Automation PC 810

User's Manual

Version: **1.10 (September 2008)**

Model number: **MAAPC800-ENG**

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Chapter 1 • General Information

1. Manual history

Version	Date	Change
0.10 Preliminary	20.11.2007	- First version
0.20 Preliminary	11.01.2008	- Text changed in the brief system unit text - Text change made to 945GME (instead of 945GM) - 256 MB main memory removed. - 5AC801.ADAS-00 and 5AC801.HDDS-00 added. - Accessories added. - Ready relay 5AC801.RDYR-00, SATA RAID controller, fan kit, IF options, replacement fan filter added. - BIOS description added.
0.30 Preliminary	31.01.2008	- Mistake regarding the configuration corrected. - BIOS default profile added. - Name change from APC810 to APC800 and model number change - Technical data for the entire device updated. - Connection examples added. - Problems and properties of the first production lot added.
0.40 Preliminary	11.04.2008	- Problems and properties of the first production lot revised. - Section "Temperature sensor locations" on page 383 in chapter appendix A expanded. - "Ambient temperatures" on page 50 added. - System unit with 1 card slot added. - Content changes (especially in "Maintenance / Servicing" chapter). -BIOS description for Version 1.10 revised.
0.41 Preliminary	09.05.2008	-Graphic corrections to "Ambient temperatures with and without a fan kit". - Measurement values of the 1 and 2 card slot devices around the heat sink 5AC801.HS00-01 updated. - "Power management" section added. - Serial number sticker information updated - Section "Automation PC 810 with Windows XP Professional and Windows XP embedded" added. - "Automation Device Interface (ADI)" expanded. - 5 card slot variants added. - Drilling templates added for 5-card slot variants. - Section "Connection of USB peripheral devices" on page 184Connection of USB peripheral devices added. - Index expanded
0.42 Preliminary	29.05.2008	- Information for mounting orientation (vertical, horizontal) added in Chapter 3 "Commissioning". - Ambient temperature values with and without a fan kit regarding mounting orientation (vertical, horizontal) updated. Error correction (Fan kit model numbers) in Figure 2 "Configuration - Drives, software, accessories" on page 34. - Error correction (pin assignments) in Table 18 "Supply voltage connection + 24VDC" on page 70. - Slide-in slot 2 description revised. - Slide-in DVD burner 5AC801.DVDS-00 added. - Fan kit for the 5-card slot variant (5PC810.FA05-00) added. - Real-time clock (RTC) specifications added.

Table 1: Manual history

Version	Date	Change
1.00	10.07.2008	- Spelling and grammar errors corrected. - Block diagram of all system units according to the bus unit added (see section "Block diagram" on page 64.) - Description of the Add-on interface module 5AC600.485I-00 updated.
1.10	12.09.2008	- Spelling and grammar errors corrected. - Values of the starting current changed (because of new power supply). - PCI Ethernet cards 5ACPCI.ETH1-01and 5ACPCI.ETH3-01 added. - Current requirements changed from 1..5A to 1..6A. - Manual adjusted to the maximum value of 130W. - New "Standards and certifications" chapter added. - Humidity specifications added, see section "Humidity specifications" on page 55. - User ID described in further detail. - Order number for Windows XP with SP3 5SWWXP.0600-ENG, 5SWWXP.0600-GER, 5SWWXP.0600-MUL added. - Minimum ambient temperature specifications added. - Internal supply cable 5CAMSC.0001-00 (for external devices on the PCI slot) added. - Configuration of a SATA RAID controller moved from "Software" to "Commissioning". - Error correction - 5PC810.FA05-00 (page 132). - BIOS settings changed (new BIOS version). - Information on creating an MS-DOS start diskette updated. - Information for creating a bootable USB flash drive added. - B&R Key Editor description expanded. - HMI Drivers & Utilities DVD updated. - Description edited for operating the add-on RS232/422/485 interface module as an RS485 interface. - ADI Control center expanded. - Glossary updated. - Update to disassembling the side cover for 5PC810.SX01-00 and 5PC810.SX05-00. - Update to assembling the UPS module (with and without add-on interface module). - Error correction to the 3-phase power supply 40A (0PS340.1**)** in the order numbers on page 29. - Update to 5 card slot system unit. - Several temperature humidity diagrams corrected. - Add-on interface slot added. - Description "Connection of an external device to the main board" on page 386 added. - Description "AP Link installation" on page 379 added. - Correction made to the power supply fuse from 10A to 15A on page 70. - Update to the CMOS profile switch position 2 on page 82. - Correction to the lifespan and the revolution speed of the fan kit 5PC810.FA01-00. - Temperature monitoring and fan control updated, see page 385.

Table 1: Manual history (Forts.)

2. Safety guidelines

2.1 Intended use

Programmable logic controllers (PLCs), operating and monitoring devices (industrial PCs, Power Panels, Mobile Panels, etc.), and B&R uninterruptible power supplies have been designed, developed, and manufactured for conventional use in industry. They were not designed, developed, and manufactured for any use involving serious risks or hazards that could lead to death, injury, serious physical damage, or loss of any kind without the implementation of exceptionally stringent safety precautions. In particular, such risks and hazards include the use of these devices to monitor nuclear reactions in nuclear power plants, as well as flight control systems, flight safety, the control of mass transit systems, medical life support systems and the control of weapons systems.

2.2 Protection against electrostatic discharges

Electrical components that are vulnerable to electrostatic discharge (ESD) must be handled accordingly.

2.2.1 Packaging

- Electrical components with housing
  … do not require special ESD packaging, but must be handled properly
  (see "Electrical components with housing").

- Electrical components without housing
  … must be protected by ESD-suitable packaging.

2.2.2 Guidelines for proper ESD handling

Electrical components with housing

- Do not touch the contacts of connectors on connected cables.
- Do not touch the contact tips on the circuit boards.

Electrical components without housing

The following is valid in addition to "Electrical components with housing"

- Any persons handling electrical components or devices that will be installed in the electrical components must be grounded.
- Components can only be touched on the small sides or on the front plate.
- Components should always be stored in a suitable medium (ESD packaging, conductive foam, etc.).
  Metallic surfaces are not suitable storage surfaces!

- Electrostatic discharges should be avoided on the components (e.g. through charged plastics).

- A minimum distance of 10 cm must be kept from monitors and TV sets.

- Measurement devices and equipment must be grounded.

- Measurement probes on potential-free measurement devices must be discharged on sufficiently grounded surfaces before taking measurements.

Individual components

- ESD protective measures for individual components are thoroughly integrated at B&R (conductive floors, footwear, arm bands, etc.).

The increased ESD protective measures for individual components are not necessary for our customers for handling B&R products.

2.3 Policy and procedures

Electronic devices are generally not failsafe. In the event of a failure on the programmable control system, operating or monitoring device, or uninterruptible power supply, the user is responsible for ensuring that other devices that may be connected, e.g. motors, are in a secure state.

Both when using programmable logic controllers and when using operating and monitoring devices as control systems in conjunction with a soft PLC (e.g. B&R Automation Runtime or comparable products) or a slot PLC (e.g. B&R LS251 or comparable products), the safety precautions applying to industrial control systems (e.g. the provision of safety devices such as emergency stop circuits, etc.) must be observed in accordance with applicable national and international regulations. The same applies for all other devices connected to the system, such as drives.

All tasks such as installation, commissioning, and maintenance are only permitted to be carried out by qualified personnel. Qualified personnel are persons who are familiar with the transport, mounting, installation, commissioning, and operation of the product and who have the appropriate qualifications (e.g. IEC 60364). National accident prevention guidelines must be followed.
The safety guidelines, connection descriptions (rating plate and documentation) and limit values listed in the technical data must be read carefully and must be observed before installation and commissioning.

2.4 Transport and storage

During transport and storage, devices must be protected from excessive stress (mechanical load, temperature, humidity, aggressive atmosphere, etc.).

2.5 Installation

- Installation must take place according to the documentation, using suitable equipment and tools.

- Devices must be installed without voltage applied and by qualified personnel.

- General safety regulations and nationally applicable accident prevention guidelines must be observed.

- Electrical installation must be carried out according to the relevant guidelines (e.g. line cross section, fuse, protective ground connection).

2.6 Operation

2.6.1 Protection against touching electrical parts

To operate programmable logic controllers, operating and monitoring devices, and uninterruptible power supplies, certain components must carry dangerous voltage levels of over 42 VDC. A life-threatening electrical shock could occur if you come into contact with these parts. This could result in death, severe injury or material damage.

Before turning on the programmable logic controller, the operating and monitoring devices and the uninterruptible power supply, ensure that the housing is properly grounded (PE rail). The ground connection must be established when testing the operating and monitoring devices or the uninterruptible power supply, even when operating them for only a short time.

Before turning the device on, make sure that all voltage-carrying parts are securely covered. During operation, all covers must remain closed.

2.6.2 Environmental conditions - dust, humidity, aggressive gases

Use of operating and monitoring devices (e.g. industrial PCs, power panels, mobile panels, etc.) and uninterruptible power supplies in very dusty environments should be avoided. Dust collection on the devices influences their function and, especially in systems with active cooling (fans), sufficient cooling cannot be guaranteed.

The presence of aggressive gases in the environment can also lead to malfunctions. When combined with high temperature and humidity, aggressive gases - e.g. with sulfuric, nitric and chloric components- spur chemical chemical process that can damage electronic components very quickly. Signs of the presence of aggressive gases are blackened copper surfaces and cables on existing installations.

For operation in dusty or humid conditions, correctly installed (cutout installation) operating and monitoring devices like Automation Panel or Power Panel are protected on the front side. The rear side of all devices must be protected from dust and humidity and must be cleaned at suitable intervals.

2.6.3 Programs, viruses and dangerous programs

The system is subject to potential danger each time data is exchanged or software is installed from a data medium (e.g. diskette, CD-ROM, USB flash drive, etc.), a network connection, or the Internet. The user is responsible for assessing these dangers, implementing preventative measures such as virus protection programs, firewalls, etc. and obtaining software from reliable sources.

3. Organization of safety notices

The safety notices in this manual are organized as follows:

Safety notice	Description
Danger!	Disregarding the safety regulations and guidelines can be life-threatening.
Caution!	Disregarding the safety regulations and guidelines can result in severe injury or major damage to material.
Warning!	Disregarding the safety regulations and guidelines can result in injury or damage to material.
Information:	Important information for preventing errors.

Table 2: Organization of safety notices

4. Guidelines

European dimension standards apply to all dimensions (e.g. dimension diagrams, etc.).

5. Model numbers

5.1 System units

Model number	Short description	Comment
5PC810.SX01-00	**APC810 System 1CS[1]** APC810 system unit 1 card slot (PCI, PCI Express, depending on bus), 1 slide-in compact slot for drive, 2 CompactFlash slots; Smart Display Link/DVI/Monitor, connections for 2x RS232, 5x USB 2.0, 2x ETH 10/100/1000, AC97 sound, 24 VDC	
5PC810.SX02-00	**APC810 system 2CS[1] 1DD[2] 1LS[3]** APC810 system unit with 2 card slots (PCI, PCI Express, depending on bus), 1 slot for Automation Panel Link Transmitter; 1 slide-in compact slot and 1 slide-in slot for drives, 2 CompactFlash slots; Smart Display Link/DVI/Monitor, connections for 2x RS232, 5x USB 2.0, 2x ETH 10/100/1000, AC97 sound, 24 VDC	
5PC810.SX05-00	**APC810 system 5CS[1] 2DD[2] 1LS[3]** APC810 system unit 5 card slots (PCI, PCI Express, depending on bus), 1 slot for Automation Panel Link Transmitter; 1 slide-in compact slot and 2 slide-in slots for drives, 2 CompactFlash slots; Smart Display Link/DVI/Monitor, connections for 2x RS232, 5x USB 2.0, 2x ETH 10/100/1000, AC97 sound, 24 VDC	

Table 3: Model numbers - System units

1) Card Slot = PCI slot: PCI or PCI Express

2) Disk drive = Slide-in drive slot

3) Link slot = Slot for one AP Link card

5.2 Bus units

Model number	Short description	Comment
5PC810.BX01-00	**APC810 bus 1PCI** APC810 bus unit with a PCI slot.	
5PC810.BX01-01	**APC810 bus 1PCIe.x4** APC810 bus unit with a PCIe slot.	
5PC810.BX02-00	**APC810 bus 2PCI** APC810 bus unit with 2 PCI slots.	
5PC810.BX02-01	**APC810 bus 1PCI 1PCIe.x4** APC810 bus unit with one PCI and one PCIe slot.	
5PC810.BX05-00	**APC810 bus 4PCI 1PCIe.x1** APC810 bus unit with 4 PCI slots and one PCIe slot.	
5PC810.BX05-01	**APC810 bus 2PCI 3PCIe.x1** APC810 bus unit with 2 PCI slots and 3 PCIe slots.	

Table 4: Model numbers - bus units

5.3 CPU boards 945GME COM Express

Model number	Short description	Comment
5PC800.B945-00	**CPU board Intel® Core™ Duo L2400, 1.66 GHz** 667 MHz FSB, 2 MB L2 cache; 945GME chipset; 2 sockets for SO-DIMM DDR2 module	
5PC800.B945-01	**CPU board Intel® Core™2 Duo L7400, 1.5 GHz** 667 MHz FSB, 4 MB L2 cache; 945GME chipset; 2 sockets for SO-DIMM DDR2 module	
5PC800.B945-02	**CPU board Intel® Core™2 Duo U7500, 1.06 GHz** 533 MHz FSB, 2 MB L2 cache; 945GME chipset; 2 sockets for SO-DIMM DDR2 module	
5PC800.B945-03	**CPU board Intel® Celeron® M 423, 1.06 GHz** 533 MHz FSB, 1 MB L2 cache; 945GME chipset; 2 sockets for SO-DIMM DDR2 module	
5PC800.B945-04	**CPU board Intel® Core™2 Duo T7400, 2.16 GHz** 667 MHz FSB, 4 MB L2 cache; 945GME chipset; 2 sockets for SO-DIMM DDR2 module	

Table 5: Model numbers - CPU boards 945GME

5.4 Heat sink

Model number	Short description	Comment
5AC801.HS00-00	**APC810 heat sink** Heat sink APC810 for CPU boards with Dual Core processors L2400, L7400, U7500 and Celeron® M 423	
5AC801.HS00-01	**APC810 heat sink T7400** Heat sink APC810 for CPU board with Dual Core processor T7400	

Table 6: Model numbers - Heat sinks

5.5 Main memory

Model number	Short description	Comment
5MMDDR.0512-01	**SO-DIMM DDR2 512MB PC2-5300**	
5MMDDR.1024-01	**SO-DIMM DDR2 1024MB PC2-5300**	
5MMDDR.2048-01	**SO-DIMM DDR2 2,048MB PC2-5300**	

Table 7: Model numbers - main memory

5.6 Drives

Model number	Short description	Comment
5AC801.ADAS-00	**APC810 slide-in compact adapter** Adapter for operating compact slide-in drives in a slide-in slot drive slot (can only be used in slide-in slot 1).	
5AC801.HDDI-00	**APC810 slide-in compact HDD 40GB** 40 GB SATA Hard Disk (slide-in compact)	

Table 8: Model numbers - Drives

Model number	Short description	Comment
5AC801.HDDI-01	**APC810 slide-in compact HDD 80GB** 80 GB SATA Hard Disk (slide-in compact)	Cancelled since 02/2008, replacement type 5AC801.HDDI-02
5AC801.HDDI-02	**APC810 slide-in compact HDD 160GB 24x7 ET** 160 GB SATA Hard Disk (slide-in compact)	
5AC801.HDDS-00	**APC810 slide-in HDD 40GB** 40 GB SATA hard disk drive (slide-in)	
5AC801.DVDS-00	**APC810 slide-in DVD-ROM** DVD-ROM drive (slide-in)	
5AC801.DVRS-00	**APC810 slide-in DVD-R/RW** DVD-R/RW, DVD+R/RW drive (slide-in)	
5ACPCI.RAIC-01	**PCI SATA RAID System 2x60 GB** PCI RAID controller + 2 x 60 GB SATA hard disks; requires a free PCI slot.	
5ACPCI.RAIC-02	**Replacement SATA-HDD 60GB** Hard disk 60 GB SATA, replacement part for 5ACPCI.RAIC-01	
5ACPCI.RAIC-03	**PCI SATA RAID System 2x160 GB** PCI RAID controller + 2 x 160 GB SATA hard disks; requires a free PCI slot.	
5ACPCI.RAIC-04	**Replacement SATA-HDD 160GB** Hard disk 160 GB SATA, replacement part for 5ACPCI.RAIC-03	

Table 8: Model numbers - Drives (Forts.)

5.7 Fan kits

Model number	Short description	Comment
5PC810.FA01-00	**APC810 fan kit for system unit 5PC800.SX01-00** APC810 fan kit for system unit with CS, made up of 3 fans (40x40x10)	
5PC810.FA02-00	**APC810 fan kit for system unit 5PC800.SX02-00** APC810 fan kit for system unit with CS, made up of 2 fans (70x70x15)	
5PC810.FA05-00	**APC810 fan kit for system unit 5PC800.SX05-00** APC810 fan kit for system unit with 5CS, made up of 3 fans (70x70x15)	

Table 9: Model numbers - Fan kits

5.8 AP Link cards

Model number	Short description	Comment
5AC801.SDL0-00	**APC810 AP Link SDL transmitter** Automation Panel SDL link transmitter	
5AC801.RDYR-00	**APC810 Ready relay** APC810 Ready relay	

Table 10: Model numbers - AP Link

5.9 Uninterruptible power supply

Model number	Short description	Comment
5AC600.UPSI-00	**Add-on UPS module** Order UPS module for Automation PC, cable (5CAUPS.0005-00 or 5CAUPS.0030-00) and battery unit (5AC600.UPSB-00) separately.	
5AC600.UPSB-00	**Battery unit 5 Ah** UPS battery unit for the add-on UPS module	
5CAUPS.0005-00	**UPS cable 0.5 m** Connection cable between add-on UPS module and UPS battery unit, length 0.5 meters	
5CAUPS.0030-00	**UPS cable 3 m** Connection cable between add-on UPS module and UPS battery unit, length 3 meters	

Table 11: Model numbers - Uninterruptible power supply

5.10 Interface options (IF option)

Model number	Short description	Comment
5AC600.CANI-00	**Add-on CAN interface** CAN interface for installation in an APC620, APC800 or PPC700.	
5AC600.485I-00	**Add-on RS232/422/485 interface** Add-on RS232/422/485 interface for installation in an APC620, AP800 and PPC700.	

Table 12: Model numbers - Interface options (IF option)

5.11 Accessories

Model number	Short description	Comment
0TB103.9	**Plug 24V 5.08 3-pin screw clamps** 24 VDC 3-pin connector, female. Screw clamps, 3.31 mm², protected against vibration by the screw flange	
0TB103.91	**Plug 24V 5.08 3-pin cage clamps** 24 VDC 3-pin connector, female. Cage clamps, 3.31 mm², protected against vibration by the screw flange	
0AC201.9	**Lithium batteries (5x)** Lithium batteries, 5 pcs., 3 V / 950 mAh, button cell	
4A0006.00-000	**Lithium battery (1x)** Lithium battery, 1 pc., 3 V / 950 mAh, button cell	
5AC801.FA01-00	**APC810 replacement fan filter for system units with 1CS 5 pcs**	
5AC801.FA02-00	**APC810 replacement fan filter for system units with 2CS 5 pcs**	
5AC801.FA05-00	**APC810 replacement fan filter for system units with 5CS 5 pcs**	
5AC900.1000-00	**Adapter DVI-A/m to CRT DB15HD/f** Adapter DVI (plug) to CRT (socket), for connecting a standard monitor to a DVI-I interface.	
5CFCRD.0064-03	**CompactFlash 64 MB SSI** CompactFlash card with 64 MB SLC NAND flash, and IDE/ATA interface	

Table 13: Model numbers - Accessories

Model number	Short description	Comment
5CFCRD.0128-03	**CompactFlash 128 MB SSI** CompactFlash card with 128 MB SLC NAND flash, and IDE/ATA interface	
5CFCRD.0256-03	**CompactFlash 256 MB SSI** CompactFlash card with 256 MB SLC NAND flash, and IDE/ATA interface	
5CFCRD.0512-03	**CompactFlash 512 MB SSI** CompactFlash card with 512 MB SLC NAND flash, and IDE/ATA interface	
5CFCRD.1024-03	**CompactFlash 1024 MB SSI** CompactFlash card with 1024 MB SLC NAND flash, and IDE/ATA interface	
5CFCRD.2048-03	**CompactFlash 2048 MB SSI** CompactFlash card with 2048 MB SLC NAND flash, and IDE/ATA interface	
5CFCRD.4096-03	**CompactFlash 4096 MB SSI** CompactFlash card with 4096 MB SLC NAND flash, and IDE/ATA interface	
5CFCRD.8192-03	**CompactFlash 8,192 MB SSI** CompactFlash card with 8,192 MB SLC NAND flash, and IDE/ATA interface	
5MD900.USB2-01	**USB 2.0 drive DVD-RW/CD-RW FDD CF USB** USB 2.0 drive combination; Consists of DVD-R/RW/DVD+R/RW/CD-RW, FDD, CompactFlash slot (type II), USB connection (type A front side, type B back side); 24 VDC.	
5A5003.03	**Front cover for the USB Media Drive 5MD900.USB2-01** Front cover for the remote USB 2.0 drive combination 5MD900.USB2-01.	
5MMUSB.2048-00	**USB flash drive 2 GB SanDisk** USB 2.0 flash drive 2 GB	
0PS102.0	**Power supply, 1-phase, 2.1 A** 24 VDC power supply, 1 phase, 2.1 A, input 100-240 VAC, wide range, DIN rail installation	
0PS104.0	**Power supply, 1-phase, 4.2 A** 24 VDC power supply, 1 phase, 4.2 A, input 115/230 VAC, auto select, DIN rail mounting	
0PS105.1	**Power supply, 1-phase, 5 A** 24 VDC power supply, 1 phase, 5 A, input 115/230 VAC, manual select, DIN rail mounting	
0PS105.2	**Power supply, 1-phase, 5 A, redundant** 24 VDC power supply, 1 phase, 5 A, redundant through parallel operation, input 115/230 VAC, manual select, DIN rail mounting	
0PS110.1	**Power supply, 1-phase, 10 A** 24 VDC power supply, 1 phase, 10 A, input 115/230 VAC, manual select, DIN rail mounting	
0PS110.2	**Power supply, 1-phase, 10 A, redundant** 24 VDC power supply, 1 phase, 10 A, redundant through parallel operation, input 115/230 VAC, manual select, DIN rail mounting	
0PS120.1	**Power supply, 1-phase, 20 A** 24 VDC power supply, 1 phase, 20 A, input 115/230 VAC, auto select, DIN rail mounting	
0PS305.1	**Power supply, 3-phase, 5 A** 24 VDC power supply, 3-phase, 5 A, input 400..500 VAC (3 phases), wide range, DIN rail mounting	
0PS310.1	**Power supply, 3-phase, 10 A** 24 VDC power supply, 3-phase, 10 A, input 400..500 VAC (3 phases), wide range, DIN rail mounting	
0PS320.1	**Power supply, 3-phase, 20 A** 24 VDC power supply, 3-phase, 20 A, input 400..500 VAC (3 phases), wide range, DIN rail mounting	

Table 13: Model numbers - Accessories (Forts.)

Model number	Short description	Comment
0PS340.1	**Power supply, 3-phase, 40 A** 24 VDC power supply, 3-phase, 40 A, input 400..500 VAC (3 phases), wide range, DIN rail mounting	
5ACPCI.ETH1-01	**PCI Ethernet card 10/100** half size PCI Ethernet card, 1 Ethernet connection	
5ACPCI.ETH3-01	**PCI Ethernet card 10/100 3port** half size PCI Ethernet card, 3 Ethernet connections	
5SWHMI.0000-00	**HMI Drivers & Utilities DVD** Contains drivers, utilities, software upgrades and user's manuals for B&R panel system products (see B&R homepage – Industrial PCs, Visualization and Operation).	
5CAMSC.0001-00	**APC810 internal supply cable**	

Table 13: Model numbers - Accessories (Forts.)

5.12 Software

Model number	Short description	Comment
5SWWXP.0426-ENG	**WinXPe FP2007 APC810 C945GM** Order Microsoft Windows XP embedded English, Feature Pack 2007, for PPC700 with CPU boards 5PC600.X855-00, 5PC600.X855-01, 5PC600.X855-02, 5PC600.X855-03, 5PC600.X855-04, 5PC600.X855-05; CompactFlash separately (at least 512 MB). Only delivered with a new PC.	
9S0000.01-010	**OEM MS-DOS 6.22 German (disk)** OEM MS-DOS 6.22 German disks Only delivered with a new PC.	
9S0000.01-020	**OEM MS-DOS 6.22 English (disk)** OEM MS-DOS 6.22 English disks Only delivered with a new PC.	
9S0000.08-010	**OEM Microsoft Windows XP Professional German** CD, German; Only delivered with a new PC.	
9S0000.08-020	**OEM Microsoft Windows XP Professional English** CD, English; Only delivered with a new PC.	
9S0000.09-090	**OEM Microsoft Windows XP Professional Multilanguage** CDs; Only delivered with a new PC.	
5SWWXP.0600-ENG	**WinXP Professional with SP3, ENG** CD, English; Only delivered with a new PC.	
5SWWXP.0600-GER	**WinXP Professional with SP3, GER** CS, German; Only delivered with a new PC.	
5SWWXP.0600-MUL	**WinXP Professional with SP3, MUL** CDs; Only delivered with a new PC.	

Table 14: Software Model Numbers

Chapter 2 • Technical data

1. Introduction

The APC810 is the sophisticated upgrade to the APC620 product series. Based on the latest Intel® Core™2 Duo technology, the APC810 offers the highest level of performance for all applications that require maximum computing power.

The APC810 saves space in the switching cabinet. Drive inserts (DVD, HDD) and two CompactFlash slots are protected behind a cover on the front of the device. The modular plug-in technology makes it easy for the user to switch drives. All connections and interfaces are located on the top side of the housing. The installation depth is not increased by protruding connectors. The different APC810 sizes with one, two or five card slots (for PCI/PCI Express cards) provide the optimum design for every installation situation - a perfect fit without wasting valuable space in the switching cabinet.

1.1 Features

- Latest processor technologies - Core Duo, Core 2 Duo and Celeron M
- Up to 3 GB main memory (Dual Channel Memory Support)
- 2 CompactFlash slots (type I)
- 1, 2 or 5 card slots (for PCI / PCI Express (PCIe) cards)
- SATA drives (slide-in and slide-in compact slots)
- 5x USB 2.0
- 2x Ethernet 10/100/1000 MBit interfaces
- 2x RS232 Interface, modem compatible
- 24 VDC supply voltage
- Fan-free operation[1]
- BIOS (AMI)
- Real-time clock, RTC (battery-buffered)
- 512 KB SRAM (with battery back-up)
- Connection of various display devices to the "Monitor/Panel" video output (supports RGB, DVI, and SDL - Smart Display Link - signals)
- 2nd graphics line with installation of the optional AP Link card
- Easy slide-in drive exchange (SATA hot plug capable)
- Optional installation of add-on UPS module
- Optional CAN interface
- Optional RS232/422/485 interface
- Optional RAID controller (requires an open PCI slot)

1.2 System components / Configuration

The AP810 system can be assembled to meet individual requirements and operating conditions.

The following components are absolutely essential for operation:

- System unit
- Bus unit
- CPU board
- Heat sink
- Main memory
- Drive (mass memory such as CompactFlash card or hard disk) for the operating system
- Software

1) Dependent on the device configuration and the ambient temperature.

1.3 Configuration - Basic system

	Configuration - Basic system		
System unit	Select 1		
A system unit consists of a housing and main board. Variations: PCI/PCIe slots (1,2 or 5) Slide-in slots (0,1 or 2) AP Link slot (0 or 1) Example: (2 / 1 / 1) = 2 PCI, 1 slide-in, 1 AP Link	5PC810.SX01-00 (1 / 0 / 0)	5PC810.SX02-00 (2 / 1 / 1)	5PC810.SX05-00 (5 / 2 / 1)
Bus unit	Select 1		
	5PC810.BX01-00 (1 PCI) 5PC810.BX01-01 (1 PCIe)	5PC810.BX02-00 (2 PCI) 5PC810.BX02-01 (1 PCI / 1 PCIe)	5PC810.BX05-00 (4 PCI / 1 PCIe) 5PC810.BX05-01 (2 PCI / 3 PCIe)
	CPU board - heat sink - main memory		
CPU board	Select 1		
	5PC800.B945-00 - Core™ Duo L2400, 1.66 GHz 5PC800.B945-01 - Core™ Duo L7400, 1.5 GHz 5PC800.B945-02 - Core™ Duo U7500, 1.06 GHz 5PC800.B945-03 - Celeron® M 423, 1.06 GHz	5PC800.B945-04 - Core™2 Duo T7400, 2.16 GHz	
Heat sink	Select 1		
	5AC801.HS00-00	5AC801.HS00-01	
Main memory	1 or 2 can be selected (max. 3 GB can be used)		
	5MMDDR.0512-01 - 512 MB 5MMDDR.1024-01 - 1 GB 5MMDDR.2048-01 - 2 GB		

Figure 1: Configuration - Basic system

Chapter 2
Technical data

1.4 Configuration - Drives, software, accessories

Configuration - drives, software, accessories		
System unit		
A system unit consists of a housing and main board. Variations: PCI/PCIe slots (1,2 or 5) Slide-in slots (0,1 or 2) AP Link slot (0 or 1) Example: (2 / 1 / 1) = 2 PCI, 1 slide-in, 1 AP Link 5PC810.SX01-00 (1 / 0 / 0)	5PC810.SX02-00 (2 / 1 / 1)	5PC810.SX05-00 (5 / 2 / 1)
Fan kit (select 1)		
5PC810.FA01-00	5PC810.FA02-00	5PC810.FA05-00
Slide-in compact	Select 1	
5AC801.HDDI-00 (40 GB) 5AC801.HDDI-02 (160 GB)		
CompactFlash	Select 1 or 2	
5CFCRD.0064-03, 5CFCRD.0128-03, 5CFCRD.0256-03, 5CFCRD.0512-03 5CFCRD.1024-03, 5CFCRD.2048-03, 5CFCRD.4096-03, 5CFCRD.8192-03		
Slide-in drive	Not possible	1 possible	2 possible
		5AC801.HDDS-00 (40 GB) 5AC801.DVDS-00 (DVD drive) 5AC801.ADAS-00 (adapter) 5AC801.DVRS-00 (DVD burner)	
AP Link card	Select 1	
	5AC801.SDL0-00 (= 2nd graphics line) 5AC801.RDYR-00 (= ready relay)	
RAID system	Select 1	
5ACPCI.RAIC-01 (2x60 GB, occupies 1 PCI Slot) 5ACPCI.RAIC-03 (2x160 GB, occupies 1 PCI Slot)		
Interface option	Select 1	
5AC600.CANI-00 (CAN) 5AC600.485I-00 (combined RS232/RS422/RS485)		
UPS module	Select 1	
5AC600.UPSI-00 (Add-On UPS module) + 5AC600.UPSB-00 (UPS battery unit) connection cable APC -> battery: 5CAUPS.0005-00 (0,5 meters) or 5CAUPS.0030-00 (3 meters)		
Supply voltage connectors	Select 1	
0TB103.9 (screw clamp) 0TB103.91 (cage clamp)		
Software	Select 1	
5SWWXP.0600-GER (XP Pro SP3 German) 5SWWXP.0600-ENG (XP Pro SP3 English) 5SWWXP.0600-MUL (XP SP3 Multilanguage)	5SWWXP.0426-ENG (XP embedded English) 9S0000.01-010 (MS-DOS 6.22 German) 9S0000.01-020 (MS-DOS 6.22 English)	

Figure 2: Configuration - Drives, software, accessories

2. Entire device

2.1 Overview of APC810 1 PCI slot variations

2.1.1 Interfaces

Add-on interface slot

MIC, Line IN,
Line OUT

Add-on UPS slot

Supply voltage +24 VDC

COM2

PCI slot (half-size)
PCI or PCIe

COM1

Monitor/Panel
SDL (Smart Display Link) / DVI

LED for:
Power
HDD
Link1
Link2

ETH1 (10/100/1000 MBit)

ETH2 (10/100/1000 MBit)

USB2, USB4 (max. 500 mA)

USB1, USB3 (max. 1A)

Warning sign
Heat sink seal

Heat sink

1) Depending on the bus unit being used.
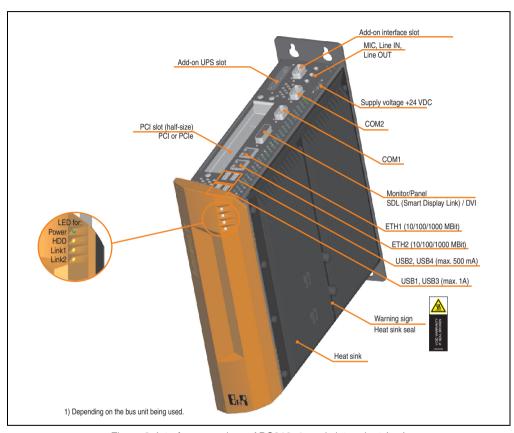
Figure 3: Interface overview - APC810, 1 card slot variant (top)

Warning!

Do not remove the mounting screws from the heat sink, as it is connected to the processor and chipset by a thermal coupling. If this connection is broken, the APC810 must be sent for repair. Removal of the mounting screws, which can be determined by a broken seal, voids all warranty.

During operation, surface temperatures of the heat sink may reach 70°C (warning "hot surface").
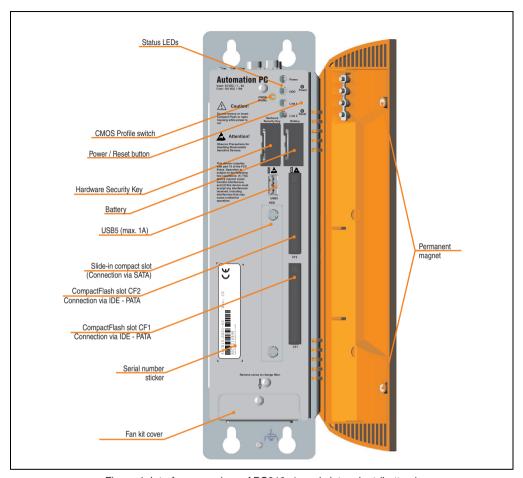
Figure 4: Interface overview - APC810, 1 card slot variant (bottom)

Information:

The front doors contain two permanent magnets. Contact between a data carrier that saves data magnetically (hard disk, diskette, the magnetic strip of a credit card, etc.) and a magnet can cause loss of data.

2.1.2 Technical data

Features	APC810 1 card slot variant
Boot loader / Operating system	BIOS
Processor Cooling Method	Component-dependent, see technical data for the "CPU boards 945GME" on page 95 Passive via heat sink and optionally supported with an active fan kit
Main memory	Max. 3 GB
Graphics Controller	Component-dependent, see technical data for the "CPU boards 945GME" on page 95

Power failure logic
    Controller
    Buffer time
	MTCX[1] (see also page 384)
	10 ms

Real-time clock (RTC)
    Battery-buffered
    Accuracy
	Yes
	see technical data of the "CPU boards 945GME" on page 95

SRAM
    Battery-buffered
    Quantity
	Yes
	512 kB

Battery
    Type
    removable
    Lifespan
	See also page 84
	Renata 950 mAh
	Yes, accessible behind the orange front doors
	2 1/2 years[2]

Ethernet
    Amount
    Speed
    Controller
	2
	10/100/1000 MBit/s
	See also page 73 or page 75

CAN bus	Optional with add-on interface (5AC600.CANI-00)

CompactFlash
    Type
    Amount
	See also page 86 or page 87
	Type I
	2

Serial interface
    Amount
    Type
    UART
    Transfer rate
    Connection
	See also page 72 or page 73
	2
	RS232, modem-capable, not electrically isolated
	16550-compatible, 16-byte FIFO
	Max. 115 kBaud
	9-pin DSUB

USB interface
    Type
    Amount
    Transfer rate
    Connection
    Current load
	Also see page 76
	USB 2.0
	5
	Low speed (1.5 MBit/s), full speed (12 MBit/s), to high speed (480 Mbit/s)
	Type A
	Max. 500 mA or 1 A per connection

Reset button	Yes, accessible behind the orange front doors
LEDs	4 directed outwards via fiber optic lines, see also section "status LEDs" on page 81

Card slots
    Amount
    half-size
	See also section "Card slot (PCI / PCIe)" on page 80
	1
	Dimensions of the PCI / PCIe cards vary

Add-on UPS slot	Yes

Table 15: Technical data - APC810, 1 card slot variant

Chapter 2
Technical data

Features	APC810 1 card slot variant
AP Link slot	-
Electrical characteristics	

Power supply
    Rated voltage
    Rated current
    Starting current
    Power consumption
	24 VDC ± 25%
	6 A
	Typ. 7 A, max. 50 A < 300µs
	Component-dependent, see section "Powercalculation with 5PC810.SX01-00 Revision >= D0" on page 57

Mechanical characteristics	

Housing[3]
    Material
    Paint
    Front cover
	Galvanized plate, plastic
	Light gray (similar to Pantone 427CV), dark gray (similar to Pantone 432CV)
	Colored orange plastic (similar to Pantone 144CV)

Outer dimensions	See section "Dimensions - APC810 1 card slot variant" on page 39.
Weight	approx. 2.2 kg (component-dependent)
Environmental characteristics	

Ambient temperature
    Operation
    Storage
    Transport
	Component-dependent - see section 2.4 "Ambient temperatures" on page 50
	-20°C .. +60°C
	-20°C .. +60°C

Relative humidity
    Operation
    Storage
    Transport
	Component-dependent, see section "Humidity specifications" on page 55
	Component-dependent, see section "Humidity specifications" on page 55
	Component-dependent, see section "Humidity specifications" on page 55

Vibration[4]
    Operation (continuous)
    Operation (occasional)
    Storage
    Transport
	2 - 9 Hz: 1.75 mm amplitude / 9 - 200 Hz: 0.5 g
	2 - 9 Hz: 3.5 mm amplitude / 9 - 200 Hz: 1 g
	2 - 8 Hz: 7.5 mm amplitude / 8 - 200 Hz: 2 g / 200 - 500 Hz: 4 g
	2 - 8 Hz: 7.5 mm amplitude / 8 - 200 Hz: 2 g / 200 - 500 Hz: 4 g

Shock[4]
    Operation
    Storage
    Transport
	15 g, 11 ms
	30 g, 15 ms
	30 g, 15 ms

Protection type	IP20
Altitude Operation	max. 3000 m[5] (component-dependent)

Table 15: Technical data - APC810, 1 card slot variant (Forts.)

1) Maintenance Controller Extended.

2) at 50°C, 8.5 µA of the supplied components and a self discharge of 40%.

3) Depending on the process or batch, there may be visible deviations in the color and surface structure.

4) Maximum values, as long as no other individual component specifies any other.

5) Derating the maximum ambient temperature - typically 1°C per 1000 meters (from 500 meters above sea level).

2.1.3 Dimensions

Figure 5: Dimensions - APC810 1 card slot variant

Information:

Measurement "A" depends on which heat sink is used.

Model number	Value in mm
5AC801.HS00-00	12.8
5AC801.HS00-01	28

Nominal measurement area	General tolerance acc. to DIN ISO 2768 medium
up to 6 mm	± 0.1 mm
over 6 to 30 mm	± 0.2 mm
over 30 to 120 mm	± 0.3 mm
over 120 to 400	± 0.5 mm
over 400 to 1000	± 0.8 mm

Chapter 2
Technical data

2.2 Overview of APC810 2 PCI slot variations

2.2.1 Interfaces
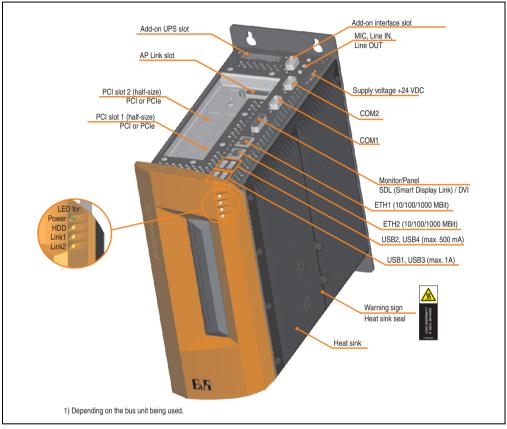
Figure 6: Interface overview - APC810, 2 card slot variant (top)

Warning!

Do not remove the mounting screws from the heat sink, as it is connected to the processor and chipset by a thermal coupling. If this connection is broken, the APC810 must be sent for repair. Removal of the mounting screws, which can be determined by a broken seal, voids all warranty.

During operation, surface temperatures of the heat sink may reach 70°C (warning "hot surface").
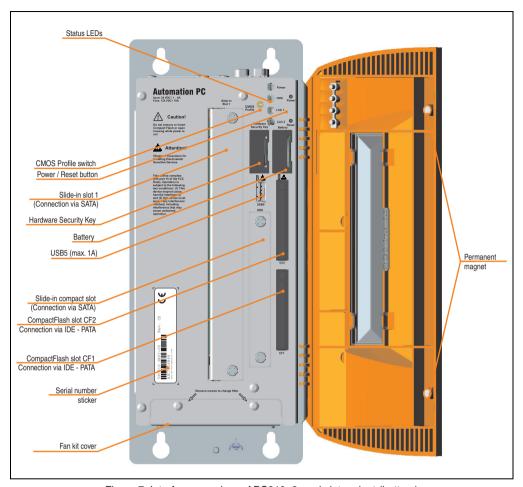
Figure 7: Interface overview - APC810, 2 card slot variant (bottom)

Information:

The front doors contain two permanent magnets. Contact between a data carrier that saves data magnetically (hard disk, diskette, the magnetic strip of a credit card, etc.) and a magnet can cause loss of data.

2.2.2 Technical data

Features	APC810 2 card slot variant
Boot loader / Operating system	BIOS
Processor Cooling Method	Component-dependent, see technical data for the "CPU boards 945GME" on page 95 Passive via heat sink and optionally supported with an active fan kit
Main memory	Max. 3 GB
Graphics Controller	Component-dependent, see technical data for the "CPU boards 945GME" on page 95

Power failure logic
    Controller
    Buffer time
	MTCX[1] (see also page 384)
	10 ms

Real-time clock (RTC)
    Battery-buffered
    Accuracy
	Yes
	see technical data of the "CPU boards 945GME" on page 95

SRAM
    Battery-buffered
    Quantity
	Yes
	512 kB

Battery
    Type
    removable
    Lifespan
	See also page 84
	Renata 950 mAh
	Yes, accessible behind the orange front doors
	2 1/2 years[2]

Ethernet
    Amount
    Speed
    Controller
	2
	10/100/1000 MBit/s
	See also page 73 or page 75

CAN bus	Optional with add-on interface (5AC600.CANI-00)

CompactFlash
    Type
    Amount
	See also page 86 or page 87
	Type I
	2

Serial interface
    Amount
    Type
    UART
    Transfer rate
    Connection
	See also page 72 or page 73
	2
	RS232, modem-capable, not electrically isolated
	16550-compatible, 16-byte FIFO
	Max. 115 kBaud
	9-pin DSUB

USB interface
    Type
    Amount
    Transfer rate
    Connection
    Current load
	Also see page 76
	USB 2.0
	5
	Low speed (1.5 MBit/s), full speed (12 MBit/s), to high speed (480 Mbit/s)
	Type A
	Max. 500 mA or 1 A per connection

Reset button	Yes, accessible behind the orange front doors
LEDs	4 directed outwards via fiber optic lines, see also section "status LEDs" on page 81

Card slots
    Amount
    half-size
	See also section "Card slot (PCI / PCIe)" on page 80
	2
	Dimensions of the PCI / PCIe cards vary

Add-on UPS slot	Yes

Table 16: Technical data - APC810, 2 card slot variant

Features	APC810 2 card slot variant
AP Link slot	Yes
Electrical characteristics	

Power supply
    Rated voltage
    Rated current
    Starting current
    Power consumption
	24 VDC ± 25%
	6 A
	Typ. 7 A, max. 50 A < 300µs
	Component-dependent, see section "Powercalculation with 5PC810.SX02-00 Revision>= D0" on page 59

Mechanical characteristics	

Housing[3]
    Material
    Paint
    Front cover
	Galvanized plate, plastic
	Light gray (similar to Pantone 427CV), dark gray (similar to Pantone 432CV)
	Colored orange plastic (similar to Pantone 144CV)

Outer dimensions	See section "Dimensions - APC810 2 card slot variant" on page 44.
Weight	approx. 2.8 kg (component-dependent)
Environmental characteristics	

Ambient temperature
    Operation
    Storage
    Transport
	Component-dependent - see section 2.4 "Ambient temperatures" on page 50
	-20°C .. +60°C
	-20°C .. +60°C

Relative humidity
    Operation
    Storage
    Transport
	Component-dependent, see section "Humidity specifications" on page 55
	Component-dependent, see section "Humidity specifications" on page 55
	Component-dependent, see section "Humidity specifications" on page 55

Vibration[4]
    Operation (continuous)
    Operation (occasional)
    Storage
    Transport
	2 - 9 Hz: 1.75 mm amplitude / 9 - 200 Hz: 0.5 g
	2 - 9 Hz: 3.5 mm amplitude / 9 - 200 Hz: 1 g
	2 - 8 Hz: 7.5 mm amplitude / 8 - 200 Hz: 2 g / 200 - 500 Hz: 4 g
	2 - 8 Hz: 7.5 mm amplitude / 8 - 200 Hz: 2 g / 200 - 500 Hz: 4 g

Shock[4]
    Operation
    Storage
    Transport
	15 g, 11 ms
	30 g, 15 ms
	30 g, 15 ms

Protection type	IP20
Altitude Operation	max. 3000 m[5] (component-dependent)

Table 16: Technical data - APC810, 2 card slot variant (Forts.)

1) Maintenance Controller Extended.

2) at 50°C, 8.5 µA of the supplied components and a self discharge of 40%.

3) Depending on the process or batch, there may be visible deviations in the color and surface structure.

4) Maximum values, as long as no other individual component specify any other.

5) Derating the maximum ambient temperature - typically 1°C per 1000 meters (from 500 meters above sea level).

2.2.3 Dimensions
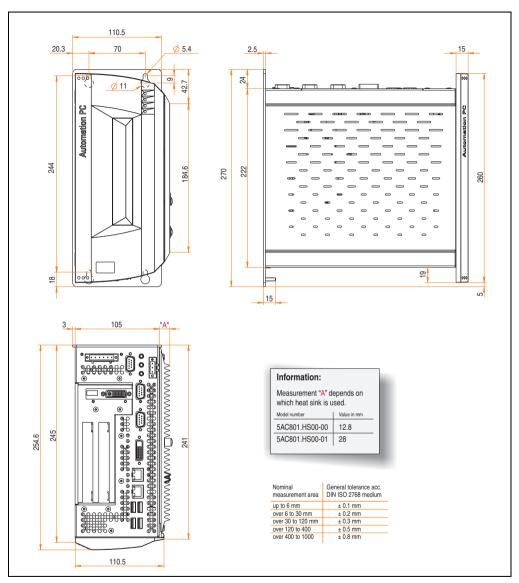
Figure 8: Dimensions - APC810 2 card slot variant

Information:

Measurement "A" depends on which heat sink is used.

Model number	Value in mm
5AC801.HS00-00	12.8
5AC801.HS00-01	28

Nominal measurement area	General tolerance acc. DIN ISO 2768 medium
up to 6 mm	± 0.1 mm
over 6 to 30 mm	± 0.2 mm
over 30 to 120 mm	± 0.3 mm
over 120 to 400	± 0.5 mm
over 400 to 1000	± 0.8 mm

2.3 Overview of APC810 5 PCI slot variations

2.3.1 Interfaces

Add-on UPS slot

AP Link slot

Card slot 1 - half-size
PCI or PCIe*

Card slot 2 - half-size
PCI or PCIe*

Card slot 3 - half-size
PCI or PCIe*

Card slot 4 - half-size
PCI or PCIe*

Card slot 5 - half-size
PCI or PC|e

LED für:
Power
HDD
Link1
Link2

Add-on interface slot

MIC, Line IN,
Line OUT

Supply voltage
+24 VDC

COM2

COM1

Monitor/panel
SDL (Smart Display Link) / DVI

ETH1 (10/100/1000 MBit)

ETH2 (10/100/1000 MBit)

USB2, USB4 (max. 500 mA)

USB1, USB3 (max. 1A)

Warning sign
Heat sink seal

Heat sink

* Depending on the bus unit being used.

Figure 9: Interface overview - APC810, 5 card slot variant (top)

Warning!

Do not remove the mounting screws from the heat sink, as it is connected to the processor and chipset by a thermal coupling. If this connection is broken, the APC810 must be sent for repair. Removal of the mounting screws, which can be determined by a broken seal, voids all warranty.

During operation, surface temperatures of the heat sink may reach 70°C (warning "hot surface").
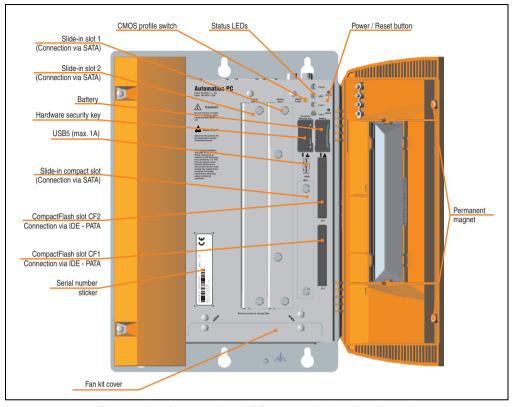
Figure 10: Interface overview - APC810, 5 card slot variant (bottom)

Information:

The front doors contain two permanent magnets. Contact between a data carrier that saves data magnetically (hard disk, diskette, the magnetic strip of a credit card, etc.) and a magnet can cause loss of data.

2.3.2 Technical data

Features	APC810 5 card slot variant
Boot loader / Operating system	BIOS
Processor Cooling Method	Component-dependent, see technical data for the "CPU boards 945GME" on page 95 Passive via heat sink and optionally supported with an active fan kit
Main memory	Max. 3 GB
Graphics Controller	Component-dependent, see technical data for the "CPU boards 945GME" on page 95

Power failure logic
    Controller
    Buffer time
	MTCX[1] (see also page 384)
	10 ms

Real-time clock (RTC)
    Battery-buffered
    Accuracy
	Yes
	see technical data of the "CPU boards 945GME" on page 95

SRAM
    Battery-buffered
    Quantity
	Yes
	512 kB

Battery
    Type
    removable
    Lifespan
	See also page 84
	Renata 950 mAh
	Yes, accessible behind the orange front doors
	2 1/2 years[2]

Ethernet
    Amount
    Speed
    Controller
	2
	10/100/1000 MBit/s
	See also page 73 or page 75

CAN bus	Optional with add-on interface (5AC600.CANI-00)

CompactFlash
    Type
    Amount
	See also page 86 or page 87
	Type I
	2

Serial interface
    Amount
    Type
    UART
    Transfer rate
    Connection
	See also page 72 or page 73
	2
	RS232, modem-capable, not electrically isolated
	16550-compatible, 16-byte FIFO
	Max. 115 kBaud
	9-pin DSUB

USB interface
    Type
    Amount
    Transfer rate
    Connection
    Current load
	Also see page 76
	USB 2.0
	5
	Low speed (1.5 MBit/s), full speed (12 MBit/s), to high speed (480 Mbit/s)
	Type A
	Max. 500 mA or 1 A per connection

Reset button	Yes, accessible behind the orange front doors
LEDs	4 directed outwards via fiber optic lines, see also section "status LEDs" on page 81

Card slots
    Amount
    half-size
	See also section "Card slot (PCI / PCIe)" on page 80
	5
	Dimensions of the PCI / PCIe cards vary

Add-on UPS slot	Yes

Table 17: Technical data - APC810, 5 card slot variant

Chapter 2
Technical data

Features	APC810 5 card slot variant
AP Link slot	Yes
Electrical characteristics	

Power supply
    Rated voltage
    Rated current
    Starting current
    Power consumption
	
	24 VDC ± 25%
	6 A
	Typ. 7 A, max. 50 A < 300µs
	Component-dependent, see section "Power calculation with 5PC810.SX05-00" on page 61

Mechanical characteristics	

Housing[3]
    Material
    Paint
    Front cover
	
	Galvanized plate, plastic
	Light gray (similar to Pantone 427CV), dark gray (similar to Pantone 432CV)
	Colored orange plastic (similar to Pantone 144CV)

Outer dimensions	See section "Dimensions - APC810 5 card slot variant" on page 49.
Weight	approx. 3.9 kg (component-dependent)
Environmental characteristics	

Ambient temperature
    Operation
    Storage
    Transport
	
	Component-dependent - see section 2.4 "Ambient temperatures" on page 50
	-20°C .. +60°C
	-20°C .. +60°C

Relative humidity
    Operation
    Storage
    Transport
	
	Component-dependent, see section "Humidity specifications" on page 55
	Component-dependent, see section "Humidity specifications" on page 55
	Component-dependent, see section "Humidity specifications" on page 55

Vibration[4]
    Operation (continuous)
    Operation (occasional)
    Storage
    Transport
	
	2 - 9 Hz: 1.75 mm amplitude / 9 - 200 Hz: 0.5 g
	2 - 9 Hz: 3.5 mm amplitude / 9 - 200 Hz: 1 g
	2 - 8 Hz: 7.5 mm amplitude / 8 - 200 Hz: 2 g / 200 - 500 Hz: 4 g
	2 - 8 Hz: 7.5 mm amplitude / 8 - 200 Hz: 2 g / 200 - 500 Hz: 4 g

Shock[4]
    Operation
    Storage
    Transport
	
	15 g, 11 ms
	30 g, 15 ms
	30 g, 15 ms

Protection type	IP20
Altitude Operation	 max. 3000 m[5] (component-dependent)

Table 17: Technical data - APC810, 5 card slot variant (Forts.)

1) Maintenance Controller Extended.

2) at 50°C, 8.5 µA of the supplied components and a self discharge of 40%.

3) Depending on the process or batch, there may be visible deviations in the color and surface structure.

4) Maximum values, as long as no other individual component specifies any other.

5) Derating the maximum ambient temperature - typically 1°C per 1000 meters (from 500 meters above sea level).
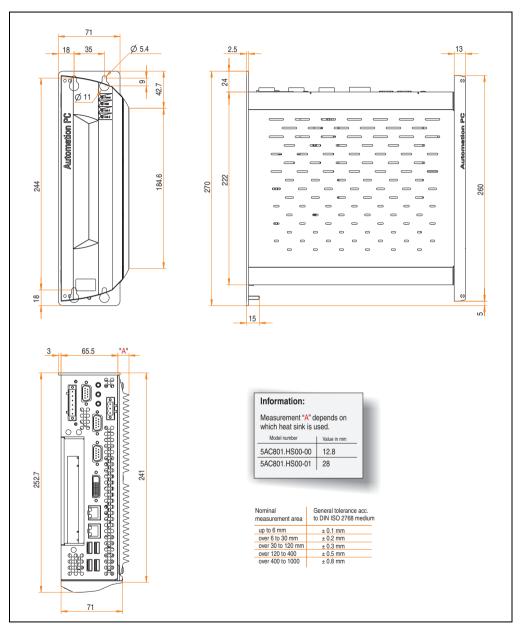
2.3.3 Dimensions

Information:

Measurement "A" depends on which heat sink is used.

Model number	Value in mm
5AC801.HS00-00	12.8
5AC801.HS00-01	28

Nominal measurement area	General tolerance acc. DIN ISO 2768 medium
up to 6 mm	± 0.1 mm
over 6 to 30 mm	± 0.2 mm
over 30 to 120 mm	± 0.3 mm
over 120 to 400	± 0.5 mm
over 400 to 1000	± 0.8 mm

Figure 11: Dimensions - APC810 5 card slot variant

2.4 Ambient temperatures

It is possible to combine CPU boards with various other components, such as drives, main memory, additional insert cards, etc. depending on system unit and fan kit. The various configurations result in varying maximum possible ambient temperatures, which can be seen in the following graphics.

Information:

The maximum specified ambient temperatures for operation with and without a fan kit were determined under worst-case conditions. Experience has shown that higher ambient temperatures can be reached under typical conditions, e.g. using Microsoft Windows. The testing and evaluation is to be done on-site by the user (temperatures can be read in BIOS or using the B&R Control Center).

Information on the worst-case conditions

- Thermal Analysis Tool (TAT V2.02) from Intel for simulating 100% processor load.
- BurnIn testing tool (BurnIn V4.0 Pro from Passmark Software) to simulate a 100% load on the interface via loop-back adapters (serial interfaces, add-on and slide-in drives, USB interfaces, audio outputs).
- Maximum system extension and power consumption.

What must be considered when determining the maximum ambient temperature?

- Operation of the Ethernet interfaces (ETH1/ETH2) in 10/100MBit or 1 GBit mode
- Operating the entire device with or without fan kit

2.4.1 Maximum ambient temperature without a fan kit

Information:

- **Differentiating the ETH2 interface in up to 100 MBit or 1 GBit operation**

- **ETH1 in 1GBit operation is not permitted without a fan kit.**

- **Operation without the fan kit is only permitted with a vertical mounting orientation (see also Chapter 3 "Commissioning", Section "Mountingorientation" on page 150).**

Chapter 2
Technical data

All temperature values in degrees Celsius (°C) at 500 meters NN. Derating the maximum ambient temperature (typically 1°C per 1000 meters above 500 NN).	ETH1: up to 100 MBit operation ETH2: up to 100 MBit operation						ETH1: up to 100 MBit operation ETH2: up to 1 GBit operation						Temperature limits	Location of sensor(s)
	L2400 5PC800.B945-00	L7400 5PC800.B945-01	U7500 5PC800.B945-02	CM 423 5PC800.B945-03	T7400 5PC800.B945-04		L2400 5PC800.B945-00	L7400 5PC800.B945-01	U7500 5PC800.B945-02	CM 423 5PC800.B945-03	T7400 5PC800.B945-04			
Maximum ambient temperature	35	35	35	45	/		30	30	30	40	/			
What can also be operated at the max. ambient temperature, or are there limits?														
Slide-in Compact On-Board CompactFlash[1]	✓	✓	✓	✓			✓	✓	✓	✓			80	I/O
5AC801.HDDI-00	✓	✓	✓	✓			✓	✓	✓	✓			80	
5AC801.HDDI-01	✓	✓	✓	✓			✓	✓	✓	✓			80	
5AC801.HDDI-02	✓	✓	✓	✓			✓	✓	✓	✓			80	
Slide-in Option 5AC801.HDDS-00	✓	✓	✓	✓			✓	✓	✓	✓			80	Slide-in drive
5AC801.DVDS-00	✓	✓	✓	40			✓	✓	✓	✓			50	
5AC801.DVRS-00	✓	✓	✓	40			✓	✓	✓	✓			50	
Main memory 5MMDDR.0512-01	✓	✓	✓	✓			✓	✓	✓	✓			-	
5MMDDR.1024-01	✓	✓	✓	✓			✓	✓	✓	✓			-	
5MMDDR.2048-01	✓	✓	✓	✓			✓	✓	✓	✓			-	
System units 5PC810.SX01-00	✓	✓	✓	✓			✓	✓	✓	✓			80	Power supply
5PC810.SX02-00	✓	✓	✓	✓			✓	✓	✓	✓			80	
5PC810.SX05-00	✓	✓	✓	✓			✓	✓	✓	✓			80	
Additional insert cards Interfaces / AP Link 5AC600.CANI-00	✓	✓	✓	✓			✓	✓	✓	✓			-	
5AC600.485I-00	✓	✓	✓	✓			✓	✓	✓	✓			-	
5AC801.SDL0-00	✓	✓	✓	✓			✓	✓	✓	✓			-	
5AC801.RDYR-00	✓	✓	✓	✓			✓	✓	✓	✓			-	
5ACPCI.RAIC-01 (24 hours/standard)	30/✓	30/✓	30/✓	30/40			✓	✓	✓	30/✓			-	
5ACPCI.RAIC-03	✓	✓	✓	✓			✓	✓	✓	✓			-	

1) Only possible with a CompactFlash card 5CFCRD.xxxx-03 from B&R.

Figure 12: Ambient temperatures without a fan kit

2.4.2 Maximum ambient temperature with a fan kit

Information:

- **Differentiating between up to 100 MBit or 1 GBit operation of ETH1 and ETH2.**
- **Vertical and horizontal (minus 5°C) mounting orientations are permitted (see also Chapter 3 "Commissioning", Section "Mountingorientation" on page 150).**

		ETH1: up to 100 MBit operation ETH2: up to 100 MBit operation					ETH1: up to 1 GBit operation ETH2: up to 1 GBit operation					Temperature limits	Location of sensor(s)
	All temperature values in degrees Celsius (°C) at 500 meters NN. **Derating the maximum ambient temperature (typically 1°C per 1000 meters above 500 NN.**	L2400 5PC800.B945-00	L7400 5PC800.B945-01	U7500 5PC800.B945-02	CM 423 5PC800.B945-03	T7400 5PC800.B945-04	L2400 5PC800.B945-00	L7400 5PC800.B945-01	U7500 5PC800.B945-02	CM 423 5PC800.B945-03	T7400 5PC800.B945-04		
	Maximum ambient temperature [1]	55	55	55	55	55	50	50	50	50	45		
	What can also be operated at the max. ambient temperature, or are there limits?												
Slide-in Compact	On-Board CompactFlash [2]	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	80	I/O
Slide-in Compact	5AC801.HDDI-00	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	80	I/O
Slide-in Compact	5AC801.HDDI-01	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	80	I/O
Slide-in Compact	5AC801.HDDI-02	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	80	I/O
Slide-in Option	5AC801.HDDS-00	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	80	Slide-in Drive
Slide-in Option	5AC801.DVDS-00	50	50	50	50	50	✓	✓	✓	✓	✓	50	Slide-in Drive
Slide-in Option	5AC801.DVRS-00	50	50	50	50	50	✓	✓	✓	✓	✓	50	Slide-in Drive
Main memory	5MMDDR.0512-01	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	-	
Main memory	5MMDDR.1024-01	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	-	
Main memory	5MMDDR.2048-01	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	-	
System unit	5PC810.SX01-00	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	80	Power supply
System unit	5PC810.SX02-00	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	80	Power supply
System unit	5PC810.SX05-00	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	80	Power supply
Additional insert cards Interfaces/ AP Link	5AC600.CANI-00	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	-	
Additional insert cards Interfaces/ AP Link	5AC600.485I-00	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	-	
Additional insert cards Interfaces/ AP Link	5AC801.SDL0-00	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	-	
Additional insert cards Interfaces/ AP Link	5AC801.RDYR-00	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	-	
Additional insert cards Interfaces/ AP Link	5ACPCI.RAIC-01(24 hours/standard)	30/40	30/40	30/40	30/40	30/40	30/40	30/40	30/40	30/40	30/40	-	
Additional insert cards Interfaces/ AP Link	5ACPCI.RAIC-03	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	-	

1) The maximum ambient temperature must be reduced by 5°C for horizontal installation!
2) Only possible with a CompactFlash card 5CFCRD.xxxx-03 available from B&R

Figure 13: Ambient temperatures with a fan kit

2.4.3 Minimum ambient temperature

For systems containing one of the following components, the minimum ambient temperature is +5°C: 5AC801.DVDS-00, 5AC801.DVRS-00, 5ACPCI.RAIC-01, 5ACPCI.RAIC-02. If none of these components are used, then the minimum ambient temperature is 0°C.

2.4.4 How do you determine the maximum ambient temperature?

1) Selection of the CPU board (use **with** or **without** fan kit).

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2) The "maximum ambient temperature" line shows the maximum ambient temperature for the entire system when using this CPU board.

> # Information:
>
> **Maximum temperature data is for operation at 500 meters. Derating the maximum ambient temperature - typically 1°C per 1000 meters (from 500 meters above sea level).**

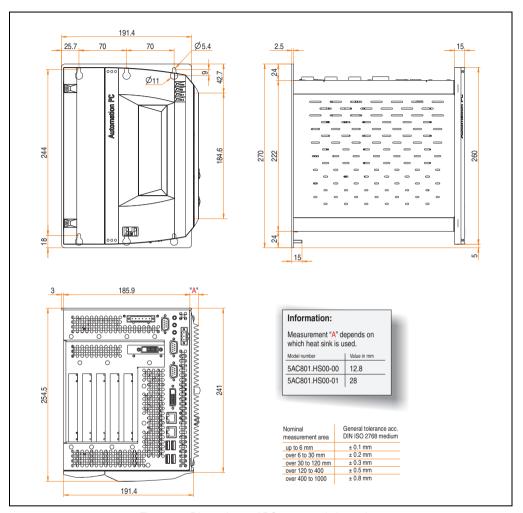3) Incorporating additional drives (add-on, slide-in), main memory, additional insert cards, etc. can change the temperature limits of an APC810 system.

If there is a "✓" (checkmark) next to the component, it can be used at the maximum ambient temperature of the whole system without problems.

If there is a specific temperature, for example "35", next to the component, then the ambient temperature of the whole APC810 system cannot exceed this temperature.

2.4.5 Temperature monitoring

Sensors monitor temperature values in various places (CPU, board, board I/O, board ETH2, board power supply, ETH2 controller, power supply and slide-in drives 1/2) on the APC810. The locations of the temperature sensors can be found in figure "Temperature sensor locations" on page 383. The value listed in the table represents the defined maximum temperature for this measurement point[1] . An alarm is not triggered when this temperature is exceeded. The temperatures[1] can be read in BIOS (menu item "Advanced" - Baseboard/panel features - Baseboard monitor) or in Microsoft Windows XP/embedded, using the B&R Control Center.
Additionally, the hard disks for PPC810 systems available from B&R are equipped with S.M.A.R.T, or Self Monitoring, Analysis, and Reporting Technology. This makes it possible to read various parameters, for example the temperature, using software (e.g. HDD thermometer - freeware) in Microsoft Windows XP/embedded.

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1) The measured temperature is a guideline for the immediate ambient temperature, but can be influenced by neighboring components.

2.5 Humidity specifications

The following table displays the minimum and maximum humidity for the individual components that are relevant for the humidity limitations of the entire device. The lowest and highest common values are always used when establishing these limits.

Relative humidity in %RH (non-condensing) at 30°C ambient temp.			
Components		**Operation**	**Storage / Transport**
945GME COM Express		10 - 90	5 - 95
System units (all types)		5 - 90	5 - 95
Main memory for CPU boards		10 - 90	5 - 95
Slide-in drives	5AC801.HDDI-00	5 - 90	5 - 95
	5AC801.HDDI-01	5 - 90	5 - 95
	5AC801.HDDI-02	8 - 90	5 - 95
	5AC801.HDDS-00	5 - 90	5 - 95
	5AC801.DVDS-00	8 - 80	5 - 95
	5AC801.DVRS-00	8 - 80	5 - 95
Additional insert cards Interfaces AP Link	5AC801.SDL0-00	5 - 90	5 - 95
	5AC801.RDYR-00	5 - 90	5 - 95
	5ACPCI.RAIC-01	8 - 90	5 - 95
	5ACPCI.RAIC-02	8 - 90	5 - 95
	5ACPCI.RAIC-03	8 - 90	5 - 95
	5ACPCI.RAIC-04	8 - 90	5 - 95
	5AC600.CANI-00	5 - 90	5 - 95
	5AC600.485I-00	5 - 90	5 - 95
Accessories	Compact Flash cards 5CFCRD.xxxx-03	8 - 95	8 - 95
	Flash drive 5MMUSB.2048-00	10 - 90	5 - 90
	USB Media Drive 5MD900.USB2-01	20 - 80	5 - 90

Figure 14: Overview of humidity specifications for individual components

The listed tasks correspond to the humidity at an ambient temperature of 30°C. More detailed information about the specific temperature-dependent humidity values can be found in the technical data of the individual components.

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Technical data

2.6 Power management

2.6.1 Power management 5PC810.SX01-00, 5PC810.SX02-00 and 5PC810.SX05-00.

The following block diagram presents the simplified structure of the APC810 supply voltage for system units 5PC810.SX01-00, 5PC810.SX02-00 and 5PC810.SX05-00.
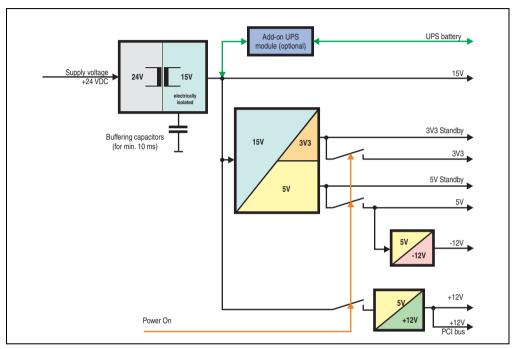
Figure 15: Supply voltage 1, 2 and 5 card slot system units

Description

The supply voltage is converted to 15 V with a DC/DC converter. These electrically isolated 15 V feed further DC/DC converters, which generate the remaining voltages.

After the system is turned on (e.g. using the power button), the voltages 3V3 and 5 V are placed on the bus. At the 5 V output, yet another DC/DC converter generates -12 V, and places these on the bus. An additional DC/DC converter generates +12 V.

The optional Add-on UPS (with battery unit) is supplied with 15 V and provides an uninterrupted power supply from the 15 V bus during power failures.

2.6.2 Powercalculation with 5PC810.SX01-00 Revision >= D0

Information:			CPU Boards					This system
			L2400 5PC800.B945-00	L7400 5PC800.B945-01	U7500 5PC800.B945-02	CM423 5PC800.B945-03	T7400 5PC800.B945-04	Enter values in this column
All entries in watts The entries for the **Generator** are maximum values. Entries for the **Device** are determined maximum values, but not peak values.								
Total power supply (max.)								130
	Add-on UPS module, optional		7.5	7.5	7.5	7.5	7.5	
	max. possible at +12V							75
+12V	CPU Board, fixed device		26	30	18	14	43	
	512MB RAM, max. 2 pcs. each 1.5 watts							
	1024MB RAM, max. 2 pcs. each 2.5 watts							
	2048MB RAM, max. 2 pcs. each 3 watts							
	Fan kit, optional		1.8	1.8	1.8	1.8	1.8	
	External keyboard, optional (via Baseboard)		10	10	10	10	10	
	PCI card manufacturer limit, optional (max. 3 watts without fan kit, max. 6 watts with fan kit) [1]							
	PCIe x4 card manufacturer limit, optional (max. 3 watts without fan kit, max. 20 watts with fan kit) [1]							
	Devices +12V ∑							
+5V	**max. possible at +5V**							65
	System unit, fixed device		4	4	4	4	4	
	Hard Disk (slide-in compact)		4	4	4	4	4	
	USB Peripheral USB2 and USB4, each 2.5 watts							
	USB Peripheral USB1, USB3 and USB5, each 5 watts							
	Interface option (Add-on interface), optional		0.5	0.5	0.5	0.5	0.5	
	External device, optional (via BaseBoard)		5	5	5	5	5	
	PCI card manufacturer limit, optional (max. 3 watts without fan kit, max. 20 watts with fan kit) [1]							
-12V	**max. possible at -12V**							1,2
	PCI card manufacturer limit, optional (max. 1.2 watts with and without fan kit) [1]							
	Devices -12V ∑							
	Devices 5V ∑							
3V3	**max. possible at 3V3**							40
	System unit, fixed device		4	4	4	4	4	
	CompactFlash, each 1 watt							
	Interface option (Add-on interface), optional		0.25	0.25	0.25	0.25	0.25	
	PCI card manufacturer limit, optional (max. 3 watts without fan kit, max. 15 watts with fan kit) [1]							
	PCIe x4 card manufacturer limit, optional (max. 3 watts without fan kit, max. 10 watts with fan kit) [1]							
	Devices 3V3 ∑							
	Devices ∑							

1) The total performance of one PCI/PCIe card per PCI slot (= sum of power consumptions for each voltage area) may not exceed the limits stated for operation with or without a fan kit. .

Figure 16: Power calculation with 5PC810.SX01-00 revision >= D0

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2.6.3 Power calculation with 5PC810.SX01-00 revision < D0

Information:		CPU Boards					This system
		L2400 5PC800.B945-00	L7400 5PC800.B945-01	U7500 5PC800.B945-02	CM423 5PC800.B945-03	T7400 5PC800.B945-04	Enter values in this column
All entries in watts The entries for the **Generator** are maximum values. Entries for the **Device** are determined maximum values, but not peak values.							⬇
Total power supply (max.)							**85**
	Add-on UPS module, optional	7.5	7.5	7.5	7.5	7.5	
	max. possible at +12V						**75**
+12V	CPU Board, fixed device	26	30	18	14	43	
	512MB RAM, max. 2 pcs. each 1.5 watts						
	1024MB RAM, max. 2 pcs. each 2.5 watts						
	2048MB RAM, max. 2 pcs. each 3 watts						
	Fan kit, optional	1.8	1.8	1.8	1.8	1.8	
	External keyboard, optional (via Baseboard)	10	10	10	10	10	
	PCI card manufacturer limit, optional (max. 3 watts without fan kit, max. 6 watts with fan kit) [1]						
	PCIe x4 card manufacturer limit, optional (max. 3 watts without fan kit, max. 20 watts with fan kit) [1]						
	Devices +12V ∑						
	max. possible at +5V						**65**
+5V	System unit, fixed device	4	4	4	4	4	
	Hard Disk (slide-in compact)	4	4	4	4	4	
	USB Peripheral USB2 and USB4, each 2.5 watts						
	USB Peripheral USB1, USB3 and USB5, each 5 watts						
	Interface option (Add-on interface), optional	0.5	0.5	0.5	0.5	0.5	
	External device, optional (via BaseBoard)	5	5	5	5	5	
	PCI card manufacturer limit, optional (max. 3 watts without fan kit, max. 20 watts with fan kit) [1]						
	max. possible at -12V						**1,2**
-12V	PCI card manufacturer limit, optional (max. 1.2 watts with and without fan kit) [1]						
	Devices -12V ∑						
	Devices 5V ∑						
	max. possible at 3V3						**40**
3V3	System unit, fixed device	4	4	4	4	4	
	CompactFlash, each 1 watt						
	Interface option (Add-on interface), optional	0.25	0.25	0.25	0.25	0.25	
	PCI card manufacturer limit, optional (max. 3 watts without fan kit, max. 15 watts with fan kit) [1]						
	PCIe x4 card manufacturer limit, optional (max. 3 watts without fan kit, max. 10 watts with fan kit) [1]						
	Devices 3V3 ∑						
	Devices ∑						

1) The total performance of one PCI/PCIe card per PCI slot (= sum of power consumptions for each voltage area) may not exceed the limits stated for operation with or without a fan kit. .

Figure 17: Power calculation with 5PC810.SX01-00 revision < D0

2.6.4 Powercalculation with 5PC810.SX02-00 Revision>= D0

Information: **All entries in watts** The entries for the **Generator** are maximum values. Entries for the **Device** are determined maximum values, but not peak values.			CPU Boards					This system
			L2400 5PC800.B945-00	L7400 5PC800.B945-01	U7500 5PC800.B945-02	CM423 5PC800.B945-03	T7400 5PC800.B945-04	Enter values in this column
Total power supply (max.)								130
	Add-on UPS module, optional		7.5	7.5	7.5	7.5	7.5	
	maximum possible at +12V							75
+12V	CPU Board, fixed device		26	30	18	14	43	
	512MB RAM max. 2 pcs. each 1.5 watts							
	1024MB RAM max. 2 pcs. each 2.5 watts							
	2048MB RAM max. 2 pcs. each 3 watts							
	Fan kit, optional		2.8	2.8	2.8	2.8	2.8	
	External device, optional (via Baseboard)		10	10	10	10	10	
	PCI card manufacturer limit, optional (max. 3 watts without fan kit, max. 6 watts with fan kit) [1]							
	PCI card manufacturer PCIe x4 Karte, optional (max. 3 watts without fan kit, max. 20 watts with fan kit) [1]							
	Devices +12V $\sum$							
+5V	**max. possible at +5V**							65
	System unit, fixed device		4	4	4	4	4	
	Hard disk (slide-in compact)		4	4	4	4	4	
	Slide-in drive (hard disk, DVD-ROM,...)		4	4	4	4	4	
	USB peripheral USB2 and USB4 each 2.5 watts							
	USB peripheral USB1, USB3 and USB5 each 5 watts							
	Interface option (Add-on interface), optional		0.5	0.5	0.5	0.5	0.5	
	Graphics adapter (AP Link), optional		5	5	5	5	5	
	External device, optional (via BaseBoard)		5	5	5	5	5	
	PCI card manufacturer PCI card, optional (max. 3 watts without fan kit, max. 20 watts with fan kit) [1]							
-12V	**max. possible at -12V**							1.2
	PCI card manufacturer PCI card, optional (max. 1.2 watts with and without fan kit)[1]							
	Device -12V $\sum$							
	Device 5V $\sum$							
3V3	**max. possible at 3V3**							40
	System unit, fixed device		4	4	4	4	4	
	CompactFlash, each 1 watt							
	Interface option (Add-on Interface), optional		0.25	0.25	0.25	0.25	0.25	
	Graphics adapter (AP Link), optional		1.5	1.5	1.5	1.5	1.5	
	PCI card manufacturer PCI card, optional (max. 3 watts without fan kit, max. 15 watts with fan kit) [1]							
	PCI card manufacturer PCIe x4 card, optional (max. 3 watst without fan kit, max. 10 watts with fan kiit) [1]							
	Device 3V3 $\sum$							
	Device $\sum$							

1) The total performance of one PCI/PCIe card per PCI slot (= sum of power consumptions for each voltage area) may not exceed the limits stated for operation with or without a fan kit. .

Figure 18: Power calculation with 5PC810.SX02-00 revision >= D0

2.6.5 Power calculation with 5PC810.SX02-00 revision < D0

Information:		CPU Boards						This system
		L2400	L7400	U7500	CM423	T7400		
All entries in watts The entries for the **Generator** are maximum values. Entries for the **Device** are determined maximum values, but not peak values.		5PC800.B945-00	5PC800.B945-01	5PC800.B945-02	5PC800.B945-03	5PC800.B945-04		Enter values in this column
	Total power supply (max.)							85
	Add-on UPS module, optional	7.5	7.5	7.5	7.5	7.5		
	maximum possible at +12V							75
+12V	CPU Board, fixed device	26	30	18	14	43		
	512MB RAM max. 2 pcs. each 1.5 watts							
	1024MB RAM max. 2 pcs. each 2.5 watts							
	2048MB RAM max. 2 pcs. each 3 watts							
	Fan kit, optional	2.8	2.8	2.8	2.8	2.8		
	External device, optional (via Baseboard)	10	10	10	10	10		
	PCI card manufacturer limit, optional (max. 3 watts without fan kit, max. 6 watts with fan kit) [1]							
	PCI card manufacturer PCIe x4 Karte, optional (max. 3 watts without fan kit, max. 20 watts with fan kit) [1]							
	Devices +12V Σ							
	max. possible at +5V							65
+5V	System unit, fixed device	4	4	4	4	4		
	Hard disk (slide-in compact)	4	4	4	4	4		
	Slide-in drive (hard disk, DVD-ROM,...)	4	4	4	4	4		
	USB peripheral USB2 and USB4 each 2.5 watts							
	USB peripheral USB1, USB3 and USB5 each 5 watts							
	Interface option (Add-on interface), optional	0.5	0.5	0.5	0.5	0.5		
	Graphics adapter (AP Link), optional	5	5	5	5	5		
	External device, optional (via BaseBoard)	5	5	5	5	5		
	PCI card manufacturer PCI card, optional (max. 3 watts without fan kit, max. 20 watts with fan kit) [1]							
	max. possible at -12V							1.2
-12V	PCI card manufacturer PCI card, optional (max. 1.2 watts with and without fan kit) [1]							
	Device -12V Σ							
	Device 5V Σ							
	max. possible at 3V3							40
3V3	System unit, fixed device	4	4	4	4	4		
	CompactFlash, each 1 watt							
	Interface option (Add-on Interface), optional	0.25	0.25	0.25	0.25	0.25		
	Graphics adapter (AP Link), optional	1.5	1.5	1.5	1.5	1.5		
	PCI card manufacturer PCI card, optional (max. 3 watts without fan kit, max. 15 watts with fan kit) [1]							
	PCI card manufacturer PCIe x4 card, optional (max. 3 watst without fan kit, max. 10 watts with fan kiit) [1]							
	Device 3V3 Σ							
	Device Σ							

[1] The total performance of one PCI/PCIe card per PCI slot (= sum of power consumptions for each voltage area) may not exceed the limits stated for operation with or without a fan kit. .

Figure 19: Power calculation with 5PC810.SX02-00 revision < D0

2.6.6 Power calculation with 5PC810.SX05-00 revision

Information:		CPU Boards					This system
		L2400	L7400	U7500	CM423	T7400	Enter values in this column
All entries in watts The entries for the **Generator** are maximum values. Entries for the **Device** are determined maximum values, but not peak values.		5PC800.B945-00	5PC800.B945-01	5PC800.B945-02	5PC800.B945-03	5PC800.B945-04	
Total power supply (max.)							**130**
	Add-on UPS module, optional	7.5	7.5	7.5	7.5	7.5	
maximum possible at +12V							**75**
+12V	CPU Board, fixed device	26	30	18	14	43	
	512MB RAM max. 2 pcs. each 1.5 watts						
	1024MB RAM max. 2 pcs. each 2.5 watts						
	2048MB RAM max. 2 pcs. each 3 watts						
	Fan kit, optional	2.8	2.8	2.8	2.8	2.8	
	External device, optional (via Baseboard)	10	10	10	10	10	
	PCI card manufacturer limit, optional (max. 3 watts without fan kit, max. 6 watts with fan kit) [1]						
	PCI card manufacturer PCIe x4 Karte, optional (max. 3 watts without fan kit, max. 20 watts with fan kit) [1]						
	Devices +12V ∑						
max. possible at +5V							**65**
+5V	System unit, fixed device	4	4	4	4	4	
	Hard disk (slide-in compact)	4	4	4	4	4	
	Slide-in drive (hard disk, DVD-ROM,...)	4	4	4	4	4	
	USB peripheral USB2 and USB4 each 2.5 watts						
	USB peripheral USB1, USB3 and USB5 each 5 watts						
	Interface option (Add-on interface), optional	0.5	0.5	0.5	0.5	0.5	
	Graphics adapter (AP Link), optional	5	5	5	5	5	
	External device, optional (via BaseBoard)	5	5	5	5	5	
	PCI card manufacturer PCI card, optional (max. 3 watts without fan kit, max. 20 watts with fan kit) [1]						
max. possible at -12V							**1.2**
-12V	PCI card manufacturer PCI card, optional (max. 1.2 watts with and without fan kit) [1]						
	Device -12V ∑						
	Device 5V ∑						
max. possible at 3V3							**40**
3V3	System unit, fixed device	4	4	4	4	4	
	CompactFlash, each 1 watt						
	Interface option (Add-on Interface), optional	0.25	0.25	0.25	0.25	0.25	
	Graphics adapter (AP Link), optional	1.5	1.5	1.5	1.5	1.5	
	PCI card manufacturer PCI card, optional (max. 3 watts without fan kit, max. 15 watts with fan kit) [1]						
	PCI card manufacturer PCIe x4 card, optional (max. 3 watst without fan kit, max. 10 watts with fan kiit) [1]						
	Device 3V3 ∑						
	Device ∑						

1) The total performance of one PCI/PCIe card per PCI slot (= sum of power consumptions for each voltage area) may not exceed the limits stated for operation with or without a fan kit. .

Figure 20: Power calculation with 5PC810.SX05-00

2.7 Serialnumber sticker

Each B&R device is assigned a unique serial number label with a bar code (type 128), which allows the device to be clearly identified. The serial number for the entire device is located behind the front door. This serial number represents all of the components built into the system (model number, name, revision, serial number, delivery date and duration of warranty).

Figure 21: Serial number sticker (front)

A sticker with detailed information about the individual components can also be found on the back side of the mounting plate.
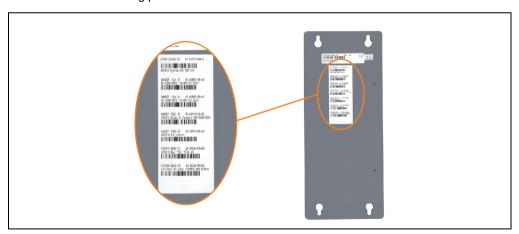
Figure 22: Serial number sticker (back)

This information can also be found on the B&R homepage. Enter the serial number of the entire device (found behind the front door) in the serial number search field on the start page **www.br-automation.com**. The search provides you with a detailed list of the individual components.
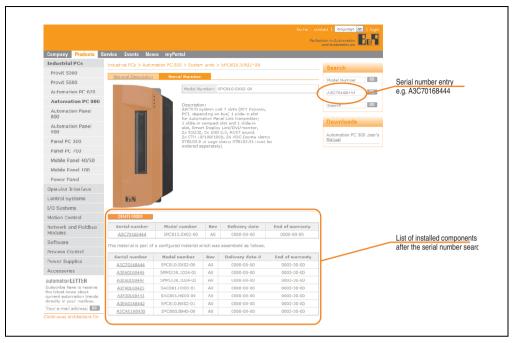
Figure 23: Example of serial number search - A3C70168444

2.8 Block diagram

The following block diagrams show the simplified structure of system units with a CPU board that depend on different bus units.

2.8.1 System unit 5PC810.SX01-00 + bus unit 5PC810.BX01-00
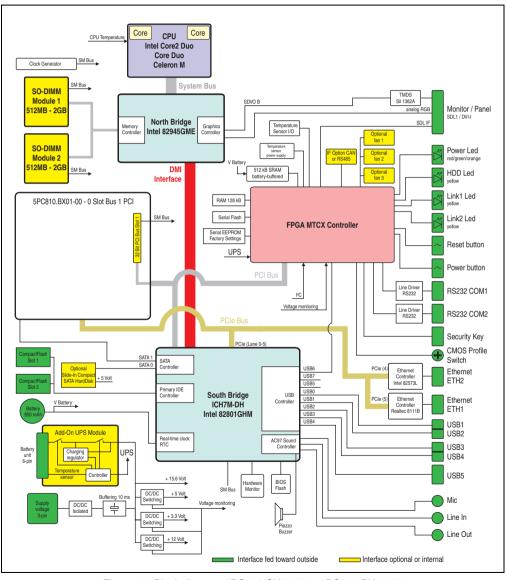
Figure 24: Block diagram 5PC810.SX01-00 + 5PC810.BX01-00

2.8.2 System unit 5PC810.SX01-00 + bus unit 5PC810.BX01-01
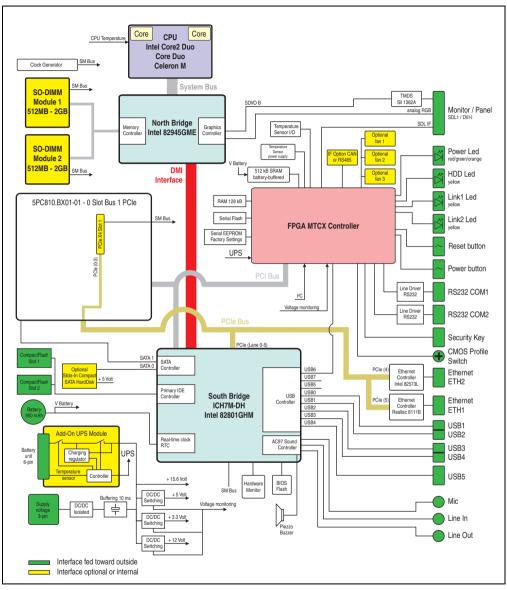
Figure 25: Block diagram 5PC810.SX01-00 + 5PC810.BX01-01

2.8.3 System unit 5PC810.SX02-00 + bus unit 5PC810.BX02-00
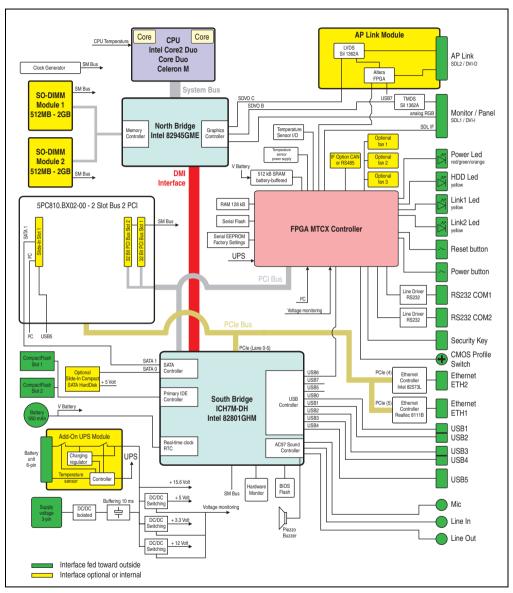
Figure 26: Block diagram 5PC810.SX02-00 + 5PC810.BX02-00

2.8.4 System unit 5PC810.SX02-00 + bus unit 5PC810.BX02-01
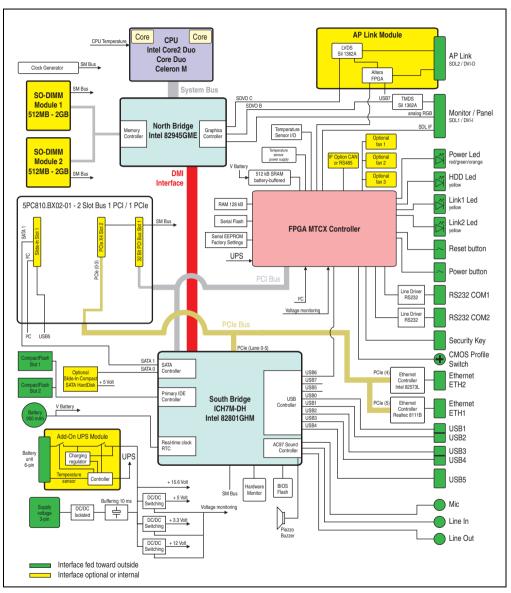
Figure 27: Block diagram 5PC810.SX02-00 + 5PC810.BX02-01

2.8.5 System unit 5PC810.SX05-00 + bus unit 5PC810.BX05-00
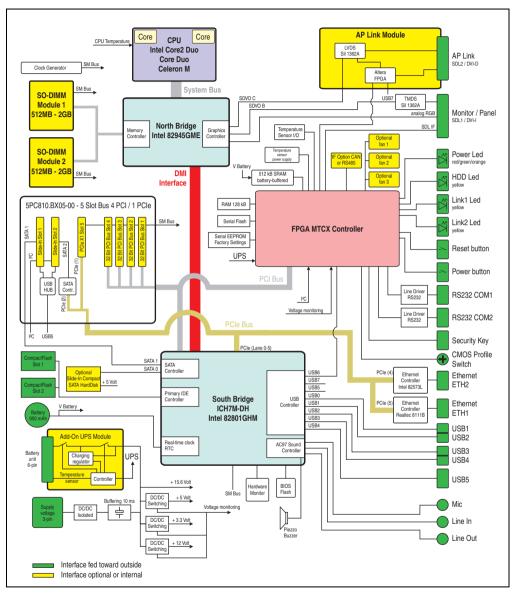
Figure 28: Block diagram 5PC810.SX05-00 + 5PC810.BX05-00

2.8.6 System unit 5PC810.SX05-00 + bus unit 5PC810.BX05-01
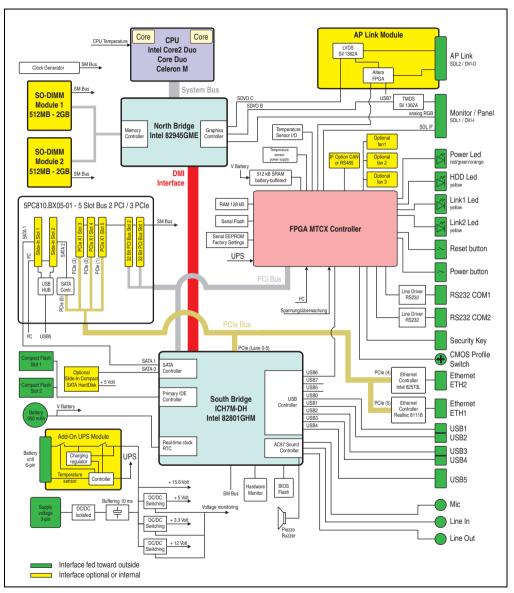
Figure 29: Block diagram 5PC810.SX05-00 + 5PC810.BX05-01

2.9 Device interfaces

2.9.1 +24 VDC supply voltage

The 3-pin socket required for the supply voltage connection is not included in delivery. This can be ordered from B&R using the model number 0TB103.9 (screw clamp) or 0TB103.91 (cage clamp).

The pin assignments can be found either in the following table or printed on the APC810 housing. The supply voltage is protected internally by a soldered fuse (15A, fast-acting), so that the device cannot be damaged if there is an overload (fuse replacement necessary) or if the voltage supply is connected incorrectly (reverse polarity protection - fuse replacement not necessary). The device must be returned to B&R for repairs if the fuse is blown because of an error.

Supply voltage		
Protected against reverse polarity		3-pin, male
Pin	**Description**	
1	-	
2	Functional grounding	
3	+	
Accessories		
0TB103.9	Plug 24 V 5.08 3p screw clamps	
0TB103.91	Plug 24 V 5.08 3p cage clamps	
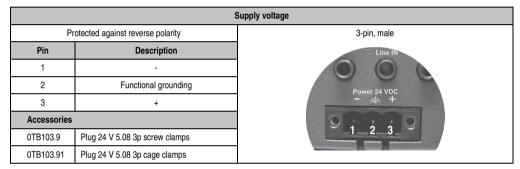
Table 18: Supply voltage connection + 24VDC

Ground

Important!

The pin's connection to the functional ground (pin 2, e.g. switching cabinet) should be as short as possible. We recommend using the largest possible conductor cross section on the supply plug.

The grounding connection is located on the bottom of the APC810 systems.

Figure 30: Ground connection

The M4 self-locking nut can be used, for example, to fasten a copper strip that is built into the APC810 at a central grounding point in the switching cabinet or system. The largest possible conductor cross section should be used (at least 2.5 mm²).

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2.9.2 Serial interface COM1

Serial interfaces COM1[1]		
Type	RS232, modem-capable, not electrically isolated	
UART	16550-compatible, 16-byte FIFO	
Transfer rate	Max. 115 kBaud	9-pin DSUB male
Cable length	Max. 15 meters	
Pin	**Assignment**	
1	DCD	
2	RXD	
3	TXD	
4	DTR	
5	GND	
6	DSR	
7	RTS	
8	CTS	
9	RI	

Table 19: Pin assignments - COM1

1) The interfaces, etc. available on the device or module were numbered accordingly for easy identification. This numbering can differ from the numbering used by the particular operating system.

2.9.3 Serial interface COM2

Serial interfaces COM2[1]		
Type	RS232, modem-capable, not electrically isolated	
UART	16550-compatible, 16-byte FIFO	9-pin DSUB male
Transfer rate	Max. 115 kBaud	
Cable length	Max. 15 meters	
Pin	**Assignment**	
1	DCD	
2	RXD	
3	TXD	
4	DTR	
5	GND	
6	DSR	
7	RTS	
8	CTS	
9	RI	

Table 20: Pin assignments - COM2

1) The interfaces, etc. available on the device or module were numbered accordingly for easy identification. This numbering can differ from the numbering used by the particular operating system.

2.9.4 Monitor / Panel connection - SDL (Smart Display Link / DVI)

Monitor / Panel connection - SDL (Smart Display Link / DVI)		
The following will provide an overview of the video signals available on the monitor/panel output.		
CPU board	**Video signals with all system unit variations**	
5PC800.B945-00	RGB, DVI, SDL	
5PC800.B945-01	RGB, DVI, SDL	
5PC800.B945-02	RGB, DVI, SDL	
5PC800.B945-03	RGB, DVI, SDL	
5PC800.B945-04	RGB, DVI, SDL	

Table 21: Monitor / Panel connection - RGB, DVI, SDL

2.9.5 Ethernet 1 (ETH1)

This Ethernet controller is integrated in the CPU board and is fed outwards via the system unit.

Ethernet 1 connection (ETH1[1])				
Controller	Relate RTL8111B			
Cabling	S/STP (Cat5e)			
Transfer rate	10/100/1000 MBit/s [2]			
Cable length	max. 100 m (min. Cat5e)			
Speed LED	**On**	**Off**		
Green	100 MBit/s	10 MBit/s[3]		
Orange	1000 MBit/s	-		
Link LED	**On**	**Off**		
Orange	Link (Ethernet network connection available)	Activity (blinking) (Data transfer in progress)		

RJ45 twisted pair (10BaseT/100BaseT), female

Speed LED (green / orange)   Link LED (orange)

ETH1

Table 22: Ethernet connection (ETH1)

1) The interfaces, etc. available on the device or module were numbered accordingly for easy identification. This numbering can differ from the numbering used by the particular operating system.

2) Change-over takes place automatically.

3) The 10 MBit/s transfer speed / connection is only present if the Link LED is simultaneously active.

Important information on transfer speed

Because of thermal factors, operation of the ETH1 in 1000 MBit/s mode is only permitted with use of a fan kit (see also Section 2.4 "Ambient temperatures" on page 50).

Driver support

A special driver is necessary for operating the Realtek Ethernet controllers RTL8111B. The necessary software can be downloaded from the download area on the B&R homepage (**www.br-automation.com**).

Information:

Required drivers can only be downloaded from the B&R homepage, not from manufacturers' pages.

2.9.6 Ethernet 2 (ETH2)

This Ethernet controller is integrated in the main board and is fed outwards via the system unit.

Ethernet 2 connection (ETH2[1])			
Controller	Intel 82573L		RJ45 twisted pair (10BaseT/100BaseT), female
Cabling	S/STP (Cat5e)		
Transfer rate	10/100/1000 MBit/s [2]		Speed LED (green / orange) Link LED (orange)
Cable length	max. 100 m (min. Cat5e)		
Speed LED	**On**	**Off**	
Green	100 MBit/s	10 MBit/s[3]	
Orange	1000 MBit/s	-	
Link LED	**On**	**Off**	ETH2
Orange	Link (Ethernet network connection available)	Activity (blinking) (Data transfer in progress)	

Table 23: Ethernet connection (ETH2)

1) The interfaces, etc. available on the device or module were numbered accordingly for easy identification. This numbering can differ from the numbering used by the particular operating system.

2) Change-over takes place automatically.

3) The 10 MBit/s transfer speed / connection is only present if the Link LED is simultaneously active.

Driver support

A special driver is necessary for operating the Intel Ethernet controller 82573L. The necessary software can be downloaded from the download area on the B&R homepage (**www.br-automation.com**).

Information:

Required drivers can only be downloaded from the B&R homepage, not from manufacturers' pages.

2.9.7 USB interfaces (USB1, 2, 3, 4)

The APC810 devices have a USB 2.0 (Universal Serial Bus) host controller with multiple USB ports, two of which are on the outside for easy access.

Warning!

Peripheral USB devices can be connected to the USB interfaces. Due to the vast number of USB devices available on the market, B&R cannot guarantee their performance. B&R does assure the performance of all USB devices that they provide.
See Chapter3 "Commissioning", Section "Connection of USB peripheral devices" on page 184 for additional information.

Important!

Because of general PC specifications, this interface should be handled with extreme care with regard to EMC, location of cables, etc.

USB1,2,3,4

Universal Serial Bus (USB1, USB2, USB3, USB4)[1]	
Transfer rate	Low speed (1.5 MBit/s), Full speed (12 MBit/s) to High speed (480 Mbit/s)	4 x USB type A, female
Power Supplies[2] USB1, USB3 USB2, USB4	Max. 1 A Max. 500 mA	
Maximum cable length	5 m (without hub)	

Table 24: USB1, USB2, USB3, USB4 connection

1) The interfaces, etc. available on the device or module were numbered accordingly for easy identification. This numbering can differ from the numbering used by the particular operating system.

2) For safety, every USB port is equipped with a maintenance free "USB current-limiting circuit breaker" (max. 500 mA or 1 A).

USB5

Universal Serial Bus (USB5)[1]		
Transfer rate	Low speed (1.5 MBit/s), full speed (12 MBit/s), to high speed (480 Mbit/s)	4 x USB type A, female
Power Supplies[2] USB5	Max. 1 A	
Maximum cable length	5 m (without hub)	

Table 25: USB5 connection

1) The interfaces, etc. available on the device or module were numbered accordingly for easy identification. This numbering can differ from the numbering used by the particular operating system.

2) For safety, every USB port is equipped with a maintenance free "USB current-limiting circuit breaker" (max. 1 A).

2.9.8 MIC, Line IN, Line OUT

All APC810 systems include an AC97 (Rev 2.2) compatible sound chip with access to the channels MIC, Line IN and Line OUT from the outside.

MIC, Line IN, Line OUT		
Controller	Realtek AC97 Rev. 2.2	3.5 mm socket, female
MIC	Connection for a mono microphone via 3.5 mm stereo (headphone) jack.	
Line IN	Stereo Line IN signals supplied via 3.5 mm plug.	
Line OUT	Connection for a stereo sound reader (e.g. amplifier) via a 3.5 mm plug.	

Table 26: MIC, Line IN, Line OUT

Driver support

A special driver is necessary for operating the audio controller. The necessary software can be downloaded from the download area on the B&R homepage (**www.br-automation.com**).

Information:

Required drivers can only be downloaded from the B&R homepage, not from manufacturers' pages.

2.9.9 Add-on interface slot

An optional add-on interface (e.g. CAN, RS485) can be installed here. See also 3.9 "Interface options (IF option)" on page 137.

Add-on interface slot		
Available add-on interfaces		
5AC600.CANI-00	Add-on CAN interface	
5AC600.458I-00	Add-on RS232/422/458 interface	
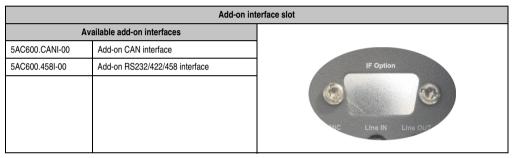
Table 27: Add-on interface slot

2.9.10 Add-on UPS slot

An optional Automation PC add-on UPS module can be installed here.

Add-on UPS slot		
Add-on UPS + accessories		
5AC600.UPSI-00	Add-on UPS module	
5AC600.UPSB-00	Battery unit 5 Ah	
5CAUPS.0005-00	UPS cable 0.5 m	
5CAUPS.0030-00	UPS cable 3 m	
Pin assignments with mounted add-on UPS module		
1	+	
2	+	
3	-	
4	-	
5	NTC (for battery temperature measurement	
6	NTC (for battery temperature measurement	

Table 28: Add-on UPS slot (with and without mounted UPS)

2.9.11 AP Link slot

When connected with the AP Link card 5AC801.SDL0-00, it is possible to implement a second graphic line with DVI and SDL, but without RGB signals. Furthermore, the APC810 ready relay 5AC801.RDYR-00 can also be mounted.

Information:

Installation of AP Link cards is only possible in connection with the system units 5PC810.SX02-00 and 5PC810.SX05-00.

2.9.12 Card slot (PCI / PCIe)

Standard PCI 2.2 half-size cards or PCI Express (PCIe) half-size cards can be plugged in depending on the type of bus unit. They cannot exceed the following dimensions.
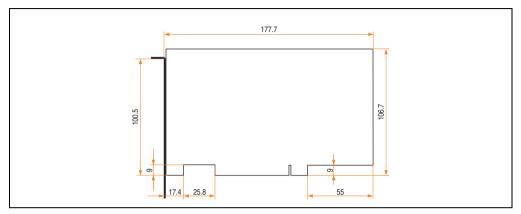
Figure 31: Dimensions - Standard half-size PCI card
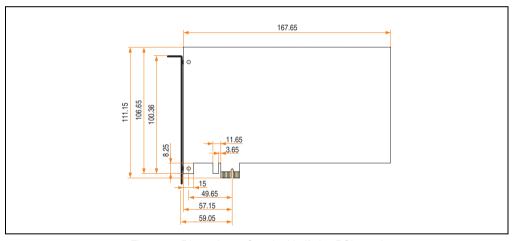
Figure 32: Dimensions - Standard half-size PCIe card

2.9.13   status LEDs

The status LEDs are in the system unit.

Status LEDs				
LED	**Color**		**Meaning**	
Power	Green	On	Supply voltage OK	
	Red	On	The system is in standby mode (S5: soft-off mode or S4: hibernate mode -Suspend-to-Disk)	
	Orange 1)	On	Supply voltage not OK; the system is operating on battery power.	
HDD	Yellow	On	Signals IDE drive access (CF, HDD, CD, etc.)	
Link 1	Yellow	On	Indicates an active SDL connection on the monitor / panel plug.	
		blink ing	An active SDL connection has been interrupted by a loss of power in the display unit.	
Link 2	Yellow	On	Indicates an active SDL connection on the AP Link.	
		blink ing	An active SDL connection on the AP link has been interrupted by a loss of power in the display unit.	

Table 29: Data - status LEDs

1) Only lit when add-on UPS module is installed.

The light for the status LEDs is fed to the front cover via fiber optic lines.
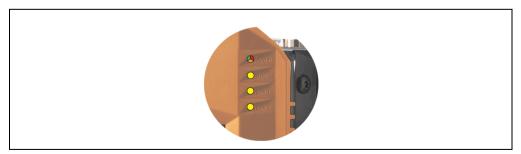
Figure 33: Front-side status LEDs

2.9.14 CMOS profile switch

CMOS profile switch	
Different BIOS default value profiles can be defined using the 16-position CMOS profile switch.	

Switch position	Description
0	Profile 0: Default profile reserved.
1	Profile 1: Optimized for system units 5PC810.SX01-00 and 5PC810.SX02-00
2	Profile 2: Optimized for system unit 5PC810.SX05-00

Table 30: CMOS profile switch

Information:

The switch position that is set upon delivery represents the optimum BIOS default values for this system and should therefore not be changed.

The position of the CMOS profile switch is is displayed in the BIOS setup pages and in the B&R ADI Control Center, among other places.

2.9.15 Power button

The power button has a variety of functions due to full ATX power supply support.

Power button
The power button can be pressed with a pointed object (i.e. paper clip or tip of a pen). The power button acts like the on/off switch on a normal desktop PC with ATX power supply: **press and release** ... Switches on APC810 or shuts down operating system and switches off the APC810. **press and hold** ... ATX power supply switches off without shutting down the APC810 (**data could be lost!**). Pressing the power button does not reset the MTCX processor.

Table 31: Power button

2.9.16 Reset button

Information:

From MTCX PX32 firmware ≥ V00.11 and higher, the reset button is only triggered by edges. This means that the device boots even when the reset button is pressed. In MTCX PX32 firmware < V00.11, the system does not start after pressing (ca. 10 seconds) and releasing the reset button.

Reset button
The reset button can be pressed with a pointed object (i.e. paper clip or tip of a pen). Pushing the reset button results in a hardware-reset, PCI-reset. The APC810 is restarted (cold restart). The MTCX processor is not reset when the reset button is pressed.	

Table 32: Reset button

Warning!

A system reset can cause data to be lost!

2.9.17 Battery

The lithium battery (3 V, 950 mAh) buffers the internal real-time clock (RTC) as well as the individually saved BIOS settings and data in the SRAM and is located behind the black cover. The buffer duration of the battery is at least 2 1/2 years (at 50°C, 8.5 mA current requirements of the supplied components and a self discharge of 40%). The battery is subject to wear and should be replaced regularly (at least following the specified buffer duration).

Battery		

Battery
    Type
    Removable
    Lifespan
	Renata 950 mAh
	Yes, accessible from the outside
	2 1/2 years[1]	

Accessories	**Short description**	
0AC201.9	**Lithium batteries (5x)** Lithium batteries (5 pcs.), 3 V / 950 mAh, button cell	
4A0006.00-000	**Lithium battery (1x)** Lithium battery (1 pcs.), 3 V / 950 mAh, button cell	
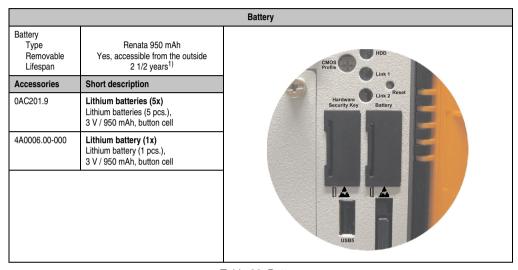
Table 33: Battery

1) At 50 ?, 8.5 µA of the supplied components and a self discharge of 40%.

Battery status evaluation

The battery status is evaluated immediately following start-up of the device and is subsequently checked by the system every 24 hours. The battery is subjected to a brief load (1 second) during the measurement and then evaluated. The evaluated battery status is displayed i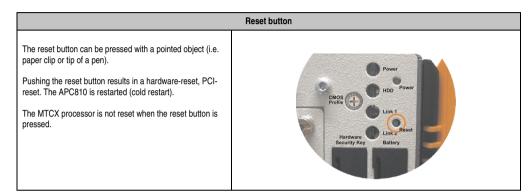n the BIOS Setup pages (under Advanced - Baseboard monitor) and in the B&R Control Center (ADI driver), but can also be read in a customer application via the ADI Library.

Battery status	Meaning
N/A	Hardware, i.e. firmware used is too old and does not support read.
Good	Data buffering is guaranteed
Bad	Data buffering is guaranteed for approx. another 500 hours from the point in time that the battery capacity is determined to be BAD (insufficient).

Table 34: Meaning of battery status

2.9.18 Hardware security key

B&R recommends a hardware security key (dongle) based on the DS1425 from MAXIM (previously Dallas Semiconductors) for software copy protection.

Hardware security key
A hardware security key (dongle) can be inserted behind the black cover.
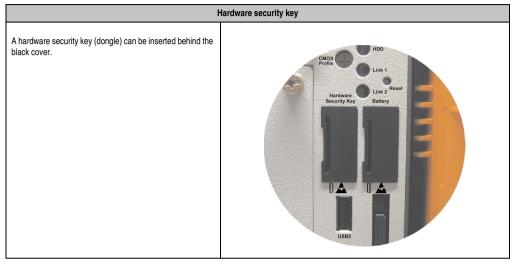
Table 35: Hardware security key

Warning!

Turn off power before removing or adding the hardware security key.

2.9.19 CompactFlash slot 1

This CompactFlash slot is a fixed part of an APC810 system, is internally connected with the chipset via IDE PATA. Type I CompactFlash cards are supported.

CompactFlash slot (CF1)		
Connection	PATA Master	
CompactFlash Type	Type I	
Accessories	**Short description**	
5CFCRD.0064-03	CompactFlash 64 MB SSI	
5CFCRD.0128-03	CompactFlash 128 MB SSI	
5CFCRD.0256-03	CompactFlash 256 MB SSI	
5CFCRD.0512-03	CompactFlash 512 MB SSI	
5CFCRD.1024-03	CompactFlash 1024 MB SSI	
5CFCRD.2048-03	CompactFlash 2048 MB SSI	
5CFCRD.4096-03	CompactFlash 4096 MB SSI	
5CFCRD.8192-03	CompactFlash 8,192 MB SSI	

Table 36: CompactFlash slot (CF1)

Warning!

Inserting and removing the CompactFlash card can only take place without power applied!

2.9.20 CompactFlash slot 2

This CompactFlash slot is a fixed part of an APC810 system, is internally connected with the chipset via IDE PATA. Type I CompactFlash cards are supported.

CompactFlash slot (CF2)		
Connection	PATA Slave	
CompactFlash Type	Type I	
Accessories	**Short description**	
5CFCRD.0064-03	CompactFlash 64 MB SSI	
5CFCRD.0128-03	CompactFlash 128 MB SSI	
5CFCRD.0256-03	CompactFlash 256 MB SSI	
5CFCRD.0512-03	CompactFlash 512 MB SSI	
5CFCRD.1024-03	CompactFlash 1024 MB SSI	
5CFCRD.2048-03	CompactFlash 2048 MB SSI	
5CFCRD.4096-03	CompactFlash 4096 MB SSI	
5CFCRD.8192-03	CompactFlash 8,192 MB SSI	

Table 37: CompactFlash slot (CF2)

Warning!

Inserting and removing the CompactFlash card can only take place without power applied!

2.9.21 Slide-In slot 1

The slide-in slot 1 is internally connected with the chipset via SATA I and USB.

Slide-in slot 1		
Connection	SATA I and USB	
Accessories	**Short description**	
5AC801.ADAS-00	APC810 slide-in compact adapter	
5AC801.HDDS-00	APC810 slide-in HDD EE25	
5AC801.DVRS-00	APC810 slide-in DVD-R/RW	
5AC801.DVDS-00	APC810 slide-in DVD-ROM	

Table 38: Slide-in slot 1

Information:

The SATA I interface allows data carriers to be exchanged during operation (hot-plug). To utilize this capability, it must be supported by the operating system.

2.9.22 Slide-In slot 2

The slide-in slot 2 is internally connected with the chipset via SATA I and USB.

Slide-in slot 2		
Connection	SATA I and USB	
Accessories	**Short description**	
5AC801.HDDS-00	APC810 slide-in HDD EE25	
5AC801.DVRS-00	APC810 slide-in DVD-R/RW	
5AC801.DVDS-00	APC810 slide-in DVD-ROM	

Table 39: Slide-in slot 2

Information:

The APC810 slide-in compact adapter 5AC801.ADAS-00 can only be inserted into slide-in slot 1 for mechanical reasons (closing the front door).

Information:

The SATA I interface allows data carriers to be exchanged during operation (hot-plug). To utilize this capability, it must be supported by the operating system.

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2.9.23 Slide-in compact slot

The slide-in compact slot is internally connected with the chipset via SATA I.

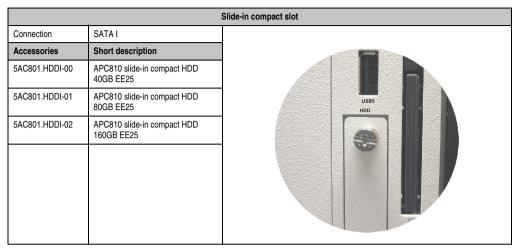| Slide-in compact slot		
Connection	SATA I	
Accessories	**Short description**	
5AC801.HDDI-00	APC810 slide-in compact HDD 40GB EE25	
5AC801.HDDI-01	APC810 slide-in compact HDD 80GB EE25	
5AC801.HDDI-02	APC810 slide-in compact HDD 160GB EE25	

Table 40: Slide-in compact slot

Information:

The SATA I interface allows data carriers to be exchanged during operation (hot-plug). To utilize this capability, it must be supported by the operating system.

For information about installing / exchanging a slide-in compact drive, see the section "Installing / exchanging a slide-in compact drive" on page 358.

3. Individual components

3.1 Systemunits

The system unit unites all of the individual components in one compact device. It consists of a housing with an integrated main board. The interfaces easily accessible on the front side, just behind the orange front doors or on the top. The system units are available in sizes with 1, 2 or 5 card slots.

3.1.1 Technical data

Features	5PC810.SX01-00	5PC810.SX02-00	5PC810.SX05-00
Photo			
Serial interface Amount	2		
Ethernet Interface Amount	2		
USB interface Amount	5		
Monitor / Panel output	Yes		
AC97 sound	Yes		
IF optional slot	Yes		
Card slots (PCI / PCIe slots[1))	1	2	5
CompactFlash slot Amount	2		
Slot for slide-in drive	-	1	2
Slot for slide-in compact drive	1		
Slot for add-on UPS module	Yes		
Reset button	Yes		
Power button	Yes		
CMOS profile switch	Yes		
Battery compartment	Yes		
Hardware security compartment	Yes		
Fan kit insert	Yes		
AP Link slot	-	Yes	

Table 41: Technical data - System units

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Features	5PC810.SX01-00	5PC810.SX02-00	5PC810.SX05-00
Status LEDs	Yes		
MTCX[2]	Yes		
Electrical characteristics			

Supply voltage
    Rated voltage
    Starting current
    Power consumption
	24 VDC $\pm$ 25%
	Typ. 7 A, max. 50 A < 300µs
	See section 2.6 "Power management".		

Mechanical characteristics			

Housing[3]
    Material
    Paint
    Front cover
	Galvanized steel plate
	Light gray (similar to Pantone 427C), dark gray (similar to Pantone 432C)
	Orange colored plastic (similar to Pantone 144C)		

Outer dimensions (without heat sink)
    Width
    Length
    Height
	74 mm
	252.7 mm
	270 mm
		113.5 mm
		254.6 mm
		270 mm
			194.4 mm
			254.5 mm
			270 mm

Weight (without heat sink)	Approx. 2.2 kg	Approx. 2.8 kg	Approx. 3.9 kg
Mounting plates (for M4 screws)	4	4	6
Drilling templates for mounting	See chapter 3 "Commissioning", section "Drillingtemplates" on page 148		

Table 41: Technical data - System units (Forts.)

1) Depends on the bus unit.

2) For more information about Maintenance Controller Extended, see the section "Maintenance Controller Extended (MTCX)" on page 384.

3) Depending on the process or batch, there may be visible deviations in the color and surface structure.

3.2 Busunits

The bus units are compatible with the system units in 1, 2 or 5 card slot sizes, available with PCI and/or PCI Express support.

1 PCI slot

1 PCIe slot

5PC810.BX01-00

5PC810.BX01-01
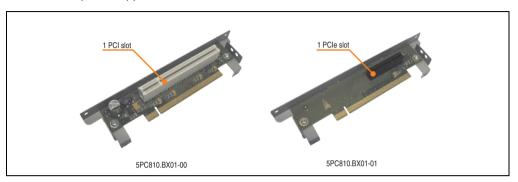
Figure 34: 1 slot bus units

2 PCI slots

1 PCIe slot

1 PCI slot

5PC810.BX02-00

5PC810.BX02-01
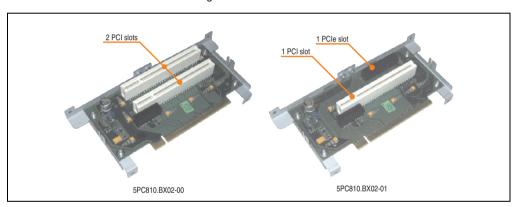
Figure 35: 2 slot bus units

1 PCIe slot

4 PCI slots

3 PCIe slots

2 PCI slots

5PC810.BX05-00

5PC810.BX05-01
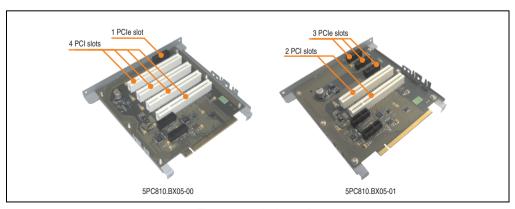
Figure 36: 5 slot bus units

3.2.1 Technical data

Features	5PC810.BX01-00	5PC810.BX01-01	5PC810.BX02-00	5PC810.BX02-01	5PC810.BX05-00	5PC810.BX05-01

PCI slot
  Amount
  Default
  Bus speed
	1
	2.2
	33 MHz
		-	2
			2.2
			33 MHz
				1
				2.2
				33 MHz
					4
					2.2
					33 MHz
						2
						2.2
						33 MHz

PCI Express
  Amount
  Default
  Bus speed
	-	1
		1.0a
		x4 (10 GB/s)
			-	1
				1.0a
				x4 (10 GB/s)
					1
					1.0a
					x1 (2.5 GB/s)
						3
						1.0a
						x1 (2.5 GB/s)

Table 42: Technical data - Bus units

3.3 CPU boards 945GME

Figure 37: CPU board

3.3.1 Technical data

Features	5PC800.B945-00	5PC800.B945-01	5PC800.B945-02	5PC800.B945-03	5PC800.B945-04
Boot loader / Operating system	embedded AMI BIOS (for a description, see Chapter 4 "Software", section "BIOS options" on page 197)				

Processor
  Type
  Name
  Speed
  Architectures
  L1 cache
  L2 cache
  Front side bus - FSB
	Intel® Core™ Duo
	L2400
	1.66 GHz
	65 nm
	32 kByte
	1 MB
	667 MHz
		Intel® Core™2 Duo
		L7400
		1.5 GHz
		65 nm
		32 kByte
		4 MB
		667 MHz
			Intel® Core™2 Duo
			U7500
			1.06 GHz
			65 nm
			32 kByte
			2 MB
			533 MHz
				Intel® Celeron® M
				423,
				1.06 GHz
				65 nm
				32 kByte
				1 MB
				533 MHz
					Intel® Core™2 Duo
					T7400
					2.16 GHz
					65 nm
					32 kByte
					4 MB
					667 MHz

Chipset	Intel® 945GME / Intel 8201 GMH (ICH7M-DH)				
DRAM	SO-DIMM DDR2 667/PC5300, max. 3 GByte				

Graphics
  Controller
  Memory
  Color depth
  Max. resolution
	Intel® Graphics Media Accelerator 950
	up to 224 MByte (reserved from main memory)
	max 32 Bit
	1920 x 1200				

Real-time clock (RTC)
  Battery-buffered
  Accuracy
	Yes
	At 25°C typ. 12 ppm (1 second)[1] per day				

Mass memory management	2 x SATA, 1 x IDE				
Power management	ACPI 2.0, S3 Support (suspend to RAM)				

Table 43: Technical data - CPU boards

1) At max. specified ambient temperature: typ. 58 ppm (5 seconds) - worst-case 220 ppm (19 seconds).

3.4 Heat sink
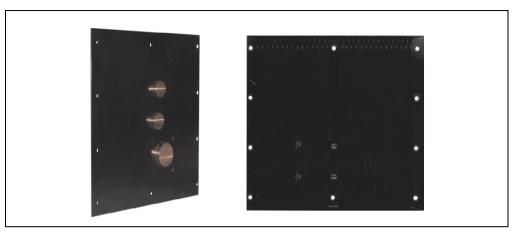
Figure 38: Heat sink

3.4.1 Technical data

Mechanical characteristics	5AC801.HS00-00	5AC801.HS00-01
Ideal for CPU boards	5PC800.B945-00 5PC800.B945-01 5PC800.B945-02 5PC800.B945-03	5PC800.B945-04
Material	Aluminum, black-coated with copper heat pipes	

Outer dimensions
  Width
  Height
  Depth
	228.7 mm
	218 mm
	12.8 mm
		228.7 mm
		218 mm
		28 mm

Weight	Approx. 1.7 kg	Approx. 2 kg

Table 44: Technical data - Heat sink

3.5 Mainmemory

The CPU boards offer room for two main memory modules. Dual-Channel memory technology is supported when two modules of the same size (e.g. 1 GB) are plugged in. This technology is not supported when two modules of different sizes (e.g. 1 GB and 2 GB) are plugged in.

When two 2 GB modules are plugged in, only 3 GB of main memory can be used.
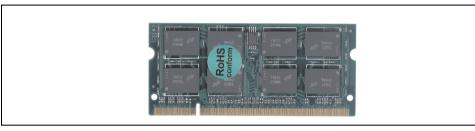
Figure 39: Main memory

3.5.1 Technical data

Features	5MMDDR.0512-01	5MMDDR.1024-01	5MMDDR.2048-01
Quantity	512 MB	1 GB	2 GB
Type	DDR2 SDRAM / PC2-5300		
Construction	200 Pin SO-DIMM		
Organization	64M x 64 bit	128M x 64 bit	256M x 64 bit

Table 45: Technical data - Main memory

Information:

A main memory module can only be replaced at the B&R plant.

3.6 Drives

3.6.1 Slide-in compact HDD 40GB EE25 - 5AC801.HDDI-00

This hard disk is specified for 24-hour operation and also provides an extended temperature specification.

Figure 40: Slide-in compact HDD 40GB EE25 - 5AC801.HDDI-00

Technical data

Information:

The following characteristics, features, and limit values only apply to this individual component and can deviate from those for the entire device. For the entire device in which this individual component is used, refer to the data given specifically for the entire device.

Features	5AC801.HDDI-00
Manufacturer's product ID	Seagate ST940817SM
Formatted capacity	40 GB
Number of heads	1
Number of sectors (user)	78.140.160
Bytes per sector	512
Revolution speed	5400 rpm
Access time (average)	12.5 ms

Table 46: Technical data - add-on hard disk - 5AC801.HDDI-00

Features	5AC801.HDDI-00

Positioning time (seek, typical values)
  Minimum (track to track)
  Average (read access)
  Maximum (read access)
	
	1 ms
	12.5 ms
	23 ms

Starting time (0 rpm to read access)	3 seconds (typically)
Interface	SATA

Data transfer rate
  Internal
  To / from host
	
	Max. 450 MBits/sec
	Max. 150 MB/s (Ultra-DMA Mode 5)

Cache	8 MB
S.M.A.R.T. support	Yes
MTBF	750000 Power On Hours[1]
Mechanical characteristics	
Slide-in compact mounting	Fixed

Outer dimensions (without slide-in)
  Width
  Length
  Height
	
	70 mm
	100 mm
	9.5 mm

Weight	100 g
Environmental characteristics	

Ambient temperature[2]
  Operation - Standard / 24-hour
  Storage
  Transport
	
	-30°C .. +85°C
	-40°C .. +95°C
	-40°C .. +95°C

Relative Humidity[3]
  Operation
  Storage
  Transport
	
	5 - 90%, non-condensing
	5 - 95%, non-condensing
	5 - 95%, non-condensing

Vibration
  Operation
  Storage
	
	2 g at 5 - 500 Hz, no non-recovered errors
	5 g at 5 - 500 Hz, no non-recovered errors

Shock (pulse with a sine half-wave)
  Operation
 	
  Storage
	
	300 g and 2 ms duration, no non-recovered errors
	150 g and 11 ms duration, no non-recovered errors
	800 g and 2 ms duration, no non-recovered errors
	400 g and 0.5 ms duration, no non-recovered errors

Altitude
  Operation
  Storage
	
	- 300 to 5000 meters
	- 300 to 12192 meters

Table 46: Technical data - add-on hard disk - 5AC801.HDDI-00 (Forts.)

1) With 8760 POH (Power On Hours) per year and 70°C surface temperature.

2) Temperature values for 305 meter elevation. The temperature specification must be reduced linearly by 1°C every 305 meters. The temperature increase and decrease can be a maximum of 20°C per hour.

3) Humidity gradient: Maximum 15% per hour.

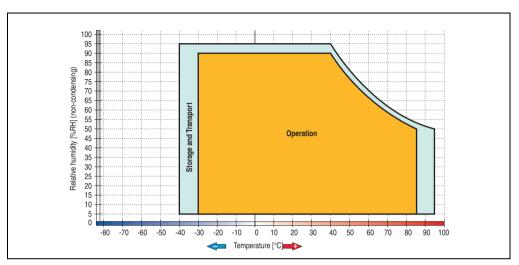### Temperature humidity diagram - Operation and storage

Figure 41: Temperature humidity diagram - 5AC801.HDDI-00

Temperature values for 305 meter elevation. The temperature specification must be reduced linearly by 1°C every 305 meters. The temperature increase and decrease can be a maximum of 20°C per hour.

3.6.2 Slide-in compact HDD 80GB EE25 - 5AC801.HDDI-01

This hard disk is specified for 24-hour operation and also provides an extended temperature specification.

Figure 42: Slide-in compact HDD 80GB EE25 - 5AC801.HDDI-01

Technical data

Information:

The following characteristics, features, and limit values only apply to this individual component and can deviate from those for the entire device. For the entire device in which this individual component is used, refer to the data given specifically for the entire device.

Features	5AC801.HDDI-01
Manufacturer's product ID	Seagate ST980817SM
Formatted capacity	80 GB
Number of heads	2
Number of sectors (user)	156.301.488
Bytes per sector	512
Revolution speed	5400 rpm
Access time (average)	12.5 ms

Positioning time (seek, typical values)
    Minimum (track to track)
    Average (read access)
    Maximum (read access)
	1 ms
	12.5 ms
	23 ms

Table 47: Technical data - Slide-in compact HDD - 5AC801.HDDI-01

Chapter 2
Technical data

Features	5AC801.HDDI-01
Starting time (0 rpm to read access)	3 seconds (typically)
Interface	SATA

Data transfer rate
    Internal
    To / from host
	Max. 450 MBits/sec
	Max. 150 MB/s (Ultra-DMA Mode 5)

Cache	8 MB
S.M.A.R.T. support	Yes
MTBF	750000 Power On Hours[1]
Mechanical characteristics	
Slide-in compact mounting	Fixed

Outer dimensions (without slide-in)
    Width
    Length
    Height
	70 mm
	100 mm
	9.5 mm

Weight	100 g
Environmental characteristics	

Ambient temperature[2]
    Operation - Standard / 24-hour
    Storage
    Transport
	-30°C .. +85°C
	-40°C .. +95°C
	-40°C .. +95°C

Relative Humidity[3]
    Operation
    Storage
    Transport
	5 - 90%, non-condensing
	5 - 95%, non-condensing
	5 - 95%, non-condensing

Vibration
    Operation
    Storage
	2 g at 5 - 500 Hz, no non-recovered errors
	5 g at 5 - 500 Hz, no non-recovered errors

Shock (pulse with a sine half-wave)
    Operation
 	
    Storage
	300 g and 2 ms duration, no non-recovered errors
	150 g and 11 ms duration, no non-recovered errors
	800 g and 2 ms duration, no non-recovered errors
	400 g and 0.5 ms duration, no non-recovered errors

Altitude
    Operation
    Storage
	- 300 to 5000 meters
	- 300 to 12192 meters

Table 47: Technical data - Slide-in compact HDD - 5AC801.HDDI-01 (Forts.)

1) With 8760 POH (Power On Hours) per year and 70°C surface temperature.

2) Temperature values for 305 meter elevation. The temperature specification must be reduced linearly by 1°C every 305 meters. The temperature increase and decrease can be a maximum of 20°C per hour.

3) Humidity gradient: Maximum 15% per hour.

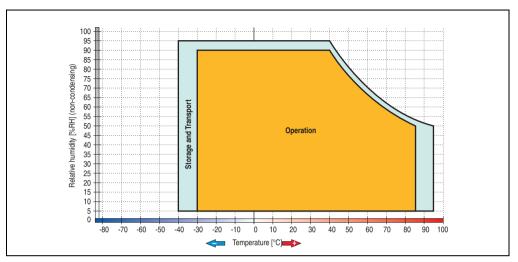### Temperature humidity diagram - Operation and storage

Figure 43: Temperature humidity diagram - 5AC801.HDDI-01

Temperature values for 305 meter elevation. The temperature specification must be reduced linearly by 1°C every 305 meters. The temperature increase and decrease can be a maximum of 20°C per hour.

3.6.3 Slide-in hard disk 160 GB GB 24x7 ET - 5AC801.HDDI-02

This hard disk is specified for 24-hour operation (24x7) and also provides an extended temperature specification (ET).

Figure 44: Slide-in compact HDD 160 GB - 5AC801.HDDI-02

Technical data

Information:

The following characteristics, features, and limit values only apply to this individual component and can deviate from those for the entire device. For the entire device in which this individual component is used, refer to the data given specifically for the entire device.

Features	5AC801.HDDI-02
Manufacturer's product ID	Fujitsu MHY2160BH-ESW
Formatted capacity	160 GB
Number of heads	3
Number of sectors (user)	312.581.808
Bytes per sector	512
Revolution speed	5400 rpm
Access time (average)	12 ms

Positioning time (seek, typical values)
    Minimum (track to track)
    Average (read access)
    Maximum (read access)
	
	1.5 ms
	12 ms
	22 ms

Table 48: Technical data - Slide-in compact HDD - 5AC801.HDDI-02

Features	5AC801.HDDI-02
Starting time (0 rpm to read access)	4 seconds (typically)
Interface	SATA

Data transfer rate
  Internal
  To / from host
	Max. 84.6 MBits/sec
	Max. 150 MB/s (Ultra-DMA Mode 5)

Cache	8 MB
S.M.A.R.T. support	Yes
MTBF	300000 Power On Hours[1]
Mechanical characteristics	
Slide-in compact mounting	Fixed

Outer dimensions (without slide-in)
  Width
  Length
  Height
	
	70 mm
	100 mm
	9.5 mm

Weight	100 g
Environmental characteristics	

Ambient temperature[2]
  Operation - Standard / 24-hour
  Storage
  Transport
	
	-15°C .. +80°C
	-40°C .. +95°C
	-40°C .. +95°C

Relative Humidity[3]
  Operation
  Storage
  Transport
	
	8 - 90% non-condensing (maximum humidity at +29°C)
	5 - 95% non-condensing (maximum humidity at +40°C)
	5 - 95% non-condensing (maximum humidity at +40°C)

Vibration
  Operation
  Storage
	
	5 - 500 Hz: 1 g, no unrecoverable errors
	5 - 500 Hz: 5 g, no damage

Shock (pulse with a sine half-wave)
  Operation
   Storage
	
	325 g, 2 ms, no unrecoverable errors
	900 g, 1 ms, no damage
	120 g, 11 ms, no damage

Altitude
  Operation
  Storage
	
	- 300 to 3000 meters
	- 300 to 12192 meters

Table 48: Technical data - Slide-in compact HDD - 5AC801.HDDI-02 (Forts.)

1) With 8760 POH (Power On Hours) per year and 70°C surface temperature.

2) Temperature values for 305 meter elevation. The temperature specification must be reduced linearly by 1°C every 305 meters. The temperature increase and decrease can be a maximum of 20°C per hour.

3) Humidity gradient: Maximum 15% per hour.

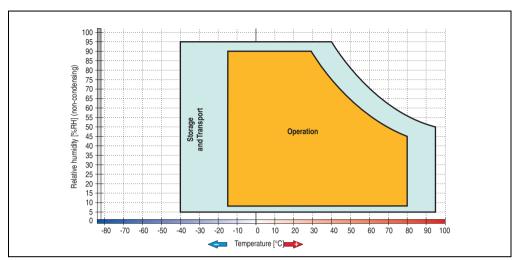### Temperature humidity diagram - Operation and storage

Figure 45: Temperature humidity diagram - 5AC801.HDDI-02

Temperature values for 305 meter elevation. The temperature specification must be reduced linearly by 1°C every 305 meters. The temperature increase and decrease can be a maximum of 20°C per hour.

3.6.4 Slide-in HDD EE25 - 5AC801.HDDS-00

Figure 46: Slide-in HDD EE25 5AC801.HDDS-00

Technical data

Information:

The following characteristics, features, and limit values only apply to this individual component and can deviate from those for the entire device. For the entire device in which this individual component is used, refer to the data given specifically for the entire device.

Features	5AC801.HDDS-00
Manufacturer's product ID	Seagate ST940817SM
Formatted capacity	40 GB
Number of heads	1
Number of sectors (user)	78.140.160
Bytes per sector	512
Revolution speed	5400 rpm
Access time (average)	12.5 ms

Positioning time (seek, typical values)
    Minimum (track to track)
    Average (read access)
    Maximum (read access)
	
	1 ms
	12.5 ms
	23 ms

Starting time (0 rpm to read access)	3 seconds (typically)

Table 49: Technical data - Slide-in HDD EE25 - 5AC801.HDDS-00

Features	5AC801.HDDS-00
Interface	SATA

Data transfer rate
    Internal
    To / from host
	Max. 450 MBits/sec
	Max. 150 MB/s (Ultra-DMA Mode 5)

Cache	8 MB
S.M.A.R.T. support	Yes
MTBF	750000 Power On Hours[1]
Mechanical characteristics	
Slide-in compact mounting	Fixed

Outer dimensions (without slide-in)
    Width
    Length
    Height
	70 mm
	100 mm
	9.5 mm

Weight	100 g
Environmental characteristics	

Ambient temperature[2]
    Operation - Standard / 24-hour
    Storage
    Transport
	-30°C .. +85°C
	-40°C .. +95°C
	-40°C .. +95°C

Relative Humidity[3]
    Operation
    Storage
    Transport
	5 - 90%, non-condensing
	5 - 95%, non-condensing
	5 - 95%, non-condensing

Vibration
    Operation
    Storage
	2 g at 5 - 500 Hz, no non-recovered errors
	5 g at 5 - 500 Hz, no non-recovered errors

Shock (pulse with a sine half-wave)
    Operation
 	
    Storage
	300 g and 2 ms duration, no non-recovered errors
	150 g and 11 ms duration, no non-recovered errors
	800 g and 2 ms duration, no non-recovered errors
	400 g and 0.5 ms duration, no non-recovered errors

Altitude
    Operation
    Storage
	- 300 to 5000 meters
	- 300 to 12192 meters

Table 49: Technical data - Slide-in HDD EE25 - 5AC801.HDDS-00 (Forts.)

1) With 8760 POH (Power On Hours) per year and 70°C surface temperature.

2) Temperature values for 305 meter elevation. The temperature specification must be reduced linearly by 1°C every 305 meters. The temperature increase and decrease can be a maximum of 20°C per hour.

3) Humidity gradient: Maximum 15% per hour.

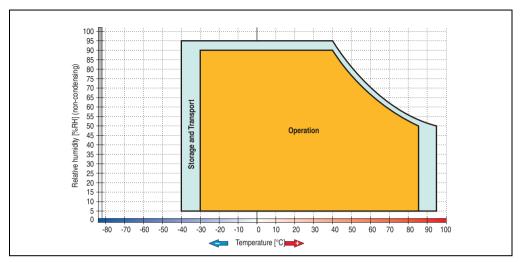### Temperature humidity diagram - Operation and storage

Figure 47: Temperature humidity diagram - 5AC801.HDDS-00

Temperature values for 305 meter elevation. The temperature specification must be reduced linearly by 1°C every 305 meters. The temperature increase and decrease can be a maximum of 20°C per hour.

3.6.5 Slide-in DVD-ROM - 5AC801.DVDS-00

Figure 48: Slide-in DVD-ROM 5AC801.DVDS-00

Technical data

> # Information:
>
> **The following characteristics, features, and limit values only apply to this individual component and can deviate from those for the entire device. For the entire device in which this individual component is used, refer to the data given specifically for the entire device.**

Features	5AC801.DVDS-00

Reading rate
  CD
  DVD
	24x
	8x

Data transfer rate	max. 1.5 Gbps

Access time (average)
  CD
  DVD
	130 ms
	140 ms

Revolution speed	Max. 5090 rpm ± 1%
Starting time (0 rpm to read access)	19 seconds (maximum)
Host interface	SATA

Table 50: Technical data - 5AC801.DVDS-00

Features	5AC801.DVDS-00

Readable media
   CD
   DVD
	CD-ROM (12 cm, 8 cm), CD-A CD-R, CD-RW
	DVD-ROM, DVD-R, DVD-R DL, DVD-RW, DVD+R DVD+R DL, DVD+RW, DVD-RAM

Compatible formats	CD-DA, CD-ROM mode 1/mode 2 CD-ROM XA mode 2 (form 1, form 2) Photo CD (single/multi-session) Enhanced CD, CD-text DVD-ROM, DVD-Video (Double Layer), DVD-R (Single/Multi-border), DVD-R DL (Single/Multi-border), DVD-RW (Single/Multi-border), DVD+R (Single/Multi session), DVD+R DL (Single/Multi session), DVD+RW (Single/Multi session), DVD-RAM (4.7 GB, 2.6 GB)
Laser class	Class 1 laser
Noise level (complete read access)	Approx. 45 dBA in a distance of 50 cm
Lifespan Opening/closing the drawer	60000 POH (Power-On Hours) > 10000 times
Environmental characteristics	

Ambient temperature[1]
   Operation
   Storage
   Transport
	+5°C .. +55°C [2]
	-20°C .. +60°C
	-40°C .. +65°C

Relative humidity
   Operation
   Storage
   Transport
	8 - 80%, non-condensing
	5 - 95%, non-condensing
	5 - 95%, non-condensing

Vibration
   Operation
   Storage
   Transport
	0.2 g at 5 - 500 Hz
	2 g at 5 - 500 Hz
	2 g at 5 - 500 Hz

Shock
   Operation
   Storage
 	
   Transport
	5 g and 11 ms duration
	60 g and 11 ms duration
	200 g and 2 ms duration
	60 g and 11 ms duration
	200 g and 2 ms duration

Table 50: Technical data - 5AC801.DVDS-00 (Forts.)

1) Temperature data is for operation at 500 meters. Derating the max. ambient temperature - typically 1°C per 1000 meters (from 500 meters above sea level).

2) Drive surface temperature

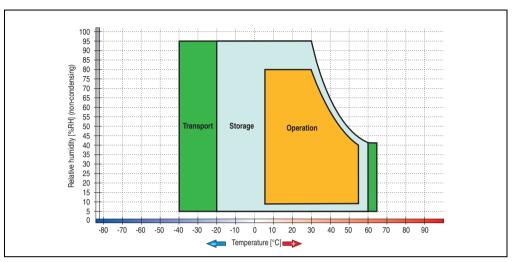### Temperature humidity diagram - Operation and storage

Figure 49: Temperature humidity diagram - Slide-in DVD-ROM/CD-RW - 5AC801.DVDS-00

Temperature data is for operation at 500 meters. Derating the max. ambient temperature - typically 1°C per 1000 meters (from 500 meters above sea level).

Hot plug capable

Hardware revision B0 of the slide-in DVD-ROM - 5AC801.DVDS-00 does not offer SATA hot plug capability. Other hardware revisions are hot plug capable.

3.6.6 Slide-in DVD-R/RW - 5AC801.DVRS-00

Figure 50: Slide-in DVD-R/RW - 5AC801.DVRS-00

Technical data

Information:

The following characteristics, features, and limit values only apply to this individual component and can deviate from those for the entire device. For the entire device in which this individual component is used, refer to the data given specifically for the entire device.

Features	5AC801.DVRS-00
Write speed 　CD-R 　CD-RW 　DVD-R 　DVD-R (Double Layer) 　DVD-RW 　DVD-RAM[1] 　DVD+R 　DVD+R (double layer) 　DVD+RW	 24x, 16x, 10x and 4x 24x, 16x, 10x and 4x 8x, 4x and 2x 6x, 4x and 2x 6x, 4x and 2x 5x, 3x and 2x 8x, 4x and 2.4x 6x, 4x and 2.4x 4x and 2x
Reading rate 　CD 　DVD	 max. 24x max. 8x
Data transfer rate	Max. 33.3 MB/sec.

Table 51: Technical data for slide-in DVD-R/RW, DVD+R/RW - 5AC801.DVRS-00

Features	5AC801.DVRS-00
Access time (average) CD DVD	140 ms (24x) 150 ms (8x)
Revolution speed	Max. 5160 rpm ± 1%
Starting time (0 rpm to read access) CD DVD	14 seconds (maximum) 15 seconds (maximum)
Host interface	SATA
Readable media CD DVD	CD/CD-ROM (12 cm, 8 cm), CD-R, CD-RW DVD-ROM, DVD-R, DVD-R (double layer), DVD-RW. DVD-RAM, DVD+R, DVD+R (double layer), DVD+RW, DVD-RAM
Non-write protected media CD DVD	CD-R, CD-RW DVD-R/RW, DVD-R (double layer), DVD-RAM (4.7 GB), DVD+R/RW, DVD+R (double layer)
Compatible formats	CD-DA, CD-ROM mode 1/mode 2 CD-ROM XA mode 2 (form 1, form 2) Photo CD (single/multi-session), Enhanced CD, CD text DVD-ROM, DVD-R, DVD-R (double layer), DVD-RW, DVD-Video DVD-RAM (4.7 GB, 2.6 GB) DVD+R, DVD+R (double layer), DVD+RW
Write-methods CD DVD	Disk at once, session at once, packet write, track at once Disk at once, incremental, over-write, sequential, multi-session
Laser class	Class 1 laser
Data buffer capacity	2 MB
Noise level (complete read access)	Approx. 45 dBA at 50 cm
Lifespan Opening/closing the drawer	60000 POH (Power-On Hours) > 10000 times
Environmental characteristics	
Ambient temperature[2] Operation Storage Transport	+5°C .. +55°C [3] -20°C .. +60°C -40°C .. +65°C
Relative humidity Operation Storage Transport	8 - 80%, non-condensing 5 - 95%, non-condensing 5 - 95%, non-condensing
Vibration Operation Storage Transport	At max. 5 - 500 Hz and 0.2 g At max. 5 - 500 Hz and 2 g At max. 5 - 500 Hz and 2 g
Shock (pulse with a sine half-wave) Operation Storage Transport	At max. 5 g for 11 ms At max. 60 g for 11 ms At max. 200 g for 2 ms At max. 60 g for 11 ms At max. 200 g for 2 ms

Table 51: Technical data for slide-in DVD-R/RW, DVD+R/RW - 5AC801.DVRS-00

1) RAM drivers are not provided by the manufacturer. Support of RAM function by the burning software "Nero" (model number 5SWUTI.0000-00) or other burning software packages and drivers from third party providers.

2) Temperature data is for operation at 500 meters. Derating the max. ambient temperature - typically 1°C per 1000 meters (from 500 meters above sea level).

3) Drive surface temperature

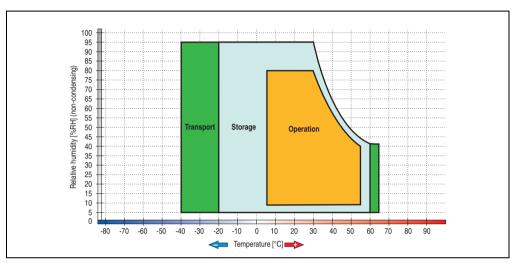## Temperature humidity diagram - Operation and storage

Figure 51: Temperature humidity diagram - Slide-in DVD-R/RW, DVD+R/RW - 5AC801.DVRS-00

Temperature data is for operation at 500 meters. Derating the max. ambient temperature - typically 1°C per 1000 meters (from 500 meters above sea level).

3.6.7 PCI SATA RAID controller - 5ACPCI.RAIC-01

Features

- SATA RAID controller
- RAID Level 0 (striped) and 1 (mirrored)
- 2 SATA hard disk drives (suitable for 24 hour operation)
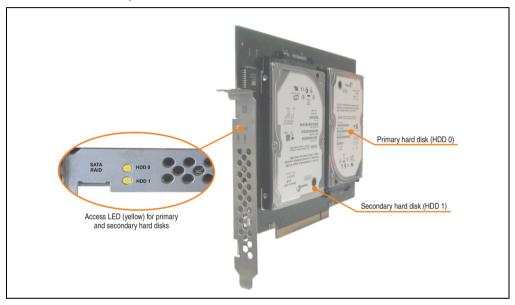- Only requires 1 PCI slot
- Transfer rates up to 150 MB/s

Figure 52: PCI SATA RAID controller - 5ACPCI.RAIC-01

Information:

The PCI SATA RAID controller can not be used in place of a Universal Power Supply (UPS). If the operating system is shut down improperly, the next time it is started it is detected as an error by the RAID 1, and a complete rebuild is executed. This generally takes at least 50 minutes (configurable) to complete.

Technical data

Information:

The following characteristics, features, and limit values only apply to this individual component and can deviate from those for the entire device. For the entire device in which this individual component is used, refer to the data given specifically for the entire device.

Features	5ACPCI.RAIC-01

SATA RAID controller
    Type
    Specifications
    Data transfer rate
    RAID level
    BIOS Extension ROM - requirements
	Sil 3512 SATA link
	Serial ATA 1.0
	Max. 1.5 GB/s (150 MB/s)
	Supports RAID 0, 1
	ca. 32 kByte

Hard disks Amount	Seagate Momentus 7200.1 ST96023AS 2
Formatted capacity (512 bytes/sector)	60 GB
Number of heads	3
Number of sectors (user)	117.210.240
Bytes per sector	512
Revolution speed	7200 rpm ± 1%
Access time (average)	4.2 ms

Positioning time (seek, typical values)
    Minimum (track to track)
    Average (read access)
    Maximum (read access)
	1.5 ms
	10.5 ms
	22 ms

Starting time (0 rpm to read access)	4 seconds (typically)
Supported transfer mode	SATA 1.0, PIO mode 0-4, multiword DMA mode 0-2, UDMA 0-5

Data transfer rate
    To the medium
    To / from host
	Max. 539 MBits/sec
	Max. 150 MB/s

Cache	8 MB
S.M.A.R.T. support	Yes
Lifespan	5 years
Electrical characteristics	
Power consumption	0.3 A at 3.3 V (PCI bus) 1 A at 5 V (PCI bus)
Mechanical characteristics	
Mounted on PCI insert	Fixed
Weight	350 g

Table 52: Technical data - RAID hard disk - 5ACPCI.RAIC-01

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Technical data

Environmental characteristics	5ACPCI.RAIC-01

Ambient temperature[1]
    Operation - Standard [2]
    Operation - 24-hour [3]
    Storage
    Transport
	+5°C .. +55°C
	+5°C .. +40°C
	-40°C .. +70°C
	-40°C .. +70°C

Relative humidity
    Operation
    Storage
    Transport
	5 - 90%, non-condensing
	5 - 95%, non-condensing
	5 - 95%, non-condensing

Vibration[4]
    Operation (continuous)
    Operation (occasional)
    Storage
    Transport
	At max. 5 - 500 Hz and 0.125 g (1.225 m/s^2 0-peak) duration 1 octave per minute no damage
	At max. 5 - 500 Hz and 0.25 g (2.45 m/s^2 0-peak) duration 1 octave per minute no damage
	At max. 5 - 500 Hz and 5 g (49 m/s^2 0-peak) duration 0.5 octave/minute no damage
	At max. 5 - 500 Hz and 5 g (49 m/s^2 0-peak) duration 0.5 octave/minute no damage

Shock [4] (pulse with a sine half-wave)
    Operation
    Storage
	At max. 125 g (1226 m/s^2 0-peak) and 2 ms duration no non-recovered errors
	At max. 400 g (3924 m/s^2 0-peak) and 2 ms duration no damage
	At max. 450 g (4424 m/s^2 0-peak) and 1 ms duration no damage
	At max. 200 g (1.962 m/s^2 0-peak) and 0.5 ms duration no damage

Altitude
    Operation
    Storage
	- 300 to 3048 meters
	- 300 to 12192 meters

Table 52: Technical data - RAID hard disk - 5ACPCI.RAIC-01 (Forts.)

1) Temperature values for 305 meter elevation. The temperature specification must be reduced linearly by 1°C every 305 meters. The temperature increase and decrease can be a maximum of 3°C per minute.

2) Standard operation means 333 POH (power-on hours) per month.

3) 24-hour operation means 732 POH (power-on hours) per month.

4) Operation in areas prone to vibration and shock can affect performance negatively (reduction of transfer rate).

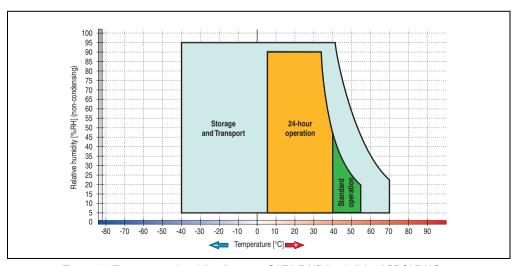## Temperature humidity diagram - Operation and storage

Figure 53: Temperature humidity diagram - SATA RAID hard disk 5ACPCI.RAIC-01

Temperature values for 305 meter elevation. The temperature specification must be reduced linearly by 1°C every 305 meters. The temperature increase and decrease can be a maximum of 3°C per minute.

Driver support

Special drivers are necessary for operating the PCI SATA RAID controller. Drivers for Windows XP Professional and Windows XP Embedded are available for download on the B&R Homepage in the download area (**www.br-automation.com**).

The .NET-based SATARaid™ serial ATA RAID management software can also be found on the B&R homepage.

Information:

Required drivers can only be downloaded from the B&R homepage, not from manufacturers' pages.

Configuration

For configuration of a SATA RAID network, see Chapter 3 "Commissioning", section "Configuration of a SATA RAID array" on page 187.

Exchanging a HDD

A hard drive can be easily exchanged in the event of an error when using the RAID1 (mirroring) configuration without having to re-install the system. The replacement SATA HDD 60GB 5ACPCI.RAIC-02 is available as a replacement part for a HDD.

For instructions on exchanging the drive, see Chapter 7 "Service and maintenance", section "Mounting the side cover" on page 377.

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3.6.8 Replacement PCI SATA RAID HDD 60GB - 5ACPCI.RAIC-02

The hard disk can be used as replacement for a HDD in a PCI SATA RAID Controller 5ACPCI.RAIC-01. For instructions on exchanging the drive, see Chapter 7 "Service and maintenance", section "Mounting the side cover" on page 377.

Figure 54: Replacement SATA HDD 60 GB - 5ACPCI.RAIC-02

Technical data

Information:

The following characteristics, features, and limit values only apply to this individual component and can deviate from those for the entire device. For the entire device in which this individual component is used, refer to the data given specifically for the entire device.

Features	5ACPCI.RAIC-02
Hard disks Amount	Seagate Momentus 7200.1 ST96023AS 1
Formatted capacity (512 bytes/sector)	60 GB
Number of heads	3
Number of sectors (user)	117.210.240
Bytes per sector	512
Revolution speed	7200 rpm ± 1%
Access time (average)	4.2 ms

Positioning time (seek, typical values)
    Minimum (track to track)
    Average (read access)
    Maximum (read access)
	1.5 ms
	10.5 ms
	22 ms

Starting time (0 rpm to read access)	4 seconds (typically)
Supported transfer mode	SATA 1.0, PIO mode 0-4, multiword DMA mode 0-2, UDMA 0-5

Table 53: Technical data - RAID hard disk - 5ACPCI.RAIC-02

Features	5ACPCI.RAIC-02

Data transfer rate
    To the medium
    To / from host
	Max. 539 MBits/sec
	Max. 150 MB/s

Cache	8 MB
S.M.A.R.T. support	Yes
Lifespan	5 years
Environmental characteristics	

Ambient temperature[1]
    Operation - Standard [2]
    Operation - 24-hour [3]
    Storage
    Transport
	+5°C .. +55°C
	+5°C .. +40°C
	-40°C .. +70°C
	-40°C .. +70°C

Relative humidity
    Operation
    Storage
    Transport
	5 - 90%, non-condensing
	5 - 95%, non-condensing
	5 - 95%, non-condensing

Vibration[4]
    Operation (continuous)
    Operation (occasional)
    Storage
    Transport
	No damage at max. 5 - 500 Hz and 0.125 g (1.225 m/s^2 0-peak) duration 1 oct/min
	No damage at max. 5 - 500 Hz and 0.25 g (2.45 m/s^2 0-peak) duration 1 oct/min
	Max. 5 - 500 Hz and 5 g (49 m/s^2 0-peak) 0.5 oct/min duration, no damage
	Max. 5 - 500 Hz and 5 g (49 m/s^2 0-peak) 0.5 oct/min duration, no damage

Shock [4] (pulse with a sine half-wave)
    Operation
    Storage
	No non-recovered errors at max. 125 g (1226 m/s^2 0-peak) and 2 ms duration
	No damage at max. 400 g (3924 m/s^2 0-peak) and 2 ms duration
	No damage at max. 450 g (4424 m/s^2 0-peak) and 1 ms duration
	No damage at max. 200 g (1962 m/s^2 0-peak) and 0.5 ms duration

Altitude
    Operation
    Storage
	- 300 to 3048 meters
	- 300 to 12192 meters

Table 53: Technical data - RAID hard disk - 5ACPCI.RAIC-02 (Forts.)

1) Temperature values for 305 meter elevation. The temperature specification must be reduced linearly by 1°C every 305 meters. The temperature increase and decrease can be a maximum of 3°C per minute.

2) Standard operation means 333 POH (power-on hours) per month.

3) 24-hour operation means 732 POH (power-on hours) per month.

4) Operation in areas prone to vibration and shock can affect performance negatively (reduction of transfer rate).

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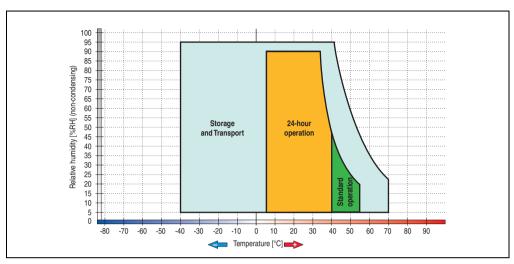### Temperature humidity diagram - Operation and storage

Figure 55: Temperature humidity diagram - SATA RAID hard disk 5ACPCI.RAIC-02

3.6.9 PCI SATA RAID 2 x 160 GB 24x7 ET - 5ACPCI.RAIC-03

The hard disks being used are specified for 24-hour operation (24x7) and also provides an extended temperature specification (ET).

Features

- SATA RAID controller
- RAID Level 0 (striped) and 1 (mirrored)
- 2 SATA hard disk drives (suitable for 24 hour operation)
- Only requires 1 PCI slot
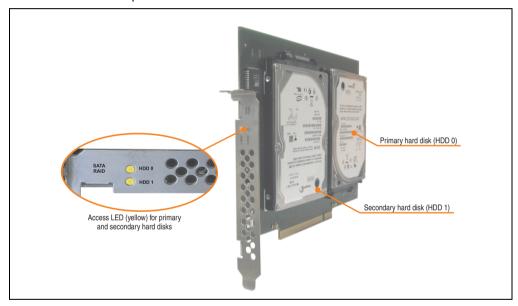- Transfer rates up to 150 MB/s

Figure 56: PCI SATA RAID controller - 5ACPCI.RAIC-03

Information:

The PCI SATA RAID controller can not be used in place of a Universal Power Supply (UPS). If the operating system is shut down improperly, the next time it is started it is detected as an error by the RAID 1, and a complete rebuild is executed. This generally takes at least 120 minutes (configurable) to complete.

Technical data

Information:

The following characteristics, features, and limit values only apply to this individual component and can deviate from those for the entire device. For the entire device in which this individual component is used, refer to the data given specifically for the entire device.

Features	5ACPCI.RAIC-03

SATA RAID controller
    Type
    Specifications
    Data transfer rate
    RAID level
    BIOS Extension ROM - requirements
	Sil 3512 SATA link
	Serial ATA 1.0
	Max. 1.5 GB/s (150 MB/s)
	Supports RAID 0, 1
	ca. 32 kByte

Hard disks Amount	Fujitsu M120-ESW MHY2160BH-ESW 2
Formatted capacity (512 bytes/sector)	160 GB
Number of heads	3
Number of sectors (user)	312.581.808
Bytes per sector	512
Revolution speed	5400 rpm ±1%
Access time (average)	5.56 ms

Positioning time (seek, typical values)
    Minimum (track to track)
    Average (read access)
    Maximum (read access)
	1.5 ms
	12 ms
	22 ms

Starting time (0 rpm to read access)	4 seconds (typically)
Supported transfer mode	SATA 1.0, PIO mode 0-4, multiword DMA mode 0-2, UDMA 0-5

Data transfer rate
    To the medium
    To / from host
	Max. 84.6 MBits/sec
	Max. 150 MB/s

Cache	8 MB
S.M.A.R.T. support	Yes
Lifespan	5 years
Electrical characteristics	
Power consumption	0.3 A at 3.3 V (PCI bus) 1 A at 5 V (PCI bus)
Mechanical characteristics	
Mounted on PCI insert	Fixed
Weight	350 g

Table 54: Technical data - RAID hard disk - 5ACPCI.RAIC-03

Environmental characteristics	5ACPCI.RAIC-03
Ambient temperature[1] Operation - Standard / 24-hour[2] Storage Transport	 -15°C .. +80°C -40°C .. +95°C -40°C .. +95°C
Relative humidity Operation Storage Transport	 8 - 90% non-condensing (maximum humidity at +29°C) 5 - 95% non-condensing (maximum humidity at +40°C) 5 - 95% non-condensing (maximum humidity at +40°C)
Vibration[3] Operation (continuous) Operation (occasional) Storage Transport	 5 - 500 Hz: max. 0.125 g; duration 1 octave per minute; no unrecoverable errors 5 - 500 Hz: max. 0.25 g; duration 1 octave per minute; no unrecoverable errors 5 - 500 Hz: max. 5 g; duration 0.5 octaves per minute; no damage 5 - 500 Hz: max. 5 g; duration 0.5 octaves per minute; no damage
Shock [4] (pulse with a sine half-wave) Operation Storage	 Max. 125 g, 2 ms; no unrecoverable errors Max. 400 g, 2 ms; no damage Max. 450 g, 1 ms; no damage Max. 200 g, 0.5 ms; no damage
Altitude Operation Storage	 - 300 to 3048 meters - 300 to 12192 meters

Table 54: Technical data - RAID hard disk - 5ACPCI.RAIC-03 (Forts.)

1) Temperature values for 305 meter elevation. The temperature specification must be reduced linearly by 1°C every 305 meters. The temperature increase and decrease can be a maximum of 3°C per minute.

2) 24-hour operation means 732 POH (power-on hours) per month.

3) Operation in areas prone to vibration and shock can affect performance negatively (reduction of transfer rate).

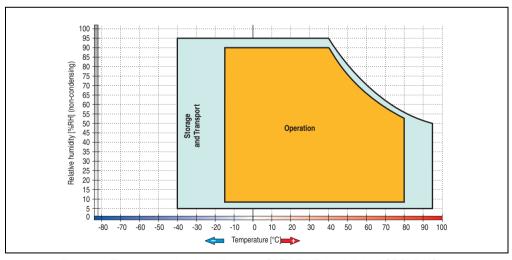### Temperature humidity diagram - Operation and storage

Figure 57: Temperature humidity diagram - SATA RAID hard disk 5ACPCI.RAIC-03

Temperature values for 305 meter elevation. The temperature specification must be reduced linearly by 1°C every 305 meters. The temperature increase and decrease can be a maximum of 3°C per minute.

Driver support

Special drivers are necessary for operating the PCI SATA RAID controller. Drivers for Windows XP Professional and Windows XP Embedded are available for download on the B&R Homepage in the download area (**www.br-automation.com**).

The .NET-based SATARaid™ serial ATA RAID management software can also be found on the B&R homepage.

Information:

Required drivers can only be downloaded from the B&R homepage, not from manufacturers' pages.

Configuration

For configuration of a SATA RAID network, see Chapter 3 "Commissioning", section "Configuration of a SATA RAID array" on page 187.

Exchanging a HDD

A hard drive can be easily exchanged in the event of an error when using the RAID1 (mirroring) configuration without having to re-install the system. The replacement SATA HDD 60GB 5ACPCI.RAIC-02 is available as a replacement part for a HDD.

For instructions on exchanging the drive, see Chapter 7 "Service and maintenance", section "Mounting the side cover" on page 377.

3.6.10 Replacement PCI SATA RAID HDD 160 GB - 5ACPCI.RAIC-04

The hard disk can be used as a replacement part for 5ACPCI.RAIC-03.

Figure 58: Replacement SATA HDD 160 GB - 5ACPCI.RAIC-04

Technical data

> # Information:
>
> **The following characteristics, features, and limit values only apply to this individual component and can deviate from those for the entire device. For the entire device in which this individual component is used, refer to the data given specifically for the entire device.**

Features	5ACPCI.RAIC-04
Hard disks Amount	Fujitsu M120-ESW MHY2160BH-ESW 1
Formatted capacity (512 bytes/sector)	160 GB
Number of heads	3
Number of sectors (user)	312.581.808
Bytes per sector	512
Revolution speed	5400 rpm ±1%
Access time (average)	5.56 ms

Positioning time (seek, typical values)
    Minimum (track to track)
    Average (read access)
    Maximum (read access)
	
	1.5 ms
	12 ms
	22 ms

Starting time (0 rpm to read access)	4 seconds (typically)
Supported transfer mode	SATA 1.0, PIO mode 0-4, multiword DMA mode 0-2, UDMA 0-5

Data transfer rate
    To the medium
    To / from host
	
	Max. 84.6 MBits/sec
	Max. 150 MB/s

Table 55: Technical data - RAID hard disk - 5ACPCI.RAIC-04

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Features	5ACPCI.RAIC-04
Cache	8 MB
S.M.A.R.T. support	Yes
Lifespan	5 years
Environmental characteristics	

Ambient temperature[1]
    Operation - Standard / 24-hour[2]
    Storage
    Transport
	-15°C .. +80°C
	-40°C .. +95°C
	-40°C .. +95°C

Relative humidity
    Operation
    Storage
    Transport
	8 - 90% non-condensing (maximum humidity at +29°C)
	5 - 95% non-condensing (maximum humidity at +40°C)
	5 - 95% non-condensing (maximum humidity at +40°C)

Vibration[3]
    Operation (continuous)
    Operation (occasional)
    Storage
    Transport
	5 - 500 Hz: max. 0.125 g; duration 1 octave per minute; no unrecoverable errors
	5 - 500 Hz: max. 0.25 g; duration 1 octave per minute; no unrecoverable errors
	5 - 500 Hz: max. 5 g; duration 0.5 octaves per minute; no damage
	5 - 500 Hz: max. 5 g; duration 0.5 octaves per minute; no damage

Shock [4] (pulse with a sine half-wave)
    Operation
    Storage
	Max. 125 g, 2 ms; no unrecoverable errors
	Max. 400 g, 2 ms; no damage
	Max. 450 g, 1 ms; no damage
	Max. 200 g, 0.5 ms; no damage

Altitude
    Operation
    Storage
	- 300 to 3048 meters
	- 300 to 12192 meters

Table 55: Technical data - RAID hard disk - 5ACPCI.RAIC-04 (Forts.)

1) Temperature values for 305 meter elevation. The temperature specification must be reduced linearly by 1°C every 305 meters. The temperature increase and decrease can be a maximum of 3°C per minute.

2) 24-hour operation means 732 POH (power-on hours) per month.

3) Operation in areas prone to vibration and shock can affect performance negatively (reduction of transfer rate).
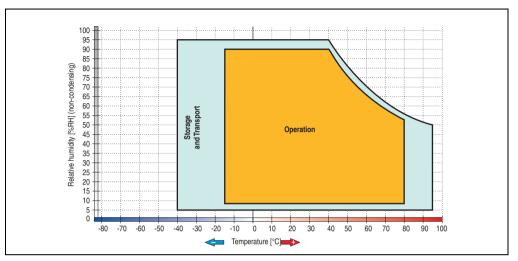
Temperature humidity diagram - Operation and storage

Figure 59: Temperature humidity diagram - SATA RAID hard disk 5ACPCI.RAIC-04

3.7 Fan kit

> # Information:
>
> **Fans are necessary when using components which must work within certain temperature limits, e.g. RAID controller, DVD combos, PCI cards.**
>
> **The fan and dust filter are subject to wear and must be checked with appropriate frequency and cleaned or replaced when not functioning properly (e.g. due to dirt and grime).**

For more information about fan switching limits, see appendix, section 2.1 "Temperature monitoring - fan regulation" on page 385.

3.7.1 Fan kit 1 card slot - 5PC810.FA01-00

This fan kit is an optional addition for system units with one card slot. For available replacement dust filters for this fan kit, see section "Replacement fan filter" on page 308.
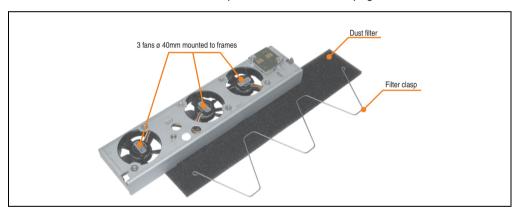

Figure 60: Fan kit - 5PC810.FA01-00

Technical data

Features	5PC810.FA01-00

Fan type
    Width
    Length
    Height
	40 mm
	40 mm
	10 mm

Revolution speed	max. 6100 rpm
Noise level	21 dB
Lifespan	29000 hours at 70°C 95000 hours at 20°C

Table 56: Technical data - 5PC810.FA01-00

Features	5PC810.FA01-00
Maintenance interval	The fans are subject to wear. Depending on the work environment, the dust filter should be checked with appropriate frequency to determine whether the air flow provides sufficient cooling. An exchange or cleaning of the filter kit is appropriate at that time.

Table 56: Technical data - 5PC810.FA01-00 (Forts.)

For information about installing or exchanging the fan kits, see the section "Installing / exchanging the fan kit" on page 362.

3.7.2 Fan kit 2 card slot - 5PC810.FA02-00

This fan kit is an optional addition for system units with 2 card slots. For available replacement dust filters for this fan kit, see section "Replacement fan filter" on page 308.
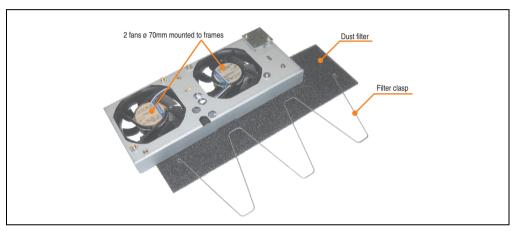

Figure 61: Fan kit - 5PC810.FA02-00

Technical data

Features	5PC810.FA02-00

Fan type
    Width
    Length
    Height
	
	70 mm
	70 mm
	15 mm

Revolution speed	Max. 4300 rpm ± 12.5%
Noise level	32 dB
Lifespan	60000 hours at 40°C
Maintenance interval	The fans are subject to wear. Depending on the work environment, the dust filter should be checked with appropriate frequency to determine whether the air flow provides sufficient cooling. An exchange or cleaning of the filter kit is appropriate at that time.

Table 57: Technical data - 5PC810.FA02-00

For information about installing or exchanging the fan kits, see the section "Installing / exchanging the fan kit" on page 362.

3.7.3 Fan kit 5 card slot - 5PC810.FA05-00

This fan kit is an optional addition for system units with 5 card slots. For available replacement dust filters for this fan kit, see section "Replacement fan filter" on page 308.
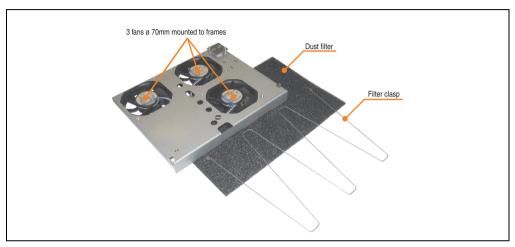

Figure 62: Fan kit - 5PC810.FA05-00

Technical data

Features	5PC810.FA05-00

Fan type
    Width
    Length
    Height
	70 mm
	70 mm
	15 mm

Revolution speed	Max. 4300 rpm ± 10%
Noise level	32 dB
Lifespan	60000 hours at 40°C
Maintenance interval	The fans are subject to wear. Depending on the work environment, the dust filter should be checked with appropriate frequency to determine whether the air flow provides sufficient cooling. An exchange or cleaning of the filter kit is appropriate at that time.

Table 58: Technical data - 5PC810.FA05-00

For information about installing or exchanging the fan kits, see the section "Installing / exchanging the fan kit" on page 362.

3.8 AP Link cards

AP Link cards can be installed in the APC810 system units 5PC810.SX02-00 and 5PC810.SX05-00 (also see the section "Configuration - Drives, software, accessories" on page 34).

3.8.1 AP Link SDL transmitter 5AC801.SDL0-00

A second graphics line can be created using an AP Link graphics adapter card. DVI and SDL signals are available with this. RGB signals are not supported.
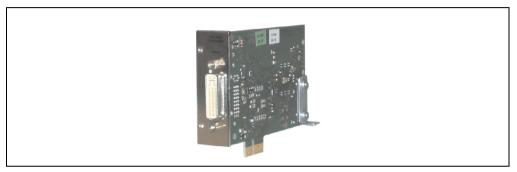

Figure 63: AP Link SDL transmitter 5AC801.SDL0-00

Information:

Installation of AP Link SDL transmitters is only possible in connection with the system units 5PC810.SX02-00 and 5PC810.SX05-00.

You can find information on installing the AP link SDL transmitters under "AP Link installation" on page 379.

Figure 64: Mounting example with the system unit 5PC810.SX02-00

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Pin assignments

PIN	Assignment	PIN	Assignment	
1	T.M.D.S. data 2-	16	Hot Plug detect	
2	T.M.D.S. data 2-	17	T.M.D.S. data 0-	
3	T.M.D.S. data 2/SDL shield	18	T.M.D.S. data 0+	
4	SDL-	19	T.M.D.S. DATA 0/XUSB1 shield	
5	SDL+	20	XUSB1-	
6	DDC clock	21	XUSB1+	DVI-I 24 pin, female
7	DDC data	22	T.M.D.S. shield	
8	n.c.	23	T.M.D.S. clock +	
9	T.M.D.S. data 1-	24	T.M.D.S. clock -	
10	T.M.D.S. Data 1+	c1	n.c.	
11	T.M.D.S. DATA 1/XUBS0 shield	c2	n.c.	
12	XUSB0-	c3	n.c.	
13	XUSB0+	c4	n.c.	
14	+ 5V power [1]	c5	n.c.	
15	Ground (return for + 5 V, HSync and VSync)		n.c.	

Table 59: Pin assignment for AP Link connection

1) Protected internally by a multifuse

Cable lengths and resolutions for SDL transfer

The following table shows the relationship between segment lengths and the maximum resolution according to the SDL cable used.

Cables	Resolution				
Segment length	VGA 640 x 480	SVGA 800 x 600	XGA 1024 x 768	SXGA 1280 x 1024	UXGA 1600 x 1200
1.8	5CASDL.0018-00 5CASDL.0018-01 5CASDL.0018-03	5CASDL.0018-00 5CASDL.0018-01 5CASDL.0018-03	5CASDL.0018-00 5CASDL.0018-01 5CASDL.0018-03	5CASDL.0018-00 5CASDL.0018-01 5CASDL.0018-03	5CASDL.0018-00 5CASDL.0018-01 5CASDL.0018-03
5	5CASDL.0050-00 5CASDL.0050-01 5CASDL.0050-03	5CASDL.0050-00 5CASDL.0050-01 5CASDL.0050-03	5CASDL.0050-00 5CASDL.0050-01 5CASDL.0050-03	5CASDL.0050-00 5CASDL.0050-01 5CASDL.0050-03	5CASDL.0050-00 5CASDL.0050-01 5CASDL.0050-03
10	5CASDL.0100-00 5CASDL.0100-01 5CASDL.0100-03	5CASDL.0100-00 5CASDL.0100-01 5CASDL.0100-03	5CASDL.0100-00 5CASDL.0100-01 5CASDL.0100-03	5CASDL.0100-00 5CASDL.0100-01 5CASDL.0100-03	5CASDL.0100-00 5CASDL.0100-01 5CASDL.0100-03
15	5CASDL.0150-00 5CASDL.0150-01 5CASDL.0150-03	5CASDL.0150-00 5CASDL.0150-01 5CASDL.0150-03	5CASDL.0150-00 5CASDL.0150-01 5CASDL.0150-03	5CASDL.0150-00 5CASDL.0150-01 5CASDL.0150-03	- - -

Table 60: Segment lengths, resolutions and SDL cables

Cables	Resolution				
Segment length	VGA 640 x 480	SVGA 800 x 600	XGA 1024 x 768	SXGA 1280 x 1024	UXGA 1600 x 1200
20	5CASDL.0200-00 5CASDL.0200-30	5CASDL.0200-00 5CASDL.0200-30	5CASDL.0200-00 5CASDL.0200-30	5CASDL.0200-00 5CASDL.0200-30	- -
25	5CASDL.0250-00 5CASDL.0250-30	5CASDL.0250-00 5CASDL.0250-30	5CASDL.0250-00 5CASDL.0250-30	- -	- -
30	5CASDL.0300-00 5CASDL.0300-03	5CASDL.0300-00 5CASDL.0300-03	5CASDL.0300-10 5CASDL.0300-13	5CASDL.0300-10 5CASDL.0300-13	- -
40	5CASDL.0400-10 5CASDL.0400-13	5CASDL.0400-10 5CASDL.0400-13	5CASDL.0400-10 5CASDL.0400-13	5CASDL.0400-10 5CASDL.0400-13	- -

Table 60: Segment lengths, resolutions and SDL cables

Chapter 2
Technical data

3.8.2 Ready relay 5AC801.RDYR-00

Figure 65: Ready relay 5AC801.RDYR-00

Information:

Installation of the ready relay is only possible in connection with the system units 5PC810.SX02-00 and 5PC810.SX05-00.

Figure 66: Mounting example with the system unit 5PC810.SX02-00

The relay contacts are closed when the APC810 is powered on.

Ready relay pin assignments		
Pin assignments - 4-pin multipoint connector N.O. and N.C., max. 30 VDC, max. 10 A		
Pin	**Assignment**	
1	Normally open	
2	Root	
3	Normally closed	
4	n.c.	
Accessories		
0TB704.90	Terminal block, 4-pin, Screw clamp, 1.5 mm²	
TB704.91	Terminal block, 4-pin, Cage clamps, 2.5 mm²	

Table 61: Pin assignments - Ready relay 5AC801.RDYR-00

3.9 Interface options (IF option)

An additional interface (CAN or combined RS232/422/485) can be installed in the APC810's IF optional slot.

Figure 67: Interface options (IF option)

Information:

It is possible to add or remove an optional interface at any time.

Caution!

Turn off power before adding or removing an optional interface.

3.9.1 Add-on CAN interface - 5AC600.CANI-00

The add-on CAN interface is equipped with an Intel 82527 CAN controller, which conforms to CAN specifications 2.0 part A/B. The CAN controller can trigger an NMI (non-maskable interrupt).

Order data

Model number	Description	Figure
5AC600.CANI-00	**Add-on CAN interface** CAN interface for installation in an APC620, APC800 or PPC700.	

Table 62: Add-on CAN interface - 5AC600.CANI-00

Technical data

Features	5AC600.CANI-00

CAN interface
    Controller
    Amount
    Connection
	Intel 82527
	1
	9-pin DSUB, male

Terminating resistor Default setting	Can be activated and deactivated using a sliding switch Disabled

Table 63: Technical data - Add-on CAN interface - 5AC600.CANI-00

Pin assignments

Add-on CAN		
Type	Electrically isolated	
Transfer rate	Max. 500 kBit/s	
Bus length	Max. 1000 Meter	
Pin	**Assignment**	9-pin DSUB plug
1	n.c.	
2	CAN low	
3	GND	
4	n.c.	
5	n.c.	
6	Reserved	
7	CAN high	
8	n.c.	
9	n.c.	

Table 64: Pin assignments - CAN

I/O address and IRQ

Resource	Default setting	Additional setting options
I/O address	384h / 385h	-
IRQ	IRQ10	NMI [1]

Table 65: Add-on CAN - I/O address and IRQ

1) NMI = Non Maskable Interrupt.

The IRQ setting can be changed in the BIOS setup. Please note any potential conflicts with other resources when changing this setting.

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

Table 66: CAN address register

Bus length and cable type

The type of cable used depends largely on the required bus length and the number of nodes. The bus length is mainly determined by the bit rate. In accordance with CiA (CAN in Automation) the maximum bus length is 1000 meters.

The following bus lengths are permitted with a maximum oscillator tolerance of 0.121%:

Distance [m]	Transfer rate [kBit/s]
≤ 1000	Typ. 50
≤ 200	Typ. 250
≤ 60	Typ. 500

Table 67: Bus length and transfer rate - CAN

The material used for the cable should preferably have all or most of the following properties in order to reach an optimal transfer rate.

CAN cable	Property

Signal lines
    Cable cross section
    Wire insulation
    Conductor resistance
    Stranding
    Shield
	2 x 0.25 mm² (24AWG/19), tinned Cu wire
	PU
	≤ 82 Ohm / km
	Wires stranded in pairs
	Paired shield with aluminum foil

Grounding line
    Cable cross section
    Wire insulation
    Conductor resistance
	1 x 0.34 mm² (22AWG/19), tinned Cu wire
	PU
	≤ 59 Ohm / km

Outer sheathing
    Material
    Properties
    Entire shielding
	PUR mixture
	Halogen free
	From tinned cu wires

Table 68: CAN cable requirements

Terminating resistors

CAN networks are cabled using a bus structure where both ends of the bus are equipped with terminating resistors. The add-on CAN interface has an integrated terminating resistor (delivery state: disabled with the setting "Off").
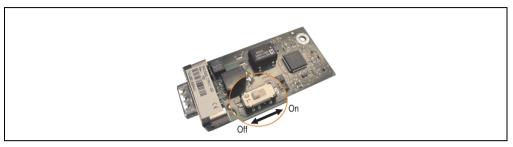

Figure 68: Terminating resistor - Add-on CAN interface 5AC600.CANI-00

Contents of delivery

The screws included in the mounting kit are to be used for installation.

Figure 69: Contents of the delivery / mounting material - 5AC600.CANI-00

Driver support

Because of the Dual Core processors, the INACAN.SYS driver version 2.36, contained in the PVI setup 2.6.0.3105, is required for the operation.

Information:

Required drivers can only be downloaded from the B&R homepage, not from manufacturers' pages.

3.9.2 Add-on RS232/422/485 interface - 5AC600.485I-00

The serial interface is a combined RS232/RS422/RS485 interface. The operating mode (RS232/RS422/RS485) is selected automatically, depending on the electrical connection.

Order data

Model number	Description	Figure
5AC600.485I-00	**Add-on RS232/422/485 interface** Add-on RS232/422/485 interface for installation in an APC620, AP800 and PPC700.	

Table 69: Add-on RS232/422/485 interface - 5AC600.485I-00

Pin assignments

Add-on RS232/422/485			
	RS232	**RS422/485**	
Type	RS232 not modem compatible; electrically isolated		
UART	16550 compatible, 16 byte FIFO		
Transfer rate	Max. 115 kBit/s		
Bus length	Max. 15 meters	Max. 1200 meters	
Pin	**Assignments (RS232)**	**Assignments (RS422)**	9-pin DSUB plug
1	n.c.	$\overline{\text{TXD}}$	
2	RXD	n.c.	
3	TXD	n.c.	
4	n.c.	TXD	
5	GND	GND	
6	n.c.	$\overline{\text{RXD}}$	
7	RTS	n.c.	
8	CTS	n.c.	
9	n.c.	RXD	

Table 70: Pin assignments - RS232/RS422

I/O address and IRQ

Resource	Default setting	Additional setting options
I/O address	2E8h	238, 2F8, 338, 3E8, 3F8
IRQ	IRQ10	IRQ 3, 4, 5, 7, 11, 12

Table 71: Add-on RS232/422/485 - I/O address and IRQ

The setting for the I/O address and the IRQ can be changed in the BIOS setup (under "Advanced" - submenu "Baseboard/Panel Features" - submenu "Legacy Devices", setting "COM E"). Please note any potential conflicts with other resources when changing this setting.

Bus length and cable type RS232

The maximum transfer rate of 115 kBit/s depends on the cable type being used.

Distance [m]	Transfer rate [kBit/s]
≤ 15	Typ. 64
≤ 10	Typ. 115
≤ 5	Typ. 115

Table 72: Bus length and transfer rate - RS232

The material used for the cable should preferably have all or most of the following properties in order to reach an optimal transfer rate.

RS232 cable	Property

Signal lines
  Cable cross section
  Wire insulation
  Conductor resistance
  Stranding
  Shield
	4 x 0.16 mm² (26AWG), tinned Cu wire
	PU
	≤ 82 Ohm / km
	Wires stranded in pairs
	Paired shield with aluminum foil

Grounding line
  Cable cross section
  Wire insulation
  Conductor resistance
	1 x 0.34 mm² (22AWG/19), tinned Cu wire
	PU
	≤ 59 Ohm / km

Outer sheathing
  Material
  Properties
  Entire shielding
	PUR mixture
	Halogen free
	From tinned cu wires

Table 73: RS232 cable requirements

Bus length and cable type RS422

The maximum transfer rate of 115 kBit/s depends on the cable type being used.

Distance [m]	Transfer rate [kBit/s]
1200	Typ. 115

Table 74: Bus length and transfer rate - RS422

The material used for the cable should preferably have all or most of the following properties in order to reach an optimal transfer rate.

RS422 cable	Property

Signal lines
    Cable cross section
    Wire insulation
    Conductor resistance
    Stranding
    Shield
	4 x 0.25 mm² (24AWG/19), tinned Cu wire
	PU
	≤ 82 Ohm / km
	Wires stranded in pairs
	Paired shield with aluminum foil

Grounding line
    Cable cross section
    Wire insulation
    Conductor resistance
	1 x 0.34 mm² (22AWG/19), tinned Cu wire
	PU
	≤ 59 Ohm / km

Outer sheathing
    Material
    Properties
    Entire shielding
	PUR mixture
	Halogen free
	From tinned cu wires

Table 75: RS422 cable requirements

RS485 interface operation

The pins of the RS422 default interface (1, 4, 6 and 9) should be used for operation. The pins should be connected as shown.
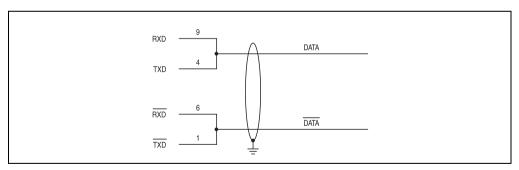
Figure 70: Add-on RS232/422/485 interface - operated in RS485 mode

The RTS line must be switched each time the driver is sent and received; there is no automatic switch back. This cannot be configured in Windows.

The voltage drop caused by long line lengths can lead to greater potential differences between the bus stations, which can hinder communication. This can be improved by running ground wire with the others.

The line ends of the RS485 interface should (at least for longer line lengths or larger transfer rates) be closed. Normally a passive terminator can be used on the bus ends by connecting each of the signal lines with 120 Ω resistance.

Bus length and cable type RS485

The maximum transfer rate of 115 kBit/s depends on the cable type being used.

Distance [m]	Transfer rate [kBit/s]
1200	Typ. 115

Table 76: Bus length and transfer rate - RS485

The material used for the cable should preferably have all or most of the following properties in order to reach an optimal transfer rate.

RS485 cable	Property
Signal lines 　　Cable cross section 　　Wire insulation 　　Conductor resistance 　　Stranding 　　Shield	4 x 0.25 mm² (24AWG/19), tinned Cu wire PU $\leq$ 82 Ohm / km Wires stranded in pairs Paired shield with aluminum foil
Grounding line 　　Cable cross section 　　Wire insulation 　　Conductor resistance	1 x 0.34 mm² (22AWG/19), tinned Cu wire PU $\leq$ 59 Ohm / km
Outer sheathing 　　Material 　　Properties 　　Entire shielding	PUR mixture Halogen free From tinned cu wires

Table 77: RS485 cable requirements

Contents of delivery

The screws included in the mounting kit are to be used for installation.

1 x　　2 x

Figure 71: Contents of the delivery / mounting material - 5AC600.485I-00

Chapter 3 • Commissioning

1. Installation

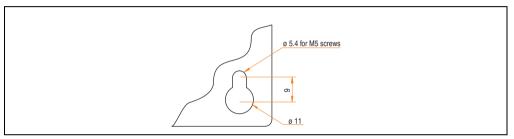The APC810 systems are mounted with the mounting plates found on the housing. The plates are designed for M5 screws.

Figure 72: Mounting plates

The exact positioning of the mounting holes can be seen in the following drilling templates.

1.1 Important mounting information

- The environmental conditions must be taken into consideration (see chapter 2 "Technical data", section 2.4 "Ambient temperatures" on page 50).

- The APC810 is only permitted for operation in closed rooms.

- The APC810 cannot be situated in direct sunlight.

- The vent holes may not be covered.

- When mounting the device, be sure to adhere to the allowable mounting orientations (see Section "Mountingorientation" on page 150).

- Be sure the wall or switching cabinet can withstand four times the total weight of the the APC810.

- When connecting certain cable types (DVI, SDL, USB, etc.), keep the flex radius of the cable in mind (see section 2 "Cable connections" on page 152).

1.2 Drillingtemplates

APC810 1 card slot	APC810 2 card slot
Mounting plate outline (APC810) 270 262 General tolerance ISO 2768 medium 18 0 0 18 53 71	Mounting plate outline (APC810) 270 262 General tolerance ISO 2768 medium 18 0 0 20.3 90.3 110.5
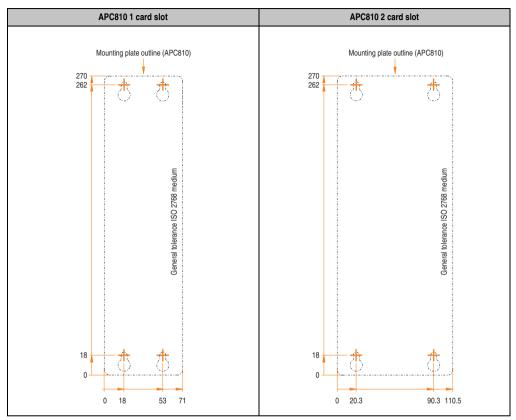
Table 78: Drilling templates - 1 and 2 card slot system units

APC810 5 card slot

Mounting plate outline (APC810)

270
262

General tolerance ISO 2768 medium

18

0

0   25.7   95.7   165.7   191.4
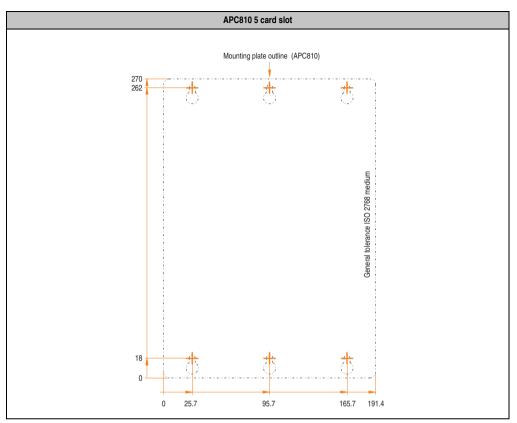
Table 79: Drilling template - 5 card slot system unit

1.3 Mountingorientation

The APC810 system must be mounted as described in the following sections.

1.3.1 Standard Mounting - vertical

Standard mounting refers to vertical mounting orientation. APC810 systems with and without fan kit can be mounted this way.
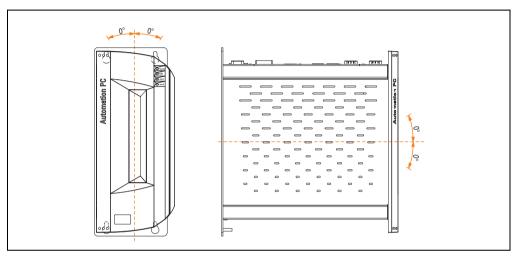
Figure 73: Standard mounting - vertical

1.3.2 Optional mounting - horizontal

Operation in the optional horizontal mounting position (heat sink on top) requires the use of a fan kit. The maximum ambient temperature specification must be lowered to 5°C.
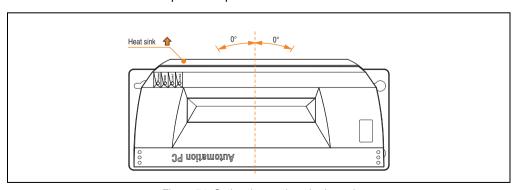
Figure 74: Optional mounting - horizontal

1.3.3 Spacing for air circulation

In order to guarantee sufficient air circulation, mount the system so that the spacing on the top, bottom, and sides is as follows.
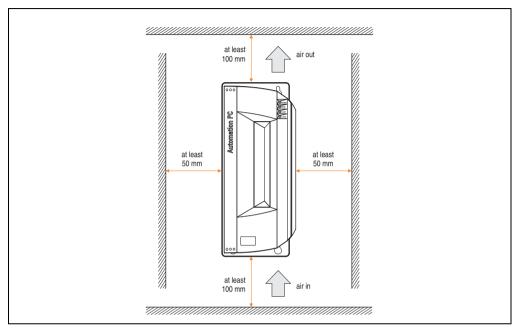
Figure 75: Standard mounting - Mounting distances

These defined distances are valid for both vertical and horizontal mounting of the APC810.

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2. Cable connections

When making cable connections and installing cables, it is not permitted to have a flex radius smaller than the minimum value specified.
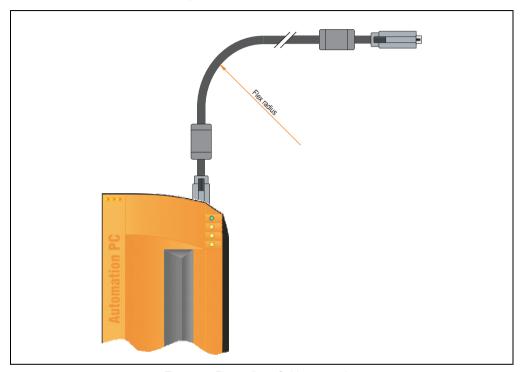
Figure 76: Flex radius - Cable connection

Information:

The specified flex radius can be found in the Automation Panel 800 or Automation Panel 900 user's manual, which can be downloaded as a .pdf file from the B&R homepage www.br-automation.com.

3. Grounding concept

The functional ground is a current path with low impedance between isolated circuits and ground, which is not a protective measure, but rather provides e.g. increased immunity to disturbances. It serves only as disturbance dissipation and not as contact protection for persons.

The APC810 functional ground has 2 connections:

- Supply voltage
- Ground connection

To guarantee secure dissipation of electric disturbances, the following points should be observed:

- The device should be connected to the ground using the shortest route possible.
- Use cable with a minimum cross section of 2.5 mm² per connection.
- Note the line shielding concept, all connected data cables are used as shielded lines.
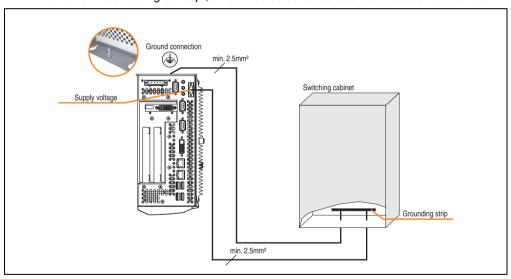
Figure 77: Grounding concept

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4. Connection examples

The following examples provide an overview of the configuration options for connecting Automation Panel 800 and Automation Panel 900 and/or Automation Panel 800 devices with the APC810. The following questions will be answered:

- How are Automation Panel 900 devices connected to the monitor / panel output of the APC810, and what needs to be considered?
- How are Automation Panel 800 devices connected to the monitor / panel output of the APC810, and what needs to be considered?
- How are Automation Panel 900 devices connected simultaneously to the Monitor / Panel output on the optional SDL AP Link of the APC810 and what needs to be considered?
- What are "Display Clone" and "Extended Desktop" modes?
- How many Automation Panel 900 devices can be connected per line?
- How many Automation Panel 900 devices can be connected to an Automation Panel 800 device per line?
- How are the connected devices internally numbered?
- Are there limitations to the segment length and if so, what are they?
- What cables and link modules are needed?
- Do BIOS settings have to be changed for a specific configuration?

4.1 Selecting the display units

If an Automation Panel 800 and an Automation Panel 900 should be connected on the same line, the devices must have the same display type. The following table lists the AP900 devices that can be connected on the same line with an AP800 device.

Automation Panel 800	Automation Panel 900
5AP820.1505-00	5AP920.1505-01 5AP951.1505-01 5AP980.1505-01 5AP981.1505-01
5AP880.1505-00	5AP920.1505-01 5AP951.1505-01 5AP980.1505-01 5AP981.1505-01

Table 80: Selecting the display units

4.2 One Automation Panel 900 via DVI (onboard)

An Automation Panel 900 with max. SXGA resolution is connected to the integrated DVI interface (onboard). As an alternative, an office TFT with DVI interface or an analog monitor (using adapter with model no. 5AC900.1000-00) can also be operated. A separate cable is used

for touch screen and USB. If USB devices are to be operated on the Automation Panel 900, the maximum distance is 5 meters. USB devices can only be connected directly to the Automation Panel (without a hub).
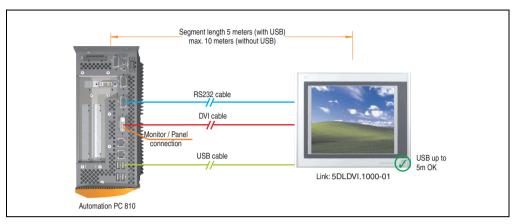

Figure 78: Configuration - One Automation Panel 900 via DVI (onboard)

4.2.1 Basic system requirements

The following table displays the possible combinations for the APC810 system unit with CPU board to implement the configuration shown in the figure above. If the maximum resolution is limited when making the combination then it is also shown in the following table (e.g. for connecting a non-B&R Automation Panel 900 device).

CPU board	with system unit			Limitation
	5PC810.SX01-00	**5PC810.SX02-00**	**5PC810.SX05-00**	**Resolution**
5PC800.B945-00	✓	✓	✓	Max. SXGA
5PC800.B945-01	✓	✓	✓	Max. SXGA
5PC800.B945-02	✓	✓	✓	Max. SXGA
5PC800.B945-03	✓	✓	✓	Max. SXGA
5PC800.B945-04	✓	✓	✓	Max. SXGA

Table 81: Possible combinations of system unit and CPU board

4.2.2 Link modules

Model number	Description	Comment
5DLDVI.1000-01	**Automation Panel Link DVI receiver** connections for DVI-D, RS232 and USB 2.0 (Type B); 24VDC (screw clamp 0TB103.9 or cage clamp 0TB103.91 sold separately).	For Automation Panel 900

Table 82: Link module for the configuration - One Automation Panel 900 via DVI

4.2.3 Cables

Select one Automation Panel 900 cable each from the 3 required types.

Model number	Type	Length
5CADVI.0018-00	DVI cable	1.8 m
5CADVI.0050-00	DVI cable	5 m
5CADVI.0100-00	DVI cable	10 m [1]
9A0014.02	Touch screen cable - serial	1.8 m
9A0014.05	Touch screen cable - serial	5 m
9A0014.10	Touch screen cable - serial	10 m [1]
5CAUSB.0018-00	USB cable	1.8 m
5CAUSB.0050-00	USB cable	5 m

Table 83: Cable for DVI configurations

1) USB support is not possible on the Automation Panel 900 because USB is limited to 5 m.

Information:

Detailed technical data about the cables can be found in the Automation Panel 900 User's Manual. This can be downloaded as a .pdf file from the B&R homepage www.br-automation.com.

4.2.4 Possible Automation Panel units, resolutions und segment lengths

The following Automation Panel 900 units can be used. In rare cases, the segment length is limited according to the resolution.

Model number	Diagonal	Resolution	Touch screen	Keys	Max. segment length
5AP920.1043-01	10.4"	VGA	✓	-	5 m / 10 m [1]
5AP920.1214-01	12.1"	SVGA	✓	-	5 m / 10 m [1]
5AP920.1505-01	15.0"	XGA	✓	-	5 m / 10 m [1]
5AP920.1706-01	17.0"	SXGA	✓	-	5 m / 10 m [1]
5AP920.1906-01	19.0"	SXGA	✓	-	5 m / 10 m [1]

Table 84: Possible Automation Panel units, resolutions und segment lengths

1) USB support is not possible on the Automation Panel 900 because USB is limited to 5 m.

Information:

The DVI transfer mode does not allow reading statistical values on Automation Panel 900 units.

4.2.5 BIOS settings

No special BIOS settings are necessary for operation.

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4.3 An Automation Panel 900 via SDL (onboard)

An Automation Panel 900 is connected to the integrated SDL interface (onboard) via an SDL cable. USB devices can only be connected directly to the Automation Panel (without a hub).
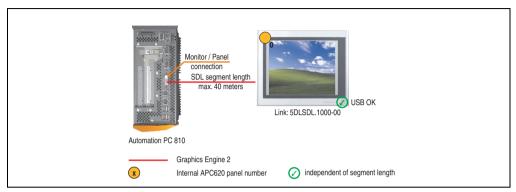

Figure 79: Configuration - An Automation Panel 900 via SDL (onboard)

4.3.1 Basic system requirements

The following table displays the possible combinations for the APC810 system unit with CPU board to implement the configuration shown in the figure above. If the maximum resolution is limited when making the combination then it is also shown in the following table (e.g. for connecting a non-B&R Automation Panel 900 device).

CPU board	with system unit			Limitation
	5PC810.SX01-00	5PC810.SX02-00	5PC810.SX05-00	Resolution
5PC800.B945-00	✓	✓	✓	Max. UXGA
5PC800.B945-01	✓	✓	✓	Max. UXGA
5PC800.B945-02	✓	✓	✓	Max. UXGA
5PC800.B945-03	✓	✓	✓	Max. UXGA
5PC800.B945-04	✓	✓	✓	Max. UXGA

Table 85: Possible combinations of system unit and CPU board

4.3.2 Link modules

Model number	Description	Comment
5DLSDL.1000-00	**Automation Panel Link SDL receiver** Connection for SDL in, transfer of display data, touch screen, USB 1.1, matrix keys, and service data, 24 VDC (screw clamp 0TB103.9 or cage clamp 0TB103.91 sold separately).	For Automation Panel 900

Table 86: Link module for the configuration - One Automation Panel 900 via DVI

4.3.3 Cables

Select an Automation Panel 900 cable from the following table.

Model number	Type	Length
5CASDL.0018-00	SDL cable for a fixed type of layout	1.8 m
5CASDL.0018-01	SDL cable with 45° plug for fixed type of layout	1.8 m
5CASDL.0018-03	SDL cable for fixed and flexible type of layout	1.8 m
5CASDL.0050-00	SDL cable for a fixed type of layout	5 m
5CASDL.0050-01	SDL cable with 45° plug for fixed type of layout	5 m
5CASDL.0050-03	SDL cable for fixed and flexible type of layout	5 m
5CASDL.0100-00	SDL cable for a fixed type of layout	10 m
5CASDL.0100-01	SDL cable with 45° plug for fixed type of layout	10 m
5CASDL.0100-03	SDL cable for fixed and flexible type of layout	10 m
5CASDL.0150-00	SDL cable for a fixed type of layout	15 m
5CASDL.0150-01	SDL cable with 45° plug for fixed type of layout	15 m
5CASDL.0150-03	SDL cable for fixed and flexible type of layout	15 m
5CASDL.0200-00	SDL cable for a fixed type of layout	20 m
5CASDL.0200-03	SDL cable for fixed and flexible type of layout	20 m
5CASDL.0250-00	SDL cable for a fixed type of layout	25 m
5CASDL.0250-30	SDL cable for fixed and flexible type of layout	25 m
5CASDL.0300-00	SDL cable for a fixed type of layout	30 m
5CASDL.0300-03	SDL cable for fixed and flexible type of layout	30 m
5CASDL.0300-10	SDL cable with extender for a fixed type of layout	30 m
5CASDL.0300-13	SDL cable with extender for fixed and flexible type of layout	30 m
5CASDL.0400-10	SDL cable with extender for a fixed type of layout	40 m
5CASDL.0400-13	SDL cable with extender for fixed and flexible type of layout	40 m

Table 87: Cables for SDL configurations

Information:

Detailed technical data about the cables can be found in the Automation Panel 900 User's Manual. This can be downloaded as a .pdf file from the B&R homepage www.br-automation.com.

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Cable lengths and resolutions for SDL transfer

The following table shows the relationship between segment lengths and the maximum resolution according to the SDL cable used:

Cables Segment length [m]	Resolution				
	VGA **640 x 480**	**SVGA** **800 x 600**	**XGA** **1024 x 768**	**SXGA** **1280 x 1024**	**UXGA** **1600 x 1200**
1.8	5CASDL.0018-00 5CASDL.0018-01 5CASDL.0018-03	5CASDL.0018-00 5CASDL.0018-01 5CASDL.0018-03	5CASDL.0018-00 5CASDL.0018-01 5CASDL.0018-03	5CASDL.0018-00 5CASDL.0018-01 5CASDL.0018-03	5CASDL.0018-00 5CASDL.0018-01 5CASDL.0018-03
5	5CASDL.0050-00 5CASDL.0050-01 5CASDL.0050-03	5CASDL.0050-00 5CASDL.0050-01 5CASDL.0050-03	5CASDL.0050-00 5CASDL.0050-01 5CASDL.0050-03	5CASDL.0050-00 5CASDL.0050-01 5CASDL.0050-03	5CASDL.0050-00 5CASDL.0050-01 5CASDL.0050-03
10	5CASDL.0100-00 5CASDL.0100-01 5CASDL.0100-03	5CASDL.0100-00 5CASDL.0100-01 5CASDL.0100-03	5CASDL.0100-00 5CASDL.0100-01 5CASDL.0100-03	5CASDL.0100-00 5CASDL.0100-01 5CASDL.0100-03	5CASDL.0100-00 5CASDL.0100-01 5CASDL.0100-03
15	5CASDL.0150-00 5CASDL.0150-01 5CASDL.0150-03	5CASDL.0150-00 5CASDL.0150-01 5CASDL.0150-03	5CASDL.0150-00 5CASDL.0150-01 5CASDL.0150-03	5CASDL.0150-00 5CASDL.0150-01 5CASDL.0150-03	- - -
20	5CASDL.0200-00 5CASDL.0200-03	5CASDL.0200-00 5CASDL.0200-03	5CASDL.0200-00 5CASDL.0200-03	5CASDL.0200-00 5CASDL.0200-03	- -
25	5CASDL.0250-00 5CASDL.0250-03	5CASDL.0250-00 5CASDL.0250-03	5CASDL.0250-00 5CASDL.0250-03	- -	- -
30	5CASDL.0300-00 5CASDL.0300-03	5CASDL.0300-00 5CASDL.0300-03	5CASDL.0300-10 5CASDL.0300-13	5CASDL.0300-10 5CASDL.0300-13	- -
40	5CASDL.0400-10 5CASDL.0400-13	5CASDL.0400-10 5CASDL.0400-13	5CASDL.0400-10 5CASDL.0400-13	5CASDL.0400-10 5CASDL.0400-13	- -

Table 88: Segment lengths, resolutions and SDL cables

4.3.4 BIOS settings

No special BIOS settings are necessary for operation.

Touch screen functionality

The COM C must be enabled in BIOS in order to operate the connected panel touch screen on the monitor / panel connection (found in the BIOS menu under "Advanced - Baseboard / Panel Features - Legacy Devices").

4.4 An Automation Panel 800 via SDL (onboard)

An Automation Panel 800 is connected to the integrated SDL interface (onboard) via an SDL cable. USB devices can only be connected directly to the extension keyboard (without a hub).
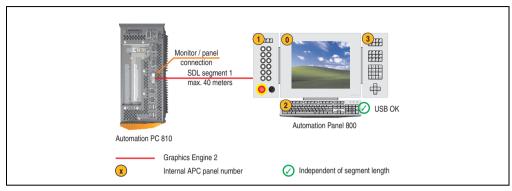

Figure 80: Configuration - An Automation Panel 800 via SDL (onboard)

4.4.1 Basic system requirements

The following table displays the possible combinations for the APC810 system unit with CPU board to implement the configuration shown in the figure above. If the maximum resolution is limited when making the combination then it is also shown in the following table (e.g. for connecting a non-B&R Automation Panel 900 device).

CPU board	with system unit			Limitation
	5PC810.SX01-00	**5PC810.SX02-00**	**5PC810.SX05-00**	**Resolution**
5PC800.B945-00	✓	✓	✓	Max. UXGA
5PC800.B945-01	✓	✓	✓	Max. UXGA
5PC800.B945-02	✓	✓	✓	Max. UXGA
5PC800.B945-03	✓	✓	✓	Max. UXGA
5PC800.B945-04	✓	✓	✓	Max. UXGA

Table 89: Possible combinations of system unit and CPU board

4.4.2 Cables

Select an Automation Panel 800 SDL cable from the following table.

Model number	Type	Length
5CASDL.0018-20	SDL cable for fixed and flexible type of layout	1.8 m
5CASDL.0050-20	SDL cable for fixed and flexible type of layout	5 m
5CASDL.0100-20	SDL cable for fixed and flexible type of layout	10 m
5CASDL.0150-20	SDL cable for fixed and flexible type of layout	15 m

Table 90: Cables for SDL configurations

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Model number	Type	Length
5CASDL.0200-20	SDL cable for fixed and flexible type of layout	20 m
5CASDL.0250-20	SDL cable for fixed and flexible type of layout	25 m
5CASDL.0300-30	SDL cable with extender for fixed and flexible type of layout	30 m
5CASDL.0400-30	SDL cable with extender for fixed and flexible type of layout	40 m

Table 90: Cables for SDL configurations (Forts.)

Information:

Detailed technical data about the cables can be found in the Automation Panel 800 User's Manual. This can be downloaded as a .pdf file from the B&R homepage www.br-automation.com.

Cable lengths and resolutions for SDL transfer

The following table shows the relationship between segment lengths and the maximum resolution according to the SDL cable used:

Cables Segment length [m]	Resolution
	XGA 1024 x 768
1.8	5CASDL.0018-20
5	5CASDL.0050-20
10	5CASDL.0100-20
15	5CASDL.0150-20
20	5CASDL.0200-20
25	5CASDL.0250-20
30	5CASDL.0300-30
40	5CASDL.0400-30

Table 91: Segment lengths, resolutions and SDL cables

4.4.3 BIOS settings

No special BIOS settings are necessary for operation.

Touch screen functionality

The COM C must be enabled in BIOS in order to operate the connected panel touch screen on the monitor / panel connection (found in the BIOS menu under "Advanced - Baseboard / Panel Features - Legacy Devices").

4.5 An AP900 and an AP800 via SDL (onboard)

An Automation Panel 900 and an Automation Panel 800 are connected to the integrated SDL interface (onboard) via SDL.

USB is supported up to a maximum distance (segment 1 + segment 2) of 30 m on the two displays. Starting at a distance of 30 m, USB is only available on the first display (front and back) up to a maximum of 40 m. USB devices can only be connected directly to the Automation Panel 900 or extension keyboard (without a hub).
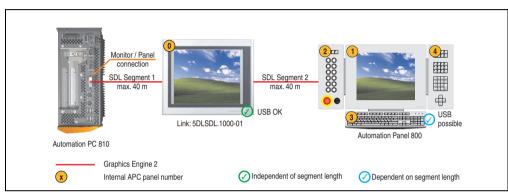

Figure 81: Configuration - An AP900 and an AP800 via SDL (onboard)

4.5.1 Basic system requirements

The following table displays the possible combinations for the APC810 system unit with CPU board to implement the configuration shown in the figure above. If the maximum resolution is limited when making the combination then it is also shown in the following table (e.g. for connecting a non-B&R Automation Panel 900 device).

CPU board	with system unit			Limitation
	5PC810.SX01-00	5PC810.SX02-00	5PC810.SX05-00	Resolution
5PC800.B945-00	✓	✓	✓	Max. UXGA
5PC800.B945-01	✓	✓	✓	Max. UXGA
5PC800.B945-02	✓	✓	✓	Max. UXGA
5PC800.B945-03	✓	✓	✓	Max. UXGA
5PC800.B945-04	✓	✓	✓	Max. UXGA

Table 92: Possible combinations of system unit and CPU board

4.5.2 Link modules

Model number	Description	Comment
5DLSDL.1000-01	**Automation Panel Link SDL transceiver** Connections for SDL in, transfer of display data, touch screen, USB 1.1, matrix keys, and service data, 24 VDC (screw clamp 0TB103.9 or cage clamp 0TB103.91 sold separately).	For Automation Panel 900 1 pieces required

Table 93: Link modules for configuration - One AP900 and one AP800 via SDL (onboard)

4.5.3 Cables

How to select an SDL cable for connecting the AP900 display to the AP900 display 4.3 "An Automation Panel 900 via SDL (onboard)".

How to select an SDL cable for connecting the AP800 display to the AP900 display4.4 "An Automation Panel 800 via SDL (onboard)".

Information:

Detailed technical data about the cables can be found in the Automation Panel 800 or Automation Panel 900 User's Manual. These can be downloaded as .pdf files from the B&R homepage www.br-automation.com.

4.5.4 BIOS settings

No special BIOS settings are necessary for operation.

Touch screen functionality

The COM C must be enabled in BIOS in order to operate the connected panel touch screen on the monitor / panel connection (found in the BIOS menu under "Advanced - Baseboard / Panel Features - Legacy Devices").

4.6 Four Automation Panel 900 units via SDL (onboard)

An Automation Panel 900 is connected to the integrated SDL interface (onboard) via an SDL cable. Up to three other Automation Panels of the same type are connected to this Automation Panel and operated via SDL. All four panels show the same content (Display Clone).

USB is supported up to a maximum distance (SDL segment 1 + SDL segment 2) of 30 m on the first two panels (front and back side). From a distance of 30 m and longer, USB is only available for the first panel (front and back side). USB devices can only be connected directly to the Automation Panel (without a hub).
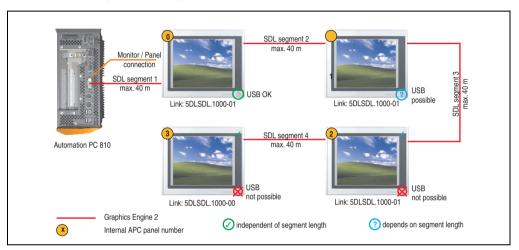
Figure 82: Configuration - Four Automation Panel 900 units via SDL (onboard)

4.6.1 Basic system requirements

The following table displays the possible combinations for the APC810 system unit with CPU board to implement the configuration shown in the figure above. If the maximum resolution is limited when making the combination then it is also shown in the following table (e.g. for connecting a non-B&R Automation Panel 900 device).

CPU board	with system unit			Limitation
	5PC810.SX01-00	**5PC810.SX02-00**	**5PC810.SX05-00**	**Resolution**
5PC800.B945-00	✓	✓	✓	Max. UXGA
5PC800.B945-01	✓	✓	✓	Max. UXGA
5PC800.B945-02	✓	✓	✓	Max. UXGA
5PC800.B945-03	✓	✓	✓	Max. UXGA
5PC800.B945-04	✓	✓	✓	Max. UXGA

Table 94: Possible combinations of system unit and CPU board

4.6.2 Link modules

Model number	Description	Comment
5DLSDL.1000-00	**Automation Panel Link SDL receiver** Connection for SDL in, transfer of display data, touch screen, USB 1.1, matrix keys, and service data, 24 VDC (screw clamp 0TB103.9 or cage clamp 0TB103.91 sold separately).	For Automation Panel 900
5DLSDL.1000-01	**Automation Panel Link SDL transceiver** Connections for SDL in, transfer of display data, touch screen, USB 1.1, matrix keys, and service data, 24 VDC (screw clamp 0TB103.9 or cage clamp 0TB103.91 sold separately).	For Automation Panel 900 3 pieces required

Table 95: Link modules for the configuration: 4 Automation Panel 900 via SDL on 1 line

4.6.3 Cables

Select an Automation Panel 900 cable from the following table.

Model number	Type	Length
5CASDL.0018-00	SDL cable for a fixed type of layout	1.8 m
5CASDL.0018-01	SDL cable with 45° plug for fixed type of layout	1.8 m
5CASDL.0018-03	SDL cable for fixed and flexible type of layout	1.8 m
5CASDL.0050-00	SDL cable for a fixed type of layout	5 m
5CASDL.0050-01	SDL cable with 45° plug for fixed type of layout	5 m
5CASDL.0050-03	SDL cable for fixed and flexible type of layout	5 m
5CASDL.0100-00	SDL cable for a fixed type of layout	10 m
5CASDL.0100-01	SDL cable with 45° plug for fixed type of layout	10 m
5CASDL.0100-03	SDL cable for fixed and flexible type of layout	10 m
5CASDL.0150-00	SDL cable for a fixed type of layout	15 m
5CASDL.0150-01	SDL cable with 45° plug for fixed type of layout	15 m
5CASDL.0150-03	SDL cable for fixed and flexible type of layout	15 m
5CASDL.0200-00	SDL cable for a fixed type of layout	20 m
5CASDL.0200-03	SDL cable for fixed and flexible type of layout	20 m
5CASDL.0250-00	SDL cable for a fixed type of layout	25 m
5CASDL.0250-30	SDL cable for fixed and flexible type of layout	25 m
5CASDL.0300-00	SDL cable for a fixed type of layout	30 m
5CASDL.0300-03	SDL cable for fixed and flexible type of layout	30 m
5CASDL.0300-10	SDL cable with extender for a fixed type of layout	30 m
5CASDL.0300-13	SDL cable with extender for fixed and flexible type of layout	30 m
5CASDL.0400-10	SDL cable with extender for a fixed type of layout	40 m
5CASDL.0400-13	SDL cable with extender for fixed and flexible type of layout	40 m

Table 96: Cables for SDL configurations

Information:

Detailed technical data about the cables can be found in the Automation Panel 900 User's Manual. This can be downloaded as a .pdf file from the B&R homepage www.br-automation.com.

Cable lengths and resolutions for SDL transfer

The following table shows the relationship between segment lengths and the maximum resolution according to the SDL cable used:

Cables	Resolution				
Segment length [m]	VGA 640 x 480	SVGA 800 x 600	XGA 1024 x 768	SXGA 1280 x 1024	UXGA 1600 x 1200
1.8	5CASDL.0018-00 5CASDL.0018-01 5CASDL.0018-03	5CASDL.0018-00 5CASDL.0018-01 5CASDL.0018-03	5CASDL.0018-00 5CASDL.0018-01 5CASDL.0018-03	5CASDL.0018-00 5CASDL.0018-01 5CASDL.0018-03	5CASDL.0018-00 5CASDL.0018-01 5CASDL.0018-03
5	5CASDL.0050-00 5CASDL.0050-01 5CASDL.0050-03	5CASDL.0050-00 5CASDL.0050-01 5CASDL.0050-03	5CASDL.0050-00 5CASDL.0050-01 5CASDL.0050-03	5CASDL.0050-00 5CASDL.0050-01 5CASDL.0050-03	5CASDL.0050-00 5CASDL.0050-01 5CASDL.0050-03
10	5CASDL.0100-00 5CASDL.0100-01 5CASDL.0100-03	5CASDL.0100-00 5CASDL.0100-01 5CASDL.0100-03	5CASDL.0100-00 5CASDL.0100-01 5CASDL.0100-03	5CASDL.0100-00 5CASDL.0100-01 5CASDL.0100-03	5CASDL.0100-00 5CASDL.0100-01 5CASDL.0100-03
15	5CASDL.0150-00 5CASDL.0150-01 5CASDL.0150-03	5CASDL.0150-00 5CASDL.0150-01 5CASDL.0150-03	5CASDL.0150-00 5CASDL.0150-01 5CASDL.0150-03	5CASDL.0150-00 5CASDL.0150-01 5CASDL.0150-03	- - -
20	5CASDL.0200-00 5CASDL.0200-03	5CASDL.0200-00 5CASDL.0200-03	5CASDL.0200-00 5CASDL.0200-03	5CASDL.0200-00 5CASDL.0200-03	- -
25	5CASDL.0250-00 5CASDL.0250-03	5CASDL.0250-00 5CASDL.0250-03	5CASDL.0250-00 5CASDL.0250-03	- -	- -
30	5CASDL.0300-00 5CASDL.0300-03	5CASDL.0300-00 5CASDL.0300-03	5CASDL.0300-10 5CASDL.0300-13	5CASDL.0300-10 5CASDL.0300-13	- -
40	5CASDL.0400-10 5CASDL.0400-13	5CASDL.0400-10 5CASDL.0400-13	5CASDL.0400-10 5CASDL.0400-13	5CASDL.0400-10 5CASDL.0400-13	- -

Table 97: Segment lengths, resolutions and SDL cables

4.6.4 BIOS settings

No special BIOS settings are necessary for operation.

Touch screen functionality

The COM C must be enabled in BIOS in order to operate the connected panel touch screen on the monitor / panel connection (found in the BIOS menu under "Advanced - Baseboard / Panel Features - Legacy Devices").

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4.7 One Automation Panel 900 unit via SDL (AP Link)

An Automation Panel 900 unit is connected to the optional SDL transmitter (AP Link) via an SDL cable. USB devices can only be connected directly to the Automation Panel (without a hub).
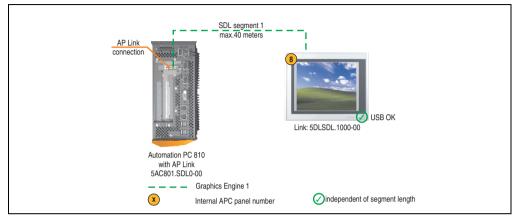

Figure 83: Configuration - One Automation Panel 900 via SDL (AP Link)

4.7.1 Basic system requirements

The following table displays the possible combinations for the APC810 system unit with CPU board to implement the configuration shown in the figure above. If the maximum resolution is limited when making the combination then it is also shown in the following table (e.g. for connecting a non-B&R Automation Panel 900 device).

CPU board	with system unit			Limitation
	5PC810.SX01-00[1)]	5PC810.SX02-00	5PC810.SX05-00	Resolution
5PC800.B945-00	-	✓	✓	Max. UXGA
5PC800.B945-01	-	✓	✓	Max. UXGA
5PC800.B945-02	-	✓	✓	Max. UXGA
5PC800.B945-03	-	✓	✓	Max. UXGA
5PC800.B945-04	-	✓	✓	Max. UXGA

Table 98: Possible combinations of system unit and CPU board

1) AP Link cannot be installed.

4.7.2 Link modules

Model number	Description	Comment
5DLSDL.1000-00	**Automation Panel Link SDL receiver** Connection for SDL in, transfer of display data, touch screen, USB 1.1, matrix keys, and service data, 24 VDC (screw clamp 0TB103.9 or cage clamp 0TB103.91 sold separately).	For Automation Panel 900
5AC801.SDL0-00	**APC810 AP Link SDL transmitter** Automation Panel SDL link transmitter	For Automation PC 810

Table 99: Link modules for the configuration: 4 Automation Panel 900 via SDL on 1 line

4.7.3 Cables

Select an Automation Panel 900 cable from the following table.

Model number	Type	Length
5CASDL.0018-00	SDL cable for a fixed type of layout	1.8 m
5CASDL.0018-01	SDL cable with 45° plug for fixed type of layout	1.8 m
5CASDL.0018-03	SDL cable for fixed and flexible type of layout	1.8 m
5CASDL.0050-00	SDL cable for a fixed type of layout	5 m
5CASDL.0050-01	SDL cable with 45° plug for fixed type of layout	5 m
5CASDL.0050-03	SDL cable for fixed and flexible type of layout	5 m
5CASDL.0100-00	SDL cable for a fixed type of layout	10 m
5CASDL.0100-01	SDL cable with 45° plug for fixed type of layout	10 m
5CASDL.0100-03	SDL cable for fixed and flexible type of layout	10 m
5CASDL.0150-00	SDL cable for a fixed type of layout	15 m
5CASDL.0150-01	SDL cable with 45° plug for fixed type of layout	15 m
5CASDL.0150-03	SDL cable for fixed and flexible type of layout	15 m
5CASDL.0200-00	SDL cable for a fixed type of layout	20 m
5CASDL.0200-03	SDL cable for fixed and flexible type of layout	20 m
5CASDL.0250-00	SDL cable for a fixed type of layout	25 m
5CASDL.0250-30	SDL cable for fixed and flexible type of layout	25 m
5CASDL.0300-00	SDL cable for a fixed type of layout	30 m
5CASDL.0300-03	SDL cable for fixed and flexible type of layout	30 m
5CASDL.0300-10	SDL cable with extender for a fixed type of layout	30 m
5CASDL.0300-13	SDL cable with extender for fixed and flexible type of layout	30 m
5CASDL.0400-10	SDL cable with extender for a fixed type of layout	40 m
5CASDL.0400-13	SDL cable with extender for fixed and flexible type of layout	40 m

Table 100: Cables for SDL configurations

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Information:

Detailed technical data about the cables can be found in the Automation Panel 900 User's Manual. This can be downloaded as a .pdf file from the B&R homepage www.br-automation.com.

Cable lengths and resolutions for SDL transfer

The following table shows the relationship between segment lengths and the maximum resolution according to the SDL cable used:

Cables	Resolution				
Segment length [m]	VGA 640 x 480	SVGA 800 x 600	XGA 1024 x 768	SXGA 1280 x 1024	UXGA 1600 x 1200
1.8	5CASDL.0018-00 5CASDL.0018-01 5CASDL.0018-03	5CASDL.0018-00 5CASDL.0018-01 5CASDL.0018-03	5CASDL.0018-00 5CASDL.0018-01 5CASDL.0018-03	5CASDL.0018-00 5CASDL.0018-01 5CASDL.0018-03	5CASDL.0018-00 5CASDL.0018-01 5CASDL.0018-03
5	5CASDL.0050-00 5CASDL.0050-01 5CASDL.0050-03	5CASDL.0050-00 5CASDL.0050-01 5CASDL.0050-03	5CASDL.0050-00 5CASDL.0050-01 5CASDL.0050-03	5CASDL.0050-00 5CASDL.0050-01 5CASDL.0050-03	5CASDL.0050-00 5CASDL.0050-01 5CASDL.0050-03
10	5CASDL.0100-00 5CASDL.0100-01 5CASDL.0100-03	5CASDL.0100-00 5CASDL.0100-01 5CASDL.0100-03	5CASDL.0100-00 5CASDL.0100-01 5CASDL.0100-03	5CASDL.0100-00 5CASDL.0100-01 5CASDL.0100-03	5CASDL.0100-00 5CASDL.0100-01 5CASDL.0100-03
15	5CASDL.0150-00 5CASDL.0150-01 5CASDL.0150-03	5CASDL.0150-00 5CASDL.0150-01 5CASDL.0150-03	5CASDL.0150-00 5CASDL.0150-01 5CASDL.0150-03	5CASDL.0150-00 5CASDL.0150-01 5CASDL.0150-03	- - -
20	5CASDL.0200-00 5CASDL.0200-03	5CASDL.0200-00 5CASDL.0200-03	5CASDL.0200-00 5CASDL.0200-03	5CASDL.0200-00 5CASDL.0200-03	- -
25	5CASDL.0250-00 5CASDL.0250-03	5CASDL.0250-00 5CASDL.0250-03	5CASDL.0250-00 5CASDL.0250-03	- -	- -
30	5CASDL.0300-00 5CASDL.0300-03	5CASDL.0300-00 5CASDL.0300-03	5CASDL.0300-10 5CASDL.0300-13	5CASDL.0300-10 5CASDL.0300-13	- -
40	5CASDL.0400-10 5CASDL.0400-13	5CASDL.0400-10 5CASDL.0400-13	5CASDL.0400-10 5CASDL.0400-13	5CASDL.0400-10 5CASDL.0400-13	- -

Table 101: Segment lengths, resolutions and SDL cables

4.7.4 BIOS settings

No special BIOS settings are necessary for operation.

Touch screen functionality

The COM D must be enabled in BIOS in order to operate the connected panel touch screen on the AP Link connection (found in the BIOS menu under "Advanced - Baseboard / Panel Features - Legacy Devices").

4.8 Four Automation Panel 900 units via SDL (AP Link)

An Automation Panel 900 unit is connected to the optional SDL transmitter (AP Link) via an SDL cable. Three other Automation Panels of the same type are connected to this Automation Panel and operated via SDL. All four panels show the same content (Display Clone).

USB is supported up to a maximum distance (SDL segment 1 + SDL segment 2) of 30 m on the first two panels (front and back side). From a distance of 30 m and longer, USB is only available for the first panel (front and back side). USB devices can only be connected directly to the Automation Panel (without a hub).
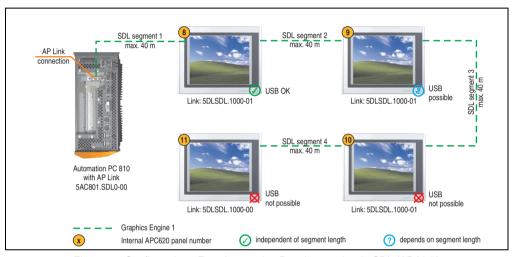
Figure 84: Configuration - Four Automation Panel 900 units via SDL (AP Link)

4.8.1 Basic system requirements

The following table displays the possible combinations for the APC810 system unit with CPU board to implement the configuration shown in the figure above. If the maximum resolution is limited when making the combination then it is also shown in the following table (e.g. for connecting a non-B&R Automation Panel 900 device).

CPU board	with system unit			Limitation
	5PC810.SX01-00[1)]	5PC810.SX02-00	5PC810.SX05-00	Resolution
5PC800.B945-00	-	✓	✓	Max. UXGA
5PC800.B945-01	-	✓	✓	Max. UXGA
5PC800.B945-02	-	✓	✓	Max. UXGA
5PC800.B945-03	-	✓	✓	Max. UXGA
5PC800.B945-04	-	✓	✓	Max. UXGA

Table 102: Possible combinations of system unit and CPU board

1) AP Link cannot be installed.

4.8.2 Link modules

Model number	Description	Comment
5DLSDL.1000-00	**Automation Panel Link SDL receiver** Connection for SDL in, transfer of display data, touch screen, USB 1.1, matrix keys, and service data, 24 VDC (screw clamp 0TB103.9 or cage clamp 0TB103.91 sold separately).	For Automation Panel 900
5DLSDL.1000-01	**Automation Panel Link SDL transceiver** Connections for SDL in, transfer of display data, touch screen, USB 1.1, matrix keys, and service data, 24 VDC (screw clamp 0TB103.9 or cage clamp 0TB103.91 sold separately).	For Automation Panel 900 3 pieces required
5AC801.SDL0-00	**APC810 AP Link SDL transmitter** Automation Panel SDL link transmitter	For Automation PC 810

Table 103: Link modules for configuration - Four Automation Panel 900 units via SDL (AP Link)

4.8.3 Cables

Select four Automation Panel 900 cables from the following table.

Model number	Type	Length
5CASDL.0018-00	SDL cable for a fixed type of layout	1.8 m
5CASDL.0018-01	SDL cable with 45° plug for fixed type of layout	1.8 m
5CASDL.0018-03	SDL cable for fixed and flexible type of layout	1.8 m
5CASDL.0050-00	SDL cable for a fixed type of layout	5 m
5CASDL.0050-01	SDL cable with 45° plug for fixed type of layout	5 m
5CASDL.0050-03	SDL cable for fixed and flexible type of layout	5 m
5CASDL.0100-00	SDL cable for a fixed type of layout	10 m
5CASDL.0100-01	SDL cable with 45° plug for fixed type of layout	10 m
5CASDL.0100-03	SDL cable for fixed and flexible type of layout	10 m
5CASDL.0150-00	SDL cable for a fixed type of layout	15 m
5CASDL.0150-01	SDL cable with 45° plug for fixed type of layout	15 m
5CASDL.0150-03	SDL cable for fixed and flexible type of layout	15 m
5CASDL.0200-00	SDL cable for a fixed type of layout	20 m
5CASDL.0200-03	SDL cable for fixed and flexible type of layout	20 m
5CASDL.0250-00	SDL cable for a fixed type of layout	25 m
5CASDL.0250-30	SDL cable for fixed and flexible type of layout	25 m
5CASDL.0300-00	SDL cable for a fixed type of layout	30 m
5CASDL.0300-03	SDL cable for fixed and flexible type of layout	30 m
5CASDL.0300-10	SDL cable with extender for a fixed type of layout	30 m
5CASDL.0300-13	SDL cable with extender for fixed and flexible type of layout	30 m
5CASDL.0400-10	SDL cable with extender for a fixed type of layout	40 m
5CASDL.0400-13	SDL cable with extender for fixed and flexible type of layout	40 m

Table 104: Cables for SDL configurations

Information:

Detailed technical data about the cables can be found in the Automation Panel 900 User's Manual. This can be downloaded as a .pdf file from the B&R homepage www.br-automation.com.

Cable lengths and resolutions for SDL transfer

The following table shows the relationship between segment lengths and the maximum resolution according to the SDL cable used:

Cables	Resolution				
Segment length [m]	VGA 640 x 480	SVGA 800 x 600	XGA 1024 x 768	SXGA 1280 x 1024	UXGA 1600 x 1200
1.8	5CASDL.0018-00 5CASDL.0018-01 5CASDL.0018-03	5CASDL.0018-00 5CASDL.0018-01 5CASDL.0018-03	5CASDL.0018-00 5CASDL.0018-01 5CASDL.0018-03	5CASDL.0018-00 5CASDL.0018-01 5CASDL.0018-03	5CASDL.0018-00 5CASDL.0018-01 5CASDL.0018-03
5	5CASDL.0050-00 5CASDL.0050-01 5CASDL.0050-03	5CASDL.0050-00 5CASDL.0050-01 5CASDL.0050-03	5CASDL.0050-00 5CASDL.0050-01 5CASDL.0050-03	5CASDL.0050-00 5CASDL.0050-01 5CASDL.0050-03	5CASDL.0050-00 5CASDL.0050-01 5CASDL.0050-03
10	5CASDL.0100-00 5CASDL.0100-01 5CASDL.0100-03	5CASDL.0100-00 5CASDL.0100-01 5CASDL.0100-03	5CASDL.0100-00 5CASDL.0100-01 5CASDL.0100-03	5CASDL.0100-00 5CASDL.0100-01 5CASDL.0100-03	5CASDL.0100-00 5CASDL.0100-01 5CASDL.0100-03
15	5CASDL.0150-00 5CASDL.0150-01 5CASDL.0150-03	5CASDL.0150-00 5CASDL.0150-01 5CASDL.0150-03	5CASDL.0150-00 5CASDL.0150-01 5CASDL.0150-03	5CASDL.0150-00 5CASDL.0150-01 5CASDL.0150-03	- - -
20	5CASDL.0200-00 5CASDL.0200-03	5CASDL.0200-00 5CASDL.0200-03	5CASDL.0200-00 5CASDL.0200-03	5CASDL.0200-00 5CASDL.0200-03	- -
25	5CASDL.0250-00 5CASDL.0250-03	5CASDL.0250-00 5CASDL.0250-03	5CASDL.0250-00 5CASDL.0250-03	- -	- -
30	5CASDL.0300-00 5CASDL.0300-03	5CASDL.0300-00 5CASDL.0300-03	5CASDL.0300-10 5CASDL.0300-13	5CASDL.0300-10 5CASDL.0300-13	- -
40	5CASDL.0400-10 5CASDL.0400-13	5CASDL.0400-10 5CASDL.0400-13	5CASDL.0400-10 5CASDL.0400-13	5CASDL.0400-10 5CASDL.0400-13	- -

Table 105: Segment lengths, resolutions and SDL cables

4.8.4 BIOS settings

No special BIOS settings are necessary for operation.

Touch screen functionality

The COM D must be enabled in BIOS in order to operate the connected panel touch screen on the monitor / panel connection (found in the BIOS menu under "Advanced - Baseboard / Panel Features - Legacy Devices").

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4.9 Two Automation Panel 900 units via SDL (onboard) and SDL (AP Link)

An Automation Panel 900 (max. UXGA) is connected to the integrated SDL interface (onboard) via an SDL cable. A second Automation Panel 900 (max. UXGA) is connected to the optional SDL transmitter (AP Link) via an SDL cable. The Automation Panels show different content (Extended Desktop) and can be different types.
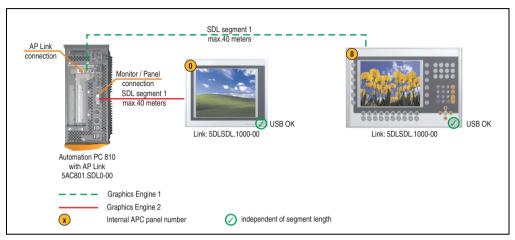
Figure 85: Configuration - Two Automation Panel 900 units via SDL (onboard) and SDL (AP Link)

4.9.1 Basic system requirements

The following table displays the possible combinations for the APC810 system unit with CPU board to implement the configuration shown in the figure above. If the maximum resolution is limited when making the combination then it is also shown in the following table (e.g. for connecting a non-B&R Automation Panel 900 device).

CPU board	with system unit			Limitation
	5PC810.SX01-00[1]	5PC810.SX02-00	5PC810.SX05-00	Resolution
5PC800.B945-00	-	✓	✓	Max. UXGA
5PC800.B945-01	-	✓	✓	Max. UXGA
5PC800.B945-02	-	✓	✓	Max. UXGA
5PC800.B945-03	-	✓	✓	Max. UXGA
5PC800.B945-04	-	✓	✓	Max. UXGA

Table 106: Possible combinations of system unit and CPU board

1) AP Link cannot be installed.

4.9.2 Link modules

Model number	Description	Comment
5DLSDL.1000-00	**Automation Panel Link SDL receiver** Connection for SDL in, transfer of display data, touch screen, USB 1.1, matrix keys, and service data, 24 VDC (screw clamp 0TB103.9 or cage clamp 0TB103.91 sold separately).	2 pieces for Automation Panel 900
5AC801.SDL0-00	**APC810 AP Link SDL transmitter** Automation Panel SDL link transmitter	For Automation PC 810

Table 107: Link modules for configuration - Two Automation Panel 900 units via SDL (onboard) and SDL (AP Link)

4.9.3 Cables

Select four Automation Panel 900 cables from the following table.

Model number	Type	Length
5CASDL.0018-00	SDL cable for a fixed type of layout	1.8 m
5CASDL.0018-01	SDL cable with 45° plug for fixed type of layout	1.8 m
5CASDL.0018-03	SDL cable for fixed and flexible type of layout	1.8 m
5CASDL.0050-00	SDL cable for a fixed type of layout	5 m
5CASDL.0050-01	SDL cable with 45° plug for fixed type of layout	5 m
5CASDL.0050-03	SDL cable for fixed and flexible type of layout	5 m
5CASDL.0100-00	SDL cable for a fixed type of layout	10 m
5CASDL.0100-01	SDL cable with 45° plug for fixed type of layout	10 m
5CASDL.0100-03	SDL cable for fixed and flexible type of layout	10 m
5CASDL.0150-00	SDL cable for a fixed type of layout	15 m
5CASDL.0150-01	SDL cable with 45° plug for fixed type of layout	15 m
5CASDL.0150-03	SDL cable for fixed and flexible type of layout	15 m
5CASDL.0200-00	SDL cable for a fixed type of layout	20 m
5CASDL.0200-03	SDL cable for fixed and flexible type of layout	20 m
5CASDL.0250-00	SDL cable for a fixed type of layout	25 m
5CASDL.0250-30	SDL cable for fixed and flexible type of layout	25 m
5CASDL.0300-00	SDL cable for a fixed type of layout	30 m
5CASDL.0300-03	SDL cable for fixed and flexible type of layout	30 m
5CASDL.0300-10	SDL cable with extender for a fixed type of layout	30 m
5CASDL.0300-13	SDL cable with extender for fixed and flexible type of layout	30 m
5CASDL.0400-10	SDL cable with extender for a fixed type of layout	40 m
5CASDL.0400-13	SDL cable with extender for fixed and flexible type of layout	40 m

Table 108: Cables for SDL configurations

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Information:

Detailed technical data about the cables can be found in the Automation Panel 900 User's Manual. This can be downloaded as a .pdf file from the B&R homepage www.br-automation.com.

Cable lengths and resolutions for SDL transfer

The following table shows the relationship between segment lengths and the maximum resolution according to the SDL cable used:

Cables	Resolution				
Segment length [m]	VGA 640 x 480	SVGA 800 x 600	XGA 1024 x 768	SXGA 1280 x 1024	UXGA 1600 x 1200
1.8	5CASDL.0018-00 5CASDL.0018-01 5CASDL.0018-03	5CASDL.0018-00 5CASDL.0018-01 5CASDL.0018-03	5CASDL.0018-00 5CASDL.0018-01 5CASDL.0018-03	5CASDL.0018-00 5CASDL.0018-01 5CASDL.0018-03	5CASDL.0018-00 5CASDL.0018-01 5CASDL.0018-03
5	5CASDL.0050-00 5CASDL.0050-01 5CASDL.0050-03	5CASDL.0050-00 5CASDL.0050-01 5CASDL.0050-03	5CASDL.0050-00 5CASDL.0050-01 5CASDL.0050-03	5CASDL.0050-00 5CASDL.0050-01 5CASDL.0050-03	5CASDL.0050-00 5CASDL.0050-01 5CASDL.0050-03
10	5CASDL.0100-00 5CASDL.0100-01 5CASDL.0100-03	5CASDL.0100-00 5CASDL.0100-01 5CASDL.0100-03	5CASDL.0100-00 5CASDL.0100-01 5CASDL.0100-03	5CASDL.0100-00 5CASDL.0100-01 5CASDL.0100-03	5CASDL.0100-00 5CASDL.0100-01 5CASDL.0100-03
15	5CASDL.0150-00 5CASDL.0150-01 5CASDL.0150-03	5CASDL.0150-00 5CASDL.0150-01 5CASDL.0150-03	5CASDL.0150-00 5CASDL.0150-01 5CASDL.0150-03	5CASDL.0150-00 5CASDL.0150-01 5CASDL.0150-03	- - -
20	5CASDL.0200-00 5CASDL.0200-03	5CASDL.0200-00 5CASDL.0200-03	5CASDL.0200-00 5CASDL.0200-03	5CASDL.0200-00 5CASDL.0200-03	- -
25	5CASDL.0250-00 5CASDL.0250-03	5CASDL.0250-00 5CASDL.0250-03	5CASDL.0250-00 5CASDL.0250-03	- -	- -
30	5CASDL.0300-00 5CASDL.0300-03	5CASDL.0300-00 5CASDL.0300-03	5CASDL.0300-10 5CASDL.0300-13	5CASDL.0300-10 5CASDL.0300-13	- -
40	5CASDL.0400-10 5CASDL.0400-13	5CASDL.0400-10 5CASDL.0400-13	5CASDL.0400-10 5CASDL.0400-13	5CASDL.0400-10 5CASDL.0400-13	- -

Table 109: Segment lengths, resolutions and SDL cables

4.9.4 BIOS settings

No special BIOS settings are necessary for operation.

Touch screen functionality

The COM C or COM D must be enabled in BIOS in order to operate the connected panel touch screen on the monitor / panel or AP Link connection (found in the BIOS menu under "Advanced - Baseboard / Panel Features - Legacy Devices").

4.10 Eight Automation Panel 900 units via SDL (onboard) and SDL (AP Link)

Four Automation Panel 900 units (max. UXGA) are connected to the integrated SDL interface (onboard) via SDL. Four additional Automation Panel 900 units (max. UXGA) are connected to the optional SDL transmitter (AP Link). The Automation Panels in each line must be the same type. The two lines display different content (Extended Desktop), but panels in the same line show the same content (Display Clone).

USB is supported up to a maximum distance (SDL segment 1 + SDL segment 2) of 30 m on the first two panels (front and back side) of the two lines. From a distance of 30 m and longer, USB is only available for the first panel on each line. USB devices can only be connected directly to the Automation Panel (without hub).
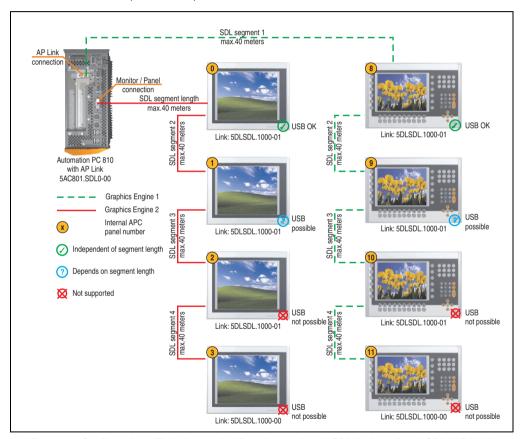
Figure 86: Configuration - Eight Automation Panel 900 units via SDL (onboard) and SDL (AP Link)

4.10.1 Basic system requirements

The following table displays the possible combinations for the APC810 system unit with CPU board to implement the configuration shown in the figure above. If the maximum resolution is limited when making the combination then it is also shown in the following table (e.g. for connecting a non-B&R Automation Panel 900 device).

CPU board	with system unit			Limitation
	5PC810.SX01-00[1]	**5PC810.SX02-00**	**5PC810.SX05-00**	**Resolution**
5PC800.B945-00	-	✓	✓	Max. UXGA
5PC800.B945-01	-	✓	✓	Max. UXGA
5PC800.B945-02	-	✓	✓	Max. UXGA
5PC800.B945-03	-	✓	✓	Max. UXGA
5PC800.B945-04	-	✓	✓	Max. UXGA

Table 110: Possible combinations of system unit and CPU board

1) AP Link cannot be installed.

4.10.2 Link modules

Model number	Description	Comment
5DLSDL.1000-00	**Automation Panel Link SDL receiver** Connection for SDL in, transfer of display data, touch screen, USB 1.1, matrix keys, and service data, 24 VDC (screw clamp 0TB103.9 or cage clamp 0TB103.91 sold separately).	For Automation Panel 900 2 pieces required
5DLSDL.1000-01	**Automation Panel Link SDL transceiver** Connections for SDL in, transfer of display data, touch screen, USB 1.1, matrix keys, and service data, 24 VDC (screw clamp 0TB103.9 or cage clamp 0TB103.91 sold separately).	For Automation Panel 900 6 pieces required
5AC801.SDL0-00	**APC810 AP Link SDL transmitter** Automation Panel SDL link transmitter	For Automation PC 810

Table 111: Link modules for the configuration: 8 Automation Panel 900 units via SDL and SDL (optional)

4.10.3 Cables

Select four Automation Panel 900 cables from the following table.

Model number	Type	Length
5CASDL.0018-00	SDL cable for a fixed type of layout	1.8 m
5CASDL.0018-01	SDL cable with 45° plug for fixed type of layout	1.8 m
5CASDL.0018-03	SDL cable for fixed and flexible type of layout	1.8 m
5CASDL.0050-00	SDL cable for a fixed type of layout	5 m
5CASDL.0050-01	SDL cable with 45° plug for fixed type of layout	5 m
5CASDL.0050-03	SDL cable for fixed and flexible type of layout	5 m
5CASDL.0100-00	SDL cable for a fixed type of layout	10 m
5CASDL.0100-01	SDL cable with 45° plug for fixed type of layout	10 m

Table 112: Cables for SDL configurations

Model number	Type	Length
5CASDL.0100-03	SDL cable for fixed and flexible type of layout	10 m
5CASDL.0150-00	SDL cable for a fixed type of layout	15 m
5CASDL.0150-01	SDL cable with 45° plug for fixed type of layout	15 m
5CASDL.0150-03	SDL cable for fixed and flexible type of layout	15 m
5CASDL.0200-00	SDL cable for a fixed type of layout	20 m
5CASDL.0200-03	SDL cable for fixed and flexible type of layout	20 m
5CASDL.0250-00	SDL cable for a fixed type of layout	25 m
5CASDL.0250-30	SDL cable for fixed and flexible type of layout	25 m
5CASDL.0300-00	SDL cable for a fixed type of layout	30 m
5CASDL.0300-03	SDL cable for fixed and flexible type of layout	30 m
5CASDL.0300-10	SDL cable with extender for a fixed type of layout	30 m
5CASDL.0300-13	SDL cable with extender for fixed and flexible type of layout	30 m
5CASDL.0400-10	SDL cable with extender for a fixed type of layout	40 m
5CASDL.0400-13	SDL cable with extender for fixed and flexible type of layout	40 m

Table 112: Cables for SDL configurations (Forts.)

Cable lengths and resolutions for SDL transfer

The following table shows the relationship between segment lengths and the maximum resolution according to the SDL cable used:

Cables Segment length [m]	Resolution				
	VGA 640 x 480	SVGA 800 x 600	XGA 1024 x 768	SXGA 1280 x 1024	UXGA 1600 x 1200
1.8	5CASDL.0018-00 5CASDL.0018-01 5CASDL.0018-03	5CASDL.0018-00 5CASDL.0018-01 5CASDL.0018-03	5CASDL.0018-00 5CASDL.0018-01 5CASDL.0018-03	5CASDL.0018-00 5CASDL.0018-01 5CASDL.0018-03	5CASDL.0018-00 5CASDL.0018-01 5CASDL.0018-03
5	5CASDL.0050-00 5CASDL.0050-01 5CASDL.0050-03	5CASDL.0050-00 5CASDL.0050-01 5CASDL.0050-03	5CASDL.0050-00 5CASDL.0050-01 5CASDL.0050-03	5CASDL.0050-00 5CASDL.0050-01 5CASDL.0050-03	5CASDL.0050-00 5CASDL.0050-01 5CASDL.0050-03
10	5CASDL.0100-00 5CASDL.0100-01 5CASDL.0100-03	5CASDL.0100-00 5CASDL.0100-01 5CASDL.0100-03	5CASDL.0100-00 5CASDL.0100-01 5CASDL.0100-03	5CASDL.0100-00 5CASDL.0100-01 5CASDL.0100-03	5CASDL.0100-00 5CASDL.0100-01 5CASDL.0100-03
15	5CASDL.0150-00 5CASDL.0150-01 5CASDL.0150-03	5CASDL.0150-00 5CASDL.0150-01 5CASDL.0150-03	5CASDL.0150-00 5CASDL.0150-01 5CASDL.0150-03	5CASDL.0150-00 5CASDL.0150-01 5CASDL.0150-03	- - -
20	5CASDL.0200-00 5CASDL.0200-03	5CASDL.0200-00 5CASDL.0200-03	5CASDL.0200-00 5CASDL.0200-03	5CASDL.0200-00 5CASDL.0200-03	- -
25	5CASDL.0250-00 5CASDL.0250-03	5CASDL.0250-00 5CASDL.0250-03	5CASDL.0250-00 5CASDL.0250-03	- -	- -
30	5CASDL.0300-00 5CASDL.0300-03	5CASDL.0300-00 5CASDL.0300-03	5CASDL.0300-10 5CASDL.0300-13	5CASDL.0300-10 5CASDL.0300-13	- -
40	5CASDL.0400-10 5CASDL.0400-13	5CASDL.0400-10 5CASDL.0400-13	5CASDL.0400-10 5CASDL.0400-13	5CASDL.0400-10 5CASDL.0400-13	- -

Table 113: Segment lengths, resolutions and SDL cables

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Information:

Detailed technical data about the cables can be found in the Automation Panel 900 User's Manual. This can be downloaded as a .pdf file from the B&R homepage www.br-automation.com.

4.10.4 BIOS settings

No special BIOS settings are necessary for operation.

Touch screen functionality

The COM C or COM D must be enabled in BIOS in order to operate the connected panel touch screen on the monitor / panel or AP Link connection (found in the BIOS menu under "Advanced - Baseboard / Panel Features - Legacy Devices").

4.11 Six AP900 and two AP800 devices via SDL (onboard) and SDL (AP Link)

Three Automation Panel 900 (max. UXGA) units and one Automation Panel 800 are connected to the integrated SDL interface (onboard) via SDL. Additionally, three Automation Panel 900 (max. UXGA) units and one Automation Panel 800 are operated on the optional SDL transmitters. The Automation Panels in each line must be the same type. The two lines display different content (Extended Desktop), but displays in the same line show the same content (Display Clone).

USB is supported up to a maximum distance (segment 1 + segment 2) of 30 m on the first two displays. Starting at a distance of 30 m, USB is only available on the first display (front and back) up to a maximum of 40 m. USB devices can only be connected directly to Automation Panel 900 devices (without a hub).
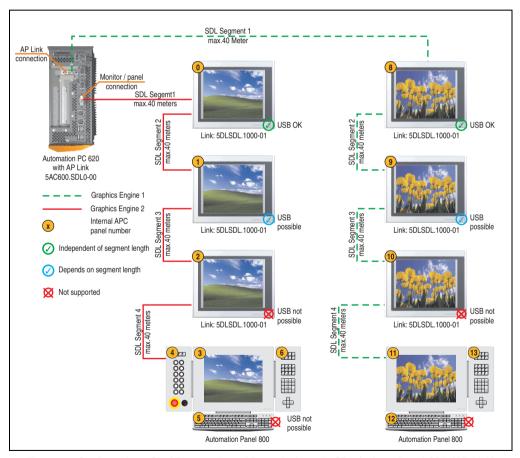
Figure 87: Configuration - Six AP900 and two AP800 devices via SDL (onboard) and SDL (AP Link)

4.11.1 Basic system requirements

The following table displays the possible combinations for the APC810 system unit with CPU board to implement the configuration shown in the figure above. If the maximum resolution is limited when making the combination then it is also shown in the following table.

If an Automation Panel 800 and an Automation Panel 900 should be connected on the same line, the devices must have the same display type.

CPU board	with system unit			Limitation
	5PC810.SX01-00[1]	5PC810.SX02-00	5PC810.SX05-00	Resolution
5PC800.B945-00	-	✓	✓	Max. UXGA
5PC800.B945-01	-	✓	✓	Max. UXGA
5PC800.B945-02	-	✓	✓	Max. UXGA
5PC800.B945-03	-	✓	✓	Max. UXGA
5PC800.B945-04	-	✓	✓	Max. UXGA

Table 114: Possible combinations of system unit and CPU board

1) AP Link cannot be installed.

4.11.2 Link modules

Model number	Description	Comment
5DLSDL.1000-00	**Automation Panel Link SDL receiver** Connection for SDL in, transfer of display data, touch screen, USB 1.1, matrix keys, and service data, 24 VDC (screw clamp 0TB103.9 or cage clamp 0TB103.91 sold separately).	For Automation Panel 900 2 pieces required
5DLSDL.1000-01	**Automation Panel Link SDL transceiver** Connections for SDL in, transfer of display data, touch screen, USB 1.1, matrix keys, and service data, 24 VDC (screw clamp 0TB103.9 or cage clamp 0TB103.91 sold separately).	For Automation Panel 900 6 pieces required
5AC801.SDL0-00	**APC810 AP Link SDL transmitter** Automation Panel SDL link transmitter	For Automation PC 810

Table 115: Link modules for the configuration: 8 Automation Panel 900 units via SDL and SDL (optional)

4.11.3 Cables

How to select an SDL cable for connecting the AP900 display to the AP900 display 4.3 "An Automation Panel 900 via SDL (onboard)".

How to select an SDL cable for connecting the AP800 display to the AP900 display4.4 "An Automation Panel 800 via SDL (onboard)".

> # Information:
>
> **Detailed technical data about the cables can be found in the Automation Panel 800 or Automation Panel 900 User's Manual. These can be downloaded as .pdf files from the B&R homepage www.br-automation.com.**

The following table shows the relationship between segment lengths and the maximum resolution according to the SDL cable used:

Cables	Resolution				
Segment length [m]	VGA 640 x 480	SVGA 800 x 600	XGA 1024 x 768	SXGA 1280 x 1024	UXGA 1600 x 1200
1.8	- - - -	- - - -	5CASDL.0018-00 5CASDL.0018-01 5CASDL.0018-20 5CASDL.0018-03	- - - -	- - - -
5	- - - -	- - - -	5CASDL.0050-00 5CASDL.0050-01 5CASDL.0050-02 5CASDL.0050-03	- - - -	- - - -
10	- - - -	- - - -	5CASDL.0100-00 5CASDL.0100-01 5CASDL.0100-02 5CASDL.0100-03	- - - -	- - - -
15	- - - -	- - - -	5CASDL.0150-00 5CASDL.0150-01 5CASDL.0150-02 5CASDL.0150-03	- - - -	- - - -
20	- - -	- - -	5CASDL.0200-00 5CASDL.0200-02 5CASDL.0200-03	- - -	- - -
25	- - -	- - -	5CASDL.0250-00 5CASDL.0250-02 5CASDL.0250-03	- - -	- - -
30	- - -	- - -	5CASDL.0300-10 5CASDL.0300-13 5CASDL.0300-30	- - -	- - -
40	- -	- -	5CASDL.0400-10 5CASDL.0400-13 5CASDL.0400-30	- -	- -

Table 116: Segment lengths, resolutions and SDL cables

Touch screen functionality

Information:

The COM C or COM D must be enabled in BIOS in order to operate the connected panel touch screen on the monitor / panel or AP Link connection (found in the BIOS menu under "Advanced - Baseboard / Panel Features - Legacy Devices").

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5. Connection of USB peripheral devices

Warning!

Peripheral USB devices can be connected to the USB interfaces. Due to the vast number of USB devices available on the market, B&R cannot guarantee their performance. B&R does assure the performance of all USB devices that they provide.

5.1 Local on the APC810

Many different peripheral USB devices can be connected to the 5 USB interfaces. This means that the USB interfaces USB1, USB3, USB5 can each handle a load of 1A and USB interfaces USB2 and USB4 can each handle a load of 500mA. The maximum transfer rate is USB 2.0.
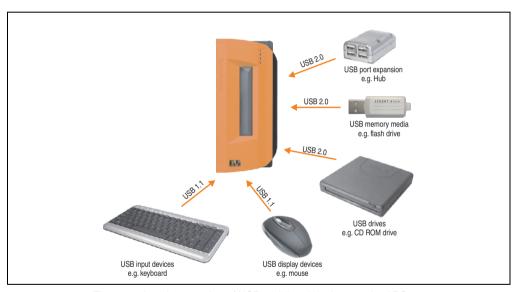
Figure 88: Local connection of USB peripheral devices on the APC810

5.2 Remote connection to Automation Panel 900 via DVI

Many different peripheral USB devices can be connected to the 2 or 3 USB interfaces on Automation Panel 900. These can each handle a load of 500 mA. The maximum transfer rate is USB 2.0.

Information:

Only end devices (no hubs) can be connected to the Automation Panel 900.

DVI

USB 2.0

RS232

USB 2.0

USB memory media
e.g. flash drive

USB 2.0

USB 1.1

USB 1.1

USB input devices
e.g. keyboard

USB display devices
e.g. mouse

USB drives
e.g. CD ROM drive

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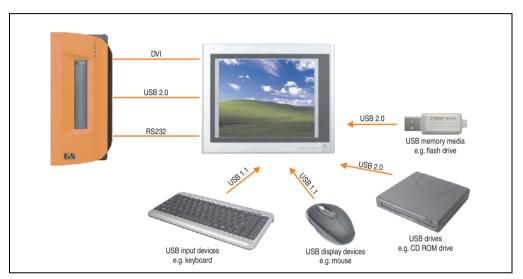
Figure 89: Remote connection of USB peripheral devices to the APC900 via DVI

5.3 Remote connection to Automation Panel 800/900 via SDL

Many different peripheral USB devices can be connected to the 2 or 3 USB interfaces on Automation Panel 900 and/or USB connections on the Automation Panel 800 devices. These can each handle a load of 500 mA. The maximum transfer rate is USB 1.1.

Information:

Only end devices (no hubs) can be connected to the Automation Panel 800/900.
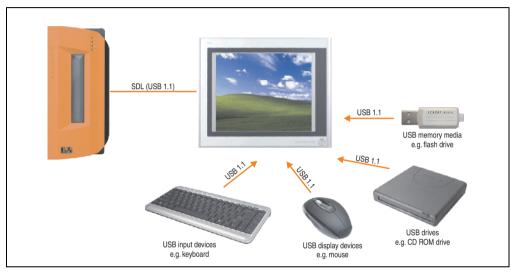
Figure 90: Remote connection of USB peripheral devices to the APC800/900 via SDL

6. Configuration of a SATA RAID array

Information:

The following software description is valid for PCI SATA controllers 5ACPCI.RAIC-01 and 5ACPCI.RAIC-03.

For the configuration, it's necessary to use the "RAID Configuration Utility" in BIOS. After the POST, enter <Ctrl+S> or <F4> to open RAID BIOS.

Figure 91: Open the RAID Configuration Utility
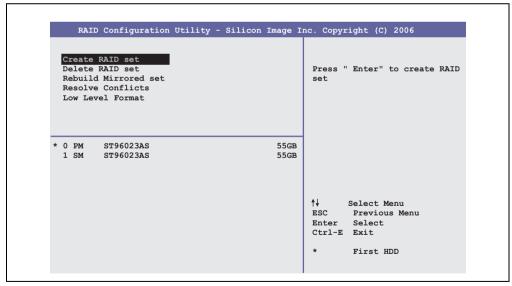
Figure 92: RAID Configuration Utility - Menu

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The following keys can be used after entering the BIOS setup:

Key	Function
Cursor ↑	Go to previous item.
Cursor ↓	Go to the next item.
Enter	Select an item or open a submenu.
ESC	Go back to previous menu.
Ctrl+E	Exit setup and save the changed settings.

Table 117: BIOS-relevant keys in the RAID Configuration Utility

6.1 Create RAID Set
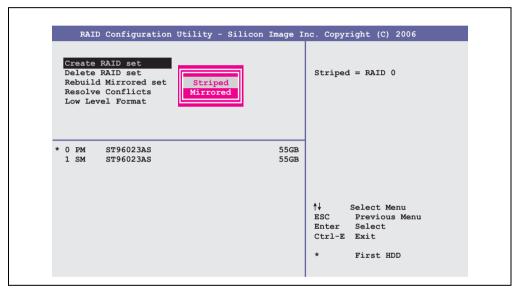
Figure 93: RAID Configuration Utility - Menu

Using the menu "Create RAID set", it's possible to recreate the RAID system as "Striped" = RAID0 or "Mirrored" = RAID1.

6.1.1 Create RAID Set - striped

```
    RAID Configuration Utility - Silicon Image Inc. Copyright (C) 2006


  Auto Configuration                          Press "Enter" to automatica-
  Manual Configuration                        lly create a striped
                                              (RAID 0) set

                                              Striped size is 16K
                                              First drive is drive 0
                                              Second drive is drive 1


* 0 PM    ST96023AS              55GB
  1 SM    ST96023AS              55GB




                                              ↑↓     Select Menu
                                              ESC    Previous Menu
                                              Enter  Select
                                              Ctrl-E Exit

                                              *      First HDD
```

Figure 94: RAID Configuration Utility - Create RAID set - striped

Auto configuration
Auto configuration optimizes all settings.

Manual configuration
It's possible to specify the first and second HDD as well as the "Chunk Size" (= block size, application-dependent).

6.1.2 Create RAID Set - Mirrored

```
    RAID Configuration Utility - Silicon Image Inc. Copyright (C) 2006

   Auto Configuration                        Press "Enter" to automatica-
   Manual Configuration                      lly create a mirrored
                                             (RAID 1) set

                                             For migrating single HDD
                                             into RAID 1 set, use Manual
                                             configuration instead


 * 0 PM    ST96023AS                55GB
   1 SM    ST96023AS                55GB



                                             ↑↓     Select Menu
                                             ESC    Previous Menu
                                             Enter  Select
                                             Ctrl-E Exit

                                             *      First HDD
```
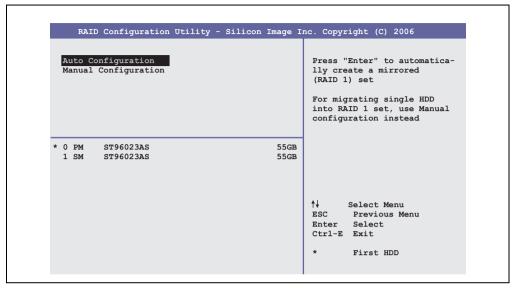
Figure 95: RAID Configuration Utility - Create RAID set - Mirrored

Auto configuration
Auto configuration optimizes all settings.

Manual configuration
It's possible to specify the "Source" and "Target" HDD, and also to specify if a rebuild (mirror) should be done immediately (approx. 50 minutes).

6.2 Delete RAID set

```
    RAID Configuration Utility - Silicon Image Inc. Copyright (C) 2006

   Create RAID set
   Delete RAID set
   Rebuild Mirrored set
   Resolve Conflicts          Set0
   Low Level Format


   0 PM    ST96023AS                      55GB
   1 SM    ST96023AS                      55GB


  *Set0 SiI Striped Set     <PM>         111GB
        0 ST96023AS              Chunk Size   16k    ↑↓       Select Menu
        1 ST96023AS              Chunk Size   16k    ESC      Previous Menu
                                                     Enter    Select
                                                     Ctrl-E   Exit

                                                     *        First HDD
```
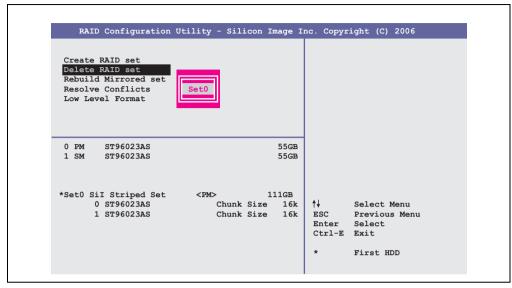
Figure 96: RAID Configuration Utility - Delete RAID set

Using the menu "Delete RAID set", it's possible to delete an existing RAID set.

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6.3 Rebuild Mirrored Set

```
    RAID Configuration Utility - Silicon Image Inc. Copyright (C) 2006

   Create RAID set
   Delete RAID set                          Rebuild help
   Rebuild Mirrored set
   Resolve Conflicts
   Low Level Format          onlinerebuild
                             offlinerebuild


   0  PM    ST96023AS                55GB
   1  SM    ST96023AS                55GB


 * Set0 SiI Mirrored Set  <PM>         55GB
        0 ST96023AS                 Current   ↑↓      Select Menu
        1 ST96023AS                 rebuild   ESC     Previous Menu
                                              Enter   Select
                                              Ctrl-E  Exit

                                              *       First HDD
```

Figure 97: RAID Configuration Utility - Rebuild Mirrored set

The "Rebuild Mirrored set" menu can be used to restart a rebuild procedure in a RAID 1 network if an error occurs, after first interrupting the rebuild procedure or when exchanging a hard disk.

If "onlinerebuild" is selected, then the rebuild is executed during operation after the system is booted. E.g. an event pop-up is displayed by the installed SATA RAID configuration program: SATARaid detected a new event and the rebuild is started. The entire rebuild lasts approximately 50 minutes.

If "offlinerebuild" is selected, then a rebuild is performed immediately before starting the operating system (lasts approximately 30 minutes).

6.4 Resolve Conflicts

```
     RAID Configuration Utility - Silicon Image Inc. Copyright (C) 2006

  Create RAID set
  Delete RAID set                          Help for resolving
  Rebuild Mirrored set                     conflicts
  Resolve Conflicts
  Low Level Format



  0 PM    ST96023AS                  55GB
  1 SM    ST96023AS                  55GB


* Set0 SiI Mirrored Set  <PM>        55GB
       0 ST96023AS                Current   ↑↓      Select Menu
       1 ST96023AS                Current   ESC     Previous Menu
                                            Enter   Select
                                            Ctrl-E  Exit

                                            *       First HDD
```
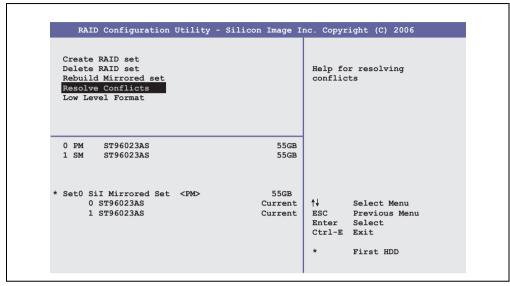
Figure 98: RAID Configuration Utility - Resolve Conflicts

Using the menu "Resolve Conflicts", it's possible to resolve RAID set conflicts. This function is only available if the status of the hard disk is "conflict".

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6.5 Low Level Format

```
        RAID Configuration Utility - Silicon Image Inc. Copyright (C) 2006

    Create RAID set
    Delete RAID set                          Select HDD to be formatted
    Rebuild Mirrored set
    Resolve Conflicts
    Low Level Format
                        0 PM
                        1 SM


    0 PM    ST96023AS                55GB
    1 SM    ST96023AS                55GB



                                         ↑↓      Select Menu
                                         ESC     Previous Menu
                                         Enter   Select
                                         Ctrl-E  Exit

                                         *       First HDD
```
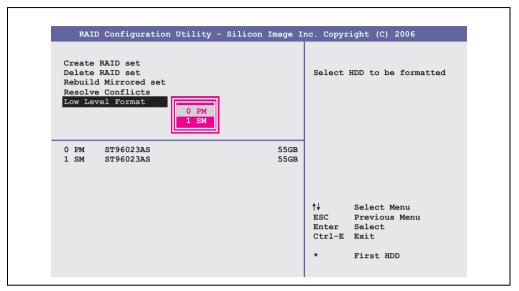
Figure 99: RAID Configuration Utility - Low Level Format

Using the menu "Low Level Format", it's possible to format individual hard disks. This can only be done if a RAID set is not configured. A low level format of a hard disk takes approx. 40 minutes.

7. Known problems / issues

The following points listed are known as of 07.05.08 in the first production lot of APC800 devices:

- The hardware security key interface is supported beginning with MTXC FPGA version 00.06 and higher.

- The status indicator of the Link or Activity LED for the ETH1 interface did not function correctly. However, this did not affect the network connection. The status indicator functions correctly beginning with hardware revisions 5PC810.SX92-00 (revision B0) and 5PC800.B945-0x (revision B0).

- Sporadically, it was possible that the ETH2 interface was not initialized during a power-on and therefore it would not function. The problem could be corrected by a reset or warm restart (Ctrl+Alt+Del). This problem is corrected in MTXC FPGA version 00.03.

- First Boot Agent Windows XP embedded and built-in SATA HDD drive
The BIOS setting "Legacy IDE Channels" under "Advanced - IDE Configuration" must be set to "PATA only" before inserting a CompactFlash card with a Windows XP embedded image and executing the First Boot Agent or the SATA drive can first be removed.

- When using two graphic lines, the Windows XP graphics driver assigns the labels "digital indicator" to the monitor / panel plug and "digital indicator 2" to the AP Link plug. In the "extended desktop" mode, the following behavior is observed: If the digital display device on the monitor / panel is removed (e.g. cable disconnected), digital display 2 is activated automatically, and the graphics driver settings also switch over accordingly. The next time the system is rebooted, the image content is diverted from the monitor / panel plug to the AP Link plug.
If the BIOS option "SDVO/DVI Hotplug support" is set to "enabled" (found under the BIOS menu point "Advanced - Graphics - Configuration"), then the image content is automatically diverted from the separate monitor / panel plug to the second graphics line on the AP Link plug.

- Special features of "Quick Switching" - if the APC810 is in Standby mode - Power LED is red (e.g. Windows XP shutdown), then buffering takes a little more time due to capacitors and low power consumption. If the "Power Loss Control" option is set to "Power On" or "Last State" in BIOS, then the system might not restart because a Power Off/On was not detected. To make sure that these system units will restart after a Power Off/On, the standby time should be set to at least 10 seconds.

- From MTCX PX32 firmware ≥ V00.11 and higher, the reset button is only triggered by edges. This means that the device boots even when the reset button is pressed. In MTCX PX32 firmware < V00.11, the system does not start after pressing (ca. 10 seconds) and releasing the reset button.

- Hardware revision B0 of the slide-in DVD-ROM - 5AC801.DVDS-00 does not offer SATA hot plug capability. Other hardware revisions are hot plug capable.

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1. BIOS options

Information:

The following diagrams and BIOS menu items including descriptions refer to BIOS version 1.11. It is therefore possible that these diagrams and BIOS descriptions do not correspond with the installed BIOS version.

1.1 General information

BIOS stands for "Basic Input Output System." It is the most basic standardized communication between the user and the system (hardware). The BIOS system used in the Automation PC 810 systems is produced by American Megatrends Inc.

The BIOS Setup Utility lets you modify basic system configuration settings. These settings are stored in CMOS and in EEPROM (as a backup).

The CMOS data is buffered by a battery (if present), and remains in the APC810 even when the power is turned off (no 24VDC supply).

1.2 BIOS setup and boot procedure

BIOS is immediately activated when switching on the power supply of the Automation PC 810 system or pressing the power button. The system checks if the setup data from the EEPROM is "OK". If the data is "OK", then it is transferred to the CMOS. If the data is "not OK", then the CMOS data is checked for validity. An error message is output if the CMOS data contains errors and the boot procedure can be continued by pressing the <F1> key. To prevent the error message from appearing at each restart, open the BIOS setup by pressing the <Del> key and re-save the settings.

BIOS reads the system configuration information in CMOS RAM, checks the system, and configures it using the Power On Self Test (POST).

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

To enter BIOS Setup, the DEL key must be pressed after the USB controller has been initialized as soon as the following message appears on the monitor (during POST):

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"Press DEL to run SETUP"

```
AMIBIOS(C)2003 American Megatrends, Inc.
[APC2R111] Bernecker + Rainer  Industrie-Elektronik H1.11
Serial Number    : 133453
CPU : Intel(R) Core(TM)2 CPU        T7400 @ 2.16GHz
 Speed : 2.16 Ghz

Press DEL to run Setup
Press F11 for BBS POPUP
The MCH is operating with DDR2-677/CL5 in Dual-Channel Interleaved Mode
Initializing USB Controllers .. Done
2040 MB OK
USB Device(s): 1 Keyboard, 1 Hub
Auto-Detecting Sec Master..IDE Hard Disk
Auto-Detecting Sec Slave...IDE Hard Disk
Sec Master: SILICONSYSTEMS INC 4GB 240-0230
Sec Slave : SILICONSYSTEMS INC 4GB 240-0230
Auto-Detecting USB Mass Storage Devices ..
00 USB mass storage devices found an configured.
```

Figure 100: Boot screen

1.2.1 BIOS setup keys

The following keys are enabled during the POST:

Information:

The key signals from the USB keyboard are only registered after the USB controller has been initialized.

Key	Function
Del	Enters the BIOS setup menu.
F12	Using the F12 key, you can boot from the network.

Table 118: 945GME bios-relevant keys at POST

Key	Function

F11	Cues the boot menu. Lists all bootable devices that are connected to the system. With cursor ↑ and cursor ↓ and by pressing <ENTER>, select the device from which will be booted.
	
	Please select boot device:
	
	`SATA:PM-ST940817SM`
	`HDD:SM-SILCONSYSTEMS INC 512MB`
	
	↑ **and** ↓ **to move selection**
	ENTER to select boot device
	ESC to boot using defaults

<Pause>	Pressing the <pause> key stops the POST. Press any other key to resume the POST.
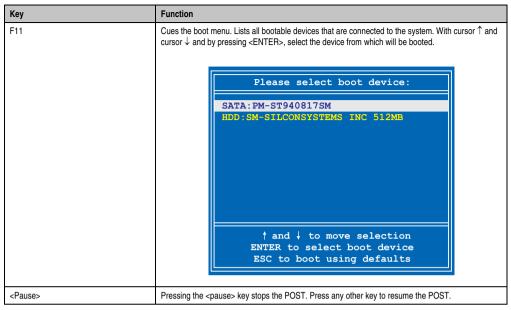
Table 118: 945GME bios-relevant keys at POST

The following keys can be used after entering the BIOS setup:

Key	Function
F1	General help.
Cursor ↑	Moves to the previous item.
Cursor ↓	Go to the next item.
Cursor ←	Moves to the previous item.
Cursor →	Go to the next item.
+ -	Changes the setting of the selected function.
Enter	Changes to the selected menu.
PgUp↑	Change to the previous page.
PgDn↓	Change to the previous page.
Pos 1	Jumps to the first BIOS menu item or object.
End	Jumps to the last BIOS menu item or object.
F2 / F3	The colors of the BIOS Setup are switched.
F7	Changes are reset.
F9	These settings are loaded for all BIOS configurations.
F10	Save and close.
Esc	Exits the submenu.

Table 119: 945GME bios-relevant keys in the BIOS menu

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1.3 Main

The BIOS setup main menu appears immediately after pressing the DEL button while the system is booting:

```
                        BIOS SETUP UTILITY
    Main      Advanced      Boot      Security      Power      Exit

  System Time                   [12:50:16]          Use [ENTER], [TAB]
  System Date                   [Wed 12/12/2007]    or [SHIFT-TAB] to
                                                    select a field.
  BIOS ID        : APC2R111
                                                    Use [+] or [-] to
  Processor      : Intel(R) Core(TM)2 CPU T7400     configure system Time.
  CPU Frequency : 2166MHZ

  System Memory : 2040MB

  Board Information                                 ←→    Select Screen
  Product Revision  : B.0                           ↑↓    Select Item
  Serial Number     : 133448                        +-    Change Field
  BC Firmware Rev.  : 907                           Tab   Select Field
  MAC Address (ETH1): 00:13:95:00:F2:90             F1    General Help
  Boot Counter      : 37                            F10   Save and Exit
  Running Time      : 16h                            ESC   Exit


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```

Figure 101: 945GME BIOS Main Menu

BIOS setting	Meaning	Setting options	Effect
System time	This is the current system time setting. The time is buffered by a battery (CMOS battery) after the system has been switched off.	Adjustment of the system time	Set the system time in the format Hour:Minute:Second (hh:mm:ss).
System date	This is the current system date setting. The time is buffered by a battery (CMOS battery) after the system has been switched off.	Changes to the system date	Set the system date in the format Month:Day:Year (mm:dd:yyyy).
BIOS ID	Displays the BIOS recognition.	None	-
Processor	Displays the processor type.	None	-
CPU frequency	Displays the processor frequency.	None	-
System memory	Displays the system memory size	None	-
Product revision	Displays the CPU board HW revision.	None	-
Serial number	Displays the CPU board serial number.	None	-
BC Firmware rev.	Displays the CPU board controller firmware revision.	None	-

Table 120: 945GME Main Menu setting options

BIOS setting	Meaning	Setting options	Effect
MAC Address (ETH1)	Displays the MAC addresses assigned for the ETH1 interface.	None	-
Boot counter	Displays the boot counter - each restart increments the counter by one (max. 16777215).	None	-
Running time	Displays the runtime in whole hours. (max. 65535).	None	-

Table 120: 945GME Main Menu setting options (Forts.)

1.4 Advanced

```
                        BIOS SETUP UTILITY
      Main      Advanced      Boot    Security    Power     Exit

    Advanced Settings

  ▶ACPI Configuration
  ▶PCI Configuration
  ▶PCI Express Configuration
  ▶Graphics Configuration
  ▶CPU Configuration
  ▶Chipset Configuration
  ▶I/O Interface Configuration
  ▶Clock Configuration
  ▶IDE Configuration
  ▶USB Configuration
  ▶Keyboard/Mouse Configuration         ←→    Select Screen
  ▶Remote Access Configuration          ↑↓    Select Item
  ▶CPU Board Monitor                    Enter Go to Sub Screen
  ▶Baseboard/Panel Features             F1    General Help
                                        F10   Save and Exit
                                        ESC   Exit

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```

Figure 102: 945GME Advanced Menu

BIOS setting	Meaning	Setting options	Effect
ACPI configuration	Configures APCI devices.	Enter	Opens submenu see "ACPI configuration" on page 203.
PCI configuration	Configures PCI devices.	Enter	Opens submenu see "PCI configuration" on page 205.
PCI Express Configuration	Configures the PCI Express.	Enter	Opens submenu see "PCI Express Configuration" on page 209.
Graphics configuration	Configures the graphic settings.	Enter	Opens submenu see "Graphics configuration" on page 211.

Table 121: 945GME - Advanced Menu - Setting options

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BIOS setting	Meaning	Setting options	Effect
CPU configuration	Configures CPU settings.	Enter	Opens submenu see "CPU configuration" on page 215.
Chipset configuration	Configures the chipset functions.	Enter	Opens submenu see "Chipset configuration" on page 216.
I/O interface configuration	Configuration of the I/O devices.	Enter	Opens submenu see "I/O interface configuration" on page 218.
Clock configuration	Configures clock settings.	Enter	Opens submenu see "Clock configuration" on page 219.
IDE Configuration	Configures the IDE functions.	Enter	Opens submenu see "IDE Configuration" on page 220.
USB configuration	Configures USB settings.	Enter	Opens submenu see "USB configuration" on page 227.
Keyboard/mouse configuration	Configuration of the keyboard/mouse options.	Enter	Opens submenu see "Keyboard/mouse configuration" on page 229.
Remote access configuration	Configures the remote access settings.	Enter	Opens submenu see "Remote access configuration" on page 230.
CPU board monitor	Displays the current voltages and temperature of the processor in use.	Enter	Opens submenu see "CPU board monitor" on page 232.
Baseboard/panel features	Displays device specific information and setup of device specific values.	Enter	Opens submenu see "Baseboard/panel features" on page 233.

Table 121: 945GME - Advanced Menu - Setting options (Forts.)

1.4.1 ACPI configuration

```
                           BIOS SETUP UTILITY
            ┌─────────────┐
            │  Advanced   │
            └─────────────┘

     ACPI Settings                                 Enable / Disable
     ──────────────────────────────────           ACPI support for
     ACPI Aware O/S              [Yes]             Operating System.

     ACPI Version Features       [ACPI v2.0]       ENABLE: If OS
     ACPI APIC support           [Enabled]         supports ACPI.
     Suspend mode                [S1 (POS)]
     USB Device Wakeup from S3/S4 [Disabled]       DISABLE: If OS
                                                   does not support
     Active Cooling Trip Point   [Disabled]        ACPI.
     Passive Cooling Trip Point  [Disabled]
     Critical Trip Point         [105°C]
                                                   ←→     Select Screen
                                                   ↑↓     Select Item
                                                   +-     Change Option
                                                   F1     General Help
                                                   F10    Save and Exit
                                                   ESC    Exit


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```

Figure 103: 945GME Advanced ACPI configuration

BIOS setting	Meaning	Setting options	Effect
ACPI Aware O/S	This function determines if the operating system supports the ACPI function (Advanced Configuration and Power Interface).	Yes	The operating system supports ACPI.
		No	The operating system does not support ACPI.
ACPI Version Features	Option for setting the power option specifications to be supported. The ACPI functions must be supported by the drivers and operating systems being used.	ACPI v1.0	ACPI functions in accordance with v1.0
		ACPI v2.0	ACPI functions in accordance with v2.0
		ACPI v3.0	ACPI functions in accordance with v3.0
ACPI APIC support	This option controls the support of the advanced programmable interrupt controller in the processor.	Enabled	Enables this function.
		Disabled	Disables the function
Suspend mode	Selects the ACPI status to be used when Suspend Mode is enabled.	S1 (POS)	Sets S1 as Suspend Mode. Only a few functions are disabled and are available again at the touch of a button
		S3 (STR)	Sets S3 as Suspend Mode. The current state of the operating system is written to the RAM, which is then supplied solely with power.
USB Device Wakeup from S3/S4	This options makes it possible for activity on a connected USB device to wake the system up from the S3/S4 standby mode.	Enabled	Enables this function.
		Disabled	Disables the function

Table 122: 945GME Advanced ACPI configuration setting options

BIOS setting	Meaning	Setting options	Effect
Active cooling trip point	With this function, an optional CPU fan is activated by the operating system when the CPU reaches the set temperature. Temperatur erreicht ist.	Disabled	Disables this function.
		50°C, 60°C, 70°C, 80°C, 90°C	Temperature setting for the active cooling trip point. Can be set in 10 degree increments.
Passive cooling trip point	With this function, a temperature can be set at which the CPU automatically reduces its speed.	Disabled	Disables this function.
		50°C, 60°C, 70°C, 80°C, 90°C	Temperature setting for the passive cooling trip point. Can be set in 10 degree increments.
Critical trip point	With this function, a temperature can be set at which the operating system automatically shuts the system down.	80°C, 85°C, 90°C, 95°C, 100°C, 105°C, 110°C	Temperature setting for the critical trip point. Can be set in 5 degree increments.

Table 122: 945GME Advanced ACPI configuration setting options (Forts.)

1.4.2 PCI configuration

```
                        BIOS SETUP UTILITY
  ┌──────────────┐
  │   Advanced   │
  └──────────────┘

  Advanced PCI/PnP Settings                    NO: lets the BIOS
                                               configure all the
  Plug & Play O/S            [Yes]             device in the system.
  PCI Latency Timer          [64]              YES: lets the
  Allocate IRQ to PCI VGA    [Yes]             operating system
  Allocate IRQ to SMBUS HC   [Yes]             configure Plug and
                                               Play (PnP) devices not
  ▶ PCI IRQ Resource Exclusion                 required for boot if
                                               your system has a Plug
  ▶ PCI Interrupt Routing                      and Play operating
                                               system.

                                               ←→     Select Screen
                                               ↑↓     Select Item
                                               +-     Change Option
                                               F1     General Help
                                               F10    Save and Exit
                                               ESC    Exit


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```

Figure 104: 945GME Advanced PCI Configuration

BIOS setting	Meaning	Setting options	Effect
Plug & Play O/S	BIOS is informed if Plug & Play is capable on the operating system.	Yes	The operating system handles the distribution of resources.
		No	The operating system handles the distribution of resources.
PCI latency timer	This option controls how long (in PCI ticks) one PCI bus card can continue to use the master after another PCI card has requested access.	32, 64, 96, 128, 160, 192, 224, 248	Manually sets the value in PCI ticks.
Allocate IRQ to PCI VGA	This function is used to determine if an interrupt is assigned to the PCI VGA.	Yes	Automatic assignment of an interrupt.
		No	No assignment of an interrupt.
Allocate IRQ to SMBUS HC	Use this function to set whether or not the SM (System Management) bus controller is assigned a PCI interrupt. oder nicht.	Yes	Automatic assignment of a PCI interrupt.
		No	No assignment of an interrupt.
PCI IRQ Resource Exclusion	Configures the PCI IRQ resource settings for ISA Legacy devices.	Enter	Opens submenu See "PCI IRQ Resource Exclusion" on page 206
PCI Interrupt Routing	Configures the PCI Interrupt Routing	Enter	Opens submenu See "PCI Interrupt Routing" on page 208

Table 123: 945GME Advanced PCI configuration setting options

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PCI IRQ Resource Exclusion

```
                        BIOS SETUP UTILITY
       Advanced

  PCI IRQ Resource Exclusion                       Available: Specified
                                                   IRQ is available to be
  IRQ3                         [Allocated]          used by PCI/PnP
  IRQ4                         [Allocated]          devices.
  IRQ5                         [Available]          Reserved: Specified
  IRQ6                         [Available]          IRQ is reserved for
  IRQ7                         [Available]          use by Legacy ISA
  IRQ9                         [Allocated]          devices.
  IRQ10                        [Available]
  IRQ11                        [Available]
  IRQ12                        [Available]
  IRQ14                        [Allocated]
  IRQ15                        [Allocated]          ←→     Select Screen
                                                   ↑↓     Select Item
                                                   +-     Change Option
                                                   F1     General Help
                                                   F10    Save and Exit
                                                   ESC    Exit



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```

Figure 105: 945GME Advanced PCI IRQ Resource Exclusion

BIOS setting	Meaning	Setting options	Effect
IRQ3	IRQ interrupt assignment for Legacy ISA devices.	Allocated	Allocated by the system - cannot be used.
IRQ4	IRQ interrupt assignment for Legacy ISA devices.	Allocated	Allocated by the system - cannot be used.
IRQ5	IRQ interrupt assignment for Legacy ISA devices. **Note:** **No ISA bus present in the APC810 system. Therefore this setting is not relevant.**	Available	Available - can be used.
		Reserved	Reserved - cannot be used.
IRQ6	IRQ interrupt assignment for Legacy ISA devices. **Note:** **No ISA bus present in the APC810 system. Therefore this setting is not relevant.**	Available	Available - can be used.
		Reserved	Reserved - cannot be used.

Table 124: 945GME Advanced PCI IRQ Resource Exclusion setting options

BIOS setting	Meaning	Setting options	Effect
IRQ7	IRQ interrupt assignment for Legacy ISA devices. **Note:** **No ISA bus present in the APC810 system. Therefore this setting is not relevant.**	Available	Available - can be used.
		Reserved	Reserved - cannot be used.
IRQ9	IRQ interrupt assignment for Legacy ISA devices.	Allocated	Allocated by the system - cannot be used.
IRQ10	IRQ interrupt assignment for Legacy ISA devices. **Note:** **No ISA bus present in the APC810 system. Therefore this setting is not relevant.**	Available	Available - can be used.
		Reserved	Reserved - cannot be used.
IRQ11	IRQ interrupt assignment for Legacy ISA devices. **Note:** **No ISA bus present in the APC810 system. Therefore this setting is not relevant.**	Available	Available - can be used.
		Reserved	Reserved - cannot be used.
IRQ12	IRQ interrupt assignment for Legacy ISA devices. **Note:** **No ISA bus present in the APC810 system. Therefore this setting is not relevant.**	Available	Available - can be used.
		Reserved	Reserved - cannot be used.
IRQ14	IRQ interrupt assignment for Legacy ISA devices.	Allocated	Allocated by the system - cannot be used.
IRQ15	IRQ interrupt assignment for Legacy ISA devices.	Allocated	Allocated by the system - cannot be used.

Table 124: 945GME Advanced PCI IRQ Resource Exclusion setting options (Forts.)

PCI Interrupt Routing

```
                         BIOS SETUP UTILITY
        Advanced

   PCI Interrupt Routing                          Select fixed IRQ for
                                                  set AUTO to let the
   PIRQ A (VGA,PCIEX0,ETH2,UHCI3)    [Auto]       BIOS and OS route an
   PIRQ B (AC97,PCIEX1,ETH1)         [Auto]       IRQ to this line.
   PIRQ C (PATA,UHCI2,PCIEX2)        [Auto]
   PIRQ D (SATA,UHCI1,SMB,PCIEX3)    [Auto]       Make sure that the
   PIRQ E (INTD)                     [Auto]       selected IRQ is not
   PIRQ F (INTA)                     [Auto]       assigned to legacy IO.
   PIRQ G (INTB)                     [Auto]
   PIRQ H (INTC,UHCI0,EHCI)          [Auto]


   PCIEXn : PCI Express Root Port n                ↔    Select Screen
   INTn   : External PCI Bus INTn Line             ↑↓   Select Item
   PATA   : Parallel ATA in Enhanced/Native Mode   +-   Change Option
   SATA   : Serial ATA in Enhanced/Native Mode     F1   General Help
   SMB    : System Management Bus Controller        F10  Save and Exit
                                                    ESC  Exit

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```

Figure 106: 945GME Advanced PCI Interrupt Routing

BIOS setting	Meaning	Setting options	Effect
PIRQ A (VGA,PCIEX0, ETH2,UHCI3)	Option for setting the PIRQ A.	Auto	Automatic assignment by the BIOS and operating system.
		5,6,7,9,10,11,12	Manual assignment
PIRQ B (AC97,PCIEX1, ETH1)	Option for setting the PIRQ B.	Auto	Automatic assignment by the BIOS and operating system.
		5,6,7,9,10,11,12	Manual assignment
PIRQ C (PATA,UHCI2, PCIEX2)	Option for setting the PIRQ C.	Auto	Automatic assignment by the BIOS and operating system.
		5,6,7,9,10,11,12	Manual assignment
PIRQ D (SATA,UHCI1,SMB, PCIEX3)	Option for setting the PIRQ D.	Auto	Automatic assignment by the BIOS and operating system.
		5,6,7,9,10,11,12	Manual assignment
PIRQ E (INTD)	Option for setting the PIRQ E.	Auto	Automatic assignment by the BIOS and operating system.
		5,6,7,9,10,11,12	Manual assignment

Table 125: 945GME Advanced PCI Interrupt Routing setting options

BIOS setting	Meaning	Setting options	Effect
PIRQ F (INTA)	Option for setting the PIRQ F.	Auto	Automatic assignment by the BIOS and operating system.
		5,6,7,9,10,11,12	Manual assignment
PIRQ G (INTB)	Option for setting the PIRQ G.	Auto	Automatic assignment by the BIOS and operating system.
		5,6,7,9,10,11,12	Manual assignment
PIRQ H (INTC,UHCI0,EHCI)	Option for setting the PIRQ H.	Auto	Automatic assignment by the BIOS and operating system.
		5,6,7,9,10,11,12	Manual assignment

Table 125: 945GME Advanced PCI Interrupt Routing setting options (Forts.)

1.4.3 PCI Express Configuration

```
                    BIOS SETUP UTILITY
  Advanced

  PCI Express Configuration                    Enable/Disable
                                               PCI Express L0s and
  Active State Power-Management  [Disabled]    L1 link power
    PCIE Port 0                  [Auto]        states.
    PCIE Port 1                  [Auto]
    PCIE Port 2                  [Auto]
    PCIE Port 3                  [Auto]
    PCIE Port 4 (ETH2)           [Auto]
    PCIE Port 5 (ETH1)           [Auto]
    PCIE High Priority Port      [Disabled]

  Res. PCIE Hotplug Resources    [No]
                                               ↔    Select Screen
    PCIE Port 0 IOxAPCI Enable   [Disabled]    ↑↓   Select Item
    PCIE Port 1 IOxAPCI Enable   [Disabled]    +-   Change Option
    PCIE Port 2 IOxAPCI Enable   [Disabled]    F1   General Help
    PCIE Port 3 IOxAPCI Enable   [Disabled]    F10  Save and Exit
                                               ESC  Exit



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```

Figure 107: 945GME Advanced PCI Express Configuration

BIOS setting	Meaning	Setting options	Effect
Active State Power-Management	Option for setting a power saving function (L0s/L1) for PCIE slots if they do not require full power.	Disabled	Disables this function.
		Enabled	Enables this function.

Table 126: 945GME Advanced PCI Express Configuration setting options

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Software

BIOS setting	Meaning	Setting options	Effect
PCIE Port 0	This option activates or deactivates the PCI Express connection function. **Note:** **If you are not using any PCI Express devices, this option should be deactivated.**	Auto	Automatic assignment by the BIOS and operating system.
		Enabled	Enables this function.
		Disabled	Disables this function.
PCIE Port 1	This option activates or deactivates the PCI Express connection function. **Note:** **If you are not using any PCI Express devices, this option should be deactivated.**	Auto	Automatic assignment by the BIOS and operating system.
		Enabled	Enables this function.
		Disabled	Disables this function.
PCIE Port 2	This option activates or deactivates the PCI Express connection function. **Note:** **If you are not using any PCI Express devices, this option should be deactivated.**	Auto	Automatic assignment by the BIOS and operating system.
		Enabled	Enables this function.
		Disabled	Disables this function.
PCIE Port 3	This option activates or deactivates the PCI Express connection function. **Note:** **If you are not using any PCI Express devices, this option should be deactivated.**	Auto	Automatic assignment by the BIOS and operating system.
		Enabled	Enables this function.
		Disabled	Disables this function.
PCIE High Priority Port	This option activates or deactivates the priority port for PCIE.	Disabled	Disables this function.
		Port 0	Activates Port 0 as priority port.
		Port 1	Activates Port 1 as priority port.
		Port 2	Activates Port 2 as priority port.
		Port 3	Activates Port 3 as priority port.
		ETH2	Activates ETH2 as priority port.
		ETH1	Activates ETH1 as priority port.
Res. PCIE Hotplug Resource	This option can be used to reserve an I/O and memory resource for a free PCIE port. A PCIE port must be set to enabled and resources must be reserved to support ExpressCard hot-plugging on a port.	No	Resource is not reserved
		Yes	Resource is reserved
PCIE Port 0 IOxAPIC Enable	This option activates or deactivates the APIC (Advanced Programmable Interrupt Controller) on PCIE port 0. When APIC mode is activated, additional IRQ resources are made available to the system.	Disabled	Disables this function.
		Enabled	Enables this function.
PCIE Port 1 IOxAPIC Enable	This option activates or deactivates the APIC (Advanced Programmable Interrupt Controller) on PCIE port 1. When APIC mode is activated, additional IRQ resources are made available to the system.	Disabled	Disables this function.
		Enabled	Enables this function.

Table 126: 945GME Advanced PCI Express Configuration setting options (Forts.)

BIOS setting	Meaning	Setting options	Effect
PCIE Port 2 IOxAPIC Enable	This option activates or deactivates the APIC (Advanced Programmable Interrupt Controller) on PCIE port 2. When APIC mode is activated, additional IRQ resources are made available to the system.	Disabled	Disables this function.
		Enabled	Enables this function.
PCIE Port 3 IOxAPIC Enable	This option activates or deactivates the APIC (Advanced Programmable Interrupt Controller) on PCIE port 3. When APIC mode is activated, additional IRQ resources are made available to the system.	Disabled	Disables this function.
		Enabled	Enables this function.

Table 126: 945GME Advanced PCI Express Configuration setting options (Forts.)

1.4.4 Graphics configuration

```
                        BIOS SETUP UTILITY
         Advanced

    Graphics Configuration                        Select primary video
                                                  adapter to be used
    Primary Video Device        [Internal VGA]    during boot up.

    Internal Graphics Mode Select  [Enabled, 8MB]
    DVMT Mode Select            [DVMT Mode]
      DVMT/FIXED Memory         [128MB]

    Boot Display Device         [Auto]
    Boot Display Preference     [SDVO-B SDVO-C LFP]
    Local Flat Panel Type       [Auto]
    Local Flat Panel Scaling    [Centering]
                                                  ←→      Select Screen
    SDVO Port B Device          [DVI]             ↑↓      Select Item
    SDVO Port C Device          [DVI]             +-      Change Option
                                                  F1      General Help
    SDVO/DVI Hotplug Support    [Enabled]         F10     Save and Exit
    Display Mode Persistence    [Enabled]         ESC     Exit


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```

Figure 108: 945GME Advanced Graphics Configuration

BIOS setting	Meaning	Setting options	Effect
Primary Video Device	Option for selecting the primary video device.	Internal VGA	The internal graphics chip on the CPU board is used as video device (monitor / panel connection).
		PCI / Int. VGA	The graphics chip of a connected graphics card is used as video device.

Table 127: 945GME Advanced Graphics Configuration setting options

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Software

BIOS setting	Meaning	Setting options	Effect
Internal Graphics Mode Select	Option for setting the memory size that can be used for the internal graphics controller.	Disabled	No reservation - Disables the graphics controller.
		Enabled, 1MB	1MB main memory provided.
		Enabled, 8MB	8MB main memory provided.
DVMT Mode Select	Option for determining the DVMT mode (Dynamic Video Memory Technology) of the DVMT graphics driver.	Fixed Mode	A fixed amount of memory is allocated to the graphics chip, which is no longer available to the PC.
		DVMT Mode	Memory consumption is controlled dynamically by the DVMT graphics driver. Only the amount of memory that is required is used.
		Combo Mode	The DVMT graphics driver reserves at least 64MB, but can use up to 224MB if necessary.
DVMT/FIXED Memory	Option for setting the amount of memory used for the DVMT mode.	64MB	64MB of main memory can be used.
		128MB	128MB of main memory can be used.
		Maximum DVMT	The remaining available main memory can be used.
Boot Display Device	Determines which video channel should be enabled for a video device during the boot procedure.	Auto	Automatic selection.
		CRT only	Only use the CRT (Cathode Ray Tube) channel.
		SDVO only	Only use the SDVO (Serial Digital Video Out) channel.
		CRT + SDVO	Use CRT and SDVO channel.
		LFP only	Only use the LFP (Local Flat Panel) channel.
		CRT + LFP	Use CRT + LFP channel.
Boot Display Preference	This option determines the order in which the devices on the connected channels LFP and SDVO should be checked and booted. **Note:** **The setting is only needed when the Option Boot Display Device is set to "Auto".**	LFP SDVO-B SDVO-C	Local Flat Panel - Serial Digital Video B output - Serial Video C output
		LFP SDVO-C SDVO-B	Local Flat Panel - Serial Digital Video C output - Serial Video B output
		SDVO-B SDVO-C LFP	Serial Digital Video B output - Serial Digital Video C output - Local Flat Panel
		SDVO-C SDVO-B LFP	Serial Digital Video C output - Serial Digital Video B output - Local Flat Panel

Table 127: 945GME Advanced Graphics Configuration setting options (Forts.)

BIOS setting	Meaning	Setting options	Effect
Local Flat Panel Type	This option can be used to set a pre-defined profile for the LVDS channel.	Auto	Automatic detection and setting using the EDID data.
		VGA 1x18 (002h)	640 x 480
		VGA 1x18 (013h)	640 x 480
		SVGA 1x18 (004h)	800 x 600
		XGA 1x18 (006h)	1024 x 768
		XGA 2x18 (007h)	1024 x 768
		XGA 1x24 (008h)	1024 x 768
		XGA 2x24 (012h)	1024 x 768
		SXGA 2x24 (00Ah)	1280 x 1024
		SXGA 2x24 (018h)	1280 x 1024
		UXGA 2x24 (00Ch)	1600 x 1200
		Customized EDID 1	User-defined profile
		Customized EDID 2	User-defined profile
		Customized EDID 3	User-defined profile
Local Flat Panel Scaling	Determines the screen content should be output according to the defined Local Flat Panel Type.	Centering	The screen content is output centered on the display.
		Expand Text	The text is stretched across the entire surface of the display.
		Expand Graphics	The graphics are stretched across the entire surface of the display.
		Expand Text & Graphics	Text and graphics are stretched across the entire surface of the display.
SDVO Port B Device	Option for selecting the video device that is connected to the SDVO Port B.	None	No video device connected.
		DVI	Video signal output is optimized for a DVI-compatible video device.
		TV	Video signal output is optimized for a TV-compatible video device.
		CRT	Video signal output is optimized for a CRT-compatible video device.
		LVDS	Video signal output is optimized for a LVDS-compatible video device.
		DVI-Analog	Video signal output is optimized for an analog DVI-compatible video device.

Table 127: 945GME Advanced Graphics Configuration setting options (Forts.)

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Software

BIOS setting	Meaning	Setting options	Effect
SDVO Port C Device	Option for selecting the video device that is connected to the SDVO Port A.	None	No video device connected.
		DVI	Video signal output is optimized for a DVI-compatible video device.
		TV	Video signal output is optimized for a TV-compatible video device.
		CRT	Video signal output is optimized for a CRT-compatible video device.
		LVDS	Video signal output is optimized for a LVDS-compatible video device.
		DVI-Analog	Video signal output is optimized for an analog DVI-compatible video device.
SDVO/DVI Hotplug Support	If this option is set to enabled, the Windows XP graphics driver supports "hotplug" and "configuration mode persistence" for DVI monitors connected to a DVI SDVO transmitter. "Hotplug" support means that when a DVI monitor is connected while the operating system is running, it is detected automatically and activated. "Configuration mode persistence" means that, for example, a dual DVI configuration is automatically restored when both DVI monitors are reconnected, even if only one of them was connected and activated during a previous boot.	Enabled	"Hotplug" and "Configuration mode persistence" mode enabled.
		Disabled	"Hotplug" and "Configuration mode persistence" mode disabled.
Display Mode Persistence	"Display mode persistence" means that the operating system can remember and restore the previous display configuration. For example, a dual DVI configuration is automatically restored when both DVI monitors are reconnected, even if only one of them was connected and activated during a previous boot.	Enabled	Enables this function.
		Disabled	Disables this function.

Table 127: 945GME Advanced Graphics Configuration setting options (Forts.)

1.4.5 CPU configuration

```
                    BIOS SETUP UTILITY
  ┌──────────────┐
  │   Advanced   │
  ─────────────────────────────────────────────────────────────────

  Configure advanced CPU settings                Select the revsion
  Module Version -13.04                           of the multi processor
  ─────────────────────────────────────          support interface that
  Manufacturer:Intel                              should be offered by
  Brand String:Intel(R) Core(TM)2 CPU     T7400   the BIOS.
  Frequency   :2.16GHz
  FSB Speed   :667MHz

  Cache L1    :64 KB
  Cache L2    :4096 KB


  MPS Revision              [1.4]            ←→     Select Screen
  Max CPUID Value Limit     [Disabled]       ↑↓     Select Item
  Execute Disable Bit       [Enabled]        +-     Change Option
  Core Multi-Processing     [Enabled]        F1     General Help
  Intel(R) SpeedStep(tm) tech.  [Automatic]  F10    Save and Exit
  Max. CPU Frequency        [2166 MHz]       ESC    Exit
     C1 Config.             [Standard]
     C2 Config.             [Disabled]
     C3 Config.             [Disabled]
     C4 Config.             [Disabled]

  ─────────────────────────────────────────────────────────────────
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```

Figure 109: 945GME Advanced CPU Configuration

BIOS setting	Meaning	Setting options	Effect
MPS Revision	This option supports the use of multiple CPUs (MPS=multi-processor system).	1.1	Sets MPS support Revision 1.1
		1.4	Sets MPS support Revision 1.4
Max CPUID Value Limit	Option for limiting the CPUID input value. This could be necessary for older operating systems.	Enabled	The processor limits the maximum CPUID input value to 03h if necessary when the the processor supports a higher value.
		Disabled	The processor returns the current maximum value upon request of the CPUID input value.
Execute Disable Bit	Option for enabling or disabling hardware support for prevention of data execution.	Enabled	Enables this function.
		Disabled	Disables this function.
Core Multi-Processing	When using a Dual Core processor, this option can be used to disable a core.	Enabled	Both cores are used in a Dual Core processor.
		Disabled	Only one core is used in a Dual Core processor.
Intel(R) Speedster(TM) tech.	Option for controlling the Intel(R) SpeedStep(TM) technology. The processor clock speed is increased or decreased according to the amount of calculations that must be made. As a result, the power consumption depends largely on the processor load.	Automatic	The processor speed is regulated by the operating system.
		Maximum speed	The processor speed is set to a maximum.
		Minimum speed	The processor speed is set to a minimum.
		Disabled	SpeedStep technology disabled.

Table 128: 945GME Advanced CPU Configuration setting options

BIOS setting	Meaning	Setting options	Effect
Max. CPU frequency	Option for setting the maximum processor speed if the value "Automatic" or "Maximum Speed" is set for the option "Intel(R) SpeedStep(TM) tech.".	xxxx MHz	
C1 Config		Default	Standard C1 support.
		Enhanced	Enhanced C1 support.
C2 Config		Default	Standard C2 support.
		Enhanced	Enhanced C2 support.
		Disabled	Disabled C2 support.
C3 Config		Default	Standard C3 support.
		Enhanced	Enhanced C3 support.
		Disabled	Disabled C3 support.
C4 Config		Default	Standard C4 support.
		Enhanced	Enhanced C4 support.
		Disabled	Disabled C4 support.

Table 128: 945GME Advanced CPU Configuration setting options (Forts.)

1.4.6 Chipset configuration


```
                        BIOS SETUP UTILITY
        Advanced

    Advanced Chipset Settings                        Options

    DRAM Frequency              [Auto]          Auto
    Memory Hole                 [Disabled]      400 MHz
    DIMM Thermal Control        [Disabled]      533 MHz
    DT in SPD                   [Disabled]      667 MHz
    TS on DIMM                  [Disabled]

    IOAPIC                      [Enabled]
    APIC ACPI SCI IRQ           [Disabled]
    C4 On C3                    [Disabled]

                                                ←→     Select Screen
                                                ↑↓     Select Item
                                                +-     Change Option
                                                F1     General Help
                                                F10    Save and Exit
                                                ESC    Exit

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```

Figure 110: 945GME Advanced Chipset Configuration

BIOS setting	Meaning	Setting options	Effect
DRAM Frequency	Option for setting the RAM frequency.	Auto	Frequency set automatically by the BIOS.
		400, 533, 667 MHz	Desired clock frequency set manually.
Memory Hole	Option for ISA cards with frame buffer. Not relevant for an APC810.	Disabled	Disables this function.
		15MB -16MB	This address area is reserved.
DIMM Thermal Control	Option for setting the maximum surface temperature of the DIMM module. The module is cooled by limiting the memory bandwidth if the defined surface temperature is reached.	Disabled	Surface temperature not limited.
		40°C, 50°C, 60°C, 70°C, 80°C, 85°C, 90°C	Temperature limit value for the limitation.
DT in SPD	Option to determine whether the GMCH (Graphics and Memory Controller Hub) supports DT (Delta Temperature) in the SPD (Serial Presence Detect) Management Algorithm of the DIMM module.	Disabled	Disables this function.
		Enabled	Enables this function.
TS on DIMM	Option to determine whether the GMCH (Graphics and Memory Controller Hub) supports TS (Thermal Sensor) in the Thermal Management Algorithm of the DIMM module.	Disabled	Disables this function.
		Enabled	Enables this function.
IOAPIC	This option is used to enable or disable APIC (Advanced Programmable Interrupt Controller). **Note:** **The IRQ resources available to the system are expanded when the APIC mode is enabled.**	Disabled	Disables this function.
		Enabled	The IRQ resources available to the system are expanded when the APIC mode is enabled.
APIC ACPI SCI IRQ	This option is used to enable or disable Modify SCI IRQ when in APIC (Advanced Programmable Interrupt Controller) mode.	Disabled	IRQ9 is used for SCI.
		Enabled	IRQ20 is used for SCI.
C4 On C3	Fine-tunes the power saving function on an ACPI operating system.	Disabled	
		Enabled	Processor is needed in C4 if the operating system is initiated in a C3 state.

Table 129: 945GME Advanced Chipset setting options

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1.4.7 I/O interface configuration

```
                          BIOS SETUP UTILITY
         Advanced

   I/O Interface Configuration                              Options

   Onboard Audio Controller           [AC97]          AC97
                                                      Disabled






                                                 ←→   Select Screen
                                                 ↑↓   Select Item
                                                 +-   Change Option
                                                 F1   General Help
                                                 F10  Save and Exit
                                                 ESC  Exit


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```
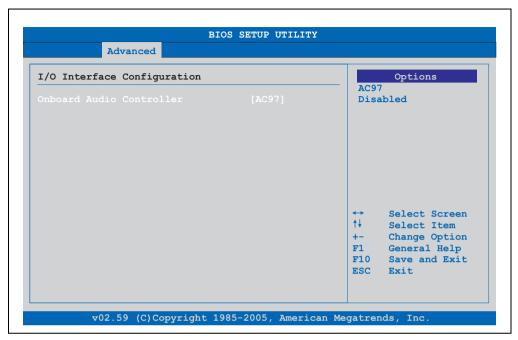
Figure 111: 945GME Advanced I/O Interface Configuration

BIOS setting	Meaning	Setting options	Effect
OnBoard Audio Controller	For turning the Onboard AC97 audio controller on and off.	AC97	Enables AC'97 sound.
		Disabled	Disables AC'97 sound.

Table 130: 945GME Advanced I/O Interface Configuration setting options

1.4.8 Clock configuration

```
                            BIOS SETUP UTILITY
           Advanced

      Clock Configuration                            Enable clock
                                                     modulation to reduce
      Spread Spectrum              [Disabled]        EMI.






                                                     ←→    Select Screen
                                                     ↑↓    Select Item
                                                     +-    Change Option
                                                     F1    General Help
                                                     F10   Save and Exit
                                                     ESC   Exit


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```
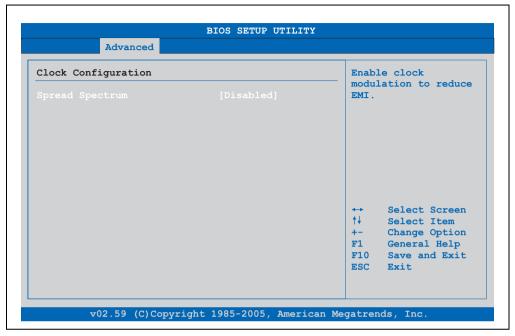
Figure 112: 945GME Advanced Clock Configuration

BIOS setting	Meaning	Setting options	Effect
Spread spectrum	With this option, the cycle frequency can be modulated by reducing electromagnetic disturbances.	Enabled	Enables this function.
		Disabled	Disables this function.

Table 131: 945GME Advanced Clock Configuration setting options

1.4.9 IDE Configuration

```
                        BIOS SETUP UTILITY
       ┌─────────────┐
       │  Advanced   │
       └─────────────┘

   IDE Configuration

   ATA/IDE Configuration          [Compatible]
     Legacy IDE Channels          [SATA Pri, PATA Sec]

   ▶ Primary IDE Master         : [Hard Disk]
   ▶ Primary IDE Slave          : [Not Detected]
   ▶ Secondary IDE Master       : [Not Detected]
   ▶ Secondary IDE Slave        : [Not Detected]

   Hard Disk Write Protect        [Disabled]
   IDE Detect Time Out (Sec)      [35]
   ATA(PI) 80Pin Cable Detection [Host & Device]    ↔    Select Screen
                                                    ↑↓   Select Item
                                                    +-   Change Option
                                                    F1   General Help
                                                    F10  Save and Exit
                                                    ESC  Exit


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```

Figure 113: 945GME Advanced IDE Configuration

BIOS setting	Meaning	Setting options	Effect
ATA/IDE Configuration	Option for configuring the integrated PATA and SATA controller.	Compatible	Both controllers run in Legacy or Compatible Mode.
		Disabled	Both controllers disabled.
		Enhanced	Both controllers run in Enhanced or Native Mode.
Legacy IDE Channels	Option for configuring the Legacy IDE channels in Compatible Mode.	SATA Pri, PATA Sec	SATA drives are address primarily and PATA drive secondarily.
		SATA only	Only use SATA drives.
		PATA only	Only use PATA drives.
Primary IDE master	The drive in the system that is connected to the IDE primary master port is configured here.	Enter	Opens submenu See "Primary IDE master" on page 221
Primary IDE slave	The drive in the system that is connected to the IDE primary slave port is configured here.	Enter	Opens submenu See "Primary IDE slave" on page 223
Secondary IDE master	The drive in the system that is connected to the IDE secondary master port is configured here.	Enter	Opens submenu See "Secondary IDE master" on page 224

Table 132: 945GME Advanced IDE Configuration setting options

BIOS setting	Meaning	Setting options	Effect
Secondary IDE slave	The drive in the system that is connected to the IDE secondary slave port is configured here.	Enter	Opens submenu See "Secondary IDE slave" on page 226
Hard disk write protect	Write protection for the hard drive can be enabled/disabled here.	Disabled	Disables this function.
		Enabled	Enables this function.
IDE Detect Time Out (Sec)	Configuring the time overrun limit value for the ATA/ATAPI device identification.	0, 5, 10, 15, 20, 25, 30, 35	Time setting in seconds.
ATA(PI) 80Pin Cable Detection	Detects whether an 80 pin cable is connected to the drive, the controller or to both. **Note: This option is not available on the APC810 CPU board. Therefore this setting is not relevant.**	Host & device	Using both IDE controllers (motherboard, disk drive).
		Host	IDE controller motherboard used.
		Device	IDE disk drive controller used.

Table 132: 945GME Advanced IDE Configuration setting options

Primary IDE master

```
                        BIOS SETUP UTILITY
  ┌──────────────┐
  │   Advanced   │
  ┌──────────────────────────────────────┬──────────────────────┐
  │ Primary IDE Master                   │ Select the type      │
  │                                      │ of device connected  │
  │ Device      :Not Detected            │ to the system.       │
  │                                      │                      │
  │ Type                     [Auto]      │                      │
  │ LBA/Large Mode           [Auto]      │                      │
  │ Block (Multi-Sector Transfer) [Auto] │                      │
  │ PIO Mode                 [Auto]      │                      │
  │ DMA Mode                 [Auto]      │                      │
  │ S.M.A.R.T.               [Auto]      │                      │
  │ 32Bit Data Transfer      [Enabled]   │                      │
  │                                      │                      │
  │                                      │ ←→    Select Screen  │
  │                                      │ ↑↓    Select Item    │
  │                                      │ +-    Change Option  │
  │                                      │ F1    General Help   │
  │                                      │ F10   Save and Exit  │
  │                                      │ ESC   Exit           │
  │                                      │                      │
  └──────────────────────────────────────┴──────────────────────┘
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```

Figure 114: 945GME Primary IDE Master

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BIOS setting	Meaning	Setting options	Effect
Type	The type of drive connected to the primary master is configured here.	Not installed	No drive installed.
		Auto	Automatic recognition of the drive and setup of appropriate values.
		CD/DVD	CD -/ DVD drive.
		ARMD	ARMD - drive (zip drive)
LBA/Large mode	This option enables logical block addressing/ large mode for IDE.	Disabled	Disables this function.
		Auto	Automatic enabling of this function when supported by the system.
Block (multi-sector transfer)	This option enables the block mode for IDE hard drives. When this option is enabled, the number of blocks per request from the configuration sector of the hard drive is read.	Disabled	Disables this function.
		Auto	Automatic enabling of this function when supported by the system.
PIO mode	The PIO mode determines the data rate of the hard drive. **Note: This option is not available on the APC810. Therefore this setting is not relevant.**	Auto	Automatic configuration of PIO mode.
		0, 1, 2, 3, 4	Manual configuration of PIO mode.
DMA mode	The data transfer rate to and from the primary master drive is defined here. The DMA mode must be enabled in the Windows device manager in order to guarantee maximum performance. Only possible when manually setting up the drive.	Auto	Automatic definition of the transfer rate.
		Disabled	Manual definition of the transfer rate.
S.M.A.R.T.	Monitoring function of modern hard drives (self-monitoring, analysis and reporting technology).	Auto	Automatic detection and enabling.
		Disabled	Disables this function.
		Enabled	Enables this function.
32 bit data transfer	This function enables 32-bit data transfer. Data transfer.	Disabled	Disables this function.
		Enabled	Enables this function.

Table 133: 945GME Primary IDE Master setting options

Primary IDE slave

```
                         BIOS SETUP UTILITY
        ┌─────────────┐
        │  Advanced   │
        └─────────────┘

   Primary IDE Slave                              Select the type
                                                  of device connected
   Device     :Not Detected                       to the system.

   Type                       [Auto]
   LBA/Large Mode             [Auto]
   Block (Multi-Sector Transfer)  [Auto]
   PIO Mode                   [Auto]
   DMA Mode                   [Auto]
   S.M.A.R.T.                 [Auto]
   32Bit Data Transfer        [Enabled]

                                                  ←→     Select Screen
                                                  ↑↓     Select Item
                                                  +-     Change Option
                                                  F1     General Help
                                                  F10    Save and Exit
                                                  ESC    Exit


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```

Figure 115: 945GME Primary IDE Slave

BIOS setting	Meaning	Setting options	Effect
Type	The type of drive connected to the primary master is configured here.	Not installed	No drive installed.
		Auto	Automatic recognition of the drive and setup of appropriate values.
		CD/DVD	CD -/ DVD drive.
		ARMD	ARMD - drive (zip drive)
LBA/Large mode	This option enables the logical block addressing/ large mode for IDE.	Disabled	Disables this function.
		Auto	Automatic enabling of this function when supported by the system.
Block (multi-sector transfer)	This option enables the block mode for IDE hard drives. When this option is enabled, the number of blocks per request from the configuration sector of the hard drive is read.	Disabled	Disables this function.
		Auto	Automatic enabling of this function when supported by the system.
PIO mode	The PIO mode determines the data rate of the hard drive. **Note:** **This option is not available on the APC810. Therefore this setting is not relevant.**	Auto	Automatic configuration of PIO mode.
		0, 1, 2, 3, 4	Manual configuration of PIO mode.

Table 134: 945GME Primary IDE Slave setting options

BIOS setting	Meaning	Setting options	Effect
DMA mode	The data transfer rate to and from the primary master drive is defined here. The DMA mode must be enabled in the Windows device manager in order to guarantee maximum performance. Only possible when manually setting up the drive.	Auto	Automatic definition of the transfer rate.
		Disabled	Manual definition of the transfer rate.
S.M.A.R.T.	Monitoring function of modern hard drives (self-monitoring, analysis and reporting technology).	Auto	Automatic detection and enabling.
		Disabled	Disables this function.
		Enabled	Enables this function.
32 bit data transfer	This function enables 32-bit data transfer. Data transfer.	Disabled	Disables this function.
		Enabled	Enables this function.

Table 134: 945GME Primary IDE Slave setting options (Forts.)

Secondary IDE master

```
                    BIOS SETUP UTILITY
   Advanced

  Secondary IDE Master                          Select the type
                                                of device connected
  Device      :Not Detected                     to the system.

  Type                         [Auto]
  LBA/Large Mode               [Auto]
  Block (Multi-Sector Transfer) [Auto]
  PIO Mode                     [Auto]
  DMA Mode                     [Auto]
  S.M.A.R.T.                   [Auto]
  32Bit Data Transfer          [Enabled]

                                                ←→    Select Screen
                                                ↑↓    Select Item
                                                +-    Change Option
                                                F1    General Help
                                                F10   Save and Exit
                                                ESC   Exit

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```

Figure 116: 945GME Secondary IDE Master

BIOS setting	Meaning	Setting options	Effect
Type	The type of drive connected to the primary master is configured here.	Not installed	No drive installed.
		Auto	Automatic recognition of the drive and setup of appropriate values.
		CD/DVD	CD -/ DVD drive.
		ARMD	ARMD - drive (zip drive)
LBA/Large mode	This option enables the logical block addressing/ large mode for IDE.	Disabled	Disables this function.
		Auto	Automatic enabling of this function when supported by the system.
Block (multi-sector transfer)	This option enables the block mode for IDE hard drives. When this option is enabled, the number of blocks per request from the configuration sector of the hard drive is read.	Disabled	Disables this function.
		Auto	Automatic enabling of this function when supported by the system.
PIO mode	The PIO mode determines the data rate of the hard drive. **Note: This option is not available on the APC810. Therefore this setting is not relevant.**	Auto	Automatic configuration of PIO mode.
		0, 1, 2, 3, 4	Manual configuration of PIO mode.
DMA mode	The data transfer rate to and from the primary master drive is defined here. The DMA mode must be enabled in the Windows device manager in order to guarantee maximum performance. Only possible when manually setting up the drive.	Auto	Automatic definition of the transfer rate.
		Disabled	Manual definition of the transfer rate.
S.M.A.R.T.	Monitoring function of modern hard drives (self-monitoring, analysis and reporting technology).	Auto	Automatic detection and enabling.
		Disabled	Disables this function.
		Enabled	Enables this function.
32 bit data transfer	This function enables 32-bit data transfer. Data transfer.	Disabled	Disables this function.
		Enabled	Enables this function.

Table 135: 945GME Secondary IDE Master setting options

Chapter 4
Software

Secondary IDE slave

```
                    BIOS SETUP UTILITY
        ┌──────────────┐
        │   Advanced   │
        └──────────────┘

   Secondary IDE Slave                          Select the type
                                                of device connected
   Device      :Not Detected                    to the system.

   Type                      [Auto]
   LBA/Large Mode            [Auto]
   Block (Multi-Sector Transfer)  [Auto]
   PIO Mode                  [Auto]
   DMA Mode                  [Auto]
   S.M.A.R.T.                [Auto]
   32Bit Data Transfer       [Enabled]

                                                ←→     Select Screen
                                                ↑↓     Select Item
                                                +-     Change Option
                                                F1     General Help
                                                F10    Save and Exit
                                                ESC    Exit


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```

Figure 117: 945GME Secondary IDE Slave

BIOS setting	Meaning	Setting options	Effect
Type	The type of drive connected to the primary master is configured here.	Not installed	No drive installed.
		Auto	Automatic recognition of the drive and setup of appropriate values.
		CD/DVD	CD -/ DVD drive.
		ARMD	ARMD - drive (zip drive)
LBA/Large mode	This option enables logical block addressing/ large mode for IDE.	Disabled	Disables this function.
		Auto	Automatic enabling of this function when supported by the system.
Block (multi-sector transfer)	This option enables the block mode for IDE hard drives. When this option is enabled, the number of blocks per request from the configuration sector of the hard drive is read.	Disabled	Disables this function.
		Auto	Automatic enabling of this function when supported by the system.
PIO mode	The PIO mode determines the data rate of the hard drive. **This option is not available on the APC810. Therefore this setting is not relevant.**	Auto	Automatic configuration of PIO mode.
		0, 1, 2, 3, 4	Manual configuration of PIO mode.

Table 136: 945GME Secondary IDE Slave setting options

BIOS setting	Meaning	Setting options	Effect
DMA mode	The data transfer rate to and from the primary master drive is defined here. The DMA mode must be enabled in the Windows device manager in order to guarantee maximum performance. Only possible when manually setting up the drive.	Auto	Automatic definition of the transfer rate.
		Disabled	Manual definition of the transfer rate.
S.M.A.R.T.	Monitoring function of modern hard drives (self-monitoring, analysis and reporting technology).	Auto	Automatic detection and enabling.
		Disabled	Disables this function.
		Enabled	Enables this function.
32 bit data transfer	This function enables 32-bit data transfer. Data transfer.	Disabled	Disables this function.
		Enabled	Enables this function.

Table 136: 945GME Secondary IDE Slave setting options (Forts.)

1.4.10 USB configuration

```
                    BIOS SETUP UTILITY
    Advanced

   USB Configuration                              Options

   USB Devices Enabled  :              Disabled
     1 Keyboard, 1 Hub                 2 USB Ports
                                       4 USB Ports
   USB Functions          [8 USB Ports]  6 USB Ports
   USB 2.0 Controller     [Enabled]      8 USB Ports

   Legacy USB Support     [Enabled]
   USB Legacy POST-Always [Enabled]
   USB Keyboard Legacy Support [Enabled]
   USB Mouse Legacy Support    [Disabled]
   USB Storage Device Support  [Enabled]   ↔   Select Screen
   Port 64/60 Emulation        [Disabled]  ↑↓  Select Item
   USB 2.0 Controller Mode     [HiSpeed]   +-  Change Option
   BIOS EHCI Hand-Off          [Disabled]  F1  General Help
   USB Beep Message            [Enabled]   F10 Save and Exit
   USB Stick Default Emulation [Hard Disk] ESC Exit
   USB Mass Storage Reset Delay [20 Sec]

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```

Figure 118: 945GME Advanced USB Configuration

BIOS setting	Meaning	Setting options	Effect
USB function	USB ports can be enabled/disabled here. The USB numbers (e.g. USB1, USB3, etc.) are printed on the APC810 housing).	Disabled	Disables the USB port.
		2 USB ports	USB1, USB3 are enabled.
		4 USB ports	USB1, USB2, USB3, USB4 are enabled.
		6 USB ports	USB1, USB2, USB3, USB4, USB5 are enabled.
		8 USB ports	USB1, USB2, USB3, USB4, USB5, USB are enabled on an AP via SDL.
USB 2.0 controller	Option for enabling or disabling USB 2.0 mode.	Enabled	All USB interfaces run in USB 2.0 mode.
		Disabled	All USB interfaces run in USB 1.1 mode.
Legacy USB support	Legacy USB support can be enabled/disabled here. USB interfaces do not function during startup. USB is supported again after the operating system has started. A USB keyboard is still recognized during the POST.	Disabled	Disables this function.
		Enabled	Enables this function.
		Auto	Automatic enabling.
USB Legacy POST-Always	Option to enable Legacy USB Support during the POST (Power On Self Test) the same as the Legacy USB Support setting.	Enabled	The BIOS Setup can be called up during the POST using a USB keyboard.
		Disabled	Disables this function.
USB keyboard legacy support	USB keyboard support can be enabled/disabled here.	Disabled	Disables this function.
		Enabled	Enables this function.
USB mouse legacy support	USB mouse support can be enabled/disabled here.	Disabled	Disables this function.
		Enabled	Enables this function.
USB storage device support	USB storage device support can be enabled/disabled here.	Disabled	Disables this function.
		Enabled	Enables this function.
Port 64/60 emulation	Port 64/60 emulation can be enabled/disabled here.	Disabled	USB keyboard functions in all systems excluding Windows NT.
		Enabled	USB keyboard functions in Windows NT.
USB 2.0 controller mode	Settings can be made for the USB controller.	Full speed	12 MBps
		Hi speed	480 MBps
BIOS EHCI hand-off	The support for the operating system can be set up without the fully automatic EHCI function.	Disabled	Disables the function
		Enabled	Enables this function.
USB beep message	Option for outputting a tone each time a USB device is detected by the BIOS during the POST.	Disabled	Disables this function.
		Enabled	Enables this function.
USB stick default emulation	You can set how the USB device is to be used.	Auto	USB devices with fewer than 530MB of memory are simulated as floppy disk drives and other devices with larger capacities are simulated as hard drives.
		Hard disk	An HDD-formatted drive can be used as an FDD (e.g. zip drive) for starting the system.

Table 137: 945GME Advanced USB Configuration setting options

BIOS setting	Meaning	Setting options	Effect
USB mass storage reset delay	The waiting time that the USB device POST requires after the device start command can be set. **Note:** **The message "No USB mass storage device detected" is displayed if no USB memory device has been installed.**	10 Sec, 20 Sec, 30 Sec, 40 Sec	Manually setting the value.

Table 137: 945GME Advanced USB Configuration setting options (Forts.)

1.4.11 Keyboard/mouse configuration

```
                    BIOS SETUP UTILITY
   Advanced

 Keyboard/Mouse Configuration              Select Power-on state
                                           for Numlock.
 Bootup Num-Lock              [On]
 Typematic Rate              [Fast]




                                           ←→     Select Screen
                                           ↑↓     Select Item
                                           +-     Change Option
                                           F1     General Help
                                           F10    Save and Exit
                                           ESC    Exit


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```
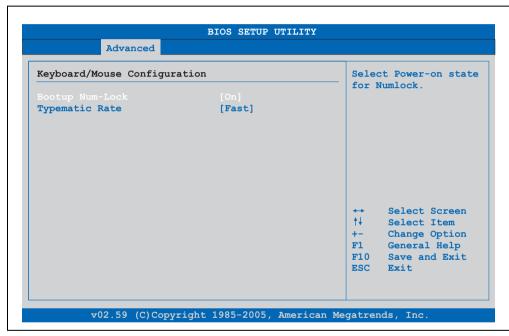
Figure 119: 945GME Advanced Keyboard/Mouse Configuration

BIOS setting	Meaning	Setting options	Effect
Bootup Num-lock	This option sets the status of the numeric keypad when the the system is booted.	Off	Only the cursor functions of the numerical keypad are enabled.
		On	Numeric keypad is enabled.
Typematic rate	The key repeat function is set here.	Slow	Slow key repeat.
		Fast	Fast key repeat.

Table 138: 945GME Advanced Keyboard/Mouse Configuration setting options

1.4.12 Remote access configuration

```
                        BIOS SETUP UTILITY
        Advanced

   Configure Remote Access type and parameters      Select Remote Access
                                                    type.
   Remote Access                 [Enabled]

   Serial Port number            [COM1]
       Base Address, IRQ         [3F8h, 4]
   Serial Port Mode              [115200 8,n,1]
   Flow Control                  [None]
   Redirection After BIOS POST   [Always]
   Terminal Type                 [ANSI]
   VT-UTF8 Combo Key Support     [Enabled]
   Sredir Memory Display Delay   [No Delay]
                                                    ←→    Select Screen
   Serial Port BIOS Update       [Disabled]         ↑↓    Select Item
                                                    +-    Change Option
                                                    F1    General Help
                                                    F10   Save and Exit
                                                    ESC   Exit


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```

Figure 120: 945GME Advanced Remote Access Configuration

BIOS setting	Meaning	Setting options	Effect
Remote access	The remote access function can be enabled/disabled here.	Disabled	Disables this function.
		Enabled	Enables this function.
Serial port number	The serial interface can be set using this option, as long as disabled is not entered in the *remote access* field.	COM1	Enables the COM1 interface as remote access interface.
		COM2	Enables the COM2 interface as remote access interface.
Base address, IRQ	Serial connection display for the logical address and interrupt, as long as disabled is not entered in the *remote access* field.	None	-
Serial port mode	The serial interface transfer rate is defined here, as long as disabled is not entered in the *remote access* field.	115200 8,n,1. 57600 8,n,1. 38400 8,n,1. 19200 8,n,1. 09600 8,n,1	Manually setting the value.
Flow control	This setting determines how the transfer is controlled via the interface. **Note:** **The setting must be the same on the terminal and the server.**	None	The interface is operated without transfer control.
		Hardware	The interface transfer control is carried out through hardware. This mode must be supported by a cable.
		Software	The interface transfer control is carried out through software.

Table 139: 945GME Advanced Remote Access Configuration setting options

BIOS setting	Meaning	Setting options	Effect
Redirection after BIOS POST	The redirection after start up can be set here, as long as disabled is not entered in the *remote access* field.	Disabled	The redirection is switched off after start up.
		Boot loader	Redirection is enabled during system start up and charging.
		Always	Redirection is always enabled.
Terminal type	The type of connection can be chosen here, as long as disabled is not entered in the *remote access* field.	ANSI, VT100, VT-UTF8	Manual configuration of the connection type.
VT-UTF8 Combo Key Support	With this option, the VT-UTF8 Combo Key Support for the ANSI and VT100 connections can be enabled, as long as disabled is not entered in the *remote access* field.	Disabled	Disables this function.
		Enabled	Enables this function.
Sredir Memory Display Delay	The memory output delay can be set using this option, as long as disabled is not entered in the *remote access* field (Sredir -> serial redirection).	No delay	No delay.
		Delay 1 sec, Delay 2 sec, Delay 4 sec	Manually setting the value.
Serial port BIOS update	During system start up, the update is loaded via the serial interface in the processor. **Note: If this option is disabled, the boot time is reduced.**	Disabled	Disables this function.
		Enabled	Enables this function.

Table 139: 945GME Advanced Remote Access Configuration setting options (Forts.)

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Software

1.4.13 CPU board monitor

Information:

The displayed voltage values (e.g. core voltage, battery voltage) on this BIOS Setup page represent uncalibrated information values. These cannot be used to draw any conclusions about any hardware alarms or error conditions. The hardware components used have automatic diagnostics functions that can be applied in the event of error.

```
                        BIOS SETUP UTILITY
        Advanced

  Hardware Health Configuration                         Options

  H/W Health Function              [Enabled]       Disabled
                                                   Enabled
  Hardware Health Event Monitoring

  Board Temperature                :63°C/145°F
  CPU Temperature                  :47°C/116°F
  Top DIMM Environment Temp.       :53°C/161°F
  Bottom DIMM Environment Temp.    :54°C/161°F

  CPU Fan Speed                    :0 RPM
                                                   ←→   Select Screen
  VcoreA                           :0.960 V        ↑↓   Select Item
  +3.3VSB                          :3.351 V        +-   Change Option
  +5VSB                            :5.080 V        F1   General Help
  +12Vin                           :12.187 V       F10  Save and Exit
  VRTC                             :3.322 V        ESC  Exit


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```
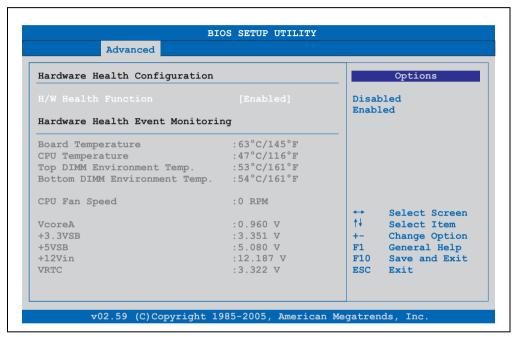
Figure 121: 945GME Advanced CPU Board Monitor

BIOS setting	Meaning	Setting options	Effect
H/W Health Function	Option for displaying all values on this page.	Enabled	Displays all values.
		Disabled	No values are shown on this page.
Board temperature	Displays the board temperature in degrees Celsius and Fahrenheit.	None	-
CPU temperature	Displays the processor's temperature (in degrees Celsius and Fahrenheit).	None	-
Top DIMM Environment Temp.	Displays the temperature of the first DRAM module.	None	-

Table 140: 945GME Advanced Remote Access Configuration setting options

BIOS setting	Meaning	Setting options	Effect
Bottom DIMM Environment Temp.	Displays the temperature of the second DRAM module.	None	-
CPU Fan Speed	Displays the rotating speed of the processor fan.	None	-
VcoreA	Displays the processor's core voltage (in volts).	None	-
+3.3VSB	Displays the current voltage of the 3.3 volt supply.	None	-
+5VSB	Displays the current voltage of the 5 volt supply.	None	-
+12Vin	Displays the current voltage of the 12 volt supply.	None	-
VRTC	Displays the battery voltage (in volts).	None	-

Table 140: 945GME Advanced Remote Access Configuration setting options (Forts.)

1.4.14 Baseboard/panel features

```
                        BIOS SETUP UTILITY
            Advanced

  Baseboard/Panel Features

 ▶Panel Control
 ▶Baseboard Monitor
 ▶Legacy Devices

  Versions
    BIOS:           R110
    MTCX PX32:      V0.06
    MTCX FPGA:      V0.03

  CMOS Profil:      0h
  Device ID:        0000AC7h                    ←→   Select Screen
  Compatibility ID: 0000h                       ↑↓    Select Item
  Serial Number:    A3C70168427                 Enter Go to Sub Screen
  Product Name:     5PC810.SX02-00              F1    General Help
  User Serial ID:   00000000h                    F10   Save and Exit
                                                 ESC   Exit


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```

Figure 122: 945GME Advanced Baseboard/Panel Features

BIOS setting	Meaning	Setting options	Effect
Panel control	For special setup of connected panels (display units).	Enter	Opens submenu See "Panel control" on page 235
Baseboard monitor	Displays different temperature values and fan speeds.	Enter	Opens submenu See "Baseboard monitor" on page 236
Legacy devices	Special settings for the interface can be changed here.	Enter	Opens submenu See "Legacy devices" on page 237
BIOS	Displays the BIOS version.	None	-
MTCX PX32	Displays the MTCX PX32 firmware version.	None	-
MTCX FPGA	Displays the MTCX FPGA firmware version.	None	-
CMOS profile	Shows the CMOS profile number.	None	-
Device ID	Displays the hexadecimal value of the hardware device ID.	None	-
Compatibility ID	Displays the version of the device within the same B&R device code. This ID is needed for Automation Runtime.	None	-
Serial number	Displays the B&R serial number.	None	-
Product name	Displays the B&R model number.	None	-
User serial ID	Displays the user serial ID. This 8 digit hex value can be freely assigned by the user (e.g. to give the device a unique ID) and can only be changed with using the "B&R Control Center" via the ADI driver.	None	-

Table 141: 945GME Advanced Baseboard/Panel Features setting options

Panel control

```
                        BIOS SETUP UTILITY
        Advanced

     Panel Control                                 Panel 0-14: connected
                                                   to Automation Panel
     Select Panel Number          [0]              Link or Monitor/Panel
       Version:            V1.04                    connector.
       Brightness:              [100%]             Panel 15: connected on
       Temperature:        41°C/105°F              Panel PC Link.
       Fan Speed:          00 RPM                   Note: DVI and PPC Link
       Keys/Leds:          128/128                 will show no valid
                                                   values. On PPC Link
                                                   only the brightness
                                                   option will work.

                                                   ↔     Select Screen
                                                   ↑↓    Select Item
                                                   +-    Change Option
                                                   F1    General Help
                                                   F10   Save and Exit
                                                   ESC   Exit


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```

Figure 123: 945GME Panel Control

BIOS setting	Meaning	Setting options	Effect
Select panel number	Selection of the panel number for which the values should be read out and/or changed.	0...15	Selection of panel 0 ... 15. Panel 15 is specifically intended for panel PC 700 systems. vorgesehen.
Version	Display of the firmware version of the SDLR controller. Controllers.	None	-
Brightness	For setting the brightness of the selected panel.	0%, 10%, 20%, 30%, 40%, 50%, 60%, 70%, 80%, 90%, 100%	For setting the brightness (in %) of the selected panel. Changes take effect after saving and restarting the system (e.g. by pressing <F10>).
Temperature	Displays the selected panel's temperature (in degrees Celsius and Fahrenheit).	None	-
Fan speed	Displays fan speed for the selected panel.	None	-
Keys/LEDs	Displays the available keys and LEDs on the selected panel.	None	-

Table 142: 945GME Panel Control setting options

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Software

Baseboard monitor

```
                        BIOS SETUP UTILITY
        ┌──────────────┐
        │   Advanced   │
        └──────────────┘

    Baseboard Monitor
    ─────────────────────────────────────────────

    CMOS Battery:        Good

    Temperatures
      Board I/O:         45°C/113°F
      Board ETH2:        39°C/102°F
      Board Power:       43°C/109°F
      Power Supply:      39°C/102°F
      ETH2 Controller:   65°C/149°F
      Slide-In Drive 1:  00°C/32°F
      Slide-In Drive 2:  00°C/32°F
                                              ←→    Select Screen
                                              ↑↓    Select Item
    Fan Speeds                                F1    General Help
      Case 1:            00 RPM               F10   Save and Exit
      Case 2:            00 RPM               ESC   Exit
      Case 3:            00 RPM
      Case 4:            00 RPM



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```

Figure 124: 945GME Baseboard Monitor

BIOS setting	Meaning	Setting options	Effect
CMOS battery	Displays the battery status. **N/A** - not available **Good** - battery ok. **Bad** - battery is damaged.	None	-
Board I/O	Displays the temperature of the I/O area in degrees Celsius and Fahrenheit.	None	-
Board ETH2	Displays the temperature in the ETH2 controller chip area in degrees Celsius and Fahrenheit.	None	-
Board Power	Displays the temperature in the power supply area in degrees Celsius and Fahrenheit.	None	-
Power supply	Displays the temperature in the power supply area in degrees Celsius and Fahrenheit.	None	
ETH2 Controller	Displays the temperature of the ETH2 controller in degrees Celsius and Fahrenheit.	None	
Slide-in drive 1	Displays the temperature of the slide-in drive 1 in degrees Celsius and Fahrenheit.	None	-

Table 143: 945GME Baseboard Monitor setting options

BIOS setting	Meaning	Setting options	Effect
Slide-in drive 2	Displays the temperature of the slide-in drive 5.08 cm degrees Celsius and Fahrenheit.	None	-
Case 1	Displays the fan speed of housing fan 1.	None	-
Case 2	Displays the fan speed of housing fan 2.	None	-
Case 3	Displays the fan speed of housing fan 3.	None	-
Case 4	Displays the fan speed of housing fan 4.	None	-

Table 143: 945GME Baseboard Monitor setting options

Legacy devices
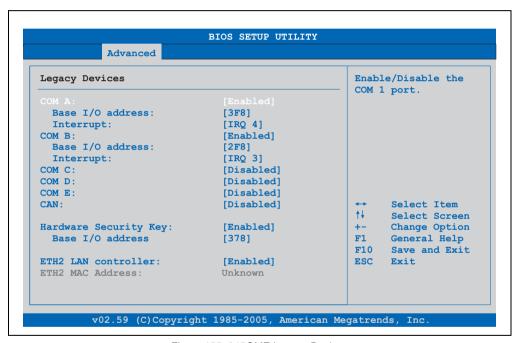
Figure 125: 945GME Legacy Devices

BIOS setting	Meaning	Setting options	Effect
COM A	Settings for the **COM1** serial interface in the system.	Disabled	Disables the interface.
		Enabled	Enables the interface.
Base I/O address	Selection of the base I/O address for the COM port.	238, 2E8, 2F8, 328, 338, 3E8, 3F8	Selected base I/O address is assigned.
Interrupt	Selection of the interrupt for the COM port.	IRQ 3, IRQ 4, IRQ 5, IRQ 6, IRQ 7, IRQ 10, IRQ 11, IRQ 12	Selected interrupt is assigned.

Table 144: 945GME Legacy Devices setting options

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BIOS setting	Meaning	Setting options	Effect
COM B	Settings for the **COM2** serial interface in the system.	Disabled	Disables the interface.
		Enabled	Enables the interface.
Base I/O address	Selection of the base I/O address for the COM port.	238, 2E8, 2F8, 328, 338, 3E8, 3F8	Selected base I/O address is assigned.
Interrupt	Selection of the interrupt for the COM 2 port.	IRQ 3, IRQ 4, IRQ 5, IRQ 6, IRQ 7, IRQ 10, IRQ 11, IRQ 12	Selected interrupt is assigned.
COM C	Setting of the COM port for the **touch screen on the monitor/panel** connector.	Disabled	Disables the interface.
		Enabled	Enables the interface.
Base I/O address	Selection of the base I/O address for the COM port.	238, 2E8, 2F8, 328, 338, 3E8, 3F8	Selected base I/O address is assigned.
Interrupt	Selection of the interrupt for the COM port.	IRQ 3, IRQ 4, IRQ 5, IRQ 6, IRQ 7, IRQ 10, IRQ 11, IRQ 12	Selected interrupt is assigned.
COM D	Setting of the COM port for the **touch screen on the AP Link** connector.	Disabled	Disables the interface.
		Enabled	Enables the interface.
Base I/O address	Selection of the base I/O address for the COM port.	238, 2E8, 2F8, 328, 338, 3E8, 3F8	Selected base I/O address is assigned.
Interrupt	Selection of the interrupt for the COM port.	IRQ 3, IRQ 4, IRQ 5, IRQ 6, IRQ 7, IRQ 10, IRQ 11, IRQ 12	Selected interrupt is assigned.
COM E	Configuration of the COM port of the B&R add-on interface option 5AC600.485I-00 (IF option).	Disabled	Disables the interface.
		Enabled	Enables the interface.
Base I/O address	Selection of the base I/O address for the COM port.	238, 2E8, 2F8, 328, 338, 3E8, 3F8	Selected base I/O address is assigned.
Interrupt	Selection of the interrupt for the COM port.	IRQ 3, IRQ 4, IRQ 5, IRQ 6, IRQ 7, IRQ 10, IRQ 11, IRQ 12	Selected interrupt is assigned.
CAN	Configuration of the CAN port of the B&R add-on CAN interface card 5AC600.CANI-00 (IF option).	Disabled	Disables the interface.
		Enabled	Enables the interface.
Base I/O address	Selection of the base I/O address for the CAN port.	None	-
Interrupt	Selection of the interrupt for the CAN port.	IRQ 10, NMI	Selected interrupt is assigned.
Hardware security key	Settings for the hardware security key (Dongle) are made here.	Disabled	Disables the interface.
		Enabled	Enables the interface.
Base I/O address	Selection of the base I/O address for the hardware security interface.	278, 378, 3BC	Selection of the base I/O address for the parallel port.
ETH2 LAN controller	For turning the onboard LAN controller (ETH2) on and off.	Disabled	Disables the controller.
		Enabled	Enables the controller.
ETH2 MAC Address	Displays the Ethernet 2 controller MAC address.	None	-

Table 144: 945GME Legacy Devices setting options (Forts.)

1.5 Boot

```
                        BIOS SETUP UTILITY
   Main      Advanced     Boot     Security     Power     Exit

   Boot Priority Selection      [Type Based]          The device based boot
                                                       priority list allows
   Boot Device Priority                                to select from a list
   ──────────────────────────────────────────         of currently detected
   1st Boot Device              [Primary Master]       devices.
   2nd Boot Device              [Primary Slave]        The type based boot
   3rd Boot Device              [USB Floppy]           priority list allows
   4th Boot Device              [USB Removable Devi]   to select device types
   5th Boot Device              [USB Harddisk]         even if a respective
   6th Boot Device              [USB CDROM]            device is not (yet)
   7th Boot Device              [Secondary Master]     present.
   8th Boot Device              [Secondary Slave]
                                                       ←→    Select Screen
   Boot Settings Configuration                         ↑↓    Select Item
   ──────────────────────────────────────────         +-    Change Option
   Quick Boot                   [Enabled]              F1    General Help
   Quiet Boot                   [Disabled]             F10   Save and Exit
   Automatic Boot List Retry    [Disabled]             ESC   Exit
   AddOn ROM Display Mode        [Keep Current]
   Halt On Error                [Disabled]
   Hit ´DEL´ Message Display    [Enabled]
   Interrupt 19 Capture         [Enabled]
   PXE Boot to LAN (ETH1)       [Disabled]
   Power Loss Control           [Turn On]

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```

Figure 126: 945GME Boot Menu

BIOS setting	Meaning	Setting options	Effect
Boot priority selection	The method for when the drives should be booted can be set here.	Device based	Only the devices that are recognized by the system are listed. The sequence of this list can be changed.
		Type based	The boot sequence of a device type list can be changed. Device types that are not connected can also be entered to this list.

Table 145: 945GME Boot Menu setting options

BIOS setting	Meaning	Setting options	Effect
1st boot device	The boot drive can be set using this option.	Disabled, primary master, primary slave, secondary master, secondary slave, Legacy floppy, USB floppy, USB hard disk, USB CDROM, USB removable device, onboard LAN, external LAN, PCI mass storage PCI SCSI Card, Any PCI BEV Device, Third Master, Third Slave, PCI RAID, Local BEV ROM	Selecting the desired sequence.
2nd boot device			
3rd boot device			
4th boot device			
5th boot device			
6th boot device			
7th boot device			
8th boot device			
Quick boot	This function reduces the boot time by skipping some POST procedures.	Disabled	Disables this function.
		Enabled	Enables this function.
Quiet boot	Determines if POST message or OEM logo (default = black background) is displayed.	Disabled	POST message display.
		Enabled	OEM logo display instead of POST message.
Automatic boot list retry	With this option, the operating system attempts to automatically restart following startup failure.	Disabled	Disables this function.
		Enabled	Enables this function.
AddOn ROM display mode	Sets the display mode for the ROM (during the booting procedure).	Force BIOS	An additional BIOS part can be displayed.
		Keep current	BIOS information is displayed.
Hold on errors	This option sets whether the system should pause the Power On Self Test (POST) when it encounters an error.	Disabled	The system does not pause. All errors are ignored.
		Enabled	The system pauses. The system pauses every time an error is encountered.
Hit 'DEL' Message Display	Settings can be made here for the "Hit 'DEL' Message" display. **Note: When quiet boot is activated the message is not displayed.**	Disabled	The message is not displayed.
		Enabled	The message is displayed.
Interrupt 19 capture	This function can be used to incorporate the BIOS interrupt.	Disabled	Disables this function.
		Enabled	Enables this function.
PXE boot to LAN (ETH1)	Enables/disables the function to boot from LAN (ETH1).	Disabled	Disables this function.
		Enabled	Enables this function.
Slide-in 2 Optional ROM	Activation/deactivation of an optional ROM for a slide-in 2 drive.	Disabled	Disables this function.
		Enabled	Enables this function.
Power loss control	Determines if the system is on/off following power loss.	Remain off	Remains off.
		Turn on	Powers on.
		Last state	Enables the previous state.

Table 145: 945GME Boot Menu setting options (Forts.)

1.6 Security

```
                        BIOS SETUP UTILITY
   Main      Advanced     Boot     Security    Power     Exit

   Security Settings                              Install or Change the
                                                  password.
   Supervisor Password  :Not Installed
   User Password        :Not Installed

   Change Supervisor Password
   Change User Password

   Boot Sector Virus Protection   [Disabled]

   Hard Disk Security

 ▶ Hard Disk Security User Passwords
 ▶ Hard Disk Security Master Passwords            ←→    Select Screen
                                                  ↑↓    Select Item
                                                  Enter  Change
                                                  F1    General Help
                                                  F10   Save and Exit
                                                  ESC   Exit


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```

Figure 127: 945GME Security Menu

BIOS setting	Meaning	Setting options	Effect
Supervisor password	Displays whether or not a supervisor password has been set.	None	-
User password	Displays whether or not a user password has been set.	None	-
Change supervisor password	To enter/change a supervisor password. A supervisor password is necessary to edit all BIOS settings.	Enter	Enter password.
Change user password	To enter/change a user password. A user password allows the user to edit only certain BIOS settings.	Enter	Enter password.
Boot sector virus protection	With this option, a warning is issued when the boot sector is accessed through a program or virus. **Note:** **With this option, only the boot sector is protected, not the entire hard drive.**	Disabled	Disables this function.
		Enabled	Enables this function.
Hard disk security user password	The hard disk security user password can be created here.	Enter	Opens submenu See "Hard disk security user password" on page 242

Table 146: 945GME Security Menu setting options

BIOS setting	Meaning	Setting options	Effect
Hard disk security master password	The hard disk security master password can be created here.	Enter	Opens submenu See "Hard disk security master password" on page 243

Table 146: 945GME Security Menu setting options (Forts.)

1.6.1 Hard disk security user password

```
                          BIOS SETUP UTILITY
                             Security

        Hard Disk Security User Passwords

        Primary Slave HDD User Password



                                              ←→    Select Screen
                                              ↑↓    Select Item
                                              F1    General Help
                                              F10   Save and Exit
                                              ESC   Exit


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```

Figure 128: 945GME Hard disk security user password

BIOS setting	Meaning	Setting options	Effect
Primary slave HDD user password	This function makes it possible to use the user password to change or configure each hard drive without having to reboot the device. A user password allows the user to edit only certain BIOS settings.	Enter	Enter password.

Table 147: 945GME Hard disk security user password

1.6.2 Hard disk security master password

```
                    BIOS SETUP UTILITY
                        Security

   Hard Disk Security Master Passwords

   Primary Slave HDD Master Password


                                        ←→    Select Screen
                                        ↑↓    Select Item
                                        F1    General Help
                                        F10   Save and Exit
                                        ESC   Exit



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```
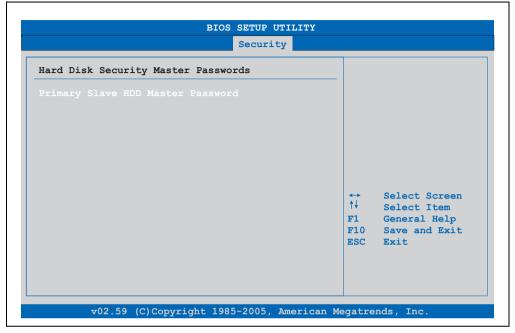
Figure 129: 945GME Hard Disk Security Master Password

BIOS setting	Meaning	Setting options	Effect
Primary slave HDD master password	This function makes it possible to use the user password to change or configure each hard drive without having to reboot the device.	Enter	Enter password.

Table 148: 945GME Hard Disk Security Master Password

1.7 Power

```
                         BIOS SETUP UTILITY
    Main      Advanced    Boot      Security    Power     Exit

    Congigure power management and control            Enable or disable
                                                      APM.
    Power Management/APM          [Enabled]
    Suspend Time Out              [Disabled]
    Video Power Down Mode         [Suspend]
    Hard Disk Power Down Mode     [Suspend]
    Keyboard & PS/2 Mouse         [MONITOR]
    FDC/LPT/COM Ports             [MONITOR]
    Primary Master IDE            [MONITOR]
    Primary Slave IDE             [MONITOR]
    Secondary Master IDE          [MONITOR]
    Secondary Slave IDE           [MONITOR]
                                                      ←→    Select Screen
    Resume On Ring                [Disabled]          ↑↓    Select Item
    Resume On PME#                [Disabled]          +-    Change Option
    Resume On RTC Alarm           [Disabled]          F1    General Help
                                                      F10   Save and Exit
    Power Button Mode             [On/Off]            ESC   Exit


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```

Figure 130: 945GME Power Menu

BIOS setting	Meaning	Setting options	Effect
Power management/APM	This option switches the APM function on or off. This is an advanced plug & play and power management functionality.	Disabled	Disables this function.
		Enabled	Enables this function.
Suspend time out	Using this option, you can configure how long the system stays inactive (all components but the CPU are shut off, if possible) before entering suspend mode.	Disabled	Disables this function.
		1 Min, 2 Min, 4 Min, 8 Min, 10 Min, 20 Min, 30 Min, 40 Min, 50 Min, 60 Min;	Manually setting the value.
Video power down mode	This option allows you to set the energy saving mode for the monitor.	Disabled	Do not switch off the monitor.
		Standby	Monitor goes to standby mode.
		Suspend	Monitor goes to suspend mode.
Hard disk power down mode	This option allows you to set the energy saving mode for the hard drive.	Disabled	Do not switch off the hard drive.
		Standby	Monitor goes to standby mode.
		Suspend	Hard drive goes to suspend mode.
Keyboard & PS/2 mouse	The monitoring of activities during power saving mode is determined here.	MONITOR	Keyboard or PS/2 mouse activities return the system to its normal state from a particular energy saving mode.
		IGNORE	Activities are ignored.

Table 149: 945GME Power Menu setting options

BIOS setting	Meaning	Setting options	Effect
FDC/LPT/COM ports	The monitoring of activities during power saving mode is determined here.	MONITOR	Activity on the parallel port, the serial 1&2 port, or the floppy port returns the system to its normal state from an energy saving mode.
		IGNORE	Activities are ignored.
Primary Master IDE	The monitoring of activities during power saving mode is determined here.	MONITOR	Activities in the IRQ of specific connections or devices return the system to its normal state from power saving mode.
		IGNORE	Activities are ignored.
Primary Slave IDE	The monitoring of activities during power saving mode is determined here.	MONITOR	Activities in the IRQ of specific connections or devices return the system to its normal state from power saving mode.
		IGNORE	Activities are ignored.
Secondary Master IDE	The monitoring of activities during power saving mode is determined here.	MONITOR	Activities in the IRQ of specific connections or devices return the system to its normal state from power saving mode.
		IGNORE	Activities are ignored.
Secondary Slave IDE	The monitoring of activities during power saving mode is determined here.	MONITOR	Activities in the IRQ of specific connections or devices return the system to its normal state from power saving mode.
		IGNORE	Activities are ignored.
Resume on ring	When the modem receives an incoming call, the PC is brought out of power saving mode.	Disabled	Disables this function.
		Enabled	Enables this function.
Resume on PME#	With this option, you can switch the PME wakeup function on or off.	Disabled	Disables this function.
		Enabled	Enables this function.
Resume on RTC alarm	With this option, you can activate the alarm and enter the date and time for the system start.	Disabled	Disables this function.
		Enabled	Enables this function.
Power button mode	This function determines the function of the power button.	On/Off	Power button switches on/off.
		Suspend	Suppresses the function

Table 149: 945GME Power Menu setting options (Forts.)

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1.8 Exit

```
                         BIOS SETUP UTILITY
    Main      Advanced     Boot      Security     Power      Exit

   Exit Options                          Exit system setup
                                         after saving the
   Save Changes and Exit                 changes.
   Discard Changes and Exit
   Discard Changes                       F10 key can be used
                                         for this operation.
   Load CMOS Defaults




                                         ↔      Select Screen
                                         ↑↓     Select Item
                                         Enter Go to Sub Screen
                                         F1    General Help
                                         F10   Save and Exit
                                         ESC   Exit


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```
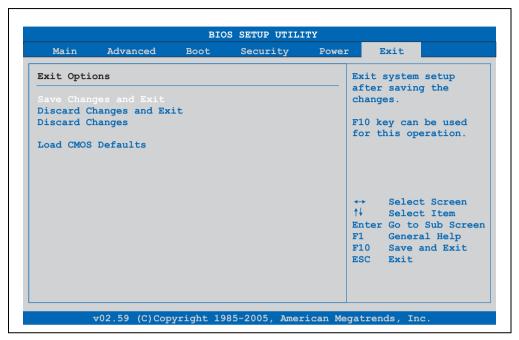
Figure 131: 945GME Exit Menu

BIOS setting	Meaning	Setting options	Effect
Save changes and exit	BIOS setup is closed with this item. Changes made are saved in CMOS after confirmation, and the system is rebooted.	OK / cancel	
Discard changes and exit	With this item you can close BIOS setup without saving the changes made. The system is then rebooted.	OK / cancel	
Discard changes	In the event that settings were made which the user can no longer remember, changes can be reset as long as they haven't been saved.	OK / cancel	
Load CMOS defaults	This item loads the CMOS default values, which are defined by the DIP switch settings. These settings are loaded for all BIOS configurations.	OK / cancel	

Table 150: 855GME (XTX) Exit menu - setting options

1.9 BIOS default settings

The CMOS Profile Hex switch (for position, see the figure "Interface overview - APC810, 2 card slot variant (bottom)" on page 41) can be used to load pre-defined BIOS profile settings based on the position.

Figure 132: CMOS Profile Hex Switch

Information:

The switch position that is set upon delivery represents the optimum BIOS default values for this system and should therefore not be changed.

If the function "load setup defaults" is chosen in the main BIOS setup menu, or if exit is selected (or <F9> is pressed) in the individual setup screens, the following BIOS settings are the optimized values that will be used.

Profile number	Optimized for	Switch position
Profile 0	Reserved	0
Profile 1	System unit 5PC810.SX02-00 / 5PC810.SX01-00	1
Profile 2	5PC810.SX05-00	2

Table 151: Profile overview

The following pages provide an overview of the BIOS default settings for the different CMOS profile switch position. Yellow highlighted settings are variations in the BIOS default profile (=profile 0).

1.9.1 Main

Setting / View	Profile 0	Profile 1	Profile 2	My setting
System time	-	-	-	
System date	-	-	-	
BIOS ID	-	-	-	
Processor	-	-	-	
CPU frequency	-	-	-	
System memory	-	-	-	
Product revision	-	-	-	
Serial number	-	-	-	
BC Firmware rev.	-	-	-	
MAC Address (ETH1)	-	-	-	
Boot counter	-	-	-	
Running time	-	-	-	

Table 152: 945GME Main profile setting overview

1.9.2 Advanced

ACPI configuration

Setting / View	Profile 0	Profile 1	Profile 2	My setting
ACPI Aware O/S	Yes	Yes	Yes	
ACPI Version Features	ACPI v2.0	ACPI v2.0	ACPI v2.0	
ACPI APIC support	Enabled	Enabled	Enabled	
Suspend mode	S1 (POS)	S1 (POS)	S1 (POS)	
USB Device Wakeup from S3/S4	Disabled	Disabled	Disabled	
Active cooling trip point	Disabled	Disabled	Disabled	
Passive cooling trip point	Disabled	Disabled	Disabled	
Critical trip point	105°C	105°C	105°C	

Table 153: 945GME Advanced - ACPI configuration profile setting overview

PCI configuration

Setting / View	Profile 0	Profile 1	Profile 2	My setting
Plug & Play O/S	No	**Yes**	**Yes**	
PCI latency timer	64	64	64	
Allocate IRQ to PCI VGA	Yes	Yes	Yes	
Allocate IRQ to SMBUS HC	Yes	Yes	Yes	
PCI IRQ Resource Exclusion				
IRQ3	Allocated	Allocated	Allocated	
IRQ4	Allocated	Allocated	Allocated	
IRQ5	Available	Available	Available	
IRQ6	Available	Available	Available	
IRQ7	Available	Available	Available	
IRQ9	Allocated	Allocated	Allocated	
IRQ10	Available	Available	Available	
IRQ11	Allocated	Available	Available	
IRQ12	Available	Available	Available	
IRQ14	Allocated	Allocated	Allocated	
IRQ15	Allocated	Allocated	Allocated	
PCI Interrupt Routing				
PIRQ A (VGA,PCIEX0,ETH2,UHCI3)	Auto	Auto	Auto	
PIRQ B (AC97,PCIEX1,ETH1)	Auto	Auto	Auto	
PIRQ C (PATA,UHCI2,PCIEX2)	Auto	Auto	Auto	
PIRQ D (SATA, UHCI1,SMB,PCIEX3)	Auto	Auto	Auto	
PIRQ E (INTD)	Auto	Auto	Auto	
PIRQ F (INTA)	Auto	Auto	Auto	
PIRQ G (INTB)	Auto	Auto	Auto	
PIRQ H (INTC,UHCI0,EHCI)	Auto	Auto	Auto	

Table 154: 945GME Advanced - PCI configuration profile setting overview

PCI Express Configuration

Setting / View	Profile 0	Profile 1	Profile 2	My setting
Active State Power-Management	Disabled	Disabled	Disabled	
PCIE Port 0	Auto	Auto	Auto	
PCIE Port 1	Auto	Auto	Auto	
PCIE Port 2	Auto	Auto	Auto	
PCIE Port 3	Auto	Auto	Auto	
PCIE Port 4	Auto	Auto	Auto	
PCIE Port 5	Auto	Auto	Auto	
PCIE High Priority Port	Disabled	Disabled	Disabled	
Res. PCIE Hotplug Resource	No	No	No	
PCIE Port 0 IOxAPIC Enable	Disabled	Disabled	Disabled	
PCIE Port 1 IOxAPIC Enable	Disabled	Disabled	Disabled	
PCIE Port 2 IOxAPIC Enable	Disabled	Disabled	Disabled	
PCIE Port 3 IOxAPIC Enable	Disabled	Disabled	Disabled	

Table 155: 945GME Advanced - PCI Express configuration profile setting overview

Graphics configuration

Setting / View	Profile 0	Profile 1	Profile 2	My setting
Primary Video Device	Internal VGA	Internal VGA	Internal VGA	
Internal Graphics Mode Select	Enabled, 8MB	Enabled, 8MB	Enabled, 8MB	
DVMT Mode Select	DVMT Mode	DVMT Mode	DVMT Mode	
DVMT/FIXED Memory	128MB	128MB	128MB	
Boot Display Device	Auto	Auto	Auto	
Boot Display Preference	SDVO-B SDVO-C LFP	SDVO-B SDVO-C LFP	SDVO-B SDVO-C LFP	
Local Flat Panel Type	Auto	Auto	Auto	
Local Flat Panel Scaling	Centering	Centering	Centering	
SDVO Port B Device	DVI	DVI	DVI	
SDVO Port C Device	DVI	DVI	DVI	
SDVO/DVI Hotplug Support	Enabled	Enabled	Enabled	
Display Mode Persistence	Enabled	Enabled	Enabled	

Table 156: 945GME Advanced - Graphics configuration profile setting overview

CPU configuration

Setting / View	Profile 0	Profile 1	Profile 2	My setting
MPS Revision	1.4	1.4	1.4	
Max CPUID Value Limit	Disabled	Disabled	Disabled	
Execute Disable Bit	Enabled	Enabled	Enabled	
Core Multi-Processing	Enabled	Enabled	Enabled	
Intel (R) SpeedStep (tm) tech.	Automatic	Automatic	Automatic	
Max. CPU frequency	xxxx MHz	xxxx MHz	xxxx MHz	
C1 Config.	Default	Default	Default	
C2 Config.	Disabled	Disabled	Disabled	
C3 Config.	Disabled	Disabled	Disabled	
C4 Config.	Disabled	Disabled	Disabled	

Table 157: 945GME Advanced - CPU configuration profile setting overview

Chipset configuration

Setting / View	Profile 0	Profile 1	Profile 2	My setting
DRAM Frequency	Auto	Auto	Auto	
Memory Hole	Disabled	Disabled	Disabled	
DIMM Thermal Control	Disabled	Disabled	Disabled	
DT in SPD	Disabled	Disabled	Disabled	
TS on DIMM	Disabled	Disabled	Disabled	
IOAPIC	Enabled	Enabled	Enabled	
APIC ACPI SCI IRQ	Disabled	Disabled	Disabled	
C4 On C3	Disabled	Disabled	Disabled	

Table 158: 945GME Advanced - Chipset configuration profile setting overview

I/O interface configuration

Setting / View	Profile 0	Profile 1	Profile 2	My setting
Onboard Audio Controller	AC97	AC97	AC97	

Table 159: 945GME Advanced - I/O Interface Configuration profile setting overview

Clock configuration

Setting / View	Profile 0	Profile 1	Profile 2	My setting
Spread spectrum	Disabled	Disabled	Disabled	

Table 160: 945GME Advanced - Clock configuration profile setting overview

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IDE Configuration

Setting / View	Profile 0	Profile 1	Profile 2	My setting
ATA/IDE Configuration	Compatible	Compatible	Compatible	
Legacy IDE Channels	SATA Pri, PATA Sec	SATA Pri, PATA Sec	SATA Pri, PATA Sec	
Hard disk write protect	Disabled	Disabled	Disabled	
IDE Detect Time Out (Sec)	35	35	35	
ATA(PI) 80Pin Cable Detection	Host & device	Host & device	Host & device	

Primary IDE master				
Type	Auto	Auto	Auto	
LBA/Large mode	Auto	Auto	Auto	
Block (multi-sector transfer)	Auto	Auto	Auto	
PIO mode	Auto	Auto	Auto	
DMA mode	Auto	Auto	Auto	
S.M.A.R.T.	Auto	Auto	Auto	
32Bit data transfer	Enabled	Enabled	Enabled	
Primary IDE slave				
Type	Auto	Auto	Auto	
LBA/Large mode	Auto	Auto	Auto	
Block (multi-sector transfer)	Auto	Auto	Auto	
PIO mode	Auto	Auto	Auto	
DMA mode	Auto	Auto	Auto	
S.M.A.R.T.	Auto	Auto	Auto	
32Bit data transfer	Enabled	Enabled	Enabled	
Secondary IDE master				
Type	Auto	Auto	Auto	
LBA/Large mode	Auto	Auto	Auto	
Block (multi-sector transfer)	Auto	Auto	Auto	
PIO mode	Auto	Auto	Auto	
DMA mode	Auto	Auto	Auto	
S.M.A.R.T.	Auto	Auto	Auto	
32Bit data transfer	Enabled	Enabled	Enabled	
Secondary IDE slave				
Type	Auto	Auto	Auto	
LBA/Large mode	Auto	Auto	Auto	

Table 161: 945GME Advanced - IDE configuration profile setting overview

Setting / View	Profile 0	Profile 1	Profile 2	My setting
Block (multi-sector transfer)	Auto	Auto	Auto	
PIO mode	Auto	Auto	Auto	
DMA mode	Auto	Auto	Auto	
S.M.A.R.T.	Auto	Auto	Auto	
32Bit data transfer	Enabled	Enabled	Enabled	

Table 161: 945GME Advanced - IDE configuration profile setting overview (Forts.)

USB configuration

Setting / View	Profile 0	Profile 1	Profile 2	My setting
USB function	8 USB ports	8 USB ports	8 USB ports	
USB 2.0 controller	Enabled	Enabled	Enabled	
Legacy USB support	Enabled	Enabled	Enabled	
USB Legacy POST-Always	Enabled	Enabled	Enabled	
USB keyboard legacy support	Enabled	Enabled	Enabled	
USB mouse legacy support	Disabled	Disabled	Disabled	
USB storage device support	Enabled	Enabled	Enabled	
Port 64/60 emulation	Disabled	Disabled	Disabled	
USB 2.0 controller mode	HiSpeed	HiSpeed	HiSpeed	
BIOS EHCI hand-off	Disabled	Disabled	Disabled	
USB beep message	Enabled	Enabled	Enabled	
USB stick default emulation	Hard disk	Hard disk	Hard disk	
USB mass storage reset delay	20 Sec	20 Sec	20 Sec	

Table 162: 945GME Advanced - USB configuration profile setting overview

Keyboard/mouse configuration

Setting / View	Profile 0	Profile 1	Profile 2	My setting
Bootup Num-lock	On	On	On	
Typematic rate	Fast	Fast	Fast	

Table 163: 945GME Advanced - Keyboard/Mouse Configuration profile setting overview

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Software

Remote access configuration

Setting / View	Profile 0	Profile 1	Profile 2	My setting
Remote access	Disabled	Disabled	Disabled	
Serial port BIOS update	Disabled	Disabled	Disabled	

Table 164: 945GME Advanced - Remote Access Configuration profile setting overview

CPU board monitor

Setting / View	Profile 0	Profile 1	Profile 2	My setting
H/W Health Function	Enabled	Enabled	Enabled	

Table 165: 945GME Advanced - CPU Board Monitor profile setting overview

Baseboard/panel features

Setting / View	Profile 0	Profile 1	Profile 2	My setting
Panel control				
Select panel number	-	-	-	
Version	-	-	-	
Brightness	100%	100%	100%	
Temperature	-	-	-	
Fan speed	-	-	-	
Keys/LEDs	-	-	-	
Baseboard monitor				
CMOS battery	-	-	-	
Board I/O	-	-	-	
Board ETH2	-	-	-	
Board Power	-	-	-	
Slide-in drive 1	-	-	-	
Slide-in drive 2	-	-	-	
ETH2 Controller	-	-	-	
Case 1	-	-	-	
Case 2	-	-	-	
Case 3	-	-	-	
Case 4	-	-	-	
Legacy devices				
COM A	Enabled	Enabled	Enabled	
Base I/O address	3F8	3F8	3F8	
Interrupt	IRQ4	IRQ4	IRQ4	
COM B	Enabled	Enabled	Enabled	

Table 166: 945GME Advanced - Baseboard/Panel Features profile setting overview

Setting / View	Profile 0	Profile 1	Profile 2	My setting
Base I/O address	2F8	2F8	2F8	
Interrupt	IRQ3	IRQ3	IRQ3	
COM C	Enabled	**Disabled**	**Disabled**	
Base I/O address	3E8	-	-	
Interrupt	IRQ11	-	-	
COM D	Disabled	Disabled	Disabled	
COM E	Disabled	Disabled	Disabled	
CAN	Disabled	Disabled	Disabled	
Hardware security key	Enabled	Enabled	Enabled	
Base I/O address	378	378	378	
ETH2 LAN Controller	Enabled	Enabled	Enabled	
ETH2 MAC Address	-	-	-	

Table 166: 945GME Advanced - Baseboard/Panel Features profile setting overview (Forts.)

1.9.3 Boot

Setting / View	Profile 0	Profile 1	Profile 2	My setting
Boot priority selection	Type based	Type based	Type based	
1st boot device	Onboard LAN	**Primary master**	**Primary master**	
2nd boot device	Primary master	**Primary slave**	**Primary slave**	
3rd boot device	Primary slave	**USB floppy**	**USB floppy**	
4th boot device	USB floppy	**USB removable device**	**USB removable device**	
5th boot device	USB removable device	**USB hard disk**	**USB hard disk**	
6th boot device	USB CDROM	USB CDROM	USB CDROM	
7th boot device	Secondary master	Secondary master	Secondary master	
8th boot device	Secondary slave	Secondary slave	Secondary slave	
Quick boot	Enabled	Enabled	Enabled	
Quiet boot	Disabled	Disabled	Disabled	
Automatic boot list retry	Disabled	Disabled	Disabled	
AddOn ROM display mode	Keep current	Keep current	Keep current	
Hold on errors	Disabled	Disabled	Disabled	
Hit "DEL" Message Display	Enabled	Enabled	Enabled	
Interrupt 19 capture	Disabled	Disabled	Disabled	
PXE boot to LAN (ETH1)	Enabled	**Disabled**	**Disabled**	
Slide-in 2 optional ROM	Enabled	**Disabled**	Enabled	
Power loss control	Turn on	Turn on	Turn on	

Table 167: 945GME Boot profile setting overview

1.9.4 Security

Setting / View	Profile 0	Profile 1	Profile 2	My setting
Supervisor password	-	-	-	
User password	-	-	-	
Boot sector virus protection	Disabled	Disabled	Disabled	
Hard disk security user password	-	-	-	
Hard disk security master password	-	-	-	

Table 168: 945GME Security profile setting overview

1.9.5 Power

Setting / View	Profile 0	Profile 1	Profile 2	My setting
Power management/APM	Enabled	Enabled	Enabled	
Suspend time out	Disabled	Disabled	Disabled	
Video power down mode	Suspend	Suspend	Suspend	
Hard disk power down mode	Suspend	Suspend	Suspend	
Keyboard & PS/2 mouse	MONITOR	MONITOR	MONITOR	
Primary Master IDE	MONITOR	MONITOR	MONITOR	
Primary Slave IDE	MONITOR	MONITOR	MONITOR	
Secondary Master IDE	MONITOR	MONITOR	MONITOR	
Secondary Slave IDE	MONITOR	MONITOR	MONITOR	
Resume on ring	Disabled	Disabled	Disabled	
Resume on PME#	Disabled	Disabled	Disabled	
Resume on RTC alarm	Disabled	Disabled	Disabled	
Power button mode	On/Off	On/Off	On/Off	

Table 169: 945GME Power profile setting overview

1.10 BIOS upgrade

Warning!

The upgrade procedures described in the following pages must be carried out for all APC810 systems with software versions lower than those listed in the following table.

CPU board software	945GME COM Express
BIOS	<R110
MTCX PX32 firmware	< V 0.0.6
MTCX FPGA firmware	< V 0.0.3

Table 170: CPU board software versions

Automation Panel Link	Transmitter (5AC801.SDL0-00)
SDLR version	< V 1.04

Table 171: Automation panel link software versions

1.10.1 Requirements

The following peripheral devices are needed for a software upgrade:

- USB floppy drive or USB flash drive
- 1.44 MB HDD diskette(s) (max. 3 diskettes)
- USB keyboard
- B&R upgrade software (**www.br-automation.com**)

1.10.2 What information do I need?

Information:

Individually saved BIOS settings are deleted when upgrading the BIOS.

Before you begin the upgrade, it helps to determine the various software versions.

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Which BIOS version and firmware are already installed on the APC810?

This information can be found on the following BIOS setup page:

- After switching on the APC810, you can get to the BIOS Setup by pressing "Del".
- From the BIOS main menu "advanced", select "baseboard/panel features".

```
                         BIOS SETUP UTILITY
        Advanced

   Baseboard/Panel Features

 ▶Panel Control
 ▶Baseboard Monitor
 ▶Legacy Devices

  Versions
    BIOS:            R110         System BIOS
    MTCX PX32:       V0.06        MTCX PX32 firmware
    MTCX FPGA:       V0.03        MTCX FPGA firmware

  CMOS Profil:       0h
  Device ID:         0000AC7h                   ↔    Select Screen
  Compatibility ID: 0000h                       ↑↓    Select Item
  Serial Number:     A3C70168427             Enter Go to Sub Screen
  Product Name:      5PC810.SX02-00           F1    General Help
  User Serial ID:    00000000h                F10   Save and Exit
                                              ESC   Exit


         v02.59 (C)Copyright 1985-2005, American Megatrends, Inc.
```
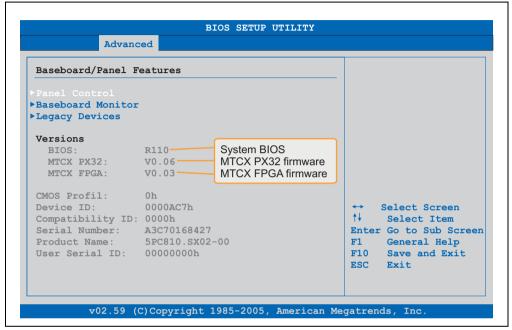
Figure 133: Software version

Which firmware is installed on the Automation Panel Link transmitter?

This information can be found on the following BIOS setup page:

- After switching on the APC810, you can get to the BIOS Setup by pressing "Del".
- From the BIOS main menu "advanced", select "baseboard/panel features" and then "panel control".

Information:

The version can only be displayed when an Automation Panel with an AP Link SDL transmitter (5AC801.SDL0-00) is connected.


```
                        BIOS SETUP UTILITY
    ┌──────────────┐
    │   Advanced   │
    ┌───────────────────────────────────┐  ┌──────────────────────┐
    │ Panel Control                      │  │ Panel 0-14: connected│
    │                                    │  │ to Automation Panel  │
    │ Select Panel Number      [0]       │  │ Link or Monitor/Panel│
    │   Version:        V1.04  ┌─────────┴──┤ connector.           │
    │   Brightness:            [100%]│ Firmware of the │ Panel 15: connected on│
    │   Temperature:    41°C/105°F   │ SDLR Controller │ Panel PC Link.        │
    │   Fan Speed:      00 RPM       └─────────┐  │  Note: DVI and PPC Link│
    │   Keys/Leds:      128/128          │  │ will show no valid   │
    │                                    │  │ values. On PPC Link  │
    │                                    │  │ only the brightness  │
    │                                    │  │ option will work.    │
    │                                    │  │                      │
    │                                    │  │ ←→    Select Screen  │
    │                                    │  │ ↑↓    Select Item    │
    │                                    │  │ +-    Change Option  │
    │                                    │  │ F1    General Help   │
    │                                    │  │ F10   Save and Exit  │
    │                                    │  │ ESC   Exit           │
    │                                    │  │                      │
    └───────────────────────────────────┘  └──────────────────────┘
        v02.59 (C)Copyright 1985-2005, American Megatrends, Inc.
```

Figure 134: Firmware version of the AP Link SDL transmitter

1.10.3 BIOS upgrade for 945GME COM Express

- Download and unzip the zip file from the B&R homepage.

- Copy the files to a MS-DOS startup disk or USB stick (see the section "Creating an MS-DOS boot diskette in Windows XP" on page 264 for information about creating a bootable disk or chapter 6 "Accessories", section 8.5 "Creating a bootable USB flash drive" on page 332 about creating a bootable USB flash drive).

- Insert the diskette in the USB floppy drive or the USB stick in the USB port and reboot the APC810.

- The following boot menu will be shown after startup:

      1. Upgrade AMI BIOS for B945

      2. Exit

         Concerning point 1:
         BIOS is automatically upgraded (default after 5 seconds).

         Concerning point 2:
         Return to the shell (MS-DOS).

- The system must be rebooted after a successful upgrade.

- Reboot and press "Del" to enter the BIOS setup menu and load the setup defaults, then select "Save Changes and Exit".

1.11 Firmware upgrade

The "Upgrade APC800 MTCX" software makes it possible to update the firmware for multiple controllers (MTCX, SDLT, SDLR, UPSI), depending on the structure of the APC810 system.

1.11.1 Procedure

- Download and unzip the zip file from the B&R homepage.
- Copy the files to a MS-DOS startup disk (see the section 1.12 "Creating an MS-DOS boot diskette in Windows XP" on page 264 for information about creating a bootable disk or section 8.5 "Creating a bootable USB flash drive" on page 332 about creating a bootable USB flash drive).
- Insert the diskette in the USB floppy drive or the USB stick in the USB port and reboot the APC810.
- The boot menu is shown after startup

Information:

The following boot menu options including descriptions are based on Version 0.4 of the APC800 upgrade (MTCX, SDLR, SDLT, UPSI) disk. In some cases, these descriptions might not match the version you are currently using.

Boot menu options:

```
1.Upgrade MTCX (APC800/PPC800) PX32 and FPGA

2.Upgrade SDLT (APC800) only

3.Upgrade SDLR (AP800/AP900) on Monitor/Panel

  3.1 Upgrade SDLR on AP 0 (AP800/AP900)

  3.2 Upgrade SDLR on AP 1 (AP800/AP900)

  3.3 Upgrade SDLR on AP 2 (AP800/AP900)

  3.4 Upgrade SDLR on AP 3 (AP800/AP900)

  3.5 Upgrade all SDLR (AP800/AP900)

  3.6 Return to main menu


4.Upgrade SDLR (AP800/AP90) on AP Link Slot

  4.1 Upgrade SDLR on AP 8 (AP800/AP900)

  4.2 Upgrade SDLR on AP 9 (AP800/AP900)
```

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```
    4.3 Upgrade SDLR on AP 10 (AP800/AP900)

    4.4 Upgrade SDLR on AP 11 (AP800/AP900)

    4.5 Upgrade all SDLR (AP800/AP900)

    4.6 Return to main menu

5.Upgrade Add-On UPS (Firmware and Battery Settings)

    5.1 Upgrade Add-On UPS Firmware (5AC600.UPSI-00)

    5.2 Upgrade Battery Settings (5AC600.UPSB-00)

    5.3 Return to main menu

6.Exit
```

Concerning point 1:
Automatically upgrade PX32 and FPGA for MTCX (default after 5 seconds).

Concerning point 2:
The FPGA of the SDLT controller on the AP Link slot is automatically updated.

Concerning point 3:
Submenu 1 is opened for upgrading the SDLR controller on the Monitor/Panel plug.

3.1 Upgrade SDLR on AP 0 (AP800/AP900)
The SDLR controller is automatically updated on Automation Panel 0.

3.2 Upgrade SDLR on AP 1 (AP800/AP900)
The SDLR controller is automatically updated on Automation Panel 1.

3.3 Upgrade SDLR on AP 2 (AP800/AP900)
The SDLR controller is automatically updated on Automation Panel 2.

3.4 Upgrade SDLR on AP 3 (AP800/AP900)
The SDLR controller is automatically updated on Automation Panel 3.

3.5 Upgrade all SDLR (AP800/AP900)
All SDLR controllers are automatically updated on all Automation Panels on the Monitor/Panel (default after 5 sec).

3.6 Return to main menu
Returns to the main menu.

Concerning point 4:
Submenu 2 is opened for upgrading the SDLR controller on the AP Link slot.

4.1 Upgrade SDLR on AP 8 (AP800/AP900)
The SDLR controller is automatically updated on Automation Panel 8.

4.2 Upgrade SDLR on AP 9 (AP800/AP900)
The SDLR controller is automatically updated on Automation Panel 9.

4.3 Upgrade SDLR on AP 10 (AP800/AP900)
The SDLR controller is automatically updated on Automation Panel 10.

4.4 Upgrade SDLR on AP 11 (AP800/AP900)
The SDLR controller is automatically updated on Automation Panel 11.

4.5 Upgrade all SDLR (AP800/AP900)
All SDLR controllers are automatically updated on all Automation Panels on the AP Link slot (default after 5 sec).

4.6 Return to main menu
Returns to the main menu.

Concerning point 5:
Submenu 3 for the add-on UPS firmware and upgrade and the battery settings upgrade is opened.

5.1 Upgrade Add-On UPS Firmware (5AC600.UPSI-00)
The firmware for the add-on UPS is updated.

5.2 Upgrade Battery Settings (5AC600.UPSB-00)
The battery settings for 5AC600.UPSB-00 are automatically updated.

5.3 Return to main menu
Returns to the main menu.

Concerning point 6:
Return to the shell (MS-DOS).

Information:

The system must be powered off and on again after a successful upgrade.

1.11.2 Possible upgrade problems and software dependencies

- The SDLR firmware can only be updated if an Automation Panel with Automation Panel Link Transceiver (5DLSDL.1000-01) and Automation Panel Link Receiver (5DLSDL.1000-00) is connected.

- Automation Panel Link transceivers (5DLSDL.1000-01) or Automation Panel Link receivers (5DLSDL.1000-00) with a Firmware version lower than or equal to V00.10 can no longer be combined with Automation Panel Link transceivers (5DLSDL.1000-01) or Automation Panel Link receivers (5DLSDL.1000-00) with a Firmware higher than or equal to V01.04. Daisy Chain mode is not possible with such a combination.

- If a UPS (e.g. 5AC600.UPSI-00) + battery unit (e.g. 5AC600.UPSB-00) is connected to the system and operable, then after an upgrade of the MTCX or SDLT you must either disconnect the battery or push the Power button (to put the system in Standby mode),

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before executing the required power off/on. If not, the firmware upgrade will not work because the UPS buffers the system.

1.12 Creating an MS-DOS boot diskette in Windows XP

• Place an empty 1.44MB HDD diskette in the disk drive.

• Open Windows Explorer.

• Right-click on the 3½" Floppy icon and select "Format...".
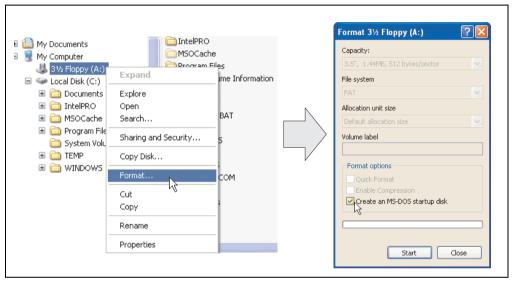
Figure 135: Creating a bootable diskette in Windows XP - step 1

• Then select the checkbox **"Create an MS-DOS startup disk"**, press **"Start"** and acknowledge the warning message with "OK".
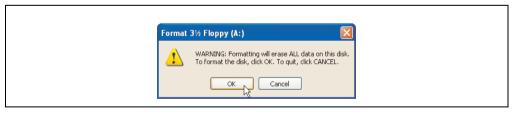
Figure 136: Creating a bootable diskette in Windows XP - step 2
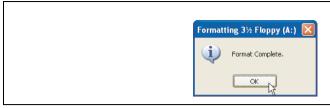
Figure 137: Creating a bootable diskette in Windows XP - step 3

After creating the startup disk, some of the files must be deleted because of the size of the update.

When doing this, all files (hidden, system files, etc.) must be shown on the diskette.

In the Explorer, go to the "Tools" menu, select "Folder Options..." and open the "View" tab - now deactivate the option "Hide protected operating system files (Recommended)" (activated as default) and activate the option "Show hidden files and folders".
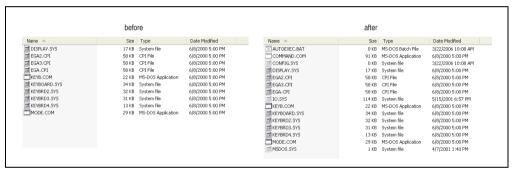
Figure 138: Creating a bootable diskette in Windows XP - step 4
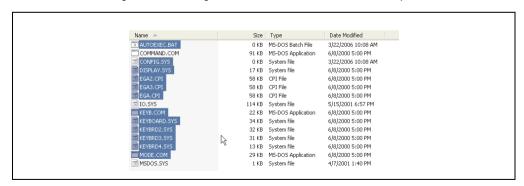
Figure 139: Creating a bootable diskette in Windows XP - step 5

Now all files (marked) except Command.com, IO.sys and MSDOS.sys can be deleted.

2. Automation PC 810 with Windows XP Professional

Figure 140: Windows XP Professional Logo

Model number	Short description	Comment
9S0000.08-010	**OEM Microsoft Windows XP Professional German** CD, German; Only delivered with a new PC.	
9S0000.08-020	**OEM Microsoft Windows XP Professional English** CD, English; Only delivered with a new PC.	
9S0000.09-090	**OEM Microsoft Windows XP Professional Multilanguage** CDs; Only delivered with a new PC.	
5SWWXP.0600-GER	**WinXP Professional with SP3, GER** OEM Windows XP Professional including Service Pack 3, CD, German, only supplied together with a new PC. in Verbindung mit einem neuen PC.	
5SWWXP.0600-ENG	**WinXP Professional with SP3, ENG** OEM Windows XP Professional including Service Pack 3, CD, German, only supplied together with a new PC. in Verbindung mit einem neuen PC.	
5SWWXP.0600-MUL	**WinXP Professional with SP3, MUL** OEM Windows XP Professional including Service Pack 3, CD, German, only supplied together with a new PC. in Verbindung mit einem neuen PC.	

Table 172: Model numbers - Windows XP Professional

2.1 Installation

Generally, the required Windows XP Professional version is already pre-installed by B&R on the desired mass memory (add-on hard disk, slide-in hard disk). All of the drivers required for operation (graphics, network, etc.) are also installed when doing so.

2.2 Drivers

The latest drivers for all released operating systems can be found in the download area (Service - Product Related Downloads - BIOS / Drivers / Updates) on the B&R homepage (**www.br-automation.com**).

Information:

Required drivers can only be downloaded from the B&R homepage, not from manufacturers' pages.

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3. Automation PC 810 with Windows XP embedded

Figure 141: Windows XP Embedded Logo

Model number	Short description	Comment
5SWWXP.0426-ENG	**WinXPe FP2007 APC810 C945GM** Order Microsoft Windows XP embedded English, Feature Pack 2007, for PPC700 with CPU boards 5PC600.X855-00, 5PC600.X855-01, 5PC600.X855-02, 5PC600.X855-03, 5PC600.X855-04, 5PC600.X855-05; CompactFlash separately (at least 512 MB). Only delivered with a new PC.	

Table 173: Model numbers - Windows XP Embedded

3.1 General information

Windows XP Embedded is the most modular version of the Windows XP Professional desktop operating system and makes it possible to quickly develop reliable and advanced embedded devices. Windows XP Embedded is based on the same binary files as Windows XP Professional and is optimally tailored to the hardware being used. In other words, only the functions and modules required by the respective device are included. Windows XP Embedded is also based on the same reliable code as Windows XP Professional. It provides industry with leading reliability, improvements in security and performance, and the latest technology for Web browsing and extensive device support.

3.2 Features with FP2007 (Feature Pack 2007)

The feature list shows the most important device functions in Windows XP Embedded with Feature Pack 2007 (FP2007).

Function	present
Enhanced write filter (EWF)	✓
File Based Write Filter	✓
Page file	configurable
Administrator account	✓
User account	configurable
Explorer shell	✓
Registry Filter	✓
Internet Explorer 6.0 + SP2	✓
Internet information service (IIS)	-
Terminal service	✓
Windows Firewall	✓
MSN-Explorer	-
Outlook Express	-
Administrative Tools	✓
Remote Desktop	✓
Remote Assistance	-
.NET Framework	-
ASP.NET	-
Codepages/User Locale/Keyboard	✓
Disk Management Service	✓
Windows Installer Service	✓
Class Installer	✓
CoDevice Installer	✓
Media Player	-
DirectX	-
Accessories	✓
Number of fonts	89

Table 174: Device functions in Windows XP Embedded with FP2007

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3.3 Installation

Windows XP Embedded is usually preinstalled at B&R Austria on a suitable CompactFlash card (at least 512 MB). The APC810 system is then automatically configured after it has been switched on for the first time. This procedure takes approximately 30 minutes, and the device will be rebooted a number of times.

3.4 Drivers

All drivers required for operation are preinstalled on the operating system. If an older driver version is installed, the latest version can be downloaded from the B&R homepage (**www.br-automation.com**) and installed. A potentially activated "Enhanced Write Filter (EWF)" must be taken into consideration.

3.4.1 Touch screen driver

The touch screen driver must be manually installed in order to operate Automation Panel 800 or Automation Panel 900 touch screen devices. The driver can be downloaded from the download area on the B&R homepage (**www.br-automation.com**). A potentially activated "Enhanced Write Filter (EWF)" must be taken into consideration.

Information:

Required drivers can only be downloaded from the B&R homepage, not from manufacturers' pages.

4. Automation Device Interface (ADI) - Control Center

The ADI (Automation Device Interface) enables access to specific functions of B&R devices. Settings for this device can be read and edited using the B&R Control Center applet in the control panel.
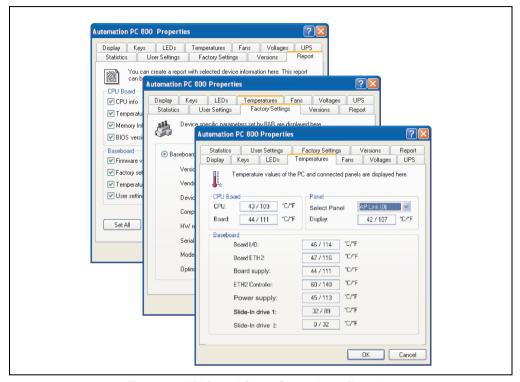
Figure 142: ADI Control Center Screenshots - Examples

Information:

The displayed temperature and voltage values (e.g. CPU temperature, core voltage, battery voltage) on the corresponding ADI page represent uncalibrated information values. These cannot be used to draw any conclusions about any hardware alarms or error conditions. The hardware components used have automatic diagnostics functions that can be applied in the event of error.

4.1 Functions

- Adjusting the display-specific parameters of connected Panels
- Reading of device-specific keys

- Activation of device specific LEDs on a foil keypad
- Reading temperatures, fan speeds, statistical data, and switch settings
- Reading user settings and factory settings
- Reading software versions
- Updating and securing firmware
- Creating reports about the current system (support assistance)
- Setting the SDL equalizer value for the SDL cable adjustment
- Configuring an optional mounted UPS
- Change the user serial ID.

Supports following systems:

System	Operating system	Comment
Automation PC 810	Windows XP Professional	Installation using its own setup
	Windows XP Embedded	Content of B&R Windows XP Embedded image
Automation PC 620	Windows XP Professional	Installation using its own setup
	Windows XP Embedded	Content of B&R Windows XP Embedded image
	Windows CE	Content of B&R Windows CE image
Panel PC 700	Windows XP Professional	Installation using its own setup
	Windows XP Embedded	Content of B&R Windows XP Embedded image
Power Panel BIOS devices	Windows XP Embedded	Content of B&R Windows XP Embedded image
	Windows CE	Content of B&R Windows CE image
Mobile Panel BIOS devices	Windows XP Embedded	Content of B&R Windows XP Embedded image
	Windows CE	Content of B&R Windows CE image
Automation Panel 800	-	Together with Automation PC 620 / Automation PC 800 and Panel PC 700
Automation Panel 900	-	Together with Automation PC 620 / Automation PC 800 and Panel PC 700

Table 175: System support - ADI driver

A detailed description of the Control Center can be found in the integrated online help.

The B&R Automation Device Interface (ADI) driver (also contains Control Center) can be downloaded for free from the download area on the B&R homepage (**www.br-automation.com**).

4.2 Installation

The latest version of the ADI driver for the existing target system can be found in the download area (Service - Product Related Downloads - BIOS / Drivers / Updates) on the B&R homepage (**www.br-automation.com**).

1. Download and unpack the ZIP archive

2. Close all applications

3. Run BrSetup.exe (e.g. double-click on it in Explorer).

- or -

Right click on BrSetup.inf in explorer and select "Install".

> # Information:
>
> **The ADI driver and B&R control center are already included in the Windows XP Embedded operating system.**
>
> **If a more current ADI driver version exists (see the B&R homepage download area), it can be installed later. A potentially activated "Enhanced Write Filter (EWF)" must be taken into consideration when installing.**

4.3 SDL equalizer setting

The equalizer makes it possible to adjust the strength of the video signal to the SDL cable length. This allows you to improve the visual representation on the display. The SDL equalizer can be set under the "Display" tab under "Settings".
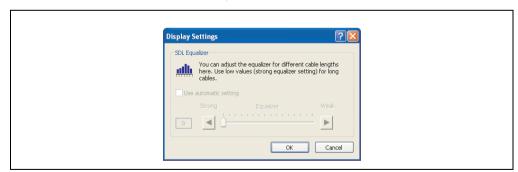
Figure 143: ADI Control Center - SDL equalizer settings

The value is optimally defined for the cable length when using the "Automatic setting".

The equalizer value can only be changed if the function is supported by Automation Panel 900 (starting with Panel Firmware version 1.04 or higher).

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4.4 UPS configuration

Here, the status values for an optionally installed B&R APC620 UPS can be displayed and the battery settings for the UPS can be changed, updated, and saved. The system settings for the UPS can also be configured.
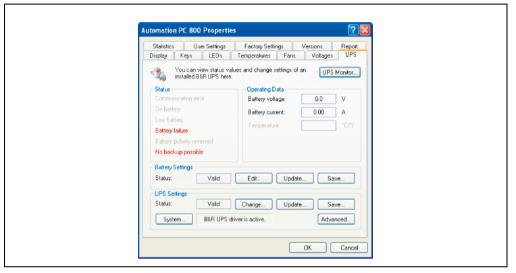
Figure 144: ADI Control Center - UPS settings

Caution!

The installed UPS must be selected and configured in the Control Panel using the energy options in order for battery operation to be supported.

Information for Windows XP Embedded:

The UPS service is supported starting with B&R Windows Embedded Version 2.10 or higher.

4.4.1 Configuration of UPS operation for the B&R APC810 UPS

1) Open the energy options dialog box in the Control Panel.

2) Go to the UPS tab and click on "Select".

3) Set the manufacturer to "Bernecker + Rainer" and the model to "APC810 UPS" and click on "Finish". The value for the COM connection is only required for a serially connected UPS and is ignored by the APC810 UPS driver.

4) Click on "Apply" to begin UPS operation. After a few seconds the UPS status and details are displayed.

Information:

- **Administrator rights are required in order to change the energy options or display the UPS status.**

- **In a German version of Windows XP Professional the battery status is displayed as "low" in the energy options, even if the battery is OK (Windows error). In an English version, three battery status levels are displayed: unknown, OK, replace. A low battery status is never displayed.**

4.4.2 Display status values for UPS

1) Open the Control Center in the Control Panel.

2) Select UPS tab.

The displayed values are updated automatically.

Information:

Notes:

The "reversed battery polarity" status is only displayed in UPS firmware version 1.08 or higher.

In UPS firmware version 1.07 or smaller, a change between battery operation and normal operation can lead to communication errors.

Select UPS monitor to display UPS status changes since the last time the system or UPS driver was started.

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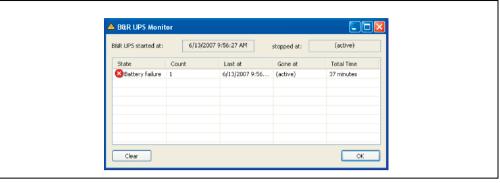
Figure 145: ADI Control Center - UPS monitor

The dialog box is updated automatically when the status changes.

To remove a status from the list, click on delete.

Information:

The current status of the UPS is also displayed when the UPS service is started in the Windows Control Panel on the UPS page in the energy options.

4.4.3 Change UPS battery settings

1) Open the Control Center in the Control Panel.

2) Select UPS tab.

3) Under "Battery settings," click on "Edit". Clicking on "Open" opens a dialog box.

4) Select and open the file containing the battery settings.
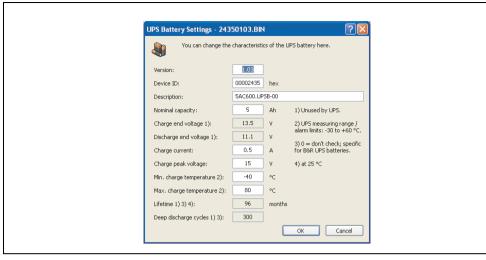
Figure 146: ADI Control Center - UPS battery settings

In this dialog box you can change settings for the UPS.

Information:

To make settings for batteries not from B&R, it is best to make a copy of a file with battery settings from B&R under a new name and make adjust the settings in this file for the battery being used.

Current files with settings for batteries from B&R can be updated using B&R's "Upgrade APC800 MTCX".

Information:

If you would like to change the current battery settings on the UPS, they must first be saved in a file.

4.4.4 Update UPS battery settings

1) Open the Control Center in the Control Panel.

2) Select UPS tab.

3) Under "Battery settings", click on "Update". Clicking on "Open" opens a dialog box.

4) Select and open the file containing the battery settings. The "Download" dialog box is opened.

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The transfer can be aborted by clicking on "Cancel" in the Download dialog box. "Cancel" is disabled when the flash memory is being written to.

Caution!

- **The UPS cannot be operated while updating the battery settings.**
- **If the transfer is interrupted, then the procedure must be repeated until the battery settings have been updated successfully. Otherwise battery operation will no longer be possible.**

Deleting the data in flash memory can take several seconds depending on the memory block being used. The progress indicator is not updated during this time.

Information:

The UPS is automatically restarted after a successful download. This can cause a brief failure in the UPS communication.

4.4.5 Save UPS battery settings

1) Open the Control Center in the Control Panel.

2) Select UPS tab.

3) Under "Battery settings", click on "Save". "Save under" dialog box opened.

4) Enter a file name or select an existing file and click on "Save".

The transfer can be aborted by clicking on "Cancel" in the Download dialog box.

4.4.6 Configure UPS system settings

1) Open the Control Center in the Control Panel.

2) Select UPS tab.

3) Under UPS settings, click on "System". The energy options dialog box in the Control Panel is opened.

Further information regarding the UPD system settings can be found in the Windows help.

Information:

Administrator rights are required in order to change the energy options or display the UPS status.

4.4.7 Configuring the "UL compliant operation"

1) Open the Control Center in the Control Panel.

2) Select UPS tab.

3) Under UPS settings, click on "Change". This opens the following dialog box:
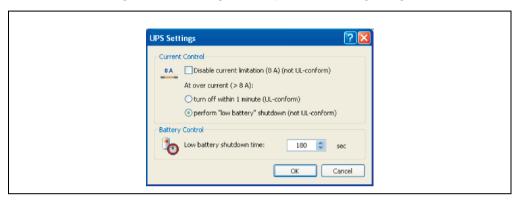
Figure 147: ADI Control Center - UPS settings

Information:

• **For UL compliant operation, ADI driver version 1.80 and UPS firmware version 1.10 are minimum requirements.**

• **The UL compliant operation is switched on by default.**

If the "Low Battery" shutdown option is activated, the LowBatteryFlag is set at over-current, and a low battery shutdown is executed (for more information on low battery shutdown, see "Low battery shutdown" on page 281). If the UL compliant operation is reactivated, the following warning is displayed.
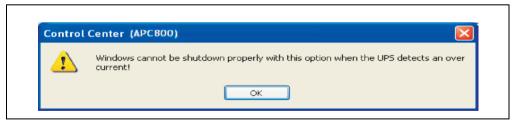
Figure 148: ADI control center warning

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4.4.8 Change additional UPS settings

1) Open the Control Center in the Control Panel.

2) Select UPS tab.

3) Under UPS settings, click on "Advanced". This opens the following dialog box:

Figure 149: ADI Control Center - Advanced UPS settings

Information:

Administer rights are required in order to display this dialog box.

Change delay time for UPS

Under "Windows UPS Service", you can enter the delay in seconds. This is the length of time that the UPS waits before switching off the power supply.

Information:

This time is evaluated by the Windows UPS Service, but can not be set in the UPS system settings of the energy options. This value should only be changed if the system requires longer than the default setting of 180 seconds to shut down.

Caution!

The time entered must be longer than the time required to shut down the operating system.

Activate UPS messages

Under "B&R UPS driver", activate the checkbox "UPS status messages". Any changes to the UPS status will then trigger a message from the B&R UPS driver.

Information:

Shutting down the system is only reported by the Windows UPS Service. The UPS Service also sends other messages if they are activated in the UPS system settings energy options. These messages are only displayed when the Windows Alerter and Windows Messenger[1] are active and the PC is logged on to a network. Additionally, some conditions of the B&R APC810 UPS are not detected by the Windows UPS Service, and are therefore do not trigger messages (e.g. when there are no battery settings on the UPS). The Windows Services can be found in the Control Panel under Administrative Tools - Services.

1) The Windows Alerter is supported starting with B&R Windows Embedded Version 2.10 or higher.

If the checkbox "Display UPS status with UPS monitor" is also activated, a new message is not displayed for every change, but only a general message and request for you to start the B&R UPS monitor. As long as the UPS monitor is active, no new messages are displayed.

Information:

Regardless of these options, all changes to the UPS status are logged in Windows event protocol (under "Application").

4.4.9 Procedure following power failure

Over-current shutdown

If an over-current >8A is present during battery operation for a duration of 16 seconds, the over-current shutdown is executed. A shut down time of one minute is available to the system.

If the supply is regenerated during this time, then the shut down process is aborted.

Information:

The over-current shutdown has the highest priority.

Low battery shutdown

If the LowBatteryFlag is set during power failure, then the "low battery" shutdown is executed. This prevents the battery from dying. Once the shutdown time expires (3 minutes by default), the UPS shuts down.

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If an "over-current" shutdown or "standard" shutdown is detected during the shutdown process, the "low battery" shutdown is replaced by the respective process.

Standard shutdown

The standard shutdown is effective when the UPS service is active, the shutdown time is 3 minutes, by default.

If the power supply returns during the shutdown process, the shutdown timer runs until the APC810 enters standby mode. Then the shutdown time is reduced to 4 seconds.

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1. Applicable European guidelines

- EMC guidelines 2004/108/EG
- Low-voltage guidelines 2006/95/EG
- Machine guidelines 98/37/EG beginning 12/29/2009: 2006/42/EG

2. Overview of standards

The Automation PC 810 as an entire device meets the following standards:

Standard	Description
EN 55011 Class A	Electromagnetic compatibility (EMC), radio disturbance product standard, industrial, scientific, and medical high-frequency devices (ISM devices), limit values and measurement procedure; group 1 (devices that do not create HF during material processing) and group 2 (devices that create HF during material processing)
EN 55022 Class A	Electromagnetic compatibility (EMC), radio disturbance characteristics, information technology equipment (ITE devices), limits and methods of measurement
EN 55024 Class A	Electromagnetic compatibility (EMC), immunity characteristics, information technology equipment (ITE devices), limits and methods of measurement
EN 60060-1	High-voltage test techniques - part 1: General specifications and testing conditions
EN 60068-2-1	Environmental testing - part 2: Tests; test A: Dry cold
EN 68068-2-2	Environmental testing - part 2: Tests; test B: Dry heat
EN 60068-2-3	Environmental testing - part 2: Tests; test and guidance: Damp heat, constant
EN 60068-2-6	Environmental testing - part 2: Tests; test: Vibration (sinusoidal)
EN 60068-2-14	Environmental testing - part 2: Tests; test N: Change of temperature
EN 60068-2-27	Environmental testing - part 2: Tests; test and guidance: Shock
EN 60068-2-30	Environmental testing - part 2: Tests; test and guidance: Damp heat, cyclic
EN 60068-2-31	Environmental testing - part 2: Tests; test: Drop and topple, primarily for equipment-type specimens
EN 60068-2-32	Environmental testing - part 2: Tests; test: Free fall
EN 60204-1	Safety of machinery, electrical equipment on machines - part 1: General requirements
EN 60529	Degrees of protection provided by enclosures (IP code)
EN 60664-1	Insulation coordination for equipment within low-voltage systems - part 1: Principles, requirements and tests

Table 176: Overview of standards

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Standard	Description
EN 60721-3-2	Classification of environmental conditions - part 3: Classification of groups of environmental parameters and their severities, section 2: Transport
EN 60721-3-3	Classification of environmental conditions - part 3: Classification of groups of environmental parameters and their severities, section 3: Stationary use at weather-protected locations
EN 61000-4-2	Electromagnetic compatibility (EMC) - part 4-2: Testing and measuring techniques; electrostatic discharge immunity test
EN 61000-3-2	Electromagnetic compatibility (EMC) - part 3-2: Limits for harmonic current emissions (equipment input current $\leq$ 16 A per phase)
EN 61000-3-3	Electromagnetic compatibility (EMC) - part 3-3: Limitation of voltage changes, voltage fluctuations and flicker in public low-voltage supply systems, equipment with rated current $\leq$ 16 A per phase, and not subject to conditional connection.
EN 61000-3-11	Electromagnetic compatibility (EMC) - part 3-11: Limitation of voltage changes, voltage fluctuations and flicker in public low-voltage supply systems, equipment with rated current $\leq$ 75 A per phase, and subject to conditional connection.
EN 61000-4-3	Electromagnetic compatibility (EMC) - part 4-3: Testing and measuring techniques; radiated radio-frequency electromagnetic field immunity test
EN 61000-4-4	Electromagnetic compatibility (EMC) - part 4-4: Testing and measuring techniques; electrical fast transient/burst immunity test
EN 61000-4-5	Electromagnetic compatibility (EMC) - part 4-5: Testing and measuring techniques; surge immunity test
EN 61000-4-6	Electromagnetic compatibility (EMC) - part 4-6: Testing and measuring techniques; immunity to conducted disturbances, induced by radio-frequency fields
EN 61000-4-8	Electromagnetic compatibility (EMC) - part 4-8: Testing and measuring techniques; power frequency magnetic field immunity test
EN 61000-4-11	Electromagnetic compatibility (EMC) - part 4-11: Testing and measuring techniques; voltage dips, short interruptions and voltage variations immunity tests
EN 61000-4-12	Electromagnetic compatibility (EMC) - part 4-12: Testing and measuring techniques; oscillatory waves immunity test
EN 61000-6-2 (EN 50082-2)	Electromagnetic compatibility (EMC), generic immunity standard - part 2: industrial environments (EN 50082-2 has been replaced by EN 61000-6-2)
EN 61000-6-4 (EN 50081-2)	Electromagnetic compatibility (EMC), generic emission standard - part 2: industrial environments (EN 50081-2 has been replaced by EN 61000-6-4)
EN 61131-2 IEC 61131-2	Product standard, programmable logic controllers - part 2: equipment requirements and tests
UL 508	Industrial control equipment (UL = Underwriters Laboratories)
VDE 0701-1	Service, modification, and testing of electrical devices - part 1: General requirements
47 CFR	Federal Communications Commission (FCC), 47 CFR Part 15 Subpart B Class A

Table 176: Overview of standards (Forts.)

3. Requirements for emissions

Emissions	Test carried out according to	Limits according to
Network-related emissions	EN 55011 / EN 55022	EN 61000-6-4: Generic standard (industrial areas)
		EN 55011: Industrial, scientific, and medical (ISM) radio-frequency equipment, class A (industrial areas)
		EN 55022: Information technology equipment (ITE devices), class A (industrial areas)
		EN 61131-2: Programmable logic controllers
		EN 50091-2: Uninterruptible power systems (UPS), class A
		47 CFR Part 15 Subpart B Class A (FCC)
Emissions, Electromagnetic emissions	EN 55011 / EN 55022	EN 61000-6-4: Generic standard (industrial areas)
		EN 55011: Industrial, scientific, and medical (ISM) radio-frequency equipment, class A (industrial areas)
		EN 55022: Information technology equipment (ITE devices), class A (industrial areas)
		EN 61131-2: Programmable logic controllers
		EN 50091-2: Uninterruptible power systems (UPS), class A
		47 CFR Part 15 Subpart B Class A (FCC)
Harmonic currents for devices with an input current of $\leq$ 16 A per line	EN 61000-3-2	EN 61000-3-2: Limits for harmonic current emissions (equipment input current $\leq$ 16 A per phase)
Voltage changes, voltage fluctuations and flicker in public low-voltage supply systems, equipment with rated current $\leq$ 16 A per phase, and not subject to conditional connection.	EN 61000-3-3	EN 61000-3-3: Limitation of voltage changes, voltage fluctuations and flicker in public low-voltage supply systems, for equipment with rated current less than or equal to $\leq$ 16 A per phase and not subject to conditional connection, class A/D
Voltage changes, voltage fluctuations and flicker in public low-voltage supply systems, equipment with rated current $\leq$ 75 A per phase, and subject to conditional connection.	EN 61000-3-11	EN 61000-3-11: Limitation of voltage changes, voltage fluctuations and flicker in public low-voltage supply systems, for equipment with rated current less than or equal to $\leq$ 75 A per phase and subject to conditional connection, class A/D

Table 177: Overview of limits and testing guidelines for emissions

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3.1 Network related emissions

Test carried out according to EN 55011 / EN 55022	Limits according to EN 61000-6-4	Limits according to EN 55011 class A	Limits according to EN 55022 class A
Power mains connections 150 kHz - 500 kHz	-	79 dB (µV) Quasi-peak value 66 dB (µV) Average	79 dB (µV) Quasi-peak value 66 dB (µV) Average
Power mains connections 500 kHz - 30 MHz	-	73 dB (µV) Quasi-peak value 60 dB (µV) Average	73 dB (µV) Quasi-peak value 60 dB (µV) Average
AC mains connections 150 kHz - 500 kHz	79 dB (µV) Quasi-peak value 66 dB (µV) Average	-	-
AC mains connections 500 kHz - 30 MHz	73 dB (µV) Quasi-peak value 60 dB (µV) Average	-	-
Other connections 150 kHz - 500 kHz	-	-	97 - 87 dB (µV) and 53 - 43 dB (µA) Quasi-peak value 84 - 74 dB (µV) and 40 - 30 dB (µA) Average
Other connections 500 kHz - 30 MHz	-	-	87 dB (µV) and 43 dB (µA) Quasi-peak value 74 dB (µV) and 30 dB (µA) Average
Test carried out according to EN 55011 / EN 55022	Limits according to EN 61000-6-4	Limits according to EN 61131-2	Limits according to 47 CFR Part 15 Subpart B Class A
Power mains connections [1] 150 kHz - 500 kHz	79 dB (µV) Quasi-peak value 66 dB (µV) Average	-	-
Power mains connections 500 kHz - 30 MHz	73 dB (µV) Quasi-peak value 60 dB (µV) Average	-	-
AC mains connections 150 kHz - 500 kHz	-	79 dB (µV) Quasi-peak value 66 dB (µV) Average	79 dB (µV) Quasi-peak value 66 dB (µV) Average
AC mains connections 500 kHz - 30 MHz	-	73 dB (µV) Quasi-peak value 60 dB (µV) Average	73 dB (µV) Quasi-peak value 60 dB (µV) Average

Table 178: Test requirements - Network-related emissions for industrial areas

Other connections 150 kHz - 500 kHz	Only informative For line lengths > 10 m 40 - 30 dB ($f\hat{E}$A) Quasi-peak value 30 - 20 dB ($f\hat{E}$A) Average	-	-
Other connections 500 kHz - 30 MHz	Only informative For line lengths > 10 m 30 dB ($f\hat{E}$A) Quasi-peak value 20 dB ($f\hat{E}$A) Average	-	-

Table 178: Test requirements - Network-related emissions for industrial areas (Forts.)

1) AC network connections only with EN 61131-2

3.2 Emissions / Electromagnetic emissions

Test carried out according to EN 55011 / EN 55022	Limits according to EN 61000-6-4	Limits according to EN 55011 class A	Limits according to EN 55022 class A
30 MHz - 230 MHz measured at a distance of 10 m	< 40 dB (µV/m) Quasi-peak value	< 40 dB (µV/m) Quasi-peak value	< 40 dB (µV/m) Quasi-peak value
230 MHz - 1 GHz measured at a distance of 10 m	< 47 dB (µV/m) Quasi-peak value	< 47 dB (µV/m) Quasi-peak value	< 47 dB (µV/m) Quasi-peak value
Test carried out according to EN 55011 / EN 55022	**Limits according to EN 61131-2**	**Limits according to EN 50091-2 Class A**	
30 MHz - 230 MHz measured at a distance of 10 m	< 40 dB (µV/m) Quasi-peak value	< 40 dB (µV/m) Quasi-peak value	
230 MHz - 1 GHz measured at a distance of 10 m	< 47 dB (µV/m) Quasi-peak value	< 47 dB (µV/m) Quasi-peak value	
Test carried out	**Limits according to 47 CFR Part 15 Subpart B class A**		
30 MHz - 88 MHz measured at a distance of 10 m	< 90 dB (µV/m) Quasi-peak value		
88 MHz - 216 MHz measured at a distance of 10 m	< 150 dB (µV/m) Quasi-peak value		
216 MHz - 960 MHz measured at a distance of 10 m	< 210 dB (µV/m) Quasi-peak value		
>960 MHz measured at a distance of 10 m	< 300 dB (µV/m) Quasi-peak value		

Table 179: : Test requirements - Electromagnetic emissions for industrial areas

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4. Requirements for immunity to disturbances

Immunity	Test carried out according to	Limits according to
Electrostatic discharge (ESD)	EN 61000-4-2	EN 61000-6-2: Generic standard (industrial areas)
		EN 61131-2: Programmable logic controllers
		EN 55024: Information technology equipment (ITE devices)
Immunity to high-frequency electromagnetic fields (HF field)	EN 61000-4-3	EN 61000-6-2: Generic standard (industrial areas)
		EN 61131-2: Programmable logic controllers
		EN 55024: Information technology equipment (ITE devices)
Immunity to high-speed transient electrical disturbances (burst)	EN 61000-4-4	EN 61000-6-2: Generic standard (industrial areas)
		EN 61131-2: Programmable logic controllers
		EN 55024: Information technology equipment (ITE devices)
Immunity to surge voltages	EN 61000-4-5	EN 61000-6-2: Generic standard (industrial areas)
		EN 61131-2: Programmable logic controllers
		EN 55024: Information technology equipment (ITE devices)
Immunity to conducted disturbances	EN 61000-4-6	EN 61000-6-2: Generic standard (industrial areas)
		EN 61131-2: Programmable logic controllers
		EN 55024: Information technology equipment (ITE devices)
Immunity against magnetic fields with electrical frequencies	EN 61000-4-8	EN 61000-6-2: Generic standard (industrial areas)
		EN 61131-2: Programmable logic controllers
		EN 55024: Information technology equipment (ITE devices)
Immunity to voltage dips, short-term interruptions and voltage fluctuations	EN 61000-4-11	EN 61000-6-2: Generic standard (industrial areas)
		EN 61131-2: Programmable logic controllers
		EN 55024: Information technology equipment (ITE devices)
Immunity to damped vibration	EN 61000-4-12	EN 61000-6-2: Generic standard (industrial areas)
		EN 61131-2: Programmable logic controllers
		EN 55024: Information technology equipment (ITE devices)

Table 180: Overview of limits and testing guidelines for immunity

Evaluation criteria according to EN 61000-6-2

Criteria A:
The operating equipment must continue to work as intended **during** the test. There should be no interference in the operating behavior and no system failures below a minimum operating quality as defined by the manufacturer.

Criteria B:
The operating equipment must continue to work as intended **after** the test. There should be no interference in the operating behavior and no system failures below a minimum operating quality as defined by the manufacturer.

Criteria C:
A temporary function failure is permitted when the function restores itself, or the function can be restored by activating configuration and control elements.

Criteria D:
Deterioration or failure of the function, which can no longer be established (operating equipment destroyed).

4.1 Electrostatic discharge (ESD)

Test carried out according to EN 61000-4-2	Limits according to EN 61000-6-2	Limits according to EN 61131-2	Limits according to EN 55024
Contact discharge to powder-coated and bare metal housing parts	± 4 kV, 10 discharges, criteria B	± 4 kV, 10 discharges, criteria B	± 4 kV, 10 discharges, criteria B
Discharge through the air to plastic housing parts	± 8 kV, 10 discharges, criteria B	± 8 kV, 10 discharges, criteria B	± 8 kV, 10 discharges, criteria B

Table 181: Test requirements - Electrostatic discharge (ESD)

4.2 High-frequency electromagnetic fields (HF field)

Test carried out according to EN 61000-4-3	Limits according to EN 61000-6-2	Limits according to EN 61131-2	Limits according to EN 55024
Housing, completely wired	80 MHz - 1 GHz, 10 V/m, 80% amplitude modulation with 1 kHz, length 3 seconds, criteria A	80 MHz - 1 GHz, 1.4 - 2 GHz, 10 V/m, 80% amplitude modulation with 1 kHz, length 3 seconds, criteria A 800-960 MHz (GSM), 10 V/m, pulse modulation with 50% duty cycle, criteria A	80 MHz - 1 GHz, 1.4 - 2 GHz, 3 V/m, 80% amplitude modulation with 1 kHz, length 3 seconds, criteria A

Table 182: Test requirements - High-frequency electromagnetic fields (HF field)

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4.3 High-speed transient electrical disturbances (Burst)

Test carried out according to EN 61000-4-4	Limits according to EN 61000-6-2	Limits according to EN 61131-2	Limits according to EN 55024
AC power I/O	± 2 kV, Criteria B	-	± 1 kV, Criteria B
AC power inputs	-	± 2 kV, Criteria B	-
AC power outputs	-	± 1 kV, Criteria B	-
DC power I/O >10 m [1]	± 2 kV, Criteria B	-	± 0.5 kV, Criteria B
DC power inputs >10 m	-	± 2 kV, Criteria B	-
DC power outputs >10 m	-	± 1 kV, Criteria B	-
Functional ground connections, signal lines and I/Os >3 m	± 1 kV, Criteria B	± 1 kV, Criteria B	± 0.5 kV, Criteria B
Unshielded AC I/O >3 m	-	± 2 kV, Criteria B	-
Analog I/O	± 1 kV, Criteria B	± 1 kV, Criteria B	-

Table 183: Test requirements - High-speed transient electrical disturbances (burst)

1) For EN 55024 without length limitation.

4.4 Surge voltages (Surge)

Test carried out according to EN 61000-4-5	Limits according to EN 61000-6-2	Limits according to EN 61131-2	Limits according to EN 55024
AC power I/O, L to L	± 1 kV, Criteria B	± 1 kV, Criteria B	± 1 kV, Criteria B
AC power I/O, L to PE	± 2 kV, Criteria B	± 2 kV, Criteria B	± 2 kV, Criteria B
DC power I/O, L+ to L-, >10 m	± 0.5 kV, Criteria B	-	-
DC power I/O, L to PE, >10 m	± 0.5 kV, Criteria B	-	± 0.5 kV, Criteria B
DC power inputs, L+ to L-	-	± 0.5 kV, Criteria B	-
DC power inputs, L to PE	-	± 1 kV, Criteria B	-
DC power outputs, L+ to L-	-	± 0.5 kV, Criteria B	-
DC power outputs, L to PE	-	± 0.5 kV, Criteria B	-
Signal connections >30 m	± 1 kV, Criteria B	± 1 kV, Criteria B	± 1 kV, Criteria B
All shielded cables	-	± 1 kV, Criteria B	-

Table 184: Test requirements - Surge voltages

4.5 Conducted disturbances

Test carried out according to EN 61000-4-6	Limits according to EN 61000-6-2	Limits according to EN 61131-2	Limits according to EN 55024
AC power I/O	150 kHz - 80 MHz, 10 V, 80% amplitude modulation with 1 kHz, length 3 seconds, criteria A	150 kHz - 80 MHz, 3 V, 80% amplitude modulation with 1 kHz, length 3 seconds, criteria A	150 kHz - 80 MHz, 3 V, 80% amplitude modulation with 1 kHz, criteria A
DC power I/O	150 kHz - 80 MHz, 10 V, 80% amplitude modulation with 1 kHz, length 3 seconds, criteria A	150 kHz - 80 MHz, 3 V, 80% amplitude modulation with 1 kHz, length 3 seconds, criteria A	150 kHz - 80 MHz, 3 V, 80% amplitude modulation with 1 kHz, criteria A
Functional ground connections	150 kHz - 80 MHz, 10 V, 80% amplitude modulation with 1 kHz, length 3 seconds, criteria A	150 kHz - 80 MHz, 3 V, 80% amplitude modulation with 1 kHz, length 3 seconds, criteria A	-
Signal connections >3 m	150 kHz - 80 MHz, 10 V, 80% amplitude modulation with 1 kHz, length 3 seconds, criteria A	150 kHz - 80 MHz, 3 V, 80% amplitude modulation with 1 kHz, length 3 seconds, criteria A	150 kHz - 80 MHz, 3 V, 80% amplitude modulation with 1 kHz, criteria A

Table 185: Test requirements - Conducted disturbances

4.6 Magnetic fields with electrical frequencies

Test carried out according to EN 61000-4-8	Limits according to EN 61000-6-2	Limits according to EN 61131-2	Limits according to EN 55024
Test direction x, test in the field of an induction coil 1 m x 1 m	30 A/m, criteria A	30 A/m, criteria A	50 Hz, 1 A/m, criteria A
Test direction y, test in the field of an induction coil 1 m x 1 m	30 A/m, criteria A	30 A/m, criteria A	50 Hz, 1 A/m, criteria A
Test direction z, test in the field of an induction coil 1 m x 1 m	30 A/m, criteria A	30 A/m, criteria A	50 Hz, 1 A/m, criteria A

Table 186: Test requirements - Magnetic fields with electrical frequencies

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4.7 Voltage dips, fluctuations and short-term interruptions

Test carried out according to EN 61000-4-11	Limits according to EN 61000-6-2	Limits according to EN 61131-2	Limits according to EN 55024
AC power inputs	Voltage dip 70% (30% reduction), 0.5 periods, criteria B	-	Voltage dip < 5% (> 95% reduction), 0.5 half-oscillations, criteria B
AC power inputs	Voltage dip 40% (60% reduction), 5 periods, criteria C	-	Voltage dip 70% (30% reduction), 25 half-oscillations, criteria C
AC power inputs	Voltage dip 40% (60% reduction), 50 periods, criteria C	-	-
AC power inputs	Voltage interruptions < 5% (> 95% reduction), 250 periods, criteria C	-	Voltage interruptions < 5% (> 95% reduction), 250 half-oscillations, criteria C
AC power inputs	-	20 interruptions, 0.5 periods, criteria A	-
DC power inputs	-	20 interruptions for 10 ms < UN - 15%, criteria A	-

Table 187: Test requirements - Voltage dips, fluctuations, and short-term interruptions

4.8 Damped oscillations

Test carried out according to EN 61000-4-12	Limits according to EN 61131-2		
Power I/O, L to L	± 1 kV, 1 MHz, repeat rate 400/seconds, length 2 seconds, connection lengths 2 m, criteria B		
Power I/O, L to PE	± 2.5 kV, 1 MHz, repeat rate 400/seconds, length 2 seconds, connection lengths 2 m, criteria B		

Table 188: Test requirements - Damped vibration

5. Mechanical conditions

Vibration	Test carried out according to	Limits according to
Vibration operation	EN 60068-2-6	EN 61131-2: Programmable logic controllers
		EN 60721-3-3 class 3M4
Vibration during transport (packaged)	EN 60068-2-6	EN 60721-3-2 class 2M1
		EN 60721-3-2 class 2M2
		EN 60721-3-2 class 2M3
Shock during operation	EN 60068-2-27	EN 61131-2: Programmable logic controllers
		EN 60721-3-3 class 3M4
Shock during transport (packaged)	EN 60068-2-27	EN 60721-3-2 class 2M1
		EN 60721-3-2 class 2M2
		EN 60721-3-2 class 2M3
Toppling (packaged)	EN 60068-2-31	EN 60721-3-2 class 2M1
		EN 60721-3-2 class 2M2
		EN 60721-3-2 class 2M3
Free fall (packaged)	EN 60068-2-32	EN 61131-2: Programmable logic controllers

Table 189: Overview of limits and testing guidelines for vibration

5.1 Vibration during operation

Test carried out according to EN 60068-2-6	Limits according to EN 61131-2		Limits according to EN 60721-3-3 class 3M4		
Vibration during operation: Uninterrupted duty with moveable frequency in all 3 axes (x, y, z), 1 octave per minute	10 sweeps for each axis		10 sweeps for each axis		
	Frequency	Limit value	Frequency	Limit value	
	5 - 9 Hz	Amplitude 3.5 mm	2 - 9 Hz	Amplitude 3 mm	
	9 - 150 Hz	Acceleration 1 g	9 - 200 Hz	Acceleration 1 g	

Table 190: Test requirements - Vibration during operation

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5.2 Vibration during transport (packaged)

Test carried out according to EN 60068-2-6	Limits according to EN 60721-3-2 class 2M1		Limits according to EN 60721-3-2 class 2M2		Limits according to EN 60721-3-2 class 2M3	
Vibration during transport: Uninterrupted duty with moveable frequency in all 3 axes (x, y, z)	10 sweeps for each axis, packaged		10 sweeps for each axis, packaged		10 sweeps for each axis, packaged	
	Frequency	**Limit value**	**Frequency**	**Limit value**	**Frequency**	**Limit value**
	2 - 9 Hz	Amplitude 3.5 mm	2 - 9 Hz	Amplitude 3.5 mm	2 - 8 Hz	Amplitude 7.5 mm
	9 - 200 Hz	Acceleration 1 g	9 - 200 Hz	Acceleration 1 g	8 - 200 Hz	Acceleration 2 g
	200 - 500 Hz	Acceleration 1.5 g	200 - 500 Hz	Acceleration 1.5 g	200 - 500 Hz	Acceleration 4 g

Table 191: Test requirements - Vibration during transport (packaged)

5.3 Shock during operation

Test carried out according to EN 60068-2-27	Limits according to EN 61131-2	Limits according to EN 60721-3-3 class 3M4	
Shock during operation: Pulse (half-sine) stress in all 3 axes (x, y, z)	Acceleration 15 g, length 11 ms, 18 shocks	Acceleration 10 g, length 11 ms	

Table 192: Test requirements - Shock during operation

5.4 Shock transport (packaged)

Test carried out according to EN 60068-2-27	Limits according to EN 60721-3-2 class 2M1	Limits according to EN 60721-3-2 class 2M2	Limits according to EN 60721-3-2 class 2M3
Pulse (half-sine) stress in all 3 axes (x, y, z)	Acceleration 10 g, Length 11 ms, each 3 shocks, packaged	Acceleration 30 g, Length 6 ms, each 3 shocks, packaged	Acceleration 100 g, Length 6 ms, each 3 shocks, packaged

Table 193: Test requirements - Shock during transport

5.5 Toppling

Test carried out according to EN 60068-2-31	Limits according to EN 60721-3-2 class 2M1		Limits according to EN 60721-3-2 class 2M2		Limits according to EN 60721-3-2 class 2M3	
Toppling and knocking over	Devices: Toppling/knocking over on each edge, packaged		Devices: Toppling/knocking over on each edge, packaged		Devices: Toppling/knocking over on each edge, packaged	
	Weight	**Required**	**Weight**	**Required**	**Weight**	**Required**
	<20 kg	Yes	<20 kg	Yes	<20 kg	Yes
	20 - 100 kg	-	20 - 100 kg	Yes	20 - 100 kg	Yes
	>100 kg	-	>100 kg	-	>100 kg	Yes

Table 194: Test requirements - Toppling

5.6 Free fall (packaged)

Test carried out according to EN 60068-2-32	Limits according to EN 61131-2		Limits according to EN 60721-3-2 class 2M1		Limits according to EN 60721-3-2 class 2M2		Limits according to EN 60721-3-2 class 2M3	
Free fall	Devices with delivery packaging each with 5 fall tests		Devices packaged		Devices packaged		Devices packaged	
	Weight	Height	Weight	Height	Weight	Height	Weight	Height
	<10 kg	1.0 m	<20 kg	0.25 m	<20 kg	1.2 m	<20 kg	1.5 m
	10 - 40 kg	0.5 m	20 - 100 kg	0.25 m	20 - 100 kg	1.0 m	20 - 100 kg	1.2 m
	>40 kg	0.25 m	>100 kg	0.1 m	>100 kg	0.25 m	>100 kg	0.5 m
	Devices with product packaging each with 5 fall tests							
	Weight	Height						
	<10 kg	0.3 m						
	10 - 40 kg	0.3 m						
	>40 kg	0.25 m						

Table 195: Test requirements - Free fall

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6. Climate conditions

Temperature / humidity	Test carried out according to	Limits according to
Worst case operation	UL 508	UL 508: Industrial control equipment EN 61131-2: Programmable logic controllers
Dry heat	EN 60068-2-2	EN 61131-2: Programmable logic controllers
Dry cold	EN 60068-2-1	EN 61131-2: Programmable logic controllers
Large temperature fluctuations	EN 60068-2-14	EN 61131-2: Programmable logic controllers
Temperature fluctuations in operation	EN 60068-2-14	EN 61131-2: Programmable logic controllers
Humid heat, cyclic	EN 60068-2-30	EN 61131-2: Programmable logic controllers
Humid heat, constant (storage)	EN 60068-2-3	EN 61131-2: Programmable logic controllers

Table 196: Overview of limits and testing guidelines for temperature and humidity

6.1 Worst case during operation

Test carried out according to UL 508	Limits according to UL 508	Limits according to EN 61131-2	
Worst case during operation. Operation of the device with the max. ambient temperature specified in the data sheet at the max. specified load	3 hours at max. ambient temperature (min. +40°C) Duration approx. 5 hours	3 hours at max. ambient temperature (min. +40°C) duration approx. 5 hours	

Table 197: Test requirements - Worst case during operation

6.2 Dry heat

Test carried out according to EN 60068-2-2	Limits according to EN 61131-2		
Dry heat	16 hours at +70°C for 1 cycle, then 1 hour acclimatization and function testing, duration approximately 17 hours		

Table 198: Test requirements - Dry heat

6.3 Dry cold

Test carried out according to EN 60068-2-1	Limits according to EN 61131-2		
Dry cold	16 hours at -40°C for 1 cycle, then 1 hour acclimatization and function testing, duration approximately 17 hours		

Table 199: Test requirements - Dry cold

6.4 Large temperature fluctuations

Test carried out according to EN 60068-2-14	Limits according to EN 61131-2		
Large temperature fluctuations	3 hours at -40° C and 3 hours at +70°C, 2 cycles, then 2 hours acclimatization and function testing, duration approximately 14 hours		

Table 200: Test requirements - Large temperature fluctuations

6.5 Temperature fluctuations in operation

Test carried out according to EN 60068-2-14	Limits according to EN 61131-2		
Open devices: These can also have a housing and are installed in switching cabinets	3 hours at +5° C and 3 hours at 55°C, 5 cycles, temperature gradient 3°C / min, the unit is occasionally supplied with voltage during testing, duration approximately 30 hours		
Closed devices: These are devices whose data sheet specifies a surrounding housing (enclosure) with the corresponding safety precautions	3 hours at +5°C and 3 hours at +55°C, 5 cycles, temperature gradient 3°C / min, the unit is occasionally supplied with voltage during testing, duration approximately 30 hours		

Table 201: Test requirements - Temperature fluctuations in operation

6.6 Humid heat, cyclical

Test carried out according to EN 60068-2-30	Limits according to EN 61131-2		
Alternating climate	24 hours at +25°C / +55°C and 97% / 83% RH, 2 cycles, then 2 hours acclimatization, function testing and insulation, duration approximately 50 hours		

Table 202: Test requirements - Humid heat, cyclic

6.7 Humid heat, constant (storage)

Test carried out according to EN 60068-2-3	Limits according to EN 61131-2		
Humid heat, constant (storage)	48 hours at +40°C and 92.5% RH, then insulation test within 3 hours, duration approximately 49 hours		

Table 203: Test requirements - Humid heat, constant (storage)

Chapter 5
Standards and
certifications

7. Safety

Safety	Test carried out according to	Limits according to
Ground resistance	EN 61131-2	EN 60204-1: Electrical equipment of machines
		EN 61131-2: Programmable logic controllers
Insulation resistance		EN 60204-1: Electrical equipment of machines
High voltage	EN 60060-1	EN 61131-2: Programmable logic controllers
		UL 508: Industrial control equipment
Residual voltage	EN 61131-2	EN 60204-1: Electrical equipment of machines
		EN 61131-2: Programmable logic controllers
Leakage current		VDE 0701-1: Service, changes and testing of electrical devices
Overload	UL 508	EN 61131-2: Programmable logic controllers
		UL 508: Industrial control equipment
Simulation component defect	UL 508	EN 61131-2: Programmable logic controllers
		UL 508: Industrial control equipment
Voltage range		EN 61131-2: Programmable logic controllers

Table 204: Overview of limits and testing guidelines for safety

7.1 Ground resistance

Test carried out according to EN 61131-2	Limits according to EN 60204-1[1]		Limits according to EN 61131-2
Ground resistance: housing (from any metal part to the ground terminal)	Smallest effective cross section of the protective ground conductor for the branch being tested	Maximum measured voltage drop at a test current of 10 A	Test current 30 A for 2 min, < 0.1 Ohm
	1.0 mm²	3.3 V	
	1.5 mm²	2.6 V	
	2.5 mm²	1.9 V	
	4.0 mm²	1.4 V	
	> 6.0 mm²	1.0 V	

Table 205: Test requirements - Ground resistance

1) See EN 60204-1:1997 page 62, table 9.

7.2 Insulation resistance

Test carried out	Limits according to EN 60204-1[1]		
Insulation resistance: main circuits to protective ground conductor	> 1 MOhm at 500 VDC voltage		

Table 206: Test requirements - Insulation resistance

1) See EN 60204-1:1997 page 62, table 9.

7.3 High voltage

Test carried out according to EN 60060-1	Limits according to EN 61131-2[1]				Limits according to UL 508		
High voltage: Primary circuit to secondary circuit and to protective ground circuit (transformers, coils, varistors, capacitors and components used to protect against over-voltage can be removed before the test)		Test voltage				Test voltage	
	Input voltage	1.2/50 µs voltage surge peak	AC, 1 min	DC, 1 min	Input voltage	AC, 1 min	DC, 1 min
	0 - 50 VAC 0 - 60 VDC	850 V	510 V	720 V	$\leq$ 50 V	500 V	707 V
	50 - 100 VAC 60 - 100 VDC	1360 V	740 V	1050 V	> 50 V	1000 V + 2 x U_N	(1000 V + 2 x U_N) x 1.414
	100 - 150 VAC 100 - 150 VDC	2550 V	1400 V	1950 V			
	150 - 300 VAC 150 - 300 VDC	4250 V	2300 V	3250 V			
	300 - 600 VAC 300 - 600 VDC	6800 V	3700 V	5250 V			
	600 - 1000 VAC 600 - 1000 VDC	10200 V	5550 V	7850 V			

Table 207: Test requirements - High voltage

1) See EN 61131-2:2003 page 104, table 59.

7.4 Residual voltage

Test carried out according to EN 61131-2	Limits according to EN 60204-1	Limits according to EN 61131-2	
Residual voltage after switching off	< 60 V after 5 sec (active parts) < 60 V after 1 sec (plug pins)	< 60 V after 5 sec (active parts) < 60 V after 1 sec (plug pins)	

Table 208: Test requirements - Residual voltage

7.5 Leakage current

Test carried out	Limits according to VDE 0701-1		
Leakage current: Phase to ground	< 3.5 mA		

Table 209: Test requirements - Leakage current

7.6 Overload

Test carried out according to UL 508	Limits according to EN 61131-2	Limits according to UL 508	
Overload of transistor outputs	50 switches, 1.5 I_N, 1 sec on / 9 sec off	50 switches, 1.5 I_N, 1 sec on / 9 sec off	

Table 210: Test requirements - Overload

7.7 Defective component

Test carried out according to UL 508	Limits according to EN 61131-2	Limits according to UL 508	
Simulation of how components in power supply became defective	Non-flammable surrounding cloth No contact with conductive parts	Non-flammable surrounding cloth No contact with conductive parts	

Table 211: Test requirements - Defective component

7.8 Voltage range

Test carried out according to	Limits according to EN 61131-2			
Supply voltage	Measurement value	Tolerance min/max		
	24 VDC 48 VDC 125 VDC	-15% +20%		
	24 VAC 48 VAC 100 VAC 110 VAC 120 VAC 200 VAC 230 VAC 240 VAC 400 VAC	15% +10%		

Table 212: Test requirements - Voltage range

8. Other tests

Other tests	Test carried out according to	Limits according to
Protection type	-	EN 60529: Degrees of protection provided by enclosures (IP code)
Degree of pollution	-	EN 60664-1: Insulation coordination for equipment within low-voltage systems - part 1: Principles, requirements and tests

Table 213: Overview of limits and testing guidelines for other tests

8.1 Protection

Test carried out according to	Limits according to EN 60529		
Protection of the operating equipment	IP2. Protection against large solid foreign bodies $\geq$ 12.5 mm diameter		
Protection of personnel	IP2. Protection against touching dangerous parts with fingers		
Protection against water permeation with damaging consequences	IP.0 Not protected		

Table 214: Test requirements - Protection

Chapter 5
Standards and
certifications

9. International certifications

B&R products and services comply with applicable standards. They are international standards from organizations such as ISO, IEC and CENELEC, as well as national standards from organizations such as UL, CSA, FCC, VDE, ÖVE, etc. We give special consideration to the reliability of our products in an industrial environment.

Certifications	
USA and Canada 	All important B&R products are tested and listed by Underwriters Laboratories and checked quarterly by a UL inspector. This mark is valid for the USA and Canada and simplifies certification of your machines and systems in these areas.
Europe 	All harmonized EN standards for the applicable guidelines are met.

Table 215: International certifications

Chapter 6 • Accessories

1. Overview

Model number	Short description	Comment
0TB103.9	**Plug 24V 5.08 3-pin screw clamps** 24 VDC 3-pin connector, female. Screw clamps, 3.31 mm², protected against vibration by the screw flange	
0TB103.91	**Plug 24V 5.08 3-pin cage clamps** 24 VDC 3-pin connector, female. Cage clamps, 3.31 mm², protected against vibration by the screw flange	
0AC201.9	**Lithium batteries (5x)** Lithium batteries, 5 pcs., 3 V / 950 mAh, button cell	
4A0006.00-000	**Lithium battery (1x)** Lithium battery, 1 pc., 3 V / 950 mAh, button cell	
5AC600.UPSI-00	**Add-on UPS module** Order UPS module for Automation PC, cable (5CAUPS.0005-00 or 5CAUPS.0030-00) and battery unit (5AC600.UPSB-00) separately.	
5AC600.UPSB-00	**Battery unit 5 Ah** UPS battery unit for the add-on UPS module	
5CAUPS.0005-00	**UPS cable 0.5 m** Connection cable between add-on UPS module and UPS battery unit, length 0.5 meters	
5CAUPS.0030-00	**UPS cable 3 m** Connection cable between add-on UPS module and UPS battery unit, length 3 meters	
5AC801.FA01-00	**APC810 replacement fan filter 1CS 5 pcs.**	
5AC801.FA02-00	**APC810 replacement fan filter 2CS 5 pcs.**	
5AC801.FA05-00	**APC810 replacement fan filter 5CS 5 pcs.**	
5AC900.1000-00	**Adapter DVI-A/m to CRT DB15HD/f** Adapter DVI (plug) to CRT (socket), for connecting a standard monitor to a DVI-I interface.	
5CFCRD.0064-03	**CompactFlash 64 MB SSI** CompactFlash card with 64 MB SLC NAND flash and IDE/ATA interface	
5CFCRD.0128-03	**CompactFlash 128 MB SSI** CompactFlash card with 128 MB SLC NAND flash and IDE/ATA interface	
5CFCRD.0256-03	**CompactFlash 256 MB SSI** CompactFlash card with 256 MB SLC NAND flash and IDE/ATA interface	
5CFCRD.0512-03	**CompactFlash 512 MB SSI** CompactFlash card with 512 MB SLC NAND flash and IDE/ATA interface	
5CFCRD.1024-03	**CompactFlash 1024 MB SSI** CompactFlash card with 1024 MB SLC NAND flash and IDE/ATA interface	
5CFCRD.2048-03	**CompactFlash 2048 MB SSI** CompactFlash card with 2048 MB SLC NAND flash and IDE/ATA interface	

Table 216: Model numbers - Accessories

Chapter 6
Accessories

Model number	Short description	Comment
5CFCRD.4096-03	**CompactFlash 4096 MB SSI** CompactFlash card with 4096 MB SLC NAND flash and IDE/ATA interface	
5CFCRD.8192-03	**CompactFlash 8192 MB SSI** CompactFlash card with 8192 MB SLC NAND flash and IDE/ATA interface	
5MD900.USB2-01	**USB 2.0 drive DVD-RW/CD-RW FDD CF USB** USB 2.0 drive combination; Consists of DVD-R/RW/DVD+R/RW/CD-RW, FDD, CompactFlash slot (type II), USB connection (type A front side, type B back side); 24 VDC.	
5MMUSB.2048-00	**USB flash drive 2 GB SanDisk** USB 2.0 flash drive 2 GB	
0PS102.0	**Power supply, 1-phase, 2.1 A** 24 VDC power supply, 1 phase, 2.1 A, input 100-240 VAC, wide range, DIN rail installation	
0PS104.0	**Power supply, 1-phase, 4.2 A** 24 VDC power supply, 1 phase, 4.2 A, input 115/230 VAC, auto select, DIN rail mounting	
0PS105.1	**Power supply, 1-phase, 5 A** 24 VDC power supply, 1 phase, 5 A, input 115/230 VAC, manual select, DIN rail mounting	
0PS105.2	**Power supply, 1-phase, 5 A, redundant** 24 VDC power supply, 1 phase, 5 A, redundant through parallel operation, input 115/230 VAC, manual select, DIN rail mounting	
0PS110.1	**Power supply, 1-phase, 10 A** 24 VDC power supply, 1 phase, 10 A, input 115/230 VAC, manual select, DIN rail mounting	
0PS110.2	**Power supply, 1-phase, 10 A, redundant** 24 VDC power supply, 1 phase, 10 A, redundant through parallel operation, input 115/230 VAC, manual select, DIN rail mounting	
0PS120.1	**Power supply, 1-phase, 20 A** 24 VDC power supply, 1 phase, 20 A, input 115/230 VAC, auto select, DIN rail mounting	
0PS305.1	**Power supply, 3-phase, 5 A** 24 VDC power supply, 3-phase, 5 A, input 400..500 VAC (3 phases), wide range, DIN rail mounting	
0PS310.1	**Power supply, 3-phase, 10 A** 24 VDC power supply, 3-phase, 10 A, input 400..500 VAC (3 phases), wide range, DIN rail mounting	
0PS320.1	**Power supply, 3-phase, 20 A** 24 VDC power supply, 3-phase, 20 A, input 400..500 VAC (3 phases), wide range, DIN rail mounting	
0PS340.1	**Power supply, 3-phase, 40 A** 24 VDC power supply, 3 phase, 40 A, input 115/230 VAC, auto select, DIN rail mounting	
5ACPCI.ETH1-01	**PCI Ethernet card 10/100 1 port** half size PCI Ethernet card, 1 Ethernet connection	
5ACPCI.ETH3-01	**PCI Ethernet card 10/100 3 port** half size PCI Ethernet card, 3 Ethernet connections	
5CAMSC.0001-00	**APC810 internal supply cable**	

Table 216: Model numbers - Accessories (Forts.)

2. TB103 3-pin supply voltage connector

2.1 General information

This single row 3-pin terminal block is mainly used to connect the supply voltage.

2.2 Order data

Model number	Description	Figure
0TB103.9	Plug for the 24 V supply voltage (screw clamps)	
0TB103.91	Plug for the 24 V supply voltage (cage clamps)	
		0TB103.9 0TB103.91

Table 217: Order data - TB103 supply plug

2.3 Technical data

Information:

The following characteristics, features and limit values only apply to this accessory and can deviate from the entire device. For the entire device where this accessory is installed, refer to the data provided specifically for the entire device.

Name	0TB103.9	0TB103.91
Number of pins	3	
Type of terminal	Screw clamps	Cage clamps
Distance between contacts	5.08 mm	
Resistance between contacts	≤ 5 mΩ	

Table 218: Technical data - TB103 supply plug

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Accessories

Name	0TB103.9	0TB103.91
Nominal voltage according to VDE / UL,CSA	250 V / 300 V	
Current load according to VDE / UL,CSA	14.5 A / 10 A per contact	
Terminal size	0.08 mm² - 3.31 mm²	
Cable type	Copper wires only (no aluminum wires!)	

Table 218: Technical data - TB103 supply plug (Forts.)

3. Replacement CMOS batteries

The lithium battery is needed for buffering the BIOS CMOS data, the real-time clock (RTC), and SRAM data.

3.1 Order data

Model number	Description	Figure
0AC201.9	Lithium batteries, 5 pcs., 3 V / 950 mAh button cell	
4A0006.00-000	Lithium battery, 1 piece, 3 V / 950 mAh button cell	

Table 219: Order data - Lithium batteries

3.2 Technical data

Information:

The following characteristics, features and limit values only apply to this accessory and can deviate from the entire device. For the entire device where this accessory is installed, refer to the data provided specifically for the entire device.

Features	0AC201.9	4A0006.00-000
Capacity	950 mAh	
Voltage	3 V	
Self discharge at 23°C	< 1% per year	
Storage time	Max. 3 years at 30°C	
Environmental characteristics		
Storage temperature	-20°C to +60°C	
Relative humidity	0 to 95%, non-condensing	

Table 220: Technical data - Lithium batteries

4. Replacement fan filter

Information:

The fan filters are subject to wear, and should be checked with appropriate frequency to determine whether the air flow provides sufficient cooling. An exchange or cleaning of the filter kit is appropriate at that time.
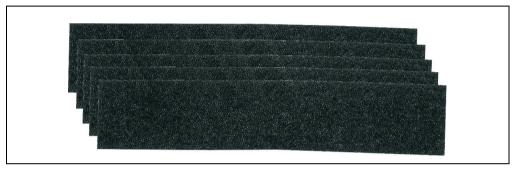
Figure 150: Replacement fan

Model number	Short description	Comment
5AC801.FA01-00	APC810 replacement fan filter 1CS 5 pcs.	
5AC801.FA02-00	APC810 replacement fan filter 2CS 5 pcs.	
5AC801.FA05-00	APC810 replacement fan filter 5CS 5 pcs.	

Table 221: Model numbers - Replacement fan filters

5. DVI - monitor adapter 5AC900.1000-00

This adapter enables a standard monitor to be connected to the DVI-I interface.

5.1 Order data

Model number	Description	Figure
5AC900.1000-00	Adapter DVI-A/m to CRT DB15HD/f Adapter DVI (plug) to CRT (socket), for connecting a standard monitor to a DVI-I interface.	

Table 222: Order data - DVI - CRT adapter

6. CompactFlash cards 5CFCRD.xxxx-03

6.1 General information

CompactFlash cards are easy-to-exchange storage media. Due to their robustness against environmental influences (e.g. temperature, shock, vibration, etc.), CompactFlash cards are ideal for use as storage media in industrial environments.

6.2 Order data

Model number	Description	Figure
5CFCRD.0064-03	CompactFlash 64 MB SSI	
5CFCRD.0128-03	CompactFlash 128 MB SSI	
5CFCRD.0256-03	CompactFlash 256 MB SSI	
5CFCRD.0512-03	CompactFlash 512 MB SSI	Example: 8 GB CompactFlash cards
5CFCRD.1024-03	CompactFlash 1024 MB SSI	
5CFCRD.2048-03	CompactFlash 2048 MB SSI	
5CFCRD.4096-03	CompactFlash 4096 MB SSI	
5CFCRD.8192-03	CompactFlash 8192 MB SSI	

Table 223: CompactFlash cards - Order data

6.3 Technical data

Information:

The following characteristics, features and limit values only apply to this accessory and can deviate from the entire device. For the entire device where this accessory is installed, refer to the data provided specifically for the entire device.

Features	5CFCRD.xxxx-03
MTBF (at 25°C)	> 4000000 hours
Maintenance	None
Data reliability	< 1 unrecoverable error in 10^{14} bit read accesses
Write/erase procedures	> 2,000,000 times
Data retention	10 years

Table 224: Technical data - CompactFlash cards 5CFCRD.xxxx-03

Mechanical characteristics	
Dimensions Length Width Thickness	36.4 ± 0.15 mm 42.8 ± 0.10 mm 3.3 ± 0.10 mm
Weight	11.4 grams
Environmental characteristics	
Ambient temperature Operation Storage Transport	0°C to +70°C -50°C to +100°C -50°C to +100°C
Relative humidity Operation / Storage	8% to 95%, non-condensing
Vibration Operation Storage / Transport	max. 16.3 g (159 m/s^2 0-peak) max. 30 g (294 m/s^2 0-peak)
Shock Operation Storage / Transport	max. 1000 g (9810 m/s^2 0-peak) max. 3000 g (29430 m/s^2 0-peak)
Altitude	Maximum 80,000 feet (24,383 meters)

Table 224: Technical data - CompactFlash cards 5CFCRD.xxxx-03 (Forts.)

6.3.1 Temperature humidity diagram - Operation and storage
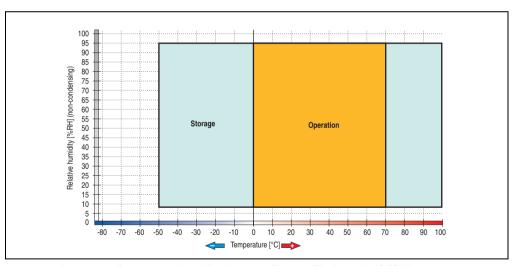
Figure 151: Temperature humidity diagram - CompactFlash cards 5CFCRD.xxxx-03

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6.4 Dimensions
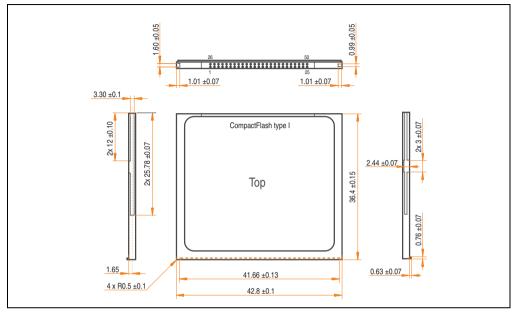
Figure 152: Dimensions - CompactFlash card Type I

6.5 Calculating the lifespan

Silicon Systems provides a 9-page "white paper" for the lifespan calculation for CompactFlash cards (see following pages). This document can also be found on the Silicon Systems homepage (**www.siliconsystems.com**).

> # Information:
>
> **A software tool for calculating the statistical lifespan of the Silicon Systems CompactFlash cards in various settings can be downloaded from the B&R Homepage (www.br-automation.com).**

Figure 153: Silicon Systems white paper - page 1 of 9

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SILICONDRIVE™ WHITE PAPER
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INTRODUCTION

SiliconSystems' SiliconDrive™ technology is specifically designed to meet the high performance and high reliability requirements of Enterprise System OEMs in the netcom, military, industrial, interactive kiosk and medical markets. One of the measures of storage reliability in Enterprise System OEM applications is endurance – the number of write/erase cycles that can be performed before the storage product "wears out."

BACKGROUND

It is important to note that endurance is not just a function of the storage media. Rather, it is the combination of the storage media and the controller technology that determines the endurance. For example, magnetic media is an order of magnitude less reliable than NAND flash, yet the controller technology employed by rotating hard drives can compensate for this deficiency to yield reliability results that meet those of solid-state storage.

{NOTE: This is a completely different discussion from the mechanical reliability involving rotating hard drives versus solid-state storage that has no moving parts. This is just an example of how a controller, if it is good enough, can compensate for the deficiencies of the media}.

Write/erase cycle endurance for solid-state storage is specified in many ways by many different vendors. Some specify the endurance at the physical block level, while others specify at the logical block level. Still others specify it at the card or drive level. Since endurance is also related to data retention, endurance can be specified at a higher level if the data retention specification is lower. For these reasons, it is often difficult to make an "apples to apples" comparison of write/erase endurance by solely relying on these numbers in a datasheet.

A better way to judge endurance is to break the specification down into the main components that affect the endurance calculation:

1.   Storage Media
2.   Wear Leveling Algorithm
3.   Error Correction Capabilities

Other factors that affect endurance include the amount of spare sectors available and whether or not the write is done using a file system or direct logical block addressing. While these issues can contribute to the overall endurance calculation, their effects on the resulting number is much lower than the three parameters above. Each of those factors will be examined individually, assuming ten-year data retention.

Figure 154: Silicon Systems white paper - page 2 of 9

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STORAGE MEDIA

The scope of this white paper is confined to non-volatile storage – systems that do not lose their data when the power is turned off. The dominant technology for non-volatile solid-state storage is NAND flash. While NOR flash is also a possible solution, implementation of NOR technology is generally confined to applications like cell phones that require the functionality of DRAM, boot PROM and storage component in a single chip. The economies of scale and component densities of NAND relative to NOR make it the ideal solution for non-volatile, solid-state storage subsystems.

The two dominant NAND technologies available today are SLC (single-level cell, sometimes called binary) and MLC (multi-level cell). SLC technology stores one bit per cell and MLC stores two bits. A comparison of SLC and MLC is shown in figure 1.

Figure 1

SLC NAND is generally specified at 100,000 write/erase cycles per block with 1-bit ECC (this is explained below). MLC NAND is specified at 10,000 write/erase cycles per block with ECC. The MLC datasheet does not specify a number of bits of ECC required. Therefore, when using the same controller, a storage device using SLC will have an endurance value roughly 10x that of a similar MLC-based product. In order to achieve maximum endurance, capacity and speed, SiliconSystems currently uses SLC NAND in our SiliconDrive technology.

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Figure 155: Silicon Systems white paper - page 3 of 9

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A more thorough discussion of SLC vs. MLC can be found from the component manufacturers:
Samsung: http://www.samsung.com
Toshiba: http://www.toshiba.com

WEAR LEVELING

Wear leveling is defined as the allowing data writes to be evenly distributed over the entire storage device. More precisely, wear leveling is an algorithm by which the controller in the storage device re-maps logical block addresses to different physical block addresses in the solid-state storage array. The frequency of this re-map, the algorithm to find the "least worn" area to which to write and any data swapping capabilities are generally considered proprietary intellectual property of the controller vendor.

It is important to note that the wear leveling is done in the solid-state memory controller and is independent of the host system. The host system performs its reads and writes to logical block addresses only, so as far as the host is concerned, the data stays in the same place.

To illustrate the effects of wear leveling on overall endurance, assume three different storage devices with the following characteristics:
1. Flash Card with No Wear Leveling
2. Flash Card with Dynamic Wear Leveling
3. SiliconDrive with Static Wear Leveling

In addition, assume that all three storage devices use the same solid-state storage technologies (SLC or MLC – for purposes of this discussion, it doesn't matter). All three devices will have 75% of the capacity as static data, which is defined below:

Static Data: Any data on a solid-state storage device that does not change. Examples include: operating system files, look-up tables and executable files.

Finally, the same type of write is performed to all three systems. The host system is writing a single block of data to the same logical block address over and over again.

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Figure 156: Silicon Systems white paper - page 4 of 9

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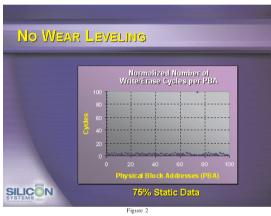
No Wear Leveling

Figure 2 shows a normalized distribution of writes to a flash card that does not use wear leveling. In this instance, the data gets written to the same physical block. Once that physical block wears out and all spare blocks are exhausted (see discussion below), the device ceases to operate, even though only a small percentage of the card was used.

In this instance, the endurance of the card is only dependent on the type of flash used and any error correction capabilities in excess of one byte per sector. Early flash cards did not use wear leveling and thus failed in write-intensive applications. For this reason, flash cards with no wear leveling are only useful in consumer electronic applications.

Figure 2

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Dynamic Wear Leveling

Figure 3 shows a normalized distribution of writes to a flash card that employs dynamic wear leveling. This algorithm only wear levels over "free" or "dynamic" data areas. That is to say, if there is static data as defined above, this area is never involved in the wear leveling process. In the current example, since 75% of the flash card is used for static data, only 25% of the card is available for wear leveling. The endurance of the card is calculated to be 25 times better than for the card with no wear leveling, but only one-fourth that of static wear leveling.
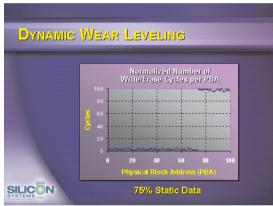
Figure 3

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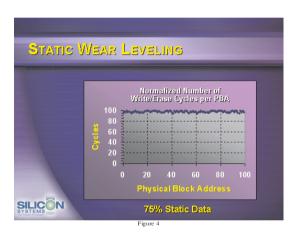
Figure 158: Silicon Systems white paper - page 6 of 9

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Static Wear Leveling

Figure 4 shows a normalized distribution of writes to a SiliconDrive that employs static wear leveling. This algorithm evenly distributes the data over the entire SiliconDrive. The algorithm searches for the least-used physical blocks and writes the data to that location. If that location is empty, the write occurs normally. If that location contains static data, the static data is moved to a more heavily-used location prior to the new data being written. The endurance of the SiliconDrive is calculated to be 100 times better than for the card with no wear leveling and four times the endurance of the card that uses dynamic wear leveling.

Figure 4

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ERROR CORRECTION

Part of the solid-state memory components specification is related to error correction. For example, SLC NAND components are specified at 100,000 write/erase cycles with one-bit ECC. It goes to reason that the specification increases with a better error correction algorithm. Most flash cards employ error correction algorithms ranging from two-bit to four-bit correction. SiliconSystems' SiliconDrive technology uses six-bit correction.

The term six-bit correction may be slightly confusing. Six-bit correction really defines the capability of correcting up to six *bytes* in a 512-byte sector. Since a byte is eight bits, this really means the SiliconDrive can correct 48 bits as long as those bits are confined to six bytes in the sector. The same definition holds for two-bit and four-bit correction.

The relationship between the number of bytes per sector the controller can correct does not appear to be directly proportional to the overall endurance, since the bit error rate of the NAND flash is not linear. To state it another way, six-bit error correction is not necessarily three times better than two-bit ECC. In most cases, it is significantly better than that.

SUMMARY OF MEDIA, WEAR LEVELING AND ECC

The matrix below summarizes the effects of the different items discussed above. In the table, a "1" indicates the best possible scenario, and a "10" indicates the least desirable in terms of endurance.

N = No Wear Leveling; D = Dynamic Wear Leveling; S = Static Wear Leveling

ECC	SLC NAND			MLC NAND		
	N	D	S	N	D	S
2-bit	6	5	4	10	9	8
4-bit	5	4	2	9	8	7
6-bit	4	3	1*	8	7	6

* = SiliconSystems' SiliconDrive Configuration

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Figure 160: Silicon Systems white paper - page 8 of 9

SILICONDRIVE™ WHITE PAPER
WP401D

ENDURANCE CALCULATIONS

To get an idea of how long a solid-state storage device will last in an application, the following calculations can be used. Note: These calculations are valid only for products that use either dynamic or static wear leveling. Use the solid-state memory component specifications for products that do not use wear leveling.

To calculate the expected life in years a product will last:

$$\text{Years} = \frac{(\alpha - \beta) \times \lambda \times (1 - \varphi)}{(\omega \times \xi) \times k}$$

Where:

α   = Capacity in MB (when converting from MB to GB, MB = GB x 1,024)
β   = Amount of Static Data in MB (this value should be 0 for static wear leveling)
λ   = Endurance Specification
φ   = Safety Margin
ω   = File Size in MB (when converting from KB to MB, KB = MB x 1,024)
ξ   = Number of Writes of file size ω per minute
k   = Number of minutes per year = 525,600

To calculate the number of data transactions:

$$\text{Transactions} = \frac{(\alpha - \beta) \times \lambda \times (1 - \varphi)}{\omega}$$

Where:

α   = Capacity in MB (when converting from MB to GB, MB = GB x 1,024)
β   = Amount of Static Data in MB (this value should be 0 for static wear leveling)
λ   = Endurance Specification
φ   = Safety Margin Percentage (usually 25%)
ω   = File Size in MB (when converting from KB to MB, KB = MB x 1,024)

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                                                                           The *Future* of Storage…Today™

Figure 161: Silicon Systems white paper - page 9 of 9

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Accessories

7. USB Media Drive - 5MD900.USB2-01

2x mounting brackets

USB Media Drive

Data carriers not included in delivery

Figure 162: USB Media Drive - 5MD900.USB2-01

7.1 Order data

Model number	Short description	Comment
5MD900.USB2-01	**USB 2.0 drive DVD-RW/CD-RW FDD CF USB** USB 2.0 drive combination, consists of DVD-R/RW/DVD+R/RW/CD-RW, FDD, CompactFlash slot (type II), USB connection (type A front, type B back); 24V DC.	

7.2 Features

- Desk-top or rack-mount operation (mounting rail brackets)
- Integrated USB diskette drive
- Integrated DVD-RW/CD-RW drive
- Integrated CompactFlash slot IDE/ATAPI (Hot Plug capable)
- Integrated USB 2.0 connection (up to 480 MBit high speed)
- +24 VDC supply (back side)
- USB/B 2.0 connection (back side)
- Optional front cover (see also section 7.9 "Front cover 5A5003.03 for the USB Media Drive" on page 328)

7.3 Technical data

Information:

The following characteristics, features and limit values only apply to this accessory and can deviate from the entire device. For the entire device where this accessory is installed, refer to the data provided specifically for the entire device.

Features - entire device	5MD900.USB2-01 Rev. D0 and higher D0
Transfer rate	Low speed (1.5 MBit/s), full speed (12 MBit/s), to high speed (480 Mbit/s)
Maximum cable length	5 m (without hub)
Power supply Rated voltage	24 VDC ± 25%
Features - diskette drive	
Data capacity	720 KB / 1.25 MB / 1.44 MB (formatted)
Data transfer rate	250 kbits (720 KB) or 500 kbits (1.25 MB and 1.44 MB)
Rotation speed	Up to 360 rpm
Diskette media	High density (2HD) or normal density (2DD) 3.5" diskettes
MTBF	30000 POH (Power-On Hours)
Features - DVD-RW/CD-RW drive	

Write speed
    CD-R
    CD-RW
    DVD-R
    DVD-RW
    DVD+R
    DVD+RW
    DVD+R (double layer)
    DVD-R (Double Layer)
    DVD-RAM[1)]
	10-24x
	10-24x
	2-6x
	2-6x
	3.3-8x
	3.3-8x
	2.4-4x
	2-4x
	3-5x

Reading rate
    CD
    DVD
	24x
	8x

Data transfer rate	Max. 33.3 MB/sec.
Access time (average) CD/DVD	130 ms (24x) / 130 ms (8x)
Revolution speed	Max. 5090 rpm ± 1%

Starting time (0 rpm to read access)
    CD
    DVD
	14 seconds (maximum)
	15 seconds (maximum)

Host interface	IDE (ATAPI)

Table 225: Technical data - USB Media Drive 5MD900.USB2-01 Rev D0 and higher D0

Features - DVD-RW/CD-RW drive	5MD900.USB2-01
Readable media 　CD 　DVD	CD/CD-ROM (12 cm, 8 cm), CD-R, CD-RW DVD-ROM, DVD-R, DVD-RW. DVD-RAM, DVD+R, DVD+R (double layer), DVD+RW
Non-write protected media 　CD 　DVD	CD-R, CD-RW DVD-R/RW, DVD-RAM (4.7 GB), DVD+R/RW, DVD+R (double layer)
Compatible formats	CD-DA, CD-ROM mode 1/mode 2 CD-ROM XA mode 2 (form 1, form 2) Photo CD (single/multi-session), Enhanced CD, CD text DVD-ROM, DVD-R, DVD-RW, DVD video DVD RAM (4.7 GB, 2.6 GB) DVD+R, DVD+R (double layer), DVD+RW
Write-methods 　CD 　DVD	Disk at once, session at once, packet write, track at once Disk at once, incremental, over-write, sequential, multi-session
Laser class	Class 1 laser
Data buffer capacity	8 MB
Noise level (complete read access)	Approx. 48 dBA in a distance of 50 cm
Lifespan 　Opening/closing the drawer	60000 POH (Power-On Hours) > 10000 times
CompactFlash slot layout	
CompactFlash 　Type 　Amount 　Connection	Type I 1 slot IDE / ATAPI
CompactFlash LED	Signals read or write access to an inserted CompactFlash card
Hot Plug capable	Yes
Features - USB connections	
USB A on the front side 　Power supply 　Type 　Transfer rate	Connection of further peripheral devices Max. 500 mA 2.0 Low speed (1.5 MBit/s), full speed (12 MBit/s), to high speed (480 Mbit/s)
USB B back side	Connection to the system
Mechanical characteristics	
Outer dimensions (without slide-in) 　Width 　Length 　Height	70 mm 100 mm 9.5 mm
Weight	Approx. 1.1 kg (without front cover)
Environmental characteristics	
Ambient temperature[2)] 　Operation 　Storage 　Transport	+5°C .. +45°C -20°C .. +60°C -40°C .. +60°C

Table 225: Technical data - USB Media Drive 5MD900.USB2-01 Rev D0 and higher D0 (Forts.)

Environmental characteristics	5MD900.USB2-01

Relative humidity
    Operation
    Storage
    Transport
	20 - 80%, non-condensing
	5 - 90%, non-condensing
	5 - 95%, non-condensing

Vibration
    Operation
    Storage
    Transport
	5 - 500 Hz: 0.3 g (2.9 m/s^2 0-peak)
	10 - 100 Hz: 2 g (19.6 m/s^2 0-peak)
	10 - 100 Hz: 2 g (19.6 m/s^2 0-peak)

Shock
    Operation
    Storage
    Transport
	Max. 5 g (49 m/s^2 0-peak) and 11 ms length
	Max. 60 g (588 m/s^2 0-peak) and 11 ms length
	Max. 60 g (588 m/s^2 0-peak) and 11 ms length

Altitude	Max. 3000 meters

Table 225: Technical data - USB Media Drive 5MD900.USB2-01 Rev D0 and higher D0 (Forts.)

1) DVD RAM drivers are not provided by the manufacturer. Support of DVD RAM function by the burning software "Nero" (model number 5SWUTI.0000-00) or other burning software packages and drivers from third party providers.

2) Temperature data is for operation at 500 meters. Derating the max. ambient temperature - typically 1°C per 1000 meters (from 500 meters above sea level).

7.4 Dimensions
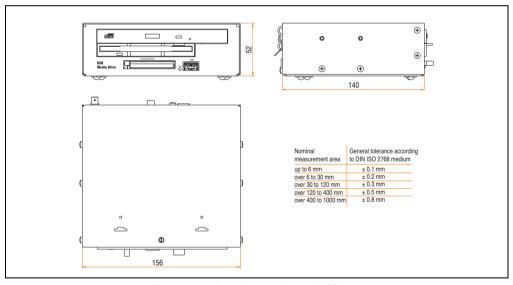
Figure 163: Dimensions - 5MD900.USB2-01

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7.5 Dimensions with front cover

Nominal measurement area	General tolerance according to DIN ISO 2768 medium
up to 6 mm	± 0.1 mm
over 6 to 30 mm	± 0.2 mm
over 30 to 120 mm	± 0.3 mm
over 120 to 400 mm	± 0.5 mm
over 400 to 1000 mm	± 0.8 mm
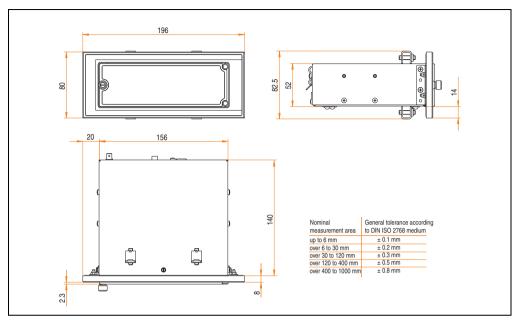
Figure 164: Dimensions - USB Media Drive with front cover

7.5.1 Cutout installation

Outer contour (front cover)   Outer contour (media device)

Cutout

Cutout dimensions 183 ±0.5 mm x 55 ±0.5 mm
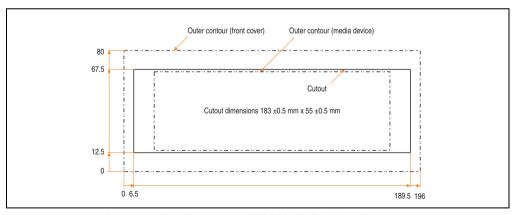
Figure 165: Installation cutout - USB Media Drive with front cover

7.6 Contents of delivery

Amount	Component
1	USB Media Drive complete unit
2	Mounting rail brackets

Table 226: Contents of delivery - USB Media Drive - 5MD900.USB2-01

7.7 Interfaces
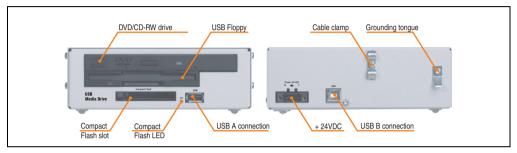
Figure 166: Interfaces - 5MD900.USB2-01

7.8 Installation

The USB Media Drive can be operated as a desk-top device (rubber feet) or as a rack-mount device (2 mounting rail brackets included).

7.8.1 Mounting orientation

Because of limits to the mounting orientation with the components used (floppy, DVD-CDRW drive), the USB media drive is only permitted to be mounted and operated as shown in the following figure.
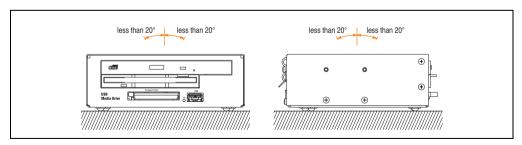
Figure 167: Mounting orientation - 5MD900.USB2-01

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7.9 Front cover 5A5003.03 for the USB Media Drive

This front cover can also be mounted on the front of the USB media drive (model number 5MD900.USB2-00 or 5MD900.USB2-01) to protect the interface.
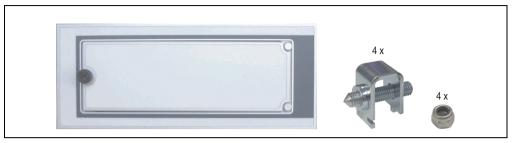
Figure 168: Front cover 5A5003.03

7.9.1 Technical data

Features	5A5003.03

Front cover design / colors
    Dark gray border around the cover
    Light gray background
	
	Pantone 432CV
	Pantone 427CV

Table 227: Technical data - 5A5003.03

7.9.2 Dimensions

Nominal measurement area	General tolerance according to DIN ISO 2768 mittel
up to 6 mm	± 0.1 mm
over 6 to 30 mm	± 0.2 mm
over 30 to 120 mm	± 0.3 mm
over 120 to 400 mm	± 0.5 mm
over 400 to 1000 mm	± 0.8 mm
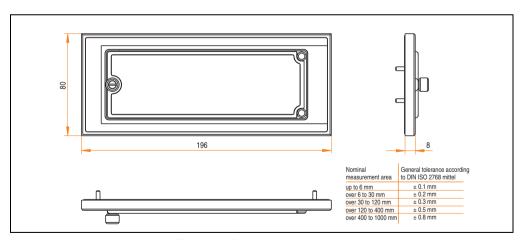
Figure 169: Dimensions - 5A5003.03

7.9.3 Installation

The front cover is attached with 2 mounting rail brackets (included with USB Media Drive) and 4 M3 locknuts. The USB media drive and front cover can be mounted as a whole in (for example) a switching cabinet door.
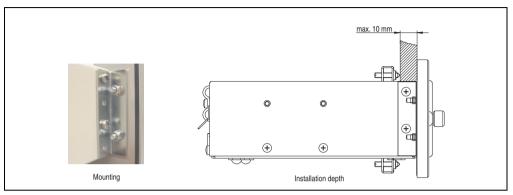
Figure 170: Front cover mounting and installation depth

7.9.4 Cutout installation

See the figure 165 "Installation cutout - USB Media Drive with front cover" on page 326.

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8. USB flash drive

Information:

We reserve the right to supply alternative products due to the vast quantity of flash drives available on the market and their corresponding short product lifecycle. Therefore, the following measures might be necessary in order to boot from these flash drives:

- **The flash drive must be reformatted or in some cases even re-partitioned (set active partition).**
- **The flash drive must be at the top of the BIOS boot order, or alternatively the IDE controllers can also be deactivated in the BIOS. This can be avoided in most cases if a "`fdisk /mbr`" command is also executed on the USB flash drive.**

8.1 General information

USB flash drives are easy-to-exchange storage media. Because of the fast data transfer (USB 2.0), the USB flash drives are ideal for use as a portable memory medium. Without requiring additional drivers ("Hot Plug & Play" - except with Windows 98SE), the USB flash drive can be converted immediately into an additional drive where data can be read or written. Only USB flash drives from the memory specialists SanDisk are used.

8.2 Order data

Model number	Description	Figure
5MMUSB.2048-00	USB flash drive 2 GB SanDisk Cruzer Micro	

Table 228: Order data - USB flash drives

8.3 Technical data

Information:

The following characteristics, features and limit values only apply to this accessory and can deviate from the entire device. For the entire device where this accessory is installed, refer to the data provided specifically for the entire device.

Features	5MMUSB.2048-00
LED	1 LED (green), signals data transfer (send and receive)
Power supply Current requirements	Via the USB port 650 µA sleep mode, 150 mA read/write

Interface
   Type
   Transfer rate
   Sequential reading
   Sequential writing
   Connection
	USB specification 2.0 high speed device, mass storage class, USB-IF and WHQL certified
	USB 1.1 and 2.0-compatible
	Up to 480 Mbit (high speed)
	Max. 8.7 MB/second
	Max. 1.7 MB/second
	To each USB type A interface

MTBF (at 25°C)	100000 hours
Data retention	10 years
Maintenance	None
Operating system support	Windows CE 4.2, CE 5.0, ME, 2000, XP and Mac OS 9.1.x+, OS X v10.1.2+
Mechanical characteristics	

Dimensions
   Length
   Width
   Thickness
	
	52.2 mm
	19 mm
	7.9 mm

Environmental characteristics	

Ambient temperature
   Operation
   Storage
   Transport
	
	0°C .. +45°C
	-20°C .. +60°C
	-20°C .. +60°C

Relative humidity
   Operation
   Storage
   Transport
	
	10% .. 90%, non-condensing
	5% .. 90%, non-condensing
	5% .. 90%, non-condensing

Vibration
   Operation
   Storage
   Transport
	
	At 10 - 500 Hz: 2 g (19.6 m/s^2 0 peak), oscillation rate 1/minute
	At 10 - 500 Hz: 4 g (39.2 m/s^2 0 peak), oscillation rate 1/minute
	At 10 - 500 Hz: 4 g (39.2 m/s^2 0 peak), oscillation rate 1/minute

Shock
   Operation
   Storage
   Transport
	
	Max. 40 g (392 m/s^2 0-peak) and 11 ms length
	Max. 80 g (784 m/s^2 0-peak) and 11 ms length
	Max. 80 g (784 m/s^2 0-peak) and 11 ms length

Altitude
   Operation
   Storage
   Transport
	
	3048 meters
	12192 meters
	12192 meters

Table 229: Technical data - USB flash drive 5MMUSB.2048-00

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8.3.1 Temperature humidity diagram - Operation and storage
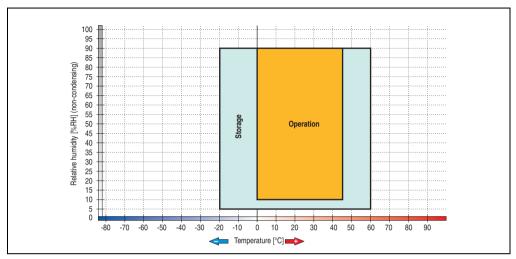
Figure 171: Temperature humidity diagram - USB flash drive - 5MMUSB.2048-00

Temperature data is for operation at 500 meters. Derating the max. ambient temperature - typically 1°C per 1000 meters (from 500 meters above sea level).

8.4 Contents of delivery

SanDisk Cruzer Micro
1 USB flash drive in desired size + 2 replacement covers (blue and pink) + 1 strap[1]
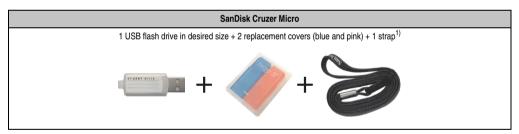
Table 230: Contents of delivery - USB flash drive 5MMUSB.2048-00

1) Due to a change in the contents of delivery from the manufacturer, it is possible that the USB flash drive (with white cap) is delivered without the replacement covers or strap.

8.5 Creating a bootable USB flash drive

When used in connection with an Automation PC 810 / Panel PC 700, it is possible to boot the system from one of the flash drives available from B&R. The flash drive must be specially prepared for this.

8.5.1 Requirements

The following peripherals are required for creating a bootable flash drive:

- B&R USB flash drive
- Automation PC 810 or Panel PC 700
- USB floppy drive (external or slide-in USB floppy 5AC600.FDDS-00)
- USB keyboard
- A start disk created using MS-DOS 6.22 or Windows 98 - 1.44MB HDD (Windows Millennium, NT4.0, 2000, XP start disks cannot be used).
  The tools "`format.com`" and "`fdisk.exe`" must be located on the diskette!

8.5.2 Procedure

- Plug in the flash drive and boot from the start disk.
- Set active partition on the flash drive using "`fdisk`" and follow the further instructions.
- Reboot the system from the start disk.

Format and simultaneously transfer the system files to the flash drive with the command "`format c: /s`".

9. Uninterruptible power supply UPS

With the optionally integrated UPS, the Automation PC 810 makes sure that the PC system completes write operations even after a power failure occurs. When the UPS detects a power failure, it switches to battery operation immediately without interruption. This means that all running programs will be ended properly by the UPS software. This prevents the possibility of inconsistent data (only functions if the UPC is already configured and the driver is activated).

Information:

The monitor is not buffered by the UPS and will shut off when the power fails.

By integrating the charging circuit in the Automation PC 810 housing, the installation has been reduced to merely attaching the connection cable to the battery unit mounted next to the PC.
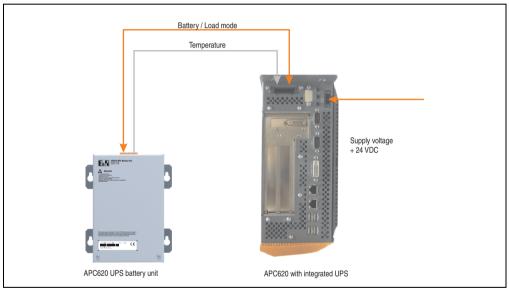
Figure 172: UPS principle

9.1 Model numbers

Model number	Short description	Comment
5AC600.UPSI-00	**Add-on UPS module** Order UPS module for Automation PC, cable (5CAUPS.0005-00 or 5CAUPS.0030-00) and battery unit (5AC600.UPSB-00) separately.	
5AC600.UPSB-00	**5Ah battery unit** UPS battery unit for the add-on UPS module	
5CAUPS.0005-00	**0.5 meter UPS cable** Connection cable between add-on UPS module and UPS battery unit, length 0.5 meters	
5CAUPS.0030-00	**3 meter UPS cable** Connection cable between add-on UPS module and UPS battery unit, length 3 meters	

9.2 Features

- Long-lasting, maintenance-free rechargeable batteries
- Communication via integrated interfaces
- Temperature sensor
- Driver software
- Deep discharge protection

9.3 Requirements

4) Add-on UPS module 5AC600.UPSI-00
   For more on installing the add-on modules, see chapter 7 "Service and maintenance", section "Installing the UPS module" on page 364.

5) Battery unit 5AC600.UPSB-00

6) UPS connection cable 0.5 m (5CAUPS.0005-00) or 3 m (5CAUPS.0030-00)

7) To configure: Automation Device Interface driver version 1.60 or higher (for the ADI Control Center)

   For info regarding configuration of the B&R UPS using the ADI Control Center, see chapter 4.4 "UPS configuration".

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9.4 Individual components

9.4.1 Add-on UPS module 5AC600.UPSI-00
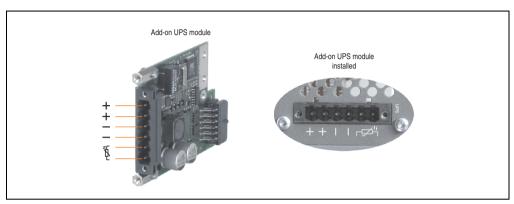
Figure 173: Add-on UPS module 5AC600.UPSI-00

Technical data

Features	5AC600.UPSI-00
Switching threshold mains / battery operation	15 / 13 V
Mains failure bridging	Max. 20 min at 150 W load
Charging current	Max. 0.5 A
Deep discharge protection	Yes, at 10 V of the battery unit
Short circuit protection	No
Power requirements	Max. 7.5 watts
Status indicators	Via the ADI Control Center (see section "Display status values for UPS" on page 275)
Parameter settings	Via the ADI Control Center (see section "UPS configuration" on page 274)

Table 231: Technical data - 5AC600.UPSI-00

Installation

The module is installed using the materials included in the delivery. For installation instructions, see chapter 7 "Service and maintenance", section "Installing the UPS module" on page 364.
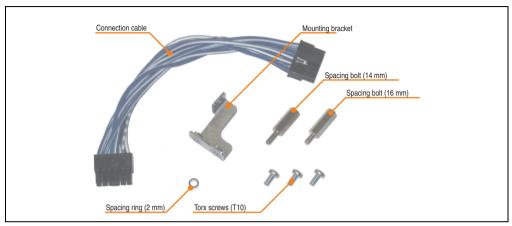
Figure 174: Add-on UPS module 5AC600.UPSI-00 - Installation materials

9.4.2 Battery unit 5AC600.UPSB-00

The battery unit is subject to wear and should be replaced regularly (at least following the specified lifespan).
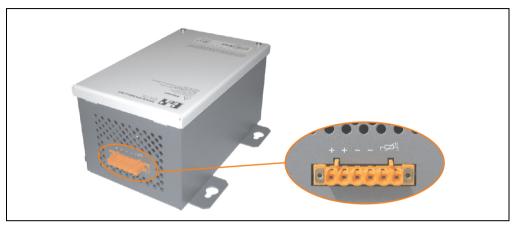
Figure 175: Battery unit 5AC600.UPSB-00

Technical data

Features	5AC600.UPSB-00

Battery
    Type
    Method
	Enersys Cyclon 2 V 5 Ah; (6 connected in series)
	Single cell (X cell)

Operating current	Max. 8 A
Deep discharge voltage	10 V
Dimensions (W x H x D)	Figure 178 "Dimensions - 5AC600.UPSB-00" on page 340
Temperature sensor	NTC resistance
Weight	Approx. 3.2 kg

Ambient temperature
    Operation
    Storage
    Transport
	-40°C .. +80°C
	-65°C .. +80°C
	-65°C .. +80°C

Relative humidity
    Operation
    Storage
    Transport
	5 - 95% (non-condensing)
	5 - 95% (non-condensing)
	5 - 95% (non-condensing)

Altitude	Max. 3000 meters
Mounting instructions	See section "Mounting instructions" on page 341.
Lifespan	10 years at 25°C (up to 80% battery capacity)
Maintenance interval during storage	Load once every 6 months

Table 232: Technical data - 5AC600.UPSB-00

Temperature life span diagram up to 20% battery capacity.

Temperature	Lifespan (days)
25	14600
30	9467
35	6139
40	3980
45	2581
50	1674
55	1085
60	704
65	456
70	296
75	192
80	124
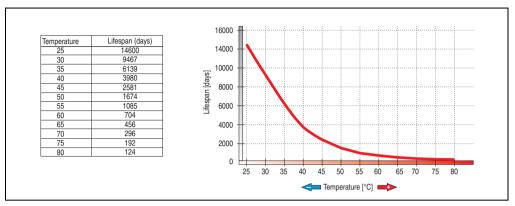
Figure 176: Temperature life span diagram

Deep discharge cycles
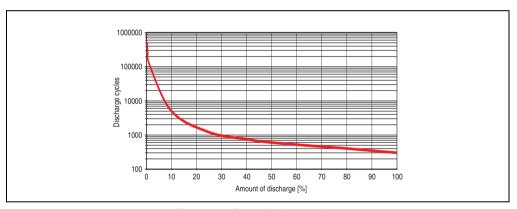
Figure 177: Deep discharge cycles

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Dimensions
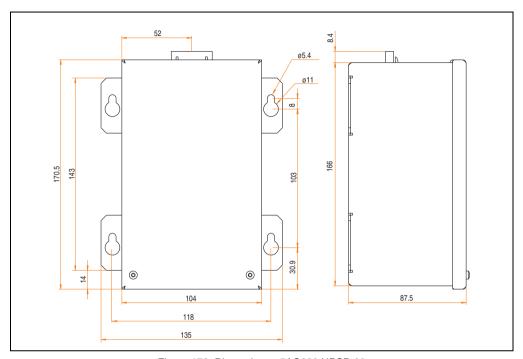
Figure 178: Dimensions - 5AC600.UPSB-00

Drilling template
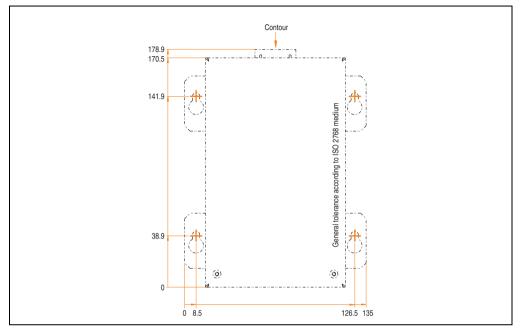
Figure 179: Drilling template for the battery unit

Mounting instructions

Due to the unique construction of these batteries, they can be stored and operated in any position.

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9.4.3 UPS connection cable

Figure 180: UPS connection cable

Technical data

Features	5CAUPS.0005-00	5CAUPS.0030-00
Length	0.5 m	3 m
Outer diameter	8.5 mm ± 0.2mm	
Connector type	6-pin plug connectors, tension clamp connection / 6-pin socket connectors, tension clamp connection	

Wire cross section
   Temperature sensor wire
   Voltage wire
	2×0.5 mm^2 (AWG 20)
	4×2.5 mm^2 (AWG 13)	

Line resistance
   0.5 mm^2
   2.5 mm^2
	Max. 39 Ω/km
	Max. 7.98 Ω/km	

Flex radius
   Fixed installation
   Free-moving
	5 x wire cross-section
	10 x wire cross-section	

Temperature range
   Moving
   Non-moving
	-5°C ... +80°C
	-30°C ... +80°C	

Weight	Approx. 143 kg/km	

Materials
   Cable shielding
   Color
	Thermoplastic PVC-based material
	Window gray (similar to RAL 7040)	

Peak operating voltage	12 V DC	
Testing AC voltage Wire/wire	1500 V	
Operating voltage	Max. 300 V	
Current load	10 A at +20°C	

Table 233: Technical data - UPS connection cable

10. Power Supplies

In order to meet demands for complete, comprehensive system solutions, power supplies are available for mounting rail installation in the B&R product line. This extensive spectrum ranges from single-phase power supplies that supply 2.1 A up to three-phase power supplies that supply 40 A. All switching power supplies can manage a wide range of AC and DC input voltages. This input ranges from 100 to 240 VAC or 400 to 500 VAC and from 85 to 375 VDC. Devices are protected against short circuit, overload, and open circuit, which allows them to be operated without functional limitations or derating even when overloads between 15% and 25% occur.

Figure 181: B&R power supplies (examples)

Two mini power supplies (PS102 and PS104) in robust plastic housing are available in the lower performance range. A well designed cooling concept allows several different mounting orientations. The functional DIN rail allows fast mounting and demounting. Wiring is essentially performed in seconds thanks to the the cage clamp terminals used. The compact design, easy mounting and several different mounting orientations make the two smallest power supplies in this product line components that can be used practically anywhere.

10.1 Model numbers and brief technical overview

The technical data listed in the following tables should act as a brief selection guide. For more detailed technical data, data sheets are available for download from production description section of the B&R homepage (**www.br-automation.com**).

10.1.1 Single-phase power supplies

Features	0PS102.0	0PS104.0	0PS105.1	0PS105.2	0PS110.1	0PS110.2	0PS120.1
Output power	50 W	100 W	120 W	120 W	240 W	240 W	480 W
AC input voltage	85-264 V	85-132 V 184-264 V	85-132 V 176-264 V	85-132 V 176-264 V	85-132 V 176-264 V	85-132 V 176-264 V	85-132 V 176-264 V
DC input voltage	85-375 V	220-375 V	210-375 V	210-375 V	210-375 V	210-375 V	-

Table 234: Single-phase power supplies

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Features	0PS102.0	0PS104.0	0PS105.1	0PS105.2	0PS110.1	0PS110.2	0PS120.1
Output voltage	24-28 V	24-28 V	24 V	24 V	24-28 V	24-28 V	24-28 V
Output current at 24 V	2.1 A	4.2 A	5 A	5 A	10 A	10 A	20 A
Parallel operation	No	Yes	Yes	Yes	Yes	Yes	Yes
Current balancing	No	Yes	No	Yes	No	Yes	Yes

Table 234: Single-phase power supplies

10.1.2 Three-phase power supplies

Features	0PS305.1	0PS310.1	0PS320.1	0PS340.1
Output power	120 W	240 W	490 W	960 W
AC input voltage	340-576 V	340-576 V	340-576 V	340-576 V
DC input voltage	450-820 V	450-820 V	450-820 V	450-820 V
Output voltage	24-28 V	24-28 V	24 V	24 V
Output current at 24 V	5 A	10 A	20 A	40 A
Parallel operation	Yes	Yes	Yes	Yes
Current balancing	No	Yes	Yes	Yes

Table 235: Three-phase power supplies

11. PCI cards

11.1 PCI Ethernet card 10/100 1 port - 5ACPCI.ETH1-01

The universal (3.3 V and 5 V) half-size PCI Ethernet card has a 10/100 MBit/s network connection and can be inserted in a 16-bit PCI slot and operated as an additional network interface.
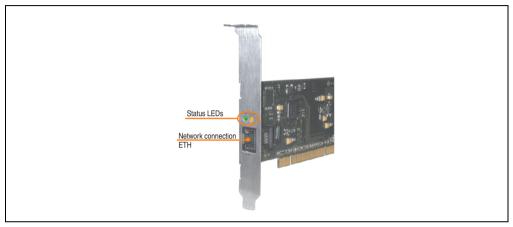
Figure 182: PCI Ethernet card 10/100 - 5ACPCI.ETH1-01

11.1.1 Technical data

Ethernet connection			
Controller	Intel 82551ER		RJ45 twisted pair (10BaseT/100BaseT), female
Power supply	Universal card (2 notches) for 3.3 V or 5 V		
Cabling	S/STP (Cat5e)		
Transfer rate	10/100 MBit/s [1]		
Cable length	max. 100 m (min. Cat5e)		
LED	**On**	Off	
Green	100 MBit/s	10 MBit/s	
Orange	Link (Ethernet network connection available)	Activity (blinking) (Data transfer in progress)	

Table 236: Ethernet connection ETH

1) Both operating modes possible. Change-over takes place automatically.

11.1.2 Model number

Model number	Short description	Comment
5ACPCI.ETH1-01	**PCI Ethernet card 10/100** half size PCI Ethernet card, 1 Ethernet connection	

11.1.3 Driver support

A special driver is necessary for operating the Intel Ethernet controller 82551ER. Drivers for Windows XP Professional, Windows XP Embedded, and DOS are available for download on the B&R Homepage in the download area (**www.br-automation.com**).

Information:

Required drivers can only be downloaded from the B&R homepage, not from manufacturers' pages.

11.1.4 Dimensions
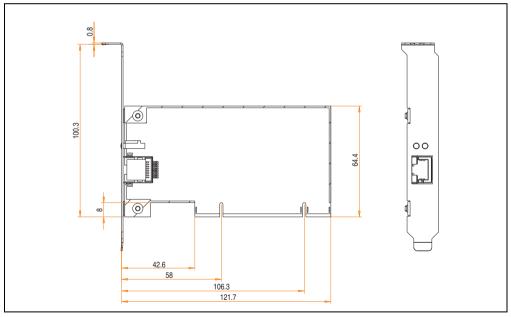
Figure 183: Dimensions - 5ACPCI.ETH1-01

11.2 PCI Ethernet card 10/100 - 5ACPCI.ETH3-01

The universal (3.3 V and 5 V) half-size PCI Ethernet card has three 10/100 MBit/s network connections and can be inserted in a 16-bit PCI slot and operated as an additional network interface.
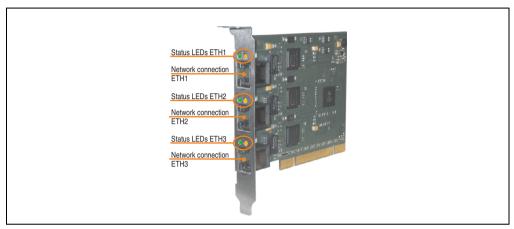
Figure 184: PCI Ethernet card 10/100 - 5ACPCI.ETH3-01

11.2.1 Technical data

Ethernet connections			
Controller	each with Intel 82551ER		3 x RJ45 twisted pair (10BaseT/100BaseT), female
Power supply	Universal card (2 notches) for 3.3 V or 5 V		
Cabling	each S/STP (Cat5e)		
Transfer rate	each 10/100 MBit/s [1]		
Cable length	each max. 100 m (min. Cat5e)		
LED	On	Off	
Green	100 MBit/s	10 MBit/s	
Orange	Link (Ethernet network connection available)	Activity (blinking) (Data transfer in progress)	

Table 237: Ethernet connections ETH1, ETH2, ETH3

1) Both operating modes possible. Change-over takes place automatically.

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11.2.2 Model number

Model number	Short description	Comment
5ACPCI.ETH3-01	**PCI Ethernet card 10/100 3port** half size PCI Ethernet card, 3 Ethernet connections	

11.2.3 Driver support

A special driver is necessary for operating the Intel Ethernet controller 82551ER. Drivers for Windows XP Professional, Windows XP Embedded, and DOS are available for download on the B&R Homepage in the download area (**www.br-automation.com**).

Information:

Required drivers can only be downloaded from the B&R homepage, not from manufacturers' pages.

11.2.4 Dimensions
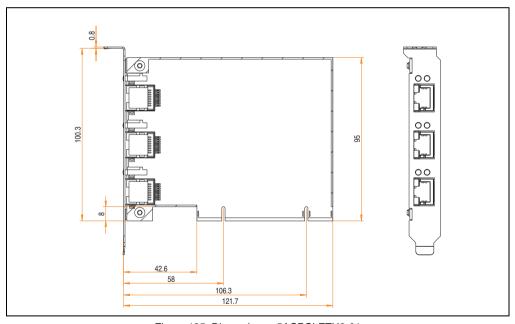
Figure 185: Dimensions - 5ACPCI.ETH3-01

12. APC810 internal supply cable 5CAMSC.0001-00

This supply cable is used internally e.g. to supply special PCI cards. It is connected to the APC810 main board. For requirements and procedures, see "Connection of an external device to the main board" on page 386.

Caution!

Cable can only be plugged in and unplugged when the device is turned off.
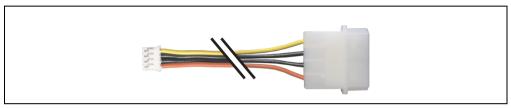
Figure 186: APC810 internal supply cable - 5CAMSC.0001-00

12.1 Model numbers

Model number	Short description	Comment
5CAMSC.0001-00	**APC810 internal supply cable**	

12.2 Technical data

Features	5CAMSC.0001-00
Length	100 mm ± 5 mm
Connector type	1x disk drive power plug 4-pin male, 1x plug housing 4-pin female
Wire cross section	AWG 22
Flexibility	Flexible

Table 238: Technical data - APC810 internal supply cable 5CAMSC.0001-00

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13. HMI Drivers & Utilities DVD 5SWHMI.0000-00

Figure 187: HMI Drivers & Utilities DVD 5SWHMI.0000-00

Model number	Short description	Comment
5SWHMI.0000-00	**HMI Drivers & Utilities DVD**	

Table 239: Model number - HMI Drivers & Utilities DVD

This DVD contains drivers, utilities, software upgrades and user's manuals for B&R Panel system products (see B&R homepage – Industrial PCs, Visualization and Operation).

BIOS upgrades for the products

- Automation PC 810
- Automation PC 620
- Automation PC 680
- Panel PC 700
- Provit 2000 product families - IPC2000/2001/2002
- Provit 5000 product families - IPC5000/5600/5000C/5600C
- Power Panel 100 / Mobile Panel 100 BIOS devices
- Power Panel 100 / Mobile Panel 100 user boot logo
- Power Panel 100 / Mobile Panel 100 REMHOST utility

Drivers for the devices

- Automation Device Interface (ADI)
- Audio
- Chipset
- CD-ROM
- LS120
- Graphics
- Network
- PCI RAID controller
- Touch screen
- Touchpad
- Interface board

Updates

- Firmware upgrades (e.g. MTCX, SMXC)

Utilities & Tools

- ACOPOS
- Automation Device Interface (ADI)
- Miscellaneous
- MTC utilities
- Key editor
- MTC & Mkey utilities
- Mkey utilities
- UPS Configuration Software
- ICU ISA configuration
- Intel PCI NIC boot ROM
- Diagnostics
- Lifespan calculation for Silicon System CompactFlash cards 5CFCRD.xxxx-03

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Windows and embedded operating systems

- Thin client
- Windows CE
- Windows NT Embedded
- Windows XP Embedded

MCAD templates for

- Industrial PCs
- Visualization and operating devices
- Legend strip templates
- Template for custom design
- Control systems
- I/O systems
- Motion control

Documentation for

- B&R Windows CE
- Automation PC 810
- Automation PC 620
- Automation PC 680
- Automation Panel 900
- Panel PC 700
- Power Panel 15/21/35/41
- Power Panel 100/200
- Provit 2000
- Provit 3030
- Provit 4000
- Provit 5000
- Provit Benchmark
- Provit Mkey
- Windows NT Embedded application guide
- Windows XP Embedded application guide
- Uninterruptible power supply

Service tools

- Acrobat Reader 5.0.5 (freeware in German, English, and French)
- Power Archiver 6.0 (freeware in German, English, and French)
- Internet Explorer 5.0 (German and English)
- Internet Explorer 6.0 (German and English)

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Chapter 7 • Service and maintenance

The following chapter describes service/maintenance work which can be carried out by a trained, qualified user.

1. Changing the battery

> # Information:
>
> - **The product design allows the battery to be changed with the APC810 switched either on or off. In some countries, safety regulations do not allow batteries to be changed while the module is switched on.**
>
> - **Any BIOS settings that have been made will remain when the battery is changed with the power turned off (stored in non-volatile EEPROM). The date and time must be reset later because this data is lost when the battery is changed.**
>
> - **The battery should only be changed by qualified personnel.**

The following replacement lithium batteries are available: 4A0006.00-000 (1 pc.) and 0AC201.9 (5 pc.).

1.1 Procedure

- Disconnect the power supply to the Automation PC 810.

- Touch the housing or ground connection (not the power supply!) in order to discharge any electrostatic charge from your body.

- Remove the black plastic cover from the battery compartment and carefully pull out the battery using removal strips.
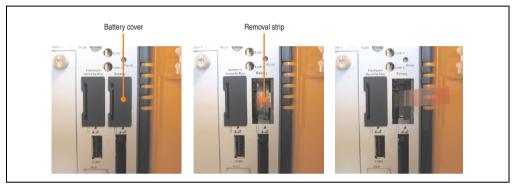
Figure 188: Remove battery

- The battery should not be held by its edges. Insulated tweezers may also be used for inserting the battery.
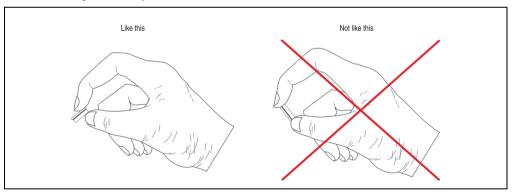
Figure 189: Battery handling

- Insert the new battery with correct polarity.
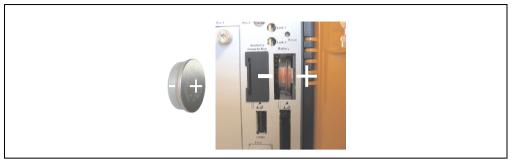
Figure 190: Battery polarity

- To make the next battery change easier, be sure the removal strip is in place when inserting battery.

- Reconnect power supply to the PC 810 (plug in power cable and press power button).

- Date and time might need to be reset in BIOS.

Warning!

Lithium batteries are considered hazardous waste. Used batteries should be disposed of according to local requirements.

2. Installing / exchanging a slide-in compact drive

Information:

The SATA I interface allows data carriers to be exchanged during operation (hot-plug). To utilize this capability, it must be supported by the operating system.

• Loosen and remove the two ¼ turn screws on the protective cover / slide-in compact drive.
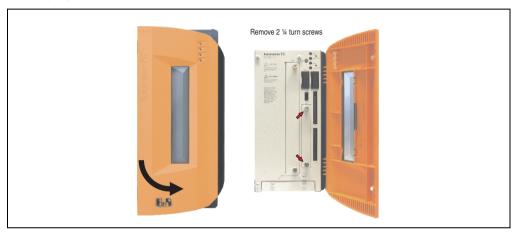
Figure 191: Loosening the ¼ turn screws

• Insert the compact SATA drive and fasten using the ¼ turn screws.

Figure 192: Inserting the compact SATA drive

3. Installing / exchanging a slide-in slot drive

Slide-in drives can be installed and exchanged in system units with 2 or 5 card slots.

3.1 Procedure

- Disconnect the power supply to the Automation PC 810.

- Touch the housing or ground connection (not the power supply!) in order to discharge any electrostatic charge from your body.

- Remove the slide-in dummy module or slide-in drive by unscrewing the 2 ¼ turn screws.

Figure 193: Loosening the ¼ turn screws

- Insert the slide-in drive and tighten with both ¼ turn screws.
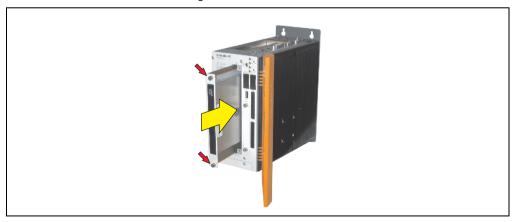
Figure 194: Installing the slide-in drive

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4. Mounting the slide-in compact adapter

Slide-in compact adapters can be installed and exchanged in system units with 2 or 5 card slots. A slide-in compact drive (e.g. slide-in compact HDD) can be mounted in a slide-in slot using the slide-in compact adapter.

4.1 Procedure

- Disconnect the power supply to the Automation PC 810.
- Touch the housing or ground connection (not the power supply!) in order to discharge any electrostatic charge from your body.
- Remove the slide-in dummy module or slide-in drive by unscrewing the 2 ¼ turn screws.

Figure 195: Loosening the ¼ turn screws

- Insert the slide-in compact adapters and tighten with both ¼ turn screws.
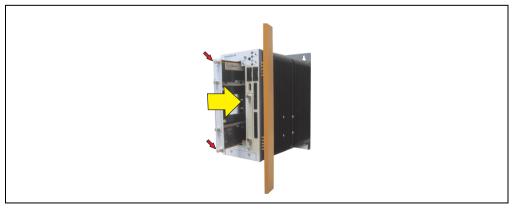
Figure 196: Installing the slide-in compact adapter

- Once it is mounted, the slide-in compact drive can be installed.

Figure 197: Mounting the slide-in compact drive

5. Installing / exchanging the fan kit

- Remove side cover (see section "Mounting the side cover" on page 377).
- After the screws have been removed, the fan kit cover can be removed toward the front.
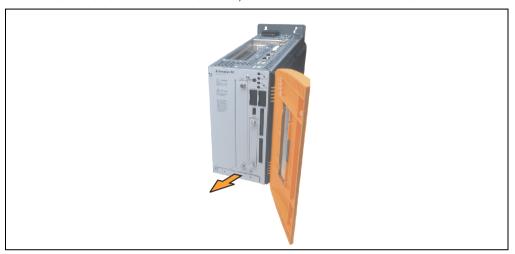
Figure 198: Remove fan kit insert

- Insert the frame - Mount the contact board side to the sliding contacts on the system unit and fasten using the ¼ turn screws.
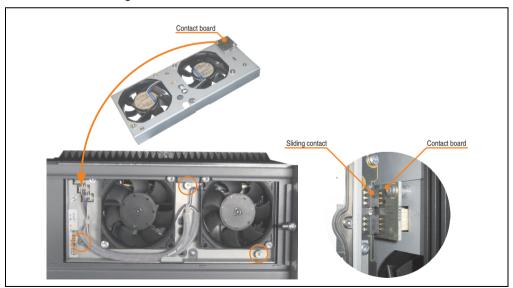
Figure 199: Inserting and fastening the fan kit

• Place the dust filter in the fan kit cover and secure with the filter clasp.
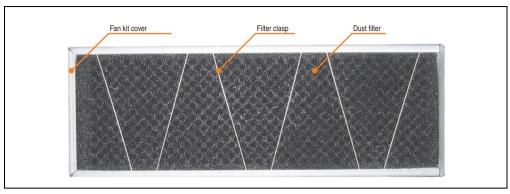
Figure 200: Securing the dust filter with the filter clasp

• Place the fan kit cover in the housing and fasten using the Torx screws removed earlier.

Information:

Regular control of the dust filter depending on area of use and degree of dirtiness.

Installation is the same as for all APC810 devices.

6. Installing the UPS module

The module is installed using the materials included in the delivery.
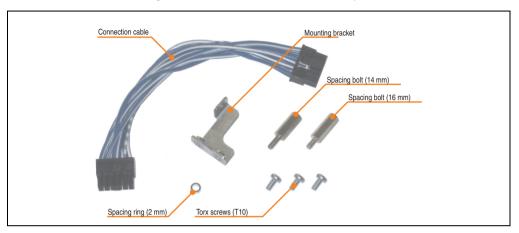
Figure 201: Add-on UPS module 5AC600.UPSI-00 - Installation materials

Installation may vary depending the system unit type (1, 2 or 5 card slots) or whether an add-on interface module (IF option) is installed in the APC810.

6.1 Installation without installed add-on interface module

Different parts are used depending on the system unit and **installed** (description starting on page 371) or **not installed** (description follows) add-on interface module.

6.1.1 APC810 1 card slot

- Remove side cover (see section "Mounting the side cover" on page 377).
- Remove UPS module cover by removing the 2 marked Torx screws (T10).
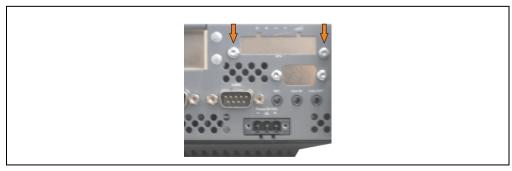
Figure 202: Remove UPS module cover

• Screw in spacing bolt and spacing ring on the main board (using M5 hex socket screwdriver).

14mm spacing bolt
+ spacing ring
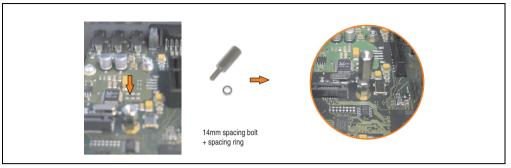
Figure 203: Screw in spacing bolt and spacing ring

• Install UPS module with 2 Torx screws (T10) on the housing and 1 Torx screw (T10) on the main board (spacing bolt). Use the previously removed Torx screws from the mounting materials.
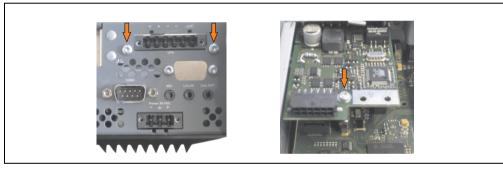
Figure 204: Install UPS module

• Plug in connection cable (see marked socket).
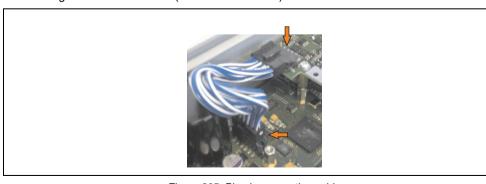
Figure 205: Plug in connection cable

Information:

When connecting the cable, make sure that the connector locking mechanism is engaged.

Figure 206: Connector locking mechanism

• Attach the side cover.

6.1.2 APC810 2 card slot

• Remove side cover (see section "Mounting the side cover" on page 377).
• Remove UPS module cover by removing the 2 marked Torx screws (T10).
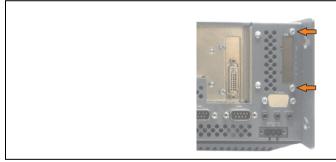
Figure 207: Remove UPS module cover

• Screw in spacing bolt and spacing ring on the main board (using M5 hex socket screwdriver).
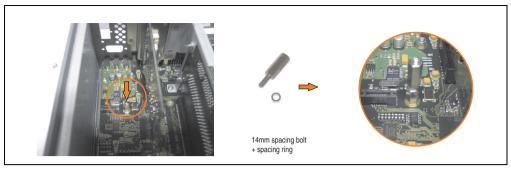
Figure 208: Screw in spacing bolt and spacing ring

14mm spacing bolt
+ spacing ring

• Install mounting bracket on UPS module using 2 Torx screws (T10).

Mounting bracket
+ 2 Torx screws
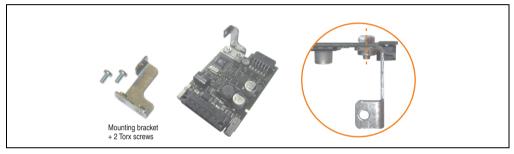
Figure 209: Install mounting bracket

• Install UPS module with 2 Torx screws (T10) on the housing and 1 Torx screw (T10) on the main board (spacing bolt). Use the previously removed Torx screws from the mounting materials.
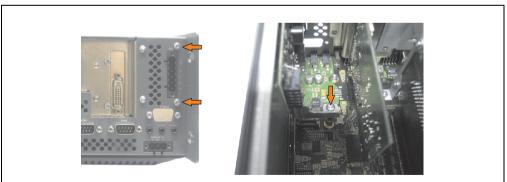
Figure 210: Install UPS module

• Plug in connection cable (see marked socket).

Figure 211: Plug in connection cable

Information:

When connecting the cable, make sure that the connector locking mechanism is engaged.

Figure 212: Connector locking mechanism

• Attach the side cover.

6.1.3 APC810 5 card slot

- Remove side cover (see section "Mounting the side cover" on page 377).
- Remove UPS module cover by removing the 2 marked Torx screws (T10).
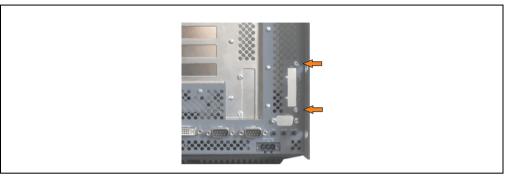
Figure 213: Remove UPS module cover

- Screw in spacing bolt and spacing ring (using M5 hex socket screwdriver).

14 mm spacing bolt
+ spacing ring
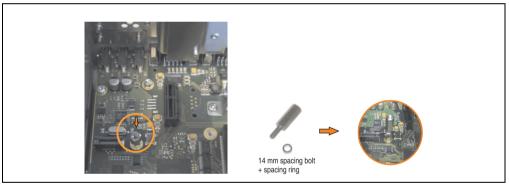
Figure 214: Screw in spacing bolt and spacing ring

- Install mounting bracket on UPS module using 2 Torx screws (T10).

Mounting bracket
+ 2 Torx screws
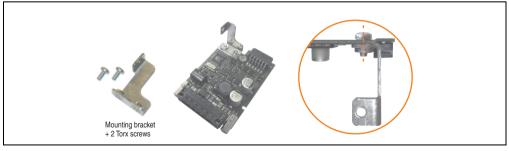
Figure 215: Install mounting bracket

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- Install UPS module with 2 Torx screws (T10) on the housing and 1 Torx screw (T10) on the main board (spacing bolt). Use the previously removed Torx screws from the mounting materials.

Figure 216: Install UPS module

- Attach connection cable (see marked socket).

Figure 217: Plug in connection cable

Information:

When connecting the cable, make sure that the connector locking mechanism is engaged.

Figure 218: Connector locking mechanism

- Attach the side cover

6.2 Installation with installed add-on interface module

6.2.1 APC810 1 card slot

- Remove side cover (see section "Mounting the side cover" on page 377).
- Remove UPS module cover by removing the 2 marked Torx screws (T10).

Figure 219: Remove UPS module cover

- Screw in spacing bolt (using M5 hex socket screwdriver).

14 mm spacing bolt
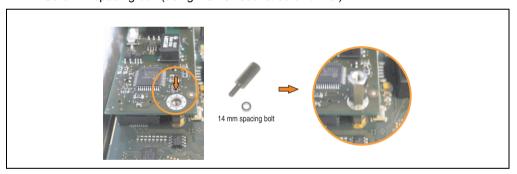
Figure 220: Screw in spacing bolt

- Install the UPS module using 3 Torx screws (T10). Use the previously removed Torx screws and one Torx screw from the mounting materials.

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Figure 221: Install UPS module

- Plug in connection cable (see marked socket).

Figure 222: Plug in connection cable

Information:

When connecting the cable, make sure that the connector locking mechanism is engaged.

Figure 223: Connector locking mechanism

- Attach cover plate and side cover.

6.2.2 APC810 2 card slot

- Remove side cover (see section "Mounting the side cover" on page 377).
- Remove UPS module cover by removing the 2 marked Torx screws (T10).
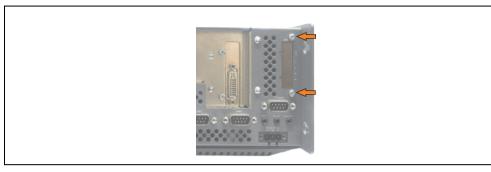
Figure 224: Remove UPS module cover

- Screw in spacing bolt (using M5 hex socket screwdriver).

14 mm spacing bolt
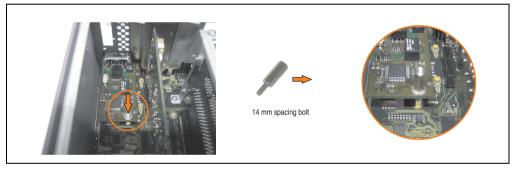
Figure 225: Screw in spacing bolt

- Install mounting bracket on UPS module using 2 Torx screws (T10).

Mounting bracket
+ 2 Torx screws
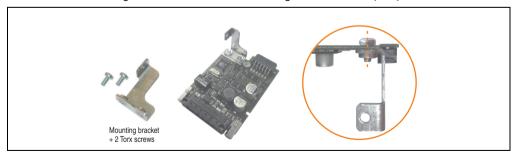
Figure 226: Install mounting bracket

- Install the UPS module using 3 Torx screws (T10). Use the previously removed Torx screws and one Torx screw from the mounting materials.
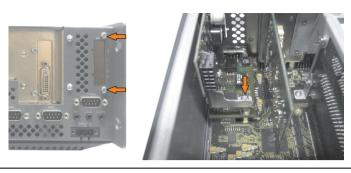
Figure 227: Install UPS module

• Plug in connection cable (see marked socket).

Figure 228: Plug in connection cable

Information:

When connecting the cable, make sure that the connector locking mechanism is engaged.

Figure 229: Connector locking mechanism

• Attach cover plate and side cover.

6.2.3 APC810 5 card slot

- Remove side cover (see section "Mounting the side cover" on page 377).
- Remove UPS module cover by removing the 2 marked Torx screws (T10).
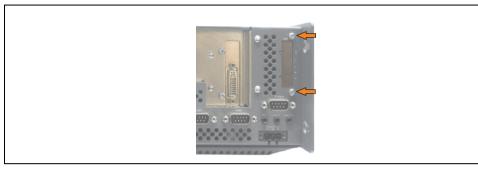
Figure 230: Remove UPS module cover

- Screw in spacing bolt (using M5 hex socket screwdriver).

14 mm spacing bolt
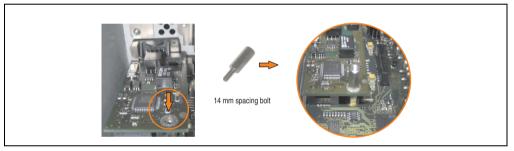
Figure 231: Screw in spacing bolt

- Install mounting bracket on UPS module using 2 Torx screws (T10).

Mounting bracket
+ 2 Torx screws
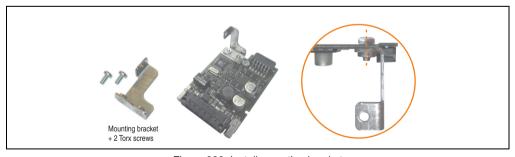
Figure 232: Install mounting bracket

- Install the UPS module using 3 Torx screws (T10). Use the previously removed Torx screws and one Torx screw from the mounting materials.
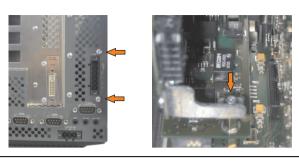
Figure 233: Install UPS module

- Plug in connection cable (see marked socket).
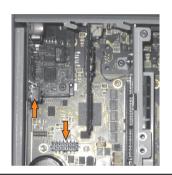
Figure 234: Plug in connection cable

Information:

When connecting the cable, make sure that the connector locking mechanism is engaged.

Figure 235: Connector locking mechanism

- Attach cover plate and side cover.

7. Mounting the side cover

The side cover can be easily removed by loosening the Torx (T10) screws. The number of Torx screws can vary depending on the system.

7.1 APC810 with 1 card slot

- Disconnect the power supply to the Automation PC 810.

- Touch the housing or ground connection (not the power supply!) in order to discharge any electrostatic charge from your body.

- Open the orange front cover. Behind the cover there are 4 Kombitorx screws (T10) that must be removed.

Figure 236: Mounting the side cover - APC810 1 card slot

- After the screws have been removed, the side cover can be removed by sliding it toward the front.

7.2 APC810 with 2 card slot

- Disconnect the power supply to the Automation PC 810.

- Touch the housing or ground connection (not the power supply!) in order to discharge any electrostatic charge from your body.

- Open the orange front cover. Behind the cover there are 4 Kombitorx screws (T10) that must be removed.

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Figure 237: Mounting the side cover - APC810 2 card slot

- After the screws have been removed, the side cover can be removed by sliding it toward the front.

7.3 APC810 with 5 card slot

- Disconnect the power supply to the Automation PC 810.

- Touch the housing or ground connection (not the power supply!) in order to discharge any electrostatic charge from your body.

- Open the orange front cover. Behind the cover there are 4 Kombitorx screws (T10) that must be removed.
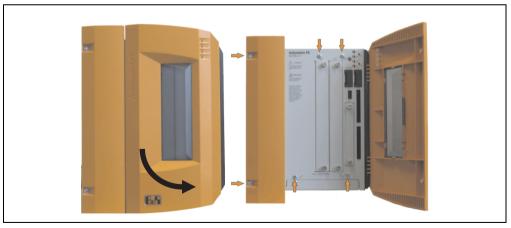
Figure 238: Mounting the side cover - APC810 5 card slot

- After the screws have been removed, the side cover can be removed by sliding it toward the front.

8. AP Link installation

- Remove side cover (see section "Mounting the side cover" on page 377).
- Remove AP Link module cover by removing the 2 marked Torx screws (T10).

Figure 239: Remove AP Link module cover

- Insert the AP Link card in appropriate slot.

Warning!

When inserting the AP Link card, be sure to push it all the way into the AP Link slot. Do not force the card into the slot.

- Install the AP Link module using 3 Torx screws (T10). Use the previously removed Torx screws and an additional Torx screw from the mounting materials.
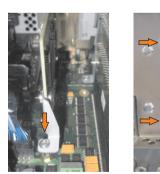
Figure 240: Install AP Link module

- Attach cover plate and side cover.

9. Exchanging a PCI SATA RAID hard disk in a RAID 1 system

In the example, the assumption is made that the secondary hard disk (HDD1) is defective in a RAID 1 configuration. In such a case, the defective hard disk can be replaced by the replacement drive SATA hard disk.

Model number - PCI SATA RAID controller	Model number of required replacement SATA HDD	Comment
5ACPCI.RAIC-01	5ACPCI.RAIC-02	60 GB hard disk
5ACPCI.RAIC-03	5ACPCI.RAIC-04	160 GB hard disk

Table 240: Overview of required replacement SATA HDD for PCI SATA HDD RAID controller

A size 10 Torx screwdriver is needed for exchanging the hard disk.

9.1 Exchange procedure

- Remove the power supply to the device (Automation PC 620 / Panel PC 700 / Automation PC 810).

- Touch the housing or ground connection (not the power supply!) in order to discharge any electrostatic charge from your body.

- Remove the side cover.

- Remove the SATA RAID insert.

- Loosen the 4 appropriate mounting screws (M3x5).
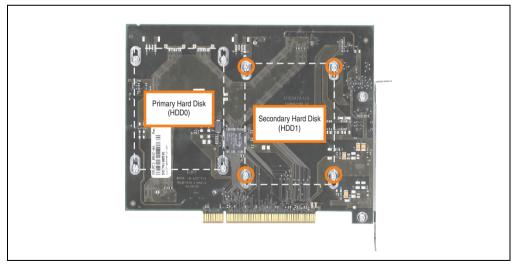
Figure 241: Screw layout on the back side of the SATA RAID controller 5ACPCI.RAIC-01

- On the front side, slide the hard disk down and away (image 1).

- Insert the new hard disk carefully into the connector (image 2), being careful to only touch it on the front, and not on the top.
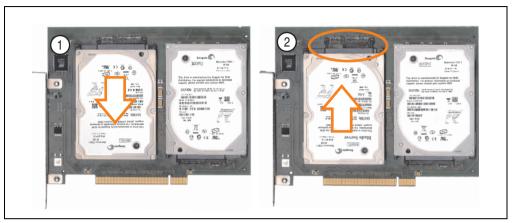
Figure 242: Hard disk exchange

- Re-secure the hard disk using the 4 fastening screws (M3x5) used earlier.

- Reassemble device in the reverse order.

- An error message is output by the RAID BIOS after starting the system "RAID1 set is in Critical status - press any key to enter Configuration Utility".

- A rebuild must be executed in the SATA RAID BIOS - for more information on this, see the section "Rebuild Mirrored Set" on page 192.

Appendix A

1. Temperature sensor locations

Sensors display temperature values in various places (CPU, board I/O, slide-in drive, etc.) on the APC810. The temperatures[1] can be read in BIOS (menu item "advanced" - CPU monitor) or in Microsoft Windows XP/embedded, using B&R Control Center[2] .
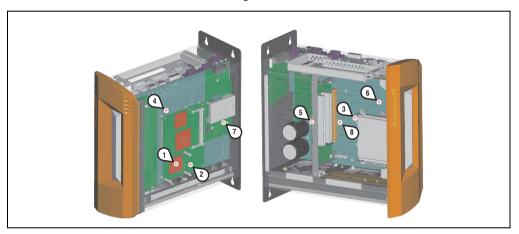
Figure 243: Temperature sensor locations

Position	Measurement point for	Measurement
1	CPU	Processor temperature (sensor integrated on the processor)
2	Board	Temperature of the CPU boards (sensor integrated on the CPU board)
3	Board I/O	Read board I/O area temperature (sensor on the baseboard)
4	Board ETH2	Temperature of the baseboard in the ETH2 controller area (sensor on the baseboard)
5	Board power supply	Board power supply temperature (sensor on the baseboard)
6	ETH2 Controller	Temperature of ETH2 controller (sensor in the ATH2 controller)
7	Power supply	Power supply temperature (sensor on the power supply)
8	Slide-in drive 1/2	Temperature of a slide-in drive (the sensor is integrated on the slide-in drive)

Table 241: Temperature sensor locations

1) The measured temperature is a guideline for the immediate ambient temperature, but can be influenced by neighboring components.

2) The B&R Control Center - ADI driver - can be downloaded for free from the download area on the B&R homepage (**www.br-automation.com**).

2. Maintenance Controller Extended (MTCX)

The MTCX controller (FPGA processor) is located on the main board (part of every system unit) of the APC810 device.
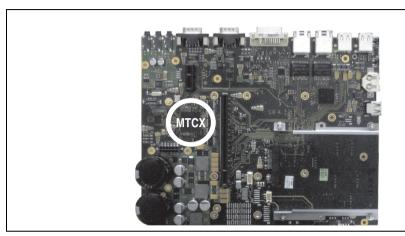
Figure 244: MTCX controller location

The MTCX is responsible for the following monitoring and control functions:

- Power on (power OK sequencing) and power fail logic
- Watchdog handling (NMI and reset handling)
- Temperature monitoring (I/O area, power supply, slide-in drive 1/2)
- Ventilation
- Key and LED handling/coordination (matrix keyboard on B&R display units)
- Advanced desktop operation (keys, USB forwarding)
- Daisy chain display operation (touch screen, USB forwarding)
- Panel locking mechanism (configurable using B&R Control Center - ADI driver)
- Backlight control for a connected B&R display
- Statistical data recording (power cycles - each power on, power on and fan hours are recorded - every full hour is counted e.g. 50 minutes no increase)
- SDL data transfer (display, matrix keyboard, touch screen, service data, USB)
- Status LEDs (HDD, panel lock, Link 1, Link 2)

The functions of the MTCX can be expanded via Firmware upgrade[1] . The version can be read in BIOS (menu item "advanced" - baseboard/panel features) or in Microsoft Windows XP/embedded, using B&R Control Center.

For more information see section 1.11 "Firmware upgrade" on page 261.

1) Can be downloaded from the download area on the B&R homepage (**www.br-automation.com**).

2.1 Temperature monitoring - fan regulation

The MTCX constantly monitors the temperature using temperature sensors (see section 1 "Temperature sensor locations" on page 383), which directly determine how the fan is controlled. The RPM depends on the temperature measured. The limit values depend on the MTCX firmware version being used.

Sensor area	Start-up temperature	Max fan speed at:
CPU	+ 65°C	+ 81°C
Board CPU	+ 65°C	+ 81°C
Board I/O	+ 60°C	+ 76°C
Board ETH2	+ 60°C	+ 76°C
Board Power	+ 60°C	+ 76°C
Power supply	+ 60°C	+ 76°C
ETH2 Controller	+ 70°C	+ 86°C
Slide-In 1/2	+ 44°C	+ 60°C

Table 242: Temperature limits of the fan (MTCX PX32 V0.06).

Once the start-up temperature is reached, the device is started at the minimum fan speed. The maximum fan speed is reached at a start-up temperature of +16°C. The fan speed in this area is controlled depending on the temperature.

e.g. at slide-In 1/2: 44°C + 16°C = 60°C --> maximum fan speed

The fans are first switched off again if the evaluated temperature remains 6°C lower than the start-up temperature for a time span of 4 hours (=lag-time).

Appendix A

3. Connection of an external device to the main board

A plug on the main board enables branching of +5 VDC and +12 VDC for the internal supply of e.g. special PCI cards.

The voltage can be accessed using the "APC810 internal supply cable 5CAMSC.0001-00" on page 349. The plug is located close to the bus unit(s) and can be attached to it with a cable tie (see arrow in image). The APC810 side cover (see 7 "Mounting the side cover" on page 377) and possibly also the slide-in drive and PCI cards must be removed to reach the connector.

Figure 245: Connector location for external devices

Connector for the external devices			
Pin	Assignment	Power	4-pin connector, male
1	+12 VDC	Max. 10 watts	
2	GND		
3	GND	Max. 5 watts	
4	+5 VDC		

Table 243: Pin assignments - Connector on main board

Connections are protected with a 1A multi-fuse.

4. B&R Key Editor information

On display units, it is often necessary to adjust the function keys and LEDs for the application software being used. With the B&R Key Editor, it is possible to quickly and easily set up the application individually.
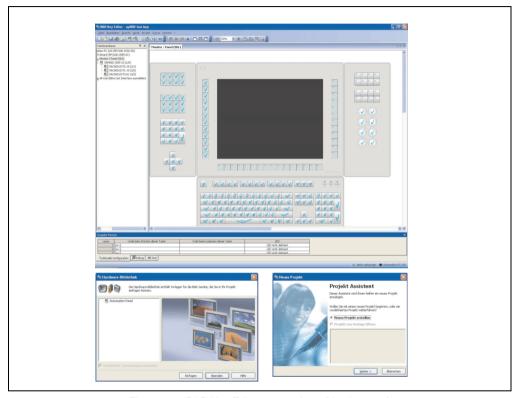
Figure 246: B&R Key Editor screenshots (Version 2.70)

Features:

- Configuration of normal keys like on a keyboard (A, B, C, etc.)

- Key combinations/shortcuts (CTRL+C, SHIFT+DEL, etc.) on one key

- Special key functions (change brightness, etc.)

- Assign functions to LEDs (HDD access, power, etc.)

- 4 assignments per key possible (using layer function)

- Configuration of panel locking time when multiple Automation Panel 900 devices are connected to Automation PC 620, Automation PC 810 and Panel PC 700 devices.

Supports following systems (Version 2.70):

- Automation PC 810
- Automation PC 620 (ETX, XTX, Embedded)
- Panel PC 300
- Panel PC 700 (ETX, XTX)
- Power Panel 100, 200
- Power Panel 300/400
- Mobile Panel 40/50
- Mobile Panel 100, 200
- Provit 2000
- Provit 5000

A detailed guide for configuring keys and LEDs can be found in the B&R Key Editor's online help.

The B&R Key Editor can be downloaded for free from the download area on the B&R homepage (**www.br-automation.com**). Additionally, it can also be found on the B&R HMI Drivers & Utilities DVD (model number 5SWHMI.0000-00).

5. B&R Automation Device Interface (ADI) development kit

The ADI development kit is used to access the functions of the ADI driver. The programming languages C (with import libraries for Microsoft Visual C++ 6.0 and Microsoft eMbedded Visual C++ 4.0) and Visual Basic (for Microsoft Visual Basic 6.0) are supported.
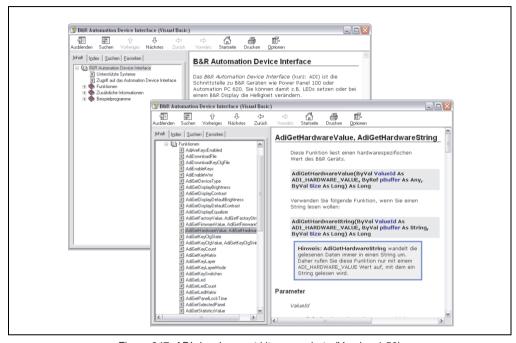
Figure 247: ADI development kit screenshots (Version 1.50)

Features:

- Extensive library of API functions
- Supported programming languages: Visual Basic, Visual C++
- Online documentation (German, English)
- Installation using its own setup

Supports following systems (Version 2.20 and higher):

- Automation PC 620
- Automation PC 800
- Mobile Panel 40/50
- Mobile Panel 100/200
- Panel PC 300
- Panel PC 700

- Panel PC 800
- Power Panel 100/200
- Power Panel 300/400

A detailed description of using the ADI functions can be found in the integrated online help.

The B&R Automation Device Interface (ADI) development kit can be downloaded for free from the download area on the B&R homepage (**www.br-automation.com**).

6. Glossary

A

ACPI

Abbreviation for "**A**dvanced **C**onfiguration and **P**ower **I**nterface". Configuration interface that enables the operating system to control the power supply for each device connected to the PC. With ACPI, the computer's BIOS is only responsible for the details of communication with the hardware.

ADI

Abbreviation for »Automation Device Interface« The ADI interface allows access to specific functions (e.g. brightness control, firmware updates, static value read) of B&R devices. The settings can be read or changed in the Control Panel with the B&R Control Center Applet (already included in the B&R embedded operating system).

APC

Abbreviation for "**A**utomation **PC**".

API

Abbreviation for "**A**pplication **P**rogram **I**nterface" The interface, which allows applications to communicate with other applications or with the operating system.

Automation Runtime

A uniform runtime system for all B&R automation components.

B

Baud rate

Measurement unit for data transfer speed. It indicates the number of states for a transferred signal per second and is measured using the baud unit of measurement. 1 baud = 1 bit/sec or 1 bps.

BIOS

An abbreviation for "**B**asic **I**nput/**O**utput **S**ystem". Core software for computer systems with essential routines for controlling input and output processes on hardware components, for performing tests after system start, and for loading the operating system. Although BIOS is used to configure a system's performance, the user does not usually come into contact with it.

Bit

Binary digit > binary position, binary character, smallest discrete unit of information. A bit can have the value 0 or 1.

Bit rate

The number of bits that can be transferred within a specified time unit. 1 bit/sec = 1 baud.

Byte

Data format [1 byte = 8 bits] and a unit for characterizing information amounts and memory capacity. The following units are the commonly used units of progression: KB, MB, GB.

B&R Automation Runtime

Windows-based program for creating installation disks to install B&R Automation Runtime™ on the target system.

C

Cache

Background memory, also known as non-addressable memory or fast buffer memory. It is used to relieve the fast main memory of a computer. For example, data that should be output to slower components by the working memory (e.g. disk storage, printers) is stored temporarily in cache memory and output from there at an appropriate speed for the target devices.

CAN

An abbreviation for "**C**ontroller **A**rea **N**etwork" (serial bus system). Structure according to ISO 11898. Bus medium: twisted pair. Good transfer properties in short distances less than 40 m with a 1 MBit/sec data transfer rate. Maximum number of stations: unlimited in theory, up to 64 with real-time capability in practice, i.e. defined maximum delay times for messages with high priority. High reliability using error detection, error handling, troubleshooting. Hamming distance.

CD-ROM

Abbreviation for "**C**ompact **D**isc **R**ead-**O**nly **M**emory". A removable data medium with a capacity of ~700 MB. CD-ROMs are optically scanned.

CE mark

A CE mark for a product. It consists of the letters "CE" and indicates conformity to all EU guidelines for the labeled product. It indicates that the individual or corporate body who has performed or attached the label assures that the product conforms to all EU guidelines for complete harmonization. It also indicates that all mandatory conformity evaluation procedures have taken place.

CMOS

"CMOS" is a battery powered memory area where fundamental parameters of an IBM (or compatible) personal computer are 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. A modem, mouse, or serial printer is typically 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 to 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 to 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 to 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.

CompactFlash®

CompactFlash memory cards [CF cards] are exchangeable nonvolatile mass memory systems with very small dimensions [43 x 36 x 3.3 mm, approximately half the size of a credit card]. In addition to the flash memory chips, the controller is also present on the cards. CF cards provide complete PC card / ATA functionality and compatibility. A 50-pin CF card can be simply inserted in a passive 68-pin type II adapter card. It conforms to all electrical and mechanical PC card interface specifications. CF cards were launched by SanDisk back in 1994. Currently, memory capacities reach up to 64 GB per unit. Since 1995, CompactFlash Association [CFA] has been looking after standardization and the worldwide distribution of CF technology

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

Abbreviation for Cathode Ray Tube. The main component of a television set or a standard computer screen. A cathode ray tube consists of a vacuum tube that contains one or more electron guns. Each electron gun creates a horizontal electron beam that appears 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.

D

DCD

An abbreviation for " **D**ata **C**arrier **D**etected". A signal used in serial communication that is sent by the modem to the computer it is connected to, indicating that it is ready for transfer.

Dial-up

Data is transferred over the telephone network using a modem or an ISDN adapter.

DIMM

"Double In-line Memory Module" consisting of one or more RAM chips on a small circuit board that is connected with the motherboard of a computer.

DMA

Direct **M**emory **A**ccess >. Accelerated direct access to a computer's RAM by bypassing the CPU.

DRAM

An abbreviation for "**D**ynamic **R**andom **A**ccess **M**emory". Dynamic RAM consists of an integrated semiconductor circuit that 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 since 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 its readiness 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 that 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 optical data carrier technology. Using this technology it is possible to encode video, audio and computer data on CD. DVDs can store a higher volume of data than conventional CDs. Standard DVDs, which have a single layer, can hold 4.7 GB. Dual-layer DVDs can hold 8.5 GB. Double-sided DVDs can therefore hold up to 17 GB. A special drive is needed for DVDs. Conventional CDs can also be played on DVD drives.

DVI

Abbreviation for »**D**igital **V**isual **I**nterface« An interface for the digital transfer of video data.

DVI-A

Analog only

DVI-D

Digital only

DVI-I

Integrated, i.e. analog and digital

E

Real time

A system is operating in real time or has real-time capability if the input sizes (e.g. signals, data) are received and processed in a defined time period, and the results are made available in real time for a partner system or the system environment. See also "real-time demands" and "real-time system".

EDID data

Abbreviation for "**E**xtended **D**isplay **I**dentification **D**ata". EDID data contains the characteristics of monitors / TFT displays transferred as 128 KB data blocks to the graphics card via the Display Data Channel (DDC). This EDID data can be used to set the graphics card to the monitor properties.

Appendix A

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.

EMC

"**E**lectro**m**agnetic **C**ompatibility". The ability of a device or a system to function satisfactorily in its electromagnetic environment without introducing intolerable electromagnetic disturbances to anything in that environment [IEV 161-01-07].

EPROM

Erasable **PROM** >(completely with ultraviolet light).

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, fiber optic cables or twisted pair cabling. Data transfer on an Ethernet network takes place in frames of variable lengths that consist of supply and controller information as well as 1500 bytes of data. The Ethernet standard provides base band transfers at 10 megabit and 100 megabit per second.

Ethernet POWERLINK

An enhancement of standard Ethernet. It enables data exchange under strict real-time conditions with cycle times down to 200 µs and jitter under 1 µs. This makes Ethernet power available on all communication levels of automation technology – from control levels to I/O. Ethernet POWERLINK was initiated by the company B&R Industrie-Elektronik and is now managed by the open end user and vendor association, EPSG - Ethernet POWERLINK Standardization Group (**www.ethernet-powerlink.org**).

ETX

Abbreviation for »**E**mbedded **T**echnology e**X**tended« This established standard offers complete PC functionality on a very compact form factor of just 114 mm x 100 mm (´4.5" x 4"). The flexibility offered by ETX® in the development of system specific main boards allows easy requirement fulfillment in a number of different applications.

F

FDD

Abbreviation for "**F**loppy **D**isk **D**rive". Reading device for removable magnetic memory from the early days of PC technology. Due to their sensitivity and moving components, FDDs have been almost completely replaced by CompactFlash memory in modern automation solutions.

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 that are waiting to be printed.

Firmware

Programs stored permanently in read-only memory. Firmware is software used to operate computer-controlled devices that generally stays in the device throughout its lifespan or over a long period of time. Such software includes operating systems for CPUs and application programs for industrial PCs as well as programmable logic controllers (e.g. the software in a washing machine controller). This software is written in read-only memory (ROM, PROM, EPROM) and cannot be easily replaced.

Floppy

Also known as a diskette. A round plastic disk with an iron oxide coating that 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. This allows 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".

FTP

"**F**ile **T**ransfer **P**rotocol". Rules for transferring data over a network from one computer to another computer. This protocol is based on TCP/IP, which has established itself as the standard for transferring data over Ethernet networks. FTP is one of the most used protocols on the Internet. It is defined in RFC 959 in the official regulations for Internet communication.

G

GB

Gigabyte (1 GB = 230 or 1,073,741,824 Bytes)

H

Handshake

Method of synchronization for data transfer when data is sent at irregular intervals. The sender signals that data can be sent, and the receiver signals when new data can be received.

Appendix A

HDD

An abbreviation for "**H**ard **D**isk **D**rive". Fixed magnetic mass memory with high capacities, e.g. 120 GB.

I

IDE

An abbreviation for "**I**ntegrated **D**rive **E**lectronics". A drive interface where the controller electronics are integrated in the drive.

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 that can be inserted in PC expansion slots.

ISO

International Organization for Standardization > Worldwide federation of national standardization institutions from over 130 countries. ISO is not an acronym for the name of the organization; it is derived from the Greek word "isos", meaning "equal" (**www.iso.ch**).

J

Jitter

Jitter is a term that describes time deviations of cyclic events. If, for example, an event should take place every 200µs and it actually occurs every 198 to 203µs, then the jitter is 5µs. Jitter has many causes. It originates in the components and transfer media of networks because of noise, crosstalk, electromagnetic interference and many other random occurrences. In automation technology, jitter is a measure of the quality of synchronization and timing.

Jumper

A small plug or wire link for adapting the hardware configuration used to connect the different points of an electronic circuit.

L

LCD

An abbreviation for "**L**iquid **C**rystal **D**isplay". A display type, based on liquid crystals that 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 that 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, thus 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 abbreviation LPT stands for "Line Printer Terminal".

Fiber optics

Fiber optic cable

M

MB

Megabyte (1 MB = 220 or 1,048,576 bytes).

Microprocessor

Highly integrated circuit with the functionality of a CPU, normally housed on a single chip. It comprises a control unit, arithmetic and logic unit, several registers and a link system for connecting memory and peripheral components. The main performance features are the internal and external data bus and address bus widths, the command set and the clock frequency. Additionally, a choice can be made between CISC and RISC processors. The first commercially available worldwide microprocessor was the Intel 4004. It came on the market in 1971.

MIPS

Million instructions per second > Measurement for the computing speed of computers.

Mkey

An abbreviation for "**M**odule **key**block". A common term given to keys found on Provit display units. They can be freely configured with Mkey utilities.

Modem

Modulator/demodulator. > Modulation/demodulation device, add-on card, or external device that allows information to be exchanged between computers over the telephone network using digital/analog or analog/digital signal conversion.

Motherboard

A circuit board that houses the main components of a computer such as the CPU switching circuit, co-processors, RAM, ROM for firmware, interface circuits, and expansion slots for hardware expansions.

Appendix A

MTBF

An abbreviation for "**M**ean **t**ime **b**etween **f**ailure". 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).

MTCX

An abbreviation for »**M**ain**t**enance **C**ontroller E**X**tended«. The MTCX is an independent processor system that provides additional functions for a B&R industrial PC that are not available with a normal PC. The MTC communicates with the B&R industrial PC via the ISA bus (using a couple register).

Multitasking

Multitasking is an operating mode in an operating system that allows several computer tasks to be executed virtually simultaneously.

N

.NET

DOTNET, Microsoft's new development platform that provides a common runtime library and type system for all programming languages. DOTNET is the umbrella term for the following products, strategies and technologies: .NET Framework, a new software platform, Visual Studio .NET, a new development environment that supports several .NET programming languages (e.g. C# or VB.NET, specially created for .NET), .NET My Services, a group of services taking over functions such as authentication, .NET Enterprise Server, which, apart from its name, is independent of the other technologies and includes the products Exchange Server 2000, Application Center 2000, and SQL Server 2000. .NET devices, supported by a slimmed down version of .NET Framework (.NET Compact Framework).

O

OEM

Abbreviation for "**O**riginal **E**quipment **M**anufacturer". A company that integrates third-party and in-house manufactured components into their own product range and then distributes these products under its own name.

OPC

OLE for Process Control > A communication standard for components in the area of automation. The goal of OPC development is to provide an open interface that builds on Windows-based technologies such as OLE, COM and DCOM. It allows problem-free standardized data transfer between controllers, operating and monitoring systems, field devices and office applications from different manufacturers. This development is promoted by the OPC Foundation, which is made up of over 200 companies from around the world, including Microsoft and other leading companies. Nowadays, OPC is also interpreted as a synonym for Openness, Productivity and Connectivity, symbolizing the new possibilities that this standard opens up.

OPC server

The missing link between connection modules for the Interbus and the visualization application. It communicates serially with the connection modules via the ISA or PCI bus or Ethernet.

P

Panel

A common term for B&R display units (with or without keys).

Panelware

A generic term given for standard and special keypad modules offered by B&R.

PC Card

Registered trademark of PCMCIA for add-on cards conforming to PCMCIA specifications.

PCI bus

Abbreviation for »**P**eripheral **C**omponent **I**nterconnect Bus«; Developed by INTEL as an intermediary/local bus for the latest PC generation. It is basically a synchronous bus. The main clock of the CPU is used for synchronization. The PCI bus is microprocessor-independent, 32-bit and 64-bit compatible, and supports both 3.3 V and 5 V cards and devices.

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 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.

PICMG

PCI Industrial Computers Manufacturers Group; Goal; Use of commercial PCI bus for industrial environments, especially CompactPCI bus (**www.picmg.org**).

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 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 that are stored in ROM on the computer and that 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 that frequently accompanies a diagnosis value on the standard output or standard error devices (generally the monitor). If the 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.

POWERLINK

See "Ethernet POWERLINK".

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. LCD 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 b/w LCD.

PROFIBUS DP

PROFIBUS für den Bereich der „Dezentralen Peripherie". PROFIBUS DB can be used to allow simple digital and analog I/O modules as well as intelligent signal and data processing units to be installed in the machine room, which among other things can significantly reduce cabling costs. Often used for time-critical factory automation applications.

Provit

An abbreviation for "**PRO**cess**VI**sualization**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.

PV

Process variable. Logical storage location for values and states in a program.

Q

QVGA

Abbreviation for "**Q**uarter **V**ideo **G**raphics **A**rray". Usually a screen resolution of 320 × 240 pixels.

QUXGA

Abbreviation for "**Q**uad **U**ltra E**x**tended **G**raphics **A**rray". Generally a screen resolution of 3200 × 2400 pixels (4:3). Quad implies the 4x greater pixel resolution compared to the UXGA.

QWUXGA

Abbreviation for "**Q**uad **WUXGA**"; Generally a screen resolution of 3840 × 2400 pixels (8:5, 16:10).

R

RAM

An abbreviation for "**R**andom **A**ccess **M**emory". Semiconductor memory which can be read or written to by the microprocessor or other hardware components. Memory locations can be accessed in any order. The various ROM memory types do allow random access, but they cannot be written to. The term RAM refers to a more temporary memory that can be written to as well as read.

ROM

An abbreviation for "**R**ead-**O**nly **M**emory". Semiconductor memory where programs or data were permanently stored during the production process.

RS232

Recommended **S**tandard **N**umber **232**. Oldest and most widespread interface standard, also called a V.24 interface. All signals are referenced to ground making this an unbalanced interface. High level: -3 ... -30 V, low level: +3 ... +30 V. Cable lengths up to 15 m, transfer rates up to 20 kBit/s. For point-to-point connections between 2 participants.

RS422

Recommended **S**tandard **N**umber **422**. Interface standard, balanced operation, increased immunity to disturbances. High level: 2 ... -6 V, low level: +2 ... +6 V. 4-wire connection [inverted/not inverted], cable lengths up to 1200 m, transfer rates up to 10 Mbit/s, 1 sender can carry out simplex communication with up to 10 receivers.

Appendix A

RS485

Recommended **S**tandard **N**umber **485**. Interface standard upgraded from RS422. High level: 1.5 ... -6 V, low level: +1.5 ... +6 V; 2-wire connection [half duplex operation] or 4-wire connection [full duplex operation. Cable lengths up to 1200 m, transfer rates up to 10 Mbit/s. Up to 32 participants can be connected to an RS485 bus [sender/receiver].

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 to pin 4 according to the hardware specifications of the RS-232-C standard.

RXD

An abbreviation for "Receive (**RX**) **D**ata". A line for transferring 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 connected to pin 3 of the plug.

S

Interface

From the hardware point of view, an interface is the connection point between two modules/devices/systems. The units on both sides of the interface are connected by the interface lines so that data, addresses, and control signals can be exchanged. The term interface includes all functional, electrical and constructive conditions [encoding, signal level, pin assignments] that characterize the connection point between the modules, devices, or systems. Depending on the type of data transfer, a differentiation is made between parallel [e.g. Centronics, IEEE 488] and serial interfaces [e.g. V.24, TTY, RS232, RS422, RS485], which are set up for different transfer speeds and transfer distances. From the point of view of software, the term "interface" describes the transfer point between program modules using specified rules for transferring the program data.

SDRAM

An abbreviation for "**S**ynchronous **D**ynamic **R**andom **A**ccess **M**emory". A construction of dynamic semiconductor components (DRAM) that 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.

SFC

Sequential function chart > Graphic input language for PLCs used to represent sequential control.

Special keypad module

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).

Slot PLC

PC insert card that has full PLC functionality. On the PC, it is coupled via a DPR with the process using a fieldbus connection. It is programmed externally or using the host PC.

SoftPLC

Synonym for SoftPLC.

PLC

Programmable Logic Controller; Computer-based control device that functions using an application program. The application program is relatively easy to create using standardized programming languages [IL, FBD, LAD, AS, ST]. Because of its serial functionality, reaction times are slower compared to connection-oriented control. Today, PLCs are available in device families with matched modular components for all levels of an automation hierarchy.

SRAM

An abbreviation for "**S**tatic **R**andom **A**ccess **M**emory". A semiconductor memory (RAM) made up of certain logic circuits (flip-flop) that only keeps stored information while powered. In computers, static RAM is generally only used for 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.

SUXGA

Abbreviation for **S**uper **U**ltra **E**xtended **G**raphics **A**rray; Generally a screen resolution of 2048 × 1536 pixels (4:3). An alternative name is QXGA (**Q**uad E**x**tended **G**raphics **A**rray), which is 4x the pixel resolution of XGA.

SVGA

Abbreviation for »**S**uper **V**ideo **G**raphics **A**rray«; Graphics standard with a resolution of at least 800×600 pixels and at least 256 colors.

Switch

Device, similar to a hub, that takes data packets received in a network and, unlike a hub, does not pass them on to all network nodes, instead only to the respective addressee. Unlike a hub, a switch provides targeted communication within a network that only takes place between sender and receiver. Other network nodes are not involved.

SXGA

Abbreviation for Super Extended Graphics Array. Graphics standard with a screen resolution of 1280 × 1024 pixels (aspect ratio 5:4).

SXGA+

Abbreviation for SXGA Plus; Generally 1400 × 1050 pixels.

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.

T

Task

Program unit that is assigned a specific priority by the real-time operating system. It contains a complete process and can consist of several modules.

Keypad modules

Keypad modules are divided into two groups: **Standard Keypad Modules** (can be cascaded to a controller) and **Special Keypad Modules** (must be connected by an electrician according to the function e.g. Emergency Stop)

TCP/IP

Transmission Control Protocol/Internet Suit of Protocols. Network protocol that has become the generally accepted standard for data exchange in heterogeneous networks. TCP/IP is used both in local networks for communication between various computer and also for LAN to WAN access.

TFT display

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) that result in an active matrix. In its 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.

Touch screen

Screen with touch sensors for activating an item with the finger.

TXD

An abbreviation for "Transmit (**TX**) **D**ata". 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 connected to pin 2 of the plug.

U

UART

An abbreviation for "**U**niversal **A**synchronous **R**eceiver-**T**ransmitter". A module generally consisting of a single integrated circuit that combines the circuits required for asynchronous serial communication for both sending and receiving. UART represents the most common type of circuit in modems for connecting to a personal computer.

UDMA

An abbreviation for "**U**ltra **D**irect **M**emory **A**ccess". A special IDE data transfer mode that allows high data transfer rates for drives. There have been many variations in recent times.
UDMA33 mode transfers 33 megabytes per second.
UDMA66 mode transfers 66 megabytes per second.
UDMA100 mode transfers 100 megabytes per second.
Both the mainboard and the hard drive must support the specification to implement modifications.

UPS

Abbreviation for "**U**ninterruptible **P**ower **S**upply". See "UPS".

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 »**U**niversal **S**erial **B**us« 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 "**U**ninterruptible **P**ower **S**upply". The UPS supplies power to systems that 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 without losing data if a power failure occurs.

UXGA

Abbreviation for »**U**ltra **E**xtended **G**raphics **A**rray« Generally a screen resolution of 1600 × 1200 pixels (aspect ratio 4:3, 12:9).

Appendix A

V

VGA

An abbreviation for "**V**ideo **G**raphics **A**dapter". A video adapter which can handle all EGA (Enhanced Graphics Adapter) video modes and adds several new modes.

W

Windows CE

Compact 32-bit operating system with multitasking and multithreading that Microsoft developed especially for the OEM market. It can be ported for various processor types and has a high degree of real-time capability. The development environment uses proven, well-established development tools. It is an open and scalable Windows operating system platform for many different devices. Examples of such devices are handheld PCs, digital wireless receivers, intelligent mobile phones, multimedia consoles, etc. In embedded systems, Windows CE is also an excellent choice for automation technology.

WSXGA

Wide SXGA, generally 1600 × 900 pixels (16:9).

WUXGA

Wide UXGA, generally 1920 × 1200 pixels (16:10).

WXGA

Wide XGA, generally 1280 × 768 pixels.

X

XGA

An abbreviation for "E**X**tended **G**raphics **A**rray". An expanded standard for graphics controllers and monitors that was introduced by IBM in 1990. This standard supports 640x480 resolution with 65,536 colors or 1024x768 resolution with 256 colors. This standard is generally used in workstation systems.

XTX

Abbreviation for »e**X**press **T**echnologoy for ET**X**« A further development consistent with the proven ETX® standard The newest I/O technology is implemented on a reliable form factor in XTX. Durch Verzicht auf den kaum mehr verwendeten ISA-Bus wird der ETX® Stecker X2 mit neuen seriellen Bussen wie PCI Express™ und Serial ATA® belegt. All other signals on the X1, X3 and X4 interfaces remain completely compatible with the ETX® Standard (Rev. 2.7). However, if ISA signals are needed, a PCI-ISA can be implemented on the base board. Wesentlich preisgünstiger als eine Bridge-Lösung ist die Verwendung des bei XTX™ bereits vorhanden LPC Busses.

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