Power Panel 300/400

User's Manual

Version: **1.30 (May 2007)**

Model number: **MAPP300.400-ENG**

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Chapter 1 • General information

Information:

B&R does its best to keep the printed versions of its user's manuals as current as possible. However, any newer versions of the User's Manual can always be downloaded in electronic form (pdf) from the B&R homepage www.br-automation.com.

1. Manual history

Version	Date	Change
0.10 Preliminary	31.10.2006	- First version
1.00	21.11.2006	Changes / new features - Contents of delivery for individual components expanded. - "Standards and certifications" on page 251 added. - "Touch screen" on page 305 added. - "Mylar" on page 307 added. - "B&R Key Editor" on page 309 added. - "Glossary" on page 322 added. - 2 GB USB flash drive 5MMUSB.2048-00 from SanDisk added. - Document now includes the chm tag "Filename". - Model numbers for Windows CE, Windows XPe and the HMI Drivers & Utilities DVD added. - Rear view of devices 5PP320.0571-29, 5PP320.0573-39, 5PP320.1043-39 and 5PP320.1214-39 added. - Text changes: General device interfaces on device interfaces. - "Distribution of resources" on page 239 added. - "VESA mode support" on page 250 added. - "Power Panel 400 with Automation Runtime" on page 242 added. - "BIOS upgrade und utilities" on page 232 added. - aPCI slot cover added. - "Legend strip templates" on page 280 added. - HMI Drivers & Utilities DVD 5SWHMI.0000-00 added. - "Mounting orientation" on page 177 added. - "Null modem cable 9A0017.0x" on page 299 added. - "Mounting compatibilities" on page 311 added. - "Key and LED configurations" on page 178 added.

Table 1: Manual history

Version	Date	Change
1.10	22.02.2007	Changes / new features - Rear view of device 5PP320.1505-39 added. - Driver support information modified. - Section "Automation Runtime and SMC" removed. - Images of battery exchange changed. - CompactFlash 8192 MB SSI is enabled. - Image of Ethernet connection changed. - Label description and images changed (there is no longer a safety sticker). - aPCI slot cover section removed. - HMI Drivers and Utilities DVD section removed. - Technical data (L1 cache, L2 cache, Touch Controller, SRAM on BIOS devices) revised. - Figure text added for Figure 149. - Windows CE description updated. - "BIOS upgrade und utilities" on page 232 updated. - Serial number sticker changed. - "Distribution of resources" on page 239 updated. - "Automation Runtime summary screen - ex. 4PP420.1043-75" on page 242 changed. - Rear views added. - Chapter "Power Panel 300 with BIOS" on page 187 updated.
1.20	20.04.2007	Changes / new features - USB flash drive 5MMUSB.0256-00 and USB flash drive 5MMUSB.1024-00 cancelled. - "Automation Runtime summary screen - ex. 4PP420.1043-75" on page 242 updated. - Rear views for devices 4PP420.0571-A5, 4PP451.0571-65 and 4PP481.1043-B5 added. - Section "USB flash drive" on page 294 updated. - Chapter "Power Panel 300 with BIOS" on page 187 updated.
1.30	04.05.2007	Changes / new features - Chapter 4 “Software“ on page 187 revised.

Table 1: Manual history (cont.)

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

In addition to "Electrical components with housing", the following also applies:

- 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 may only 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 operational 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 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.

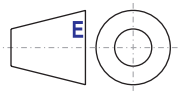
3. Organization of safety notices

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 Power Panel 300 with BIOS

Model number	Short description	Note
5PP320.0571-29	**Power Panel PP320 BIOS 5.7" QVGA, touch screen** 5.7" QVGA color LC display with touch screen (resistive), 256 MB SDRAM; CompactFlash slot (type I), ETH 10/100, RS 232, 2xUSB; battery; metal housing, IP65 protection (front side); 24VDC (Order screw clamp 0TB103.9 or cage clamp 0TB103.91 separately.)	See page 38
5PP320.0573-39	**Power Panel PP320 BIOS 5.7" VGA, touch screen** 5.7" VGA color TFT display with touch screen (resistive), 256 MB SDRAM; CompactFlash slot (type I), ETH 10/100, RS 232, 2xUSB; battery; metal housing, IP65 protection (front side); 24VDC (Order screw clamp 0TB103.9 or cage clamp 0TB103.91 separately.)	See page 44
5PP320.1043-39	**Power Panel PP320 BIOS 10.4" VGA, touch screen** 10.4" VGA color TFT display with touch screen (resistive), 256 MB SDRAM; CompactFlash slot (type I), ETH 10/100, RS 232, 2xUSB; battery; metal housing, IP65 protection (front side); 24VDC (Order screw clamp 0TB103.9 or cage clamp 0TB103.91 separately.)	See page 50
5PP320.1214-39	**Power Panel PP320 BIOS 12.1" SVGA, touch screen** 12.1" SVGA color TFT display with touch screen (resistive), 256 MB SDRAM; CompactFlash slot (type I), ETH 10/100, RS 232, 2xUSB; battery; metal housing, IP65 protection (front side); 24VDC (Order screw clamp 0TB103.9 or cage clamp 0TB103.91 separately.)	See page 56
5PP320.1505-39	**Power Panel PP320 BIOS 15" XVGA, touch screen** 15" XGA color TFT display with touch screen (resistive), 256 MB SDRAM; CompactFlash slot (type I), ETH 10/100, RS 232, 2xUSB; battery; metal housing, IP65 protection (front side); 24VDC (Order screw clamp 0TB103.9 or cage clamp 0TB103.91 separately.)	See page 62

Table 3: Model number overview - Power Panel 300 devices

5.2 Power Panel 400 with Automation Runtime

Model number	Short description	Note
4PP420.0571-45	**Power Panel PP420 5.7" QVGA, 1 aPCI, touch screen** 5.7" QVGA b/w LC display with touch screen (resistive); 1 aPCI slot; 64 MB SDRAM; 512KB SRAM; CompactFlash slot (Type I); ETH 10/100; RS232; 2xUSB; battery; metal housing, IP65 protection (front side); 24 VDC (Order 0TB103.9 screw clamps or 0TB103.91 cage clamps separately).	See page 78
4PP420.0571-65	**Power Panel PP420 5.7" QVGA, 1 aPCI, touch screen** 5.7" QVGA color LC display with touch screen (resistive); 1 aPCI slot; 64 MB SDRAM; 512KB SRAM; CompactFlash slot (Type I); ETH 10/100; RS232; 2xUSB; battery; metal housing, IP65 protection (front side); 24 VDC (Order 0TB103.9 screw clamp or 0TB103.91 cage clamp separately).	See page 84
4PP420.0571-A5	**Power Panel PP420 5.7" QVGA, 2 aPCI, touch screen** 5.7" QVGA color LC display with touch screen (resistive), 2 aPCI slots; 64 MB SDRAM; 512 KB SRAM, CompactFlash slot (type I), ETH 10/100, RS232, 2xUSB; battery; metal housing, IP65 protection (front side); 24VDC (Order screw clamp 0TB103.9 or cage clamp 0TB103.91 separately.)	See page 90
4PP420.0573-75	**Power Panel PP420 5.7" VGA, 1 aPCI, touch screen** 5.7" VGA color TFT display with touch screen (resistive); 1 aPCI slot; 64 MB SDRAM; 512 KB SRAM; CompactFlash slot (Type I); ETH 10/100; RS232; 2xUSB; battery; metal housing, IP65 protection (front side); 24 VDC (Order 0TB103.9 screw clamp or 0TB103.91 cage clamp separately).	See page 96

Table 4: Model number overview - Power Panel 400 devices

Model number	Short description	Note
4PP420.1043-75	**Power Panel PP420 10.4" VGA, 1 aPCI, touch screen** 10.4" VGA color TFT display with touch screen (resistive), 1 aPCI slot; 64 MB SDRAM; 512 KB SRAM, CompactFlash slot (type I), ETH 10/100, RS232, 2xUSB; battery; metal housing, IP65 protection (front side); 24 VDC (Order screw clamp 0TB103.9 or cage clamp 0TB103.91 separately.)	See page 102
4PP420.1043-B5	**Power Panel PP420 10.4" VGA, 2 aPCI, touch screen** 10.4" VGA color TFT display with touch screen (resistive), 2 aPCI slots; 64 MB SDRAM; 512 KB SRAM, CompactFlash slot (type I), ETH 10/100, RS232, 2xUSB; battery; metal housing, IP65 protection (front side); 24 VDC (Order screw clamp 0TB103.9 or cage clamp 0TB103.91 separately.)	See page 108
4PP420.1505-75	**Power Panel PP420 15" XGA, 1 aPCI, touch screen** 15" XGA color TFT display with touch screen (resistive); 1 aPCI slot; 64 MB SDRAM; 512 KB SRAM; CompactFlash slot (Type I); ETH 10/100; RS232; 2xUSB; battery; metal housing, IP65 protection (front side); 24 VDC (Order 0TB103.9 screw clamp or 0TB103.91 cage clamp separately).	See page 114
4PP420.1505-B5	**Power Panel PP420 15" XGA, 2 aPCI, touch screen** 15" XGA color TFT display with touch screen (resistive), 2 aPCI slots; 64 MB SDRAM; 512 KB SRAM, CompactFlash slot (type I), ETH 10/100, RS232, 2xUSB; battery; metal housing, IP65 protection (front side); 24 VDC (Order screw clamp 0TB103.9 or cage clamp 0TB103.91 separately.)	See page 120
4PP451.0571-65	**Power Panel PP451 5.7" QVGA, 1 aPCI, touch screen, keys** 5.7" QVGA color LC display; 6 softkeys; 16 function and 20 system keys; 1 aPCI slot; 64 MB SDRAM; 512 KB SRAM; CompactFlash slot (type I); ETH 10/100; RS232; 2xUSB; battery; metal housing, IP65 protection (front side); 24VDC (Order screw clamp 0TB103.9 or cage clamp 0TB103.91 separately.)	See page 126
4PP452.0571-65	**Power Panel PP452 5.7" QVGA, 1 aPCI, touch screen, keys** 5.7" QVGA color LC display; 20 function and 20 system keys; 1 aPCI slot; 64 MB SDRAM; 512 KB SRAM; CompactFlash slot (type I); ETH 10/100; RS232; 2xUSB; battery; metal housing, IP65 protection (front side); 24VDC (Order screw clamp 0TB103.9 or cage clamp 0TB103.91 separately.)	See page 132
4PP480.1043-75	**Power Panel PP480 10.4" VGA, 1 aPCI, touch screen, keys** 10.4" VGA color TFT display with touch screen (resistive); 10 softkeys and 12 function keys; 1 aPCI slot; 64 MB SDRAM; 512 KB SRAM; CompactFlash slot (Type I); ETH 10/100; RS232; 2xUSB; battery; metal housing, IP65 protection (front side); 24 VDC (Order 0TB103.9 screw clamp or 0TB103.91 cage clamp separately).	See page 138
4PP480.1505-75	**Power Panel PP480 15" XGA, 1 aPCI, touch screen, keys** 15" XGA color TFT display with touch screen (resistive); 12 softkeys and 20 function keys; 1 aPCI slot; 64 MB SDRAM; 512 KB SRAM; CompactFlash slot (type I); ETH 10/100; RS232; 2xUSB; battery; metal housing, IP65 protection (front side); 24 VDC (Order screw clamp 0TB103.9 or cage clamp 0TB103.91 separately.)	See page 144
4PP481.1043-75	**Power Panel PP481 10.4" VGA, 1 aPCI, touch screen, keys** 10.4" VGA TFT color display with touch screen (resistive); 10 softkeys, 28 function keys and 2 system keys; 1 aPCI slot; 64 MB SDRAM; 512 KB SRAM; CompactFlash slot (type I); ETH 10/100; RS232; 2xUSB; battery; metal housing, IP65 protection (front side); 24 VDC (Order 0TB103.9 screw clamp or 0TB103.91 cage clamp separately).	See page 150
4PP481.1043-B5	**Power Panel PP481 10.4" VGA, 2 aPCI, touch screen, keys** 10.4" VGA TFT color display with touch screen (resistive); 10 softkeys, 28 function keys and 20 system keys; 2 aPCI slots; 64 MB SDRAM; 512 KB SRAM; CompactFlash slot (type I); ETH 10/100; RS232; 2xUSB; battery; metal housing, IP65 protection (front side); 24 VDC (Order screw clamp 0TB103.9 or cage clamp 0TB103.91 separately.)	See page 156

Table 4: Model number overview - Power Panel 400 devices (cont.)

Model number	Short description	Note
4PP481.1505-75	**Power Panel PP481 15" XGA, 1 aPCI, touch screen, keys** 15" XGA color TFT display with touch screen (resistive); 12 softkeys, 20 function keys and 92 system keys; 1 aPCI slot; 64 MB SDRAM; 512 KB SRAM; CompactFlash slot (type I); ETH 10/100; RS232; 2xUSB; battery; metal housing, IP65 protection (front side); 24 VDC (Order screw clamp 0TB103.9 or cage clamp 0TB103.91 separately.)	See page 162
4PP482.1043-75	**Power Panel PP482 10.4" VGA, 1 aPCI, touch screen, keys** 10.4" VGA color TFT display with touch screen (resistive); 44 function keys and 20 system keys; 1 aPCI slot; 64 MB SDRAM; 512 KB SRAM; CompactFlash slot (type I); ETH 10/100; RS232; 2xUSB; battery; metal housing, IP65 protection (front side); 24 VDC (Order screw clamp 0TB103.9 or cage clamp 0TB103.91 separately.)	See page 168

Table 4: Model number overview - Power Panel 400 devices (cont.)

5.3 Accessories

Model number	Short description	Note
0AC201.9	**Lithium batteries, 5 pcs.** Lithium batteries, 5 pcs., 3 V / 950 mAh, button cell	See page 277
4A0006.00-000	**Lithium battery (1x)** Lithium battery, 1 pc., 3 V / 950 mAh, button cell	See page 277
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	See page 278
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	See page 278
5AC900.057X-00	**Legend strips 3x 5.7" vertical1** Legend strip template for Power Panel 4PP451.0571-65. For 3 devices.	See page 280
5AC900.057X-01	**Legend strips 2x 5.7" horizontal2** Legend strip template for Power Panel 4PP452.0571-65. For 2 devices.	See page 280
5AC900.104X-00	**Legend strip 1x 10.4" vertical1** Legend strip template for Power Panel 4PP451.1043-75 and 4PP481.1043-B5. For 1 device.	See page 280
5AC900.104X-01	**Legend strip 1x 10.4" horizontal2** Legend strip template for Power Panel 4PP482.1043-75. For 1 device.	See page 280
5AC900.104X-02	**Legend strips 3x 10.4" horizontal1** Legend strip template for Power Panel 4PP480.1043-75. For 3 devices.	See page 280
5AC900.150X-00	**Legend strips 4x 15"** Legend strip template for Power Panel 4PP481.1505-75 and 4PP480.1505-75. For 4 devices.	See page 280
5CFCRD.0064-03	**CompactFlash 64 MB SSI** CompactFlash card with 64 MB SLC NAND Flash, and IDE/ATA interface	See page 282
5CFCRD.0128-03	**CompactFlash 128 MB SSI** CompactFlash card with 128 MB SLC NAND Flash, and IDE/ATA interface	See page 282
5CFCRD.0256-03	**CompactFlash 256 MB SSI** CompactFlash card with 256 MB SLC NAND Flash, and IDE/ATA interface	See page 282
5CFCRD.0512-03	**CompactFlash 512 MB SSI** CompactFlash card with 512 MB SLC NAND Flash, and IDE/ATA interface	See page 282
5CFCRD.1024-03	**CompactFlash 1024 MB SSI** CompactFlash card with 1024 MB SLC NAND Flash, and IDE/ATA interface	See page 282

Table 5: Model number overview - accessories

Model number	Short description	Note
5CFCRD.2048-03	**CompactFlash 2048 MB SSI** CompactFlash card with 2048 MB SLC NAND Flash, and IDE/ATA interface	See page 282
5CFCRD.4096-03	**CompactFlash 4096 MB SSI** CompactFlash card with 4096 MB SLC NAND Flash, and IDE/ATA interface	See page 282
5CFCRD.8192-03	**CompactFlash 8192 MB SSI** CompactFlash card with 8192 MB SLC NAND Flash, and IDE/ATA interface	See page 282
5MMUSB.0128-00	**USB flash drive 128 MB SanDisk** USB 2.0 flash drive 128 MB	*Cancelled since 12/2005 - Replaced by 5MMUSB.0512-00*
5MMUSB.0256-00	**USB flash drive 256 MB SanDisk** USB 2.0 flash drive 256 MB	*Cancelled since 12/2005 - Replaced by 5MMUSB.0512-00*
5MMUSB.0512-00	**USB flash drive 512 MB SanDisk** USB 2.0 flash drive 512 MB	See page 294
5MMUSB.1024-00	**USB flash drive 1 GB SanDisk** USB 2.0 flash drive 1 GB	*Cancelled since 12/2005 - Replaced by 5MMUSB.2048-00*
5MMUSB.2048-00	**USB flash drive 2 GB SanDisk** USB 2.0 flash drive 2 GB	See page 294
9A0017.01	**RS232 DB9 null modem cable 0.6 m** Null modem cable RS232 0.6 m to connect UPS and IPC (9-pin DSUB socket - 9-pin DSUB socket)	See page 299
9A0017.02	**RS232 DB9 null modem cable 1.8 m** Null modem cable RS232 1.8 m to connect UPS and IPC (9-pin DSUB socket - 9-pin DSUB socket)	See page 299

Table 5: Model number overview - accessories (cont.)

5.4 Software

Model number	Short description	Note
9S0001.13-010	**OEM MS-WinCE4.1 German** OEM Microsoft Windows CE 4.1 German license; only supplied together with a Power Panel BIOS device.	
9S0001.37-020	**OEM Microsoft Windows CE 5.0 English** OEM Microsoft Windows CE 5.0 English license; only supplied together with a Power Panel BIOS device.	
9S0001.39-020	**OEM MS WinXPe PP 300/400 w/CF SP2** OEM Microsoft Windows XP embedded SP2 for PP300/400 BIOS, German. Only delivered with a Power Panel BIOS device	

Table 6: Model number overview - software

Chapter 2 • Technical data

1. General information

The new Power Panel 300/400 generation expands upon B&R's proven Power Panel 100/200 line. With more than twice the computing power, the new generation covers a performance range that until recently could only be handled by industrial PCs.

For the Power Panel 300 and the Power Panel 400, B&R also implements the proven product lines of BIOS devices (Power Panel 300) and embedded devices (Power Panel 400). Power Panel 300 devices can be delivered with the Windows XP embedded and Windows CE operating systems. They cover the entire range of PC systems, from simple thin clients and web terminals to full SCADA systems. Power Panel 400 products are designed to automate complete systems. Integrated control functionality and drive technology together with modular interfaces for connecting peripheral devices for the process. Models ranging from 5.7" QVGA to 15" XGA meet all requirements for series machine manufacturing. There is a new combination of 5.7" diagonal and VGA TFT display. It allows a great deal of information to be displayed in a small amount of space and images can be shown is detail. Entries are made either via touch screen or using function keys.

Figure 1: Power Panel 300 and Power Panel 400 devices

1.1 Features

- 24 VDC supply voltage
- 2 USB 2.0 connections
- Ethernet 10/100 MBit interface
- CompactFlash card (type I) slot
- RS232 interface, modem-capable, not electrically isolated
- 2 operating mode switches (2 x 16 digit)
- 2 status LEDs (User or CompactFlash card access)
- ATX power supply compatibility
- Power button
- Fan-free operation
- Touch screen (analog resistive), function keys or both[1)]
- Horizontal and vertical mounting orientations, numeric and alphanumeric keys[1)]
- Maximum 2 aPCI slots (see B&R System 2005 User's Manual for available aPCI interface modules)[1)]
- BIOS or Automation Runtime operating system[1)]
- Real-time clock (battery-buffered)
- Up to 256 MB SDRAM main memory[1)]

1) Depending on the design of the particular Power Panel device.

1.2 Advantages of Power Panel 300/400 over Power Panel 100/200

1.2.1 Electrical

- More powerful processor (Geode LX800 = more than twice the performance)
- 180° rotated power supply plug
- Insyde BIOS
- Power button
- ATX compatible power supply
- USB 2.0 support
- Different network controller
- MTCX controller
- Lower power consumption

1.2.2 Mechanical

- Mechanically mounting compatible (see "Mounting compatibilities" on page 311) - but connections are not compatible (locations of interfaces, plugs, and keys have changed).

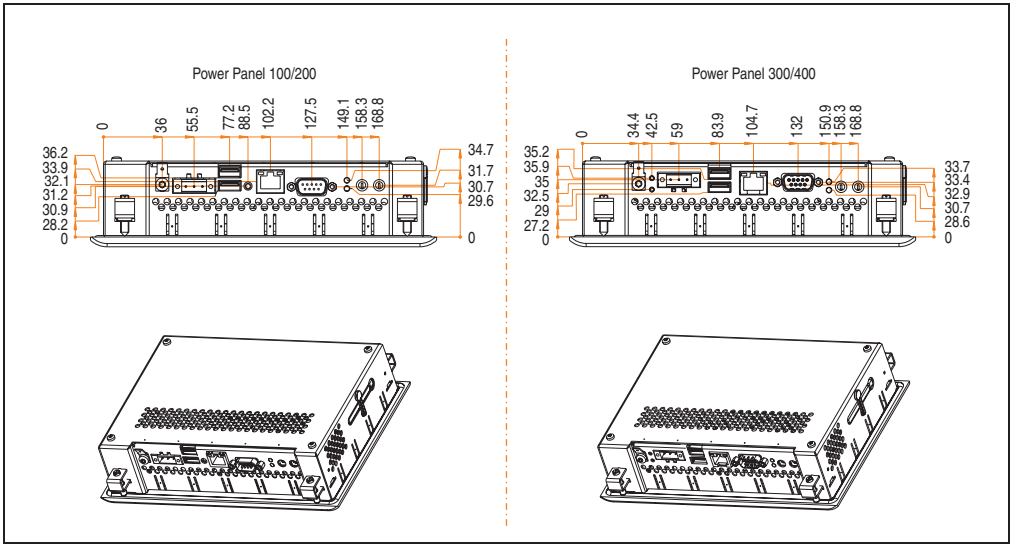


Figure 2: Different plug and key positions (PP100/200 - PP300/400)

2. Power Panel 300 with BIOS

2.1 Device interfaces

The following section provides a description of all interfaces and plugs possible with a Power Panel 300 device with BIOS.

2.1.1 Supply voltage

Input voltage: 24 VDC ± 25%

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 clamps) or 0TB103.91 (cage clamps).

The pin assignments can be found either in the following table or printed onto the Power Panel plate. The supply voltage is internally protected 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).

Supply voltage	
Protected against reverse polarity	
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

Figure 3: Supply voltage connection

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.

2.1.2 Functional grounding clip

Next to the supply voltage plug there is a functional grounding clip. The grounding clip (functional ground) must be connected with a central grounding point on the switching cabinet using a 6.3 mm blade connector via the shortest distance and with as little resistance as possible (e.g. copper strip, but must be at least 2.5 mm²).

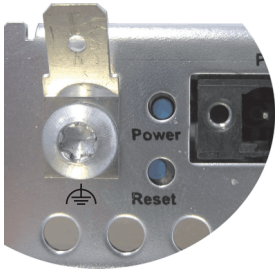
Grounding clip


Figure 4: Functional grounding clip

2.1.3 Serial interface COM

The Power Panel is equipped with a PC-compatible serial interface with a TBD FIFO buffer. This non-electrically isolated interface is primarily intended for programming Power Panel devices using Automation Studio.

The RS232 can also be used as a general interface (e.g. third-party connections, barcode reader, etc.).

Serial interface (COM)		
Type	RS232, modem-capable, not electrically isolated	9-pin DSUB connector 
UART	TBD	
Transfer rate	Up to 115 kBaud	
Pin	**Assignment**	
1	DCD	
2	RxD	
3	TxD	
4	DTR	
5	GND	
6	DSR	
7	RTS	
8	CTS	
9	RI	

Table 7: Pin assignments - COM

2.1.4 USB port

The Power Panel 300/400 devices have a USB 2.0 (Universal Serial Bus) host controller with multiple USB ports, two of which are on the outside for easy user access.

Universal serial bus		
Transfer rate	Low speed (1.5 MBit/s), full speed (12 MBit/s), to high speed (480 Mbit/s)	2x USB Type A, female 
Power supplies	Max. 500 mA per port[1)]	
Maximum cable length	5 m (not including hub)	

Table 8: USB port

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

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.

Important!

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

Driver support

For optimal functionality of USB 2.0 (transfer speed up to 480 Mbit/s), special drivers must be installed.
Drivers for Windows XP Embedded and Windows CE are available for download on the B&R homepage in the download area (**www.br-automation.com**) .

2.1.5 Mode/Node switches

Power Panel devices are equipped with 2 hex switches that serve as operating mode switches. Switch positions 01 to FD are available for any purpose in an application and can be evaluated by the application program.

Mode/Node switches


Table 9: Mode/Node switches

Switch position		Function	Description
SW1 (x16)	SW2 (x1)		
0	0	Service mode	TBD
x	x	None	No other switch positions have significance.

Table 10: Switch settings for the mode/node switch

2.1.6 Status LEDs

Power Panels are equipped with two status LEDs that are visible on the outside.

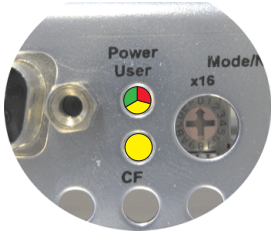
Status LEDs				
LED	**Color**		**Meaning**	1x three-color, 1x one-color 
Power User	Green	On	Supply voltage OK	
	Red	On	The system is in standby mode (S5: soft-off mode or S4: hibernate mode - suspend-to-disk).	
	Yellow	On	Can be used however the user wants (for example, can be turned on/off directly using the ADI library)	
CF	Yellow	On	Indicates access to CompactFlash drive (read or write)	

Figure 5: Status LEDs

2.1.7 Ethernet connection

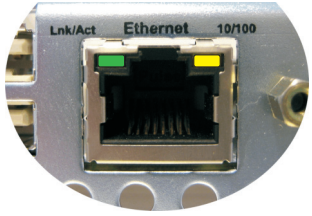
Ethernet connection			
Controller	Intel 82551ER		RJ45 twisted pair (10BaseT/100BaseT), female 
Cabling	S/STP (category 5)		
Transfer rate	10/100 MBit/s [1]		
LED	**On**	**Off**	
Green	100 MBit/s	10 MBit/s	
Orange	Link (Ethernet network connection available)	Activity (blinking) (Data transfer in progress)	

Table 11: Ethernet connection

1) Both operating modes possible. Change-over takes place automatically.

2.1.8 Power button

Due to the complete ATX power supply support, the power button serves a number of functions, which can be configured in BIOS setup.

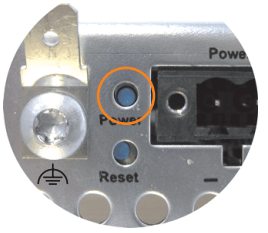
Power button	
The power button can be pressed with a pointed object (i.e. paper clip or tip of a pen). The power button acts like the on/off switch on a normal desktop PC with ATX power supply: **press and release** ... turn on or shut down operating system. **press and hold** ... ATX power supply switches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

Table 12: Power button

2.1.9 Reset button

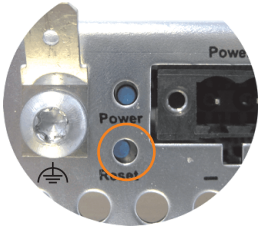
Reset button	
The reset button can be pressed with a pointed object (i.e. paper clip or tip of a pen). Pushing the reset button results in a hardware-reset. The Power Panel restarts (cold restart). The MTCX processor is not reset when the reset button is pressed.	

Table 13: Reset button

Warning!

A system reset can cause data to be lost!

2.1.10 CompactFlash slot

Power Panel devices are equipped with a CompactFlash slot that is accessible from the side. CompactFlash cards of type I are supported.

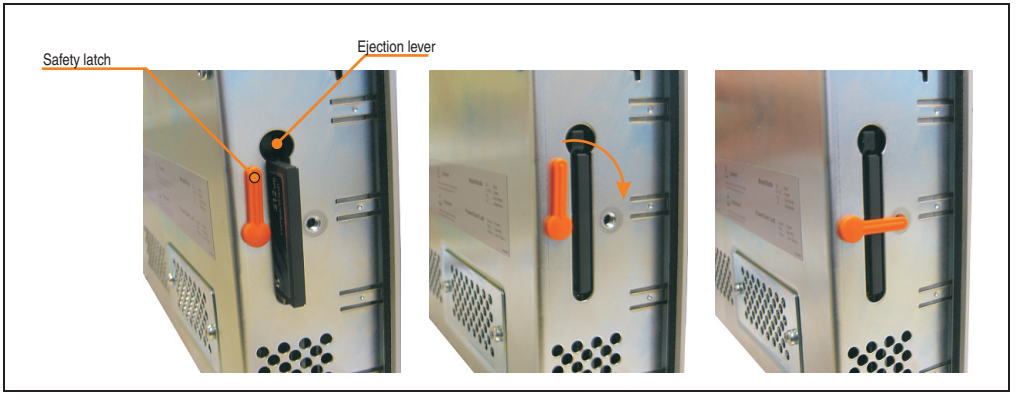


Figure 6: CompactFlash slot

It is possible to protect the CompactFlash slot using a safety latch. By pressing the ejector (using a pointed object is the best way to do this) the CompactFlash card can be changed quickly and safely.

Caution!

The power must be turned off before inserting or removing the CompactFlash card! As a safety measure, a sticker is also attached to Power Panel devices stating this.

2.2 Labels

2.2.1 Device label

The following sticker can be found in a suitable location on the Power Panel device:

Figure 7: Device label

2.2.2 Serial number sticker

General information

Each B&R device is given a unique serial number sticker with a barcode that allows the device to be clearly identified.

Design/Dimensions

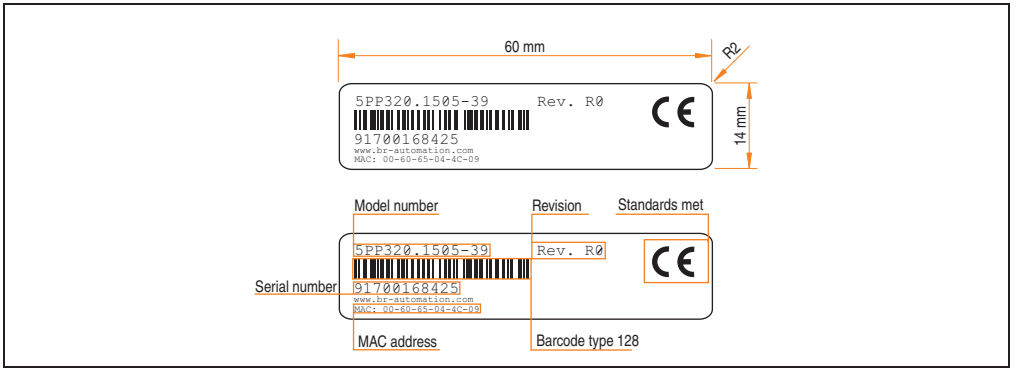


Figure 8: Serial number sticker design/dimensions

Information on the Internet

Information about each device can also be found on the B&R homepage. Enter the device's serial number in the serial number search field on the start page **www.br-automation.com**. The search also works if you enter the model number or the material number in the material number search field. The search provides you with a detailed list of the individual components.

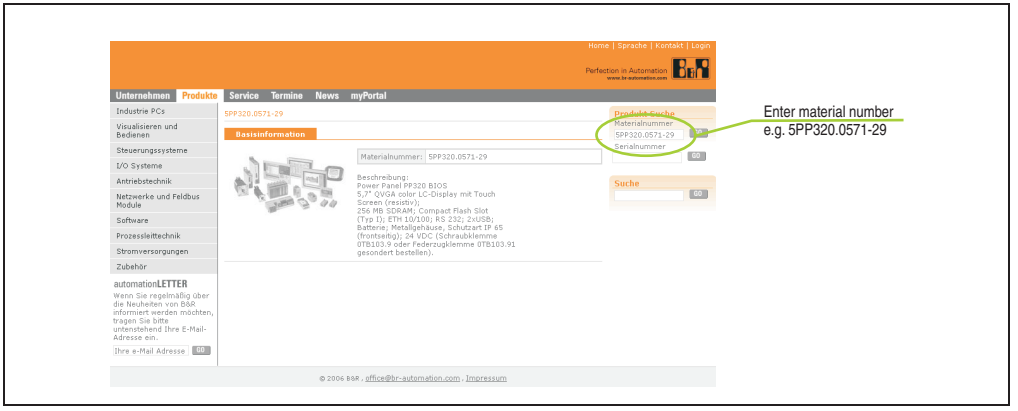


Figure 9: Example - material number search: 5PP320.0571-29

2.3 Device 5PP320.0571-29

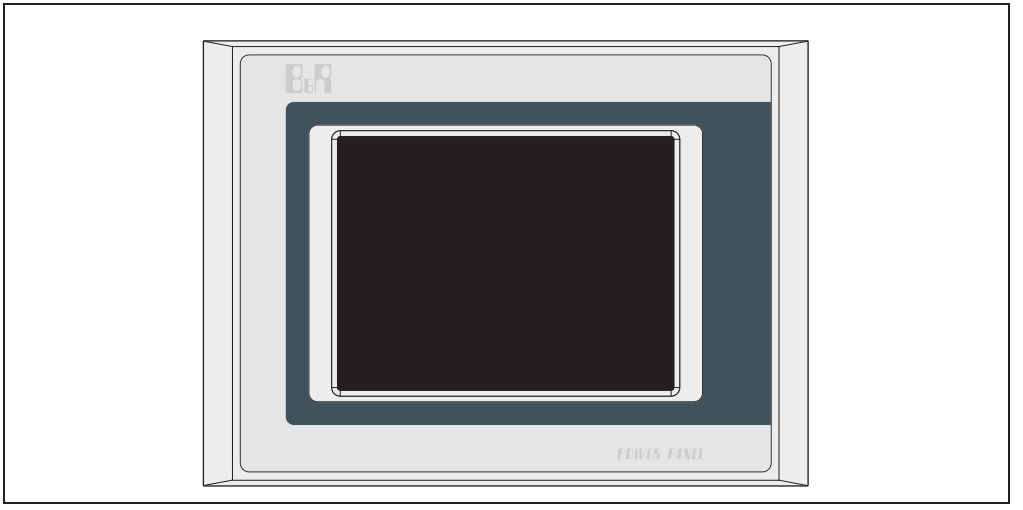


Figure 10: Front view - 5PP320.0571-29

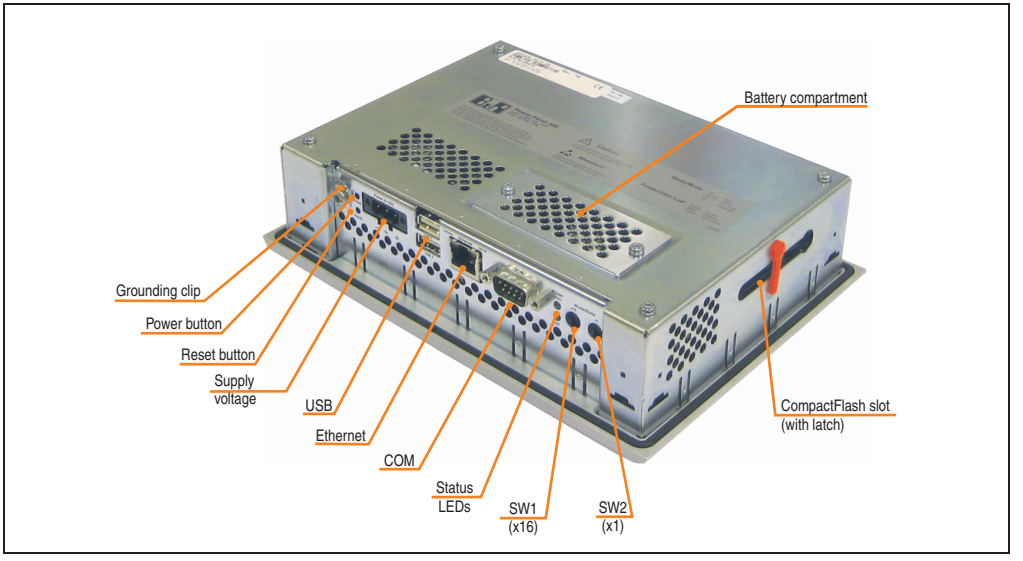


Figure 11: Rear view - 5PP320.0571-29

2.3.1 Technical data

Features	5PP320.0571-29
Boot loader / Operating system	BIOS
Processor Type Expanded command set L1 cache L2 cache Floating point unit (FPU) Cooling Type	 Geode LX800 500 MHz, 32-bit x86 MMX technology, streaming SIMD extension 128 KB (64 KB L cache / 64 KB D cache) 128 KB Yes Passive (heat sink)
Flash	2 MB (for firmware)
Memory Type Size	 DDRAM 256 MB
Graphics[1)] Controller Memory	 Geode LX800 TBD MB shared memory (reserved by main memory)
SRAM Size Battery-buffered	 -
Watchdog Controller	 MTCX[2)]
Power failure logic Controller Buffer time	 MTCX[2)] TBD ms
Real-time clock Battery-buffered Accuracy	 Yes Typ. TBD ppm[3)]
Battery Type Removable Lifespan Backup capacitor (for changing battery) Buffer time	 Renata 950 mAh Yes, accessible from the outside 4 years [4)] 10 minutes
Ethernet[1)] Controller Transfer rate Connection Cable NE2000-compatible	 Intel 82551ER 10/100 Mbps RJ45 twisted pair (10 Base T / 100 Base T) S/STP (category 5) -
CompactFlash Type Number Connection	 Type I 1 slot Primary IDE device
Serial interface Type UART Transfer rate Connection	 RS232, modem-capable, not electrically isolated TBD compatible, TBD byte FIFO Max. 115 kBaud 9-pin DSUB

Table 14: Technical data - 5PP320.0571-29

Features	5PP320.0571-29
USB interface	
Type	USB 1.1, USB 2.0
Number	2
Transfer rate	Low speed (1.5 MBit/s), full speed (12 MBit/s), to high speed (480 Mbit/s)
Connection	Type A
Current load	Max. 500 mA per connection
Reset button	Yes, accessible from the outside
Power button	Yes, accessible from the outside
LEDs	1x CF (yellow) 1x combined power (red/green) and user (yellow)
Mode/Node switches	2, 16 digits each
aPCI slots	-
Display	
Type	Color LCD
Diagonal	5.7" (144 mm)
Colors	512 colors [5]
Resolution	QVGA, 320 x 240 pixels
Contrast	40:1
Perspective (see page 308)	
Horizontal	Direction a / direction b = 40°
Vertical	Direction c = 40°/ direction d = 50°
Background lighting	
Brightness	150 cd/m²
Half-brightness time	50000 hours
Touch screen [1]	
Technology	Analog, resistive
Controller	Elo, serial, 12-bit
Degree of transmission	Up to 80% ± 5%
Filter glass	-
Degree of transmission	
Coating	
Keys/LED	-
Function keys	
Soft keys	
Cursor keys	
Number block	
Other keys	
Key lifespan	
LED brightness	
Electrical characteristics	
Power supply	
Rated voltage	24 VDC ±25%
Rated current	TBD A
Starting current	Maximum TBD A for < TBD ms
Power consumption	TBD W typically, maximum TBD W max.
Electrical isolation	Yes
Ground resistance	0 Ohm

Table 14: Technical data - 5PP320.0571-29 (cont.)

Mechanical characteristics	5PP320.0571-29
Outer dimensions	
Width	212 mm
Height	156 mm
Depth	55.5 mm
Front	
Frame	Aluminum, naturally anodized[6)]
Design	Gray[6)]
Membrane	Polyester
Dark gray border around display	Similar to Pantone 432CV[6)]
Light background	Similar to Pantone 427CV[6)]
Gasket	Flat gasket around display front
Housing	Metal
Weight	Approx. 1.6 kg
Environmental characteristics	
Ambient temperature	
Operation	TBD
Storage	TBD
Transport	TBD
Relative humidity	
Operation	TBD
Storage	TBD
Transport	TBD
Vibration	
Operation (continuous)	TBD
Operation (occasional)	TBD
Storage	TBD
Transport	TBD
Shock	
Operation	TBD
Storage	TBD
Transport	TBD
Protection type	IP20 back side (only with installed CompactFlash card) IP65 / NEMA 250 type 4X, dust and sprayed water protection (front side)
Altitude	Max. 3000 m

Table 14: Technical data - 5PP320.0571-29 (cont.)

1) The necessary drivers can be downloaded from the download area on the B&R homepage (www.br-automation.com).

2) Maintenance Controller Extended.

3) At the maximum specified ambient temperature, the deviation can increase to typically TBD ppm.

4) Enter environmental conditions (temperature, self discharge, etc.)

5) The actual number of colors depends on the graphics memory, the graphics mode set and the graphics driver used.

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

2.3.2 Dimensions

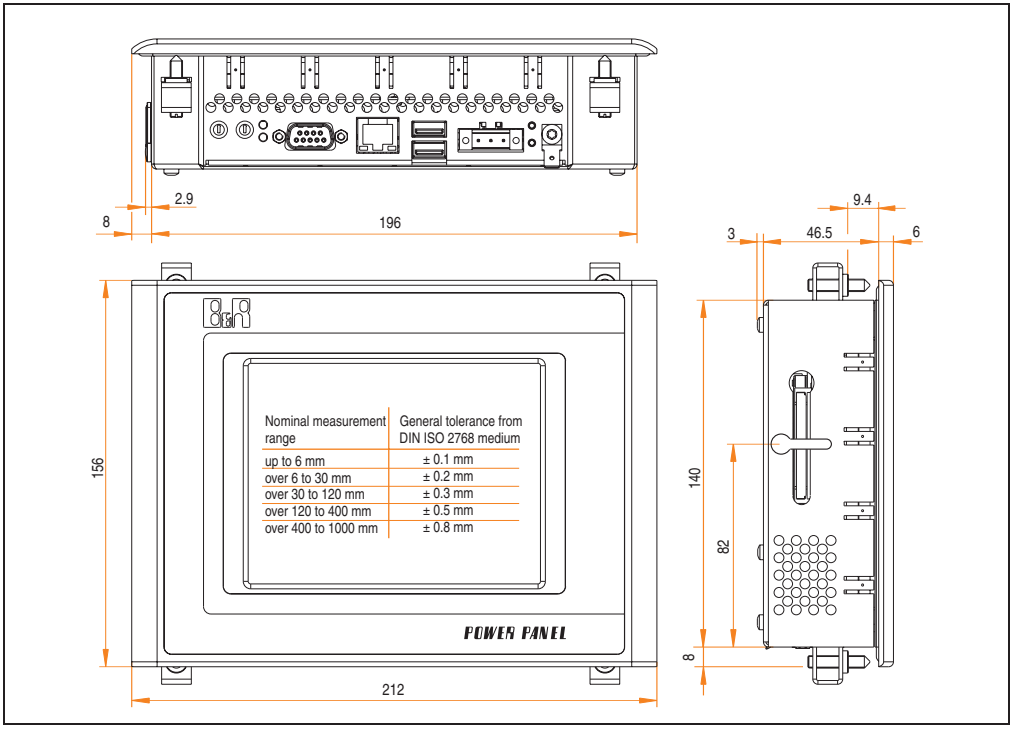


Figure 12: Dimensions - 5PP320.0571-29

2.3.3 Cutout installation

The cutout hole is to be made according to the following dimensions for cutout installation. The device must be mounted using the retaining clips included in delivery.

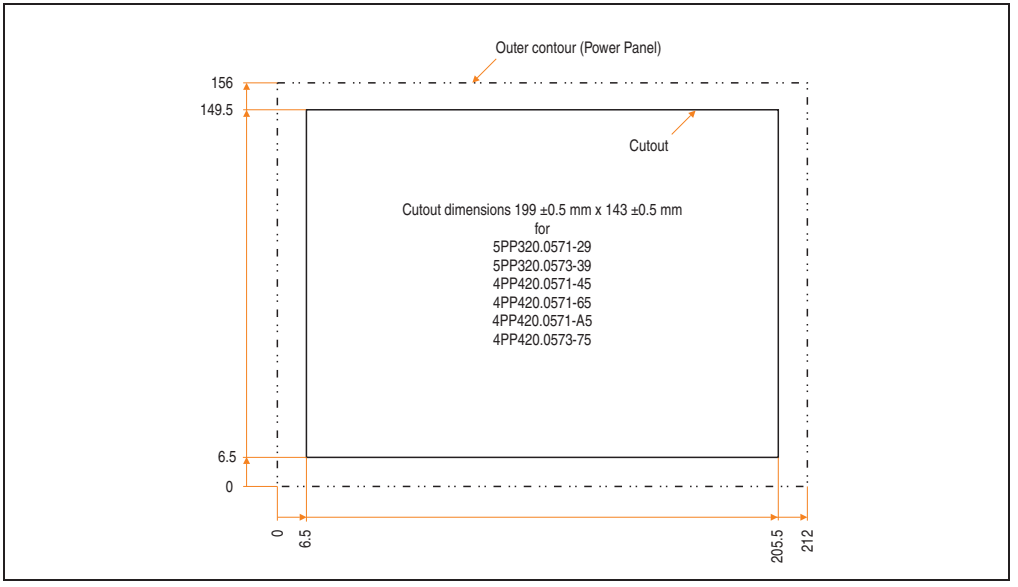


Figure 13: Cutout installation - 5PP320.0571-29

2.3.4 Contents of delivery

The following components are included in the delivery of the Power Panel device:

Number	Component
1	Power Panel PP320 BIOS 5.7" QVGA, touch screen
4	Retaining clips included
1	Lithium battery 3 V / 950 mAh included

Table 15: Contents of delivery - 5PP320.0571-29

2.4 Device 5PP320.0573-39

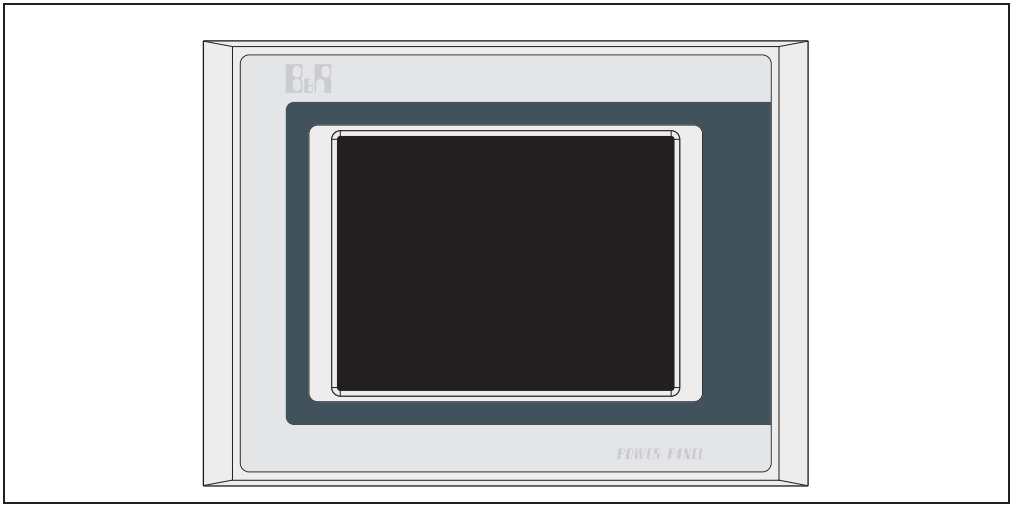


Figure 14: Front view - 5PP320.0573-39

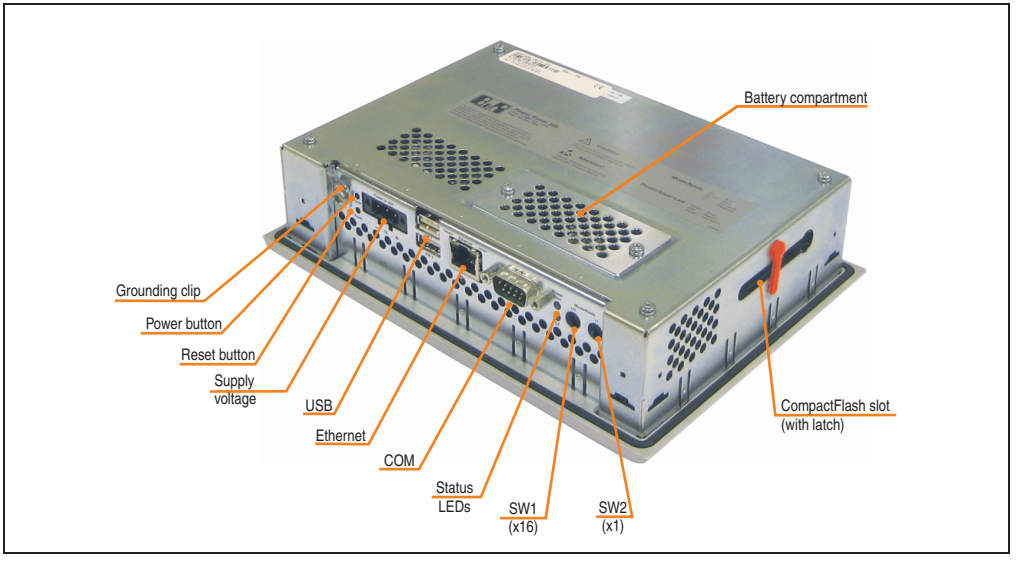


Figure 15: Rear view - 5PP320.0573-39

2.4.1 Technical data

Features	5PP320.0573-39
Boot loader / Operating system	BIOS
Processor Type Expanded command set L1 cache L2 cache Floating point unit (FPU) Cooling Type	 Geode LX800 500 MHz, 32-bit x86 MMX technology, streaming SIMD extension 128 KB (64 KB L cache / 64 KB D cache) 128 KB Yes Passive (heat sink)
Flash	2 MB (for firmware)
Memory Type Size	 DDRAM 256 MB
Graphics[1)] Controller Memory	 Geode LX800 TBD MB shared memory (reserved by main memory)
SRAM Size Battery-buffered	 -
Watchdog Controller	 MTCX[2)]
Power failure logic Controller Buffer time	 MTCX[2)] TBD ms
Real-time clock Battery-buffered Accuracy	 Yes Typ. TBD ppm[3)]
Battery Type Removable Lifespan Backup capacitor (for changing battery) Buffer time	 Renata 950 mAh Yes, accessible from the outside 4 years [4)] 10 minutes
Ethernet[1)] Controller Transfer rate Connection Cable NE2000-compatible	 Intel 82551ER 10/100 Mbps RJ45 twisted pair (10 Base T / 100 Base T) S/STP (category 5) -
CompactFlash Type Number Connection	 Type I 1 slot Primary IDE device
Serial interface Type UART Transfer rate Connection	 RS232, modem-capable, not electrically isolated TBD compatible, TBD byte FIFO Max. 115 kBaud 9-pin DSUB

Table 16: Technical data - 5PP320.0573-39

Features	5PP320.0573-39
USB interface Type Number Transfer rate Connection Current load	 USB 1.1, USB 2.0 2 Low speed (1.5 MBit/s), full speed (12 MBit/s), to high speed (480 Mbit/s) Type A Max. 500 mA per connection
Reset button	Yes, accessible from the outside
Power button	Yes, accessible from the outside
LEDs	1x CF (yellow) 1x combined power (red/green) and user (yellow)
Mode/Node switches	2, 16 digits each
aPCI slots	-
Display Type Diagonal Colors Resolution Contrast Perspective (see page 308) Horizontal Vertical Background lighting Brightness Half-brightness time	 TFT colors 5.7" (144 mm) 262144 colors [5)] VGA, 640 x 480 pixels 400:1 Direction a / direction b = 80° Direction c = 80°/ direction d = 70° 350 cd/m² 75000 hours
Touch screen [1)] Technology Controller Degree of transmission	 Analog, resistive Elo, serial, 12-bit Up to 80% ± 5%
Filter glass Degree of transmission Coating	-
Keys/LED Function keys Soft keys Cursor keys Number block Other keys Key lifespan LED brightness	-
Electrical characteristics	
Power supply Rated voltage Rated current Starting current Power consumption Electrical isolation	 24 VDC ±25% TBD A Maximum TBD A for < TBD ms TBD W typically, maximum TBD W max. Yes
Ground resistance	0 Ohm

Table 16: Technical data - 5PP320.0573-39 (cont.)

Mechanical characteristics	5PP320.0573-39
Outer dimensions	
Width	212 mm
Height	156 mm
Depth	55.5 mm
Front	
Frame	Aluminum, naturally anodized[6)]
Design	Gray[6)]
Membrane	Polyester
Dark gray border around display	Similar to Pantone 432CV[6)]
Light background	Similar to Pantone 427CV[6)]
Gasket	Flat gasket around display front
Housing	Metal
Weight	Approx. 1.6 kg
Environmental characteristics	
Ambient temperature	
Operation	TBD
Storage	TBD
Transport	TBD
Relative humidity	
Operation	TBD
Storage	TBD
Transport	TBD
Vibration	
Operation (continuous)	TBD
Operation (occasional)	TBD
Storage	TBD
Transport	TBD
Shock	
Operation	TBD
Storage	TBD
Transport	TBD
Protection type	IP20 back side (only with installed CompactFlash card) IP65 / NEMA 250 type 4X, dust and sprayed water protection (front side)
Altitude	Max. 3000 m

Table 16: Technical data - 5PP320.0573-39 (cont.)

1) The necessary drivers can be downloaded from the download area on the B&R homepage (www.br-automation.com).

2) Maintenance Controller Extended.

3) At the maximum specified ambient temperature, the deviation can increase to typically TBD ppm.

4) Enter environmental conditions (temperature, self discharge, etc.)

5) The actual number of colors depends on the graphics memory, the graphics mode set and the graphics driver used.

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

2.4.2 Dimensions

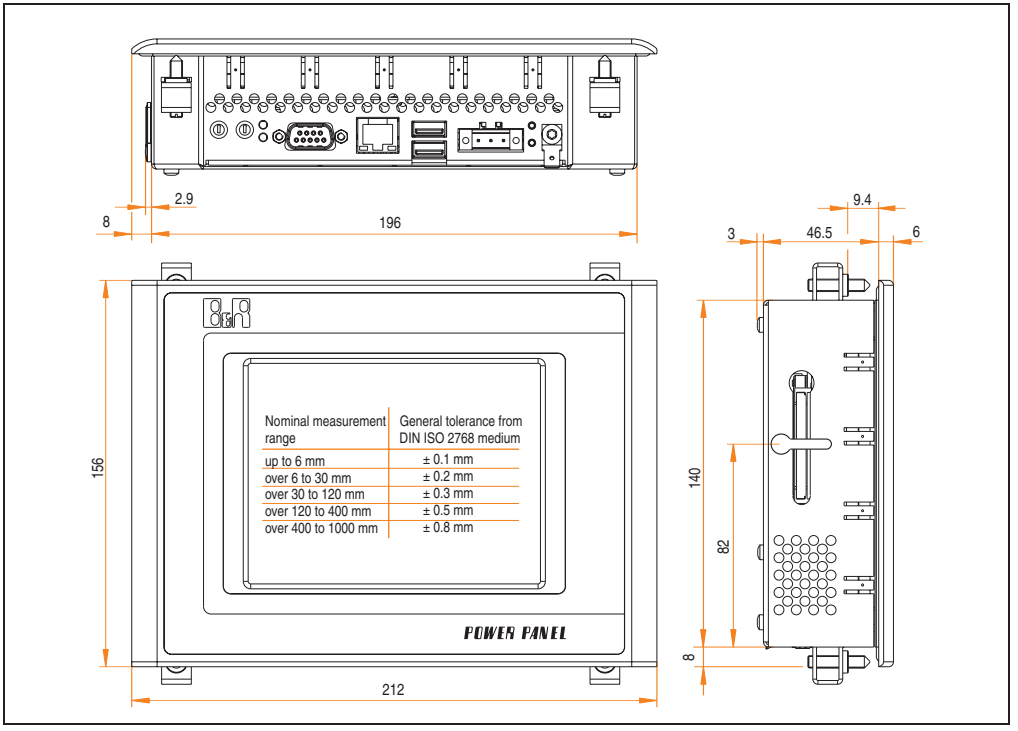


Figure 16: Dimensions - 5PP320.0573-39

2.4.3 Cutout installation

The cutout hole is to be made according to the following dimensions for cutout installation. The device must be mounted using the retaining clips included in delivery.

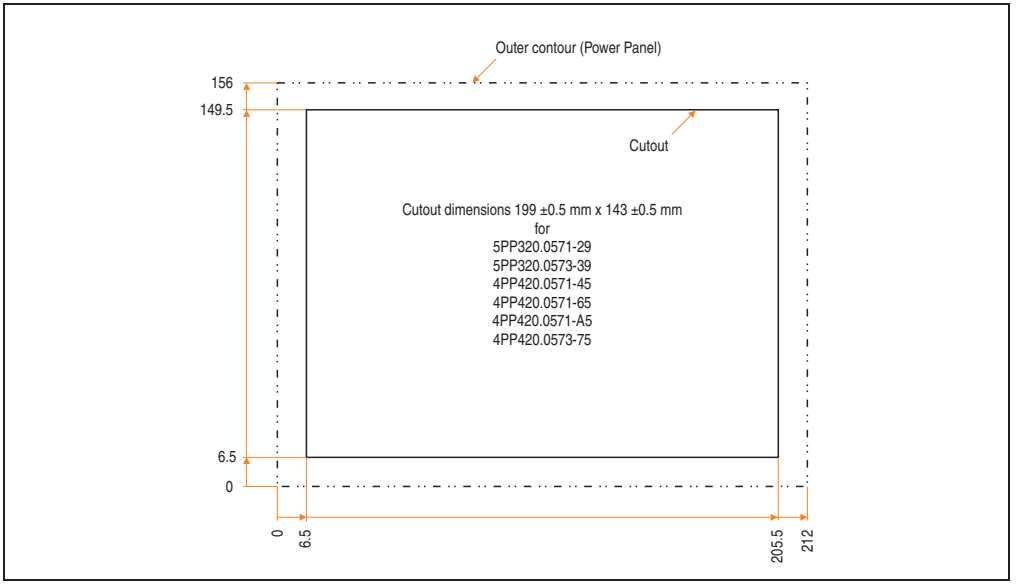


Figure 17: Cutout installation - 5PP320.0573-39

2.4.4 Contents of delivery

The following components are included in the delivery of the Power Panel device:

Number	Component
1	Power Panel PP320 BIOS 5.7" VGA, touch screen
4	Retaining clips included
1	Lithium battery 3 V / 950 mAh included

Table 17: Contents of delivery - 5PP320.0573-39

2.5 Device 5PP320.1043-39

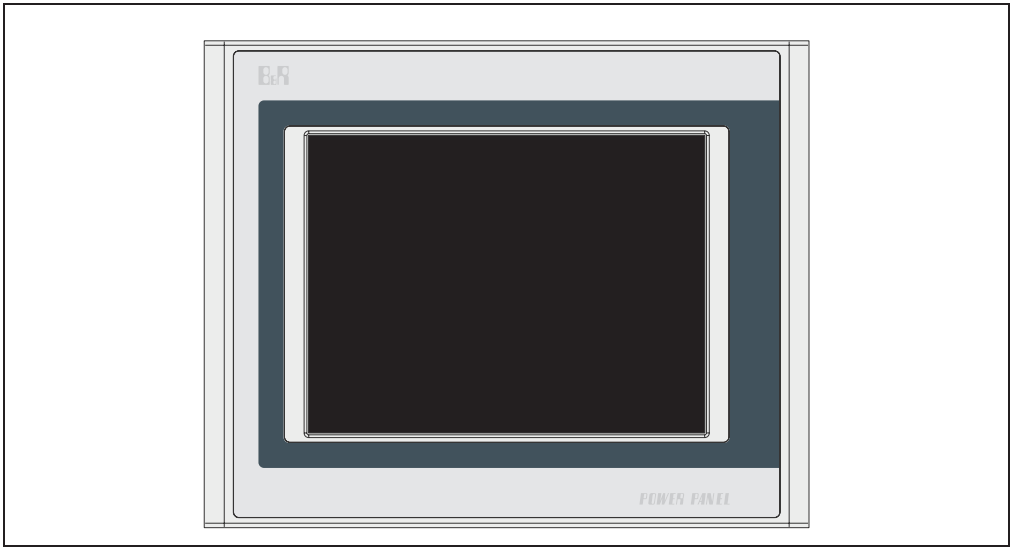


Figure 18: Front view - 5PP320.1043-39

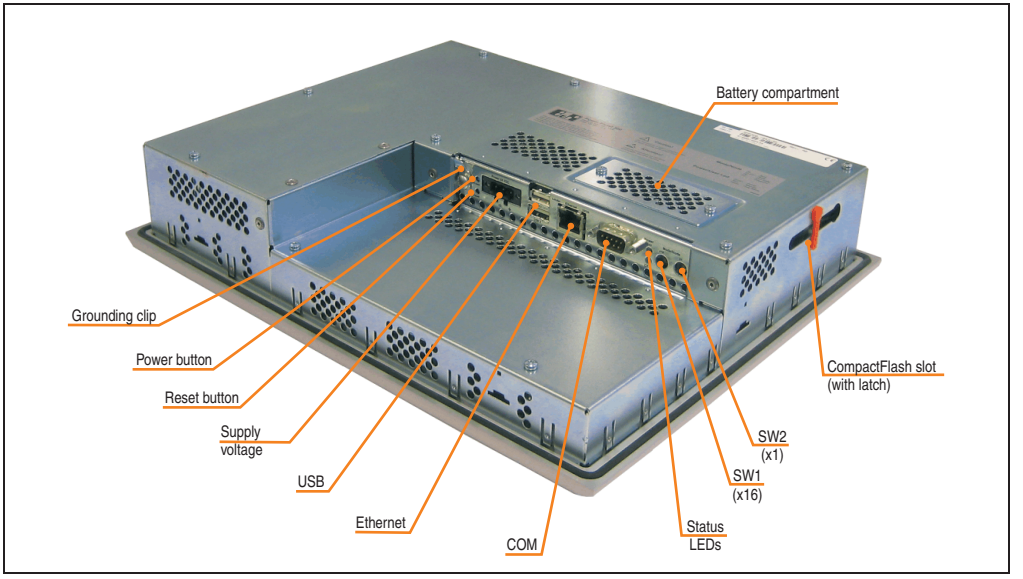


Figure 19: Rear view - 5PP320.1043-39

2.5.1 Technical data

Features	5PP320.1043-39
Boot loader / Operating system	BIOS
Processor Type Expanded command set L1 cache L2 cache Floating point unit (FPU) Cooling Type	 Geode LX800 500 MHz, 32-bit x86 MMX technology, streaming SIMD extension 128 KB (64 KB L cache / 64 KB D cache) 128 KB Yes Passive (heat sink)
Flash	2 MB (for firmware)
Memory Type Size	 DDRAM 256 MB
Graphics[1)] Controller Memory	 Geode LX800 TBD MB shared memory (reserved by main memory)
SRAM Size Battery-buffered	 -
Watchdog Controller	 MTCX[2)]
Power failure logic Controller Buffer time	 MTCX[2)] TBD ms
Real-time clock Battery-buffered Accuracy	 Yes Typ. TBD ppm[3)]
Battery Type Removable Lifespan Backup capacitor (for changing battery) Buffer time	 Renata 950 mAh Yes, accessible from the outside 4 years [4)] 10 minutes
Ethernet[1)] Controller Transfer rate Connection Cable NE2000-compatible	 Intel 82551ER 10/100 Mbps RJ45 twisted pair (10 Base T / 100 Base T) S/STP (category 5) -
CompactFlash Type Number Connection	 Type I 1 slot Primary IDE device
Serial interface Type UART Transfer rate Connection	 RS232, modem-capable, not electrically isolated TBD compatible, TBD byte FIFO Max. 115 kBaud 9-pin DSUB

Table 18: Technical data - 5PP320.1043-39

Features	5PP320.1043-39
USB interface Type Number Transfer rate Connection Current load	 USB 1.1, USB 2.0 2 Low speed (1.5 MBit/s), full speed (12 MBit/s), to high speed (480 Mbit/s) Type A Max. 500 mA per connection
Reset button	Yes, accessible from the outside
Power button	Yes, accessible from the outside
LEDs	1x CF (yellow) 1x combined power (red/green) and user (yellow)
Mode/Node switches	2, 16 digits each
aPCI slots	-
Display Type Diagonal Colors Resolution Contrast Perspective (see page 308) Horizontal Vertical Background lighting Brightness Half-brightness time	 TFT colors 10.4" (264 mm) 262144 colors [5)] VGA, 640 x 480 pixels 600:1 Direction a / direction b = 70° Direction c = 45°/ direction d = 35° 350 cd/m² 55000 hours
Touch screen [1)] Technology Controller Degree of transmission	 Analog, resistive Elo, serial, 12-bit Up to 80% ± 5%
Filter glass Degree of transmission Coating	-
Keys/LED Function keys Soft keys Cursor keys Number block Other keys Key lifespan LED brightness	-
Electrical characteristics	
Power supply Rated voltage Rated current Starting current Power consumption Electrical isolation	 24 VDC ±25% TBD A Maximum TBD A for < TBD ms TBD W typically, maximum TBD W max. Yes
Ground resistance	0 Ohm

Table 18: Technical data - 5PP320.1043-39 (cont.)

Mechanical characteristics	5PP320.1043-39
Outer dimensions	
Width	323 mm
Height	260 mm
Depth	65.5 mm
Front	
Frame	Aluminum, naturally anodized[6]
Design	Gray[6]
Membrane	Polyester
Dark gray border around display	Similar to Pantone 432CV[6]
Light background	Similar to Pantone 427CV[6]
Gasket	Flat gasket around display front
Housing	Metal
Weight	Approx. 1.3 kg
Environmental characteristics	
Ambient temperature	
Operation	TBD
Storage	TBD
Transport	TBD
Relative humidity	
Operation	TBD
Storage	TBD
Transport	TBD
Vibration	
Operation (continuous)	TBD
Operation (occasional)	TBD
Storage	TBD
Transport	TBD
Shock	
Operation	TBD
Storage	TBD
Transport	TBD
Protection type	IP20 back side (only with installed CompactFlash card) IP65 / NEMA 250 type 4X, dust and sprayed water protection (front side)
Altitude	Max. 3000 m

Table 18: Technical data - 5PP320.1043-39 (cont.)

1) The necessary drivers can be downloaded from the download area on the B&R homepage (www.br-automation.com).

2) Maintenance Controller Extended.

3) At the maximum specified ambient temperature, the deviation can increase to typically TBD ppm.

4) Enter environmental conditions (temperature, self discharge, etc.)

5) The actual number of colors depends on the graphics memory, the graphics mode set and the graphics driver used.

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

2.5.2 Dimensions

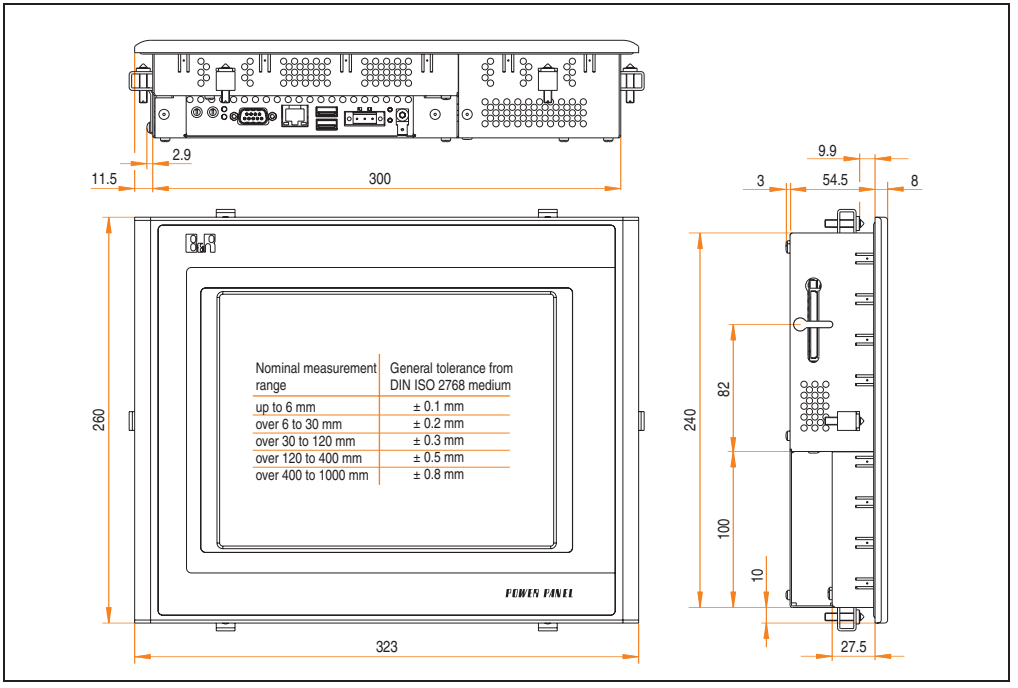


Figure 20: Dimensions - 5PP320.1043-39

2.5.3 Cutout installation

The cutout hole is to be made according to the following dimensions for cutout installation. The device must be mounted using the retaining clips included in delivery.

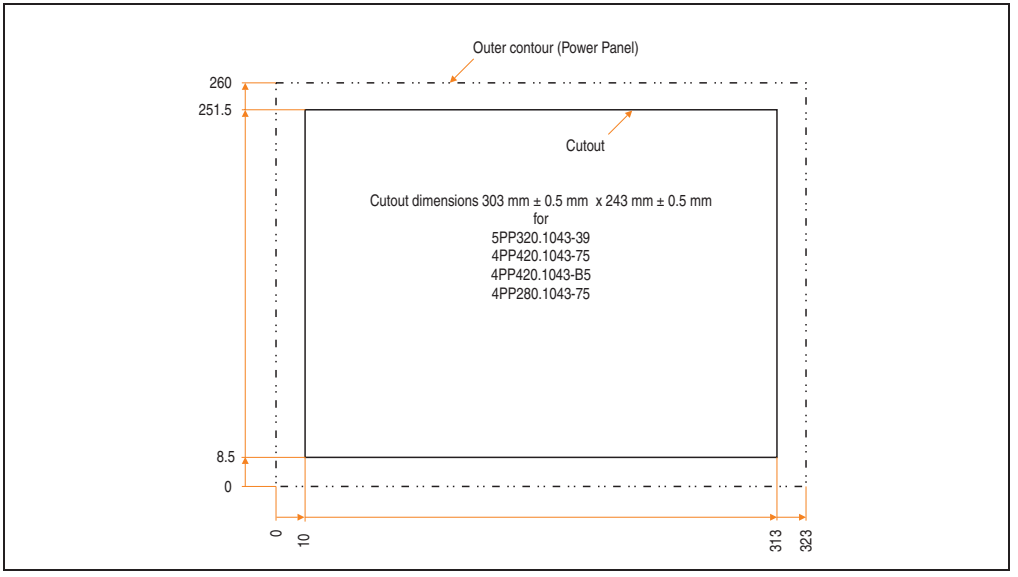


Figure 21: Cutout installation - 5PP320.1043-39

2.5.4 Contents of delivery

The following components are included in the delivery of the Power Panel device:

Number	Component
1	Power Panel PP320 BIOS 10.4" VGA, touch screen
6	Retaining clips included
1	Lithium battery 3 V / 950 mAh included

Table 19: Contents of delivery - 5PP320.1043-39

2.6 Device 5PP320.1214-39

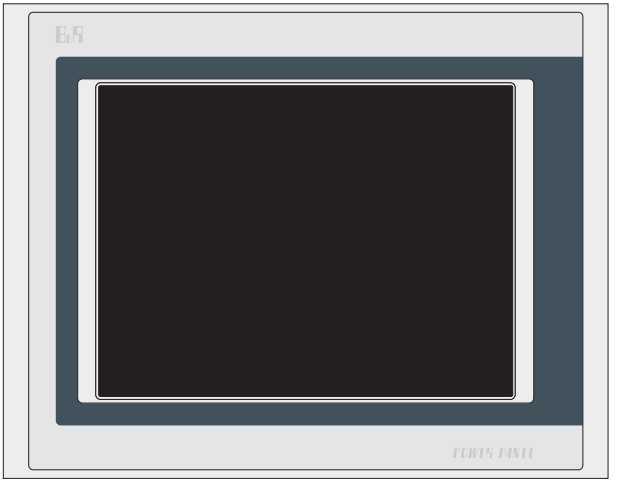


Figure 22: Front view - 5PP320.1214-39

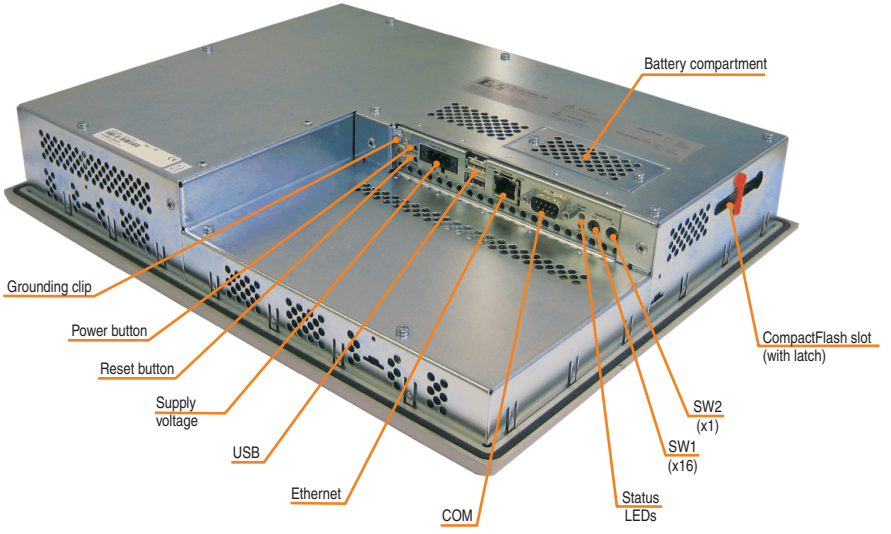


Figure 23: Rear view - 5PP320.1214-39

2.6.1 Technical data

Features	5PP320.1214-39
Boot loader / Operating system	BIOS
Processor Type Expanded command set L1 cache L2 cache Floating point unit (FPU) Cooling Type	 Geode LX800 500 MHz, 32-bit x86 MMX technology, streaming SIMD extension 128 KB (64 KB L cache / 64 KB D cache) 128 KB Yes Passive (heat sink)
Flash	2 MB (for firmware)
Memory Type Size	 DDRAM 256 MB
Graphics[1)] Controller Memory	 Geode LX800 TBD MB shared memory (reserved by main memory)
SRAM Size Battery-buffered	 -
Watchdog Controller	 MTCX[2)]
Power failure logic Controller Buffer time	 MTCX[2)] TBD ms
Real-time clock Battery-buffered Accuracy	 Yes Typ. TBD ppm[3)]
Battery Type Removable Lifespan Backup capacitor (for changing battery) Buffer time	 Renata 950 mAh Yes, accessible from the outside 4 years [4)] 10 minutes
Ethernet[1)] Controller Transfer rate Connection Cable NE2000-compatible	 Intel 82551ER 10/100 Mbps RJ45 twisted pair (10 Base T / 100 Base T) S/STP (category 5) -
CompactFlash Type Number Connection	 Type I 1 slot Primary IDE device
Serial interface Type UART Transfer rate Connection	 RS232, modem-capable, not electrically isolated TBD compatible, TBD byte FIFO Max. 115 kBaud 9-pin DSUB

Table 20: Technical data - 5PP320.1214-39

Features	5PP320.1214-39
USB interface Type Number Transfer rate Connection Current load	 USB 1.1, USB 2.0 2 Low speed (1.5 MBit/s), full speed (12 MBit/s), to high speed (480 Mbit/s) Type A Max. 500 mA per connection
Reset button	Yes, accessible from the outside
Power button	Yes, accessible from the outside
LEDs	1x CF (yellow) 1x combined power (red/green) and user (yellow)
Mode/Node switches	2, 16 digits each
aPCI slots	-
Display Type Diagonal Colors Resolution Contrast Perspective (see page 308) Horizontal Vertical Background lighting Brightness Half-brightness time	 TFT colors 12.1" (307 mm) 262144 colors [5)] VGA, 800 x 600 pixels 300:1 Direction a / direction b = 70° Direction c = 50°/ direction d = 60° 350 cd/m² 55000 hours
Touch screen [1)] Technology Controller Degree of transmission	 Analog, resistive Elo, serial, 12-bit Up to 80% ± 5%
Filter glass Degree of transmission Coating	-
Keys/LED Function keys Soft keys Cursor keys Number block Other keys Key lifespan LED brightness	-
Electrical characteristics	
Power supply Rated voltage Rated current Starting current Power consumption Electrical isolation	 24 VDC ±25% TBD A Maximum TBD A for < TBD ms TBD W typically, maximum TBD W max. Yes
Ground resistance	0 Ohm

Table 20: Technical data - 5PP320.1214-39 (cont.)

Mechanical characteristics	5PP320.1214-39
Outer dimensions	
Width	362 mm
Height	284 mm
Depth	65.5 mm
Front	
Frame	Aluminum, naturally anodized[6)]
Design	Gray[6)]
Membrane	Polyester
Dark gray border around display	Similar to Pantone 432CV[6)]
Light background	Similar to Pantone 427CV[6)]
Gasket	Flat gasket around display front
Housing	Metal
Weight	Approx. TBD kg
Environmental characteristics	
Ambient temperature	
Operation	TBD
Storage	TBD
Transport	TBD
Relative humidity	
Operation	TBD
Storage	TBD
Transport	TBD
Vibration	
Operation (continuous)	TBD
Operation (occasional)	TBD
Storage	TBD
Transport	TBD
Shock	
Operation	TBD
Storage	TBD
Transport	TBD
Protection type	IP20 back side (only with installed CompactFlash card) IP65 / NEMA 250 type 4X, dust and sprayed water protection (front side)
Altitude	Max. 3000 m

Table 20: Technical data - 5PP320.1214-39 (cont.)

1) The necessary drivers can be downloaded from the download area on the B&R homepage (www.br-automation.com).

2) Maintenance Controller Extended.

3) At the maximum specified ambient temperature, the deviation can increase to typically TBD ppm.

4) Enter environmental conditions (temperature, self discharge, etc.)

5) The actual number of colors depends on the graphics memory, the graphics mode set and the graphics driver used.

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

2.6.2 Dimensions

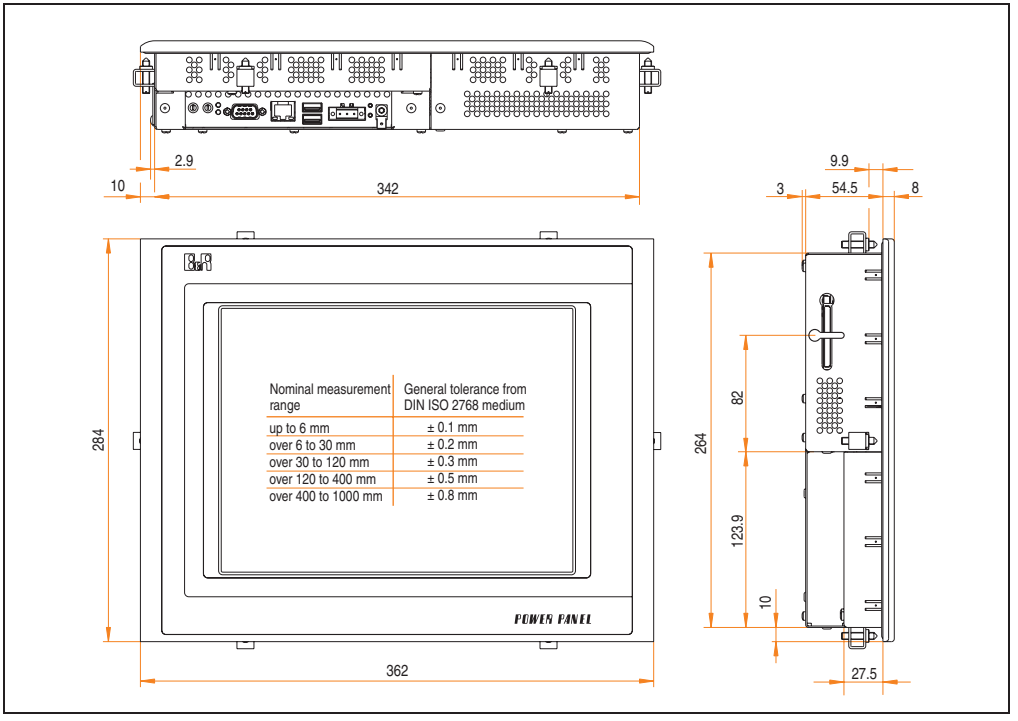


Figure 24: Dimensions - 5PP320.1214-39

2.6.3 Cutout installation

The cutout hole is to be made according to the following dimensions for cutout installation. The device must be mounted using the retaining clips included in delivery.

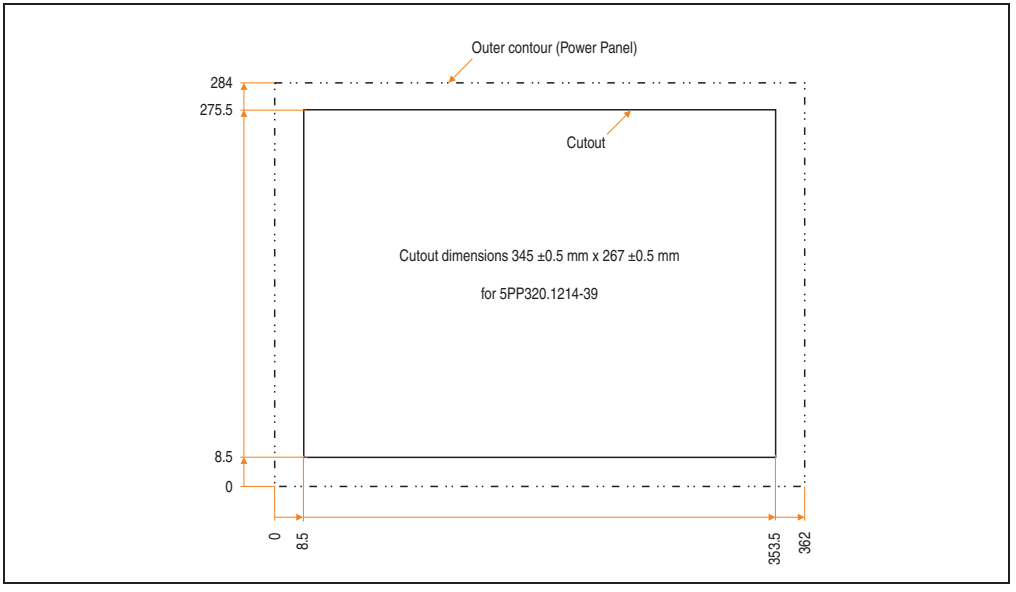


Figure 25: Cutout installation - 5PP320.1214-39

2.6.4 Contents of delivery

The following components are included in the delivery of the Power Panel device:

Number	Component
1	Power Panel PP320 BIOS 12.1" SVGA, touch screen
6	Retaining clips included
1	Lithium battery 3 V / 950 mAh included

Table 21: Contents of delivery - 5PP320.1214-39

2.7 Device 5PP320.1505-39

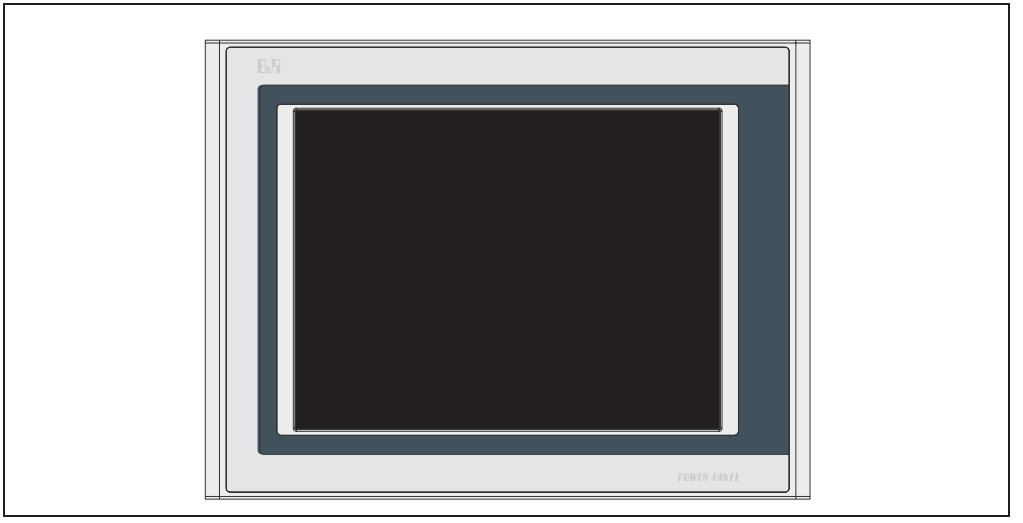


Figure 26: Front view - 5PP320.1505-39

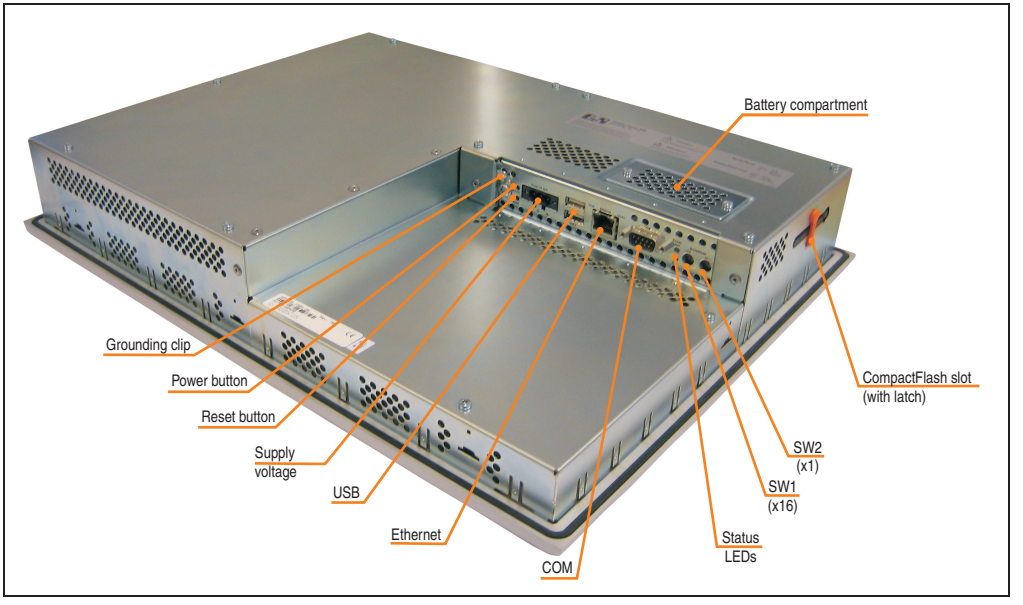


Figure 27: Rear view - 5PP320.1505-39

2.7.1 Technical data

Features	5PP320.1505-39
Boot loader / Operating system	BIOS
Processor Type Expanded command set L1 cache L2 cache Floating point unit (FPU) Cooling Type	 Geode LX800 500 MHz, 32-bit x86 MMX technology, streaming SIMD extension 128 KB (64 KB L cache / 64 KB D cache) 128 KB Yes Passive (heat sink)
Flash	2 MB (for firmware)
Memory Type Size	 DDRAM 256 MB
Graphics[1)] Controller Memory	 Geode LX800 TBD MB shared memory (reserved by main memory)
SRAM Size Battery-buffered	 -
Watchdog Controller	 MTCX[2)]
Power failure logic Controller Buffer time	 MTCX[2)] TBD ms
Real-time clock Battery-buffered Accuracy	 Yes Typ. TBD ppm[3)]
Battery Type Removable Lifespan Backup capacitor (for changing battery) Buffer time	 Renata 950 mAh Yes, accessible from the outside 4 years [4)] 10 minutes
Ethernet[1)] Controller Transfer rate Connection Cable NE2000-compatible	 Intel 82551ER 10/100 Mbps RJ45 twisted pair (10 Base T / 100 Base T) S/STP (category 5) -
CompactFlash Type Number Connection	 Type I 1 slot Primary IDE device
Serial interface Type UART Transfer rate Connection	 RS232, modem-capable, not electrically isolated TBD compatible, TBD byte FIFO Max. 115 kBaud 9-pin DSUB

Table 22: Technical data - 5PP320.1505-39

Features	5PP320.1505-39
USB interface	
Type	USB 1.1, USB 2.0
Number	2
Transfer rate	Low speed (1.5 MBit/s), full speed (12 MBit/s), to high speed (480 Mbit/s)
Connection	Type A
Current load	Max. 500 mA per connection
Reset button	Yes, accessible from the outside
Power button	Yes, accessible from the outside
LEDs	1x CF (yellow) 1x combined power (red/green) and user (yellow)
Mode/Node switches	2, 16 digits each
aPCI slots	-
Display	
Type	TFT colors
Diagonal	15" (381 mm)
Colors	262144 colors [5)]
Resolution	XGA, 1024 x 768 pixels
Contrast	300:1
Perspective (see page 308)	
Horizontal	Direction a / direction b = 85°
Vertical	Direction c / direction d = 85°
Background lighting	
Brightness	330 cd/m²
Half-brightness time	35000 hours
Touch screen [1)]	
Technology	Analog, resistive
Controller	Elo, serial, 12-bit
Degree of transmission	Up to 80% ± 5%
Filter glass	-
Degree of transmission	
Coating	
Keys/LED	-
Function keys	
Soft keys	
Cursor keys	
Number block	
Other keys	
Key lifespan	
LED brightness	
Electrical characteristics	
Power supply	
Rated voltage	24 VDC ±25%
Rated current	TBD A
Starting current	Maximum TBD A for < TBD ms
Power consumption	TBD W typically, maximum TBD W max.
Electrical isolation	Yes
Ground resistance	0 Ohm

Table 22: Technical data - 5PP320.1505-39 (cont.)

Mechanical characteristics	5PP320.1505-39
Outer dimensions	
Width	435 mm
Height	330 mm
Depth	71.5 mm
Front	
Frame	Aluminum, naturally anodized[6)]
Design	Gray[6)]
Membrane	Polyester
Dark gray border around display	Similar to Pantone 432CV[6)]
Light background	Similar to Pantone 427CV[6)]
Gasket	Flat gasket around display front
Housing	Metal
Weight	Approx. TBD kg
Environmental characteristics	
Ambient temperature	
Operation	TBD
Storage	TBD
Transport	TBD
Relative humidity	
Operation	TBD
Storage	TBD
Transport	TBD
Vibration	
Operation (continuous)	TBD
Operation (occasional)	TBD
Storage	TBD
Transport	TBD
Shock	
Operation	TBD
Storage	TBD
Transport	TBD
Protection type	IP20 back side (only with installed CompactFlash card) IP65 / NEMA 250 type 4X, dust and sprayed water protection (front side)
Altitude	Max. 3000 m

Table 22: Technical data - 5PP320.1505-39 (cont.)

1) The necessary drivers can be downloaded from the download area on the B&R homepage (www.br-automation.com).

2) Maintenance Controller Extended.

3) At the maximum specified ambient temperature, the deviation can increase to typically TBD ppm.

4) Enter environmental conditions (temperature, self discharge, etc.)

5) The actual number of colors depends on the graphics memory, the graphics mode set and the graphics driver used.

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

2.7.2 Dimensions

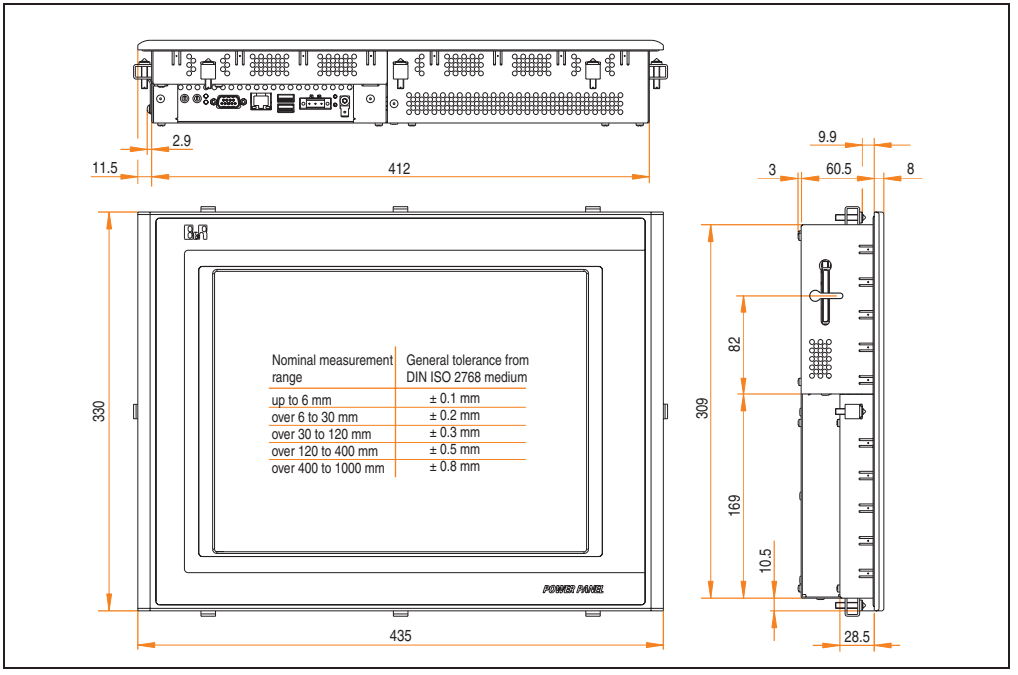


Figure 28: Dimensions - 5PP320.1505-39

2.7.3 Cutout installation

The cutout hole is to be made according to the following dimensions for cutout installation. The device must be mounted using the retaining clips included in delivery.

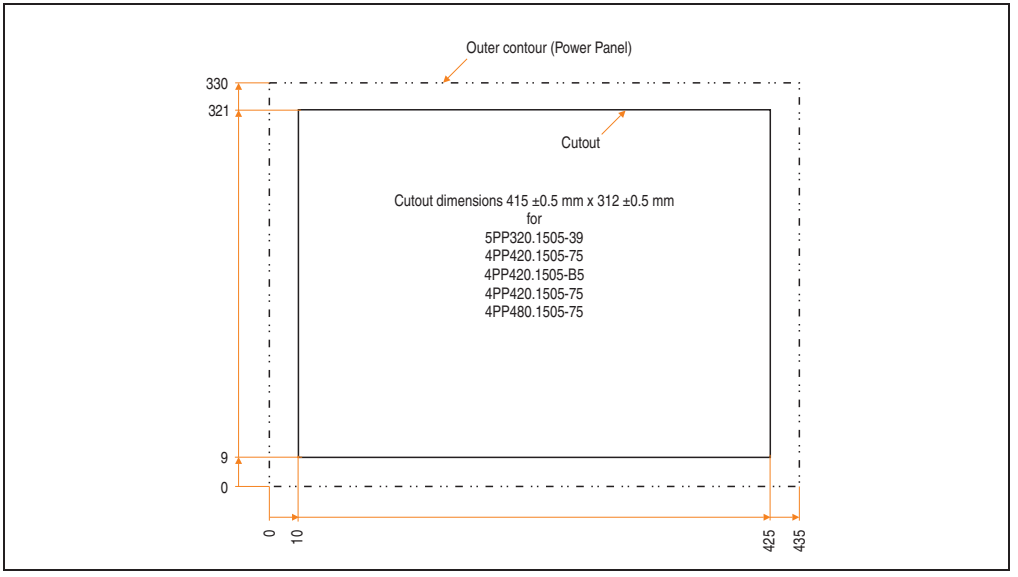


Figure 29: Cutout installation - 5PP320.1505-39

2.7.4 Contents of delivery

The following components are included in the delivery of the Power Panel device:

Number	Component
1	Power Panel PP320 BIOS 15" XGA, touch screen
8	Retaining clips included
1	Lithium battery 3 V / 950 mAh included

Table 23: Contents of delivery - 5PP320.1505-39

3. Power Panel 400 with Automation Runtime

3.1 Device interfaces

The following section provides a description of all interfaces and plugs possible with a Power Panel 400 device with Automation Runtime.

3.1.1 Supply voltage

Input voltage: 24 VDC ± 25%

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 clamps) or 0TB103.91 (cage clamps).

The pin assignments can be found either in the following table or printed onto the Power Panel plate. The supply voltage is internally protected 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).

Supply voltage	
Protected against reverse polarity	
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

Figure 30: Supply voltage connection

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.

3.1.2 Functional grounding clip

Next to the supply voltage plug there is a functional grounding clip. The grounding clip (functional ground) must be connected with a central grounding point on the switching cabinet using a 6.3 mm blade connector via the shortest distance and with as little resistance as possible (e.g. copper strip, but must be at least 2.5 mm²).

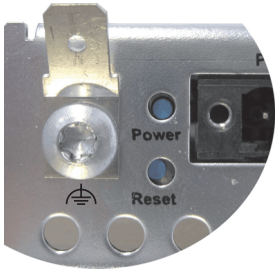
Grounding clip


Figure 31: Functional grounding clip

3.1.3 Serial interface COM

The Power Panel is equipped with a PC-compatible serial interface with a TBD FIFO buffer. This non-electrically isolated interface is primarily intended for programming Power Panel devices using Automation Studio.

The RS232 can also be used as a general interface (e.g. third-party connections, barcode reader, etc.).

Serial interface (COM)		
Type	RS232, modem-capable, not electrically isolated	9-pin DSUB connector 
UART	TBD	
Transfer rate	Up to 115 kBaud	
Pin	**Assignment**	
1	DCD	
2	RxD	
3	TxD	
4	DTR	
5	GND	
6	DSR	
7	RTS	
8	CTS	
9	RI	

Table 24: Pin assignments - COM

3.1.4 USB port

The Power Panel 300/400 devices have a USB 2.0 (Universal Serial Bus) host controller with multiple USB ports, two of which are on the outside for easy user access.

Universal serial bus		
Transfer rate	Low speed (1.5 MBit/s), full speed (12 MBit/s), to high speed (480 Mbit/s)	2x USB Type A, female 
Power supplies	Max. 500 mA per port[1)]	
Maximum cable length	5 m (not including hub)	

Table 25: USB port

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

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.

Important!

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

Driver support

For optimal functionality of USB 2.0 (transfer speed up to 480 Mbit/s), special drivers must be installed.
Drivers for Windows XP Embedded and Windows CE are available for download on the B&R homepage in the download area (**www.br-automation.com**) .

3.1.5 Mode/Node switches

Power Panel devices are equipped with 2 hex switches that serve as operating mode switches. Switch positions 01 to FD are available for any purpose in an application and can be evaluated by the application program.

Mode/Node switches


Table 26: Mode/Node switches

Switch position		Function	Description
SW1 (x16)	SW2 (x1)		
0	0	Boot	Automation Runtime boot mode for operating system (firmware) upgrade (default Automation Runtime). In this position, a new or missing operating system can be downloaded.
0 ... F	0 ... D	Node	Automation Runtime run mode with node 01-FD (CompactFlash Automation Runtime or terminal operation). Freely available for use in an application, e.g. setting the INA2000 node number for the Ethernet interface.
F	E	Dyn. mode	Automation Runtime run mode with node 01-FD (CompactFlash Automation Runtime or terminal operation). Device addresses can be assigned through the software.
F	F	Diagnostics	Automation Runtime diagnostics mode (CompactFlash Automation Runtime or terminal operation).

Table 27: Switch settings for the mode/node switch

3.1.6 Status LEDs

Power Panels are equipped with two status LEDs that are visible on the outside.

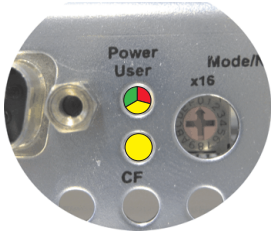
Status LEDs				
LED	**Color**		**Meaning**	1x three-color, 1x one-color 
Power User	Green	On	Supply voltage OK	
	Red	On	The system is in standby mode (S5: soft-off mode or S4: hibernate mode - suspend-to-disk).	
	Yellow	On	Can be used however the user wants (for example, can be turned on/off directly using the ADI library)	
CF	Yellow	On	Indicates access to CompactFlash drive (read or write)	

Figure 32: Status LEDs

3.1.7 Ethernet connection

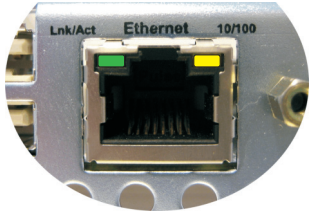
Ethernet connection			
Controller	Intel 82551ER		RJ45 twisted pair (10BaseT/100BaseT), female 
Cabling	S/STP (category 5)		
Transfer rate	10/100 MBit/s [1]		
LED	**On**	**Off**	
Green	100 MBit/s	10 MBit/s	
Orange	Link (Ethernet network connection available)	Activity (blinking) (Data transfer in progress)	

Table 28: Ethernet connection

1) Both operating modes possible. Change-over takes place automatically.

3.1.8 Power button

Due to the complete ATX power supply support, the power button serves a number of functions, which can be configured in BIOS setup.

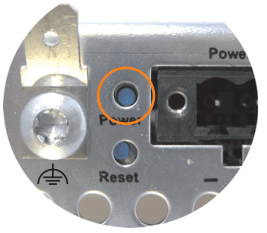
Power button	
The power button can be pressed with a pointed object (i.e. paper clip or tip of a pen).	

Table 29: Power button

3.1.9 Reset button

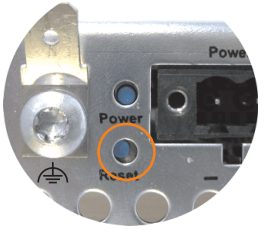
Reset button	
The reset button can be pressed with a pointed object (i.e. paper clip or tip of a pen). Pushing the reset button results in a hardware-reset. The Power Panel restarts (cold restart). The MTCX processor is not reset when the reset button is pressed.	

Table 30: Reset button

Warning!

A system reset can cause data to be lost!

3.1.10 CompactFlash slot

Power Panel devices are equipped with a CompactFlash slot that is accessible from the side. CompactFlash cards of type I are supported.

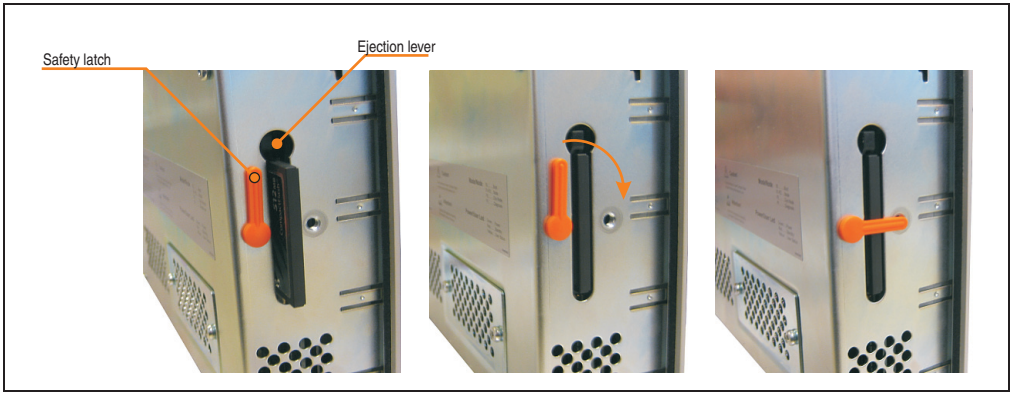


Figure 33: CompactFlash slot

It is possible to protect the CompactFlash slot using a safety latch. By pressing the ejector (using a pointed object is the best way to do this) the CompactFlash card can be changed quickly and safely.

Caution!

The power must be turned off before inserting or removing the CompactFlash card! As a safety measure, a sticker is also attached to Power Panel devices stating this.

3.2 Labels

3.2.1 Device label

The following sticker can be found in a suitable location on the Power Panel device:

Figure 34: Device label

3.2.2 Serial number sticker

General information

Each B&R device is given a unique serial number sticker with a barcode that allows the device to be clearly identified.

Design/Dimensions

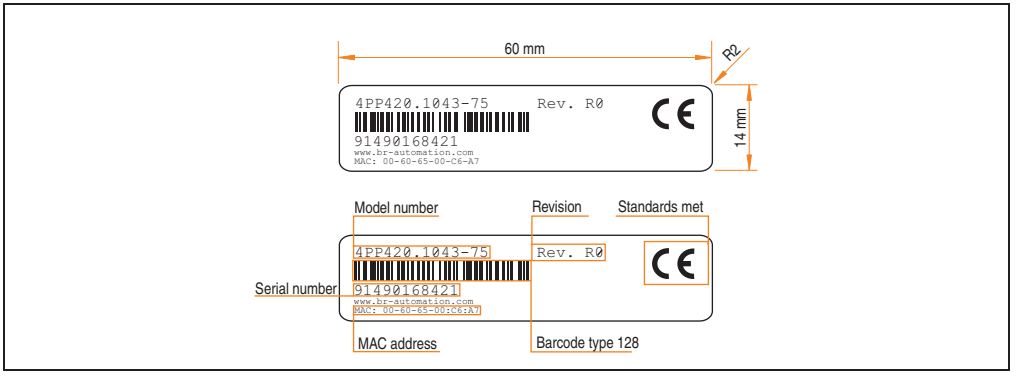


Figure 35: Serial number sticker design/dimensions

Information on the Internet

Information about each device can also be found on the B&R homepage. Enter the device's serial number in the serial number search field on the start page **www.br-automation.com**. The search also works if you enter the model number or the material number in the material number search field. The search provides you with a detailed list of the individual components.

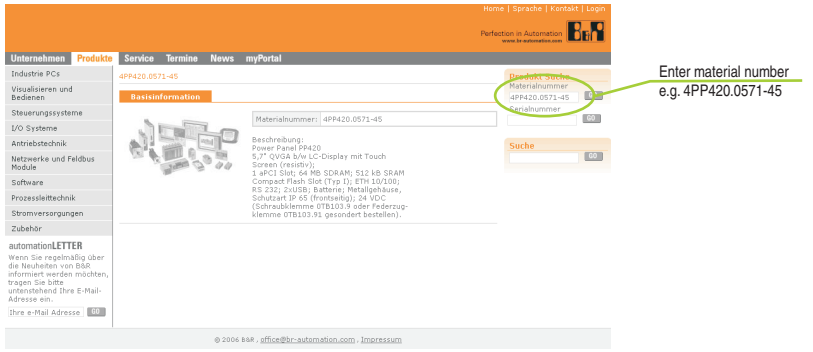


Figure 36: Example - material number search: 4PP420.0571-45

3.3 Device 4PP420.0571-45

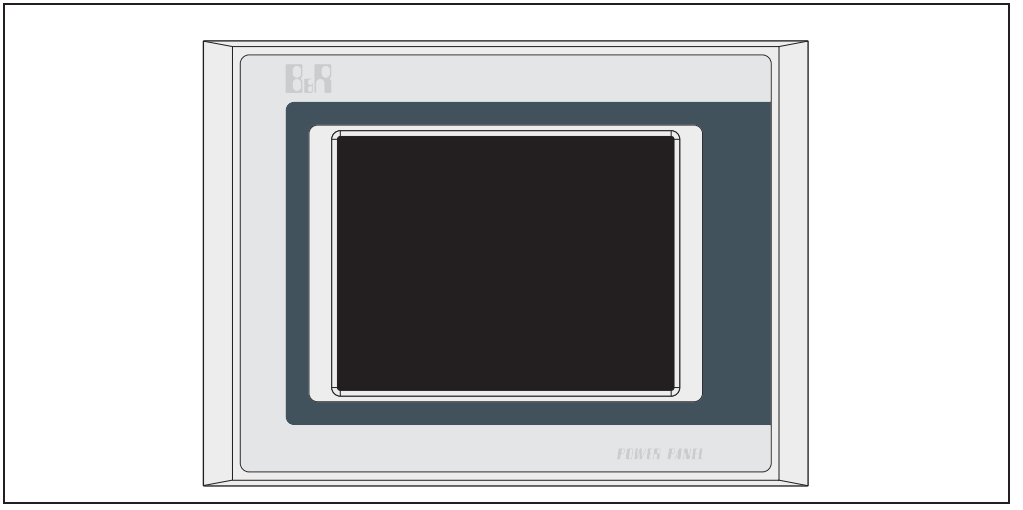


Figure 37: Front view - 4PP420.0571-45

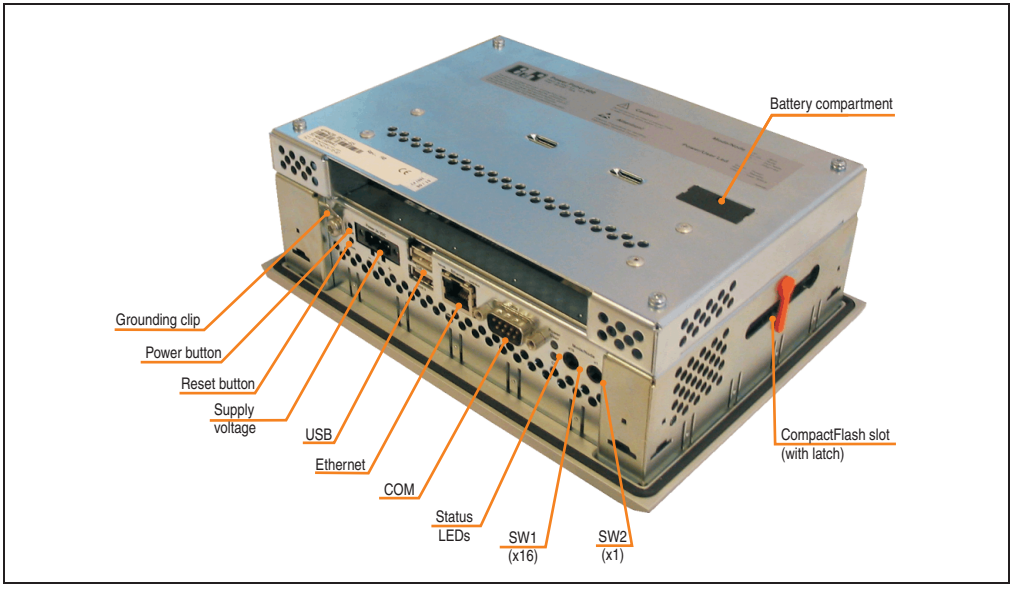


Figure 38: Rear view - 4PP420.0571-45

3.3.1 Technical data

Features	4PP420.0571-45
Boot loader / Operating system	Automation Runtime
Processor Type Expanded command set L1 cache L2 cache Floating point unit (FPU) Cooling Type	 Geode LX800 500 MHz, 32-bit x86 MMX technology, streaming SIMD extension 128 KB (64 KB L cache / 64 KB D cache) 128 KB Yes Passive (heat sink)
Flash	2 MB (for firmware)
Memory Type Size	 DDRAM 64 MB
Graphics Controller Memory	 Geode LX800 TBD MB shared memory (reserved by main memory)
SRAM Size Battery-buffered	 512 KB Yes
Watchdog Controller	 MTCX[1)]
Power failure logic Controller Buffer time	 MTCX[2)] TBD ms
Real-time clock Battery-buffered Accuracy	 Yes Typ. TBD ppm[2)]
Battery Type Removable Lifespan Backup capacitor (for changing battery) Buffer time	 Renata 950 mAh Yes, accessible from the outside 4 years [3)] 10 minutes
Ethernet Controller Transfer rate Connection Cable NE2000-compatible	 Intel 82551ER 10/100 Mbps RJ45 twisted pair (10 Base T / 100 Base T) S/STP (category 5) -
CompactFlash Type Number Connection	 Type I 1 slot Primary IDE device
Serial interface Type UART Transfer rate Connection	 RS232, modem-capable, not electrically isolated TBD compatible, TBD byte FIFO Max. 115 kBaud 9-pin DSUB

Table 31: Technical data - 4PP420.0571-45

Features	4PP420.0571-45
USB interface Type Number Transfer rate Connection Current load	 USB 1.1, USB 2.0 2 Low speed (1.5 MBit/s), full speed (12 MBit/s), to high speed (480 Mbit/s) Type A Max. 500 mA per connection
Reset button	Yes, accessible from the outside
Power button	Yes, accessible from the outside
LEDs	1x CF (yellow) 1x combined power (red/green) and user (yellow)
Mode/Node switches	2, 16 digits each
aPCI slots	1 (see B&R System 2005 manual for available aPCI interface modules)
Display Type Diagonal Colors Resolution Contrast Perspective (see page 308) Horizontal Vertical Background lighting Brightness Half-brightness time	 Color LCD 5.7" (144 mm) 8 shades of gray QVGA, 320 x 240 pixels 25:1 Direction a / direction b = 40° Direction c = 40°/ direction d = 50° 140 cd/m² 50000 hours
Touch screen Technology Controller Degree of transmission	 Analog, resistive Elo, serial, 12-bit Up to 80% ± 5%
Filter glass Degree of transmission Coating	-
Keys/LED Function keys Soft keys Cursor keys Number block Other keys Key lifespan LED brightness	-
Electrical characteristics	
Power supply Rated voltage Rated current Starting current Power consumption Electrical isolation	 24 VDC ±25% TBD A Maximum TBD A for < TBD ms TBD W typically, maximum TBD W max. Yes
Ground resistance	0 Ohm

Table 31: Technical data - 4PP420.0571-45 (cont.)

Mechanical characteristics	4PP420.0571-45
Outer dimensions	
Width	212 mm
Height	156 mm
Depth	76 mm
Front	
Frame	Aluminum, naturally anodized[4)]
Design	Gray[6)]
Membrane	Polyester
Dark gray border around display	Similar to Pantone 432CV[6)]
Light background	Similar to Pantone 427CV[6)]
Gasket	Flat gasket around display front
Housing	Metal
Weight	Approx. TBD kg (without aPCI interface module)
Environmental characteristics	
Ambient temperature	
Operation	TBD
Storage	TBD
Transport	TBD
Relative humidity	
Operation	TBD
Storage	TBD
Transport	TBD
Vibration	
Operation (continuous)	TBD
Operation (occasional)	TBD
Storage	TBD
Transport	TBD
Shock	
Operation	TBD
Storage	TBD
Transport	TBD
Protection type	IP20 back side (only with installed CompactFlash card, inserted aPCI module or with an optional aPCI cover) IP65 / NEMA 250 type 4X, dust and sprayed water protection (front side)
Altitude	Max. 3000 m

Table 31: Technical data - 4PP420.0571-45 (cont.)

1) Maintenance Controller Extended.

2) At the maximum specified ambient temperature, the deviation can increase to typically TBD ppm.

3) Enter environmental conditions (temperature, self discharge, etc.)

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

3.3.2 Dimensions

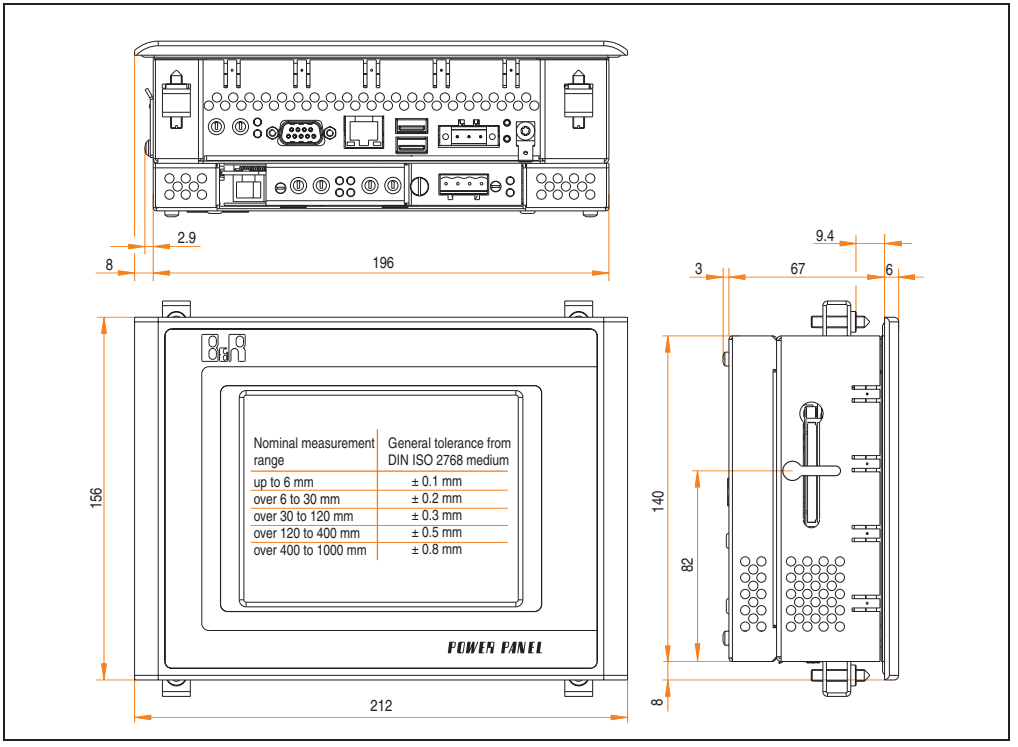


Figure 39: Dimensions - 4PP420.0571-45

3.3.3 Cutout installation

The cutout hole is to be made according to the following dimensions for cutout installation. The device must be mounted using the retaining clips included in delivery.

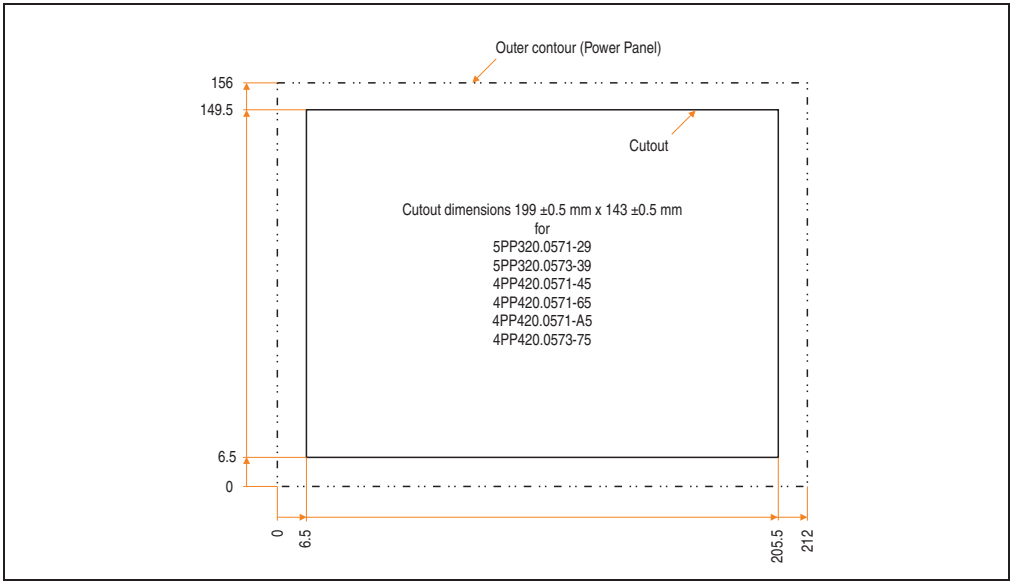


Figure 40: Cutout installation - 4PP420.0571-45

3.3.4 Contents of delivery

The following components are included in the delivery of the Power Panel device:

Number	Component
1	Power Panel PP420 5.7" QVGA, 1 aPCI, touch screen
4	Retaining clips included
1	Lithium battery 3 V / 950 mAh included

Table 32: Contents of delivery - 4PP420.0571-45

3.4 Device 4PP420.0571-65

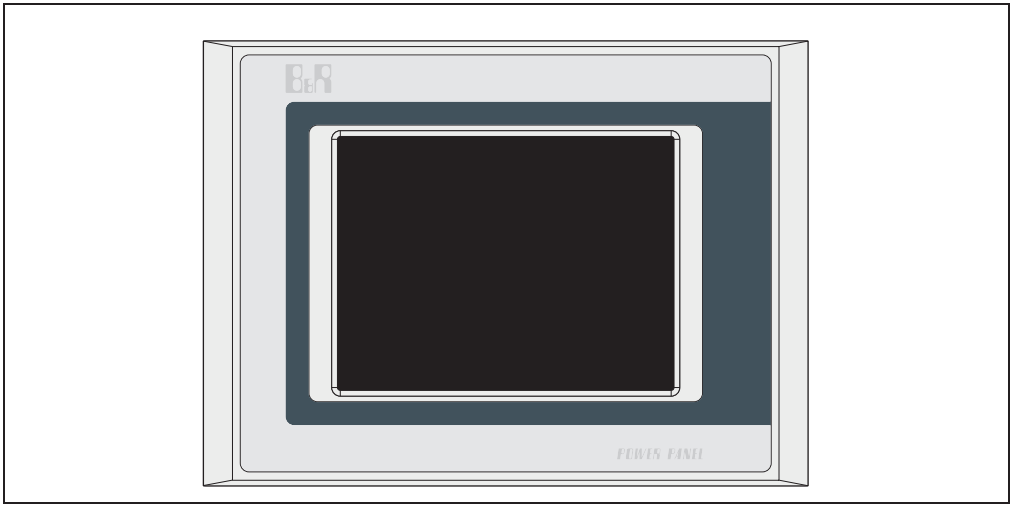


Figure 41: Front view - 4PP420.0571-65

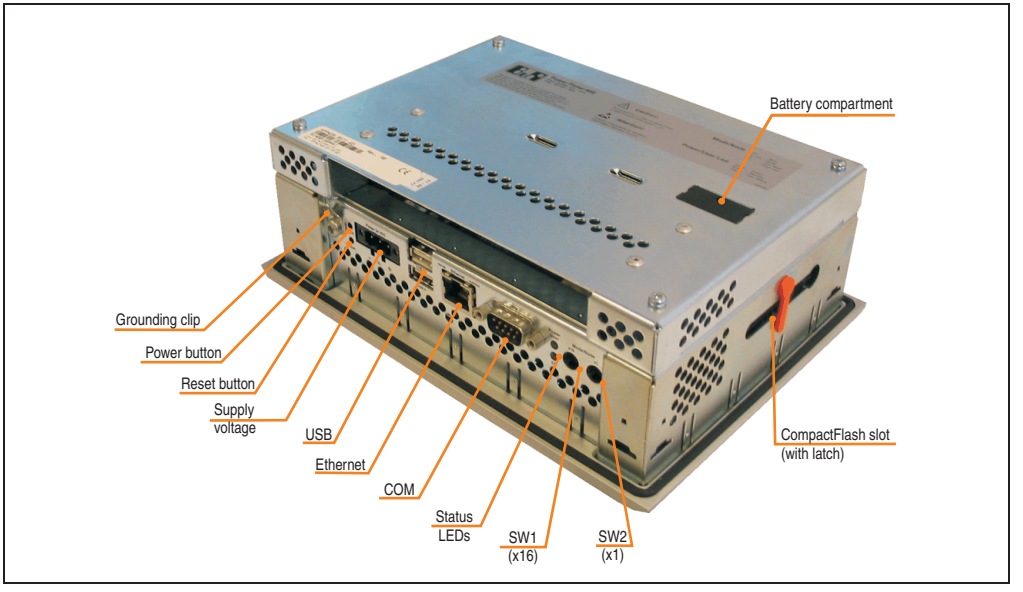


Figure 42: Rear view - 4PP420.0571-65

3.4.1 Technical data

Features	4PP420.0571-65
Boot loader / Operating system	Automation Runtime
Processor Type Expanded command set L1 cache L2 cache Floating point unit (FPU) Cooling Type	 Geode LX800 500 MHz, 32-bit x86 MMX technology, streaming SIMD extension 128 KB (64 KB L cache / 64 KB D cache) 128 KB Yes Passive (heat sink)
Flash	2 MB (for firmware)
Memory Type Size	 DDRAM 64 MB
Graphics Controller Memory	 Geode LX800 TBD MB shared memory (reserved by main memory)
SRAM Size Battery-buffered	 512 KB Yes
Watchdog Controller	 MTCX[1)]
Power failure logic Controller Buffer time	 MTCX[2)] TBD ms
Real-time clock Battery-buffered Accuracy	 Yes Typ. TBD ppm[2)]
Battery Type Removable Lifespan Backup capacitor (for changing battery) Buffer time	 Renata 950 mAh Yes, accessible from the outside 4 years [3)] 10 minutes
Ethernet Controller Transfer rate Connection Cable NE2000-compatible	 Intel 82551ER 10/100 Mbps RJ45 twisted pair (10 Base T / 100 Base T) S/STP (category 5) -
CompactFlash Type Number Connection	 Type I 1 slot Primary IDE device
Serial interface Type UART Transfer rate Connection	 RS232, modem-capable, not electrically isolated TBD compatible, TBD byte FIFO Max. 115 kBaud 9-pin DSUB

Table 33: Technical data - 4PP420.0571-65

Features	4PP420.0571-65
USB interface Type Number Transfer rate Connection Current load	 USB 1.1, USB 2.0 2 Low speed (1.5 MBit/s), full speed (12 MBit/s), to high speed (480 Mbit/s) Type A Max. 500 mA per connection
Reset button	Yes, accessible from the outside
Power button	Yes, accessible from the outside
LEDs	1x CF (yellow) 1x combined power (red/green) and user (yellow)
Mode/Node switches	2, 16 digits each
aPCI slots	1 (see B&R System 2005 manual for available aPCI interface modules)
Display Type Diagonal Colors Resolution Contrast Perspective (see page 308) Horizontal Vertical Background lighting Brightness Half-brightness time	 Color LCD 5.7" (144 mm) 256 colors QVGA, 320 x 240 pixels 40:1 Direction a / direction b = 40° Direction c = 40°/ direction d = 50° 140 cd/m² 50000 hours
Touch screen Technology Controller Degree of transmission	 Analog, resistive Elo, serial, 12-bit Up to 80% ± 5%
Filter glass Degree of transmission Coating	-
Keys/LED Function keys Soft keys Cursor keys Number block Other keys Key lifespan LED brightness	-
Electrical characteristics	
Power supply Rated voltage Rated current Starting current Power consumption Electrical isolation	 24 VDC ±25% TBD A Maximum TBD A for < TBD ms TBD W typically, maximum TBD W max. Yes
Ground resistance	0 Ohm

Table 33: Technical data - 4PP420.0571-65 (cont.)

Mechanical characteristics	4PP420.0571-65
Outer dimensions	
Width	212 mm
Height	156 mm
Depth	76 mm
Front	
Frame	Aluminum, naturally anodized[4]
Design	Gray[6]
Membrane	Polyester
Dark gray border around display	Similar to Pantone 432CV[6]
Light background	Similar to Pantone 427CV[6]
Gasket	Flat gasket around display front
Housing	Metal
Weight	Approx. TBD kg (without aPCI interface module)
Environmental characteristics	
Ambient temperature	
Operation	TBD
Storage	TBD
Transport	TBD
Relative humidity	
Operation	TBD
Storage	TBD
Transport	TBD
Vibration	
Operation (continuous)	TBD
Operation (occasional)	TBD
Storage	TBD
Transport	TBD
Shock	
Operation	TBD
Storage	TBD
Transport	TBD
Protection type	IP20 back side (only with installed CompactFlash card, inserted aPCI module or with an optional aPCI cover) IP65 / NEMA 250 type 4X, dust and sprayed water protection (front side)
Altitude	Max. 3000 m

Table 33: Technical data - 4PP420.0571-65 (cont.)

1) Maintenance Controller Extended.

2) At the maximum specified ambient temperature, the deviation can increase to typically TBD ppm.

3) Enter environmental conditions (temperature, self discharge, etc.)

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

3.4.2 Dimensions

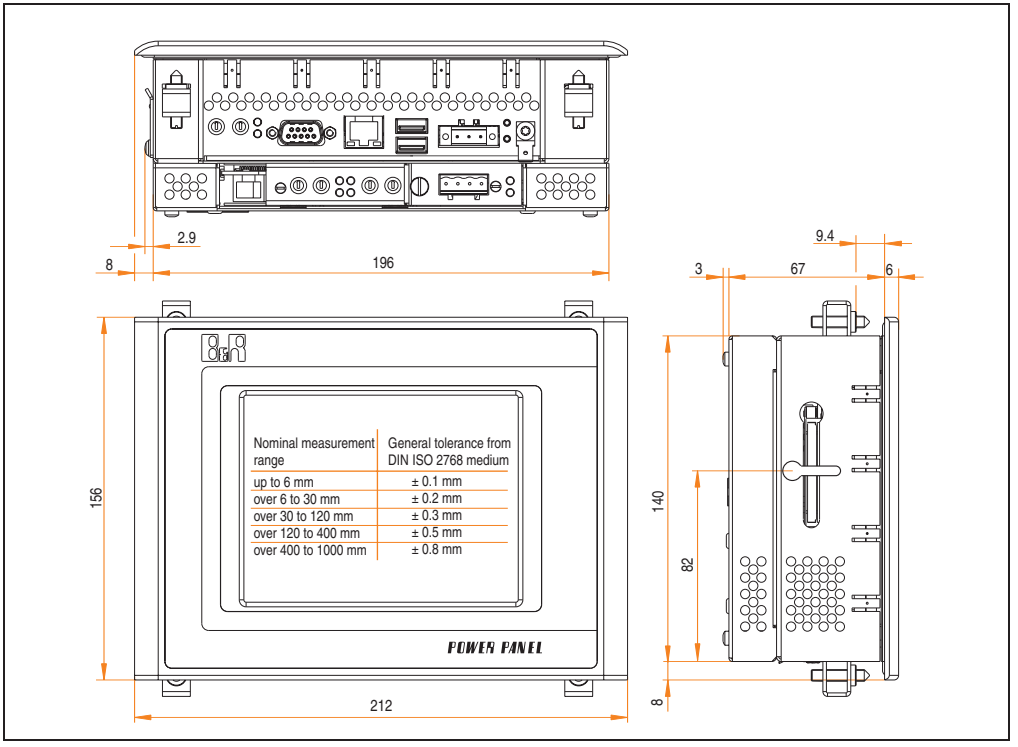


Figure 43: Dimensions - 4PP420.0571-65

3.4.3 Cutout installation

The cutout hole is to be made according to the following dimensions for cutout installation. The device must be mounted using the retaining clips included in delivery.

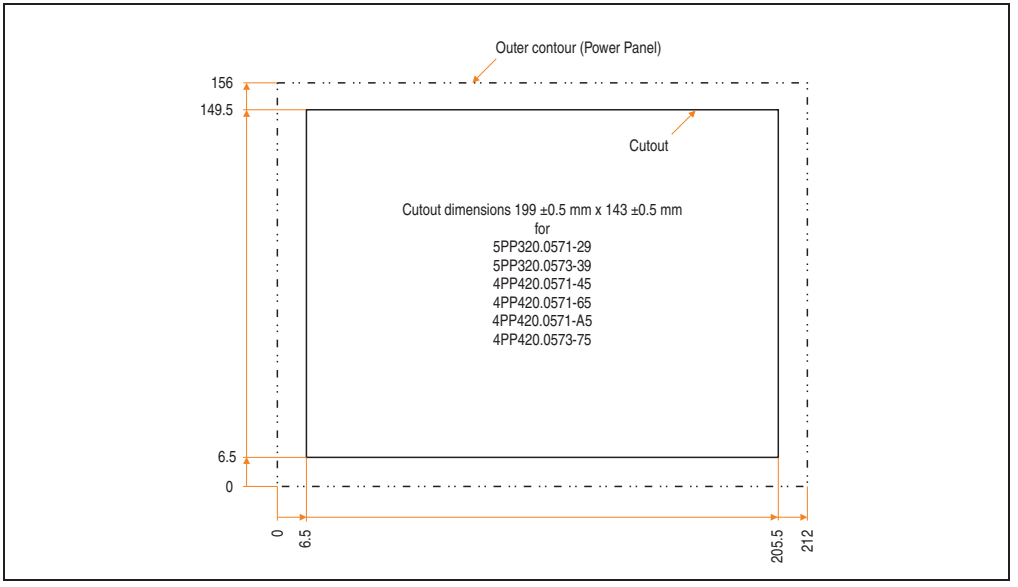


Figure 44: Cutout installation - 4PP420.0571-65

3.4.4 Contents of delivery

The following components are included in the delivery of the Power Panel device:

Number	Component
1	Power Panel PP420, 5.7" QVGA, 1 aPCI, touch screen
4	Retaining clips included
1	Lithium battery 3 V / 950 mAh included

Table 34: Contents of delivery - 4PP420.0571-65

3.5 Device 4PP420.0571-A5

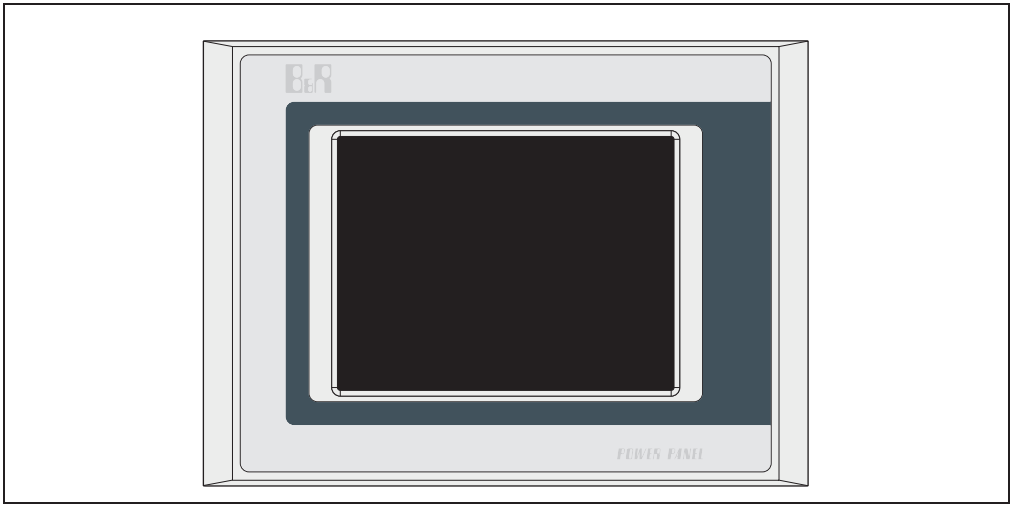


Figure 45: Front view - 4PP420.0571-A5

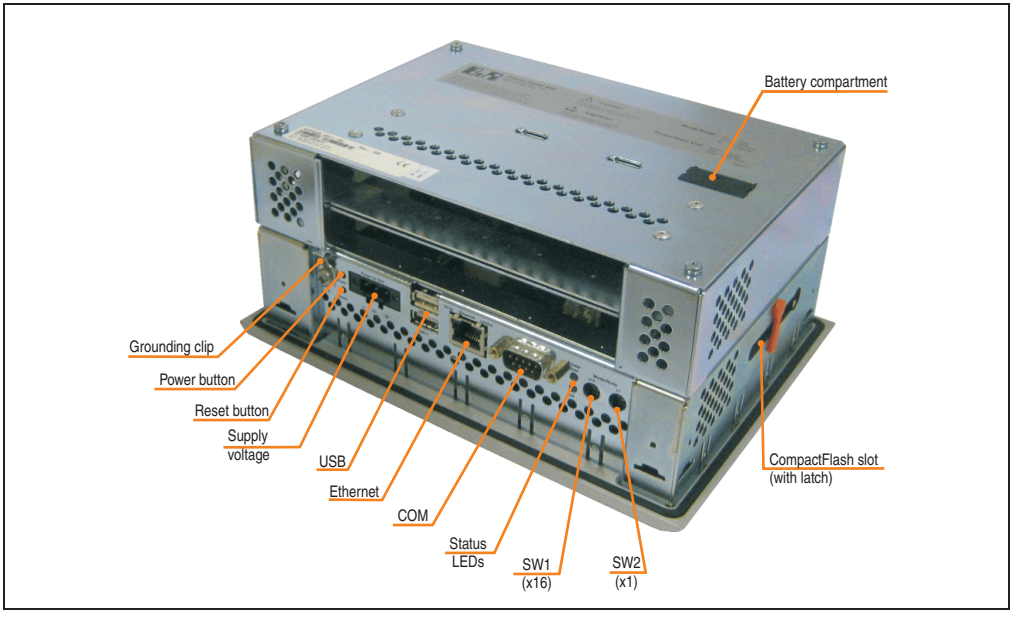


Figure 46: Rear view - 4PP420.0571-A5

3.5.1 Technical data

Features	4PP420.0571-A5
Boot loader / Operating system	Automation Runtime
Processor Type Expanded command set L1 cache L2 cache Floating point unit (FPU) Cooling Type	 Geode LX800 500 MHz, 32-bit x86 MMX technology, streaming SIMD extension 128 KB (64 KB L cache / 64 KB D cache) 128 KB Yes Passive (heat sink)
Flash	2 MB (for firmware)
Memory Type Size	 DDRAM 64 MB
Graphics Controller Memory	 Geode LX800 TBD MB shared memory (reserved by main memory)
SRAM Size Battery-buffered	 512 KB Yes
Watchdog Controller	 MTCX[1)]
Power failure logic Controller Buffer time	 MTCX[2)] TBD ms
Real-time clock Battery-buffered Accuracy	 Yes Typ. TBD ppm[2)]
Battery Type Removable Lifespan Backup capacitor (for changing battery) Buffer time	 Renata 950 mAh Yes, accessible from the outside 4 years [3)] 10 minutes
Ethernet Controller Transfer rate Connection Cable NE2000-compatible	 Intel 82551ER 10/100 Mbps RJ45 twisted pair (10 Base T / 100 Base T) S/STP (category 5) -
CompactFlash Type Number Connection	 Type I 1 slot Primary IDE device
Serial interface Type UART Transfer rate Connection	 RS232, modem-capable, not electrically isolated TBD compatible, TBD byte FIFO Max. 115 kBaud 9-pin DSUB

Table 35: Technical data - 4PP420.0571-A5

Features	4PP420.0571-A5
USB interface Type Number Transfer rate Connection Current load	 USB 1.1, USB 2.0 2 Low speed (1.5 MBit/s), full speed (12 MBit/s), to high speed (480 Mbit/s) Type A Max. 500 mA per connection
Reset button	Yes, accessible from the outside
Power button	Yes, accessible from the outside
LEDs	1x CF (yellow) 1x combined power (red/green) and user (yellow)
Mode/Node switches	2, 16 digits each
aPCI slots	2 (see B&R System 2005 manual for available aPCI interface modules)
Display Type Diagonal Colors Resolution Contrast Perspective (see page 308) Horizontal Vertical Background lighting Brightness Half-brightness time	 Color LCD 5.7" (144 mm) 256 colors QVGA, 320 x 240 pixels 40:1 Direction a / direction b = 40° Direction c = 40°/ direction d = 50° 140 cd/m² 50000 hours
Touch screen Technology Controller Degree of transmission	 Analog, resistive Elo, serial, 12-bit Up to 80% ± 5%
Filter glass Degree of transmission Coating	-
Keys/LED Function keys Soft keys Cursor keys Number block Other keys Key lifespan LED brightness	-
Electrical characteristics	
Power supply Rated voltage Rated current Starting current Power consumption Electrical isolation	 24 VDC ±25% TBD A Maximum TBD A for < TBD ms TBD W typically, maximum TBD W max. Yes
Ground resistance	0 Ohm

Table 35: Technical data - 4PP420.0571-A5 (cont.)

Mechanical characteristics	4PP420.0571-A5
Outer dimensions	
Width	212 mm
Height	156 mm
Depth	98 mm
Front	
Frame	Aluminum, naturally anodized[4]
Design	Gray[6]
Membrane	Polyester
Dark gray border around display	Similar to Pantone 432CV[6]
Light background	Similar to Pantone 427CV[6]
Gasket	Flat gasket around display front
Housing	Metal
Weight	Approx. TBD kg (without aPCI interface module)
Environmental characteristics	
Ambient temperature	
Operation	TBD
Storage	TBD
Transport	TBD
Relative humidity	
Operation	TBD
Storage	TBD
Transport	TBD
Vibration	
Operation (continuous)	TBD
Operation (occasional)	TBD
Storage	TBD
Transport	TBD
Shock	
Operation	TBD
Storage	TBD
Transport	TBD
Protection type	IP20 back side (only with installed CompactFlash card, inserted aPCI module or with an optional aPCI cover) IP65 / NEMA 250 type 4X, dust and sprayed water protection (front side)
Altitude	Max. 3000 m

Table 35: Technical data - 4PP420.0571-A5 (cont.)

1) Maintenance Controller Extended.

2) At the maximum specified ambient temperature, the deviation can increase to typically TBD ppm.

3) Enter environmental conditions (temperature, self discharge, etc.)

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

3.5.2 Dimensions

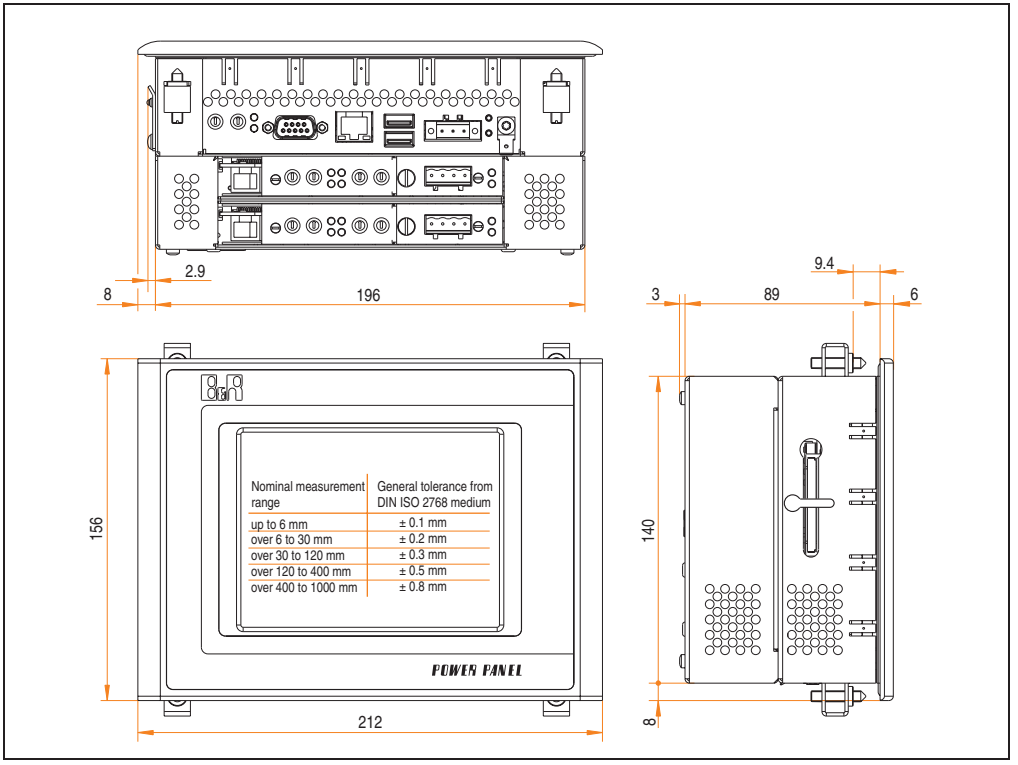


Figure 47: Dimensions - 4PP420.0571-A5

3.5.3 Cutout installation

The cutout hole is to be made according to the following dimensions for cutout installation. The device must be mounted using the retaining clips included in delivery.

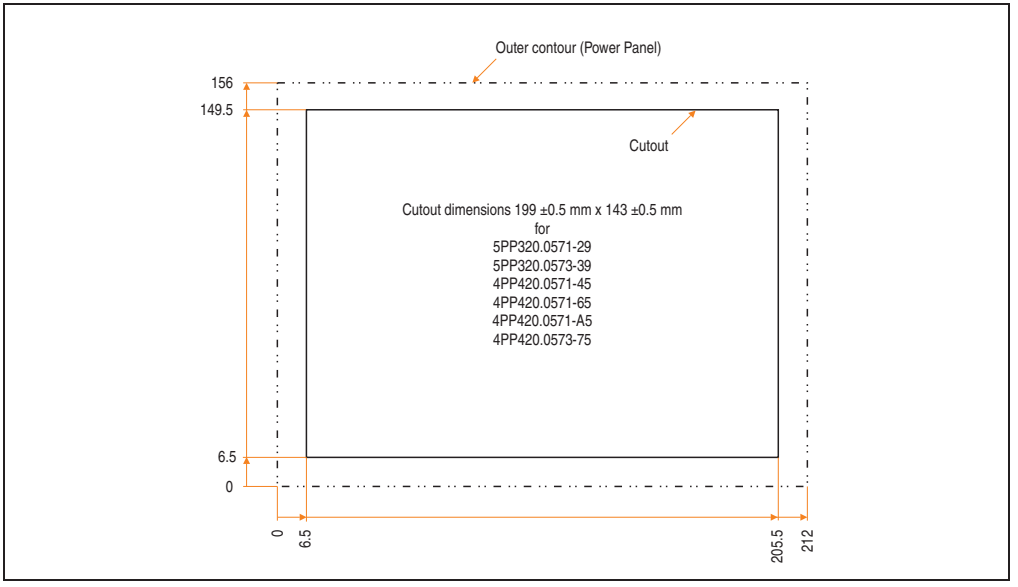


Figure 48: Cutout installation - 4PP420.0571-A5

3.5.4 Contents of delivery

The following components are included in the delivery of the Power Panel device:

Number	Component
1	Power Panel PP420, 5.7" QVGA, 2 aPCI, touch screen
4	Retaining clips included
1	Lithium battery 3 V / 950 mAh included

Table 36: Contents of delivery - 4PP420.0571-A5

3.6 Device 4PP420.0573-75

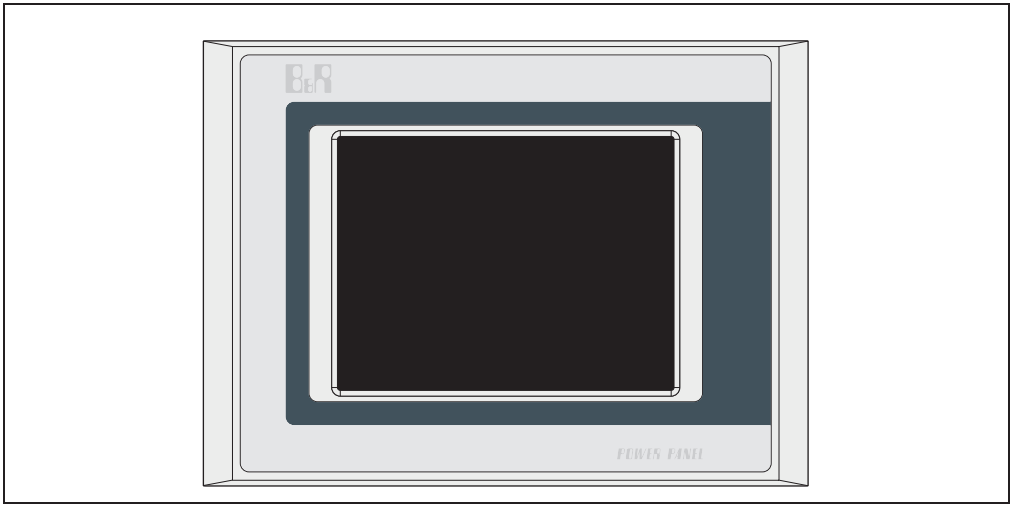


Figure 49: Front view - 4PP420.0573-75

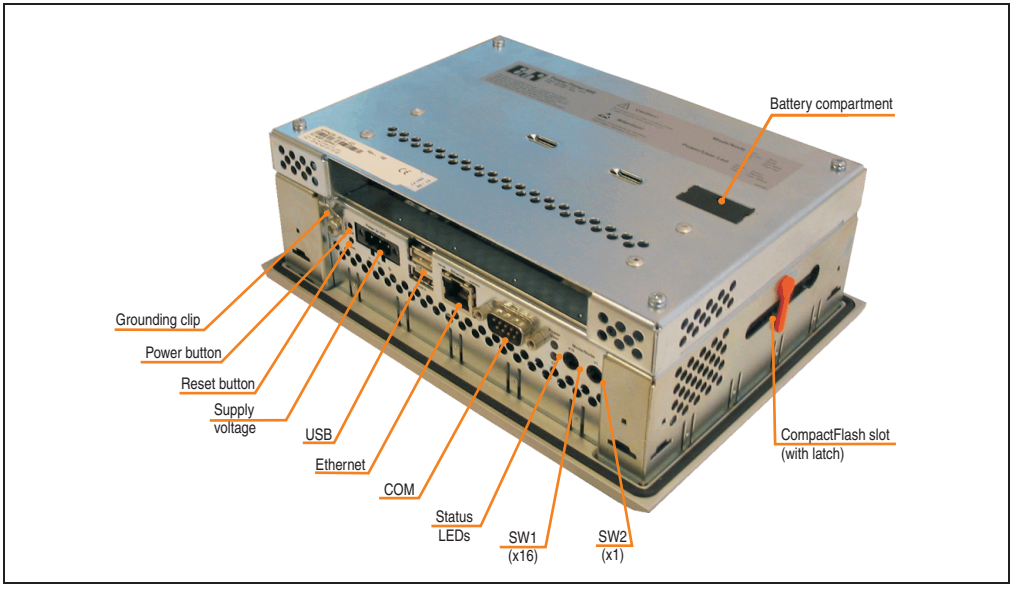


Figure 50: Rear view - 4PP420.0573-75

3.6.1 Technical data

Features	4PP420.0573-75
Boot loader / Operating system	Automation Runtime
Processor Type Expanded command set L1 cache L2 cache Floating point unit (FPU) Cooling Type	 Geode LX800 500 MHz, 32-bit x86 MMX technology, streaming SIMD extension 128 KB (64 KB L cache / 64 KB D cache) 128 KB Yes Passive (heat sink)
Flash	2 MB (for firmware)
Memory Type Size	 DDRAM 64 MB
Graphics Controller Memory	 Geode LX800 TBD MB shared memory (reserved by main memory)
SRAM Size Battery-buffered	 512 KB Yes
Watchdog Controller	 MTCX[1)]
Power failure logic Controller Buffer time	 MTCX[2)] TBD ms
Real-time clock Battery-buffered Accuracy	 Yes Typ. TBD ppm[2)]
Battery Type Removable Lifespan Backup capacitor (for changing battery) Buffer time	 Renata 950 mAh Yes, accessible from the outside 4 years [3)] 10 minutes
Ethernet Controller Transfer rate Connection Cable NE2000-compatible	 Intel 82551ER 10/100 Mbps RJ45 twisted pair (10 Base T / 100 Base T) S/STP (category 5) -
CompactFlash Type Number Connection	 Type I 1 slot Primary IDE device
Serial interface Type UART Transfer rate Connection	 RS232, modem-capable, not electrically isolated TBD compatible, TBD byte FIFO Max. 115 kBaud 9-pin DSUB

Table 37: Technical data - 4PP420.0573-75

Features	4PP420.0573-75
USB interface Type Number Transfer rate Connection Current load	 USB 1.1, USB 2.0 2 Low speed (1.5 MBit/s), full speed (12 MBit/s), to high speed (480 Mbit/s) Type A Max. 500 mA per connection
Reset button	Yes, accessible from the outside
Power button	Yes, accessible from the outside
LEDs	1x CF (yellow) 1x combined power (red/green) and user (yellow)
Mode/Node switches	2, 16 digits each
aPCI slots	1 (see B&R System 2005 manual for available aPCI interface modules)
Display Type Diagonal Colors Resolution Contrast Perspective (see page 308) Horizontal Vertical Background lighting Brightness Half-brightness time	 TFT colors 5.7" (144 mm) 256 colors VGA, 640 x 480 pixels 400:1 Direction a / direction b = 80° Direction c = 80°/ direction d = 70° 350 cd/m² 75000 hours
Touch screen Technology Controller Degree of transmission	 Analog, resistive Elo, serial, 12-bit Up to 80% ± 5%
Filter glass Degree of transmission Coating	-
Keys/LED Function keys Soft keys Cursor keys Number block Other keys Key lifespan LED brightness	-
Electrical characteristics	
Power supply Rated voltage Rated current Starting current Power consumption Electrical isolation	 24 VDC ±25% TBD A Maximum TBD A for < TBD ms TBD W typically, maximum TBD W max. Yes
Ground resistance	0 Ohm

Table 37: Technical data - 4PP420.0573-75 (cont.)

Mechanical characteristics	4PP420.0573-75
Outer dimensions	
Width	212 mm
Height	156 mm
Depth	76 mm
Front	
Frame	Aluminum, naturally anodized[4]
Design	Gray[6]
Membrane	Polyester
Dark gray border around display	Similar to Pantone 432CV[6]
Light background	Similar to Pantone 427CV[6]
Gasket	Flat gasket around display front
Housing	Metal
Weight	Approx. TBD kg (without aPCI interface module)
Environmental characteristics	
Ambient temperature	
Operation	TBD
Storage	TBD
Transport	TBD
Relative humidity	
Operation	TBD
Storage	TBD
Transport	TBD
Vibration	
Operation (continuous)	TBD
Operation (occasional)	TBD
Storage	TBD
Transport	TBD
Shock	
Operation	TBD
Storage	TBD
Transport	TBD
Protection type	IP20 back side (only with installed CompactFlash card, inserted aPCI module or with an optional aPCI cover) IP65 / NEMA 250 type 4X, dust and sprayed water protection (front side)
Altitude	Max. 3000 m

Table 37: Technical data - 4PP420.0573-75 (cont.)

1) Maintenance Controller Extended.

2) At the maximum specified ambient temperature, the deviation can increase to typically TBD ppm.

3) Enter environmental conditions (temperature, self discharge, etc.)

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

3.6.2 Dimensions

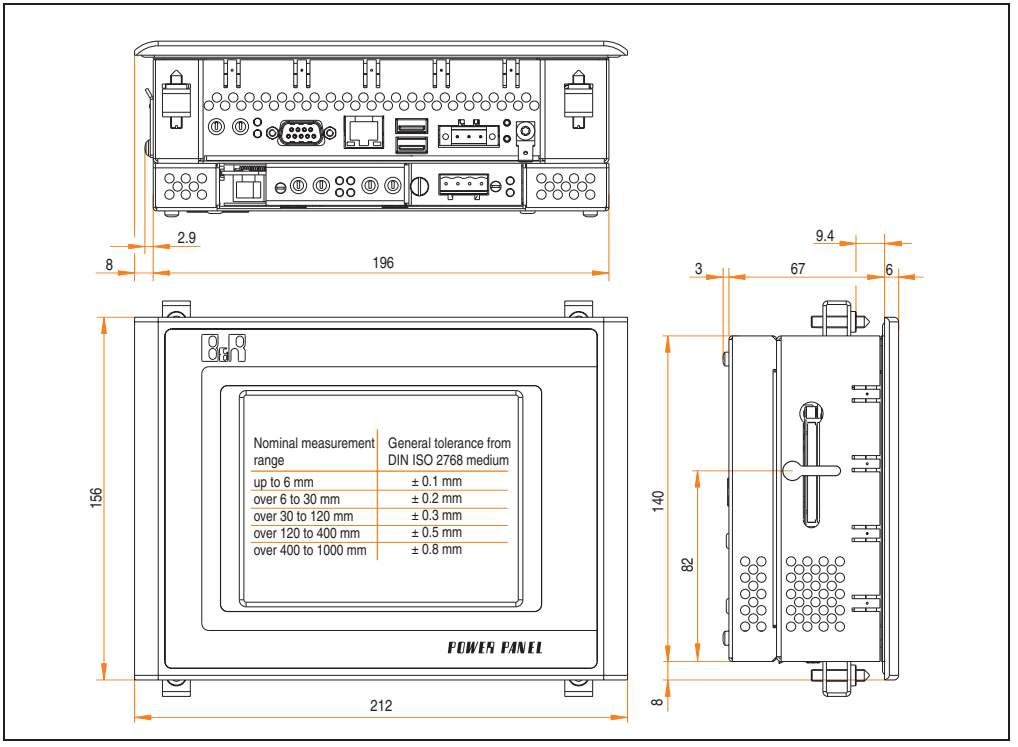


Figure 51: Dimensions - 4PP420.0573-75

3.6.3 Cutout installation

The cutout hole is to be made according to the following dimensions for cutout installation. The device must be mounted using the retaining clips included in delivery.

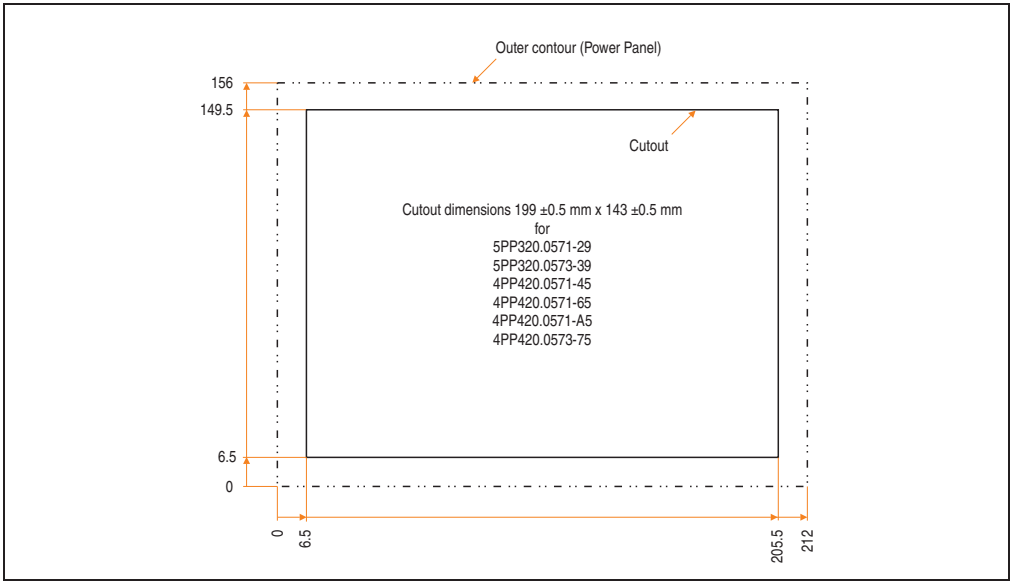


Figure 52: Cutout installation - 4PP420.0573-75

3.6.4 Contents of delivery

The following components are included in the delivery of the Power Panel device:

Number	Component
1	Power Panel PP420 5.7" VGA, 1 aPCI, touch screen
4	Retaining clips included
1	Lithium battery 3 V / 950 mAh included

Table 38: Contents of delivery - 4PP420.0573-75

3.7 Device 4PP420.1043-75

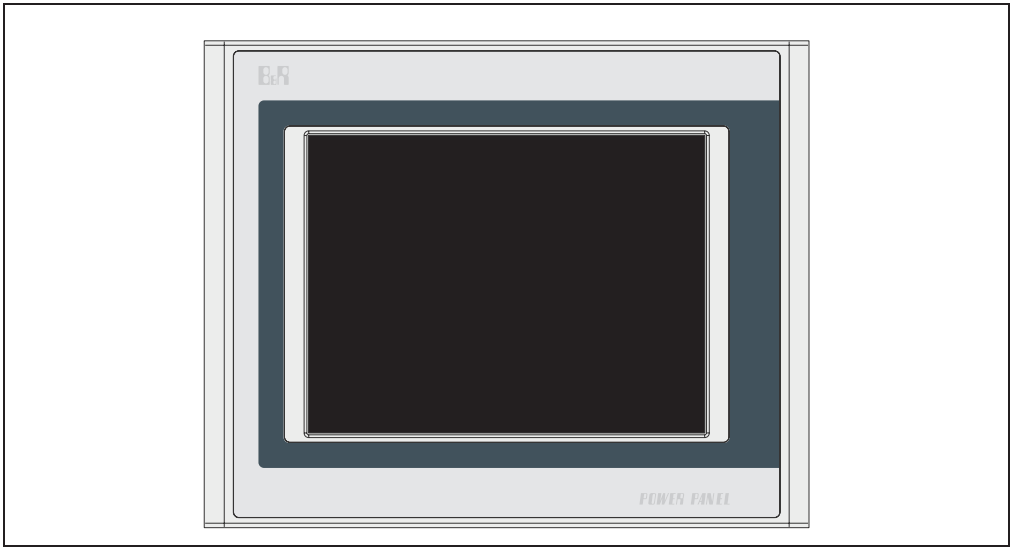


Figure 53: Front view - 4PP420.1043-75

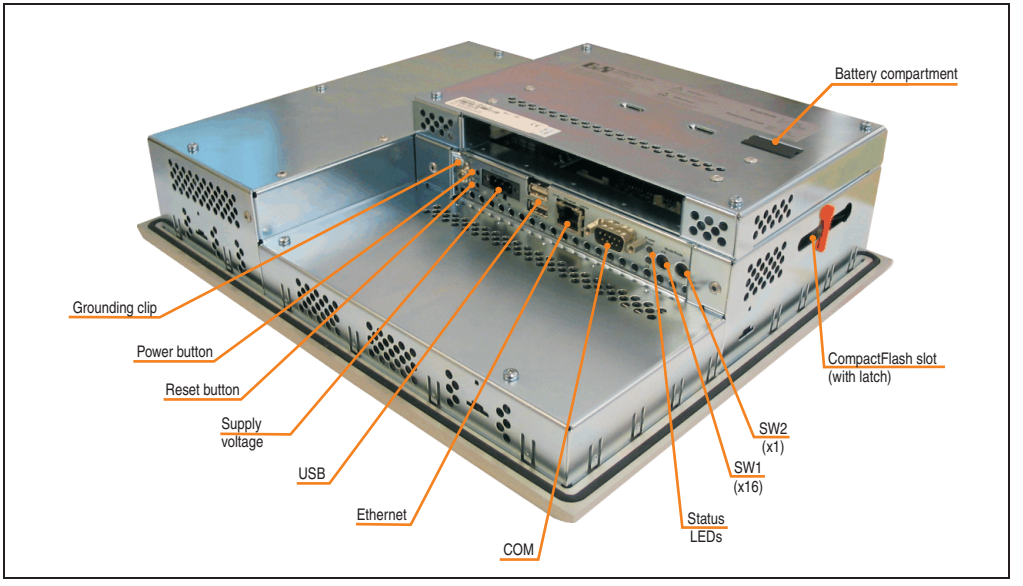


Figure 54: Rear view - 4PP420.1043-75

3.7.1 Technical data

Features	4PP420.1043-75
Boot loader / Operating system	Automation Runtime
Processor Type Expanded command set L1 cache L2 cache Floating point unit (FPU) Cooling Type	 Geode LX800 500 MHz, 32-bit x86 MMX technology, streaming SIMD extension 128 KB (64 KB L cache / 64 KB D cache) 128 KB Yes Passive (heat sink)
Flash	2 MB (for firmware)
Memory Type Size	 DDRAM 64 MB
Graphics Controller Memory	 Geode LX800 TBD MB shared memory (reserved by main memory)
SRAM Size Battery-buffered	 512 KB Yes
Watchdog Controller	 MTCX[1)]
Power failure logic Controller Buffer time	 MTCX[2)] TBD ms
Real-time clock Battery-buffered Accuracy	 Yes Typ. TBD ppm[2)]
Battery Type Removable Lifespan Backup capacitor (for changing battery) Buffer time	 Renata 950 mAh Yes, accessible from the outside 4 years [3)] 10 minutes
Ethernet[1)] Controller Transfer rate Connection Cable NE2000-compatible	 Intel 82551ER 10/100 Mbps RJ45 twisted pair (10 Base T / 100 Base T) S/STP (category 5) -
CompactFlash Type Number Connection	 Type I 1 slot Primary IDE device
Serial interface Type UART Transfer rate Connection	 RS232, modem-capable, not electrically isolated TBD compatible, TBD byte FIFO Max. 115 kBaud 9-pin DSUB

Table 39: Technical data - 4PP420.1043-75

Features	4PP420.1043-75
USB interface	
Type	USB 1.1, USB 2.0
Number	2
Transfer rate	Low speed (1.5 MBit/s), full speed (12 MBit/s), to high speed (480 Mbit/s)
Connection	Type A
Current load	Max. 500 mA per connection
Reset button	Yes, accessible from the outside
Power button	Yes, accessible from the outside
LEDs	1x CF (yellow) 1x combined power (red/green) and user (yellow)
Mode/Node switches	2, 16 digits each
aPCI slots	1 (see B&R System 2005 manual for available aPCI interface modules)
Display	
Type	TFT colors
Diagonal	10.4" (264 mm)
Colors	256 colors
Resolution	VGA, 640 x 480 pixels
Contrast	600:1
Perspective (see page 308)	
Horizontal	Direction a / direction b = 70°
Vertical	Direction c = 45°/ direction d = 35°
Background lighting	
Brightness	350 cd/m²
Half-brightness time	55000 hours
Touch screen	
Technology	Analog, resistive
Controller	Elo, serial, 12-bit
Degree of transmission	Up to 80% ± 5%
Filter glass	-
Degree of transmission	
Coating	
Keys/LED	-
Function keys	
Soft keys	
Cursor keys	
Number block	
Other keys	
Key lifespan	
LED brightness	
Electrical characteristics	
Power supply	
Rated voltage	24 VDC ±25%
Rated current	TBD A
Starting current	Maximum TBD A for < TBD ms
Power consumption	TBD W typically, maximum TBD W max.
Electrical isolation	Yes
Ground resistance	0 Ohm

Table 39: Technical data - 4PP420.1043-75 (cont.)

Mechanical characteristics	4PP420.1043-75
Outer dimensions	
Width	323 mm
Height	260 mm
Depth	86 mm
Front	
Frame	Aluminum, naturally anodized[4]
Design	Gray[6]
Membrane	Polyester
Dark gray border around display	Similar to Pantone 432CV[6]
Light background	Similar to Pantone 427CV[6]
Gasket	Flat gasket around display front
Housing	Metal
Weight	Approx. TBD kg (without aPCI interface module)
Environmental characteristics	
Ambient temperature	
Operation	TBD
Storage	TBD
Transport	TBD
Relative humidity	
Operation	TBD
Storage	TBD
Transport	TBD
Vibration	
Operation (continuous)	TBD
Operation (occasional)	TBD
Storage	TBD
Transport	TBD
Shock	
Operation	TBD
Storage	TBD
Transport	TBD
Protection type	IP20 back side (only with installed CompactFlash card, inserted aPCI module or with an optional aPCI cover) IP65 / NEMA 250 type 4X, dust and sprayed water protection (front side)
Altitude	Max. 3000 m

Table 39: Technical data - 4PP420.1043-75 (cont.)

1) Maintenance Controller Extended.

2) At the maximum specified ambient temperature, the deviation can increase to typically TBD ppm.

3) Enter environmental conditions (temperature, self discharge, etc.)

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

3.7.2 Dimensions

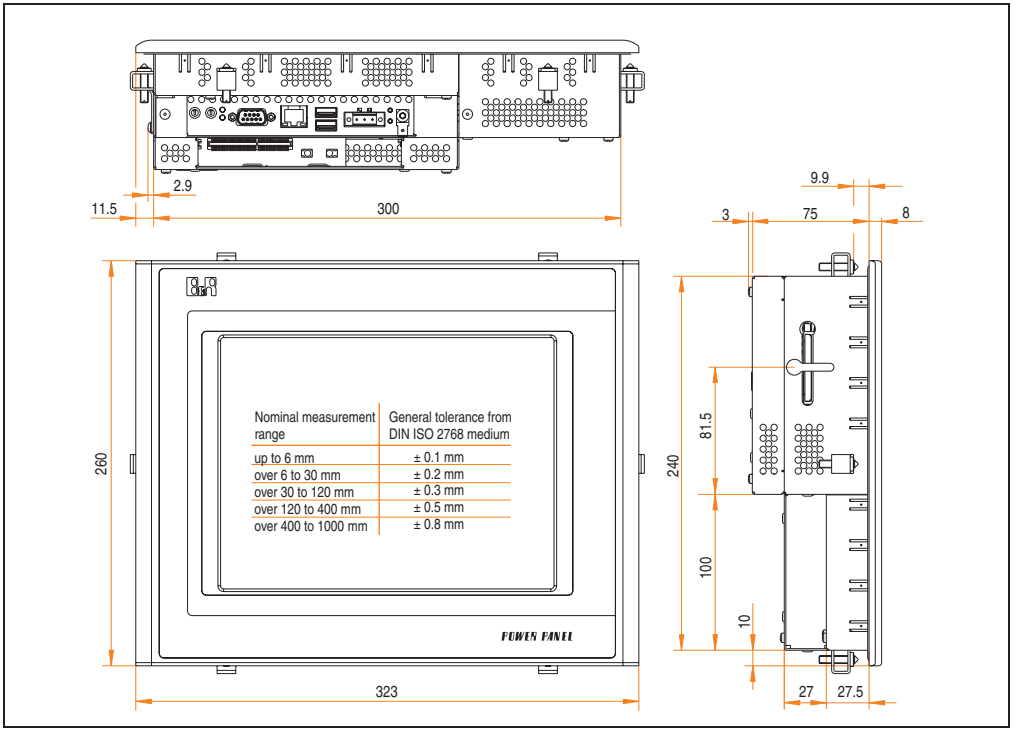


Figure 55: Dimensions - 4PP420.1043-75

3.7.3 Cutout installation

The cutout hole is to be made according to the following dimensions for cutout installation. The device must be mounted using the retaining clips included in delivery.

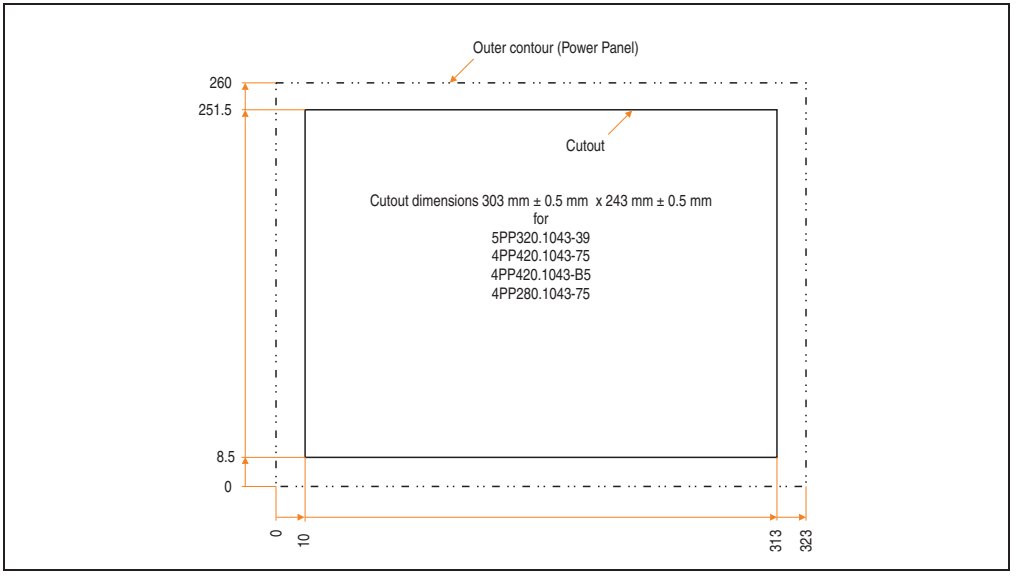


Figure 56: Cutout installation - 4PP420.1043-75

3.7.4 Contents of delivery

The following components are included in the delivery of the Power Panel device:

Number	Component
1	Power Panel PP420 10.4" VGA, 1 aPCI, touch screen
6	Retaining clips included
1	Lithium battery 3 V / 950 mAh included

Table 40: Contents of delivery - 4PP420.1043-75

3.8 Device 4PP420.1043-B5

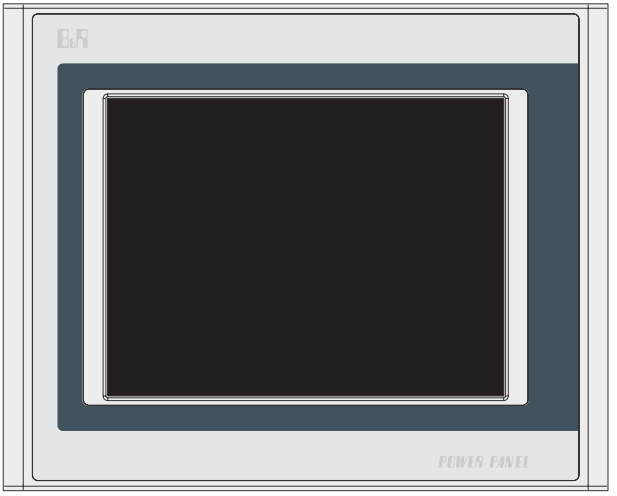


Figure 57: Front view - 4PP420.1043-B5

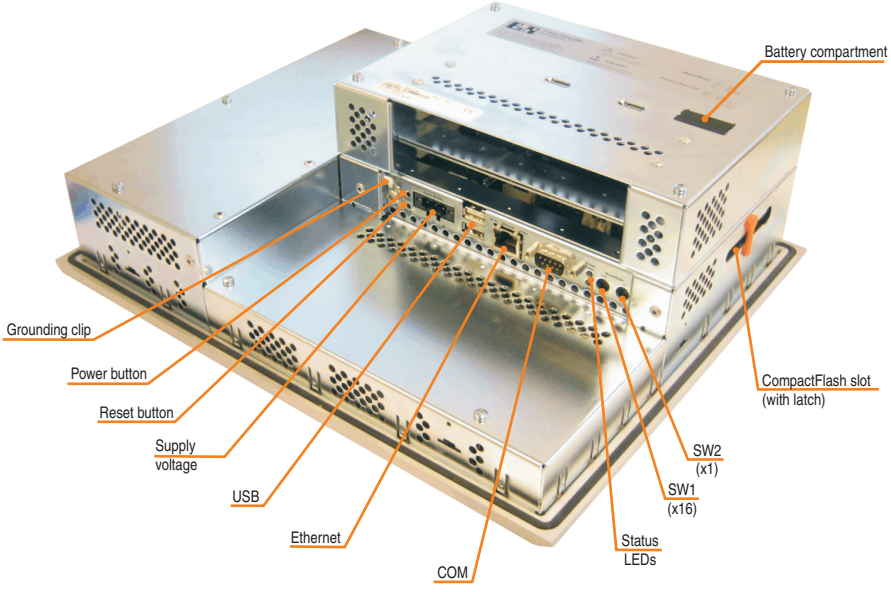


Figure 58: Rear view - 4PP420.1043-B5

3.8.1 Technical data

Features	4PP420.1043-B5
Boot loader / Operating system	Automation Runtime
Processor Type Expanded command set L1 cache L2 cache Floating point unit (FPU) Cooling Type	 Geode LX800 500 MHz, 32-bit x86 MMX technology, streaming SIMD extension 128 KB (64 KB L cache / 64 KB D cache) 128 KB Yes Passive (heat sink)
Flash	2 MB (for firmware)
Memory Type Size	 DDRAM 64 MB
Graphics Controller Memory	 Geode LX800 TBD MB shared memory (reserved by main memory)
SRAM Size Battery-buffered	 512 KB Yes
Watchdog Controller	 MTCX[1)]
Power failure logic Controller Buffer time	 MTCX[2)] TBD ms
Real-time clock Battery-buffered Accuracy	 Yes Typ. TBD ppm[2)]
Battery Type Removable Lifespan Backup capacitor (for changing battery) Buffer time	 Renata 950 mAh Yes, accessible from the outside 4 years [3)] 10 minutes
Ethernet Controller Transfer rate Connection Cable NE2000-compatible	 Intel 82551ER 10/100 Mbps RJ45 twisted pair (10 Base T / 100 Base T) S/STP (category 5) -
CompactFlash Type Number Connection	 Type I 1 slot Primary IDE device
Serial interface Type UART Transfer rate Connection	 RS232, modem-capable, not electrically isolated TBD compatible, TBD byte FIFO Max. 115 kBaud 9-pin DSUB

Table 41: Technical data - 4PP420.1043-B5

Features	4PP420.1043-B5
USB interface	
Type	USB 1.1, USB 2.0
Number	2
Transfer rate	Low speed (1.5 MBit/s), full speed (12 MBit/s), to high speed (480 Mbit/s)
Connection	Type A
Current load	Max. 500 mA per connection
Reset button	Yes, accessible from the outside
Power button	Yes, accessible from the outside
LEDs	1x CF (yellow) 1x combined power (red/green) and user (yellow)
Mode/Node switches	2, 16 digits each
aPCI slots	2 (see B&R System 2005 manual for available aPCI interface modules)
Display	
Type	TFT colors
Diagonal	10.4" (264 mm)
Colors	256 colors
Resolution	VGA, 640 x 480 pixels
Contrast	600:1
Perspective (see page 308)	
Horizontal	Direction a / direction b = 70°
Vertical	Direction c = 45°/ direction d = 35°
Background lighting	
Brightness	350 cd/m²
Half-brightness time	55000 hours
Touch screen	
Technology	Analog, resistive
Controller	Elo, serial, 12-bit
Degree of transmission	Up to 80% ± 5%
Filter glass	-
Degree of transmission	
Coating	
Keys/LED	-
Function keys	
Soft keys	
Cursor keys	
Number block	
Other keys	
Key lifespan	
LED brightness	
Electrical characteristics	
Power supply	
Rated voltage	24 VDC ±25%
Rated current	TBD A
Starting current	Maximum TBD A for < TBD ms
Power consumption	TBD W typically, maximum TBD W max.
Electrical isolation	Yes
Ground resistance	0 Ohm

Table 41: Technical data - 4PP420.1043-B5 (cont.)

Mechanical characteristics	4PP420.1043-B5
Outer dimensions	
Width	323 mm
Height	260 mm
Depth	108 mm
Front	
Frame	Aluminum, naturally anodized[4]
Design	Gray[4]
Membrane	Polyester
Dark gray border around display	Similar to Pantone 432CV[4]
Light background	Similar to Pantone 427CV[4]
Gasket	Flat gasket around display front
Housing	Metal
Weight	Approx. TBD kg (without aPCI interface module)
Environmental characteristics	
Ambient temperature	
Operation	TBD
Storage	TBD
Transport	TBD
Relative humidity	
Operation	TBD
Storage	TBD
Transport	TBD
Vibration	
Operation (continuous)	TBD
Operation (occasional)	TBD
Storage	TBD
Transport	TBD
Shock	
Operation	TBD
Storage	TBD
Transport	TBD
Protection type	IP20 back side (only with installed CompactFlash card, inserted aPCI module or with an optional aPCI cover) IP65 / NEMA 250 type 4X, dust and sprayed water protection (front side)
Altitude	Max. 3000 m

Table 41: Technical data - 4PP420.1043-B5 (cont.)

1) Maintenance Controller Extended.

2) At the maximum specified ambient temperature, the deviation can increase to typically TBD ppm.

3) Enter environmental conditions (temperature, self discharge, etc.)

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

3.8.2 Dimensions

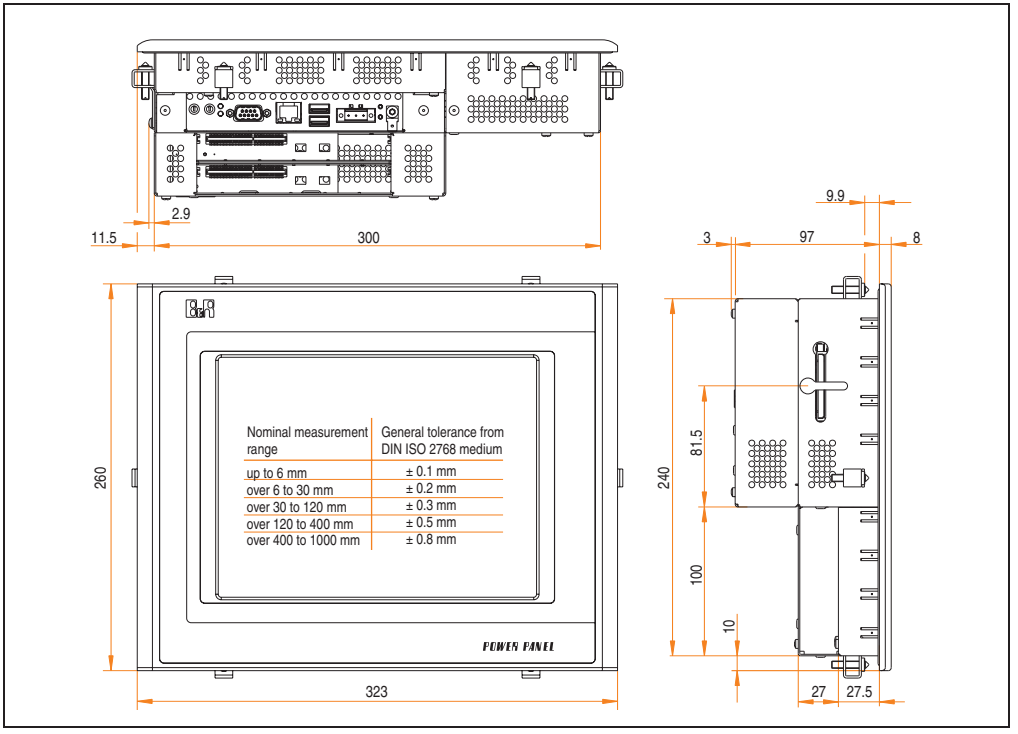


Figure 59: Dimensions - 4PP420.1043-B5

3.8.3 Cutout installation

The cutout hole is to be made according to the following dimensions for cutout installation. The device must be mounted using the retaining clips included in delivery.

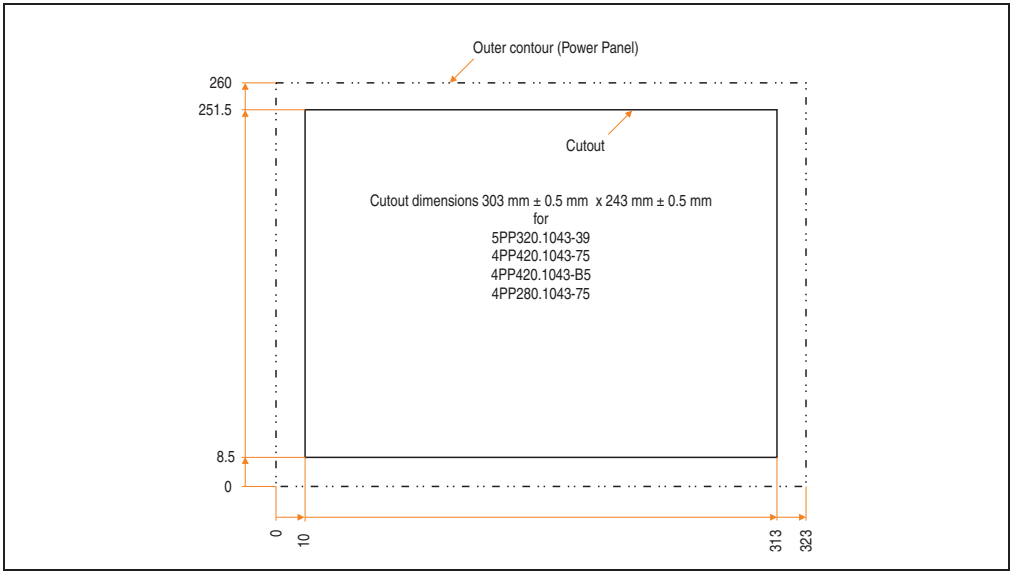


Figure 60: Cutout installation - 4PP420.1043-B5

3.8.4 Contents of delivery

The following components are included in the delivery of the Power Panel device:

Number	Component
1	Power Panel PP420 10.4" VGA, 2 aPCI, touch screen
6	Retaining clips included
1	Lithium battery 3 V / 950 mAh included

Table 42: Contents of delivery - 4PP420.1043-B5

3.9 Device 4PP420.1505-75

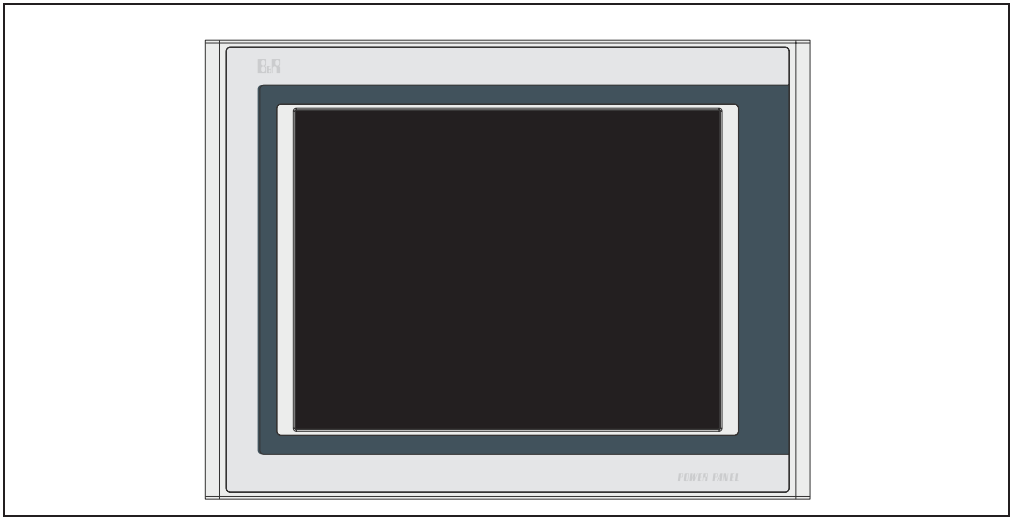


Figure 61: Front view - 4PP420.1505-75

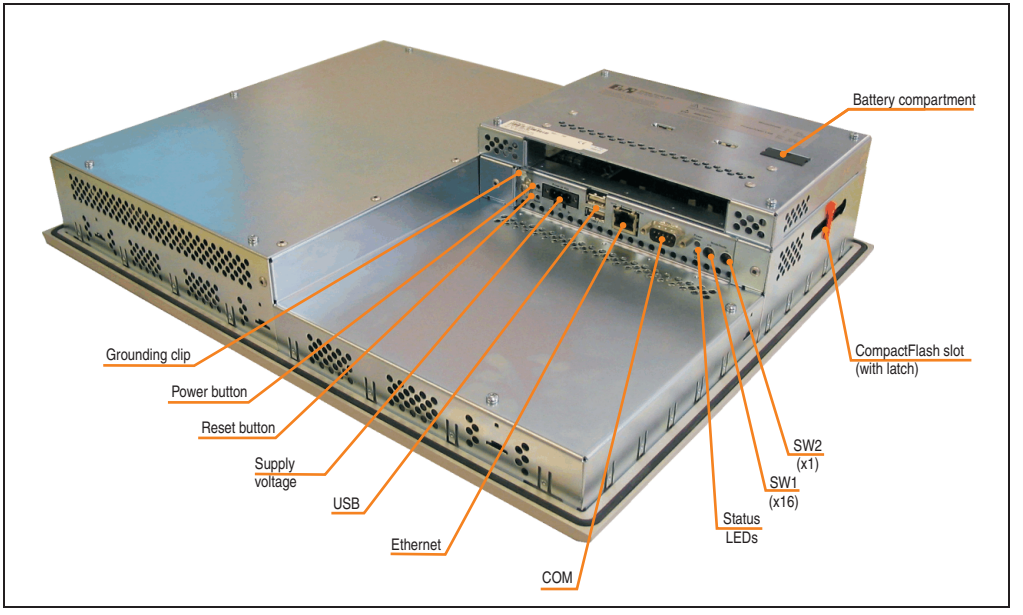


Figure 62: Rear view - 4PP420.1505-75

3.9.1 Technical data

Features	4PP420.1505-75
Boot loader / Operating system	Automation Runtime
Processor Type Expanded command set L1 cache L2 cache Floating point unit (FPU) Cooling Type	 Geode LX800 500 MHz, 32-bit x86 MMX technology, streaming SIMD extension 128 KB (64 KB L cache / 64 KB D cache) 128 KB Yes Passive (heat sink)
Flash	2 MB (for firmware)
Memory Type Size	 DDRAM 64 MB
Graphics Controller Memory	 Geode LX800 TBD MB shared memory (reserved by main memory)
SRAM Size Battery-buffered	 512 KB Yes
Watchdog Controller	 MTCX[1)]
Power failure logic Controller Buffer time	 MTCX[2)] TBD ms
Real-time clock Battery-buffered Accuracy	 Yes Typ. TBD ppm[2)]
Battery Type Removable Lifespan Backup capacitor (for changing battery) Buffer time	 Renata 950 mAh Yes, accessible from the outside 4 years [3)] 10 minutes
Ethernet[1)] Controller Transfer rate Connection Cable NE2000-compatible	 Intel 82551ER 10/100 Mbps RJ45 twisted pair (10 Base T / 100 Base T) S/STP (category 5) -
CompactFlash Type Number Connection	 Type I 1 slot Primary IDE device
Serial interface Type UART Transfer rate Connection	 RS232, modem-capable, not electrically isolated TBD compatible, TBD byte FIFO Max. 115 kBaud 9-pin DSUB

Table 43: Technical data - 4PP420.1505-75

Features	4PP420.1505-75
USB interface	
Type	USB 1.1, USB 2.0
Number	2
Transfer rate	Low speed (1.5 MBit/s), full speed (12 MBit/s), to high speed (480 Mbit/s)
Connection	Type A
Current load	Max. 500 mA per connection
Reset button	Yes, accessible from the outside
Power button	Yes, accessible from the outside
LEDs	1x CF (yellow) 1x combined power (red/green) and user (yellow)
Mode/Node switches	2, 16 digits each
aPCI slots	1 (see B&R System 2005 manual for available aPCI interface modules)
Display	
Type	TFT colors
Diagonal	15" (381 mm)
Colors	256 colors
Resolution	XGA, 1024 x 768 pixels
Contrast	300:1
Perspective (see page 308)	
Horizontal	Direction a / direction b = 85°
Vertical	Direction c / direction d = 85°
Background lighting	
Brightness	330 cd/m²
Half-brightness time	35000 hours
Touch screen	
Technology	Analog, resistive
Controller	Elo, serial, 12-bit
Degree of transmission	Up to 80% ± 5%
Filter glass	-
Degree of transmission	
Coating	
Keys/LED	-
Function keys	
Soft keys	
Cursor keys	
Number block	
Other keys	
Key lifespan	
LED brightness	
Electrical characteristics	
Power supply	
Rated voltage	24 VDC ±25%
Rated current	TBD A
Starting current	Maximum TBD A for < TBD ms
Power consumption	TBD W typically, maximum TBD W max.
Electrical isolation	Yes
Ground resistance	0 Ohm

Table 43: Technical data - 4PP420.1505-75 (cont.)

Mechanical characteristics	4PP420.1505-75
Outer dimensions	
Width	435 mm
Height	330 mm
Depth	86 mm
Front	
Frame	Aluminum, naturally anodized[4)]
Design	Gray[6)]
Membrane	Polyester
Dark gray border around display	Similar to Pantone 432CV[6)]
Light background	Similar to Pantone 427CV[6)]
Gasket	Flat gasket around display front
Housing	Metal
Weight	Approx. TBD kg (without aPCI interface module)
Environmental characteristics	
Ambient temperature	
Operation	TBD
Storage	TBD
Transport	TBD
Relative humidity	
Operation	TBD
Storage	TBD
Transport	TBD
Vibration	
Operation (continuous)	TBD
Operation (occasional)	TBD
Storage	TBD
Transport	TBD
Shock	
Operation	TBD
Storage	TBD
Transport	TBD
Protection type	IP20 back side (only with installed CompactFlash card, inserted aPCI module or with an optional aPCI cover) IP65 / NEMA 250 type 4X, dust and sprayed water protection (front side)
Altitude	Max. 3000 m

Table 43: Technical data - 4PP420.1505-75 (cont.)

1) Maintenance Controller Extended.

2) At the maximum specified ambient temperature, the deviation can increase to typically TBD ppm.

3) Enter environmental conditions (temperature, self discharge, etc.)

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

3.9.2 Dimensions

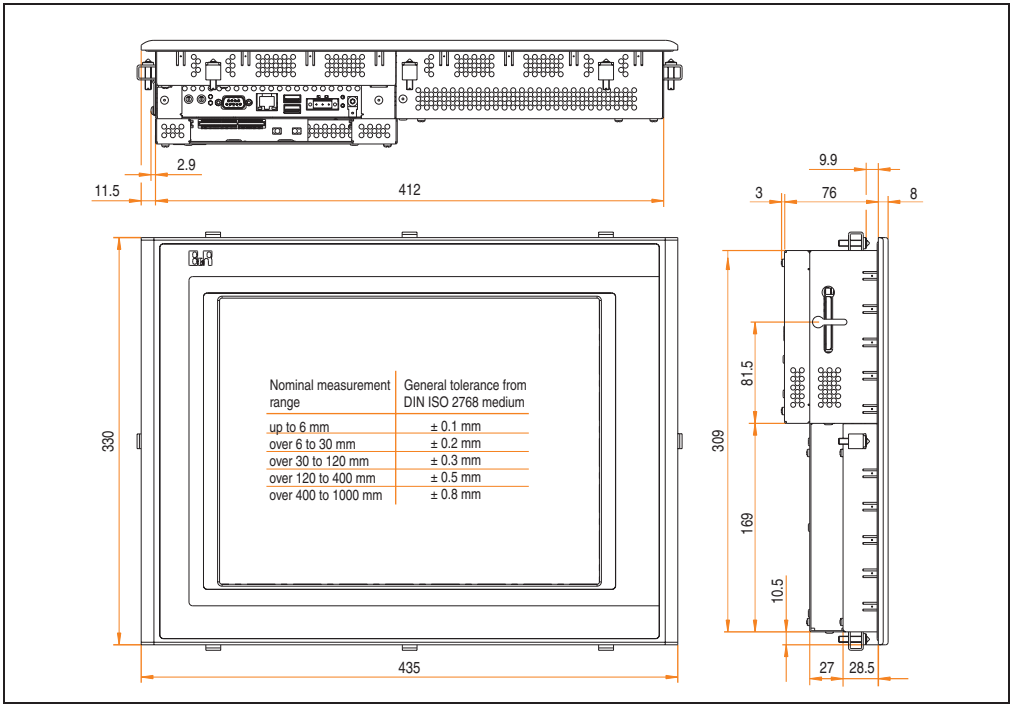


Figure 63: Dimensions - 4PP420.1505-75

3.9.3 Cutout installation

The cutout hole is to be made according to the following dimensions for cutout installation. The device must be mounted using the retaining clips included in delivery.

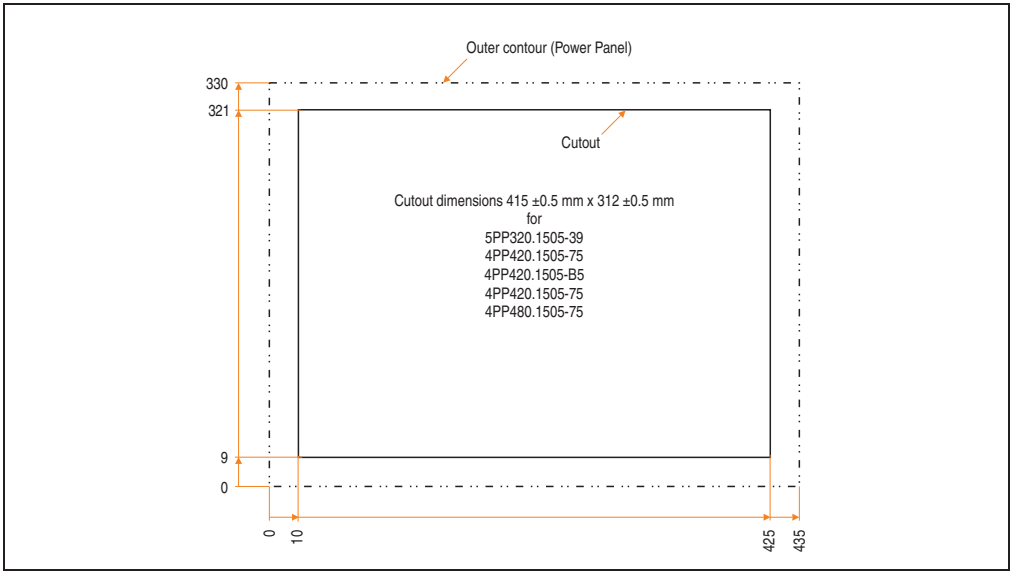


Figure 64: Cutout installation - 4PP420.1505-75

3.9.4 Contents of delivery

The following components are included in the delivery of the Power Panel device:

Number	Component
1	Power Panel PP420 15" XGA, 1 aPCI, touch screen
8	Retaining clips included
1	Lithium battery 3 V / 950 mAh included

Table 44: Contents of delivery - 4PP420.1505-75

3.10 Device 4PP420.1505-B5

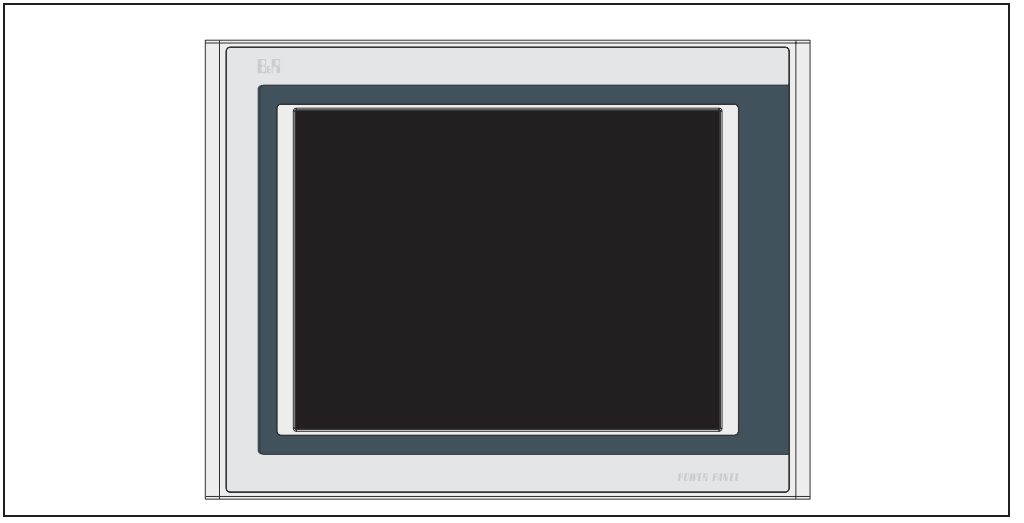


Figure 65: Front view - 4PP420.1505-B5

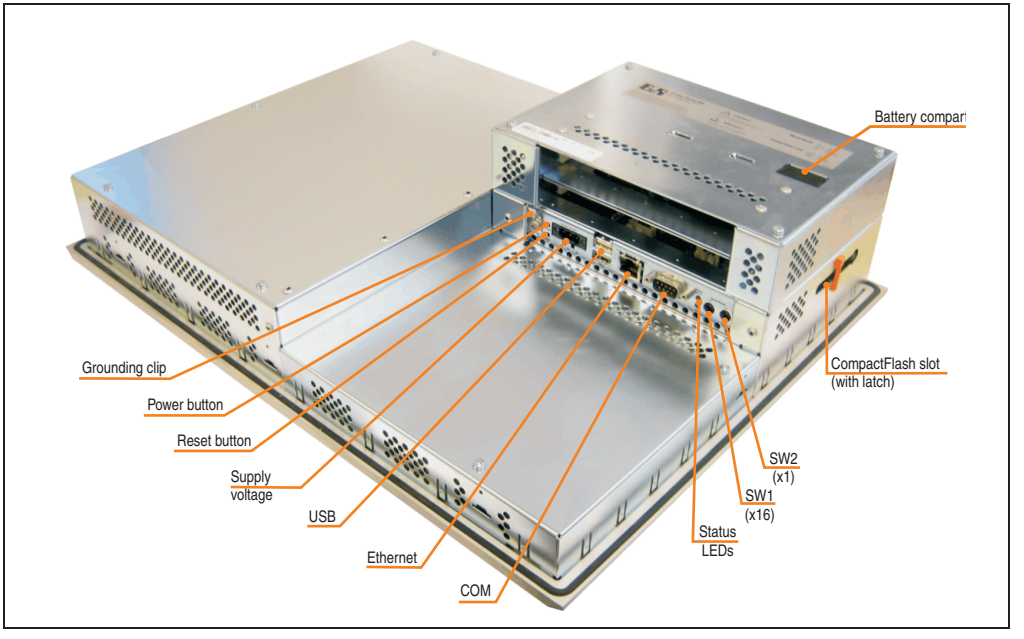


Figure 66: Rear view - 4PP420.1505-B5

3.10.1 Technical data

Features	4PP420.1505-B5
Boot loader / Operating system	Automation Runtime
Processor Type Expanded command set L1 cache L2 cache Floating point unit (FPU) Cooling Type	 Geode LX800 500 MHz, 32-bit x86 MMX technology, streaming SIMD extension 128 KB (64 KB L cache / 64 KB D cache) 128 KB Yes Passive (heat sink)
Flash	2 MB (for firmware)
Memory Type Size	 DDRAM 64 MB
Graphics Controller Memory	 Geode LX800 TBD MB shared memory (reserved by main memory)
SRAM Size Battery-buffered	 512 KB Yes
Watchdog Controller	 MTCX[1)]
Power failure logic Controller Buffer time	 MTCX[2)] TBD ms
Real-time clock Battery-buffered Accuracy	 Yes Typ. TBD ppm[2)]
Battery Type Removable Lifespan Backup capacitor (for changing battery) Buffer time	 Renata 950 mAh Yes, accessible from the outside 4 years [3)] 10 minutes
Ethernet[1)] Controller Transfer rate Connection Cable NE2000-compatible	 Intel 82551ER 10/100 Mbps RJ45 twisted pair (10 Base T / 100 Base T) S/STP (category 5) -
CompactFlash Type Number Connection	 Type I 1 slot Primary IDE device
Serial interface Type UART Transfer rate Connection	 RS232, modem-capable, not electrically isolated TBD compatible, TBD byte FIFO Max. 115 kBaud 9-pin DSUB

Table 45: Technical data - 4PP420.1505-B5

Features	4PP420.1505-B5
USB interface	
Type	USB 1.1, USB 2.0
Number	2
Transfer rate	Low speed (1.5 MBit/s), full speed (12 MBit/s), to high speed (480 Mbit/s)
Connection	Type A
Current load	Max. 500 mA per connection
Reset button	Yes, accessible from the outside
Power button	Yes, accessible from the outside
LEDs	1x CF (yellow) 1x combined power (red/green) and user (yellow)
Mode/Node switches	2, 16 digits each
aPCI slots	2 (see B&R System 2005 manual for available aPCI interface modules)
Display	
Type	TFT colors
Diagonal	15" (381 mm)
Colors	256 colors
Resolution	XGA, 1024 x 768 pixels
Contrast	300:1
Perspective (see page 308)	
Horizontal	Direction a / direction b = 85°
Vertical	Direction c / direction d = 85°
Background lighting	
Brightness	330 cd/m²
Half-brightness time	35000 hours
Touch screen	
Technology	Analog, resistive
Controller	Elo, serial, 12-bit
Degree of transmission	Up to 80% ± 5%
Filter glass	-
Degree of transmission	
Coating	
Keys/LED	-
Function keys	
Soft keys	
Cursor keys	
Number block	
Other keys	
Key lifespan	
LED brightness	
Electrical characteristics	
Power supply	
Rated voltage	24 VDC ±25%
Rated current	TBD A
Starting current	Maximum TBD A for < TBD ms
Power consumption	TBD W typically, maximum TBD W max.
Electrical isolation	Yes
Ground resistance	0 Ohm

Table 45: Technical data - 4PP420.1505-B5 (cont.)

Mechanical characteristics	4PP420.1505-B5
Outer dimensions	
Width	435 mm
Height	330 mm
Depth	109 mm
Front	
Frame	Aluminum, naturally anodized[4]
Design	Gray[4]
Membrane	Polyester
Dark gray border around display	Similar to Pantone 432CV[4]
Light background	Similar to Pantone 427CV[4]
Gasket	Flat gasket around display front
Housing	Metal
Weight	Approx. TBD kg (without aPCI interface module)
Environmental characteristics	
Ambient temperature	
Operation	TBD
Storage	TBD
Transport	TBD
Relative humidity	
Operation	TBD
Storage	TBD
Transport	TBD
Vibration	
Operation (continuous)	TBD
Operation (occasional)	TBD
Storage	TBD
Transport	TBD
Shock	
Operation	TBD
Storage	TBD
Transport	TBD
Protection type	IP20 back side (only with installed CompactFlash card, inserted aPCI module or with an optional aPCI cover) IP65 / NEMA 250 type 4X, dust and sprayed water protection (front side)
Altitude	Max. 3000 m

Table 45: Technical data - 4PP420.1505-B5 (cont.)

1) Maintenance Controller Extended.

2) At the maximum specified ambient temperature, the deviation can increase to typically TBD ppm.

3) Enter environmental conditions (temperature, self discharge, etc.)

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

3.10.2 Dimensions

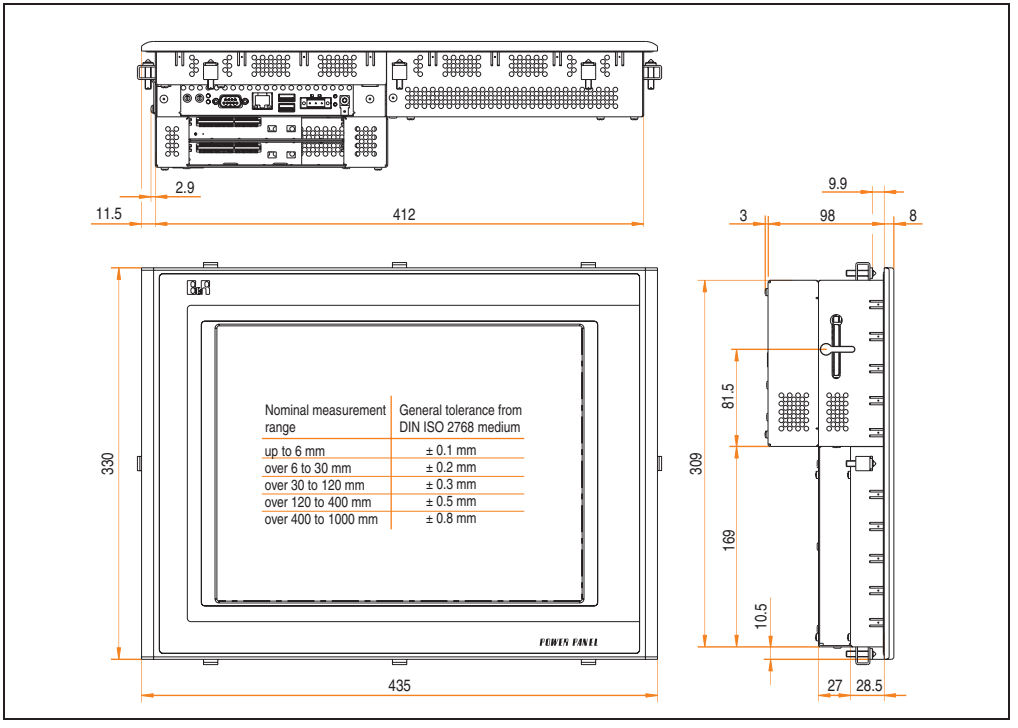


Figure 67: Dimensions - 4PP420.1505-B5

3.10.3 Cutout installation

The cutout hole is to be made according to the following dimensions for cutout installation. The device must be mounted using the retaining clips included in delivery.

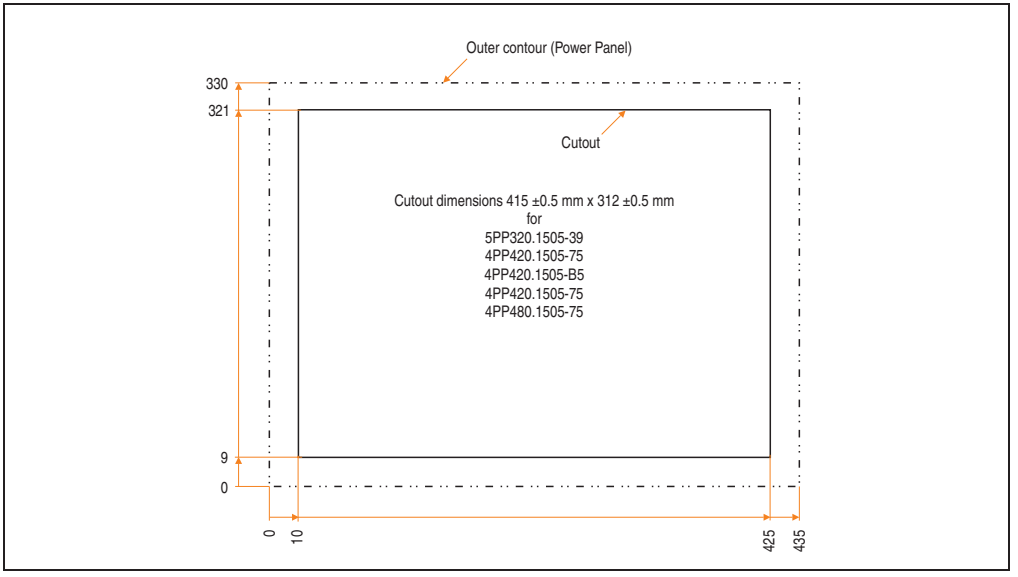


Figure 68: Cutout installation - 4PP420.1505-B5

3.10.4 Contents of delivery

The following components are included in the delivery of the Power Panel device:

Number	Component
1	Power Panel PP420 15" XGA, 2 aPCI, touch screen
8	Retaining clips included
1	Lithium battery 3 V / 950 mAh included

Table 46: Contents of delivery - 4PP420.1505-B5

3.11 Device 4PP451.0571-65

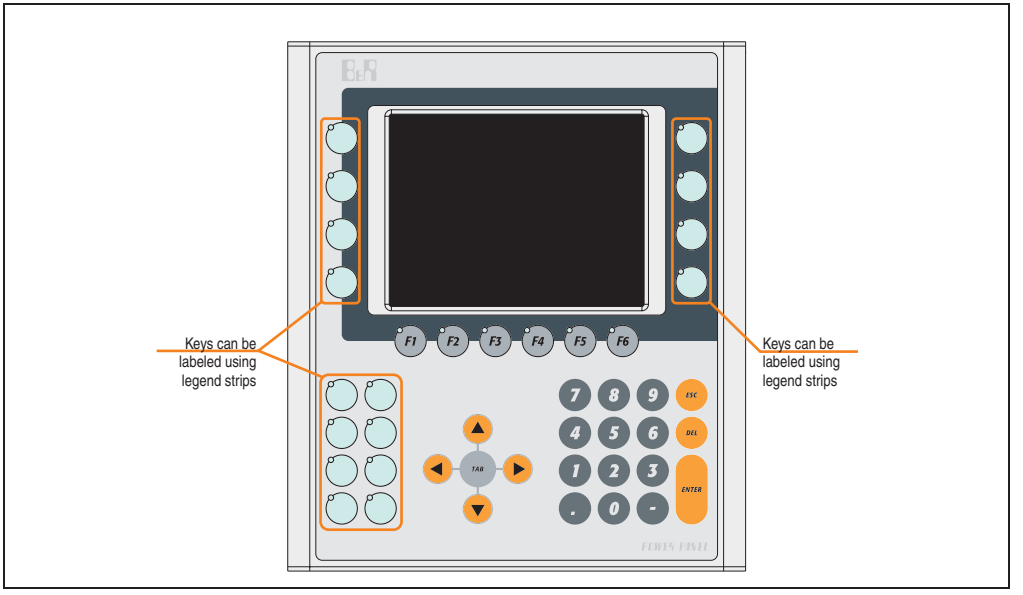


Figure 69: Front view - 4PP451.0571-65

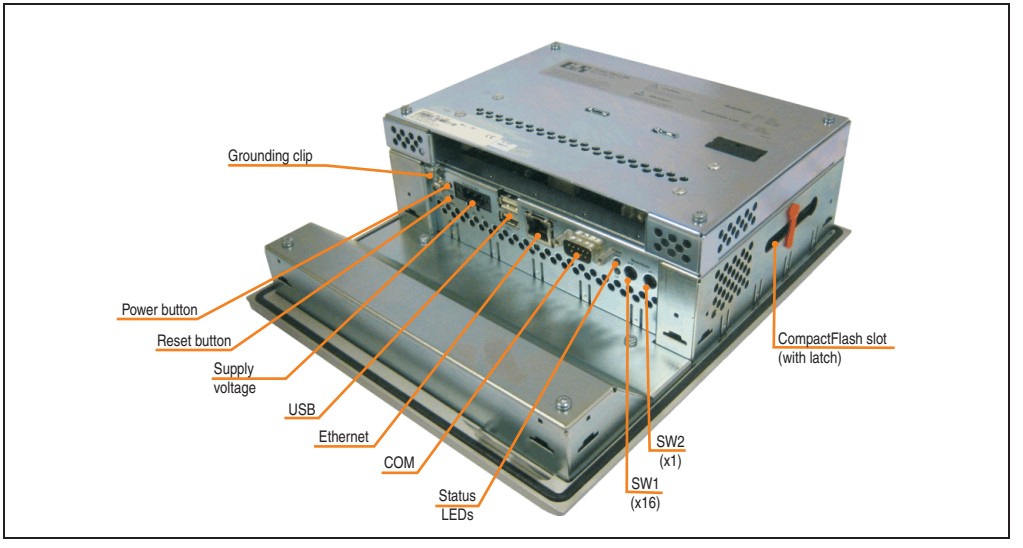


Figure 70: Rear view - 4PP451.0571-65

3.11.1 Technical data

Features	4PP451.0571-65
Boot loader / Operating system	Automation Runtime
Processor Type Expanded command set L1 cache L2 cache Floating point unit (FPU) Cooling Type	 Geode LX800 500 MHz, 32-bit x86 MMX technology, streaming SIMD extension 128 KB (64 KB L cache / 64 KB D cache) 128 KB Yes Passive (heat sink)
Flash	2 MB (for firmware)
Memory Type Size	 DDRAM 64 MB
Graphics Controller Memory	 Geode LX800 TBD MB shared memory (reserved by main memory)
SRAM Size Battery-buffered	 512 KB Yes
Watchdog Controller	 MTCX[1)]
Power failure logic Controller Buffer time	 MTCX[2)] TBD ms
Real-time clock Battery-buffered Accuracy	 Yes Typ. TBD ppm[2)]
Battery Type Removable Lifespan Backup capacitor (for changing battery) Buffer time	 Renata 950 mAh Yes, accessible from the outside 4 years [3)] 10 minutes
Ethernet Controller Transfer rate Connection Cable NE2000-compatible	 Intel 82551ER 10/100 Mbps RJ45 twisted pair (10 Base T / 100 Base T) S/STP (category 5) -
CompactFlash Type Number Connection	 Type I 1 slot Primary IDE device
Serial interface Type UART Transfer rate Connection	 RS232, modem-capable, not electrically isolated TBD compatible, TBD byte FIFO Max. 115 kBaud 9-pin DSUB

Table 47: Technical data - 4PP451.0571-65

Features	4PP451.0571-65
USB interface	
Type	USB 1.1, USB 2.0
Number	2
Transfer rate	Low speed (1.5 MBit/s), full speed (12 MBit/s), to high speed (480 Mbit/s)
Connection	Type A
Current load	Max. 500 mA per connection
Reset button	Yes, accessible from the outside
Power button	Yes, accessible from the outside
LEDs	1x CF (yellow) 1x combined power (red/green) and user (yellow)
Mode/Node switches	2, 16 digits each
aPCI slots	1 (see B&R System 2005 manual for available aPCI interface modules)
Display	
Type	Color LCD
Diagonal	5.7" (144 mm)
Colors	256 colors
Resolution	QVGA, 320 x 240 pixels
Contrast	40:1
Perspective (see page 308)	
Horizontal	Direction a / direction b = 40°
Vertical	Direction c = 40°/ direction d = 50°
Background lighting	
Brightness	140 cd/m²
Half-brightness time	50000 hours
Touch screen	
Technology	Analog, resistive
Controller	Elo, serial, 12-bit
Degree of transmission	Up to 80% ± 5%
Filter glass	-
Degree of transmission	
Coating	
Keys/LED[4)]	
Function keys	16 with LED (yellow)
Soft keys	6 with LED (yellow)
Cursor keys	-
Number block	15 without LED
Other keys	5 without LED
Key lifespan	> 1,000,000 actuations with 1 ±0.3 to 3 ±0.3 N operating force
LED brightness	Typ. 12 mcd (yellow) and 20 mcd (green)
Caution! **Pressing several keys at the same time may trigger unintended actions.**	
Electrical characteristics	
Power supply	
Rated voltage	24 VDC ±25%
Rated current	TBD A
Starting current	Maximum TBD A for < TBD ms
Power consumption	TBD W typically, maximum TBD W max.
Electrical isolation	Yes
Ground resistance	0 Ohm

Table 47: Technical data - 4PP451.0571-65 (cont.)

Mechanical characteristics	4PP451.0571-65
Outer dimensions	
Width	212 mm
Height	245 mm
Depth	76 mm
Front	
Frame	Aluminum, naturally anodized[5]
Design	Gray[6]
Membrane	Polyester
Dark gray border around display	Similar to Pantone 432CV[6]
Light background	Similar to Pantone 427CV[6]
Orange keys	Similar to Pantone 151CV[6]
Dark gray keys	Similar to Pantone 431CV[6]
Legend strips (gray)	Similar to Pantone 429CV[6]
Gasket	Flat gasket around display front
Housing	Metal
Weight	Approx. TBD kg (without aPCI interface module)
Environmental characteristics	
Ambient temperature	
Operation	TBD
Storage	TBD
Transport	TBD
Relative humidity	
Operation	TBD
Storage	TBD
Transport	TBD
Vibration	
Operation (continuous)	TBD
Operation (occasional)	TBD
Storage	TBD
Transport	TBD
Shock	
Operation	TBD
Storage	TBD
Transport	TBD
Protection type	IP20 back side (only with installed CompactFlash card, inserted aPCI module or with an optional aPCI cover) IP65 / NEMA 250 type 4X, dust and sprayed water protection (front side)
Altitude	Max. 3000 m

Table 47: Technical data - 4PP451.0571-65 (cont.)

1) Maintenance Controller Extended.

2) At the maximum specified ambient temperature, the deviation can increase to typically TBD ppm.

3) Enter environmental conditions (temperature, self discharge, etc.)

4) The functions of the keys and the LEDs can be configured using B&R Automation Studio - Visual Components.

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

3.11.2 Dimensions

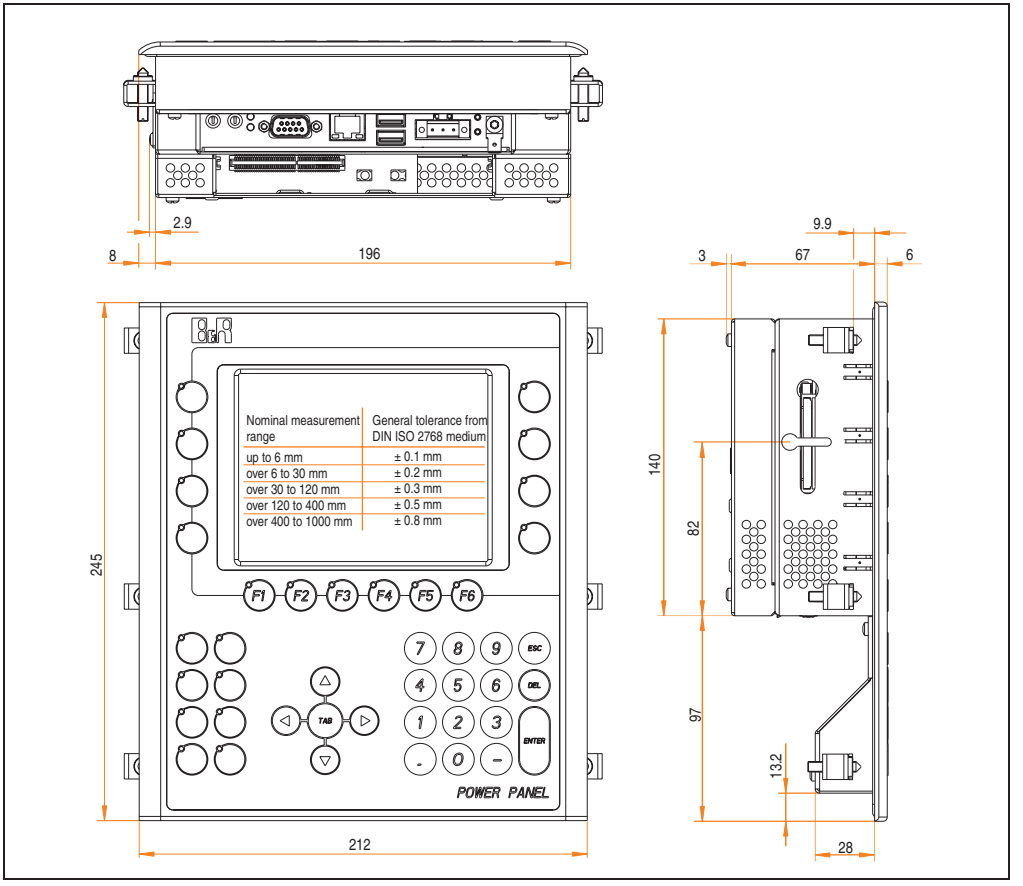


Figure 71: Dimensions - 4PP451.0571-65

3.11.3 Cutout installation

The cutout hole is to be made according to the following dimensions for cutout installation. The device must be mounted using the retaining clips included in delivery.

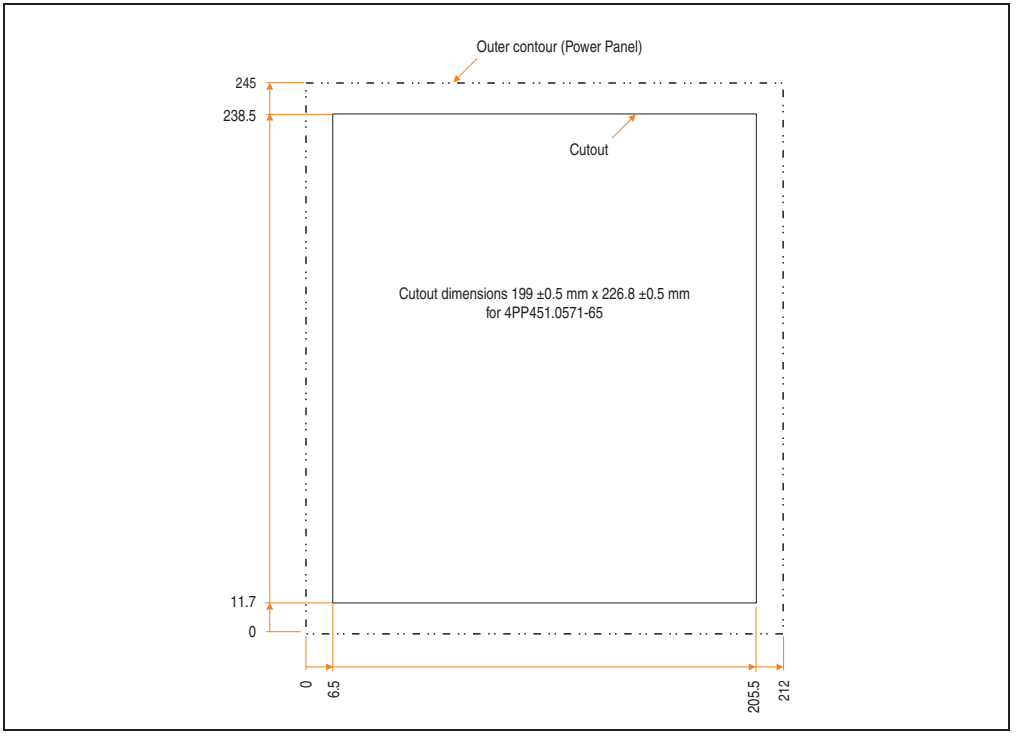


Figure 72: Cutout installation - 4PP451.0571-65

3.11.4 Contents of delivery

The following components are included in the delivery of the Power Panel device:

Number	Component
1	Power Panel PP451 5.7" QVGA, 1 aPCI, touch screen, keys
6	Retaining clips included
1	Lithium battery 3 V / 950 mAh included

Table 48: Contents of delivery - 4PP451.0571-65

3.12 Device 4PP452.0571-65

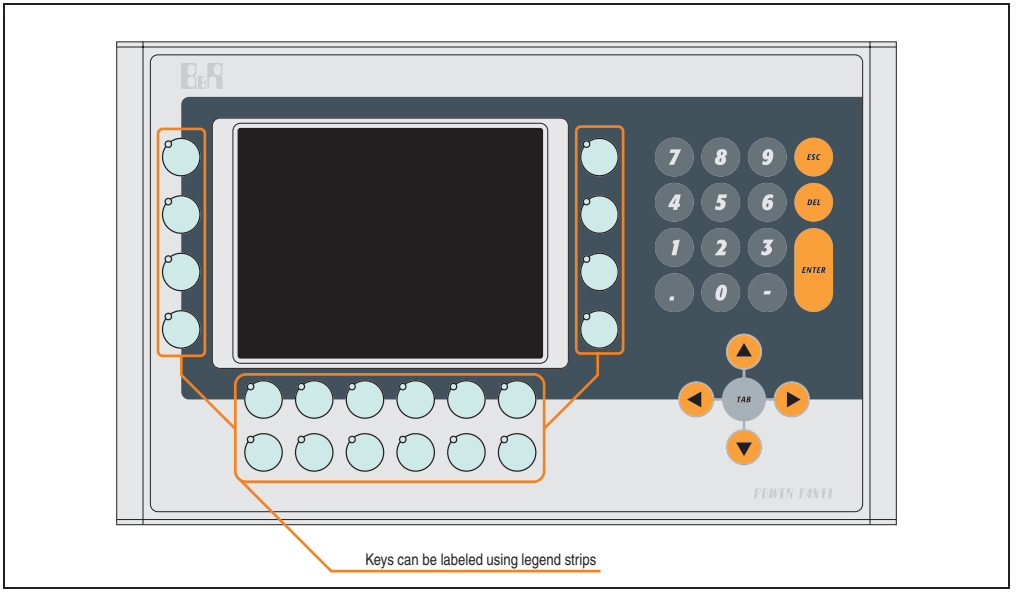


Figure 73: Front view - 4PP452.0571-65

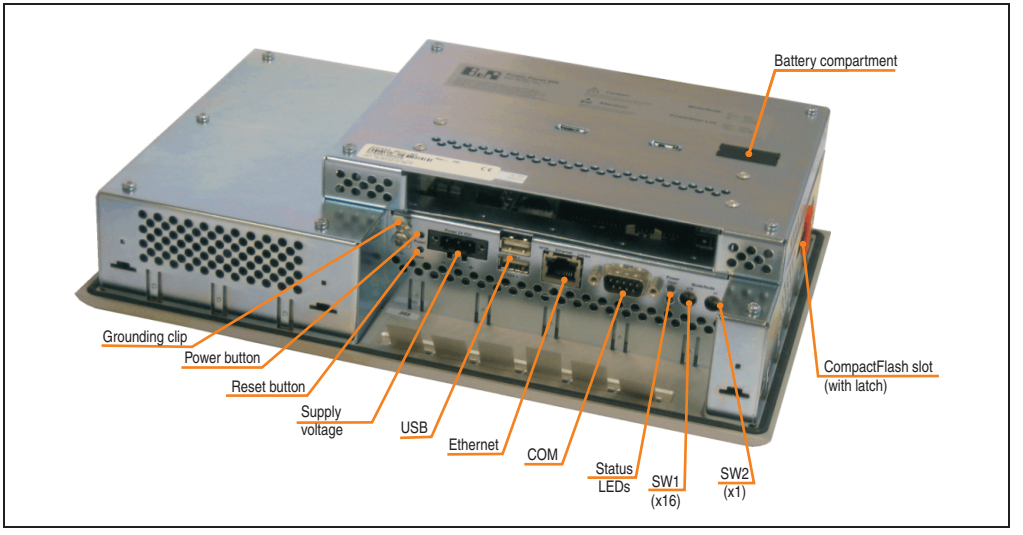


Figure 74: Rear view - 4PP452.0571-65

3.12.1 Technical data

Features	4PP452.0571-65
Boot loader / Operating system	Automation Runtime
Processor Type Expanded command set L1 cache L2 cache Floating point unit (FPU) Cooling Type	 Geode LX800 500 MHz, 32-bit x86 MMX technology, streaming SIMD extension 128 KB (64 KB L cache / 64 KB D cache) 128 KB Yes Passive (heat sink)
Flash	2 MB (for firmware)
Memory Type Size	 DDRAM 64 MB
Graphics Controller Memory	 Geode LX800 TBD MB shared memory (reserved by main memory)
SRAM Size Battery-buffered	 512 KB Yes
Watchdog Controller	 MTCX[1)]
Power failure logic Controller Buffer time	 MTCX[2)] TBD ms
Real-time clock Battery-buffered Accuracy	 Yes Typ. TBD ppm[2)]
Battery Type Removable Lifespan Backup capacitor (for changing battery) Buffer time	 Renata 950 mAh Yes, accessible from the outside 4 years [3)] 10 minutes
Ethernet Controller Transfer rate Connection Cable NE2000-compatible	 Intel 82551ER 10/100 Mbps RJ45 twisted pair (10 Base T / 100 Base T) S/STP (category 5) -
CompactFlash Type Number Connection	 Type I 1 slot Primary IDE device
Serial interface Type UART Transfer rate Connection	 RS232, modem-capable, not electrically isolated TBD compatible, TBD byte FIFO Max. 115 kBaud 9-pin DSUB

Table 49: Technical data - 4PP452.0571-65

Features	4PP452.0571-65
USB interface	
Type	USB 1.1, USB 2.0
Number	2
Transfer rate	Low speed (1.5 MBit/s), full speed (12 MBit/s), to high speed (480 Mbit/s)
Connection	Type A
Current load	Max. 500 mA per connection
Reset button	Yes, accessible from the outside
Power button	Yes, accessible from the outside
LEDs	1x CF (yellow) 1x combined power (red/green) and user (yellow)
Mode/Node switches	2, 16 digits each
aPCI slots	1 (see B&R System 2005 manual for available aPCI interface modules)
Display	
Type	Color LCD
Diagonal	5.7" (144 mm)
Colors	256 colors
Resolution	QVGA, 320 x 240 pixels
Contrast	40:1
Perspective (see page 308)	
Horizontal	Direction a / direction b = 40°
Vertical	Direction c = 40°/ direction d = 50°
Background lighting	
Brightness	140 cd/m²
Half-brightness time	50000 hours
Touch screen	
Technology	Analog, resistive
Controller	Elo, serial, 12-bit
Degree of transmission	Up to 80% ± 5%
Filter glass	-
Degree of transmission	
Coating	
Keys/LED[4)]	
Function keys	20 with LED (yellow)
Soft keys	-
Cursor keys	-
Number block	15 without LED
Other keys	5 without LED
Key lifespan	> 1,000,000 actuations with 1 ±0.3 to 3 ±0.3 N operating force
LED brightness	Typ. 12 mcd (yellow) and 20 mcd (green)
Caution! **Pressing several keys at the same time may trigger unintended actions.**	
Electrical characteristics	
Power supply	
Rated voltage	24 VDC ±25%
Rated current	TBD A
Starting current	Maximum TBD A for < TBD ms
Power consumption	TBD W typically, maximum TBD W max.
Electrical isolation	Yes
Ground resistance	0 Ohm

Table 49: Technical data - 4PP452.0571-65 (cont.)

Mechanical characteristics	4PP452.0571-65
Outer dimensions	
Width	302 mm
Height	187 mm
Depth	76 mm
Front	
Frame	Aluminum, naturally anodized[5]
Design	Gray[6]
Membrane	Polyester
Dark gray border around display	Similar to Pantone 432CV[6]
Light background	Similar to Pantone 427CV[6]
Orange keys	Similar to Pantone 151CV[6]
Dark gray keys	Similar to Pantone 431CV[6]
Legend strips (gray)	Similar to Pantone 429CV[6]
Gasket	Flat gasket around display front
Housing	Metal
Weight	Approx. TBD kg (without aPCI interface module)
Environmental characteristics	
Ambient temperature	
Operation	TBD
Storage	TBD
Transport	TBD
Relative humidity	
Operation	TBD
Storage	TBD
Transport	TBD
Vibration	
Operation (continuous)	TBD
Operation (occasional)	TBD
Storage	TBD
Transport	TBD
Shock	
Operation	TBD
Storage	TBD
Transport	TBD
Protection type	IP20 back side (only with installed CompactFlash card, inserted aPCI module or with an optional aPCI cover) IP65 / NEMA 250 type 4X, dust and sprayed water protection (front side)
Altitude	Max. 3000 m

Table 49: Technical data - 4PP452.0571-65 (cont.)

1) Maintenance Controller Extended.

2) At the maximum specified ambient temperature, the deviation can increase to typically TBD ppm.

3) Enter environmental conditions (temperature, self discharge, etc.)

4) The functions of the keys and the LEDs can be configured using B&R Automation Studio - Visual Components.

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

3.12.2 Dimensions

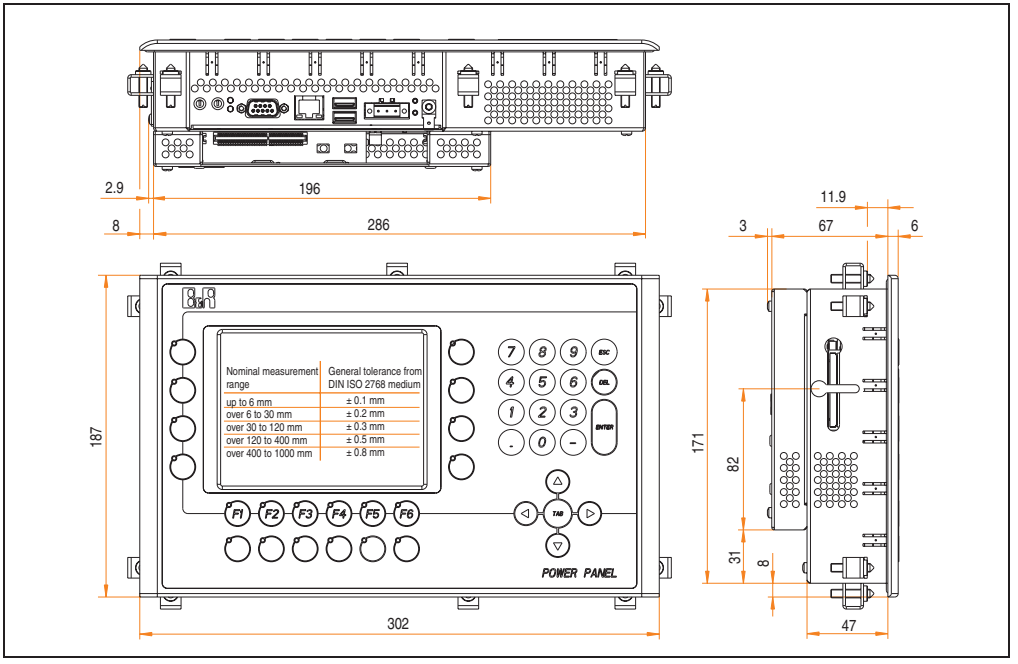


Figure 75: Dimensions - 4PP452.0571-65

3.12.3 Cutout installation

The cutout hole is to be made according to the following dimensions for cutout installation. The device must be mounted using the retaining clips included in delivery.

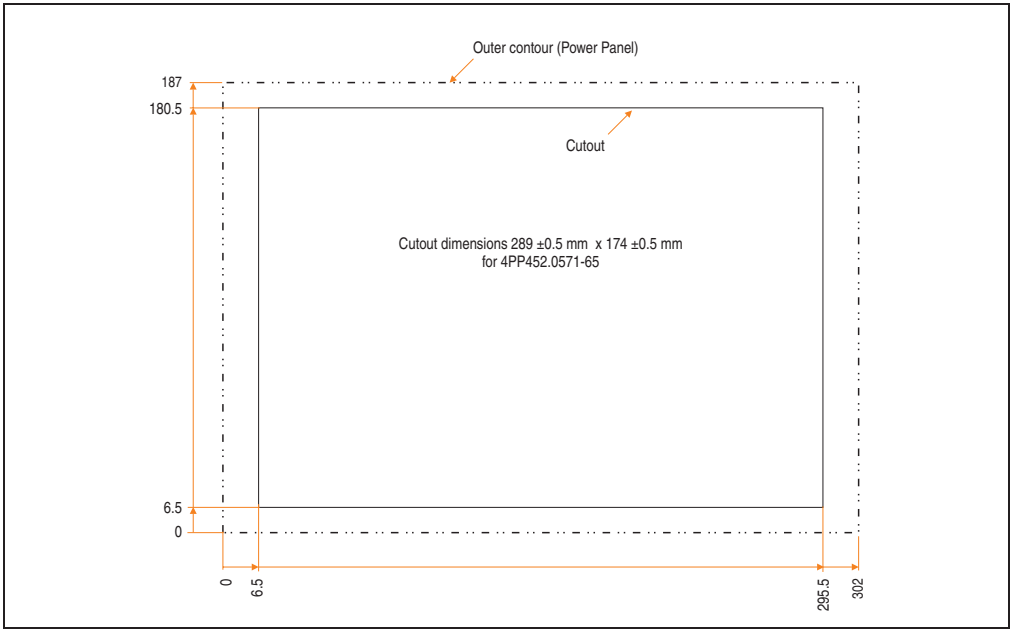


Figure 76: Cutout installation - 4PP452.0571-65

3.12.4 Contents of delivery

The following components are included in the delivery of the Power Panel device:

Number	Component
1	Power Panel PP452 5.7" QVGA, 1 aPCI, touch screen, keys
10	Retaining clips included
1	Lithium battery 3 V / 950 mAh included

Table 50: Contents of delivery - 4PP452.0571-65

3.13 Device 4PP480.1043-75

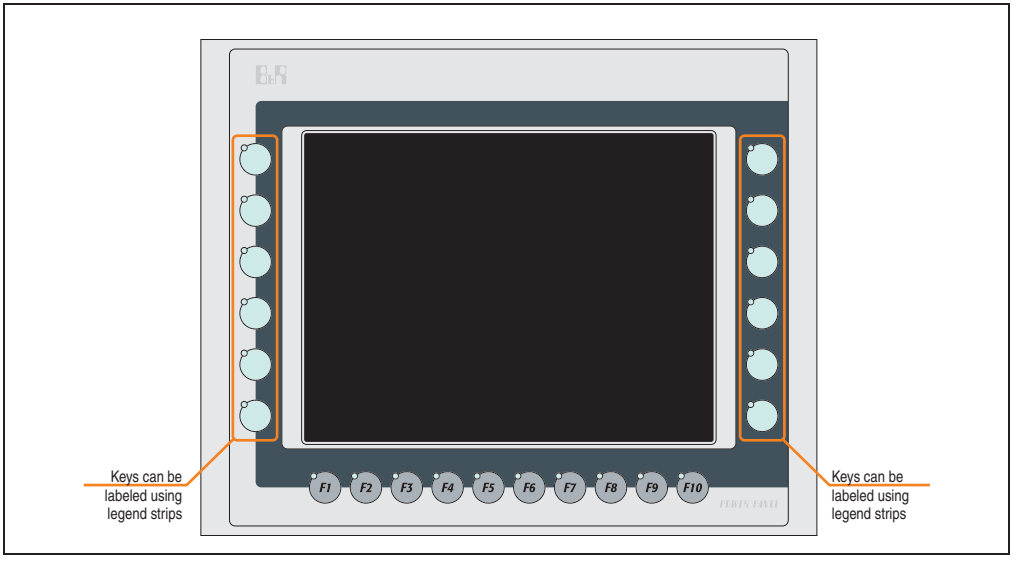


Figure 77: Front view - 4PP480.1043-75

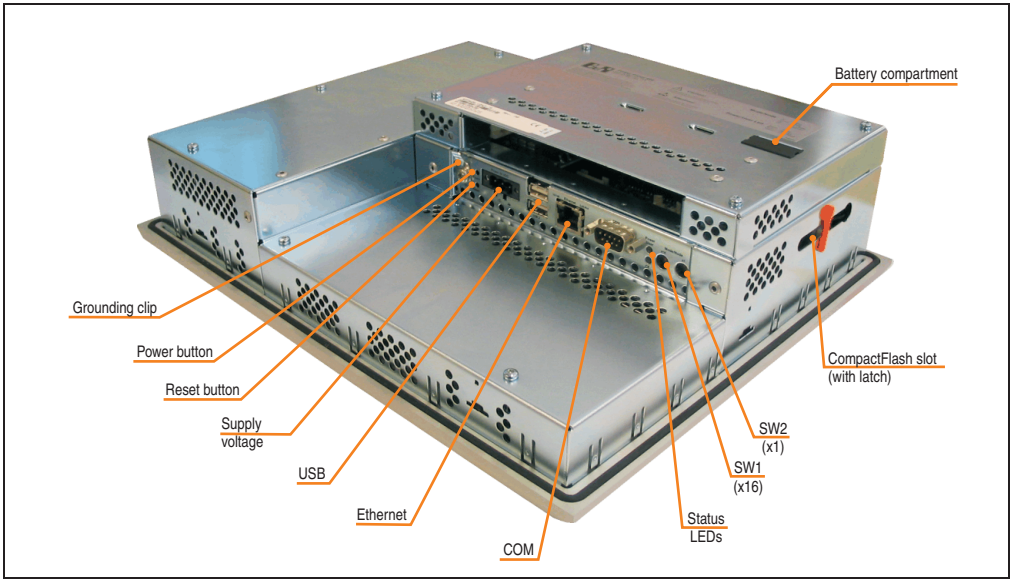


Figure 78: Rear view - 4PP480.1043-75

3.13.1 Technical data

Features	4PP480.1043-75
Boot loader / Operating system	Automation Runtime
Processor Type Expanded command set L1 cache L2 cache Floating point unit (FPU) Cooling Type	 Geode LX800 500 MHz, 32-bit x86 MMX technology, streaming SIMD extension 128 KB (64 KB L cache / 64 KB D cache) 128 KB Yes Passive (heat sink)
Flash	2 MB (for firmware)
Memory Type Size	 DDRAM 64 MB
Graphics Controller Memory	 Geode LX800 TBD MB shared memory (reserved by main memory)
SRAM Size Battery-buffered	 512 KB Yes
Watchdog Controller	 MTCX[1)]
Power failure logic Controller Buffer time	 MTCX[1)] TBD ms
Real-time clock Battery-buffered Accuracy	 Yes Typ. TBD ppm[2)]
Battery Type Removable Lifespan Backup capacitor (for changing battery) Buffer time	 Renata 950 mAh Yes, accessible from the outside 4 years [3)] 10 minutes
Ethernet Controller Transfer rate Connection Cable NE2000-compatible	 Intel 82551ER 10/100 Mbps RJ45 twisted pair (10 Base T / 100 Base T) S/STP (category 5) -
CompactFlash Type Number Connection	 Type I 1 slot Primary IDE device
Serial interface Type UART Transfer rate Connection	 RS232, modem-capable, not electrically isolated TBD compatible, TBD byte FIFO Max. 115 kBaud 9-pin DSUB

Table 51: Technical data - 4PP480.1043-75

Features	4PP480.1043-75
USB interface	
Type	USB 1.1, USB 2.0
Number	2
Transfer rate	Low speed (1.5 MBit/s), full speed (12 MBit/s), to high speed (480 Mbit/s)
Connection	Type A
Current load	Max. 500 mA per connection
Reset button	Yes, accessible from the outside
Power button	Yes, accessible from the outside
LEDs	1x CF (yellow) 1x combined power (red/green) and user (yellow)
Mode/Node switches	2, 16 digits each
aPCI slots	1 (see B&R System 2005 manual for available aPCI interface modules)
Display	
Type	TFT colors
Diagonal	10.4" (264mm)
Colors	256 colors
Resolution	VGA, 640 x 480 pixels
Contrast	600:1
Perspective (see page 308)	
Horizontal	Direction a / direction b = 70°
Vertical	Direction c = 45°/ direction d = 35°
Background lighting	
Brightness	350 cd/m²
Half-brightness time	50000 hours
Touch screen	
Technology	Analog, resistive
Controller	Elo, serial, 12-bit
Degree of transmission	Up to 80% ± 5%
Filter glass	-
Degree of transmission	
Coating	
Keys/LED[4)]	
Function keys	12 with LED (yellow)
Soft keys	10 with LED (yellow)
Cursor keys	-
Number block	-
Other keys	-
Key lifespan	> 1,000,000 actuations with 1 ±0.3 to 3 ±0.3 N operating force
LED brightness	Typ. 12 mcd (yellow) and 20 mcd (green)
Caution! **Pressing several keys at the same time may trigger unintended actions.**	
Electrical characteristics	
Power supply	
Rated voltage	24 VDC ±25%
Rated current	TBD A
Starting current	Maximum TBD A for < TBD ms
Power consumption	TBD W typically, maximum TBD W max.
Electrical isolation	Yes
Ground resistance	0 Ohm

Table 51: Technical data - 4PP480.1043-75 (cont.)

Mechanical characteristics	4PP480.1043-75
Outer dimensions	
Width	323 mm
Height	260 mm
Depth	86 mm
Front	
Frame	Aluminum, naturally anodized[5)]
Design	Gray[5)]
Membrane	Polyester
Dark gray border around display	Similar to Pantone 432CV[5)]
Light background	Similar to Pantone 427CV[5)]
Legend strips (gray)	Similar to Pantone 429CV[5)]
Gasket	Flat gasket around display front
Housing	Metal
Weight	Approx. TBD kg (without aPCI interface module)
Environmental characteristics	
Ambient temperature	
Operation	TBD
Storage	TBD
Transport	TBD
Relative humidity	
Operation	TBD
Storage	TBD
Transport	TBD
Vibration	
Operation (continuous)	TBD
Operation (occasional)	TBD
Storage	TBD
Transport	TBD
Shock	
Operation	TBD
Storage	TBD
Transport	TBD
Protection type	IP20 back side (only with installed CompactFlash card, inserted aPCI module or with an optional aPCI cover) IP65 / NEMA 250 type 4X, dust and sprayed water protection (front side)
Altitude	Max. 3000 m

Table 51: Technical data - 4PP480.1043-75 (cont.)

1) Maintenance Controller Extended.

2) At the maximum specified ambient temperature, the deviation can increase to typically TBD ppm.

3) Enter environmental conditions (temperature, self discharge, etc.)

4) The functions of the keys and the LEDs can be configured using B&R Automation Studio - Visual Components.

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

3.13.2 Dimensions

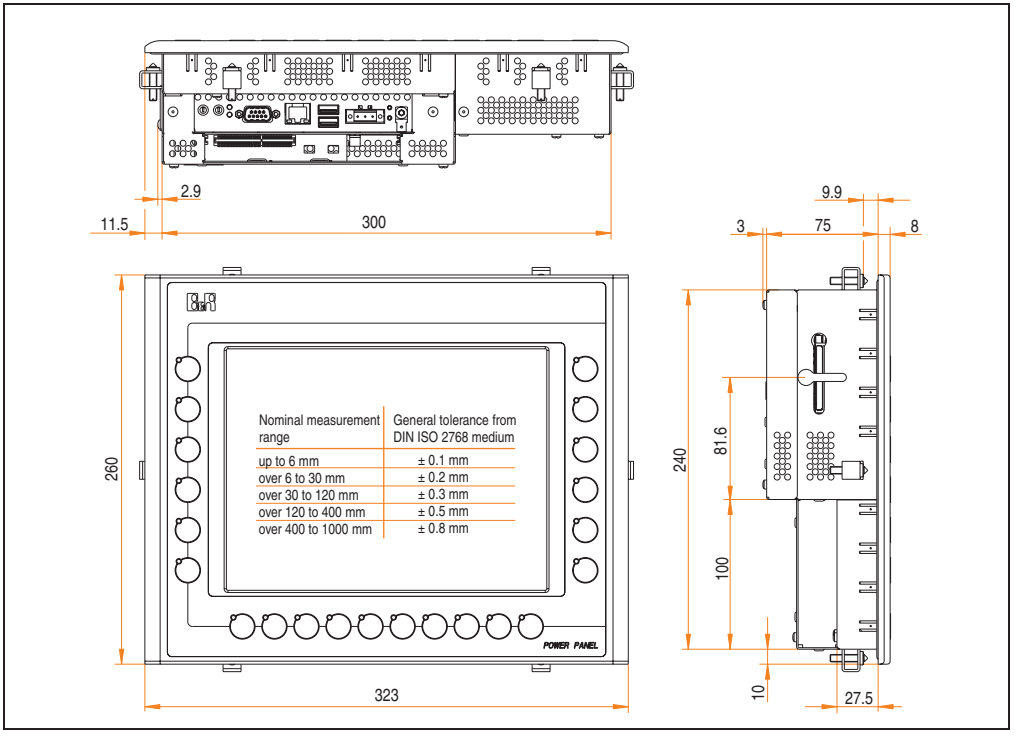


Figure 79: Dimensions - 4PP480.1043-75

3.13.3 Cutout installation

The cutout hole is to be made according to the following dimensions for cutout installation. The device must be mounted using the retaining clips included in delivery.

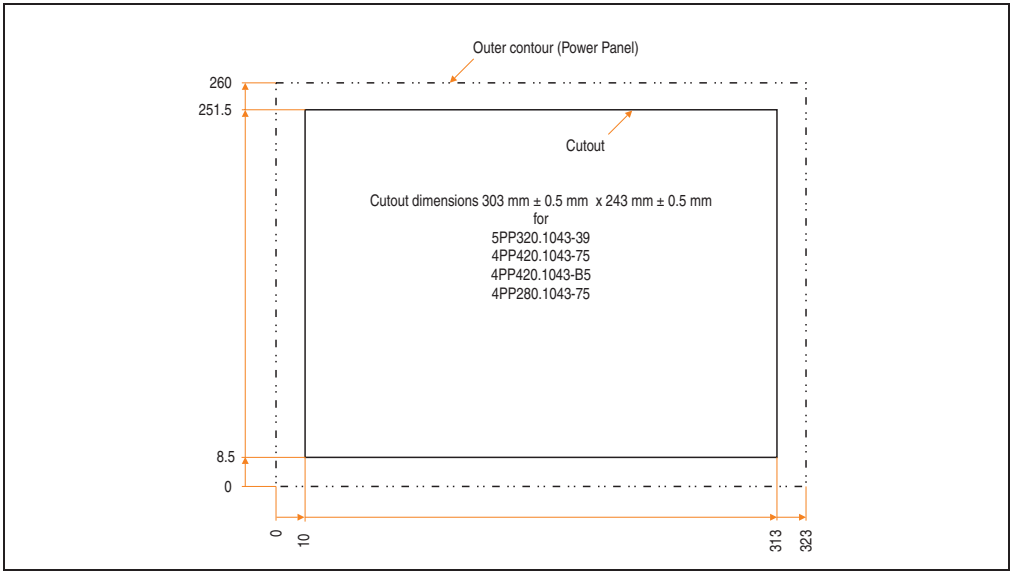


Figure 80: Cutout installation - 4PP480.1043-75

3.13.4 Contents of delivery

The following components are included in the delivery of the Power Panel device:

Number	Component
1	Power Panel PP480 10.4" VGA, 1 aPCI, touch screen, keys
6	Retaining clips included
1	Lithium battery 3 V / 950 mAh included

Table 52: Contents of delivery - 4PP480.1043-75

3.14 Device 4PP480.1505-75

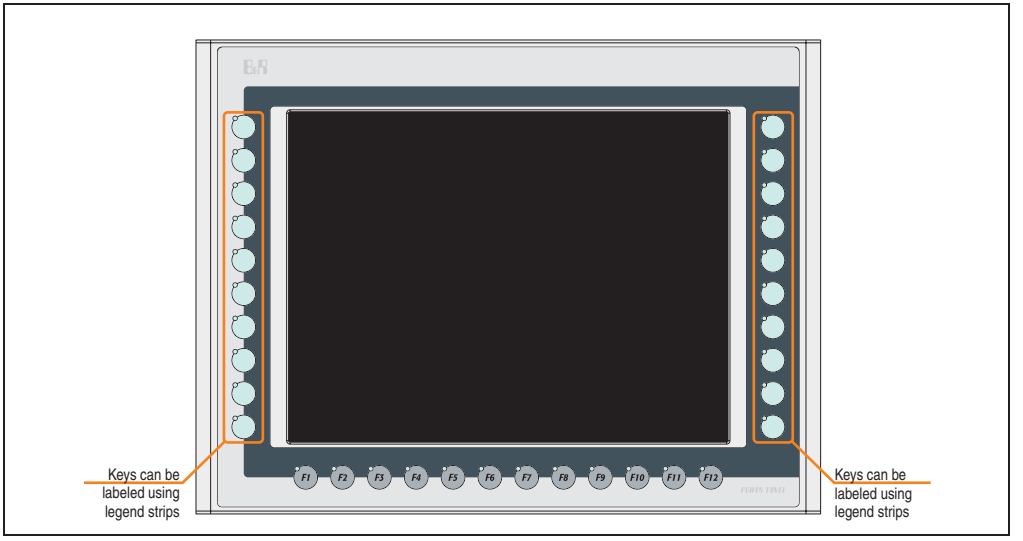


Figure 81: Front view - 4PP480.1505-75

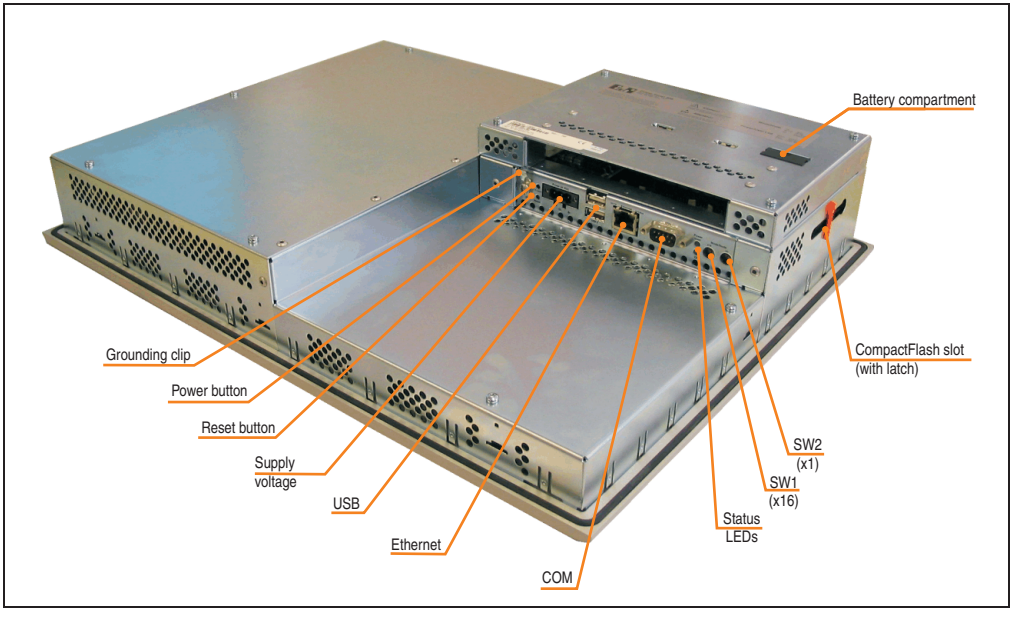


Figure 82: Rear view - 4PP480.1505-75

3.14.1 Technical data

Features	4PP480.1505-75
Boot loader / Operating system	Automation Runtime
Processor Type Expanded command set L1 cache L2 cache Floating point unit (FPU) Cooling Type	 Geode LX800 500 MHz, 32-bit x86 MMX technology, streaming SIMD extension 128 KB (64 KB L cache / 64 KB D cache) 128 KB Yes Passive (heat sink)
Flash	2 MB (for firmware)
Memory Type Size	 DDRAM 64 MB
Graphics Controller Memory	 Geode LX800 TBD MB shared memory (reserved by main memory)
SRAM Size Battery-buffered	 512 KB Yes
Watchdog Controller	 MTCX[1)]
Power failure logic Controller Buffer time	 MTCX[1)] TBD ms
Real-time clock Battery-buffered Accuracy	 Yes Typ. TBD ppm[2)]
Battery Type Removable Lifespan Backup capacitor (for changing battery) Buffer time	 Renata 950 mAh Yes, accessible from the outside 4 years [3)] 10 minutes
Ethernet Controller Transfer rate Connection Cable NE2000-compatible	 Intel 82551ER 10/100 Mbps RJ45 twisted pair (10 Base T / 100 Base T) S/STP (category 5) -
CompactFlash Type Number Connection	 Type I 1 slot Primary IDE device
Serial interface Type UART Transfer rate Connection	 RS232, modem-capable, not electrically isolated TBD compatible, TBD byte FIFO Max. 115 kBaud 9-pin DSUB

Table 53: Technical data - 4PP480.1505-75

Features	4PP480.1505-75
USB interface	
Type	USB 1.1, USB 2.0
Number	2
Transfer rate	Low speed (1.5 MBit/s), full speed (12 MBit/s), to high speed (480 Mbit/s)
Connection	Type A
Current load	Max. 500 mA per connection
Reset button	Yes, accessible from the outside
Power button	Yes, accessible from the outside
LEDs	1x CF (yellow) 1x combined power (red/green) and user (yellow)
Mode/Node switches	2, 16 digits each
aPCI slots	1 (see B&R System 2005 manual for available aPCI interface modules)
Display	
Type	TFT colors
Diagonal	15" (380 mm)
Colors	256 colors
Resolution	XGA, 1024 x 768 pixels
Contrast	300:1
Perspective (see page 308)	
Horizontal	Direction a / direction b = 85°
Vertical	Direction c / direction d = 85°
Background lighting	
Brightness	330 cd/m²
Half-brightness time	35000 hours
Touch screen	
Technology	Analog, resistive
Controller	Elo, serial, 12-bit
Degree of transmission	Up to 80% ± 5%
Filter glass	-
Degree of transmission	
Coating	
Keys/LED[4)]	
Function keys	20 with LED (yellow)
Soft keys	12 with LED (yellow)
Cursor keys	-
Number block	-
Other keys	-
Key lifespan	> 1,000,000 actuations with 1 ±0.3 to 3 ±0.3 N operating force
LED brightness	Typ. 12 mcd (yellow) and 20 mcd (green)

Caution!

Pressing several keys at the same time may trigger unintended actions.

Electrical characteristics	
Power supply	
Rated voltage	24 VDC ±25%
Rated current	TBD A
Starting current	Maximum TBD A for < TBD ms
Power consumption	TBD W typically, maximum TBD W max.
Electrical isolation	Yes
Ground resistance	0 Ohm

Table 53: Technical data - 4PP480.1505-75 (cont.)

Mechanical characteristics	4PP480.1505-75
Outer dimensions	
Width	435 mm
Height	330 mm
Depth	87 mm
Front	
Frame	Aluminum, naturally anodized[5)]
Design	Gray[5)]
Membrane	Polyester
Dark gray border around display	Similar to Pantone 432CV[5)]
Light background	Similar to Pantone 427CV[5)]
Legend strips (gray)	Similar to Pantone 429CV[5)]
Gasket	Flat gasket around display front
Housing	Metal
Weight	Approx. TBD kg (without aPCI interface module)
Environmental characteristics	
Ambient temperature	
Operation	TBD
Storage	TBD
Transport	TBD
Relative humidity	
Operation	TBD
Storage	TBD
Transport	TBD
Vibration	
Operation (continuous)	TBD
Operation (occasional)	TBD
Storage	TBD
Transport	TBD
Shock	
Operation	TBD
Storage	TBD
Transport	TBD
Protection type	IP20 back side (only with installed CompactFlash card, inserted aPCI module or with an optional aPCI cover) IP65 / NEMA 250 type 4X, dust and sprayed water protection (front side)
Altitude	Max. 3000 m

Table 53: Technical data - 4PP480.1505-75 (cont.)

1) Maintenance Controller Extended.

2) At the maximum specified ambient temperature, the deviation can increase to typically TBD ppm.

3) Enter environmental conditions (temperature, self discharge, etc.)

4) The functions of the keys and the LEDs can be configured using B&R Automation Studio - Visual Components.

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

3.14.2 Dimensions

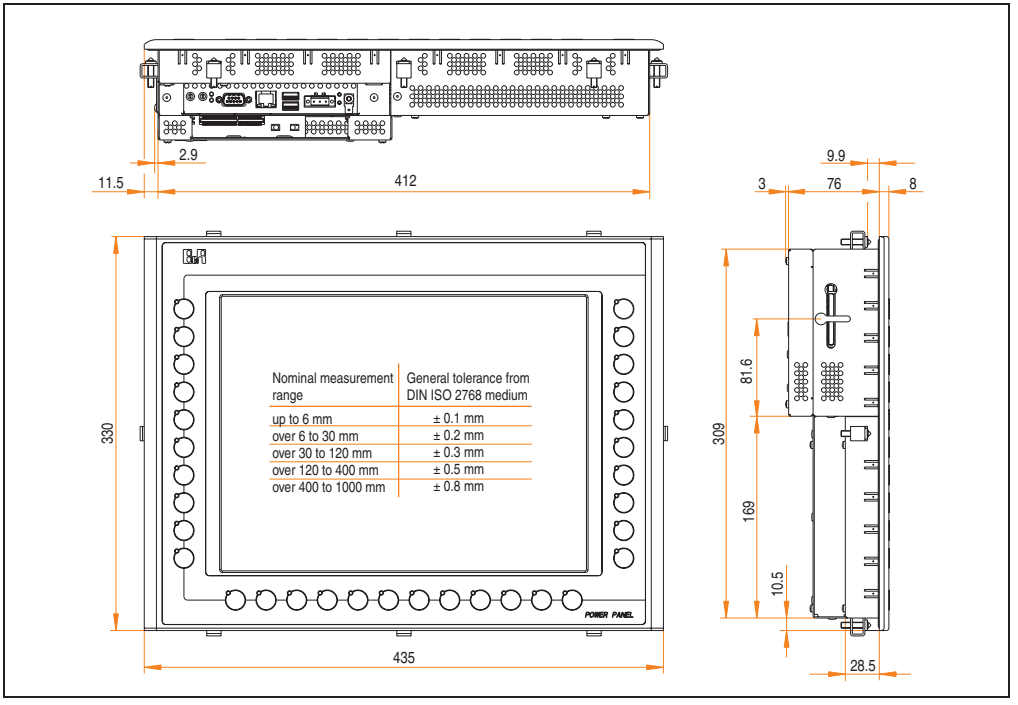


Figure 83: Dimensions - 4PP480.1505-75

3.14.3 Cutout installation

The cutout hole is to be made according to the following dimensions for cutout installation. The device must be mounted using the retaining clips included in delivery.

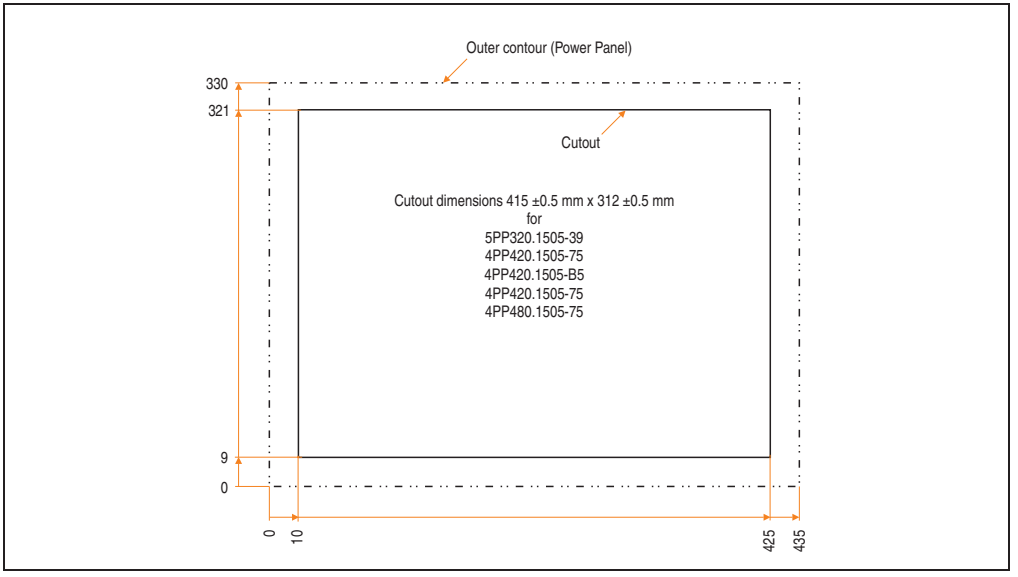


Figure 84: Cutout installation - 4PP480.1505-75

3.14.4 Contents of delivery

The following components are included in the delivery of the Power Panel device:

Number	Component
1	Power Panel PP480 15" XGA, 1 aPCI, touch screen, keys
8	Retaining clips included
1	Lithium battery 3 V / 950 mAh included

Table 54: Contents of delivery - 4PP480.1505-75

3.15 Device 4PP481.1043-75

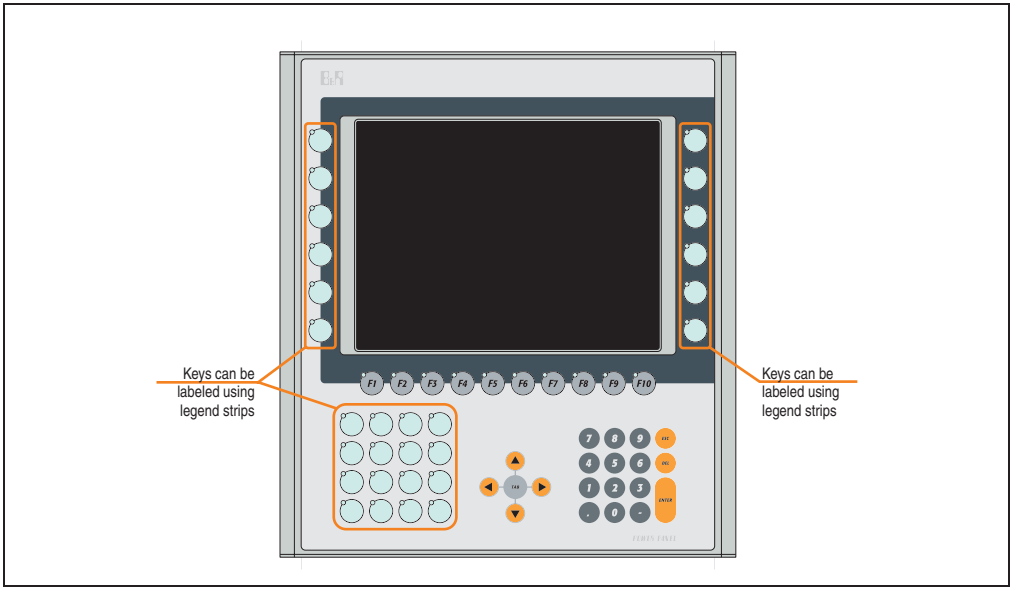


Figure 85: Front view - 4PP481.1043-75

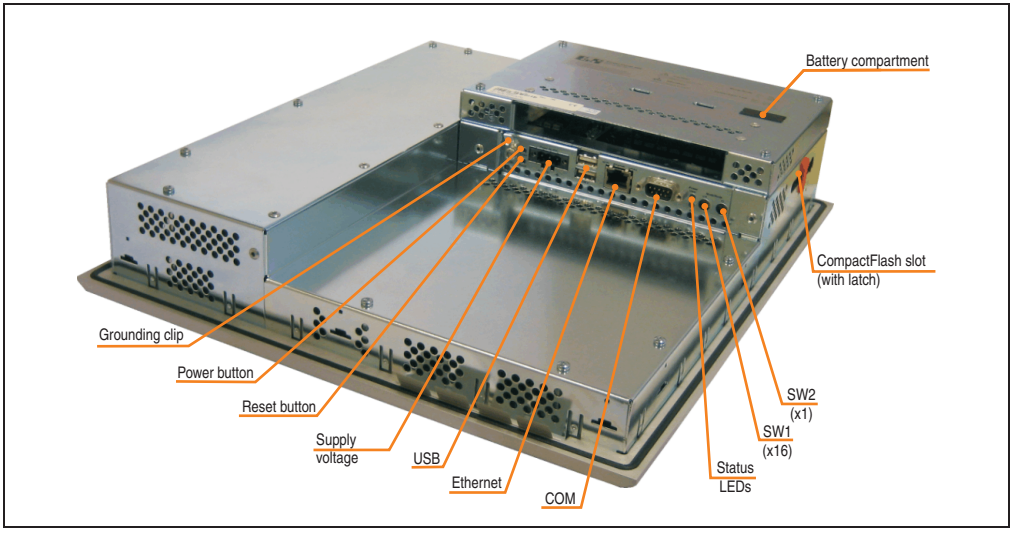


Figure 86: Rear view - 4PP481.1043-75

3.15.1 Technical data

Features	4PP481.1043-75
Boot loader / Operating system	Automation Runtime
Processor Type Expanded command set L1 cache L2 cache Floating point unit (FPU) Cooling Type	 Geode LX800 500 MHz, 32-bit x86 MMX technology, streaming SIMD extension 128 KB (64 KB L cache / 64 KB D cache) 128 KB Yes Passive (heat sink)
Flash	2 MB (for firmware)
Memory Type Size	 DDRAM 64 MB
Graphics Controller Memory	 Geode LX800 TBD MB shared memory (reserved by main memory)
SRAM Size Battery-buffered	 512 KB Yes
Watchdog Controller	 MTCX[1)]
Power failure logic Controller Buffer time	 MTCX[1)] TBD ms
Real-time clock Battery-buffered Accuracy	 Yes Typ. TBD ppm[2)]
Battery Type Removable Lifespan Backup capacitor (for changing battery) Buffer time	 Renata 950 mAh Yes, accessible from the outside 4 years [3)] 10 minutes
Ethernet Controller Transfer rate Connection Cable NE2000-compatible	 Intel 82551ER 10/100 Mbps RJ45 twisted pair (10 Base T / 100 Base T) S/STP (category 5) -
CompactFlash Type Number Connection	 Type I 1 slot Primary IDE device
Serial interface Type UART Transfer rate Connection	 RS232, modem-capable, not electrically isolated TBD compatible, TBD byte FIFO Max. 115 kBaud 9-pin DSUB

Table 55: Technical data - 4PP481.1043-75

Features	4PP481.1043-75
USB interface	
Type	USB 1.1, USB 2.0
Number	2
Transfer rate	Low speed (1.5 MBit/s), full speed (12 MBit/s), to high speed (480 Mbit/s)
Connection	Type A
Current load	Max. 500 mA per connection
Reset button	Yes, accessible from the outside
Power button	Yes, accessible from the outside
LEDs	1x CF (yellow) 1x combined power (red/green) and user (yellow)
Mode/Node switches	2, 16 digits each
aPCI slots	1 (see B&R System 2005 manual for available aPCI interface modules)
Display	
Type	TFT colors
Diagonal	10.4" (264 mm)
Colors	256 colors
Resolution	VGA, 640 x 480 pixels
Contrast	600:1
Perspective (see page 308)	
Horizontal	Direction a / direction b = 70°
Vertical	Direction c = 45°/ direction d = 35°
Background lighting	
Brightness	350 cd/m²
Half-brightness time	55000 hours
Touch screen	
Technology	Analog, resistive
Controller	Elo, serial, 12-bit
Degree of transmission	Up to 80% ± 5%
Filter glass	-
Degree of transmission	
Coating	
Keys/LED[4)]	
Function keys	28 with LED (yellow)
Soft keys	10 with LED (yellow)
Cursor keys	-
Number block	15 without LED
Other keys	5 without LED
Key lifespan	> 1,000,000 actuations with 1 ±0.3 to 3 ±0.3 N operating force
LED brightness	Typ. 12 mcd (yellow) and 20 mcd (green)

Caution!

Pressing several keys at the same time may trigger unintended actions.

Electrical characteristics	
Power supply	
Rated voltage	24 VDC ±25%
Rated current	TBD A
Starting current	Maximum TBD A for < TBD ms
Power consumption	TBD W typically, maximum TBD W max.
Electrical isolation	Yes
Ground resistance	0 Ohm

Table 55: Technical data - 4PP481.1043-75 (cont.)

Mechanical characteristics	4PP481.1043-75
Outer dimensions	
Width	323 mm
Height	358 mm
Depth	86 mm
Front	
Frame	Aluminum, naturally anodized[5)]
Design	Gray[5)]
Membrane	Polyester
Dark gray border around display	Similar to Pantone 432CV[5)]
Light background	Similar to Pantone 427CV[5)]
Orange keys	Similar to Pantone 151CV[5)]
Dark gray keys	Similar to Pantone 431CV[5)]
Legend strips (gray)	Similar to Pantone 429CV[5)]
Gasket	Flat gasket around display front
Housing	Metal
Weight	Approx. TBD kg (without aPCI interface module)
Environmental characteristics	
Ambient temperature	
Operation	TBD
Storage	TBD
Transport	TBD
Relative humidity	
Operation	TBD
Storage	TBD
Transport	TBD
Vibration	
Operation (continuous)	TBD
Operation (occasional)	TBD
Storage	TBD
Transport	TBD
Shock	
Operation	TBD
Storage	TBD
Transport	TBD
Protection type	IP20 back side (only with installed CompactFlash card, inserted aPCI module or with an optional aPCI cover) IP65 / NEMA 250 type 4X, dust and sprayed water protection (front side)
Altitude	Max. 3000 m

Table 55: Technical data - 4PP481.1043-75 (cont.)

1) Maintenance Controller Extended.

2) At the maximum specified ambient temperature, the deviation can increase to typically TBD ppm.

3) Enter environmental conditions (temperature, self discharge, etc.)

4) The functions of the keys and the LEDs can be configured using B&R Automation Studio - Visual Components.

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

3.15.2 Dimensions

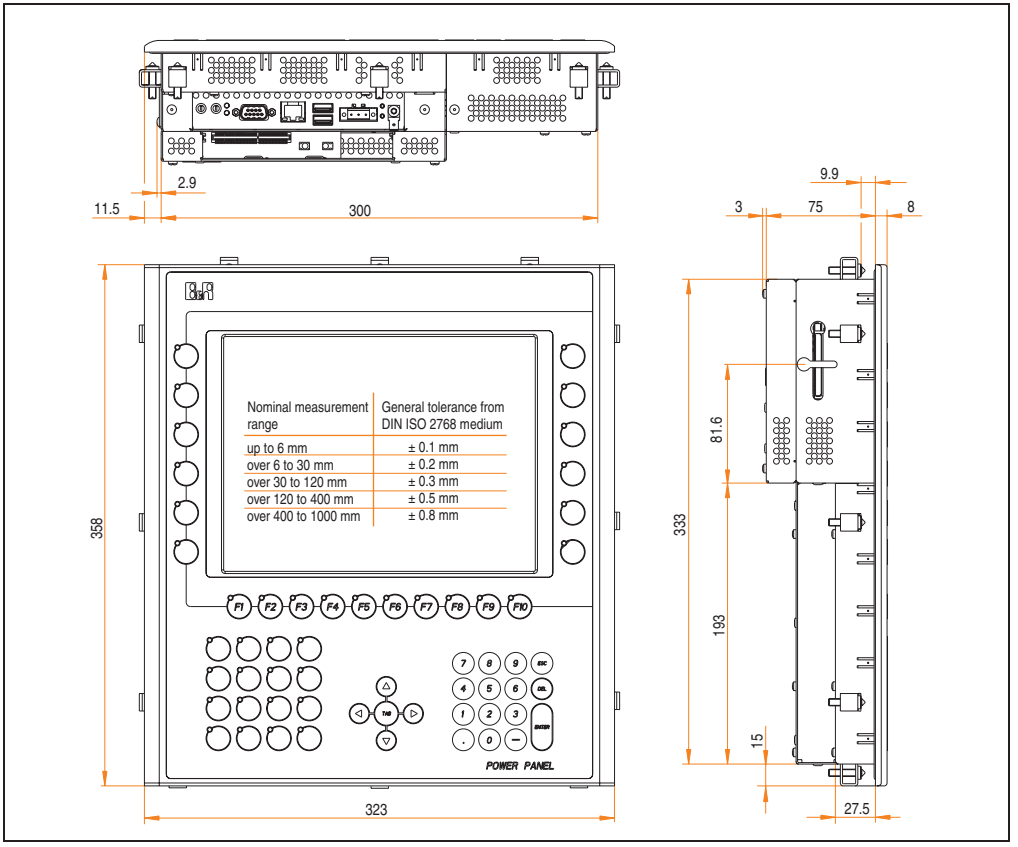


Figure 87: Dimensions - 4PP481.1043-75

3.15.3 Cutout installation

The cutout hole is to be made according to the following dimensions for cutout installation. The device must be mounted using the retaining clips included in delivery.

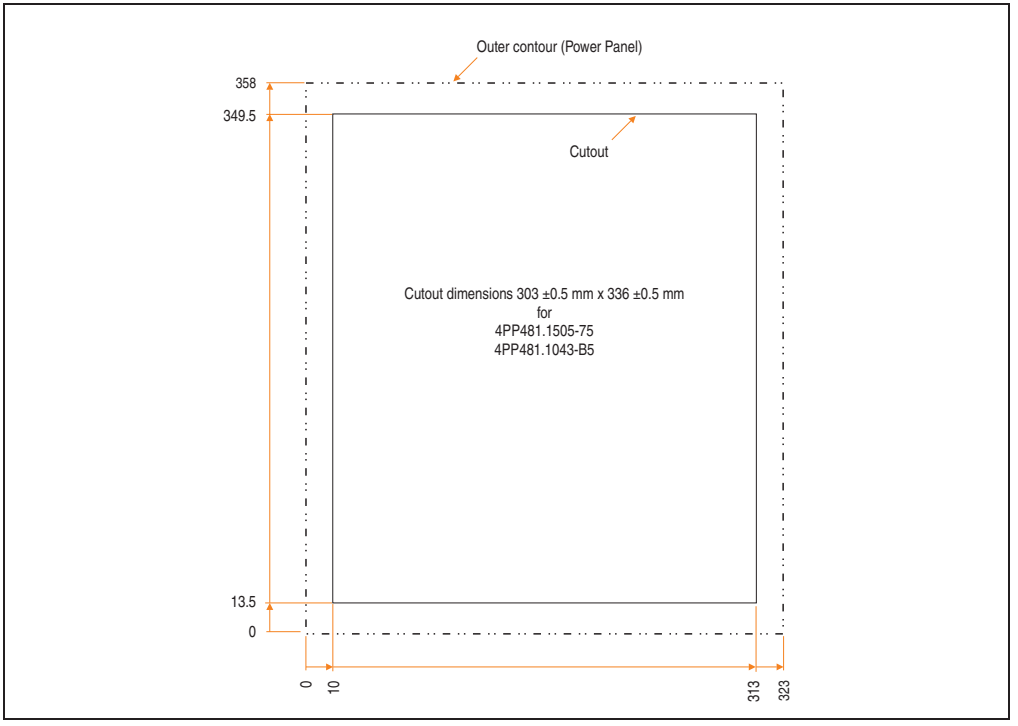


Figure 88: Cutout installation - 4PP481.1043-75

3.15.4 Contents of delivery

The following components are included in the delivery of the Power Panel device:

Number	Component
1	Power Panel PP481 10.4" VGA, 1 aPCI, touch screen, keys
12	Retaining clips included
1	Lithium battery 3 V / 950 mAh included

Table 56: Contents of delivery - 4PP481.1043-75

3.16 Device 4PP481.1043-B5

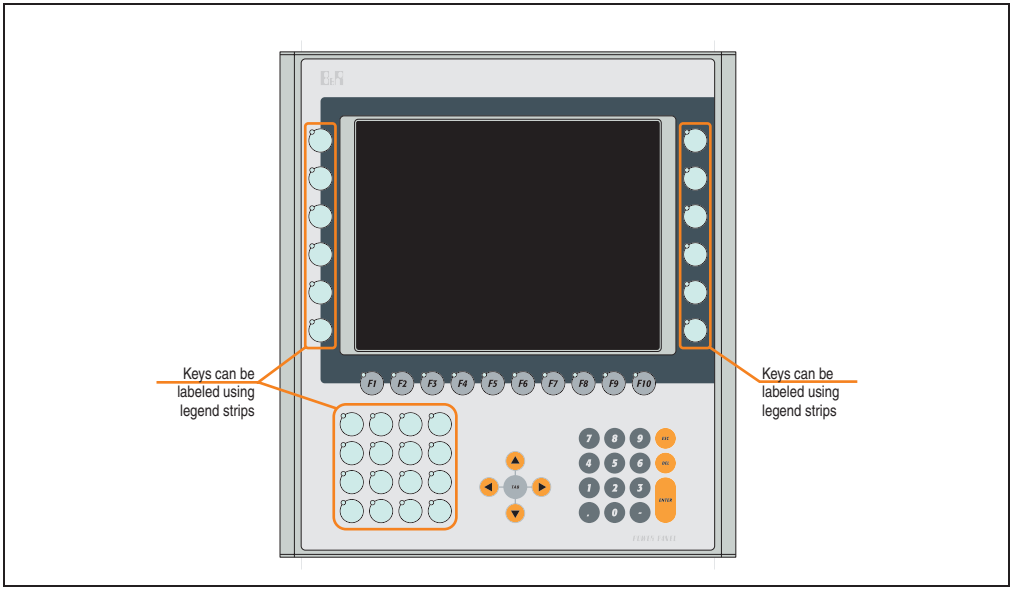


Figure 89: Front view - 4PP481.1043-B5

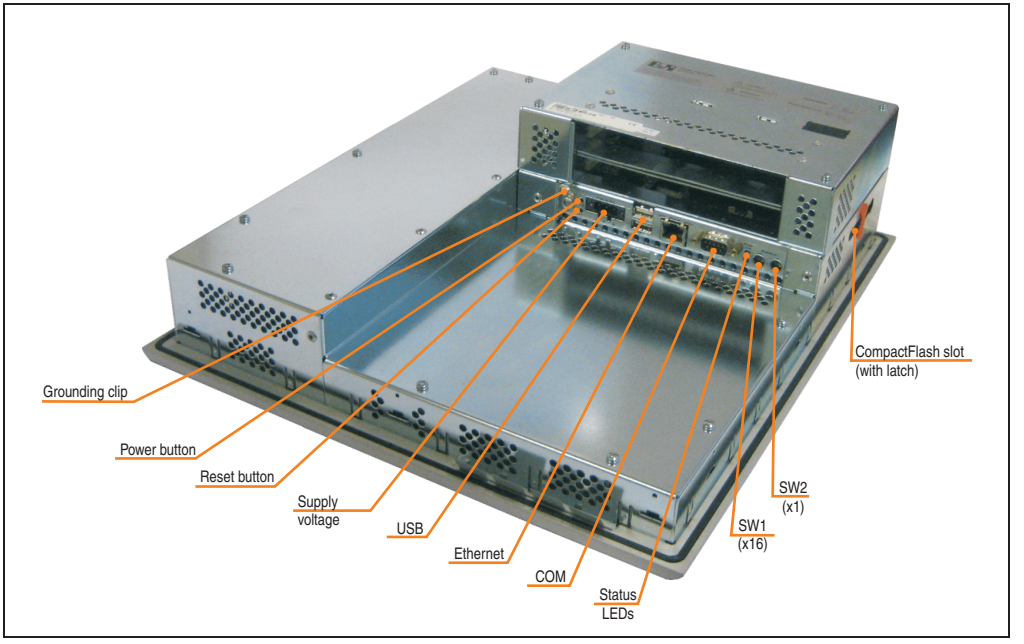


Figure 90: Rear view - 4PP481.1043-B5

3.16.1 Technical data

Features	4PP481.1043-B5
Boot loader / Operating system	Automation Runtime
Processor Type Expanded command set L1 cache L2 cache Floating point unit (FPU) Cooling Type	 Geode LX800 500 MHz, 32-bit x86 MMX technology, streaming SIMD extension 128 KB (64 KB L cache / 64 KB D cache) 128 KB Yes Passive (heat sink)
Flash	2 MB (for firmware)
Memory Type Size	 DDRAM 64 MB
Graphics Controller Memory	 Geode LX800 TBD MB shared memory (reserved by main memory)
SRAM Size Battery-buffered	 512 KB Yes
Watchdog Controller	 MTCX[1)]
Power failure logic Controller Buffer time	 MTCX[1)] TBD ms
Real-time clock Battery-buffered Accuracy	 Yes Typ. TBD ppm[2)]
Battery Type Removable Lifespan Backup capacitor (for changing battery) Buffer time	 Renata 950 mAh Yes, accessible from the outside 4 years [3)] 10 minutes
Ethernet Controller Transfer rate Connection Cable NE2000-compatible	 Intel 82551ER 10/100 Mbps RJ45 twisted pair (10 Base T / 100 Base T) S/STP (category 5) -
CompactFlash Type Number Connection	 Type I 1 slot Primary IDE device

Table 57: Technical data - 4PP481.1043-75

Features	4PP481.1043-B5
Serial interface	
Type	RS232, modem-capable, not electrically isolated
UART	TBD compatible, TBD byte FIFO
Transfer rate	Max. 115 kBaud
Connection	9-pin DSUB
USB interface	
Type	USB 1.1, USB 2.0
Number	2
Transfer rate	Low speed (1.5 MBit/s), full speed (12 MBit/s), to high speed (480 Mbit/s)
Connection	Type A
Current load	Max. 500 mA per connection
Reset button	Yes, accessible from the outside
Power button	Yes, accessible from the outside
LEDs	1x CF (yellow) 1x combined power (red/green) and user (yellow)
Mode/Node switches	2, 16 digits each
aPCI slots	2 (see B&R System 2005 manual for available aPCI interface modules)
Display	
Type	TFT colors
Diagonal	10.4" (264 mm)
Colors	256 colors
Resolution	VGA, 640 x 480 pixels
Contrast	600:1
Perspective (see page 308)	
Horizontal	Direction a / direction b = 70°
Vertical	Direction c = 45°/ direction d = 35°
Background lighting	
Brightness	350 cd/m²
Half-brightness time	55000 hours
Touch screen	
Technology	Analog, resistive
Controller	Elo, serial, 12-bit
Degree of transmission	Up to 80% ± 5%
Filter glass	-
Degree of transmission	
Coating	
Keys/LED[4)]	
Function keys	28 with LED (yellow)
Soft keys	10 with LED (yellow)
Cursor keys	-
Number block	15 without LED
Other keys	5 without LED
Key lifespan	> 1,000,000 actuations with 1 ±0.3 to 3 ±0.3 N operating force
LED brightness	Typ. 12 mcd (yellow) and 20 mcd (green)

Caution!

Pressing several keys at the same time may trigger unintended actions.

Table 57: Technical data - 4PP481.1043-75 (cont.)

Electrical characteristics	
Power supply	
Rated voltage	24 VDC ±25%
Rated current	TBD A
Starting current	Maximum TBD A for < TBD ms
Power consumption	TBD W typically, maximum TBD W max.
Electrical isolation	Yes
Ground resistance	0 Ohm
Mechanical characteristics	**4PP481.1043-B5**
Outer dimensions	
Width	323 mm
Height	358 mm
Depth	108 mm
Front	
Frame	Aluminum, naturally anodized[5)]
Design	Gray[5)]
Membrane	Polyester
Dark gray border around display	Similar to Pantone 432CV[5)]
Light background	Similar to Pantone 427CV[5)]
Orange keys	Similar to Pantone 151CV[5)]
Dark gray keys	Similar to Pantone 431CV[5)]
Legend strips (gray)	Similar to Pantone 429CV[5)]
Gasket	Flat gasket around display front
Housing	Metal
Weight	Approx. TBD kg (without aPCI interface module)
Environmental characteristics	
Ambient temperature	
Operation	TBD
Storage	TBD
Transport	TBD
Relative humidity	
Operation	TBD
Storage	TBD
Transport	TBD
Vibration	
Operation (continuous)	TBD
Operation (occasional)	TBD
Storage	TBD
Transport	TBD
Shock	
Operation	TBD
Storage	TBD
Transport	TBD
Protection type	IP20 back side (only with installed CompactFlash card, inserted aPCI module or with an optional aPCI cover) IP65 / NEMA 250 type 4X, dust and sprayed water protection (front side)
Altitude	Max. 3000 m

Table 57: Technical data - 4PP481.1043-75 (cont.)

1) Maintenance Controller Extended.

2) At the maximum specified ambient temperature, the deviation can increase to typically TBD ppm.

3) Enter environmental conditions (temperature, self discharge, etc.)

4) The functions of the keys and the LEDs can be configured using B&R Automation Studio - Visual Components.

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

3.16.2 Dimensions

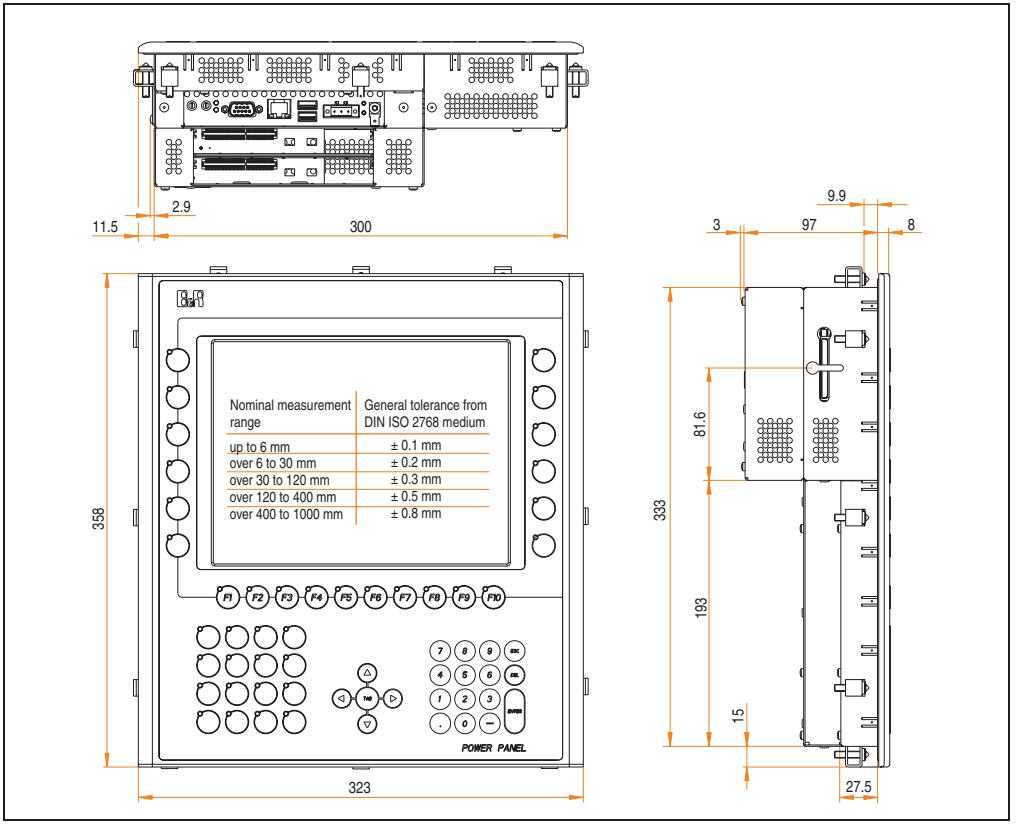


Figure 91: Dimensions - 4PP481.1043-B5

3.16.3 Cutout installation

The cutout hole is to be made according to the following dimensions for cutout installation. The device must be mounted using the retaining clips included in delivery.

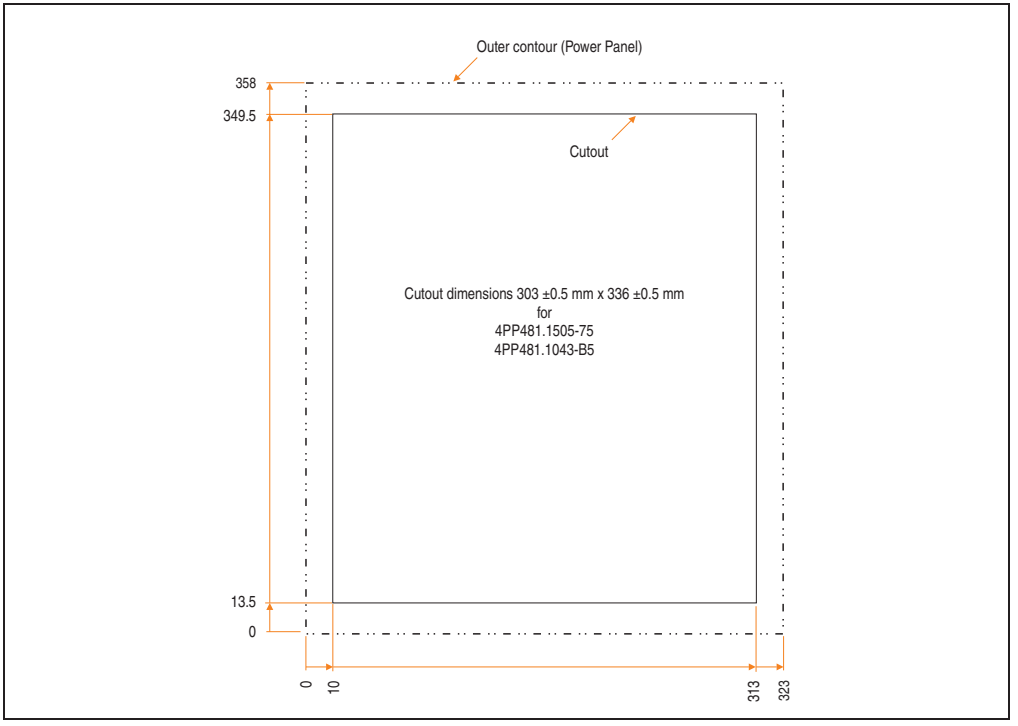


Figure 92: Cutout installation - 4PP481.1043-B5

3.16.4 Contents of delivery

The following components are included in the delivery of the Power Panel device:

Number	Component
1	Power Panel PP481 10.4" VGA, 2 aPCI, touch screen, keys
12	Retaining clips included
1	Lithium battery 3 V / 950 mAh included

Table 58: Contents of delivery - 4PP481.1043-B5

3.17 Device 4PP481.1505-75

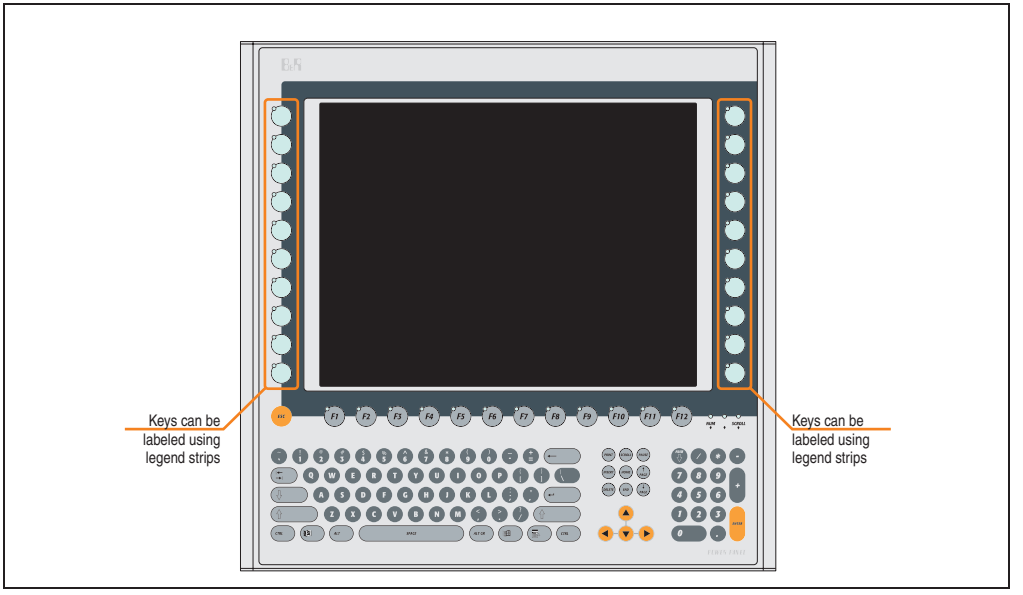


Figure 93: Front view - 4PP481.1505-75

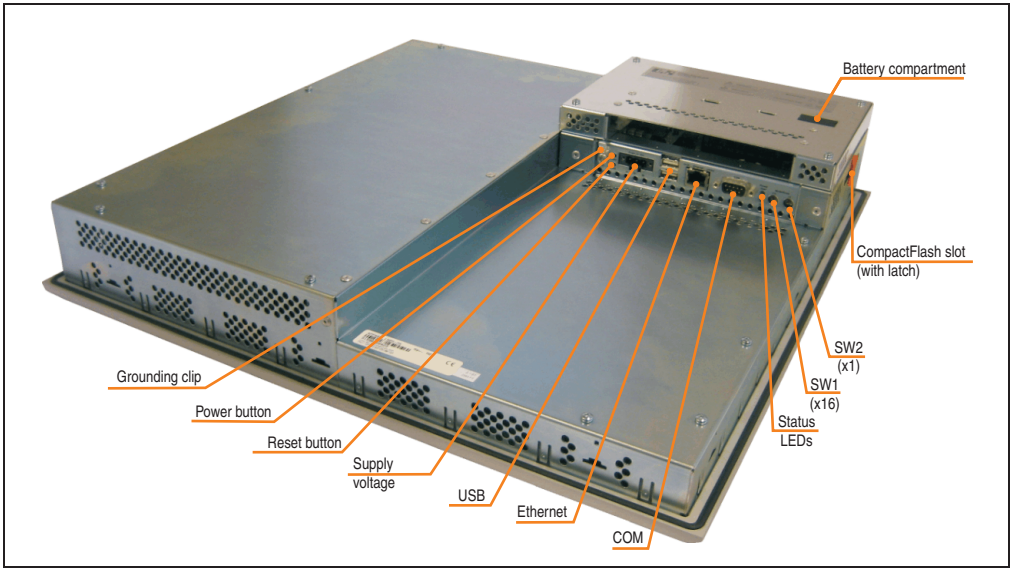


Figure 94: Rear view - 4PP481.1505-75

3.17.1 Technical data

Features	4PP481.1505-75
Boot loader / Operating system	Automation Runtime
Processor Type Expanded command set L1 cache L2 cache Floating point unit (FPU) Cooling Type	 Geode LX800 500 MHz, 32-bit x86 MMX technology, streaming SIMD extension 128 KB (64 KB L cache / 64 KB D cache) 128 KB Yes Passive (heat sink)
Flash	2 MB (for firmware)
Memory Type Size	 DDRAM 64 MB
Graphics Controller Memory	 Geode LX800 TBD MB shared memory (reserved by main memory)
SRAM Size Battery-buffered	 512 KB Yes
Watchdog Controller	 MTCX[1)]
Power failure logic Controller Buffer time	 MTCX[1)] TBD ms
Real-time clock Battery-buffered Accuracy	 Yes Typ. TBD ppm[2)]
Battery Type Removable Lifespan Backup capacitor (for changing battery) Buffer time	 Renata 950 mAh Yes, accessible from the outside 4 years [3)] 10 minutes
Ethernet Controller Transfer rate Connection Cable NE2000-compatible	 Intel 82551ER 10/100 Mbps RJ45 twisted pair (10 Base T / 100 Base T) S/STP (category 5) -
CompactFlash Type Number Connection	 Type I 1 slot Primary IDE device
Serial interface Type UART Transfer rate Connection	 RS232, modem-capable, not electrically isolated TBD compatible, TBD byte FIFO Max. 115 kBaud 9-pin DSUB

Table 59: Technical data - 4PP481.1505-75

Features	4PP481.1505-75
USB interface	
Type	USB 1.1, USB 2.0
Number	2
Transfer rate	Low speed (1.5 MBit/s), full speed (12 MBit/s), to high speed (480 Mbit/s)
Connection	Type A
Current load	Max. 500 mA per connection
Reset button	Yes, accessible from the outside
Power button	Yes, accessible from the outside
LEDs	1x CF (yellow) 1x combined power (red/green) and user (yellow)
Mode/Node switches	2, 16 digits each
aPCI slots	1 (see B&R System 2005 manual for available aPCI interface modules)
Display	
Type	TFT colors
Diagonal	15" (380 mm)
Colors	256 colors
Resolution	XGA, 1024 x 768 pixels
Contrast	300:1
Perspective (see page 308)	
Horizontal	Direction a / direction b = 85°
Vertical	Direction c / direction d = 85°
Background lighting	
Brightness	330 cd/m²
Half-brightness time	35000 hours
Touch screen	
Technology	Analog, resistive
Controller	Elo, serial, 12-bit
Degree of transmission	Up to 80% ± 5%
Filter glass	-
Degree of transmission	
Coating	
Keys/LED[4)]	
Function keys	20 with LED (yellow)
Soft keys	12 with LED (yellow)
Cursor keys	-
Number block	15 without LED
Other keys	77 without LED
Key lifespan	> 1,000,000 actuations with 1 ±0.3 to 3 ±0.3 N operating force
LED brightness	Typ. 12 mcd (yellow) and 20 mcd (green)

Caution!

Pressing several keys at the same time may trigger unintended actions.

Electrical characteristics	
Power supply	
Rated voltage	24 VDC ±25%
Rated current	TBD A
Starting current	Maximum TBD A for < TBD ms
Power consumption	TBD W typically, maximum TBD W max.
Electrical isolation	Yes
Ground resistance	0 Ohm

Table 59: Technical data - 4PP481.1505-75 (cont.)

Mechanical characteristics	4PP481.1505-75
Outer dimensions	
Width	435 mm
Height	430 mm
Depth	87 mm
Front	
Frame	Aluminum, naturally anodized[5)]
Design	Gray[5)]
Membrane	Polyester
Dark gray border around display	Similar to Pantone 432CV[5)]
Light background	Similar to Pantone 427CV[5)]
Orange keys	Similar to Pantone 151CV[5)]
Dark gray keys	Similar to Pantone 431CV[5)]
Legend strips (gray)	Similar to Pantone 429CV[5)]
Gasket	Flat gasket around display front
Housing	Metal
Weight	Approx. TBD kg (without aPCI interface module)
Environmental characteristics	
Ambient temperature	
Operation	TBD
Storage	TBD
Transport	TBD
Relative humidity	
Operation	TBD
Storage	TBD
Transport	TBD
Vibration	
Operation (continuous)	TBD
Operation (occasional)	TBD
Storage	TBD
Transport	TBD
Shock	
Operation	TBD
Storage	TBD
Transport	TBD
Protection type	IP20 back side (only with installed CompactFlash card, inserted aPCI module or with an optional aPCI cover) IP65 / NEMA 250 type 4X, dust and sprayed water protection (front side)
Altitude	Max. 3000 m

Table 59: Technical data - 4PP481.1505-75 (cont.)

1) Maintenance Controller Extended.

2) At the maximum specified ambient temperature, the deviation can increase to typically TBD ppm.

3) Enter environmental conditions (temperature, self discharge, etc.)

4) The functions of the keys and the LEDs can be configured using B&R Automation Studio - Visual Components.

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

3.17.2 Dimensions

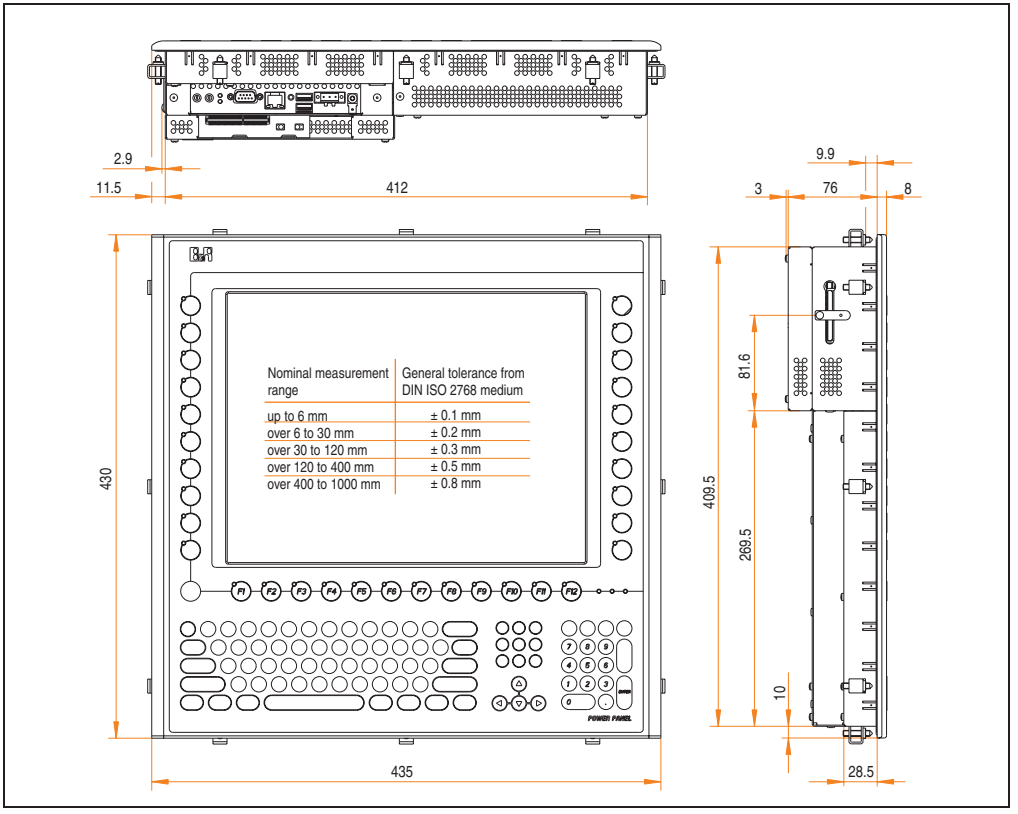


Figure 95: Dimensions - 4PP481.1505-75

3.17.3 Cutout installation

The cutout hole is to be made according to the following dimensions for cutout installation. The device must be mounted using the retaining clips included in delivery.

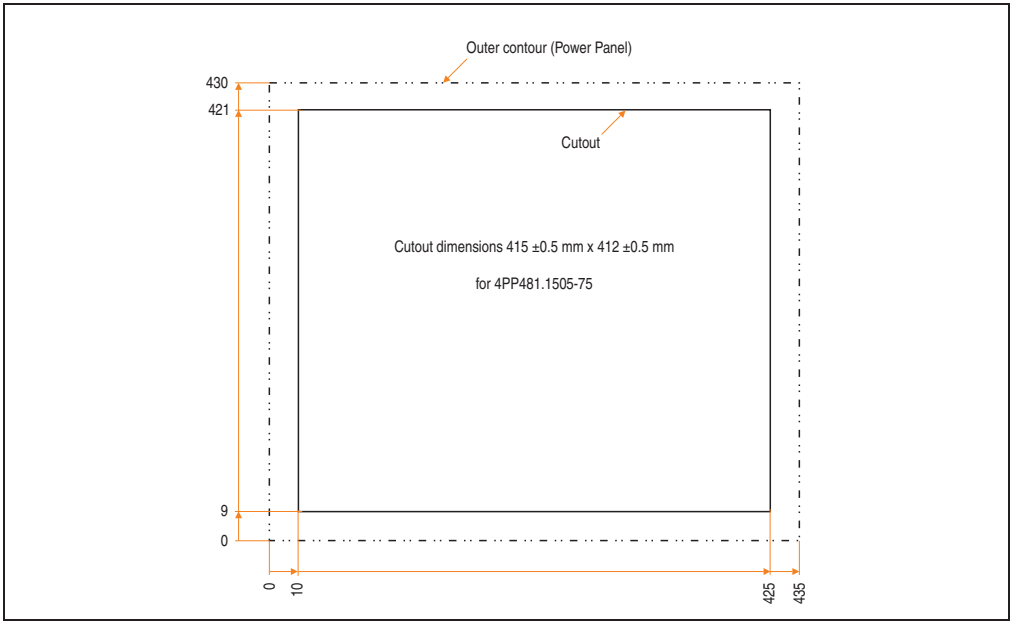


Figure 96: Cutout installation - 4PP481.1505-75

3.17.4 Contents of delivery

The following components are included in the delivery of the Power Panel device:

Number	Component
1	Power Panel PP481 15" XGA, 1 aPCI, touch screen, keys
12	Retaining clips included
1	Lithium battery 3 V / 950 mAh included

Table 60: Contents of delivery - 4PP481.1505-75

3.18 Device 4PP482.1043-75

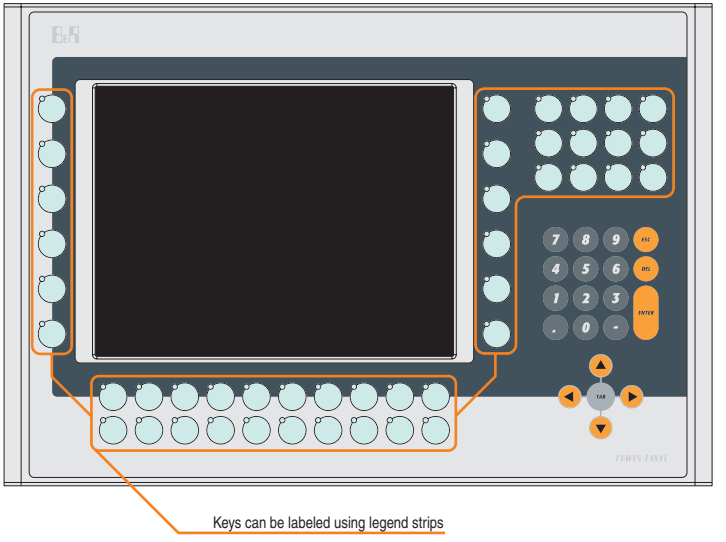


Figure 97: Front view - 4PP482.1043-75

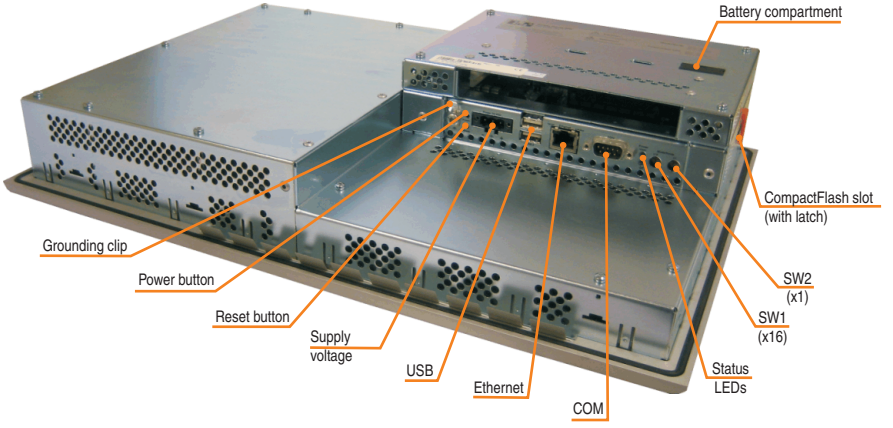


Figure 98: Rear view - 4PP482.1043-75

3.18.1 Technical data

Features	4PP482.1043-75
Boot loader / Operating system	Automation Runtime
Processor Type Expanded command set L1 cache L2 cache Floating point unit (FPU) Cooling Type	 Geode LX800 500 MHz, 32-bit x86 MMX technology, streaming SIMD extension 128 KB (64 KB L cache / 64 KB D cache) 128 KB Yes Passive (heat sink)
Flash	2 MB (for firmware)
Memory Type Size	 DDRAM 64 MB
Graphics Controller Memory	 Geode LX800 TBD MB shared memory (reserved by main memory)
SRAM Size Battery-buffered	 512 KB Yes
Watchdog Controller	 MTCX[1)]
Power failure logic Controller Buffer time	 MTCX[1)] TBD ms
Real-time clock Battery-buffered Accuracy	 Yes Typ. TBD ppm[2)]
Battery Type Removable Lifespan Backup capacitor (for changing battery) Buffer time	 Renata 950 mAh Yes, accessible from the outside 4 years [3)] 10 minutes
Ethernet Controller Transfer rate Connection Cable NE2000-compatible	 Intel 82551ER 10/100 Mbps RJ45 twisted pair (10 Base T / 100 Base T) S/STP (category 5) -
CompactFlash Type Number Connection	 Type I 1 slot Primary IDE device
Serial interface Type UART Transfer rate Connection	 RS232, modem-capable, not electrically isolated TBD compatible, TBD byte FIFO Max. 115 kBaud 9-pin DSUB

Table 61: Technical data - 4PP482.1043-75

Features	4PP482.1043-75
USB interface	
Type	USB 1.1, USB 2.0
Number	2
Transfer rate	Low speed (1.5 MBit/s), full speed (12 MBit/s), to high speed (480 Mbit/s)
Connection	Type A
Current load	Max. 500 mA per connection
Reset button	Yes, accessible from the outside
Power button	Yes, accessible from the outside
LEDs	1x CF (yellow) 1x combined power (red/green) and user (yellow)
Mode/Node switches	2, 16 digits each
aPCI slots	1 (see B&R System 2005 manual for available aPCI interface modules)
Display	
Type	TFT colors
Diagonal	10.4" (264 mm)
Colors	256 colors
Resolution	VGA, 640 x 480 pixels
Contrast	600:1
Perspective (see page 308)	
Horizontal	Direction a / direction b = 70°
Vertical	Direction c = 45°/ direction d = 35°
Background lighting	
Brightness	350 cd/m²
Half-brightness time	55000 hours
Touch screen	
Technology	Analog, resistive
Controller	Elo, serial, 12-bit
Degree of transmission	Up to 80% ± 5%
Filter glass	-
Degree of transmission	
Coating	
Keys/LED[4)]	
Function keys	44 with LED (yellow)
Soft keys	-
Cursor keys	-
Number block	15 without LED
Other keys	5 without LED
Key lifespan	> 1,000,000 actuations with 1 ±0.3 to 3 ±0.3 N operating force
LED brightness	Typ. 12 mcd (yellow) and 20 mcd (green)
Caution! **Pressing several keys at the same time may trigger unintended actions.**	
Electrical characteristics	
Power supply	
Rated voltage	24 VDC ±25%
Rated current	TBD A
Starting current	Maximum TBD A for < TBD ms
Power consumption	TBD W typically, maximum TBD W max.
Electrical isolation	Yes
Ground resistance	0 Ohm

Table 61: Technical data - 4PP482.1043-75 (cont.)

Mechanical characteristics	4PP482.1043-75
Outer dimensions	
Width	423 mm
Height	288 mm
Depth	86 mm
Front	
Frame	Aluminum, naturally anodized[5)]
Design	Gray[5)]
Membrane	Polyester
Dark gray border around display	Similar to Pantone 432CV[5)]
Light background	Similar to Pantone 427CV[5)]
Orange keys	Similar to Pantone 151CV[5)]
Dark gray keys	Similar to Pantone 431CV[5)]
Legend strips (gray)	Similar to Pantone 429CV[5)]
Gasket	Flat gasket around display front
Housing	Metal
Weight	Approx. TBD kg (without aPCI interface module)
Environmental characteristics	
Ambient temperature	
Operation	TBD
Storage	TBD
Transport	TBD
Relative humidity	
Operation	TBD
Storage	TBD
Transport	TBD
Vibration	
Operation (continuous)	TBD
Operation (occasional)	TBD
Storage	TBD
Transport	TBD
Shock	
Operation	TBD
Storage	TBD
Transport	TBD
Protection type	IP20 back side (only with installed CompactFlash card, inserted aPCI module or with an optional aPCI cover) IP65 / NEMA 250 type 4X, dust and sprayed water protection (front side)
Altitude	Max. 3000 m

Table 61: Technical data - 4PP482.1043-75 (cont.)

1) Maintenance Controller Extended.

2) At the maximum specified ambient temperature, the deviation can increase to typically TBD ppm.

3) Enter environmental conditions (temperature, self discharge, etc.)

4) The functions of the keys and the LEDs can be configured using B&R Automation Studio - Visual Components.

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

3.18.2 Dimensions

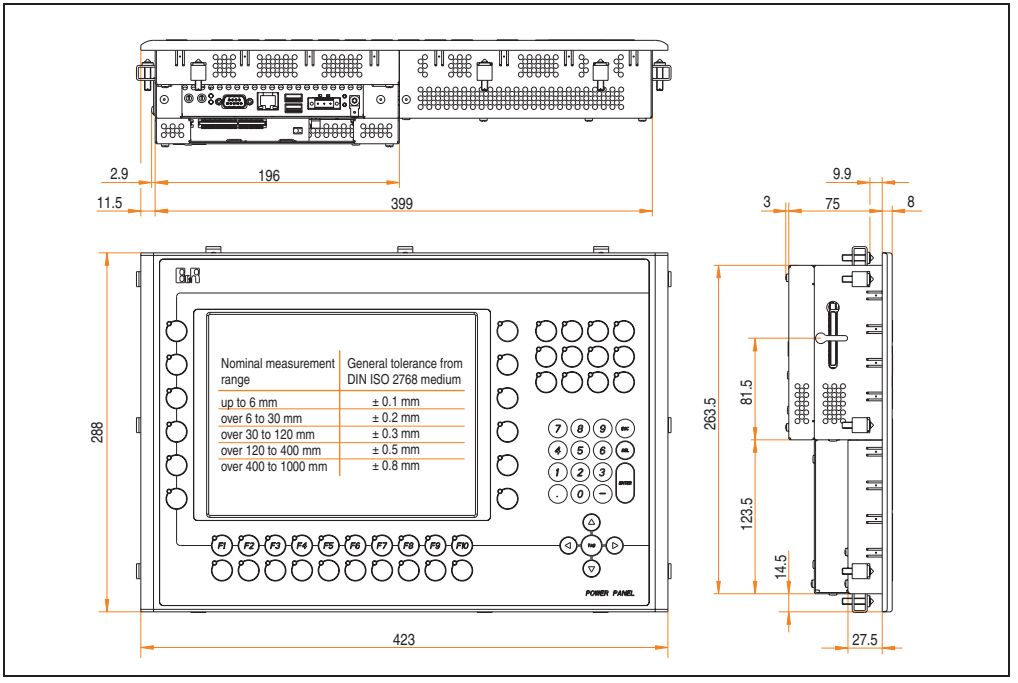


Figure 99: Dimensions - 4PP482.1043-75

3.18.3 Cutout installation

The cutout hole is to be made according to the following dimensions for cutout installation. The device must be mounted using the retaining clips included in delivery.

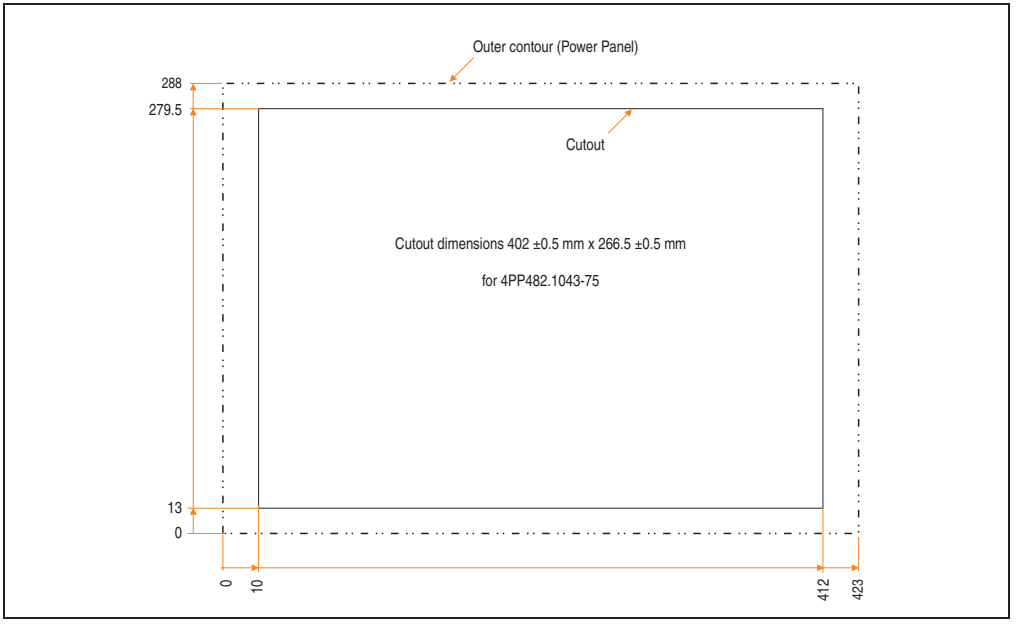


Figure 100: Cutout installation - 4PP482.1043-75

3.18.4 Contents of delivery

The following components are included in the delivery of the Power Panel device:

Number	Component
1	Power Panel PP482 10.4" VGA, 1 aPCI, touch screen, keys
12	Retaining clips included
1	Lithium battery 3 V / 950 mAh included

Table 62: Contents of delivery - 4PP482.1043-75

Chapter 3 • Commissioning

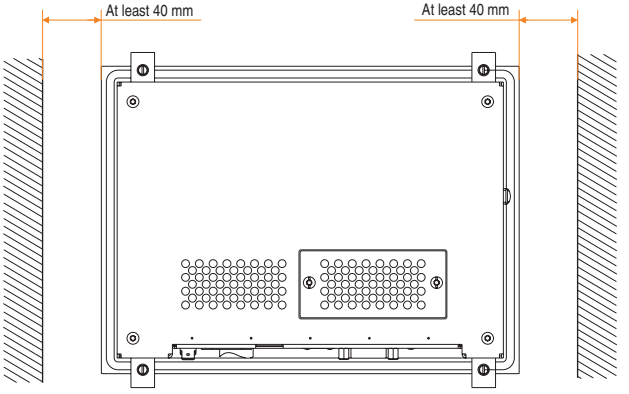
1. Mounting instructions

- The Power Panel must be mounted using the retaining clips included in the delivery. Depending on the Power Panel version a corresponding number of retaining clips are included.

Figure 101: Retaining clip

- In order to guarantee proper air circulation, allow a sufficient amount of space above, below, to the side and behind the Power Panel device. The minimum specified free space can be found in the diagram below. Free space specifications apply to all Power Panel versions (with/without aPCI slots and keys).

Page view



Rear view

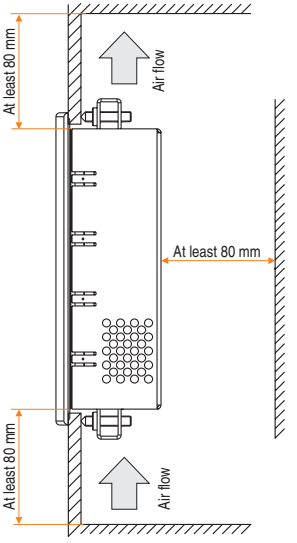


Table 63: Distance for air circulation

2. Mounting orientation

The following diagram displays the specified mounting orientation for the Power Panel device. The mounting orientation applies to all Power Panel versions (with/without aPCI slots and keys).

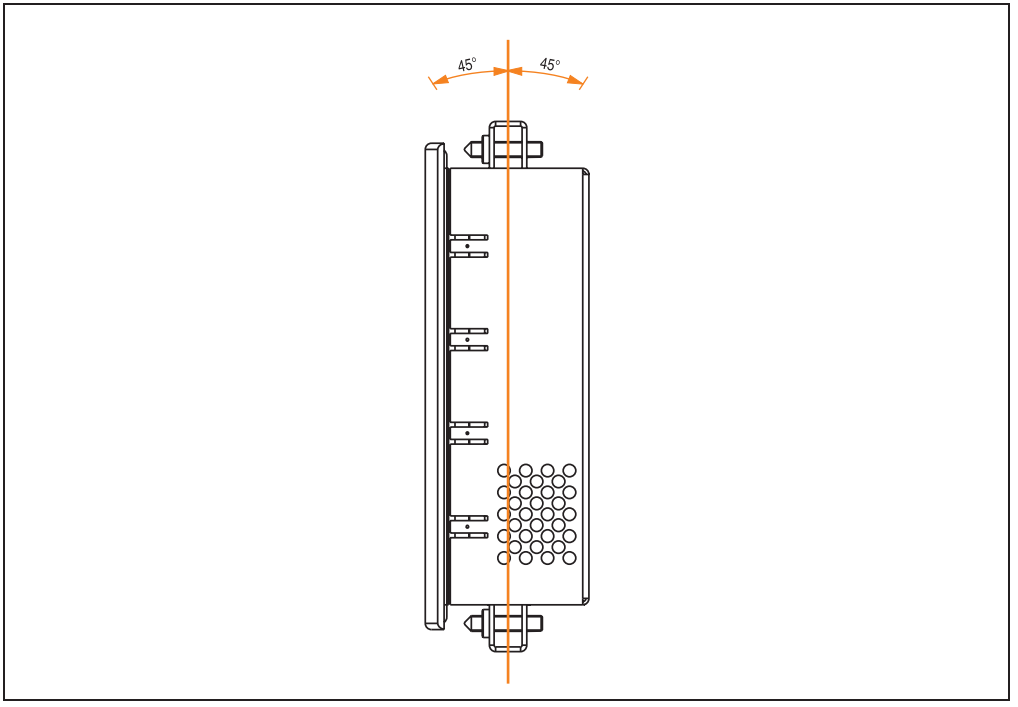


Figure 102: Mounting orientation for the Power Panel

Caution!

The maximum permitted ambient temperature can be found in the technical data for the respective Power Panel device.

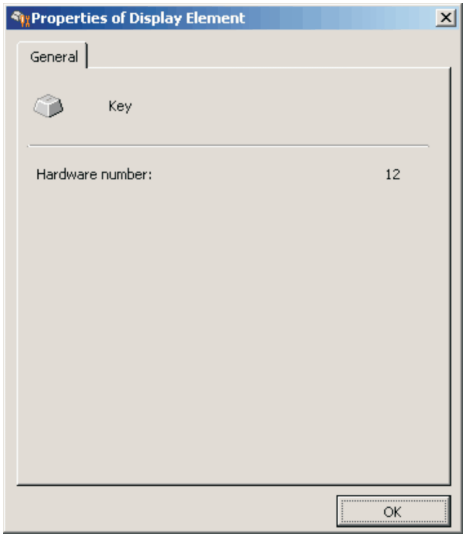
3. Key and LED configurations

Each key or LED can be configured individually and therefore adjusted to suit the application. Various B&R tools are available for this purpose:

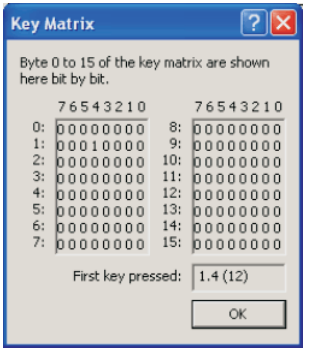
- B&R Key Editor for Windows operating systems
- Visual Components for Automation Runtime

Keys and LEDs from each device are processed by the matrix controller in a bit sequence of 128 bits each.

The positions of the keys and LEDs in the matrix are shown as hardware numbers. The hardware numbers can be read directly on the target system, for example with the B&R Key Editor and the B&R Control Center.



Screenshot from B&R Key Editor



Screenshot from B&R Control Center

Figure 103: Example - Hardware number in the B&R Key Editor or in the B&R Control Center

The following graphics show the positions of the keys and LEDs in the matrix. They are shown as follows.

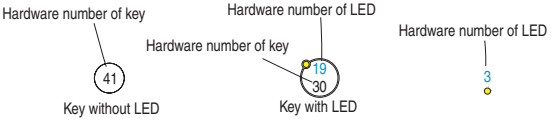


Figure 104: Display - keys and LEDs in the matrix

3.1 Power Panel 5.7" QVGA

3.1.1 Power Panel 4PP451.0571-65

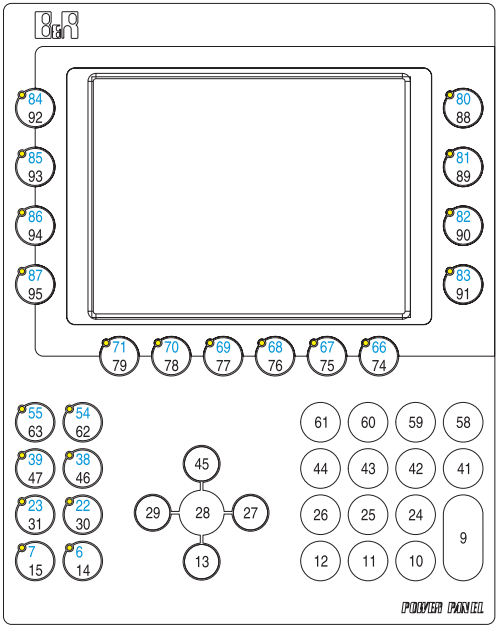


Figure 105: Hardware numbers - 4PP451.0571-65

3.1.2 Power Panel 4PP452.0571-65

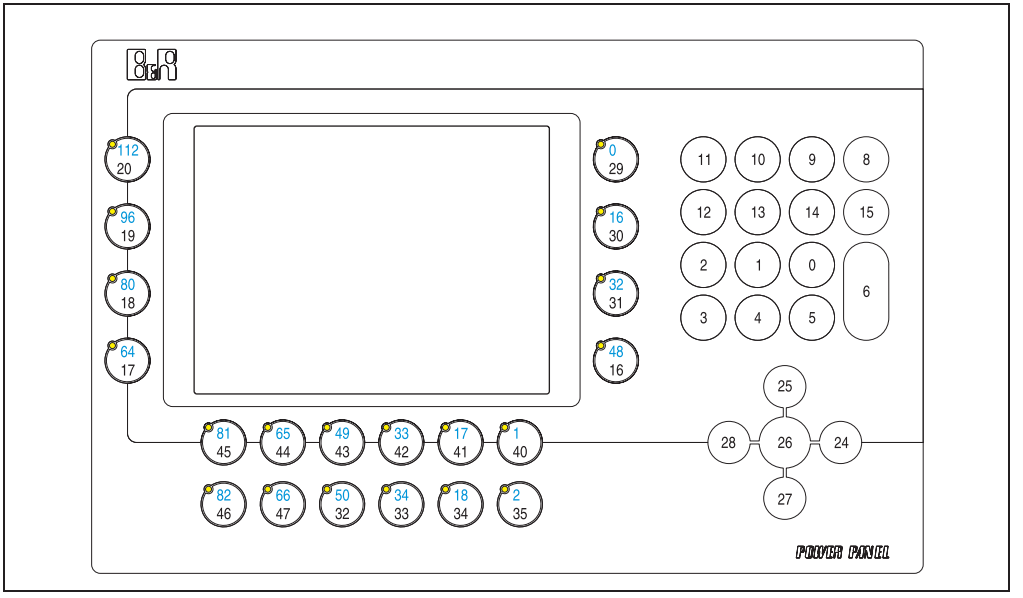


Figure 106: Hardware numbers - 4PP452.0571-65

3.2 Power Panel 10.4" VGA

3.2.1 Power Panel 4PP480.1043-75

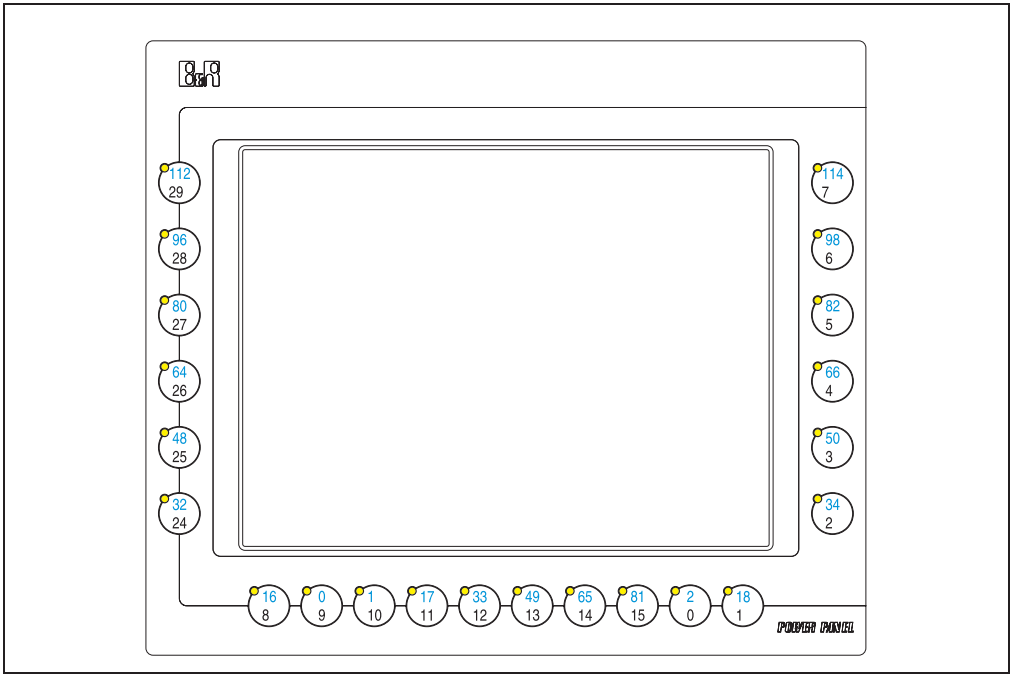


Figure 107: Hardware numbers - 4PP480.1043-75

3.2.2 Power Panel 4PP481.1043-75 / 4PP481.1043-B5

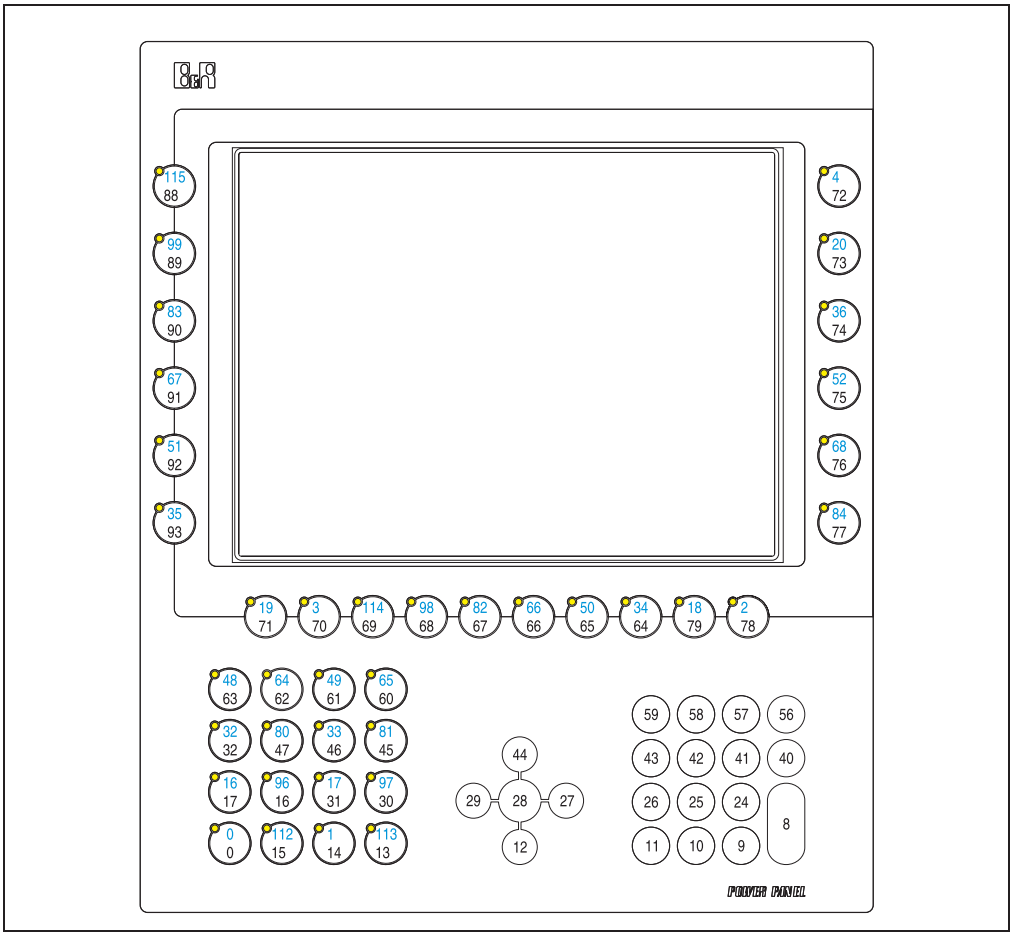


Figure 108: Hardware numbers - 4PP481.1043-75 / 4PP481.1043-B5

3.2.3 Power Panel 4PP482.1043-B5

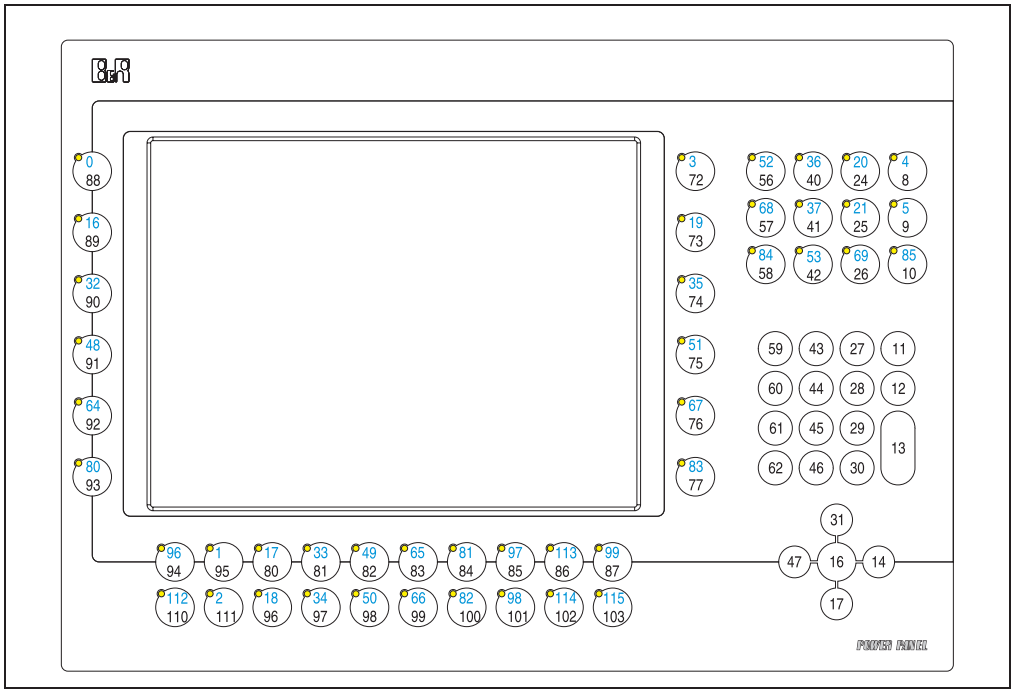


Figure 109: Hardware numbers - 4PP482.1043-B5

3.3 Power Panel 15" XGA

3.3.1 Power Panel 4PP480.1505-75

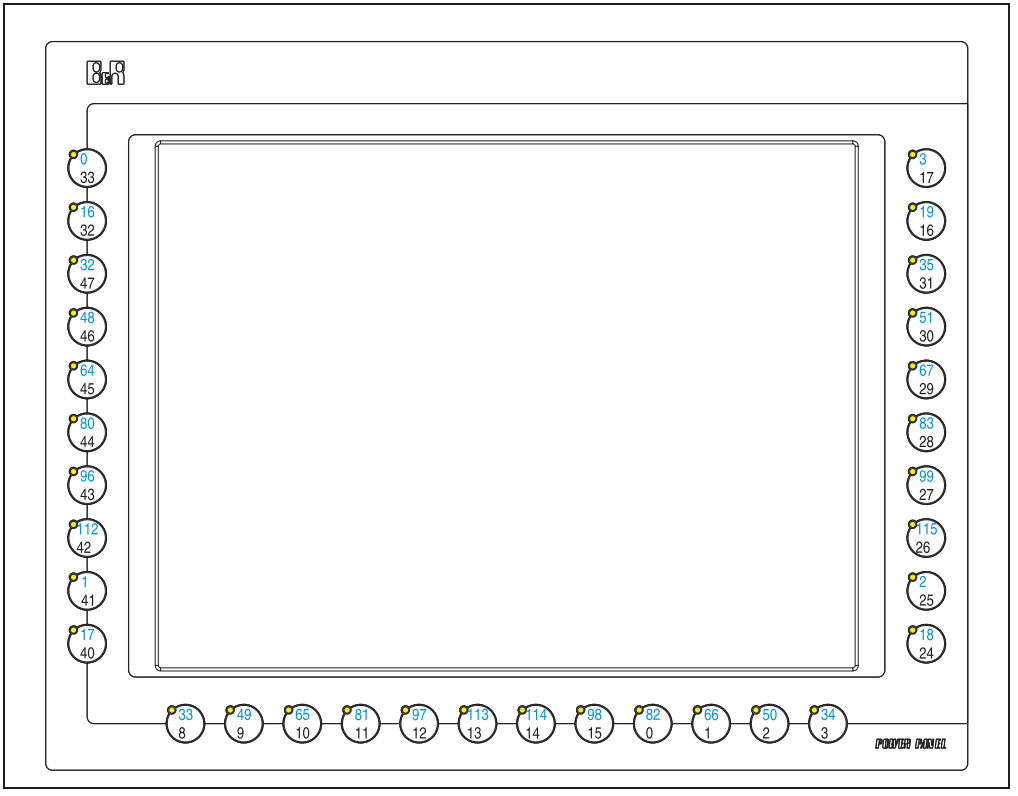


Figure 110: Hardware numbers - 4PP480.1505-75

3.3.2 Power Panel 4PP481.1505-75

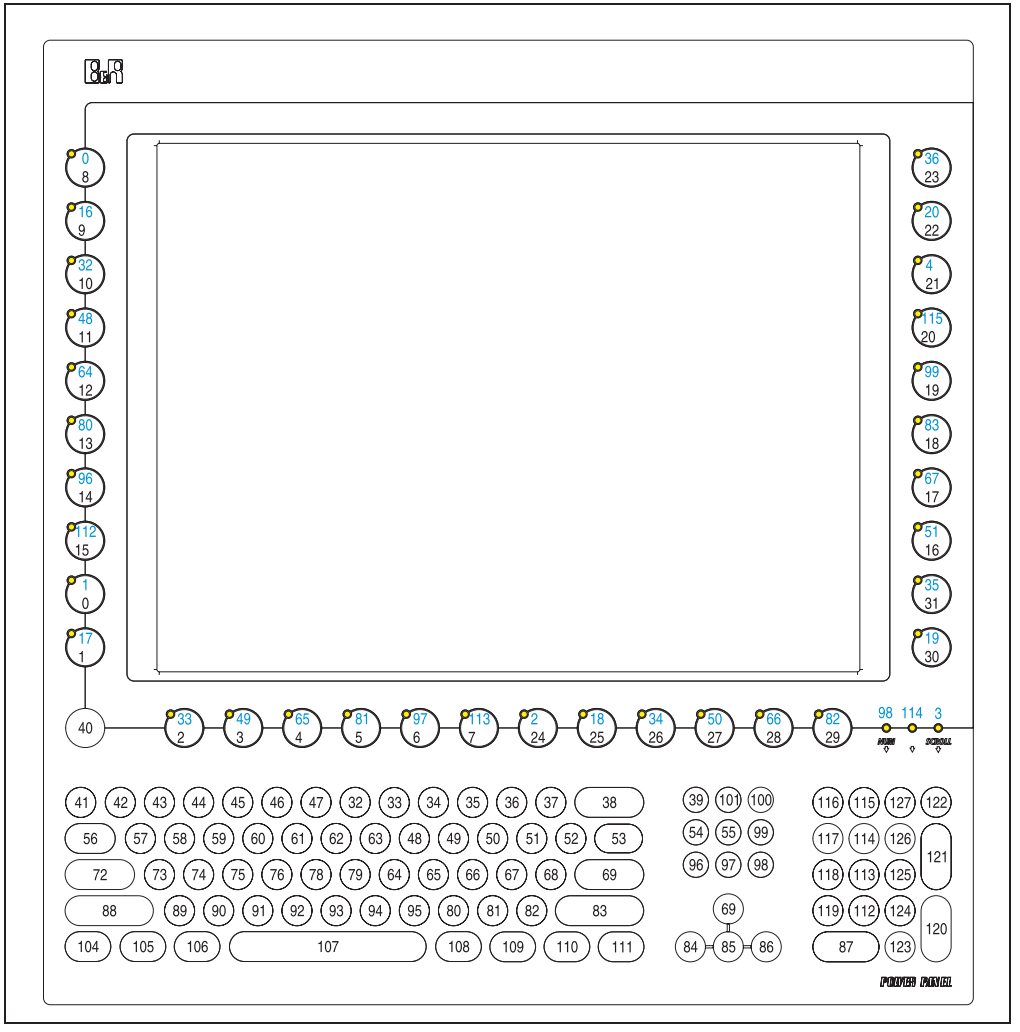


Figure 111: Hardware numbers - 4PP481.1505-75

Chapter 4 • Software

1. Power Panel 300 with BIOS

Information:

The following diagrams and BIOS menu items including descriptions refer to BIOS Version 1.07. It is therefore possible that these diagrams and BIOS descriptions do not correspond with your 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). A B&R-modified BIOS from Insyde is used in the Power Panel devices.

BIOS setup lets you modify basic system configuration settings. These settings are saved in CMOS RAM.

The CMOS RAM is a nonvolatile, battery-backed memory that retains information when power is not applied to the Power Panel.

BIOS is immediately activated when switching on the power supply of the Power Panel.

BIOS reads the system configuration information in CMOS RAM, checks the system, and configures it using the power-on self-test (POST).

1.2 Summary screen

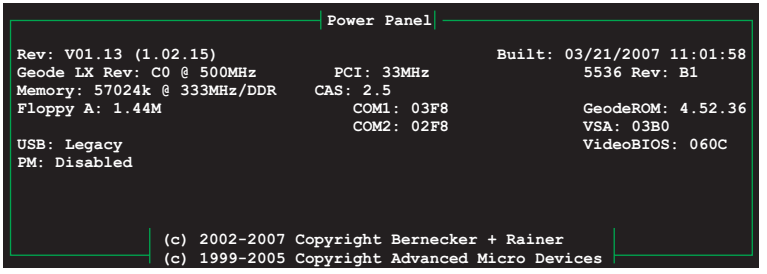


Figure 112: BIOS summary screen for VGA and XGA Power Panel devices

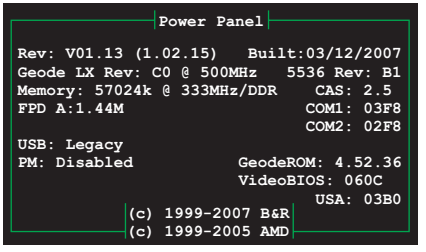


Figure 113: BIOS summary screen for QVGA Power Panel devices

To deactivate this summary screen, see "Miscellaneous configuration" on page 205.

To make changes in the BIOS setup, the DEL key must be pressed when booting the Power Panel device as soon as the following message appears in the upper margin of the display (during POST):

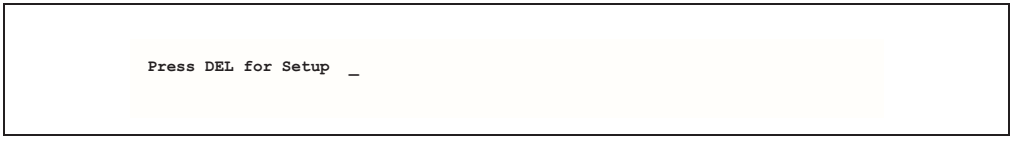


Figure 114: Press DEL for setup

If the message disappears before DEL has been pressed[1)] , then the Power Panel must be booted again in order to enter BIOS setup.

Important!

The following general rule applies: Only modify those settings that you completely understand. On no account should settings be changed without a good reason. The BIOS settings have been carefully chosen by B&R to guarantee ideal performance and reliability. Even a minor change may cause the system to become unstable.

Information:

The settings recommended by B&R can be loaded with "Load defaults".

The following keys[1)] help you navigate in BIOS setup:

Key	Function
Cursor ↑	Moves to previous item.
Cursor ↓	Moves to next item.
Cursor ←	Moves to previous item.
Cursor →	Moves to next item.
ESC	Exits the submenu.
Enter or press highlighted character shortcut	Change into the selected menu.
F1 and ALT+H	A help window opens up that describes the possible values for the highlighted item. Press ESC to exit the help window. In a help window, the cursor ↑, Cursor ↓, Home, End, Page Up, and Page Down keys can be used to navigate when help texts are longer that the displayable area.
Home	Jumps to the first BIOS menu item or object.
End	Jumps to the last BIOS menu item or object.
ALT+Q and ALT+X	Enters the BIOS main menu.
- (Minus)	Decreases the numerical value or selects the previous parameter value.
+ (Plus)	Increases the numerical value or selects the next parameter value.

Table 64: BIOS-relevant keys

1) A USB keyboard is required to enter characters and operate BIOS setup pages.

1.3 BIOS settings for VGA and XGA Power Panel devices

Information:

The BIOS default values are shaded gray in the table.

1.3.1 Main menu

The BIOS setup main menu appears immediately after pressing the DEL button while the system is booting:

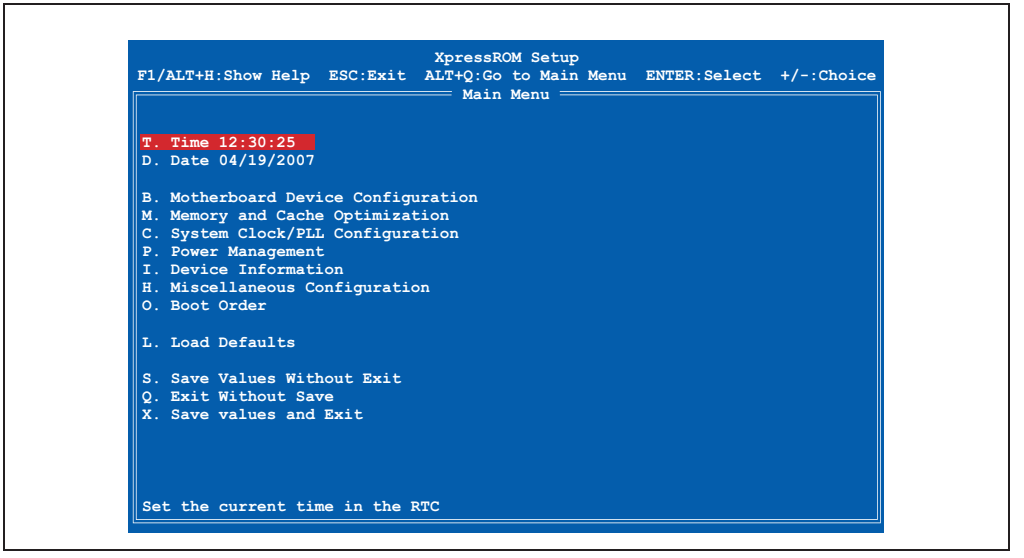


Figure 115: Main menu

The individual menu items are explained in detail in the following sections.

Shortcut	BIOS setup menu	Function
T	**Time 09:56:12 PM**	The system time can be configured here.
D	**Date 02/17/2004**	The system date can be configured here.
B	**Motherboard device config.**	Motherboard resources can be configured here.
M	**Memory and cache optimization**	The settings for memory management can be made here.
C	**System clock/PLL configuration**	The timing settings can be made here.
P	**Power management**	Setup of various APM (Advanced Power Management) options.
I	**Device information**	Important parameters (temperature, mode/node position) are displayed here.
H	**Miscellaneous configuration**	Various BIOS settings can be configured here (Summary screen, Halt on errors)
O	**Boot order**	The boot order can be set here.

Table 65: Overview of BIOS main menu functions

Shortcut	BIOS setup menu	Function
L	Load defaults	Load the optimal BIOS settings for best performance.
S	Save values without exit	Saves BIOS values without exiting BIOS setup.
Q	Exit without save	Exits BIOS setup without saving any changes.
X	Save values and exit	Saves settings and exits BIOS setup.

Table 65: Overview of BIOS main menu functions (cont.)

1.3.2 Time

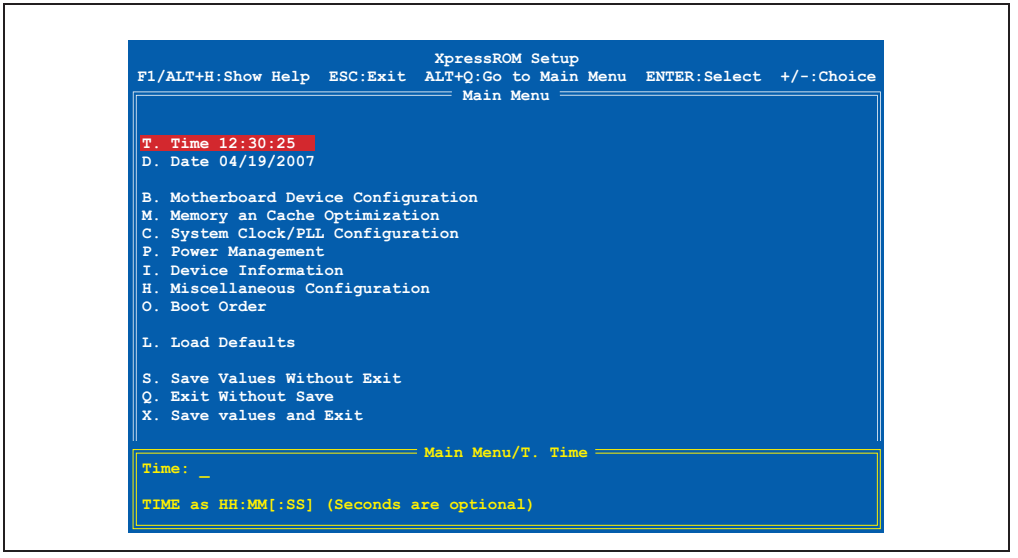


Figure 116: Time

The currently configured system time is displayed here. The time is buffered by a battery (CMOS battery) after the Power Panel device has been switched off.

A new system time can be entered with the shortcut "A" or by selecting "Time" and confirming with Enter. The format HH:MM[:SS] must be entered as shown in the following example:

Example: Set time to 13:00:00.

The entry can be made in three different ways using the keyboard:

- 01:00:00 PM - Confirm with Enter
- 13:00 - Confirm with Enter
- 13: - Confirm with Enter

Information:

If using a German keyboard, press Shift + ö to enter ":".

1.3.3 Date

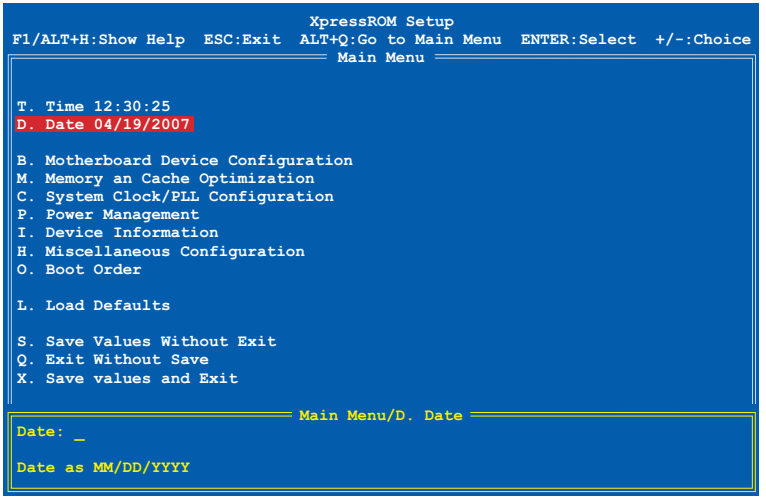


Figure 117: Date

The current system date is displayed here. The date is buffered by a battery (CMOS battery) after the Power Panel device has been switched off.

A new system date can be entered with the shortcut "B" or by selecting "Date" and confirming with Enter. The format MM:DD:YYYY must be entered as shown in the following example:

Example: Set date to 2/12/2003.

Entry using keyboard:

- 02/12/2003 - Confirm with Enter

Information:

If using a German keyboard, press the "-" key (next to the Shift key) to enter "/".

1.3.4 Motherboard device configuration

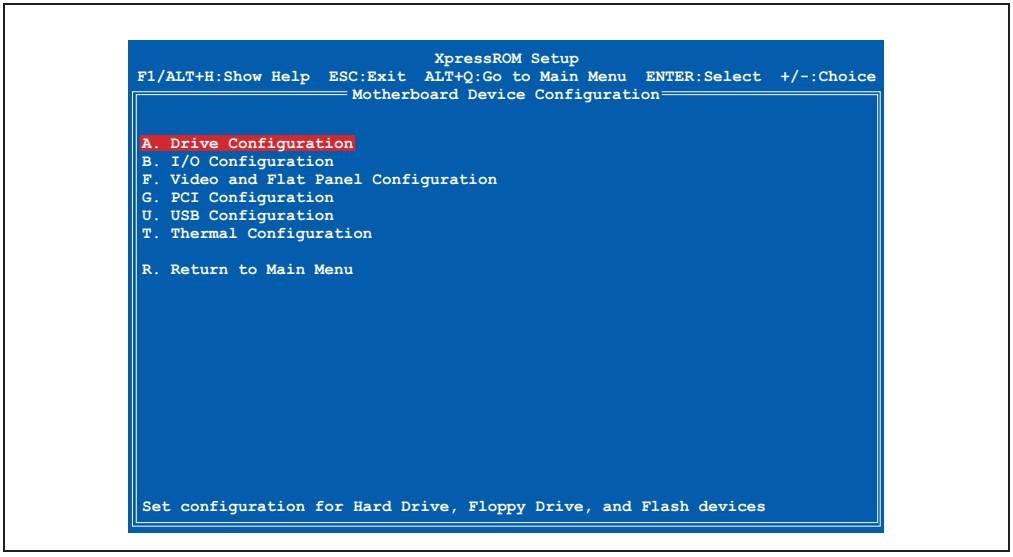


Figure 118: Motherboard device configuration

Shortcut	BIOS setup menu	Function
A	Drive configuration	Settings for floppy drive and CompactFlash card.
B	I/O configuration	Configuration of the I/O devices.
F	Video and flat panel configuration	Displays the video settings and configuration for resolution, brightness, and contrast display parameters.
G	PCI configuration	Configures PCI bus settings.
U	USB configuration	Configures USB settings.
T	Thermal configuration	Display of temperatures.
R	Return to main menu	Exits the current page and returns to the BIOS main menu.

Table 66: BIOS motherboard device configuration menu

Motherboard device configuration - drive configuration

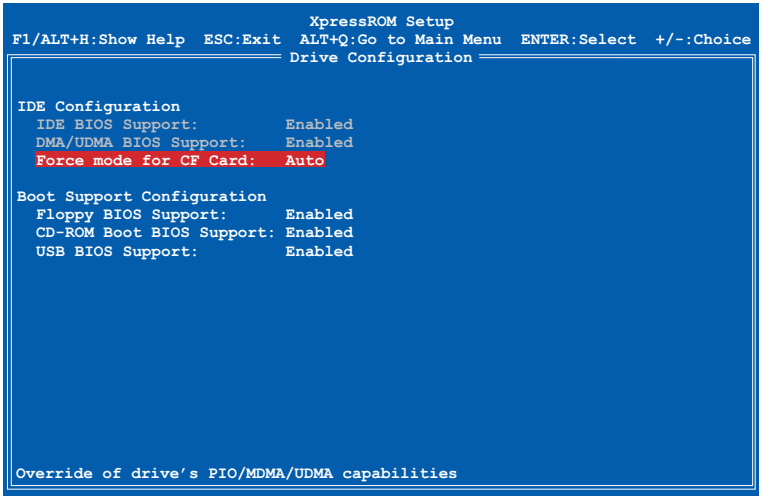


Figure 119: Motherboard device configuration - drive configuration

BIOS setting	Meaning	Setting options	Effect
IDE BIOS support	Displays the IDE configuration for the Power Panel device.	None	-
DMA/UDMA BIOS support	Here you can make settings for the DMA/UDMA BIOS support .	None	-
Force mode for CF card	The maximum data transfer mode to and from a CompactFlash card can be configured here. **Information:** **If a mode is configured that is not supported by the CompactFlash card, then the fastest supported mode is configured.**	Auto	Configures the fastest mode supported by the inserted CompactFlash card.
		PIO 0 to PIO 4	Manual configuration option for PIO mode.
		MDMA 0 to MDMA 2	Manual configuration option for MDMA mode.
		UDMA 0 to UDMA 5	Manual configuration option for UDMA mode.
Floppy BIOS support	Floppy support (USB) can be activated/deactivated here.	Enabled	Floppy support activated.
		Disabled	Floppy support deactivated.
CD-ROM boot BIOS support	The CD-ROM boot BIOS support can be activated/deactivated here.	Enabled	CD-ROM boot support activated.
		Disabled	CD-ROM boot support deactivated.
USB BIOS support	USB BIOS support can be activated/deactivated here.	Enabled	USB BIOS support activated.
		Disabled	USB BIOS support deactivated.

Table 67: BIOS drive configuration menu

Motherboard device configuration - I/O configuration

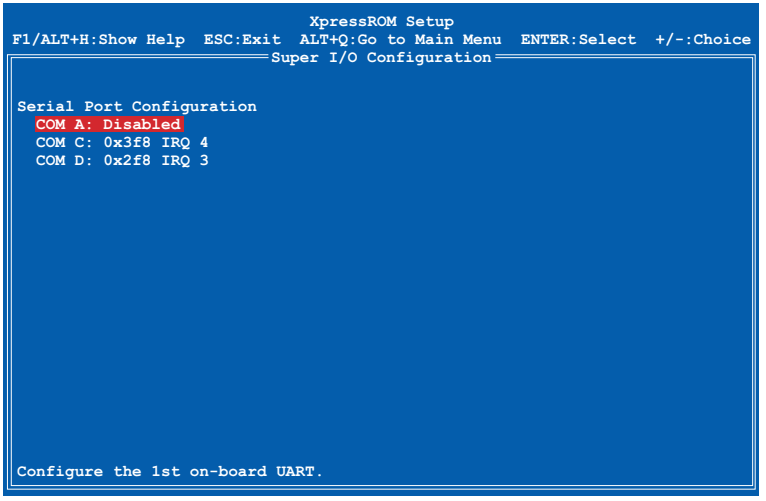


Figure 120: Motherboard device configuration - I/O configuration

BIOS setting	Meaning	Setting options	Effect
COM A	Configures the UART address range and the corresponding interrupt for the optional internal interface. **Information:** **Two ports cannot use the same address range and interrupt.**	Disabled	No assignment.
		0x3f8 IRQ 4	Use this address range and interrupt.
		0x2f8 IRQ 3	
		0x3e8 IRQ 4	
		0x2e8 IRQ 3	
COM C	Configures the UART address range and the corresponding interrupt for the external serial interface. **Information:** **Two ports cannot use the same address range and interrupt.**	Disabled	No assignment.
		0x3f8 IRQ 4	Use this address range and interrupt.
		0x2f8 IRQ 3	
		0x3e8 IRQ 4	
		0x2e8 IRQ 3	
		0x3f8 IRQ 12	
		0x2f8 IRQ 11	
		0x3e8 IRQ 12	
		0x2e8 IRO 11	

Table 68: BIOS super I/O configuration menu

BIOS setting	Meaning	Setting options	Effect
COM D	Configures the UART address range and the corresponding interrupt for the touch controller. **Information:** **Two ports cannot use the same address range and interrupt.**	Disabled	No assignment.
		0x3f8 IRQ 4	Use this address range and interrupt.
		0x2f8 IRQ 3	
		0x3e8 IRQ 4	
		0x2e8 IRQ 3	
		0x3f8 IRQ 12	
		0x2f8 IRQ 11	
		0x3e8 IRQ 12	
		0x2e8 IRQ 11	

Table 68: BIOS super I/O configuration menu (cont.)

Motherboard device configuration - video and flat panel

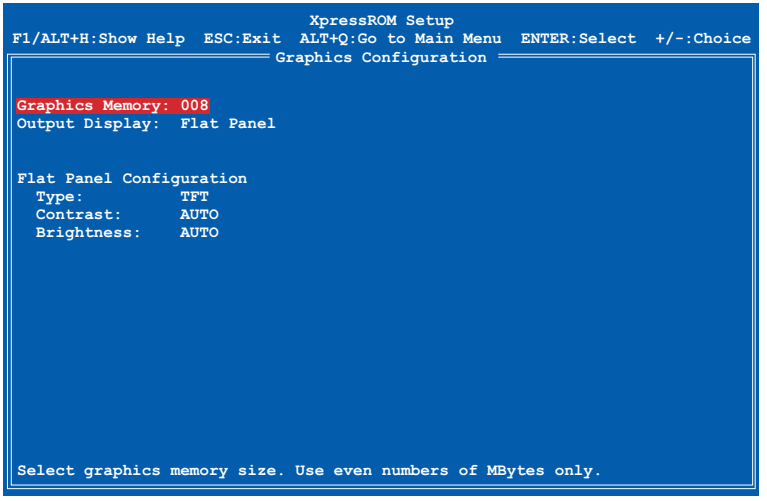


Figure 121: Motherboard device configuration - video and flat panel configuration

BIOS setting	Meaning	Setting options	Effect
Graphics memory	Setting for the amount of graphics memory reserved by the main memory. **BIOS default setting: 008.**	2-254	Manual configuration of the setting.
Output display	Selection of display mode	Flat panel	Displays on a Power Panel display.
		Panel and CRT	Displays on an external monitor and Power Panel display.
Type	Displays the Power Panel type.	None	-

Table 69: BIOS video configuration menu

BIOS setting	Meaning	Setting options	Effect
Contrast	Setting for the contrast of the display. **Note: Contrast settings can only be configured for passive displays. If the mode/node switch is set to 0/0, then contrast settings are automatically set to the default factory settings every time the Power Panel device is restarted.**	Auto	The optimal contrast is automatically configured using the factory settings. A contrast value between 100% and 0% is set.
		0% to 100%	Manual setting of the desired contrast within factory settings limits.
Brightness	Setting for the background lighting of the display. **Note: If the mode/node switch is set to 0/0, then brightness settings are automatically set to the default values from the factory settings every time the Power Panel device is restarted.**	Auto	The optimal brightness is automatically configured using the factory settings. A brightness setting between 100% and 0% is set.
		0% to 100%	Manual setting of the desired brightness within factory settings limits.

Table 69: BIOS video configuration menu (cont.)

Motherboard device configuration - PCI configuration

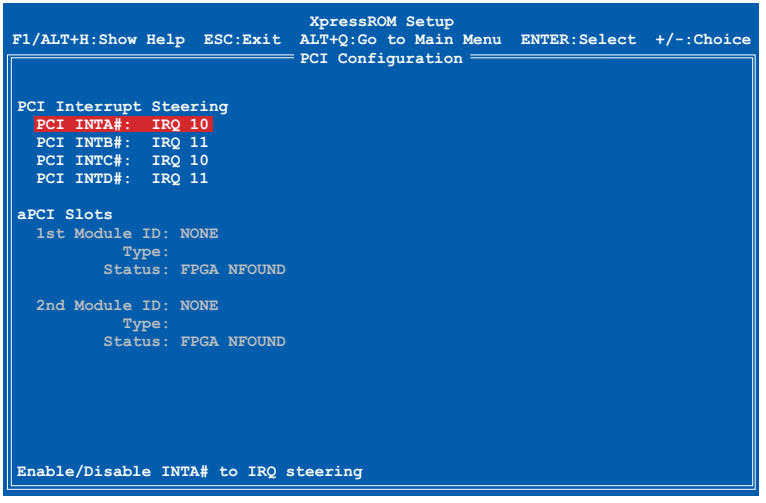


Figure 122: Motherboard device configuration - PCI configuration

BIOS setting	Meaning	Setting options	Effect
PCI INTA#	Activates the IRQ for the Ethernet controller. **BIOS default setting: IRQ 10.**	Disabled	No IRQ is reserved.
		3, 4, 5, 6, 7, 9, 10, 11, 12, 14 or 15	Manual configuration of the IRQ.

Table 70: BIOS PCI configuration menu

BIOS setting	Meaning	Setting options	Effect
PCI INTB#	Activates IRQ for aPCI slot 1. **BIOS default setting: IRQ 11.** First IRQ for aPCI slot 1 and IRQ for USB controller.	Disabled	No IRQ is reserved.
		3, 4, 5, 6, 7, 9, 10, 11, 12, 14 or 15	Manual configuration of the IRQ.
PCI INTC#	Activates IRQ for aPCI slot 2. **BIOS default setting: IRQ 10.** First IRQ for aPCI slot 2 and IRQ for IRQ for aPCI slot 1.	Disabled	No IRQ is reserved.
		3, 4, 5, 6, 7, 9, 10, 11, 12, 14 or 15	Manual configuration of the IRQ.
PCI INTD#	Activates IRQ for the USB controller. **BIOS default setting: IRQ 11.** Second IRQ for aPCI slot 2.	Disabled	No IRQ is reserved.
		3, 4, 5, 6, 7, 9, 10, 11, 12, 14 or 15	Manual configuration of the IRQ.
aPCI slots	Information about aPCI modules located in the aPCI slots of the Power Panel device are displayed here.	None	-

Table 70: BIOS PCI configuration menu (cont.)

Motherboard device configuration - USB configuration

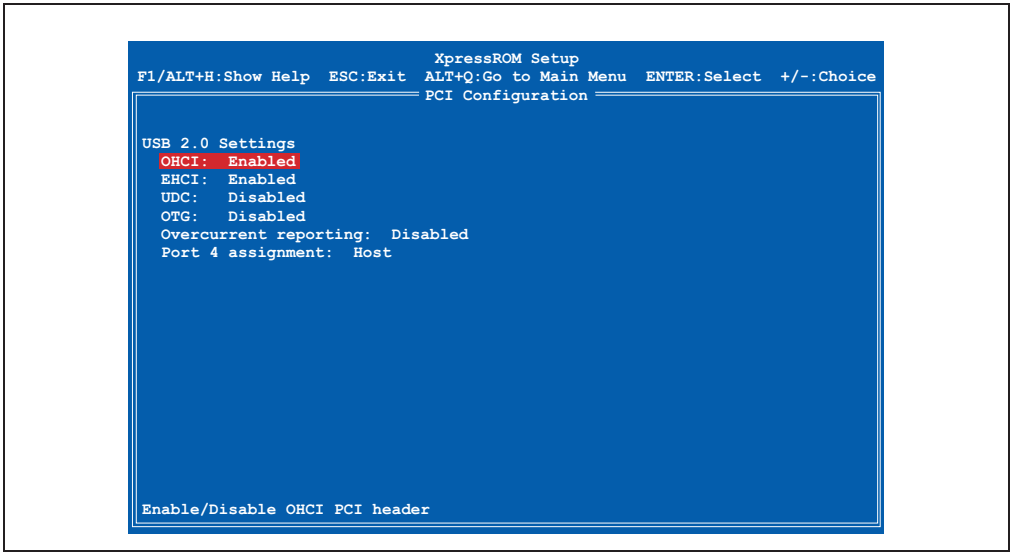


Figure 123: Motherboard device configuration - USB configuration

BIOS setting	Meaning	Setting options	Effect
OHCI	Turns USB 1.0/1.1 support on/off (OHCI - Open Host Controller Interface).	Enabled	Activates the USB port.
		Disabled	Deactivates the USB port.
EHCI	Turns USB 2.0 support on/off (EHCI - Enhanced Host Controller Interface).	Enabled	Enables this function.
		Disabled	Disables this function.

Table 71: BIOS USB configuration menu

BIOS setting	Meaning	Setting options	Effect
UDC	Turns the USB device controller on/off. When on, only the PCI config space is activated in BIOS.	Enabled	Enables this function.
		Disabled	Disables this function.
OTG	Turns the On-to-go device on/off. Only the PCI config space is activated in BIOS. When two computers are connected, the OTG is responsible for assigning the master and slave. This function is not yet fully developed in B&R systems.	Enabled	Enables this function.
		Disabled	Disables this function.
Overcurrent reporting	This function sends an error message to the system when an overload is detected. **Information:** **Only possible with OTG>.**	Enabled	Enables this function.
		Disabled	Disables this function.
Port 4 assignment	With this option, USB port 4 can be configured. **Information:** **The USB port that this function supports is always the one that is closest to the motherboard.**	Host	Functions as host.
		Device	Functions as device (two computers can be connected via port 4 - Master -> Slave).
		Not used	In BIOS, the default value (=Host) is assigned.

Table 71: BIOS USB configuration menu

Motherboard device configuration - thermal configuration

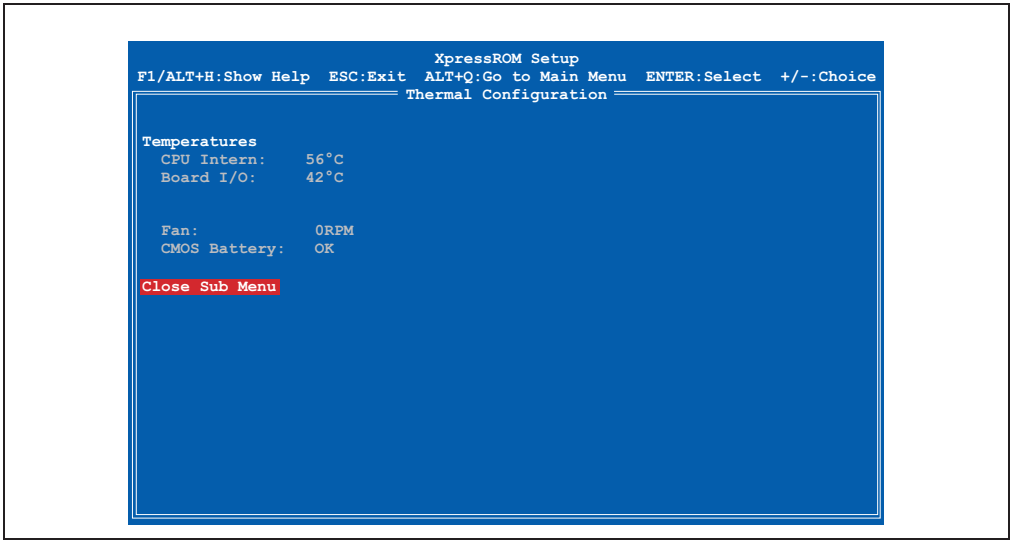


Figure 124: Motherboard device configuration - thermal configuration

BIOS setting	Meaning	Setting options	Effect
CPU intern	Displays the current internal processor temperature.	None	-
Board I/O	Indicates the current board I/O temperature.	None	-
Fan	Displays fan speed for the selected panel (depending on features).	None	-
Close submenu	Close submenu	Enter	Closes the submenu.
CMOS battery	Displays whether the CMOS battery is ok.	None	-

Table 72: BIOS thermal configuration menu

1.3.5 Memory and cache optimization

Warning!

The parameters in this screen are for system designers, service personnel, and technically competent users only. Only modify those settings that you completely understand.

Incorrectly setting "Memory optimization" values can cause instability and even cause the entire system not to boot. If the Power Panel device can no longer be booted, then the default values can be restored by restarting three times.

Information:

More detailed information about the meaning and effects of the settings can also be found in the corresponding user's manual for the processor.

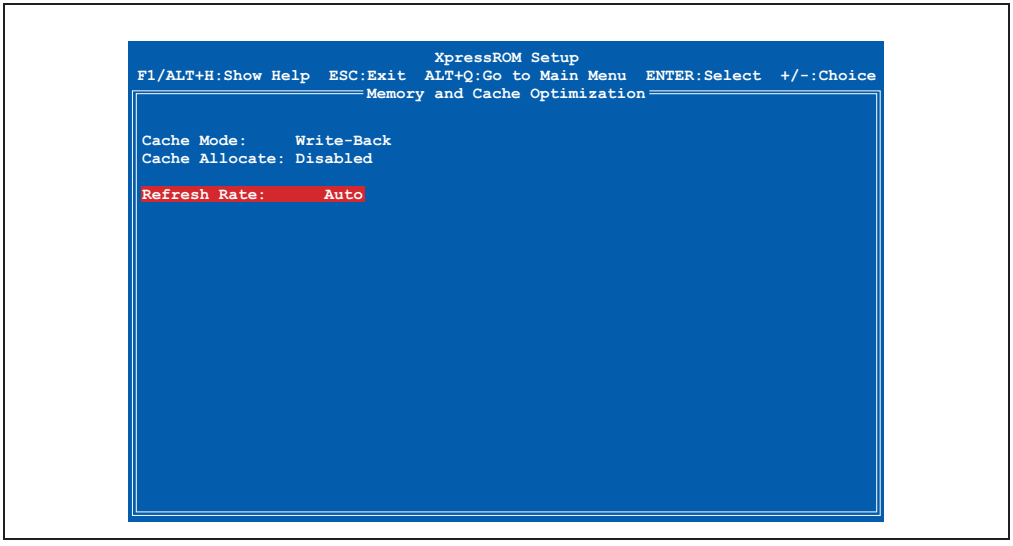


Figure 125: Memory and cache optimization

BIOS setting	Meaning	Setting options	Effect
Cache mode	Using cache mode, write accesses are determined on the cache.	Write back	The data is only written in the main memory if necessary (main memory and cache do not have the same information content).
		Write through	Data is written to the cache and to the main memory.
Cache allocate	The cache is divided into memory levels.	Disabled	Disables this function.
		Enabled	Enables this function.
Refresh rate	The refresh cycle can be set here. **Note: Enter the clock frequency, the chipset does the rest.**	Auto	Value selected automatically.
		15µs, 3µs, 7µs, 31µs, 62µs or 125µs	Manual configuration of the setting.

Table 73: BIOS memory and cache optimization menu

1.3.6 System clock/PLL configuration

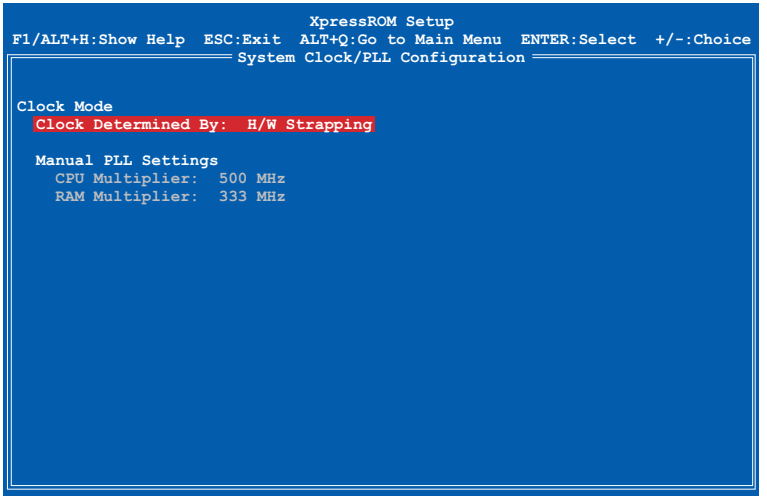


Figure 126: System clock/PLL configuration

BIOS setting	Meaning	Setting options	Effect
Clock determined by	The processor clock can be set with this option.	H/W strapping	Value is set automatically.
		Manual settings	Value must be set manually (CPU multiplier, RAM multiplier).
CPU multiplier	The CPU multiplier can be selected with this option. (This value can only be set if the BIOS setting "Clock determined by" is set to **Manual**.) **BIOS default setting: 500 MHz**	None	-
		233 MHz, 266 MHz, 300 MHz, 333 MHz, 366 MHz, 400 MHz, 433 MHz, 466 MHz, 500 MHz	Manual configuration of the setting.
RAM multiplier	The RAM multiplier can be selected with this option. (This value can only be set if the BIOS setting "Clock determined by" is set to **Manual**.) **BIOS default setting: 333 MHz**	None	-
		233 MHz, 266 MHz, 300 MHz, 333 MHz, 366 MHz, 400 MHz, 433 MHz, 466 MHz, 500 MHz	Manual configuration of the setting.

Table 74: System clock/PLL configuration

1.3.7 Power management

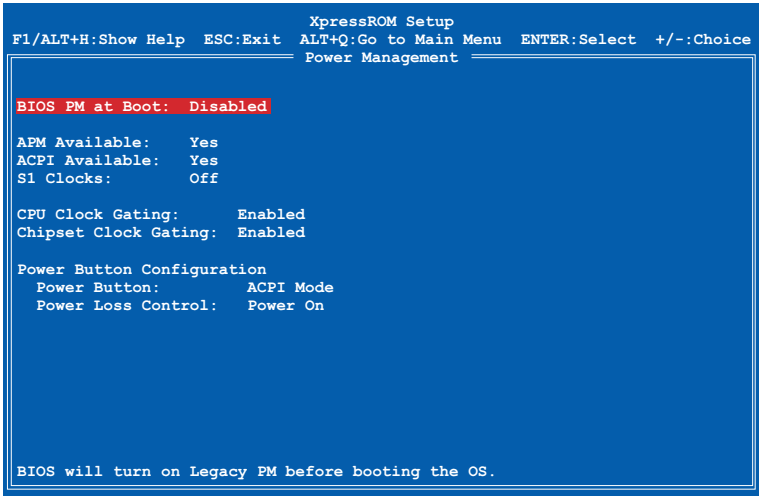


Figure 127: Power management

BIOS setting	Meaning	Setting options	Effect
BIOS PM at boot	BIOS setup can be started without Linux, Win XP or Win CE.	Enabled	Enables this function.
		Disabled	Disables this function.
APM available	Under this option you can set whether the operating system is allowed to change the BIOS power management settings.	Yes	Enables this function.
		No	Disables this function.
ACPI available	The ACPI (Advanced Configuration and Power Interface) option is an extended PnP and power management function.	Yes	Enables this function.
		No	Disables this function.
S1 clocks	The processor can be "stopped" with this option.	Off	Disables this function.
		On	Enables this function.
CPU clock gating	During power management, the clock lines are turned off for devices connected to the CPU.	Enabled	Enables this function.
		Disabled	Disables this function.
Chipset clock gating	During power management, the clock lines are turned off for devices connected to the chipset.	Enabled	Enables this function.
		Disabled	Disables this function.
Power button	This option determines how the Power button will function.	ACPI mode	Turns off ACPI mode.
		Instant off	Turns off immediately.
Power loss control	This option determines what should occur after a power failure.	Power-on	The device turns back on.
		Stay off	Device remains off.

Table 75: BIOS power management menu

1.3.8 Device information

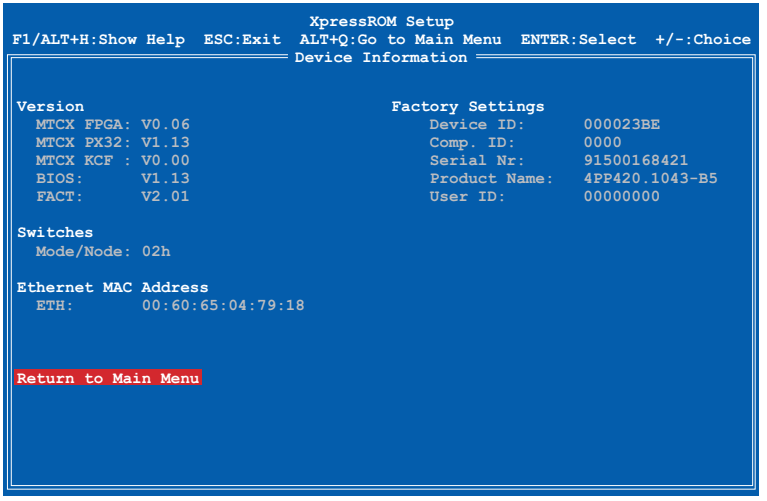


Figure 128: Device information

BIOS setting	Meaning	Setting options	Effect
FPGA	The FPGA version is displayed here.	None	-
MTCX	The MTCX version is displayed here.	None	-
KCF	The KCF version is displayed here.	None	-
BIOS	The BIOS version is displayed here.	None	-
FACT	The version of the factory settings is displayed here.	None	-
Mode/Node	Displays the current mode/node switch position.	None	-
Device ID	Hex value for the device code of the Power Panel device.	None	-
Comp. ID	The compatibility code of the Power Panel device is displayed here.	None	-
Serial no.	The serial number of the Power Panel device is displayed here.	None	-
Product name	The product name of the Power Panel device is displayed here.	None	-
User ID	The User ID of the Power Panel device is displayed here.	None	-

Table 76: BIOS device information menu

1.3.9 Miscellaneous configuration

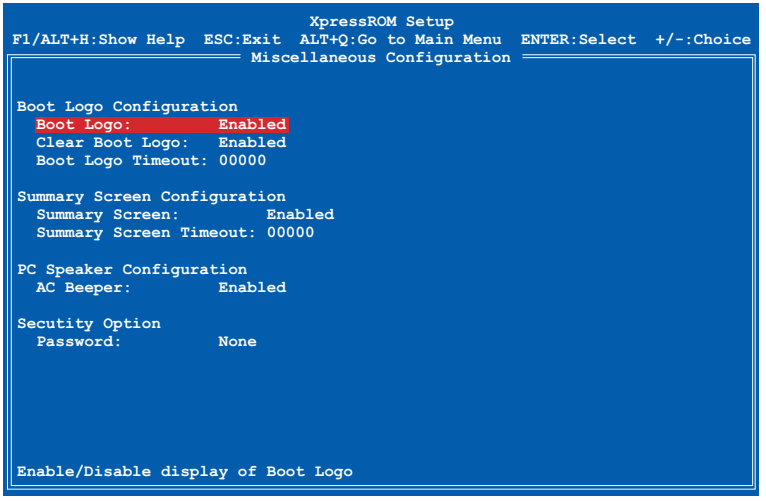


Figure 129: Miscellaneous configuration

BIOS setting	Meaning	Setting options	Effect
Boot logo	Displays a boot logo while the Power Panel is starting.	Disabled	No boot logo displayed during booting.
		Enabled	A B&R boot logo is displayed during booting as long as no customized bitmap is shown.
Clear boot logo	BIOS automatically clears the boot logo after starting in order to reduce the boot time.	Disabled	The boot logo is removed.
		Enabled	Disables this function.
Boot logo timeout	Defines the length of time the message "Press DEL for setup" is shown on the display, and how long the user has to switch to BIOS configuration . **By pressing any key the boot can be continued before the timeout has expired.**	0	No waiting.
		1-65535 [milliseconds]	The manually set value in milliseconds that must pass before the boot process continues.
Summary screen	Displays information about the BIOS, VGA, VSA versions, devices found, etc..	Disabled	Shows the summary screen.
		Enabled	Hides the summary screen.
Summary screen timeout	Defines the length of time the summary screen is shown. **By pressing any key the boot can be continued before the timeout has expired.**	0	No waiting.
		1-65535 [milliseconds]	The manually set value in milliseconds that must pass before the boot process continues.

Table 77: BIOS miscellaneous configuration menu

BIOS setting	Meaning	Setting options	Effect
AC beeper	The tone that sounds after startup can be turned on/off here.	Disabled	Disables this function.
		Enabled	Enables this function.
Password	A password for BIOS setup can be specified here. No changes can be made without entering the password.	None	No password.
		Enter password	Enter a password manually (max. 8 characters).

Table 77: BIOS miscellaneous configuration menu (cont.)

1.3.10 Boot order

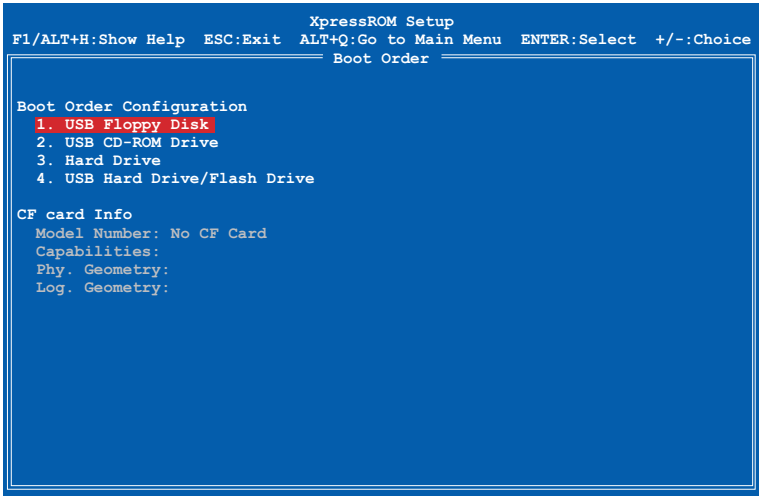


Figure 130: Boot order

BIOS setting	Meaning	Setting options		Effect
Boot order configuration	Configures the order in which memory media is booted. If two identical devices are selected a conflict warning is displayed.	1	USB floppy disk	The device attempts to boot from this drive first.
			USB CD-ROM drive	
			Hard drive	
			USB hard drive / flash drive	
			None	
		2	USB floppy disk	The device attempts to boot from this drive second.
			USB CD-ROM drive	
			Hard drive	
			USB hard drive / flash drive	
			None	
		3	USB floppy disk	The device attempts to boot from this drive third.
			USB CD-ROM drive	
			Hard drive	
			USB hard drive / flash drive	
			None	
		4	USB floppy disk	The device attempts to boot from this drive fourth.
			USB CD-ROM drive	
			Hard drive	
			USB hard drive / flash drive	
			None	
Model number	Displays the CompactFlash model ID.	None		-
Capabilities	Displays the possible data transfer speeds to or from the inserted CompactFlash card.	None		-
Phy. geometry	Displays the physical geometry of the inserted CompactFlash card in cylinders, heads, and number of sectors.	None		-
Log. geometry	Displays the logical geometry of the inserted CompactFlash card in cylinders, heads, and number of sectors.	None		-

Table 78: BIOS drive configuration menu

1.3.11 Load defaults

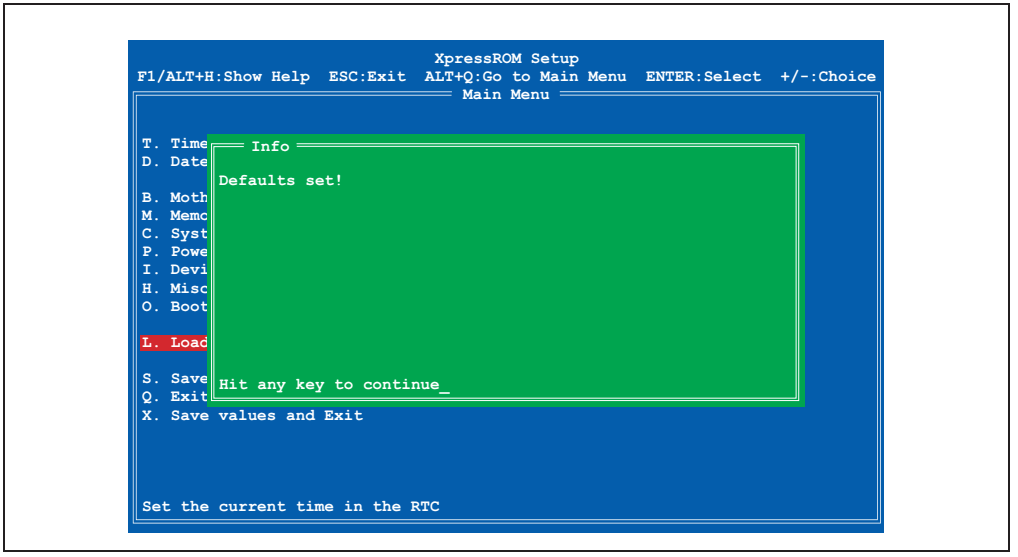


Figure 131: Load defaults

Under this BIOS menu item (shortcut "L"), by pressing any key you can load the values that were set at the time BIOS setup was opened. All changes made up to that point are lost as a result.

1.3.12 Save values without exit

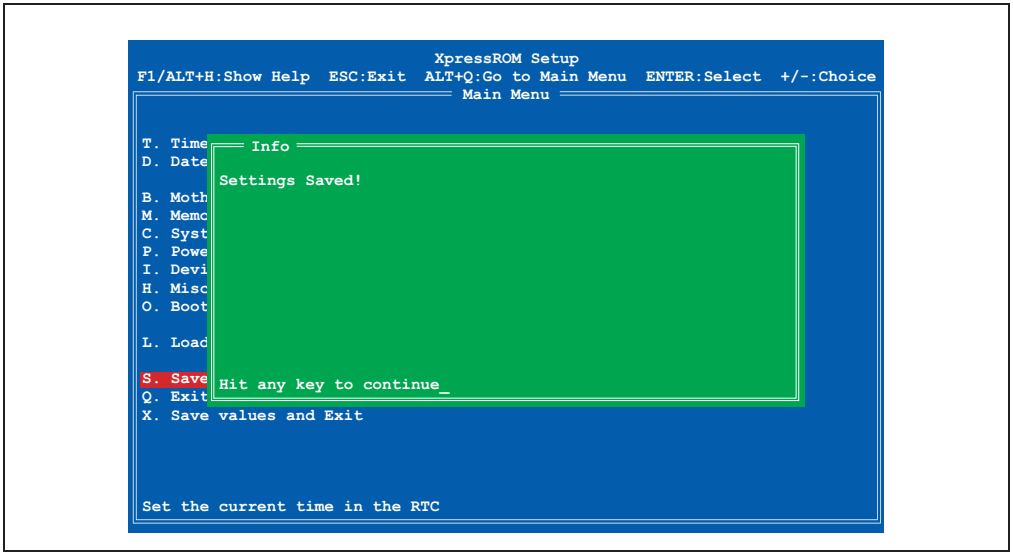


Figure 132: Save values without exit

The BIOS values are saved using this menu item (shortcut "S") by pressing any key. The user can then make additional settings or exit BIOS setup.

1.3.13 Exit without save

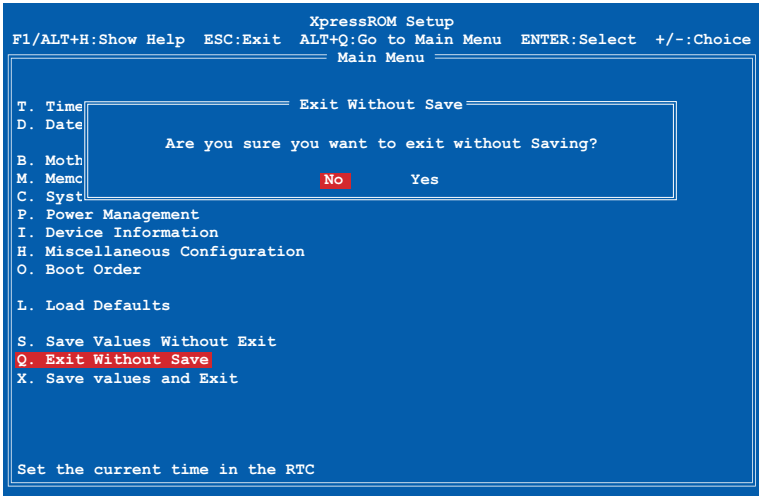


Figure 133: Exit without save

BIOS setup can be exited by selecting "Yes" under this menu item (shortcut "Q") without saving any changes that might have been made. The system is then automatically restarted.

Information:

If using a German keyboard, press the "z" key to enter "y".

1.3.14 Save values and exit

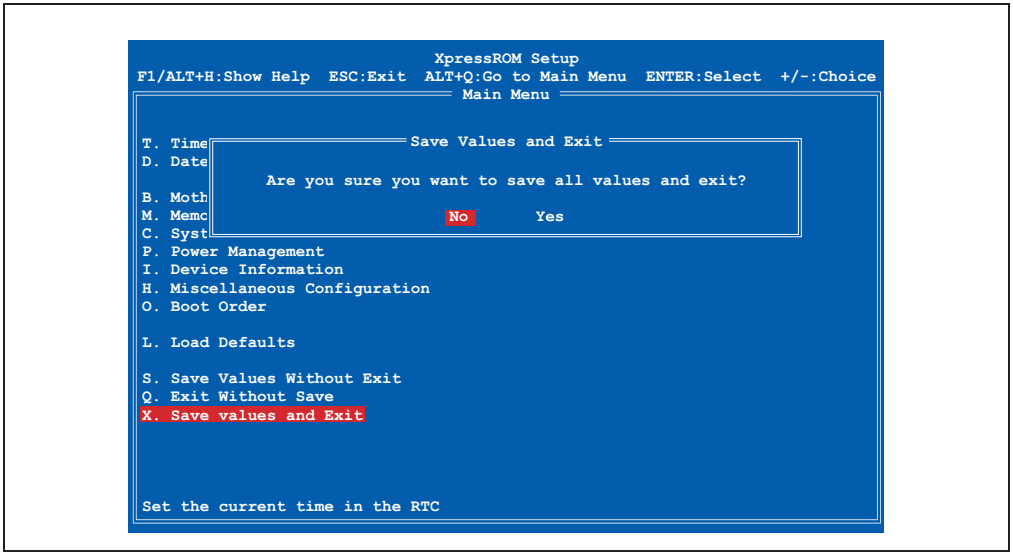


Figure 134: Save values and exit

If "Yes" is selected under this menu item (X shortcut), the system saves the settings, automatically exits BIOS setup, and reboots the system.

Information:

If using a German keyboard, press the "z" key to enter "y".

1.4 BIOS settings for QVGA Power Panel devices

1.4.1 Main menu

The BIOS setup main menu appears immediately after pressing the DEL button while the system is booting:

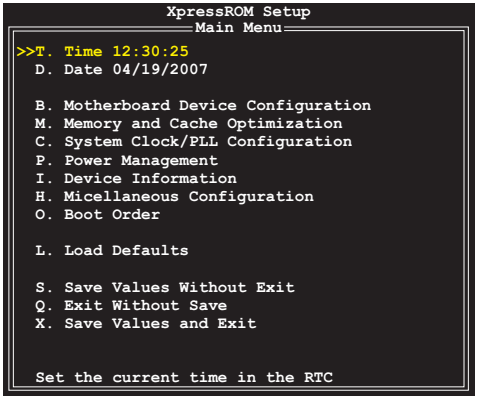


Figure 135: Main menu

The individual menu items are explained in detail in the following sections.

Shortcut	BIOS setup menu	Function
T	Time 12:02:56 AM	The system time can be configured here.
D	Date 03/12/2007	The system date can be configured here.
B	Motherboard device configuration	Motherboard resources can be configured here.
M	Memory and cache optimization	The settings for memory management can be made here.
C	System clock/PLL configuration	The timing settings can be made here.
P	Power management	Setup of various APM (Advanced Power Management) options.
I	Device information	Important parameters (e.g. temperature, mode/node position, etc.) for a Power Panel device are displayed here.
H	Miscellaneous configuration	The various BIOS settings can be configured here(Summary screen, Halt on errors, etc.)
O	Boot order	The boot order can be set here.
L	Load defaults	Load the optimal BIOS settings for best performance.
S	Save values without exit	Saves BIOS values without exiting BIOS setup.
Q	Exit without save	Exits BIOS setup without saving any changes.
X	Save values and exit	Saves settings and exits BIOS setup.

Table 79: Overview of BIOS main menu functions

1.4.2 Time

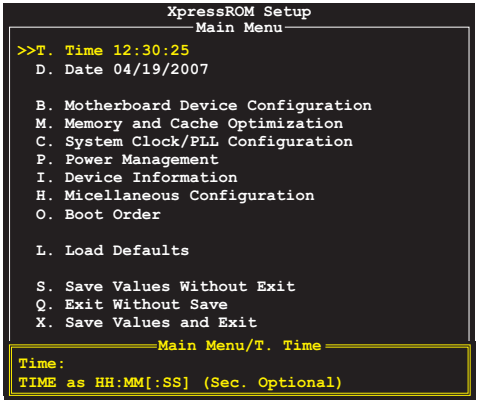


Figure 136: Time

The currently configured system time is displayed here. The time is buffered by a battery (CMOS battery) after the Power Panel device has been switched off.

A new system time can be entered with the shortcut "A" or by selecting "Time" and then confirming with Enter. The format HH:MM[:SS] must be entered as shown in the following example:

Example: Set time to 13:00:00.

The entry can be made in three different ways using the keyboard:

- 01:00:00 PM - Confirm with Enter
- 13:00 - Confirm with Enter
- 13: - Confirm with Enter

Information:

If using a German keyboard, press Shift + ö to enter ":".

1.4.3 Date

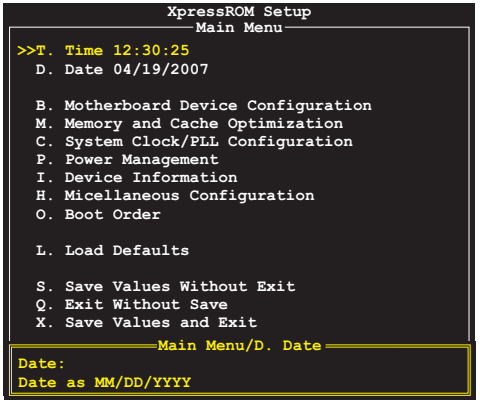


Figure 137: Date

The current system date is displayed here. The date is buffered by a battery (CMOS battery) after the Power Panel device has been switched off.

A new system date can be entered with the shortcut "B" or by selecting "Date" and then confirming with Enter. The format MM:DD:YYYY must be entered as shown in the following example:

Example: Set date to 2/12/2003.

Entry using keyboard:

- 02/12/2003 - Confirm with Enter

Information:

If using a German keyboard, press the "-" key (next to the Shift key) to enter "/".

1.4.4 Motherboard device configuration

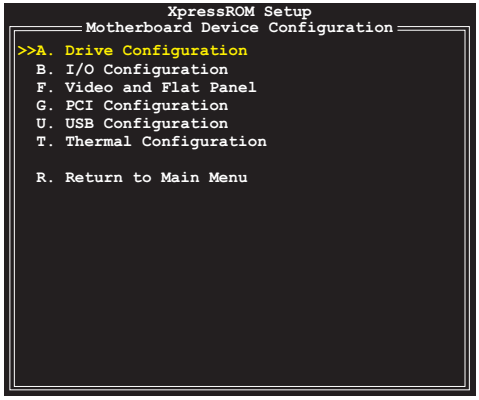


Figure 138: Motherboard device configuration

Shortcut	BIOS setup menu	Function
A	**Drive configuration**	Settings for floppy drive and CompactFlash card.
B	**I/O configuration**	Configuration of the I/O devices.
F	**Video and flat panel**	Displays the video settings and configuration for resolution, brightness, and contrast display parameters.
G	**PCI configuration**	Configures PCI bus settings.
U	**USB configuration**	Configures USB settings.
T	**Thermal configuration**	Display of temperatures.
R	**Return to main menu**	Exits the current page and returns to the BIOS main menu.

Table 80: BIOS motherboard device configuration menu

Motherboard device configuration - drive configuration

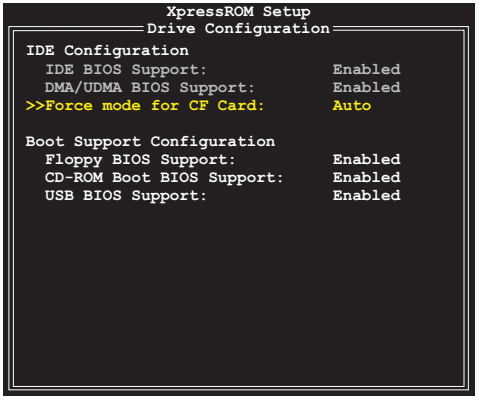


Figure 139: Motherboard device configuration - drive configuration

BIOS setting	Meaning	Setting options	Effect
IDE BIOS support	Displays the IDE configuration for the Power Panel device.	None	Function is activated.
DMA/UDMA BIOS support	Here you can make settings for the DMA/UDMA BIOS support .	None	Function is activated.
Force mode for CF card	The maximum data transfer mode to and from a CompactFlash card can be configured here. **Information:** **If a mode is configured that is not supported by the CompactFlash card, then the fastest supported mode is configured.**	Auto	Configures the fastest mode supported by the inserted CompactFlash card.
		PIO 0 to PIO 4	Manual configuration option for PIO mode.
		MDMA 0 to MDMA 2	Manual configuration option for MDMA mode.
		UDMA 0 to UDMA 5	Manual configuration option for UDMA mode.
Floppy BIOS support	Floppy support (USB) can be activated/deactivated here.	Enabled	Floppy support activated.
		Disabled	Floppy support deactivated.
CD-ROM boot BIOS support	The CD-ROM boot BIOS support can be activated/deactivated here.	Enabled	CD-ROM boot support activated.
		Disabled	CD-ROM boot support deactivated.
USB BIOS support	USB BIOS support can be activated/deactivated here.	Enabled	USB BIOS support activated.
		Disabled	USB BIOS support deactivated.

Table 81: BIOS drive configuration menu

Motherboard device configuration - I/O configuration

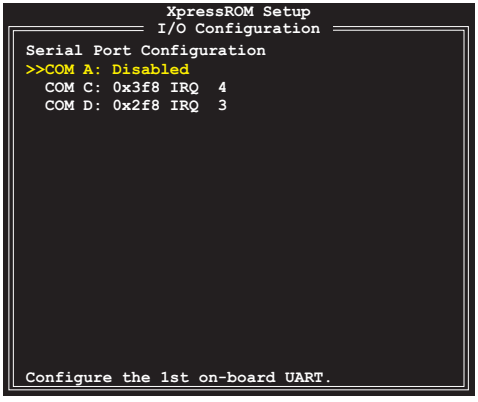


Figure 140: Motherboard device configuration - I/O configuration

BIOS setting	Meaning	Setting options	Effect
COM A	Configures the UART address range and the corresponding interrupt for the optional internal interface. **Information:** **Two ports cannot use the same address range and interrupt.**	Disabled	No assignment.
		0x3f8 IRQ 4	Use this address range and interrupt.
		0x2f8 IRQ 3	
		0x3e8 IRQ 4	
		0x2e8 IRQ 3	
COM C	Configures the UART address range and the corresponding interrupt for the external serial interface. **Information:** **Two ports cannot use the same address range and interrupt.**	Disabled	No assignment.
		0x3f8 IRQ 4	Use this address range and interrupt.
		0x2f8 IRQ 3	
		0x3e8 IRQ 4	
		0x2e8 IRQ 3	
		0x3f8 IRQ 12	
		0x2f8 IRQ 11	
		0x3e8 IRQ 12	
		0x2e8 IRO 11	

Table 82: BIOS super I/O configuration menu

BIOS setting	Meaning	Setting options	Effect
COM D	Configures the UART address range and the corresponding interrupt for the touch controller. **Information:** **Two ports cannot use the same address range and interrupt.**	Disabled	No assignment.
		0x3f8 IRQ 4	Use this address range and interrupt.
		0x2f8 IRQ 3	
		0x3e8 IRQ 4	
		0x2e8 IRQ 3	
		0x3f8 IRQ 12	
		0x2f8 IRQ 11	
		0x3e8 IRQ 12	
		0x2e8 IRQ 11	

Table 82: BIOS super I/O configuration menu (cont.)

Motherboard device configuration - video and flat panel

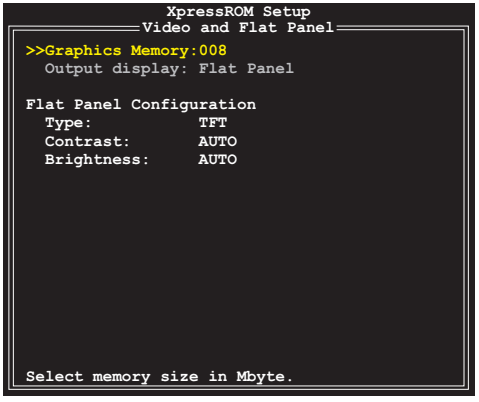


Figure 141: Motherboard device configuration - video and flat panel configuration

BIOS setting	Meaning	Setting options	Effect
Graphics memory	Setting for the amount of graphics memory reserved by the main memory. **BIOS default setting: 008.**	2-254	Manual configuration of the setting.
Output display	Selection of display mode	None	-
Type	Displays the Power Panel type.	None	-
Contrast	Setting for the contrast of the display. **Note: Contrast settings can only be configured for passive displays. If the mode/node switch is set to 0/0, then contrast settings are automatically set to the default factory settings every time the Power Panel device is restarted.**	Auto	The optimal contrast is automatically configured using the factory settings. A contrast value between 100% and 0% is set.
		0% to 100%	Manual setting of the desired contrast within factory settings limits.

Table 83: BIOS video configuration menu

BIOS setting	Meaning	Setting options	Effect
Brightness	Setting for the background lighting of the display. **Note: If the mode/node switch is set to 0/0, then brightness settings are automatically set to the default values from the factory settings every time the Power Panel device is restarted.**	Auto	The optimal brightness is automatically configured using the factory settings. A brightness setting between 100% and 0% is set.
		0% to 100%	Manual setting of the desired brightness within factory settings limits.

Table 83: BIOS video configuration menu (cont.)

Motherboard device configuration - PCI configuration

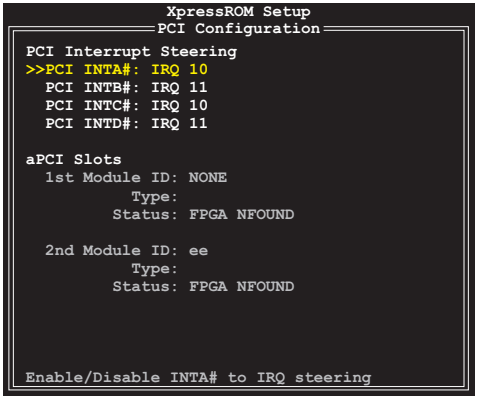


Figure 142: Motherboard device configuration - PCI configuration

BIOS setting	Meaning	Setting options	Effect
PCI INTA#	Activates the IRQ for the Ethernet controller. **BIOS default setting: IRQ 10.**	Disabled	No IRQ is reserved.
		3, 4, 5, 6, 7, 9, 10, 11, 12, 14 or 15	Manual configuration of the IRQ.
PCI INTB#	Activates IRQ for aPCI slot 1. **BIOS default setting: IRQ 11.** First IRQ for aPCI slot 1 and IRQ for USB controller.	Disabled	No IRQ is reserved.
		3, 4, 5, 6, 7, 9, 10, 11, 12, 14 or 15	Manual configuration of the IRQ.
PCI INTC#	Activates IRQ for aPCI slot 2. **BIOS default setting: IRQ 10.** First IRQ for aPCI slot 2 and IRQ for IRQ for aPCI slot 1.	Disabled	No IRQ is reserved.
		3, 4, 5, 6, 7, 9, 10, 11, 12, 14 or 15	Manual configuration of the IRQ.
PCI INTD#	Activates IRQ for the USB controller. **BIOS default setting: IRQ 11.** Second IRQ for aPCI slot 2.	Disabled	No IRQ is reserved.
		3, 4, 5, 6, 7, 9, 10, 11, 12, 14 or 15	Manual configuration of the IRQ.
aPCI slots	Information about aPCI modules located in the aPCI slots of the Power Panel device are displayed here.	None	-

Table 84: BIOS PCI configuration menu

Motherboard device configuration - USB configuration

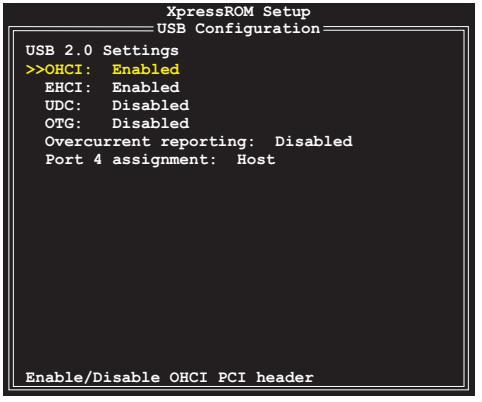


Figure 143: Motherboard device configuration - USB configuration

BIOS setting	Meaning	Setting options	Effect
OHCI	Turns USB 1.0/1.1 support on/off (OHCI - Open Host Controller Interface).	Enabled	Activates the USB port.
		Disabled	Deactivates the USB port.
EHCI	Turns USB 2.0 support on/off (EHCI - Enhanced Host Controller Interface).	Enabled	Enables this function.
		Disabled	Disables this function.
UDC	Turns the USB device controller on/off. When on, only the PCI config space is activated in BIOS.	Enabled	Enables this function.
		Disabled	Disables this function.
OTG	Turns the On-to-go device on/off. Only the PCI config space is activated in BIOS. When two computers are connected, the OTG is responsible for assigning the master and slave. This function is not yet fully developed in B&R systems.	Enabled	Enables this function.
		Disabled	Disables this function.
Overcurrent reporting	This function sends an error message to the system when an overload is detected. **Information:** **Only possible when OTG is enabled.**	Enabled	Enables this function.
		Disabled	Disables this function.
Port 4 assignment	With this option, USB port 4 can be configured. **Information:** **The USB port that this function supports is always the one that is closest to the motherboard.**	Host	Functions as host.
		Device	Functions as device (two computers can be connected via port 4 - Master -> Slave).
		Not used	In BIOS, the default value (=Host) is assigned.

Table 85: BIOS USB configuration menu

Motherboard device configuration - thermal configuration

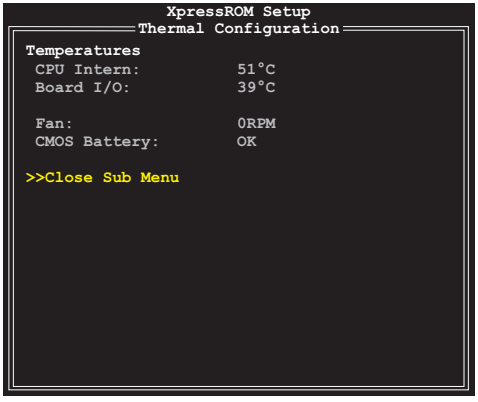


Figure 144: Motherboard device configuration - thermal configuration

BIOS setting	Meaning	Setting options	Effect
CPU intern	Displays the current internal processor temperature.	None	-
Board I/O	Indicates the current board I/O temperature.	None	-
Fan	Displays fan speed for the selected panel (depending on features).	None	-
CMOS battery	Displays whether the CMOS battery is ok.	None	-
Close submenu	Close submenu	Enter	Closes the submenu.

Table 86: BIOS thermal configuration menu

1.4.5 Memory and cache optimization

Warning!

The parameters in this screen are for system designers, service personnel, and technically competent users only. Only modify those settings that you completely understand.

Incorrectly setting "Memory optimization" values can cause instability and even cause the entire system not to boot. If the Power Panel device can no longer be booted, then the default values can be restored by restarting three times.

Information:

More detailed information about the meaning and effects of the settings can also be found in the corresponding user's manual for the processor.

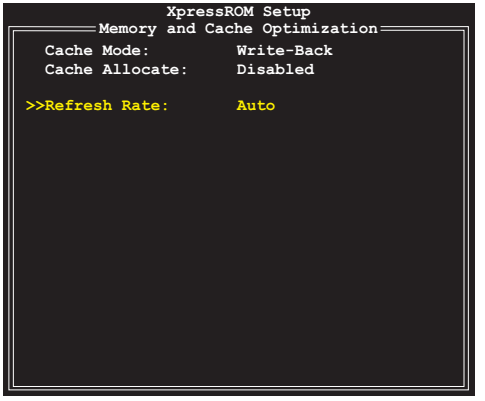


Figure 145: Memory and cache optimization

BIOS setting	Meaning	Setting options	Effect
Cache mode	Using cache mode, write accesses are determined on the cache.	Write back	The data is only written in the main memory if necessary (main memory and cache do not have the same information content).
		Write through	Data is written to the cache and to the main memory.
Cache allocate	The cache is divided into memory levels.	Disabled	Disables this function.
		Enabled	Enables this function.
Refresh rate	The refresh cycle can be set here. **Note:** **Enter the clock frequency, the chipset does the rest.**	Auto	Value selected automatically.
		15µs, 3µs, 7µs, 31µs, 62µs or 125µs	Manual configuration of the setting.

Table 87: BIOS memory and cache optimization menu

1.4.6 System clock/PLL configuration

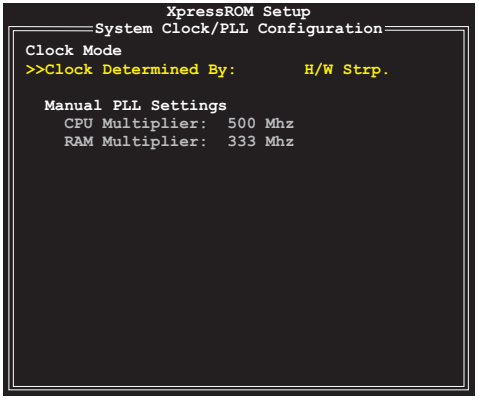


Figure 146: System clock/PLL configuration

BIOS setting	Meaning	Setting options	Effect
Clock determined by	The processor clock can be set with this option.	H/W strapping	Value is set automatically.
		Manual	Value must be set manually (CPU multiplier, RAM multiplier).
CPU multiplier	The CPU multiplier can be selected with this option. (This value can only be set if the BIOS setting "Clock determined by" is set to **Manual**.) **BIOS default setting: 500 MHz.**	None	-
		233 MHz, 266 MHz, 300 MHz, 333 MHz, 366 MHz, 400 MHz, 433 MHz, 466 MHz, 500 MHz	Manual configuration of the setting.
RAM multiplier	The RAM multiplier can be selected with this option. (This value can only be set if the BIOS setting "Clock determined by" is set to **Manual**.) **BIOS default setting: 333 MHz.**	None	-
		233 MHz, 266 MHz, 300 MHz, 333 MHz, 366 MHz, 400 MHz, 433 MHz, 466 MHz, 500 MHz	Manual configuration of the setting.

Table 88: System clock/PLL configuration

1.4.7 Power management

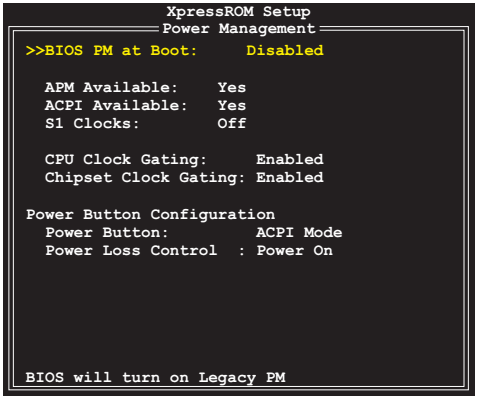


Figure 147: Power management

BIOS setting	Meaning	Setting options	Effect
BIOS PM at boot	BIOS setup can be started without Linux, Win XP or Win CE.	Enabled	Enables this function.
		Disabled	Disables this function.
APM available	Under this option you can set whether the operating system is allowed to change the BIOS power management settings.	Yes	Enables this function.
		No	Disables this function.
ACPI available	The ACPI (Advanced Configuration and Power Interface) option is an extended PnP and power management function.	Yes	Enables this function.
		No	Disables this function.
S1 clocks	The processor can be "stopped" with this option.	Off	Disables this function.
		On	Enables this function.
CPU clock gating	During power management, the clock lines are turned off for devices connected to the CPU.	Enabled	Enables this function.
		Disabled	Disables this function.
Chipset clock gating	During power management, the clock lines are turned off for devices connected to the chipset.	Enabled	Enables this function.
		Disabled	Disables this function.
Power button	This option determines how the Power button will function.	ACPI mode	Turns off ACPI mode.
		Instant off	Turns off immediately.
Power loss control	This option determines what should occur after a power failure.	Power-on	The device turns back on.
		Stay off	Device remains off.

Table 89: BIOS power management menu

1.4.8 Device information

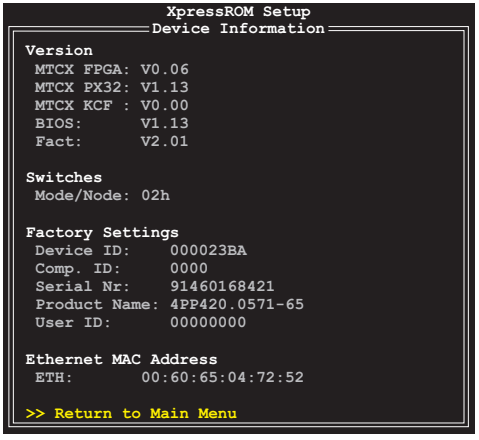


Figure 148: Device information

BIOS setting	Meaning	Setting options	Effect
MTCX FPGA	The FPGA version is displayed here.	None	-
MTCX PX32	The MTCX version is displayed here.	None	-
MTCX KCF	The KCF version is displayed here.	None	-
BIOS	The BIOS version is displayed here.	None	-
FACT	The version of the factory settings is displayed here.	None	-
Mode/Node	Displays the current mode/node switch position.	None	-
Device ID	Hex value for the device code of the Power Panel device.	None	-
Comp. ID	The compatibility code of the Power Panel device is displayed here.	None	-
Serial no.	The serial number of the Power Panel device is displayed here.	None	-
Product name	The product name of the Power Panel device is displayed here.	None	-
User ID	The User ID of the Power Panel device is displayed here.	None	-
Return to main menu	Closes the submenu.	Enter	Exits current page and return to Main Menu.

Table 90: BIOS device information menu

1.4.9 Miscellaneous configuration

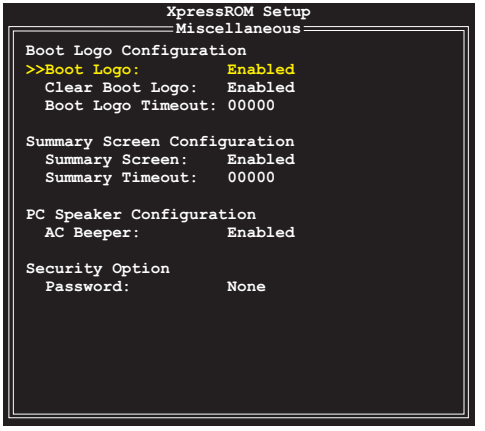


Figure 149: Miscellaneous configuration

BIOS setting	Meaning	Setting options	Effect
Boot logo	Displays a boot logo while the Power Panel is starting.	Disabled	No boot logo displayed during booting.
		Enabled	A B&R boot logo is displayed during booting as long as no customized bitmap is shown.
Clear boot logo	BIOS automatically clears the boot logo after starting in order to reduce the boot time.	Disabled	The boot logo is removed.
		Enabled	Disables this function.
Boot logo timeout	Defines the length of time the message "Press DEL for setup" is shown on the display, and how long the user has to switch to BIOS configuration . **By pressing any key the boot can be continued before the timeout has expired.**	0	No waiting.
		1-65535 [milliseconds]	The manually set value in milliseconds that must pass before the boot process continues.
Summary screen	Displays information about the BIOS, VGA, VSA versions, devices found, etc..	Disabled	Shows the summary screen.
		Enabled	Hides the summary screen.
Summary screen timeout	Defines the length of time the summary screen is shown. **By pressing any key the boot can be continued before the timeout has expired.**	0	No waiting.
		1-65535 [milliseconds]	The manually set value in milliseconds that must pass before the boot process continues.
AC beeper	The tone that sounds after startup can be turned on/off here.	Disabled	Disables this function.
		Enabled	Enables this function.

Table 91: BIOS miscellaneous configuration menu

BIOS setting	Meaning	Setting options	Effect
Password	A password for BIOS setup can be specified here. No changes can be made without entering the password.	None	No password.
		Enter password	Enter a password manually (max. 8 characters).

Table 91: BIOS miscellaneous configuration menu (cont.)

1.4.10 Boot order

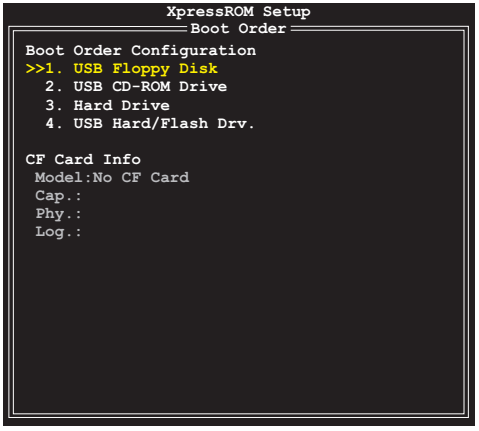


Figure 150: Boot order

BIOS setting	Meaning	Setting options		Effect
Boot order configuration	Configures the order in which memory media is booted. If two identical devices are selected a conflict warning is displayed.	1	USB floppy disk	The device attempts to boot from this drive first.
			USB CD-ROM drive	
			Hard drive	
			USB hard drive / flash drive	
			None	
		2	USB floppy disk	The device attempts to boot from this drive second.
			USB CD-ROM drive	
			Hard drive	
			USB hard drive / flash drive	
			None	
		3	USB floppy disk	The device attempts to boot from this drive third.
			USB CD-ROM drive	
			Hard drive	
			USB hard drive / flash drive	
			None	
		4	USB floppy disk	The device attempts to boot from this drive fourth.
			USB CD-ROM drive	
			Hard drive	
			USB hard drive / flash drive	
			None	
Model number	Displays the CompactFlash model ID.	None		-
Capabilities	Displays the possible data transfer speeds to or from the inserted CompactFlash card.	None		-
Phy. geometry	Displays the physical geometry of the inserted CompactFlash card in cylinders, heads, and number of sectors.	None		-
Log. geometry	Displays the logical geometry of the inserted CompactFlash card in cylinders, heads, and number of sectors.	None		-

Table 92: BIOS drive configuration menu

1.4.11 Load defaults

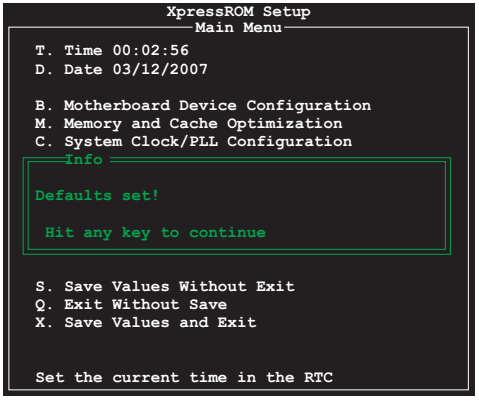


Figure 151: Load defaults

Under this BIOS menu item (shortcut "L"), by pressing any key you can load the values that were set at the time BIOS setup was opened. All changes made up to that point are lost as a result.

1.4.12 Save values without exit

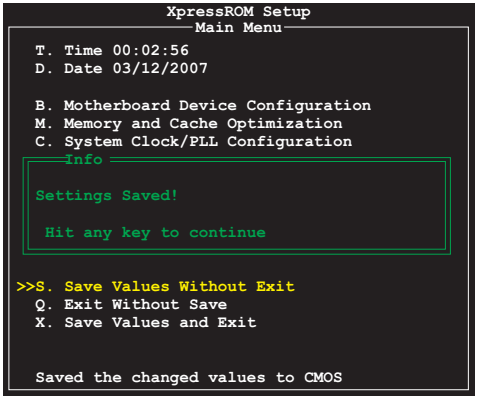


Figure 152: Save values without exit

The BIOS values are saved using this menu item (shortcut "S") by pressing any key. The user can then make additional settings or exit BIOS setup.

1.4.13 Exit without save

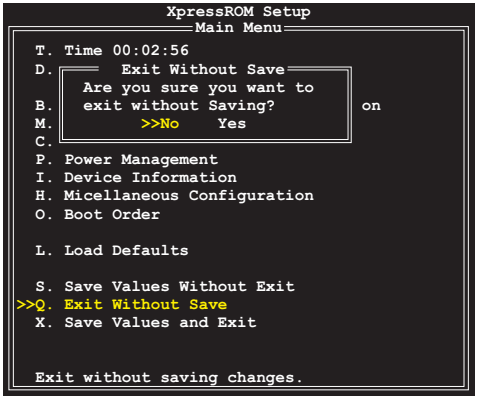


Figure 153: Exit without save

BIOS setup can be exited by selecting "Yes" under this menu item (shortcut "Q") without saving any changes that might have been made. The system is then automatically restarted.

Information:

If using a German keyboard, press the "z" key to enter "y".

1.4.14 Save values and exit

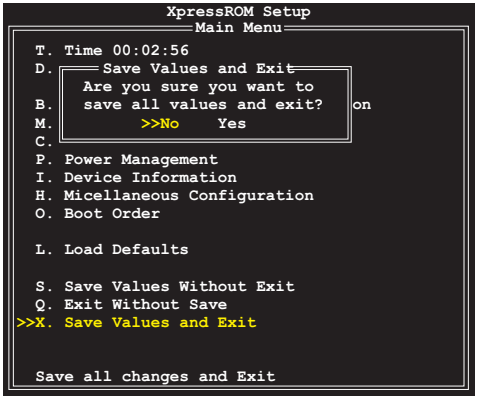


Figure 154: Save values and exit

If "Yes" is selected under this menu item (X shortcut), the system saves the settings, automatically exits BIOS setup, and reboots the system.

Information:

If using a German keyboard, press the "z" key to enter "y".

1.5 BIOS upgrade und utilities

Information:

The following diagrams, BIOS menu items, and descriptions refer to BIOS version 1.12. It is therefore possible that these diagrams and BIOS descriptions do not correspond with your installed BIOS version.

BIOS Upgrade und Utilities consists of the following parts:

- BIOS Upgrade Disk
- aPCI Firmware Upgrade Disk
- User Boot Logo Upgrade Disk

1.5.1 BIOS Upgrade Disk

An upgrade might be necessary for the following reason:

- To update implemented functions or to add newly implemented functions or components to the BIOS setup (information about changes can be found in the Readme files of the BIOS upgrade).

A current BIOS upgrade can be found on the HMI Drivers & Utilities DVD (model number 5SWHMI.0000-00) or directly downloaded from the download area on the B&R homepage (www.br-automation.com).

Procedure

The following steps should be carried out to upgrade or save BIOS:

- First, a blank HD disk must be made bootable (command line "sys a:" or "format a: /s")

Information:

For the upgrade, a boot disk must be created (or a bootable CompactFlash card) with Windows ME, Windows XP or MS-DOS 6.22.

- Copy the content of the *.zip file to this diskette.
- Insert the diskette in the USB drive and reboot the Power Panel device. See section "Motherboard device configuration - drive configuration" on page 194 for the necessary settings for the Power Panel device when booting from a diskette.
- After booting from the diskette, the following start menu opens up:

```
Microsoft Windows Startup Menu
==================================

1. Update BIOS
2. Save BIOS
3. Exit

Enter a choice:_
```

Figure 155: BIOS upgrade start menu

Item	Menu item	Description
1	Update BIOS	All areas of BIOS are automatically upgraded (default after 5 seconds). **Information:** **Settings that have been changed in BIOS setup must be set again after the update.** **The update process may not be interrupted, as the Power Panel could no longer be started, and would have to be sent to B&R for repair. Try to repeat an interrupted update process WITHOUT restarting the Power Panel, e.g. by starting the batch file UPDBIOS.BAT directly.**
2	Save BIOS	BIOS is automatically saved in the SAVED directory. **Information:** **There must be up to 256 KB free space on the disk.**
3	Exit	Returns to the shell (MS-DOS).

Table 93: BIOS upgrade menu description

Information:

If you do not press a button within 5 seconds, then step 1 "Update BIOS" is automatically carried out and the Power Panel is automatically updated.

- The system must be rebooted after a successful upgrade.

1.5.2 aPCI firmware upgrade disk

A software tool for backing up or upgrading aPCI firmware can be downloaded directly from the service portal of the B&R homepage (www.br-automation.com).

Procedure

The following steps should be taken to upgrade or save the firmware for aPCI modules:

- First, a blank HD disk must be made bootable (command line "sys a:" or "format a: /s")

Information:

For the upgrade, a boot disk must be created (or a bootable CompactFlash card) with Windows ME, Windows XP or MS-DOS 6.22.

- Copy the content of the *.zip file to this diskette.
- To upgrade the aPCI firmware, aPCI firmware files (FPGA files) for aPCI modules must be copied to this disk. If aPCI modules are already connected and BIOS V1.04 is installed, the file name can be determined automatically by XFLASH.EXE. Otherwise, the filename is queried by XFLASH.EXE or a default file name is used: "apci1.rom" for aPCI slot 1, "apci2.rom" for aPCI slot 2 -> the aPCI firmware file must be renamed beforehand!

Information:

The appropriate aPCI firmware files are available from B&R.

- Insert the diskette into the USB drive and reboot the Power Panel device. See section "Motherboard device configuration - drive configuration" on page 194 for Power Panel devices for the necessary settings for the Power Panel device when booting from a diskette.
- After booting from the diskette, the following start menu opens up:

```
Microsoft Windows Startup Menu
==================================

1. Update FPGA firmware automatically
2. Update FPGA firmware of aPCI slot 1
3. Update FPGA firmware of aPCI slot 2
4. Save FPGA firmware of both aPCI slots
5. Exit

Enter a choice:_
```

Figure 156: aPCI firmware upgrade start menu

Item	Menu item	Description
1	Update FPGA firmware automatically	The firmware for both aPCI slots is automatically updated (default after 5 seconds). **Information:** **According to the inserted modules, the aPCI FPGA firmware files are searched for automatically.**
2	Update FPGA firmware of aPCI slot 1	Only firmware from aPCI slot 1 is updated. **Information:** **If no aPCI module is present, the aPCI FPGA firmware file must be renamed "apci1.pci" (for aPCI slot 1) before updating.**
3	Update FPGA firmware of aPCI slot 2	Only firmware from aPCI slot 2 is updated. **Information:** **If no aPCI module is present, the aPCI FPGA firmware file must be renamed "apci2.pci" (for aPCI slot 2) before updating.**
4	Save FPGA firmware of both aPCI slots	Firmware for both aPCI slots are automatically saved. **Information:** **There must be up to 640 KB free space on the disk.**
5	Exit	Returns to the shell (MS-DOS).

Table 94: aPCI firmware upgrade menu description

Information:

If you do not press a button within 5 seconds, then step 1 "Update FPGA firmware automatically" is automatically carried out and the Power Panel is automatically updated.

- The system must be rebooted after a successful upgrade.

1.5.3 User boot logo upgrade disk

A software tool for updating, backing up, or deleting the user boot logo can be downloaded directly from the service portal of the B&R homepage (www.br-automation.com).

Procedure

The following steps should be taken to update, save or delete a user boot:

- First, a blank HD disk must be made bootable (command line "sys a:" or "format a: /s")

Information:

For the upgrade, a boot disk must be created (or a bootable CompactFlash card) with Windows ME, Windows XP or MS-DOS 6.22.

- Copy the content of the *.zip file to this diskette.
- Creates the user boot logo according to section "Guidelines for creating a user boot logo" on page 237 and copies to the disk.
- Insert the diskette in the USB drive and reboot the Power Panel device. See section "Motherboard device configuration - drive configuration" on page 194 for the necessary settings for the Power Panel device when booting from a diskette.
- After booting from the diskette, the following start menu opens up:

```
Microsoft Windows Startup Menu
==================================

1. Update BIOS User Boot Logo
2. Update BIOS Default Boot Logo
3. Save BIOS Boot Logo
4. Delete BIOS Boot Logo
5. Exit

Enter a choice:_
```

Figure 157: User boot logo upgrade start menu

Item	Menu item	Description
1	Update BIOS user boot logo	The user boot logo is automatically updated with the file USERLOGO.ROM (default after 5 seconds).
2	Update BIOS default boot logo	The BIOS default boot logo for the device is automatically updated with the correct resolution.
3	Save BIOS boot logo	The user boot logo is automatically saved in the file BOOTLOGO.SAV. **Information:** **There must be up to 192 KB free space on the disk.**
4	Delete BIOS boot logo	An existing user boot logo is deleted in the flash.
5	Exit	Returns to the shell (MS-DOS).

Table 95: User boot logo upgrade menu description

Information:

If you do not press a button within 5 seconds, then step 1 "Update BIOS user boot logo" is automatically carried out and the Power Panel is automatically updated.

- The system must be rebooted after a successful upgrade.
- In the BIOS CMOS setup, the display of the boot logo must be set from "No" to "Yes" (see section 1.3.9 "Miscellaneous configuration" on page 205).

Guidelines for creating a user boot logo

To update the user boot logo, a bitmap must be created according to the following guidelines and then copied to the user boot logo upgrade disk:

1) A Windows bitmap with a maximum of 256 colors must be created with the appropriate resolution for the Power Panel: 320x240 (QVGA), 640x480 (VGA), 800x600 (SVGA) or 1024x768 (XGA). The bitmap is not allowed to be compressed.

2) Since status messages are output on the top of the display when booting the Power Panel, there should not be any user boot logo pixels positioned here in the bitmap (approximately 10 pixel stripes), as these will be cross-faded. These status messages use bitmap palette index 0 as the background color and index 7 as the foreground color (starting from BIOS V1.05; index 63 with older versions).

3) Using the utility USERLOGO.EXE, the bitmap file must then be converted into a ROM file that can be read by BIOS (please refer to the online help for the utility for more instructions about this).

4) The userlogo.rom file created by the utility is only permitted to have a maximum size of 192 KB. If this size is exceeded, a warning appears. The user can e.g. reduce the details in the Windows bitmap in order not to exceed the maximum byte size.

5) After this, the userlogo.rom file should be copied to the disk.

1.6 CMOS backup

To protect CMOS data, a CMOS backup has been integrated into BIOS. If the BIOS setup was ended using "Save Values and Exit“ (see section 1.3.14 "Save values and exit" on page 211) and the Power Panel device was successfully restarted, then the CMOS data is burned in the flash memory. If the CMOS checksum is incorrect during startup (battery empty) or the Power Panel device cannot be booted correctly three times consecutively, then the salvaged data from flash memory is copied again to CMOS. Setup is back to its original state, except for the time.

1.7 Distribution of resources

1.7.1 RAM address assignment

RAM address	Resource
00000000 - 000003FF	Interrupt vectors
00000400 - 000004FF	BIOS data area
00000500 - 0009FBFF	Freely available for the operating system (MS-DOS program area)
0009FC00 - 0009FFFF	Advanced BIOS data area
000A0000 - 000BFFFF	VGA memory
000C0000 - 000C7FFF	VGA BIOS
000C8000 - 000CBFFF	Reserved
000CC000 - 000EFFFF	XpressROM expansion ROMS. Unused areas can be used for HMA.
000F0000 - 000FFFFF	XpressROM BIOS
00100000 - BC_RAM_TOP	Remaining DRAM and VGA memory
D0000000 - FBFFFFFF	PCI memory and PCI ROM (are dynamically assigned during POST)
FFE00000 - FFFFFFFF	High BIOS area (flash memory)

Table 96: RAM address assignment

1.7.2 DMA channel assignment

DMA channel	Resource
0	Free
1	Free
2	Free
3	Free
4	Free
5	Free
6	Free
7	Free

Table 97: DMA channel assignment

1.7.3 I/O address assignment

I/O address	Resource
0000 - 000F	DMA controller channels 0-3
0020 - 0021	Master programmable interrupt controller
0022 - 0023	CPU configuration registers
0040 - 0043	Programmable interval timer
0060 - 0066	Keyboard controller (emulated by Legacy USB)
0070 - 0071	RTC (real-time clock)
0072 - 0073	Extended RTC (real-time clock)
0080	BIOS POST debug output port
0081 - 0083	DMA channel low page registers
0084	VSA debug output port
0085 - 008F	DMA channel low page registers
0092	Port A control register
00A0 - 00A1	Slave programmable interrupt controller
00C0 - 00CF	DMA controller channels 4-7
00D0 - 00DF	DMA status/control/mode registers channel 0-7
00F0 - 00F1	Co-processor error register
015C - 015D	On-chip SIO configuration
0170 - 0177	Primary IDE
01F0 - 01F7	Primary IDE
0220 - 02E8	Audio (not supported)
02EF - 02FF	COM2
0376 - 0377	Secondary IDE channel
03B0 - 03BB	Video controller
03C0 - 03DF	Video controller
03E8 - 03EF	COM3
03F0 - 03F5	Floppy controller (emulated by Legacy USB)
03F6 - 03F7	Primary IDE
03F8 - 03FF	COM1
0480 - 048F	DMA channel high page registers
04D0 - 04D1	Interrupt edge/level registers
0CF8 - 0CFF	PCI configuration registers

Table 98: I/O address assignment

In addition, the I/O addresses that were selected for additional functions (COM, etc.) are assigned.

1.7.4 Interrupt assignment

Interrupt	Resource
IRQ 0	System timer
IRQ 1	Keyboard (Legacy USB emulation)
IRQ 2	2nd PIC IRQ cascade
IRQ 3	COM2 [1)]
IRQ 4	COM1 [1)]
IRQ 5	PCI configuration space
IRQ 6	Disk drive
IRQ 7	PCI configuration space
IRQ 8	RTC (real-time clock)
IRQ 9	PCI configuration space
IRQ 10	PCI configuration space
IRQ 11	COM3 [1)]
IRQ 12	PS/2 mouse (Legacy USB emulation)
IRQ 13	FPU (co-processor)
IRQ 14	Primary IDE (primary hard disk)
IRQ 15	PCI configuration space

Table 99: Interrupt assignment

1) BIOS setup default setting

2. Power Panel 400 with Automation Runtime

2.1 General information

B&R Automation Runtime guarantees a uniform runtime environment for Automation Studio programs on all target systems. This assures uniform programming and operation on all devices.

Automation Runtime possesses a multitasking operating system adapted especially for use with control technology. The cycle time for your application can be separated among several task classes. Automation Runtime ensures that all application programs are executed within defined time periods, proving itself to be a configurable, deterministic real-time multitasking system.

An extensive project can be divided into small individual tasks. This way of working increases modularity and makes it much easier to maintain projects.

2.1.1 Summary screen

When switching on a Power Panel 400 device, a summary screen appears after the message "Booting, please wait..."; it displays the most important parameters of an Automation Runtime Power Panel device:

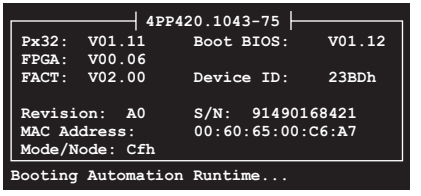


Figure 158: Automation Runtime summary screen - ex. 4PP420.1043-75

Information	Example value	Meaning
Version	03	Displays the factory settings version. These factory settings determine the device ID, display ID, display-specific initialization sequences, and other important parameters. **Information:** **Factory settings are set by B&R and cannot be changed by the user!**
Device ID	1697	Displays the hexadecimal value of the hardware device number.
Compatibility ID	00	Displays the hardware device revision.
Brightness (min / typ / max)	D5 EA FF	Indicates the minimum, typical and maximum value as a hex value for the brightness settings of the display.
Contrast (min / typ / max)	00 46 FF	Indicates the minimum, typical and maximum value as a hex value for the contrast settings of the display.
Mode/Node	00	Displays the current operating mode switch positions.
MAC address	00:60:65:00:C6:A7	Displays the assigned media access control (MAC) address.

Table 100: Automation Runtime summary screen

Information	Example value	Meaning
Boot loader	2.07	Displays the version of the boot loader.
HW layer	1.2.0	Displays the version of the hardware layer.
Onboard AR	V2.66	Displays the current onboard Automation Runtime version.
SMC version	AD	Displays the current SMC (system management controller) software version.

Table 100: Automation Runtime summary screen

2.2 Control and visualization with the Power Panel 300 device

The visualization project runs on the Power Panel 300. Serial RS232 or Ethernet TCP/IP provides the communication to the controller system. Flexible programming with frame drivers or Ethernet socket services allows a connection to be made to any control system. I/O peripherals and drives are connected to the controller.

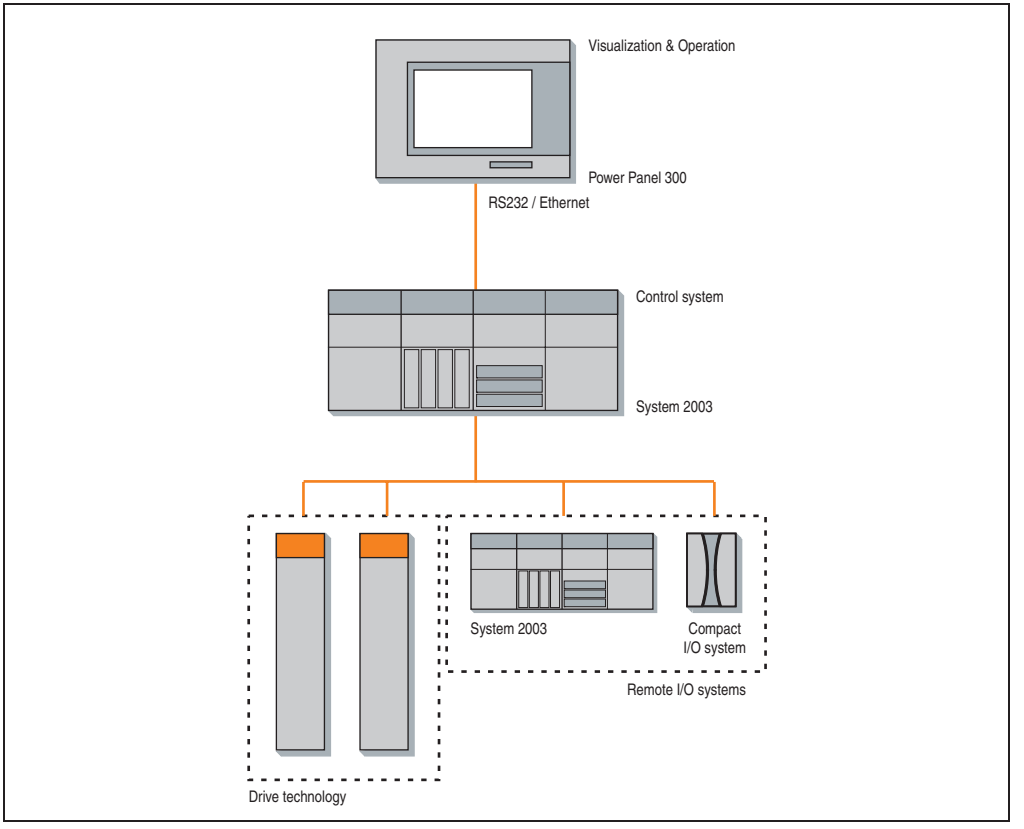


Figure 159: Power Panel 400 as an intelligent visualization system

2.3 Power Panel 400 with Power Panel 300 terminals

Control program and visualization run on the Power Panel 400. I/O peripherals and drives are connected via CAN, X2X and Ethernet POWERLINK. Other Power Panel 300 units are connected as terminals via Ethernet TCP/IP. The central data storage occurs on the Power Panel 400.

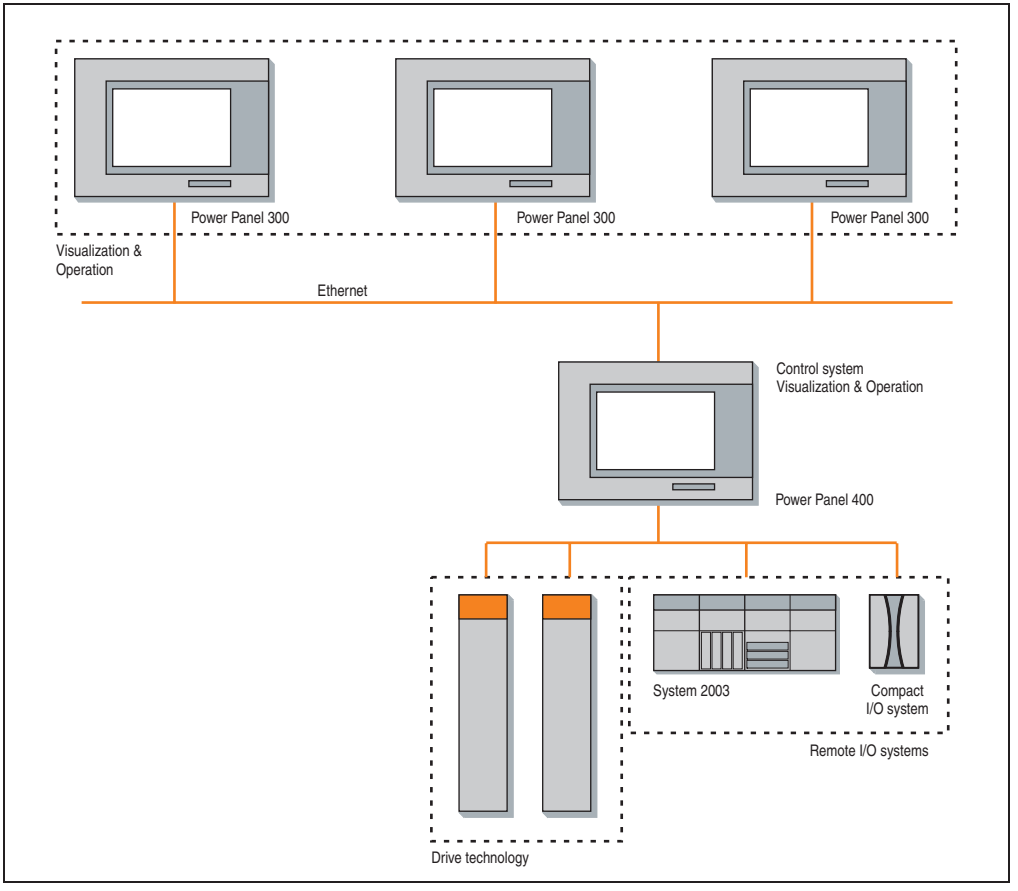


Figure 160: Power Panel 400 with Power Panel 300 terminals

3. Power Panel 300 with Windows CE

Figure 161: Windows CE logo

3.1 General information

Windows CE is an operating system that is optimally tailored to the hardware used. This means that only the functions and modules required by the respective device are included. This makes this operating system extremely robust and stable.

Advantages

- Windows CE is a 32-bit operating system with multitasking and multithreading capabilities.
- In addition to being compact, it even offers high performance for configurations with limited RAM.
- Windows CE is best suited for integrated automation used in industrial systems.
- Windows CE is also less expensive than other Windows licenses.

The Windows CE available from B&R (see section "Software" on page 24 for model number) was developed for Power Panel BIOS devices, and is only available with a Power Panel BIOS device.

3.2 Requirements

The Power Panel must meet the following criteria to be able run the Windows CE operating system.

- Power Panel device with BIOS (see the overview "Power Panel 300 with BIOS" on page 187)
- BIOS version >= 1.00
- At least 128 MB RAM

3.3 Installation procedures

Windows CE is usually preinstalled at B&R Austria. After switching on the device, only the touch screen needs to be calibrated.

More detailed instructions for manual installation can be found in the Windows CE help file. This help file is found on the HMI Drivers & Utilities DVD (model number 5SWHMI.0000-00) or downloaded directly from the download area of the B&R homepage (www.br-automation.com).

4. Power Panel 300 with Windows XP Embedded

Figure 162: Windows XP Embedded Logo

4.1 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.

The Windows XP Embedded version available from B&R (see section "Software" on page 24 for model number) was developed for Power Panel BIOS devices, and is only available with a Power Panel BIOS device.

4.2 Requirements

The Power Panel must meet the following criteria to be able run the Windows XP Embedded operating system.

- Power Panel device with BIOS (see the overview "Power Panel 300 with BIOS" on page 187)
- BIOS version >= 1.04
- At least 128 MB RAM

4.3 Installation procedures

Windows XP Embedded is usually preinstalled at B&R Austria on a suitable CompactFlash card (256 MB). The Power Panel device is 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.

A short guide to creating individual Windows XP Embedded Images as well as a suitable target designer export file for Power Panel BIOS devices can be found on the HMI Drivers & Utilities DVD (model number 5SWHMI.0000-00) or downloaded directly from B&R's homepage (www.br-automation.com).

5. VESA mode support

The following VESA standards (see **www.vesa.org**) are supported.

VESA mode	Resolution
101h	640 x 480 x 8
103h	800 x 600 x 8
105h	1024 x 768 x 8
107h	1280 x 1024 x 8
110h	640 x 480 x 15
111h	640 x 480 x 16
112h	640 x 480 x 24
113h	800 x 600 x 15
114h	800 x 600 x 16
115h	800 x 600 x 24
116h	1024 x 768 x 15
117h	1024 x 768 x 16
118h	1024 x 768 x 24
119h	1280 x 1024 x 15
11Ah	1280 x 1024 x 16
11Bh	1280 x 1024 x 24
121h	320 x 240 x 8
122h	320 x 240 x 15
123h	320 x 240 x 16
124h	320 x 240 x 24
125h	1152 x 864 x 8
126h	1152 x 864 x 15
127h	1152 x 864 x 16
128h	1152 x 864 x 24
131h	1600 x 1200 x 8
132h	1600 x 1200 x 15
133h	1600 x 1200 x 16
134h	1600 x 1200 x 24
135h	1920 x 1440 x 8
136h	1920 x 1440 x 15
137h	1920 x 1440 x 16
138h	1920 x 1440 x 24

Table 101: Setting options - VESA mode

Chapter 5 • Standards and certifications

1. Applicable European guidelines

- EMC guidelines 89/336/EWG
- Low-voltage guidelines 73/23/EWG
- Machine guidelines 98/37/EG

2. Overview of standards

Standard	Description
EN 50081-1	Electromagnetic compatibility (EMC), generic emission standard - part 1: Residential, commercial, and light industrial environments (EN 50081-1 has been replaced by EN 61000-6-3)
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 50082-1	Electromagnetic compatibility (EMC), generic immunity standard - part 1: Residential, commercial, and light industrial environments (EN 50082-1 has been replaced by EN 61000-6-1)
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 50091-2	Uninterruptible power systems (UPS) - part 2: EMC requirements
EN 55011 Class A, B	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 55014-1	Electromagnetic compatibility (EMC), requirements for household appliances, electric tools, and similar apparatus - part 1: Emissions
EN 55014-2	Electromagnetic compatibility (EMC), requirements for household appliances, electric tools, and similar apparatus - part 2: Immunity; product family standard
EN 55022 Class A, B	Electromagnetic compatibility (EMC), radio disturbance characteristics, information technology equipment (ITE devices), limits and methods of measurement
EN 55024 Class A or B	Electromagnetic compatibility (EMC), immunity characteristics, information technology equipment (ITE devices), limits and methods of measurement
EN 60060-2	High-voltage test techniques - part 2: Measuring systems
EN 60068-2-1	Environmental testing - part 2: Tests; test A: 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)

Table 102: Overview of standards

Standard	Description
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
EN 60721-1	Classification of environmental conditions - part 1: Environmental parameters and their severities
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 60950	Information technology equipment - safety
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 ≤ 75 A and subject to conditional connection
EN 61000-3-2 Class A, B, C, D	Electromagnetic compatibility (EMC) - part 3-2: Limits for harmonic current emissions (equipment input current ≤ 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, for equipment with rated current ≤ 16 A per phase and not subject to conditional connection
EN 61000-4-2	Electromagnetic compatibility (EMC) - part 4-2: Testing and measuring techniques; electrostatic discharge immunity test
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 61000-4-17	Electromagnetic compatibility (EMC) - part 4-12: Testing and measuring techniques; ripple on DC input power port immunity test
EN 61000-4-29	Electromagnetic compatibility (EMC) - part 4-29: Testing and measuring techniques; voltage dips, short interruptions and voltage variations on DC input power port immunity tests

Table 102: Overview of standards (cont.)

Standard	Description
EN 61000-6-1 (EN 50082-1)	Electromagnetic compatibility (EMC), generic immunity standard - part 1: residential, commercial, and light industrial environments (EN 50082-1 has been replaced by EN 61000-6-1)
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 61000-6-3 (EN 50081-1)	Electromagnetic compatibility (EMC), generic emission standard - part 1: residential, commercial, and light industrial environments (EN 50081-1 has been replaced by EN 61000-6-3)
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
EN 61508-1	Functional safety of electrical/electronic/programmable electronic safety-related systems - part 1: General requirements
EN 61508-2	Functional safety of electrical/electronic/programmable electronic safety-related systems - part 2: Requirements for electrical/electronic/programmable electronic safety-related systems
NEMA 250 Type 4X	UL protection against sprayed water
UL 508	Industrial control equipment (UL = Underwriters Laboratories)
VDE 0701-1	Service, modification, and testing of electrical devices - part 1: General requirements
VDE 0801	Principles for computers in systems with safety tasks
47 CFR	Federal Communications Commission (FCC), 47 CFR Part 15 Subpart B Class A

Table 102: Overview of standards (cont.)

3. Emission requirements

Emission	Test carried out according to	Limits according to
Network-related emissions	EN 55011 / EN 55022	EN 61000-6-3: Generic standard (residential areas)
		EN 55011: Industrial, scientific, and medical (ISM) radio-frequency equipment, class B (residential areas)
		EN 55022: Information technology equipment (ITE devices), class B (residential areas)
		EN 50091-2: Uninterruptible power systems (UPS), class B
		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)

Table 103: Overview of limits and testing guidelines for emissions

Emission	Test carried out according to	Limits according to
Emissions, electromagnetic emissions	EN 55011 / EN 55022	EN 61000-6-3: Generic standard (residential areas)
		EN 55011: Industrial, scientific, and medical (ISM) radio-frequency equipment, class B (residential areas)
		EN 55022: Information technology equipment (ITE devices), class B (residential areas)
		EN 50091-2: Uninterruptible power systems (UPS), class B
		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 ≤ 16 A per line	EN 61000-3-2	EN 61000-3-2: Limits for harmonic current emissions (equipment input current ≤ 16 A per phase)
Voltage changes, voltage fluctuations and flicker in public low-voltage supply systems, for equipment with rated current less than or equal to ≤ 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 ≤ 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, for equipment with rated current ≤ 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 ≤ 75 A per phase and subject to conditional connection, class A/D

Table 103: Overview of limits and testing guidelines for emissions (cont.)

3.1 Network-related emissions

Test carried out according to EN 55011 / EN 55022	Limits according to EN 61000-6-3	Limits according to EN 55011 class B	Limits according to EN 55022 class B
Power mains connections [1)] 150 kHz - 500 kHz	66 - 56 dB (µV) quasi-peak value 56 - 46 dB (µV) average	66 - 56 dB (µV) quasi-peak value 56 - 46 dB (µV) average	66 - 56 dB (µV) quasi-peak value 56 - 46 dB (µV) average
Power mains connections 500 kHz - 5 MHz	56 dB (µV) quasi-peak value 46 dB (µV) average	56 dB (µV) quasi-peak value 46 dB (µV) average	56 dB (µV) quasi-peak value 46 dB (µV) average
Power mains connections 5 MHz - 30 MHz	60 dB (µV) quasi-peak value 50 dB (µV) average	60 dB (µV) quasi-peak value 50 dB (µV) average	60 dB (µV) quasi-peak value 50 dB (µV) average

Table 104: Test requirements - network-related emissions for residential areas

Other connections [2] 150 kHz - 500 kHz	40 - 30 dB (µA) quasi-peak value 30 - 20 dB (µA) average	-	84 - 74 dB (µV) and 40 - 30 dB (µA) quasi-peak value 74 - 64 dB (µV) and 30 - 20 (µA) average
Other connections 500 kHz - 30 MHz	74 dB (µV) and 30 dB (µA) quasi-peak value 64 dB (µV) and 20 dB (µA) average	-	74 dB (µV) and 30 dB (µA) quasi-peak value 64 dB (µV) and 20 dB (µA) average
Test carried out according to EN 55011 / EN 55022	**Limits according to EN 50091-2 class B [3]**		
Power mains connections 150 kHz - 500 kHz	66 - 56 dB (µV) quasi-peak value 56 - 46 dB (µV) average		
Power mains connections 500 kHz - 5 MHz	56 dB (µV) quasi-peak value 46 dB (µV) average		
Power mains connections 5 MHz - 30 MHz	60 dB (µV) quasi-peak value 50 dB (µV) average		
Other connections 150 kHz - 500 kHz	-		
Other connections 500 kHz - 30 MHz	-		

Table 104: Test requirements - network-related emissions for residential areas (cont.)

1) AC network connections only with EN 61000-6-3

2) DC voltage inputs and outputs as well for EN 61000-6-3.

3) UPS for unrestricted sales

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	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	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

Table 105: Test requirements - network-related emissions for industrial areas

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 61131-2**	**Limits according to EN 50091-2 class A**	**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	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	73 dB (µV) quasi-peak value 60 dB (µV) average
Other connections 150 kHz - 500 kHz	-	-	
Other connections 500 kHz - 30 MHz	-	-	

Table 105: Test requirements - network-related emissions for industrial areas (cont.)

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 61000-6-3**	**Limits according to EN 55011 class B**	**Limits according to EN 55022 class B**
30 MHz - 230 MHz measured at a distance of 10 m	< 30 dB (µV/m) quasi-peak value	< 30 dB (µV/m) quasi-peak value	< 30 dB (µV/m) quasi-peak value
230 MHz - 1 GHz measured at a distance of 10 m	< 37 dB (µV/m) quasi-peak value	< 37 dB (µV/m) quasi-peak value	< 37 dB (µV/m) quasi-peak value
Test carried out according to EN 55011 / EN 55022	**Limits according to EN 50091-2 class B**		
30 MHz - 230 MHz measured at a distance of 10 m	< 30 dB (µV/m) quasi-peak value		
230 MHz - 1 GHz measured at a distance of 10 m	< 37 dB (µV/m) quasi-peak value		

Table 106: Test requirements - electromagnetic emissions for residential areas

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

Table 107: Test requirements - electromagnetic emissions for industrial areas

Test carried out according to EN 55011 / EN 55022	Limits according to EN 61131-2		
30 MHz - 230 MHz measured at a distance of 10 m	< 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		
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 107: Test requirements - electromagnetic emissions for industrial areas (cont.)

3.3 Harmonic currents for devices ≤ 16 A

Test carried out according to EN 61000-3-2	Limits according to EN 61000-3-2				
Largest permissible value of harmonic current according to the order (n)	Only odd harmonics				
	n	**mA/W**	**A**		
	3	3.4	2.30		
	5	1.9	1.14		
	7	1.0	0.77		
	9	0.5	0.40		
	11	0.35	0.33		
	13 ≤ n ≤ 39	3.85/n	0.15 x 15/n		

Table 108: Test requirements - harmonic currents for devices with an input current ≤ 16 A

3.4 Voltage fluctuations and flickering ≤ 16 A

Test carried out according to EN 61000-3-3	Limits according to EN 61000-3-3		
	$P_{st} \leq 1.0$ $P_{lt} \leq 0.65$ d(t): 3.3% for max. 500 ms $d_c \leq 3.3\%$ $d_{max} \leq 4\%$		

Table 109: Test requirements - voltage fluctuations and flickering in low-voltage systems ≤ 16 A

3.5 Voltage fluctuations and flickering ≤ 75 A

Test carried out according to EN 61000-3-11	Limits according to EN 61000-3-11		
	TBD		

Table 110: Test requirement - voltage fluctuations and flickering in low-voltage systems ≤ 75 A

4. Requirements for immunity to disturbances

Immunity	Test carried out according to	Limits according to
Electrostatic discharge (ESD)	EN 61000-4-2	EN 61000-6-1: Generic standard (residential areas)
		EN 61000-6-2: Generic standard (industrial areas)
		EN 61131-2: Programmable logic controllers
		EN 55024: Information technology equipment (ITE devices)
Immunity against high-frequency electromagnetic fields (HF field)	EN 61000-4-3	EN 61000-6-1: Generic standard (residential areas)
		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 61000-6-1: Generic standard (residential areas)
		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 61000-6-1: Generic standard (residential areas)
		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 61000-6-1: Generic standard (residential areas)
		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 61000-6-1: Generic standard (residential areas)
		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 61000-6-2: Generic standard (industrial areas)
		EN 61131-2: Programmable logic controllers
		EN 55024: Information technology equipment (ITE devices)

Table 111: 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:
Impairment 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 112: 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 113: Test requirements - high-frequency electromagnetic fields (HF field)

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 114: 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 115: 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

Table 116: Test requirements - 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
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	0.15 - 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	0.15 - 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 116: Test requirements - conducted disturbances (cont.)

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 117: Test requirements - magnetic fields with electrical frequencies

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 118: Test requirements - voltage dips, fluctuations, and short-term interruptions

4.8 Damped vibration

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 119: 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
		B&R
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
		B&R
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
		B&R

Table 120: Overview of limits and testing guidelines for vibration

5.1 Vibration 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 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 121: Test requirements - vibration operation

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
	Limit values according to B&R					
	10 sweeps per axis, not packaged					
	2 - 8 Hz	Amplitude 7.5 mm				
	8 - 200 Hz	Acceleration 2 g				
	200 - 500 Hz	Acceleration 4 g				

Table 122: Testing 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 operation: Pulse (half-sine) stress in all 3 axes (x, y, z)	Acceleration 15 g, length 11 ms, 18 shocks	Acceleration 15 g, length 11 ms	

Table 123: Test requirements - shock operation

5.4 Shock during 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
	Limits according to B&R		
	Acceleration 30 g, Length 11 ms, each 3 shocks, not packaged		

Table 124: Test requirements - shock 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		Devices: Toppling/knocking over on each edge		Devices: Toppling/knocking over on each edge	
	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 125: 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						
	Limits according to B&R							
	Devices packaged							
	Weight	**Height**						
	<40 kg	1 m						

Table 126: Test requirements - toppling

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
Sprayed water (from front)	NEMA 250 Type 4X	UL 50 - NEMA 250 4X: Degree of protection provided by housing

Table 127: Overview of limits and testing guidelines for temperature and humidity

6.1 Worst case operation

Test carried out according to UL 508	Limits according to UL 508	Limits according to EN 61131-2	
Worst case 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 128: Test requirements - worst case 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 129: 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 130: 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 131: 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 132: Test requirements - temperature fluctuations in operation

6.6 Humid heat, cyclic

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 133: 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 134: Test requirements - humid heat, constant (storage)

6.8 Sprayed water (front side)

Test carried out according to UL 50	Limits according to NEMA 250 Type 4X		
Sprayed water (front side)	Spraying using a 25.4 mm (diameter) water jet nozzle Distance: 3 to 3.7 meters (all angles) Water flow: 246 liters/minute Duration: 48 seconds, 5 seconds minimum		

Table 135: Test requirement - sprayed water (front side)

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
		B&R
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 136: 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 137: 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 138: 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)	Input voltage	Test voltage			Input voltage	Test voltage	
		1.2/50 µs voltage surge peak	AC, 1 min	DC, 1 min		AC, 1 min	DC, 1 min
	0 - 50 VAC 0 - 60 VDC	850 V	510 V	720 V	≤ 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 139: 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 140: Test requirements - residual voltage

7.5 Leakage current

Test carried out	Limits according to VDE 0701-1	B&R	
Leakage current: Phase to ground	< 3.5 mA	< 1 mA	

Table 141: 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 142: 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 143: 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 144: Test requirements - voltage range

8. Other tests

Other tests	Test carried out according to	Limits according to
Function test	-	-
Optical test	-	-
Hot spot measurement	-	-
Impact resistance	-	-
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
Mounting dimensions	-	B&R

Table 145: Overview of limits and testing guidelines for other tests

8.1 Impact resistance

Test carried out according to	Limits according to		
	TBD		

Table 146: Test requirement - impact resistance

8.2 Protection type

Test carried out according to	Limits according to EN 60529	Limits according to EN 60529	
Protection of the operating equipment	IP2. Protection against large solid foreign bodies =12.5 mm diameter	IP.6 Protection against large solid foreign bodies: dust-proof	
Protection of personnel	IP2. Protection against touching dangerous parts with finger	IP.6 Protection against touching dangerous parts with conductor	
Protection against water permeation with damaging consequences	IP.0 Not protected	IP.5 Protected against sprayed water	

Table 147: Test requirements - protection

8.3 Degree of pollution

Test carried out according to	Limits according to EN 60664-1		
Definition	Degree of pollution II		

Table 148: Test requirements - degree of pollution

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 149: International certifications

Chapter 6 • Accessories

1. Overview

Model number	Product ID	Note
0AC201.9	**Lithium batteries, 5 pcs.** 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	
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	
5AC900.057X-00	**Legend strips 3x 5.7" vertical1** Legend strip template for Power Panel 4PP451.0571-65. For three devices.	
5AC900.057X-01	**Legend strips 2x 5.7" horizontal2** Legend strip template for Power Panel 4PP452.0571-65. For 2 devices.	
5AC900.104X-00	**Legend strip 1x 10.4" vertical1** Legend strip template for Power Panel 4PP451.1043-75 and 4PP481.1043-B5. For 1 device.	
5AC900.104X-01	**Legend strip 1x 10.4" horizontal2** Legend strip template for Power Panel 4PP482.1043-75. For 1 device.	
5AC900.104X-02	**Legend strips 3x 10.4" horizontal1** Legend strip template for Power Panel 4PP480.1043-75. For 3 devices.	
5AC900.150X-00	**Legend strips 4x 15"** Legend strip template for Power Panel 4PP481.1505-75 and 4PP480.1505-75. For 4 devices.	
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 150: Model numbers - accessories

Model number	Product ID	Note
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	
5MMUSB.0128-00	**USB flash drive 128 MB SanDisk** USB 2.0 flash drive 128 MB	*Cancelled since 03/2007*
5MMUSB.0256-00	**USB flash drive 256 MB SanDisk** USB 2.0 flash drive 256 MB	*Cancelled since 03/2007*
5MMUSB.0512-00	**USB flash drive 512 MB SanDisk** USB 2.0 flash drive 512 MB	
5MMUSB.1024-00	**USB flash drive 1 GB SanDisk** USB 2.0 flash drive 1 GB	*Cancelled since 03/2007*
5MMUSB.2048-00	**USB flash drive 2 GB SanDisk** USB 2.0 flash drive 2 GB	
9A0017.01	**RS232 DB9 null modem cable 0.6 m** Null modem cable RS232 0.6 m to connect UPS and IPC (9-pin DSUB socket - 9-pin DSUB socket)	
9A0017.02	**RS232 DB9 null modem cable 1.8 m** Null modem cable RS232 1.8 m to connect UPS and IPC (9-pin DSUB socket - 9-pin DSUB socket)	

Table 150: Model numbers - accessories

2. Replacement CMOS batteries

The lithium battery is needed for buffering the BIOS CMOS data, the real-time clock, and SRAM data.

2.1 Order data

Model number	Description	Image
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 151: Order data - lithium batteries

2.2 Technical data

Information:

The following characteristics, features and limit values only apply to this accessory and can deviate from those for the entire device. For the entire device where this accessory is installed, refer to the data provided specifically for the entire device.

The technical data is current as of when this manual was printed. We reserve the right to make changes.

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 152: Technical data - lithium batteries

2.3 Contents of delivery

Number	Component
1 or 5	Lithium batteries

Table 153: Contents of delivery for lithium batteries

3. TB103 3-pin supply voltage connector

3.1 General information

This single row 3-pin terminal block is mainly used to connect the supply voltage.

3.2 Order data

Model number	Description	Image
0TB103.9	Plug for the 24 V supply voltage (screw clamps)	 0TB103.9  0TB103.91
0TB103.91	Plug for the 24 V supply voltage (cage clamps)	

Table 154: Order data - TB103 supply plug

3.3 Technical data

Information:

The following characteristics, features and limit values only apply to this accessory and can deviate from those for the entire device. For the entire device where this accessory is installed, refer to the data provided specifically for the entire device.

The technical data is current as of when this manual was printed. We reserve the right to make changes.

Name	0TB103.9	0TB103.91
Number of pins	3	

Table 155: Technical data - TB103 supply plug

Name	0TB103.9	0TB103.91
Type of terminal	Screw clamps	Cage clamps
Distance between contacts	5.08 mm	
Resistance between contacts	≤ 5 mΩ	
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 155: Technical data - TB103 supply plug (cont.)

3.4 Contents of delivery

Number	Component
1	Supply plug in desired design.

Table 156: Contents of delivery - TB103 supply plug

4. Legend strip templates

Power Panel devices with keys are delivered with partially pre-labeled key legend strips (F1, F2, etc.). The key legend strip slots are accessible on the back of the Power Panel device (above and below).

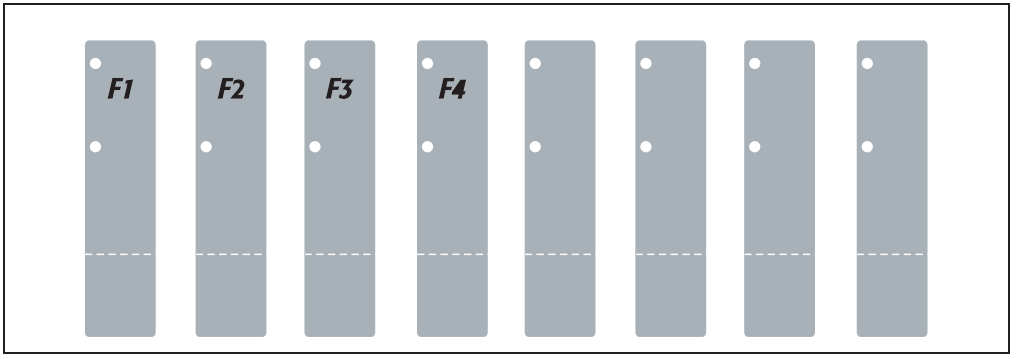


Figure 163: Legend strip templates

Printable legend strips (A4 format) can be ordered from B&R (see table 157 "Order data - legend strip template" on page 281). They can be printed using a standard laser printer (b/w or color) in a temperature range from -40°C to +125°C. A print template (available for Corel Draw version 7, 9 and 10) for the respective legend strip template can be downloaded from the B&R homepage **www.br-automation.com**.

4.1 Order data

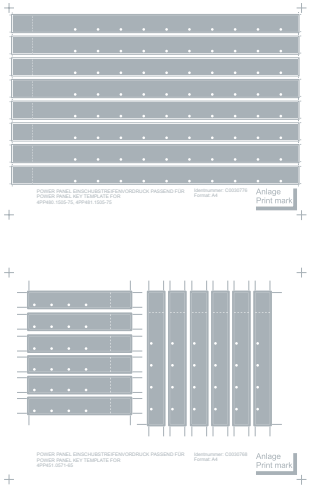
Model number	Description	Image
5AC900.057X-00	**Legend strips 3x 5.7" vertical1** Legend strip template for Power Panel 4PP451.0571-65. For three devices.	Examples of legend strip templates 
5AC900.057X-01	**Legend strips 2x 5.7" horizontal2** Legend strip template for Power Panel 4PP452.0571-65. For 2 devices.	
5AC900.104X-00	**Legend strip 1x 10.4" vertical1** Legend strip template for Power Panel 4PP451.1043-75 and 4PP481.1043-B5. For 1 device.	
5AC900.104X-01	**Legend strip 1x 10.4" horizontal2** Legend strip template for Power Panel 4PP482.1043-75. For 1 device.	
5AC900.104X-02	**Legend strips 3x 10.4" horizontal1** Legend strip template for Power Panel 4PP480.1043-75. For 3 devices.	
5AC900.150X-00	**Legend strips 4x 15"** Legend strip template for Power Panel 4PP481.1505-75 and 4PP480.1505-75. For 4 devices.	

Table 157: Order data - legend strip template

5. CompactFlash cards 5CFCRD.xxxx-03

5.1 General information

CompactFlash cards are easy-to-exchange memory media. Due to their robustness against environmental influences (e.g. temperature, shock, vibration, etc.), CompactFlash cards are ideal for use as memory media in industrial environments.

5.2 Order data

Model number	Description	Image
5CFCRD.0064-03	CompactFlash 64 MB SSI	 Example: 256 MB CompactFlash card
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 8192 MB SSI	

Table 158: Order data - CompactFlash cards

5.3 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.

The technical data is current as of when this manual was printed. We reserve the right to make changes.

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 159: Technical data - 5CFCRD.xxxx-03 CompactFlash cards

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	 Maximum 16.3 g (point to point) Maximum 30 g (point to point)
Shock Operation Storage / Transport	 Maximum 1000 g Maximum 3000 g
Altitude	Maximum 80000 feet (24,383 meters)

Table 159: Technical data - 5CFCRD.xxxx-03 CompactFlash cards (cont.)

5.3.1 Temperature humidity diagram - operation and storage

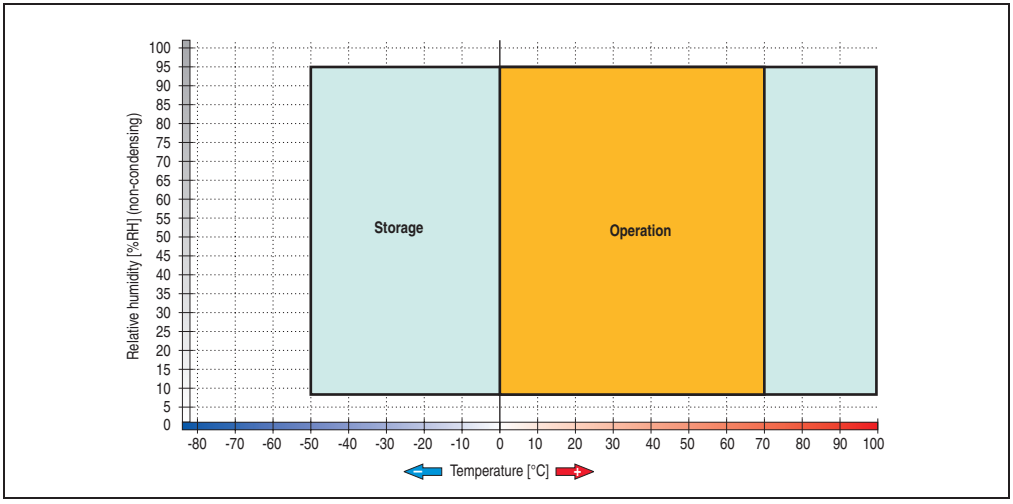


Figure 164: Temperature humidity diagram - CompactFlash cards 5CFCRD.xxxx-03

5.4 Contents of delivery

Number	Component
1	CompactFlash card in desired size

Table 160: Contents of delivery - CompactFlash cards 5CFCRD.xxxx-03

5.5 Dimensions

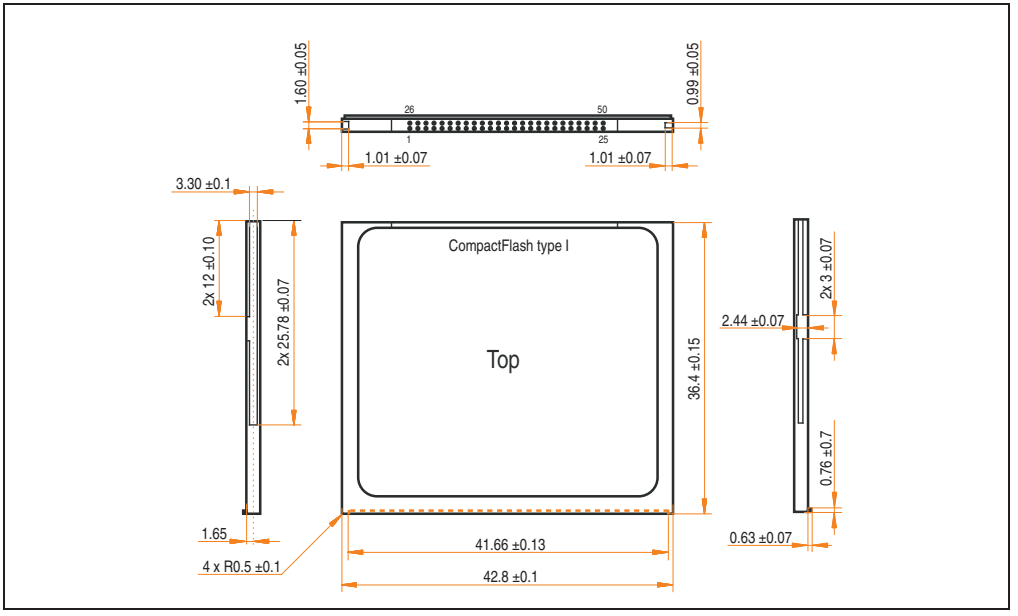


Figure 165: Dimensions - CompactFlash card Type I

5.6 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).

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Advanced Storage Technology

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ENDURANCE CONSIDERATIONS

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WP401
Revision D
January 2006

Figure 166: Silicon Systems white paper - page 1 of 9

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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 167: 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.

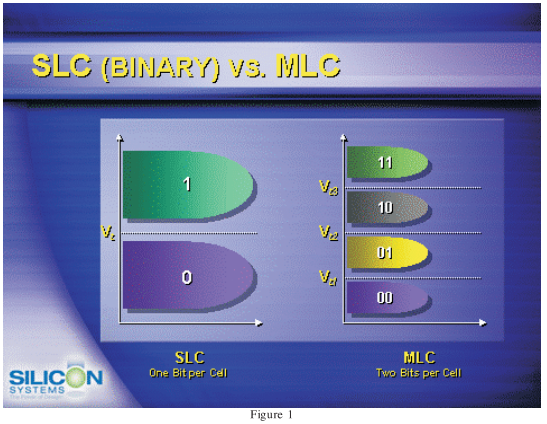

Figure 1

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.

Figure 168: Silicon Systems white paper - page 3 of 9

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.

Figure 169: 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.

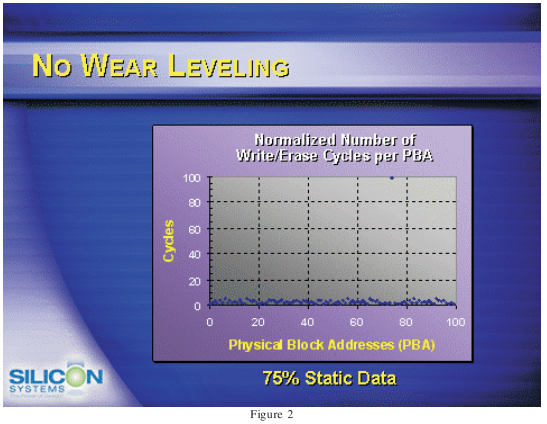

Figure 2

Figure 170: Silicon Systems white paper - page 5 of 9

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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.

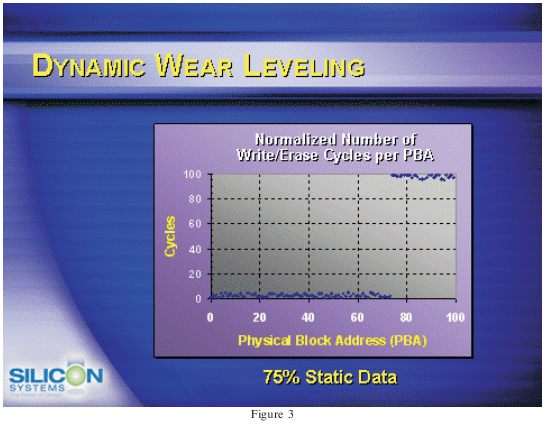

Figure 3

Figure 171: 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.

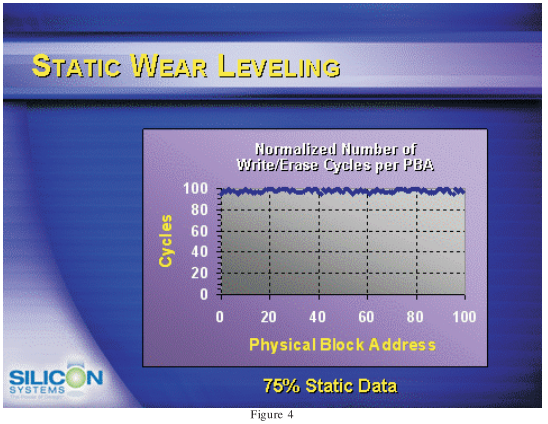

Figure 4

PAGE 7 OF 9 SILICONSYSTEMS PROPRIETARY SILICONSYSTEMS The Future of Storage...Today™

Figure 172: Silicon Systems white paper - page 7 of 9

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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

Figure 173: Silicon Systems white paper - page 8 of 9

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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)

Figure 174: Silicon Systems white paper - page 9 of 9

6. 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 (e.g. the SanDisk Cruzer Micro Flash Drive with 512 MB):

- **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`" is also executed on the USB flash drive.**

6.1 General information

USB flash drives are easy-to-exchange memory 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.

6.2 Order data

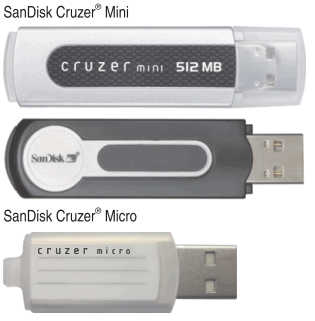
Model number	Description	Image
5MMUSB.0128-00	USB flash drive 128 MB SanDisk Cruzer Mini	
5MMUSB.0256-00	USB flash drive 256 MB SanDisk Cruzer Mini	
5MMUSB.0512-00	USB flash drive 512 MB SanDisk Cruzer Mini up to Rev. E0 or Cruzer Micro starting with Rev. E0	
5MMUSB.1024-00	USB flash drive 1 GB SanDisk Cruzer Mini up to Rev. C0 or Cruzer Micro starting with Rev. C0	
5MMUSB.2048-00	USB flash drive 2 GB SanDisk Cruzer Micro	

Table 161: Order data - USB flash drives

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.

The technical data is current as of when this manual was printed. We reserve the right to make changes.

Features	5MMUSB.0128-00	5MMUSB.0256-00	5MMUSB.0512-00	5MMUSB.1024-00	5MMUSB.2048-00
LED Cruzer Mini / Cruzer Micro	1 LED (green), signals data transfer (send and receive)				
Power supply Current requirements Cruzer Mini / Cruzer Micro	via the USB port 650 µA sleep mode, 150 mA read/write				
Interface Cruzer Mini / Cruzer Micro 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) Cruzer Mini / Cruzer Micro	100000 hours				
Data retention Cruzer Mini / Cruzer Micro	10 years				
Maintenance Cruzer Mini / Cruzer Micro	None				
Operating system support Cruzer Mini Cruzer Micro	Windows CE 4.1, CE 4.2, 98SE[1)] , ME, 2000, XP, Mac OS 9.1.x and Mac OS X 10.1.2 Windows CE 4.2, CE 5.0, ME, 2000, XP and Mac OS 9.1.x+, OS X v10.1.2+				
Mechanical characteristics					
Dimensions Height - Cruzer Mini / Cruzer Micro Width - Cruzer Mini / Cruzer Micro Depth - Cruzer Mini / Cruzer Micro	 62 mm / 52.2 mm 19 mm / 19 mm 11 mm / 7.9 mm				
Environmental characteristics					
Environmental temperature Cruzer Mini / Cruzer Micro Operation Storage Transport	 0°C .. +45°C -20°C .. +60°C -20°C .. +60°C				
Humidity Cruzer Mini / Cruzer Micro Operation Storage Transport	 10% .. 90%, non-condensing 5% .. 90%, non-condensing 5% .. 90%, non-condensing				

Table 162: Technical data - USB flash drive 5MMUSB.xxxx-00

Features	5MMUSB.0128-00	5MMUSB.0256-00	5MMUSB.0512-00	5MMUSB.1024-00	5MMUSB.2048-00
Vibration Cruzer Mini / Cruzer Micro					
Operation	At 10 - 500 Hz: 2 g (19.6 m/s^2 0 peak), oscillation rate 1/minute				
Storage	At 10 - 500 Hz: 4 g (39.2 m/s^2 0 peak), oscillation rate 1/minute				
Transport	At 10 - 500 Hz: 4 g (39.2 m/s^2 0 peak), oscillation rate 1/minute				
Shock Cruzer Mini / Cruzer Micro					
Operation	Max. 40 g (392 m/s^2 0-peak) and 11 ms length				
Storage	Max. 80 g (784 m/s^2 0-peak) and 11 ms length				
Transport	Max. 80 g (784 m/s^2 0-peak) and 11 ms length				
Altitude Cruzer Mini / Cruzer Micro					
Operation	3048 meters				
Storage	12192 meters				
Transport	12192 meters				

Table 162: Technical data - USB flash drive 5MMUSB.xxxx-00 (cont.)

1) For Win 98SE, a driver can be downloaded from the SanDisk homepage.

6.3.1 Temperature humidity diagram - operation and storage

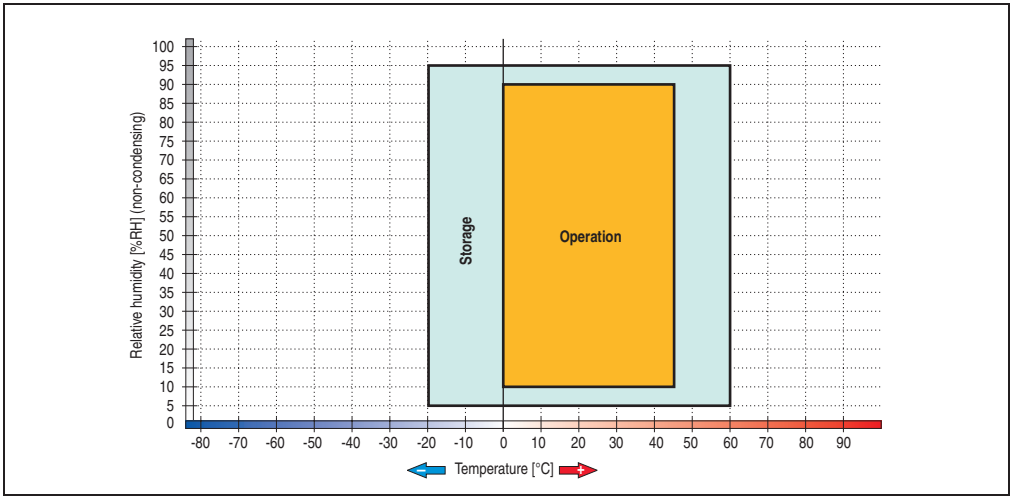


Figure 175: Temperature humidity diagram - USB flash drive - 5MMUSB.xxxx-00

6.4 Contents of delivery

SanDisk Cruzer Mini
1 USB flash drive in desired size + 1 strap 
SanDisk Cruzer Micro
1 USB flash drive in desired size + 2 replacement covers (blue and pink) + 1 strap[1)] 

Table 163: Contents of delivery - USB flash drives 5MMUSB.xxxx-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.

6.5 Creating a bootable USB flash drive

When used in connection with an Automation PC 620 / Panel PC 700, it is possible to boot the system from one of the flash drives available from B&R (5MMUSB.0512-00, 5MMUSB.1024-00 and 5MMUSB.2048-00). The flash drive must be specially prepared for this.

6.5.1 Requirements

The following peripherals are required for creating a bootable flash drive:

- B&R USB flash drive (see model number "USB Flash Drives", on page 30)
- Automation PC 620 or Panel PC 700
- USB floppy drive (external or slide-in USB floppy 5AC600.FDDS-00)
- PS/2 or 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!

6.5.2 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`".

7. Null modem cable 9A0017.0x

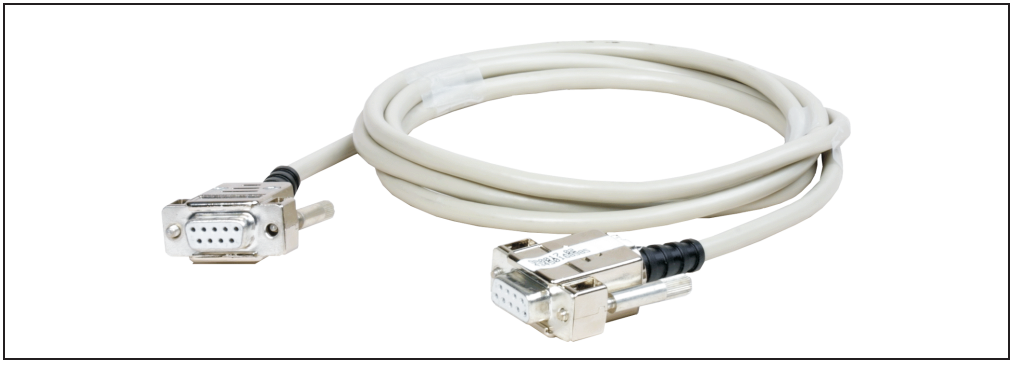


Figure 176: Null modem cable 9A0017.0x

7.1 Order data

Model number	Description	Note
9A0017.01	**RS232 DB9 null modem cable 0.6 m** Null modem cable RS232 0.6 m to connect UPS and IPC (9-pin DSUB socket - 9-pin DSUB socket).	
9A0017.02	**RS232 DB9 null modem cable 1.8 m** Null modem cable RS232 1.8 m to connect UPS and IPC (9-pin DSUB socket - 9-pin DSUB socket).	

Table 164: Model numbers - USB cables

7.2 Technical data

Features	9A0017.01	9A0017.02
Length	0.6 m ± 10 mm	1.8 m ± 30 mm
Outer diameter	Max. 5 mm	
Shielding	Entire cable	
Connector type	2 9-pin DSUB sockets - female	
Wire cross section	AWG 22,	
Flexibility	Flexible	
Flex radius	Min. 100 mm	

Table 165: Technical data - null modem cable

7.3 Cable specifications

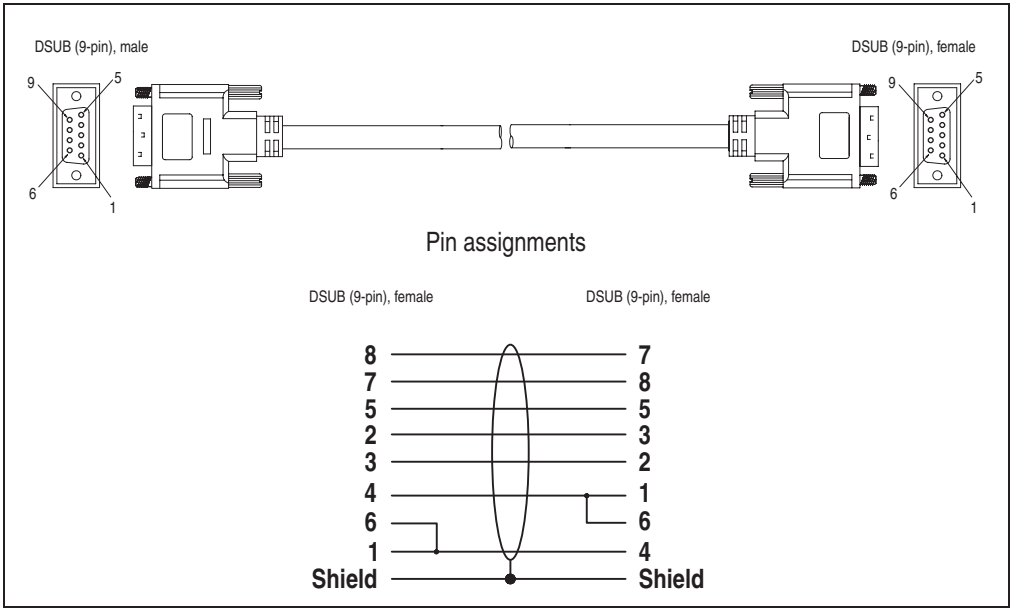


Figure 177: Pin assignments - null modem cable

Chapter 7 • Maintenance / servicing

1. Cleaning

Danger!

Power Panel devices may only be cleaned when switched off. This is to prevent unintended functions from being triggered when touching the touch screen or pressing the buttons.

A moist towel should be used to clean the Power Panel device. When moistening the cloth, use only water with detergent, screen cleaning agent, or alcohol (ethanol). The cleaning agent should be applied to the cloth beforehand, not sprayed directly on the Power Panel device! Never use aggressive solvents, chemicals, scouring agents, pressurized air or steam jet.

Information:

Displays with touch screens should be cleaned at regular intervals.

2. Changing the battery

Changing the battery is only necessary for devices with a lithium battery (see chapter "Technical data" on page 25 for Power Panel devices).

Battery check

The lithium battery guarantees buffering of the internal real-time clock (RTC), SRAM data, and individually saved BIOS settings. The battery status (good or bad) is checked every time the device is turned on, as well as every 24 hours. The check involves applying a load to the battery for a short time (approx. 1 second).

From the point when battery capacity is recognized as insufficient, data buffering is guaranteed for approximately another TBD hours. When changing the battery, data is buffered for approximately another 10 minutes by a gold leaf capacitor.

Under normal operating conditions, the battery has a typical lifespan of approximately 2 years.

Information:

The battery should only be changed by qualified personnel.

2.1 Procedure for changing the battery

- Disconnect the power supply to the Power Panel
- Touch the housing or ground connection (not the power supply!) in order to discharge any electrostatic charge from your body.
- Remove the battery cover: The battery cover is found on the rear side of the Power Panel device.

0 aPCI slot Power Panel devices	1 or 2 aPCI slot Power Panel devices
	

Table 166: Changing the battery

- Remove the battery from the holder (don't use uninsulated tools >- risk of short circuiting). The battery should not be held by its edges. Insulated tweezers may also be used for removing the battery.

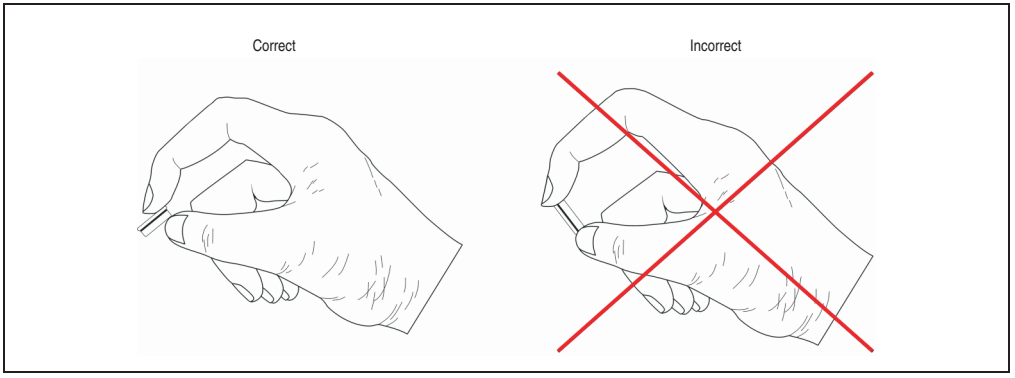


Figure 178: Battery handling

- After removing the battery, the data is buffered for at least another 10 minutes by a gold leaf capacitor so that data is not lost.
- Insert the new battery with correct polarity.
- Put on the battery cover and fasten the screws.
- Reconnect the power supply to the Power Panel.
- The data and time in BIOS may have to be set again (see section "Power Panel 300 with BIOS" on page 187).

Warning!

Lithium batteries are considered hazardous waste. Used batteries should be disposed of accordingly.

Appendix A

1. Touch screen

1.1 Elo Accu Touch

Information:

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

Elo Accu touch screen	Specifications
Manufacturer	Elo
Accuracy For < 18" diagonals For > 18" diagonals	 Typically < than 0.080 inches (2.032 mm) Maximum error in all directions 0.180 inches (4.752 mm) Maximum 1% of the diagonal for the active area of the touch screens
Reaction time	< 10 ms
Release pressure	< 113 grams
Resolution	4096 x 4096 touch points
Light permeability	Up to 80% ± 5%
Temperature Operation Storage Transport	 - 10°C to + 50°C - 40°C to + 71°C - 40°C to + 71°C
Relative humidity Operation Storage Transport	 Max. 90% at max. 35°C Max. 90% at max. 35°C for 240 hours, non-condensing Max. 90% at max. 35°C for 240 hours, non-condensing
Waterproofing	IP65
Lifespan	35 million contacts on the same point
Chemical resistance [1)]	Acetone, ammonia-based glass cleaner, normal food and drinks, hexane, methylene chloride, methyl ethyl ketone, mineral spirits, turpentine, isopropyl alcohol
Activation	Finger, pointer, credit card, glove

Table 167: Technical data - Elo Accu touch screen 5-wire

Elo Accu touch screen	Specifications
Drivers	Touch screen drivers can be downloaded from the download area on the B&R homepage (www.br-automation.com). Additionally, they can also be found on the B&R HMI Driver and Utilities DVD (Mod. No. 5SWHMI.0000-00).

Table 167: Technical data - Elo Accu touch screen 5-wire (cont.)

1) The active area of the touch screen is resistant to these chemicals for a timeframe of one hour at 21°C.

1.1.1 Temperature humidity diagram - operation and storage

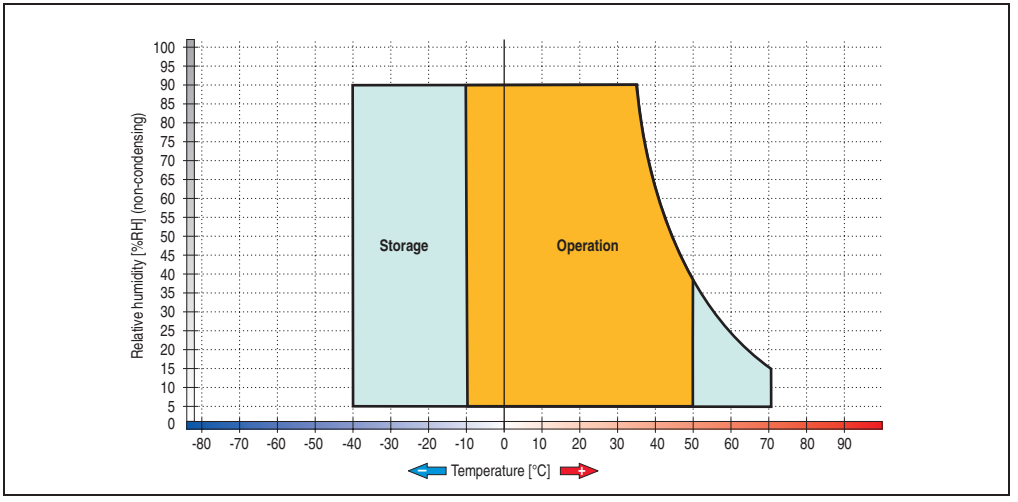


Figure 179: Temperature humidity diagram - Elo Accu touch screen

1.1.2 Cleaning

The touch screen should be cleaned with a moist lint-free cloth. When moistening the cloth, use only water with detergent, screen cleaning agent, or alcohol (ethanol). The cleaning agent should be applied to the cloth beforehand and not sprayed directly onto the touch screen itself. Never use aggressive solvents, chemicals, scouring agents, pressurized air or steam jet.

2. Mylar

The mylar conforms to DIN 42115 (section 2). This means it is resistant to exposure to the following chemicals for a 24 hour period with no visible signs of damage:

Information:

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

Alcohol Cyclohexanol Diacetone alcohol Glycol Isopropanol Glycerin Methanol Triacetin Dowandol DRM/PM	Formaldehyde 37%-42% Acetaldehyde Aliphatic hydrocarbons Toluene Xylene White spirits	1.1.1.Trichloroethane Ethyl acetate Diethyl ether N-Butyl acetate Amyl acetate Butylcellosolve Ether
Acetone Methyl ethyl ketone Dioxan Cyclohexanone MIBK Isophorone	Formic acid <50% Acetic acid <50% Phosphoric acid <30% Hydrochloric acid <36% Nitric acid <10% Trichloracetic acid <50% Sulphuric acid <10%	Sodium hypochlorite <20% Hydrogen peroxide <25% Potassium carbonate Washing powders Fabric conditioner Ferric chloride Ferrous chloride (FeCl2) Ferrous chloride (FeCl3) Dibutyl phthalate Dioctyl phthalate Sodium carbonate
Ammonia <40% Caustic soda <40% Potassium hydroxide Alkali carbonate Bichromate Potassium Acetonitrile Sodium bisulphate	Cutting oil Diesel oil Linseed oil Paraffin oil Blown castor oil Silicon oil Turpentine oil substitute Universal brake fluid Aviation fuel Petrol Water Sea water Decon	

Table 168: Chemical resistance of the mylar

The mylar conforms to DIN 42115 section 2 for exposure to glacial acetic acid for less than one hour without visible damage.

3. Perspectives

The perspectives can be seen in the technical data for the individual components.

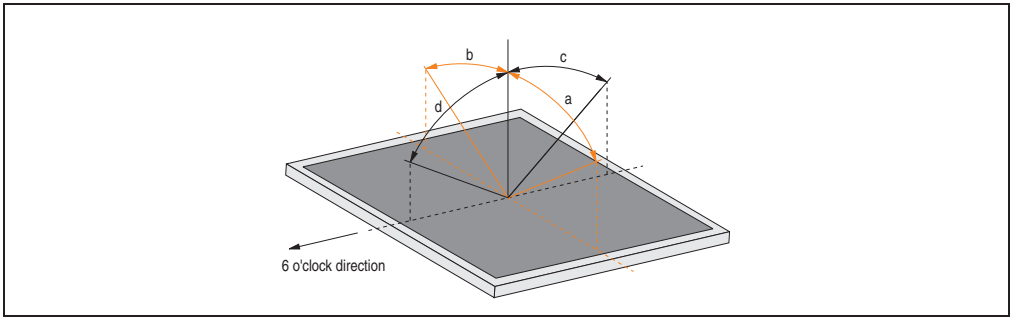


Figure 180: Perspectives

4. B&R Key Editor

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.

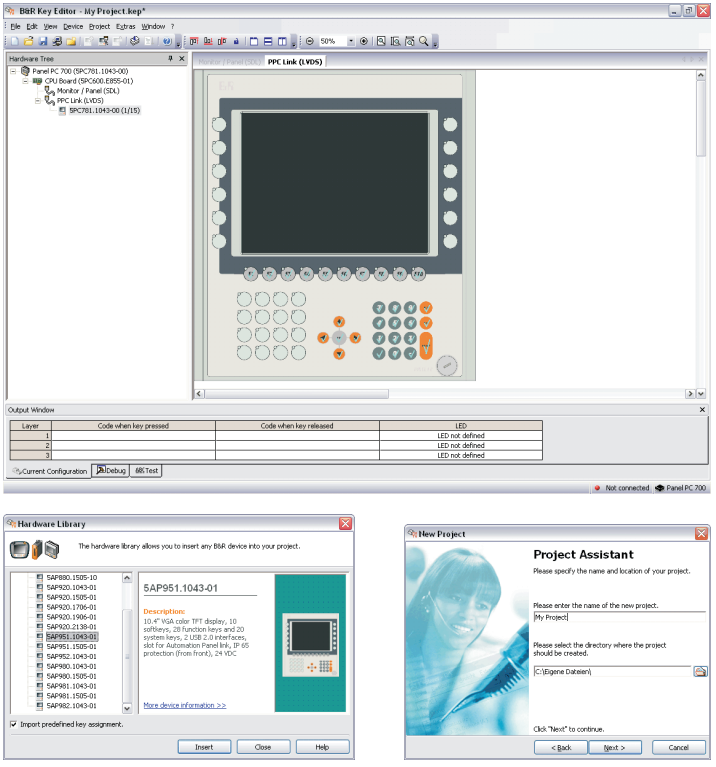


Figure 181: B&R Key Editor screenshots (Version 2.10)

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 and Panel PC 700 devices.

Supports following systems:

- Automation PC 620
- Panel PC 700
- Provit 2000
- Provit 5000
- Power Panel BIOS devices
- Mobile Panel BIOS devices

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 Driver and Utilities DVD (model number 5SWHMI.0000-00).

5. Mounting compatibilities

This section describes the compatibility of the installation dimensions for the Power Panel 100/200, Power Panel 300/400, Automation Panel 900 and Panel PC 700 units according to the respective device diagonals.

The outer dimensions of the device types are identical for the respective diagonals.
The different device types are abbreviated as follows:

Device type	Abbreviation
Power Panel 100/200	PP100/200
Power Panel 300/400	PP300/400
Automation Panel 900	AP900
Panel PC 700	PPC700

Table 169: Product abbreviations

5.1 Compatibility overview

The following table offers a brief overview of the devices PP100/200, PP300/400, AP900 and PPC700. Detailed information can be found in the section "Compatibility details" on page 313.

Compatibility between the device types is represented on each line by matching symbols.

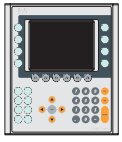
Size	Format	Image	Compatible	PP100/200	PP300/400	AP900	PPC700
5.7"	Horizontal1		Outer dimension	■	■	-	-
			Installation dimension	●	●	-	-
	Horizontal2		Outer dimension	■	■	-	-
			Installation dimension	●	●	-	-
	Vertical1		Outer dimension	■	■	-	-
			Installation dimension	●	●	-	-

Table 170: Device compatibility overview

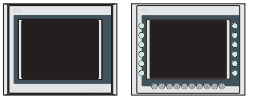
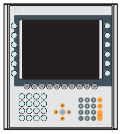
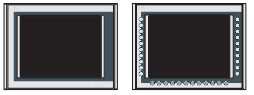
Size	Format	Image	Compatible	PP100/200	PP300/400	AP900	PPC700
10.4"	Horizontal1		Outer dimensions	■	■	■	■
			Installation dimensions	●	●	●	●
	Horizontal2		Outer dimensions	■	■	■	■
			Installation dimensions	●	●	▲	▲
	Vertical1		Outer dimensions	■	■	■	■
			Installation dimensions	●	●	▲	▲
12.1"	Horizontal1		Outer dimensions	■	■	■	■
			Installation dimensions	●	●	▲	▲
15"	Horizontal1		Outer dimensions	■	■	■	■
			Installation dimensions	●	●	●	●
	Vertical1		Outer dimensions	■	■	■	■
			Installation dimensions	●	●	●	●
17"	Horizontal1		Outer dimensions	-	-	■	■
			Installation dimensions	-	-	▲	▲
19"	Horizontal1		Outer dimensions	-	-	■	■
			Installation dimensions	-	-	▲	-

Table 170: Device compatibility overview

Size	Format	Image	Compatible	PP100/200	PP300/400	AP900	PPC700
21.3"	Horizontal1		Outer dimensions	-	-	■	-
			Installation dimensions	-	-	▲	-

Table 170: Device compatibility overview

5.2 Compatibility details

The measurement values (all in mm) in the following figures have the following meaning.

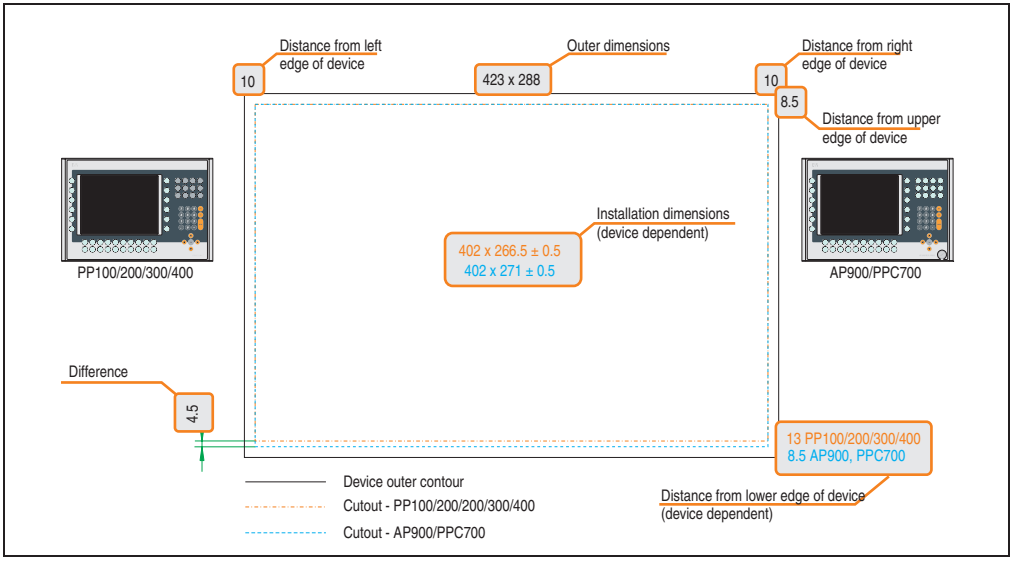


Figure 182: Compatibility details - figure structure

5.2.1 5.7" devices

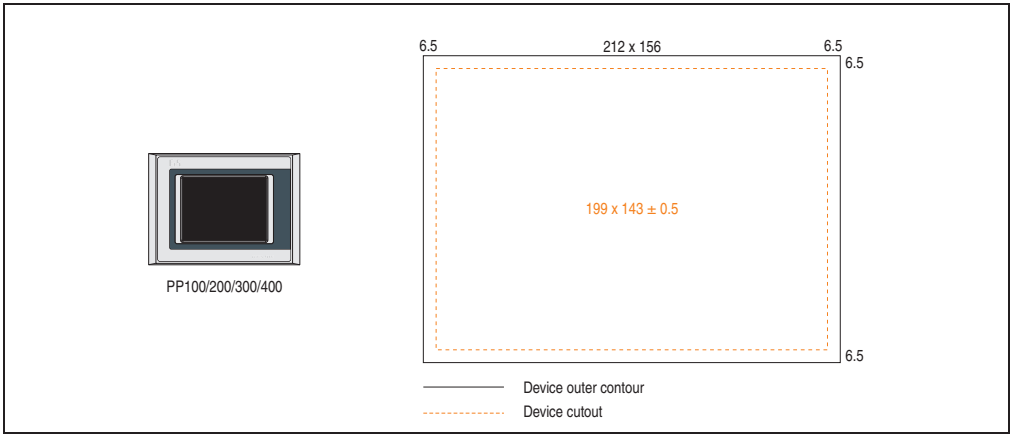


Figure 183: Mounting compatibility - 5.7" device format - horizontal1

5.7" Power Panel 100/200 and Power Panel 300/400 devices **Horizontal1 format** are 100% mounting compatible.

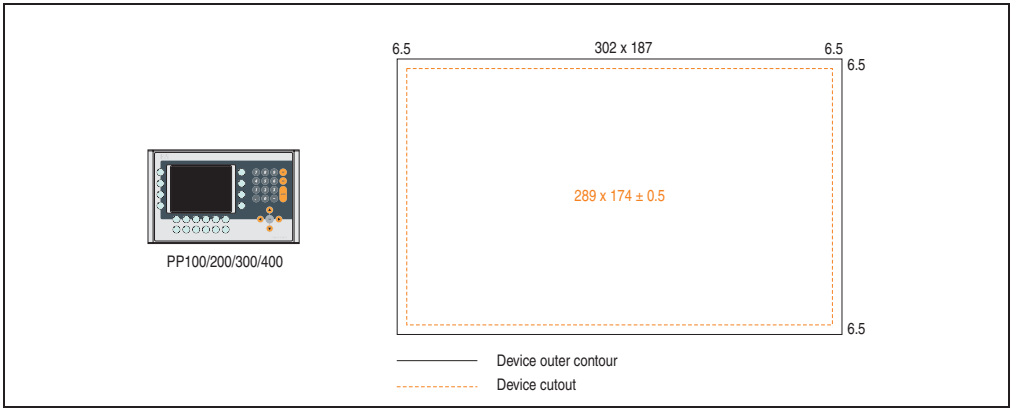


Figure 184: Mounting compatibility - 5.7" device format - horizontal2

5.7" Power Panel 100/200 and Power Panel 300/400 devices **Vertical1 format** are 100% mounting compatible.

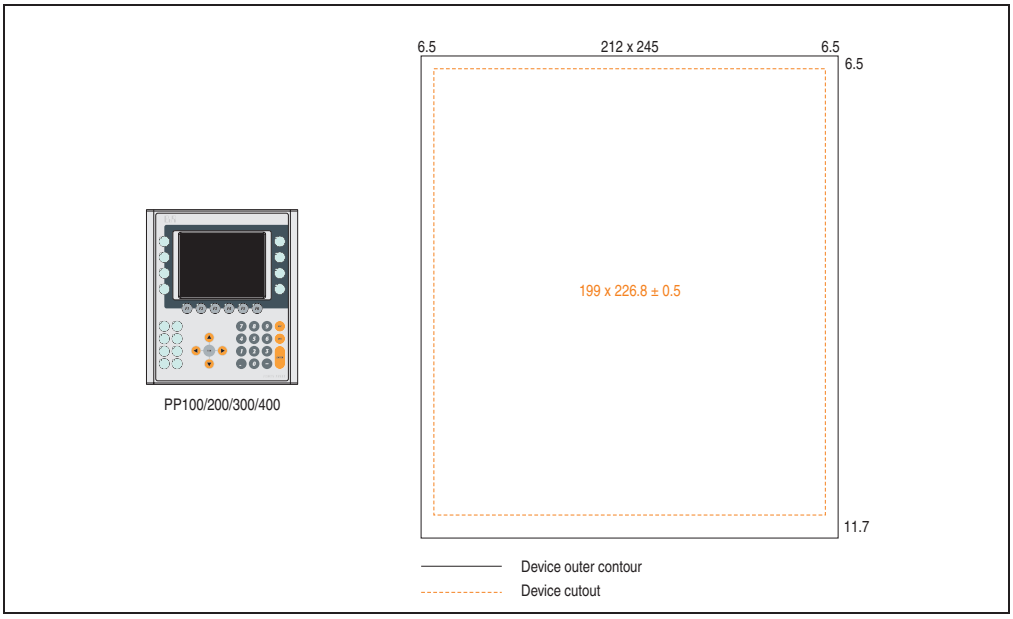


Figure 185: Mounting compatibility - 5.7" device format - vertical1

5.7" Power Panel 100/200 and Power Panel 300/400 devices **Vertical1 format** are 100% mounting compatible.

5.2.2 10.4" devices

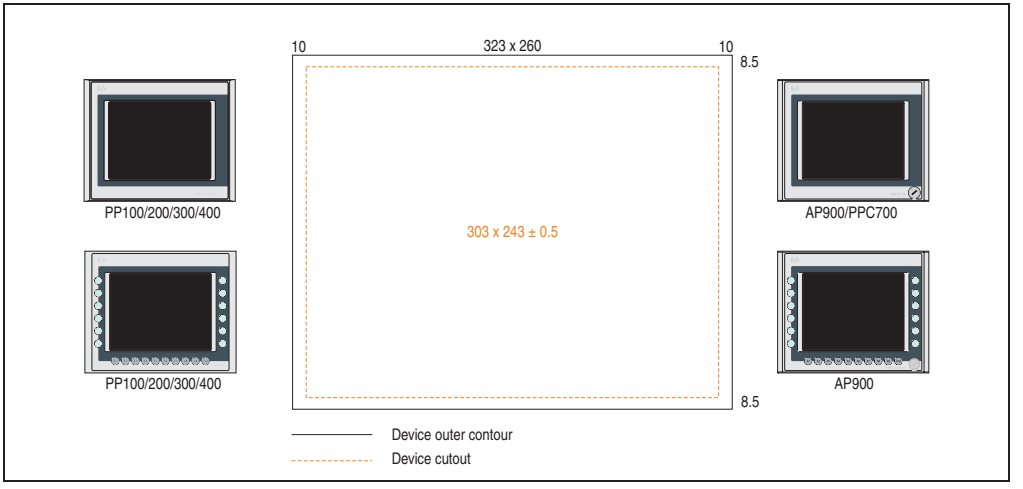


Figure 186: Mounting compatibility - 10.4" device format - horizontal1

10.4" Power Panel 100/200, Power Panel 300/400, Automation Panel 900 and Panel PC 700 devices **Horizontal1 format** are 100% mounting compatible.

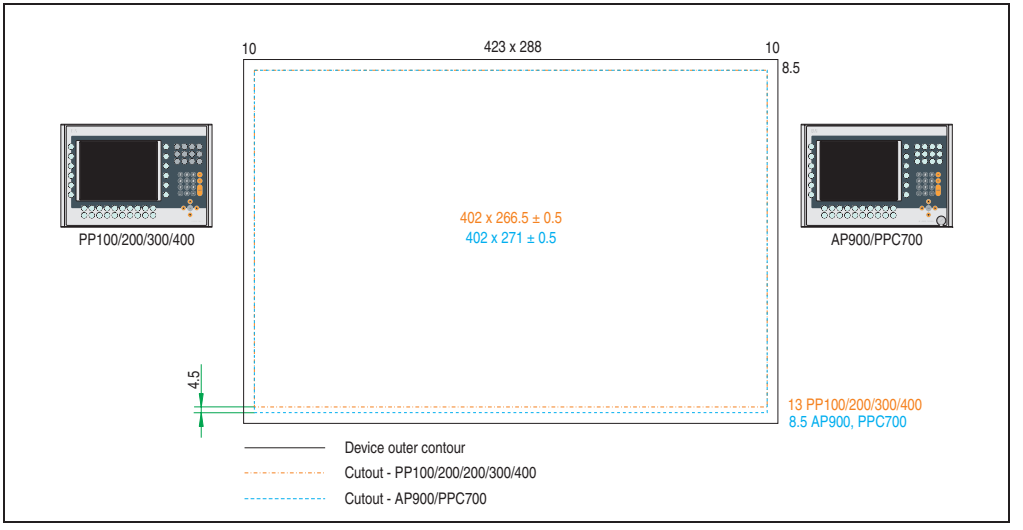


Figure 187: Mounting compatibility - 10.4" device format - horizontal2

10.4" Power Panel 100/200 and Power Panel 300/400 are are *not 100% mounting compatible* with the **Horizontal2 format** Automation Panel 900 and Panel PC 700 devices. The Automation Panel 900 and Panel PC 700 devices require a cutout that is 4.5 mm larger vertically (lower edge).

The larger cutout can can be conditionally used for all devices:

- When mounting, make sure that the PP100/200/300/400 devices are placed and mounted as close to the center of the cutout as possible. Failure to do so can prevent the retaining clips from holding firmly, which means that a firm seal is no longer guaranteed with the gasket (IP65).

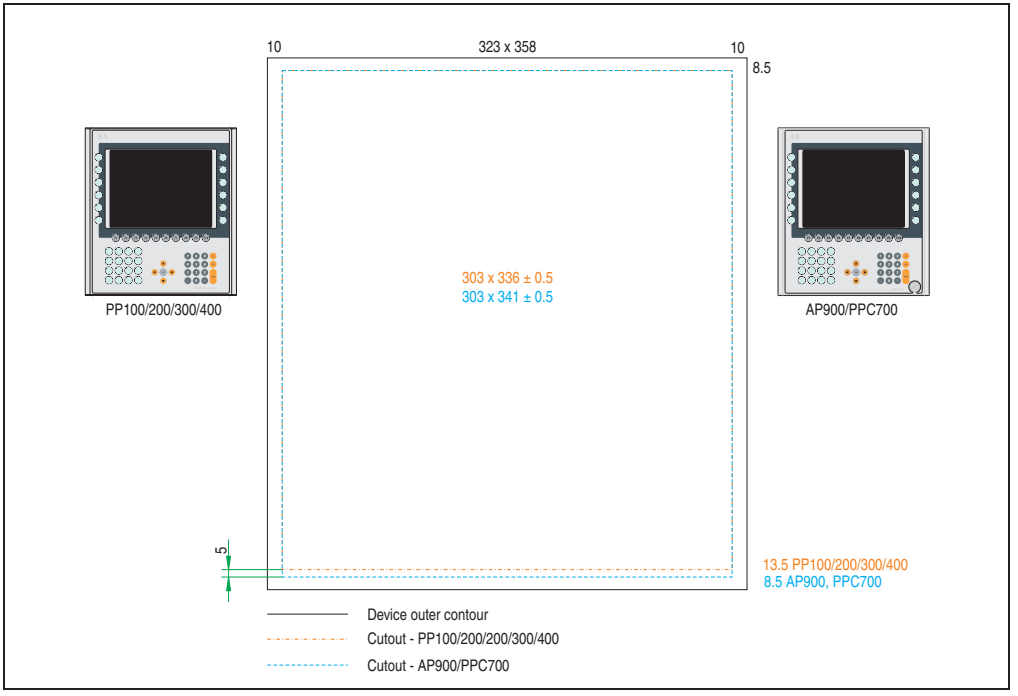


Figure 188: Mounting compatibility - 10.4" device format - vertical1

10.4" Power Panel 100/200 and Power Panel 300/400 are are *not 100% mounting compatible* with the **Vertical1 format**Automation Panel 900 and Panel PC 700 devices. The Automation Panel 900 and Panel PC 700 devices require a cutout that is 5 mm larger vertically (lower edge).

The larger cutout can can be conditionally used for all devices:

- When mounting, make sure that the PP100/200/300/400 devices are placed and mounted as close to the center of the cutout as possible. Failure to do so can prevent the retaining clips from holding firmly, which means that a firm seal is no longer guaranteed with the gasket (IP65).

5.2.3 12.1" devices

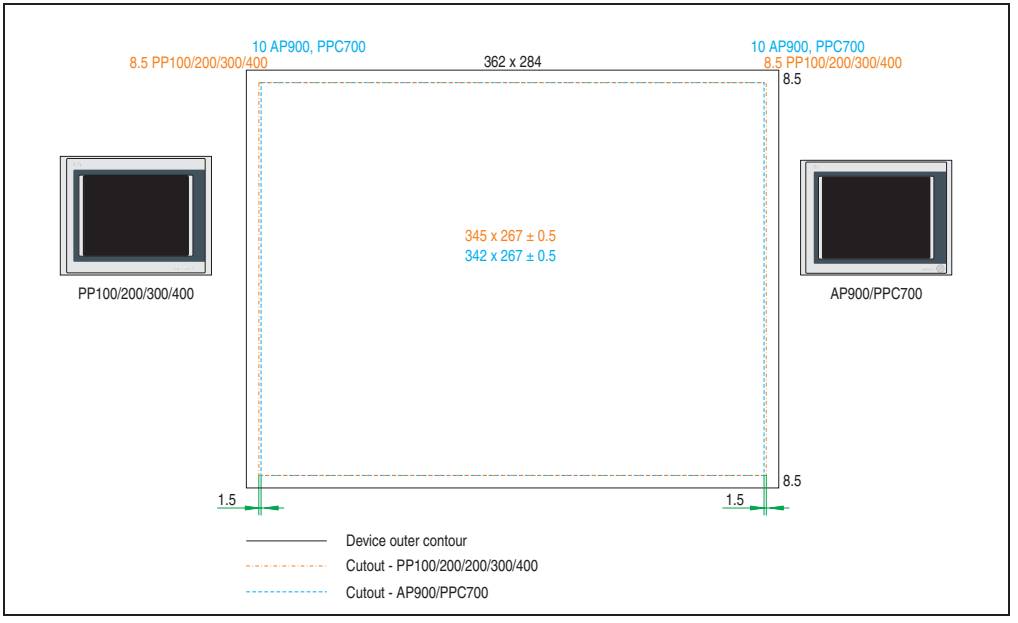


Figure 189: Mounting compatibility - 12.1" device format - horizontal1

12.1" Power Panel 100/200 and Power Panel 300/400 are are *not 100% mounting compatible* with the **Horizontal1 format**Automation Panel 900 and Panel PC 700 devices. The Power Panel 100/200 and Power Panel 300/400 devices require a cut that is 1.5 mm wider (left and right).

The larger cutout can can be conditionally used for all devices:

- When mounting, make sure that the AP900 and PPC700 devices can be placed and mounted as close to the center of the cutout as possible.

5.2.4 15" devices

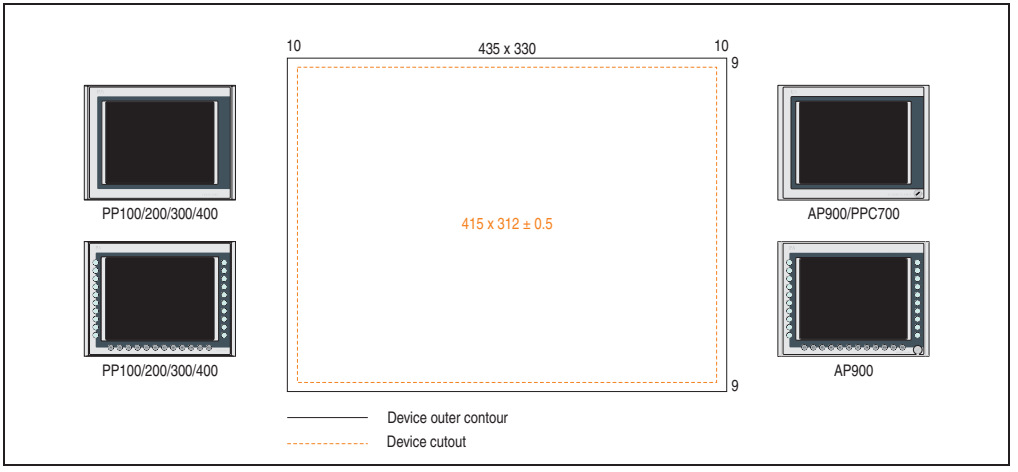


Figure 190: Mounting compatibility - 15" device format - horizontal1

15" Power Panel 100/200, Power Panel 300/400, Automation Panel 900 and Panel PC 700 devices **Horizontal1 format** are 100% mounting compatible.

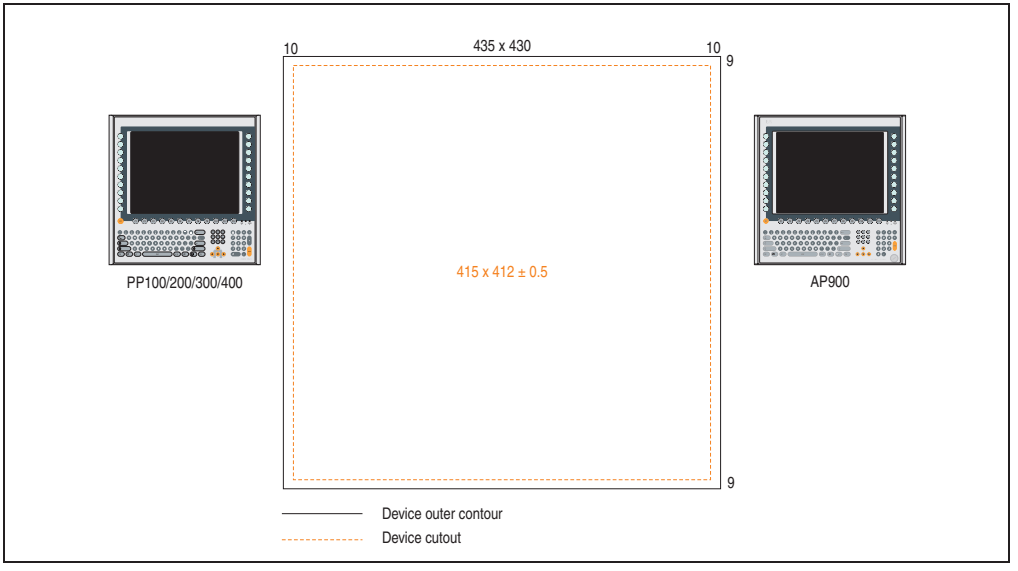


Figure 191: Mounting compatibility - 15" device format - vertical1

15" Power Panel 100/200, Power Panel 300/400, Automation Panel 900 and Panel PC 700 devices **Vertical1 format** are 100% mounting compatible.

5.2.5 17" devices

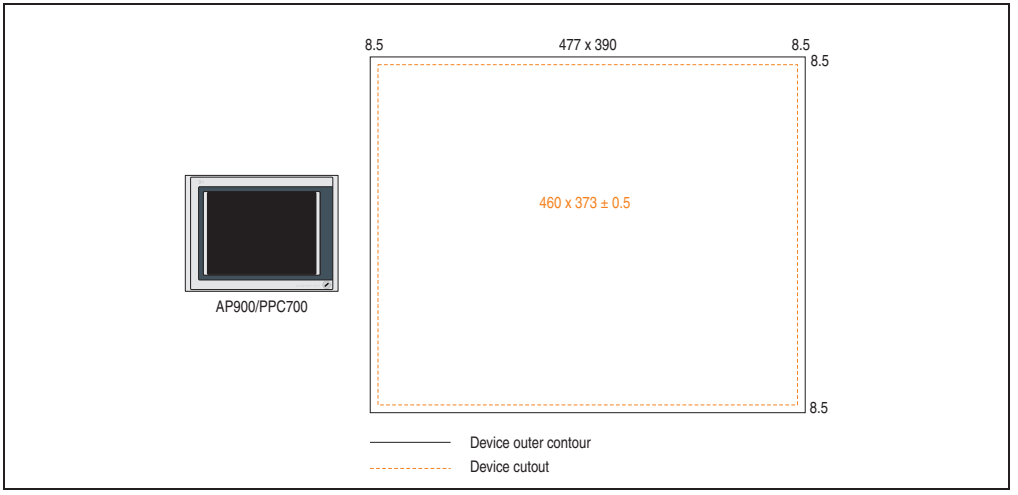


Figure 192: Mounting compatibility - 17" device format - horizontal1

17" Automation Panel 900 and Panel PC 700 **Horizontal1 format** are 100% mounting compatible.

5.2.6 19" devices

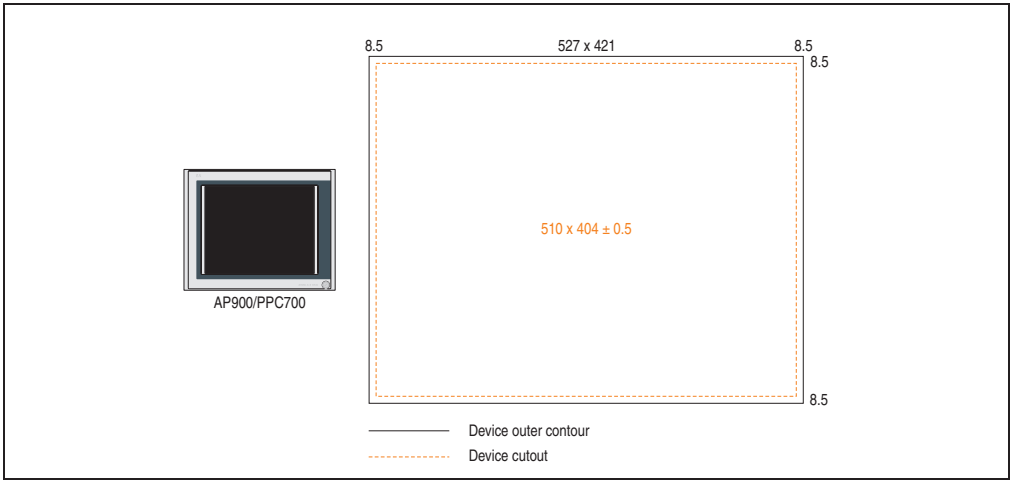


Figure 193: Mounting compatibility - 19" device format - horizontal1

19" Automation Panel 900 and Panel PC 700 **Horizontal1 format** are 100% mounting compatible.

5.2.7 21.3" devices

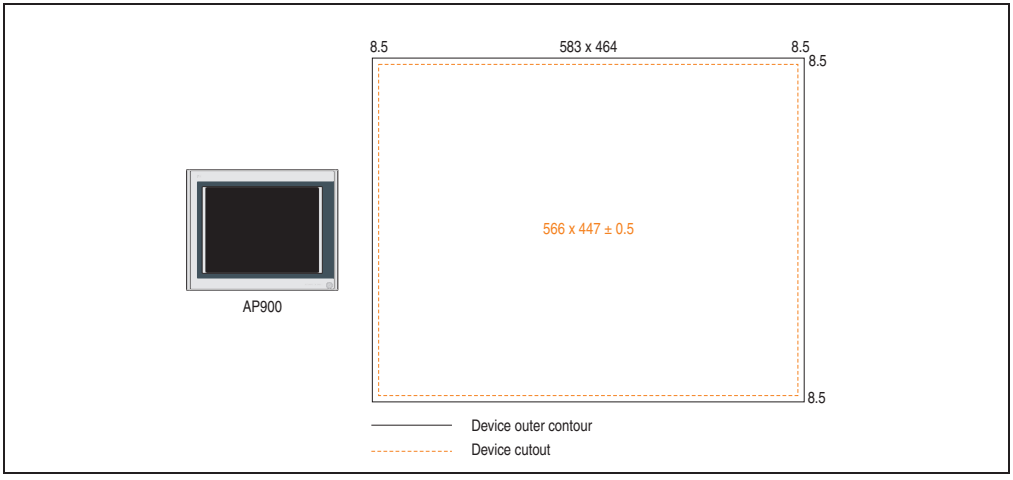


Figure 194: Mounting compatibility - 21.3" device format - horizontal1

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.

APC

Abbreviation for »**A**utomation **PC**«

Automation Runtime

A uniform runtime system for all B&R automation components.

B

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, binary digit smallest discrete information unit. 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.

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.

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. Data, which e.g. should be output to slower components by the working memory (e.g. disk storage, printers), is stored temporarily in the cache and output from there with 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-ranges below 40 m with a 1 MBit/sec data transfer rate. Maximum number of stations: Unlimited in theory, practically up to 64 with real-time capability, i.e. defined maximum queuing time 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 high 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 the 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.

Code, coding

When processing information, it is often necessary to change the information from one form of representation to another. This conversion process is called coding and rules used to assign one character set to another are referred to as the code. A differentiation is made between ambiguous and unambiguous coding depending on if one set is a direct reflection of the other. Most codes use unambiguous coding with one set directly reflecting the other. A differentiation is also made between redundant and non-redundant codes. With non-redundant codes, the full

range of the available character set is used, i.e. each code is defined. With redundant codes, the available character set also contains codes that are not used. This differentiation is important during data transfer when detecting and, if necessary, correcting data transfer errors.

COM

A device name used to access serial ports in MS-DOS. The first serial port can be accessed under COM1, the second under COM2 etc. Typically, a modem, mouse or serial printer is connected to a serial port.

COM1

Device name for the first serial port in a PC system. The input-output area for COM1 is usually found at address 03F8H. Generally, the COM1 port is assigned IRQ 4. In many systems, an RS232 serial mouse is connected to COM1.

COM2

Device name for the second serial port in a PC system. The input-output area for COM2 is usually found at address 02F8H. Generally, the COM2 port is assigned IRQ 3. In many systems, a modem is connected to COM2.

COM3

Device name for a serial port in a PC system. The input-output area for COM3 is usually found at address 03E8H. Generally, the COM3 port is assigned IRQ 4. In many systems, COM3 is used as an alternative for COM1 or COM2 if peripheral devices are already connected to COM1 and COM2.

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 accommodated 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 8 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

An abbreviation for »**C**athode **R**ay **T**ube« The main component of a television set or a standard computer screen. A cathode ray tube consists of a vacuum tube, in which one or more electron guns are installed. Each electron gun creates a horizontal electron beam, which 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 which is sent by the modem to the computer it is connected to, indicating that it is ready for transfer.

DMA

Direct **M**emory **A**ccess > Accelerated direct access to a computer's RAM through by-passing the CPU.

DRAM

An abbreviation for »**D**ynamic **R**andom **A**ccess **M**emory« Dynamic RAM consists of an integrated semiconductor circuit, which stores information based on the capacitor principle. Capacitors lose their charge in a relatively short time. Therefore, dynamic RAM circuit boards must contain a logic that allows continual recharging of RAM chips. Since the processor cannot access dynamic RAM while it is being recharged, one or more waiting states can occur when reading or writing data. Although it is slower, dynamic RAM is used more often than static RAM, because the simple design of the circuits means that it can store four times more data than static RAM.

DSR

An abbreviation for »**D**ata **S**et **R**eady« A signal used in serial data transfer, which is sent by the modem to the computer it is connected to, indicating 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, which is sent by the computer to the modem it is connected to, indicating the computer's readiness to accept incoming signals.

DVD

An abbreviation for »**D**igital **V**ersatile **D**isc« The next generation of optic data carrier technology. Using this technology it is possible to code video, audio and computer data on CD. DVDs can store a higher volume of data than conventional CDs. Standard DVDs , which have a single coating, can hold 4.7 GB. Double coated DVDs can hold 8.5 GB. Double sided DVDs can hold up to 17 GB. A special drive is needed for DVDs. Conventional CDs can also be played on DVD drives.

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

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 block 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.

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** > (complete 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, optical fiber cables or twisted pair cabling. Data transfer on an Ethernet network takes place in frames of variable lengths, which consist of supply and controller information as well as 1500 bytes of data. The Ethernet standard provides base band transfers at 10 megabit and 100 megabit per second.

Ethernet POWERLINK

is an enhancement of standard Ethernet. It enables data exchange under strict real-time conditions with cycle times down to 200 µs and jitter under 1µs. This makes Ethernet power available on all communication levels of Automation technology – from control levels to I/O. Ethernet POWERLINK was initialized 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).

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.

Fiber optics

Fiber optic cable

FIFO

An abbreviation for »**F**irst **I**n **F**irst **O**ut«. A queuing organization method whereby elements are removed in the same order as they were inserted. The first element inserted is the first one removed. Such an organization method is typical for a list of documents, which are waiting to be printed.

Firmware

Programs stored permanently in read-only memory. Firmware is software used to operate computer-controlled devices, which 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, (i.e. 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, which can store a magnetic field. When the floppy disk is inserted in a disk drive, it rotates, so that the different areas (or sectors) of the disk's surface are moved under the read-write head, allowing the magnetic orientation of the particle to be modified and recorded. Orientation in one direction represents binary 1, while the reverse orientation represents binary 0.

FPC

An abbreviation for »**F**lat **P**anel **C**ontroller«

FPD

An abbreviation for »**F**lat **P**anel **D**isplay«

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 quasi standard for the transfer of data via 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.

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.

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 [coding, signal level, pin assignments], which 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.

ISA

An abbreviation for »**I**ndustry **S**tandard **A**rchitecture« A term given for the bus design which allows expansion of the system with plug-in cards which can be inserted in the expansion slots provided in the PC.

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 200s and it actually occurs every 198 to 203s, then the jitter is 5s. 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.

Jumpers

A small plug or wire link for adapting the hardware configuration used to connect the different points of an electronic circuit.

K

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).

L

LCD

An abbreviation for »**L**iquid **C**rystal **D**isplay« A display type, based on liquid crystals which have a polarized molecular structure and are enclosed between two transparent electrodes as a thin layer. If an electrical field is applied to the electrodes, the molecules align themselves with the field and form crystalline arrangements, which polarize the light passing through. A polarization filter, which is arranged using lamellar electrodes, blocks the polarized light. In this way, a cell (pixel) containing liquid crystals can be switched on using electrode gates, 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.

LD

Ladder Diagram (Graphical programming language according to IEC 1131-3 and DIN EN 61131-3 for creating PLC application programs. LAD).

LED

An abbreviation for »**L**ight **E**mitting **D**iode« A semiconductor diode which converts electrical energy into light. LEDs work on the principle of electroluminescence. They are highly efficient because they do not produce much heat in spite of the amount of light they emit. For example, "operational status indicators" on floppy disk drives are LEDs.

LPT

Logical device name for line printers. In MS DOS, names are reserved for up to three parallel printer ports with the names LPT1, LPT2 and LPT3. The first parallel port (LPT1) is usually identical to the primary parallel output device PRN (in MS-DOS the logical device name for the printer). The lettering LPT was originally stood for "Line Printer Terminal".

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 equipment, an add-on card or external device, which allows information to be exchanged between computers over the telephone network using digital/analog or analog/digital signal conversion.

Motherboard

A circuit board, which 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.

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).

Multitasking

Multitasking is an operating mode in an operating system, which allows several computer tasks to be executed parallel and simultaneously.

N

Nodes

Branching point in a network

O

OEM

Original **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 of 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. 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

Peripheral **C**omponent **I**nterconnect Bus; developed by INTEL as intermediary /Local-Bus for the latest PC generations. It is basically a synchronous bus. The main clock of the CPU is used for synchronization. The PCI bus is microprocessor independent, compatible with 32-bit and 64-bit 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 is immediately runs (play), without having to manually configure the system. A Plug and Play PC requires a BIOS that supports Plug and Play and a respective expansion card.

POH

An abbreviation for »**P**ower **O**n **H**ours« see MTBF

POST

An abbreviation for »**P**ower-**O**n **S**elf **T**est« A set of routines which are stored in ROM on the computer and test different system components e.g. RAM, disk drive and the keyboard, in order to determine that the connection is operating correctly and ready for operation. POST routines notify the user of problems that occur. This is done using several signal tones or by displaying a message, which frequently accompanies a diagnosis value, on the standard output or standard error devices (generally the monitor). If POST runs successfully, control is transferred over to the system's bootstrap loader.

Power Panel

Power Panel is part of the B&R product family and is a combination of an operator panel and controller in one device. This covers products PP21 and PP41.

Powerlink

See "Ethernet POWERLINK".

PROFIBUS-DP

PROFIBUS for "decentralized peripherals". PROFIBUS-DP can be used to allow simply 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. Many used for time-critical factory automation applications.

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. Generally a screen resolution of 320 × 240 pixels.

R

RAM

An abbreviation for »**R**andom **A**ccess **M**emory« A semiconductor memory which can be read or written to by the microprocessor or other hardware components. Memory locations can be accessed in any order. The various ROM memory types do allow random access, however 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« A semiconductor in which programs or data have already been permanently stored during the production process.

RS232

Recommended **S**tandard **N**umber **232**. Oldest and most widespread interface standard, also called 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.

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 hardware specifications of the RS-232-C standard.

RXD

An abbreviation for »Receive (**RX**) **D**ata« A line for the transfer of serial data received from one device to another - e.g. from a modem to a computer. For connections complying with the RS-232-C standard, the RXD is connected to pin 3 of the plug.

S

SCADA

Supervision, **C**ontrol **A**nd **D**ata **A**cquisition; SCADA systems are used for control, to monitor and to log industrial processes. A high degree of configurability allows customization for various processes.

SDRAM

An abbreviation for »**S**ynchronous **D**ynamic **R**andom **A**ccess **M**emory« A construction of dynamic semiconductor components (DRAM), which can operate with higher clock rates than conventional DRAM switching circuits. This is made possible using block access. For each access, the DRAM determines the next memory addresses to be accessed.

SFC

Sequential function chart >; Used for graphic representation of sequential control, graphic input language for PLCs.

Special keypad modules

The following keypad modules are offered by B&R: Dummy module, emergency stop module, key switch module (made up of 1 key switch and 1 on /off switch) and a start/stop module (made up of 2 buttons and a label field).

SRAM

An abbreviation for »**S**tatic **R**andom **A**ccess **M**emory« A semiconductor memory (RAM) made up of certain logic circuits (flip-flop), which only keeps stored information while the operating voltage is active. In computers, static RAM is generally only used for the cache memory.

Standard keypad module

The following keypad modules are offered by B&R: 16 keys with 16 LEDs, 12+4 keys with 4 LEDs, 8 keys with 4 LEDs and a label field and 4 keys with 4 LEDs and 4 label fields.

SVGA

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.

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, which is assigned a specific priority by the real-time operating system. It contains a complete process and can consist of several modules.

TCP/IP

Transmission Control Protocol/Internet Suit of Protocols; Network protocol, 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

An LCD (Liquid Crystal Display) technology where the display consists of a large grid of LCD cells. Each pixel is represented by a cell, whereby electrical fields produced in the cells are supported by thin film transistors (TFT) resulting in an active matrix. In the simplest form, there is exactly one thin film transistor per cell. Displays with an active matrix are generally used in laptops and notebooks because they are thin, offer high quality color displays and can be viewed from all angles.

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« Generally, a module consisting of a single integrated circuit, which combines the circuits required for asynchronous serial communication for both sending and receiving. UART represents the most common type of circuit in modems for connection to a personal computer.

UDMA

An abbreviation for »**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 the recent times.
The UDMA33 mode transfers 33 megabytes per second.
The UDMA66 mode transfers 66 megabytes per second.
The UDMA100 mode transfers 100 megabytes per second.
A condition for modifications is that both the mainboard and the hard drive support the specification.

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 which cannot be connected directly to the power mains for safety reasons because a power failure could lead to loss of data. The UPS allows the PC to be shut down securely without losing data if a power failure occurs.

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.

Visual Components

Integrated in B&R Automation Studio. Visual Components can be used to configure visualization projects which use text and graphics.

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.

X

XGA

An abbreviation for »E**X**tended **G**raphics **A**rray« An expanded standard for graphics controllers and monitors which was introduced by IBM in 1990. This standard supports a 640 * 480 resolution with 65.536 colors or a 1024 * 768 resolution with 256 colors. This standard is generally used in workstation systems.

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