





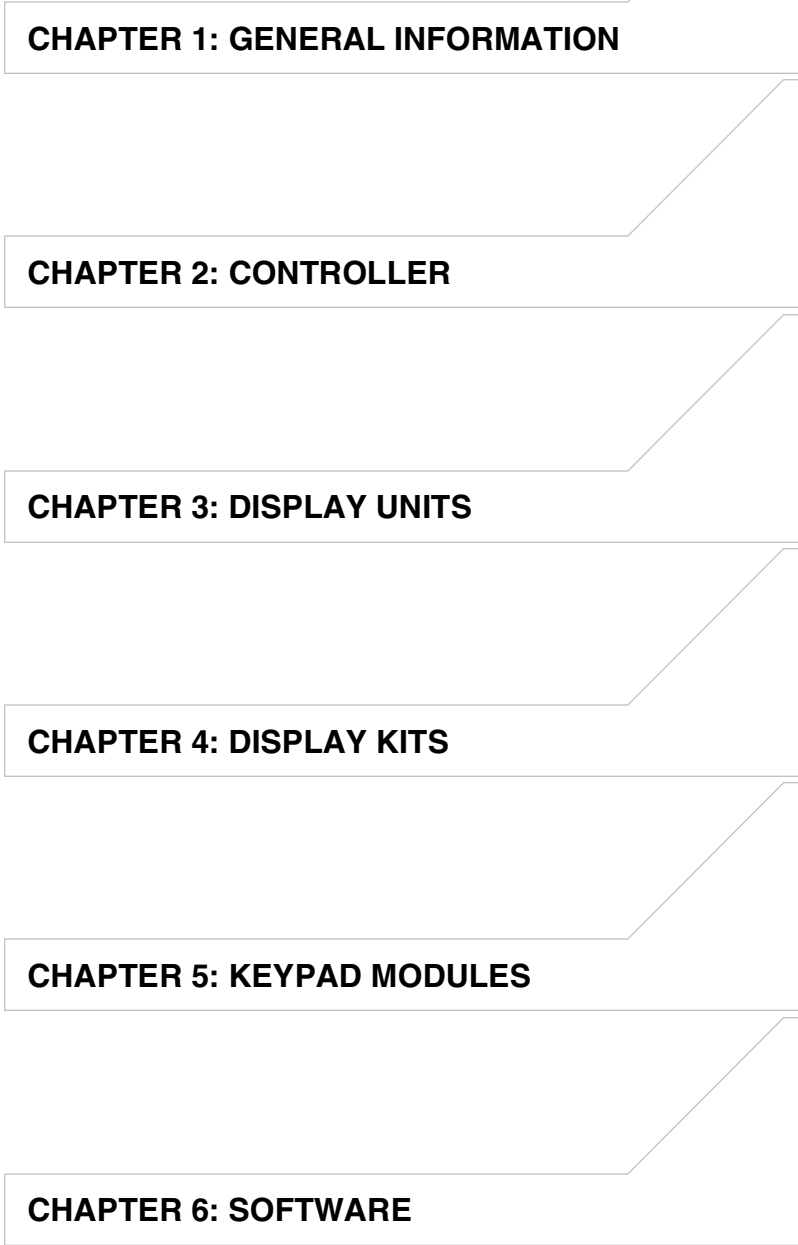
Provit 2000

USER'S MANUAL

Version: **4.4 (February 2002)**
Mod. No.: **MAPRV2000-E**

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CHAPTER 1: GENERAL INFORMATION

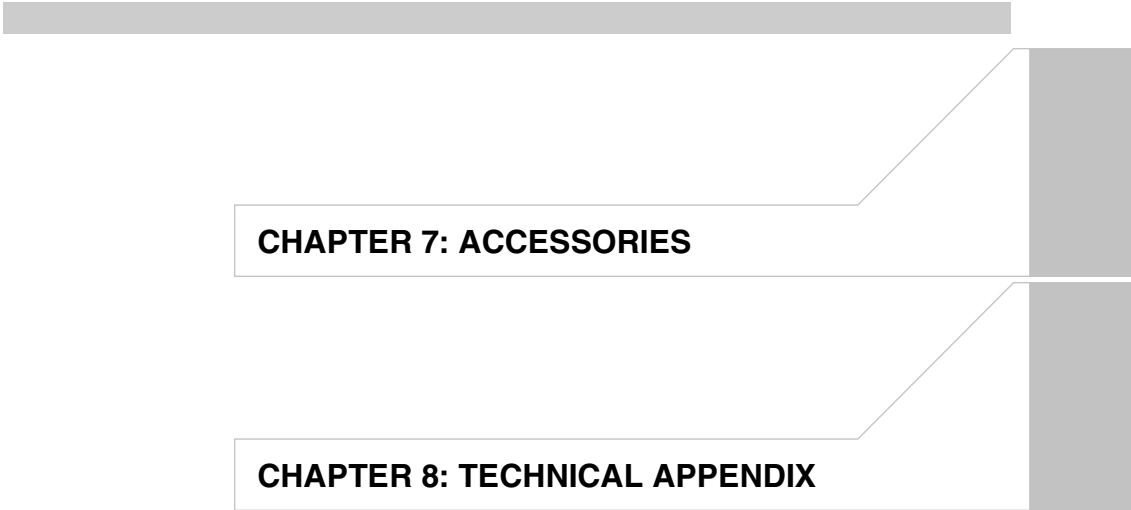
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Chapter 1 • General Information

1. Manual History

Version	Date	Comments	Barcode ID
4.4	December 2001	Changes/New features - Model number for UPS manual added - 2.1 GB HDD technical data included - Glossary terms added - Note: PCMCIA controller modification; IPC2001 changed to VG469 - CAN specifications revised - Lithium battery storage properties added - IPC2001 mounting instructions revised - Legend included - Maintenance procedure included - Hard disk specifications included - Altitude for operating the controllers included - Display design/colors for the display units included - Tables unformatted - Footnote changes for all tables - Separate model number tables for mass memory - "Environmental temperature" changed to "Operating temperature" - Changeover to a new layout - Compact IPC 5C2002.02 included	0112
4.0	January 2001	Changes/New features - New products included	0101

Table 1: Manual History

2. Information for Using the Manual

2.1 Legend



Special attention must be given to instructions which are shown with an exclamation mark. Bernecker & Rainer shall not be liable for product damages resulting from a failure to comply with the instructions and regulations.



Dimension diagrams (e.g. display dimensions, etc.) are made using European dimension standards.

3. Chapter Overview

Chapter 1: General Information

Overview of PROVIT industrial PCs and order information.

Chapter 2: Controller

Chapter 2 describes the different control units and the respective components. Descriptions for BIOS, memory allocations, interrupts and the controller accessories are also provided. Important differences between IPC2000 and IPC2001 controllers are listed.

Chapter 3: Display Units

Chapter 3 describes the display units (technical data, measurements and installation guidelines).

Chapter 4: Display Kits

Chapter 4 describes display kits (technical data, measurements and installation guidelines).

Chapter 5: Keypad Modules

Chapter 5 provides an explanation of Panelware keypad modules and a description of all modules.

Chapter 6: Software

Chapter 6 provides a description of the software (B&R software, device drivers).

Chapter 7: Accessories

Chapter 7 provides an overview of accessories and additional equipment which can be ordered from B&R. (e.g. ISA adapter, compact Flash cards, lithium batteries, disk drives, etc.).

Chapter 8: Technical Appendix

Chapter 8 contains various technical information and guidelines concerning: CAN bus, performance data, touch screen, Y2K compliance, etc.

4. Provit 2000 Industrial PC

Hardware Modularity

Provit Industrial PCs offer the distinct advantage of a modular design for your computer controlled industrial workplace. You can select from a large range of controllers, displays and options which guarantees flexibility for your industrial PC.

This includes modular and flexible installation options and fieldbus interfaces constructed for use in industrial environments.

Open Architecture

B&R Provit industrial PCs offer you all the advantages of open architecture including performance. This guarantees that your individual requirements are met.

5. Operating System

100% compatibility with the IBM AT standard allows the use of various operating systems.

6. Documentation

The following documentation can be ordered:

- Provit 2000 Documentation
User's manual for the Provit 2000 product line.

We recommend that you read the user's manual carefully to guarantee proper operation of these products.

Up to date information can be found on the Internet at www.br-automation.com.

Also available:

- Mkey Documentation

User's manual for the Mkey (Modular key block) configuration program.

7. Contents of Delivery

Accessories are delivered with each controller, display unit and keypad module. An exact description is provided separately in the respective chapters.

The user's manual for the Provit 2000 product line is not included in the contents of the delivery.

Standard delivery of controllers does not include software. All device drivers must be ordered separately.

8. Model Number

8.1 Provit 2000 Controller

8.1.1 IPC2000

Model Number	Description	Remark
5C2000.02	Controller 486SXLC2; FPROM; SRAM Processor 80486SXLC2-50, 4 MB DRAM, 256 kB SRAM, 2 MB FPROM, 3 serial interfaces (16 Byte FIFO, 1 electrically isolated), 1 parallel interface, CAN bus interface (electrically isolated), 2 PC-Card Slots (Type II), Dallas Hardware Security Key, battery packed real-time clock. Connection for flat display, monitor, PS/2 AT keyboard, keypad modules and external diskette drive 3.5 inch (88.9 mm) 1.44 MB. 24 V DC supply voltage.	<i>Cancelled!</i> <i>Replacement Type:</i> <i>5C2001.02</i>
5C2000.03	Controller 486SXLC2; HDD Processor 80486SXLC2-50, 4 MB DRAM, 504 MB Hard Disk, 4 serial interfaces (16 byte FIFO, 2 electrically isolated), 1 parallel interface, CAN bus interface (electrically isolated), 2 PC-Card Slots (Type II), Dallas Hardware Security Key, battery packed real-time clock, fan. Connection for flat display, monitor, PS/2 AT keyboard. Panelware keypad modules and external diskette drive 3.5 inch (88.9 mm) 1.44 MB. 24 V DC supply voltage.	<i>Cancelled!</i> <i>Replacement Type:</i> <i>5C2001.03</i>
5C2000.05	Controller 486SXLC2; SD; SRAM Processor 80486SXLC2-50, 8 MB DRAM, 256 kB SRAM, 6 MB Silicon Disk, 4 serial interfaces (16 Byte FIFO, 2 electrically isolated), 1 parallel interface, CAN bus interface (electrically isolated), 2 PC-Card Slots (Type II), Dallas Hardware Security Key, battery packed real-time clock. Connection for flat display, monitor, PS/2 AT keyboard, Panelware keypad modules and external diskette drive 3.5 inch (88.9 mm) 1.44 MB. 24 V DC supply voltage.	<i>Cancelled!</i> <i>Replacement Type:</i> <i>5C2001.15</i>
5C2000.07	Controller 486SXLC2; HDD; ARC; ETH Processor 80486SXLC2-50, FPU, 8 MB DRAM, 256 kB SRAM, 504 MB Hard Disk, 4 serial interfaces (16 byte FIFO, 2 electrically isolated), 1 parallel interface, CAN bus interface (electrically isolated), Ethernet interface (BNC, NE2000 compatible) Arcnet interface, 1 PC-Card Slot (Type II), Dallas Hardware Security Key, battery packed real-time clock, fan. Connection for flat display, monitor, PS/2 AT keyboard, Panelware keypad modules and external diskette drive 3.5 inch (88.9 mm) 1.44 MB. 24 V DC supply voltage.	<i>Cancelled!</i> <i>Replacement Type:</i> <i>5C2001.07</i>

Table 2: IPC2000 Model Numbers

8.1.2 IPC2001

Model Number	Description	Remark
5C2001.01	Controller 486DX2-66; FEPROM; SRAM; CF Processor 80486DX2-66 MHz, 8 MB DRAM, 256 kB SRAM, 2 MB FEPROM, Compact Flash Slot (Type I), 2 serial interfaces (16 Byte FIFO), 1 parallel interface, CAN bus interface (electrically isolated), Dallas Hardware Security Key, battery packed real-time clock. Connection for flat display, monitor, PS/2 AT keyboard, Panelware keypad modules and external diskette drive 3.5 inch (88.9 mm) 1.44 MB, 24 V DC supply voltage.	
5C2001.02	Controller 486DX2-66; FEPROM; SRAM Processor 80486DX2-66 MHz, 8 MB DRAM, 256 kB SRAM, 2 MB FEPROM, 3 serial interfaces (16 Byte FIFO, 1 electrically isolated), 1 parallel interface, CAN bus interface (electrically isolated), 2 PC-Card Slots (Type II), Dallas Hardware Security Key, battery packed real-time clock. Connection for flat display, monitor, PS/2 AT keyboard, Panelware keypad modules and external diskette drive 3.5 inch (88.9 mm) 1.44 MB, 24 V DC supply voltage.	<i>Replacement type for 5C2000.02</i>
5C2001.03	Controller 486DX5-133; HDD Processor 80486DX5-133 MHz, 8 MB DRAM, 2.1 GB Hard Disk, 4 serial interfaces (16 byte FIFO, 2 electrically isolated), 1 parallel interface, CAN bus interface (electrically isolated), 2 PC-Card Slots (Type II), Dallas Hardware Security Key, battery packed real-time clock, fan. Connection for flat display, monitor, PS/2 AT keyboard, Panelware keypad modules and external diskette drive 3.5 inch (88.9 mm) 1.44 MB, 24 V DC supply voltage.	<i>Replacement type for 5C2000.03</i>
5C2001.05	Controller 486DX2-66; SD; SRAM Processor 80486DX2-66, 8 MB DRAM, 256 kB SRAM, 20 MB Silicon Disk, 4 serial interfaces (16 Byte FIFO, 2 electrically isolated), 1 parallel interface, CAN bus interface (electrically isolated), 2 PC-Card Slots (Type II), Dallas Hardware Security Key, battery packed real-time clock. Connection for flat display, monitor, PS/2 AT keyboard, Panelware keypad modules and external diskette drive 3.5 inch (88.9 mm) 1.44 MB, 24 V DC supply voltage.	<i>Cancelled!</i> <i>Replacement type: 5C2001.15</i>
5C2001.07 ¹⁾	Controller 486DX5-133; HDD; ARC; ETH Processor 80486DX5-133 MHz, 8 MB DRAM, 256 kB SRAM, 2.1 GB Hard Disk, 4 serial interfaces (16 byte FIFO, 2 electrically isolated), 1 parallel interface, CAN bus interface (electrically isolated), Ethernet interface (BNC, NE2000 compatible) Arcnet interface, 2 PC-Card Slots (Type II), Dallas Hardware Security Key, battery packed real-time clock, fan. Connection for flat display, monitor, PS/2 AT keyboard, Panelware keypad modules and external diskette drive 3.5 inch (88.9 mm) 1.44 MB, 24 V DC supply voltage.	<i>Replacement type for 5C2000.07</i>
5C2001.15	Controller 486DX2-66; CF; SRAM Processor 80486DX2-66 MHz, 8 MB DRAM, 256 kB SRAM, Compact Flash (Type I), 4 serial interfaces (16 Byte FIFO, 2 electrically isolated), 1 parallel interface, CAN bus interface (electrically isolated), 2 PC-Card Slots (Type II), Dallas Hardware Security Key, battery packed real-time clock. Connection for flat display, monitor, PS/2 AT keyboard, Panelware keypad modules and external diskette drive 3.5 inch (88.9 mm) 1.44 MB, 24 V DC supply voltage.	<i>Replacement type for 5C2000.05 5C2001.05</i>
5C2001.16	Controller 486DX2-66; CF; SRAM; ETH Processor 80486DX2-66 MHz, 8 MB DRAM, 256 kB SRAM, Compact Flash (Type I), 4 serial interfaces (16 Byte FIFO, 2 electrically isolated), 1 parallel interface, CAN bus interface (electrically isolated), 2 PC-Card Slots (Type II), Ethernet (BNC, NE2000 compatible), Dallas Hardware Security Key, battery packed real-time clock. Connection for flat display, monitor, PS/2 AT keyboard, Panelware keypad modules and external diskette drive 3.5 inch (88.9 mm) 1.44 MB, 24 V DC supply voltage.	
5C2001.21 ¹⁾	Controller 486DX5-133; HDD; ETH Processor 80486DX5-133 MHz, 32 MB DRAM, 2.1 GB Hard Disk, 4 serial interfaces (16 byte FIFO, 2 electrically isolated), 1 parallel interface, CAN bus interface (electrically isolated), Ethernet interface (BNC, NE2000 compatible), Dallas Hardware Security Key, battery packed real-time clock, fan. Connection for flat display, monitor, PS/2 AT keyboard, Panelware keypad modules and external diskette drive 3.5 inch (88.9 mm) 1.44 MB, 24 V DC supply voltage.	

Table 3: IPC2001 Model Numbers

General Information • Model Number

Model Number	Description	Remark
5C2001.22	Controller 486DX5-133; CF; ETH Processor 80486DX5-133 MHz, 32 MB DRAM, 256 kB SRAM, Compact Flash (Type I), 4 serial interfaces (16 byte FIFO, 2 electrically isolated), 1 parallel interface, CAN bus interface (electrically isolated), Ethernet interface (BNC, NE2000 compatible), Dallas Hardware Security Key, battery packed real-time clock, fan. Connection for flat display, monitor, PS/2 AT keyboard, Panelware keypad modules and external diskette drive 3.5 inch (88.9 mm) 1.44 MB, 24 V DC supply voltage.	

Table 3: IPC2001 Model Numbers (cont.)

1) Starting with Rev. F0 this controller has a 6GB Hard Disk (see 10.8, Technical Data 6GB Hard Disk)

8.1.3 IPC2002

Model Number	Description	Remark
5C2002.02	Controller 486DX5-133; CF; ETH Processor 80486DX5-133 MHz, 32 MB DRAM, Compact Flash (Type I), 1 serial interface (16 Byte FIFO), 1 parallel interface, Dallas Hardware Security Key, battery packed real-time clock, connection for CAN Bus, Ethernet (Twisted Pair, 10MBit, NE2000 compatible), PS/2 AT keyboard and external diskette drive 3.5 inch (88.9 mm) 1.44 MB, fan 10.4" color TFT-Display with Touch Screen (resistive). IP 65 protection (from front). 310 x 236 x 78 mm (WxHxD), 24 V DC supply voltage.	

Table 4: Model Numbers IPC2002

8.2 Provit 2000 Display Units

Model Number	Description	Remark
5D2000.02	Panel LCD B/W; QVGA; 4.7 in; F Display Unit with B/W LCD, 320 x 240 pixel resolution, 4.7 inch (120 mm) diagonal and integrated keyboard containing 6 softkeys with LED. Softkeys can be labeled with insert strips. IP54 protection (from front). Comes complete with accessories (cable). Outline dimensions 192 x 192 x 63 mm (WxHxD).	<i>Customer specific</i>
5D2200.01	Panel TFT C; VGA; 10.4 in; T Display Unit with color TFT-display, 640 x 480 pixel resolution, 10.4 inch (264 mm) diagonal and integrated touch screen (resistive). IP65 protection (from front). Comes complete with accessories (cable). Touch Screen driver must be ordered separately (5S0000.01-090). Outline dimensions 310 x 236 x 41 mm (WxHxD).	<i>Customer specific</i> <i>Replacement type:</i> <i>5D2210.01</i>
5D2200.02	Panel EL M; VGA; 10.4 in; T Display Unit with monochrome EL-display, 640 x 480 pixel resolution, 10.4 inch (264 mm) diagonal and integrated touch screen (resistive). IP65 protection (from front). Comes complete with accessories (cable). External 24 V DC supply voltage necessary. Touch screen driver must be ordered separately (5S0000.01-090). Outline dimensions 310 x 236 x 76 mm (WxHxD).	<i>Customer specific</i>
5D2200.04	Panel TFT C; VGA; 13.8 in; T Display Unit with color TFT-display, 640 x 480 pixel resolution, 13.8 inch (350 mm) diagonal and integrated touch screen (resistive). IP65 protection (from front). Comes complete with accessories (cable). Touch screen driver must be ordered separately (5S0000.01-090). Outline dimensions 392 x 296 x 52 mm (WxHxD).	<i>Cancelled</i>
5D2210.01	Panel TFT C; VGA; 10.4 in; T Display Unit with color TFT-display, 640 x 480 pixel resolution, 10.4 inch (264 mm) diagonal and integrated touch screen (resistive). IP65 protection (from front). Comes complete with accessories (cable). Touch screen driver must be ordered separately (5S0000.01-090). Outline dimensions 310 x 236 x 45 mm (WxHxD).	<i>Replacement type</i> <i>for</i> <i>5D2200.01</i>
5D2219.01	Panel LCD B/W; QVGA; 5.7 in; T Display Unit with B/W LCD, 320 x 240 pixel resolution, 5.7 inch (145 mm) diagonal and integrated touch screen (resistive), 8 softkeys and 16 function keys with LEDs. Function keys and softkeys can be labeled. IP65 protection (from front). Comes complete with accessories (cable). Touch screen driver must be ordered separately (5S0003.0x-020). Outline dimensions 250 x 220 x 29.3 mm (WxHxD).	
5D2219.02	Panel LCD C; QVGA; 5.7 in; T Display Unit with color LCD, 320 x 240 pixel resolution, 5.7 inch (145 mm) diagonal and integrated touch screen (resistive), 8 softkeys and 16 function keys with LEDs. Function keys and softkeys can be labeled. IP65 protection (from front). Comes complete with accessories (cable). Touch screen driver must be ordered separately (5S0003.0x-020). Outline dimensions 250 x 220 x 29.3 mm (WxHxD).	
5D2300.01	Panel TFT C; VGA; 10.4 in; M Display Unit with color TFT-display, 640 x 480 pixel resolution, 10.4 inch (264 mm) diagonal and integrated micro module (pointing device). IP65 protection (from front). Comes complete with accessories (cable). Micro module driver must be ordered separately (5S0003.03-020). Outline dimensions 310 x 270 x 41 mm (WxHxD).	<i>Cancelled!</i>
5D2300.02	Panel LCD C; VGA; 10.4 in; M Display Unit with color LCD, 640 x 480 pixel resolution, 10.4 inch (264 mm) diagonal and integrated micro module (pointing device). IP65 protection (from front). Comes complete with accessories (cable). Micro module driver must be ordered separately (5S0000.03-020). Outline dimensions 310 x 270 x 41 mm (WxHxD).	<i>Cancelled!</i>
5D2300.03	Panel LCD B/W; VGA; 9.4 in; M Display Unit with color B/W LCD, 640 x 480 pixel resolution, 9.4 inch (239 mm) diagonal and integrated micro module (pointing device). IP65 protection (from front). Comes complete with accessories (cable). Micro module driver must be ordered separately (5S0000.03-020). Outline dimensions 310 x 270 x 41 mm (WxHxD).	<i>Cancelled!</i>

Table 5: Provit 2000 Display Unit Model Numbers

General Information • Model Number

Model Number	Description	Remark
5D2500.01	Panel LCD B/W; VGA; 9.4 in; F Display Unit with B/W LCD, 640 x 480 pixel resolution, 9.4 inch (239 mm) diagonal and integrated keyboard containing 10 softkeys with LED, 13 function keys with LED and 20 system keys (cursor block and numeric block). The softkeys and function keys can be labeled. IP65 protection (from front). Comes complete with accessories (cable). Outline dimensions 310 x 387 x 35 mm (WxHxD).	
5D2500.02	Panel LCD C; VGA; 9.4 in; F Display Unit with color LCD, 640 x 480 pixel resolution, 9.4 inch (239 mm) diagonal and integrated keyboard containing 10 softkeys with LED, 13 function keys with LED and 20 system keys (cursor block and numeric block). The softkeys and function keys can be labeled. IP65 protection (from front). Comes complete with accessories (cable). Outline dimensions 310 x 387 x 35 mm (WxHxD).	<i>Cancelled!</i>
5D2500.10	Panel TFT C; VGA; 10.4 in; F Display Unit with color TFT display, 640 x 480 pixel resolution, 10.4 inch (264 mm) diagonal and integrated keyboard containing 10 softkeys with LED, 13 function keys with LED and 20 system keys (cursor block and numeric block). The softkeys and function keys can be labeled. IP65 protection (from front). Comes complete with accessories (cable). Outline dimensions 310 x 387 x 38 mm (WxHxD).	<i>Cancelled!</i>
5D2500.22	Panel LCD C; VGA; 10.4 in; F Display Unit with color LCD, 640 x 480 pixel resolution, 10.4 inch (264 mm) diagonal and integrated keyboard containing 10 softkeys with LED, 13 function keys with LED and 20 system keys (cursor block and numeric block). The softkeys and function keys can be labeled. IP65 protection (from front). Comes complete with accessories (cable). Outline dimensions 310 x 387 x 38 mm (WxHxD).	<i>Cancelled!</i> <i>Replacement type:</i> <i>5D2510.10</i>
5D2510.01	Panel LCD B/W; VGA; 9.4 in; F Display Unit with B/W LCD, 640 x 480 pixel resolution, 9.4 inch (239 mm) diagonal and integrated keyboard containing 10 softkeys with LED, 13 function keys with LED and 20 system keys (cursor block and numeric block). The softkeys and function keys can be labeled. IP65 protection (from front). Comes complete with accessories (cable). Outline dimensions 310 x 387 x 38 mm (WxHxD).	
5D2510.10	Panel TFT C; VGA; 10.4 in; F Display Unit with color TFT display, 640 x 480 pixel resolution, 10.4 inch (264 mm) diagonal and integrated keyboard containing 10 softkeys with LED, 13 function keys with LED and 20 system keys (cursor block and numeric block). The softkeys and function keys can be labeled. IP65 protection (from front). Comes complete with accessories (cable). Outline dimensions 310 x 387 x 38 mm (WxHxD).	<i>Replacement type</i> <i>for 5D2500.22 and</i> <i>5D2510.22</i>
5D2510.22	Panel LCD C; VGA; 10.4 in; F Display Unit with color LCD, 640 x 480 pixel resolution, 10.4 inch (264 mm) diagonal and integrated keyboard containing 10 softkeys with LED, 13 function keys with LED and 20 system keys (cursor block and numeric block). The softkeys and function keys can be labeled. IP65 protection (from front). Comes complete with accessories (cable). Outline dimensions 310 x 387 x 38 mm (WxHxD).	<i>Cancelled!</i> <i>Replacement type</i> <i>5D2510.10</i>
5D2519.01	Panel LCD B/W; QVGA; 5.7 in; F Display Unit with B/W LCD, 320 x 240 pixel resolution, 5.7 inch (145 mm) diagonal and integrated keyboard existing of 8 softkeys with LED, 16 function keys with LED and 24 system keys (cursor block and numeric block). The softkeys and function keys can be labeled. IP65 protection (from front). Comes complete with accessories (cable). Outline dimensions 350 x 220 x 29.3 mm (WxHxD).	
5D2519.02	Panel LCD C; QVGA; 5.7 in; F Display Unit with color LCD, 320 x 240 pixel resolution, 5.7 inch (145 mm) diagonal and integrated keyboard containing 8 softkeys with LED, 16 function keys with LED and 24 system keys (cursor block and numeric block). The softkeys and function keys can be labeled. IP65 protection (from front). Comes complete with accessories (cable). Outline dimensions 350 x 220 x 29.3 mm (WxHxD).	

Table 5: Provit 2000 Display Unit Model Numbers (cont.)

8.3 Display Kits

Model Number	Description	Remark
5D2000.03	Panel Kit TFT C; VGA; 10.4 in Display Kit with color TFT display, 640 x 480 pixel resolution, 10.4 inch (264 mm) diagonal. Comes complete with accessories (250 mm cable) but without housing.	
5D2000.04	Panel Kit LCD B/W; VGA; 9.4 in Display Kit with B/W LCD, 640 x 480 pixel resolution, 10.4 inch (264 mm) diagonal. Comes complete with accessories (250 mm cable) but without housing.	
5D2000.10	Panel Kit LCD C; VGA; 10.4 in Display Kit with color LCD, 640 x 480 pixel resolution, 10.4 inch (264 mm) diagonal. Comes complete with accessories (250 mm cable) but without housing.	<i>Cancelled!</i>

Table 6: Display Kit Model Numbers

8.4 Provit 2000 Accessories

Model Number	Description	Remark
0AC201.9	Lithium Battery Replacement batteries for IPC2000 and IPC5000. Packaging unit: 5 pcs., button cell	
0TP360.04	ARCNET AN-520BT ISA board	
5A1109.00-090	ARCNET PCX-CXB ISA board	
5A2001.01	External FDD 3.5 in 1.44 MB beige External 3.5 inch (88.9 mm) 1.44 MB diskette drive (beige front) in housing to be installed in a panel cutout. Can be used with all IPC2000 and IPC5000 controllers. Cable is not included with the delivery (standard Centronics cable 9A0005.01). Color: PS/2 Beige.	
5A2001.02	FDD Transparent Door, Lockable IP55 FDD transparent door, sealed for external disk drive. Protection IP55 (from front). Matches with external diskette drives 5A2001.01 and 5A2001.05.	
5A2001.05	External FDD 3.5 in 1.44 MB black External 3.5 inch (88.9 mm) 1.44 MB diskette drive (black front) in housing to be installed in a panel cutout. Can be used with all IPC2000 and IPC5000 controllers. Cable is not included with the delivery (standard Centronics cable 9A0005.01). Color: Black.	
5A2005.01 ¹⁾	IPC2001 ISA Adapter ISA Adapter for a 16 Bit ISA card.	
5A2005.02 ¹⁾	IPC2001 ISA Adapter 2 Slots 2 Slot ISA Adapter for up to two 16 Bit ISA cards.	
5A2500.01	FDD Extension Front plate for installing an external floppy disk drive and two optional push buttons.	
5A2500.04	Panel A4 Slide in Legends 9.4 inch A4 Template for 9.4 inch (239 mm) Provit 2500 display units with cut out symbols in A4 size format for printing with e.g. a laser printer. 1 sheet includes 2 complete sets of legend strips. Matches with all 10.4 inch (264 mm) display units 5D2500.01, 5D2500.02.	<i>Cancelled!</i>
5A2500.06	Panel A4 Slide in Legends 10.4 inch A4 Template for 10.4 inch (264 mm) Provit 2500 display units with cut out symbols in A4 size format for printing with e.g. a laser printer. 1 sheet includes 2 complete sets of legend strips. Matches with all 10.4 inch (264 mm) display units 5D2500.10, 5D2500.22.	<i>Customer specific</i>
5A2500.08	Panel A4 Slide in Legends 9.4 inch A4 Template for 9.4 inch (239 mm) Provit 2500 display units with cut out symbols in A4 size format for printing with e.g. a laser printer. 1 sheet includes 2 complete sets of legend strips. Matches with all 9.4 inch (239 mm) display units 5D2510.01.	
5A2500.09	Panel A4 Slide in Legends 10.4 inch A4 Template for 10.4 inch (264 mm) Provit 2500 display units with cut out symbols in A4 size format for printing with e.g. a laser printer. 1 sheet includes 2 complete sets of legend strips. Matches with all 10.4 inch (239 mm) display units 5D2510.22.	
5A2519.01	Panel A4 Slide in Legends 5.7 inch A4 Template for 5.7 inch (145 mm) Provit 2500 display units with cut out symbols in A4 size format for printing with e.g. a laser printer. 1 sheet includes 2 complete sets of legend strips. Matches with all 5.7 inch (145 mm) display units 5D2219.01, 5D2219.02, 5D2519.01 and 5D2519.02.	
5A9000.01	Provit Fitting Template Drill and section template for all standard display units of the Provit 2000 and Provit 5000 product line.	
9A0002.02	PS/2 Keyboard Adapter; AT Female to PS/2 Male Adapter for operation of an AT keyboard with DIN plug on the PS/2 socket of an IPC2000 or IPC5000.	

Table 7: Model Numbers for Provit 2000 Accessories

Model Number	Description	Remark
9A0003.01	Dallas Keyring Adapter Dallas Key Ring adapter for operating the Dallas dongle on a parallel PC interface	
9A0005.01	Centronics Cable 1.8m Centronics cable (1.8m) to connect a printer or external disk drive on an IPC2000 or IPC5000.	
9A0007.01	Keyboard Module Cable 90 cm; only for Provit Keypad module cable (90cm) to connect Panelware keypad modules on a Provit industrial PC.	
9A0013.01	Pen for resistive touch screen	
9A0016.01	PS/2 Extension Cable, length 2.0m	
9A0017.01	RS232 Null Modem Cable 0.6 m To connect UPS and IPC (9 pin DSUB socket - 9 pin DSUB socket)	
9A0017.02	RS232 Null Modem Cable 1.8 m To connect UPS and IPC (9 pin DSUB socket - 9 pin DSUB socket)	
9A0100.11	UPS 24 V DC 24 V DC input, 24 V DC output; serial interface.	
9A0100.12	UPS Battery Unit Type A 24 V; 7 Ah; including battery cage.	
9A0100.13	UPS Battery Unit Type A (replacement part) 2 x 12 V; 7 Ah; for battery unit 9A0100.12.	
9A0100.14	UPS Battery Unit Type B 24 V; 2.2 Ah; including battery cage.	
9A0100.15	UPS Battery Unit Type B (replacement part) 2 x 12 V; 2.2 Ah; for battery unit 9A0100.14.	

Table 7: Model Numbers for Provit 2000 Accessories (cont.)

- 1) Can be used for all controllers with model number 5C2001.xx. Not included with the delivery of this controller.
16 Bit ISA cards are offered by B&R, however they are not included with the delivery of the ISA adapter.

8.5 Mass Memory

Model Number	Description	Remark
9A0009.01	PC Card Flash 6 MByte PC Card ATA Flash 6 MB Type II PCMCIA 6 MB FEPROM, True IDE/ATA	<i>Cancelled!</i>
9A0009.02	PC Card Flash 40 MByte PC Card ATA Flash 40 MB Type II PCMCIA 40 MB FEPROM, True IDE/ATA	<i>Cancelled!</i>
9A0009.03	PC Card Flash 20 MByte PC Card ATA Flash 20 MB Type II PCMCIA 20 MB FEPROM, True IDE/ATA	<i>Cancelled!</i>
9A0009.04	PC Card Flash 110 MByte PC Card ATA Flash 110 MB Type II PCMCIA 110 MB FEPROM, True IDE/ATA	<i>Cancelled!</i>
9A0009.05	PC Card Flash 60 MByte PC Card ATA Flash 60 MB Type II PCMCIA 60 MB FEPROM, True IDE/ATA	<i>Cancelled!</i>
9A0009.06	PC Card Flash 220 MByte FMC PC Card ATA Flash 220 MB Type II PCMCIA 220 MB FEPROM, True IDE/ATA	<i>Customer specific</i>
9A0009.07	PC Card Flash 220 MByte PC Card ATA Flash 220 MB, Type II PCMCIA 220 MB FEPROM, True IDE/ATA	
9A0009.08	PC Card Flash 48 MByte PC Card ATA Flash 48 MB Type II PCMCIA 48 MB FEPROM, True IDE/ATA	<i>Cancelled!</i>
9A0009.09	PC Card Flash 440 MByte PC Card ATA Flash 440 MB Type II PCMCIA 440 MB FEPROM, True IDE/ATA	
9A0015.01 ¹⁾	Compact Flash 20 MByte ATA/True IDE Compact Flash card with 20 MB FEPROM, and true IDE/ATA interface.	<i>Cancelled!</i>
9A0015.02 ¹⁾	Compact Flash 64 MByte ATA/True IDE Compact Flash card with 64 MB FEPROM, and true IDE/ATA interface.	
9A0015.03 ¹⁾	Compact Flash 10 MByte ATA/True IDE Type I Compact Flash with 10 MB FEPROM, True IDE/ATA interface	<i>Cancelled!</i>
9A0015.04 ¹⁾	Compact Flash 48 MByte ATA/True IDE Type I Compact Flash with 48 MB FEPROM, True IDE/ATA interface	<i>Customer specific</i>
9A0015.05 ¹⁾	Compact Flash 128 MByte ATA/True IDE Type I Compact Flash with 128 MB FEPROM, True IDE/ATA interface	
9A0015.06 ¹⁾	Compact Flash 32 MByte ATA/True IDE Type I Compact Flash with 32 MB FEPROM, True IDE/ATA interface	
9A0015.07 ¹⁾	Compact Flash 8 MByte ATA/True IDE Type I Compact Flash with 8 MB FEPROM, True IDE/ATA interface	
9A0015.08 ¹⁾	Compact Flash 192 MByte ATA/True IDE Type I Compact Flash with 192 MB FEPROM, True IDE/ATA interface	
9A0015.09 ¹⁾	Compact Flash 320 MByte ATA/True IDE Type I Compact Flash with 320 MB FEPROM, True IDE/ATA interface	

Table 8: Provit 2000 Mass Memory Model Numbers

¹⁾ Can only be used with controllers 5C2001.15, 5C2001.22 and the IPC2002 (5C2002.02). Not included with the delivery of the controller.

8.6 Software

Model Number	Description	Remark
5S0000.01-090	ProvIt Drivers & Utilities CD Contains driver (touch screen, graphics, etc.) as well as the latest BIOS upgrades for all ProvIt product lines	<i>Replacement for the cancelled software</i>
5S0001.01-090	ProvIt MKEY Utilities; Modular Key Blocks Configuration software for supporting the modular keypad modules connected to a IPC2000 and IPC 5000. Incl. German and English documentation.	<i>Cancelled!</i>
5S0001.02-090	ProvIt MKEY Dev Kit; Modular Key Blocks Development kit to support the modular keypad modules connected to a IPC2000 and IPC5000. Incl. examples and German documentation.	<i>Cancelled!</i>
5S0003.02-020	ELO Touch Screen Utilities Touch Screen Driver for display units 5D2210.01, 5D5200.01, 5D5200.04, 5D5201.02, 5D5201.03, 5D5202.01, 5D521x.xx and 5D560x.03 (not included with the delivery of the display unit). For operating systems MS-DOS®, MS Windows®3.x, MS Windows®95, MS Windows®NT and OS/2.	<i>Cancelled!</i>
5S0003.03-020	Interlink Micro Module Utilities Micro Module Driver for mouse pointer on display units 5D23xx.xx (not included with the delivery of the display unit). For operating systems MS Windows® 95/98.	<i>Cancelled!</i>
5S0003.05-020	Gunze MS-DOS® Touch Screen Utilities Gunze MS-DOS® Touch Screen Driver for Display Units 5D2219.01, 5D2219.02, 5D2519.01 and 5D2519.02 (not included with the delivery of the display units).	<i>Cancelled!</i>
5S0003.06-020	Gunze MS Windows95 Touch Screen Utilities Gunze MS-DOS® Touch Screen Driver for Display Units 5D2219.01, 5D2219.02, 5D2519.01 and 5D2519.02 (not included with the delivery of the display units).	<i>Cancelled!</i>
5S2001.01-090	ProvIt 2000 Utilities IPC2001 Contains various utility programs. e.g. Device Driver for SRAM, FROM, etc.	<i>Cancelled!</i>
5S2001.02-090	ProvIt 2000 Upgrade IPC2001 Contains the latest BIOS version	<i>Cancelled!</i>
5S2001.03-090	ProvIt 2000 Graphic IPC2001 Contains the latest version of the Graphics Driver for operating systems MS-DOS®, MS Windows®3.x, MS Windows®95, MS Windows®NT and OS/2.	<i>Cancelled!</i>
9S0000.01-010	OEM MS-DOS 6.22 German (Disk) OEM MS-DOS®; German, user's manual and installation diskettes Only available with a new IPC.	
9S0000.01-020	OEM MS-DOS 6.22 English (Disk) OEM MS-DOS®; English, user's manual and installation diskettes Only available with a new IPC.	
9S0000.02-010	OEM MS Windows95 German (CD) OEM MS Windows®95; German CD, including manual Only available with a new IPC.	
9S0000.02-020	OEM MS Windows95 English (CD) OEM MS Windows®95; English CD, including manual Only available with a new IPC.	
9S0000.03-010	OEM MS-DOS 6.22 / MS Windows3.11 German (Disk) OEM MS-DOS® and MS Windows® 3.11, German, manuals and diskettes included. Only available with a new IPC.	
9S0000.03-020	OEM MS DOS 6.22 / MS Windows3.11 English (Disk) OEM MS-DOS® and MS Windows®3.11, English, manuals and diskettes included, Only available with a new IPC.	

Table 9: ProvIt 2000 Software Model Numbers

General Information • Model Number

Model Number	Description	Remark
9S0000.04-010	OEM MS WindowsNT4.0 WS German (CD) OEM MS Windows®NT4.0 WS, CD, German, manual included Only available with a new IPC.	
9S0000.04-020	OEM MS WinNT4.0 WS English (CD) OEM MS Windows®NT4.0 WS, CD, English, manual included Only available with a new IPC.	
9S0000.05-010	OEM MS Windows98 German (CD) OEM MS Windows®98, CD, German, manual included Only available with a new IPC.	
9S0000.05-020	OEM MS Windows98 English (CD) OEM MS Windows®98, CD, English, manual included Only available with a new IPC.	
9S0001.02-090	OEM MS WindowsCE 2.12 OEM MS Windows®CE 2.12 license sticker and security key included Only available with a new IPC.	

Table 9: Provit 2000 Software Model Numbers (cont.)

Provit product line drivers, utilities and BIOS upgrades can be downloaded from the B&R Homepage. www.br-automation.com

8.7 Documentation

Model Number	Description	Remark
MAPRV2000-0 MAPRV2000-E	Provit 2000 Documentation User's manual for the Provit 2000 product line. German English	
MAMKEY-0 MAMKEY-E MAMKEY-F	MKEY Documentation User's manual for MKEY (Modular Key Block) configuration program. German English French	
MAUSV1-0 MAUSV1-E MAUSV1-F	Uninterruptible Power Supply Uninterruptible Power Supply - User Documentation German English French	

Table 10: Model Numbers for Provit 2000 Documentation

All user's manuals can be downloaded from the B&R Homepage. www.br-automation.com

Chapter 2 • Controllers

1. IPC2000

1.1 Controller Overview

Resource	5C2000.01	5C2000.02	5C2000.03	5C2000.05	5C2000.07
Processor	80386 SX-25	80386 SX-25	80486SLC-25	80486SLC-25	80486SLC-25
Dynamic RAM ¹⁾	2 MByte	4 MByte	4 MByte	8 MByte	8 MByte
Static RAM	-	256 KByte	-	256 KByte	-
Flash PROM	512 KByte	2 MByte ²⁾	-	-	-
Flash Disk	-	-	--	5 MByte	-
Hard Disk	-	-	Min. 120 MByte	-	Min. 120 MByte
Math Processor	-	-	-	-	✓
Real-time Clock	✓ ³⁾				
Fan (temperature controlled)	-	-	✓	✓	✓
PCMCIA 2.0 / JEIDA 4.1	-	2 slots Type II	2 slots Type II	2 slots Type II	1 Slot Type II
Operating Voltage	24 VDC (±6V)				
Power Consumption ⁴⁾ 18 V 24 V 30 V	9.9 W 10.6 W 11.4 W	9.9 W 10.6 W 11.4 W	14.8 W 15.0 W 15.5 W	13.8 W 14.0 W 14.5 W	17.8 W 18.0 W 18.6 W
COM1 - RS232	✓	✓	✓	✓	✓
COM2 - RS232/TTY	✓	✓	✓	✓	✓
COM3 – RS485/TTY (isolated)	✓	with FIFO ⁵⁾	with FIFO ⁵⁾	with FIFO	with FIFO
COM4 - RS232/RS422 (isolated)	-	-	with FIFO ⁶⁾	with FIFO	with FIFO
CAN (isolated)	-	✓	✓	✓	✓
LPT1	✓	✓	✓	✓	✓
Ext. Disk Drive	Alternative with LPT1	✓ ⁷⁾	✓ ⁷⁾	✓	✓
Arcnet (SMC20020)	-	-	-	-	✓
Ethernet (NE2000 compatible)	-	-	-	-	✓

Table 11: IPC Controller Overview

Resource	5C2000.01	5C2000.02	5C2000.03	5C2000.05	5C2000.07
Flat Displays	¼ VGA (320 x 240) LCD monochrome VGA (640 x 480) LCD monochrome VGA (640 x 480) LCD color ⁸⁾ VGA (640 x 480) TFT color ⁸⁾				
Real-time Clock	✓	✓	✓	✓	✓
Keypad Modules	✓	✓	✓	✓	✓
External Monitor	-	✓ ⁹⁾	✓ ⁹⁾	✓	✓
AT Enhanced Keyboard	✓	✓	✓	✓	✓
Interact Ready	-	✓	✓	✓	✓
Operating Temperature	0 -50°C	0 -50°C	0 -45°C	0 -45°C	0 -45°C
Relative Humidity	5 - 95 %, non-condensing				
Altitude	Max. 3,000 m				

Table 11: IPC Controller Overview (cont.)

- 1) The maximum DRAM size is 8 Mbytes. Memory for controllers which are equipped with less than 8 Mbytes DRAM cannot be expanded using SIMM modules!
- 2) Rev. < 50.07 only 1 MByte
- 3) The quartz used with the IPC has an accuracy of 10 ppm. Under consideration of influences such as operating temperature and wiring of the quartz, inaccuracy depends on the type. 2 seconds per day
- 4) Power data [W] are typical values, not maximal values!
- 5) Rev. < 50.07 no FIFO
- 6) Rev. < 50.07 no COM4
- 7) Rev. < Rev. < 50.07 a socket that is used as an alternative for LPT1 or for the external diskette drive.
- 8) Rev. < 50.07 not possible
- 9) Rev. < 50.07 flat display and monitor can be used at the same time (note restrictions).

1.2 IPC2000 Dimensions

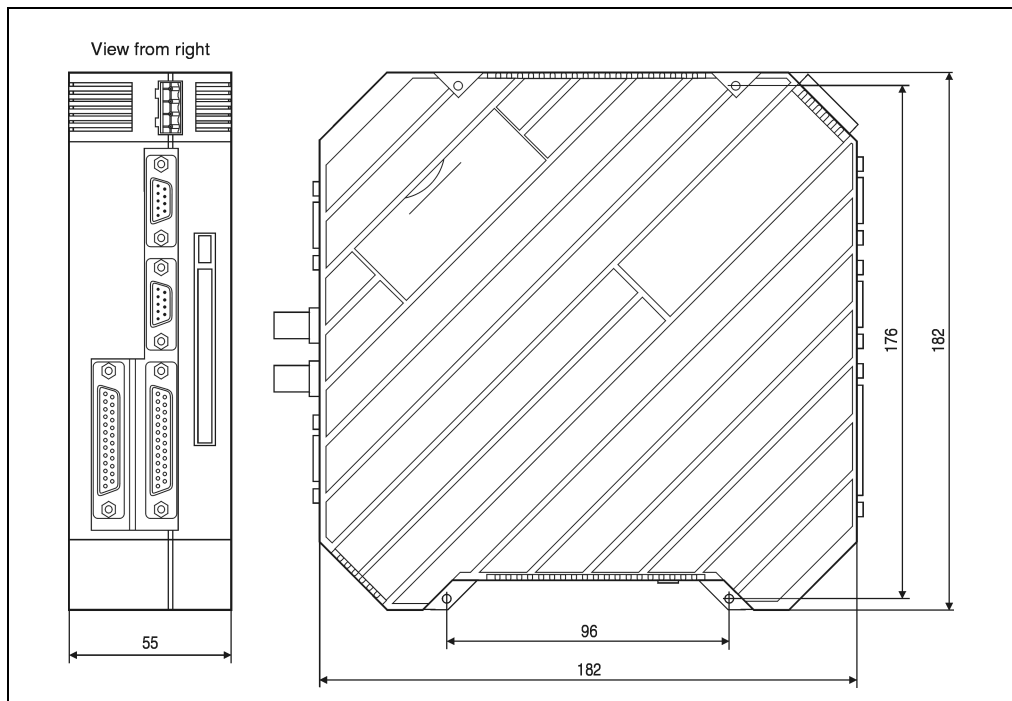


Figure 1: IPC2000 – Controller Dimensions

1.3 Mounting Instructions

- Controllers with a fan are required to be mounted with the fan facing up.
- The controller can be mounted at a maximal angle of 45°

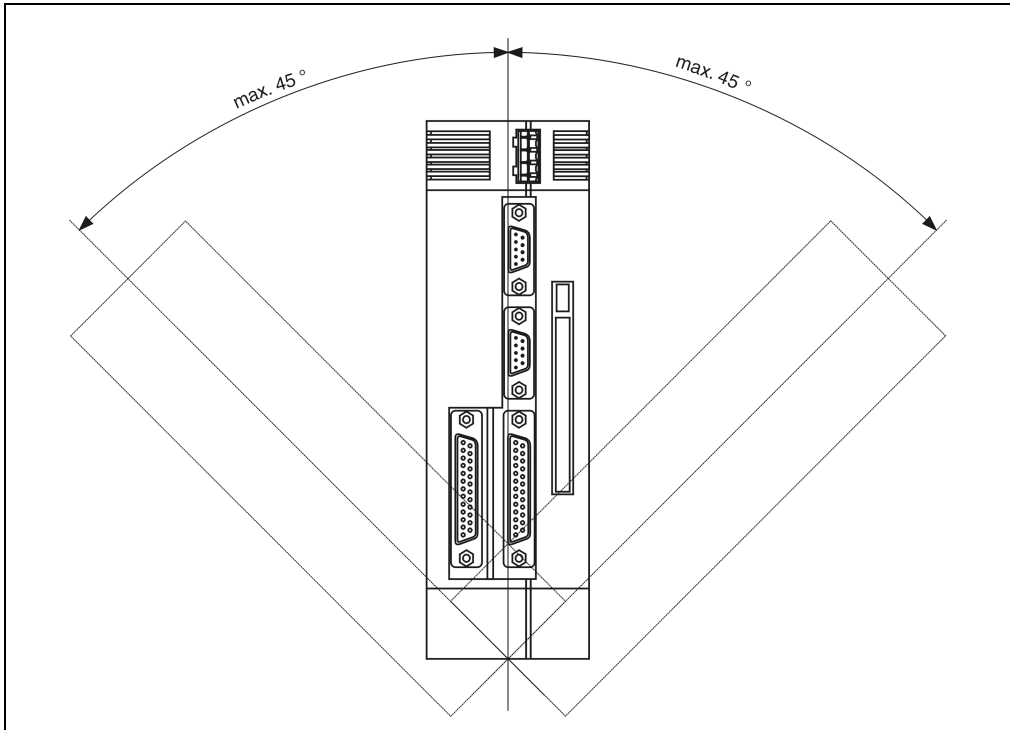


Figure 2: IPC 2000 Mounting Instructions

1.4 Component Overview

1.4.1 Controller with Rev. < 50.07

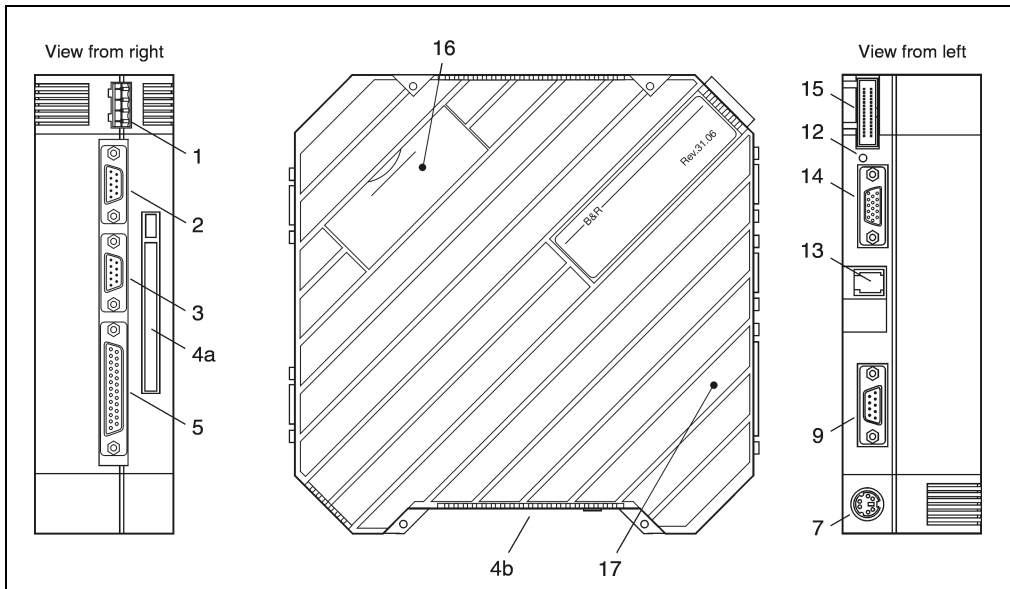


Figure 3: Controller with Rev. < 50.07

- | | | | |
|----|---|----|--------------------------------|
| 1 | Power Supply | 7 | AT Enhanced Keyboard Connector |
| 2 | COM1 - RS232 | 9 | COM3 - RS485/TTY/CAN |
| 3 | COM2 - RS232/TTY | 12 | Reset Button |
| 4a | PC Card Interface 1 | 13 | Keypad Module Connector |
| 4b | PC Card Interface 2 | 14 | VGA Monitor |
| 5 | External Disk Drive
or LPT1 Parallel Interface | 15 | Display Unit Connection |
| | | 16 | Lithium Battery Compartment |
| | | 17 | Interact Hardware Key |

1.4.2 Controller starting with Rev. 50.07

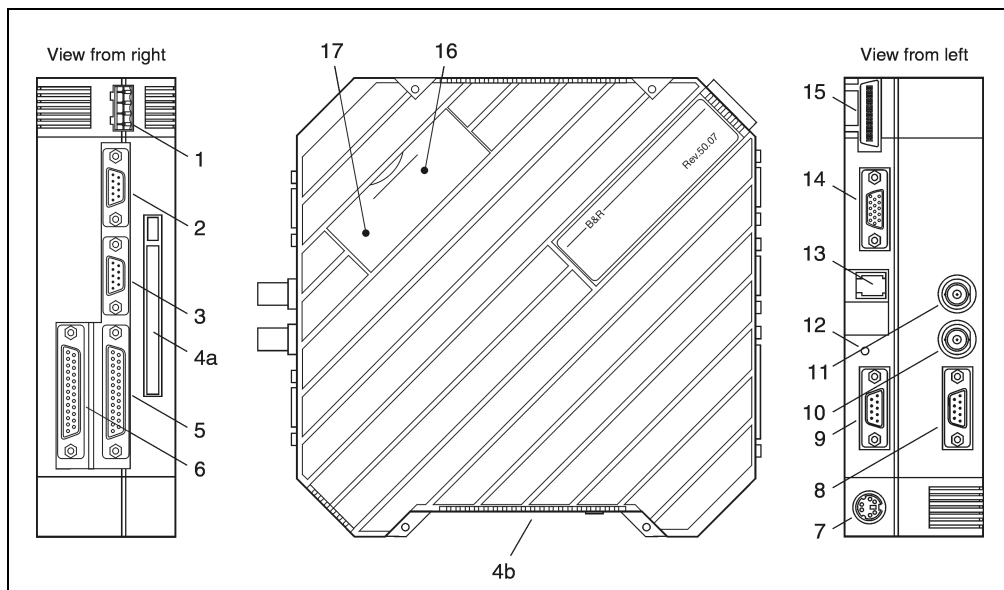


Figure 4: Controller starting with Rev. 50.07

- | | | | |
|----|--------------------------------|----|-----------------------------|
| 1 | Power Supply | 9 | COM3 - RS485/TTY/CAN |
| 2 | COM1 - RS232 | 10 | Ethernet |
| 3 | COM2 - RS232/TTY | 11 | Arcnet |
| 4a | PC Card Interface 1 | 12 | Reset Button |
| 4b | PC Card Interface 2 | 13 | Keypad Module Connector |
| 5 | External Disk Drive | 14 | VGA Monitor |
| 6 | Parallel Interface LPT1 | 15 | Display Unit Connection |
| 7 | AT Enhanced Keyboard Connector | 16 | Lithium Battery Compartment |
| 8 | COM4 - RS232/RS422 | 17 | Interact Hardware Key |

1.5 Component Descriptions

1.5.1 Power Supply

Input Voltage: 24 V DC ($\pm 6V$)



The pins connection to the ground should be as short as possible. If the controller is installed in a switching cabinet, the connection cable may not be longer than 15 cm.

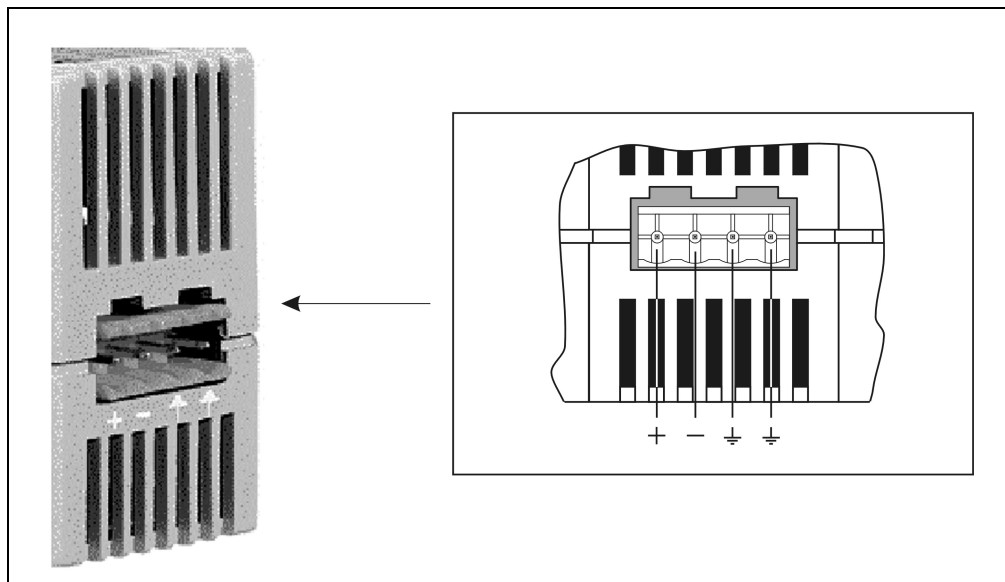


Figure 5: IPC2000 – Power Connection

1.5.2 COM1 - RS232

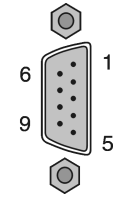
COM1		
RS232 interface Not electrically isolated up to 115 kBaud		9 pin DSUB plug 
Pin	RS232	
1	DCD	
2	RXD	
3	TXD	
4	DTR	
5	GND	
6	DSR	
7	RTS	
8	CTS	
9	RI	

Table 12: IPC2000 – Pin Assignments COM1

Default setting	COM1
Interrupt	IRQ4
I/O Address	3F8h - 3FFh

Table 13: IPC2000 - Default Settings for COM1

1.5.3 COM2 - RS232/TTY

COM2		
RS232/TTY Interface Not electrically isolated RS232: up to 115 kBaud TTY: up to 115 kBaud		
Pin	RS232	TTY
1		TXD
2	RXD	
3	TXD	
4	DTR	
5	GND	TXD Ret
6		RXD
7	RTS	
8	CTS	
9		RXD Ret

9 pin DSUB plug

Table 14: IPC2000 – Pin Assignments COM2

Default setting	COM2
Interrupt	IRQ3
I/O Address	2F8h - 2FFh

Table 15: IPC2000 – Default Settings for COM2

The interface is selected automatically:

Interface	Selection
RS232	After start up or a hardware reset, COM2 is set to RS232 mode.
TTY	As soon as current flows through the TTY receiver (TTY must be connected), the interface is switched to TTY.

1.5.4 COM3 - RS485/TTY/CAN

COM3			
RS485 / TTY / CAN Interface Electrically isolated from the system ground No isolation between interface types 16 Bytes FIFO RS485: up to 115 kBaud TTY: up to 115 kBaud			
Pin	RS485	TTY	CAN
1		TXD	
2			CAN L
3			GND
4		RXD	
5	DATA		
6	GND	TXD Ret	
7			CAN H
8	DATA\		
9		RXD Ret	

9 pin DSUB plug

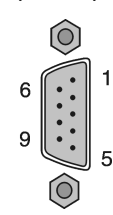


Table 16: IPC2000 – Pin Assignments COM3

Default setting	COM3
Interrupt	IRQ11
I/O Address	3E8h - 3EFh

Table 17: IPC2000 – Default Settings for COM3

The interface is selected automatically:

Interface	Selection
TTY	As soon as current flows through the TTY receiver (TTY must be connected), the interface is switched to TTY. Note: To use TTY mode, the RTS line cannot be actively connected!
RS485	As soon as the RS485 Sender (RTS) is turned on, RS485 becomes active.
CAN	Active, when connected

Table 18: IPC2000 - COM3 Interface Selection

The Intel 82527 processor is used as CAN controller. The controller used by B&R complies with the CAN specification 2.0B. Protocols Standard CAN and Extended CAN can be used on a bus.

Setting	CAN
Interrupt	IRQ10
I/O Address	384h - 385h

Table 19: IPC2000 – CAN default settings

I/O Address	Register	Function
384h	Address Register	Defines the register number to access.
385h	Data Register	Access of the register defined in the address register.

Table 20: IPC2000 - CAN Address Register

Additional information concerning the CAN bus can be found in the Technical Appendix.

1.5.5 COM4 - RS232/RS422

COM4		
RS232/RS422 interface Electrically isolated 16 Bytes FIFO RS232: up to 115 kBaud RS422: up to 115 kBaud		
Pin	RS232	RS422
1		T8Ø
2	RXD	
3	TXD	
4		TXD
5	GND	GND
6		28Ø
7	RTS	
8	CTS	
9		RXD

9 pin DSUB plug

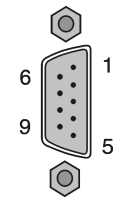


Table 21: IPC2000 – Pin Assignments COM4

Default setting	COM4
Interrupt	IRQ12
I/O Address	2E8h - 2EFh

Table 22: IPC2000 – Default Settings for COM4

The following controllers have no COM4:5C2000.01

5C2000.02

5C2000.03 with Rev. < 50.07

In this case, IRQ12 and the I/O address are free!

The interface is selected automatically. The interface connected is recognized as being active.



The RS422 interface can also be used as an RS485 interface. Tristate switching takes place via RTS.

Wiring:

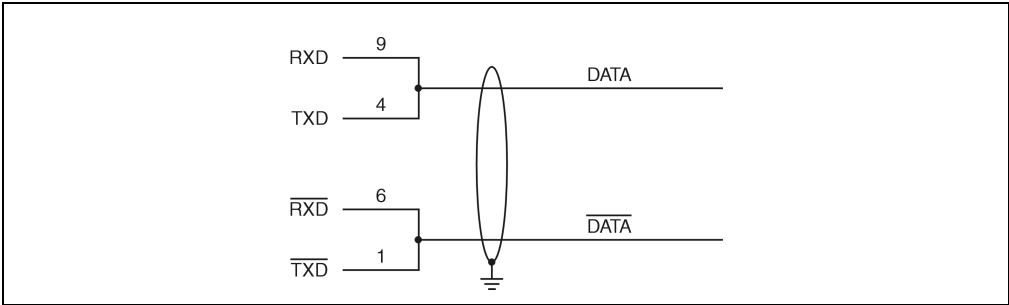


Figure 6: IPC2000 - Tristate Switching

1.5.6 AT Enhanced Keyboard Connection

An external AT keyboard is connected using a PS/2 connector. The external AT keyboard functions parallel to optional keypad modules.

AT Enhanced Keyboard Connection		
Pin	Assignment	
1	KBDATA	
2		
3	GND	
4	+5 V	
5	KBCLK	
6		

Table 23: IPC2000 – Pin Assignments PS/2 Socket

Setting	PS/2 Keyboard
Interrupt	IRQ1
I/O Address	060h - 06Fh

Table 24: IPC2000 – Default Settings PS/2 Keyboard



Because of general PC specifications, this interface should be used with extreme care concerning EMC, location of cables, etc. Therefore it should only be used for service!

1.5.7 Connection for External Disk Drive

An external disk drive can be connected to the 25 pin DSUB socket.

(see Chapter 7.5 "Accessories" for Disk Drive)

Connection for External Disk Drive				
Pin	Assignment		Pin	Assignment
1	n.c.		14	Density
2	Index		15	Side Select
3	Track 0		16	Direction
4	Write Protect		17	Step
5	Read Data		18	GND
6	Disk. Chan.		19	GND
7	n.c.		20	GND
8	n.c.		21	GND
9	+5 V		22	GND
10	Drive Select		23	GND
11	Motor on		24	GND
12	Write Data		25	GND
13	Write Gate			

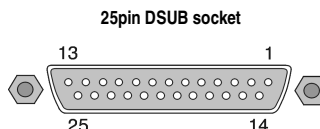


Table 25: IPC2000 – Pin Assignment for External 3.5" Disk Drive Connector

Setting	LPT1
Interrupt	IRQ6
I/O Address	3F0h-37Fh

Table 26: IPC2000 – Default Settings for External Disk Drive



Controller 5C2000.01 and Controllers with a Rev. < 50.07 use this interface alternatively as parallel interface (LPT1). The settings are made in BIOS Setup (see section 1.8.2). The parallel interface assignments are shown in the table in section 1.5.8.

Controllers with Rev. 50.07 and higher are equipped with two 25 pin interfaces. However, the interface for the external disk drive **cannot** be configured as a second parallel interface!

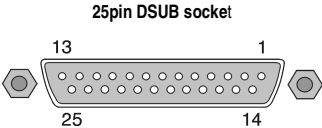


Because of general PC specifications, this interface should be used with extreme care concerning EMC, cabling. Therefore, it should only be used for service!

1.5.8 Parallel Interface LPT1

Parallel interface LPT1 uses a 25 pin DSUB socket.

Parallel Interface LPT1				
Pin	Assignment		Pin	Assignment
1	Data Strobe		14	Autofeed
2	Data 0		15	Error
3	Data 1		16	Printer Init
4	Data 2		17	Printer Select Input
5	Data 3		18	GND
6	Data 4		19	GND
7	Data 5		20	GND
8	Data 6		21	GND
9	Data 7		22	GND
10	Acknowledge		23	GND
11	Busy		24	GND
12	Paper End		25	GND
13	Printer Select Status			



25pin DSUB socket

Table 27: IPC2000 – LPT1 Interface Pin Assignment

Default Settings	LPT1
Interrupt	IRQ7
I/O Address	378h - 37Fh

Table 28: IPC2000 – Default Settings for LPT1



Controller 5C2000.01 and controllers with a Rev. < 50.07 do not have this interface. The printer is connected to the interface described in section 4.1.5.7.

1.5.9 Monitor Connection

A monitor (CRT) can be connected to the controller via a 15 pin DSUB socket.

Monitor Connection				
Pin	Assignment		Pin	Assignment
1	Red		9	n.c.
2	Green		10	GND
3	Blue		11	n.c.
4	n.c.		12	n.c.
5	GND		13	HSYNC
6	GND		14	VSYNC
7	GND		15	n.c.
8	GND			

15 pin DSUB socket

Table 29: IPC2000 – Pin Assignments for External VGA Connection

The VGA controller (C&T 65535) used in the IPC2000 is equipped with 512 Kbyte memory.

Resolutions supported by monitors (CRT):

Resolution	Color Depth
VGA (640 x 480 pixels)	256 colors
SVGA (800 x 600 pixels)	256 colors
XGA (1024 x 768 pixels)	16 colors

Table 30: IPC2000 - Resolutions Supported by Monitors (CRT)



With exception of the the 5C2000.01 controller, it is possible to connect an external monitor to all controllers.

Information concerning parallel operation of display and monitor can be found in the "Technical Appendix" Chapter 8.2.

1.5.10 Display Unit Connection



Chapter 3 "Display Units" and Chapter 4 "Display Kits" provide information concerning which controller (revision number) can be connected to which display.

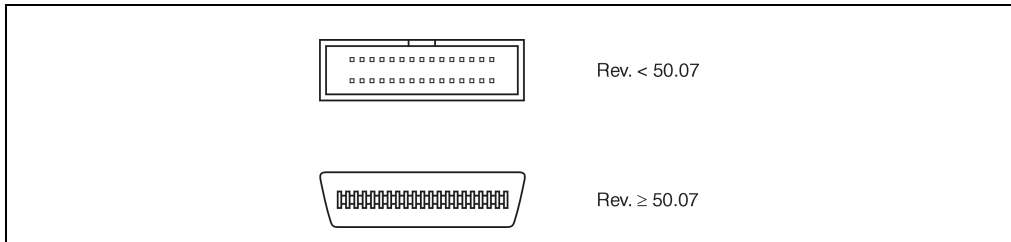


Figure 7: IPC2000 – Display Connection

The VGA controller (C&T 65535) used in the IPC2000 is equipped with 512 Kbyte memory.

Resolutions supported by flat displays:

Resolution	Color Depth
VGA (640 x 480 pixels)	256 colors

Table 31: IPC2000 - Resolutions Supported by Flat Displays

Information concerning parallel operation of display and monitor can be found in the "Technical Appendix" Chapter 8.2.

1.5.11 Keypad Module Connection

Various keypad modules can be connected here. Up to eight modules can operate with a controller if they are daisy chained. The keypad modules can be operated parallel to an optional AT Enhanced keyboard. They are described in detail in section 5.

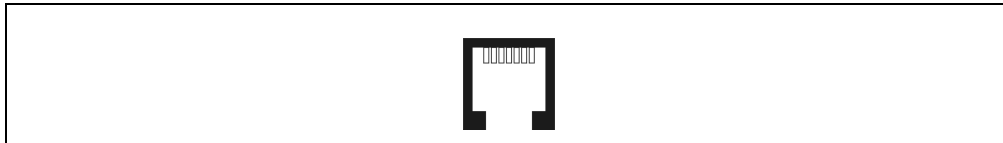


Figure 8: IPC2000 - Keypad Module Connection

Keypad Module	
DMA Channel	0/1
I/O Address	380h - 383h

Note:



1. The configuration is made with Mkey utilities (see "Provit Mkey Utilities User's Manual")
2. The keys are evaluated using the respective Mkey driver software.
3. A maximum of eight key modules and respectively, 128 keys (128 LEDs) can be operated.
4. A maximum of 48 LEDs can be turned on simultaneously.

1.5.12 Reset Button

Hardware can be reset using this button (cold restart).

1.5.13 Ethernet

The National DP83905 VQB ethernet controller, which is used in the 5C2000.07 controller is compatible to the NE2000 standard. This guarantees that the standard software available on the market (NOVELL, etc.) can be used for network applications. The network connection is made with a T connector. A RG58/50 W cable is used.



The ethernet connection is only available on the 5C2000.07 controller.

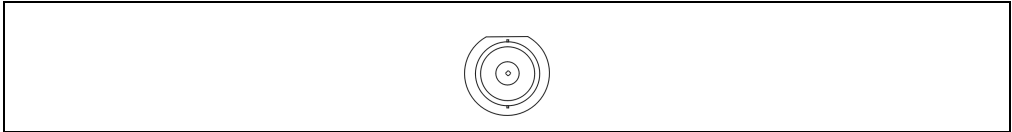


Figure 9: IPC2000 - Ethernet Connection

Setting	Ethernet
Interrupt	IRQ9
I/O Address	300h - 31Fh

1.5.14 Arcnet

The SMC COM20020 Arcnet controller which is used in the 5C2000.07 controller can be connected in an Arcnet network using a BNC socket. The connection is made with a T-connector. A RG62/93 W cable is used.



The Arcnet connection is only available on the 5C2000.07 controller.

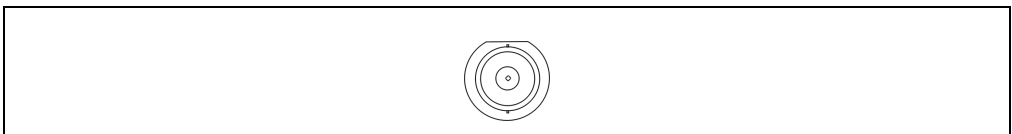


Figure 10: IPC2000 - Arcnet connection

Setting	Arcnet
Interrupt	IRQ15
I/O Address	340h - 347h

In order to use standard network software for Arcnet, you need the respective drivers from the manufacturer of the network software. B&R offers Arcnet Utilities for the OS-9/Net communication established by B&R.

1.5.15 PC Card Interface I and II

All controllers up to the 5C2000.01 are equipped either with a PC card interface (5C2000.02) or with two type II PC card interfaces. The slot is compatible with JEIDA version 4.1 and PCMCIA Standard Release 2.0. Memory cards, network cards, etc., can be inserted in the PC card interface.

Additional information can be found in Chapter 6, "Software".



Not all cards available on the market can be used with the drivers stored on the Provit PC Card Utilities disk (model number 5S0002.01-020). The required software is included in delivery when a PC card is purchased (e.g. network cards).

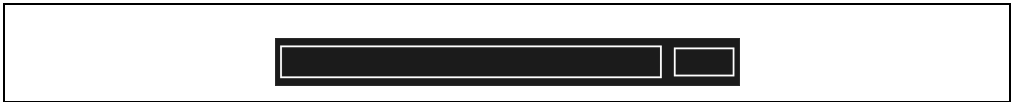


Figure 11: IPC2000 - PC Card Interface

1.5.16 Status LEDs

Two status LEDs, can be seen on the side of the controller.

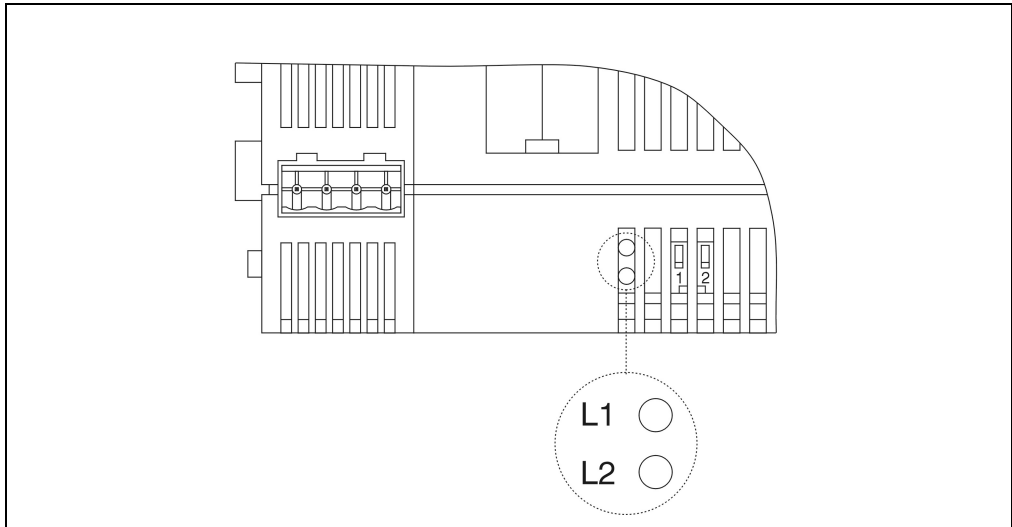


Figure 12: IPC2000 - Status LEDs

LED	Function
L1	Voltage supply is OK

Table 32: IPC2000 - Status LEDs

Controllers • IPC2000

LED	Function
L2	Temperature in the housing is too high (only for controllers; 5C2000.03, 5C2000.05 and 5C2000.07)

Table 32: IPC2000 - Status LEDs

Evaluating LED L2 in a Program

LED L2 (controllers 5C2000.03, 5C2000.05 and 5C2000.07) can be evaluated using software:

- Disable interrupt (necessary because the PC card controller also uses this address.)
- Read and store I/O address, 3E0h
- 'Write "1" to I/O address 3E0h
- Read I/O address 3E1h
- Bit 7 receives the LED status: 0 ... Temperature OK
 1 ... Temperature too high
- Set I/O address 3E0h to the value stored in step 2
- Enable interrupt

1.5.17 DIP Switch

A DIP switch, can be seen on the side of the controller.

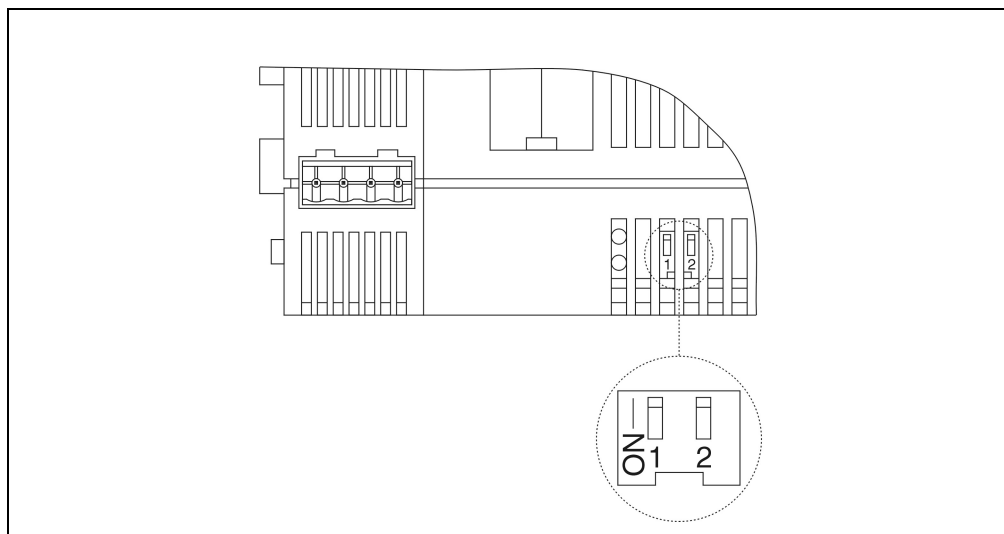


Figure 13: IPC2000 - DIP Switch

Switch Position	Function
"1" = ON	"Write enable" - The Flash PROM ¹⁾ can be programmed
"1" = OFF (Default)	"Write protect" - The Flash PROM ¹⁾ cannot be programmed

Table 33: IPC2000 - DIP Switch

Switch Position	Function
"2" = OFF (Default)	DIP switch 2, is reserved for B&R and must always remain in the "OFF" position!

Table 33: IPC2000 - DIP Switch

1) see "Device Driver for Internal FPROM"

1.5.18 Lithium Battery Compartment

The lithium battery is placed in a separate compartment and protected by a cover.

Battery Data: Lithium battery 3V / 950 mAh



According to CE regulations, the power supply must be removed from the controller for safety reasons when changing the lithium battery. The data in the internal CMOS and the time are lost when power is removed!

Lithium batteries are hazardous waste! Please consider the legal provisions for disposal in your area.

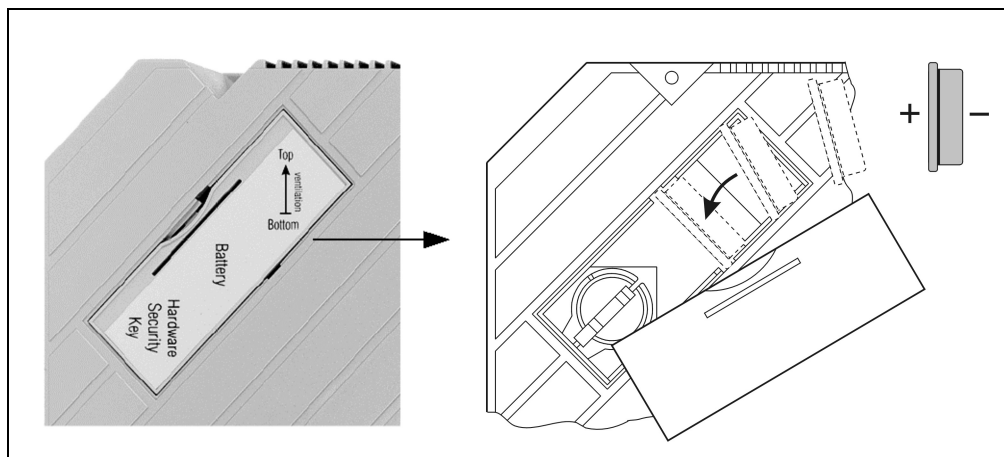


Figure 14: IPC2000 - Lithium Battery Compartment

1.5.19 Interact Hardware Key

Interact can be operated on all controllers except for 5C2000.01.

Controller with Rev. < 50.07

These controllers, must have an Interact key connected externally to LPT1 (starting with Interact Version 4.0). Interact keys are inserted internally on a slot for Version 3.0.

In order to get to the key slot, the housing cover must be removed.

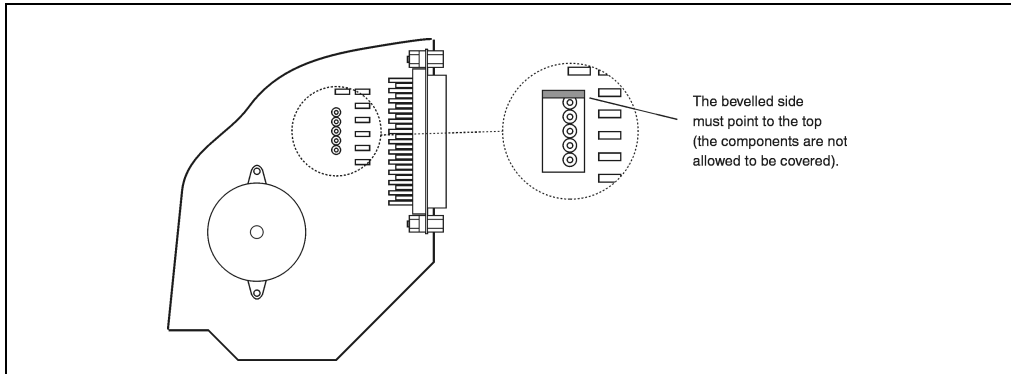


Figure 15: IPC2000 - Interact Hardware Key, Rev. < 50.07

Controller starting with Rev. 50.07

The Interact key slot is found in the battery compartment.

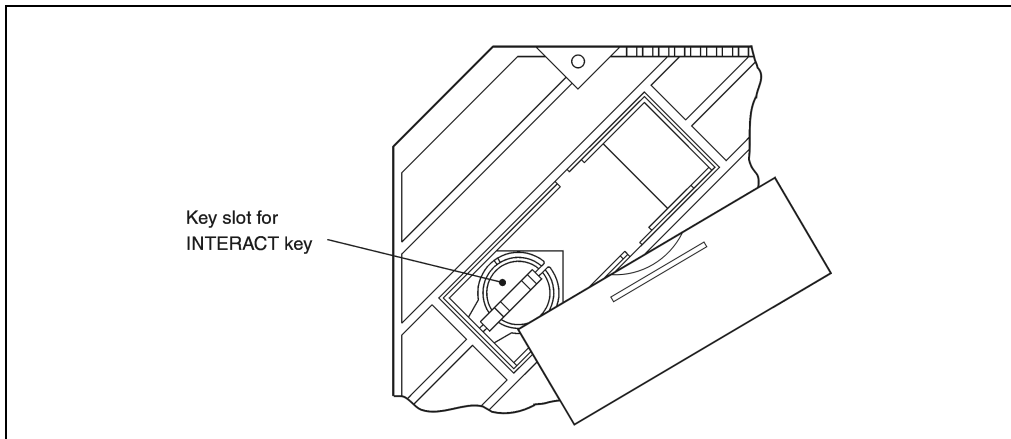


Figure 16: IPC2000 - Interact Hardware Key, Rev. ≥ 50.07

1.6 Distribution of Resources

1.6.1 RAM Address Assignments

RAM Address	Function
000000h - 0003FFh	Interrupt Vectors
000400h - 09FFFFh	MS-DOS Programs
0A0000h - 0AFFFFh	VGA Graphics
0B8000h - 0BBFFFh	VGA Text Mode
0C0000h - 0C7FFFh	VGA BIOS
0C8000h - 0CBFFFh	PC Card Boot
0CC000h - 0CFFFFh	Reserved for PROM
0D0000h - 0EFFFFh	Free
0F0000h - 0FFFFFFh	BIOS
100000h - 7FFFFFFh	DRAM (up to 8 MByte) ¹⁾
C00000h - DFFFFFFh	FPROM (up to 2 MByte) ²⁾
E00000h - E3FFFFh	SRAM (256 KByte)

Table 34: IPC2000 - Memory Assignments

1) The size of the DRAM depends on the controller:

Controller	DRAM
5C2000.01	2 MByte
5C2000.02	4 MByte
5C2000.03	4 MByte
5C2000.05	8 MByte
5C2000.07	8 MByte

Table 35: IPC2000 - DRAM

2) Controllers 5C2000.01 and 5C2000.02 are equipped with a FPROM. The size of the FPROM depends on the revision number:

Controller	Revision	Size	Address Range	Chip	Access
5C2000.01	xx.xx	512 KByte	C80000h - CFFFFFFh	28F020	16 bit
5C2000.02	< 50.07	1 MByte	C80000h - D7FFFFh	28F020	16 bit
	≥ 50.07	2 MByte	C00000h - DFFFFFFh	29F040	16 bit

Table 36: IPC2000 - FPROM

Information concerning FPROM programming can be found in chapter 6.1 "Provit2000 Utilities IPC2001".

1.6.2 I/O Address Assignments

I/O Address	Resource
000h - 01Fh	DMA Controller 1
020h - 03Fh	Interrupt Controller 1
040h - 05Fh	Timer
060h - 06Fh	Keyboard Controller
070h - 07Fh	Real-time Clock, NMI mask, CMOS
080h - 09Fh	Page Register DMA Controller
0A0h - 0BFh	Interrupt Controller 2
0C0h - 0DFh	DMA Controller 2
1F0h - 1F8h	Hard Disk
278h - 27Fh	Interact Key
2E8h - 2EFh	COM4
2F8h - 2FFh	COM2
300h - 31Fh	Ethernet
340h - 347h	Arcnet
378h - 37Fh	LPT1
380h - 382h	Keypad Modules
384h - 385h	CAN Controller
388h - 389h	Vpp FEPROM
38Ah - 38Fh	LCD DAC, Type Recognition
3B0h - 3BFh	Monochrome Display
3C0h - 3DFh	VGA Display
3E0h - 3E1h	PC Card Controller
3E8h - 3EFh	COM3
3F0h - 3F7h	Floppy Controller
3F8h - 3FFh	COM1

Table 37: IPC2000 - I/O Address Assignments

Keypad Modules		
I/O Address	Access	Function
380h	R/W	Data Register
381h	-/W	PL - Cycle
CAN Interface		
I/O Address	Access	Function
384h	-/W	Address Register
385h	R/W	Data Register
BIOS Vpp Control		
I/O Address	Access	Function
388h	-/W	Vpp On
389h	-/W	Vpp Off
LCD Contrast		
I/O Address	Access	Function
38Ah	-/W	DAC Select On
38Bh	-/W	DAC Select Off
38Ch	-/W	DAC Direction Up, Mode = Background Lighting
38Dh	-/W	DAC Direction Down, Modus = Contrast
38Eh	-/W	DAC Count
38Fh	-/W	DAC Count Inactive

Table 38: IPC2000 - B&R 38xh Address Assignments

1.6.3 DMA Channels

DMA Channel	Resource
0	Panelware
1	Panelware
2	Floppy Disk
3	Free
4	Reserved
5	Free
6	Free
7	Free

Table 39: IPC2000 - DMA Channels

1.6.4 Interrupts

Interrupt	All Controllers with Rev. < 50.07	Controller 5C2000.01 5C2000.02 5C2000.03 5C2000.05 with Rev. ≥ 50.07	Controller 5C2000.07 with Rev. ≥ 50.07
IRQ0	System Timer	System Timer	System Timer
IRQ1	Keyboard	Keyboard	Keyboard
IRQ2	Shared with Interrupt Controller 2	Shared with Interrupt Controller 2	Shared with Interrupt Controller 2
IRQ3	COM2	COM2 / PC Card Controller ¹⁾	COM2 / PC Card Controller ¹⁾
IRQ4	COM1 and COM3	COM1 / PC Card Controller ¹⁾	COM1 / PC Card Controller ¹⁾
IRQ5	Keypad Modules	PC Card Controller	PC Card Controller
IRQ6	Disk Drive	Disk Drive	Disk Drive
IRQ7	LPT1	LPT1	LPT1
IRQ8	Real-time Clock	Real-time Clock	Real-time Clock
IRQ9	VGA Controller	PC Card Controller ¹⁾	Ethernet / PC Card Controller ¹⁾
IRQ10	CAN Controller	CAN Controller	CAN Controller
IRQ11	PC Card Controller	COM3	COM3
IRQ12	PC Card Controller	COM4 / PC Card Controller ¹⁾	COM4 / PC Card Controller ¹⁾
IRQ13	--	--	Co-processor
IRQ14	Hard Disk / PC Card Controller	Hard Disk / PC Card Controller	Hard Disk / PC Card Controller
IRQ15	PC Card Controller	PC Card Controller	Arcnet

Table 40: IPC2000 – Interrupt Assignments

1) The PC Card Controllers interrupts can be set with software - PC Card Controller Configuration. The interrupts 3 and 4 for PC Cards can be set electrically (e.g. for PC Card Modem). However, this can cause conflicts during the operation of COM2 or COM1. That means, the interfaces COM1 and COM2 must be turned off for this type of operation (with software).

1.7 Accessories

Accessories are included with the delivery of all controllers. They are packed together with the module.

Accessories	Amount
Screws: - Screws for plastic housing - Screws with M3 threads	4 4
4 Pin Terminal Block	1

Table 41: IPC2000 – Accessories

1.8 BIOS

1.8.1 General Information

BIOS stands for "Basic Input Output System". It is the most basic standardized connection with the system. When compared with a standard PC, the Provit 2000 BIOS offers several features that enable it to be used in an industrial environment. These include:

- Different Boot Media: Hard Disk
 Floppy Disk
 FEPROM
 SRAM PC
 Card
- Automatic Display Recognition

1.8.2 BIOS Setup Menu

Entering the BIOS Setup Menu is done by pressing the [F2] key during or immediately after the system RAM check. The desired items can be selected from the menu.

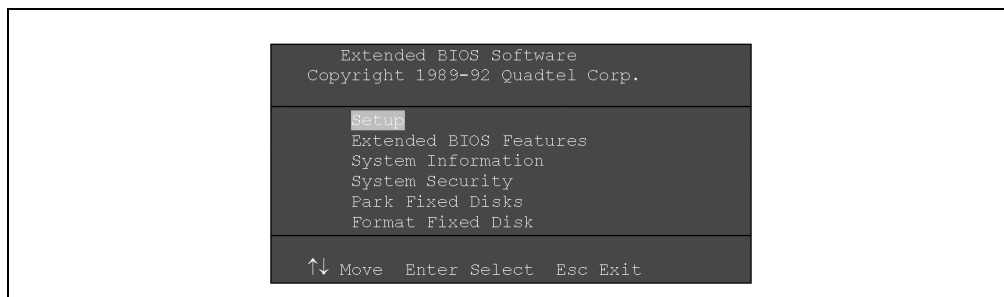


Figure 17: BIOS Setup Menu

Setup

The settings for the operation of an external disk drive and a printer are made with BIOS Setup. The settings that need to be made are shown with a gray background (see next page).

The COM1 and COM2 interfaces can be turned off using the BIOS Setup. The settings are shown at the end of the section (gray background).

Controller 5C2000.01

The 5C2000.01 controller is only equipped with a 25 pin DSUB connector. It is used alternatively as the interface for the external disk drives or as printer interface.

Settings for the External Disk Drive:

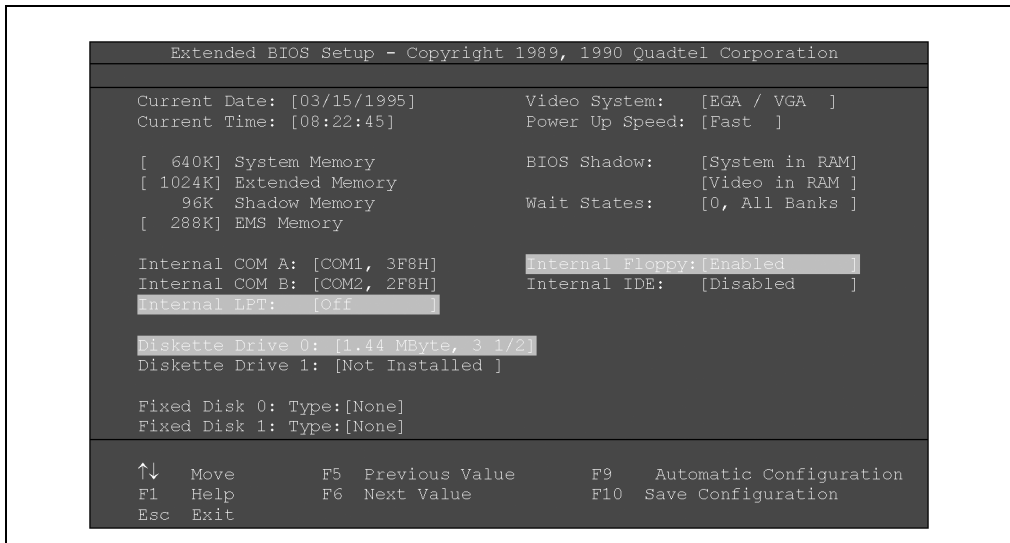


Figure 18: Settings for the External Disk Drive

Settings for the Printer Interface:

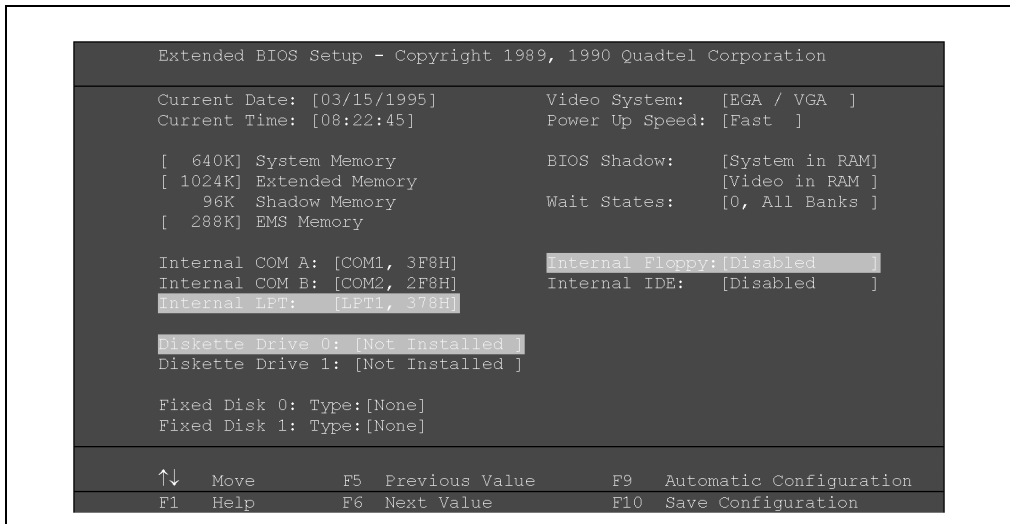


Figure 19: Settings for the Printer Interface

Controller 5C2000.02

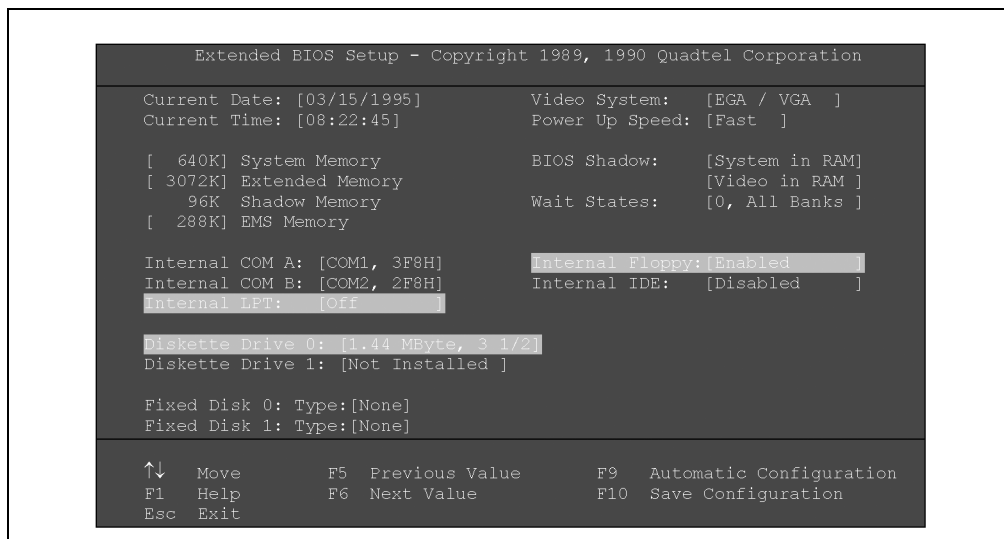


Figure 20: Controller 5C2000.02

Controller 5C2000.03

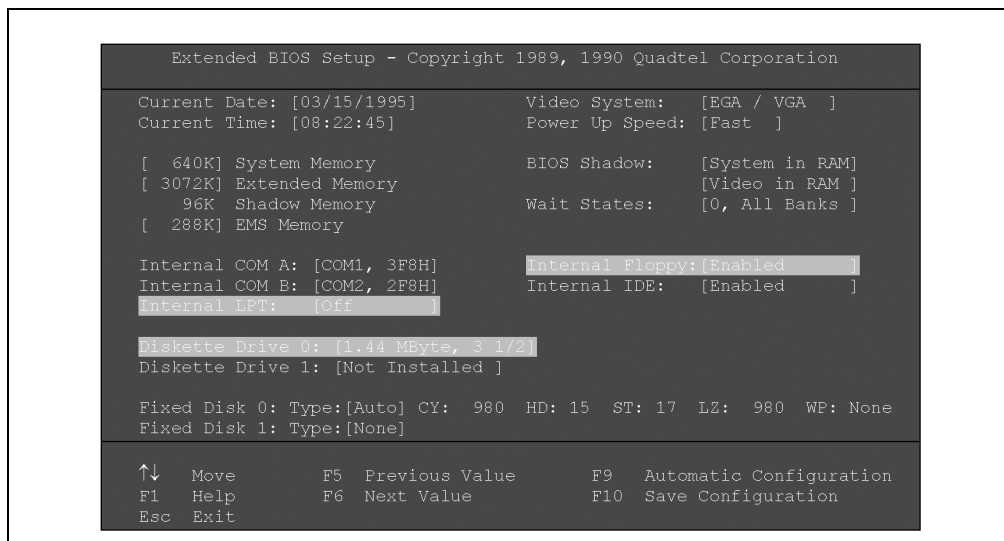


Figure 21: Controller 5C2000.03

Controller 5C2000.05

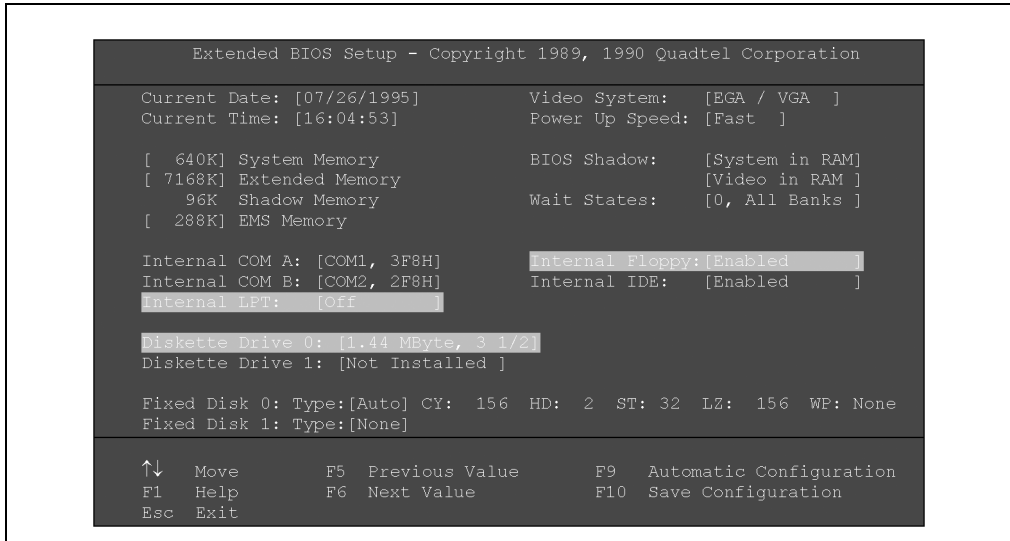


Figure 22: Controller 5C2000.05

Controller 5C2000.07

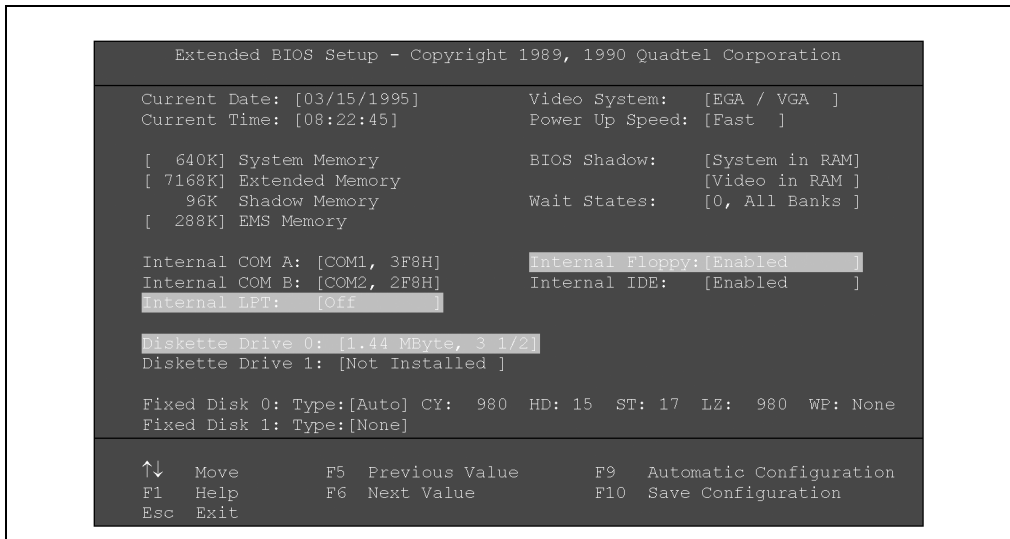


Figure 23: Controller 5C2000.07

Turning OFF Serial Interfaces COM1 and COM2

Using the BIOS Setup, COM1 (Internal COM A) and COM2 (Internal COM B) can be turned off (by setting "Off").

Example with 5C2000.07 Controller:

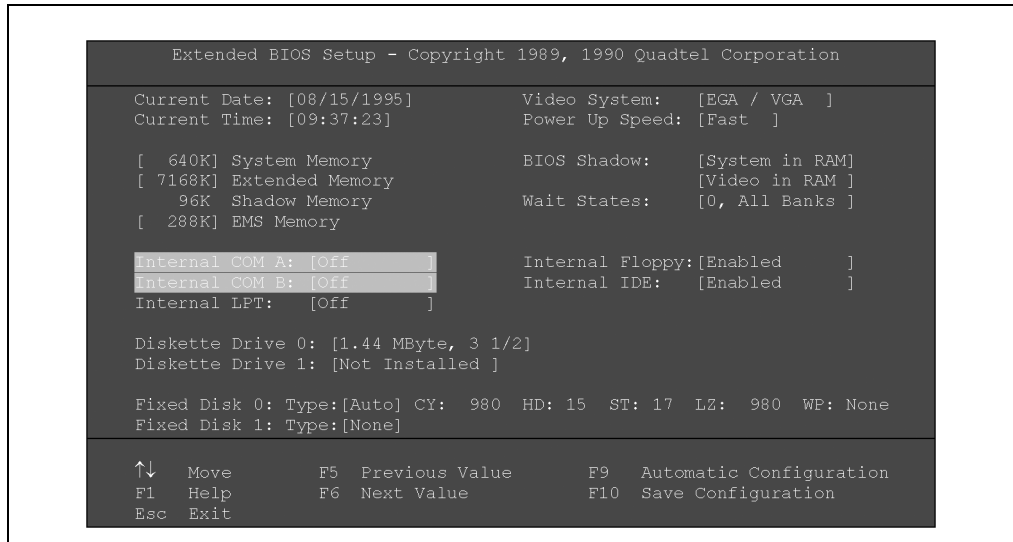


Figure 24: Turning OFF Serial Interfaces COM1 and COM2

Internal COM A (COM1): Off:

The I/O address 3F8h is enabled and is available for other system components (PC cards). IRQ4 is also available.

Internal COM B (COM2): Off:

The I/O address 2F8h is enabled and is available for other system components (PC cards). IRQ3 is also available.



If the controller also provides COM3 and COM4, they will be entered in the ROS (Resident Operating System) variable range as COM1 and COM2.

1.8.3 Extended BIOS Features

To speed up the start procedure, booting from the disk station and the memory check can be turned off. The following settings are required to do this:

The entry "Quick Boot" must be set to "Yes" under the menu item, "Extended BIOS Features".

1.8.4 System Information

The following system information is shown on the display:

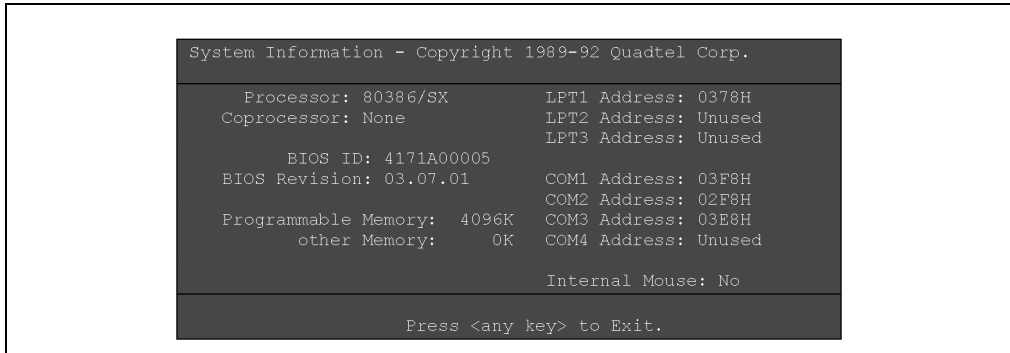


Figure 25: System Information

1.8.5 System Security

A password can be set with the help of this menu. The system only boots after the password is entered.

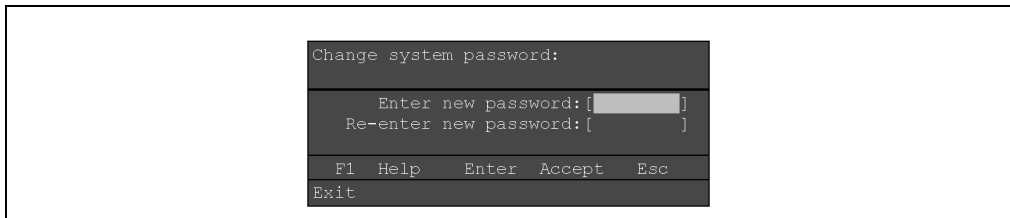


Figure 26: System Security

1.8.6 Park Fixed Disk

The hard disk parks itself when the device is turned off. Therefore, the menu item "Park Fixed Disks" does not have to be considered.

1.8.7 Format Fixed Disk



Do not call the menu item, "Format Fixed Disks"! Activating this item damages the hard disk.

1.9 Boot Procedure

1.9.1 Initialization

The important steps in the initialization procedure are described in the following section:

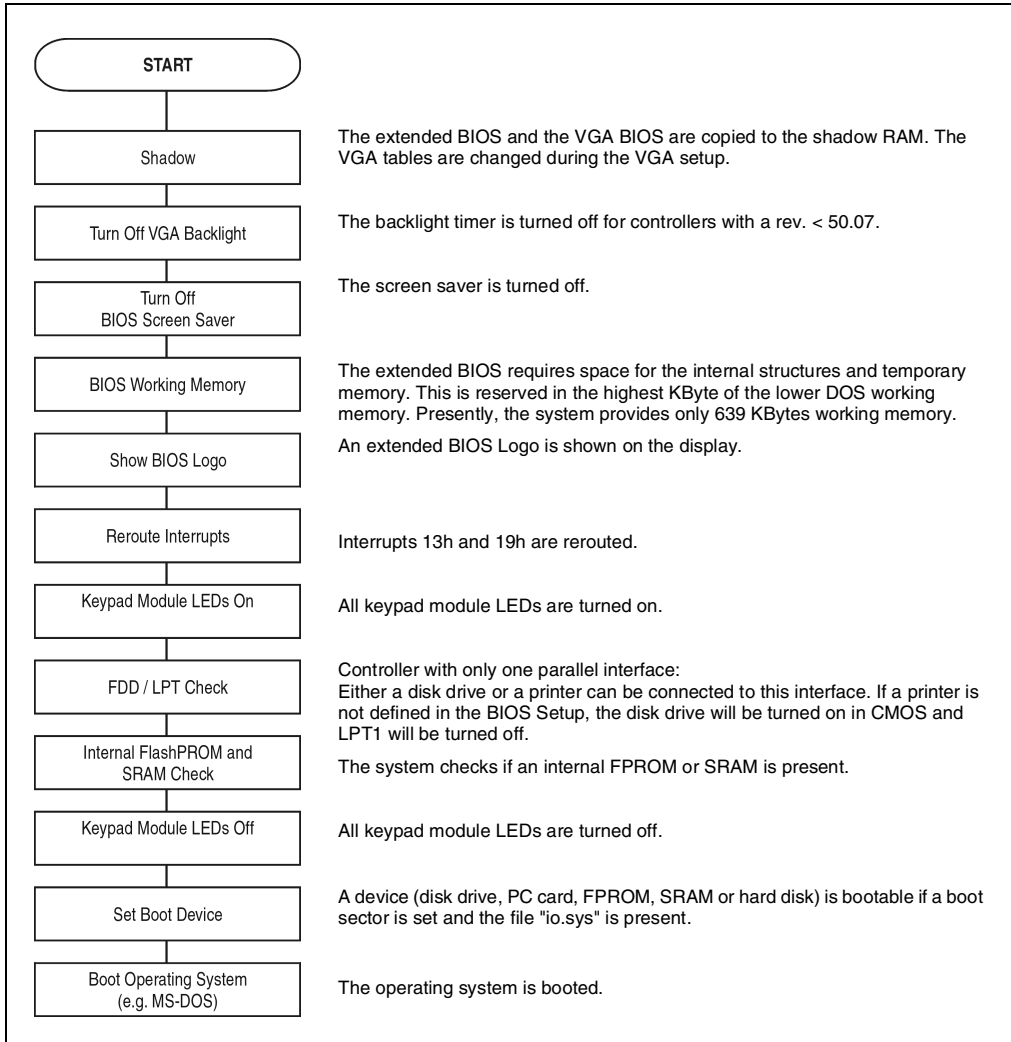


Figure 27: Boot Procedure - Initialization

1.9.2 Boot Order

The system searches for a bootable device according to a predefined order. This is set as follows:

- Disk Drive
- PC Card (slot 1 and 2)
- FEPROM
- SRAM
- Hard Disk

A table shown on the display (monitor), indicates the drives that are present as well as the selected boot device. All drives that are present are shown with a "*" in the line labeled "present". The selected boot device is shown with a "*" in the line labeled "start". Another line shows the DRAM size (extended memory).

If the system cannot be booted successfully, an error message is given.

A successful boot procedure from a hard disk is shown below for a 5C2000.07 controller:

- the controller provides a disk drive, a PC card controller (one slot) and a hard disk
- the controller is booted from the hard disk
- the controller provides 8 MBytes extended memory

	Floppy	PCMCIA	FEPROM	SRAM	HDD
present	*	*			*
start					*
Extended Memory: 8 MByte					

Figure 28: Boot Order

Remarks

1. PC Card Controller

The system sets up the PC Card controller. The memory window is put in another area according to the memory configuration. The size of the window is a maximum of 2 MBytes. The card is then checked by the system to see if it is bootable.. A card is bootable if a boot sector is set and the file "io.sys" is present.

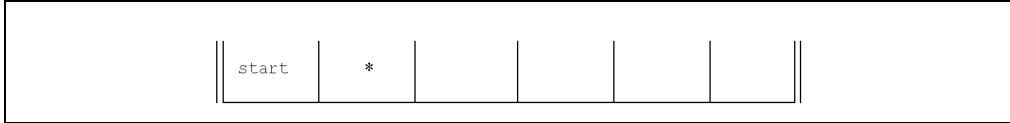


Figure 29: PC Card Controller

2. Boot Error

A boot error occurs if none of the drives provided in the system can be booted. The line in the table labelled "start" is still shown by the system.

One of the following error messages will then be given:

"Boot sector not found"

"Please reconfigure the system"

"Insert boot disk and strike a key when ready"

Pressing a key will cause the boot procedure to be repeated. The system automatically attempts to boot from the disk drive (bootable disk must be inserted).

3. DRAM size

Shows the DRAM size (extended memory).



Drive name assignments (e.g. under MS-DOS). See chapter 6.2.2 "Assigning a Drive Designation".

2. IPC2001

2.1 General Information

Complete compatibility to the IPC2000 controller was given high priority when developing the new IPC2001. The mechanical dimensions, electrical properties and software (BIOS) make it possible to run existing application software without having to make additional changes.

- The most important differences as compared to the IPC2000 are:
- Better computing power using new processors with built-in math processor (80486DX2-66 MHz, 80486DX5-133 MHz)
- Faster graphics controller (65550) with local bus interface and 1 MByte video memory
- More memory (8 to 32 MByte, for e.g. MS-Windows® 95, MS-Windows® NT, etc.)
- ISA Adapter for a 16 Bit ISA card
- Integral battery voltage monitoring
- Backup of CMOS Setup data in FEPROM

2.2 IPC2001 Controller Overview

The most important data is shown in the following table. Detailed descriptions of each controller can be found at the end of this chapter.

Resource	5C2001.01	5C2001.02	5C2001.03	5C2001.05 ¹⁾	5C2001.07	5C2001.15
Processor	486DX2 66 MHz	486DX2 66 MHz	486DX5 133 MHz	486DX2 66 MHz	486DX5 133 MHz	486DX2 66 MHz
DRAM ²⁾ (1 PS/2 SIMM Slot)	8 MByte	8 MByte	8 MByte	8 MByte	8 MByte	8 MByte
Mass Memory	Compact-Flash ³⁾ ATA / True IDE	- Hard Disk	2.1 GByte ⁴⁾ Silicon Disk	ATA / True IDE 20 MByte	Hard Disk 2.1 GByte ⁴⁾	Compact-Flash ³⁾ ATA / True IDE
SRAM (256 KByte) FPROM (2 MByte)	✓ ✓	✓ ✓	- -	✓ -	✓ -	✓ -
Network	- -	- -	- -	- -	Ethernet Arcnet	- -
Operating Voltage	24 VDC (±6V)					
Serial Interfaces (16 Byte FIFO)	COM1 COM2 -	COM1 COM2 COM3 -	COM1 COM2 COM3 COM4	COM1 COM2 COM3 COM4	COM1 COM2 COM3 COM4	COM1 COM2 COM3 COM4
LPT1 (bidirectional)	✓	✓	✓	✓	✓	✓
CAN Field Bus	✓	✓	✓	✓	✓	✓
Fan	-	-	✓	-	✓	-
Altitude	Max. 3,000m					

Table 42: IPC2001 Controller Overview

1) Controller 5C2001.05 has been replaced by controller 5C2001.15

2) Cannot be added by the user!

3) Compact Flash is not included in the delivery! Compact Flash is presently available with 20 MByte or 192 MByte and can be exchanged by the user. Model numbers are listed in Chapter 1.6.5.

4) Starting with Rev. F0 this controller has a 6GB Hard Disk (see chapter 8.8, "Technical Data - 6GB Hard Disk")

Resource	5C2001.16	5C2001.21	5C2001.22			
Processor	486DX2 66 MHz	486DX5 133 MHz	486DX5 133 MHz			
DRAM ¹⁾ (1 PS/2 SIMM Slot)	8 MByte	32 MByte	32 MByte			
Mass Memory	Compact-Flash ²⁾ ATA / True IDE	Hard Disk 2.1 GByte ³⁾	Compact-Flash ²⁾ ATA / True IDE			
SRAM (256 KByte) FPROM (2 MByte)	✓ -	- -	✓ -			
Network	Ethernet -	Ethernet -	Ethernet -			
Operating Voltage	24 VDC (±6V)					
Serial Interfaces (16 Byte FIFO)	COM1 COM2 COM3 COM4	COM1 COM2 COM3 COM4	COM1 COM2 COM3 COM4			
LPT1 (bidirectional)	✓	✓	✓			
CAN Field Bus	✓	✓	✓			
Fan	-	✓	✓			
Altitude	Max. 3,000m					

Table 43: IPC2001 Controller Overview

1) Cannot be added by the user!

2) Compact Flash is not included in the delivery! Compact Flash is presently available with 20 MByte or 192 MByte and can be exchanged by the user. Model numbers are listed in Chapter 1.6.5.

3) Starting with Rev. F0 this controller has a 6GB Hard Disk (see chapter 8.8, "Technical Data - 6GB Hard Disk")

2.3 IPC2001 Dimensions

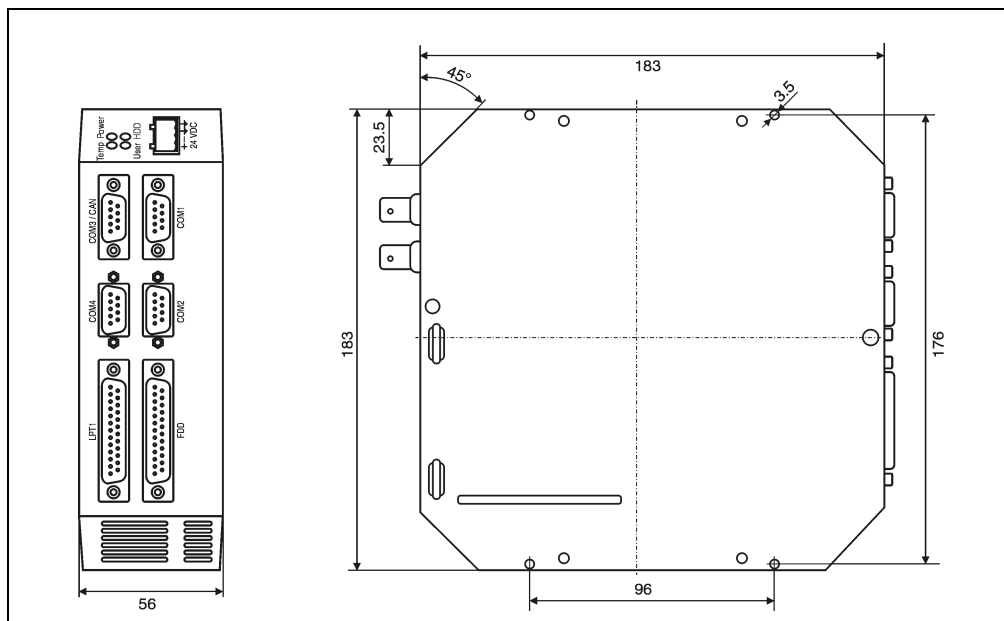


Figure 30: IPC2001 - Controller Dimensions

2.4 Mounting Instructions

- Controllers with a fan are required to be mounted with the fan facing up.
- In order to guarantee sufficient air circulation, allow a distance of at least 10 cm between the fans and all other objects.
- The controller can be mounted at a maximal angle of 45°

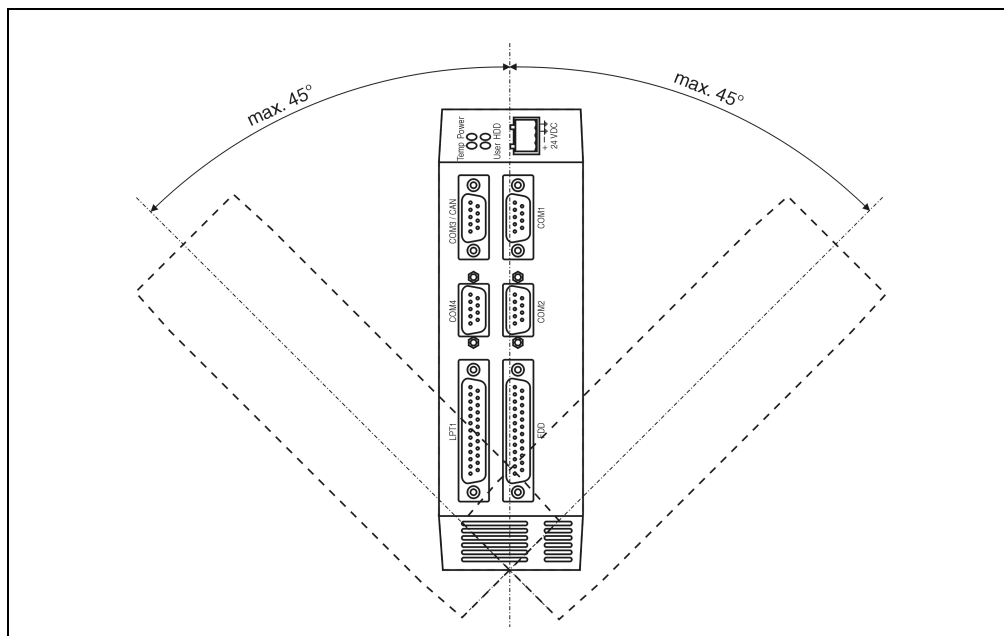


Figure 31: IPC2001 - Mounting Instructions

2.5 Component Overview

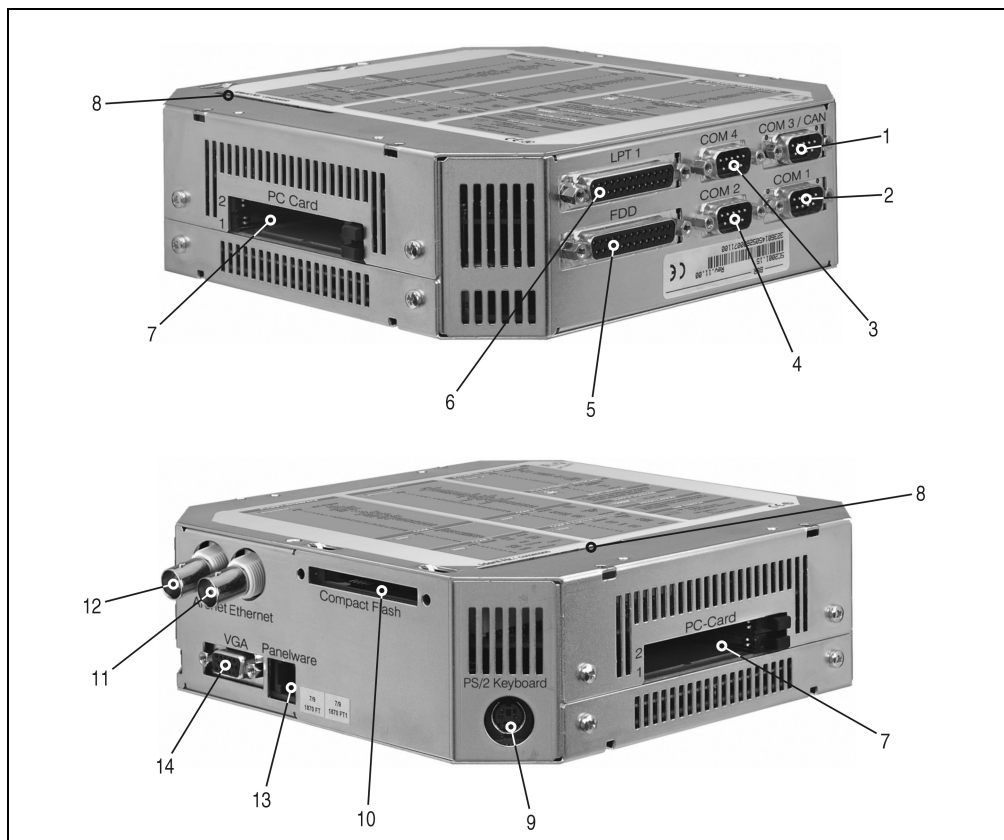


Figure 32: IPC2001 - Component Overview

- | | | | |
|---|-------------------------------|----|------------------------|
| 1 | COM3 / CAN Interface* | 8 | ISA Extension |
| 2 | COM1 Interface | 9 | PS/2 External Keyboard |
| 3 | COM4 Interface* | 10 | Compact Flash Slot* |
| 4 | COM2 Interface | 11 | Ethernet ¹⁾ |
| 5 | Floppy Interface | 12 | Arcnet ¹⁾ |
| 6 | Standard LPT1 (bidirectional) | 13 | Panelware |
| 7 | PC Card / PCMCIA I, II, III | 14 | External VGA Monitor |

1) according to controller type

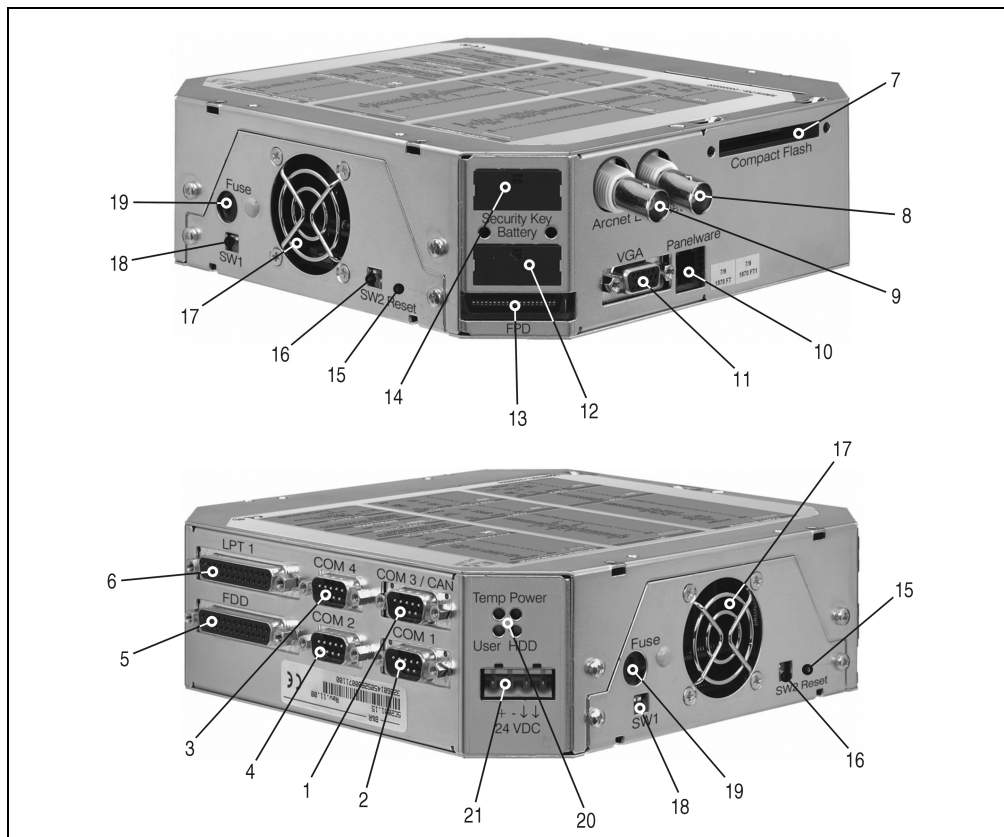


Figure 33: IPC2001 - Component Overview

- | | | | |
|----|------------------------------------|----|------------------------|
| 1 | COM3 / CAN Interface ¹⁾ | 12 | CMOS Battery (RTC) |
| 2 | COM1 Interface | 13 | Flat Display Connector |
| 3 | COM4 Interface* | 14 | Hardware Security Key |
| 4 | COM2 Interface | 15 | Reset Button |
| 5 | Floppy Interface | 16 | DIP Switch 2 |
| 6 | Standard LPT1 (bidirectional) | 17 | Fan* |
| 7 | Compact Flash Slot* | 18 | DIP Switch 1 |
| 8 | Ethernet* | 19 | Fuse Holder |
| 9 | Arcnet* | 20 | Status LEDs |
| 10 | Panelware | 21 | Power Supply |
| 11 | External VGA Monitor | | |

1) according to controller type

2.6 Component Descriptions

2.6.1 Power Supply

Input Voltage: 24 V DC ($\pm 6V$)



The $\perp$ pins are to be connected to the ground with the shortest possible cable. If the controller is installed in a switching cabinet, the connection cable may not be longer than 15 cm.

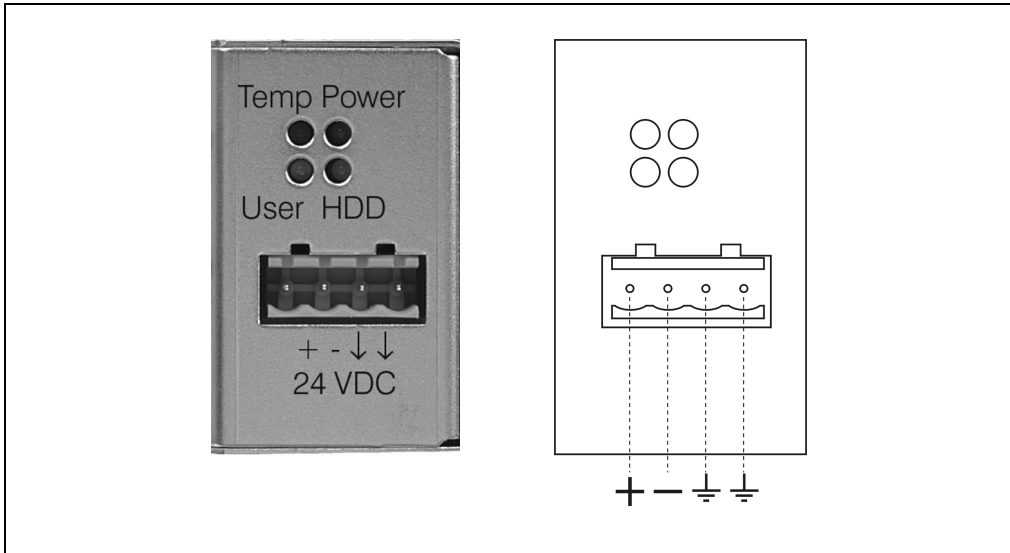


Figure 34: IPC2001 - Controller Power Supply



Performance data can be found in chapter 8.4!

2.6.2 COM1 - RS232

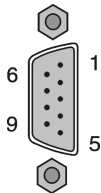
COM1		
RS232 interface Not electrically isolated up to 115 kBaud		9 pin DSUB plug 
Pin	RS232	
1	DCD	
2	RXD	
3	TXD	
4	DTR	
5	GND	
6	DSR	
7	RTS	
8	CTS	
9	RI	

Table 44: IPC2001 – COM1 Pin Assignments

Default setting	COM1
Interrupt	IRQ4
I/O Address	3F8h - 3FFh

Table 45: IPC2001 - Default Settings for COM1

These settings can be changed in BIOS under "INTEGRATED PERIPHERALS" (see chapter 2.2.9.8)

2.6.3 COM2 - RS232/TTY

COM2		
RS232/TTY Interface Not electrically isolated RS232: up to 115 kBaud TTY: up to 115 kBaud		
Pin	RS232	TTY
1		TXD
2	RXD	
3	TXD	
4	DTR	
5	GND	TXD Ret
6		RXD
7	RTS	
8	CTS	
9		RXD Ret

9 pin DSUB plug

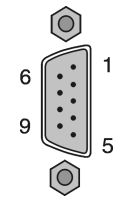


Table 46: IPC2001 – Pin Assignments COM2

Default setting	COM2
Interrupt	IRQ3
I/O Address	2F8h - 2FFh

Table 47: IPC2001 – Default Settings for COM2

These settings can be changed in BIOS under "INTEGRATED PERIPHERALS" (see chapter 2.2.9.8)

The interface is selected automatically:

Interface	Selection
RS232	After start up or a hardware reset, COM2 is set to RS232 mode.
TTY	As soon as current flows through the TTY receiver (TTY must be connected), the interface is switched to TTY.

2.6.4 COM3 - RS485/TTY/CAN

COM3			
RS485 / TTY / CAN Interface Electrically isolated from the system ground No isolation between interface types 16 Bytes FIFO RS485: up to 115 kBaud TTY: up to 115 kBaud			
Pin	RS485	TTY	CAN
1		TXD	
2			CAN L
3			GND
4		RXD	
5	DATA		
6	GND	TXD Ret	
7			CAN H
8	DATA\		
9		RXD Ret	

9 pin DSUB plug

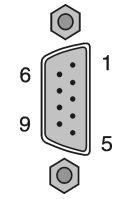


Table 48: IPC2001 – Pin Assignments COM3

Default setting	COM3
Interrupt	IRQ11
I/O Address	3E8h - 3EFh

Table 49: IPC2001 – Default Settings for COM3

Note: Controller 5C2001.01 has no COM3, IRQ11 and the I/O addresses are free!

The interface is selected automatically:

Interface	Selection
TTY	As soon as current flows through the TTY receiver (TTY must be connected), the interface is switched to TTY. Note: To use TTY mode, the RTS line cannot be actively connected!
RS485	As soon as the RS485 Sender (RTS) is turned on, RS485 becomes active.
CAN	Active, when connected

Table 50: IPC2001 - COM3 Interface Selection

The Intel 82527 processor is used as CAN controller. The controller used by B&R complies with the CAN specification 2.0B. Protocols Standard CAN and Extended CAN can be used on a bus.

Setting	CAN
Interrupt ¹⁾	IRQ10
I/O Address	384h - 385h

Table 51: IPC2001 - CAN Settings

1) CAN can be assigned an interrupt in the BIOS Setup menu under "Additional Peripherals". However, this only functions if a CAN controller is installed (Default Setting: IRQ10).

I/O Address	Register	Function
384h	Address Register	Defines the register number to access.
385h	Data Register	Access of the register defined in the address register.

Table 52: IPC2001 - CAN Address Register

Additional information concerning the CAN bus can be found in the Technical Appendix.

2.6.5 COM4 - RS232/RS422

COM4		
RS232/RS422 interface electrically isolated 16 Bytes FIFO RS232: up to 115 kBaud RS422: up to 19200 Baud		
Pin	RS232	RS422
1		TXD
2	RXD	
3	TXD	
4		TXD
5	GND	GND
6		RXD
7	RTS	
8	CTS	
9		RXD

9 pin DSUB plug

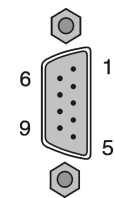


Table 53: IPC2001 – Pin Assignments COM4

Default setting	COM4
Interrupt	IRQ12
I/O Address	2E8h - 2EFh

Table 54: IPC2001 – Default Settings for COM4

The interface is selected automatically. The interface connected is recognized as being active.

Note: Controllers 5C2001.01 and 5C2001.02 have no COM4, IRQ12 and the I/O addresses are free!



The RS422 interface can also be used as an RS485 interface. Tristate switching takes place via RTS.

Wiring:

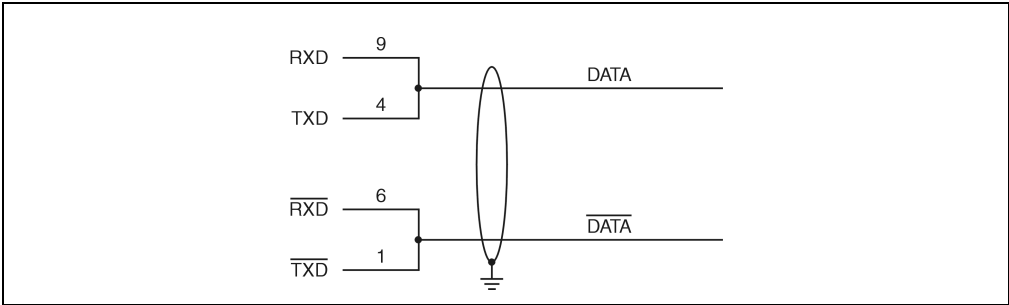


Figure 35: IPC2001 - Tristate Switching

2.6.6 Connection for External Disk Drive

An external disk drive can be connected to this 25 pin DSUB socket.
(see Chapter 7.5 "Accessories" for Disk Drive)

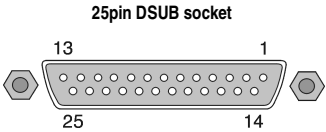
Connection for External Disk Drive					
Pin	Assignment		Pin	Assignment	
1	n.c.		14	Density	
2	Index		15	Side Select	
3	Track 0		16	Direction	
4	Write Protect		17	Step	
5	Read Data		18	GND	
6	Disk. Chan.		19	GND	
7	n.c.		20	GND	
8	n.c.		21	GND	
9	+5 V		22	GND	
10	Drive Select		23	GND	
11	Motor on		24	GND	
12	Write Data		25	GND	
13	Write Gate				

Table 55: IPC2001 – Pin Assignment for External 3.5" Disk Drive Connector

Setting	LPT1
Interrupt	IRQ6
I/O Address	3F0h-37Fh

Table 56: IPC2001 – Settings for External Disk Drive



Because of general PC specifications, this interface should be used with extreme care concerning EMC, location of cables, etc. Therefore it should only be used for service! This interface cannot be configured as a parallel interface!

2.6.7 Parallel Interface LPT1

Parallel interface LPT1 uses a 25 pin DSUB socket.

Parallel Interface LPT1				
Pin	Assignment		Pin	Assignment
1	Data Strobe		14	Autofeed
2	Data 0		15	Error
3	Data 1		16	Printer Init
4	Data 2		17	Printer Select Input
5	Data 3		18	GND
6	Data 4		19	GND
7	Data 5		20	GND
8	Data 6		21	GND
9	Data 7		22	GND
10	Acknowledge		23	GND
11	Busy		24	GND
12	Paper End		25	GND
13	Printer Select Status			

25pin DSUB socket

Table 57: IPC2001 – LPT1 Interface Pin Assignment

Default Settings	LPT1
Interrupt	IRQ7
I/O Address	378h - 37Fh

Table 58: IPC2001 – Default Settings for LPT1

2.6.8 AT Enhanced Keyboard Connection

An external AT keyboard is connected using a PS/2 connector. The external AT keyboard works parallel to optional keypad modules.

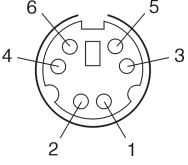
AT Enhanced Keyboard Connection		
Pin	Assignment	
1	KBDATA	
2		
3	GND	
4	+5 V	
5	KBCLK	
6		

Table 59: IPC2001 – Pin Assignments PS/2 Socket



Because of general PC specifications, this interface should be used with extreme care concerning EMC, location of cables, etc. Therefore it should only be used for service!

2.6.9 Monitor Connection

A monitor (CRT) can be connected to the controller via a 15 pin DSUB socket.

Monitor Connection				
Pin	Assignment		Pin	Assignment
1	Red		9	n.c.
2	Green		10	GND
3	Blue		11	n.c.
4	n.c.		12	n.c.
5	GND		13	HSYNC
6	GND		14	VSYNC
7	GND		15	n.c.
8	GND			

15 pin DSUB socket

Table 60: IPC2001 – Pin Assignments External VGA Connection

The VGA controller (C&T 65550) used in the IPC2001 is equipped with 1 MByte memory.

Resolutions supported by monitors (CRT):

Resolution	Color Depth
VGA (640 x 480 pixels)	16.7 Mill. colors
SVGA (800 x 600 pixels)	65,536 colors
XGA (1024 x 768 pixels)	256 colors

Table 61: IPC2001 - Resolutions Supported by (CRT) Monitors

Information concerning parallel operation of display and monitor can be found in the "Technical Appendix" Chapter 8.2.

2.6.10 Display Unit Connection

The connection to the controller is made with a ribbon cable.

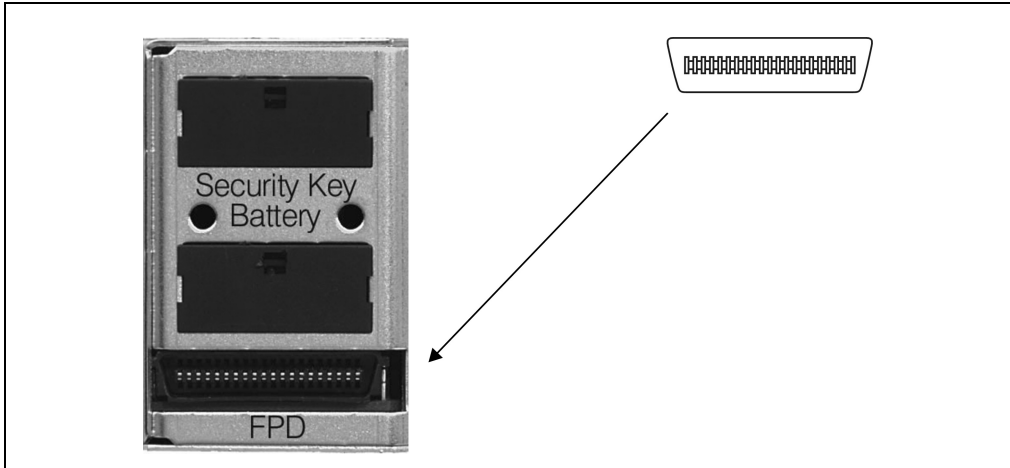


Figure 36: IPC2001 - Display Unit Connection

The VGA controller (C&T 65550) used in the IPC2001 is equipped with 1 MByte memory.

Resolutions supported by flat displays:

Resolution	Color Depth
VGA (640 x 480 pixels)	262,144 colors

Table 62: IPC2001 - Resolutions Supported by Flat Displays

Information concerning parallel operation of display and monitor can be found in the "Technical Appendix" Chapter 8.2.

2.6.11 Keypad Module Connection

Various keypad modules can be connected here. Up to eight modules can operate with a controller if they are daisy chained. The keypad modules can be operated parallel to an optional AT Enhanced keyboard. They are described in detail in section 5.

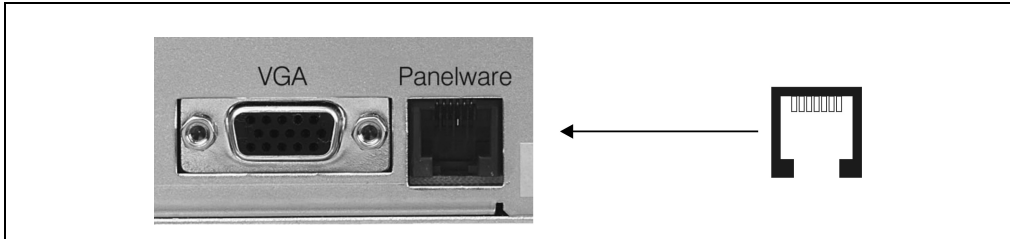


Figure 37: IPC2001 - Keypad Module Connection

Keypad Module	
DMA Channel	0/1
I/O Address	380h - 383h

Note:



- 1.The configuration is made with Mkey utilities (see "Provit Mkey Utilities User's Manual")
- 2.The keys are evaluated using the respective Mkey driver software.
- 3.A maximum of eight key modules and respectively, 128 keys (128 LEDs) can be operated.
- 4.A maximum of 48 LEDs can be turned on simultaneously.

2.6.12 Ethernet

The National DP83905 VQP ETHERNET controller used is compatible to the NE2000 standard. This guarantees that the standard software available on the market (NOVELL, etc.) can be used for network applications. The connection is made with a T-connector. A RG58/50 cable is used.

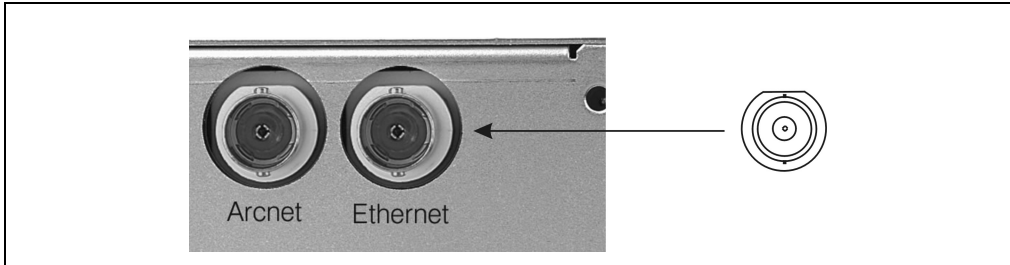


Figure 38: IPC2001 - Ethernet Connection

Setting	Ethernet
Interrupt	IRQ9
I/O Address	300h - 31Fh

2.6.13 Arcnet

The SMC COM20020 Arcnet controller which is used in the 5C2000.07 controller can be connected in an Arcnet network using a BNC socket. The connection is made with a T-connector. A RG62/93 W cable is used.

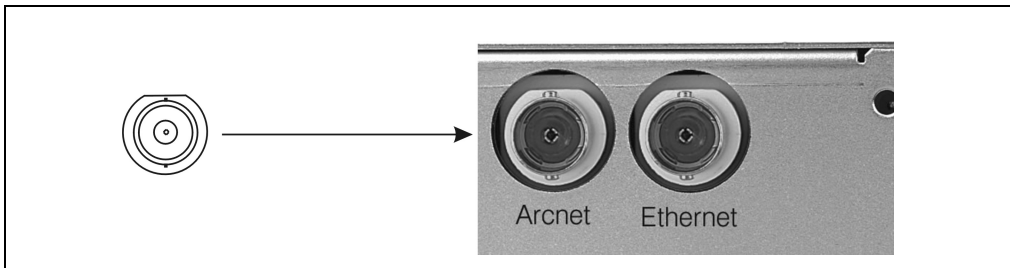


Figure 39: IPC2001 - Arcnet connection

Setting	Arcnet
Interrupt	IRQ15
I/O Address	340h - 347h

In order to use standard network software for Arcnet, you need the respective drivers from the manufacturer of the network software. B&R offers Arcnet Utilities for the OS-9/Net communication.

2.6.14 PC Card Interface

Some controller types are equipped with a PC Card Interface (either 2 x Type I / 2 x Type II / 1 x Type III can be inserted). The slot is compatible with JEIDA Vers. 4.1 and PCMCIA Standard Release 2.0. Memory cards, network cards, etc. can be inserted in the PC Card Interface.

Additional information can be found in chapter 6.1.5 "Device Driver for External PC Card - "brpcmcia.sys" and in chapter 7.3.1 "PC Card Data Type I / II / III".

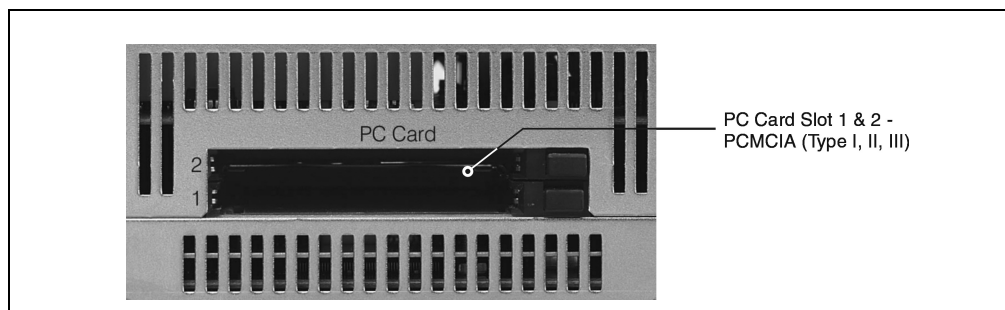


Figure 40: IPC2001 - PC Card Slot 1 & 2



Not all cards found on the market can be used with the drivers stored on the Provit PC Card Utilities disk. The required software is included in delivery when a PC card is purchased (e.g. network cards).



Starting with newer IPC2001 revisions (see Table 63, "VG469 on IPC2001", on page 88), a new PCMCIA controller (VG469) is used. For the controller to work properly, the following BIOS version must be used: IPC2001 starting with BIOS Version 1.06 or higher. All current deliveries are equipped with the correct BIOS Version or higher. Systems with older BIOS versions must be updated.

5C2001.02	5C2001.03	5C2001.07	5C2001.15	5C2001.16	5C2001.21	5C2001.22
Starting with revision G0	Starting with revision H0	Starting with revision H0	Starting with revision G0	Starting with revision H0	Starting with revision H0	Starting with revision D0

Table 63: VG469 on IPC2001

Model Number	Description	Remark
9A0009.01	PC Card Flash 6 MByte PC Card ATA Flash 6 MB Type II PCMCIA 6 MB FPROM, True IDE/ATA	Cancelled!

Table 64: IPC2001 - PC Cards

Model Number	Description	Remark
9A0009.02	PC Card Flash 40 MByte PC Card ATA Flash 40 MB Type II PCMCIA 40 MB FEPROM, True IDE/ATA	<i>Cancelled!</i>
9A0009.03	PC Card Flash 20 MByte PC Card ATA Flash 20 MB Type II PCMCIA 20 MB FEPROM, True IDE/ATA	<i>Cancelled!</i>
9A0009.04	PC Card Flash 110 MByte PC Card ATA Flash 110 MB Type II PCMCIA 110 MB FEPROM, True IDE/ATA	<i>Cancelled!</i>
9A0009.05	PC Card Flash 60 MByte PC Card ATA Flash 60 MB Type II PCMCIA 60 MB FEPROM, True IDE/ATA	<i>Cancelled!</i>
9A0009.06	PC Card Flash 220 MByte FMC PC Card ATA Flash 220 MB Type II PCMCIA 220 MB FEPROM, True IDE/ATA	<i>Customer specific</i>
9A0009.07	PC Card Flash 220 MByte PC Card ATA Flash 220 MB, Type II PCMCIA 220 MB FEPROM, True IDE/ATA	
9A0009.08	PC Card Flash 48 MByte PC Card ATA Flash 48 MB Type II PCMCIA 48 MB FEPROM, True IDE/ATA	<i>Cancelled!</i>
9A0009.09	PC Card Flash 440 MByte PC Card ATA Flash 440 MB Type II PCMCIA 440 MB FEPROM, True IDE/ATA	

Table 64: IPC2001 - PC Cards

2.6.15 Compact Flash Slot (Type I)

Controllers 5C2001.01, 5C2001.15 and 5C2001.16 are equipped with a Compact Flash slot. The Compact Flash cards are ATA/True IDE compatible and can be accessed without additional drivers like a hard disk. The use of these memory cards allows the amount of memory to be determined by the user.

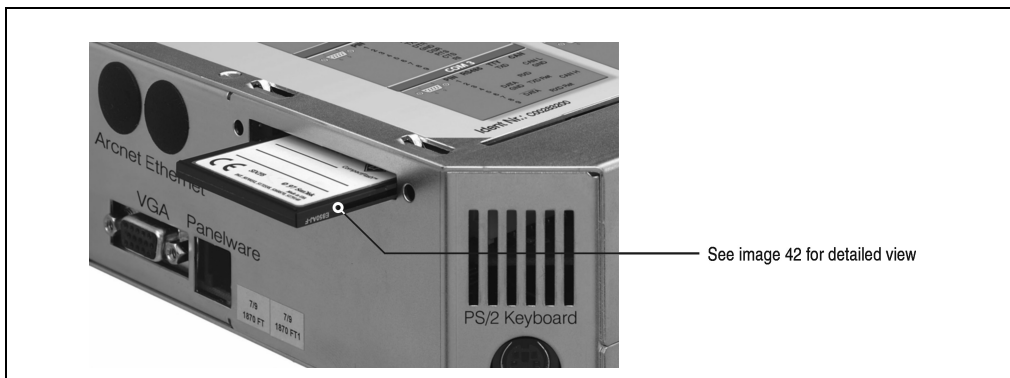


Figure 41: IPC2001 - Compact Flash Slot



When inserting a Compact Flash card, make sure the the ridge (Detail 1) and the notch (Detail 2) are on the top of the card! When inserted correctly, the Compact Flash card is flush with the controller.

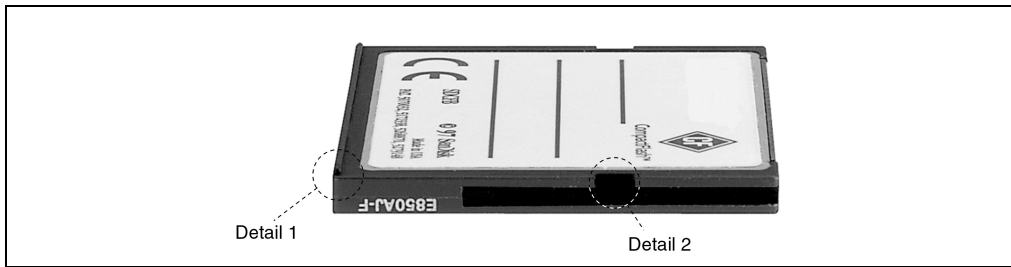


Figure 42: Detailed View of Compact Flash Card

The Compact Flash card can be removed using a pointed object (e.g. pen) by pressing the black release mechanism to the left of the card. During operation, we recommend that you use the cover plate (EMC, protection from accidental release). The cover plate is included in the delivery of the controller.

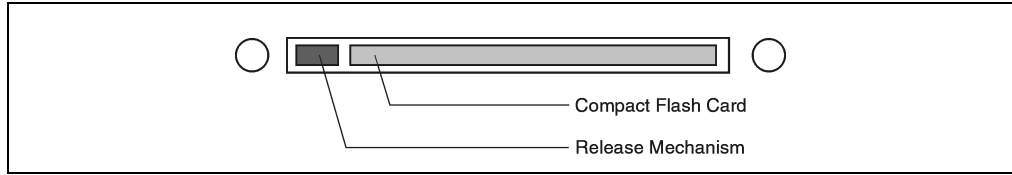


Figure 43: Compact Flash Card - Release Mechanism

Additional information concerning the Compact Flash card can be found in chapter 7.3 "Compact Flash".



Do not change the Compact Flash card during operation!



The Compact Flash card is not included in the delivery!
Compact Flash cards can only be used on controllers 5C2001.01, 5C2001.15, 5C2001.16 and 5C2001.22!

Model Number	Description	Remark
9A0015.01	Compact Flash 20 MByte Type I Compact Flash with 20 MByte PROM, True IDE/ATA	<i>Cancelled!</i>
9A0015.02	Compact Flash 64 MByte Type I Compact Flash with 64 MByte PROM, True IDE/ATA	
9A0015.03	Compact Flash 10 MByte Type I Compact Flash with 10 MByte PROM, True IDE/ATA	<i>Cancelled!</i>
9A0015.04	Compact Flash 48 MByte Type I Compact Flash with 48 MByte PROM, True IDE/ATA	<i>Customer specific</i>
9A0015.05	Compact Flash 128 MByte Type I Compact Flash with 128 MByte PROM, True IDE/ATA	
9A0015.06	Compact Flash 32 MByte Type I Compact Flash with 32 MByte PROM, True IDE/ATA	
9A0015.07	Compact Flash 8 MByte Type I Compact Flash with 8 MByte PROM, True IDE/ATA	
9A0015.08	Compact Flash 192 MByte Type I Compact Flash with 192 MByte PROM, True IDE/ATA	
9A0015.09	Compact Flash 320 MByte Type I Compact Flash with 320 MByte PROM, True IDE/ATA	

Table 65: IPC2001 - Compact Flash Cards

2.6.16 Status LEDs

The IPC2001 is equipped with four LEDs. The LEDs are shown here below:

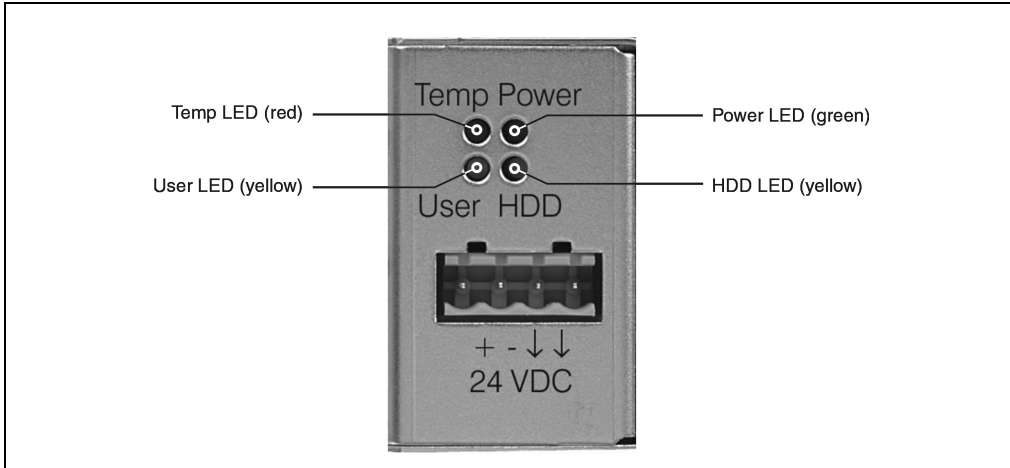


Figure 44: IPC2001 - Status LEDs

LED	Color	Function
Power LED	Green	Lit when power is applied
HDD LED	Yellow	Lit when reading from or writing to the hard disk
User LED	Yellow	The user LED can be controlled by the application. I/O Address 388h
Temp LED	Red	Note: Only possible on controllers with a fan! Lit when a temperature limit has been exceeded on the IPC2001. The fan is temperature controlled and starts when the temperature is 48°C (in housing) and reaches maximum rpm at 56°C. The fan stops again when the temperature drops below 44°C (in housing).

Table 66: IPC2001 - Status LEDs

2.6.17 DIP Switch SW1 & SW2

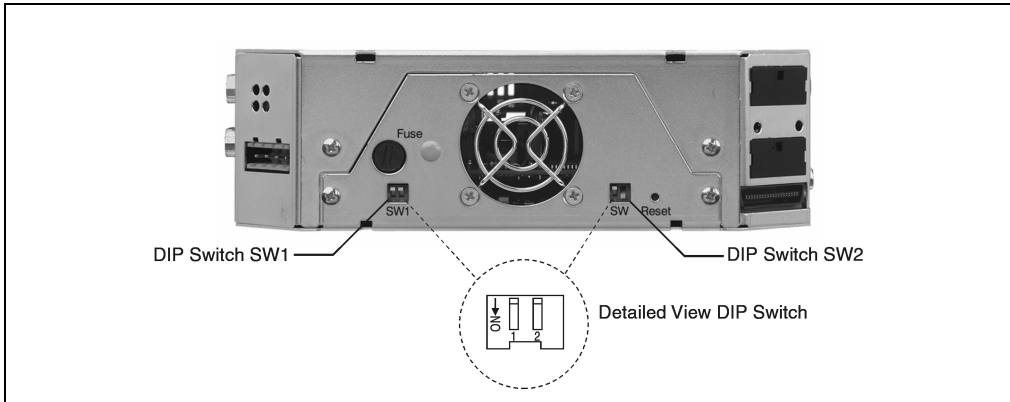


Figure 45: IPC2001 - DIP Switch SW1 and SW2

DIP Switch SW1

Switch Position	Function
"1" = ON	BIOS Recovery Mode - used if the system cannot be booted
"1" = OFF (Default)	BIOS Normal Mode
"2" = ON	Boot Block "Write enable" Note: During an upgrade, you will be asked to set this switch!
"2" = OFF (Default)	Boot Block "Write protect" Note: During an upgrade, you will be asked to set this switch!

Table 67: IPC2001 - DIP Switch SW1

DIP Switch SW2

Switch Position	Function
"1" = ON	Reserved
"1" = OFF (Default)	Reserved
"2" = ON	User Flash "Write enable" - The FEPROM can be programmed
"2" = OFF (Default)	User Flash "Write protect" - The FEPROM cannot be programmed

Table 68: IPC2001 - DIP Switch SW2

2.6.18 Hardware security key

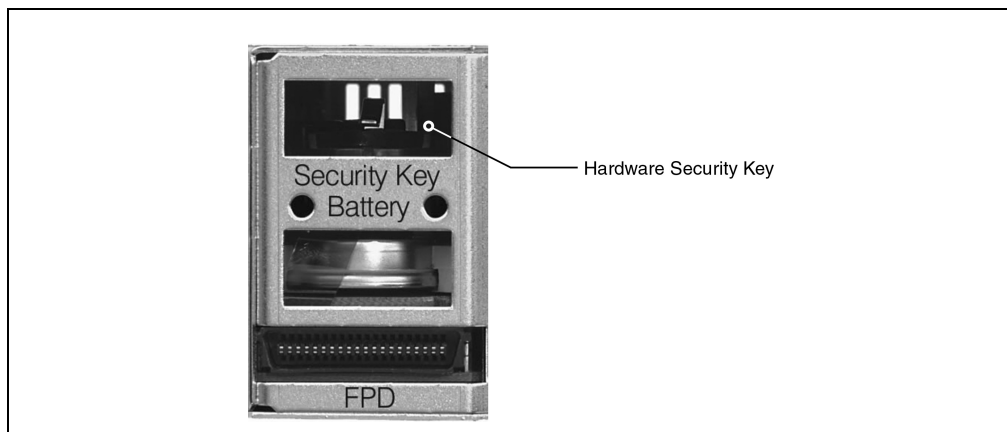


Figure 46: IPC2001 - Hardware Security Key



To make it easier to remove the dongle, we recommend that you use the dongle removal strip when inserting the dongle in the controller (included with delivery)!

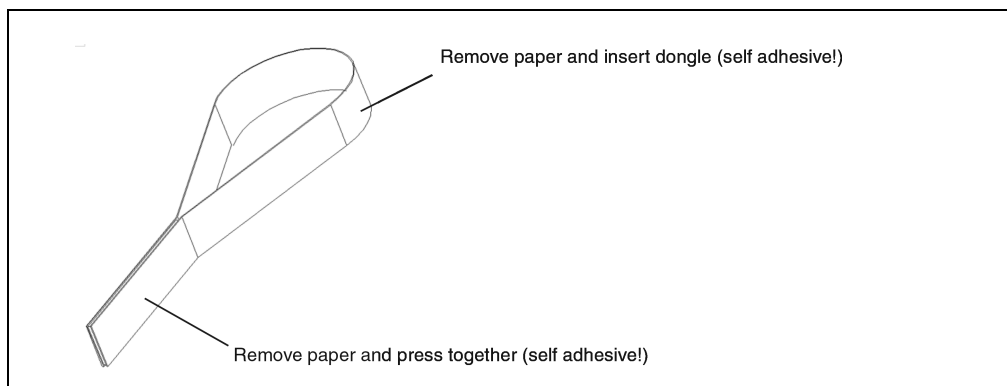


Figure 47: Dongle Removal Strip

2.6.19 CMOS Battery Compartment

The lithium battery is placed in a separate compartment and protected by a cover.

Battery Data: Lithium battery 3V, 950 mAh



According to CE regulations, the power supply must be removed from the controller for safety reasons when changing the lithium battery. Time data are lost when power is removed!

Lithium batteries are hazardous waste! Please consider the legal provisions for disposal in your area.

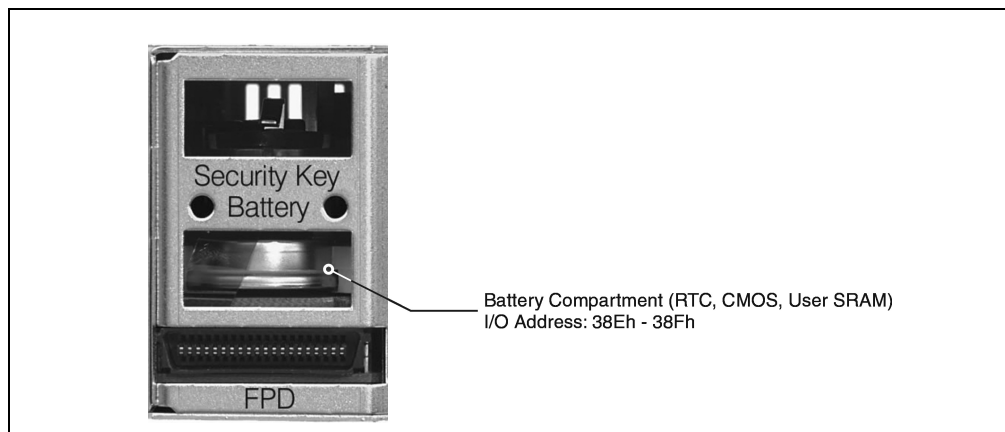


Figure 48: IPC2001 - Battery Compartment

2.6.20 Reset Button

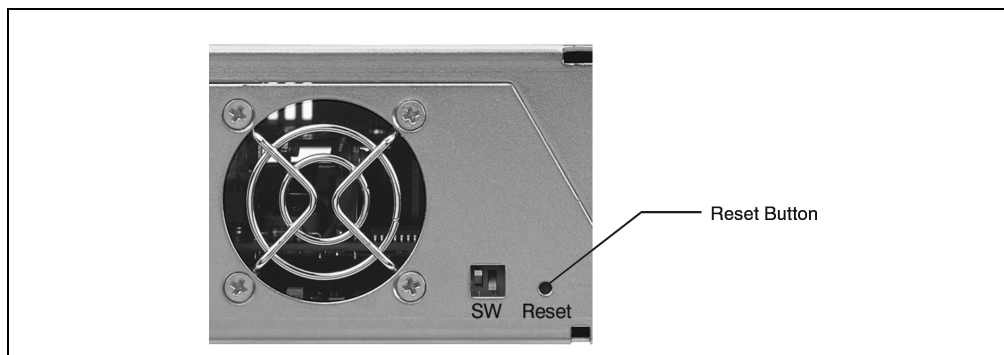


Figure 49: IPC2001 - Reset Button

The IPC2001 has a reset button which can be used to trigger a hardware reset. A pointed object is needed for pressing the button (thus preventing an accidental reset).

2.6.21 Fuse

3.15 A, 250 V / for Power Supply

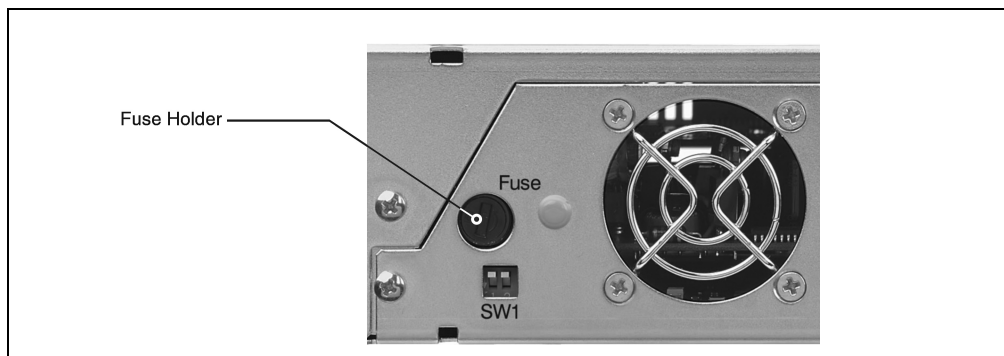


Figure 50: IPC2001 - Fuse Holder

2.7 Distribution of Resources

2.7.1 Memory Assignments in UMA (Upper Memory Area, 640 KByte - 1024 KByte)

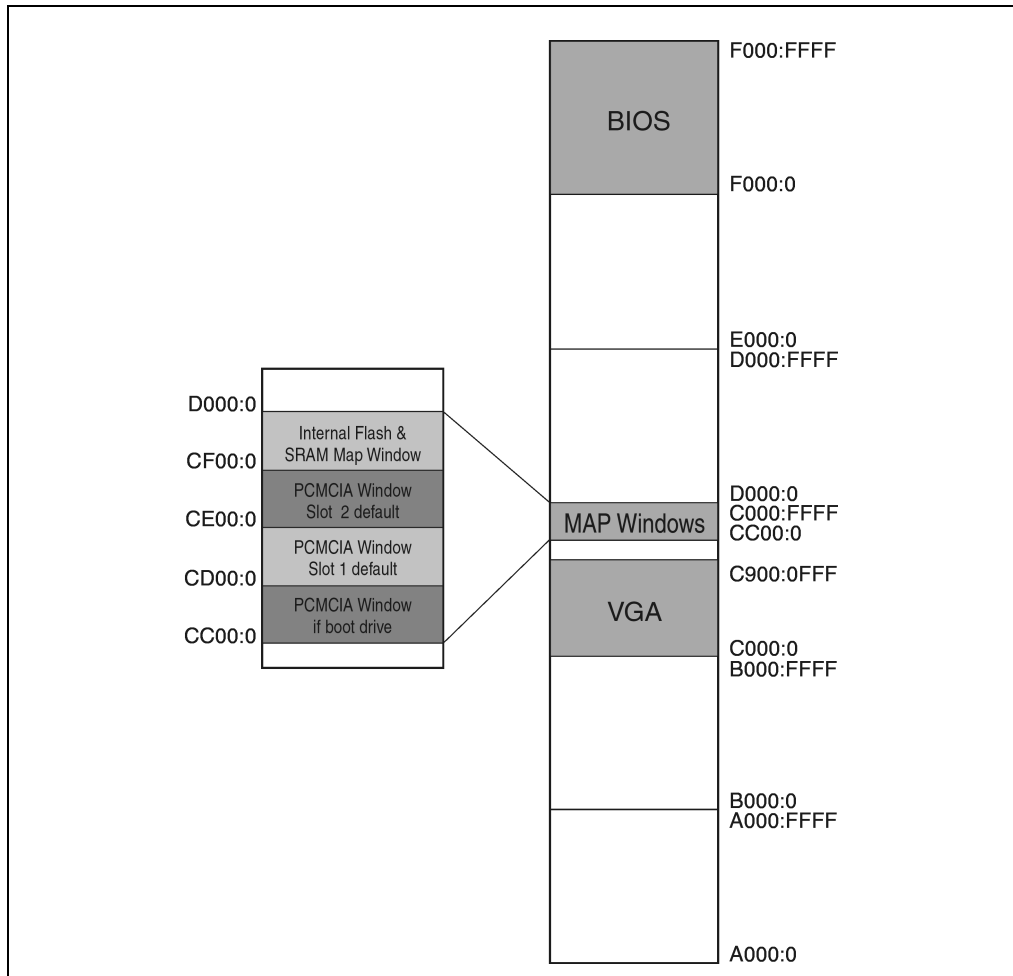


Figure 51: IPC2001 - Memory Assignments in UMA

2.7.2 RAM Address Assignments

RAM Address	Resource
000000h - 0003FFh	Interrupt Vectors
000400h - 09FFFFh	MS-DOS Programs
0A0000h - 0AFFFFh	VGA Graphics
0B8000h - 0BBFFFh	VGA Text Mode
0C0000h - 0C9FFFh	VGA BIOS
0CA000h - 0CBFFFh	Reserved
0CC000h - 0CFFFFh	Reserved Memory for Internal Flash, SRAM and PCMCIA Boot Map Window
0D0000h - 0DFFFFh ¹⁾	Expansion, placed at First Free Position according to PnP Standard
0E0000h - 0EFFFFh	Free
0F0000h - 0FFFFFFh	Award Elite BIOS
100000h -	DRAM (up to 32 MByte) ²⁾

Table 69: IPC2001 - RAM Address Assignments

1) **Attention:** a continuous 16 KByte Block has to remain free for BIOS expansion

2) The size of the DRAM depends on the controller.

2.7.3 I/O Address Assignments

I/O Address	Resource
000h - 01Fh	DMA Controller 1
020h - 03Fh	Interrupt Controller 1
040h - 05Fh	Timer
060h - 06Fh	Keyboard Controller
070h - 07Fh	Real-time Clock, NMI mask, CMOS
080h - 09Fh	Page Register DMA Controller
0A0h - 0BFh	Interrupt Controller 2
0C0h - 0DFh	DMA Controller 2
1F0h - 1F8h	Hard Disk
238h - 23Fh	COM1 / COM2
278h - 27Fh	Interact Key
2E8h - 2EFh	COM4
2F8h - 2FFh	COM1 / COM2 ¹⁾
300h - 31Fh	Ethernet
338h - 33Fh	COM1 / COM2
340h - 347h	Arcnet
378h - 37Fh	LPT1
380h - 383h	Keypad Modules
384h - 385h	CAN Controller
386h - 387h	Page Register (SRAM, FEPROM)
388h	User LED
38Ah - 38Bh	Temperature
38Ch - 38Dh	LCD
38Eh - 38Fh	Battery
3B0h - 3BFh	Monochrome Display
3C0h - 3DFh	VGA Display
3E0h - 3E1h	PC Card Controller
3E8h - 3EFh	COM3
3F0h - 3F7h	Floppy Controller
3F8h - 3FFh	COM1 ¹⁾ / COM2

Table 70: IPC2001 - I/O Address Assignments

1) Default settings for COM1 and COM2.

Description of B&R I/O Addresses 38xh:

I/O Address	Resource	Read	Write	Remark
380h	Keypad Modules	PW_Data R	PW_Data W	Data Register
381h	Keypad Modules	-	PW_PL	PL - Cycle
382h	Keypad Modules	PW_Byte Ready		
383h	Keypad Modules	PW_DMA Ready		
384h	CAN Controller			CAN Index
385h	CAN Controller			CAN Data
386h	Internal User Memory	-	8 Bit from Window	12 Bit Paging Register for User SRAM & FPROM
387h	Internal User Memory	-	4 Bit from Window	
388h	User LED	User LED	User LED	388.0 = 1: ON; 388.0 = 0: OFF
389h		-	-	
38Ah	Temperature	Temp	Disp. Select	Temp: 38A.0 = 0: Overtemp (only for versions with fan)
38Bh		-	Disp. Unselect	
38Ch	LCD Contrast	Disp_Data	Disp_Data = 1	
38Dh	LCD Contrast	-	Disp_Data = 0	
38Eh	Battery Status	Bat. Status	Disp_CLK = 0	Bat.: 38E.0 = 0: OK
38Fh	Battery Status		Disp_CLK = 1	

Table 71: IPC2001 - Description of B&R I/O Addresses 38xh:

2.7.4 DMA Channels

DMA Channel	Resource
0	Panelware
1	Panelware
2	Floppy Disk
3	Free
4	Reserved
5	Free
6	Free
7	Free

Table 72: IPC2001 - DMA Channels

2.7.5 Interrupts

Interrupt Assignments for IPC2001:

IRQ	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	None
System Timer	●																
Keyboard		●															
IRQ cascade			●														
COM1				○	●												○
COM2				●	○												○
PC Card Controller ¹⁾				○	○	●				○	○			○	○	○	○
Disk Drive							●										
LPT1								●									
Real-time Clock									●								
Ethernet ²⁾					○					●							
CAN Controller											●						○
COM3 ²⁾												●					
COM4 ²⁾													●				
Co-processor														●			
Hard Disk															●		○
Arcnet ²⁾																●	

Table 73: IPC2001 - Interrupt Assignments

1) The PC Card controllers interrupts can be set with software - PC Card Controller Configuration. The interrupts IRQ3 and IRQ4 for PC Cards can be set electrically (e.g. for PC Card Modem). However, conflicts can occur with COM2 or COM1 during operation. That means interfaces COM1 and COM2 must be turned off in BIOS for this type of operation.

2) Depending on controller, otherwise the interrupts are free.

● ... Default Setting

○ ... Possible Settings

2.8 Accessories

Accessories are included with the delivery of all controllers. They are packed together with the module.

Accessories	Amount
Screws with M3 threads	4
4 Pin Terminal Block	1
Dongle Removal Strip	1

Table 74: IPC2001 – Accessories

2.9 BIOS

2.9.1 General Information

BIOS stands for "Basic Input Output System". BIOS setup is the most basic standardized connection between the user and the system. Elite BIOS from Award Software is used on the IPC2001.

The Setup program lets you modify basic system configuration settings. The settings are then stored in Flash PROM and a dedicated battery-backed memory, called CMOS RAM, which retains the information when the power is turned off.

Elite BIOS on the IPC 2001 is a customized version of an industry-standard BIOS for IBM PC AT-compatible personal computers. It supports Intel x86 and compatible processors. The BIOS provides critical low-level support for the central processing unit, memory and I/O subsystems.

BIOS has been customized by adding important, but nonstandard, features such as virus or password protection, power management, and detailed fine-tuning of the chipset controlling the system.

The following information is intended to guide you through the process of configuring your system using Setup.

2.9.2 Setup Start

Elite BIOS is immediately activated when you first turn on the computer. The BIOS reads system configuration information in CMOS RAM, compares it with the FEPROM and begins the process of checking out the system and configuring it through the power-on self test (POST).

When these preliminaries are finished, the BIOS seeks an operating system on one of the data storage devices (hard drive, floppy drive, etc.). The BIOS launches the operating system and hands over control of system operations to it.

To start Setup, press the Del key when this message appears briefly at the bottom of the screen (during POST):

Press DEL to enter SETUP

If the message disappears before you press DEL and you still wish to enter Setup, you must reboot the system.



The best advice is to alter only those settings that you thoroughly understand. Settings should not be changed in the Chipset screen without a good reason. The Chipset defaults have been carefully chosen by Award or from B&R to guarantee ideal performance and reliability. Even a seemingly small change to the Chipset setup may cause the system to become unstable!

2.9.3 Setup Keys

The following keys help you navigate in Setup:

Cursor ↑	Move to previous item
Cursor ↓	Move to next item
Cursor ←	Move to the item in the left hand direction
Cursor →	Move to the item in the right hand direction
Esc	Main Menu: Quit without saving changes into CMOS RAM. Other pages: Exit current page and return to Main Menu
PgUp↑	Decrease the numeric value or make changes
PgDn ↓	Increase the numeric value or make changes
+	Increase the numeric value or make changes
-	Decrease the numeric value or make changes
F1	General Help
F2	Change color from a selection of 16 colors. F2 to select color forward, Shift-F2 to select color backward
F3	Reserved
F4	Reserved
F5	Restore the previous CMOS value from CMOS (only possible in the Option Page Setup Menu)
F6	Load the default CMOS RAM value from BIOS default table (only possible in the Option Page Setup Menu)
F7	Load the default value (only possible in the Option Page Setup Menu)
F8	Reserved
F9	Reserved
F10	Save all the CMOS changes (only possible in Main Menu)

Table 75: Setup Keys

2.9.4 Help

Press F1 to pop up a help window which describes the appropriate keys to use and the possible selections for the highlighted item. To exit the Help Window press Esc or the F1 key again.

2.9.5 BIOS Setup Menu

Entering the BIOS Setup Menu is done by pressing the [Del] key during or immediately after the system RAM check. The desired items can be selected from the menu.

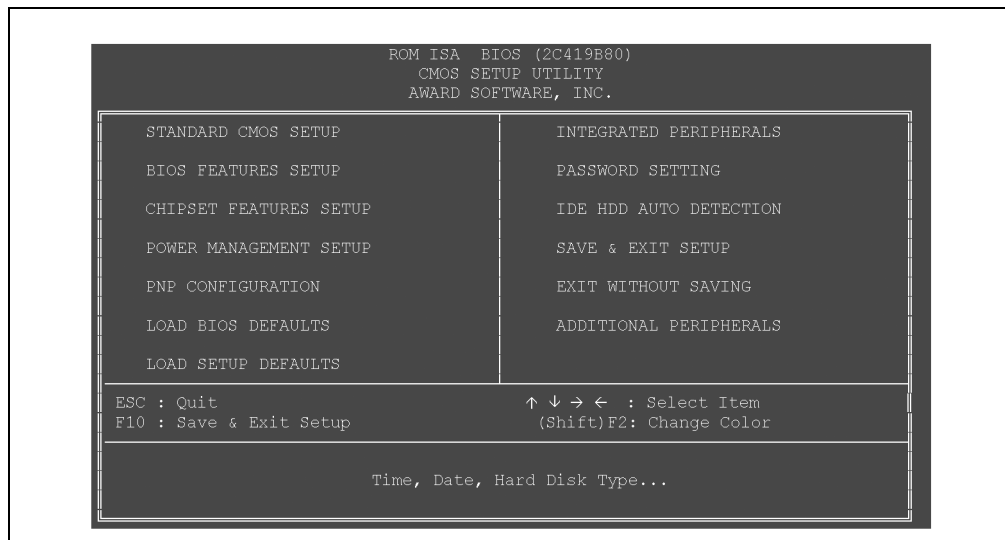


Figure 52: BIOS Setup Menu

Following is a brief summary of each Setup category.

Standard CMOS Setup

Options in the original PC AT-compatible BIOS.

BIOS Features Setup

Award enhanced BIOS options.

Chipset Features Setup

Options specific to your system chipset.

Power Management Setup

Advanced Power Management (APM) options.

PnP Configuration

Plug and Play configuration options

Load BIOS Defaults

BIOS defaults are factory settings for the most stable, minimal-performance system operations.

Load Setup Defaults

Setup defaults are factory settings for optimal-performance system operations.

Integrated Peripherals

I/O subsystems that depend on the integrated peripherals controller in your system.

Password Setting

Change, set, or disable a password.

IDE HDD Auto Detection

Automatically detect and configure IDE hard disk parameters.

Save & Exit Setup

Save settings in nonvolatile CMOS RAM and exit Setup.

Exit without saving

Abandon all changes and exit Setup.

Additional Peripherals

Settings can be made for peripheral devices.

Standard CMOS Setup

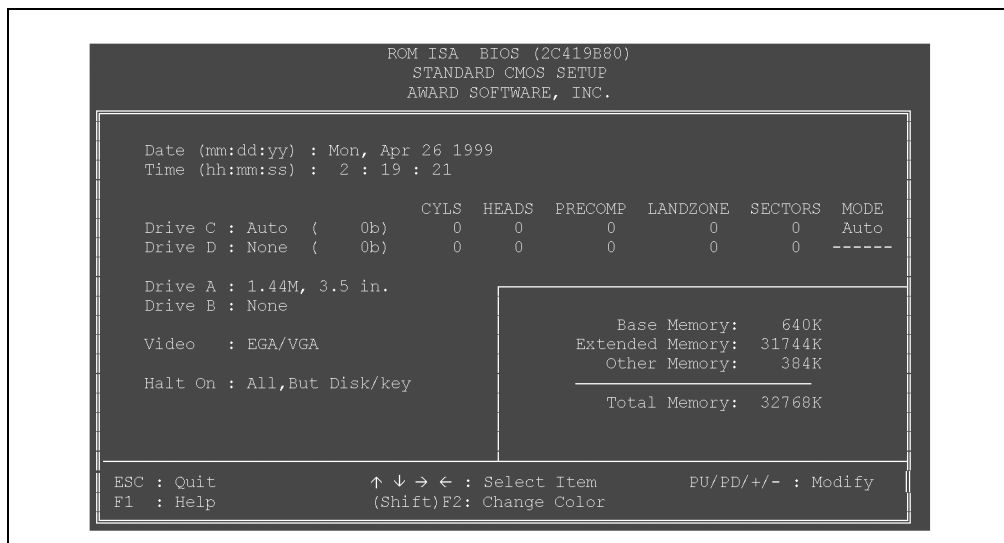


Figure 53: Standard CMOS Setup

Date and Time

The RTC (real-time clock) can be set here. These fields are not stored in the CMOS Data Backup.

Drive C: and Drive D:

The hard disk parameters can be set here. We recommend that you select type "AUTO". BIOS can automatically detect the specifications and optimal operating mode of almost all IDE hard drives. When you select type AUTO for the hard drive, BIOS detects its specifications during POST, every time the system boots.

If you do not want to select drive type AUTO, other methods of selecting the drive type are available:

- Match the specifications of your installed HDD or Compact Flash card with the predefined values for drive types 1 through 45. If one of the predefined drive types corresponds to your hard disk or Compact Flash card then you can select this type.
- Select "USER" and enter values into each drive parameter field.
- Use the HDD AUTO DETECTION function in Setup.

Here is a brief explanation of drive specifications:

Type

BIOS contains a table of predefined drive types. Each defined drive type has a certain specification. Drives whose specifications do not accommodate any predefined type are classified as type "USER".

Size

Disk drive capacity. Note that this size is usually slightly greater than the size of a formatted disk given by a disk-checking program.

Cyls Number of cylinders

Head Number of heads

Precomp Write Precompensation Cylinder

Landzone Landing Zone

Sector Number of Sectors

Mode "Auto", "Normal", "Large" or "LBA"

Auto BIOS automatically determines the optimal mode.

Normal The following maximum values are supported: Number of cylinders = 1025, Number of heads = 16 and Number of sectors = 64

Large For drives that do not support LBA and have more than 1024 cylinders.

LBA Logical Block Addressing - During drive accesses, the IDE controller transforms the data address described by sector, head, and cylinder number into a physical block address, significantly improving data transfer rates. For drives with more than 1024 cylinders.

Drive A: and Drive B:

Select the correct specifications for the diskette drive(s) installed in the computer.

None No diskette drive installed

1.44M, 3.5 in. 3½ inch diskette; 1.44 MByte capacity

2.88M, 3.5 in. 3½ inch diskette; 2.88 MByte capacity

VIDEO

Select the type of primary video subsystem in your computer. BIOS usually detects the correct video type automatically. BIOS supports a secondary video subsystem, but you do not select it in Setup.

EGA/VGA	Enhanced Graphics Adapter / Video Graphics Array. For EGA, VGA, SEGA, SVGA or PGA monitor adapters.
CGA 40	Color Graphics Adapter, power up in 40 column mode
CGA 80	Color Graphics Adapter, power up in 80 column mode
MONO	Monochrome adapter, includes high resolution monochrome adapters

Halt On

During the POST, the computer stops if BIOS detects a hardware error (waits for the <F1>key to be pressed).

You can tell BIOS to ignore certain errors during POST and continue the boot-up process.

No errors	POST does not stop for any errors.
All errors	If BIOS detects any non-fatale errors POST stops and prompts you to take corrective action.
All, but Keyboard	POST does not stop for a keyboard error, but stops for all other errors.
All, but Diskette	POST does not stop for diskette drive errors, but stops for all other errors.
All, but Disk/Key	POST does not stop for a keyboard or disk error, but stops for all other errors.

BIOS FEATURES SETUP

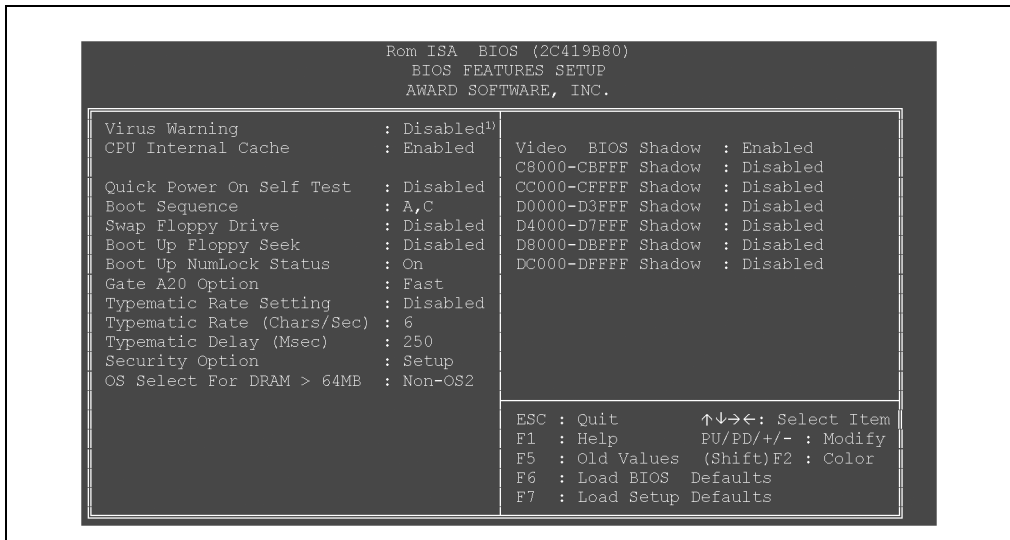


Figure 54: BIOS FEATURES SETUP

1) This function is available starting with the BIOS Upgrade Version 1.05 and only functions when using MS-DOS.

Virus Warning

When enabled, you receive a warning message if a program (especially a virus) attempts to alter the boot sector or the partition table of the boot drive (not the rest of the hard drive!). If this is the case, you should then run an anti-virus program and check over the data carriers.



Some disk diagnostic programs (e.g. data carrier maintenance or partitioning) alter the boot sector. If you plan to run such a program, we recommend that you first disable the virus warning.

CPU Internal Cache

Switches the L1 cache on or off. Switching off the internal cache slows the system down considerably, and therefore is not advisable.

Quick Power On Self Test

When "Enabled", the "Power on Self Test" (POST) is accelerated (no detailed memory test).

Boot Sequence

You can select "A,C", "C,A", and "C only" here.

The default sequence (A,C) is:

1. FDD
2. PC - Card Slot 1
3. PC - Card Slot 2
4. Internal FEPROM
5. Internal SRAM
6. HDD

If you select "C,A", the hard disk is placed in the first position, then the other devices. If you select "C only", the system will only attempt the boot from the hard disk. Each bootable device (except for the hard disk) is automatically assigned drive designation A:. The disk drive (when it is not used to boot), is assigned drive designation B:.

Swap Floppy Drive

This field is effective only in systems with two floppy drives. Selecting "Enabled" assigns physical drive B to logical drive A, and physical drive A to logical drive B.

Boot Up Floppy Seek

When "Enabled", BIOS tests (seeks) floppy drives to determine whether they have 40 or 80 tracks.

Note: Only 360 KByte diskettes have 40 tracks. All diskettes with 720 KByte, 1.2 MByte and 1.44 MByte have 80 tracks. Because very few modern PCs have 40-track floppy drives, we recommend that you set this field to "Disabled" to save time.

Boot Up NumLock Status

Toggle between "On" or "Off" to control the state of the NumLock key when the system boots. When toggled "On", the numeric keypad generates numbers instead of controlling cursor operations. When togled "On", the control fields are used for the keys (Cursor Keys, Pos1, End, etc.).

Gate A20 Option

Gate A20 refers to the way the system addresses memory above 1 MB (extended memory). When set to "Fast", the system chipset controls Gate A20. When set to "Normal", a pin in the keyboard controller controls Gate A20. Setting Gate A20 to "Fast" improves system speed, particularly with OS/2 and Windows.

Typematic Rate Setting

When "Disabled", the following two items (Typematic Rate and Typematic Delay) are irrelevant. Keystrokes repeat at a rate determined by the keyboard controller in your system.

When "Enabled", you can select a typematic rate and typematic delay.

Typematic Rate (chars/sec)

When the typematic rate setting is enabled, you can select a typematic rate (the rate at which the character repeats when you hold down a key) of 6, 8, 10, 12, 15, 20, 24 or 30 characters per second. The repeat rate determines the speed that characters are repeated when a key is pressed and held down.

Typematic Delay (Msec)

When the typematic rate setting is enabled, you can select a typematic delay (the delay before key strokes begin to repeat) of 250, 500, 750 or 1000 milliseconds. The typematic delay begins when you hold a key down.

Security Option

Here you can select between Setup and System. This option appears after a set password is requested. If you have a password, select whether the password is required every time the system boots or only when you enter Setup.

OS Select For DRAM > 64MB

Select OS/2 only if you are running OS/2 operating system with greater than 64 MB of DRAM on your system.

Shadow

Shadow settings are only valid for ISA cards. Software that resides in a read-only memory (ROM) chip on a device is called firmware. Elite BIOS permits shadowing of firmware such as the system BIOS, video BIOS, and similar operating instructions that come with some expansion peripherals, such as, for example, a SCSI adaptor.

Video BIOS Shadow & C8000-CBFFF Shadow

These settings have no function because the 40 KByte VGA is always shadowed. The last 8 KByte of C8000 to CBFFF are still available but they are always shadowed.

CC000-CFFFF

The Map Windows for internal FPRAM, SRAM and PCMCIA are stored here. Therefore, this area is always set to read write ISA.

Memory area D0000 - DFFFF

These areas can be used by the Firmware on other expansion cards. If an expansion device in your system contains ROM based firmware, you need to know the address range which the ROM occupies in order to shadow it into the correct area of RAM.

CHIPSET FEATURES SETUP

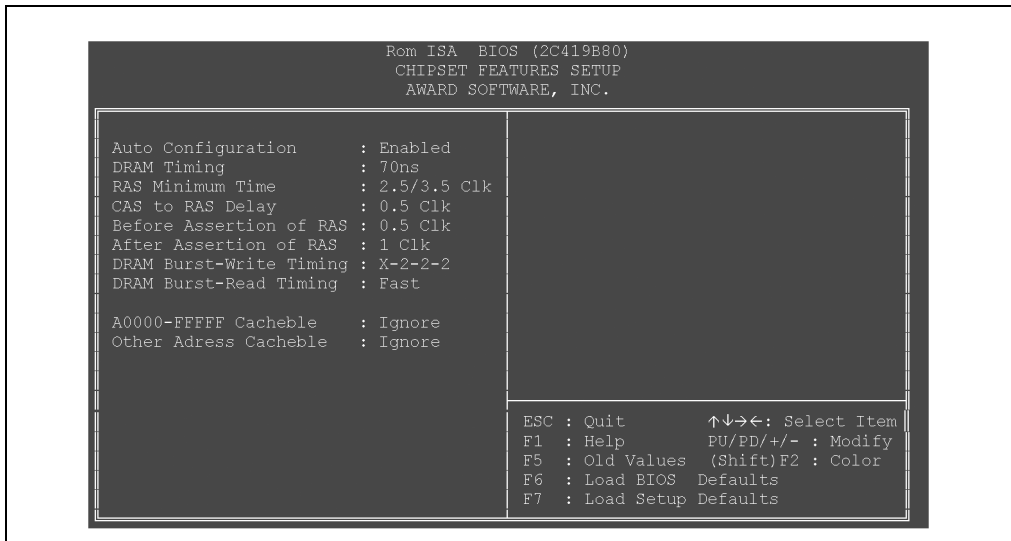


Figure 55: Chipset Features Setup

When "Enabled", BIOS sets the ideal values for the respective DRAM.

DRAM Timing

You can select "50", "60", "70" and "80" nsec. This determines the access time for the main memory that is installed.

The next 6 settings are for DRAM timing. They can only be set when Auto Configuration is "Disabled".

A0000-FFFF Cacheable

If "Recognize" is set here, then "A0000-FFFF" is cached.

Other Address Cacheable

If "Recognize" is set here, then everything other than "A0000-FFFF" is cached.

POWER MANAGEMENT SETUP

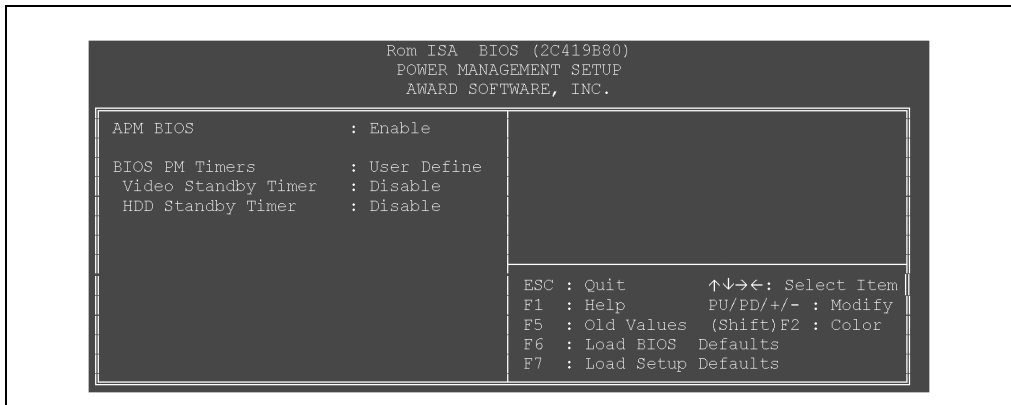


Figure 56: Power Management Setup

Turns the APM BIOS (Advanced Power Management BIOS) on ("Enable") or off ("Disable").

BIOS PM Timers

You can select "Disable", "User Define", "Min Timeouts" and "Max Timeouts".

If you select "Disable", the items Video Standby Timer and HDD Standby Timer are automatically set to "Disable".

Disable

User Define Allows manual settings for Video Standby Timer and HDD Standby Timer.

Min Timeouts /

Max Timeouts The minimum / maximum values are set for Video Standby Timer und HDD Standby Timer.

Video Standby Timer

You can set the standby time (15min - 1min) for the video signal here. Only possible when BIOS PM Timers is set to "User Define".

HDD Standby Timer

You can set the standby time (15min - 15sec) for the hard disk here. Only possible when BIOS PM Timers is set to "User Define".

This function only works under certain circumstances because most hard disks have an integrated timer for "Power Down" mode. That means the hard disk goes into "Power Down" mode after a certain time even though "Disable" is set. This takes place after approx. 45 minutes on the Toshiba 2.5" Disk (MK2103MAV).

PNP CONFIGURATION

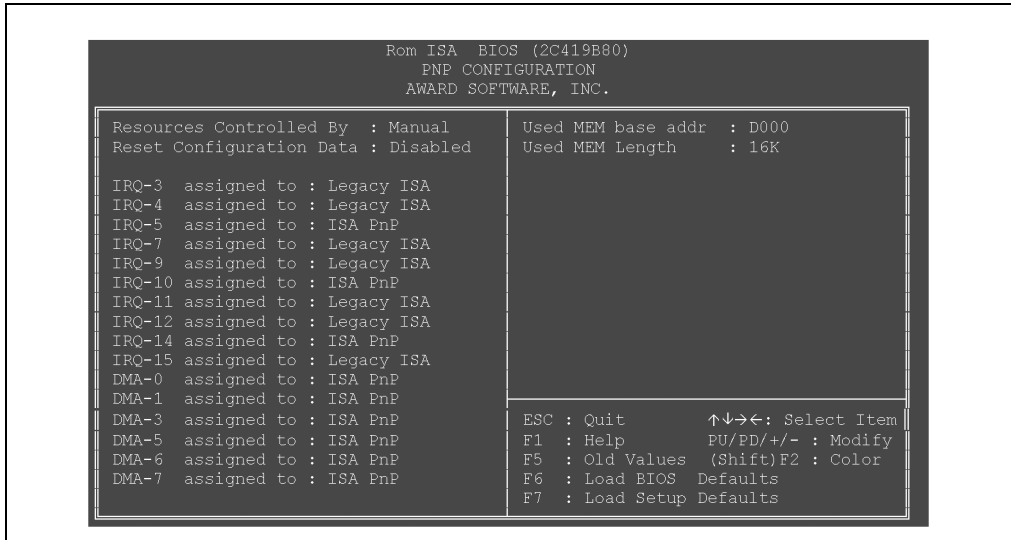


Figure 57: PNP Configuration

Resources Controlled By

When set to "Auto", BIOS can automatically configure all Plug and Play compatible and bootable devices. When set to "Manual", all IRQ and DMA settings can be made by the user.

Reset Configuration Data

If "Enabled" is set here, BIOS deletes the ESCD area and rewrites it again. After the ESCD area is deleted, this setting is automatically returned to "Disabled".

IRQ-xx assigned to

Here, you can determine if the IRQ is available for the installed PNP devices (ISA PnP) or not (Legacy ISA). IRQ12 is set to "Legacy ISA" as default. If COM4 is not installed on the device, this IRQ should be set to "ISA PNP".

DMA-x assigned to

Same function as "IRQ-xx assigned to", but the DMA channels are assigned here.

Used MEM base addr

This option makes it possible to reserve a main memory window in the upper memory area, e.g. for some older ISA network cards. If a starting address is specified instead of N/A (not available), the option "Used MEM Length" can be used to set the size of the memory area required.

Used MEM Length

Sets the size of the memory area to be reserved, starting at the address defined in "Used MEM base addr".



ATTENTION: a continuous 16 KByte memory area has to remain free for BIOS expansions.

2.9.6 LOAD BIOS DEFAULTS

Loads the BIOS defaults. These settings are standard values from AWARD. BIOS defaults are safe values, but for example DRAM Timing is slower here than for the Setup defaults.

2.9.7 LOAD SETUP DEFAULTS

Loads the Setup defaults. These items have been optimized by B&R for the IPC2001 and are therefore preferable to BIOS defaults.

2.9.8 INTEGRATED PERIPHERALS

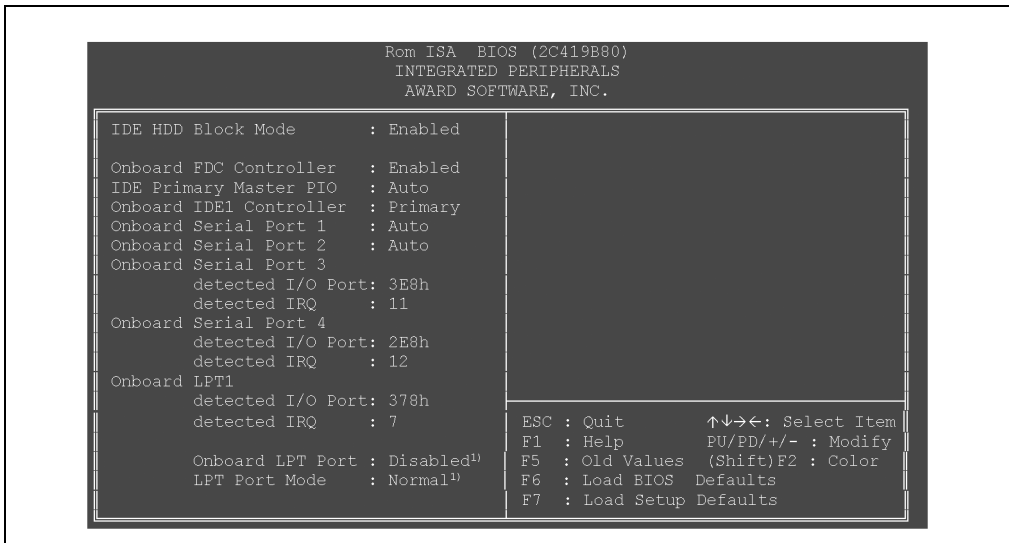


Figure 58: Integrated Peripherals

1) This function is available starting with the BIOS Upgrade Version 1.05.

IDE HDD Block Mode

Switches the block mode on/off for the hard disk. If block mode is on ("Enabled"), several sectors are transferred at the same time. This increases the speed.

Onboard FDC Controller

Switches the Floppy controller on/off. If this setting is turned off ("Disabled"), the floppy does not work.

IDE Primary Master PIO

Sets the transfer speed on the IDE Bus. "PIO Mode 0" is the slowest and "PIO Mode 4" is the fastest. If "Auto" is set, BIOS reads the maximum speed from the IDE device.



Attention: With older hard drives and ATA Flash disks, setting the PIO mode too high can cause read and write errors.

Onboard IDE1 Controller

Switches the primary hard disk controller on ("Primary") or off ("Disabled"). A hard disk only functions if "Primary" is set.

Onboard Serial Port 1 and 2

Here you can set the I/O addresses and interrupts for COM1 and COM2 interfaces. Make sure that these variables are not all the same. These two interfaces can also be turned off ("Disabled").

Default assignment for "Auto":

COM1: I/O Address 3F8h - 3FFh, IRQ4

COM2: I/O Address 2F8h - 3FFh, IRQ3

For **Onboard Serial Port 3**, **Onboard Serial Port 4** and **Onboard LPT1**, only the I/O addresses and interrupts are shown. These values cannot be changed or deactivated!

Onboard LPT Port



For IPC2001 systems with a BIOS Upgrade Version 1.05, B&R recommends setting "Disabled". Otherwise the system cannot boot. This function is supported starting with IPC2002.

LPT Port Mode



For IPC2001 systems with a BIOS Upgrade Version 1.05, B&R recommends setting "Normal". Otherwise the system cannot boot. This function is supported starting with IPC2002.

2.9.9 PASSWORD SETTING

You can set the system password here. If, you press "Enter", without entering a password, the password function is deactivated.



ATTENTION: The password entered is also saved in the CMOS Backup, and is impossible to delete. If you forget the password, the Flash must be exchanged by B&R!

2.9.10 IDE HDD AUTO DETECTION

Hard disks are automatically recognized in this menu. For larger hard disks, you can select one of three entries (NORMAL / LBA / LARGE Mode) depending on the HDD type and size. For Windows systems, LBA mode is preferable (BIOS default).

2.9.11 SAVE & EXIT SETUP

Ends the SETUP UTILITY. Changes are saved in CMOS!

2.9.12 EXIT WITHOUT SAVING

Ends the SETUP UTILITY without saving changes in CMOS.

2.9.13 ADDITIONAL PERIPHERALS

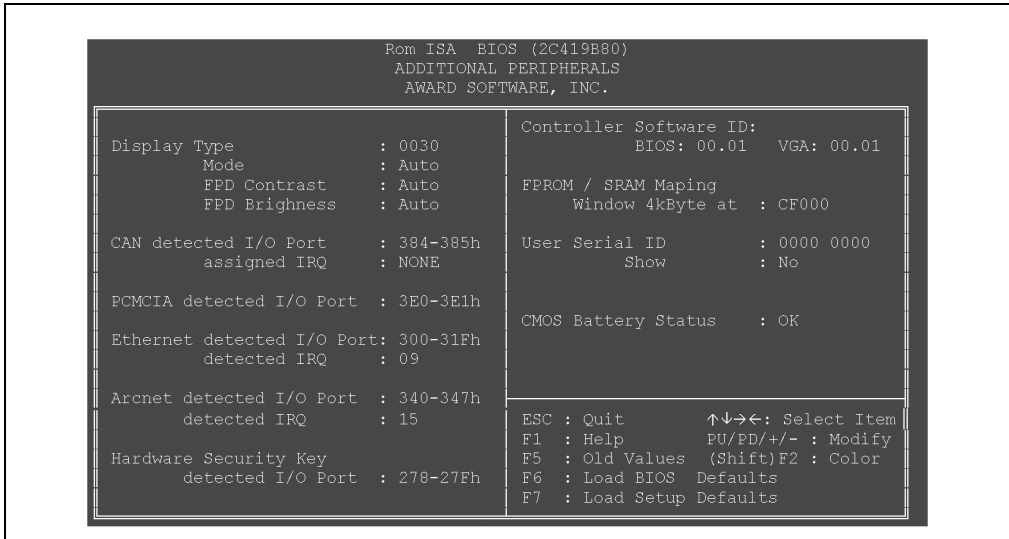


Figure 59: Additional Peripherals

Display Type

B&R display type connected is shown (4 digit number). If a display unit is not connected, 0000 is shown.

Mode

Select display device (Display = FPD, Monitor = CRT) should be active when the system is started:

- "Auto" All connected display devices are automatically activated. If **no** display device is connected then the monitor is activated
- "CRT" Only the monitor is activated
- "FPD" Only the display is activated
- "CRT+FPD" The monitor and display are activated (simultaneous mode)

FPD Contrast

The contrast of the display can be set (only for passive LCDs!)

Possible settings: 0% to 100 %, Auto

FPD Brightness

The brightness of the display can be set.

Possible settings: 0% to 100 %, Auto



ATTENTION: These values can only be scrolled through. "Auto" is between values 100% and 0%.
(...97%, 98%, 99%, 100%, AUTO, 0%, 1%, 2%, 3%....).

There are 2 ways to set the desired brightness:

- 1) Save brightness in BIOS
- 2) Save brightness in display(recommended)
 - 1) If a value (e.g. 80%) is saved in the BIOS Setup, then BIOS sets this value every time the system is started, even if another display is connected. The disadvantage is that BIOS cannot read brightness values from the display and therefore the display is set to 0% brightness each time the system starts (reference point). The display is then set to the defined brightness value (80% in this case).

If you always want to use the same brightness, we recommend saving the value in the display and setting "Auto" in BIOS to avoid this procedure. If "Auto" is saved, then BIOS uses the value saved on the display each time the system starts

- 2) You can save the brightness value on the display as follows:

Set "auto" in BIOS and end Setup with "SAVE & EXIT SETUP". The next time the system starts, go into BIOS Setup and set the desired brightness (e.g. 50%). Now end the Setup with "EXIT WITHOUT SAVING". The display uses the value 50% and BIOS is set to "Auto". BIOS uses the value from the display each time the system is started (50% in this case).

CAN assigned IRQ

Here, an IRQ can be assigned for CAN (enable interrupt). However, this only functions if a CAN controller is installed (default: IRQ10).

"PCMCIA detected", "Ethernet detected", "Arcnet detected" and "Hardware Security detected" provide information concerning the standard addresses and interrupts for the - original IPC2001 - components.

Controller Software ID

Shows BIOS and VGA-BIOS version.

FPROM / SRAM Mapping - Window 4 KByte at

Shows address of the Map Window for internal FPROM and SRAM.

User Serial ID

You can enter a user serial number here (32 bit, Hex). It is stored in CMOS.

Show

When set to "Yes" the user serial number (see above, User Serial ID) is displayed in the device window during system start.

CMOS Battery Status

Checks if the CMOS (SRAM) buffer battery is OK.

"OK": Battery OK

"Bad": Battery should be changed



If the CMOS battery is changed, the system has to be restarted to update the battery status!

2.10 Comparison of BIOS Settings (BIOS defaults / Setup defaults)

2.10.1 BIOS Features Setup

BIOS Upgrade Version	V01.03		V01.05	
Description	Bios Defaults	Setup Defaults	Bios Defaults	Setup Defaults
Virus Warning	(not Supported)	(not Supported)	Disabled	Disabled
CPU Internal Cache	Enabled	Enabled	Enabled	Enabled
Quick Power On Self Test	Disabled	Disabled	Disabled	Disabled
Boot Sequence	A, C	A, C	A, C	A, C
Swap Floppy Drive	Disabled	Disabled	Disabled	Disabled
Boot Up Floppy Seek	Disabled	Disabled	Disabled	Disabled
Boot Up NumLock Status	On	On	On	On
Gate A20 Option	Normal	Fast	Normal	Fast
Typematic Rate Setting	Disabled	Disabled	Disabled	Disabled
Typematic Rate (Chars/Sec)	6	6	6	6
Typematic Delay (Msec)	250	250	250	250
Security Option	Setup	Setup	Setup	Setup
OS Select For DRAM > 64 MB	Non-OS2	Non-OS2	Non-OS2	Non-OS2
Video BIOS Shadow	Enabled	Enabled	Enabled	Enabled
C8000-CBFFF	Disabled	Disabled	Disabled	Disabled
CC000-CFFFF	Disabled	Disabled	Disabled	Disabled
D0000-D3FFF	Disabled	Disabled	Disabled	Disabled
D4000-D7FFF	Disabled	Disabled	Disabled	Disabled
D8000-DBFFF	Disabled	Disabled	Disabled	Disabled
DC000-DFFFF	Disabled	Disabled	Disabled	Disabled

Table 76: BIOS Features Setup

2.10.2 Chipset Features Setup

BIOS Upgrade Version	V01.03		V01.05	
Description	BIOS Defaults	Setup Defaults	BIOS Defaults	Setup Defaults
Auto Configuration	Enabled	Enabled	Enabled	Enabled
DRAM Timing	80ns	70ns	80ns	70ns
RAS Minimum Time	2.5/3.5 Clk	2.5/3.5 Clk	2.5/3.5 Clk	2.5/3.5 Clk
CAS to RAS Delay	1 Clk	0.5 Clk	1 Clk	0.5 Clk
Before Assertion of RAS	1 Clk	0.5 Clk	1 Clk	0.5 Clk
After Assertion of RAS	1 Clk	1 Clk	1 Clk	1 Clk
DRAM Burst-Write Timing	X-3-3-3	X-2-2-2	X-3-3-3	X-2-2-2
DRAM Burst-Read Timing	Slow	Fast	Slow	Fast
A0000-FFFF Cacheable	Ignore	Ignore	Ignore	Ignore
Other Address Cachable	Recognize	Recognize	Recognize	Recognize

Table 77: Chipset Features Setup

2.10.3 Power Management Setup

BIOS Upgrade Version	V01.03		V01.05	
Description	Bios Defaults	Setup Defaults	Bios Defaults	Setup Defaults
APM BIOS	Disable	Disable	Disable	Disable
BIOS PM Timers	User Define	User Define	User Define	User Define
Video Standby Timer	Disable	Disable	Disable	Disable
HDD Standby Timer	Disable	Disable	Disable	Disable

Table 78: Power Management Setup

2.10.4 PnP Configuration

BIOS Upgrade Version	V01.03		V01.05	
Description	Bios Defaults	Setup Defaults	Bios Defaults	Setup Defaults
Resources Controlled By	Auto	Manual	Auto	Manual
Reset Configuration Data	Disabled	Disabled	Disabled	Disabled
IRQ-3 assigned to		Legacy ISA		Legacy ISA
IRQ-4 assigned to		Legacy ISA		Legacy ISA
IRQ-5 assigned to		ISA PnP		ISA PnP
IRQ-7 assigned to		Legacy ISA		Legacy ISA
IRQ-9 assigned to		Legacy ISA		Legacy ISA
IRQ-10 assigned to		ISA PnP		ISA PnP
IRQ-11 assigned to		Legacy ISA		Legacy ISA
IRQ-12 assigned to		Legacy ISA		Legacy ISA
IRQ-14 assigned to		ISA PnP		ISA PnP
IRQ-15 assigned to		Legacy ISA		Legacy ISA
DMA-0 assigned to		ISA PnP		ISA PnP
DMA-1 assigned to		ISA PnP		ISA PnP
DMA-3 assigned to		ISA PnP		ISA PnP
DMA-5 assigned to		ISA PnP		ISA PnP
DMA-6 assigned to		ISA PnP		ISA PnP
DMA-7 assigned to		ISA PnP		ISA PnP
Used MEM base addr		N/A		N/A

Table 79: PNP/PCI Configuration

2.10.5 Integrated Peripherals

BIOS Upgrade Version	V01.03		V01.05	
Description	Bios Defaults	Setup Defaults	Bios Defaults	Setup Defaults
IDE HDD Block Mode	Disabled	Enabled	Disabled	Enabled
Onboard FDC Controller	Enabled	Enabled	Enabled	Enabled
IDE Primary Master PIO	Auto	Auto	Auto	Auto
Onboard IDE1 Controller	Primary	Primary	Primary	Primary
Onboard Serial Port 1	Auto	Auto	Auto	Auto
Onboard Serial Port 2	Auto	Auto	Auto	Auto
Onboard Serial Port 3				
Onboard Serial Port 4				
Onboard LPT1				
Onboard LPT Port	(not Supported)	(not Supported)	Disabled	Disabled
LPT Port Mode	(not Supported)	(not Supported)	Normal	Normal

Table 80: Integrated Peripherals

2.10.6 Additional Peripherals

BIOS Upgrade Version	V01.03		V01.05	
Description	Bios Defaults	Setup Defaults	Bios Defaults	Setup Defaults
Display Type	1)	1)	1)	1)
Mode	AUTO	AUTO	AUTO	AUTO
FPD Contrast	AUTO	AUTO	AUTO	AUTO
FPD Brightness	AUTO	AUTO	AUTO	AUTO
CAN detected I/O Port				
assigned IRQ				
PCMCIA detected I/O Port				
Ethernet detected I/O Port				
Arcnet detected I/O Port				
Hardware Security Key detected I/O Port				
FEPROM / SRAM Mapping				
User Serial ID	0000 0000	0000 0000	0000 0000	0000 0000
Show	No	No	No	No

Table 81: Additional Peripherals

1) Hängt vom angeschlossenen Displaytyp ab.

2.11 IPC2001 Technical Data

Controller	5C2001.01	5C2001.02	5C2001.03	5C2001.05	5C2001.07	5C2001.15
Processor	486 DX2-66	486 DX2-66	486 DX5-133	486 DX2-66	486 DX5-133	486 DX2-66
Coprocessor (built-in)	✓	✓	✓	✓	✓	✓
Real-time Clock	✓ ¹⁾					
BIOS	Award Elite	Award Elite	Award Elite	Award Elite	Award Elite	Award Elite
DRAM (1x PS/2 SIMM)	8 MB	8 MB	8 MB	8 MB	8 MB	8 MB
Graphics Controller C&T 65550	✓	✓	✓	✓	✓	✓
Graphic Memory	1 MB	1 MB	1 MB	1 MB	1 MB	1 MB
SRAM (battery buffered)	256 kB	256 kB	-	256 kB	256 kB	256 kB
FlashPROM (on board)	2 MB	2 MB	-	-	-	-
SiliconDisk ATA/ TruIDE (PcCard internal)	-	-	-	20 MB	-	-
SiliconDisk ATA/ TruIDE (CompactFlash external)	✓	-	-	-	-	✓
Hard Disk	-	-	2.1 GB ²⁾	-	2.1 GB ²⁾	-
COM1 (16 Byte FIFO)	RS 232	RS 232	RS 232	RS 232	RS 232	RS 232
COM2 (16 Byte FIFO)	RS 232/TTY	RS 232/TTY	RS 232/TTY	RS 232/TTY	RS 232/TTY	RS 232/TTY
COM3 (16 Byte FIFO, isolated)	-	RS 485/TTY	RS 485/TTY	RS 485/TTY	RS 485/TTY	RS 485/TTY
COM4 (16 Byte FIFO, isolated)	-	-	RS 232/422	RS 232/422	RS 232/422	RS 232/422
LPT1 (bidirectional)	✓	✓	✓	✓	✓	✓
CAN (isolated, on COM3 plug)	✓	✓	✓	✓	✓	✓
Ethernet (BNC, NE2000 compatible)	-	-	-	-	✓	-
Arcnet (BNC)	-	-	-	-	✓	-
PC Card	-	2x Type II / 1x Type III	2x Type II / 1x Type III	2x Type II / 1x Type III	2x Type II / 1x Type III	2x Type II / 1x Type III

Table 82: IPC2001 - Technical Data

Controllers • IPC2001

Controller	5C2001.01	5C2001.02	5C2001.03	5C2001.05	5C2001.07	5C2001.15
40mm Fan with ball bearing	-	-	✓	-	✓	-
PS/2 AT Keyboard Connector	✓	✓	✓	✓	✓	✓
Flat Display Connector	✓	✓	✓	✓	✓	✓
Monitor Connector	✓	✓	✓	✓	✓	✓
Panelware Keypad Module Connector	✓	✓	✓	✓	✓	✓
External Disk Drive Connector	✓	✓	✓	✓	✓	✓
Dallas Hardware Security Key	✓	✓	✓	✓	✓	✓
ISA Slot Option	✓	✓	✓	✓	✓	✓
Temperature	IEC61131-2 / IEC60068-2-x					
Shock: Standard / Tests	IEC61131-2 / IEC60068-2-27					
Vibration: Standard / Tests	IEC61131-2 / IEC60068-2-6					
Emission: Standard / Tests	EN50081-2 / EN55022+A1					
Immunity: Standard / Tests	IEC61131-2 / IEC61000-4-x					
Power Supply	24 V DC (± 6 V)					
Operating Temperature	0 - 50°C	0 - 50°C	3)	0 - 50°C	3)	0 - 50°C
Relative Humidity	5 - 95%, non-condensing					
Dimensions [mm] (W x H x D)	182 x 182 x 50					
Weight	Approx. 1.7kg					
Installation	Vertical, ±45°					
Altitude	Max. 3,000m					

Table 82: IPC2001 - Technical Data (cont.)

- 1) The quartz used with the IPC has an accuracy of 10 ppm. Under consideration of influences such as operating temperature and wiring of the quartz, inaccuracy depends on the type. 2 seconds per day
- 2) Controllers starting with Rev. F0 have a 6GB Hard Disk (see chapter 8.8, "Technical Data - 6GB Hard Disk")
- 3) 5-50°C when less than 250 operating hours per month, 5-47°C when 24h-operation (see chapter 8, Technical Data 6GB Hard Disk)

Controller	5C2001.16	5C2001.21	5C2001.22			
Processor	486DX2-66	486DX5-133	486DX5-133			
Coprocessor (built-in)	✓	✓	✓			
Real-time Clock	✓ ¹⁾					
BIOS	Award Elite	Award Elite	Award Elite			
DRAM (1x PS/2 SIMM)	8 MB	32 MB	32 MB			
Graphics Controller C&T 65550	✓	✓	✓			
Graphic Memory	1 MB	1 MB	1 MB			
SRAM (battery buffered)	256 kB	-	256 kB			
FlashPROM (on board)	-	-	-			
SiliconDisk ATA/ TrueIDE (PcCard internal)	-	-	-			
SiliconDisk ATA/ TrueIDE (CompactFlash external)	✓	-	✓			
Hard Disk	-	2.1 GB ²⁾	-			
COM1 (16 Byte FIFO)	RS 232	RS 232	RS 232			
COM2 (16 Byte FIFO)	RS 232/TTY	RS 232/TTY	RS 232/TTY			
COM3 (16 Byte FIFO, isolated)	RS 485/TTY	RS 485/TTY	RS 485/TTY			
COM4 (16 Byte FIFO, isolated)	RS 232/422	RS 232/422	RS 232/422			
LPT1 (bidirectional)	✓	✓	✓			
CAN (isolated, on COM3 plug)	✓	✓	✓			
Ethernet (BNC, NE2000 compatible)	✓	✓	✓			
Arcnet (BNC)	-	-	-			
PC-Card	2x Type II / 1x Type III	2x Type II / 1x Type III	2x Type II / 1x Type III			
Fan 40mm ball bearing	-	✓	✓			

Table 83: IPC2001 - Technical Data

Controller	5C2001.16	5C2001.21	5C2001.22			
PS/2 AT Keyboard Connector	✓	✓	✓			
Flat Display Connection	✓	✓	✓			
Monitor Connection	✓	✓	✓			
Panelware Keypad Module Connector	✓	✓	✓			
Connection for External Disk Drive	✓	✓	✓			
Dallas Hardware Security Key	✓	✓	✓			
ISA Slot Option	✓	✓	✓			
Temperature	IEC61131-2 / IEC60068-2-x					
Shock: Standard / Tests	IEC61131-2 / IEC60068-2-27					
Vibration: Standard / Tests	IEC61131-2 / IEC60068-2-6					
Emission: Standard / Tests	EN50081-2 / EN55022+A1					
Immunity: Standard / Tests	IEC61131-2 / IEC61000-4-x					
Power Supply	24 V DC (± 6 V)					
Operating Temperature	0 - 50°C	3)	0 - 50°C			
Relative Humidity	5 - 95%, non-condensing					
Dimensions [mm] (W x H x D)	182 x 182 x 50					
Weight	Approx. 1.7kg					
Installation	Vertical, ±45°					
Altitude	Max. 3,000m					

Table 83: IPC2001 - Technical Data (cont.)

- 1) The quartz used with the IPC has an accuracy of 10 ppm. Under consideration of influences such as operating temperature and wiring of the quartz, inaccuracy depends on the type. 2 seconds per day
- 2) Controllers starting with Rev. F0 have a 6GB Hard Disk (see chapter 8.8, "Technical Data - 6GB Hard Disk")
- 3) 5-50°C when less than 250 operating hours per month, 5-47°C when 24h operation (see chapter 8, Technical Data 6GB Hard Disk)

3. Differences between IPC2000 / IPC2001

3.1 General Information

New features in the IPC2001 have resulted in some differences to the IPC2000.

The following section gives a detailed description of some of the most important changes.

3.2 FEPROM and SRAM Internal Memory

- The integrated SRAM has a different address. When accessing this memory using the B&R driver BRSRAM.SYS, there is 100% software compatibility.
- The integrated FEPROM has a different address. When accessing this memory using the B&R driver BRFEPROM.SYS, there is 100% software compatibility.

3.3 COM1 and COM2

The addresses and interrupts for COM1 and COM2 can be set in BIOS. In "Auto" mode, they are set by BIOS. Take note that the settings can be different than for the IPC2000.

3.4 Division of Memory

The division of memory has changed because of the introduction of a 4 KByte Map window and the larger VGA BIOS (40 KByte using VESA Expansion). Additionally, the IPC2001 BIOS is a Plug and Play (PnP) BIOS, therefore memory areas are assigned according to PnP. When using non-PnP expansions cards, the memory area used, I/O addresses, interrupts and DMA channels have to be entered in BIOS in the "PnP CONFIGURATION SETUP". Take note that a continuous 16 KByte Block has to remain free in the D000 segment for the B&R BIOS Extensions.

3.4.1 Utilities and Device Driver

Utilities BRINFO.COM and BRMODE.EXE are not needed on the IPC2001 and are no longer supported.

The device driver BRIMAGE.SYS can only be used on the IPC2001 starting with Version 2.50 (also IPC2000). The Utility BRIMAGE.COM can only be used on the IPC2001 starting with Version 2.50 and BRMODES.COM can only be used on the IPC2001 starting with Version 2.10 (both still function on the IPC2000).

3.4.2 CMOS Data

The CMOS data contents are different because of the different BIOS used for the IPC2000 (Phoenix). CMOS data backups from an IPC2000 cannot be used on an IPC2001.

3.5 VGA BIOS

A new VGA BIOS is installed because of the new Graphics Chip (65550). Some functions of this VGA BIOS are different from the BIOS for the 65535 in an IPC2000.

- VESA included in VGA BIOS
- New graphics driver

3.6 LCD Settings

Settings for brightness and contrast can now also be made in BIOS. The Utilities used previously can still be used.

3.7 Mkey and Interact

MKey and Interact functions have been expanded.

3.8 CAN

With the IPC2001, it is possible to assign CAN "IRQ10" (or "Disabled"). The default setting is IRQ10.

3.9 HDD

The IPC2001 BIOS also supports HDD Modes "Large" and "LBA". Therefore it is possible to use hard disks with more than 504 MBytes.

4. IPC2002

4.1 General Information

The IPC2002 (also called Compact IPC) is a closed controller including Display. In comparison to the earlier models IPC2000 and IPC2001, the controller and the panel are one unit.

The most important differences as compared to the IPC2001 are:

- Compact Construction
- Separate CAN Interface
- No COM3, COM4 Interface
- Compact Flash instead of Hard Drive
- No Arcnet Connection

4.2 IPC2002 Controller

The most important data is shown in the following table. IPC2002 Technical Data can be found in section 4.9.

Resource	5C2002.02
Display	
Display Type Colors ¹⁾	TFT color, CFL background lighting 262,144 colors
Resolution	VGA (640 x 480 pixels)
Display Diagonal	10.4 in (264mm)
Touch Screen ²⁾ Technology	Accu Touch Analog, resistive
Controller	
Processor	486DX5 - 133MHz
DRAM ³⁾ (1 PS/2 SIMM Slot)	32 MByte
Mass Memory	Compact Flash ATA / True IDE
Network Connection	Ethernet RJ45, Twisted Pair
Operating Voltage	24 VDC (±6V)
Interfaces COM1 COM2 ⁴⁾ LPT1 CAN Keyboard External Disk Drive	16 Byte FIFO Bidirectional ✓ Enhanced AT PS/2 ✓
Fan	✓
VGA Controller	Chips & Technologies 65550
Graphic Memory	1 MB

Table 84: IPC2002 Controller

1) The actual number of colors depends on the graphics mode set and the software used (graphic driver).

2) See chapter 8 "Technical Appendix"

3) Cannot be added by the user!

4) Used internally for the Touch Screen

4.3 Dimensions

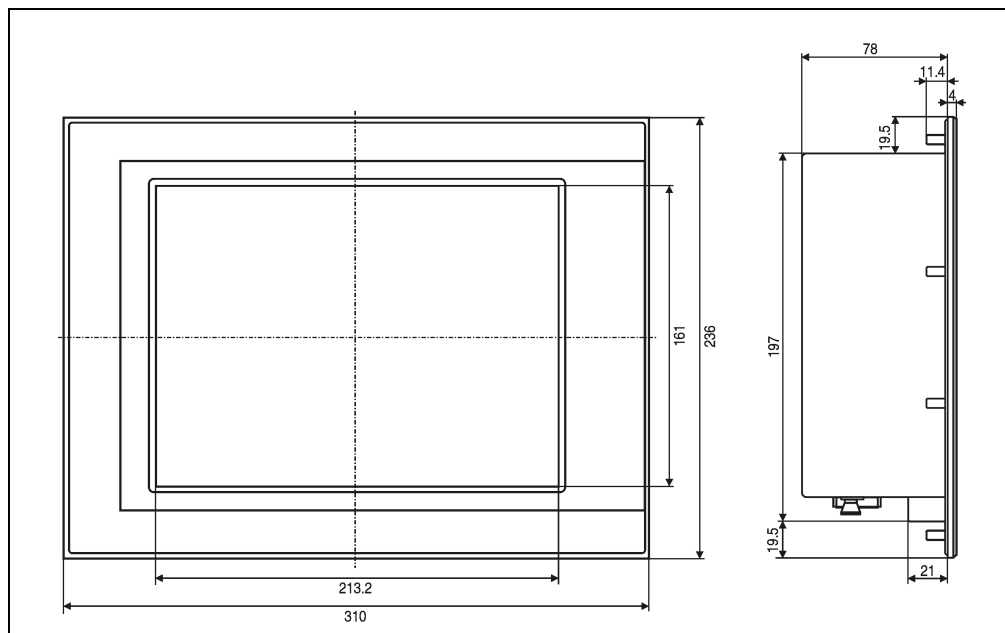


Figure 60: IPC2002 - Dimensions

4.4 Door Mount Installation

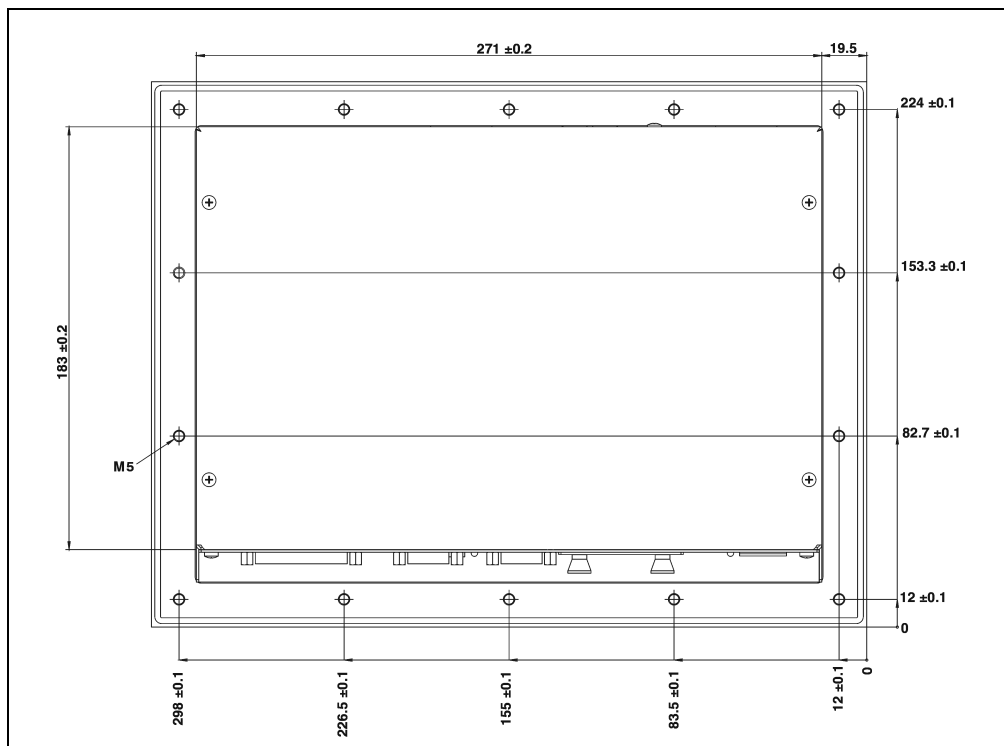


Figure 61: Door Mount Installation

The cutout and drill holes are to be made according to the following measurements for door installation.

4.5 Mounting Instructions

- See diagram for mounting position
- In order to guarantee sufficient air circulation, allow a distance of at least 10 cm between the fans and all other objects.
- Mount the panel using the 14 M5 Durlok nuts and mounting bolts provided on the backside

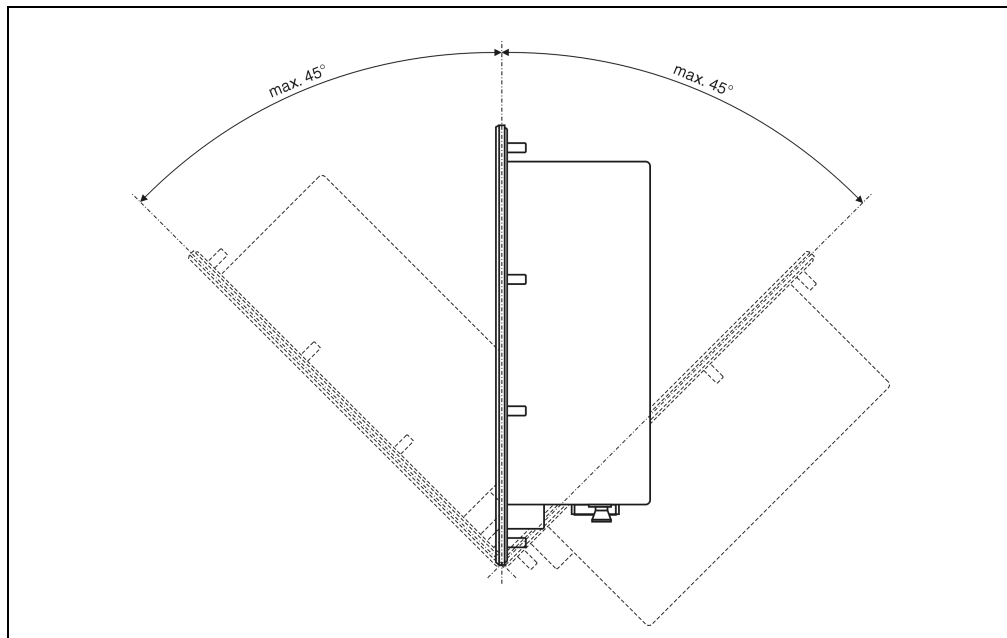


Figure 62: IPC2002 - Mounting Instructions

4.6 Component Overview

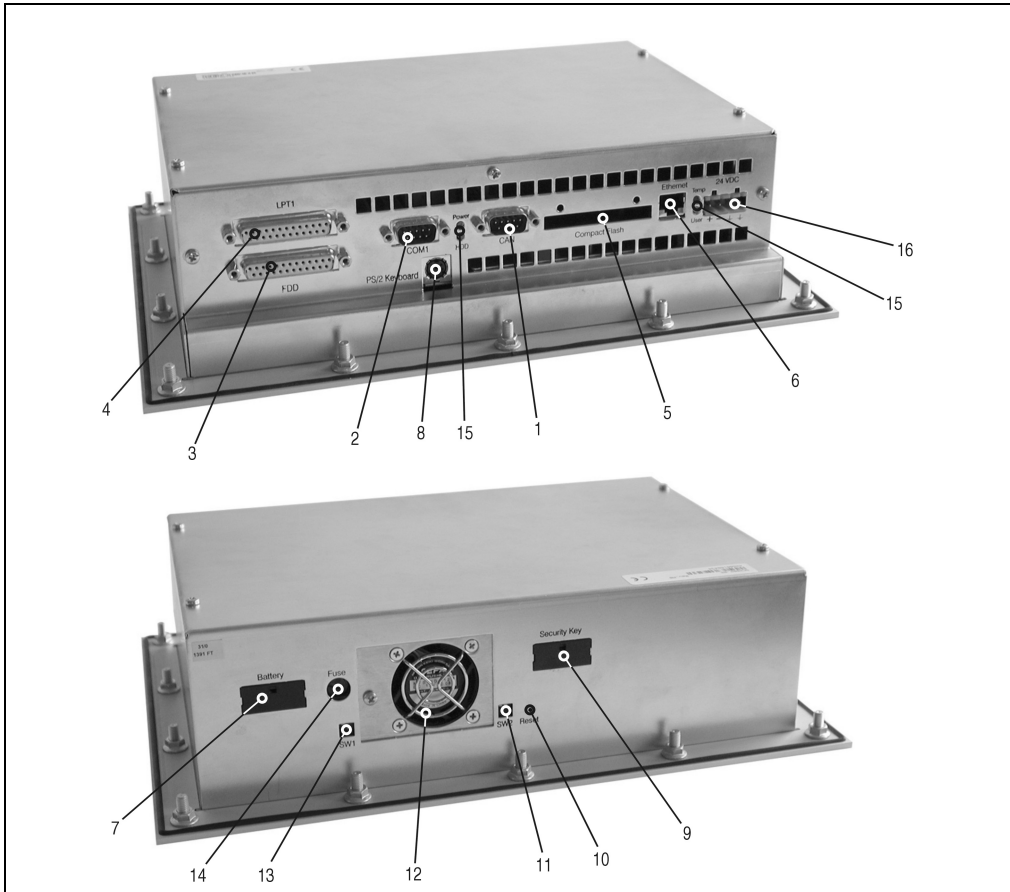


Figure 63: Component Overview

- | | | | |
|---|-------------------------------|----|-----------------------|
| 1 | CAN Interface | 9 | Hardware Security Key |
| 2 | COM1 Interface | 10 | Reset Button |
| 3 | Floppy Interface | 11 | DIP Switch 2 |
| 4 | Standard LPT1 (bidirectional) | 12 | Fan |
| 5 | Compact Flash Slot | 13 | DIP Switch 1 |
| 6 | Ethernet | 14 | Fuse Holder |
| 7 | CMOS Battery (RTC) | 15 | Status LEDs |
| 8 | PS/2 External Keyboard | 16 | Power Supply |

4.7 Component Descriptions

4.7.1 Power Supply

Input Voltage: 24 V DC ($\pm 6V$)



The pins connection to the ground should be as short as possible. If the controller is installed in a switching cabinet, the connection cable may not be longer than 15 cm.

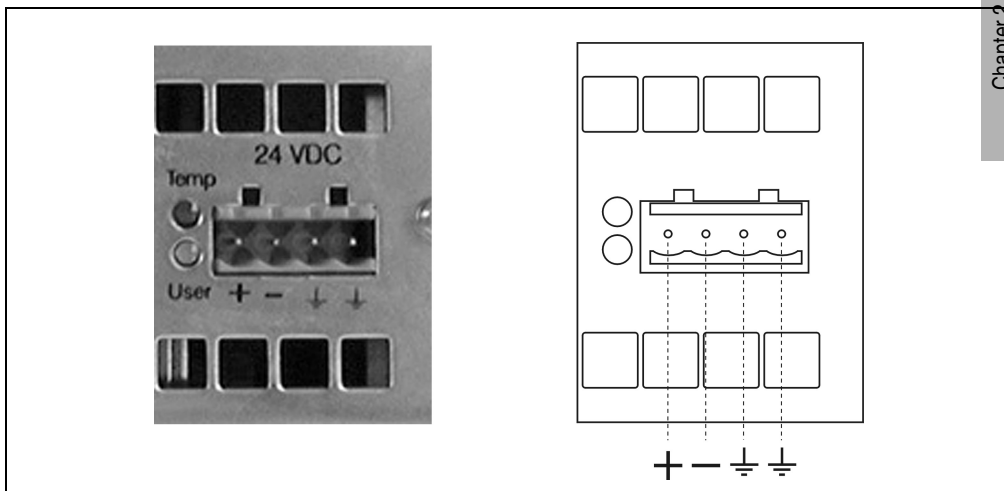


Figure 64: IPC2002 - Controller Power Supply

Performance data can be found in chapter 8.4!

4.7.2 COM1 - RS232

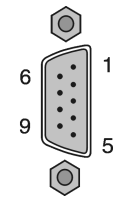
COM1		
RS232 interface Not electrically isolated up to 115 kBaud		9 pin DSUB plug 
Pin	RS232	
1	DCD	
2	RXD	
3	TXD	
4	DTR	
5	GND	
6	DSR	
7	RTS	
8	CTS	
9	RI	

Table 85: IPC2002 – COM1 Pin Assignments

Default Settings	COM1
Interrupt	IRQ4
I/O Address	3F8h-3FFh

Table 86: IPC2002 - Default Settings for COM1

These settings can be changed in BIOS under "INTEGRATED PERIPHERALS" (see chapter 2.2.9.8)

4.7.3 CAN Interface

The Intel 82527 processor is used as CAN controller. The controller used by B&R complies with the CAN specification 2.0B. Protocols Standard CAN and Extended CAN can be used on a bus.

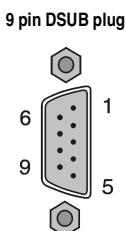
CAN		
Electrically isolated from the system ground Assignment according to CiA DS 102-1		 9 pin DSUB plug
Pin	Assignment	
1		
2	CAN Low	
3	GND	
4		
5		
6	Reserved	
7	CAN High	
8		
9		

Table 87: IPC2002 – CAN Pin Assignments

Default Settings	CAN
Interrupt 1)	IRQ10
I/O address	384h - 385h

Table 88: IPC2002 - Default Settings for CAN

I/O Address	Register	Function
384h	Address Register	Defines the register number to access.
385h	Data Register	Access of the register defined in the address register.

Table 89: IPC2002 - CAN Address Register

Additional information concerning the CAN bus can be found in the Technical Appendix.

4.7.4 Connection for External Disk Drive

An external disk drive can be connected to this 25 pin DSUB socket.

(see Chapter 7.5 "Accessories" for Disk Drive)

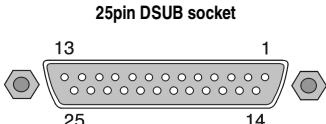
Connection for External Disk Drive					
Pin	Assignment		Pin	Assignment	
1	n.c.		14	Density	
2	Index		15	Side Select	
3	Track 0		16	Direction	
4	Write Protect		17	Step	
5	Read Data		18	GND	
6	Disk. Chan.		19	GND	
7	n.c.		20	GND	
8	n.c.		21	GND	
9	+5 V		22	GND	
10	Drive Select		23	GND	
11	Motor on		24	GND	
12	Write Data		25	GND	
13	Write Gate				

Table 90: IPC2002 – Pin Assignment for External 3.5" Disk Drive Connector

Setting	FDD
Interrupt	IRQ6
I/O Address	3F0h-37Fh

Table 91: IPC2002 – Settings for External Disk Drive

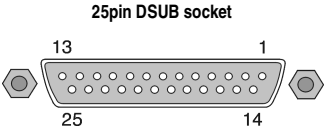


Because of general PC specifications, this interface should be used with extreme care concerning EMC, location of cables, etc. Therefore it should only be used for service! This interface cannot be configured as a parallel interface!

4.7.5 Parallel Interface LPT1

Parallel interface LPT1 uses a 25 pin DSUB socket.

Parallel Interface LPT1				
Pin	Assignment		Pin	Assignment
1	Data Strobe		14	Autofeed
2	Data 0		15	Error
3	Data 1		16	Printer Init
4	Data 2		17	Printer Select Input
5	Data 3		18	GND
6	Data 4		19	GND
7	Data 5		20	GND
8	Data 6		21	GND
9	Data 7		22	GND
10	Acknowledge		23	GND
11	Busy		24	GND
12	Paper End		25	GND
13	Printer Select Status			



25pin DSUB socket

Table 92: IPC2002 – LPT1 Interface Pin Assignment

Default Settings	LPT1
Interrupt	IRQ7
I/O Address	378h-37Fh

Table 93: IPC2002 – Default Settings for LPT1



Only functions if the BIOS setting, Onboard LPT Port (see chapter INTEGRATED PERIPHERALS) is set to a value. (set to **Disabled** with the BIOS Defaults or Setup Defaults)

4.7.6 AT Enhanced Keyboard Connection

An external AT keyboard is connected using a PS/2 connector.

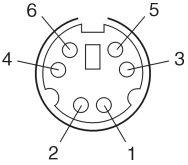
AT Enhanced Keyboard Connection		
Pin	Assignment	
1	KBDATA	
2		
3	GND	
4	+5 V	
5	KBCLK	
6		

Table 94: IPC2002 – Pin Assignments PS/2 Socket



Because of general PC specifications, this interface should be used with extreme care concerning EMC, location of cables, etc. Therefore it should only be used for service!

Setting	PS/2 Keyboard
Interrupt	IRQ1
I/O Address	060h-06Fh

Table 95: IPC2002 – Default Settings PS/2 Keyboard

4.7.7 Ethernet

The Realtek Semiconductor Corp. RTL8019AS ETHERNET controller used in the IPC2002, is compatible to the NE2000 standard.

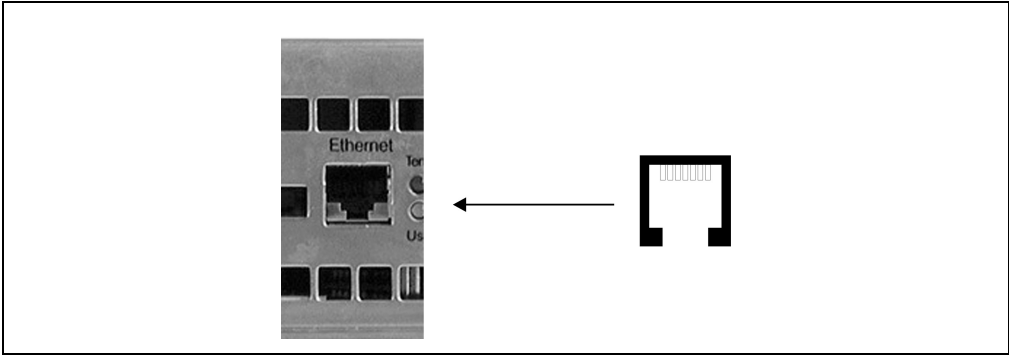


Figure 65: IPC2002 - Ethernet Connection

Setting	Ethernet
Interrupt	IRQ9
I/O Address	300h-31Fh

Table 96: IPC2002 - Default Settings for Ethernet

4.7.8 Compact Flash Slot

The IPC2002 controller has a Compact Flash Slot. The Compact Flash cards are ATA/True IDE compatible and can be accessed without additional drivers like a hard disk. The use of these memory cards allows the amount of memory to be determined by the user.

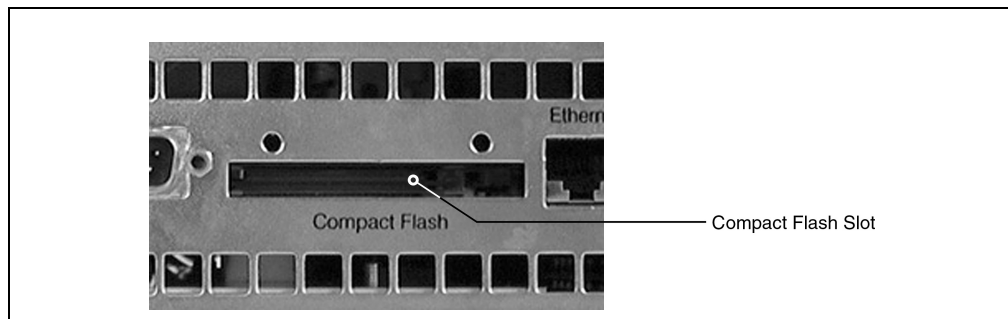


Figure 66: IPC2002 - Compact Flash Slot

The Compact Flash card can be removed by pressing the black release mechanism to the left of the card with a pointed object (e.g. pen). During operation, we recommend that you use the cover plate (EMC, protection from accidental release). The cover plate is included in the delivery.

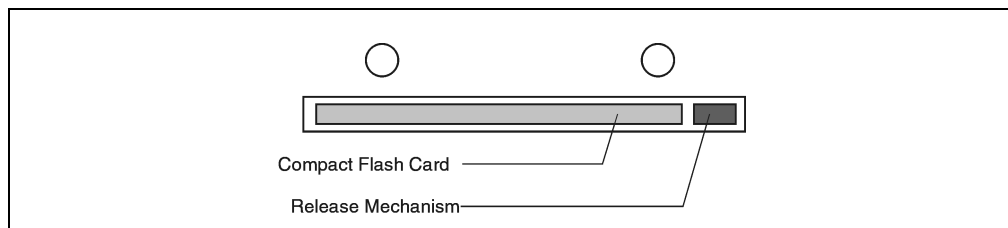


Figure 67: Compact Flash Card - Release Mechanism



Do not change the Compact Flash card during operation!

Model Number	Description	Remark
9A0015.01	Compact Flash 20 MByte Type I Compact Flash with 20 MByte PROM, True IDE/ATA	<i>Cancelled!</i>
9A0015.02	Compact Flash 64 MByte Type I Compact Flash with 64 MByte PROM, True IDE/ATA	
9A0015.03	Compact Flash 10 MByte Type I Compact Flash with 10 MByte PROM, True IDE/ATA	<i>Cancelled!</i>
9A0015.04	Compact Flash 48 MByte Type I Compact Flash with 48 MByte PROM, True IDE/ATA	<i>Customer specific</i>
9A0015.05	Compact Flash 128 MByte Type I Compact Flash with 128 MByte PROM, True IDE/ATA	
9A0015.06	Compact Flash 32 MByte Type I Compact Flash with 32 MByte PROM, True IDE/ATA	
9A0015.07	Compact Flash 8 MByte Type I Compact Flash with 8 MByte PROM, True IDE/ATA	
9A0015.08	Compact Flash 192 MByte Type I Compact Flash with 192 MByte PROM, True IDE/ATA	
9A0015.09	Compact Flash 320 MByte Type I Compact Flash with 320 MByte PROM	

Table 97: IPC2002 - Compact Flash Cards

4.7.9 Status LEDs

The IPC2002 is equipped with four LEDs. The LEDs are shown here below:

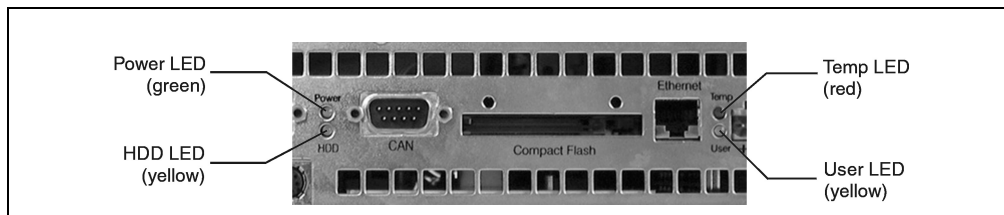


Figure 68: IPC2002 - Status LEDs

LED	Color	Function
Power LED	Green	Lit when power is applied
HDD LED	Yellow	Lit when reading from or writing to the hard disk
User LED	Yellow	The user LED can be controlled by the application. I/O Address 388h
Temp LED	Red	Note: Only possible on controllers with a fan! Lit when a temperature limit has been exceeded on the IPC2002. The fan is temperature controlled and starts when the temperature is 48°C (in housing) and reaches maximum rpm at 56°C. The fan stops again when the temperature drops below 44°C (in housing).

Table 98: IPC2002 - Status LEDs

4.7.10 DIP Switch SW1 & SW2

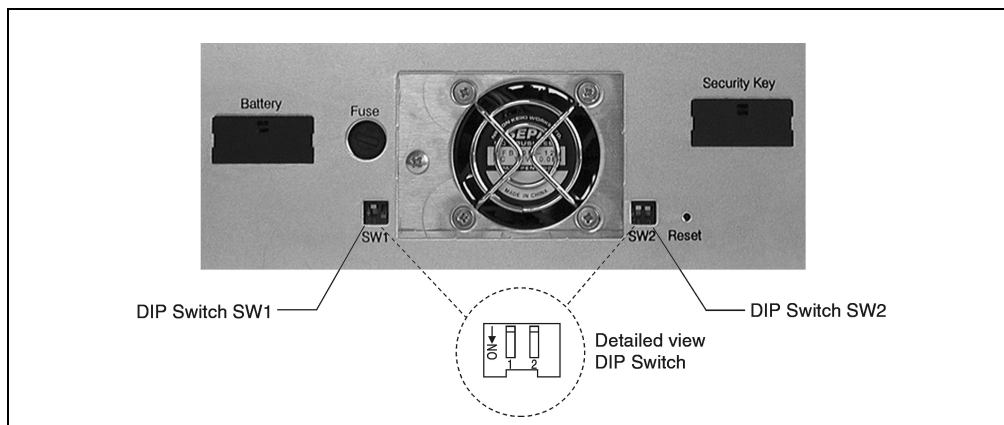


Figure 69: IPC2002 - DIP Switch SW1 and SW2

DIP Switch SW1

Switch Position	Function
"1" = ON	BIOS Recovery Mode - used if the system cannot be booted
"1" = OFF (Default)	BIOS Normal Mode
"2" = ON	Boot Block "Write enable" Note: During an upgrade, you will be asked to set this switch!
"2" = OFF (Default)	Boot Block "Write protect" Note: During an upgrade, you will be asked to set this switch!

Table 99: IPC2002 - DIP Switch SW1

DIP Switch SW2

Switch Position Function

"1" = ON	Reserved
"1" = OFF (Default)	Reserved
"2" = ON	User Flash "Write enable" - The FEPROM can be programmed
"2" = OFF (Default)	User Flash "Write protect" - The FEPROM cannot be programmed

Table 100: IPC2002 - DIP Switch SW2

4.7.11 Hardware Security Key

The Hardware Security Key is placed in a separate compartment and protected by a cover.

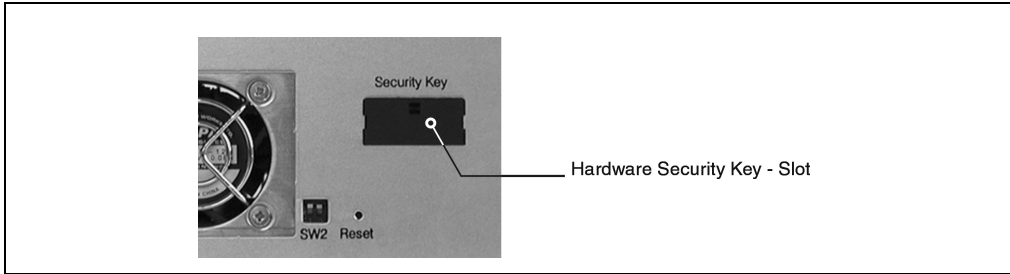


Figure 70: IPC2002 - Hardware Security Key



To make it easier to remove the dongle, we recommend that you use the dongle removal strip when inserting the dongle in the controller (included with delivery)!

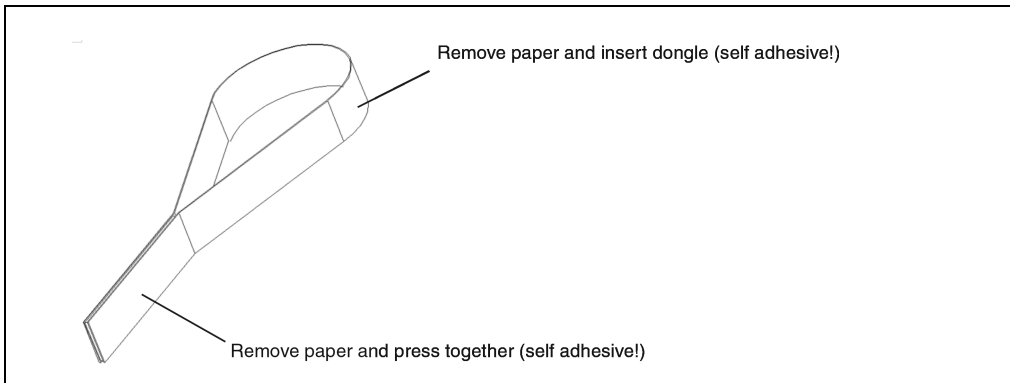


Figure 71: Dongle Removal Strip

4.7.12 CMOS Battery Compartment

The lithium battery is placed in a separate compartment and protected by a cover.

Battery Data: Lithium battery 3V, 950 mAh



According to CE regulations, the power supply must be removed from the controller when changing the lithium battery for safety reasons. Time data are lost when power is removed!

Lithium batteries are hazardous waste! Please consider the legal provisions for disposal in your area.

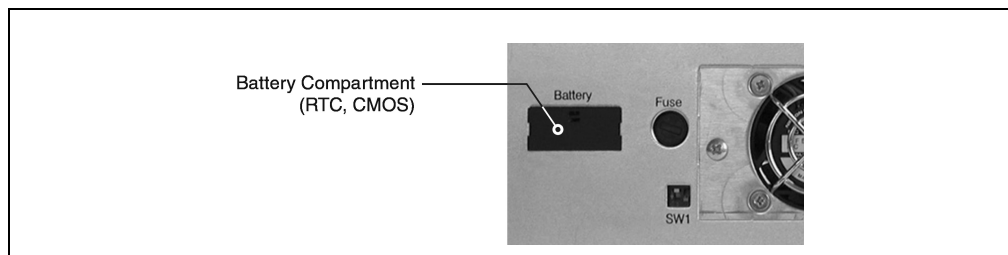


Figure 72: IPC2002 - Battery Compartment

4.7.13 Reset Button / Fuse Holder

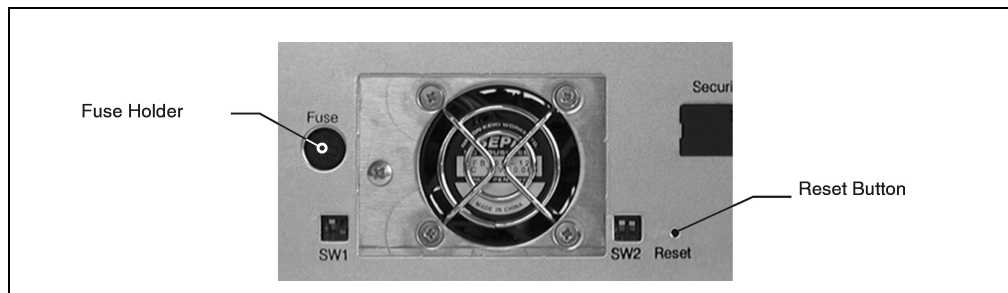


Figure 73: IPC2002 - Reset Button, Fuse Holder

Reset Button: The IPC2002 is equipped with a Reset Button. In order to avoid accidental activation, a reset can only be triggered using a pointed object.

Fuse:Type: 3.15A, 250V

4.8 Resources

4.8.1 Memory Assignments in UMA (Upper Memory Area, 640 KByte - 1024 KByte)

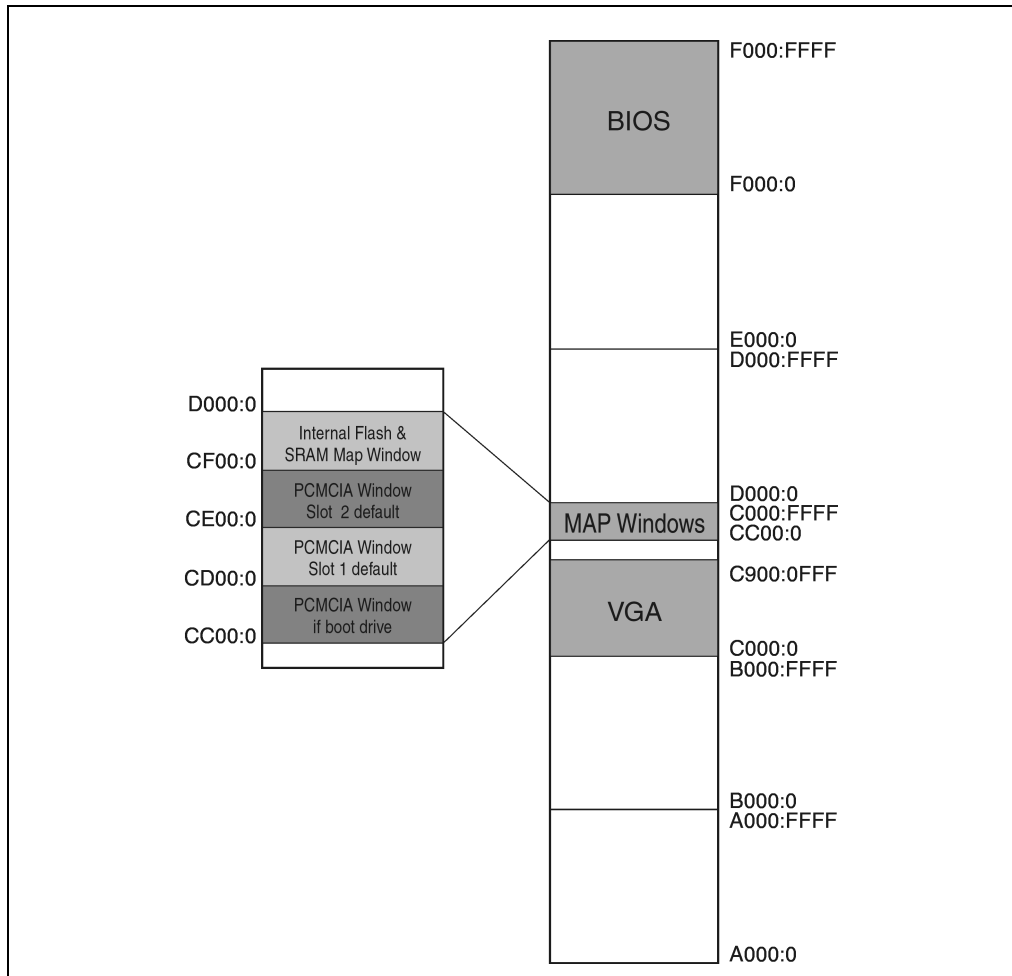


Figure 74: IPC2002 - Memory Assignments in UMA

4.8.2 RAM Address Assignments

RAM Address	Resource
000000h - 0003FFh	Interrupt Vectors
000400h - 09FFFFh	MS-DOS Programs
0A0000h - 0AFFFFh	VGA Graphics
0B8000h - 0BBFFFh	VGA Text Mode
0C0000h - 0C9FFFh	VGA BIOS
0CA000h - 0CBFFFh	Reserved
0CC000h - 0CFFFFh	Reserved Memory for Internal Flash, SRAM and PCMCIA Boot Map Window
0D0000h - 0DFFFFh ¹⁾	Expansion, placed at First Free Position according to PnP Standard
0E0000h - 0EFFFFh	Free
0F0000h - 0FFFFFh	Award Elite BIOS
100000h -	DRAM (up to 32 MByte) ²⁾

Table 101: IPC2002 - RAM Address Assignments

1) **Attention:** a continuous 16 KByte Block has to remain free for BIOS expansion

2) The size of the DRAM depends on the controller.

4.8.3 I/O Address Assignments

I/O Address	Resource
000h - 01Fh	DMA Controller 1
020h - 03Fh	Interrupt Controller 1
040h - 05Fh	Timer
060h - 06Fh	Keyboard Controller
070h - 07Fh	Real-time Clock, NMI mask, CMOS
080h - 09Fh	Page Register DMA Controller
0A0h - 0BFh	Interrupt Controller 2
0C0h - 0DFh	DMA Controller 2
1F0h - 1F8h	Compact Flash
238h - 23Fh	COM1 / COM2
278h - 27Fh	Interact Key
2F8h - 2FFh	COM1 / COM2 ¹⁾
300h - 31Fh	Ethernet
338h - 33Fh	COM1 / COM2
378h - 37Fh	LPT1
380h - 383h	Keypad Modules
384h - 385h	CAN Controller
388h	User LED
38Ah - 38Bh	Temperature
38Ch - 38Dh	LCD
38Eh - 38Fh	Battery
3B0h - 3BFh	Monochrome Display
3C0h - 3DFh	VGA Display
3E0h - 3E1h	Reserved
3F0h - 3F7h	Floppy Controller
3F8h - 3FFh	COM1 1) / COM2

Table 102: IPC2002 - I/O Address Assignments

1) Default settings for COM1 and COM2.

Description of B&R I/O Addresses 38xh:

I/O Address	Resource	Read	Write	Remark
380h	Keypad Modules	PW_Data R	PW_Data W	Data Register
381h	Keypad Modules	-	PW_PL	PL - Cycle
382h	Keypad Modules	PW_Byte Ready		
383h	Keypad Modules	PW_DMA Ready		
384h	CAN Controller			CAN Index
385h	CAN Controller			CAN Data
386h	Internal User Memory	-	8 Bit from Window	12 Bit Paging Register for User SRAM & FEPROM
387h	Internal User Memory	-	4 Bit from Window	
388h	User LED	User LED	User LED	388.0 = 1: ON; 388.0 = 0: OFF
389h		-	-	
38Ah	Temperature	Temp	Disp. Select	Temp: 38A.0 = 0: Overtemp (only for versions with fan)
38Bh		-	Disp. Unselect	
38Ch	LCD Contrast	Disp_Data	Disp_Data = 1	
38Dh	LCD Contrast	-	Disp_Data = 0	
38Eh	Battery Status	Bat. Status	Disp_CLK = 0	Bat.: 38E.0 = 0: OK
38Fh	Battery Status		Disp_CLK = 1	

Table 103: IPC2002 - Description of B&R I/O Addresses 38xh:

4.8.4 DMA Channels

DMA Channel	Resource
0	Panelware
1	Panelware
2	Floppy Disk
3	Free
4	Reserved
5	Free
6	Free
7	Free

Table 104: IPC2002 - DMA Channels

4.8.5 Interrupts

Interrupt Assignments for IPC2002:

IRQ	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	None
System Timer	●																
Keyboard		●															
IRQ cascade			●														
COM1				○	●												○
COM2 ¹⁾				●	○												○
Disk Drive							●										
LPT1						○		●									
Real-time Clock									●								
Ethernet						○				●							
CAN Controller											●						○
Co-processor														●			
Hard Disk															●		○

Table 105: IPC2002 - Interrupt Assignments

1) This interface is used internally for the touch screen.

- ... Default Setting
- ... Possible Settings

4.9 IPC2002 Technical Data

Controller	
Processor	486 DX5, 133 MHz
Coprocessor (built-in)	yes
Real-time Clock	✓ ¹⁾
BIOS	Award Elite
DRAM (1x PS/2 SIMM)	32 MByte
Graphics Controller	C&T 65550
Graphic Memory	1 MB
SiliconDisk ATA/TrueIDE (CompactFlash)	✓
COM1 (16 Byte FIFO)	UART 16550
LPT1 (bidirectional)	✓
CAN Interface	i82527

Table 106: IPC2002 - Technical Data

Controller	
Ethernet (Twisted Pair, NE2000 compatible)	✓
40mm Fan with Ball Bearing	✓
PS/2 AT Keyboard Connector	✓
Connection for External Disk Drive	✓
Dallas Hardware Security Key	✓
Temperature	IEC61131-2 / IEC60068-2-x
Shock: Standard / Tests	IEC61131-2 / IEC60068-2-27
Vibration: Standard / Tests	IEC61131-2 / IEC60068-2-6
Emission: Standard / Tests	EN50081-2 / EN55022+A1
Immunity: Standard / Tests	IEC61131-2 / IEC61000-4-x
Protection	IP20
Power Supply	24 V DC (± 6 V)
Operating Temperature	0 -50°C
Relative Humidity	5 -95%, non-condensing
Measurements in mm (W x H x D)	310 x 236 x 82
Weight	3.45 kg
Installation	see Mounting Instructions
Altitude	Max. 3,000m
Display	
Display Type Colors	TFT color, CFL background lighting 262,144 colors
Resolution	VGA (640 x 480 pixels)
Display Diagonal	10.4 in (264mm)
Touch Screen Technology	Accu Touch, analog, resistive
Design	Light Gray
Background Lighting (type) Brightness Lifespan	200 cd/m ² 25,000h
Relative Humidity	5 -85%, non-condensing
Display design / Colors Gray border around the display Bright background	Pantone 432c Pantone 427c

Table 106: IPC2002 - Technical Data (cont.)

1) The quartz used with the IPC has an accuracy of 10 ppm. Under consideration of influences such as operating temperature and wiring of the quartz, inaccuracy depends on the type; 2 seconds per day.

4.10 BIOS

4.10.1 General Information

BIOS stands for "Basic Input Output System". BIOS setup is the most basic standardized connection between the user and the system. Elite BIOS from Award Software is used on the IPC2002.

The Setup program lets you modify basic system configuration settings. These settings are stored in CMOS RAM and in FEPROM. The CMOS RAM is a nonvolatile battery backed memory which retains information when the power is turned off on the IPC2002.

Elite BIOS on the IPC 2002 is a customized version of an industry-standard BIOS for IBM PC AT-compatible personal computers. It supports Intel x86 and compatible processors. BIOS provides critical low-level support for the central processing unit, memory and I/O subsystems.

BIOS has been customized by adding important, but nonstandard, features such as virus or password protection, power management, and detailed fine-tuning of the chipset controlling the system.

The following information is intended to guide you through the process of configuring your system using Setup.

4.10.2 Setup Start

Elite BIOS is immediately activated when you first turn on the computer. BIOS reads system configuration information in CMOS RAM, compares it with the FEPROM and begins the process of checking out the system and configuring it through the power-on self test (POST).

When these preliminaries are finished, the BIOS seeks an operating system on one of the data storage devices (hard drive, floppy drive, etc.). BIOS launches the operating system and hands over control of system operations to it.

To start Setup, press the Del key when this message appears briefly at the bottom of the screen (during POST):

Press DEL to enter SETUP

If the message disappears before you press DEL and you still wish to enter Setup, you must reboot the system.



The best advice is to alter only those settings that you thoroughly understand. Settings should not be changed in the Chipset screen without a good reason. The Chipset defaults have been carefully chosen by Award or from B&R to guarantee ideal performance and reliability. Even a seemingly small change to the Chipset setup may cause the system to become unstable!

4.10.3 Setup Keys

The following keys help you navigate in Setup:

Cursor ↑	Move to previous item
Cursor ↓	Move to next item
Cursor ←	Move to the item in the left hand direction
Cursor →	Move to the item in the right hand direction
Esc	Main Menu: Quit without saving changes into CMOS RAM. Other pages: Exit current page and return to Main Menu
PgUp↑	Decrease the numeric value or make changes
PgDn ↓	Increase the numeric value or make changes
+	Increase the numeric value or make changes
-	Decrease the numeric value or make changes
F1	General Help
F2	Change color from a selection of 16 colors. F2 to select color forward, Shift-F2 to select color backward
F3	Reserved
F4	Reserved
F5	Restore the previous CMOS value from CMOS, (only possible in the Option Page Setup Menu)
F6	Load the default CMOS RAM value from BIOS default table, (only possible in the Option Page Setup Menu)
F7	Load the default (only possible in the Option Page Setup Menu)
F8	Reserved
F9	Reserved
F10	Save all changes to CMOS and exit Setup. (only possible in Main Menu)

Table 107: Setup Keys

4.10.4 Help

Press F1 to pop up a help window which describes the appropriate keys to use and the possible selections for the highlighted item. To exit the Help Window press Esc or the F1 key again.

4.10.5 BIOS Setup Menu

Entering the BIOS Setup Menu is done by pressing the [Del] key during or immediately after the system RAM check. The desired items can be selected from the menu.

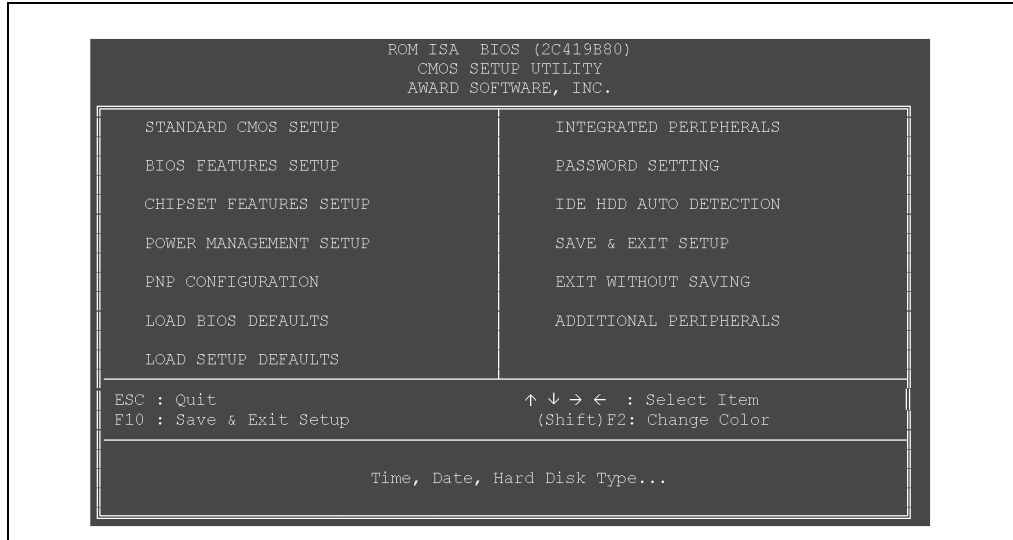


Figure 75: BIOS Setup Menu

Following is a brief summary of each Setup category.

Standard CMOS Setup

Options in the original PC AT-compatible BIOS.

BIOS Features Setup

Award enhanced BIOS options.

Chipset Features Setup

Options specific to your system chipset.

Power Management Setup

Advanced Power Management (APM) options.

PnP Configuration

Plug and Play configuration options

Load BIOS Defaults

BIOS defaults are factory settings for the most stable, minimal-performance system operations.

Load Setup Defaults

Setup defaults are factory settings for optimal-performance system operations.

Integrated Peripherals

I/O subsystems that depend on the integrated peripherals controller in your system.

Password Setting

Change, set, or disable a password.

IDE HDD Auto Detection

Automatically detect and configure IDE hard disk parameters.

Save & Exit Setup

Save settings in nonvolatile CMOS RAM and exit Setup.

Exit without saving

Abandon all changes and exit Setup.

Additional Peripherals

Settings can be made for peripheral devices.

Standard CMOS Setup

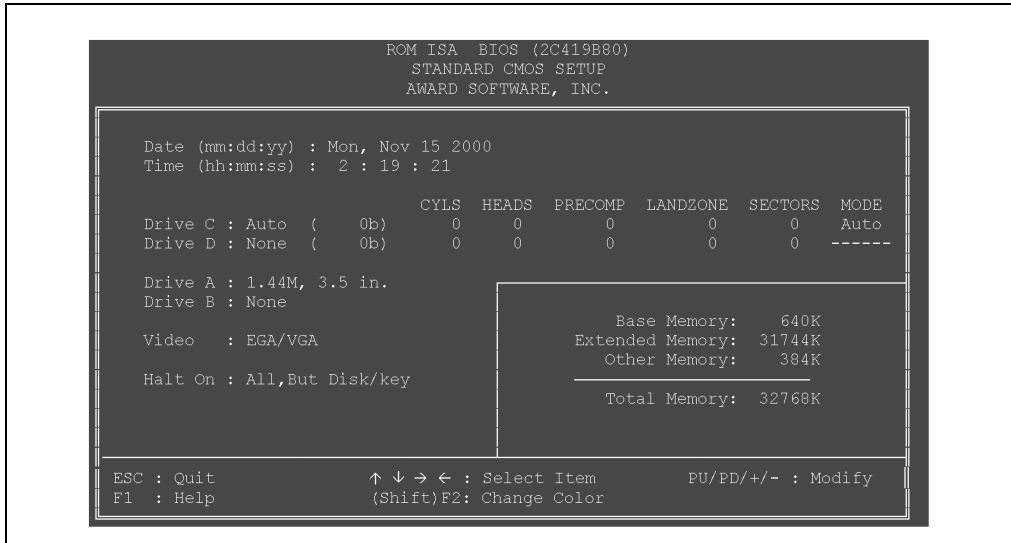


Figure 76: Standard CMOS Setup

Date and Time

The RTC (real-time clock) can be set here. These fields are not stored in the CMOS Data Backup.

Drive C: and Drive D:

The hard disk parameters can be set here. We recommend that you select type "AUTO". BIOS can automatically detect the specifications and optimal operating mode of almost all IDE hard drives. When you select type AUTO for the hard drive, BIOS detects its specifications during POST, every time the system boots.

If you do not want to select drive type AUTO, other methods of selecting the drive type are available:

- Match the specifications of your installed HDD or Compact Flash card with the predefined values for drive types 1 through 45. If one of the predefined drive types corresponds to your hard disk or Compact Flash card then you can select this type.
- Select "USER" and enter values into each drive parameter field.
- Use the HDD AUTO DETECTION function in Setup.

Here is a brief explanation of drive specifications:

Type

The BIOS contains a table of predefined drive types. Each defined drive type has a certain specification. Drives whose specifications do not accommodate any predefined type are classified as type "USER".

Size

Disk drive capacity. Note that this size is usually slightly greater than the size of a formatted disk given by a disk-checking program.

Cyls Number of cylinders

Head Number of heads

Precomp Write Precompensation Cylinder

Landzone Landing Zone

Sector Number of Sectors

Mode "Auto", "Normal", "Large" or "LBA"

Auto The BIOS automatically determines the optimal mode.

Normal The following maximum values are supported: Number of cylinders = 1025, Number of heads = 16 and Number of sectors = 64

Large For drives that do not support LBA and have more than 1024 cylinders.

LBA Logical Block Addressing - During drive accesses, the IDE controller transforms the data address described by sector, head, and cylinder number into a physical block address. This results in a significantly improved data transfer rate. For drives with more than 1024 cylinders.

Drive A: and Drive B:

Select the correct specifications for the diskette drive(s) installed in the computer.

None No diskette drive installed

1.44M, 3.5 in. 3½ inch diskette; 1.44 MByte capacity

2.88M, 3.5 in. 3½ inch diskette; 2.88 MByte capacity

VIDEO

Select the type of primary video subsystem in your computer.

BIOS usually detects the correct video type automatically. BIOS supports a secondary video subsystem, but you do not select it in Setup.

EGA/VGA Enhanced Graphics Adapter / Video Graphics Array.

For EGA, VGA, SEGA, SVGA or PGA monitor adapters.

CGA 40 Color Graphics Adapter, power up in 40 column mode

CGA 80 Color Graphics Adapter, power up in 80 column mode

MONO Monochrome adapter, includes high resolution monochrome adapters

Halt On

During the POST, the computer stops if BIOS detects a hardware error (waits for the <F1>key to be pressed).

You can tell BIOS to ignore certain errors during POST (the boot-up process continues) and to wait until the <F1> key has been pressed.

No errors POST does not stop for any errors.

All errors If BIOS detects any non-fatale errors POST stops and prompts you to take corrective action.

All, but Keyboard POST does not stop for a keyboard error, but stops for all other errors.

All, but Diskette POST does not stop for diskette drive errors, but stops for all other errors.

All, but Disk/Key POST does not stop for a keyboard or disk error, but stops for all other errors.

BIOS FEATURES SETUP

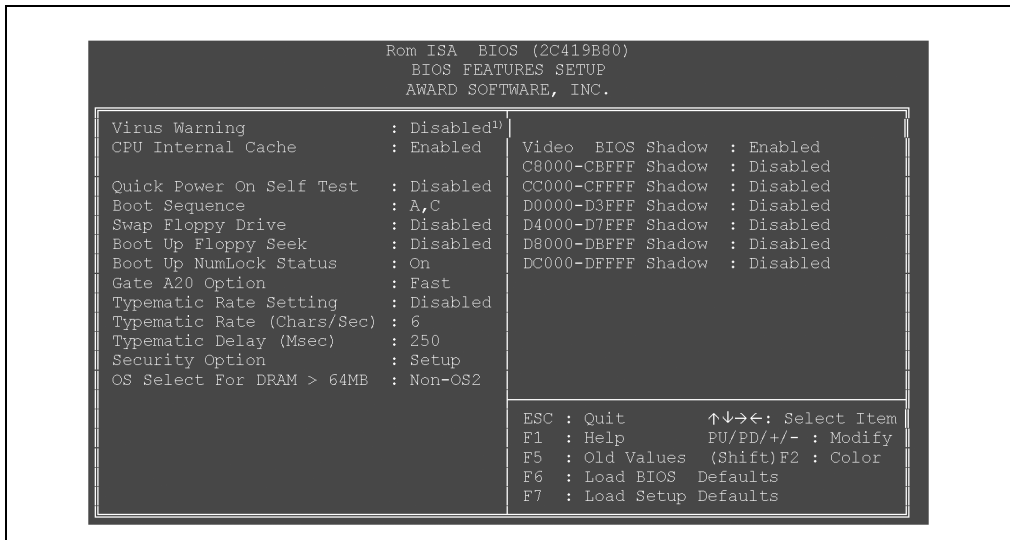


Figure 77: BIOS Features Setup

Virus Warning

When enabled, you receive a warning message if a program (especially a virus) attempts to alter the boot sector or the partition table of the boot drive (not the rest of the hard drive!). If this is the case, you should then run an anti-virus program and check over the data carriers.



Some disk diagnostic programs (e.g. data carrier maintenance or partitioning) alter the boot sector. If you plan to run such a program, we recommend that you first disable the virus warning.

CPU Internal Cache

Switches the L1 cache on or off. Switching off the internal cache slows the system down considerably, and therefore is not advisable.

Quick Power On Self Test

When "Enabled", the "Power on Self Test" (POST) is accelerated (no detailed memory test).

Boot Sequence

You can select "A,C", "C,A", and "C only" here.

The default sequence (A,C) is:

1. FDD
2. PC - Card Slot 1
3. PC - Card Slot 2
4. Internal FEPROM
5. Internal SRAM
6. HDD

If you select "C,A", the hard disk is placed in the first position, then the other devices. If you select "C only", the system will only attempt the boot from the hard disk. Each bootable device (except for the hard disk) is automatically assigned drive designation A:. The disk drive (when it is not used to boot), is assigned drive designation B:.

Swap Floppy Drive

This field is effective only in systems with two floppy drives. Selecting "Enabled" assigns physical drive B to logical drive A, and physical drive A to logical drive B.

Boot Up Floppy Seek

When "Enabled", BIOS tests (seeks) floppy drives to determine whether they have 40 or 80 tracks. Only 360 KByte diskettes have 40 tracks. All diskettes with 720 KByte, 1.2 MByte and 1.44 MByte have 80 tracks. Because very few modern PCs have 40-track floppy drives, we recommend that you set this field to "Disabled" to save time.

Boot Up NumLock Status

With this field you can define the state of the NumLock button when booting. When toggled "On", the numeric keypad generates numbers instead of controlling cursor operations. When toggled "Off", the control fields are used for the keys "Cursor Keys, Pos1,End, etc.).

Gate A20 Option

Gate A20 refers to the way the system addresses memory above 1 MB (extended memory). When set to "Fast", the system chipset controls Gate A20. When set to "Normal", a pin in the keyboard controller controls Gate A20. Setting Gate A20 to "Fast" improves system speed, particularly with OS/2 and Windows.

Typematic Rate Setting

When "Disabled", the following two items (Typematic Rate and Typematic Delay) are irrelevant. Keystrokes repeat at a rate determined by the keyboard controller in your system.

When "Enabled", you can select a typematic rate and typematic delay.

Typematic Rate (chars/sec)

When the typematic rate setting is enabled, you can select a typematic rate (the rate at which the character repeats when you hold down a key) of 6, 8, 10, 12, 15, 20, 24 or 30 characters per second. The repeat rate determines the speed that characters are repeated when a key is pressed and held down.

Typematic Delay (Msec)

When the typematic rate setting is enabled, you can select a typematic delay (the delay before key strokes begin to repeat) of 250, 500, 750 or 1000 milliseconds. The typematic delay begins when you hold a key down.

Security Option

Here you can select between Setup and System. This option appears after a set password is requested. If you have a password, select whether the password is required every time the system boots or only when you enter Setup.

OS Select For DRAM > 64MB

Select OS/2 only if you are running OS/2 operating system with greater than 64 MB of DRAM on your system.

Shadow

Shadow settings are only valid for ISA cards. Software that resides in a read-only memory (ROM) chip on a device is called firmware. Elite BIOS permits shadowing of firmware such as the system BIOS, video BIOS, and similar operating instructions that come with some expansion peripherals, such as, for example, a SCSI adaptor.

Video BIOS Shadow & C8000-CBFFF Shadow

These settings have no function because the 40 KByte VGA is always shadowed. The last 8 KByte of C8000 to CBFFF are still available but they are always shadowed.

CC000-CFFFF

The Map Windows for internal FPR0M, SRAM and PCMCIA are stored here. Therefore, this area is always set to read write ISA.

Memory area D0000 - DFFFF

These areas can be used by the Firmware on other expansion cards. If an expansion device in your system contains ROM based firmware, you need to know the address range which the ROM occupies in order to shadow it into the correct area of RAM.

CHIPSET FEATURES SETUP

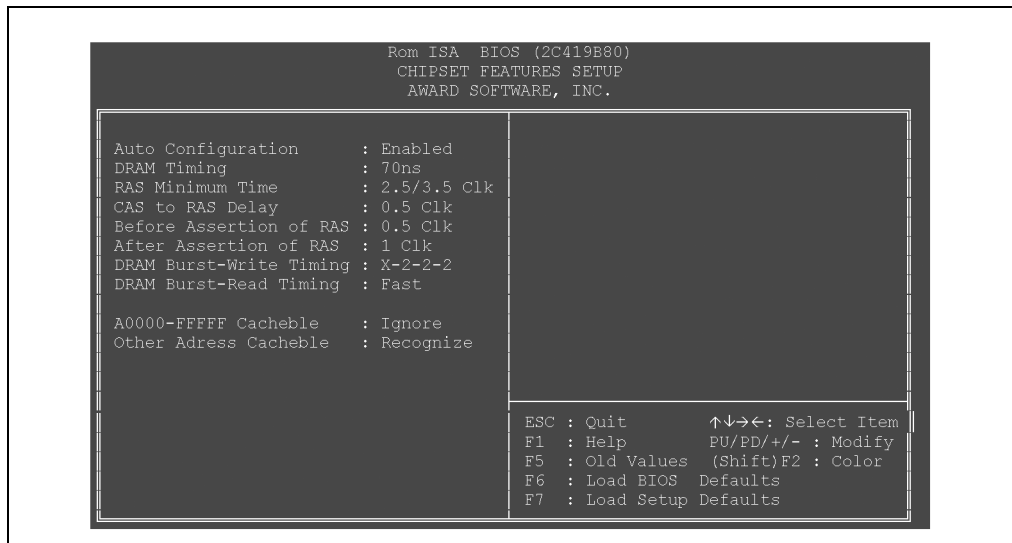


Figure 78: Chipset Features Setup

Auto Configuration

When "Enabled", BIOS sets the ideal values for the respective DRAM.

DRAM Timing

You can select "50", "60", "70" and "80" nsec. This determines the access time for the main memory that is installed.

The next 6 settings are for DRAM timing. They can only be set when **Auto Configuration** is "Disabled".

A0000-FFFFFF Cacheable

If "Recognize" is set here, then "A0000-FFFFFF" is cached.

Other Address Cacheable

If "Recognize" is set here, then everything other than "A0000-FFFFFF" is cached.

POWER MANAGEMENT SETUP

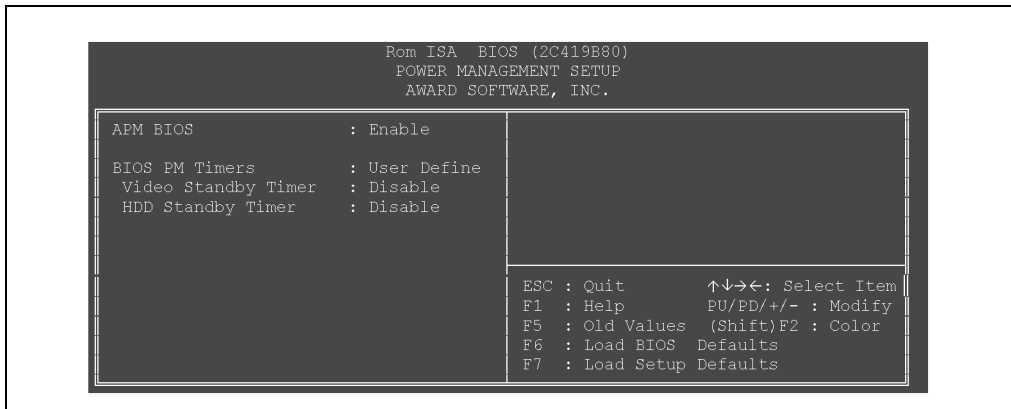


Figure 79: Power Management Setup

APM BIOS

Turns the APM BIOS (Advanced Power Management BIOS) on ("Enable") or off ("Disable").

BIOS PM Timers

You can select "Disable", "User Define", "Min Timeouts" and "Max Timeouts".

If you select "Disable", the items **Video Standby Timer** and **HDD Standby Timer** are automatically set to "Disable".

Disable

User Define Allows manual settings for **Video Standby Timer** and **HDD Standby Timer**.

Min Timeouts /

Max Timeouts The minimum / maximum values are set for **Video Standby Timer** and **HDD Standby Timer**.

Video Standby Timer

You can set the standby time (15min - 1min) for the video signal here. Only possible when **BIOS PM Timers** is set to "User Define".

HDD Standby Timer

You can set the standby time (15min - 15sec) for the hard disk here. Only possible when BIOS PM Timers is set to "User Define".

This function only works under certain circumstances because most hard disks have an integrated timer for "Power Down" mode. That means the hard disk goes into "Power Down" mode after a certain time even though "Disable" is set. This takes place after approx. 45 minutes on the Toshiba 2.5" Disk (MK2103MAV).

PNP CONFIGURATION

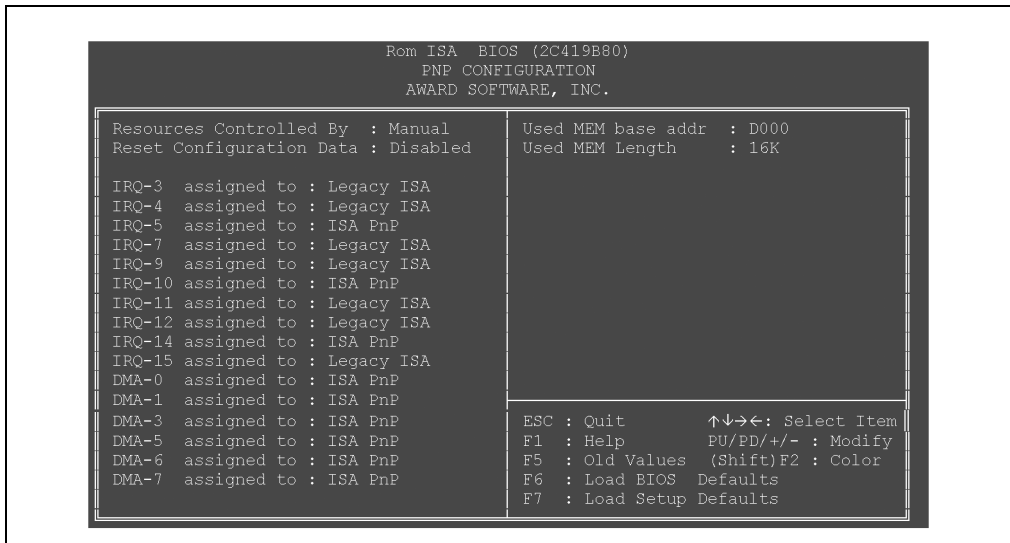


Figure 80: PNP Configuration

Resources Controlled By

When set to "Auto", BIOS can automatically configure all Plug and Play compatible and bootable devices. When set to "Manual", all IRQ and DMA settings can be made by the user.

Reset Configuration Data

If "Enabled" is set here, BIOS deletes the ESCD area and rewrites it again. After the ESCD area is deleted, this setting is automatically returned to "Disabled".

IRQ-xx assigned to

Here, you can determine if the IRQ is available for the installed PNP devices (ISA PnP) or not (Legacy ISA). IRQ12 is set to "Legacy ISA" as default. If COM4 is not installed on the device, this IRQ should be set to "ISA PnP".

DMA-x assigned to

Same function as "IRQ-xx assigned to", but the DMA channels are assigned here.

Used MEM base addr

This option makes it possible to reserve a main memory window in the upper memory area, e.g. for some older ISA network cards. If a starting address is specified instead of N/A (not available), the option "Used MEM Length" can be used to set the size of the memory area required.

Used MEM Length

Sets the size of the memory area to be reserved, starting at the address defined in "**Used MEM base addr**".



ATTENTION: a continuous 16 KByte memory area has to remain free for BIOS expansions.

LOAD BIOS DEFAULTS

Loads the BIOS defaults. These settings are standard values from AWARD. BIOS defaults are safe values, but for example DRAM Timing is slower here than for the Setup defaults.

LOAD SETUP DEFAULTS

Loads the Setup defaults. These items have been optimized by B&R for the IPC2001 and are therefore preferable to BIOS defaults.

INTEGRATED PERIPHERALS

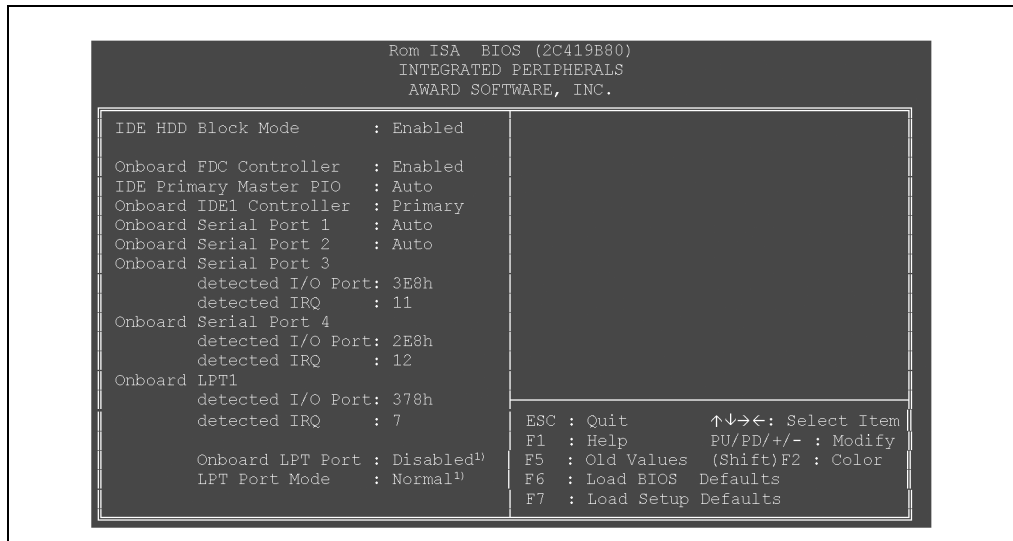


Figure 81: Integrated Peripherals

IDE HDD Block Mode

Switches the block mode on/off for the hard disk. If block mode is on ("Enabled"), several sectors are transferred at the same time. This increases the speed.

Onboard FDC Controller

Switches the Floppy controller on/off. If this setting is turned off ("Disabled"), the floppy does not work.

IDE Primary Master PIO

Sets the transfer speed on the IDE Bus. "PIO Mode 0" is the slowest and "PIO Mode 4" is the fastest. If "Auto" is set, BIOS reads the maximum speed from the IDE device.



Attention: With older hard drives and ATA Flash disks, setting the PIO mode too high can cause read and write errors.

Onboard IDE1 Controller

Switches the primary hard disk controller on ("Primary") or off ("Disabled"). A hard disk only functions if "Primary" is set.

Onboard Serial Port 1 and 2

Here you can set the I/O addresses and interrupts for COM1 and COM2 interfaces. Make sure that these variables are not all the same. These two interfaces can also be turned off ("Disabled").

Default assignment for "Auto":

COM1: I/O Address 3F8h - 3FFh, IRQ4

COM2: I/O Address 2F8h - 3FFh, IRQ3

For **Onboard Serial Port 3**, **Onboard Serial Port 4** and **Onboard LPT1**, only the I/O addresses and interrupts are shown. These values cannot be changed or deactivated!

Onboard LPT Port

Activated (3BC/IRQ7, 378/IRQ7, 278/IRQ5) and deactivated (Disabled) the LPT1 interface on a Compact IPC.

LPT Port Mode

Here you can set the operating mode of the parallel interface. The following items can be selected:

Normal Normal Transfer

EPP Enhanced Parallel Port

ECP Enhanced Capability Port

ECP+EPP Combined ECP/EPP transfer

PASSWORD SETTING

You can set the system password here. If, you press "Enter", without entering a password, the password function is deactivated.



ATTENTION: The password entered is also saved in the CMOS Backup, and is impossible to delete. If you forget the password, the Flash must be exchanged by B&R!

IDE HDD AUTO DETECTION

Hard disks are automatically recognized in this menu . For larger hard disks, you can select one of three entries (NORMAL / LBA / LARGE Mode) depending on the HDD type and size. For Windows systems, LBA mode is preferable (BIOS default).

SAVE & EXIT SETUP

Ends the SETUP UTILITY. Changes are saved in CMOS!

EXIT WITHOUT SAVING

Ends the SETUP UTILITY without saving changes in CMOS.

ADDITIONAL PERIPHERALS

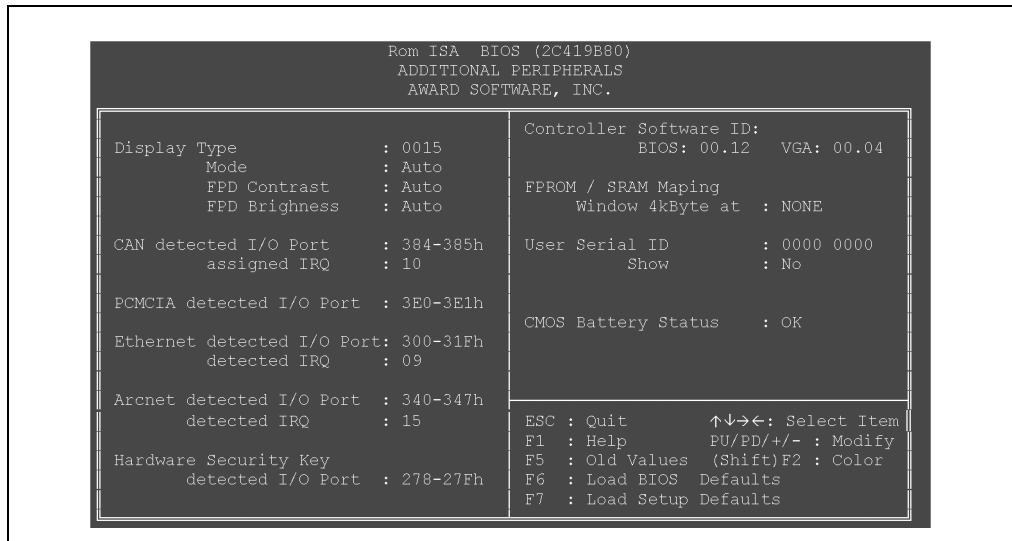


Figure 82: Additional Peripherals

Display Type

B&R display type connected is shown (4 digit number). If a display unit is not connected, 0000 is shown.

Mode

Select display device (Display = FPD, Monitor = CRT) should be active when the system is started:

- "Auto"** All connected display devices are automatically activated. If no display device is connected then the monitor is activated
- "CRT"** Only the monitor is activated
- "FPD"** Only the display is activated
- "CRT+FPD"** The monitor and display are activated (simultaneous mode)

FPD Contrast

The contrast of the display can be set (only for passive LCDs!)

Possible settings: 0% to 100 %, Auto

FPD Brightness

The brightness of the display can be set.

Possible settings: 0% to 100 %, Auto



ATTENTION: These values can only be scrolled through. "Auto" is between values 100% and 0%.

(...97%, 98%, 99%, 100%, AUTO, 0%, 1%, 2%, 3%....).

There are 2 ways to set the desired brightness:

- 1) Save brightness in BIOS
- 2) Save brightness in display(recommended)
 - 1) If a value (e.g. 80%) is saved in the BIOS Setup, then BIOS sets this value every time the system is started, even if another display is connected. The disadvantage is that BIOS cannot read brightness values from the display and therefore the display is set to 0% brightness each time the system starts (reference point). The display is then set to the defined brightness value (80% in this case).
If you always want to use the same brightness, we recommend saving the value in the display and setting "Auto" in BIOS to avoid this procedure. If "Auto" is saved, then BIOS uses the value saved on the display each time the system starts
 - 2) You can save the brightness value on the display as follows: Set "auto" in BIOS and end Setup with "SAVE & EXIT SETUP". The next time the system starts, go into BIOS Setup and set the desired brightness (e.g. 50%). Now end the Setup with "EXIT WITHOUT SAVING". The display uses the value 50% and BIOS is set to "Auto". BIOS uses the value from the display each time the system is started (50% in this case).

CAN assigned IRQ

Here, an IRQ can be assigned for CAN (enable interrupt). However, this only functions if a CAN controller is installed (default: IRQ10).

"PCMCIA detected", "Ethernet detected", "Arcnet detected" and "Hardware Security detected" provide information concerning the standard addresses and interrupts for the - original IPC2001 - components.

Controller Software ID

Shows BIOS and VGA-BIOS version.

FEPROM / SRAM Mapping - Window 4 KByte at

Shows address of the Map Window for internal FEPROM and SRAM.

User Serial ID

You can enter a user serial number here (32 bit, Hex). It is stored in CMOS.

Show

When set to "Yes" the user serial number (see above, User Serial ID) is displayed in the device window during system start.

CMOS Battery Status

Checks if the CMOS (SRAM) buffer battery is OK.

"OK": Battery OK

"Bad": Battery should be changed



If the CMOS battery is changed, the system has to be restarted to update the battery status!

4.11 Comparison of BIOS settings (BIOS defaults / Setup defaults)

4.11.1 BIOS Features Setup

BIOS Upgrade Version	V01.03		V01.05	
Description	Bios Defaults	Setup Defaults	Bios Defaults	Setup Defaults
Virus Warning	(not supported)	(not supported)	Disabled	Disabled
CPU Internal Cache	Enabled	Enabled	Enabled	Enabled
Quick Power On Self Test	Disabled	Disabled	Disabled	Disabled
Boot Sequence	A, C	A, C	A, C	A, C
Swap Floppy Drive	Disabled	Disabled	Disabled	Disabled
Boot Up Floppy Seek	Disabled	Disabled	Disabled	Disabled
Boot Up NumLock Status	On	On	On	On
Gate A20 Option	Normal	Fast	Normal	Fast
Typematic Rate Setting	Disabled	Disabled	Disabled	Disabled
Typematic Rate (Chars/Sec)	6	6	6	6
Typematic Delay (Msec)	250	250	250	250
Security Option	Setup	Setup	Setup	Setup
OS Select For DRAM > 64 MB	Non-OS2	Non-OS2	Non-OS2	Non-OS2
Video BIOS Shadow	Enabled	Enabled	Enabled	Enabled
C8000-CBFFF	Disabled	Disabled	Disabled	Disabled
CC000-CFFFF	Disabled	Disabled	Disabled	Disabled
D0000-D3FFF	Disabled	Disabled	Disabled	Disabled
D4000-D7FFF	Disabled	Disabled	Disabled	Disabled
D8000-DBFFF	Disabled	Disabled	Disabled	Disabled
DC000-DFFFF	Disabled	Disabled	Disabled	Disabled

Table 108: Bios Features Setup

4.11.2 Chipset Features Setup

BIOS Upgrade Version	V01.03		V01.05	
Description	BIOS Defaults	Setup Defaults	BIOS Defaults	Setup Defaults
Auto Configuration	Enabled	Enabled	Enabled	Enabled
DRAM Timing	80ns	70ns	80ns	70ns
RAS Minimum Time	2.5/3.5 Clk	2.5/3.5 Clk	2.5/3.5 Clk	2.5/3.5 Clk
CAS to RAS Delay	1 Clk	0.5 Clk	1 Clk	0.5 Clk
Before Assertion of RAS	1 Clk	0.5 Clk	1 Clk	0.5 Clk
After Assertion of RAS	1 Clk	1 Clk	1 Clk	1 Clk
DRAM Burst-Write Timing	X-3-3-3	X-2-2-2	X-3-3-3	X-2-2-2
DRAM Burst-Read Timing	Slow	Fast	Slow	Fast
A0000-FFFFFF Cacheable	Ignore	Ignore	Ignore	Ignore
Other Address Cachable	Recognize	Recognize	Recognize	Recognize

Table 109: Chipset Features Setup

4.11.3 Power Management Setup

BIOS Upgrade Version	V01.03		V01.05	
Description	Bios Defaults	Setup Defaults	Bios Defaults	Setup Defaults
APM BIOS	Disable	Disable	Disable	Disable
BIOS PM Timers	User Define	User Define	User Define	User Define
Video Standby Timer	Disable	Disable	Disable	Disable
HDD Standby Timer	Disable	Disable	Disable	Disable

Table 110: Power Management Setup

4.11.4 PnP Configuration

BIOS Upgrade Version	V01.03		V01.05	
Description	Bios Defaults	Setup Defaults	Bios Defaults	Setup Defaults
Resources Controlled By	Auto	Manual	Auto	Manual
Reset Configuration Data	Disabled	Disabled	Disabled	Disabled
IRQ-3 assigned to		Legacy ISA		Legacy ISA
IRQ-4 assigned to		Legacy ISA		Legacy ISA
IRQ-5 assigned to		ISA PnP		ISA PnP
IRQ-7 assigned to		Legacy ISA		Legacy ISA
IRQ-9 assigned to		Legacy ISA		Legacy ISA
IRQ-10 assigned to		ISA PnP		ISA PnP
IRQ-11 assigned to		Legacy ISA		Legacy ISA
IRQ-12 assigned to		Legacy ISA		Legacy ISA
IRQ-14 assigned to		ISA PnP		ISA PnP
IRQ-15 assigned to		Legacy ISA		Legacy ISA
DMA-0 assigned to		ISA PnP		ISA PnP
DMA-1 assigned to		ISA PnP		ISA PnP
DMA-3 assigned to		ISA PnP		ISA PnP
DMA-5 assigned to		ISA PnP		ISA PnP
DMA-6 assigned to		ISA PnP		ISA PnP
DMA-7 assigned to		ISA PnP		ISA PnP
Used MEM base addr		N/A		N/A

Table 111: PNP/PCI Configuration

4.11.5 Integrated Peripherals

BIOS Upgrade Version	V01.03		V01.05	
Description	Bios Defaults	Setup Defaults	Bios Defaults	Setup Defaults
IDE HDD Block Mode	Disabled	Enabled	Disabled	Enabled
Onboard FDC Controller	Enabled	Enabled	Enabled	Enabled
IDE Primary Master PIO	Auto	Auto	Auto	Auto
Onboard IDE1 Controller	Primary	Primary	Primary	Primary
Onboard Serial Port 1	Auto	Auto	Auto	Auto
Onboard Serial Port 2	Auto	Auto	Auto	Auto
Onboard Serial Port 3				
Onboard Serial Port 4				
Onboard LPT1				
Onboard LPT Port	(not Supported)	(not Supported)	Disabled	Disabled
LPT Port Mode	(not Supported)	(not Supported)	Normal	Normal

Table 112: Integrated Peripherals

4.11.6 Additional Peripherals

BIOS Upgrade Version	V01.03		V01.05	
Description	Bios Defaults	Setup Defaults	Bios Defaults	Setup Defaults
Display Type	0015	0015	0015	0015
Mode	AUTO	AUTO	AUTO	AUTO
FPD Contrast	AUTO	AUTO	AUTO	AUTO
FPD Brightness	AUTO	AUTO	AUTO	AUTO
CAN detected I/O Port				
assigned IRQ	10	10	10	10
PCMCIA detected I/O Port				
Ethernet detected I/O Port				
Arcnet detected I/O Port				
Hardware Security Key detected I/O Port				
FPROM / SRAM Mapping				
User Serial ID	0000 0000	0000 0000	0000 0000	0000 0000
Show	No	No	No	No

Table 113: Additional Peripherals

Chapter 3 • Display Units

1. Display Units

1.1 Overview

Display Type	Description	Remark
5D2000.02	Panel; LCD B/W; QVGA; 4.7 in; F ¹⁾	
5D2200.01	Panel; TFT Color; VGA; 10.4 in; T ²⁾	<i>Cancelled!</i> <i>Replacement type 5D2210.01</i>
5D2200.02	Panel; EL monochrome; VGA; 10.4 in; T	
5D2200.04	Panel; TFT Color; VGA; 13.8 in; T	
5D2210.01	Panel; TFT Color; VGA; 10.4 in; T	<i>Replacement type for 5D2200.01</i>
5D2219.01	Panel; LCD B/W; QVGA; 5.7 in; T	
5D2219.02	Panel; LCD Color; QVGA; 5.7 in; T	
5D2300.01	Panel; TFT Color; VGA; 10.4 in; M ³⁾	
5D2300.02	Panel; LCD Color; VGA; 10.4 in; M	
5D2300.03	Panel; LCD B/W; VGA; 9.4 in; M	
5D2500.01	Panel; LCD B/W; VGA; 9.4 in; F	<i>Cancelled!</i> <i>Replacement type 5D2510.01</i>
5D2500.02	Panel; LCD Color; VGA; 9.4 in; F	
5D2500.10	Panel; TFT Color; VGA; 10.4 in; F	
5D2500.22	Panel; LCD Color; VGA; 10.4 in; F	<i>Cancelled!</i> <i>Replacement type 5D2510.22</i>
5D2510.01	Panel; LCD B/W; VGA; 9.4 in; F	<i>Replacement type for 5D2500.01</i>
5D2510.10	Panel; TFT Color; VGA; 10.4 in; F	<i>Replacement type for 5D2510.22</i>
5D2510.22	Panel; LCD Color; VGA; 10.4 in; F	<i>Cancelled!</i> <i>Replacement type for 5D2500.22</i>
5D2519.01	Panel; LCD B/W; QVGA; 5.7 in; F	
5D2519.02	Panel; LCD Color; QVGA; 5.7 in; F	

Table 114: Display Unit Overview

1) F..Integrated keypad

2) T..Touch Screen

3) M..Micro Mouse

2. Display Unit 5D2000.02

2.1 Photo

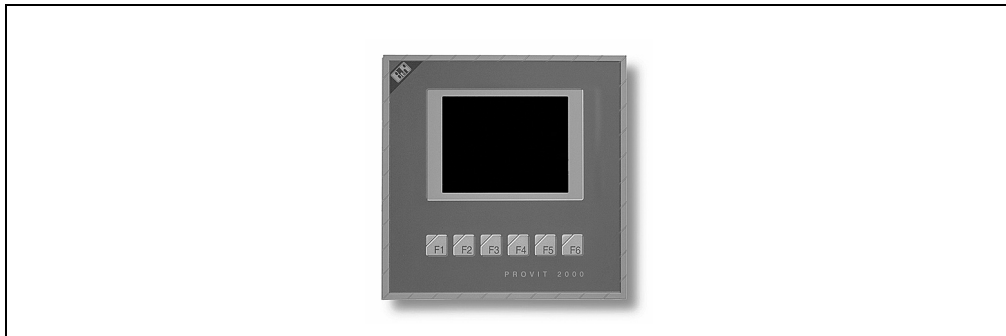


Figure 83: Display Unit 5D2000.02

2.2 Dimensions

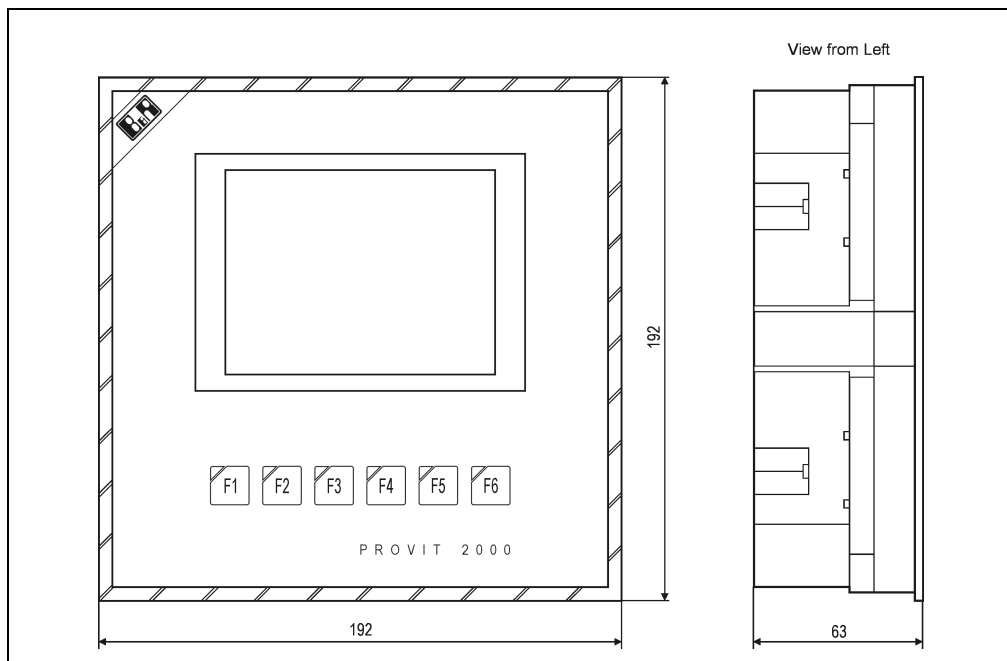


Figure 84: Display Unit 5D2000.02

2.3 Technical Data

Product ID	5D2000.02
Controller	IPC2000 ¹⁾ , IPC2001
Display Type Colors ²⁾	LCD B/W, CFL background lighting 16 shades of gray
Resolution	QVGA (320 x 240 pixels)
Display Diagonal	4.7 in (120 mm)
Front Filter Glass Frame Décor Foil ³⁾ Gasket	IP 54, dust and sprayed water protection (from front) Non Reflective Plastic Polyester None
Design	Blue
Background Lighting (type) Brightness Lifespan ⁴⁾ ⁵⁾	 90 cd/m2 10,000 h
Keys Total with LEDs Key Geometry	 6 6 Square
Operating Temperature	0 - 50°C, depending on installation
Weight	0.8 kg
Outer Dimensions (W x H x D) ⁶⁾	192 x 192 x 63 mm
Relative Humidity	5 - 85 %, non-condensing

Table 115: Display Unit 5D2000.02

1) Controller connection depends on revision

2) The actual number of colors depends on the graphics mode set and the software used (graphic driver).

3) Resistant according to DIN 42 115 part 2, see "Technical Appendix".

4) Decrease in brightness of 50%.

5) At 25°C environmental temperature.

6) Without controller

Display Unit 5D2000.02	Controller	
	Rev. < 50.07	Rev. ≥ 50.07
Rev. < 2.00	●	
Rev. ≥ 2.00		●

2.4 Connections

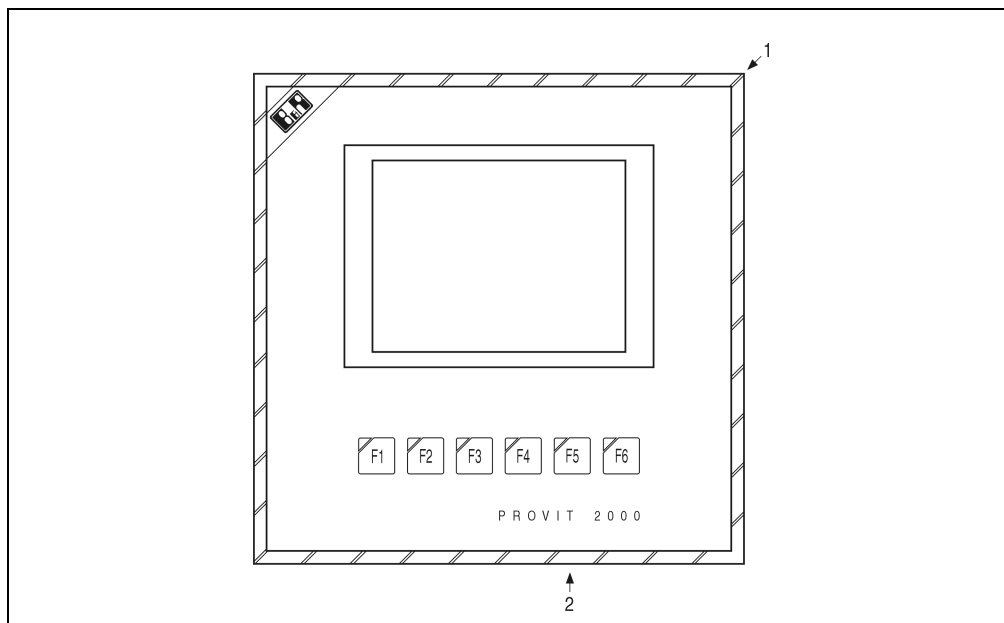


Figure 85: Display Unit 5D2000.02 - Connections

- 1) VGA connection for controller
- 2) Keypad Module Connection

2.4.1 Controller Connection

The controller connection is on the top right. The connection is made with a ribbon cable.

2.4.2 Keypad Module Connection

The display unit is equipped with six function keys. The connection to the controller or to one of the standard keypad modules is made with a short cable. There are two female connectors provided on the display unit for this purpose. The female connectors are labeled as input or output with triangle arrows! An output is provided on the controller, which can be connected to a display unit or a keypad module input.



Make sure that an input is never connected to an input or an output is never connected to an output, as this will damage the modules!

Besides the function keys on the display unit, up to six more keypad modules can be daisy chained to a controller. The function keys and keypad modules can be operated parallel to an optional AT Enhanced keyboard.

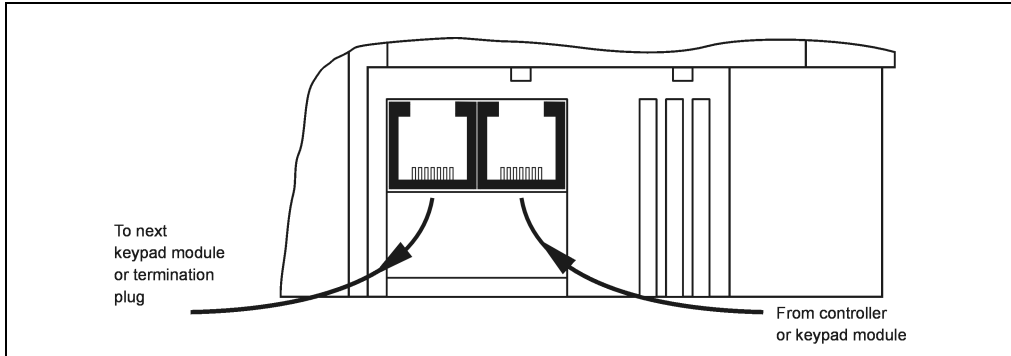


Figure 86: Keypad Module Connection



- 1) The configuration is made with Mkey utilities (see "Provit Mkey Utilities User's Manual")
- 2) The keys are evaluated using the respective Mkey driver software.

2.5 Brightness

The brightness (background lighting) can be set. The setting is made with the help of Mkey utilities (see "Provit Mkey Utilities User's Manual"). On the IPC2001, the brightness can also be set in BIOS (see chapter 2.2.9.13 "ADDITIONAL PERIPHERALS").

2.6 Contrast

The contrast can also be set for passive LCDs. The setting is made with the help of Mkey utilities (see "Provit Mkey Utilities User's Manual"). On the IPC2001, the contrast can also be set in BIOS (see chapter 2.2.9.13 "ADDITIONAL PERIPHERALS").

2.7 Accessories

Accessories	Amount
30 Pin MINI-FIX Connector Clamp	1
Connector Cable: Controller - Display	1
Spring Clamps	8
Mounting Pint Set	2
Module Connectors (one pointed end)	4
Module Connectors (two pointed ends)	2
Keypad module cable 230 mm	1

Table 116: Accessories

3. Display Unit 5D2210.01, 5D2200.0x

3.1 Photo

These display units are equipped with a touch screen

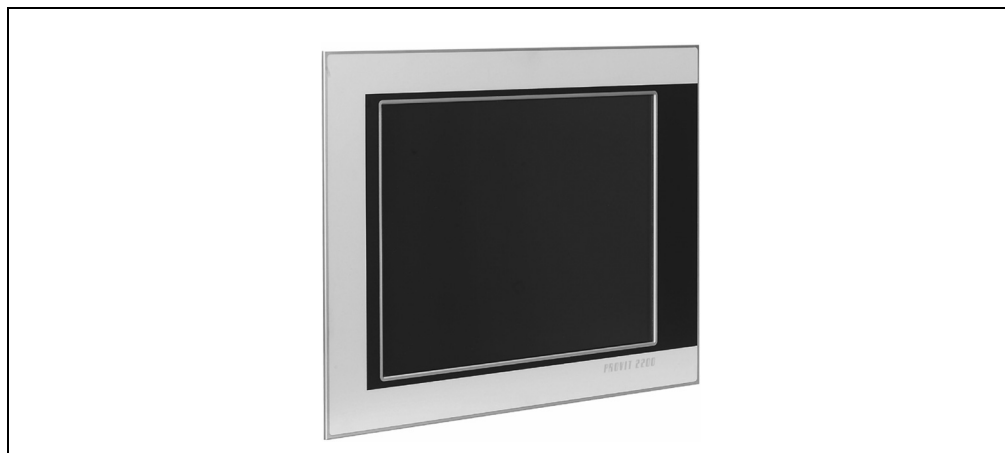


Figure 87: Display Unit 5D2210.01



Figure 88: Display Unit 5D2200.0x

3.2 Dimensions

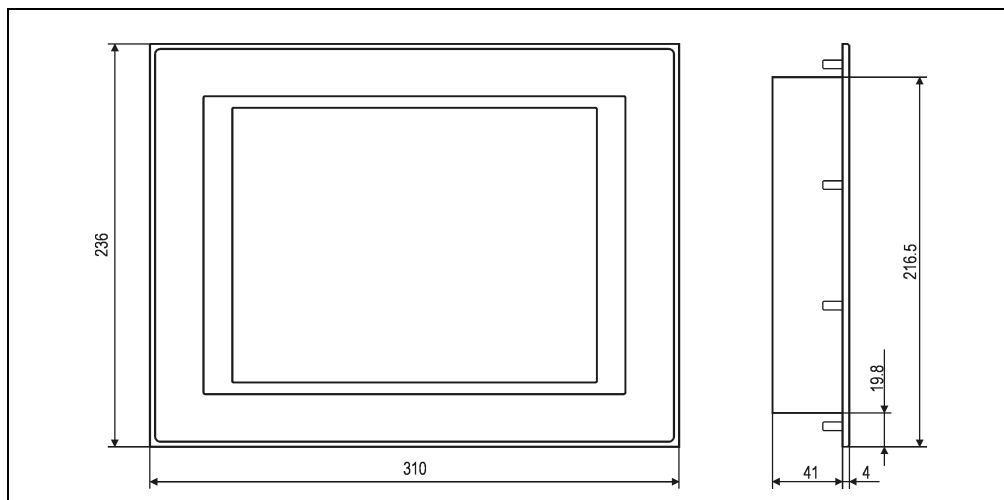


Figure 89: Display Unit 5D2200.0x, 5D2210.01

3.3 Technical Data

Product ID	5D2200.01	5D2200.02	5D2210.01
Controller	IPC2000 ¹⁾ ; IPC2001		
Display Type Colors ²⁾	TFT color, CFL background lighting 262,144 colors	EL (electro luminescence) Monochrome	TFT color, CFL background lighting 262,144 colors
Resolution	VGA (640 x 480 pixels)		
Display Diagonal	10.4 in (264 mm)		
Protection	IP20 back side		
Front Frame Décor Foil ³⁾ Gasket	IP65, dust and sprayed water protection (from front) Aluminum anodized Polyester Flat gasket around display front		
Design	Black	Black	Light Gray
Touch Screen ⁴⁾ Technology	Accu Touch Analog, resistive		
Background Lighting (type) Brightness Lifespan ⁵⁾ ⁶⁾	200 cd/m2 25,000 h	87 cd/m2 30,000 h	200 cd/m2 25,000 h
Operating Temperature	0 - 50°C, depending on installation	-5 - 55°C, depending on installation	0 - 50°C, depending on installation
Weight	Approx. 2 kg	2.7 kg	Approx. 2 kg

Table 117: Display Units 5D2200.01, 5D2210.01 and 5D2200.02

Product ID	5D2200.01	5D2200.02	5D2210.01
Outer Dimensions (W x H x D) ⁷⁾	310 x 236 x 45 mm	310 x 236 x 76 mm	310 x 236 x 45 mm
Relative Humidity	5 - 85 %, non-condensing		
Display design/colors dark grey border around the display bright background	Black	Black	Pantone 432c Pantone 427c

Table 117: Display Units 5D2200.01, 5D2210.01 and 5D2200.02 (cont.)

- 1) Starting with Rev. 50.07
- 2) The actual number of colors depends on the graphics mode set and the software used (graphic driver).
- 3) Resistant according to DIN 42 115 part 2, see "Technical Appendix"
- 4) See "Technical Appendix"
- 5) Decrease in brightness of 50 %.
- 6) At 25°C operating temperature.
- 7) Without controller



Display Unit 5D2200.02 requires an external 24 V DC supply!

3.4 Door Mount Installation

For door mount installation, the cutout and drill holes are to be made according to the diagram below (template must be ordered separately).

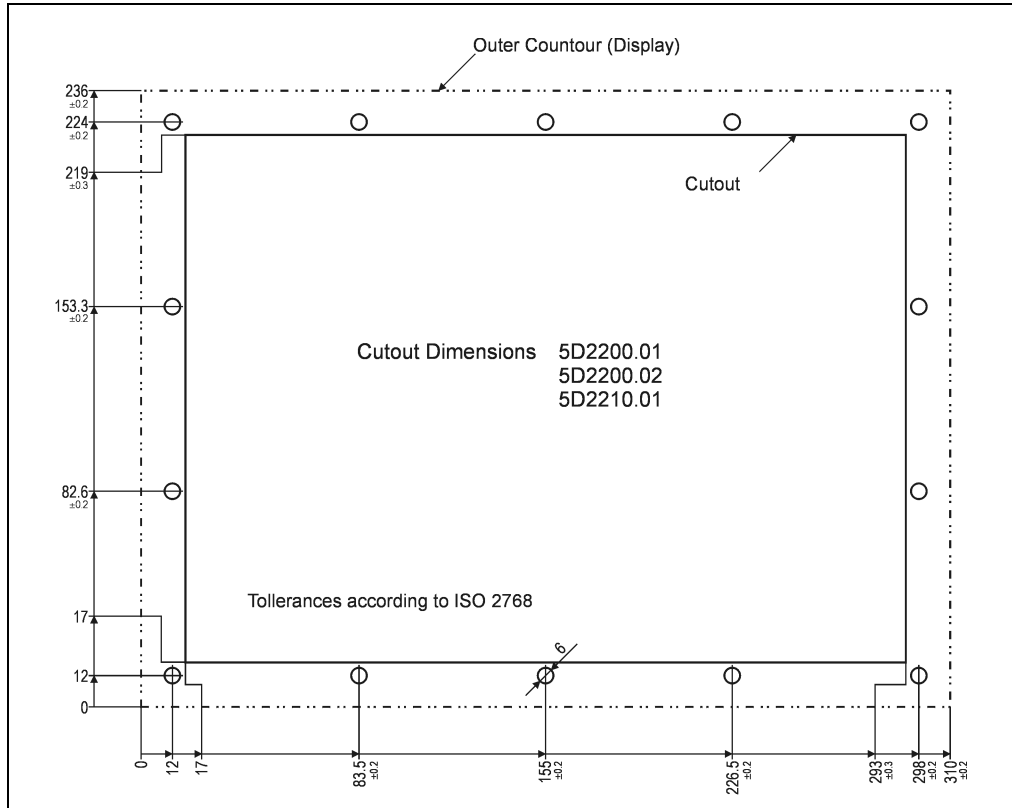


Figure 90: Door Mount Installation, Display Units 5D2200.01, 5D2210.01 and 5D 2200.02

3.5 Mounting the Controller

The controller is mounted on the backside of the housing. The four screws required to mount the controller are included with delivery.

With IPC2000 controllers, make sure that the battery compartment can be accessed. The display plug must point in the direction of the display cable.

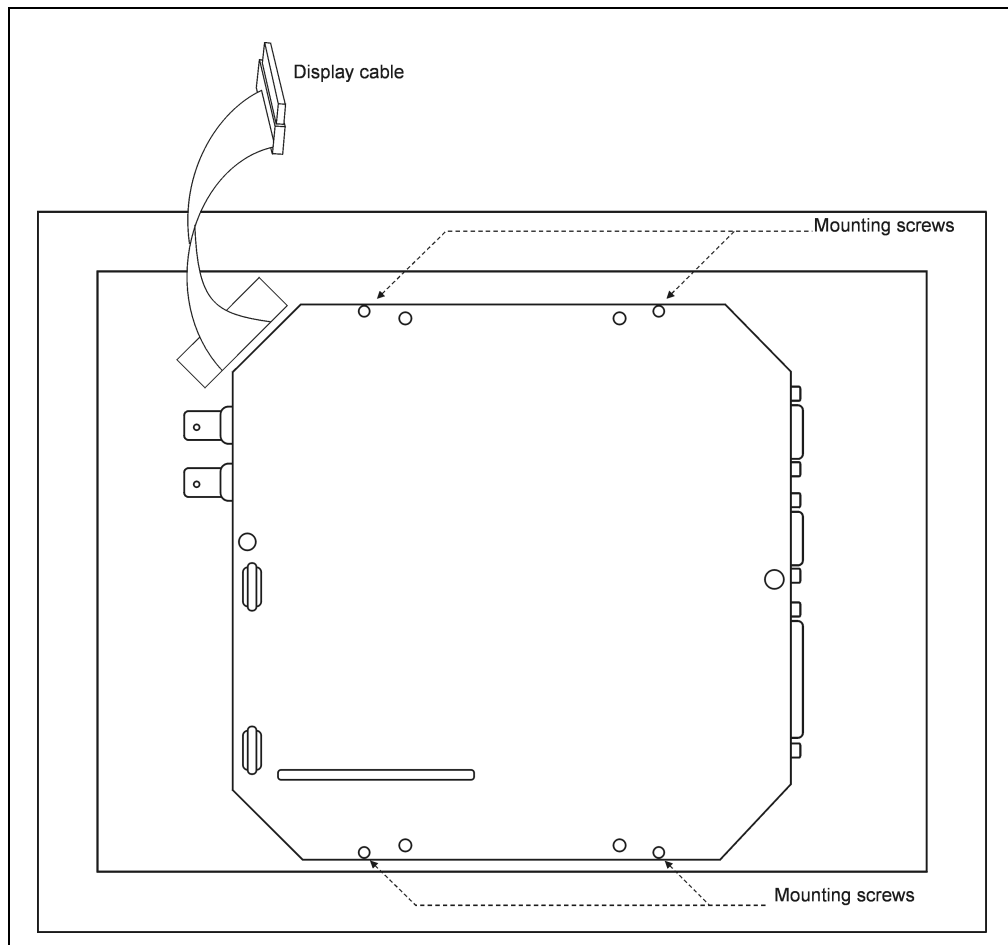


Figure 91: Controller Connection for 5D2200.01, 5D2210.01 and 5D2200.02

3.6 Connecting the Display to the Controller

The connection from the display unit to the controller is made with a ribbon cable.

3.7 Connecting the Touch Screen to the Controller

The connection to the controller is made with the cable included in delivery. That cable is connected to COM1 on the controller.

3.8 Brightness

The brightness (background lighting) can be set. The setting is made with the help of Mkey utilities (see "Provit Mkey Utilities User's Manual").

On the IPC2001, the brightness can also be set in BIOS (see chapter 2.2.9.13 "ADDITIONAL PERIPHERALS").

3.9 Accessories

Accessories	Amount
Touch Connector Cable	1

Table 118: Accessories

4. Display Unit 5D2200.04

4.1 Photo

This display unit is equipped with a touch screen.



Figure 92: Display Unit 5D2200.04

4.2 Dimensions

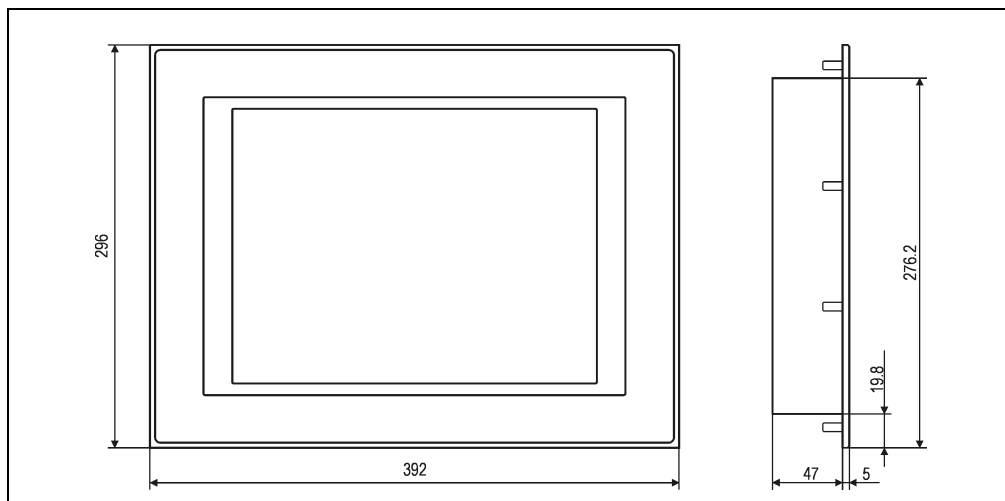


Figure 93: Display Unit 5D2200.04

4.3 Technical Data

Product ID	5D2200.04
Controller	IPC2000 ¹⁾ ; IPC2001
Display Type Colors ²⁾	TFT color, CFL background lighting 262,144 colors
Resolution	VGA (640 x 480 pixels)
Display Diagonal	13.8 in (350 mm)
Protection	IP20 back side
Front Frame Décor Foil ³⁾ Gasket	IP65, dust and sprayed water protection (from front) Aluminum anodized Polyester Flat gasket around display front
Design	Black
Touch Screen ⁴⁾ Technology	Accu Touch Analog, resistive
Background Lighting (type) Brightness Lifespan ⁵⁾ ⁶⁾	180 cd/m2 10,000 h
Operating Temperature	0 - 50°C, depending on installation
Weight	4.2 kg
Outer Dimensions (W x H x D) ⁷⁾	392 x 296 x 52 mm
Relative Humidity	5 - 85 %, non-condensing

Table 119: Display Unit 5D2200.04

1) Starting with Rev. 50.07

2) The actual number of colors depends on the graphics mode set and the software used (graphic driver).

3) Resistant according to DIN 42 115 part 2, see "Technical Appendix"

4) See "Technical Appendix"

5) Decrease in brightness of 50 %.

6) At 25°C operating temperature.

7) Without controller

4.4 Door Mount Installation

For door mount installation, the cutout and drill holes are to be made according to the diagram below (template is not included in delivery).

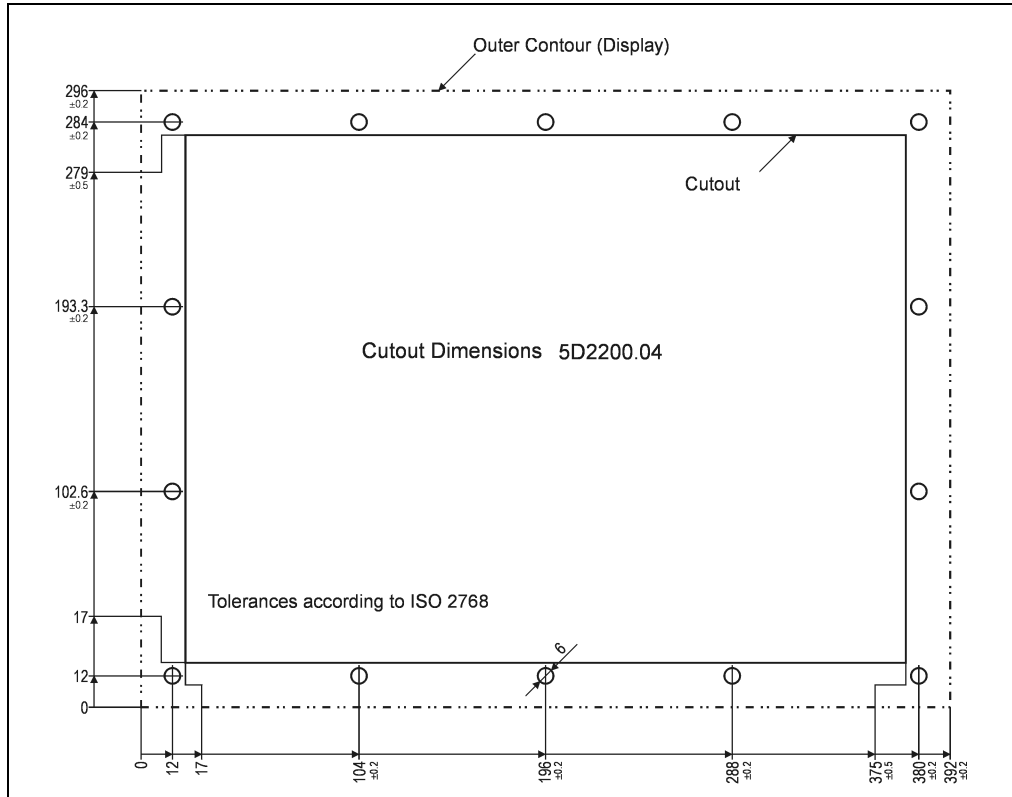


Figure 94: Door Mount Installation 5D2200.04



For information concerning mounting the controller on the display, Touch Screen connections, brightness, contrast and accessories see “Mounting the Controller,” sections 3.5 - 3.9.

5. Display Unit 5D2219.01, 5D2219.02

5.1 Photo

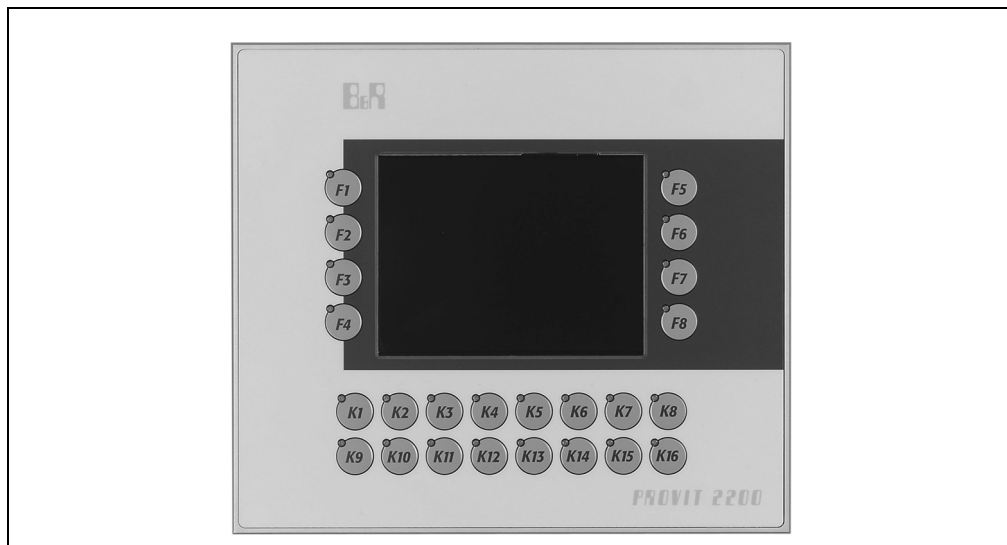


Figure 95: Display Unit 5D2219.01, 5D2219.02

5.2 Dimensions

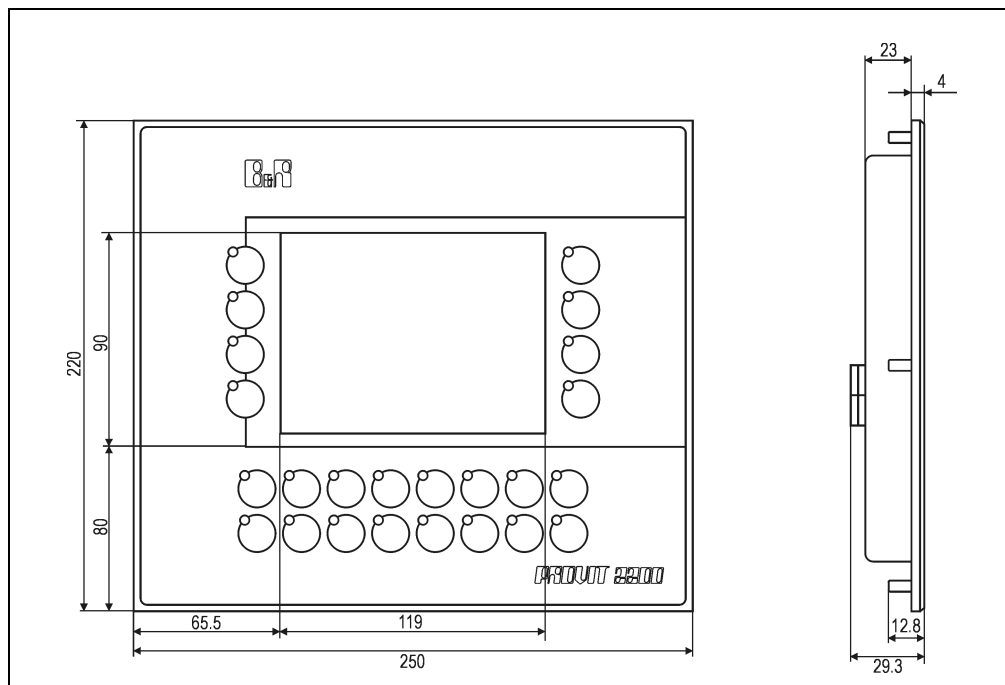


Figure 96: Display Unit 5D2219.01, 5D2219.02

5.3 Technical Data

Product ID	5D2219.01	5D2219.02
Controller	IPC2001	
Display Type Colors ¹⁾	LCD B/W, CFL background lighting 64 shades of gray	LCD color, CFL background lighting 262,144 colors
Resolution	QVGA (320 x 240 pixels)	
Display Diagonal	5.7 in (145 mm)	
Protection	IP20 back side	
Front Frame Décor Foil ²⁾ Gasket	IP65, dust and sprayed water protection (from front) Aluminum anodized Polyester Flat gasket around display front	
Design	Light Gray	
Touch Screen ³⁾ Technology	Gunze Touch Analog, resistive	

Table 120: Display Unit 5D2219.01. 5D2219.02

Display Units • Display Unit 5D2219.01, 5D2219.02

Product ID	5D2219.01	5D2219.02
Background Lighting (type) Brightness Lifespan ⁴⁾ ⁵⁾	130 cd/m2 25,000 h	180 cd/m2 25,000 h
Keys Total with LEDs Key Geometry	24 24 Round	
Operating Temperature	0 -55°C, depending on installation	0 - 50°C, depending on installation
Weight	1.21 kg	
Outer Dimensions (W x H x D) ⁶⁾	250 x 220 x 29.3	
Relative Humidity	5 -85 %, non-condensing	10 -85 %, non-condensing
Display design / Colors Dark gray border around the display Bright background Key Colors	Pantone 432c Pantone 427c Pantone 429c	

Table 120: Display Unit 5D2219.01. 5D2219.02 (cont.)

- 1) The actual number of colors depends on the graphics mode set and the software used (graphic driver).
- 2) Resistant according to DIN 42 115 part 2, see "Technical Appendix"
- 3) See "Technical Appendix"
- 4) Decrease in brightness of 50 %.
- 5) At 25°C operating temperature.
- 6) Without controller

5.4 Door Mount Installation

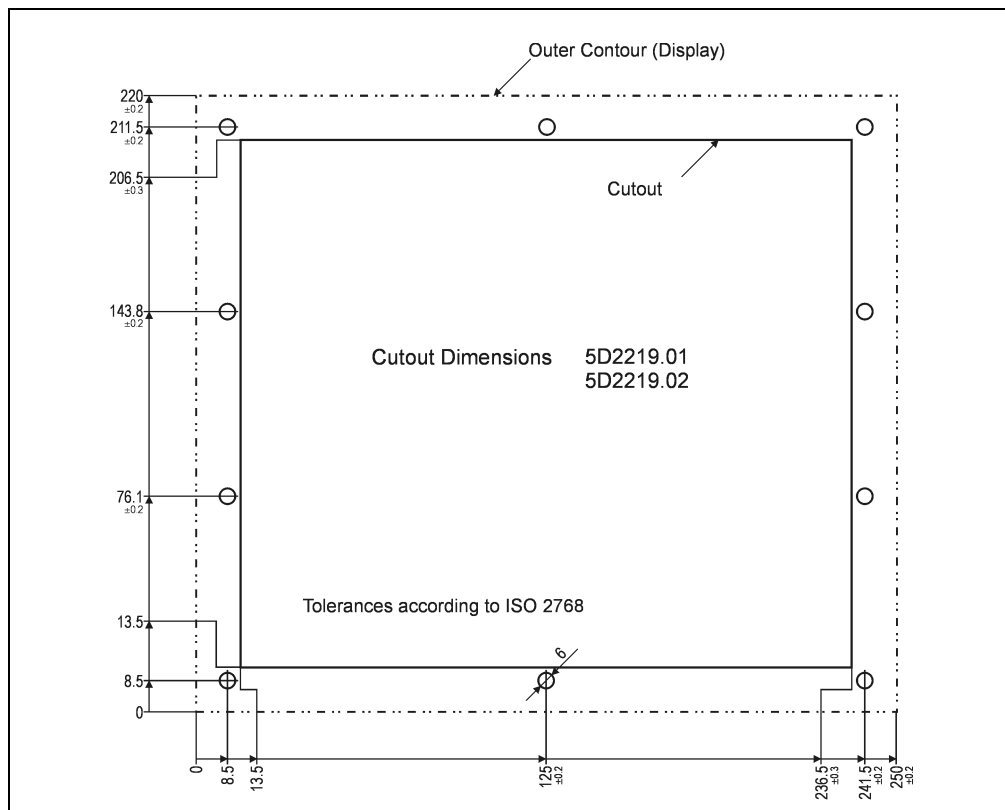


Figure 97: Door Mount Installation , Display Unit 5D2219.01, 5D2219.02

5.5 Key Labels

Displays are delivered with key legend strips installed (partially pre-labeled).



Blank key legend strips can be ordered from B&R. They can be printed on a laser printer and cut to size along the cutout markings. The strips have a transparent corner for the key LEDs (model numbers for the legend strips can be found in the "Accessories" chapter.)

5.6 Mounting the Controller

The controller is mounted on the backside of the housing. The four screws required to mount the controller are included with delivery.

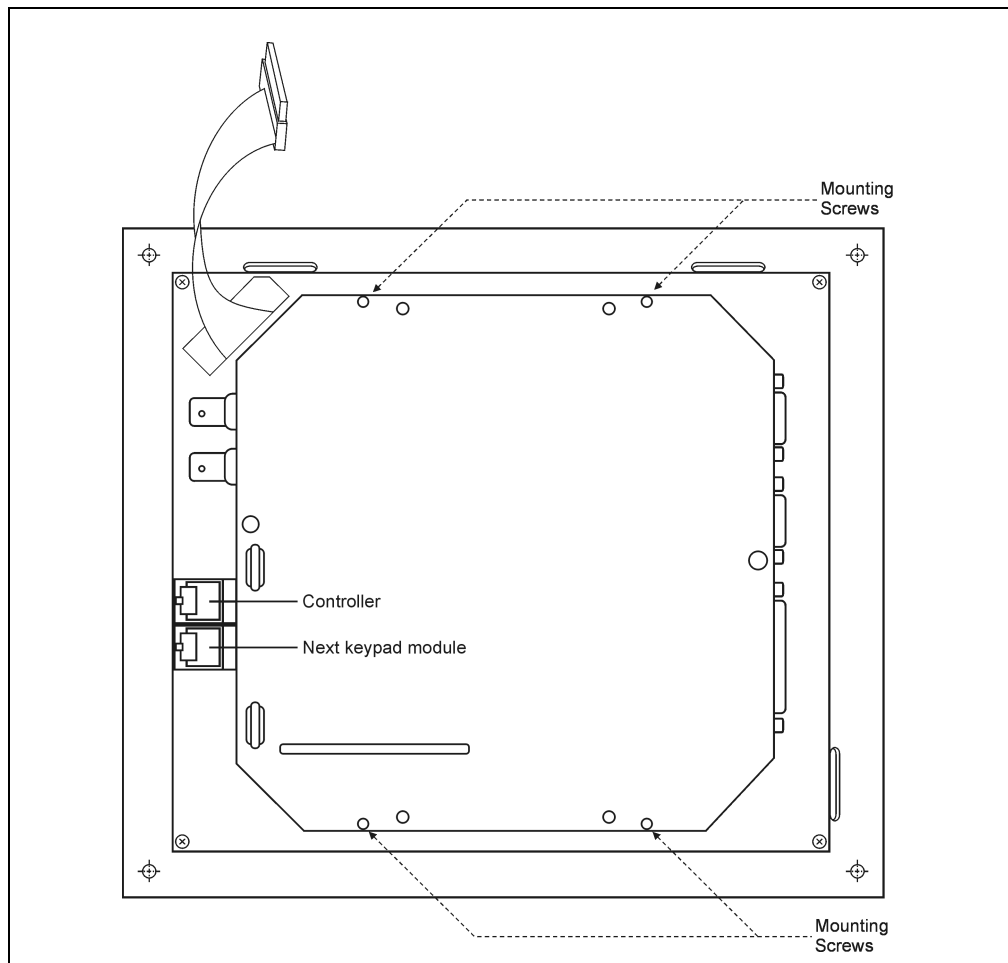


Figure 98: Mounting Display Units 5D2219.01 and 5D2219.02 on the Controller



For information about connecting the controller to the display, Touch Screen connections, brightness, contrast and accessories see “Mounting the Controller,” sections 3.5 - 3.9.

5.7 Accessories

Accessories	Amount
Touch Connector Cable	1
Keypad Module Cable 130 mm	1

Table 121: Accessories

6. Display Unit 5D2300.01, 5D2300.02, 5D2300.03

6.1 Photo

These display units are equipped with a Micro Module (pointing device)



Figure 99: Display Unit 5D2300.xx

6.2 Dimensions

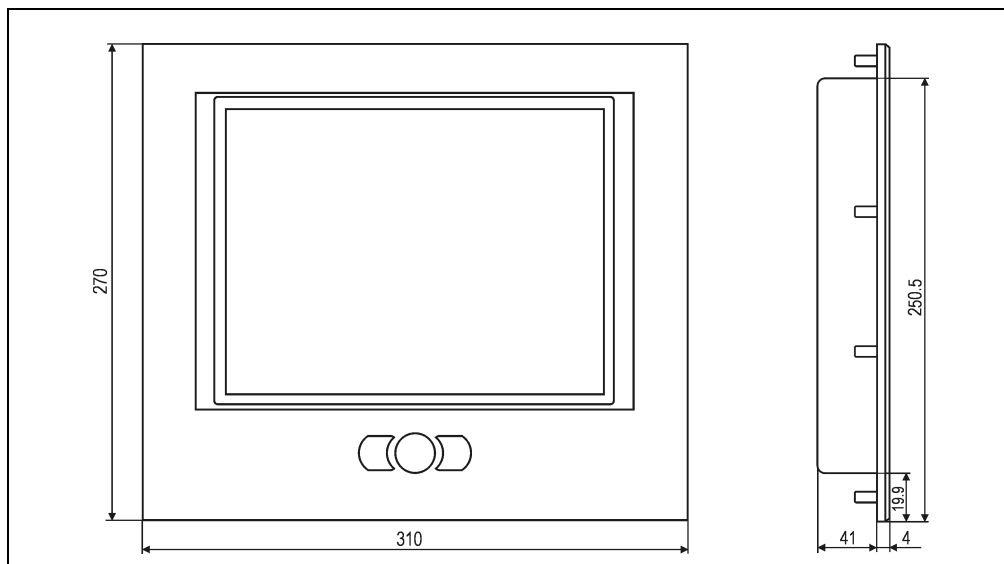


Figure 100: Display Units 5D2300.01, 5D2300.02 and 5D2300.03

6.3 Technical Data

Product ID	5D2300.01	5D2300.02	5D2300.03
Controller	IPC2000 ¹⁾ , IPC2001		
Display Type Colors ²⁾	TFT Color CFL background lighting 262,144 colors	LCD Color CFL background lighting 262,144 colors	LCD B/W CFL background lighting 61 shades of gray
Resolution	VGA (640 x 480 pixels)		
Display Diagonal	10.4" (264 mm)	10.4" (264 mm)	9.4" (239 mm)
Protection	IP20 back side		
Front Filter Glass Frame Décor Foil ³⁾ Gasket	IP65, dust and sprayed water protection (from front) Non Reflective Aluminum anodized Polyester Flat gasket around display front		
Design	Black		
Pointer Instrument	Micro Module MS mouse compatible		
Background Lighting (type) Brightness Lifespan ⁴⁾ ⁵⁾	200 cd/m2 25,000 h	70 cd/m2 10,000 h	65 cd/m2 25,000 h

Table 122: Display Units 5D2300.01, 5D2300.02 and 5D2300.03

Product ID	5D2300.01	5D2300.02	5D2300.03
Operating Temperature	0 - 50°C, depending on installation	5 -40°C, depending on installation	0 -45°C, depending on installation
Weight	Approx. 1.7 kg	Approx. 1.7 kg	Approx. 1.7 kg
Outer Dimensions (W x H x D) ⁶⁾	310 x 270 x 45 mm	310 x 270 x 45 mm	310 x 270 x 45 mm
Relative Humidity	5 - 85 %, non-condensing		

Table 122: Display Units 5D2300.01, 5D2300.02 and 5D2300.03 (cont.)

1) Starting with Rev. 50.07

2) The actual number of colors depends on the graphics mode set and the software used (graphic driver).

3) Resistant according to DIN 42 115 part 2, see "Technical Appendix"

4) Decrease in brightness of 50 %.

5) At 25°C operating temperature.

6) Without controller

6.4 Door Mount Installation

For door mount installation, the cutout and drill holes are to be made according to the diagram below (fitting template is not included in delivery).

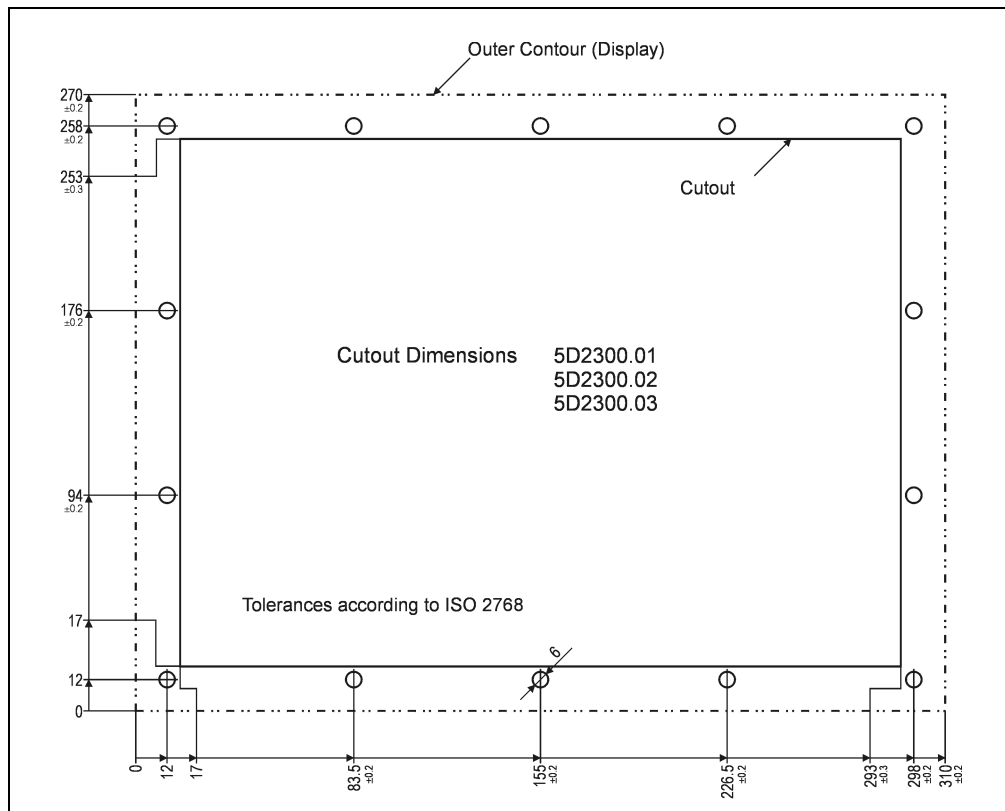


Figure 101: Door Mount Installation , Display Units 5D2300.xx

6.5 Mounting the Controller

The controller is mounted on the backside of the housing. The four screws required to mount the controller are included with delivery.

With IPC2000 controllers, make sure the the battery compartment can be accessed. The display plug must point in the direction of the display cable.

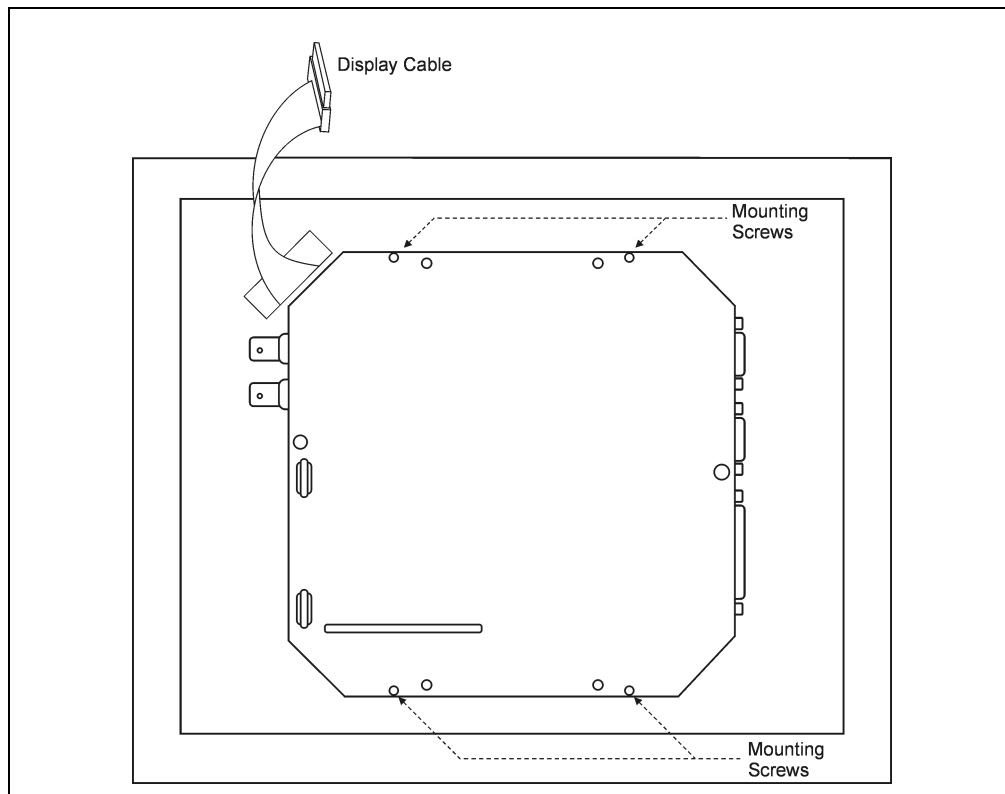


Figure 102: Controller Connection for 5D2300.01, 5D2300.02 and 5D2300.03

6.6 Connecting the Display to the Controller

The connection to the controller is made with a ribbon cable.

6.7 Connecting the Micro Module to the Controller

The connection to the controller is made with the cable included in delivery. That cable is connected to COM1 on the controller.

6.8 Brightness

The brightness (background lighting) can be set. The setting is made with the help of Mkey utilities (see "Provit Mkey Utilities User's Manual"). On the IPC2001, the brightness can also be set in BIOS (see chapter 2.2.9.13 "ADDITIONAL PERIPHERALS").

6.9 Contrast

The contrast can also be set for passive LCDs. This setting is made with the help of the Mkey Utilities. On the IPC2001, the contrast can also be set in BIOS (see chapter 2.2.9.13 "ADDITIONAL PERIPHERALS").

7. Display Units 5D2500.xx, 5D2510.xx

7.1 Photo

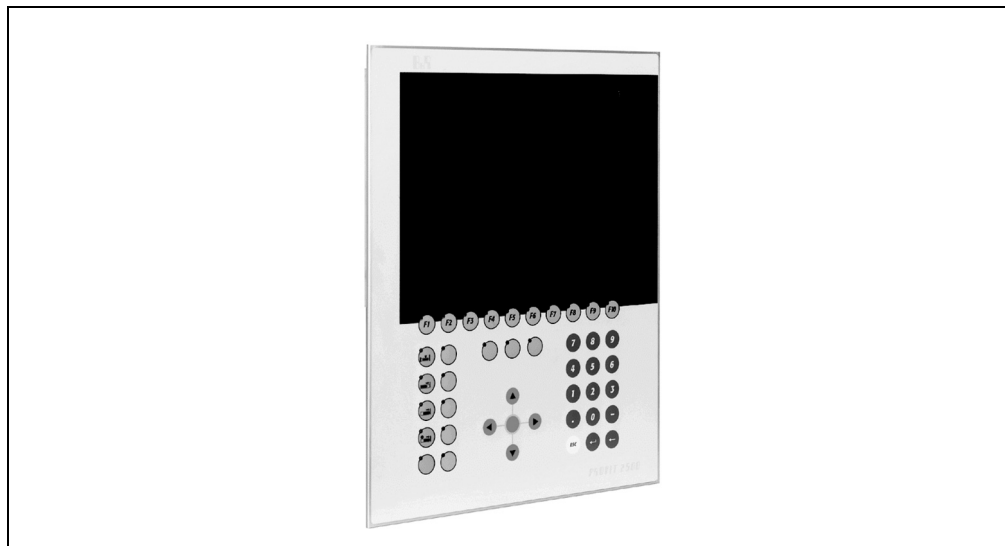


Figure 103: Display Units 5D2510.xx

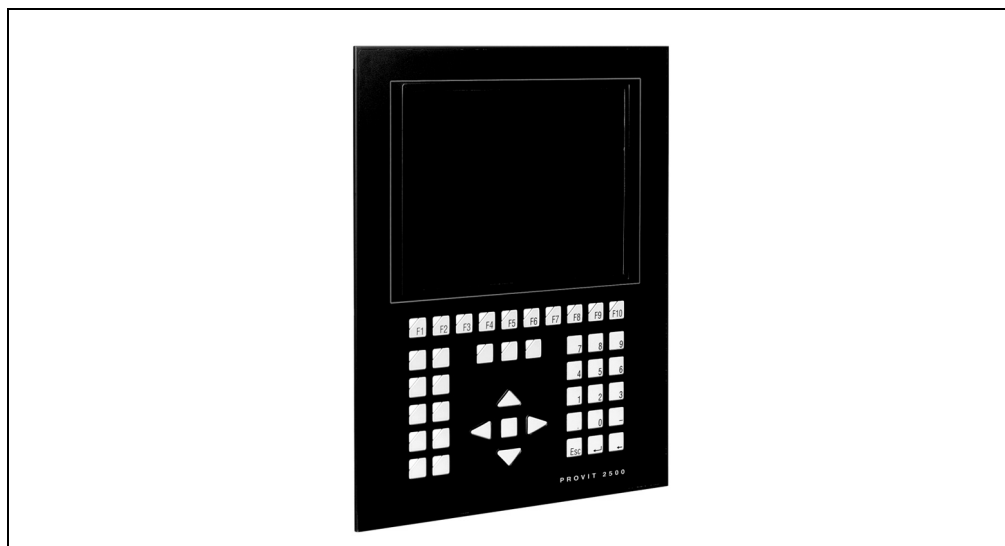


Figure 104: Display Units 5D2500.xx

7.2 Dimensions

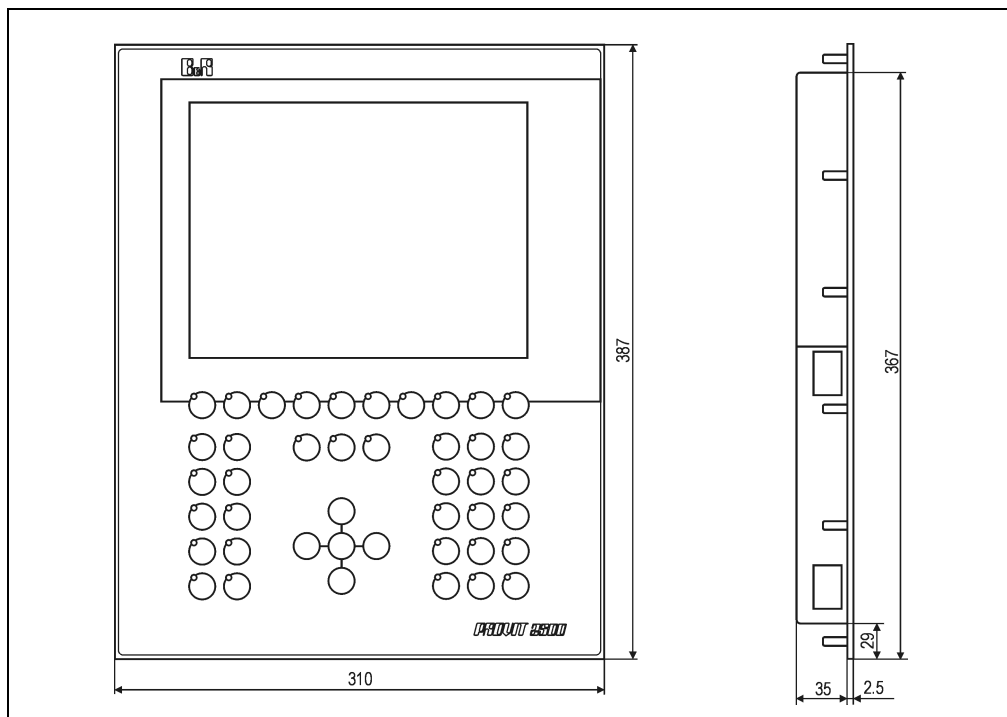


Figure 105: Display Unit 5D25xx.xx

7.3 Technical Data

Product ID	5D2500.01	5D2500.02	5D2500.10	5D2500.22	5D2510.01	5D2510.10	5D2510.22
Controller	IPC2000 ¹⁾ , IPC2001						
Display Type	LCD B/W CFL background lighting 61 shades of gray	LCD Color CFL background lighting 262,144	TFT Color CFL background lighting 262,144	LCD Color CFL background lighting 262,144	LCD B/W CFL background lighting 61 shades of gray	TFT Color background lighting 262,144	LCD Color CFL background lighting 262,144
Colors ²⁾							
Resolution	VGA (640 x 480 pixels)						
Display Diagonal	9.4 in (239 mm)	9.4 in (239 mm)	10.4 in (264 mm)	10.4 in (264 mm)	9.4 in (239 mm)	10.4 in (264 mm)	10.4 in (264 mm)
Protection	IP20						
Front Filter Glass Frame Décor Foil ³⁾ Gasket	IP65, dust and sprayed water protection (from front) Non Reflective Aluminum anodized Polyester Flat gasket around display front						
Design	Black	Black	Black	Black	Light Gray	Light Gray	Light Gray
Keys							
Total	43	43	43	43	43	43	43
With LEDs	23	23	23	23	23	23	23
Key Geometry	Square	Square	Square	Square	Round	Round	Round
Background Lighting (type)							
Brightness	65 cd/m ²	70 cd/m ²	200 cd/m ²	70 cd/m ²	65 cd/m ²	200 cd/m ²	70 cd/m ²
Lifespan ⁴⁾ ⁵⁾	25,000 h	10,000 h	25,000 h	10,000 h	25,000 h	25,000 h	10,000 h
Environmental Temperature	0 - 45°C, depending on Installation	5 - 40°C, depending on Installation	0 - 50°C, depending on Installation	5 - 40°C depending on Installation	0 - 45°C, depending on Installation	0 - 50°C, depending on Installation	5 - 40°C, depending on Installation
Weight	2.1 kg	2.6 kg	2.6 kg	2.6 kg	2.1 kg	2.6 kg	2.6 kg
Outer Dimensions (W x H x D) ⁶⁾	310 x 387 x 38 mm						
Relative Humidity	5 - 85 %, non-condensing						
Display Design / Colors							
Dark Gray						Pantone 432c	
Light Gray Background						Pantone 427c	
Orange Keys						Pantone 151c	
Dark Gray Keys						Pantone 431c	
Legend Strips (gray)						Pantone 429c	

Table 123: Display Units 5D2500.xx, 5D2510.xx

1) Starting with Rev. 50.07

2) The actual number of colors depends on the graphics mode set and the software used (graphic driver).

3) Resistant according to DIN 42 115 part 2, see "Technical Appendix"

4) Decrease in brightness of 50 %.

5) At 25°C operating temperature.

6) Without controller

7.4 Door Mount Installation

For door mount installation, the cutout and drill holes are to be made according to the diagram below (fitting template must be ordered separately).

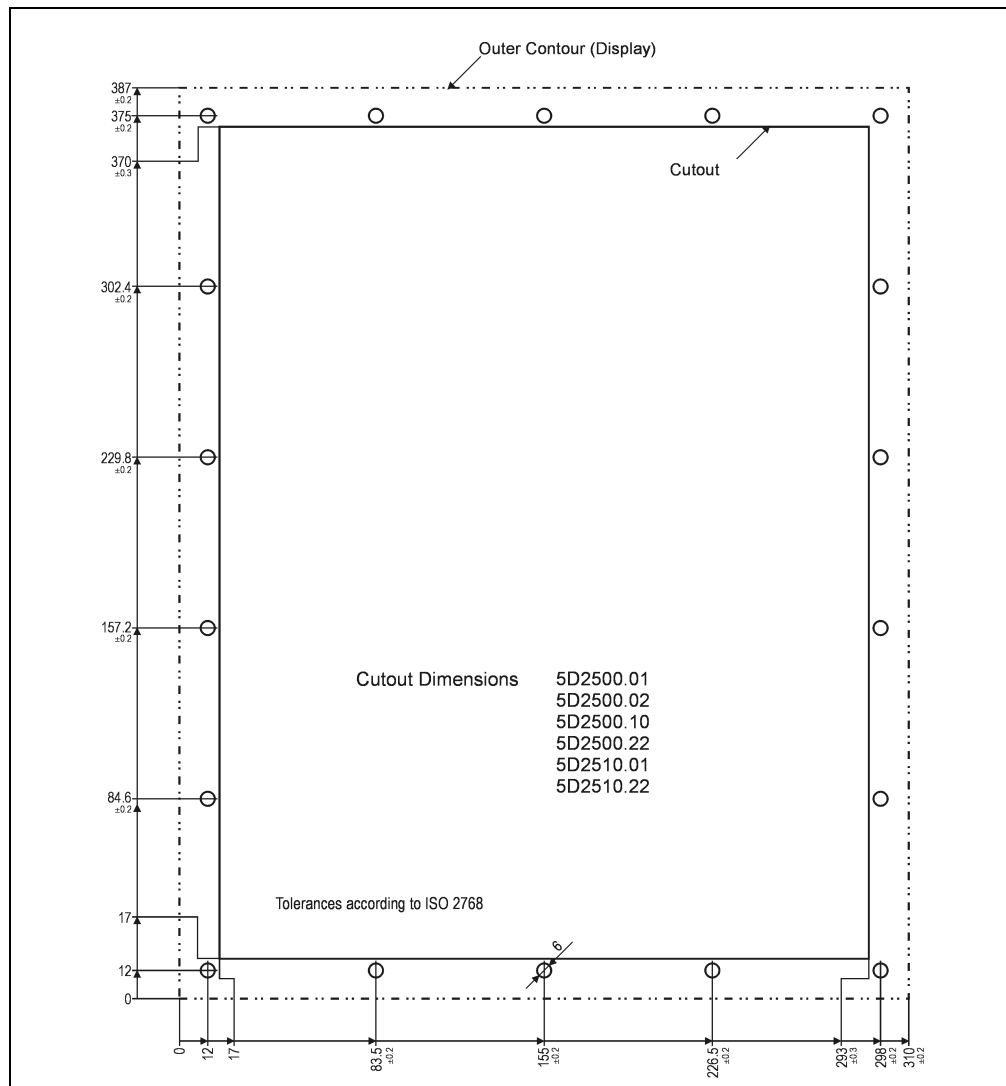


Figure 106: Door mount installation 5D2500.xx, 5D2510.xx

7.5 Key Labels

The keys shown below can be labeled with legend strips. The key legend strip slots can be accessed from the back of the display. Two legend strips are required for the function keys ([F1] - [F5] and [F6] - [F0]). The legend strips for the 3 key block are inserted from the side and the ones for the 10 key block are inserted from below.

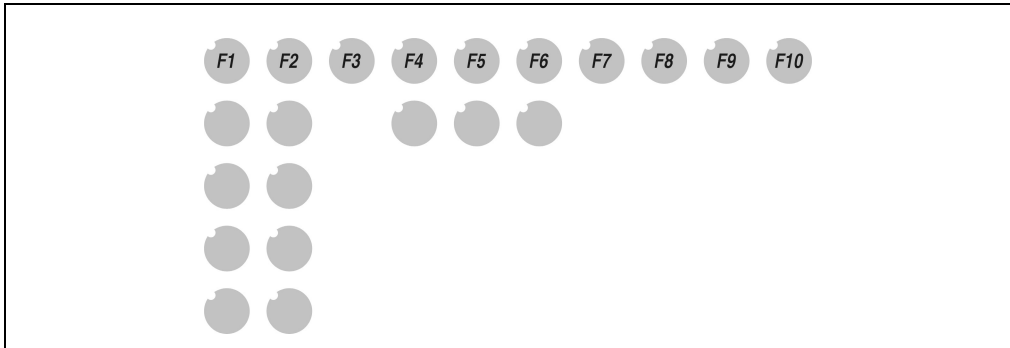


Figure 107: Key Labels - Round

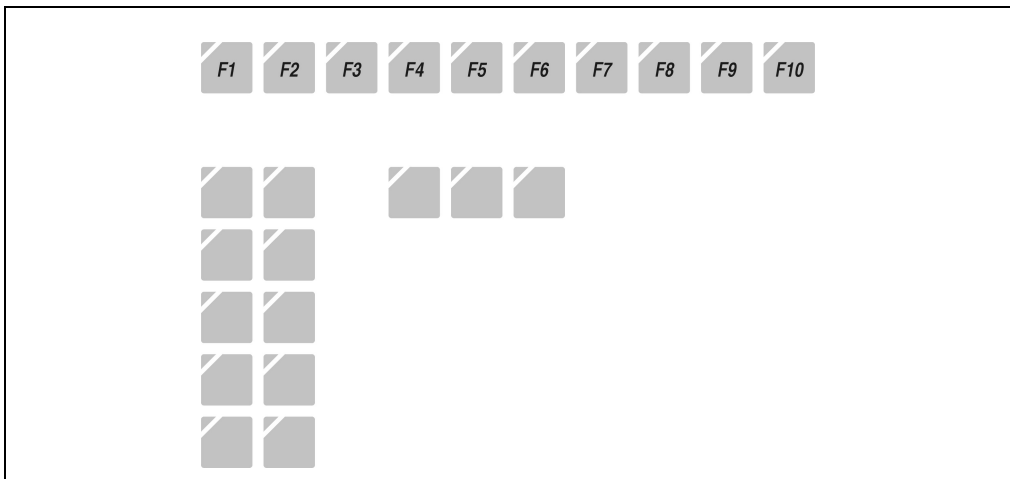


Figure 108: Key Labels - Square

Displays are delivered with key legend strips installed (partially pre-labeled).



Blank key legend strips can be ordered from B&R. They can be printed on a laser printer and cut to size along the cutout markings. The strips have a transparent corner for the key LEDs (model numbers for the legend strips can be found in the "Accessories" chapter.)

7.6 Mounting the Controller

The controller is mounted on the backside of the housing. The four screws required to mount the controller are included with delivery.



With IPC2001 controllers, make sure the battery compartment can be accessed. The display plug must point in the direction of the display cable.

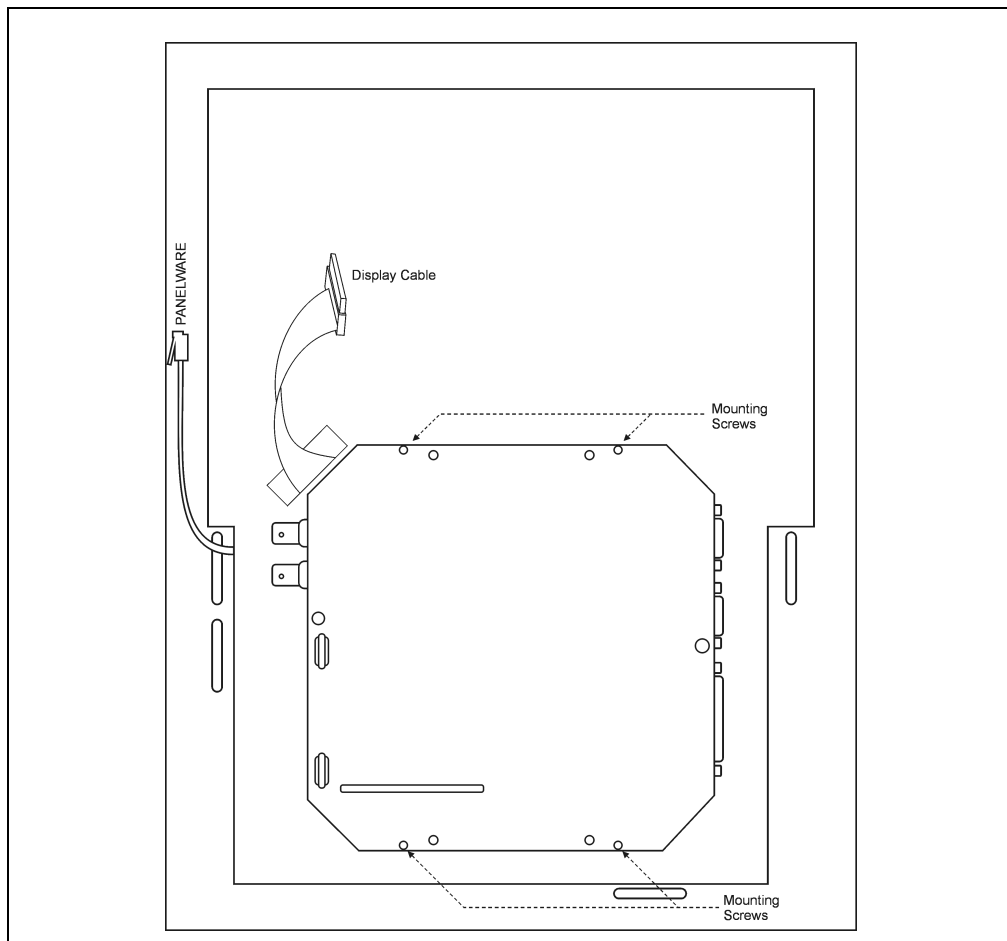


Figure 109: Mounting Display Units 5D2500.xx and 5D2510.xx on the Controller

7.7 Connecting the Display to the Controller

The connection to the controller is made with a ribbon cable.

7.8 Connecting the Keyboard to the Controller

The display unit is equipped with a matrix keyboard. The connection to the controller or to one of the standard keypad modules is made with a short cable. There are two female connectors provided on the display unit for this purpose. The controller is equipped with an output that can be connected to the display unit input (see next page)!



Make sure that an input is never connected to an input or an output is never connected to an output, as this will damage the modules!

More keypad modules can be connected in addition to the display unit. The maximum number of keys may not exceed 128! The matrix keyboard and keypad modules can be operated parallel to an optional AT Enhanced keyboard.



- 1) The configuration is made with Mkey utilities (see "Provit Mkey Utilities User's Manual")
- 2) The keys are evaluated using the respective Mkey driver software.
- 3) A maximum of 48 LEDs can be used.

7.9 Connecting the Matrix Keyboard to the Controller

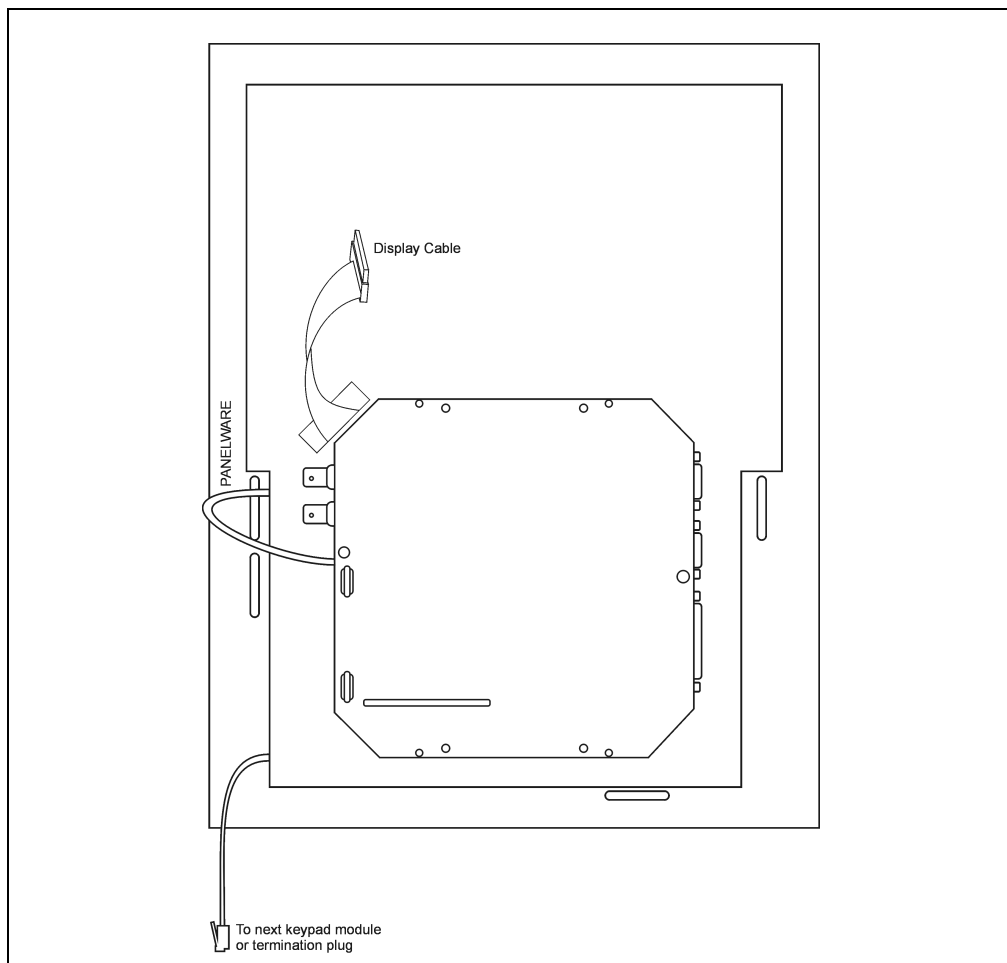


Figure 110: Connecting the Matrix Keyboard to the Controller

7.10 Brightness

The brightness (background lighting) can be set. The setting is made with the help of Mkey utilities (see "Provit Mkey Utilities User's Manual"). On the IPC2001, the brightness can also be set in BIOS (see chapter 2.2.9.13 "ADDITIONAL PERIPHERALS").

7.11 Contrast

The contrast can also be set for passive LCDs. The setting is made with the help of Mkey utilities (see "Provit Mkey Utilities User's Manual"). On the IPC2001, the contrast can also be set in BIOS (see chapter 2.2.9.13 "ADDITIONAL PERIPHERALS").

7.12 Accessories

Accessories	Amount
Keypad Module Cable 130 mm	1

Table 124: Accessories

8. Display Unit 5D2519.01, 5D2519.02

8.1 Photo

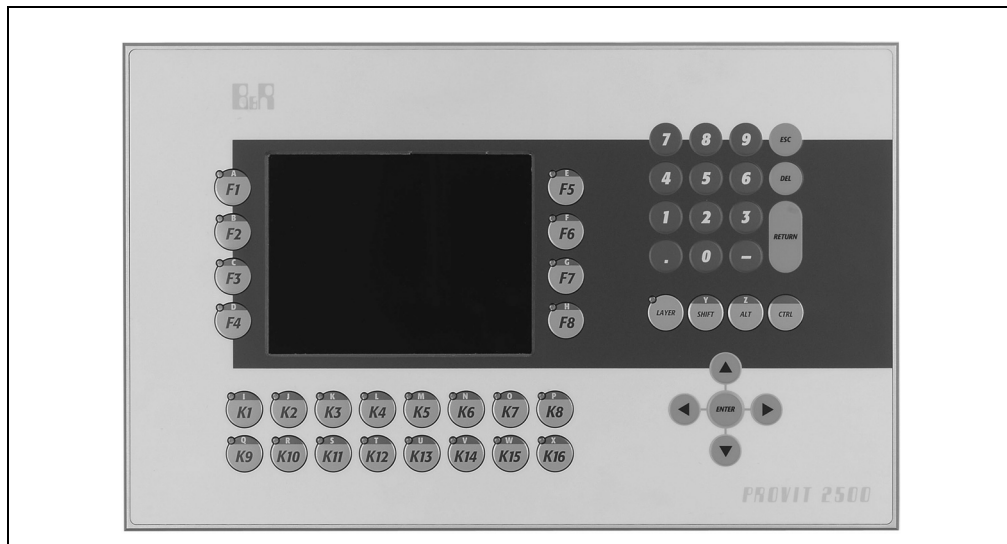


Figure 111: Display Unit 5D2519.01, 5D2519.02

8.2 Dimensions

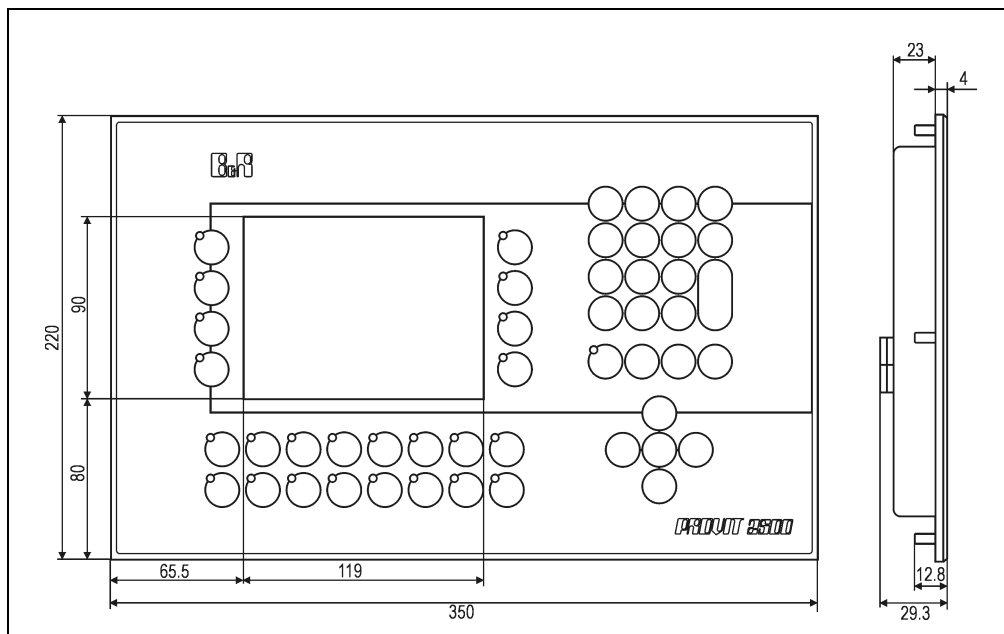


Figure 112: Display Unit 5D2519.01, 5D2519.02

8.3 Technical Data

Product ID	5D2519.01	5D2519.02
Controller	IPC2001	IPC2001
Display Type	LCD B/W CFL background lighting 64 shades of gray	LCD Color CFL background lighting 262,144 colors
Resolution	QVGA (320 x 240 pixels)	
Display Diagonal	14.48 cm (145 mm)	
Protection	IP20	
Front Filter Glass Frame Décor Foil ²⁾ Gasket	IP65, dust and sprayed water protection (from front) Non Reflective Aluminum anodized Polyester Flat gasket around display front	
Design	Gray	Gray

Table 125: Display Unit 5D2519.01, 5D2519.02

Display Units • Display Unit 5D2519.01, 5D2519.02

Product ID	5D2519.01	5D2519.02
Keys		
Total	48	48
With LEDs	24	24
Key Geometry	Round	Round
Background Lighting		
Brightness	130 cd/m ²	180 cd/m ²
Lifespan ³⁾ 4)	25,000 h	25,000 h
Operating Temperature	0 -55°C, depending on installation	0 - 50°C, depending on installation
Weight	1.39 kg	1.39 kg
Outer Dimensions (W x H x D) ⁵⁾	350 x 220 x 29.3	
Relative Humidity	5 -85 %, non-condensing	10 -85 %, non-condensing
Display Design / Colors		
Dark Gray	Pantone 432c	
Light Gray Background	Pantone 427c	
Orange Keys	Pantone 151c	
Dark Gray Keys	Pantone 431c	
Legend Strips (gray)	Pantone 429c	

Table 125: Display Unit 5D2519.01, 5D2519.02 (cont.)

1) The actual number of colors depends on the graphics mode set and the software used (graphic driver).

2) Resistant according to DIN 42 115 part 2, see "Technical Appendix"

3) Decrease in brightness of 50 %.

4) At 25°C operating temperature.

5) Without controller

8.4 Door Mount Installation

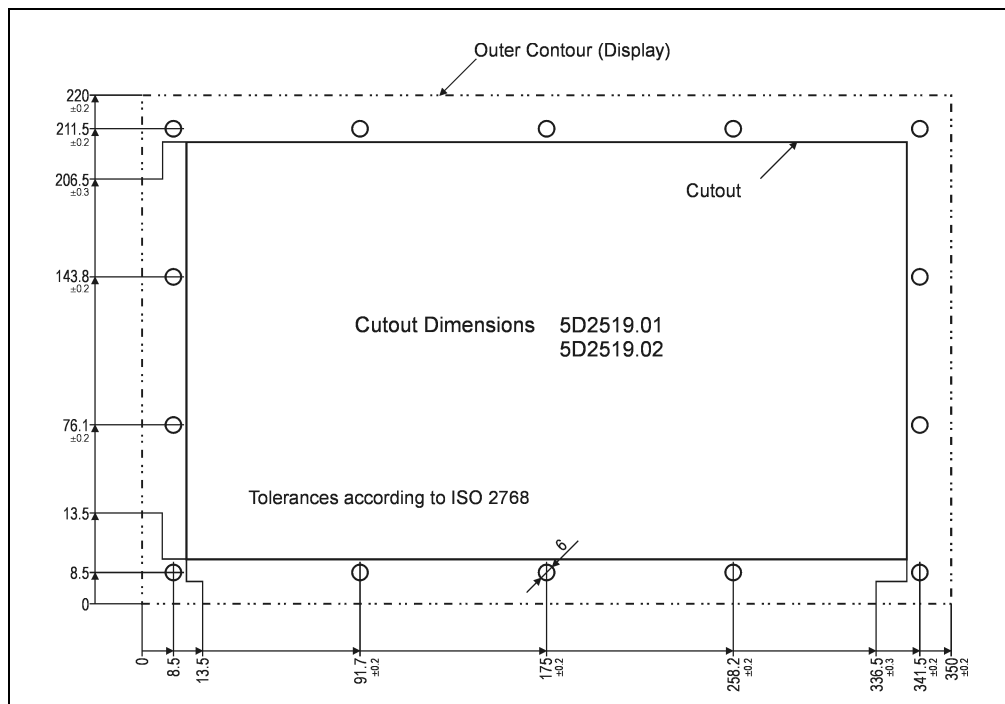


Figure 113: Display Unit 5D2519.01, 5D2519.02

8.5 Key Labels

Displays are delivered with key legend strips installed (partially pre-labeled).



Blank key legend strips can be ordered from B&R. They can be printed on a laser printer and cut to size along the cutout markings. The strips have a transparent corner for the key LEDs (model numbers for the legend strips can be found in the "Accessories" chapter.)

8.6 Mounting the Controller

The controller is mounted on the backside of the housing. The four screws required to mount the controller are included with delivery.

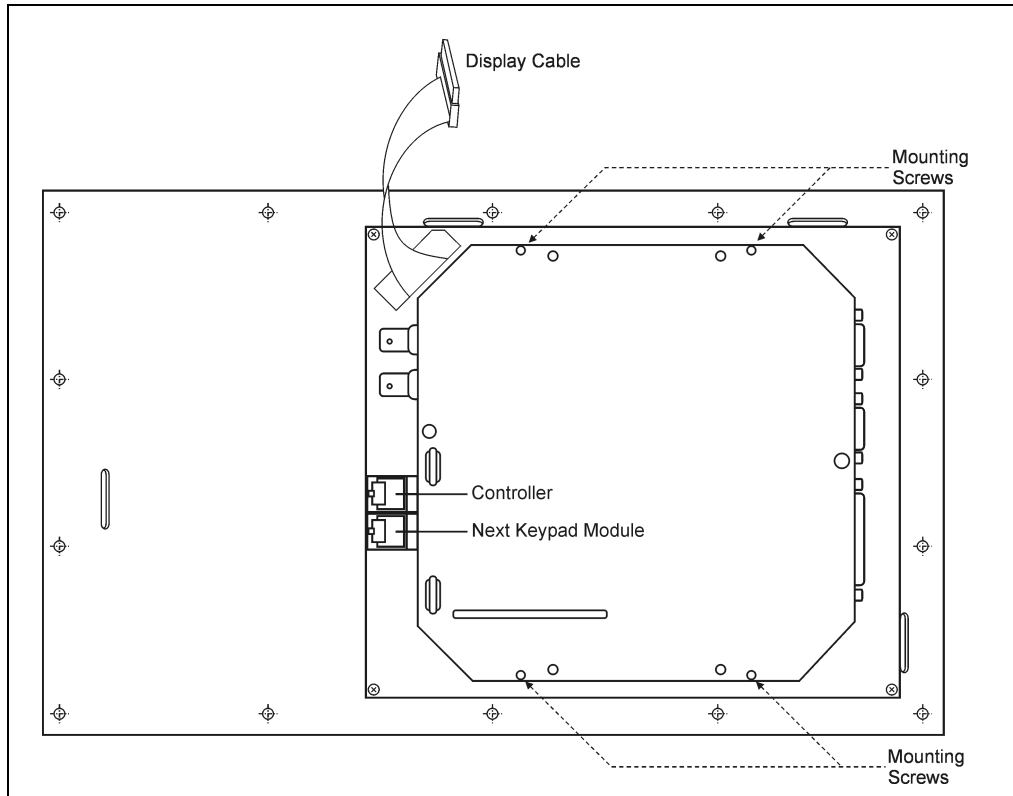


Figure 114: Mounting Display Units 5D2519.01 and 5D2519.02 on the Controller



For information concerning mounting the controller on the display, connecting the keyboard to the controller, brightness, contrast and accessories see “Mounting the Controller,” sections 7.6 - 7.12.

8.7 Accessories

Accessories	Amount
Keypad Module Cable 130 mm	1

Table 126: Accessories

Chapter 4 • Display Kits

1. General Information

Display kits are intended to be installed by the customer in a custom panel (integration in a machine). The display kits consist of a display and cabling. Three different display kits can be delivered for the Provit 2000.

1.1 Overview

Display Type	Description	Remark
5D2000.03	Panel Kit, TFT Color; VGA; 9.4 in	<i>Cancelled</i>
5D2000.03	Panel Kit, TFT Color; VGA; 10.4 in	
5D2000.04	Panel Kit, LCD B/W; VGA; 9.4 in	
5D2000.10	Panel Kit, LCD Color; VGA; 9.4 in	<i>Cancelled</i>
5D2000.10	Panel Kit, LCD Color; VGA; 10.4 in	

Table 127: Display Kit Overview

2. Display Kit 5D2000.03



Display kit 5D2000.03 with a display diagonal of 9.4 in (239 mm) was changed to a 10.4 in (264 mm) display diagonal for revision 08.00.

2.1 Photo

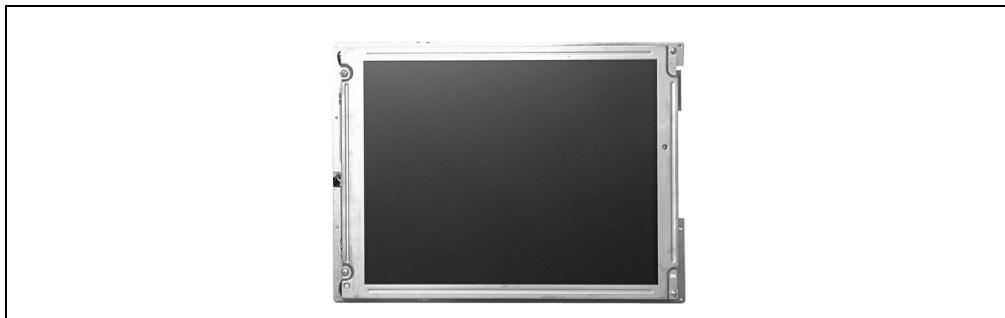


Figure 115: Display Kit 5D2000.03 - 9.4 in

2.2 Dimensions 5D2000.03 (9.4 in)

Four M3 press-in bolts are required for installation in a machine. The image below shows the dimensions for the bolt holes and the active surface of the display (144 x 192 mm).

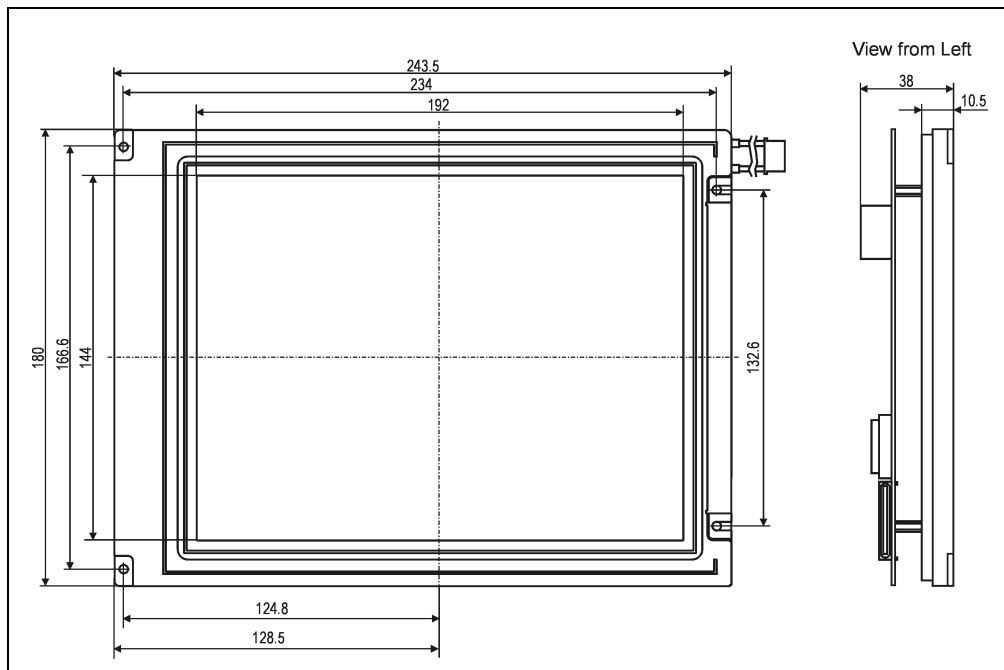


Figure 116: Display Kit 5D2000.03 - 9.4 in, Dimensions

2.3 Dimensions 5D2000.03 - 10.4 in

Four M3 press-in bolts are required for installation in a machine. The image below shows the dimensions for the bolt holes and the active surface of the display (158.4 x 211.2 mm).

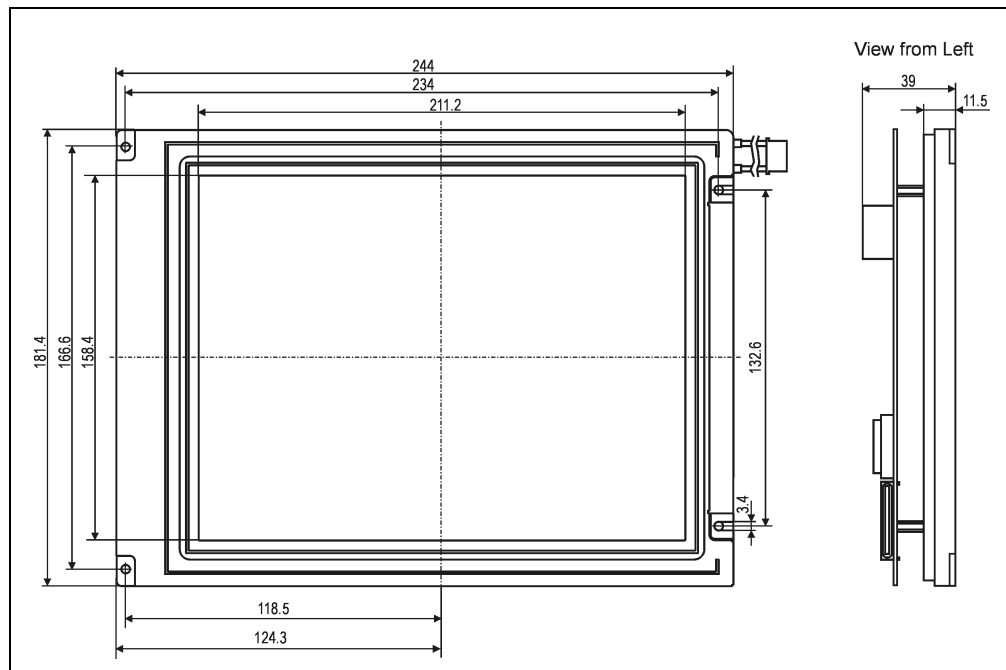


Figure 117: Display Kit 5D2000.03 - 10.4 in, Dimensions

2.4 5D2000.03 (10.4 in) Technical Data

Product ID	5D2000.03	5D2000.03 (10.4 in)
Controller	IPC2000 ¹⁾ , IPC2001	
Display Type	TFT color, CFL background lighting	
Colors ²⁾	262,144 colors	
Resolution	VGA (640 x 480 pixels)	
Display Diagonal	9.4 in (239 mm)	10.4 in (264mm)
Background Lighting (type)		
Brightness	60 cd/m ²	200 cd/m ²
Lifespan ³⁾ ⁴⁾	7,000 h	25,000 h
Operating Temperature	0 -45 °C, depending on installation	
Weight	Approx. 0.4 kg	
Relative Humidity	5 - 85 %, non-condensing	
Outer Dimensions (W x H x D)	243.5 x 180 x 38	244 x 181.4 x 39

Table 128: Display Kit 5D2000.03 - 9.4 in / 10.4 in

1) Starting with Rev. 50.07

2) The actual number of colors depends on the graphics mode set and the software used (graphic driver).

3) Decrease in brightness of 50 %.

4) at 25°C operating temperature.

2.5 Controller Connection

The connection from the display unit to the controller is made with a ribbon cable.

3. Display Kit 5D2000.04

This display kit is designed to be installed by the customer (integration in a machine). Display kits consist of a display and cabling. The active surface of the display is 144 x 192 mm.

3.1 Photo

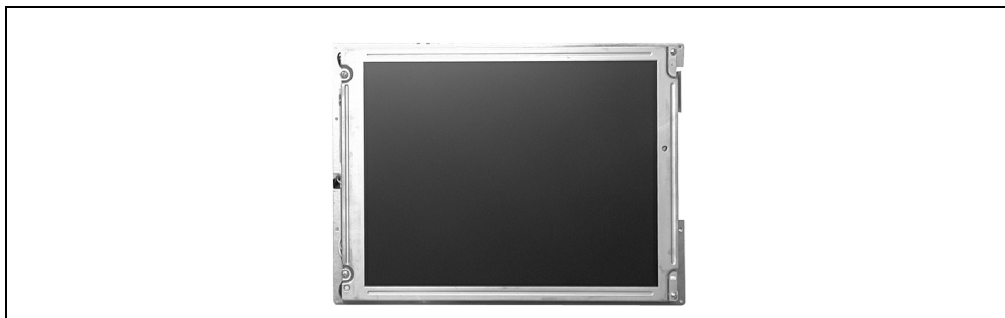


Figure 118: Display Kit 5D2000.04 - 10.4 in

3.2 Dimensions

Four M3 press-in bolts are required for installation in a machine. The image below shows the dimensions for the bolt holes and the active surface of the display (144 x 192 mm).

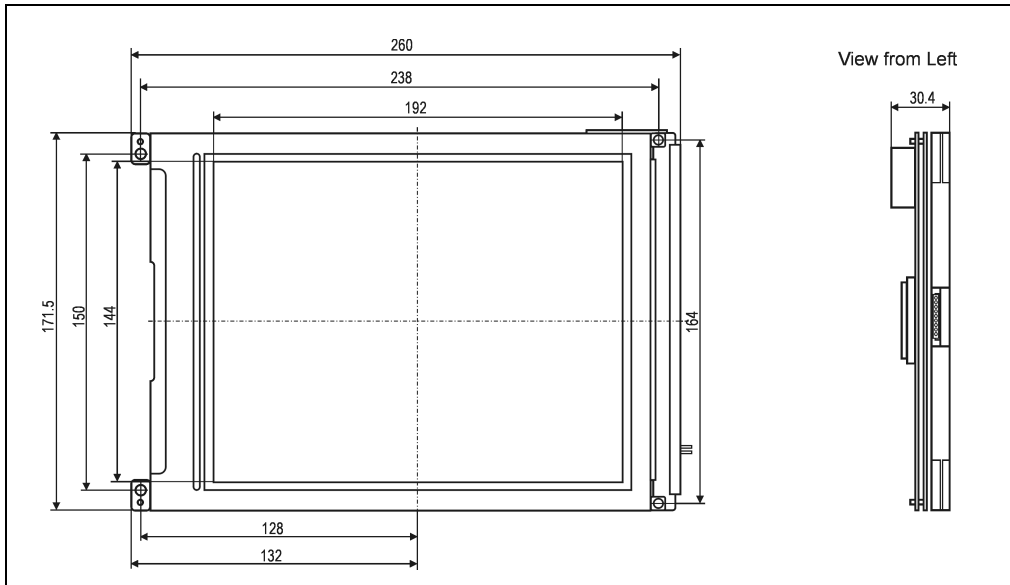


Figure 119: Display Kit 5D2000.04 - 10.4 in, Dimensions

3.3 5D2000.04 Technical Data

Product ID	5D2000.04
Controller	IPC2000 ¹⁾ , IPC2001
Display Type Colors ²⁾	LCD B/W, CFL background lighting 16 shades of gray
Resolution	VGA (640 x 480 pixels)
Display Diagonal	23.88 cm (239 mm)
Background Lighting (type) Brightness Lifespan ³⁾ ⁴⁾	65 cd/m ² 25,000 h
Operating Temperature	0 -45°C, depending on installation
Weight	0.44 kg
Relative Humidity	5 - 85 %, non-condensing
Outer Dimensions (W x H x D)	260 x 171.5 x 30.4

Table 129: Display Kit 5D2000.04

1) Controller connection depends on revision

2) The actual number of colors depends on the graphics mode set and the software used (graphic driver).

3) Decrease in brightness of 50 %.

4) at 25°C operating temperature.

Display Unit 5D2000.04	Controller	
	Rev. < 50.07	Rev. ≥ 50.07
Rev. < 10.00	•	
Rev. ≥ 10.00	•	•

3.4 Controller Connection

The connection from the display unit to the controller is made with a ribbon cable.

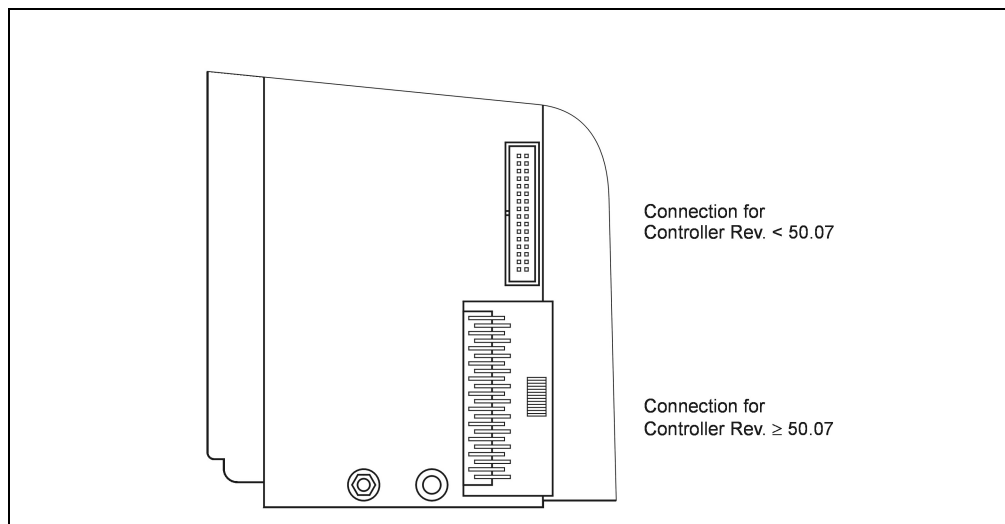


Figure 120: Controller Connection

4. Display Kit 5D2000.10



Display kit 5D2000.03 with a display diagonal of 9.4 in (239 mm) was changed to a 10.4 in (264 mm) display diagonal for revision 08.00.

4.1 Photo

This display kit is designed to be installed by the customer (integration in a machine). Display kits consist of a display and cabling. The active surface of the display is 144 x 192 mm.

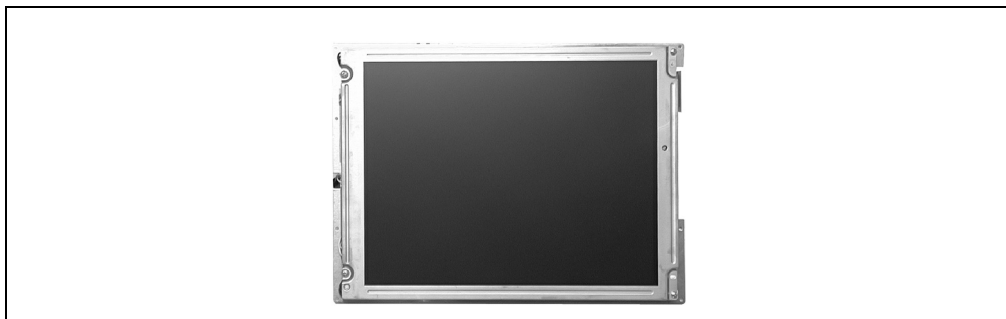


Figure 121: Display Kit 5D2000.01 - 9.4 in

4.2 Dimensions 5D2000.10 (9.4 in)

Four M3 press-in bolts are required for installation in a machine. The image below shows the dimensions for the bolt holes and the active surface of the display (144 x 192 mm).

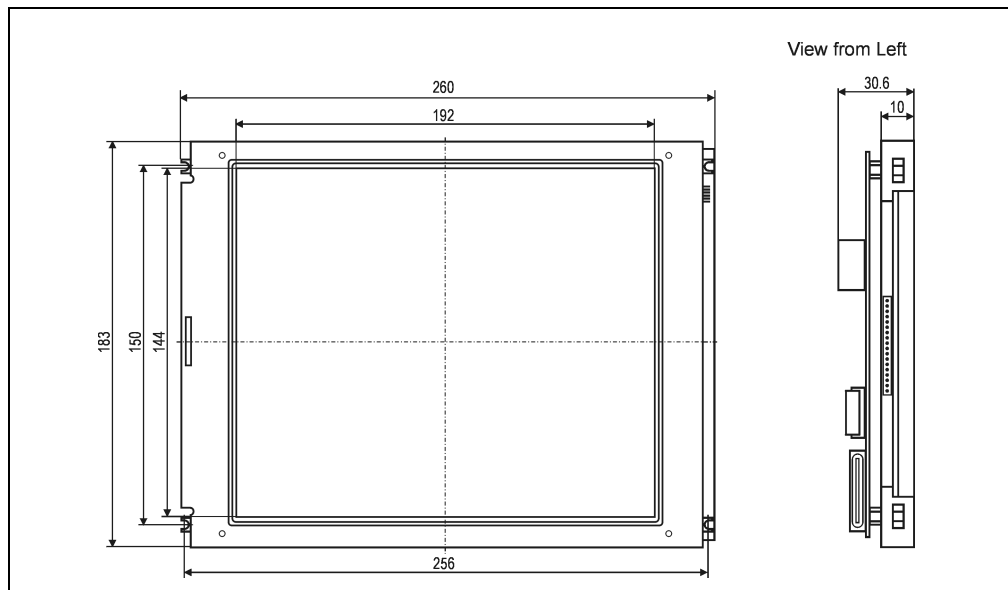


Figure 122: Display Kit 5D2000.10 - 9.4 in, Dimensions

4.3 Dimensions 5D2000.10 (10.4 in)

This display kit is designed to be installed by the customer (integration in a machine). Display kits consist of a display and cabling. The active surface of the display is 158.4 x 211.2 mm.

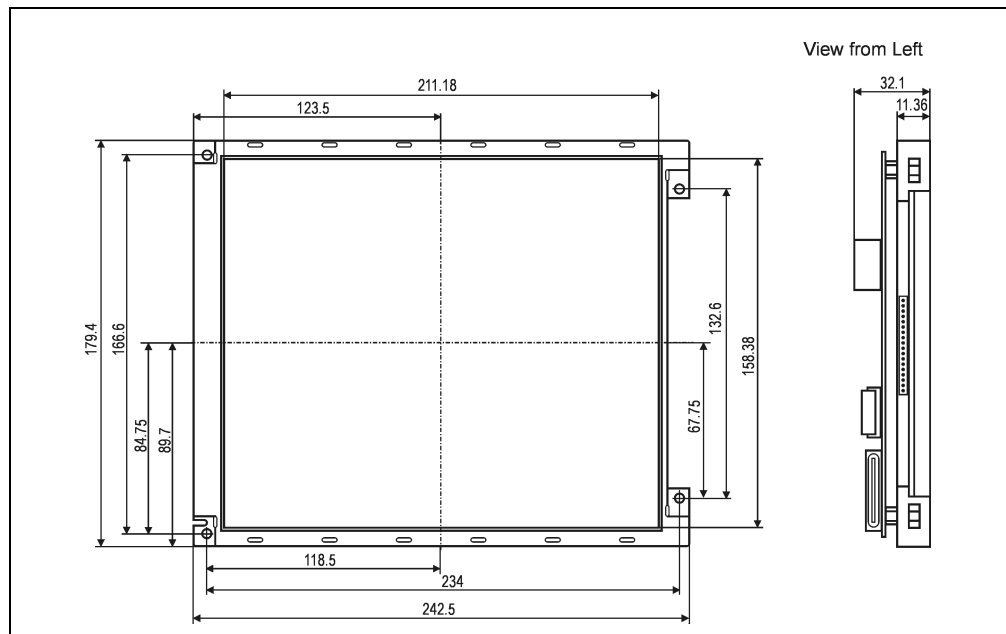


Figure 123: Display Kit 5D2000.10 - 10.4 in, Dimensions

4.4 5D2000.10 (9.4 in), 5D2000.10 (10.4 in) Technical Data

Product ID	5D2000.10 (9.4 in)	5D2000.10 (10.4 in)
Controller	IPC2000 ¹⁾ , IPC2001	
Display Type Colors ²⁾	LCD color, CFL background lighting 262,144 colors	LCD color, CFL background lighting 262,144 colors
Resolution	VGA (640 x 480 pixels)	VGA (640 x 480 pixels)
Display Diagonal	9.4 in (239 mm)	10.4 in (264 mm)
Background Lighting (type) Brightness Lifespan ³⁾ ⁴⁾	70 cd/m2 10,000 h	70 cd/m2 10,000 h
Operating Temperature	5 -40°C, depending on installation	
Weight	Approx. 0.75 kg	
Relative Humidity	5 - 85 %, non-condensing	
Outer Dimensions (W x H x D)	260 x 183 x 30.6	242.5 x 179.4 x 32.1

Table 130: Display Kit 5D2000.10 - 9.4 in / 5D2000.10 - 10.4 in

1) Starting with Rev. 50.07

2) The actual number of colors depends on the graphics mode set and the software used (graphic driver).

3) Decrease in brightness of 50 %.

4) at 25°C operating temperature.

4.5 Controller Connection

The connection from the display unit to the controller is made with a ribbon cable.

Chapter 5 • Keypad Modules

1. Overview

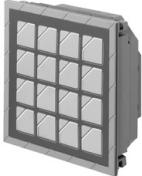
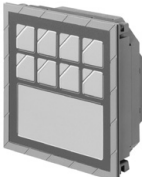
16 Keys, 16 LEDs 	Dummy Module 
16 Keys, 4 LEDs 	E-STOP Button 
8 Keys, 4 LEDs, 1 Label Field 	Key Switch 
4 Keys, 4 LEDs, 4 Label Fields 	Start/Stop, 2 Buttons, 1 Label Field 

Figure 124 : Keypad Modules Overview

2. General Information

2.1 Dimensions

All standard keypad modules have the same dimensions, special keypad modules can be up to 60 mm deep.

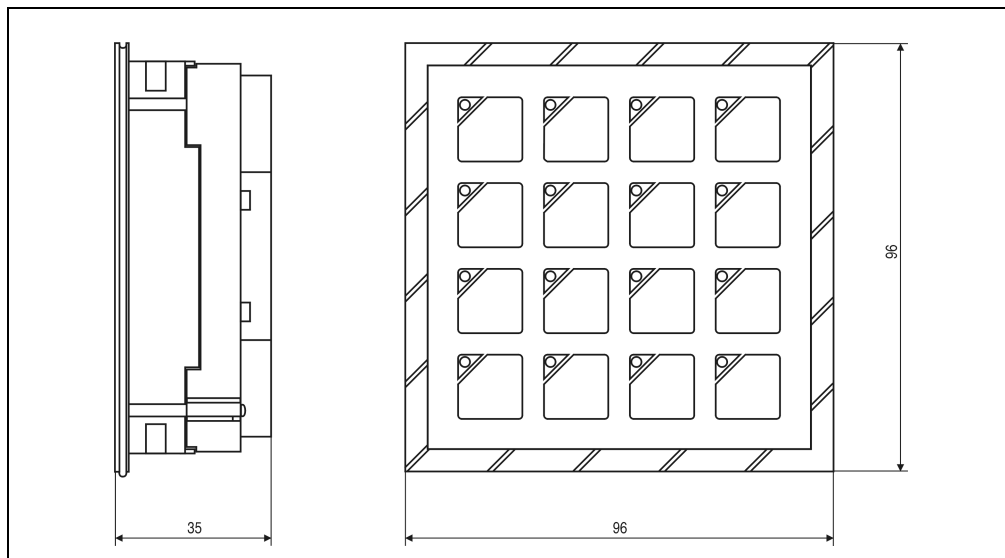


Figure 125 : Standard keypad module

2.2 Standard and Special Keypad Modules

The keypad modules are divided into two groups:

- Up to eight **Standard Keypad Modules** can be daisy chained and connected to a controller.
- **Special Keypad Modules** are identical to the rest of the keypad modules regarding their design. An electrical connection with a controller or standard keypad module is not possible. They are to be wired by an electrician according to their function (e.g. connecting an E-STOP button to an emergency stop circuit).

3. Standard Keypad Modules

3.1 Connecting to a Controller or Other Keypad Modules

All standard keypad modules can be connected to a controller or another keypad module with a short connection cable. There are two female connectors provided on the module for this purpose. The female connectors are labeled as input or output with triangle arrows! An output is provided on the controller which can be connected to a keypad module input!



Make sure that an input is never connected to an input or an output is never connected to an output, as this will damage the modules!

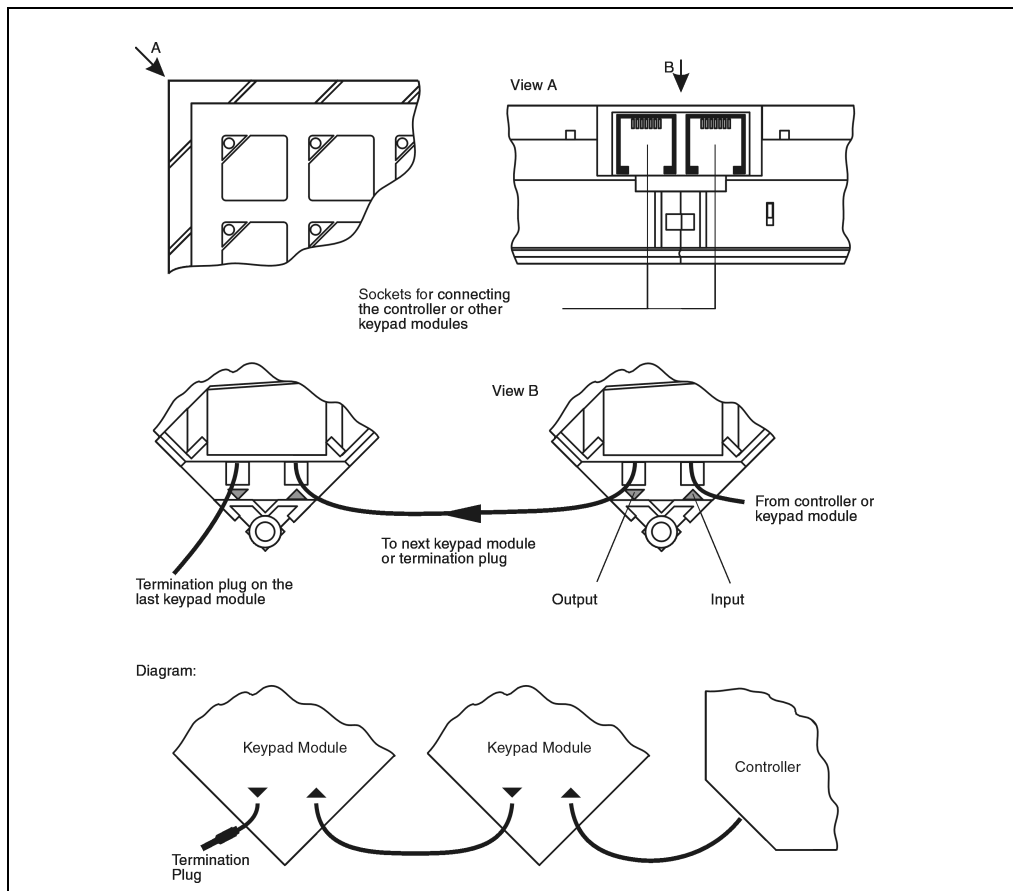


Figure 126 : Connecting to a Controller or Other Keypad Modules

Keypad Module Cable (90 cm)

A 90 cm long keypad module cable can be ordered as an accessory.

Model Number	
9A0007.01	Keypad Module Cable (90 cm)

It can only be connected between the Provit 2000 Controller and the first keypad module. The standard keypad module cable is to be used for connecting any additional keypad modules (13 cm long).



Only keypad modules with the following model numbers can be used:

Product ID	Keypad Module
4E0011.01-090	16 Keys
4E0021.01-090	12 + 4 Keys
4E0031.01-090	8 Keys
4E0041.01-090	4 Keys

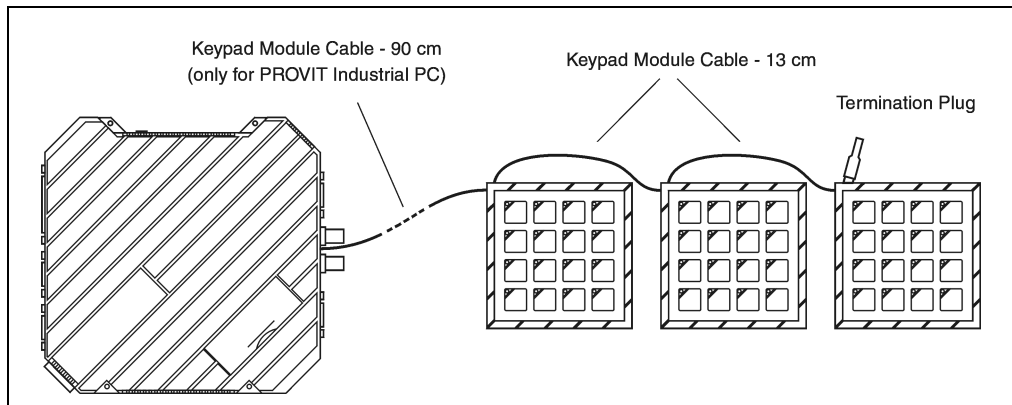


Figure 127 : Connection between Controller and Keypad Module

3.2 Keypad Module 16 Keys

3.2.1 Dimensions

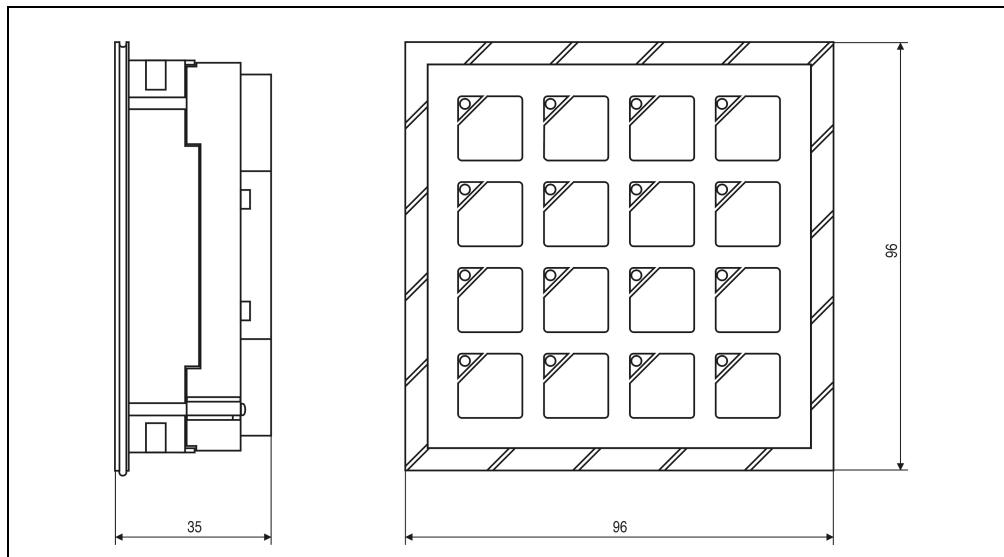


Figure 128 : Keypad Module 16 Keys, Dimensions

3.2.2 Technical Data

Product ID	4E0011.01-090
Number of Keys	16 Short Stroke Keys
Number of LEDs	16 (yellow)
Labeling	Can be labeled by the user
Temperature Range Operating Storage	0 to 50° C -20 to 60° C
Relative Humidity Operating Storage	5 to 95 % (non condensing) 5 to 95 % (non condensing)
Shock	According to IEC 68-2-27
Vibration	According to IEC 68-2-6

Table 131 : Keypad Module 16 Keys, Technical Data

3.3 Keypad Module 12+4 Keys

3.3.1 Dimensions

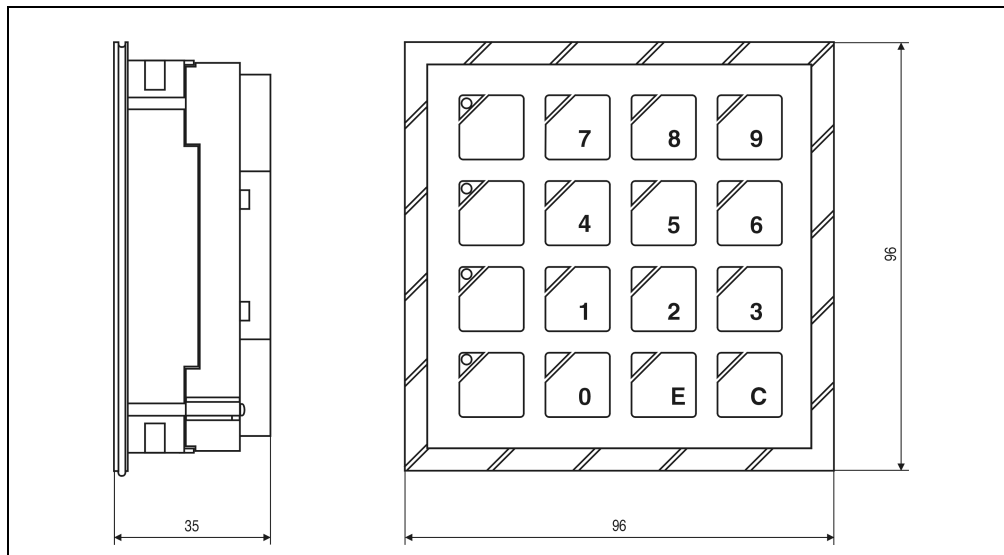


Figure 129 : Keypad Module 12+4 Keys, Dimensions

3.3.2 Technical Data

Product ID	4E0021.01-090
Number of Keys	16 Short Stroke Keys
Number of LEDs	4 (yellow)
Labeling	12 keys are labeled as a number block 4 keys can be labeled by the user
Temperature Range Operating Storage	0 to 50 °C (32 to 122 °F) -20 to 60 °C (-4 to 140 °F)
Relative Humidity Operating Storage	5 to 95 % (non condensing) 5 to 95 % (non condensing)
Shock	According to IEC 68-2-27
Vibration	According to IEC 68-2-6

Table 132 : Keypad Module 12+4 Keys, Technical Data

3.4 Keypad Module 8 Keys

3.4.1 Dimensions

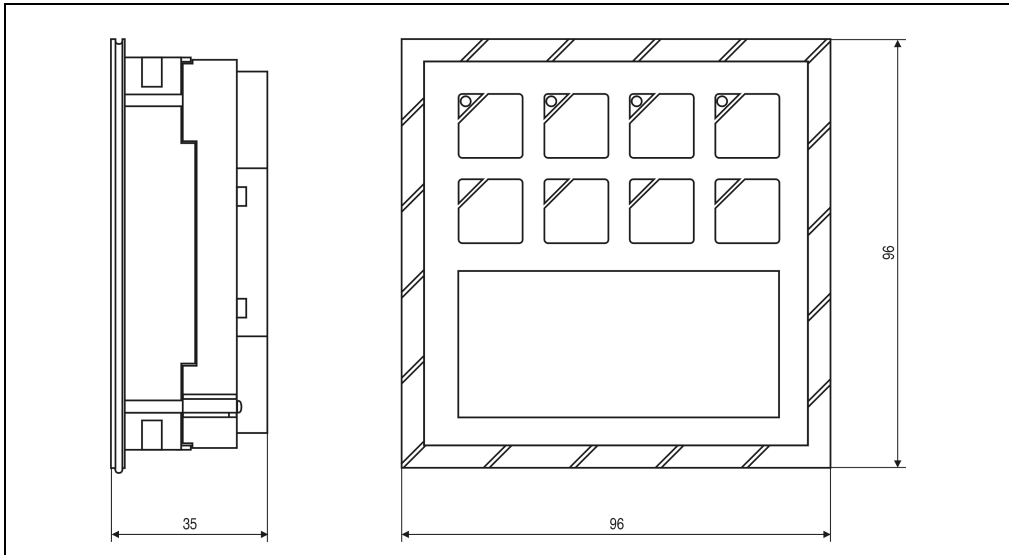


Figure 130 : Keypad Module 8 Keys, Dimensions

3.4.2 Technical Data

Product ID	4E0031.01-090
Number of Keys	8 Short Stroke Keys
Number of LEDs	4 (yellow)
Labeling	Can be labeled by the user
Label Fields	A field for additional information
Temperature Range Operating Storage	0 to 50 °C (32 to 122 °F) -20 to 60 °C (-4 to 140 °F)
Relative Humidity Operating Storage	5 to 95 % (non condensing) 5 to 95 % (non condensing)
Shock	According to IEC 68-2-27
Vibration	According to IEC 68-2-6

Table 133 : Keypad Module 8 Keys, Technical Data

3.5 Keypad Module 4 Keys

3.5.1 Dimensions

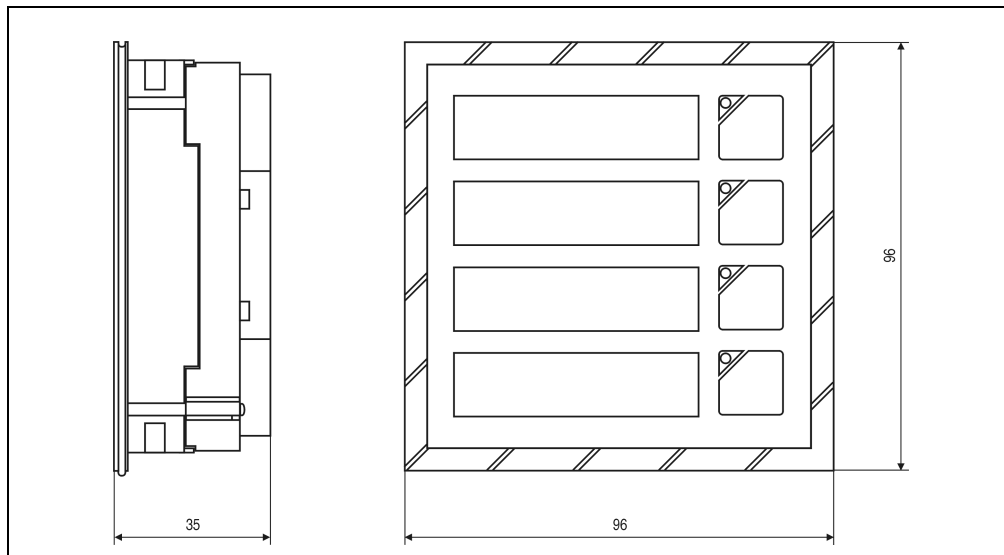


Figure 131 : Keypad Module 4 Keys, Dimensions

3.5.2 Technical Data

Product ID	4E0041.01-090
Number of Keys	4 Short Stroke Keys
Number of LEDs	4 (yellow)
Labeling	Can be labeled by the user
Label Fields	4 fields for additional information
Temperature Range Operating Storage	0 to 50 °C (32 to 122 °F) -20 to 60 °C (-4 to 140 °F)
Relative Humidity Operating Storage	5 to 95 % (non condensing) 5 to 95 % (non condensing)
Shock	According to IEC 68-2-27
Vibration	According to IEC 68-2-6

Table 134 : Keypad Module 4 Keys, Technical Data

4. Special Keypad Modules

4.1 Dummy module

4.1.1 Dimensions

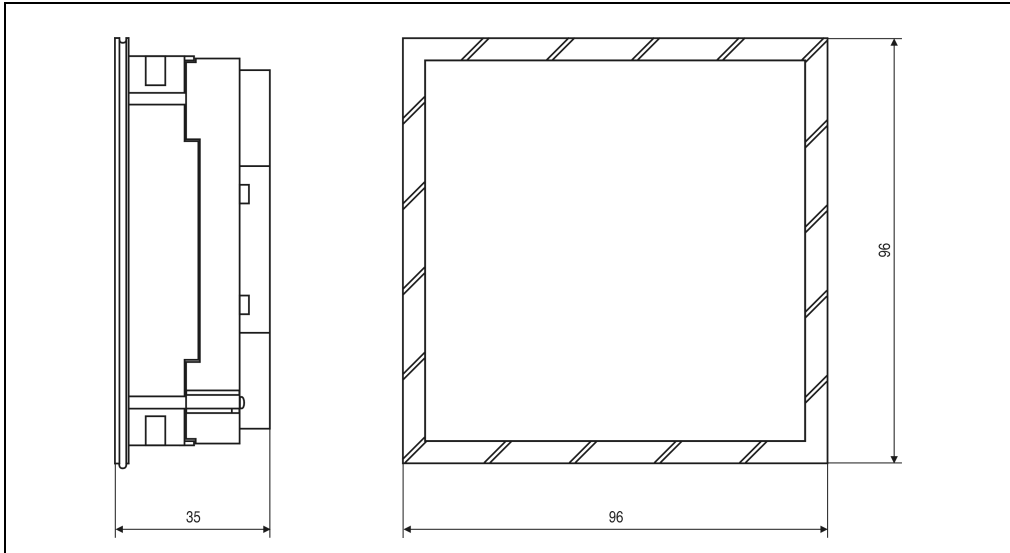


Figure 132 : Dummy Module, Dimensions

4.1.2 Technical Data

Product ID	4E0050.01-090
Number of Keys	None
Number of LEDs	None
Temperature Range Operating Storage	0 to 50 °C (32 to 122 °F) -20 to 60 °C (-4 to 140 °F)
Relative Humidity Operating Storage	5 to 95 % (non condensing) 5 to 95 % (non condensing)
Shock	According to IEC 68-2-27
Vibration	According to IEC 68-2-6

Table 135 : Dummy Module, Technical Data

4.2 E-Stop Button



Due to the depth of the module, a controller cannot be placed behind this module!

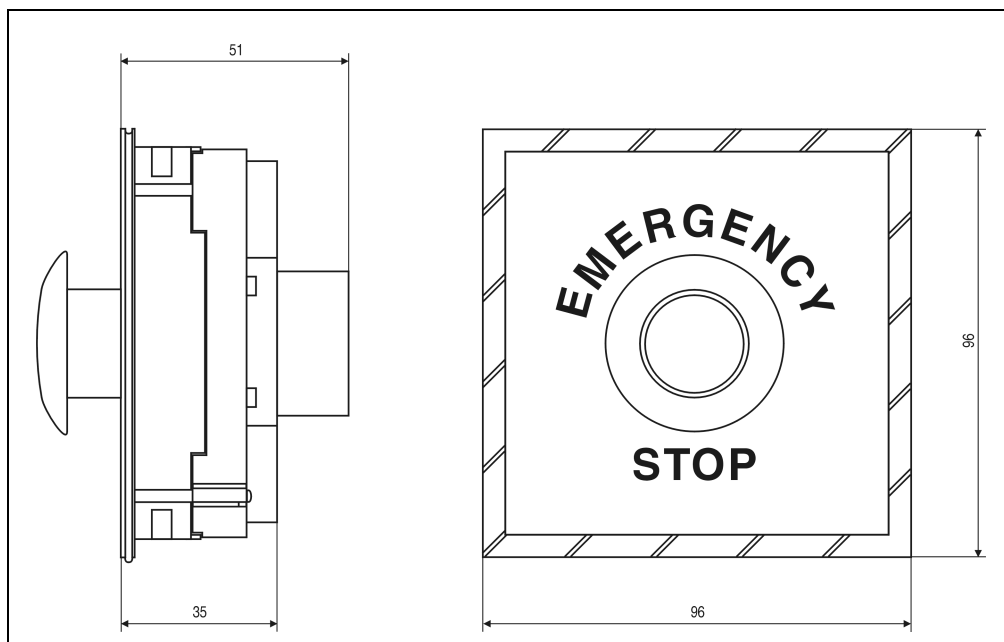


Figure 133 : E-Stop Button, Dimensions

4.2.1 Technical Data

Product ID	4E0060.01-090
Number of Switches	1 E-Stop Button
Temperature Range	
Operating	0 to 50 °C (32 to 122 °F)
Storage	-20 to 60 °C (-4 to 140 °F)
Relative Humidity	5 to 95 % (non condensing)
Operating	5 to 95 % (non condensing)
Storage	
Shock	According to IEC 68-2-27
Vibration	According to IEC 68-2-6

Table 136 : E-Stop Button, Technical Data

4.3 Key Switch



Due to the depth of the module, a controller cannot be placed behind this module!

4.3.1 Dimensions

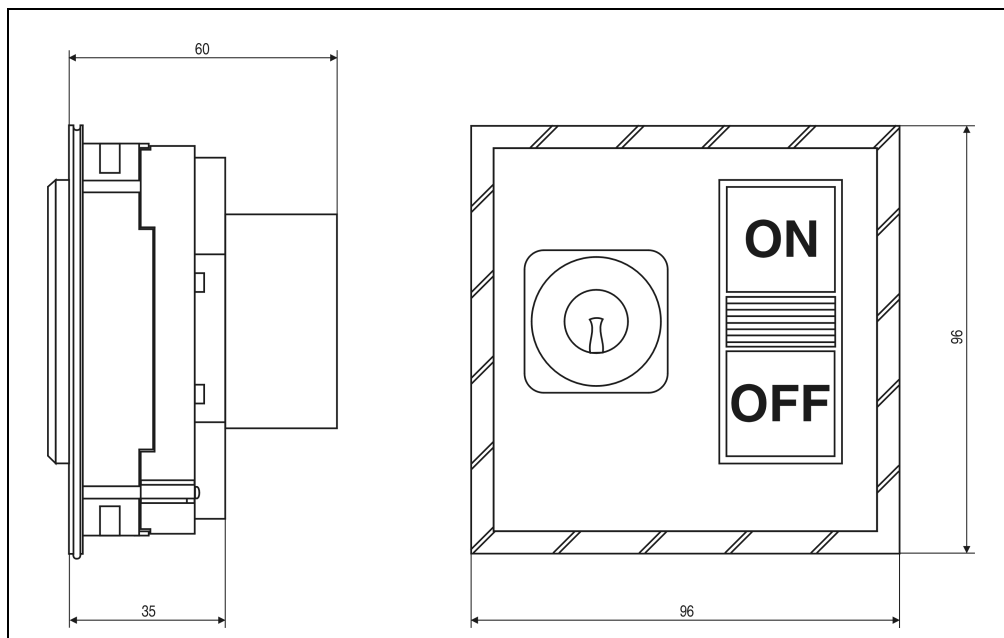


Figure 134 : Key Switch, Dimensions

4.3.2 Technical Data

Product ID	4E0070.01-090
Number of Switches	1 key switch 1 ON/OFF switch
Temperature Range Operating Storage	0 to 50 °C (32 to 122 °F) -20 to 60 °C (-4 to 140 °F)
Relative Humidity Operating Storage	5 to 95 % (non condensing) 5 to 95 % (non condensing)
Shock	According to IEC 68-2-27
Vibration	According to IEC 68-2-6

Table 137 : Key Switch, Technical Data

4.4 START/STOP



Due to the depth of the module, a controller cannot be placed behind this module!

4.4.1 Dimensions

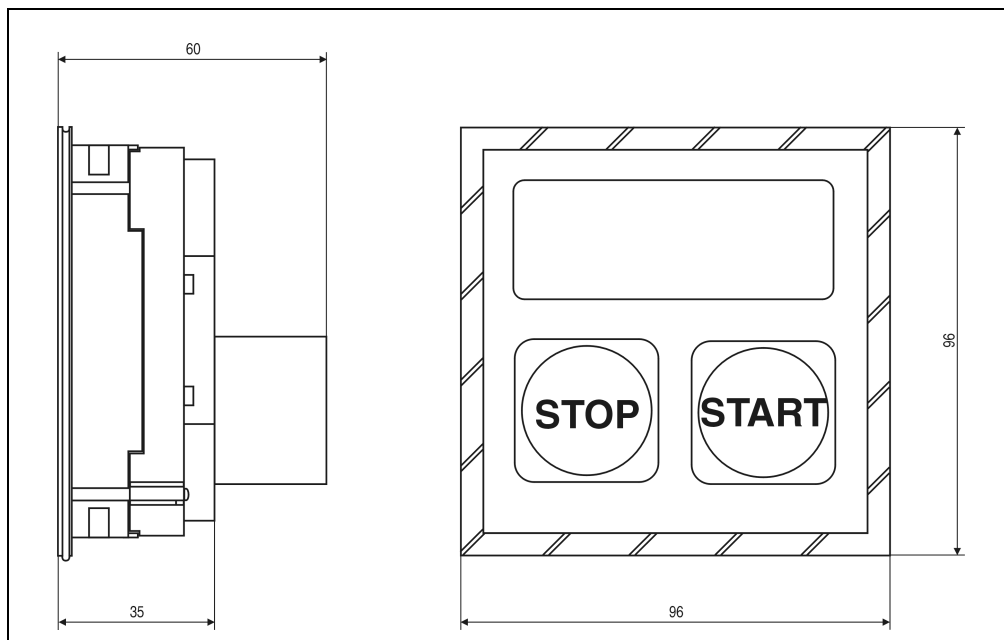


Figure 135 : Start/Stop Keypad Module, Dimensions

4.4.2 Technical Data

Product ID	4E0080.01-090
Number of Keys	2 keys (labeled with START or STOP)
Temperature Range Operating Storage	0 to 50 °C (32 to 122 °F) -20 to 60 °C (-4 to 140 °F)
Relative Humidity Operating Storage	5 to 95 % (non condensing) 5 to 95 % (non condensing)
Shock	According to IEC 68-2-27
Vibration	According to IEC 68-2-6

Table 138 : Start/Stop, Technical Data

5. Key Legend Sheets for Keypad Modules

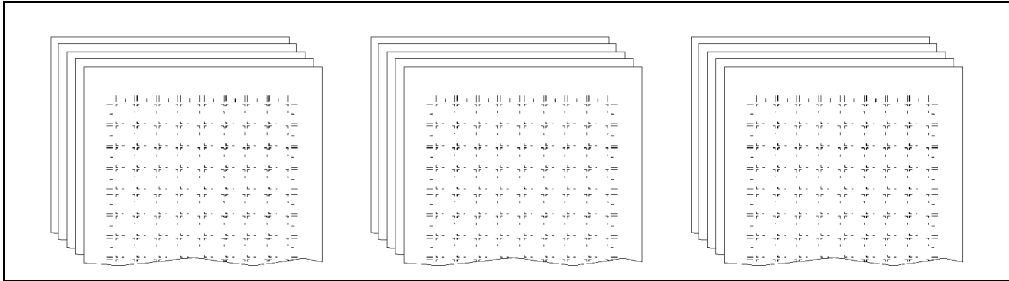


Figure 136 : Key Legend Sheets

Key Legend Sheets for Keypad Modules	Blue	4A0005.00-000
	Black	4A0005.00-500
Five label sheets each for keypad modules with 4, 8, and 16 LEDs in A4 and US Letter format. Each label sheet has six keypad labels. The keypad labels are perforated so they can be removed from the label sheet easily.		

Table 139 : Key Legend Sheets for Keypad Modules

6. Accessories

Accessories are delivered with each keypad module. They are packed together with the module.

Accessories	Amount	
	Standard Keypad Module	Special Keypad Module
Connection Elements	2	2
Cable Covers	2	2
Keypad Module Cable (connection to a controller or a keypad module)	1	--
Clamps	2	2
Set of Mounting Bolts	1	1

Table 140 : Accessories

Chapter 6 • Software

1. General Information

Programs and utilities have been developed so that the special features of the B&R Provit 2000 controller can be used. Changes were also made to the "Original BIOS" to allow support of additional boot devices (FPROM, SRAM and PC Card from B&R).

When developing the utilities, a compact structure and simple operation were given high priority. VGA Utilities for the operation of Provit 2000 displays are available in addition to the utilities for operation of internal and external memory.

Overview of Provit 2000 Software

Model Number		
5S0000.01-090	Provit Drivers & Utilities CD	<i>Replacement for canceled software</i>
5S2000.01-090 ¹⁾	Provit 2000 Utilities IPC2000	<i>Cancelled!</i>
5S2001.01-090	Provit 2000 Utilities IPC2001	<i>Cancelled!</i>
5S2001.02-090	Provit 2000 Upgrade IPC2001	<i>Cancelled!</i>
5S2001.03-090	Provit 2000 Graphics Driver IPC2001	<i>Cancelled!</i>

Table 141 : Overview of Provit 2000 Software

1) Replaced by 5S2001.01-090

The software can be ordered from B&R (Provit Drivers & Utilities) or taken directly from the Internet www.br-automation.com.

2. Provit 2000 Utilities IPC2001/IPC2002

2.1 Overview

Name	Description
Brsram.sys	Allows access of Internal (bootable) SRAM as DOS device (drive) with FAT format
Brfprom.sys	Allows access of Internal (bootable) SRAM as DOS device (drive) with FAT format
Brimage.sys (with Brimage.com)	Allows generation of internal FPPROM as (bootable) DOS device (drive) with FAT format using an image file
Brpccmci.sys	Allows operation of PCMCIA SRAM and FPPROM memory cards with FAT format
Brcomoff.sys	Allows COM1 and COM2 to be turned off (for IPC2000)
Brcomos.com	Allows output of BIOS CMOS settings
Brmodes.com	Allows VGA settings such as brightness, contrast, etc. to be made

Table 142 : Provit 2000 Utilities IPC2001/IPC2002, Overview



During installation of the device driver, it is important to take the drive designations into consideration.

2.2 Assigning a Drive Designation

Except for the hard disk, all boot drives have the drive designation "a:". That means, if the system is started from a disk drive then this drive has the designation, "a:". If the boot procedure is carried out from either the PC card, FPPROM or SRAM, then this device has the drive designation "a:" and the disk drive has the drive designation "b:". The other drive designations are assigned according to the sequence in the "config.sys" file and are named starting with "c:" (if there is a HDD, then "d:").

The following five examples show the assignment of the drive designation depending on the boot device:

Controller with FDD (bootable disk inserted), PC Card, HDD		
Device Type	Designation	Remark
Floppy Drive	A:	Activated in BIOS Setup
Hard Disk	C:	Activated in BIOS Setup
Other Device Drivers	D:, E:	The other drive designations are assigned according to the order in the "config.sys" file.

Controller with FDD, PC Card (bootable card in slot I or II), HDD		
Device Type	Designation	Remark
PC Card Slot I or II	A:	Automatic Recognition FPPROM and SRAM cards up to 63 MByte can be used.
Floppy Drive	B:	Activated in BIOS Setup
Hard Disk	C:	Activated in BIOS Setup
Other Device Drivers	D:, E:	The other drive designations are assigned according to the order in the "config.sys" file.

Controller with FDD, PC Card, FPPROM (bootable), SRAM		
Device Type	Designation	Remark
Internal FPPROM	A:	Automatic Recognition
Floppy Drive	B:	Activated in BIOS Setup
Other Device Drivers	C:, D:	The other drive designations are assigned according to the order in the "config.sys" file.

Controller with FDD, PC Card, FPPROM, SRAM (bootable)		
Device Type	Designation	Remark
Internal SRAM	A:	Activated in BIOS Setup
Floppy Drive	B:	Activated in BIOS Setup
Other Device Drivers	C:, D:	The other drive designations are assigned according to the order in the "config.sys" file.

Controller with FDD (bootable disk inserted), PC Card, FPPROM, SRAM		
Device Type	Designation	Remark
Floppy Drive	A:	Activated in BIOS Setup
Other Device Drivers	C:, D:, E:	The other drive designations are assigned according to the order in the "config.sys" file.

2.3 Device Driver for Internal SRAM - "brsram.sys"

The "brsram.sys" device driver is used to operate the internal 256 KByte SRAM memory. The device driver is on the "Provit 2000 Utilities" diskette in the "SYS" directory. After starting the driver, all DOS file operations are possible without limitations.

Syntax	
Entry in the "config.sys" file: Device=<DD>:[Path]brsram.sys [Parameter]	
Explanation:	
<DD>	Drive Designation
[Path]	Optional path entry, used to access "brsram.sys"
[Parameter]	
-r	Drive is write protected using software

After rebooting the controller, the device driver searches for the memory used and also determines the size. The device (SRAM) is assigned a drive designation (see section 2.2 "Assigning a Drive Designation")

The following version information is given when starting the device driver	
B&R SRAM Driver <DD>: V2.0 95-05-29 (c)1995 Segment Address: [Programsegmentaddr] Data Address: [Dataaddr]	
Explanation:	
<DD>	Drive Designation
[Programsegmentaddr]	Address for driver in system
[Dataaddr]	Start address for data area on the drive
If no valid memory is found, the following text is shown: General error on device!	
Note: The device driver is not added to the system!	



If a memory manager started in config.sys (e.g. EMM386.exe), the area for the MapWindow (CF00 - CFFF) has to be excluded on the IPC2001 and IPC2002.

Example

IPC2001 Controller (5C2001.07) with HDD as boot device (drive C:). The device driver is on the hard disk in the \SYS\ directory.
1. Start the device driver using an entry in the "config.sys" file: Device=C:\SYS\brsram.sys
2. Device receives a drive designation (D: in this case).
3. The following information is shown on the screen: B&R SRAM Driver D: V2.0 95-05-29 (c)1995 Segment Address : 0FA0 Data Address : E00000
4. Then the SRAM can be accessed as D: without limitations.

Example

IPC2001 Controller (5C2001.07) with HDD as boot device (drive C:). The device driver is on the hard disk in the \SYS\ directory. The drive is to be write protected using software.
Start the device driver using an entry in the "config.sys" file: Device=C:\SYS\brsram.sys -r The drive is write protected using software

Example

IPC2001 Controller (5C2001.07) with HDD as boot device (drive C:). The device driver is on the hard disk in the \SYS\ directory. SRAM is to be bootable.
1. Start the device driver using an entry in the "config.sys" file: Device=C:\SYS\brsram.sys
2. Device receives a drive designation (D: in this case).
3. In MS-DOS, SRAM is made bootable using the following command: Format D: /u /s Note: Because of the limited memory, it doesn't make sense to use SRAM as a boot device. However it is possible.

2.4 Device Driver for Internal FEPROM - "brfprom.sys"

The device driver "brfprom.sys" is used to operate the internal FEPROM. It is on the "Provit 2000 Utilities" diskette in the "SYS" directory. After starting the device driver, limited DOS file operations are possible.

IPC2000

Controllers 5C2000.01 and 5C2000.02 are equipped with internal FEPROM (up to 2 MByte). The size and address range are listed in the "Resources" section.

A DIP switch can be found on the side of the controller (see chapter 2.1.5.17 "DIP Switch"). DIP switch 1 switches the FEPROM to "Write enable" or "Write protect".

Switch Position	Function
"1" = ON	"Write enable" - The Flash PROM can be programmed
"1" = OFF (Default)	"Write protect" - The Flash PROM cannot be programmed
"2" = OFF (Default)	DIP switch 2, is reserved for B&R and must always remain in the "OFF" position!

IPC2001

Controllers 5C2001.01 and 5C2001.02 are equipped with a FEPROM (2 MByte). The size and address range are listed in the "Resources" section.

A DIP switch can be found on the side of the controller (see chapter 2.2.6.17 "DIP Switch SW1 & SW2"). DIP switch SW2 (switch 2) switches the FEPROM to "Write enable" or "Write protect".

DIP Switch SW2

Switch Position	Function
"1" = ON	Reserved
"1" = OFF (Default)	Reserved
"2" = ON	User Flash "Write enable" - The FEPROM can be programmed
"2" = OFF (Default)	User Flash "Write protect" - The FEPROM cannot be programmed

Description

Syntax	
Entry in the "config.sys" file: Device=<DD>:\[Path]\brfprom.sys [Parameter]	
Explanation:	
<DD>	Drive Designation
[Path]	Optional path entry, used to reach "brfprom.sys"
[Parameter]	
-w	Drive is write protected using software

After rebooting the controller, the device driver searches for the memory used and also determines the size. The device (FPROM) is assigned a drive designation (see section 2.2 "Assigning a Drive Designation")

The following version information is given when starting the device driver	
B&R Flash Driver <DD>: V2.0 95-05-29 (c)1995 Segment Address : [Programsegmentaddr] Data Address: [Dataaddr]	
Explanation:	
<DD>	Drive Designation
[Programsegmentaddr]	Address for driver in system
[Dataaddr]	Start address for data area on the drive
If no valid memory is found, the following text is shown: General error on device!	
Note: The device driver is not added to the system!	



If a memory manager is started in config.sys (e.g. EMM386.exe), the area for the MapWindow (CF00 - CFFF) must be excluded on the IPC2001.

(e.g. Device=C:\EMM386.exe noems X=CF00 - CFFF)

Limitations of Internal FPROM

Command	Function
Copy	Copying to a file with the same name causes an error because the old FAT entry has to be deleted when opening the target file. That is not possible
Attrib	Attributes can be set but not turned off. Changing active file attributes to Hidden is possible. It is not possible in the other direction.
rename	Changing the file names is limited: "test.exe" can be changed to "test1.exe" changing "test.exe" to "abcd.exe" causes an error
del	Files cannot be deleted using "del". Deleting is only possible by formatting the entire Flash Prom.
Subdirectory	Up to 16 subdirectory entries can be created. Starting with the 17th entry, DOS tries to program a byte on an address in the FAT area which is already being used. This is not possible.
smartdrv	"smartdrv" has to be turned off for this device. (command: "smartdrv <DD>-").
Windows	Most Windows programs create a temporary file when saving. Temporary files are not supported on this device.
Write to Sector	To write to a sector (e.g. "label.exe"), DOS support has to be turned off (using an interrupt).

Example

IPC2001 Controller (5C2001.02) with FDD as boot device (drive A:). The "brfprom.sys" device driver is on the diskette in the \SYS\ directory.
1. Start the device driver using an entry in the "config.sys" file: Device=A:\SYS\brfprom.sys
2. Device receives a drive designation (C: in this case).
3. The following information is shown on the screen: B&R Flash Driver C: V2.0 95-05-29 (c)1995 Segment Address : 0FFE Data Address : C00000
4. The SRAM can then be accessed as C: (with limitations listed).

Example

IPC2001 Controller (5C2001.01) with FDD as boot device (drive A:). The device driver is on the diskette in the \SYS\ directory. The drive is to be write protected using software.
Start the device driver using an entry in the "config.sys" file: Device=A:\SYS\brfprom.sys -r The drive is write protected using software

Example

IPC2001 Controller (5C2001.01) with FDD as boot device (drive A:). The device driver is on the diskette in the \SYS\ directory. FPROM is to be bootable.

1. Start the device driver using an entry in the "config.sys" file:

Device=A:\SYS\brfprom.sys

2. Device receives a drive designation (C: in this case).

3. In MS-DOS, FPROM is made bootable using the following command:

Format C: /u /s

2.5 brimage.sys" - "brimage.com"

The tools "brimage.sys" or "brimage.com" are used to generate the internal FPROM on the IPC2000 or IPC2001.

Procedure

1. Start the device driver using an entry in the "config.sys" file:

2. Format device created (RAM Disk in DRAM, can be accessed as drive).

Note:

If the internal FPROM is to be bootable, the RAM Disk has to be formatted as "format <DD>: /u /s"

3. Copy the desired data to the RAM Disk (without limitations, like "brfprom.sys" device driver!).

4. Create an image file from the RAM Disk using the program "brimage.com".

5. Use the same program "brimage.com" to program the contents of the image file to the internal FPROM.

or

4. Use the program "brimage.com" to copy the contents of the RAM Disk directly to the internal FPROM.



If you use this tool to make FPROM bootable and programmed, file operations cannot be carried out on the FPROM after booting.

brimage.sys

Start the device driver "brimage.sys" using an entry in the "config.sys" file:



Take note that the device driver "brimage.sys" always has to be started before a memory manager (e.g. "EMM386.exe").

Syntax	
Entry in the "config.sys" file: Device=<DD>:[Path]brimage.sys [Parameter]	
Explanation:	
<DD>	Drive Designation
[Path]	Optional path entry, used to reach "brimage.sys"
[Parameter]	
/Size:xxxx	Determines the size of the device (RAM Disk) to be installed. The values "1024" or "2048" make sense depending on the Provit2000 Controller used. If the option, "Size:xxxx" is not entered, the device driver determines the size of the FEPROM available. If no FEPROM is available (e.g. preparing an image file on a development computer), the size has to be entered.

brimage.com

The program "brimage.com"

- programs internal FEPROM,
- creates an image file or
- programs internal FEPROM with content of an image file.

Syntax	
Entry in the "config.sys" file: [Path] brimage [Parameter]	
Explanation:	
[Path]	Optional path entry, used to reach "brimage.com"
[Parameter]	
-f=File	Writes the contents of the device driver that was started ("brimage.sys") in the image file entered (with optional path entry). Default file name: "brimage.img"
-pf=File	Programs the internal FEPROM with the contents of the image file entered (with optional path entry). Default file name: "brimage.img"
-p	Programs the internal FEPROM with the contents of the device driver that was started ("brimage.sys").
-?	Help information

Example:

Controller 5C2001.01, bootable FDD, 8 MByte DRAM, 2MByte FEPROM, 20 MByte Compact Flash. The internal FEPROM is to be programmed and made bootable. Program on another 5C2001.01 Controller should be used.
1. Start the device driver using an entry in the "config.sys" file: Device=A:\brimage.sys /Size: 2048 Note: The device driver "brimage.sys" and the program "brimage.com" are on the diskette.
2. The following text is shown after booting the controller: B&R Image Driver D: V 2.50 98-10-07 (c) 1995-98 B&R Segment Address : 0B87 ffrom Address: 000000 Device Address: 200000 Note: The device driver creates a 2 MByte device (RAM-Disk) in DRAM with drive designation, D:. The drive designation is assigned automatically (see section 2.2 "Assigning a Drive Designation")
3. Format device (RAM-Disk = D:) (Option /s to create bootable FEPROM) A:\format D: /u /s
4. Copy the desired files to device (RAM Disk)
5. Create the image file with A:\brimage -f=c:\testprogramm.img Note: The entire contents of the device (RAM Disk) are copied as an image file to drive C: (C: is the Compact Flash in this case), the file name is optional. The size of the image file is always 2 MByte (or 1 MByte), regardless of how many files have previously been copied to the device (RAM Disk)!
6. The command A:\brimage -pf=c:\testprogramm.img can now be used to burn the contents of the image file "testprogramm.img" to the internal FEPROM!
7. The image file, "testprogramm.img" and the program "brimage.com" can now be programmed to the internal FEPROM on another controller.

2.6 Device Driver for External PC Card- "brpcmcia.sys"

2.6.1 FEPROM and SRAM PCMCIA Cards

The "brpcmcia.sys" device driver allows easy management of FEPROM or SRAM PC Cards, that can be used in slots 1 and 2 on Provit 2000 controllers. Previously, the B&R driver supported external PC cards up to 2 MByte. Using the device driver (starting with Rev. 02.42), it is possible to address up to 63 MByte.

A device driver has to be started for each slot (card). A device driver cannot be started twice in DOS, therefore the device driver "brpcmcia.sys" has to be copied using another name and then started (e.g. "brpcmci2.sys").

Syntax	
Entry in the "config.sys" file: Device=<DD>:[Path]brpcmcia.sys /Slot:a /Type:b /Size:c /Off:d /Base:e /Pwin:f /WP:g	
Explanation:	
<DD>	Drive Designation
[Path]	Optional path entry, used to reach "brimage.com"
[Parameter]	
/Slot:a	a = Slot number: 1,2 or B Default: 1; B automatically determines the PCMCIA Boot Slot
/Type:b	b = Card type; FEPROM or SRAM Default: SRAM
/Size:c	c = Size of the memory card. The entry has to be a multiple of 512 KByte, maximum 63 MByte can be addressed (=64512) Default: 1 MByte = 1024
/Off:d	d = Defines the offset for the next partition on a card. The parameter "Off" is the sum of the size of memory areas for defined drives or partitions (e.g. "Off" for drive 3 = Size of drive 1 + Size of drive 2).
/Base:e	e = Base address for MapWindow of the device driver. Starting at this address, 4 KBytes are required. Reading from a card or writing to a card takes place using this memory. Attention: If a memory manager is started (e.g. EMM385.exe), this area has to be excluded.
/Pwin:f	f = Value between 1 and 5; defines the window where the device driver should run. A window for the device driver has to be entered for each drive (max. number of drives is 5)
/WP:g	Software write protection; g = ON or OFF Default: OFF



If you boot from a PCMCIA card that is larger than 2 MByte, it must be partitioned because the boot drive cannot be larger than 2 MByte (only 2 MByte supported by BIOS). All other drives are not limited in this manner. Take note that the boot drive always uses window "1" (Pwin:1)!

IPC2001 Controller with HDD as boot device (drive C:). A 4 MByte FEPROM PCMCIA card in slot 1 is to be bootable and the boot drive should be 1 MByte. The device driver "brpcmcia.sys" is on the hard disk in the \SYS\ directory.

1. Start the device driver using an entry in the "config.sys" file:

Device=C:\SYS\brpcmcia.sys /Slot:1 /Type:FEPROM /Size:1024 /Base:D400 /Pwin:1

Device=C:\SYS\brpcmcia2.sys /Slot:1 /Type:FEPROM /Size:3072 /Off:1024 /Base:D500 /Pwin:2

2. After booting the controller, you have 2 other drives, drive (D:) with 1 MByte and drive (E:) with 3 MBytes. The following information is shown on the screen:

B&R Extern Driver D: V 2.50 97-04-21 (c) 1995,1996,1997
 Type : FEPROM Slot : 1
 Polarity : ON Size (kb) : 1024
 WP : OFF Offset : 0
 Window page reg. : 2
 Segment Address : 20b Data Address: D400

B&R Extern Driver E : V 2.50 97-04-21 (c) 1995,1996,1997
 Type : FEPROM Slot : 1
 Polarity : ON Size (kb) : 3072
 WP : OFF Offset : 1024
 Window page reg. : 3
 Segment Address : 3gh Data Address : D500

3. Drive D: (bootable) is formatted with the command

C:\ format D: /u /s

and drive E: (user drive) with the command

C:\ format E: /u

4. Copy the desired files to the device (drive D: or E:)

Note:

The "brpcmcia.sys" device driver has to be started in the "config.sys" file on drive (D:) so that the user drive can be accessed after the controller is rebooted.

Entry in the "config.sys" file (on bootable drive D:), the device driver "brpcmcia.sys" is placed in directory \SYS\:

Device=A:\SYS\brpcmcia.sys /Slot:1 /Type:FEPROM /Size:3072 /Off:1024 /Base:D400 /Pwin:2

see section 2.2 "Assigning a Drive Designation"



If a memory manager is used (e.g. EMM386.exe), the memory area used by the device driver has to be defined in the "config.sys" file.

(e.g. Device=A:\EMM386.exe noems X=CC00 - CDFF X=D400 - D500)

The following memory areas are used by the "brpcmcia.sys" device driver:

Memory Area	Description
CC00 - CCFF	If booted with the PC Card
CD00 - CDFF	When using Slot 1
CE00 - CEFF	When using Slot 2
Base: 4 KByte	4 KByte starting with the base address defined



If a base address is defined in D-Block (e.g. D400-D5FF), on an IPC2001, make sure that this area is excluded in BIOS under "PnP Configuration"!

Limitations

PC Card Utilities (Card+Socket Services) and the B&R device driver cannot be used together.

For the operation of FEPROM PCMCIA cards, the same limitations apply as for the internal FEPROM (see section 2.4 "Device Driver for Internal FEPROM").

2.6.2 PCMCIA Modem

If PCMCIA Modems are used, they normally need COM1 or COM2. To reserve an interface for the modem, it is necessary to disable the required interface before calling the "PCMCIA Slot Services". The Provit 2000 Utilities Diskette contains the device driver "brcomoff.sys", which can be used to turn off interfaces COM1 and/or COM2 using software (see section 2.7 "Turning Off COM1 or COM2").

2.7 Turning Off COM1 or COM2 - "brcomoff.sys"

This tool switches off COM1 and/or COM2 on the IPC200 or IPC2001. The device driver is started in the "config.sys" file. On the IPC2001, COM1 or COM2 can also be turned off in BIOS (see chapter 2.2.10.5 "INTEGRATED PERIPHERALS").

Syntax	
Entry in the "config.sys" file: Device=<DD>:[Path]brcomoff.sys [Parameter]	
Explanation:	
<DD>	Drive Designation
[Path]	Optional path entry, used to reach "brcomoff.sys"
[Parameter]	
/p:1	Defines the interface number to be turned off. Only the first two interfaces (COM1 and COM2) can be turned off. COM3 and COM4 are permanently installed.
/p:2	

Example:

IPC2001 Controller, COM1 should be switched off using software. The device driver is on the diskette in the \SYS\ directory.
1. Start the device driver using an entry in the "config.sys" file: Device=A:\SYS\brcomoff.sys /p:1 2. The following version text is then shown: B&R COM1 or 2 switch off : V 2.44 96-11-05 (c) 1996 B&R COM1 removed

2.8 BIOS-CMOS Information - "brcmos.com"

With this program, the BIOS CMOS settings can be printed or sent to a file on the standard output path (Stdout). It is also possible to update the BIOS CMOS settings from a file.



CMOS data backups from IPC2000 controllers cannot be used on IPC2001 controllers because the CMOS data contents are different.

Syntax	
Entry in the "config.sys" file: [Path]\brcmos [Parameter]	
Explanation:	
[Path]	Optional path entry, used to reach "brcmos.com"
[Parameter]	
-r	Reads CMOS contents and sends the information on the standard output path (display/monitor)
-r=File	Reads CMOS contents and places the information in a file (file name optional)
-p=File	Writes the contents of the file given to CMOS
-?	Help information

Example:

IPC2001 Controller, COM1 should be switched off using software. The device driver is on the diskette in the \SYS\ directory.	
1. Entry on the command line A:\SYS\brcmos -r 2. CMOS contents sent to the monitor/display	

2.9 VGA Settings - "brmodes.com"

With this program, VGA settings (e.g. brightness, contrast, etc.) can be made on the IPC2000 (starting with Rev. >50.07), IPC2001, IPC4000 and IPC5000.

Syntax	
Entry in the "config.sys" file: [Path]brmodes [Parameter]	
Explanation:	
[Path]	Optional path entry, used to reach "brmodes.com"
[Parameter]	
-c=<aa.bb>	Sets the contrast and brightness. Values for aa and bb: 0 - 100
-m=<c>	Selects the target device c: 0 = Monitor, 1 = B&R Display, 2 = parallel operation
-p=<d>	Switches inverse display on or off. The setting is only valid for B&R displays d: 0 = Normal, 1 = Inverse
-?	Help information

Example:

IPC2001 Controller, the display should be set to inverse operation. The device driver is on the diskette in the \SYS\ directory.
1. Entry on the command line A:\SYS\brmodes -p=1 2. The display is set to inverse operation

3. Provit 2000 BIOS Upgrade IPC2001 / IPC2002

To upgrade your system BIOS to a newer version, you need the Upgrade Diskette. This is available on the Provit Drivers & Utilities CD (Mod. No. 5S0000.01-090) or on the B&R Homepage.

- An upgrade could be necessary for a few reasons:
- The system BIOS was destroyed or damaged and the IPC can no longer be booted.
- To update the functions implemented in BIOS Setup or to add new function or components.



This tool is only used to upgrade BIOS on the IPC2001 and IPC2002. The IPC2000 cannot be upgraded!

3.1 Normal Mode Upgrade

To upgrade, the diskette "Normal Mode Upgrade" has to be bootable. To do this, call "sys.a" on a DOS system to make the diskette bootable (for licensing reasons, the diskette cannot be delivered with system files).

Place the upgrade diskette in the floppy drive and restart the IPC. You then arrive at the following start menu:

Start menu for MS-DOS 6.22

=====

1. Upgrade complete System (BIOS, VGA)
2. Upgrade VGA only
3. Upgrade ELITE BIOS only
4. Start upgrade utility
5. Exit to MS-DOS

Choose the desired option: 1



If you do not press a key within 5 seconds, then step 1. Upgrade complete System is automatically carried out and System-BIOS, VGA-BIOS and MTC are independently upgraded.

If you want to individually upgrade System-BIOS or VGA-BIOS, then you can either select the respective option (2 or 3) in the start menu or menu item 4. Start Upgrade Utility. With this utility, you can both manually execute BIOS upgrades and also protect existing Firmware on the diskette.

A more detailed description can be found in the Readme files.



If the following message is shown when upgrading BIOS,

"!!! SWITCH BOOTBLOCK WRITE ENABLE TO ON !!!"

then the DIP switch SW1 (switch 2) must be turned ON. If this switch is turned OFF, the upgrade tool attempts to write on the boot block. 4 long and then 4 short beep tones are output. This occurs until the switch is turned ON. When the following message is shown,

"!!! SWITCH BOOTBLOCK WRITE ENABLE TO OFF !!!"

then the switch must be turned OFF again.

Note:

The DIP switch SW1 (switch 2) is turned "OFF" as default and is only permitted to be turned "ON" for the duration of the upgrade.

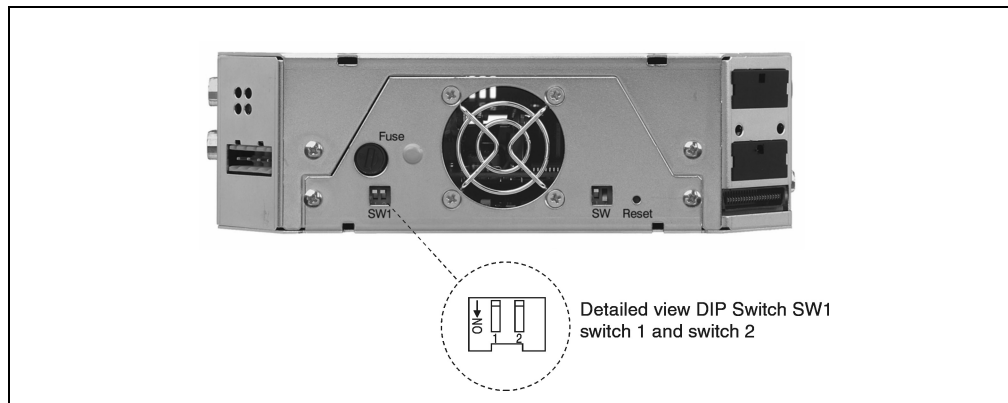


Figure 137 : DIP SW1

Removing power from the IPC2001 during an upgrade will destroy the BIOS. If this happens, the IPC2001 can only be booted in Recovery Mode (see section 3.2 "Recovery Mode Upgrade")

3.2 Recovery Mode Upgrade

If the IPC2001 does not boot after an upgrade that has failed, it can be booted in Recovery Mode. In this case, set Dip Switch SW1 (switch 1) to "ON" (see chapter 2.2.6.17 "DIP Switch SW1 & SW2"). A "Recovery Mode Upgrade" diskette is included with the delivery of the "Provit 2000 Upgrade IPC2001". After making the diskette bootable (see section 3.1 "Normal Mode Upgrade"), the IPC2001 can be booted from this diskette!

The Recovery Mode Upgrade is finished when the controller no longer beeps and the floppy drive is no longer being accessed.

4. Provit 2000 Graphic Driver IPC2001

Contains the latest version of the following graphic drivers:

- IPC2001 Graphic Driver for OS/2
- IPC2001 Graphic Driver for Windows 3.x
- IPC2001 Graphic Driver for Windows 95
- IPC2001 Graphic Driver for Windows 98

Chapter 7 • Accessories

1. IPC2001 ISA Adapter 5A2005.01, 5A2005.02

All IPC2001 controllers can be expanded by adding one or two additional ISA slots. An ISA adapter is simply screwed into the main controller unit. This allows flexible expansion, without changing the main dimensions of the controller.

Another advantage of the IPC2001 ISA Adapter:

- It can be mounted on an IPC2001 that is already installed or one that has not yet been installed

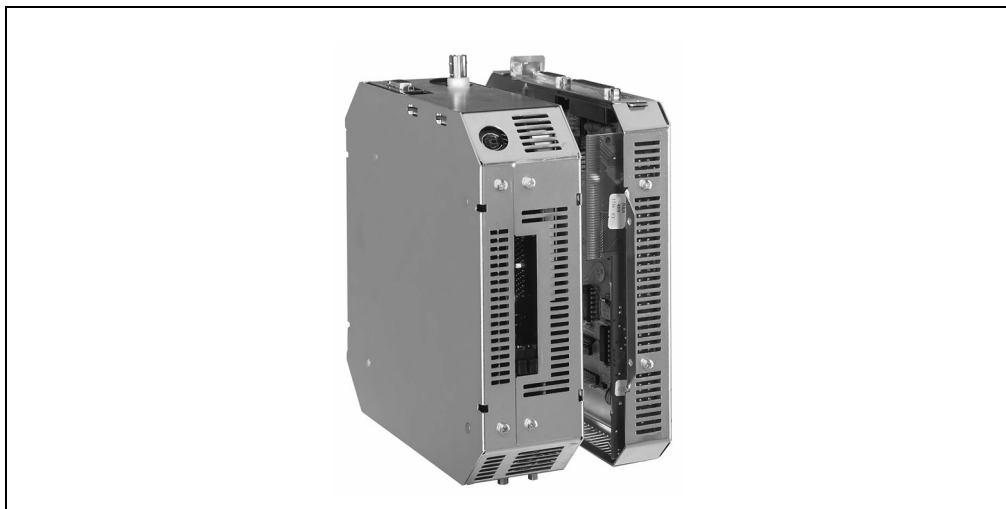


Figure 138 : IPC2001 - ISA Adapter (1 Slot)



Only cards that do not require Master DMA functionality can be used (not supported by chipset)!

The following maximum voltage levels can be applied to the ISA Adapter slot:



+5V: 1A
 -5V: 200mA
 +12V: 250mA
 -12V: 200mA

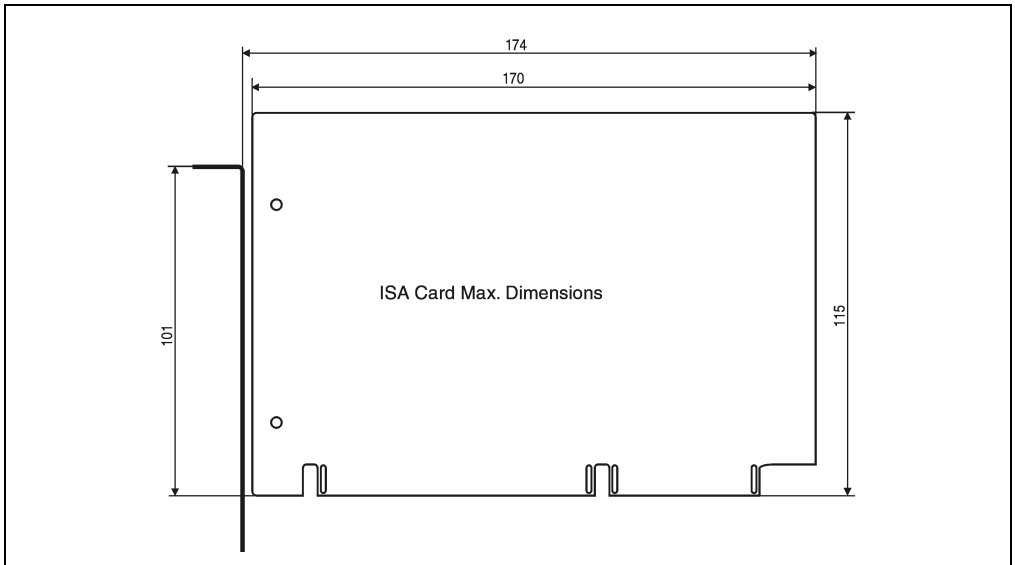


Figure 139 : ISA Card - Dimensions

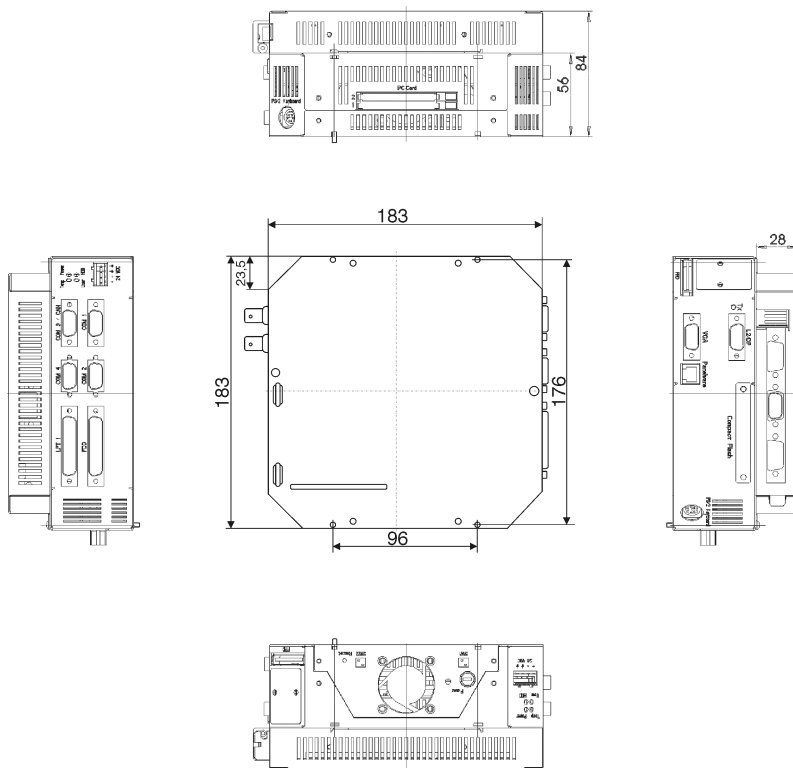


Figure 140 : Controller 2001 with ISA Adapter (1 Slot)

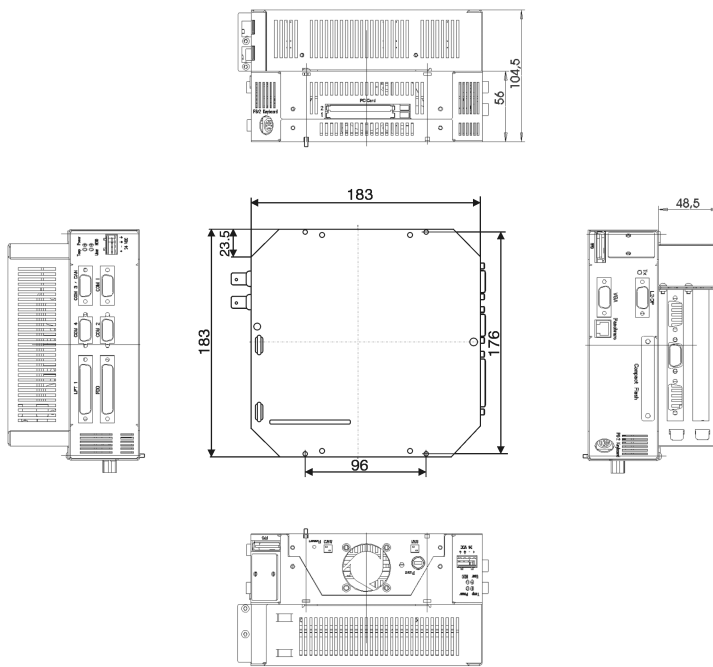


Figure 141 : Controller 2001 with ISA Adapter (2 Slots)

2. Arcnet Interface Boards 0TP360.04, 5A1109.00-090

Arcnet Board	5A51105.00-090	0TP360.04
Slot	ISA	
Arcnet Connector Controller Cabling	ISA 8 Bit BNC SMC 0022063 RG62	ISA 16 Bit BNC, Twisted Pair SMC 90C66 RG62, UTP wire RJ-11

Table 143: Technical Data for Arcnet interface boards



Additional Arcnet boards can only be used on an IPC2001 with ISA Adapter.

3. PC Card ATA (PCMCIA Card)

It is often necessary to exchange data between a Provit 2000 system and another PC. The exchange can take place over a network or using a removable data carrier. The Provit 2000 Industry PCs provide two types of mobile data carriers:

- Diskette
- PC Card Memory Cards

B&R offers a memory card driver (brpcmcia.sys) for the operation of PC card memory cards. It can manage SRAM and FEPROM memory cards as devices (drives). It also supports the creation of a bootable SRAM or FEPROM card (see section "Device Driver for External PC Card").

3.1 PC Card Data Type I / II / III

PCMCIA (Personal Computer Memory Card International Association) defines 3 types of memory cards. Only the thickness dimensions of types I to III are different. Therefore, it is possible to insert e.g. type I PC cards in a slot for type II or III cards. B&R used 2 Type II slots on the IPC2001. In this way, it is possible to use 2 Type I/II PC cards or a Type III card.

PC Card	Length	Width	Thickness	Pins	Shock
Type I	36.4 mm	42.8 mm	3.3 mm	68	1000 Gs
Type II	85.6 mm	54.0 mm	5.0 mm	68	1000 Gs
Type III	85.6 mm	54.0 mm	10.5 mm	68	1000 Gs

Table 144 : PC Card, Type I / II / III

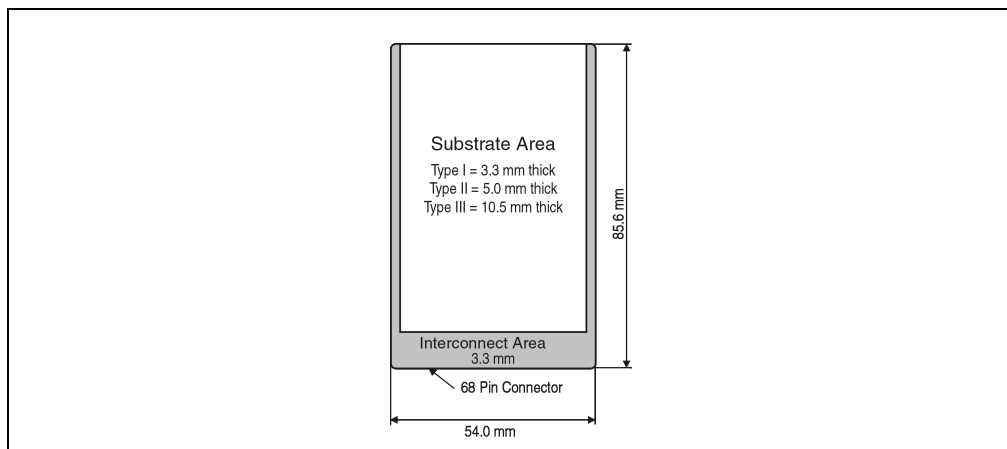


Figure 142 : PC Card, Type I / II / III

An MTBF (Mean Time Between Failures) of > 1,000,000 is given by the manufacturer.

4. Compact Flash

Compact Flash cards (CF Cards) are electrically identical to PC Cards ATA, which are defined by PCMCIA (Personal Computer Memory Card International Association). Compact Flash cards can also be used in Type II (or III) PCMCIA slots using a passive adapter.

The main differences between CF cards and PC cards are the dimensions and the number of pins. Compact Flash cards use 50 pins, PC Cards use 68 pins. The memory capacity for Compact Flash presently goes up to 192 MByte.



Figure 143 : Compact Flash

Compact Flash Card	Length	Width	Thickness	Pins	Shock	Weight
Type I	36.4 mm	42.8 mm	3.3 mm	50	2000 Gs	11.4 gr. (typ.)

Table 145 : Compact Flash Card

An MTBF (Mean Time Between Failures) of > 1,000,000 is given by the manufacturer.

5. External Disk Drive 5A2001.05

An external disk drive can be connected to Provit 2000 controllers. The connection is made using a standard printer cable (Centronics).

Diskette Format: 3.5" / 1.44 MByte



A shielded Centronics cable with a maximum length of 1.8 m is to be used. Otherwise error free operation cannot be guaranteed.

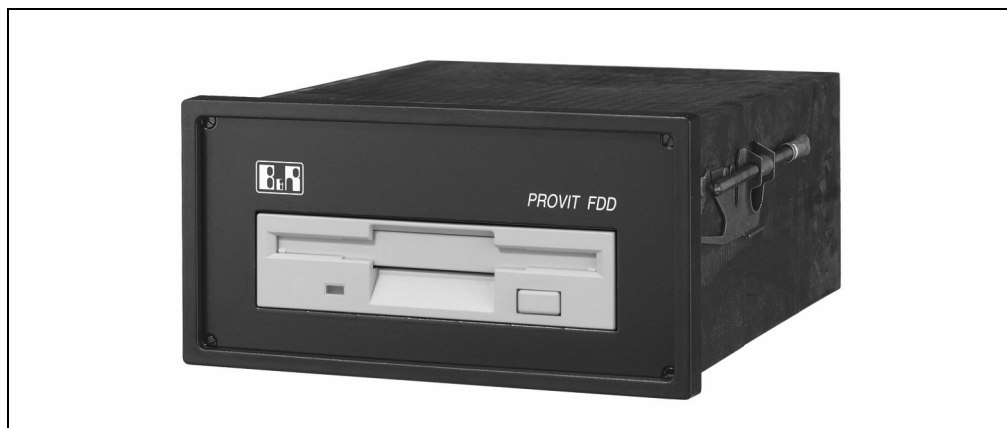


Figure 144 : External Disk Drive (beige front plate)

The disk drive is integrated into a housing that is designed to be installed in a panel cutout. An optional cover, which can be locked, can be obtained (IP55 protection).

Dimensions in mm: D x H x W = approx. 163 x 72 x 144

Cutout dimensions in mm: 138+1 x 68+0.7

Model Number	Description	Remark
5A2001.01	External 3.5 inch (88.9 mm) 1.44 MB floppy disk drive (beige front) in a housing that is designed to be installed in a control panel. There is no cable included in the delivery (Standard Centronics Cable 9A0005.01). Color: PS/2 beige.	
5A2001.05	External 3.5 inch (88.9 mm) 1.44 MB floppy disk drive (black front) in a housing that is designed to be installed in a control panel. There is no cable included in the delivery (Standard Centronics Cable 9A0005.01). Color: black	
5A2001.02	Transparent door with sealed lock suitable for external disk drive . IP55 protection (from front). Suitable for the external floppy disk drive 5A2001.01 and 5A2001.05	
9A0005.01	Centronics Cable (1.8 m) for connecting to a printer or an external disk drive.	

Table 146 : External Disk Drive

6. Lithium Battery 0AC201.9

Lifespan:	TBL
Capacity:	950 mAh
Voltage:	3 V
Current Consumption:	8.5 μ A at 60 °C
Storage Time:	Max. 3 years at 30 °C
Humidity	0 to 95 %, non-condensing

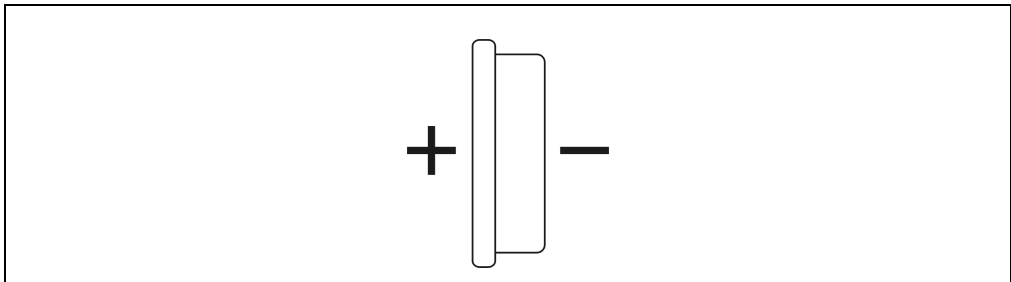


Figure 145 : Lithium Battery

The buffer duration of the battery is at least 4 years (at 50°C, 8.5 mA current consumption of the supplied components and a self discharge of 40%).

Model Number	Description	Remark
0AC201.9	Replacement battery for IPC2000, IPC2001 and IPC2002. Package : 5 pcs.	

Table 147 : Lithium Battery

Chapter 8 • Technical Appendix

1. CAN Bus

1.1 General Information

CAN stands for Controller Area Network protocol.

CAN Bus features:

- Fieldbus
- Low costs
- High noise immunity
- Bus structure
- Open system
- Fast data transfer for small data packages (up to 8 bytes)
- Error detection by means of CRC (Cyclic Redundancy Check) and frame testing - Hamming Distance 6
- Predictable transmission time for high priority messages (real time behavior)
- Easy to use

B&R and CAN

The controller used by B&R (Intel 82527) meets the CAN Bus specification 2.0B. Protocols Standard CAN and Extended CAN can be used on a bus.

B&R software currently supports the standard CAN identifier (11 Bit).

1.2 Bus Length and Cable Type

The type of cable used depends on the required bus length and the number of nodes. The bus length is mainly determined by the bit rate.

The table on the next page includes values for the maximum bus length depending on the transfer speed and the Synchronization Jump Width (SJW). Permitted oscillator tolerances are given in the fourth column.

The synchronization jump width (SJW) is the factor that determines the range over which the CPU can be synchronized. The bigger the SJW, the shorter the maximum bus length.

Bit Rate [kBit/s]	Synchronization Jump Width (SJW)	Bus Length [m]	Permitted Oscillator Tolerance [%]
500	0	67	0,121
	1	56	0,242
	2	33	0,363
	3	10	0,485
250	0	215	0,121
	1	192	0,242
	2	147	0,363
	3	101	0,485
125	0	510	0,121
	1	465	0,242
	2	374	0,363
	3	283	0,485
100	0	658	0,121
	1	601	0,242
	2	488	0,363
	3	374	0,485
50	0	1397 ¹⁾	0,121
	1	1284 ¹⁾	0,242
	2	1056 ¹⁾	0,363
	3	829	0,485
20	0	3613 ¹⁾	0,121
	1	3329 ¹⁾	0,242
	2	2761 ¹⁾	0,363
	3	2193 ¹⁾	0,485
10	0	7306 ¹⁾	0,121
	1	6738 ¹⁾	0,242
	2	5602 ¹⁾	0,363
	3	4456 ¹⁾	0,485

Table 148: CAN Bus length

1) According to CiA (CAN in Automation) the maximum bus length is 1000 m.

Relationship between the number of nodes and the bus length for each cable type:

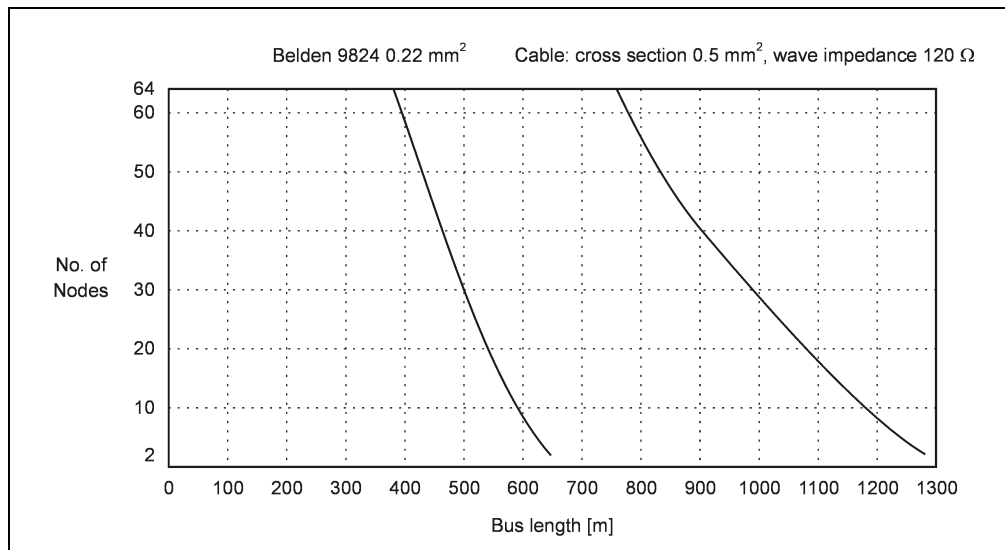


Figure 146 : CAN – Number of Nodes / Bus Length

1.3 Operation Information

CAN interface

Chip:	Intel 82527
Interrupt:	IRQ10
I/O Address:	384h - 385h

Access to the CAN Data Area

I/O Address	Register	Function
384h	Address Register	Defines the register number to access.
385h	Data Register	Access of the register defined in the address register.

Table 149: CAN - Access to Data Area

Clock Out Data Register (Bit Timing Registers)

To set the baud rate, the bit timing registers 0 and 1 must be set to the values below.

The PC and PLC columns show which B&R products the baud rate can be set for.

Bit Timing Register 1	Bit Timing Register 0	Baud Rate	PC	SPS
80h	23h	1000 Kbits/s	●	○
80h	25h	800 Kbits/s	●	○
80h	2Bh	500 Kbits/s	●	●
81h	2Bh	250 Kbits/s	●	●
83h	2Bh	125 Kbits/s	●	●
84h	2Bh	100 Kbits/s	●	○
89h	2Bh	50 Kbits/s	●	○
98h	2Bh	20 Kbits/s	●	●
B1h	2Bh	10 Kbits/s	●	○

Table 150: CAN - Clock Out Data Registerss

2. Parallel Operation Flat Display / Monitor

2.1 IPC2000 / IPC2001



When using controllers with rev. ≥ 50.07 (IPC2000), you should be aware that for parallel operation of monitor / color LCD flat display, a multisync-monitor with a horizontal frequency starting from 25 kHz must be used. This type of operation amounts to a vertical frequency of approximately 54 Hz.

This limitation does not apply when:

- only the external monitor is used
- for parallel operation of a monitor / monochrome LCD flat display
- for parallel operation of a monitor / color TFT flat display

Controllers with rev. < 50.07 can only run the flat display or monitor. Parallel operation is not possible!

3. Touch Screen

3.1 Elo - Accu Touch

Accu Touch Screens	Specifications
Precision	± 2.03 mm
Light permeability	75% for HL panels
Resistance	35 million contacts on the same point
Chemical Resistance	Acetone, Methyl, Isophyl alcohol, Ammonia
Release pressure	< 100 gr.
Input	Finger, pencil
Accu Touch Controller	
Reaction time	21 msec at 9600 Baud / 7 ms at 19.200 Baud
Resolution	4096 x 4096 pixels

Table 151: Accu Touch

Further information is available from the internet at www.elotouch.com.

3.2 Gunze Touch

Gunze Touch	Specifications
Precision	< 1%
Light permeability	79%
Resistance	1 million contacts on the same point
Release pressure	< 80 gr.
Input	Finger, pencil
Gunze Touch Controller	
Resolution	> 900 x 900
Scan time	< 30 ms

Table 152: Gunze Touch

Further information is available from the internet at <http://www.gunze-ny.com>.

4. Performance Data



All the performance data (in watts) are typical values and are determined using a voltage of 24 (±6)V DC in a specified temperature range.

4.1 Power Consumption IPC2000

Controller	5C2000.01	5C2000.02	5C2000.03	5C2000.05 1)	5C2000.07
Power [W]	11.4	11.4	15.5	14.5	18.6

Table 153: IPC2000 Power Consumption

4.2 Power Consumption IPC2001

Controller	5C2001 .01	5C2001 .02	5C2001 .03	5C2001 .05	5C2001 .07	5C2001 .15	5C2001 .16	5C2001 .21	5C2001 .22
Power [W]	10.4	10.4	17.3	11.3	20.2	11.3	12.8	18.8	14.5

Table 154: IPC2001 Power Consumption

4.3 Power Consumption IPC2002

Controller	5C2002.02
Power [W]	20.1

Table 155: IPC2002 Power Consumption

4.4 Display Power Consumption

Display	Power [W]
5D2000.02	7.5
5D2200.01	8.8
5D2200.02	21 ¹⁾
5D2200.04	12.5
5D2210.01	8.8
5D2219.01	5.2
5D2219.02	5.2
5D2300.01	8.3

Table 156: Display Power Consumption

Display	Power [W]
5D2300.02	5.2
5D2300.03	5
5D2500.01	7
5D2510.01	7
5D2500.02	9
5D2500.10	10.5
5D2500.22	7.5
5D2510.10	7.7
5D2510.22	7.5
5D2519.01	5.4
5D2519.02	5.4

Table 156: Display Power Consumption (cont.)

1) The 5D2200.02 display requires a separate, external power supply. The total power consumption used by the display is 21 W. Of this total, 20 watts come from the external source and 1 watt from the controller.

4.5 Display Kit Power Consumption

Display Kits	Power [W]
5D2000.03	8.3
5D2000.04	5
5D2000.10	5.2

Table 157: Display Kit Power Consumption

4.6 Floppy Drive Power Consumption

Floppy Drive	Power [W]
5A2001.01	2.9
5A2001.05	2.9

Table 158: Floppy Drive Power Consumption

4.7 Key Modules Power Consumption (16 LEDs On)

Keypad Modules	Power [W]
	1.74

Table 159: Keypad Modules Power Consumption

5. Lifespan of Silicon Disks (Compact Flash, PC Card)

5.1 General Information

The silicon disks used in the IPCs are from the manufacturer SanDisk. They are 100% compatible with all operating systems because of their ATA industry standard design.

5.2 Construction

A silicon disk is divided internally into individual sectors, whereby one sector corresponds to 512 bytes. (Example: 48 MByte = $48 \times 1,024,000 \text{ byte} = 49,152,000 \text{ byte} / 512 \text{ byte} = 96,000 \text{ sectors}$) These e.g. 96,000 sectors, are named user sectors and can be chosen by the user.

Compact Flash and PC cards possess over 1% of spare (reserve) sectors in addition to user sectors which are also based on their memory capacity (960 spare sectors in the example).

This additional memory is run automatically and therefore cannot be accessed by the user. The necessity of these sectors is a result of the limited number of write/erase cycles per sector, currently specified by at least 300,000 accesses (typically 1,000,000 accesses). If a user sector can no longer be successfully written to and tested, it is automatically replaced with a spare sector.

5.3 Organization of Data in an Application

Ring Buffer Storage

With ring buffer storage, data is always saved on the same sectors, e.g. from an application that always writes the same amount of data (file size does not change). The date and time information is also updated for the designated sectors.

Continuous Storage

With continuous storage, the data is continually saved at the end of the last defined sector (continuous writing e.g. trending). Date, time and file size information (changed with every write cycle) is thereby updated for the designated sectors.

5.4 Calculation of the Lifespan

5.4.1 Example 1: Ring Buffer Data Storage

An application records the data every minute for the previous 5 hours. The data is saved on the same sectors (ring buffer).

Specifications:

64 MByte Silicon Disk

10 kByte per minute i.e. $10 \times 1,024 \text{ Byte} / 512 \text{ Byte} = 20 \text{ sectors per minute}$

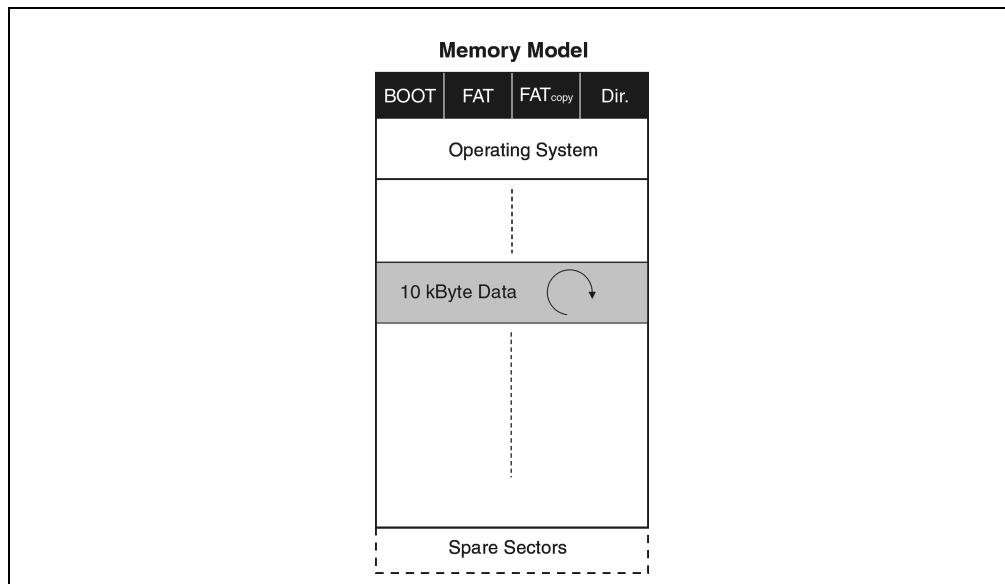


Figure 147 : Ring Buffer Data Storage

1. Calculations of the sectors

User sectors: $64 \times 1,024,000 \text{ byte} / 512 \text{ byte} = 128,000 \text{ sectors}$

Spare sectors: 1% of user sectors = 1,280 sectors

2. Write cycles per year

23 sectors per minute (20 data + 2 FAT + 1 directory)

$(20 + 2 + 1) \text{ sectors} \times 60 \text{ minutes} \times 24 \text{ hours} \times 365 \text{ days} = 12,088,800 \text{ write cycles per year.}$

Technical Appendix • Lifespan of Silicon Disks (Compact Flash, PC Card)

3. Possible number of write/erase cycles per year

$(1,280 \text{ spare sectors} + 23 \text{ sectors}) \times 300,000 \text{ accesses} = 390,900,000 \text{ write/erase cycles per year}$

4. Lifespan

$390,900,000 \text{ write erase cycles per year} / 12,088,800 \text{ write cycles per year} = \text{a guaranteed lifespan of 32 years}$

Typical lifespan: $32 \text{ years} \times 3.3 = 105.6 \text{ years}$

5.4.2 Example 2: Continuous Data Storage

An application writes consecutively a data amount on a PC card (e.g. trending).

Specifications:

40 MByte PC Card 20 MByte System Data (operating system, application, etc.)
 20 MByte Data (application memory)
 20 kByte per minute i.e. $20 \times 1,024 \text{ Byte} / 512 \text{ Byte} = 40 \text{ sectors per minute}$

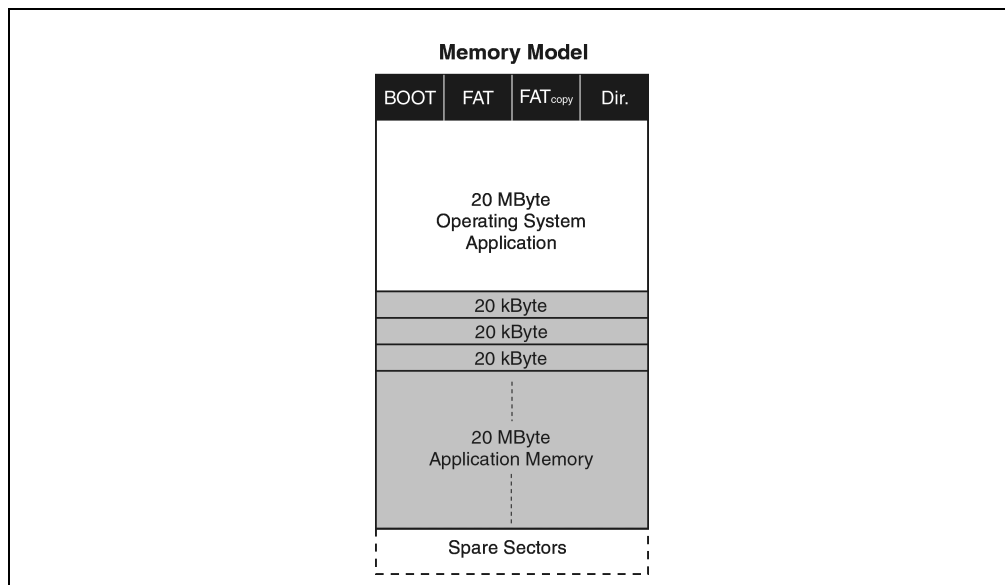


Figure 148 : Continuous data storage

1. Calculation of the sectors

User Sectors (System Data): $20 \times 1,024,000 \text{ Byte} / 512 \text{ Byte} = 40,000 \text{ sectors (not changed)}$

User Sectors: $20 \times 1,024,000 \text{ byte} / 512 \text{ byte} = 40,000 \text{ sectors}$

Spare Sectors: $1\% \text{ of user sectors} = 800 \text{ Sectors}$

2. Write cycles per year

3 sectors (2 FAT + 1 directory) are always upgraded every minute.

$(2 + 1) \text{ sectors} \times 60 \text{ minutes} \times 24 \text{ hours} \times 365 \text{ days} = 1,576,800 \text{ write cycles per year.}$

3. Possible number of write/erase cycles per year

3 user sectors + 800 spare sectors = 803 sectors

$803 \text{ sectors} \times 300,000 \text{ accesses} = 240,900,000 \text{ write/erase cycles per year}$

4. Lifespan

The lifespan is then determined by 2 factors:

- a) Memory capacity depleted (20 kByte are continually written)

$20 \text{ MByte application memory} / 20 \text{ kByte per minute} = 16.67 \text{ hours}$

- b) Spare sectors depleted (3 sectors are continually specified)

$240,900,000 \text{ write erase cycles per year} / 1,576,800 \text{ write cycles per year} = \text{a guaranteed lifespan of } 152.8 \text{ years}$

Typical lifespan: $152.8 \text{ years} \times 3.3 = 504.24 \text{ years}$



Due to the data amounts written every minute, the memory capacity is depleted before the lifespan is reached, and no further data can be saved.

6. Décor foil (polyester foil)

6.1 Chemical Resistance

The polyester décor foil used by B&R conforms to DIN 42 115 section 2. This means it is resistant to exposure to the following chemicals for a 24 hour period with no visible signs of damage:

Ethanol Cyclohexanol Diacetone alcohol Glycol Isopropanol Glycerin Methanol Triacetin Dowanol DRM/PM	Formaldehyde 37% - 42% Acetaldehyde Aliphatic hydrocarbons Toluene Xylene White spirits	Trichloroethane Ethyl acetate Diethyl ether N-Butyl acetate Amyl acetate Butylcellosolve Ether
Acetone Methyl ethyl ketone Dioxan Cyclohexanone MIBK Isophorone	Formic acid<50% Acetic acid<50% Phosphoric acid<30% Hydrochloric acid<36% Nitric acid <10% Trichloroacetic acid <50% Sulphuric acid<10%	Sodium hypochlorite<20% Hydrogen peroxide <25% Potassium carbonate Washing powders Fabric conditioner Ferric chloride Ferrous chloride (FeCl ₂) Ferrous chloride (FeCl ₃) Dibutyl Phthalate Diocetyl Phthalate Sodium Carbonate
Ammonia <40% Caustic soda<40% Potassium hydroxide Alkali carbonate Bichromate Potassium Ferro cyanide/ Ferro cyanide Acetonitrile Sodium bisulphate	Cutting oil Diesel oil Linseed oil Paraffin oil Blown castor oil Silicon oil Turpentine oil substitute Universal brake fluid Decon	Aviation fuel Petrol Water Sea water

Table 160: Polyester Foil Resistance against Chemicals

The polyester décor foil conforms to DIN 42 115 section 2 for exposure to glacial acetic acid< 1 hour without any sign of visible damage.

7. Year 2000 Problem / Year 2000 Compliance

Only the behavior of the BIOS installed in IPCs can be predicted. The application behavior is the responsibility of the author of the software. Make sure that the application is evaluating the year correctly, especially when using 2 digit values.

7.1 IPC2001

The date is correctly changed each new year on all controllers with model number 5C2001.xx execute.

Controller type	Award EliteBIOS Version	Leap year	Date limit
5C2001.xx	all versions	yes	31.12. 2079

Table 161: IPC2001

7.2 IPC2000

7.2.1 Phoenix BIOS Version $\geq$ 2.6

The year 2000 date is correctly changed.

Controller type	Phoenix BIOS Version	Leap year	Date limit
5C2000.xx	$\geq$ 2.6	yes	31.12.2079

Table 162: IPC2000 - Phoenix BIOS Version $\geq$ 2.6

7.2.2 Phoenix BIOS Version $<$ 2.6

Controller type	Phoenix BIOS Version	Leap year	Date limit
5C2000.xx	$<$ 2.6	yes	31.12.1999

Table 163: IPC2000 - Phoenix BIOS Version $<$ 2.6

- If the PC is switched off during the date change, the date will be changed to 01.01.1980
- If the PC remains switched on during the date change, the change is carried out correctly (as long as the PC remains switched on). If however, the PC is switched off after the change, the date will be reset to 01.01.1980.
- If you manually set and confirm the year 2000 in BIOS, it remains stored even after you switch off the PC.

"Year 2000" Representative

Please direct any "year 2000" questions to your B&R sales representative. The Y2K issue is being dealt with at the B&R HQ in Eggelsberg by the International Support department (support@br-automation.co.at, FAX Ext. 26).

8. Technical Data, Hard Disks



A silicon disk (PC card, Compact flash) is required in environments with vibration and shock. Hard disk drives are normally not designed for use in industrial environments. If there is vibration or shock existing during the applications, B&R shall not be liable for damage to a properly functioning hard disk. The specified limit values can be read from the corresponding tables.

8.1 Technical Data 2.1 GB

Manufacturer's Specifications	Toshiba MK2110MAT
Capacity	2.1 GB
Number of Heads	2
Number of Cylinders (user)	8910
Bytes per Sector	512
Speed of Revolution	4,200 rpm
Access Time	7.14 ms
Positioning Time (seek, typical values)	
Minimum (track to track)	3 ms
Average	13 ms
Maximum	25 ms
Starting Time (0 rpm to read access)	4 seconds (typically)
Stopping Time	3 seconds (typically)
Adapter Card Mounting	fixed
Powersave	The hard disk is shut down regardless of the IPC's Power Management settings, if no access is made after 45 minutes
Interface	AT (ATA-2/ATA-3/ATA-4)
Data Transfer Rate	
To the Medium	12.5 to 22.3 MB/s
To / from Host	max. 33.3 MB/s (Ultra-DMA Mode 2)
Cache	512 KB
Noise Level (Idle Mode)	approx. 36 dBA
Vibration	
Operating	No non-recovered errors at max. 5 -500 Hz and 0.5 G (4.9 m/s ² 0-peak)
Storage	No damage at max. 10 -500 Hz and 5 G (49 m/s ² 0-peak)

Table 164: Technical Data for the 2.1 GB Hard Disk

Shock (pulse with a Sinus Half-wave) Operating Storage	No non-recovered errors at max. 150 G (1.470 m/s ² 0-peak) and 2 ms duration No damage at max. 500 G (4.900 m/s ² 0-peak) and 2 ms duration No damage at max. 150 G (1.470 m/s ² 0-peak) and 11 ms duration
MTBF (hours)	300,000
Product Life	5 years or 20,000 POH
Temperature (operating / storage)	5 to 55 °C / -20 to 60 °C

Table 164: Technical Data for the 2.1 GB Hard Disk

8.2 Technical Data for the 6 GB Hard Disk

Manufacturer's Specifications	Fujitsu MHK2060AT (customized)
Capacity (LBA mode)	6 GB
Number of Heads	2
Number of Cylinders (user)	14,784
Number of Sectors (user)	11,733,120
Bytes per Sector	512
Memory Methods	16/17 MTR
Track Density	24,300 TPI
Bit Density	383 kbp
Speed of Revolution	4,200 rpm ±1%
Access Time (average)	7.14 ms
Positioning Time (seek, typical values) Minimum (track to track) Average Maximum	1.5 ms 13 ms 23 ms
Starting Time (0 rpm to read access)	5 seconds (typically)
Stopping time	5 seconds (typically)
Powersave	Regardless of the IPC Power Management settings, the hard disk is shut down if it is not accessed over a 30 minute time period. Otherwise, the hard disk is routinely shut down once every 24 hours.
Interface	ATA-5
Data Transfer Rate To the medium To / from host	12.5 to 22.3 MB/s max. 66.6 MB/s (Ultra-DMA Mode 4)
Cache	512 kB
Noise Level (Idle Mode)	approx. 30 dBA at 1 meter
Manufacturer's Specifications	Fujitsu MHK2060AT (customized)
Vibration Operating Storage	at max. 5 - 400 Hz and 1 G (9.8 m/s ² 0-peak) no non-recovered errors at max. 5 - 400 Hz and 5 G (49 m/s ² 0-peak) no errors
Shock (pulse with a Sinus Half-wave) Operating Storage	No non-recovered errors at max. 150 G (1.470 m/s ² 0-peak) and 2 ms duration No errors at max. 700 G (6.860 m/s ² 0-peak) and 2 ms duration No errors at max. 120 G (1.176 m/s ² 0-peak) and 11 ms duration

Table 165: Technical Data for the 6 GB Hard Disk

8.3 Reliability

Mean Time Between Failure (MTBF)

300,000 hours under the following conditions:

Operating Time: max. 250 hours per month or 3,000 hours per year

Working time (read or write accesses): max. 20% of the operating time

CSS access (parking of the heads): max. 50 per day; max. 50,000 in total

Data Protection

In the event of power loss, all data stored on the hard disk is safe. This does not apply to a block which is just being written on during the formatting and the reorganization of data blocks, at the time of a power failure.

Error Rate

With repeated read attempts and ECC corrections, non-recoverable read errors do not occur more than 10 times when reading 1014 bits.

Positioning errors which can be corrected within a new attempt, are triggered max. 10 times for every 107 accesses.

8.4 24 Hour Operation

When setting the environmental conditions for operating the hard disk, a differentiation occurs in regard to continuous 24 hour operation.

24 hour operation of the hard disk is possible by observing the following conditions:

- Controller operating temperature must be within 5 -47°C
- 3 year lifespan or max. 15,000 operating hours
- MTBF is 200,000 hours



The 24 hour operation facility is a special feature of this hard disk! The hard disk is equipped with a special microcode to fulfill this purpose, which automatically carries out a spin-down/spin-up cycle every 24 hours (motor switched off and switched back on; duration is approx. 7 seconds). During this period of time, the magnet data carrier cannot be written on (write accesses are cached).

9. Maintenance Work

The following section describes maintenance work which can be easily carried out by the user.

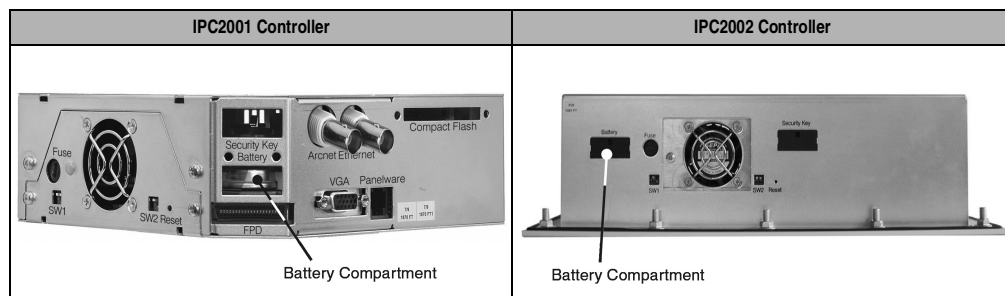
Device	Maintenance Work	Maintenance Interval ¹⁾
IPC2001/IPC2002 Controller	Battery	every 4 years
	Fuse	---

Table 166: Maintenance Work

1) The interval for replacement is recommended by B&R and is based on the average life span and operating conditions.

9.1 Lithium Battery

The IPC2001 and IPC2002 controllers are equipped with a lithium battery. The lithium battery is placed in a separate compartment and protected by a cover.



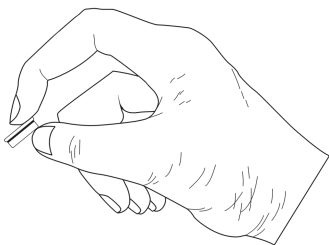
Lithium Battery: 3V / 950 mAh
Product ID: 0AC201.9 (5 lithium batteries)

Storage Time: Max. 3 years at 30 °C
Humidity: 0 to 95 %, non-condensing

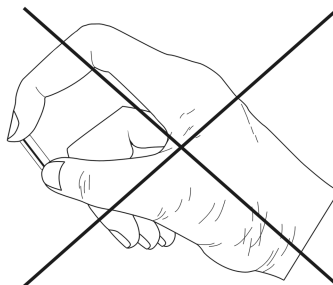
9.1.1 Changing the Battery

1. Disconnect the power supply
2. Touch the housing or ground connection (not the power supply!) in order to discharge any electrostatic charge from your body.
3. Remove the battery compartment cover.
4. Remove the battery by pulling the removal strip (do not use - pliers or uninsulated tools! --> risk of short circuiting).
5. The battery should not be held by its ends. **Insulated** tweezers may also be used for removing the battery.

Right



Wrong



6. Insert the new battery with correct polarity. The removal strip should be protruding from the battery holder and the "+" side of the battery should be facing downward. To be able to remove the battery again, the removal strip must protrude from the upper side of the battery.
7. Now wrap the end of the removal strip over the top of the battery and insert it underneath the battery so that it does not protrude from the battery holder.
8. Replace cover.
9. Reconnect the power supply.
10. Set the date and time



Lithium batteries are hazardous waste! Used batteries should be disposed of accordingly.

9.2 Fuse

The IPC2001 and IPC2002 controllers are protected against overload.

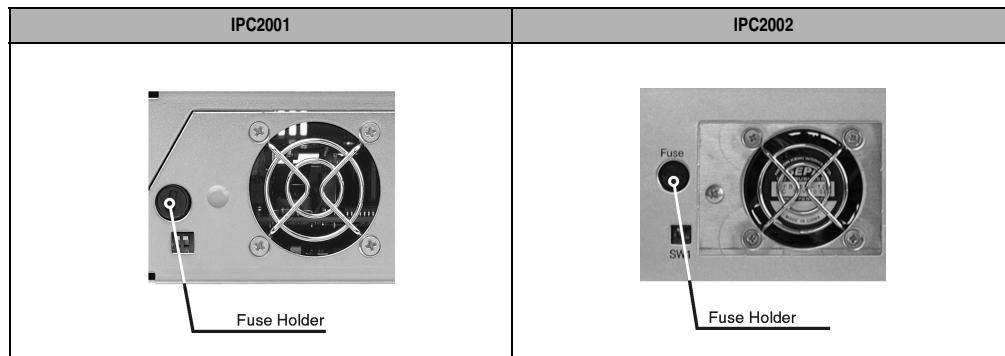
Type: Glass tube fuses 5 x 20 mm: T 3.15 A / 250 V



Before changing the fuse, the power supply must be disconnected.

9.2.1 Changing the Fuse

1. Disconnect the power supply.
2. Unlock fuse holders by turning the slotted bolt in the direction of arrow



3. Remove the fuse holder.
4. Remove the old fuse from the fuse holder.
5. Insert the new fuse.
6. Replace the fuse holder. It can be fastened by using a flat head screwdriver in the opposite direction of the arrow.
7. Reconnect the power supply.

10. Glossary

BIOS

An abbreviation for »**B**asic **I**nput/**O**utput **S**ystem«. On computers conforming to the PC standard, a set of important software routines, which carry out a hardware test after start up, load the operating system and provide routines for data transfer between hardware components. BIOS is stored in ROM, so that the contents are not lost after the PC is switched off. Although BIOS is used to configure a system's performance, the user does not usually come into contact with it.

Bus Unit

Provit bus units consist of the housing, interface board slots and the power supply for the system units.

CAN

An abbreviation for »**C**ontroller **A**rea **N**etwork« (serial bus system) CAN was developed by Bosch and was originally designed for use in motor vehicles. CAN is used in numerous applications.

CD-ROM

An abbreviation for »**C**ompact **D**isc **R**ead-**O**nly **M**emory« A data carrier which is distinguished by its high capacity (approx 650 megabytes) and its use of laser optics (instead of magnetic scanning) for reading data. Although CD-ROM drives can read and not write, they still have much in common with CD-R drives and optical WORM drives (which can write to a disk once). They are also similar to optical drives, which can write to a disk several times.

CMOS

»CMOS« is battery powered memory, where the fundamental parameters of an IBM (or compatible) personal computer is stored. Information such as the type of hard drive, size of the working memory and the current date and time are required when booting the computer. As the name suggests, the memory is based on CMOS technology standards.

COM

A device name used to access serial ports in MS-DOS. The first serial port can be accessed under COM1, the second under COM2 etc. Typically, a modem, mouse or serial printer is connected to a serial port.

COM1

Device name for the first serial port in a PC system. The input-output area for COM1 is usually found at address 03F8H. Generally, the COM1 port is assigned IRQ 4. In many systems, an RS232 serial mouse is connected to COM1.

COM2

Device name for the second serial port in a PC system. The input-output area for COM2 is usually found at address 02F8H. Generally, the COM2 port is assigned IRQ 3. In many systems, a modem is connected to COM2.

COM3

Device name for a serial port in a PC system. The input-output area for COM3 is usually found at address 03E8H. Generally, the COM3 port is assigned IRQ 4. In many systems, COM3 is used as an alternative for COM1 or COM2 if peripheral devices are already connected to COM1 and COM2.

Compact IPC

The B&R Compact IPC is a very cost effective industrial PC with an integrated 10.4" TFT touch display. It is also known as the IPC2002.

Controller

A device component which allows access to other devices on a computer subsystem. A disk controller, for example, allows access to hard disks and disk drives and is responsible both for physical and logic drive access.

CPU

An abbreviation for »**C**entral **P**rocessing **U**nit« Interprets and executes commands. It is also known as a "microprocessor" or "processor" for short. A processor is able to receive, decode and execute commands, as well as transfer information to and from other resources via the computer bus.

CRT

An abbreviation for »**C**athode **R**ay **T**ube« The main component of a television set or a standard computer screen. A cathode ray tube consists of a vacuum tube, in which one or more electron guns are installed. Each electron gun creates a horizontal electron beam, which appear on the front of the tube (the screen). The inner surface of the screen is coated with phosphor, which is lit when hit by the electrons. Each of the electron beams move in a line from top to bottom. In order to prevent flickering, the screen content is updated at least 25 times per second. The sharpness of the picture is determined by the number of pixels on the screen.

CTS

An abbreviation for »**C**lear **T**o **S**end« A signal used when transferring serial data from modem to computer, indicating its readiness to send the data. CTS is a hardware signal which is transferred via line number 5 in compliance with the RS-232-C standard.

DCD

An abbreviation for »**D**ata **C**arrier **D**etected« A signal used in serial communication which is sent by the modem to the computer it is connected to, indicating that it is ready for transfer.

DRAM

An abbreviation for »**D**ynamic **R**andom **A**ccess **M**emory« Dynamic RAM consists of an integrated semiconductor circuit, which stores information based on the capacitor principle. Capacitors lose their charge in a relatively short time. Therefore, dynamic RAM circuit boards must contain a logic that allows continual recharging of RAM chips. Since the processor cannot access dynamic RAM while it is being recharged, one or more waiting states can occur when reading or writing data. Although it is slower, dynamic RAM is used more often than static RAM, because the simple design of the circuits means that it can store four times more data than static RAM.

DSR

An abbreviation for »**D**ata **S**et **R**eady« A signal used in serial data transfer, which is sent by the modem to the computer it is connected to, indicating that it is ready for processing. DSR is a hardware signal which is sent via line number 6 in compliance with the RS-232-C standard.

DTR

An abbreviation for »**D**ata **T**erminal **R**eady« A signal used in serial data transfer, which is sent by the computer to the modem it is connected to, indicating the computer's readiness to accept incoming signals.

DVD

An abbreviation for »**D**igital **V**ersatile **D**isc« The next generation of optic data carrier technology. Using this technology it is possible to code video, audio and computer data on CD. DVDs can store a higher volume of data than conventional CDs. Standard DVDs , which have a single coating, can hold 4.7 GB. Double coated DVDs can hold 8.5 GB. Double sided DVDs can hold up to 17 GB. A special drive is needed for DVDs. Conventional CDs can also be played on DVD drives.

EDO-RAM

An abbreviation for »**E**xtended **D**ata **O**ut **R**andom **A**ccess **M**emory« Dynamic RAM, which provides data for the CPU, while the next memory access is being initialized. This increases speed.

EIDE

An abbreviation for »**E**nhanced **I**ntegrated **D**rive **E**lectronics« An expansion of the IDE standard. Enhanced IDE is considered the standard for hardware interfaces. This interface is designed for drives, with an integrated drive controller.

Ethernet

An IEEE 802.3 standard for networks. Ethernet uses bus or star topology and controls the traffic on communication lines using the access procedure CSMA/CD (Carrier Sense Multiple Access with Collision Detection). Network nodes are connected using coaxial cables, optical fiber cables

or twisted pair cabling. Data transfer on an Ethernet network takes place in frames of variable lengths, which consist of supply and controller information as well as 1500 bytes of data. The Ethernet standard provides baseband transfers at 10 megabit and 100 megabit per second.

FDD

An abbreviation for »**Floppy Disk Drive**«

FIFO

An abbreviation for »**F**irst **I**n **F**irst **O**ut«. A queuing organization method whereby elements are removed in the same order as they were inserted. The first element inserted is the first one removed. Such an organization method is typical for a list of documents, which are waiting to be printed.

Floppy

Also known as a diskette. A round plastic disk with an iron oxide coating, which can store a magnetic field. When the floppy disk is inserted in a disk drive, it rotates, so that the different areas (or sectors) of the disk's surface are moved under the read-write head, allowing the magnetic orientation of the particle to be modified and recorded. Orientation in one direction represents binary 1, while the reverse orientation represents binary 0.

FPC

An abbreviation for »**F**lat **P**anel **C**ontroller«

FPD

An abbreviation for »**F**lat **P**anel **D**isplay«

HDD

An abbreviation for »**H**ard **D**isk **D**rive«

IDE

An abbreviation for »**I**ntegrated **D**rive **E**lectronics« A drive interface where the controller electronics are integrated in the drive.

IPC

An abbreviation for »**I**ndustrial **P**C«

IPC2000

Product from the B&R industrial PC family.

IPC2001

Product from the B&R industrial PC family. A further development on the IPC2000

IPC2002

see Compact IPC

IPC5000

Product from the B&R industrial PC family. Pentium processors (100 MHz - 200 MHz and AMD K6-166 MHz or K6-266 MHz) can be used.

IPC5600

Product from the B&R industrial PC family. Pentium processors (100 MHz - 200 MHz and AMD K6-166 MHz or K6-266 MHz) can be used.

IPC5000C

Product from the B&R industrial PC family. Celeron (300, 366, 433, 566 MHz) and Pentium III (600 und 850 MHz) processors can be used.

IPC5600C

Product from the B&R industrial PC family. Celeron (300, 366, 433, 566 MHz) and Pentium III (600 und 850 MHz) processors can be used.

ISA

An abbreviation for »**I**ndustry **S**tandard **A**rchitecture« A term given for the bus design which allows expansion of the system with plug-in cards which can be inserted in the expansion slots provided in the PC.

Jumper

A small plug or wire link for adapting the hardware configuration used to connect the different points of an electronic circuit.

LCD

An abbreviation for »**L**iquid **C**rystal **D**isplay« A display type, based on liquid crystals which have a polarized molecular structure and are enclosed between two transparent electrodes as a thin layer. If an electrical field is applied to the electrodes, the molecules align themselves with the field and form crystalline arrangements, which polarize the light passing through. A polarization filter, which is arranged using lamellar electrodes, blocks the polarized light. In this way, a cell (pixel) containing liquid crystals can be switched on using electrode gates and coloring this pixel black. Some LCD displays have an electroluminescent plate behind the LCD screen for lighting. Other types of LCD displays can use color.

LED

An abbreviation for »**L**ight **E**mitting **D**iode« A semiconductor diode which converts electrical energy into light. LEDs work on the principle of electroluminescence. They are highly efficient because they do not produce much heat in spite of the amount of light they emit. For example, "operational status indicators" on floppy disk drives are LEDs.

LPT

Logical device name for line printers. In MS DOS, names are reserved for up to three parallel printer ports with the names LPT1, LPT2 and LPT3. The first parallel port (LPT1) is usually identical to the primary parallel output device PRN (in MS-DOS the logical device name for the printer). The lettering LPT was originally stood for "Line Printer Terminal".

LS-120

A disk drive which holds up to 120 MB on a 3.5" diskette. LS-120 drives can be also used for other diskette formats.

Mkey

An abbreviation for »**Module Keyblock**«, a common term given to keys found on Provit display units. They can be freely configured with Mkey utilities.

MTBF

An abbreviation for »**Mean Time Between Failure**« The average time which passes before a hardware component fails and repair is needed. This time is usually expressed in thousands or ten thousands of hours, sometimes known as power-on hours (POH).

MTC

An abbreviation for »**Maintenance Controller**« The MTC is an independent processor system, which provides additional functions that are not available with a normal PC. The MTC communicates with the PC via the ISA bus (using a couple register).

Panel

A common term for display units (with or without keys).

Panelware

A generic term given for standard and special keypad modules offered by B&R.

PC Card

A registered trademark from Personnel Computer Memory Card International Association (PCMCIA), which indicates the add-on card's conformity with PCMCIA specifications. A PC Card is approximately the size of a credit card and can be inserted in a PCMCIA slot. Version 1 (introduced September 1990) specifies a type I card with a depth of 3.3 millimeters, which is intended mainly for use as external memory. PCMCIA specification version 2 (introduced September 1991) defines a 5 mm depth for a type II card and a 10.5 mm depth for a type III card. Devices such as modems, fax and network cards can be implemented on type II cards. Type III cards can accommodate devices with greater space requirements, such as wireless communication devices or rotating memory media (e.g. hard drives).

PCMCIA

An abbreviation for »**P**ersonal **C**omputer **M**emory **C**ard **I**nternational **A**ssociation« An association of manufacturers and dealers, who are dedicated to the cultivation and further development of common standards for peripheral devices based on PC cards and with a slot for such cards. PC Cards are mainly used for laptops, palmtops (and other portable computers) and intelligent electronic devices. Version 1 of the PCMCIA standard was introduced in 1990.

PnP

An abbreviation for »**P**lug and **P**lay« Specifications developed by Intel. Using Plug and Play allows a PC to automatically configure itself, so that it can communicate with peripheral devices (e.g. monitors, modems and printers). Users can connect a peripheral device (plug) and it is immediately runs (play), without having to manually configure the system. A Plug and Play PC requires a BIOS that supports Plug and Play and a respective expansion card.

POH

An abbreviation for »**P**ower **O**n **H**ours« see MTBF

POST

An abbreviation for »**P**ower-**O**n **S**elf **T**est« A set of routines which are stored in ROM on the computer and test different system components e.g. RAM, disk drive and the keyboard, in order to determine that the connection is operating correctly and ready for operation. POST routines notify the user of problems that occur. This is done using several signal tones or by displaying a message, which frequently accompanies a diagnosis value, on the standard output or standard error devices (generally the monitor). If POST runs successfully, control is transferred over to the system's bootstrap loader.

Power Panel

Power Panel is part of the B&R product family and is a combination of an operator panel and controller in one device. This covers products PP21 and PP41.

PP21

B&R Power Panel type. It is equipped with an RS232 interface, a CAN interface, a PCMCIA slot and integrated digital input/output channels. Additionally, up to six B&R SYSTEM 2003 screw-in modules can be connected. LC display 4 x 20 characters.

PP41

B&R Power Panel type. It is equipped with an RS232 interface, a CAN interface, a PCMCIA slot and integrated digital input/output channels. Additionally, up to six B&R SYSTEM 2003 screw-in modules can be connected. 5.7" QVGA black/white LC display

Provit

An abbreviation for »**P**ROcess**V**isualization**T**erminal« Product family name for B&R industrial PCs.

Provit 2000

Product family name for B&R industrial PCs. It is divided into the following products: IPC2000, IPC2001, Compact IPC (IPC2002) and the display units belonging to them.

Provit 5000

Product family name for B&R industrial PCs. It is divided into the following products: IPC5000, IPC5600, IPC5000C, IPC5600C and the display units belonging to them.

RAM

An abbreviation for »**R**andom **A**ccess **M**emory« A semiconductor memory which can be read or written to by the microprocessor or other hardware components. Memory locations can be accessed in any order. While ROM types cannot be written to, RAM memory allows both read and write access.

ROM

An abbreviation for »**R**ead-Only **M**emory« A semiconductor in which programs or data have already been permanently stored during the production process.

RTS

An abbreviation for »**R**equest **T**o **S**end« A signal used in serial data transfer for requesting send permission. For example, it is sent from a computer to the modem connected to it. The RTS signal is assigned according to hardware specifications of the RS-232-C standard for connection 4.

RXD

An abbreviation for »**R**eceive (**RX**) **D**ata« A line for the transfer of serial data received from one device to another - e.g. from a modem to a computer. For connections complying with the RS-232-C standard, the RXD is controlled by connection 3 of the plug.

SDRAM

An abbreviation for »**S**ynchronous **D**ynamic **R**andom **A**ccess **M**emory« A construction of dynamic semiconductor components (DRAM), which can operate with higher clock rates than conventional DRAM switching circuits. This is made possible using block access. For each access, the DRAM determines the next memory addresses to be accessed.

Special Keypad Modules

The following keypad modules are offered by B&R: Dummy module, emergency stop module, key switch module (made up of 1 key switch and 1 on /off switch) and a start/stop module (made up of 2 buttons and a label field).

SRAM

An abbreviation for »**Static Random Access Memory**« A semiconductor memory (RAM) made up of certain logic circuits (flip-flop), which only keeps stored information while the operating voltage is active. In computers, static RAM is generally only used for the cache memory.

Standard Keypad Module

The following keypad modules are offered by B&R: 16 keys with 16 LEDs, 12+4 keys with 4 LEDs, 8 keys with 4 LEDs and a label field and 4 keys with 4 LEDs and 4 label fields.

SVGA

An abbreviation for »**Super Video Graphics Array**« A graphic standard which was created in 1989 by the Video Electronics Standards Association (VESA) in order to offer the option of high resolution color screens for IBM compatible computers. Although SVGA is a single standard, compatibility problems can occur with the video BIOS.

System Units

Provit system units consist of a mainboard (without processor), slots for RAM modules, VGA controller, serial and parallel interfaces, and connections for the FPD, monitor, PS/2 AT keyboard, PS/2 mouse, USB, Ethernet (for system units with Intel Celeron and Pentium III processors), Panelware keypad modules and external FDD.

Keypad Modules

Keypad modules are divided into two groups: **Standard Keypad Modules** (can be daisy chained to a controller) and **Special Keypad Modules** (must be connected by an electrician according to the function e.g. Emergency Stop)

TFT Display

An LCD (Liquid Crystal Display) technology where the display consists of a large grid of LCD cells. Each pixel is represented by a cell, whereby electrical fields produced in the cells are supported by thin film transistors (TFT) resulting in an active matrix. In the simplest form, there is exactly one thin film transistor per cell. Displays with an active matrix are generally used in laptops and notebooks because they are thin, offer high quality color displays and can be viewed from all angles.

TXD

An abbreviation for »**Transmit (TX) Data**« A line for the transfer of serial data sent from one device to another - e.g. from a computer to a modem. For connections complying with the RS-232-C standard, the TXD is controlled by connection 2 of the plug.

UART

An abbreviation for »**Universal Asynchronous Receiver-Transmitter**« Generally, a module consisting of a single integrated circuit, which combines the circuits required for asynchronous serial communication for both sending and receiving. UART represents the most common type of circuit in modems for connection to a personal computer.

UDMA

An abbreviation for »**Ultra Direct Memory Access**« A special IDE data transfer mode that allows high data transfer rates for drives. There has been some variations in the recent times.

The UDMA33 mode transfers 33 megabytes per second.

The UDMA66 mode transfers 66 megabytes per second.

The UDMA100 mode transfers 100 megabytes per second.

A condition for modifications is that both the mainboard and the hard drive support the specification.

Bootstrap Loader

A program that automatically runs when the computer is switched on or restarted. After some basic hardware tests have been carried out, the bootstrap loader starts a larger loader and hands over control to it, which in turn boots the operating system. The bootstrap loader is typically found in ROM on the computer.

USB

An abbreviation for »**Universal Serial Bus**« A serial bus with a bandwidth of up to 12 megabits per second (Mbit/s) for connecting a peripheral device to a microcomputer. Up to 127 devices can be connected to the system using a single multipurpose connection, the USB bus (e.g. external CD drives, printer, modems as well as the mouse and keyboard). This is done by connecting the devices in a row. USB allows devices to be changed when the power supply is switched on (hot plugging) and multi-layered data flow.

UPS

An abbreviation for »**Uninterruptible PowerSupply**« UPS supplies power to systems which cannot be connected directly to the power mains for safety reasons because a power failure could lead to loss of data. The UPS allows the PC to be shut down securely if a power failure occurs without losing data.

UPS

Abbreviation for »**Uninterruptible Power Supply**« see UPS

VGA

An abbreviation for »**Video Graphics Adapter**« A video adapter which can handle all EGA (Enhanced Graphics Adapter) video modes and adds several new modes.

XGA

An abbreviation for »**EX**tended **G**raphics **A**rray« An expanded standard for graphic controllers and monitors which was introduced by IBM in 1990. This standard supports a 640 * 480 resolution with 65,536 colors or a 1024 * 768 resolution with 256 colors. This standard is generally used in workstation systems.

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