | B7        | -12V    | Power supply  |
| A8   | SD1     | Input/Output  | B8        | 0WS#    | Input         |
| A9   | SD0     | Input/Output  | B9        | +12V    | Power supply  |
| A10  | IOCHRDY | Input         | B10       | GND     | Power supply  |
| A11  | AEN     | Output        | B11       | SMEMW#  | Output        |
| A12  | SA19    | Output        | B12       | SMEMR#  | Output        |
| A13  | SA18    | Output        | B13       | IOW#    | Output        |
| A14  | SA17    | Output        | B14       | IOR#    | Output        |
| A15  | SA16    | Output        | B15       | DACK3#  | Output        |
| A16  | SA15    | Output        | B16       | DRQ3    | Input         |
| A17  | SA14    | Output        | B17       | DACK1#  | Output        |
| A18  | SA13    | Output        | B18       | DRQ1    | Input         |
| A19  | SA12    | Output        | B19       | DACK0#  | Output        |
| A20  | SA11    | Output        | B20       | BCLK    | Output        |
| A21  | SA10    | Output        | B21       | IRQ7    | Input         |
| A22  | SA9     | Output        | B22       | IRQ6    | Input         |
| A23  | SA8     | Output        | B23       | IRQ5    | Input         |
| A24  | SA7     | Output        | B24       | IRQ4    | Input         |
| A25  | SA6     | Output        | B25       | IRQ3    | Input         |
| A26  | SA5     | Output        | B26       | DACK2#  | Output        |
| A27  | SA4     | Output        | B27       | TC      | Output        |
| A28  | SA3     | Output        | B28       | BALE#   | Output        |
| A29  | SA2     | Output        | B29       | +5V     | Power supply  |
| A30  | SA1     | Output        | B30       | OSC     | Output        |
| A31  | SA0     | Output        | B31       | GND     | Power supply  |

## **SECTION 3**

# **INSTALLATION AND CONFIGURATION**

### 3 INSTALLATION AND CONFIGURATION

The module can be installed into **MicroPC** mounting baskets, **ISA** - compatible mounting frames or connected by a **flexible ribbon cable** with edge connectors to other modules.



**Attention!**

Installation into **PC slots** can bring module out of operation.



**Attention!**

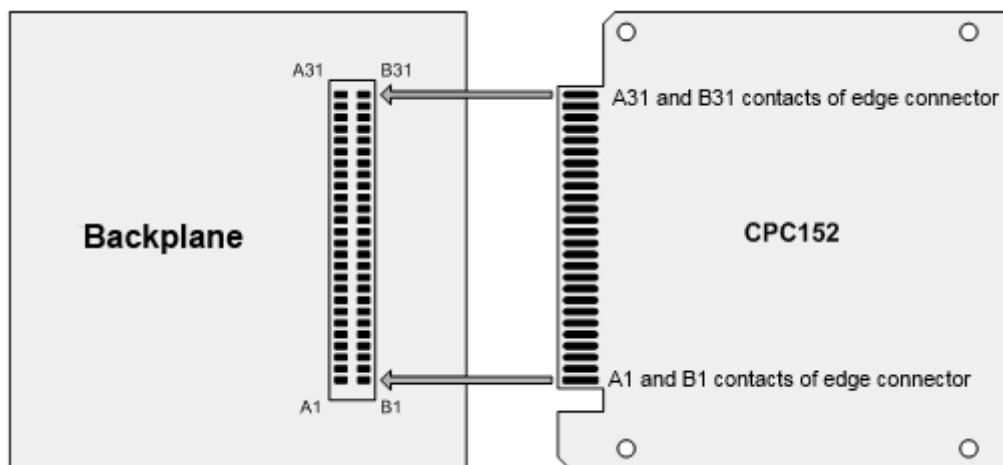
The module contains sensitive components. Installation, removal, connection of module **with its power on**, as well as a **static discharge from your hands** can damage the module.



**Attention!**

During installation it is required to observe the proper orientation of module connectors towards connectors of the backplane.

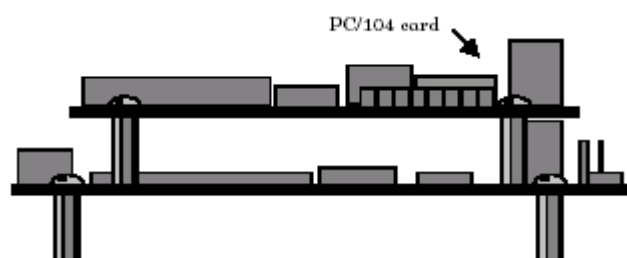
Fig. 3-1: Diagram of CPC152 module connection to backplane



It is also possible to extend functionalities by installing modules in **PC/104 format (ISA 8/16 bit)**. It is permitted to install no more than 4 PC/104 extension modules.

Conventional view of installation and connection of extension modules in PC/104 format is shown in the figure.

Fig. 3-2: Conventional view of installation and connection of extension modules in PC/104 format



### 3.1 Installation of module switches

For module hardware configuration, it is possible to use the group of switches, which general description is specified in the table below.

**Table 3-1: Purpose of switched for module configuration**

| Switches   | Description   |
|------------|---|
| X1         | Permission / prohibition of switching to BIOS backup copy   |
| X2         | Service jumper (do not close!)  |
| X3, X4, X5 | Purpose of IDE integrated devices: Master or Slave  |
| X6         | Selection of power supply voltage for LCD panel (connection via KIB98102, XP15)                                   |
| X7, X8, X9 | Switching of Power Fail signals, watchdog timer (WDT2) actuation, of remote reset line to CPU hardware reset line |
| X10 – X13  | Binding of COM1 (RS-422/485) lines and connection of conforming resistors   |
| X14        | Selection of COM1 operation mode (RS-422/485): rate of rise limitation  |
| X15 – X18  | Binding COM2 lines (RS-422/485) and connection of conforming resistors  |
| X19        | Selection of COM2 operation mode (RS-422/485): rate of rise limitation  |
| X23        | Setting actuation voltage level of remote reset   |
| X40        | Connection of nonvolatile RAM 128 KB  |

#### 3.1.1 Switching to BIOS booting from the main / standby source

**Table 3-2: Switching to BIOS booting from the main / standby source**

| Jumper          | Description  |
|-----------------|--|
| X1 [1-2]        | Prohibition of automatic switching to BIOS backup copy<br>(in this case there will be no automatic switching to the backup copy) |
| <b>X1 [0-0]</b> | <b>Mode of automatic switching to booting from BIOS backup copy</b>  |

### 3.1.2 Purpose of IDE integrated devices: Master or Slave

Table 3-3: Purpose of IDE integrated devices: Master or Slave

| Jumper   | Description   |
|----------|---|
| X3 [1-2] | <b>Flash-drive: Primary Master</b><br><b>Compact Flash: Primary Slave</b> |
| X4 [0-0] |   |
| X5 [0-0] |   |
| X3 [0-0] | Flash-drive: Primary Slave<br>Compact Flash: Primary Master               |
| X4 [1-2] |   |
| X5 [0-0] |   |
| X3 [0-0] | Flash-drive: deactivated<br>Compact Flash: Primary Master                 |
| X4 [1-2] |   |
| X5 [1-2] |   |
| X3 [0-0] | Flash-drive: deactivated<br>Compact Flash: Primary Slave                  |
| X4 [0-0] |   |
| X5 [1-2] |   |

### 3.1.3 Selection of power supply voltage for LCD panel (connection via KIB98102, XP15)

Table 3-4: Selection of power supply voltage for LCD panel (connection via KIB98102, XP15)

| Jumper  | Description  |
|---------|--|
| X6[1-2] | There was a selection of voltage of +5 V for power supply of LCD panel, connected via KIB98102 module (XP15 connector of CPC152 module)          |
| X6[2-3] | <b>There was a selection of voltage of +3.3 V for power supply of LCD-panel, connected via KIB98102 module (XP15 connector of CPC152 module)</b> |

### 3.1.4 Switching of Power Fail signals, watchdog timer actuation, remote access to the line of CPU hardware reset

Table 3-5: Switching of Power Fail signals, watchdog timer actuation, remote access to the line of CPU hardware reset

| Jumper  | Description  |
|---------|--|
| X7[1-2] | Switching of Power Fail signal to the line of CPU hardware reset   |
| X8[1-2] | <b>Switching of watchdog timer (WDT2) actuation signal to the line of CPU hardware reset (used for automatic switching to the BIOS backup copy in case of a boot failure while booting from the main copy)</b> |
| X9[1-2] | Switching of external signal of a remote reset / interrupt (from XP17, XP18 connectors) to the line of CPU hardware reset  |

### 3.1.5 Binding and matching of COM1 port lines (RS-422/485)

Table 3-6: Binding and matching of COM1 port (RS-422/485)

| Jumper                | Description  |
|-----------------------|--|
| X10 [1-2]             | Signal +TX / +RTXD via resistor 680 Ohm is brought up to the isolated power supply voltage of +5VS1 for generation of 200 mW displacement on Y/Z lines |
| X11 [1-2]             | Signal -TX / -RTXD via resistor 680 Ohm is brought up to the GNDS1 isolated ground.  |
| X10 [1-2] & X11 [1-2] | Connection of conforming resistor 120 Ohm between the lines $\pm$ TX / $\pm$ RTxD  |
| X12 [1-2]             | Selection of rate of rise mode limitation of output signal. In this case, the exchange speed is limited by the value of 250 Kb/sec.                    |

### 3.1.6 Selection of COM1 port operation mode (RS-422/485)

Table 3-7: Selection of COM1 port operation mode (RS-422/485)

| Jumper  | Description             |
|---|-------------------------|
| X13 [1-2] & X14 [1-2]                         | Half-duplex mode        |
| <b>X13 [0-0] &amp; X14 [0-0]<sup>16</sup></b> | <b>Full-duplex mode</b> |

### 3.1.7 Binding and matching of COM2 port lines (RS-422/485)

Table 3-8: Binding and matching of COM2 lines (RS-422/485)

| Jumper                | Description  |
|-----------------------|--|
| X15 [1-2]             | Signal +TX / +RTXD via resistor 680 Ohm is brought up to the isolated power supply voltage +5VS2 for generating 200 mW displacement on Y/Z lines |
| X16 [1-2]             | Signal -TX / -RTXD via resistor 680 Ohm is brought up to the GNDS2 isolated ground.  |
| X15 [1-2] & X16 [1-2] | Connection of conforming resistor 120 Ohm between the lines $\pm$ TX / $\pm$ RTxD  |
| X17 [1-2]             | Selection of rate of rise mode limitation of output signal. In this case, the exchange speed is limited by the value of 250 Kb/sec.              |

### 3.1.8 Selection of COM2 port operation mode (RS-422/485)

Table 3-9: Selection of COM2 port operation mode (RS-422/485)

| Jumper                           | Description             |
|----------------------------------|-------------------------|
| X18 [1-2] & X19 [1-2]            | Half-duplex mode        |
| <b>X18 [0-0] &amp; X19 [0-0]</b> | <b>Full-duplex mode</b> |

<sup>16</sup> From this point on: write of "Xnn[0-0]" view means that the specified jumper is open.



### 3.1.9 Setting the voltage level of remote reset actuation (XP17)

Table 3-10: Setting the voltage level of remote reset actuation (XP17)

| Jumper   | Description                                |
|----------|--|
| X23[1-2] | Range of actuation voltages: 3 V ... 15 V  |
| X23[2-3] | Range of actuation voltages: 10 V ... 30 V |

### 3.1.10 Connection of nonvolatile RAM

Table 3-11: Connection of integrated nonvolatile RAM

| Jumper    | Description                                       |
|-----------|---|
| X40 [1-2] | Integrated nonvolatile RAM of 128 KB is connected |

## 3.2 Configuration of module's parameters (BIOS SETUP)

Parameters of CPC152 module configuration are stored in the internal nonvolatile memory (FRAM) and can be changed in BIOS Setup.

Setting configuration parameters for CPC152 is carried out during module's booting while pressing the <De1> button on the keyboard, connected to the PS/2 or USB port, by <F4> button on the keyboard of the remote terminal, when connection the module via a console serial COM-port.

Description of BIOS Setup settings is given in [Section 5 "Basic Input/Output System \(BIOS\)"](#).

## **SECTION 4**

### **INTENDED USE OF CPC152**

## 4 Intended use of CPC152

### 4.1 Basic software

At the time of delivery, the integrated FLASH-drive of CPC152 contains programs, ensuring operating readiness of the device:

- integrated FreeDOS operating system
- service program of data uploading/downloading (**ftrans.exe**)
- system utility for transfer of system files (**sys.com**)

Кроме того, в комплект поставки модуля входит диск с документацией, утилитами для модификации FLASH BIOS и примерами программирования.

The latest versions of documents, BIOS and utilities can be found at <ftp://ftp.prosoft.ru/pub/Hardware/Fastwel/CPx/CPC152/>.

### 4.2 Setting connection between PC and CPC152

For setting connection between the PC and CPC152 module it is required:

1. When the power of PC and CPC152 is off, connect the cable VTC-9F with a 0-modem adapter to PC COM-port and XP6 / XP7 connector of the CPC152 module (by default, COM3 is set as a console one). For connection to COM3 (XP6) and COM4 ports (XP7), ACS00005 adapter cable is used (1 pcs. included into the delivery checklist).
2. Install the package of terminal software SmartLINK or any other equivalent program with the following sequence link parameters:
  - PC port (COM1 / COM2)
  - 8 bit data
  - 1x stop bit
  - without even-parity check
  - exchange rate of 115200 Kb/sec
3. Switch on the power and press the RESET button, if it is not necessary to fulfill items 1, 2 and the power is on. In case the connection has been set successfully, after the booting of operating system, on PC screen there will be a line of DOS invitation: **C:>**
4. For booting of operating system without execution of commands of **CONFIG.SYS** and **AUTOEXEC.BAT** files, after power on or RESET it is required to press combinations of <Ctrl-B> or <Ctrl-C> keys on PC keyboard for step-by-step execution of commands.

### 4.3 Module operation wit AT-keyboard and CRT-display/TFT-panel

When connecting an AT-keyboard and CRT-display or TFT-panel to the module (via KIB98102 interface board using an integrated video controller or by using an external MicroPC or PC/104 video adapter) the CPC152 module can be used as a standard AT (x86) - compatible PC. In this case, start and debugging of programs is carried out as usual and is not described here.

## 4.4 Loading files with FTRANS.EXE program

File exchange between PC and CPC152 module is performed using the **ftrans.exe** utility. For exchanging files it is required to carry out the following activities:

- set the connection between PC and CPC152;
- start the **ftrans.exe** program with the required parameters (see integrated program help);
- within no more than 50 seconds from the start of **ftrans.exe** program, to carry out the required activities (specify the transfer direction, file name etc.) in **SmartLINK** program or other terminal program (see program description).

In order to use the **FTRANS** utility for remote loading of files via COM3 / COM4 ports, it is required to specify their base addresses 3F8h and 2F8h in BIOS Setup settings, which corresponds to the standard allocation of addresses for COM1 / COM2 (set by default in BIOS Setup settings).

## 4.5 Interface BIOS SOC Vortex86DX for reading serial number, MAC-address

for storing system parameters, FRAM array is used. In order to store the whole system information, a volume equal to 1KB is used (it can be subject to minor changes depending on BIOS revision).

### 4.5.1 Array structure:

```

_FRAM    STRUCT

           db        256 dup (0)        ; Reserve for storage of CMOS copy

dSerNum  dd        0                  ; Module serial number

wMac    dw        -1,-1,-1            ; MAC-address of integrated LAN

_FRAM    ENDS

```

Parameter values, transferred in CPU registers, are given below.

In case of a wrong number of (AL) function, AX = -1 (0FFFFh) is returned.

### 4.5.2 Obtaining module serial number.

Input: AL = 6

Output: AX = Result code (0 - no error)

CX:DX = serial number.

### 4.5.3 Reading of MAC address of integrated LAN-control from the FRAM area.

Input: AL = 8

AX = Result code (0 - no error)

Output: SI:CX:DX = MAC-address.

The function returns the value, stored in the area of MAC-address of FRAM. Actual value used by the controller, can vary if it was overwritten to the registers of controller by application software.

## 4.6 Interface BIOS SOC Vortex86DX for reading/writing to FRAM

Integrated nonvolatile memory FRAM is also available for storing user data.

In order to call the FRAM reading/writing service, **INT 17H** interrupt is used with a parameter in the AH = 0ADh register.

Values of other parameters, transferred in CPU registers, are described below.

In case of a wrong number of (AL) function, AX = -1 (0FFFFh) is returned.

### 4.6.1 Reading user data from FRAM.

Input: AL = 0Ch

BX = address of data start in the user area of FRAM

CX = number of readable bytes

DS:DX = indicator to the reading buffer

Output: AX = result code (0 - no error, -2 (0FFFEh) – parameter error, wrong address)

BX = maximum permissible address (size of user area -1)

CX = number of actual bytes read

This function reads the specified bytes of FRAM user area into the buffer of calling program.

### 4.6.2 Writing user data from FRAM.

Input: AL = 0Dh

BX = address of data start in the user area of FRAM

CX = number of bytes written

DS:DX = indicator to the data written

Output: AX = result code (0 - no error, -2 (0FFFEh) – parameter error, wrong address)

BX = maximum permissible address (size of user area -1)

CX = number of actual bytes written

\* This function writes data to FRAM user area.

## 4.7 Service utility programs

This chapter describes a set of drivers for operation with I/O devices, connected to CPC152 module.

### 4.7.1 XFLASH.EXE utility (upgrade of BIOS backup copy)

The `xflash.exe` program is designed for modifying BIOS with writing into the integrated SPI-Flash of the CPU in the CPC152 module. A prerequisite of the upgrade is booting from BIOS backup copy.

In order to modify BIOS it is required to start the program with "w" key and specify BIOS file name as parameter:

```
xflash w bios.bin
```

### 4.7.2 VXDXBIOS.EXE utility (upgrade of BIOS main copy)

The `vxdxbios.exe` program is designed for modifying BIOS with writing to the external FLASH-memory (from PLCCC32 socket) in the CPC152 module. In this case it is required to properly install the jumpers, responsible for switching the BIOS booting source.

In order to modify BIOS it is required to start the program and specify BIOS file name as parameter:

```
vxdxbios bios.bin
```



#### Attention!

After BIOS upgrade, it is required to enter the BIOS Setup menu and load optimum values, since CMOS structure can distinguish from various BIOS versions (see [Section 5 Basic Input/Output System \(BIOS\)](#) of this User Manual).

After that BIOS Setup settings can be changed.

### 4.7.3 CMOS\_RST.EXE utility (remote reset of BIOS settings)

The `CMOS_RST.EXE` program is designed for reset of BIOS settings to the default state (similarly to the effect of item BIOS Setup "Load Optimal Defaults"). For reset of the setting using `CMOS_RST.EXE` program it is required to connect COM3 or COM4 port of CPC152 module with COM port of the PC by a null modem cable and turn on the module power supply (settings will be reset and written to the CMOS and FRAM, then a hardware reset will be carried out automatically and module will be started with default settings). The used PC should be equipped with installed OS Win32 (WinNT/2000/XP).

Syntax:

```
cmos_rst.exe [COM]
```

where [COM] – number of the COM-port used in PC, COM1 by default.

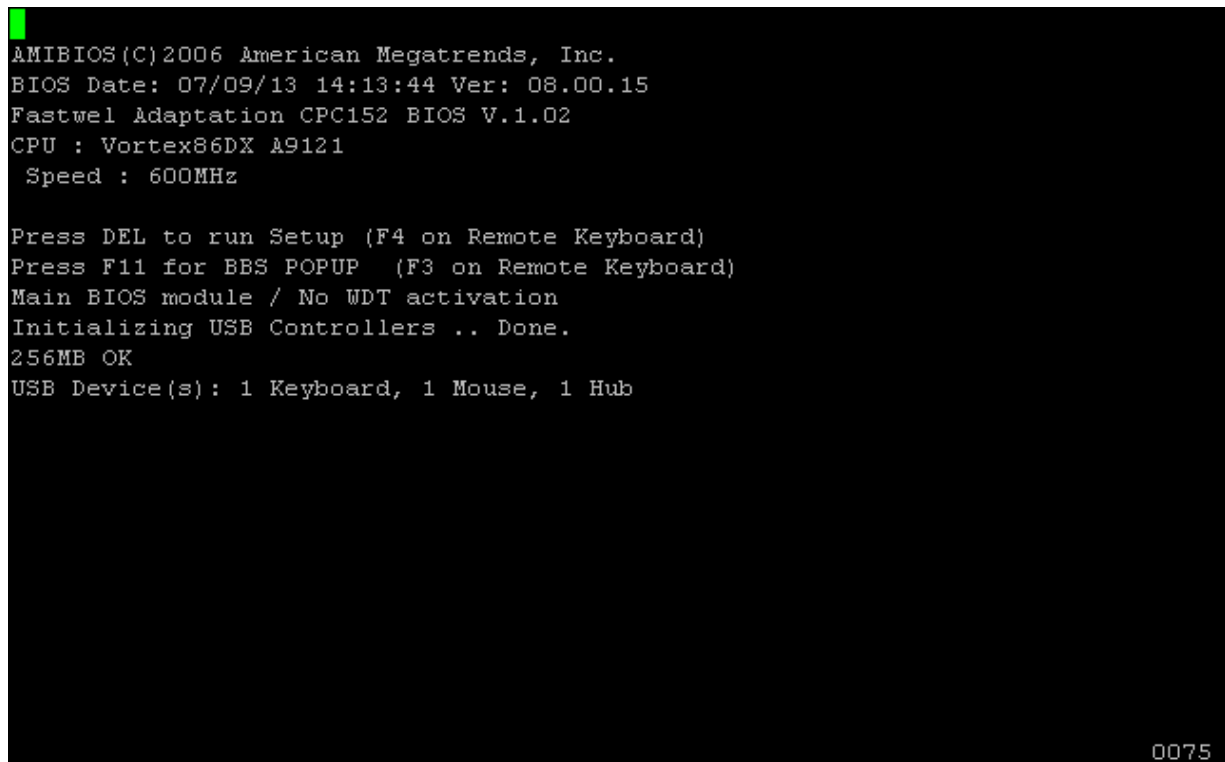
## **SECTION 5**

# **BASIC INPUT/OUTPUT SYSTEM (BIOS)**

## 5 BASIC INPUT/OUTPUT SYSTEM (BIOS)

In order to enter the BIOS Setup, it is required during system booting and at the time of the POST (Power On Self Test) procedure to press the «DEL» button on the keyboard or «F4» button on the keyboard of a console PC (the "Console Redirect" option should be on). Example of the POST procedure screen is shown in Figure 5.1.

Fig. 5-1: Screen view during module booting process (POST)

A screenshot of a BIOS POST screen. The background is black with white text. The text includes: AMIBIOS(C)2006 American Megatrends, Inc.; BIOS Date: 07/09/13 14:13:44 Ver: 08.00.15; Fastwel Adaptation CPC152 BIOS V.1.02; CPU : Vortex86DX A9121; Speed : 600MHz; Press DEL to run Setup (F4 on Remote Keyboard); Press F11 for BBS POPUP (F3 on Remote Keyboard); Main BIOS module / No WDT activation; Initializing USB Controllers .. Done.; 256MB OK; USB Device(s): 1 Keyboard, 1 Mouse, 1 Hub. In the bottom right corner, the number 0075 is displayed.

```
AMIBIOS(C)2006 American Megatrends, Inc.  
BIOS Date: 07/09/13 14:13:44 Ver: 08.00.15  
Fastwel Adaptation CPC152 BIOS V.1.02  
CPU : Vortex86DX A9121  
Speed : 600MHz  
  
Press DEL to run Setup (F4 on Remote Keyboard)  
Press F11 for BBS POPUP (F3 on Remote Keyboard)  
Main BIOS module / No WDT activation  
Initializing USB Controllers .. Done.  
256MB OK  
USB Device(s): 1 Keyboard, 1 Mouse, 1 Hub  
  
0075
```

Using the BIOS Setup Utility it is possible to change BIOS (Basic Input Output System) parameters and control special modes of module operation. This program uses the system menu for making changes, as well as for activation or deactivation of special functions.

Information fields (highlighted with grey font color) are designed for output of additional information on module and/or module settings and are not available for changing by the user.

When describing menu items, values set by default, are underlined. Information fields should be printed in italics. Setting the wrong values could lead to malfunctions in system operation.



For displaying the menu for selection of a drive, which will be used for booting of operating system, during system booting and at the time of POST procedure it is required to press the "F11" button on keyboard or "F3" button on the keyboard of console PC (the "Console Redirect" option should be on). Example of the menu of boot device selection is given in the figure 5.2.

Fig. 5-2: Menu of boot device selection



## 5.1 Main

This menu tab contains description of BIOS version, installed CPU and RAM. There are also two items, responsible for adjustment of current date and time. Screen of "Main" menu is shown in Figure 5.3, description of items is shown in table 5.1.

Fig. 5-3: Screen of "Main" menu

```

BIOS SETUP UTILITY
Main  Advanced  PCIPnP  Boot  Security  Chipset  Exit
*****
* System Overview                               * Use [ENTER], [TAB]
* *****                                     * or [SHIFT-TAB] to
* AMIBIOS                                       * select a field.
* Version   :08.00.15                           *
* Build Date:07/09/13                           * Use [+] or [-] to
* ID        :3BABT000                           * configure system Time.
* Fastwel FPGA Firmware                         *
* XCS05 Rev.:1.3                               *
* Processor                                     *
* Vortex86DX A9121                             *
* Speed     :600MHz                             *
* System Memory                               * *   Select Screen
* 256MB at 333MHz                             * **   Select Item
*                                               * +-   Change Field
* System Time                                 [00:00:07] * Tab  Select Field
* System Date                                [Tue 07/09/2013] * F1   General Help
*                                               * F6   Reset WDT
*                                               * F10  Save and Exit
*                                               * ESC  Exit
*****
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```

Table 5-1: Description of "Main" menu

| Menu item  | Assignment   |
|--|--|
| <b>AMIBIOS</b><br>(Information on BIOS version)  | Version – current BIOS version<br>Build Date – build date of BIOS<br>ID – BIOS identifier                              |
| <b>Fastwel FPGA Firmware</b><br>(firmware versions and identifiers of integrated PLDs) | XCS05 Rev. – version of system PLD   |
| <b>Processor</b><br>(information field)  | Information on CPU installed on the module:<br>Vortex A9121 – version of Vortex86DX CPU<br>Speed – CPU clock frequency |
| <b>System Memory</b><br>(information field)  | Information on DDR2 SDRAM installed on the module:<br>volume of RAM and frequency of bus operation                     |
| System Time  | Current time in format [hour/min/sec]  |
| System Date  | Current date in format [month/day/year]  |

## 5.2 Advanced (additional settings)

This menu tab contains items responsible for operation of the soldered ATA Flash Disk controller, Cache-memory of the CPU, IDE bus, console input-output and USB devices. Screen of "Advanced" menu is shown in Figure 5.4, description of items is given in the table 5.2.

Fig. 5-4: Screen of "Advanced" menu



Table 5-2: Description of "Advanced" menu (additional settings)

| Menu item                             | Assignment   |   |
|---------------------------------------|--|---|
| Embedded NAND Flash                   | Operation of soldered ATA Flash Disk controller is permitted (FLASH-disk)  |   |
|                                       | [Enabled]  | operation is permitted  |
|                                       | [Disabled]   | operation if prohibited   |
| Reserve BIOS Switch by WDT            | Control of switching to BIOS backup copy   |   |
|                                       | [Enabled]  | function of switching to BIOS backup copy is activated (in case of hang-up, during completion of the POST procedure)  |
|                                       | [Disabled]   | function of switching to BIOS backup copy is deactivated (in case of hang-up, during completion of the POST procedure), the function is deactivated immediately after the start of BIOS |
| Start Manufacturing Link              | Activating the mode of direct access to Primary IDE Master via a console COM-port.                                   |   |
| <b>CPU Configuration</b><br>(submenu) | It contains information on CPU manufacturer, as well as items to control operation of integrated Cache-memory of CPU |   |
| <b>IDE Configuration</b><br>(submenu) | Operation control of devices on IDE bus  |   |
| <b>Remote Access Configuration</b>    | Console input-output settings  |   |

| Menu item                             | Assignment  |
|---------------------------------------|---|
| (submenu)                             |   |
| <b>USB Configuration</b><br>(submenu) | Settings of USB ports. These settings apply to all 4 USB ports. |

### 5.2.1 CPU Configuration

Screen of "CPU Configuration" menu is shown in Figure 5.5, description of items is given in the table 5.3.

Fig. 5-5: Screen of "CPU Configuration" menu



Table 5-3: Description of "CPU Configuration" menu

| Menu item | Assignment |  |
|-----------|------------|--|
| L1 Cache  | [Enabled]  | Operation of L1 Cache-memory is permitted  |
|           | [Disabled] | Operation of L1 Cache-memory is prohibited |
| L2 Cache  | [Enabled]  | Operation of L2 Cache-memory is permitted  |
|           | [Disabled] | Operation of L2 Cache-memory is prohibited |

### 5.2.2 IDE Configuration

Screen of "IDE Configuration" menu is shown in figure 5.6, description of items is given in the table 5.4.

Fig. 5-6: Screen of "IDE Configuration" menu



Table 5-4: Description of "IDE Configuration" menu (IDE controller configuration)

| Menu item                           | Assignment   |   |
|-------------------------------------|--|---|
| Onboard PCI IDE Controller          | Operation control of integrated PCI controller of IDE bus.   |   |
|                                     | [Primary]  | operation is permitted                        |
|                                     | [Disabled]   | operation if prohibited                       |
| <b>Primary IDE Master</b> (submenu) | It contains information on the connected IDE device, operating in the Master mode (Fig 5.5, table 5.3).  |   |
| <b>Primary IDE Slave</b> (submenu)  | It contains information on the connected IDE device, operating in the Master mode. Menu structure is gully identical to the Primary IDE Master menu structure (Fig. 5.5, table 5.3). |   |
| Hard Disk Write Protect             | Permission to set the access lockout for writing to IDE devices  |   |
|                                     | [Enabled]  | Set the lockout                               |
|                                     | [Disabled]   | lift the lockout                              |
| IDE Detect Time Out (Sec)           | Waiting limit for determination of ATA/ATAPI device, in seconds. The following values are available:   |   |
|                                     | [0], [5], [10], [15], [20], [25], [30], [35]   |   |
| ATA(PI) 80Pin Cable Detection       | Selection of a way for determination of 80-wire ATA(PI) cable  |   |
|                                     | [Host & Device]  | check from the side of system and IDE devices |
|                                     | [Host]   | check only from the side of system            |
|                                     | [Device]   | check only from the side of IDE devices       |

5.2.2.1 Primary IDE Master (Configuration of IDE Primary Master)

Screen "Primary IDE Master" menu is shown in the figure 5.7, description of items is given in the table 5.5. "IDE Primary Slave" menu is fully identical to the "Primary IDE Master" menu.

Fig. 5-7: Screen "Primary IDE Master" menu



Table 5-5: Description of "Primary IDE Master" menu

| Menu item                     | Assignment  |
|-------------------------------|---|
| Type                          | Type of device connected to this IDE channel  |
|                               | [Not Installed]      Prohibition for searching for the connected devices  |
|                               | [Auto]                Automatic detection of connected device type  |
|                               | [CD/DVD]             Determine the connected device as CD/DVD drive   |
| LBA/Large Mode                | [ARMD]               Determine the connected device as ATAPI removable data storage device (ZIP, LS-120)  |
|                               | Addressing type of device connected to this IDE channel   |
| Block (Multi-Sector Transfer) | [Auto]                Automatic determination of LBA mode support   |
|                               | [Disabled]            Prohibition of LBA mode determination, Large Mode is used   |
|                               | Mode of block data transmission   |
| [Auto]                        | This option enables BIOS to automatically determine, whether the Multi-Sector Transfers mode is supported on this channel. This option enables BIOS to automatically determine the number of sectors per block for transmission from the hard drive to memory. Data to/from the device will be transmitted via several sectors per unit of time. Default value. |
|                               | [Disabled]            This option prohibits BIOS to use the Multi-Sector Transfer mode on this channel. Data to/from the device will be transmitted via a single sector per unit of time.   |

| Menu item            | Assignment   |   |
|----------------------|--|---|
| PIO Mode             | Programmable input-output (PIO) mode                 |   |
|                      | [Auto]   | This option enables BIOS to automatically determine whether a device supports the PIO mode. It is recommended to use this unit when it is impossible to determine which mode is supported by the connected device                             |
|                      | [0], [1], [2], [3], [4]                              | Set the PIO 0,1,2,3,4 mode for the connected device.<br>Data transmission rate in the mode<br>PIO 0 – up to 3.3 MB/sec,<br>PIO 1 – up to 5.2 MB/sec,<br>PIO 2 – up to 8.3 MB/sec,<br>PIO 3 – up to 11.1 MB/sec,<br>PIO 4 – up to 16.6 MB/sec. |
| DMA Mode             | DMA (Direct Memory Access) mode of data transmission |   |
|                      | [Auto]   | Recommended value for the most efficient data transmission. BIOS will automatically determine the most relevant DMA mode.   |
|                      | [SWDMA0]<br>[SWDMA1]<br>[SWDMA2]                     | "Single Word DMA" modes   |
|                      | [MWDMA0]<br>[MWDMA1]<br>[MWDMA2]                     | "Multi Word DMA" modes  |
| S.M.A.R.T.           | Smart Monitoring, Analysis, and Reporting Technology |   |
|                      | [Auto]   | BIOS will automatically determine and support the connected device. It is recommended to use this option when it is impossible to determine and support of the connected drive.   |
|                      | [Enabled]  | This option enables BIOS to use the SMART function during operation with the connected drives   |
|                      | [Disabled]   | This option prohibits BIOS to use the SMART function during operation with the connected drives   |
| 32-bit Data Transfer | 32-bit Data Transfer Mode                            |   |
|                      | [Enabled]  | This option enables to use 32 bit data transmission for the device connected  |
|                      | [Disabled]   | This option prohibits to use the 32 bit data transmission for the device connected  |

\* Available volume of integrated drive – 1.8 GB (incorrect determination of the volume of integrated drive is attributed to peculiarities of AMI BIOS operation).

### 5.2.3 Remote Access Configuration

Screen of "Remote Access Configuration" menu is shown in the Figure 5.8, description of items is given in the table 5.6.

Fig. 5-8: Screen of "Remote Access Configuration" menu

```

BIOS SETUP UTILITY
Advanced
*****
* Configure Remote Access type and parameters          * Select Remote Access *
* *****                                             * type.                *
* Remote Access [Enabled]                             *                    *
* *                    *                               *                    *
* Serial port number [COM3]                            *                    *
*   Base Address, IRQ [3F8h, 4]                        *                    *
* Serial Port Mode [115200 8,n,1]                     *                    *
* Flow Control [None]                                 *                    *
* Redirection After BIOS POST [Boot Loader]           *                    *
* Terminal Type [ANSI]                                *                    *
* VT-UTF8 Combo Key Support [Disabled]                *                    *
* Sredir Memory Display Delay [No Delay]              *                    *
* Terminal Display Mode [Recorder Mode]              * *   Select Screen   *
* Terminal Size [80 X 25]                             * **  Select Item    *
* *****                                             * +-  Change Option  *
* Manufacturing Link Mode [Disabled]                  * F1  General Help   *
* *                    *                               * F6  Reset WDT      *
* *                    *                               * F10 Save and Exit  *
* *                    *                               * ESC Exit           *
* *                    *                               *                    *
*****
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```



**Attention!**

Console I/O module integrated into BIOS carries out scanning of the available COM-ports during system start. Scanning is carried out using base addresses in the following sequence: 0x3F8, 0x2F8, 0x3E8, 0x2E8. In BIOS Setup "Advanced -> Remote Access Configuration" section, the first available port obtains the number of COM1 and further in the right order. If the number of available COM-ports changes during the next start of the system (e.g. by changing the settings of "SouthBridge Configuration -> Serial/Parallel Port Configuration"), in this case it can result in a displacement of actual base address and COM-port, used for console I/O.

E.g. if COM3 has been selected as a console port, and then COM 1 has been deactivated in the "South Bridge Configuration" settings and other parameters remained as by default, in this case after system restart there will be displacement of the console COM-port by 1, in such a way that for console I/O COM 4 parameters will be used (the third in succession among the available COM-ports).

Table 5-6: "Remote Access Configuration" menu description (Console I/O settings)

| Menu item     | Assignment                            |
|---------------|---------------------------------------|
| Remote Access | Console I/O                           |
|               | [Disabled] Console I/O is deactivated |



| Menu item                   | Assignment   |  |
|-----------------------------|--|--|
|                             | [Enabled]  | Console I/O is activated, additional options of console I/O parameters setting become available. |
| Serial port number          | Selection of console I/O serial port   |  |
|                             | [COM1]   | COM1 port is used as console I/O port  |
|                             | [COM2]   | COM2 port is used as console I/O port  |
|                             | [COM3]   | COM3 port is used as console I/O port  |
|                             | [COM4]   | COM4 port is used as a console I/O port  |
| Serial port mode            | Operation mode of the console I/O port   |  |
|                             | [115200 8,n,1],  | Data transmission speed 115,2 kbaud, 8 bit, without parity check, 1 stop bit                     |
|                             | [57600 8,n,1],   | Data transmission speed 57,6 kbaud, 8 bit, without parity check, 1 stop bit                      |
|                             | [38400 8,n,1],   | Data transmission speed 38,4 kbaud, 8 bit, without parity check, 1 stop bit                      |
|                             | [19200 8,n,1],   | Data transmission speed 19,2 kbaud, 8 bit, without parity check, 1 stop bit                      |
|                             | [09600 8,n,1],   | Data transmission speed 9,6 kbaud, 8 bit, without parity check, 1 stop bit                       |
| Flow Control                | Control of symbol stream for console port  |  |
|                             | [None]   | No   |
|                             | [Hardware]   | CTS/RTS hardware control   |
|                             | [Software]   | XON/XOFF software control  |
| Redirection After BIOS POST | Console I/O operation mode after the POST procedure of by BIOS   |  |
|                             | [Disabled]   | Disable the console I/O after the POST procedure by BIOS   |
|                             | [Boot Loader]  | Console I/O is active during the POST procedure by BIOS and during OS booting                    |
|                             | [Always]   | Console I/O operates constantly. Certain OS could not work in case this option is selected.      |
| Terminal Type               |  |  |
|                             | [ANSI]   | ANSI standard  |
|                             | [VT100]  | VT100 standard   |
|                             | [VT-UTF8]  | VT-UTF8 standard   |
| VT-UTF8 Combo Key Support   | Support of VT-UTF8 symbols for ANSI/ME100 terminals  |  |
|                             | [Disabled]   | Support is deactivated   |
|                             | [Enabled]  | Support is allowed   |
| Sredir Memory Display Delay | Delay of module booting during displaying the screen with information on the installed RAM to console PC |  |
|                             | [No Delay]   | Without delay  |
|                             | [Delay 1 Sec],   | Set the delay for 1 sec.   |
|                             | [Delay 2 Sec],   | Set the delay for 2 sec.   |
|                             | [Delay 4 Sec]  | Set the delay for 4 sec.   |
| Terminal Display Mode       | Mode of data transmission to console PC  |  |
|                             | [Normal Mode]  |  |
|                             | [Recorder Mode]  | Only text  |

| Menu item               | Assignment   |                        |
|-------------------------|--|------------------------|
| Terminal Size           | Number of transferred symbols and lines  |                        |
|                         | [80x24]  | 80 symbols, 24 lines   |
|                         | [80x25]  | 80 symbols, 25 lines   |
| Manufacturing Link Mode | "Manufacturing Link" mode. Enables to gain access to the connected data storage media using the special-purpose software via COM-port, selected. |                        |
|                         | [Disabled]   | Support is deactivated |
|                         | [Enabled]  | Support is allowed     |

### 5.2.4 USB Configuration

Screen of "USB Configuration" menu is shown in Figure 5.9, description of the items is given in the Table 5.7.

Fig. 5-9: Screen of "USB Configuration" menu



Table 5-7: Description of "USB Configuration" menu (Configuration of USB ports)

| Menu item          | Assignment                  |   |
|--------------------|-----------------------------|---|
| Legacy USB Support | Support of Legacy USB mode. |   |
|                    | [Disabled]                  | Legacy USB mode is deactivated  |
|                    | [Enabled]                   | Legacy USB mode is activated  |
|                    | [Auto]                      | Legacy USB mode is activated only if at least one USB device is connected |

| Menu item               | Assignment  |   |
|-------------------------|---|---|
| USB 2.0 Controller Mode | Determination of the speed of data exchange with USB device   |   |
|                         | [HiSpeed]   | data exchange speed is 25-480 Mb/sec                    |
|                         | [FullSpeed]   | data exchange speed is 0,5-12 Mb/sec (USB 1.0/1.1 mode) |
| USB EHCI Hand-Off       | Mechanism of interface control transfer EHCI (Enhanced Host Controller Interface) between devices, with support of BIOS resources |   |
|                         | [Disabled]  | controlled by operating system                          |
|                         | [Enabled]   | controlled by BIOS resources                            |

In case of detection of a USB drive (USB Mass Storage Device Configuration), an additional submenu is available. Screen of the "USB Mass Storage Device Configuration" menu is shown in the Figure 5.10, description of items is given in the Table 5.8.

Fig. 5-10: Screen of the "USB Mass Storage Device Configuration" menu

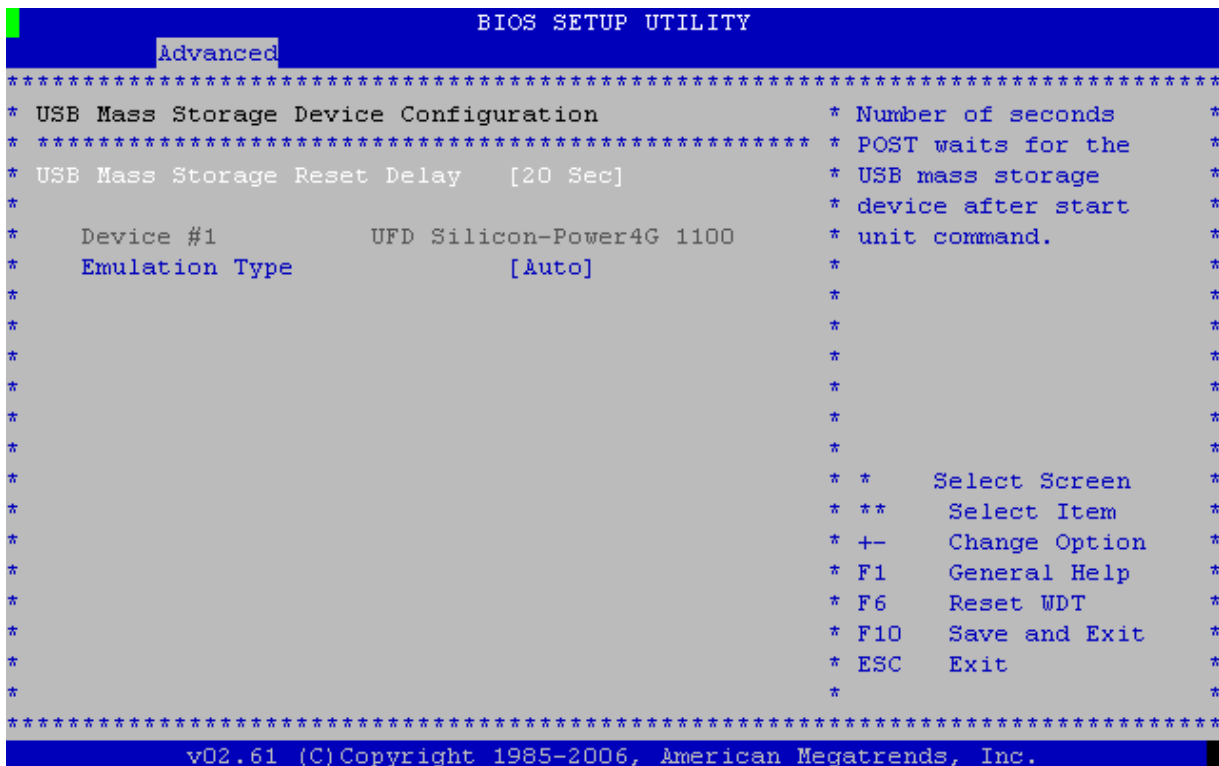


Table 5-8: Description of "USB Mass Storage Device Configuration" menu (Configuration of USB drive)

| Menu item      | Assignment      |  |
|----------------|-----------------|--|
| Emulation Type | Operation mode. |  |
|                | [Auto]          | Automatic mode                                     |
|                | [Floppy]        | Emulation type of the drive on floppy disks        |
|                | [Forced FDD]    | Forced emulation mode of the drive on floppy disks |
|                | [Hard Disk]     | HDD emulation mode                                 |
|                | [CDROM]         | CDROM emulation mode                               |

### 5.3 PCI/ PnP (additional settings of PCI plug and play)

This tab contains items responsible for operation of PCI and ISA buses, as well as control of interrupt switching. Screen of "PCI/ PnP" menu is shown in Figures 5.11 and 5.12, description of the menu is given in the Table 5.9.

Fig. 5-11: Screen of "PCI/ PnP" menu

```

BIOS SETUP UTILITY
Main    Advanced    PCIPnP    Boot    Security    Chipset    Exit
*****
* Advanced PCI/PnP Settings                ** Clear NVRAM during   *
* ***** System Boot.                    **                     *
* WARNING: Setting wrong values in below sections **             *
*      may cause system to malfunction.    **                     *
*                                           **                     *
* Clear NVRAM                             [No]                **             *
* Plug & Play O/S                         [No]                **             *
* PCI Latency Timer                       [64]                **             *
* Allocate IRQ to PCI VGA                 [No]                **             *
* Palette Snooping                       [Disabled]          **             *
* PCI IDE BusMaster                       [Enabled]           **             *
* OffBoard PCI/ISA IDE Card               [Auto]              **             *
*                                           ** *             *
* IRQ3                                    [Reserved]          ** **          *
* IRQ4                                    [Reserved]          ** +-          *
* IRQ5                                    [Available]         ** F1          *
* IRQ7                                    [Available]         ** F6          *
* IRQ9                                    [Available]         ** F10         *
* IRQ10                                   [Available]         ** ESC         *
* IRQ11                                   [Reserved]          **             *
*****
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```

Fig. 5-12: Screen of "PCI/ PnP" menu (continued)

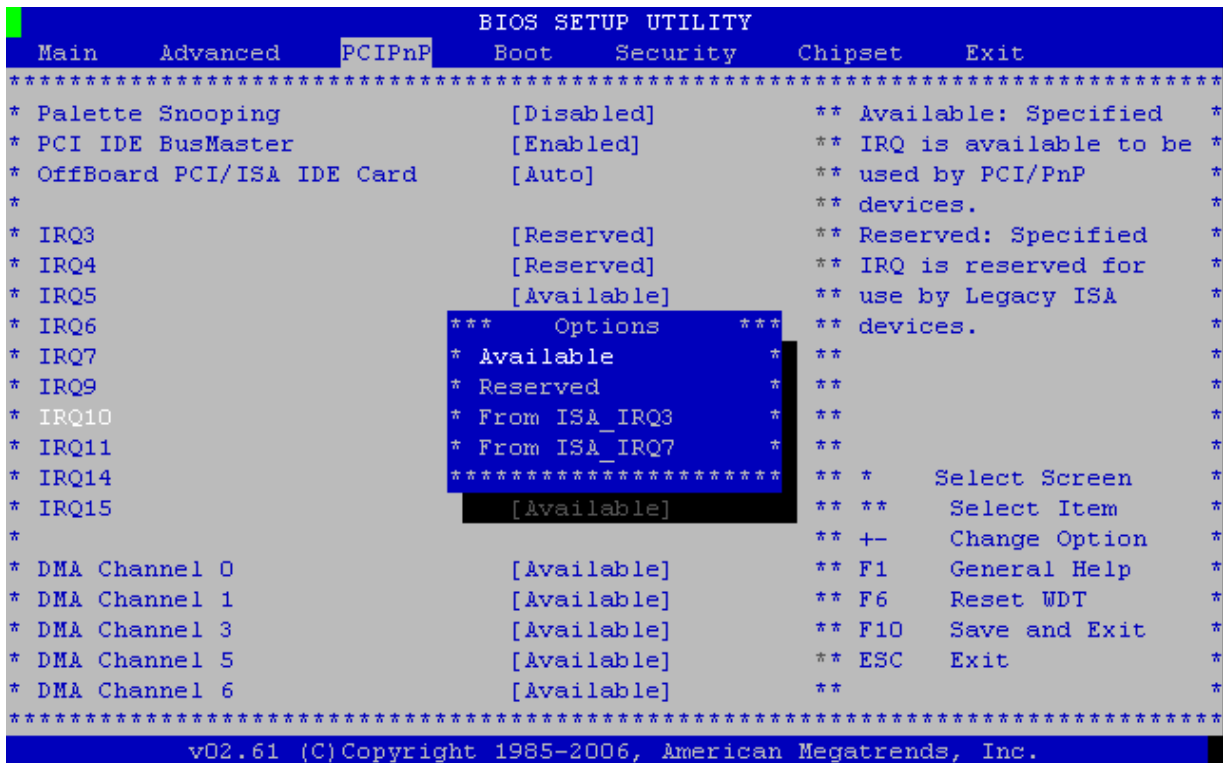


Table 5-9: Description of "PCI/ PnP" menu (additional settings of PCI Plug and Play)

| Menu item                 | Assignment  |   |
|---------------------------|---|---|
| Clear NVRAM               | Reset of the table of PnP parameters  |   |
|                           | [No]  | Without change  |
|                           | [Yes]   | Reset table after reboot  |
| Plug & Play O/S           | OS with PnP support is installed  |   |
|                           | [No]  | No  |
|                           | [Yes]   | Yes   |
| PCI Latency Timer         | Maximum number of PCI bus strokes, during which the device connected to the bus, can hold it occupied, transmitting data. |   |
|                           | [32], [64], [96], [128], [160], [192], [224], [248]   |   |
| Allocate IRQ to PCI VGA   | Permission of interrupt purpose to the graphics card on PCI bus   |   |
|                           | [No]  | Not to assign interrupt to the PCI graphics card  |
|                           | [Yes]   | Assign interrupt to the PCI graphics card   |
| Palette Snooping          | Synchronization of graphics card palette and image, video captured with the I/O card (video editing card).                |   |
|                           | [Disabled]  | Function is deactivated Recommended value   |
|                           | [Enabled]   | Function is activated   |
| PCI IDE BusMaster         | Permission for using the Bus Mastering PCI mode by the IDE bus controller   |   |
|                           | [Disabled]  | Prohibit the use of Bus Mastering mode  |
|                           | [Enabled]   | Permit the use of Bus Mastering mode  |
| OffBoard PCI/ISA IDE Card | Selection of the external PCI/ISA card of IDE bus controller  |   |
|                           | [Auto]  | Automatic detection of presence of the PCI/ISA card of IDE bus controller. Recommended value. |

| Menu item            | Assignment   |  |
|----------------------|--|--|
|                      | [PCI Slot1], [PCI Slot2], [PCI Slot3], [PCI Slot4], [PCI Slot5], [PCI Slot6] | Specify that the relevant PCI slot contains the installed IDE bus controller card  |
| IRQ3                 | Redundancy of IRQ interrupt for internal Legacy devices SNK Vortex86DX       |  |
| IRQ4                 | [Available]  | Permit the use of this interrupt for external PCI/PnP devices  |
| IRQ5                 | [Reserved]   | Prohibit the use of this interrupt for external PCI/PnP devices, reserve for Legacy device.  |
| IRQ6                 |  |  |
| IRQ7                 |  |  |
| IRQ9                 | [From ISA_IRQx]  | Use interrupt redirection.<br>E.g., option [From ISA_IRQ3], installed for IRQ10 interrupt means redirection of IRQ3 interrupt line of ISA bus to the IRQ10 line of ISA bus controller of Vortex86DX CPU. |
| IRQ10                |  |  |
| IRQ11                |  |  |
| IRQ12                |  |  |
| IRQ14                | [SYSTEM_EVENT]   | Use of the interrupt line for indication of SYSTEM_EVENT (see <a href="#">Section 2.8.4</a> "Register of control / state of system interrupts")  |
| IRQ15                |  |  |
| DMA Channel 0        | Redundancy of DMA channel for internal Legacy devices SnK Vortex86DX         |  |
| DMA Channel 1        | [Available]  | Permit the use of this DMA channel to external PCI/PnP devices   |
| DMA Channel 3        |  |  |
| DMA Channel 5        | [Reserved]   | Prohibit the use of this DMA channel to external PCI/PnP devices, reserve for Legacy devices   |
| DMA Channel 6        |  |  |
| DMA Channel 7        |  |  |
| Reserved Memory Size | BIOS reservation of memory for devices based on ISA bus                      |  |
|                      | [Disabled]   | Prohibit reservation of memory for ISA devices on ISA bus by BIOS. Recommended value.  |
|                      | [16k], [32k], [64k]  | Reserve the specified volume of memory for devices based on ISA bus  |
| SYSTEM_EVENT         | [EXT_INT]  | Only external interrupt source (XP17, XP18) participates in generation of SYSTEM_EVENT.  |
|                      | [PWR_FAIL]   | Only the Power_Fail event from power supply supervisor (reduction of input power supply lower than the level of 4.65V) participates in generation of SYSTEM_EVENT.                                       |
|                      | [WDT2]   | Only event of a watchdog timer, integrated into the power supply supervisor, participates in generation of SYSTEM_EVENT.   |
|                      | [EXT_INT&PWR_FAIL]   | Generation of SYSTEM_EVENT is carried out with participation of [EXT_INT] and [PWR_FAIL] events (via "or").  |
|                      | [ALL]  | Generation of SYSTEM_EVENT is carried out with participation of [EXT_INT] and [PWR_FAIL] and [WDT2] events (via "or").   |

## 5.4 Boot (Boot modes)

This tab contains items, responsible for module booting modes as well as for choosing the IDE device which will be used for booting operating system. Screen of "Boot" menu is shown in the Figure 5.13, description of the items is given in the Table 5.10.

Fig. 5-13: Screen of "Boot" menu

```

BIOS SETUP UTILITY
Main   Advanced   PCIPnP   Boot   Security   Chipset   Exit
*****
* Boot Settings                               * Configure Settings          *
* *****                                     * during System Boot.        *
* * Boot Settings Configuration               *                             *
* *                                           *                             *
* 1st Boot Device [HDD:PS-SanDisk SDC] *                             *
*                                           *                             *
*                                           *                             *
*                                           *                             *
*                                           *                             *
*                                           *                             *
*                                           *                             *
*                                           *                             *
*                                           * *      Select Screen      *
*                                           * **     Select Item       *
*                                           * Enter Go to Sub Screen  *
*                                           * F1     General Help     *
*                                           * F6     Reset WDT        *
*                                           * F10    Save and Exit    *
*                                           * ESC    Exit              *
*                                           *                             *
*****
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```

Table 5-10: Description of the "Boot" menu (boot modes)

| Menu item                                       | Assignment |
|---|------------|
| <b>Boot Settings Configuration</b><br>(submenu) |            |
| <b>1st Boot Device Priority</b><br>(submenu)    |            |

### 5.4.1 Boot Settings Configuration

Screen of the "Boot Settings Configuration" menu is shown in the Figure 5.14, description of menu items is given in the Table 5.11.

Fig. 5-14: Screen of "Boot Settings Configuration" menu

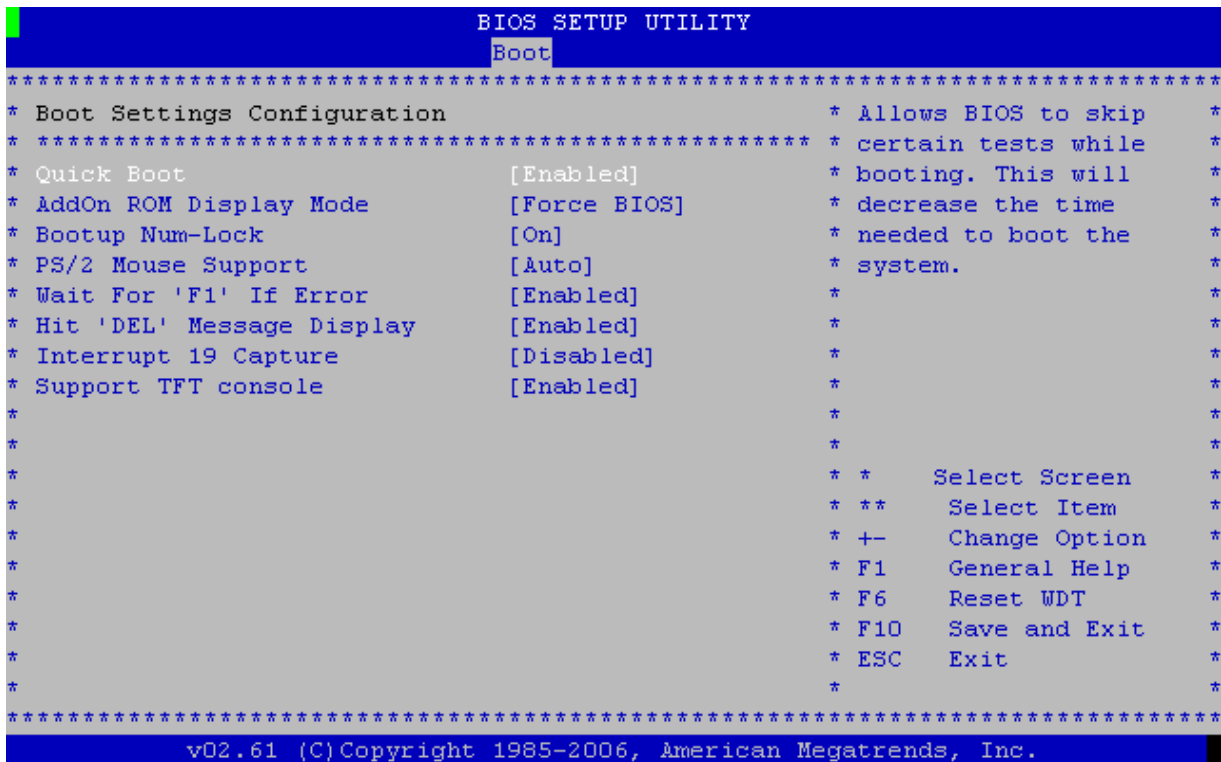


Table 5-11: Description of the "Boot Settings Configuration" menu

| Menu item               | Assignment   |  |
|-------------------------|--|--|
| Quick Boot              |  |  |
|                         | [Disabled]   | Selection of this value ensures the complete self-testing of the system during power on  |
|                         | [Enabled]  | Selection of this value enables to reduce the number of tests during the power on and this way to speed up the booting process |
| Add On ROM Display Mode |  |  |
|                         | [Force BIOS]   | This value permits to output data to monitor from BIOS extension cards during the system booting                               |
|                         | [Keep Current]                                       | This value enables computer system to display only P.O.S.T. information during the booting process                             |
| Bootup Num-Lock         |  |  |
|                         | [Off]  | Bootup Num-Lock is OFF   |
|                         | [On]   | Bootup Num-Lock is ON  |
| PS/2 Mouse Support      |  |  |
|                         | [Disabled]   | Support is deactivated   |
|                         | [Enabled]  | Support is activated   |
|                         | [Auto]   | Automatic support detection Recommended value  |
| Wait for 'F1' If Error  | Waiting for "F1" button pressing in case of an error |  |



| Menu item                 | Assignment   |  |
|---------------------------|--|--|
|                           | [Disabled]   | This option does not require waiting for user's interference in case of an error. This value should be selected only if you know the reason why the BIOS error is occurred |
|                           | [Enabled]  | Permit BIOS system to wait for pressing the "F1" button in case of an error during booting   |
| Hit 'DEL' Message Display | Display of "Hit Del to enter Setup" message during memory initialization (press DEL button for entering the setup program) |  |
|                           | [Disabled]   | Output of message is prohibited  |
|                           | [Enabled]  | Output of message is permitted   |
| Interrupt 19 Capture      | Interception of INT19 program interrupt  |  |
|                           | [Disabled]   | BIOS prohibits additional controllers to intercept INT19 interrupt   |
|                           | [Enabled]  | BIOS permits additional controllers to intercept INT19 interrupt   |
| Support TFT Console       | Showing information on TFT-display in text mode after the OS control transfer  |  |
|                           | [Disabled]   | Showing information on TFT-display in text mode of OS control transfer is prohibited   |
|                           | [Enabled]  | Showing information on TFT-display in text mode of OS control transfer is permitted  |

## 5.5 Security

Screen of "Security" menu is shown in the Figure 5.15, description of menu items is given in the Table 5.12.

Fig. 5-15: Screen of "Security" menu



Table 5-12: Description of "Security" menu

| Menu item                    | Assignment   |
|------------------------------|--|
| Change Supervisor Password   | Change of password for system booting permission (request is output during the P.O.S.T. procedure)   |
| Change User Password         | Change of password for access to BIOS Setup (request at the time of entering BIOS Setup)   |
| Boot Sector Virus Protection | Protection of boot sector against viruses  |
|                              | <p>[Disabled] Selection of this value deactivates boot sector protection against viruses</p> <p>[Enabled] Selection of "Enabled" value includes protection of boot sector against viruses. If any program (or virus) executes Disk Format command or tries to write into the boot sector on a hard drive, in this case there will be a warning on the display. An attempt to address to the boot sector in case of activated protection, the following messages will appear:<br/> <b>Boot Sector Write!</b><br/> <b>Possible VIRUS: Continue (Y/N)?_</b></p> <p>The following messages will appear in case of any attempt to format any hard drive via BIOS INT 13 Hard disk drive Service:<br/> <b>Format!!!</b><br/> <b>Possible VIRUS: Continue (Y/N)?_</b></p> |

## 5.6 Chipset (integrated devices)

Screen of "Chipset" menu is shown in the Figure 5.16. Description of menu items is given in the table 5.13.

Fig. 5-16: Screen of "Chipset" menu

```

BIOS SETUP UTILITY
Main   Advanced   PCIPnP   Boot   Security   Chipset   Exit
*****
* Advanced Chipset Settings                               * Options for SB   *
* ***** *
* WARNING: Setting wrong values in below sections      *
*           may cause system to malfunction.           *
*
* * SouthBridge Configuration                            *
* * Onboard Devices                                    *
*
*
*
*
* *          Select Screen                               *
* **         Select Item                                *
* Enter Go to Sub Screen *
* F1        General Help                               *
* F6        Reset WDT                                  *
* F10       Save and Exit                              *
* ESC       Exit                                        *
*
*****
v02.61 (C) Copyright 1985-2006, American Megatrends, Inc.
    
```

Table 5-13: Description of "Chipset" menu (integrated devices)

| Menu item                                     | Assignment  |
|---|---|
| <b>SouthBridge Configuration</b><br>(submenu) |   |
| <b>Onboard Devices</b><br>(submenu)           | Configuration of integrated devices (audio and video controllers) |

## 5.6.1 SouthBridge Configuration

Screen of "SouthBridge Configuration" menu is shown in the Figure 5.17, description of menu items is given in the Table 5.14.

Fig. 5-17: Screen of "SouthBridge Configuration" menu

```

BIOS SETUP UTILITY
Chipset
*****
* South Bridge Chipset Configuration          * A9121 LAN Enable      *
* *****                                  * or Disable           *
* USB Port 0,1                               [Enabled]             *
* USB Port 2,3                               [Enabled]             *
* USB IRQ:                                   [use IRQ 6]          *
* SB LAN                                     [Enabled]             *
* LAN IRQ:                                   [IRQ 10]              *
* MAC Address F4 6D 04 66 6A 4B              *
*
* * ISA Configuration                        *
* * Serial/Parallel Port Configuration      *
* * WatchDog Configuration                 *
* * GPIO Configuration                      * *   Select Screen    *
* * NV SRAM Configuration                  * **   Select Item    *
*                                           * +-   Change Option  *
*                                           * F1   General Help   *
*                                           * F6   Reset WDT      *
*                                           * F10  Save and Exit  *
*                                           * ESC  Exit           *
*                                           *
*****
v02.61 (C)Copyright 1985-2006, American Megatrends, Inc.

```

Table 5-14: Description of "SouthBridge Configuration" menu (SouthBridge Configuration)

| Menu item                          | Assignment   |                               |
|------------------------------------|--|-------------------------------|
| USB Port 0,1                       | Control of operation of 0 and 1st USB port   |                               |
|                                    | [Enabled]  | Permit operation of ports     |
|                                    | [Disabled]   | Prohibit operation of ports   |
| USB Port 2,3                       | Control of operation of the 2nd and 3rd USB ports  |                               |
|                                    | [Enabled]  | Permit operation of ports     |
|                                    | [Disabled]   | Prohibit operation of ports   |
| USB IRQ                            | Selection of interrupt line for USB controller   |                               |
| SB LAN                             | Control of operation of integrated Ethernet controller (LAN)                             |                               |
|                                    | [Enabled]  | Permit controller operation   |
|                                    | [Disabled]   | Prohibit controller operation |
| LAN IRQ                            | Selection of interrupt line for LAN controller   |                               |
| MAC Address<br>(information field) | MAC-address of integrated Ethernet controller (LAN)                                      |                               |
| ISA Configuration<br>(submenu)     | This option enables to install timings for ISA bus – operations of I/O and memory access |                               |

| Menu item  | Assignment   |
|--|--|
| <b>Serial/Parallel Port Configuration</b><br>(submenu) | This option sets the address / mode/ interrupt for serial and parallel ports |
| <b>WatchDog Configuration</b><br>(submenu)             | Control of operation of WDT0, WDT1 integrated watchdog timers                |

### 5.6.2 Onboard Devices

Screen of "Onboard Devices" menu is shown in the Figure 5.18, description of menu items is given in the Table 5.15.

Fig. 5-18: Screen of "Onboard Devices" menu

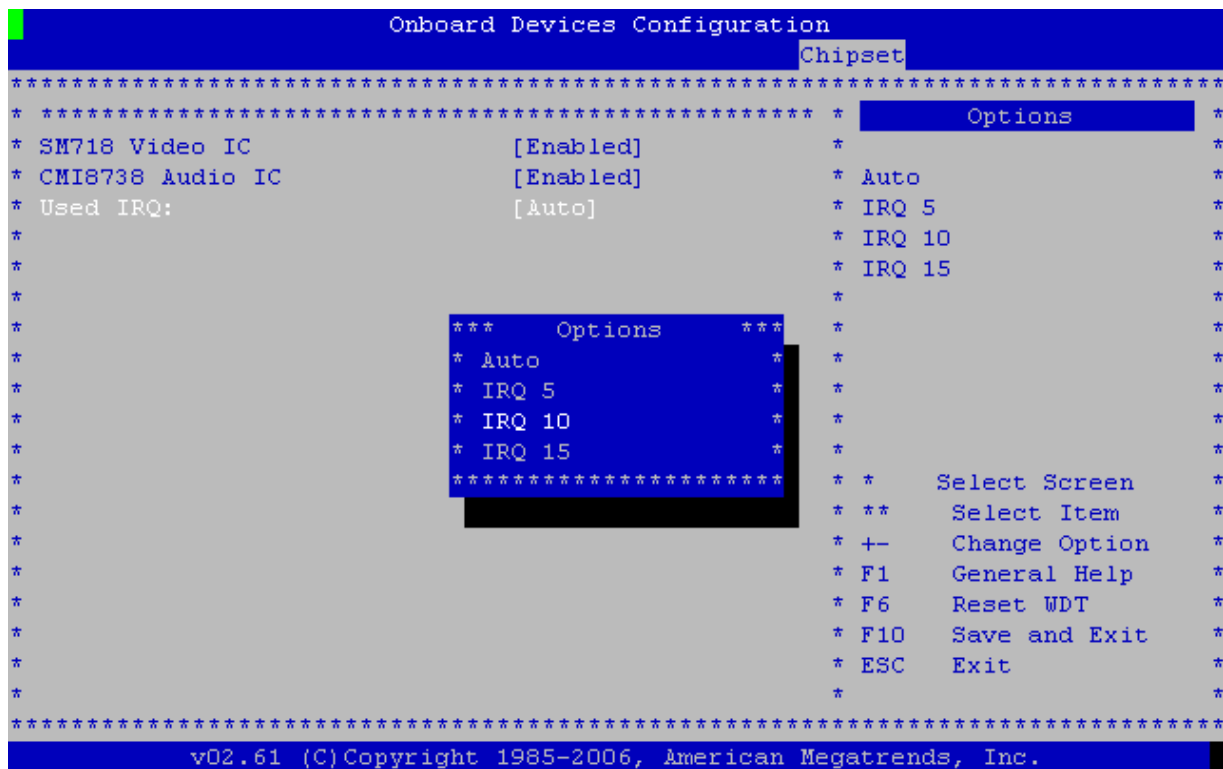


Table 5-15: Description of "NorthBridge Configuration" menu

| Menu item      | Assignment  |
|----------------|---|
| SM718 Video IC | Configuration of integrated controller SM718          |
|                | [Enabled] Integrated video controller is activated    |
|                | [Disabled] Integrated video controller is deactivated |
| CMI8738 IC     | Configuration of integrated audio controller CMI8738  |
|                | [Enabled] Integrated audio controller is activated    |
|                | [Disabled] Integrated audio controller is deactivated |

| Menu item | Assignment                        |   |
|-----------|-----------------------------------|---|
| Used IRQ  | Auto<br>IRQ 5<br>IRQ 10<br>IRQ 15 | Selection of interrupt for Audio controller |

### 5.6.2.1 ISA Configuration

Screen of "ISA Configuration" menu is shown in the Figure 5.19, description of menu items is given in the Table 5.16.

Fig. 5-19: Screen of "ISA Configuration" menu

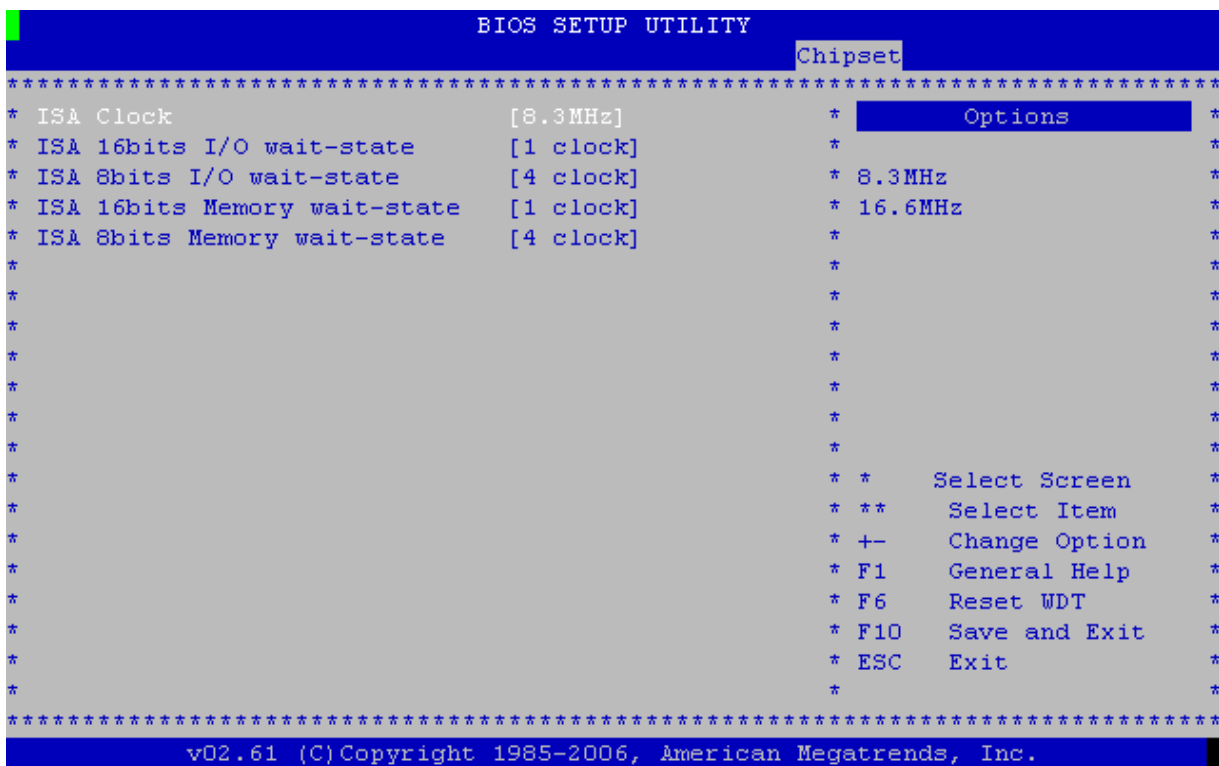


Table 5-16: Description of "ISA Configuration" menu (ISA configuration)

| Menu item                    | Assignment   |                                     |
|------------------------------|--|-------------------------------------|
| ISA Clock                    | Clock frequency ISA_SYSCLK (CLK, XS2 connector, B20 output)                            |                                     |
|                              | [8.3MHz]   | Set the clock frequency of 8.3 MHz  |
|                              | [16.6MHz]  | Set the clock frequency of 16.6 MHz |
| ISA 16bits I/O wait-state    | Duration of I/O wait-state cycle at 16 bit memory reference on ISA bus                 |                                     |
|                              | [1 clock], [2 clock], [3 clock], [4 clock], [5 clock], [6 clock], [7 clock], [8 clock] |                                     |
| ISA 8bits I/O wait-state     | Duration of I/O wait-state cycle at 8 bit memory reference on ISA bus                  |                                     |
|                              | [1 clock], [2 clock], [3 clock], [4 clock], [5 clock], [6 clock], [7 clock], [8 clock] |                                     |
| ISA 16bits Memory wait-state | Duration of Memory wait-state cycle at 16 bit memory reference on ISA bus              |                                     |
|                              | [0 clock], [1 clock], [2 clock], [3 clock], [4 clock], [5 clock], [6 clock], [7 clock] |                                     |

| Menu item                   | Assignment   |
|-----------------------------|--|
| ISA 8bits Memory wait-state | Duration of Memory wait-state cycle at 8 bit memory reference on ISA bus<br>[1 clock], [2 clock], [3 clock], [4 clock], [5 clock], [6 clock], [7 clock], [8 clock] |

### 5.6.2.2 Serial/Parallel Port Configuration

Screen of "Serial/Parallel Port Configuration" menu is shown in the Figure 5.20, description of menu items is given in the Table 5.17.

Fig. 5-20: Screen of "Serial/Parallel Port Configuration" menu

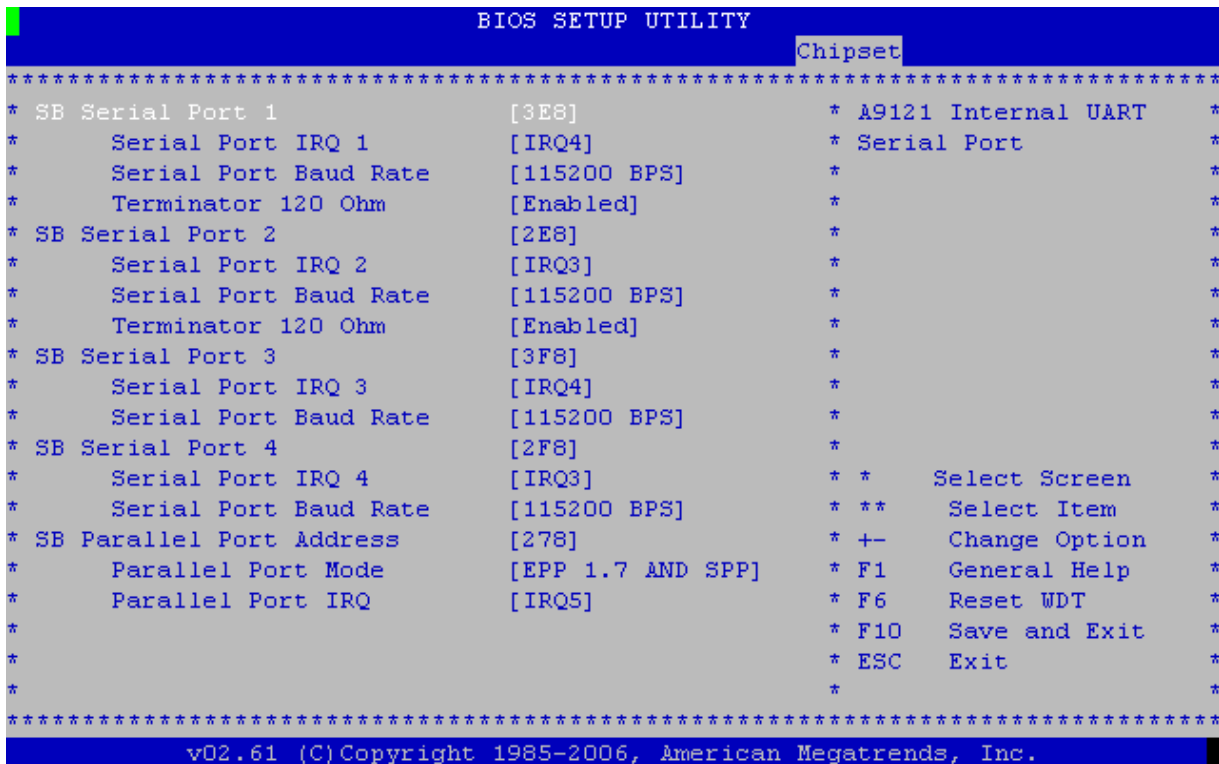


Table 5-17: Description of "Serial/Parallel Port Configuration" menu

| Menu item  | Assignment   |
|--|--|
| SB Serial Port 1<br>SB Serial Port 2<br>SB Serial Port 3<br>SB Serial Port 4     | This option sets the address for the relevant serial port (for each port individually)           |
|  | [Disabled] Port operation is prohibited  |
|  | [3E8] 3E8h I/O base address assignment   |
|  | [2E8] 2E8h I/O base address assignment   |
|  | [3F8] 3F8h I/O base address assignment   |
|  | [2F8] 2F8h I/O base address assignment   |
| Serial Port IRQ 1<br>Serial Port IRQ 2<br>Serial Port IRQ 3<br>Serial Port IRQ 4 | This option assigns the interrupt line for the relevant serial port (for each port individually) |
|  | [IRQ3] IRQ3 interrupt line assignment  |
|  | [IRQ4] IRQ4 interrupt line assignment  |
|  | [IRQ9] IRQ interrupt line assignment   |

| Menu item                | Assignment  |   |
|--------------------------|---|---|
|                          | [IRQ10]   | IRQ10 interrupt line assignment   |
|                          | [IRQ11]   | IRQ11 interrupt line assignment   |
| Serial Port Baud Rate    | This option sets the speed of data exchange for the relevant serial port (for each port individually) |   |
|                          | [2400 BPS], [4800 BPS], [9600 BPS], [19200 BPS], [38400 BPS], [57600 BPS], [115200 BPS]               |   |
| SB Parallel Port Address | This option sets the address for LPT1 parallel port   |   |
|                          | [Disabled]  | Port operation is prohibited  |
|                          | [378]   | 378h I/O base address assignment  |
|                          | [278]   | 278h I/O base address assignment  |
| Parallel Port Mode       | This option sets the operation mode for LPT1 parallel port  |   |
|                          | [BPP]   | Operation mode "Bi-directional Parallel Port" (BPP)<br>Data receive-transmit mode for parallel port   |
|                          | [EPP 1.9 AND SPP]   | Operation mode compatible with EPP 1.9 and SPP modes  |
|                          | [ECP]   | Operation mode "Enhanced Capabilities Port" (ECP)<br>ECP uses DMA protocol for reaching the speed of data transmission up to 2.5 Mb/sec. ECP ensures symmetrical, bidirectional data communication                |
|                          | [ECP AND EPP 1.9]   | Operation mode compatible with ECP and EPP 1.9 modes  |
|                          | [SPP]   | Operation mode "Standard Parallel Port" (SPP)   |
|                          | [EPP 1.7 AND SPP]   | Operation mode compatible with EPP 1.7 and SPP modes.<br>Operation mode "Enhanced Parallel Port" (EPP) uses parallel port existing signals for asymmetrical bidirectional data communication from the main device |
|                          | [ECP AND EPP 1.7]   | Operation mode compatible with ECP and EPP 1.7 modes  |
| Parallel Port IRQ        | This option assigns the interrupt line for LPT1 parallel port   |   |
|                          | [IRQ5]  | IRQ5 interrupt line assignment  |
|                          | [IRQ7]  | IRQ7 interrupt line assignment  |





### 5.6.2.4 GPIO Configuration

Screen of "GPIO Configuration" menu is shown in the Figure 5.22, description of menu items is given in the Table 5.19.

Fig. 5-22: Screen of "GPIO Configuration" menu

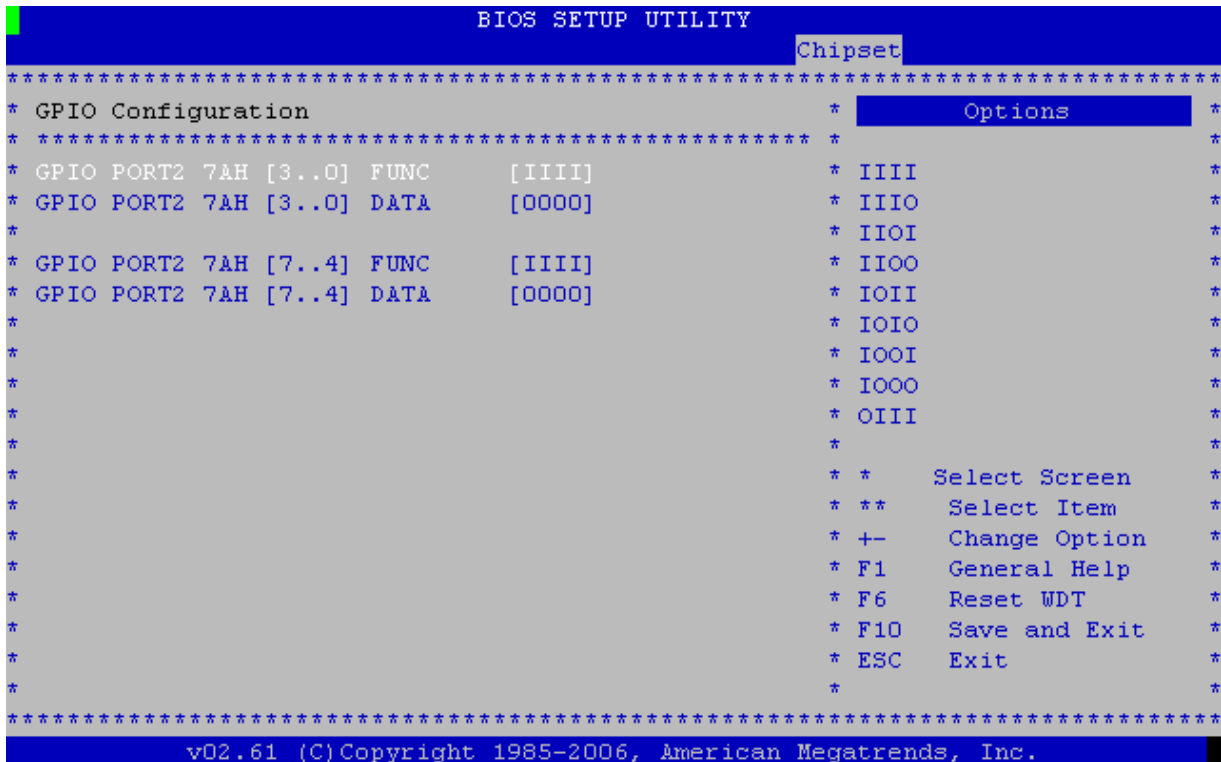


Table 5-19: Description of "GPIO Configuration" menu

| Menu item                  | Assignment   |
|----------------------------|--|
| GPIO PORT2 7AH [3..0] FUNC | Configuration of the relevant line of GPIO PORT2 port , integrated into the SnK Vortex86DX CPU, as input or output.<br>Setting bit to 'I' assigns this bit as input. |
| GPIO PORT2 7AH [7..4] FUNC | Setting bit to '0' assigns this bit as output.<br>[IIII], [III0], [II0I], [II00], [I0II], [I0I0], [I00I], [I000], [0000]   |
| GPIO PORT2 7AH [3..0] DATA | Setting condition of the relevant line of GPIO PORT2 port, integrated into SnK Vortex86DX CPU.<br>Setting bit to '1' assigns the relevant output to '1'.             |
| GPIO PORT2 7AH [7..4] DATA | Setting bit to '0' assigns the relevant output to '0'.<br>[1111], [1110], [1101], [1100], [1011], [1010], [1001], [1000], [0000]                                     |



## 5.7 Exit

Screen of "Exit" menu is shown in the Figure 5.24. Description of menu items is given in the Table 5.21.

Fig. 5-24: Screen of "Exit" menu



Table 5-21: Description of "Exit" menu

| Menu item                | Assignment   |
|--------------------------|--|
| Save Changes and Exit    | Save the settings in CMOS and FRAM memory, and exit the BIOS Setup program     |
| Discard Changes and Exit | Discard changes in CMOS and FRAM memory and exit                               |
| Discard Changes          | Discard changes made in settings without exiting the BIOS Setup program        |
| Load Optimal Defaults    | Load optimal (factory) default settings without exiting the BIOS Setup program |

## **SECTION 6**

### **TRANSPORTATION, UNPACKING AND STORAGE**

## 6. TRANSPORTATION, UNPACKING AND STORAGE

### 6.1 Transportation

The module must be transported in individual factory packages consisting of an individual antistatic bag and a cardboard box, in closed vehicles (in heated and airtight compartments of motor, railroad or airborne vehicles) under storage conditions 5 as per GOST 15150-69 or under storage conditions 3 during transportation by sea.

It is allowed to transport modules packed in individual antistatic bags in factory multipacks.

Packed modules must be transported pursuant to the cargo transportation rules applicable to this mode of transport.

During loading and unloading work and transportation, packed modules must not be exposed to jerks, falls, shocks and atmospheric precipitation. The stowage of packed modules in a vehicle must exclude their shifting.

### 6.2 Unpacking

The modules that were transported at subzero ambient temperature must be stored for 6 hours under storage conditions 1 as per GOST 15150-69 before they can be unpacked.

Placing packed modules in front of a heat source before their unpacking is forbidden.

In the process of the modules unpacking one must observe all the precautions ensuring their safety and marketable appearance of the factory packages.

Upon unpacking, the modules must be checked for external mechanical damage after transportation.

### 6.3 Storage

Modules storage conditions: 1 as per GOST 15150-69 (IEC721).

# **ANNEXES**

# ANNEXES

## A Tables of contacts for connecting displays

Table A-1: Table of cable contact for connection of 4 bit STN EL-displays to LPT port

| SGD-DEMO or<br>EL240.128.45 connector |           | LPT connector<br>(XP5, IDC2-26) |       |
|---------------------------------------|-----------|---------------------------------|-------|
| 1                                     | VH (+12V) | -                               |       |
| 2                                     | VH (+12V) | -                               |       |
| 3                                     | GND       | -                               |       |
| 4                                     | GND       | -                               |       |
| 5                                     | VL (+5V)  | 26                              | +5V   |
| 6                                     | RES       | -                               |       |
| 7                                     | /WR       | 1                               | STB*  |
| 8                                     | /RD       | 6                               | INIT* |
| 9                                     | /CS       | 10                              | GND   |
| 10                                    | A0        | 2                               | AFD*  |
| 11                                    | SELFTTEST | 12                              | GND   |
| 12                                    | GND       | 14                              | GND   |
| 13                                    | D0        | 3                               | DATA0 |
| 14                                    | D1        | 5                               | DATA1 |
| 15                                    | D2        | 7                               | DATA2 |
| 16                                    | D3        | 9                               | DATA3 |
| 17                                    | D4        | 11                              | DATA4 |
| 18                                    | D5        | 13                              | DATA5 |
| 19                                    | D6        | 15                              | DATA6 |
| 20                                    | D7        | 17                              | DATA7 |
| 21                                    | SEL1      | 16                              | GND   |
| 22                                    | READY     | -                               |       |
| 23                                    | GND       | 22                              | GND   |
| 24                                    | LUMA      | -                               |       |

\* Connection of display to LPT port requires the development of a relevant driver



## B Frequently asked questions related to programming of CPC152

1. I need to use an external watchdog timer, however some functions of the library that I use, are performed longer than 1,6 seconds and as a result, the watchdog timer makes CPU to restart. I don't have the source texts of this library and as a consequence, can't insert a watchdog strobing procedure into the code. Microcontroller does not allow to repeatedly stop and restart the watchdog timer. What should I do?

Solution: If functions of your library operate at permitted interrupts, you should create your own program for pre-processing of occasionally emerging interrupts.

During the performance of library functions (at this time only!), you should strobe the watchdog timer in this pre-processor.

2. While working with CPC152, I use SmartLink terminal program. I noticed that some of the files transferred to the module using FTRANS.EXE program, are saved with errors. What could be the reason?

It happens because SmartLink program uses XMODEM protocol while exchanging files with FTRANS.EXE program. This protocol does not have a sufficient ability to detect transmission errors.

In order to completely exclude possibility of errors during file transmission, it is strongly recommended not to use SmartLink, and use the terminal program instead, which supports XMODEM/CRC (HYPERTERMINAL, TELEMAR, TERM90, TERM95) exchange protocol.

In this case, for exchange of files the CPC152 is required to have the FTRANS.EXE program, written in "Fastwel", which is supplied from the beginning of March of 2001 and can be obtained at <ftp://ftp.prosoft.ru/pub/Hardware/Fastwel/CPx/CPC152/>. While transferring the file to module, it is recommended to launch the FTRANS program with the key /CRC.

During transfer of files with FTRANS it is also recommended to specify an exact size of the transferred file.

3. Problem with a console via COM-port. It is possible to enter BIOS Setup settings, but when DOS is started, using keyboard via terminal is unsuccessful. What could be the reason?

The most probable cause for that is in BIOS Setup settings. A remote console integrated into the AMI BIOS by default is switched on until the time BIOS will pass control to the operating system. In order to activate console I/O integrated into the AMI BIOS, it is required to change BIOS Setup settings – in section "Advanced -> Remote Access Configuration" it is necessary to set the parameter "Redirection after BIOS POST" to "Always" (By default this parameter is set to "Boot Loader" at the time of delivery). However it should be considered that console implemented in the AMI BIOS uses system timer.

It is also possible to use FreeDOS resources (OS preinstalled by default), namely the **MODE commands** (changing parameters of I/O devices) and **CTTY** (changing a standard I/O device) in AUTOEXEC.BAT file:

```
MODE COMm[:] [BAUD[HARD]=b] [PARITY=p] [DATA=d] [STOP=s]  
CTTY COMm
```

**COMm** – used COM-port (COM1, COM2, COM3, COM4). Remember! That in BIOS Setup settings, for COM3 port (RS-232) and COM4 (RS-232) port base addresses of COM1 (3F8h) and COM2 (2F8h) ports are assigned by default – therefore they are recognized by FreeDOS operating system as COM1 and COM2 ports. In order to use COM3 (RS-232) for console I/O, it is required to set the BAUD parameter as equal to COM1.

**BAUD** – code of exchange speed: 96 – 9600 kbit/s, 192 – 19200 kbit/s.

**BAUDHARD** – code of exchange speed: 96 – 9600 kbit/s, 192 – 19200 kbit/s, 384 – 38400 kbit/s, 1152 – 115200 kbit/s.

**PARITY** – even parity (Even, Odd, Mark, Space, None)

**DATA** – number of data bits (7, 8)

**STOP** – number of stop bits (1, 2)

Examples of entries in AUTOEXEC.BAT file:

```
MODE COM1 BAUDHARD=1152 PARITY=NONE DATA=8 STOP=1
CTTY COM1
```

```
MODE COM2 BAUD=96 PARITY=NONE DATA=8 STOP=1
CTTY COM2
```

However, it is required to consider certain limitations when operating with the console while FreeDOS operating system is started (preinstalled to the integrated FLASH-drive during delivery), namely: pressing of such buttons as "Backspace" and "←", "→" is carried out improperly (though such problems were not detected during operation with MSDOS OS).

## C Terms, abbreviations and acronyms

| Term              | Meaning   |
|-------------------|---|
| ACPI              | Advanced Configuration and Power Interface                              |
| AGP               | Accelerated Graphics Port   |
| AGTL              | Advanced Gunning Transceiver Logic                                      |
| BIOS              | Basic Input-Output System   |
| CRT-display       | Cathode Ray Tube Display  |
| DAC               | Digital-Analog Converter  |
| DDR SDRAM         | Double Data Rate Synchronous Dynamic Random Access Memory               |
| DMA               | Direct Memory Access  |
| DMI               | Direct Media Interface  |
| DVMT              | Dynamic Video Memory Technology   |
| ECC               | Error Correction Code   |
| EEPROM            | Electrically Erasable Programmable Read-Only Memory                     |
| EHCI              | Enhanced Host Controller Interface (Universal Serial Bus specification) |
| EIDE              | Enhanced Integrated Drive Electronics                                   |
| EOS               | Electrical Overstress   |
| ESD               | Electrostatically Sensitive Device<br>Electrostatic Discharge           |
| FSB               | Frequency System Bus  |
| FWH               | Firmware Hub  |
| GMCH              | Graphics and Memory Controller Hub                                      |
| I <sup>2</sup> C™ | Inter Integrated Circuit  |
| LCD               | Liquid crystal display  |
| LPC               | Low Pin Count   |
| LVDS              | Low Voltage Differential Signal   |
| MDI               | Media Dependent Interface   |
| PC                | Personal Computer   |

| <b>Term</b> | <b>Meaning</b>                                   |
|-------------|--|
| PIO         | Programmed Input/Output                          |
| PLCC        | Plastic Leaded Chip Carrier                      |
| PM          | Peripheral Management Controller                 |
| POST        | Power On Self Test                               |
| PSB         | Processor System Bus                             |
| PWM output  | Pulse-Width Modulation                           |
| RAMDAC      | Random Access Memory Digital-to-Analog Converter |
| RTC         | Real Time Clock                                  |
| SMB         | System Management Bus                            |
| SMBus       | System Management Bus                            |
| SODIMM      | Small Outline Dual In-Line Memory Module         |
| SSD         | Solid State Disk                                 |
| TFT         | Thin Film Transistor                             |
| TTL         | Transistor-Transistor Logic                      |
| UART        | Universal Asynchronous Receiver-Transmitter      |
| UHCI        | Universal Host Controller Interface              |
| USB         | Universal Serial Bus                             |
| UTP         | Unshielded Twisted Pair                          |

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