Panel PC 900

User's manual

Version: **1.15 (December 2015)**
Model no.: **MAPPC900-ENG**

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Chapter 1 • General information

1 Manual history

Version	Date	Change
1.00	2013-12-19	• First version
1.05	2014-04-16	• Updated section "Maximum ambient temperature during operation" on page 34. • Updated vibration and shock specifications of the complete system for storage and transport, see page 41. • Corrected technical data for ambient temperature and humidity for the following drives: "5AC901.CSSD-03" on page 131, "5AC901.CSSD-04" on page 134, "5AC901.CSSD-05" on page 137, "5MMSSD.0060-01" on page 141, "5MMSSD.0128-01" on page 144, "5MMSSD.0256-00" on page 147. • Updated ready relay IF option "5AC901.IRDY-00" on page 171. • Updated service life diagram for the "5AC901.BUPS-00" and "5AC901.BUPS-01" battery units. • Updated section "Serial number sticker" on page 78. • Updated section "Installation information for individual components" on page 198. • Updated section "Chemical resistance" on page 378. • Updated section "Touch screen" on page 382.
1.06	2014-07-25	• Corrected technical data for bus units with PCI Express slots – PCIe standard and bus speed, see "Technical data" on page 126. • Updated 5AC902.BX02-02 bus unit, see "Bus units" on page 125. • Documented new revision of CFast cards, see "CFast cards" on page 341. • Updated section "Maximum ambient temperature during operation" on page 34. • Corrected Tab. 34 "CPU board - Power calculation" on page 43.
1.10	2015-02-13	• Changed panel overlay design of display units with single-touch, see "5AP923.1215-00" on page 79, "5AP923.1505-00" on page 81 and "5AP923.1906-00" on page 83. • Updated section Chemical resistance. • Updated 5AC901.ISIO-00 interface option, see "Interface options" on page 156. • Updated 5CFAST.032G-10, 5CFAST.064G-10 and 5CFAST.128G-10 CFast cards, see "CFast cards" on page 341. • Updated section "Known problems/issues" on page 232. • Updated the BIOS version to V1.19, see "BIOS options" on page 233. • Updates section "Automation Runtime" on page 318. • Updated section "Protection" on page 41. • Updated technical data for display units (operating conditions), see "AP9x3 display units" on page 79. • Updated "Windows Embedded 8.1 Industry Pro" on page 306. • Updated section "B&R Automation Device Interface (ADI) - Control Center" on page 322. • Updated section "B&R Automation Device Interface (ADI) Development Kit" on page 324. • Updated section "B&R Automation Device Interface (ADI) .NET SDK" on page 326.
1.15	2015-12-18	• Updated AP1000 display units, see "AP1000 display units" on page 93. • Updated slide-in compact drive "5AC901.CSSD-06" on page 139. • Updated replacement SSD "5MMSSD.0512-00" on page 149. • Updated POWERLINK IF option "5AC901.IPLK-00" on page 165. • Updated terminal block "0TB2104.8000" on page 339 for ready relay. • Updated SDL cable 5CASDL.0008-00, see "SDL cables" on page 355. • Reduced weight of system unit from "Approx. 3020 g" to "Approx. 2821 g", updated for system unit from revision D0 to E0. • Updated "B&R KCF Editor" on page 330. • Updated "HMI Service Center" on page 331 (5SWUTI.0001-000). • Updated section "Protection" on page 41. • Revised overview of "Windows Embedded 8.1 Industry Pro", "Windows 7" and "Windows Embedded Standard 7". • Updated section "Automation Runtime Embedded (ARemb)" on page 319. • Updated Debian 8 section, see "Debian (GNU/Linux)" on page 320. • Updated 0TG1000.02 Technology Guard (HID), see "Automation Runtime" on page 318. • Updated section "Mounting orientations" on page 31. • Updated the BIOS version to V1.23, see "BIOS options" on page 233.

Table 1: Manual history

2 Safety guidelines

2.1 Intended use

Programmable logic controllers (PLCs), operating/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 industrial environments. 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, their use in flight control or flight safety systems as well as in the control of mass transportation systems, medical life support systems or weapons systems.

2.2 Protection against electrostatic discharge

Electrical components that can be damaged by electrostatic discharge (ESD) must be handled accordingly.

2.2.1 Packaging

- **Electrical components with a housing**
  ...do not require special ESD packaging but must be handled properly (see "Electrical components with a housing").
- **Electrical components without a housing**
  …are protected by ESD-suitable packaging.

2.2.2 Guidelines for proper ESD handling

Electrical components with a housing

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

Electrical components without a housing

The following applies in addition to the points listed under "Electrical components with a housing":

- Any persons handling electrical components or devices with installed electrical components must be grounded.
- Components are only permitted to be touched on their narrow sides or front plate.
- Components should always be stored in a suitable medium (ESD packaging, conductive foam, etc.). Metallic surfaces are not suitable storage surfaces!
- Components should not be subjected to electrostatic discharge (e.g. through the use of charged plastics).
- Ensure a minimum distance of 10 cm from monitors and TV sets.
- Measuring instruments and equipment must be grounded.
- Probes on potential-free measuring instruments 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.).
- These increased ESD protective measures for individual components are not necessary for customers handling B&R products.

2.3 Policies and procedures

Electronic devices are never completely failsafe. If the programmable control system, operating/monitoring device or uninterruptible power supply fails, the user is responsible for ensuring that other connected devices, e.g. motors, are brought to a secure state.

When using programmable logic controllers or operating/monitoring devices as control systems together with a soft PLC (e.g. B&R Automation Runtime or comparable product) or slot PLC (e.g. B&R LS251 or comparable product), safety precautions relevant 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 the installation, commissioning and servicing of devices are only permitted to be carried out by qualified personnel. Qualified personnel are those familiar with the transport, mounting, installation, commissioning and operation of devices who also have the appropriate qualifications (e.g. IEC 60364). National accident prevention regulations must be observed.
The safety notices, connection descriptions (type plate and documentation) and limit values listed in the technical data are to be read carefully before installation and commissioning and must be observed.

2.4 Transport and storage

During transport and storage, devices must be protected against undue stress (mechanical loads, temperature, moisture, corrosive atmospheres, etc.).

2.5 Installation

- These devices are not ready for use upon delivery and must be installed and wired according to the specifications in this documentation in order for the EMC limit values to apply.
- Installation must be performed according to this documentation using suitable equipment and tools.
- Devices are only permitted to be installed by qualified personnel without voltage applied. Before installation, voltage to the control cabinet must be switched off and prevented from being switched on again.
- General safety guidelines and national accident prevention regulations must be observed.
- Electrical installation must be carried out in accordance with applicable guidelines (e.g. line cross sections, fuses, protective ground connections).

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. Touching one of these parts can result in a life-threatening electric shock. This could lead to death, severe injury or damage to equipment.

Before turning on the programmable logic controller, operating/monitoring devices or uninterruptible power supply, the housing must be properly grounded (PE rail). Ground connections must be established even when testing or operating operating/monitoring devices or the uninterruptible power supply for a short time!

Before turning the device on, all parts that carry voltage must be securely covered. During operation, all covers must remain closed.

2.6.2 Environmental conditions - Dust, moisture, corrosive gases

The use of operating/monitoring devices (e.g. industrial PCs, Power Panels, Mobile Panels, etc.) and uninterruptible power supplies in very dusty environments should be avoided. Dust collection on the devices can affect functionality and may prevent sufficient cooling, especially in systems with active cooling systems (fans).

The presence of corrosive gases can also lead to malfunctions. When combined with high temperature and humidity, corrosive gases – e.g. with sulfur, nitrogen and chlorine components – can induce chemical reactions that can damage electronic components very quickly. Signs of the presence of corrosive gases are blackened copper surfaces and cable ends on existing equipment.

For operation in dusty or moist conditions, correctly installed (e.g. cutout installations) operating/monitoring devices like the Automation Panel or Power Panel are protected on the front. The back of all devices must be protected from dust and moisture and cleaned at suitable intervals.

2.6.3 Viruses and dangerous programs

This system is subject to potential risk 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 preventive measures such as virus protection programs, firewalls, etc. and making sure that software is only obtained from trusted sources.

2.7 Environmentally friendly disposal

All B&R programmable controllers, operating/monitoring devices and uninterruptible power supplies are designed to inflict as little harm as possible on the environment.

2.7.1 Separation of materials

It is necessary to separate different materials so the device can undergo an environmentally friendly recycling process.

Component	Disposal
Programmable logic controllers Operating/Monitoring devices Uninterruptible power supply Batteries and rechargeable batteries Cables	Electronics recycling
Cardboard box / Paper packaging	Cardboard box / Paper recycling
Plastic packaging	Plastic recycling

Table 2: Environmentally friendly separation of materials

Disposal must comply with applicable legal regulations.

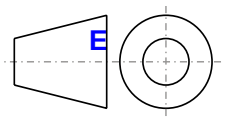
3 Organization of safety notices

Safety notices in this manual are organized as follows:

Safety notice	Description
Danger!	Disregarding these safety guidelines and notices can be life-threatening.
Warning!	Disregarding these safety guidelines and notices can result in severe injury or substantial damage to equipment.
Caution!	Disregarding these safety guidelines and notices can result in injury or damage to equipment.
Information:	This information is important for preventing errors.

Table 3: Description of the safety notices used in this documentation

4 Guidelines



European dimension standards apply to all dimension diagrams in this document.

All dimensions are specified in mm.

Range of nominal sizes	General tolerance according to DIN ISO 2768 (medium)
Up to 6 mm	±0.1 mm
For 6 to 30 mm	±0.2 mm
For 30 to 120 mm	±0.3 mm
For 120 to 400 mm	±0.5 mm
For 400 to 1000 mm	±0.8 mm

Table 4: Range of nominal sizes

5 Overview

Product ID	Short description	on page
5AP1120.1043-000	Automation Panel 10.4" VGA TFT - 640 x 480 pixels (4:3) - Single-touch (analog resistive) - Control cabinet installation - Landscape format - Front USB interface - For PPC900 / PPC2100 / Link modules - Installation compatible with 5PP520.1043-00	93
5AP1120.1214-000	Automation Panel 12.1" SVGA TFT - 800 x 600 pixels (4:3) - Single-touch (analog resistive) - Control cabinet installation - Landscape format - Front USB interface - For PPC900 / PPC2100 / Link module - Installation compatible with 5PP520.1214-00	105
5AP1120.1505-000	Automation Panel 15.0" XGA TFT - 1024 x 768 pixels (4:3) - Single-touch (analog resistive) - Control cabinet installation - Landscape format - Front USB interface - For PPC900 / PPC2100 / Link module - Installation compatible with 5PP520.1505-00/5AP920.1505-01/ 5PC720.1505-xx/5PC820.1505-00	107
5AP1120.156B-000	Automation Panel 15.6" HD TFT - 1366 x 768 pixels (16:9) - Single-touch (analog resistive) - Control cabinet installation - Landscape format - For PPC900 / PPC2100 / link modules	111
5AP1120.1906-000	Automation Panel 19.0" SXGA TFT - 1280 x 1024 pixels (4:3) - Single-touch (analog resistive) - Control cabinet installation - Landscape format - Front USB interface - For PPC900 / PPC2100 / Link module - Installation compatible with 5AP920.1906-01 5PC720.1906-00/5PC820.1906-00	113
5AP1180.1043-000	Automation Panel 10.4" VGA TFT - 640 x 480 pixels (4:3) - Single-touch (analog resistive) - Control cabinet installation - Landscape format - Front USB interface - 22 function keys - For PPC900 / PPC2100 / Link module - Installation compatible with 5PP580.1043-00/ 5AP980.1043-01	96
5AP1180.1505-000	Automation Panel 15.0" XGA TFT - 1024 x 768 pixels (4:3) - Single-touch (analog resistive) - Control cabinet installation - Landscape format - Front USB interface - 32 function keys - For PPC900 / PPC2100 / Link modules - Installation compatible with 5PP580.1505-00/5AP980.1505-01	109
5AP1181.1043-000	Automation Panel 10.4" VGA TFT - 640 x 480 pixels (4:3) - Single-touch (analog resistive) - Control cabinet installation - Portrait format - Front USB interface - 38 function keys and 20 system keys - For PPC900 / PPC2100 / Link module - Installation compatible with 5PP581.1043-00 5AP981.1043-01/5PC781.1043-00	99
5AP1182.1043-000	Automation Panel 10.4" VGA TFT - 640 x 480 pixels (4:3) - Single-touch (analog resistive) - Control cabinet installation - Landscape format - Front USB interface - 44 function keys and 20 system keys - For PPC900 / PPC2100 / Link module - Installation compatible with 5PP582.1043-00 5AP982.1043-01/5PC782.1043-00	102
	Accessories	
5SWUTI.0001-000	HMI Service Center USB Flash Drive - Hardware diagnostics software - For APC810/PPC800 - For APC910/PPC900 - For APC2100/PPC2100 - For APC51x/PP500 - For Automation Panel 800/900	331
	Batteries	
0AC201.91	Lithium batteries 4 pcs., 3 V / 950 mAh button cell We hereby state that the lithium cells contained in this shipment qualify as "partly regulated". Handle with care. If the package is damaged, inspect the cells, repack intact cells and protect cells against short circuits. For emergency information, call RENATA SA at + 41 61 319 28 27	340
4A0006.00-000	Lithium battery, 3 V / 950 mAh, button cell	340
	Bus units	
5AC902.BX01-00	PPC900 bus unit, 1-slot - 1 PCI - 1 slide-in	126
5AC902.BX01-01	PPC900 bus unit, 1-slot - 1 PCI Express x8 - 1 slide-in	126
5AC902.BX02-00	PPC900 bus unit, 2-slot - 2 PCI - 1 slide-in	126
5AC902.BX02-01	PPC900 2-slot bus unit - 1 PCI - 1 PCI Express x8 - 1 slide-in	126
5AC902.BX02-02	PPC900 bus unit, 2-slot - 2 PCI Express x4 - 1 slide-in	126
	CFast cards	
5CFAST.016G-00	CFast card, 16 GB SLC	343
5CFAST.032G-00	CFast card, 32 GB SLC	343
5CFAST.032G-10	CFast card, 32 GB MLC	347
5CFAST.064G-10	CFast card, 64 GB MLC	347
5CFAST.128G-10	CFast card, 128 GB MLC	347
5CFAST.2048-00	CFast card, 2 GB SLC	343
5CFAST.4096-00	CFast card, 4 GB SLC	343
5CFAST.8192-00	CFast card, 8 GB SLC	343
	CPU boards	
5PC901.TS77-00	CPU board Intel Core i7 3615QE 2.3 GHz - Quad core - QM77 chipset - For Panel PC 900	116
5PC901.TS77-01	CPU board Intel Core i7 3612QE 2.1 GHz - Quad core - QM77 chipset - For Panel PC 900	116
5PC901.TS77-03	CPU board Intel Core i7 3517UE 1.7 GHz - Dual core - QM77 chipset - For Panel PC 900	116
5PC901.TS77-04	CPU board Intel Core i5 3610ME 2.7 GHz - Dual core - QM77 chipset - For Panel PC 900	116
5PC901.TS77-05	CPU board Intel Core i3 3120ME 2.4 GHz - Dual core - QM77 chipset - For Panel PC 900	116
5PC901.TS77-06	CPU board Intel Core i3 3217UE 1.6 GHz - Dual core - QM77 chipset - For Panel PC 900	116
5PC901.TS77-07	CPU board Intel Celeron 847E 1.1 GHz - Dual core - HM76 chipset - For Panel PC 900	119
5PC901.TS77-08	CPU board Intel Celeron 827E 1.4 GHz - Single core - HM76 chipset - For Panel PC 900	119
5PC901.TS77-09	CPU board Intel Celeron 1020E 2.2 GHz - Dual core - HM76 chipset - For Panel PC 900	119
5PC901.TS77-10	CPU board Intel Celeron 1047UE 1.4 GHz - Dual core - HM76 chipset - For Panel PC 900	119
	DVI cables	
5CADVI.0018-00	DVI-D cable - 1.8 m	352
5CADVI.0050-00	DVI-D cable - 5 m	352
5CADVI.0100-00	DVI-D cable - 10 m	352
	Debian 8	
5SWLIN.0541-MUL	Debian 8 - 32-bit - Multilingual - For PPC900 - Image	320
5SWLIN.0641-MUL	Debian 8 - 64-bit - Multilingual - For PPC900 - Image	320
	Display units	
5AP923.1215-00	Automation Panel 12.1" XGA TFT - 1024 x 768 pixels (4:3) - Single-touch (analog resistive) - Control cabinet installation - Landscape format - For PPC900 / PPC2100 / Link modules	79
5AP923.1505-00	Automation Panel 15.0" XGA TFT - 1024 x 768 pixels (4:3) - Single-touch (analog resistive) - Control cabinet installation - Landscape format - For PPC900 / PPC2100 / Link modules	81
5AP923.1906-00	Automation Panel 19.0" SXGA TFT - 1280 x 1024 pixels (4:3) - Single-touch (analog resistive) - Control cabinet installation - Landscape format - For PPC900 / PPC2100 / Link modules	83

Product ID	Short description	on page
5AP933.156B-00	Automation Panel 15.6" HD TFT - 1366 x 768 pixels (16:9) - Multi-touch (projected capacitive) - Control cabinet installation - Landscape format - For PPC900 / PPC2100 / Link modules	85
5AP933.185B-00	Automation Panel 18.5" HD TFT - 1366 x 768 pixels (16:9) - Multi-touch (projected capacitive) - Control cabinet installation - Landscape format - For PPC900 / PPC2100 / Link modules	87
5AP933.215C-00	Automation Panel 21.5" Full HD TFT - 1920 x 1080 pixels (16:9) - Multi-touch (projected capacitive) - Control cabinet installation - Landscape format - For PPC900 / PPC2100 / Link modules	89
5AP933.240C-00	Automation Panel 24.0" Full HD TFT - 1920 x 1080 pixels (16:9) - Multi-touch (projected capacitive) - Control cabinet installation - Landscape format - For PPC900 / PPC2100 / Link modules	91
	Drives	
5AC901.CCFA-00	CFast adapter - For slide-in compact slot	152
5AC901.CHDD-01	500 GB hard disk - Slide-in compact - SATA	129
5AC901.CHDD-99	Slide-in compact kit	151
5AC901.CSSD-03	60 GB SSD MLC - Slide-in compact - SATA	131
5AC901.CSSD-04	128 GB SSD MLC - Slide-in compact - SATA	134
5AC901.CSSD-05	256 GB SSD MLC - Slide-in compact - Toshiba - SATA	137
5AC901.CSSD-06	512 GB SSD MLC - Slide-in compact - Toshiba - SATA	139
5AC901.SDVW-00	DVD drive - DVD-R/RW|DVD+R/RW - Slide-in	153
5AC901.SSCA-00	Slide-in compact adapter - For slide-in compact drives	155
5MMSSD.0060-01	60 GB SSD MLC - Intel - SATA	141
5MMSSD.0128-01	128 GB SSD MLC - Toshiba - SATA	144
5MMSSD.0256-00	256 GB SSD MLC - Toshiba - SATA	147
5MMSSD.0512-00	512 GB SSD MLC - Toshiba - SATA	149
	Fan kit	
5AC902.FA00-00	PPC900 fan kit - For system unit 5PC911.SX00-00	127
5AC902.FA0X-00	PPC900 fan kit - For PPC900 bus unit	128
	Interface options	
5AC901.I485-00	Interface card - 1x RS232/422/458 interface - For APC910/PPC900	156
5AC901.ICAN-00	Interface card - 1x CAN interface - For APC910/PPC900	160
5AC901.IHDA-00	Interface card - 1x audio interface (1x MIC/1x Line In/1x OUT) - For APC910/PPC900	169
5AC901.IPLK-00	Interface card - 1x POWERLINK interface - 2 MB SRAM - For APC910/PPC900	165
5AC901.IRDY-00	Interface card - Ready relay - For APC910/PPC900	171
5AC901.ISIO-00	Interface card - System I/O - For APC910/PPC900	173
5AC901.ISRM-00	Interface cards - 2 MB SRAM - For APC910/PPC900	164
	Main memory	
5MMDDR.1024-03	SO-DIMM DDR3, 1024 MB	124
5MMDDR.2048-03	SO-DIMM DDR3, 2048 MB	124
5MMDDR.4096-03	SO-DIMM DDR3, 4096 MB	124
5MMDDR.8192-03	SO-DIMM DDR3, 8192 MB	124
	Power supply	
5AC902.PS00-00	PPC900 power supply 85-264 VAC	190
	RS232 cables	
9A0014.02	RS232 extension cable for remote operation of a display unit with touch screen, 1.8 m	369
9A0014.05	RS232 extension cable for remote operation of a display unit with touch screen, 5 m	369
9A0014.10	RS232 extension cable for remote operation of a display unit with touch screen, 10 m	369
	SDL cables	
5CASDL.0008-00	SDL cable - 0.8 m	355
5CASDL.0018-00	SDL cable - 1.8 m	355
5CASDL.0050-00	SDL cable - 5 m	355
5CASDL.0100-00	SDL cable - 10 m	355
5CASDL.0150-00	SDL cable - 15 m	355
5CASDL.0200-00	SDL cable - 20 m	355
5CASDL.0250-00	SDL cable - 25 m	355
5CASDL.0300-00	SDL cable - 30 m	355
	SDL cables with 45° connectors	
5CASDL.0018-01	SDL cable - 45 degree connector - 1.8 m	358
5CASDL.0050-01	SDL cable - 45 degree connector - 5 m	358
5CASDL.0100-01	SDL cable - 45 degree connector - 10 m	358
5CASDL.0150-01	SDL cable - 45 degree connector - 15 m	358
	SDL flex cables	
5CASDL.0018-03	SDL flex cable - 1.8 m	361
5CASDL.0050-03	SDL flex cable - 5 m	361
5CASDL.0100-03	SDL flex cable - 10 m	361
5CASDL.0150-03	SDL flex cable - 15 m	361
5CASDL.0200-03	SDL flex cable - 20 m	361
5CASDL.0250-03	SDL flex cable - 25 m	361
5CASDL.0300-03	SDL flex cable - 30 m	361
5CASDL.0300-13	SDL flex cable with extender - 30 m	364
5CASDL.0400-13	SDL flex cable with extender - 40 m	364
5CASDL.0430-13	SDL flex cable with extender - 43 m	364
	System units	
5PC911.SX00-00	PPC900 active system unit	122
5PC911.SX00-01	PPC900 passive system unit	123
	Technology Guard	
0TG1000.01	Technology Guard (MSD) is made available in the USB device class MSD (Mass Storage Device)	318

Product ID	Short description	on page
0TG1000.02	Technology Guard (HID) is available for the USB device class HID (human interface device). Automation Runtime supports HID beginning with version D4.09.	318
1TG4600.10-5	Automation Runtime Windows, TG license	318
1TG4601.06-5	Automation Runtime Embedded, TG license	318
	Terminal blocks	
0TB103.9	Connector 24 VDC - 3-pin female - Screw clamps 3.31 mm²	337
0TB103.91	Connector 24 VDC - 3-pin female - Cage clamp terminal block 3.31 mm²	337
0TB2104.8000	Connector 24 VDC - 4-pin female - Screw clamps 2.5 mm²	339
0TB3103.8000	Connector, 230 VAC, 3-pin female, 4 mm² screw clamps, protected against vibration by the screw flange	338
	USB accessories	
5MMUSB.2048-01	USB 2.0 flash drive, 2048 MB, B&R	350
5MMUSB.4096-01	USB 2.0 flash drive, 4096 MB, B&R	350
	USB cables	
5CAUSB.0018-00	USB 2.0 connection cable - Type A - Type B connector - 1.8 m	368
5CAUSB.0050-00	USB 2.0 connection cable - Type A - Type B connector - 5 m	368
	Uninterruptible power supplies	
5AC901.BUPS-00	Battery unit 4.5 Ah - For UPS 5AC901.IUPS-00	180
5AC901.BUPS-01	Battery unit 2.2 Ah - For UPS 5AC901.IUPS-01	184
5AC901.IUPS-00	UPS - For 4.5 Ah battery	176
5AC901.IUPS-01	UPS - For 2.2 Ah battery	178
5CAUPS.0005-01	UPS cable - 0.5 m - For 5AC901.IUPS-xx	188
5CAUPS.0010-01	UPS cable - 1 m - For 5AC901.IUPS-xx	188
5CAUPS.0030-01	UPS cable - 3 m - For 5AC901.IUPS-xx	188
	Windows 7 Professional/Ultimate	
5SWWI7.1100-ENG	Windows 7 Professional SP1 - 32-bit - English - DVD	309
5SWWI7.1100-GER	Windows 7 Professional SP1 - 32-bit - German - DVD	309
5SWWI7.1200-ENG	Windows 7 Professional SP1 - 64-bit - English - DVD	309
5SWWI7.1200-GER	Windows 7 Professional SP1 - 64-bit - German - DVD	309
5SWWI7.1300-MUL	Windows 7 Ultimate SP1 - 32-bit - Multilingual - DVD	309
5SWWI7.1400-MUL	Windows 7 Ultimate SP1 - 64-bit - Multilingual - DVD	309
	Windows Embedded 8.1 Industry Professional	
5SWWI8.0341-MUL	Windows 8.1 Industry Professional - 32-bit - Multilingual - For PPC900 QM77/HM76 - License	306
5SWWI8.0441-MUL	Windows 8.1 Industry Professional - 64-bit - Multilingual - For PPC900 QM77/HM76 - License	306
	Windows Embedded Standard 2009	
5SWWXP.0741-ENG	Windows Embedded Standard 2009 - English - For PPC900 with QM77/HM76 chipset	316
	Windows Embedded Standard 7	
5SWWI7.1541-ENG	Windows Embedded Standard 7 SP1 - 32-bit - English - For PPC900 with QM77/HM76 chipset - License	312
5SWWI7.1641-ENG	Windows Embedded Standard 7 SP1 - 64-bit - English - For PPC900 with QM77/HM76 chipset - License	312
5SWWI7.1741-MUL	Windows Embedded Standard 7 Premium SP1 - 32-bit - Multilingual - For PPC900 with QM77/HM76 chipset - License	312
5SWWI7.1841-MUL	Windows Embedded Standard 7 Premium SP1 - 64-bit - Multilingual - For PPC900 with QM77/HM76 chipset - License	312
	Windows XP Professional	
5SWWXP.0600-ENG	Windows XP Professional SP3 - English - CD	314
5SWWXP.0600-GER	Windows XP Professional SP3 - German - CD	314
5SWWXP.0600-MUL	Windows XP Professional SP3 - Multilingual - CD	314

Chapter 2 • Technical data

1 Introduction

1.1 About this user's manual

This user's manual contains all relevant information about an operational Panel PC 900.

1.2 Description of individual modules

1.2.1 Display units AP9x3

AP9x3 display units consist of a display and touch screen and form the basis for the Automation Panel 9x3, Panel PC 900 and Panel PC 2100 system families. Different display sizes and touch screen technologies are available. These display units can only be operated as a complete system together with a link module (Automation Panel 9x3) or CPU board and system unit (Panel PC 900, Panel PC 2100). Display units are mounted using retaining clips. Model numbers for single-touch display units begin with 5AP923.xxxx-xx; those for multi-touch display units begin with 5AP933.xxxx-xx.

1.2.2 AP1000 display units

AP1000 display units form the basis for the Automation Panel 1000, Panel PC 900 and Panel PC 2100 system families. A wide selection of different display sizes and display units with touch screen are available. These display units can only be operated as a complete system together with a link module (Automation Panel 1000) or CPU board and system unit (Panel PC 900, Panel PC 2100). Display units are mounted using retaining clips or clamping blocks.

1.2.3 CPU board and system unit

In addition to making it possible to insert interface options, slide-in compact drives and CFast cards, the CPU board also includes all of the PPC900's interfaces.

A system unit consists of an anthracite gray housing and heat sink. Both passive variants (without a fan kit) and active variants (with a fan kit) are available.

An operational Panel PC 900 is assembled by installing a CPU board, system unit, main memory and mass storage device on a display unit. Panel PC 900 systems are mounted using retaining clips.

A CPU board and system unit cannot function without a display unit.

1.3 Structure/Configuration

Automation Panel 9x3, Panel PC 900 and Panel PC 2100 systems can be assembled to meet individual requirements and operating conditions. Automation Panel 9x3, Panel PC 900 and Panel PC 2100 systems are so flexible that an Automation Panel can be converted to a Panel PC, or vice versa.

1.3.1 Configuration

The following components are absolutely essential for operation as a Panel PC 900:

- Display unit
- CPU board
- System unit
- Main memory
- Fan kit[1)]
- Drive (mass storage device such as CFast card or hard disk) for the operating system
- Operating system

Panel PC 900 systems can be operated with or without a fan kit. This choice plays a role in determining the type of housing to be used.

Using a fan kit allows for operation at higher ambient temperatures. More information can be found in section "Maximum ambient temperature during operation" on page 34.

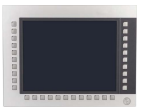
1) It may be necessary to use a fan kit under certain conditions. Detailed information can be found in section "Maximum ambient temperature during operation" on page 34.

Configuration - Base system

Display unit — Select 1

	Display size	Resolution	Touch screen	Keys	Format
Display unit 923					
5AP923.1215-00	12.1"	XGA	Single-touch	No	Landscape
5AP923.1505-00	15.0"	XGA	Single-touch	No	Landscape
5AP923.1906-00	19.0"	SXGA	Single-touch	No	Landscape

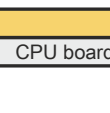
Display unit 933					
5AP933.156B-00	15.6"	HD	Multi-touch	No	Landscape
5AP933.185B-00	18.5"	HD	Multi-touch	No	Landscape
5AP933.215C-00	21.5"	FHD	Multi-touch	No	Landscape
5AP933.240C-00	24.0"	FHD	Multi-touch	No	Landscape



Display unit 1120					
5AP1120.1043-000	10.4"	VGA	Single-touch	No	Landscape
5AP1120.1214-000	12.1"	SVGA	Single-touch	No	Landscape
5AP1120.1505-000	15.0"	XGA	Single-touch	No	Landscape
5AP1120.156B-000	15.6"	HD	Single-touch	No	Landscape
5AP1120.1906-000	19.0"	SXGA	Single-touch	No	Landscape

Display unit 1180					
5AP1180.1043-000	10.4"	VGA	Single-touch	Yes	Landscape
5AP1180.1505-000	15.5"	XGA	Single-touch	Yes	Landscape

Display unit 1181					
5AP1181.1043-000	10.4"	VGA	Single-touch	Yes	Portrait



Display unit 1182					
5AP1182.1043-000	10.4"	VGA	Single-touch	Yes	Landscape

CPU board - System unit - Fan kit - Main memory

CPU board — Select 1

QM77 CPU boards		HM76 CPU boards
5PC901.TS77-00 [1)]	5PC901.TS77-04	5PC901.TS77-07
5PC901.TS77-01	5PC901.TS77-05	5PC901.TS77-08
5PC901.TS77-03	5PC901.TS77-06	5PC901.TS77-09
		5PC901.TS77-10

System unit — Select 1

5PC911.SX00-00 Active system	5PC911.SX00-01 Passive system

Fan kit — Select 1

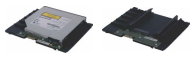
5AC902.FA00-00	

Main memory — Select 1 or 2

5MMDDR.1024-03	5MMDDR.4096-03
5MMDDR.2048-03	5MMDDR.8192-03

1) The 5PC901.TS77-00 CPU board can only be used with the 5PC911.SX00-00 system unit.

Figure 1: Panel PC 900 - Base system configuration

Accessory and software configuration	
Power supply	Select 1
	5AC902.PS00-00
Slide-in compact drives	Select 1
	5AC901.CHDD-01 5AC901.CSSD-03 5AC901.CSSD-04 5AC901.CSSD-05 5AC901.CSSD-06 5AC901.CCFA-00
IF options	Select max. 2 [1]
	5AC901.I485-00 5AC901.ICAN-00 5AC901.IHDA-00 5AC901.ISRM-00 5AC901.IPLK-00 5AC901.IRDY-00 5AC901.ISIO-00
UPS	Select 1 of each
	UPS module [2] **+ Battery unit + UPS cable** 5AC901.IUPS-00 + 5AC901.BUPS-00 5CAUPS.0005-01 5AC901.IUPS-01 + 5AC901.BUPS-01 5CAUPS.0010-01 5CAUPS.0030-01
	Bus unit - Slide-in drive - Fan kit
Bus units	Select 1
	5AC902.BX01-00 Bus 1PCI 1SI 5AC902.BX01-01 Bus 1PCIe.x8 1SI 5AC902.BX02-00 Bus 2PCI 1SI 5AC902.BX02-01 Bus 1PCI 1PCIe.x8 1SI 5AC902.BX02-02 Bus 2PCIe.x4 1SI
Slide-in drives	Select max. 1
	5AC901.SDVW-00 5AC901.SSCA-00
Fan kit [3]	Select max. 1
	5AC902.FA0X-00
CFast cards	Select 1
	5CFAST.2048-00 5CFAST.4096-00 5CFAST.8192-00 5CFAST.016G-00 5CFAST.032G-00 5CFAST.032G-10 5CFAST.064G-10 5CFAST.128G-10
USB accessories	Select 1
	5MMUSB.2048-01 5MMUSB.4096-01
Terminal blocks	Select 1
	DC power connector 0TB103.9 0TB103.91 **AC power connector** 0TB3103.8000
Operating systems	Select 1
Windows 7 Windows Embedded Standard 2009 Windows Embedded Standard 7 Automation Runtime Windows Embedded 8 debian	**Windows 7** 5SWWI7.1100-ENG 5SWWI7.1100-GER 5SWWI7.1300-MUL 5SWWI7.1200-ENG 5SWWI7.1200-GER 5SWWI7.1400-MUL **Windows Embedded Standard 7** 5SWWI7.1541-ENG 5SWWI7.1641-ENG 5SWWI7.1741-MUL 5SWWI7.1841-MUL **Windows Embedded Standard 2009** 05SWWXP.071-ENG **Windows Embedded 8.1 Industry** 5SWWI8.0341-MUL 5SWWI8.0441-MUL **Debian 8 (GNU/Linux)** 5SWLIN.0541-MUL 5SWLIN.0641-MUL **Automation Runtime** 0TG1000.01 0TG1000.02 1TG4600.10-5 1TG4601.06-5 **Windows XP** 5SWWXP.0600-ENG 5SWWXP.0600-GER 5SWWXP.0600-MUL

1) Certain limitations must be taken into account when using IF options. For more information, please refer to the section "Device interfaces" in Chapter 2 "Technical data".
2) The UPS module can only be operated in the IF option 1 slot.
3) If using an active system unit, then a fan kit must be selected for the bus unit.

Figure 2: Panel PC 900 - Accessory configuration

Configuration options

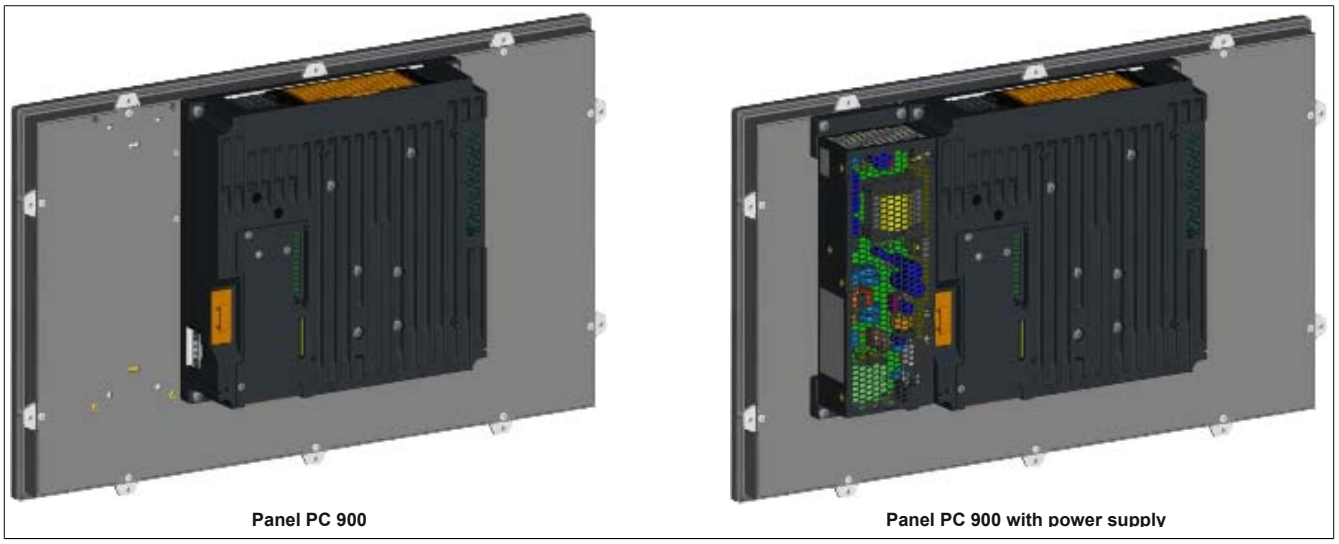


Figure 3: Panel PC 900 without bus unit

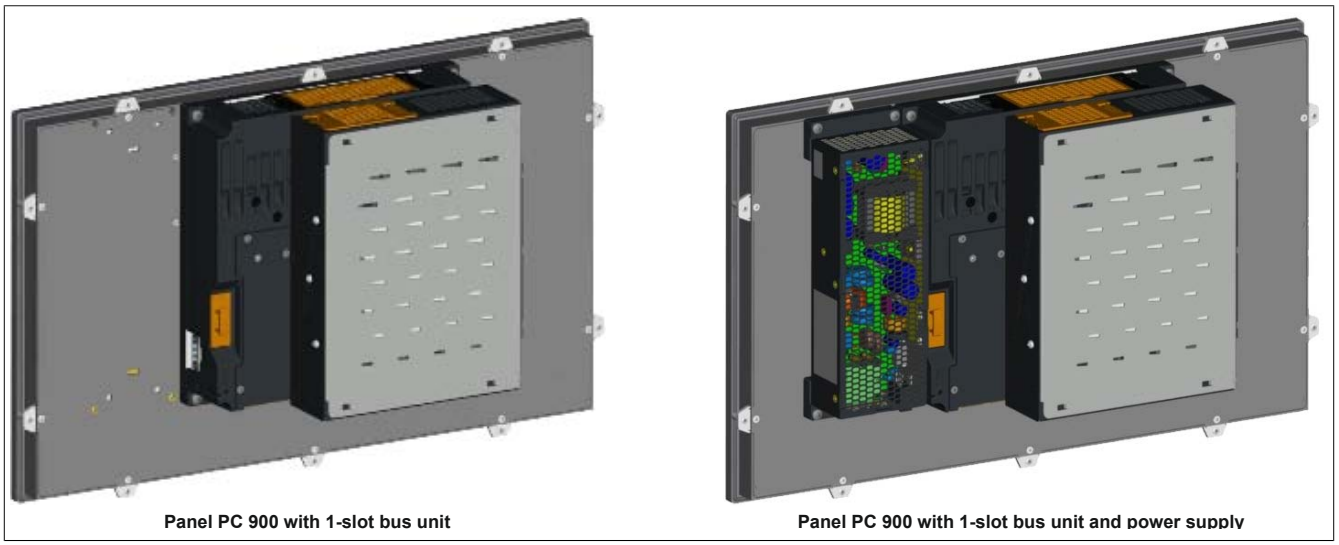


Figure 4: Panel PC 900 with 1-slot bus unit

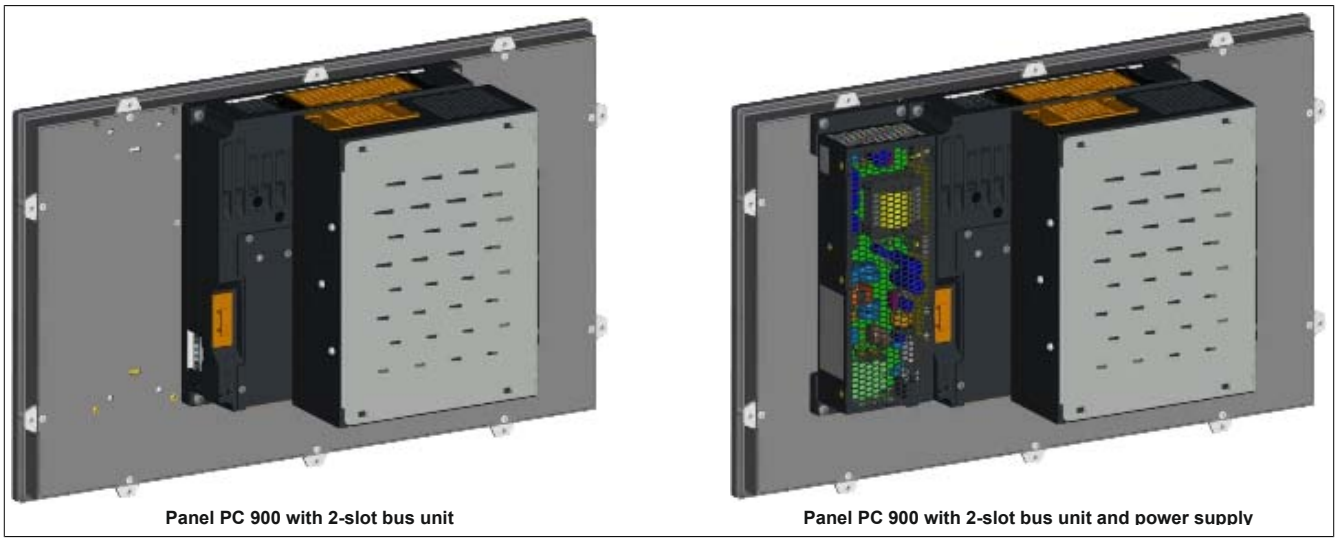


Figure 5: Panel PC 900 with 2-slot bus unit

2 Complete system

2.1 Mechanical characteristics

2.1.1 Dimensions

AP9x3 display units - Dimensions

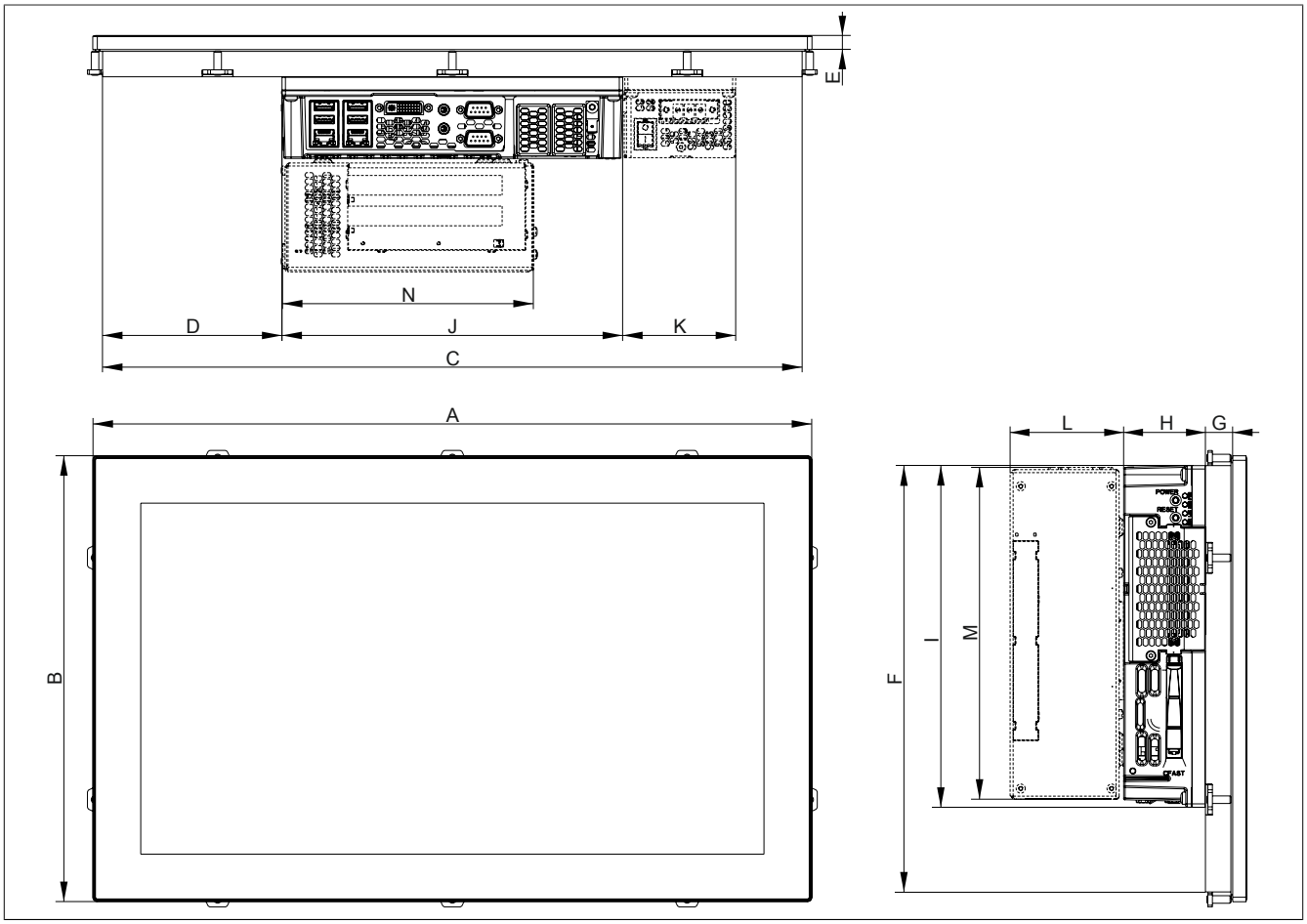


Figure 6: Panel PC 900 with AP9x3 display units - Dimensions

All dimensions are specified in mm.

Display type	Model number	A	B	C	D	E	F	G	H
12.1" single-touch	5AP923.1215-00	315	239	302	0	9	226	13.5	-
15.0" single-touch	5AP923.1505-00	370	288	357	36.5	9	275	14.5	-
19.0" single-touch	5AP923.1906-00	440	358	427	101	9	345	23	-
15.6" wide multi-touch	5AP933.156B-00	414	258.5	401	57.5	9	245.5	20	-
18.5" wide multi-touch	5AP933.185B-00	475	295	462	118.5	9	282	18	-
21.5" wide multi-touch	5AP933.215C-00	541.5	333	528.5	151.75	9	320	18	-
24.0" wide multi-touch	5AP933.240C-00	598.5	364	585.5	180.25	9	351	18	-

Table 5: Dimensions - AP9x3 display units

Component	Model number	T	U	V	W	X	Y	Z
CPU board and System unit	5PC901.TS77-xx & 5PC911.SX00-xx	54	226	225	-	-	-	-
1-slot bus unit	5AC902.BX01-xx	-	-	-	-	54.7	218	164
2-slot bus unit	5AC902.BX02-xx	-	-	-	-	75	218	164
Power supply	5AC902.PS00-00	53.5	225.5	-	74.5	-	-	-

Table 6: CPU boards, system units, bus units and power supply - Dimensions

Information:

2D and 3D drawings (in DXF and STEP format) can be downloaded from the B&R website (www.br-automation.com).

AP1000 display units with retaining clips - Dimensions

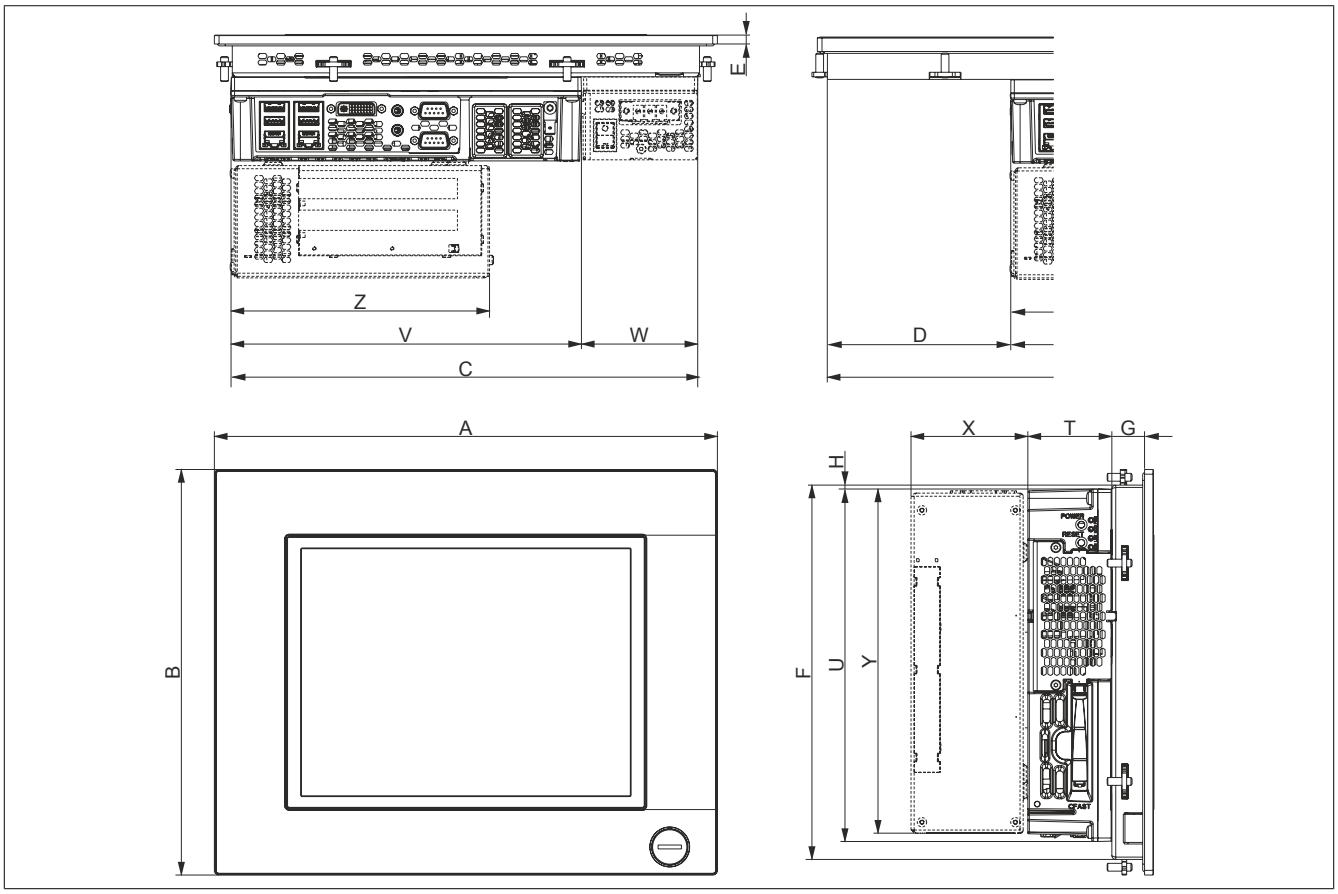


Figure 7: Panel PC 900 with AP1000 display units with retaining clips - Dimensions

All dimensions are specified in mm.

Display type	Model number	A	B	C	D	E	F	G	H
10.4" single-touch	5AP1120.1043-000	323	260	300	-	5.7	240	21	2.5
10.4" single-touch with keys	5AP1180.1043-000	323	260	300	-	5.7	240	21	2.5
15.6" single-touch	5AP1120.156B-000	414	258.5	401	57.5	9	245.5	20	-

Table 7: AP1000 display units with retaining clips - Dimensions

Component	Model number	T	U	V	W	X	Y	Z
CPU board and System unit	5PC901.TS77-xx & 5PC911.SX00-xx	54	226	225	-	-	-	-
1-slot bus unit	5AC902.BX01-xx	-	-	-	-	54.7	218	164
2-slot bus unit	5AC902.BX02-xx	-	-	-	-	75	218	164
Power supply	5AC902.PS00-00	53.5	225.5	-	74.5	-	-	-

Table 8: CPU boards, system units, bus units and power supply - Dimensions

Information:

2D and 3D drawings (in DXF and STEP format) can be downloaded from the B&R website (www.br-automation.com).

AP1000 display units with clamping blocks - Dimensions

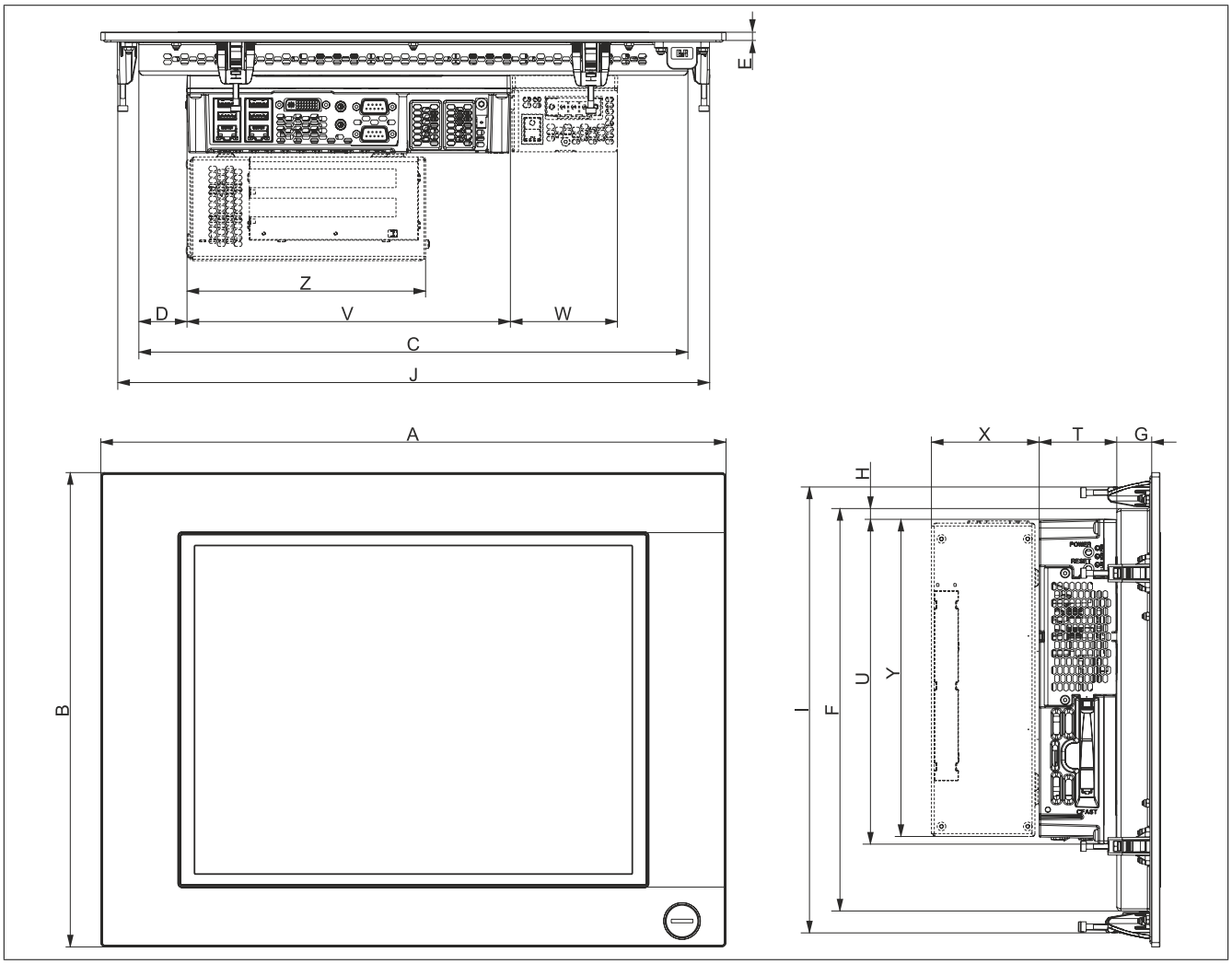


Figure 8: Panel PC 900 with AP1000 display units with clamping blocks - Dimensions

All dimensions are specified in mm.

Display type	Model number	A	B	C	D	E	F	G	H	I	J
10.4" single-touch with keys	5AP1181.1043-000	323	358	270	22.5	5.7	305	21.3	4	338	300
10.4" single-touch with keys	5AP1182.1043-000	423	288	355.5	22.5	5.7	234	21.3	4	268	400
12.1" single-touch	5AP1120.1214-000	362	284	309	4.5	5.7	234	20.3	4	264	339
15.0" single-touch	5AP1120.1505-000	435	330	382	33.5	5.7	280	24.3	10.5	310	412
15.0" single-touch with keys	5AP1180.1505-000	435	330	382	33.5	5.7	280	24.3	10.5	310	412
19.0" single-touch	5AP1120.1906-000	527	421	445	138.5	5.7	351	23.3	5.8	401	507

Table 9: AP1000 display units with clamping blocks - Dimensions

Component	Model number	T	U	V	W	X	Y	Z
CPU board and System unit	5PC901.TS77-xx & 5PC911.SX00-xx	54	226	225	-	-	-	-
1-slot bus unit	5AC902.BX01-xx	-	-	-	-	54.7	218	164
2-slot bus unit	5AC902.BX02-xx	-	-	-	-	75	218	164
Power supply	5AC902.PS00-00	53.5	225.5	-	74.5	-	-	-

Table 10: CPU boards, system units, bus units and power supply - Dimensions

Information:

2D and 3D drawings (in DXF and STEP format) can be downloaded from the B&R website (www.br-automation.com).

2.1.2 Installation diagrams

Information:

When installing the Panel PC 900, be sure to leave sufficient space for air circulation as well as additional space for operation and maintenance of the device.

AP9x3 display units - Installation diagrams

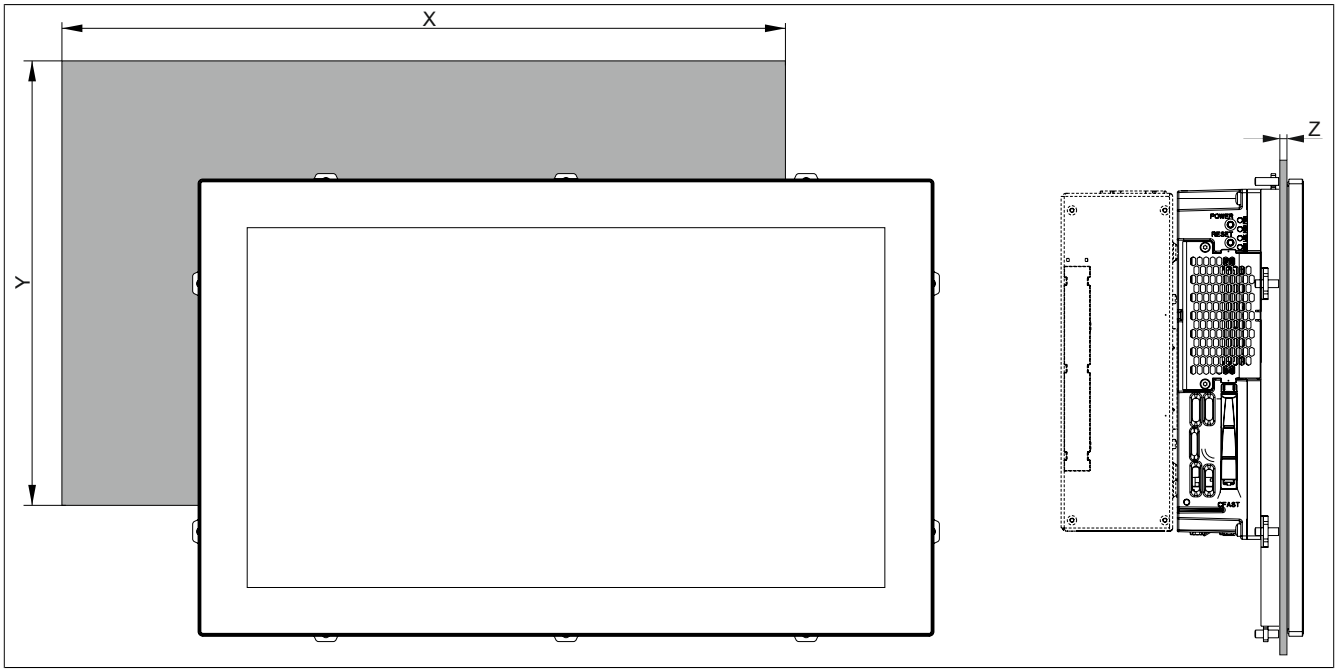


Figure 9: Panel PC 900 with AP9x3 display units - Installation diagram

All dimensions are specified in mm.

The cutout tolerance values are +0 mm / -0.5 mm.

Display type	Model number	X	Y	Z min	Z max	Number of retaining clips
12.1" single-touch	5AP923.1215-00	304	228	1	6	10 pcs.
15.0" single-touch	5AP923.1505-00	359	277	1	6	10 pcs.
19.0" single-touch	5AP923.1906-00	429	347	1	6	12 pcs.
15.6" multi-touch	5AP933.156B-00	403	247.5	1	6	10 pcs.
18.5" multi-touch	5AP933.185B-00	464	284	1	6	10 pcs.
21.5" multi-touch	5AP933.215C-00	530.5	322	1	6	14 pcs.
24.0" multi-touch	5AP933.240C-00	587.5	353	1	6	14 pcs.

Table 11: Installation diagrams - AP9x3 display units

The "Z" dimension indicates the thickness of the wall or control cabinet panel.

A hex screwdriver is needed to tighten and loosen the screws on the retaining clips. The maximum tightening torque for the retaining clips is 1 Nm.

AP1000 display units with retaining clips - Installation diagrams

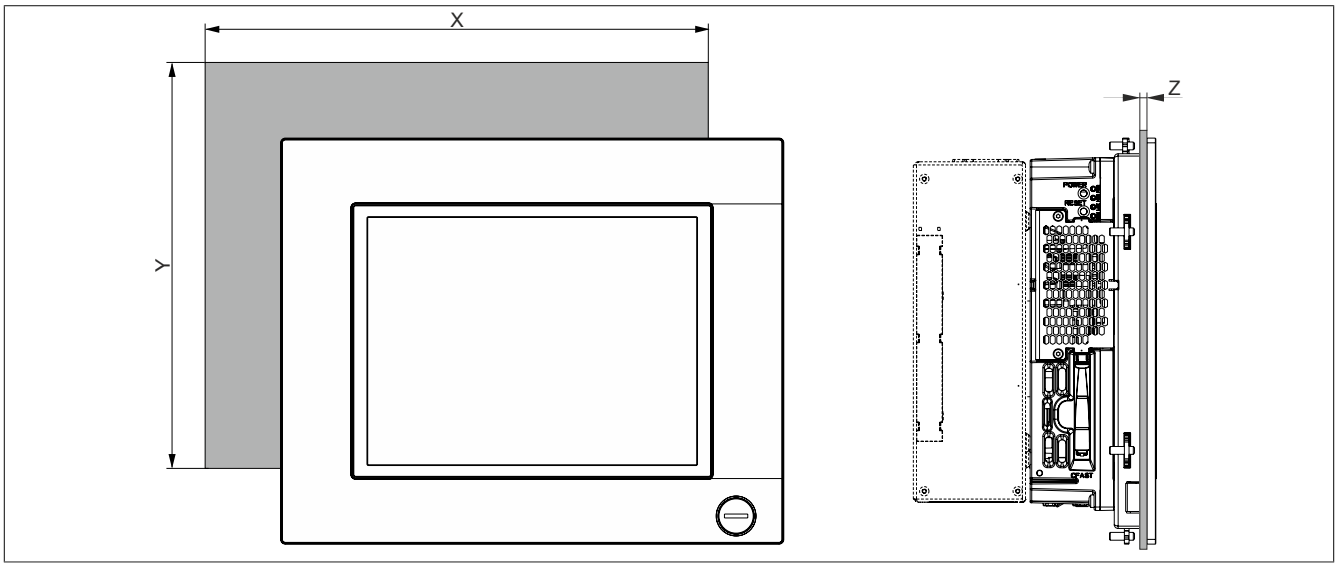


Figure 10: Panel PC 900 with AP1000 display units with retaining clips - Installation diagram

All dimensions are specified in mm.

The cutout tolerance values are +0 mm / -0.5 mm.

Display type	Model number	X	Y	Z min	Z max	Number of retaining clips
10.4" single-touch	5AP1120.1043-000	303	243	1	10	8
10.4" single-touch with keys	5AP1180.1043-000	303	243	1	10	8
15.6" single-touch	5AP1120.156B-000	403	247.5	1	6	10

Table 12: AP1000 display units with retaining clips - Installation diagrams

The "Z" measurement indicates the thickness of the wall or control cabinet panel.

A hex screwdriver is needed to tighten and loosen the screws on the retaining clips. The maximum tightening torque for the retaining clips is 1 Nm.

AP1000 display units with clamping blocks - Installation diagrams

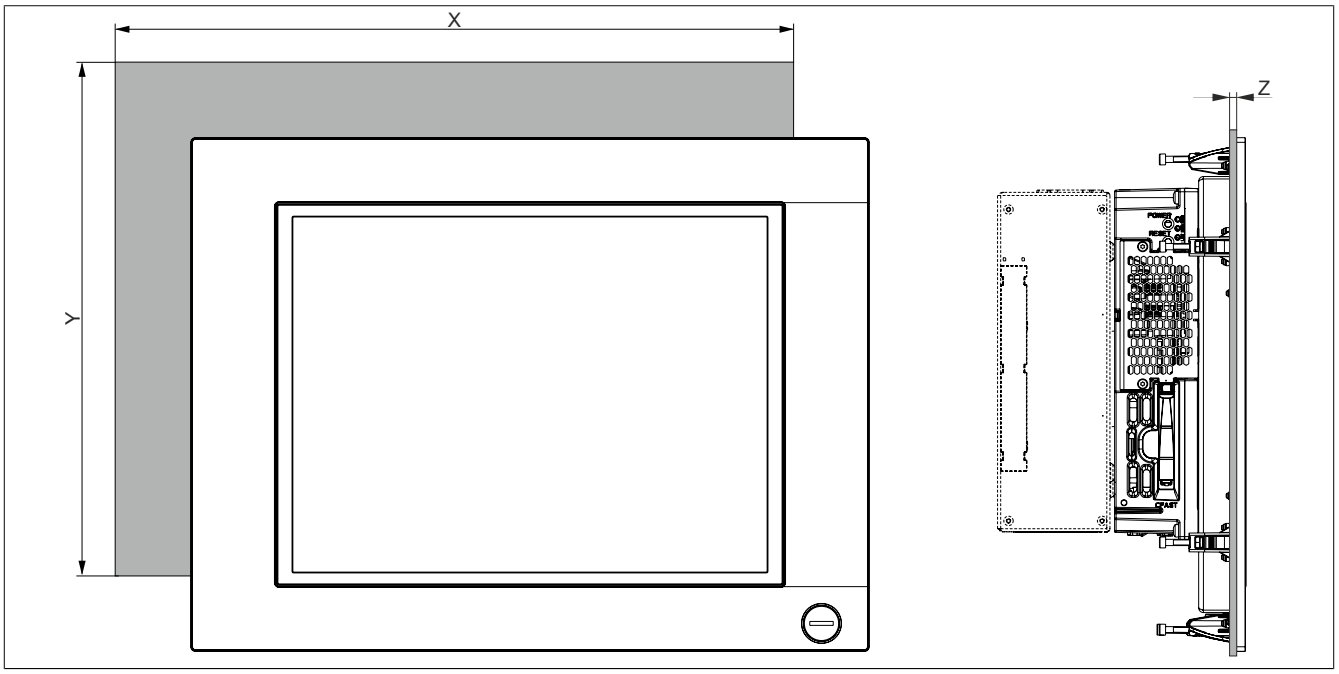


Figure 11: Panel PC 900 with AP1000 display units with retaining clips - Clamping blocks

All dimensions are specified in mm.

The cutout tolerance values are +0 mm / -0.5 mm.

Display type	Model number	X	Y	Z min	Z max	Number of clamping blocks
10.4" single-touch with keys	5AP1181.1043-000	303	341	2	10	10
10.4" single-touch with keys	5AP1182.1043-000	403	271	2	10	8
12.1" single-touch	5AP1120.1214-000	342	267	2	10	8
15.0" single-touch	5AP1120.1505-000	415	313	2	10	8
15.0" single-touch with keys	5AP1180.1505-000	415	313	2	10	8
19.0" single-touch	5AP1120.1906-000	510	404	2	10	12

Table 13: AP1000 display units with clamping blocks - Installation diagrams

The "Z" measurement indicates the thickness of the wall or control cabinet panel.

A 3 mm hex socket screwdriver is needed to tighten and loosen the screws on the clamping blocks. The maximum tightening torque for the clamping blocks is 0.5 Nm.

2.1.3 Spacing for air circulation

In order to guarantee sufficient air circulation, allow the specified amount of space above, below, to the side and behind the device. The minimum specified spacing is indicated in the following diagram. This applies to all variants.

Information:

The following image and table provide a thermal examination of the complete system. If additional space is needed to operate or maintain the device, this must be taken into consideration during installation.

The air intake and outlet are indicated in the following image for active Panel PCs (i.e. with a fan kit). The air intake on passive Panel PCs (i.e. without a fan kit) is located on the bottom to accommodate the rising warm air.

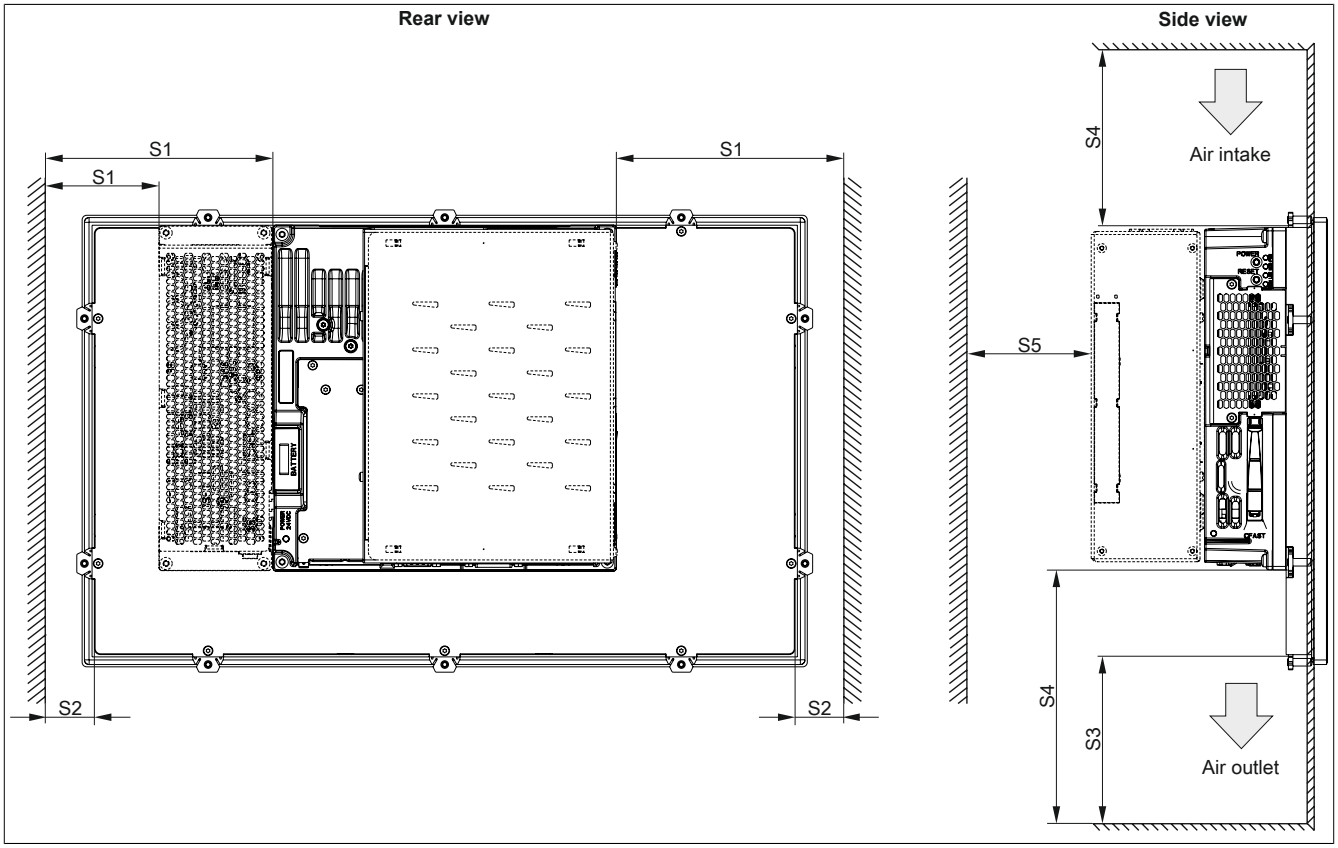


Figure 12: Panel PC 900 - Spacing for air circulation

S1: ≥ 20 mm

S2: ≥ 20 mm

S3: ≥ 50 mm

S4: ≥ 100 mm

S5: ≥ 50 mm

Caution!

Spacing specifications for air circulation are based on the worst-case scenario for operation at the maximum specified ambient temperature. The maximum specified ambient temperature must not be exceeded!

If the spacing specifications for air circulation cannot be observed, then the maximum specified temperatures for the temperature sensors (see "Temperature sensor positions" on page 38) must be monitored by the user and appropriate measures taken if they are exceeded.

2.1.4 Mounting orientations

The following diagrams show the approved mounting orientations for the Panel PC 900. The PPC900 must be mounted as described in the following sections.

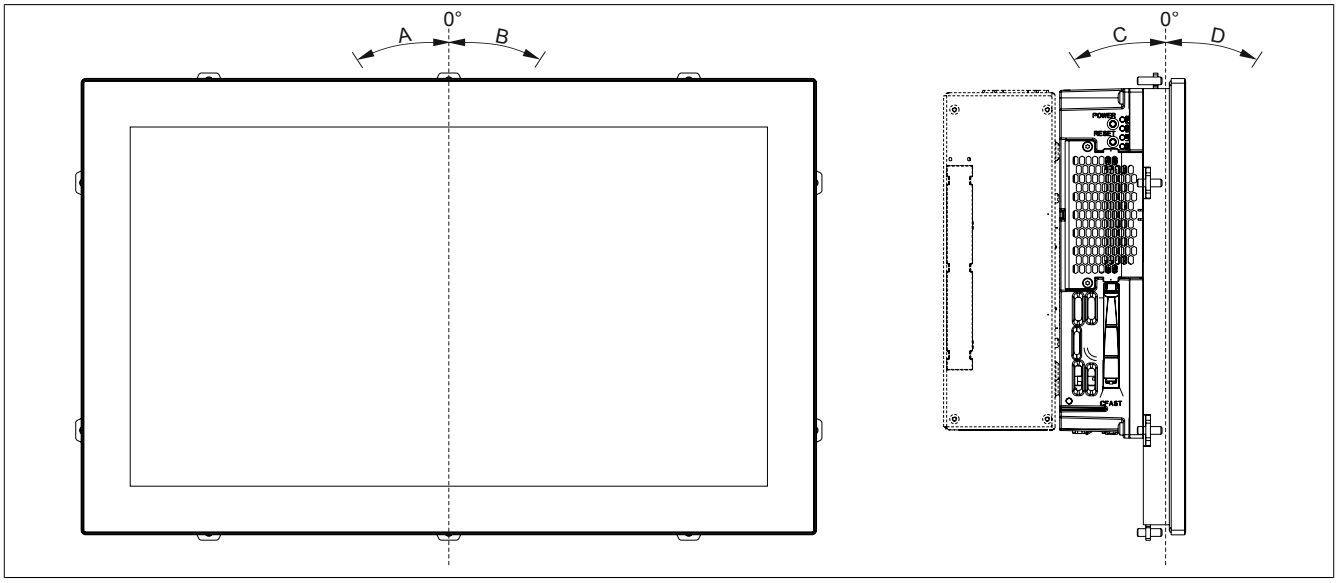


Figure 13: Panel PC 900 - Mounting orientation

Mounting orientation		Ambient temperature limitation[1)]
0°	0°	None
A	-1° to -90° (counterclockwise)	None
B	+1° to +90° (clockwise)	5°C
C, D	±180° (interfaces on top)	None
C	-1° to -45°	None
C	-46° to -90°	10°C
D	+1° to +90° (display facing down)	5°C

Table 14: Mounting orientations when operated without a fan kit

1) The maximum ambient temperature must be reduced by ....

Mounting orientation		Ambient temperature limitation[1)]
0°	0°	None
A	-1° to -90° (counterclockwise)	None
B	+1° to +90° (clockwise)	5°C
C, D	±180° (interfaces on top)	None
C	-1° to -45°	None
C	-46° to -90°	5°C
D	+1° to +90° (display facing down)	5°C

Table 15: Mounting orientations when operated with a fan kit

1) The maximum ambient temperature must be reduced by ....

Mounting orientation	Limitation of mounting orientation with individual components[1)]
	5AC901.SDVW-00
0°	0°
A	-1° to -30°
B	+1° to +30°
C	-1° to -5°
D	+1° to +30°

Table 16: Mounting orientations when operated with individual components with limitations

1) The mounting orientation may only be max. ....

In order to facilitate natural air circulation, devices must be mounted according to the spacing indicated in section "Spacing for air circulation" on page 30.

2.1.5 Weight specifications

All weights are specified in g (grams).

Display type	Model number	Weight
12.1" single-touch	5AP923.1215-00	2200
15.0" single-touch	5AP923.1505-00	3700
19.0" single-touch	5AP923.1906-00	5800
15.6" multi-touch	5AP933.156B-00	3850
18.5" multi-touch	5AP933.185B-00	4850
21.5" multi-touch	5AP933.215C-00	5400
24.0" multi-touch	5AP933.240C-00	7800

Table 17: AP9x3 display units - Weight

Display type	Model number	Weight
10.4" single-touch	5AP1120.1043-000	2800
10.4" single-touch with keys	5AP1180.1043-000	2800
10.4" single-touch with keys	5AP1181.1043-000	3400
10.4" single-touch with keys	5AP1182.1043-000	3500
12.1" single-touch	5AP1120.1214-000	3200
15.0" single-touch	5AP1120.1505-000	5000
15.0" single-touch with keys	5AP1180.1505-000	4900
15.6" single-touch	5AP1120.156B-000	4200
19.0" single-touch	5AP1120.1906-000	7300

Table 18: AP1000 display units - Weight

Component	Model number	Weight
CPU boards	5PC901.TS77-xx	450
System units	5PC911.SX00-00	2821
	5PC911.SX00-01	2821
1-slot bus units	5AC902.BX01-00	1020
	5AC902.BX01-01	1020
2-slot bus units	5AC902.BX02-00	1220
	5AC902.BX02-01	1220
	5AC902.BX02-02	1220
Power supply	5AC902.PS00-00	580
Fan kits	5AC902.FA00-00	70
	5AC902.FA0X-00	36
Slide-in compact drives	5AC901.CHDD-01	134
	5AC901.CSSD-03	118
	5AC901.CSSD-04	118
	5AC901.CSSD-05	118
	5AC901.CSSD-06	118
Slide-in drives	5AC901.SDVW-00	400
Interface options	5AC901.I485-00	34
	5AC901.ICAN-00	33
	5AC901.ISRM-00	20
	5AC901.IPLK-00	35
	5AC901.IHDA-00	21
	5AC901.IRDY-00	30
Uninterruptible power supplies	5AC901.IUPS-00	28
	5AC901.IUPS-01	28
	5AC901.BUPS-00	4600
	5AC901.BUPS-01	2550

Table 19: CPU boards, system units, bus units and power supply - Weight

2.2 Environmental characteristics

2.2.1 Temperature specifications

Depending on the display unit and system unit, CPU boards can be combined with various other components such as drives, main memory, additional plug-in cards, etc. The many different configurations possible result in varying maximum ambient temperatures, which can be seen in the following tables in this section.

Information:

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

Information regarding worst-case conditions

- Thermal Analysis Tool (TAT V7.1) from Intel for simulating a 100% processor load
- BurnInTest tool (BurnInTest V4.0 Pro from Passmark Software) for simulating a 100% load on the interface via loop back adapters (serial interfaces, slide-in drives, USB interfaces, audio outputs)
- Maximum system expansion and power consumption

2.2.1.1 Maximum ambient temperature during operation

Operation with a fan kit

Information:

The 5PC911.SX00-00 system unit must be used when operating the Panel PC 900 with a fan kit.

All specifications are valid for non-condensing operation.

		Operation with a fan kit and 5PC911.SX00-00 system unit											
	All temperature values in degrees Celsius (°C) at 500 m above sea level. The maximum ambient temperature is typically derated by 1°C per 1000 meters (starting at 500 meters above sea level).	i7 3615QE 5PC901.TS77-00	i7 3612QE 5PC901.TS77-01	i7 3517UE 5PC901.TS77-03	i5 3610ME 5PC901.TS77-04	i3 3120ME 5PC901.TS77-05	i3 3217UE 5PC901.TS77-06	C 847E 5PC901.TS77-07	C 827E 5PC901.TS77-08	C 1020E 5PC901.TS77-09	C 1047UE 5PC901.TS77-10	Temperature limits	Location of sensor(s)
	Maximum ambient temperature	**50**	**55**	**55**	**55**	**55**	**55**	**55**	**55**	**55**	**55**		
	What else can also be operated at the max. ambient temperature, or are there any limits?												
AP9x3 display units	5AP923.1215-00	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	See temperature sensor positions.	Display
	5AP923.1505-00	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓		
	5AP923.1906-00	45	45	45	45	45	45	45	45	45	45		
	5AP933.156B-00	✓	50	50	50	50	50	50	50	50	50		
	5AP933.185B-00	✓	50	50	50	50	50	50	50	50	50		
	5AP933.215C-00	45	45	45	45	45	45	45	45	45	45		
	5AP933.240C-00	45	45	45	45	45	45	45	45	45	45		
AP1000 display units	5AP1120.1043-000	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓		
	5AP1180.1043-000	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓		
	5AP1181.1043-000	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓		
	5AP1182.1043-000	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓		
	5AP1120.1214-000	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓		
	5AP1120.1505-000	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓		
	5AP1180.1505-000	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓		
	5AP1120.156B-000	✓	50	50	50	50	50	50	50	50	50		
	5AP1120.1906-000	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓		
Main memory	1x 5MMDDR.xxxx-03 inserted[1)]	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓		-
	2x 5MMDDR.xxxx-03 inserted	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓		
Slide-in compact drives	5AC901.CHDD-01	✓	50	50	50	50	50	50	50	50	50		-
	5AC901.CSSD-03	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓		
	5AC901.CSSD-04	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓		
	5AC901.CSSD-05	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓		
	5AC901.CSSD-06	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓		
	5AC901.CCFA-00	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓		
Slide-in drives	5AC901.SDVW-00	40	40	40	40	40	40	40	40	40	40		Slide-in drive
	5AC901.SSCA-00[2)]	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓		
Interface options	5AC901.I485-00	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓		-
	5AC901.ICAN-00	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓		
	5AC901.IHDA-00	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓		
	5AC901.ISRM-00	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓		
	5AC901.IPLK-00	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓		
	5AC901.IRDY-00	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓		
	5AC901.ISIO-00	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓		
	5AC901.IUPS-00	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓		
	5AC901.IUPS-01	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓		
Bus units	5AC902.BX01-00	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓		-
	5AC902.BX01-01	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓		
	5AC902.BX02-00	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓		
	5AC902.BX02-01	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓		
	5AC902.BX02-02	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓		
Power supply	5AC902.PS00-00	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓		-
CFast cards	5CFAST.xxxx-00	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓		CFast slot
	5CFAST.xxxx-10	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓		

1) Main memory must be inserted in RAM slot 2.
2) The max. ambient temperature depends on the slide-in compact drive being used.

Table 20: Ambient temperature with a fan kit

Operation without a fan kit

Information:

The 5PC901.TS77-00 CPU board cannot be operated without a fan kit.

The 5PC911.SX00-01 system unit must be used when operating the Panel PC 900 without a fan kit.

All specifications are valid for non-condensing operation.

	All temperature values in degrees Celsius (°C) at 500 m above sea level. The maximum ambient temperature is typically derated by 1°C per 1000 meters (starting at 500 meters above sea level).	Operation without a fan kit and 5PC911.SX00-01 system unit										Temperature limits	Location of sensor(s)
		i7 3615QE 5PC901.TS77-00	i7 3612QE 5PC901.TS77-01	i7 3517UE 5PC901.TS77-03	i5 3610ME 5PC901.TS77-04	i3 3120ME 5PC901.TS77-05	i3 3217UE 5PC901.TS77-06	C 847E 5PC901.TS77-07	C 827E 5PC901.TS77-08	C 1020E 5PC901.TS77-09	C 1047UE 5PC901.TS77-10		
	Maximum ambient temperature	**-**	**35**	**50**	**35**	**35**	**50**	**50**	**50**	**35**	**50**		
	What else can also be operated at the max. ambient temperature, or are there any limits?												
AP9x3 display units	5AP923.1215-00	-	✓	✓	✓	✓	✓	✓	✓	✓	✓	See temperature sensor positions.	Display
	5AP923.1505-00	-	✓	✓	✓	✓	✓	✓	✓	✓	✓		
	5AP923.1906-00	-	✓	40	✓	✓	40	40	40	✓	40		
	5AP933.156B-00	-	✓	45	✓	✓	45	45	45	✓	45		
	5AP933.185B-00	-	✓	45	✓	✓	45	45	45	✓	45		
	5AP933.215C-00	-	✓	40	✓	✓	40	40	40	✓	40		
	5AP933.240C-00	-	✓	40	✓	✓	40	40	40	✓	40		
AP1000 display units	5AP1120.1043-000	-	✓	✓	✓	✓	✓	✓	✓	✓	✓		
	5AP1180.1043-000	-	✓	✓	✓	✓	✓	✓	✓	✓	✓		
	5AP1181.1043-000	-	✓	✓	✓	✓	✓	✓	✓	✓	✓		
	5AP1182.1043-000	-	✓	✓	✓	✓	✓	✓	✓	✓	✓		
	5AP1120.1214-000	-	✓	✓	✓	✓	✓	✓	✓	✓	✓		
	5AP1120.1505-000	-	✓	✓	✓	✓	✓	✓	✓	✓	✓		
	5AP1180.1505-000	-	✓	✓	✓	✓	✓	✓	✓	✓	✓		
	5AP1120.156B-000	-	✓	45	✓	✓	45	45	45	✓	45		
	5AP1120.1906-000	-	✓	✓	✓	✓	✓	✓	✓	✓	✓		
Main memory	1x 5MMDDR.xxxx-03 inserted[1)]	-	✓	✓	✓	✓	✓	✓	✓	✓	✓		-
	2x 5MMDDR.xxxx-03 inserted	-	30	45	30	30	45	45	45	30	45		
Slide-in compact drives	5AC901.CHDD-01	-	30[3)]	35[3)]	30[3)]	30[3)]	35[3)]	35[3)]	35[3)]	30[3)]	35[3)]		-
	5AC901.CSSD-03 ≥ Rev. D0	-	✓	✓[3)]	✓	✓	✓[3)]	✓[3)]	✓[3)]	✓	✓[3)]		
	5AC901.CSSD-03 ≤ Rev. C0	-	✓	40[3)]	✓	✓	40[3)]	40[3)]	40[3)]	✓	40[3)]		
	5AC901.CSSD-04 ≥ Rev. D0	-	✓	✓[3)]	✓	✓	✓[3)]	✓[3)]	✓[3)]	✓	✓[3)]		
	5AC901.CSSD-04 ≤ Rev. C0	-	✓	40[3)]	✓	✓	40[3)]	40[3)]	40[3)]	✓	40[3)]		
	5AC901.CSSD-05	-	✓	✓[3)]	✓	✓	✓[3)]	✓[3)]	✓[3)]	✓	✓[3)]		
	5AC901.CSSD-06	-	✓	✓[3)]	✓	✓	✓[3)]	✓[3)]	✓[3)]	✓	✓[3)]		
	5AC901.CCFA-00	-	✓	✓	✓	✓	✓	✓	✓	✓	✓		
Slide-in drives	5AC901.SDVW-00	-	✓	40	✓	✓	40	40	40	✓	40		Slide-in drive
	5AC901.SSCA-00[2)]	-	✓	✓	✓	✓	✓	✓	✓	✓	✓		
Interface options	5AC901.I485-00	-	✓	✓	✓	✓	✓	✓	✓	✓	✓		-
	5AC901.ICAN-00	-	✓	✓	✓	✓	✓	✓	✓	✓	✓		
	5AC901.IHDA-00	-	✓	40	✓	✓	40	40	40	✓	40		
	5AC901.ISRM-00	-	✓	✓	✓	✓	✓	✓	✓	✓	✓		
	5AC901.IPLK-00	-	✓	✓	✓	✓	✓	✓	✓	✓	✓		
	5AC901.IRDY-00	-	✓	✓	✓	✓	✓	✓	✓	✓	✓		
	5AC901.ISIO-00	-	✓	✓	✓	✓	✓	✓	✓	✓	✓		
	5AC901.IUPS-00	-	✓	✓	✓	✓	✓	✓	✓	✓	✓		
	5AC901.IUPS-01	-	✓	✓	✓	✓	✓	✓	✓	✓	✓		
Bus units	5AC902.BX01-00	-	✓	✓	✓	✓	✓	✓	✓	✓	✓		-
	5AC902.BX01-01	-	✓	✓	✓	✓	✓	✓	✓	✓	✓		
	5AC902.BX02-00	-	✓	✓	✓	✓	✓	✓	✓	✓	✓		
	5AC902.BX02-01	-	✓	✓	✓	✓	✓	✓	✓	✓	✓		
	5AC902.BX02-02	-	✓	✓	✓	✓	✓	✓	✓	✓	✓		
Power supply	5AC902.PS00-00	-	✓	✓	✓	✓	✓	✓	✓	✓	✓		-
CFast cards	5CFAST.xxxx-00	-	✓	✓	✓	✓	✓	✓	✓	✓	✓		CFast slot
	5CFAST.xxxx-10	-	✓	✓	✓	✓	✓	✓	✓	✓	✓		

1) Main memory must be inserted in RAM slot 2.
2) The max. ambient temperature depends on the slide-in compact drive being used.
3) For systems with a total system load >90 W, the max. ambient temperature must be reduced by 5°C.

Table 21: Ambient temperature without a fan kit

2.2.1.1.1 How to determine the maximum ambient temperature for the Panel PC 900

1. Select the system unit (with or without a fan kit).
2. Select the CPU board.
3. The "Maximum ambient temperature" row shows the maximum ambient temperature for the complete system, including the respective CPU board.

> **Information:**
>
> **Maximum temperature data is for operation at 500 meters. The maximum ambient temperature is typically derated by 1°C per 1000 meters (starting at 500 meters above sea level).**

4. Incorporating additional drives, interface options, etc. can change the temperature limits of a PPC900 system.
5. The mounting orientation of the Panel PC 900 may result in limitations. For more information, see section "Mounting orientations" on page 31.

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

If there is a specific temperature next to the component, for example "45", then the ambient temperature of the complete PPC900 system is not permitted to exceed this temperature.

2.2.1.2 Minimum ambient temperature during operation

For systems containing the following components, the minimum ambient temperature for non-condensing operation is +5°C: 5AC901.SDVW-00.

If none of these components are used, then the minimum ambient temperature for non-condensing operation is 0°C.

2.2.1.3 Ambient temperature for storage and transport

The following table provides an overview of the minimum and maximum ambient temperatures for storing and transporting individual components.

Display type	Model number	Storage	Transport
12.1" single-touch	5AP923.1215-00	-25 to 80°C	-25 to 80°C
15.0" single-touch	5AP923.1505-00	-25 to 80°C	-25 to 80°C
19.0" single-touch	5AP923.1906-00	-20 to 60°C	-20 to 60°C
15.6" multi-touch	5AP933.156B-00	-10 to 60°C	-10 to 60°C
18.5" multi-touch	5AP933.185B-00	-10 to 60°C	-10 to 60°C
21.5" multi-touch	5AP933.215C-00	-10 to 60°C	-10 to 60°C
24.0" multi-touch	5AP933.240C-00	-10 to 60°C	-10 to 60°C

Table 22: AP9x3 display units - Ambient temperature during storage and transport

Display type	Model number	Storage	Transport
10.4" single-touch	5AP1120.1043-000	-25 to 80°C	-25 to 80°C
10.4" single-touch with keys	5AP1180.1043-000	-25 to 70°C	-25 to 70°C
10.4" single-touch with keys	5AP1181.1043-000	-25 to 70°C	-25 to 70°C
10.4" single-touch with keys	5AP1182.1043-000	-25 to 70°C	-25 to 70°C
12.1" single-touch	5AP1120.1214-000	-25 to 80°C	-25 to 80°C
15.0" single-touch	5AP1120.1505-000	-25 to 80°C	-25 to 80°C
15.0" single-touch with keys	5AP1180.1505-000	-25 to 80°C	-25 to 80°C
15.6" single-touch	5AP1120.156B-000	-20 to 60°C	-20 to 60°C
19.0" single-touch	5AP1120.1906-000	-25 to 70°C	-25 to 70°C

Table 23: AP1000 display units - Ambient temperature during storage and transport

Component	Model number	Storage	Transport
CPU boards	5PC901.TS77-xx	-20 to 60°C	-20 to 60°C
System units	5PC911.SX00-xx	-20 to 60°C	-20 to 60°C
1-slot bus units	5AC902.BX01-xx	-20 to 60°C	-20 to 60°C
2-slot bus units	5AC902.BX02-xx	-20 to 60°C	-20 to 60°C
Power supply	5AC902.PS00-00	-20 to 60°C	-20 to 60°C
Slide-in compact drives	5AC901.CHDD-01	-40 to 70°C	-40 to 70°C
	5AC901.CSSD-03 ≤ Rev. C0	-40 to 85°C	-40 to 85°C
	5AC901.CSSD-03 ≥ Rev. D0	-40 to 85°C	-40 to 85°C
	5AC901.CSSD-04 ≤ Rev. C0	-40 to 85°C	-40 to 85°C
	5AC901.CSSD-04 ≥ Rev. D0	-40 to 85°C	-40 to 85°C
	5AC901.CSSD-05	-40 to 85°C	-40 to 85°C
	5AC901.CSSD-06	-40 to 85°C	-40 to 85°C

Table 24: CPU boards, system units, bus units and power supply - Ambient temperature during storage and transport

Component	Model number	Storage	Transport
	5AC901.CCFA-00	-20 to 60°C	-20 to 60°C
Slide-in drives	5AC901.SDVW-00	-20 to 60°C	-20 to 60°C
Interface options	5AC901.I485-00	-20 to 60°C	-20 to 60°C
	5AC901.ICAN-00	-20 to 60°C	-20 to 60°C
	5AC901.IHDA-00	-20 to 60°C	-20 to 60°C
	5AC901.ISRM-00	-20 to 60°C	-20 to 60°C
	5AC901.IPLK-00	-20 to 60°C	-20 to 60°C
	5AC901.IRDY-00	-20 to 60°C	-20 to 60°C
	5AC901.ISIO-00	-20 to 60°C	-20 to 60°C
CFast cards	5CFAST.xxxx-00	-50 to 100°C	-50 to 100°C
	5CFAST.xxxx-10	-55 to 95°C	-55 to 95°C
Uninterruptible power supplies	5AC901.IUPS-00	-20 to 60°C	-20 to 60°C
	5AC901.IUPS-01	-20 to 60°C	-20 to 60°C
	5AC901.BUPS-00	-65 to 80°C	-65 to 80°C
	5AC901.BUPS-01	-15 to 40°C	-15 to 40°C

Table 24: CPU boards, system units, bus units and power supply - Ambient temperature during storage and transport

2.2.1.4 Temperature monitoring

Sensors monitor temperature values at various locations in the PPC900 device. The location of these temperature sensors is illustrated in Fig. 14 "Panel PC 900 - Temperature sensor positions" on page 38. The values listed in Tab. 25 "Temperature sensor locations" on page 38 represent the defined maximum temperature for this measurement point. An alarm is not triggered if this temperature is exceeded. These temperatures can be read in BIOS or approved Microsoft Windows operating systems using the B&R Control Center.

In addition, the hard disks for PPC900 systems available from B&R are equipped with S.M.A.R.T, or Self-Monitoring, Analysis and Reporting Technology. This makes it possible to read various parameters such as temperature using software (e.g. HDD Thermometer, a freeware program) on approved Microsoft operating systems.

2.2.1.5 Temperature sensor positions

Sensors indicate temperature values at many different locations in the PPC900. These temperatures[2)] can be read in BIOS (Advanced - OEM features - System board features / CPU board features - Temperature values) or with the B&R Control Center in Microsoft Windows operating systems[3)].

For applications that don't use Windows, temperatures can be evaluated using the B&R implementation guide. In addition to the implementation guide, there are also programs available in MS-DOS.

Figure 14: Panel PC 900 - Temperature sensor positions

ADI sensors	Position	Measurement point for	Measurement	Max. specified
Panel	A	Display	Temperature of the display (sensor integrated in display unit)	5AP923.1215-00: 80°C 5AP923.1505-00: 80°C 5AP923.1906-00: 75°C 5AP933.156B-00: 75°C 5AP933.185B-00: 75°C 5AP933.215C-00: 80°C 5AP933.240C-00: 75°C 5AP1120.1043-000: 90°C 5AP1180.1043-000: 90°C 5AP1181.1043-000: 90°C 5AP1182.1043-000: 90°C 5AP1120.1214-000: 80°C 5AP1120.1505-000: 90°C 5AP1180.1505-000: 90°C 5AP1120.156B-000: 75°C 5AP1120.1906-000: 80°C
CPU board	B	CPU	Temperature of the processor (sensor integrated in the processor)	95°C
System unit 1	C	Board	Temperature of the board (sensor integrated on the CPU board)	95°C
System unit 2	D	Chipset	Temperature of the chipset area (sensor integrated on the CPU board)	85°C
System unit 3	E	Board power supply	Temperature of the board power supply area (sensor integrated on the CPU board)	95°C
System unit 4	F	CFast	Temperature of the CFast area (sensor integrated on the CPU board)	85°C
Slide-in drive	G	Slide-in drive	Temperature of slide-in drive 1 (sensor integrated on the slide-in drive)	Depends on the drive
	H	Interface option[1)]	Temperature of the interface option (sensor integrated on the interface option)	Depends on the IF option

Table 25: Temperature sensor locations

1) A temperature sensor is currently not integrated in the interface options.

2) Measured temperatures approximate the immediate ambient temperature but may also be influenced by neighboring components.
3) The ADI driver that includes the B&R Control Center is available in the Downloads section of the B&R website (www.br-automation.com).

2.2.1.6 Fan control

The MTCX constantly monitors the temperature using temperature sensors, which directly determines how the fans are controlled. Their speed depends on the measured temperature. Limit values may depend on the MTCX firmware version being used.

Position	Measurement point for	Startup temperature	Max. fan speed at:
A	Display	5AP923.1215-00: 70°C, 5AP923.1505-00: 70°C, 5AP923.1906-00: 70°C, 5AP933.156B-00: 70°C, 5AP933.185B-00: 70°C, 5AP933.215C-00: 70°C, 5AP933.240C-00: 70°C, 5AP1120.1043-000: 70°C, 5AP1180.1043-000: 70°C, 5AP1181.1043-000: 70°C, 5AP1182.1043-000: 70°C, 5AP1120.1214-000: 70°C, 5AP1120.1505-000: 70°C, 5AP1180.1505-000: 70°C, 5AP1120.156B-000: 70°C, 5AP1120.1906-000: 70°C	5AP923.1215-00: 86°C, 5AP923.1505-00: 86°C, 5AP923.1906-00: 86°C, 5AP933.156B-00: 86°C, 5AP933.185B-00: 86°C, 5AP933.215C-00: 86°C, 5AP933.240C-00: 86°C, 5AP1120.1043-000: 86°C, 5AP1180.1043-000: 86°C, 5AP1181.1043-000: 86°C, 5AP1182.1043-000: 86°C, 5AP1120.1214-000: 86°C, 5AP1120.1505-000: 86°C, 5AP1180.1505-000: 86°C, 5AP1120.156B-000: 86°C, 5AP1120.1906-000: 86°C
B	CPU	65°C	81°C
C	Board controller	70°C	86°C
D	Chipset	70°C	86°C
E	Board power supply	70°C	86°C
F	CFast	60°C	76°C
G	Slide-in drive 1	5AC901.SDVW-00: 44°C, 5AC901.SSCA-00: 55°C	5AC901.SDVW-00: 60°C, 5AC901.SSCA-00: 71°C
H	Interface option[1)]	-	-

Table 26: Temperature sensor locations

1) A temperature sensor is currently not integrated in the interface options.

Once the startup temperature is reached, the device is started at the minimum fan speed. The maximum fan speed is reached at a startup temperature of 16°C. The fan speed in this area is controlled depending on the temperature.

Example with slide-in drive 5AC901.SDVW-00: 44°C + 16°C = 60°C --> Maximum fan speed

The fans will only be shut off again if the evaluation temperature is more than 6°C below the switch-on temperature for a period of 4 hours (overshoot time).

2.2.2 Humidity

The following table lists the minimum and maximum relative humidity values (non-condensing) for the individual components that are relevant for the humidity limitations of a complete system. The lowest and highest common values are always used when establishing these limits.

Display type	Model number	Operation	Storage	Transport
12.1" single-touch	5AP923.1215-00	5 to 90%	5 to 90%	5 to 90%
15.0" single-touch	5AP923.1505-00	8 to 90%	8 to 90%	8 to 90%
19.0" single-touch	5AP923.1906-00	5 to 90%	5 to 90%	5 to 90%
15.6" multi-touch	5AP933.156B-00	5 to 90%	5 to 90%	5 to 90%
18.5" multi-touch	5AP933.185B-00	5 to 90%	5 to 90%	5 to 90%
21.5" multi-touch	5AP933.215C-00	10 to 90%	10 to 90%	10 to 90%
24.0" multi-touch	5AP933.240C-00	5 to 90%	5 to 90%	5 to 90%

Table 27: AP9x3 display units - Humidity

Display type	Model number	Operation	Storage	Transport
10.4" single-touch	5AP1120.1043-000	5 to 90%	5 to 90%	5 to 90%
10.4" single-touch with keys	5AP1180.1043-000	5 to 80%	5 to 90%	5 to 90%
10.4" single-touch with keys	5AP1181.1043-000	5 to 80%	5 to 90%	5 to 90%
10.4" single-touch with keys	5AP1182.1043-000	5 to 80%	5 to 90%	5 to 90%
12.1" single-touch	5AP1120.1214-000	8 to 90%	8 to 90%	8 to 90%
15.0" single-touch	5AP1120.1505-000	8 to 90%	8 to 90%	8 to 90%
15.0" single-touch with keys	5AP1180.1505-000	8 to 90%	8 to 90%	8 to 90%
15.6" single-touch	5AP1120.156B-000	5 to 90%	5 to 90%	5 to 90%
19.0" single-touch	5AP1120.1906-000	5 to 90%	5 to 90%	5 to 90%

Table 28: AP1000 display units - Humidity

Component	Model number	Operation	Storage	Transport
CPU boards	5PC901.TS77-xx	10 to 90%	5 to 95%	5 to 95%
System units	5PC911.SX00-xx	5 to 95%	5 to 95%	5 to 95%
1-slot bus units	5AC902.BX01-xx	5 to 95%	5 to 95%	5 to 95%
2-slot bus units	5AC902.BX02-xx	5 to 95%	5 to 95%	5 to 95%
Power supply	5AC902.PS00-00	7 to 90%	7 to 90%	7 to 90%
Slide-in compact drives	5AC901.CHDD-01	5 to 95%	5 to 95%	5 to 95%
	5AC901.CSSD-03 ≤ Rev. C0	8 to 90%	8 to 95%	8 to 95%
	5AC901.CSSD-03 ≥ Rev. D0	5 to 90%	5 to 95%	5 to 95%
	5AC901.CSSD-04 ≤ Rev. C0	8 to 90%	8 to 95%	8 to 95%
	5AC901.CSSD-04 ≥ Rev. D0	5 to 90%	5 to 95%	5 to 95%
	5AC901.CSSD-05	5 to 90%	5 to 95%	5 to 95%
	5AC901.CSSD-06	5 to 90%	5 to 95%	5 to 95%
	5AC901.CCFA-00	5 to 95%	5 to 95%	5 to 95%
Slide-in drives	5AC901.SDVW-00	8 to 80%	5 to 95%	5 to 95%
Interface options	5AC901.I485-00	5 to 90%	5 to 95%	5 to 95%
	5AC901.ICAN-00	5 to 90%	5 to 95%	5 to 95%
	5AC901.IHDA-00	5 to 90%	5 to 95%	5 to 95%
	5AC901.ISRM-00	5 to 90%	5 to 95%	5 to 95%
	5AC901.IPLK-00	5 to 90%	5 to 95%	5 to 95%
	5AC901.IRDY-00	5 to 90%	5 to 95%	5 to 95%
	5AC901.ISIO-00	5 to 90%	5 to 95%	5 to 95%
CFast cards	5CFAST.xxxx-00	Max. 85% at 85°C	Max. 85% at 85°C	Max. 85% at 85°C
	5CFAST.xxxx-10	10 to 95%	10 to 95%	10 to 95%
Uninterruptible power supplies	5AC901.IUPS-00	5 to 90%	5 to 95%	5 to 95%
	5AC901.IUPS-01	5 to 90%	5 to 95%	5 to 95%
	5AC901.BUPS-00	5 to 95%	5 to 95%	5 to 95%
	5AC901.BUPS-01	25 to 85%	25 to 85%	25 to 85%

Table 29: CPU boards, system units, bus units and power supply - Humidity

The specifications listed correspond to the relative humidity (non-condensing) at an ambient temperature of 30°C. More detailed information about specific temperature-dependent humidity values can be found in the technical data for the individual components.

2.2.3 Vibration

The following table provides an overview of the maximum vibration specifications of the complete system. The use of individual components may result in limitations.

Panel PC	Operation[1]		Storage[1][2]	Transport[1][2]
	Continuous	Periodic		
With SSD drives and CFast cards	2 to 9 Hz: 1.75 mm amplitude 9 to 200 Hz: 0.5 g	2 to 9 Hz: 3.5 mm amplitude 9 to 200 Hz: 1 g	2 to 8 Hz: 7.5 mm amplitude 8 to 200 Hz: 2 g 200 to 500 Hz: 4 g	2 to 8 Hz: 7.5 mm amplitude 8 to 200 Hz: 2 g 200 to 500 Hz: 4 g
With hard disk drives	5 to 500 Hz: 0.25 g	5 to 500 Hz: 0.5 g	2 to 8 Hz: 7.5 mm amplitude 8 to 200 Hz: 2 g 200 to 500 Hz: 4 g	2 to 8 Hz: 7.5 mm amplitude 8 to 200 Hz: 2 g 200 to 500 Hz: 4 g
With DVD-R/RW drives	-	5 to 500 Hz: 0.2 g	2 to 8 Hz: 7.5 mm amplitude 8 to 200 Hz: 2 g 200 to 500 Hz: 4 g	2 to 8 Hz: 7.5 mm amplitude 8 to 200 Hz: 2 g 200 to 500 Hz: 4 g

Table 30: Vibration

1) Testing is performed in accordance with EN 60068-2-6.
2) This value applies to a device in its original packaging.

2.2.4 Shock

The following table provides an overview of the maximum shock specifications of the complete system. The use of individual components may result in limitations.

Panel PC	Operation[1]	Storage[1][2]	Transport[1][2]
With SSD drives and CFast cards	15 g, 11 ms	30 g, 6 ms	30 g, 6 ms
With hard disk drives	400 g, 2 ms	30 g, 6 ms	30 g, 6 ms
With DVD-R/RW drives	5 g, 11 ms	30 g, 6 ms	30 g, 6 ms

Table 31: Shock

1) Testing is performed in accordance with EN 60068-2-27.
2) This value applies to a device in its original packaging.

2.2.5 Protection

In accordance with EN 60529, the Panel PC 900 is rated IP65 on the front and IP20 on the back under the following conditions:

- The Panel PC 900 is installed correctly (see "Installation Panel PC with AP9x3 display unit" on page 191).
- All covers and components are installed on the interfaces and slots.
- All environmental conditions are being observed.

The Panel PC 900 with AP9x3 and AP1000 display units also has "Type 4X indoor use only" in accordance with UL50 on the front under the same conditions.

2.3 Electrical characteristics

2.3.1 +24 VDC voltage supply

The 3-pin male connector required for the power supply interface is not included in delivery. It can be ordered from B&R using model number 0TB103.9 (screw clamps) or 0TB103.91 (cage clamps).

The pinout is listed in the following table. The supply voltage is protected internally by a soldered fuse (15 A, fast-acting) to prevent damage to the device in the event of an overload (fuse replacement necessary) or if the voltage supply is connected incorrectly (reverse polarity protection -> fuse replacement not necessary). The device must be returned to B&R for repairs if the fuse is blown in the event of an error.

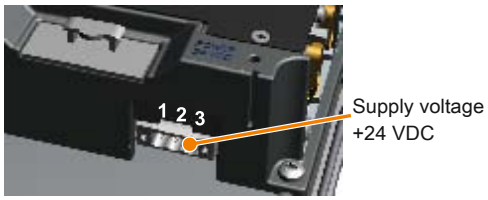
+24 VDC power supply		
Protected against reverse polarity		3-pin male power supply connector
Pin	**Description**	
1	+	
2	Functional ground	
3	-	
Model number	**Short description**	
	Terminal blocks	
0TB103.9	Male connector 24 V 5.08 3-pin screw clamps	
0TB103.91	Male connector 24 V 5.08 3-pin cage clamps	

Table 32: +24 VDC voltage supply connection

Electrical characteristics	
Nominal voltage	24 VDC ±25%
Nominal current	5.5 A
Starting current	Max. 60 A for <300 µs
Electrical isolation	Yes
Uninterruptible power supply	Optional, with 5AC901.IUPS-00 or 5AC901.IUPS-01

2.3.2 Optional VAC voltage supply

The optional 5AC902.PS00-00 power supply must be installed on the Panel PC in order to operate the Panel PC with AC power.

The 3-pin male connector required for the power supply interface is not included in delivery. It can be ordered from B&R using model number 0TB3103.8000.

The pinout is listed in the following table and printed on the housing. The supply voltage is protected internally by a soldered fuse so that the device cannot be damaged if an overload occurs (fuse replacement necessary) or the voltage supply is connected incorrectly (reverse polarity protection -> fuse replacement not necessary). The device must be returned to B&R for repairs if the fuse is blown in the event of an error.

VAC power supply		
Protected against reverse polarity		3-pin male power supply connector
Pin	**Description**	
1	Protective ground	
2	L	
3	N	
Model number	**Short description**	
	Terminal blocks	
0TB3103.8000	Connector, 230 VAC, 3-pin female, 4 mm² screw clamp, protected against vibration by the screw flange	

Table 33: Voltage supply connection - VAC power supply

Electrical characteristics	
Nominal voltage	100 to 240 VAC
Frequency	45 to 65 Hz
Nominal current	1.25 to 2.5 A
Starting current	<20 A (on cold restart, 100% load and 100 VAC)
Internal fuse	Yes
Uninterruptible power supply	Optional with external UPS

2.3.3 Power calculation

In order to calculate the total power of the Panel PC, the power rating of the display being used (see "AP9x3 display units - Power calculation") must be entered in the "Display unit, permanent consumer" row of the "CPU board - Power calculation" table.

Information:

The power supply's maximum total power of 130 watts must not be exceeded.

Information: All values in **watts** The values for the **suppliers** are maximum values. The values for the **consumers** are average maximum values but not peak values.											**CPU board**	**Current system**
											i7 3615QE 45 W CPU 5PC901.TS77-00	i7 3612QE 35 W CPU 5PC901.TS77-01	i7 3517UE 17 W CPU 5PC901.TS77-03	i5 3610ME 35 W CPU 5PC901.TS77-04	i3 3120ME 35 W CPU 5PC901.TS77-05	i3 3217UE 17 W CPU 5PC901.TS77-06	C 847E 17 W CPU 5PC901.TS77-07	C 827E 17 W CPU 5PC901.TS77-08	C 1020E 35 W CPU 5PC901.TS77-09	C 1047UE 17 W CPU 5PC901.TS77-10	Enter values in this column
										Total power supply power (maximum)											**130**
										Maximum possible											**130**
Total power supply +12 V	**+12 V**									Display unit, permanent consumer[1]											
										CPU board, permanent consumer	50	40	22	40	40	22	22	22	40	22	
										1024 MB RAM, each 2 W, max. 2 pcs.											
										2048 MB RAM, each 2.5 W, max. 2 pcs.											
										4096 MB RAM, each 3 W, max. 2 pcs.											
										8192 MB RAM, each 3.5 W, max. 2 pcs.											
										Fan kit, optional	3	3	3	3	3	3	3	3	3	3	
										UPS IF option 5AC901.IUPS-00 during operation, optional	30	30	30	30	30	30	30	30	30	30	
										UPS IF option 5AC901.IUPS-01 during operation, optional	25	25	25	25	25	25	25	25	25	25	
										PCI card power rating, optional (max. 3 W without fan kit, max. 6 W with fan kit)[2]											
										PCIe x8 card power rating, optional (max. 3 W without fan kit, max. 20 W with fan kit)[2]											
										Maximum possible at -12 V											**1.2**
		-12 V								PCI card power rating, optional (max. 1.2 W with or without fan kit)[2]											
										Consumers -12 V ∑											
										Consumers ∑											
										Maximum possible at +5 V											**50**
		+5 V								Display unit, permanent consumer[1]											
										CPU board, permanent consumer	2	2	2	2	2	2	2	2	2	2	
										Slide-in compact drive (HDD / SSD)	4	4	4	4	4	4	4	4	4	4	
										Slide-in drive (DVD / ...)	4	4	4	4	4	4	4	4	4	4	
										4x USB peripherals, each max. 5 W											
										Interface option, optional[3], max. 2 connections											
										PCI card power rating, optional (max. 3 W without fan kit, max. 20 W with fan kit)[2]											
										Consumers +5 V ∑											
										Maximum possible at 3V3											**33**
		3V3								Display unit, permanent consumer[1]											
										CPU board, permanent consumer	5	5	5	5	5	5	5	5	5	5	
										CFast card	1	1	1	1	1	1	1	1	1	1	
										Interface option, optional[3]											
										PCI card power rating, optional (max. 3 W without fan kit, max. 15 W with fan kit)[2]											
										PCIe x8 card power rating, optional (max. 3 W without fan kit, max. 10 W with fan kit)[2]											
										Consumers 3V3 ∑											
										Total power supply, consumers ∑											

1) Power ratings for the display units can be found in the table below.

2) The total power of one PCI/PCIe card per PCI slot (i.e. sum of the power consumption for each voltage range) is not permitted to exceed the max. power rating stated for operation with or without a fan kit.

3) Power ratings for the interface options are listed in the table below.

Table 34: CPU board - Power calculation

In order to accurately determine the total power of the complete system, the values in this table must be entered in the power calculation table depending on the display unit being used.

The following specifications are maximum values without additional consumers (USB devices, etc.).

Display type	Model number	+5 V	3V3	+12 V	Power consumption Total
12.1" single-touch	5AP923.1215-00	-	4.2 W	7.2 W	11.4 W
15.0" single-touch	5AP923.1505-00	-	2.1 W	8.9 W	11 W
19.0" single-touch	5AP923.1906-00	8 W	-	22.4 W	30.4 W
15.6" multi-touch	5AP933.156B-00	3.35 W	-	10.5 W	13.85 W
18.5" multi-touch	5AP933.185B-00	6.1 W	-	10.8 W	16.9 W
21.5" multi-touch	5AP933.215C-00	7.4 W	-	18.3 W	25.7 W
24.0" multi-touch	5AP933.240C-00	6.35 W	-	24 W	30.35 W

Table 35: AP9x3 display units - Power calculation

The following specifications are maximum values without additional consumers (USB devices, etc.).

Display type	Model number	+5 V	3V3	+12 V	Power consumption Total
10.4" single-touch	5AP1120.1043-000	-	1.3 W	3.6 W	4.9 W
10.4" single-touch with keys	5AP1180.1043-000	0.5 W	1.9 W	3.6 W	6 W
10.4" single-touch with keys	5AP1181.1043-000	0.7 W	1.9 W	3.6 W	6.2 W
10.4" single-touch with keys	5AP1182.1043-000	1 W	1.9 W	3.6 W	6.5 W
12.1" single-touch	5AP1120.1214-000	-	1.9 W	7 W	8.9 W
15.0" single-touch	5AP1120.1505-000	-	2.1 W	8.9 W	11 W
15.0" single-touch with keys	5AP1180.1505-000	0.5 W	2.7 W	8.9 W	12.1 W
15.6" single-touch	5AP1120.156B-000	2.5 W	-	10.5 W	13 W
19.0" single-touch	5AP1120.1906-000	5 W	-	22 W	27 W

Table 36: AP1000 display units - Power calculation

In order to accurately determine the total power of the complete system, the values in this table must be entered in the power calculation table if one or more of these options are connected to the system unit.

Component	Model number	+5 V	3V3	+12 V	Power consumption Total
Interface option					
RS232/RS422/RS485 IF option	5AC901.I485-00	1 W	-	-	1 W
CAN IF option	5AC901.ICAN-00	1 W	-	-	1 W
Audio IF option	5AC901.IHDA-00	0.2 W	0.2 W	-	0.4 W
POWERLINK IF option	5AC901.IPLK-00	-	1.5 W	-	1.5 W
SRAM IF option	5AC901.ISRM-00	-	2 W	-	2 W
Ready relay IF option	5AC901.IRDY-00	0.2 W	-	-	0.2 W
UPS IF option	5AC901.IUPS-00 in standby	-	-	0.1 W	0.1 W
UPS IF option	5AC901.IUPS-01 in standby	-	-	0.1 W	0.1 W

Table 37: Interface options - Power calculation

2.3.4 Block diagram

The following block diagram shows the simplified structure of the Panel PC 900 complete system without a display unit.

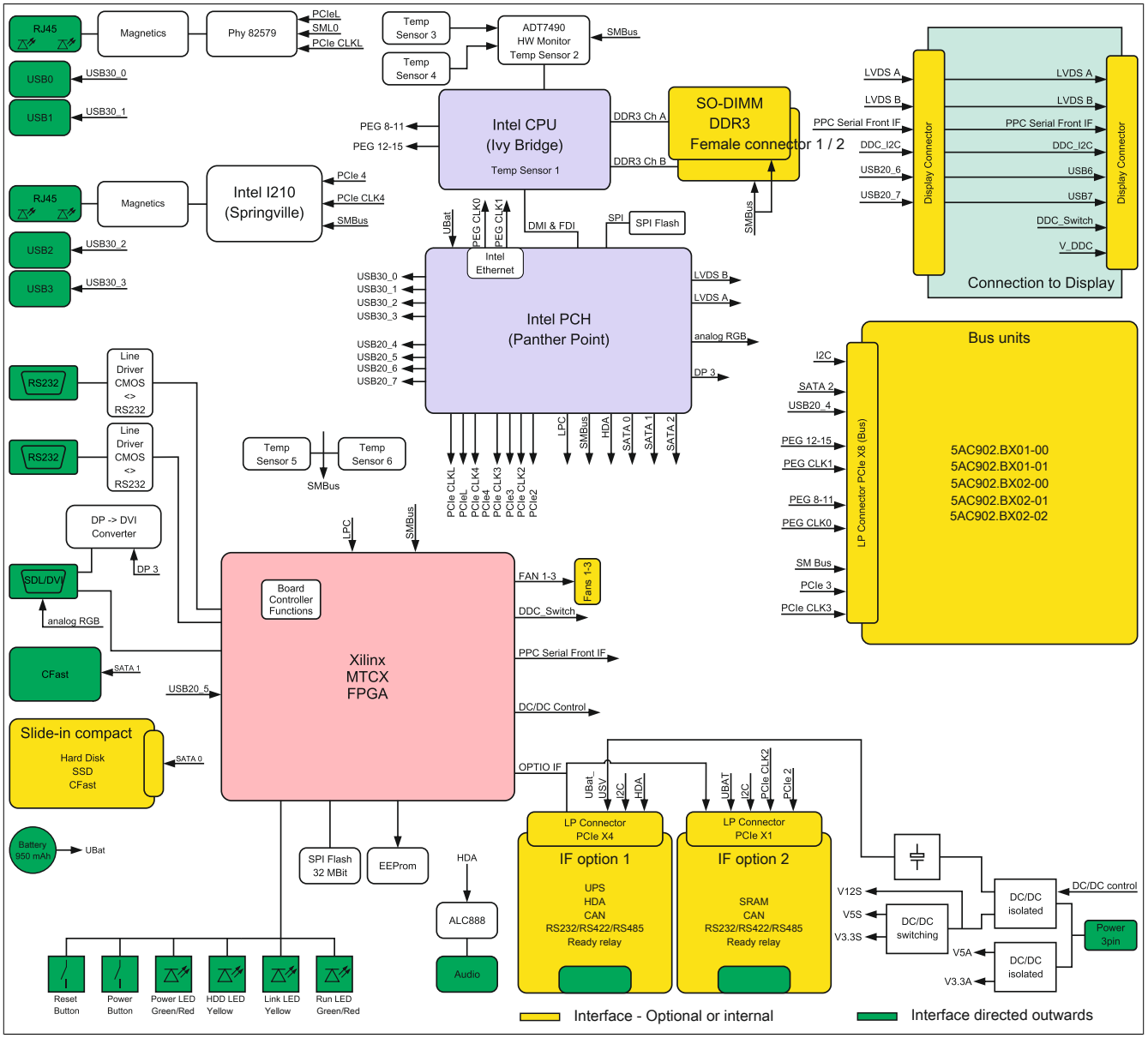


Figure 15: Panel PC 900 - Block diagram

2.4 Device interfaces and slots

2.4.1 Overview of device interfaces

Interfaces are located on the bottom of the Panel PC 900.

The following figure indicates the position of the interfaces on a Panel PC 900 with an installed bus unit and AC power supply.

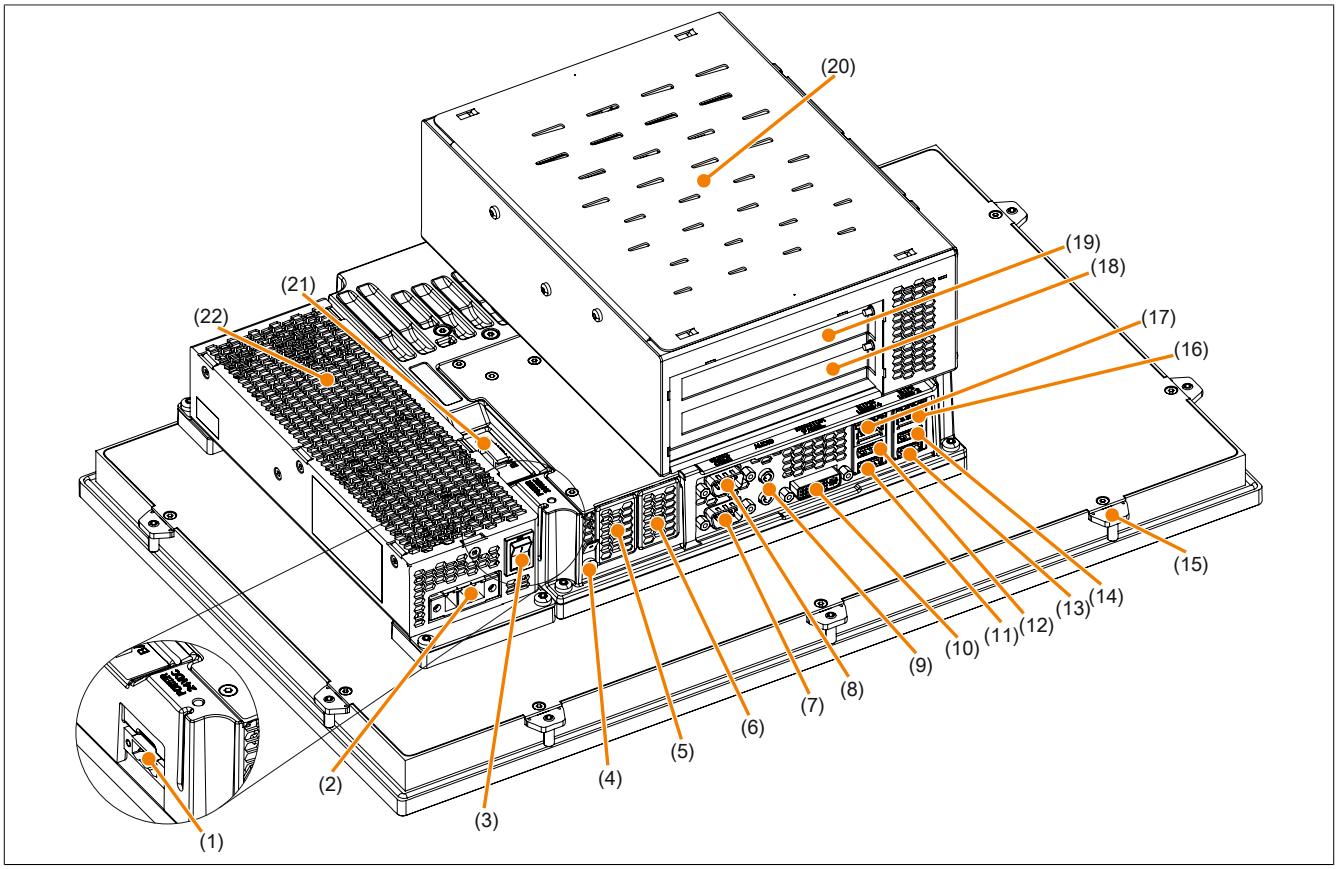


Figure 16: Device interfaces - Overview (bottom)

No.	Type of interface		No.	Type of interface	
1	24 VDC power	"+24 VDC voltage supply"	12	USB4	"USB interfaces"
2	230 VAC power	"Optional VAC voltage supply"	13	USB1	"USB interfaces"
3	On/Off switch	"On/Off switch"	14	USB2	"USB interfaces"
4	Functional ground connection	"Grounding"	15	Retaining clip	
5	IF option 1	"IF option 1 slot"	16	ETH1 (Ethernet1)	"Ethernet 1 interface (ETH1)"
6	IF option 2	"IF option 2 slot"	17	ETH2 (Ethernet2)	"Ethernet 2 interface (ETH2)"
7	COM 1	"COM1 serial interface"	18	Card slot 1	"Card slot (PCI / PCIe)"
8	COM 2	"COM2 serial interface"	19	Card slot 2	"Card slot (PCI / PCIe)"
9	Audio	"Audio"	20	Optional bus unit	
10	Monitor/Panel	"Panel/Monitor interface"	21	Battery	"Battery"
11	USB3	"USB interfaces"	22	Optional AC power supply	

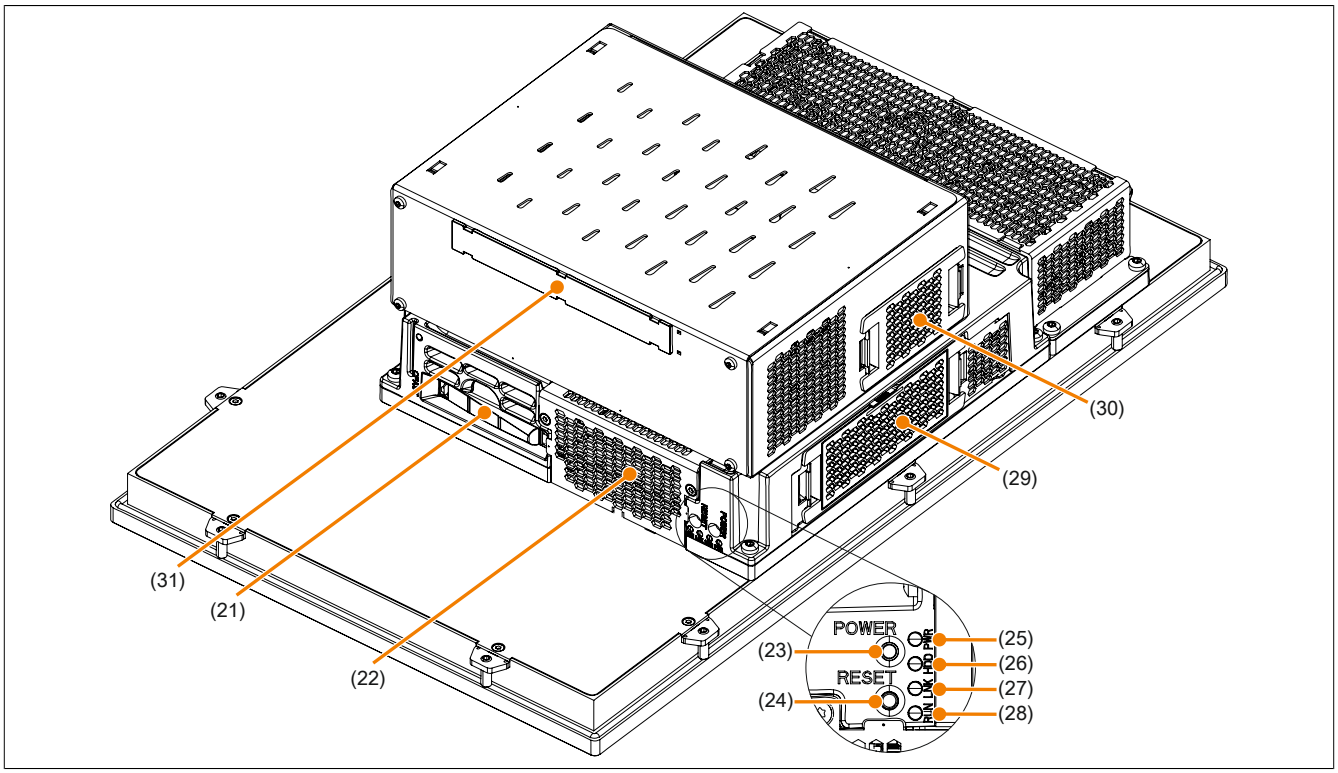


Figure 17: Device interfaces - Overview (side)

No.	Type of interface		No.	Type of interface	
21	CFast	"CFast slot"	27	LINK LED	"LED status indicators"
22	Main memory and Slide-in compact drive	"Main memory slots" Slide-in compact slot	28	RUN LED	"LED status indicators"
23	Power button	"Power button"	29	Fan kit for system unit	
24	Reset button	"Reset button"	30	Fan kit for bus unit	
25	Power LED	"LED status indicators"	31	Slide-in drive on bus unit	"Slide-in slot"
26	HDD LED	"LED status indicators"			

2.4.2 Power supply

The Panel PC can be operated with 24 VDC or optionally with 100~240 VAC. The 5AC902.PS00-00 power supply is required for AC power.

For information about installing or replacing the power supply, see section "Installing or replacing the AC power supply" on page 201.

Danger!

- **All supplied power must be disconnected before removing device covers or components or installing/removing accessories, hardware or cables.**
- **The power cable must be disconnected from the device and from the voltage supply.**
- **All covers, components, accessories, hardware and cables must be installed or connected before the device can be connected to the power supply and turned on.**

2.4.2.1 +24 VDC voltage supply

The 3-pin male connector required for the power supply interface is not included in delivery. It can be ordered from B&R using model number 0TB103.9 (screw clamps) or 0TB103.91 (cage clamps).

The pinout is listed in the following table. The supply voltage is protected internally by a soldered fuse (15 A, fast-acting) to prevent damage to the device in the event of an overload (fuse replacement necessary) or if the voltage supply is connected incorrectly (reverse polarity protection -> fuse replacement not necessary). The device must be returned to B&R for repairs if the fuse is blown in the event of an error.

+24 VDC power supply	
Protected against reverse polarity	
Pin	**Description**
1	+
2	Functional ground
3	-
Model number	**Short description**
	Terminal blocks
0TB103.9	Male connector 24 V 5.08 3-pin screw clamps
0TB103.91	Male connector 24 V 5.08 3-pin cage clamps

3-pin male power supply connector

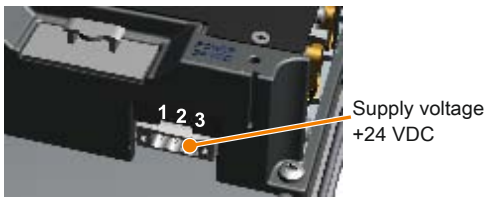


Table 38: +24 VDC voltage supply connection

Electrical characteristics	
Nominal voltage	24 VDC ±25%
Nominal current	5.5 A
Starting current	Max. 60 A for <300 µs
Electrical isolation	Yes
Uninterruptible power supply	Optional, with 5AC901.IUPS-00 or 5AC901.IUPS-01

2.4.2.1.1 Grounding

Caution!

Functional ground (pin 2 of power supply and ground connection) must be kept as short as possible and connected to the largest possible wire cross section at the central grounding point (e.g. the control cabinet or system).

The ground connection is located on the bottom of the Panel PC system.

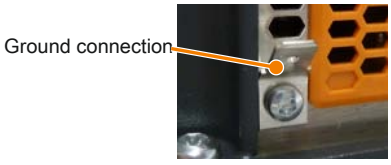


Figure 18: Ground connection

The ground connection must be used, for example, to fasten a copper strip to a central grounding point in the control cabinet or system where the device is installed. The largest possible conductor cross section should be used (at least 2.5 mm²).

2.4.2.2 Optional VAC voltage supply

The optional 5AC902.PS00-00 power supply must be installed on the Panel PC in order to operate the Panel PC with AC power.

The 3-pin male connector required for the power supply interface is not included in delivery. It can be ordered from B&R using model number 0TB3103.8000.

The pinout is listed in the following table and printed on the housing. The supply voltage is protected internally by a soldered fuse so that the device cannot be damaged if an overload occurs (fuse replacement necessary) or the voltage supply is connected incorrectly (reverse polarity protection -> fuse replacement not necessary). The device must be returned to B&R for repairs if the fuse is blown in the event of an error.

VAC power supply	
Protected against reverse polarity	3-pin male power supply connector
Pin	**Description**
1	Protective ground
2	L
3	N
Model number	**Short description**
	Terminal blocks
0TB3103.8000	Connector, 230 VAC, 3-pin female, 4 mm² screw clamp, protected against vibration by the screw flange

Table 39: Voltage supply connection - VAC power supply

Electrical characteristics	
Nominal voltage	100 to 240 VAC
Frequency	45 to 65 Hz
Nominal current	1.25 to 2.5 A
Starting current	<20 A (on cold restart, 100% load and 100 VAC)
Internal fuse	Yes
Uninterruptible power supply	Optional with external UPS

2.4.2.2.1 On/Off switch

The on/off switch can be used to turn the Panel PC on and off. It is located on the 100~240 VAC power supply.

On/Off switch	
Switch position	**Description**
o	The Panel PC is switched off.
I	The Panel PC is switched on.

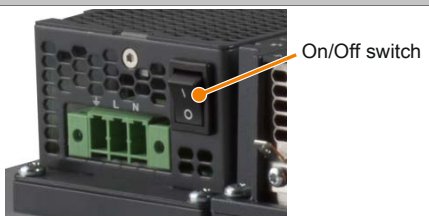


Table 40: On/Off switch

2.4.3 COM1 serial interface

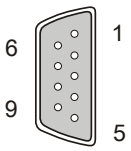
COM1 serial interface[1]		
	RS232	9-pin, male, DSUB connector 
Type	RS232, modem-capable, not electrically isolated	
UART	16550-compatible, 16-byte FIFO	
Transfer rate	Max. 115 kbit/s	
Bus length	Max. 15 m	
Pin	**Assignment**	
1	DCD	
2	RXD	
3	TXD	
4	DTR	
5	GND	
6	DSR	
7	RTS	
8	CTS	
9	RI	

Table 41: COM1 - Pinout

1) The interfaces, etc. available on the device or module have been numbered as such for easy identification. This numbering may differ from that used by the particular operating system.

2.4.4 COM2 serial interface

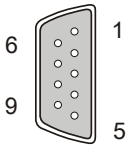
COM2 serial interface[1]		
	RS232	9-pin, male, DSUB connector 
Type	RS232, modem-capable, not electrically isolated	
UART	16550-compatible, 16-byte FIFO	
Transfer rate	Max. 115 kbit/s	
Bus length	Max. 15 m	
Pin	**Assignment**	
1	DCD	
2	RXD	
3	TXD	
4	DTR	
5	GND	
6	DSR	
7	RTS	
8	CTS	
9	RI	

Table 42: COM2 - Pinout

1) The interfaces, etc. available on the device or module have been numbered as such for easy identification. This numbering may differ from that used by the particular operating system.

2.4.5 Panel/Monitor interface

Panel/Monitor interface - SDL (Smart Display Link) / DVI / RGB	
The following overview lists the video signals available on the panel/monitor output. For details, see the technical data for the CPU board being used.	
CPU board	**Video signals with all system unit variants**
5PC901.TS77-00	SDL, DVI, RGB
5PC901.TS77-01	SDL, DVI, RGB
5PC901.TS77-03	SDL, DVI, RGB
5PC901.TS77-04	SDL, DVI, RGB
5PC901.TS77-05	SDL, DVI, RGB
5PC901.TS77-06	SDL, DVI, RGB
5PC901.TS77-07	SDL, DVI, RGB
5PC901.TS77-08	SDL, DVI, RGB
5PC901.TS77-09	SDL, DVI, RGB
5PC901.TS77-10	SDL, DVI, RGB

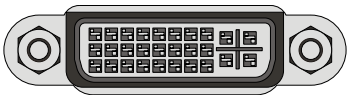


Table 43: Panel/Monitor interface - SDL, DVI, RGB

Information:

The hardware and graphics drivers of approved operating systems support the hot plugging of display devices to the panel/monitor interface for service purposes. The panel/monitor connector is specified for 100 connection cycles.

Information:

If a display device with touch screen is connected to the panel/monitor interface and then disconnected again during operation (hot plugging), it may be necessary to recalibrate the touch screen.

Information:

The RGB interface uses an analog signal; the line length depends on the resolution and prevailing environmental conditions. This interface is therefore only recommended for service purposes.

2.4.5.1 USB communication in SDL and DVI mode

Information:

The USB transfer rate is limited to USB 1.1 in SDL mode.

In DVI mode, the maximum USB transfer rate is determined by the USB interface and USB hub on the display device.

2.4.5.2 Pinout

Pin	Assignment	Description	Pin	Assignment	Description
1	TMDS data 2-	DVI lane 2 (negative)	16	HPD	Hot plug detect
2	TMDS data 2+	DVI lane 2 (positive)	17	TMDS data 0-	DVI lane 0 (negative)
3	TMDS data 2/4 SHIELD	Shield for data pair 2 and 4	18	TMDS data 0+	DVI lane 0 (positive)
4	SDL-	SDL lane (negative)	19	TMDS Data 0/ XUSB1 SHIELD	Shield for data pair 0 and USB1
5	SDL+	SDL lane (positive)	20	XUSB1-	USB lane 1 (negative)
6	DDC clock	DDC-based control signal (clock)	21	XUSB1+	USB lane 1 (positive)
7	DDC data	DDC-based control signal (data)	22	TMDS clock shield	Shield for clock pair
8	ANALOG VERT SYNC	Analog vertical synchroniza-tion	23	TMDS clock+	DVI clock (positive)
9	TMDS data 1-	DVI lane 1 (negative)	24	TMDS clock -	DVI clock (negative)
10	TMDS DATA 1+	DVI lane 1 (negative) HDMI clock (positive)	C1	ANALOG RED	Analog red
11	TMDS DATA 1/ XUSB0 SHIELD	Shield for data pair 1 and USB0	C2	ANALOG GREEN	Analog green

DVI, 24-pin, female

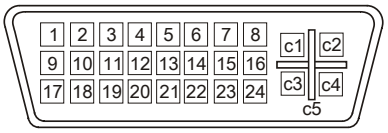


Table 44: DVI interface - Pinout

Pin	Assignment	Description	Pin	Assignment	Description	
12	XUSB0-	USB lane 0 (negative)	C3	ANALOG BLUE	Analog blue	
13	XUSB0+	USB lane 0 (positive)	C4	ANALOG HORZ SYNC	Analog horizontal synchro-nization	
14	+5 V power[1)]	+5 V power supply	C5	ANALOG GND	Analog ground (return for R, G and B signals)	
15	Ground (return for +5 V, HSync and VSync)	Ground				

Table 44: DVI interface - Pinout

1) Protected internally by a multifuse.

2.4.5.3 Cable lengths and resolutions for SDL transmission

The following table lists the relationship between segment lengths and maximum resolution depending on the SDL cable being used:

SDL cable	Resolution						
Segment length [m]	VGA 640 x 480	SVGA 800 x 600	XGA 1024 x 768	HD 1366 x 768	SXGA 1280 x 1024	UXGA 1600 x 1200	FHD 1920 x 1080
0.8	5CASDL.0008-00	5CASDL.0008-00	5CASDL.0008-00	5CASDL.0008-00	5CASDL.0008-00	5CASDL.0008-00	5CASDL.0008-00
1.8	5CASDL.0018-00 5CASDL.0018-01 5CASDL.0018-03	5CASDL.0018-00 5CASDL.0018-01 5CASDL.0018-03	5CASDL.0018-00 5CASDL.0018-01 5CASDL.0018-03	5CASDL.0018-00 5CASDL.0018-01 5CASDL.0018-03	5CASDL.0018-00 5CASDL.0018-01 5CASDL.0018-03	5CASDL.0018-00 5CASDL.0018-01 5CASDL.0018-03	5CASDL.0018-00 5CASDL.0018-01 5CASDL.0018-03
5	5CASDL.0050-00 5CASDL.0050-01 5CASDL.0050-03	5CASDL.0050-00 5CASDL.0050-01 5CASDL.0050-03	5CASDL.0050-00 5CASDL.0050-01 5CASDL.0050-03	5CASDL.0050-00 5CASDL.0050-01 5CASDL.0050-03	5CASDL.0050-00 5CASDL.0050-01 5CASDL.0050-03	5CASDL.0050-00 5CASDL.0050-01 5CASDL.0050-03	5CASDL.0050-00 5CASDL.0050-01 5CASDL.0050-03
10	5CASDL.0100-00 5CASDL.0100-01 5CASDL.0100-03	5CASDL.0100-00 5CASDL.0100-01 5CASDL.0100-03	5CASDL.0100-00 5CASDL.0100-01 5CASDL.0100-03	5CASDL.0100-00 5CASDL.0100-01 5CASDL.0100-03	5CASDL.0100-00 5CASDL.0100-01 5CASDL.0100-03	5CASDL.0100-00 5CASDL.0100-01 5CASDL.0100-03	5CASDL.0100-00 5CASDL.0100-01 5CASDL.0100-03
15	5CASDL.0150-00 5CASDL.0150-01 5CASDL.0150-03	5CASDL.0150-00 5CASDL.0150-01 5CASDL.0150-03	5CASDL.0150-00 5CASDL.0150-01 5CASDL.0150-03	5CASDL.0150-00 5CASDL.0150-01 5CASDL.0150-03	5CASDL.0150-00 5CASDL.0150-01 5CASDL.0150-03	- - -	- - 5CASDL.0150-03
20	5CASDL.0200-00 5CASDL.0200-03	5CASDL.0200-00 5CASDL.0200-03	5CASDL.0200-00 5CASDL.0200-03	5CASDL.0200-00 5CASDL.0200-03	5CASDL.0200-00 5CASDL.0200-03	- -	- 5CASDL.0200-03
25	5CASDL.0250-00 5CASDL.0250-03	5CASDL.0250-00 5CASDL.0250-03	5CASDL.0250-00 5CASDL.0250-03	5CASDL.0250-00 5CASDL.0250-03	- -	- -	- -
30	5CASDL.0300-00 5CASDL.0300-03	5CASDL.0300-00 5CASDL.0300-03	- 5CASDL.0300-13	- 5CASDL.0300-13	- 5CASDL.0300-13	- -	- 5CASDL.0300-13
40	5CASDL.0400-13	5CASDL.0400-13	5CASDL.0400-13	5CASDL.0400-13	5CASDL.0400-13	-	5CASDL.0400-13

Table 45: Cable lengths and resolutions for SDL transmission

2.4.5.4 Cable lengths and resolutions for DVI transmission

The following table lists the relationship between segment lengths and maximum resolution depending on the DVI cable being used:

DVI cable	Resolution						
Segment length [m]	VGA 640 x 480	SVGA 800 x 600	XGA 1024 x 768	HD 1366 x 768	SXGA 1280 x 1024	UXGA 1600 x 1200	FHD 1920 x 1080
1.8	5CADVI.0018-00	5CADVI.0018-00	5CADVI.0018-00	5CADVI.0018-00	5CADVI.0018-00	5CADVI.0018-00	5CADVI.0018-00
5	5CADVI.0050-00	5CADVI.0050-00	5CADVI.0050-00	5CADVI.0050-00	5CADVI.0050-00	5CADVI.0050-00	5CADVI.0050-00

Table 46: Cable lengths and resolutions for DVI transmission

The maximum cable length for DVI transfer is limited to 5 m due to the USB specification.

2.4.6 Ethernet 1 interface (ETH1)

This Ethernet controller is integrated in the CPU board and connected to external devices via the system unit.

Ethernet 1 interface (ETH1[1])			
Controller	Intel 82579V		RJ45, female
Cabling	S/STP (Cat 5e)		
Transfer rate	10/100/1000 Mbit/s[2]		
Cable length	Max. 100 m (min. Cat5e)		
Speed LED	**On**	**Off**	
Green	100 Mbit/s	10 Mbit/s[3]	
Orange	1000 Mbit/s	-	
Link LED	**On**	**Off**	
Green	Link (Ethernet network connection available)	Activity (blinking - data transfer in progress)	

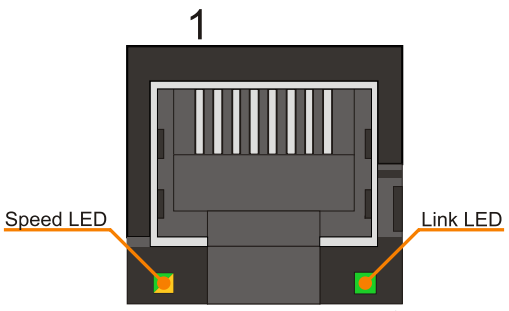


Table 47: Ethernet interface (ETH1)

1) The interfaces, etc. available on the device or module have been numbered as such for easy identification. This numbering may differ from that used by the particular operating system.
2) Switching takes place automatically.
3) The 10 Mbit/s transfer speed / connection only exists if the Link LED is also lit at the same time.

Driver support

A special driver is required to operate the Ethernet controller. Drivers for approved operating systems are available in the Downloads section of the B&R website www.br-automation.com.

Information:

Required drivers can only be downloaded from the B&R website, not from manufacturer websites.

2.4.7 Ethernet 2 interface (ETH2)

This Ethernet controller is integrated in the CPU board and connected to external devices via the system unit.

Ethernet 2 interface (ETH2[1])			
Controller	Intel I210		RJ45, female
Cabling	S/STP (Cat 5e)		
Transfer rate	10/100/1000 Mbit/s[2]		
Cable length	Max. 100 m (min. Cat5e)		
Speed LED	**On**	**Off**	
Green	100 Mbit/s	10 Mbit/s[3]	
Orange	1000 Mbit/s	-	
Link LED	**On**	**Off**	
Green	Link (Ethernet network connection available)	Activity (blinking - data transfer in progress)	

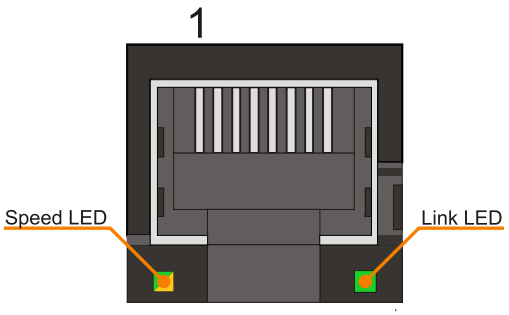


Table 48: Ethernet interface (ETH2)

1) The interfaces, etc. available on the device or module have been numbered as such for easy identification. This numbering may differ from that used by the particular operating system.
2) Switching takes place automatically.
3) The 10 Mbit/s transfer speed / connection only exists if the Link LED is also lit at the same time.

Driver support

A special driver is required to operate the Ethernet controller. Drivers for approved operating systems are available in the Downloads section of the B&R website www.br-automation.com.

Information:

Required drivers can only be downloaded from the B&R website, not from manufacturer websites.

2.4.8 USB interfaces

The Panel PC comes equipped with a USB 3.0 (Universal Serial Bus) host controller with multiple USB interfaces, 4 of which are accessible externally for the user.

Warning!

Peripheral USB devices can be connected to the USB interfaces on this device. Due to the large number of USB devices available on the market, B&R cannot guarantee their performance. All USB devices provided by B&R are guaranteed to function properly.

Caution!

Because this interface is designed according to general PC specifications, extreme care should be exercised with regard to EMC, cable routing, etc.

USB1, USB2, USB3, USB4

4 USB 3.0 interfaces are provided on the bottom of the Panel PC.

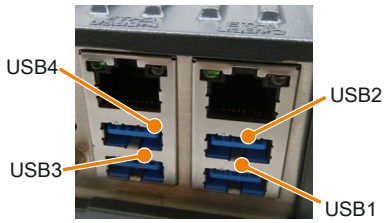
Universal Serial Bus (USB1, USB2, USB3, USB4)[1]		
Type	USB 3.0	4x USB type A, female 
Design	Type A	
Transfer rate	Low speed (1.5 Mbit/s), full speed (12 Mbit/s), high speed (480 Mbit/s), super speed (5 Gbit/s)[2]	
Current load[3] USB1, USB2 USB3, USB4	 Max. 1 A Max. 1 A	
Cable length USB 2.0 USB 3.0	 Max. 5 m (without hub) Max. 3 m (without hub)	

Table 49: USB1, USB2, USB3, USB4 interfaces

1) The interfaces, etc. available on the device or module have been numbered as such for easy identification. This numbering may differ from that used by the particular operating system.
2) Compatibility with SuperSpeed USB depends on the operating system being used.
3) Each USB interface is protected by a maintenance-free "USB current-limiting circuit breaker" (max. 1 A).

Front USB

Automation Panel 1000 display units with 10.4", 12.1" (4:3 format only), 15" and 19" display sizes are equipped with a USB 2.0 interface on the front. For more information, see section "USB interface" on page 67.

2.4.9 CFast slot

The Panel PC offers an easy-to-access CFast slot on the side so that a CFast card can also be used as removable media for transferring data or performing upgrades.

This CFast slot is connected to the chipset internally via SATA 1 with SATA III design (SATA 6.0 Gbit/s).

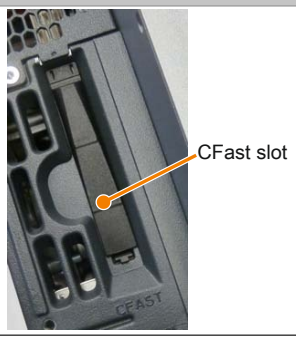
CFast slot		
Connection	SATA 1	
Model number	**Short description**	
	CFast cards	
5CFAST.2048-00	CFast card, 2 GB SLC	
5CFAST.4096-00	CFast card, 4 GB SLC	
5CFAST.8192-00	CFast card, 8 GB SLC	
5CFAST.016G-00	CFast card, 16 GB SLC	
5CFAST.032G-00	CFast card, 32 GB SLC	
5CFAST.032G-10	CFast 32 GB MLC	
5CFAST.064G-10	CFast 64 GB MLC	
5CFAST.128G-10	CFast 128 GB MLC	

Table 50: CFast slot

Warning!

Power must be disconnected before inserting or removing the CFast card.

2.4.10 Audio

The MIC and Line IN inputs use the same female connector (pink). The Line OUT output has its own female connector (green). Connecting a device is detected by the driver so that the user can configure the connections.

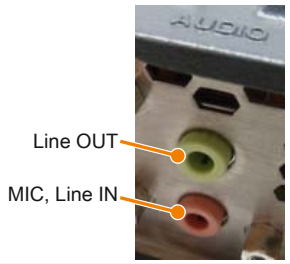
MIC, Line IN, Line OUT		
Controller	Realtek RTL888	3.5 mm female connector
MIC	Connection of a mono microphone with a 3.5 mm jack	
Line IN	Stereo Line IN signal supplied via a 3.5 mm jack	
Line OUT	Connection of a stereo playback device (e.g. amplifier) via a 3.5 mm jack	

Table 51: Audio

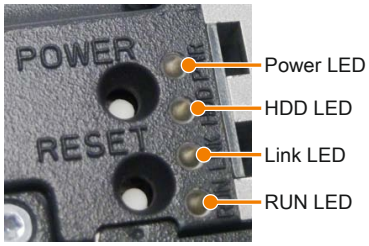
A special driver is required to operate the audio controller. Drivers for approved operating systems are available in the Downloads section of the B&R website (www.br-automation.com).

Information:

Required drivers can only be downloaded from the B&R website, not from manufacturer websites.

2.4.11 LED status indicators

The LED status indicators are located on the right side of the Panel PC when viewed from the front.



The following timing is used for the LED status indicators:
Block size: 250 ms
Repeat interval: 500 ms, 2 boxes thus represent one interval

LED	Color	Status	Function	LED status indicators
Power	Green	On	Voltage supply OK	
		Blinking	Device booted, battery status "BAD"	
			Information: **For more information, see "Battery" on page 58.**	
	Red	On	System in standby mode (S5: Soft-off mode or S4: Hibernation mode suspend-to-disk)	
		Blinking	MTCX running, battery status "BAD". System in standby mode (S5: Soft-off mode or S4: Hibernation mode suspend-to-disk)	
	Red/Green	Blinking	Faulty or incomplete BIOS, MTCX or I/O FPGA update, battery status OK, voltage supply OK	
			Faulty or incomplete BIOS, MTCX or I/O FPGA update, battery status OK, standby mode (S5: Soft-off mode or S4: Hibernation mode suspend-to-disk)	
			Faulty or incomplete BIOS, MTCX or I/O FPGA update, battery status BAD, voltage supply OK	
			Faulty or incomplete BIOS, MTCX or I/O FPGA update, battery status BAD, standby mode (S5: Soft-off mode or S4: Hibernation mode suspend-to-disk)	
			Information: **An update must be performed again.**	
	Yellow	On	Voltage supply not OK, system operating from UPS	
HDD	Yellow	On	Indicates drive access (HDD, CFast)	
Link	Yellow	On	Indicates an active SDL connection on the male panel connector	
		Blinking	Indicates that an active SDL connection has been interrupted by a loss of power to the display unit	
			Information: **Check the voltage supply / power connector of the connected display unit.**	
Run	Green	Blinking	Automation Runtime booting Controlled by Automation Runtime (ARemb and ARwin)	
	Green	On	Application running Controlled by Automation Runtime (ARemb and ARwin)	
	Red	On	Application in service mode Controlled by Automation Runtime (ARemb and ARwin)	
		Blinking	Indicates a licensing violation	

Table 52: LED status indicators - Data

2.4.12 Power button

The power button provides a wide range of ATX power supply functions.

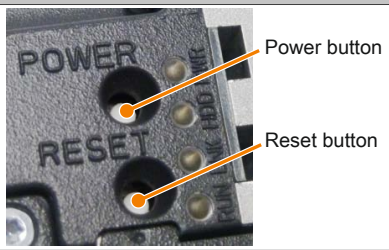
Power button	
The power button can be pressed with a pointed object (e.g. paper clip or tip of a pen). The power button acts like the on/off switch on a normal desktop PC with an ATX power supply: **Press and release** ... Switches on the Panel PC or shuts down the operating system and switches off the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

Table 53: Power button

2.4.13 Reset button

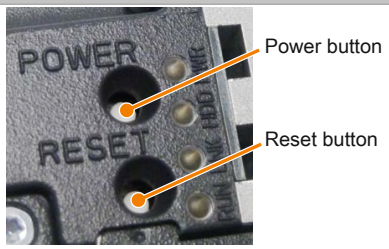
Reset button	
The reset button can be pressed with a pointed object (e.g. paper clip or tip of a pen). Pushing the reset button triggers a hardware and PCI reset. The Panel PC is restarted (cold restart). Pressing the reset button does not reset the MTCX processor.	

Table 54: Reset button

Warning!

A system reset can result in lost data!

2.4.14 Battery

The lithium battery (3 V, 950 mAh) buffers the internal real-time clock (RTC). It is located on the back of the Panel PC. The battery is installed in a battery holder, making it very easy to replace.

The battery's buffer time is at least 4 years (at 50°C, 8.5 µA for the components being supplied and a self-discharge of 40%). If an SRAM interface option has been installed, this lifespan is reduced to 2½ years. The battery has a limited service life and should be replaced regularly (after the specified service life at the latest).

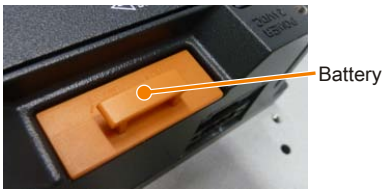
	Battery	
Battery Type Removable Service life	 Renata 950 mAh Yes, accessible from the outside 4 years[1)]	
Model number	**Short description**	
	Batteries	
0AC201.91	Lithium batteries, 4 pcs., 3 V / 950 mAh, button cell	
4A0006.00-000	Lithium battery, 1 pc., 3 V / 950 mAh, button cell	

Table 55: Battery

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

The status of the battery is determined immediately after the device is started and subsequently checked by the system every 24 hours. During this measurement, the battery is subjected to a brief load (approximately 1 second) and then evaluated. Once determined, the battery status is displayed in BIOS (Advanced - OEM Features - System board features - Voltage values) and in the B&R Control Center (ADI driver); it can also be read in a customer application using the ADI library.

Battery status	Function
N/A	The hardware or firmware being used is too old and does not support reading the battery status.
GOOD	Data buffering is intact.
BAD	From the point when battery capacity is recognized as insufficient (BAD), data buffering is intact for approximately another 500 hours.

Table 56: Battery status

From the point when battery capacity is recognized as insufficient, data buffering is intact for approximately another 500 hours. When replacing the battery, data is buffered for approximately 10 minutes by a gold leaf capacitor.

2.4.15 Slide-in compact slot

The slide-in compact slot is connected to the chipset internally via SATA 0 with SATA III design (SATA 6.0 Gbit/s).

Slide-in compact slot	
Connection	SATA 0
Model number	**Short description**
	Drives
5AC901.CHDD-01	500 GB hard disk - Slide-in compact - SATA
5AC901.CSSD-03	60 GB SSD MLC - Slide-in compact - SATA
5AC901.CSSD-04	128 GB SSD MLC - Slide-in compact - SATA
5AC901.CSSD-05	256 GB SSD MLC - Slide-in compact - Toshiba - SATA
5AC901.CSSD-06	512 GB SSD MLC - Slide-in compact - Toshiba - SATA
5AC901.CCFA-00	CFast adapter - For slide-in compact slot

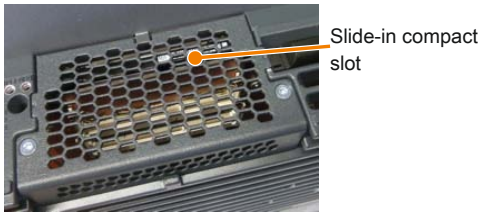


Table 57: Slide-in compact slot

Information:

For information about installing or replacing a slide-in compact drive, please refer to the section "Installing and replacing the slide-in compact drive" on page 208.

2.4.16 Slide-in slot

The slide-in slot is integrated on the bus unit, meaning that it is only available when the bus unit is installed. It is connected to the chipset internally via SATA 2 and USB with SATA II design (SATA 3.0 Gbit/s).

Slide-in slot	
Connection	SATA 2 and USB
Model number	**Short description**
	Drives
5AC901.SDVW-00	DVD drive - DVD-R/RW|DVD+R/RW - Slide-in
5AC901.SSCA-00	Slide-in compact adapter - For slide-in compact drives

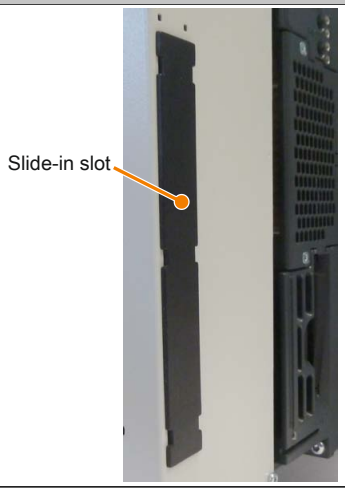


Table 58: Slide-in slot

Information:

For information about installing or replacing a slide-in drive, please refer to the section "Installing a slide-in drive" on page 216.

2.4.17 Main memory slots

The Panel PC 900 provides 2 slots for DDR3 main memory modules.

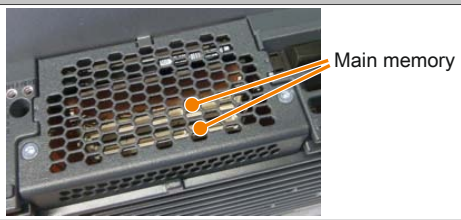
Main memory slots		
Speed	DDR3-1600 (PC3-12800)	
Model number	**Short description**	
	Main memory	
5MMDDR.1024-03	SO-DIMM DDR3, 1024 MB	
5MMDDR.2048-03	SO-DIMM DDR3, 2048 MB	
5MMDDR.4096-03	SO-DIMM DDR3, 4096 MB	
5MMDDR.8192-03	SO-DIMM DDR3, 8192 MB	

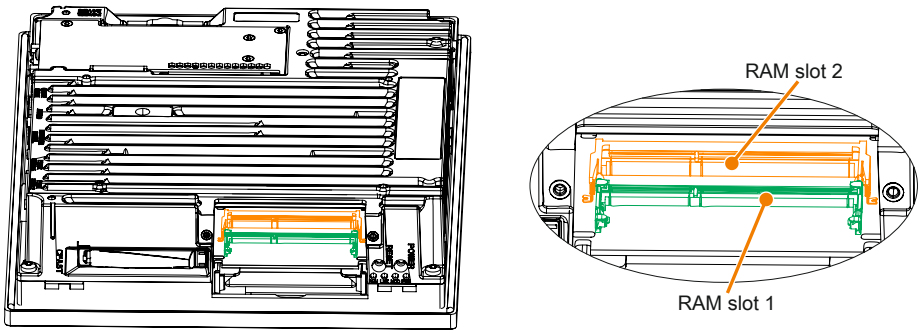
Table 59: Main memory slots

Information:

For information about installing or replacing main memory, please refer to the section "Replacing main memory modules" on page 203.

Caution!

If using only one main memory module, it must be installed in RAM slot 2.



2.4.18 IF option 1 slot

The Panel PC system units include 2 slots for interface options.

The following table lists the interface options that can be used in the IF option 1 slot.

IF option 1 slot	
Model number	**Short description**
	Interface option
5AC901.I485-00[1)]	Interface card - 1x RS232/422/458 interface - For APC910/PPC900
5AC901.ICAN-00[1)2)]	Interface card - 1x CAN interface - For APC910/PPC900
5AC901.IHDA-00	Interface card - 1x audio interface (1x MIC/1x Line In/1x OUT) - For APC910/PPC900
5AC901.IRDY-00	Interface card - Ready relay - For APC910/PPC900
5AC901.IUPS-00[3)]	UPS - For 4.5 Ah battery
5AC901.IUPS-01[4)]	UPS - For 2.2 Ah battery
5AC901.ISIO-00	Interface card - System I/O - For APC910/PPC900

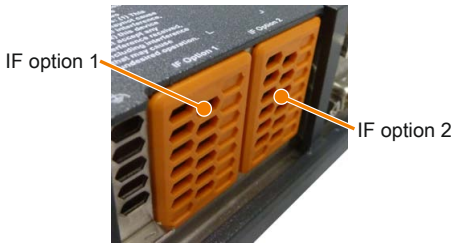


Table 60: IF option 1 slot

1) If IF options 5AC901.I485-00 and 5AC901.ICAN-00 are used simultaneously, the 5AC901.ICAN-00 should be installed in the IF option 1 slot and the 5AC901.I485-00 should be installed in the IF option 2 slot.
2) It is not possible to operate two 5AC901.ICAN interface options (in the IF option 1 and IF option 2 slots) at the same time.
3) The 5AC901.IUPS-00 UPS IF option is only permitted to be operated with the 5AC901.BUPS-00 battery unit!
4) The 5AC901.IUPS-01 UPS IF option is only permitted to be operated with the 5AC901.BUPS-01 battery unit!

Information:

For information about installing or replacing an interface option, please refer to the section "Installing the interface option" on page 205.

2.4.19 IF option 2 slot

The Panel PC system units include 2 slots for interface options.

The following table lists the interface options that can be used in the IF option 2 slot.

IF option 2 slot	
Model number	**Short description**
	Interface option
5AC901.I485-00[1)]	Interface card - 1x RS232/422/458 interface - For APC910/PPC900
5AC901.ICAN-00[1)2)]	Interface card - 1x CAN interface - For APC910/PPC900
5AC901.IPLK-00	Interface card - 1x POWERLINK interface - 2 MB SRAM - For APC910/PPC900
5AC901.ISRM-00	Interface cards - 2 MB SRAM - For APC910/PPC900
5AC901.IRDY-00	Interface card - Ready relay - For APC910/PPC900
5AC901.ISIO-00	Interface card - System I/O - For APC910/PPC900

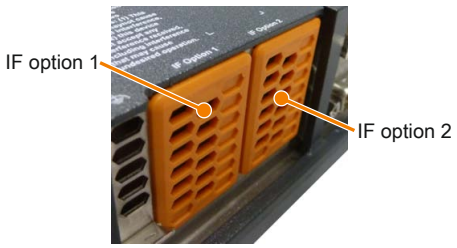


Table 61: IF option 2 slot

1) If IF options 5AC901.I485-00 and 5AC901.ICAN-00 are used simultaneously, the 5AC901.ICAN-00 should be installed in the IF option 1 slot and the 5AC901.I485-00 should be installed in the IF option 2 slot.
2) It is not possible to operate two 5AC901.ICAN interface options (in the IF option 1 and IF option 2 slots) at the same time.

Information:

For information about installing or replacing an interface option, please refer to the section "Installing the interface option" on page 205.

2.4.20 Card slot (PCI / PCIe)

If a bus unit is installed in the Panel PC 900, the bus unit variant being used will determine whether standard PCI 2.2 half-size cards or PCI Express (PCIe) half-size cards can be inserted. They must not exceed the following dimensions.

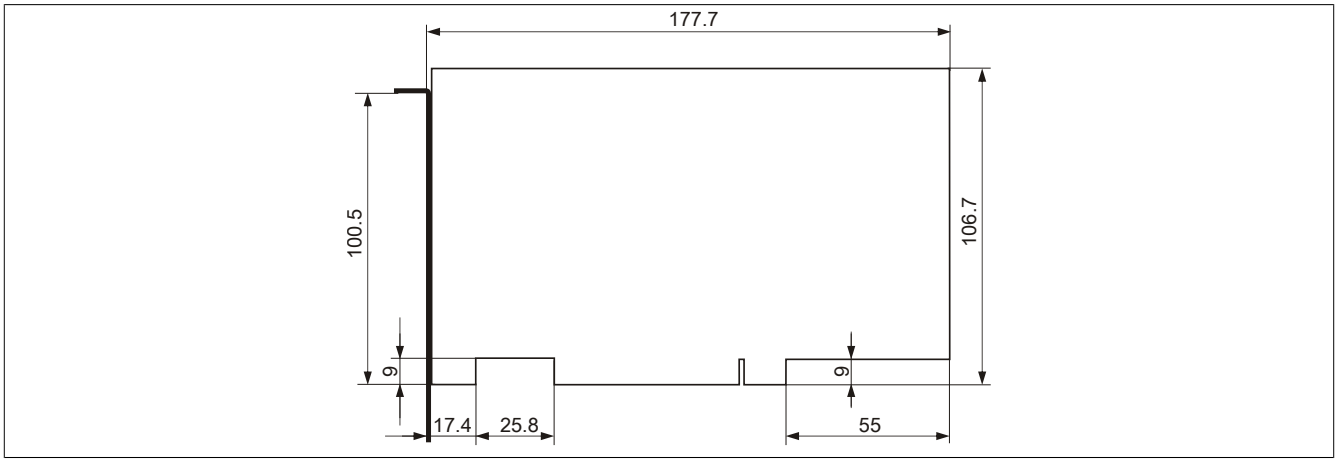


Figure 19: Standard half-size 32-bit PCI card - Dimensions

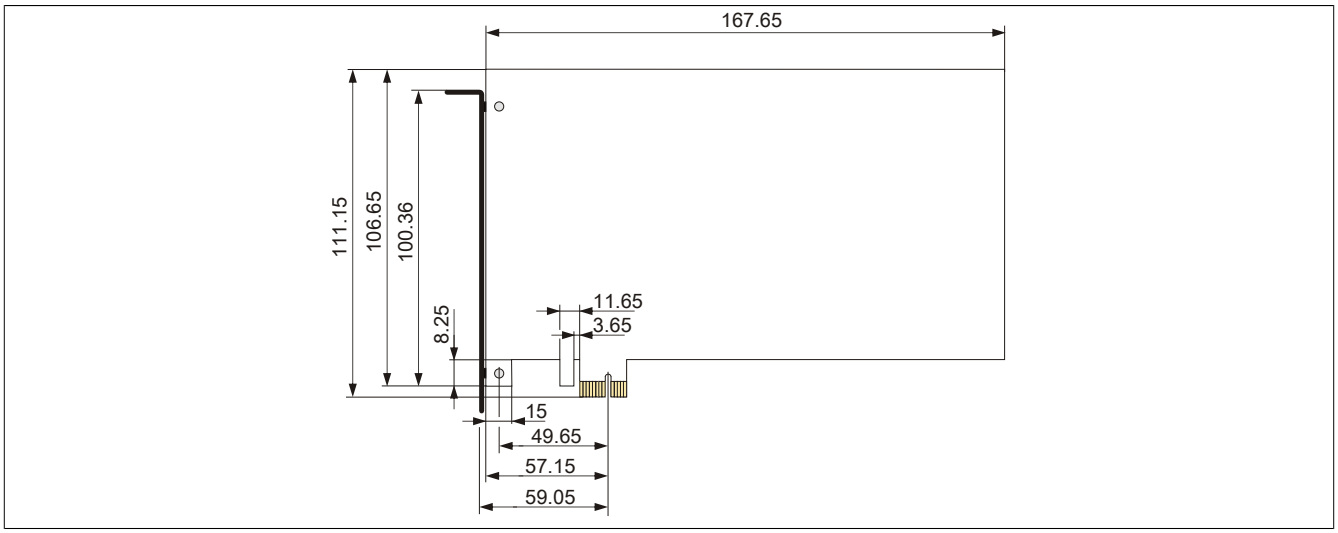


Figure 20: Standard half-size PCIe card - Dimensions

Information:

For information about installing or replacing a PCI/PCIe card, please refer to section "Installing PCI/ PCIe cards" on page 214.

2.5 Layout of AP1000 display units

A wide selection of different display sizes and display units with touch screen are available. The following table provides an overview of the display units and their features.

Display type	Model number	Resolution	Touch screen	Function keys	System keys	Front USB interface
10.4" single-touch	5AP1120.1043-000	VGA	Single-touch	No	No	Yes
10.4" single-touch with keys	5AP1180.1043-000	VGA	Single-touch	Yes	No	Yes
10.4" single-touch with keys	5AP1181.1043-000	VGA	Single-touch	Yes	Yes	Yes
10.4" single-touch with keys	5AP1182.1043-000	VGA	Single-touch	Yes	Yes	Yes
12.1" single-touch	5AP1120.1214-000	SVGA	Single-touch	No	No	Yes
15.0" single-touch	5AP1120.1505-000	XGA	Single-touch	No	No	Yes
15.0" single-touch with keys	5AP1180.1505-000	XGA	Single-touch	Yes	No	Yes
15.6" single-touch	5AP1120.156B-000	HD	Single-touch	No	No	No
19.0" single-touch	5AP1120.1906-000	SXGA	Single-touch	No	No	Yes

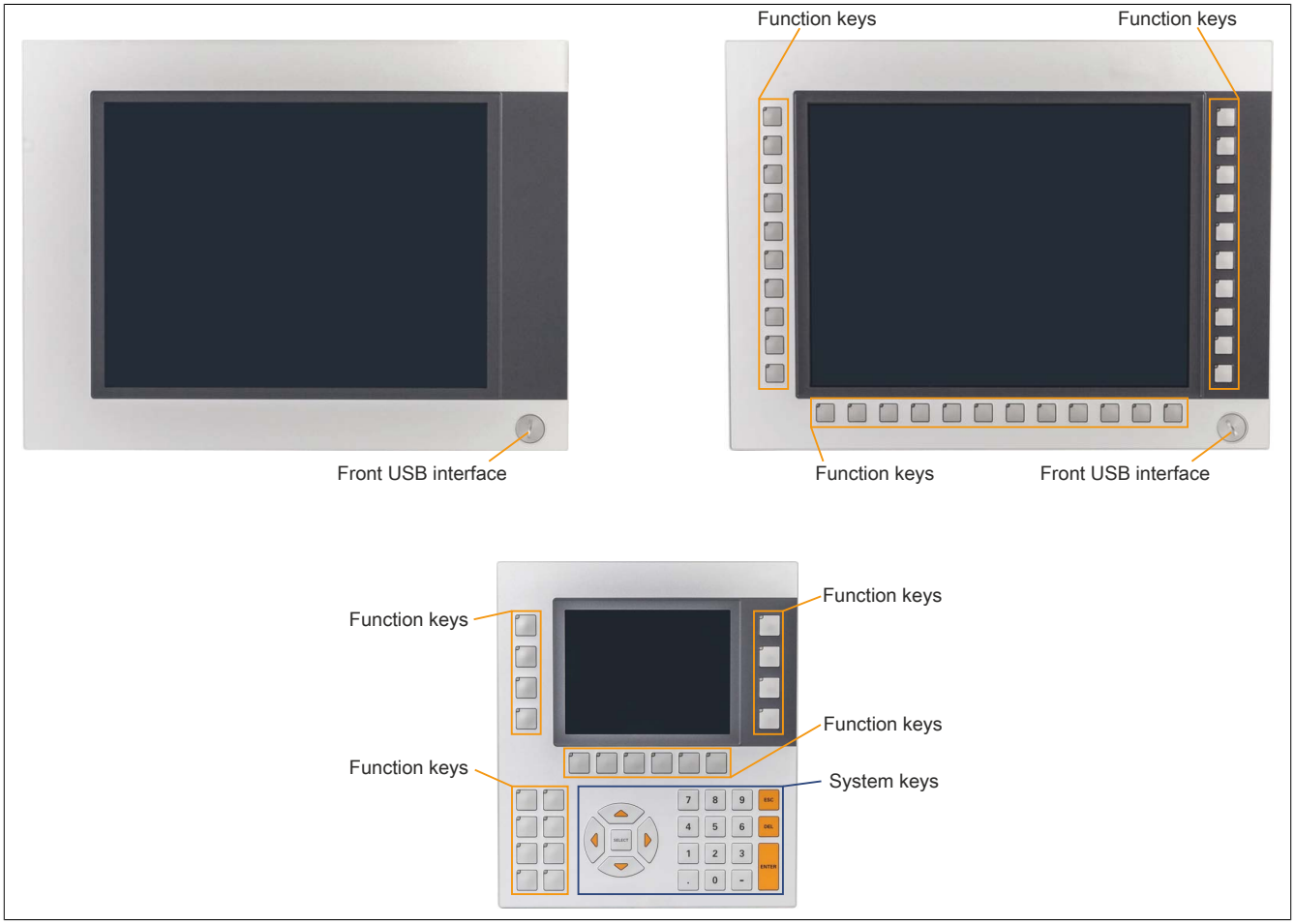


Figure 21: Layout of AP1000 display units

2.5.1 Slide-in labels

Display units with keys are delivered with inserted, transparent slide-in labels in the function keys for custom labeling.

The slide-in label slots are accessible on the back of the Automation Panel device.

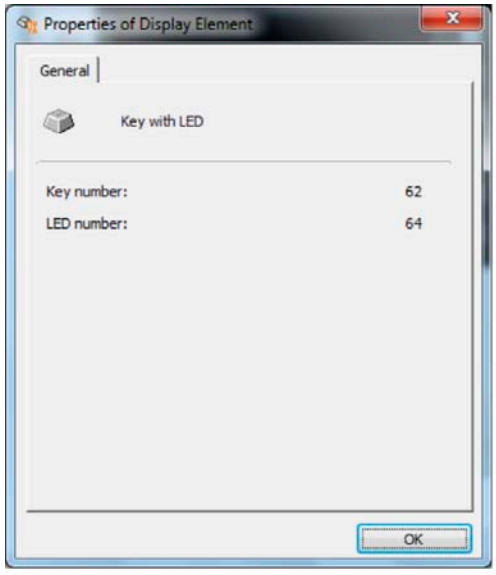
2.5.2 Key and LED configuration

Each button and LED can be individually configured and adapted directly to the application. Various B&R tools are available for this:

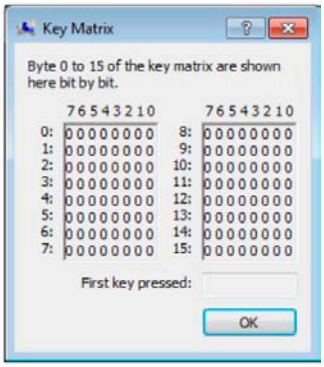
- B&R Key Editor for Windows operating systems
- Visual Components for Automation Runtime

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

The positions of keys and LEDs in the matrix are shown as hardware numbers. These hardware numbers can be read directly from the target system using the B&R Key Editor or B&R Control Center.



Screenshot B&R Key Editor



Screenshot B&R Control Center

Figure 22: Hardware numbers in the B&R Key Editor and B&R Control Center

The images below show the positions of buttons and LEDs in the matrix. This information is indicated as follows.

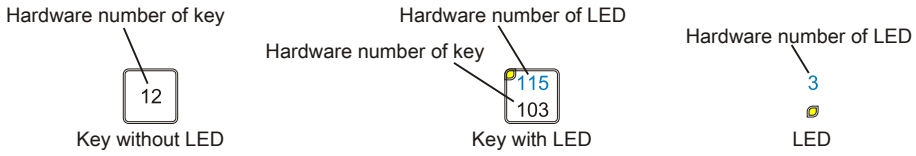


Figure 23: Display - Keys and LEDs

5AP1180.1043-000

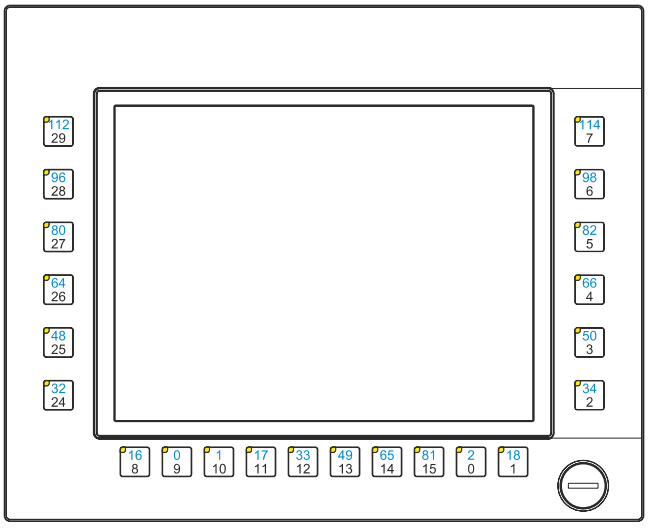


Figure 24: 5AP1180.1043-000 - Key and LED configuration

5AP1181.1043-000

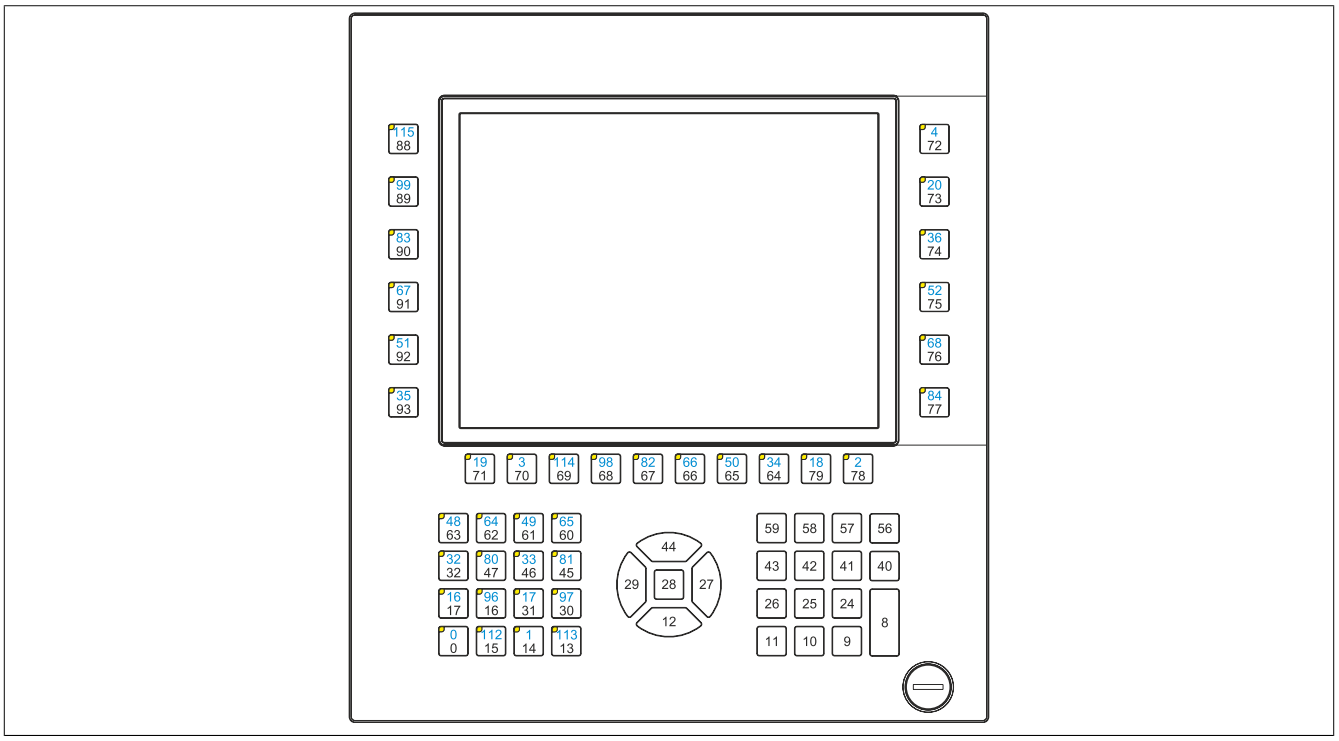


Figure 25: 5AP1181.1043-000 - Key and LED configuration

5AP1182.1043-000

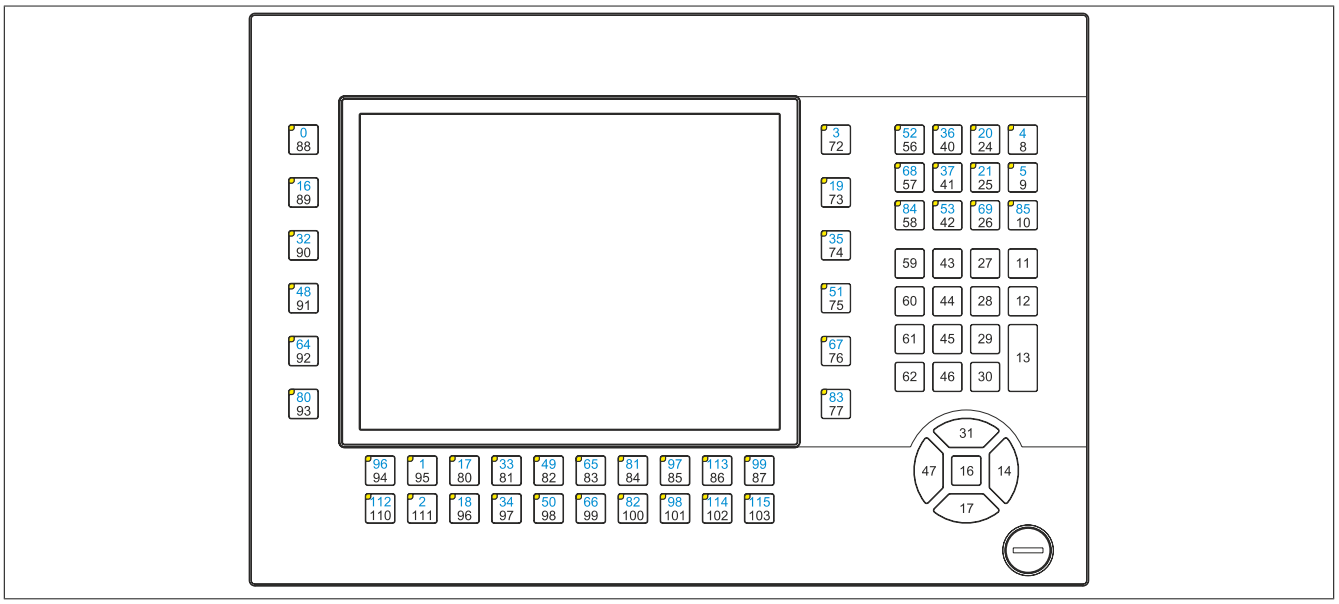


Figure 26: 5AP1182.1043-000 - Key and LED configuration

5AP1180.1505-000

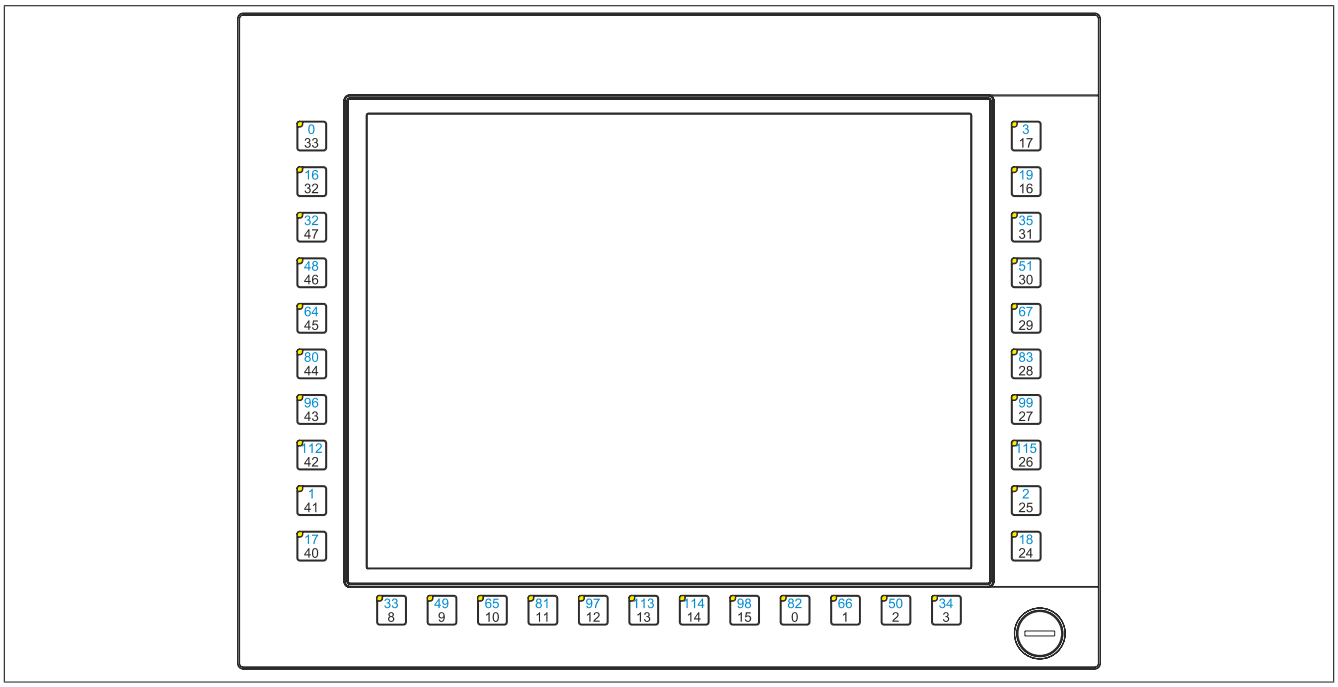


Figure 27: 5AP1180.1505-000 - Key and LED configuration

2.5.3 USB interface

The AP 1000 display units with 10.4", 12.1" (only 4:3 format), 15" and 19" display sizes are equipped with a USB 2.0 interface on the front. This is equipped with a USB interface cover. IP65 protection (front) is only provided if the USB interface cover is installed correctly.

Warning!

Peripheral USB devices can be connected to the USB interfaces on this device. Due to the large number of USB devices available on the market, B&R cannot guarantee their performance. All USB devices provided by B&R are guaranteed to function properly.

Caution!

Because this interface is designed according to general PC specifications, extreme care should be exercised with regard to EMC, cable routing, etc.

Front USB

The front USB interface is available to the user for service purposes.

Universal Serial Bus (front USB)[1]		
Type	USB 2.0	1x USB type A, female
Design	Type A	
Transfer rate	Low speed (1.5 Mbit/s), full speed (12 Mbit/s), high speed (480 Mbit/s)	
Current load[2] Front USB	Max. 500 mA	
Cable length USB 2.0	Max. 5 m (without hub)	

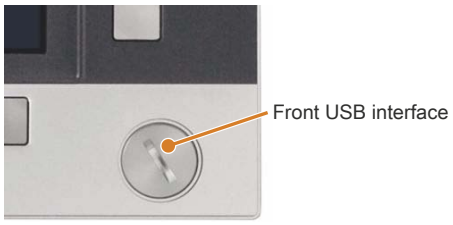


Table 62: Front USB interface

1) The interfaces, etc. available on the device or module have been numbered as such for easy identification. This numbering may differ from that used by the particular operating system.
2) The USB interface is protected by a maintenance-free "USB current-limiting circuit breaker" (max. 500 mA).

2.6 Mounting compatibility

This section provides information about the compatibility of the installation dimensions for Power Panel 100/200, Power Panel 300/400, Power Panel 500, Automation Panel 900, Automation Panel 1000, Automation Panel 700 and Panel PC 800 devices in relation to the respective device display size.

The outer dimensions of the device types are identical for the respective display sizes.

Information:

The device name "AP1000" refers to the Automation Panel 1000 as well as Panel PC 900 and Panel PC 2100 systems with an installed AP1000 display unit.

The names of the different device types are shortened as follows:

Device type	Shortened form
Power Panel 100/200	PP100/200
Power Panel 300/400	PP300/400
Power Panel 500	PP500
Automation Panel 900	AP900
Automation Panel 1000	AP1000
Panel PC 700	PPC700
Panel PC 800	PPC800

Table 63: Shortened product names

2.6.1 Compatibility overview

The following table provides an overview of PP100/200, PP300/400, PP500, AP900, AP1000, PPC700 and PPC800 devices. Detailed information can be found in section "Compatibility details".

Information:

The cutout tolerance for PP100/200, PP300/400, PP500, AP900, PPC700 and PPC800 systems is ±0.5 mm.
The cutout tolerance for the AP1000 is +0 mm / -0.5 mm.

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

Display size	Format		PP100/200	PP300/400	PP500	AP900	AP1000[1)]	PPC700	PPC800
5.7"	Horizontal1	Outer dimensions	■ 212 x 156	■ 212 x 156	■ 212 x 156	-	■ 212 x 156	-	-
		Installation dimensions	● 199 x 143	● 199 x 143	● 199 x 143	-	● 199 x 143	-	-
	Horizontal2	Outer dimensions	■ 302 x 187	■ 302 x 187	■ 302 x 187	-	-	-	-
		Installation dimensions	● 289 x 174	● 289 x 174	● 289 x 174	-	-	-	-
	Vertical1	Outer dimensions	■ 212 x 245	■ 212 x 245	■ 212 x 245	-	■ 212 x 245	-	-
		Installation dimensions	● 199 x 226.8	● 199 x 226.8	▲ 199 x 232	-	▲ 199 x 232	-	-
7"	Horizontal1	Outer dimensions	-	-	■ 212 x 156	-	■ 212 x 156	-	-
		Installation dimensions	-	-	▲ 199 x 143	-	▲ 199 x 143	-	-
10.4"	Horizontal1	Outer dimensions	■ 323 x 260	■ 323 x 260	■ 323 x 260	■ 323 x 260	■ 323 x 260	■ 323 x 260	-
		Installation dimensions	● 303 x 243	● 303 x 243	● 303 x 243	● 303 x 243	● 303 x 243	● 303 x 243	-
	Horizontal2	Outer dimensions	■ 423 x 288	■ 423 x 288	■ 423 x 288	■ 423 x 288	■ 423 x 288	■ 423 x 288	-
		Installation dimensions	● 402 x 266.5	● 402 x 266.5	▲ 403 x 271	□ 402 x 271	▲ 403 x 271	□ 402 x 271	-
	Vertical1	Outer dimensions	■ 323 x 358	■ 323 x 358	■ 323 x 358	■ 323 x 358	■ 323 x 358	■ 323 x 358	-
		Installation dimensions	● 303 x 336	● 303 x 336	▲ 303 x 341	▲ 303 x 341	▲ 303 x 341	▲ 303 x 341	-

Table 64: Overview of device compatibility

Display size	Format		PP100/200	PP300/400	PP500	AP900	AP1000[1)]	PPC700	PPC800
12.1"	Horizontal1	Outer dimensions	■ 362 x 284	■ 362 x 284	■ 362 x 284	■ 362 x 284	■ 362 x 284	■ 362 x 284	-
		Installation dimensions	● 345 x 267	● 345 x 267	▲ 342 x 267	▲ 342 x 267	▲ 342 x 267	▲ 342 x 267	-
15"	Horizontal1	Outer dimensions	■ 435 x 330	■ 435 x 330	■ 435 x 330	■ 435 x 330	■ 435 x 330	■ 435 x 330	■ 435 x 330
		Installation dimensions	● 415 x 312	● 415 x 312	▲ 415 x 313	● 415 x 312	▲ 415 x 313	● 415 x 312	● 415 x 312
	Vertical1	Outer dimensions	■ 435 x 430	■ 435 x 430	■ 435 x 430	■ 435 x 430	-	■ 435 x 430	-
		Installation dimensions	● 415 x 412	● 415 x 412	▲ 415 x 413	● 415 x 412	-	● 415 x 412	-
17"	Horizontal1	Outer dimensions	-	-	-	■ 477 x 390	-	■ 477 x 390	-
		Installation dimensions	-	-	-	▲ 460 x 373	-	▲ 460 x 373	-
19"	Horizontal1	Outer dimensions	-	-	-	■ 527 x 421	■ 527 x 421	■ 527 x 421	■ 527 x 421
		Installation dimensions	-	-	-	▲ 510 x 404	▲ 510 x 404	▲ 510 x 404	▲ 510 x 404
21.3"	Horizontal1	Outer dimensions	-	-	-	■ 583 x 464	-	-	-
		Installation dimensions	-	-	-	▲ 566 x 447	-	-	-

Table 64: Overview of device compatibility

1) The device name "AP1000" refers to the Automation Panel 1000 as well as Panel PC 900 and Panel PC 2100 systems with an installed AP1000 display unit.

2.6.2 Compatibility details

2.6.2.1 Example

The measurement values (all in mm) and information in the following figure also apply to the other figures below.

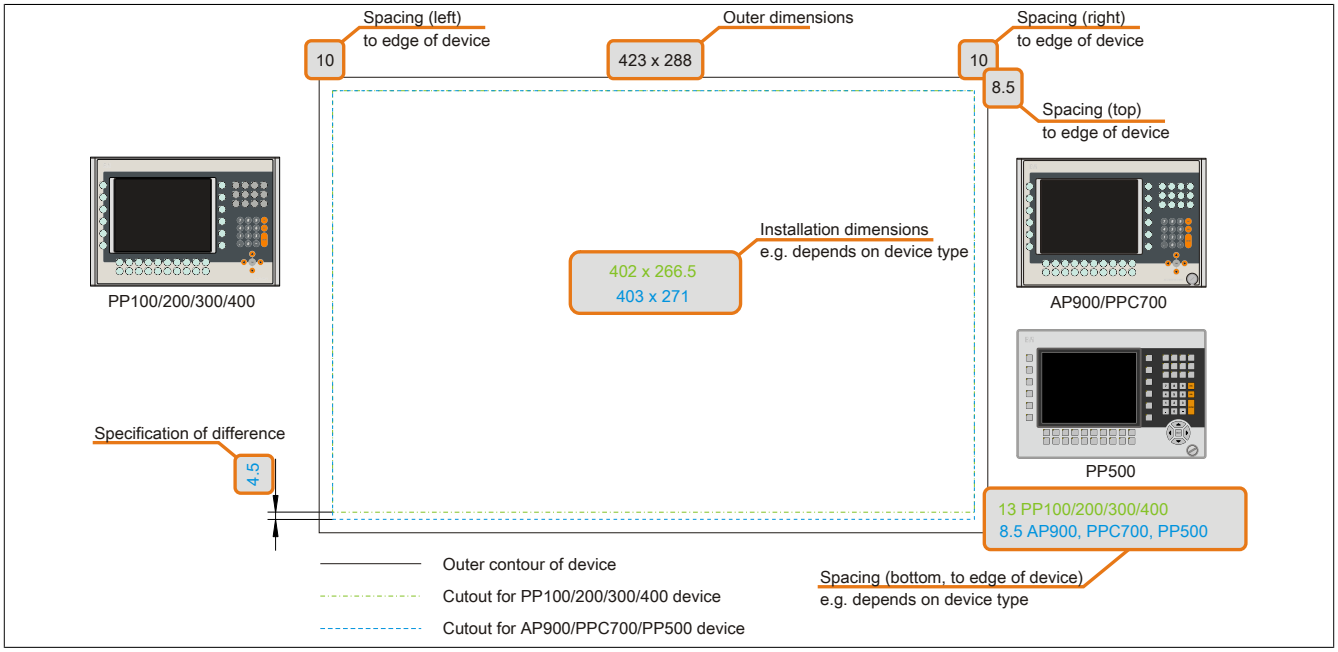


Figure 28: Compatibility details - Figure layout

2.6.2.2 5.7" devices

The cutout tolerance for PP100/200, PP300/400, PP500, AP900, PPC700 and PPC800 systems is ±0.5 mm. The cutout tolerance for the AP1000 is +0 mm / -0.5 mm.

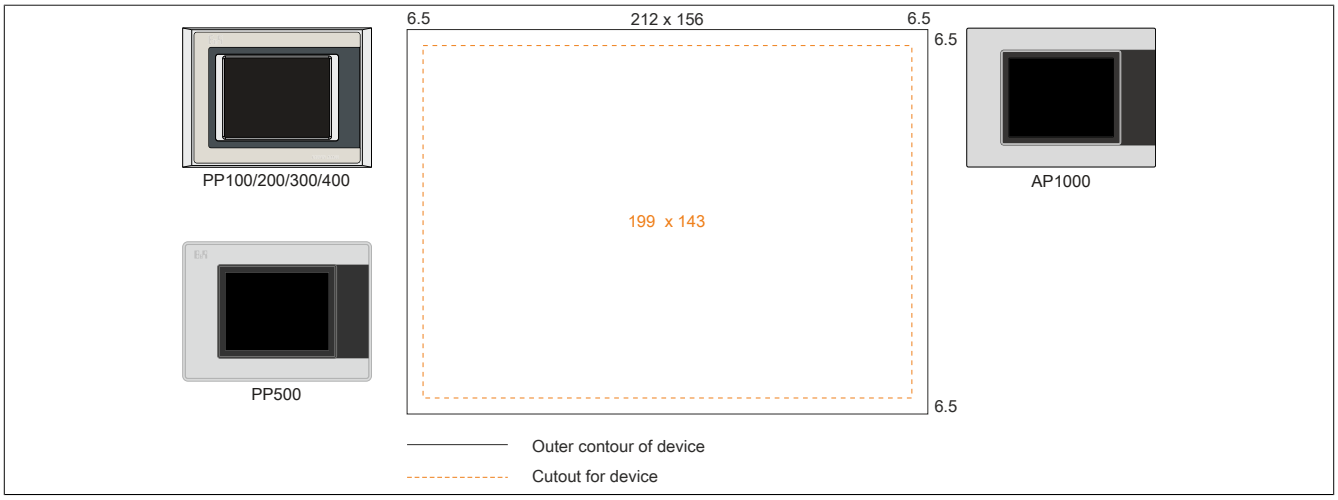


Figure 29: Mounting compatibility - 5.7" device - Horizontal1

5.7" Automation Panel 1000, Power Panel 500 devices and Power Panel 100/200/300/400 devices are 100% mounting compatible in the Horizontal1 format.

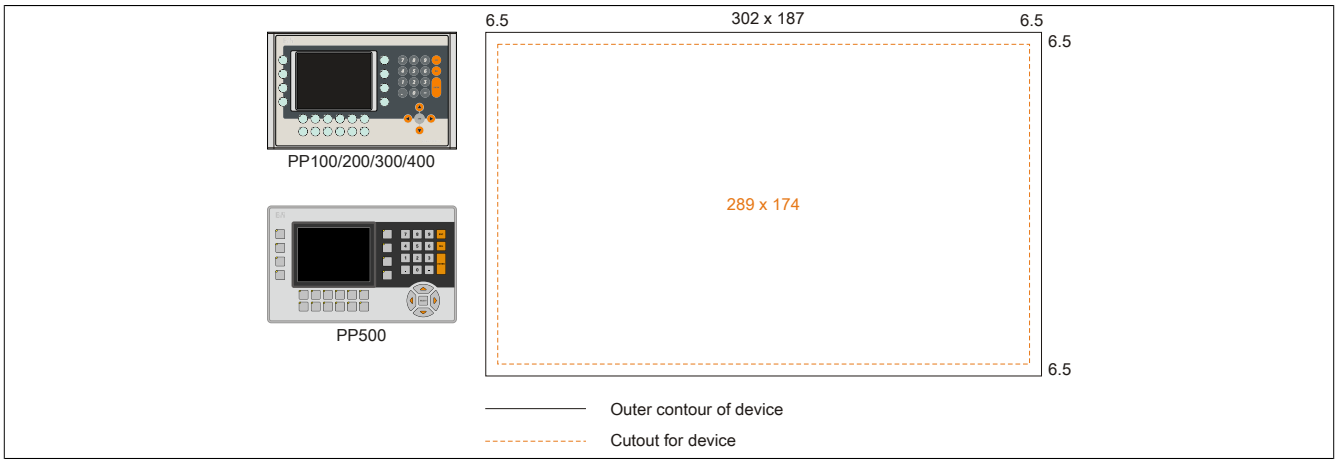


Figure 30: Mounting compatibility - 5.7" device - Horizontal2

5.7" Power Panel 500 devices and Power Panel 100/200/300/400 devices are 100% mounting compatible in the Horizontal2 format.

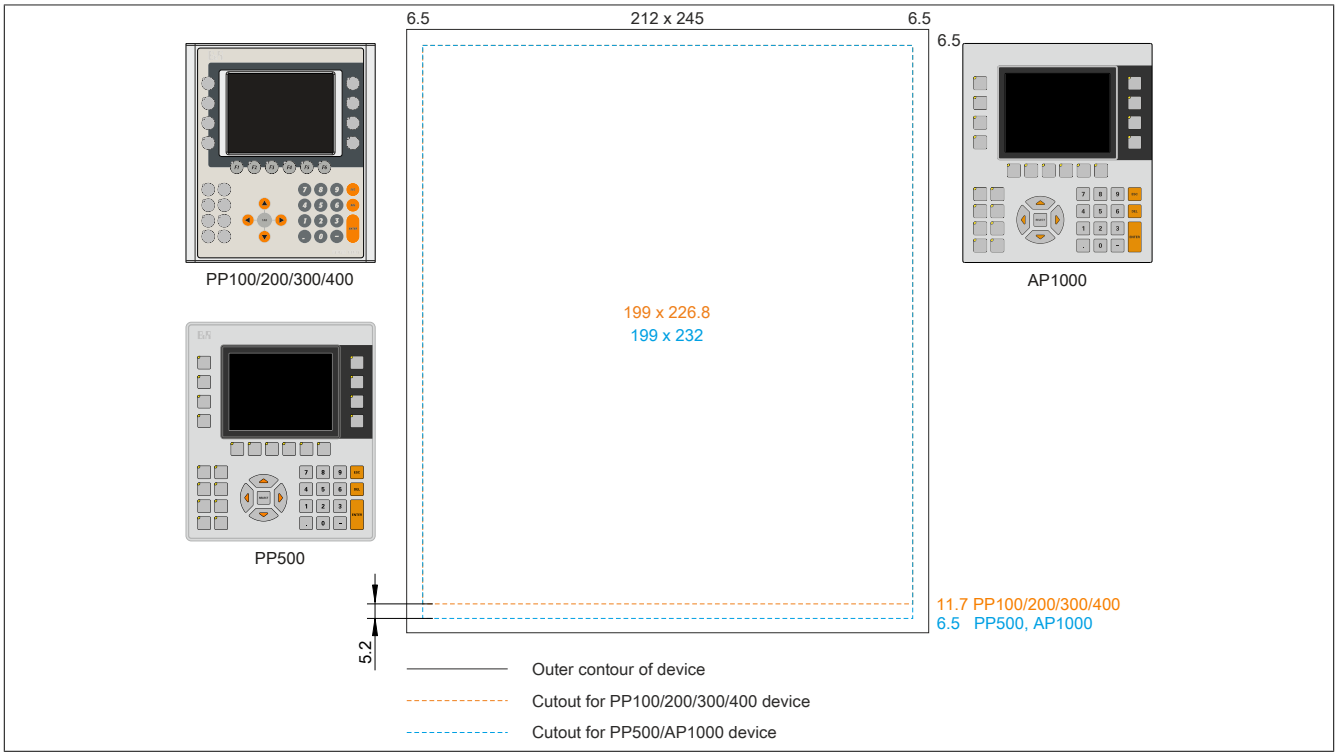


Figure 31: Mounting compatibility - 5.7" device - Vertical1

5.7" Automation Panel 1000 and Power Panel 500 devices are not 100% mounting compatible with Power Panel 100/200/300/400 devices in the Vertical1 format. Automation Panel 1000 and Power Panel 500 devices require a cutout that is 5.2 mm higher (bottom edge).

The larger cutout can be used for all devices under certain conditions:

- 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 solid seal is no longer guaranteed by the gasket (IP65).

2.6.2.3 10.4" devices

The cutout tolerance for PP100/200, PP300/400, PP500, AP900, PPC700 and PPC800 systems is ±0.5 mm. The cutout tolerance for the AP1000 is +0 mm / -0.5 mm.

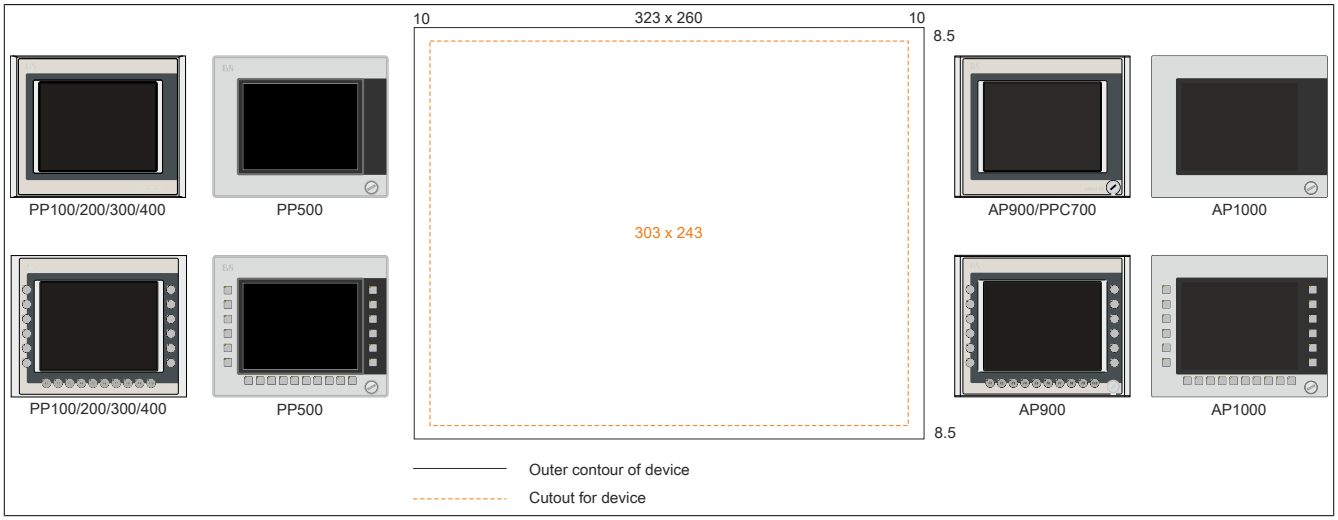


Figure 32: Mounting compatibility - 10.4" device - Horizontal1

10.4" Automation Panel 1000, Automation Panel 900, Panel PC 700, Power Panel 500 devices and Power Panel 100/200/300/400 devices are 100% mounting compatible in Horizontal1 format.

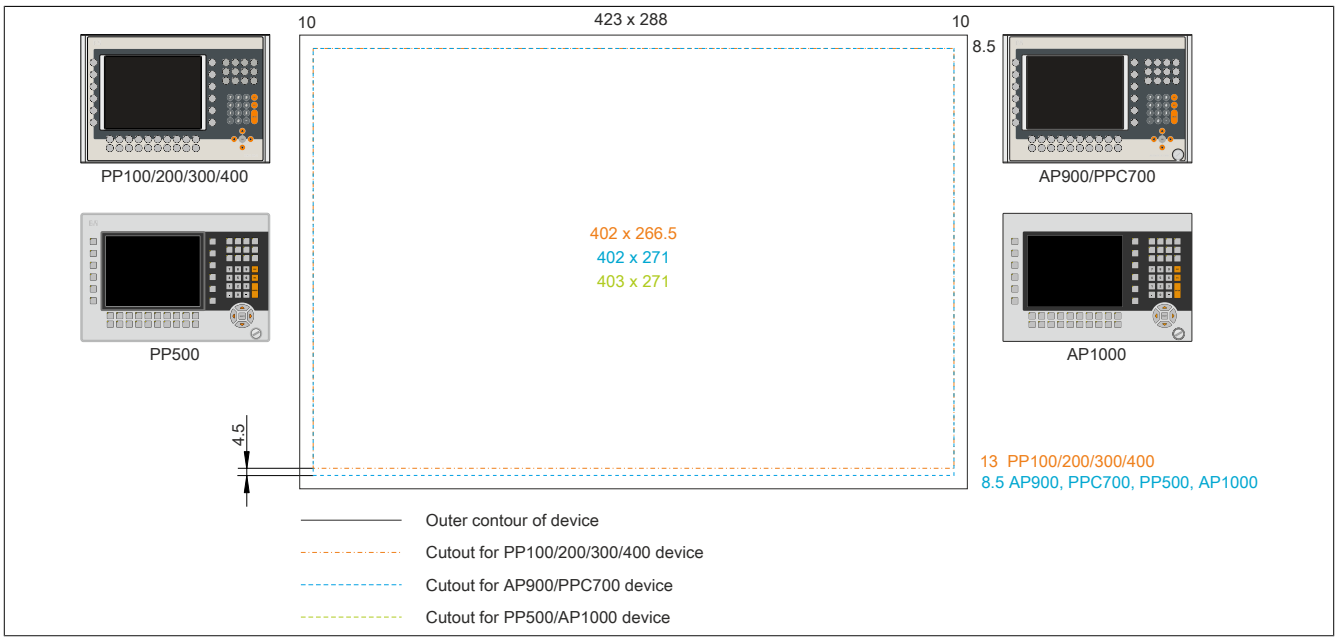


Figure 33: Mounting compatibility - 10.4" device - Horizontal2

10.4" Automation Panel 1000, Automation Panel 900, Panel PC 700 and Power Panel 500 devices are not 100% mounting compatible with Power Panel 100/200/300/400 devices in Horizontal2 format. Automation Panel 1000, Automation Panel 900, Panel PC 700 and Power Panel 500 devices require a cutout that is 4.5 mm higher (bottom edge).

The larger cutout can be used for all devices under certain conditions:

- 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 solid seal is no longer guaranteed by the gasket (IP65).

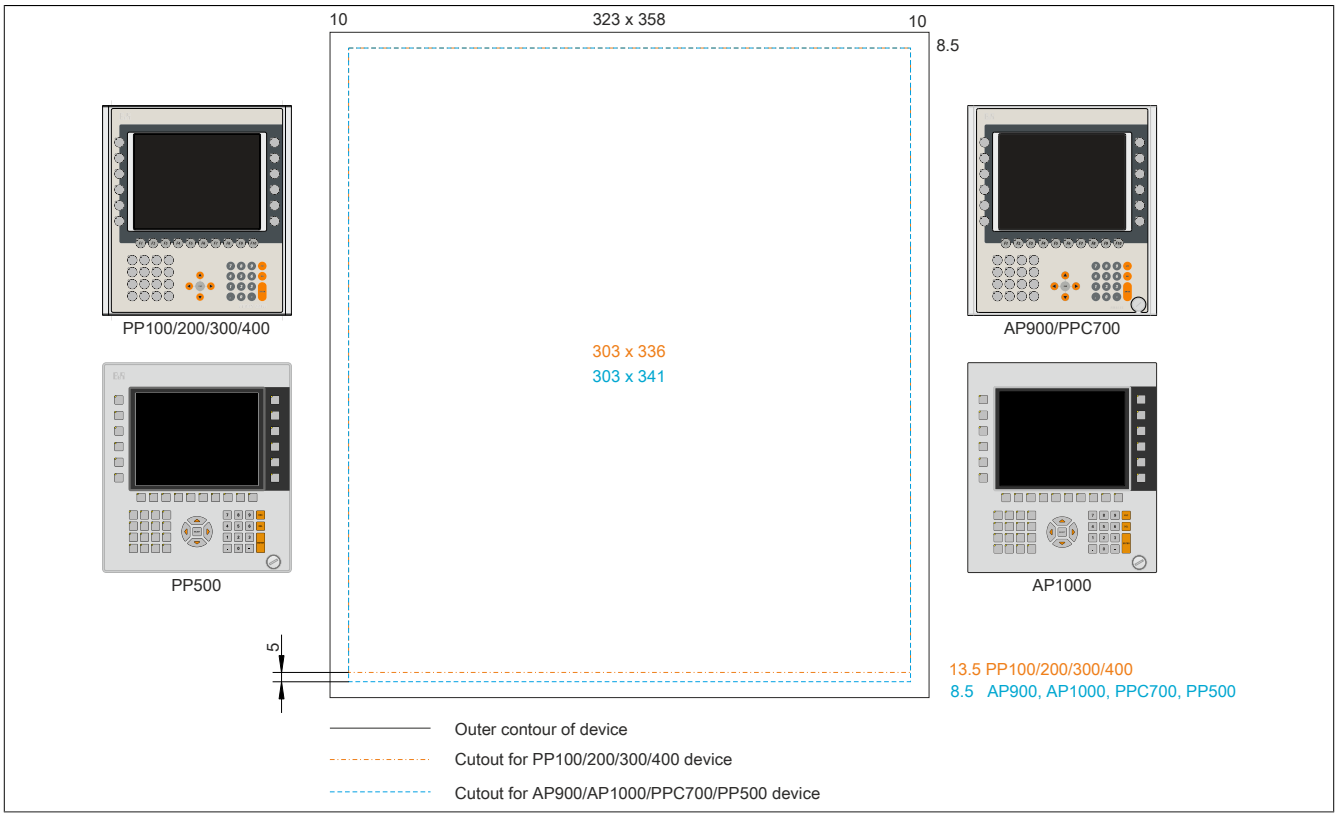


Figure 34: Mounting compatibility - 10.4" device - Vertical1

10.4" Automation Panel 1000, Automation Panel 900, Panel PC 700 and Power Panel 500 devices are not 100% mounting compatible with Power Panel 100/200/300/400 devices in Vertical1 format. Automation Panel 1000, Automation Panel 900, Panel PC 700 and Power Panel 500 devices require a cutout that is 5 mm higher (bottom edge).

The larger cutout can be used for all devices under certain conditions:

- 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 solid seal is no longer guaranteed by the gasket (IP65).

2.6.2.4 12.1" devices

The cutout tolerance for PP100/200, PP300/400, PP500, AP900, PPC700 and PPC800 systems is ±0.5 mm. The cutout tolerance for the AP1000 is +0 mm / -0.5 mm.

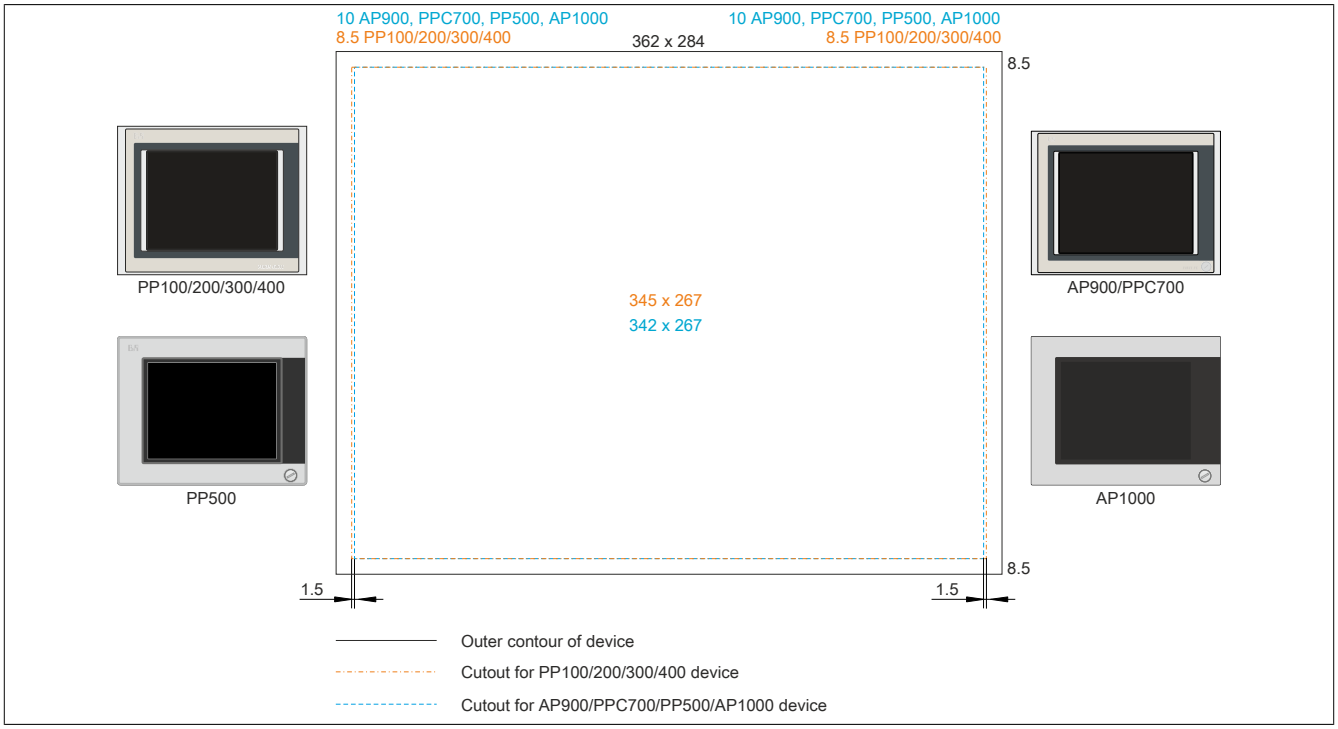


Figure 35: Mounting compatibility - 12.1" device - Horizontal1

12.1" Automation Panel 1000, Automation Panel 900, Panel PC 700 and Power Panel 500 devices are not 100% mounting compatible with Power Panel 100/200/300/400 devices in Horizontal1 format. The Power Panel 300/400 and Power Panel 100/200 devices require a cut that is 1.5 mm wider (left and right).

The larger cutout can be used for all devices under certain conditions:

- When mounting, make sure that the AP1000, AP900, PPC700 and PP500 devices are placed and mounted as close to the center of the cutout as possible.

2.6.2.5 15" devices

The cutout tolerance for PP100/200, PP300/400, PP500, AP900, PPC700 and PPC800 systems is ±0.5 mm.
The cutout tolerance for the AP1000 is +0 mm / -0.5 mm.

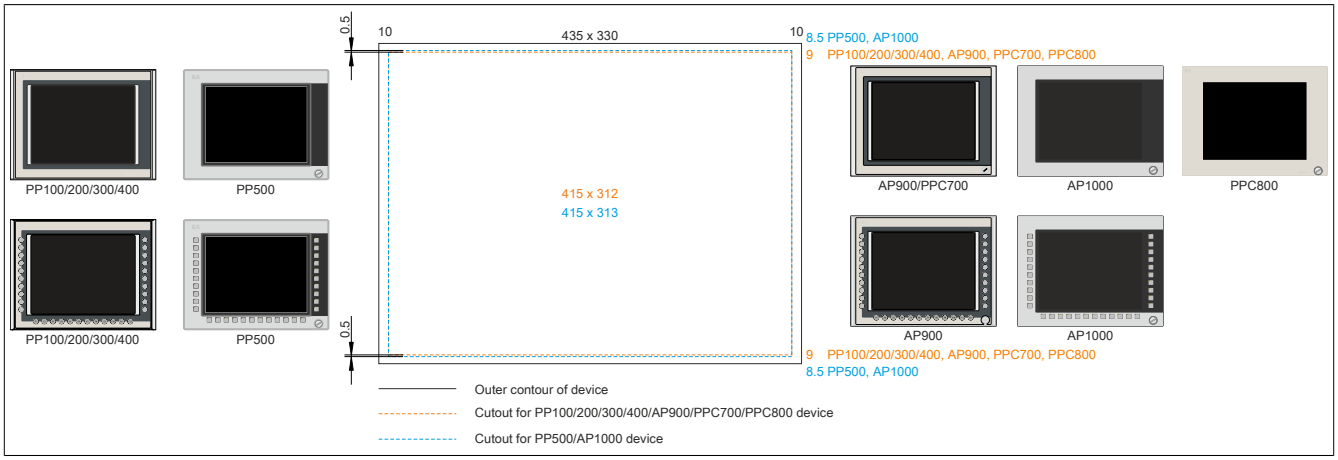


Figure 36: Mounting compatibility - 15" device - Horizontal1

15" Automation Panel 1000 and Power Panel 500 devices are not 100% mounting compatible with Power Panel 100/200/300/400, Automation Panel 900, Panel PC 700 and Panel PC 800 devices in the Vertical1 format. Automation Panel 1000 and Power Panel 500 devices require a cutout that is 0.5 mm higher (top and bottom edge).

The larger cutout can be used for all devices under certain conditions:

- When mounting, make sure that the PP100/200, PP300/400, AP900, PPC700 and PPC800 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 solid seal is no longer guaranteed by the gasket (IP65).

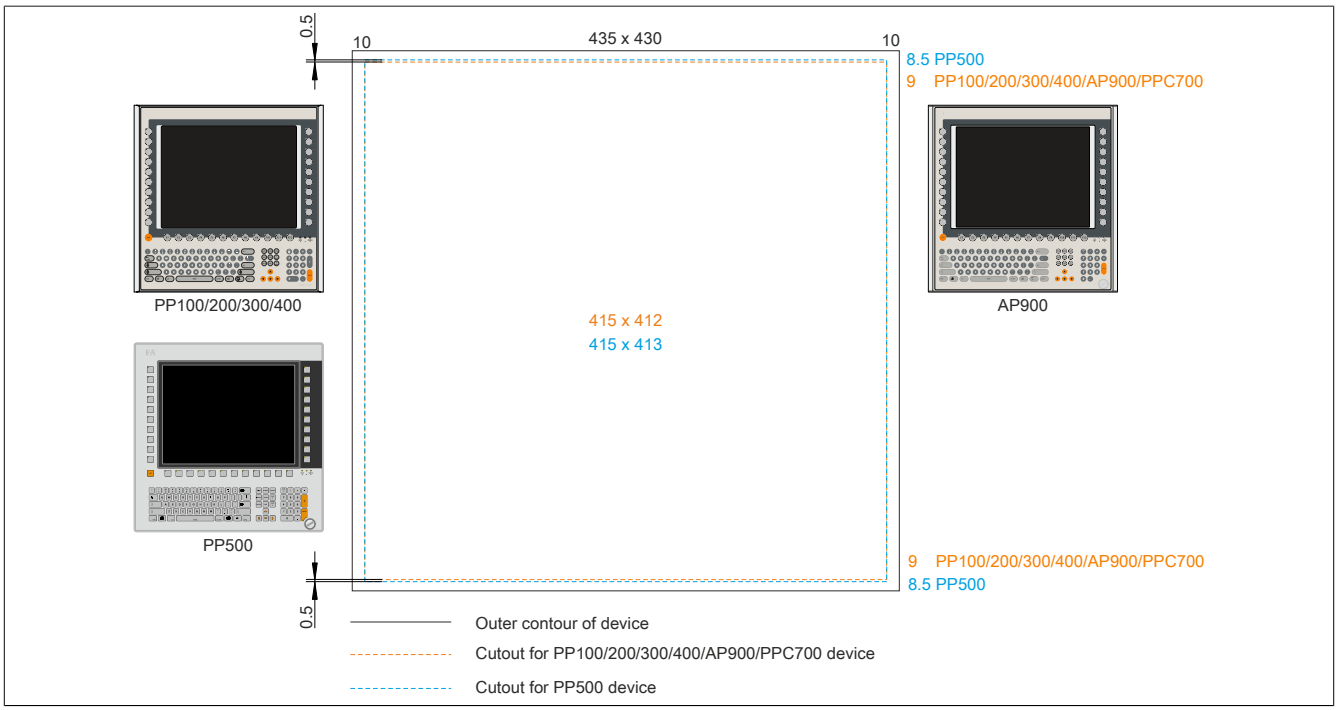


Figure 37: Mounting compatibility - 15" device - Vertical1

15" Power Panel 500 devices are not 100% mounting compatible with Power Panel 100/200/300/400, Automation Panel 900 and Panel PC 700 devices in the Vertical1 format. The Power Panel 500 devices require a cutout that is 0.5 mm higher (top and bottom edge).

The larger cutout can be used for all devices under certain conditions:

- When mounting, make sure that the PP100/200, PP300/400, AP900 and PPC700 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 solid seal is no longer guaranteed by the gasket (IP65).

2.6.2.6 17" devices

The cutout tolerance for PP100/200, PP300/400, PP500, AP900, PPC700 and PPC800 systems is ±0.5 mm.
The cutout tolerance for the AP1000 is +0 mm / -0.5 mm.

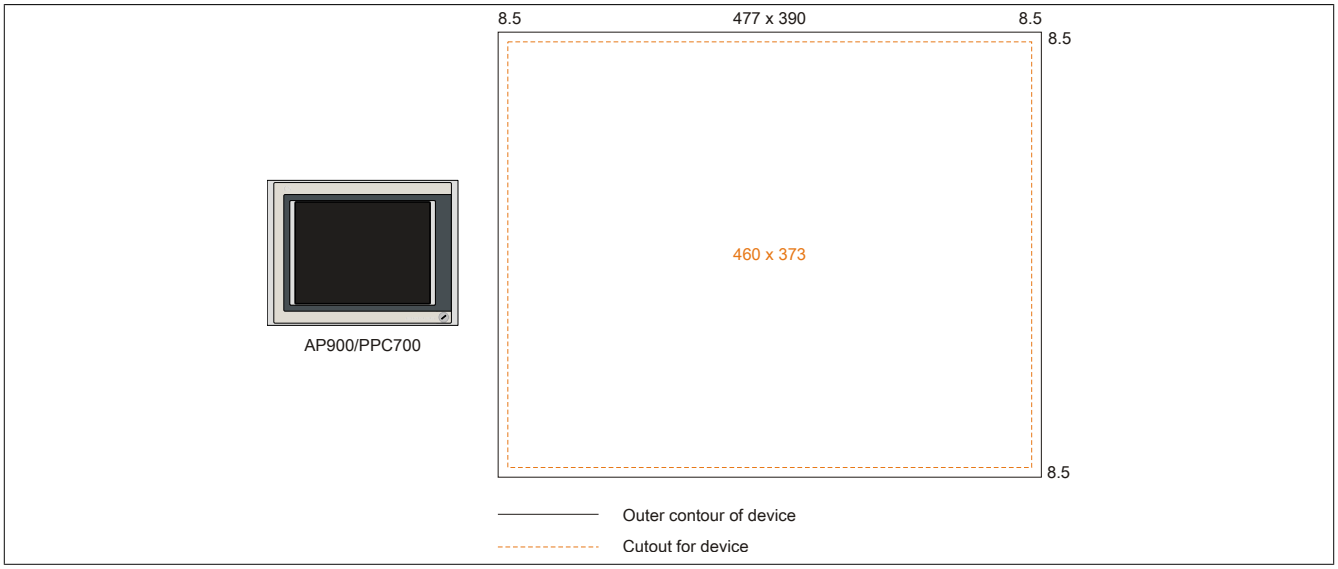


Figure 38: Mounting compatibility - 17" device - Horizontal1

17" Automation Panel 900 devices are 100% mounting compatible with Panel PC 700 devices in the Horizontal1 format.

2.6.2.7 19" devices

The cutout tolerance for PP100/200, PP300/400, PP500, AP900, PPC700 and PPC800 systems is ±0.5 mm.
The cutout tolerance for the AP1000 is +0 mm / -0.5 mm.

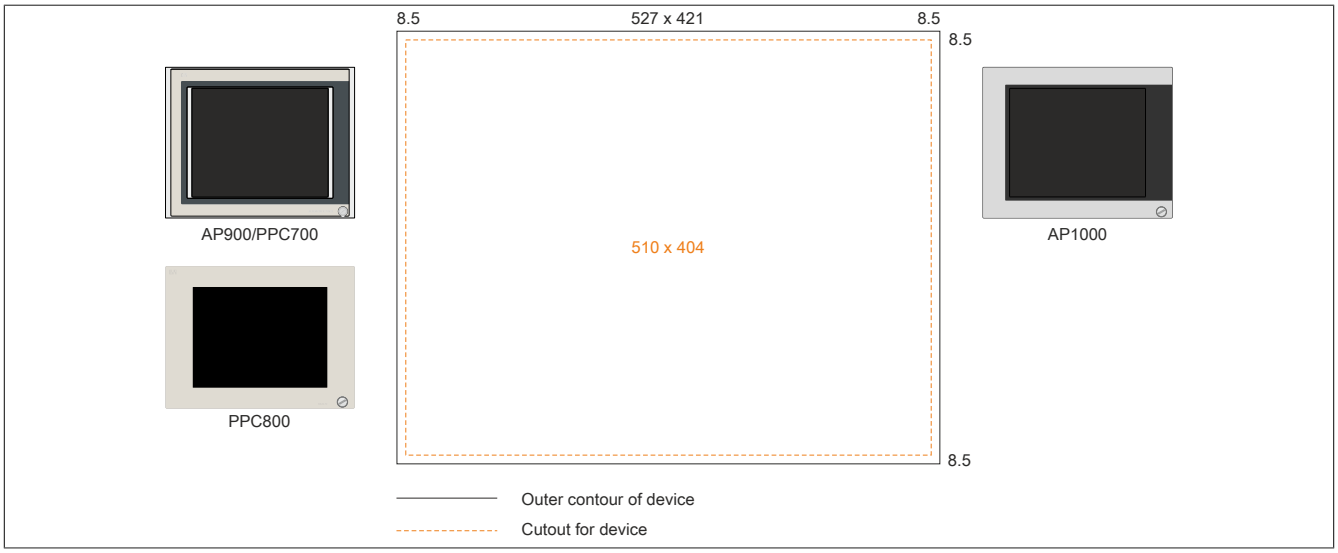


Figure 39: Mounting compatibility - 19" device - Horizontal1

19" Automation Panel 1000, Automation Panel 900, Panel PC 700 and Panel PC 800 are 100% mounting compatible in the Horizontal1 format.

2.6.2.8 21.3" devices

The cutout tolerance for PP100/200, PP300/400, PP500, AP900, PPC700 and PPC800 systems is ±0.5 mm.
The cutout tolerance for the AP1000 is +0 mm / -0.5 mm.

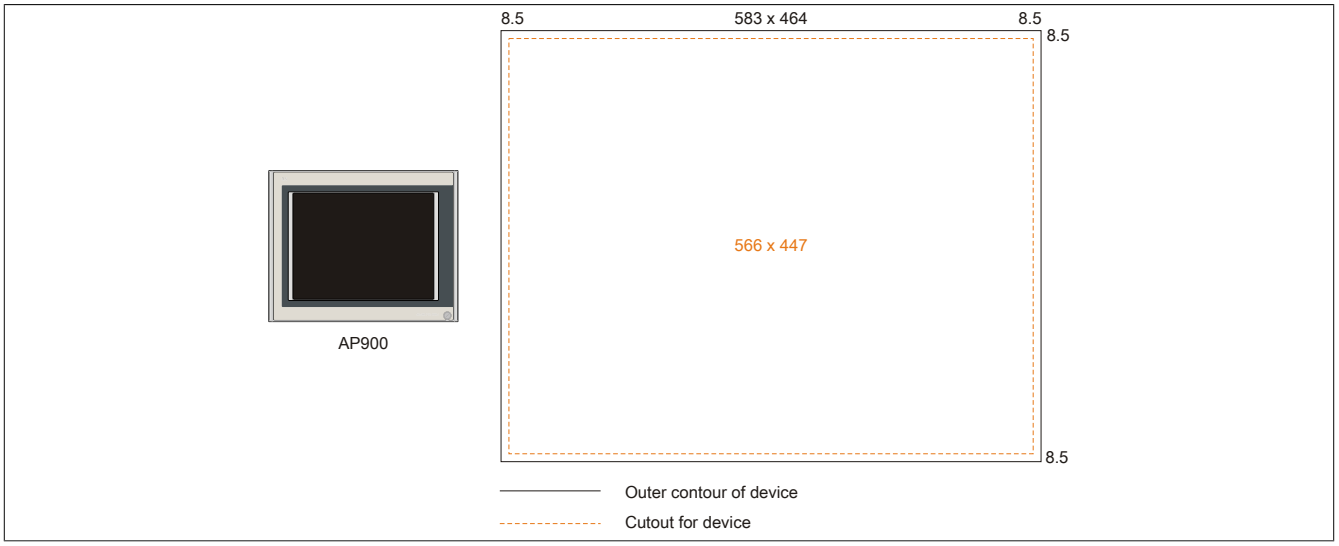


Figure 40: Mounting compatibility - 21.1" device - Horizontal1

2.7 Serial number sticker

A unique serial number sticker with a barcode (Code 128) is affixed to each B&R device for identification purposes. This serial number represents all of the individual components built into the system (model number, name, revision, serial number, delivery date and duration of warranty).

A sticker with the Panel PC 900's configuration number is located on the back of the device.

Three stickers are also included with the Panel PC 900 with detailed information of the installed components. Two of these stickers can be affixed individually.

This information can also be found on the B&R website by entering the serial number of the complete system in the search field tab (after selecting the "Serial number" option) at the top of the website (www.br-automation.com). The search provides a detailed list of installed components.

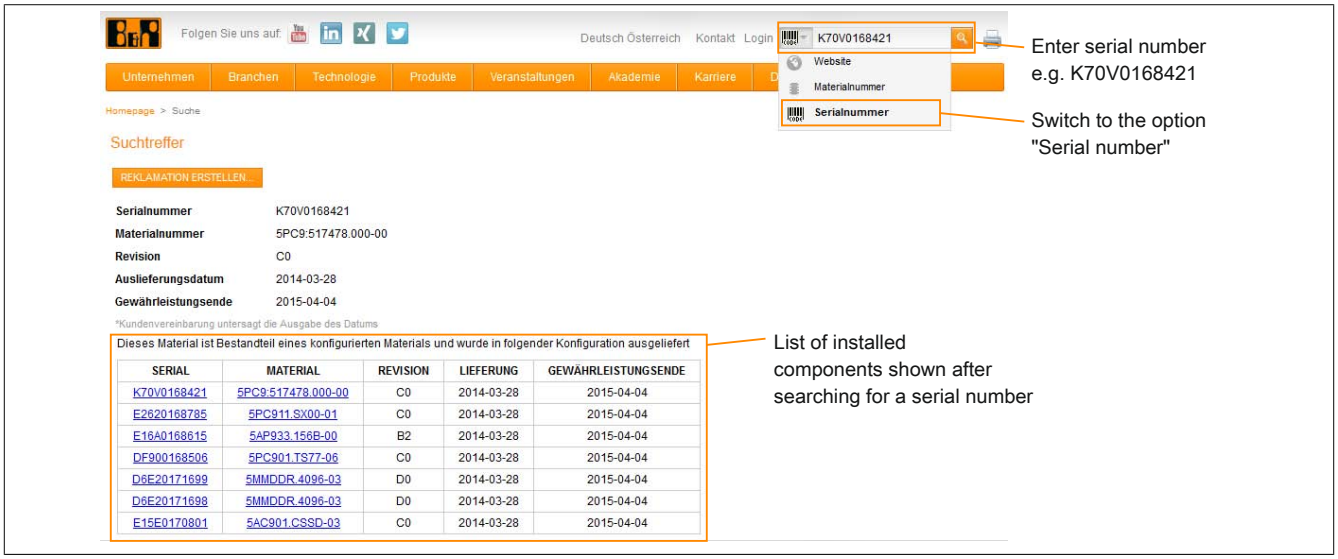


Figure 41: Searching for a serial number on the B&R website

3 Individual components

3.1 AP9x3 display units

3.1.1 5AP923.1215-00

3.1.1.1 General information

- Display unit for AP9x3, PPC900 or PPC2100
- 12.1" TFT XGA color display
- Single-touch (analog resistive)
- Control cabinet installation

3.1.1.2 Order data

Model number	Short description	Figure
	Display units	
5AP923.1215-00	Automation Panel 12.1" XGA TFT - 1024 x 768 pixels (4:3) - Single-touch (analog resistive) - Control cabinet installation - Landscape format - For PPC900 / PPC2100 / Link modules	

Table 65: 5AP923.1215-00 - Order data

3.1.1.3 Technical data

Product ID	5AP923.1215-00
General information	
B&R ID code	0xE1B0
Certification	
CE	Yes
cULus	Yes
cULus HazLoc Class 1 Division 2	Yes [1]
Display	
Type	Color TFT
Display size	12.1"
Colors	16.2 million
Resolution	XGA, 1024 x 768 pixels
Contrast	700:1
Viewing angles	
Horizontal	Direction R = 80° / Direction L = 80°
Vertical	Direction U = 80° / Direction D = 80°
Backlight	
Type	LED
Brightness (dimmable)	Typ. 25 to 500 cd/m²
Half-brightness time [2]	50,000 h
Touch screen [3]	
Type	AMT
Technology	Analog, resistive
Controller	B&R, serial, 12-bit
Transmittance	81% ±3%
Operating conditions	
EN 60529 protection	Front: IP65 Back: IP20 (only with installed link module or installed system unit)
UL 50 protection	Front: Type 4X indoor use only
Mechanical characteristics	
Front	
Frame	Coated aluminum
Panel overlay	
Material	Polyester
Light background	RAL 9006
Dark gray border around display	RAL 7024
Gasket	3 mm built-in seal

Table 66: 5AP923.1215-00 - Technical data

Product ID	5AP923.1215-00
Dimensions	
Width	315 mm
Height	239 mm
Weight	2200 g

Table 66: 5AP923.1215-00 - Technical data

1) Yes, although applies only if all components installed within the complete system have this certification and the complete system itself carries the corresponding mark.
2) At an ambient temperature of 25°C. Reducing the brightness by 50% can result in an approximately 50% increase in the half-brightness time.
3) Touch screen drivers for approved operating systems are available in the Downloads section of the B&R website.

3.1.1.4 Dimensions

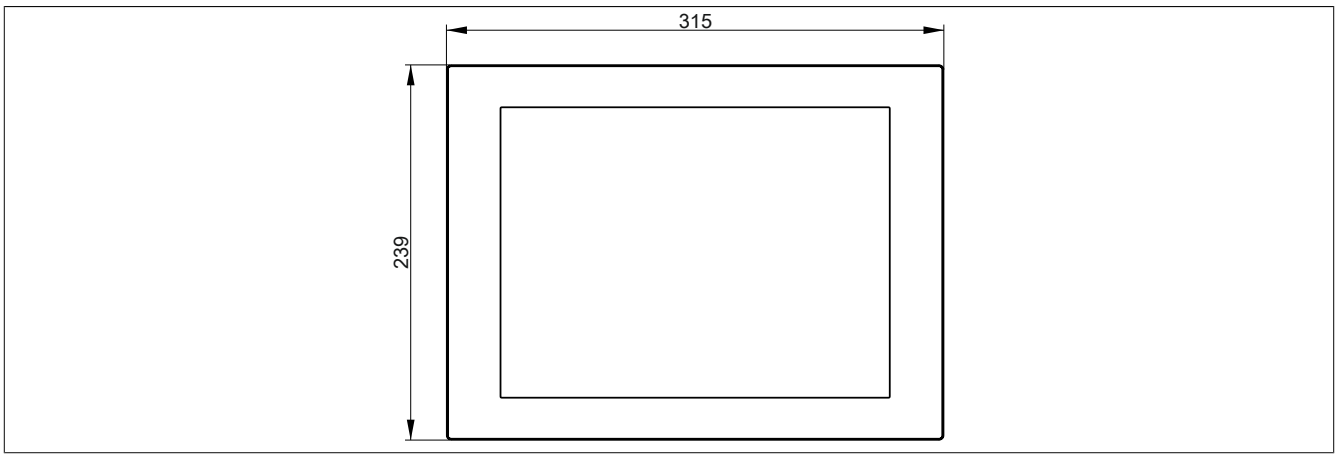


Figure 42: 5AP923.1215-00 - Dimensions

3.1.1.5 Temperature/Humidity diagram

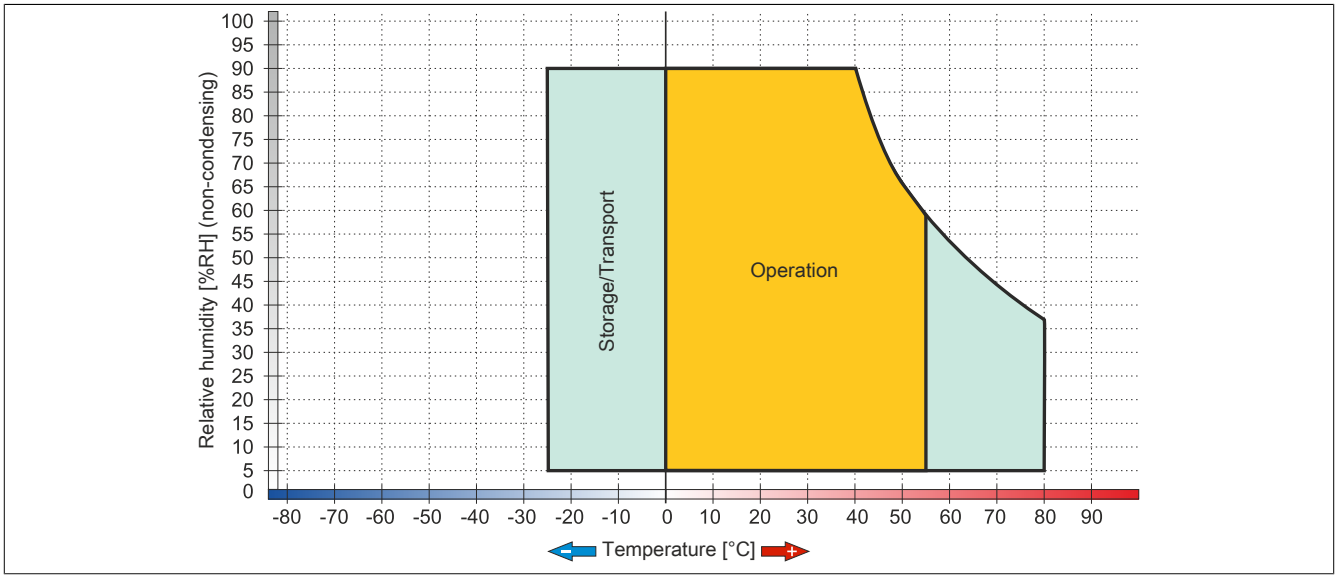


Figure 43: 5AP923.1215-00 - Temperature/Humidity diagram

3.1.2 5AP923.1505-00

3.1.2.1 General information

- Display unit for AP9x3, PPC900 or PPC2100
- 15.0" TFT XGA color display
- Single-touch (analog resistive)
- Control cabinet installation

3.1.2.2 Order data

Model number	Short description	Figure
	Display units	
5AP923.1505-00	Automation Panel 15.0" XGA TFT - 1024 x 768 pixels (4:3) - Single-touch (analog resistive) - Control cabinet installation - Landscape format - For PPC900 / PPC2100 / Link modules	

Table 67: 5AP923.1505-00 - Order data

3.1.2.3 Technical data

Product ID	5AP923.1505-00
General information	
B&R ID code	0xE169
Certification	
CE	Yes
cULus	Yes
cULus HazLoc Class 1 Division 2	Yes [1]
GOST-R	Yes
GL	Yes [2]
Display	
Type	Color TFT
Display size	15.0"
Colors	16.2 million
Resolution	XGA, 1024 x 768 pixels
Contrast	700:1
Viewing angles	
Horizontal	Direction R = 80° / Direction L = 80°
Vertical	Direction U = 70° / Direction D = 70°
Backlight	
Type	LED
Brightness (dimmable)	Typ. 20 to 400 cd/m²
Half-brightness time [3]	50,000 h
Touch screen [4]	
Type	AMT
Technology	Analog, resistive
Controller	B&R, serial, 12-bit
Transmittance	81% ±3%
Operating conditions	
EN 60529 protection	Front: IP65 Back: IP20 (only with installed link module or installed system unit)
UL 50 protection	Front: Type 4X indoor use only
Mechanical characteristics	
Front	
Frame	Coated aluminum
Panel overlay	
Material	Polyester
Light background	RAL 9006
Dark gray border around display	RAL 7024
Gasket	3 mm built-in seal

Table 68: 5AP923.1505-00 - Technical data

Product ID	5AP923.1505-00
Dimensions	
Width	370 mm
Height	288 mm
Weight	3700 g

Table 68: 5AP923.1505-00 - Technical data

1) Yes, although applies only if all components installed within the complete system have this certification and the complete system itself carries the corresponding mark.
2) Yes, although applies only if all components installed within the complete system have this certification.
3) At an ambient temperature of 25°C. Reducing the brightness by 50% can result in an approximately 50% increase in the half-brightness time.
4) Touch screen drivers for approved operating systems are available in the Downloads section of the B&R website.

3.1.2.4 Dimensions

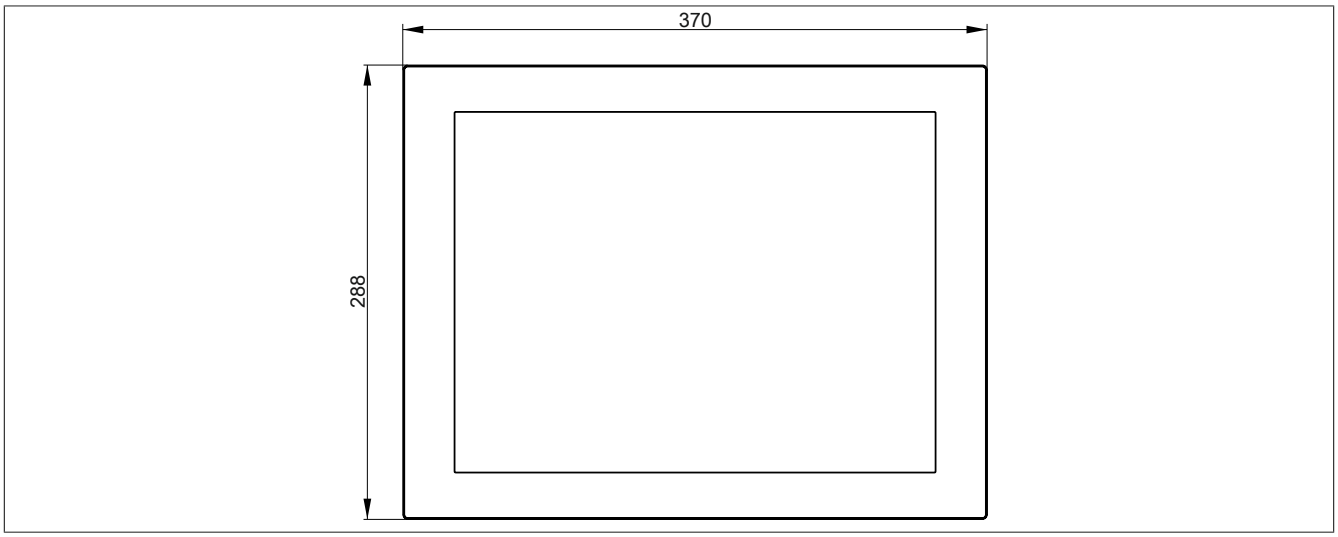


Figure 44: 5AP923.1505-00 - Dimensions

3.1.2.5 Temperature/Humidity diagram

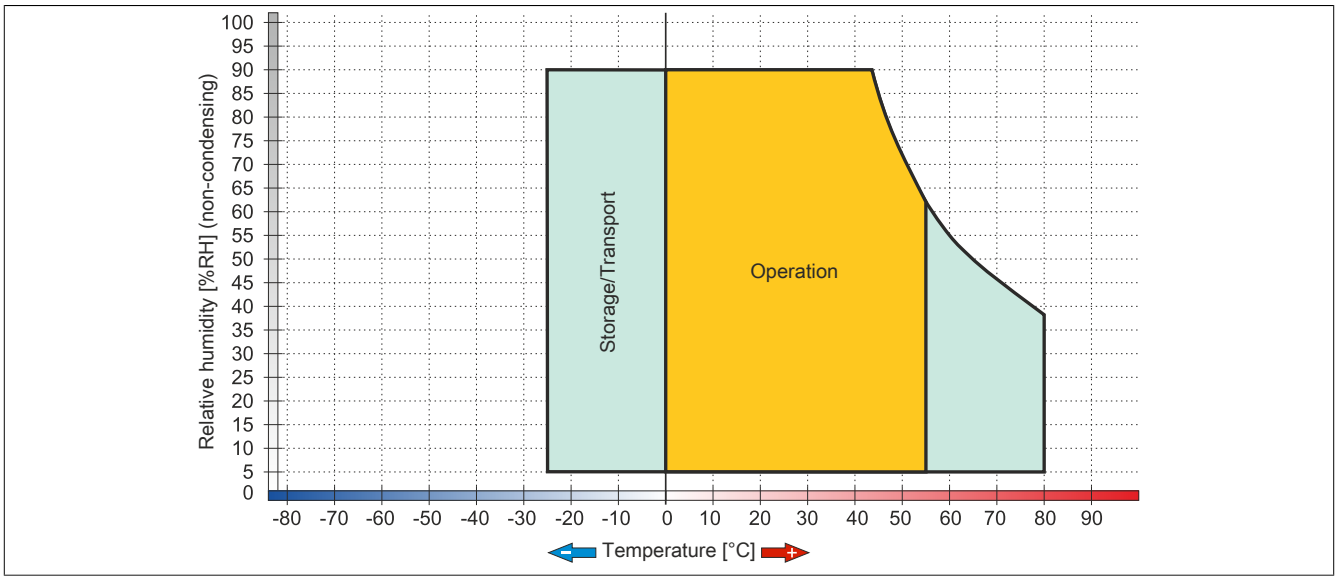


Figure 45: 5AP923.1505-00 - Temperature/Humidity diagram

3.1.3 5AP923.1906-00

3.1.3.1 General information

- Display unit for AP9x3, PPC900 or PPC2100
- 19.0" TFT SXGA color display
- Single-touch (analog resistive)
- Control cabinet installation

3.1.3.2 Order data

Model number	Short description	Figure
	Display units	
5AP923.1906-00	Automation Panel 19.0" SXGA TFT - 1280 x 1024 pixels (4:3) - Single-touch (analog resistive) - Control cabinet installation - Landscape format - For PPC900 / PPC2100 / Link modules	

Table 69: 5AP923.1906-00 - Order data

3.1.3.3 Technical data

Product ID	5AP923.1906-00
General information	
B&R ID code	0xE1B1
Certification	
CE	Yes
cULus	Yes
cULus HazLoc Class 1 Division 2	Yes [1]
Display	
Type	Color TFT
Display size	19.0"
Colors	16.7 million
Resolution	SXGA, 1280 × 1024 pixels
Contrast	2000:1
Viewing angles	
Horizontal	Direction R = 89° / Direction L = 89°
Vertical	Direction U = 89° / Direction D = 89°
Backlight	
Type	LED
Brightness (dimmable)	Typ. 30 to 300 cd/m²
Half-brightness time [2]	50,000 h
Touch screen [3]	
Type	AMT
Technology	Analog, resistive
Controller	B&R, serial, 12-bit
Transmittance	81% ±3%
Operating conditions	
EN 60529 protection	Front: IP65 Back: IP20 (only with installed link module or installed system unit)
UL 50 protection	Front: Type 4X indoor use only
Mechanical characteristics	
Front	
Frame	Coated aluminum
Panel overlay	
Material	Polyester
Light background	RAL 9006
Dark gray border around display	RAL 7024
Gasket	3 mm built-in seal

Table 70: 5AP923.1906-00 - Technical data

Product ID	5AP923.1906-00
Dimensions	
Width	440 mm
Height	358 mm
Weight	5800 g

Table 70: 5AP923.1906-00 - Technical data

1) Yes, although applies only if all components installed within the complete system have this certification and the complete system itself carries the corresponding mark.
2) At an ambient temperature of 25°C. Reducing the brightness by 50% can result in an approximately 50% increase in the half-brightness time.
3) Touch screen drivers for approved operating systems are available in the Downloads section of the B&R website.

3.1.3.4 Dimensions

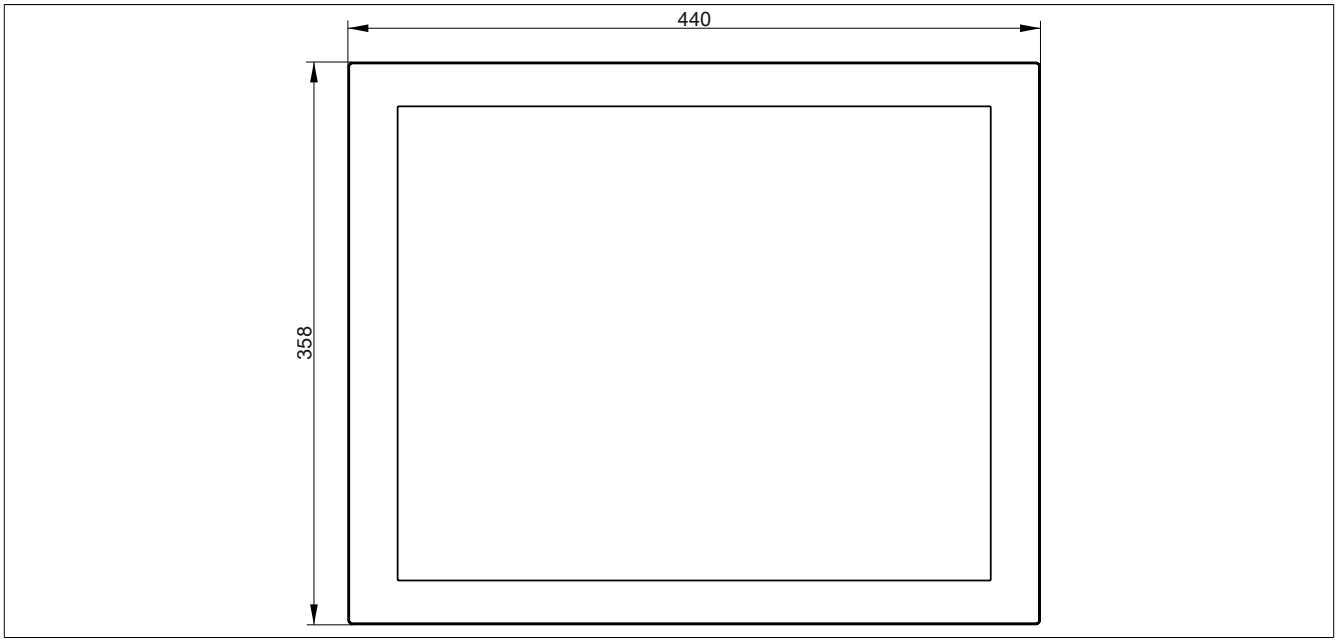


Figure 46: 5AP923.1906-00 - Dimensions

3.1.3.5 Temperature/Humidity diagram

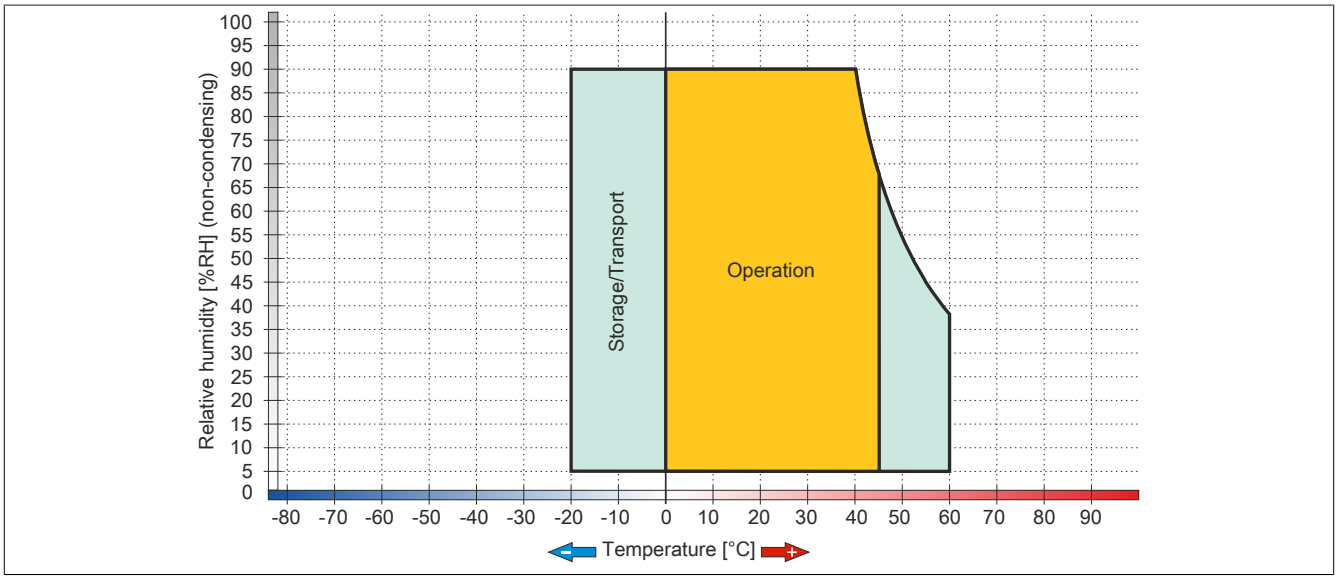


Figure 47: 5AP923.1906-00 - Temperature/Humidity diagram

3.1.4 5AP933.156B-00

3.1.4.1 General information

- Display unit for AP9x3, PPC900 or PPC2100
- 15.6" TFT HD color display
- Multi-touch (PCT)
- Control cabinet installation

3.1.4.2 Order data

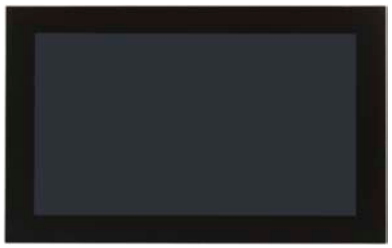
Model number	Short description	Figure
	Display units	
5AP933.156B-00	Automation Panel 15.6" HD TFT - 1366 x 768 pixels (16:9) - Multi-touch (projected capacitive) - Control cabinet installation - Landscape format - For PPC900 / PPC2100 / Link modules	

Table 71: 5AP933.156B-00 - Order data

3.1.4.3 Technical data

Product ID	5AP933.156B-00
General information	
B&R ID code	0xE16A
Certification	
CE	Yes
cULus	Yes
GOST-R	Yes
Display	
Type	Color TFT
Display size	15.6"
Colors	16.7 million
Resolution	HD, 1366 × 768 pixels
Contrast	500:1
Viewing angles	
Horizontal	Direction R = 85° / Direction L = 85°
Vertical	Direction U = 80° / Direction D = 80°
Backlight	
Type	LED
Brightness (dimmable)	Typ. 15 to 300 cd/m²
Half-brightness time [1)]	50,000 h
Touch screen	
Type	3M
Technology	Projected capacitive touch (PCT)
Controller	3M
Transmittance	88% ±2%
Operating conditions	
EN 60529 protection	Front: IP65 Back: IP20 (only with installed link module or installed system unit)
UL 50 protection	Front: Type 4X indoor use only
Mechanical characteristics	
Front	
Frame	Coated aluminum
Design	Black
Gasket	3 mm built-in gasket
Dimensions	
Width	414 mm
Height	258.5 mm
Weight	3850 g

Table 72: 5AP933.156B-00 - Technical data

1) At an ambient temperature of 25°C. Reducing the brightness by 50% can result in an approximately 50% increase in the half-brightness time.

3.1.4.4 Dimensions

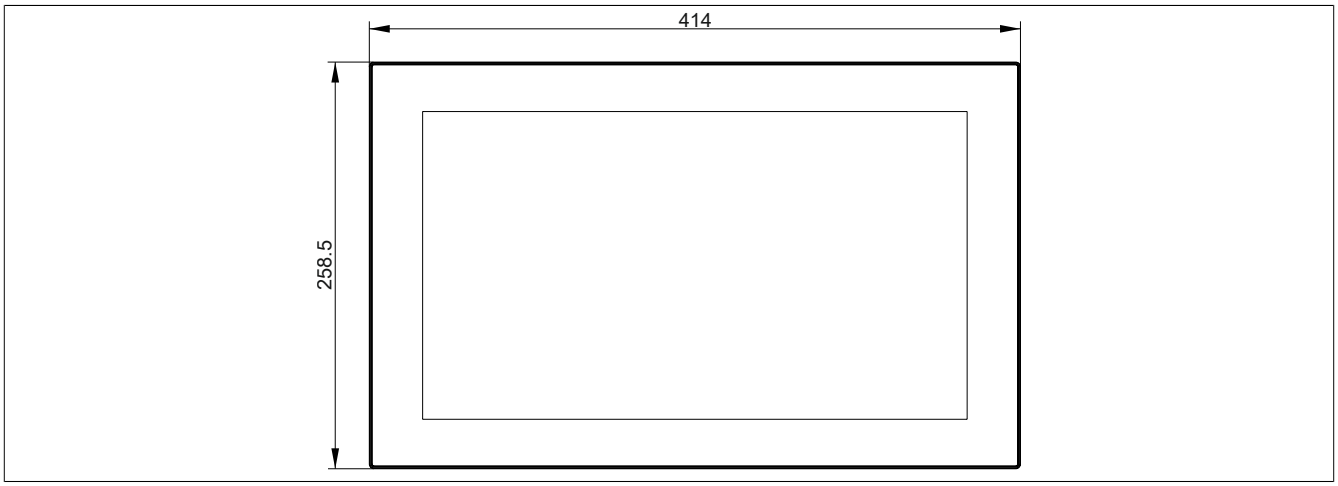


Figure 48: 5AP933.156B-00 - Dimensions

3.1.4.5 Temperature/Humidity diagram

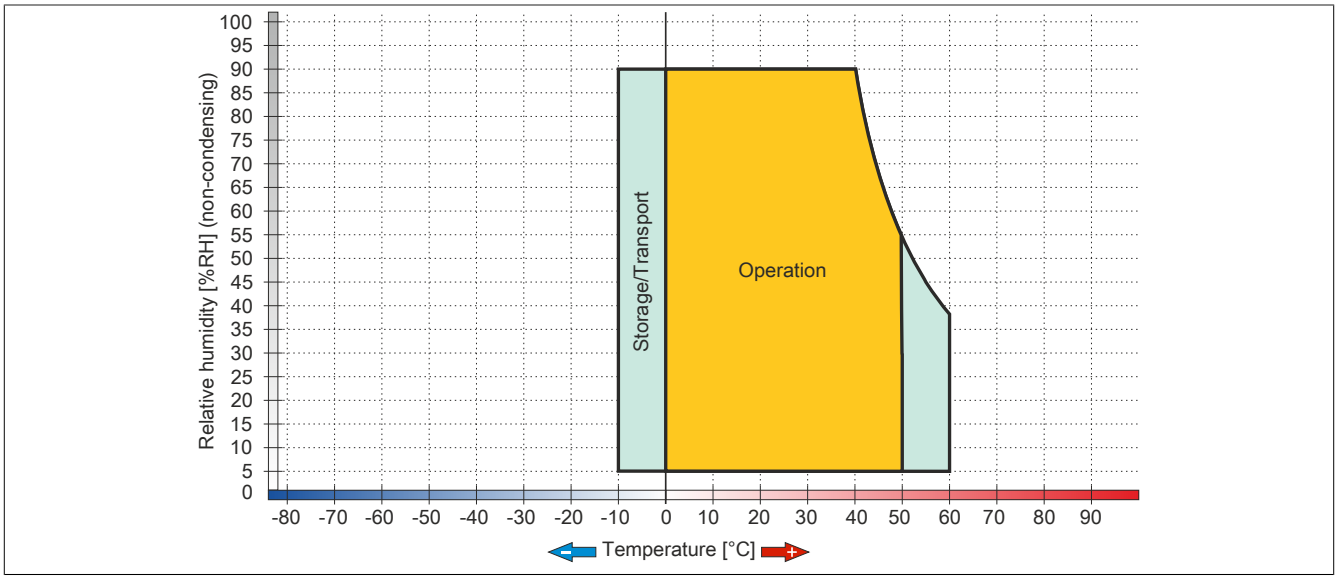


Figure 49: 5AP933.156B-00 - Temperature/Humidity diagram

3.1.5 5AP933.185B-00

3.1.5.1 General information

- Display unit for AP9x3, PPC900 or PPC2100
- 18.5" TFT HD color display
- Multi-touch (PCT)
- Control cabinet installation

3.1.5.2 Order data

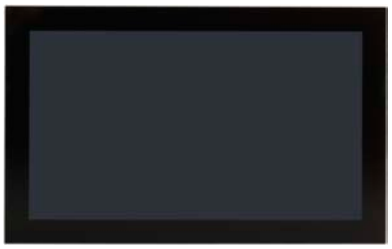
Model number	Short description	Figure
	Display units	
5AP933.185B-00	Automation Panel 18.5" HD TFT - 1366 x 768 pixels (16:9) - Multi-touch (projected capacitive) - Control cabinet installation - Landscape format - For PPC900 / PPC2100 / Link modules	

Table 73: 5AP933.185B-00 - Order data

3.1.5.3 Technical data

Product ID	5AP933.185B-00
General information	
B&R ID code	0xE16B
Certification	
CE	Yes
cULus	Yes
GOST-R	Yes
Display	
Type	Color TFT
Display size	18.5"
Colors	16.7 million
Resolution	HD, 1366 × 768 pixels
Contrast	1000:1
Viewing angles	
Horizontal	Direction R = 85° / Direction L = 85°
Vertical	Direction U = 80° / Direction D = 80°
Backlight	
Type	LED
Brightness (dimmable)	Typ. 15 to 300 cd/m²
Half-brightness time [1)]	50,000 h
Touch screen	
Type	3M
Technology	Projected capacitive touch (PCT)
Controller	3M
Transmittance	88% ±2%
Operating conditions	
EN 60529 protection	Front: IP65 Back: IP20 (only with installed link module or installed system unit)
UL 50 protection	Front: Type 4X indoor use only
Mechanical characteristics	
Front	
Frame	Coated aluminum
Design	Black
Gasket	3 mm built-in gasket
Dimensions	
Width	475 mm
Height	295 mm
Weight	4850 g

Table 74: 5AP933.185B-00 - Technical data

1) At an ambient temperature of 25°C. Reducing the brightness by 50% can result in an approximately 50% increase in the half-brightness time.

3.1.5.4 Dimensions

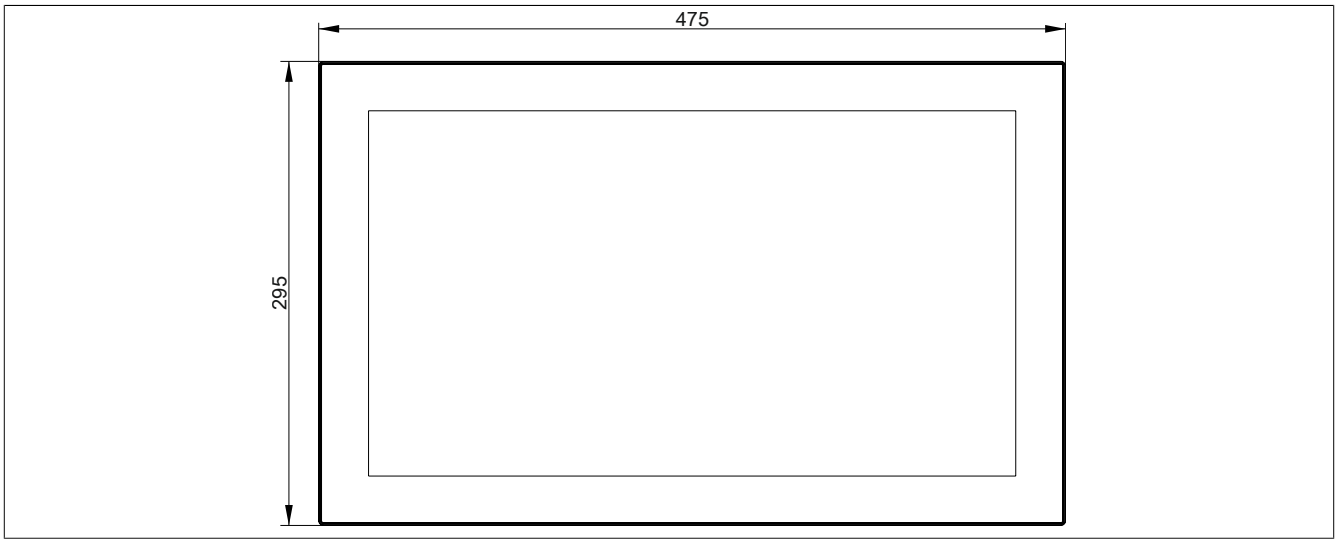


Figure 50: 5AP933.185B-00 - Dimensions

3.1.5.5 Temperature/Humidity diagram

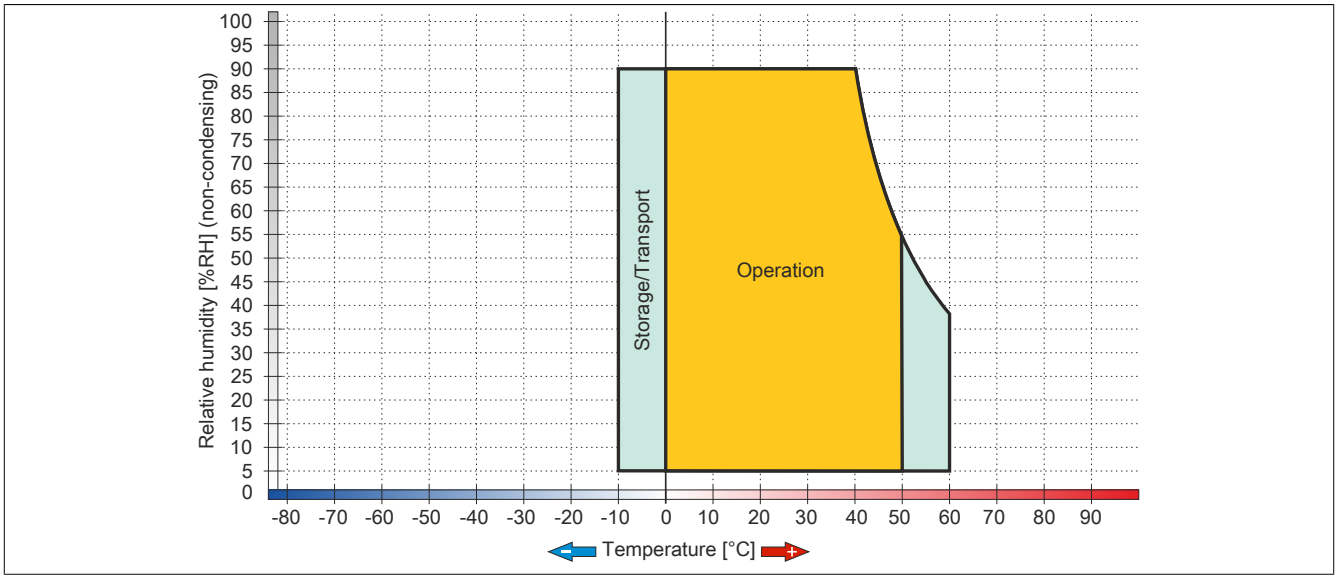


Figure 51: 5AP933.185B-00 - Temperature/Humidity diagram

3.1.6 5AP933.215C-00

3.1.6.1 General information

- Display unit for AP9x3, PPC900 or PPC2100
- 21.5" TFT FHD color display
- Multi-touch (PCT)
- Control cabinet installation

3.1.6.2 Order data

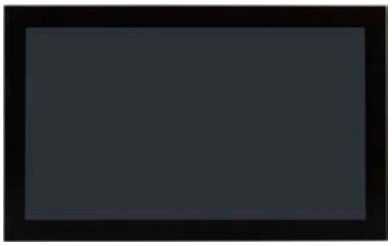
Model number	Short description	Figure
	Display units	
5AP933.215C-00	Automation Panel 21.5" Full HD TFT - 1920 x 1080 pixels (16:9) - Multi-touch (projected capacitive) - Control cabinet installation - Landscape format - For PPC900 / PPC2100 / Link modules	

Table 75: 5AP933.215C-00 - Order data

3.1.6.3 Technical data

Product ID	5AP933.215C-00
General information	
B&R ID code	0xE16C
Certification	
cULus	Yes
GOST-R	Yes
Display	
Type	Color TFT
Display size	21.5"
Colors	16.7 million
Resolution	FHD, 1920 × 1080 pixels
Contrast	1000:1
Viewing angles	
Horizontal	Direction R = 89° / Direction L = 89°
Vertical	Direction U = 89° / Direction D = 89°
Backlight	
Type	LED
Brightness (dimmable)	Typ. 12.5 to 250 cd/m²
Half-brightness time [1)]	30,000 h
Touch screen	
Type	3M
Technology	Projected capacitive touch (PCT)
Controller	3M
Transmittance	88% ±2%
Operating conditions	
EN 60529 protection	Front: IP65 Back: IP20 (only with installed link module or installed system unit)
UL 50 protection	Front: Type 4X indoor use only
Mechanical characteristics	
Front	
Frame	Coated aluminum
Design	Black
Gasket	3 mm built-in seal
Dimensions	
Width	541.5 mm
Height	333 mm
Weight	5400 g

Table 76: 5AP933.215C-00 - Technical data

1) At an ambient temperature of 25°C. Reducing the brightness by 50% can result in an approximately 50% increase in the half-brightness time.

3.1.6.4 Dimensions

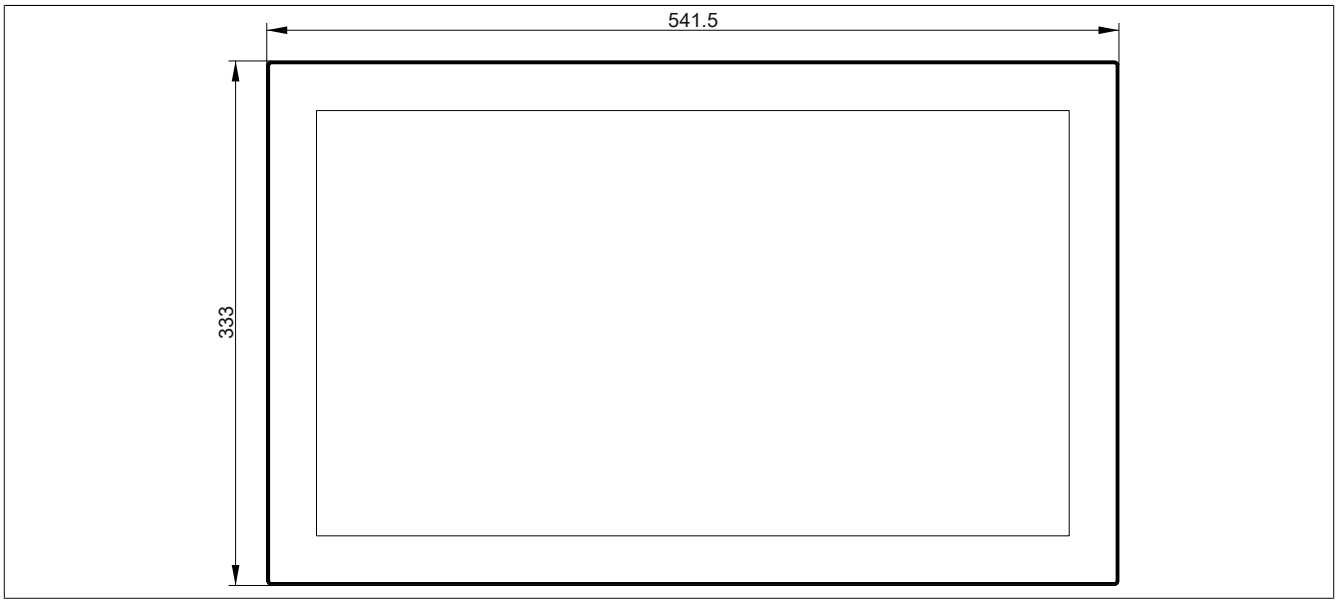


Figure 52: 5AP933.215C-00 - Dimensions

3.1.6.5 Temperature/Humidity diagram

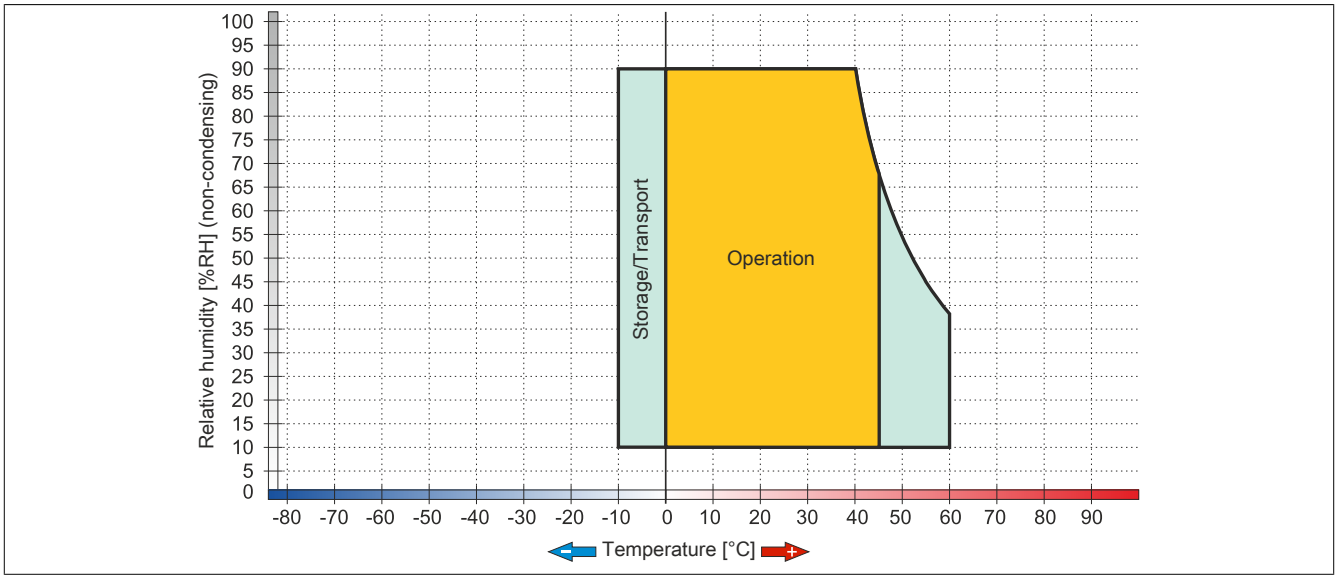


Figure 53: 5AP933.215C-00 - Temperature/Humidity diagram

3.1.7 5AP933.240C-00

3.1.7.1 General information

- Display unit for AP9x3, PPC900 or PPC2100
- 24" TFT FHD color display
- Multi-touch (PCT)
- Control cabinet installation

3.1.7.2 Order data

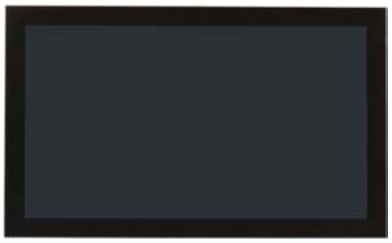
Model number	Short description	Figure
	Display units	
5AP933.240C-00	Automation Panel 24.0" Full HD TFT - 1920 x 1080 pixels (16:9) - Multi-touch (projected capacitive) - Control cabinet installation - Landscape format - For PPC900 / PPC2100 / Link modules	

Table 77: 5AP933.240C-00 - Order data

3.1.7.3 Technical data

Product ID	5AP933.240C-00
General information	
B&R ID code	0xE1B4
Certification	
CE	Yes
cULus	Yes
Display	
Type	Color TFT
Display size	24.0"
Colors	16.7 million
Resolution	FHD, 1920 × 1080 pixels
Contrast	5000:1
Viewing angles	
Horizontal	Direction R = 89° / Direction L = 89°
Vertical	Direction U = 89° / Direction D = 89°
Backlight	
Type	LED
Brightness (dimmable)	Typ. 30 to 300 cd/m²
Half-brightness time [1)]	50,000 h
Touch screen	
Type	3M
Technology	Projected capacitive touch (PCT)
Controller	3M
Transmittance	88% ±2%
Operating conditions	
EN 60529 protection	Front: IP65 Back: IP20 (only with installed link module or installed system unit)
UL 50 protection	Front: Type 4X indoor use only
Mechanical characteristics	
Front	
Frame	Coated aluminum
Design	Black
Gasket	3 mm built-in gasket
Dimensions	
Width	598.5 mm
Height	364 mm
Weight	Approx. 7800 g

Table 78: 5AP933.240C-00 - Technical data

1) At an ambient temperature of 25°C. Reducing the brightness by 50% can result in an approximately 50% increase in the half-brightness time.

3.1.7.4 Dimensions

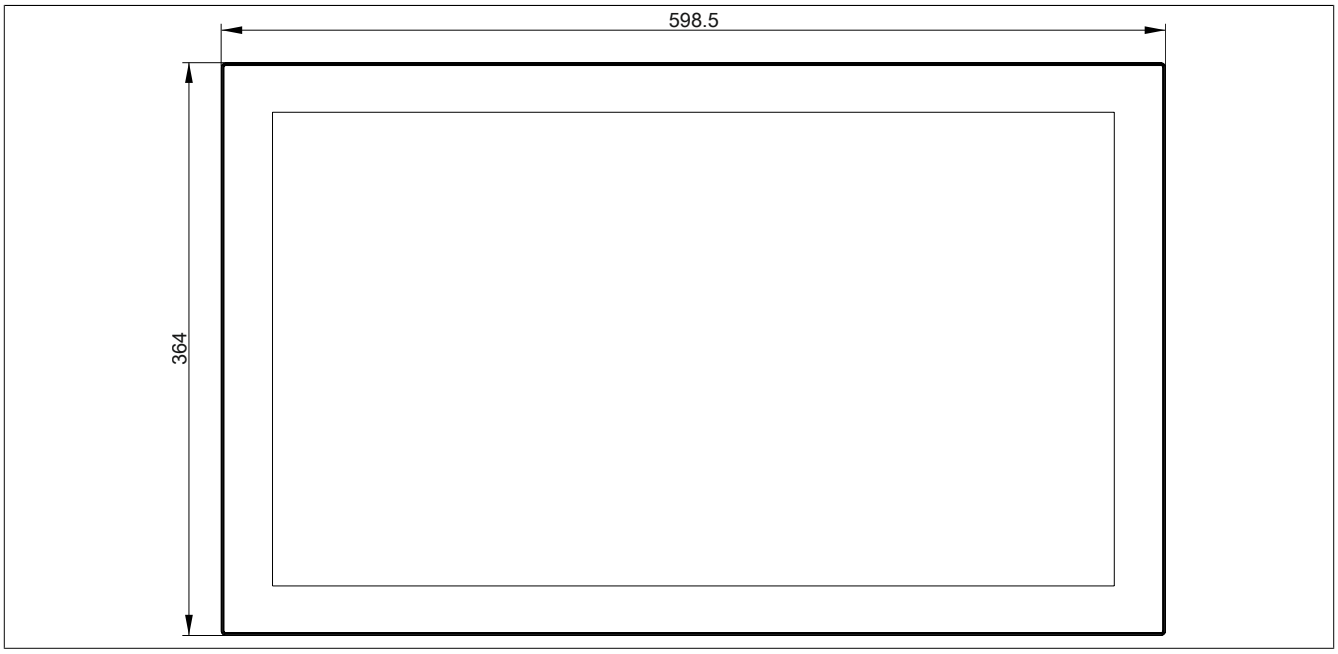


Figure 54: 5AP933.240C-00 - Dimensions

3.1.7.5 Temperature/Humidity diagram

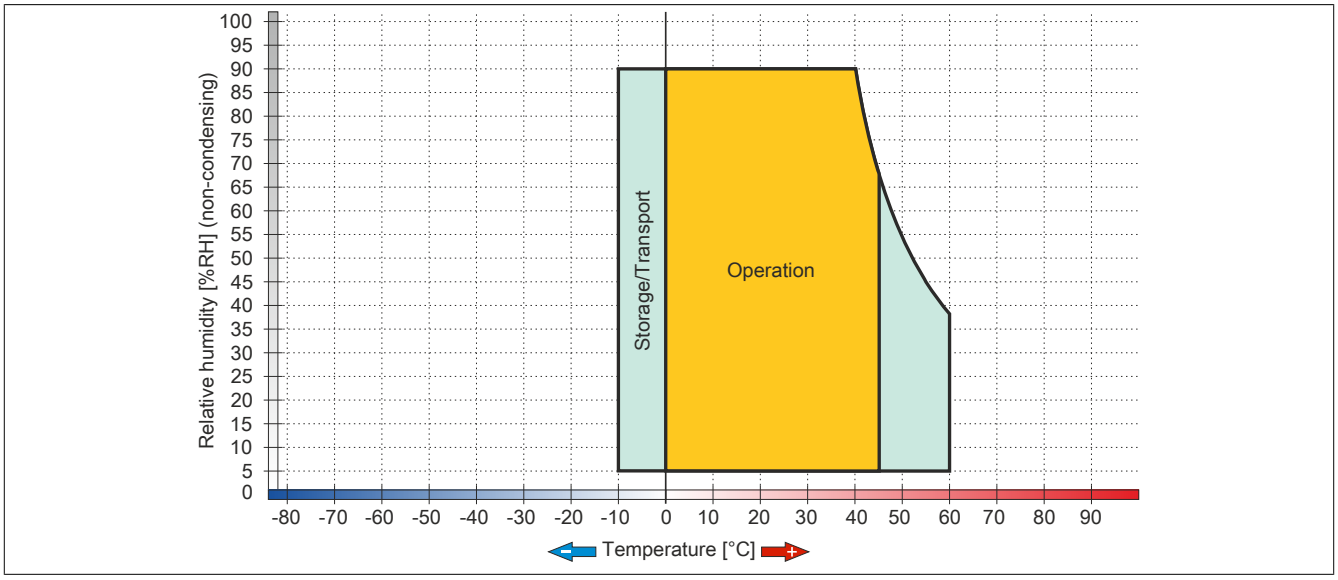


Figure 55: 5AP933.240C-00 - Temperature/Humidity diagram

3.2 AP1000 display units

3.2.1 5AP1120.1043-000

3.2.1.1 General information

- Display unit for AP1000, PPC900 or PPC2100
- 10.4" TFT VGA color display
- Single-touch (analog resistive)
- Front USB interface
- Control cabinet installation

3.2.1.2 Order data

Model number	Short description	Figure
5AP1120.1043-000	Automation Panel 10.4" VGA TFT - 640 x 480 pixels (4:3) - Single-touch (analog resistive) - Control cabinet installation - Landscape format - Front USB interface - For PPC900 / PPC2100 / Link modules - Installation compatible with 5PP520.1043-00	

Table 79: 5AP1120.1043-000 - Order data

3.2.1.3 Technical data

Product ID	5AP1120.1043-000
General information	
B&R ID code	0xE7AD
Certification	
CE	Yes
cULus	Yes
cULus HazLoc Class 1 Division 2	Yes [1]
Interfaces	
USB	
Quantity	1
Type	USB 2.0
Design	Type A
Transfer rate	Low speed (1.5 Mbit/s), full speed (12 Mbit/s), high speed (480 Mbit/s)
Current load	Max. 500 mA
Display	
Type	Color TFT
Display size	10.4"
Colors	16.2 million
Resolution	VGA, 640 x 480 pixels
Contrast	900:1
Viewing angles	
Horizontal	Direction R = 80° / Direction L = 80°
Vertical	Direction U = 80° / Direction D = 80°
Backlight	
Type	LED
Brightness (dimmable)	Typ. 22.5 to 450 cd/m²
Half-brightness time [2]	70,000 h
Touch screen [3]	
Type	AMT
Technology	Analog, resistive
Controller	B&R, serial, 12-bit
Transmittance	81% ±3%
Operating conditions	
EN 60529 protection	Front: IP65 Back: IP20 (only with installed link module or installed system unit)
UL 50 protection	Front: Type 4X indoor use only

Table 80: 5AP1120.1043-000 - Technical data

Product ID	5AP1120.1043-000
Mechanical characteristics	
Front [4]	
Frame	Naturally anodized aluminum
Panel overlay	
Material	Polyester
Light background	RAL 9006
Dark gray border around display	RAL 7024
Gasket	3 mm built-in gasket
Dimensions	
Width	323 mm
Height	260 mm
Weight	2800 g

Table 80: 5AP1120.1043-000 - Technical data

1) Yes, although applies only if all components installed within the complete system have this certification and the complete system itself carries the corresponding mark.
2) At an ambient temperature of 25°C. Reducing the brightness by 50% can result in an approximately 50% increase in the half-brightness time.
3) Touch screen drivers for approved operating systems are available in the Downloads section of the B&R website.
4) There may be visible deviations in the color and surface appearance depending on the process or batch.

3.2.1.4 Dimensions

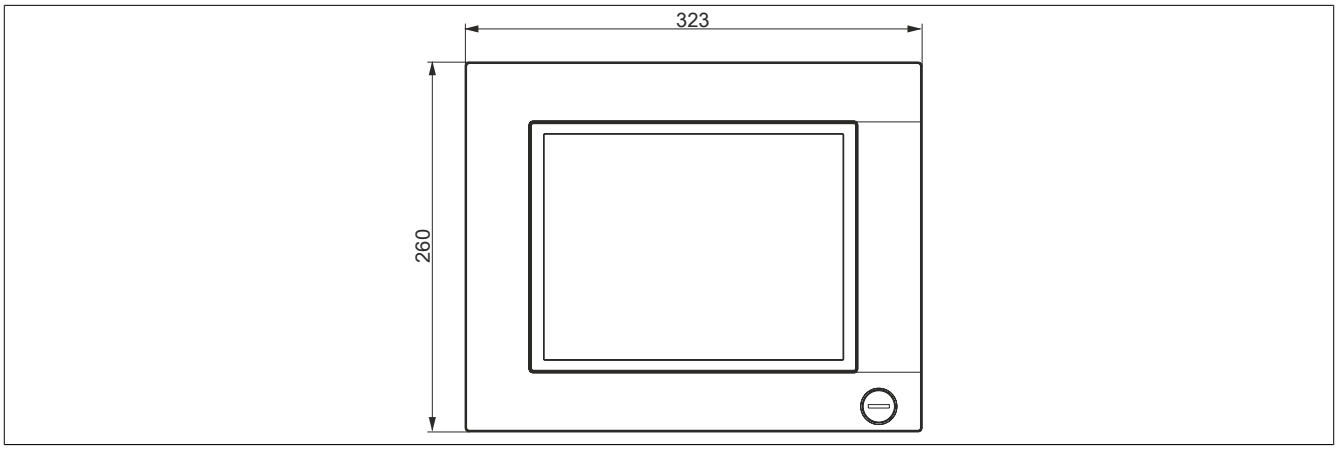


Figure 56: 5AP1120.1043-000 - Dimensions

3.2.1.5 Prerequisites and requirements

10.4" AP1000 display units are supported beginning with the following firmware versions:

- V3.11 for the 5DLSDL.1001-00 SDL/DVI receiver
- V4.08 for the 5DLSD3.1001-00 SDL3 receiver
- V1.03 for the 5PPC2100.BYxx-000 PPC2100 system unit
- V1.18 for the 5PC901.TS77-xx PPC900 system unit

3.2.1.6 Temperature/Humidity diagram

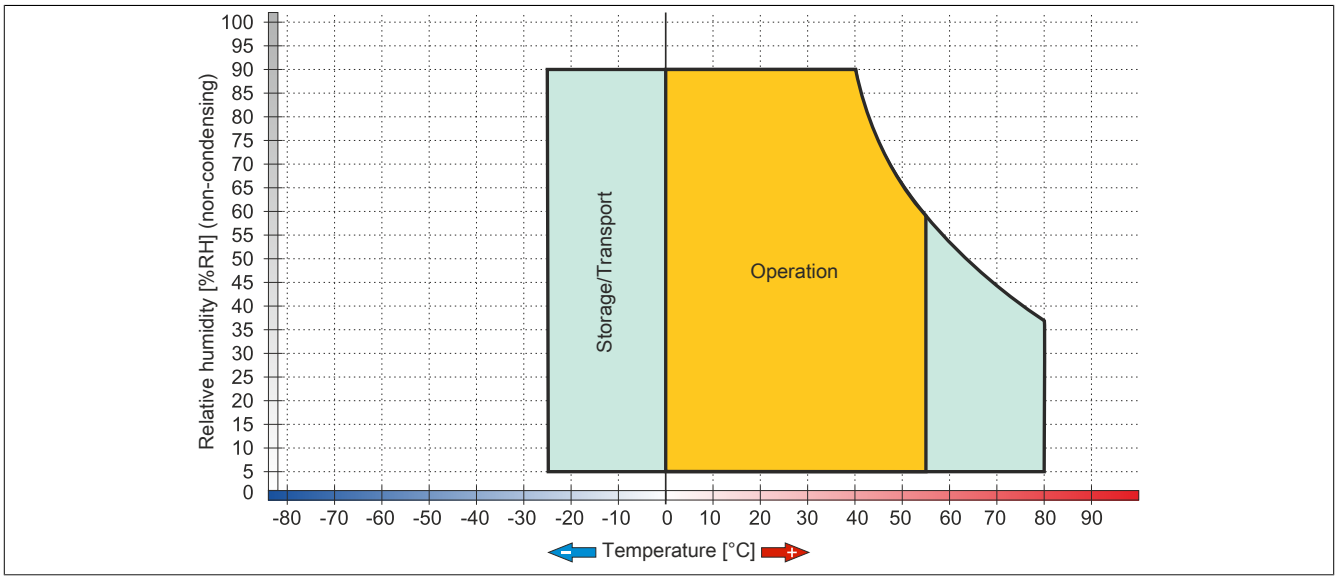


Figure 57: 5AP1120.1043-000 - Temperature/Humidity diagram

3.2.2 5AP1180.1043-000

3.2.2.1 General information

- Display unit for AP1000, PPC900 or PPC2100
- 10.4" TFT VGA color display
- Single-touch (analog resistive)
- 22 function keys
- Front USB interface
- Control cabinet installation

3.2.2.2 Order data

Model number	Short description	Figure
5AP1180.1043-000	Automation Panel 10.4" VGA TFT - 640 x 480 pixels (4:3) - Single-touch (analog resistive) - Control cabinet installation - Landscape format - Front USB interface - 22 function keys - For PPC900 / PPC2100 / Link module - Installation compatible with 5PP580.1043-00/ 5AP980.1043-01	

Table 81: 5AP1180.1043-000 - Order data

3.2.2.3 Technical data

Product ID	5AP1180.1043-000
General information	
B&R ID code	0xE7AE
Certification	
CE	Yes
cULus	Yes
cULus HazLoc Class 1 Division 2	Yes [1]
Interfaces	
USB	
Quantity	1
Type	USB 2.0
Design	Type A
Transfer rate	Low speed (1.5 Mbit/s), full speed (12 Mbit/s), high speed (480 Mbit/s)
Current load	Max. 500 mA
Display	
Type	Color TFT
Display size	10.4"
Colors	16.2 million
Resolution	VGA, 640 x 480 pixels
Contrast	900:1
Viewing angles	
Horizontal	Direction R = 80° / Direction L = 80°
Vertical	Direction U = 80° / Direction D = 80°
Backlight	
Type	LED
Brightness (dimmable)	Typ. 22.5 to 450 cd/m²
Half-brightness time [2]	70,000 h
Touch screen [3]	
Type	AMT
Technology	Analog, resistive
Controller	B&R, serial, 12-bit
Transmittance	81% ±3%
Keys	
Function keys	22 with LED (yellow)
System keys	No
Service life	>1,000,000 actuations at 1 ±0.3 N to 3 ±0.3 N actuating force
LED brightness	
Yellow	Typ. 38 mcd

Table 82: 5AP1180.1043-000 - Technical data

Product ID	5AP1180.1043-000
Operating conditions	
EN 60529 protection	Front: IP65 Back: IP20 (only with installed link module or installed system unit)
UL 50 protection	Front: Type 4X indoor use only
Mechanical characteristics	
Front [4]	
Frame	Naturally anodized aluminum
Panel overlay	
Material	Polyester
Light background	RAL 9006
Dark gray border around display	RAL 7024
Gasket	3 mm built-in seal
Dimensions	
Width	323 mm
Height	260 mm
Weight	2800 g

Table 82: 5AP1180.1043-000 - Technical data

1) Yes, although applies only if all components installed within the complete system have this certification and the complete system itself carries the corresponding mark.
2) At an ambient temperature of 25°C. Reducing the brightness by 50% can result in an approximately 50% increase in the half-brightness time.
3) Touch screen drivers for approved operating systems are available in the Downloads section of the B&R website.
4) There may be visible deviations in the color and surface appearance depending on the process or batch.

3.2.2.4 Dimensions

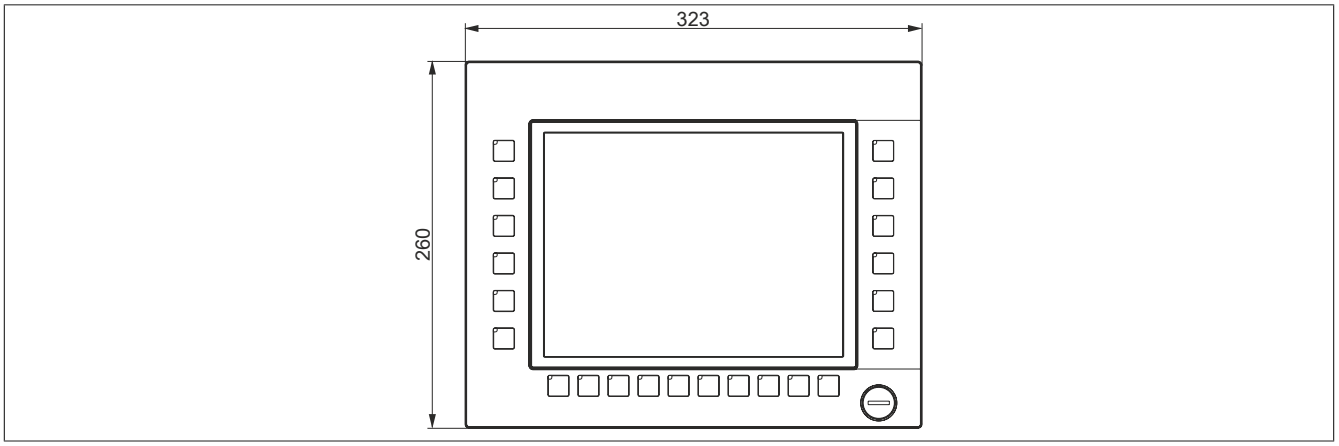


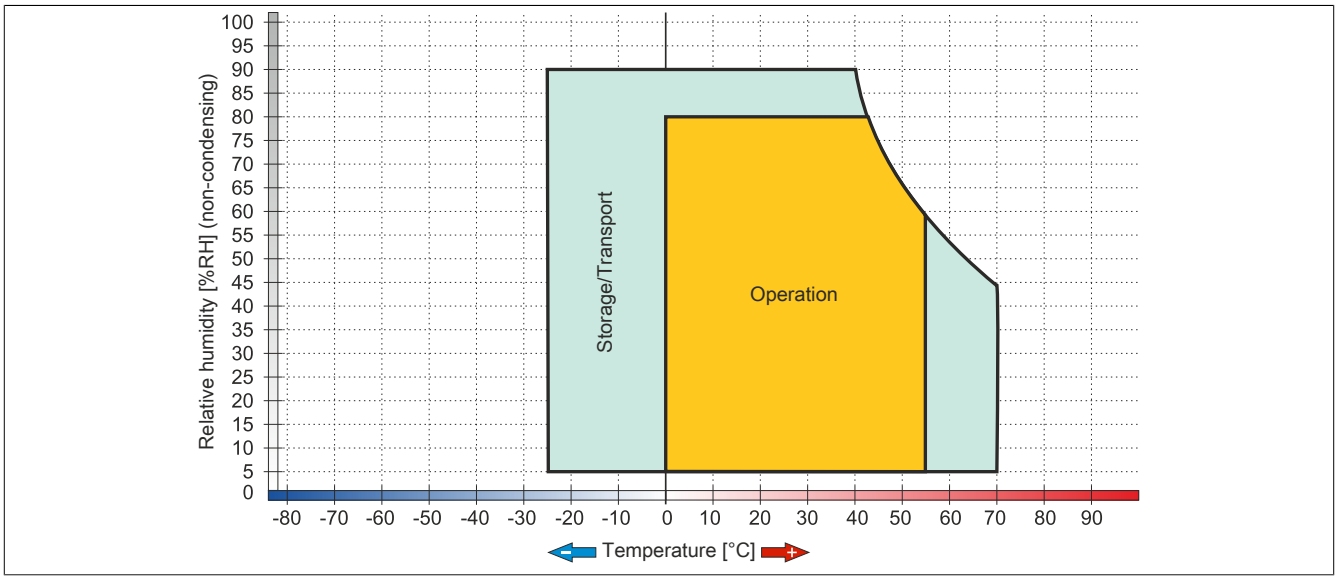
Figure 58: 5AP1180.1043-000 - Dimensions

3.2.2.5 Prerequisites and requirements

10.4" AP1000 display units are supported beginning with the following firmware versions:

- V3.11 for the 5DLSDL.1001-00 SDL/DVI receiver
- V4.08 for the 5DLSD3.1001-00 SDL3 receiver
- V1.03 for the 5PPC2100.BYxx-000 PPC2100 system unit
- V1.18 for the 5PC901.TS77-xx PPC900 system unit

3.2.2.6 Temperature/Humidity diagram



3.2.3 5AP1181.1043-000

3.2.3.1 General information

- Display unit for AP1000, PPC900 or PPC2100
- 10.4" TFT VGA color display
- Single-touch (analog resistive)
- 38 function keys and 20 system keys
- Front USB interface
- Control cabinet installation

3.2.3.2 Order data

Model number	Short description	Figure
5AP1181.1043-000	Automation Panel 10.4" VGA TFT - 640 x 480 pixels (4:3) - Single-touch (analog resistive) - Control cabinet installation - Portrait format - Front USB interface - 38 function keys and 20 system keys - For PPC900 / PPC2100 / Link module - Installation compatible with 5PP581.1043-00 5AP981.1043-01/5PC781.1043-00	

Table 83: 5AP1181.1043-000 - Order data

3.2.3.3 Technical data

Product ID	5AP1181.1043-000
General information	
B&R ID code	0xE7AF
Certification	
CE	Yes
cULus	Yes
cULus HazLoc Class 1 Division 2	Yes [1]
Interfaces	
USB	
Quantity	1
Type	USB 2.0
Design	Type A
Transfer rate	Low speed (1.5 Mbit/s), full speed (12 Mbit/s), high speed (480 Mbit/s)
Current load	Max. 500 mA
Display	
Type	Color TFT
Display size	10.4"
Colors	16.2 million
Resolution	VGA, 640 x 480 pixels
Contrast	900:1
Viewing angles	
Horizontal	Direction R = 80° / Direction L = 80°
Vertical	Direction U = 80° / Direction D = 80°
Backlight	
Type	LED
Brightness (dimmable)	Typ. 22.5 to 450 cd/m²
Half-brightness time [2]	70,000 h
Touch screen [3]	
Type	AMT
Technology	Analog, resistive
Controller	B&R, serial, 12-bit
Transmittance	81% ±3%
Keys	
Function keys	38 with LED (yellow)
System keys	Numeric keys, cursor block
Service life	>1,000,000 actuations at 1 ±0.3 N to 3 ±0.3 N actuating force

Table 84: 5AP1181.1043-000 - Technical data

Product ID	5AP1181.1043-000
LED brightness	
Yellow	Typ. 38 mcd
Operating conditions	
EN 60529 protection	Front: IP65 Back: IP20 (only with installed link module or installed system unit)
UL 50 protection	Front: Type 4X indoor use only
Mechanical characteristics	
Front [4]	
Frame	Naturally anodized aluminum
Panel overlay	
Material	Polyester
Light background	RAL 9006
Dark gray border around display	RAL 7024
Gasket	3 mm built-in seal
Dimensions	
Width	323 mm
Height	358 mm
Weight	3400 g

Table 84: 5AP1181.1043-000 - Technical data

1) Yes, although applies only if all components installed within the complete system have this certification and the complete system itself carries the corresponding mark.
2) At an ambient temperature of 25°C. Reducing the brightness by 50% can result in an approximately 50% increase in the half-brightness time.
3) Touch screen drivers for approved operating systems are available in the Downloads section of the B&R website.
4) There may be visible deviations in the color and surface appearance depending on the process or batch.

3.2.3.4 Dimensions

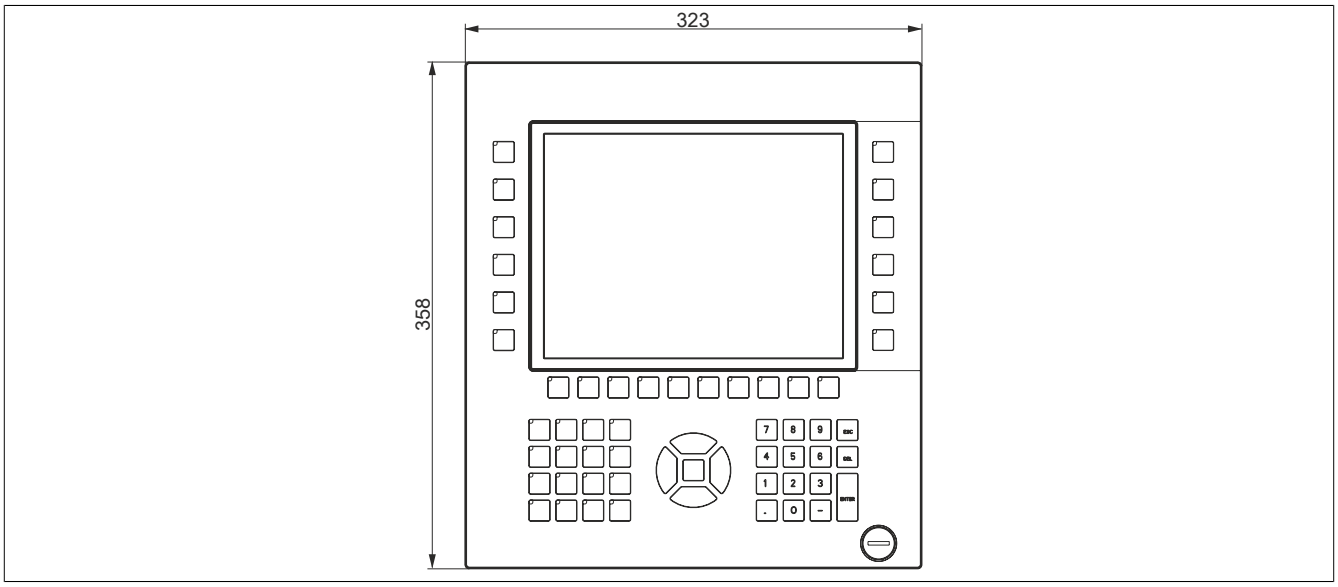


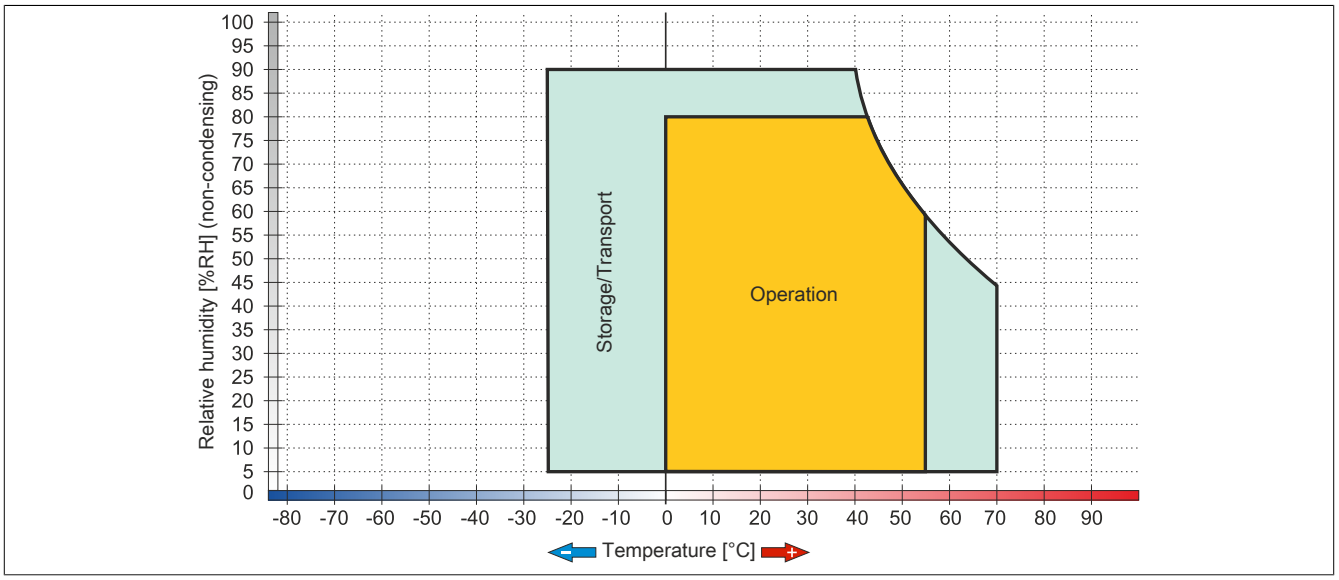
Figure 59: 5AP1181.1043-000 - Dimensions

3.2.3.5 Prerequisites and requirements

10.4" AP1000 display units are supported beginning with the following firmware versions:

- V3.11 for the 5DLSDL.1001-00 SDL/DVI receiver
- V4.08 for the 5DLSD3.1001-00 SDL3 receiver
- V1.03 for the 5PPC2100.BYxx-000 PPC2100 system unit
- V1.18 for the 5PC901.TS77-xx PPC900 system unit

3.2.3.6 Temperature/Humidity diagram



3.2.4 5AP1182.1043-000

3.2.4.1 General information

- Display unit for AP1000, PPC900 or PPC2100
- 10.4" TFT VGA color display
- Single-touch (analog resistive)
- 44 function keys and 20 system keys
- Front USB interface
- Control cabinet installation

3.2.4.2 Order data

Model number	Short description	Figure
5AP1182.1043-000	Automation Panel 10.4" VGA TFT - 640 x 480 pixels (4:3) - Single-touch (analog resistive) - Control cabinet installation - Landscape format - Front USB interface - 44 function keys and 20 system keys - For PPC900 / PPC2100 / Link module - Installation compatible with 5PP582.1043-00 5AP982.1043-01/5PC782.1043-00	

Table 85: 5AP1182.1043-000 - Order data

3.2.4.3 Technical data

Product ID	5AP1182.1043-000
General information	
B&R ID code	0xE7B0
Certification	
CE	Yes
cULus	Yes
cULus HazLoc Class 1 Division 2	Yes [1]
Interfaces	
USB	
Quantity	1
Type	USB 2.0
Design	Type A
Transfer rate	Low speed (1.5 Mbit/s), full speed (12 Mbit/s), high speed (480 Mbit/s)
Current load	Max. 500 mA
Display	
Type	Color TFT
Display size	10.4"
Colors	16.2 million
Resolution	VGA, 640 x 480 pixels
Contrast	900:1
Viewing angles	
Horizontal	Direction R = 80° / Direction L = 80°
Vertical	Direction U = 80° / Direction D = 80°
Backlight	
Type	LED
Brightness (dimmable)	Typ. 22.5 to 450 cd/m²
Half-brightness time [2]	70,000 h
Touch screen [3]	
Type	AMT
Technology	Analog, resistive
Controller	B&R, serial, 12-bit
Transmittance	81% ±3%
Keys	
Function keys	44 with LED (yellow)
System keys	Numeric keys, cursor block
Service life	>1,000,000 actuations at 1 ±0.3 N to 3 ±0.3 N actuating force
LED brightness	
Yellow	Typ. 38 mcd
Operating conditions	
EN 60529 protection	Front: IP65 Back: IP20 (only with installed link module or installed system unit)

Table 86: 5AP1182.1043-000 - Technical data

Product ID	5AP1182.1043-000
UL 50 protection	Front: Type 4X indoor use only
Mechanical characteristics	
Front [4]	
Frame	Naturally anodized aluminum
Panel overlay	
Material	Polyester
Light background	RAL 9006
Dark gray border around display	RAL 7024
Gasket	3 mm built-in seal
Dimensions	
Width	423 mm
Height	288 mm
Weight	3500 g

Table 86: 5AP1182.1043-000 - Technical data

1) Yes, although applies only if all components installed within the complete system have this certification and the complete system itself carries the corresponding mark.
2) At an ambient temperature of 25°C. Reducing the brightness by 50% can result in an approximately 50% increase in the half-brightness time.
3) Touch screen drivers for approved operating systems are available in the Downloads section of the B&R website.
4) There may be visible deviations in the color and surface appearance depending on the process or batch.

3.2.4.4 Dimensions

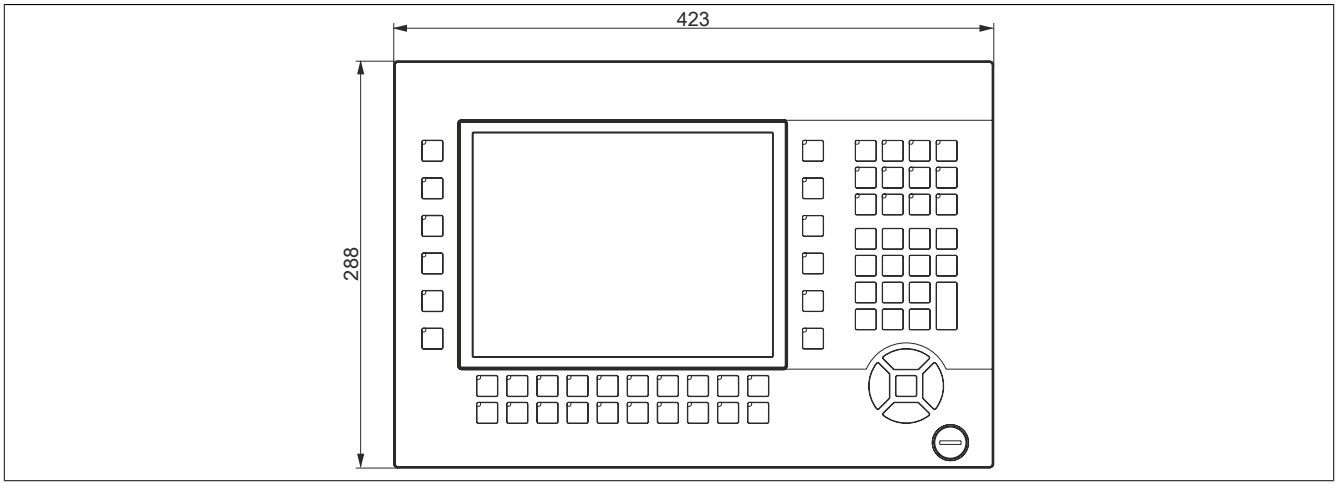


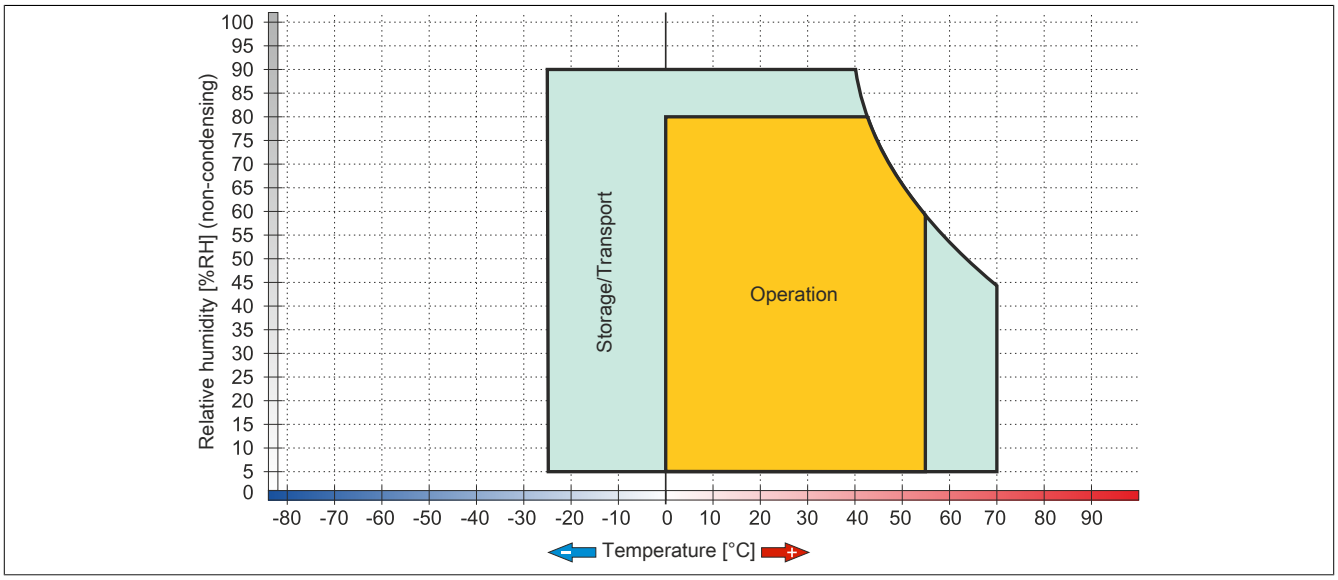
Figure 60: 5AP1182.1043-000 - Dimensions

3.2.4.5 Prerequisites and requirements

10.4" AP1000 display units are supported beginning with the following firmware versions:

- V3.11 for the 5DLSDL.1001-00 SDL/DVI receiver
- V4.08 for the 5DLSD3.1001-00 SDL3 receiver
- V1.03 for the 5PPC2100.BYxx-000 PPC2100 system unit
- V1.18 for the 5PC901.TS77-xx PPC900 system unit

3.2.4.6 Temperature/Humidity diagram



3.2.5 5AP1120.1214-000

3.2.5.1 General information

- Display unit for AP1000, PPC900 or PPC2100
- 12.1" TFT SVGA color display
- Single-touch (analog resistive)
- Front USB interface
- Control cabinet installation

3.2.5.2 Order data

Model number	Short description	Figure
5AP1120.1214-000	Automation Panel 12.1" SVGA TFT - 800 x 600 pixels (4:3) - Single-touch (analog resistive) - Control cabinet installation - Landscape format - Front USB interface - For PPC900 / PPC2100 / Link module - Installation compatible with 5PP520.1214-00	

Table 87: 5AP1120.1214-000 - Order data

3.2.5.3 Technical data

Product ID	5AP1120.1214-000
General information	
B&R ID code	0xE7BB
Certification	
CE	Yes
cULus	Yes
cULus HazLoc Class 1 Division 2	Yes [1]
Interfaces	
USB	
Quantity	1
Type	USB 2.0
Design	Type A
Transfer rate	Low speed (1.5 Mbit/s), full speed (12 Mbit/s), high speed (480 Mbit/s)
Current load	Max. 500 mA
Display	
Type	Color TFT
Display size	12.1"
Colors	16.2 million
Resolution	SVGA, 800 x 600 pixels
Contrast	1500:1
Viewing angles	
Horizontal	Direction R = 89° / Direction L = 89°
Vertical	Direction U = 89° / Direction D = 89°
Backlight	
Type	LED
Brightness (dimmable)	Typ. 22.5 to 450 cd/m²
Half-brightness time [2]	50,000 h
Touch screen [3]	
Type	AMT
Technology	Analog, resistive
Controller	B&R, serial, 12-bit
Transmittance	81% ±3%
Operating conditions	
EN 60529 protection	Front: IP65 Back: IP20 (only with installed link module or installed system unit)
UL 50 protection	Front: Type 4X indoor use only

Table 88: 5AP1120.1214-000 - Technical data

Product ID	5AP1120.1214-000
Mechanical characteristics	
Front [4]	
Frame	Naturally anodized aluminum
Panel overlay	
Material	Polyester
Light background	RAL 9006
Dark gray border around display	RAL 7024
Gasket	3 mm built-in seal
Dimensions	
Width	362 mm
Height	284 mm
Weight	3200 g

Table 88: 5AP1120.1214-000 - Technical data

1) Yes, although applies only if all components installed within the complete system have this certification and the complete system itself carries the corresponding mark.
2) At an ambient temperature of 25°C. Reducing the brightness by 50% can result in an approximately 50% increase in the half-brightness time.
3) Touch screen drivers for approved operating systems are available in the Downloads section of the B&R website.
4) There may be visible deviations in the color and surface appearance depending on the process or batch.

3.2.5.4 Dimensions

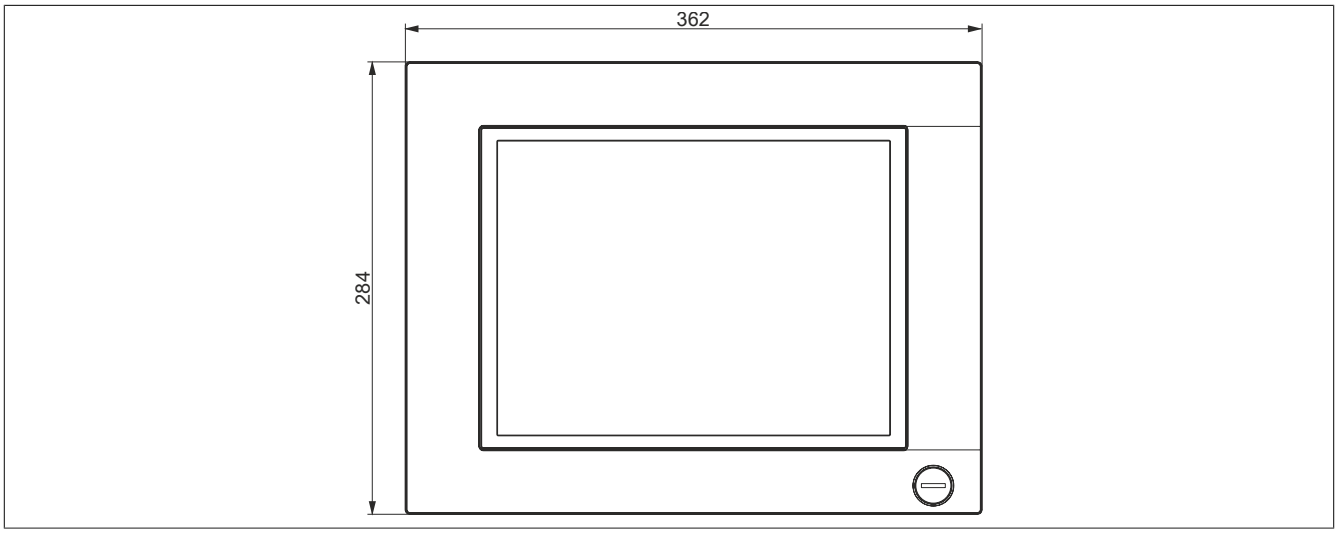


Figure 61: 5AP1120.1214-000 - Dimensions

3.2.5.5 Temperature/Humidity diagram

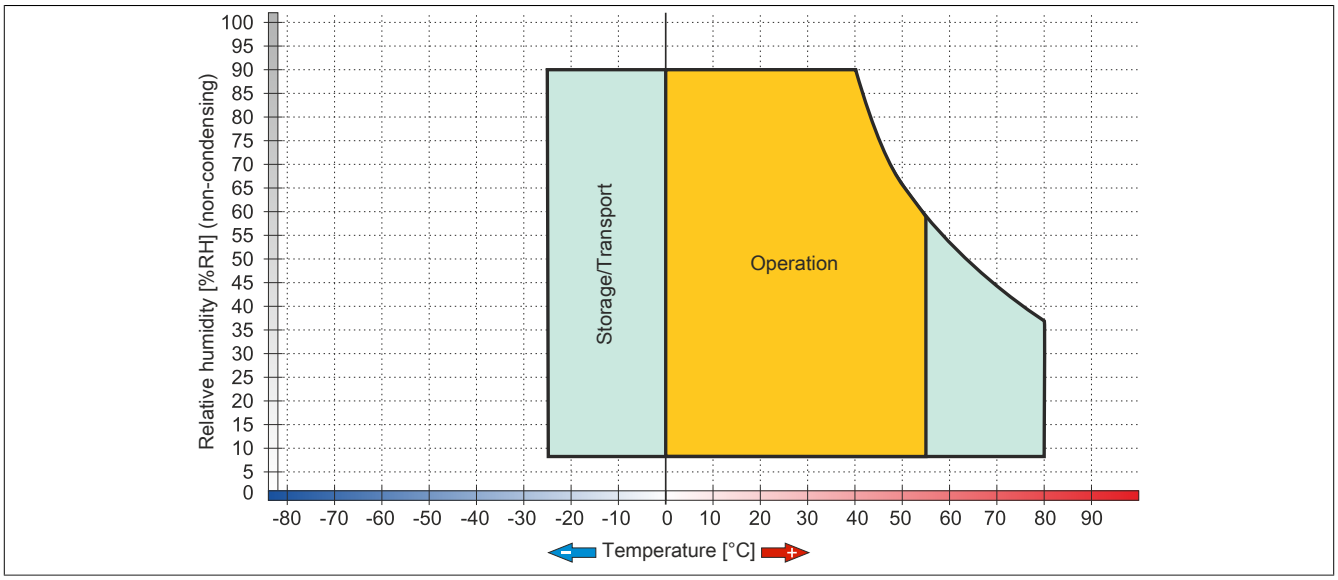


Figure 62: 5AP1120.1214-000 - Temperature/Humidity diagram

3.2.6 5AP1120.1505-000

3.2.6.1 General information

- Display unit for AP1000, PPC900 or PPC2100
- 15.0" TFT XGA color display
- Single-touch (analog resistive)
- Front USB interface
- Control cabinet installation

3.2.6.2 Order data

Model number	Short description	Figure
5AP1120.1505-000	Automation Panel 15.0" XGA TFT - 1024 x 768 pixels (4:3) - Single-touch (analog resistive) - Control cabinet installation - Landscape format - Front USB interface - For PPC900 / PPC2100 / Link module - Installation compatible with 5PP520.1505-00/5AP920.1505-01/ 5PC720.1505-xx/5PC820.1505-00	

Table 89: 5AP1120.1505-000 - Order data

3.2.6.3 Technical data

Product ID	5AP1120.1505-000
General information	
B&R ID code	0xE7BC
Certification	
CE	Yes
cULus	Yes
cULus HazLoc Class 1 Division 2	Yes [1]
Interfaces	
USB	
Quantity	1
Type	USB 2.0
Design	Type A
Transfer rate	Low speed (1.5 Mbit/s), full speed (12 Mbit/s), high speed (480 Mbit/s)
Current load	Max. 500 mA
Display	
Type	Color TFT
Display size	15.0"
Colors	16.2 million
Resolution	XGA, 1024 x 768 pixels
Contrast	700:1
Viewing angles	
Horizontal	Direction R = 80° / Direction L = 80°
Vertical	Direction U = 70° / Direction D = 70°
Backlight	
Type	LED
Brightness (dimmable)	Typ. 20 to 400 cd/m²
Half-brightness time [2]	50,000 h
Touch screen [3]	
Type	AMT
Technology	Analog, resistive
Controller	B&R, serial, 12-bit
Transmittance	81% ±3%
Operating conditions	
EN 60529 protection	Front: IP65 Back: IP20 (only with installed link module or installed system unit)
UL 50 protection	Front: Type 4X indoor use only

Table 90: 5AP1120.1505-000 - Technical data

Product ID	5AP1120.1505-000
Mechanical characteristics	
Front [4]	
Frame	Naturally anodized aluminum
Panel overlay	
Material	Polyester
Light background	RAL 9006
Dark gray border around display	RAL 7024
Gasket	3 mm built-in seal
Dimensions	
Width	435 mm
Height	330 mm
Weight	5000 g

Table 90: 5AP1120.1505-000 - Technical data

1) Yes, although applies only if all components installed within the complete system have this certification and the complete system itself carries the corresponding mark.
2) At an ambient temperature of 25°C. Reducing the brightness by 50% can result in an approximately 50% increase in the half-brightness time.
3) Touch screen drivers for approved operating systems are available in the Downloads section of the B&R website.
4) There may be visible deviations in the color and surface appearance depending on the process or batch.

3.2.6.4 Dimensions

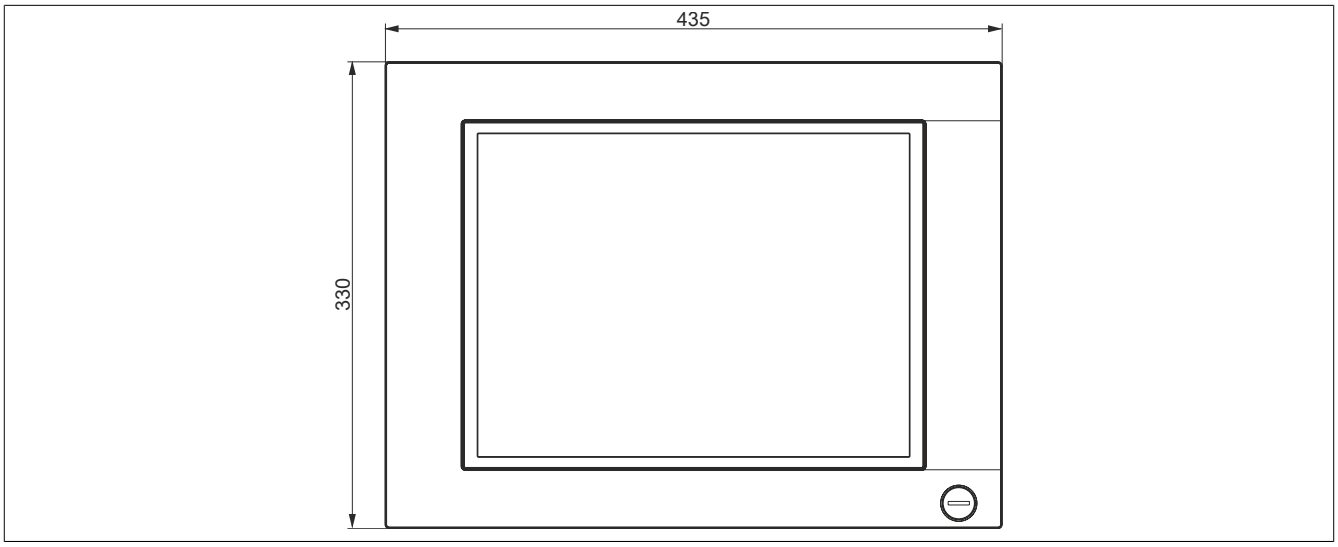


Figure 63: 5AP1120.1505-000 - Dimensions

3.2.6.5 Temperature/Humidity diagram

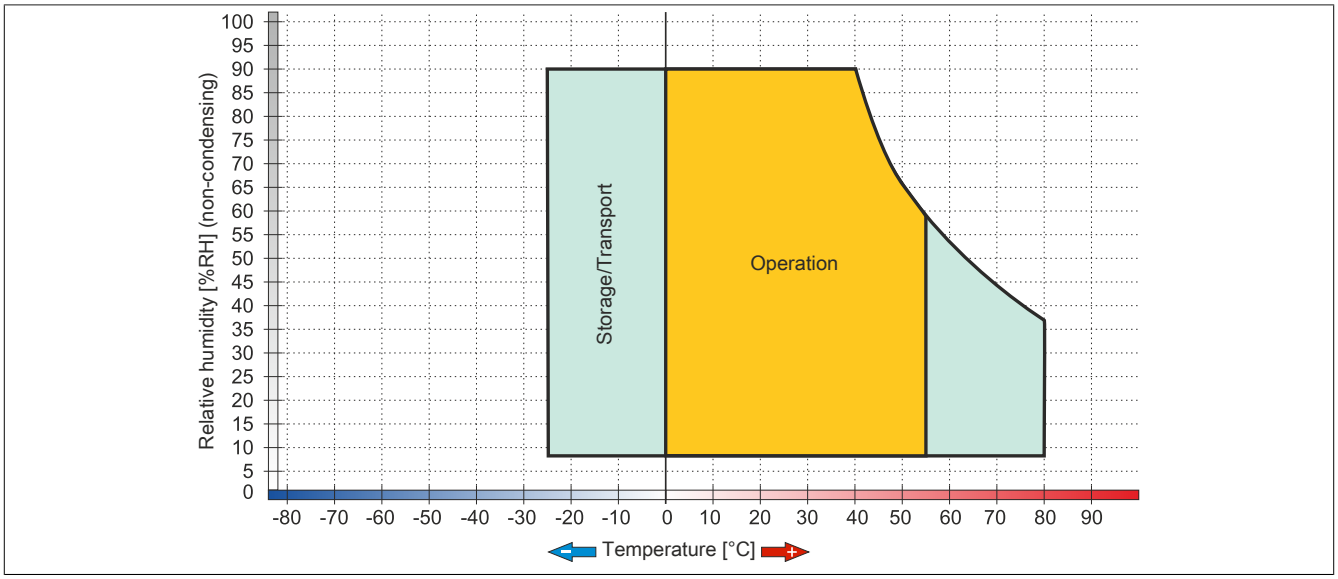


Figure 64: 5AP1120.1505-000 - Temperature/Humidity diagram

3.2.7 5AP1180.1505-000

3.2.7.1 General information

- Display unit for AP1000, PPC900 or PPC2100
- 15.0" TFT XGA color display
- Single-touch (analog resistive)
- 32 function keys
- Front USB interface
- Control cabinet installation

3.2.7.2 Order data

Model number	Short description	Figure
5AP1180.1505-000	Automation Panel 15.0" XGA TFT - 1024 x 768 pixels (4:3) - Single-touch (analog resistive) - Control cabinet installation - Landscape format - Front USB interface - 32 function keys - For PPC900 / PPC2100 / Link modules - Installation compatible with 5PP580.1505-00/5AP980.1505-01	

Table 91: 5AP1180.1505-000 - Order data

3.2.7.3 Technical data

Product ID	5AP1180.1505-000
General information	
B&R ID code	0xE7BD
Certification	
CE	Yes
cULus	Yes
cULus HazLoc Class 1 Division 2	Yes [1]
Interfaces	
USB	
Quantity	1
Type	USB 2.0
Design	Type A
Transfer rate	Low speed (1.5 Mbit/s), full speed (12 Mbit/s), high speed (480 Mbit/s)
Current load	Max. 500 mA
Display	
Type	Color TFT
Display size	15.0"
Colors	16.2 million
Resolution	XGA, 1024 x 768 pixels
Contrast	700:1
Viewing angles	
Horizontal	Direction R = 80° / Direction L = 80°
Vertical	Direction U = 70° / Direction D = 70°
Backlight	
Type	LED
Brightness (dimmable)	Typ. 20 to 400 cd/m²
Half-brightness time [2]	50,000 h
Touch screen [3]	
Type	AMT
Technology	Analog, resistive
Controller	B&R, serial, 12-bit
Transmittance	81% ±3%
Keys	
Function keys	32 with LED (yellow)
System keys	No
Service life	>1,000,000 actuations at 1 ±0.3 N to 3 ±0.3 N actuating force
LED brightness	
Yellow	Typ. 38 mcd

Table 92: 5AP1180.1505-000 - Technical data

Product ID	5AP1180.1505-000
Operating conditions	
EN 60529 protection	Front: IP65 Back: IP20 (only with installed link module or installed system unit)
UL 50 protection	Front: Type 4X indoor use only
Mechanical characteristics	
Front [4]	
Frame	Naturally anodized aluminum
Panel overlay	
Material	Polyester
Light background	RAL 9006
Dark gray border around display	RAL 7024
Gasket	3 mm built-in seal
Dimensions	
Width	435 mm
Height	330 mm
Weight	4900 g

Table 92: 5AP1180.1505-000 - Technical data

1) Yes, although applies only if all components installed within the complete system have this certification and the complete system itself carries the corresponding mark.
2) At an ambient temperature of 25°C. Reducing the brightness by 50% can result in an approximately 50% increase in the half-brightness time.
3) Touch screen drivers for approved operating systems are available in the Downloads section of the B&R website.
4) There may be visible deviations in the color and surface appearance depending on the process or batch.

3.2.7.4 Dimensions

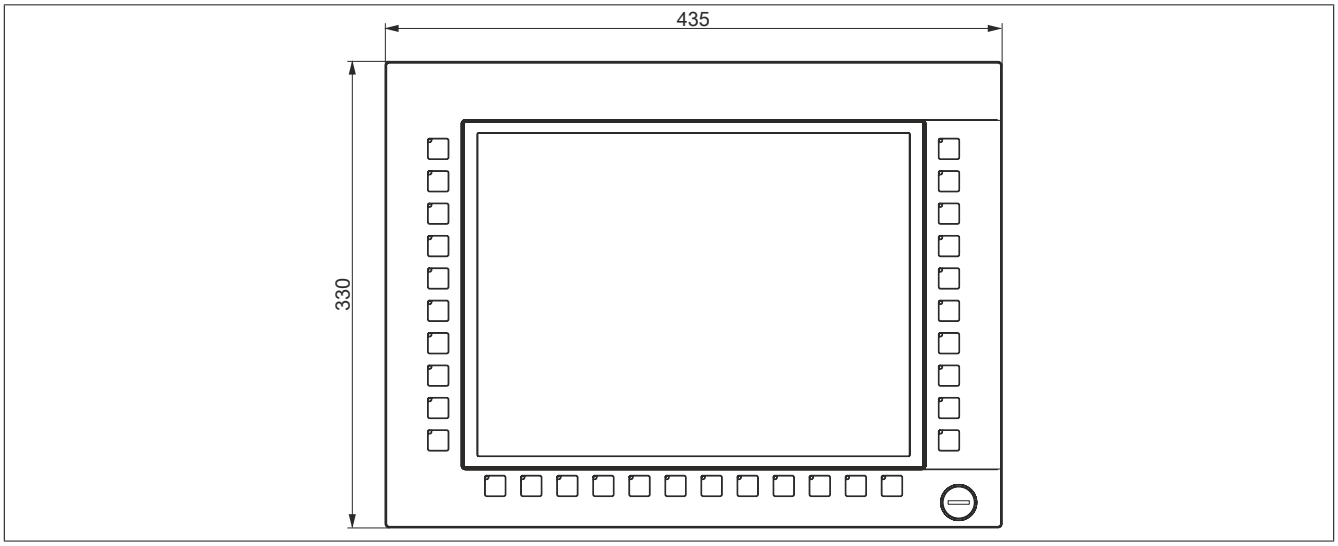
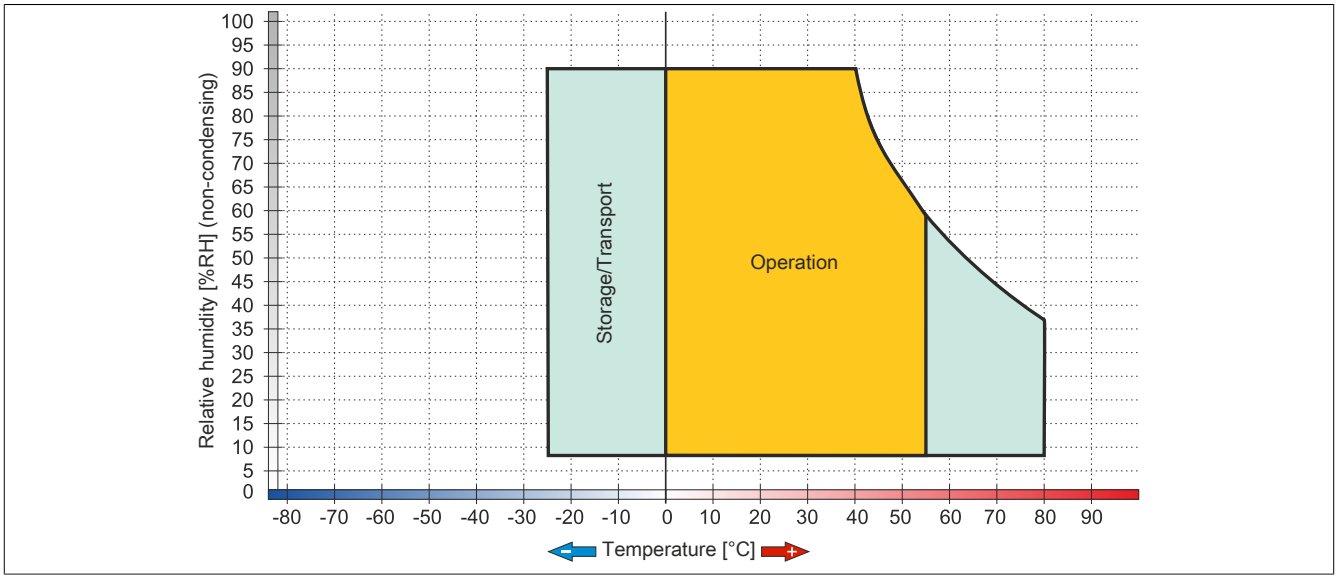


Figure 65: 5AP1180.1505-000 - Dimensions

3.2.7.5 Temperature/Humidity diagram



3.2.8 5AP1120.156B-000

3.2.8.1 General information

- Display unit for AP1000, PPC900 or PPC2100
- 15.6" TFT HD color display
- Single-touch (analog resistive)
- Control cabinet installation

3.2.8.2 Order data

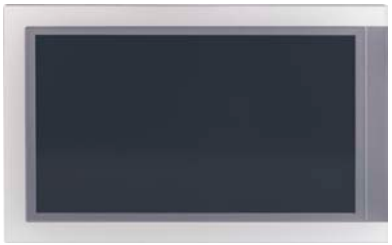
Model number	Short description	Figure
5AP1120.156B-000	Automation Panel 15.6" HD TFT - 1366 x 768 pixels (16:9) - Single-touch (analog resistive) - Control cabinet installation - Landscape format - For PPC900 / PPC2100 / link modules	

Table 93: 5AP1120.156B-000 - Order data

3.2.8.3 Technical data

Product ID	5AP1120.156B-000
General information	
B&R ID code	0xE8E5
Certification	
CE	Yes
cULus	Yes
cULus HazLoc Class 1 Division 2	Yes [1]
Display	
Type	Color TFT
Display size	15.6"
Colors	16.2 million
Resolution	HD, 1366 x 768 pixels
Contrast	500:1
Viewing angles	
Horizontal	Direction R = 85° / Direction L = 85°
Vertical	Direction U = 80° / Direction D = 80°
Backlight	
Type	LED
Brightness (dimmable)	Typ. 15 to 300 cd/m²
Half-brightness time [2]	50,000 h
Touch screen [3]	
Type	AMT
Technology	Analog, resistive
Controller	B&R, serial, 12-bit
Transmittance	81% ±3%
Operating conditions	
EN 60529 protection	Front: IP65 Back: IP20 (only with installed link module or installed system unit)
UL 50 protection	Front: Type 4X indoor use only
Mechanical characteristics	
Front [4]	
Frame	Naturally anodized aluminum
Panel overlay	
Material	Polyester
Light background	RAL 9006
Dark gray border around display	RAL 7024
Gasket	3 mm built-in gasket

Table 94: 5AP1120.156B-000 - Technical data

Product ID	5AP1120.156B-000
Dimensions	
Width	414 mm
Height	258.5 mm
Weight	4200 g

Table 94: 5AP1120.156B-000 - Technical data

1) Yes, although applies only if all components installed within the complete system have this certification and the complete system itself carries the corresponding mark.
2) At an ambient temperature of 25°C. Reducing the brightness by 50% can result in an approximately 50% increase in the half-brightness time.
3) Touch screen drivers for approved operating systems are available in the Downloads section of the B&R website.
4) There may be visible deviations in the color and surface appearance depending on the process or batch.

3.2.8.4 Dimensions

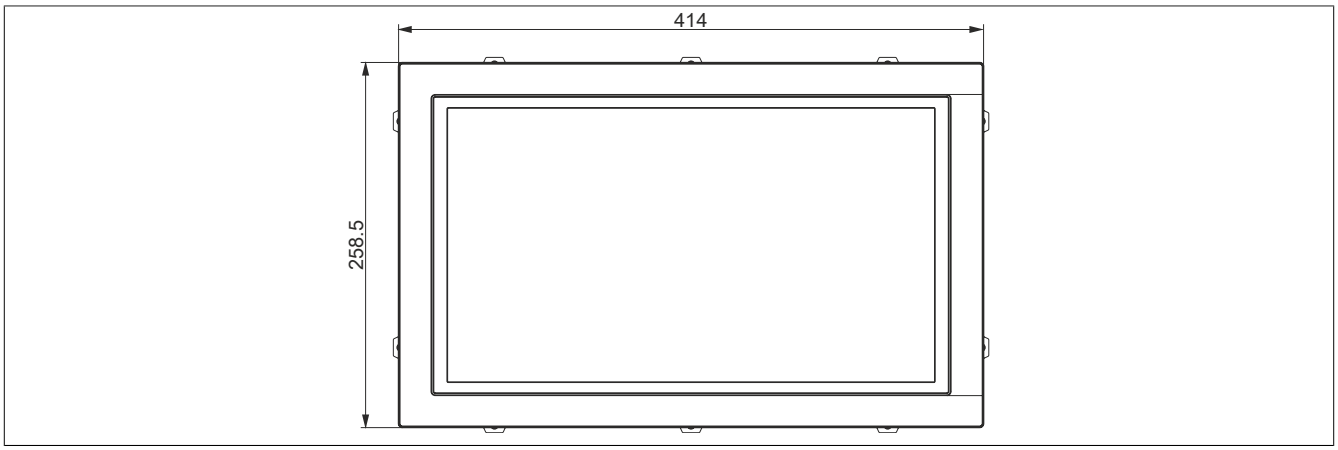


Figure 66: 5AP1120.156B-000 - Dimensions

3.2.8.5 Temperature/Humidity diagram

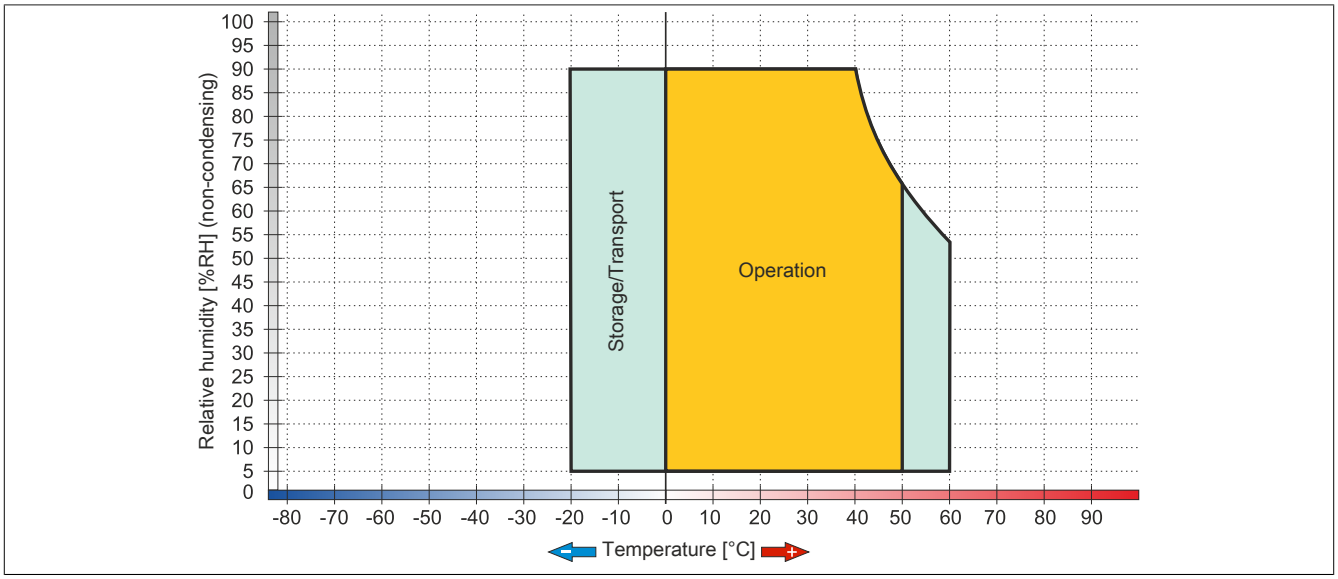


Figure 67: 5AP1120.156B-000 - Temperature/Humidity diagram

3.2.9 5AP1120.1906-000

3.2.9.1 General information

- Display unit for AP1000, PPC900 or PPC2100
- 19.0" TFT SXGA color display
- Single-touch (analog resistive)
- Front USB interface
- Control cabinet installation

3.2.9.2 Order data

Model number	Short description	Figure
5AP1120.1906-000	Automation Panel 19.0" SXGA TFT - 1280 x 1024 pixels (4:3) - Single-touch (analog resistive) - Control cabinet installation - Landscape format - Front USB interface - For PPC900 / PPC2100 / Link module - Installation compatible with 5AP920.1906-01 5PC720.1906-00/5PC820.1906-00	

Table 95: 5AP1120.1906-000 - Order data

3.2.9.3 Technical data

Product ID	5AP1120.1906-000
General information	
B&R ID code	0xE7BE
Certification	
CE	Yes
cULus	Yes
cULus HazLoc Class 1 Division 2	Yes [1]
Interfaces	
USB	
Quantity	1
Type	USB 2.0
Design	Type A
Transfer rate	Low speed (1.5 Mbit/s), full speed (12 Mbit/s), high speed (480 Mbit/s)
Current load	Max. 500 mA
Display	
Type	Color TFT
Display size	19.0"
Colors	16.2 million
Resolution	SXGA, 1280 x 1024 pixels
Contrast	1500:1
Viewing angles	
Horizontal	Direction R = 85° / Direction L = 85°
Vertical	Direction U = 85° / Direction D = 85°
Backlight	
Type	LED
Brightness (dimmable)	Typ. 35 to 350 cd/m²
Half-brightness time [2]	70,000 h
Touch screen [3]	
Type	AMT
Technology	Analog, resistive
Controller	B&R, serial, 12-bit
Transmittance	81% ±3%
Operating conditions	
EN 60529 protection	Front: IP65 Back: IP20 (only with installed link module or installed system unit)
UL 50 protection	Front: Type 4X indoor use only

Table 96: 5AP1120.1906-000 - Technical data

Product ID	5AP1120.1906-000
Mechanical characteristics	
Front [4]	
Frame	Naturally anodized aluminum
Panel overlay	
Material	Polyester
Light background	RAL 9006
Dark gray border around display	RAL 7024
Gasket	3 mm built-in seal
Dimensions	
Width	527 mm
Height	421 mm
Weight	7300 g

Table 96: 5AP1120.1906-000 - Technical data

1) Yes, although applies only if all components installed within the complete system have this certification and the complete system itself carries the corresponding mark.
2) At an ambient temperature of 25°C. Reducing the brightness by 50% can result in an approximately 50% increase in the half-brightness time.
3) Touch screen drivers for approved operating systems are available in the Downloads section of the B&R website.
4) There may be visible deviations in the color and surface appearance depending on the process or batch.

3.2.9.4 Dimensions

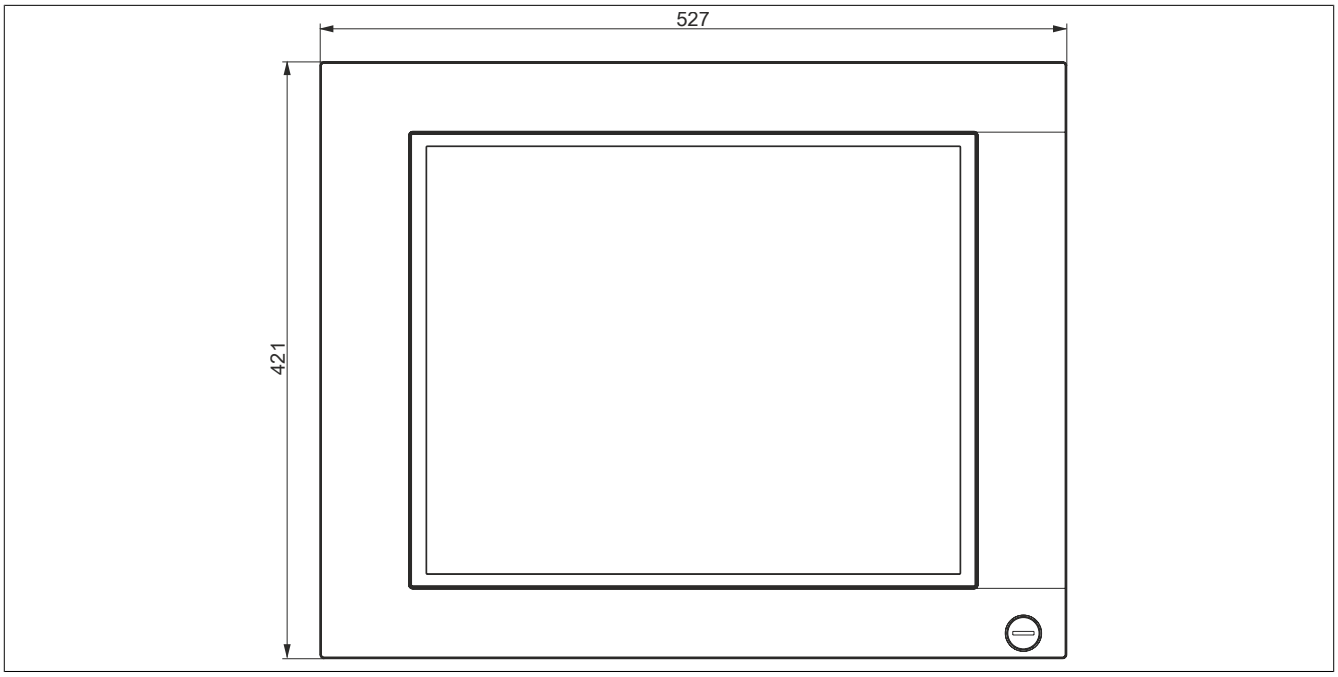


Figure 68: 5AP1120.1906-000 - Dimensions

3.2.9.5 Temperature/Humidity diagram

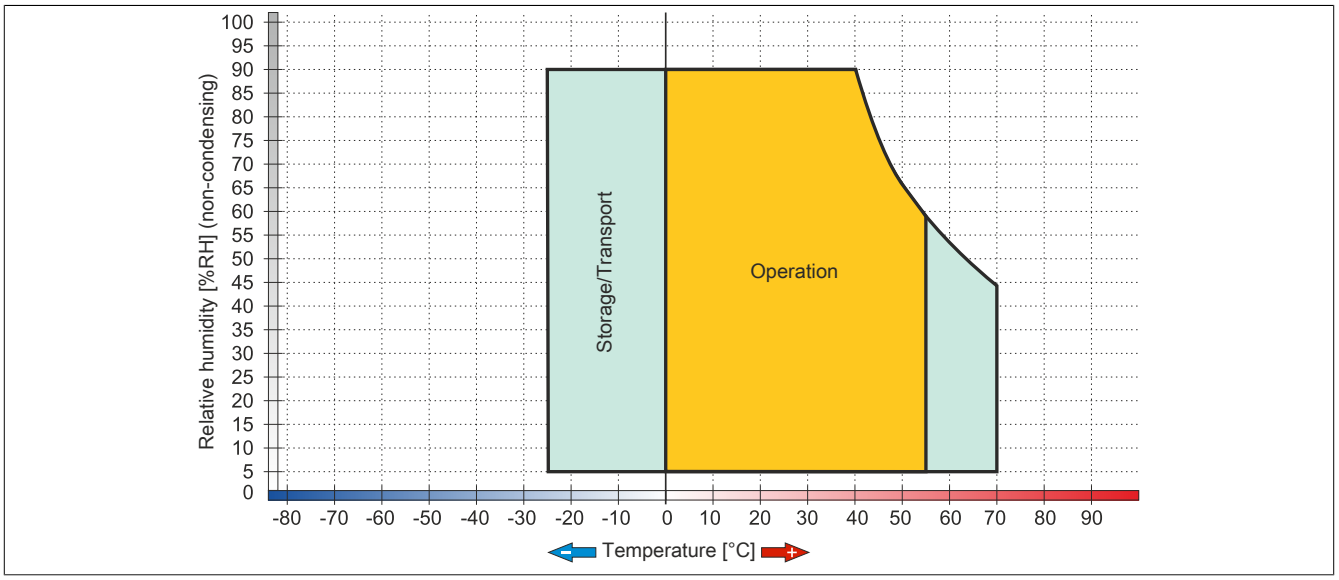


Figure 69: 5AP1120.1906-000 - Temperature/Humidity diagram

3.3 QM77 CPU boards

3.3.1 5PC901.TS77-0x

3.3.1.1 General information

- Intel Core i-series processors
- Intel QM77 chipset
- 2x DDR3 memory slot
- Intel HD Graphics 4000
- AMI BIOS (UEFI)

Information:

It is only possible to operate the 5PC901.TS77-00 CPU board if the system unit is equipped with a fan kit (active, 5PC911.SX00-00).

3.3.1.2 Order data

Model number	Short description	Figure
	CPU boards	
5PC901.TS77-00	CPU board Intel Core i7 3615QE 2.3 GHz - Quad core - QM77 chipset - For Panel PC 900	
5PC901.TS77-01	CPU board Intel Core i7 3612QE 2.1 GHz - Quad core - QM77 chipset - For Panel PC 900	
5PC901.TS77-03	CPU board Intel Core i7 3517UE 1.7 GHz - Dual core - QM77 chipset - For Panel PC 900	
5PC901.TS77-04	CPU board Intel Core i5 3610ME 2.7 GHz - Dual core - QM77 chipset - For Panel PC 900	
5PC901.TS77-05	CPU board Intel Core i3 3120ME 2.4 GHz - Dual core - QM77 chipset - For Panel PC 900	
5PC901.TS77-06	CPU board Intel Core i3 3217UE 1.6 GHz - Dual core - QM77 chipset - For Panel PC 900	
	Required accessories	
	Main memory	
5MMDDR.1024-03	SO-DIMM DDR3, 1024 MB	
5MMDDR.2048-03	SO-DIMM DDR3, 2048 MB	
5MMDDR.4096-03	SO-DIMM DDR3, 4096 MB	
5MMDDR.8192-03	SO-DIMM DDR3, 8192 MB	

Table 97: 5PC901.TS77-00, 5PC901.TS77-01, 5PC901.TS77-03, 5PC901.TS77-04, 5PC901.TS77-05, 5PC901.TS77-06 - Order data

3.3.1.3 Technical data

Product ID	5PC901.TS77-00	5PC901.TS77-01	5PC901.TS77-03	5PC901.TS77-04	5PC901.TS77-05	5PC901.TS77-06
General information						
Cooling	Passive via heat sink					
LED status indicators	Power, HDD, Link, Run					
B&R ID code	0xDF8A	0xDF8B	0xDF8D	0xDF8E	0xDF8F	0xDF90
Battery						
Type	Renata 950 mAh					
Service life	4 years [1]					
Removable	Yes, on the back of the Panel PC					
Design	Lithium ion					
Power button	Yes					
Reset button	Yes					
Buzzer	Yes					
Certification						
CE	Yes					
cULus	Yes					
cULus HazLoc Class 1 Division 2	Yes [2]					
GOST-R	Yes					
Controller						
Boot loader	BIOS					

Table 98: 5PC901.TS77-00, 5PC901.TS77-01, 5PC901.TS77-03, 5PC901.TS77-04, 5PC901.TS77-05, 5PC901.TS77-06 - Technical data

Product ID	5PC901.TS77-00	5PC901.TS77-01	5PC901.TS77-03	5PC901.TS77-04	5PC901.TS77-05	5PC901.TS77-06
Processor						
Type	Intel Core i7-3615QE	Intel Core i7-3612QE	Intel Core i7-3517UE	Intel Core i5-3610ME	Intel Core i3-3120ME	Intel Core i3-3217UE
Clock frequency	2300 MHz	2100 MHz	1700 MHz	2700 MHz	2400 MHz	1600 MHz
Number of cores	4	4	2	2	2	2
Architecture	22 nm					
Intel Smart Cache	6 MB	6 MB	4 MB	3 MB	3 MB	3 MB
External bus	DMI, 5 GT/s					
Intel 64 architecture	Yes					
Intel Turbo Boost Technology	2.0	2.0	2.0	2.0	No	No
Intel Hyper-Threading Technology	Yes					
Intel Virtualization Technology (VT-x)	Yes					
Enhanced Intel SpeedStep Technology	Yes					
Chipset	Intel QM77					
Real-time clock						
Precision	At 25°C: typ. 12 ppm (1 second) per day [3]					
Battery-backed	Yes					
Power failure logic						
Controller	MTCX [4]					
Buffer time	10 ms					
Memory slot						
Number of memory channels	2					
Type	DDR3					
Memory size	Max. 16 GB					
Max. memory bandwidth	25.6 GB/s					
Graphics						
Controller	Intel HD Graphics 4000					
Max. dynamic graphics frequency	1 GHz	1 GHz	1 GHz	950 MHz	900 MHz	900 MHz
Color depth	Max. 32-bit					
Resolution						
DVI	Resolution up to 1920 x 1200 (WUXGA)					
RGB	350 MHz RAMDAC, resolution up to 2048 x 1536 @ 75 Hz (QXGA)					
Mass memory management	3x SATA					
Power management	ACPI 4.0 with battery support					
Interfaces						
COM1						
Type	RS232, modem-capable, not electrically isolated					
Design	9-pin, male, DSUB connector					
UART	16550-compatible, 16-byte FIFO					
Max. baud rate	115 kbit/s					
COM2						
Type	RS232, modem-capable, not electrically isolated					
Design	9-pin, male, DSUB connector					
UART	16550-compatible, 16-byte FIFO					
Max. baud rate	115 kbit/s					
CFast slot						
Quantity	1					
Type	SATA III (SATA 60 Gbit/s)					
USB						
Quantity	4					
Type	USB 3.0 (on bottom)					
Design	Type A					
Transfer rate	Low speed (1.5 Mbit/s), full speed (12 Mbit/s), high speed (480 Mbit/s), super speed (5 Gbit/s) [5]					
Current load	Max. 1 A per connection					
Ethernet						
Quantity	2					
Design	Shielded RJ45					
Transfer rate	10/100/1000 Mbit/s					
Max. baud rate	1 Gbit/s					
Monitor/Panel interface						
Design	DVI-I					
Type	SDL/DVI/Monitor					
Audio						
Type	HDA					
Controller	Realtek RTL888					
Inputs	Microphone, Line IN					
Outputs	Line OUT					
Inserts						
Slide-in compact drives						
Quantity	1					
Type	SATA III (SATA 60 Gbit/s)					
Interface option	2					

Table 98: 5PC901.TS77-00, 5PC901.TS77-01, 5PC901.TS77-03, 5PC901.TS77-04, 5PC901.TS77-05, 5PC901.TS77-06 - Technical data

Product ID	5PC901.TS77-00	5PC901.TS77-01	5PC901.TS77-03	5PC901.TS77-04	5PC901.TS77-05	5PC901.TS77-06
Add-on UPS slot	Yes [6]					
Insert for fan kit	Yes					
Electrical characteristics						
Nominal voltage	24 VDC ±25%					
Nominal current	5.5 A					
Starting current	Max. 60 A for <300 µs					
Electrical isolation	Yes					
Environmental conditions						
Elevation						
Operation	Max. 3000 m (component-dependent) [7]					
Mechanical characteristics						
Weight	Approx. 450 g					

Table 98: 5PC901.TS77-00, 5PC901.TS77-01, 5PC901.TS77-03, 5PC901.TS77-04, 5PC901.TS77-05, 5PC901.TS77-06 - Technical data

1) At 50°C, 8.5 µA of the supplied components and a self-discharge of 40%. If an SRAM interface option has been installed, the service life is 2½ years.
2) Yes, although applies only if all components installed within the complete system have this certification and the complete system itself carries the corresponding mark.
3) At max. specified ambient temperature: typ. 58 ppm (5 seconds) - worst-case 220 ppm (19 seconds).
4) Maintenance Controller Extended.
5) The super speed transfer rate (5 Gbit/s) is only possible with USB 3.0.
6) This UPS module can only be operated in the IF option 1 slot.
7) The maximum ambient temperature is typically derated by 1°C per 1000 meters (starting at 500 meters above sea level).

3.4 HM76 CPU boards

3.4.1 5PC901.TS77-0x

3.4.1.1 General information

- Intel Celeron processors
- Intel HM76 chipset
- 2x DDR3 memory slot
- Intel HD Graphics 2000/2500
- AMI BIOS (UEFI)

3.4.1.2 Order data

Model number	Short description	Figure
	CPU boards	
5PC901.TS77-07	CPU board Intel Celeron 847E 1.1 GHz - Dual core - HM76 chipset - For Panel PC 900	
5PC901.TS77-08	CPU board Intel Celeron 827E 1.4 GHz - Single core - HM76 chipset - For Panel PC 900	
5PC901.TS77-09	CPU board Intel Celeron 1020E 2.2 GHz - Dual core - HM76 chipset - For Panel PC 900	
5PC901.TS77-10	CPU board Intel Celeron 1047UE 1.4 GHz - Dual core - HM76 chipset - For Panel PC 900	
	Required accessories	
	Main memory	
5MMDDR.1024-03	SO-DIMM DDR3, 1024 MB	
5MMDDR.2048-03	SO-DIMM DDR3, 2048 MB	
5MMDDR.4096-03	SO-DIMM DDR3, 4096 MB	
5MMDDR.8192-03	SO-DIMM DDR3, 8192 MB	

Table 99: 5PC901.TS77-07, 5PC901.TS77-08, 5PC901.TS77-09, 5PC901.TS77-10 - Order data

3.4.1.3 Technical data

Product ID	5PC901.TS77-07	5PC901.TS77-08	5PC901.TS77-09	5PC901.TS77-10
General information				
Cooling	Passive via heat sink			
LED status indicators	Power, HDD, Link, Run			
B&R ID code	0xDFCD	0xDFCE	0xE18E	0xE1AD
Battery				
Type	Renata 950 mAh			
Service life	4 years [1]			
Removable	Yes, on the back of the Panel PC			
Design	Lithium ion			
Power button	Yes			
Reset button	Yes			
Buzzer	Yes			
Certification				
CE	Yes			
cULus	Yes			
cULus HazLoc Class 1 Division 2	Yes [2]			
GOST-R	Yes			
Controller				
Boot loader	BIOS			
Processor				
Type	Intel Celeron 847E	Intel Celeron 827E	Intel Celeron 1020E	Intel Celeron 1047UE
Clock frequency	1100 MHz	1400 MHz	2200 MHz	1400 MHz
Number of cores	2	1	2	2
Architecture	32 nm	32 nm	22 nm	22 nm
Intel Smart Cache	2 MB	1.5 MB	2 MB	2 MB
External bus	DMI, 5 GT/s			
Intel 64 architecture	Yes			
Intel Turbo Boost Technology	No			
Intel Hyper-Threading Technology	No			
Intel Virtualization Technology (VT-x)	Yes			
Enhanced Intel SpeedStep Technology	Yes			
Chipset	Intel HM76			

Table 100: 5PC901.TS77-07, 5PC901.TS77-08, 5PC901.TS77-09, 5PC901.TS77-10 - Technical data

Product ID	5PC901.TS77-07	5PC901.TS77-08	5PC901.TS77-09	5PC901.TS77-10
Real-time clock				
Precision	At 25°C: typ. 12 ppm (1 second) per day [3]			
Battery-backed	Yes			
Power failure logic				
Controller	MTCX [4]			
Buffer time	10 ms			
Memory slot				
Number of memory channels	2			
Type	DDR3			
Memory size	Max. 16 GB			
Max. memory bandwidth	21.3 GB/s	21.3 GB/s	25.6 GB/s	25.6 GB/s
Graphics				
Controller	Intel HD Graphics 2000	Intel HD Graphics 2000	Intel HD Graphics 2500	Intel HD Graphics 2500
Max. dynamic graphics frequency	800 MHz	800 MHz	1 GHz	900 MHz
Color depth	Max. 32-bit			
Resolution				
DVI	Resolution up to 1920 x 1200 (WUXGA)			
RGB	350 MHz RAMDAC, resolution up to 2048 x 1536 @ 75 Hz (QXGA)			
Mass memory management	3x SATA			
Power management	ACPI 4.0 with battery support			
Interfaces				
COM1				
Type	RS232, modem-capable, not electrically isolated			
Design	9-pin, male, DSUB connector			
UART	16550-compatible, 16-byte FIFO			
Max. baud rate	115 kbit/s			
COM2				
Type	RS232, modem-capable, not electrically isolated			
Design	9-pin, male, DSUB connector			
UART	16550-compatible, 16-byte FIFO			
Max. baud rate	115 kbit/s			
CFast slot				
Quantity	1			
Type	SATA III (SATA 60 Gbit/s)			
USB				
Quantity	4			
Type	USB 3.0 (on bottom)			
Design	Type A			
Transfer rate	Low speed (1.5 Mbit/s), full speed (12 Mbit/s), high speed (480 Mbit/s), super speed (5 Gbit/s) [5]			
Current load	Max. 1 A per connection			
Ethernet				
Quantity	2			
Design	Shielded RJ45			
Transfer rate	10/100/1000 Mbit/s			
Max. baud rate	1 Gbit/s			
Monitor/Panel interface				
Design	DVI-I			
Type	SDL/DVI/Monitor			
Audio				
Type	HDA			
Controller	Realtek RTL888			
Inputs	Microphone, Line IN			
Outputs	Line OUT			
Inserts				
Slide-in compact drives				
Quantity	1			
Type	SATA III (SATA 60 Gbit/s)			
Interface option	2			
Add-on UPS slot	Yes [6]			
Insert for fan kit	Yes			
Electrical characteristics				
Nominal voltage	24 VDC ±25%			
Nominal current	5.5 A			
Starting current	Max. 60 A for <300 µs			
Electrical isolation	Yes			
Environmental conditions				
Elevation				
Operation	Max. 3000 m (component-dependent) [7]			
Mechanical characteristics				
Weight	Approx. 450 g			

Table 100: 5PC901.TS77-07, 5PC901.TS77-08, 5PC901.TS77-09, 5PC901.TS77-10 - Technical data

1) At 50°C, 8.5 µA of the supplied components and a self-discharge of 40%. If an SRAM interface option has been installed, the service life is 2½ years.
2) Yes, although applies only if all components installed within the complete system have this certification and the complete system itself carries the corresponding mark.
3) At max. specified ambient temperature: typ. 58 ppm (5 seconds) - worst-case 220 ppm (19 seconds).

4) Maintenance Controller Extended.
5) The super speed transfer rate (5 Gbit/s) is only possible with USB 3.0.
6) This UPS module can only be operated in the IF option 1 slot.
7) The maximum ambient temperature is typically derated by 1°C per 1000 meters (starting at 500 meters above sea level).

3.5 System units

3.5.1 5PC911.SX00-00

3.5.1.1 General information

The active Panel PC 900 system unit consists of a housing and heat sink. A fan kit is also required for operation. A CPU board, main memory, IF options, fan kit and slide-in compact drive are installed in the system unit.

The 5AC902.FA00-00 fan kit is not included with the system unit and must be ordered separately.

3.5.1.2 Order data

Model number	Short description	Figure
	System units	
5PC911.SX00-00	PPC900 active system unit	
	Required accessories	
	CPU boards	
5PC901.TS77-00	CPU board Intel Core i7 3615QE 2.3 GHz - Quad core - QM77 chipset - For Panel PC 900	
5PC901.TS77-01	CPU board Intel Core i7 3612QE 2.1 GHz - Quad core - QM77 chipset - For Panel PC 900	
5PC901.TS77-03	CPU board Intel Core i7 3517UE 1.7 GHz - Dual core - QM77 chipset - For Panel PC 900	
5PC901.TS77-04	CPU board Intel Core i5 3610ME 2.7 GHz - Dual core - QM77 chipset - For Panel PC 900	
5PC901.TS77-05	CPU board Intel Core i3 3120ME 2.4 GHz - Dual core - QM77 chipset - For Panel PC 900	
5PC901.TS77-06	CPU board Intel Core i3 3217UE 1.6 GHz - Dual core - QM77 chipset - For Panel PC 900	
5PC901.TS77-07	CPU board Intel Celeron 847E 1.1 GHz - Dual core - HM76 chipset - For Panel PC 900	
5PC901.TS77-08	CPU board Intel Celeron 827E 1.4 GHz - Single core - HM76 chipset - For Panel PC 900	
5PC901.TS77-09	CPU board Intel Celeron 1020E 2.2 GHz - Dual core - HM76 chipset - For Panel PC 900	
5PC901.TS77-10	CPU board Intel Celeron 1047UE 1.4 GHz - Dual core - HM76 chipset - For Panel PC 900	
	Fan kit	
5AC902.FA00-00	PPC900 fan kit - For 5PC911.SX00-00	

Table 101: 5PC911.SX00-00 - Order data

3.5.1.3 Technical data

Product ID	5PC911.SX00-00
General information	
Cooling	Active via fan kit Passive via heat sink
Certification	
CE	Yes
cULus	Yes
cULus HazLoc Class 1 Division 2	Yes [1]
GOST-R	Yes
Mechanical characteristics	
Housing	
Material	Aluminum, Light metal die casting
Coating	Anthracite
Dimensions	
Width	225 mm
Height	226 mm
Depth	54 mm
Weight	Approx. 2821 g

Table 102: 5PC911.SX00-00 - Technical data

1) Yes, although applies only if all components installed within the complete system have this certification and the complete system itself carries the corresponding mark.

3.5.2 5PC911.SX00-01

3.5.2.1 General information

The passive Panel PC 900 system unit consists of a housing and heat sink. A CPU board, main memory, IF options and slide-in compact drive are installed in the system unit.

3.5.2.2 Order data

Model number	Short description	Figure
	System units	
5PC911.SX00-01	PPC900 passive system unit	
	Required accessories	
	CPU boards	
5PC901.TS77-01	CPU board Intel Core i7 3612QE 2.1 GHz - Quad core - QM77 chipset - For Panel PC 900	
5PC901.TS77-03	CPU board Intel Core i7 3517UE 1.7 GHz - Dual core - QM77 chipset - For Panel PC 900	
5PC901.TS77-04	CPU board Intel Core i5 3610ME 2.7 GHz - Dual core - QM77 chipset - For Panel PC 900	
5PC901.TS77-05	CPU board Intel Core i3 3120ME 2.4 GHz - Dual core - QM77 chipset - For Panel PC 900	
5PC901.TS77-06	CPU board Intel Core i3 3217UE 1.6 GHz - Dual core - QM77 chipset - For Panel PC 900	
5PC901.TS77-07	CPU board Intel Celeron 847E 1.1 GHz - Dual core - HM76 chipset - For Panel PC 900	
5PC901.TS77-08	CPU board Intel Celeron 827E 1.4 GHz - Single core - HM76 chipset - For Panel PC 900	
5PC901.TS77-09	CPU board Intel Celeron 1020E 2.2 GHz - Dual core - HM76 chipset - For Panel PC 900	
5PC901.TS77-10	CPU board Intel Celeron 1047UE 1.4 GHz - Dual core - HM76 chipset - For Panel PC 900	

Table 103: 5PC911.SX00-01 - Order data

3.5.2.3 Technical data

Product ID	5PC911.SX00-01
General information	
Cooling	Passive via heat sink
Certification	
CE	Yes
cULus	Yes
cULus HazLoc Class 1 Division 2	Yes [1]
GOST-R	Yes
Mechanical characteristics	
Housing	
Material	Aluminum, Light metal die casting
Coating	Anthracite
Dimensions	
Width	225 mm
Height	226 mm
Depth	54 mm
Weight	Approx. 2821 g

Table 104: 5PC911.SX00-01 - Technical data

1) Yes, although applies only if all components installed within the complete system have this certification and the complete system itself carries the corresponding mark.

3.6 Main memory

3.6.1 5MMDDR.xxxx-03

3.6.1.1 General information

These 204-pin DDR3 main memory modules operate at 1600 MHz and range in size from 1 GB to 8 GB.

If two RAM modules with the same size (e.g. 2 GB) are inserted into the CPU board, then dual-channel memory technology is supported. This technology is not supported if two RAM modules of different sizes (e.g. 2 GB and 4 GB) are inserted.

If two 2 GB modules or one 4 GB module is installed on a 32-bit operating system, only 3 GB of main memory can be used. On a 64-bit operating system, up to 16 GB of main memory can be used.

3.6.1.2 Order data

Model number	Short description	Figure
	Main memory	
5MMDDR.1024-03	SO-DIMM DDR3, 1024 MB	
5MMDDR.2048-03	SO-DIMM DDR3, 2048 MB	
5MMDDR.4096-03	SO-DIMM DDR3, 4096 MB	
5MMDDR.8192-03	SO-DIMM DDR3, 8192 MB	

Table 105: 5MMDDR.1024-03, 5MMDDR.2048-03, 5MMDDR.4096-03, 5MMDDR.8192-03 - Order data

3.6.1.3 Technical data

Product ID	5MMDDR.1024-03	5MMDDR.2048-03	5MMDDR.4096-03	5MMDDR.8192-03
General information				
Certification				
CE	Yes			
cULus	Yes			
cULus HazLoc Class 1 Division 2	Yes [1]			
GOST-R	Yes			
GL	Yes [2]			
Controller				
Memory				
Type	SO-DIMM DDR3 SDRAM			
Memory size	1 GB	2 GB	4 GB	8 GB
Construction	204-pin			
Organization	128M x 64-bit	256M x 64-bit	512M x 64-bit	1024M x 64 bits
Speed	DDR3-1600 (PC3-12800)			

Table 106: 5MMDDR.1024-03, 5MMDDR.2048-03, 5MMDDR.4096-03, 5MMDDR.8192-03 - Technical data

1) Yes, although applies only if all components installed within the complete system have this certification and the complete system itself carries the corresponding mark.
2) Yes, although applies only if all components installed within the complete system have this certification.

3.7 Bus units

> **Information:**
>
> **For information about installing or replacing a bus unit, please refer to the section "Installing the bus unit" on page 212.**
>
> **When installing or replacing a bus unit, it is also necessary to load the default settings in BIOS Setup (see "Save & Exit" on page 289).**

3.7.1 5AC902.BX0x-xx

3.7.1.1 General information

Bus units consist of a housing and bus. They can be expanded on the Panel PC 900 system unit.

In addition to the availability of different variants with PCI and PCIe slots, every bus unit has a slide-in drive slot and fan kit.

The fan kit is not included in the delivery of the bus unit and must be ordered separately. If an active system unit (5PC911.SX00-00) is being used, then a fan kit must be configured in the bus unit.

1-slot bus units

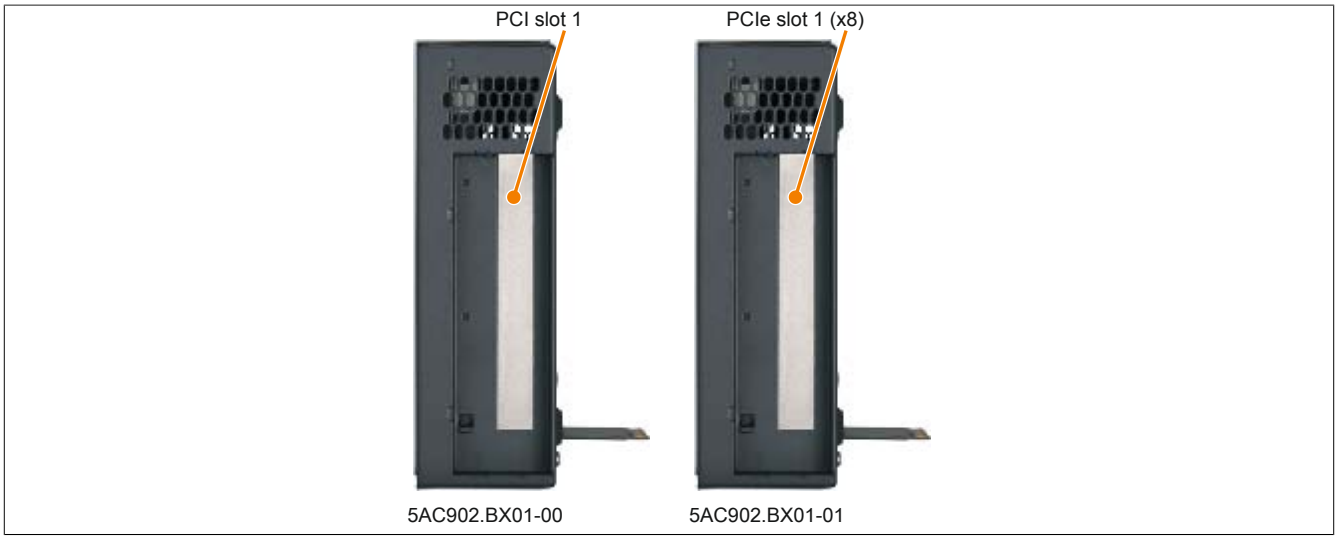


Figure 70: 1-slot bus units

2-slot bus units

Figure 71: 2-slot bus units

Information:

Bus unit 5AC902.BX02-02 is supported beginning with firmware version V1.14. Additional information about firmware upgrades can be found in the section "Firmware upgrade" on page 301.

3.7.1.2 Order data

Model number	Short description	Figure
	Bus units	
5AC902.BX01-00	PPC900 bus unit, 1-slot - 1 PCI - 1 slide-in	
5AC902.BX01-01	PPC900 bus unit, 1-slot - 1 PCI Express x8 - 1 slide-in	
5AC902.BX02-00	PPC900 bus unit, 2-slot - 2 PCI - 1 slide-in	
5AC902.BX02-01	PPC900 2-slot bus unit - 1 PCI - 1 PCI Express x8 - 1 slide-in	
5AC902.BX02-02	PPC900 bus unit, 2-slot - 2 PCI Express x4 - 1 slide-in	
	Optional accessories	
	Fan kit	
5AC902.FA0X-00	PPC900 fan kit - For PPC900 bus unit	

Table 107: 5AC902.BX01-00, 5AC902.BX01-01, 5AC902.BX02-00, 5AC902.BX02-01, 5AC902.BX02-02 - Order data

3.7.1.3 Technical data

Product ID	5AC902.BX01-00	5AC902.BX01-01	5AC902.BX02-00	5AC902.BX02-01	5AC902.BX02-02
General information					
Certification					
CE			Yes		
cULus			Yes		
cULus HazLoc Class 1 Division 2			Yes [1]		
GOST-R	Yes	Yes	Yes	Yes	-
Inserts					
PCI slots					
Quantity	1	-	2	1	-
Type	32-bit	-	32-bit	32-bit	-
Design	PCI half-size	-	PCI half-size	PCI half-size	-
Standard	2.2	-	2.2	2.2	-
Bus speed	33 MHz	-	33 MHz	33 MHz	-
PCIe to PCI bridge	Yes	-	Yes	Yes	-
PCIe slots					
Quantity	-	1	-	1	2
Design	-	PCIe half-size	-	PCIe half-size	PCIe half-size
Standard	-	2.0	-	2.0	2.0
Bus speed	-	x8 (4 GB/s)	-	x8 (4 GB/s)	x4 (2 GB/s)
Slide-in drives			1		
Mechanical characteristics					
Dimensions					
Width			164 mm		
Height			218 mm		
Depth	54.7 mm	54.7 mm	75 mm	75 mm	75 mm
Weight	Approx. 1020 g	Approx. 1020 g	Approx. 1220 g	Approx. 1220 g	Approx. 1220 g

Table 108: 5AC902.BX01-00, 5AC902.BX01-01, 5AC902.BX02-00, 5AC902.BX02-01, 5AC902.BX02-02 - Technical data

1) Yes, although applies only if all components installed within the complete system have this certification and the complete system itself carries the corresponding mark.

Information:

By default, PCIe slots are limited to Gen1 in BIOS. However, this PCIe Gen setting can be changed in BIOS (Advanced - PCI Express configuration - PCI Express GEN 2 settings).

3.8 Fan kit

Information:

Fan kits are subject to wear and must be checked at appropriate intervals and cleaned or replaced when not functioning properly (e.g. due to dirt and grime). For information about replacing fan filters, please refer to the section "Replacing the fan filter" on page 211.

Information:

For information about installing or replacing a fan kit, please refer to the section "Replacing the fan kit" on page 210.

3.8.1 5AC902.FA00-00

3.8.1.1 General information

This fan kit includes 2 fans that are installed to improve the heat dissipation of the active 5PC911.SX00-00 PPC900 system unit.

- 2 fans for improved heat dissipation of the system unit
- Simple installation and removal

The 5AC902.FA00-00 fan kit is not included with the system unit and must be ordered separately.

3.8.1.2 Order data

Model number	Short description	Figure
	Fan kit	
5AC902.FA00-00	PPC900 fan kit - For system unit 5PC911.SX00-00	
	Optional accessories	
	Accessories	
5AC902.FI00-00	PPC900 filter kit for system unit	

Table 109: 5AC902.FA00-00 - Order data

3.8.1.3 Technical data

Product ID	5AC902.FA00-00
General information	
Number of fans	2
Speed	Max. 9500 ±10% rpm
Noise level	40.2 dB(A) [1]
Service life	70,000 hours at 40°C
Certification	
CE	Yes
cULus	Yes
cULus HazLoc Class 1 Division 2	Yes [2]
GOST-R	Yes
Mechanical characteristics	
Weight	Approx. 70 g

Table 110: 5AC902.FA00-00 - Technical data

1) At maximum fan speed.
2) Yes, although applies only if all components installed within the complete system have this certification and the complete system itself carries the corresponding mark.

3.8.2 5AC902.FA0X-00

3.8.2.1 General information

This fan kit includes a fan that is installed to improve the heat dissipation of a PPC900 bus unit.

- 1 fan for improved heat dissipation on the bus unit
- Simple installation and removal

The fan kit is not included in the delivery of the bus unit and must be ordered separately. If an active system unit (5PC911.SX00-00) is being used, then a fan kit must be configured in the bus unit.

3.8.2.2 Order data

Model number	Short description	Figure
	Fan kit	Image not found for 5AC902.FA0X-00!
5AC902.FA0X-00	PPC900 fan kit - For PPC900 bus unit	
	Optional accessories	
	Accessories	
5AC902.FI0X-00	PPC900 filter kit for bus unit	

Table 111: 5AC902.FA0X-00 - Order data

3.8.2.3 Technical data

Product ID	5AC902.FA0X-00
General information	
Number of fans	1
Speed	Max. 9500 ±10% rpm
Noise level	40.2 dB(A) 1)
Service life	70,000 hours at 40°C
Certification	
CE	Yes
cULus	Yes
cULus HazLoc Class 1 Division 2	Yes 2)
GOST-R	Yes
Mechanical characteristics	
Weight	Approx. 36 g

Table 112: 5AC902.FA0X-00 - Technical data

1) At maximum fan speed.
2) Yes, although applies only if all components installed within the complete system have this certification and the complete system itself carries the corresponding mark.

3.9 Drives

3.9.1 5AC901.CHDD-01

3.9.1.1 General information

This 500 GB slide-in compact hard disk is specified for 24-hour operation and can be used in APC910 and PPC900 system units.

- 500 GB hard disk
- Slide-in compact
- Specified for 24-hour operation
- S.M.A.R.T. support

3.9.1.2 Order data

Model number	Short description	Figure
	Drives	
5AC901.CHDD-01	500 GB hard disk - Slide-in compact - SATA	
	Optional accessories	
	Drives	
5MMHDD.0500-00	500 GB hard disk - SATA	

Table 113: 5AC901.CHDD-01 - Order data

3.9.1.3 Technical data

Information:

The following characteristics, features and limit values only apply to this accessory and can deviate from those specified for the complete system. The data specifications for the complete system take precedence over those of individual components.

Product ID	5AC901.CHDD-01
General information	
Certification	
CE	Yes
cULus	Yes
cULus HazLoc Class 1 Division 2	Yes [1]
GOST-R	Yes
Hard disk drive	
Capacity	500 GB
Number of heads	2
Number of sectors	976,773,168
Bytes per sector	512 (logical) / 4096 (physical)
Cache	16 MB
Speed	5400 rpm ±0.2%
Startup time	Typ. 3.5 s (from 0 rpm to read access)
Service life	5 years
MTBF	1,000,000 POH [2]
S.M.A.R.T. support	Yes
Interface	SATA
Access time	5.5 ms
Supported transfer modes	SATA II
Data transfer rate	
Internal	Max. 147 MB/s
To/From host	Max. 150 Mbit/s (SATA I), max. 300 Mbit/s (SATA II)
Positioning time	
Nominal (read only)	11 ms
Maximum (read only)	21 ms
Environmental conditions	
Temperature [3]	
Operation [4]	0 to 60°C
24-hour operation [5]	0 to 60°C
Storage	-40 to 70°C
Transport	-40 to 70°C
Relative humidity [6]	
Operation	5 to 95%, non-condensing
Storage	5 to 95%, non-condensing
Transport	5 to 95%, non-condensing

Table 114: 5AC901.CHDD-01 - Technical data

Product ID	5AC901.CHDD-01
Vibration	
Operation (continuous)	5 to 500 Hz: 0.25 g, no unrecoverable errors
Operation (occasional)	5 to 500 Hz: 0.5 g, no unrecoverable errors
Storage	10 to 500 Hz: 5 g, no unrecoverable errors
Transport	10 to 500 Hz: 5 g, no unrecoverable errors
Shock	
Operation	400 g and 2 ms duration, no unrecoverable errors
Storage	1000 g and 2 ms duration, no unrecoverable errors
Transport	1000 g and 2 ms duration, no unrecoverable errors
Elevation	
Operation	-305 to 3048 m
Storage	-305 to 12192 m
Mechanical characteristics	
Installation	Fixed [7)]
Dimensions	
Width	10 mm
Height	75 mm
Depth	105 mm
Weight	134 g
Manufacturer information	
Manufacturer	Western Digital
Manufacturer's product ID	WD5000LUCT

Table 114: 5AC901.CHDD-01 - Technical data

1) Yes, although applies only if all components installed within the complete system have this certification and the complete system itself carries the corresponding mark.
2) With 8760 POH (power-on hours) per year and 25°C surface temperature.
3) Temperature values at an elevation of 305 meters. The temperature specification must be reduced linearly by 1°C every 305 meters. The temperature is permitted to increase or decrease by a maximum of 20°C per hour.
4) Standard operation refers to 333 POH (power-on hours) per month.
5) 24-hour operation refers to 732 POH (power-on hours) per month.
6) Humidity gradient: Maximum 20% per hour.
7) Slide-in compact installation.

3.9.1.4 Temperature/Humidity diagram

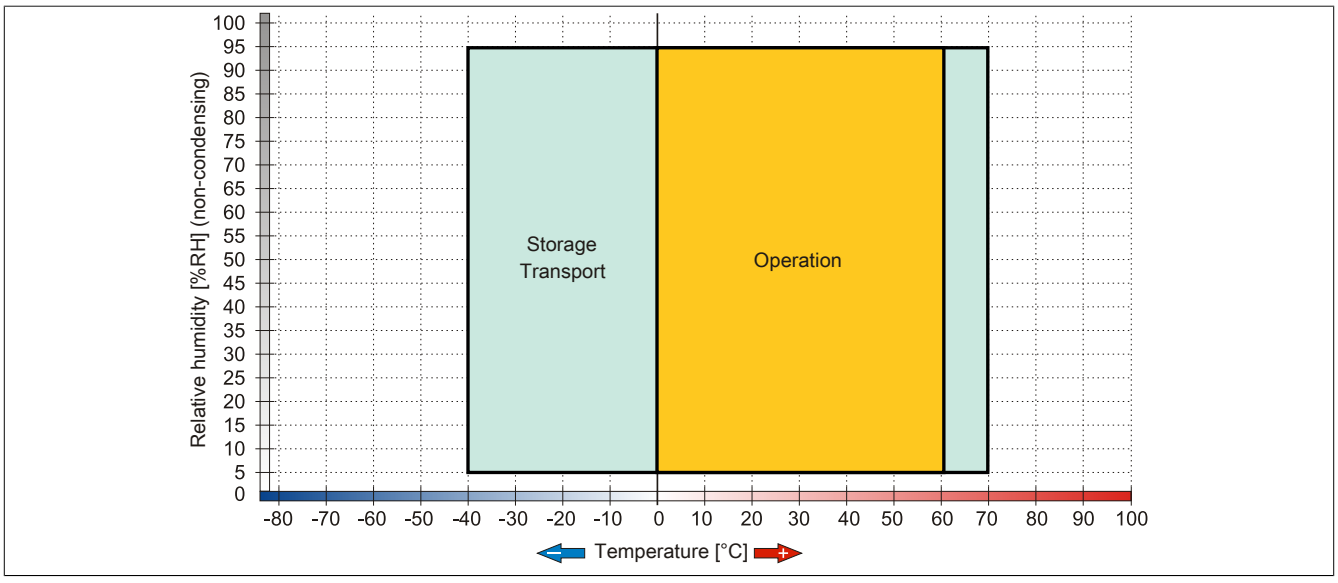


Figure 72: 5AC901.CHDD-01 - Temperature/Humidity diagram

3.9.2 5AC901.CSSD-03

3.9.2.1 General information

This 60 GB slide-in compact solid-state drive (SSD) is based on multi-level cell (MLC) technology and is SATA 3.0 compatible. The slide-in compact drive can be used in APC910 and PPC900 system units.

- 60 GB solid-state drive
- MLC flash
- S.M.A.R.T. support
- Slide-in compact
- Compatible with SATA 3.0

3.9.2.2 Order data

Model number	Short description	Figure
	Drives	
5AC901.CSSD-03	60 GB SSD MLC - Slide-in compact - SATA	
	Optional accessories	
	Drives	
5MMSSD.0060-01	60 GB SSD MLC - Intel - SATA	

Table 115: 5AC901.CSSD-03 - Order data

3.9.2.3 Technical data

Caution!

A sudden power failure may result in data loss! In very rare cases, the mass storage device may also become damaged.

To prevent damage and loss of data, the use of a UPS is recommended.

Information:

The following characteristics, features and limit values only apply to this accessory and can deviate from those specified for the complete system. The data specifications for the complete system take precedence over those of individual components.

Product ID	5AC901.CSSD-03	
Revision	C0	D0
General information		
Certification		
CE	Yes	
cULus	Yes	
cULus HazLoc Class 1 Division 2	Yes [1]	
GOST-R	Yes	
GL	Yes [2]	
Solid-state drive		
Capacity	60 GB	
Data reliability	<1 unrecoverable error in 10^{15} bit read accesses	
MTBF	1,500,000 hours	
S.M.A.R.T. support	Yes	
Interface	SATA	
Maintenance	None	
Sequential read	Max. 510 MB/s	
Sequential write	Max. 430 MB/s	
IOPS [3]		
4k read	Max. 50,000 (random)	
4k write	Max. 25,000 (random)	
Endurance		
MLC flash	Yes	
Guaranteed data volume		
Guaranteed	35 TBW [4]	
Compatibility	SATA 3.0 compliant ACS-2 SSD Enhanced SMART ATA feature set Native Command Queuing (NCQ)	

Table 116: 5AC901.CSSD-03, 5AC901.CSSD-03 - Technical data

Product ID	5AC901.CSSD-03	
Revision	**C0**	**D0**
Environmental conditions		
Temperature		
Operation	0 to 70°C	-30 to 85°C
Storage	-40 to 85°C	
Transport	-40 to 85°C	
Relative humidity		
Operation	8 to 90%, non-condensing	5 to 90%, non-condensing
Storage	8 to 95%, non-condensing	5 to 95%, non-condensing
Transport	8 to 95%, non-condensing	5 to 95%, non-condensing
Vibration		
Operation	10 to 2000 Hz: 20 g	
Storage	10 to 2000 Hz: 20 g	
Transport	10 to 2000 Hz: 20 g	
Shock		
Operation	1500 g, 0.5 ms	
Storage	1500 g, 0.5 ms	
Transport	1500 g, 0.5 ms	
Elevation		
Operation	-300 to 12192 m	
Storage	-300 to 12192 m	
Transport	-300 to 12192 m	
Mechanical characteristics		
Installation	Fixed [5]	
Dimensions		
Width	13 mm	
Height	98 mm	
Depth	105 mm	
Weight	118 g	
Manufacturer information		
Manufacturer	Toshiba	
Manufacturer's product ID	THNSNH060GBST	THNSNJ060WCST

Table 116: 5AC901.CSSD-03, 5AC901.CSSD-03 - Technical data

1) Yes, although applies only if all components installed within the complete system have this certification and the complete system itself carries the corresponding mark.
2) Yes, although applies only if all components installed within the complete system have this certification.
3) IOPS: Random read and write input/output operations per second.
4) TBW: Terabytes written.
5) Slide-in compact installation.

3.9.2.4 Temperature/Humidity diagram

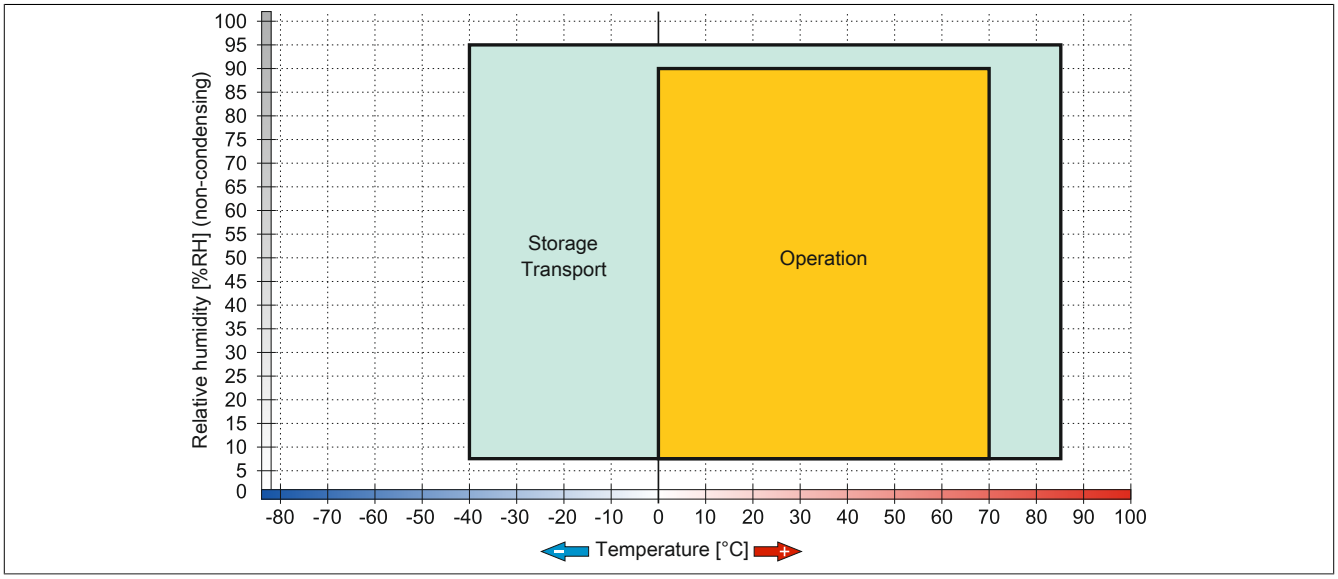


Figure 73: 5AC901.CSSD-03 ≤ Rev. C0 - Temperature/Humidity diagram

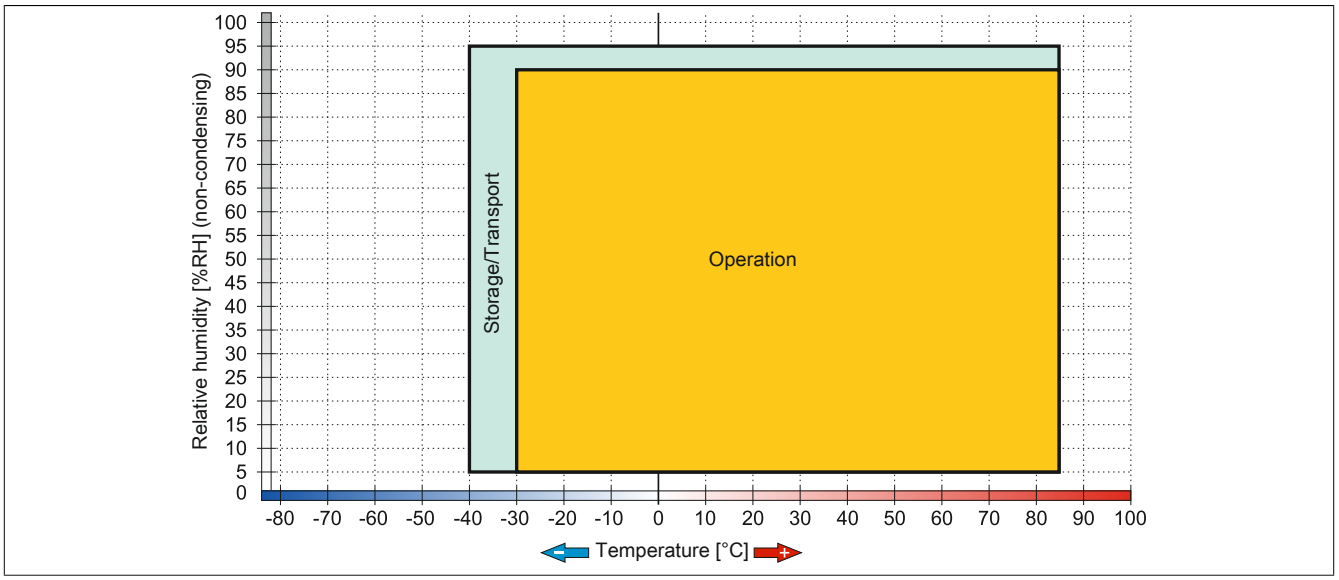


Figure 74: 5AC901.CSSD-03 ≥ Rev. D0 - Temperature/Humidity diagram

3.9.3 5AC901.CSSD-04

3.9.3.1 General information

This 128 GB slide-in compact solid-state drive (SSD) is based on multi-level cell (MLC) technology and is SATA 3.0 compatible. The slide-in compact drive can be used in APC910 and PPC900 system units.

- 128 GB solid-state drive
- MLC flash
- S.M.A.R.T. support
- Slide-in compact
- Compatible with SATA 3.0

3.9.3.2 Order data

Model number	Short description	Figure
	Drives	
5AC901.CSSD-04	128 GB SSD MLC - Slide-in compact - SATA	
	Optional accessories	
	Drives	
5MMSSD.0128-01	128 GB SSD MLC - Toshiba - SATA	

Table 117: 5AC901.CSSD-04 - Order data

3.9.3.3 Technical data

Caution!

A sudden power failure may result in data loss! In very rare cases, the mass storage device may also become damaged.

To prevent damage and loss of data, the use of a UPS is recommended.

Information:

The following characteristics, features and limit values only apply to this accessory and can deviate from those specified for the complete system. The data specifications for the complete system take precedence over those of individual components.

Product ID	5AC901.CSSD-04		
Revision	**C0**	**D0**	**E0**
General information			
Certification			
CE		Yes	
cULus		Yes	
cULus HazLoc Class 1 Division 2		Yes [1]	
GOST-R		Yes	
GL		Yes [2]	
Solid-state drive			
Capacity		128 GB	
Data reliability		<1 unrecoverable error in 10^{15} bit read accesses	
MTBF		1,500,000 hours	
S.M.A.R.T. support		Yes	
Interface		SATA	
Maintenance		None	
Sequential read		Max. 510 MB/s	
Sequential write		Max. 450 MB/s	
IOPS [3]			
4k read	Max. 80,000 (random)	Max. 85,000 (random)	
4k write		Max. 35,000 (random)	
Endurance			
MLC flash		Yes	
Guaranteed data volume			
Guaranteed		74 TBW [4]	

Table 118: 5AC901.CSSD-04, 5AC901.CSSD-04, 5AC901.CSSD-04 - Technical data

Product ID	5AC901.CSSD-04		
Revision	**C0**	**D0**	**E0**
Compatibility	SATA 3.0 compliant ACS-2 SSD Enhanced SMART ATA feature set Native Command Queuing (NCQ)		
Environmental conditions			
Temperature			
Operation	0 to 70°C	-30 to 85°C	
Storage		-40 to 85°C	
Transport		-40 to 85°C	
Relative humidity			
Operation	8 to 90%, non-condensing	5 to 90%, non-condensing	
Storage	8 to 95%, non-condensing	5 to 95%, non-condensing	
Transport	8 to 95%, non-condensing	5 to 95%, non-condensing	
Vibration			
Operation	10 to 2000 Hz: 20 g		
Storage	10 to 2000 Hz: 20 g		
Transport	10 to 2000 Hz: 20 g		
Shock			
Operation	1500 g, 0.5 ms		
Storage	1500 g, 0.5 ms		
Transport	1500 g, 0.5 ms		
Elevation			
Operation	-300 to 12192 m		
Storage	-300 to 12192 m		
Transport	-300 to 12192 m		
Mechanical characteristics			
Installation	Fixed [5]		
Dimensions			
Width	13 mm		
Height	98 mm		
Depth	105 mm		
Weight	118 g		
Manufacturer information			
Manufacturer	Toshiba		
Manufacturer's product ID	THNSNH128GBST	THNSNJ128WBST	THNSNJ128WCST

Table 118: 5AC901.CSSD-04, 5AC901.CSSD-04, 5AC901.CSSD-04 - Technical data

1) Yes, although applies only if all components installed within the complete system have this certification and the complete system itself carries the corresponding mark.
2) Yes, although applies only if all components installed within the complete system have this certification.
3) IOPS: Random read and write input/output operations per second.
4) TBW: Terabytes written.
5) Slide-in compact installation.

3.9.3.4 Temperature/Humidity diagram

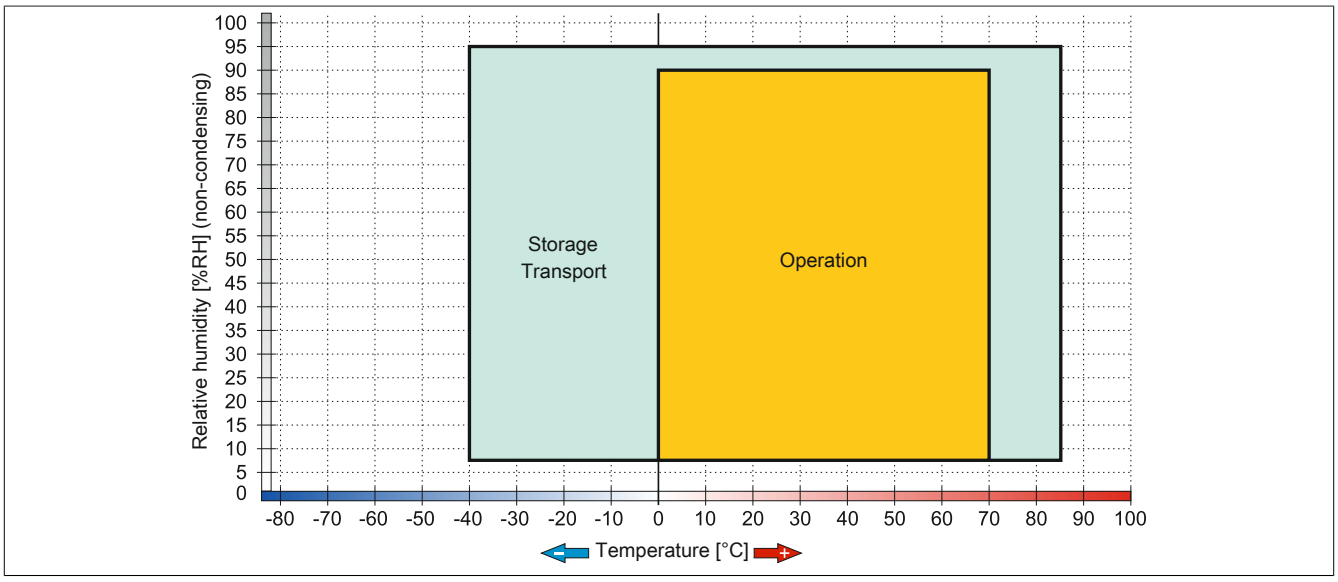


Figure 75: 5AC901.CSSD-04 ≤ Rev. C0 - Temperature/Humidity diagram

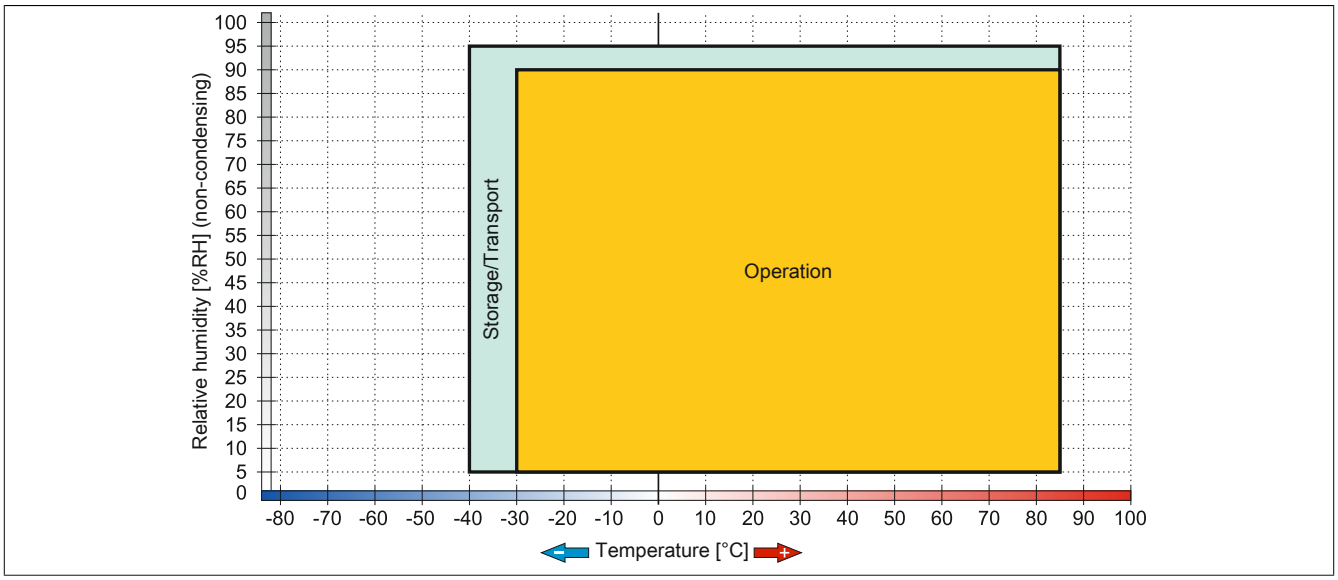


Figure 76: 5AC901.CSSD-04 ≥ Rev. D0 - Temperature/Humidity diagram

3.9.4 5AC901.CSSD-05

3.9.4.1 General information

This 256 GB slide-in compact solid-state drive (SSD) is based on multi-level cell (MLC) technology and is SATA 3.0 compatible. The slide-in compact drive can be used in APC910 and PPC900 system units.

- 256 GB solid state drive
- MLC flash
- S.M.A.R.T. support
- Slide-in compact
- Compatible with SATA 3.0

3.9.4.2 Order data

Model number	Short description	Figure
	Drives	
5AC901.CSSD-05	256 GB SSD MLC - Slide-in compact - Toshiba - SATA	
	Optional accessories	
	Drives	
5MMSSD.0256-00	256 GB SSD MLC - Toshiba - SATA	

Table 119: 5AC901.CSSD-05 - Order data

3.9.4.3 Technical data

Caution!

A sudden power failure may result in data loss! In very rare cases, the mass storage device may also become damaged.

To prevent damage and loss of data, the use of a UPS is recommended.

Information:

The following characteristics, features and limit values only apply to this accessory and can deviate from those specified for the complete system. The data specifications for the complete system take precedence over those of individual components.

Product ID	5AC901.CSSD-05
General information	
Certification	
CE	Yes
cULus	Yes
cULus HazLoc Class 1 Division 2	Yes [1]
GOST-R	Yes
GL	Yes [2]
Solid-state drive	
Capacity	256 GB
Data reliability	<1 unrecoverable error in 10^{15} bit read accesses
MTBF	1,500,000 hours
S.M.A.R.T. support	Yes
Interface	SATA
Maintenance	None
Sequential read	Max. 510 MB/s
Sequential write	Max. 460 MB/s
IOPS [3]	
4k read	Max. 90,000 (random)
4k write	Max. 35,000 (random)
Endurance	
MLC flash	Yes
Guaranteed data volume	
Guaranteed	148 TBW [4]
Compatibility	SATA 3.0 compliant ACS-2 SSD Enhanced SMART ATA feature set Native Command Queuing (NCQ)

Table 120: 5AC901.CSSD-05 - Technical data

Product ID	5AC901.CSSD-05
Environmental conditions	
Temperature	
Operation	-30 to 85°C
Storage	-40 to 85°C
Transport	-40 to 85°C
Relative humidity	
Operation	5 to 90%, non-condensing
Storage	5 to 95%, non-condensing
Transport	5 to 95%, non-condensing
Vibration	
Operation	10 to 2000 Hz: 20 g
Storage	10 to 2000 Hz: 20 g
Transport	10 to 2000 Hz: 20 g
Shock	
Operation	1500 g, 0.5 ms
Storage	1500 g, 0.5 ms
Transport	1500 g, 0.5 ms
Elevation	
Operation	-300 to 12192 m
Storage	-300 to 12192 m
Transport	-300 to 12192 m
Mechanical characteristics	
Installation	Fixed [5]
Dimensions	
Width	13 mm
Height	98 mm
Depth	105 mm
Weight	118 g
Manufacturer information	
Manufacturer	Toshiba
Manufacturer's product ID	THNSNJ256WCST

Table 120: 5AC901.CSSD-05 - Technical data

1) Yes, although applies only if all components installed within the complete system have this certification and the complete system itself carries the corresponding mark.
2) Yes, although applies only if all components installed within the complete system have this certification.
3) IOPS: Random read and write input/output operations per second.
4) TBW: Terabytes written.
5) Slide-in compact installation.

3.9.4.4 Temperature/Humidity diagram

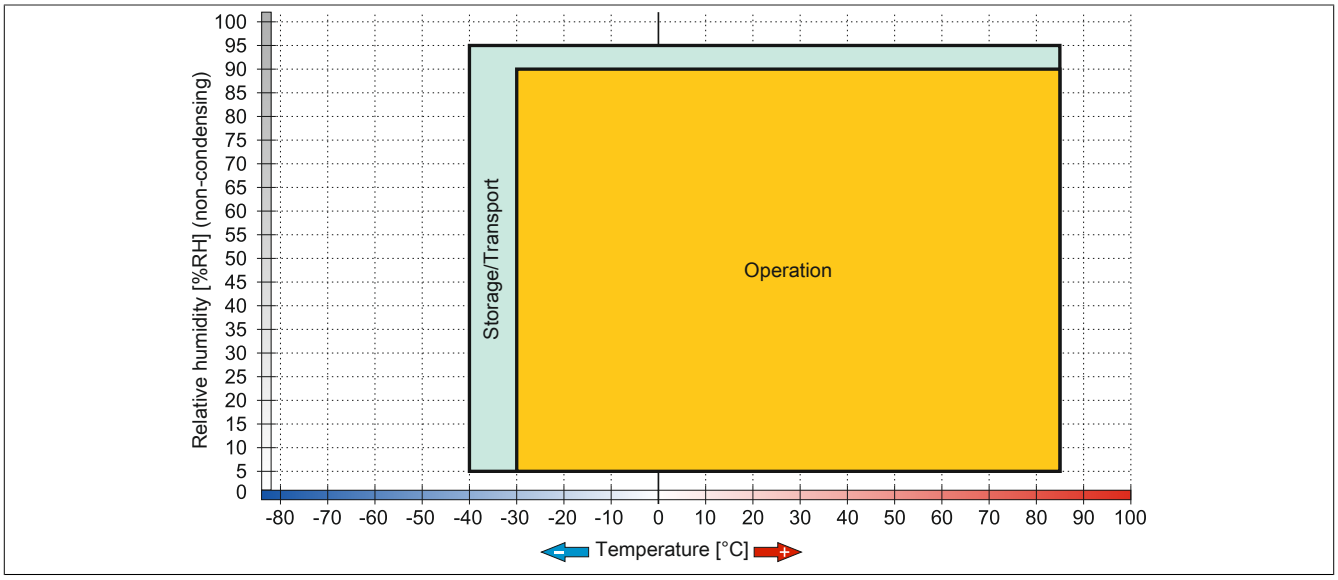


Figure 77: 5AC901.CSSD-05 - Temperature/Humidity diagram

3.9.5 5AC901.CSSD-06

3.9.5.1 General information

This 512 GB slide-in compact solid-state drive (SSD) is based on multi-level cell (MLC) technology and is SATA 3.0 compatible. The slide-in compact drive can be used in APC910 and PPC900 system units.

- 512 GB solid-state drive
- MLC flash
- S.M.A.R.T. support
- Slide-in compact
- Compatible with SATA 3.0

3.9.5.2 Order data

Model number	Short description	Figure
	Drives	
5AC901.CSSD-06	512 GB SSD MLC - Slide-in compact - Toshiba - SATA	
	Optional accessories	
	Drives	
5MMSSD.0512-00	512 GB SSD MLC - Toshiba - SATA	

Table 121: 5AC901.CSSD-06 - Order data

3.9.5.3 Technical data

Caution!

A sudden power failure may result in data loss! In very rare cases, the mass storage device may also become damaged.

To prevent damage and loss of data, the use of a UPS is recommended.

Information:

The following characteristics, features and limit values only apply to this accessory and can deviate from those specified for the complete system. The data specifications for the complete system take precedence over those of individual components.

Product ID	5AC901.CSSD-06
General information	
Certification	
CE	Yes
cULus	Yes
cULus HazLoc Class 1 Division 2	Yes [1]
GOST-R	Yes
GL	Yes [2]
Solid-state drive	
Capacity	512 GB
Data reliability	<1 unrecoverable error in 10^{15} bit read accesses
MTBF	1,500,000 hours
S.M.A.R.T. support	Yes
Interface	SATA
Maintenance	None
Sequential read	Max. 510 MB/s
Sequential write	Max. 460 MB/s
IOPS [3]	
4k read	Max. 90,000 (random)
4k write	Max. 35,000 (random)
Endurance	
MLC flash	Yes
Guaranteed data volume	
Guaranteed	400 TBW [4]
Compatibility	SATA 3.1 compliant ACS-2 SSD Enhanced SMART ATA feature set Native Command Queuing (NCQ)

Table 122: 5AC901.CSSD-06 - Technical data

Product ID	5AC901.CSSD-06
Environmental conditions	
Temperature	
Operation	-40 to 85°C
Storage	-40 to 85°C
Transport	-40 to 85°C
Relative humidity	
Operation	5 to 90%, non-condensing
Storage	5 to 95%, non-condensing
Transport	5 to 95%, non-condensing
Vibration	
Operation	10 to 2000 Hz: 20 g
Storage	10 to 2000 Hz: 20 g
Transport	10 to 2000 Hz: 20 g
Shock	
Operation	1500 g, 0.5 ms
Storage	1500 g, 0.5 ms
Transport	1500 g, 0.5 ms
Elevation	
Operation	-300 to 12192 m
Storage	-300 to 12192 m
Transport	-300 to 12192 m
Mechanical characteristics	
Installation	Fixed [5]
Dimensions	
Width	13 mm
Height	98 mm
Depth	105 mm
Weight	118 g
Manufacturer information	
Manufacturer	Toshiba
Manufacturer's product ID	THNSNJ512WCSU

Table 122: 5AC901.CSSD-06 - Technical data

1) Yes, although applies only if all components installed within the complete system have this certification and the complete system itself carries the corresponding mark.
2) Yes, although applies only if all components installed within the complete system have this certification.
3) IOPS: Random read and write input/output operations per second.
4) TBW: Terabytes written.
5) Slide-in compact installation.

3.9.5.4 Temperature/Humidity diagram

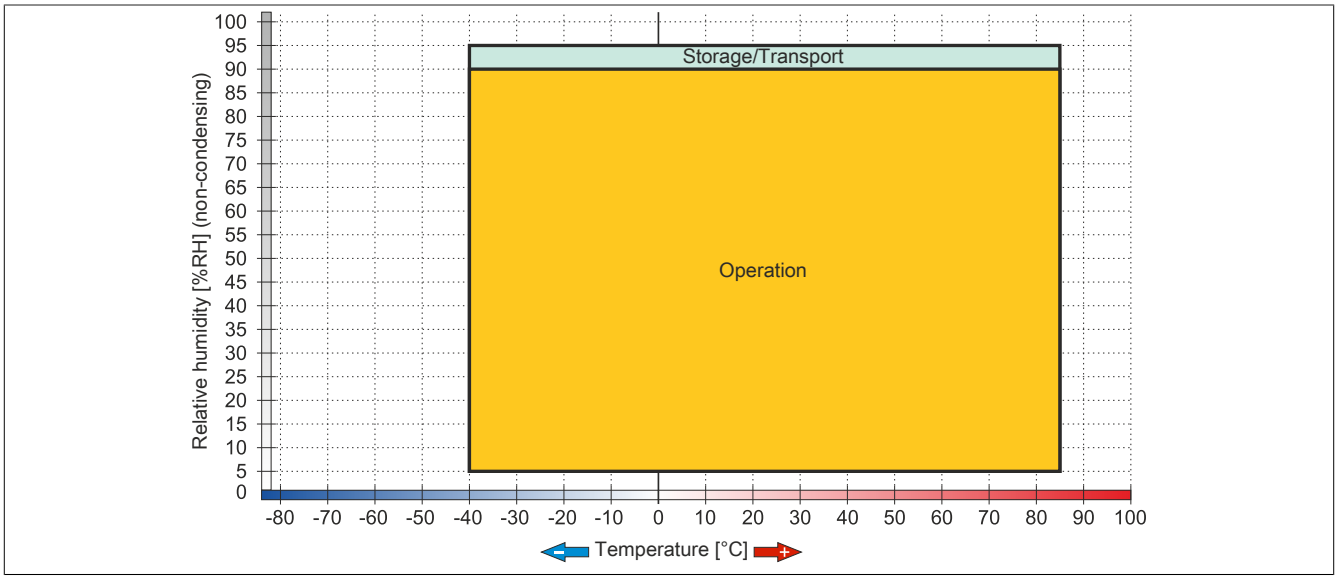


Figure 78: 5AC901.CSSD-06 - Temperature/Humidity diagram

3.9.6 5MMSSD.0060-01

3.9.6.1 General information

This 60 GB slide-in compact solid-state drive (SSD) is based on multi-level cell (MLC) technology and can be used as a replacement or accessory part.

- Replacement for 5AC801.SSDI-03 or 5AC901.CSSD-03 SSD drives
- Accessory for the APC510 (optional SSD for I/O board)

3.9.6.2 Order data

Model number	Short description	Figure
	Drives	
5MMSSD.0060-01	60 GB SSD MLC - Intel - SATA	

Table 123: 5MMSSD.0060-01 - Order data

3.9.6.3 Technical data

Caution!

A sudden power failure may result in data loss! In very rare cases, the mass storage device may also become damaged.

To prevent damage and loss of data, the use of a UPS is recommended.

Information:

The following characteristics, features and limit values only apply to this accessory and can deviate from those specified for the complete system. The data specifications for the complete system take precedence over those of individual components.

Product ID	5MMSSD.0060-01	
Revision	**C0**	**D0**
General information		
Certification		
CE	Yes	
cULus	Yes	
cULus HazLoc Class 1 Division 2	Yes [1)]	
GOST-R	Yes	
Solid-state drive		
Capacity	60 GB	
Data reliability	<1 unrecoverable error in 10^{15} bit read accesses	
MTBF	1,500,000 hours	
S.M.A.R.T. support	Yes	
Interface	SATA	
Maintenance	None	
Sequential read	Max. 510 MB/s	
Sequential write	Max. 430 MB/s	
IOPS [2)]		
4k read	Max. 50,000 (random)	
4k write	Max. 25,000 (random)	
Endurance		
MLC flash	Yes	
Guaranteed data volume		
Guaranteed	35 TBW [3)]	
Compatibility	SATA 3.0 compliant ACS-2 SSD Enhanced SMART ATA feature set Native Command Queuing (NCQ)	
Environmental conditions		
Temperature		
Operation	0 to 70°C	-30 to 85°C
Storage	-40 to 85°C	
Transport	-40 to 85°C	

Table 124: 5MMSSD.0060-01, 5MMSSD.0060-01 - Technical data

Product ID	5MMSSD.0060-01	
Revision	**C0**	**D0**
Relative humidity		
Operation	8 to 90%, non-condensing	5 to 90%, non-condensing
Storage	8 to 95%, non-condensing	5 to 95%, non-condensing
Transport	8 to 95%, non-condensing	5 to 95%, non-condensing
Vibration		
Operation	10 to 2000 Hz: 20 g	
Storage	10 to 2000 Hz: 20 g	
Transport	10 to 2000 Hz: 20 g	
Shock		
Operation	1500 g, 0.5 ms	
Storage	1500 g, 0.5 ms	
Transport	1500 g, 0.5 ms	
Elevation		
Operation	-300 to 12192 m	
Storage	-300 to 12192 m	
Transport	-300 to 12192 m	
Mechanical characteristics		
Dimensions		
Width	9.5 mm	7 mm
Height	69 mm	
Depth	100 mm	
Weight	78 g	
Manufacturer information		
Manufacturer	Toshiba	
Manufacturer's product ID	THNSNH060GBST	THNSNJ060WCST

Table 124: 5MMSSD.0060-01, 5MMSSD.0060-01 - Technical data

1) Yes, although applies only if all components installed within the complete system have this certification and the complete system itself carries the corresponding mark.
2) IOPS: Random read and write input/output operations per second.
3) TBW: Terabytes written.

3.9.6.4 Temperature/Humidity diagram

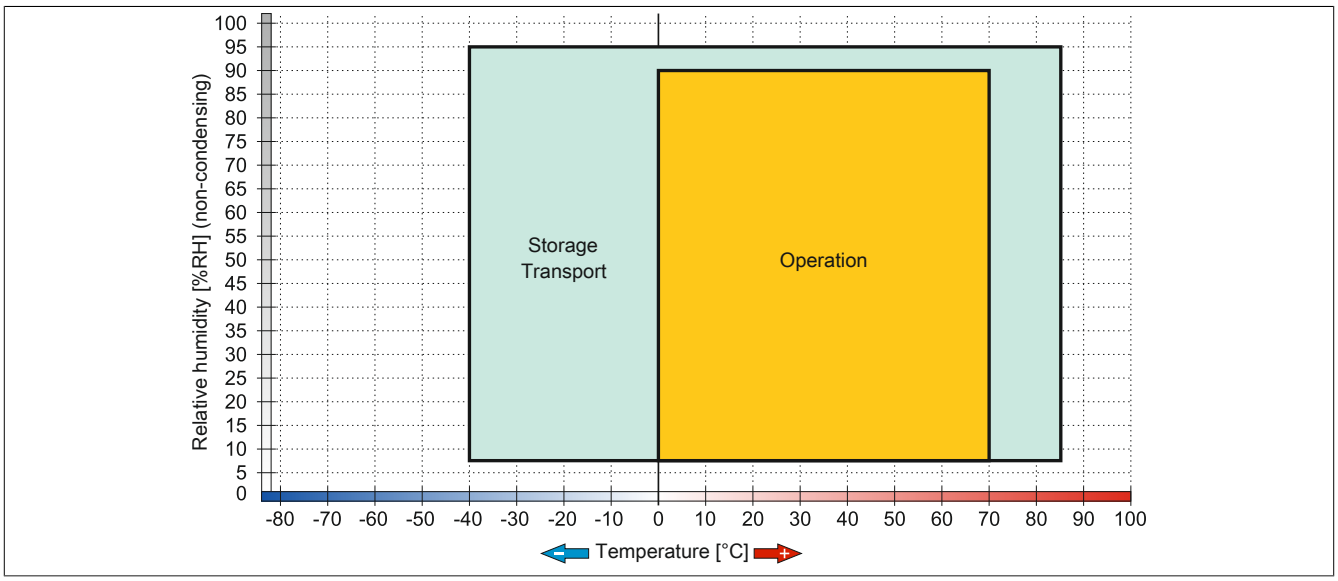


Figure 79: 5MMSSD.0060-01 ≤ Rev. C0 - Temperature/Humidity diagram

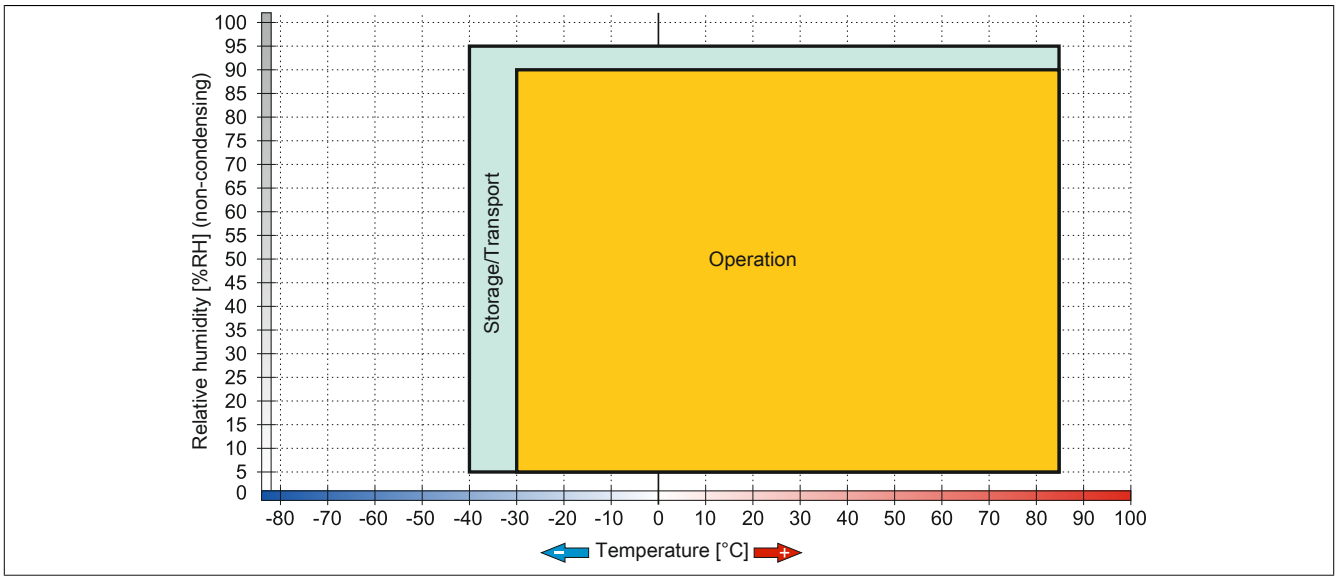


Figure 80: 5MMSSD.0060-01 ≥ Rev. D0 - Temperature/Humidity diagram

3.9.7 5MMSSD.0128-01

3.9.7.1 General information

This 128 GB slide-in compact solid-state drive (SSD) is based on multi-level cell (MLC) technology and can be used as a replacement or accessory part.

- Replacement for 5AC801.SSDI-04 or 5AC901.CSSD-04 SSD drives
- Accessory for the APC510 (optional SSD for I/O board)

3.9.7.2 Order data

Model number	Short description	Figure
	Drives	
5MMSSD.0128-01	128 GB SSD MLC - Toshiba - SATA	

Table 125: 5MMSSD.0128-01 - Order data

3.9.7.3 Technical data

Caution!

A sudden power failure may result in data loss! In very rare cases, the mass storage device may also become damaged.

To prevent damage and loss of data, the use of a UPS is recommended.

Information:

The following characteristics, features and limit values only apply to this accessory and can deviate from those specified for the complete system. The data specifications for the complete system take precedence over those of individual components.

Product ID	5MMSSD.0128-01	
Revision	C0	D0
General information		
Certification		
CE	Yes	
cULus	Yes	
cULus HazLoc Class 1 Division 2	Yes [1]	
GOST-R	Yes	
Solid-state drive		
Capacity	128 GB	
Data reliability	<1 unrecoverable error in 10^{15} bit read accesses	
MTBF	1,500,000 hours	
S.M.A.R.T. support	Yes	
Interface	SATA	
Maintenance	None	
Sequential read	Max. 510 MB/s	
Sequential write	Max. 450 MB/s	
IOPS [2]		
4k read	Max. 85,000 (random)	
4k write	Max. 35,000 (random)	
Endurance		
MLC flash	Yes	
Guaranteed data volume		
Guaranteed	74 TBW [3]	
Compatibility	SATA 3.0 compliant ACS-2 SSD Enhanced SMART ATA feature set Native Command Queuing (NCQ)	

Table 126: 5MMSSD.0128-01, 5MMSSD.0128-01 - Technical data

Product ID	5MMSSD.0128-01	
Revision	**C0**	**D0**
Environmental conditions		
Temperature		
Operation	0 to 70°C	-30 to 85°C
Storage	-40 to 85°C	
Transport	-40 to 85°C	
Relative humidity		
Operation	8 to 90%, non-condensing	5 to 90%, non-condensing
Storage	8 to 95%, non-condensing	5 to 95%, non-condensing
Transport	8 to 95%, non-condensing	5 to 95%, non-condensing
Vibration		
Operation	10 to 2000 Hz: 20 g	
Storage	10 to 2000 Hz: 20 g	
Transport	10 to 2000 Hz: 20 g	
Shock		
Operation	1500 g, 0.5 ms	
Storage	1500 g, 0.5 ms	
Transport	1500 g, 0.5 ms	
Elevation		
Operation	-300 to 12192 m	
Storage	-300 to 12192 m	
Transport	-300 to 12192 m	
Mechanical characteristics		
Dimensions		
Width	9.5 mm	7 mm
Height	69 mm	
Depth	100 mm	
Weight	78 g	
Manufacturer information		
Manufacturer	Toshiba	
Manufacturer's product ID	THNSNH128GBST	THNSNJ128WCST

Table 126: 5MMSSD.0128-01, 5MMSSD.0128-01 - Technical data

1) Yes, although applies only if all components installed within the complete system have this certification and the complete system itself carries the corresponding mark.
2) IOPS: Random read and write input/output operations per second.
3) TBW: Terabytes written.

3.9.7.4 Temperature/Humidity diagram

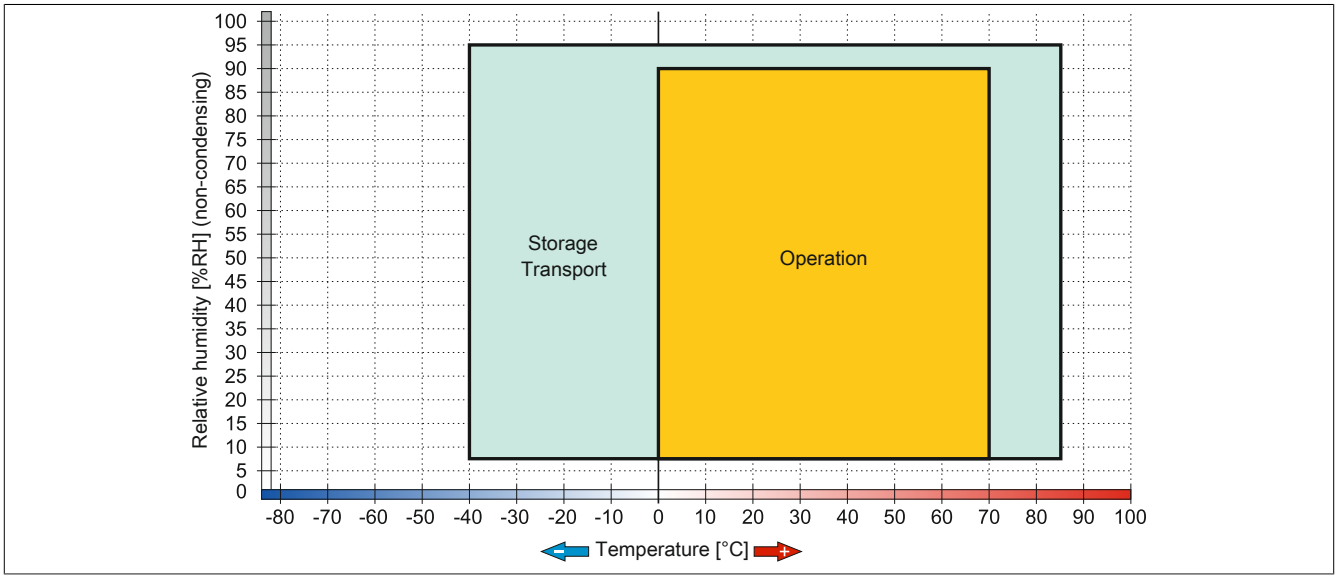


Figure 81: 5MMSSD.0128-01 ≤ Rev. C0 - Temperature/Humidity diagram

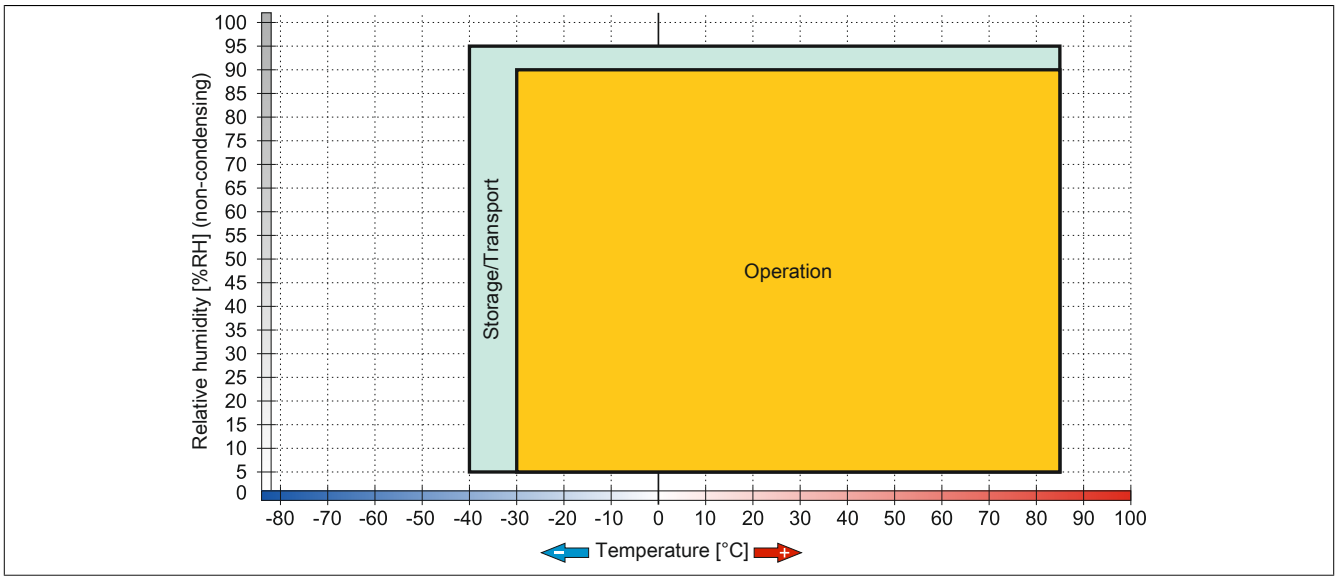


Figure 82: 5MMSSD.0128-01 ≥ Rev. D0 - Temperature/Humidity diagram

3.9.8 5MMSSD.0256-00

3.9.8.1 General information

This 256 GB slide-in compact solid-state drive (SSD) is based on multi-level cell (MLC) technology and can be used as a replacement or accessory part.

- Replacement for 5AC801.SSDI-05 or 5AC901.CSSD-05 SSD drives
- Accessory for the APC510 (optional SSD for I/O board)

3.9.8.2 Order data

Model number	Short description	Figure
	Drives	
5MMSSD.0256-00	256 GB SSD MLC - Toshiba - SATA	

Table 127: 5MMSSD.0256-00 - Order data

3.9.8.3 Technical data

Caution!

A sudden power failure may result in data loss! In very rare cases, the mass storage device may also become damaged.

To prevent damage and loss of data, the use of a UPS is recommended.

Information:

The following characteristics, features and limit values only apply to this accessory and can deviate from those specified for the complete system. The data specifications for the complete system take precedence over those of individual components.

Product ID	5MMSSD.0256-00
General information	
Certification	
CE	Yes
cULus	Yes
cULus HazLoc Class 1 Division 2	Yes [1]
Solid-state drive	
Capacity	256 GB
Data reliability	<1 unrecoverable error in 10^{15} bit read accesses
MTBF	1,500,000 hours
S.M.A.R.T. support	Yes
Interface	SATA
Maintenance	None
Sequential read	Max. 510 MB/s
Sequential write	Max. 460 MB/s
IOPS [2]	
4k read	Max. 90,000 (random)
4k write	Max. 35,000 (random)
Endurance	
MLC flash	Yes
Guaranteed data volume	
Guaranteed	148 TBW [3]
Compatibility	SATA 3.0 compliant ACS-2 SSD Enhanced SMART ATA feature set Native Command Queuing (NCQ)

Table 128: 5MMSSD.0256-00 - Technical data

Product ID	5MMSSD.0256-00
Environmental conditions	
Temperature	
Operation	-30 to 85°C
Storage	-40 to 85°C
Transport	-40 to 85°C
Relative humidity	
Operation	5 to 90%, non-condensing
Storage	5 to 95%, non-condensing
Transport	5 to 95%, non-condensing
Vibration	
Operation	10 to 2000 Hz: 20 g
Storage	10 to 2000 Hz: 20 g
Transport	10 to 2000 Hz: 20 g
Shock	
Operation	1500 g, 0.5 ms
Storage	1500 g, 0.5 ms
Transport	1500 g, 0.5 ms
Elevation	
Operation	-300 to 12192 m
Storage	-300 to 12192 m
Transport	-300 to 12192 m
Mechanical characteristics	
Dimensions	
Width	7 mm
Height	69 mm
Depth	100 mm
Weight	78 g
Manufacturer information	
Manufacturer	Toshiba
Manufacturer's product ID	THNSNJ256WCST

Table 128: 5MMSSD.0256-00 - Technical data

1) Yes, although applies only if all components installed within the complete system have this certification and the complete system itself carries the corresponding mark.
2) IOPS: Random read and write input/output operations per second.
3) TBW: Terabytes written.

3.9.8.4 Temperature/Humidity diagram

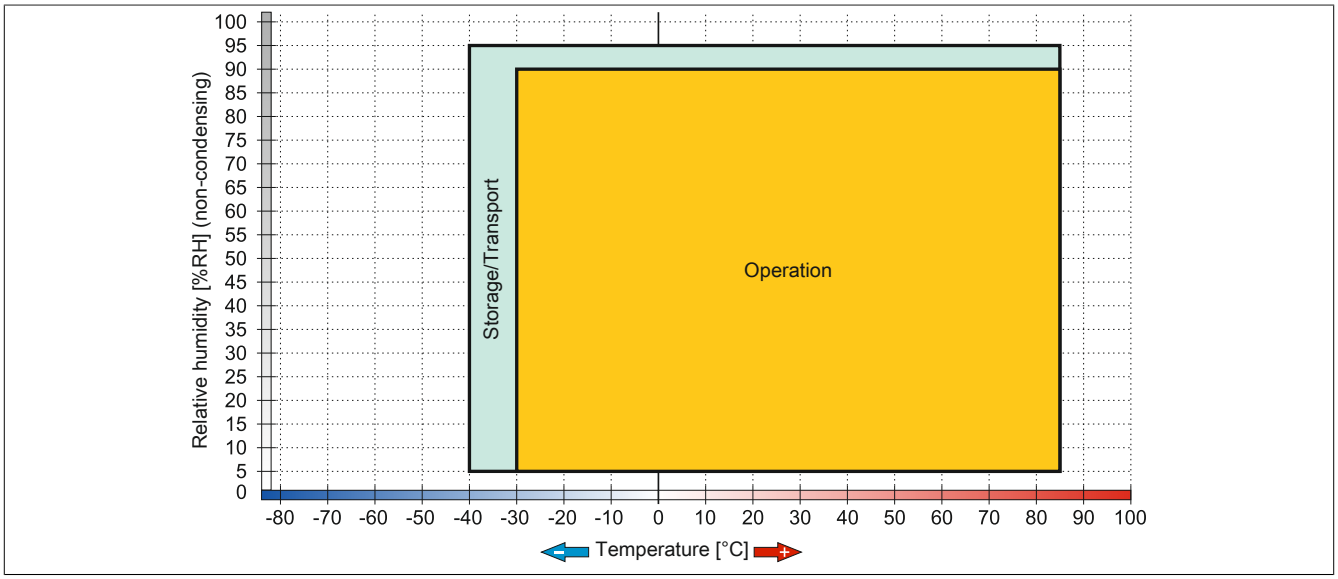


Figure 83: 5MMSSD.0256-00 - Temperature/Humidity diagram

3.9.9 5MMSSD.0512-00

3.9.9.1 General information

This 512 GB slide-in compact solid-state drive (SSD) is based on multi-level cell (MLC) technology and can be used as a replacement or accessory part.

- Replacement drive for 5AC901.CSSD-06 solid-state drive

3.9.9.2 Order data

Model number	Short description	Figure
	Drives	
5MMSSD.0512-00	512 GB SSD MLC - Toshiba - SATA	

Table 129: 5MMSSD.0512-00 - Order data

3.9.9.3 Technical data

Caution!

A sudden power failure may result in data loss! In very rare cases, the mass storage device may also become damaged.

To prevent damage and loss of data, the use of a UPS is recommended.

Information:

The following characteristics, features and limit values only apply to this accessory and can deviate from those specified for the complete system. The data specifications for the complete system take precedence over those of individual components.

Product ID	5MMSSD.0512-00
General information	
Certification	
CE	Yes
cULus	Yes
cULus HazLoc Class 1 Division 2	Yes [1]
GOST-R	Yes
Solid-state drive	
Capacity	512 GB
Data reliability	<1 unrecoverable error in 10^{15} bit read accesses
MTBF	1,500,000 hours
S.M.A.R.T. support	Yes
Interface	SATA
Maintenance	None
Sequential read	Max. 510 MB/s
Sequential write	Max. 460 MB/s
IOPS [2]	
4k read	Max. 90,000 (random)
4k write	Max. 35,000 (random)
Endurance	
MLC flash	Yes
Guaranteed data volume	
Guaranteed	400 TBW [3]
Compatibility	SATA 3.1 compliant ACS-2 SSD Enhanced SMART ATA feature set Native Command Queuing (NCQ)

Table 130: 5MMSSD.0512-00 - Technical data

Product ID	5MMSSD.0512-00
Environmental conditions	
Temperature	
Operation	-40 to 85°C
Storage	-40 to 85°C
Transport	-40 to 85°C
Relative humidity	
Operation	5 to 90%, non-condensing
Storage	5 to 95%, non-condensing
Transport	5 to 95%, non-condensing
Vibration	
Operation	10 to 2000 Hz: 20 g
Storage	10 to 2000 Hz: 20 g
Transport	10 to 2000 Hz: 20 g
Shock	
Operation	1500 g, 0.5 ms
Storage	1500 g, 0.5 ms
Transport	1500 g, 0.5 ms
Elevation	
Operation	-300 to 12192 m
Storage	-300 to 12192 m
Transport	-300 to 12192 m
Mechanical characteristics	
Dimensions	
Width	7 mm
Height	69 mm
Depth	100 mm
Weight	78 g
Manufacturer information	
Manufacturer	Toshiba
Manufacturer's product ID	THNSNJ512WCSU

Table 130: 5MMSSD.0512-00 - Technical data

1) Yes, although applies only if all components installed within the complete system have this certification and the complete system itself carries the corresponding mark.
2) IOPS: Random read and write input/output operations per second.
3) TBW: Terabytes written.

3.9.9.4 Temperature/Humidity diagram

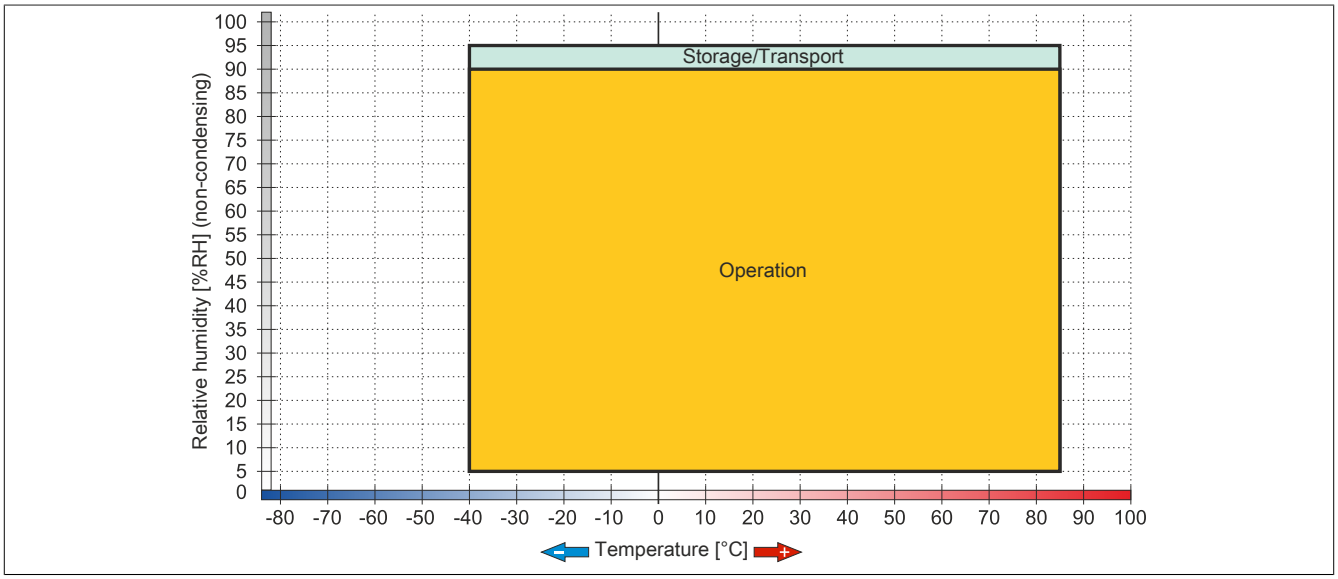


Figure 84: 5MMSSD.0512-00 - Temperature/Humidity diagram

3.9.10 5AC901.CHDD-99

3.9.10.1 General information

The slide-in compact kit can be used as a replacement part for slide-in compact drives (HDD/SSD). It consists of an extraction strip, plastic guide rails as well as the necessary screws.

Information:

If this slide-in compact kit is used with components (HDD/SDD) not approved by B&R, then B&R cannot make any guarantees regarding fit, form or function. In addition, B&R is not able to guarantee that the specifications, norms and certifications applicable to this device continue to apply.

3.9.10.2 Order data

Model number	Short description	Figure
	Drives	
5AC901.CHDD-99	Slide-in compact kit	

Table 131: 5AC901.CHDD-99 - Order data

3.9.11 5AC901.CCFA-00

3.9.11.1 General information

This CFast adapter is a slide-in compact adapter that allows a CFast card to be inserted and operated on a B&R Industrial PC. The CFast adapter can be used in APC910 and PPC900 system units.

- CFast slot
- Slide-in compact

3.9.11.2 Order data

Model number	Short description	Figure
	Drives	
5AC901.CCFA-00	CFast adapter - For slide-in compact slot	
	Optional accessories	
	CFast cards	
5CFAST.016G-00	CFast card, 16 GB SLC	
5CFAST.032G-00	CFast card, 32 GB SLC	
5CFAST.032G-10	CFast card, 32 GB MLC	
5CFAST.064G-10	CFast card, 64 GB MLC	
5CFAST.128G-10	CFast card, 128 GB MLC	
5CFAST.2048-00	CFast card, 2 GB SLC	
5CFAST.4096-00	CFast card, 4 GB SLC	
5CFAST.8192-00	CFast card, 8 GB SLC	

Table 132: 5AC901.CCFA-00 - Order data

3.9.11.3 Technical data

Caution!

A sudden power failure may result in data loss! In very rare cases, the mass storage device may also become damaged.

To prevent damage and loss of data, the use of a UPS is recommended.

Information:

The following characteristics, features and limit values only apply to this accessory and can deviate from those specified for the complete system. The data specifications for the complete system take precedence over those of individual components.

Product ID	5AC901.CCFA-00
General information	
Certification	
CE	Yes
cULus	Yes
cULus HazLoc Class 1 Division 2	Yes [1]
GOST-R	Yes
Interfaces	
CFast slot	
Quantity	1
Environmental conditions	
Temperature	
Operation	Depends on the CFast card being used
Storage	Depends on the CFast card being used
Transport	Depends on the CFast card being used
Relative humidity	
Operation	Depends on the CFast card being used
Storage	Depends on the CFast card being used
Transport	Depends on the CFast card being used

Table 133: 5AC901.CCFA-00 - Technical data

1) Yes, although applies only if all components installed within the complete system have this certification and the complete system itself carries the corresponding mark.

3.9.12 5AC901.SDVW-00

3.9.12.1 General information

The DVD-R/RW slide-in drive can be used in APC910 system units and PPC800 bus units with a slide-in drive slot.

- DVD-R/RW, DVD+R/RW drive
- Slide-in

3.9.12.2 Order data

Model number	Short description	Figure
	Drives	
5AC901.SDVW-00	DVD drive - DVD-R/RW|DVD+R/RW - Slide-in	

Table 134: 5AC901.SDVW-00 - Order data

3.9.12.3 Technical data

Information:

The following characteristics, features and limit values only apply to this accessory and can deviate from those specified for the complete system. The data specifications for the complete system take precedence over those of individual components.

Product ID	5AC901.SDVW-00
General information	
Certification	
CE	Yes
cULus	Yes
cULus HazLoc Class 1 Division 2	Yes [1]
GOST-R	Yes
GL	Yes [2]
CD / DVD drive	
Data buffer capacity	2 MB
Data transfer rate	Max. 33.3 MB/s
Speed	Max. 5160 rpm ±1%
Noise level	Approx. 45 dBA at a distance of 50 cm (full read access)
Compatible formats	CD-DA, CD-ROM mode 1/mode 2 CD-ROM XA mode 2 (form 1, form 2) Photo CD (single-/multi-session), Enhanced CD, CD text DVD-ROM, DVD-R, DVD-R (dual layer), DVD-RW, DVD-Video DVD-RAM (4.7 GB, 2.6 GB) DVD+R, DVD+R (dual layer), DVD+RW
Laser class	Class 1 laser
Service life	60000 POH (power-on hours)
Interface	SATA
Startup time	
CD	Max. 14 seconds (from 0 rpm to read operation)
DVD	Max. 15 seconds (from 0 rpm to read operation)
Access time	
CD	On average 140 ms (24x)
DVD	On average 150 ms (8x)
Readable media	
CD	CD/CD-ROM (12 cm, 8 cm), CD-R, CD-RW
DVD	DVD-ROM, DVD-R, DVD-R (dual layer), DVD-RW. DVD-RAM, DVD+R, DVD+R (dual layer), DVD+RW, DVD-RAM
Writable media	
CD	CD-R, CD-RW
DVD	DVD-R/RW, DVD-R (dual layer), DVD-RAM (4.7 GB), DVD+R/RW, DVD+R (dual layer)
Read speed	
CD	24x
DVD	8x

Table 135: 5AC901.SDVW-00 - Technical data

Product ID	5AC901.SDVW-00
Write speed	
CD-R	24x, 16x, 10x and 4x
CD-RW	24x, 16x, 10x and 4x
DVD+R	8x, 4x and 2.4x
DVD+R (dual layer)	6x, 4x and 2.4x
DVD+RW	4x and 2x
DVD-R	8x, 4x and 2x
DVD-R (dual layer)	6x, 4x and 2x
DVD-RAM [3]	5x, 3x and 2x
DVD-RW	6x, 4x and 2x
Write methods	
CD	Disk at once, session at once, packet write, track at once
DVD	Disk at once, incremental, overwrite, sequential, multi-session
Environmental conditions	
Temperature [4]	
Operation	5 to 55°C [5]
Storage	-20 to 60°C
Transport	-40 to 65°C
Relative humidity	
Operation	8 to 80%, non-condensing
Storage	5 to 95%, non-condensing
Transport	5 to 95%, non-condensing
Vibration	
Operation	5 to 500 Hz: 0.2 g
Storage	5 to 500 Hz: 2 g
Transport	5 to 500 Hz: 2 g
Shock	
Operation	At max. 5 g and 11 ms duration
Storage	At max. 60 g and 11 ms duration At max. 200 g and 2 ms duration
Transport	At max. 60 g and 11 ms duration At max. 200 g and 2 ms duration
Mechanical characteristics	
Dimensions	
Width	22 mm
Height	172.5 mm
Depth	150 mm
Weight	400 g

Table 135: 5AC901.SDVW-00 - Technical data

1) Yes, although applies only if all components installed within the complete system have this certification and the complete system itself carries the corresponding mark.
2) Yes, although applies only if all components installed within the complete system have this certification.
3) RAM drivers are not provided by the manufacturer. Support of RAM function by "Nero" burning software (model number 5SWUTI.0000-00) or other burning software packages or drivers from third-party providers.
4) Temperature specifications refer to operation at 500 meters. The maximum ambient temperature is typically derated by 1°C per 1000 meters (starting at 500 meters above sea level).
5) Surface temperature of drive.

3.9.12.4 Temperature/Humidity diagram

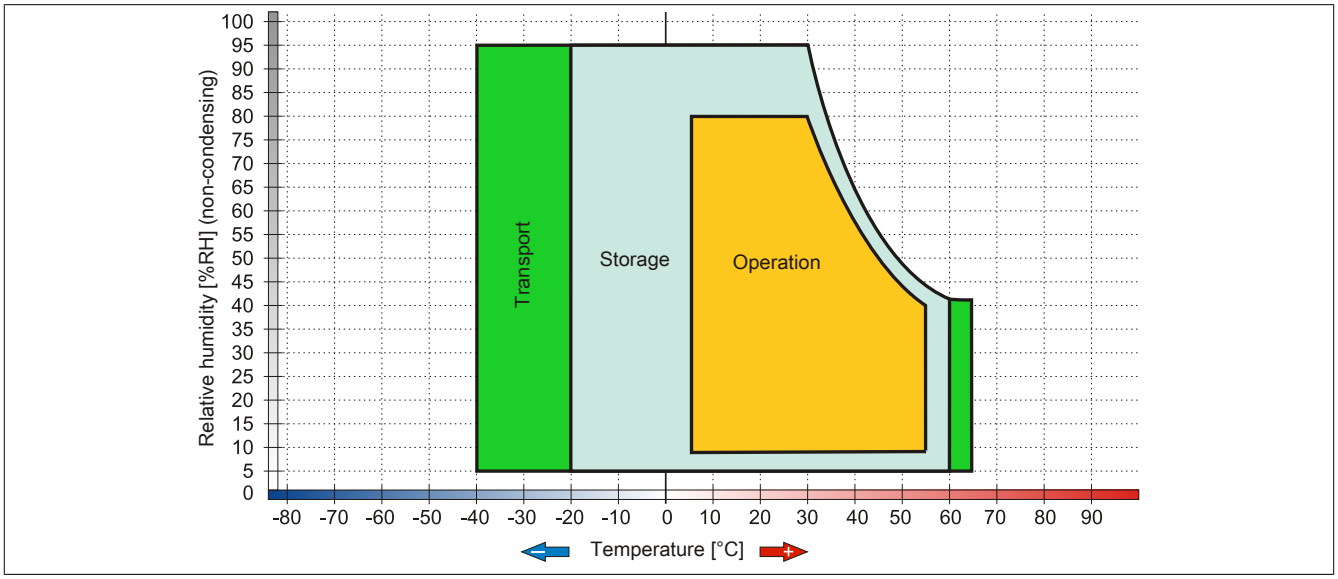


Figure 85: 5AC901.SDVW-00 - Temperature/Humidity diagram

3.9.13 5AC901.SSCA-00

3.9.13.1 General information

The slide-in compact adapter is a slide-in adapter that allows a slide-in compact drive to be installed and operated on a B&R Industrial PC. The slide-in compact adapter can be used in APC910 system units and PPC900 bus units.

- Slide-in compact slot
- Slide-in

3.9.13.2 Order data

Model number	Short description	Figure
	Drives	
5AC901.SSCA-00	Slide-in compact adapter - For slide-in compact drives	
	Optional accessories	
	Drives	
5AC901.CCFA-00	CFast adapter - For slide-in compact slot	
5AC901.CHDD-01	500 GB hard disk - Slide-in compact - SATA	
5AC901.CSSD-00	32 GB SSD SLC - Slide-in compact - SATA	
5AC901.CSSD-03	60 GB SSD MLC - Slide-in compact - SATA	
5AC901.CSSD-04	128 GB SSD MLC - Slide-in compact - SATA	
5AC901.CSSD-05	256 GB SSD MLC - Slide-in compact - Toshiba - SATA	
5AC901.CSSD-06	512 GB SSD MLC - Slide-in compact - Toshiba - SATA	

Table 136: 5AC901.SSCA-00 - Order data

3.9.13.3 Technical data

Caution!

A sudden power failure may result in data loss! In very rare cases, the mass storage device may also become damaged.

To prevent damage and loss of data, the use of a UPS is recommended.

Information:

The following characteristics, features and limit values only apply to this accessory and can deviate from those specified for the complete system. The data specifications for the complete system take precedence over those of individual components.

Product ID	5AC901.SSCA-00
General information	
Certification	
CE	Yes
cULus	Yes
cULus HazLoc Class 1 Division 2	Yes [1]
GOST-R	Yes
GL	Yes [2]
Inserts	
Slide-in compact drives	1
Environmental conditions	
Temperature	
Operation	Depends on the slide-in compact drive being used
Storage	Depends on the slide-in compact drive being used
Transport	Depends on the slide-in compact drive being used
Relative humidity	
Operation	Depends on the slide-in compact drive being used
Storage	Depends on the slide-in compact drive being used
Transport	Depends on the slide-in compact drive being used

Table 137: 5AC901.SSCA-00 - Technical data

1) Yes, although applies only if all components installed within the complete system have this certification and the complete system itself carries the corresponding mark.
2) Yes, although applies only if all components installed within the complete system have this certification.

3.10 Interface options

Information:

Please note that not every interface option can be installed in interface slots 1 and 2. For more information, see "IF option 1 slot" on page 61 and "IF option 2 slot" on page 61.

Information:

For information about installing or replacing an interface option, please refer to the section "Installing the interface option" on page 205.

Depending on the IF option being used, it may be necessary to load the default settings in BIOS Setup after replacement or installation (see "Save & Exit" on page 289).

3.10.1 5AC901.I485-00

3.10.1.1 General information

The 5AC901.I485-00 interface option is equipped with an RS232/RS422/RS485 interface. The operating mode (RS232/RS422/RS485) is selected automatically depending on the electrical connection.

- 1x RS232/422/485 interface
- Compatible with the APC910 and PPC900

3.10.1.2 Order data

Model number	Short description	Figure
	Interface options	
5AC901.I485-00	Interface card - 1x RS232/422/458 interface - For APC910/ PPC900	

Table 138: 5AC901.I485-00 - Order data

3.10.1.3 Technical data

Information:

The following characteristics, features and limit values only apply to this accessory and can deviate from those specified for the complete system. The data specifications for the complete system take precedence over those of individual components.

Product ID	5AC901.I485-00
General information	
B&R ID code	0xD84A
Certification	
CE	Yes
cULus	Yes
cULus HazLoc Class 1 Division 2	Yes [1]
GOST-R	Yes
GL	Yes [2]
Interfaces	
COM	
Type	RS232/RS422/RS485, electrically isolated
Design	9-pin, male, DSUB connector
UART	16550-compatible, 16-byte FIFO
Max. baud rate	115 kbit/s
Terminating resistor	Yes
Electrical characteristics	
Power consumption	1 W

Table 139: 5AC901.I485-00 - Technical data

Product ID	5AC901.I485-00
Environmental conditions	
Temperature	
Operation	0 to 55°C [3]
Storage	-20 to 60°C
Transport	-20 to 60°C
Relative humidity	
Operation	5 to 90%, non-condensing
Storage	5 to 95%, non-condensing
Transport	5 to 95%, non-condensing
Mechanical characteristics	
Weight	Approx. 34 g

Table 139: 5AC901.I485-00 - Technical data

1) Yes, although applies only if all components installed within the complete system have this certification and the complete system itself carries the corresponding mark.
2) Yes, although applies only if all components installed within the complete system have this certification.
3) Detailed information can be found in the temperature tables in the user's manual.

3.10.1.3.1 Pinout

COM serial interface			
	RS232	RS422/485	
Type	RS232, not modem-capable, electrically isolated		
UART	16550-compatible, 16-byte FIFO		
Transfer rate	Max. 115 kbit/s		
Bus length	Max. 15 m	Max. 1200 m	
Pin	**RS232 - Pinout**	**RS422 - Pinout**	9-pin, male, DSUB connector
1	N/C	TXD\	
2	RXD	N/C	
3	TXD	N/C	
4	N/C	TXD	
5	GND	GND	
6	N/C	RXD\	
7	RTS	N/C	
8	CTS	N/C	
9	N/C	RXD	

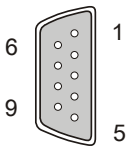


Table 140: COM - Pinout

3.10.1.3.2 I/O address and IRQ

Slot	I/O address	IRQ
IF option 1 (COM F)	228h - 22Fh	7
IF option 2 (COM E)	2E8h - 2EFh	10

Table 141: I/O address and IRQ

3.10.1.3.3 RS232 - Bus length and cable type

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

Extension	Transfer rate
≤15 m	Typ. 64 kbit/s
≤10 m	Typ. 115 kbit/s
≤5 m	Typ. 115 kbit/s

Table 142: RS232 - Bus length and transfer rate

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

RS232 cables	Property
Signal lines	
Cable cross section	4x 0.16 mm² (26 AWG), tinned copper stranded wire
Wire insulation	PE
Conductor resistance	≤82 Ω/ km
Stranding	Wires stranded in pairs
Shield	Paired shield with aluminum foil
Grounding line	
Cable cross section	1x 0.34 mm² (22 AWG / 19), tinned copper stranded wire
Wire insulation	PE
Conductor resistance	≤59 Ω/km
Outer sheathing	
Material	PUR mixture
Features	Halogen-free
Complete shielding	From tinned copper wires

Table 143: RS232 - Cable requirements

3.10.1.3.4 RS422 - Bus length and cable type

The RTS line must be switched on to switch the transmitter to active.

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

Extension	Transfer rate
1200 m	Typ. 115 kbit/s

Table 144: RS422 - Bus length and transfer rate

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

RS422 cable	Property
Signal lines	
Cable cross section	4x 0.25 mm² (24 AWG / 19), tinned copper stranded wire
Wire insulation	PE
Conductor resistance	≤82 Ω/km
Stranding	Wires stranded in pairs
Shield	Paired shield with aluminum foil
Grounding line	
Cable cross section	1x 0.34 mm² (22 AWG / 19), tinned copper stranded wire
Wire insulation	PE
Conductor resistance	≤59 Ω/km
Outer sheathing	
Material	PUR mixture
Features	Halogen-free
Complete shielding	From tinned copper wires

Table 145: RS422 - Cable requirements

3.10.1.3.5 When operated as an RS485 interface

When operated in this mode, the pins of the RS422 default interface (1, 4, 6 and 9) must be used. Pins should be connected as shown.

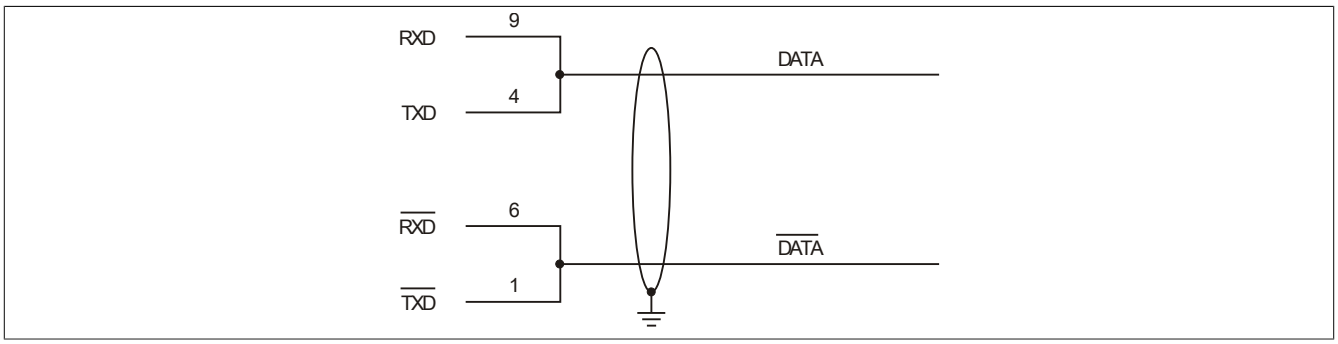


Figure 86: RS232/RS422/RS485 interface - Operation in RS485 mode

The RTS line must be switched by the driver for each transmission or reception; there is no automatic switch-back mechanism. This cannot be configured in Windows.

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

3.10.1.3.6 RS485 - Bus length and cable type

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

Extension	Transfer rate
1200 m	Typ. 115 kbit/s

Table 146: RS485 - Bus length and transfer rate

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

RS485 cables	Property
Signal lines	
Cable cross section	4x 0.25 mm² (24 AWG / 19), tinned copper stranded wire
Wire insulation	PE
Conductor resistance	≤82 Ω/km
Stranding	Wires stranded in pairs
Shield	Paired shield with aluminum foil
Grounding line	
Cable cross section	1x 0.34 mm² (22 AWG / 19), tinned copper stranded wire
Wire insulation	PE
Conductor cross section	≤59 Ω/km
Outer sheathing	
Material	PUR mixture
Features	Halogen-free
Complete shielding	From tinned copper wires

Table 147: RS485 - Cable requirements

3.10.1.3.7 Terminating resistor

A terminating resistor for the serial interface is already integrated in the IF option. There is a switch to activate or deactivate the terminating resistor, but the system unit needs to be opened in order to reach it. An active terminating resistor is indicated by a yellow LED.

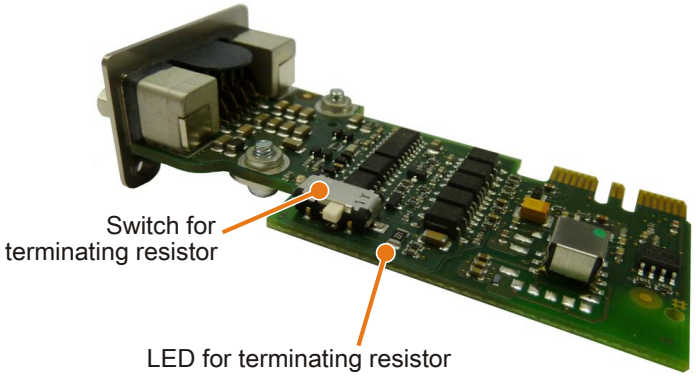


Figure 87: 5AC901.I485-00 - Terminating resistor

3.10.2 5AC901.ICAN-00

3.10.2.1 General information

The 5AC901.ICAN-00 interface option is equipped with a CAN bus master interface.

- 1x CAN bus master interface
- Compatible with the APC910 and PPC900

It is not possible to operate two 5AC901.ICAN interface options (in the IF option 1 and IF option 2 slots) at the same time.

3.10.2.2 Order data

Model number	Short description	Figure
	Interface options	
5AC901.ICAN-00	Interface card - 1x CAN interface - For APC910/PPC900	

Table 148: 5AC901.ICAN-00 - Order data

3.10.2.3 Technical data

Information:

The following characteristics, features and limit values only apply to this accessory and can deviate from those specified for the complete system. The data specifications for the complete system take precedence over those of individual components.

Product ID	5AC901.ICAN-00
General information	
B&R ID code	0xD84B
Certification	
CE	Yes
cULus	Yes
cULus HazLoc Class 1 Division 2	Yes [1]
GOST-R	Yes
GL	Yes [2]
Interfaces	
CAN	
Quantity	1
Controller	Bosch CC770 (compatible with Intel 82527 CAN controller)
Design	DSUB, 9-pin, male, electrically isolated
Transfer rate	Max. 1 Mbit/s
Terminating resistor	Yes
Electrical characteristics	
Power consumption	1 W
Environmental conditions	
Temperature	
Operation	0 to 55°C [3]
Storage	-20 to 60°C
Transport	-20 to 60°C
Relative humidity	
Operation	5 to 90%, non-condensing
Storage	5 to 95%, non-condensing
Transport	5 to 95%, non-condensing
Mechanical characteristics	
Weight	Approx. 33 g

Table 149: 5AC901.ICAN-00 - Technical data

1) Yes, although applies only if all components installed within the complete system have this certification and the complete system itself carries the corresponding mark.
2) Yes, although applies only if all components installed within the complete system have this certification.
3) Detailed information can be found in the temperature tables in the user's manual.

3.10.2.3.1 - Pinout

CAN bus		
Type	Electrically isolated	
Transfer rate	Max. 1 Mbit/s	
Bus length	Max. 1000 meters	
Pin	**Assignment**	9-pin, male, DSUB connector
1	N/C	
2	CAN LOW	
3	GND	
4	N/C	
5	N/C	
6	Reserved	
7	CAN HIGH	
8	N/C	
9	N/C	

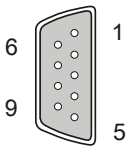


Table 150: 5AC901.ICAN-00 - Pinout

3.10.2.3.2 I/O address and IRQ

Resource	Default setting	Function
I/O address	384h (address register)	Defines the register number to access.
	385h (data register)	Access to the register defined in the address register.
IRQ	IRQ10	Interrupt

Table 151: I/O address and IRQ

1) Resource allocation for the interface option 1 and 2 slots is the same.

3.10.2.3.3 CAN - Bus length and cable type

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

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

Extension	Transfer rate
≤1000 m	Typ. 50 kbit/s
≤200 m	Typ. 250 kbit/s
≤100 m	Typ. 500 kbit/s
≤20 m	Typ. 1 Mbit/s

Table 152: CAN - Bus length and transfer rate

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

CAN cable	Property
Signal lines	
Cable cross section	2x 0.25 mm² (24 AWG / 19), tinned copper stranded wire
Wire insulation	PE
Conductor resistance	≤82 Ω/ km
Stranding	Wires stranded in pairs
Shield	Paired shield with aluminum foil
Grounding line	
Cable cross section	1x 0.34 mm² (22 AWG / 19), tinned copper stranded wire
Wire insulation	PE
Conductor resistance	≤59 Ω/km
Outer sheathing	
Material	PUR mixture
Features	Halogen-free
Complete shielding	From tinned copper wires

Table 153: CAN cable requirements

3.10.2.3.4 CAN driver settings

The baud rate can be set in Automation Studio either with predefined values or with the bit timing register. More information on this can be found in the Automation Studio help system.

Bit timing register 1	Bit timing register 0	Baud rate
00h	14h	1000 kbit/s
80h or 00h	1 ch	500 kbit/s
81h or 01h	1 ch	250 kbit/s
83h or 03h	1 ch	125 kbit/s
84h or 04h	1 ch	100 kbit/s
89h or 09h	1 ch	50 kbit/s

Table 154: CAN driver settings

3.10.2.3.5 Terminating resistor

A terminating resistor for the CAN interface is already integrated in the IF option. There is a switch to activate or deactivate the terminating resistor, but the system unit needs to be opened in order to reach it. An active terminating resistor is indicated by a yellow LED.

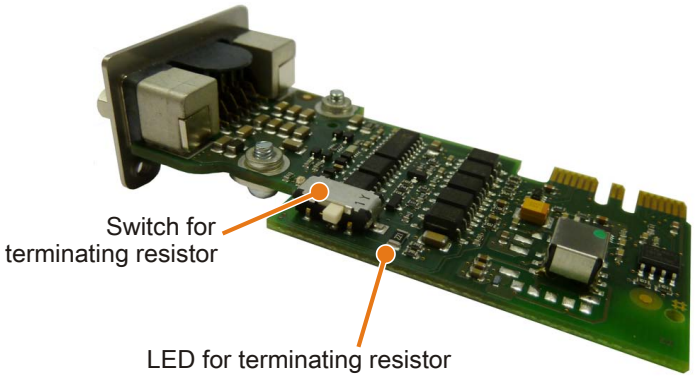


Figure 88: 5AC901.ICAN-00 - Terminating resistor

3.10.2.3.6 Drivers

The CAN IF option is supported in PVI for Windows XP Professional and Windows Embedded Standard 2009.

3.10.3 5AC901.ISRM-00

3.10.3.1 General information

The 5AC901.ISRM-00 interface option has 2 MB SRAM.

- 2 MB SRAM
- Compatible with the APC910 and PPC900

The 5AC901.ISRM-00 interface option can only be operated in the IF option 2 slot.

Information:

When writing, reading or accessing the SRAM, "non-aligned accesses" are not supported by the AVLON bus (internal bus in the PCI Express core).

3.10.3.2 Order data

Model number	Short description	Figure
	Interface options	
5AC901.ISRM-00	Interface cards - 2 MB SRAM - For APC910/PPC900	

Table 155: 5AC901.ISRM-00 - Order data

3.10.3.3 Technical data

Information:

The following characteristics, features and limit values only apply to this accessory and can deviate from those specified for the complete system. The data specifications for the complete system take precedence over those of individual components.

Product ID	5AC901.ISRM-00
General information	
B&R ID code	0xD850
Certification	
CE	Yes
cULus	Yes
cULus HazLoc Class 1 Division 2	Yes [1]
GOST-R	Yes
Controller	
SRAM	
Value	2 MB
Battery-backed	Yes
Remanent variables in power failure mode	256 kB (e.g. for Automation Runtime, see the AS help system)
Electrical characteristics	
Power consumption	2 W
Environmental conditions	
Temperature	
Operation	0 to 55°C [2]
Storage	-20 to 60°C
Transport	-20 to 60°C
Relative humidity	
Operation	5 to 90%, non-condensing
Storage	5 to 95%, non-condensing
Transport	5 to 95%, non-condensing
Mechanical characteristics	
Weight	Approx. 20 g

Table 156: 5AC901.ISRM-00 - Technical data

1) Yes, although applies only if all components installed within the complete system have this certification and the complete system itself carries the corresponding mark.
2) Detailed information can be found in the temperature tables in the user's manual.

3.10.4 5AC901.IPLK-00

3.10.4.1 General information

The 5AC901.IPLK-00 interface option is equipped with 1 POWERLINK interface and 2 MB SRAM.

- 1x POWERLINK interface managing or controlled node
- 2 MB SRAM
- Compatible with the APC910 and PPC900

The 5AC901.IPLK-00 interface option can only be operated in the IF option 2 slot.

Information:

When writing, reading or accessing the SRAM, "non-aligned accesses" are not supported by the AVLON bus (internal bus in the PCI Express core).

3.10.4.2 Order data

Model number	Short description	Figure
	Interface options	
5AC901.IPLK-00	Interface card - 1x POWERLINK interface - 2 MB SRAM - For APC910/PPC900	

Table 157: 5AC901.IPLK-00 - Order data

3.10.4.3 Technical data

Information:

The following characteristics, features and limit values only apply to this accessory and can deviate from those specified for the complete system. The data specifications for the complete system take precedence over those of individual components.

Product ID	5AC901.IPLK-00
General information	
B&R ID code	0xE025
Certification	
CE	Yes
cULus	Yes
cULus HazLoc Class 1 Division 2	Yes [1]
Controller	
SRAM	
Value	2 MB
Battery-backed	Yes
Remanent variables in power failure mode	256 kB (e.g. for Automation Runtime, see the AS help system)
Interfaces	
POWERLINK	
Quantity	1
Transmission	100BASE-TX
Type	Type 4 [2]
Design	Shielded RJ45
Transfer rate	100 Mbit/s
Cable length	Max. 100 m between two stations (segment length)
Electrical characteristics	
Power consumption	1.5 W
Environmental conditions	
Temperature	
Operation	0 to 55°C [3]
Storage	-20 to 60°C
Transport	-20 to 60°C

Table 158: 5AC901.IPLK-00 - Technical data

Product ID	5AC901.IPLK-00
Relative humidity	
Operation	5 to 90%, non-condensing
Storage	5 to 95%, non-condensing
Transport	5 to 95%, non-condensing
Mechanical characteristics	
Weight	Approx. 35 g

Table 158: 5AC901.IPLK-00 - Technical data

1) Yes, although applies only if all components installed within the complete system have this certification and the complete system itself carries the corresponding mark.
2) More information is available in the Automation Studio help system (Communication - POWERLINK - General information - Hardware - IF / LS).
3) Detailed information can be found in the temperature tables in the user's manual.

3.10.4.3.1 - Pinout

LEDs are integrated on the interface option.

POWERLINK				
Cabling			S/STP (Cat 5e)	RJ45, female
Cable length			Max. 100 m (min. Cat5e)	
LED	**Color**	**Status**	**Function**	
Link LED	Yellow	On	Link (POWERLINK network connection available)	
		Off	Activity (blinking - data transfer in progress)	

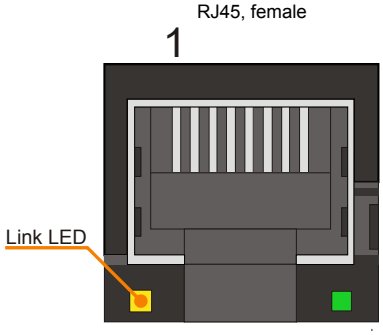


Table 159: 5AC901.IPLK-00 - POWERLINK interface

3.10.4.3.2 Status/Error LED

The Status/Error LED is a green and red dual LED. The LED status can have different meanings depending on the operating mode.

Status/Error LED

POWERLINK - Status/Error LED				
LED	**Color**	**Status**	**Function**	RJ45, female
Status/Error LED	Green-Red	On	POWERLINK Status/Error LED, see 3.10.4.3.2 "Status/Error LED"	
		Off	POWERLINK Status/Error LED, see 3.10.4.3.2 "Status/Error LED"	

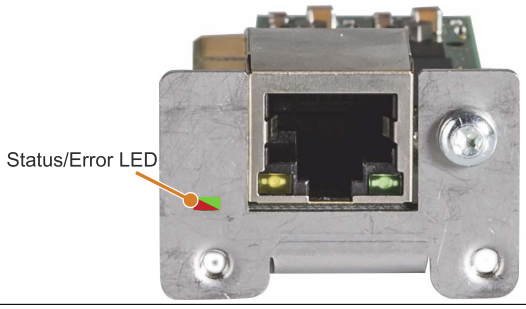


Table 160: 5AC901.IPLK-00 - POWERLINK Status/Error LED

Ethernet mode

In this mode, the interface is operated as an Ethernet interface.

Green - Status	Description
On	Interface being operated as an Ethernet interface

Table 161: Status/Error LED - Ethernet mode

POWERLINK

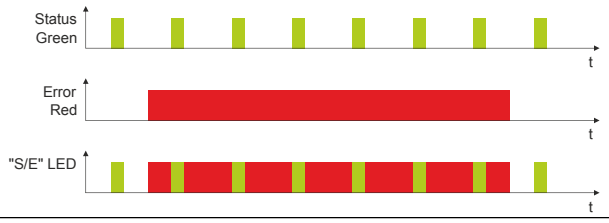
Red - Error	Description
On	The interface is in an error state (failed Ethernet frames, increased number of collisions on the network, etc.). If an error occurs in the following states, then the green LED blinks over the red LED: • BASIC_ETHERNET • PRE_OPERATIONAL_1 • PRE_OPERATIONAL_2 • READY_TO_OPERATE 

Table 162: Status/Error LED - POWERLINK - Error

Green - Status	Description
Off NOT_ACTIVE	**Status** The interface is in the NOT_ACTIVE state or: • Switched off • Starting up • Not configured correctly in Automation Studio • Defective **Managing node (MN)** The bus is being monitored for POWERLINK frames. If a frame is not received within the configured time window (timeout), the interface switches immediately to PRE_OPERATIONAL_1 mode (single flash). If POWERLINK communication is detected before the time expires, however, then the MN will not be started. **Controlled node (CN)** The bus is being monitored for POWERLINK frames. If a corresponding frame is not received within the defined time frame (timeout), then the module switches immediately to BASIC_ETHERNET mode (flickering). If POWERLINK communication is detected before this time expires, however, the interface switches immediately to PRE_OPERATIONAL_1 mode (single flash).
Green flickering (approx. 10 Hz) BASIC_ETHERNET	**Status** The interface is in the BASIC_ETHERNET state and being operated as an Ethernet TCP/IP interface. **Managing node (MN)** This state can only be exited by resetting the interface. **Controlled node (CN)** If POWERLINK communication is detected while in this state, the interface switches to the PRE_OPERATIONAL_1 state (single flash).
Single flash (approx. 1 Hz) PRE_OPERATIONAL_1	**Status** The interface status is in the PRE_OPERATIONAL_1 state. **Managing node (MN)** The MN starts "reduced cycle" operation. Cyclic communication is not yet taking place. **Controlled node (CN)** The module can be configured by the MN in this state. The CN waits until it receives an SoC frame and then switches to the PRE_OPERATIONAL_2 state (double flash). An LED lit red in this state indicates failure of the MN.

Table 163: Status/Error LED - POWERLINK - Status

Green - Status	Description
Double flash (approx. 1 Hz) PRE_OPERATIONAL_2	**Status** The interface is in the PRE_OPERATIONAL_2 state. **Managing node (MN)** The MN begins cyclic communication (cyclic input data is not yet being evaluated). The CNs are configured in this state. **Controlled node (CN)** The interface can be configured by the MN in this state. A command then switches the state to READY_TO_OPERATE (triple flash). An LED lit red in this mode indicates failure of the MN.
Triple flash (approx. 1 Hz) READY_TO_OPERATE	**Status** The interface is in the READY_TO_OPERATE state. **Managing node (MN)** Cyclic and asynchronous communication is taking place. Any received PDO data is ignored. **Controlled node (CN)** The configuration of the module is completed. Normal cyclic and asynchronous communication is taking place. The PDO data being sent corresponds to the PDO mapping. Cyclic data is not yet being evaluated, however. An LED lit red in this mode indicates failure of the MN.
On OPERATIONAL	**Status** The interface is in the OPERATIONAL state. PDO mapping is active and cyclic data is being evaluated.
Blinking (approx. 2.5 Hz) STOPPED	**Status** The interface is in the STOPPED state. **Managing node (MN)** This status is not possible for the MN. **Controlled node (CN)** No output data is being produced, and no input data is being received. It is only possible to enter or leave this mode after the MN has given the appropriate command.

Table 163: Status/Error LED - POWERLINK - Status

System stop error codes

Incorrect configuration or defective hardware can cause a system stop error.

The error code is indicated by the red Error LED using four switch-on phases. Each switch-on phase has a duration of either 150 ms or 600 ms. The error code is repeated every 2 seconds.

Error description	Error code indicated by red Status LED									
RAM error: The interface is defective and must be replaced.	•	•	•	-	Pause	•	•	•	-	Pause
Hardware error: The interface or a system component is defective and must be replaced.	-	•	•	-	Pause	-	•	•	-	Pause

Table 164: System stop error codes

Key	•	...150 ms
	−	...600 ms
	Pause	2 second delay

3.10.4.3.3 Drivers

The POWERLINK IF option is supported by Automation Runtime beginning with the following versions:

- AR Upgrade AR H4.10
- Automation Studio V4.1.x.x

3.10.5 5AC901.IHDA-00

3.10.5.1 General information

The 5AC901.IHDA-00 interface option has an HDA sound chip with externally accessible MIC, Line IN and Line OUT channels.

- 1x MIC
- 1x Line IN
- 1x Line OUT
- Compatible with the APC910 and PPC900

The 5AC901.IHDA-00 interface option can only be operated in the IF option 1 slot.

3.10.5.2 Order data

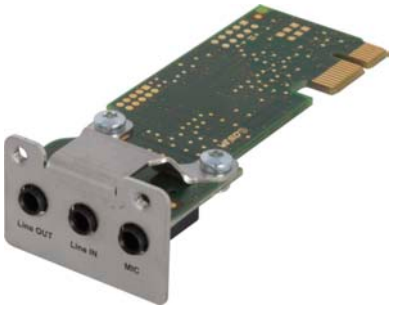
Model number	Short description	Figure
	Interface options	
5AC901.IHDA-00	Interface card - 1x audio interface (1x MIC/1x Line In/1x OUT) - For APC910/PPC900	

Table 165: 5AC901.IHDA-00 - Order data

3.10.5.3 Technical data

Information:

The following characteristics, features and limit values only apply to this accessory and can deviate from those specified for the complete system. The data specifications for the complete system take precedence over those of individual components.

Product ID	5AC901.IHDA-00
General information	
B&R ID code	0xD84E
Certification	
CE	Yes
cULus	Yes
cULus HazLoc Class 1 Division 2	Yes [1]
GOST-R	Yes
GL	Yes [2]
Interfaces	
Audio	
Type	HDA sound
Controller	Realtek ALC 662
Inputs	Microphone, Line IN
Outputs	Line OUT
Electrical characteristics	
Power consumption	0.4 W
Environmental conditions	
Temperature	
Operation	0 to 55°C [3]
Storage	-20 to 60°C
Transport	-20 to 60°C

Table 166: 5AC901.IHDA-00 - Technical data

Product ID	5AC901.IHDA-00
Relative humidity	
Operation	5 to 90%, non-condensing
Storage	5 to 95%, non-condensing
Transport	5 to 95%, non-condensing
Mechanical characteristics	
Weight	Approx. 21 g

Table 166: 5AC901.IHDA-00 - Technical data

1) Yes, although applies only if all components installed within the complete system have this certification and the complete system itself carries the corresponding mark.
2) Yes, although applies only if all components installed within the complete system have this certification.
3) Detailed information can be found in the temperature tables in the user's manual.

3.10.5.3.1 Pinout

MIC, Line IN, Line OUT		
Controller	Realtek ALC 662	3.5 mm female connector
MIC	Connection of a mono microphone with a 3.5 mm jack	
Line IN	Stereo Line IN signal supplied via a 3.5 mm jack	
Line OUT	Connection of a stereo playback device (e.g. amplifier) via a 3.5 mm jack	

Table 167: 5AC901.IHDA-00 - Pinout

A special driver is required to operate the audio controller. Drivers for approved operating systems are available in the Downloads section of the B&R website (www.br-automation.com).

Information:

Required drivers can only be downloaded from the B&R website, not from manufacturer websites.

3.10.6 5AC901.IRDY-00

3.10.6.1 General information

The 5AC901.IRDY-00 ready relay is switched as soon as the B&R Industrial PC has booted and all internal supply voltages are applied. Additional devices can also be connected to the ready relay, which are then also switched on when the B&R Industrial PC boots.

- 1 normally closed contact, 1 normally open contact
- Compatible with the APC910 and PPC900

The 0TB2104.8000 terminal block is not included and must be ordered separately.

3.10.6.2 Order data

Model number	Short description	Figure
	Interface options	
5AC901.IRDY-00	Interface card - Ready relay - For APC910/PPC900	
	Required accessories	
	Terminal blocks	
0TB2104.8000	Connector 24 VDC - 4-pin female - Screw clamps 2.5 mm²	

Table 168: 5AC901.IRDY-00 - Order data

3.10.6.3 Technical data

Information:

The following characteristics, features and limit values only apply to this accessory and can deviate from those specified for the complete system. The data specifications for the complete system take precedence over those of individual components.

Product ID	5AC901.IRDY-00
General information	
B&R ID code	0xD84F
Ready relay	Normally open contact and normally closed contact, max. 30 VDC, max. 2 A
Certification	
CE	Yes
cULus	Yes
Electrical characteristics	
Power consumption	0.2 W
Environmental conditions	
Temperature	
Operation	0 to 55°C [1]
Storage	-20 to 60°C
Transport	-20 to 60°C
Relative humidity	
Operation	5 to 90%, non-condensing
Storage	5 to 95%, non-condensing
Transport	5 to 95%, non-condensing
Mechanical characteristics	
Weight	Approx. 30 g

Table 169: 5AC901.IRDY-00 - Technical data

1) Detailed information can be found in the temperature tables in the user's manual.

3.10.6.3.1 Pinout

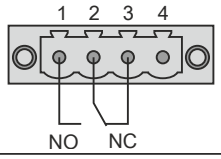
Ready relay			
Pin	**Assignment**	**Description**	4-pin male connector
1	NO	Normally open contact	
2	COM	Changeover contact	
3	NC	Normally closed contact	
4	-	Not connected	

Table 170: 5AC901.IRDY-00 - Pinout

3.10.7 5AC901.ISIO-00

3.10.7.1 General information

The ready relay function of the 5AC901.ISIO-00 IF option can be controlled using the MTCX. Corresponding commands must be issued via the MTCX to switch the ready relay.

In addition to the ready relay function, the reset button, power button and power LED on the APC910 or PPC900 can be made accessible externally.

Unlike the 5AC901.IRDY-00 IF option, the 5AC901.ISIO-00 ready relay is not automatically switched on and off if the power supply to the PC is connected or disconnected.

The maximum cable length for connecting the reset button, power button and power LED is 2 m.

- Connections for the reset button and power button on the PC
- Connection for the power LED on the PC
- 1 normally closed contact and 1 normally open contact on the ready relay
- Controlling the ready relay functions using MTCX commands
- Compatible with the APC910 and PPC900

3.10.7.2 Order data

Model number	Short description	Figure
	Interface options	
5AC901.ISIO-00	Interface card - System I/O - For APC910/PPC900	

Table 171: 5AC901.ISIO-00 - Order data

3.10.7.3 Technical data

Information:

The following characteristics, features and limit values only apply to this accessory and can deviate from those specified for the complete system. The data specifications for the complete system take precedence over those of individual components.

Product ID	5AC901.ISIO-00
General information	
B&R ID code	0xE674
Ready relay	Normally open contact and normally closed contact, max. 30 VDC, max. 1 A
Certification	
CE	Yes
cULus	Yes
Electrical characteristics	
Power consumption	0.5 W
Environmental conditions	
Temperature	
Operation	0 to 55°C [1]
Storage	-20 to 60°C
Transport	-20 to 60°C
Relative humidity	
Operation	5 to 90%, non-condensing
Storage	5 to 95%, non-condensing
Transport	5 to 95%, non-condensing
Mechanical characteristics	
Weight	Approx. 30 g

Table 172: 5AC901.ISIO-00 - Technical data

1) Detailed information can be found in the temperature tables in the user's manual.

3.10.7.4 Pinout

Ready relay		
Max. cable length	Max. 2 meters	
Pin	**Assignment**	
1	Output (power) LED - Green	9-pin female DSUB connector
2	Output (power) LED - Red	
3	GND	
4	Input - Power button	
5	Input - Reset button	
6	Normally open contact	
7	Normally closed contact	
8	GND	
9	COM, changeover contact	

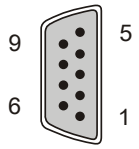


Table 173: 5AC901.ISIO-00 - Pinout

Details about the power LED can be found in section "LED status indicators" on page 56.

Details about the power and reset buttons can be found in section "Power button" on page 57.

3.10.7.5 Firmware

In order to guarantee the functionality of the interface option, at least the following firmware version (MTCX) must be installed on the PC:

- Automation PC 910: V1.13
- Panel PC 900: V1.15

This firmware can be downloaded from the B&R website (www.br-automation.com).

Information about firmware upgrades can be found in section "Firmware upgrade" on page 301.

3.10.7.6 Connection example

Information:

Series resistors for the LEDs are already installed on the interface option.

The LED outputs are dimensioned for a typical LED current of 3.5 mA.

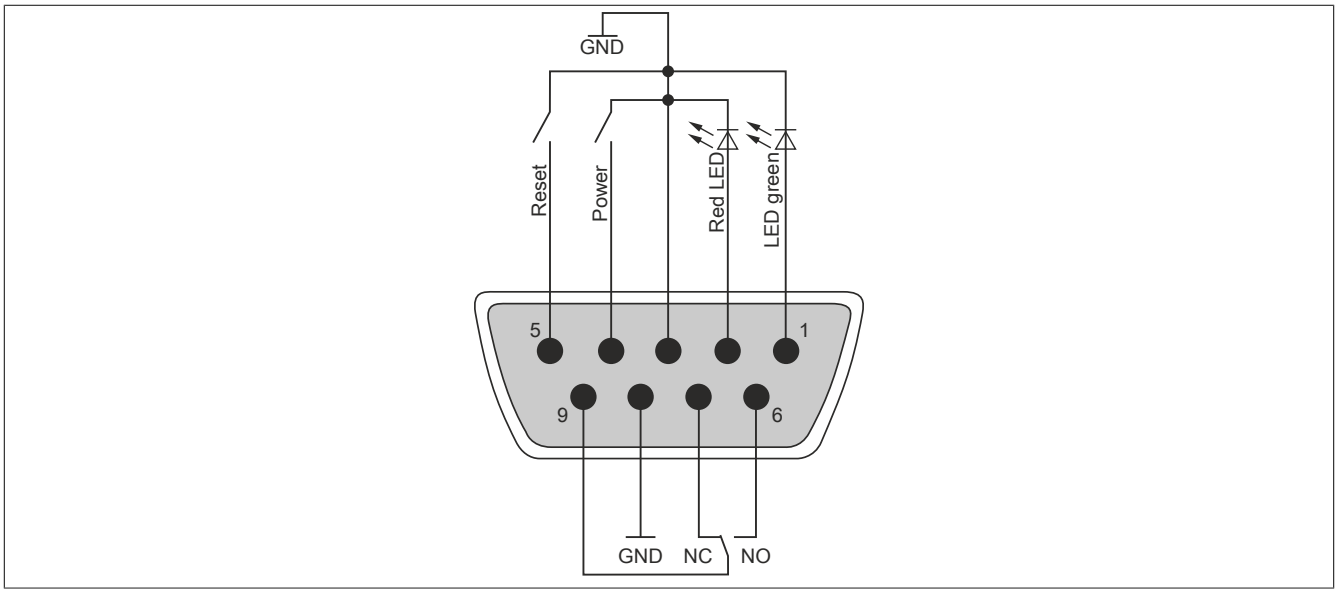


Figure 89: 5AC901.ISIO-00 - Connection example

3.11 Uninterruptible power supply (UPS)

With an optionally integrated UPS, the B&R Industrial PC makes sure that the PC system completes write operations even when a power failure occurs. If the UPS detects a power failure, it switches to battery operation immediately without interruption. Any running programs will be properly terminated by the UPS. This eliminates the chance of inconsistent data (only works if the UPS has already been configured and the drive is enabled).

Information:

- **The monitor/panel is not buffered by the UPS and will shut off when the power fails.**
- **More detailed information about uninterruptible power supplies can be found in the user's manual for the external UPS. This can be downloaded from the B&R website.**

Because the charging circuit is integrated in the housing of the B&R Industrial PC, installation has been simplified to merely attaching the connection cable to the battery unit mounted next to the PC.

Special emphasis was placed on ease of maintenance when the battery unit was designed. Batteries are easily accessible from the front and can be replaced in just a few moments when servicing.

3.11.1 Requirements

- A suitable system unit
- 5AC901.IUPS-00 or 5AC901.IUPS-01UPS IF option
- Battery unit 5AC901.BUPS-00 or 5AC901.BUPS-01
- UPS connection cable 0.5 meters (5CAUPS.0005-01), 1 meter (5CAUPS.0010-01) or 3 meters (5CAUPS.0030-01)
- B&R UPS configured in the ADI Control Center

Warning!

The 5AC901.BUPS-00 battery unit is only permitted to be operated with the 5AC901.IUPS-00 UPS IF option!

The 5AC901.BUPS-01 battery unit is only permitted to be operated with the 5AC901.IUPS-01 UPS IF option!

Information:

For information about installation and connecting to the UPS IF option, see "Installing and connecting the UPS battery unit" on page 218.

3.11.2 5AC901.IUPS-00

3.11.2.1 General information

The 5AC901.IUPS-00 UPS IF option, together with the 5AC901.BUPS-00 battery unit, allows the B&R Industrial PC to be shut down without any loss of data during a power failure.

The 5AC901.IUPS-00 UPS interface option can only be operated in the IF option 1 slot.

Warning!

The 5AC901.IUPS-00 UPS IF option is only permitted to be operated with the 5AC901.BUPS-00 battery unit!

Information:

If the system is in standby mode (S5: Soft-off mode or S4: Hibernation mode - suspend-to-disk), then the internal UPS interface option charges the connected battery unit. The system's internal power supplies are active during this procedure. This allows various actions to be completed (e.g. opening the tray of the slide-in DVD drive).

3.11.2.2 Order data

Model number	Short description	Figure
	Uninterruptible power supplies	
5AC901.IUPS-00	UPS - For 4.5 Ah battery	
	Required accessories	
	Uninterruptible power supplies	
5AC901.BUPS-00	Battery unit 4.5 Ah - For UPS 5AC901.IUPS-00	
5CAUPS.0005-01	UPS cable - 0.5 m - For 5AC901.IUPS-xx	
5CAUPS.0010-01	UPS cable - 1 m - For 5AC901.IUPS-xx	
5CAUPS.0030-01	UPS cable - 3 m - For 5AC901.IUPS-xx	

Table 174: 5AC901.IUPS-00 - Order data

3.11.2.3 Technical data

Information:

The following characteristics, features and limit values only apply to this accessory and can deviate from those specified for the complete system. The data specifications for the complete system take precedence over those of individual components.

Product ID	5AC901.IUPS-00
General information	
B&R ID code	0xD851
Certification	
CE	Yes
cULus	Yes
cULus HazLoc Class 1 Division 2	Yes [1]
GOST-R	Yes
Electrical characteristics	
Power consumption	Max. 30 W at 1 A
Deep discharge protection	Yes
Short circuit protection	Yes [2]
Battery charging data	
Charging current	Typ. 1 A
Environmental conditions	
Temperature	
Operation	0 to 55°C [3]
Storage	-20 to 60°C
Transport	-20 to 60°C

Table 175: 5AC901.IUPS-00 - Technical data

Product ID	5AC901.IUPS-00
Relative humidity	
Operation	5 to 90%, non-condensing
Storage	5 to 95%, non-condensing
Transport	5 to 95%, non-condensing
Mechanical characteristics	
Weight	Approx. 28 g

Table 175: 5AC901.IUPS-00 - Technical data

1) Yes, although applies only if all components installed within the complete system have this certification and the complete system itself carries the corresponding mark.
2) The interface option provides protection against short circuits. This does not apply to the connected battery unit.
3) Detailed information can be found in the temperature tables in the user's manual.

3.11.2.3.1 Pinout

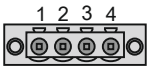
UPS interface		
Pin	**Assignment**	4-pin male connector 
1	Temperature sensor	
2	Temperature sensor	
3	-	
4	+	

Table 176: 5AC901.IUPS-00 / -01 - Pinout

3.11.2.4 Installation

This module is installed using the materials included in delivery. For more information regarding installation, see "Installing the interface option" on page 205.

3.11.3 5AC901.IUPS-01

3.11.3.1 General information

The 5AC901.IUPS-01 UPS IF option, together with the 5AC901.BUPS-01 battery unit, allows the B&R Industrial PC to be shut down without any loss of data during a power failure.

The 5AC901.IUPS-01 UPS interface option can only be operated in the IF option 1 slot.

Warning!

The 5AC901.IUPS-01 UPS IF option is only permitted to be operated with the 5AC901.BUPS-01 battery unit!

Information:

If the system is in standby mode (S5: Soft-off mode or S4: Hibernation mode - suspend-to-disk), then the internal UPS interface option charges the connected battery unit. The system's internal power supplies are active during this procedure. This allows various actions to be completed (e.g. opening the tray of the slide-in DVD drive).

3.11.3.2 Order data

Model number	Short description	Figure
	Uninterruptible power supplies	
5AC901.IUPS-01	UPS - For 2.2 Ah battery	
	Required accessories	
	Uninterruptible power supplies	
5AC901.BUPS-01	Battery unit 2.2 Ah - For UPS 5AC901.IUPS-01	
5CAUPS.0005-01	UPS cable - 0.5 m - For 5AC901.IUPS-xx	
5CAUPS.0010-01	UPS cable - 1 m - For 5AC901.IUPS-xx	
5CAUPS.0030-01	UPS cable - 3 m - For 5AC901.IUPS-xx	

Table 177: 5AC901.IUPS-01 - Order data

3.11.3.3 Technical data

Information:

The following characteristics, features and limit values only apply to this accessory and can deviate from those specified for the complete system. The data specifications for the complete system take precedence over those of individual components.

Product ID	5AC901.IUPS-01
General information	
B&R ID code	0xDF84
Certification	
CE	Yes
cULus	Yes
cULus HazLoc Class 1 Division 2	Yes [1)]
GOST-R	Yes
Electrical characteristics	
Power consumption	Max. 25 W at 0.9 A
Deep discharge protection	Yes
Short circuit protection	Yes [2)]
Battery charging data	
Charging current	Typ. 0.88 A
Environmental conditions	
Temperature	
Operation	0 to 55°C [3)]
Storage	-20 to 60°C
Transport	-20 to 60°C

Table 178: 5AC901.IUPS-01 - Technical data

Product ID	5AC901.IUPS-01
Relative humidity	
Operation	5 to 90%, non-condensing
Storage	5 to 95%, non-condensing
Transport	5 to 95%, non-condensing
Mechanical characteristics	
Weight	Approx. 28 g

Table 178: 5AC901.IUPS-01 - Technical data

1) Yes, although applies only if all components installed within the complete system have this certification and the complete system itself carries the corresponding mark.
2) The interface option provides protection against short circuits. This does not apply to the connected battery unit.
3) Detailed information can be found in the temperature tables in the user's manual.

3.11.3.3.1 Pinout

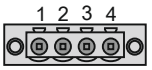
UPS interface		
Pin	**Assignment**	4-pin male connector 
1	Temperature sensor	
2	Temperature sensor	
3	-	
4	+	

Table 179: 5AC901.IUPS-00 / -01 - Pinout

3.11.3.4 Installation

This module is installed using the materials included in delivery. For more information regarding installation, see "Installing the interface option" on page 205.

3.11.4 5AC901.BUPS-00

3.11.4.1 General information

- Battery unit for the 5AC901.IUPS-00 UPS IF option
- Single-cell rechargeable battery
- 2 Hawker Cyclon 12 V 4.5 Ah rechargeable batteries connected in series
- Rated voltage: 24 V
- Capacity: 4.5 Ah

The battery unit has a limited service life and should be replaced regularly (after the specified service life at the latest).

Warning!

The 5AC901.BUPS-00 battery unit is only permitted to be operated with the 5AC901.IUPS-00 UPS IF option!

3.11.4.2 Order data

Model number	Short description	Figure
	Uninterruptible power supplies	
5AC901.BUPS-00	Battery unit 4.5 Ah - For UPS 5AC901.IUPS-00	
	Required accessories	
	Uninterruptible power supplies	
5CAUPS.0005-01	UPS cable - 0.5 m - For 5AC901.IUPS-xx	
5CAUPS.0010-01	UPS cable - 1 m - For 5AC901.IUPS-xx	
5CAUPS.0030-01	UPS cable - 3 m - For 5AC901.IUPS-xx	

Table 180: 5AC901.BUPS-00 - Order data

3.11.4.3 Technical data

Product ID	5AC901.BUPS-00
General information	
Battery	
Type	Hawker Cyclon 12 V 4.5 Ah; two rechargeable batteries connected in series
Service life	Up to 15 years at 20°C / 10 years at 25°C [1]
Design	Single cell
Temperature sensor	NTC resistance
Maintenance interval during storage	6-month interval between charges
Certification	
CE	Yes
cULus	Yes
cULus HazLoc Class 1 Division 2	Yes [2]
GOST-R	Yes
Charge duration when battery low	Typ. 7 hours
Electrical characteristics	
Nominal voltage	24 V
Capacity	4.5 Ah
Fuse	Yes
Battery charging data	
Charging current [3]	Typ. 1 A
Environmental conditions	
Temperature	
Operation	-30 to 60°C [4]
Storage	-65 to 80°C
Transport	-65 to 80°C
Relative humidity	
Operation	5 to 95%, non-condensing
Storage	5 to 95%, non-condensing
Transport	5 to 95%, non-condensing
Elevation	
Operation	Max. 3000 m

Table 181: 5AC901.BUPS-00 - Technical data

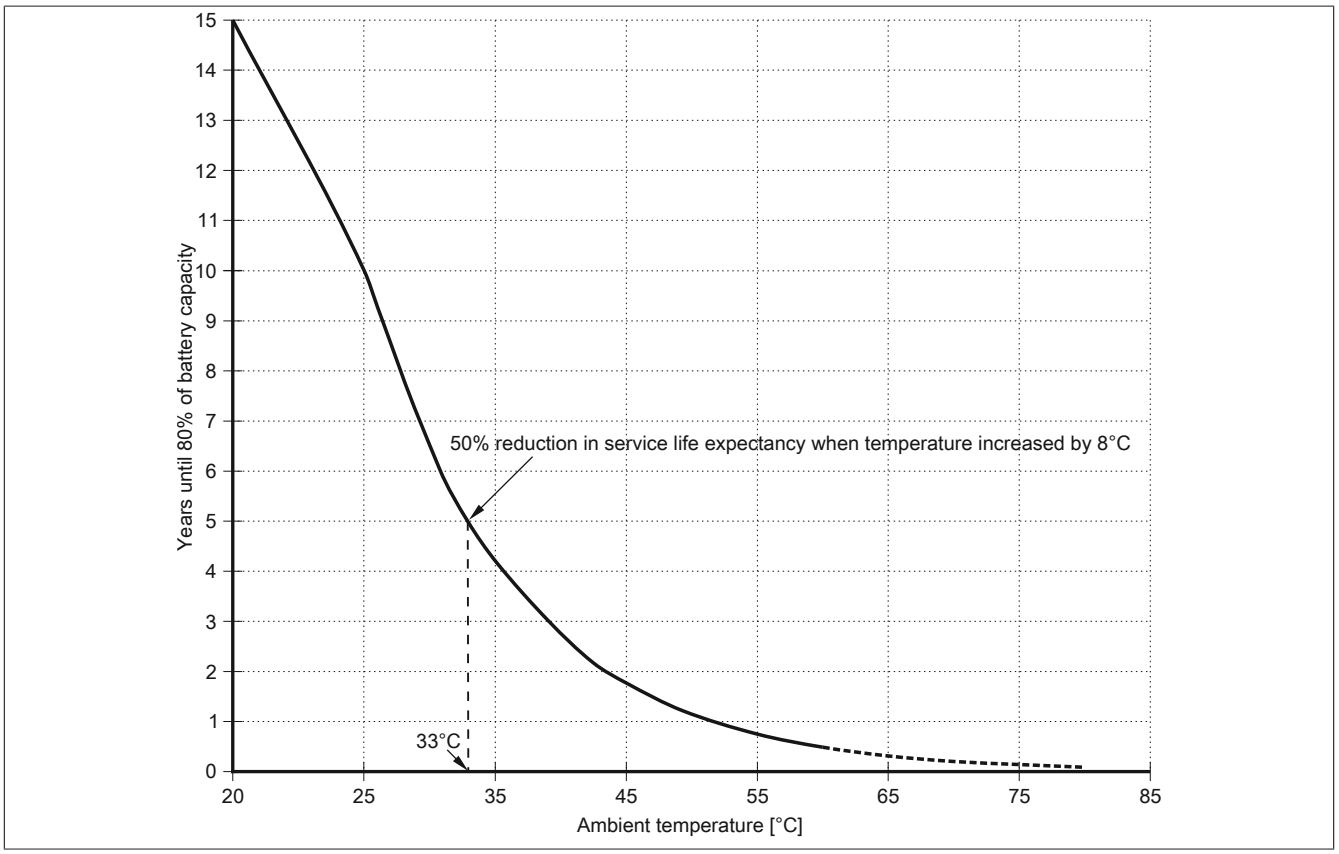
Product ID	5AC901.BUPS-00
Mechanical characteristics	
Dimensions	
Width	223.2 mm
Height	78.2 mm
Depth	145 mm
Weight	Approx. 4600 g

Table 181: 5AC901.BUPS-00 - Technical data

1) Depends on the charging and discharging cycles (up to 80% battery capacity).
2) Yes, although applies only if all components installed within the complete system have this certification and the complete system itself carries the corresponding mark.
3) Maximum charging current.
4) Battery backing is no longer provided if the temperature falls below the minimum temperature or rises above the maximum temperature. Charging also no longer takes place since this could lead to battery damage.

3.11.4.4 Service life

The following diagram shows the relationship between ambient temperature and service life.



3.11.4.5 Dimensions

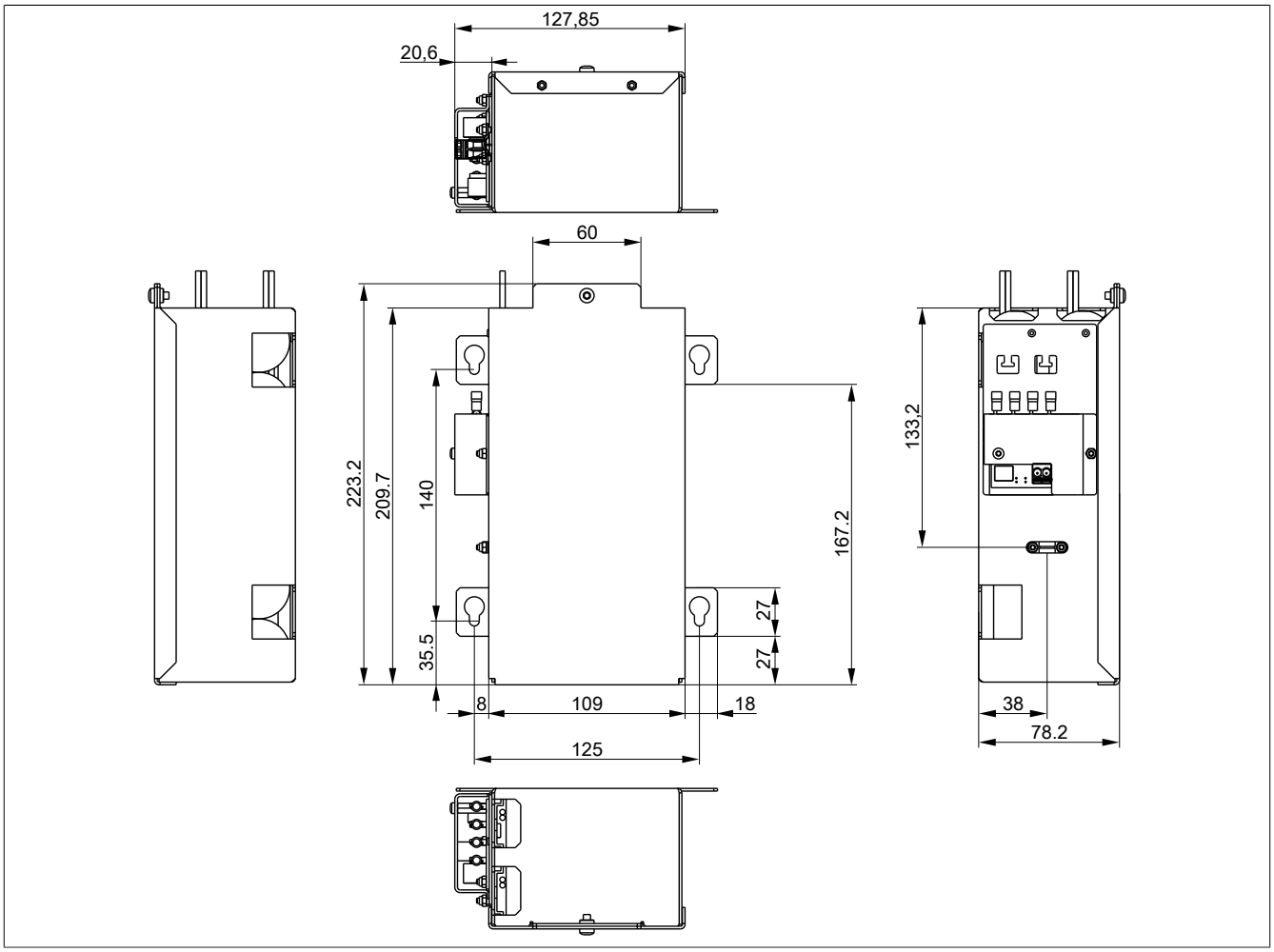


Figure 90: 5AC901.BUPS-00 - Dimensions

3.11.4.6 Drilling template

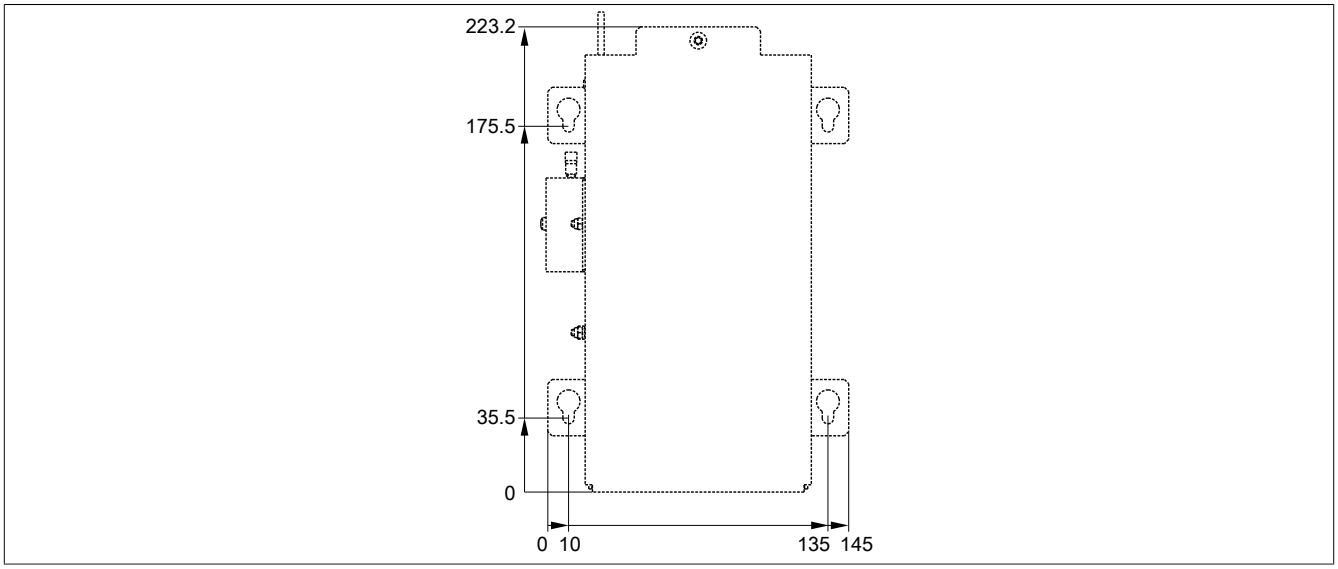


Figure 91: 5AC901.BUPS-00 - Drilling template

3.11.4.7 Installation

For information about installation and connecting to the UPS IF option, see "Installing and connecting the UPS battery unit" on page 218.

3.11.4.8 Precautions for handling and use

Spills and leaks:

Any further spillage or leakage must be prevented. Smaller spills must be bonded with dry sand, dirt and vermiculite. The use of flammable materials is prohibited. If possible, neutralize acids with sodium bicarbonate, chalk, etc. Acid-resistant clothing, shoes, gloves and face protection must be worn. The disposal of unneutralized acid in the sewage system is prohibited!

Waste disposal:

Used batteries must be disposed of in an environmentally friendly recycling process.

Neutralized mud must be stored in closed containers and stored/disposed of in accordance with applicable regulations. After neutralization and testing, larger spills diluted with water must be disposed of in accordance with applicable regulations.

Handling and storage:

- Batteries must be kept in cool, dry and well ventilated rooms with impermeable surfaces and appropriate containment conditions in case of leakage.
- Batteries must be protected from adverse weather conditions and separated from incompatible materials during storage and transport.
- A sufficient supply of water must be located nearby.
- Damage to containers where batteries are stored and transported must be prevented.
- Keep away from fire, sparks and excessive heat.

3.11.5 5AC901.BUPS-01

3.11.5.1 General information

- Battery unit for the 5AC901.IUPS-01 UPS IF option
- Maintenance-free lead acid battery
- 2 Panasonic 12 V 2.2 Ah rechargeable batteries connected in series
- Rated voltage: 24 V
- Capacity: 2.2 Ah

The battery unit has a limited service life and should be replaced regularly (after the specified service life at the latest).

Warning!

The 5AC901.BUPS-01 battery unit is only permitted to be operated with the 5AC901.IUPS-01 UPS IF option!

3.11.5.2 Order data

Model number	Short description	Figure
	Uninterruptible power supplies	
5AC901.BUPS-01	Battery unit 2.2 Ah - For UPS 5AC901.IUPS-01	
	Required accessories	
	Uninterruptible power supplies	
5CAUPS.0005-01	UPS cable - 0.5 m - For 5AC901.IUPS-xx	
5CAUPS.0010-01	UPS cable - 1 m - For 5AC901.IUPS-xx	
5CAUPS.0030-01	UPS cable - 3 m - For 5AC901.IUPS-xx	

Table 182: 5AC901.BUPS-01 - Order data

3.11.5.3 Technical data

Product ID	5AC901.BUPS-01
General information	
Battery	
Type	Panasonic 12 V 2.2 Ah; two rechargeable batteries connected in series
Service life	Up to 5 years at 20°C [1)]
Design	Maintenance-free lead acid battery
Temperature sensor	NTC resistance
Maintenance interval during storage	6-month interval between charges
Certification	
CE	Yes
cULus	Yes
cULus HazLoc Class 1 Division 2	Yes [2)]
GOST-R	Yes
Charge duration when battery low	Typ. 5 hours
Electrical characteristics	
Nominal voltage	24 V
Capacity	2.2 Ah
Fuse	Yes
Battery charging data	
Charging current [3)]	Typ. 0.88 A
Environmental conditions	
Temperature	
Operation	0 to 40°C [4)]
Storage	-15 to 40°C
Transport	-15 to 40°C
Relative humidity	
Operation	25 to 85%, non-condensing
Storage	25 to 85%, non-condensing
Transport	25 to 85%, non-condensing
Elevation	
Operation	Max. 3000 m

Table 183: 5AC901.BUPS-01 - Technical data

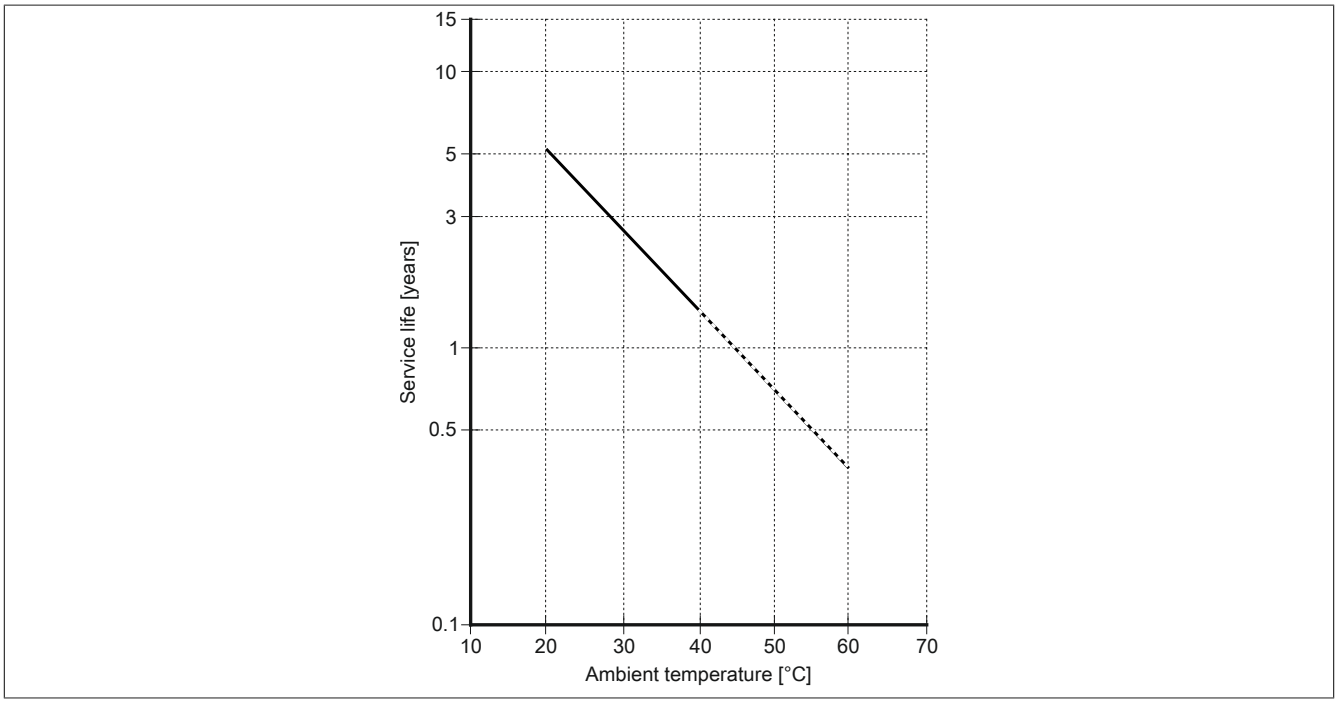
Product ID	5AC901.BUPS-01
Mechanical characteristics	
Dimensions	
Width	188 mm
Height	78 mm
Depth	115 mm
Weight	Approx. 2550 g

Table 183: 5AC901.BUPS-01 - Technical data

1) Depends on the charging and discharging cycles.
2) Yes, although applies only if all components installed within the complete system have this certification and the complete system itself carries the corresponding mark.
3) Maximum charging current.
4) Battery backing is no longer provided if the temperature falls below the minimum temperature or rises above the maximum temperature. Charging also no longer takes place since this could lead to battery damage.

3.11.5.4 Service life

The following diagram shows the relationship between ambient temperature and service life.



3.11.5.5 Dimensions

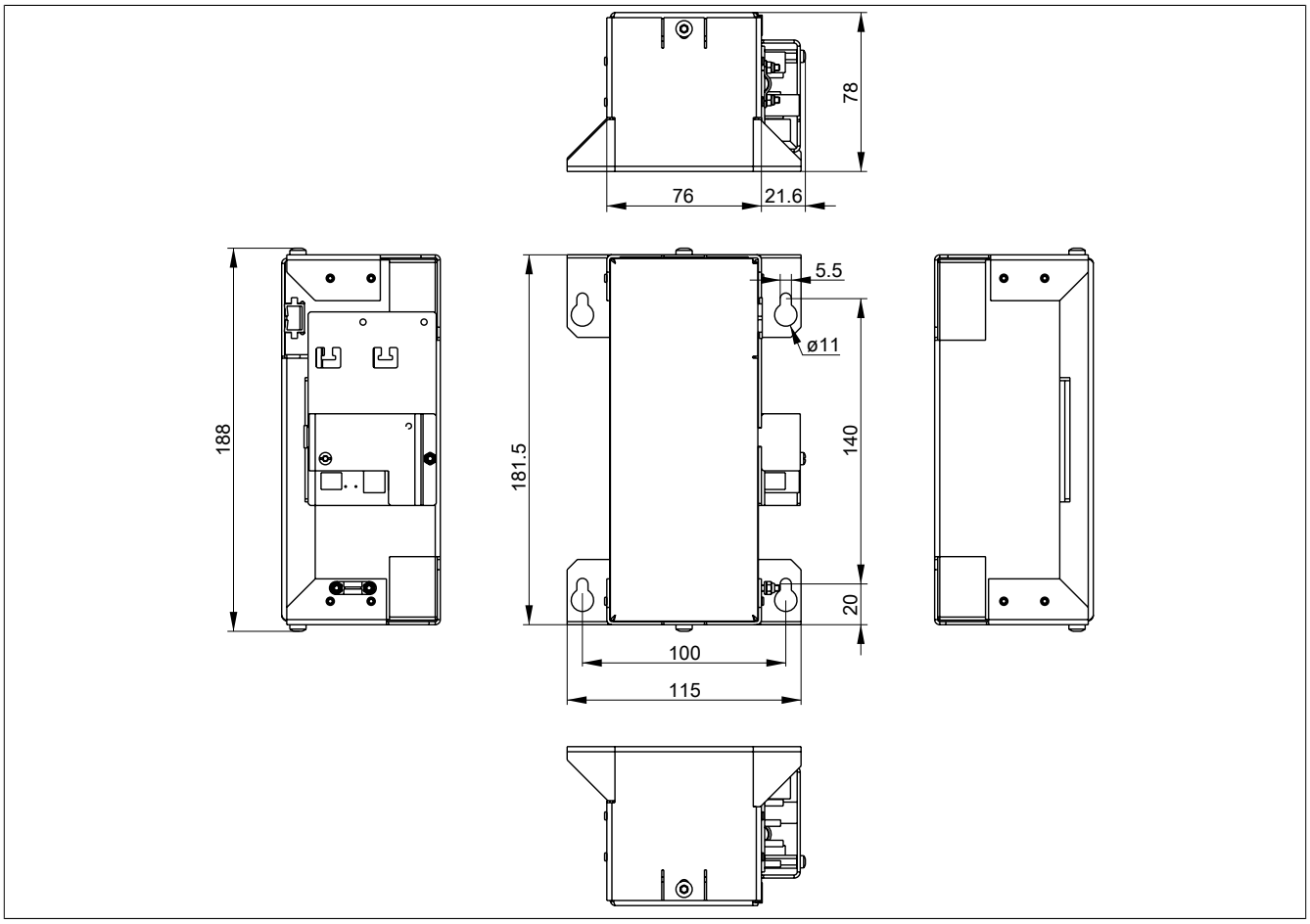


Figure 92: 5AC901.BUPS-01 - Dimensions

3.11.5.6 Drilling template

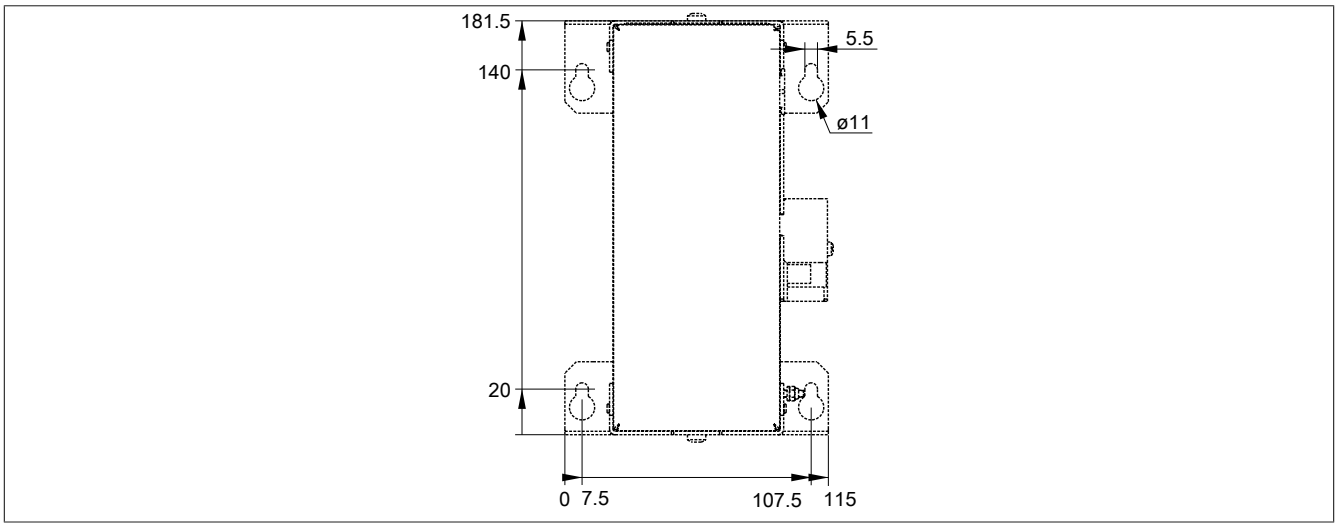


Figure 93: 5AC901.BUPS-01 - Drilling template

3.11.5.7 Installation

For information about installation and connecting to the UPS IF option, see "Installing and connecting the UPS battery unit" on page 218.

3.11.5.8 Precautions for handling and use

Spills and leaks:

Any further spillage or leakage must be prevented. Smaller spills must be bonded with dry sand, dirt and vermiculite. The use of flammable materials is prohibited. If possible, neutralize acids with sodium bicarbonate, chalk, etc. Acid-resistant clothing, shoes, gloves and face protection must be worn. The disposal of unneutralized acid in the sewage system is prohibited!

Waste disposal:

Used batteries must be disposed of in an environmentally friendly recycling process.

Neutralized mud must be stored in closed containers and stored/disposed of in accordance with applicable regulations. After neutralization and testing, larger spills diluted with water must be disposed of in accordance with applicable regulations.

Handling and storage:

- Batteries must be kept in cool, dry and well ventilated rooms with impermeable surfaces and appropriate containment conditions in case of leakage.
- Batteries must be protected from adverse weather conditions and separated from incompatible materials during storage and transport.
- A sufficient supply of water must be located nearby.
- Damage to containers where batteries are stored and transported must be prevented.
- Keep away from fire, sparks and excessive heat.

3.11.6 5CAUPS.xxxx-01

3.11.6.1 General information

The UPS connection cable establishes the connection between the UPS interface option and the battery unit.

3.11.6.2 Order data

Model number	Short description	Figure
	Uninterruptible power supplies	
5CAUPS.0005-01	UPS cable - 0.5 m - For 5AC901.IUPS-xx	
5CAUPS.0010-01	UPS cable - 1 m - For 5AC901.IUPS-xx	
5CAUPS.0030-01	UPS cable - 3 m - For 5AC901.IUPS-xx	

Table 184: 5CAUPS.0005-01, 5CAUPS.0010-01, 5CAUPS.0030-01 - Order data

3.11.6.3 Technical data

Product ID	5CAUPS.0005-01	5CAUPS.0010-01	5CAUPS.0030-01
General information			
Certification			
CE		Yes	
cULus		Yes	
cULus HazLoc Class 1 Division 2		Yes [1]	
GOST-R		Yes	
Cable construction			
Wire cross section		2x 0.5 mm² (AWG 20) 2x 2.5 mm² (AWG 13)	
Conductor resistance		At 0.5 mm² max. 39 Ω/km At 2.5 mm² max. 7.98 Ω/km [2]	
Outer sheathing			
Material		Thermoplastic PVC-based material	
Color		Window gray (similar to RAL 7040)	
Connector			
Type		Screw clamps, 4-pin [3]	
Electrical characteristics			
Operating voltage		Max. 30 VDC	
Peak operating voltage		Typ. 30 VDC	
Test voltage			
Wire/Wire		1500 V	
Current load		10 A at 20°C	
Environmental conditions			
Temperature			
Moving		-5 to 70°C	
Static		-30 to 70°C	
Mechanical characteristics			
Dimensions			
Length	0.5 m	1 m	3 m
Diameter		7 mm	
Flex radius			
Moving		10x wire diameter	
Fixed installation		5x wire diameter	
Weight	Approx. 55 g	Approx. 100 g	Approx. 250 g

Table 185: 5CAUPS.0005-01, 5CAUPS.0010-01, 5CAUPS.0030-01 - Technical data

1) Yes, although applies only if all components installed within the complete system have this certification and the complete system itself carries the corresponding mark.
2) At an ambient temperature of 20°C.
3) Tightening torque: min. 0.4 Nm, max. 0.5 Nm.

Information:

The maximum length of the UPS connection cable depends on the following:

- **Power**
- **Voltage drop**
- **Wire cross section**
- **Sensor lines**

3.11.6.4 Installation

For information about connecting the cable to the battery unit, please see section "Installing and connecting the UPS battery unit" on page 218.

3.12 Power supply

3.12.1 5AC902.PS00-00

3.12.1.1 General information

This AC power supply for the Panel PC can optionally be expanded to allow operation with 100~240 VAC.

3.12.1.2 Order data

Model number	Short description	Figure
	Power supply	
5AC902.PS00-00	PPC900 power supply 85-264 VAC	
	Required accessories	
	Terminal blocks	
0TB3103.8000	Connector, 230 VAC, 3-pin female, 4 mm² screw clamps, protected against vibration by the screw flange	

Table 186: 5AC902.PS00-00 - Order data

3.12.1.3 Technical data

Product ID	5AC902.PS00-00
General information	
Power button	Yes
Certification	
CE	Yes
cULus	Yes
cULus HazLoc Class 1 Division 2	Yes [1]
GOST-R	Yes
Input	
Nominal input voltage	100 to 240 VAC
Frequency	45 to 65 Hz
Starting current	<20 A (on cold restart, 100% load and 100 VAC)
Power failure bypass	>10 ms (100 VAC and 230 VAC)
Internal fuse	Yes
Output	
Nominal voltage	24 VDC ±10%
Output current	
0 to 55°C	5.5 A [2]
Mechanical characteristics	
Housing	
Material	Sheet metal
Coating	Anthracite
Dimensions	
Width	73.5 mm
Height	225.5 mm
Depth	53.5 mm
Weight	580 g

Table 187: 5AC902.PS00-00 - Technical data

1) Yes, although applies only if all components installed within the complete system have this certification and the complete system itself carries the corresponding mark.
2) At an ambient temperature of 0 to 55°C and nominal voltage.

3.12.1.4 Installation

For information about installing this power supply, please refer to the section "Installing or replacing the AC power supply" on page 201.

Chapter 3 • Installation

1 Installation

Danger!

- **All supplied power must be disconnected before removing device covers or components or installing/removing accessories, hardware or cables.**
- **The power cable must be disconnected from the device and from the voltage supply.**
- **All covers, components, accessories, hardware and cables must be installed or connected before the device can be connected to the power supply and turned on.**

1.1 Important installation information

- Environmental conditions must be taken into consideration.
- When installed in an enclosure, enough space must be available for air to circulate sufficiently.
- This device must be installed on a flat, clean and burr-free surface.
- This device is only certified for operation in enclosed rooms.
- This device must not be subjected to direct sunlight.
- Ventilation holes must not be covered.
- This device must be installed using one of the approved mounting orientations.
- The wall or control cabinet must be able to withstand four times the total weight of the device.
- The flex radius of connected cables (DVI, SDL, USB, etc.) must not be exceeded.
- This device must be installed in a position that minimizes glare on the screen.
- This device must be installed in a position and orientation that make viewing as easy as possible for the operator.

1.2 Installation Panel PC with AP9x3 display unit

The Panel PC 900 with AP9x3 display unit is installed in the cutout using retaining clips. The number of retaining clips depends on the display unit.

The thickness of the wall or cabinet plate must be between 1 mm and 6 mm.

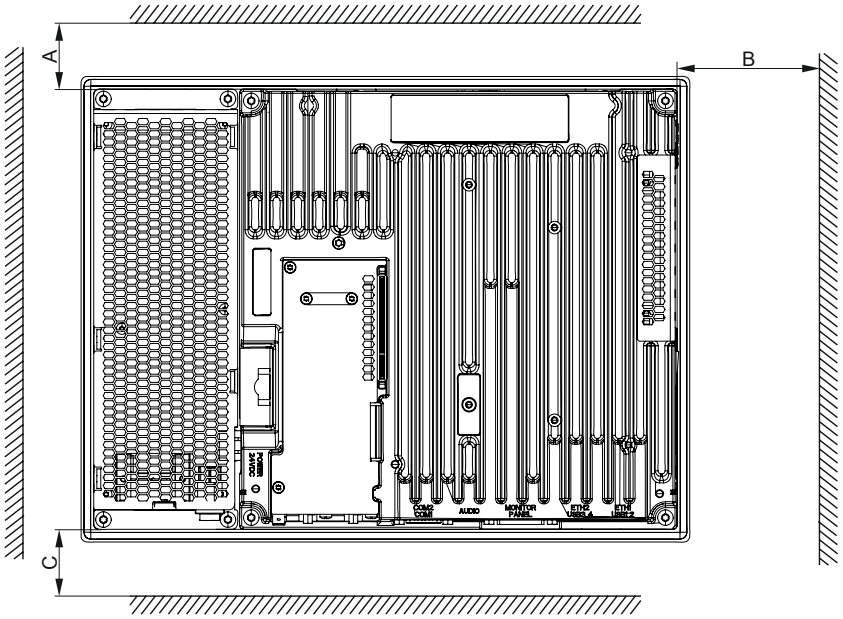
A 2.5 mm hex socket screwdriver is needed to tighten and loosen the screws on the retaining clips. The maximum tightening torque for the retaining clips is 1 Nm.

Devices must be installed on a flat, clean and burr-free surface; uneven areas can cause damage to the display when the screws are tightened or the intrusion of dust and water.

Information:

Sufficient clearance must be available on the sides of the Panel PC 900 (A, B and C in der image below) to allow unrestricted operation and maintenance of the back of the PPC. This clearance depends on the configuration of the Panel PC 900 as well as how it affects operating and service personnel.

- **The clearance indicated by the letter "A" is necessary to replace the fan kit and fan filter.**
- **The clearance indicated by the letter "B" is necessary to access the LED status indicators, the power and reset buttons, the CFast slot, the slide-in compact drive and the slide-in DVD drive.**
- **The clearance indicated by the letter "C" is necessary to connect and disconnect cables as well as to ensure that the maximum flex radius of cables is not exceeded.**



Procedure

1. Check whether the included mounting screws are screwed into the retaining clips. If not, then the mounting screws must be screwed into the retaining clips with a 2.5 mm hex key screwdriver. The mounting screws only need to be screwed in far enough that they no longer protrude above the retaining clip.

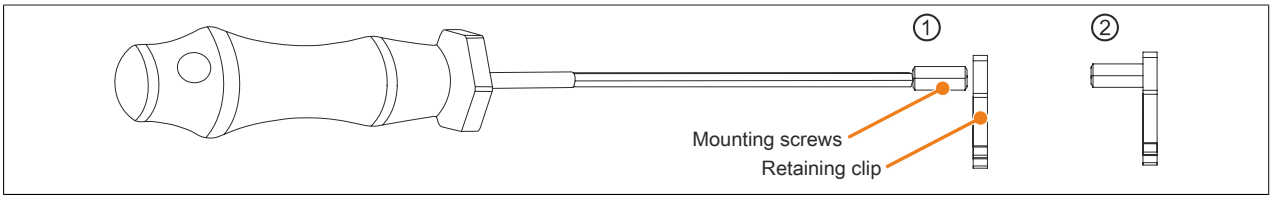


Figure 94: Preparing the retaining clips

2. Insert the device into the front side of the smooth, flat installation cutout. The dimensions for the cutout can be found in Tab. 11 "Installation diagrams - AP9x3 display units" on page 27.

3. Install the retaining clips on the device. This is done by inserting the clips into the openings on the sides of the device (indicated by the orange circles). The number of retaining clips may vary depending on the display unit. The exact number can be found in Tab. 11 "Installation diagrams - AP9x3 display units" on page 27.

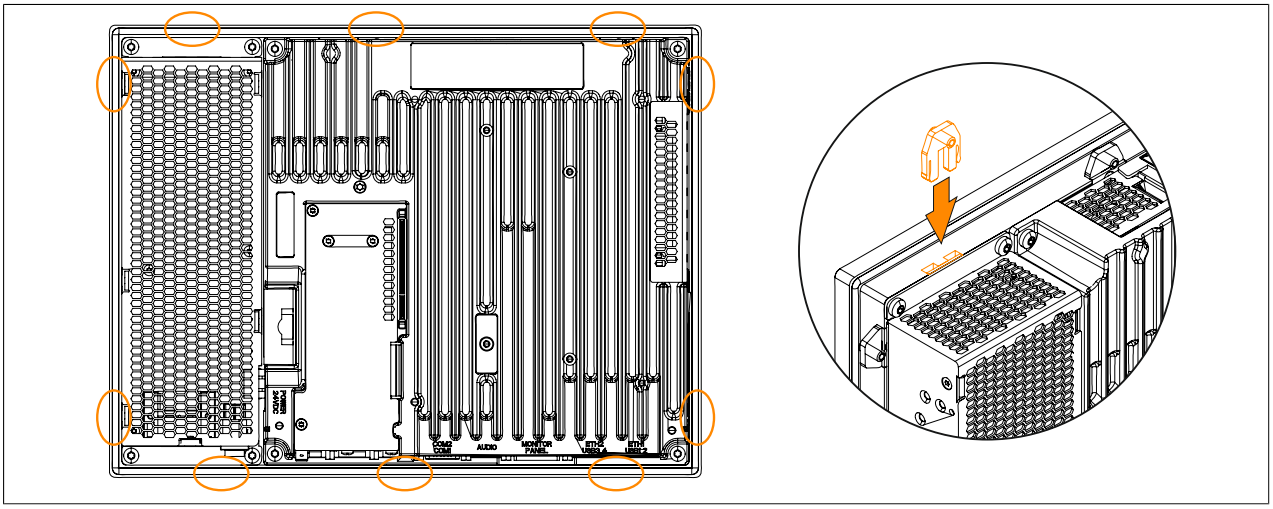


Figure 95: Inserting the retaining clips

4. Fasten the retaining clips to the wall or control cabinet by alternately tightening the screws with a 2.5 hex key screwdriver. The tightening torque should be max. 1 Nm to provide an optimal seal.

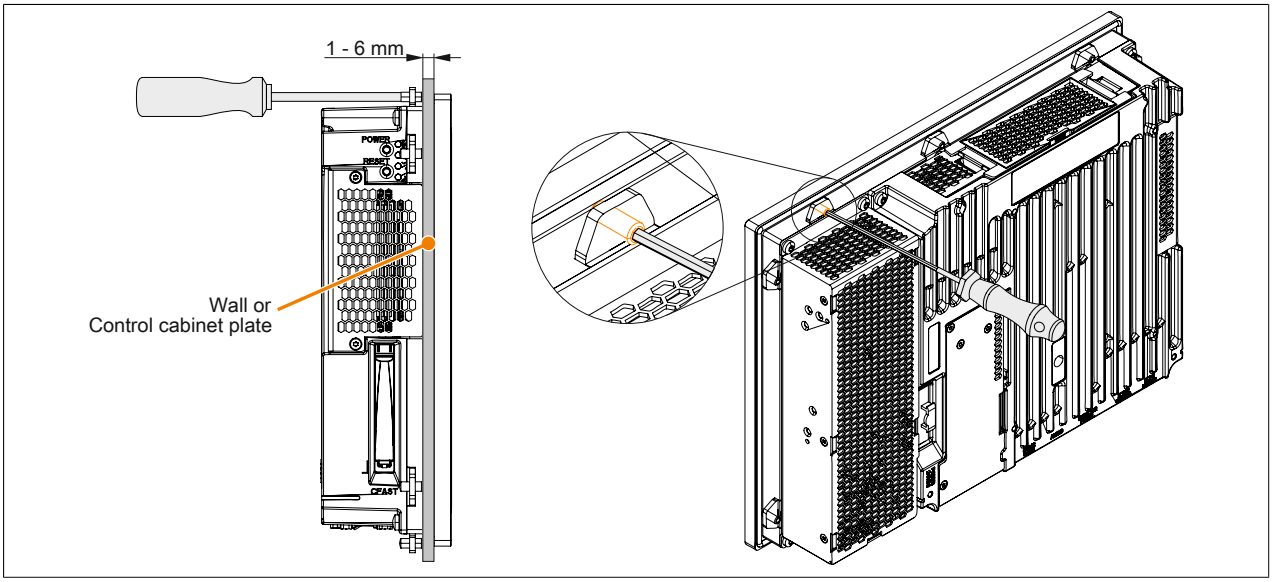


Figure 96: Fastening the retaining clips

1.3 Mounting an Automation Panel 1000 with retaining clips

The Panel PC 900 with AP1000 display unit is installed in the cutout using retaining clips. The number of retaining clips depends on the display unit.

The following Automation Panel 1000 display units are mounted using retaining clips:

- 5AP1120.0573-000
- 5AP1151.0573-000
- 5AP1120.0702-000
- 5AP1120.1043-000
- 5AP1180.1043-000
- 5AP1120.156B-000

The thickness of the wall or cabinet plate must be between 1 mm and 6 mm.

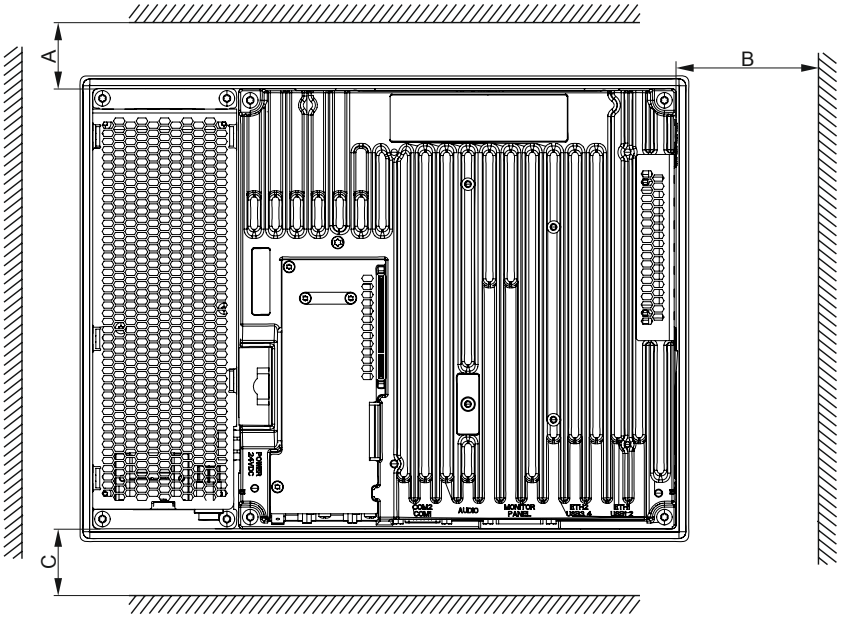
A 2.5 mm hex socket screwdriver is needed to tighten and loosen the screws on the retaining clips. The maximum tightening torque for the retaining clips is 1 Nm.

Devices must be installed on a flat, clean and burr-free surface; uneven areas can cause damage to the display when the screws are tightened or the intrusion of dust and water.

Information:

Sufficient clearance must be available on the sides of the Panel PC 900 (A, B and C in der image below) to allow unrestricted operation and maintenance of the back of the PPC. This clearance depends on the configuration of the Panel PC 900 as well as how it affects operating and service personnel.

- **The clearance indicated by the letter "A" is necessary to replace the fan kit and fan filter.**
- **The clearance indicated by the letter "B" is necessary to access the LED status indicators, the power and reset buttons, the CFast slot, the slide-in compact drive and the slide-in DVD drive.**
- **The clearance indicated by the letter "C" is necessary to connect and disconnect cables as well as to ensure that the maximum flex radius of cables is not exceeded.**



Procedure

1. Check whether the included mounting screws are screwed into the retaining clips. If not, then the mounting screws must be screwed into the retaining clips with a 2.5 mm hex key screwdriver. The mounting screws only need to be screwed in far enough that they no longer protrude above the retaining clip.

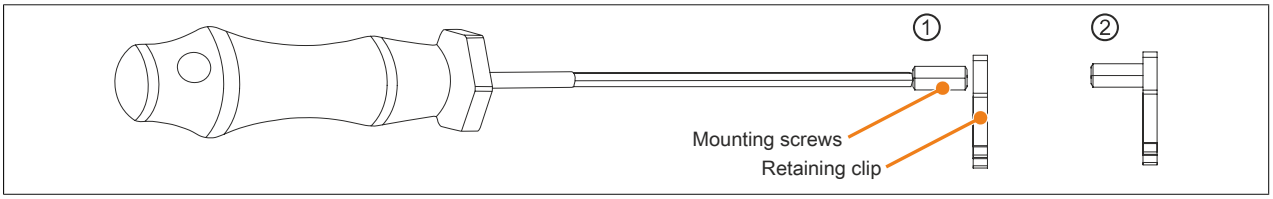


Figure 97: Preparing the retaining clips

2. Insert the device into the front side of the smooth, flat installation cutout. The dimensions for the cutout can be found in Tab. 12 "AP1000 display units with retaining clips - Installation diagrams" on page 28.
3. Install the retaining clips on the device. This is done by inserting the clips into the openings on the sides of the device (indicated by the orange circles). The number of retaining clips may vary depending on the display unit. The exact number can be found in Tab. 12 "AP1000 display units with retaining clips - Installation diagrams" on page 28.

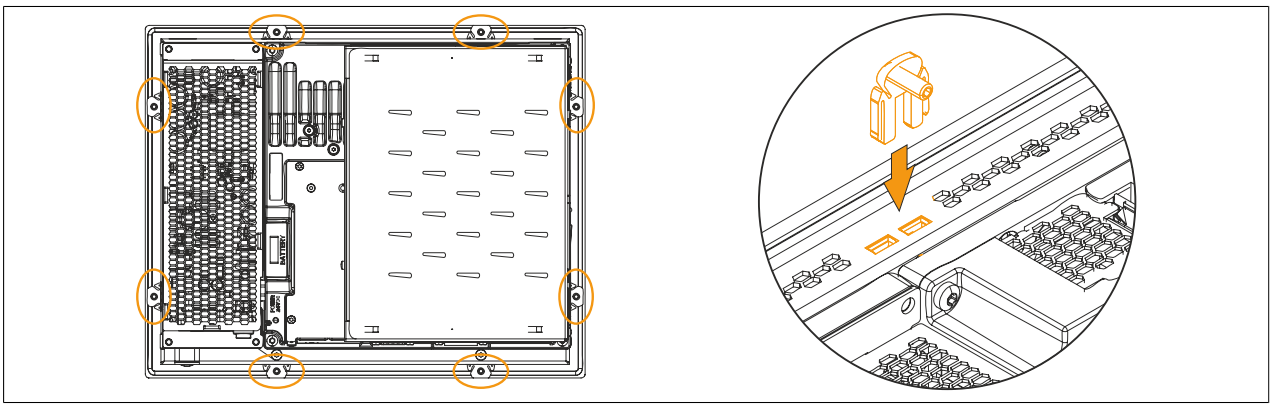


Figure 98: Inserting the retaining clips

4. Fasten the retaining clips to the wall or control cabinet by alternately tightening the screws with a 2.5 hex key screwdriver. The tightening torque should be max. 1 Nm to provide an optimal seal.

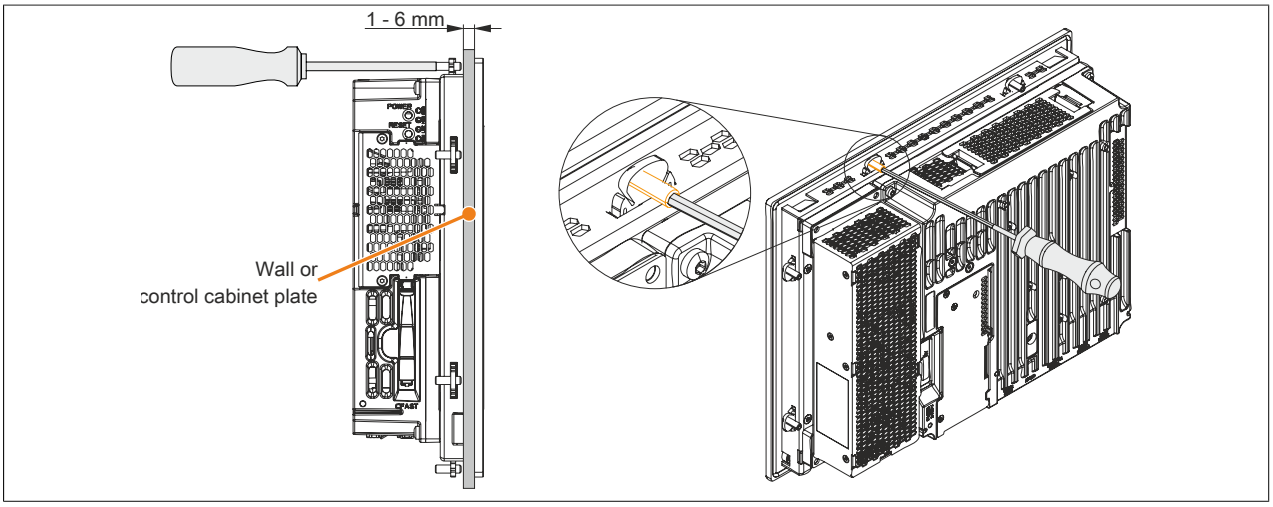


Figure 99: Fastening the retaining clips

1.4 Mounting an Automation Panel 1000 with clamping blocks

The Panel PC 900 with AP1000 display unit is installed in the cutout using clamping blocks. The number of clamping blocks depends on the display unit.

The following Automation Panel 1000 display units are mounted using clamping blocks:

- 5AP1181.1043-000
- 5AP1182.1043-000
- 5AP1120.1214-000
- 5AP1120.1505-000
- 5AP1180.1505-000
- 5AP1120.1906-000

The thickness of the wall or cabinet plate must be between 2 mm and 10 mm.

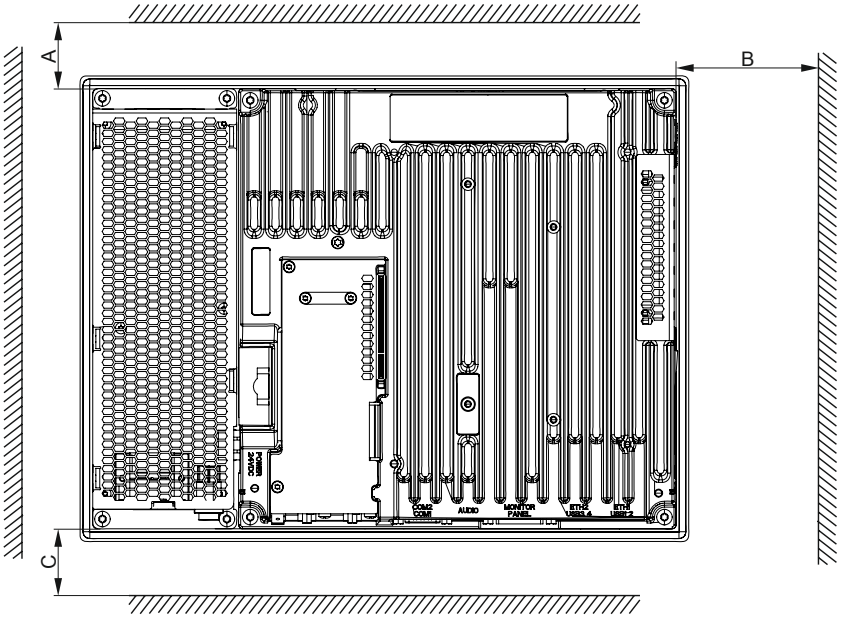
A 3 mm hex socket screwdriver is needed to tighten and loosen the screw on the clamping block. The maximum tightening torque for the screw is 0.5 Nm.

Devices must be installed on a flat, clean and burr-free surface; uneven areas can cause damage to the display when the screws are tightened or the intrusion of dust and water.

Information:

Sufficient clearance must be available on the sides of the Panel PC 900 (A, B and C in der image below) to allow unrestricted operation and maintenance of the back of the PPC. This clearance depends on the configuration of the Panel PC 900 as well as how it affects operating and service personnel.

- **The clearance indicated by the letter "A" is necessary to replace the fan kit and fan filter.**
- **The clearance indicated by the letter "B" is necessary to access the LED status indicators, the power and reset buttons, the CFast slot, the slide-in compact drive and the slide-in DVD drive.**
- **The clearance indicated by the letter "C" is necessary to connect and disconnect cables as well as to ensure that the maximum flex radius of cables is not exceeded.**



Procedure

1. Insert the device into the front side of the smooth, flat installation cutout. The dimensions for the cutout can be found in Tab. 13 "AP1000 display units with clamping blocks - Installation diagrams" on page 29. The number of clamping blocks may vary depending on the display unit. The exact number can be found in Tab. 13 "AP1000 display units with clamping blocks - Installation diagrams" on page 29.

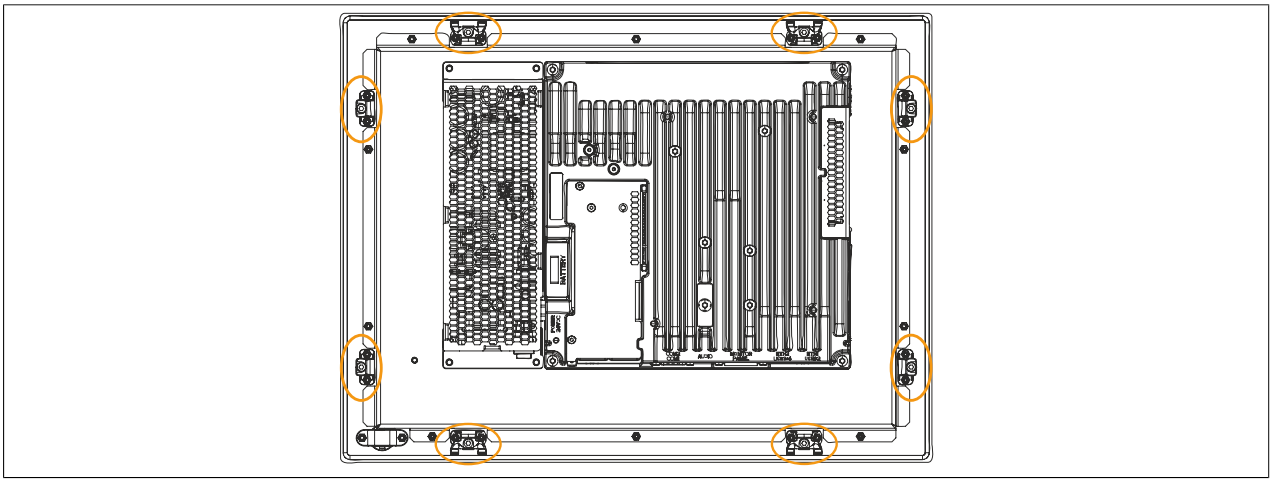


Figure 100: Position of the clamping blocks

2. Fasten the clamping blocks to the wall or control cabinet by alternately tightening the screws with a 3 mm hex key screwdriver. Tightening the screw presses down the integrated clamping lever to hold the device securely in place. The tightening torque should be max. 0.5 Nm to provide an optimal seal.

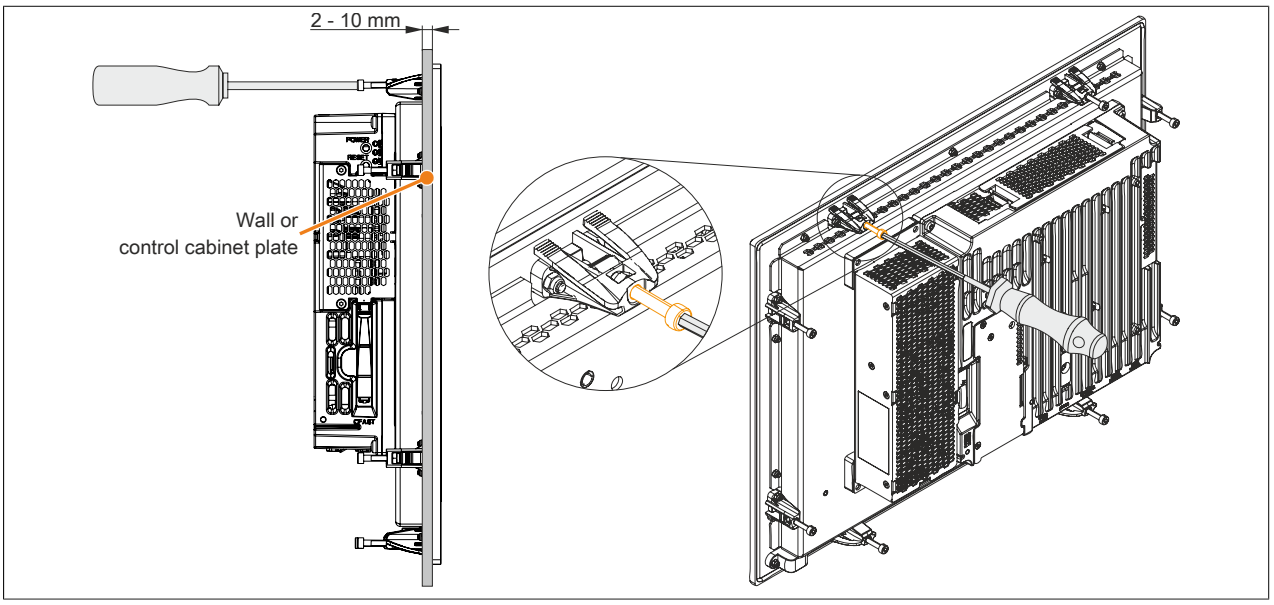


Figure 101: Fastening the clamping blocks

1.5 Installation information for individual components

Information:

If the Panel PC 900 is not delivered as a complete system but as individual components (or individual components are installed afterward), then these components must be enabled in BIOS. This is done by launching BIOS when booting the system, loading the default BIOS values and then saving the settings. For additional information, see "Save & Exit" on page 289. This is required for the following individual components:

- **CPU board and system unit**
- **Interface option**
- **Fan kit**
- **Bus unit**

1.6 Replacing the CPU board and system unit

1. Disconnect the power supply to the B&R Industrial PC (disconnect the power cable). Isolate the system from all potential sources of electrical power!
2. Touch the housing or ground connection in order to discharge any electrostatic charge from your body.

> **Information:**
>
> **If a bus unit is mounted on the Panel PC, it must be removed first.**

3. Remove the Panel PC from the control cabinet by following the installation steps in reverse order.
4. Place the Panel PC on a clean, flat surface.
5. Remove the 4 Torx screws (T20) and 2 Torx screws (T10) shown in the following image.

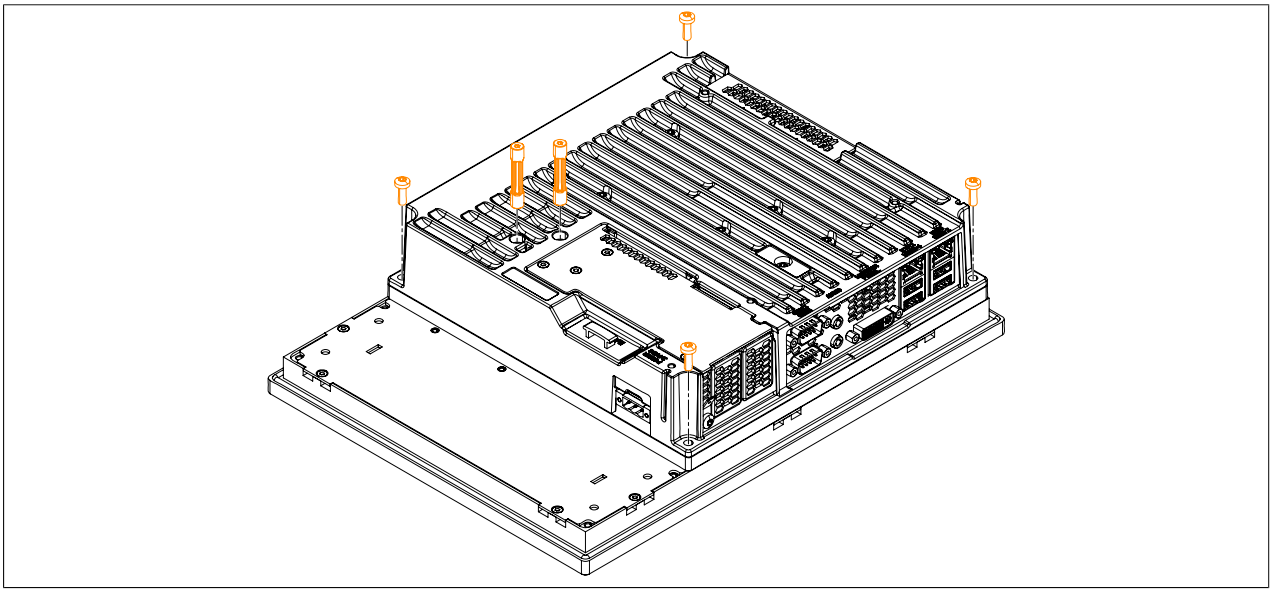


Figure 102: Removing the Torx screws on the system unit

6. Remove the system unit with the installed CPU board.

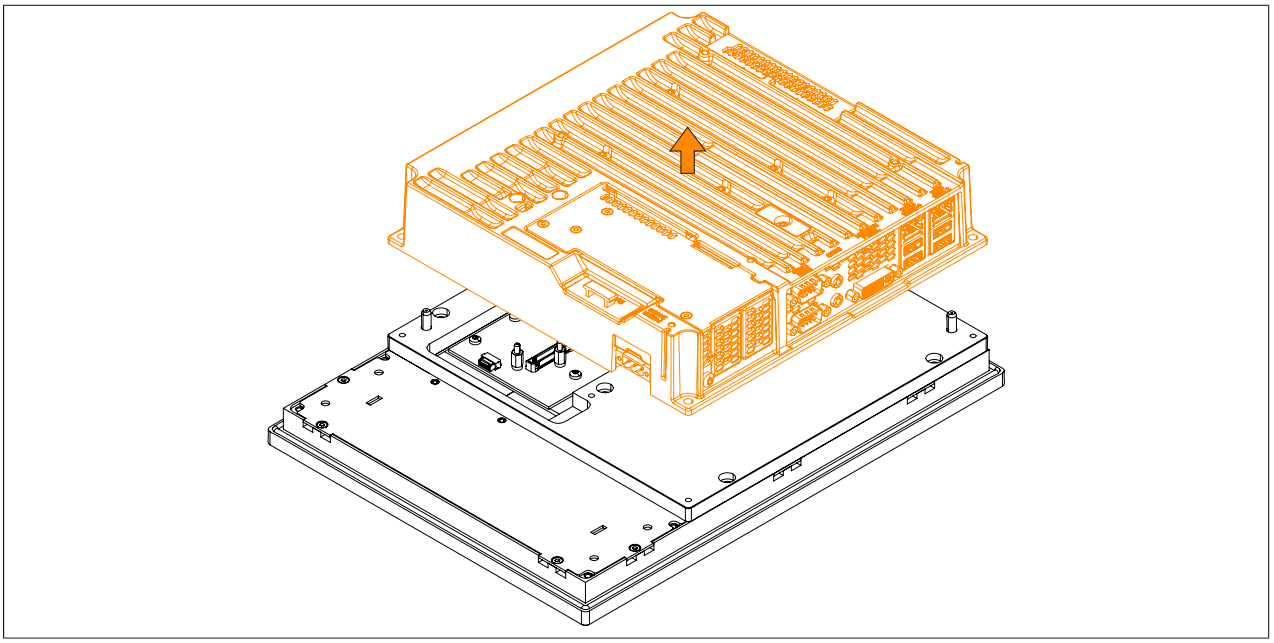


Figure 103: Removing the system unit and CPU board

7. A different system unit with a preinstalled CPU board can now be installed on the display unit. Installation takes place in reverse order. The max. tightening torque is 0.5 Nm for the T10 Torx screws and 1.2 Nm for the T20 Torx screws.

It is very important that the system unit is installed correctly. The connector for the display interface must be carefully connected to the female connector on the display unit.

8. If the Panel PC 900 is converted to an Automation Panel, then the mounting plate must also be removed. To do so, remove the 5 Torx screws (T20) indicated below.

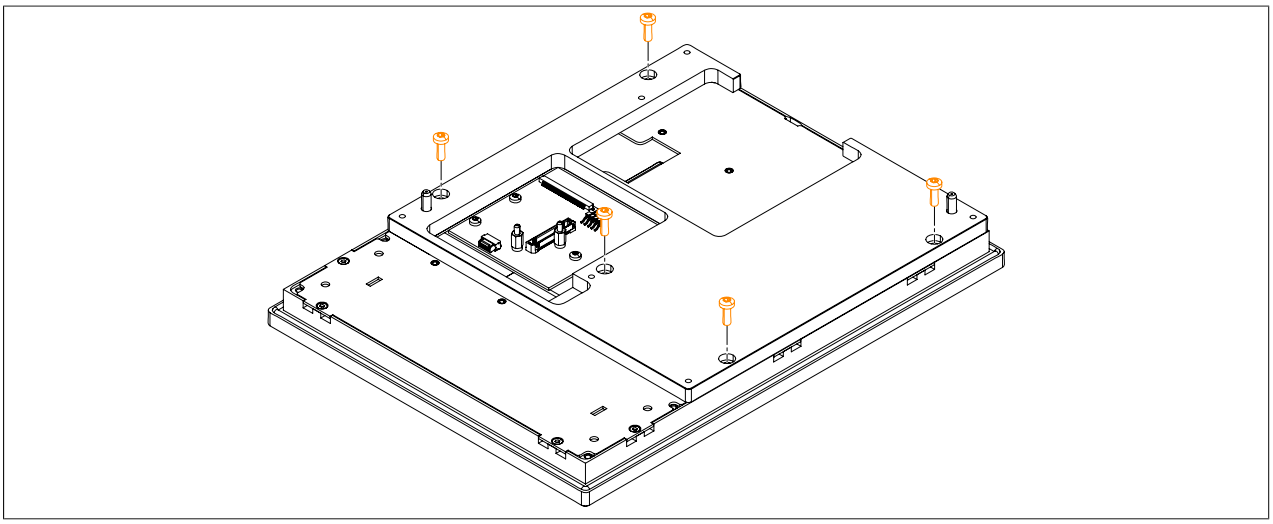


Figure 104: Removing the Torx screws on the mounting plate

9. Remove the mounting plate from the display unit.

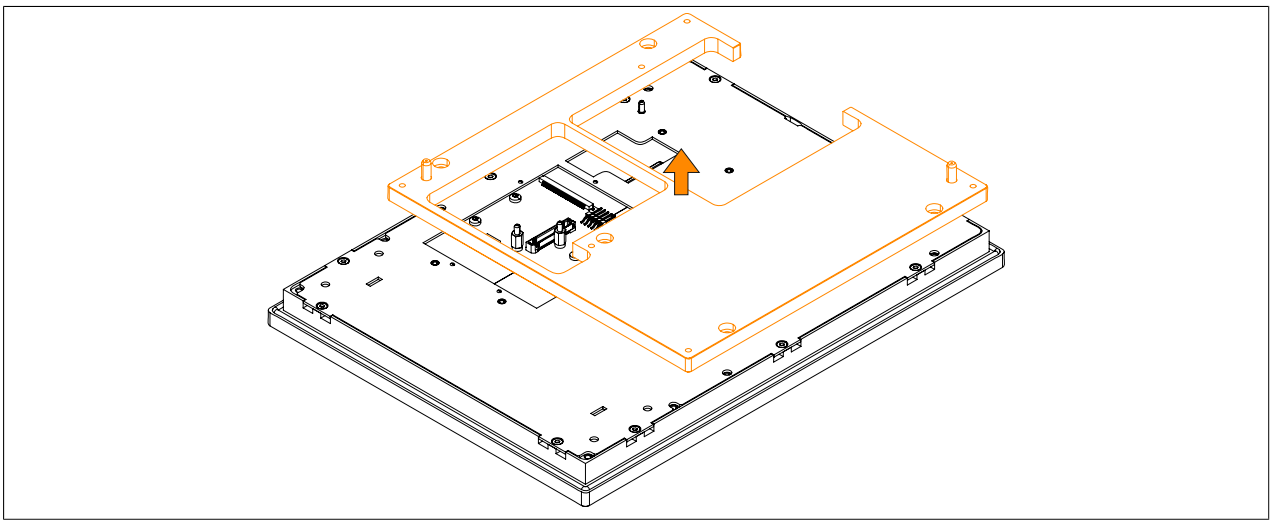


Figure 105: Removing the mounting plate

10. The mounting plate is installed by following these instructions in reverse; the max. tightening torque is 1.2 Nm. It is very important that the mounting plate is installed correctly.

1.7 Installing or replacing the AC power supply

1. The on/off switch must be set to position "0" (off). Disconnect the power supply to the B&R Industrial PC (disconnect the power cable). Isolate the system from all potential sources of electrical power!
2. Touch the housing or ground connection in order to discharge any electrostatic charge from your body.
3. Remove the Panel PC from the control cabinet by following the installation steps in reverse order.
4. Place the Panel PC on a clean, flat surface.
5. Remove the Torx screws (T20) indicated in the following image.

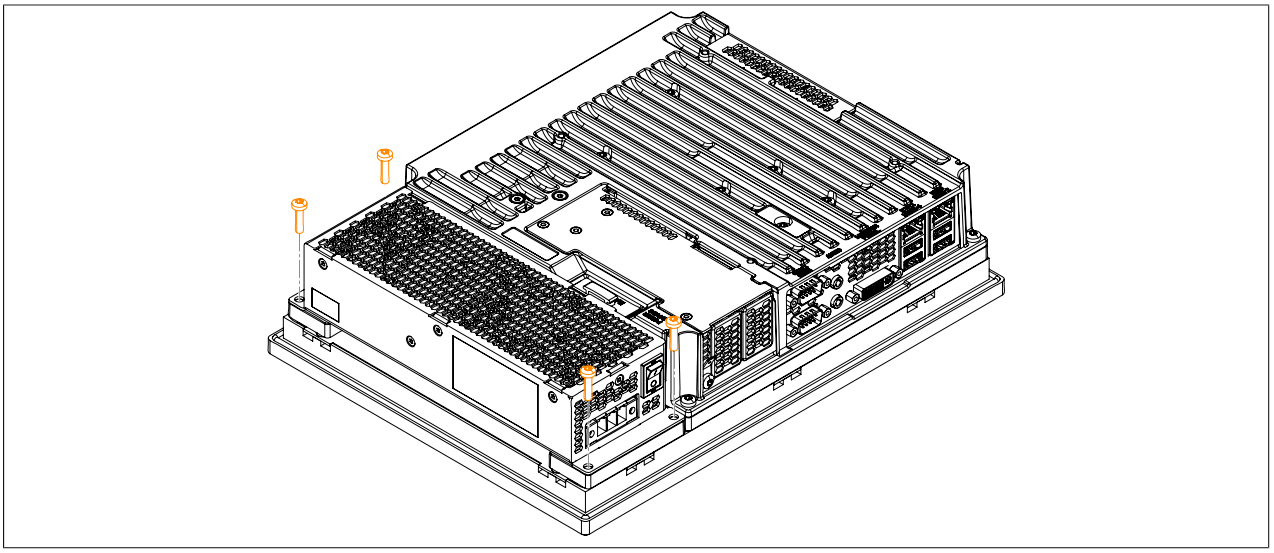


Figure 106: Removing the screws

6. The AC power supply can now be removed parallel to the Panel PC in the direction indicated by the arrows in the image below. Exercise caution to prevent damage to the power supply connector.

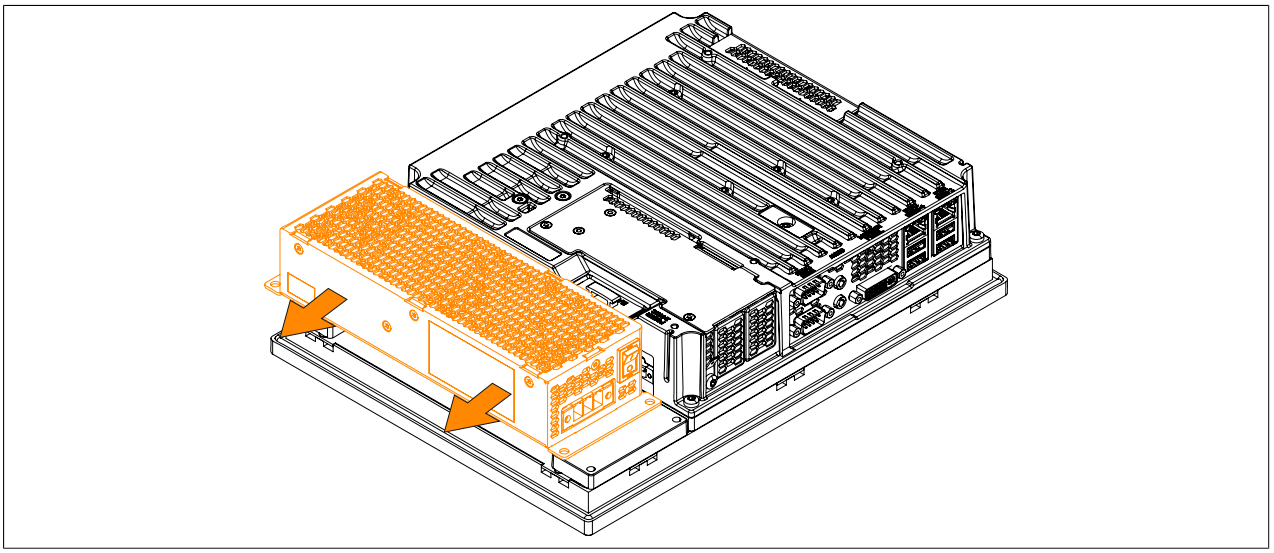


Figure 107: Replacing the AC power supply

7. If the AC power supply is being installed for the first time (i.e. not a replacement), then both mounting plates must be installed first. To do so, guide the mounting plates into each of the three slots at a slight angle. These mounting plates are included with the AC power supply.

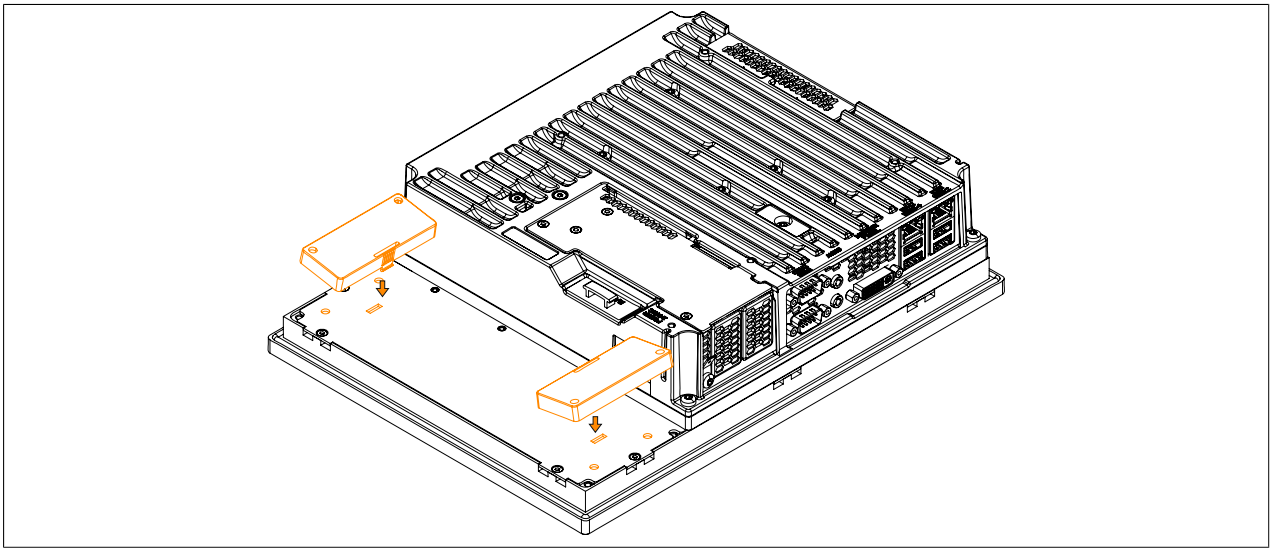


Figure 108: Installing the mounting plates

8. To install an AC power supply on the Panel PC, it must be aligned parallel to the Panel PC. Plug the power supply connector into the female connector on the Panel PC.
9. Fasten the AC power supply with the 4 Torx screws (T20) (max. tightening torque 1.2 Nm). It is important that it is aligned parallel to the housing. The power supply connector must click into place in the female connector on the Panel PC. There must not be any pressure or mechanical stress on the connector.

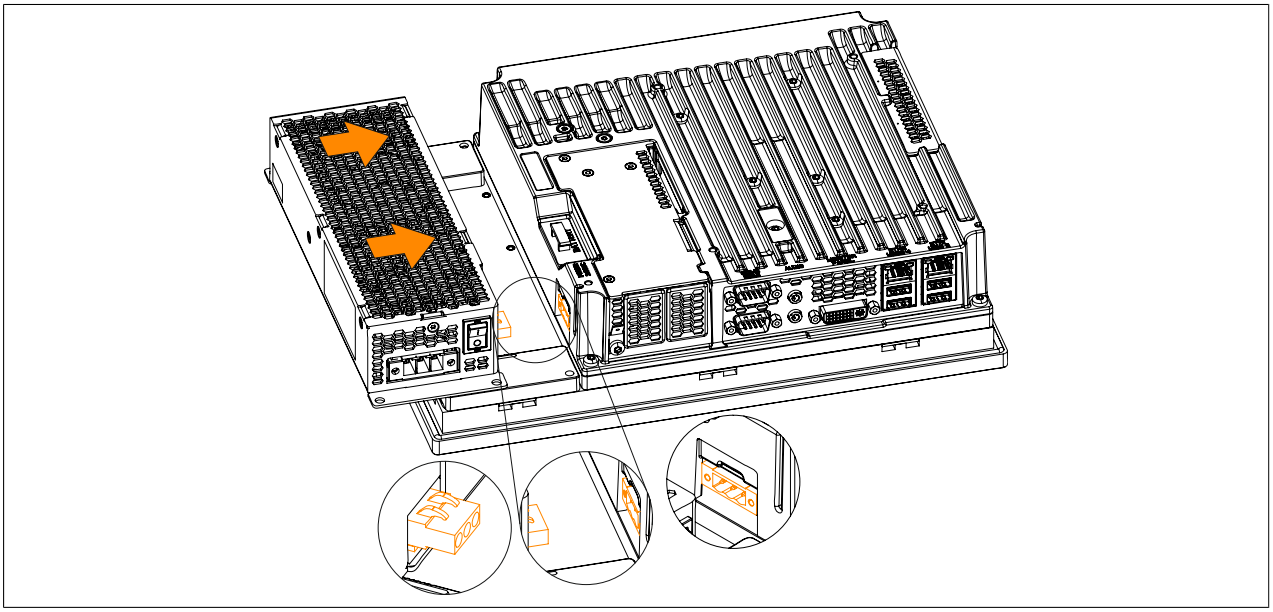


Figure 109: Installing the AC power supply

10. The Panel PC can now be installed back in the control cabinet.

1.8 Replacing main memory modules

Information:

The Panel PC has 2 slots for main memory modules. Only the following B&R main memory modules are permitted:

- **5MMDDR.1024-03, 5MMDDR.2048-03, 5MMDDR.4096-03, 5MMDDR.8192-03**

1. Disconnect the power supply to the B&R Industrial PC (disconnect the power cable). Isolate the system from all potential sources of electrical power!
2. Discharge any electrostatic charge on the ground connection.
3. Remove the Panel PC from the control cabinet by following the installation steps in reverse order.
4. Place the Panel PC on a clean, flat surface.
5. Remove the Torx screws (T10) indicated in the following image.

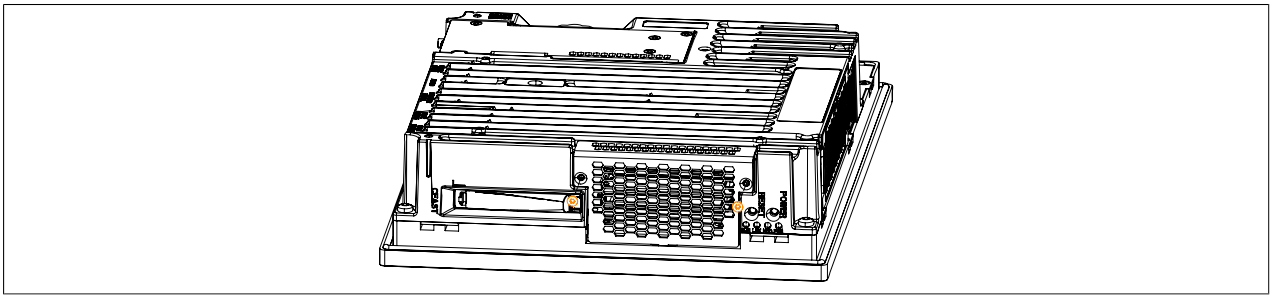


Figure 110: Removing the Torx screws

6. Tilt the cover plate forward and remove it by sliding it upward.

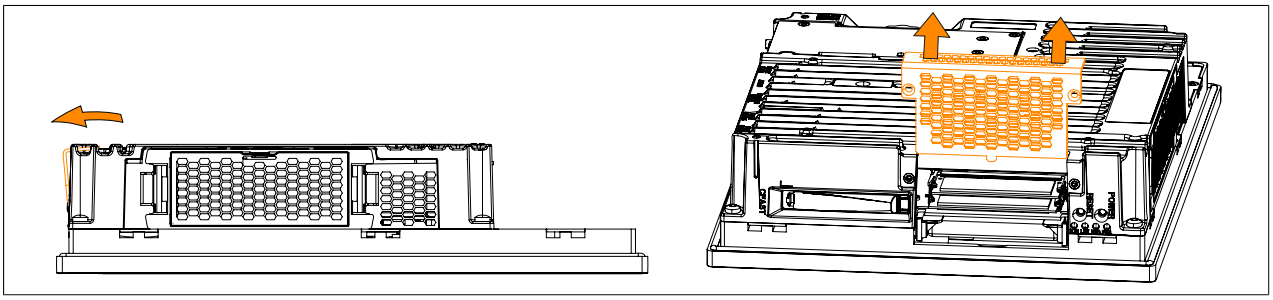


Figure 111: Removing the cover plate

Information:

The lower main memory module can only be replaced after the top one has been removed.

7. The main memory modules can now be replaced. This is done by carefully pressing the fastening clamps outward and pull out the main memory module.

8. If inserting a new main memory module, align the notch on the connector side of the memory module with the notch above the slot. The main memory module can then be carefully pressed into the slot until the fastening clamps are engaged.

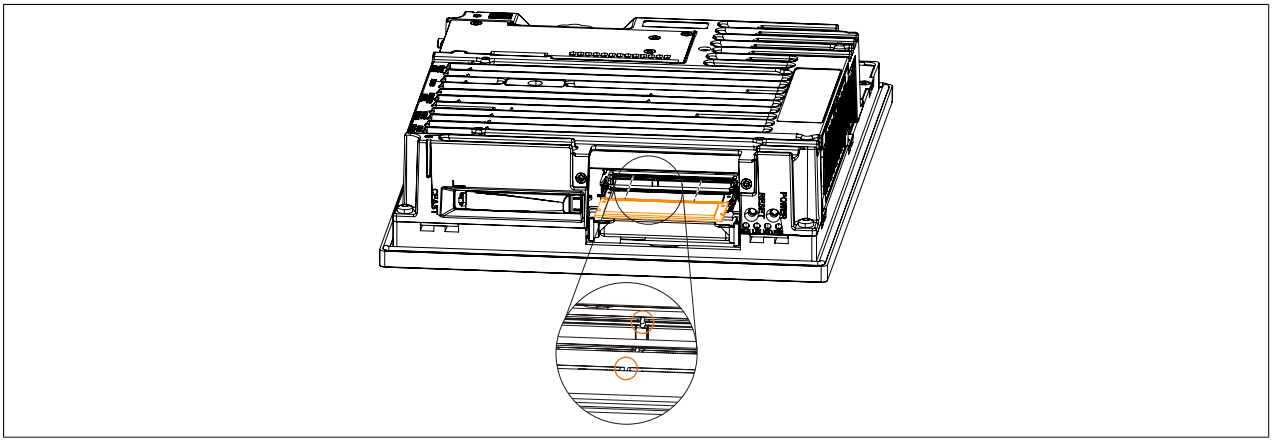
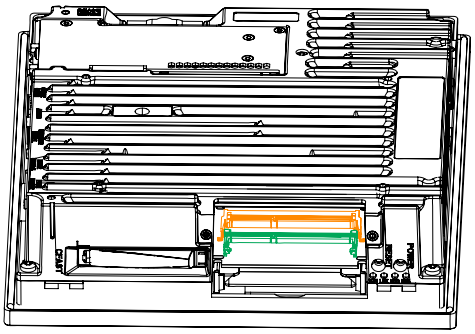
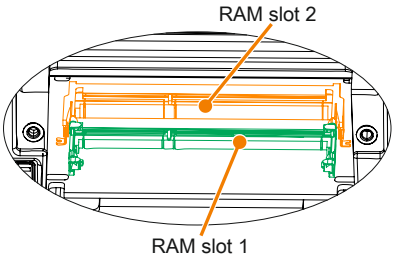


Figure 112: Replacing main memory modules

Caution!

If using only one main memory module, it must be installed in RAM slot 2.





9. The cover plate can now be replaced by following these steps in reverse order. The maximum tightening torque of the Torx screws (T10) is 0.5 Nm.
10. The Panel PC can now be installed back in the control cabinet.

1.9 Installing the interface option

Information:

Please note that not every interface option can be installed in interface slots 1 and 2. For more information, see the sections "IF option 1 slot" on page 61 and "IF option 2 slot" on page 61.

1. Disconnect the power supply to the B&R Industrial PC (disconnect the power cable). Isolate the system from all potential sources of electrical power!
2. Touch the housing or ground connection in order to discharge any electrostatic charge from your body.

Information:

If a bus unit is mounted on the Panel PC, it must be removed first.

3. Remove the Torx screws (T10) indicated by ① in the following image. The Torx screws indicated by ② only need to be removed if an IF option is already mounted.

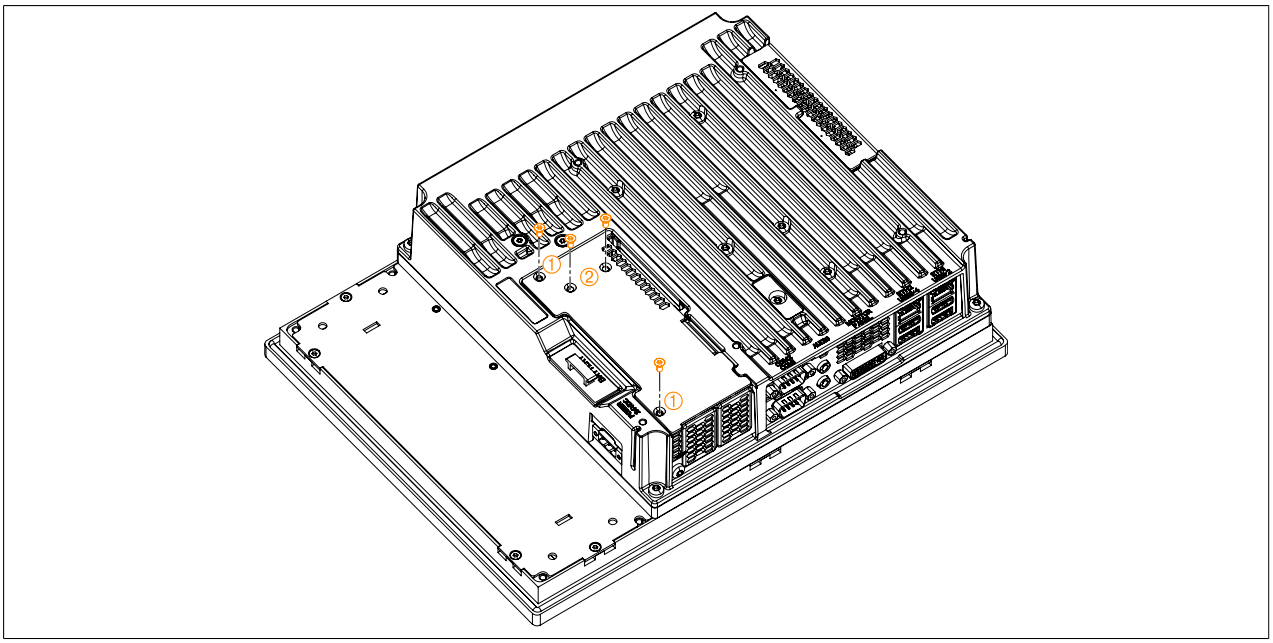


Figure 113: Removing the Torx screws from the cover plate

4. Lift the cover plate up and away to remove it.

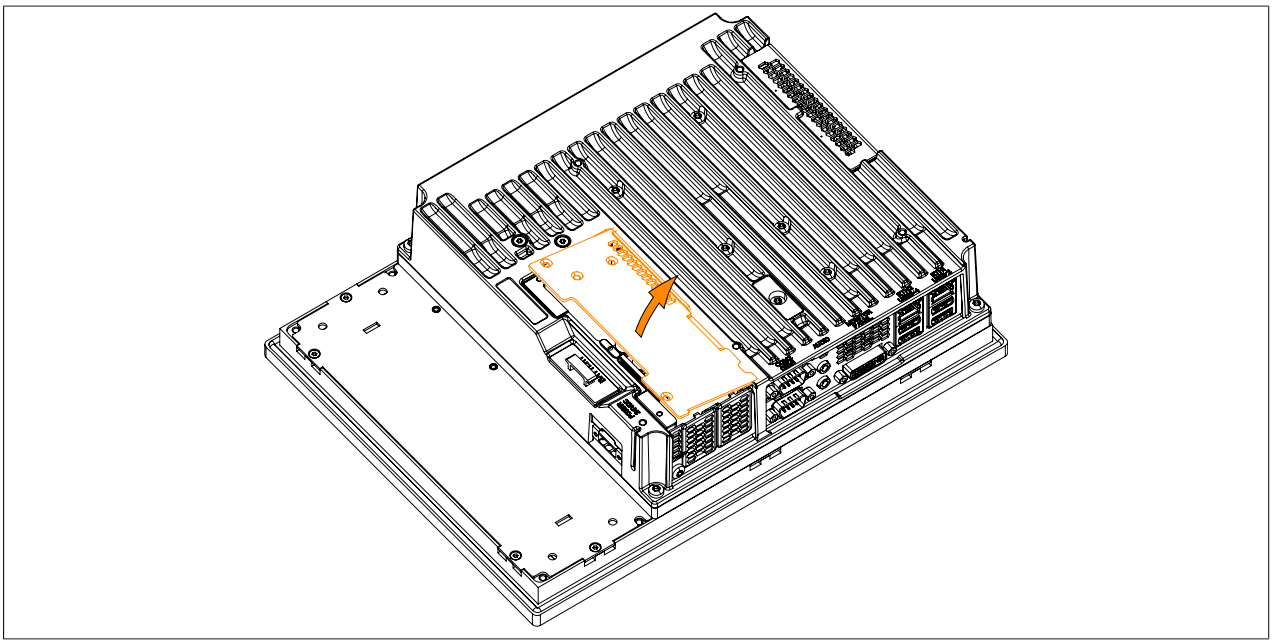


Figure 114: Removing the cover plate

5. Remove the cover plate by sliding it upwards and also remove the installed IF option.

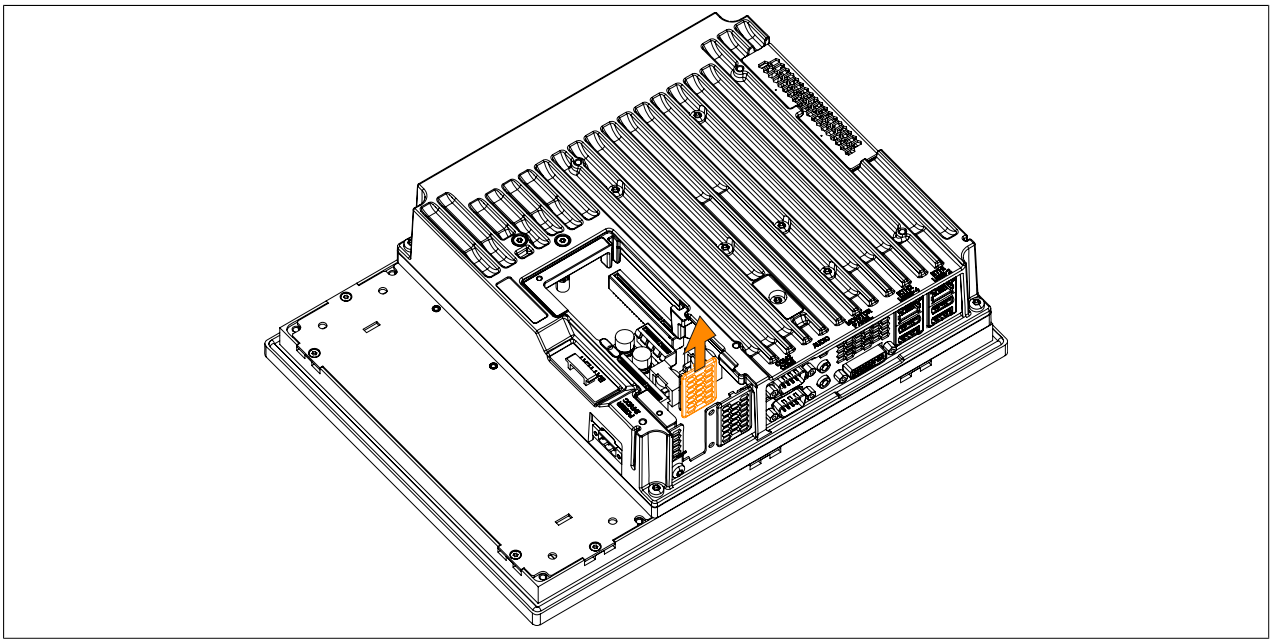


Figure 115: Removing the Torx screws and slot cover

6. Insert the interface option in the slot and fasten it to the Panel PC (max. tightening torque 0.5 Nm) with 2 Torx screws (T10).

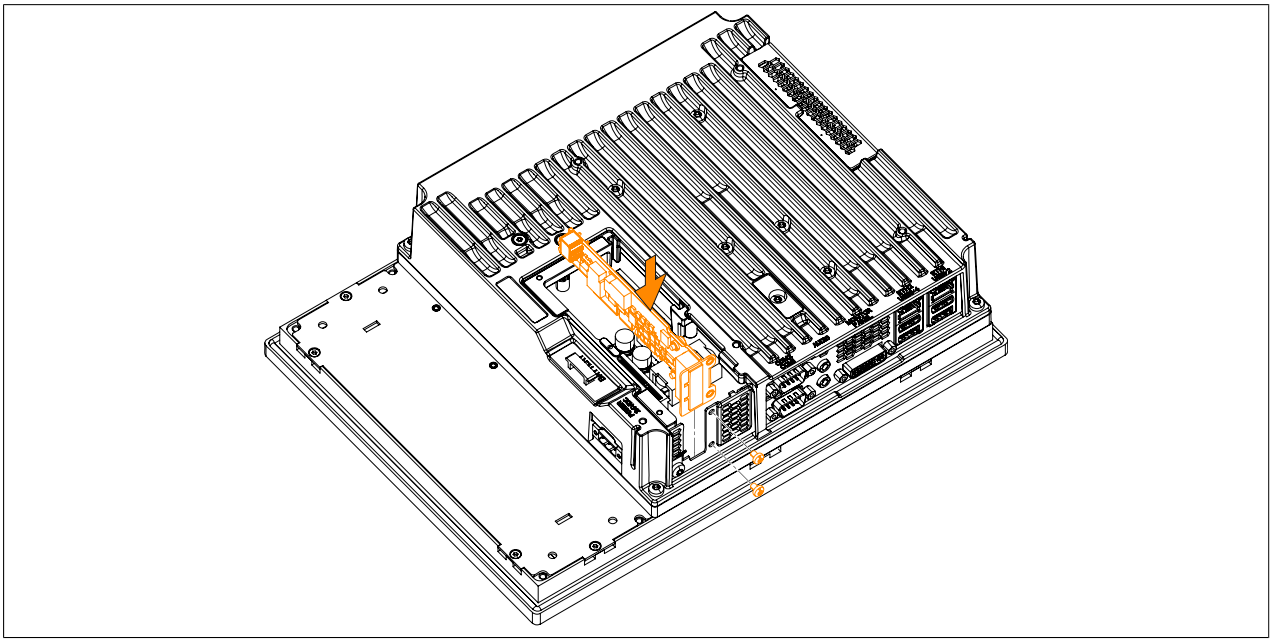


Figure 116: Inserting and fastening the IF option

7. Replace the cover plate.

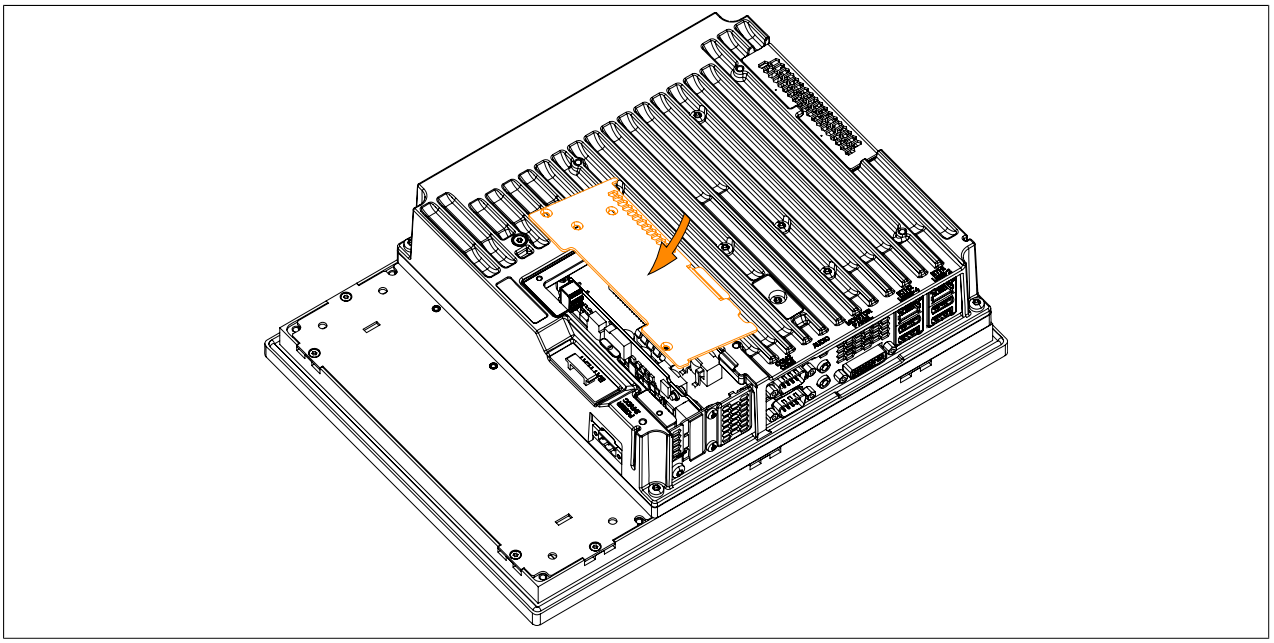


Figure 117: Replacing the cover plate

8. Secure the cover plate to the B&R Industrial PC using the same Torx screws (T10) from before. The Torx screws indicated by ② only need to be tightened if an IF option is mounted (max. tightening torque 0.5 Nm).

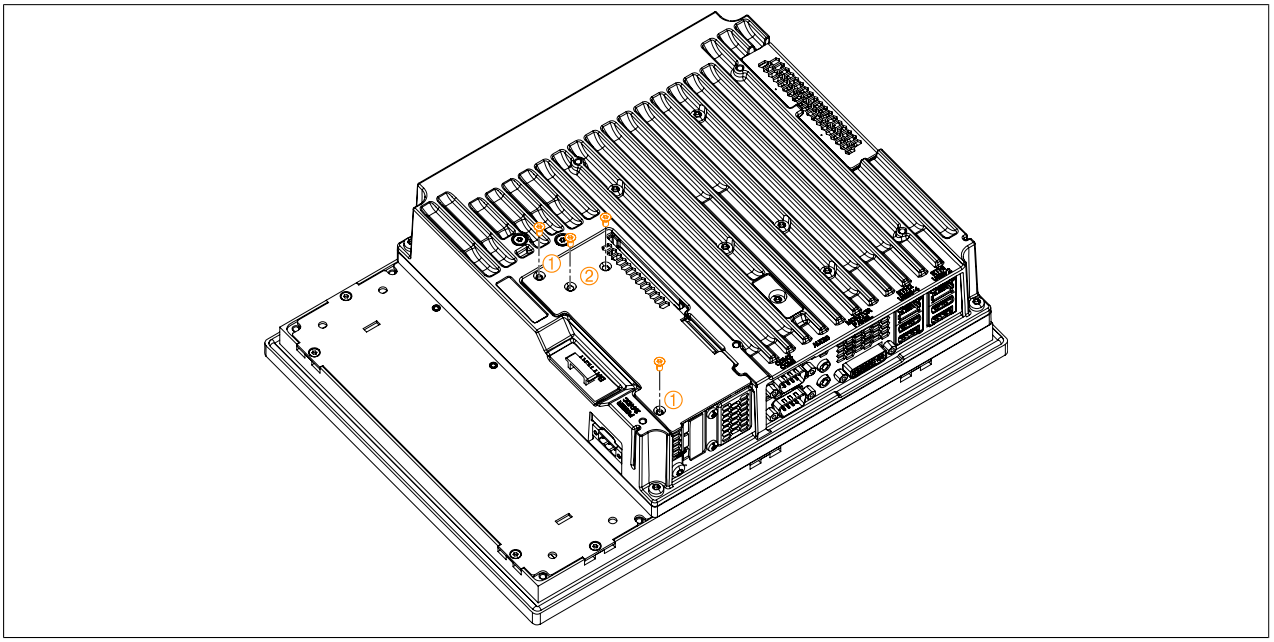


Figure 118: Fastening the cover plate with the Torx screws

9. Once installed successfully, the interface option must be enabled in BIOS. This is done by launching BIOS when booting the system, loading the default BIOS values and then saving the settings. For additional information, see "Save & Exit" on page 289.

1.10 Installing and replacing the slide-in compact drive

Information:

The slide-in compact drive can only be replaced without removing the PPC from the control cabinet if the wall is less than 5.5 mm thick. Steps 3, 4 and 11 are only necessary if the Panel PC is removed from the cabinet.

1. Disconnect the power supply to the B&R Industrial PC (disconnect the power cable). Isolate the system from all potential sources of electrical power!
2. Touch the housing or ground connection in order to discharge any electrostatic charge from your body.
3. Remove the Panel PC from the control cabinet by following the installation steps in reverse order.
4. Place the Panel PC on a clean, flat surface.
5. Remove the Torx screws (T10) indicated in the following image.

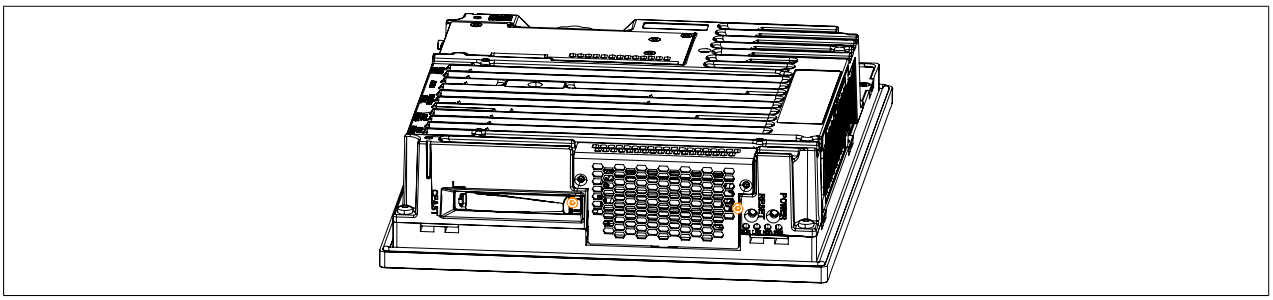


Figure 119: Removing the Torx screws

6. Tilt the cover plate forward and remove it by sliding it upward.

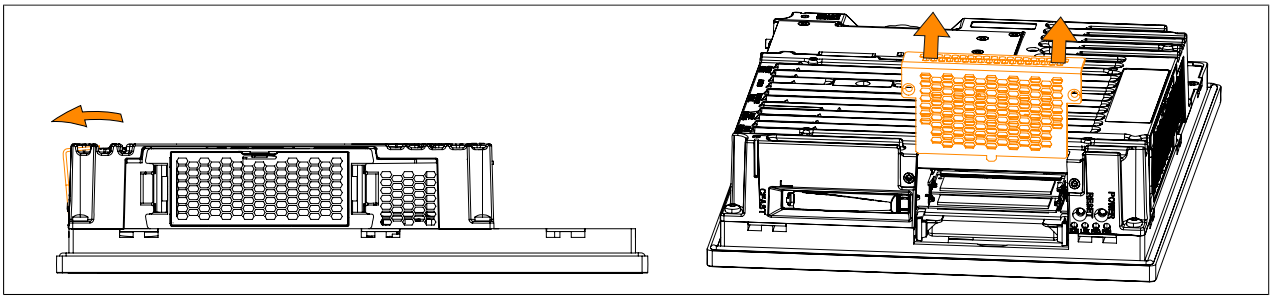


Figure 120: Removing the cover plate

7. Free the plastic removal strip fastened to the side of the slide-in compact drive.

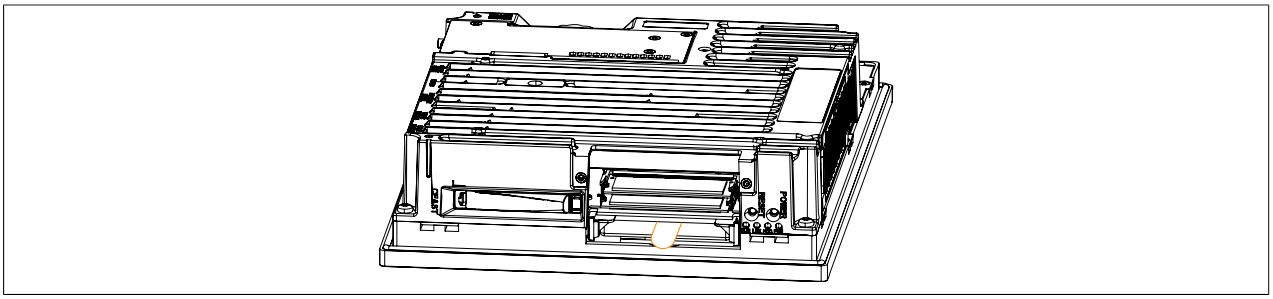


Figure 121: Freeing the removal strip on the slide-in compact drive

8. Pull firmly on the removal strip to remove the slide-in compact drive.

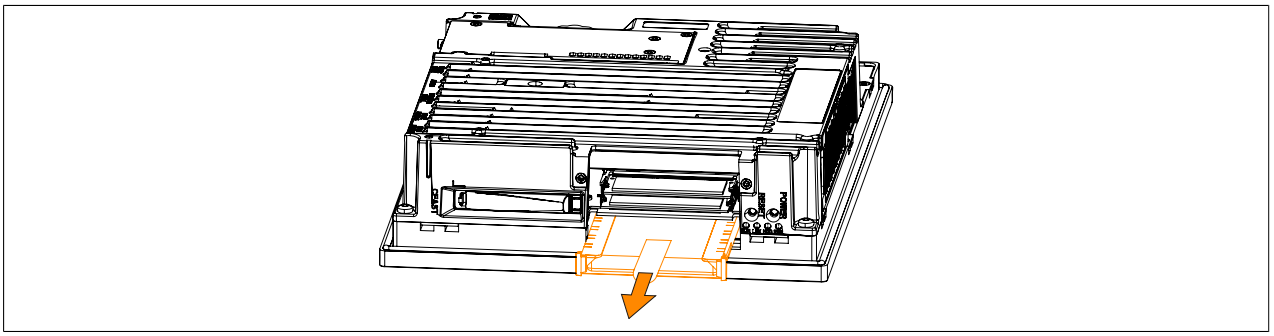


Figure 122: Removing the slide-in compact drive

9. When inserting a slide-in compact drive, be sure to align it with the guide rails. Tuck the removal strip back between the drive and the frame (as it was before it was pulled out).
10. The cover plate can now be replaced by following these steps in reverse order.
11. The Panel PC can now be installed back in the control cabinet.

1.11 Replacing the fan kit

1. Disconnect the power supply to the B&R Industrial PC (disconnect the power cable). Isolate the system from all potential sources of electrical power!
2. Touch the housing or ground connection in order to discharge any electrostatic charge from your body.
3. Press in the indicated latching mechanisms (①) while pulling out the fan kit (②) at the same time.

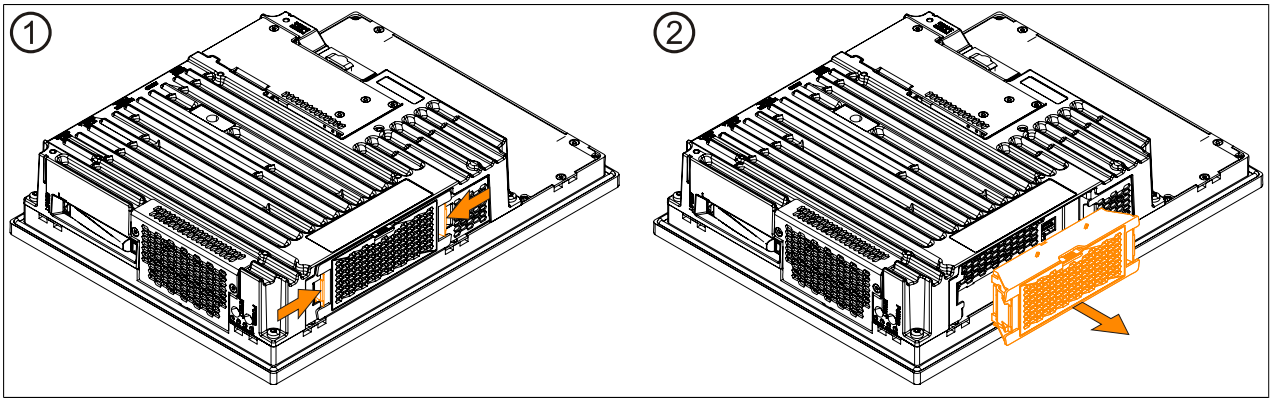


Figure 123: Pressing in the latching mechanisms

4. A new fan kit can now be installed. Align the fan kit parallel to the Panel PC and press it in until it latches. Make sure the fan kit is inserted so that the connections match up.
5. If a fan kit is being installed for the first time (i.e. fan kit previously not used in device), then it still needs to be programmed. To do so, follow the instructions in the "Programming fan kit data" section.
   If a fan kit has been removed from the device and is not being replaced, then its data must be deleted. To do so, follow the instructions in the "Deleting fan kit data" section.

> **Information:**
>
> **If a fan kit has been replaced, then an incorrect serial number will be displayed. To display the correct serial number, the fan kit data must be deleted and reprogrammed.**

6. After the fan kit has been programmed, the BIOS default values must be loaded and the settings saved. For additional information, see "Save & Exit" on page 289.

Programming fan kit data

> **Information:**
>
> **If a fan kit is being installed for the first time (i.e. fan kit previously not used in device), then it still needs to be programmed.**

1. Boot the B&R Industrial PC and type the following on the command line:
   `mtxcsvc i fanfset` - Checks whether the fan kit has already been programmed
2. If the fan kit has not yet been programmed, this can be done by typing in the following:
   `mtxcsvc u fanfset "fn"` - The path of the file and filename must be specified in place of "fn".

Deleting fan kit data

> **Information:**
>
> **If a fan kit has been removed from the device and is not being replaced, then its data must be deleted.**

1. Boot the B&R Industrial PC and type the following on the command line:
   `mtxcsvc i fanfset` - Checks whether the fan kit has already been programmed
2. Since a fan kit was already installed, its data must be deleted. This is done by typing the following on the command line:
   `mtxcsvc d fanfset` - Deletes the data for the previously installed fan kit

1.12 Replacing the fan filter

1. Disconnect the power supply to the B&R Industrial PC (disconnect the power cable). Isolate the system from all potential sources of electrical power!
2. Touch the housing or ground connection in order to discharge any electrostatic charge from your body.
3. Press down the indicated latching mechanism (①) while pulling out the filter cover (②) at the same time.

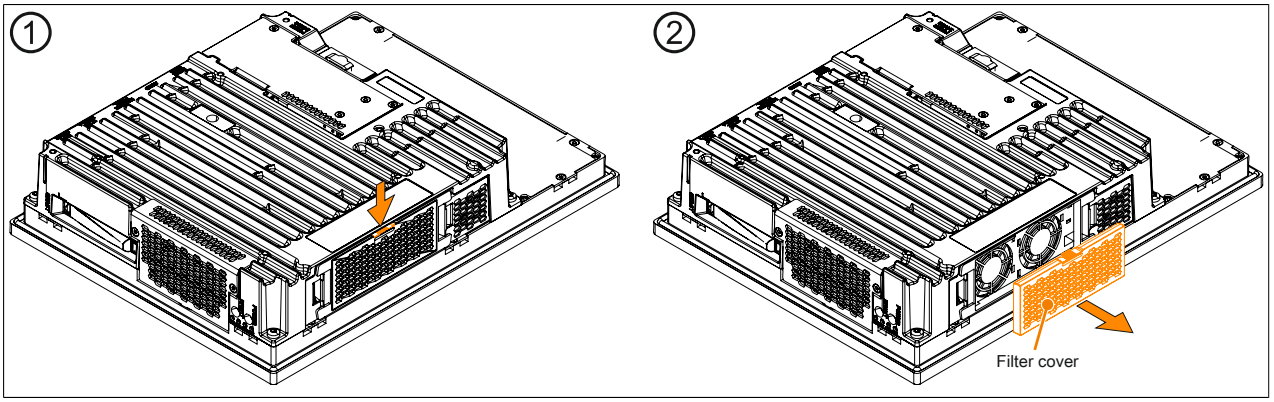


Figure 124: Removing the filter cover

4. Insert the new filter cover into the fan kit by following these instructions in the reverse order.

1.13 Installing the bus unit

Information:

Since the 5AC902.BX02-02 bus unit is supported beginning with firmware version V1.14, a firmware upgrade must be carried out before installation. See "Firmware upgrade" on page 301.

1. Disconnect the power supply to the B&R Industrial PC (disconnect the power cable). Isolate the system from all potential sources of electrical power!
2. Touch the housing or ground connection in order to discharge any electrostatic charge from your body.
3. Remove the Panel PC from the control cabinet by following the installation steps in reverse order.
4. Place the Panel PC on a clean, flat surface.
5. Remove the 2 or 4 Torx screws (T10). Slide the cover plate forward to remove it.

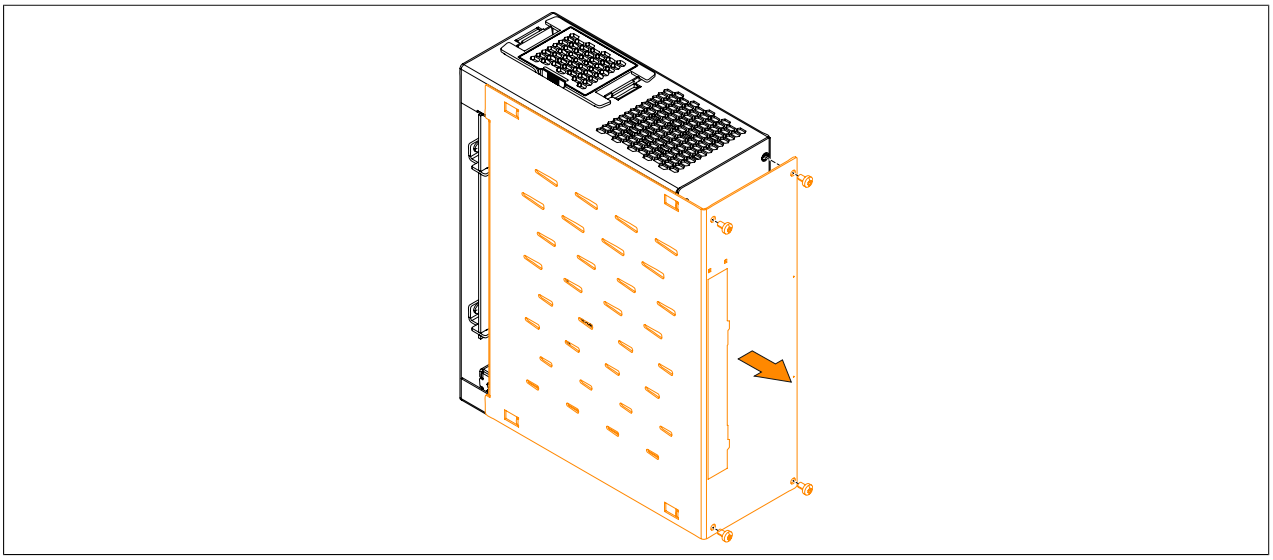


Figure 125: Removing the Torx screws and side cover

6. Install the bus unit on the system unit using the 4 Torx screws (T20) included in delivery (tightening torque approx. 1.2 Nm).

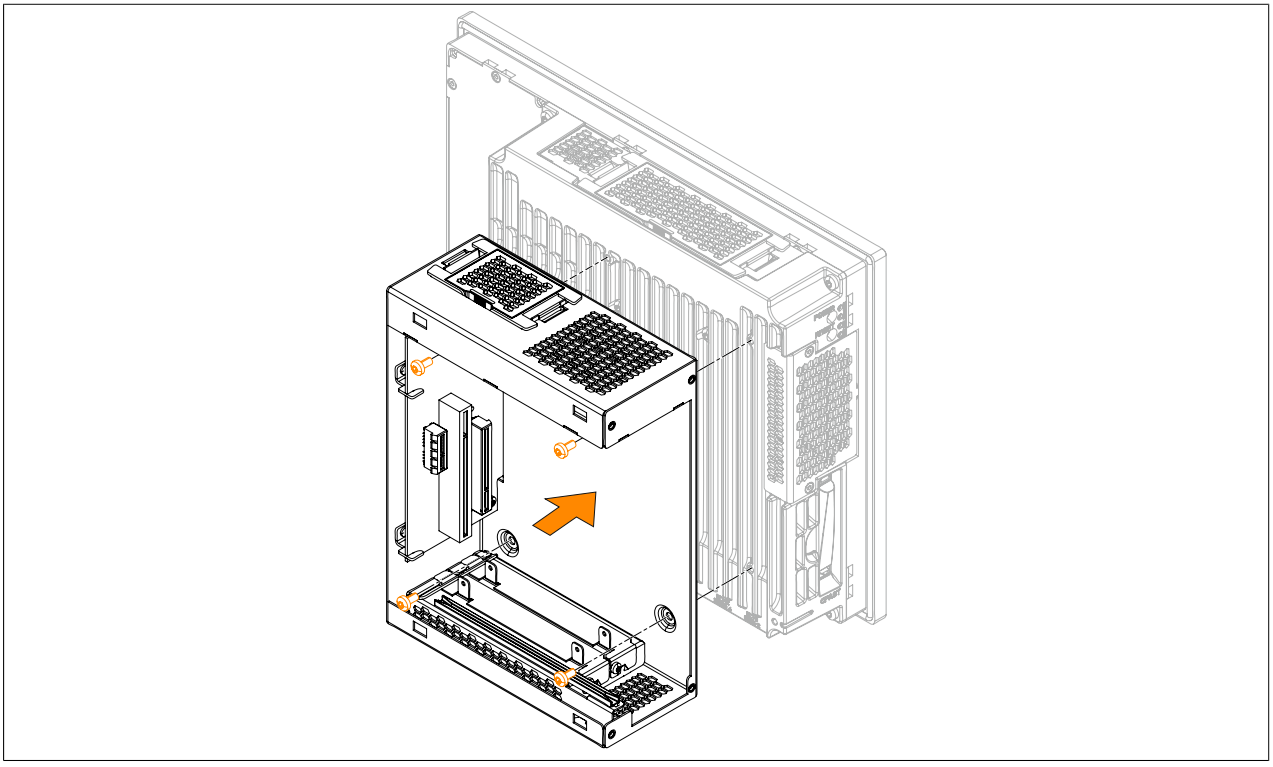


Figure 126: Installing the bus unit on the system unit

7. Install the side cover on the bus expansion using the 4 indicated Torx screws (T10) (2 already removed, 2 included in delivery); the tightening torque is approx. 0.5 Nm.

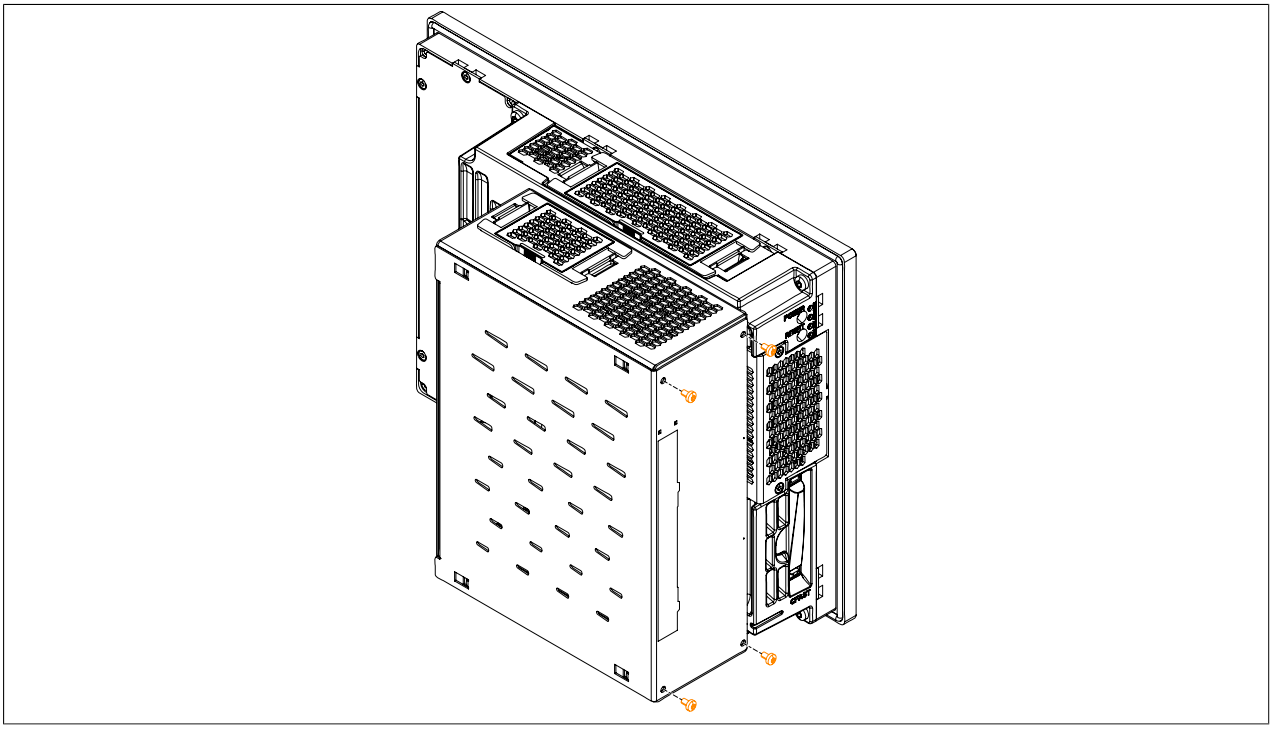


Figure 127: Replacing the side cover

8. The Panel PC can now be installed back in the control cabinet.

1.14 Installing PCI/PCIe cards

1. Disconnect the power supply to the B&R Industrial PC (disconnect the power cable). Isolate the system from all potential sources of electrical power!
2. Touch the housing or ground connection in order to discharge any electrostatic charge from your body.
3. Remove the Panel PC from the control cabinet by following the installation steps in reverse order.
4. Place the Panel PC on a clean, flat surface.
5. Remove the Torx screws (T10) indicated in the following image. Slide the cover plate forward to remove it.

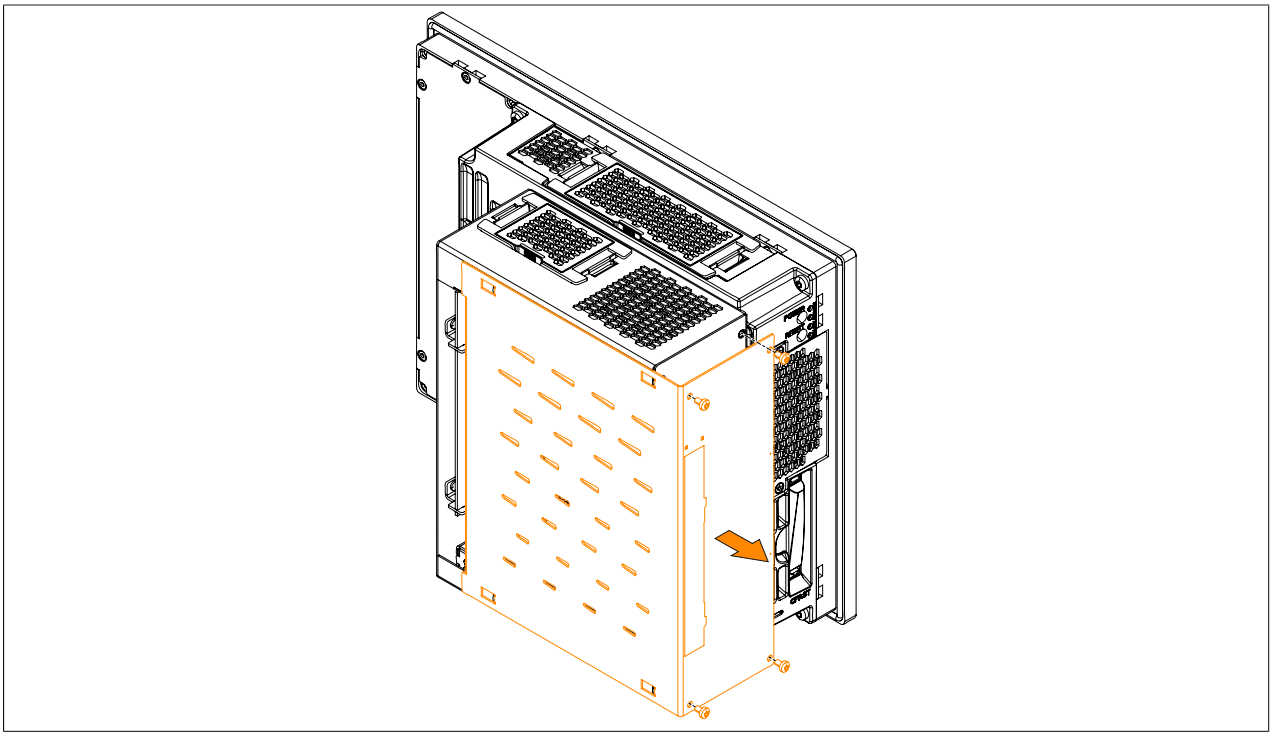


Figure 128: Removing the Torx screws and side cover

6. Remove the PCI slot cover from the bus unit. This is done by first removing the indicated Torx screws (T10) and then removing the cover.

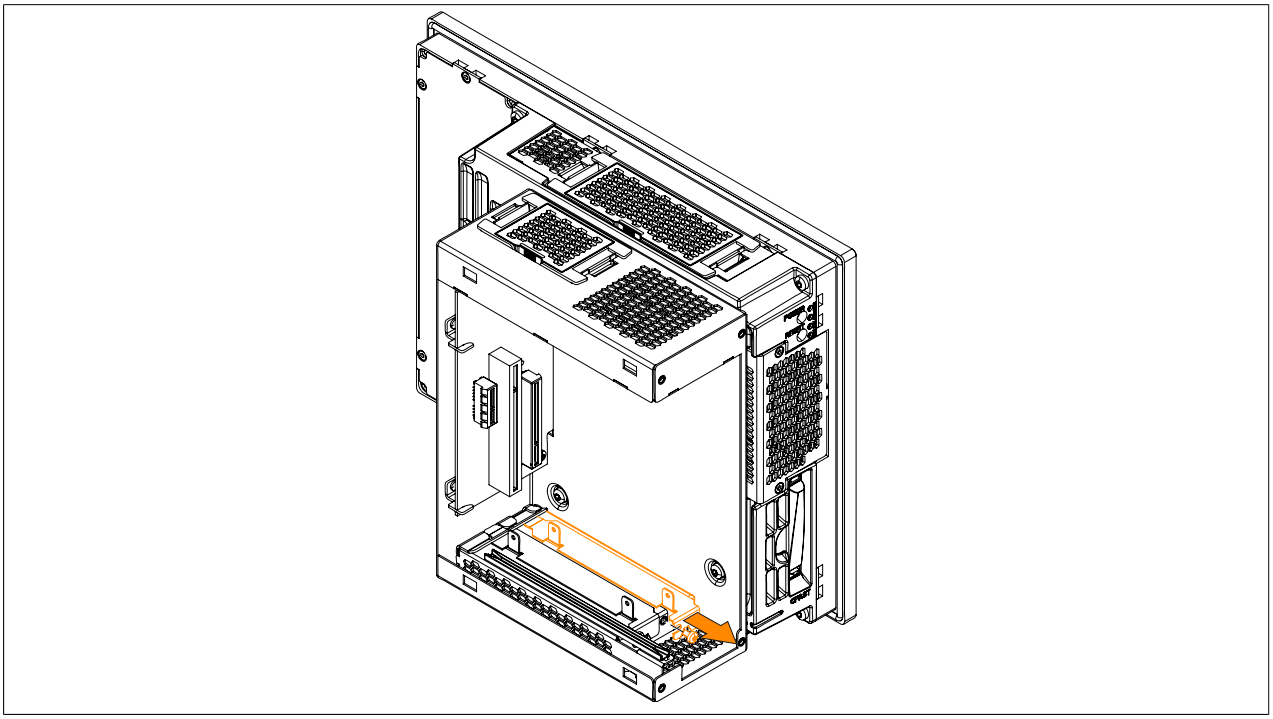


Figure 129: Removing the Torx screws and slot cover

7. Install the PCI or PCIe card in the bus unit. Be sure to insert the PCI or PCIe card in the black guide rail at the top of the bus unit. Fasten the PCI or PCIe card using the indicated Torx screws (T10) removed earlier (max. tightening torque 0.5 Nm).
   A description and pinout of the bus units can be found in section "Bus units" on page 125.

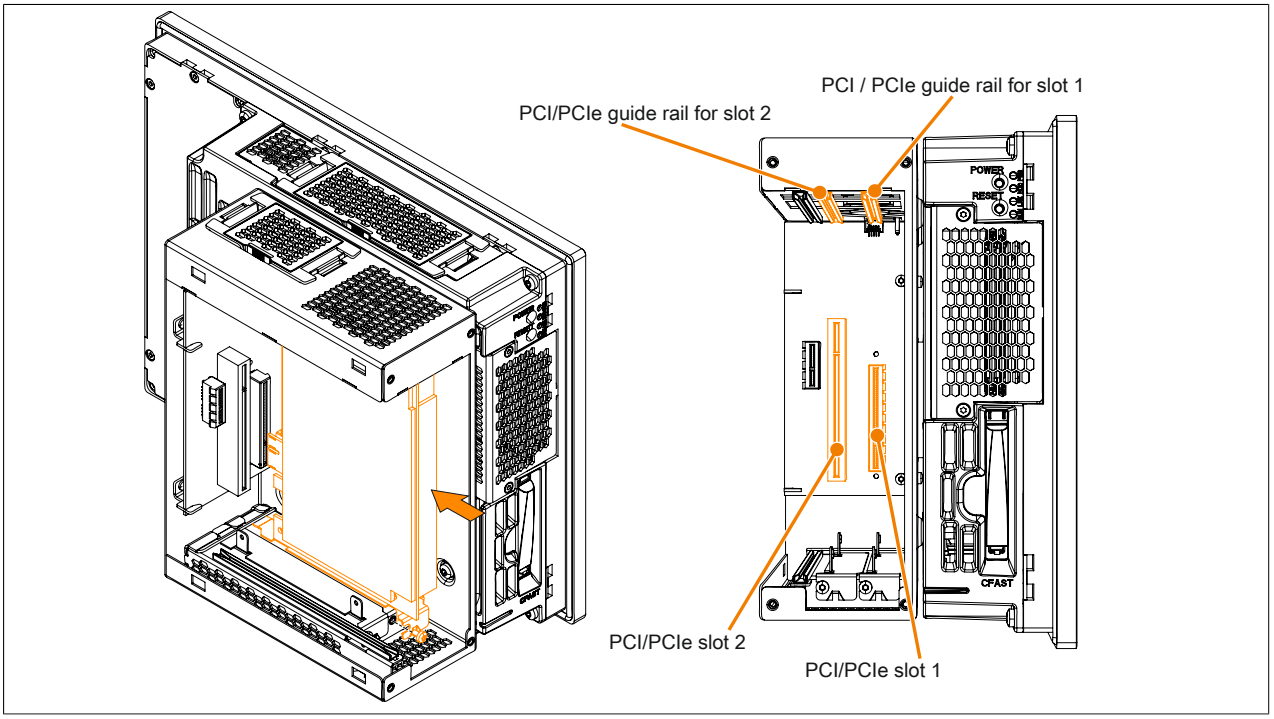


Figure 130: Installing the PCI/PCIe card in the bus unit

8. Install the side cover on the bus unit using the 4 indicated Torx screws (T10); the max. tightening torque is 0.5 Nm.

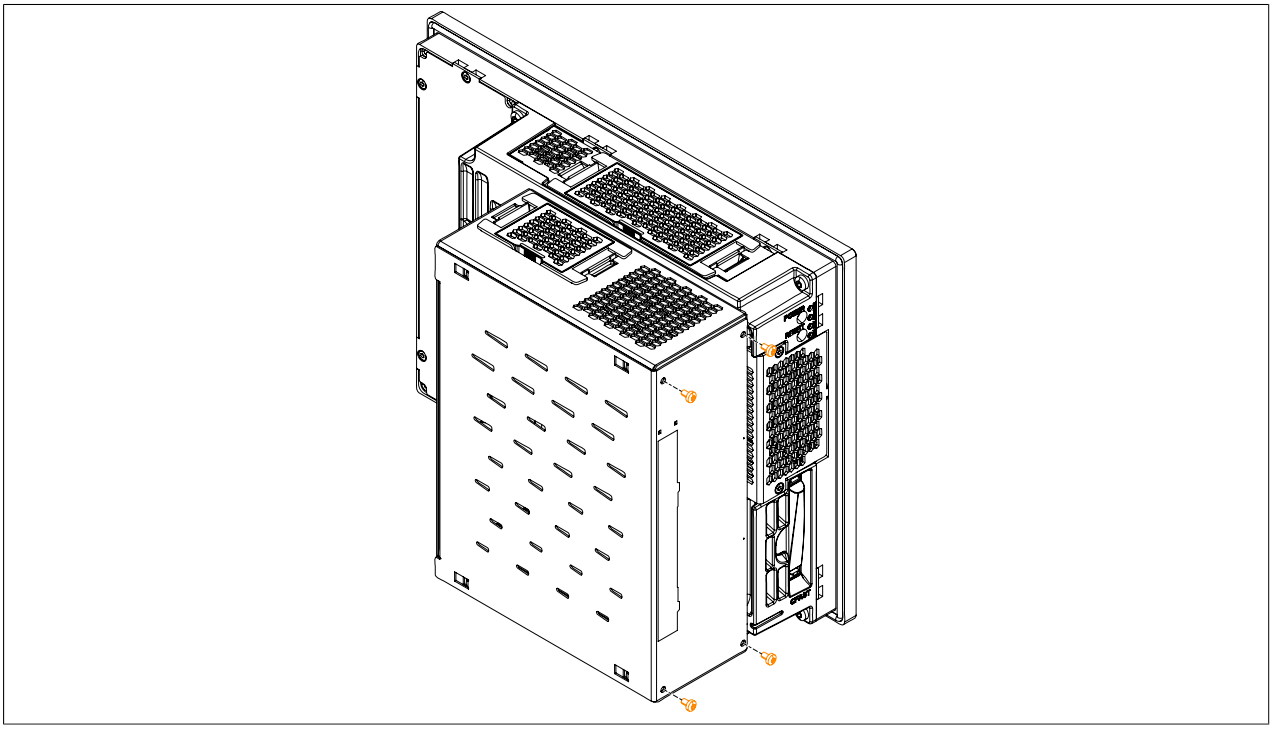


Figure 131: Replacing the side cover

9. The Panel PC can now be installed back in the control cabinet.

1.15 Installing a slide-in drive

1. Disconnect the power supply to the B&R Industrial PC (disconnect the power cable). Isolate the system from all potential sources of electrical power!
2. Touch the housing or ground connection in order to discharge any electrostatic charge from your body.
3. Remove the Panel PC from the control cabinet by following the installation steps in reverse order.
4. Place the Panel PC on a clean, flat surface.
5. Remove the Torx screws (T10) indicated in the following image. Slide the cover plate forward to remove it.

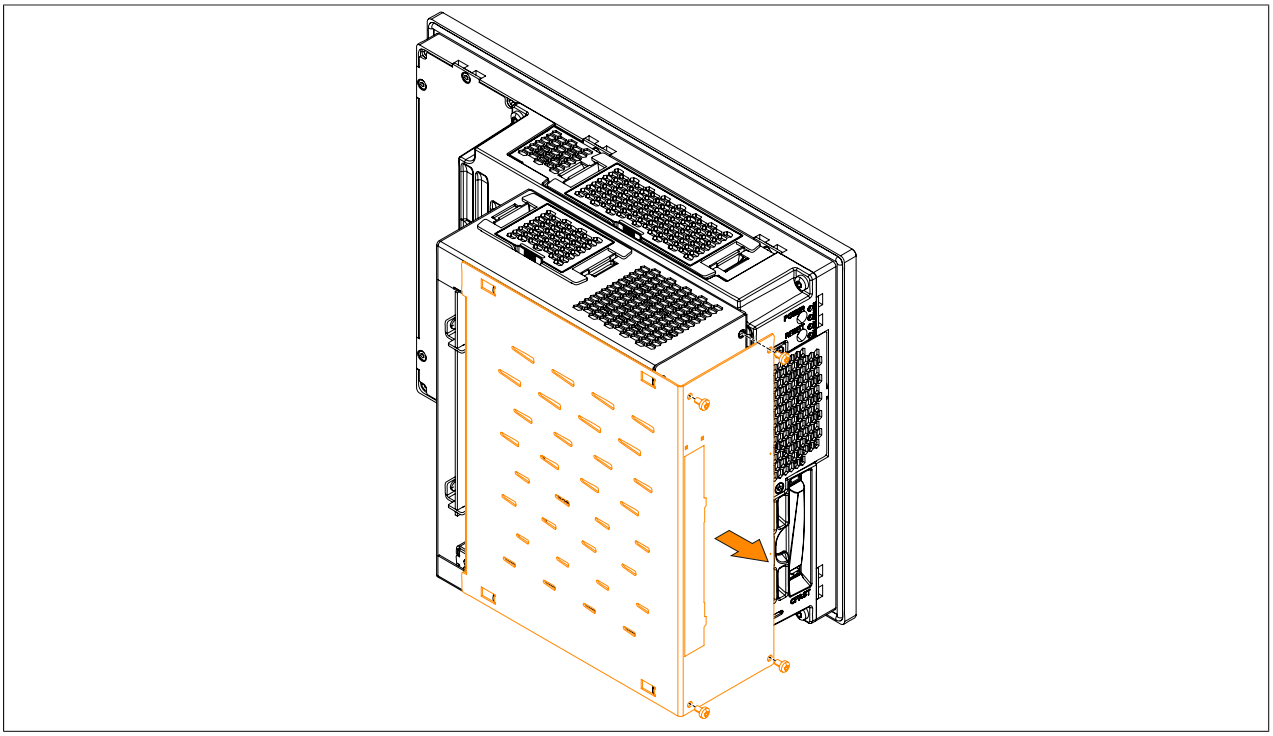


Figure 132: Removing the Torx screws and side cover

6. Remove the slide-in slot cover from the side cover. This is done by pressing in the 6 indicated snap arms and removing the slot cover.

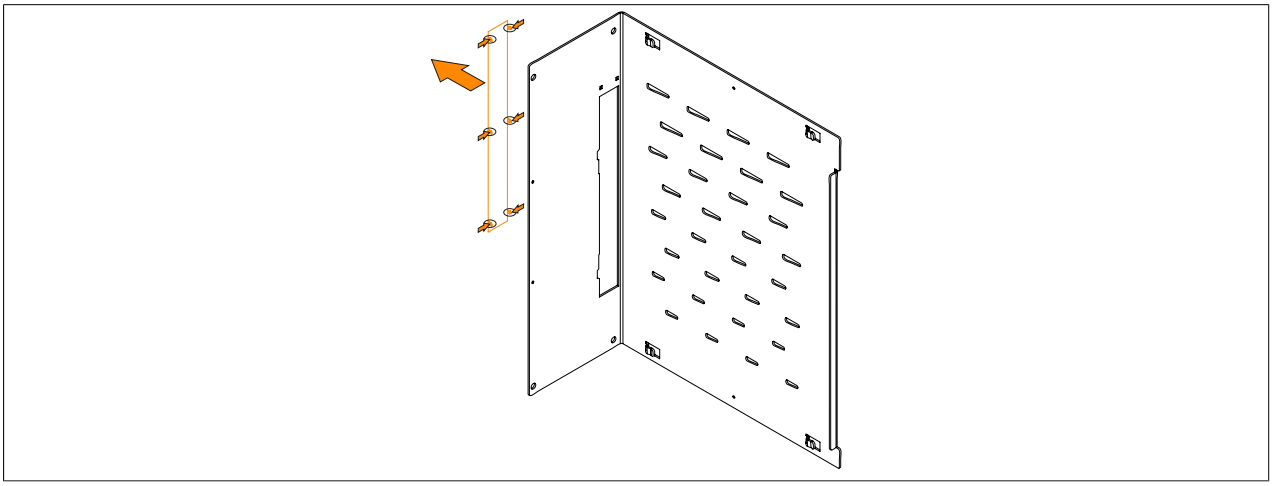


Figure 133: Removing the slide-in slot cover from the side cover

7. Install the slide-in drive in the bus unit. Be sure to insert the slide-in drive in the black guide rails at the top and bottom of the bus unit.

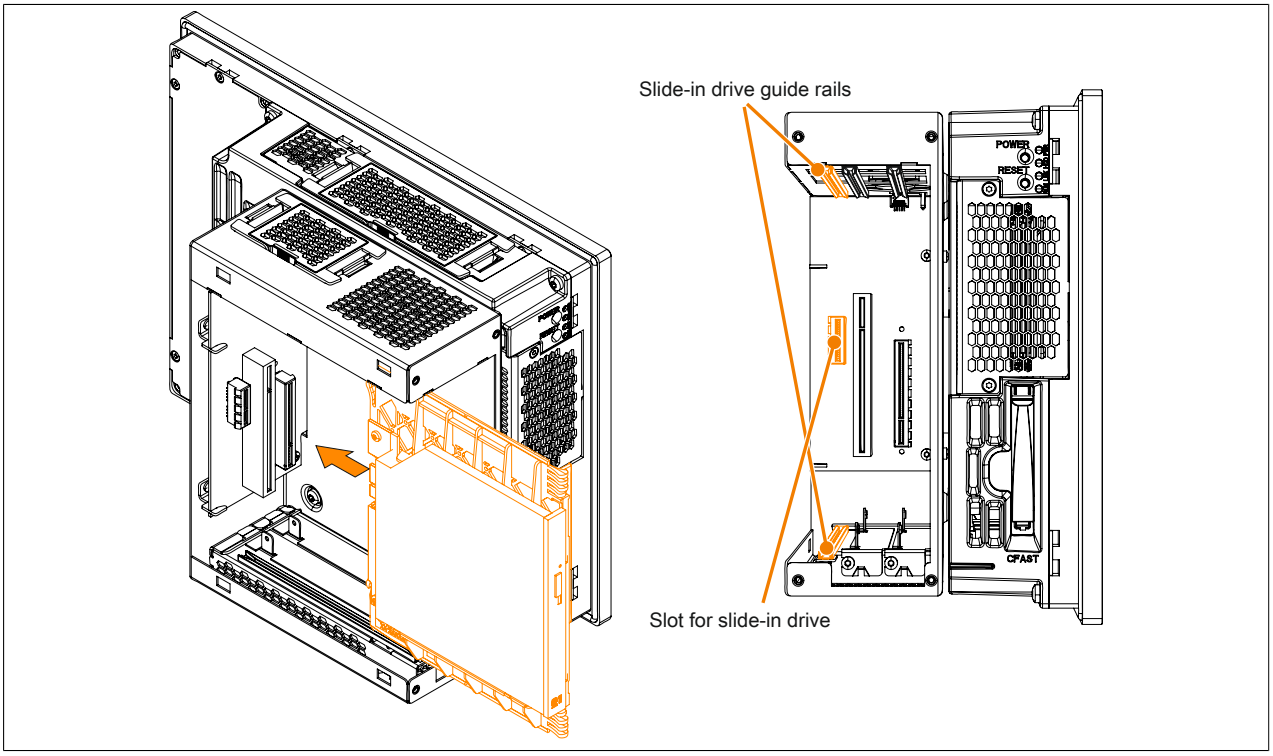


Figure 134: Installing the slide-in drive in the bus unit

8. Install the side cover on the bus unit using the 4 indicated Torx screws (T10); the max. tightening torque is 0.5 Nm.
   The slide-in slot cover must be installed in order to operate the 5AC901.SSCA-00 slide-in compact adapter.

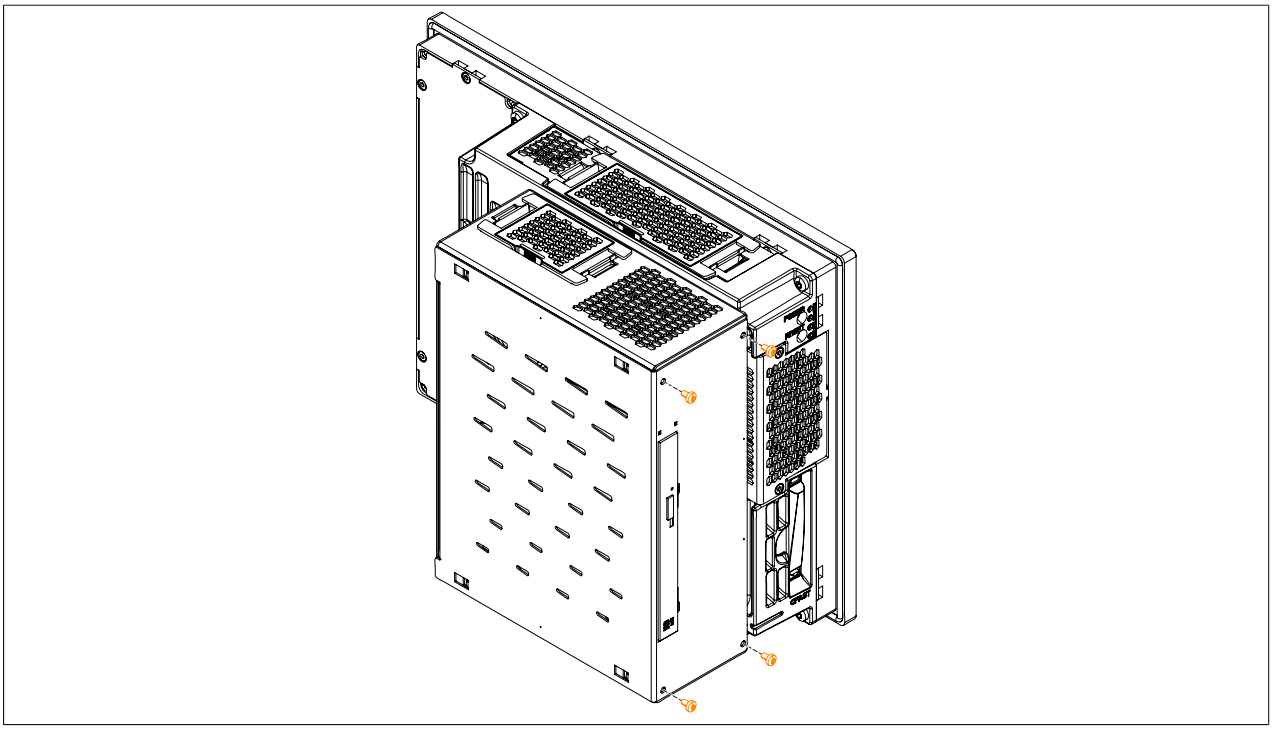


Figure 135: Replacing the side cover

9. The Panel PC can now be installed back in the control cabinet.

1.16 Installing and connecting the UPS battery unit

Warning!

Do not open the UPS battery unit!

1. Disconnect the power supply to the B&R Industrial PC.
2. Install the battery unit. Information about the drilling template can be found in the technical data of the respective UPS battery unit. Ensure that the distance between the battery unit and the B&R Industrial PC allows them to be connected with the UPS cable (0.5 m, 1 m or 3 m).
   Installation requires 4 M5 screws, 4 washers and 1 screw lock (min. tightening torque 1.3 Nm; screw depth as per applicable DIN regulations and specific application). These are not included in delivery.
3. Connect the UPS cable to the battery unit. When doing so, make sure to connect the red and black wires to the power supply (orange screw clamp). Be sure to use the right connection terminals (red wire for +; black wire for -)!
   Connect the white and brown wires (brown wire for 1; white wire for 2) to the temperature sensor (green screw clamp terminal block).

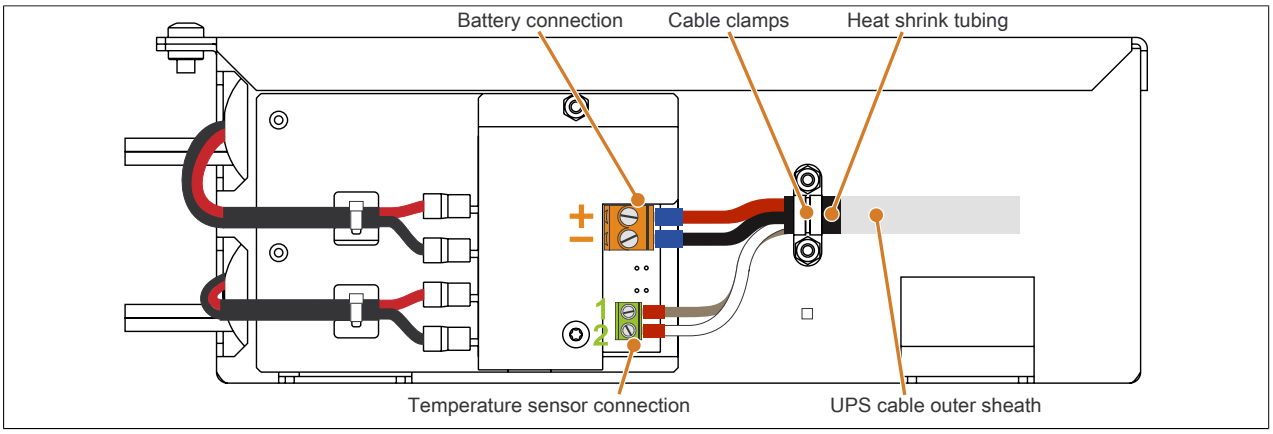


Figure 136: Connecting the UPS cable to the battery

4. Tighten the connected wires in the screw clamps with a screwdriver (max. tightening torque 0.4 Nm).
5. Loosen the two nuts (M3) on the cable clamp and feed the UPS cable through.
6. Fasten the UPS cable using the cable clamp. Tighten the previously removed nuts onto the cable clamp in alternating order (max. tightening torque 0.35 Nm).
7. Connect the 4-pin screw clamp to the UPS IF option and tighten the two screws with a screwdriver (max. tightening torque 0.4 Nm).

2 Connecting to the power mains

Danger!

- **All supplied power must be disconnected before removing device covers or components or installing/removing accessories, hardware or cables.**
- **The power cable must be disconnected from the device and from the voltage supply.**
- **All covers, components, accessories, hardware and cables must be installed or connected before the device can be connected to the power supply and turned on.**

2.1 Installing the DC power cable

Danger!

All supplied power to the B&R Industrial PC must be completely disconnected. Before connecting the DC power cable, it is important to make absolutely sure that it has been disconnected from the power source (e.g. power supply).

2.1.1 Wiring

The DC power cable must be secured in the terminal block (power connector) as shown in the image. Wires with a cross section of 0.75 mm² to 1.5 mm² and wire end sleeves must be used.

Installing the 0TB103.9 screw clamp terminal block

Insert the wires with the wire end sleeves into the terminal contacts ② as shown in the image and tighten the screw clamps ① with a screwdriver (max. torque of 0.4 Nm).

Please note the pinout of the power supply connector on the device!

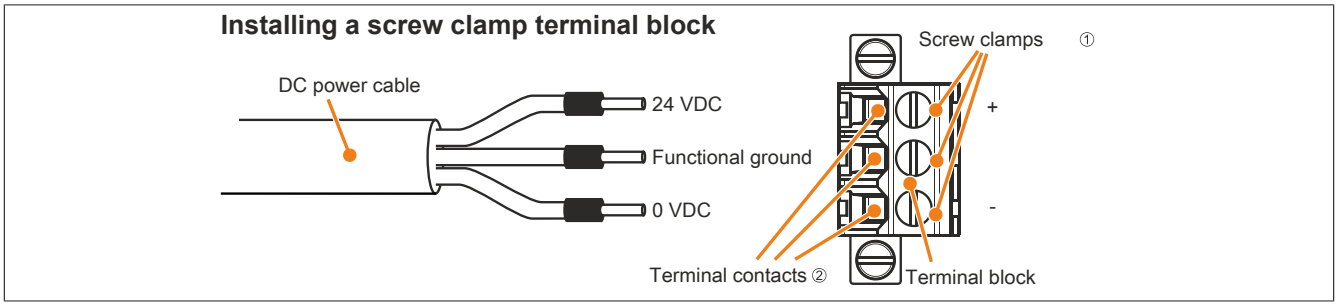


Figure 137: Installing a screw clamp terminal block

Installing the 0TB103.91 cage clamp terminal block

Insert a screwdriver into the cage clamp terminal ① and fasten the wires with wire end sleeves in the terminal contacts ② as shown in the image below. Close the terminal contact by removing the screwdriver.

Please note the pinout of the power supply connector on the device!

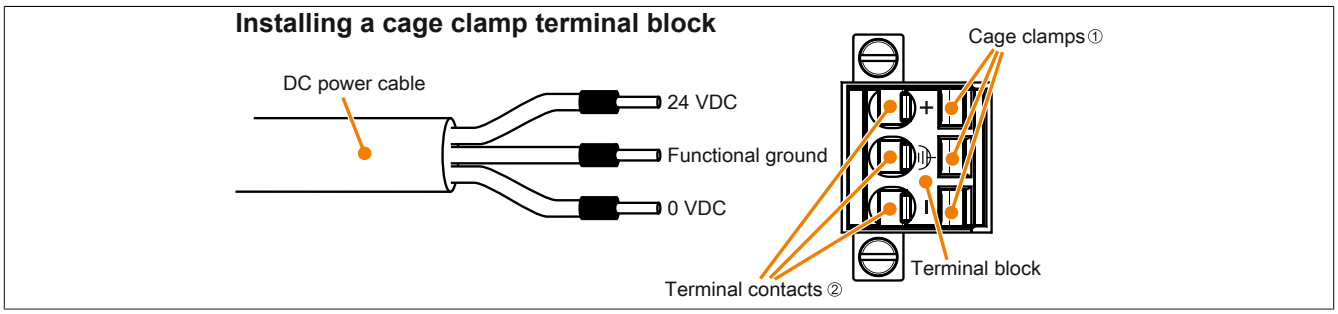


Figure 138: Installing a cage clamp terminal block

2.2 Installing the AC power cable

Danger!

All supplied power to the B&R Industrial PC must be completely disconnected. Before connecting the AC power cable, it is important to make absolutely sure that it has been disconnected from the power source (e.g. power supply).

2.2.1 Wiring

The AC power cable must be secured in the terminal block (power connector) as shown in the image. Wires with a cross section of 0.75 mm² to 4 mm² and wire end sleeves must be used.

Installing the 0TB3103.8000 screw clamp terminal block

Insert the wires with the wire end sleeves into the terminal contacts ② as shown in the image and tighten the screw clamps (located on the top of the screw clamp terminal block) with a screwdriver (max. tightening torque 0.6 Nm).

Please note the pinout of the power supply connector on the device!

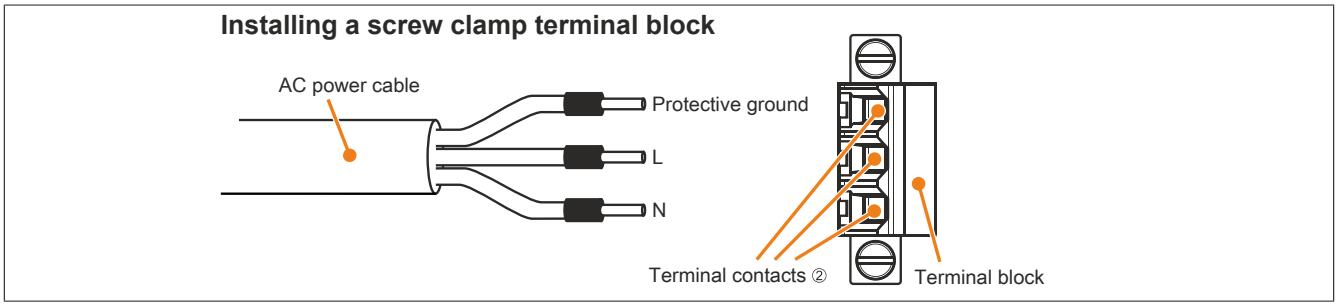


Figure 139: Installing a screw clamp terminal block

2.3 Connecting the power supply to a B&R device

Danger!

The voltage supply to the B&R device must be completely disconnected. Before connecting the power cable, it is important to make absolutely sure that it has been disconnected from the power source (e.g. power supply).

1. Touch the housing or ground connection in order to discharge any electrostatic charge from your body.
2. Connect the power supply connector to the B&R device and tighten the fastening screws (max. tightening torque 0.5 Nm).

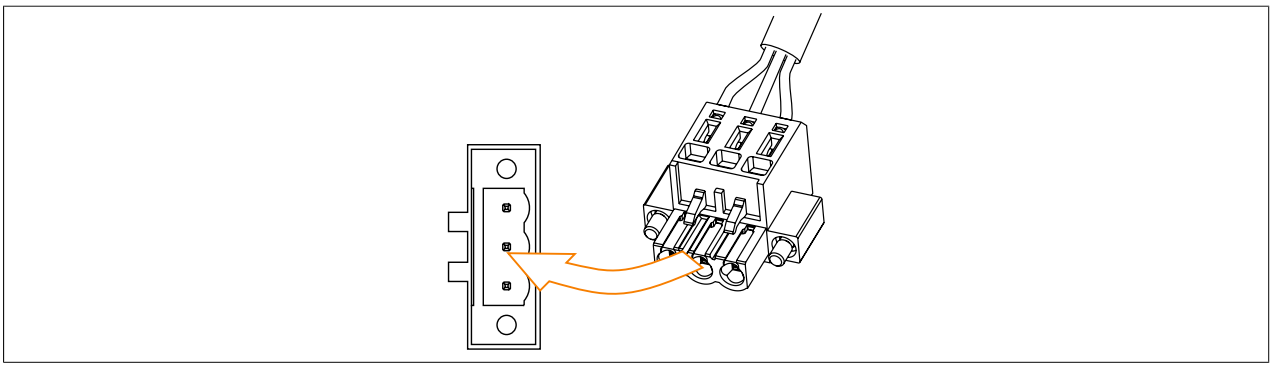


Figure 140: Connecting the power supply connector to a B&R device

2.4 Functional ground - Grounding concept

Functional ground is a current path of low impedance between electrical circuits and ground. It is used, for example, to improve immunity to disturbances and not necessarily as a protective measure. It therefore serves only to deflect disturbances, not to provide any kind of protection against electric shock.

This device comes equipped with two functional ground connections:

- Power supply
- Ground connection

To guarantee safe conductance of electric disturbances, the following points must be observed:

- The device must be connected to the central grounding point in the control cabinet using the shortest route possible.
- A cable with a minimum cross section of 2.5 mm² per connection should be used. If a cable with wire end sleeves is connected to the 0TB103.9 or 0TB103.91 terminal block, then a cable with maximum 1.5 mm² per connection is possible.
- Note the line shielding concept. All data cables connected to the device must be shielded.

Symbol indicating functional ground on the B&R device:

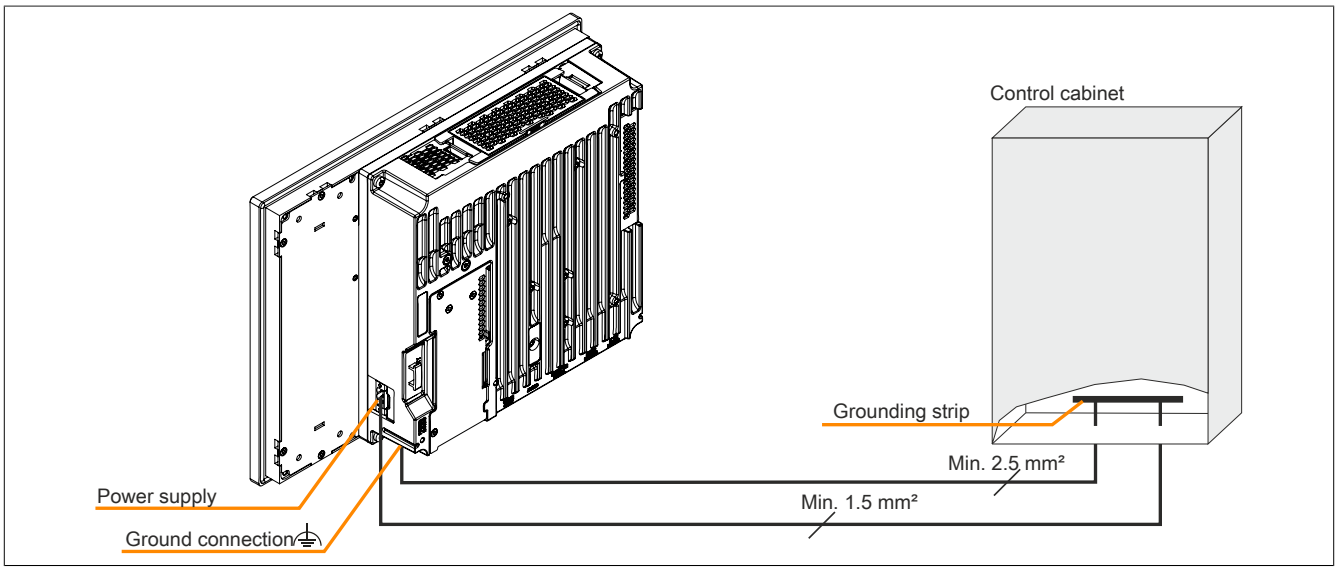


Figure 141: Panel PC 900 - Grounding concept

3 Cable connections

Flex radius specifications must be taken into account when installing or connecting cables.

Information:

The maximum torque for the locating screws is 0.5 Nm.

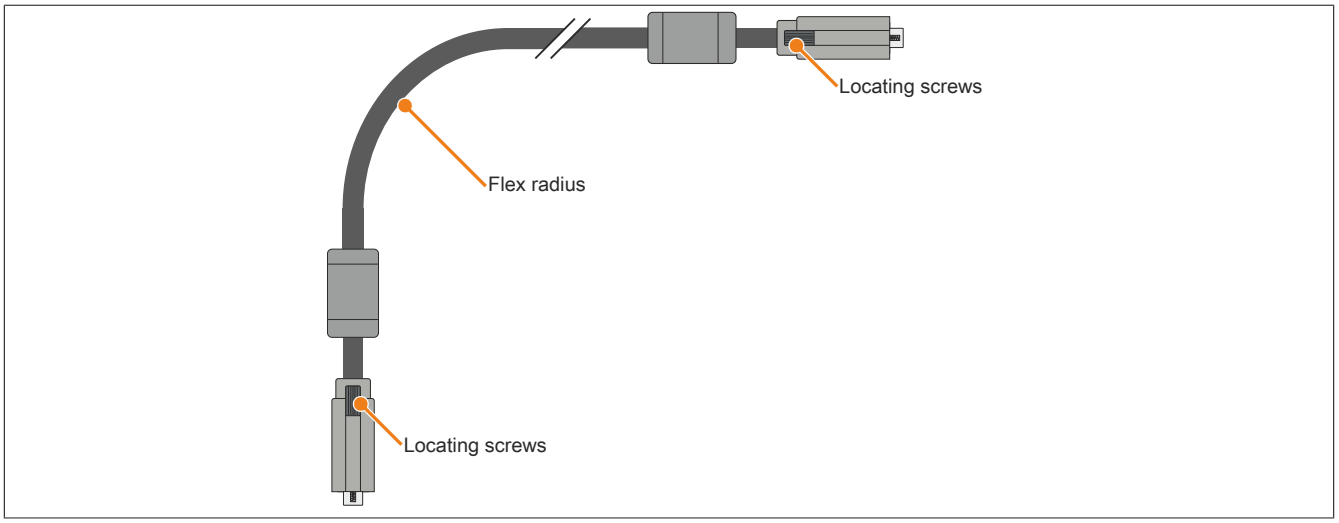


Figure 142: Flex radius - Cable connection

Information:

The specified flex radius is listed in the technical data for the respective cable.

4 Switching on the device for the first time

4.1 General information before switching on the device

Checklist

The following items must be checked before the device is put into operation for the first time:

- Have the installation notes as specified in "Installation" on page 191 been observed.
- Have the permitted environmental conditions been taken into consideration for the device?
- Is the power supply connected correctly, and have the associated values been checked?
- Is the ground cable connected correctly to the ground connection?
- The device must be put into operation first before additional hardware is installed.

> **Caution!**
>
> **Before the device is put into operation, it must first be acclimated to room temperature! It should not be immediately subjected to thermal radiation.**
>
> **If transported at low temperatures or if there are large temperature fluctuations, the device must not be subjected to any type of moisture.**

Prerequisites and requirements

The following requirements must be fulfilled before the device is switched on for the first time:

- The functional ground connections must be kept as short as possible and connected to the central grounding point using the largest possible wire cross section.
- All connection cables must be connected correctly.
- A USB keyboard and USB mouse must be connected (optional).

4.2 Switching on the device

Procedure

1. Connect and switch on the voltage supply (e.g. power supply).
2. The device is switched on and booting; the power LED is lit.

5 Touch screen calibration

B&R touch screen devices are equipped with a B&R touch controller that supports hardware calibration. As a result, devices are pre-calibrated when delivered. This is an advantageous feature when replacing devices of the same model or type since it avoids having to recalibrate the new device. Nevertheless, calibrating the device is still recommended in order to achieve the best results and to better adapt the touch screen to the user's preferences.

5.1 Single-touch (analog resistive)

5.1.1 Windows Embedded 8.1 Industry Pro

After starting Windows Embedded 8.1 Industry Pro on the Panel PC for the first time, the corresponding touch screen driver is installed automatically.

On all other devices, the touch screen driver must be installed in order to operate the touch screen. The necessary driver is available in the Downloads section of the B&R website (www.br-automation.com).

5.1.2 Windows 7 Professional / Ultimate

After installing Windows 7 on the device, the touch screen driver must be installed in order to operate the touch screen. The necessary driver is available in the Downloads section of the B&R website (www.br-automation.com).

5.1.3 Windows Embedded Standard 7 Embedded / Premium

A touch screen driver will be installed automatically if a touch controller is detected during the Windows Embedded Standard 7 installation.

The touch screen driver must be installed manually if a touch controller was not detected when installing Windows Embedded Standard 7 or if an Automation Panel has been connected after installation. The necessary driver is available in the Downloads section of the B&R website (www.br-automation.com).

5.1.4 Windows XP Professional

After installing Windows XP Professional on the device, the touch screen driver must be installed in order to operate the touch screen. The necessary driver is available in the Downloads section of the B&R website (www.br-automation.com).

5.1.5 Windows Embedded Standard 2009

After starting Windows Embedded Standard 2009 on the Panel PC or Power Panel for the first time (first boot agent), the corresponding touch screen driver is installed automatically.

On all other devices, the touch screen driver must be installed in order to operate the touch screen. The necessary driver is available in the Downloads section of the B&R website (www.br-automation.com).

5.2 Multi-touch (projected capacitive - PCT)

5.2.1 Windows Embedded 8.1 Industry Pro

Microsoft multi-touch drivers are installed when Windows Embedded 8.1 Industry Pro is installed on the device. Once the installation of Windows Embedded 8.1 Industry Pro has completed, the device can be operated immediately.

5.2.2 Windows 7 Professional / Ultimate

Microsoft multi-touch drivers are installed when Windows 7 is installed on the device. Once the installation of Windows 7 has completed, the device can be operated immediately.

5.2.3 Windows Embedded Standard 7 Premium

Microsoft multi-touch drivers are installed when Windows Embedded Standard 7 Premium is installed on the device. Once the installation of Windows Embedded Standard 7 Premium has completed, the device can be operated immediately.

6 Adjusting the display brightness

1. Open the Control Center in the Control Panel.
2. Select the Display tab.
3. Select a panel from the list. Only the local display (PP Link) and connected panels are shown in the list.
4. Set the desired brightness using the slider control.

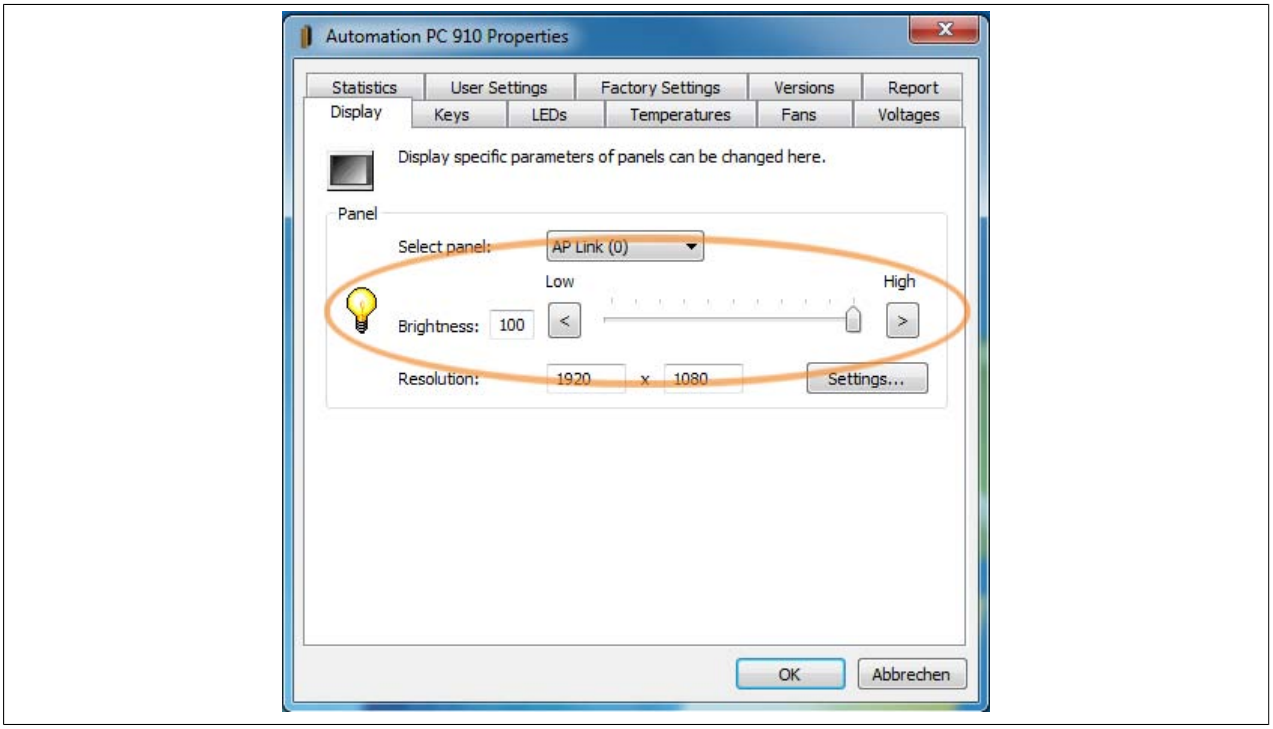


Figure 143: Adjusting the display brightness

Information:

Changes to these settings are displayed online but are only applied by the system (and applied during the next restart) if the Control Center is closed with *OK*.

The configured brightness is separate from the value configured in BIOS Setup, i.e. the value in BIOS is used until Windows boots. The value from BIOS is only applied the first time the Control Center is launched.

7 Configuring a SATA RAID set using the internal RAID controller

The following software description applies to the internal RAID controller on the QM77 chipset. The HM76 chipset does not provide RAID support.

Information:

B&R recommends using only drives of the same type in a SATA RAID set (hard disk with hard disk in a set, SSD with SSD in a set; CFast with CFast in a set).

Caution!

The maximum number of possible write cycles must be taken into consideration when setting up a RAID set with SSDs or CFast cards (with MLC technology).

In order to create a SATA RAID set and get into the "Configuration Utility", *SATA mode selection* must be set to *RAID* in the "Advanced - SATA configuration" menu.

The "Configuration Utility" in BIOS must be started in order to make the necessary settings. After POST, pressing <Ctrl+I> opens the RAID BIOS.


```
Intel(R) Rapid Storage Technology - Option ROM - 11.6.0.1624
Copyright(C) 2003-12 Intel Corporation. All Rights Reserved.


 RAID Volumes:
 ID  Name     Level                Strip             Size  Status          Bootable
 0   Mirror   RAID1(Mirror)        N/A             465.8GB  Normal             Yes

 Pyhsical Devices:
 ID  Device   Model         Serial #                  Size  Type/Status(Vol ID)
 0   WDC      WD500LUCT-6   WD-WX21AB2X6150        465.7GB  Member Disk(0)
 2   WDC      WD500LUCT-6   WD-WX21AB2X6150        465.7GB  Member Disk(0)

Press <CTRL-I> to enter Configuration Utility..
```

Figure 144: Configuration Utility - Boot

```
            Intel(R) Rapid Storage Technology - Option ROM - 11.6.0.1624
            Copyright(C) 2003-12 Intel Corporation. All Rights Reserved.
                                  [ MAIN MENU ]
          1.  Create RAID Volume            4.  Recovery Volume Options
          2.  Delete RAID Volume            5.  Acceleration Options
          3.  Reset Disks to Non-RAID       6.  Exit
                              [ DISK/VOLUME INFORMATION ]
RAID Volumes:
ID  Name     Level                Strip             Size  Status          Bootable
0   Mirror   RAID1(Mirror)        N/A             465.8GB  Normal             Yes

Pyhsical Devices:
ID  Device   Model         Serial #                  Size  Type/Status(Vol ID)
0   WDC      WD500LUCT-6   WD-WX21AB2X6150        465.7GB  Member Disk(0)
2   WDC      WD500LUCT-6   WD-WX21AB2P6063        465.7GB  Member Disk(0)

        [↑↓]-Select              [ESC]-Exit           [ENTER]-Select Menu
```

Figure 145: Configuration Utility - Overview

The following keys can be used once inside BIOS Setup:

Key	Function
Cursor ↑	Moves to the previous item
Cursor ↓	Moves to the next item
Enter	Selects an item or opens a submenu
ESC	Returns to the previous menu
Ctrl+E	Saves any changed settings and exits setup

Table 188: BIOS-relevant keys in the RAID Configuration Utility

7.1 Create RAID volume

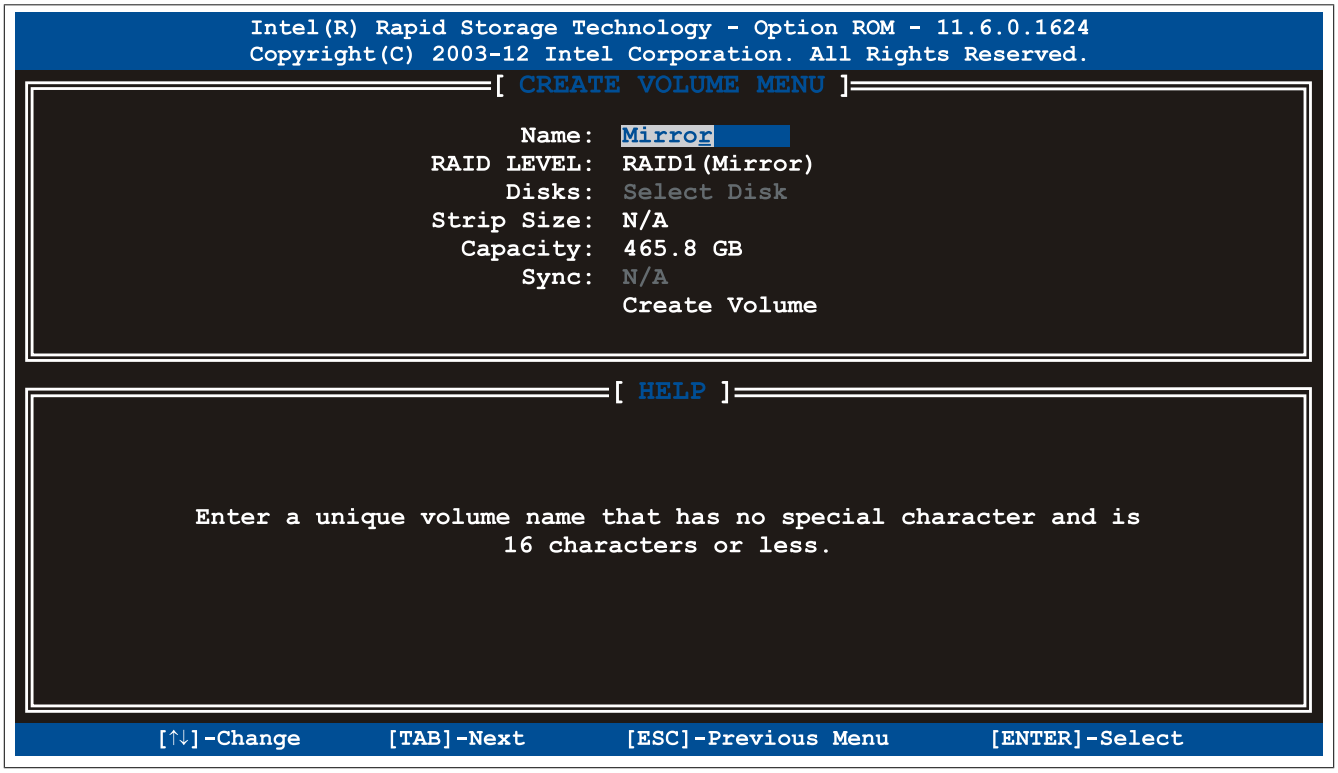


Figure 146: Configuration Utility - Create RAID volume

Parameter	Function	Configuration options	Effect
Name	Option for entering the RAID name	Name with up to 16 characters	Assigns a name to the RAID volume
RAID level	Option for setting the RAID level	RAID0 (Stripes)	Creates RAID0
		RAID1 (Mirror)	Creates RAID1
		Recovery	Creates recovery RAID
Disks[1)]	Specifies the installed hard disks as either master or recovery	Master, Recovery	Defines the hard disks as master or recovery
Strip size[2)]	Option for configuring the size of data blocks	4 kB, 8 kB, 16 kB, 32 kB, 64 kB, 128 kB	Configures the size of the data block
Capacity	Option for configuring the RAID capacity		Configures the memory size of the RAID volume
Sync[3)]	Option for configuring RAID synchronization	N/A	-
		Continuous	Automatically synchronizes the RAID volume
		On request	Manually synchronizes the RAID volume
Create volume	Creates the RAID volume	-	Creates the RAID volume

Table 189: Configuration Utility - Create RAID volume

1) This setting is only possible if *RAID level* is set to *Recovery*.
2) This setting is only possible if *RAID level* is set to *RAID0(Stripe)*.
3) This setting is only possible if *RAID level* is set to *Recovery*.

7.2 Delete RAID volume

The "Delete RAID volume" menu option can be used to format the RAID drive, making it non-RAID. The drive to be deleted is selected and then deleted by pressing <DEL>.

Information:

This option deletes all data on the drive, including the operating system.

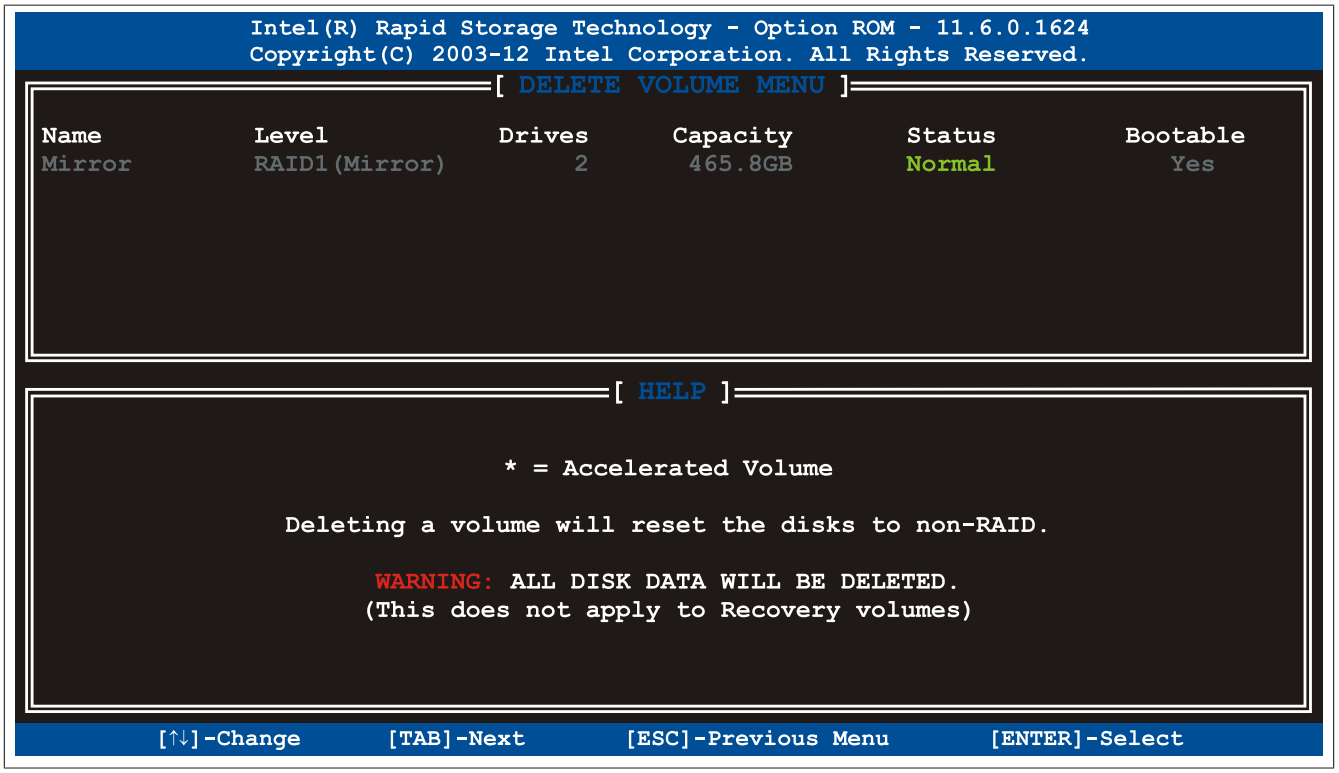


Figure 147: Configuration Utility - Delete RAID volume

7.3 Reset disks to non-RAID

An existing RAID set can be deleted using the "Reset disks to non-RAID" option. The RAID to be deleted is selected and then deleted by pressing <SPACE> (<ENTER> to confirm).

Information:

Deleting a RAID set also deletes all of the data on the drive.

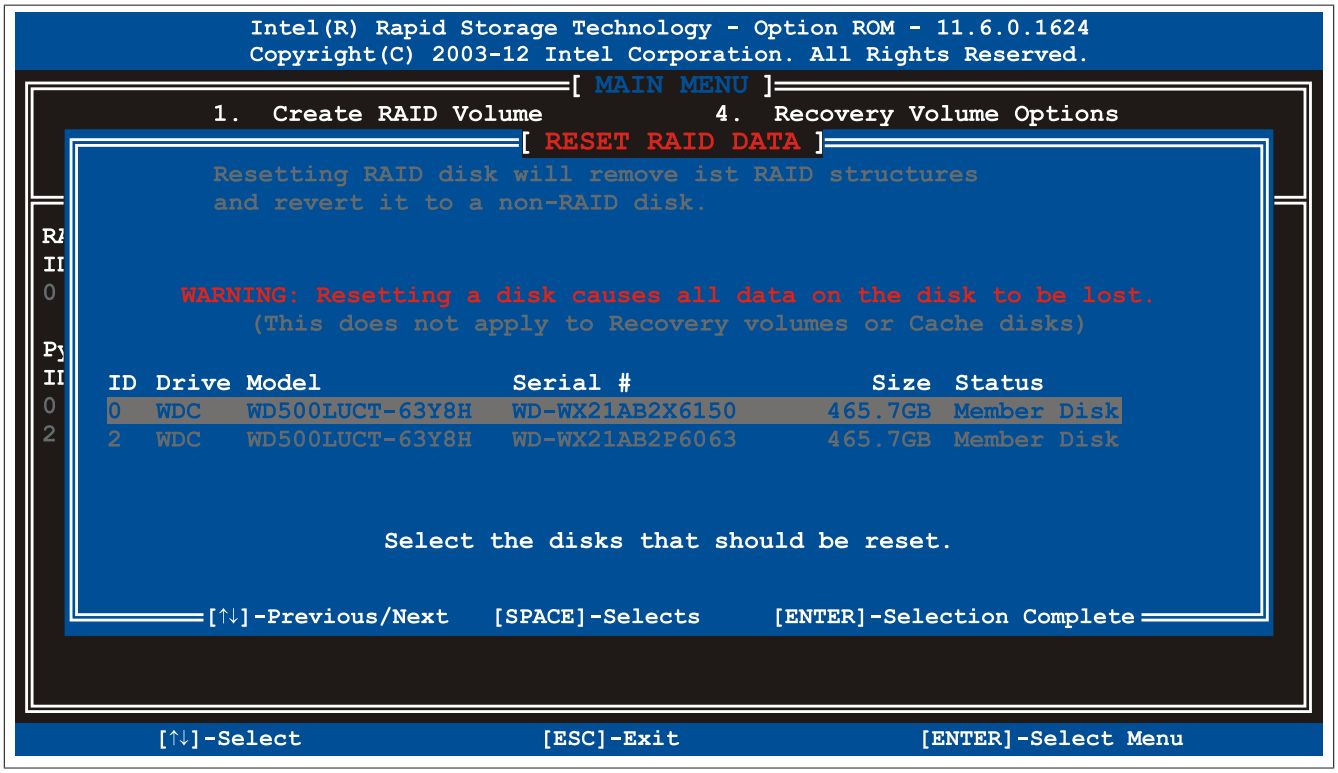


Figure 148: Configuration Utility - Reset disks to non-RAID

7.4 Recovery volume options

The "Recovery volume options" menu option can be used to enable/disable recovery disk and master disk.

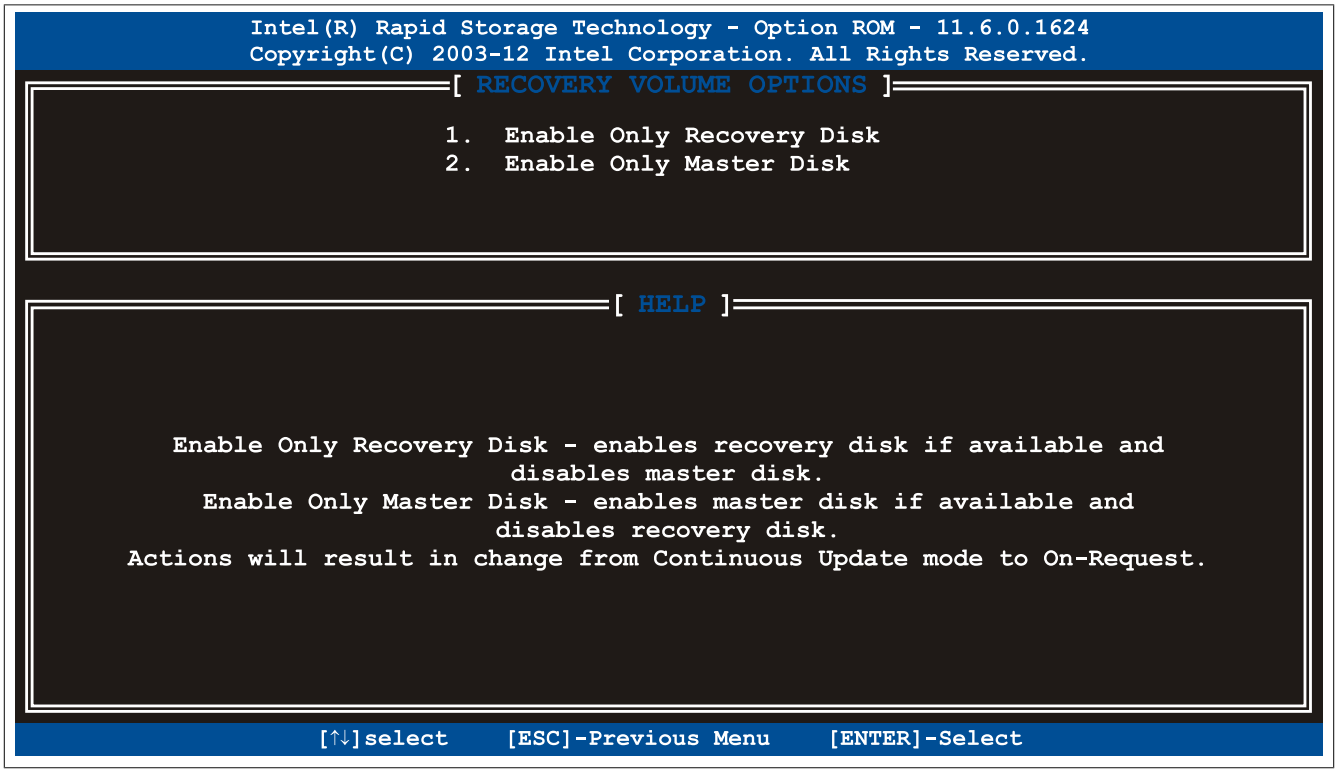


Figure 149: Configuration Utility - Recovery volume options

8 Known problems/issues

- The CAN IF option is supported in PVI for Windows XP Professional and Windows Embedded Standard 2009. The 5AC901.ICAN-00 interface option is not longer supported by PVI beginning with Windows 7.
- When using a PCI or PCIe RAID controller, we recommend disabling ASPM or power management for the respective PCI or PCIe slot.

Chapter 4 • Software

1 BIOS options

Information:

The following diagrams, BIOS menu items and their descriptions refer to BIOS version 1.23. It is therefore possible that these diagrams and BIOS descriptions will not correspond with the BIOS version actually installed. In addition, the BIOS menu items provided depend on the system configuration.

1.1 General information

BIOS is an acronym for "Basic Input/Output System". It is the most basic standardized interface between the user and the system (hardware). The BIOS system used in this B&R Industrial PC was developed by American Megatrends, Inc.

The BIOS Setup utility can be used to modify basic system configuration settings. These settings are stored in CMOS and EEPROM memory (as a backup).

CMOS data is buffered by a battery (if present) and remains stored on the B&R Industrial PC even when the power is turned off (no 24 VDC supply).

1.2 BIOS Setup and boot procedure

BIOS is activated immediately when switching on the power supply or pressing the power button on the B&R Industrial PC. The system checks if the setup data from EEPROM memory is "OK". If the data is "OK", then it is transferred to CMOS. If the data is "Not OK", then the CMOS data is checked to see whether it is valid. An error message is output if the CMOS data contains errors, and the boot procedure can be continued by pressing <F1>. To prevent an error message from appearing on each restart, launch the BIOS Setup utility by pressing <F2> and resave the settings.

BIOS reads the system configuration information, checks and configures the system with the Power-On Self-Test (POST).

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

To enter BIOS Setup, press the <Del> key after the USB controller has been initialized as soon as the following message appears on the screen (during POST): "Press DEL to run SETUP".

Figure 150: Bootscreen

1.2.1 BIOS Setup keys

The following keys are enabled during POST:

Information:

Key signals from USB keyboards will only be registered after the USB controller has been initialized.

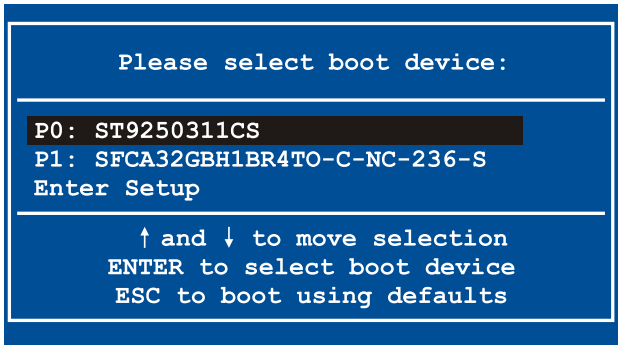
Keys	Function
Del, F2	Opens the main BIOS Setup screen
F12	Network boot
F11	Opens the boot menu. This lists all bootable devices that are connected to the system. Selecting a device with cursor ↑, cursor ↓ and then pressing <ENTER> will boot from that device. 
<Pause>	Pauses POST. Pressing any other key resumes POST.

Table 190: BIOS-relevant keys for POST

The following keys can be used once inside BIOS Setup:

Key	Function
F1	Opens general help information
Cursor ↑	Moves to the previous item
Cursor ↓	Moves to the next item
Cursor ←	Moves to the previous item
Cursor →	Moves to the next item
+-	Changes the setting for the selected function
Enter	Changes to the selected screen
Page ↑	Changes to the previous page
Page ↓	Changes to the next page
Home	Jumps to the first BIOS menu item or object
End	Jumps to the last BIOS menu item or object
F2 / F3	Changes the colors of BIOS Setup
F7	Resets any changes
F9	Loads and configures CMOS default values for all BIOS settings
F10	Saves and exits
ESC	Exits a submenu

Table 191: BIOS-relevant keys

1.3 Main

The main BIOS Setup screen appears immediately after the <Del> button is pressed during startup.

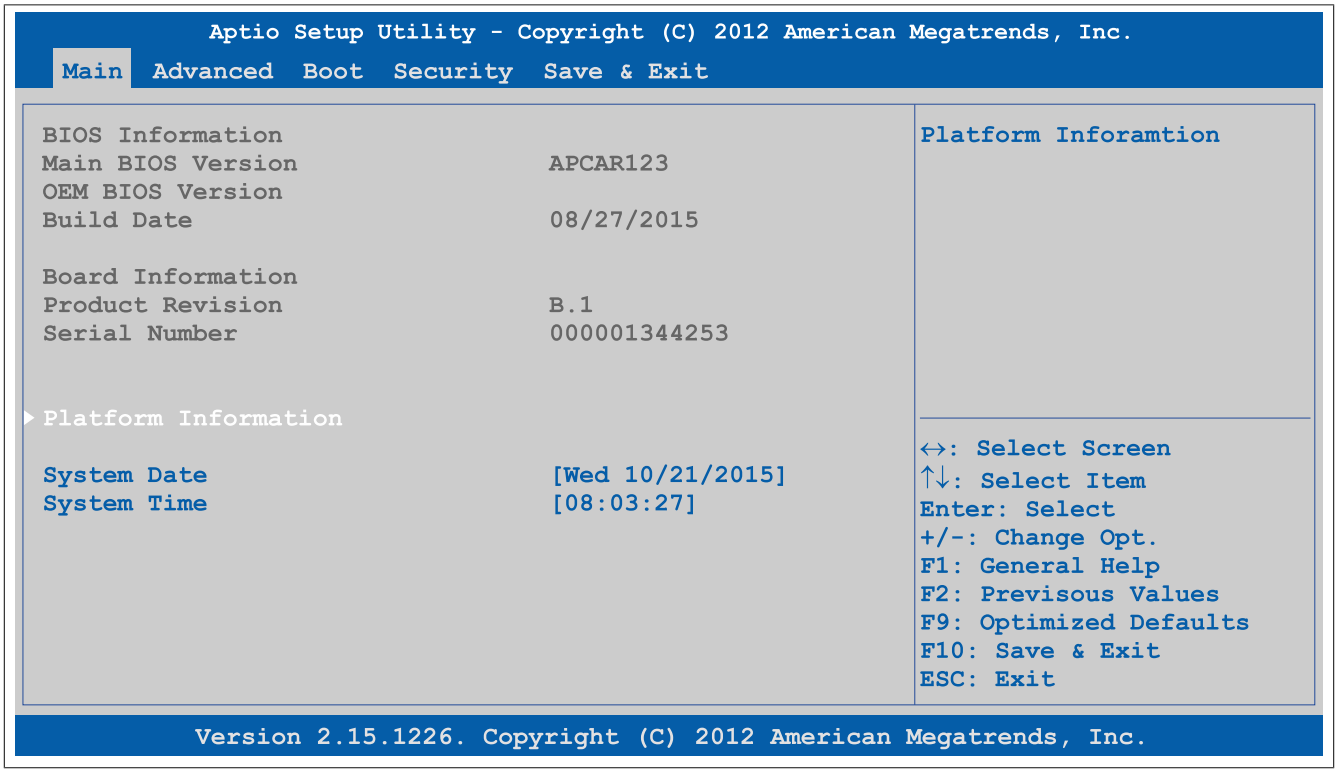


Figure 151: Main

BIOS setting	Function	Configuration options	Effect
BIOS information			
Main BIOS version	Displays the BIOS version	None	-
OEM BIOS version	Displays the OEM BIOS version	None	
Build date	Displays the date the BIOS was created	None	-
Board information			
Product revision	Displays the hardware revision of the CPU board	None	-
Serial number	Displays the serial number of the CPU board	None	-
Platform information	Displays information about the chipset, CPU board and main memory	Enter	Opens this submenu See "Platform information" on page 236.
System date	The currently configured system date. This is buffered by the CMOS battery when the system is switched off.	Change the system date	Sets the system date in the format Month:Day:Year (mm:dd:yyyy)
System time	The currently configured system time setting. This is buffered by the CMOS battery when the system is switched off.	Change the system time	Sets the system time in the format Hour:Minute:Second (hh:mm:ss)

Table 192: Main - Configuration options

1.3.1 Platform information

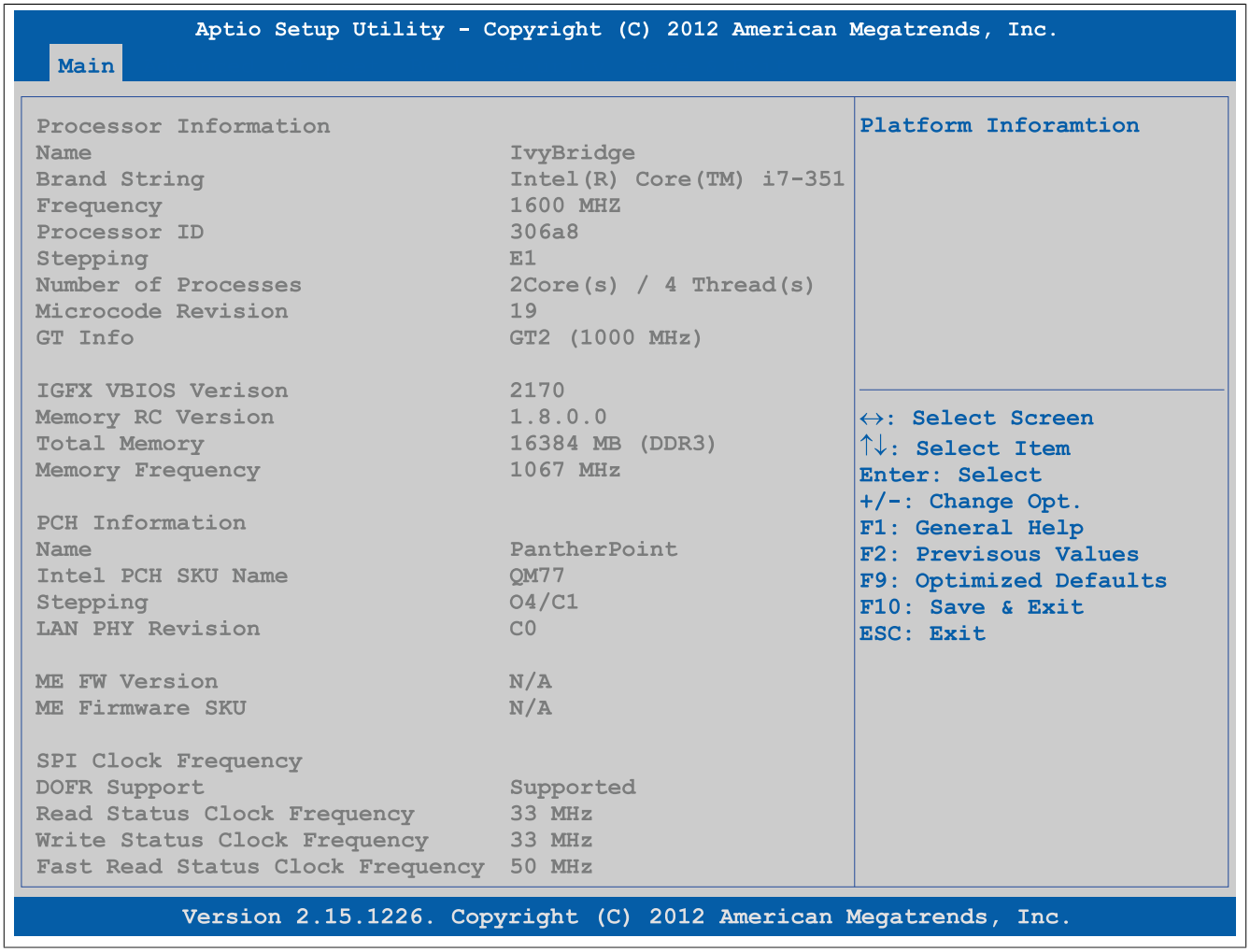


Figure 152: Main - Platform Information

BIOS setting	Function	Configuration options	Effect
Processor information			
Name	Displays the processor architecture	None	-
Brand string	Displays the processor type	None	-
Frequency	Displays the processor frequency	None	-
Processor ID	Displays the processor ID	None	-
Stepping	Displays the processor stepping version	None	-
Number of processors	Displays the number of processor cores/threads	None	-
Microcode revision	Displays the processor microcode revision	None	-
GT info	Displays GT information	None	-
IGFX VBIOS version	Displays the IGFX VBIOS version	None	-
Memory RC version	Displays the memory RC version	None	-
Total memory	Displays the system memory size	None	-
Memory frequency	Displays the RAM frequency	None	-
PCH information			
Name	Displays the platform controller hub	None	-
Intel PCH SKU name	Displays the chipset on the CPU board	None	-
Stepping	Displays the chipset stepping version	None	-
LAN PHY revision	Displays the LAN revision	None	-
ME FW version	Displays the Intel management engine firmware version	None	-
ME firmware SKU	Displays the Intel management stock-keeping unit version	None	-
SPI clock frequency			
DOFR support	Displays information about DOFR support	None	-
Read status clock frequency	Displays the clock frequency read status	None	-
Write status clock frequency	Displays the clock frequency write status	None	-
Fast read status clock frequency	Displays the fast read status clock frequency	None	-

Table 193: Main - Platform information - Overview

1.4 Advanced

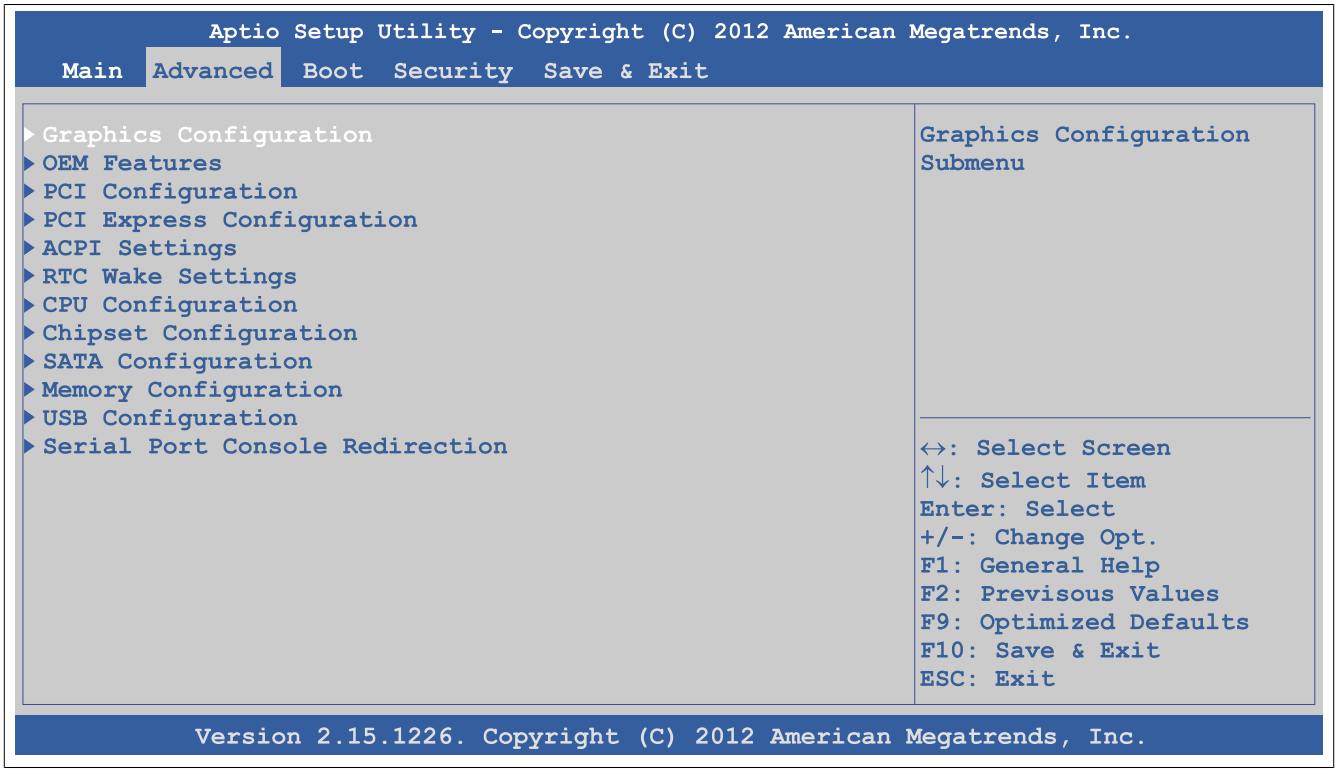


Figure 153: Advanced - Overview

BIOS setting	Function	Configuration options	Effect
Graphics configuration	Configures graphics settings	Enter	Opens this submenu See "Graphics configuration" on page 238.
OEM features	Configures OEM features	Enter	Opens this submenu See "OEM features" on page 240.
PCI configuration	Configures PCI devices	Enter	Opens this submenu See "PCI configuration" on page 259.
PCI express configuration	Configures PCI Express devices	Enter	Opens this submenu See "PCI express configuration" on page 261.
ACPI settings	Configures ACPI settings	Enter	Opens this submenu See "ACPI settings" on page 267.
RTC wake settings	Configures the start time when switched off	Enter	Opens this submenu See "RTC wake settings" on page 268.
CPU configuration	Configures the CPU settings	Enter	Opens this submenu See "CPU configuration" on page 269.
Chipset configuration	Configures chipset settings	Enter	Opens this submenu See "Chipset configuration" on page 272.
SATA configuration	Configures the SATA settings	Enter	Opens this submenu See "SATA configuration" on page 274.
Memory configuration	Configures main memory settings	Enter	Opens this submenu See "Memory configuration" on page 277.
USB configuration	Configures the USB settings	Enter	Opens this submenu See "USB configuration" on page 280.
Serial port console redirection	Configures the remote console	Enter	Opens this submenu See "Serial port console redirection" on page 283.

Table 194: Advanced - Overview

1.4.1 Graphics configuration

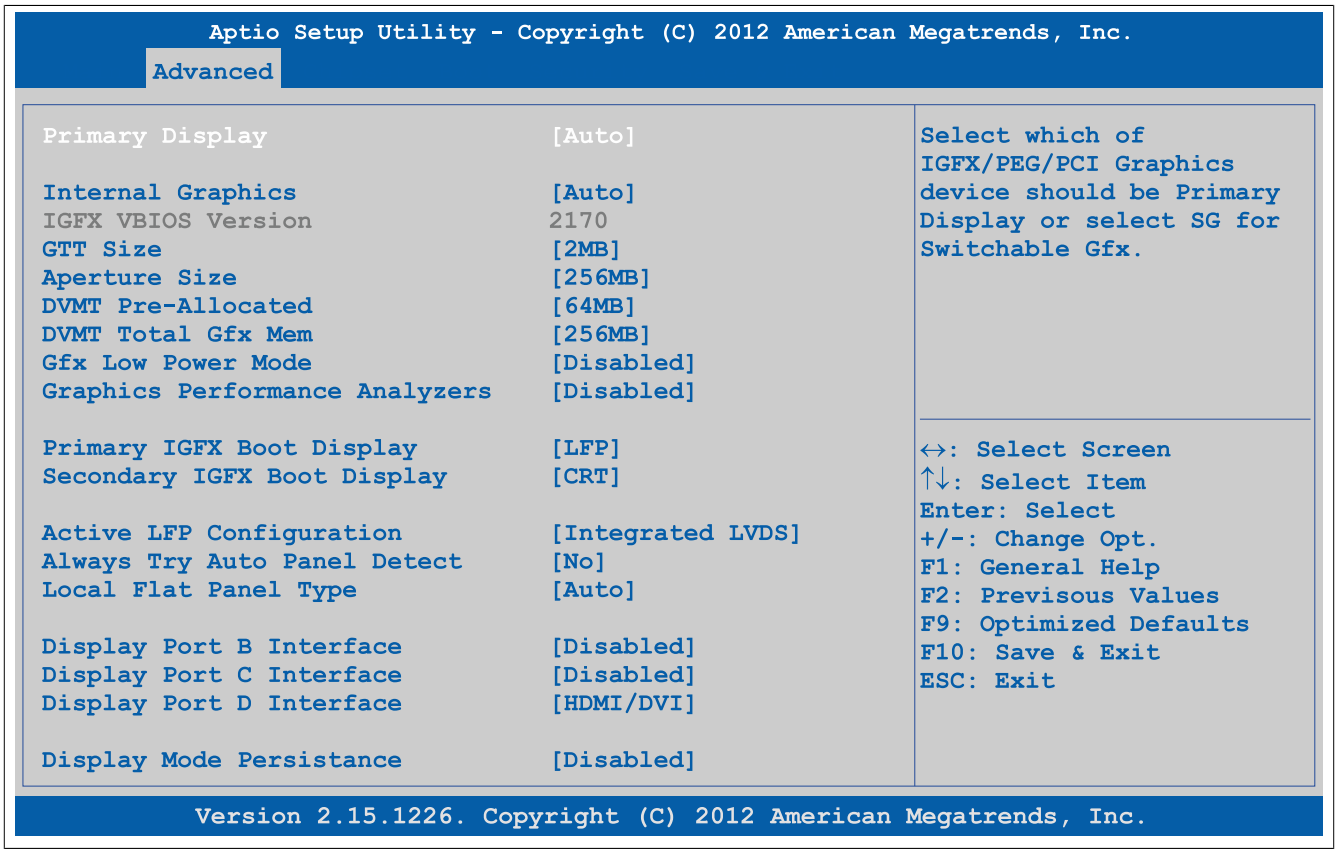


Figure 154: Advanced - Graphics configuration

BIOS setting	Function	Configuration options	Effect
Primary display	Option for selecting the primary display device	Auto	Configures the display device automatically
		IGD	Uses the internal graphics chip on the CPU board as the display device
		PEG	Uses an external PCI Express graphics card connected to the x16 PEG port as the display device
		PCI	Uses the graphics chip of a connected graphics card as the display device
Internal graphics	Option for configuring the internal graphics chip	Auto	Enables the internal graphics chip
		Disabled	Disables the internal graphics chip
		Enabled	Enables the internal graphics chip
IGFX VBIOS version	Displays the IGFX BIOS version	None	-
GTT size	Option for setting the GTT size	1 MB	1 MB GTT
		2 MB	2 MB GTT
Aperture size	Option for configuring the maximum amount of RAM made available to the main memory when graphics memory is full	128M	Reserves 128 MB
		256M	Reserves 256 MB
		512M	Reserves 512 MB
DVMT pre-allocated	Option for setting the fixed amount of memory used for the internal graphics controller	32 MB, 64 MB, 96 MB up to 1024 MB	Defines the fixed graphic memory as a value between 32 and 1024 MB
DVMT total gfx mem	Option for setting the amount of memory that can be used for the internal graphics controller. Memory over the permanently assigned graphics memory is assigned dynamically according to the DVMT 5.0 standard.	128M	Allocates 128 MB of main memory
		256M	Allocates 256 MB of main memory
		MAX	Allocates the entire main memory
Gfx low power mode	Option for setting the power saving function for the graphics controller **Information:** **This option can only be used for SFF.**	Enabled	Enables low power mode. The graphics controller does not operate at full speed.
		Disabled	Disables low power mode
Graphics performance analyzers	Option for enabling/disabling the Intel graphics performance analyzers	Enabled	Enables this function
		Disabled	Disables this function
Primary IGFX boot display	Option for defining the primary enabled display device during booting.	VBIOS default	Uses the default setting from IGFX BIOS
		CRT	Uses the CRT (cathode ray tube) channel
		LFP	Uses the LFP (local flat panel) channel
		EFP	Uses the EFP (external flat panel) channel

Table 195: Advanced - Graphics configuration options

BIOS setting	Function	Configuration options	Effect
	Information: **The numbering of EFP occurs dynamically depending on the DisplayPort interface (B/C/D).**	EFP2	Uses the EFP2 (external flat panel 2) channel
		EFP3	Uses the EFP3 (external flat panel 3) channel
Secondary IGFX boot display	Option for defining the secondary enabled panel during POST **Information:** **The numbering of EFP occurs dynamically depending on the DisplayPort interface (B/C/D).** **Information:** **After the BIOS boot screen, nothing more is shown on this display until the graphics driver is reloaded by the operating system.**	Disabled	Disables this function. Only shows POST on one display.
		CRT	Uses the CRT (cathode ray tube) channel
		LFP	Uses the LFP (local flat panel) channel
		EFP	Uses the EFP (external flat panel) channel
		EFP2	Uses the EFP2 (external flat panel 2) channel
		EFP3	Uses the EFP3 (external flat panel 3) channel
Active LFP configuration	Option for selecting the active LFP (local flat panel) channel	No local flat panel	Does not use the LVDS channel
		Integrated LVDS	Uses the integrated LVDS channel
Always try auto panel detect	This option first searches for EDID data in an external EEPROM to configure the LFP. If no EDID data is found, then the data selected under "Local flat panel type" is used.	No	Disables this function
		Yes	Enables this function
Local flat panel type	This option can be used to set a predefined profile for the LVDS channel.	Auto	Automatic detection and configuration using the EDID data
		VGA 1x18 (002h)	640 x 480
		VGA 1x18 (013h)	640 x 480
		WVGA 1x18 (01Fh)	800 x 480
		WVGA 1x24 (01Bh)	800 x 480
		SVGA 1x18 (01Ah)	800 x 600
		XGA 1x18 (006h)	1024 x 768
		XGA 2x18 (007h)	1024 x 768
		XGA 1x24 (008h)	1024 x 768
		XGA 2x24 (012h)	1024 x 768
		WXGA 1x18 (01Eh)	1280 x 800
		WXGA 1x24 (01Ch)	1280 x 768
		SXGA 2x24 (00Ah)	1280 x 1024
		SXGA 2x24 (018h)	1280 x 1024
		UXGA 2x24 (00Ch)	1600 x 1200
		HD 2x24 (01Dh)	1920 x 1080
		WUXGA 2x18 (015h)	1920 x 1200
		WUXGA 2x24 (00Dh)	1920 x 1200
		Customized EDID 1	User-defined profile
		Customized EDID 2	User-defined profile
		Customized EDID 3	User-defined profile
Display port B interface	Option for selecting the display device that is connected to the DisplayPort interface	Disabled	Disables the DisplayPort interface
		DisplayPort	Configures the DisplayPort interface as a DisplayPort interface
		HDMI/DVI	Configures the DisplayPort interface as an HDMI/DVI interface
Display Port C interface	Option for selecting the display device that is connected to the monitor/panel option	Disabled	Disables the monitor/panel option
		DisplayPort	Configures the monitor/panel option as a DisplayPort interface
		HDMI/DVI	Configures the monitor/panel option as an HDMI/DVI interface

Table 195: Advanced - Graphics configuration options

BIOS setting	Function	Configuration options	Effect
Display Port D interface	Option for selecting the display device that is connected to the monitor/panel interface	Disabled	Disables the monitor/panel interface
		DisplayPort	Configures the monitor/panel interface as a DisplayPort interface **Information:** **This setting disables the monitor/panel interface.**
		HDMI/DVI	Configures the monitor/panel interface as an HDMI/DVI interface
Display mode persistence	"Display mode persistence" means that the operating system can remember and restore past display configurations. For example, a dual DVI configuration is automatically restored when both DVI monitors are reconnected, even if only one of them was connected and enabled during a previous boot.	Disabled	Disables this function
		Enabled	Enables this function

Table 195: Advanced - Graphics configuration options

1.4.2 OEM features

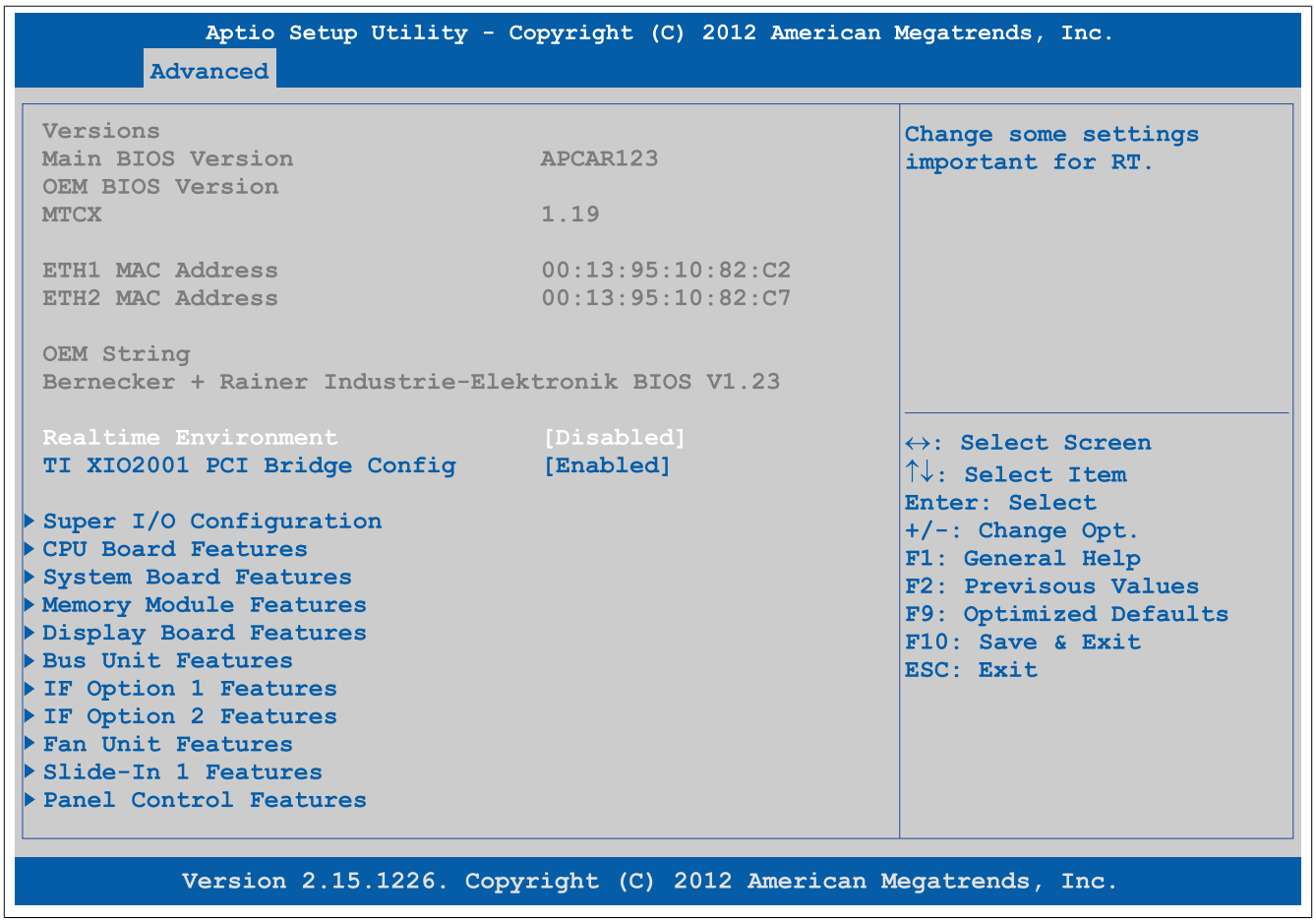


Figure 155: Advanced - OEM features

BIOS setting	Function	Configuration options	Effect
Main BIOS version	Displays the installed B&R BIOS version	None	-
OEM BIOS version		None	-
MTCX	Displays the installed MTCX version	None	-
ETH1 MAC address	Displays the assigned MAC address for the ETH1 interface	None	-
ETH2 MAC address	Displays the assigned MAC address for the ETH2 interface	None	-
Real-time environment	Configures settings for real-time operating systems such as ARwin	Disabled	Disables this function
		Enabled	Disables hyper-threading, turbo mode and EIST. Also disables ASPM and the IRQ of root ports 2 and 3.
TI XIO2001 PCI bridge[1)]	Option for setting DMA access	Enabled	Optimizes DMA access
		Disabled	Disables this function

Table 196: Advanced - OEM features screen

BIOS setting	Function	Configuration options	Effect
Super I/O configuration	Configures special interface settings	Enter	Opens this submenu See "Super I/O configuration" on page 241.
CPU board features	Displays device-specific information for the CPU board	Enter	Opens this submenu See "CPU board features" on page 242.
System board features	Displays device-specific information for the system unit	Enter	Opens this submenu See "System board features" on page 243.
Memory module features	Displays device-specific information for the main memory	Enter	Opens this submenu See "Memory module features" on page 246.
Display board features	Displays device-specific information about the Panel PC display.	Enter	Opens this submenu See "Display board features" on page 247.
Bus unit features	Displays device-specific information for the bus unit	Enter	Opens this submenu See "Bus unit features" on page 250.
IF option 1 features[2]	Displays device-specific information for interface option 1	Enter	Opens this submenu See "IF option 1 features" on page 251.
IF option 2 features[2]	Displays device-specific information for interface option 2	Enter	Opens this submenu See "IF option 2 features" on page 253.
Fan unit features[3]	Displays device-specific information for the fan kit	Enter	Opens this submenu See "Fan unit features" on page 254.
Slide-in 1 features[4]	Displays device-specific information for slide-in drive 1	Enter	Opens this submenu See "Slide-in 1 features" on page 256.
Panel control features	Displays device-specific information for the connected panel	Enter	Opens this submenu See "Panel control features" on page 258.

Table 196: Advanced - OEM features screen

1) This option is only shown if a bus unit with a PCI slot is installed.
2) This option is only shown if the corresponding option is installed in the system unit.
3) This option is only shown if a fan kit is installed in the system unit.
4) This option is only shown if a slide-in drive is installed in the bus unit.

1.4.2.1 Super I/O configuration

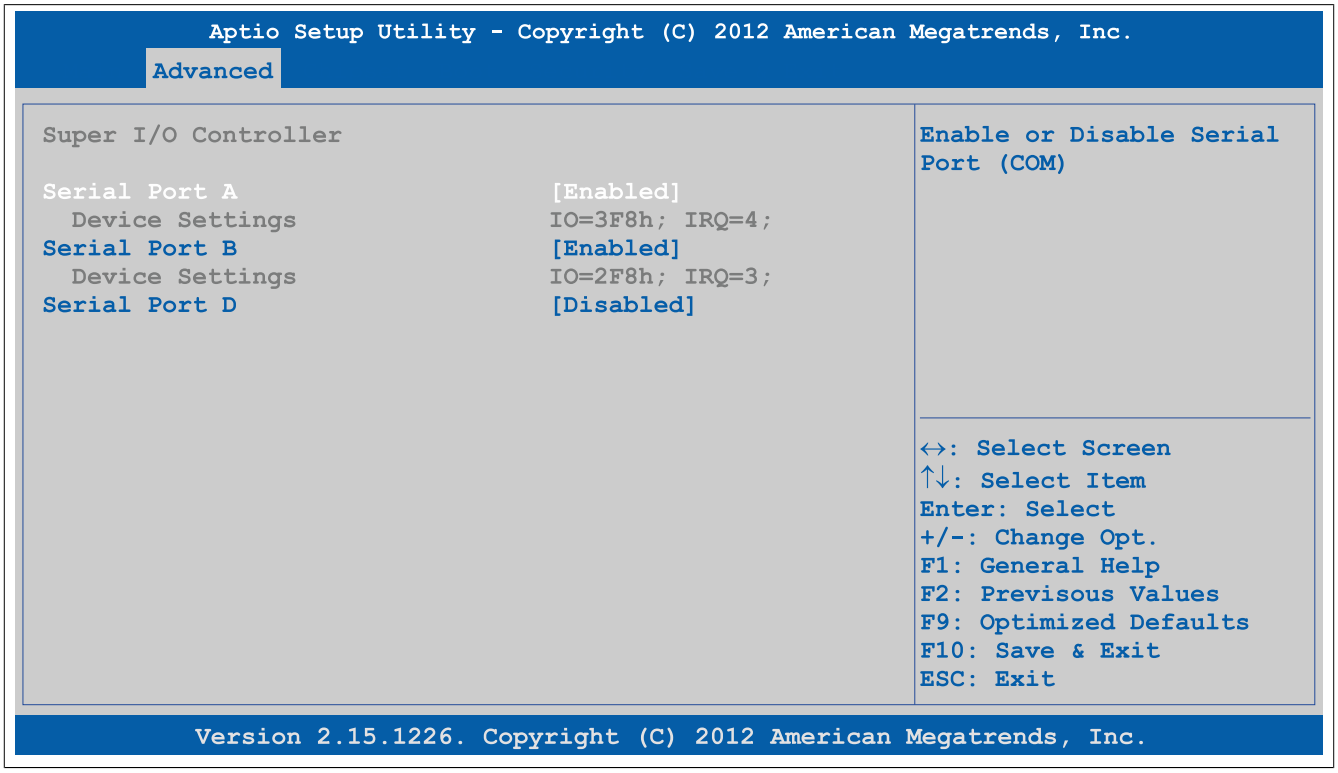


Figure 156: Advanced - OEM features - Super I/O configuration

BIOS setting	Function	Configuration options	Effect
Serial port A	Settings for the COM1 serial interface	Enabled	Enables this interface
		Disabled	Disables this interface
Device settings	Displays the I/O address and interrupt of the COM1 interface	None	-
Serial port B	Settings for the COM2 serial interface	Enabled	Enables this interface
		Disabled	Disables this interface
Device settings	Displays the I/O address and interrupt for the COM2 serial interface in the system	None	-
Serial port C	Setting for the onboard touch screen	Enabled	Enables this interface
		Disabled	Disables this interface

Table 197: Advanced - OEM features - Super I/O configuration - Configuration options

BIOS setting	Function	Configuration options	Effect
Device settings	Displays the I/O address and the interrupt of the onboard touch screen	None	-
Serial port D	Setting for the touch screen of a connected panel	Enabled	Enables this interface
		Disabled	Disables this interface
Device settings	Displays the I/O address and the interrupt for the touch screen of a connected panel	None	-
Serial port E[1)]	Setting for the RS232 IF option in IF option slot 1	Enabled	Enables this interface
		Disabled	Disables this interface
Device settings	Displays the I/O address and interrupt for the RS232 IF option in IF option slot 1	None	-
Serial port F[1)]	Setting for the RS232 IF option in IF option slot 2	Enabled	Enables this interface
		Disabled	Disables this interface
Device settings	Displays the I/O address and interrupt for the RS232 IF option in IF option slot 2	None	-
CAN controller[1)]	Setting for the CAN IF option	Enabled	Enables this interface
		Disabled	Disables this interface
Device settings	Displays the I/O address and interrupt for the CAN IF option	None	-

Table 197: Advanced - OEM features - Super I/O configuration - Configuration options

1) This option is only shown if the corresponding IF option is installed in the system unit.

1.4.2.2 CPU board features

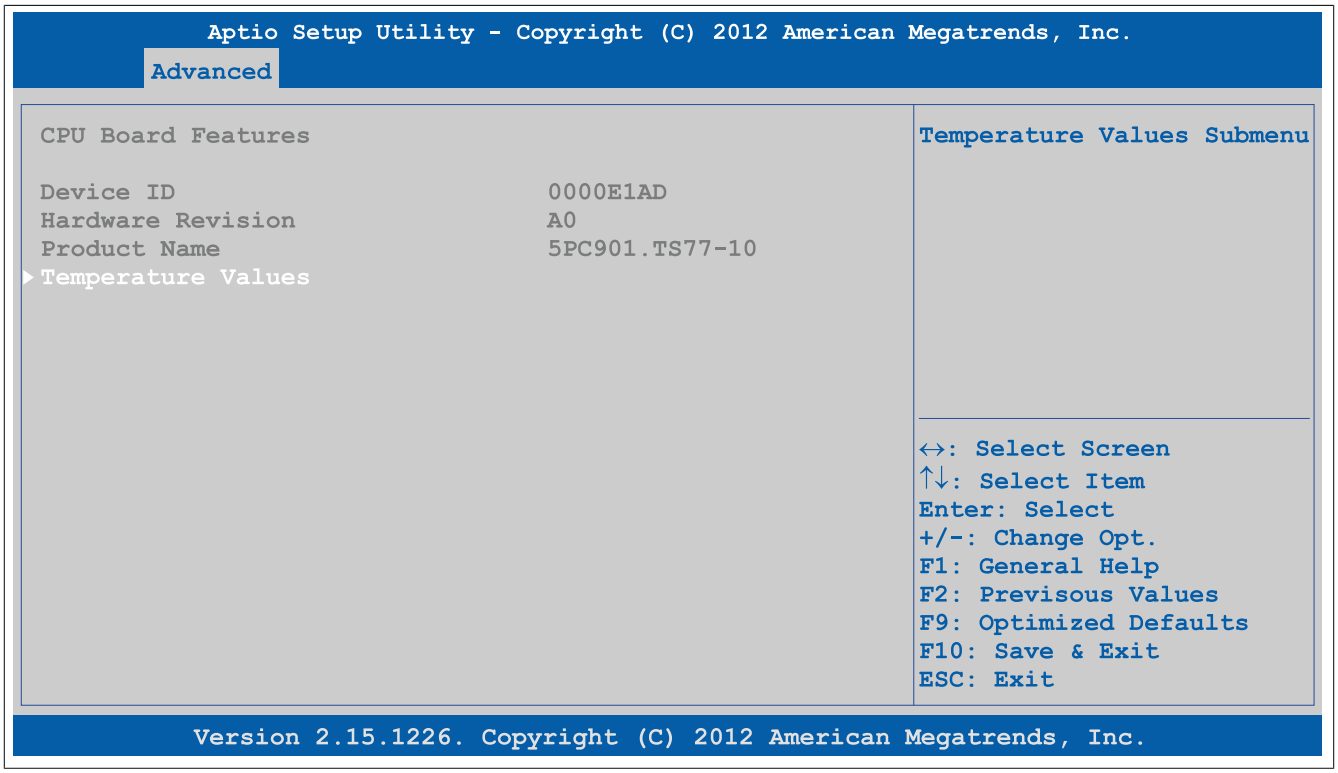


Figure 157: Advanced - OEM features - CPU board features

BIOS setting	Function	Configuration options	Effect
Device ID	Displays the device ID of the CPU board	None	-
Hardware revision	Displays the hardware revision of the CPU board	None	-
Product name	Displays the B&R model number	None	-
Temperature values	Displays current temperature values	Enter	Opens this submenu See "Temperature values" on page 243.

Table 198: Advanced - OEM features - CPU board features

1.4.2.2.1 Temperature values

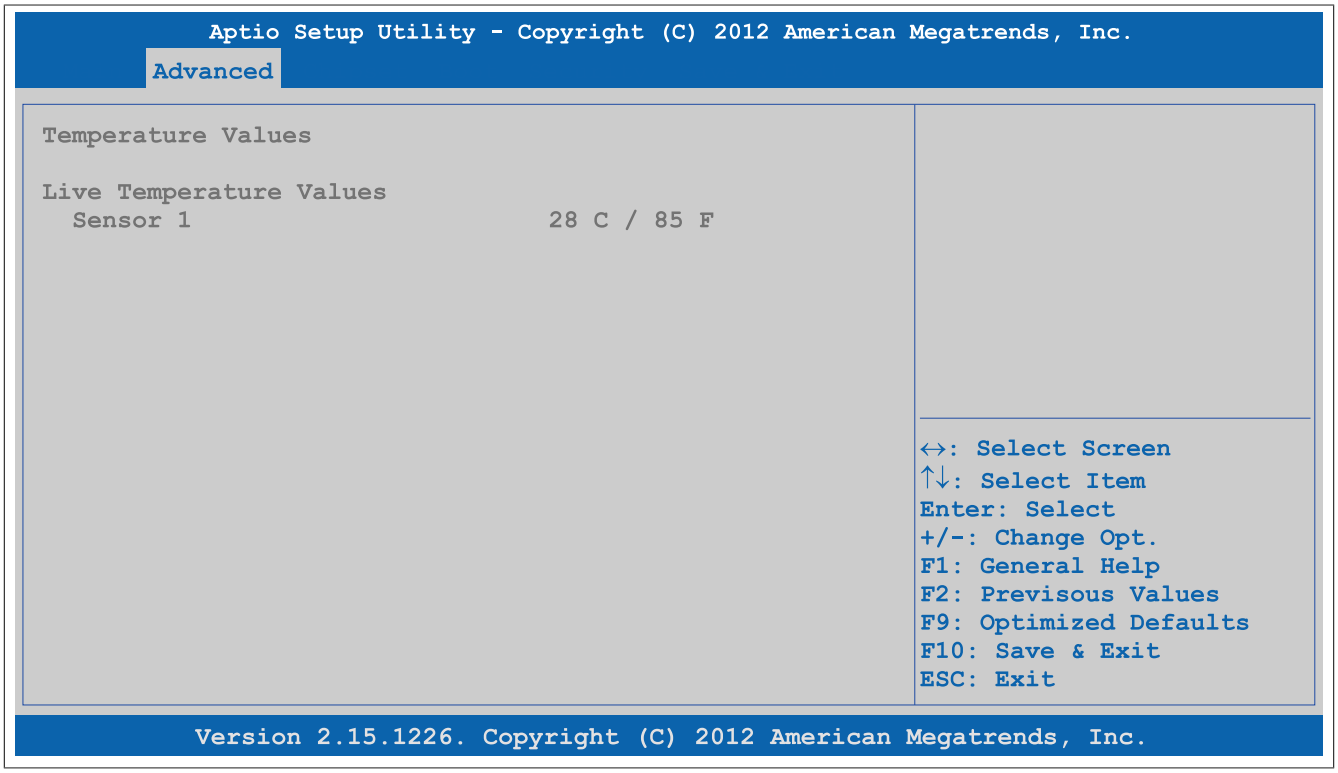


Figure 158: Advanced - OEM features - CPU board features - Temperature values

BIOS setting	Function	Configuration options	Effect
Sensor 1	Displays the current temperature of sensor 1 (CPU) in °C and °F	None	-

Table 199: Advanced - OEM features - CPU board features - Temperature values

1.4.2.3 System board features

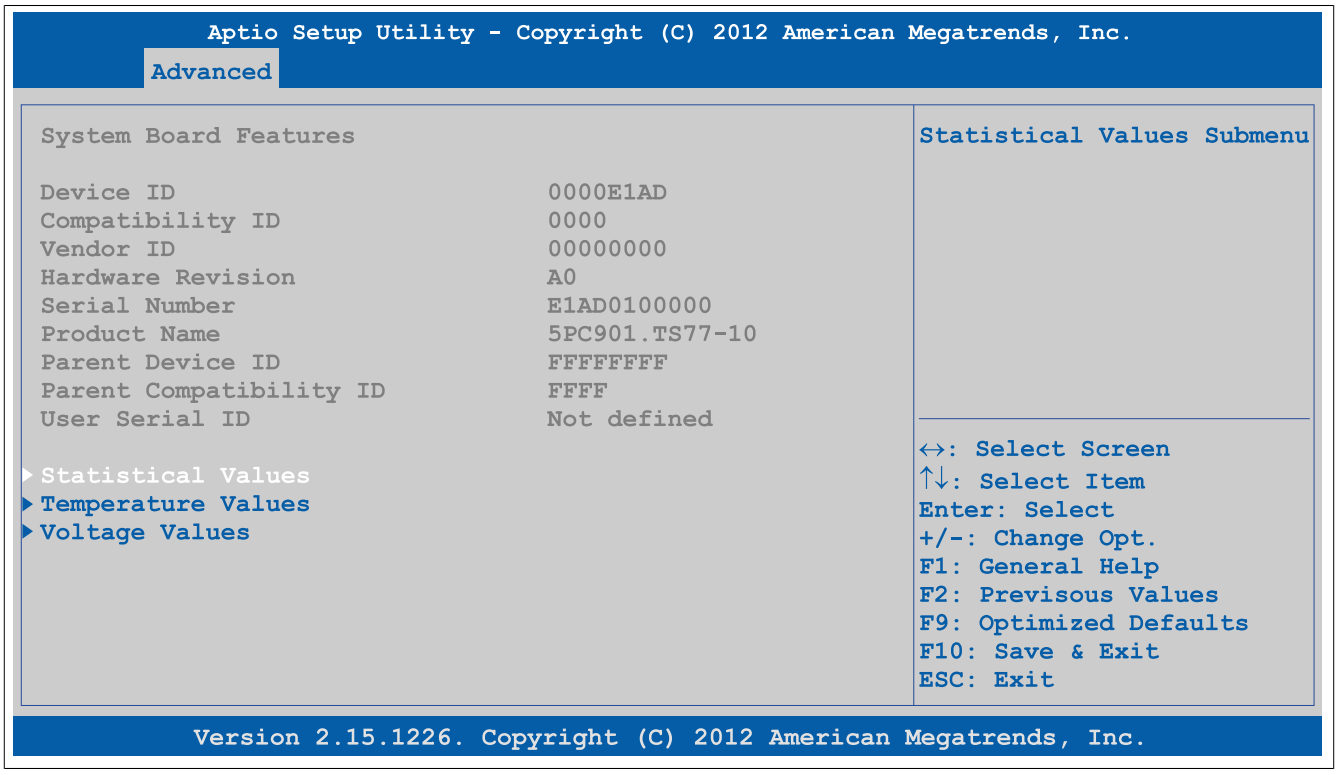


Figure 159: Advanced - OEM features - System board features

BIOS setting	Function	Configuration options	Effect
Device ID	Displays the device ID of the CPU board	None	-
Compatibility ID	Displays the version of the device within the same B&R device ID. This ID is needed for Automation Runtime.	None	-
Vendor ID	Displays the vendor ID	None	-
Hardware revision	Displays the hardware revision of the CPU board	None	-
Serial number	Displays the B&R serial number	None	-
Product name	Displays the B&R model number	None	-
Parent device ID	Displays the manufacturer number	None	-
Parent compatibility ID	Displays the manufacturer ID	None	-
User serial ID	Displays the user serial ID. This 8-digit hexadecimal value can be freely specified by the user (e.g. to give the device a unique ID) and can only be changed using the "B&R Control Center" included with the ADI driver.	None	-
Statistical values	Displays statistical values	Enter	Opens this submenu See "Statistical values" on page 244.
Temperature values	Displays current temperature values	Enter	Opens this submenu See "Temperature values" on page 245.
Voltage control	Displays current battery properties	Enter	Opens this submenu See "Voltage values" on page 246.

Table 200: Advanced - OEM features - System board features

1.4.2.3.1 Statistical values

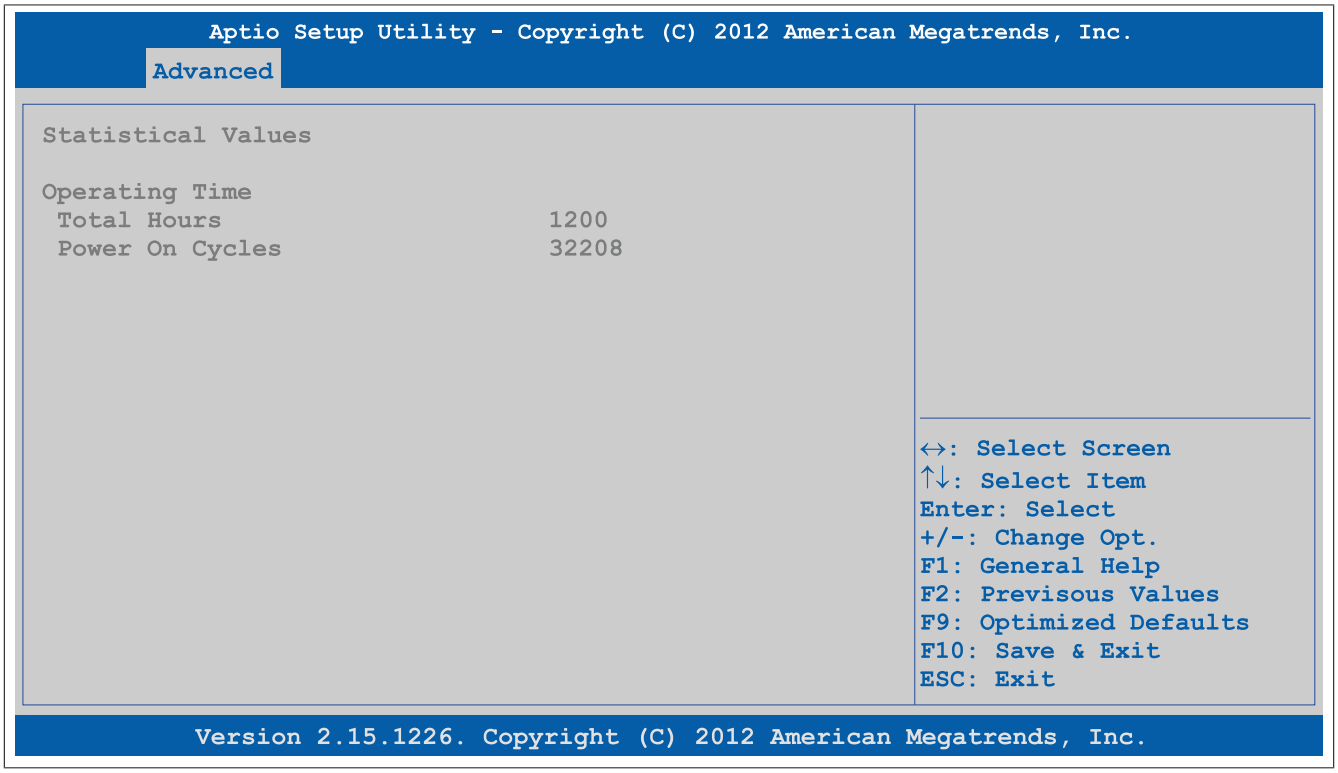


Figure 160: Advanced - OEM Features - System Board Features - Statistical Values

BIOS setting	Function	Configuration options	Effect
Total hours	Displays the runtime in hours	None	-
Power on cycles	Displays the number of power-on cycles. Each restart increases the counter by one.	None	-

Table 201: Advanced - OEM features - System board features - Statistical values

1.4.2.3.2 Temperature values

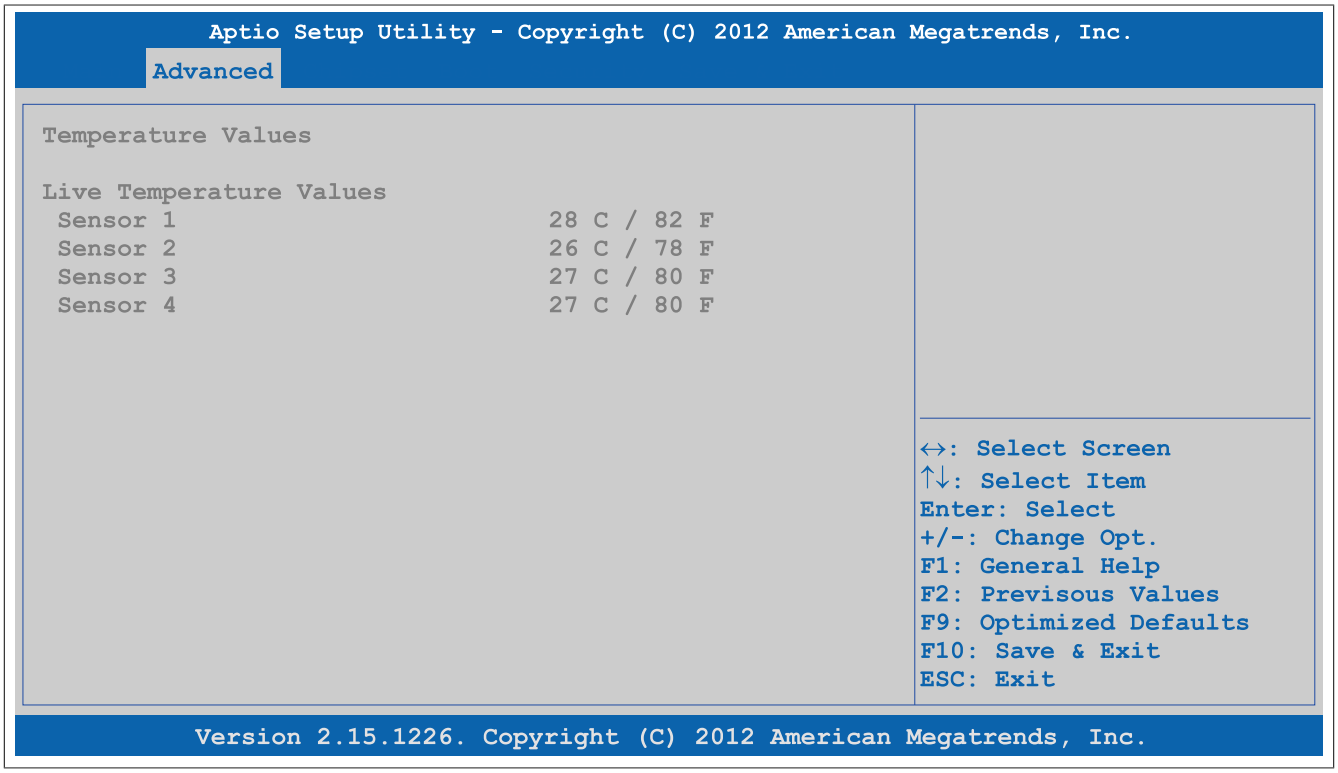


Figure 161: Advanced - OEM features - System board features - Temperature values

BIOS setting	Function	Configuration options	Effect
Sensor 1	Displays the current temperature of sensor 1 (board) in °C and °F	None	-
Sensor 2	Displays the current temperature of sensor 2 (chipset) in °C and °F	None	-
Sensor 3	Displays the current temperature of sensor 3 (board power supply) in °C and °F	None	-
Sensor 4	Displays the current temperature of sensor 4 (CFast) in °C and °F	None	-

Table 202: Advanced - OEM features - System board features - Temperature values

1.4.2.3.3 Voltage values

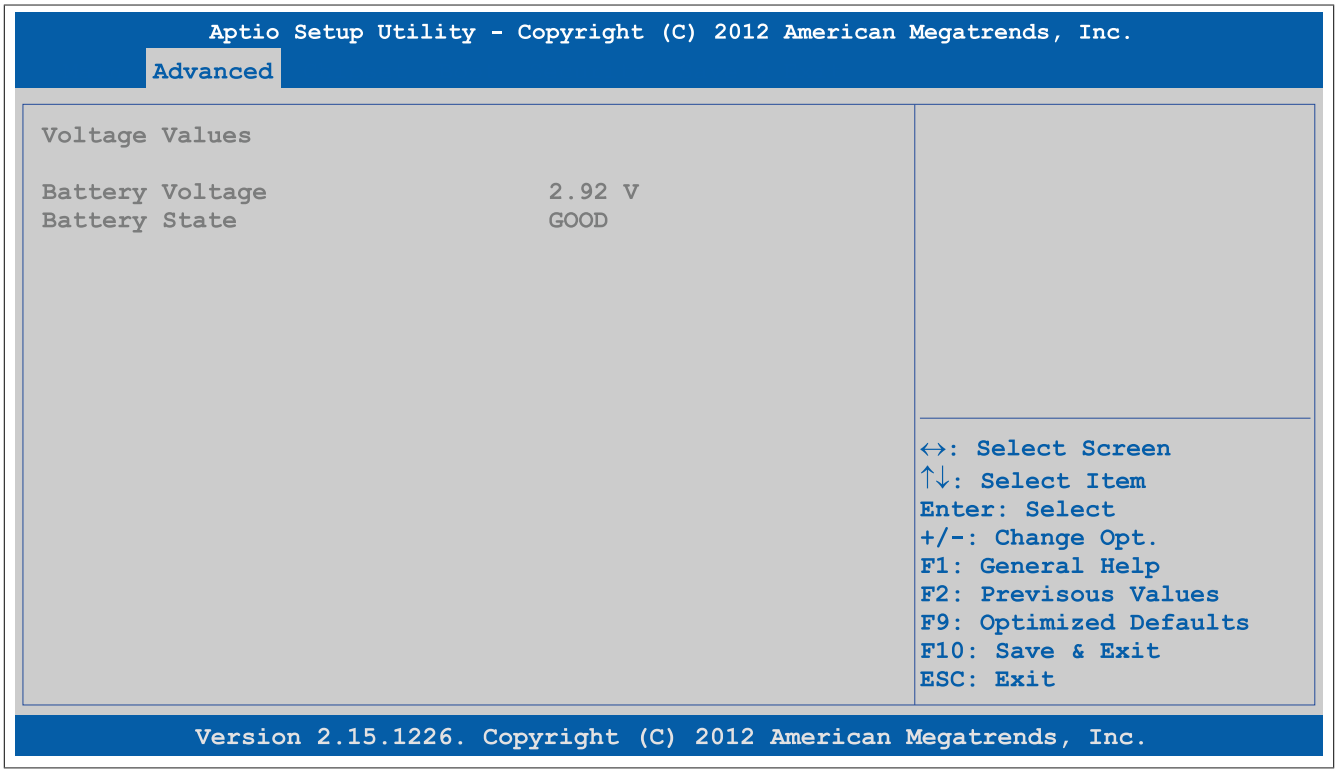


Figure 162: Advanced - OEM Features - System Board Features - Voltage Values

BIOS setting	Function	Configuration options	Effect
Battery voltage	Displays the battery voltage in volts	None	-
Battery state	Displays the status of the battery	None	-

Table 203: Advanced - OEM features - System board features - Voltage values

1.4.2.4 Memory module features

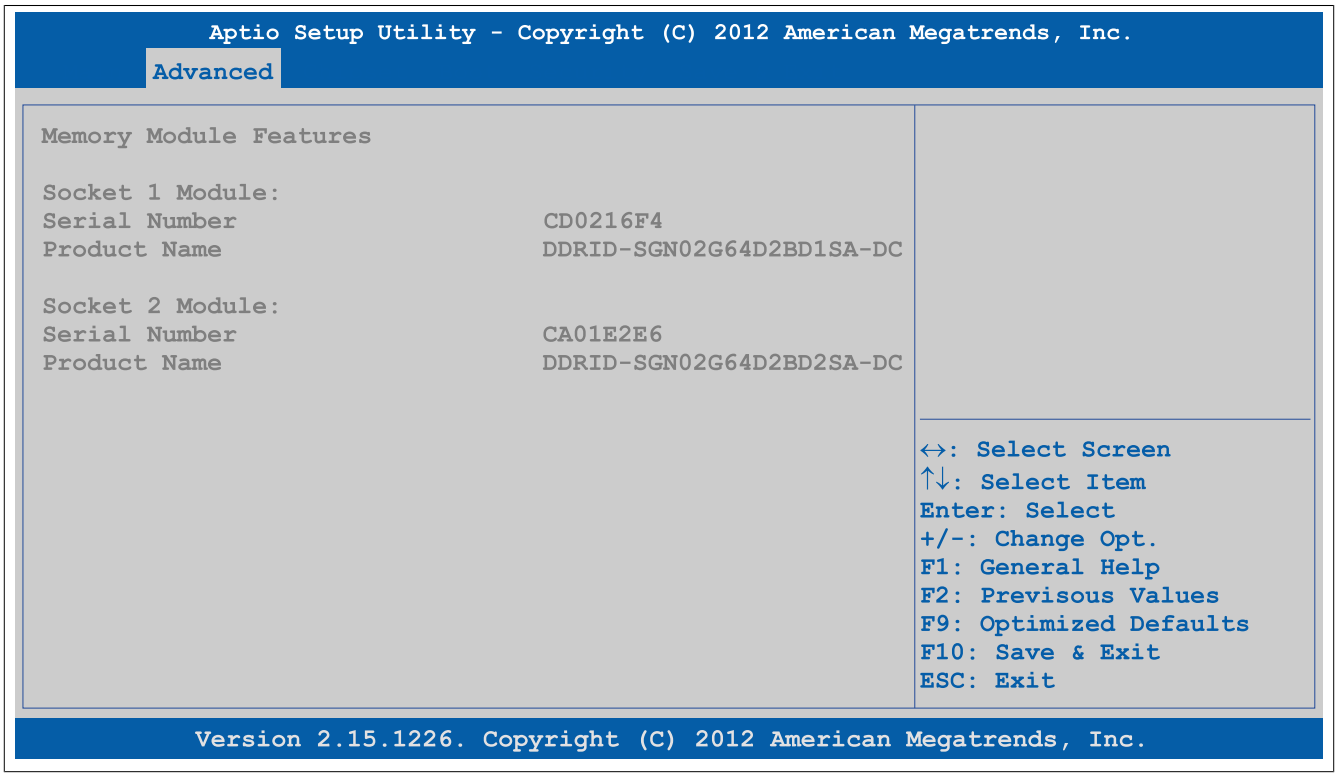


Figure 163: Advanced - OEM features - Memory module features

BIOS setting	Function	Configuration options	Effect
Socket 1 module			
Serial number	Displays the B&R serial number	None	-
Product name	Displays the product number	None	-
Socket 2 module			
Serial number	Displays the B&R serial number	None	-
Product name	Displays the product number	None	-

Table 204: Advanced - OEM features - Memory module features

1.4.2.5 Display board features

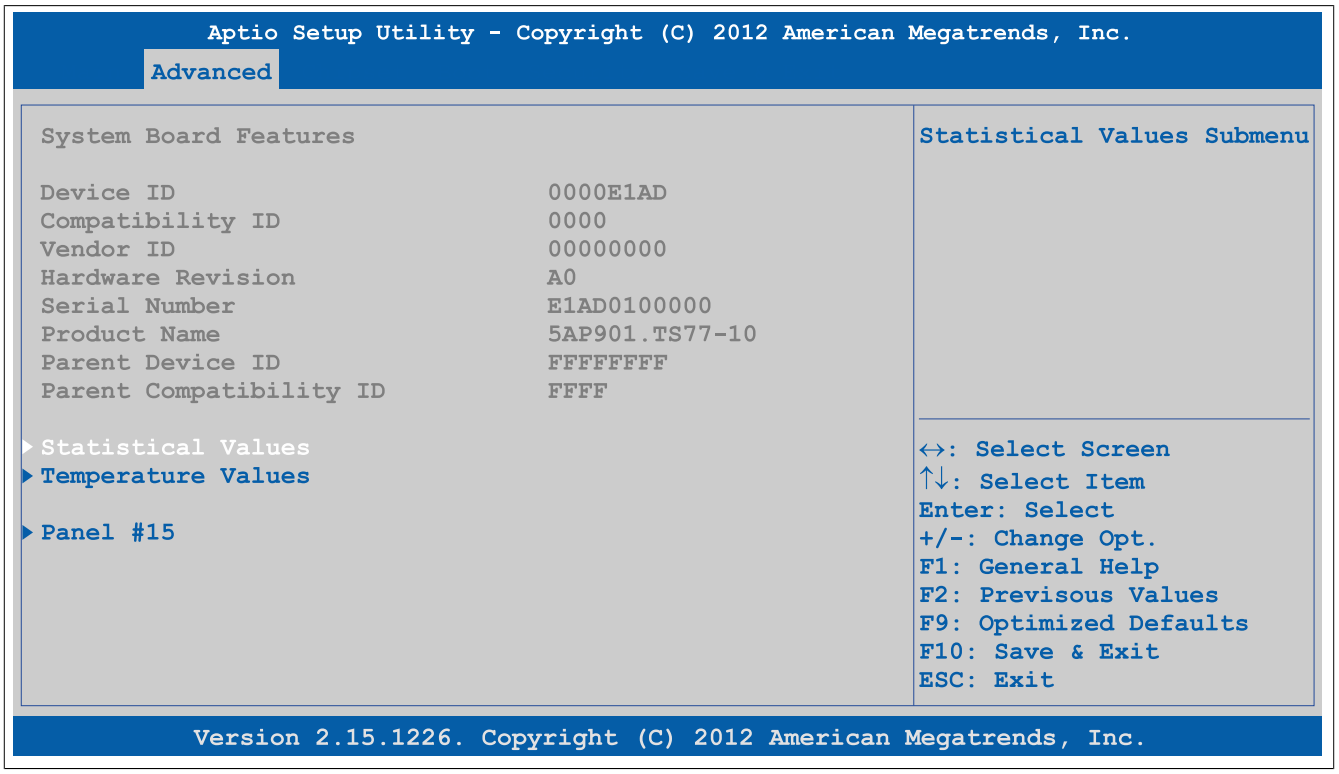


Figure 164: Advanced - OEM features - Display board features

BIOS setting	Function	Configuration options	Effect
Device ID	Displays the device ID of the display unit	None	-
Compatibility ID	Displays the version of the device within the same B&R device ID. This ID is needed for Automation Runtime.	None	-
Vendor ID	Displays the vendor ID	None	-
Hardware revision	Displays the hardware revision of the display unit	None	-
Serial number	Displays the B&R serial number	None	-
Product name	Displays the B&R model number	None	-
Parent device ID	Displays the manufacturer number	None	-
Parent compatibility ID	Displays the manufacturer ID	None	-
Statistical values	Displays statistical values	Enter	Opens this submenu See "Statistical values" on page 248.
Temperature values	Displays current temperature values	Enter	Opens this submenu See "Temperature values" on page 248.
Panel #15	Displays the panel properties of the display unit	Enter	Opens this submenu See "Panel #15" on page 249.

Table 205: Advanced - OEM features - Display board features

1.4.2.5.1 Statistical values

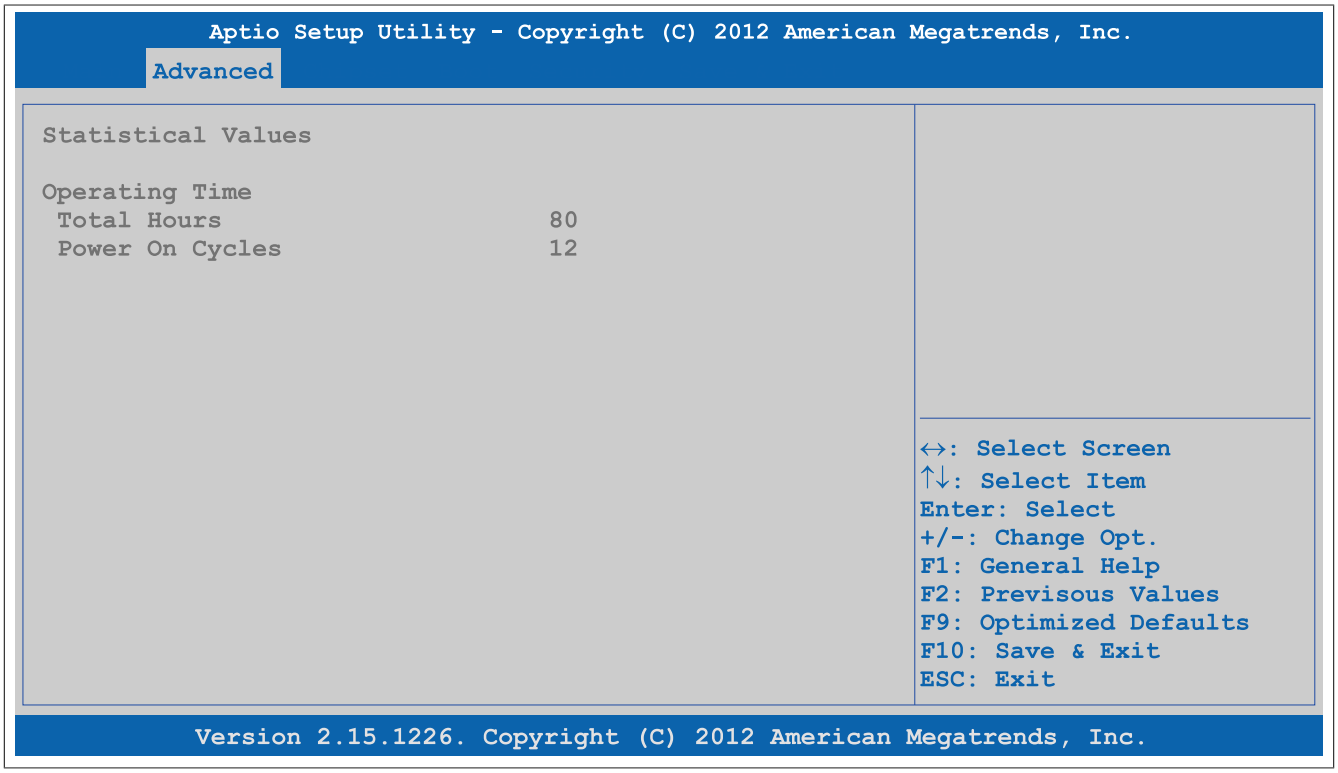


Figure 165: Advanced - OEM features - Display board features - Statistical values

BIOS setting	Function	Configuration options	Effect
Total hours	Displays the runtime in hours	None	-
Power on cycles	Displays the number of power-on cycles. Each restart increases the counter by one.	None	-

Table 206: Advanced - OEM features - Display board features - Statistical values

1.4.2.5.2 Temperature values

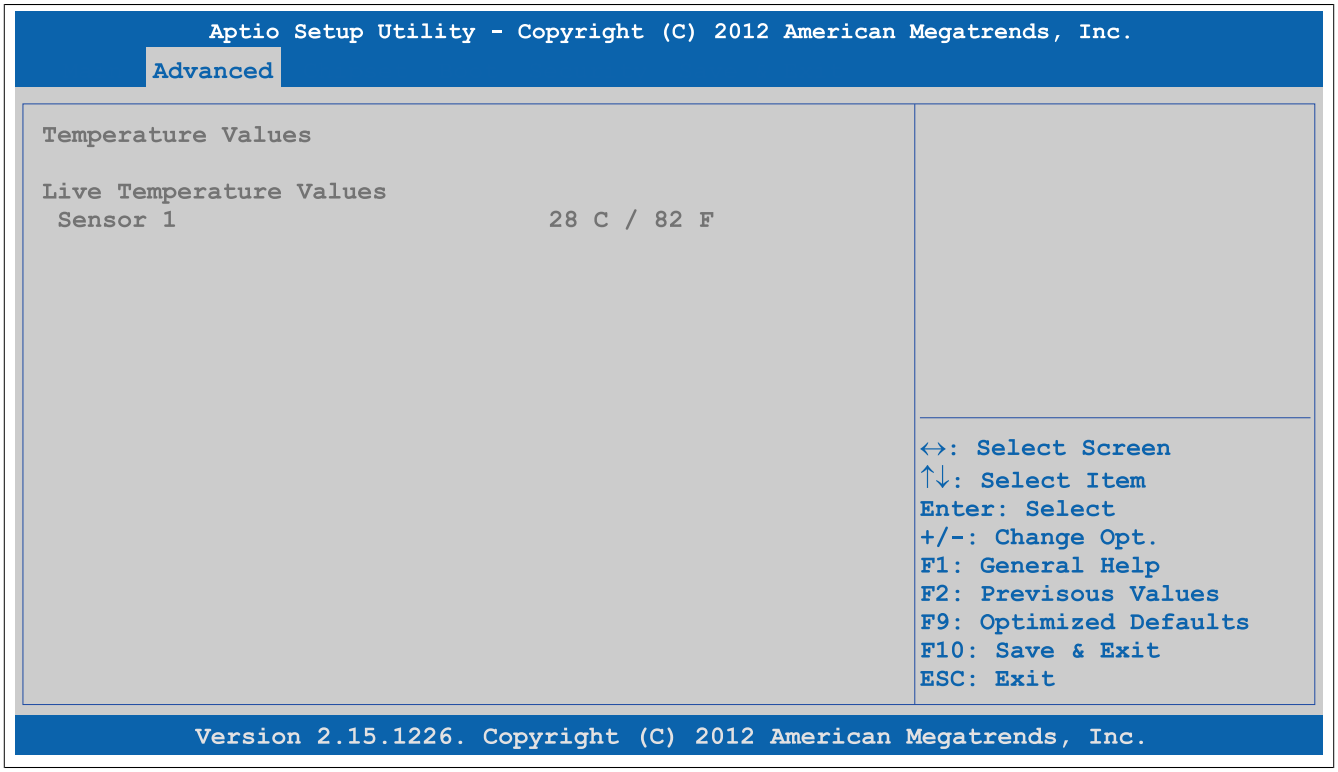


Figure 166: Advanced - OEM features - Display board features - Temperature values

BIOS setting	Function	Configuration options	Effect
Sensor 1	Displays the current temperature of sensor 1 (display unit) in °C and °F	None	-

Table 207: Advanced - OEM features - Display board features - Temperature values

1.4.2.5.3 Panel #15

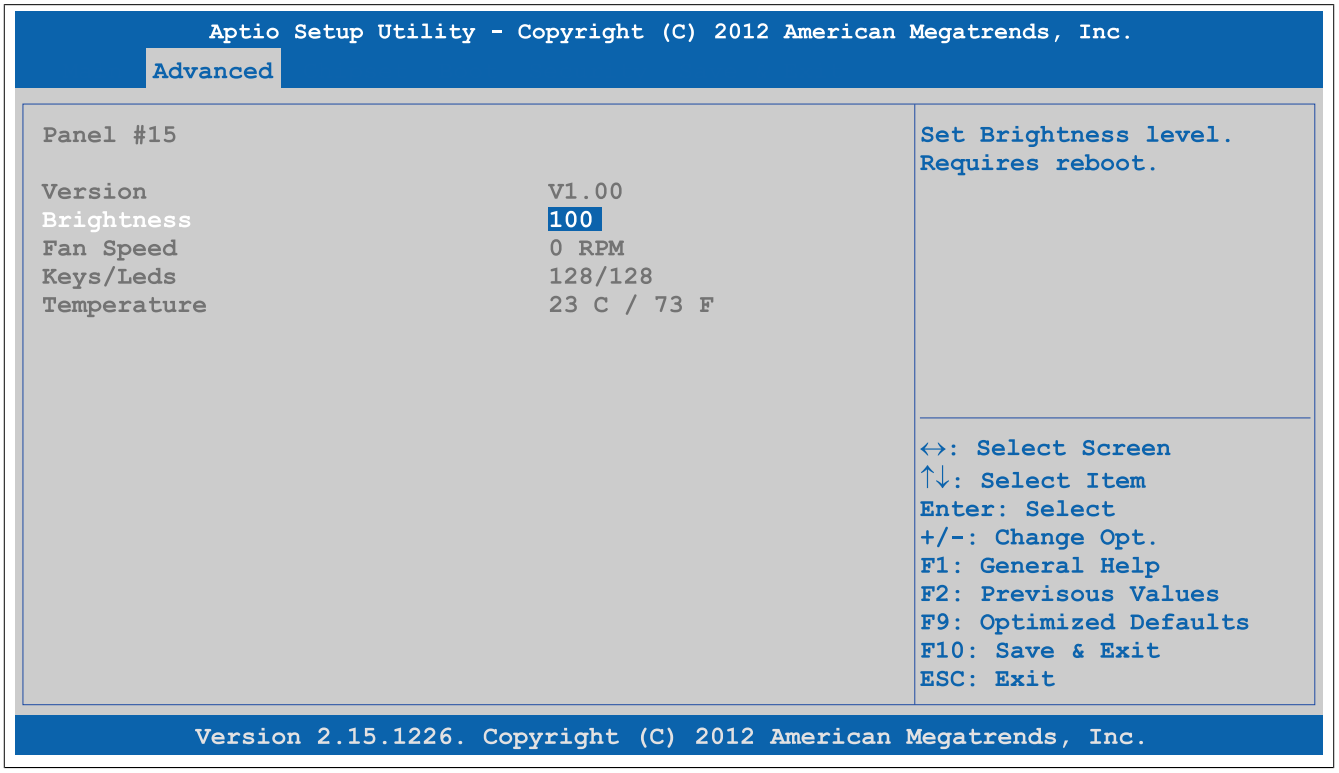


Figure 167: Advanced - OEM features - Display board features - Panel #15

BIOS setting	Function	Configuration options	Effect
Version	Displays the firmware revision.	None	-
Brightness	Setting for the brightness of the display unit	0 to 100	Sets the brightness (in %) of the selected panel. Settings take effect immediately.
Fan speed	Displays the fan speed of the display unit	None	-
Keys/LEDs	Displays the available keys and LEDs for the display unit	None	-
Temperature	Displays the temperature of the display unit in °C and °F	None	-

Table 208: Advanced - OEM features - Display board features - Panel #15

1.4.2.6 Bus unit features

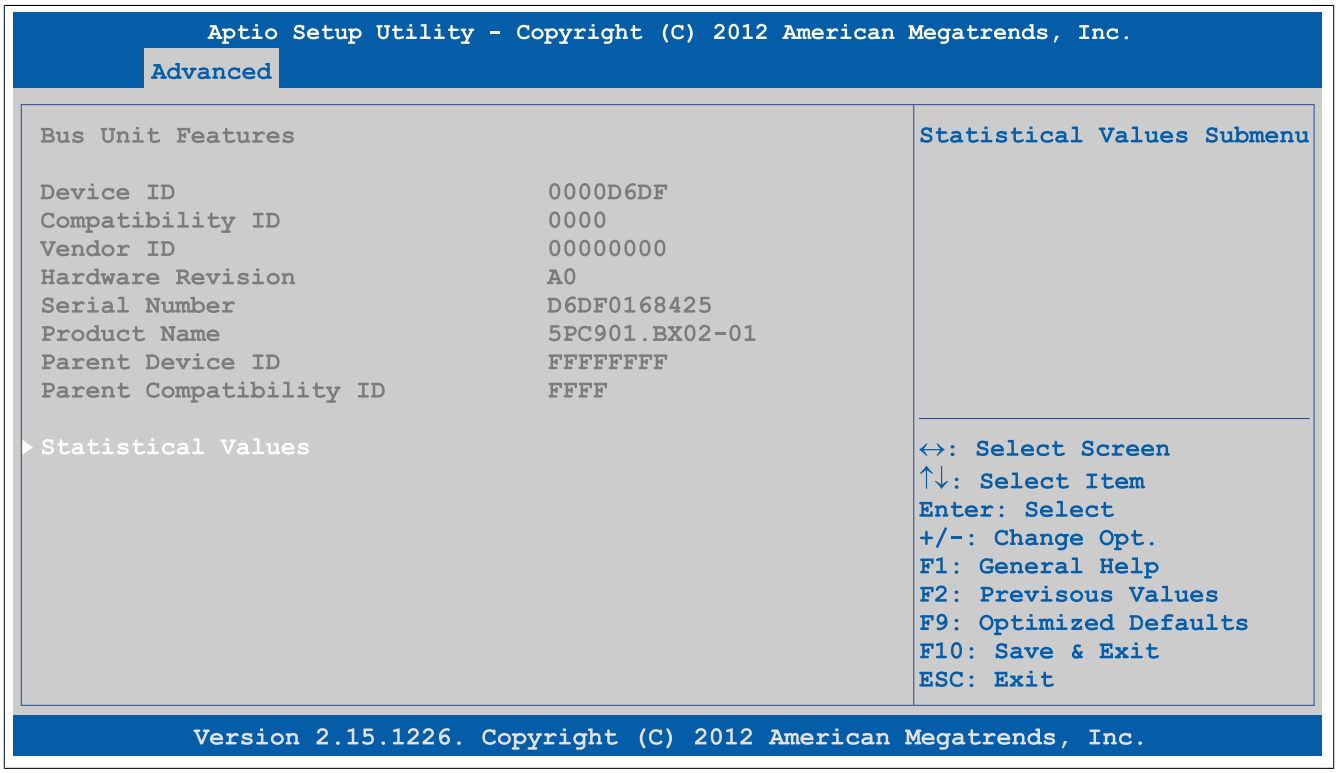


Figure 168: Advanced - OEM Features - Bus Unit Features

BIOS setting	Function	Configuration options	Effect
Device ID	Displays the device ID of the bus unit	None	-
Compatibility ID	Displays the version of the device within the same B&R device ID. This ID is needed for Automation Runtime.	None	-
Vendor ID	Displays the vendor ID	None	-
Hardware revision	Displays the hardware revision of the bus unit	None	-
Serial number	Displays the B&R serial number	None	-
Product name	Displays the B&R model number	None	-
Parent device ID	Displays the manufacturer number	None	-
Parent compatibility ID	Displays the manufacturer ID	None	-
Statistical values	Displays statistical values	Enter	Opens this submenu See "Statistical values" on page 251.

Table 209: Advanced - OEM features - Bus unit features

1.4.2.6.1 Statistical values

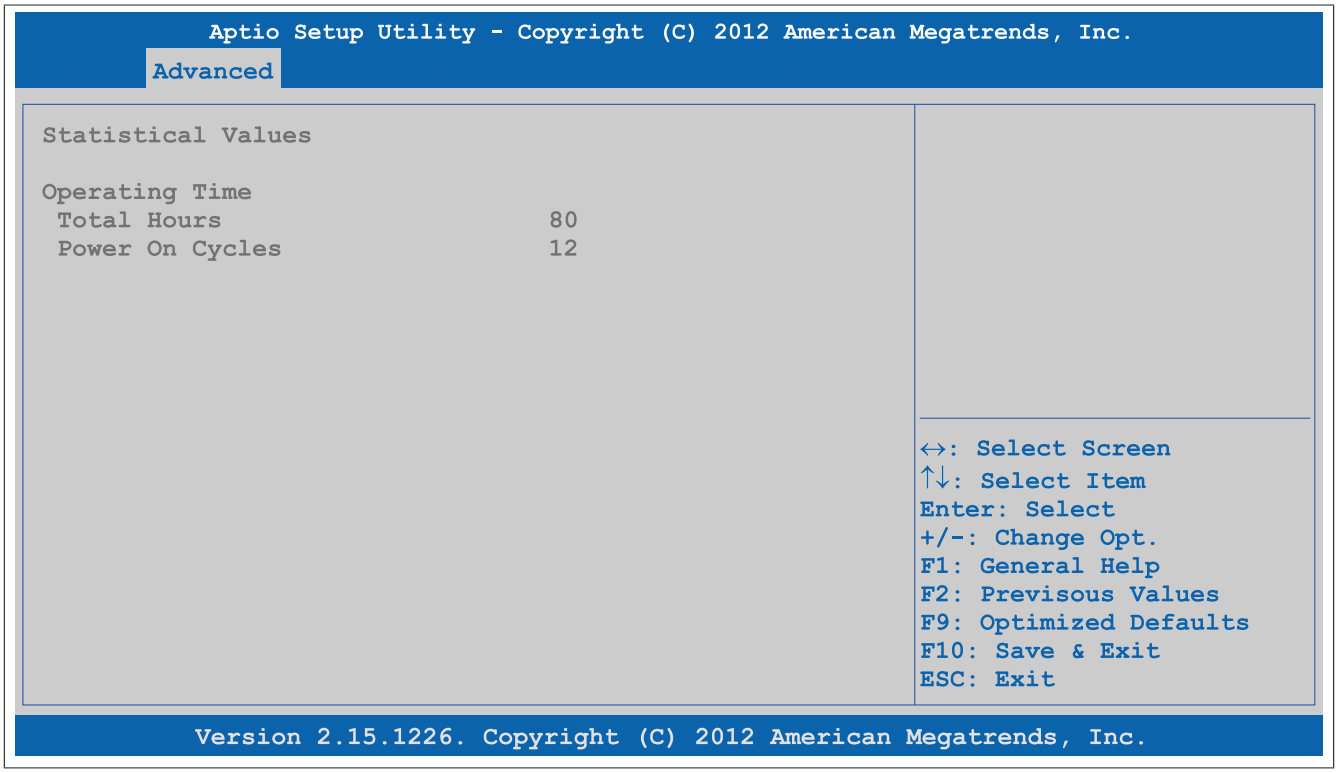


Figure 169: Advanced - OEM Features - Bus Unit Features - Statistical Values

BIOS setting	Function	Configuration options	Effect
Total hours	Displays the runtime in hours	None	-
Power on cycles	Displays the number of power-on cycles. Each restart increases the counter by one.	None	-

Table 210: Advanced - OEM features - Bus unit features - Statistical values

1.4.2.7 IF option 1 features

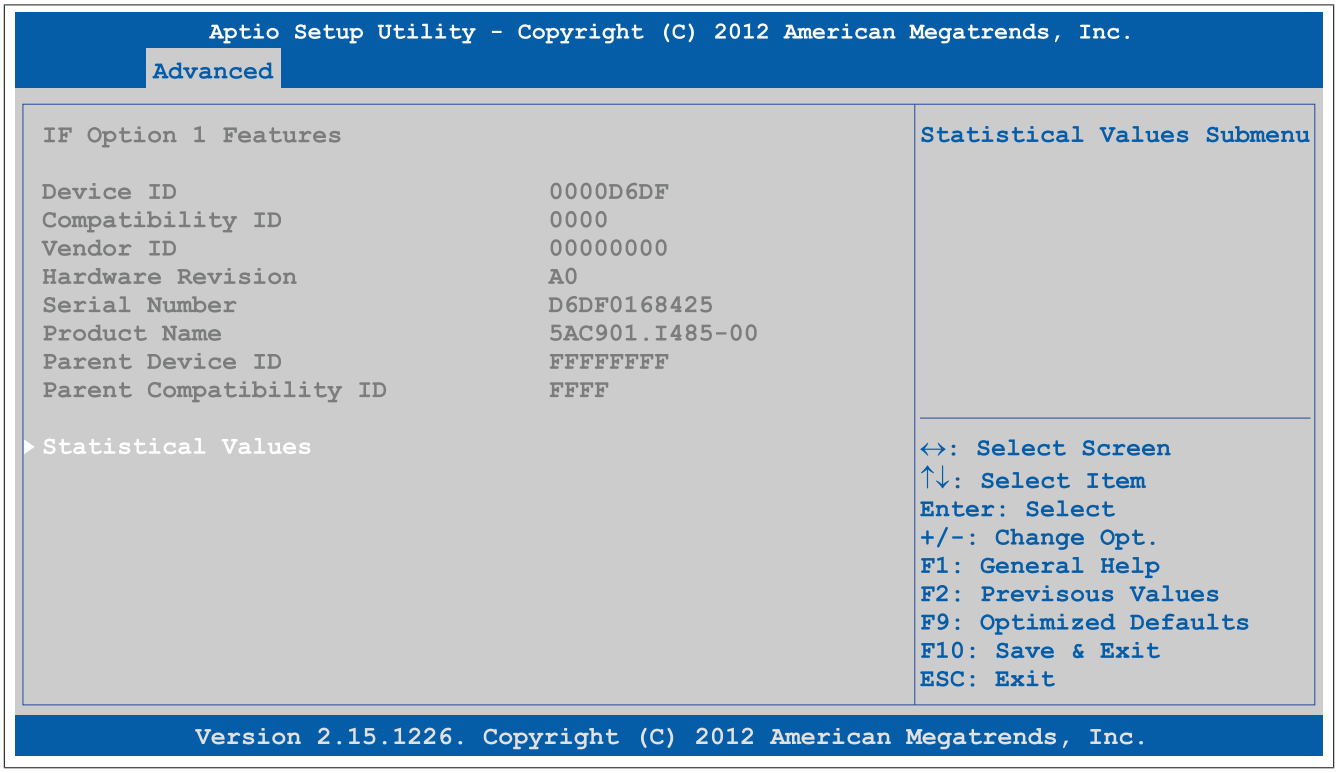


Figure 170: Advanced - OEM features - IF option 1 features

BIOS setting	Function	Configuration options	Effect
Device ID	Displays the device ID of IF option 1	None	-
Compatibility ID	Displays the version of the device within the same B&R device ID. This ID is needed for Automation Runtime.	None	-
Vendor ID	Displays the vendor ID	None	-
Hardware revision	Displays the hardware revision of IF option 1	None	-
Serial number	Displays the B&R serial number	None	-
Product name	Displays the B&R model number	None	-
Parent device ID	Displays the manufacturer number	None	-
Parent compatibility ID	Displays the manufacturer ID	None	-
Statistical values	Displays statistical values	Enter	Opens this submenu See "Statistical values" on page 252.

Table 211: Advanced - OEM features - IF option 1 features

1.4.2.7.1 Statistical values

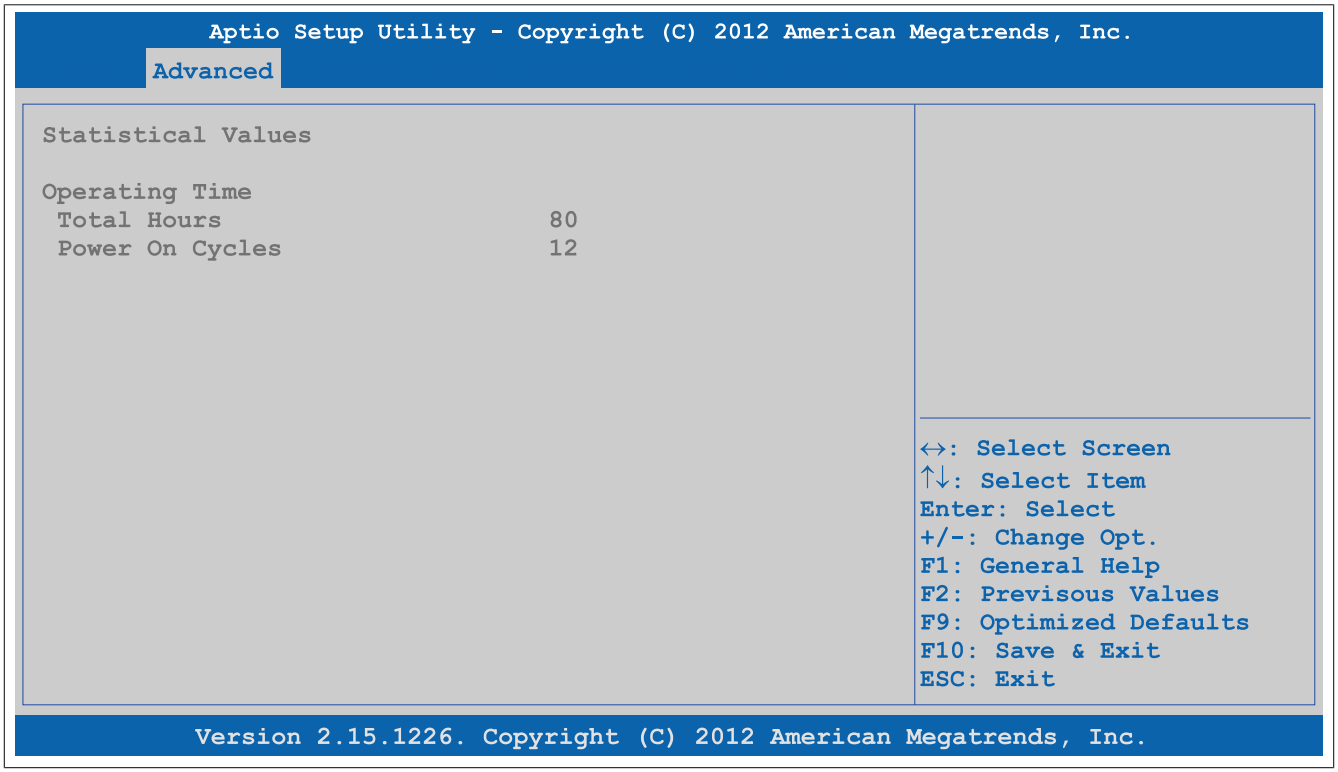


Figure 171: Advanced - OEM features - IF option 1 features - Statistical values

BIOS setting	Function	Configuration options	Effect
Total hours	Displays the runtime in hours	None	-
Power on cycles	Displays the number of power-on cycles. Each restart increases the counter by one.	None	-

Table 212: Advanced - OEM features - IF option 1 features - Statistical values

1.4.2.8 IF option 2 features

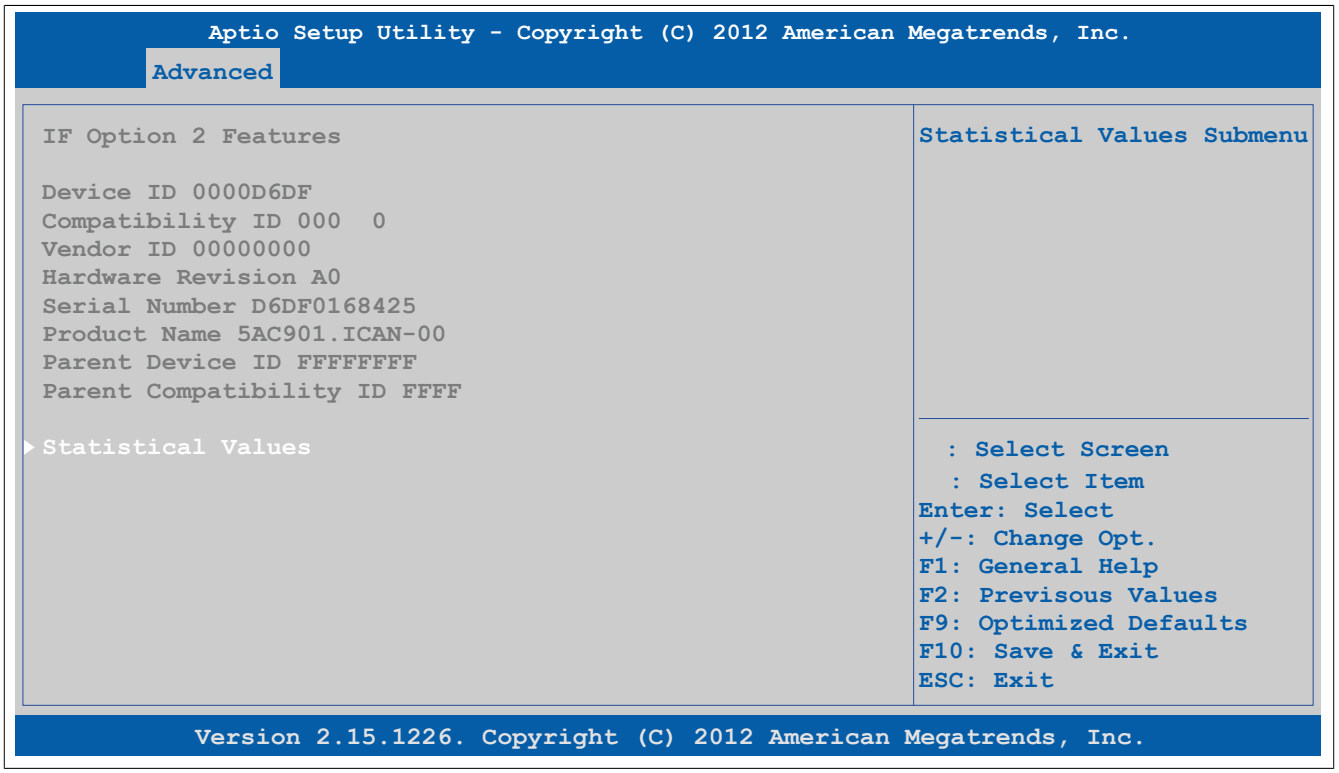


Figure 172: Advanced - OEM features - IF option 2 features

BIOS setting	Function	Configuration options	Effect
Device ID	Displays the device ID of IF option 2	None	-
Compatibility ID	Displays the version of the device within the same B&R device ID. This ID is needed for Automation Runtime.	None	-
Vendor ID	Displays the vendor ID	None	-
Hardware revision	Displays the hardware revision of IF option 2	None	-
Serial number	Displays the B&R serial number	None	-
Product name	Displays the B&R model number	None	-
Parent device ID	Displays the manufacturer number	None	-
Parent compatibility ID	Displays the manufacturer ID	None	-
Statistical values	Displays statistical values	Enter	Opens this submenu See "Statistical values" on page 254.

Table 213: Advanced - OEM features - IF option 2 features

1.4.2.8.1 Statistical values

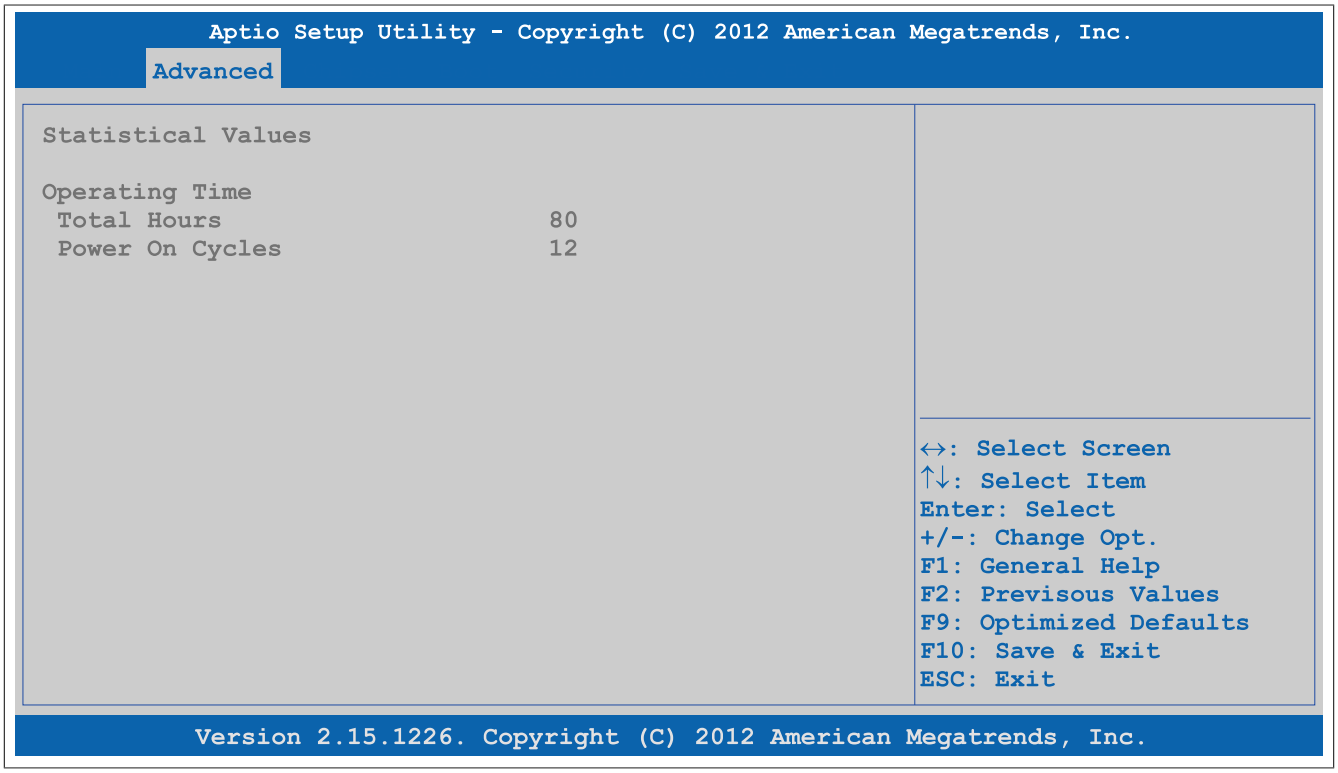


Figure 173: Advanced - OEM features - IF option 2 features - Statistical values

BIOS setting	Function	Configuration options	Effect
Total hours	Displays the runtime in hours	None	-
Power on cycles	Displays the number of power-on cycles. Each restart increases the counter by one.	None	-

Table 214: Advanced - OEM features - IF option 2 features - Statistical values

1.4.2.9 Fan unit features

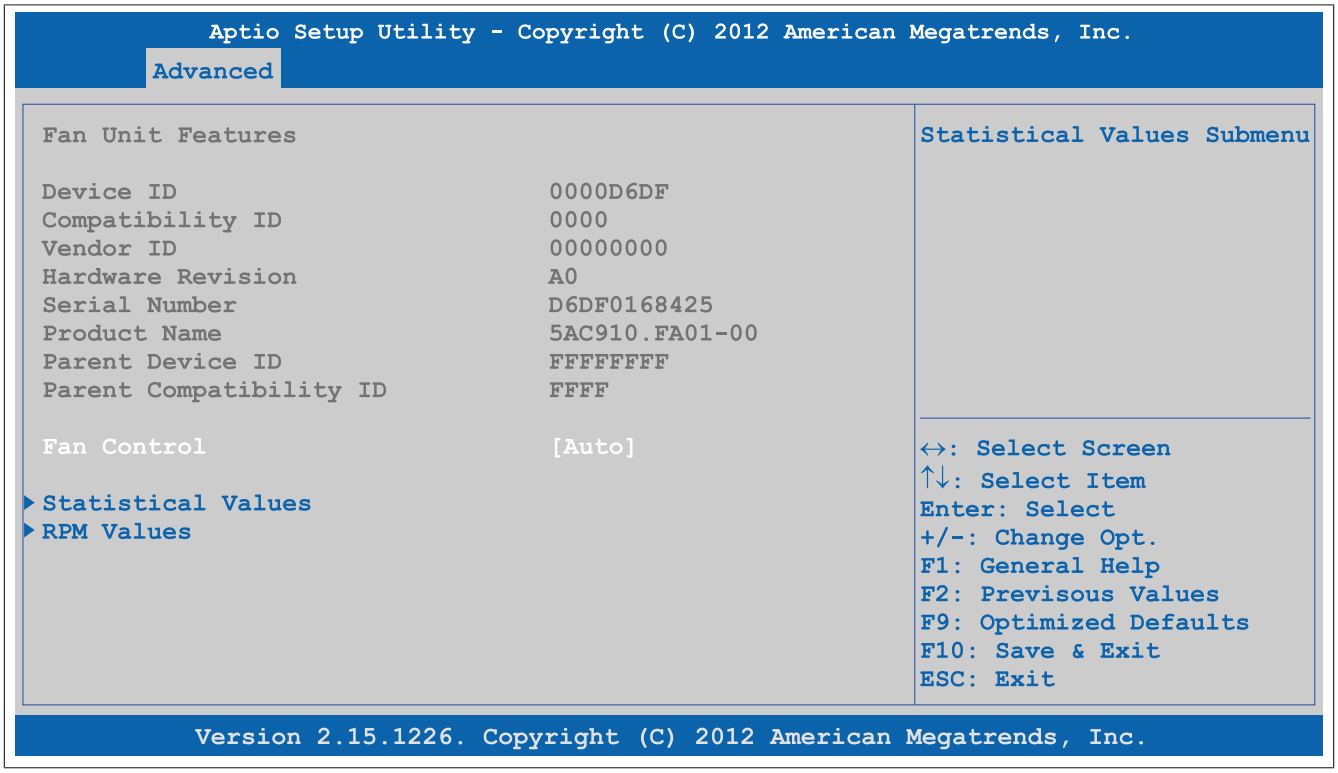


Figure 174: Advanced - OEM features - Fan unit features

BIOS setting	Function	Configuration options	Effect
Device ID	Displays the device ID of the fan kit	None	-
Compatibility ID	Displays the version of the device within the same B&R device ID. This ID is needed for Automation Runtime.	None	-
Vendor ID	Displays the vendor ID	None	-
Hardware revision	Displays the hardware revision of the fan kit	None	-
Serial number	Displays the B&R serial number	None	-
Product name	Displays the B&R model number	None	-
Parent device ID	Displays the manufacturer number	None	-
Parent compatibility ID	Displays the manufacturer ID	None	-
Fan control	Option for setting the fan control **Information:** **It is not possible for a manual fan setting to take effect when starting back up from S3 mode. The setting "Auto" is active.**	Auto	Automatic fan control
		Minimum	Sets the minimum revolution speed. If the temperature increases, however, the fan adjusts its speed automatically to prevent critical temperatures from being exceeded.
		25%	Sets 25% of the maximum revolution speed
		50%	Sets 50% of the maximum revolution speed
		75%	Sets 75% of the maximum revolution speed
		Maximum	Sets the maximum revolution speed
Statistical values	Displays statistical values	Enter	Opens this submenu See "Statistical values" on page 255.
RPM values	Displays the speed (in rpm) of the individual fans in the fan kit	Enter	Opens this submenu See "RPM values" on page 256.

Table 215: Advanced - OEM features - Fan unit features

1.4.2.9.1 Statistical values

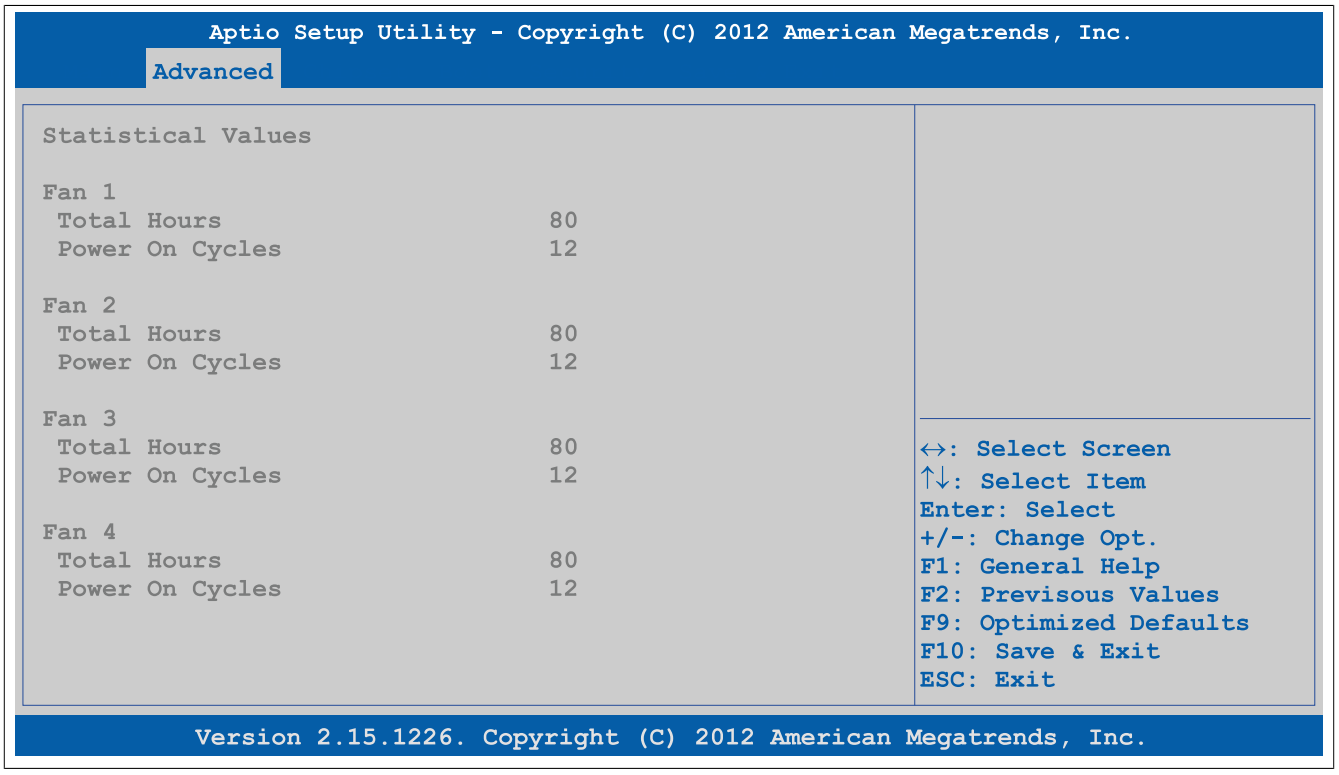


Figure 175: Advanced - OEM features - Fan unit features - Statistical values

BIOS setting	Function	Configuration options	Effect
Total hours	Displays the runtime in hours	None	-
Power on cycles	Displays the number of power-on cycles. Each restart increases the counter by one.	None	-

Table 216: Advanced - OEM features - Fan unit features - Statistical values

1.4.2.9.2 RPM values

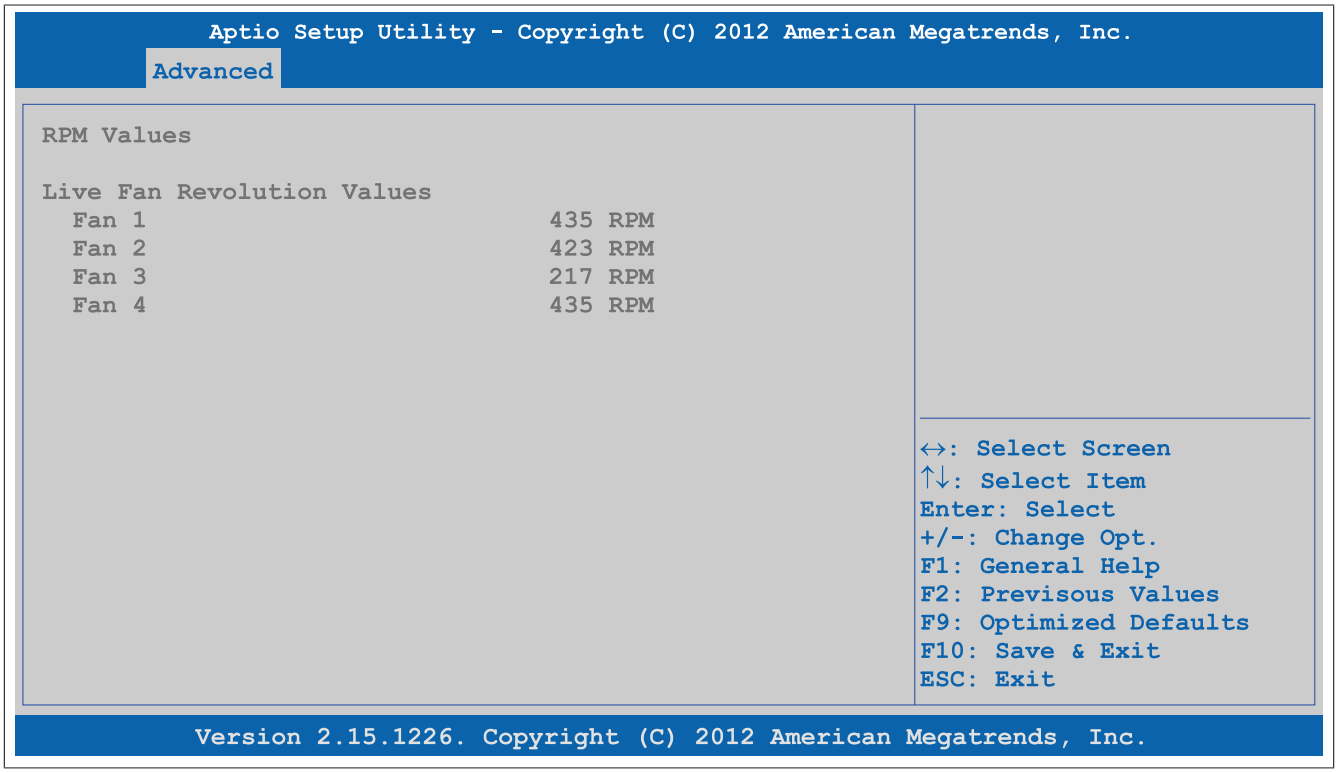


Figure 176: Advanced - OEM features - Fan unit features - RPM values

BIOS setting	Function	Configuration options	Effect
Fan 1	Displays the current speed of fan 1 in rpm	None	-
Fan 2	Displays the current speed of fan 2 in rpm	None	-
Fan 3	Displays the current speed of fan 3 in rpm	None	-
Fan 4	Displays the current speed of fan 4 in rpm	None	-

Table 217: Advanced - OEM features - Fan unit features - RPM values

1.4.2.10 Slide-in 1 features

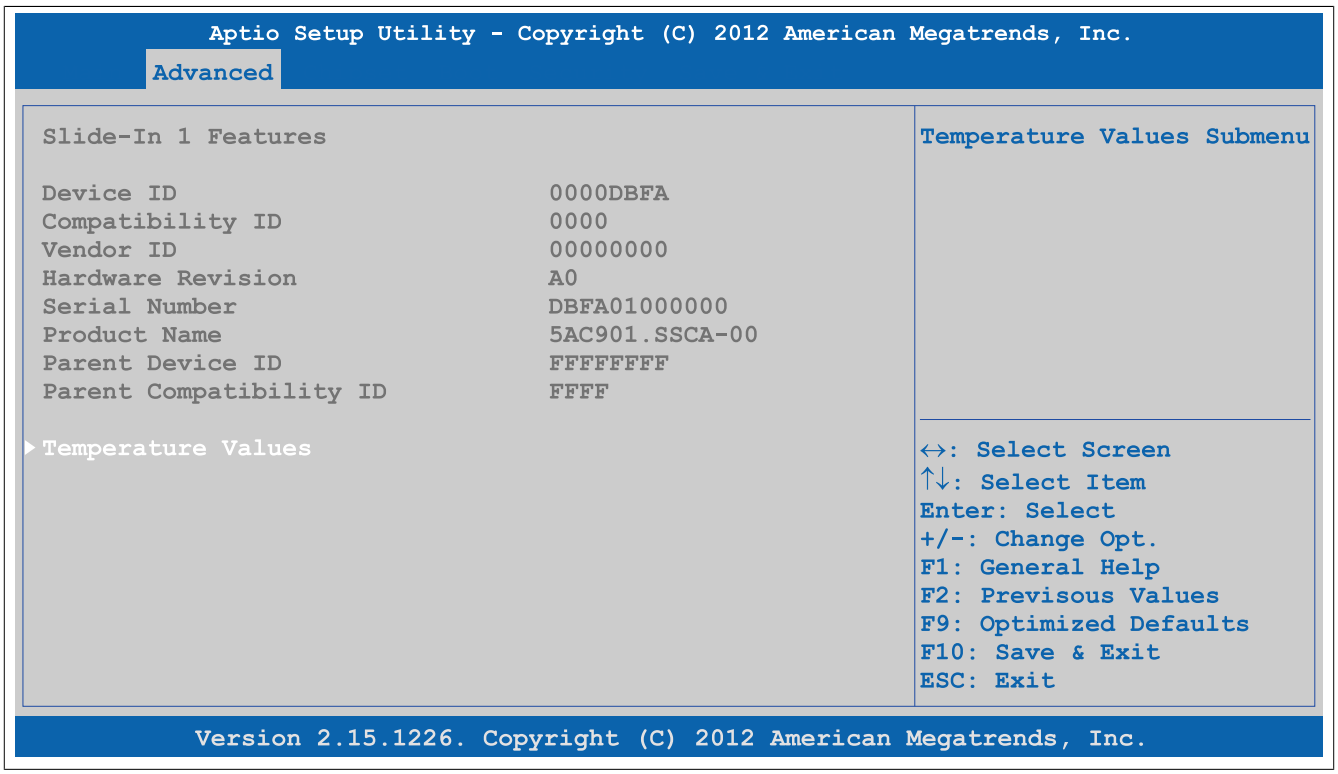


Figure 177: Advanced - OEM features - Slide-in 1 features

BIOS setting	Function	Configuration options	Effect
Device ID	Displays the device ID of the slide-in 1 drive	None	-
Compatibility ID	Displays the version of the device within the same B&R device ID. This ID is needed for Automation Runtime.	None	-
Vendor ID	Displays the vendor ID	None	-
Hardware revision	Displays the hardware revision of the slide-in drive	None	-
Serial number	Displays the B&R serial number	None	-
Product name	Displays the B&R model number	None	-
Parent device ID	Displays the manufacturer number	None	-
Parent compatibility ID	Displays the manufacturer ID	None	-
Temperature values	Displays current temperature values	Enter	Opens this submenu See "Temperature values" on page 257.

Table 218: Advanced - OEM features - Slide-in 1 features

1.4.2.10.1 Temperature values

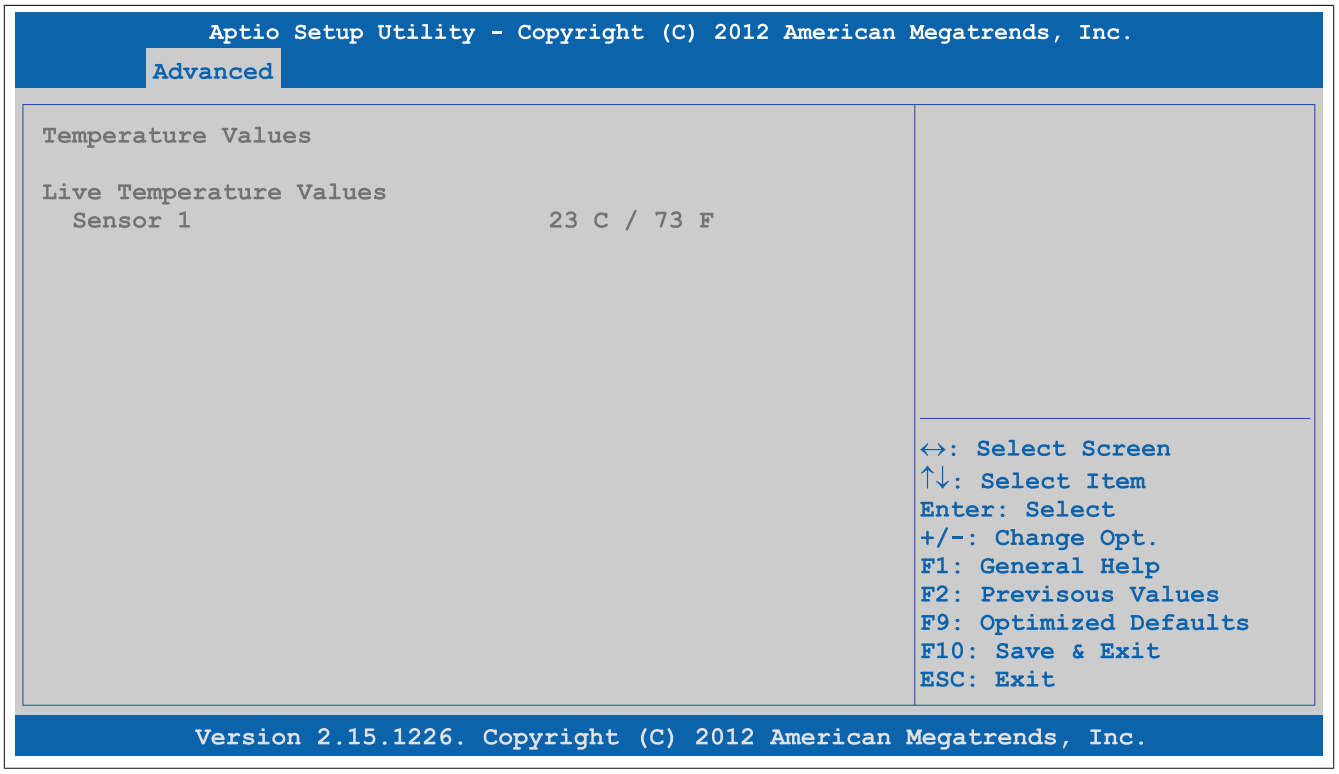


Figure 178: Advanced - OEM features - Slide-in 1 features - Temperature values

BIOS setting	Function	Configuration options	Effect
Sensor 1	Displays the current temperature of sensor 1 (slide-in 1 drive) in °C and °F	None	-

Table 219: Advanced - OEM features - Slide-in 1 features - Temperature values

1.4.2.11 Panel control features

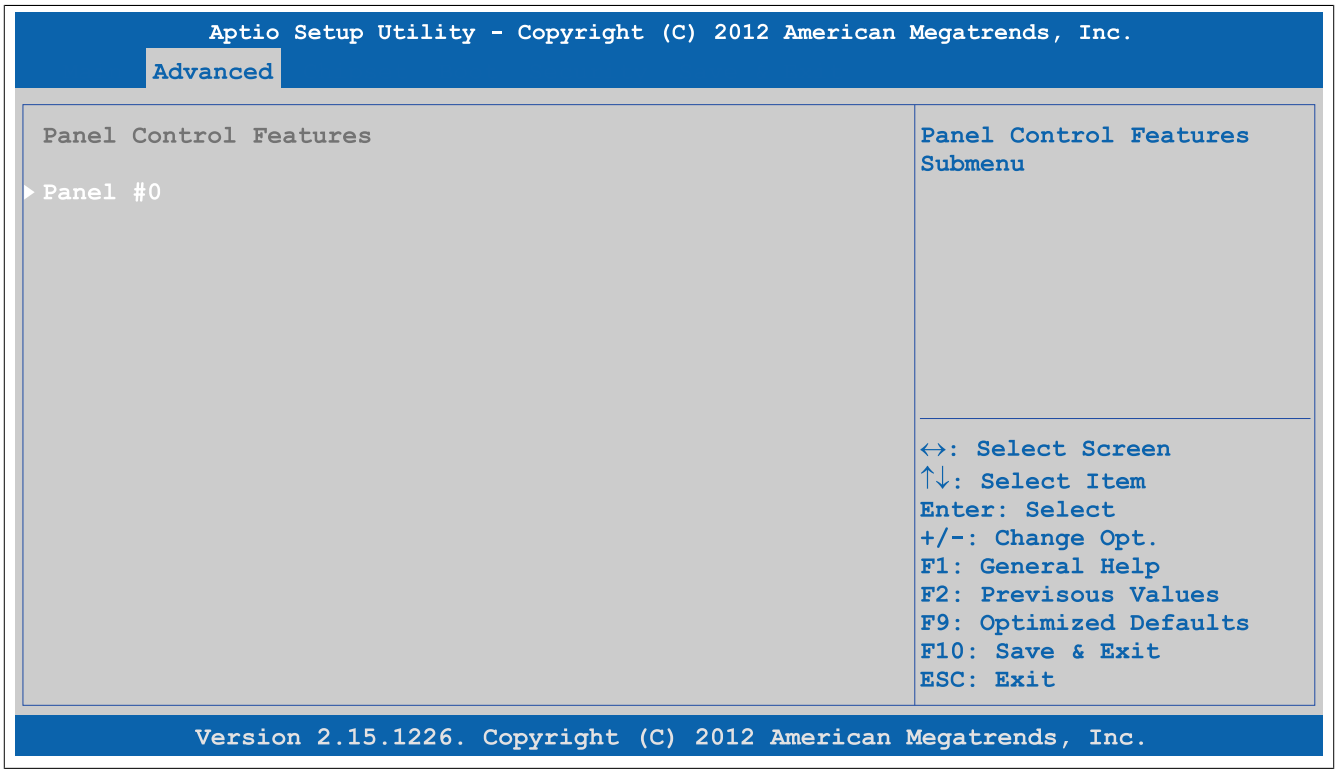


Figure 179: Advanced - OEM Features - Panel Control Features

BIOS setting	Function	Configuration options	Effect
Panel #X	Displays the panel properties of the connected panel	Enter	Opens this submenu See "Panel #X" on page 258.

Table 220: Advanced - OEM features - Panel control features

1.4.2.11.1 Panel #X

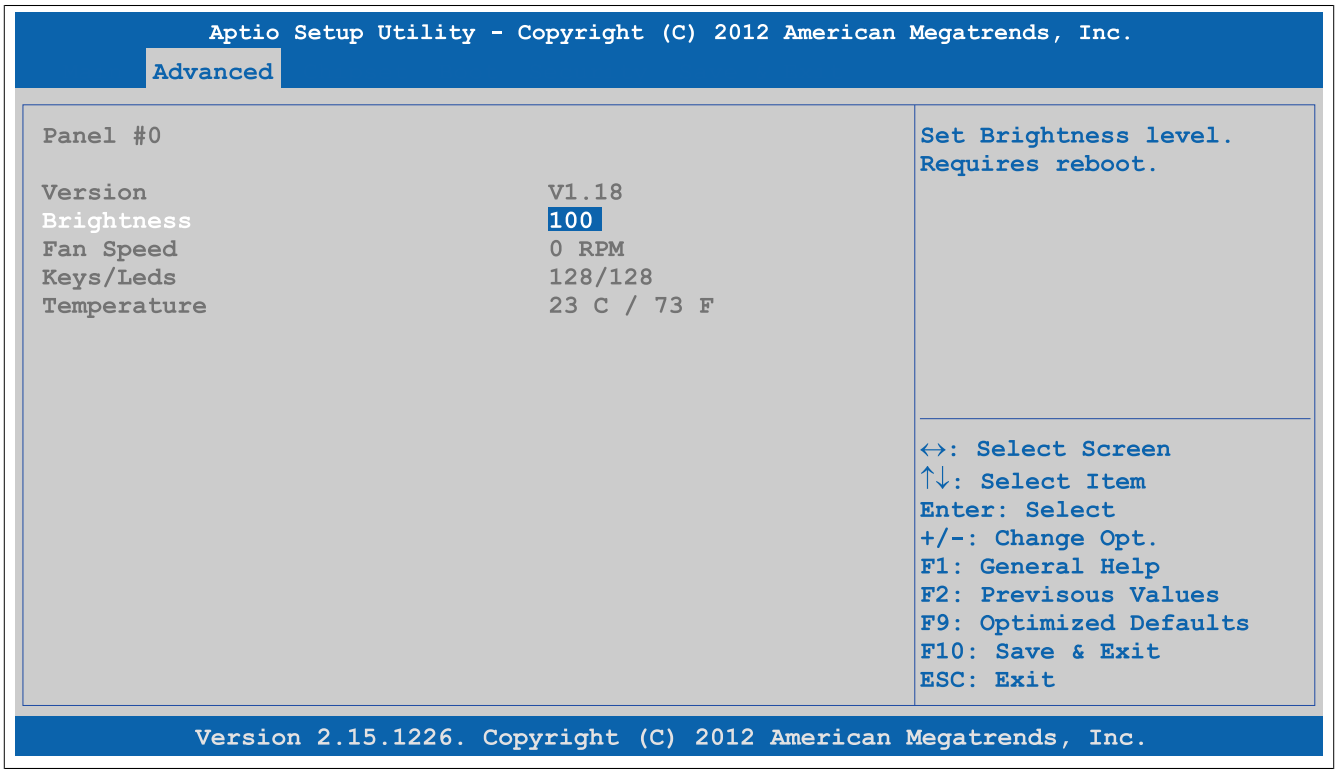


Figure 180: Advanced - OEM Features - Panel Control Features - Panel #x

BIOS setting	Function	Configuration options	Effect
Version	Displays the firmware version of the SDLR controller	None	-
Brightness	Setting for the brightness of the panel	0 to 100	Sets the brightness (in %) of the selected panel. Settings take effect immediately.
Fan speed	Displays the fan speed of the panel	None	-
Keys/LEDs	Displays the available keys and LEDs for the panel	None	-
Temperature	Displays the temperature of the panel in °C and °F	None	-

Table 221: Advanced - OEM features - Panel control features - Panel #X

1.4.3 PCI configuration

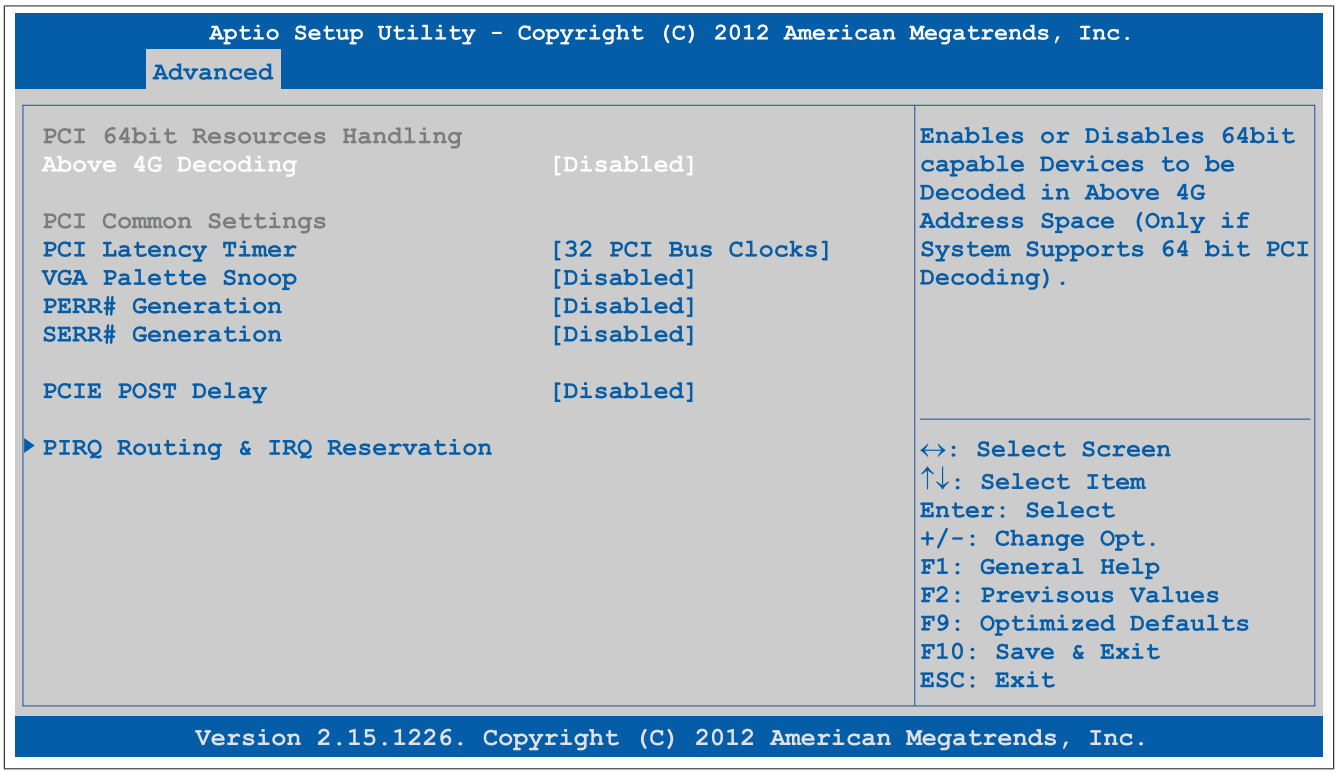


Figure 181: Advanced - PCI Configuration

BIOS setting	Function	Configuration options	Effect
Above 4G decoding	Option for enabling/disabling 64-bit capable devices to decode them in the address space above 4 GB (only if the system supports 64-bit decoding)	Disabled	Disables this function
		Enabled	Enables this function
PCI latency timer	Option for controlling how long (in PCI ticks) one PCI bus card can continue to use the master after another PCI card has requested access	32 PCI bus clocks to 248 PCI bus clocks	Manually sets the value in PCI ticks
VGA palette snoop	Option for supporting graphics cards with 256 colors. This option should only be set to "Enabled" if colors are not displayed correctly.	Disabled	Disables this function
		Enabled	Enables this function
PERR# generation	Option for generating a PERR signal (parity error). This signal indicates a data parity error one cycle after *PAR*.	Disabled	Disables this function
		Enabled	Enables this function
SERR# generation	Option for generating a SERR signal (system error). This signal indicates a data error or other type of system error when executing a special cycle command.	Disabled	Disables this function
		Enabled	Enables this function
PCIE POST delay	Option for delaying PCIE bus emulation	Disabled	Disables this function
		0.1 s	0.1 s delay before the PCIE bus is scanned
		0.2 s	0.2 s delay before the PCIE bus is scanned
		0.3 s	0.3 s delay before the PCIE bus is scanned
		1 s	1 s delay before the PCIE bus is scanned
		2 s	2 s delay before the PCIE bus is scanned
		3 s	3 s delay before the PCIE bus is scanned

Table 222: Advanced - PCI configuration - Configuration options

BIOS setting	Function	Configuration options	Effect
		4 s	4 s delay before the PCIE bus is scanned
		5 s	5 s delay before the PCIE bus is scanned
		10 s	10 s delay before the PCIE bus is scanned
PIRQ routing & IRQ reservation	Configures PIRQ routing	Enter	Opens this submenu See "PIRQ routing & IRQ reservation" on page 260.

Table 222: Advanced - PCI configuration - Configuration options

1.4.3.1 PIRQ routing & IRQ reservation

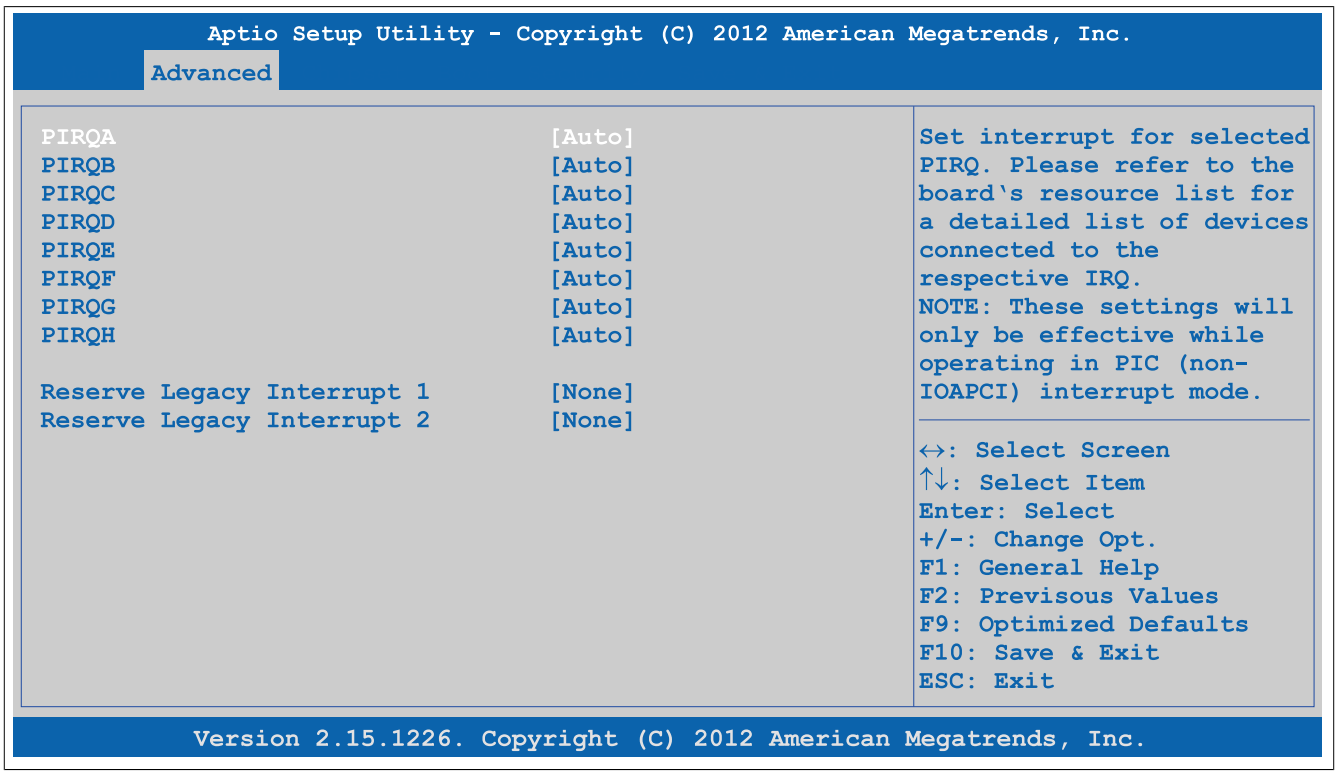


Figure 182: Advanced - PCI Configuration - PIRQ Routing & IRQ Reservation

BIOS setting	Function	Configuration options	Effect
PIRQA	Option for configuring PIRQ A	Auto	Automatic assignment by BIOS and the operating system
		IRQ3, IRQ4, IRQ5, IRQ6, IRQ10, IRQ11, IRQ14, IRQ15	Manual assignment
PIRQB	Option for configuring PIRQ B	Auto	Automatic assignment by BIOS and the operating system
		IRQ3, IRQ4, IRQ5, IRQ6, IRQ10, IRQ11, IRQ14, IRQ15	Manual assignment
PIRQC	Option for configuring PIRQ C	Auto	Automatic assignment by BIOS and the operating system
		IRQ3, IRQ4, IRQ5, IRQ6, IRQ10, IRQ11, IRQ14, IRQ15	Manual assignment
PIRQD	Option for configuring PIRQ D	Auto	Automatic assignment by BIOS and the operating system
		IRQ3, IRQ4, IRQ5, IRQ6, IRQ10, IRQ11, IRQ14, IRQ15	Manual assignment
PIRQE	Option for configuring PIRQ E	Auto	Automatic assignment by BIOS and the operating system
		IRQ3, IRQ4, IRQ5, IRQ6, IRQ10, IRQ11, IRQ14, IRQ15	Manual assignment
PIRQF	Option for configuring PIRQ F	Auto	Automatic assignment by BIOS and the operating system
		IRQ3, IRQ4, IRQ5, IRQ6, IRQ10, IRQ11, IRQ14, IRQ15	Manual assignment
PIRQG	Option for configuring PIRQ G	Auto	Automatic assignment by BIOS and the operating system
		IRQ3, IRQ4, IRQ5, IRQ6, IRQ10, IRQ11, IRQ14, IRQ15	Manual assignment
PIRQH	Option for configuring PIRQ H	Auto	Automatic assignment by BIOS and the operating system
		IRQ3, IRQ4, IRQ5, IRQ6, IRQ10, IRQ11, IRQ14, IRQ15	Manual assignment

Table 223: Advanced - PCI configuration - PIRQ routing & IRQ reservation - Configuration options

BIOS setting	Function	Configuration options	Effect
Reserve legacy interrupt 1	Prevents the interrupt reserved here from being made available to a PCI or PCI Express device	None	No interrupt assigned
		IRQ3, IRQ4, IRQ5, IRQ6, IRQ10, IRQ11, IRQ14, IRQ15	Reserves IRQx
Reserve legacy interrupt 2	Prevents the interrupt reserved here from being made available to a PCI or PCI Express device	None	No interrupt assigned
		IRQ3, IRQ4, IRQ5, IRQ6, IRQ10, IRQ11, IRQ14, IRQ15	Reserves IRQx

Table 223: Advanced - PCI configuration - PIRQ routing & IRQ reservation - Configuration options

1.4.4 PCI express configuration

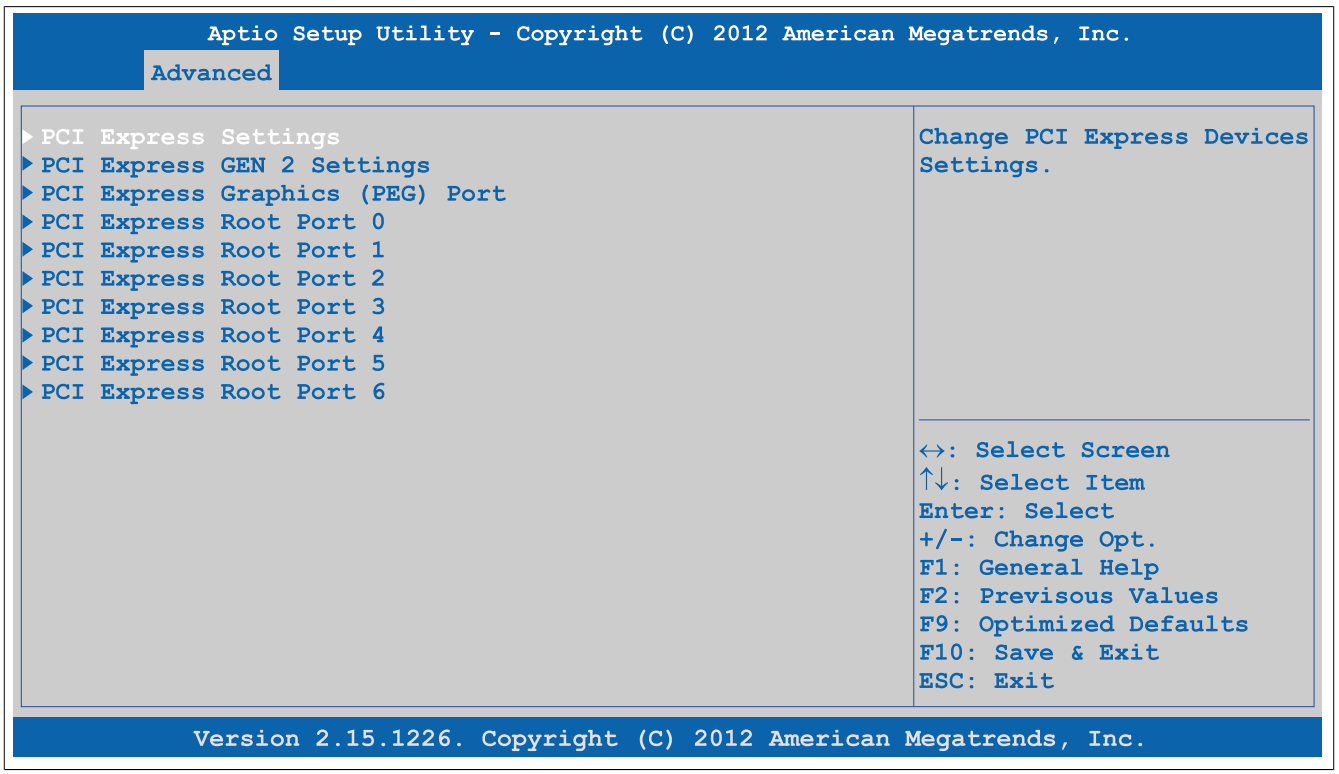


Figure 183: Advanced - PCI Express Configuration

BIOS setting	Function	Configuration options	Effect
PCI Express settings	Configures PCI Express settings	Enter	Opens this submenu See "PCI Express settings" on page 262.
PCI Express GEN 2 settings	Configures PCI Express GEN2 settings	Enter	Opens this submenu See "PCI Express GEN 2 settings" on page 263.
PCI Express graphics (PEG) port	Configures PCI Express graphics settings	Enter	Opens this submenu See "PCI Express graphics (PEG) port" on page 264.
PCI Express root port 0	Configures PCI Express settings on port 0	Enter	Opens this submenu See "PCI Express root port" on page 266.
PCI Express root port 1	Configures PCI Express settings on port 1	Enter	Opens this submenu See "PCI Express root port" on page 266.
PCI Express root port 2	Configures PCI Express settings on port 2	Enter	Opens this submenu See "PCI Express root port" on page 266.
PCI Express root port 3	Configures PCI Express settings on port 3	Enter	Opens this submenu See "PCI Express root port" on page 266.
PCI Express root port 4	Configures PCI Express settings on port 4	Enter	Opens this submenu See "PCI Express root port" on page 266.
PCI Express root port 5	Configures PCI Express settings on port 5	Enter	Opens this submenu See "PCI Express root port" on page 266.
PCI Express root port 6	Configures PCI Express settings on port 6	Enter	Opens this submenu See "PCI Express root port" on page 266.

Table 224: Advanced - PCI Express configuration - Menu

1.4.4.1 PCI Express settings

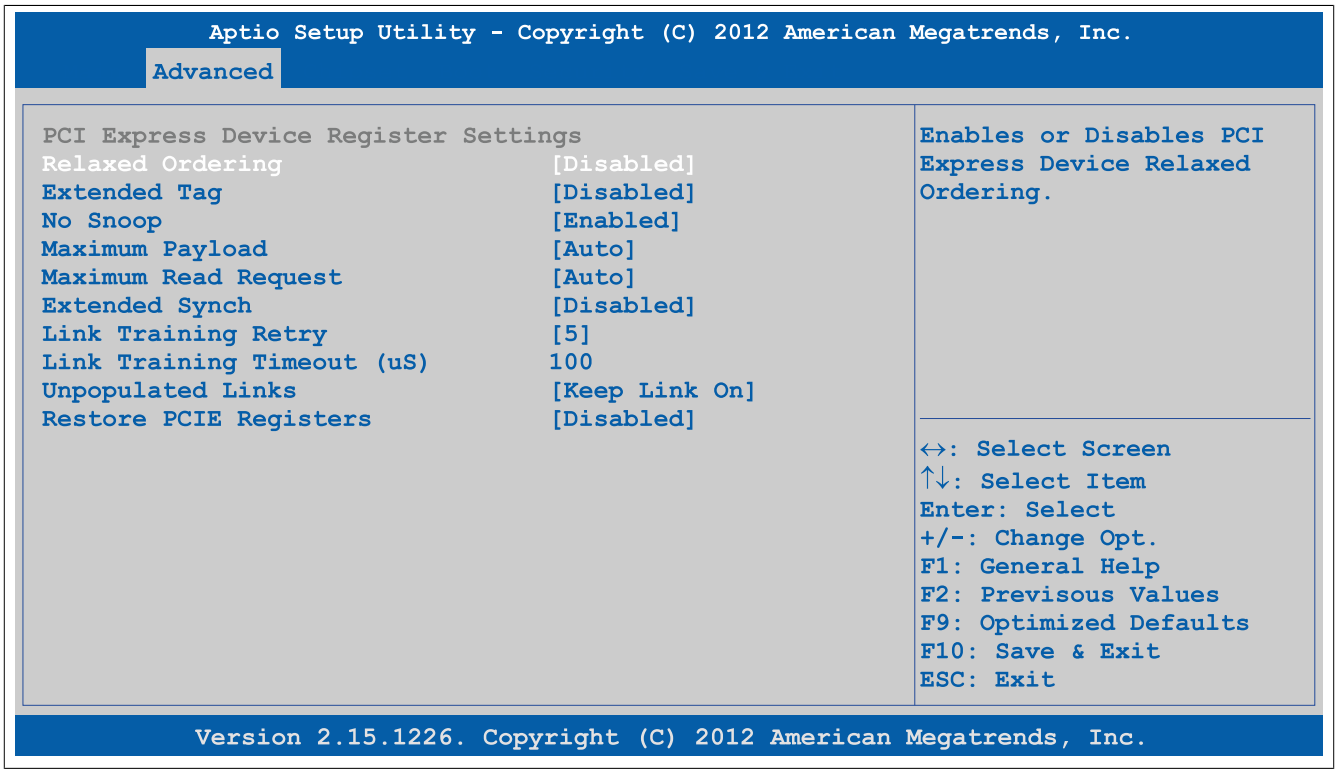


Figure 184: Advanced - PCI Express Configuration - PCI Express Settings

BIOS setting	Function	Configuration options	Effect
Relaxed ordering	Option for enabling/disabling relaxed ordering	Disabled	Disables this function
		Enabled	Enables this function
Extended tag	Option for enabling/disabling the extended tag	Disabled	Disables this function. Only 5 bits can be used.
		Enabled	Enables this function. Devices with 8 bits in the requester transaction ID field can be used.
No snoop	Option for enabling/disabling the "No snoop" option	Disabled	Disables this function
		Enabled	Enables this function
Maximum payload	Option for setting the maximum surface packet size for data transfers	Auto	Automatically assigns the packet size
		128 bytes to 4096 bytes	Manually assigns the packet size
Maximum read request	Option for setting the maximum read request	Auto	Automatic assignment
		128 bytes to 4096 bytes	Manual assignment
Extended synch	Option for setting an extended synchronization pattern to improve system performance	Disabled	Disables this function
		Enabled	Enables this function
Link training retry	Option for defining the number of times the software should attempt to reroute a link if the previous training attempt was unsuccessful	Disabled	Disables this function
		2	2 link training attempts
		3	3 link training attempts
		5	5 link training attempts
Link training timeout (µS)	Option for defining how many microseconds the software waits before the link training bit in the link status register is queried	10 to 1000	Time setting in µs
Unpopulated links	Option for enabling/disabling PCIe slots where no devices are connected	Keep link on	Keeps PCIe slots where no devices are connected enabled
		Disable link	Disables PCIe slots where no devices are connected to save power
Restore PCIE registers	Option for enabling/disabling the restoring of PCIE registers	Enabled	Enables this function
		Disabled	Disables this function

Table 225: Advanced - PCI Express configuration - PCI Express settings - Configuration options

1.4.4.2 PCI Express GEN 2 settings

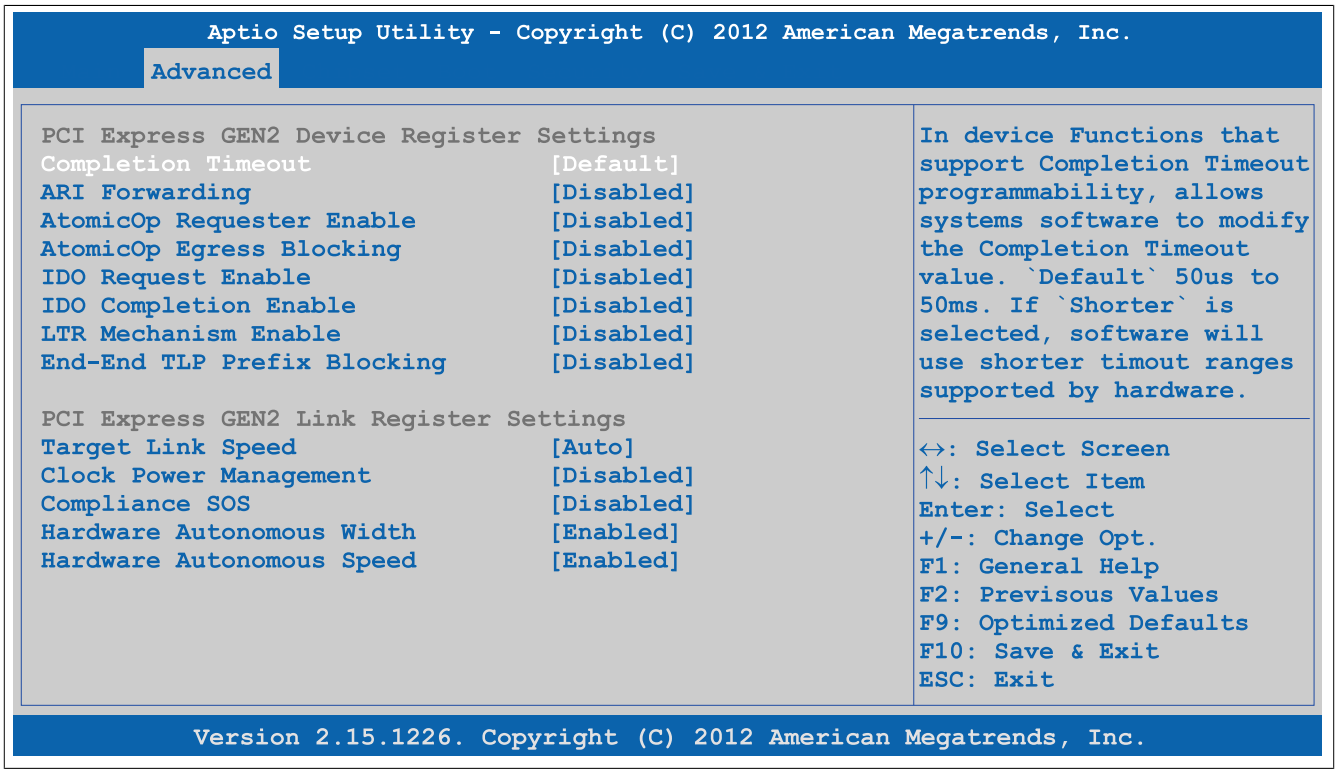


Figure 185: Advanced - PCI Express Configuration - PCI Express GEN 2 Settings

BIOS setting	Function	Configuration options	Effect
Completion timeout	Option for allowing software to modify the completion timeout value if supported by device functions	Default	Timeout range: 50 µs - 50 ms
		Shorter	The software uses shorter timeout ranges than are supported by the hardware.
		Longer	The software uses longer timeout ranges than are supported by the hardware.
		Disabled	Disables this function
ARI forwarding	If supported by the hardware and set to "Enabled", the downstream port disables its traditional "Device number" field being 0 enforcement when turning a Type1 configuration request into a Type0 configuration request, permitting access to extended functions in an ARI device immediately below the port.	Disabled	Disables this function
		Enabled	Enables this function
AtomicOp requester enable	Option for enabling/disabling the AtomicOp requester	Disabled	Disables this function
		Enabled	Enables this function AtomicOp queries are only initiated if the bus master enable bit is set in the command register.
AtomicOp egress blocking	Option for enabling/disabling AtomicOp egress blocking If supported by the hardware and set to "Enabled", outbound AtomicOp requests via egress ports will be locked.	Disabled	Disables this function
		Enabled	Enables this function Blocks outbound AtomicOp requests via the egress port
IDO request enable	If supported by the hardware and set to "Enabled", this option permits setting the number of ID-based ordering (IDO) bit (Attribute[2]) requests to be initiated.	Disabled	Disables this function
		Enabled	Enables this function
IDO completion enable	If supported by the hardware and set to "Enabled", this option permits setting the number of ID-based ordering (IDO) bit (Attribute[2]) requests to be initiated.	Disabled	Disables this function
		Enabled	Enables this function
LTR mechanism enable	If supported by the hardware and set to "Enabled", this enables the Latency Tolerance Reporting (LTR) mechanism.	Disabled	Disables this function
		Enabled	Enables this function
End-End TLP prefix blocking	If supported by the hardware and set to "Enabled", this function will block forwarding of TLPs containing End-End TLP prefixes.	Disabled	Disables this function
		Enabled	Enables this function

Table 226: Advanced - PCI Express configuration - PCI Express GEN 2 settings - Configuration options

BIOS setting	Function	Configuration options	Effect
Target link speed	If supported by the hardware and set to "Force to 2.5 GT/s" for downstream ports, this sets an upper limit on Link operational speed by restricting the values advertised by the upstream component in its training sequences. When "Auto" is selected, hardware-initialized data will be used.	Auto	Target link speed is detached by hardware.
		Force to 2.5 GT/s	Limits target link speed to 2.5 GT/s
		Force to 5.0 GT/s	Limits target link speed to 5 GT/s
Clock power management	If supported by the hardware and set to "Enabled", the device is permitted to use the CLKREQ# signal for power management of the Link clock in accordance with the protocol defined in the appropriate form factor specification.	Disabled	Disables this function
		Enabled	Enables this function
Compliance SOS	If supported by the hardware and set to "Enabled", this will force LTSSM to send SKP ordered sets between sequences when sending compliance patterns or modified compliance patterns.	Disabled	Disables this function
		Enabled	Enables this function
Hardware autonomous width	If supported by the hardware and set to "Disabled", this will disable the hardware's ability to change link width except width size reduction for the purpose of correcting unstable link operation.	Disabled	Disables this function
		Enabled	Enables this function
Hardware autonomous speed	If supported by the hardware and set to "Disabled", this will disable the hardware's ability to change link speed except speed size reduction for the purpose of correcting unstable link operation.	Disabled	Disables this function The PCIe device can no longer change the link speed except to correct unstable operation.
		Enabled	Enables this function

Table 226: Advanced - PCI Express configuration - PCI Express GEN 2 settings - Configuration options

1.4.4.3 PCI Express graphics (PEG) port

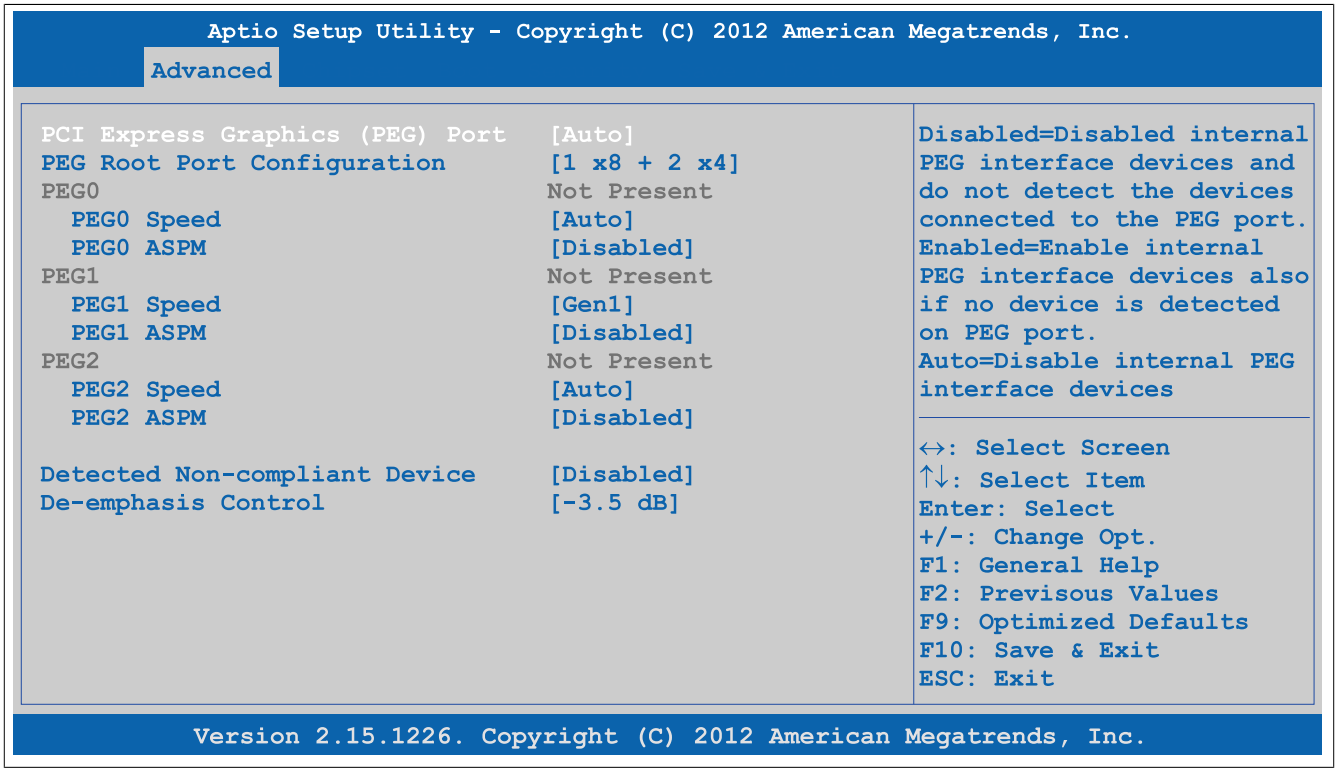


Figure 186: Advanced - PCI Express Configuration - PCI Express Graphics (PEG) Port

BIOS setting	Function	Configuration options	Effect
PCI Express graphics (PEG) port	Option for configuring the PCI Express graphics port	Disabled	Disables internal PEG interface devices. Devices connected to the PEG port are not detected.
		Enabled	Enables internal PEG interface devices even if no device is detected on the PEG port
		Auto	Disables internal PEG interface devices if no device is detected on the PEG port
PEG root port configuration	Option for selecting the root port configuration on the 16 PCIe channels of the PEG port	1 x 16	Configuration with 1 x 16
		2 x 8	Configuration with 2 x 8
		1 x 8 + 2 x 4	Configuration with 1 x 8 and 2 x 4
PEG0	Displays the mode in which the device connected to the PEG0 port is being operated	None	-

Table 227: Advanced - PCI Express configuration - PCI Express graphics (PEG) port - Configuration options

BIOS setting	Function	Configuration options	Effect
PEG0 speed	Option for setting the maximum transfer rate of the PEG0 port	Auto	Selects the maximum transfer rate
		Gen1	Maximum transfer rate = 2.5 GT/s
		Gen2	Maximum transfer rate = 5 GT/s
		Gen3	Maximum transfer rate = 8 GT/s
PEG0 ASPM[1)]	Option for configuring a power saving function for the PEG0 port if it does not require full power	Disabled	Disables this function
		Auto	Automatic assignment by BIOS and the operating system
		ASPM L0s	Enables the L0 energy saving function
		ASPM L1	Enables the L1 energy saving function. Power consumption is lower than with L0, but the exit latency is higher.
		ASPM L0sL1	Automatic assignment of L0s or L1 power saving function by the PCIe device
ASPM L0s[2)]	Option for configuring the L0 power saving function	Disabled	Disables this function
		Root port only	Enables the power saving function for the root port
		Endpoint only	Enables the power saving function for the endpoint port
		Both root and endpoint ports	Enables the power saving function for the root and endpoint ports
PEG1	Displays the mode in which the device connected to the PEG1 port is being operated	None	-
PEG1 speed	Option for setting the maximum transfer rate for the PEG1 port	Auto	Selects the maximum transfer rate
		Gen1	Maximum transfer rate = 2.5 GT/s
		Gen2	Maximum transfer rate = 5 GT/s
		Gen3	Maximum transfer rate = 8 GT/s
PEG1 ASPM[1)]	Option for configuring a power saving function for the PEG1 port if it does not require full power	Disabled	Disables this function
		Auto	Automatic assignment by BIOS and the operating system
		ASPM L0s	Enables the L0 energy saving function
		ASPM L1	Enables the L1 energy saving function. Power consumption is lower than with L0, but the exit latency is higher.
		ASPM L0sL1	Automatic assignment of L0s or L1 power saving function by the PCIe device
ASPM L0s[3)]	Option for configuring the L0 power saving function	Disabled	Disables this function
		Root port only	Enables the power saving function for the root port
		Endpoint only	Enables the power saving function for the endpoint port
		Both root and endpoint ports	Enables the power saving function for the root and endpoint ports
PEG2	Displays the mode in which the device connected to the PEG2 port is being operated	None	-
PEG2 speed	Option for setting the maximum transfer rate for the PEG2 port	Auto	Selects the maximum transfer rate
		Gen1	Maximum transfer rate = 2.5 GT/s
		Gen2	Maximum transfer rate = 5 GT/s
		Gen3	Maximum transfer rate = 8 GT/s
PEG2 ASPM[1)]	Option for configuring a power saving function for the PEG2 port if it does not require full power	Disabled	Disables this function
		Auto	Automatic assignment by BIOS and the operating system
		ASPM L0s	Enables the L0 energy saving function
		ASPM L1	Enables the L1 energy saving function. Power consumption is lower than with L0, but the exit latency is higher.
		ASPM L0sL1	Automatic assignment of L0s or L1 power saving function by the PCIe device
ASPM L0s[4)]	Option for configuring the L0 power saving function	Disabled	Disables this function
		Root port only	Enables the power saving function for the root port
		Endpoint only	Enables the power saving function for the endpoint port
		Both root and endpoint ports	Enables the power saving function for the root and endpoint ports
Detect non-compliant device	Option for detecting incompatible PCI Express devices on the PEG port	Disabled	Disables this function
		Enabled	Enables this function. Even incompatible PCI Express devices are detected on the PEG port.
De-emphasis control	Option for configuring de-emphasis on the PEG port	-6 dB	-6 dB de-emphasis
		-3.5 dB	-35 dB de-emphasis

Table 227: Advanced - PCI Express configuration - PCI Express graphics (PEG) port - Configuration options

1) ASPM = Active State Power Management.
2) This setting is only possible if *PEG0 ASPM* is set to *ASPM L0s* or *ASPM L0sL1*.
3) This setting is only possible if *PEG1 ASPM* is set to *ASPM L0s* or *ASPM L0sL1*.
4) This setting is only possible if *PEG2 ASPM* is set to *ASPM L0s* or *ASPM L0sL1*.

1.4.4.4 PCI Express root port

Warning!

Improper settings can cause instability or device problems. It is therefore strongly recommended that these settings only be changed by experienced users.

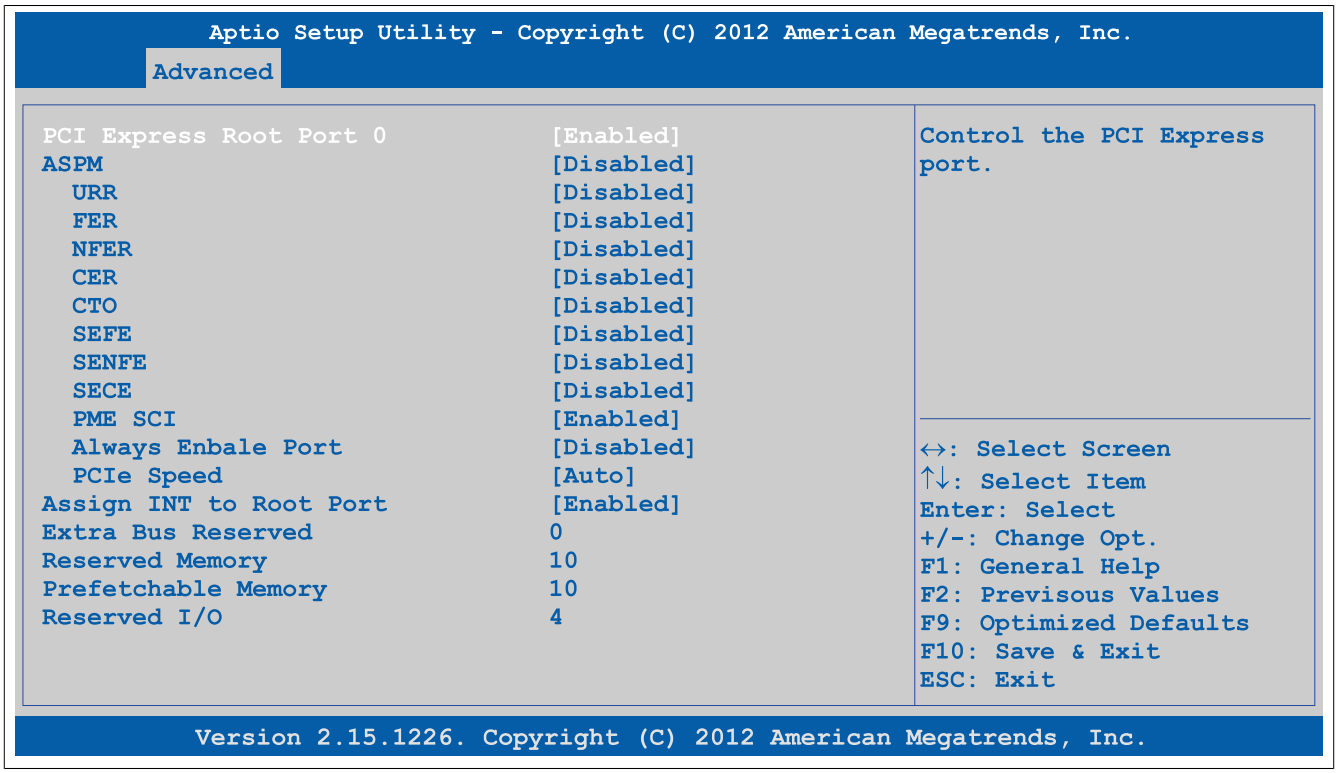


Figure 187: Advanced - PCI Express Configuration - PCI Express Root Port

BIOS setting	Function	Configuration options	Effect
PCI Express root port x	Option for enabling/disabling the PCI Express root port	Enabled	Enables PCI Express root port 1
		Disabled	Disables PCI Express root port 1 and 2
ASPM	*Active State Power Management* Option for configuring a power saving function (L0s/L1) for PCIe devices if they do not require full power	Disabled	Disables this function
		L0s	Enables the L0 energy saving function
		L1	Enables the L1 energy saving function. Power consumption is lower than with L0, but the exit latency is higher.
		L0sL1	Automatic assignment of L0s or L1 power saving function by the PCIe device
		Auto	Automatic assignment by BIOS and the operating system
URR	*Unsupported Request (UR) reporting* Option for reporting unsupported requests. Logging of error messages received by the root port is controlled exclusively by the root control register.	Enabled	Enables this function
		Disabled	Disables this function
FER	*Fatal error reporting* Option for reporting fatal errors. All of the functions of a multifunction device will be monitored. The report for the root port takes place internally inside the root complex.	Enabled	Enables this function
		Disabled	Disables this function
NFER	*Non-fatal error reporting* Option for reporting non-fatal errors. All of the functions of a multifunction device will be monitored. The report for the root port takes place internally inside the root complex.	Enabled	Enables this function
		Disabled	Disables this function
CER	*Correctable error reporting* Option for reporting non-fatal errors. All of the functions of a multifunction device will be monitored. The report for the root port takes place internally inside the root complex.	Enabled	Enables this function
		Disabled	Disables this function
CT0	*PCI Express completion timer T0*	Enabled	Enables this function

Table 228: Advanced - PCI Express configuration - PCI Express root port - Configuration options

BIOS setting	Function	Configuration options	Effect
	Option for enabling/disabling the PCI Express completion timer **Information:** **This setting should be set to "Enabled" if the system detected an ROB (processor reorder buffer) timeout.**	Disabled	Disables this function
SEFE	*System error on fatal error* Option for generating a system error if a fatal error is reported by a device on the root port or by the root port itself	Enabled	Enables this function
		Disabled	Disables this function
SENFE	*System error on non-fatal error* Option for generating a system error if a non-fatal error is reported by a device on the root port or by the root port itself	Enabled	Enables this function
		Disabled	Disables this function
SECE	*System error on correctable error* Option for generating a system error if a correctable error is reported by a device on the root port or by the root port itself	Enabled	Enables this function
		Disabled	Disables this function
PME SCI	Option for generating an SCI if power management is detected	Enabled	Enables this function Enables the root port to generate an SCI if power management is detected
		Disabled	Disables this function
Always enable port	Option for keeping the port enabled constantly	Enabled	Enables this function
		Disabled	Disables this function
PCIe speed	Option for setting the PCI Express transfer rate	Auto	Automatically sets the transfer rate
		Gen1	Maximum transfer rate = 2.5 GT/s
		Gen2	Maximum transfer rate = 5 GT/s
Assign INT to root port	Option for enabling/disabling the IRQ for the root port	Disabled	Disables this function
		Enabled	Enables this function
Extra bus reserved	Option for reserving the extra bus to bridges behind this root bridge	0 to 7	
Reserved memory	Option for configuring reserved memory for this root bridge	0 to 20	
Prefetchable memory	Option for configuring prefetchable memory for this root bridge	1 to 20	
Reserved I/O	Option for configuring a reserved I/O range (4K/8K/12K/16K/20K) for this root bridge	4 to 20	

Table 228: Advanced - PCI Express configuration - PCI Express root port - Configuration options

1.4.5 ACPI settings

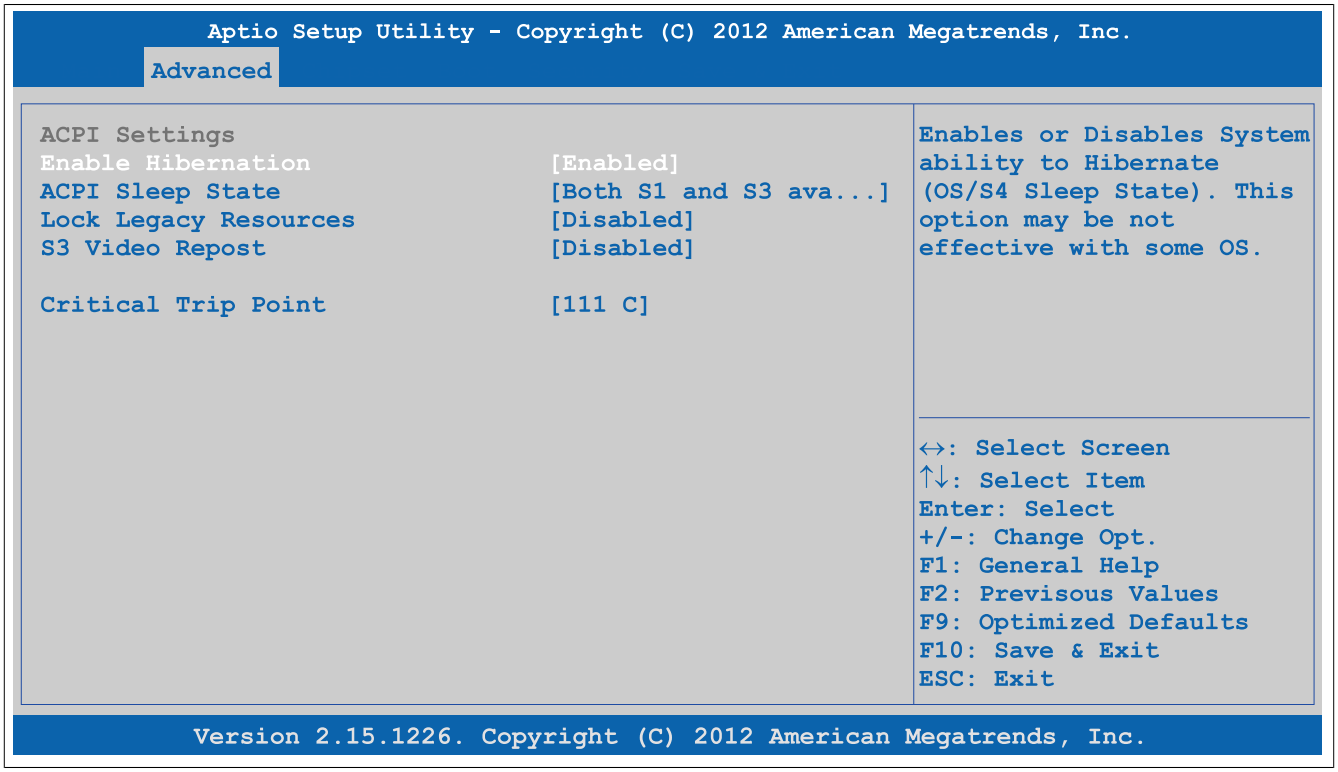


Figure 188: Advanced - ACPI Settings

BIOS setting	Function	Configuration options	Effect
Enable hibernation	Option for enabling/disabling the hibernate function. This can put the operating system into the S4 state. This option may not have any effect on some operating systems.	Disabled	Disables this function
		Enabled	Enables this function
ACPI sleep state	Selects the ACPI status to be used when Suspend mode is enabled	Suspend disabled	Disables this function
		S1 only (CPU stop clock)	Sets S1 as Suspend mode. Only a few functions are disabled and are available again at the touch of a button.
		S3 only (Suspend to RAM)	Sets S3 as Suspend mode. The current state of the operating system is written to RAM, which is then the only component to receive power.
		Both S1 and S3 available for OS to choose from	Enables S1 and S3. The states can then be selected by the operating system.
Lock legacy resources	Option for configuring whether the operating system is permitted to configure legacy resources	Disabled	Disables this function
		Enabled	Enables this function
S3 video repost	Option for configuring whether the graphic ROM should be reposted after starting in the S3 status	Disabled	Disables this function
		Enabled	Enables this function
Critical trip point	Option for configuring a CPU temperature at which the operating system automatically shuts down	POR	Sets the critical trip point to 105°C
		87 C, 95 C, 103 C, 111 C, 119 C, 127 C	Temperature setting for the critical trip point. Configurable in increments of 8°C.

Table 229: Advanced - ACPI settings - Configuration options

1.4.6 RTC wake settings

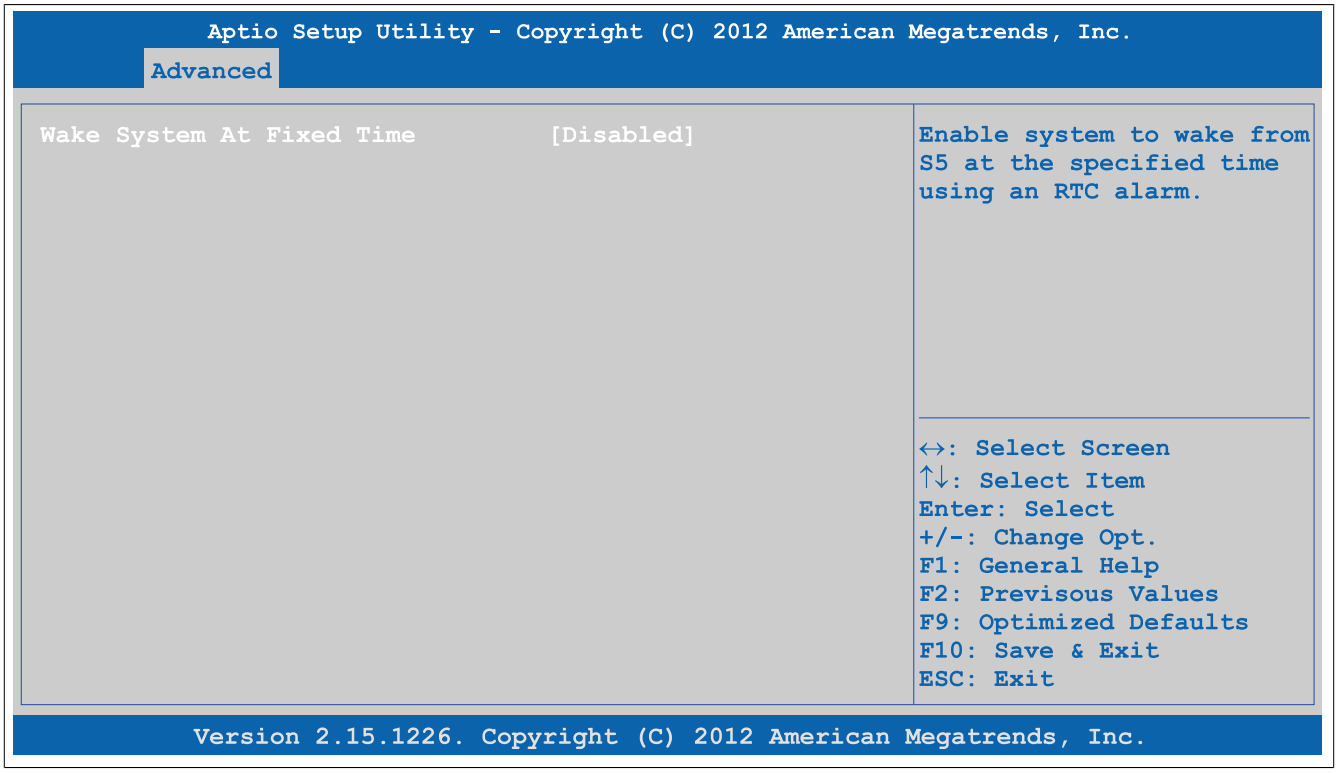


Figure 189: Advanced - RTC Wake Settings

BIOS setting	Function	Configuration options	Effect
Wake system at fixed time	Option for setting the time (to the second) when the system should boot from a switched-off state (ACPI S5)	Disabled	Disables this function
		Enabled	Enables this function
Wake up hour	Option for setting the hour	0 to 23	Example: If set to 3, the system will start up at 3 AM. If set to 15, the system will start up at 3 PM.
Wake up minute	Option for setting the minute	0 to 59	Example: If set to 15, the system will start up at minute 15.
Wake up second	Option for setting the second	0 to 59	Example: If set to 32, the system will start up at second 32.

Table 230: Advanced - RTC wake settings - Configuration options

1.4.7 CPU configuration

Information:

The settings shown may vary depending on the CPU board being used.

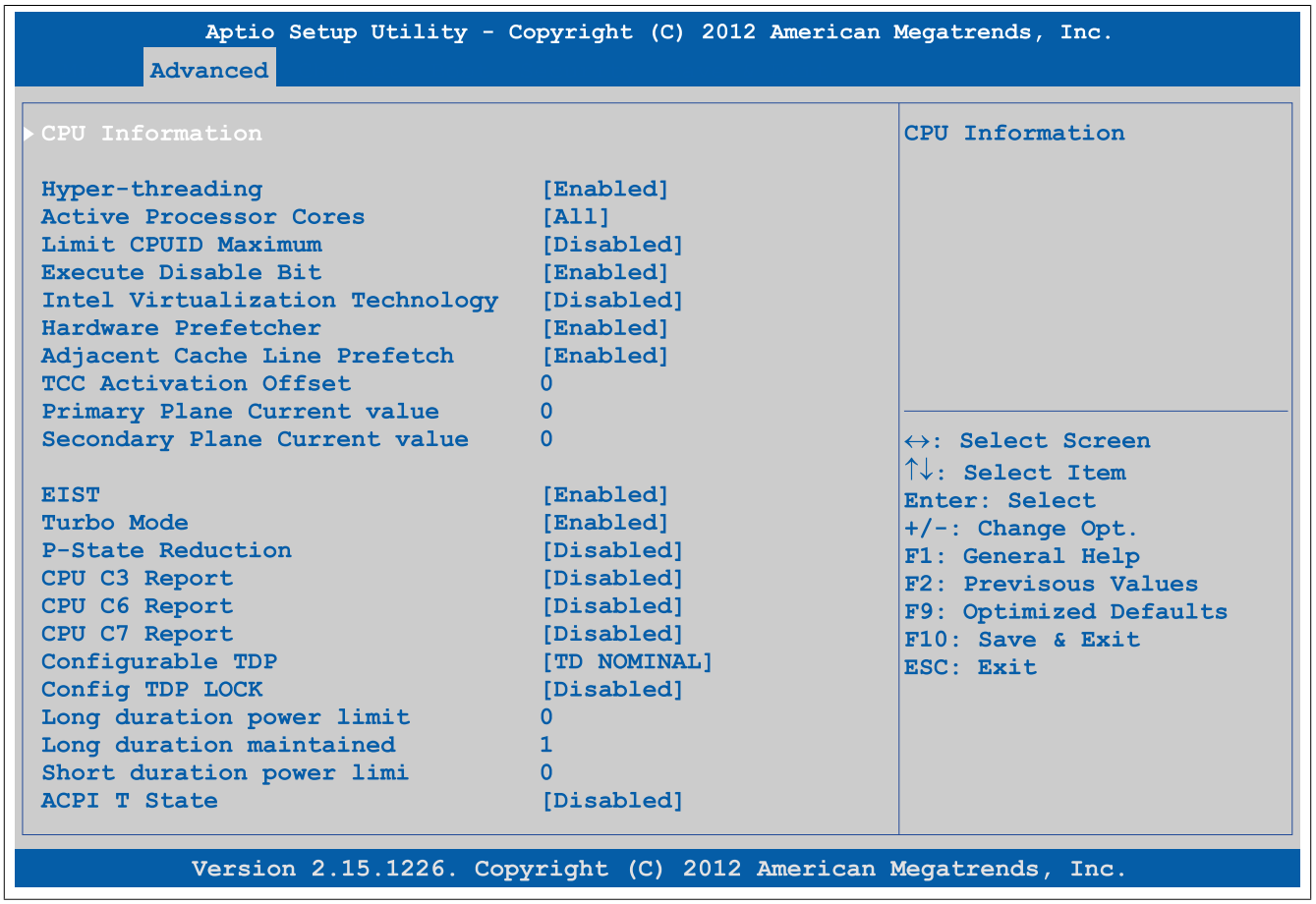


Figure 190: Advanced - CPU Configuration

BIOS setting	Function	Configuration options	Effect
CPU information	Displays CPU properties	Enter	Opens this submenu See "CPU information" on page 271.
Hyper-threading	Option for enabling/disabling Intel Hyper-Threading Technology	Disabled	Disables this function
		Enabled	Enables this function Each processor core can execute multiple tasks (threads) at the same time. Intel Hyper-Threading Technology increases processor throughput and improves the overall performance of multi-thread software.
Active processor cores	Option for configuring which processor cores are to be used	All	Uses all processor cores
		1	Only uses one processor core
Limit CPUID maximum	Option for limiting the CPUID value. This may be necessary for older operating systems. **Information:** **This option must be set to *Disabled* when using Windows XP.**	Disabled	The processor returns the current maximum value when the CPUID value is requested.
		Enabled	The processor limits the maximum CPUID value to 03h if necessary if the processor supports a higher value.
Execute disable bit	Option for enabling/disabling hardware support for prevention of data execution	Disabled	Disables this function
		Enabled	Enables this function
Intel virtualization technology	Option for enabling/disabling a virtual machine **Information:** **A restart is required in order to apply changes made to this setting.**	Disabled	Disables this function
		Enabled	Allows a virtual machine to use the additional hardware capacity
Hardware prefetcher	Option for enabling/disabling the hardware prefetcher	Disabled	Disables this function
		Enabled	Enables this function. Data is temporarily stored in cache memory to increase performance.

Table 231: Advanced - CPU configuration - Configuration options

BIOS setting	Function	Configuration options	Effect
Adjacent cache line prefetch	Option for enabling/disabling the adjacent cache line prefetcher	Disabled	Disables this function
		Enabled	Enables this function. Loads the current and next line to cache in order to accelerate the read process
TCC[1] activation offset	Option for configuring the offset of the thermal control circuit (TCC) at temperatures below the TCC activation temperature	0 to 50	Sets the offset value
Primary plane current value	Option for configuring the maximum current on the primary plane at any single time	0 to 255	Setting from 0 to 255
Secondary plane current value	Option for configuring the maximum current on the secondary plane at any single time	0 to 255	Setting from 0 to 255
EIST	Option for enabling/disabling Intel® SpeedStep™ technology The processor clock speed is increased or decreased according to the number of calculations that must be made. As a result, the power consumption depends largely on the processor load.	Disabled	Disables Intel® SpeedStep™ technology
		Enabled	Enables Intel® SpeedStep™ technology The processor speed is regulated by the operating system.
Turbo mode	Option for enabling/disabling Intel® Turbo Boost Technology	Disabled	Disables Intel® Turbo Boost technology
		Enabled	Enables Intel® Turbo Boost technology
P state reduction	Option for reducing the CPU performance and power usage.	Disabled	Disables this function
		by 1, 2, 3, 4, 5, 6, 7, 8	The performance is reduced by the set value depending on the CPU used.
CPU C3 report	Option for enabling/disabling the CPU C3 (ACPI C2) report to the operating system	Disabled	Disables this function. No report is sent to the operating system.
		Enabled	Enables this function
CPU C6 report	Option for enabling/disabling the CPU C6 (ACPI C3) report to the operating system	Disabled	Disables this function. No report is sent to the operating system.
		Enabled	Enables this function
CPU C7 report	Option for enabling/disabling the CPU C7 (ACPI C3) report to the operating system	Disabled	Disables this function. No report is sent to the operating system.
		Enabled	Enables this function
Configurable TDP[2]	Option for configuring the TDP level	TDP NOMINAL	Value remains at the TDP level
		TDP DOWN	Value falls below the TDP level, with the CPU running at lower power
		TDP UP	Value rises above the TDP level, with the CPU running at higher power
		Disabled	Disables this function
Config TDP LOCK	Option for locking and configuring the TDP control register	Disabled	Disables this function
		Enabled	Enables this function
Long duration power limit	Long duration power limit in watts	0 to 255	Setting from 0 to 255
Long duration maintained	Time period during which the "Long duration power" option is enabled	0 to 120	Setting from 0 to 120
Short duration power limit	Short duration power limit in watts	0 to 255	Setting from 0 to 255
ACPI T state	Option for enabling/disabling ACPI T state support.	Disabled	Disables this function
		Enabled	Enables this function

Table 231: Advanced - CPU configuration - Configuration options

1) TCC = Thermal control circuit.
2) TDP = Thermal design power.

1.4.7.1 CPU information

Information:

The settings shown may vary depending on the CPU board being used.

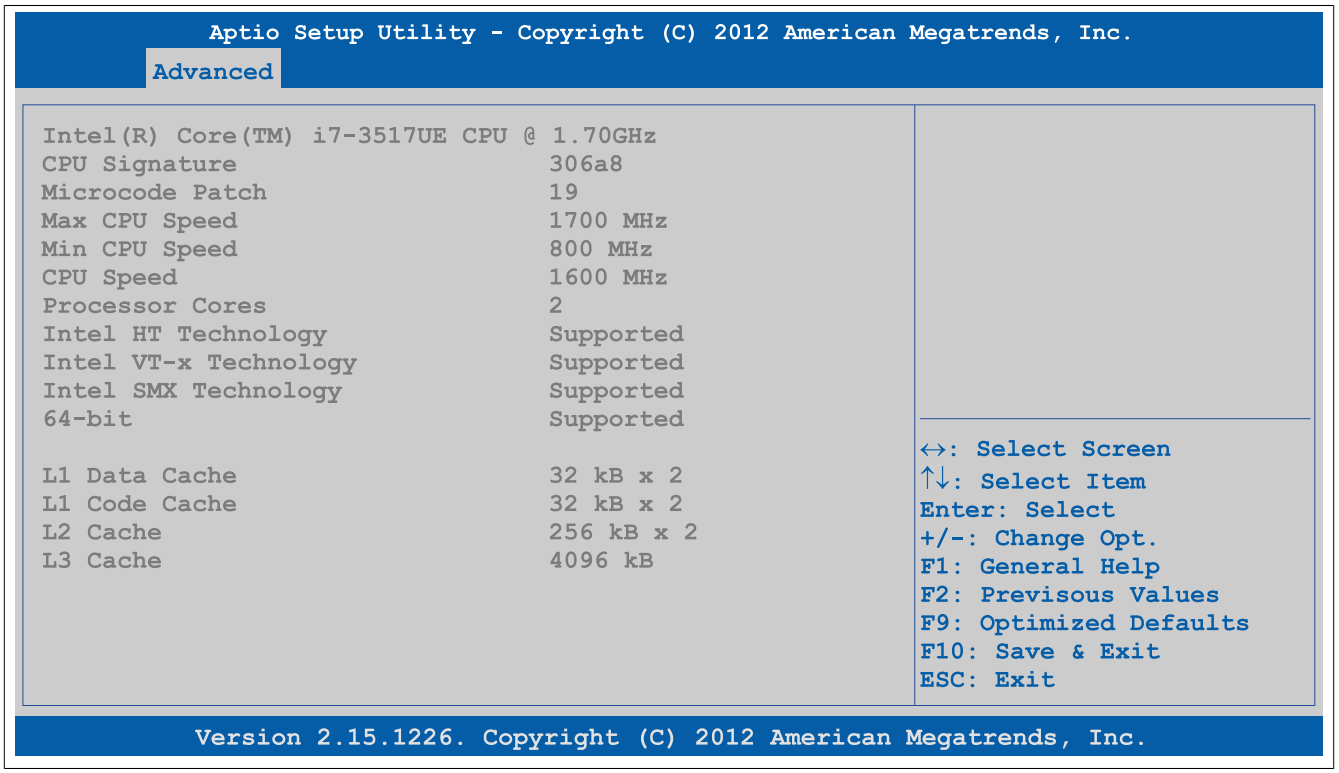


Figure 191: Advanced - CPU Configuration - CPU Information

BIOS setting	Function	Configuration options	Effect
CPU signature	Displays the CPU ID	None	-
Microcode patch	Displays the microcode patch ID	None	-
Max CPU speed	Displays the maximum processor frequency	None	-
Min CPU speed	Displays the minimum processor frequency	None	-
CPU speed	Displays the processor frequency	None	-
Processor cores	Displays the number of processor cores	None	-
Intel HT technology	Displays whether the processor supports HT technology	None	-
Intel VT-x technology	Displays whether the processor supports VT-x technology	None	-
Intel SMX technology	Displays whether the processor supports SMX technology	None	-
64-bit	Displays whether the processor supports Intel 64-bit architectures	None	-
L1 data cache	Displays the size of the L1 data cache	None	-
L1 code cache	Displays the size of the L1 code cache	None	-
L2 cache	Displays the size of the L2 code cache	None	-
L3 cache	Displays the size of the L3 cache	None	-

Table 232: Advanced - CPU configuration - CPU information - Configuration options

1.4.8 Chipset configuration

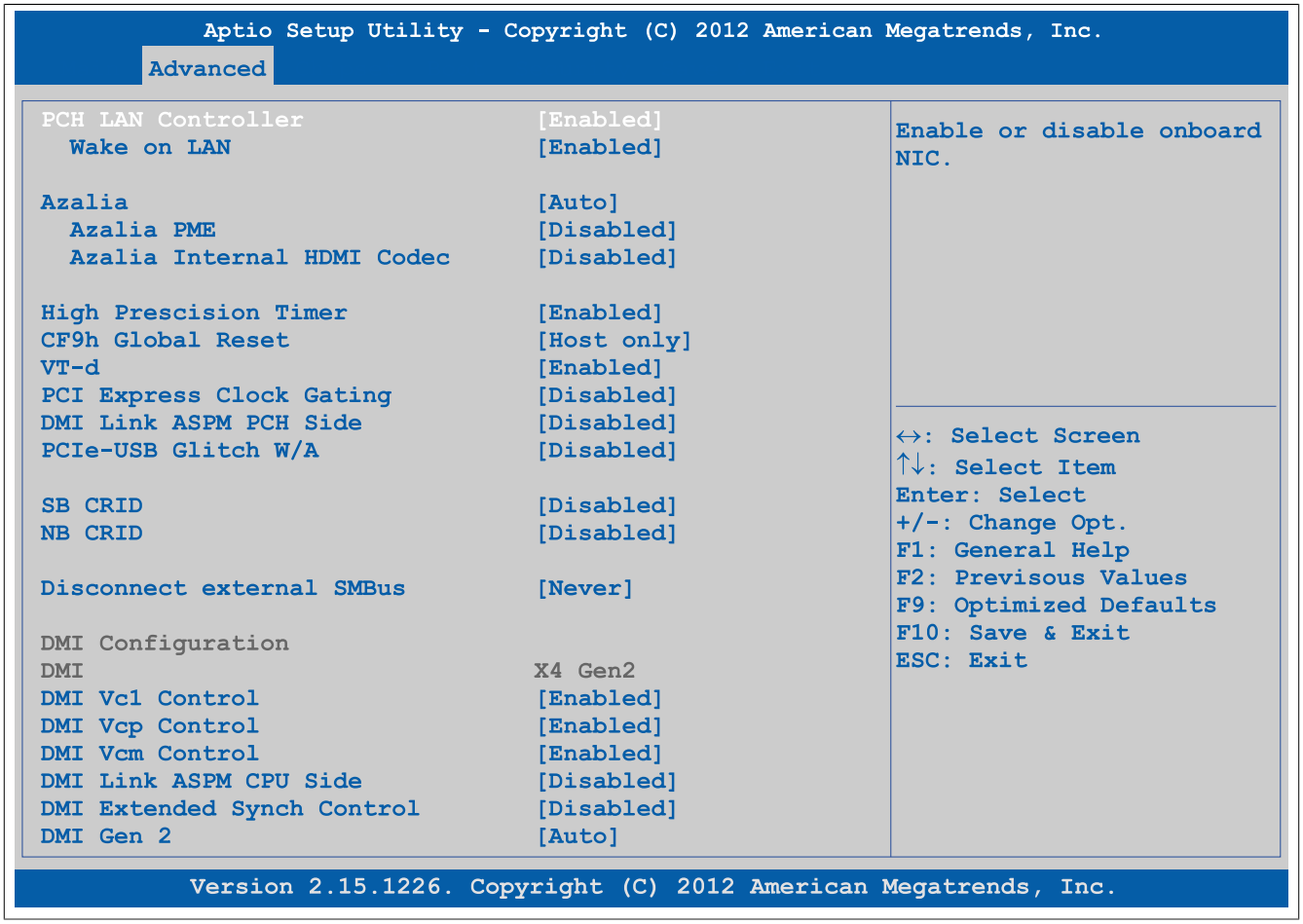


Figure 192: Advanced - Chipset Configuration

BIOS setting	Function	Configuration options	Effect
PCH LAN controller	Option for turning the onboard LAN controller (ETH1) on and off	Disabled	Disables the controller
		Enabled	Enables the controller
Wake on LAN	Option for switching on the system via the on-board LAN controller (ETH1)	Enabled	Enables this function. The LAN controller can switch on the system.
		Disabled	Disables this function. The LAN controller cannot switch on the system.
Azalia	Option for enabling/disabling the audio controller	Disabled	Disables the audio controller
		Enabled	Enables the audio controller
		Auto	Only enables the audio controller if a device is connected
Azalia PME	Option for enabling/disabling power management for the audio controller	Disabled	Disables this function
		Enabled	Enables this function
Azalia internal HDMI codec	Option for enabling/disabling the internal HDMI codec for Azalia	Disabled	Disables audio output
		Enabled	Enables audio output
High-precision timer	The HPET is a timer inside the PC. It is able to trigger an interrupt with a high degree of accuracy, which allows other programs to better synchronize a variety of applications.	Disabled	Disables this function
		Enabled	Enables this function. This function is recommended for multimedia applications.
CF9h global reset	Option for setting the restart on the CF9h reset register	Host only	Chipset only
		Host+ME	Chipset and management engine
VT-d	Option for enabling/disabling a virtual machine **Information:** **A restart is required in order to apply changes made to this setting.**	Enabled	Enables this function Allows a virtual machine to use the additional hardware capacity
		Disabled	Disables this function
PCI Express clock gating	Option for enabling/disabling PCI Express clock gating for each individual root port	Disabled	Disables this function
		Enabled	Enables this function
DMI link ASPM PCH side	Option for enabling/disabling active state power management (ASPM) for the DMI link on the PCH side	Disabled	Disables this function
		Enabled	Enables this function
PCIe USB glitch W/A	Option for enabling/disabling the PCIe USB glitch if a malfunctioning USB device is connected after the PCIe/PEG port	Disabled	Disables this function
		Enabled	Enables this function

Table 233: Advanced - Chipset configuration - Configuration options

BIOS setting	Function	Configuration options	Effect
SB CRID	Option for enabling/disabling the southbridge compatible revision ID	Disabled	Disables this function
		Enabled	Enables this function
NB CRID	Option for enabling/disabling the northbridge compatible revision ID	Disabled	Disables this function
		Enabled	Enables this function
Disconnect external SM-Bus	Option for always/never disconnecting the external SMBus	Always	Always allows disconnection of the SMBus
		During Post	Allows disconnection of the SMBus until EOP (end of POST)
		Never	Never allow disconnection of the SMBus
DMI Configuration			
DMI	Displays the DMI version / generation	None	-
DMI Vc1 control	Option for enabling/disabling DMI Vc1	Enabled	Enables this function
		Disabled	Disables this function
DMI Vcp control	Option for enabling/disabling DMI Vcp	Enabled	Enables this function
		Disabled	Disables this function
DMI Vcm control	Option for enabling/disabling DMI Vcm	Enabled	Enables this function
		Disabled	Disables this function
DMI link ASPM CPU side	Option for enabling/disabling active state power management (ASPM) for the DMI link on the CPU side	Disabled	Disables this function
		L0s	Enables the L0 energy saving function
		L1	Enables the L1 energy saving function. Power consumption is lower than with L0, but the exit latency is higher.
		L0sL1	Automatic assignment of L0s or L1 power saving function by the PCIe device
DMI extended synch control	Option for enabling/disabling DMI extended synchronization	Enabled	Enables this function
		Disabled	Disables this function
DMI Gen 2	Option for enabling/disabling DMI Gen 2	Auto	Disabled for IVB A0 MB/DT and IVB B0 MB, enabled for other CPUs
		Enabled	Enables this function
		Disabled	Disables this function

Table 233: Advanced - Chipset configuration - Configuration options

1.4.9 SATA configuration

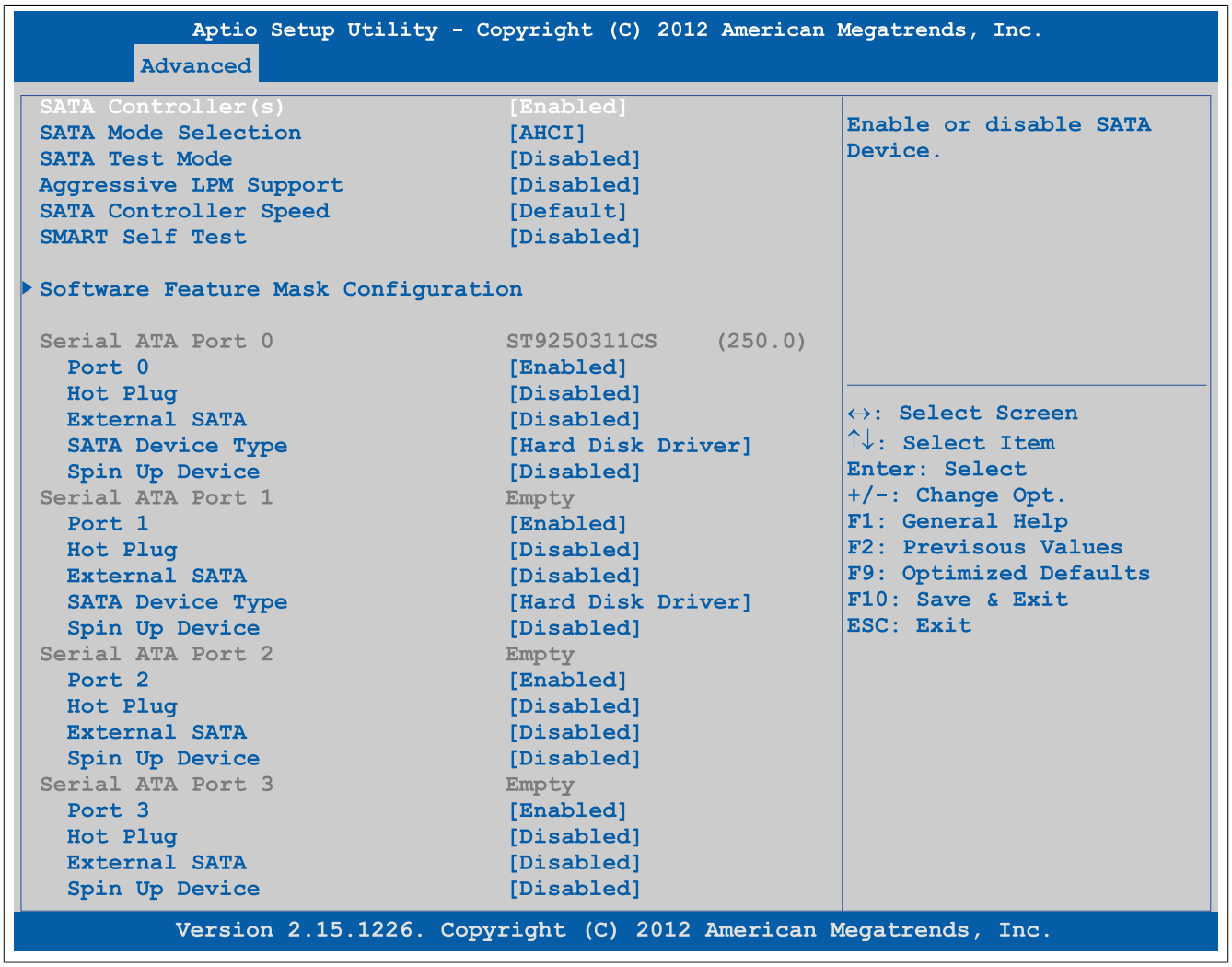


Figure 193: Advanced - SATA configuration

BIOS setting	Function	Configuration options	Effect
SATA controller(s)	Option for configuring SATA support	Enabled	Provides support for SATA devices
		Disabled	No support for SATA devices
SATA mode selection	Option for configuring supported serial ATA connections	IDE	Uses the serial ATA hard drive as a parallel ATA physical drive It is not possible to configure the SATA port.
		AHCI	The AHCI setting enables the internal memory driver for SATA functions, which increases the storage performance for random read-write access by allowing the drive itself to determine the sequence of commands.
		RAID	RAID 0, 1, 5, 10 or Intel® Matrix Storage technology can be configured here with the serial ATA hard drive.
SATA test mode	Option for configuring the test function. This is only used for test measurements.	Enabled	Enables this function
		Disabled	Disables this function
Aggressive LPM support	Aggressive Link Power Management (ALPM) is a power saving method for SATA drives.	Enabled	Enables this function
		Disabled	Disables this function
SATA controller speed	Option for setting the maximum SATA transfer rate The transfer rate is also dependent on the maximum possible transfer rate of the drive.	Gen1	Maximum SATA transfer rate = 1.5 Gbit/s
		Gen2	Maximum SATA transfer rate = 3.0 Gbit/s
		Gen3	Maximum SATA transfer rate = 6.0 Gbit/s
		Default	The maximum SATA transfer rate is set by default.
IDE legacy / Native mode selection	Selects legacy or native mode	Legacy	Legacy IDE mode
		Native	Native IDE mode
SMART self test	Option for configuring the SMART self-test function on all hard drives	Enabled	Enables this function
		Disabled	Disables this function
Software feature mask configuration	Configuration of various drive settings	Enter	Opens this submenu See "Software feature mask configuration" on page 276.

Table 234: Advanced - SATA configuration - Configuration options

BIOS setting	Function	Configuration options	Effect
Alternate ID[1]	Option for enabling/disabling a report of the alternate device ID	Enabled	Enables this function
		Disabled	Disables this function
Serial ATA port 0	Displays the device connected to SATA port 0	None	-
Port 0	Option for enabling/disabling SATA port 0	Disabled	Disables SATA port 0
		Enabled	Enables SATA port 0
Hot plug	Option for configuring hot plugging for SATA port 0	Disabled	Disables hot plugging for SATA port 0
		Enabled	Enables hot plugging for SATA port 0. Devices can be connected/disconnected during operation.
External SATA	Option for configuring the external SATA port	Disabled	Uses the port externally as eSATA
		Enabled	Uses the port internally as SATA
Mechanical presence switch[2]	Option for enabling/disabling the report if this port has a mechanical presence switch	Disabled	Disables this function
		Enabled	Enables this function
SATA device type	Identifies whether a solid state or hard disk drive is connected to the SATA port	Hard disk drive	A hard disk is connected to the SATA port.
		Solid-state drive	A solid-state drive is connected to the SATA port.
Spin up device	Option for configuring an initialization sequence for the connected device during startup for the SATA port	Disabled	Disables this function
		Enabled	Enables this function
Serial ATA port 1	Displays the device connected to SATA port 1	None	-
Port 1	Option for enabling/disabling SATA port 1	Disabled	Disables SATA port 1
		Enabled	Enables SATA port 1
Hot plug	Option for configuring hot plugging for SATA port 1	Disabled	Disables hot plugging for SATA port 1
		Enabled	Enables hot plugging for SATA port 1. Devices can be connected/disconnected during operation.
External SATA	Option for configuring the external SATA port	Disabled	Uses the port externally as eSATA
		Enabled	Uses the port internally as SATA
Mechanical presence switch[2]	Option for enabling/disabling the report if this port has a mechanical presence switch	Disabled	Disables this function
		Enabled	Enables this function
SATA device type	Identifies whether a solid state or hard disk drive is connected to the SATA port	Hard disk drive	A hard disk is connected to the SATA port.
		Solid-state drive	A solid-state drive is connected to the SATA port.
Spin up device	Option for configuring an initialization sequence for the connected device during startup for the SATA port	Disabled	Disables this function
		Enabled	Enables this function
Serial ATA port 2	Displays the device connected to SATA port 2	None	-
Port 2	Option for enabling/disabling SATA port 2	Disabled	Disables SATA port 2
		Enabled	Enables SATA port 2
Hot plug	Option for configuring hot plugging for SATA port 2	Disabled	Disables hot plugging for SATA port 2
		Enabled	Enables hot plugging for SATA port 2. Devices can be connected/disconnected during operation.
External SATA	Option for configuring the external SATA port	Disabled	Uses the port externally as eSATA
		Enabled	Uses the port internally as SATA
Mechanical presence switch[2]	Option for enabling/disabling the report if this port has a mechanical presence switch	Disabled	Disables this function
		Enabled	Enables this function
SATA device type	Identifies whether a solid state or hard disk drive is connected to the SATA port	Hard disk drive	A hard disk is connected to the SATA port.
		Solid-state drive	A solid-state drive is connected to the SATA port.
Spin up device	Option for configuring an initialization sequence for the connected device during startup for the SATA port	Disabled	Disables this function
		Enabled	Enables this function
Serial ATA port 3	Displays the device connected to SATA port 3	None	-
Port 3	Option for enabling/disabling SATA port 3	Disabled	Disables SATA port 3
		Enabled	Enables SATA port 3
Hot plug	Option for configuring hot plugging for SATA port 3	Disabled	Disables hot plugging for SATA port 3
		Enabled	Enables hot plugging for SATA port 3. Devices can be connected/disconnected during operation.
External SATA	Option for configuring the external SATA port	Disabled	Uses the port externally as eSATA
		Enabled	Uses the port internally as SATA
Mechanical presence switch[2]	Option for enabling/disabling the report if this port has a mechanical presence switch	Disabled	Disables this function
		Enabled	Enables this function
SATA device type	Identifies whether a solid state or hard disk drive is connected to the SATA port	Hard disk drive	A hard disk is connected to the SATA port.
		Solid-state drive	A solid-state drive is connected to the SATA port.
Spin up device	Option for configuring an initialization sequence for the connected device during startup for the SATA port	Disabled	Disables this function
		Enabled	Enables this function

Table 234: Advanced - SATA configuration - Configuration options

1) This setting is only possible if *SATA mode selection* is set to *RAID*.
2) This setting is only possible if *Hot plug* is set to *Enabled*.

1.4.9.1 Software feature mask configuration

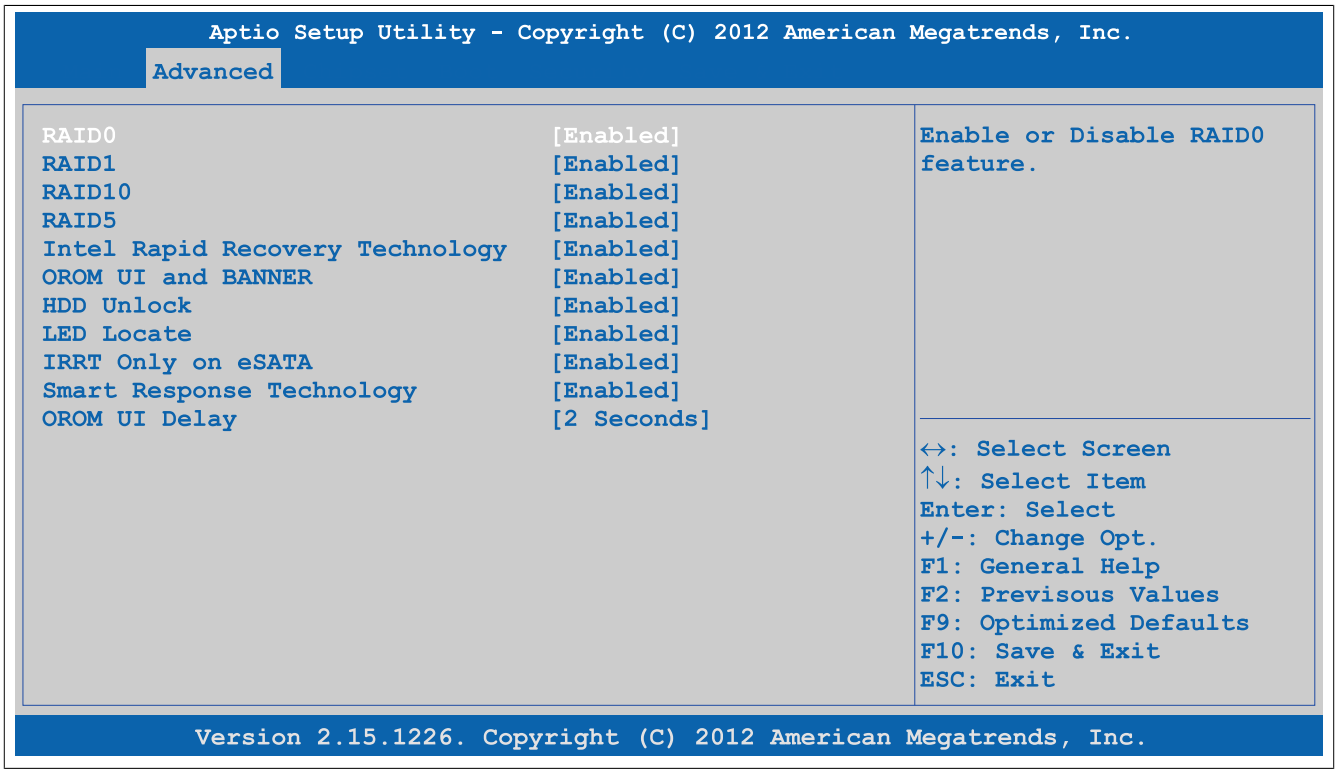


Figure 194: Advanced - SATA Configuration - Software Feature Mask Configuration

BIOS setting	Function	Configuration options	Effect
RAID0	Option for enabling/disabling a RAID0 system	Disabled	Disables this function
		Enabled	Enables this function
RAID1	Option for enabling/disabling a RAID1 system	Disabled	Disables this function
		Enabled	Enables this function
RAID10	Option for enabling/disabling a RAID10 system	Disabled	Disables this function
		Enabled	Enables this function
RAID5	Option for enabling/disabling a RAID5 system	Disabled	Disables this function
		Enabled	Enables this function
Intel Rapid Recovery technology	Option for enabling/disabling Intel® Rapid Recovery Technology	Disabled	Disables this function
		Enabled	Enables this function
OROM UI and BANNER	Option for displaying the OROM UI	Disabled	Does not display the OROM UI or banner
		Enabled	Displays the OROM UI
HDD unlock	Option for enabling/disabling the HDD password unlock mechanism in the operating system	Disabled	Disables the HDD password unlock mechanism
		Enabled	Enables the HDD password unlock mechanism
LED locate	Option for displaying the LED/SGPIO when a drive is connected	Disabled	Disables this function
		Enabled	Enables an indicator for when a drive is connected
IRRT only on eSATA[1)]	Option for configuring Intel® Rapid Recovery technology	Disabled	Every RAID system can use internal and eSATA drives.
		Enabled	Only IRRT systems can use internal eSATA drives.
Smart Response technology	Option for enabling/disabling Intel® Smart Response Technology	Disabled	Disables this function
		Enabled	Enables this function
OROM UI delay	Option for displaying the delay time for the OROM UI splash screen	2 seconds, 4 seconds, 6 seconds, 8 seconds	Setting in seconds

Table 235: Advanced - SATA configuration - Software feature mask configuration - Configuration options

1) IRRT = Intel Rapid Recovery technology.

1.4.10 Memory configuration

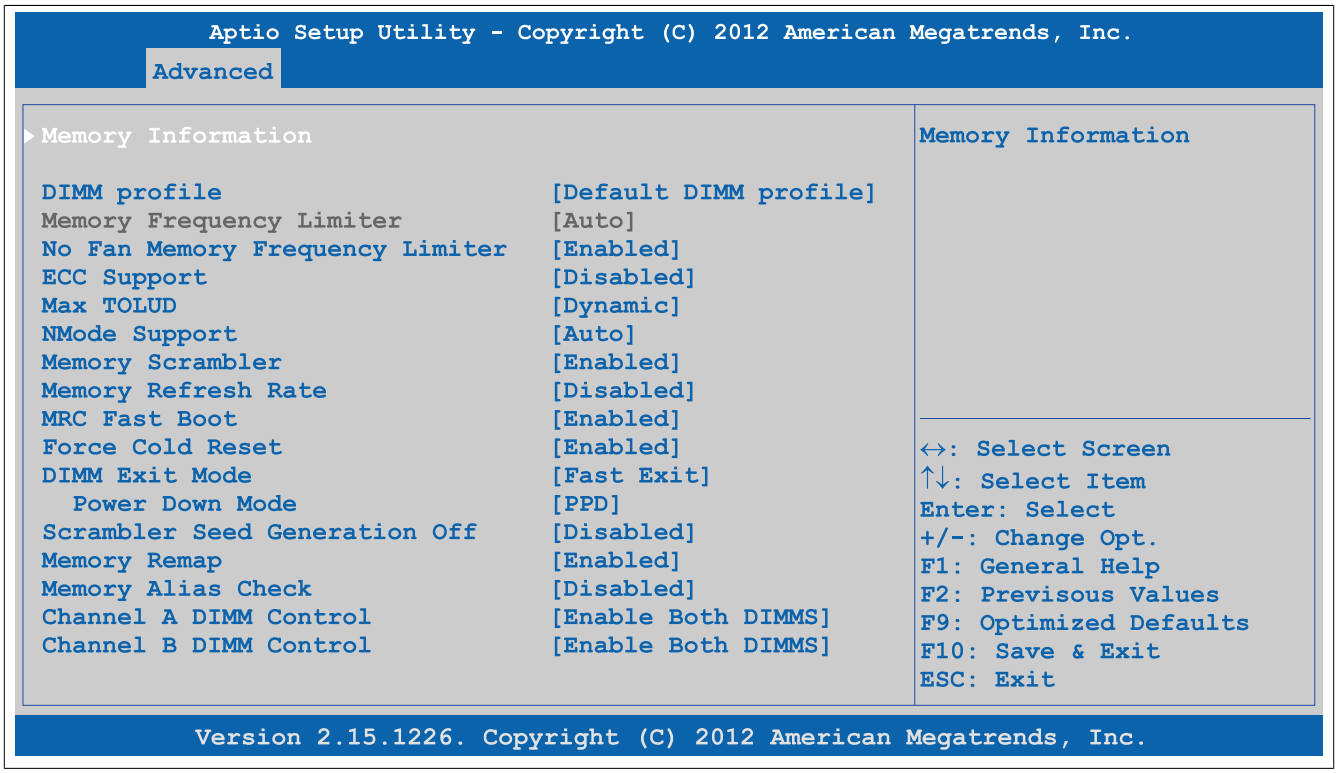


Figure 195: Advanced - Memory Configuration

BIOS setting	Function	Configuration options	Effect
Memory information	Displays main memory properties	Enter	Opens this submenu See "Memory information" on page 278.
DIMM profile	Option for configuring the main memory timing profile	Default DIMM profile	Uses the default profile
		Custom profile	Uses a user-defined profile
		XMP Profile 1	Uses XMP profile 1
		XMP profile 2	Uses XMP profile 2
Custom profile control[1)]	Configuration of the main memory timing profile	Enter	Opens this submenu See "Custom profile control" on page 279.
Memory frequency limiter[2)]	Option for setting the maximum possible main memory frequency **Information:** **If a fan kit is not installed in the device, then the main memory frequency is limited to 1067 MHz when set to "Auto".**	Auto	Automatic configuration
		1067, 1333, 1600, 1867, 2133, 2400, 2667	Manual configuration
No fan memory frequency limiter	Option for automatically throttling down the main memory frequency when the system unit has no fan	Disabled	Disables this function
		Enabled	Enables this function
ECC support	Option for enabling/disabling main memory ECC support	Disabled	Disables this function
		Enabled	Enables this function
Max TOLUD[3)]	Option for configuring the maximum "Top of low usable DRAM"	Dynamic	Automatically adjusts the TOLUD based on the MMIO length of the graphics controller
		1 GB, 1.25 GB, 1.5 GB, 1.75 GB, 2 GB, 2.25 GB, 2.5 GB, 2.75 GB, 3 GB, 3.25 GB	Manual setting of the TOLUD
NMode support	Option for configuring NMode support	Auto	Sets automatically
		1N mode	Sets 1N mode
		2N mode	Sets 2N mode
Memory scrambler	Option for enabling/disabling memory scrambler support	Enabled	Enables this function
		Disabled	Disables this function
Memory refresh rate	Option for configuring the RAM refresh rate	Disabled	Sets automatically
		x1	Manual setting
		x2	Manual setting
MRC fast boot	Option for enabling/disabling MRC fast booting	Enabled	Enables this function
		Disabled	Disables this function
Force cold reset	Option for enabling/disabling force cold resets	Enabled	Enables this function
		Disabled	Disables this function
DIMM exit mode	Option for configuring the DIMM exit mode	Auto	Sets automatically

Table 236: Advanced - Memory configuration - Configuration options

BIOS setting	Function	Configuration options	Effect
		Slow exit	Enables slow exit mode
		Fast exit	Enables fast exit mode
Power down mode	Option for setting the power saving function for main memory	No power down	No power down
		APD	Active power down
		PPD	Precharged power down
		APD-PPD	Active power down - Precharged power down
Scrambler seed generation off	Option for enabling/disabling the scrambler seed generation off function	Enabled	Enables this function
		Disabled	Disables this function
Memory remap	Option for enabling/disabling memory remapping over 4 GB	Enabled	Enables this function
		Disabled	Disables this function
Memory alias check	Option for enabling/disabling the memory alias check function	Enabled	Enables this function
		Disabled	Disables this function
Channel A DIMM control	Option for configuring main memory channel A	Enable both DIMMS	Enables both channel A main memory modules
		Disable DIMM0	Disables channel A DIMM0 main memory
		Disable DIMM1	Disables channel A DIMM1 main memory
		Disable both DIMMS	Disables both channel A main memory modules
Channel B DIMM control	Option for configuring main memory channel B	Enable both DIMMS	Enables both channel B main memory modules.
		Disable DIMM0	Disables channel B DIMM0 main memory
		Disable DIMM1	Disables channel B DIMM1 main memory
		Disable both DIMMS	Disables both channel B main memory modules

Table 236: Advanced - Memory configuration - Configuration options

1) This setting is only shown if *DIMM profile* is set to *Custom profile*.
2) This setting is only possible if *No fan memory frequency limiter* is set to *Disabled*.
3) TOLUD = Top of low usable DRAM.

1.4.10.1 Memory information

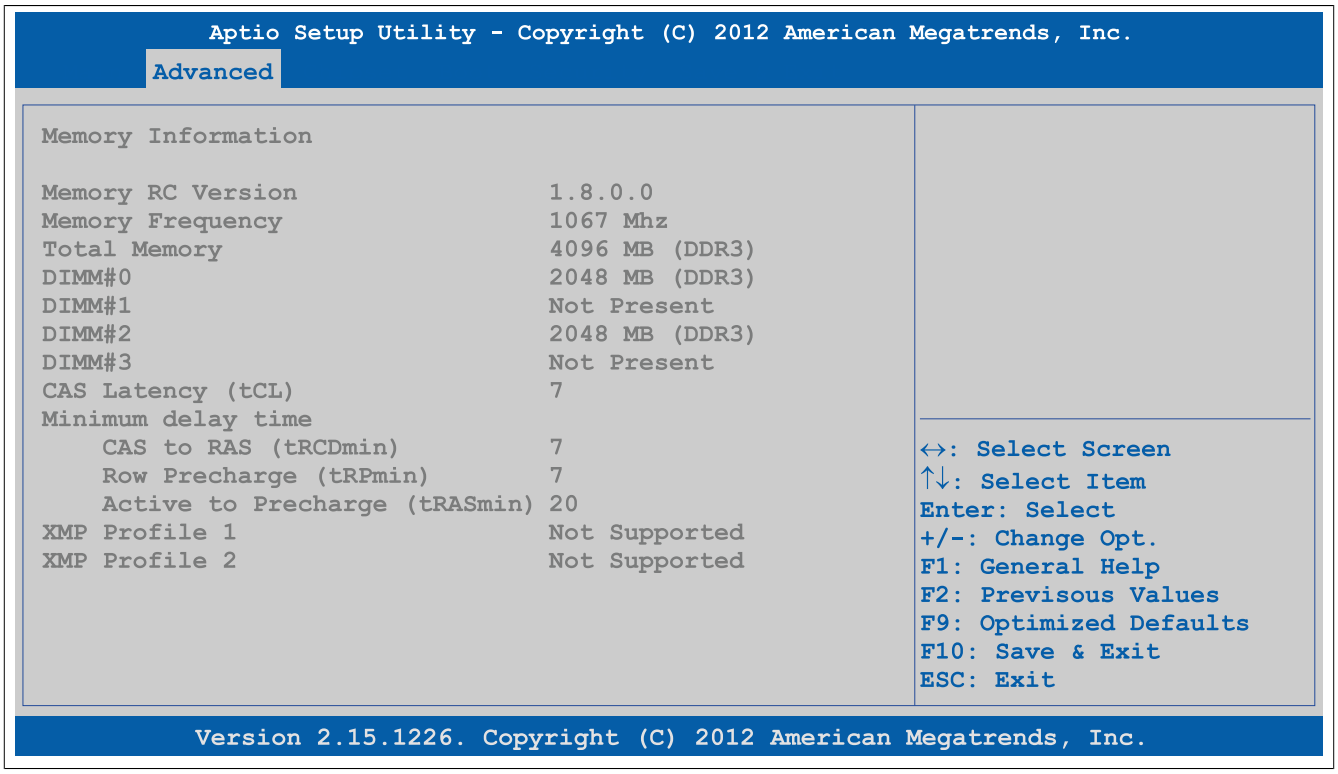


Figure 196: Advanced - Memory Configuration - Memory Information

BIOS setting	Function	Configuration options	Effect
Memory RC version	Displays the main memory RC version	None	-
Memory frequency	Displays the main memory frequency	None	-
Total memory	Displays the total amount of main memory	None	-
DIMM#0	Displays the amount of main memory in DIMM slot 0	None	-
DIMM#1	Displays the amount of main memory in DIMM slot 1	None	-
DIMM#2	Displays the amount of main memory in DIMM slot 2	None	-
DIMM#3	Displays the amount of main memory in DIMM slot 3	None	-
CAS latency (tCL)	Displays the CAS latency	None	-

Table 237: Advanced - Memory configuration - Memory information

BIOS setting	Function	Configuration options	Effect
Minimum delay time			
CAS to RAS (tRCDmin)	Displays the delay time between CAS# and RAS#	None	-
Row precharge (tRPmin)	Displays the row precharge time	None	-
Active to precharge (tRASmin)	Displays the minimum active RAS# time	None	-
XMP Profile 1	Displays XMP profile 1	None	-
XMP profile 2	Displays XMP profile 2	None	-

Table 237: Advanced - Memory configuration - Memory information

1.4.10.2 Custom profile control

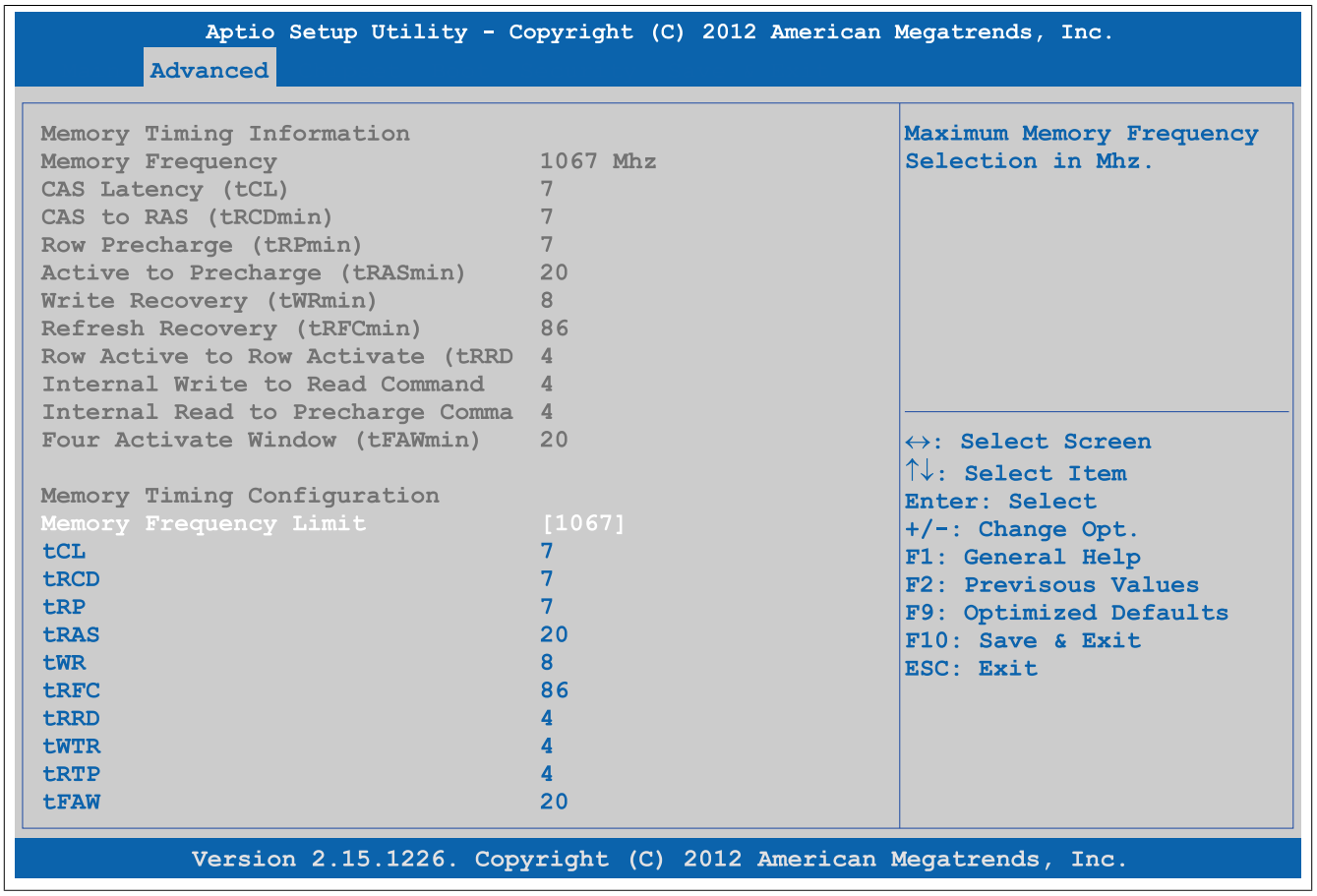


Figure 197: Advanced - Memory Configuration - Custom Profile Control

BIOS setting	Function	Configuration options	Effect
Memory frequency limiter	Sets the maximum main memory frequency in MHz	1067, 1333, 1600, 1867, 2133, 2400, 2667	
tCL	Sets the CAS latency	4 to 18	
tRCD	Sets the minimum "CAS to RAS" time	1 to 38	
tRP	Sets the minimum "Row precharge" time	1 to 38	
tRAS	Sets the minimum "Active to precharge" time	1 to 586	
tWR	Sets the minimum "Write recovery" time	1 to 38	
tRFC	Sets the minimum "Refresh recovery" time	1 to 9363	
tRRD	Sets the minimum "Row active to row active" time	1 to 38	
tWTR	Sets the minimum "Internal write to read command" time	1 to 38	
tRTP	Sets the minimum "Internal read to precharge command" time	1 to 38	
tFAW	Sets the minimum "Four active window" time	1 to 586	

Table 238: Advanced - Memory configuration - Custom profile control - Configuration options

1.4.11 USB configuration

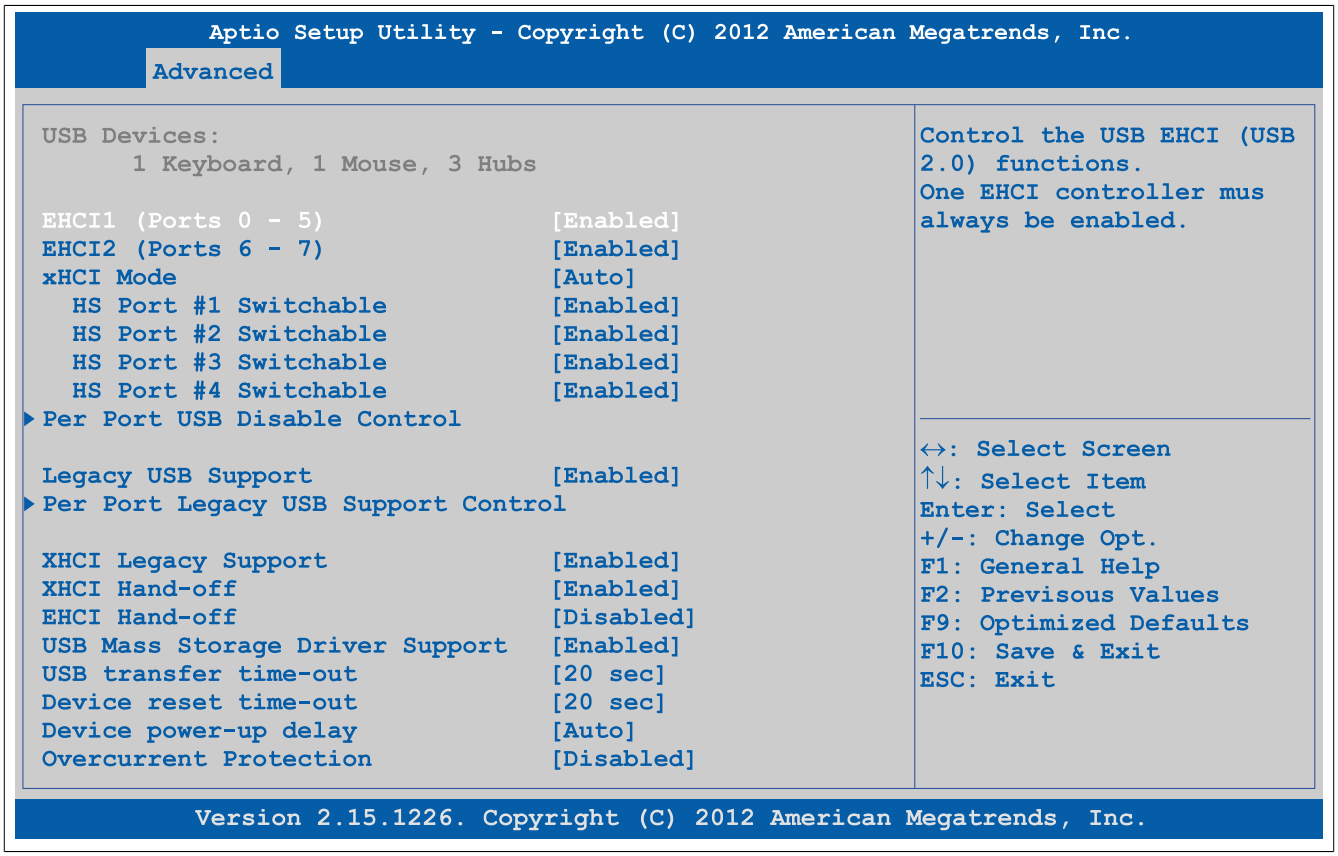


Figure 198: Advanced - USB Configuration

BIOS setting	Function	Configuration options	Effect
EHCI1 (ports 0-5)	Sets USB EHCI controller 1 for USB interfaces #0 through #5 (USB1 through USB4 on the system unit, USB on the monitor/panel interface and the bus unit)	Enabled	Enables EHCI controller 1
		Disabled	Disables EHCI controller 1
EHC2 (ports 6-7)	Sets USB EHCI controller 1 for USB interfaces #6 through #7 (USB5 on the system unit and USB on the monitor/panel option)	Enabled	Enables EHCI controller 2
		Disabled	Disables EHCI controller 2
xHCI mode	Option for configuring the xHCI controller	Smart auto	USB 3.0 interfaces are not handled as USB 3.0 until after the operating system has started. Until then, they are handled as USB 2.0 interfaces. If the APC910 is rebooted, then the USB 3.0 interfaces are handled as USB 3.0 during booting.
		Auto	During the BIOS boot procedure, USB 3.0 interfaces are handled as USB 2.0 interfaces. They are not handled as USB 3.0 interfaces until after the operating system has started and the USB 3.0 driver has been loaded.
		Enabled	Enables the xHCI controller so that USB 3.0 interfaces are always identified as such
		Disabled	Disables the xHCI controller. All USB 3.0 interfaces become USB 2.0 interfaces.
HS port #1 switchable	Option to switch HS port 1 between xHCI and EHCI	Disabled	Routes port 1 to EHCI and operates it as USB 2.0
		Enabled	Routes port 1 to xHCI and enables the corresponding HS port
HS port #2 switchable	Option to switch HS port 2 between xHCI and EHCI	Disabled	Routes port 2 to EHCI and operates it as USB 2.0
		Enabled	Routes port 2 to xHCI and enables the corresponding HS port
HS port #3 switchable	Option to switch HS port 3 between xHCI and EHCI	Disabled	Routes port 3 to EHCI and operates it as USB 2.0
		Enabled	Routes port 3 to xHCI and enables the corresponding HS port
HS port #4 switchable	Option to switch HS port 4 between xHCI and EHCI	Disabled	Routes port 4 to EHCI and operates it as USB 2.0
		Enabled	Routes port 4 to xHCI and enables the corresponding HS port
Per port USB disable control	Option for enabling/disabling individual USB interfaces	Enter	Opens this submenu See "Per port USB disable control" on page 281.

Table 239: Advanced - USB configuration - Configuration options

BIOS setting	Function	Configuration options	Effect
Legacy USB support	Option for configuring legacy USB support. USB interfaces do not function during startup. USB support is available again after the operating system has started. A USB keyboard is still recognized during POST.	Enabled	Enables this function
		Disabled	Disables this function
		Auto	Automatic enabling
Per port legacy USB support control	Option for enabling/disabling legacy USB support for individual USB interfaces	Enter	Opens this submenu See "Per port legacy USB support control" on page 282.
XHCI legacy support	Option for enabling/disabling legacy support for the XHCI controller	Enabled	Uses USB 3.0 for all USB 3.0 interfaces
		Disabled	Uses USB 2.0 or 1.1 for all USB interfaces
XHCI Hand-off	Option for configuring support for operating systems without a fully automated XHCI function	Enabled	Enables USB 3.0 support
		Disabled	Disables this function. On operating systems that do not have a fully automated XHCI function, only USB 2.0 is used with USB devices.
EHCI hand-off	Option for configuring support for operating systems without a fully automated EHCI function	Disabled	Disables this function. On operating systems that do not have a fully automated EHCI function, only USB 1.1 is used with USB devices.
		Enabled	Enables USB 2.0 support
USB mass storage driver support	Option for enabling/disabling USB mass storage device support	Enabled	Enables this function
		Disabled	Disables this function
USB transfer time-out	Option for configuring the timeout value for control, bulk and interrupt transfers	1 sec, 5 sec, 10 sec, 20 sec	Value in seconds
Device reset time-out	Option for configuring the time that POST waits for USB memory storage devices after the device start command is issued	10 sec, 20 sec, 30 sec, 40 sec	Value in seconds
Device power-up delay	Option to set the maximum time to wait for a USB device to report to the host controller	Auto	Sets the maximum time automatically. For a root port, 100 ms is set; for a hub port, the data from the hub descriptor is used.
		Manual	Allows the maximum time to be entered manually using the "Device power-up delay in seconds" option
Device power-up delay in seconds[1)]	Option for setting the device power-up delay time manually	1 to 40	Value in seconds
Overcurrent protection	Option for configuring overcurrent protection for all USB interfaces	Disabled	Disables this function
		Enabled	Enables this function

Table 239: Advanced - USB configuration - Configuration options

1) This setting is only possible if *Device power-up delay* is set to *Manual*.

1.4.11.1 Per port USB disable control

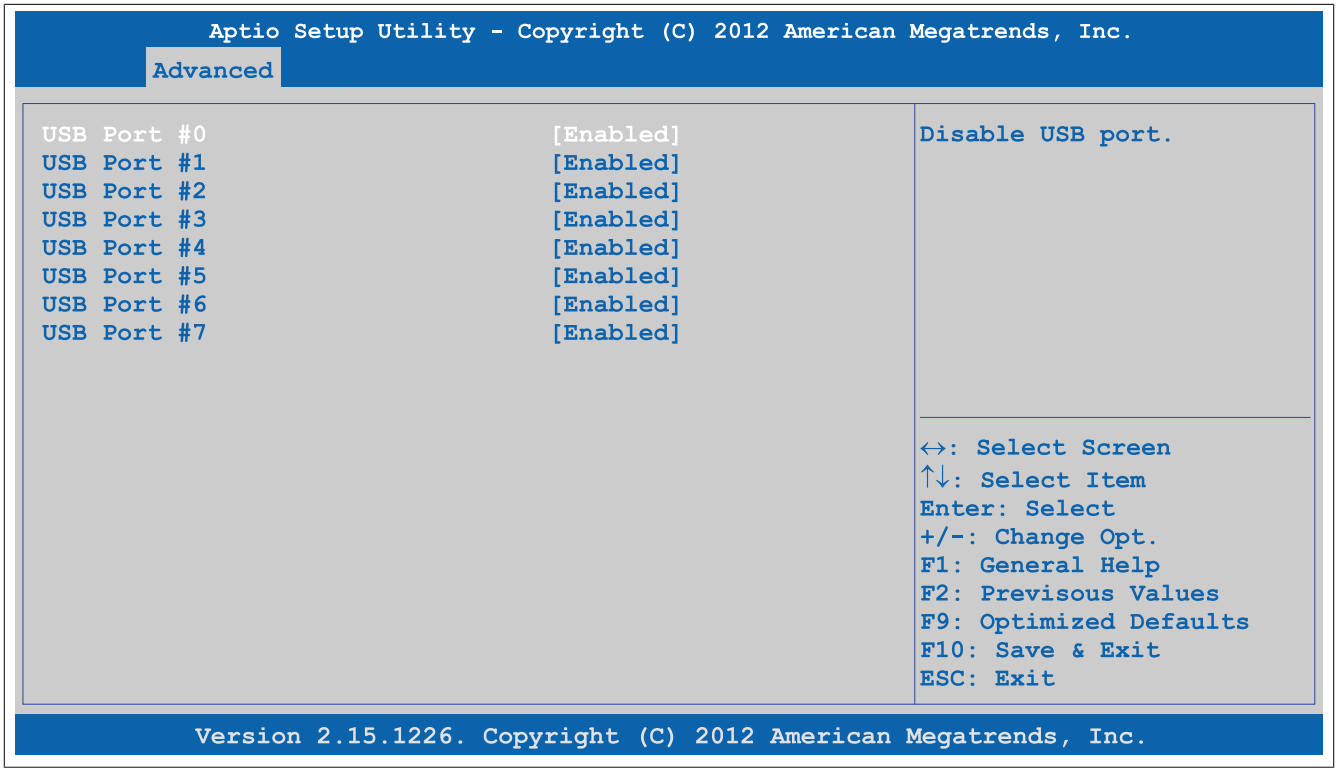


Figure 199: Advanced - USB Configuration - Per Port USB Disable Control

BIOS setting	Function	Configuration options	Effect
USB port #0	Option for enabling/disabling the USB4 port	Disabled	Disables the USB interface
		Enabled	Enables this USB interface
USB port #1	Option for enabling/disabling the USB2 interface	Disabled	Disables the USB interface
		Enabled	Enables this USB interface
USB port #2	Option for enabling/disabling the USB3 port	Disabled	Disables the USB interface
		Enabled	Enables this USB interface
USB port #3	Option for enabling/disabling the USB1 interface	Disabled	Disables the USB interface
		Enabled	Enables this USB interface
USB port #4	Option for enabling/disabling the USB interface on the bus unit	Disabled	Disables the USB interface
		Enabled	Enables this USB interface
USB port #5	Option for enabling/disabling the USB interface on the monitor/panel interface	Disabled	Disables the USB interface
		Enabled	Enables this USB interface
USB port #6	Option for enabling/disabling the USB5 port	Disabled	Disables the USB interface
		Enabled	Enables this USB interface
USB port #7	Option for enabling/disabling the USB interface on the monitor/panel option	Disabled	Disables the USB interface
		Enabled	Enables this USB interface

Table 240: Advanced - USB configuration - Per port USB disable control - Configuration options

1.4.11.2 Per port legacy USB support control

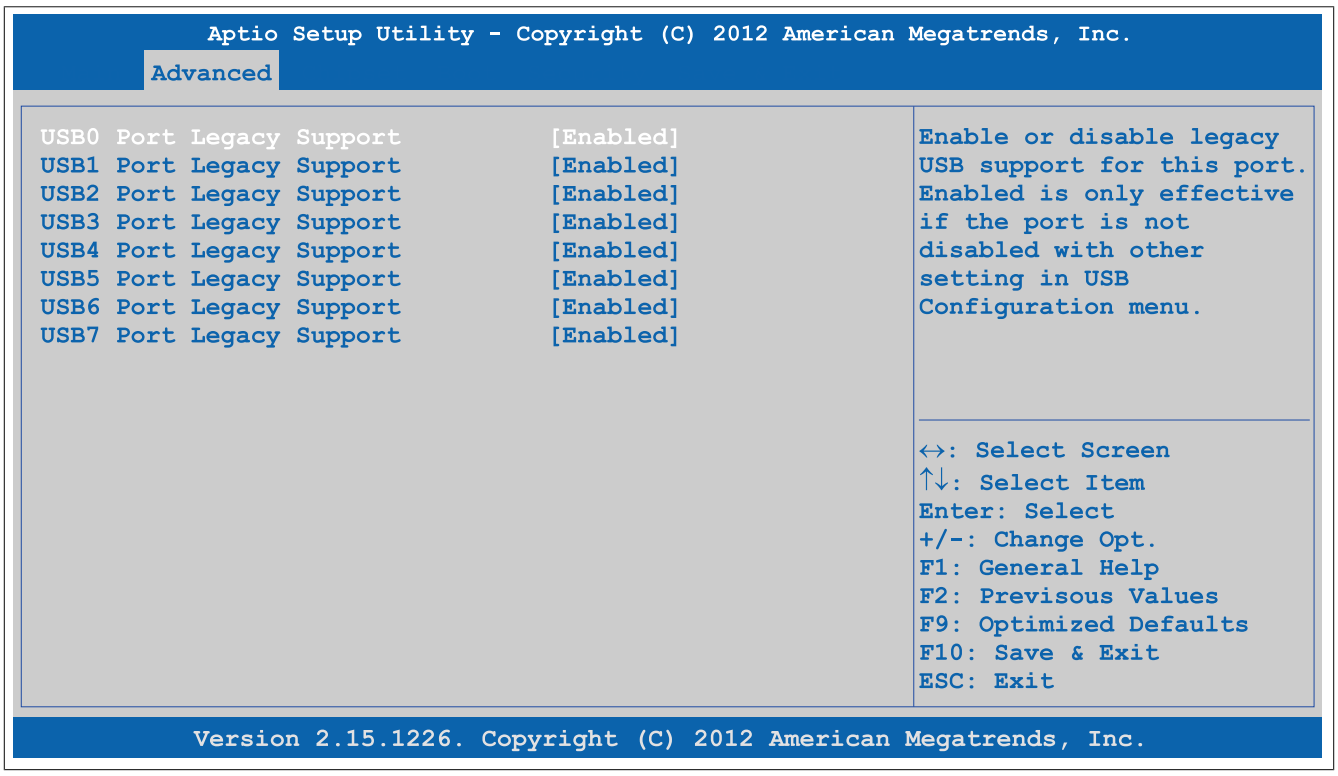


Figure 200: Advanced - USB Configuration - Per Port Legacy USB Support Control

BIOS setting	Function	Configuration options	Effect
USB0 port legacy support	Option for enabling/disabling legacy support for the USB4 port	Disabled	Disables the USB interface
		Enabled	Enables this USB interface
USB1 port legacy support	Option for enabling/disabling legacy support for the USB2 interface	Disabled	Disables the USB interface
		Enabled	Enables this USB interface
USB2 port legacy support	Option for enabling/disabling legacy support for the USB3 port	Disabled	Disables the USB interface
		Enabled	Enables this USB interface
USB3 port legacy support	Option for enabling/disabling legacy support for the USB1 interface	Disabled	Disables the USB interface
		Enabled	Enables this USB interface
USB4 port legacy support	Option for enabling/disabling legacy support for the USB interface on the bus unit	Disabled	Disables the USB interface
		Enabled	Enables this USB interface
USB5 port legacy support	Option for enabling/disabling legacy support for the USB interface on the monitor/panel interface	Disabled	Disables the USB interface
		Enabled	Enables this USB interface
USB6 port legacy support	Option for enabling/disabling legacy support for the USB5 port	Disabled	Disables the USB interface
		Enabled	Enables this USB interface
USB7 port legacy support	Option for enabling/disabling legacy support for the USB interface on the monitor/panel option	Disabled	Disables the USB interface
		Enabled	Enables this USB interface

Table 241: Advanced - USB configuration - Per port legacy USB support control - Configuration options

1.4.12 Serial port console redirection

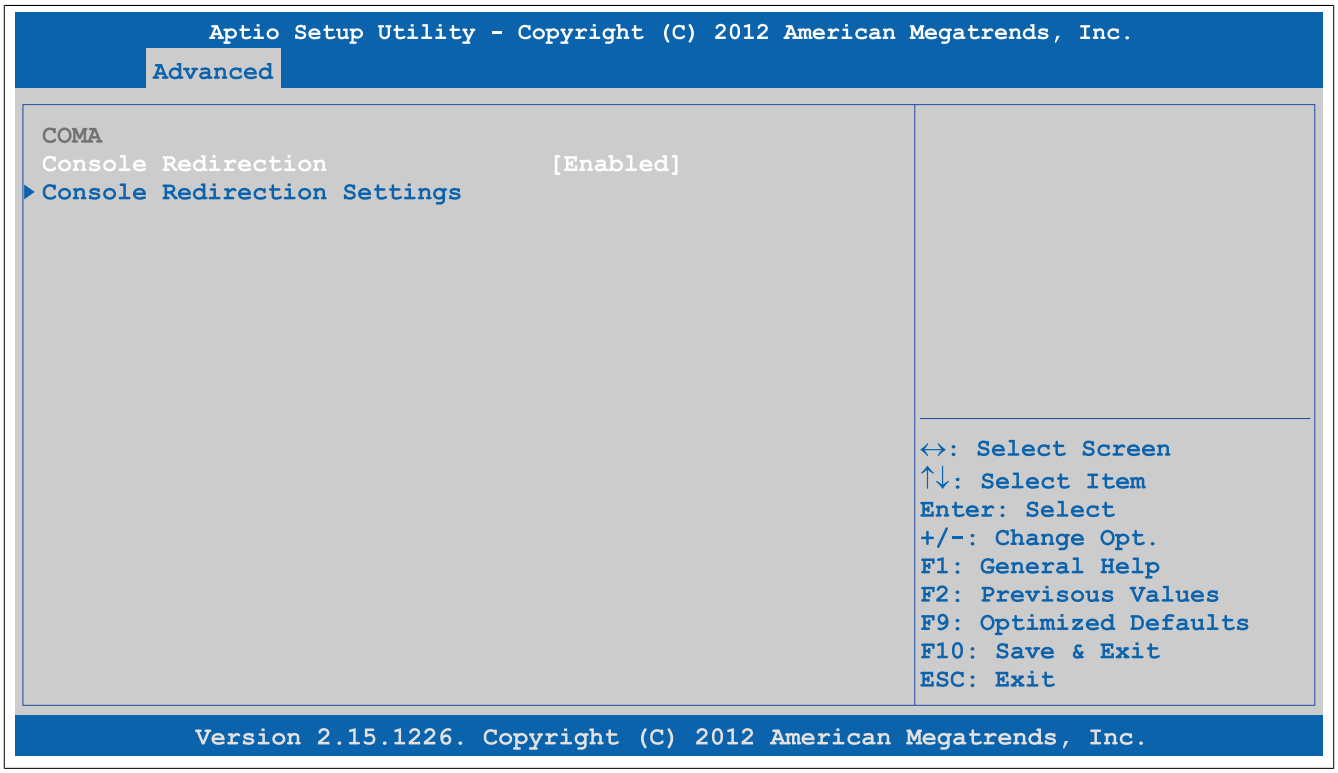


Figure 201: Advanced - Serial Port Console Redirection

BIOS setting	Function	Configuration options	Effect
Console redirection	Option for enabling/disabling console redirection	Disabled	Disables this function
		Enabled	Enables this function
Console redirection settings	Configures the remote console	Enter	Opens this submenu See "Console redirection settings" on page 283.

Table 242: Advanced - Serial port console redirection - Configuration options

1.4.12.1 Console redirection settings

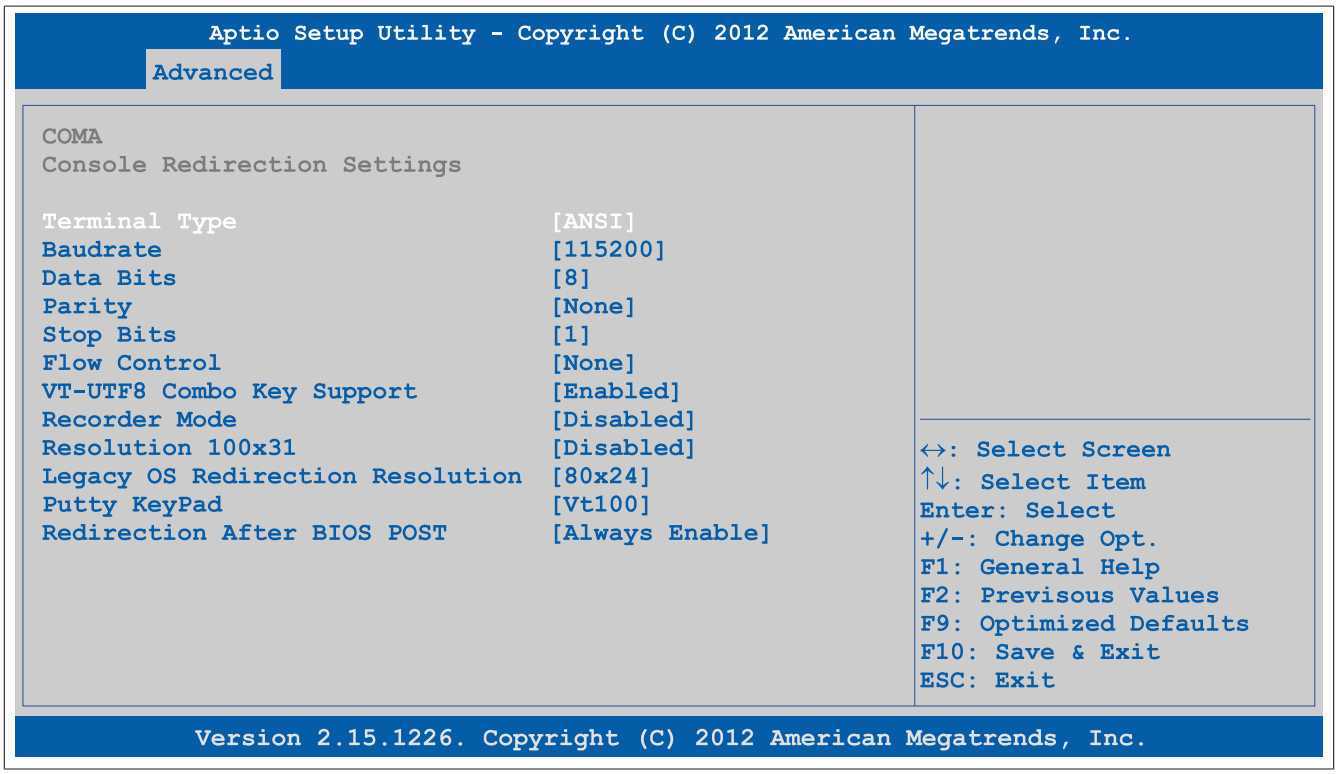


Figure 202: Advanced - Console Redirection - Console Redirection Settings

BIOS setting	Function	Configuration options	Effect
Terminal type	Option for configuring keyboard input	VT100	Enables the VT100 convention (ASCII character set)
		VT100+	Enables the VT100+ convention (ASCII character set and support for color, function keys, etc)
		VT-UTF8	Enables the VT-UTF8 convention (uses UTF-8 encoding to assign Unicode characters to one or more bytes)
		ANSI	Enables the ANSI convention (extended ASCII character set)
Baud rate	Option for setting the transfer rate of the serial interface (bits per second)	1200, 2400, 4800, 9600, 19200, 38400, 57600, 115200	Enables a transfer rate of x bits
Data bits	Option for configuring the character length (data bits) to use for serial communication	7	Character length with 7 bits
		8	Character length with 8 bits
Parity	Option for configuring the parity bit to use for serial communication	None	Parity bit not used
		Even	Uses an even number of parity bits
		Odd	Uses an odd number of parity bits
		Mark	Parity bit always 1
		Space	Parity bit always 0
Stop bits	Option for configuring the stop bits to use for serial communication	1	Uses 1 bit as the stop bit
		2	Uses 2 bits as the stop bit
Flow control	Option for configuring the data flow control	None	Disables data flow control
		Hardware RTS/CTS	Enables hardware handshake
VT-UTF8 combo key support	Option for enabling/disabling VT-UTF8 combo key support for ANSI and VT100 connections	Disabled	Disables this function
		Enabled	Enables this function
Recorder mode	Option for enabling/disabling recorder mode	Disabled	Disables this function
		Enabled	Enables this function When this setting is used, all control escape sequences are suppressed from the serial redirection output. This may lead to incorrectly formatted screen output but makes automatic storage of the serial console output easier.
Resolution 100x31	Option for enabling/disabling extended terminal resolution	Disabled	Disables this function
		Enabled	Enables this function
Legacy OS redirection resolution	Option for configuring the number of lines and columns for legacy OS redirection	80x24	Resolution of 80x24
		80x25	Resolution of 80x25
Putty keypad	Terminal emulation	VT100	VT100 emulation
		LINUX	LINUX emulation
		XTERMR6	XTERMR6 emulation
		SCO	SCO emulation
		ESCN	ESCN emulation
		VT400	VT400 emulation
Redirection After BIOS POST	Option for configuring redirection after startup	Always enable	Keeps redirection enabled permanently
		Bootloader	Enables redirection during system startup and when charging

Table 243: Advanced - Console redirection - Console redirection settings - Configuration options

1.5 Boot

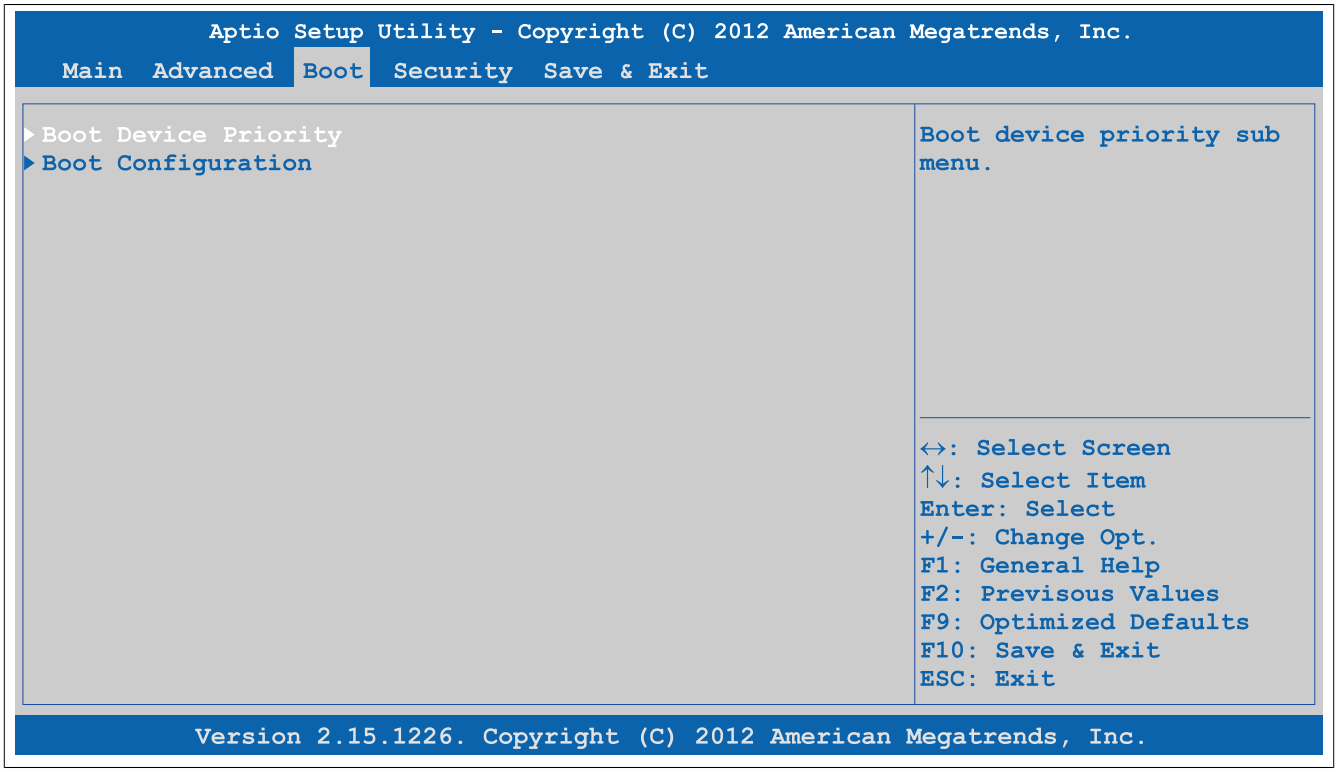


Figure 203: Boot

BIOS setting	Function	Configuration options	Effect
Boot device priority	Configures the boot order	Enter	Opens this submenu See "Boot device priority" on page 285.
Boot configuration	Configures boot properties	Enter	Opens this submenu See "Boot configuration" on page 286.

Table 244: Boot - Overview

1.5.1 Boot device priority

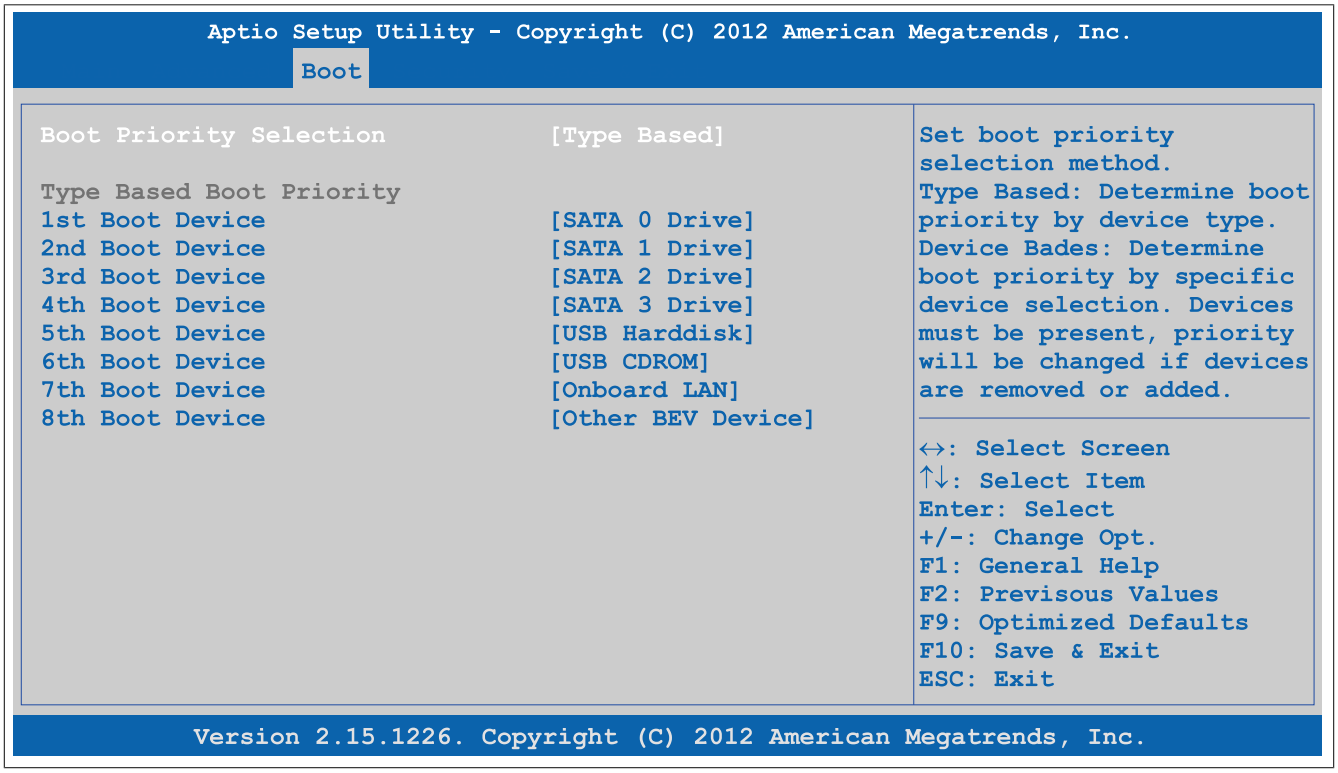


Figure 204: Boot - Boot Device Priority

BIOS setting	Function	Configuration options	Effect
Boot priority selection	Option for determining the method for how drives should be booted	Device based	Only lists devices that are recognized by the system. The order of devices in this list can be changed. **Information:** **It is only possible to use either "Device based" or "Type based". Using both together is not permitted.**
		Type based	The boot sequence of a device type list can be changed. It is also possible to add device types that are not connected to this list. **Information:** **It is only possible to use either "Device based" or "Type based". Using both together is not permitted.**
1st boot device 2nd boot device 3rd boot device 4th boot device 5th boot device 6th boot device 7th boot device 8th boot device	Option for selecting drives to be used for booting	Disabled, SATA 0 drive, SATA 1 drive, SATA 2 drive, SATA 3 drive, USB floppy, USB hard disk, USB CDROM, Onboard LAN, External LAN, Other BEV device	Specifies the desired boot sequence

Table 245: Boot - Boot device priority - Configuration options

1.5.2 Boot configuration

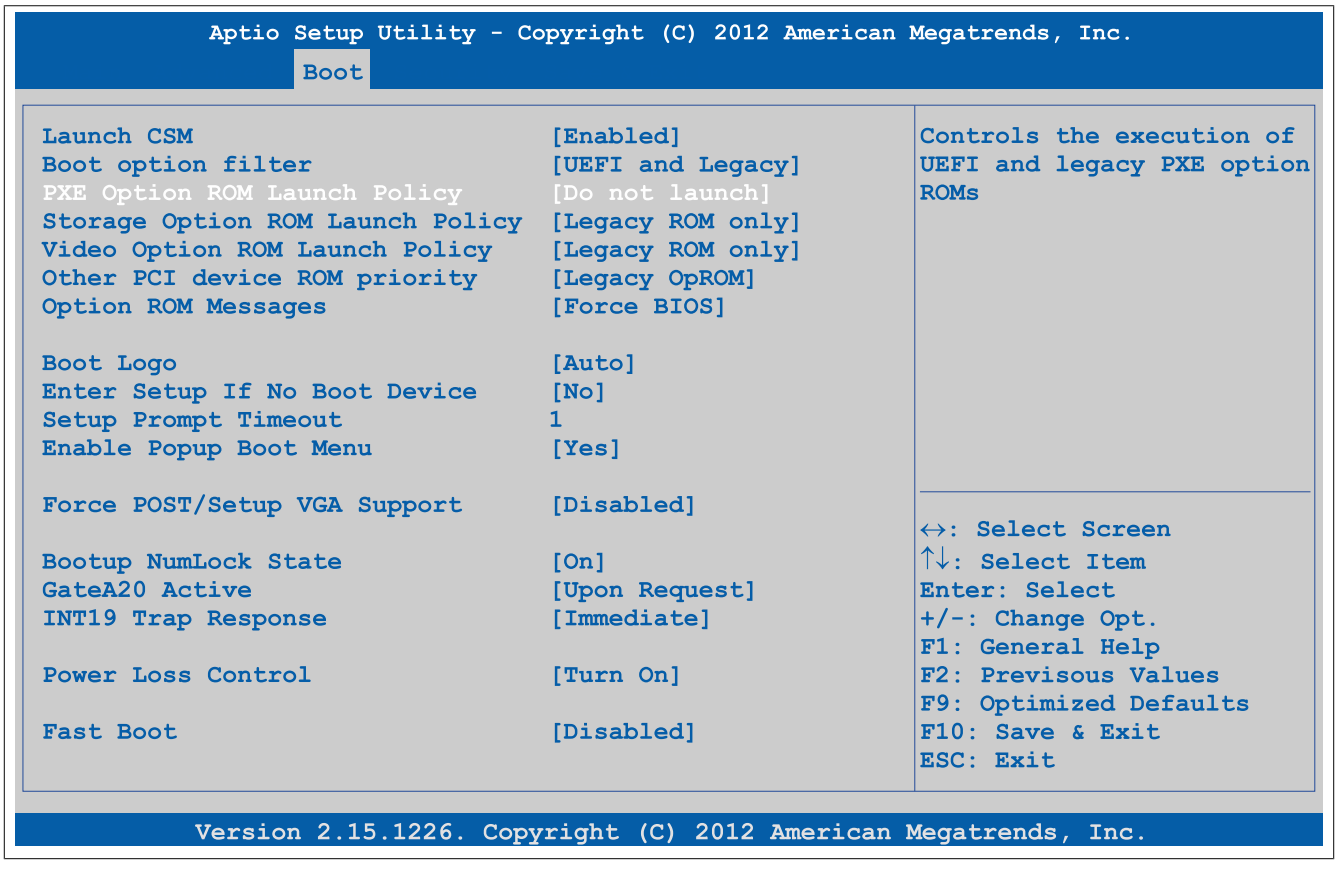


Figure 205: Boot - Boot Configuration

BIOS setting	Function	Configuration options	Effect
Launch CSM	Option for enabling/disabling the CSM module	Enabled	Enables this function
		Disabled	Disables this function
Boot option filter	Option for controlling which device system should be booted	UEFI and legacy	Boots from UEFI and legacy
		UEFI only	Boots from UEFI
		Legacy only	Boots from legacy

Table 246: Boot - Boot configuration - Configuration options

BIOS setting	Function	Configuration options	Effect
PXE Option ROM launch policy	Option for booting from PXE Option ROM	Do not launch	Does not boot from PXE Option ROM
		UEFI ROM only	Boots from UEFI ROM
		Legacy ROM only	Boots from legacy ROM
Storage Option ROM launch policy	Option for booting from Storage Option ROM	Do not launch	Does not boot from Storage Option ROM
		UEFI ROM only	Boots from UEFI ROM
		Legacy ROM only	Boots from legacy ROM
Video Option ROM launch policy	Option for booting from Video Option ROM	Do not launch	Does not boot from Video Option ROM
		UEFI ROM only	Boots from UEFI ROM
		Legacy ROM only	Boots from legacy ROM
Other PCI device ROM priority	Option for configuring which OpROM should be booted if not network, mass storage or video	UEFI opROM	Boots from UEFI OpROM
		Legacy OpROM	Boots from legacy OpROM
Option ROM messages	Option to display Option ROM messages during POST	Force BIOS	Displays Option ROM messages during POST
		Keep current	Does not display Option ROM messages during POST
Boot logo	Option for configuring the boot logo	Disabled	Does not display the boot logo
		Enabled	Displays the boot logo
		Auto	Displays the boot logo
Enter setup if no boot device	Option for configuring whether the setup screen is displayed when no bootable drive is connected	No	Does not display the setup screen
		Yes	Displays the setup screen
Setup prompt timeout	Option for configuring how long the setup activation key (key for entering BIOS) is displayed	1 to 65534	Displays the setup activation key for x seconds
		65535	Displays the setup activation key for an unlimited amount of time
Enable popup boot menu	Option for enabling/disabling the popup boot menu	Yes	Enables this function. Pressing "F11" during POST allows a boot device to be selected.
		No	Disables this function. It is not possible to select a boot device during POST. Devices will boot in their configured order.
Force POST/Setup VGA support	Option for enabling/disabling 640 x 480 VGA support in BIOS and POSt	Disabled	Disables this function
		Enabled	Enables this function
Bootup NumLock state	Option for configuring the numeric keypad when booting the system	On	Enables the numeric keypad
		Off	Only enables the cursor (movement) functions of the numeric keypad
GateA20 active	Option for defining how memory above 1 MB is accessed	Upon request	Allows GA20 to be disabled
		Always	Does not disable GA20
INT19 trap response	Option for configuring the interrupt trap response for the ROM option	Immediate	Executes the interrupt trap response immediately
		Postponed	Executes the interrupt trap response during the legacy boot
Power loss control	Specifies whether the system should be on/off following power loss	Remain off	Keeps the PC turned off
		Turn on	Turns on the PC
		Last state	Enables the previous state
Fast boot	Option for reducing the boot time by skipping some POST procedures	Enabled	Enables this option
		Disabled	Disables this option
SATA support	Function for configuring for which option SATA support should be implemented	Last boot HDD only	On the last boot of the hard drive
		All SATA devices	For all SATA devices
		HDD only	On the hard drive
VGA support	Function for configuring how VGA support should be implemented. If "Auto", legacy OpRom with the legacy OS is installed and the logo will not be displayed during POST. The EFI driver is installed with the EFI OS.	Auto	Automatic enabling
		EFI driver	Option handled by EFI driver
USB support	Enables/Disables USB support. USB interfaces do not function during startup. USB support is available again after the operating system has started. A USB keyboard is still recognized during POST.	Disabled	Disables this option
		Full initial	Enables the option's complete procedure
		Partial initial	Enables the option's partial procedure
PS2 devices support	Option for enabling/disabling PS2 device support	Enabled	Enables this option
		Disabled	Disables this option

Table 246: Boot - Boot configuration - Configuration options

1.6 Security

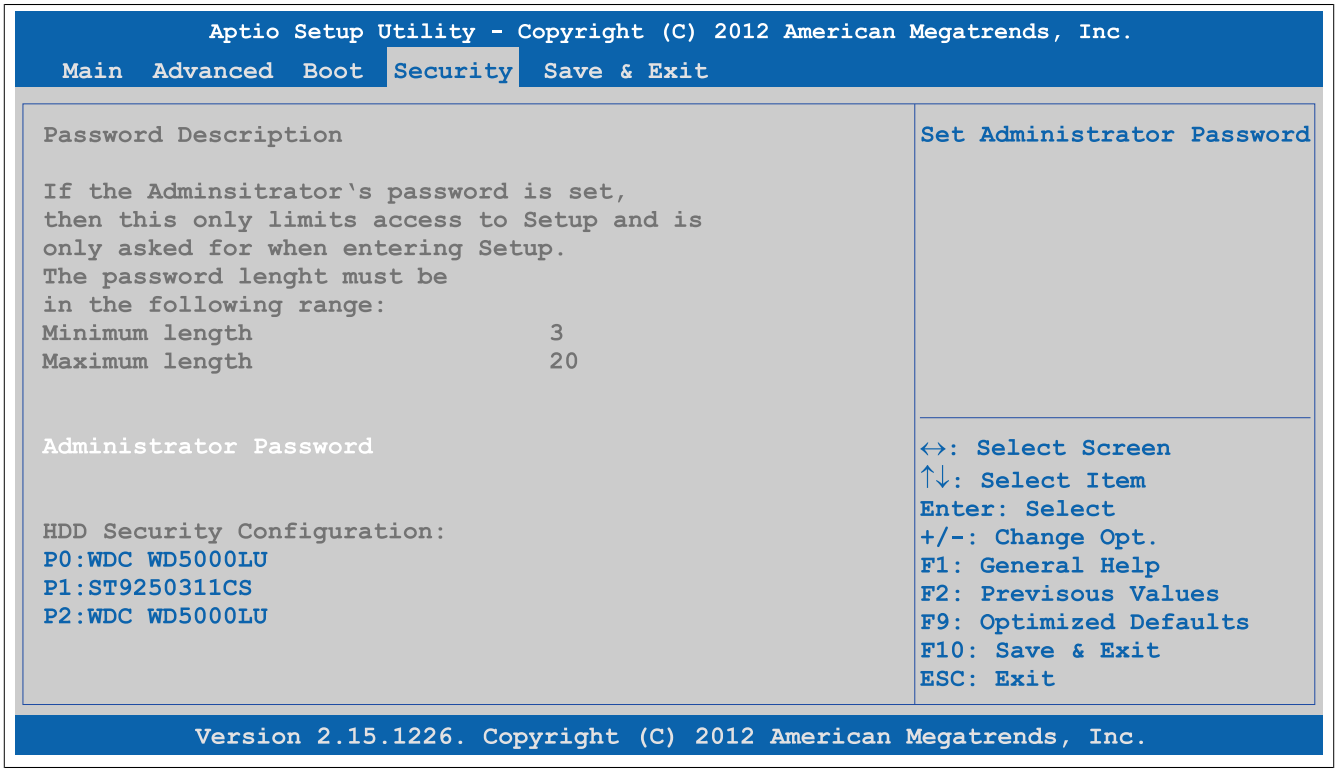


Figure 206: Security

BIOS setting	Function	Configuration options	Effect
Administrator password	Function for entering/changing the administrator password	Enter	Password entry

Table 247: Security menu - Configuration options

1.6.1 HDD user password

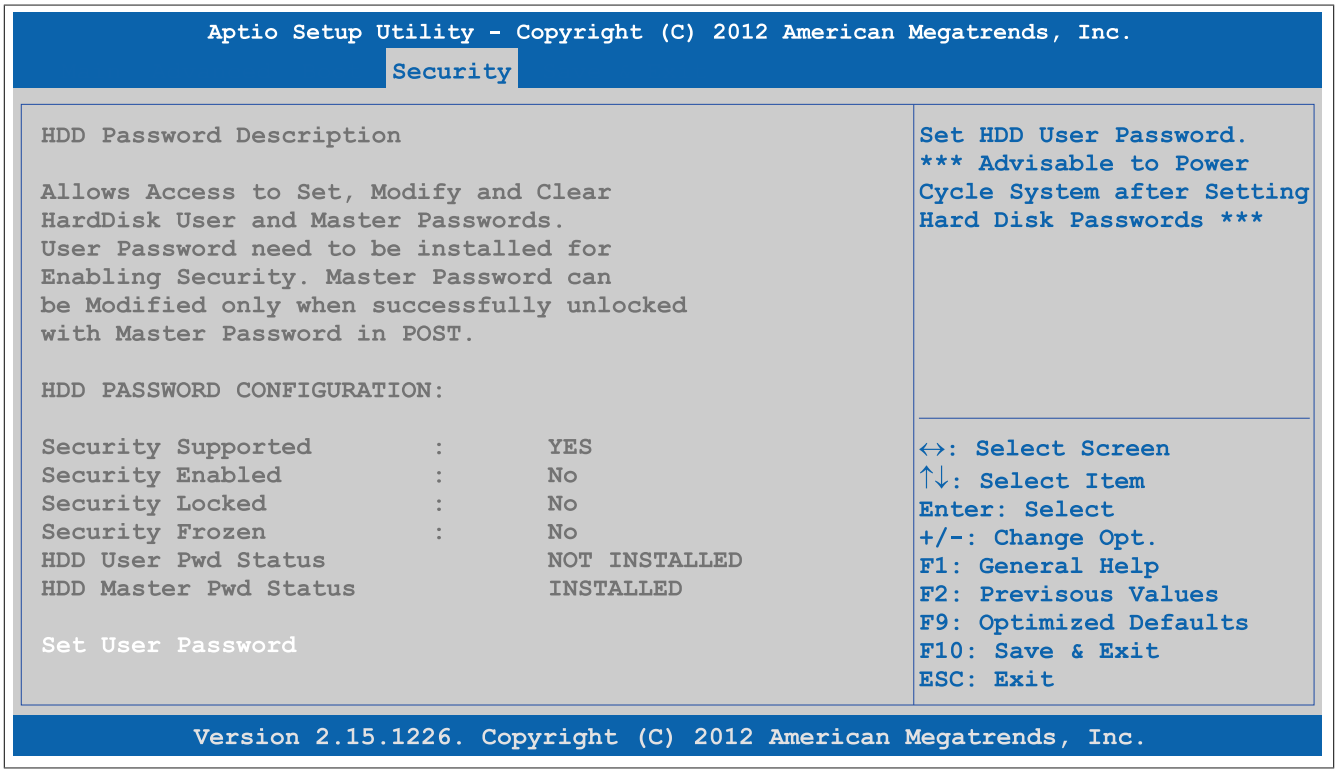


Figure 207: Security - HDD user password

BIOS setting	Function	Configuration options	Effect
User password	Function for entering/changing a user password.	Enter	Password entry

Table 248: Security - HDD user password - Configuration options

1.7 Save & Exit

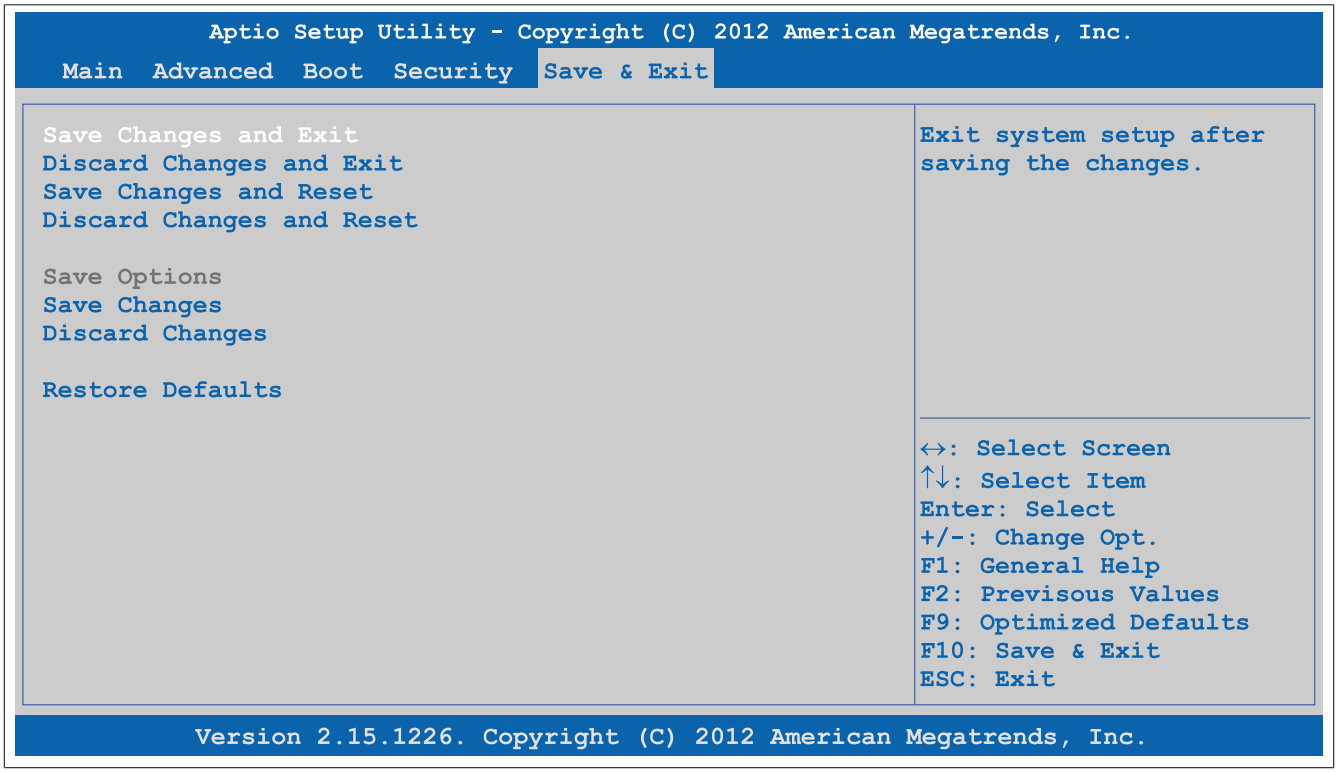


Figure 208: Save & Exit

BIOS setting	Function	Configuration options	Effect
Save changes and exit	Selecting this option closes BIOS Setup. Selecting this option saves any changes made to CMOS after confirmation.	Yes/No	
Discard changes and exit	Selecting this option closes BIOS Setup without saving any changes made.	Yes/No	
Save changes and reset	Selecting this option closes BIOS Setup. Selecting this option saves any changes made to CMOS after confirmation and reboots the system.	Yes/No	
Discard changes and reset	Selecting this option closes BIOS Setup without saving any changes made. The system is then rebooted.	Yes/No	
Save changes	Selecting this option saves any changes made to CMOS after confirmation.	Yes/No	
Discard changes	Selecting this option resets any settings that may have been made but forgotten in the meantime (provided they have not yet been saved).	Yes/No	
Restore defaults	Selecting this option restores the BIOS default values.	Yes/No	

Table 249: Save & Exit menu - Configuration options

1.8 BIOS default settings

BIOS default settings may vary depending on how the complete system is configured.

If the function "Restore defaults" is selected in the main BIOS Setup menu, or if "Save & Exit" is selected (or F9 is pressed) in the individual setup screens, the following BIOS settings are the optimized values that will be used.

1.8.1 Advanced

1.8.1.1 Graphics configuration

Setting/Option	Default profile	My setting
Primary display	Auto	
Internal graphics	Auto	
IGFX VBIOS version	-	
GTT size	2 MB	
Aperture size	256M	
DVMT pre-allocated	64M	
DVMT total gfx mem	256M	
Gfx low power mode	Disabled	
Graphics performance analyzers	Disabled	
Primary IGFX boot display	LFP	
Secondary IGFX boot display	CRT	
Active LFP configuration	Integrated LVDS	
Always try auto panel detect	No	
Local flat panel type	Auto	
Display port B interface	Disabled	
Display Port C interface	Disabled	
Display Port D interface	HDMI/DVI	
Display mode persistence	Disabled	

Table 250: Advanced - Graphics configuration - Overview of profile settings

1.8.1.2 OEM features

Setting/Option	Default profile	My setting
Main BIOS version	-	
OEM BIOS version	-	
MTCX	-	
ETH2 MAC address	-	
Realtime environment	Disabled	

Table 251: Advanced - OEM features - Overview of profile settings

1.8.1.2.1 Super I/O configuration

Setting/Option	Default profile	My setting
Serial port A	Enabled	
Device settings	-	
Serial port B	Enabled	
Device settings	-	
Serial port C	Enabled	
Device settings	-	
Serial port D	Disabled	
Device settings	-	
Serial port E	Enabled	
Device settings	-	
Serial port F	Enabled	
Device settings	-	

Table 252: Advanced - OEM features - Super I/O configuration - Overview of profile settings

1.8.1.3 PCI configuration

Setting/Option	Default profile	My setting
Above 4G decoding	Disabled	
PCI latency timer	32 PCI bus clocks	
VGA palette snoop	Disabled	
PERR# generation	Disabled	
SERR# generation	Disabled	
PCIE POST delay	Disabled	
PIRQ routing & IRQ reservation		

Table 253: Advanced - PCI configuration - Overview of profile settings

Setting/Option	Default profile	My setting
PIRQA	Auto	
PIRQB	Auto	
PIRQC	Auto	
PIRQD	Auto	
PIRQE	Auto	
PIRQF	Auto	
PIRQG	Auto	
PIRQH	Auto	
Reserve legacy interrupt 1	None	
Reserve legacy interrupt 2	None	

Table 253: Advanced - PCI configuration - Overview of profile settings

1.8.1.4 PCI express configuration

1.8.1.4.1 PCI Express settings

Setting/Option	Default profile	My setting
Relaxed ordering	Disabled	
Extended tag	Disabled	
No snoop	Enabled	
Maximum payload	Auto	
Maximum read request	Auto	
Extended synch	Disabled	
Link training retry	5	
Link training timeout (µS)	100	
Unpopulated links	Keep link on	
Restore PCIE registers	Disabled	

Table 254: Advanced - PCI Express configuration - PCI Express settings - Overview of profile settings

1.8.1.4.2 PCI Express GEN 2 settings

Setting/Option	Default profile	My setting
Completion timeout	Default	
ARI forwarding	Disabled	
AtomicOp requester enable	Disabled	
AtomicOp egress blocking	Disabled	
IDO request enable	Disabled	
IDO completion enable	Disabled	
LTR mechanism enable	Disabled	
End-End TLP prefix blocking	Disabled	
Target link speed	Auto	
Clock power management	Disabled	
Compliance SOS	Disabled	
Hardware autonomous width	Enabled	
Hardware autonomous speed	Enabled	

Table 255: Advanced - PCI Express configuration - PCI Express GEN 2 settings - Overview of profile settings

1.8.1.4.3 PCI Express graphics (PEG) port

Setting/Option	Default profile	My setting
PCI Express graphics (PEG) port	Disabled	

Table 256: Advanced - PCI Express configuration - PCI Express graphics (PEG) port - Overview of profile settings

1.8.1.4.4 PCI Express root port

Setting/Option	Default profile	My setting
PCI Express root port x	Enabled	
ASPM	Disabled	
URR	Disabled	
FER	Disabled	
NFER	Disabled	
CER	Disabled	
CT0	Disabled	
SEFE	Disabled	
SENFE	Disabled	
SECE	Disabled	
PME SCI	Enabled	
Always enable port	Disabled	

Table 257: Advanced - PCI Express configuration - PCI Express root port - Overview of profile settings

Setting/Option	Default profile	My setting
PCIe speed	Auto	
Assign INT to root port	Enabled	
Extra bus reserved	0	
Reserved memory	10	
Prefetchable memory	10	
Reserved I/O	4	

Table 257: Advanced - PCI Express configuration - PCI Express root port - Overview of profile settings

1.8.1.5 ACPI settings

Setting/Option	Default profile	My setting
Enable hibernation	Enabled	
ACPI sleep state	Both S1 and S3 available for OS to choose from	
Lock legacy resources	Disabled	
S3 video repost	Disabled	
Critical trip point	111 C	

Table 258: Advanced - ACPI settings - Overview of profile settings

1.8.1.6 RTC wake settings

Setting/Option	Default profile	My setting
Wake system at fixed time	Disabled	

Table 259: Advanced - RTC wake settings - Overview of profile settings

1.8.1.7 CPU configuration

Setting/Option	Default profile	My setting
Hyper-threading	Enabled	
Active processor cores	All	
Limit CPUID maximum	Disabled	
Execute disable bit	Enabled	
Intel virtualization technology	Disabled	
Hardware prefetcher	Enabled	
Adjacent cache line prefetch	Enabled	
TCC activation offset	0	
Primary plane current value	0	
Secondary plane current value	0	
EIST	Enabled	
Turbo mode	Enabled	
P state reduction	Disabled	
CPU C3 report	Disabled	
CPU C6 report	Disabled	
CPU C7 report	Disabled	
Configurable TDP	TDP NOMINAL	
Config TDP LOCK	Disabled	
Long duration power limit	0	
Long duration maintained	1	
Short duration power limit	0	
ACPI T state	Disabled	

Table 260: Advanced - CPU configuration - Overview of profile settings

1.8.1.8 Chipset configuration

Setting/Option	Default profile	My setting
PCH LAN controller	Enabled	
Wake on LAN	Enabled	
Azalia	Auto	
Azalia PME	Disabled	
Azalia internal HDMI codec	Disabled	
High-precision timer	Enabled	
CF9h global reset	Host only	
VT-d	Enabled	
PCI Express clock gating	Disabled	
DMI link ASPM PCH side	Disabled	
PCIe USB glitch W/A	Disabled	
SB CRID	Disabled	
NB CRID	Disabled	
Disconnect external SMBus	Never	

Table 261: Advanced - Chipset configuration - Overview of profile settings

Setting/Option	Default profile	My setting
DMI Configuration	-	
DMI	-	
DMI Vc1 control	Enabled	
DMI Vcp control	Enabled	
DMI Vcm control	Enabled	
DMI link ASPM CPU side	Disabled	
DMI extended synch control	Disabled	
DMI Gen 2	Auto	

Table 261: Advanced - Chipset configuration - Overview of profile settings

1.8.1.9 SATA configuration

Setting/Option	Default profile	My setting
SATA controller(s)	Enabled	
SATA mode selection	AHCI	
SATA test mode	Disabled	
Aggressive LPM support	Disabled	
SATA controller speed	Default	
SMART self test	Disabled	
Alternate ID	Disabled	
Serial ATA port 0	-	
Port 0	Enabled	
Hot plug	Disabled	
External SATA	Disabled	
SATA device type	Hard disk drive	
Spin up device	Disabled	
Serial ATA port 1	-	
Port 1	Enabled	
Hot plug	Disabled	
External SATA	Disabled	
SATA device type	Hard disk drive	
Spin up device	Disabled	
Serial ATA port 2	-	
Port 2	Enabled	
Hot plug	Disabled	
External SATA	Disabled	
Spin up device	Disabled	
Serial ATA port 3	-	
Port 3	Enabled	
Hot plug	Disabled	
External SATA	Disabled	
Spin up device	Disabled	
Software feature mask configuration		
RAID0	Enabled	
RAID1	Enabled	
RAID10	Enabled	
RAID5	Enabled	
Intel Rapid Recovery technology	Enabled	
OROM UI and BANNER	Enabled	
HDD unlock	Enabled	
LED locate	Enabled	
IRRT only on eSATA	Enabled	
Smart Response technology	Enabled	
OROM UI delay	2 seconds	

Table 262: Advanced - SATA configuration - Overview of profile settings

1.8.1.10 Memory configuration

Setting/Option	Default profile	My setting
DIMM profile	Default DIMM profile	
Memory frequency limiter	Auto	
No fan memory frequency limiter	Enabled	
ECC support	Disabled	
Max TOLUD	Dynamic	
NMode support	Auto	
Memory scrambler	Enabled	
Memory refresh rate	Disabled	
MRC fast boot	Enabled	
Force cold reset	Enabled	
DIMM exit mode	Fast exit	

Table 263: Advanced - Memory configuration - Overview of profile settings

Setting/Option	Default profile	My setting
Power down mode	PPD	
Scrambler seed generation off	Disabled	
Memory remap	Enabled	
Memory alias check	Disabled	
Channel A DIMM control	Enable both DIMMS	
Channel B DIMM control	Enable both DIMMS	

Table 263: Advanced - Memory configuration - Overview of profile settings

1.8.1.11 USB configuration

Setting/Option	Default profile	My setting
EHCI1 (ports 0-5)	Enabled	
EHC2 (ports 6-7)	Enabled	
xHCI mode	Auto	
HS port #1 switchable	Enabled	
HS port #2 switchable	Enabled	
HS port #3 switchable	Enabled	
HS port #4 switchable	Enabled	
Legacy USB support	Enabled	
XHCI legacy support	Enabled	
XHCI Hand-off	Enabled	
EHCI hand-off	Disabled	
USB mass storage driver support	Enabled	
USB transfer time-out	20 sec	
Device reset time-out	20 sec	
Device power-up delay	Auto	
Overcurrent protection	Disabled	
Per port USB disable control		
USB port #0	Enabled	
USB port #1	Enabled	
USB port #2	Enabled	
USB port #3	Enabled	
USB port #4	Enabled	
USB port #5	Enabled	
USB port #6	Enabled	
USB port #7	Enabled	
Per port legacy USB support control		
USB0 port legacy support	Enabled	
USB1 port legacy support	Enabled	
USB2 port legacy support	Enabled	
USB3 port legacy support	Enabled	
USB4 port legacy support	Enabled	
USB5 port legacy support	Enabled	
USB6 port legacy support	Enabled	
USB7 port legacy support	Enabled	

Table 264: Advanced - USB configuration - Overview of profile settings

1.8.1.12 Serial port console redirection

Setting/Option	Default profile	My setting
Console redirection	Disabled	

Table 265: Advanced - Serial port console redirection - Overview of profile settings

1.8.2 Boot

1.8.2.1 Boot device priority

Setting/Option	Default profile	My setting
Boot priority selection	Type based	
1st boot device	SATA 0 drive	
2nd boot device	SATA 1 drive	
3rd boot device	SATA 2 drive	
4th boot device	SATA 3 drive	
5th boot device	USB hard disk	
6th boot device	USB CDROM	
7th boot device	Onboard LAN	
8th boot device	Other BEV device	

Table 266: Boot - Boot device priority - Overview of profile settings

1.8.2.2 Boot configuration

Setting/Option	Default profile	My setting
Launch CSM	Enabled	
Boot option filter	UEFI and legacy	
PXE Option ROM launch policy	Do not launch	
Storage Option ROM launch policy	Legacy ROM only	
Video Option ROM launch policy	Legacy ROM only	
Other PCI devices ROM priority	Legacy OpROM	
Option ROM messages	Force BIOS	
Boot logo	Auto	
Enter setup if no boot device	No	
Force POST/Setup VGA support	Disabled	
Setup prompt timeout	1	
Enable popup boot menu	Yes	
Bootup NumLock state	On	
GateA20 active	Upon request	
INT19 trap response	Immediate	
Power loss control	Turn on	
Fast boot	Disabled	

Table 267: Boot - Boot configuration - Overview of profile settings

1.9 Allocation of resources

1.9.1 RAM address assignments

RAM address	Address in hexadecimal	Resource
(TOM - xxxx) – TOM[1)]	N.A.	ACPI reclaim, PCI memory range, video
1024 kB – (TOM - xxxx)	100000 - N.A.	Extended memory
869 kB – 1024 kB	0E0000h - 0FFFFFh	Runtime BIOS
768 kB – 896 kB	0C0000h - 0DFFFFh	Expansion area
640 kB – 768 kB	0A0000h - 0BFFFFh	Video memory and BIOS
639 kB – 640 kB	09FC00h - 09FFFFh	Extended BIOS data
0 – 639 kB	000000h - 09FC00h	Conventional memory

Table 268: RAM address assignments

1) TOM = Top of memory: max. installed DRAM.

1.9.2 I/O address assignments

I/O address	Resource
0000h - 00FFh	Motherboard resources
0170h - 0177h	Secondary IDE channel
01F0h - 01F7h	Primary IDE channel
0228h - 022Fh	COM F (IF option 2)
02E8h - 02EFh	COM E (IF option 1)
02F8h - 02FFh	COM B (COM2)
0376h - 0376h	Secondary IDE channel command port
0377h - 0377h	Secondary IDE channel status port
0384h - 0385h	CAN controller
03B0h - 03DFh	Video system
03E8h - 03EFh	COM C (onboard SDL)
03F6h - 03F6h	Primary IDE channel command port
03F7h - 03F7h	Primary IDE channel status port
03F8h - 03FFh	COM A (COM1)
0400h - 047Fh	Motherboard resources
0500h - 057Fh	Motherboard resources
0CF8h - 0CFBh	PCI config address register
0CFCh - 0CFFh	PCI config data register
0D00h - FFFFh	PCI / PCI Express bus
4100h - 417Fh	MTCX
FF00h - FF07h	IDE bus master register

Table 269: I/O address assignments

1.9.3 Interrupt assignments in PIC mode

IRQ		0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	NONE
System timer		●																
Keyboard			●															
IRQ cascade				●														
COM A (COM1)					○	●	○	○	○			○	○	○				
COM B (COM2)					●	○	○	○	○									
ACPI[1)]											●							
Real-time clock										●								
Co-processor (FPU)															●			
Primary IDE channel																●		
Secondary IDE channel																	●	
B&R	COM C (onboard SDL)				○	○	○	○	○			○	●	○				
	COM E (IF option 1 / I/O board 1)				○	○	○	○	○			●	○	○				
	COM F (IF option 2 / I/O board 2)				○	○	○	○	●			○	○	○				
	CAN				○	○	○	○	○			●	○	○				

Table 270: IRQ interrupt assignments in PIC mode

1) **A**dvanced **C**onfiguration and **P**ower **I**nterface.

● ... Default setting
○ ... Optional setting

1.9.4 Interrupt assignments in APIC mode

A total of 23 IRQs are available in APIC (**A**dvanced **P**rogrammable **I**nterrupt **C**ontroller) mode. Enabling this option is only effective if done before the Windows operating system is installed.

IRQ		0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	NONE
System timer		●																								
Keyboard			●																							
IRQ cascade				●																						
COM A (COM1)					○	●	○	○	○			○	○	○												
COM B (COM2)					●	○	○	○	○																	
ACPI[1]											●															
Real-time clock										●																
Co-processor (FPU)															●											
Primary IDE channel																●										
Secondary IDE channel																	●									
B&R	COM C (onboard SDL)				○	○	○	○	○			○	●	○												
	COM E (IF option 1 / I/O board 1)				○	○	○	○	○			●	○	○												
	COM F (IF option 2 / I/O board 2)				○	○	○	○	●			○	○	○												
	CAN				○	○	○	○	○			●	○	○												
	POWERLINK (IF option 2)																			●						
PIRQ A[2]																		●								
PIRQ B[3]																			●							
PIRQ C[4]																				●						
PIRQ D[5]																					●					
PIRQ E[6]																						●				
PIRQ F[7]																							●			
PIRQ G[8]																								●		
PIRQ H[9]																									●	

Table 271: IRQ interrupt assignments in APIC mode

1) **A**dvanced **C**onfiguration and **P**ower **I**nterface.
2) PIRQ A: For PCIe; PEG 0/1/2, PCI Express root port 0, VGA controller, PCI Express root port 4 (ETH2).
3) PIRQ B: For PCIe; PCI Express root port 1, PCI Express root port 5.
4) PIRQ C: For PCIe; PCI Express root port 2, SRAM, POWERLINK
5) PIRQ D: For PCIe; PCI Express root port 3, PCIe to PCI bridge.
6) PIRQ E: For PCIe; onboard gigabit LAN controller (ETH1).
7) PIRQ F: For PCIe; EHCI host controller 2, serial ATA controller 1, serial ATA controller 2.
8) PIRQ G: For PCIe; Intel High Definition Audio controller, SMBus controller.
9) PIRQ H: For PCIe; EHCI host controller 1, XHCI host controller.

● ... Default setting
○ ... Optional setting

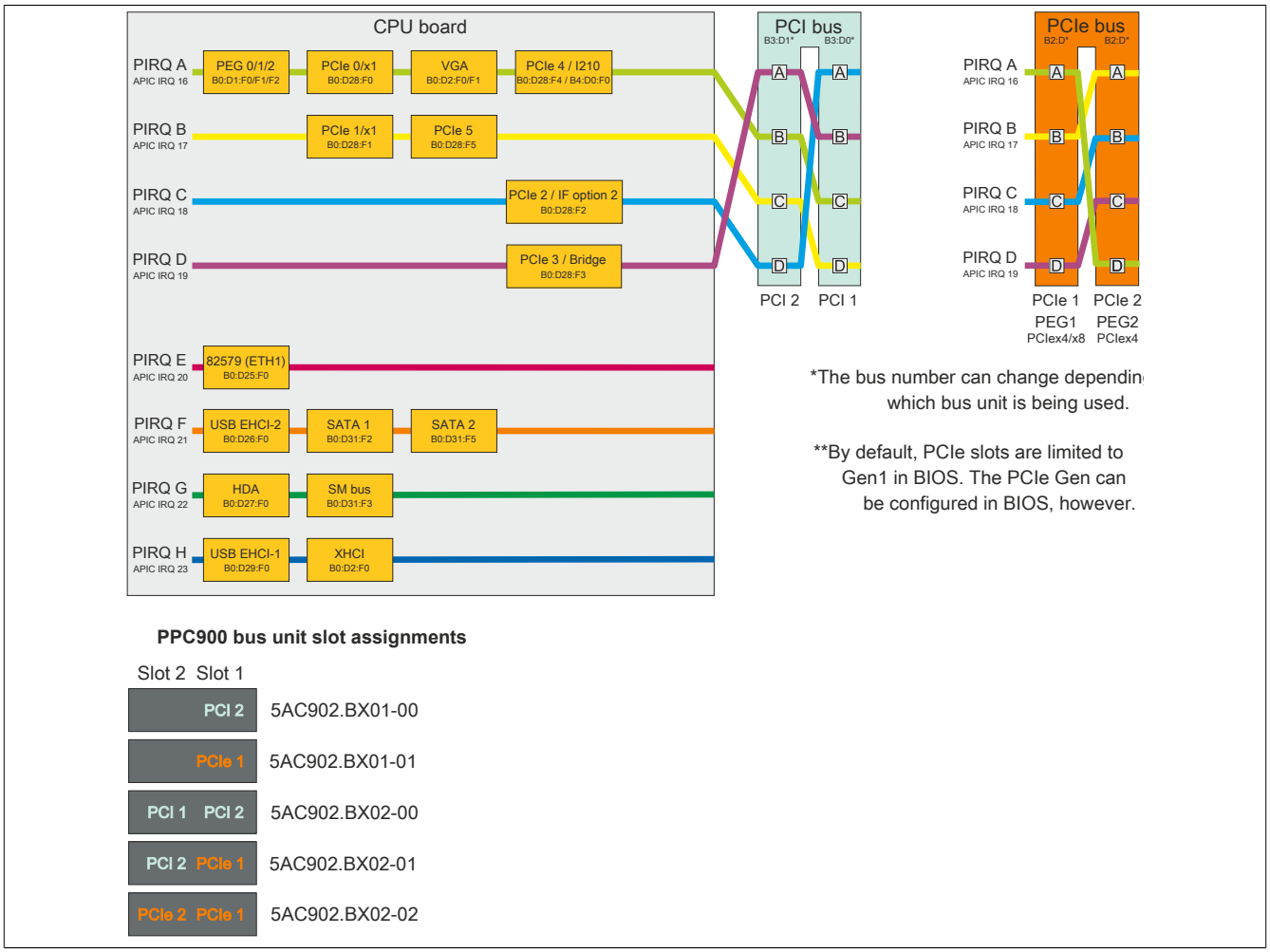


Figure 209: PCI and PCIe routing with enabled APIC for QM77/HM76 CPU boards

2 Upgrade information

Warning!

The BIOS and firmware on B&R devices must be kept current. New versions can be downloaded from the B&R website (www.br-automation.com).

2.1 BIOS upgrade

An upgrade may be necessary in order to accomplish the following:

- Updating implemented functions or adding newly implemented functions or components to BIOS Setup (information about changes can be found in the Readme file for the BIOS upgrade).

2.1.1 Important information

Information:

Customized BIOS settings are deleted when upgrading BIOS.

Before starting an upgrade, it helps to determine the various software versions.

2.1.1.1 Which BIOS version and firmware are already installed?

This information can be found on the following BIOS Setup screen:

- After switching on the PPC900, BIOS Setup can be accessed by pressing <Del>.
- From the "Advanced" menu in BIOS, select "OEM features".

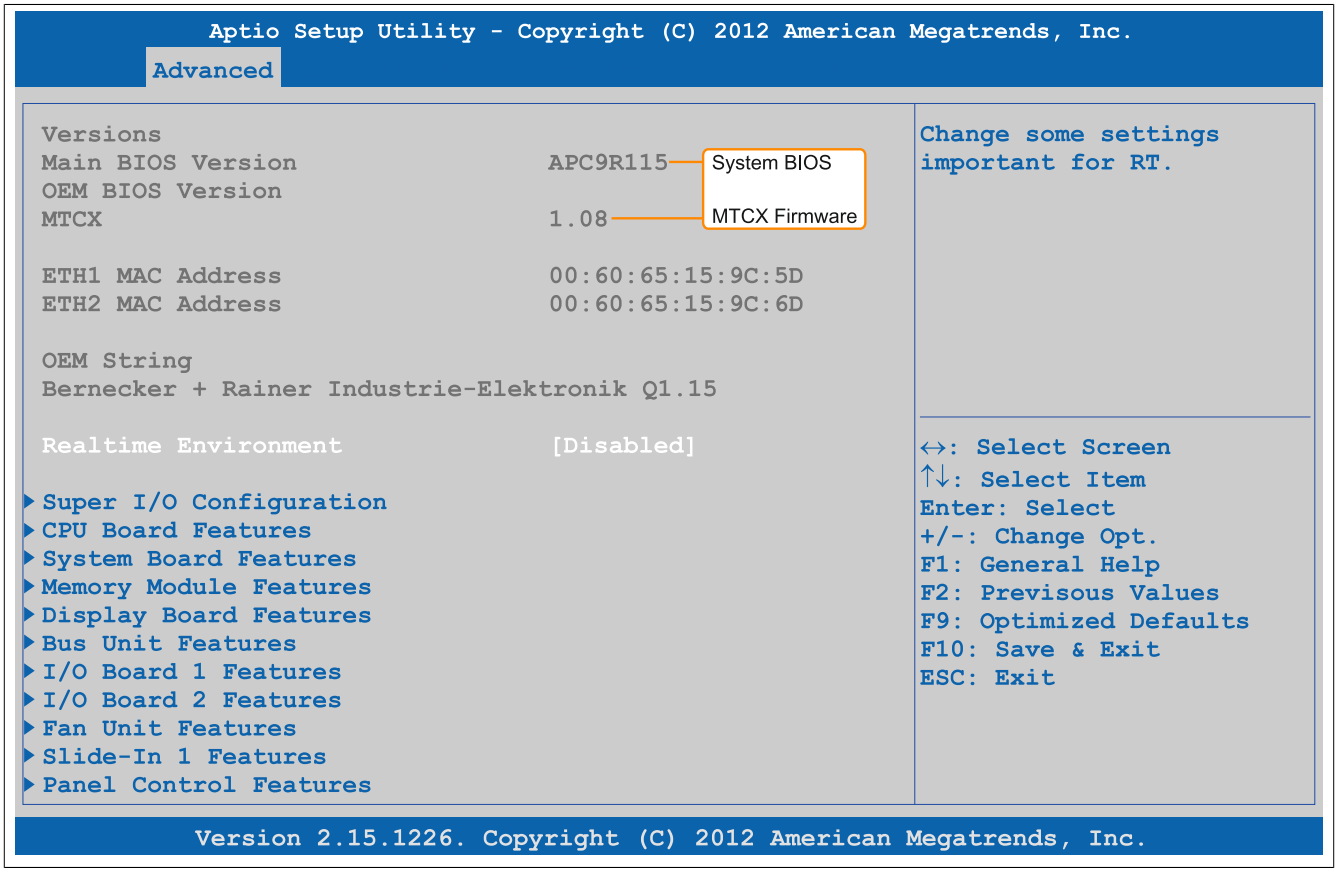


Figure 210: Software version

2.1.2 Procedure with MS-DOS

1. Download the .zip file from the B&R website (www.br-automation.com).
2. Create bootable media.

Information:

In MS-DOS, Win95 and Win98, a blank HD disk can be made bootable by typing "sys a:" or "format a: /s" on the command line.
Information about creating a bootable diskette in Windows XP can be found on page 302.

Information about creating a USB flash drive for a B&R upgrade can be found on page 304.

Information about creating a storage device for a B&R upgrade can be found on page 305.

3. Copy the contents of the .zip file to the bootable media. If the B&R upgrade was already added when creating the bootable media with the B&R Embedded OS Installer, then this step is not necessary.
4. Connect the bootable media to the B&R device and reboot.
5. The following boot menu will be shown after startup:

```
1. Upgrade AMI BIOS for APC910/PPC900 (QM77 bzw. HM76)
2. Exit
```

Option 1:
Automatically upgrades BIOS (default after 5 seconds)

Option 2:
Returns to the shell (MS-DOS)

Information:

If a key is not pressed within 5 seconds, then option 1 is automatically carried out to update the industrial PC.

6. The system must be rebooted after a successful upgrade.
7. Reboot and press <Del> to enter BIOS Setup and load the setup defaults, then select "Save changes and exit".

2.2 Firmware upgrade

The "Firmware upgrade (MTCX, SDLR, AP830, AP9x3)" software makes it possible to update the firmware for multiple controllers (MTCX, SDLR, AP830, AP9x3) depending on the PPC900 system variant.

The latest firmware upgrade is available in the Downloads section of the B&R website (www.br-automation.com).

2.2.1 The procedure in Windows (B&R Control Center)

1. Download the .zip file from the B&R website (www.br-automation.com).
2. Open the **Control Center** in the Control Panel.
3. Select the **Versions** tab.
4. Under "System unit", click on **Update** for **MTCX**. This brings up the "Open" dialog box.
5. Enter the name of the firmware file or select the file under **Filename**.
6. Click on **Open**. This brings up the "Open" dialog box.

The transfer can be canceled by clicking on **Cancel**. **Cancel** is disabled when writing to flash memory.

> **Warning!**
>
> **Do not press any panel keys while the firmware is being transferred! This can disrupt the procedure.**

Deleting the data in flash memory can take several seconds depending on the memory block being used. The progress indicator is not updated during this time.

> **Information:**
>
> **Power to the PC must be shut off and turned back on for the new firmware to take effect and for the updated version to be displayed. The user is prompted to do this when closing the Control Center.**

> **Information:**
>
> **For more information about saving and updating firmware, please refer to the help documentation for the Control Center.**

2.3 Creating an MS-DOS boot diskette in Windows XP

1. Insert a blank 1.44 MB HD diskette into the disk drive.
2. Open Windows Explorer.
3. Right-click on the 3½ floppy diskette icon and select "Format".

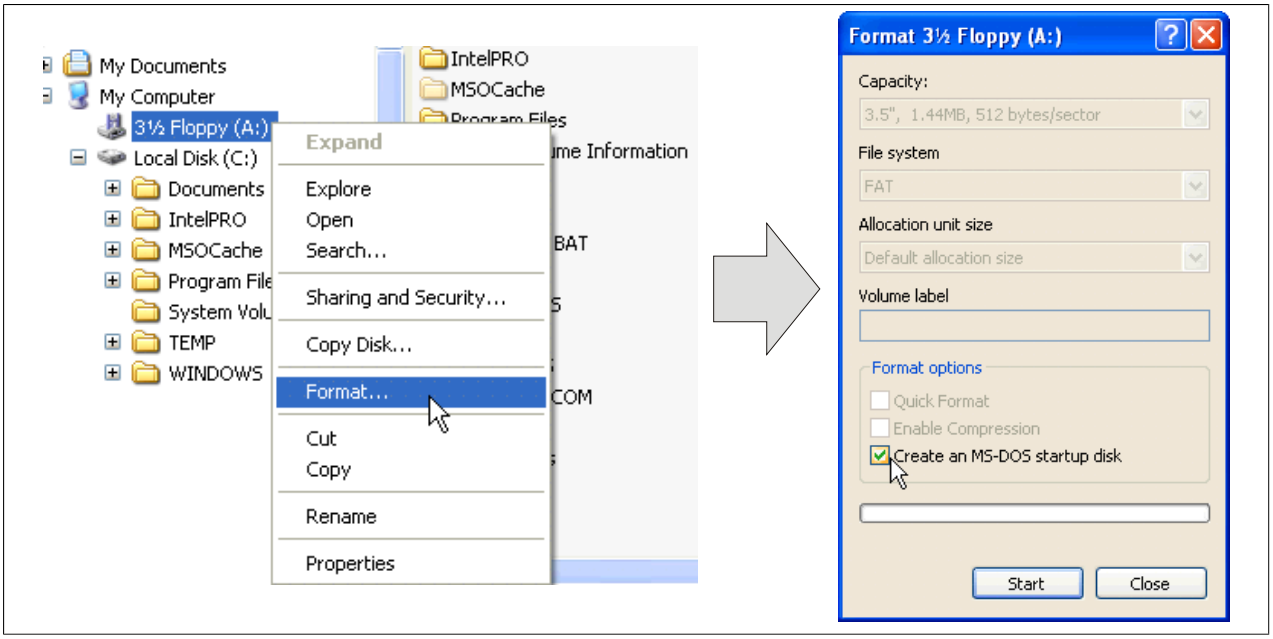


Figure 211: Creating a bootable diskette in Windows XP - Step 1

4. Select the **"Create an MS-DOS startup disk"** option, click on **"Start"** and acknowledge the warning message with "OK".

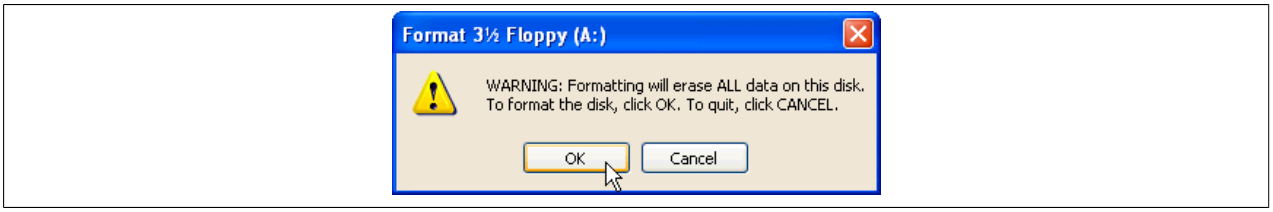


Figure 212: Creating a bootable diskette in Windows XP - Step 2

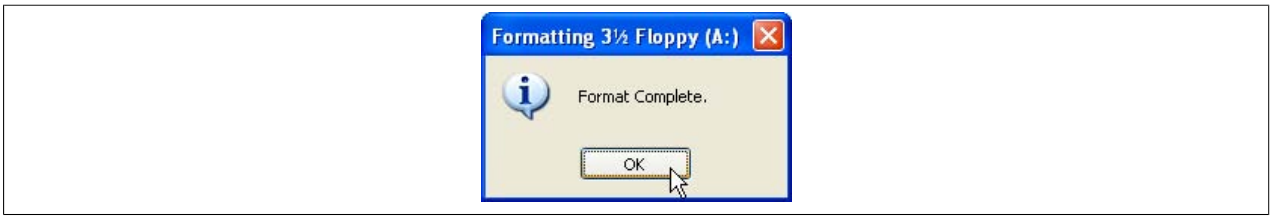


Figure 213: Creating a bootable diskette in Windows XP - Step 3

After creating the startup disk, some of the files must be deleted because of the size of the update.

To do this, all files (hidden system files, etc.) must be visible on the diskette.

In Windows Explorer, go to the "Tools" menu, select "Folder options" and open the "View" tab. Then deselect the option "Hide protected operating system files (Recommended)" (enabled by default) and enable the option "Show hidden files and folders".

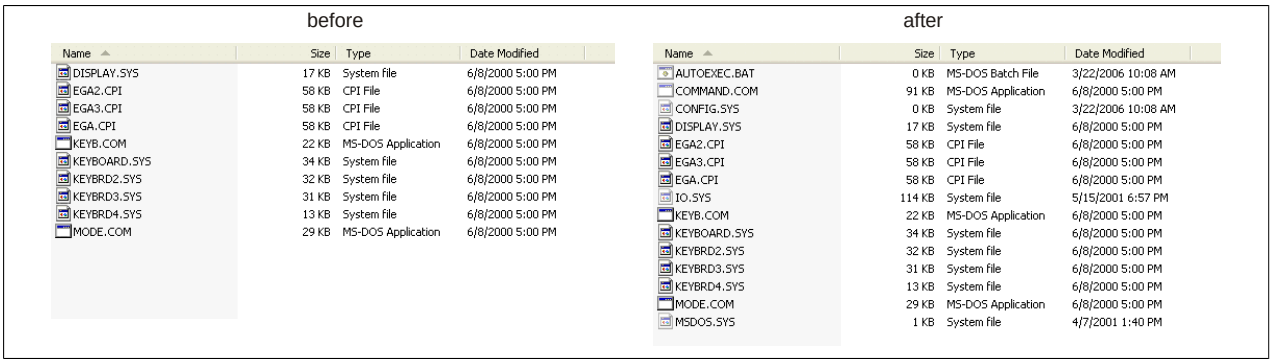


Figure 214: Creating a bootable diskette in Windows XP - Step 4

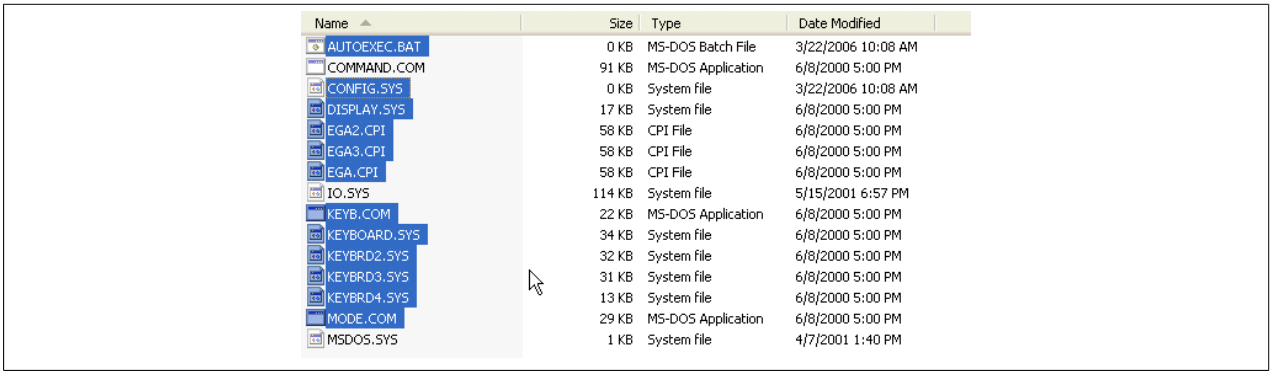


Figure 215: Creating a bootable diskette in Windows XP - Step 5

Now all files (selected) except Command.com, IO.sys and MSDOS.sys can be deleted.

2.4 Creating a bootable USB flash drive for B&R upgrade files

When used in connection with a B&R Industrial PC, it is possible to upgrade (e.g. BIOS) from one of the USB flash drives available from B&R. To do this, the USB flash drive must be prepared accordingly. This is done with the B&R Embedded OS Installer, which can be downloaded at no cost from the B&R website (www.br-automation.com).

2.4.1 Requirements

The following is required to create a bootable USB flash drive:

- B&R USB flash drive
- B&R Industrial PC
- USB media drive
- B&R Embedded OS Installer (V3.00 or higher)

2.4.2 Procedure

1. Connect the USB flash drive to the PC.
2. If the drive list is not refreshed automatically, update the list using the **Drives > Refresh** command.
3. Select the desired USB flash drive in the drive list.
4. Change to the **Action** tab and select **Install a B&R update to a USB flash drive** as the type of action.
5. Enter the path to the MS-DOS operating system files. If the files are part of a .zip archive, then click on the button **From .zip file**. If the files are stored in a directory on the hard drive, then click on the button **From folder**.
6. In the **B&R upgrade** text box, it is also possible to enter the path to the .zip file for the B&R upgrade disk and select the file.
7. Click on the **Start action** button in the toolbar.

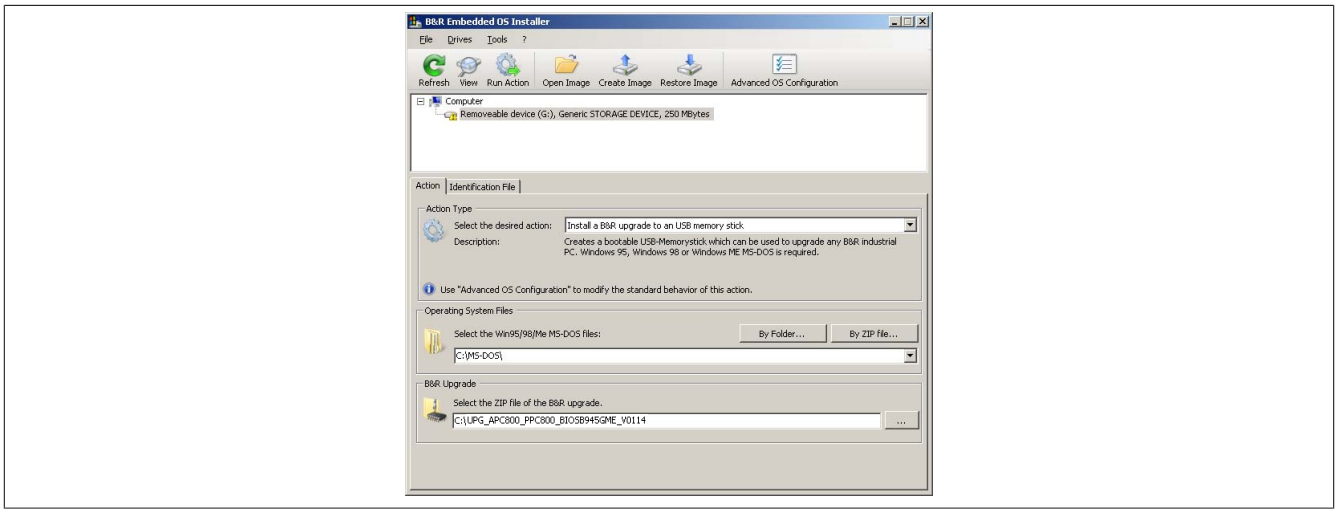


Figure 216: Creating a USB flash drive for B&R upgrade files

2.4.3 How to access MS-DOS

Information about creating an MS-DOS boot diskette can be found in section "Creating an MS-DOS boot diskette in Windows XP" on page 302. The files from the diskette are then copied to the hard drive.

2.5 Creating a bootable mass storage device for B&R upgrade files

When used in connection with a B&R Industrial PC, it is possible to upgrade (e.g. BIOS) from a mass storage device (e.g. CFast card) available from B&R. To do this, the mass storage device must be prepared accordingly. This is done with the B&R Embedded OS Installer, which can be downloaded at no cost from the B&R website (www.br-automation.com).

2.5.1 Requirements

The following is required to create a bootable mass storage device:

- B&R mass storage device (e.g. CFast card)
- PC with CFast slot
- B&R Embedded OS Installer (V3.00 or higher)

2.5.2 Procedure

1. Connect the storage device to the PC.
2. If the drive list is not refreshed automatically, update the list using the **Drives > Refresh** command.
3. Select the desired mass storage device from the list of drives.
4. Change to the **Action** tab and select **Install a B&R update to a mass storage device** as the type of action.
5. Enter the path to the MS-DOS operating system files. If the files are part of a .zip archive, then click on the button **From .zip file**. If the files are stored in a directory on the hard drive, then click on the button **From folder**.
6. In the **B&R upgrade** text box, it is also possible to enter the path to the .zip file for the B&R upgrade disk and select the file.
7. Click on the **Start action** button in the toolbar.

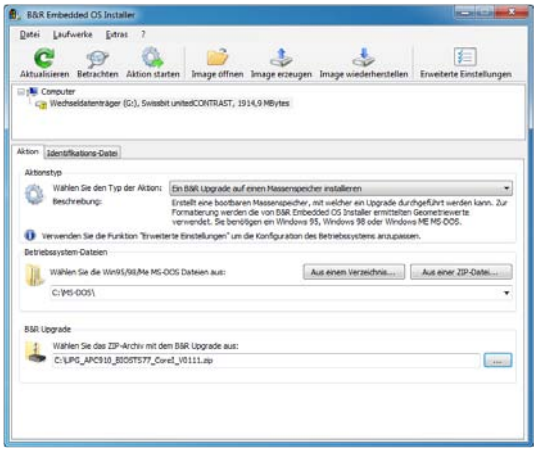


Figure 217: Creating a mass storage device for B&R upgrade files

2.5.3 How to access MS-DOS

Information about creating an MS-DOS boot diskette can be found in section "Creating an MS-DOS boot diskette in Windows XP" on page 302. The files from the diskette are then copied to the hard drive.

3 Windows Embedded 8.1 Industry Pro

3.1 General information

Windows Embedded 8.1 Industry Pro is an operating system specially tailored to industrial applications. Based on new Windows 8.1 technology, this edition offers full compatibility for applications and drivers while also integrating additional lockdown functions that make industrial PCs more secure.

3.2 Order data

Model number	Short description	Figure
	Windows Embedded 8.1 Industry Professional	
5SWWI8.0341-MUL	Windows 8.1 Industry Professional - 32-bit - Multilingual - For PPC900 QM77/HM76 - License	
5SWWI8.0441-MUL	Windows 8.1 Industry Professional - 64-bit - Multilingual - For PPC900 QM77/HM76 - License	
	Required accessories	
	CFast cards	
5CFAST.016G-00	CFast card, 16 GB SLC	
5CFAST.032G-00	CFast card, 32 GB SLC	
5CFAST.032G-10	CFast card, 32 GB MLC	
5CFAST.064G-10	CFast card, 64 GB MLC	
5CFAST.128G-10	CFast card, 128 GB MLC	
	Optional accessories	
	Windows Embedded 8.1 Industry Professional	
5SWWI8.0100-MUL	Windows Embedded 8.1 Industry Pro - 32-bit - Recovery DVD	
5SWWI8.0200-MUL	Windows Embedded 8.1 Industry Pro - 64-bit - Recovery DVD	
5SWWI8.0500-MUL	Windows Embedded 8.1 Industry Pro - 32-bit - Language Pack DVD	
5SWWI8.0600-MUL	Windows Embedded 8.1 Industry Pro - 64-bit - Language Pack DVD	

Table 272: 5SWWI8.0341-MUL, 5SWWI8.0441-MUL - Order data

3.3 Overview

Model number	Edition	Target system	Chipset	Architecture	Language	Minimum disk size	Minimum RAM required
5SWWI8.0341-MUL	Embedded	PPC900	QM77 HM76	32-bit	Multilingual	16 GB [1]	1 GB [2]
5SWWI8.0441-MUL	Embedded	PPC900	QM77 HM76	64-bit	Multilingual	20 GB [1]	2 GB [3]

1) The memory used by additional language packs is not taken into account in the minimum size specified for the disk.
2) With an active UWF (Unified Write Filter), 2 GB RAM are recommended.
The specified size is the minimum requirement according to Microsoft. B&R recommends, however, using 2 GB or more of RAM with 32-bit operating systems.
3) The specified size is the minimum requirement according to Microsoft. B&R recommends, however, using 4 GB or more of RAM with 64-bit operating systems.

3.4 Features with Windows Embedded 8.1 Industry Pro (W81Ipro)

The following list of features shows the most important device functions included in Windows Embedded 8.1 Industry Pro.

Function	Windows Embedded 8.1 Industry Pro
Range of functions in Windows 8.1 Pro	✓
Internet Explorer 11, including Enterprise Mode	✓
Multi-touch support	✓
Multilingual support	After installation using language pack DVDs (default language is English)
Page file	Configurable (switched off in image by default by UWF)
Hibernate file	Configurable (switched off in image by default)
System restore	Configurable (switched off in image by default by UWF)
SuperFetch	Configurable (switched off in image by default by UWF)
File indexing service	Configurable (switched off in image by default by UWF)
Fast boot	Configurable (switched off in image by default by UWF)
Defragmentation service	Configurable (switched off in image by default by UWF)
Additional embedded lockdown functions	
Assigned access	Configurable
Dialog filter	Configurable
Embedded Lockdown Manager	✓
Keyboard filter	Configurable
Shell launcher	Configurable
Toast Notification Filter	Configurable

Table 273: Device functions in Windows Embedded 8.1 Industry Pro

Function	Windows Embedded 8.1 Industry Pro
USB filter	Configurable
Unified Write Filter	✓
Windows 8 Application Launcher	Configurable
Gesture filter	Configurable

Table 273: Device functions in Windows Embedded 8.1 Industry Pro

3.5 Installation

B&R preinstalls Windows Embedded 8.1 Industry Pro on a suitable data storage device (32-bit: minimum 16 GB, 64-bit: minimum 20 GB). When switched on for the first time, the system runs through the OOBE (Out-of-Box Experience), which allows different settings to be made (e.g. language, region, keyboard layout, computer name, username, etc.).

Information:

If the product key is requested during the OOBE, it can be skipped by pressing "Skip".

3.6 Drivers

All drivers required for operation are preinstalled along with the operating system. If an older version of a driver is still being used, its latest version can be downloaded and installed from the B&R website (www.br-automation.com). It is important that Unified Write Filter (UWF) is disabled for this.

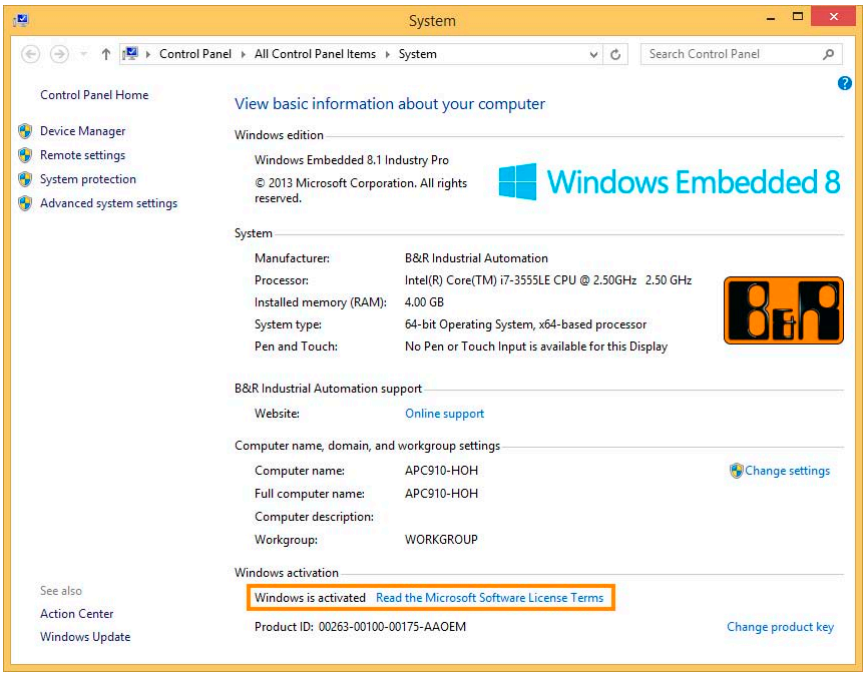
Information:

Required drivers can only be downloaded from the B&R website, not from manufacturer websites.

3.7 Activation

In contrast to previous versions – Windows 7 and Windows XP Professional – Windows Embedded 8.1 Industry Pro must be activated. This has already been done at B&R.

The status of the activation can be viewed in the Control Panel:



Information:

Activation can become negated when making changes to hardware (e.g. replacing components in repair situations) and when reinstalling the system (e.g. with the recovery DVD).

In this case, a "watermark message" will always be shown on the screen:

Windows Embedded 8.1 Industry Pro does not carry out any restarts or show any pop-up messages, which means that it is fully functional at all times. Personalization is not possible, however (e.g. setting the desktop background).

The product can be activated at a later time either over the phone or via the Internet. Instructions for doing so can be found on the Microsoft website.

Activation via direct Internet connection:
http://msdn.microsoft.com/en-us/library/dn449258(v=winembedded.82).aspx
Activation over the telephone:
http://msdn.microsoft.com/en-us/library/dn449379(v=winembedded.82).aspx

Information:

The product key never has to be entered for reactivation.

3.8 Contents of the recovery DVD

DVDs with model numbers 5SWWI8.0100-MUL and 5SWWI8.0200-MUL are only for recovery purposes.

Information:

They are only used to carry out the basic installation of Windows Embedded 8.1 Industry Pro. In contrast to the preinstalled operating system versions, the operating system does not include device-specific drivers (network, graphics, ADI, etc.) or optimized settings, nor is it activated! The product can be activated at a later time either over the phone or via the Internet (see "Activation").

3.9 Lockdown features

The lockdown functions in Windows Embedded 8.1 Industry Pro make it possible to individually configure the device while making the system more secure at the same time. They include:

- Unified Write Filter (UWF)
  These features make it possible to configure a data storage device (e.g. CFast) for read-only access, for example, or to allow only certain registry keys to be accessed. As a result, the system always starts with the same configuration after rebooting.
- Dialog filter
  This feature can be used to suppress pop-up windows and dialog boxes. Such dialog boxes can occur, for example, if virus scanners are updated, network connections fail or the Windows Security Center shows warnings. These windows can simply be hidden.
- Keyboard filter
  The keyboard filter allows individual keys or certain keyboard shortcuts to be locked to prevent users from accessing certain functions (e.g. Task Manager).

Additional information about lockdown functions can be found on the Microsoft website at this address:
http://msdn.microsoft.com/en-us/library/dn449278(v=winembedded.82).aspx

3.10 Supported display resolutions

In accordance with Microsoft requirements, Windows Embedded 8.1 Industry Pro requires XGA resolution (1024 x 768) or higher in order to allow unimpeded operation of the Windows user interface (including system dialog boxes and apps, etc.). A lower resolution can be selected for applications.

4 Windows 7

4.1 General information

Windows 7 offers a wealth of innovative features and performance improvements. The 64-bit variants can also exploit the full power of current PC architectures. Faster switching to power saving mode, quicker restores, less memory usage and high-speed detection of USB devices are just a few of the advantages provided by Windows 7. Both English and German are available in Windows 7 Professional, while Windows 7 Ultimate supports up to 35 different languages (up to 36 languages in Service Pack 1). Product activation is not necessary on B&R PCs, which is a huge advantage for simple logistical procedures relating to machine automation.

All of the Windows operating systems offered by B&R are from the Microsoft Embedded division. This guarantees much longer availability, especially compared to products offered on the consumer market.

4.2 Order data

Model number	Short description	Figure
	Windows 7 Professional/Ultimate	
5SWWI7.1100-GER	Windows 7 Professional SP1 - 32-bit - German - DVD	
5SWWI7.1100-ENG	Windows 7 Professional SP1 - 32-bit - English - DVD	
5SWWI7.1200-GER	Windows 7 Professional SP1 - 64-bit - German - DVD	
5SWWI7.1200-ENG	Windows 7 Professional SP1 - 64-bit - English - DVD	
5SWWI7.1300-MUL	Windows 7 Ultimate SP1 - 32-bit - Multilingual - DVD	
5SWWI7.1400-MUL	Windows 7 Ultimate SP1 - 64-bit - Multilingual - DVD	

Table 274: 5SWWI7.1100-GER, 5SWWI7.1100-ENG, 5SWWI7.1200-GER, 5SWWI7.1200-ENG, 5SWWI7.1300-MUL, 5SWWI7.1400-MUL - Order data

4.3 Overview

Model number	Edition	Target system	Chipset	Service pack	Architecture	Language	Minimum hard disk space required	Minimum RAM required
5SWWI7.1100-GER	Professional	APC510 APC511 APC810 APC910 APC2100 PPC800 PPC900 PPC2100 PP500	945GME GM45 QM77/HM76 NM10 US15W Bay Trail	SP1	32-bit	German	16 GB	1 GB [1]
5SWWI7.1100-ENG	Professional	APC510 APC511 APC810 APC910 APC2100 PPC800 PPC900 PPC2100 PP500	945GME GM45 QM77/HM76 NM10 US15W Bay Trail	SP1	32-bit	English	16 GB	1 GB [1]
5SWWI7.1200-GER	Professional	APC810 APC910 APC2100 PPC800 PPC900 PPC2100	945GME Intel Core2 Duo GM45 QM77/HM76 Bay Trail	SP1	64-bit	German	20 GB	2 GB [2]
5SWWI7.1200-ENG	Professional	APC810 APC910 APC2100 PPC800 PPC900 PPC2100	945GME Intel Core2 Duo GM45 QM77/HM76 Bay Trail	SP1	64-bit	English	20 GB	2 GB [2]
5SWWI7.1300-MUL	Ultimate	APC510 APC511 APC810 APC910 APC2100 PPC800 PPC900 PPC2100 PP500	945GME GM45 QM77/HM76 NM10 US15W Bay Trail	SP1	32-bit	Multilingual	16 GB [3]	1 GB [1]
5SWWI7.1400-MUL	Ultimate	APC810 APC910 APC2100 PPC800 PPC900 PPC2100	945GME Intel Core2 Duo GM45 QM77/HM76 Bay Trail	SP1	64-bit	Multilingual	20 GB [3]	2 GB [2]

Table 275: Windows 7 - Overview

1) The specified size is the minimum requirement according to Microsoft. B&R recommends, however, using 2 GB or more of RAM with 32-bit operating systems.
2) The specified size is the minimum requirement according to Microsoft. B&R recommends, however, using 4 GB or more of RAM with 64-bit operating systems.
3) The memory used by additional language packs is not taken into account in the minimum size of the disk.

4.4 Installation

B&R preinstalls the required Windows 7 version on the desired storage device (e.g. CFast card, etc.). All of the drivers required for operation (graphics, network, etc.) are also installed in this process.

4.5 Drivers

Current drivers for all approved operating systems are available in the Downloads section of the B&R website (www.br-automation.com).

Information:

Required drivers can only be downloaded from the B&R website, not from manufacturer websites.

4.6 Special considerations, limitations

- Windows 7 does not contain a Beep.sys file, which means that an audible signal is not sounded when pressing a key, for example.
- There is currently no support for the Windows 7 system rating (although this does not apply to PP500, APC2100, APC510, APC511, APC910, PPC2100 or PPC800 devices with an NM10 chipset).

4.7 Supported display resolutions

In accordance with Microsoft requirements, Windows 7 requires XGA resolution (1024 x 768) or higher in order to allow unimpeded operation of the Windows user interface (including system dialog boxes, etc.). A lower resolution can be selected for applications.

5 Windows Embedded Standard 7

5.1 General information

The successor to Windows XP Embedded is Windows Embedded Standard 7. As with previous versions, this embedded operating system offers full system support for B&R Industrial PCs. In addition to brand new features that are also included in Windows 7 Professional, Windows Embedded Standard 7 includes embedded components such as Enhanced Write Filter, File-Based Write Filter, Registry Filter and USB Boot. Windows Embedded Standard 7 is available in two different versions. The main difference between them has to do with multilingual support. Windows Embedded Standard 7 is only available in a single language, whereas Windows Embedded Standard 7 Premium supports the installation of several languages simultaneously.

With Windows Embedded Standard 7, Microsoft has made substantial improvements in the area of security. The AppLocker program, available in the premium version, can prevent the execution of unknown or potentially undesired applications that are being installed over a network or from drives that are directly connected. A tiered approach allows the differentiation between scripts (.ps1, .bat, .cmd, .vbs and .js), installation files (.msi, .msp) and libraries (.dll, .ocx). AppLocker can also be configured to record undesired activity and display it in the Event Viewer. Windows Embedded Standard 7 is available as both a 32-bit and 64-bit version[4)], which ensures that even the most demanding applications have the level of support they need.

5.2 Order data

Model number	Short description	Figure
	Windows Embedded Standard 7	
5SWWI7.1541-ENG	Windows Embedded Standard 7 SP1 - 32-bit - English - For PPC900 with QM77/HM76 chipset - License	
5SWWI7.1641-ENG	Windows Embedded Standard 7 SP1 - 64-bit - English - For PPC900 with QM77/HM76 chipset - License	
5SWWI7.1741-MUL	Windows Embedded Standard 7 Premium SP1 - 32-bit - Multilingual - For PPC900 with QM77/HM76 chipset - License	
5SWWI7.1841-MUL	Windows Embedded Standard 7 Premium SP1 - 64-bit - Multilingual - For PPC900 with QM77/HM76 chipset - License	
	Required accessories	
	CFast cards	
5CFAST.016G-00	CFast card, 16 GB SLC	
5CFAST.032G-00	CFast card, 32 GB SLC	
5CFAST.032G-10	CFast card, 32 GB MLC	
5CFAST.064G-10	CFast card, 64 GB MLC	
5CFAST.128G-10	CFast card, 128 GB MLC	

Table 276: 5SWWI7.1541-ENG, 5SWWI7.1641-ENG, 5SWWI7.1741-MUL, 5SWWI7.1841-MUL - Order data

5.3 Overview

Model number	Edition	Target system	Chipset	Service pack	Architecture	Language	Minimum disk size	Minimum RAM required
5SWWI7.1541-ENG	Embedded	PPC900	QM77 HM76	SP1	32-bit	English	16 GB	1 GB [1)]
5SWWI7.1641-ENG	Embedded	PPC900	QM77 HM76	SP1	64-bit	English	16 GB	2 GB [2)]
5SWWI7.1741-MUL	Premium	PPC900	QM77 HM76	SP1	32-bit	Multilingual	16 GB [3)]	1 GB [1)]
5SWWI7.1841-MUL	Premium	PPC900	QM77 HM76	SP1	64-bit	Multilingual	16 GB [3)]	2 GB [2)]

1) The specified size is the minimum requirement according to Microsoft. B&R recommends, however, using 2 GB or more of RAM with 32-bit operating systems.
2) The specified size is the minimum requirement according to Microsoft. B&R recommends, however, using 4 GB or more of RAM with 64-bit operating systems.
3) The memory used by additional language packs is not taken into account in the minimum size of the disk.

5.4 Features with WES7 (Windows Embedded Standard 7)

The following list of features shows the most important device functions included in Windows Embedded Standard 7.

Function	Windows Embedded Standard 7	Windows Embedded Standard 7 Premium
Enhanced Write Filter (EWF)	✓	✓
File-Based Write Filter (FBWF)	✓	✓
Administrator accounts	✓	✓
User accounts	Configurable	Configurable
Windows Explorer shell	✓	✓

Table 277: Device functions in Windows Embedded Standard 7

4) 64-bit versions are not supported by all systems.

Function	Windows Embedded Standard 7	Windows Embedded Standard 7 Premium
Registry filter	✓	✓
Internet Explorer 11.0	✓	✓
Internet Information Service (IIS) 7.0	✓	✓
Anti-malware (Windows Defender)	-	✓
Add-ons (Snipping Tool, Sticky Notes)	-	✓
Windows Firewall	✓	✓
.NET Framework 3.5	✓	✓
32-bit and 64-bit	✓	✓
Remote Desktop Protocol 7.0	✓	✓
File Compression Utility	✓	✓
Windows Installer Service	✓	✓
Windows XP mode	-	-
Media Player 12	✓	✓
DirectX	✓	✓
Multilingual user interface packs in the same image	-	✓
International components and language services	✓	✓
Language pack setup	✓	✓
Windows Update	Configurable	Configurable
Windows PowerShell 2.0	✓	✓
BitLocker	-	✓
AppLocker	-	✓
Tablet PC support	-	✓
Multi-touch support	-	✓
Boot from USB flash drive	✓	✓
Accessories	✓	✓
Page file	Configurable	Configurable
Number of fonts	134	134

Table 277: Device functions in Windows Embedded Standard 7

5.5 Installation

B&R preinstalls Windows Embedded Standard 7 on a suitable CFast card (32-bit: minimum 16 GB, 64-bit: minimum 16 GB). The system is then automatically configured when it is switched on for the first time. This procedure takes approximately 30 minutes, with the device being rebooted a number of times.

Information:

If Enhanced Write Filter (EWF) should be used, all mass storage devices should be disconnected from the system during installation or SYSPREP (except for the boot drive). It is also possible to disable additional mass storage devices in BIOS.

5.6 Drivers

All drivers required for operation are preinstalled along with the operating system. If an older version of a driver is still being used, its latest version can be downloaded and installed from the B&R website (www.br-automation.com). It is important that Enhanced Write Filter (EWF) is disabled for this.

5.6.1 Touch screen driver

A touch screen driver will be installed automatically if a touch controller is detected during the Windows Embedded Standard 7 installation. If a touch controller is not detected during Windows Embedded Standard 7 installation or a B&R Automation Panel is connected at a later time, then the touch screen driver needs to be installed manually or the additional touch screen interface must be selected in the touch screen settings in the Windows Control Panel. The driver is available in the Downloads section of the B&R website (www.br-automation.com). It is important that both Enhanced Write Filter (EWF) and File Based Write Filter (FBWF) are disabled for this.

Information:

Required drivers can only be downloaded from the B&R website, not from manufacturer websites.

5.7 Supported display resolutions

In accordance with Microsoft requirements, Windows Embedded Standard 7 requires XGA resolution (1024 x 768) or higher in order to allow unimpeded operation of the Windows user interface (including system dialog boxes and apps, etc.). A lower resolution can be selected for applications.

6 Windows XP Professional

6.1 General information

> **Information:**
>
> **Discontinuation of support for Windows XP by Microsoft:**
>
> **After *April 8th, 2014*, Microsoft will no longer be providing any security updates, hotfixes, support (free or paid) or technical resources for Windows XP.**

6.2 Order data

Model number	Short description	Figure
	Windows XP Professional	
5SWWXP.0600-GER	Windows XP Professional SP3 - German - CD	
5SWWXP.0600-ENG	Windows XP Professional SP3 - English - CD	
5SWWXP.0600-MUL	Windows XP Professional SP3 - Multilingual - CD	

Table 278: 5SWWXP.0600-GER, 5SWWXP.0600-ENG, 5SWWXP.0600-MUL - Order data

6.3 Overview

Model number	Edition	Target system	Chipset	Service pack	Language	Minimum hard disk space required	Minimum RAM required
5SWWXP.0600-GER	Professional	APC510 APC511 APC620 APC810 APC820 APC910 PPC700 PPC725 PPC800 PPC900 PP500	945GME GM45 QM77/HM76 NM10 US15W	SP3	German	≤2.1 GB	128 MB
5SWWXP.0600-ENG	Professional	APC510 APC511 APC620 APC810 APC820 APC910 PPC700 PPC725 PPC800 PPC900 PP500	945GME GM45 QM77/HM76 NM10 US15W	SP3	English	≤2.1 GB	128 MB
5SWWXP.0600-MUL	Professional	APC510 APC511 APC620 APC810 APC820 APC910 PPC700 PPC725 PPC800 PPC900 PP500	945GME GM45 QM77/HM76 NM10 US15W	SP3	Multilingual	≤2.1 GB	128 MB

6.4 Installation

B&R preinstalls the required Windows XP Professional version on the desired storage device (e.g. CompactFlash card, etc.). All of the drivers required for operation (graphics, network, etc.) are also installed in this process.

6.5 Drivers

Current drivers for all approved operating systems are available in the Downloads section of the B&R website (www.br-automation.com).

Information:

Required drivers can only be downloaded from the B&R website, not from manufacturer websites.

6.6 Supported display resolutions

In accordance with Microsoft requirements, Windows XP Professional requires SVGA resolution (800 x 600) or higher in order to allow unimpeded operation of the Windows user interface (including system dialog boxes and apps, etc.). A lower resolution can be selected for applications.

7 Windows Embedded Standard 2009

7.1 General information

Windows Embedded Standard 2009 is the modular version of Windows XP Professional. It is used if XP applications should be executed with a minimal operating system size. Together with CompactFlash memory, Windows Embedded Standard 2009 makes it possible to use the Microsoft desktop operating system in harsh environmental conditions. In addition to the familiar features included in Windows XP Professional, Windows Embedded Standard 2009 has been improved with regard to dependability by adding a write filter for individual memory partitions. By protecting individual partitions such as the boot partition, the PC system can be started without problems even after an unexpected power failure. B&R offers complete images for industrial PCs, Power Panel and Mobile Panel devices to make the transition to Windows Embedded Standard 2009 as easy as possible. In addition to Windows Embedded Standard 2009, the standard Windows XP Professional operating system is also available in English, German and a multilingual version.

Windows Embedded Standard 2009 is based on the same binary files as Windows XP Professional with Service Pack 3 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 Embedded Standard 2009 is also based on the same reliable code as Windows XP Professional with SP3. It provides industry with leading reliability, security and performance improvements as well as the latest technology for web browsing and extensive device support.

7.2 Order data

Model number	Short description	Figure
	Windows Embedded Standard 2009	
5SWWXP.0741-ENG	Windows Embedded Standard 2009 - English - For PPC900 with QM77/HM76 chipset	

Table 279: 5SWWXP.0741-ENG - Order data

7.3 Overview

Model number	Target system	Chipset	Language	Minimum disk size	Minimum RAM required
5SWWXP.0741-ENG	PPC900	QM77 HM76	English	2 GB	256 MB

7.4 Features with WES2009 (Windows Embedded Standard 2009)

The following list of features shows the most important device functions included in Windows Embedded Standard 2009.

Function	Included?
Enhanced Write Filter (EWF)	✓
File-Based Write Filter (FBWF)	✓
Page file	Configurable
Administrator accounts	✓
User accounts	Configurable
Explorer shell	✓
Registry filter	✓
Internet Explorer 8.0	✓
Internet Information Service (IIS)	-
Terminal service	✓
Windows Firewall	✓
MSN Explorer	-
Outlook Express	-
Administrative Tools	✓
Remote Desktop	✓
Remote Assistance	-
.NET Framework	-
ASP.NET	-
OpenGL support	✓
Local network bridge	✓
Codepages / User locales / Keyboards	✓
Disk Management Service	✓
Windows Installer Service	✓
Class Installer	✓
CoDevice Installer	✓

Table 280: Device functions in Windows Embedded Standard 2009

Function	Included?
Media Player 64	✓
DirectX 9.0c	✓
Accessories	✓
Number of fonts	89

Table 280: Device functions in Windows Embedded Standard 2009

7.5 Installation

Windows Embedded Standard 2009 is already preinstalled on a suitable CFast card by B&R (minimum 1 GB). The system is then automatically configured when it is switched on for the first time. This procedure takes approximately 10 minutes, with the device being rebooted a number of times.

7.6 Drivers

All drivers required for operation are preinstalled along with the operating system. If an older version of a driver is still being used, its latest version can be downloaded and installed from the B&R website (www.br-automation.com). It is important that Enhanced Write Filter (EWF) is disabled for this.

7.7 Supported display resolutions

In accordance with Microsoft requirements, Windows Embedded Standard 2009 requires SVGA resolution (800 x 600) or higher in order to allow unimpeded operation of the Windows user interface (including system dialog boxes, etc.). A lower resolution can be selected for applications.

8 Automation Runtime

8.1 General information

An integral component of Automation Studio is the Automation Runtime real-time operating system. This real-time operating system is the software kernel that allows applications to run on a target system.

- Guaranteed highest possible performance for the hardware being used
- Runs on all B&R target systems
- Makes the application hardware-independent
- Easy portability of applications between B&R target systems
- Deterministic behavior guaranteed by cyclic system
- Configurable jitter tolerance in all task classes
- Supports all major programming languages such as IEC 61131-3 and C
- Extensive function library conforming to IEC 61131-3 as well as the expanded B&R Automation library
- Integrated into Automation NET. Access to all networks and bus systems via function calls or the Automation Studio™ configuration

B&R Automation Runtime is fully embedded in the corresponding target system (the hardware where Automation Runtime is installed). It allows application programs to access I/O systems (e.g. via the fieldbus) and other devices (interfaces, networks, etc.).

8.2 Order data

Model number	Short description	Figure
	Technology Guard	
0TG1000.01	Technology Guard (MSD) is made available in the USB device class MSD (Mass Storage Device)	
0TG1000.02	Technology Guard (HID) is available for the USB device class HID (human interface device). Automation Runtime supports HID beginning with version D4.09.	
1TG4600.10-5	Automation Runtime Windows, TG license	
1TG4601.06-5	Automation Runtime Embedded, TG license	

Table 281: 0TG1000.01, 0TG1000.02, 1TG4600.10-5, 1TG4601.06-5 - Order data

8.3 Automation Runtime Windows (ARwin)

System requirements

In order to run Automation Runtime Windows on a Panel PC 900, the following software versions (or higher) are required:

- ARwin upgrade AR A4.06
- Automation Studio V4.0.17.x
- Technology Guard

Information:

In order to use Automation Runtime Windows (ARwin), the BIOS setting *Advanced - OEM features - Miscellaneous configuration - Realtime environment* must be set to *Enabled*.

Information:

In ARwin 4.06, ADI access is no longer possible from Windows and ARwin at the same time since the ADI interface is blocked by ARwin.

The following components are required in order to be able to access the ADI interface by Windows and ARwin simultaneously:

- **ADI driver V2.3 (or higher)**
- **ARwin I4.06 (or higher)**

8.4 Automation Runtime Embedded (ARemb)

System requirements

In order to run Automation Runtime Embedded on a Panel PC 900, the following software versions (or higher) are required:

- ARemb upgrade AR A4.06
- Automation Studio V4.0.17.x
    - There is support starting from this version exclusively for 5AP923* single-touch display units.
    - There is support starting from this version exclusively for 5AP112x*, 5AP115x*, 5AP118x* single-touch display units.
- ARemb upgrade AR I4.06 and Automation Studio V4.0.19.x
    - There is support with single-touch functionality starting with this version for 5AP933* multi-touch display units with Rev. ≤ B7.
- ARemb upgrade AR O4.06, AR E4.09 or AR F4.10 and Automation Studio V4.0.19.x
    - There is support with single-touch functionality starting with this version for 5AP933* multi-touch display units with Rev. ≤ B7 and Rev. ≥ B8.
- Visual Components Runtime (VC) V4.05.5
- Technology Guard

PVI Development Setup must be downloaded from the B&R website (www.br-automation.com) and installed separately!

Information:

In order to use Automation Runtime Embedded (ARemb), the BIOS setting *Advanced - OEM features - Miscellaneous configuration - Realtime environment* must be set to *Enabled*.

8.5 Technology Guarding

Technology Guarding is a licensing approach used to safeguard individual software components. Licenses are stored on a "Technology Guard" (also referred to simply as a dongle), which is connected to an available USB interface on the target system.

The B&R software components Automation Runtime Embedded (ARemb), Automation Runtime Windows (ARwin) and Automation Runtime Embedded Terminal require a license, so a Technology Guard must always be used.

Information:

Licensing with the Technology Guarding wizard is available in Automation Studio 4.1 and Automation Runtime 4.08 and higher. Earlier versions of Automation Runtime do not require a Technology Guard.

Additional information about Technology Guarding can be found in the Automation Studio help system.

9 Debian (GNU/Linux)

9.1 General information

A Linux or GNU/Linux system is an open, Unix-like multiuser operating system based on the Linux kernel and GNU software. Widespread use and commercial applications were made possible starting in 1992 with the licensing of the Linux kernel under the GPL.

The Debian 8 operating system developed by B&R already contains all of the necessary drivers for the devices and can be used immediately without additional work.

Advantages of Debian:

- High degree of stability
- Wide selection of packages
- Suitable packages with real-time kernels already available

For more information about Debian, please visit http://www.debian.org.

9.2 Order data

Model number	Short description	Figure
	Debian 8	
5SWLIN.0541-MUL	Debian 8 - 32-bit - Multilingual - For PPC900 - Image	
5SWLIN.0641-MUL	Debian 8 - 64-bit - Multilingual - For PPC900 - Image	
	Optional accessories	
	CFast cards	
5CFAST.016G-00	CFast card, 16 GB SLC	
5CFAST.032G-00	CFast card, 32 GB SLC	
5CFAST.032G-10	CFast card, 32 GB MLC	
5CFAST.064G-10	CFast card, 64 GB MLC	
5CFAST.128G-10	CFast card, 128 GB MLC	
5CFAST.4096-00	CFast card, 4 GB SLC	
5CFAST.8192-00	CFast card, 8 GB SLC	

Table 282: 5SWLIN.0541-MUL, 5SWLIN.0641-MUL - Order data

9.3 Overview

Model number	Target system	Chipset	Architecture	Language	Minimum disk size	Minimum RAM required
5SWLIN.0541-MUL	PPC900	QM77 HM76	32-bit	Multilingual	4 GB	1 GB
5SWLIN.0641-MUL	PPC900	QM77 HM76	64-bit	Multilingual	4 GB	1 GB

9.4 Features

- LXDE desktop
- Touch driver
- MTCX driver
- ADI library
- HMI diagnostics tool
- Tool for right-click support via touch screen
- Virtual keyboard

Detailed information about Debian 8 for B&R devices is available in the Downloads section of the B&R website (www.br-automation.com).

9.5 Installation

B&R preinstalls Debian 8 on the desired storage device (e.g. CompactFlash card, etc.). All of the drivers required for operation (graphics, network, etc.) are also installed in this process.

Debian 8 can also be downloaded from the Debian website (http://www.debian.org) and installed separately. The Debian website provides more detailed instructions.

Notes regarding installation on B&R devices are included in a separate document that can be downloaded from the B&R website (www.br-automation.com).

Installation packages for the necessary B&R adjustments are also available on the B&R website (www.br-automation.com).

9.6 Drivers

All drivers required for operation are preinstalled along with the operating system.

The most current versions of B&R-specific drivers can be downloaded and installed from the B&R website (www.br-automation.com).

10 B&R Automation Device Interface (ADI) - Control Center

The ADI (Automation Device Interface) enables access to specific functions on B&R devices. Settings for devices can be read and configured using the B&R Control Center applet in the Control Panel.

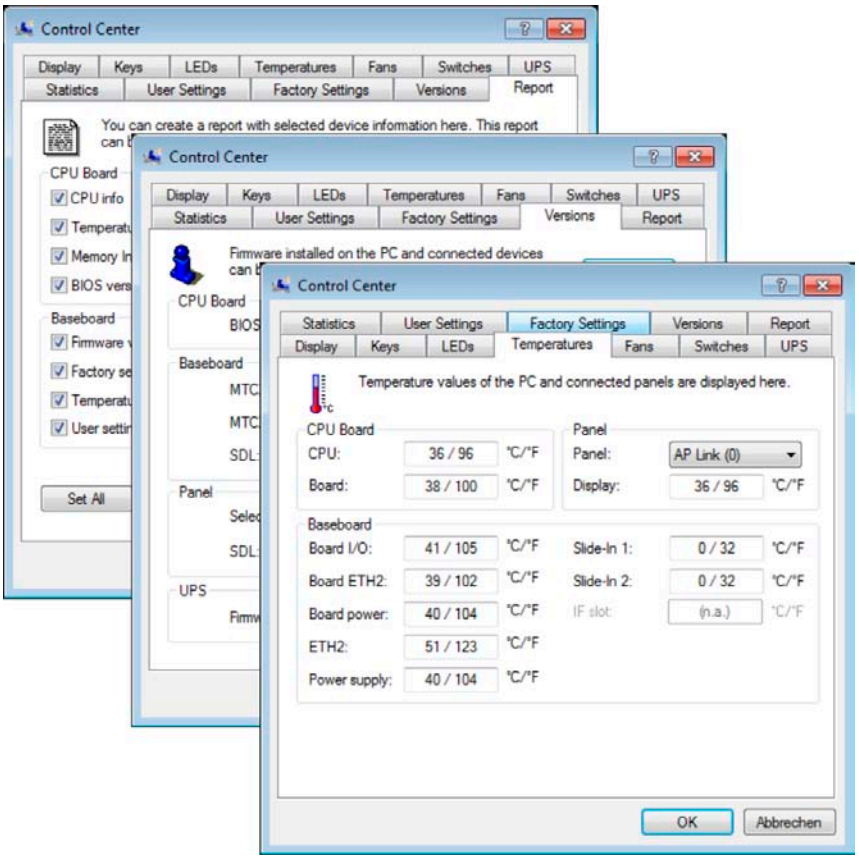


Figure 218: ADI Control Center screenshots - Examples

Information:

The temperature and voltage values (e.g. CPU temperature, core voltage, battery voltage) shown in the corresponding ADI window represent uncalibrated values for informational purposes. They cannot be used to draw any conclusions about hardware alarms or error conditions. The hardware components used have automatic diagnostic functions that can be applied in the event of error.

10.1 Functions

Information:

The functions provided by the Automation Device Interface (ADI) - Control Center vary according to the device series.

- Changing display-specific parameters
- Reading device-specific keys
- Updating the key configuration
- Enabling device-specific LEDs on a membrane keypad or keys
- Reading and calibrating control devices (e.g. key switches, handwheels, joysticks, potentiometers)
- Reading temperatures, fan speeds, statistical data and switch settings
- Reading operating hours (power-on hours)
- Reading user and factory settings
- Reading software versions
- Updating and backing up BIOS and firmware
- Creating reports about the current system (support assistance)
- Setting the SDL equalizer value when adjusting SDL cables
- Changing the user serial ID

Supports the following systems:

- Automation PC 510
- Automation PC 511
- Automation PC 620
- Automation PC 810
- Automation PC 820
- Automation PC 910
- Automation PC 2100
- Panel PC 300
- Panel PC 700
- Panel PC 725
- Panel PC 800
- Panel PC 900
- Panel PC 2100
- Power Panel 100/200
- Power Panel 300/400
- Power Panel 500
- Mobile Panel 40/50
- Mobile Panel 100/200
- Connected Automation Panel 800
- Connected Automation Panel 900
- Connected Automation Panel 1000

10.2 Installation

A detailed description of the Control Center can be found in the integrated help system. The B&R Automation Device Interface (ADI) driver (also includes the Control Center) is available at no charge in the Downloads section of the B&R website (www.br-automation.com).

1. Download and unzip the .zip archive.
2. Close all applications.
3. Run the Setup.exe file (e.g. double-click on it in Explorer).

Information:

The ADI driver is already included in B&R images of embedded operating systems.

If a more current ADI driver version exists (see the Downloads section of the B&R website), it can be installed later. It is important that Enhanced Write Filter (EWF) is disabled for this.

11 B&R Automation Device Interface (ADI) Development Kit

This software can be used to access B&R Automation Device Interface (ADI) functions directly from Windows applications created in one of the following development environments:

- Microsoft Visual C++ 6.0
- Microsoft Visual Basic 6.0
- Microsoft Embedded Visual C++ 4.0
- Microsoft Visual Studio 2008 (or newer)

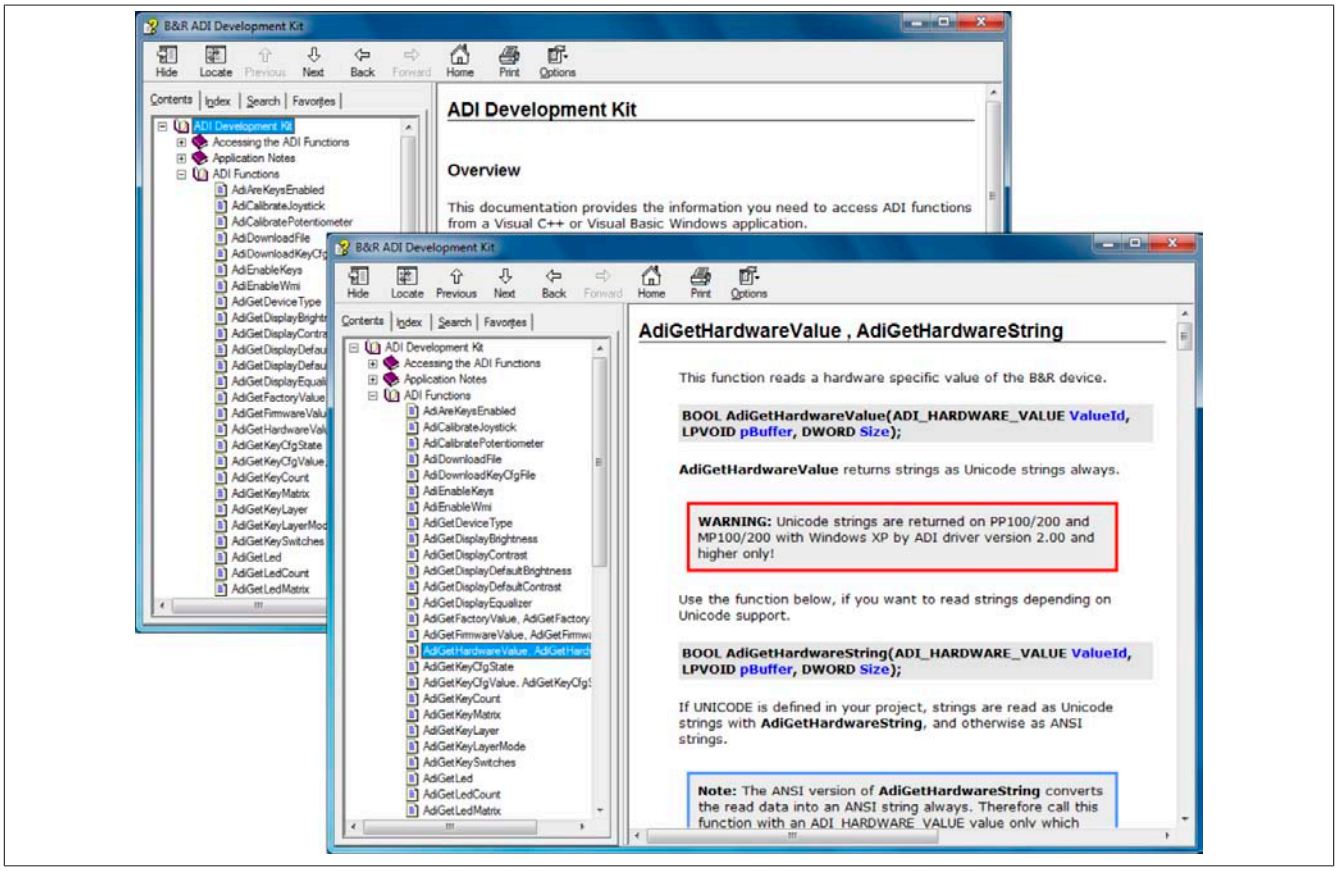


Figure 219: ADI Development Kit Screenshots (Version 3.70)

Features:

- One Microsoft Visual Basic module with ADI function declarations
- Header files and import libraries for Microsoft Visual C++
- Help files for Visual Basic and Visual C++
- Sample projects for Visual Basic and Visual C++
- ADI DLL (for application testing if no ADI driver is installed)

The following systems are supported (version 3.70 and higher):

- Automation PC 510
- Automation PC 511
- Automation PC 620
- Automation PC 810
- Automation PC 820
- Automation PC 910
- Automation PC 2100
- Panel PC 300
- Panel PC 700
- Panel PC 800
- Panel PC 900
- Panel PC 2100

- Power Panel 100/200
- Power Panel 300/400
- Power Panel 500
- Mobile Panel 40/50
- Mobile Panel 100/200

The ADI driver installed on the stated product series must be suitable for that device. The ADI driver is already included in B&R images of embedded operating systems.

A detailed description of how to use ADI functions can be found in the help system.

The B&R Automation Device Interface (ADI) development kit is available at no cost in the Downloads section of the B&R website (www.br-automation.com).

12 B&R Automation Device Interface (ADI) .NET SDK

This software can be used to access B&R Automation Device Interface (ADI) functions directly from .NET applications created using Microsoft Visual Studio 2005 or later.

Supported programming languages:

- Visual Basic
- Visual C++
- Visual C#

System requirements

- Development system: PC with Windows XP or Windows 7 and
  - Microsoft Visual Studio 2005 (or newer)
  - Microsoft .NET Framework 2.0 and/or Microsoft .NET Compact Framework 2.0 (or newer)

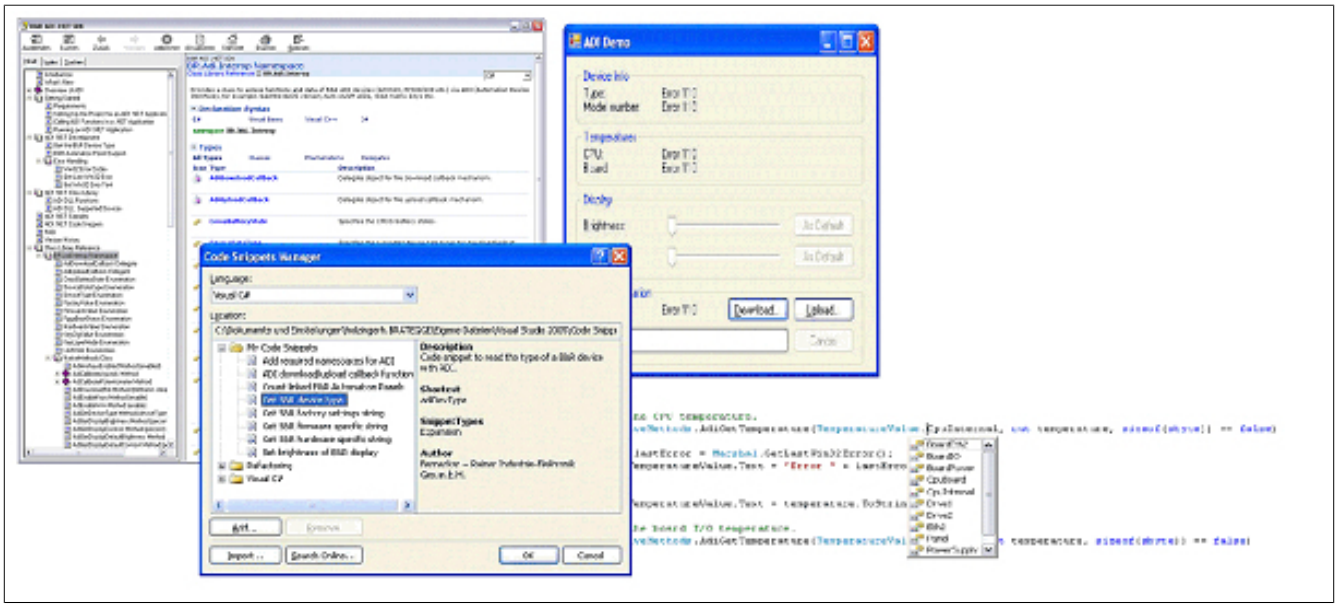


Figure 220: ADI .NET SDK screenshots (version 2.10)

Features (version 2.10 and higher)

- ADI .NET class library
- Help files in HTML Help 1.0 format (.chm), MS Help 2.0 format (.HxS) and MS Help Viewer format (.MSHC) (help documentation is in English only)
- Sample projects and code snippets for Visual Basic, Visual C++ and Visual C#
- ADI DLL (for application testing if no ADI driver is installed)

The following systems are supported (version 2.10 and higher):

- Automation PC 510
- Automation PC 511
- Automation PC 620
- Automation PC 810
- Automation PC 820
- Automation PC 910
- Automation PC 2100
- Panel PC 300
- Panel PC 700
- Panel PC 800
- Panel PC 900
- Panel PC 2100
- Power Panel 100/200
- Power Panel 300/400

- Power Panel 500
- Mobile Panel 40/50
- Mobile Panel 100/200

The ADI driver installed on the stated product series must be suitable for that device. The ADI driver is already included in B&R images of embedded operating systems.

A detailed description of how to use ADI functions can be found in the help system.

The ADI .NET SDK is available in the Downloads section of the B&R website (www.br-automation.com).

13 B&R Key Editor

On display devices, it is often necessary to adapt the function keys and LEDs directly to the application software being used. The B&R Key Editor makes it quick and easy to implement a unique configuration for the application.

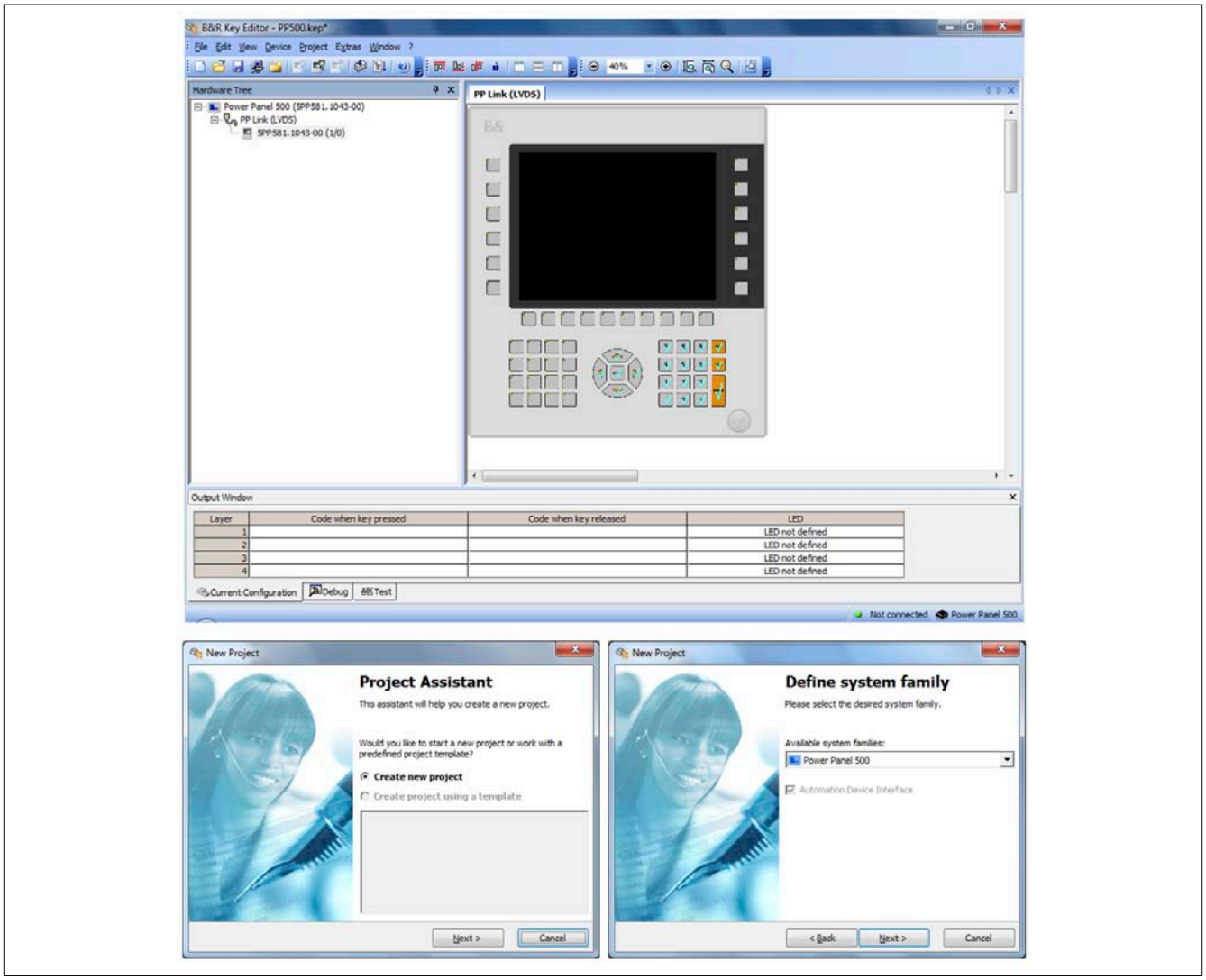


Figure 221: B&R Key Editor screenshots (version 3.60)

Features:

- Configuration of normal keyboard keys (A, B, C, etc.)
- Keyboard shortcuts (CTRL+C, SHIFT+DEL, etc.) using only one key
- Special key functions (change brightness, etc.)
- Assignment of functions to LEDs (HDD access, power, etc.)
- 4 assignments possible per key (using layers)
- Configuration of the panel locking time when multiple Automation Panel 900 devices are connected to Automation PC and Panel PC devices.

The following systems are supported (version 3.60 and higher):

- Automation PC 510
- Automation PC 511
- Automation PC 620
- Automation PC 810
- Automation PC 820
- Automation PC 910
- Automation PC 2100
- Automation Panel 800
- Automation Panel 830

- Automation Panel 900
- Automation Panel 9x3
- Automation Panel 9xD
- Automation Panel 1000
- IPC2000, IPC2001, IPC2002
- IPC5000, IPC5600
- IPC5000C, IPC5600C
- Mobile Panel 40/50
- Mobile Panel 100/200
- Panel PC 300
- Panel PC 700
- Panel PC 800
- Panel PC 900
- Panel PC 2100
- Power Panel 100/200
- Power Panel 300/400
- Power Panel 500

A detailed guide for configuring keys and LEDs as well as installing the key configuration on the target system can be found in the B&R Key Editor's help system. The B&R Key Editor is available in the Downloads section of the B&R website (www.br-automation.com).

14 B&R KCF Editor

The B&R KCF Editor can be used as a simple alternative to the B&R Key Editor. This tool allows function keys and LEDs to be adapted to the application software as needed. Unlike the B&R Key Editor, this program is operated from a simple Windows dialog box instead of graphically on the display. This makes it possible to use the B&R KCF Editor for devices that are not yet supported by the B&R Key Editor. The B&R KCF Editor is a portable application and can be launched on the target device without prior installation (directly from a USB flash drive, for example). An installed ADI driver is required to use the software's full range of functions.

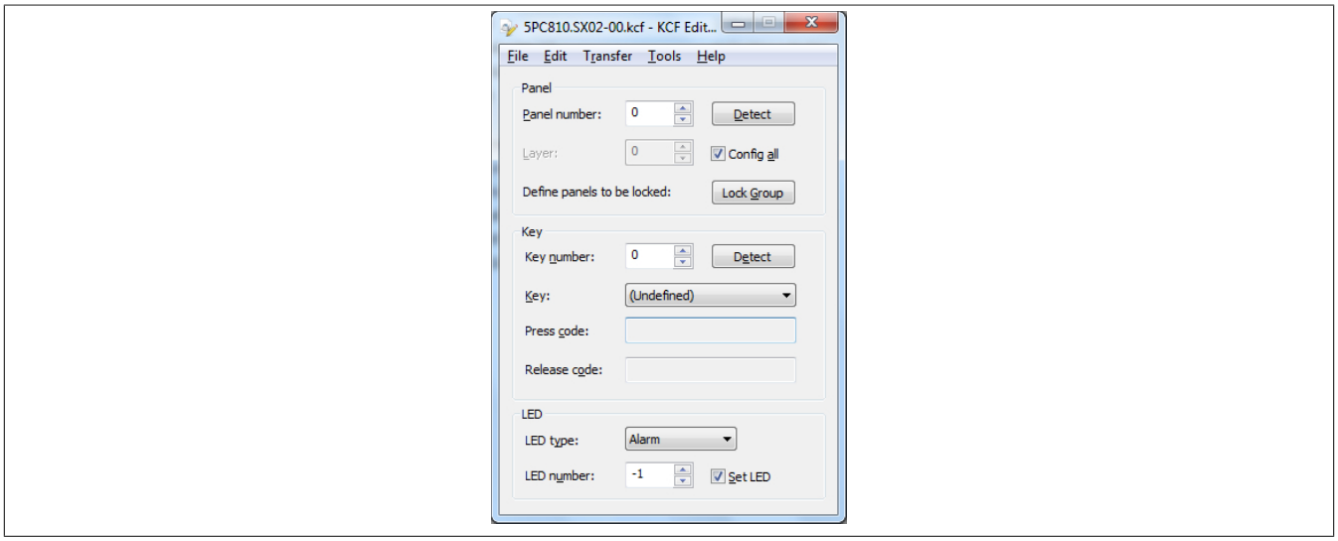


Figure 222: B&R KCF Editor screenshot (version 1.0)

Features

- Configuration of normal keyboard keys (A, B, C, etc.)
- Special key functions (change brightness, etc.)
- Assignment of functions to LEDs (HDD access, power, etc.)
- 4 assignments possible per key (using layers)
- Configuration of the panel locking time when multiple Automation Panel devices are connected to B&R PCs
- Configuration export/import (.ini files)
- Possible to save configuration as a report (text file)

Additional features when executing the B&R KCF Editor on the target device[5)]

- Panel and key detection
- LED test
- Configuration uploads/downloads

The following systems are supported (version 1.0 and higher)

- Automation PCs
- Panel PCs
- Automation Panels
- Power Panels
- Mobile panels

A detailed guide for configuring keys and LEDs can be found in the B&R KCF Editor user's manual. The B&R KCF Editor and its user's manual are available at no cost in the Downloads section of the B&R website (www.br-automation.com).

[5)] The ADI driver must be installed on the B&R PC to use these features.

15 HMI Service Center

15.1 5SWUTI.0001-000

15.1.1 General information

The HMI Service Center is a software tool used to test B&R Industrial PCs and Automation Panels. These tests cover many different aspects, including COM interfaces, network connectivity, SRAM, etc.

The test system consists of a USB flash drive with an installed Windows PE 5.1 operating system and the HMI Service Center.

Details regarding the HMI Service Center are available in the HMI Service Center user's manual. This can be downloaded from the B&R website (www.br-automation.com).

15.1.2 Order data

Model number	Short description	Figure
	Accessories	
5SWUTI.0001-000	HMI Service Center USB Flash Drive - Hardware diagnostics software - For APC810/PPC800 - For APC910/PPC900 - For APC2100/PPC2100 - For APC51x/PP500 - For Automation Panel 800/900	

Table 283: 5SWUTI.0001-000 - Order data

Chapter 5 • Standards and certifications

1 Standards and guidelines

1.1 CE mark

Product complies with all applicable directives and their harmonized EN standards.

1.2 EMC directive

These devices meet the requirements of EC directive "2004/108/EC Electromagnetic compatibility" and are designed for the following areas:

EN 61131-2:2007	Programmable logic controllers - Part 2: Equipment requirements and tests
EN 61000-6 -2:2005	Electromagnetic compatibility (EMC) - Part 6-2: Generic standards - Immunity for industrial environments
EN 61000-6 -4:2007	Electromagnetic compatibility (EMC) - Part 6-4: Generic standards - Emission standard for industrial environments

1.3 Low voltage directive

These devices satisfy the requirements of EC directive "2006/95/EC Low voltage directive" and are designed for the following areas:

EN 61131-2:2007	Programmable logic controllers - Part 2: Equipment requirements and tests
EN 60204-1:2006 + A1:2009	Safety of machinery - Electrical equipment of machines - Part 1: General requirements

2 Certifications

Danger!

A complete system can only receive certification if ALL of the individual components it includes have the applicable certifications. If an individual component is being used that DOES NOT have an applicable certification, then the complete system WILL NOT receive certification.

B&R products and services comply with applicable standards. This includes 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 are committed to ensuring the reliability of our products in an industrial environment.

Unless otherwise specified, the following certifications apply:

2.1 UL certification

Products with this mark have been tested by Underwriters Laboratories and are listed as "Industrial Control Equipment". This mark is valid for the USA and Canada and simplifies the certification of your machines and systems in these areas.

Underwriters Laboratories (UL) in accordance with the UL508 standard - 17th Edition
Canadian (CSA) standard in accordance with C22.2 No. 142-M1987

Ind.Cont.Eq.
E115267

2.2 GOST-R

Products with this mark have been certified by an accredited testing laboratory and have been approved for import to the Russian Federation (based on CE compliance).

2.3 Certifications for use in potentially explosive environments

2.3.1 UL Haz. Loc. Certifications

Products with this mark have been certified by Underwriters Laboratories and are listed as "Industrial Control Equipment for Use in Hazardous Locations". This mark is valid for the USA and Canada and simplifies the certification of your machines and systems in these regions.

Underwriters Laboratories (UL) in accordance with standard ANSI/ISA 12.12.01:2013
Canadian (CSA) standard in accordance with C22.2 No. 213-M1987

Ind.Cont.Eq.
for Haz.Locs.
Cl. I, Div. 2,
Groups ABCD
E180196 (T3C)

2.3.1.1 General safety guidelines

PPC900 system with AP923 or AP1000 display units that are certified for use in potentially explosive environments and carry the marking above are suitable for use in Class I, Division 2, Groups A, B, C and D as well as non-potentially explosive environments.

Devices with explosion protection are to be used as intended and are only permitted to be operated by knowledgeable and qualified personnel according to these operating instructions and the corresponding PPC900 and AP923 or AP1000 user's manuals. Operation in any other way endangers the safety and functionality of the devices and the connected systems. The operator is responsible for following all applicable safety and accident prevention regulations, as well as adhering to standards.

PPC900 systems with AP923 or AP1000 display units that are certified for use in potentially explosive environments and carry the marking above correspond to the following standards: UL 508 - 17th Edition, ANSI/ISA 12.12.01:2013, CSA C22.2 No. 213-M1987, and CSA C22.2 No. 142-M1987.

2.3.1.2 Mounting and installation

PPC900 systems with AP923 or AP1000 display units are only permitted to be installed by knowledgeable and qualified personnel in accordance with the PPC900 and AP923 or AP1000 user's manuals. Devices must be installed in a suitable protective housing that can only be opened by using a tool. In order to guarantee sufficient air circulation, allow the specified amount of space around the device. Use only in environments with pollution degree 2. The maximum ambient temperature varies depending on the individual components being used, see section "Temperature specifications" on page 33.

The certification marking on the device must be checked before each installation or use of the device in potentially explosive environments. Additional equipment must be suitable for the operating location. Final assembly must be approved by the relevant local authorities. Wiring must follow national regulations and meet all legal requirements.

Devices must remain voltage-free until installation work is complete. The tightening torque for the power supply terminals is 0.5 Nm. Cables must be able to handle a surface temperature of 75°C. PPC900 systems with AP923 or AP1000 display units are only permitted to operated with 24 VDC.

Unshielded/Ungrounded cables are never permitted to be used in potentially explosive areas. Devices must be securely connected to the potential offset. Power supply, communication and accessory cables must be secured on the device or control cabinet. Power supply, communication and accessory cables are not permitted to exert excessive tensile stress on the interfaces. Possible vibrations in the environment must be taken into account for this.

2.3.1.3 Operation

To switch PP900 systems with AP923 or AP1000 display units on/off in a potentially explosive area, either the switch must be located outside the explosive area or a switch certified for use in potentially explosive areas must be used.

Danger!

Explosion hazard: The accessory is not permitted to be connected or disconnected with voltage applied unless the area is considered nonhazardous and is free of ignitable concentrations!

Explosion hazard: Replacing components may impair eligibility for Class I, Division 2!

Explosion hazard: Fuses or batteries (Renata CR2477N) are not permitted to be removed or replaced with voltage applied unless the area is considered nonhazardous and is free of ignitable concentrations!

Danger !

Risque d'explosion – Ne pas connecter ou déconnecter un quelconque équipement lorsque le circuit est sous tension, à moins que la zone soit connue comme étant sans risque et sans concentrations inflammables!

Risque d'explosion – Le remplacement de composants peut compromettre l’aptitude au respect de la Classe I, Division 2!

Risque d'explosion – Ne pas retirer ou remplacer les fusibles ou les batteries (Renata CR2477N), sauf si l'alimentation électrique a été déconnectée ou si la zone est connue comme étant sans risque et sans concentrations inflammables!

With the exception of USB dongle 0TG1000.01 or in line with the requirements set forth in "Control drawing (non-incendive)", USB interfaces are not certified for operation in potentially explosive areas and may only be used for service purposes.

2.3.1.4 Maintenance, breakdowns and disassembly

Devices must be shut down and protected against accidental startup. A voltmeter must be used to verify that the power supply is cut off.

Before removing or installing accessories, components or cables, all power supplies to PPC900 systems with AP923 or AP1000 display units must be interrupted. Defective devices must only be replaced by knowledgeable and qualified personnel. Before switching on or connecting the power supply, all covers and system components must be reinstalled and secured.

Danger!

Nonobservance of these instructions can result in material damage, severe injury or death!

Danger !

Le non-respect de ces instructions peut entraîner des blessures graves ou mortelles!

2.3.1.5 USB connection with the Automation Panel 1000

2.3.1.5.1 Introduction

The information below describes the use of USB peripheral devices on the USB interface on the front of the B&R Automation Panel 1000 in Hazardous Locations Class I, Division 2, Groups A, B, C and D.

Danger!

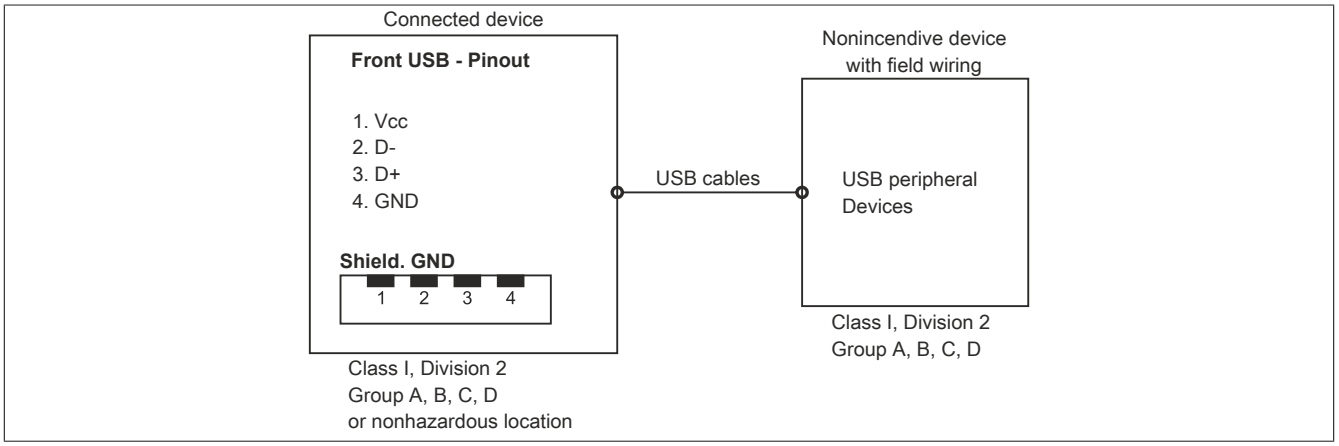
EXPLOSION HAZARD

- **Before installation or use in a potentially explosive area, the explosion protection class of the device must be verified with regard to ANSI/ISA 12.12.01 and CSA C22.2 N°213.**
- **One of the following must be used to switch on/off B&R devices installed in a potentially explosive area:**
  - **A switch located outside the potentially explosive area**
  - **A switch certified for "Tube use" in the applicable Hazardous Location class and division**
- **Do not connect or disconnect any cables or wires while the circuit is live unless the area is known to be free of ignitable concentrations of vapors, gases, and other flammable or combustible materials. This applies to all connections and circuits, including electrical, ground and network connections as well as series and parallel circuits.**
- **Unshielded/Ungrounded cables are never permitted to be used in potentially explosive areas.**
- **Only configurations with nonincendive USB devices are permitted to be used.**
- **Doors and openings on housings must always remain closed to prevent the accumulation of foreign bodies inside the workstation.**

Nonobservance of these instructions can result in material damage, severe injury or death!

2.3.1.5.2 Description

Nonincendive equipment (keyboards, mouse) is certified for use on the front USB interface of the B&R Automation Panel 1000 (connected device). In addition to being nonincendive, any equipment connected to the front USB interface must satisfy the following criteria.



Front USB interface (USB 2.0):	
No load voltage [V_{oc}]	512 V
Short circuit current [I_{sc}]	1165 mA
Associated capacitance [C_a]	20 µF
Associated inductance [L_a]	16.8 µH

Table 284: Nonincendive circuit parameters for front USB interface

The unity concept allows the interconnection of nonincendive devices with connected devices without specifically verified combinations as the system. For this, the permitted values of V_{oc} (or U_o) and I_{sc} (or I_o) for the connected device must be less than or equal to V_{max} (U_i) and I_{max} (I_i) for the nonincendive device, and the permitted values of C_a (C_o) and L_a (L_o) for the connected device must be greater than or equal to $C_i + C_{Cable}$ and $L_i + L_{Cable}$ for the nonincendive device with field wiring.

Where C_{Cable} = 196.85 pF/m (60 pF/ft), if unknown

Where L_{Cable} = 0.656 µH/m (0.20 µH/ft), if unknown

B&R device (associated device)	-	Associated nonincendive field wiring apparatus (mouse, keyboard)
V_{oc}	≤	V_{max}
I_{sc}	≤	I_{max}
C_a	≥	$C_i + C_{Cable}$
L_a	≥	$L_i + L_{Cable}$

Table 285: Associated nonincendive field wiring apparatus

Wiring must follow national regulations and meet all legal requirements.

The B&R device must be installed in a suitable protective housing. For installations in Class I, Division 2 Hazardous Locations, the housing must be able to withstand one or more Division 2 wiring methods.

Warning!

- **Substitution of components may impair suitability for Division 2 or Division 1 hazardous (classified) locations.**
- **Do not energize or disconnect the device while the area is known to be hazardous.**
- **The associated nonincendive field wiring apparatus shall not be connected in parallel unless permitted by the associated nonincendive apparatus approval.**

The B&R device is suitable for use in Class I, Division 2, Groups A, B, C and D. It also offers nonincendive field wiring for devices in Class I, Division 2, Groups A, B, C and D.

Chapter 6 • Accessories

The following accessories have successfully completed functional testing at B&R and are approved for use with this device. Nevertheless, it is important to observe any limitations that may apply to the complete system when operated with other individual components. When operating the complete system, the specifications for the individual components must be observed.

All components listed in this manual have been subjected to extensive system and compatibility testing and are approved for use. B&R can make no guarantee regarding the functionality of non-approved accessories.

1 Power connectors

1.1 0TB103.9x

1.1.1 General information

This single-row, 3-pin 0TB103 terminal block is used to connect the voltage supply.

1.1.2 Order data

Model number	Short description	Figure
	Terminal blocks	
0TB103.9	Connector 24 VDC - 3-pin female - Screw clamps 3.31 mm²	
0TB103.91	Connector 24 VDC - 3-pin female - Cage clamp terminal block 3.31 mm²	

Table 286: 0TB103.9, 0TB103.91 - Order data

1.1.3 Technical data

> **Information:**
>
> **The following characteristics, features and limit values only apply to this accessory and can deviate from those specified for the complete system. The data specifications for the complete system take precedence over those of individual components.**

Product ID	0TB103.9	0TB103.91
General information		
Certification		
CE	Yes	
cULus	Yes	
cULus HazLoc Class 1 Division 2	Yes [1]	
GL	Yes [2]	
Terminal block		
Note	Protected against vibration by the screw flange Nominal values according to UL	
Number of pins	3 (female)	
Type of terminal clamp	Screw clamps	Cage clamp terminal block [3]
Cable type	Only copper wires (no aluminum wires!)	
Distance between contacts	5.08 mm	
Connection cross section		
AWG wire	26 to 14 AWG	26 to 12 AWG
Wire end sleeves with plastic covering	0.20 to 1.50 mm²	
Solid wires	0.20 to 2.50 mm²	
Fine strand wires	0.20 to 1.50 mm²	0.20 to 2.50 mm²
With wire end sleeves	0.20 to 1.50 mm²	
Tightening torque	0.4 Nm	-

Table 287: 0TB103.9, 0TB103.91 - Technical data

Product ID	0TB103.9	0TB103.91
Electrical characteristics		
Nominal voltage	300 V	
Nominal current [4]	10 A / contact	
Contact resistance	≤5 mΩ	

Table 287: 0TB103.9, 0TB103.91 - Technical data

1) Yes, although applies only if all components installed within the complete system have this certification and the complete system itself carries the corresponding mark.
2) Yes, although applies only if all components installed within the complete system have this certification.
3) Cage clamp terminal blocks cannot be used side-by-side.
4) The limit data for each I/O module must be taken into consideration.

1.2 0TB3103.8000

1.2.1 General information

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

1.2.2 Order data

Model number	Short description	Figure
	Terminal blocks	
0TB3103.8000	Connector, 230 VAC, 3-pin female, 4 mm² screw clamps, protected against vibration by the screw flange	

Table 288: 0TB3103.8000 - Order data

1.2.3 Technical data

Product ID	0TB3103.8000
General information	
Certification	
CE	Yes
cULus	Yes
cULus HazLoc Class 1 Division 2	Yes [1]
Terminal block	
Note	Protected against vibration by the screw flange
Number of pins	3 (male)
Type of terminal clamp	Screw clamps
Distance between contacts	7.62 mm
Connection cross section	
AWG wire	24 to 10 AWG
Wire end sleeves with plastic covering	0.25 to 4 mm²
Flexible	0.2 to 4 mm²
Inflexible	0.2 to 4 mm²
Tightening torque	0.5 to 0.6 Nm
Electrical characteristics	
Nominal voltage	400 V
Nominal current	20 A

Table 289: 0TB3103.8000 - Technical data

1) Yes, although applies only if all components installed within the complete system have this certification and the complete system itself carries the corresponding mark.

2 Terminal block ready relay

2.1 0TB2104.8000

2.1.1 General information

The single-row 4-pin TB2104 terminal block is used as the xxx for the 5AC901.IRDY-00 ready relay.

2.1.2 Order data

Model number	Short description	Figure
	Terminal blocks	
0TB2104.8000	Connector 24 VDC - 4-pin female - Screw clamps 2.5 mm²	

Table 290: 0TB2104.8000 - Order data

2.1.3 Technical data

Product ID	0TB2104.8000
General information	
Certification	
CE	Yes
cULus	Yes
Terminal block	
Note	Nominal values according to UL
Number of pins	4 (female)
Type of terminal clamp	Screw clamps
Cable type	Only copper wires (no aluminum wires!)
Distance between contacts	5.08 mm
Connection cross section	
AWG wire	26 to 14 AWG
Wire end sleeves with plastic covering	0.2 to 1.5 mm²
Solid wires	0.2 to 2.5 mm²
Fine strand wires	0.2 to 1.5 mm²
With wire end sleeves	0.2 to 1.5 mm²
Electrical characteristics	
Nominal voltage	300 V
Nominal current [1)]	10 A

Table 291: 0TB2104.8000 - Technical data

1) The limit data for each IF option must be taken into consideration.

3 Replacement CMOS batteries

3.1 0AC201.91 / 4A0006.00-000

3.1.1 General information

This lithium battery is needed to back BIOS CMOS data and the real-time clock (RTC).

The battery is subject to wear and must be replaced when the battery power is insufficient ("Bad" status).

3.1.2 Order data

Model number	Short description	Figure
	Batteries	
0AC201.91	Lithium batteries 4 pcs., 3 V / 950 mAh button cell We hereby state that the lithium cells contained in this shipment qualify as "partly regulated". Handle with care. If the package is damaged, inspect the cells, repack intact cells and protect cells against short circuits. For emergency information, call RENATA SA at + 41 61 319 28 27	
4A0006.00-000	Lithium battery, 3 V / 950 mAh, button cell	

Table 292: 0AC201.91, 4A0006.00-000 - Order data

3.1.3 Technical data

Warning!

The battery is only permitted to be replaced by a Renata CR2477N battery. The use of another battery may present a risk of fire or explosion.

The battery may explode if handled improperly. Do not recharge, disassemble or dispose of in fire.

Information:

The following characteristics, features and limit values only apply to this accessory and can deviate from those specified for the complete system. The data specifications for the complete system take precedence over those of individual components.

Product ID	0AC201.91	4A0006.00-000
General information		
Storage time	Max. 3 years at 30°C	
Certification		
CE	Yes	
cULus	Yes	
Electrical characteristics		
Capacity	950 mAh	
Self-discharging	<1% per year (at 23°C)	
Voltage range	3 V	
Environmental conditions		
Temperature		
Storage	-20 to 60°C	
Relative humidity		
Operation	0 to 95%	
Storage	0 to 95%	
Transport	0 to 95%	

Table 293: 0AC201.91, 4A0006.00-000 - Technical data

4 CFast cards

4.1 General information

CFast cards are data storage devices that are easy to exchange. Due to their robustness against environmental influences (e.g. temperature, shock, vibration, etc.), CFast cards are ideal for use as storage media in industrial environments.

CFast cards are a development derived from CompactFlash cards that use the SATA protocol instead. CFast cards are not compatible with CompactFlash cards.

4.2 Basic information

In order to be suited for use in industrial automation, CFast cards must be highly reliable. The following items are very important to achieving the necessary level of reliability:

- The flash technology used
- An efficient algorithm for maximizing service life
- Good mechanisms for detecting and fixing errors in the flash memory

4.2.1 Flash technology

CFast cards are currently available with MLC (multi-level cell) and SLC (single-level cell) flash blocks.

In addition to a service life that is 10 times longer than MLC flash components, SLC flash components also have write/delete cycles that are 33 times faster, making CFast cards with SLC flash components the preferred choice for industrial environments. These factors are still heavily dependent on the actual application, however, so that no blanket statement can be made.

Due to increasing cost pressure as well as improved wear level algorithms and monitoring features (S.M.A.R.T.), MLC flash technology is still widely used in this market.

4.2.2 Wear leveling

Wear leveling is an algorithm that can be used to maximize the service life of a CFast card. There are three different algorithms:

- Dynamic wear leveling
- Static wear leveling

The basic idea behind wear leveling is to distribute data over a broad area of blocks or cells on the disk so that the same areas aren't deleted and rewritten over and over again.

4.2.2.1 Dynamic wear leveling

Dynamic wear leveling makes it possible to utilize unused flash blocks when writing to a file.
If the disk is 80% full with files, then only 20% can be used for wear leveling.
The service life of the CFast card is therefore dependent on the amount of unused flash blocks.

4.2.2.2 Static wear leveling

Static wear leveling monitors which data is rarely modified. From time to time, the controller then moves this data to blocks that have already been used frequently in order to prevent further wear on those cells.

4.2.3 ECC error correction

Bit errors can be caused by inactivity or when a certain cell is being operated. Error correction coding (ECC) implemented via hardware or software can detect and correct many errors of this type.

4.2.4 S.M.A.R.T. support

Self-Monitoring, Analysis and Reporting Technology (S.M.A.R.T.) is an industry standard for mass storage devices that has been introduced to monitor important parameters and quickly detect imminent failures. Critical performance and calibration data is monitored and stored in order to help predict the probability of errors.

4.2.5 Calculating the expected service life for an existing application

The following procedure can be used to better verify whether a CFast card with SLC or MLC technology should be used in a particular application.

- Read the "Average erase count" of the data storage device via S.M.A.R.T.
- Fully operate the system with the respective data storage device over a defined period of time (e.g. 1 week).
- Determine the number of erase cycles with "Average erase count".
- Determine the expected service life using the maximum guaranteed write/erase cycles (MLC: 3,000, SLC: 100,000).

Example of an MLC CFast card over the period of a week:

$$\text{Expected service life} = \frac{3000 * 1 \text{ week}}{\text{Completed erase cycles}}$$

4.2.6 Dimensions

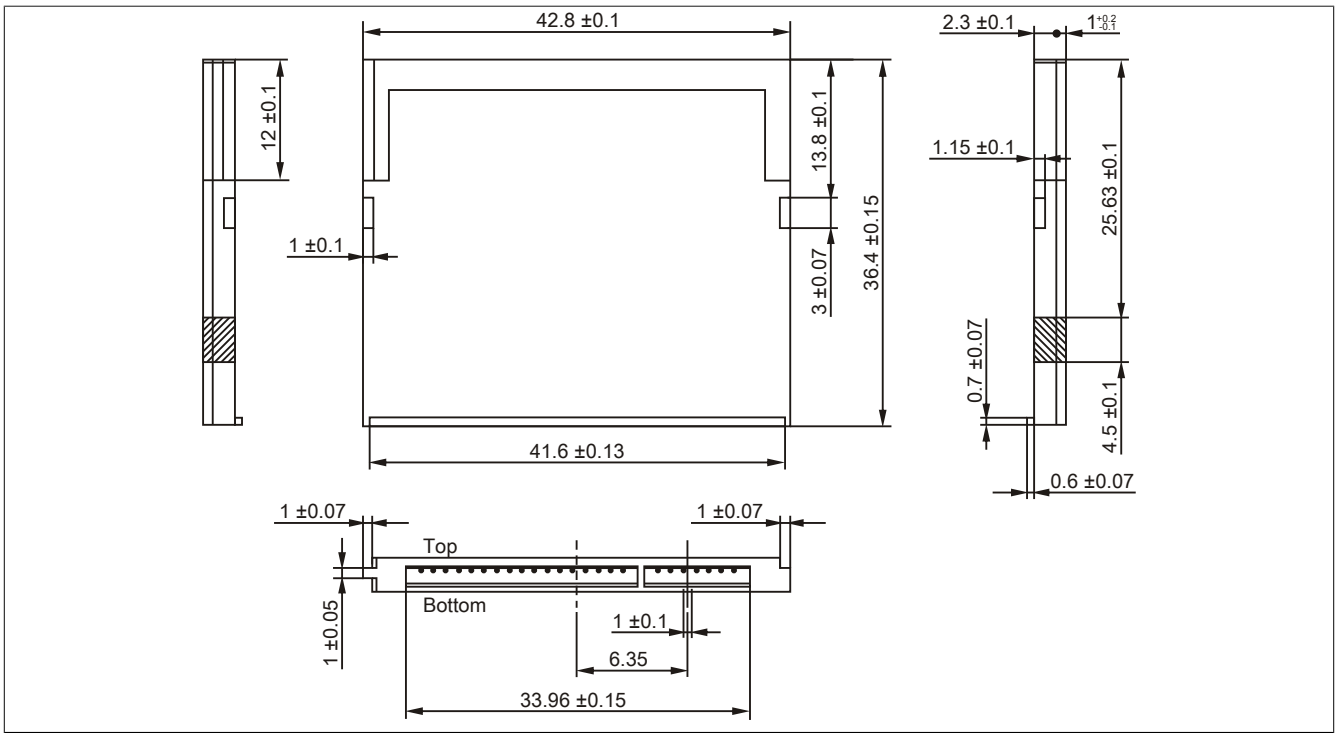


Figure 223: CFast card - Dimensions

4.3 5CFAST.xxxx-00

4.3.1 General information

These CFast cards are based on single-level cell (SLC) technology and compatible with SATA 2.6. Their dimensions are identical to CompactFlash cards.

4.3.2 Order data

Model number	Short description	Figure
	CFast cards	
5CFAST.2048-00	CFast card, 2 GB SLC	
5CFAST.4096-00	CFast card, 4 GB SLC	
5CFAST.8192-00	CFast card, 8 GB SLC	
5CFAST.016G-00	CFast card, 16 GB SLC	
5CFAST.032G-00	CFast card, 32 GB SLC	

Table 294: 5CFAST.2048-00, 5CFAST.4096-00, 5CFAST.8192-00, 5CFAST.016G-00, 5CFAST.032G-00 - Order data

4.3.3 Technical data

Information:

Due to the changeover to the new controller, revision E0 may not be image-compatible to previous revisions when using older cloning tools. This is not the case when using current cloning tools.

Information:

The following characteristics, features and limit values only apply to this accessory and can deviate from those specified for the complete system. The data specifications for the complete system take precedence over those of individual components.

Product ID	5CFAST.2048-00 ≥ Rev. E0	5CFAST.4096-00 ≥ Rev. E0	5CFAST.8192-00 ≥ Rev. E0	5CFAST.016G-00 ≥ Rev. E0	5CFAST.032G-00 ≥ Rev. E0
General information					
Capacity	2 GB	4 GB	8 GB	16 GB	32 GB
Data retention	10 years				
Data reliability	<1 unrecoverable error in 10^{14} bit read accesses				
Lifetime monitoring	Yes				
MTBF	>2,500,000 hours (at 25°C)				
Maintenance	None				
Supported operating modes	SATA 2.6, max. PIO Mode 4, Multiword DMA Mode 2, Ultra DMA Mode 6				
Sequential read					
Typical					
With 128 kB block size	94 MB/s	108 MB/s	108 MB/s	108 MB/s	116 MB/s
With 4 kB block size	42 MB/s	46 MB/s	46 MB/s	46 MB/s	46 MB/s
Maximum					
With 128 kB block size	100 MB/s	115 MB/s	115 MB/s	115 MB/s	120 MB/s
With 4 kB block size	42 MB/s				
Sequential write					
Typical					
With 128 kB block size	57 MB/s	86 MB/s	86 MB/s	86 MB/s	111 MB/s
With 4 kB block size	36 MB/s	40 MB/s	40 MB/s	40 MB/s	40 MB/s
Maximum					
With 128 kB block size	65 MB/s	95 MB/s	95 MB/s	95 MB/s	120 MB/s
With 4 kB block size	40 MB/s	45 MB/s	45 MB/s	45 MB/s	45 MB/s
Certification					
CE	Yes				
cULus	Yes				
cULus HazLoc Class 1 Division 2	Yes[1)]				
GOST-R	Yes				
GL	Yes[2)]				
Endurance					
SLC flash	Yes				

Table 295: 5CFAST.2048-00, 5CFAST.4096-00, 5CFAST.8192-00, 5CFAST.016G-00, 5CFAST.032G-00 - Technical data

Product ID	5CFAST.2048-00 ≥ Rev. E0	5CFAST.4096-00 ≥ Rev. E0	5CFAST.8192-00 ≥ Rev. E0	5CFAST.016G-00 ≥ Rev. E0	5CFAST.032G-00 ≥ Rev. E0
Guaranteed data volume					
Guaranteed [3]	185 TBW	371 TBW	745 TBW	1468 TBW	2937 TBW
Clear/Write cycles					
Guaranteed	100,000				
Wear leveling	Static				
S.M.A.R.T. support	Yes				
Support					
Hardware	APC2100, APC910, PPC2100, PPC900				
Operating systems					
Windows 7 32-bit	No	No	No	Yes	Yes
Windows 7 64-bit	No	No	No	No	Yes
Windows Embedded Standard 7, 32-bit	No	No	No	Yes	Yes
Windows Embedded Standard 7, 64-bit	No	No	No	Yes	Yes
Windows XP Professional	No	Yes	Yes	Yes	Yes
Windows Embedded Standard 2009	Yes				
Software					
PVI Transfer	≥V4.0.0.8 (part of PVI Development Setup ≥V3.0.2.3014)				
B&R Embedded OS Installer	≥V3.10	≥V3.10	≥V3.10	≥V3.20	≥V3.21
Environmental conditions					
Temperature					
Operation	-40 to 85°C				
Storage	-50 to 100°C				
Transport	-50 to 100°C				
Relative humidity					
Operation	Max. 85% at 85°C				
Storage	Max. 85% at 85°C				
Transport	Max. 85% at 85°C				
Vibration					
Operation	10 to 2000 Hz: 20 g peak				
Storage	10 to 2000 Hz: 20 g peak				
Transport	10 to 2000 Hz: 20 g peak				
Shock					
Operation	1500 g peak, 0.5 ms				
Storage	1500 g peak, 0.5 ms				
Transport	1500 g peak, 0.5 ms				
Mechanical characteristics					
Dimensions					
Width	42.8 ±0.10 mm				
Length	36.4 ±0.10 mm				
Depth	3.6 ±0.10 mm				
Weight	10 g				

Table 295: 5CFAST.2048-00, 5CFAST.4096-00, 5CFAST.8192-00, 5CFAST.016G-00, 5CFAST.032G-00 - Technical data

1) Yes, although applies only if all components installed within the complete system have this certification and the complete system itself carries the corresponding mark.
2) Yes, although applies only if all components installed within the complete system have this certification.
3) TBW = Terabytes written.
Sequential access without a file system.

Product ID	5CFAST.2048-00 ≤ Rev. D0	5CFAST.4096-00 ≤ Rev. D0	5CFAST.8192-00 ≤ Rev. D0	5CFAST.016G-00 ≤ Rev. D0	5CFAST.032G-00 ≤ Rev. D0
General information					
Capacity	2 GB	4 GB	8 GB	16 GB	32 GB
Data retention	10 years				
Data reliability	<1 unrecoverable error in 10^{14} bit read accesses				
Lifetime monitoring	Yes				
MTBF	>2,500,000 hours (at 25°C)				
Maintenance	None				
Supported operating modes	SATA 2.6, max. PIO Mode 4, Multiword DMA Mode 2, Ultra DMA Mode 6				
Sequential read					
Typical					
With 128 kB block size	56 MB/s	107 MB/s	116 MB/s	116 MB/s	116 MB/s
With 4 kB block size	23 MB/s	26 MB/s	29 MB/s	29 MB/s	29 MB/s
Maximum					
With 128 kB block size	60 MB/s	110 MB/s	120 MB/s	120 MB/s	120 MB/s
With 4 kB block size	25 MB/s	30 MB/s	35 MB/s	35 MB/s	35 MB/s
Sequential write					
Typical					
With 128 kB block size	24 MB/s	49 MB/s	93 MB/s	93 MB/s	93 MB/s
With 4 kB block size	17 MB/s	19 MB/s	21 MB/s	21 MB/s	21 MB/s
Maximum					
With 128 kB block size	30 MB/s	55 MB/s	100 MB/s	100 MB/s	100 MB/s
With 4 kB block size	20 MB/s	25 MB/s	25 MB/s	25 MB/s	25 MB/s
Certification					
CE	Yes				
cULus	Yes				
cULus HazLoc Class 1 Division 2	Yes[1)]				
GOST-R	Yes				
GL	Yes[2)]				
Endurance					
SLC flash	Yes				
Guaranteed data volume					
Guaranteed [3)]	185 TBW	371 TBW	745 TBW	1468 TBW	2937 TBW
Clear/Write cycles					
Guaranteed	100,000				
Wear leveling	Static				
S.M.A.R.T. support	Yes				
Support					
Hardware	APC910, PPC900				
Operating systems					
Windows 7 32-bit	No	No	No	Yes	Yes
Windows 7 64-bit	No	No	No	No	Yes
Windows Embedded Standard 7, 32-bit	No	No	No	Yes	Yes
Windows Embedded Standard 7, 64-bit	No	No	No	Yes	Yes
Windows XP Professional	No	Yes	Yes	Yes	Yes
Windows Embedded Standard 2009	Yes				
Software					
PVI Transfer	≥V4.0.0.8 (part of PVI Development Setup ≥V3.0.2.3014)				
B&R Embedded OS Installer	≥V3.10	≥V3.10	≥V3.10	≥V3.20	≥V3.21
Environmental conditions					
Temperature					
Operation	0 to 70°C				
Storage	-50 to 100°C				
Transport	-50 to 100°C				
Relative humidity					
Operation	Max. 85% at 70°C				
Storage	Max. 85% at 70°C				
Transport	Max. 85% at 70°C				
Vibration					
Operation	10 to 2000 Hz: 20 g peak				
Storage	10 to 2000 Hz: 20 g peak				
Transport	10 to 2000 Hz: 20 g peak				
Shock					
Operation	1500 g peak, 0.5 ms				
Storage	1500 g peak, 0.5 ms				
Transport	1500 g peak, 0.5 ms				

Table 296: 5CFAST.2048-00, 5CFAST.4096-00, 5CFAST.8192-00, 5CFAST.016G-00, 5CFAST.032G-00 - Technical data

Product ID	5CFAST.2048-00 ≤ Rev. D0	5CFAST.4096-00 ≤ Rev. D0	5CFAST.8192-00 ≤ Rev. D0	5CFAST.016G-00 ≤ Rev. D0	5CFAST.032G-00 ≤ Rev. D0
Mechanical characteristics					
Dimensions					
Width	42.8 ±0.10 mm				
Length	36.4 ±0.10 mm				
Depth	3.6 ±0.10 mm				
Weight	10 g				

Table 296: 5CFAST.2048-00, 5CFAST.4096-00, 5CFAST.8192-00, 5CFAST.016G-00, 5CFAST.032G-00 - Technical data

1) Yes, although applies only if all components installed within the complete system have this certification and the complete system itself carries the corresponding mark.
2) Yes, although applies only if all components installed within the complete system have this certification.
3) TBW = Terabytes written.
Sequential access without a file system.

4.3.4 Temperature/Humidity diagram

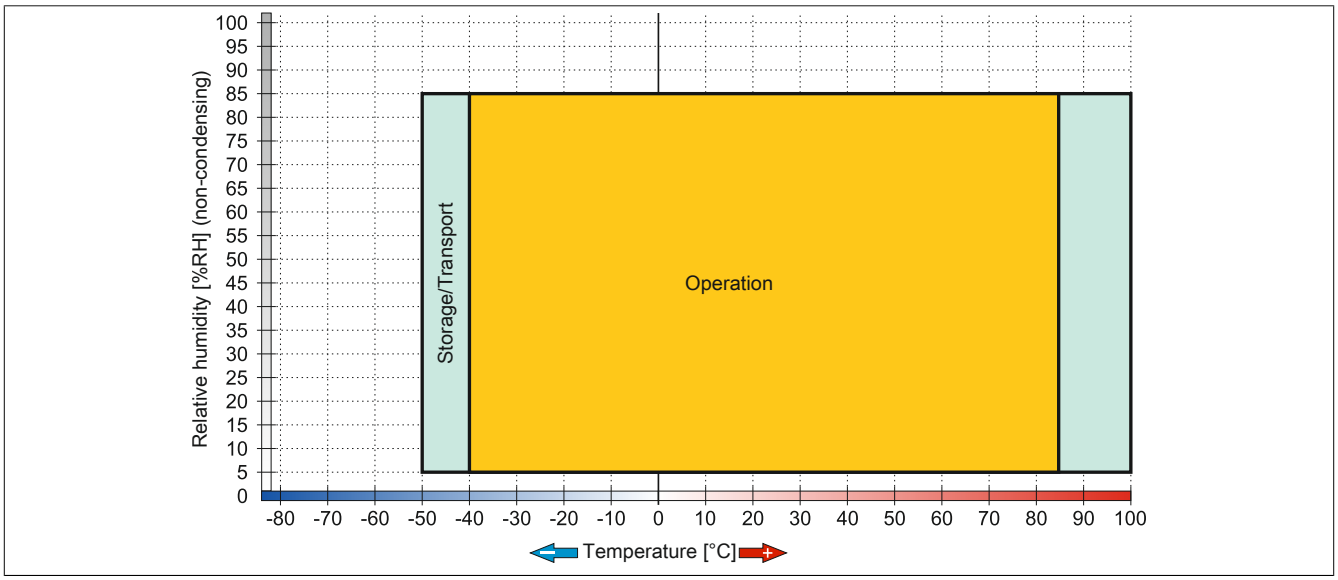


Figure 224: 5CFAST.xxxx-00 ≥ Rev. E0 - Temperature/Humidity diagram

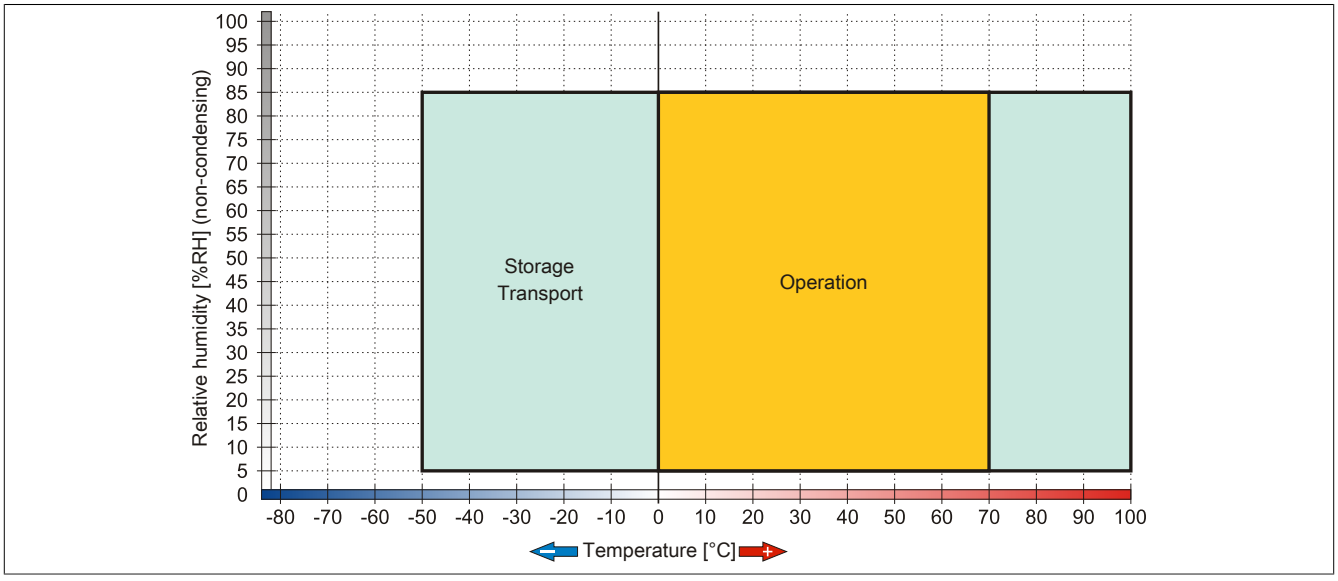


Figure 225: 5CFAST.xxxx-00 ≤ Rev. D0 - Temperature/Humidity diagram

4.4 5CFAST.xxxx-10

4.4.1 General information

CFast cards are based on multi-level cell (MLC) technology and compatible with SATA 3. Their dimensions are identical to CompactFlash cards.

4.4.2 Order data

Model number	Short description	Figure
	CFast cards	
5CFAST.032G-10	CFast card, 32 GB MLC	
5CFAST.064G-10	CFast card, 64 GB MLC	
5CFAST.128G-10	CFast card, 128 GB MLC	

Table 297: 5CFAST.032G-10, 5CFAST.064G-10, 5CFAST.128G-10 - Order data

4.4.3 Technical data

Information:

The following characteristics, features and limit values only apply to this accessory and can deviate from those specified for the complete system. The data specifications for the complete system take precedence over those of individual components.

Product ID	5CFAST.032G-10	5CFAST.064G-10	5CFAST.128G-10
General information			
Capacity	32 GB	64 GB	128 GB
Data retention	10 years [1]		
Data reliability	<1 unrecoverable error in 10^{17} bit read accesses		
Lifetime monitoring	Yes		
MTBF	>3,000,000 hours (at 25°C)		
Maintenance	None		
Supported operating modes	SATA 3, SATA 2, SATA 1		
Sequential read			
Maximum	300 MB/s	310 MB/s	310 MB/s
Sequential write			
Maximum	75 MB/s	150 MB/s	150 MB/s
Certification			
CE	Yes		
cULus	Yes		
cULus HazLoc Class 1 Division 2	Yes [2]		
GL	Yes [3]		
Endurance			
MLC flash	Yes		
Guaranteed data volume			
Guaranteed [4]	86.4 TBW	172.8 TBW	345.6 TBW
Clear/Write cycles			
Guaranteed	3000		
Wear leveling	Static		
Error correction coding (ECC)	Yes		
S.M.A.R.T. support	Yes		
Support			
Hardware	APC910, APC2100, PPC900, PPC2100		

Table 298: 5CFAST.032G-10, 5CFAST.064G-10, 5CFAST.128G-10 - Technical data

Product ID	5CFAST.032G-10	5CFAST.064G-10	5CFAST.128G-10
Operating systems			
Windows 7 32-bit		Yes	
Windows 7 64-bit		Yes	
Windows Embedded Standard 7, 32-bit		Yes	
Windows Embedded Standard 7, 64-bit		Yes	
Windows XP Professional		Yes	
Windows Embedded Standard 2009		Yes	
Software			
PVI Transfer	≥ V4.0.20 or V4.1.5	≥ V4.0.20 or V4.1.5	≥V4.0.22 or V4.1.6
B&R Embedded OS Installer		≥V3.21	
Environmental conditions			
Temperature			
Operation		-40 to 85°C	
Storage		-55 to 95°C	
Transport		-55 to 95°C	
Relative humidity			
Operation		10 to 95%, non-condensing	
Storage		10 to 95%, non-condensing	
Transport		10 to 95%, non-condensing	
Vibration			
Operation		7 to 2000 Hz: 20 g peak	
Storage		7 to 2000 Hz: 20 g peak	
Transport		7 to 2000 Hz: 20 g peak	
Shock			
Operation		1500 g peak, 0.5 ms	
Storage		1500 g peak, 0.5 ms	
Transport		1500 g peak, 0.5 ms	
Mechanical characteristics			
Dimensions			
Width		42.8 ±0.10 mm	
Length		36.4 ±0.10 mm	
Depth		3.6 ±0.10 mm	
Weight		10 g	

Table 298: 5CFAST.032G-10, 5CFAST.064G-10, 5CFAST.128G-10 - Technical data

1) At 25°C ambient temperature at the start of service life.
2) Yes, although applies only if all components installed within the complete system have this certification and the complete system itself carries the corresponding mark.
3) Yes, although applies only if all components installed within the complete system have this certification.
4) TBW = Terabytes written.
Sequential access without a file system.

4.4.4 Temperature/Humidity diagram

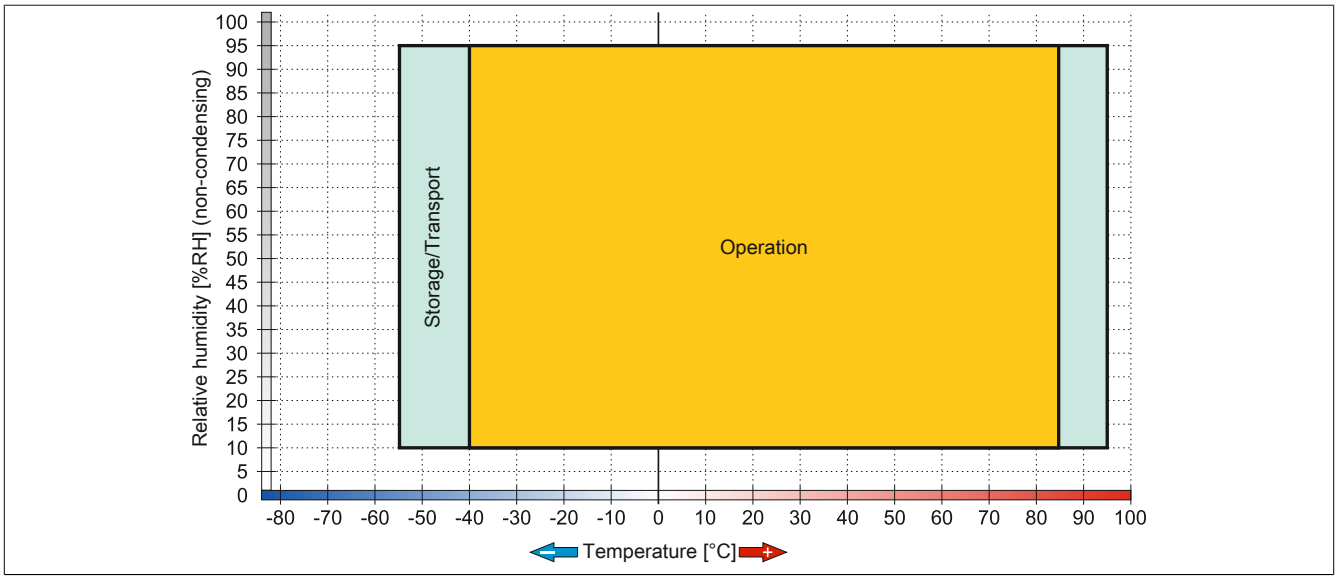


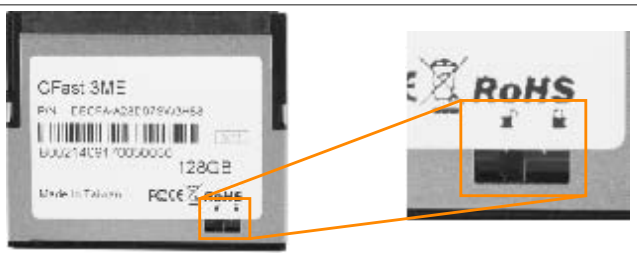
Figure 226: 5CFAST.xxxx-10 - Temperature/Humidity diagram

4.4.5 Write protection

Write protection can prevent data from being deleted or changed on the CFast card. If write protection is enabled, data can only be read.

Information:

If an operating system is installed on the CFast card, write protection must be disabled.



Disabled Enabled

5 USB flash drives

5.1 5MMUSB.xxxx-01

5.1.1 General information

USB flash drives are data storage devices that are easy to exchange. Because of their high-speed data transfer (USB 2.0), USB flash drives are ideal for use as portable data storage. Without requiring additional drivers ("hot plugging", except in the case of Windows 98SE), the USB flash drive can immediately act as an additional drive for reading or writing data.

Information:

Due to the large number of USB flash drives available on the market as well as their short product life cycle, we reserve the right to supply alternative products at any time. The following measures may therefore be necessary in order to boot from these flash drives as well:

- **The flash drive must be reformatted or in some cases even repartitioned (set active partition).**
- **The flash drive must be the first bootable device in the BIOS boot order; alternatively, the IDE controllers can be disabled in BIOS. This can be avoided in most cases if the "fdisk /mbr" command is additionally executed on the USB flash drive.**

5.1.2 Order data

Model number	Short description	Figure
	USB accessories	
5MMUSB.2048-01	USB 2.0 flash drive, 2048 MB, B&R	
5MMUSB.4096-01	USB 2.0 flash drive, 4096 MB, B&R	

Table 299: 5MMUSB.2048-01, 5MMUSB.4096-01 - Order data

5.1.3 Technical data

Product ID	5MMUSB.2048-01	5MMUSB.4096-01
General information		
Capacity	2 GB	4 GB
LED status indicators	1 LED (green) [1)]	
MTBF	>3,000,000 hours	
Type	USB 1.1, USB 2.0	
Maintenance	None	
Default file system	FAT16	FAT32
Certification		
CE	Yes	
GOST-R	Yes	
Interfaces		
USB		
Type	USB 1.1, USB 2.0	
Connection	To any USB type A interface	
Transfer rate	Low speed (1.5 Mbit/s), full speed (12 Mbit/s), high speed (480 Mbit/s)	
Sequential reading	Full speed max. 1 MB/s, High speed max. 32 MB/s	
Sequential writing	Full speed max. 0.9 MB/s, High speed max. 23 MB/s	
Endurance		
SLC flash	Yes	
Data retention	>10 years	
Data reliability	<1 unrecoverable error in 10^{14} bit read accesses	
Connection cycles	>1,500	
Support		
Operating systems		
Windows 7	Yes	
Windows XP Professional	Yes	
Windows XP Embedded	Yes	
Windows ME	Yes	
Windows 2000	Yes	
Windows CE 5.0	Yes	
Windows CE 4.2	Yes	

Table 300: 5MMUSB.2048-01, 5MMUSB.4096-01 - Technical data

Product ID	5MMUSB.2048-01	5MMUSB.4096-01
Electrical characteristics		
Current consumption	Max. 500 µA sleep mode, max. 120 mA read/write	
Environmental conditions		
Temperature		
Operation	0 to 70°C	
Storage	-50 to 100°C	
Transport	-50 to 100°C	
Relative humidity		
Operation	85%, non-condensing	
Storage	85%, non-condensing	
Transport	85%, non-condensing	
Vibration		
Operation	20 to 2000 Hz: 20 g (peak)	
Storage	20 to 2000 Hz: 20 g (peak)	
Transport	20 to 2000 Hz: 20 g (peak)	
Shock		
Operation	Max. 1500 g (peak)	
Storage	Max. 1500 g (peak)	
Transport	Max. 1500 g (peak)	
Elevation		
Operation	Max. 3048 m	
Storage	Max. 12192 m	
Transport	Max. 12192 m	
Mechanical characteristics		
Dimensions		
Width	17.97 mm	
Length	67.85 mm	
Height	8.35 mm	

Table 300: 5MMUSB.2048-01, 5MMUSB.4096-01 - Technical data

1) Indicates data being transferred (sending and receiving).

5.1.4 Temperature/Humidity diagram

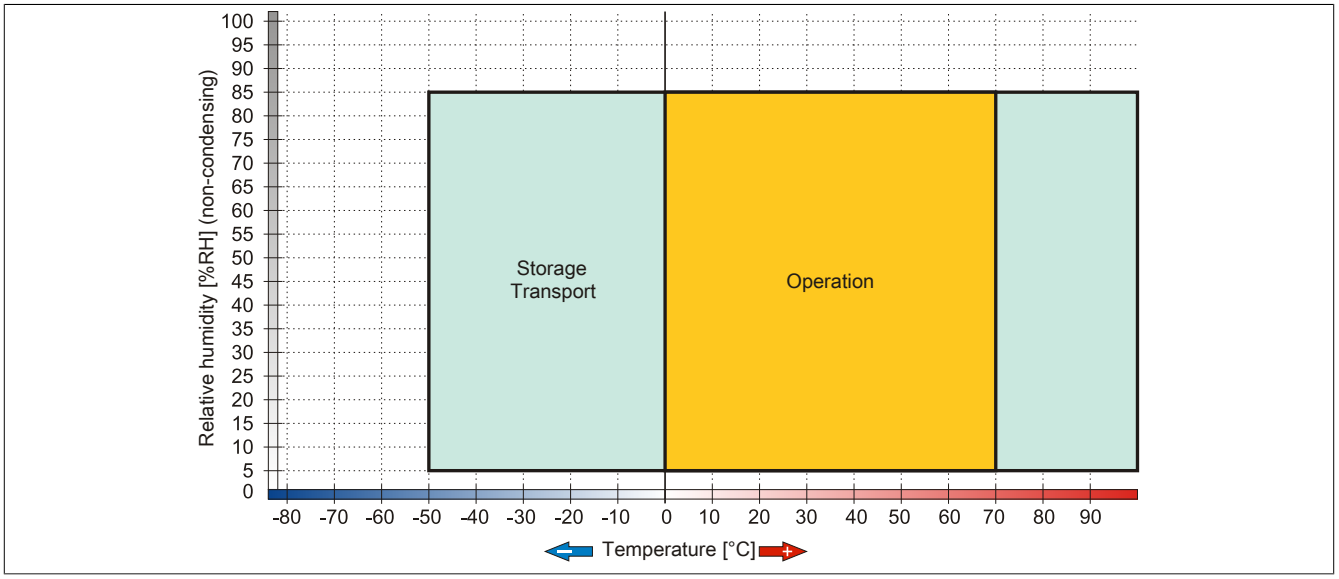


Figure 227: 5MMUSB.xxxx-01 - Temperature/Humidity diagram

6 Cables

6.1 DVI cables

6.1.1 5CADVI.0xxx-00

6.1.1.1 General information

5CADVI.0xxx-00 DVI cables are designed for use in inflexible applications.

> **Caution!**
>
> **Power must be disconnected before connecting or disconnecting cables.**

6.1.1.2 Order data

Model number	Short description	Figure
	DVI cables	
5CADVI.0018-00	DVI-D cable - 1.8 m	
5CADVI.0050-00	DVI-D cable - 5 m	
5CADVI.0100-00	DVI-D cable - 10 m	

Table 301: 5CADVI.0018-00, 5CADVI.0050-00, 5CADVI.0100-00 - Order data

6.1.1.3 Technical data

Product ID	5CADVI.0018-00	5CADVI.0050-00	5CADVI.0100-00
General information			
Certification			
CE		Yes	
cULus		Yes	
GOST-R		Yes	
GL		Yes [1]	
Cable construction			
Wire cross section		AWG 28	
Shield		Individual cable pairs, entire cable	
Complete shielding		Tinned copper braiding, optical coverage >86%	
Outer sheathing			
Material		PVC	
Color		Beige	
Labeling		AWM STYLE 20276 80°C 30V VW1 DVI DIGITAL SINGLE LINK DER AN	
Connector			
Type		2x DVI-D (18+1), male	
Connection cycles		100	
Locating screw tightening torque		Max. 0.5 Nm	
Electrical characteristics			
Conductor resistance		Max. 237 Ω/km	
Insulation resistance		Min. 100 MΩ/km	
Mechanical characteristics			
Dimensions			
Length	1.8 m ±50 mm	5 m ±80 mm	10 m ±100 mm
Diameter		Max. 8.5 mm	
Flex radius		≥5x cable diameter (male connector - ferrite bead and ferrite bead - ferrite bead)	
Weight	Approx. 260 g	Approx. 460 g	Approx. 790 g

Table 302: 5CADVI.0018-00, 5CADVI.0050-00, 5CADVI.0100-00 - Technical data

1) Yes, although applies only if all components installed within the complete system have this certification.

6.1.1.4 Flex radius specifications

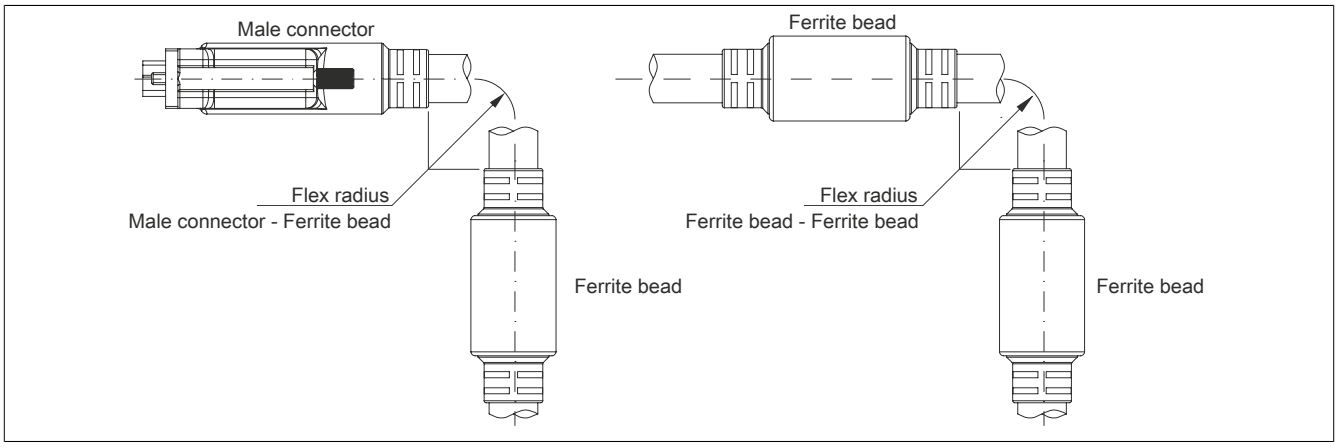


Figure 228: Flex radius specifications

6.1.1.5 Dimensions

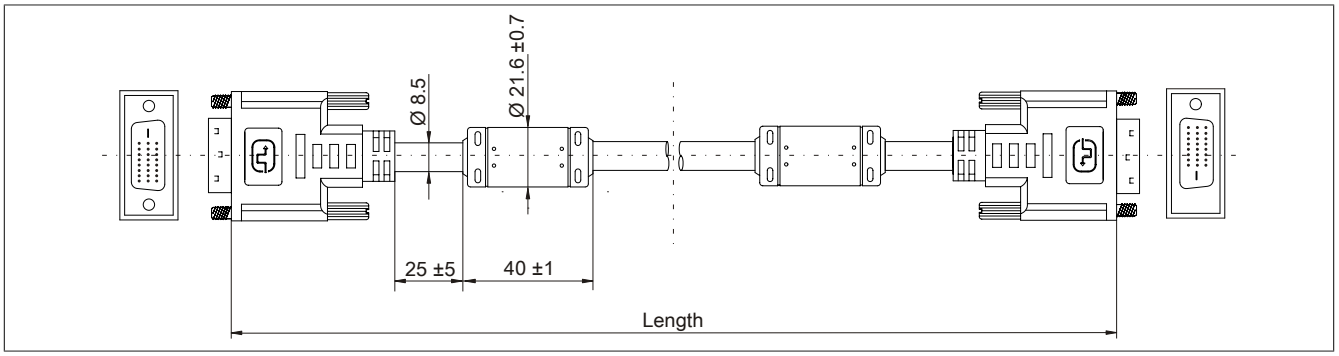


Figure 229: 5CADVI.0xxx-00 - Dimensions

6.1.1.6 Cable pinout

Warning!

Field-assembled cables must be wired according to these specifications.

If a field-assembled cable is used, B&R cannot guarantee that it will function properly. All cables provided by B&R are guaranteed to function properly, however.

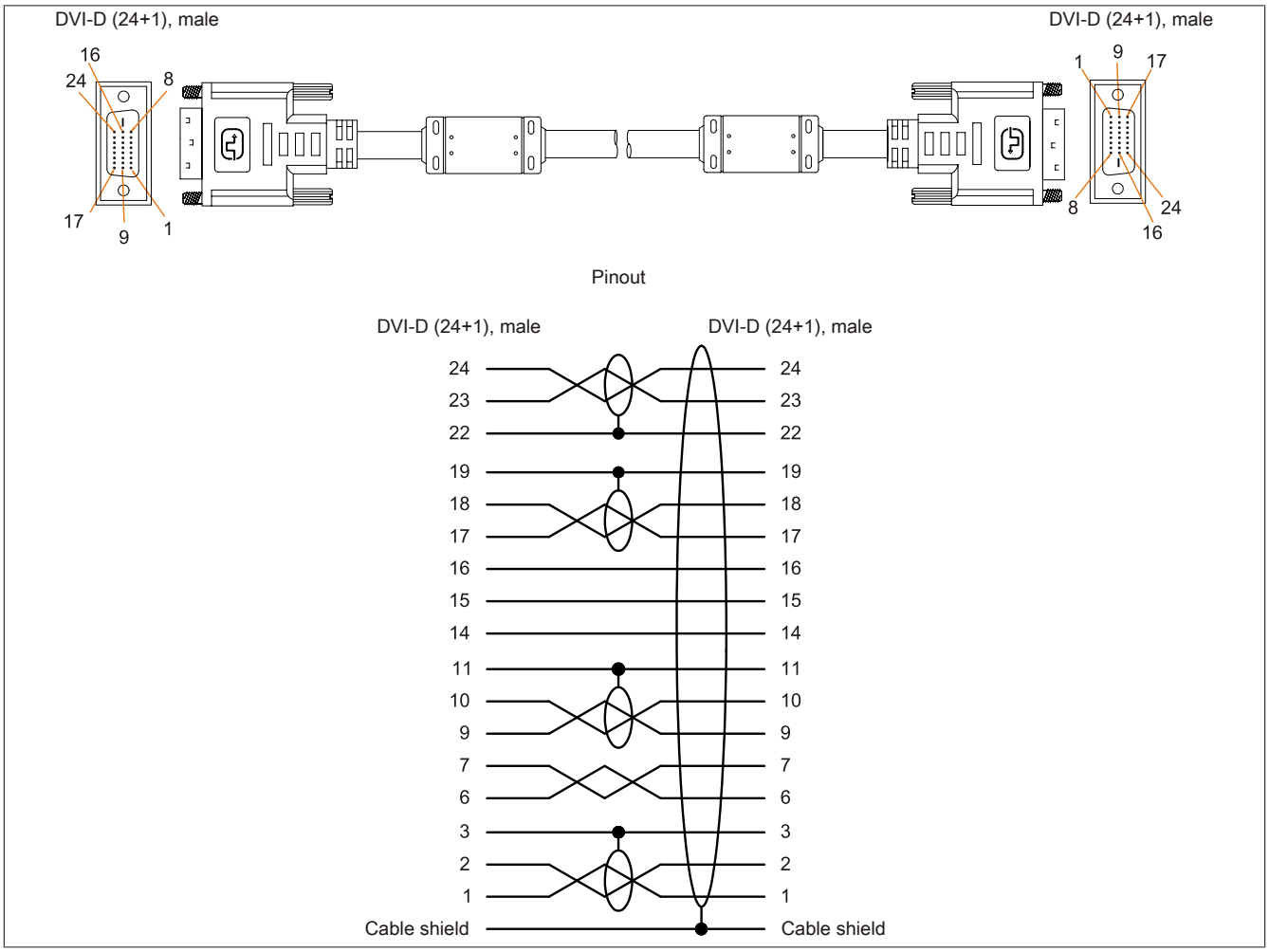


Figure 230: 5CADVI.0xxx-00 - Pinout

6.2 SDL cables

6.2.1 5CASDL.0xxx-00

6.2.1.1 General information

5CASDL.0xxx-00 SDL cables are designed for use in inflexible applications. 5CASDL.0xxx-03 SDL flex cables are required for flexible applications (e.g. swing arm systems).

Caution!

Power must be disconnected before connecting or disconnecting cables.

6.2.1.2 Order data

Model number	Short description	Figure
	SDL cables	
5CASDL.0008-00	SDL cable - 0.8 m	
5CASDL.0018-00	SDL cable - 1.8 m	
5CASDL.0050-00	SDL cable - 5 m	
5CASDL.0100-00	SDL cable - 10 m	
5CASDL.0150-00	SDL cable - 15 m	
5CASDL.0200-00	SDL cable - 20 m	
5CASDL.0250-00	SDL cable - 25 m	
5CASDL.0300-00	SDL cable - 30 m	

Table 303: 5CASDL.0008-00, 5CASDL.0018-00, 5CASDL.0050-00, 5CASDL.0100-00, 5CASDL.0150-00, 5CASDL.0200-00, 5CASDL.0250-00, 5CASDL.0300-00 - Order data

6.2.1.3 Technical data

Product ID	5CASDL. 0008-00	5CASDL. 0018-00	5CASDL. 0050-00	5CASDL. 0100-00	5CASDL. 0150-00	5CASDL. 0200-00	5CASDL. 0250-00	5CASDL. 0300-00
General information								
Certification								
CE	Yes							
cULus	Yes							
GOST-R	-	Yes						
GL	Yes [1]							
Cable construction								
Wire cross section	AWG 28			AWG 24				
Shield	Individual cable pairs, entire cable							
Complete shielding	Tinned copper braiding, optical coverage >85%							
Outer sheathing								
Material	PVC							
Color	Black							
Labeling	E74020-C (UL) AWM STYLE 20176 80°C 30V VW-1 DVI DIGITAL LINK							
Connector								
Type	2x DVI-D (24+1), male							
Connection cycles	100							
Contacts	Gold-plated							
Mechanical protection	Metal cover with crimped stress relief							
Locating screw tightening torque	Max. 0.5 Nm							
Electrical characteristics								
Conductor resistance								
AWG 24	-			≤93 Ω/km				
AWG 28	≤237 Ω/km			-				
Insulation resistance	Min. 10 MΩ/km							
Mechanical characteristics								
Dimensions								
Length	0.8 m ±25 mm	1.8 m ±30 mm	5 m ±30 mm	10 m ±50 mm	15 m ±100 mm	20 m ±100 mm	25 m ±100 mm	30 m ±100 mm
Diameter	Typ. 8.6 ±0.2 mm Max. 9 mm			Typ. 11 ±0.2 mm Max. 11.5 mm				
Flex radius	≥5x cable diameter (male connector - ferrite bead and ferrite bead - ferrite bead)							
Flexibility	Limited flexibility, valid for ferrite bead - ferrite bead (tested 100 cycles with 5x cable diameter, 20 cycles/minute)							
Weight	Approx. 206 g	Approx. 300 g	Approx. 580 g	Approx. 1500 g	Approx. 2250 g	Approx. 2880 g	Approx. 4800 g	Approx. 5520 g

Table 304: 5CASDL.0008-00, 5CASDL.0018-00, 5CASDL.0050-00, 5CASDL.0100-00, 5CASDL.0150-00, 5CASDL.0200-00, 5CASDL.0250-00, 5CASDL.0300-00 - Technical data

1) Yes, although applies only if all components installed within the complete system have this certification.

6.2.1.4 Flex radius specifications

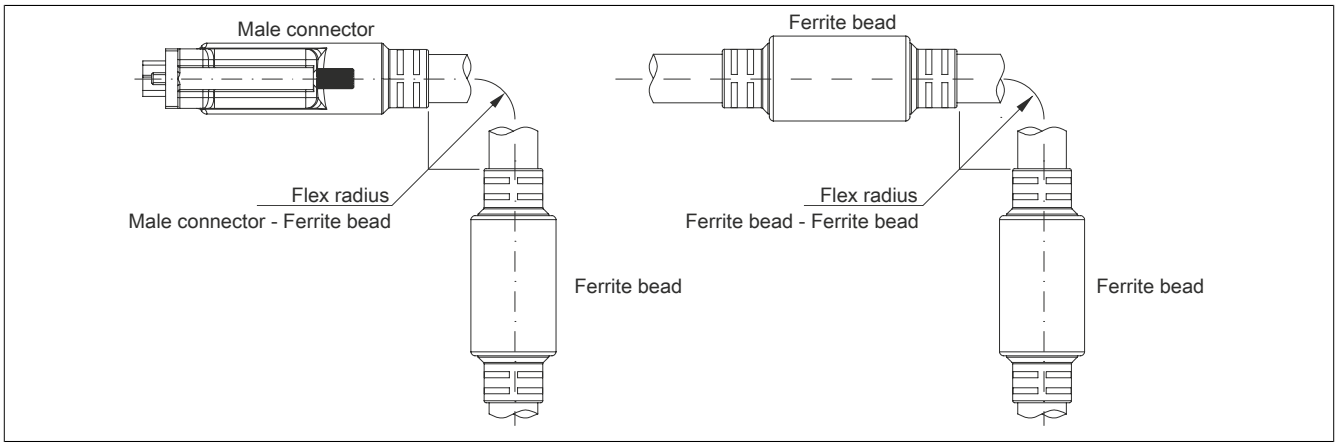


Figure 231: Flex radius specifications

6.2.1.5 Dimensions

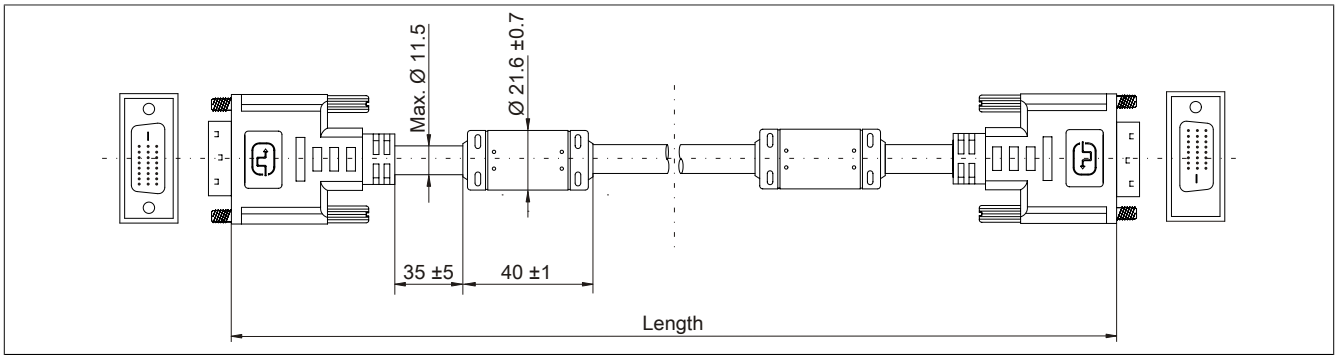


Figure 232: 5CASDL.0xxx-00- Dimensions

6.2.1.6 Cable pinout

Warning!

Field-assembled cables must be wired according to these specifications.

If a field-assembled cable is used, B&R cannot guarantee that it will function properly. All cables provided by B&R are guaranteed to function properly, however.

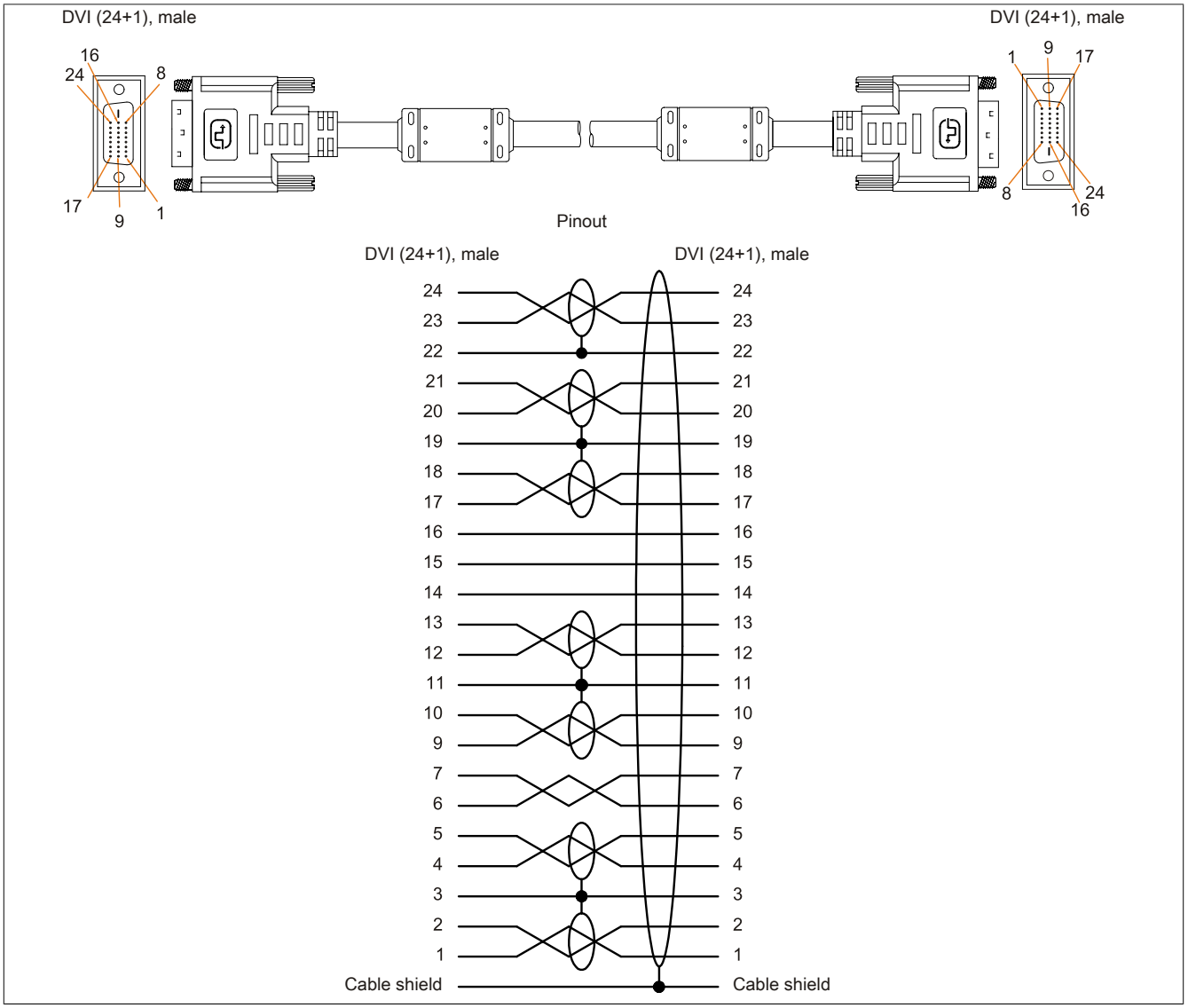


Figure 233: 5CASDL.0xxx-00 - Pinout

6.3 SDL cables with 45° male connector

6.3.1 5CASDL.0xxx-01

6.3.1.1 General information

5CASDL.0xxx-01 SDL cables with a 45° connector are designed for use in inflexible applications.

Caution!

Power must be disconnected before connecting or disconnecting cables.

6.3.1.2 Order data

Model number	Short description	Figure
	SDL cables with 45° connectors	
5CASDL.0018-01	SDL cable - 45 degree connector - 1.8 m	
5CASDL.0050-01	SDL cable - 45 degree connector - 5 m	
5CASDL.0100-01	SDL cable - 45 degree connector - 10 m	
5CASDL.0150-01	SDL cable - 45 degree connector - 15 m	

Table 305: 5CASDL.0018-01, 5CASDL.0050-01, 5CASDL.0100-01, 5CASDL.0150-01 - Order data

6.3.1.3 Technical data

Product ID	5CASDL.0018-01	5CASDL.0050-01	5CASDL.0100-01	5CASDL.0150-01
General information				
Certification				
CE	Yes			
cULus	Yes			
GOST-R	Yes			
GL	Yes [1]			
Cable construction				
Wire cross section	AWG 28		AWG 24	
Shield	Individual cable pairs, entire cable			
Complete shielding	Tinned copper braiding, optical coverage >85%			
Outer sheathing				
Material	PVC			
Color	Black			
Connector				
Type	2x DVI-D (24+1), male			
Connection cycles	100			
Contacts	Gold-plated			
Mechanical protection	Metal cover with crimped stress relief			
Locating screw tightening torque	Max. 0.5 Nm			
Electrical characteristics				
Conductor resistance				
AWG 24	-		≤93 Ω/km	
AWG 28	≤237 Ω/km		-	
Insulation resistance	Min. 10 MΩ/km			
Mechanical characteristics				
Dimensions				
Length	1.8 m ±30 mm	5 m ±50 mm	10 m ±100 mm	15 m ±100 mm
Diameter	Max. 9 mm		Max. 11.5 mm	
Flex radius				
Fixed installation	≥5x cable diameter (male connector - ferrite bead and ferrite bead - ferrite bead)			
Flexibility	Limited flexibility, valid for ferrite bead - ferrite bead (tested 100 cycles with 5x cable diameter, 20 cycles/minute)			
Weight	Approx. 300 g	Approx. 590 g	Approx. 2800 g	Approx. 2860 g

Table 306: 5CASDL.0018-01, 5CASDL.0050-01, 5CASDL.0100-01, 5CASDL.0150-01 - Technical data

1) Yes, although applies only if all components installed within the complete system have this certification.

6.3.1.4 Flex radius specifications

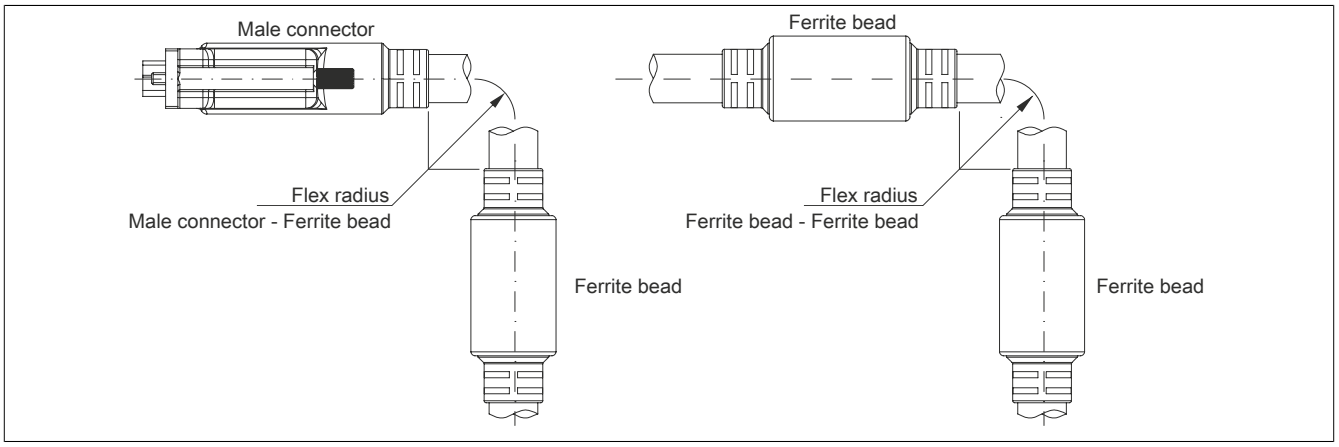


Figure 234: Flex radius specifications

6.3.1.5 Dimensions

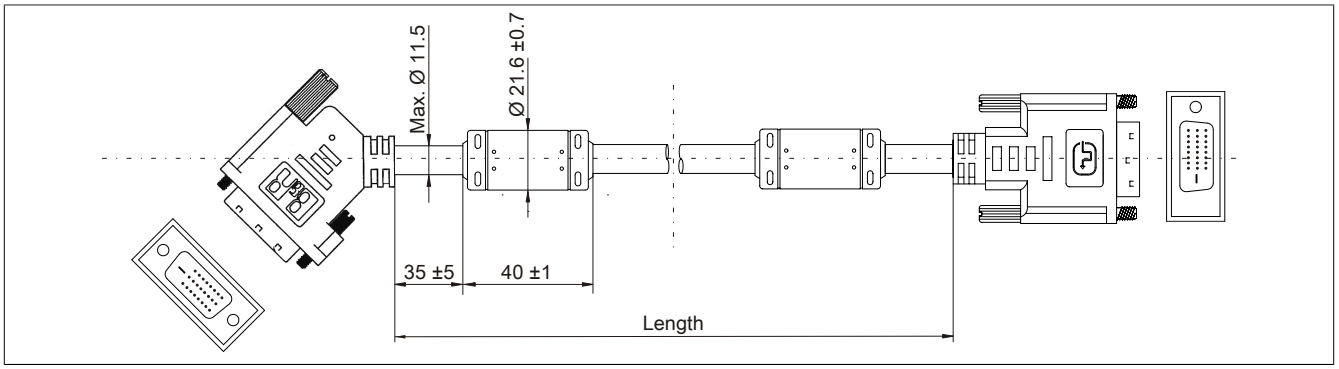


Figure 235: 5CASDL.0xxx-01 - Dimensions

6.3.1.6 Cable pinout

Warning!

Field-assembled cables must be wired according to these specifications.

If a field-assembled cable is used, B&R cannot guarantee that it will function properly. All cables provided by B&R are guaranteed to function properly, however.

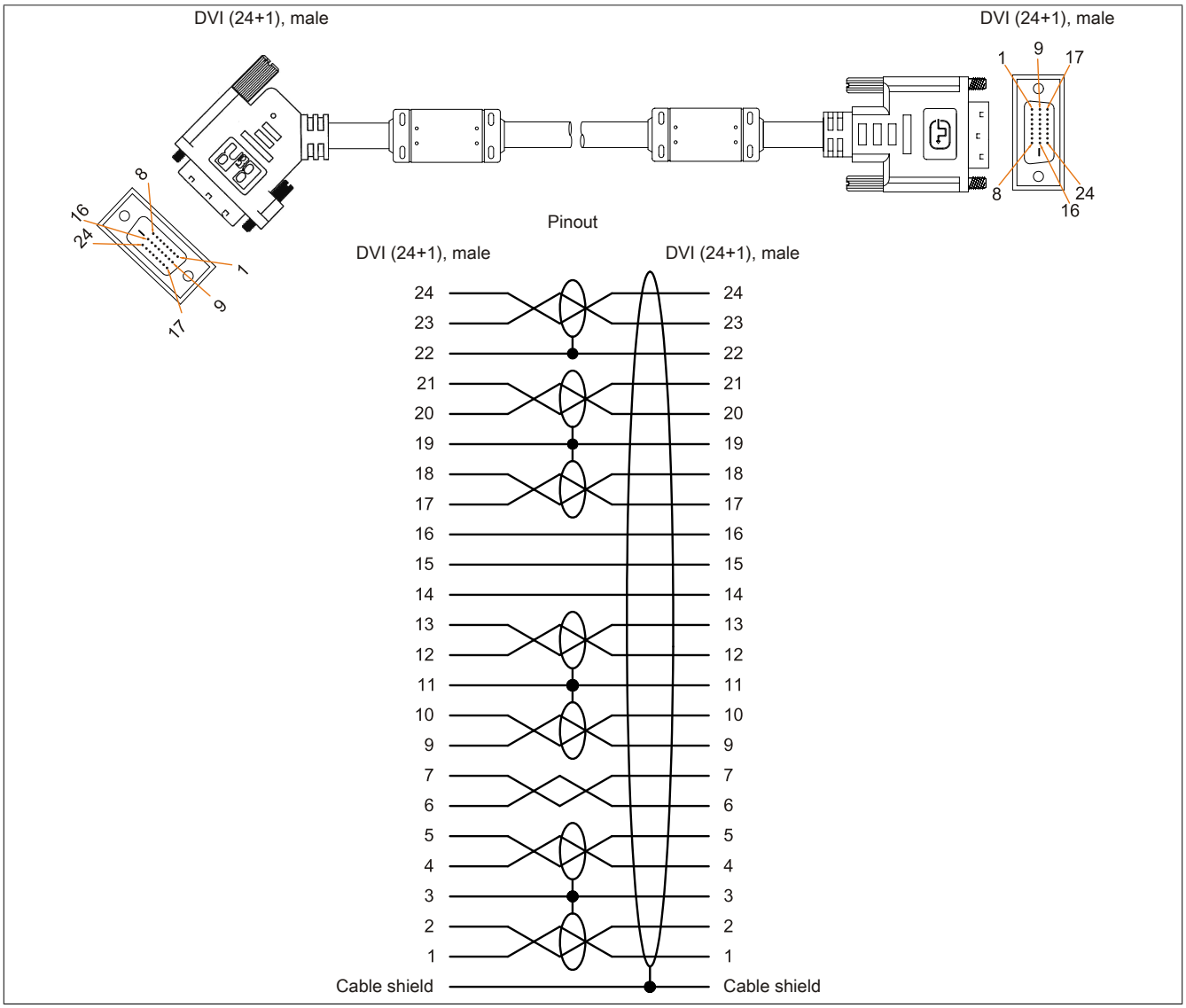


Figure 236: 5CASDL.0xxx-01 - Pinout

6.4 SDL flex cables

6.4.1 5CASDL.0xxx-03

6.4.1.1 General information

5CASDL.0xxx-03 SDL flex cables are designed for use in both inflexible and flexible applications (e.g. swing arm systems).

Caution!

Power must be disconnected before connecting or disconnecting cables.

6.4.1.2 Order data

Model number	Short description	Figure
	SDL flex cables	
5CASDL.0018-03	SDL flex cable - 1.8 m	
5CASDL.0050-03	SDL flex cable - 5 m	
5CASDL.0100-03	SDL flex cable - 10 m	
5CASDL.0150-03	SDL flex cable - 15 m	
5CASDL.0200-03	SDL flex cable - 20 m	
5CASDL.0250-03	SDL flex cable - 25 m	
5CASDL.0300-03	SDL flex cable - 30 m	

Table 307: 5CASDL.0018-03, 5CASDL.0050-03, 5CASDL.0100-03, 5CASDL.0150-03, 5CASDL.0200-03, 5CASDL.0250-03, 5CASDL.0300-03 - Order data

6.4.1.3 Technical data

Product ID	5CASDL. 0018-03	5CASDL. 0050-03	5CASDL. 0100-03	5CASDL. 0150-03	5CASDL. 0200-03	5CASDL. 0250-03	5CASDL. 0300-03
General information							
Certification							
CE	Yes						
cULus	Yes						
GOST-R	Yes						
GL	Yes [1)]						
Cable construction							
Wire cross section	AWG 24 (control wires) AWG 26 (DVI, USB, data)						
Features	Silicone- and halogen-free						
Shield	Individual cable pairs, entire cable						
Complete shielding	Aluminum-clad foil and tinned copper braiding						
Outer sheathing							
Material	Special semi-glossy TMPU						
Color	Black						
Labeling	(B&R) SDL Cable (UL) AWM 20236 80°C 30V E 63216						
Connector							
Type	2x DVI-D (24+1), male						
Connection cycles	Min. 200						
Contacts	Gold-plated						
Mechanical protection	Metal cover with crimped stress relief						
Locating screw tightening torque	Max. 0.5 Nm						
Electrical characteristics							
Operating voltage	≤30 V						
Test voltage							
Wire/Wire	1 kV						
Wire/Shield	0.5 kV						
Wave impedance	100 ±10 Ω						
Conductor resistance							
AWG 24	≤95 Ω/km						
AWG 26	≤145 Ω/km						
Insulation resistance	>200 MΩ/km						
Operating conditions							
Approbation	UL AWM 20236 80°C 30 V						
Flame-retardant	In accordance with UL758 (cable vertical flame test)						
Oil and hydrolysis resistance	In accordance with VDE 0282-10						

Table 308: 5CASDL.0018-03, 5CASDL.0050-03, 5CASDL.0100-03, 5CASDL.0150-03, 5CASDL.0200-03, 5CASDL.0250-03, 5CASDL.0300-03 - Technical data

Product ID	5CASDL. 0018-03	5CASDL. 0050-03	5CASDL. 0100-03	5CASDL. 0150-03	5CASDL. 0200-03	5CASDL. 0250-03	5CASDL. 0300-03
Environmental conditions							
Temperature							
Storage	-20 to 80°C						
Fixed installation	-20 to 80°C						
Flexible installation	-5 to 60°C						
Mechanical characteristics							
Dimensions							
Length	1.8 m ±20 mm	5 m ±45 mm	10 m ±90 mm	15 m ±135 mm	20 m ±180 mm	25 m ±225 mm	30 m ±270 mm
Diameter	Max. 12 mm						
Flex radius							
Fixed installation	≥3.5x cable diameter (from male connector - ferrite bead) ≥10x cable diameter (from ferrite bead - ferrite bead)						
Flexible installation	≥15x cable diameter (from ferrite bead - ferrite bead)						
Flexibility	Flexible, valid for ferrite bead - ferrite bead (tested 300,000 cycles with 15x cable diameter, 4800 cycles/hour)						
Drag chain data							
Flex cycles	300,000						
Speed	4800 cycles/hour						
Flex radius	180 mm, 15x cable diameter						
Hub	460 mm						
Weight	Approx. 460 g	Approx. 1020 g	Approx. 1940 g	Approx. 2840 g	Approx. 3740 g	Approx. 4560 g	Approx. 5590 g
Tension							
During operation	≤50 N						
During installation	≤400 N						

Table 308: 5CASDL.0018-03, 5CASDL.0050-03, 5CASDL.0100-03, 5CASDL.0150-03, 5CASDL.0200-03, 5CASDL.0250-03, 5CASDL.0300-03 - Technical data

1) Yes, although applies only if all components installed within the complete system have this certification.

6.4.1.4 Flex radius specifications

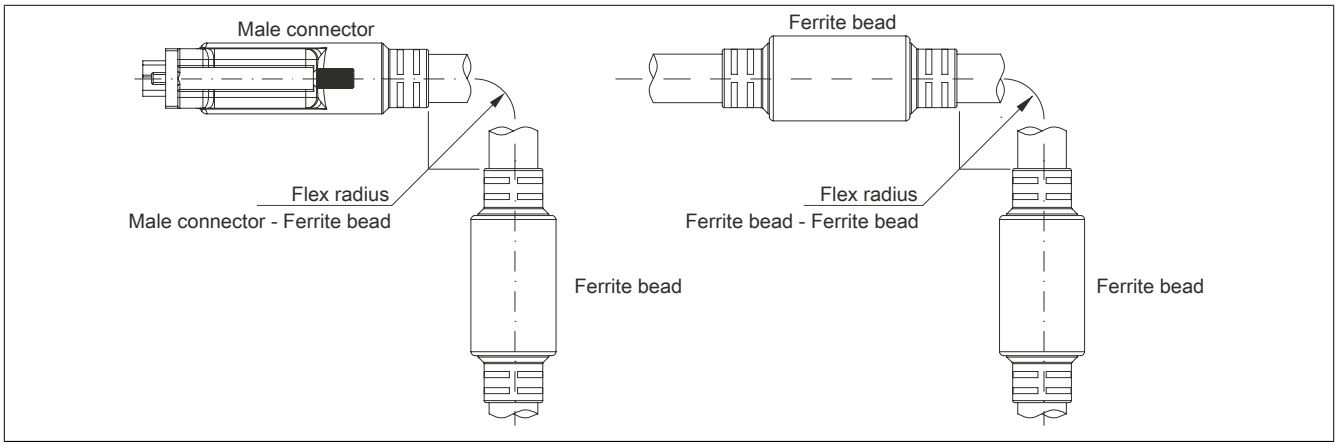


Figure 237: Flex radius specifications

6.4.1.5 Dimensions

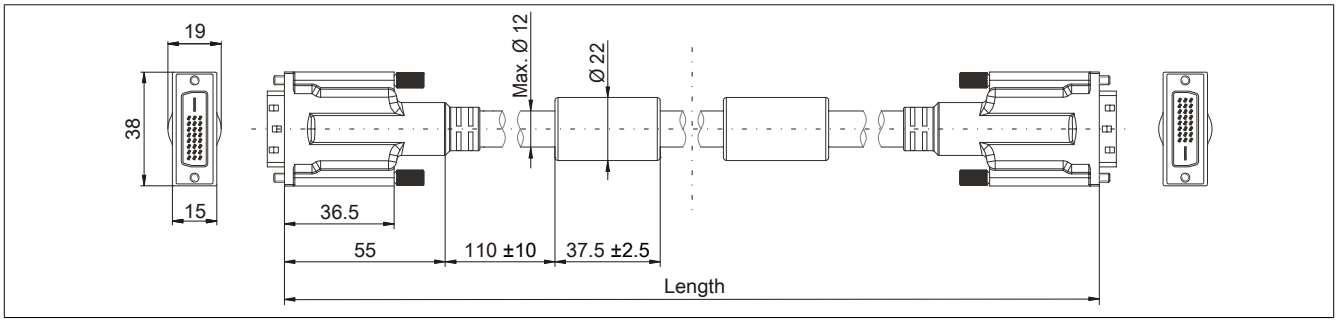


Figure 238: 5CASDL.0xxx-03 - Dimensions

6.4.1.6 Design

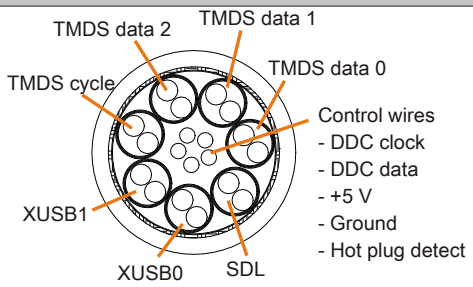
Element	Assignment	Cross section	
DVI	TMDS data 0	26 AWG	
	TMDS data 1	26 AWG	
	TMDS data 2	26 AWG	
	TMDS cycle	26 AWG	
USB	XUSB0	26 AWG	
	XUSB1	26 AWG	
Data	SDL	26 AWG	
Control wires	DDC cycle	24 AWG	
	DDC data	24 AWG	
	+5 V	24 AWG	
	Ground	24 AWG	
	Hot plug detect	24 AWG	

Table 309: 5CASDL.0xxx-03 SDL flex cables - Structure

6.4.1.7 Cable pinout

Warning!

Field-assembled cables must be wired according to these specifications.

If a field-assembled cable is used, B&R cannot guarantee that it will function properly. All cables provided by B&R are guaranteed to function properly, however.

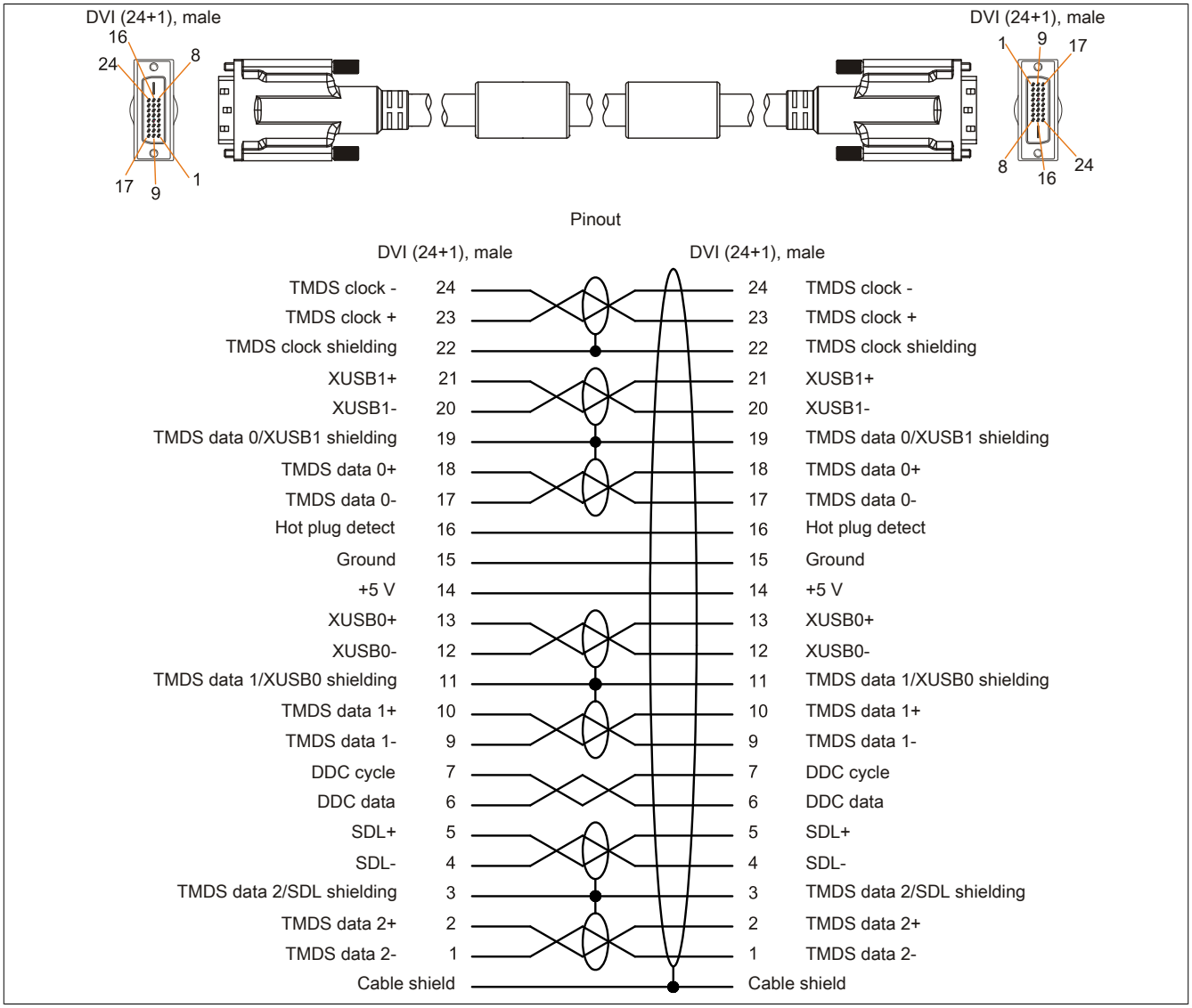


Figure 239: 5CASDL.0xxx-03 - Pinout

6.5 SDL flex cables with extender

6.5.1 5CASDL.0xx0-13

6.5.1.1 General information

5CASDL.0xx0-13 SDL flex cables with an extender are designed for use in both inflexible and flexible applications (e.g. swing arm systems).

> **Caution!**
>
> **Power must be disconnected before connecting or disconnecting cables.**

6.5.1.2 Order data

Model number	Short description	Figure
	SDL flex cables	
5CASDL.0300-13	SDL flex cable with extender - 30 m	
5CASDL.0400-13	SDL flex cable with extender - 40 m	
5CASDL.0430-13	SDL flex cable with extender - 43 m	

Table 310: 5CASDL.0300-13, 5CASDL.0400-13, 5CASDL.0430-13 - Order data

6.5.1.3 Technical data

Product ID	5CASDL.0300-13	5CASDL.0400-13	5CASDL.0430-13
General information			
Certification			
CE	Yes		
cULus	Yes		
GOST-R	Yes		
GL	Yes [1)]		
Cable construction			
Wire cross section	AWG 24 (control wires) AWG 26 (DVI, USB, data)		
Features	Silicone- and halogen-free		
Shield	Individual cable pairs, entire cable		
Complete shielding	Aluminum-clad foil and tinned copper braiding		
Outer sheathing			
Material	Special semi-glossy TMPU		
Color	Black		
Labeling	(B&R) SDL cable (UL) AWM 20236 80°C 30V E63216		
Connector			
Type	2x DVI-D (24+1), male		
Connection cycles	Min. 200		
Contacts	Gold-plated		
Mechanical protection	Metal cover with crimped stress relief		
Locating screw tightening torque	Max. 0.5 Nm		
Electrical characteristics			
Operating voltage	≤30 V		
Test voltage			
Wire/Wire	1 kV		
Wire/Shield	0.5 kV		
Wave impedance	100 ±10 Ω		
Conductor resistance			
AWG 24	≤95 Ω/km		
AWG 26	≤145 Ω/km		
Insulation resistance	>200 MΩ/km		
Operating conditions			
Approbation	UL AWM 20236 80°C 30 V		
Flame-retardant	In accordance with UL758 (cable vertical flame test)		
Oil and hydrolysis resistance	In accordance with VDE 0282-10		
Environmental conditions			
Temperature			
Storage	-20 to 60°C		
Fixed installation	-20 to 60°C		
Flexible installation	-5 to 60°C		

Table 311: 5CASDL.0300-13, 5CASDL.0400-13, 5CASDL.0430-13 - Technical data

Product ID	5CASDL.0300-13	5CASDL.0400-13	5CASDL.0430-13
Mechanical characteristics			
Dimensions			
Length	30 m ±280 mm	40 m ±380 mm	43 m ±410 mm
Diameter		Max. 12 mm	
Extender box			
Width		35 mm	
Length		125 mm	
Height		18.5 mm	
Flex radius			
Fixed installation		≥6x cable diameter (from male connector - ferrite bead) ≥10x cable diameter (from ferrite bead - ferrite bead)	
Flexible installation		≥15x cable diameter (from ferrite bead - ferrite bead)	
Flexibility		Flexible, valid for ferrite bead - ferrite bead (tested 300,000 cycles with 15x cable diameter, 4800 cycles/hour)	
Drag chain data			
Flex cycles		300,000	
Speed		4800 cycles/hour	
Flex radius		180 mm, 15x cable diameter	
Hub		460 mm	
Weight	Approx. 5430 g	Approx. 7200 g	Approx. 7790 g
Tension			
During operation		≤50 N	
During installation		≤400 N	

Table 311: 5CASDL.0300-13, 5CASDL.0400-13, 5CASDL.0430-13 - Technical data

1) Yes, although applies only if all components installed within the complete system have this certification.

6.5.1.4 Flex radius specifications

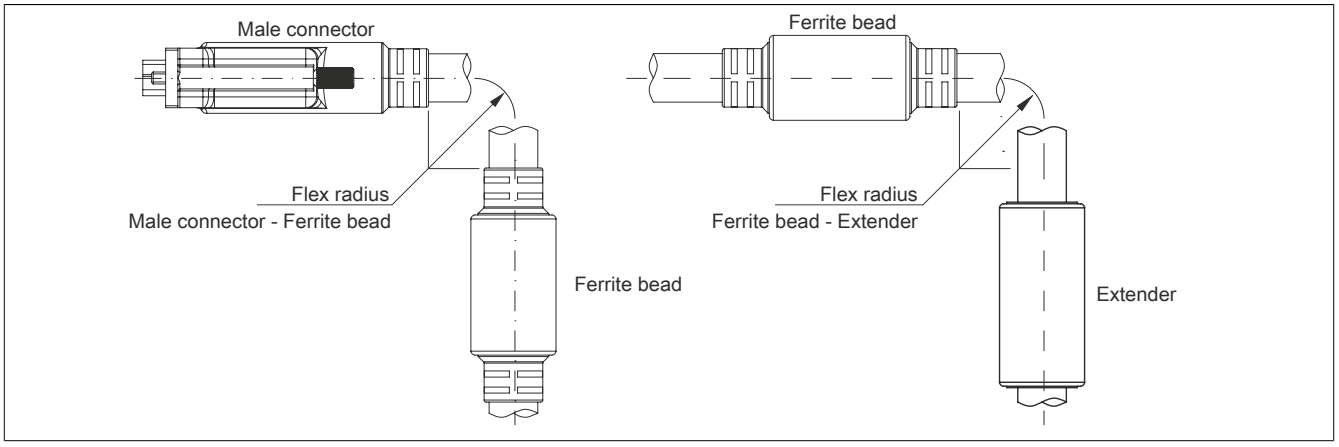


Figure 240: Flex radius specification with extender

6.5.1.5 Dimensions

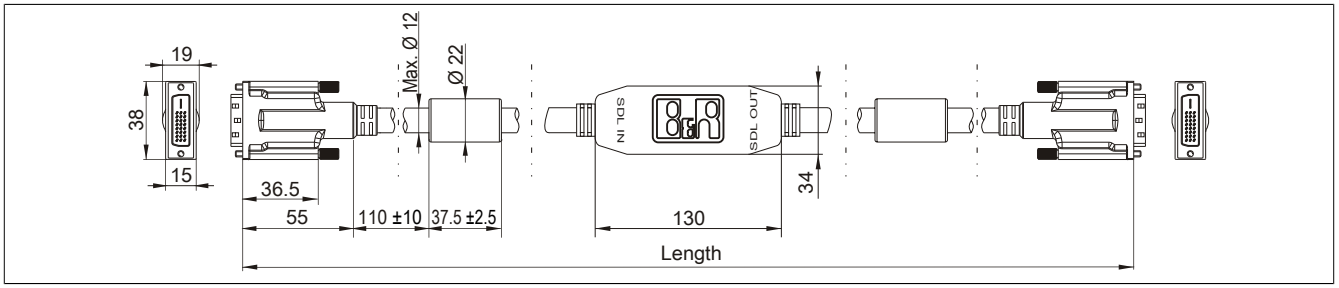


Figure 241: 5CASDL.0xx0-13 - Dimensions

6.5.1.6 Cable pinout

Warning!

Field-assembled cables must be wired according to these specifications.

If a field-assembled cable is used, B&R cannot guarantee that it will function properly. All cables provided by B&R are guaranteed to function properly, however.

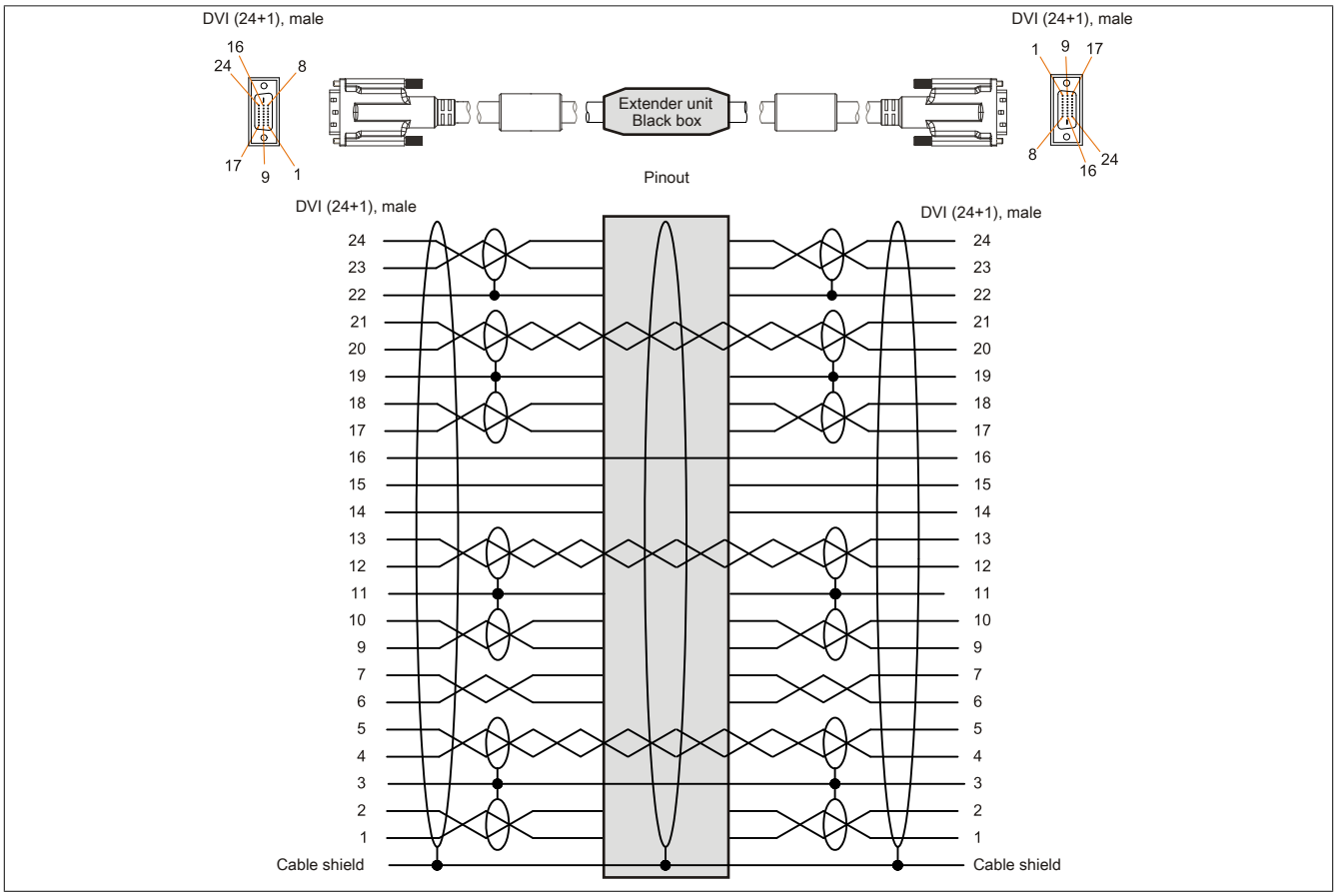


Figure 242: 5CASDL.0xx0-13 - Pinout

6.5.1.7 Cable connection

SDL flex cables with an extender must be connected between the B&R Industrial PC and the Automation Panel display unit in the correct direction. The proper signal direction is indicated on the extender.

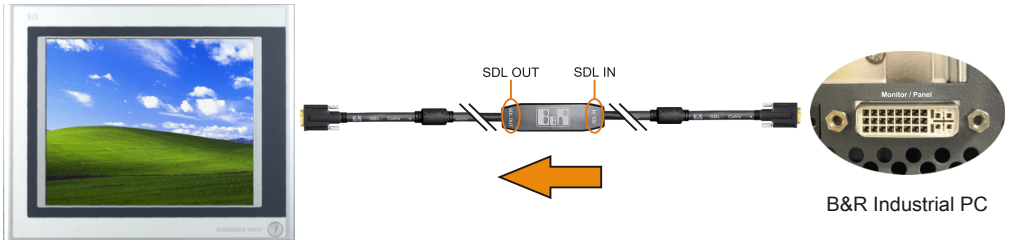


Figure 243: Example of the signal direction for an SDL flex cable with extender

6.6 USB cables

6.6.1 5CAUSB.00xx-00

6.6.1.1 General information

USB cables are designed to achieve USB 2.0 transfer speeds.

6.6.1.2 Order data

Model number	Short description	Figure
	USB cables	
5CAUSB.0018-00	USB 2.0 connection cable - Type A - Type B connector - 1.8 m	
5CAUSB.0050-00	USB 2.0 connection cable - Type A - Type B connector - 5 m	

Table 312: 5CAUSB.0018-00, 5CAUSB.0050-00 - Order data

6.6.1.3 Technical data

Product ID	5CAUSB.0018-00	5CAUSB.0050-00
General information		
Certification		
CE	Yes	
cULus	Yes	
GOST-R	Yes	
GL	Yes	
Cable construction		
Wire cross section	AWG 24, 28	
Shield	Entire cable	
Outer sheathing		
Color	Beige	
Connector		
Type	USB type A male and USB type B male	
Mechanical characteristics		
Dimensions		
Length	1.8 m ±30 mm	5 m ±50 mm
Diameter	Max. 5 mm	
Flex radius	Min. 100 mm	

Table 313: 5CAUSB.0018-00, 5CAUSB.0050-00 - Technical data

6.6.1.4 Cable pinout

Warning!

Field-assembled cables must be wired according to these specifications.

If a field-assembled cable is used, B&R cannot guarantee that it will function properly. All cables provided by B&R are guaranteed to function properly, however.

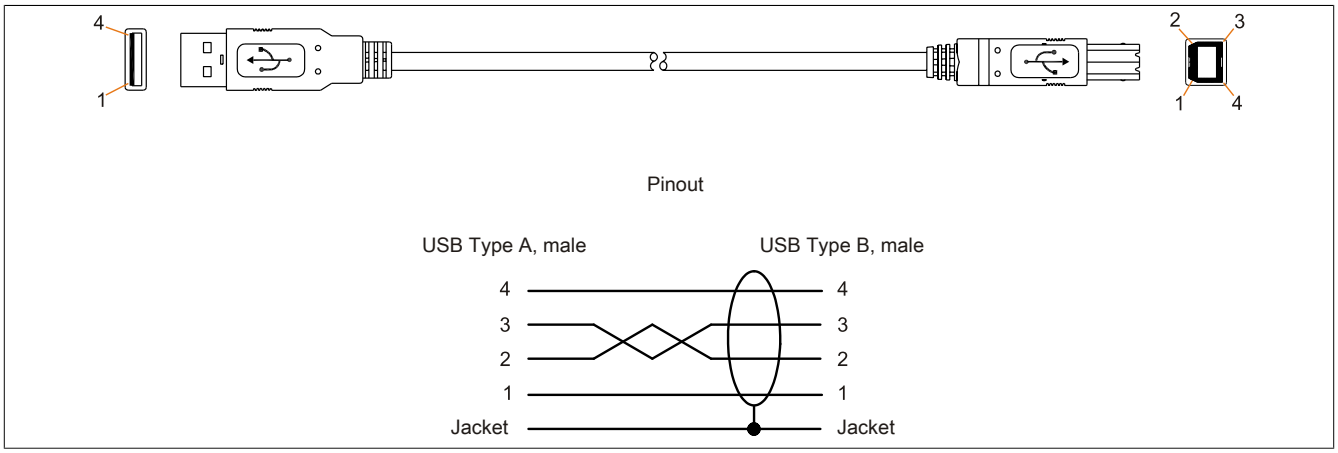


Figure 244: 5CAUSB.00xx-00 USB cables - Pinout

6.7 RS232 cables

6.7.1 9A0014.xx

6.7.1.1 General information

RS232 cables are used as extension cables between two RS232 interfaces.

6.7.1.2 Order data

Model number	Short description	Figure
	RS232 cables	
9A0014.02	RS232 extension cable for remote operation of a display unit with touch screen, 1.8 m	
9A0014.05	RS232 extension cable for remote operation of a display unit with touch screen, 5 m	
9A0014.10	RS232 extension cable for remote operation of a display unit with touch screen, 10 m	

Table 314: 9A0014.02, 9A0014.05, 9A0014.10 - Order data

6.7.1.3 Technical data

Product ID	9A0014.02	9A0014.05	9A0014.10
General information			
Certification			
CE		Yes	
GOST-R	-	Yes	
Cable construction			
Wire cross section		AWG 26	
Shield		Entire cable	
Outer sheathing			
Color		Beige	
Connector			
Type		9-pin male/female DSUB connector	
Locating screw tightening torque		Max. 0.5 Nm	
Mechanical characteristics			
Dimensions			
Length	1.8 m ±50 mm	5 m ±80 mm	10 m ±100 mm
Diameter		Max. 5 mm	
Flex radius		Min. 70 mm	

Table 315: 9A0014.02, 9A0014.05, 9A0014.10 - Technical data

6.7.1.4 Cable pinout

Warning!

Field-assembled cables must be wired according to these specifications.

If a field-assembled cable is used, B&R cannot guarantee that it will function properly. All cables provided by B&R are guaranteed to function properly, however.

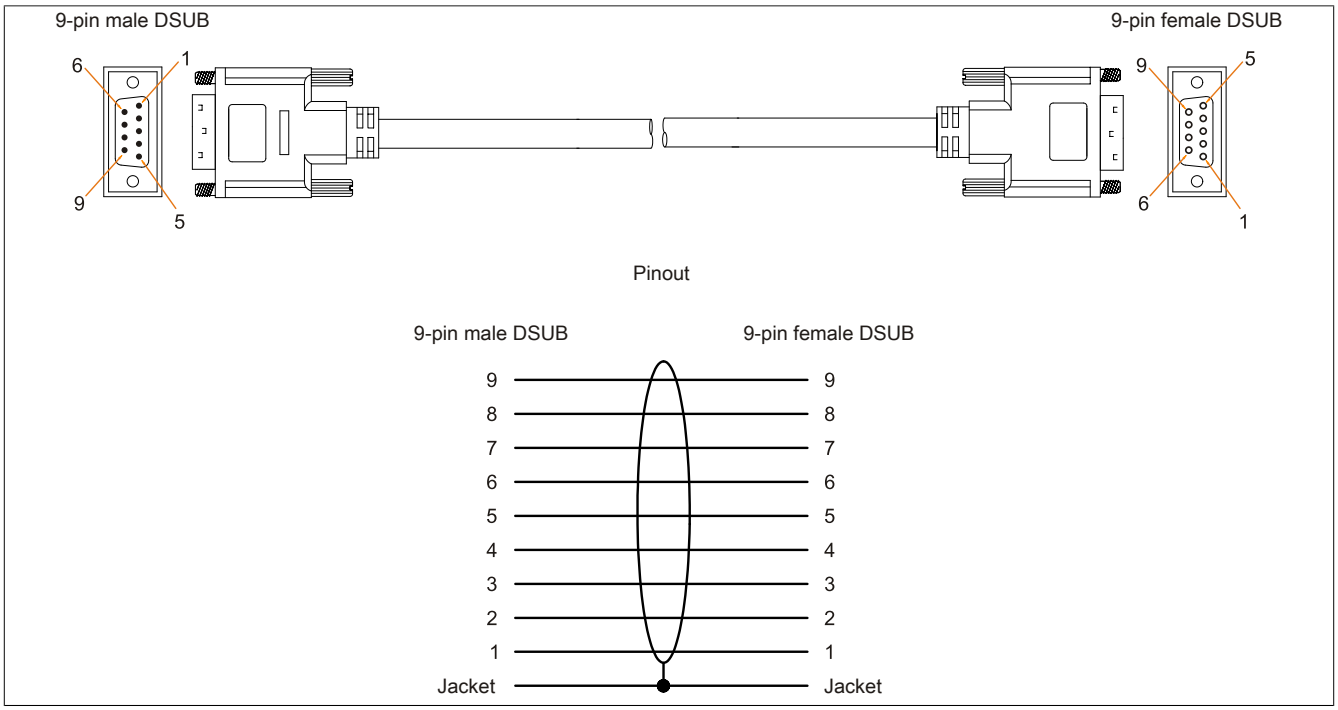


Figure 245: 9A0014.xx RS232 cables - Pinout

Chapter 7 • Maintenance and service

This chapter describes service/maintenance work that can be carried out by a qualified end user.

1 Replacing the battery

The lithium battery buffers the internal real-time clock (RTC) and CMOS data.

Information:

- **The product design allows the battery to be changed with the B&R device switched either on or off. In some countries, safety regulations do not allow batteries to be changed while the module is switched on.**
- **Any BIOS settings that have been made will remain when the battery is changed with the power turned off (stored in nonvolatile EEPROM). The date and time must be reset later since this data is lost when the battery is changed.**
- **The battery should only be replaced by qualified personnel.**

Warning!

The battery is only permitted to be replaced by a Renata CR2477N battery. The use of another battery may present a risk of fire or explosion.

The battery may explode if handled improperly. Do not recharge, disassemble or dispose of in fire.

The following replacement lithium batteries are available: 4A0006.00-000 (1 pc.) and 0AC201.91 (4 pcs.).

1.1 Procedure

- Disconnect the power supply to the B&R Industrial PC (disconnect the power cable). Isolate the system from all potential sources of electrical power!
- Touch the housing or ground connection in order to discharge any electrostatic charge from your body.
- Pull the battery holder out of the Panel PC (①) and remove the battery (②).

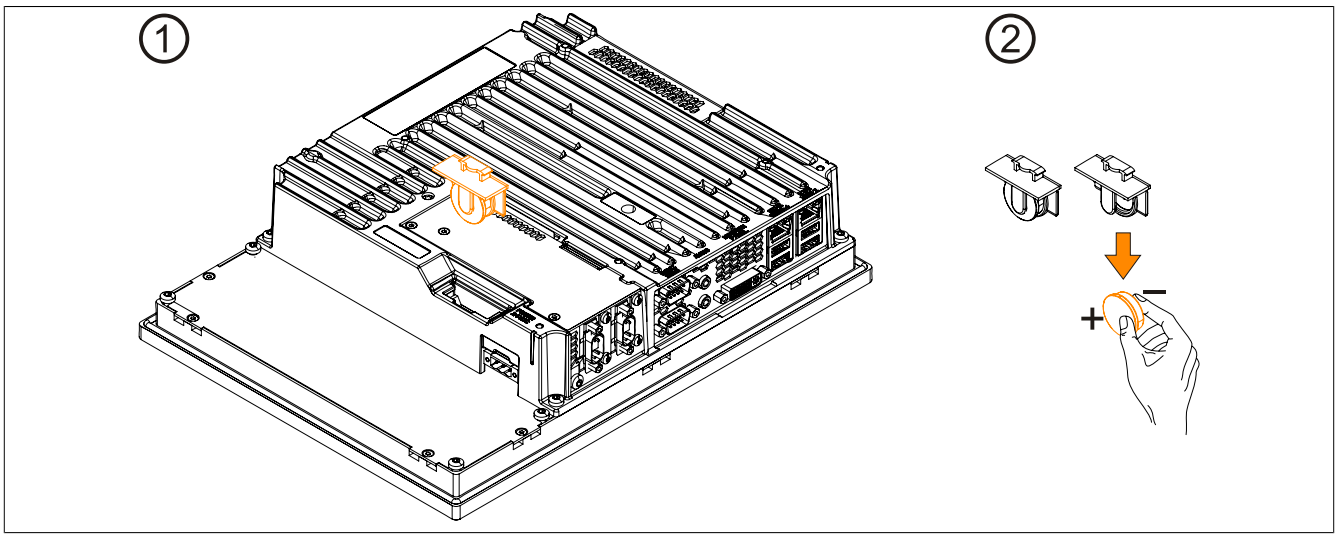


Figure 246: Pull out battery holder and remove battery

- The battery should not be held by its edges. Insulated tweezers may also be used to insert the battery.

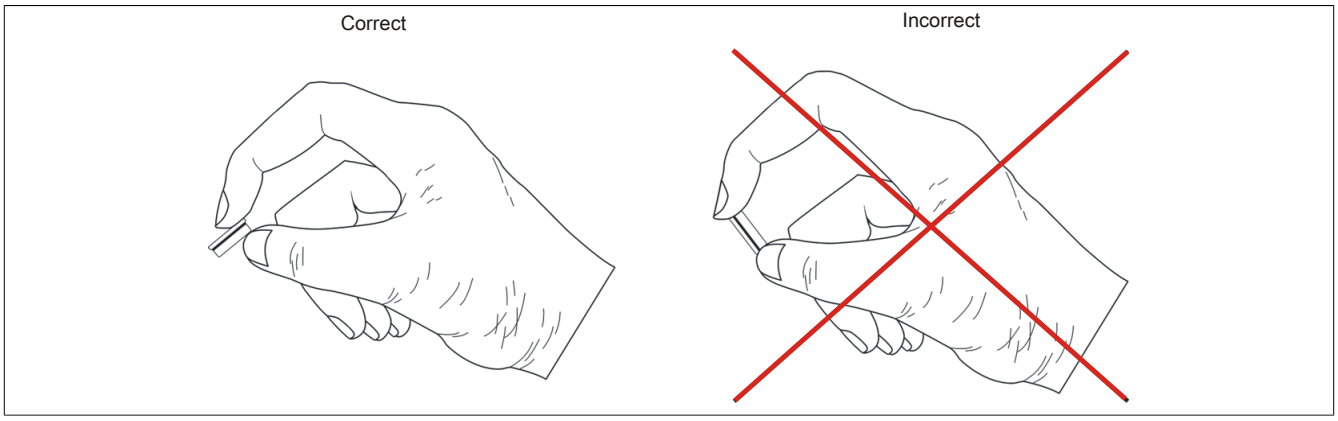


Figure 247: Battery handling

- Insert the new battery with the correct polarity.
- Insert the battery holder into the Panel PC.
- Reconnect the power supply to the B&R Industrial PC (plug in the power cable).
- Check the date and time in BIOS and correct them if necessary.

Warning!

Lithium batteries are considered hazardous waste. Used batteries should be disposed of in accordance with applicable local regulations.

2 Exchanging a CFast card

Caution!

Power must be turned off before exchanging CFast cards.

The CFast card can be exchanged quickly and easily using the ejector (see image).

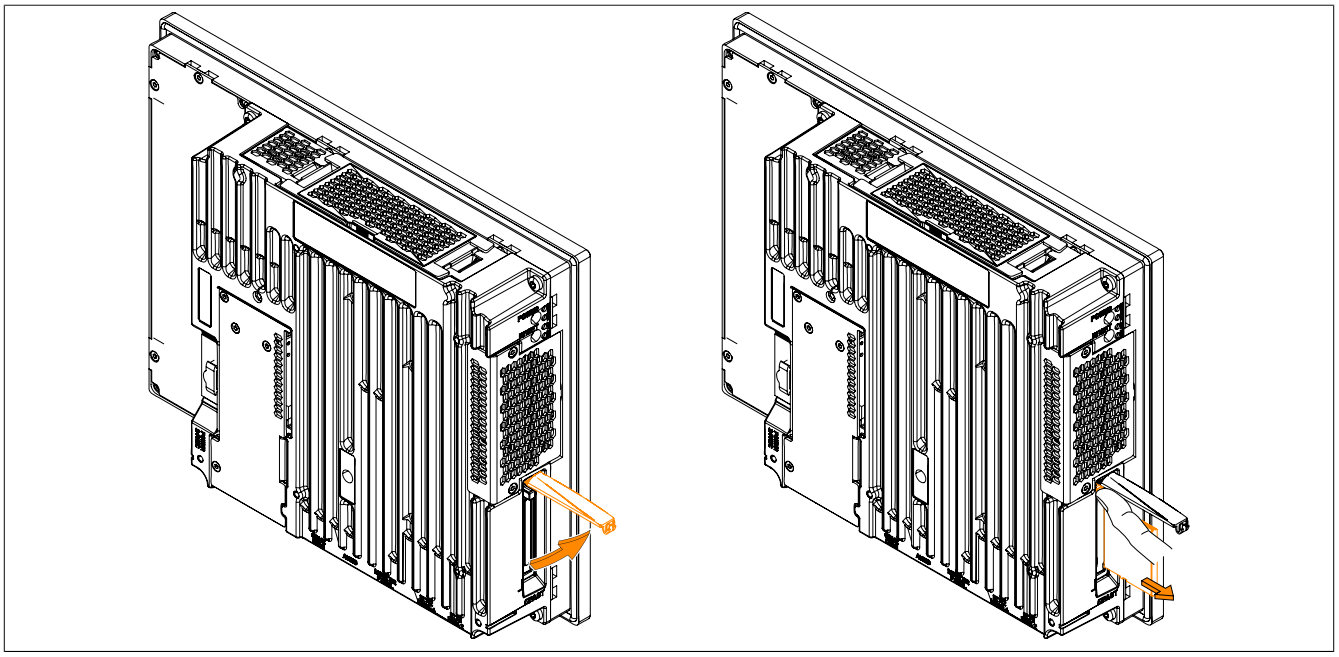


Figure 248: Exchanging a CFast card

3 Cleaning

Danger!

This device must be switched off before cleaning in order to prevent unintended functions from being triggered when handling the touch screen or pressing keys.

This device should be cleaned with a moist cloth. The cloth should be moistened with water and detergent, a screen cleaning agent or alcohol (ethanol). The cleaning agent should be applied to the cloth beforehand, not sprayed directly on the device! Aggressive solvents, chemicals, scouring agents, pressurized air or steam jets should never be used.

Information:

Displays with a touch screen should be cleaned regularly.

4 Tips for extending the service life of the display

4.1 Backlight

The service life of the backlight is specified by its "half-brightness time". For example, a specified operating time of 50,000 hours means that the display would still retain 50% of its brightness after this time.

4.1.1 How can the service life of the backlight be extended?

- By setting the display brightness to the lowest value that is still comfortable for the eyes
- By using dark images
- By reducing the brightness by 50%, which can result in an approximately 50% increase in the half-brightness time

4.2 Screen burn-in

Screen burn-in refers to the "burning in" of a static image on a display after being displayed for a prolonged period of time. Nevertheless, static images are not the only cause of screen burn-in. Screen burn-in is also referred to as burn-in effect, image retention, memory effect, memory sticking or ghost image.

There are basically two types:

- Area type: This type of screen burn-in is indicated by a dark gray image. The effect will disappear if the display is switched off for a long period of time.
- Line type: This type of screen burn-in can cause lasting damage.

4.2.1 What causes screen burn-in?

- Static images
- No screensaver
- Sharp transitions in contrast (e.g. black/white)
- High ambient temperatures
- Operation outside of specifications

4.2.2 How can screen burn-in be avoided?

- By constantly changing between static and dynamic images
- By avoiding excessive brightness differences between foreground and background elements
- By using colors with similar brightness
- By using complementary colors in follow-up images
- By using a screensaver

5 Pixel errors

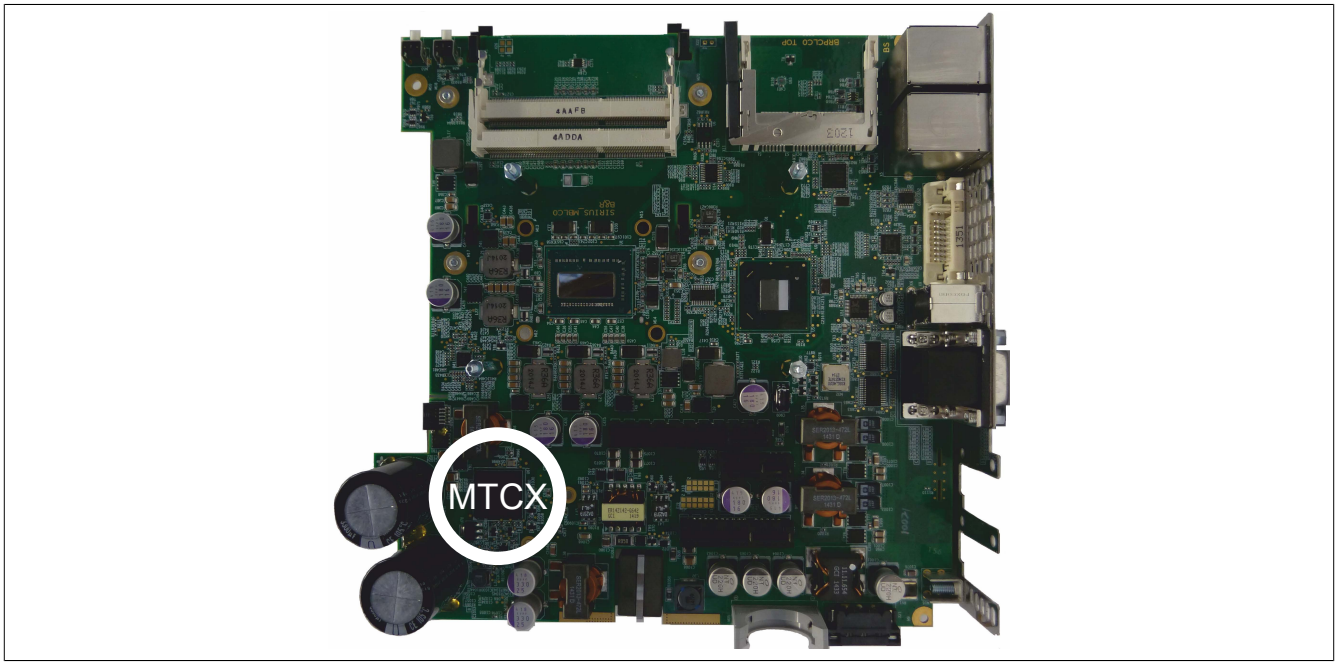
Information:

Displays may contain defective pixels (dead/stuck pixels) that result from the manufacturing process. These flaws are not grounds for reclamation or initiating a warranty claim.

Appendix A

1 Maintenance Controller Extended (MTCX)

The MTCX controller (FPGA processor) is located on the mainboard (part of every system unit) of the PPC900 device.



The MTCX is responsible for the following monitoring and control functions:

- Power on (power OK sequencing) and power failure logic
- Watchdog handling (NMI and reset handling)
- Temperature monitoring
- Fan control
- Key and LED handling/coordination (matrix keyboard on B&R display units)
- Advanced desktop operation (keys, USB forwarding)
- Daisy chain display operation (touch screen, USB forwarding)
- Panel locking mechanism (can be configured using B&R Control Center - ADI driver)
- Backlight control for connected B&R displays
- Statistical data recording (power cycles - records every switch-on, power on and fan hour; each quarter hour is counted)
- SDL data transfer (display, matrix keyboard, touch screen, service data, USB)
- LED status indicators (Power, HDD, Link, Run)
- Optimal default BIOS are reported to BIOS by the MTCX based on the actual hardware.

Extended MTCX functions are available by upgrading firmware [6)]. The version can be read in BIOS or approved Microsoft Windows operating systems using the B&R Control Center.

[6)] Available in the Downloads section of the B&R website (www.br-automation.com).

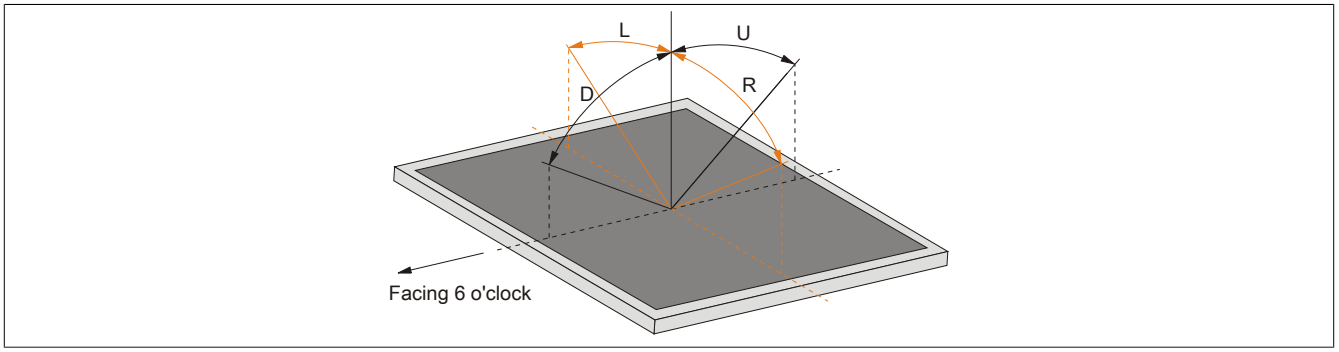
2 Abbreviations

Abbreviation	Stands for	Description
NC	Normally closed	A normally closed relay contact
	Not connected	Used in pinout descriptions if a terminal or pin is not connected to a module
ND	Not defined	In data tables, this stands for a value that has not been defined. This may be because a cable manufacturer does not provide certain technical data, for example.
NO	Normally open	A normally open relay contact
TBD	To be defined	Used in technical data tables when certain information is not yet available. The value will be provided later.

Table 316: Abbreviations in this user's manual

3 Viewing angles

Viewing angle specifications (R, L, U, D) for the display types are listed in the technical data for each device.



4 Chemical resistance

Single-touch display units feature the Autotex panel overlay starting with the following revision number:

- 5AP923.1215-00 ≥ Revision B8
- 5AP923.1505-00 ≥ Revision B8
- 5AP923.1906-00 ≥ Revision B8

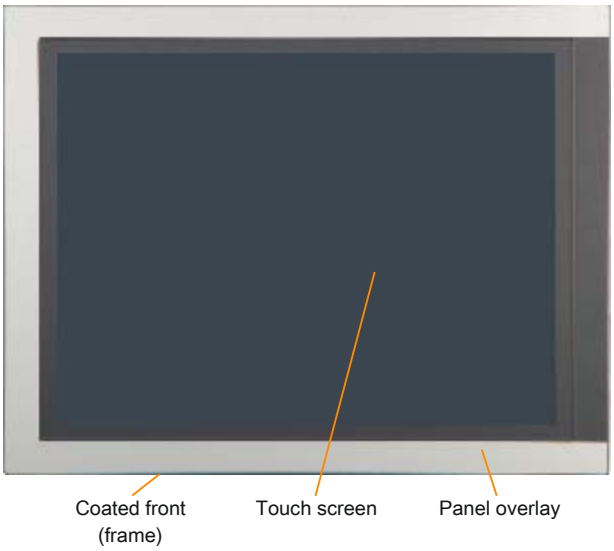
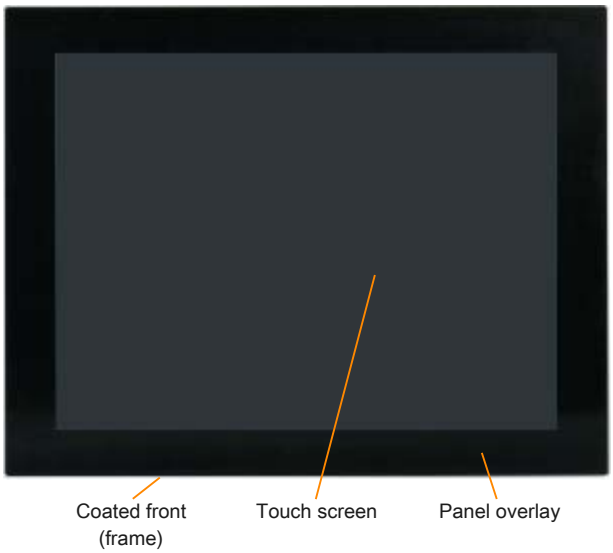


Figure 249: Single-touch display unit with Autotex panel overlay

Single-touch display units < Revision B8 were manufactured with the aluminum panel overlay.



Multi-touch display units feature an edge-to-edge glass surface.

4.1 Autotex panel overlay (polyester)

Unless otherwise specified, the panel overlay conforms to DIN 42115 (Part 2). This means it is resistant to exposure to the following chemicals for a 24-hour period with no visible signs of damage:

- Acetaldehyde
- Acetone
- Acetonitrile
- Aliphatic hydrocarbons
- Alkali carbonate
- Formic acid <50%
- Ammonia <40%
- Amyl acetate
- Ethanol
- Ether
- Gasoline
- Bichromate
- Potassium
- Cutting oil
- Brake fluid
- Butylcellosolve
- Sodium hypochlorite <20%
- Cyclohexanol
- Cyclohexanone
- Decon
- Diacetone alcohol
- Dibutyl phthalate
- Diesel
- Diethyl ether
- Diethyl phthalate
- Dioxan
- Dowandol
- DRM/PM
- Iron chloride (FeCl2)
- Iron chloride (FeCl3)
- Acetic acid <50%
- Ethyl acetate
- Linseed oil
- Aviation fuel
- Formaldehyde 37 to 42%
- Glycerine
- Glycol
- Isophorone
- Isopropanol
- Potassium hydroxide
- Potassium carbonate
- Methanol
- Methylisobutylketone
- MIBK
- Sodium bisulphate
- Sodium carbonate
- Caustic soda <40%
- N-Butyl acetate
- Paraffin oil
- Phosphoric acid <30%
- Blown castor oil
- Nitric acid <10%
- Hydrochloric acid <36%
- Sea water
- Sulphuric acid <10%
- Silicon oil
- Tenside
- Turpentine oil replacement
- Toluene
- Triacetin
- Trichloracetic acid <50%
- Trichloroethane
- White spirits
- Washing agents
- Water
- Hydrogen peroxide <25%
- Fabric conditioner
- Xylene

The panel overlay conforms to DIN 42115 Part 2 for exposure to glacial acetic acid for less than one hour without visible damage.

4.2 Aluminum panel overlay

Unless otherwise specified, the panel overlay conforms to DIN 42115 (Part 2). This means it is resistant to exposure to the following chemicals for a 24-hour period with no visible signs of damage:

- Acetaldehyde
- Acetone
- Acetonitrile
- Alkali carbonate
- Alkane
- Formic acid <50%
- Ammonia <40%
- Amyl acetate
- Gasoline
- Bichromate
- Brake fluid
- Castor oil
- Hydrochloric acid <36%
- Cyclohexanol
- Cyclohexanone
- Decon
- Diacetone alcohol
- Diesel
- Diethyl ether
- Diethyl phthalate
- Dimethylbenzene
- Dioxan
- Dowandol
- DRM/PM
- Iron chloride
- Iron chloride (FeCl2)
- Iron chloride (FeCl3)
- Acetic acid <50%
- Butyl acetate
- Ethanol
- Ether
- Ethyl acetate
- 2-Butoxyethanol
- Aviation fuel
- Formaldehyde 37 to 42%
- Transmission fluid
- Glycerine
- Glycol
- Isophorone
- Isopropanol
- Potassium
- Potassium carbonate
- Potassium hydroxide
- White spirit
- Linseed oil
- Methanol
- Methylbenzene
- Methyl ethyl ketone
- Methylisobutylketone
- Sodium bisulphate
- Sodium carbonate
- Sodium hydroxide <40%
- Sodium hypochlorite <20%
- Paraffin oil
- Phosphoric acid <30%
- Phthalate
- Nitric acid <10%
- Sea water
- Cutting oil
- Sulphuric acid <10%
- Turpentine oil replacement
- Triacetin
- Trichloracetic acid <50%
- Trichloroethane
- Washing agents
- Water
- Hydrogen peroxide <25%
- Fabric conditioner

The panel overlay is not resistant to the following chemicals:

- Benzyl alcohol
- Dimethyl formamide
- Concentrated mineral acid
- Concentrated caustic solution
- High-pressure steam over 100°C
- Methylene chloride
- Tetrahydrofuran

4.3 Coated aluminum front

Unless otherwise specified, the coated front conforms to DIN 42115 Part 2. This means it is resistant to exposure to the following chemicals for a 24-hour period with no visible signs of damage:

- Formic acid <50%
- Ammonia <40%
- Brake fluid
- Hydrochloric acid <10%
- Diesel
- Acetic acid <50%
- Transmission fluid
- Lactic acid <10%
- Isopropanol
- Coolant <4%
- Sodium hydroxide <40%
- Petroleum
- Phosphoric acid <25%
- Saline <10%
- Sulphuric acid <25%
- Sidolin
- Skydrol

The coated aluminum front is not resistant to the following chemicals:

- Acetone
- Ethyl acetate

4.4 Touch screen

AMT touch screen (single-touch)

Unless otherwise specified, the AMT touch screen is resistant to exposure to the following chemicals for a 1-hour period (at 25°C) with no visible signs of damage:

- Acetone
- Ammonia-based glass cleaner
- Beer
- Unleaded gasoline
- Chemical cleaning agents
- Hydrochloric acid <6%
- Coca-Cola
- Diesel
- Dimethylbenzene
- Vinegar
- Ethanol
- Antifreeze
- Transmission fluid
- Household cleaning agents
- Hexane
- n-hexane
- Isopropanol
- Coffee
- Methylbenzene
- Methylene chloride
- Methyl ethyl ketone
- Mineral spirits
- Motor oil
- Nitric acid <70%
- Salt solution <5% tea
- Turpentine
- Grease
- Sulphuric acid <40%
- Cooking oil

3M touch screen (multi-touch)

Unless otherwise specified, the 3M touch screen conforms to ASTM D 1308-02 and ASTM F 1598-95. This means it is resistant to exposure to the following chemicals for a 24-hour period with no visible signs of damage:

- Acetone
- Ammonia <5%
- Gasoline
- Beer
- Lead
- Brake fluid
- Hydrochloric acid <6%
- Coca-Cola
- Dimethylbenzene
- Ethanol
- Rubber cement
- Isopropanol
- Coffee
- Ink
- Lipstick
- Lysol
- Methylbenzene
- Methyl ethyl ketone
- Naphtha
- Nitric acid <70%
- Grease
- Sulphuric acid <40%
- Stamping ink
- Tea
- Trichloroethylene
- Water
- White wine vinegar
- Windex Original

5 Touch screen

5.1 5-wire AMT touch screen (single-touch)

5.1.1 Technical data

Information:

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

Product ID	5-wire AMT touch screen
General information	
Certification	
CE	Yes
c-UL-us	Yes
Manufacturer	AMT
Technology	Analog, resistive
Release pressure	<1 N
Light permeability	81% ±3%
Environmental conditions	
Temperature	
Operation	- 20 to 70°C
Storage	- 40 to 80°C
Transport	- 40 to 80°C
Relative humidity	
Operation	90% at max. 50°C
Storage	90% RH at max. 60°C for 504 hours
Transport	90% RH at max. 60°C for 504 hours
Operating conditions	
Service life	36 million touch operations at the same position (release pressure: 250 g, interval: 2x per second)
Activation	Finger, pointer, credit card, glove
Drivers	Touch screen drivers for approved operating systems are available in the Downloads section of the B&R website (www.br-automation.com).

Table 317: 5-wire AMT touch screen - Technical data

5.1.2 Temperature/Humidity diagram

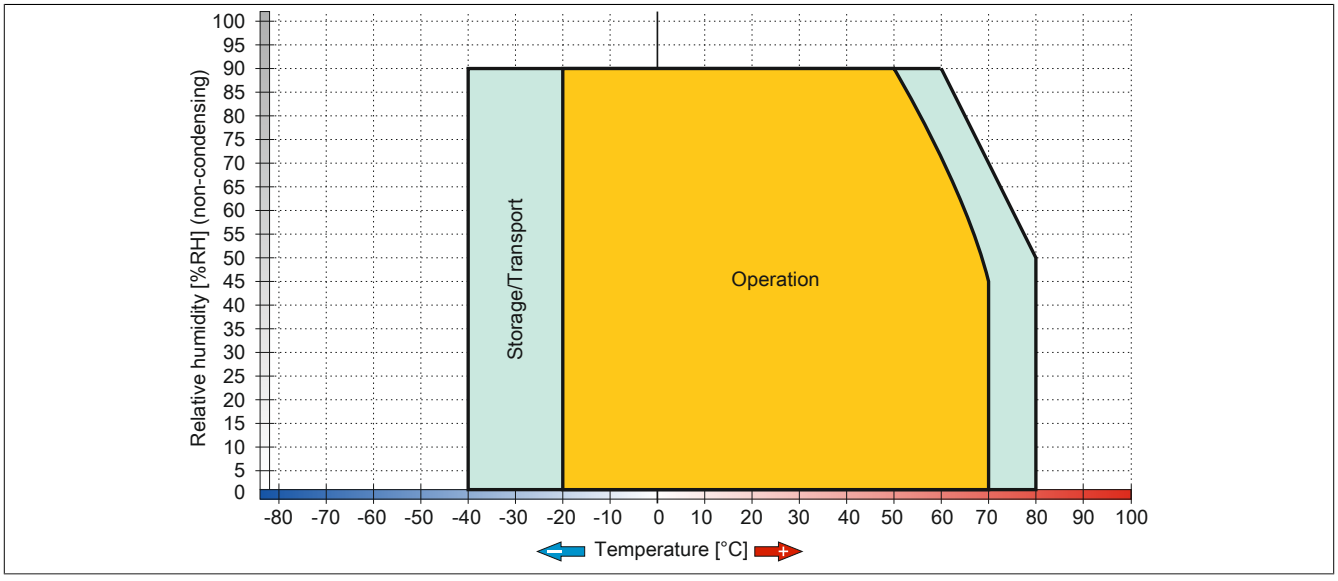


Figure 250: 5-wire AMT touch screen - Temperature/Humidity diagram

5.2 3M touch screen (multi-touch)

5.2.1 Technical data

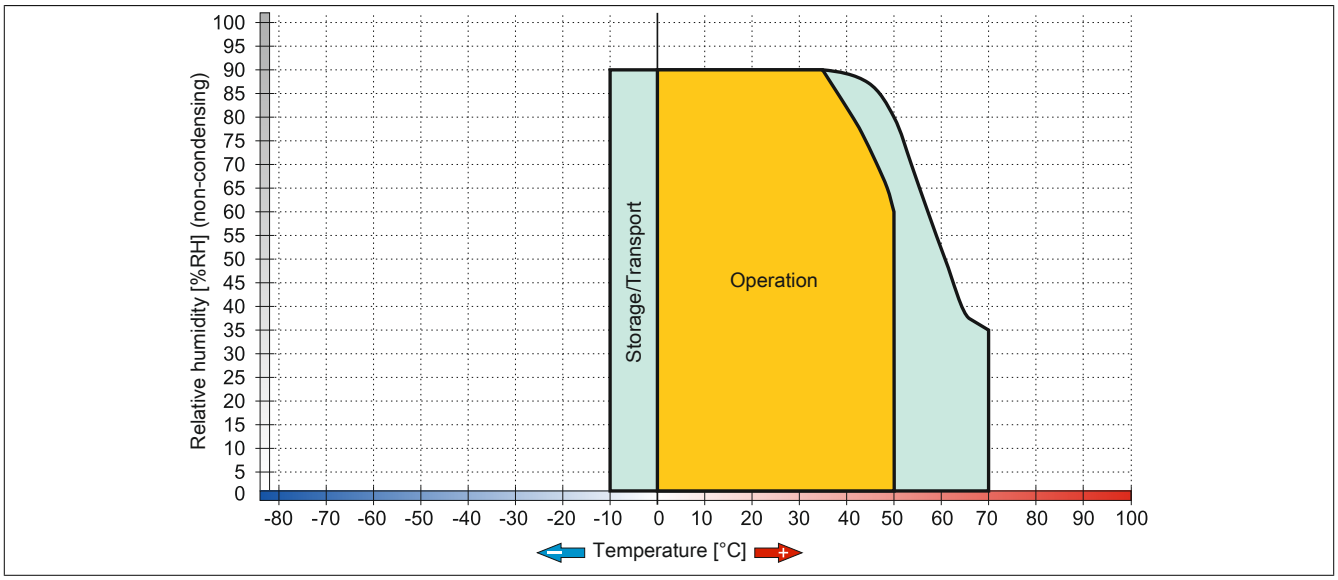
Information:

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

Product ID	3M touch screen
General information	
Certification	
CE	Yes
Manufacturer	3M
Technology	Projected capacitive touch (PCT)
Light permeability	88 ±2%
Environmental conditions	
Temperature	
Operation	0 to 50°C
Storage	-10 to 70°C
Transport	-10 to 70°C
Relative humidity	
Operation	90% at max. 35°C
Storage	90% at max. 35°C
Transport	90% at max. 35°C
Operating conditions	
Activation	Finger, thin glove, 3M Smart Pen

Table 318: 3M touch screen - Technical data

5.2.2 Temperature/Humidity diagram



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