

Automation PC 910

User's manual

Version: **1.35 (April 2016)**
Model no.: **MAAPC900-ENG**

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Chapter 1 • General information

1 Manual history

Version	Date	Change
0.10 Preliminary	2012-06-12	First version
1.00	2012-11-26	- Updated chapter 4 "Software" on page 204. - Updated chapter 7 "Maintenance and service" on page 361. - Updated "Appendix A" on page 389. - Modified "Organization of safety notices" on page 17. Updated descriptions for cautions and warnings. - Revised terminology in German edition. - Updated the following sections in chapter "Technical data": "Temperature specifications" on page 26, "Block diagrams" on page 41, "Humidity specifications" on page 32. - Updated the following sections in chapter "Installation": "Mounting orientations" on page 184, "Spacing for air circulation" on page 186, "Grounding concept" on page 188. - Updated CPU boards 5PC900.TS77-00, 5PC900.TS77-01, 5PC900.TS77-05, 5PC900.TS77-06, 5PC900.TS77-07 and 5PC900.TS77-08 in sections "QM77 CPU boards" on page 82 and "HM76 CPU boards" on page 84. - Updated the following drives: "5AC901.CSSD-00" on page 100, "5AC901.CSSD-01" on page 102, "5AC901.CSSD-02" on page 104, "5AC901.CCFA-00" on page 132. - Updated the following interface options: "5AC901.ICAN-00" on page 144, "5AC901.IHDA-00" on page 147, "5AC901.ISRM-00" on page 149. - Updated section "Monitor/Panel options" on page 159. - Updated heat sink 5AC901.HS01-00, see "5AC901.HS0x-00" on page 90. - Modified section "System components / Configuration" on page 23. - Updated bus units 5AC901.BX01-01 and 5AC901.BX02-01, see "Bus units" on page 87. - Updated "CFast cards" on page 317. - Updated USB media drive, see "5MD900.USB2-02" on page 328.
1.05	2013-03-19	- Updated the following sections in chapter 2 "Technical data": "Monitor/Panel option" on page 61, "Slide-in slot 1" on page 65, "Uninterruptible power supply (UPS)" on page 167. - Updated the following drives: "5AC901.CHDD-01" on page 96, "5MMHDD.0500-00" on page 98, "5AC901.CHDD-99" on page 133. - Updated the service life of the battery, see "Battery" on page 64. - Updated sections "BIOS options" on page 204 and "Upgrade information" on page 273 in chapter 4 "Software". - Updated sections "Replacing the battery" on page 361, "Installing PCI/PCIe cards" on page 376 and "Connecting an external device to the mainboard" on page 384 in 7 "Maintenance and service". - Modified tables "Umgebungstemperatur mit Lüfter" on page and "Umgebungstemperatur ohne Lüfter" on page . - Updated "Internal supply cable" on page 357.
1.10	2013-06-12	- Updated system unit "5PC910.SX05-00" on page 77. - Updated fan kit "5AC901.FA05-00" on page 93. - Updated front covers 5AC901.FF01-01, 5AC901.FF02-01, 5AC901.FF05-00 and 5AC901.FF05-01 on page 182. - Updated slide-in compact drive "5AC901.CSSD-03" on page 106. - Updated replacement SSDs "5MMSSD.0060-00" on page 117, "5MMSSD.0060-01" on page 119 and "5MMSSD.0180-00" on page 125. - Updated slide-in drives "5AC901.SDVW-00" on page 134 and "5AC901.SSCA-00" on page 136. - Updated bus units 5AC901.BX05-00, 5AC901.BX05-01 and 5AC901.BX05-02 on page 87. - Updated PCI RAID system "5ACPCI.RAIC-06" on page 137. - Updated the replacement fan kits on page 358. - Updated section "Slide-in slot 2" on page 66. - Updated chapter 5 "Standards and certifications" on page 310. - Updated section "Configuring a SATA RAID set using the internal RAID controller" on page 198. - Updated sections "Slide-in 1 features" on page 228 and "Slide-in 2 features" on page 230 in BIOS. - Revised section "Installing and connecting the UPS battery unit" on page 379. - Revised section "Power management" on page 33. - Modified Fig. 156 "PCI and PCIe routing with enabled APIC for QM77/HM76 CPU boards" on page 272. - Updated the BIOS version to V1.13, see "BIOS options" on page 204.

Table 1: Manual history

Version	Date	Change
1.05	2013-07-30	- Updated section "Fan control" on page 31. - Updated UPS cable 5CAUPS.0010-01, see "5CAUPS.xxxx-01" on page 180. - Updated B&R USB flash drive 5MMUSB.4096-01, see "USB flash drives" on page 326. - Updated slide-in compact drive "5AC901.CSSD-04" on page 109. - Updated replacement SSD "5MMSSD.0128-01" on page 122. - Updated UPS IF option "5AC901.IUPS-01" on page 170 and UPS battery unit "5AC901.BUPS-01" on page 176. - Updated replacement disk tray "5AC901.FRAME-00" on page 334. - Updated tightening torque of locating screws in section "Cables" on page 335. - Updated 5AC901.BX02-02 and 5AC901.BX05-03 in section "Bus units" on page 87. - Updated sections "B&R Automation Device Interface (ADI) Development Kit" on page 302 and "B&R Automation Device Interface (ADI) .NET SDK" on page 304. - Updated HM76 CPU boards 5PC900.TS77-09 and 5PC900.TS77-10 in section "5PC900.TS77-0x" on page 84.
1.20	2014-04-14	- Revised sections "IF option 1 slot" on page 60 and "IF option 2 slot" on page 60. - Updated following section in "Windows 7": "Installing on the internal RAID controller (QM77)" on page 287. - Updated following section in "Windows XP Professional": "Installing on the internal RAID controller (QM77) or in AHCI mode" on page 293. - Updated information about the discontinuation of support for the operating system "Windows XP Professional" on page 292. - Revised section "Automation Runtime" on page 296. - Updated "GL", "cULus HazLoc Class 1 Division 2" and "GOST-R" certification to the technical data for several individual components. - Updated sections "GOST-R" on page 311 and "GL certification (Germanischer Lloyd)" on page 311 in chapter 5 "Standards and certifications". - Updated the BIOS version to V1.15, see "BIOS options" on page 204. - Updated front covers 5AC901.FF01-02, 5AC901.FF02-02 and 5AC901.FF05-02 on page 182. - Updated monitor/panel option "5AC901.LSD3-00" on page 164. - Updated ready relay IF option "5AC901.IRDY-00" on page 155. - Updated slide-in compact drive "5AC901.CSSD-05" on page 112. - Updated replacement SSD "5MMSSD.0256-00" on page 127. - Corrected technical data for ambient temperature and humidity for the following drives: "5AC901.CSSD-03" on page 106, "5AC901.CSSD-04" on page 109, "5MMSSD.0060-01" on page 119, "5MMSSD.0128-01", "5MMSSD.0256-00" on page 127. - Updated "Line filter" on page 359. - Updated SDL3 cables "5CASD3.xxxx-00" on page 351. - Updated service life diagram for the "5AC901.BUPS-00" and "5AC901.BUPS-01" battery units.
1.21	2014-05-27	- Corrected technical data for bus units with PCI Express slots – PCIe standard and bus speed, see "Technical data" on page 89. - Corrected Fig. 156 "PCI and PCIe routing with enabled APIC for QM77/HM76 CPU boards" on page 272. - Documented new revision of CFAST cards, see "CFAST cards" on page 317.
1.22	2014-08-25	- Corrected Fig. X "Leistungskalkulation APC 1 Slot" on page , Fig. X "Leistungskalkulation APC 2 Slot" on page and Tab. 14 "5-slot APC variant - Power calculation table" on page 38. - Corrected Fig. 5 "Voltage supply for system units" on page 33.
1.25	2015-02-11	- Updated 5AC901.ISIO-00 interface option, see "Interface options" on page 140. - Updated "Windows Embedded 8.1 Industry Pro" on page 283. - Updated Fig. X "Revision der Einzelkomponenten mit GL-Zulassung" on page and Fig. X "GL-Zertifikat Nr. 61 601 - 13 HH" on page . - Updated section "Mounting orientation - Floor-mounted" on page 185. - Updated section "Known problems / Issues" on page 203. - Updated the BIOS version to V1.19, see "BIOS options" on page 204. - Updated section "Automation Runtime" on page 296. - Updated 5CFAST.032G-10, 5CFAST.064G-10 and 5CFAST.128G-10 CFAST cards, see "CFAST cards" on page 317. - Updated section "Fan control" on page 31.

Table 1: Manual history

Version	Date	Change
1.30	2015-09-30	- Updated terminal block 0TB2104.8000 for ready relay, see "0TB2104.8000" on page 315. - Updated SDL cable 5CASDL.0008-00, see "SDL cables" on page 338. - Updated "B&R KCF Editor". - Updated "HMI Service Center" on page 309 (5SWUTI.0001-000). - Documented new revision of 5AC901.BX02-02 bus unit, see "Bus units" on page 87. - Updated figure "Grounding concept" on page 188. - Revised section "SDL3 - LED status indicators" on page 166. - Updated section "B&R Automation Device Interface (ADI) - Control Center" on page 300. - Updated "Humidity specifications" on page 32. - Updated MTCX controller, see "Maintenance Controller Extended (MTCX)" on page 389. - Updated section "GL certification (Germanischer Lloyd)" on page 311. - Updated Debian 8 section, see "Debian (GNU/Linux)" on page 298. - Updated POWERLINK IF option "5AC901.IPLK-00" on page 151. - Revised overview of "Windows Embedded 8.1 Industry Pro", "Windows 7" and "Windows Embedded Standard 7".
1.31	2015-11-12	- Updated slide-in compact drive "5AC901.CSSD-06" on page 115. - Updated replacement SSD "5MMSSD.0512-00" on page 130. - Updated OTG1000.02 Technology Guard (HID), see "Automation Runtime" on page 296. - Updated slide-in compact drive "5AC901.CHDD-99" on page 133.
1.32	2016-01-28	- Updated the BIOS version to V1.23, see "BIOS options" on page 204. - Correct PCI slot assignment n "PCI and PCIe routing with enabled APIC for QM77/HM76 CPU boards" on page 272.
1.35	2016-04-14	- Renamed SO-DIMM 1 and SO-DIMM 2 to CPU board sensor 3 and CPU board sensor 4, see "Temperature sensor locations" on page 30. - Updated "Humidity specifications" on page 32. - Updated drives "5AC901.CHDD-01" on page 96 and "5MMHDD.0500-00" on page 98. - Documented new revisions of drives "5AC901.CSSD-03", "5AC901.CSSD-04", "5AC901.CSSD-05", "5MMSSD.0060-01", "5MMSSD.0128-01" and "5MMSSD.0256-00". - Updated "Windows 10 IoT Enterprise 2015 LTSC" on page 280. - Updated section "General instructions for performing temperature testing" on page 189 in chapter 3 "Installation". - Updated PCI RAID controller "5ACPCI.RAIC-06" on page 137. - Updated SDL3 cable 5CASD3.0030-00, see "SDL3 cables" on page 351. - Updated section "Power supply +24 VDC" on page 53.

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 points apply 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 over 42 VDC. Touching one of these parts can result in a life-threatening electric shock. This could lead to death, severe injury or damage to property.

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 switching on the device, 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.

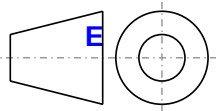
3 Organization of safety notices

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 property.
Caution!	Disregarding these safety guidelines and notices can result in injury or damage to property.
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.

Unless otherwise specified, the following general tolerances apply:

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

Model number	Short description	Page
Accessories		
5AC804.MFLT-00	Line filter	359
5AC901.FI01-00	APC910 air filter - For 1-slot APC910 - 1 pieces	358
5AC901.FI02-00	APC910 air filter - For 2-slot APC910 - 1 pieces	358
5AC901.FI05-00	APC910 air filter - For 5-slot APC910 - 1 pieces	358
5AC901.FRAME-00	APC910 slide-in compact tray	334
5CAMSC.0001-00	Internal supply cable	357
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	309
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	316
4A0006.00-000	Lithium battery, 3 V / 950 mAh, button cell	316
Buseinheiten		
5AC901.BX01-00	APC910 1-slot bus - 1 PCI	88
5AC901.BX01-01	APC910 1-slot bus - 1 PCI Express x8	88
5AC901.BX02-00	APC910 2-slot bus - 2 PCI	88
5AC901.BX02-01	APC910 2-slot bus - 1 PCI - 1 PCI Express x8	88
5AC901.BX02-02	APC910 2-slot bus - 2 PCI Express x4	88
5AC901.BX05-00	APC910 5-slot bus - 5 PCI	88
5AC901.BX05-01	APC910 5-slot bus - 4 PCI - 1 PCI Express x8	88
5AC901.BX05-02	APC910 5-slot bus - 2 PCI - 1 PCI Express x8 - 2 PCI Express x1	88
5AC901.BX05-03	APC910 5-slot bus - 2 PCI Express x4 - 3 PCI Express x1	88
CFast cards		
5CFAST.016G-00	CFast card, 16 GB SLC	319
5CFAST.032G-00	CFast card, 32 GB SLC	319
5CFAST.032G-10	CFast card, 32 GB MLC	323
5CFAST.064G-10	CFast card, 64 GB MLC	323
5CFAST.128G-10	CFast card, 128 GB MLC	323
5CFAST.2048-00	CFast card, 2 GB SLC	319
5CFAST.4096-00	CFast card, 4 GB SLC	319
5CFAST.8192-00	CFast card, 8 GB SLC	319
CPU boards		
5PC900.TS77-00	CPU board Intel Core i7 3615QE 2.3 GHz - Quad core - QM77 chipset - For APC910	82
5PC900.TS77-01	CPU board Intel Core i7 3612QE 2.1 GHz - Quad core - QM77 chipset - For APC910	82
5PC900.TS77-02	CPU board Intel Core i7 3555LE 2.5 GHz - Dual core - QM77 chipset - For APC910	82
5PC900.TS77-03	CPU board Intel Core i7 3517UE 1.7 GHz - Dual core - QM77 chipset - For APC910	82
5PC900.TS77-04	CPU board Intel Core i5 3610ME 2.7 GHz - Dual core - QM77 chipset - For APC910	82
5PC900.TS77-05	CPU board Intel Core i3 3120ME 2.4 GHz - Dual core - QM77 chipset - For APC910	82
5PC900.TS77-06	CPU board Intel Core i3 3217UE 1.6 GHz - Dual core - QM77 chipset - For APC910	82
5PC900.TS77-07	CPU board Intel Celeron 847E 1.1 GHz - Dual core - HM76 chipset - For APC910	84
5PC900.TS77-08	CPU board Intel Celeron 827E 1.4 GHz - Single core - HM76 chipset - For APC910	84
5PC900.TS77-09	CPU board Intel Celeron 1020E 2.2 GHz - Dual core - HM76 chipset - For APC910	84
5PC900.TS77-10	CPU board Intel Celeron 1047UE 1.4 GHz - Dual core - HM76 chipset - For APC910	84
DVI cables		
5CADVI.0018-00	DVI-D cable - 1.8 m	335
5CADVI.0050-00	DVI-D cable - 5 m	335
5CADVI.0100-00	DVI-D cable - 10 m	335
Debian 8		
5SWLIN.0540-MUL	Debian 8 - 32-bit - Multilingual - APC910 chipset QM77/HM76 - Installation (without Recovery DVD) - Only available with a new device	298
5SWLIN.0640-MUL	Debian 8 - 64-bit - Multilingual - APC910 chipset QM77/HM76 - Installation (without Recovery DVD) - Only available with a new device	298
Drives		
5AC901.CCFA-00	CFast adapter - For slide-in compact slot	132
5AC901.CHDD-00	250 GB hard disk - Slide-in compact - SATA	94
5AC901.CHDD-01	500 GB hard disk - Slide-in compact - SATA	96
5AC901.CHDD-99	Slide-in compact kit	133
5AC901.CSSD-00	32 GB SSD SLC - Slide-in compact - SATA	100
5AC901.CSSD-01	60 GB SSD MLC - Slide-in compact - SATA	102
5AC901.CSSD-02	180 GB SSD MLC - Slide-in compact - SATA	104
5AC901.CSSD-03	60 GB SSD MLC - Slide-in compact - SATA	106
5AC901.CSSD-04	128 GB SSD MLC - Slide-in compact - SATA	109
5AC901.CSSD-05	256 GB SSD MLC - Slide-in compact - Toshiba - SATA	112
5AC901.CSSD-06	512 GB SSD MLC - Slide-in compact - Toshiba - SATA	115
5AC901.SDVW-00	DVD drive - DVD-R/RW DVD+R/RW - Slide-in	134
5AC901.SSCA-00	Slide-in compact adapter - For slide-in compact drives	136
5ACPCI.RAIC-06	PCI RAID System 2x 500 GB - SATA	137
5MMHDD.0500-00	500 GB hard disk - SATA	98
5MMSSD.0060-00	60 GB SSD MLC - Intel - SATA	117
5MMSSD.0060-01	60 GB SSD MLC - Intel - SATA	119

Model number	Short description	Page
5MMSSD.0128-01	128 GB SSD MLC - Toshiba - SATA	122
5MMSSD.0180-00	180 GB SSD MLC - Intel - SATA	125
5MMSSD.0256-00	256 GB SSD MLC - Toshiba - SATA	127
5MMSSD.0512-00	512 GB SSD MLC - Toshiba - SATA	130
	Fan kit	
5AC901.FA01-00	APC910 fan kit - For 5PC910.SX01-00	91
5AC901.FA02-00	APC910 fan kit - For 5PC910.SX02-00	92
5AC901.FA05-00	APC910 fan kit - For 5PC910.SX05-00 system unit	93
	Front cover	
5AC901.FF01-00	Front cover for 1-slot APC910 - Orange	182
5AC901.FF01-01	Front cover for 1-slot APC910 - Dark gray	182
5AC901.FF01-02	Front cover for 1-slot APC910 - Dark gray - Without logo	182
5AC901.FF02-00	Front cover for 2-slot APC910 - Orange	182
5AC901.FF02-01	Front cover for 2-slot APC910 - Dark gray	182
5AC901.FF02-02	Front cover for 2-slot APC910 - Dark gray - Without logo	182
5AC901.FF05-00	Front cover for 5-slot APC910 - Orange	182
5AC901.FF05-01	Front cover for 5-slot APC910 - Dark gray	182
5AC901.FF05-02	Front cover for 5-slot APC910 - Dark gray - Without logo	182
	Heat sink	
5AC901.HS00-00	APC910 heat sink, active	90
5AC901.HS01-00	APC910 heat sink, passive	90
	Interface options	
5AC901.I485-00	Interface card - 1x RS232/422/458 interface - For APC910/PPC900	140
5AC901.ICAN-00	Interface card - 1x CAN interface - For APC910/PPC900	144
5AC901.IHDA-00	Interface card - 1x audio interface (1x MIC/1x Line In/1x OUT) - For APC910/PPC900	147
5AC901.IPLK-00	Interface card - 1x POWERLINK interface - 2 MB SRAM - For APC910/PPC900	151
5AC901.IRDY-00	Interface card - Ready relay - For APC910/PPC900	155
5AC901.ISIO-00	Interface card - System I/O - For APC910/PPC900	157
5AC901.ISRM-00	Interface cards - 2 MB SRAM - For APC910/PPC900	149
	Main memory	
5MMDDR.1024-03	SO-DIMM DDR3, 1024 MB	86
5MMDDR.2048-03	SO-DIMM DDR3, 2048 MB	86
5MMDDR.4096-03	SO-DIMM DDR3, 4096 MB	86
5MMDDR.8192-03	SO-DIMM DDR3, 8192 MB	86
	Monitor/Panel options	
5AC901.LDPO-00	DisplayPort transmitter	159
5AC901.LSD3-00	SDL3 transmitter	164
5AC901.LSDL-00	SDL/DVI transmitter	161
	RS232 cables	
9A0014.02	RS232 extension cable for remote operation of display unit with touch screen, 1.8 m	355
9A0014.05	RS232 extension cable for remote operation of display unit with touch screen, 5 m	355
9A0014.10	RS232 extension cable for remote operation of display unit with touch screen, 10 m	355
	SDL cables	
5CASDL.0008-00	SDL cable - 0.8 m	338
5CASDL.0018-00	SDL cable - 1.8 m	338
5CASDL.0050-00	SDL cable - 5 m	338
5CASDL.0100-00	SDL cable - 10 m	338
5CASDL.0150-00	SDL cable - 15 m	338
5CASDL.0200-00	SDL cable - 20 m	338
5CASDL.0250-00	SDL cable - 25 m	338
5CASDL.0300-00	SDL cable - 30 m	338
	SDL cables with 45° connectors	
5CASDL.0018-01	SDL cable - 45 degree connector - 1.8 m	341
5CASDL.0050-01	SDL cable - 45 degree connector - 5 m	341
5CASDL.0100-01	SDL cable - 45 degree connector - 10 m	341
5CASDL.0150-01	SDL cable - 45 degree connector - 15 m	341
	SDL flex cables	
5CASDL.0018-03	SDL flex cable - 1.8 m	344
5CASDL.0050-03	SDL flex cable - 5 m	344
5CASDL.0100-03	SDL flex cable - 10 m	344
5CASDL.0150-03	SDL flex cable - 15 m	344
5CASDL.0200-03	SDL flex cable - 20 m	344
5CASDL.0250-03	SDL flex cable - 25 m	344
5CASDL.0300-03	SDL flex cable - 30 m	344
5CASDL.0300-13	SDL flex cable with extender - 30 m	347
5CASDL.0400-13	SDL flex cable with extender - 40 m	347
5CASDL.0430-13	SDL flex cable with extender - 43 m	347
	SDL3 cables	
5CASD3.0030-00	SDL3 cable - 3 m	351
5CASD3.0050-00	SDL3 cable - 5 m	351
5CASD3.0100-00	SDL3 cable - 10 m	351
5CASD3.0150-00	SDL3 cable - 15 m	351
5CASD3.0200-00	SDL3 cable - 20 m	351
5CASD3.0300-00	SDL3 cable - 30 m	351

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5CASD3.0500-00	SDL3 cable - 50 m	351
5CASD3.1000-00	SDL3 cable - 100 m	351
	System units	
5PC910.SX01-00	1-slot APC910 system unit	67
5PC910.SX02-00	2-slot APC910 system unit	72
5PC910.SX05-00	5-slot APC910 system unit	77
	Technology Guard	
0TG1000.01	Technology Guard (MSD) is provided in USB device class MSD (mass storage device)	296
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.	296
1TG4600.10-5	Automation Runtime Windows, TG license	296
1TG4601.06-5	Automation Runtime Embedded, TG license	296
	Terminal blocks	
0TB103.9	Connector 24 VDC - 3-pin female - Screw clamp terminal block 3.31 mm ²	313
0TB103.91	Connector 24 VDC - 3-pin female - Cage clamp terminal block 3.31 mm ²	313
0TB2104.8000	Connector 24 VDC - 4-pin female - Screw clamps 2.5 mm ²	315
	USB accessories	
5A5003.03	Front cover for drives - 5A5003.02 - 5MD900.USB2	332
5MD900.USB2-02	USB 2.0 drive combination - DVD-R/RW, DVD+R/RW - CompactFlash slot	328
5MMUSB.2048-01	USB 2.0 flash drive 2048 MB B&R	326
5MMUSB.4096-01	USB 2.0 flash drive 4096 MB B&R	326
	USB cables	
5CAUSB.0018-00	USB 2.0 connection cable - Type A - Type B connector - 1.8 m	354
5CAUSB.0050-00	USB 2.0 connection cable - Type A - Type B connector - 5 m	354
	Uninterruptible power supplies	
5AC901.BUPS-00	Battery unit 4.5 Ah - For UPS 5AC901.IUPS-00	172
5AC901.BUPS-01	Battery unit 2.2 Ah - For UPS 5AC901.IUPS-01	176
5AC901.IUPS-00	UPS - For 4.5 Ah battery	168
5AC901.IUPS-01	UPS - For 2.2 Ah battery	170
5CAUPS.0005-01	UPS cable - 0.5 m - For 5AC901.IUPS-xx	180
5CAUPS.0010-01	UPS cable - 1 m - For 5AC901.IUPS-xx	180
5CAUPS.0030-01	UPS cable - 3 m - For 5AC901.IUPS-xx	180
	Windows 10 IoT Enterprise	
5SWW10.0240-MUL	Windows 10 IoT Enterprise 2015 LTSB - 64-bit - Multilingual - APC910 QM77/HM76 chipset - License (without Recovery DVD) - Only available with a new device	280
	Windows 7 Professional/Ultimate	
5SWWI7.1100-ENG	Windows 7 Professional SP1 - 32-bit - English - DVD	286
5SWWI7.1100-GER	Windows 7 Professional SP1 - 32-bit - German - DVD	286
5SWWI7.1200-ENG	Windows 7 Professional SP1 - 64-bit - English - DVD	286
5SWWI7.1200-GER	Windows 7 Professional SP1 - 64-bit - German - DVD	286
5SWWI7.1300-MUL	Windows 7 Ultimate SP1 - 32-bit - Multilingual - DVD	286
5SWWI7.1400-MUL	Windows 7 Ultimate SP1 - 64-bit - Multilingual - DVD	286
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5SWWI8.0340-MUL	Windows Embedded 8.1 Industry Pro - 32-bit - Multilingual - For APC910 QM77/HM76 - License	283
5SWWI8.0440-MUL	Windows Embedded 8.1 Industry Pro - 64-bit - Multilingual - For APC910 QM77/HM76 - License	283
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5SWWXP.0740-ENG	Windows Embedded Standard 2009 - English - For PPC900 with QM77/HM76 chipset - License	294
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5SWWI7.1540-ENG	Windows Embedded Standard 7 SP1 - 32-bit - English - For APC910 with QM77/HM76 chipset - License	289
5SWWI7.1640-ENG	Windows Embedded Standard 7 SP1 - 64-bit - English - For APC910 with QM77/HM76 chipset - License	289
5SWWI7.1740-MUL	Windows Embedded Standard 7 Premium SP1 - 32-bit - Multilingual - For APC910 with QM77/HM76 chipset - License	289
5SWWI7.1840-MUL	Windows Embedded Standard 7 Premium SP1 - 64-bit - Multilingual - For APC910 with QM77/HM76 chipset - License	289
	Windows XP Professional	
5SWWXP.0600-ENG	Windows XP Professional SP3 - English - CD	292
5SWWXP.0600-GER	Windows XP Professional SP3 - German - CD	292
5SWWXP.0600-MUL	Windows XP Professional SP3 - Multilingual - CD	292

Chapter 2 • Technical data

1 Introduction

1.1 Intel Core i-series processors for the most demanding tasks

The APC910 is based on the latest Intel Core i-series technology and offers maximum performance for demanding tasks such as those that involve vision systems. The proven standard design of the [Automation](#) PCs has been retained while adding many new details to keep up with the advancements being made on the PC market. Robust design for use in industrial applications around the world and long-term series availability continue to define the [Automation](#) PC series, a trend now being continued by the APC910.



1.2 Maximum performance

The APC910 has the latest Intel Core i-series technology at its heart. By further reducing the structural size of the chip and implementing a new microprocessor architecture that now integrates graphics directly into the CPU, Intel has been able to improve performance by leaps and bounds over their first Core i-series generation and Core 2 Duo systems. The rest of the PC infrastructure has also been streamlined for maximum computing performance and optimal data throughput. The APC910 now has a serial ATA-based CFast card to replace the previously used CompactFlash. And just like the APC810, hard disks and solid-state drives are connected to the PC system via the high-speed SATA interface. These devices are also well-equipped when it comes to interface options. Two Gigabit Ethernet ports, USB interfaces and onboard as well as modular serial interfaces round off the extensive capabilities of the APC910.

1.3 Availability and reliability for many productive years

[Automation](#) PCs are built for continuous operation over a period of many years. This starts with the robust welded housing that shields the electronics from the external environment, easily withstanding rough conditions. The industrial-grade coating can endure even the most aggressive environments so that even a well-seasoned [Automation](#) PC might be mistaken for new. Components have also been selected to provide many years of reliable service. These components have been designed specifically for use in industrial environments, can withstand high ambient temperatures and enjoy guaranteed long-term availability. In addition, [Automation](#) PC generations are produced in excess of 10 years – quite the exception in the otherwise fast-paced PC sector and a significant advantage for

the user. The third generation of **Automation** PCs, represented by the APC910, proves once again that innovation and product continuity are not incompatible goals. From the ease of connecting cables to the interfaces on top of the device to the location of mounting holes, many details have stayed the same. For the many thousands of panels in the field – whether customized or in the standard design – there is always the proven SDL interface for easily connecting the PC to its display.

1.4 Features

- Latest processor technology - Intel Core i-series (Generation 3 - Ivy Bridge)
- Up to 16 GB main memory (dual-channel memory support)
- 1 CFast slot¹⁾
- 1, 2 or 5 card slots (for PCI / PCI Express (PCIe) cards)
- SATA drives (slide-in and slide-in compact slots)
- 4x USB 3.0, 1x USB 2.0
- 2x Ethernet 10/100/1000 Mbit interfaces
- 1x RS232 interface, modem-compatible
- Connections for a wide range of display devices to the monitor/panel and DisplayPort interfaces
- 24 VDC supply voltage
- Fanless operation²⁾
- BIOS (AMI)
- Real-time clock (RTC, battery-backed)
- Wide range of interface options
- Wide range of monitor/panel options

¹⁾ A CFast adapter allows multiple CFast cards to be used. This depends on the respective system unit.

²⁾ Depends on the device configuration and ambient temperature.

1.5 System components / Configuration

The APC910 system can be assembled to meet individual requirements and operating conditions. The following components are required for operation:

- System unit
- Bus unit
- CPU board
- Heat sink
- Fan kit³⁾
- Main memory
- Drive (mass storage device such as CFast card or hard disk) for the operating system
- Operating system

1.5.1 Configuration - Base system

System units can be operated with or without a fan kit. This choice plays a role in determining the various types of heat sinks to be used.

Using a fan kit allows for operation at higher ambient temperatures. More information can be found in section ["Maximum ambient temperature" on page 27](#).

Configuration with a fan kit

Configuration - Base system with a fan kit (active)			
System unit	Select 1		
A system unit consists of a housing and mainboard.	 5PC910.SX01-00	 5PC910.SX02-00	 5PC910.SX05-00
Bus unit	Select 1		
	5AC901.BX01-00 5AC901.BX01-01	5AC901.BX02-00 5AC901.BX02-01 5AC901.BX02-02	5AC901.BX05-00 5AC901.BX05-01 5AC901.BX05-02 5AC901.BX05-03
CPU board / Heat sink / Fan kit / Main memory			
CPU board	Select 1		
	QM77 CPU boards 5PC900.TS77-00 5PC900.TS77-04 5PC900.TS77-01 5PC900.TS77-05 5PC900.TS77-02 5PC900.TS77-06 5PC900.TS77-03		HM76 CPU boards 5PC900.TS77-07 5PC900.TS77-08 5PC900.TS77-09 5PC900.TS77-10
Heat sink	Select 1		
	5AC901.HS00-00		
Fan kit	Select 1		
	5AC901.FA01-00	5AC901.FA02-00	5AC901.FA05-00
Main memory	Select 1 or 2		
	5MMDDR.1024-03 5MMDDR.2048-03	5MMDDR.4096-03 5MMDDR.8192-03	

Figure 1: Configuration - Base system with a fan kit

³⁾ A fan kit is only mandatory when using the 5AC901.HS00-00 heat sink. If a fan kit is not used, it is important to consider the more limited ambient temperature specifications (see ["Maximum ambient temperature" on page 27](#)).

Configuration without a fan kit

Configuration - Base system without a fan kit (passive)			
System unit	Select 1		
A system unit consists of a housing and mainboard.			
	5PC910.SX01-00	5PC910.SX02-00	5PC910.SX05-00
Bus unit	Select 1		
	5AC901.BX01-00 5AC901.BX01-01	5AC901.BX02-00 5AC901.BX02-01 5AC901.BX02-02	5AC901.BX05-00 5AC901.BX05-01 5AC901.BX05-02 5AC901.BX05-03
CPU board / Heat sink / Main memory			
CPU board	Select 1		
	QM77 CPU boards 5PC900.TS77-01 5PC900.TS77-04 5PC900.TS77-02 5PC900.TS77-05 5PC900.TS77-03 5PC900.TS77-06 HM76 CPU boards 5PC900.TS77-07 5PC900.TS77-08 5PC900.TS77-09 5PC900.TS77-10		
Heat sink	Select 1		
	5AC901.HS01-00		
Main memory	Select 1 or 2		
	5MMDDR.1024-03 5MMDDR.4096-03 5MMDDR.2048-03 5MMDDR.8192-03		

Figure 2: Configuration - Base system without a fan kit

1.5.2 Accessory and software configuration

Accessory and software configuration			
System unit A system unit consists of a housing and mainboard.	Select 1  5PC910.SX01-00	 5PC910.SX02-00	 5PC910.SX05-00
Front covers	Select 1 ¹⁾  5AC901.FF01-00 5AC901.FF01-01 5AC901.FF01-02	5AC901.FF02-00 5AC901.FF02-01 5AC901.FF02-02	5AC901.FF05-00 5AC901.FF05-01 5AC901.FF05-02
Slide-in compact drives	Select 1 	5AC901.CHDD-01 5AC901.CSSD-03 5AC901.CSSD-04	5AC901.CSSD-05 5AC901.CSSD-06 5AC901.CCFA-00
Slide-in drives 		Select max. 1	Select max. 2 5AC901.SDVW-00 5AC901.SSCA-00
RAID system 	Select 1	5ACPCI.RAIC-06 (uses 1 PCI slot) 5MMHDD.0500-00	
IF options 	Select max. 2 ²⁾ 5AC901.I485-00 5AC901.ICAN-00	5AC901.IHDA-00 5AC901.IRDY-00 5AC901.IPLK-00	5AC901.ISIO-00 5AC901.ISRM-00
Monitor/Panel options 		Select 1	5AC901.LDPO-00 5AC901.LSDL-00 5AC901.LSD3-00
UPS 	Select 1 of each	UPS module³⁾ + 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	
CFast cards 	Select 1	5CFAST.2048-00 5CFAST.4096-00 5CFAST.8192-00	5CFAST.016G-00 5CFAST.032G-00 5CFAST.064G-10 5CFAST.128G-10
USB accessories 	Select 1	5MMUSB.2048-01 5MMUSB.4096-01	
Terminal blocks 	Select 1	Power connectors 0TB103.9 0TB103.91	
Operating systems 	Select 1	Windows 7 5SWWI7.1100-ENG 5SWWI7.1100-GER 5SWWI7.1300-MUL 5SWWI7.1200-ENG 5SWWI7.1200-GER 5SWWI7.1400-MUL Windows Embedded 8.1 Industry 5SWWI8.0340-MUL 5SWWI8.0440-MUL Windows Embedded Standard 7 5SWWI7.1540-ENG 5SWWI7.1640-ENG 5SWWI7.1740-MUL 5SWWI7.1840-MUL Windows Embedded Standard 2009 5SXXWP.0740-ENG Debian 8 (GNU/Linux) 5SWLIN.0540-MUL 5SWLIN.0640-MUL Automation Runtime 0TG1000.01 0TG1000.02 1TG4600.10-5 1TG4601.06-5 Windows XP 5SXXWP.0600-ENG 5SXXWP.0600-GER 5SXXWP.0600-MUL	

- 1) The front cover is not included with the system unit and must be ordered separately.
- 2) 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".
- 3) This UPS module can only be operated in the IF option 1 slot.

Figure 3: Accessory and software configuration

2 Complete system

2.1 Temperature specifications

CPU boards can be combined with various other components such as drives, main memory, additional plug-in cards, etc. depending on the system unit and fan kit. 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 V4.3) 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 loopback adapters (serial interfaces, slide-in drives, USB interfaces, audio outputs)
- Maximum system expansion and power consumption

2.1.1 Maximum ambient temperature

Operation with a fan kit

Information:

The 5AC901.HS00-00 heat sink must be used when operating the **Automation PC 910** with a fan kit.

All specifications apply to non-condensing operation.

		Operation with a fan kit and 5AC901.HS00-00 heat sink											Location of sensor(s)
		i7 3615QE 5PC900.TS77-00	i7 3612QE 5PC900.TS77-01	i7 3555LE 5PC900.TS77-02	i7 3517UE 5PC900.TS77-03	i5 3610ME 5PC900.TS77-04	i3 3120ME 5PC900.TS77-05	i3 3217UE 5PC900.TS77-06	CM 847E 5PC900.TS77-07	CM 827E 5PC900.TS77-08	CM 1020E 5PC900.TS77-09	CM 1047UE 5PC900.TS77-10	
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).													
Maximum ambient temperature		50	55	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?													
System units	5PC910.SX01-00	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	Power supply
	5PC910.SX02-00	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	
	5PC910.SX05-00	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	
Main memory	5MMDDR.1024-03	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	-
	5MMDDR.2048-03	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	
	5MMDDR.4096-03	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	
	5MMDDR.8192-03	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	
Slide-in compact Drives	5AC901.CHDD-00	✓	50	50	50	50	50	50	50	50	50	50	Slide-in compact drive
	5AC901.CHDD-01	✓	50	50	50	50	50	50	50	50	50	50	
	5AC901.CSSD-00	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	
	5AC901.CSSD-01	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	
	5AC901.CSSD-02	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	
	5AC901.CSSD-03	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	
	5AC901.CSSD-04	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	
	5AC901.CSSD-05	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	
	5AC901.CSSD-06	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	
Slide-in drives	5AC901.CCFA-00	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	Slide-in drive
	5AC901.SDVW-00	40	40	40	40	40	40	40	40	40	40	40	
RAID system	5AC901.SSCA-00 ¹⁾	-	-	-	-	-	-	-	-	-	-	-	-
	5ACPCI.RAIC-06	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	
Interface options	5AC901.I485-00	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	Interface option
	5AC901.ICAN-00	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	
	5AC901.IHDA-00	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	
	5AC901.ISRM-00	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	
	5AC901.IPLK-00	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	
	5AC901.IRDY-00	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	
	5AC901.ISIO-00	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	
	5AC901.IUPS-00	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	
	5AC901.IUPS-01	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	
Monitor/Panel Options	5AC901.LDPO-00	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	Monitor/ Panel option
	5AC901.LSDL-00	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	
	5AC901.LSD3-00	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	
CFast cards	5CFAST.xxxx-00	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	-
	5CFAST.xxxx-10	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	

1) The max. temperature depends on the slide-in compact drive being used.

Table 5: Ambient temperature with a fan kit

Operation without a fan kit

Information:

The 5PC900.TS77-00 CPU board cannot be operated without a fan kit.

The 5AC901.HS01-00 heat sink must be used when operating the **Automation PC 910** without a fan kit.

All specifications apply to non-condensing operation.

		Operation without a fan kit and with 5AC901.HS01-00 heat sink											Location of sensor(s)
		17 3615OE	17 3612OE	17 3555LE	17 3517UE	15 3610ME	13 3120ME	13 3217UE	CM 847E	CM 827E	CM 1020E	CM 1047UE	
		5PC900.TS77-00	5PC900.TS77-01	5PC900.TS77-02	5PC900.TS77-03	5PC900.TS77-04	5PC900.TS77-05	5PC900.TS77-06	5PC900.TS77-07	5PC900.TS77-08	5PC900.TS77-09	5PC900.TS77-10	
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).													
Maximum ambient temperature		-	35	40	50	35	35	50	50	50	35	50	
What else can also be operated at the max. ambient temperature, or are there any limits?													
System units	5PC910.SX01-00	-	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	Power supply
	5PC910.SX02-00	-	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	
	5PC910.SX05-00	-	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	
Main memory	5MMDDR.1024-03	-	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	-
	5MMDDR.2048-03	-	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	
	5MMDDR.4096-03	-	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	
	5MMDDR.8192-03	-	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	
		-	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	
Slide-in compact Drives	5AC901.CHDD-00	-	✓	✓	45	✓	✓	45	45	45	✓	45	Slide-in compact drive
	5AC901.CHDD-01	-	✓	✓	45	✓	✓	45	45	45	✓	45	
	5AC901.CSSD-00	-	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	
	5AC901.CSSD-01	-	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	
	5AC901.CSSD-02	-	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	
	5AC901.CSSD-03	-	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	
	5AC901.CSSD-04	-	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	
	5AC901.CSSD-05	-	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	
	5AC901.CSSD-06	-	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	
	-	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓		
Slide-in drives	5AC901.SDVW-00	-	25	25	25	25	25	25	25	25	25	25	Slide-in drive
	5AC901.SSCA-00 ¹⁾	-	-	-	-	-	-	-	-	-	-	-	
RAID system	5ACPCI.RAIC-06	-	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	-
Interface options	5AC901.I485-00	-	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	Interface option
	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	-	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	
Monitor/Panel Options	5AC901.LDPO-00	-	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	Monitor/ Panel option
	5AC901.LSDL-00	-	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	
	5AC901.LSD3-00	-	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	
CFast cards	5CFAST.xxxx-00	-	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	-
	5CFAST.xxxx-10	-	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	

1) The max. temperature depends on the slide-in compact drive being used.

Table 6: Ambient temperature without a fan kit

2.1.1.1 How to determine the maximum ambient temperature

1. Select the CPU board (operation with or without a fan kit).
2. 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).

3. Incorporating additional drives, main memory, interface options, etc. can change the temperature limits of an APC910 system.

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 APC910 system is not permitted to exceed this temperature.

2.1.2 Minimum ambient temperature

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.

2.1.3 Temperature monitoring

Sensors monitor temperature values at various locations in the APC910 device. The location of these temperature sensors is illustrated in [Fig. 4 "Temperature sensor locations" on page 30](#). The values listed in [Tab. 7 "Temperature sensor locations" on page 30](#) 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 APC910 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.

2.1.4 Temperature sensor positions

Sensors indicate temperature values at various locations in the APC910. These temperatures⁴⁾ can be read in BIOS (Advanced - OEM features - System board features / CPU board features - Temperature values) or Microsoft Windows operating systems using the B&R Control Center⁵⁾.

For applications that do not run in 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.

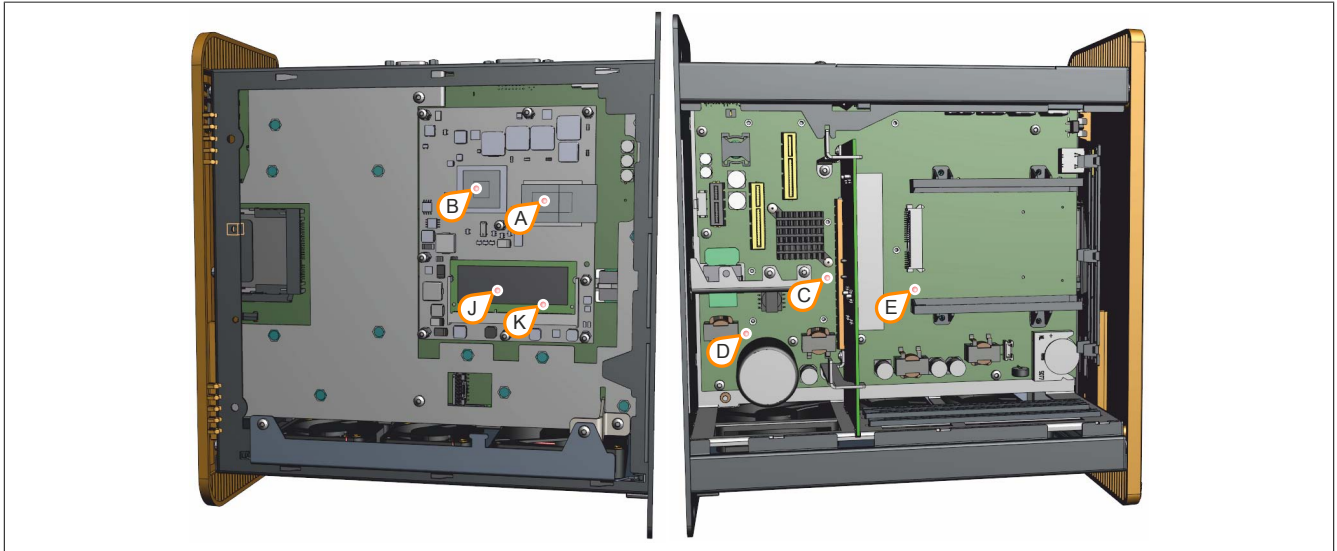


Figure 4: Temperature sensor locations

ADI sensors	Position	Measurement point for	Measurement	Max. specified
CPU board Sensor 2	A	CPU	Temperature of the processor (sensor integrated in the processor)	95°C
CPU board Sensor 1	B	Board controller	Temperature of the board controller (sensor integrated on the CPU board)	95°C
System unit Sensor 3	C	Main memory	Temperature of the main memory area (sensor integrated on the mainboard)	75°C
System unit Sensor 1	D	Board power supply	Temperature of the board power supply (sensor on the mainboard)	90°C
System unit Sensor 2	E	Slide-in compact	Temperature of the slide-in compact drive area (sensor on the mainboard)	Depends on the drive
Slide-in drive 1	F	Slide-in drive 1	Temperature of slide-in drive 1 (sensor integrated in the slide-in slot)	Depends on the drive
Slide-in drive 2	G	Slide-in drive 2	Temperature of slide-in drive 2 (sensor integrated in the slide-in slot)	Depends on the drive
-	H	Interface option ¹⁾	Temperature of the interface option (sensor integrated on the interface option)	Depends on the interface option
Display Link Sensor	I	Monitor/Panel option	Temperature of the monitor/panel option (sensor integrated on the monitor/panel option)	Depends on the monitor/panel option
CPU board Sensor 3	J	SO-DIMM 1 ²⁾	Temperature of main memory 1 (sensor integrated on main memory 1).	85°C
CPU board Sensor 4	K	SO-DIMM 2 ²⁾	Temperature of main memory 2 (sensor integrated on main memory 2).	85°C

Table 7: Temperature sensor locations

- 1) A temperature sensor is currently not integrated in the interface options.
- 2) A valid temperature is only provided if the module is connected and equipped with a temperature sensor. Otherwise, the value 0 is output in the ADI Control Center and BIOS; an alarm is also output in the ADI Control Center.

⁴⁾ Measured temperatures approximate the immediate ambient temperature but may also be influenced by neighboring components.

⁵⁾ 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).

2.1.5 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	CPU	65°C	81°C
B	Board controller	65°C	81°C
C	Main memory	60°C	76°C
D	Board power supply	70°C	86°C
E	Slide-in compact	60°C	76°C
F	Slide-in drive 1	5AC901.SDVW-00: 44°C, 5AC901.SSCA-00: 55°C	5AC901.SDVW-00: 60°C, 5AC901.SSCA-00: 71°C
G	Slide-in drive 2	5AC901.SDVW-00: 44°C, 5AC901.SSCA-00: 55°C	5AC901.SDVW-00: 60°C, 5AC901.SSCA-00: 71°C
H	Interface option ¹⁾	-	-
I	Monitor/Panel option	5AC901.LDPO-00: 60°C, 5AC901.LSDL-00: 60°C, 5AC901.LSD3-00: 60°C	5AC901.LDPO-00: 76°C, 5AC901.LSDL-00: 76°C, 5AC901.LSD3-00: 76°C
J	SO-DIMM 1	60°C	76°C
K	SO-DIMM 2	60°C	76°C

Table 8: 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 Humidity specifications

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.

Component		Operation	Storage	Transport
System units (all models)		5 to 90%	5 to 95%	5 to 95%
QM77/HM76 CPU boards		10 to 90%	5 to 95%	5 to 95%
Main memory for CPU boards		10 to 90%	5 to 95%	5 to 95%
Slide-in compact drives	5AC901.CHDD-00	5 to 95%	5 to 95%	5 to 95%
	5AC901.CHDD-01	8 to 90%	5 to 95%	5 to 95%
	5AC901.CSSD-00	5 to 95%	5 to 95%	5 to 95%
	5AC901.CSSD-01	5 to 95%	5 to 95%	5 to 95%
	5AC901.CSSD-02	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%
Slide-in drives	5AC901.CCFA-00	5 to 90%	5 to 95%	5 to 95%
Slide-in drives	5AC901.SDVW-00	8 to 80%	5 to 95%	5 to 95%
RAID system	5ACPCI.RAIC-06	8 to 90%	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%
	5AC901.IUPS-00	5 to 90%	5 to 95%	5 to 95%
	5AC901.IUPS-01	5 to 90%	5 to 95%	5 to 95%
Monitor/Panel options	5AC901.LDPO-00	5 to 90%	5 to 95%	5 to 95%
	5AC901.LSDL-00	5 to 90%	5 to 95%	5 to 95%
	5AC901.LSD3-00	5 to 90%	5 to 95%	5 to 95%
Accessories	5MMUSB.2048-01 USB flash drive	10 to 90%	5 to 90%	5 to 90%
	5MMUSB.4096-01 USB flash drive	10 to 90%	5 to 90%	5 to 90%
	5CFAST.xxxx-00 CFast cards	Max. 85%	Max. 85%	Max. 85%
	5CFAST.xxxx-10 CFast cards	10 to 95%	10 to 95%	10 to 95%
	5MD900.USB2-02 USB media drive	20 to 80%	5 to 90% / 5 to 95%	5 to 90% / 5 to 95%

Table 9: Overview of humidity specifications for individual components

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.

2.3 Power management

2.3.1 Power supply - Block diagram

The following block diagram illustrates the simplified structure of the APC910 voltage supply for system units.

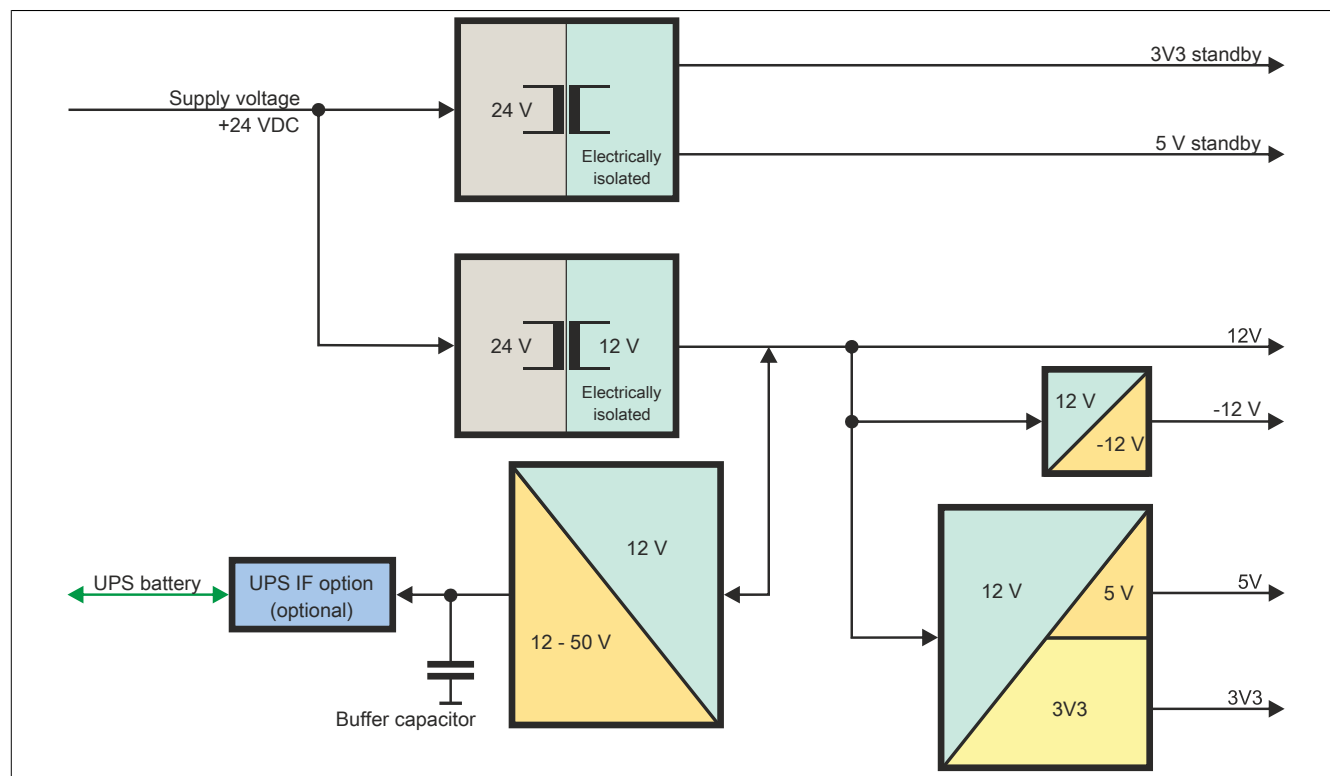


Figure 5: Voltage supply for system units

2.3.2 Power calculation with 5PC910.SX01-00

Information:

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

Information:		CPU board									Current system		
		5PC900.TS77-00	5PC900.TS77-01	5PC900.TS77-02	5PC900.TS77-03	5PC900.TS77-04	5PC900.TS77-05	5PC900.TS77-06	5PC900.TS77-07	5PC900.TS77-08	Enter values in this column		
All values are specified in watts . The values specified for the producers are maximum values. The values for the consumers are average maximum values, but not peak values.		Total power supply power (maximum)									130		
Total power supply +12 V	Maximum possible									130			
	CPU board, permanent consumers	53	43	33	25	43	43	25	25	25			
	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			
	External consumers, optional	10	10	10	10	10	10	10	10	10			
	Power consumption of PCI cards, optional (max. 3 W without fan kit, max. 6 W with fan kit) ¹⁾												
	Power consumption of PCIe x8 cards, optional (max. 3 W without fan kit, max. 20 W with fan kit) ¹⁾												
	Consumers Σ												
	Maximum possible at +5V									45			
	+5 V	Slide-in compact (HDD / SSD)	4	4	4	4	4	4	4	4	4		
		5x USB peripherals, each max. 5 W											
		Interface option, optional ²⁾ , max. 2 connections											
		External consumers, optional	5	5	5	5	5	5	5	5	5		
		Power consumption of PCI cards, optional (max. 3 W without fan kit, max. 20 W with fan kit) ¹⁾											
		Maximum possible at -12V									1.2		
		-12 V	Power consumption of PCI cards, optional (max. 1.2 W with or without fan kit) ¹⁾										
			Consumers -12 V Σ										
		Consumers +5 V Σ											
		Maximum possible at 3V3									30		
	3V3	System unit, permanent consumers	5	5	5	5	5	5	5	5	5		
		CFast card	1	1	1	1	1	1	1	1	1		
		Interface option, optional ²⁾											
Power consumption of PCI cards, optional (max. 3 W without fan kit, max. 15 W with fan kit) ¹⁾													
Power consumption of PCIe x8 cards, optional (max. 3 W without fan kit, max. 10 W with fan kit) ¹⁾													
Consumers 3V3 Σ													
Total power supply, permanent consumers Σ													

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

2) Power ratings for the interface options can be found in the table below.

Table 10: Power calculation table - 1-slot APC variant

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
System I/O IF option	5AC901.ISIO-00	-	0.5 W	-	0.5 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 11: Interface and monitor/panel options - Power rating table

Component	Model number	+5 V	3V3	12 V	Power consumption Total
Monitor/Panel option					
DisplayPort transmitter	5AC901.LDPO-00	-	0.2 W	-	0.2 W
SDL/DVI transmitter	5AC901.LSDL-00	-	1 W	-	1 W
SDL3 transmitter	5AC901.LSD3-00	2.2 W	1.8 W	-	4 W

Table 11: Interface and monitor/panel options - Power rating table

2.3.3 Power calculation with 5PC910.SX02-00

Information:

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

Information:		CPU board								Current system		
		5PC900.TS77-00	5PC900.TS77-01	5PC900.TS77-02	5PC900.TS77-03	5PC900.TS77-04	5PC900.TS77-05	5PC900.TS77-06	5PC900.TS77-07	5PC900.TS77-08	Enter values in this column	
All values are specified in watts . The values specified for the producers are maximum values. The values for the consumers are average maximum values, but not peak values.		Total power supply power (maximum)										130
		Maximum possible										130
Total power supply +12 V	+5 V	CPU board, permanent consumers	53	43	33	25	43	43	25	25	25	
		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	
		External consumers, optional	10	10	10	10	10	10	10	10	10	
		Power consumption of PCI cards, optional (max. 3 W without fan kit, max. 6 W with fan kit) ¹⁾										
		Power consumption of PCIe x8 cards, optional (max. 3 W without fan kit, max. 20 W with fan kit) ¹⁾										
		Consumers ∑										
+5 V	Maximum possible at +5V										45	
	Slide-in compact (HDD / SSD)	4	4	4	4	4	4	4	4	4		
	Slide-in (DVD / ...)	4	4	4	4	4	4	4	4	4		
	5x USB peripherals, each max. 5 W											
	Interface option, optional ²⁾ , max. 2 connections											
	Monitor/Panel option, optional ²⁾											
	External consumers, optional	5	5	5	5	5	5	5	5	5		
	Power consumption of PCI cards, optional (max. 3 W without fan kit, max. 20 W with fan kit) ¹⁾											
	Maximum possible at -12V										1.2	
	-12 V	Power consumption of PCI cards, optional (max. 1.2 W with or without fan kit) ¹⁾										
Consumers -12 V ∑												
Consumers +5 V ∑												
3V3	Maximum possible at 3V3										30	
	System unit, permanent consumers	5	5	5	5	5	5	5	5	5		
	CFAST card	1	1	1	1	1	1	1	1	1		
	Interface option, optional ²⁾											
	Monitor/Panel option, optional ²⁾											
	Power consumption of PCI cards, optional (max. 3 W without fan kit, max. 15 W with fan kit) ¹⁾											
	Power consumption of PCIe x8 cards, optional (max. 3 W without fan kit, max. 10 W with fan kit) ¹⁾											
Consumers 3V3 ∑												
Total power supply, permanent consumers ∑												

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

2) Power ratings for the interface and monitor/panel options can be found in the table below.

Table 12: Power calculation table - 2-slot APC variant

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

Table 13: Interface and monitor/panel options - Power rating table

Component	Model number	+5 V	3V3	12 V	Power consumption Total
System I/O IF option	5AC901.ISIO-00	-	0.5 W	-	0.5 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
Monitor/Panel option					
DisplayPort transmitter	5AC901.LDPO-00	-	0.2 W	-	0.2 W
SDL/DVI transmitter	5AC901.LSDL-00	-	1 W	-	1 W
SDL3 transmitter	5AC901.LSD3-00	2.2 W	1.8 W	-	4 W

Table 13: Interface and monitor/panel options - Power rating table

2.3.4 Power calculation with 5PC910.SX05-00

Information:

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

Information:		CPU board										Current system		
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.		5PC900.TS77-00	5PC900.TS77-01	5PC900.TS77-02	5PC900.TS77-03	5PC900.TS77-04	5PC900.TS77-05	5PC900.TS77-06	5PC900.TS77-07	5PC900.TS77-08	5PC900.TS77-09	5PC900.TS77-10	Enter values in this column	
Total power supply power (maximum)													130	
Total power supply +12 V	+12 V	Maximum possible											130	
		CPU board, permanent consumers	53	43	33	25	43	43	25	25	43	25		
		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	5	5	5	5	5	5	5	5	5	5		
		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		
		External consumers, optional	10	10	10	10	10	10	10	10	10	10		
	PCI card power rating, optional (max. 3 W without fan kit, max. 6 W with fan kit) ¹⁾													
	PCIe x8 card power rating, optional (max. 3 W without fan kit, max. 20 W with fan kit) ¹⁾													
	Maximum possible at -12 V											1.2		
	PCI card power rating, optional (max. 1.2 W with or without fan kit) ¹⁾													
	Consumers -12 V Σ													
	Consumers Σ													
	+5 V	+5 V	Maximum possible at +5 V											45
			Slide-in compact (HDD / SSD)	4	4	4	4	4	4	4	4	4	4	
Slide-in (DVD / ...)			4	4	4	4	4	4	4	4	4	4		
5x USB peripherals, each max. 5 W														
Interface option, optional ²⁾ , max. 2 connections														
Monitor/Panel option, optional ²⁾														
External consumers, optional			5	5	5	5	5	5	5	5	5	5		
PCI card power rating, optional (max. 3 W without fan kit, max. 20 W with fan kit) ¹⁾														
Consumers +5 V Σ														
3V3			3V3	Maximum possible at 3V3										
	System unit, permanent consumers	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 ²⁾													
	Monitor/Panel option, optional ²⁾													
	PCI card power rating, optional (max. 3 W without fan kit, max. 15 W with fan kit) ¹⁾													
	PCIe x8 card power rating, optional (max. 3 W without fan kit, max. 10 W with fan kit) ¹⁾													
	Consumers 3V3 Σ													
Total power supply, consumers Σ														

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

2) Power ratings for interface and monitor/panel options are listed in the table below.

Table 14: 5-slot APC variant - Power calculation table

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

Table 15: Interface and monitor/panel options - Power rating table

Component	Model number	+5 V	3V3	12 V	Power consumption Total
SRAM IF option	5AC901.ISRM-00	-	2 W	-	2 W
Ready relay IF option	5AC901.IRDY-00	0.2 W	-	-	0.2 W
System I/O IF option	5AC901.ISIO-00	-	0.5 W	-	0.5 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
Monitor/Panel option					
DisplayPort transmitter	5AC901.LDPO-00	-	0.2 W	-	0.2 W
SDL/DVI transmitter	5AC901.LSDL-00	-	1 W	-	1 W
SDL3 transmitter	5AC901.LSD3-00	2.2 W	1.8 W	-	4 W

Table 15: Interface and monitor/panel options - Power rating table

2.4 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 detailed information about the installed components can also be found on the back of the mounting plate.

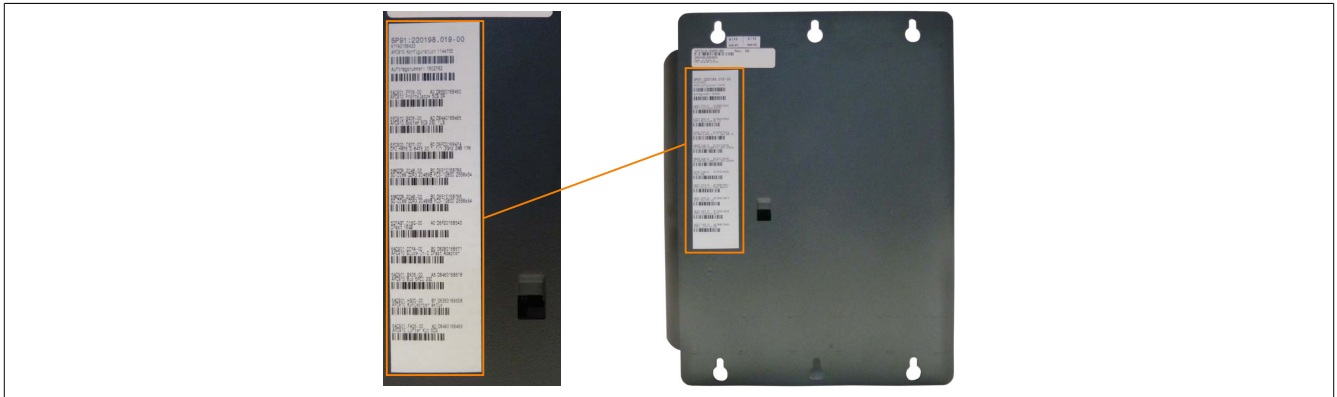


Figure 6: Serial number sticker (back)

The serial number represents all of the individual components built into the system (serial number, model number, revision, delivery date and duration of warranty). 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.

Enter serial number e.g. D6DA0168430

Switch to the option "Serial number"

List of installed components shown after searching for a serial number

SERIAL	MATERIAL	REVISION	LIEFERUNG	GEWÄHRLEISTUNGSSENDE
D88D0168423	5P91.220198.001-00	A0	*N/V	*N/A
AB240174146	5MMDDR.2048-02	C0	*N/V	*N/A
AB240174147	5MMDDR.2048-02	C0	*N/V	*N/A
D6E50168438	5AC901.HS00-00	A0	*N/V	*N/A
D6DD0168447	5AC901.BX01-01	A0	*N/V	*N/A
D6F80168425	5PC900.TS77-03	A0	*N/V	*N/A
D6DA0168430	5PC910.SX01-00	A0	*N/V	*N/A
D7540168426	5AC901.CHDD-00	A0	*N/V	*N/A

Figure 7: Searching for a serial number on the B&R website

2.5 Block diagrams

The following block diagrams illustrate the simplified structure of system units with a CPU board in relation to the various bus units.

2.5.1 5PC910.SX01-00 system unit + 5AC901.BX01-00 bus unit

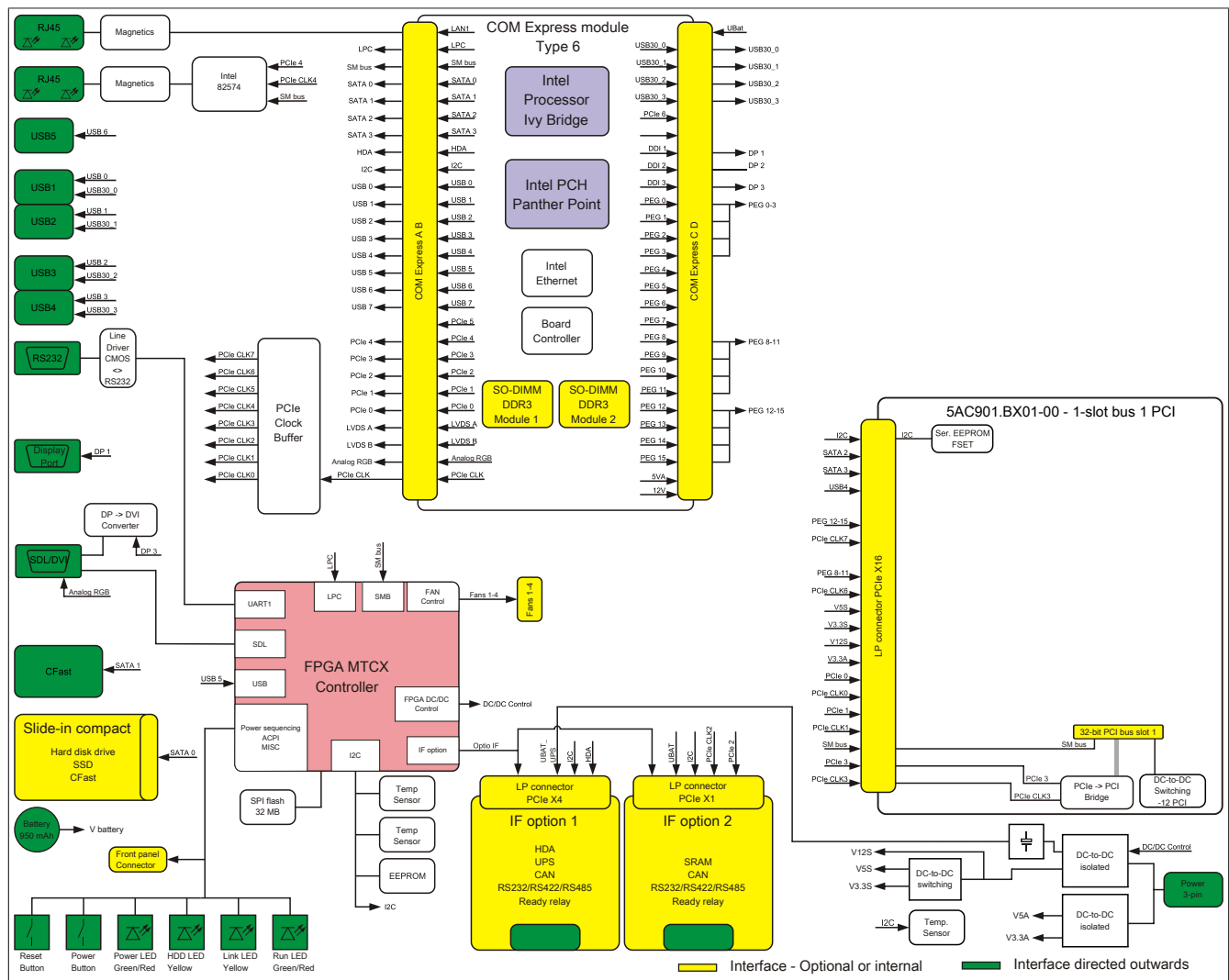


Figure 8: 5PC910.SX01-00 system unit + 5AC901.BX01-00 bus unit - Block diagram

2.5.2 5PC910.SX01-00 system unit + 5AC901.BX01-01 bus unit

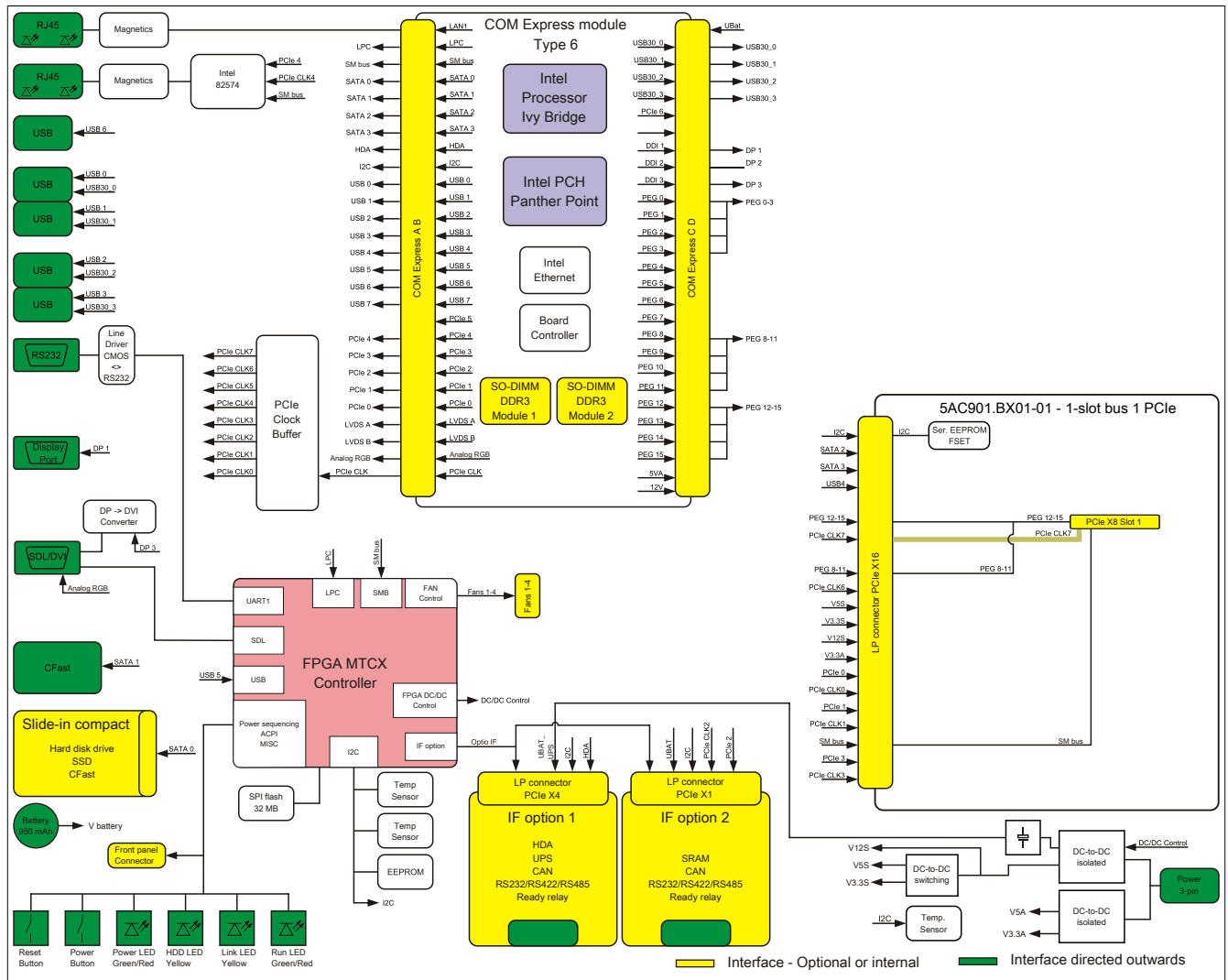


Figure 9: 5PC910.SX01-00 system unit + 5AC901.BX01-01 bus unit - Block diagram

2.5.3 5PC910.SX02-00 system unit + 5AC901.BX02-00 bus unit

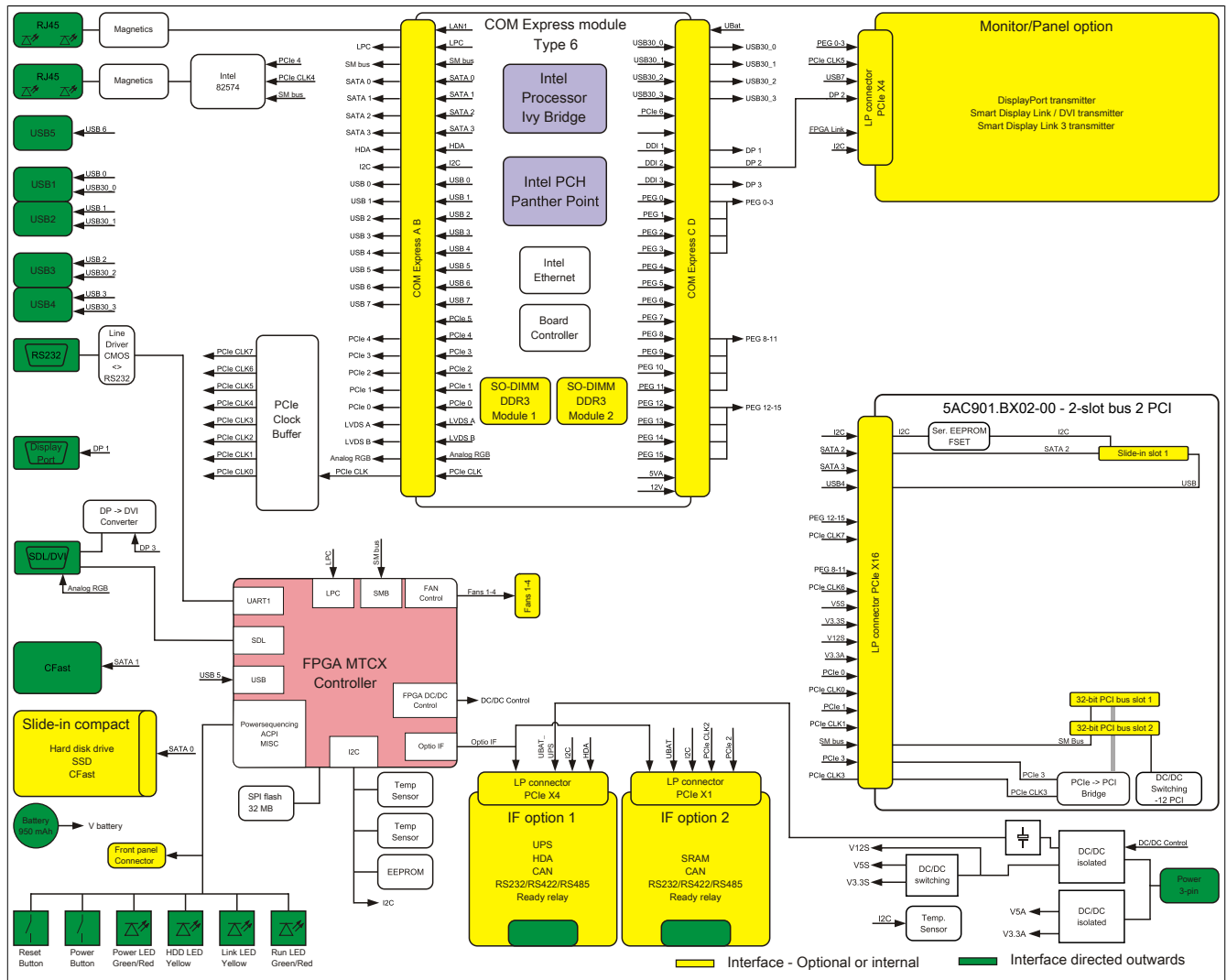


Figure 10: 5PC910.SX02-00 system unit + 5AC901.BX02-00 bus unit - Block diagram

2.5.4 5PC910.SX02-00 system unit + 5AC901.BX02-01 bus unit

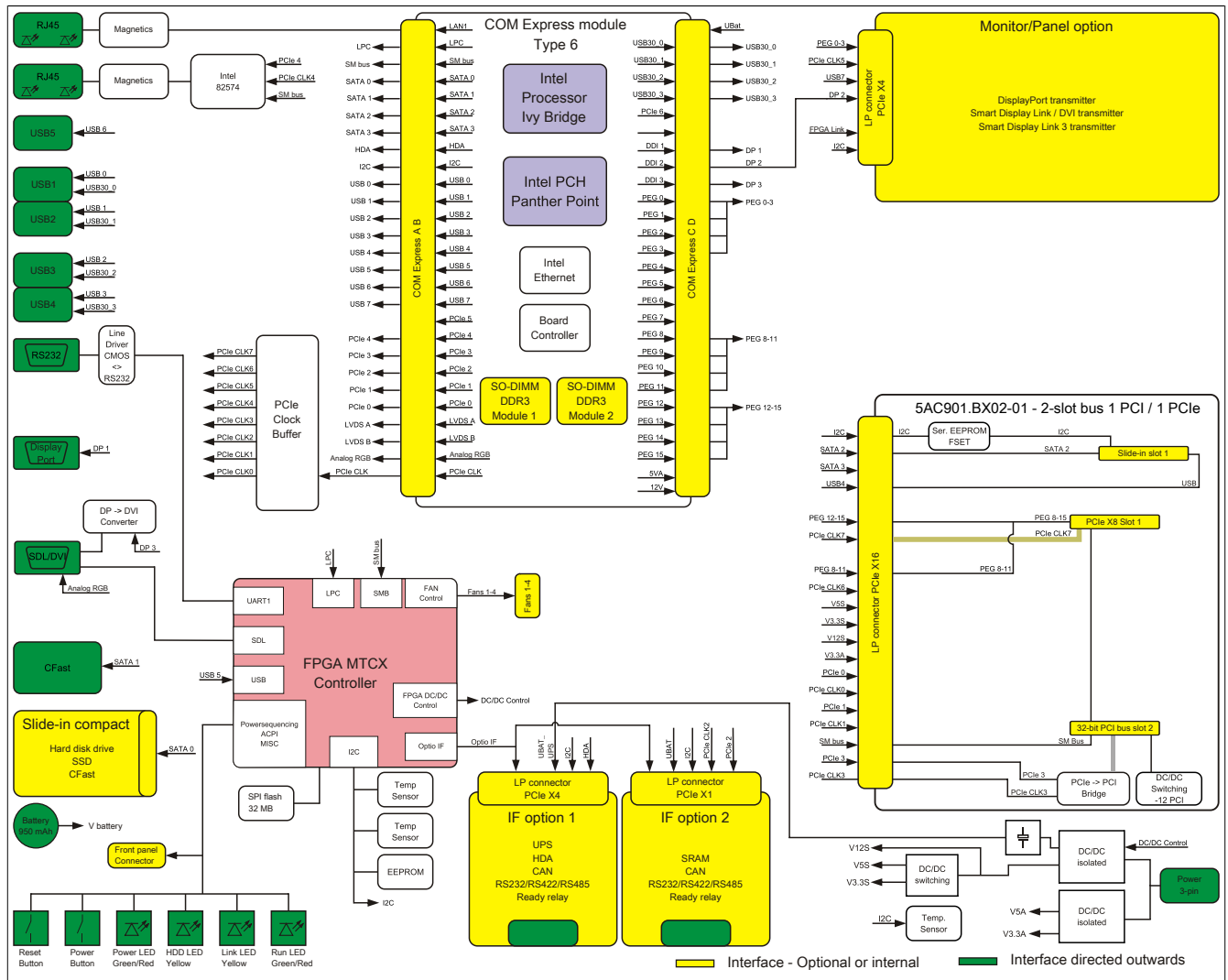


Figure 11: 5PC910.SX02-00 system unit + 5AC901.BX02-01 bus unit - Block diagram

2.5.5 5PC910.SX02-00 system unit + 5AC901.BX02-02 bus unit

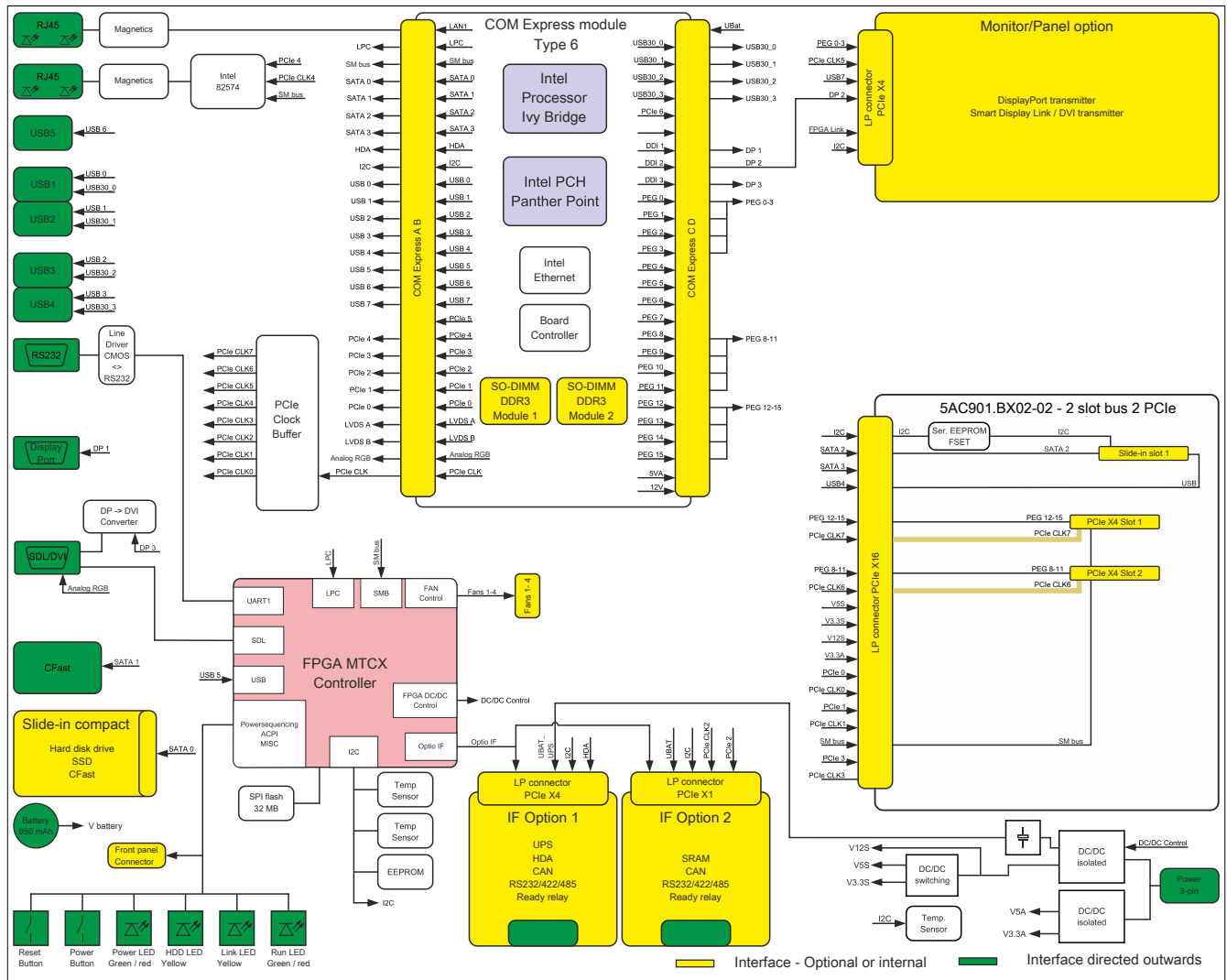


Figure 12: 5PC910.SX02-00 system unit + 5AC901.BX02-02 bus unit - Block diagram

2.5.6 5PC910.SX05-00 system unit + 5AC901.BX05-00 bus unit

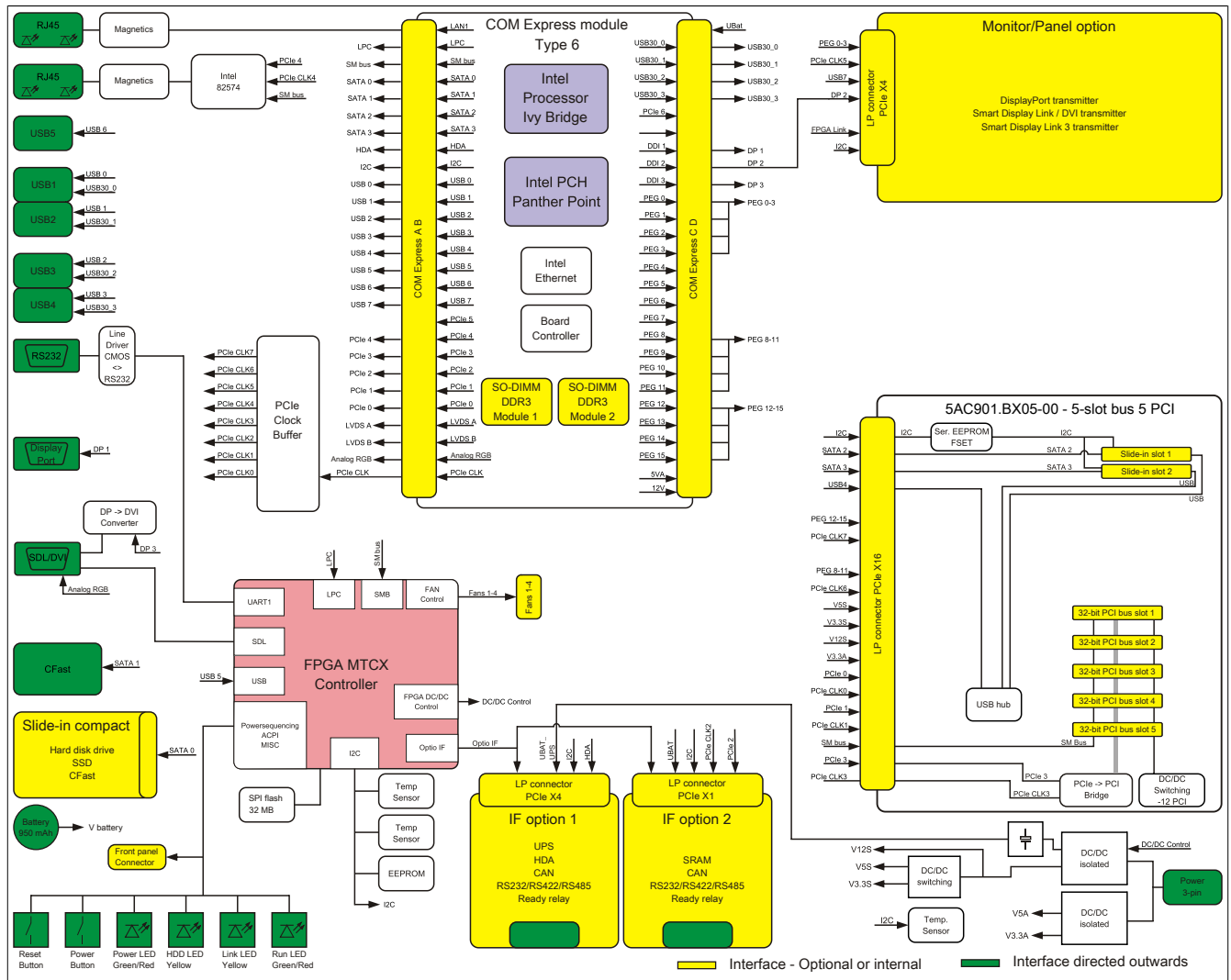


Figure 13: 5PC910.SX05-00 system unit + 5AC901.BX05-00 bus unit - Block diagram

2.5.7 5PC910.SX05-00 system unit + 5AC901.BX05-01 bus unit

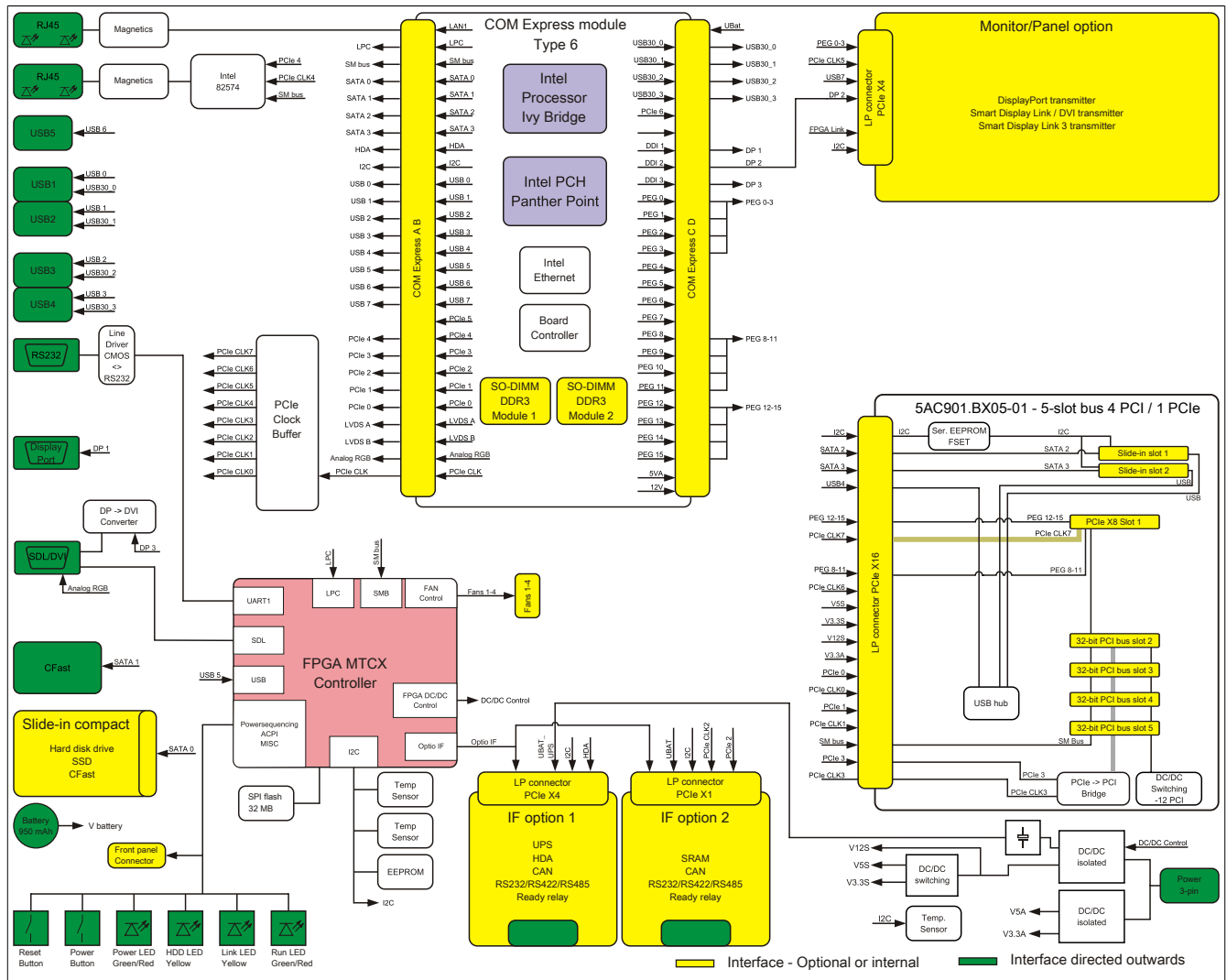


Figure 14: 5PC910.SX05-00 system unit + 5AC901.BX05-01 bus unit - Block diagram

2.5.8 5PC910.SX05-00 system unit + 5AC901.BX05-02 bus unit

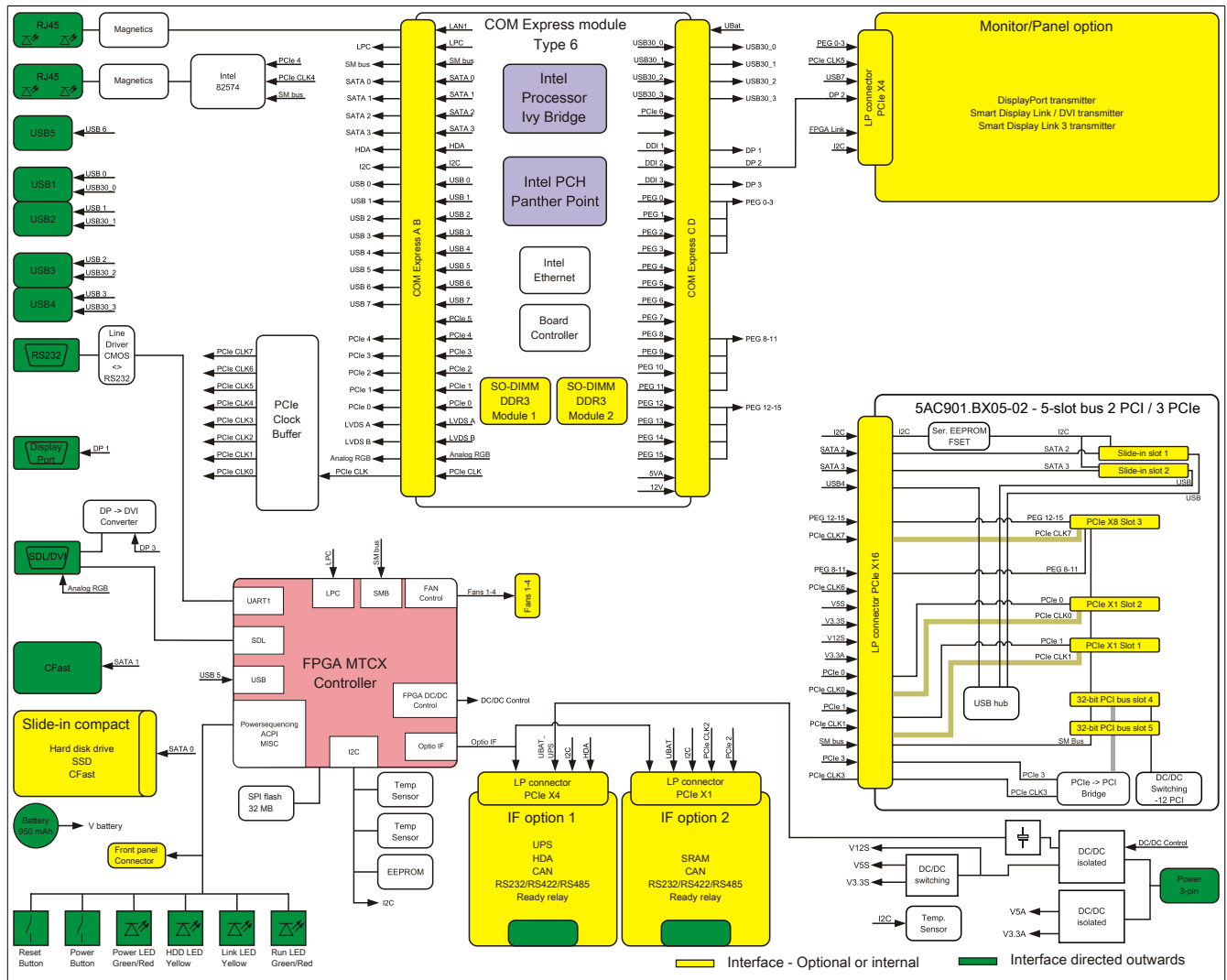


Figure 15: 5PC910.SX05-00 system unit + 5AC901.BX05-02 bus unit - Block diagram

2.5.9 5PC910.SX05-00 system unit + 5AC901.BX05-03 bus unit

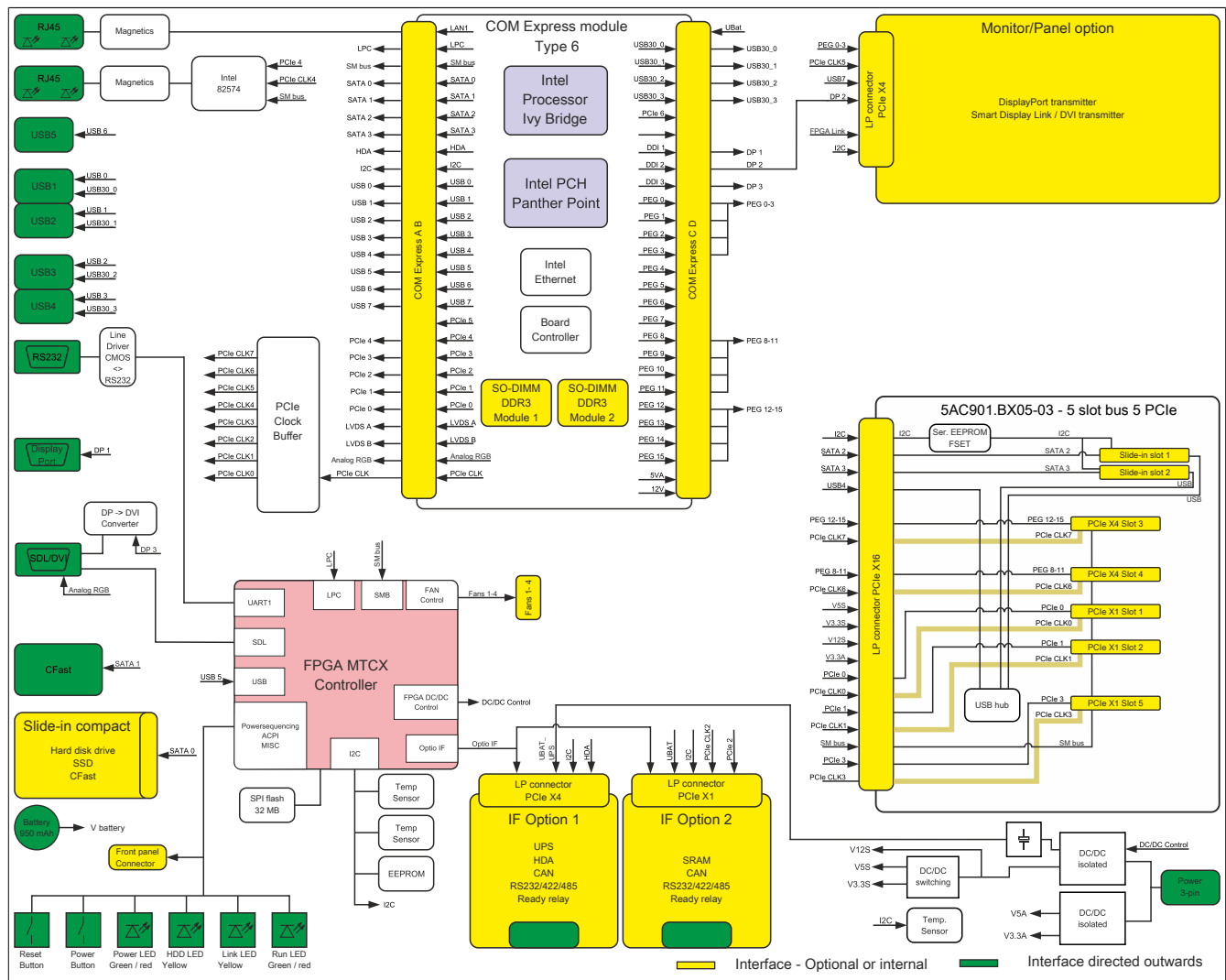


Figure 16: 5PC910.SX05-00 system unit + 5AC901.BX05-03 bus unit - Block diagram

2.5.10 Monitor/Panel options

DisplayPort transmitter

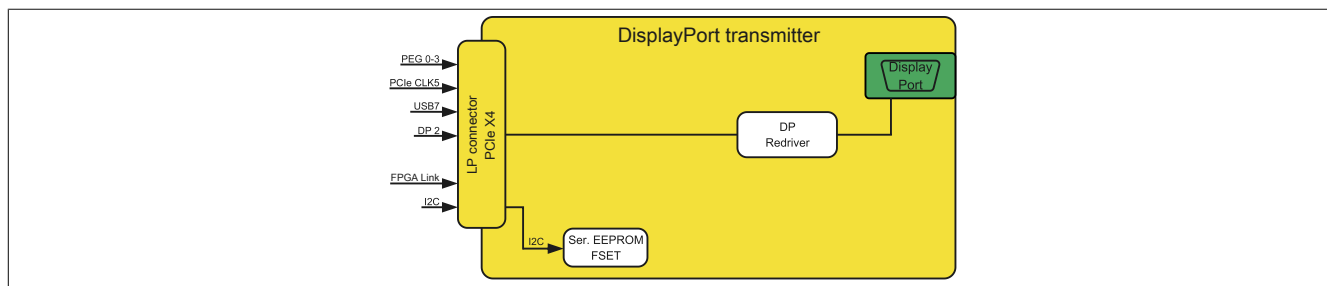


Figure 17: 5AC901.LDPO-00 DisplayPort transmitter - Block diagram

SDL/DVI transmitter

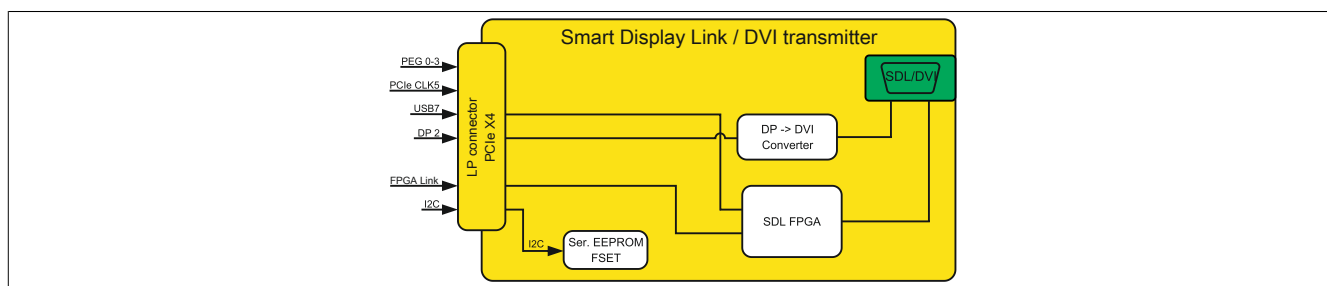


Figure 18: 5AC901.LSDL-00 Smart Display Link / DVI transmitter - Block diagram

SDL3 transmitter

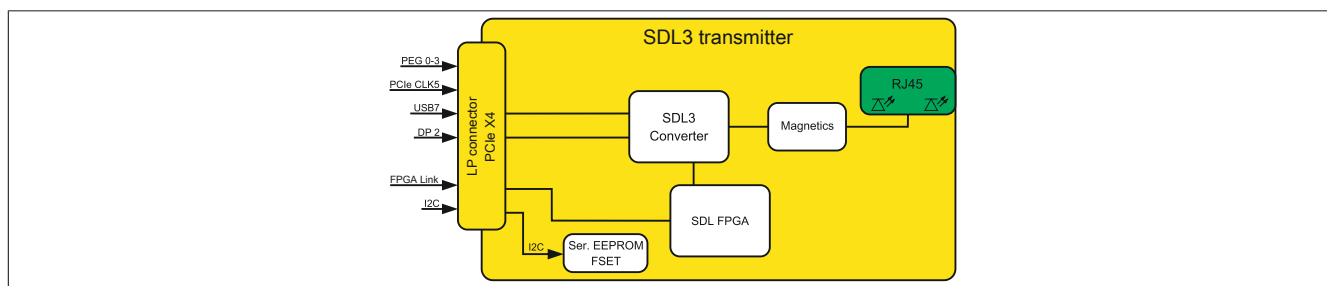


Figure 19: 5AC901.LSD3-00 Smart Display Link 3 transmitter - Block diagram

2.6 Device interfaces and slots

2.6.1 Device interfaces - Overview

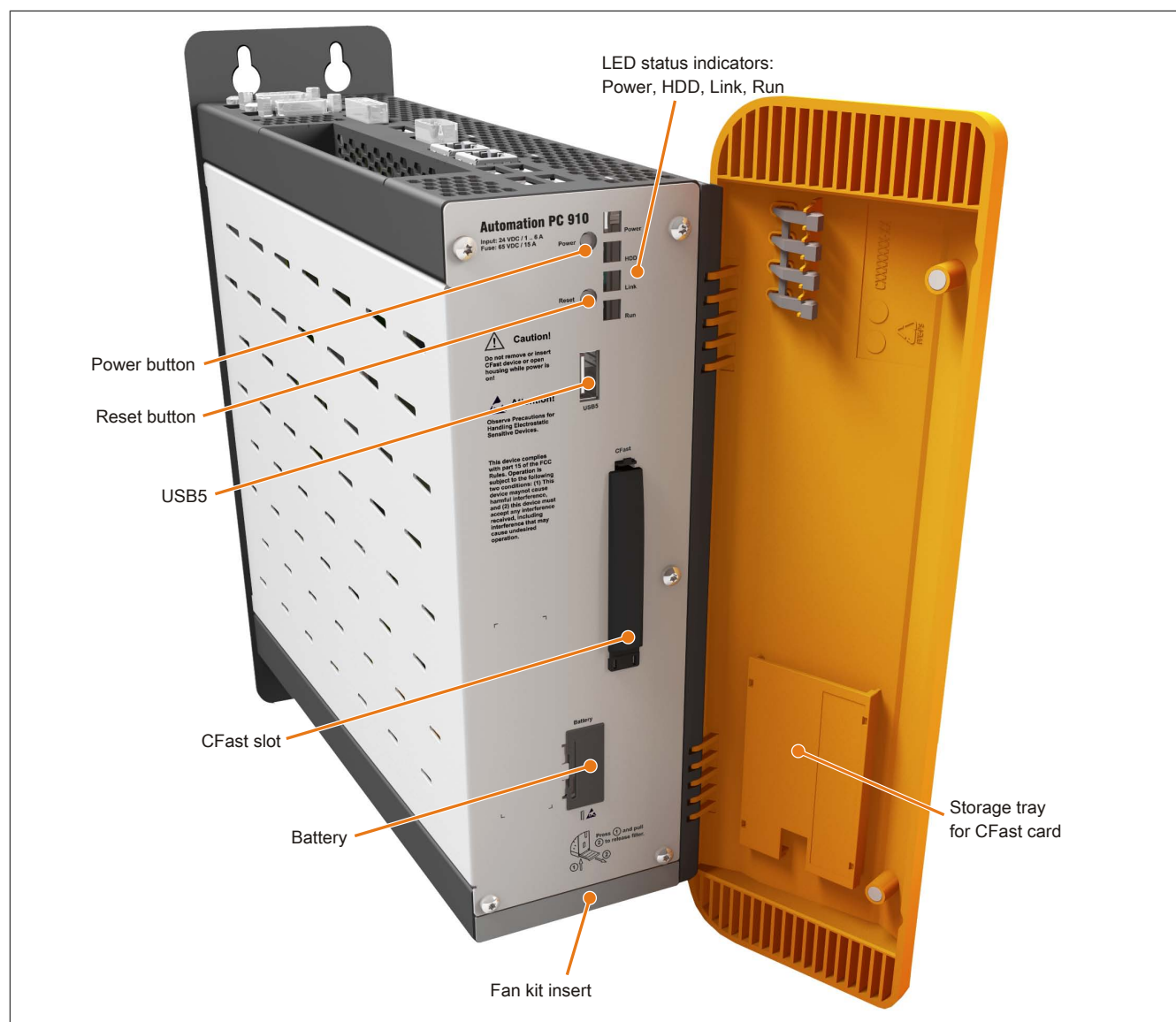


Figure 20: Device interfaces - Overview (front)

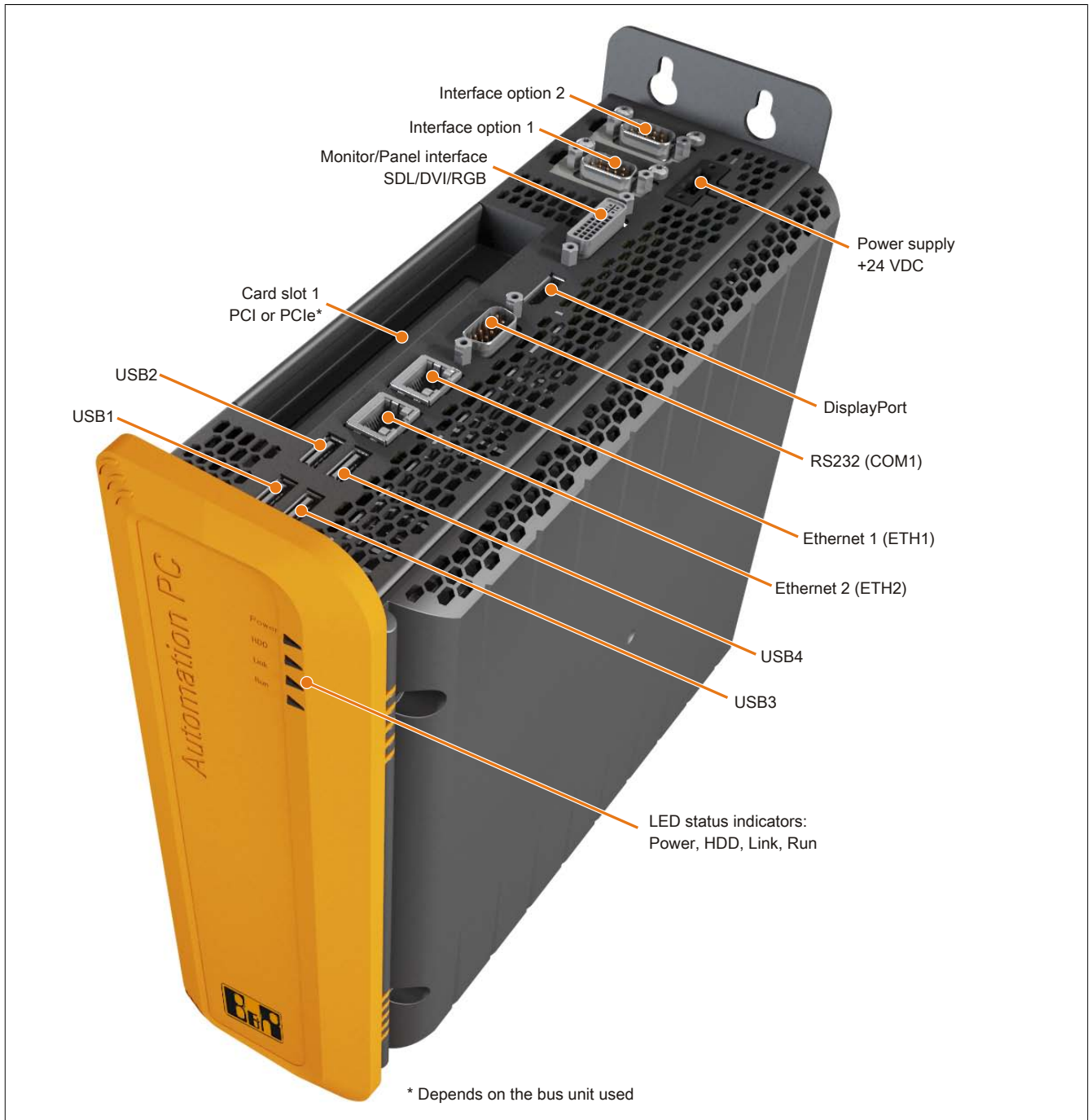


Figure 21: Device interfaces - Overview (top)

2.6.2 Power supply +24 VDC

Danger!

This device is only permitted to be supplied by a SELV / PELV power supply or with safety extra-low voltage (SELV) in accordance with EN 60950.

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 clamp terminal block).

The pinout is listed in the following table and printed on the housing. 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.

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 clamp terminal block

3-pin male power supply connector

Power supply
+24 VDC



Table 16: 24 VDC voltage supply connection

2.6.2.1 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 APC910 system.



Figure 22: Ground connection

The M4 self-locking nut must be used, for example, to fasten a copper strip to a central grounding point in the control cabinet or system where the APC910 is installed. The largest possible conductor cross section should be used (at least 2.5 mm²).

2.6.3 COM1 serial interface

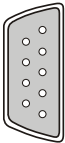
COM1 serial interface¹⁾

	RS232
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

9-pin, male, DSUB connector

6

9



1

5

Table 17: 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.

2.6.4 Panel/Monitor interface

Panel/Monitor interface - SDL (Smart Display Link) / DVI / RGB	
The following overview lists the video signals available on the monitor/panel output. For details, see the technical data for the CPU board being used.	
CPU board	Video signals with all system unit variants
5PC900.TS77-00	SDL, DVI, RGB
5PC900.TS77-01	SDL, DVI, RGB
5PC900.TS77-02	SDL, DVI, RGB
5PC900.TS77-03	SDL, DVI, RGB
5PC900.TS77-04	SDL, DVI, RGB
5PC900.TS77-05	SDL, DVI, RGB
5PC900.TS77-06	SDL, DVI, RGB
5PC900.TS77-07	SDL, DVI, RGB
5PC900.TS77-08	SDL, DVI, RGB
5PC900.TS77-09	SDL, DVI, RGB
5PC900.TS77-10	SDL, DVI, RGB



Table 18: 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.

2.6.4.1 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.

2.6.4.2 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 synchronization	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

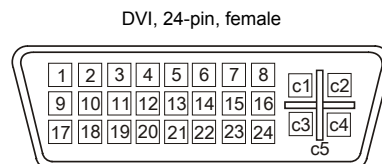


Table 19: DVI interface - Pinout

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 19: DVI interface - Pinout

1) Protected internally by a multifuse.

2.6.4.3 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 Segment length [m]	Resolution						
	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 20: Cable lengths and resolutions for SDL transmission

2.6.4.4 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 Segment length [m]	Resolution						
	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 21: Cable lengths and resolutions for DVI transmission

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

2.6.5 DisplayPort interface

DisplayPort 1.1	
The following overview lists the video signals available on the DisplayPort 1.1 output. For details, see the technical data for the CPU board being used.	
CPU board	Video signals with all system unit variants
5PC900.TS77-00	DisplayPort, DVI, HDMI
5PC900.TS77-01	DisplayPort, DVI, HDMI
5PC900.TS77-02	DisplayPort, DVI, HDMI
5PC900.TS77-03	DisplayPort, DVI, HDMI
5PC900.TS77-04	DisplayPort, DVI, HDMI
5PC900.TS77-05	DisplayPort, DVI, HDMI
5PC900.TS77-06	DisplayPort, DVI, HDMI
5PC900.TS77-07	DisplayPort, DVI, HDMI
5PC900.TS77-08	DisplayPort, DVI, HDMI
5PC900.TS77-09	DisplayPort, DVI, HDMI
5PC900.TS77-10	DisplayPort, DVI, HDMI

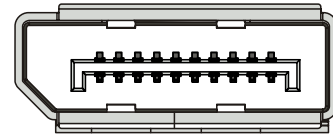


Table 22: DisplayPort 1.1

Information:

The hardware and graphics drivers of approved operating systems support the hot plugging of display devices to the DisplayPort interface for service purposes. The DisplayPort connector is specified for 10,000 connection cycles.

2.6.5.1 DisplayPort - Pinout

Pin	Signal	Description	Pin	Signal	Description
1	DP_LANE0+	DisplayPort lane 0 (positive)	11	GND	Ground
2	GND	Ground	12	DP_LANE3-	DisplayPort lane 3 (negative)
3	DP_LANE0-	DisplayPort lane 0 (negative)	13	CONFIG1	Configuration pin 1 (connected to ground)
4	DP_LANE1+	DisplayPort lane 1 (positive)	14	CONFIG2	Configuration pin 2 (connected to ground)
5	GND	Ground	15	DP_AUX+	Auxiliary channel (positive)
6	DP_LANE1-	DisplayPort lane 1 (negative)	16	GND	Ground
7	DP_LANE2+	DisplayPort lane 2 (positive)	17	DP_AUX-	Auxiliary channel (negative)
8	GND	Ground	18	DP_HPD#	Hot plug detect
9	DP_LANE2-	DisplayPort lane 2 (negative)	19	RETURN	Return for power
10	DP_LANE3+	DisplayPort lane 3 (positive)	20	DP_PWR	Power for connector

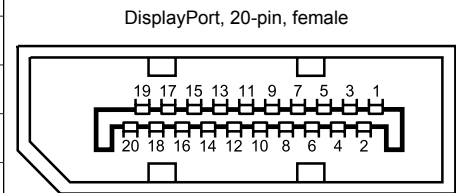


Table 23: DisplayPort - Pinout

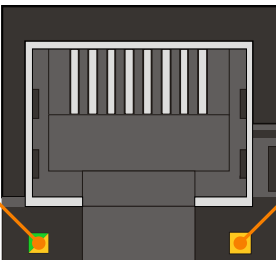
2.6.6 Ethernet 1 interface (ETH1)

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® 82579	
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
Orange	Link (Ethernet network connection available)	Activity (blinking - data transfer in progress)

RJ45, female

1



Speed LED

Link LED

Table 24: 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.

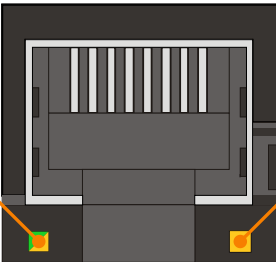
2.6.7 Ethernet 2 interface (ETH2)

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

Ethernet 2 interface (ETH2 ¹⁾)		
Controller	Intel® 82574L	
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
Orange	Link (Ethernet network connection available)	Activity (blinking - data transfer in progress)

RJ45, female

1



Speed LED

Link LED

Table 25: 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.

2.6.8 USB interfaces

The APC910 comes equipped with a USB 3.0 (Universal Serial Bus) host controller with multiple USB interfaces, 5 of which are accessible externally for the user. The 4 USB interfaces (USB1-4) on the top are USB 3.0 ports. The USB interface on the front (USB5) is a USB 2.0 interface.

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 top of the APC910.

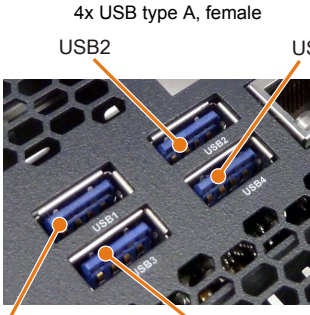
Universal Serial Bus (USB1, USB2, USB3, USB4) ¹⁾		
Type	USB 2.0 / 3.0	
Design	Type A	
Transfer rate	Low speed (1.5 Mbit/s), full speed (12 Mbit/s), high speed (480 Mbit/s), SuperSpeed (5 Gbit/s)	
Current load ²⁾ USB1, USB2 USB3, USB4	Max. 1 A Max. 1 A	
Cable length USB 2.0 USB 3.0	Max. 5 m (without hub)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

Table 26: USB1, USB2, USB3, USB4 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) Each USB interface is protected by a maintenance-free "USB current-limiting circuit breaker" (max. 1 A).

USB5

A USB 2.0 interface is provided on the APC910 behind the front cover.

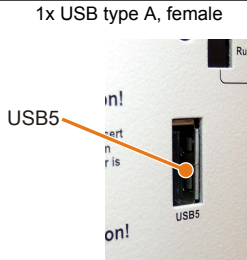
Universal Serial Bus (USB5) ¹⁾		
Type	USB 2.0	
Design	Type A	
Transfer rate	Low speed (1.5 Mbit/s), full speed (12 Mbit/s), high speed (480 Mbit/s)	
Current load ²⁾ USB5	Max. 1 A	
Cable length	Max. 5 m (without hub)	

Table 27: USB5 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. 1 A).

2.6.9 IF option 1 slot

Automation PC 910 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 28: 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 interface options"** on page 364.

2.6.10 IF option 2 slot

Automation PC 910 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 29: 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 interface options"** on page 364.

2.6.11 Monitor/Panel option

2-slot (5PC910.SX02-00) and 5-slot (5PC910.SX05-00) APC910 variants allow a third graphics line to be set up. There are a variety of monitor/panel options available for this.

Monitor/Panel option	
Model number	Short description
Monitor/Panel options	
5AC901.LDPO-00	DisplayPort transmitter
5AC901.LSDL-00	Smart Display Link / DVI transmitter
5AC901.LSD3-00	SDL3 transmitter

Monitor/Panel option



Table 30: Monitor/Panel option

Information:

For information about installing or replacing a monitor/panel option, please refer to the section **"Installing monitor/panel options"** on page 367.

2.6.12 Card slot (PCI/PCIe)

Standard PCI 2.2 half-size cards or PCI Express (PCIe) half-size cards can be installed depending on the type of bus unit. They must not exceed the following dimensions.

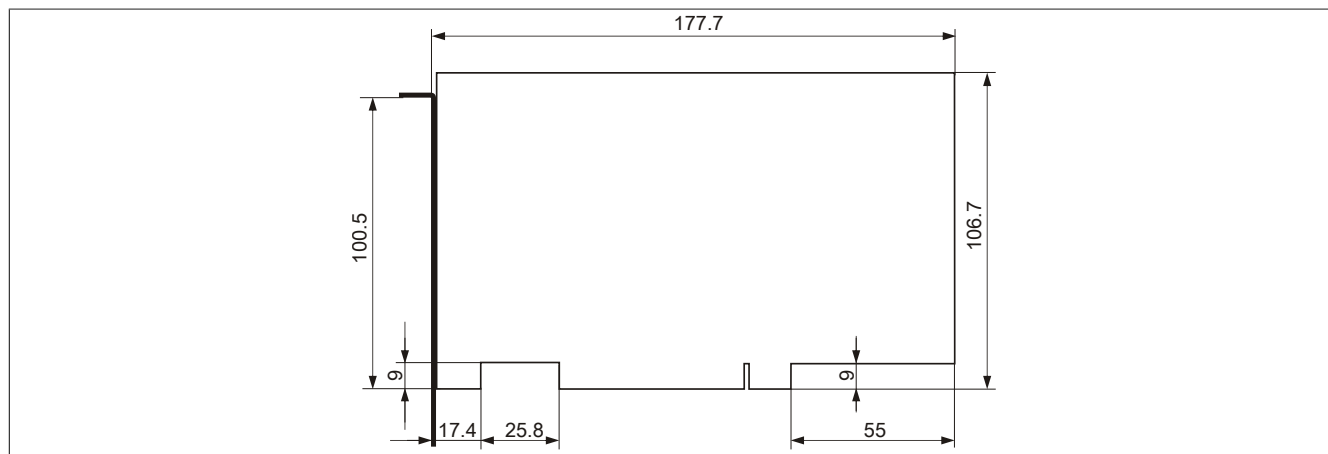


Figure 23: Standard half-size 32-bit PCI card - Dimensions

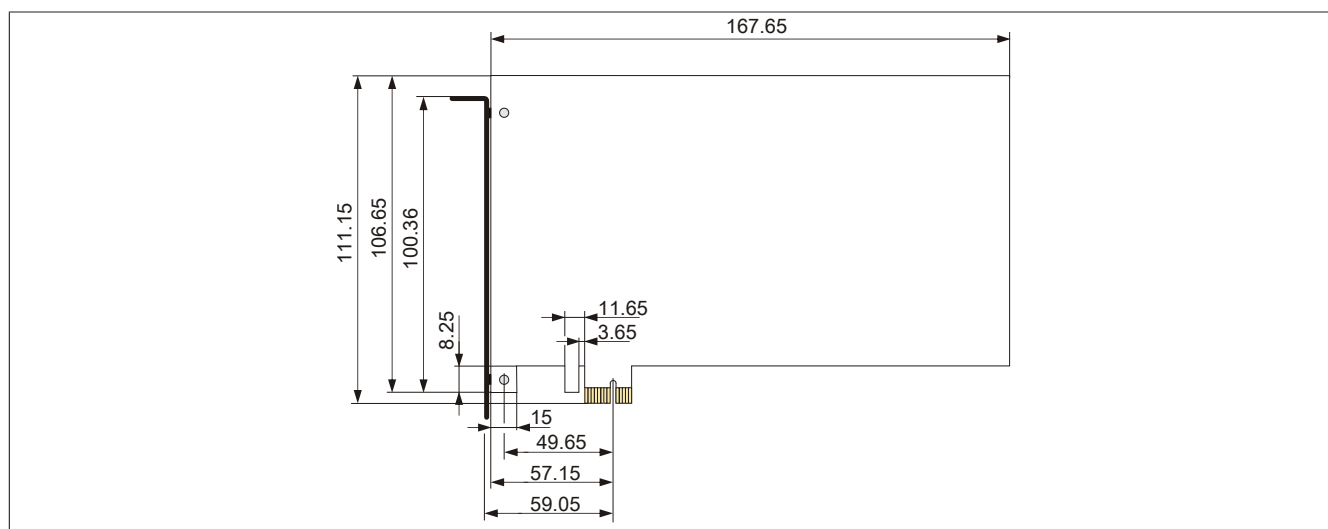


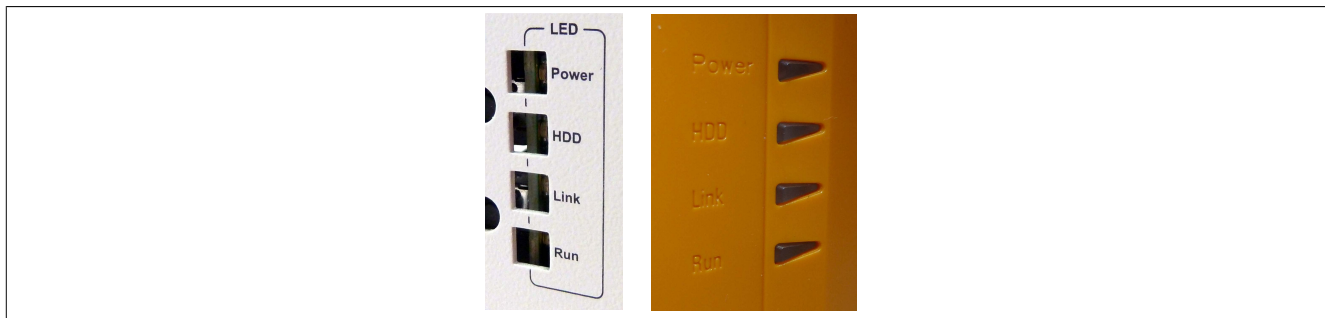
Figure 24: Standard half-size PCIe card - Dimensions

Information:

For information about installing or replacing a PCI/PCIe card, please refer to section **"Installing PCI/PCIe cards"** on page 376.

2.6.13 LED status indicators

LED status indicators are located on the front of the system unit.



The following timing is used for the LED status indicators:

Block size: 250 ms

Repeat interval: 500 ms, 2 boxes thus represent one interval

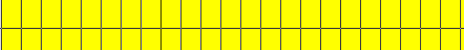
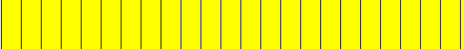
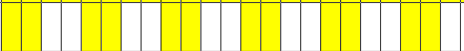
LED	Color	Status	Function	LED status indicators
Power	Green	On	Voltage supply OK	
		Blinking	Device booted, battery status "BAD"	
			Information: For more information, see "Battery" on page 64.	
	Red	On	System in standby mode (S5: Soft-off mode or S4: Hibernation mode suspend-to-disk)	
		Blinking	MTCX 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 31: LED status indicators - Data

2.6.14 Power button

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

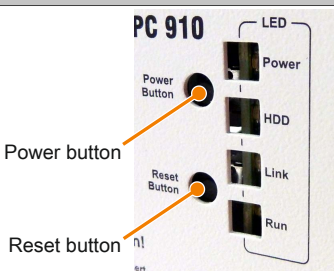
Power button	
The power button can be pressed with a pointed object (e.g. paper clip or tip of a pen). The power button acts like the on/off switch on a normal desktop PC with an ATX power supply: Press and release ... Switches on the APC910 or shuts down the operating system and switches off the APC910 Press and hold ... Switches off the ATX power supply without shutting down the APC910 (data could be lost!) Pressing the power button does not reset the MTCX processor.	

Table 32: Power button

2.6.15 Reset button

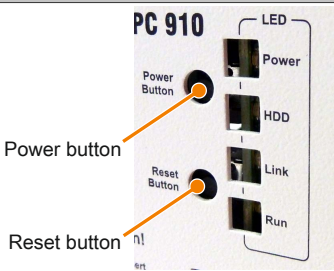
Reset button	
The reset button can be pressed with a pointed object (e.g. paper clip or tip of a pen). Pushing the reset button triggers a hardware and PCI reset. The APC910 is restarted (cold restart). Pressing the reset button does not reset the MTCX processor.	

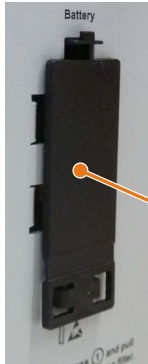
Table 33: Reset button

Warning!
A system reset can result in lost data!

2.6.16 Battery

The lithium battery (3 V, 950 mAh) buffers the internal real-time clock (RTC). It is located behind the black cover on the front of the device. 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



Battery

Table 34: Battery

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.

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 35: Battery status

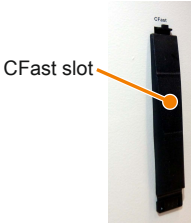
From the point when battery capacity is recognized as insufficient, data buffering is intact for approximately another 500 hours. When replacing the battery, data is buffered for approximately 10 minutes by a gold leaf capacitor.

2.6.17 CFast slot

The APC910 offers an easy-to-access CFast slot behind its front cover so that a CFast card can 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 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 card, 32 GB MLC
5CFAST.064G-10	CFast card, 64 GB MLC
5CFAST.128G-10	CFast card, 128 GB MLC



CFast slot

Table 36: CFast slot

Warning!

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

2.6.18 Slide-in compact slot

The slide-in compact slot is connected to the chipset internally via SATA 0 with SATA III design (SATA 6 Gbit/s).

Slide-in compact slot	
Connection	SATA 0
Model number	Short description
	Drives
5AC901.CHDD-00	250 GB hard disk - Slide-in compact - SATA
5AC901.CHDD-01	500 GB hard disk - Slide-in compact - SATA
5AC901.CSSD-00	32 GB SSD (SLC) - Slide-in compact - SATA
5AC901.CSSD-01	60 GB SSD (MLC) - Slide-in compact - SATA
5AC901.CSSD-02	180 GB SSD (MLC) - 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 - SATA
5AC901.CSSD-06	512 GB SSD (MLC) - Slide-in compact - SATA
5AC901.CCFA-00	CFast adapter - For slide-in compact slot

Table 37: Slide-in compact slot

Information:

The slide-in compact slot cannot be accessed from the outside. The side panel must be removed in order to replace a drive. For information about installing or replacing a slide-in compact drive, please refer to the section ["Installing and exchanging slide-in compact drives" on page 370](#).

2.6.19 Slide-in slot 1

Slide-in slot 1 is available on the 2-slot system unit (5PC910.SX02-00) and 5-slot system unit (5PC910.SX05-00). It is connected to the chipset internally via SATA 2 and USB 0 with SATA II design (SATA 3 Gbit/s).

Slide-in slot 1	
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

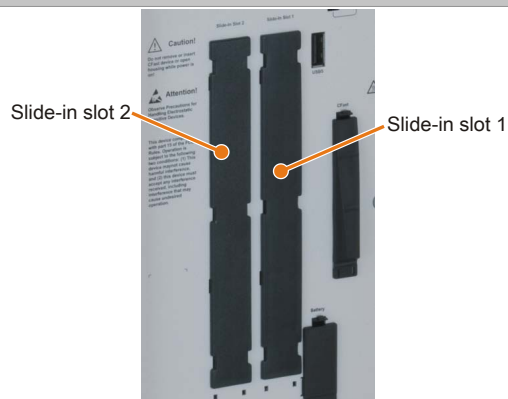


Table 38: Slide-in slot 1

Information:

The slide-in slot cannot be accessed from the outside. The side panel must be removed in order to replace a drive. For information about installing or replacing a slide-in drive, please refer to the section ["Installing and exchanging slide-in drives" on page 373](#).

2.6.20 Slide-in slot 2

Slide-in slot 2 is only available on the 5-slot system unit (5PC910.SX05-00). It is connected to the chipset internally via SATA 3 and USB 0 with SATA II design (SATA 3 Gbit/s).

Slide-in slot 2	
Connection	SATA 3 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 39: Slide-in slot 2

Information:

The slide-in slot cannot be accessed from the outside. The side panel must be removed in order to replace a drive. For information about installing or replacing a slide-in drive, please refer to the section ["Installing and exchanging slide-in drives" on page 373](#).

3 Individual components

3.1 System units

The system unit unites all of the individual components into one compact device. It consists of a housing and an integrated mainboard. Interfaces are easily accessible either on top of the device or behind the orange cover on the front. System units have either 1, 2 or 5 card slots.

The front cover is not included with the system unit and must be ordered separately, see "[Front covers](#)" on page 182.

3.1.1 5PC910.SX01-00

3.1.1.1 General information

- Slot for a bus unit with 1 PCI or 1 PCIe slot
- Insert for 1 slide-in compact drive
- Insert for 2 interface options
- SDL/DVI/Monitor and DisplayPort interfaces
- CFast slot

3.1.1.2 Order data

Model number	Short description	Figure
	System units	
5PC910.SX01-00	1-slot APC910 system unit	
	Required accessories	
	Accessories	
0TB103.9	Connector 24 VDC - 3-pin female - Screw clamp terminal block 3.31 mm ²	
0TB103.91	Connector 24 VDC - 3-pin female - Cage clamp terminal block 3.31 mm ²	
	Bus units	
5AC901.BX01-00	APC910 1-slot bus - 1 PCI	
5AC901.BX01-01	APC910 1-slot bus - 1 PCI Express x8	
	CPU boards	
5PC900.TS77-00	CPU board Intel Core i7 3615QE 2.3 GHz - Quad core - QM77 chipset - For APC910	
5PC900.TS77-01	CPU board Intel Core i7 3612QE 2.1 GHz - Quad core - QM77 chipset - For APC910	
5PC900.TS77-02	CPU board Intel Core i7 3555LE 2.5 GHz - Dual core - QM77 chipset - For APC910	
5PC900.TS77-03	CPU board Intel Core i7 3517UE 1.7 GHz - Dual core - QM77 chipset - For APC910	
5PC900.TS77-04	CPU board Intel Core i5 3610ME 2.7 GHz - Dual core - QM77 chipset - For APC910	
5PC900.TS77-05	CPU board Intel Core i3 3120ME 2.4 GHz - Dual core - QM77 chipset - For APC910	
5PC900.TS77-06	CPU board Intel Core i3 3217UE 1.6 GHz - Dual core - QM77 chipset - For APC910	
5PC900.TS77-07	CPU board Intel Celeron 847E 1.1 GHz - Dual core - HM76 chipset - For APC910	
5PC900.TS77-08	CPU board Intel Celeron 827E 1.4 GHz - Single core - HM76 chipset - For APC910	
5PC900.TS77-09	CPU board Intel Celeron 1020E 2.2 GHz - Dual core - HM76 chipset - For APC910	
5PC900.TS77-10	CPU board Intel Celeron 1047UE 1.4 GHz - Dual core - HM76 chipset - For APC910	
	Heat sink	
5AC901.HS00-00	APC910 heat sink, active	
5AC901.HS01-00	APC910 heat sink, passive	
	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	
	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-04	128 GB SSD MLC - Slide-in compact - SATA	

Table 40: 5PC910.SX01-00 - Order data

Model number	Short description	Figure
5AC901.CSSD-05	256 GB SSD MLC - Slide-in compact - Toshiba - SATA	
5AC901.CSSD-06	512 GB SSD MLC - Slide-in compact - Toshiba - SATA	
	Fan kit	
5AC901.FA01-00	APC910 fan kit - For 5PC910.SX01-00	
	Front cover	
5AC901.FF01-00	Front cover for 1-slot APC910 - Orange	
5AC901.FF01-01	Front cover for 1-slot APC910 - Dark gray	
5AC901.FF01-02	Front cover for 1-slot APC910 - Dark gray - Without logo	
	Interface options	
5AC901.I485-00	Interface card - 1x RS232/422/485 interface - For APC910/PPC900	
5AC901.ICAN-00	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.IPLK-00	Interface card - 1x POWERLINK interface - 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	
5AC901.ISRM-00	Interface cards - 2 MB SRAM - For APC910/PPC900	
	Uninterruptible power supplies	
5AC901.IUPS-00	UPS - For 4.5 Ah battery	
5AC901.IUPS-01	UPS - For 2.2 Ah battery	

Table 40: 5PC910.SX01-00 - Order data

3.1.1.3 Technical data

Model number	5PC910.SX01-00
General information	
Cooling	Passive via heat sink and optionally supported with an active fan kit
LED status indicators	Power, HDD, Link, Run
B&R ID code	0xD6DA
Battery	
Type	Renata 950 mAh
Service life	4 years ¹⁾
Removable	Yes, accessible behind the front cover
Design	Lithium ion
Power button	Yes
Reset button	Yes
Buzzer	Yes
Certification	
CE	Yes
cULus	Yes
GOST-R	Yes
GL	Yes ²⁾
Controller	
Boot loader	BIOS
Real-time clock	
Battery-backed	Yes
Power <i>failure</i> logic	
Controller	MTCX ³⁾
Buffer time	10 ms
Graphics	
Controller	Depends on the CPU board being used
Memory	
Type	SO-DIMM DDR3 SDRAM
Memory size	Max. 16 GB
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
CFAST slot	
Quantity	1
Type	SATA III (SATA 60 Gbit/s)
USB	
Quantity	5
Type	4x USB 3.0 (top) 1x USB 2.0 (front)
Design	Type A
Transfer rate	Low speed (1.5 Mbit/s), full speed (12 Mbit/s), high speed (480 Mbit/s), SuperSpeed (5 Gbit/s) ⁴⁾
Current-carrying capacity	Max. 1 A per connection

Table 41: 5PC910.SX01-00 - Technical data

Model number	5PC910.SX01-00
Ethernet	
Quantity	2
Design	Shielded RJ45
Transfer rate	10/100/1000 Mbit/s
Max. baud rate	1 Gbit/s
DisplayPort	
Quantity	1
Version	1.1
Monitor/Panel interface	
Design	DVI-I
Type	SDL/DVI/Monitor
Inserts	
PCI/PCIe slots	
Quantity	1 PCI slot or 1 PCIe slot ⁵⁾
Slide-in drives	
Quantity	-
Slide-in compact drives	
Quantity	1
Type	SATA III (SATA 60 Gbit/s)
Interface option	2
Monitor/Panel option	No
Add-on UPS slot	Yes ⁶⁾
Insert for fan kit	Yes
Electrical characteristics	
Nominal voltage	24 VDC ±25%
Nominal current	Max. 5.5 A ⁷⁾
Starting current	Max. 60 A for <300 µs
Electrical isolation	Yes
Operating conditions	
EN 60529 protection	IP20 ⁸⁾
Environmental conditions	
Temperature	
Operation	Component-dependent ⁹⁾
Storage	-20 to 60°C
Transport	-20 to 60°C
Relative humidity	
Operation	Component-dependent
Storage	Component-dependent
Transport	Component-dependent
Vibration ¹⁰⁾	
Operation (continuous)	2 to 9 Hz: 1.75 mm amplitude / 9 to 200 Hz: 0.5 g
Operation (occasional)	2 to 9 Hz: 3.5 mm amplitude / 9 to 200 Hz: 1 g
Storage	2 to 8 Hz: 7.5 mm amplitude / 8 to 200 Hz: 2 g / 200 to 500 Hz: 4 g
Transport	2 to 8 Hz: 7.5 mm amplitude / 8 to 200 Hz: 2 g / 200 to 500 Hz: 4 g
Shock ¹⁰⁾	
Operation	15 g, 11 ms
Storage	30 g, 6 ms
Transport	30 g, 6 ms
Elevation	
Operation	-300 to 3000 m above sea level ¹¹⁾
Mechanical characteristics	
Housing ¹²⁾	
Material	Galvanized plate, plastic
Coating	Anthracite gray
Dimensions	
Width	91 mm
Height	270 mm
Depth	254.75 mm
Weight	2050 g

Table 41: 5PC910.SX01-00 - Technical data

- At 50°C, 8.5 µA of the supplied components and a self-discharge of 40%. If an interface option with SRAM or POWERLINK has been installed, the service life is 2½ years.
- Yes, although applies only if all components installed within the complete system have this certification.
- Maintenance Controller Extended.
- The SuperSpeed transfer rate (5 Gbit/s) is only possible with USB 3.0.
- The PCI and PCIe slots available depend on the 5AC901.BX01-00 and 5AC901.BX01-01 bus unit being used.
- This UPS module can only be operated in the IF option 1 slot.
- Maximum current consumption (24 V / 130 W). This can vary depending on the configuration (see "Power calculation" section). The starting current must also be taken into consideration when selecting the power supply.
- Only when all interface covers and the front cover are closed.
- Detailed information can be found in the temperature tables in the user's manual.

- 10) Maximum values unless specified otherwise by another individual component. Vibration testing is performed in accordance with EN 60068-2-6. Shock testing is performed in accordance with EN 60068-2-27.
- 11) The maximum ambient temperature is typically derated by 1°C per 1000 meters (starting at 500 meters above sea level).
- 12) There may be visible deviations in the color and surface appearance depending on the process or batch.

3.1.1.4 Dimensions

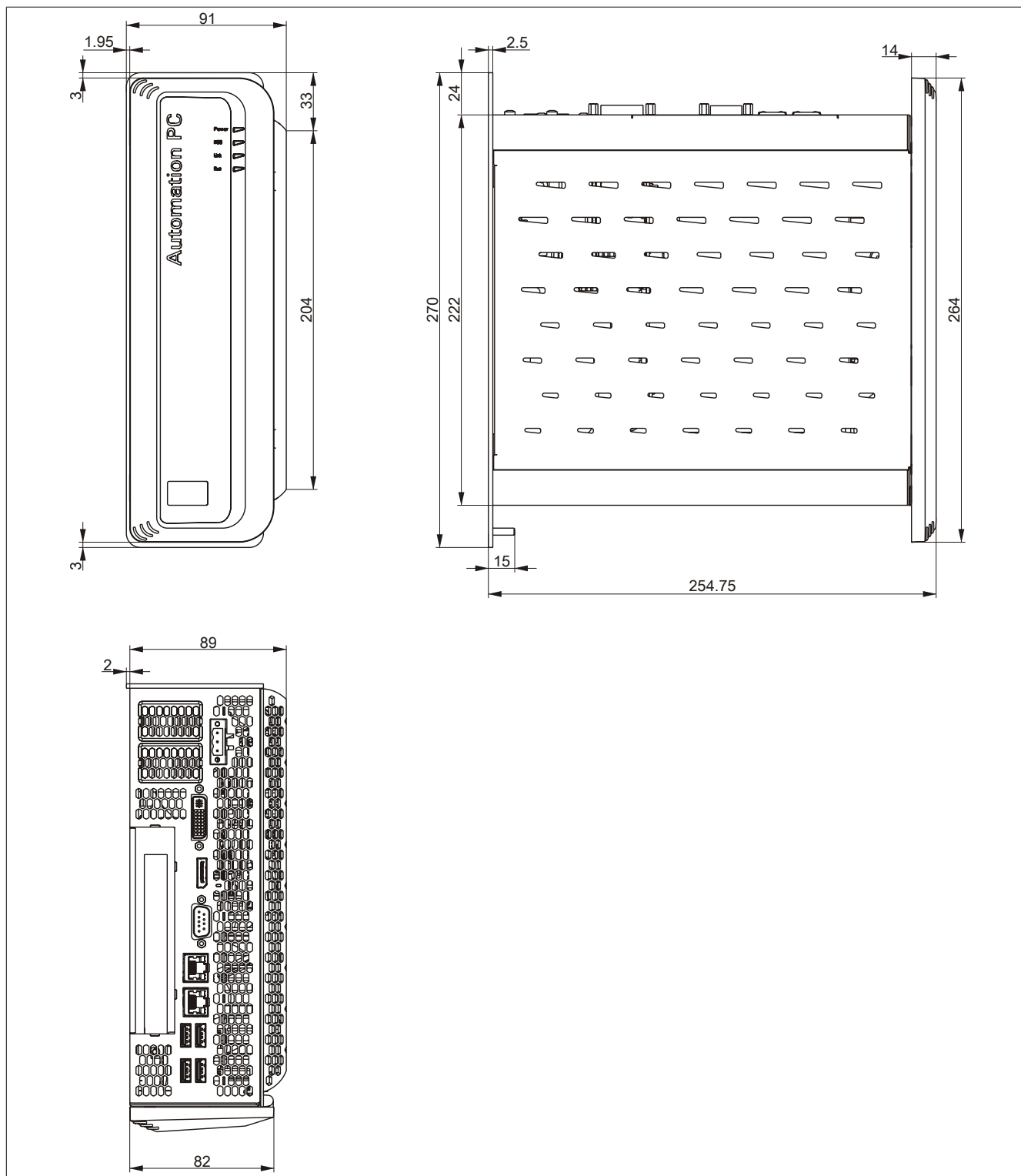


Figure 25: 5PC910.SX01-00 - Dimensions

3.1.1.5 Drilling template

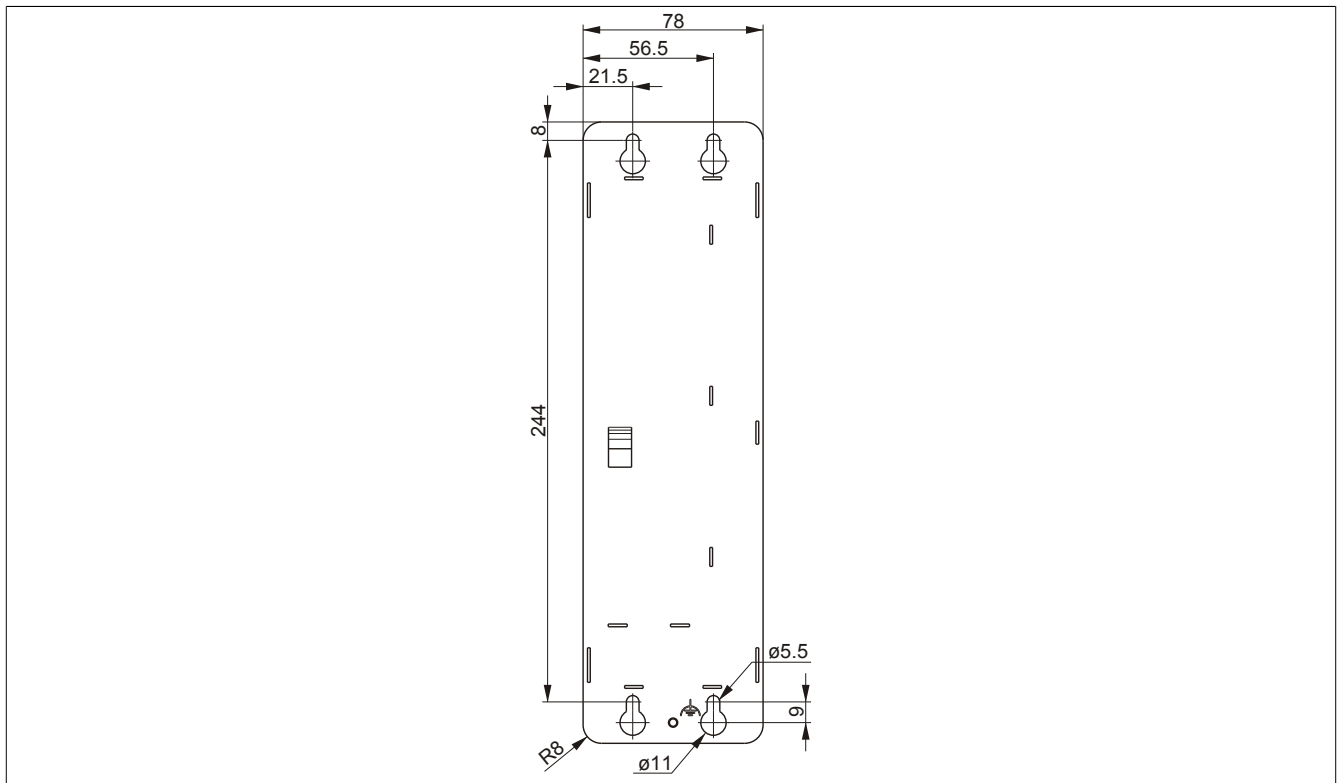


Figure 26: 5PC910.SX01-00 - Drilling template

3.1.2 5PC910.SX02-00

3.1.2.1 General information

- Slot for a bus unit with 2 PCI slots or 1 PCI and 1 PCIe slots
- Insert for 1 slide-in compact drive and 1 slide-in drive
- Insert for 2 interface options
- SDL/DVI/Monitor and DisplayPort interfaces
- Insert for monitor/panel option
- CFAST slot

3.1.2.2 Order data

Model number	Short description	Figure
	System units	
5PC910.SX02-00	2-slot APC910 system unit	
	Required accessories	
	Accessories	
0TB103.9	Connector 24 VDC - 3-pin female - Screw clamp terminal block 3.31 mm²	
0TB103.91	Connector 24 VDC - 3-pin female - Cage clamp terminal block 3.31 mm²	
	Bus units	
5AC901.BX02-00	APC910 2-slot bus - 2 PCI	
5AC901.BX02-01	APC910 2-slot bus - 1 PCI - 1 PCI Express x8	
5AC901.BX02-02	APC910 2-slot bus - 2 PCI Express x4	
	CPU boards	
5PC900.TS77-00	CPU board Intel Core i7 3615QE 2.3 GHz - Quad core - QM77 chipset - For APC910	
5PC900.TS77-01	CPU board Intel Core i7 3612QE 2.1 GHz - Quad core - QM77 chipset - For APC910	
5PC900.TS77-02	CPU board Intel Core i7 3555LE 2.5 GHz - Dual core - QM77 chipset - For APC910	
5PC900.TS77-03	CPU board Intel Core i7 3517UE 1.7 GHz - Dual core - QM77 chipset - For APC910	
5PC900.TS77-04	CPU board Intel Core i5 3610ME 2.7 GHz - Dual core - QM77 chipset - For APC910	
5PC900.TS77-05	CPU board Intel Core i3 3120ME 2.4 GHz - Dual core - QM77 chipset - For APC910	
5PC900.TS77-06	CPU board Intel Core i3 3217UE 1.6 GHz - Dual core - QM77 chipset - For APC910	
5PC900.TS77-07	CPU board Intel Celeron 847E 1.1 GHz - Dual core - HM76 chipset - For APC910	
5PC900.TS77-08	CPU board Intel Celeron 827E 1.4 GHz - Single core - HM76 chipset - For APC910	
5PC900.TS77-09	CPU board Intel Celeron 1020E 2.2 GHz - Dual core - HM76 chipset - For APC910	
5PC900.TS77-10	CPU board Intel Celeron 1047UE 1.4 GHz - Dual core - HM76 chipset - For APC910	
	Heat sink	
5AC901.HS00-00	APC910 heat sink, active	
5AC901.HS01-00	APC910 heat sink, passive	
	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	
	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-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.SDVW-00	DVD drive - DVD-R/RW DVD+R/RW - Slide-in	
5AC901.SSCA-00	Slide-in compact adapter - For slide-in compact drives	
	Fan kit	
5AC901.FA02-00	APC910 fan kit - For 5PC910.SX02-00	
	Front cover	
5AC901.FF02-00	Front cover for 2-slot APC910 - Orange	
5AC901.FF02-01	Front cover for 2-slot APC910 - Dark gray	
5AC901.FF02-02	Front cover for 2-slot APC910 - Dark gray - Without logo	

Table 42: 5PC910.SX02-00 - Order data

Model number	Short description	Figure
	Interface options	
5AC901.I485-00	Interface card - 1x RS232/422/485 interface - For APC910/PPC900	
5AC901.ICAN-00	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.IPLK-00	Interface card - 1x POWERLINK interface - 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	
5AC901.ISRM-00	Interface cards - 2 MB SRAM - For APC910/PPC900	
	Monitor/Panel options	
5AC901.LDPO-00	DisplayPort transmitter	
5AC901.LSD3-00	SDL3 transmitter	
5AC901.LSDL-00	SDL/DVI transmitter	
	Uninterruptible power supplies	
5AC901.IUPS-00	UPS - For 4.5 Ah battery	
5AC901.IUPS-01	UPS - For 2.2 Ah battery	

Table 42: 5PC910.SX02-00 - Order data

3.1.2.3 Technical data

Model number	5PC910.SX02-00
General information	
Cooling	Passive via heat sink and optionally supported with an active fan kit
LED status indicators	Power, HDD, Link, Run
B&R ID code	0xD6DB
Battery	
Type	Renata 950 mAh
Service life	4 years ¹⁾
Removable	Yes, accessible behind the front cover
Design	Lithium ion
Power button	Yes
Reset button	Yes
Buzzer	Yes
Certification	
CE	Yes
cULus	Yes
GOST-R	Yes
GL	Yes ²⁾
Controller	
Boot loader	BIOS
Real-time clock	
Battery-backed	Yes
Power failure logic	
Controller	MTCX ³⁾
Buffer time	10 ms
Graphics	
Controller	Depends on the CPU board being used
Memory	
Type	SO-DIMM DDR3 SDRAM
Memory size	Max. 16 GB
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
CFast slot	
Quantity	1
Type	SATA III (SATA 60 Gbit/s)
USB	
Quantity	5
Type	4x USB 3.0 (top) 1x USB 2.0 (front)
Design	Type A
Transfer rate	Low speed (1.5 Mbit/s), full speed (12 Mbit/s), high speed (480 Mbit/s), SuperSpeed (5 Gbit/s) ⁴⁾
Current-carrying capacity	Max. 1 A per connection

Table 43: 5PC910.SX02-00 - Technical data

Model number	5PC910.SX02-00
Ethernet	
Quantity	2
Design	Shielded RJ45
Transfer rate	10/100/1000 Mbit/s
Max. baud rate	1 Gbit/s
DisplayPort	
Quantity	1
Version	1.1
Monitor/Panel interface	
Design	DVI-I
Type	SDL/DVI/Monitor
Inserts	
PCI/PCIe slots	
Quantity	2 PCI slots or 1 PCI slots and 1 PCIe slot or 2 PCIe slots ⁵⁾
Slide-in drives	
Quantity	1
Type	SATA II (SATA 30 Gbit/s)
Slide-in compact drives	
Quantity	1
Type	SATA III (SATA 60 Gbit/s)
Interface option	2
Monitor/Panel option	1
Add-on UPS slot	Yes ⁶⁾
Insert for fan kit	Yes
Electrical characteristics	
Nominal voltage	24 VDC ±25%
Nominal current	Max. 5.5 A ⁷⁾
Starting current	Max. 60 A for <300 µs
Electrical isolation	Yes
Operating conditions	
EN 60529 protection	IP20 ⁸⁾
Environmental conditions	
Temperature	
Operation	Component-dependent ⁹⁾
Storage	-20 to 60°C
Transport	-20 to 60°C
Relative humidity	
Operation	Component-dependent
Storage	Component-dependent
Transport	Component-dependent
Vibration ¹⁰⁾	
Operation (continuous)	2 to 9 Hz: 1.75 mm amplitude / 9 to 200 Hz: 0.5 g
Operation (occasional)	2 to 9 Hz: 3.5 mm amplitude / 9 to 200 Hz: 1 g
Storage	2 to 8 Hz: 7.5 mm amplitude / 8 to 200 Hz: 2 g / 200 to 500 Hz: 4 g
Transport	2 to 8 Hz: 7.5 mm amplitude / 8 to 200 Hz: 2 g / 200 to 500 Hz: 4 g
Shock ¹⁰⁾	
Operation	15 g, 11 ms
Storage	30 g, 6 ms
Transport	30 g, 6 ms
Elevation	
Operation	-300 to 3000 m above sea level ¹¹⁾
Mechanical characteristics	
Housing ¹²⁾	
Material	Galvanized plate, plastic
Coating	Anthracite gray
Dimensions	
Width	130 mm
Height	270 mm
Depth	254.75 mm
Weight	2550 g

Table 43: 5PC910.SX02-00 - Technical data

- At 50°C, 8.5 µA of the supplied components and a self-discharge of 40%. If an interface option with SRAM or POWERLINK has been installed, the service life is 2½ years.
- Yes, although applies only if all components installed within the complete system have this certification.
- Maintenance Controller Extended.
- The SuperSpeed transfer rate (5 Gbit/s) is only possible with USB 3.0.
- The PCI and PCIe slots available depend on the bus unit being used (5AC901.BX02-00, 5AC901.BX02-01 or 5AC901.BX02-02).
- This UPS module can only be operated in the IF option 1 slot.
- Maximum current consumption (24 V / 130 W). This can vary depending on the configuration (see "Power calculation" section). The starting current must also be taken into consideration when selecting the power supply.
- Only when all interface covers and the front cover are closed.
- Detailed information can be found in the temperature tables in the user's manual.

- 10) Maximum values unless specified otherwise by another individual component. Vibration testing is performed in accordance with EN 60068-2-6. Shock testing is performed in accordance with EN 60068-2-27.
- 11) The maximum ambient temperature is typically derated by 1°C per 1000 meters (starting at 500 meters above sea level).
- 12) There may be visible deviations in the color and surface appearance depending on the process or batch.

3.1.2.4 Dimensions

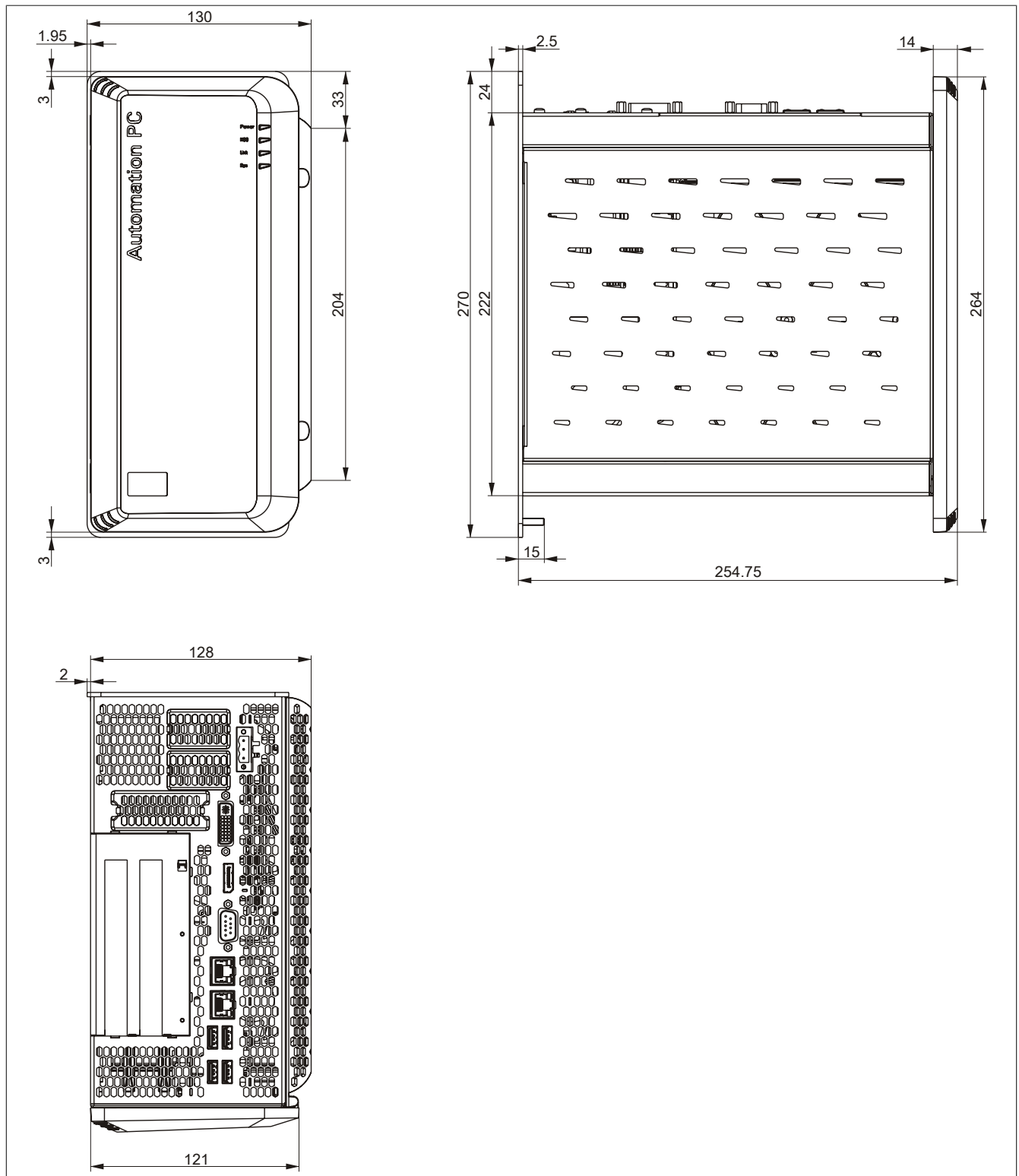


Figure 27: 5PC910.SX02-00 - Dimensions

3.1.2.5 Drilling template

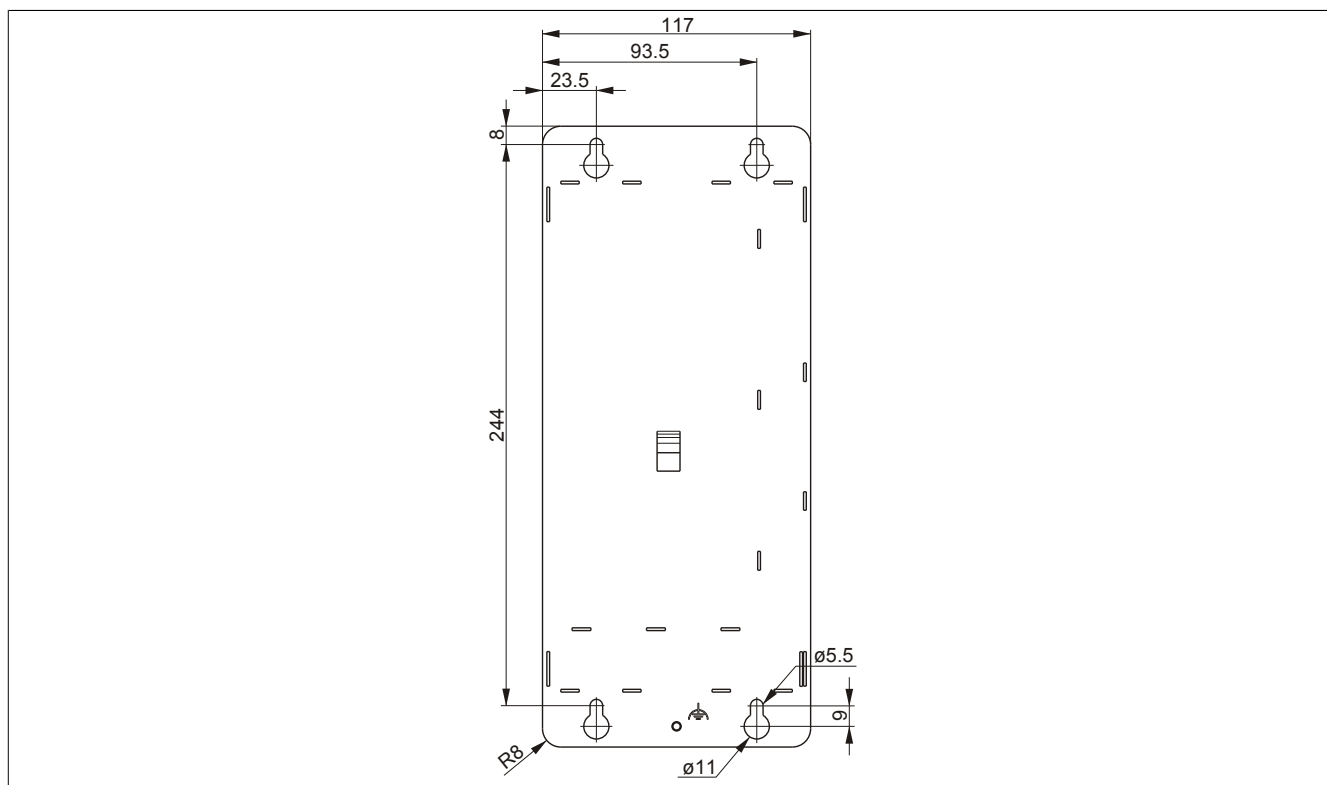


Figure 28: 5PC910.SX02-00 - Drilling template

3.1.3 5PC910.SX05-00

3.1.3.1 General information

- Slot for a bus unit with 5 PCI/PCIe slots
- Insert for 1 slide-in compact drive and 2 slide-in drives
- Insert for 2 interface options
- SDL/DVI/Monitor and DisplayPort interfaces
- Insert for monitor/panel option
- CFast slot

3.1.3.2 Order data

Model number	Short description	Figure
System units		
5PC910.SX05-00	5-slot APC910 system unit	
Required accessories		
Accessories		
0TB103.9	Connector 24 VDC - 3-pin female - Screw clamp terminal block 3.31 mm²	
0TB103.91	Connector 24 VDC - 3-pin female - Cage clamp terminal block 3.31 mm²	
Bus units		
5AC901.BX05-00	APC910 5-slot bus - 5 PCI	
5AC901.BX05-01	APC910 5-slot bus - 4 PCI - 1 PCI Express x8	
5AC901.BX05-02	APC910 5-slot bus - 2 PCI - 1 PCI Express x8 - 2 PCI Express x1	
5AC901.BX05-03	APC910 5-slot bus - 2 PCI Express x4 - 3 PCI Express x1	
CPU boards		
5PC900.TS77-00	CPU board Intel Core i7 3615QE 2.3 GHz - Quad core - QM77 chipset - For APC910	
5PC900.TS77-01	CPU board Intel Core i7 3612QE 2.1 GHz - Quad core - QM77 chipset - For APC910	
5PC900.TS77-02	CPU board Intel Core i7 3555LE 2.5 GHz - Dual core - QM77 chipset - For APC910	
5PC900.TS77-03	CPU board Intel Core i7 3517UE 1.7 GHz - Dual core - QM77 chipset - For APC910	
5PC900.TS77-04	CPU board Intel Core i5 3610ME 2.7 GHz - Dual core - QM77 chipset - For APC910	
5PC900.TS77-05	CPU board Intel Core i3 3120ME 2.4 GHz - Dual core - QM77 chipset - For APC910	
5PC900.TS77-06	CPU board Intel Core i3 3217UE 1.6 GHz - Dual core - QM77 chipset - For APC910	
5PC900.TS77-07	CPU board Intel Celeron 847E 1.1 GHz - Dual core - HM76 chipset - For APC910	
5PC900.TS77-08	CPU board Intel Celeron 827E 1.4 GHz - Single core - HM76 chipset - For APC910	
5PC900.TS77-09	CPU board Intel Celeron 1020E 2.2 GHz - Dual core - HM76 chipset - For APC910	
5PC900.TS77-10	CPU board Intel Celeron 1047UE 1.4 GHz - Dual core - HM76 chipset - For APC910	
Heat sink		
5AC901.HS00-00	APC910 heat sink, active	
5AC901.HS01-00	APC910 heat sink, passive	
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	
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-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.SDVW-00	DVD drive - DVD-R/RW DVD+R/RW - Slide-in	
5AC901.SSCA-00	Slide-in compact adapter - For slide-in compact drives	
Fan kit		
5AC901.FA05-00	APC910 fan kit - For 5PC910.SX05-00 system unit	
Front cover		
5AC901.FF05-00	Front cover for 5-slot APC910 - Orange	
5AC901.FF05-01	Front cover for 5-slot APC910 - Dark gray	

Table 44: 5PC910.SX05-00 - Order data

Model number	Short description	Figure
5AC901.FF05-02	Front cover for 5-slot APC910 - Dark gray - Without logo	
	Interface options	
5AC901.I485-00	Interface card - 1x RS232/422/485 interface - For APC910/PPC900	
5AC901.ICAN-00	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.IPLK-00	Interface card - 1x POWERLINK interface - 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	
5AC901.ISRM-00	Interface cards - 2 MB SRAM - For APC910/PPC900	
	Monitor/Panel options	
5AC901.LDPO-00	DisplayPort transmitter	
5AC901.LSD3-00	SDL3 transmitter	
5AC901.LSDL-00	SDL/DVI transmitter	
	Uninterruptible power supplies	
5AC901.IUPS-00	UPS - For 4.5 Ah battery	
5AC901.IUPS-01	UPS - For 2.2 Ah battery	

Table 44: 5PC910.SX05-00 - Order data

3.1.3.3 Technical data

Model number	5PC910.SX05-00
General information	
Cooling	Passive via heat sink and optionally supported with an active fan kit
LED status indicators	Power, HDD, Link, Run
B&R ID code	0xD844
Battery	
Type	Renata 950 mAh
Service life	4 years ¹⁾
Removable	Yes, accessible behind the front cover
Design	Lithium ion
Power button	Yes
Reset button	Yes
Buzzer	Yes
Certification	
CE	Yes
cULus	Yes
GOST-R	Yes
Controller	
Boot loader	BIOS
Real-time clock	
Battery-backed	Yes
Power failure logic	
Controller	MTCX ²⁾
Buffer time	10 ms
Graphics	
Controller	Depends on the CPU board being used
Memory	
Type	SO-DIMM DDR3 SDRAM
Memory size	Max. 16 GB
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
CFast slot	
Quantity	1
Type	SATA III (SATA 60 Gbit/s)
USB	
Quantity	5
Type	4x USB 3.0 (top) 1x USB 2.0 (front)
Design	Type A
Transfer rate	Low speed (1.5 Mbit/s), full speed (12 Mbit/s), high speed (480 Mbit/s), SuperSpeed (5 Gbit/s) ³⁾
Current-carrying capacity	Max. 1 A per connection

Table 45: 5PC910.SX05-00 - Technical data

Model number	5PC910.SX05-00
Ethernet	
Quantity	2
Design	Shielded RJ45
Transfer rate	10/100/1000 Mbit/s
Max. baud rate	1 Gbit/s
DisplayPort	
Quantity	1
Version	1.1
Monitor/Panel interface	
Design	DVI-I
Type	SDL/DVI/Monitor
Inserts	
PCI/PCIe slots	
Quantity	5 PCI slots or 4 PCI slots and 1 PCIe slot or 2 PCI slots and 3 PCIe slots or 5 PCIe slots ⁴⁾
Slide-in drives	
Quantity	2
Type	SATA II (SATA 30 Gbit/s)
Slide-in compact drives	
Quantity	1
Type	SATA III (SATA 60 Gbit/s)
Interface option	2
Monitor/Panel option	1
Add-on UPS slot	Yes ⁵⁾
Insert for fan kit	Yes
Electrical characteristics	
Nominal voltage	24 VDC $\pm 25\%$
Nominal current	Max. 5.5 A ⁶⁾
Starting current	Max. 60 A for <300 μ s
Electrical isolation	Yes
Operating conditions	
EN 60529 protection	IP20 ⁷⁾
Environmental conditions	
Temperature	
Operation	Component-dependent ⁸⁾
Storage	-20 to 60°C
Transport	-20 to 60°C
Relative humidity	
Operation	Component-dependent
Storage	Component-dependent
Transport	Component-dependent
Vibration ⁹⁾	
Operation (continuous)	2 to 9 Hz: 1.75 mm amplitude / 9 to 200 Hz: 0.5 g
Operation (occasional)	2 to 9 Hz: 3.5 mm amplitude / 9 to 200 Hz: 1 g
Storage	2 to 8 Hz: 7.5 mm amplitude / 8 to 200 Hz: 2 g / 200 to 500 Hz: 4 g
Transport	2 to 8 Hz: 7.5 mm amplitude / 8 to 200 Hz: 2 g / 200 to 500 Hz: 4 g
Shock ⁹⁾	
Operation	15 g, 11 ms
Storage	30 g, 6 ms
Transport	30 g, 6 ms
Elevation	
Operation	-300 to 3000 m above sea level ¹⁰⁾
Mechanical characteristics	
Housing ¹¹⁾	
Material	Galvanized plate, plastic
Coating	Anthracite gray
Dimensions	
Width	211 mm
Height	270 mm
Depth	254.75 mm
Weight	2850 g

Table 45: 5PC910.SX05-00 - Technical data

- At 50°C, 8.5 μ A of the supplied components and a self-discharge of 40%. If an interface option with SRAM or POWERLINK has been installed, the service life is 2½ years.
- Maintenance Controller Extended.
- The SuperSpeed transfer rate (5 Gbit/s) is only possible with USB 3.0.
- The PCI and PCIe slots available depend on the bus unit being used (5AC901.BX05-00, 5AC901.BX05-01, 5AC901.BX05-02 or 5AC901.BX05-03).
- This UPS module can only be operated in the IF option 1 slot.
- Maximum current consumption (24 V / 130 W). This can vary depending on the configuration (see "Power calculation" section). The starting current must also be taken into consideration when selecting the power supply.
- Only when all interface covers and the front cover are closed.
- Detailed information can be found in the temperature tables in the user's manual.

- 9) Maximum values unless specified otherwise by another individual component. Vibration testing is performed in accordance with EN 60068-2-6. Shock testing is performed in accordance with EN 60068-2-27.
- 10) The maximum ambient temperature is typically derated by 1°C per 1000 meters (starting at 500 meters above sea level).
- 11) There may be visible deviations in the color and surface appearance depending on the process or batch.

3.1.3.4 Dimensions

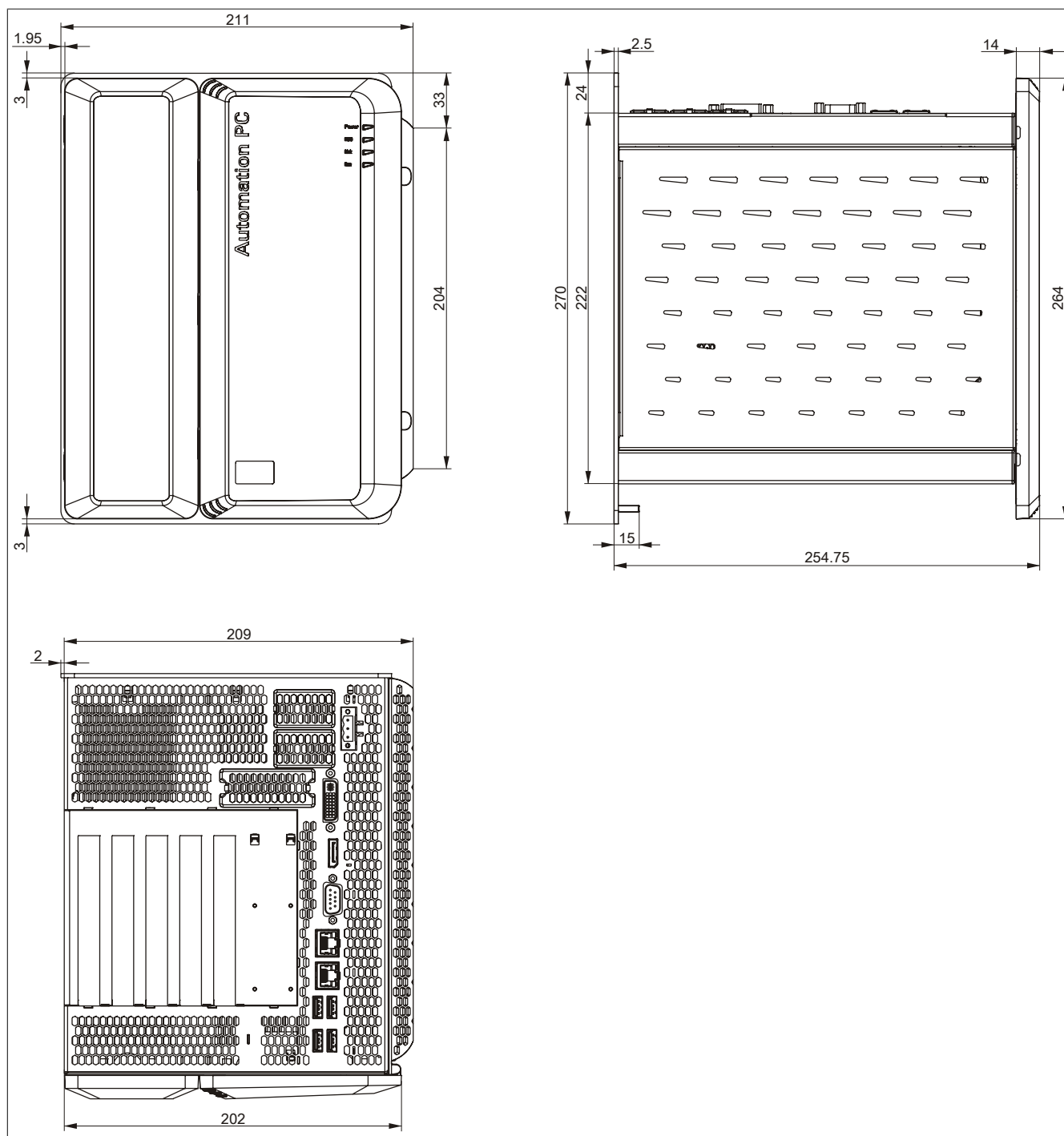


Figure 29: 5PC910.SX05-00 - Dimensions

3.1.3.5 Drilling template

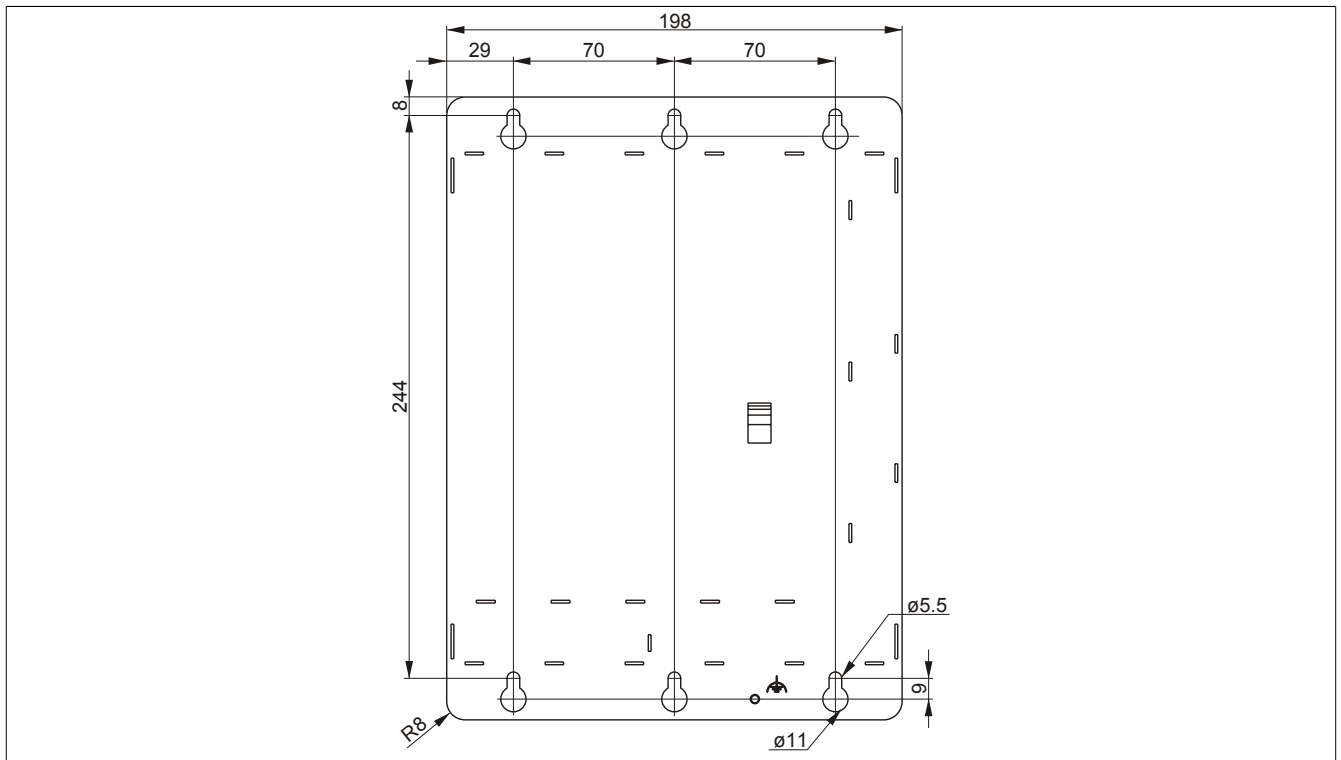


Figure 30: 5PC910.SX05-00 - Drilling template

3.2 QM77 CPU boards

3.2.1 5PC900.TS77-0x

3.2.1.1 General information

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

Information:

A fan kit is required when using the 5PC900.TS77-00 CPU board.

3.2.1.2 Order data

Model number	Short description	Figure 
CPU boards		
5PC900.TS77-00	CPU board Intel Core i7 3615QE 2.3 GHz - Quad core - QM77 chipset - For APC910	
5PC900.TS77-01	CPU board Intel Core i7 3612QE 2.1 GHz - Quad core - QM77 chipset - For APC910	
5PC900.TS77-02	CPU board Intel Core i7 3555LE 2.5 GHz - Dual core - QM77 chipset - For APC910	
5PC900.TS77-03	CPU board Intel Core i7 3517UE 1.7 GHz - Dual core - QM77 chipset - For APC910	
5PC900.TS77-04	CPU board Intel Core i5 3610ME 2.7 GHz - Dual core - QM77 chipset - For APC910	
5PC900.TS77-05	CPU board Intel Core i3 3120ME 2.4 GHz - Dual core - QM77 chipset - For APC910	
5PC900.TS77-06	CPU board Intel Core i3 3217UE 1.6 GHz - Dual core - QM77 chipset - For APC910	
Required accessories		
Heat sink		
5AC901.HS00-00	APC910 heat sink, active	
5AC901.HS01-00	APC910 heat sink, passive	
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 46: 5PC900.TS77-00, 5PC900.TS77-01, 5PC900.TS77-02, 5PC900.TS77-03, 5PC900.TS77-04, 5PC900.TS77-05, 5PC900.TS77-06 - Order data

3.2.1.3 Technical data

Model number	5PC900. TS77-00	5PC900. TS77-01	5PC900. TS77-02	5PC900. TS77-03	5PC900. TS77-04	5PC900. TS77-05	5PC900. TS77-06
General information							
Certification							
CE	Yes						
cULus	Yes						
GOST-R	Yes						
GL	Yes ¹⁾	-	-	-	Yes ¹⁾	-	-
Controller							
Boot loader	Embedded AMI BIOS						
Processor							
Type	Intel Core i7-3615QE	Intel Core i7-3612QE	Intel Core i7-3555LE	Intel Core i7-3517UE	Intel Core i5-3610ME	Intel Core i3-3120ME	Intel Core i3-3217UE
Clock frequency	2300 MHz	2100 MHz	2500 MHz	1700 MHz	2700 MHz	2400 MHz	1600 MHz
Number of cores	4	4	2	2	2	2	2
Architecture	22 nm						
Intel Smart Cache	6 MB	6 MB	4 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	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 ²⁾						
Battery-backed	Yes						
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	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)						
DisplayPort	Version 1.1						
Mass memory management	4x SATA						
Power management	ACPI 4.0 with battery support						

Table 47: 5PC900.TS77-00, 5PC900.TS77-01, 5PC900.TS77-02, 5PC900.TS77-03, 5PC900.TS77-04, 5PC900.TS77-05, 5PC900.TS77-06 - Technical data

- 1) Yes, although applies only if all components installed within the complete system have this certification.
 2) At max. specified ambient temperature: typ. 58 ppm (5 seconds) - worst-case 220 ppm (19 seconds).

3.3 HM76 CPU boards

3.3.1 5PC900.TS77-0x

3.3.1.1 General information

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

3.3.1.2 Order data

Model number	Short description	Figure
	CPU boards	
5PC900.TS77-07	CPU board Intel Celeron 847E 1.1 GHz - Dual core - HM76 chipset - For APC910	
5PC900.TS77-08	CPU board Intel Celeron 827E 1.4 GHz - Single core - HM76 chipset - For APC910	
5PC900.TS77-09	CPU board Intel Celeron 1020E 2.2 GHz - Dual core - HM76 chipset - For APC910	
5PC900.TS77-10	CPU board Intel Celeron 1047UE 1.4 GHz - Dual core - HM76 chipset - For APC910	
	Required accessories	
	Heat sink	
5AC901.HS00-00	APC910 heat sink, active	
5AC901.HS01-00	APC910 heat sink, passive	
	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 48: 5PC900.TS77-07, 5PC900.TS77-08, 5PC900.TS77-09, 5PC900.TS77-10 - Order data

3.3.1.3 Technical data

Model number	5PC900.TS77-07	5PC900.TS77-08	5PC900.TS77-09	5PC900.TS77-10
General information				
Certification				
CE	Yes			
cULus	Yes			
GL	-	-	-	Yes ¹⁾
GOST-R	Yes			
Controller				
Boot loader	Embedded AMI 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			
Real-time clock				
Precision	At 25°C: typ. 12 ppm (1 second) per day ²⁾			
Battery-backed	Yes			
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

Table 49: 5PC900.TS77-07, 5PC900.TS77-08, 5PC900.TS77-09, 5PC900.TS77-10 - Technical data

Model number	5PC900.TS77-07	5PC900.TS77-08	5PC900.TS77-09	5PC900.TS77-10
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)			
DisplayPort	Version 1.1			
Mass memory management	4x SATA			
Power management	ACPI 4.0 with battery support			

Table 49: 5PC900.TS77-07, 5PC900.TS77-08, 5PC900.TS77-09, 5PC900.TS77-10 - Technical data

- 1) Yes, although applies only if all components installed within the complete system have this certification.
- 2) At max. specified ambient temperature: typ. 58 ppm (5 seconds) - worst-case 220 ppm (19 seconds).

3.4 Main memory

3.4.1 5MMDDR.xxxx-03

3.4.1.1 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.

3.4.1.2 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 50: 5MMDDR.1024-03, 5MMDDR.2048-03, 5MMDDR.4096-03, 5MMDDR.8192-03 - Order data

3.4.1.3 Technical data

Model number	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 51: 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.

Information:

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

3.5 Bus units

3.5.1 5AC901.BX0x-0x

3.5.1.1 General information

These bus units are compatible with system units that support PCI and/or PCI Express.

1-slot bus units



Figure 31: 1-slot bus units

2-slot bus units

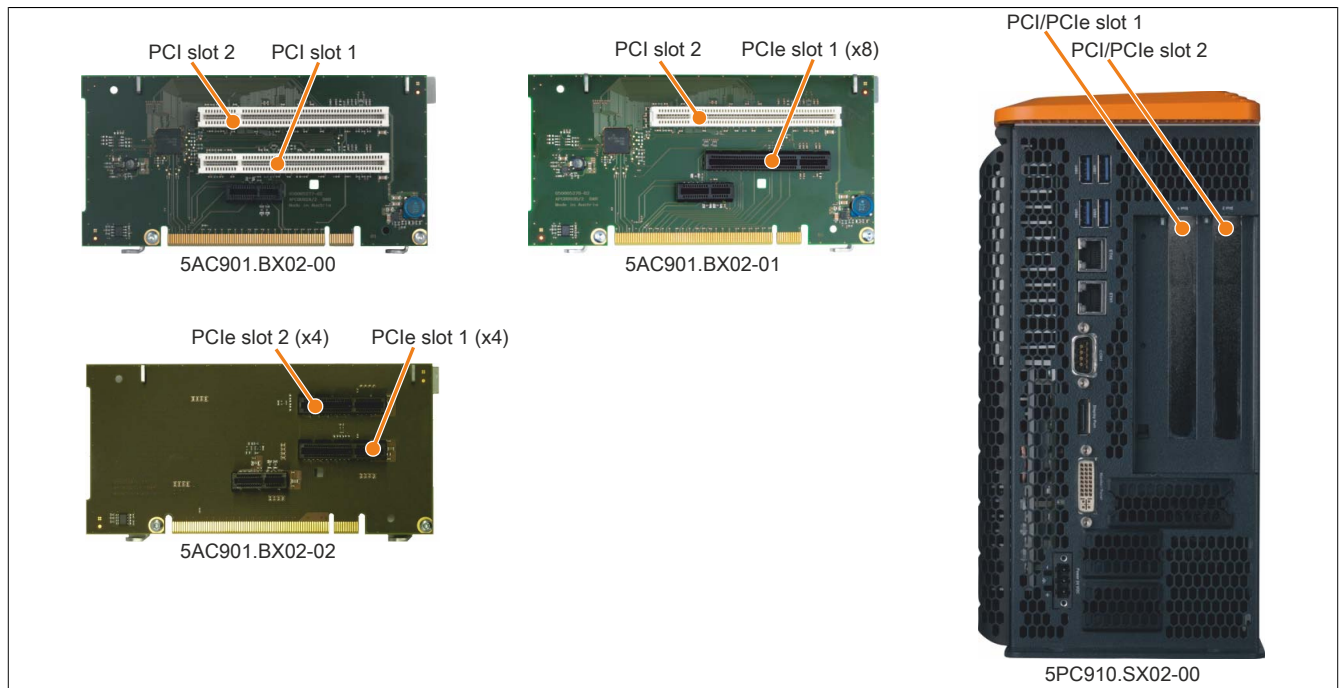


Figure 32: 2-slot bus units

5-slot bus units

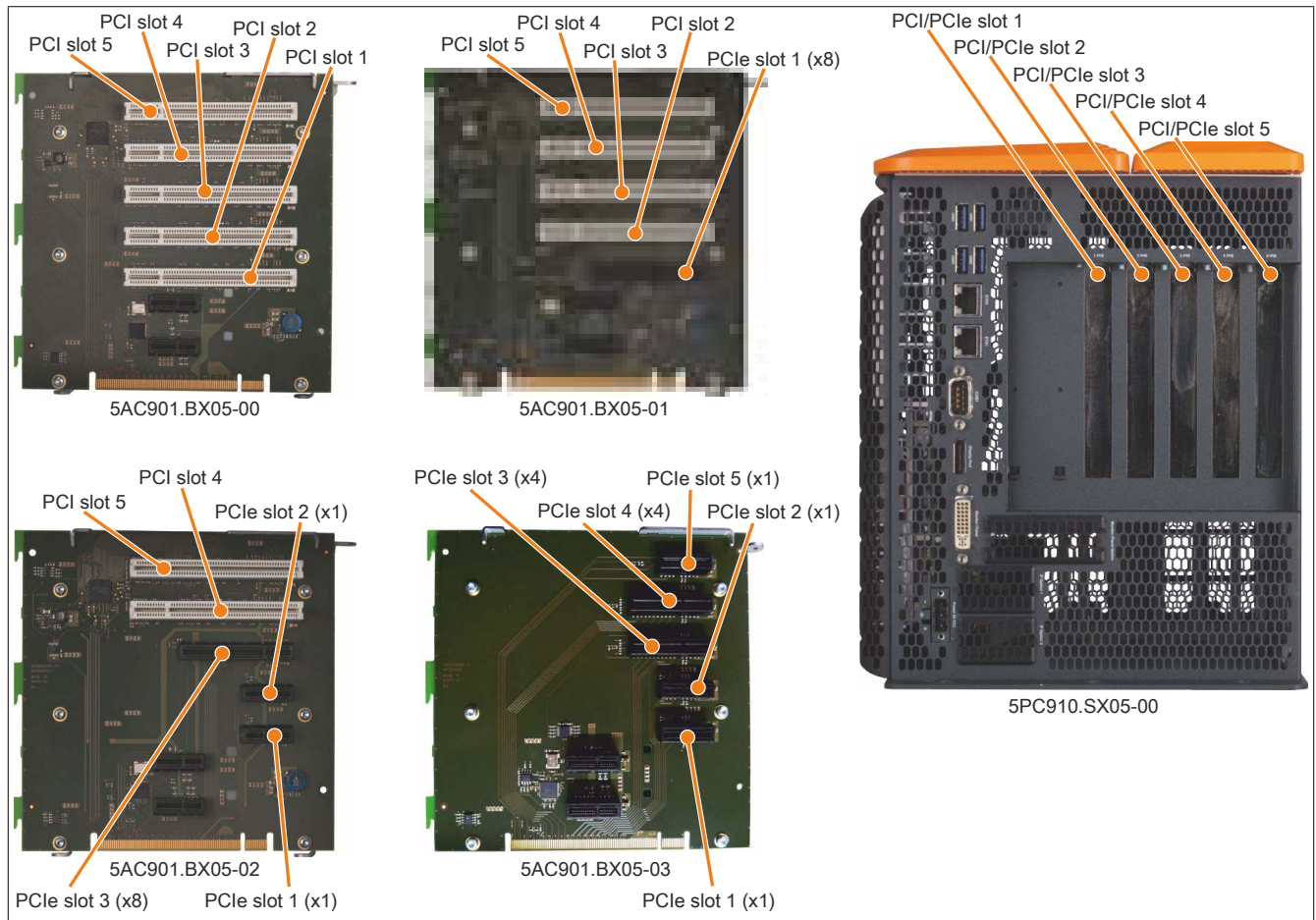


Figure 33: 5-slot bus units

3.5.1.2 Order data

Model number	Short description	Figure
	Bus units	
5AC901.BX01-00	APC910 1-slot bus - 1 PCI	
5AC901.BX01-01	APC910 1-slot bus - 1 PCI Express x8	
5AC901.BX02-00	APC910 2-slot bus - 2 PCI	
5AC901.BX02-01	APC910 2-slot bus - 1 PCI - 1 PCI Express x8	
5AC901.BX02-02 ≤ Rev. C0	APC910 2-slot bus - 2 PCI Express x4	
5AC901.BX02-02 ≥ Rev. D0	APC910 2-slot bus - 2 PCI Express x4, open-ended	
5AC901.BX05-00	APC910 5-slot bus - 5 PCI	
5AC901.BX05-01	APC910 5-slot bus - 4 PCI - 1 PCI Express x8	
5AC901.BX05-02	APC910 5-slot bus - 2 PCI - 1 PCI Express x8 - 2 PCI Express x1	
5AC901.BX05-03	APC910 5-slot bus - 2 PCI Express x4 - 3 PCI Express x1	

Table 52: 5AC901.BX01-00, 5AC901.BX01-01, 5AC901.BX02-00, 5AC901.BX02-01, 5AC901.BX02-02, 5AC901.BX05-00, 5AC901.BX05-01, 5AC901.BX05-02, 5AC901.BX05-03 - Order data

3.5.1.3 Technical data

Information:

Up to revision A0, the PCI Express slots on 5AC901.BX01-01 and 5AC901.BX02-01 bus units are equipped with the PCIe x4 standard.

Model number	5AC901.BX01-00	5AC901.BX01-01	5AC901.BX02-00	5AC901.BX02-01	5AC901.BX02-02
General information					
Certification					
CE	Yes				
cULus	Yes				
GOST-R	Yes				
GL	Yes ¹⁾				
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) (2x)

Table 53: 5AC901.BX01-00, 5AC901.BX01-01, 5AC901.BX02-00, 5AC901.BX02-01, 5AC901.BX02-02 - Technical data

1) Yes, although applies only if all components installed within the complete system have this certification.

Model number	5AC901.BX05-00	5AC901.BX05-01	5AC901.BX05-02	5AC901.BX05-03
General information				
Certification				
CE	Yes			
cULus	Yes			
GOST-R	Yes			
Inserts				
PCI slots				
Quantity	5	4	2	-
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	3	5
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) (1x); x1 (500 MB/s) (2x)	x4 (2 GB/s) (2x); x1 (500 MB/s) (3x)

Table 54: 5AC901.BX05-00, 5AC901.BX05-01, 5AC901.BX05-02, 5AC901.BX05-03 - Technical data

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).

3.6 Heat sinks

3.6.1 5AC901.HS0x-00

3.6.1.1 General information

The 5AC901.HS00-00 heat sink has cooling fins and heat pipes for improved heat dissipation. It is only used together with system units that have fan kits.

The 5AC901.HS01-00 heat sink has cooling fins and heat pipes for improved heat dissipation. It is only used together with system units that do not have fan kits.

3.6.1.2 Order data

Model number	Short description	Figure
	Heat sink	
5AC901.HS00-00	APC910 heat sink, active	
5AC901.HS01-00	APC910 heat sink, passive	
	Required accessories	
	CPU boards	
5PC900.TS77-00	CPU board Intel Core i7 3615QE 2.3 GHz - Quad core - QM77 chipset - For APC910	
5PC900.TS77-01	CPU board Intel Core i7 3612QE 2.1 GHz - Quad core - QM77 chipset - For APC910	
5PC900.TS77-02	CPU board Intel Core i7 3555LE 2.5 GHz - Dual core - QM77 chipset - For APC910	
5PC900.TS77-03	CPU board Intel Core i7 3517UE 1.7 GHz - Dual core - QM77 chipset - For APC910	
5PC900.TS77-04	CPU board Intel Core i5 3610ME 2.7 GHz - Dual core - QM77 chipset - For APC910	
5PC900.TS77-05	CPU board Intel Core i3 3120ME 2.4 GHz - Dual core - QM77 chipset - For APC910	
5PC900.TS77-06	CPU board Intel Core i3 3217UE 1.6 GHz - Dual core - QM77 chipset - For APC910	
5PC900.TS77-07	CPU board Intel Celeron 847E 1.1 GHz - Dual core - HM76 chipset - For APC910	
5PC900.TS77-08	CPU board Intel Celeron 827E 1.4 GHz - Single core - HM76 chipset - For APC910	
5PC900.TS77-09	CPU board Intel Celeron 1020E 2.2 GHz - Dual core - HM76 chipset - For APC910	
5PC900.TS77-10	CPU board Intel Celeron 1047UE 1.4 GHz - Dual core - HM76 chipset - For APC910	

Table 55: 5AC901.HS00-00, 5AC901.HS01-00 - Order data

3.7 Fan kits

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 fan filters" on page 380](#).

Information:

For information about installing or replacing a fan kit, please refer to the section ["Replacing fan kits" on page 381](#).

3.7.1 5AC901.FA01-00

3.7.1.1 General information

This fan kit includes 3 fans for improving heat dissipation on 1-slot APC910 system units.

- 3 fans for improved heat dissipation
- Simple installation and removal

3.7.1.2 Order data

Model number	Short description	Figure
	Fan kit	
5AC901.FA01-00	APC910 fan kit - For 5PC910.SX01-00	
	Optional accessories	
	Accessories	
5AC901.FI01-00	APC910 air filter - For 1-slot APC910 - 1 pieces	

Table 56: 5AC901.FA01-00 - Order data

3.7.1.3 Technical data

Model number	5AC901.FA01-00
General information	
Number of fans	3 (1x 50x50x15, 2x 70x70x15)
Speed	Max. 5000 ±10% rpm (50x50x15) Max. 2200 ±250 rpm (70x70x15)
Noise level	33.5 dB(A) (50x50x15) 28.3 dB(A) (70x70x15)
Service life	100,000 hours at 40°C (50x50x15) 100,000 hours at 40°C (70x70x15)
Certification	
CE	Yes
cULus	Yes
GOST-R	Yes
GL	Yes ¹⁾
Mechanical characteristics	
Dimensions	
Fan	
Width	50 mm 70 mm
Height	50 mm 70 mm
Depth	15 mm 15 mm

Table 57: 5AC901.FA01-00 - Technical data

1) Yes, although applies only if all components installed within the complete system have this certification.

3.7.2 5AC901.FA02-00

3.7.2.1 General information

This fan kit includes 4 fans for improving heat dissipation on 2-slot APC910 system units.

- 4 fans for improved heat dissipation
- Simple installation and removal

3.7.2.2 Order data

Model number	Short description	Figure
	Fan kit	
5AC901.FA02-00	APC910 fan kit - For 5PC910.SX02-00	
	Optional accessories	
	Accessories	
5AC901.FI02-00	APC910 air filter - For 2-slot APC910 - 1 pieces	

Table 58: 5AC901.FA02-00 - Order data

3.7.2.3 Technical data

Model number	5AC901.FA02-00
General information	
Number of fans	4 (3x 50x50x15, 1x 70x70x15)
Speed	Max. 5000 ±10% rpm (50x50x15) Max. 2200 ±250 rpm (70x70x15)
Noise level	33.5 dB(A) (50x50x15) 28.3 dB(A) (70x70x15)
Service life	100,000 hours at 40°C (50x50x15) 100,000 hours at 40°C (70x70x15)
Certification	
CE	Yes
cULus	Yes
GOST-R	Yes
GL	Yes ¹⁾
Mechanical characteristics	
Dimensions	
Fan	
Width	50 mm 70 mm
Height	50 mm 70 mm
Depth	15 mm 15 mm

Table 59: 5AC901.FA02-00 - Technical data

1) Yes, although applies only if all components installed within the complete system have this certification.

3.7.3 5AC901.FA05-00

3.7.3.1 General information

This fan kit includes 4 fans for improving heat dissipation on 5-slot APC910 system units.

- 4 fans for improved heat dissipation
- Simple installation and removal

3.7.3.2 Order data

Model number	Short description	Figure
	Fan kit	
5AC901.FA05-00	APC910 fan kit - For 5PC910.SX05-00 system unit	
	Optional accessories	
	Accessories	
5AC901.FI05-00	APC910 air filter - For 5-slot APC910 - 1 pieces	

Table 60: 5AC901.FA05-00 - Order data

3.7.3.3 Technical data

Model number	5AC901.FA05-00
General information	
Number of fans	4 (1x 50x50x15, 3x 70x70x15)
Speed	Max. 5000 ±10% rpm (50x50x15) Max. 2200 ±250 rpm (70x70x15)
Noise level	33.5 dB(A) (50x50x15) 28.3 dB(A) (70x70x15)
Service life	100,000 hours at 40°C (50x50x15) 100,000 hours at 40°C (70x70x15)
Certification	
CE	Yes
cULus	Yes
GOST-R	Yes
Mechanical characteristics	
Dimensions	
Fan	
Width	50 mm 70 mm
Height	50 mm 70 mm
Depth	15 mm 15 mm

Table 61: 5AC901.FA05-00 - Technical data

3.8 Drives

3.8.1 5AC901.CHDD-00

3.8.1.1 General information

This 250 GB slide-in compact hard disk is specified for 24-hour operation and can be used in APC910 system units.

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

3.8.1.2 Order data

Model number	Short description	Figure
	Drives	
5AC901.CHDD-00	250 GB hard disk - Slide-in compact - SATA	

Table 62: 5AC901.CHDD-00 - Order data

3.8.1.3 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.

Model number	5AC901.CHDD-00
General information	
Certification	
CE	Yes
cULus	Yes
cULus HazLoc Class 1 Division 2	Yes ¹⁾
GOST-R	Yes
Hard disk drive	
Capacity	250 GB
Number of heads	2
Number of sectors	488397168
Bytes per sector	512
Cache	8 MB
Speed	5400 rpm $\pm 0.2\%$
Startup time	Typ. 3.6 s (from 0 rpm to read access)
MTBF	550,000 POH ²⁾
S.M.A.R.T. support	Yes
Interface	SATA
Access time	5.6 ms
Supported transfer modes	SATA 1.0, serial ATA revision 2.6 PIO mode 0-4, multiword DMA mode 0-2, UDMA mode 0-6
Data transfer rate	
Internal	Max. 1175 Mbit/s
To/From host	Max. 150 Mbit/s (SATA I), max. 300 Mbit/s (SATA II)
Positioning time	
Minimum (track to track)	1 ms
Nominal (read only)	14 ms
Maximum (read only)	30 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

Table 63: 5AC901.CHDD-00 - Technical data

Model number	5AC901.CHDD-00
Relative humidity ⁶⁾	
Operation	5 to 95%, non-condensing
Storage	5 to 95%, non-condensing
Transport	5 to 95%, non-condensing
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	350 g and 2 ms duration, no unrecoverable errors
Storage	800 g and 2 ms duration, no unrecoverable errors 800 g and 1 ms duration, no unrecoverable errors 600 g and 0.5 ms duration, no unrecoverable errors
Transport	800 g and 2 ms duration, no unrecoverable errors 800 g and 1 ms duration, no unrecoverable errors 600 g and 0.5 ms duration, no unrecoverable errors
Elevation	
Operation	-300 to 3048 m
Storage	-300 to 12192 m
Mechanical characteristics	
Installation	Fixed ⁷⁾
Dimensions	
Width	13 mm
Height	75 mm
Depth	105 mm
Weight	134 g
Manufacturer information	
Manufacturer	Seagate
Manufacturer's product ID	ST9250311CS

Table 63: 5AC901.CHDD-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) 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 30% per hour.
- 7) Slide-in compact installation.

3.8.1.4 Temperature/Humidity diagram

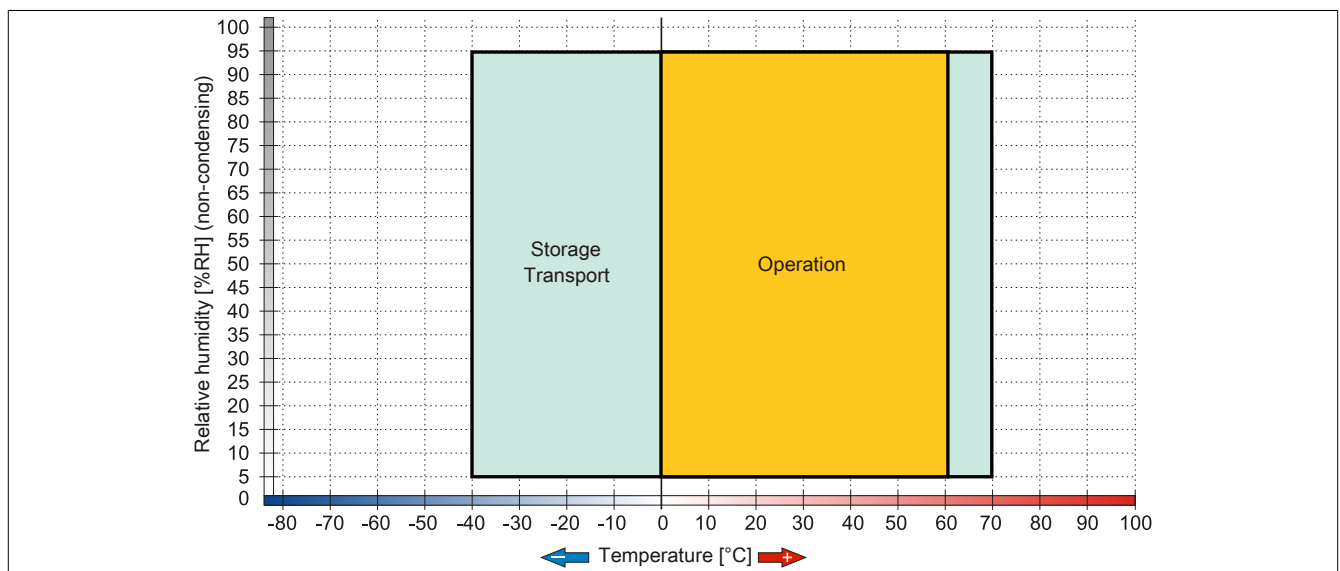


Figure 34: 5AC901.CHDD-00 - Temperature/Humidity diagram

3.8.2 5AC901.CHDD-01

3.8.2.1 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

3.8.2.2 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 64: 5AC901.CHDD-01 - Order data

3.8.2.3 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.

Model number	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 $\pm 0.2\%$
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	8 to 90%, non-condensing
Storage	5 to 95%, non-condensing
Transport	5 to 95%, non-condensing

Table 65: 5AC901.CHDD-01 - Technical data

Model number	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 65: 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.

3.8.2.4 Temperature/Humidity diagram

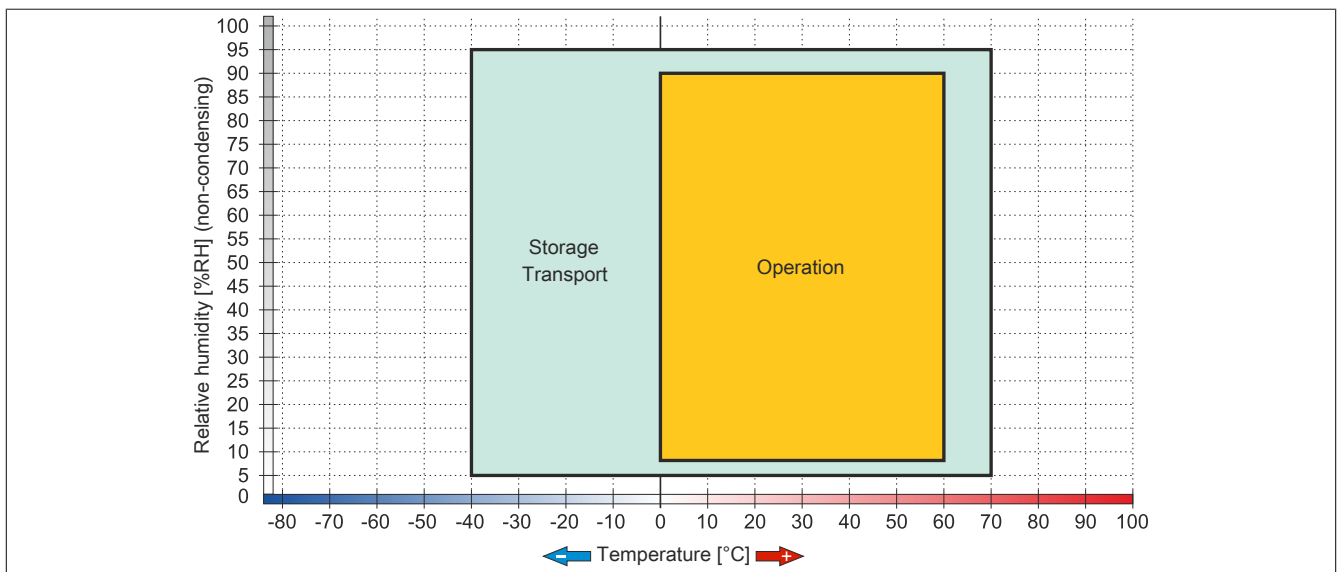


Figure 35: 5AC901.CHDD-01 - Temperature/Humidity diagram

3.8.3 5MMHDD.0500-00

3.8.3.1 General information

This 500 GB hard disk can be used as a replacement part or accessory.

- 500 GB hard disk
- Replacement hard disk for a 5AC801.HDDI-04 / 5AC901.CHDD-01 hard disk or a 5ACPCI.RAIC-05 RAID controller
- Accessory for the APC510 (optional hard disk for I/O board)
- Specified for 24-hour operation
- S.M.A.R.T. support

3.8.3.2 Order data

Model number	Short description	Figure
	Drives	
5MMHDD.0500-00	500 GB hard disk - SATA	

Table 66: 5MMHDD.0500-00 - Order data

3.8.3.3 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.

Model number	5MMHDD.0500-00
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 $\pm 0.2\%$
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

Table 67: 5MMHDD.0500-00 - Technical data

Model number	5MMHDD.0500-00
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	8 to 90%, non-condensing
Storage	5 to 95%, non-condensing
Transport	5 to 95%, non-condensing
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	
Dimensions	
Width	7 mm
Height	69 mm
Depth	100 mm
Weight	100 g
Manufacturer information	
Manufacturer	Western Digital
Manufacturer's product ID	WD5000LUCT

Table 67: 5MMHDD.0500-00 - 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) 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.

3.8.3.4 Temperature/Humidity diagram

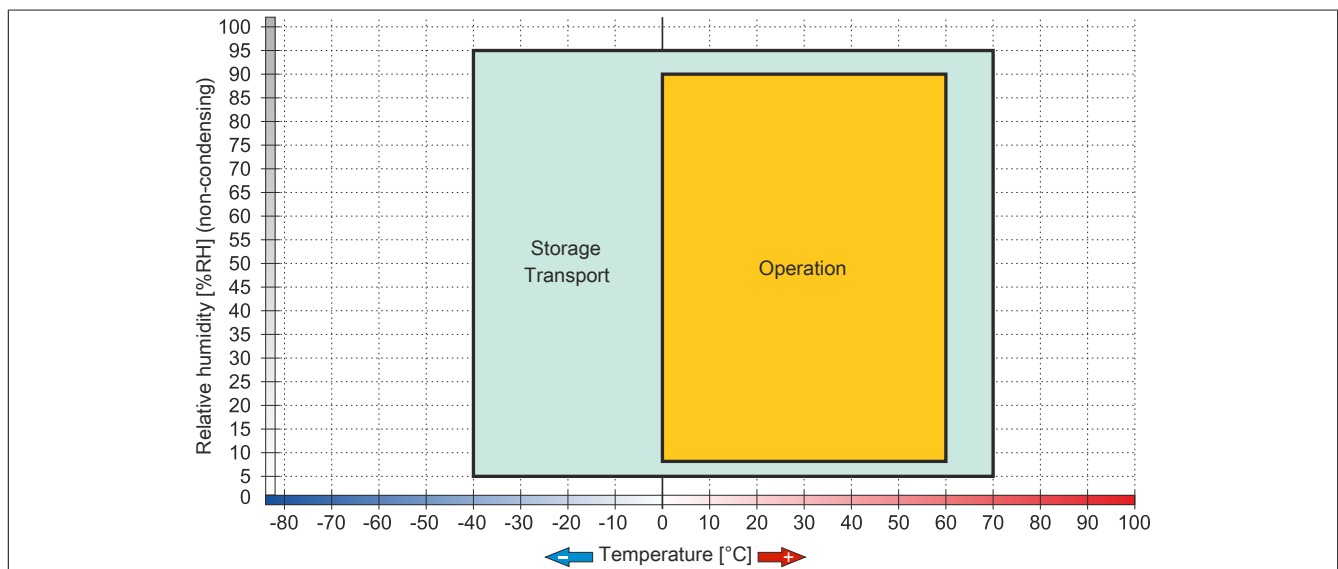


Figure 36: 5MMHDD.0500-00 - Temperature/Humidity diagram

3.8.4 5AC901.CSSD-00

3.8.4.1 General information

This 32 GB slide-in compact solid-state drive (SSD) is based on single-level cell (SLC) technology and is SATA 2.6 compatible. The slide-in compact drive can be used in APC910 system units.

- 32 GB solid-state drive
- SLC flash
- S.M.A.R.T. support
- Slide-in compact
- SATA 2.6 compatible

3.8.4.2 Order data

Model number	Short description	Figure
	Drives	
5AC901.CSSD-00	32 GB SSD SLC - Slide-in compact - SATA	

Table 68: 5AC901.CSSD-00 - Order data

3.8.4.3 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.

Model number	5AC901.CSSD-00
General information	
Certification	
CE	Yes
cULus	Yes
cULus HazLoc Class 1 Division 2	Yes ¹⁾
GOST-R	Yes
Solid-state drive	
Capacity	32 GB
Data reliability	<1 unrecoverable error in 10 ¹⁶ bit read accesses
MTBF	2,000,000 hours
Power on/off cycles	50000
S.M.A.R.T. support	Yes
Interface	SATA
Maintenance	None
Sequential read	Max. 250 MB/s
Sequential write	Max. 195 MB/s
IOPS ²⁾	
4k read	45000
4k write	5500
Endurance	
SLC flash	Yes
Guaranteed data volume	
Guaranteed	700 TB
Results for 5 years	350 GB/day
Wear leveling	Static
Error correction coding (ECC)	Yes

Table 69: 5AC901.CSSD-00 - Technical data

Model number	5AC901.CSSD-00
Compatibility	SATA revision 2.6 compatible, compatible with SATA 1.5 Gbit/s and 3 Gbit/s interface rates ATA/ATAPI-7 SSD Enhanced SMART ATA feature set Native Command Queuing (NCQ)
Environmental conditions	
Temperature	
Operation	0 to 70°C
Storage	-55 to 95°C
Transport	-55 to 95°C
Relative humidity	
Operation	5 to 95%, non-condensing
Storage	5 to 95%, non-condensing
Transport	5 to 95%, non-condensing
Vibration	
Operation	5 to 700 Hz: 2.17 g
Storage	5 to 800 Hz: 3.13 g
Transport	5 to 800 Hz: 3.13 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 ³⁾
Dimensions	
Width	13 mm
Height	98 mm
Depth	105 mm
Weight	118 g
Manufacturer information	
Manufacturer	Intel
Manufacturer's product ID	SSDSA2SH032G201

Table 69: 5AC901.CSSD-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) Slide-in compact installation.

3.8.4.4 Temperature/Humidity diagram

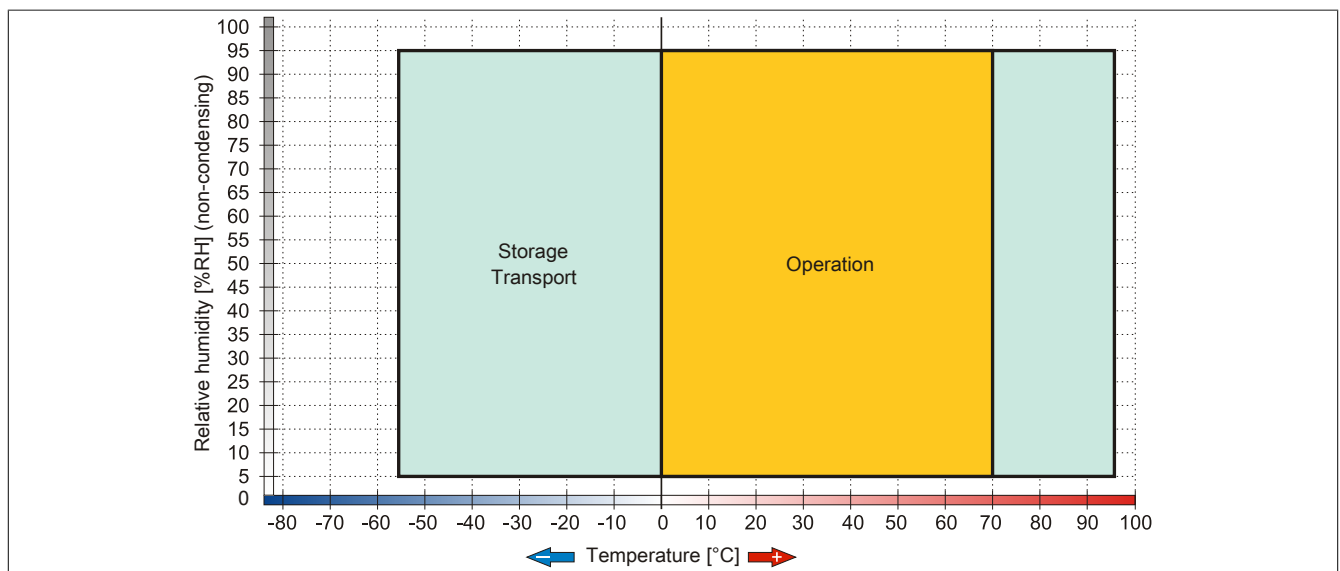


Figure 37: 5AC901.CSSD-00 - Temperature/Humidity diagram

3.8.5 5AC901.CSSD-01

3.8.5.1 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 system units.

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

3.8.5.2 Order data

Model number	Short description	Figure
	Drives	
5AC901.CSSD-01	60 GB SSD MLC - Slide-in compact - SATA	
	Optional accessories	
	Drives	
5MMSSD.0060-00	60 GB SSD MLC - Intel - SATA	

Table 70: 5AC901.CSSD-01 - Order data

3.8.5.3 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.

Model number	5AC901.CSSD-01
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 ¹⁶ bit read accesses
MTBF	1,200,000 hours
S.M.A.R.T. support	Yes
Interface	SATA
Maintenance	None
Sequential read	Max. 550 MB/s, with SATA 6 Gbit/s Max. 280 MB/s, with SATA 3 Gbit/s
Sequential write	Max. 475 MB/s, with SATA 6 Gbit/s Max. 245 MB/s, with SATA 3 Gbit/s
IOPS ²⁾	
4k read	15000
4k write	
Typical	23000
Maximum	80000
Endurance	
MLC flash	Yes
Compatibility	SATA 3.0 compliant ACS-2 SSD Enhanced SMART ATA feature set Native Command Queuing (NCQ)

Table 71: 5AC901.CSSD-01 - Technical data

Model number	5AC901.CSSD-01
Environmental conditions	
Temperature	
Operation	0 to 70°C
Storage	-55 to 95°C
Transport	-55 to 95°C
Relative humidity	
Operation	5 to 95%, non-condensing
Storage	5 to 95%, non-condensing
Transport	5 to 95%, non-condensing
Vibration	
Operation	5 to 700 Hz: 2.17 g
Storage	5 to 800 Hz: 3.13 g
Transport	5 to 800 Hz: 3.13 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 ³⁾
Dimensions	
Width	13 mm
Height	98 mm
Depth	105 mm
Weight	118 g
Manufacturer information	
Manufacturer	Intel
Manufacturer's product ID	SSDSC2CW060A3

Table 71: 5AC901.CSSD-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) Slide-in compact installation.

3.8.5.4 Temperature/Humidity diagram

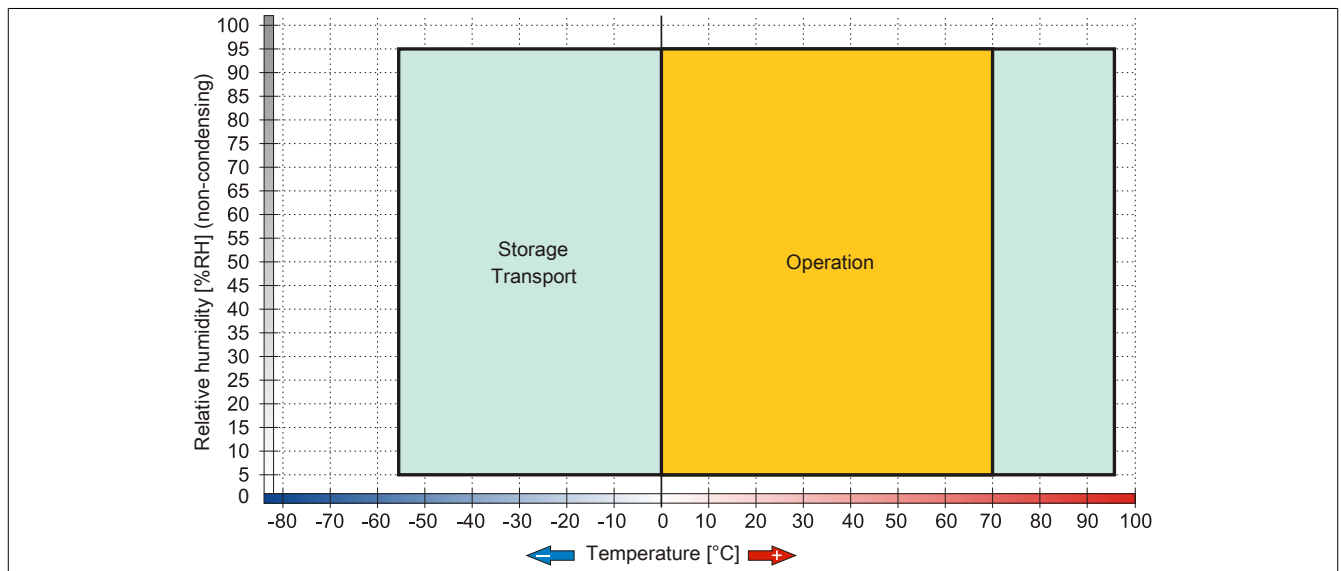


Figure 38: 5AC901.CSSD-01 - Temperature/Humidity diagram

3.8.6 5AC901.CSSD-02

3.8.6.1 General information

This 180 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 system units.

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

3.8.6.2 Order data

Model number	Short description	Figure
	Drives	
5AC901.CSSD-02	180 GB SSD MLC - Slide-in compact - SATA	
	Optional accessories	
	Drives	
5MMSSD.0180-00	180 GB SSD MLC - Intel - SATA	

Table 72: 5AC901.CSSD-02 - Order data

3.8.6.3 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.

Model number	5AC901.CSSD-02
General information	
Certification	
CE	Yes
cULus	Yes
cULus HazLoc Class 1 Division 2	Yes ¹⁾
GOST-R	Yes
Solid-state drive	
Capacity	180 GB
Data reliability	<1 unrecoverable error in 10 ¹⁶ bit read accesses
MTBF	1,200,000 hours
S.M.A.R.T. support	Yes
Interface	SATA
Maintenance	None
Sequential read	Max. 550 MB/s, with SATA 6 Gbit/s Max. 280 MB/s, with SATA 3 Gbit/s
Sequential write	Max. 520 MB/s, with SATA 6 Gbit/s Max. 260 MB/s, with SATA 3 Gbit/s
IOPS ²⁾	
4k read	50000
4k write	
Typical	60000
Maximum	80000
Endurance	
MLC flash	Yes
Compatibility	SATA 3.0 compliant ACS-2 SSD Enhanced SMART ATA feature set Native Command Queuing (NCQ)

Table 73: 5AC901.CSSD-02 - Technical data

Model number	5AC901.CSSD-02
Environmental conditions	
Temperature	
Operation	0 to 70°C
Storage	-55 to 95°C
Transport	-55 to 95°C
Relative humidity	
Operation	5 to 95%, non-condensing
Storage	5 to 95%, non-condensing
Transport	5 to 95%, non-condensing
Vibration	
Operation	5 to 700 Hz: 2.17 g
Storage	5 to 800 Hz: 3.13 g
Transport	5 to 800 Hz: 3.13 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 ³⁾
Dimensions	
Width	13 mm
Height	98 mm
Depth	105 mm
Weight	118 g
Manufacturer information	
Manufacturer	Intel
Manufacturer's product ID	SSDSC2CW180A3

Table 73: 5AC901.CSSD-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.
- 2) IOPS: Random read and write input/output operations per second.
- 3) Slide-in compact installation.

3.8.6.4 Temperature/Humidity diagram

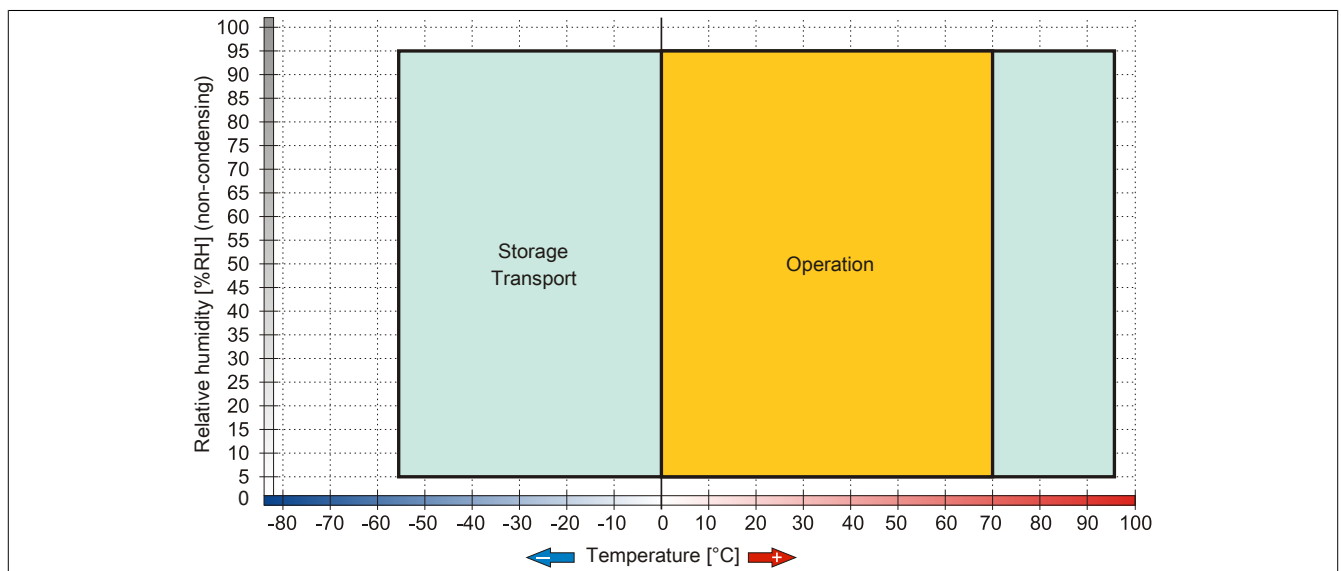


Figure 39: 5AC901.CSSD-02 - Temperature/Humidity diagram

3.8.7 5AC901.CSSD-03

3.8.7.1 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

3.8.7.2 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 74: 5AC901.CSSD-03 - Order data

3.8.7.3 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.

Model number	5AC901.CSSD-03		
Revision	C0	D0	F0
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⁾	47 TBW ⁴⁾
Compatibility		SATA 3.0 compliant ACS-2 SSD Enhanced SMART ATA feature set Native Command Queuing (NCQ)	

Table 75: 5AC901.CSSD-03, 5AC901.CSSD-03, 5AC901.CSSD-03 - Technical data

Model number	5AC901.CSSD-03		
Revision	C0	D0	F0
Environmental conditions			
Temperature			
Operation	0 to 70°C	-30 to 85°C	-40 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	THNSNJ060WCSU

Table 75: 5AC901.CSSD-03, 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.

3.8.7.4 Temperature/Humidity diagram

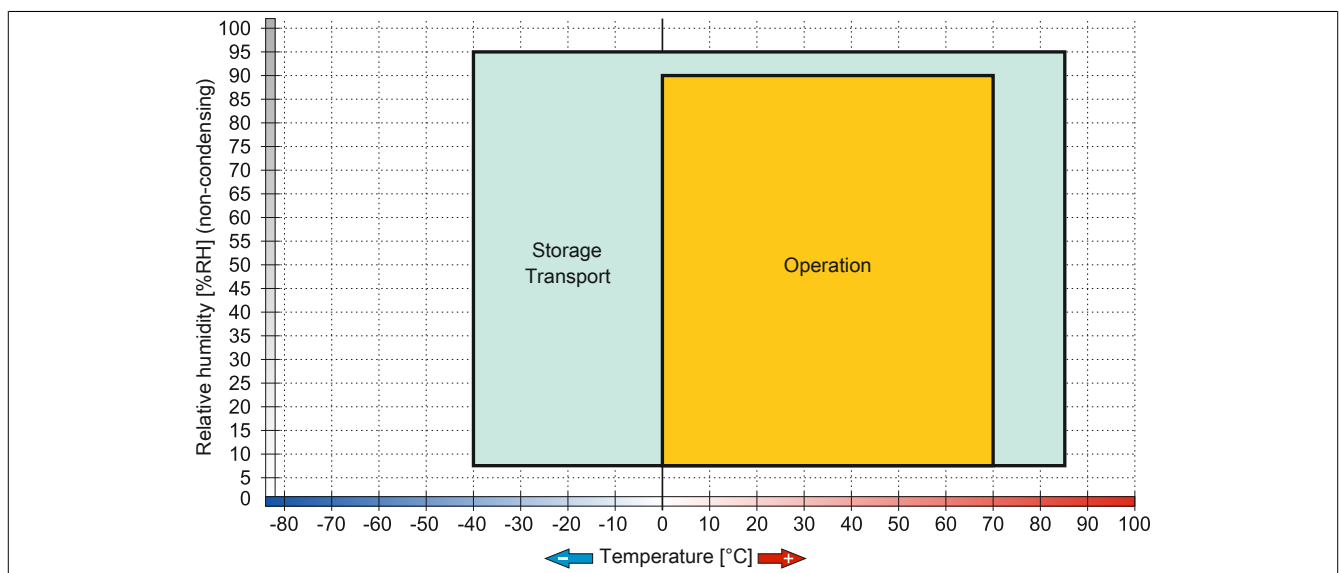


Figure 40: 5AC901.CSSD-03 ≤ Rev. C0 - Temperature/Humidity diagram

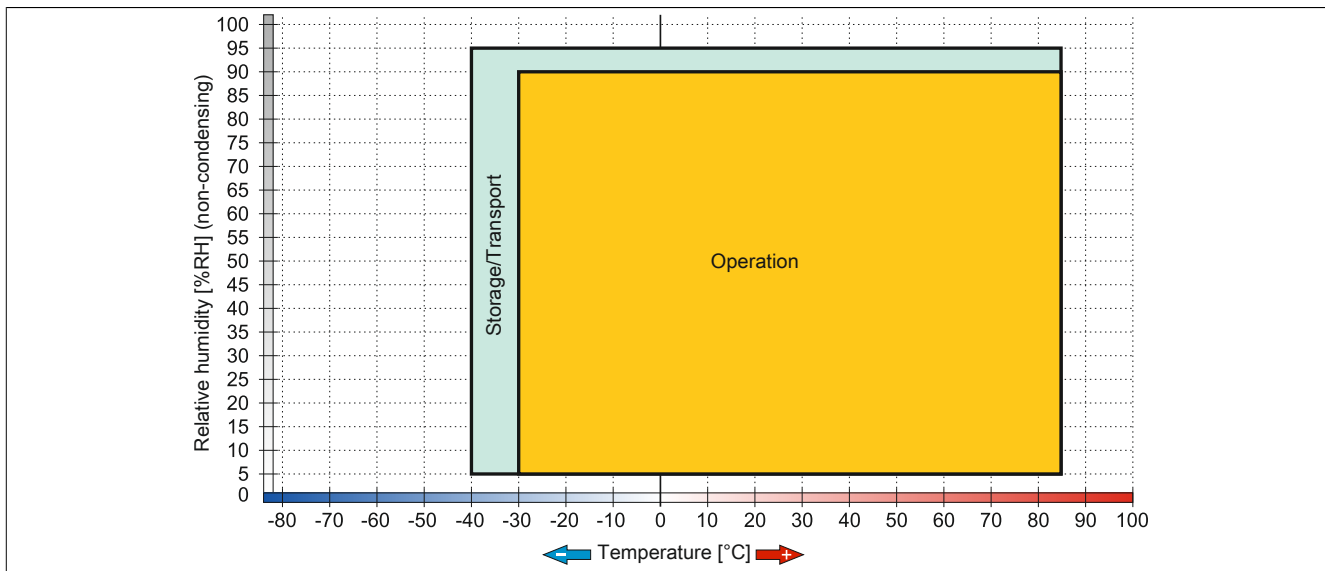


Figure 41: 5AC901.CSSD-03 ≥ Rev. D0 - Temperature/Humidity diagram

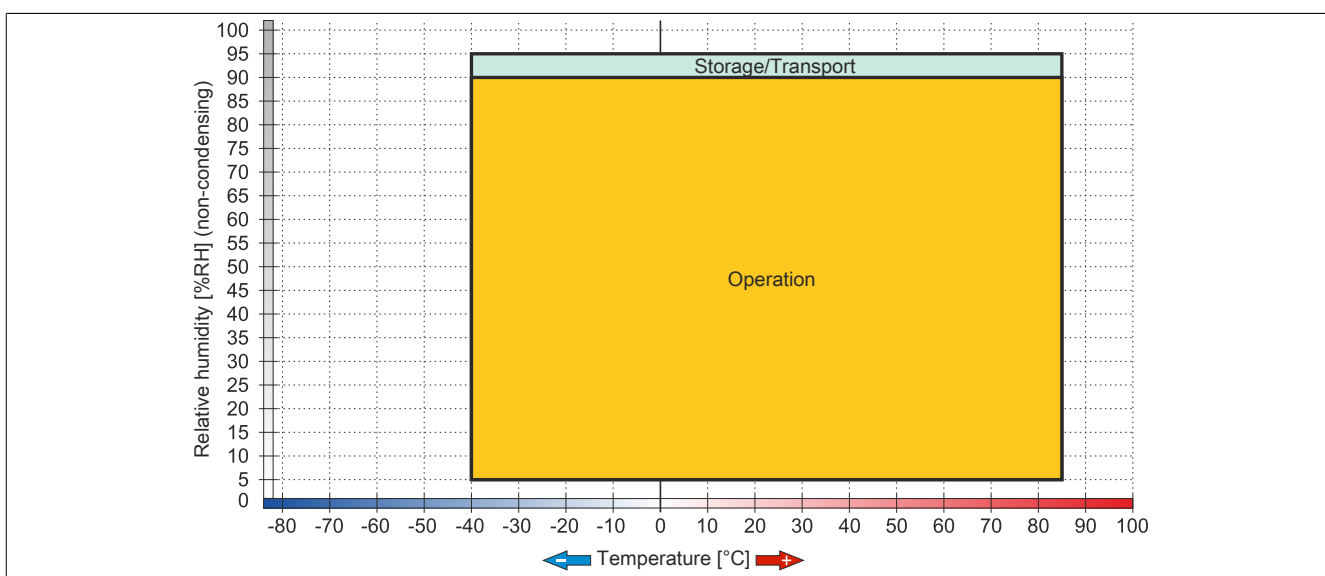


Figure 42: 5AC901.CSSD-03 ≥ Rev. F0 - Temperature/Humidity diagram

3.8.8 5AC901.CSSD-04

3.8.8.1 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

3.8.8.2 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 76: 5AC901.CSSD-04 - Order data

3.8.8.3 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.

Model number	5AC901.CSSD-04			
Revision	C0	D0	E0	G0
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⁾			100 TBW ⁴⁾

Table 77: 5AC901.CSSD-04, 5AC901.CSSD-04, 5AC901.CSSD-04, 5AC901.CSSD-04 - Technical data

Model number	5AC901.CSSD-04			
Revision	C0	D0	E0	G0
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		-40 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	THNSNJ128WCSU

Table 77: 5AC901.CSSD-04, 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.

3.8.8.4 Temperature/Humidity diagram

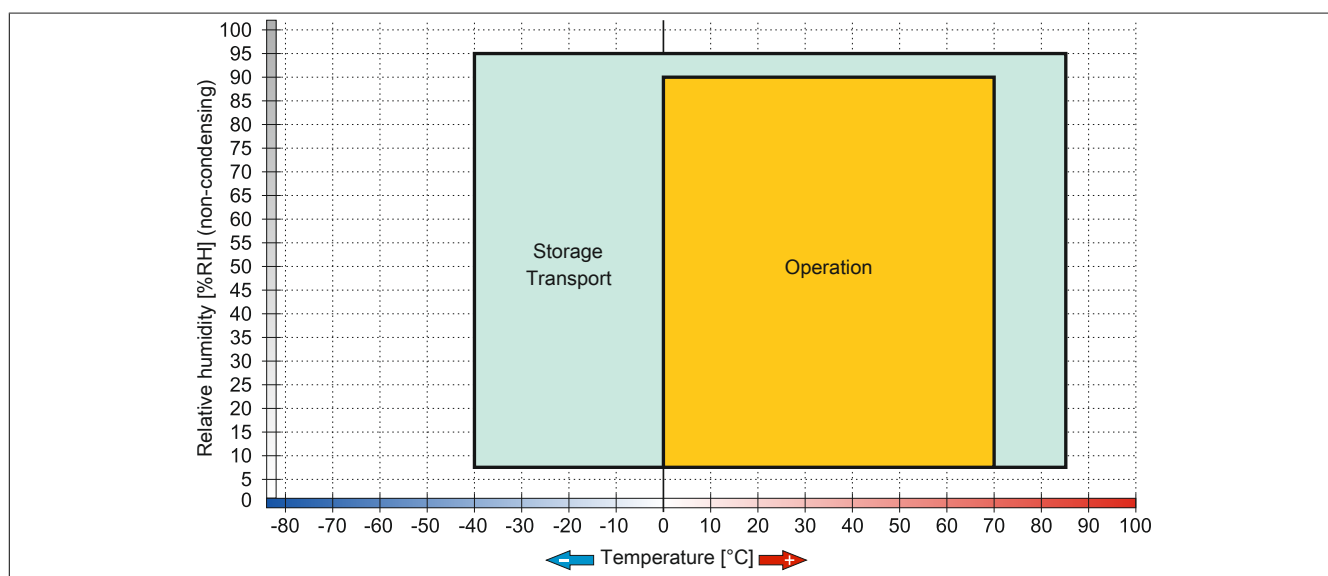


Figure 43: 5AC901.CSSD-04 ≤ Rev. C0 - Temperature/Humidity diagram

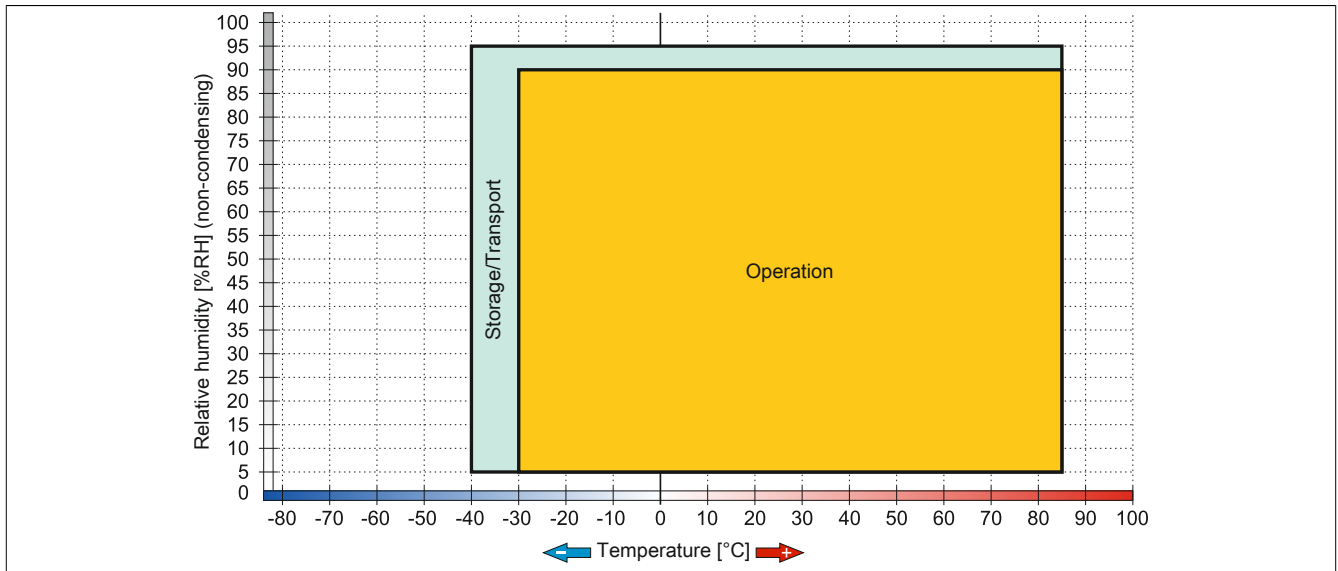


Figure 44: 5AC901.CSSD-04 ≥ Rev. D0 - Temperature/Humidity diagram

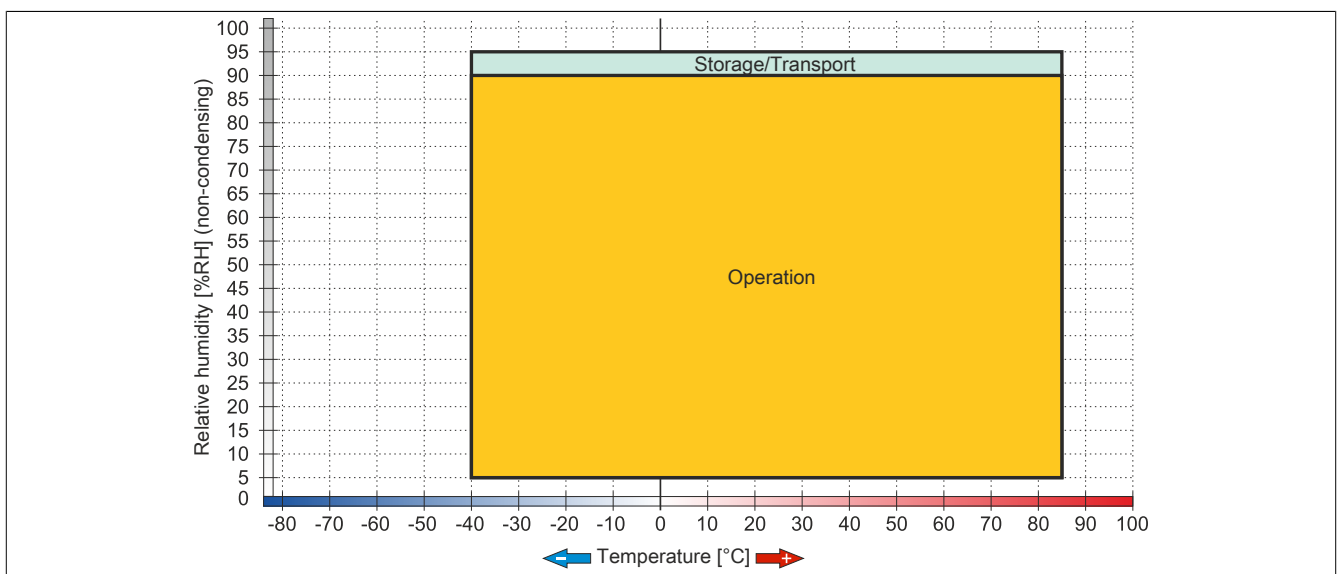


Figure 45: 5AC901.CSSD-04 ≥ Rev. G0 - Temperature/Humidity diagram

3.8.9 5AC901.CSSD-05

3.8.9.1 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

3.8.9.2 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 78: 5AC901.CSSD-05 - Order data

3.8.9.3 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.

Model number	5AC901.CSSD-05	
Revision	C0	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	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⁾	200 TBW ⁴⁾

Table 79: 5AC901.CSSD-05, 5AC901.CSSD-05 - Technical data

Model number	5AC901.CSSD-05	
Revision	C0	E0
Compatibility	SATA 3.0 compliant ACS-2 SSD Enhanced SMART ATA feature set Native Command Queuing (NCQ)	
Environmental conditions		
Temperature		
Operation	-30 to 85°C	-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	THNSNJ256WCST	THNSNJ256WCSU

Table 79: 5AC901.CSSD-05, 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.

3.8.9.4 Temperature/Humidity diagram

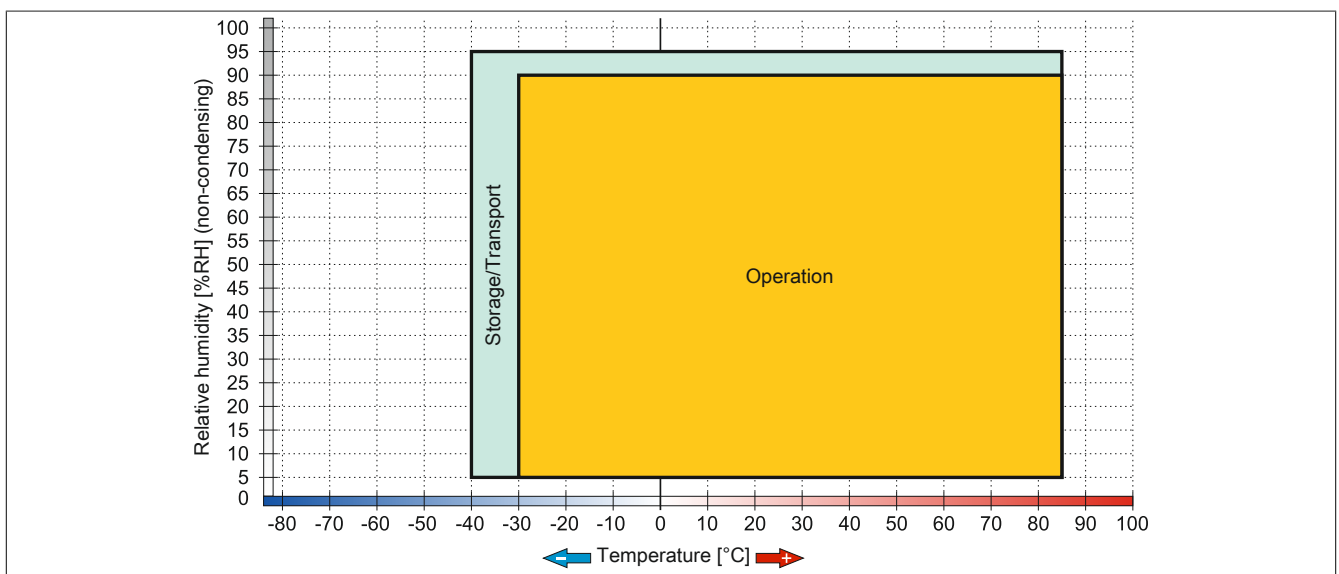


Figure 46: 5AC901.CSSD-05 ≤ Rev. D0 - Temperature/Humidity diagram

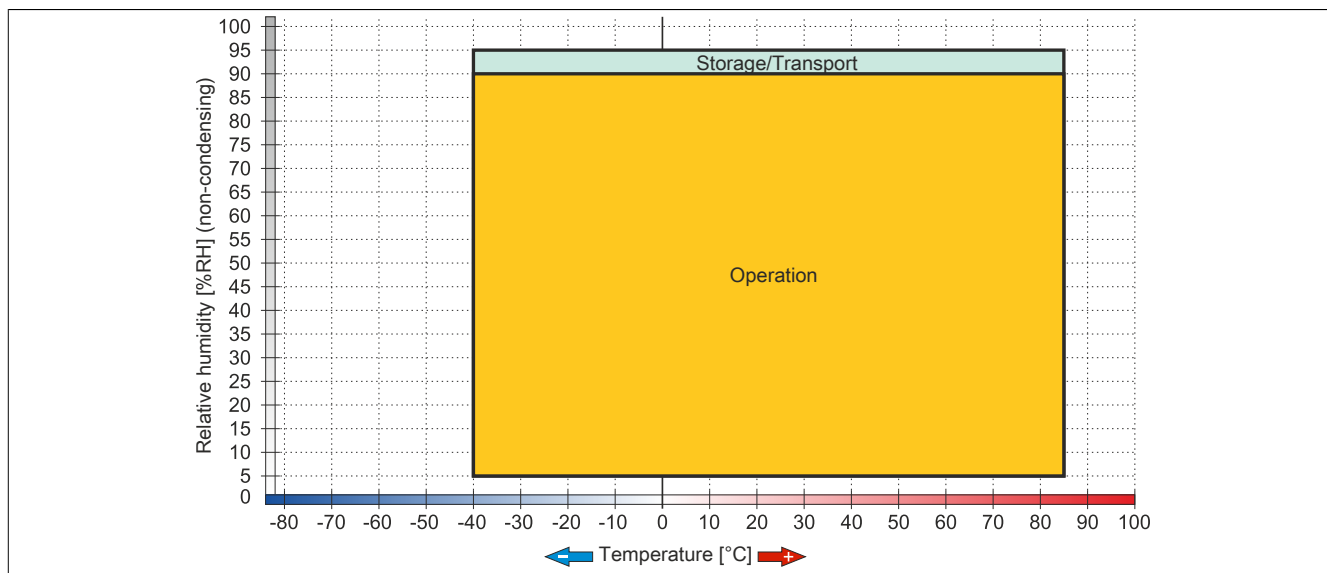


Figure 47: 5AC901.CSSD-05 ≥ Rev. E0 - Temperature/Humidity diagram

3.8.10 5AC901.CSSD-06

3.8.10.1 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

3.8.10.2 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 80: 5AC901.CSSD-06 - Order data

3.8.10.3 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.

Model number	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 81: 5AC901.CSSD-06 - Technical data

Model number	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 81: 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.

3.8.10.4 Temperature/Humidity diagram

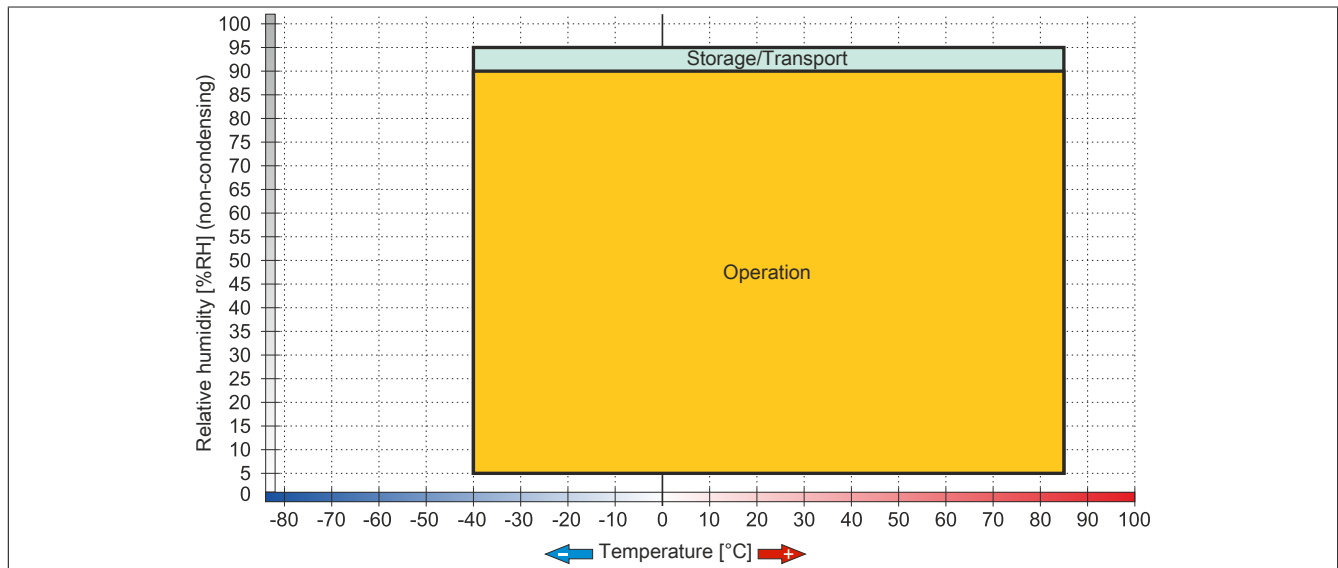


Figure 48: 5AC901.CSSD-06 - Temperature/Humidity diagram

3.8.11 5MMSSD.0060-00

3.8.11.1 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-01 or 5AC901.CSSD-01 SSD drives
- Accessory for the APC510 (optional SSD for I/O board)

3.8.11.2 Order data

Model number	Short description	Figure
	Drives	
5MMSSD.0060-00	60 GB SSD MLC - Intel - SATA	

Table 82: 5MMSSD.0060-00 - Order data

3.8.11.3 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.

Model number	5MMSSD.0060-00
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 ¹⁶ bit read accesses
MTBF	1,200,000 hours
S.M.A.R.T. support	Yes
Interface	SATA
Maintenance	None
Sequential read	Max. 550 MB/s, with SATA 6 Gbit/s Max. 280 MB/s, with SATA 3 Gbit/s
Sequential write	Max. 475 MB/s, with SATA 6 Gbit/s Max. 245 MB/s, with SATA 3 Gbit/s
IOPS ²⁾	
4k read	15000
4k write	
Typical	23000
Maximum	80000
Endurance	
MLC flash	Yes
Compatibility	SATA 3.0 compliant ACS-2 SSD Enhanced SMART ATA feature set Native Command Queuing (NCQ)

Table 83: 5MMSSD.0060-00 - Technical data

Model number	5MMSSD.0060-00
Environmental conditions	
Temperature	
Operation	0 to 70°C
Storage	-55 to 95°C
Transport	-55 to 95°C
Relative humidity	
Operation	5 to 95%, non-condensing
Storage	5 to 95%, non-condensing
Transport	5 to 95%, non-condensing
Vibration	
Operation	5 to 700 Hz: 2.17 g
Storage	5 to 800 Hz: 3.13 g
Transport	5 to 800 Hz: 3.13 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
Height	69 mm
Depth	100 mm
Weight	78 g
Manufacturer information	
Manufacturer	Intel
Manufacturer's product ID	SSDSC2CW060A3

Table 83: 5MMSSD.0060-00 - 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.

3.8.11.4 Temperature/Humidity diagram

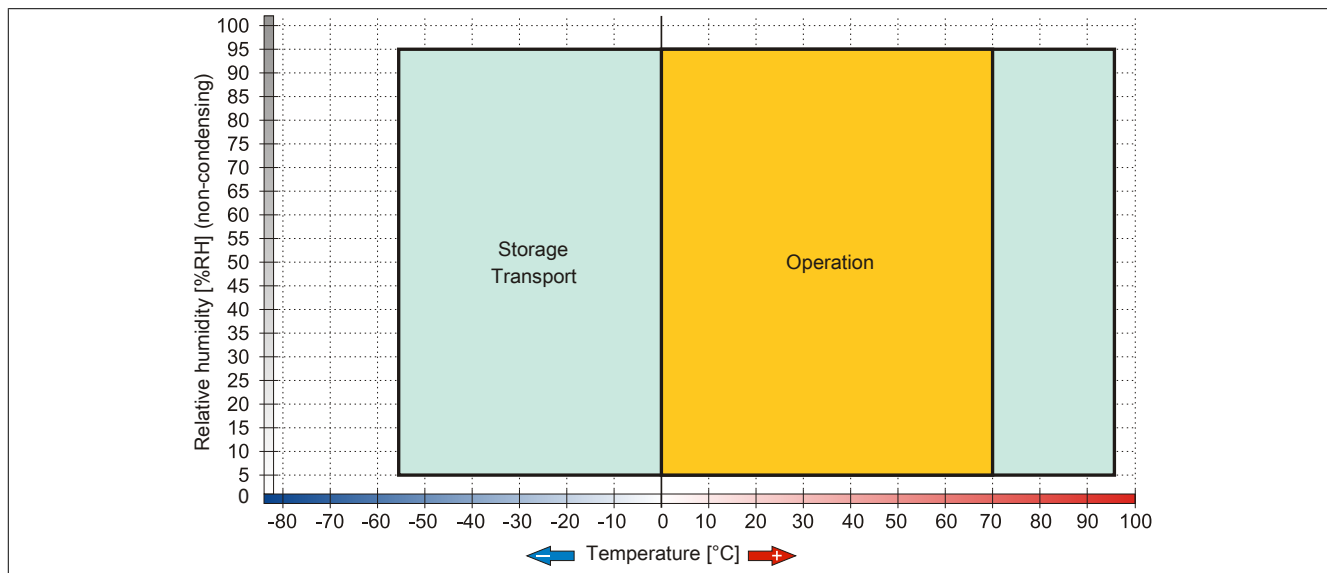


Figure 49: 5MMSSD.0060-00 - Temperature/Humidity diagram

3.8.12 5MMSSD.0060-01

3.8.12.1 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)

3.8.12.2 Order data

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

Table 84: 5MMSSD.0060-01 - Order data

3.8.12.3 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.

Model number	5MMSSD.0060-01		
Revision	C0	D0	E0
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⁾	47 TBW ³⁾
Compatibility		SATA 3.0 compliant ACS-2 SSD Enhanced SMART ATA feature set Native Command Queuing (NCQ)	

Table 85: 5MMSSD.0060-01, 5MMSSD.0060-01, 5MMSSD.0060-01 - Technical data

Model number	5MMSSD.0060-01		
Revision	C0	D0	E0
Environmental conditions			
Temperature			
Operation	0 to 70°C	-30 to 85°C	-40 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	THNSNH060GBST	THNSNJ060WCST	THNSNJ060WCSU

Table 85: 5MMSSD.0060-01, 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.

3.8.12.4 Temperature/Humidity diagram

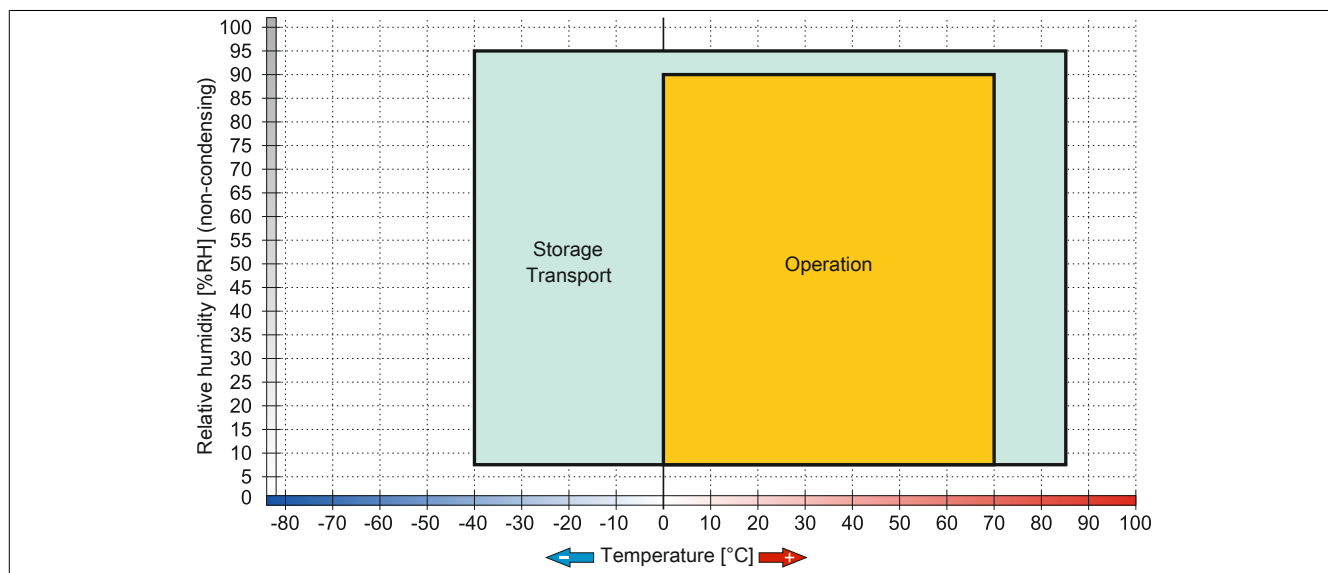
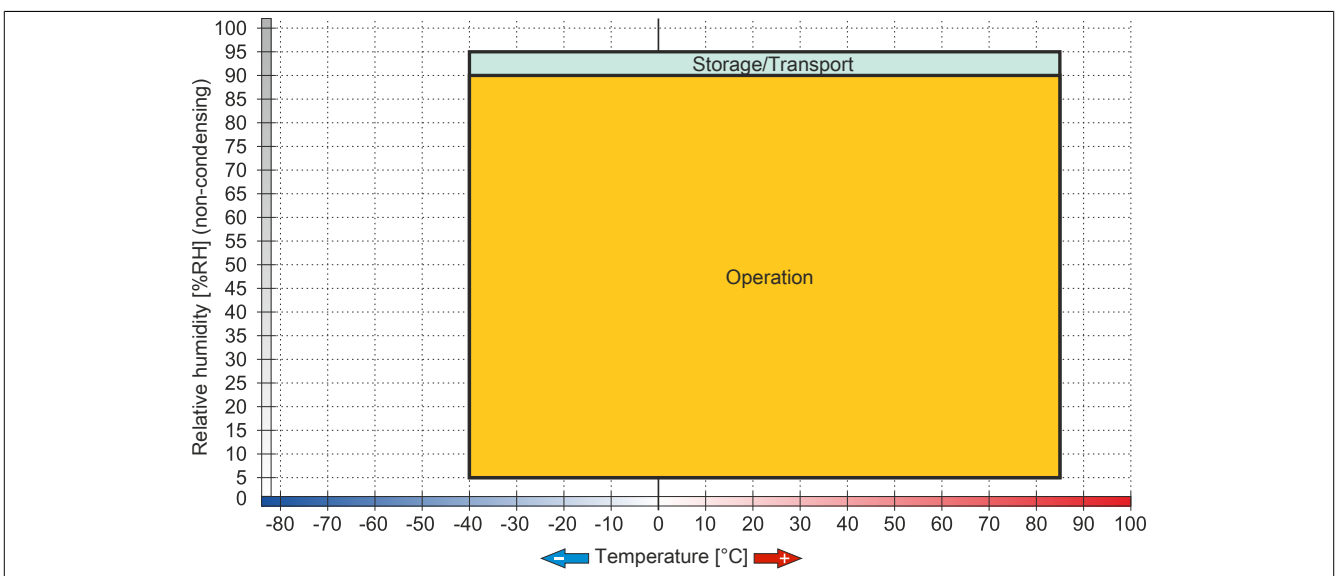
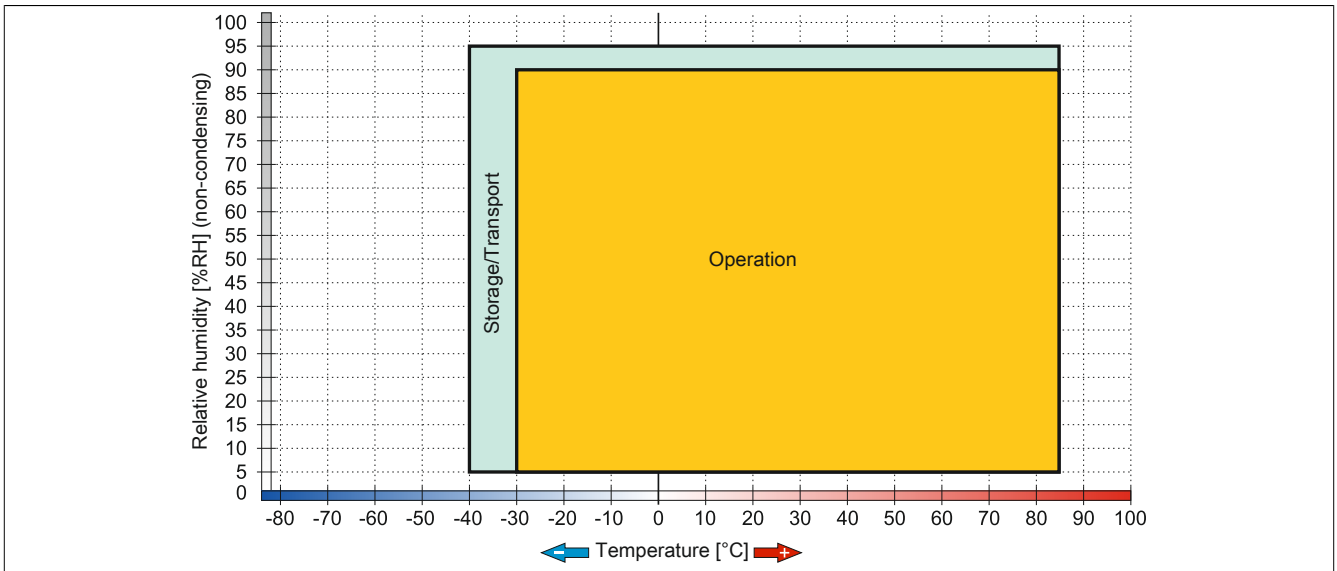


Figure 50: 5MMSSD.0060-01 ≤ Rev. C0 - Temperature/Humidity diagram



3.8.13 5MMSSD.0128-01

3.8.13.1 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)

3.8.13.2 Order data

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

Table 86: 5MMSSD.0128-01 - Order data

3.8.13.3 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.

Model number	5MMSSD.0128-01		
Revision	C0	D0	E0
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⁾	100 TBW ³⁾
Compatibility		SATA 3.0 compliant ACS-2 SSD Enhanced SMART ATA feature set Native Command Queuing (NCQ)	

Table 87: 5MMSSD.0128-01, 5MMSSD.0128-01, 5MMSSD.0128-01 - Technical data

Model number	5MMSSD.0128-01		
Revision	C0	D0	E0
Environmental conditions			
Temperature			
Operation	0 to 70°C	-30 to 85°C	-40 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	THNSNJ128WCSU

Table 87: 5MMSSD.0128-01, 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.

3.8.13.4 Temperature/Humidity diagram

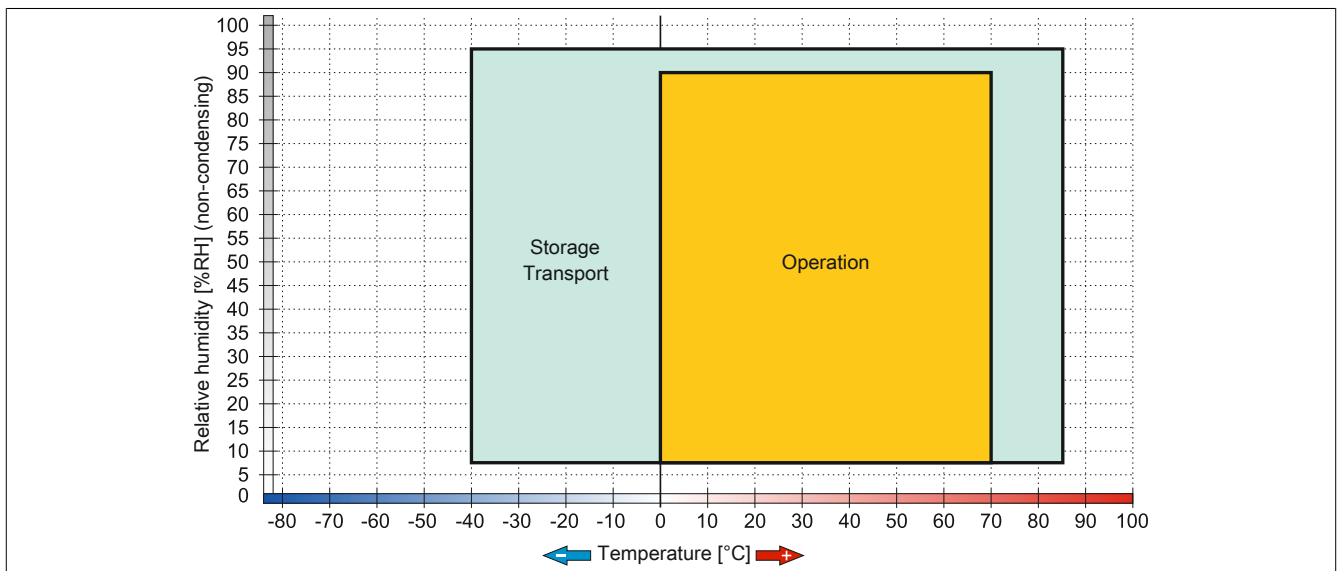


Figure 53: 5MMSSD.0128-01 ≤ Rev. C0 - Temperature/Humidity diagram

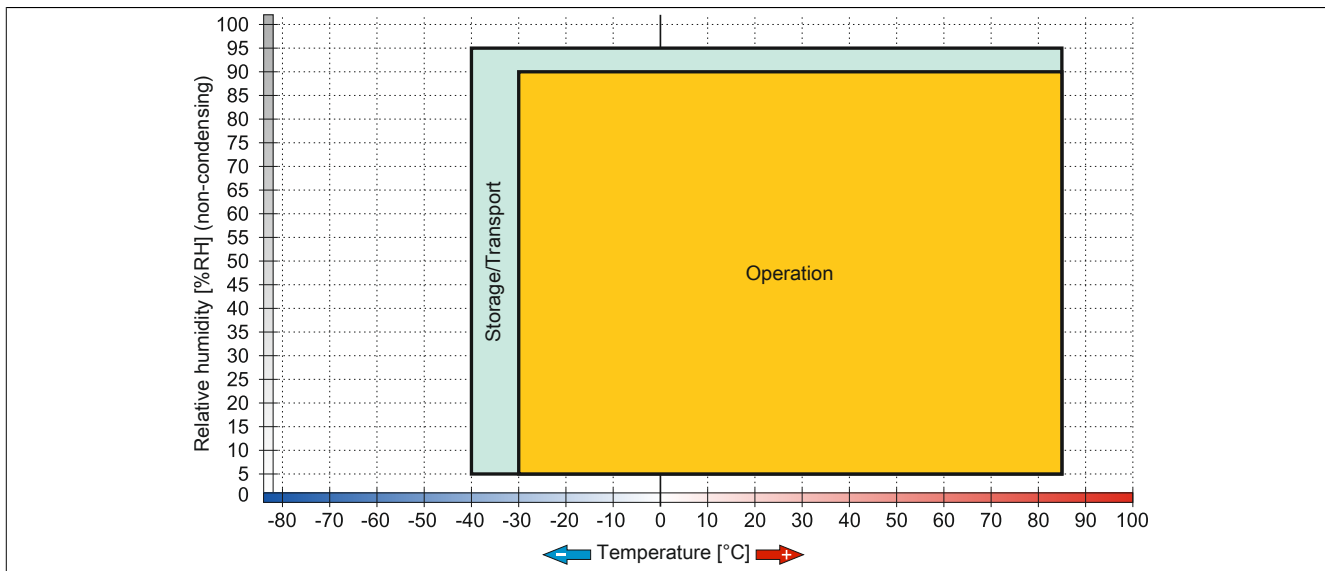


Figure 54: 5MMSSD.0128-01 Rev. D0 - Temperature/Humidity diagram

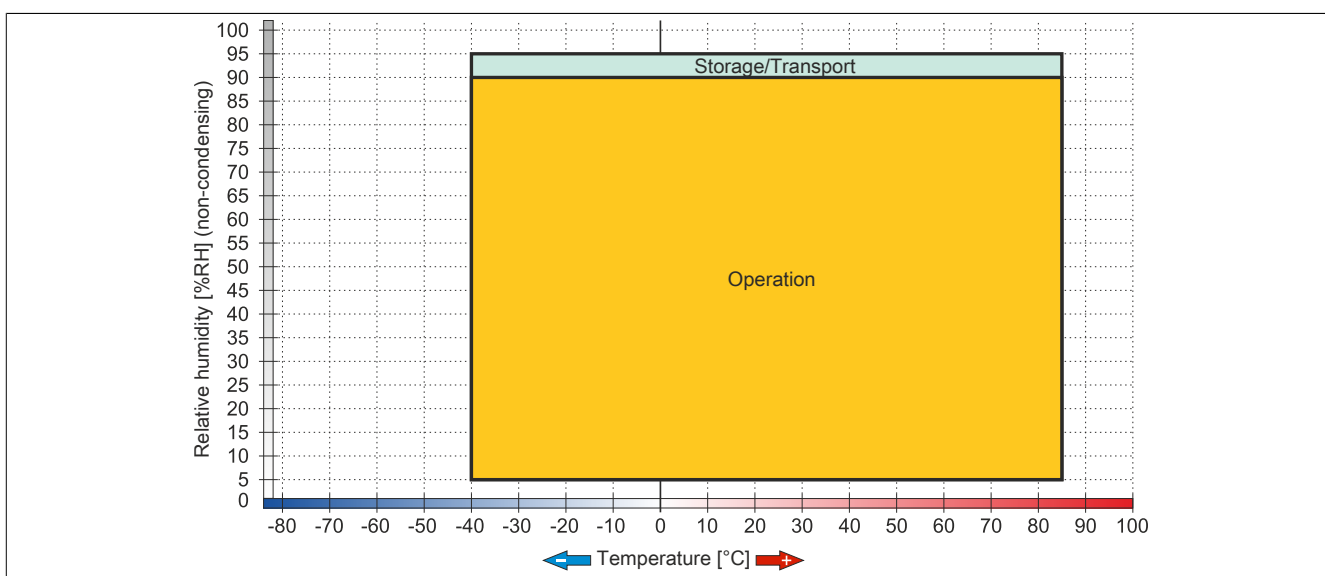


Figure 55: 5MMSSD.0128-01 ≥ Rev. E0 - Temperature/Humidity diagram

3.8.14 5MMSSD.0180-00

3.8.14.1 General information

This 180 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-02 or 5AC901.CSSD-02 SSD drives
- Accessory for the APC510 (optional SSD for I/O board)

3.8.14.2 Order data

Model number	Short description	Figure
	Drives	
5MMSSD.0180-00	180 GB SSD MLC - Intel - SATA	

Table 88: 5MMSSD.0180-00 - Order data

3.8.14.3 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.

Model number	5MMSSD.0180-00
General information	
Certification	
CE	Yes
cULus	Yes
cULus HazLoc Class 1 Division 2	Yes ¹⁾
GOST-R	Yes
Solid-state drive	
Capacity	180 GB
Data reliability	<1 unrecoverable error in 10 ¹⁶ bit read accesses
MTBF	1,200,000 hours
S.M.A.R.T. support	Yes
Interface	SATA
Maintenance	None
Sequential read	Max. 550 MB/s, with SATA 6 Gbit/s Max. 280 MB/s, with SATA 3 Gbit/s
Sequential write	Max. 520 MB/s, with SATA 6 Gbit/s Max. 260 MB/s, with SATA 3 Gbit/s
IOPS ²⁾	
4k read	50000
4k write	
Typical	60000
Maximum	80000
Endurance	
MLC flash	Yes
Compatibility	SATA 3.0 compliant ACS-2 SSD Enhanced SMART ATA feature set Native Command Queuing (NCQ)

Table 89: 5MMSSD.0180-00 - Technical data

Model number	5MMSSD.0180-00
Environmental conditions	
Temperature	
Operation	0 to 70°C
Storage	-55 to 95°C
Transport	-55 to 95°C
Relative humidity	
Operation	5 to 95%, non-condensing
Storage	5 to 95%, non-condensing
Transport	5 to 95%, non-condensing
Vibration	
Operation	5 to 700 Hz: 2.17 g
Storage	5 to 800 Hz: 3.13 g
Transport	5 to 800 Hz: 3.13 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
Height	69 mm
Depth	100 mm
Weight	78 g
Manufacturer information	
Manufacturer	Intel
Manufacturer's product ID	SSDSC2CW180A3

Table 89: 5MMSSD.0180-00 - 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.

3.8.14.4 Temperature/Humidity diagram

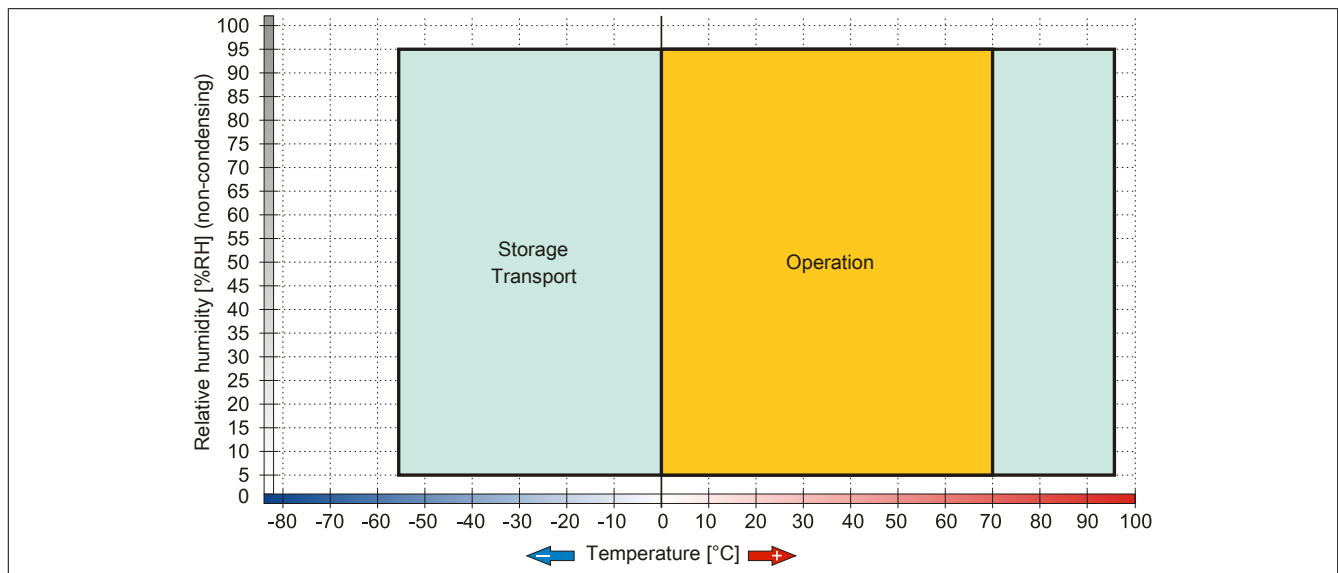


Figure 56: 5MMSSD.0180-00 - Temperature/Humidity diagram

3.8.15 5MMSSD.0256-00

3.8.15.1 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)

3.8.15.2 Order data

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

Table 90: 5MMSSD.0256-00 - Order data

3.8.15.3 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.

Model number	5MMSSD.0256-00	
Revision	C0	D0
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⁾	200 TBW ³⁾
Compatibility	SATA 3.0 compliant ACS-2 SSD Enhanced SMART ATA feature set Native Command Queuing (NCQ)	

Table 91: 5MMSSD.0256-00, 5MMSSD.0256-00 - Technical data

Model number	5MMSSD.0256-00	
Revision	C0	D0
Environmental conditions		
Temperature		
Operation	-30 to 85°C	-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	THNSNJ256WCST	THNSNJ256WCSU

Table 91: 5MMSSD.0256-00, 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.

3.8.15.4 Temperature/Humidity diagram

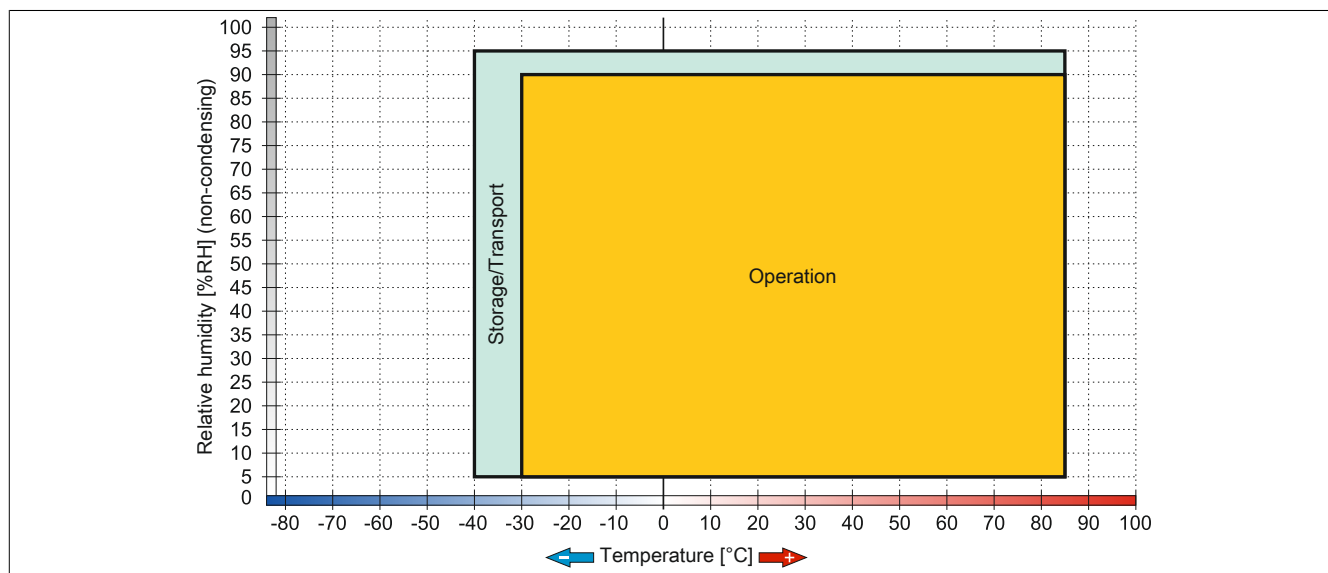


Figure 57: 5MMSSD.0256-00 ≤ C0 - Temperature/Humidity diagram

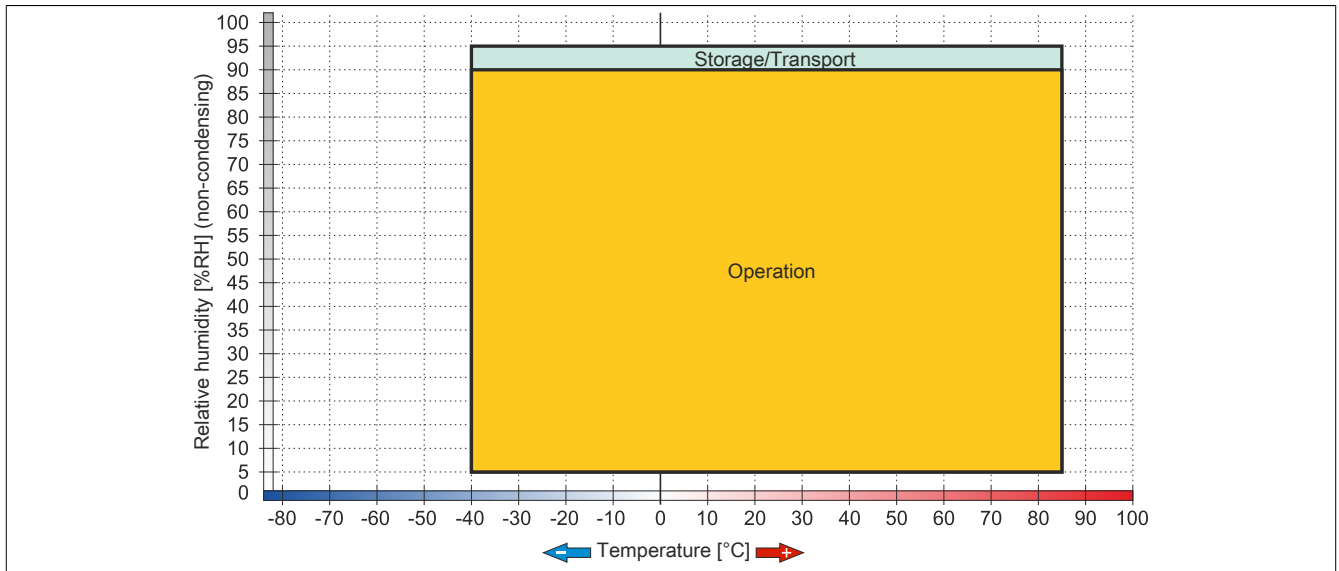


Figure 58: 5MMSSD.0256-00 ≥ D0 - Temperature/Humidity diagram

3.8.16 5MMSSD.0512-00

3.8.16.1 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

3.8.16.2 Order data

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

Table 92: 5MMSSD.0512-00 - Order data

3.8.16.3 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.

Model number	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 93: 5MMSSD.0512-00 - Technical data

Model number	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 93: 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.

3.8.16.4 Temperature/Humidity diagram

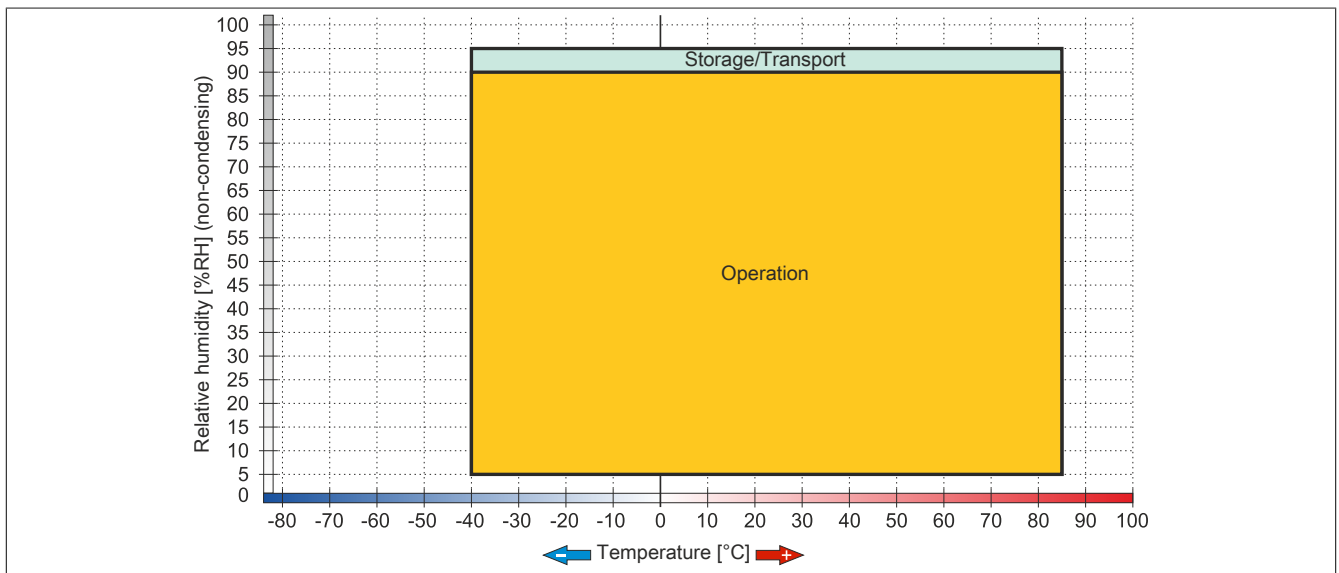


Figure 59: 5MMSSD.0512-00 - Temperature/Humidity diagram

3.8.17 5AC901.CCFA-00

3.8.17.1 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

3.8.17.2 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 94: 5AC901.CCFA-00 - Order data

3.8.17.3 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.

Model number	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 95: 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.

3.8.18 5AC901.CHDD-99

3.8.18.1 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.

3.8.18.2 Order data

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

Table 96: 5AC901.CHDD-99 - Order data

3.8.19 5AC901.SDVW-00

3.8.19.1 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

3.8.19.2 Order data

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

Table 97: 5AC901.SDVW-00 - Order data

3.8.19.3 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.

Model number	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 98: 5AC901.SDVW-00 - Technical data

Model number	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 98: 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 5SWUT1.0000-00) 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.

3.8.19.4 Temperature/Humidity diagram

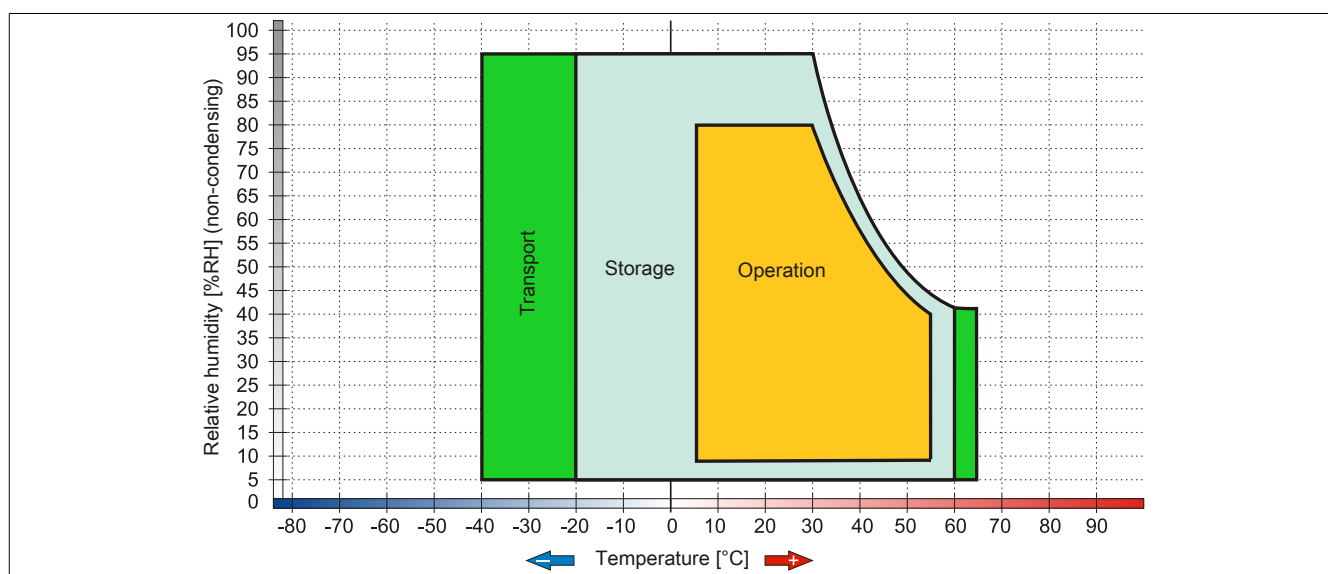


Figure 60: 5AC901.SDVW-00 - Temperature/Humidity diagram

3.8.20 5AC901.SSCA-00

3.8.20.1 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

3.8.20.2 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 99: 5AC901.SSCA-00 - Order data

3.8.20.3 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.

Model number	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 100: 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.

3.8.21 5ACPCI.RAIC-06

3.8.21.1 General information

This SATA RAID controller supports RAID level 0 and 1 and can be inserted in a PCI slot. The 500 GB hard disks that are used are specified for 24-hour operation (24x7).

- SATA RAID controller
- RAID level 0 (striped) and 1 (mirrored)
- 2x 500 GB SATA hard disks (suitable for 24-hour operation)
- Only requires 1 PCI slot
- Transfer rates up to 150 MB/s

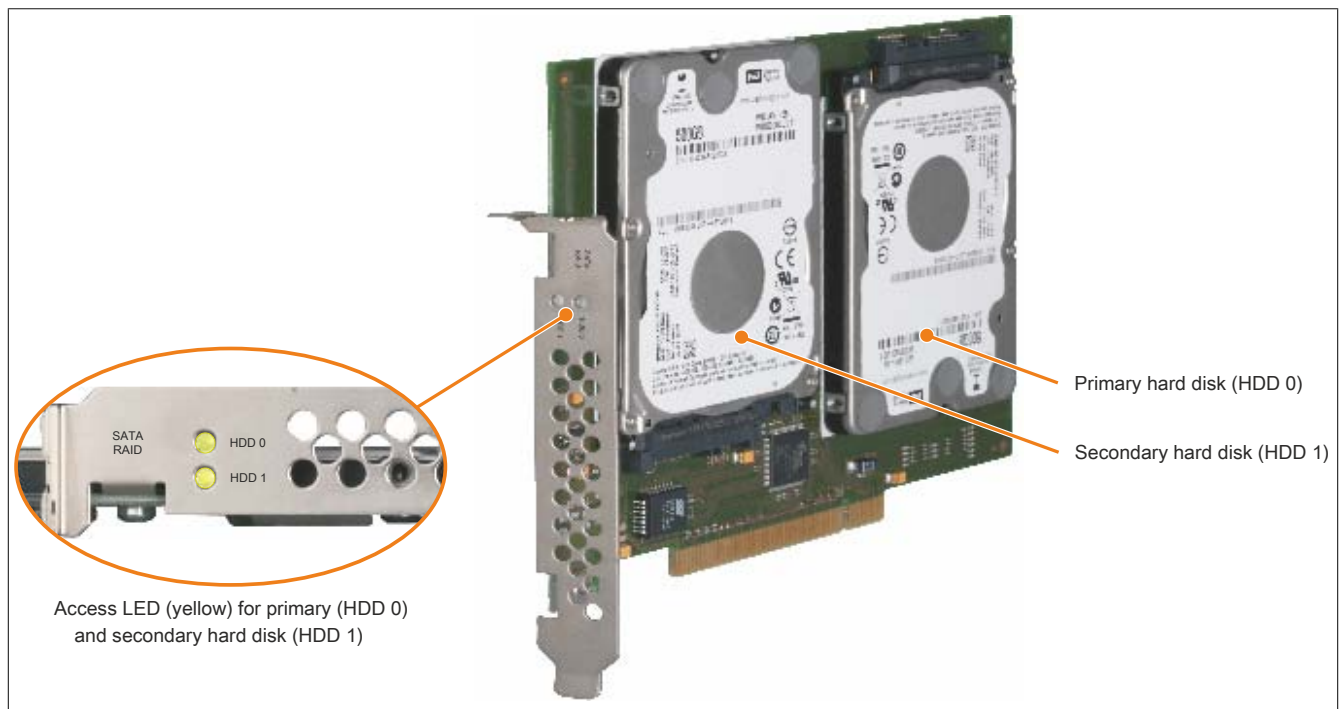


Figure 61: PCI SATA RAID controller

Information:

The PCI SATA RAID controller cannot be used in place of a universal power supply (UPS). If the operating system is not shut down properly, then this will be detected as an error state (with RAID 1 sets) at the next system startup and a complete rebuild is performed. If 500 GB of memory are used, this generally takes approximately 500 minutes (configurable) to complete.

3.8.21.2 Order data

Model number	Short description	Figure
	Drives	
5ACPCI.RAIC-06	PCI RAID System 2x 500 GB - SATA	
	Optional accessories	
	Drives	
5MMHDD.0500-00	500 GB hard disk - SATA	

Table 101: 5ACPCI.RAIC-06 - Order data

3.8.21.3 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.

Model number	5ACPCI.RAIC-06
General information	
Capacity	2x 500 GB
Number of hard disks	2
Certification	
CE	Yes
cULus	Yes
cULus HazLoc Class 1 Division 2	Yes ¹⁾
GOST-R	Yes
Controller	
Type	SII 3512 SATA link
Specification	Serial ATA 1.0
Data transfer rate	Max. 1.5 Gbit/s (150 MB/s)
RAID level	Supports RAID 0, 1
BIOS extension ROM requirements	Approx. 32 kB
Hard disk drive ²⁾	
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 $\pm 0.2\%$
Startup time	Typ. 3.5 s (from 0 rpm to read access)
Service life	5 years
MTBF	1,000,000 POH ³⁾
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 ⁴⁾	
Operation ⁵⁾	0 to 60°C
24-hour operation ⁶⁾	0 to 60°C
Storage	-40 to 70°C
Transport	-40 to 70°C
Relative humidity ⁷⁾	
Operation	8 to 90%, non-condensing
Storage	5 to 95%, non-condensing
Transport	5 to 95%, non-condensing
Vibration ⁸⁾	
Operation (continuous)	5 to 500 Hz: 0.125 g, no unrecoverable errors
Operation (occasional)	5 to 500 Hz: 0.25 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	200 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 ⁹⁾

Table 102: 5ACPCI.RAIC-06 - Technical data

Model number	5ACPCI.RAIC-06
Weight	350 g
Manufacturer information	
Manufacturer	Western Digital
Manufacturer's product ID	WD5000LUCT

Table 102: 5ACPCI.RAIC-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) Technical data for a hard disk.
- 3) With 8760 POH (power-on hours) per year and 25°C surface temperature.
- 4) 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.
- 5) Standard operation refers to 333 POH (power-on hours) per month.
- 6) 24-hour operation refers to 732 POH (power-on hours) per month.
- 7) Humidity gradient: Maximum 20% per hour.
- 8) Operation in areas prone to vibration and shock can affect performance negatively (reduction of transfer rate).
- 9) PCI slot installation.

3.8.21.4 Temperature/Humidity diagram

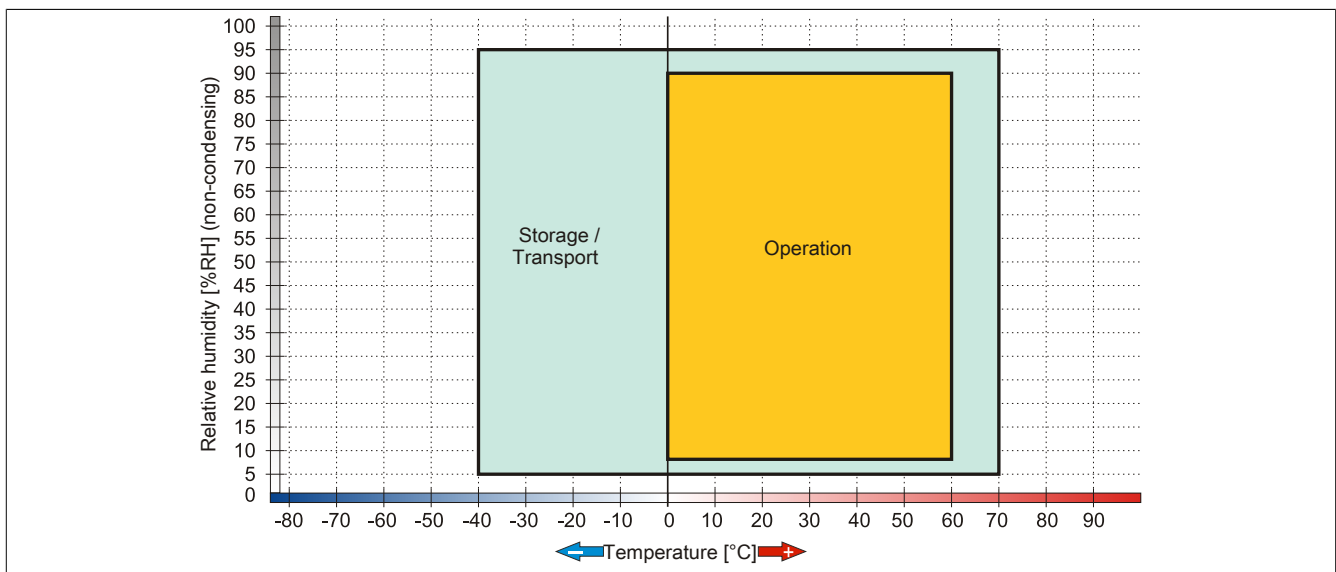


Figure 62: 5ACPCI.RAIC-06 - Temperature/Humidity diagram

3.8.21.5 Driver support

Special drivers are necessary for operating the PCI SATA RAID controller. Drivers for supported and approved operating systems are available in the Downloads section of the B&R website (www.br-automation.com).

.NET-based SATA Raid™ serial ATA RAID management software can also be found on the B&R website.

Information:

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

3.8.21.6 Configuration

For information about configuring a SATA RAID set, see chapter 3 "Installation", section 5 "Configuring a SATA RAID set" on page 193.

3.8.21.7 Replacing a HDD

A hard drive can be easily replaced in the event of an error when using the RAID1 (mirroring) configuration without having to reinstall the system. The 500 GB 5MMHDD.0500-00 SATA HDD is available as a replacement hard disk.

For information about replacing a drive, see "Replacing a PCI SATA RAID hard disk in a RAID 1 set" on page 387.

3.9 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 60](#) and ["IF option 2 slot" on page 60](#).

Information:

For information about installing or replacing an interface option, please refer to section ["Installing interface options" on page 364](#).

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 263](#)).

3.9.1 5AC901.I485-00

3.9.1.1 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

3.9.1.2 Order data

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

Table 103: 5AC901.I485-00 - 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.

Model number	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 104: 5AC901.I485-00 - Technical data

Model number	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 104: 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.

3.9.1.3.1 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
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

9-pin, male, DSUB connector

6

9

1

5

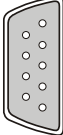


Table 105: COM - Pinout

3.9.1.3.2 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 106: I/O address and IRQ

3.9.1.3.3 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 107: 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 mm ² (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 mm ² (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 108: RS232 - Cable requirements

3.9.1.3.4 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 109: 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 mm ² (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 mm ² (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 110: RS422 - Cable requirements

3.9.1.3.5 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.

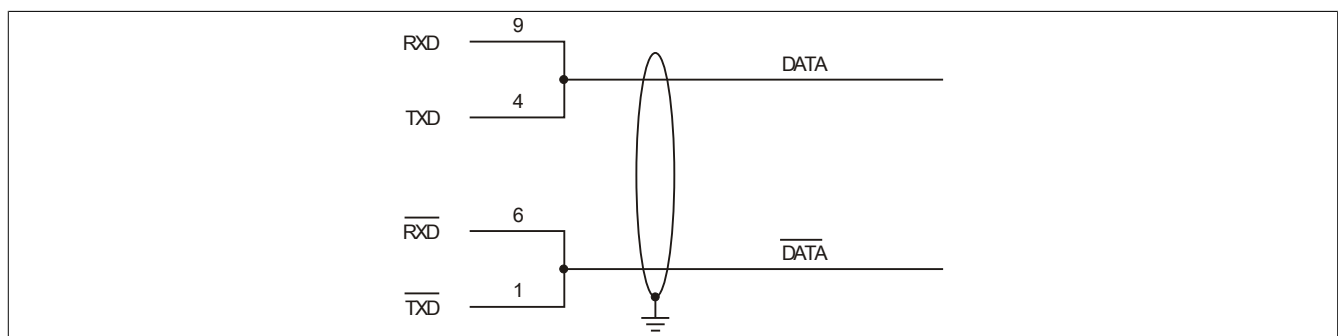


Figure 63: RS232/RS422/RS485 interface - Operation in RS485 mode

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.

3.9.1.3.6 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 111: 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 mm ² (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 mm ² (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 112: RS485 - Cable requirements

3.9.1.3.7 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.

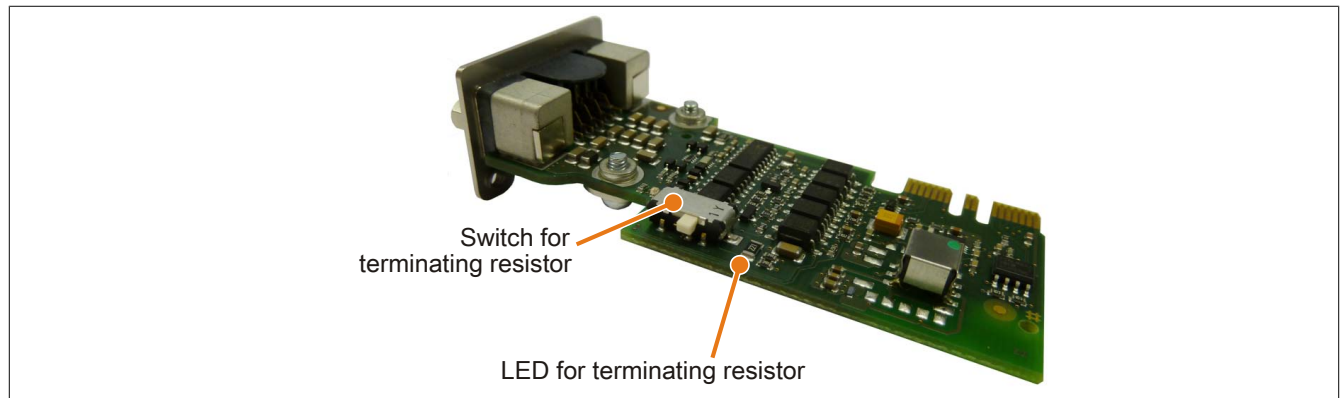


Figure 64: 5AC901.I485-00 - Terminating resistor

3.9.2 5AC901.ICAN-00

3.9.2.1 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.

3.9.2.2 Order data

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

Table 113: 5AC901.ICAN-00 - Order data

3.9.2.3 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.

Model number	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 114: 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.

3.9.2.3.1 - Pinout

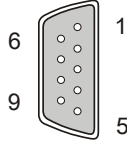
CAN bus		9-pin, male, DSUB connector 
Type	Electrically isolated	
Transfer rate	Max. 1 Mbit/s	
Bus length	Max. 1000 meters	
Pin	Assignment	
1	N/C	
2	CAN LOW	
3	GND	
4	N/C	
5	N/C	
6	Reserved	
7	CAN HIGH	
8	N/C	
9	N/C	

Table 115: 5AC901.ICAN-00 - Pinout

3.9.2.3.2 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 116: I/O address and IRQ

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

3.9.2.3.3 CAN - Bus length and cable type

The type of cable to be used depends largely on the required bus length and number of nodes. The bus length is 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 117: 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 mm ² (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 mm ² (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 118: CAN cable requirements

3.9.2.3.4 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 [Automation](#) Help.

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

Table 119: CAN driver settings

3.9.2.3.5 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.

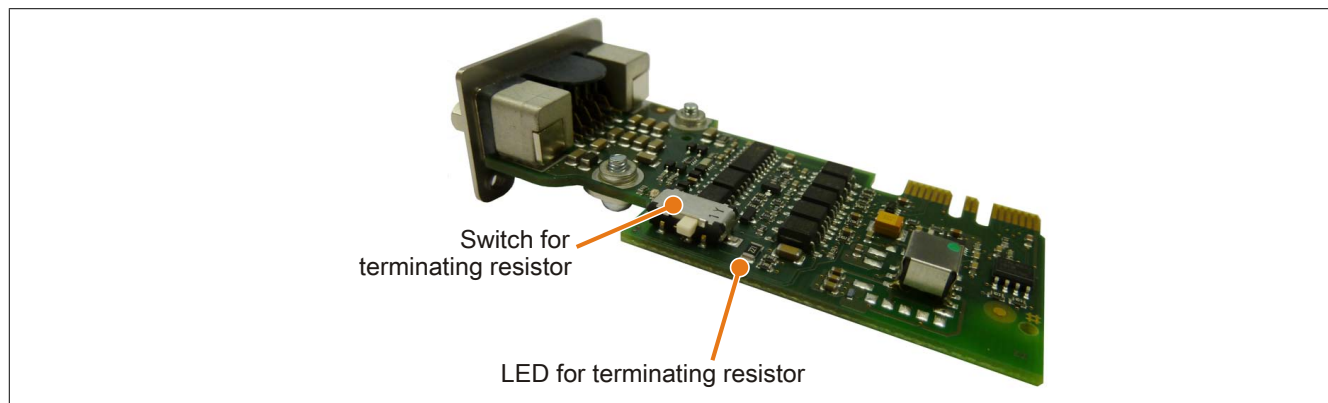


Figure 65: 5AC901.ICAN-00 - Terminating resistor

3.9.2.3.6 Drivers

The CAN IF option is supported in PVI for Windows XP Professional and Windows Embedded Standard 2009. The 5AC901.ICAN-00 interface option is no longer supported by PVI V4.2.5 or Windows CAN Driver V3.0 beginning with Windows 7.

3.9.3 5AC901.IHDA-00

3.9.3.1 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.

3.9.3.2 Order data

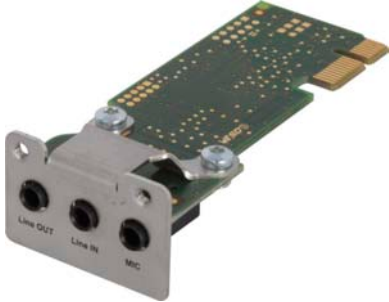
Model number	Short description	Figure
5AC901.IHDA-00	Interface options Interface card - 1x audio interface (1x MIC/1x Line In/1x OUT) - For APC910/PPC900	

Table 120: 5AC901.IHDA-00 - Order data

3.9.3.3 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.

Model number	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 121: 5AC901.IHDA-00 - Technical data

Model number	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 121: 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.

3.9.3.3.1 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 122: 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.

3.9.4 5AC901.ISRM-00

3.9.4.1 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).

3.9.4.2 Order data

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

Table 123: 5AC901.ISRM-00 - Order data

3.9.4.3 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.

Model number	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	
Size	2 MB
Battery-backed	Yes
Remanent variables in power <i>failure</i> mode	256 kB (e.g. for <i>Automation Runtime</i> , 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

Table 124: 5AC901.ISRM-00 - Technical data

Model number	5AC901.ISRM-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. 20 g

Table 124: 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.

3.9.5 5AC901.IPLK-00

3.9.5.1 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).

3.9.5.2 Order data

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

Table 125: 5AC901.IPLK-00 - Order data

3.9.5.3 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.

Model number	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	
Size	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 126: 5AC901.IPLK-00 - Technical data

Model number	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 126: 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.

3.9.5.3.1 - Pinout

LEDs are integrated on the interface option.

POWERLINK			
Cabling	S/STP (Cat 5e)		
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)

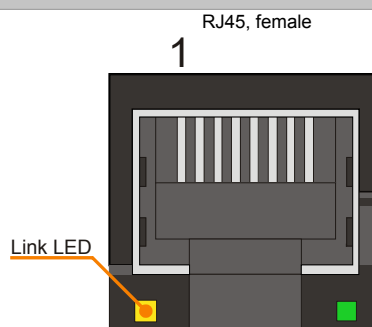


Table 127: 5AC901.IPLK-00 - POWERLINK interface

3.9.5.3.2 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
Status/Error LED	Green-Red	On	POWERLINK Status/Error LED, see 3.9.5.3.2 "Status/Error LED"
		Off	POWERLINK Status/Error LED, see 3.9.5.3.2 "Status/Error LED"

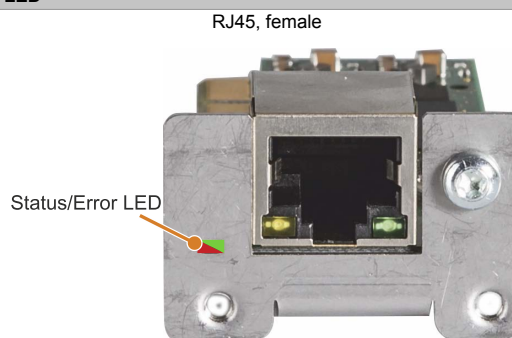


Table 128: 5AC901.IPLK-00 - POWERLINK Status/Error LED

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 129: Status/Error LED - Ethernet mode

POWERLINK

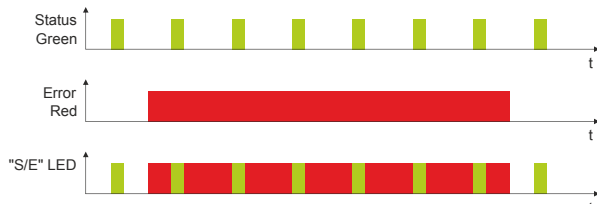
Red - Error	Description
On	The interface is in an error state (failed Ethernet frames, increased number of collisions on the network, etc.). If an error occurs in the following states, then the green LED blinks over the red LED: - BASIC_ETHERNET - PRE_OPERATIONAL_1 - PRE_OPERATIONAL_2 - READY_TO_OPERATE 

Table 130: Status/Error LED - POWERLINK - Error

Green - Status	Description
Off NOT_ACTIVE	State 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).
Flickering green (approx. 10 Hz) BASIC_ETHERNET	State 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	State The interface 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 131: Status/Error LED - POWERLINK - Status

Green - Status	Description
Double flash (approx. 1 Hz) PRE_OPERATIONAL_2	State 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	State 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	State The interface is in the OPERATIONAL state. PDO mapping is active and cyclic data is being evaluated.
Blinking (approx. 2.5 Hz) STOPPED	State 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 131: 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 132: System stop error codes

Key	•	...150 ms
	-	...600 ms
	Pause	2 second delay

3.9.5.3.3 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](#)

3.9.6 5AC901.IRDY-00

3.9.6.1 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.

3.9.6.2 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 mm ²	

Table 133: 5AC901.IRDY-00 - Order data

3.9.6.3 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.

Model number	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 134: 5AC901.IRDY-00 - Technical data

1) Detailed information can be found in the temperature tables in the user's manual.

3.9.6.3.1 Pinout

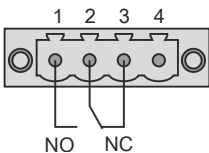
Ready relay			4-pin male connector 
Pin	Assignment	Description	
1	NO	Normally open contact	
2	COM	Changeover contact	
3	NC	Normally closed contact	
4	-	Not connected	

Table 135: 5AC901.IRDY-00 - Pinout

3.9.7 5AC901.ISIO-00

3.9.7.1 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

3.9.7.2 Order data

Model number	Short description	Figure
	Interface options	
5AC901.ISIO-00	Interface card - System I/O - For APC910/PPC900	

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

3.9.7.3 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.

Model number	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 137: 5AC901.ISIO-00 - Technical data

1) Detailed information can be found in the temperature tables in the user's manual.

3.9.7.4 Pinout

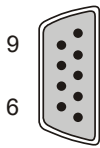
Ready relay		
Max. cable length	Max. 2 meters	
Pin	Assignment	9-pin female DSUB connector 
1	Output (power) LED - Green	
2	Output (power) LED - Red	
3	GND	
4	Input - Power button	
5	Input - Reset button	
6	Normally open contact	
7	Normally closed contact	
8	GND	
9	COM, changeover contact	

Table 138: 5AC901.ISIO-00 - Pinout

Details about the power LED can be found in section "[LED status indicators](#)" on page 62.

Details about the power and reset buttons can be found in section "[Power button](#)" on page 63.

3.9.7.5 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 275.

3.9.7.6 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.

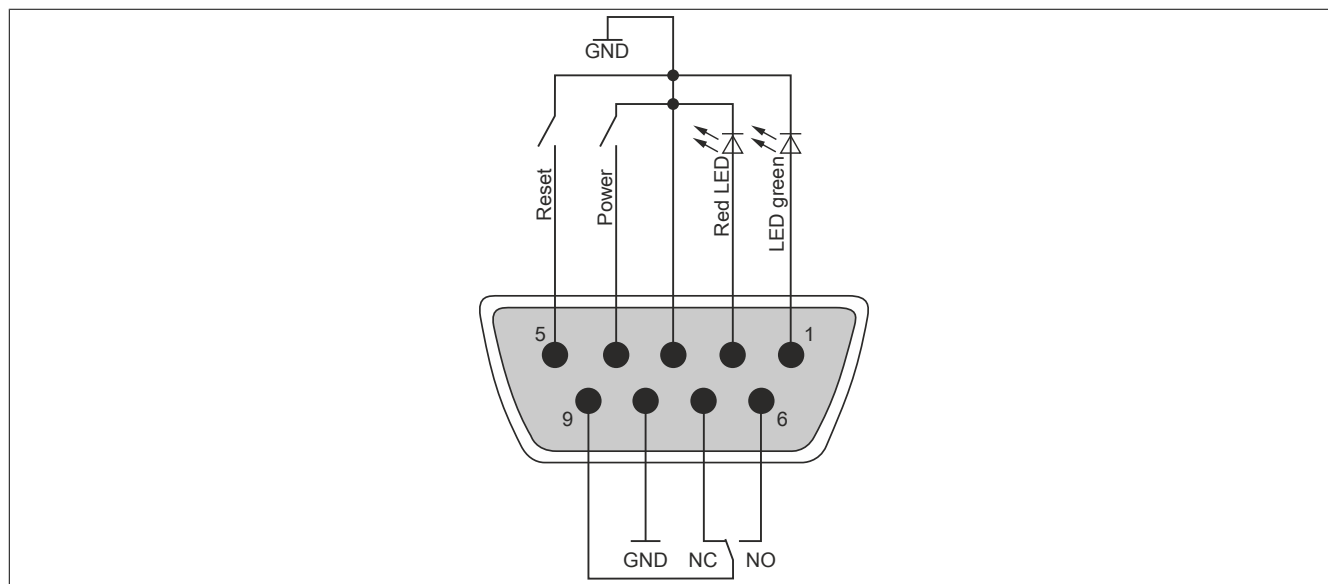


Figure 66: 5AC901.ISIO-00 - Connection example

3.10 Monitor/Panel options

Information:

Monitor/Panel options can only be connected to system units with 2 or 5 PCI/PCIe slots.

Information:

For information about installing or replacing a monitor/panel option, please refer to the section ["Installing monitor/panel options" on page 367](#).

After replacement or installation, it may be necessary to load the setup defaults in BIOS (see ["Save & Exit" on page 263](#)).

3.10.1 5AC901.LDPO-00

3.10.1.1 General information

The 5AC901.LDPO-00 monitor/panel option is equipped with a DisplayPort 1.1 and a USB 2.0 interface.

- DisplayPort interface
- USB 2.0 port
- Installation compatible with APC910

3.10.1.2 Order data

Model number	Short description	Figure
	Monitor/Panel options	
5AC901.LDPO-00	DisplayPort transmitter	

Table 139: 5AC901.LDPO-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.

Model number	5AC901.LDPO-00
General information	
B&R ID code	0xD852
Certification	
CE	Yes
cULus	Yes
GOST-R	Yes
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-carrying capacity	Max. 1 A
DisplayPort	
Quantity	1
Version	1.1
Electrical characteristics	
Power consumption	0.2 W

Table 140: 5AC901.LDPO-00 - Technical data

Model number	5AC901.LDPO-00
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. 26 g

Table 140: 5AC901.LDPO-00 - Technical data

1) Detailed information can be found in the temperature tables in the user's manual.

3.10.1.3.1 DisplayPort interface

DisplayPort 1.1	
The following overview lists the video signals available on the DisplayPort 1.1 output.	
Monitor/Panel option	Video signals with all system unit variants
5AC901.LDPO-00	DisplayPort, DVI, HDMI

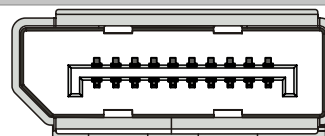


Table 141: DisplayPort interface

Information:

The hardware and graphics drivers of approved operating systems support the hot plugging of display devices to the DisplayPort interface for service purposes. The DisplayPort connector is specified for 10,000 connection cycles.

3.10.1.3.2 DisplayPort - Pinout

Pin	Signal	Description	Pin	Signal	Description
1	DP_LANE0+	DisplayPort lane 0 (positive)	11	GND	Ground
2	GND	Ground	12	DP_LANE3-	DisplayPort lane 3 (negative)
3	DP_LANE0-	DisplayPort lane 0 (negative)	13	CONFIG1	Configuration pin 1 (connected to ground)
4	DP_LANE1+	DisplayPort lane 1 (positive)	14	CONFIG2	Configuration pin 2 (connected to ground)
5	GND	Ground	15	DP_AUX+	Auxiliary channel (positive)
6	DP_LANE1-	DisplayPort lane 1 (negative)	16	GND	Ground
7	DP_LANE2+	DisplayPort lane 2 (positive)	17	DP_AUX-	Auxiliary channel (negative)
8	GND	Ground	18	DP_HPD#	Hot plug detect
9	DP_LANE2-	DisplayPort lane 2 (negative)	19	RETURN	Return for power
10	DP_LANE3+	DisplayPort lane 3 (positive)	20	DP_PWR	Power for connector

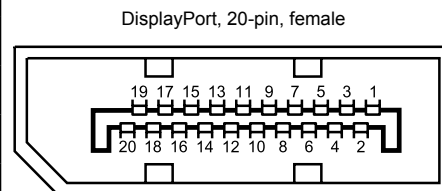


Table 142: DisplayPort - Pinout

3.10.2 5AC901.LSDL-00

3.10.2.1 General information

The 5AC901.LSDL-00 monitor/panel option is equipped with a monitor/panel interface for connecting additional panels via SDL or DVI.

- SDL/DVI interface
- Installation compatible with APC910

3.10.2.2 Order data

Model number	Short description	Figure
	Monitor/Panel options	
5AC901.LSDL-00	SDL/DVI transmitter	

Table 143: 5AC901.LSDL-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.

Model number	5AC901.LSDL-00
General information	
B&R ID code	0xD853
Certification	
CE	Yes
cULus	Yes
GOST-R	Yes
GL	Yes ¹⁾
Interfaces	
Monitor/Panel interface	
Design	DVI-D
Type	SDL/DVI
Electrical characteristics	
Power consumption	1 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. 45 g

Table 144: 5AC901.LSDL-00 - Technical data

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

3.10.2.3.1 Monitor/Panel interface

Monitor/Panel interface - SDL (Smart Display Link) / DVI	
The following overview lists the video signals available on the monitor/panel output.	
Monitor/Panel option	Video signals
5AC901.LSDL-00	SDL, DVI



Table 145: Monitor/Panel interface - SDL, DVI

Information:

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

Information:

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

3.10.2.3.2 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.

3.10.2.3.3 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	N/C	Not connected	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	N/C	Not connected
11	TMDS DATA 1/ XUSB0 SHIELD	Shield for data pair 1 and USB0	C2	N/C	Not connected
12	XUSB0-	USB lane 0 (negative)	C3	N/C	Not connected
13	XUSB0+	USB lane 0 (positive)	C4	N/C	Not connected
14	+5 V power ¹⁾	+5 V power supply	C5	N/C	Not connected
15	Ground (return for +5 V, HSync and VSync)	Ground			

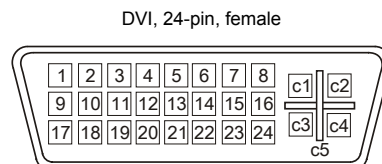


Table 146: DVI interface - Pinout

1) Protected internally by a multifuse.

3.10.2.3.4 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 Segment length [m]	Resolution						
	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.0018-00	5CASDL.0018-00	5CASDL.0018-00	5CASDL.0018-00	5CASDL.0018-00	5CASDL.0018-00
	5CASDL.0018-01	5CASDL.0018-01	5CASDL.0018-01	5CASDL.0018-01	5CASDL.0018-01	5CASDL.0018-01	5CASDL.0018-01
	5CASDL.0018-03	5CASDL.0018-03	5CASDL.0018-03	5CASDL.0018-03	5CASDL.0018-03	5CASDL.0018-03	5CASDL.0018-03
5	5CASDL.0050-00	5CASDL.0050-00	5CASDL.0050-00	5CASDL.0050-00	5CASDL.0050-00	5CASDL.0050-00	5CASDL.0050-00
	5CASDL.0050-01	5CASDL.0050-01	5CASDL.0050-01	5CASDL.0050-01	5CASDL.0050-01	5CASDL.0050-01	5CASDL.0050-01
	5CASDL.0050-03	5CASDL.0050-03	5CASDL.0050-03	5CASDL.0050-03	5CASDL.0050-03	5CASDL.0050-03	5CASDL.0050-03
10	5CASDL.0100-00	5CASDL.0100-00	5CASDL.0100-00	5CASDL.0100-00	5CASDL.0100-00	5CASDL.0100-00	5CASDL.0100-00
	5CASDL.0100-01	5CASDL.0100-01	5CASDL.0100-01	5CASDL.0100-01	5CASDL.0100-01	5CASDL.0100-01	5CASDL.0100-01
	5CASDL.0100-03	5CASDL.0100-03	5CASDL.0100-03	5CASDL.0100-03	5CASDL.0100-03	5CASDL.0100-03	5CASDL.0100-03
15	5CASDL.0150-00	5CASDL.0150-00	5CASDL.0150-00	5CASDL.0150-00	5CASDL.0150-00	-	-
	5CASDL.0150-01	5CASDL.0150-01	5CASDL.0150-01	5CASDL.0150-01	5CASDL.0150-01	-	-
	5CASDL.0150-03	5CASDL.0150-03	5CASDL.0150-03	5CASDL.0150-03	5CASDL.0150-03	-	5CASDL.0150-03
20	5CASDL.0200-00	5CASDL.0200-00	5CASDL.0200-00	5CASDL.0200-00	5CASDL.0200-00	-	-
	5CASDL.0200-03	5CASDL.0200-03	5CASDL.0200-03	5CASDL.0200-03	5CASDL.0200-03	-	5CASDL.0200-03
25	5CASDL.0250-00	5CASDL.0250-00	5CASDL.0250-00	5CASDL.0250-00	-	-	-
	5CASDL.0250-03	5CASDL.0250-03	5CASDL.0250-03	5CASDL.0250-03	-	-	-
30	5CASDL.0300-00	5CASDL.0300-00	-	-	-	-	-
	5CASDL.0300-03	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 147: Cable lengths and resolutions for SDL transmission

3.10.2.3.5 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 Segment length [m]	Resolution						
	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 148: Cable lengths and resolutions for DVI transmission

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

3.10.3 5AC901.LSD3-00

3.10.3.1 General information

The 5AC901.LSD3-00 monitor/panel option is equipped with an SDL3 interface.

- SDL3 interface
- Installation compatible with APC910

3.10.3.1.1 SDL3 mode

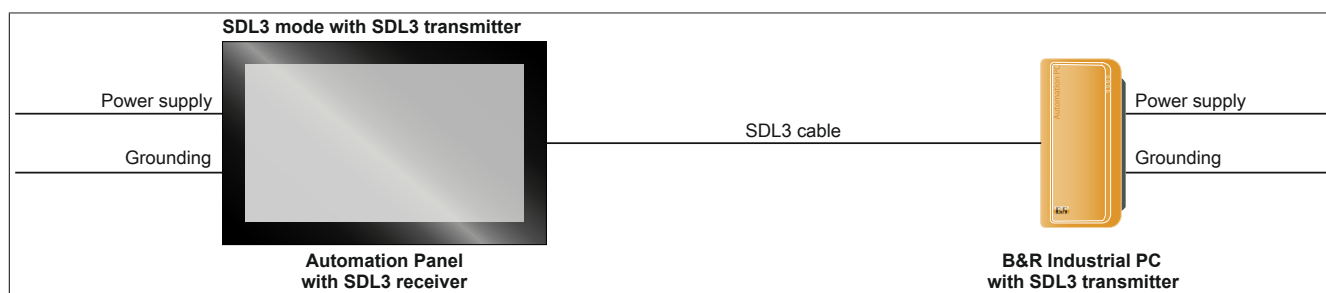
Smart Display Link 3 (SDL3) technology is used to transfer data from all communication channels between a B&R Industrial PC and a panel up to 100 m over a standard Ethernet cable. A male RJ45 connector designed for tight spaces such as feed-throughs and swing arm systems is used to connect to the device.

SDL3 mode with SDL3 transmitter

SDL3 mode with an SDL3 transmitter in the B&R Industrial PC allows all communication between the [Automation Panel](#) and the PC to be handled using a single SDL3 cable.

It is used to transfer not just display data, but touch screen, matrix key, LED, service and diagnostic data as well. The [Automation Panel](#) can be installed up to 100 m from the B&R Industrial PC. USB 2.0 is fully integrated in SDL3 and also transferred over this distance without the need for external modules.

The display's brightness can be configured using the ADI Control Center.



Availability of interfaces on the [Automation Panel](#) with SDL3 receiver:

SDL3 interface ✓ USB1, USB2 ✓ USB 2.0 ✓ Power supply ✓ Grounding ✓

Maximum cable length of SDL3: 100 m

Prerequisites and requirements

- [Automation Panel](#) with SDL3 receiver
- B&R Industrial PC with SDL3 interface
- SDL3 cable

3.10.3.2 Order data

Model number	Short description	Figure
	Monitor/Panel options	
5AC901.LSD3-00	SDL3 transmitter	

Table 149: 5AC901.LSD3-00 - 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.

Model number	5AC901.LSD3-00
General information	
LED status indicators	Status, Link
B&R ID code	0xE400
Certification	
CE	Yes
cULus	Yes
Interfaces	
SDL3 Out	
Design	Shielded RJ45
Type	SDL3
Electrical characteristics	
Power consumption	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. 47 g

Table 150: 5AC901.LSD3-00 - Technical data

1) Detailed information can be found in the temperature tables in the user's manual.

3.10.3.3.1 SDL3 interface

The SDL3 interface is a female RJ45 connector and operated with SDL3 transmission technology.

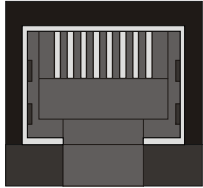
SDL3 interface		
The following overview lists the video signals available on the SDL3 output.		Female RJ45 connector 
Monitor/Panel option	Video signals	
5AC901.LSD3-00	SDL3	

Table 151: SDL3 interface

Information:

The hardware and graphics drivers of approved operating systems support the hot plugging of display devices to the SDL3 interface for service purposes. The female RJ45 connector is specified for 500 connection cycles.

Information:

If a display device with touch screen is connected to the SDL3 interface and then disconnected again during operation (hot plugging), it may be necessary to recalibrate the touch screen.

3.10.3.3.2 Cable lengths and resolutions for SDL3 transmission

The following table lists the relationship between segment lengths and maximum resolution depending on the SDL3 cable being used:

SDL3 cable Segment length [m]	Resolution						
	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
3	5CASD3.0030-00	5CASD3.0030-00	5CASD3.0030-00	5CASD3.0030-00	5CASD3.0030-00	5CASD3.0030-00	5CASD3.0030-00
5	5CASD3.0050-00	5CASD3.0050-00	5CASD3.0050-00	5CASD3.0050-00	5CASD3.0050-00	5CASD3.0050-00	5CASD3.0050-00
10	5CASD3.0100-00	5CASD3.0100-00	5CASD3.0100-00	5CASD3.0100-00	5CASD3.0100-00	5CASD3.0100-00	5CASD3.0100-00
15	5CASD3.0150-00	5CASD3.0150-00	5CASD3.0150-00	5CASD3.0150-00	5CASD3.0150-00	5CASD3.0150-00	5CASD3.0150-00

Table 152: Cable lengths and resolutions for SDL3 transmission

SDL3 cable Segment length [m]	Resolution						
	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
20	5CASD3.0200-00	5CASD3.0200-00	5CASD3.0200-00	5CASD3.0200-00	5CASD3.0200-00	5CASD3.0200-00	5CASD3.0200-00
30	5CASD3.0300-00	5CASD3.0300-00	5CASD3.0300-00	5CASD3.0300-00	5CASD3.0300-00	5CASD3.0300-00	5CASD3.0300-00
50	5CASD3.0500-00	5CASD3.0500-00	5CASD3.0500-00	5CASD3.0500-00	5CASD3.0500-00	5CASD3.0500-00	5CASD3.0500-00
100	5CASD3.1000-00	5CASD3.1000-00	5CASD3.1000-00	5CASD3.1000-00	5CASD3.1000-00	5CASD3.1000-00	5CASD3.1000-00

Table 152: Cable lengths and resolutions for SDL3 transmission

3.10.3.3.3 SDL3 - LED status indicators

The LEDs are located next to the SDL3 interface.

SDL3 - LED status indicators			
LED	Color	Status	Function
Link	Yellow	On	Indicates an active SDL3 connection
		Off	No active SDL3 connection
Status	Yellow	On	SDL3 connection established and OK
		Blinking	No active SDL3 connection

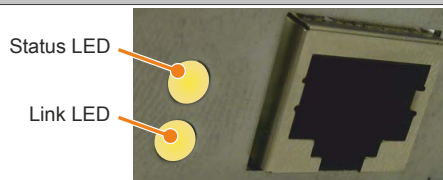


Table 153: SDL3 - LED status indicators

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-01 UPS 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 379.

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 154: 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.

Model number	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 155: 5AC901.IUPS-00 - Technical data

Model number	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 155: 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

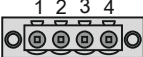
UPS interface		4-pin male connector 
Pin	Assignment	
1	Temperature sensor	
2	Temperature sensor	
3	-	
4	+	

Table 156: 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 interface options" on page 364](#).

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 157: 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.

Model number	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 158: 5AC901.IUPS-01 - Technical data

Model number	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 158: 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

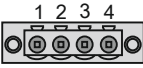
UPS interface		4-pin male connector 
Pin	Assignment	
1	Temperature sensor	
2	Temperature sensor	
3	-	
4	+	

Table 159: 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 interface options" on page 364](#).

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 160: 5AC901.BUPS-00 - Order data

3.11.4.3 Technical data

Model number	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 161: 5AC901.BUPS-00 - Technical data

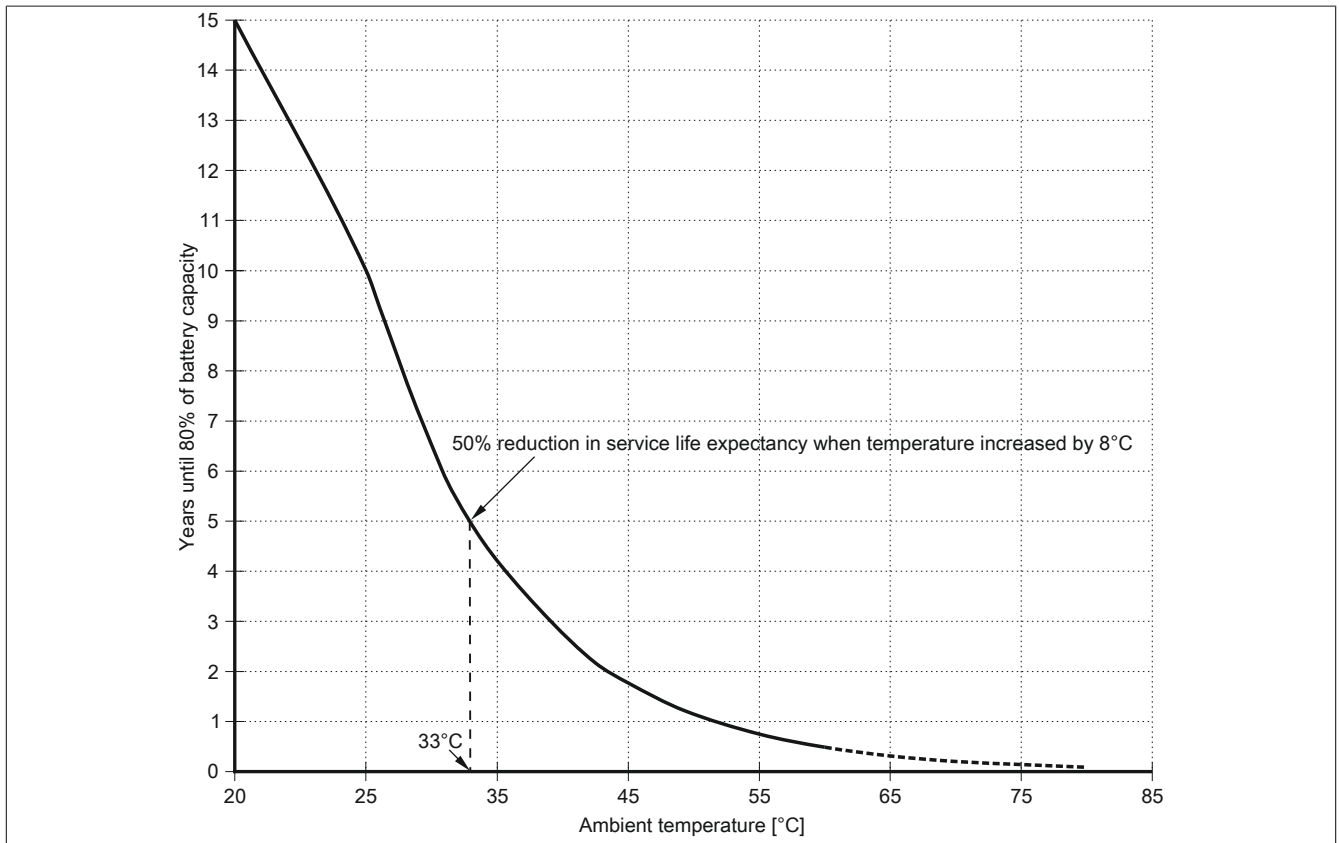
Model number	5AC901.BUPS-00
Mechanical characteristics	
Dimensions	
Width	223.2 mm
Height	78.2 mm
Depth	145 mm
Weight	Approx. 4600 g

Table 161: 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

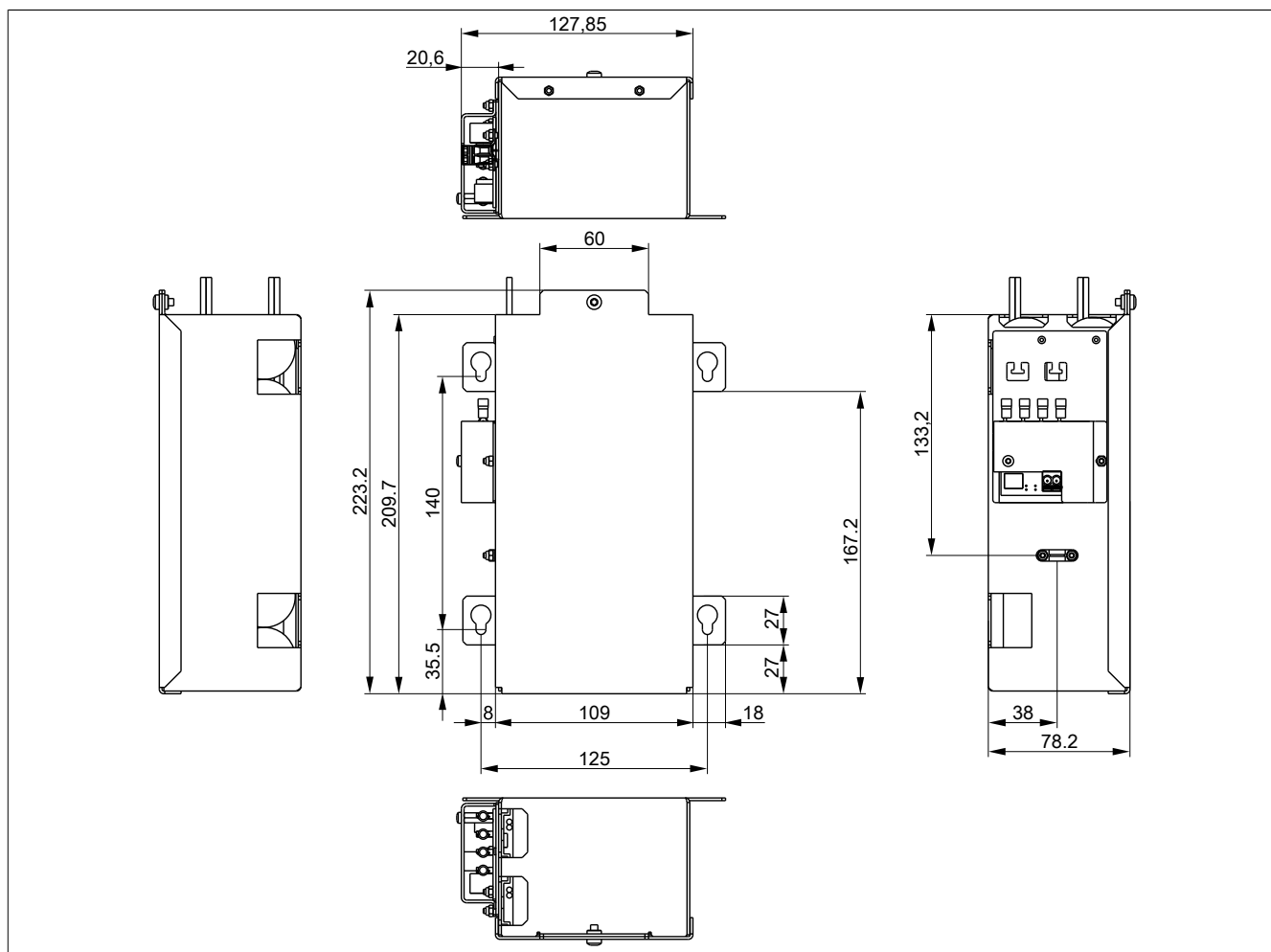


Figure 67: 5AC901.BUPS-00 - Dimensions

3.11.4.6 Drilling template

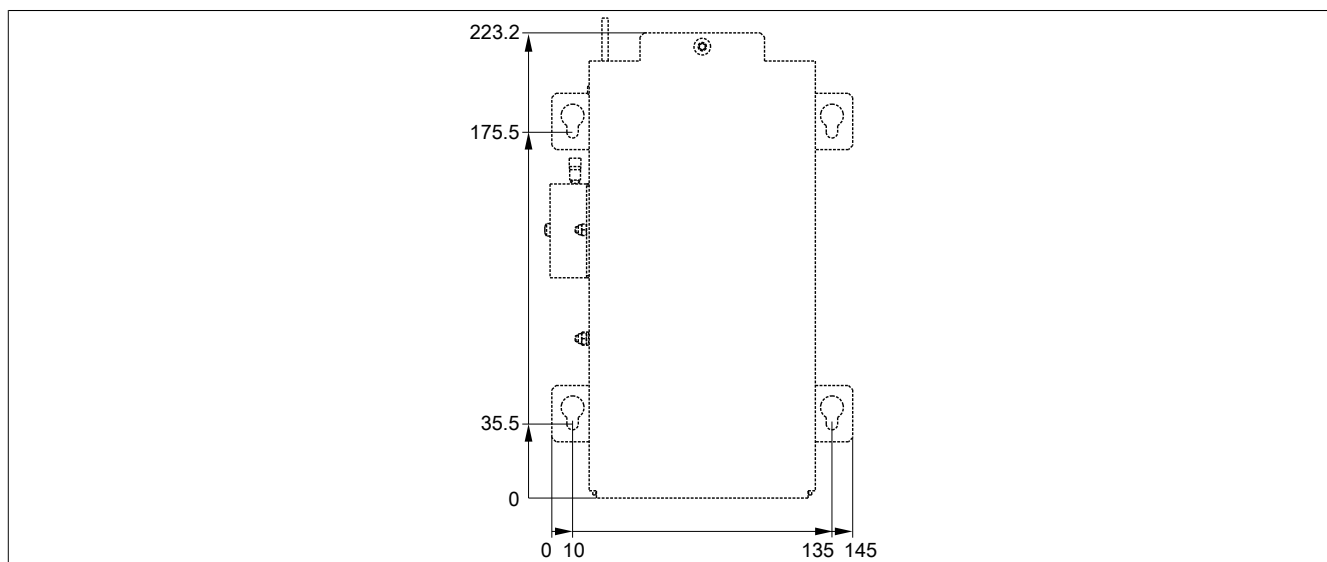


Figure 68: 5AC901.BUPS-00 - Drilling template

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 379](#).

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 162: 5AC901.BUPS-01 - Order data

3.11.5.3 Technical data

Model number	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 163: 5AC901.BUPS-01 - Technical data

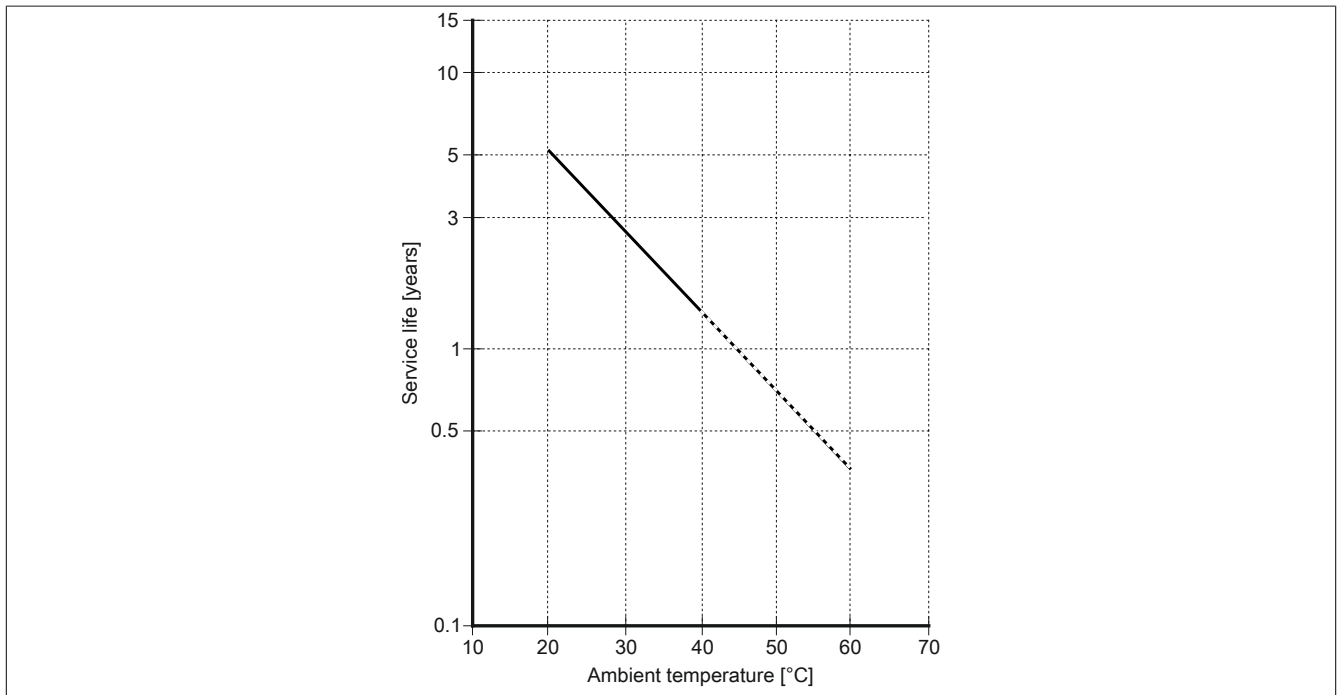
Model number	5AC901.BUPS-01
Mechanical characteristics	
Dimensions	
Width	188 mm
Height	78 mm
Depth	115 mm
Weight	Approx. 2550 g

Table 163: 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

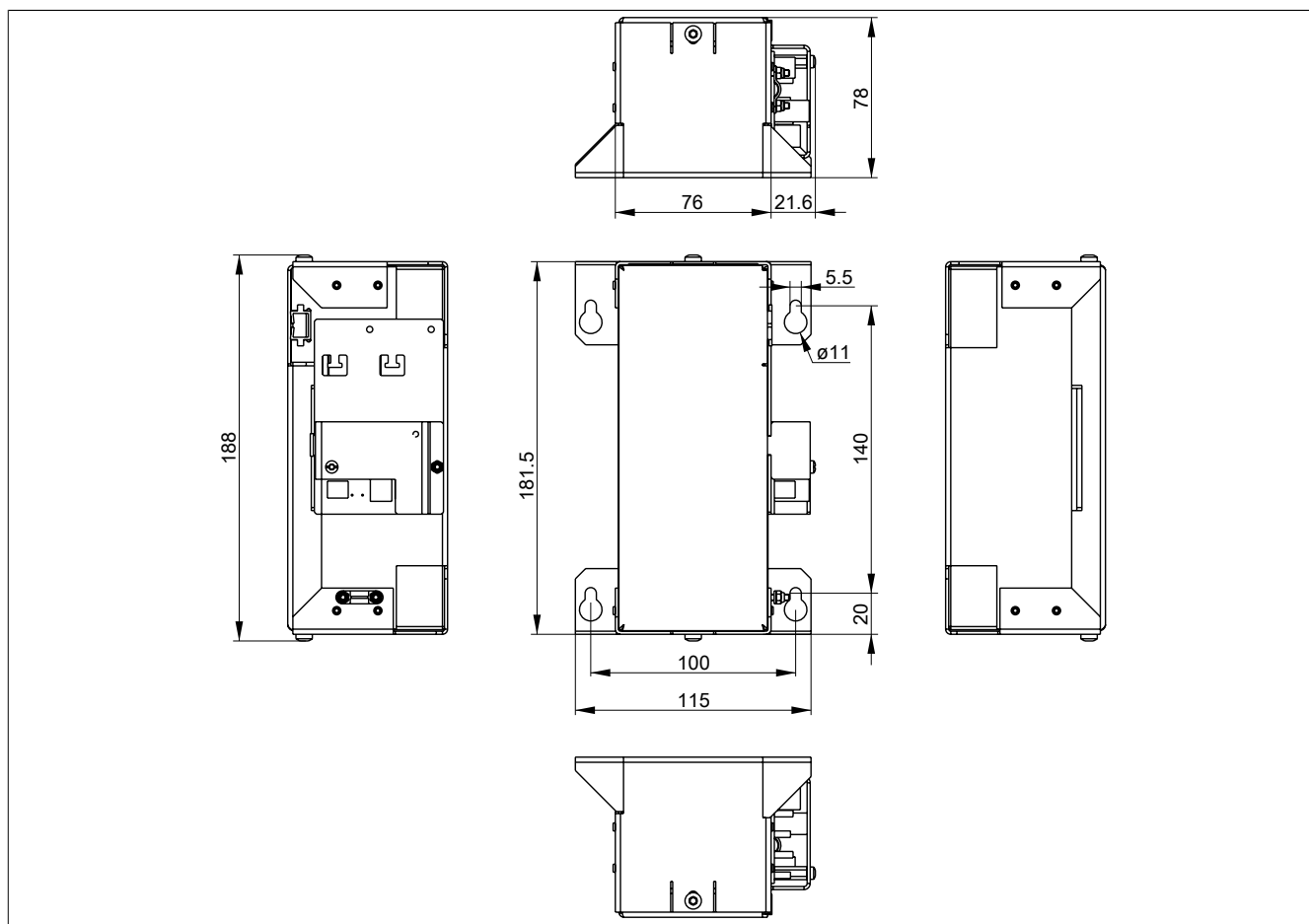


Figure 69: 5AC901.BUPS-01 - Dimensions

3.11.5.6 Drilling template

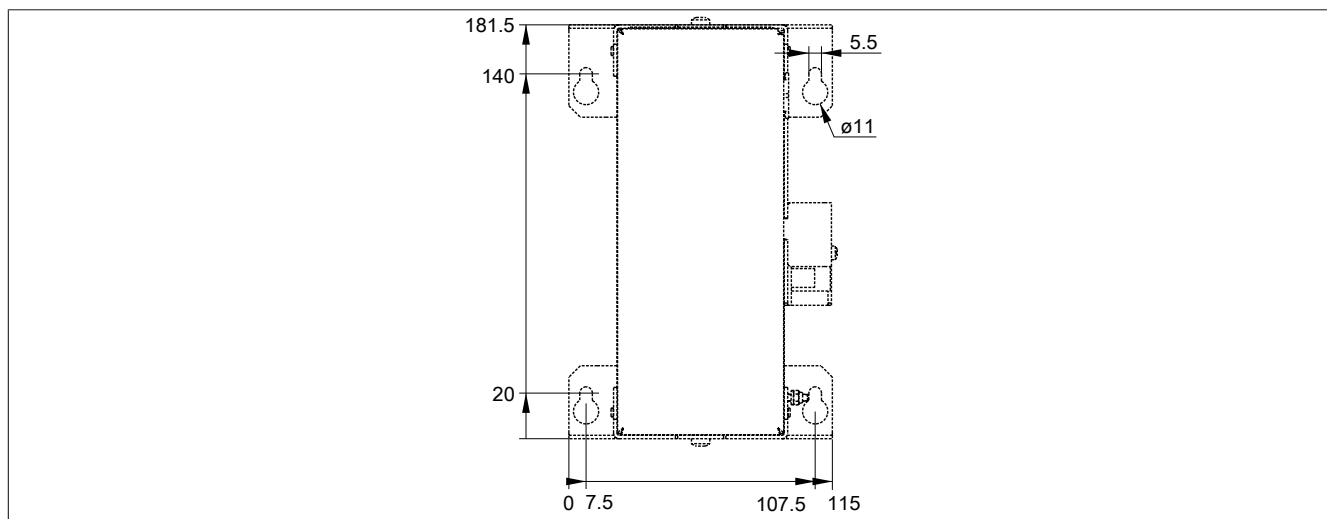


Figure 70: 5AC901.BUPS-01 - Drilling template

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 379](#).

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 164: 5CAUPS.0005-01, 5CAUPS.0010-01, 5CAUPS.0030-01 - Order data

3.11.6.3 Technical data

Model number	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 mm ² (AWG 20) 2x 2.5 mm ² (AWG 13)	
Conductor resistance		At 0.5 mm ² max. 39 Ω/km At 2.5 mm ² 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-carrying capacity		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	
Bend radius			
Moving		10x wire diameter	
Fixed installation		5x wire diameter	
Weight	Approx. 55 g	Approx. 100 g	Approx. 250 g

Table 165: 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 the section ["Installing and connecting the UPS battery unit" on page 379](#).

3.12 Front covers

3.12.1 5AC901.FF0x-00

3.12.1.1 General information

The front cover on the APC910 keeps the front-side interfaces free of dust, dirt and other contaminants.

3 different front cover variants are available for the APC910 system units.

Information:

The front cover is not included with the system unit and must be ordered separately.

3.12.1.2 Order data

Model number	Short description	Figure
	Front cover	
5AC901.FF01-00	Front cover for 1-slot APC910 - Orange	
5AC901.FF01-01	Front cover for 1-slot APC910 - Dark gray	
5AC901.FF01-02	Front cover for 1-slot APC910 - Dark gray - Without logo	
5AC901.FF02-00	Front cover for 2-slot APC910 - Orange	
5AC901.FF02-01	Front cover for 2-slot APC910 - Dark gray	
5AC901.FF02-02	Front cover for 2-slot APC910 - Dark gray - Without logo	
5AC901.FF05-00	Front cover for 5-slot APC910 - Orange	
5AC901.FF05-01	Front cover for 5-slot APC910 - Dark gray	
5AC901.FF05-02	Front cover for 5-slot APC910 - Dark gray - Without logo	

Table 166: 5AC901.FF01-00, 5AC901.FF01-01, 5AC901.FF01-02, 5AC901.FF02-00, 5AC901.FF02-01, 5AC901.FF02-02, 5AC901.FF05-00, 5AC901.FF05-01, 5AC901.FF05-02 - Order data

3.12.1.3 Technical data

Model number	5AC901.FF01-00	5AC901.FF01-01	5AC901.FF01-02	5AC901.FF02-00	5AC901.FF02-01	5AC901.FF02-02	5AC901.FF05-00	5AC901.FF05-01	5AC901.FF05-02
General information									
Certification	Yes								
CE	Yes								
cULus	Yes								
GOST-R	Yes	Yes	Yes	Yes	Yes	-	Yes	Yes	-
GL	Yes ¹⁾	Yes ¹⁾	Yes ¹⁾	Yes ¹⁾	Yes ¹⁾	Yes ¹⁾	-	-	-
Mechanical characteristics									
Housing									
Front cover	Orange plastic (similar to Pantone 144CV)	Dark gray plastic (similar to Pantone 432C)	Dark gray plastic (similar to Pantone 432C)	Orange plastic (similar to Pantone 144CV)	Dark gray plastic (similar to Pantone 432C)	Dark gray plastic (similar to Pantone 432C)	Orange plastic (similar to Pantone 144CV)	Dark gray plastic (similar to Pantone 432C)	Dark gray plastic (similar to Pantone 432C)
Material	Plastic								
Dimensions									
Width	82 mm	82 mm	82 mm	120.9 mm	120.9 mm	120.9 mm	202 mm	202 mm	202 mm
Height	264 mm								
Depth	14 mm								
Weight	Approx. 84 g	Approx. 84 g	Approx. 84 g	Approx. 117 g	Approx. 117 g	Approx. 117 g	Approx. 197 g	Approx. 197 g	Approx. 197 g

Table 167: 5AC901.FF01-00, 5AC901.FF01-01, 5AC901.FF01-02, 5AC901.FF02-00, 5AC901.FF02-01, 5AC901.FF02-02, 5AC901.FF05-00, 5AC901.FF05-01, 5AC901.FF05-02 - Technical data

¹⁾ Yes, although applies only if all components installed within the complete system have this certification.

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.

Devices are installed using the mounting clip found on the housing. These clips are designed for M5 screws.

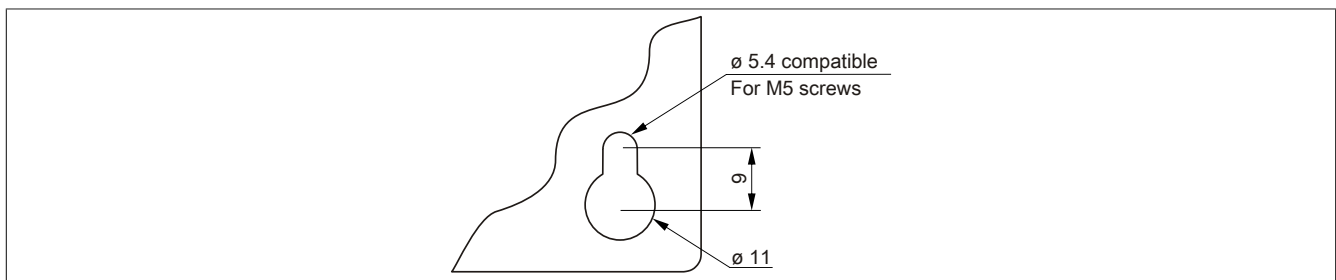


Figure 71: Mounting plates

The exact position of the mounting holes is illustrated in the drilling templates in 2 "Technical data", section "Individual components" on page 67.

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.

1.2 Procedure

1. Drill the necessary holes in the mounting surface. The exact position of the mounting holes is illustrated in the drilling templates.
2. Mount the B&R Industrial PC using M5 screws.

1.3 Mounting orientations

The following diagrams show the approved mounting orientations for the [Automation PC 910](#). The APC910 must be mounted as described in the following sections.

1.3.1 Vertical mounting orientation

APC910 systems with or without a fan kit can be mounted in this orientation.

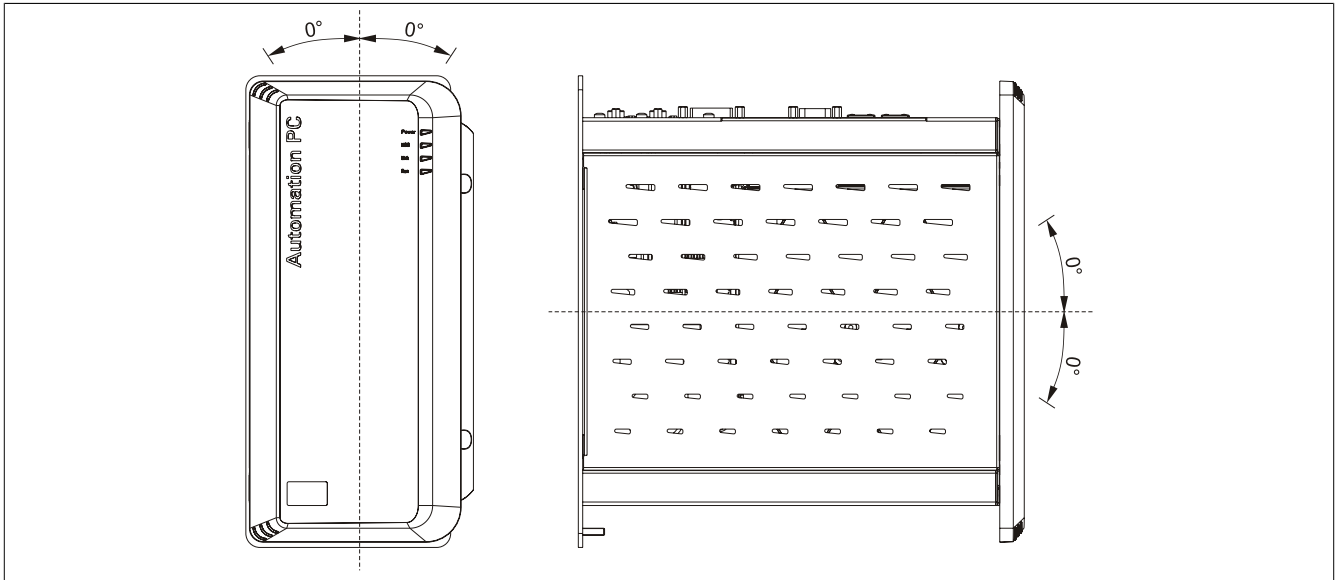


Figure 72: Vertical mounting orientation

In order to facilitate natural air circulation, devices must be mounted according to the spacing indicated in the section ["Spacing for air circulation" on page 186](#).

1.3.2 Horizontal mounting orientation

Operation in the horizontal mounting orientation (heat sink on top) requires the use of a fan kit. The maximum ambient temperature specification must be reduced by 5°C.

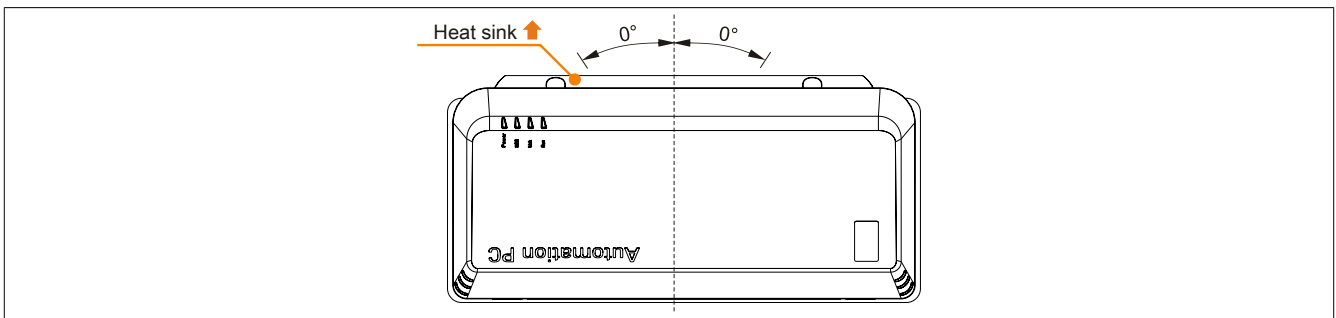


Figure 73: Horizontal mounting orientation

In order to facilitate natural air circulation, devices must be mounted according to the spacing indicated in the section ["Spacing for air circulation" on page 186](#).

1.3.3 Mounting orientation - Floor-mounted

Floor-mounted operation (mounting plate mounted to the floor) requires the use of a fan kit. The maximum ambient temperature specification must be reduced by 5°C.

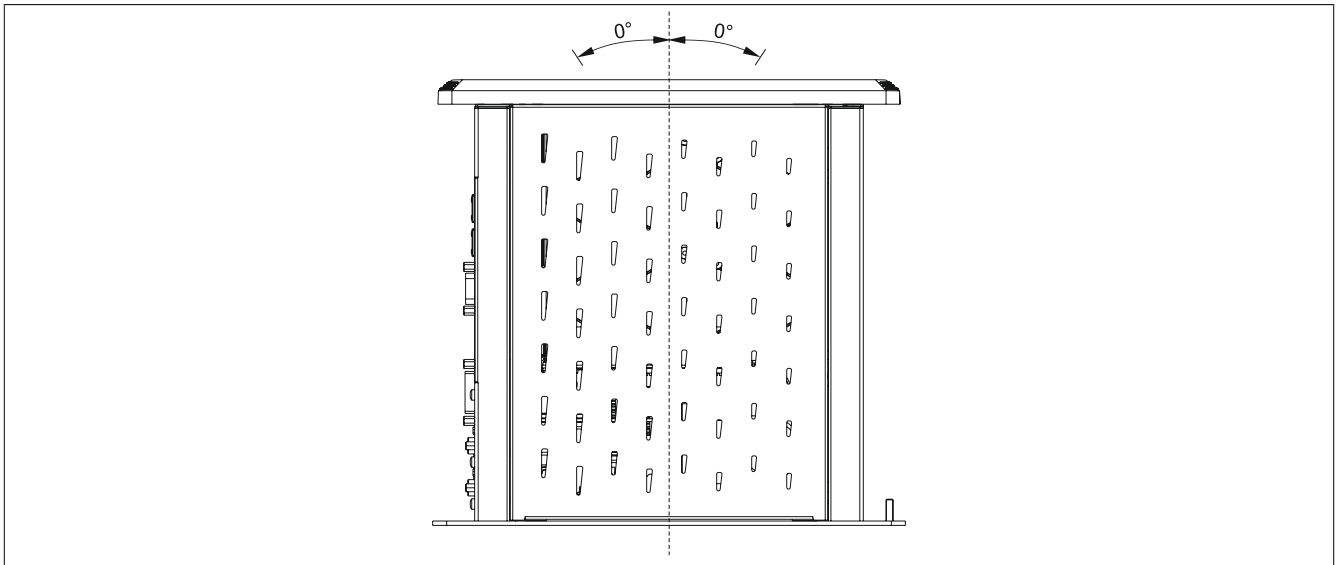


Figure 74: Mounting orientation - Floor-mounted

In order to facilitate natural air circulation, devices must be mounted according to the spacing indicated in the section "[Spacing for air circulation](#)" on page 186.

1.4 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 **Automation PC 910**. The minimum specified spacing is indicated in the following diagram. This applies to all **Automation PC 910** variants.

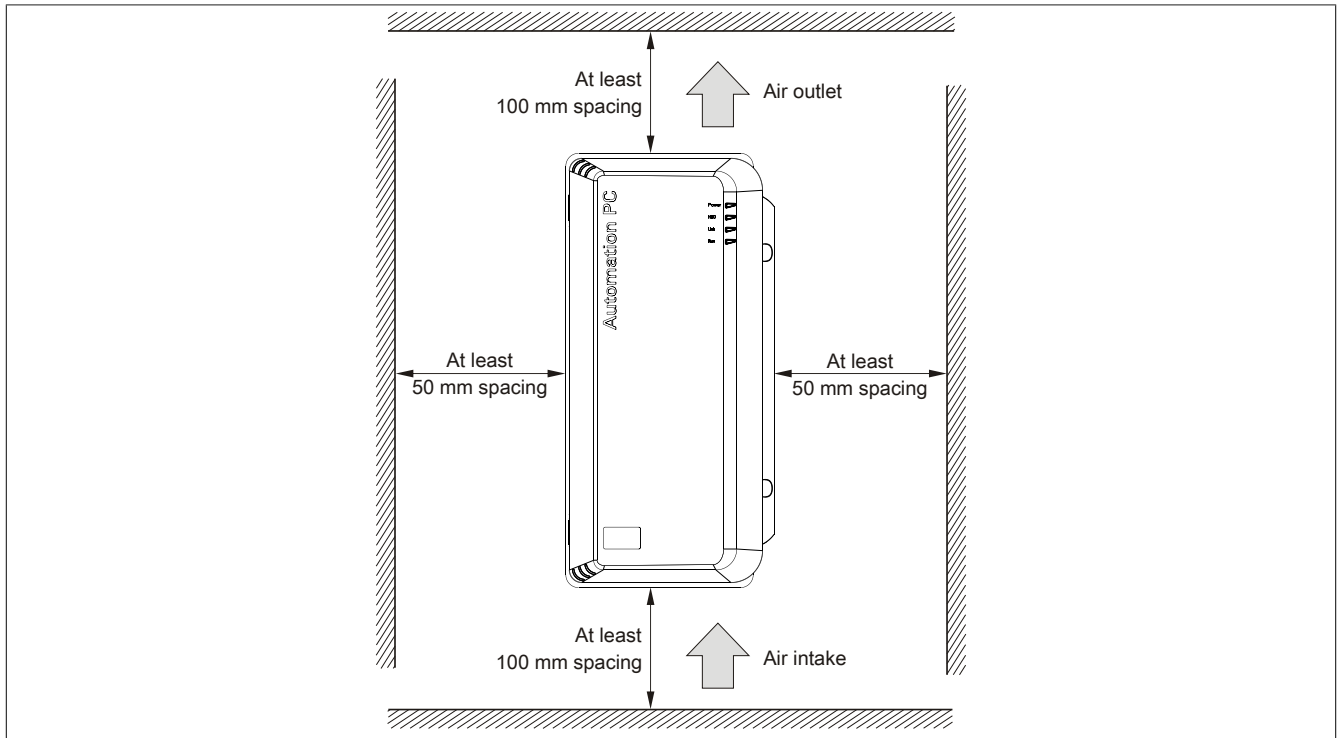


Figure 75: Standard mounting - Spacing

These defined distances are valid for both the vertical and horizontal mounting orientations for the APC910.

Information:

The spacing specifications for air circulation are based on the worst-case scenario for operation at the maximum specified ambient temperature (see "Temperature specifications" in the chapter "**Technical data**").

If the spacing specifications for air circulation cannot be adhered to, then the maximum specified temperatures for the temperature sensors (see "Temperature sensor positions" in the chapter "**Technical data**") must be monitored by the user and appropriate measures taken if they are exceeded.

2 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.

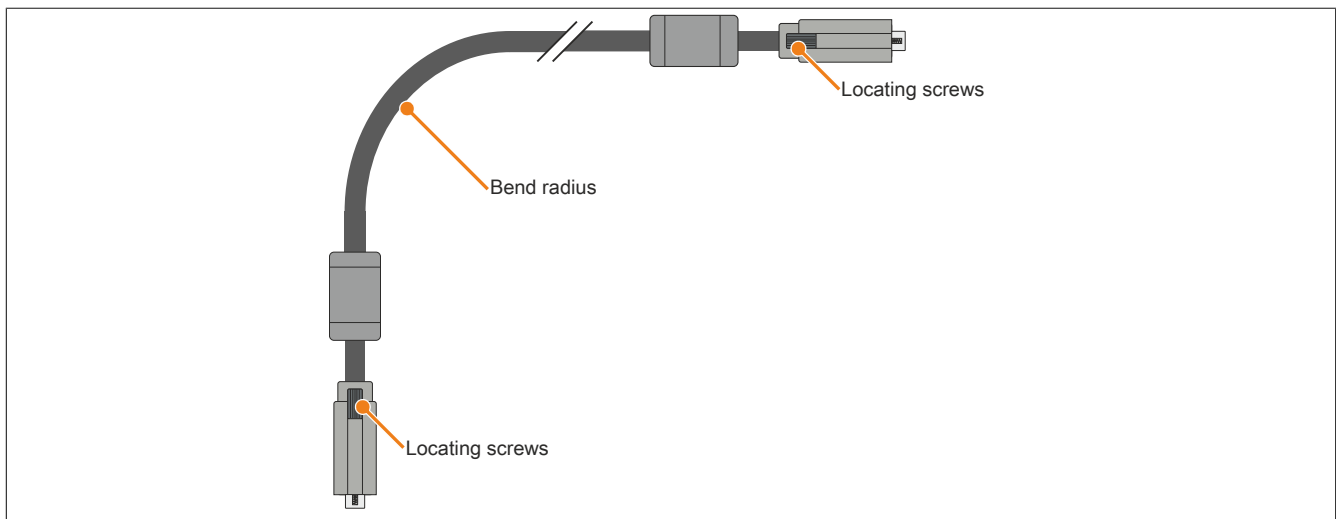


Figure 76: Bend radius - Cable connection

Information:

The specified bend radius is listed in the technical data for the respective cable.

3 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 2 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 mm^2 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 mm^2 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: 

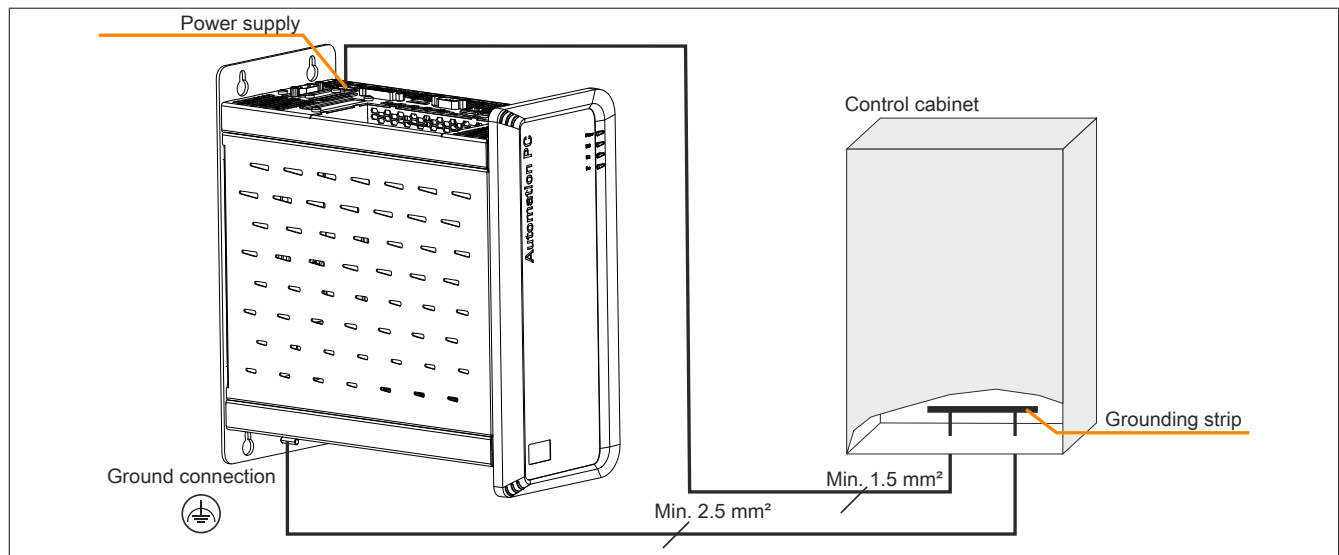


Figure 77: Grounding concept

4 General instructions for performing temperature testing

The purpose of these instructions is to explain general procedures for performing application-specific temperature testing on B&R Industrial PCs and Power Panels. Nevertheless, these instructions are meant to serve only as guidelines.

4.1 Procedure

In order to obtain accurate results, testing conditions should match conditions in the field. This means that for the duration of the temperature tests, the target application should be running, the PC should be installed in the control cabinet that will be used, etc.

In addition, a temperature sensor should be installed for the device being tested to provide live monitoring of the ambient temperature. In order to obtain accurate measurements, this sensor should be installed at a distance of 5 to 10 cm from the B&R Industrial PC near the air intake (not near the exhaust).

All B&R Industrial PCs and Power Panels are equipped with internal temperature sensors. They are installed at different locations for each device family. The number of sensors and temperature limits also vary from series to series.

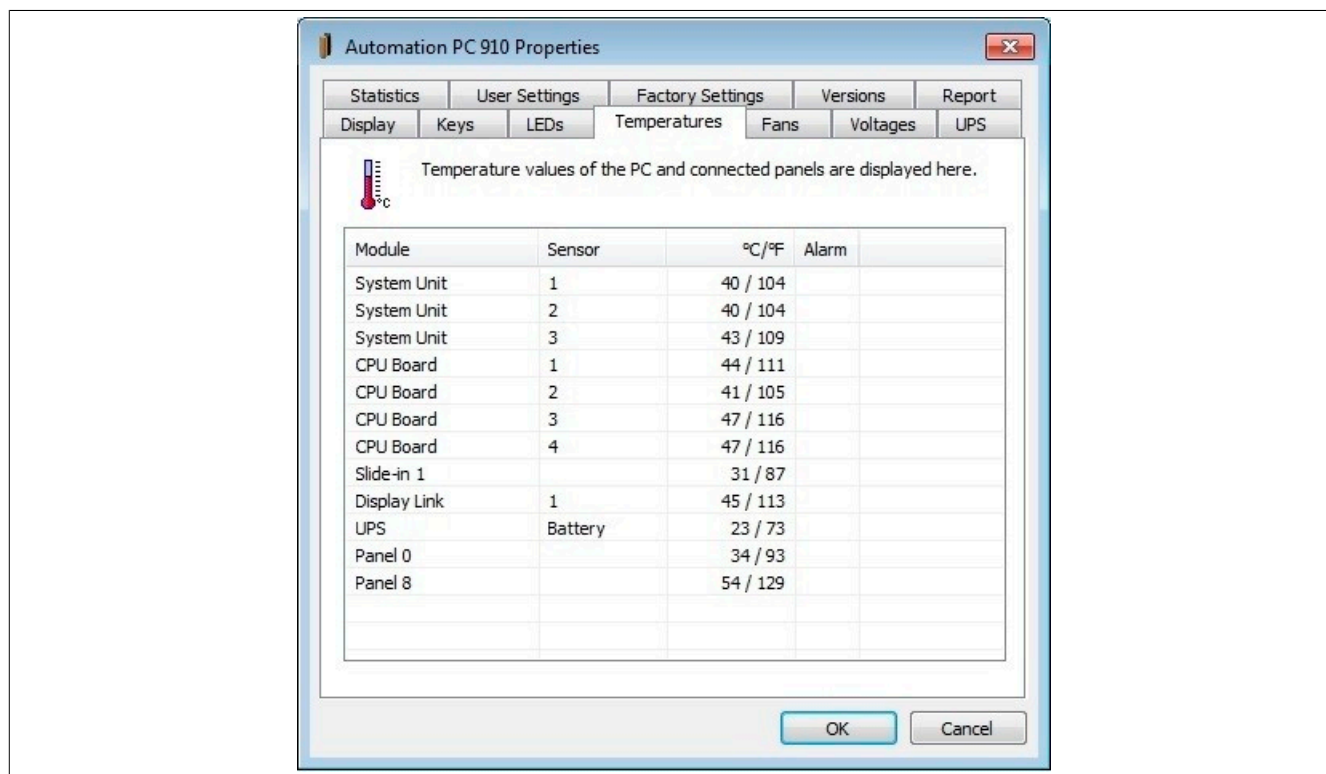
For information about the locations of temperature sensors and maximum specified values, see section "Temperature sensor positions" in 2 "Technical data".

To ensure that the temperature situation is evaluated reliably, a minimum of 8 hours is recommended for testing.

4.2 Evaluating temperatures in Windows operating systems

4.2.1 Evaluating with the B&R Control Center

The B&R Control Center can be used to evaluate temperatures. The temperatures can be viewed on the "Temperatures" tab. The B&R Control Center is available at no cost in the Downloads section of the B&R website (www.br-automation.com). The B&R Control Center uses the B&R Automation Device Interface (ADI).



A separate application can be developed if it is necessary to collect historical data.

Information:

Software development kits such as the ADI .NET SDK are available on the B&R website (www.br-automation.com) to develop a separate application.

4.2.2 Evaluating with the BurnInTest tool from Passmark

If a separate application is not developed or used to evaluate the temperature, then B&R recommends using the BurnInTest software tool from PassMark.

Standard and professional versions of BurnInTest are available. In addition to the software package, there are also various loopback adapters (serial, parallel, USB, etc.) and test CDs/DVDs available. The exact software and loopback adapters used will determine the corresponding load that can be generated on the system and peripheral devices.

Information:

Loopback adapters are also available from PassMark. More information is available at www.passmark.com.

The following screenshots are based on Passmark BurnInTest Pro V6 and a 2-slot APC910 with DVD.

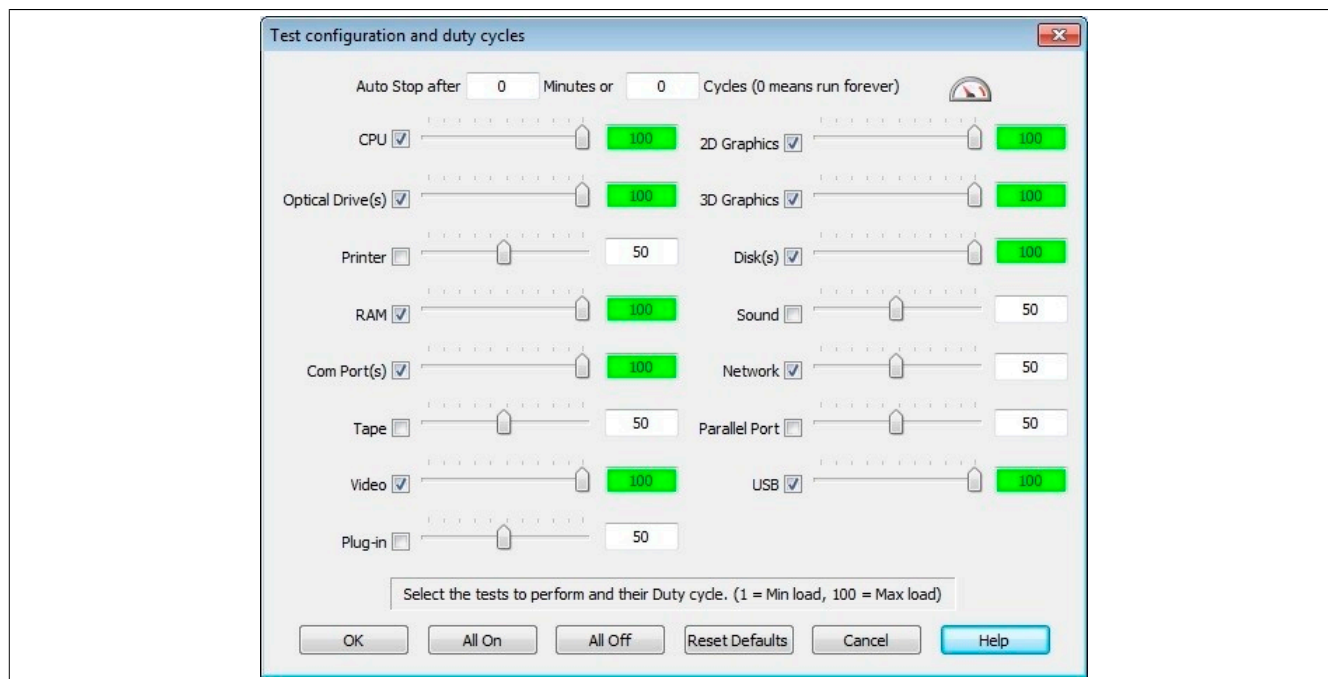


Figure 78: Settings for Passmark BurnInTest Pro V6 and a 2-slot APC910 with DVD

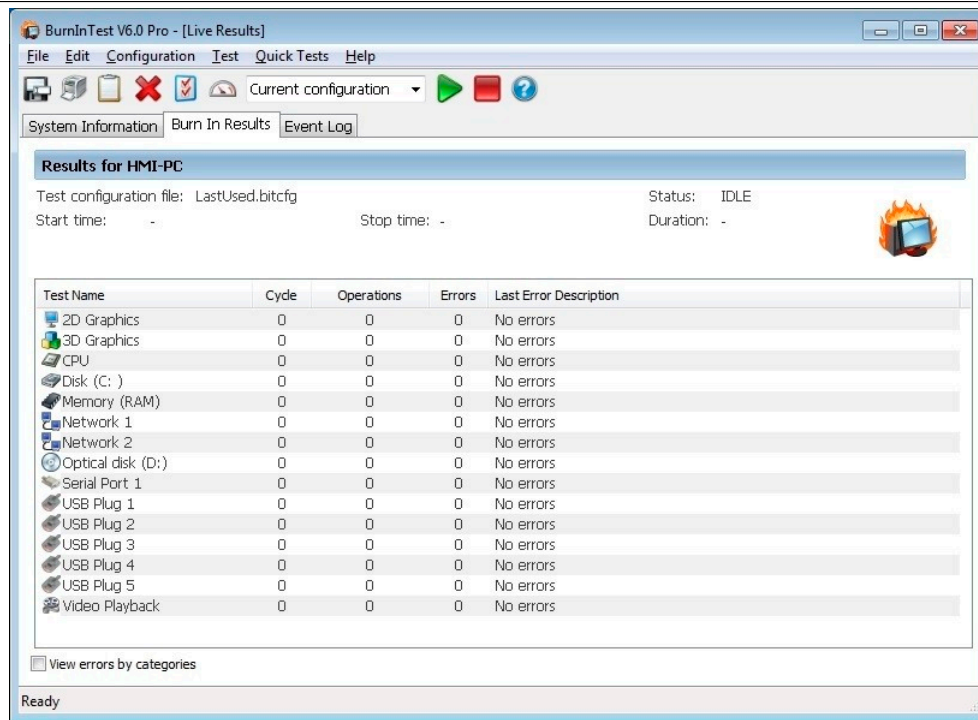


Figure 79: Test overview of a 2-slot APC910 with DVD

The respective test properties may need to be fine-tuned depending on the availability of a loopback plug and DVDs.

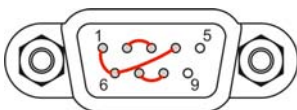
Information:

USB flash drives can also be used if no USB loopback adapters are available. The USB flash drives must be detected as formatted drives in Windows. The test USB must then be deselected, and the USB flash drives must be configured as the testing device in the disk properties.



Information:

Serial loopback adapters are relatively easy to create. Simply connect several pins on the serial interface with wires.



4.3 Evaluating temperatures in non-Windows operating systems

For applications that do not run in Windows, temperatures can be evaluated with the help of the B&R implementation guide. In addition to the implementation guide, there are also programs available in MS-DOS.

The implementation guide only describes device-specific functions, not the main functions of the sample programs.

If code from the sample programs is used, it is important to observe the notes in the implementation guide regarding TODO statements, I/O access functions, etc.

Information:

Sample programs and implementation guides for all B&R Industrial PCs and Power Panels are available at no cost from the B&R website (www.br-automation.com).

4.4 Evaluating the measurement results

The maximum temperature value recorded by each sensor is not permitted to exceed the temperature limits specified in the user's manuals.

If the temperature tests cannot be performed in a climate-controlled chamber, they can still be performed in an office environment. However, it is necessary to measure the ambient temperature in this case. Experience at B&R has shown that values measured on passive systems (systems without a fan kit) can be projected linearly based on the ambient temperature. In order to be able to project the temperature values for systems with a fan kit, the fans must be running. It is also important to take values such as speed into consideration.

If the temperature tests are performed in a climate-controlled chamber with fans, the fans will cool the devices being tested and distort the results. Measurement results for passive devices are therefore unusable. In order to obtain accurate results in climate-controlled chambers with fans, the fans must be turned off and the device must be allowed to run for a sufficient amount of time (several hours) before beginning the test.

5 Configuring a SATA RAID set

Information:

The following software description is valid for 5ACPCI.RAIC-01, 5ACPCI.RAIC-03, 5ACPCI.RAIC-05 and 5ACPCI.RAIC-06 PCI SATA controllers.

The "RAID Configuration Utility" in BIOS must be started in order to make the necessary settings. After POST, pressing <Ctrl+S> or <F4> opens the RAID BIOS.

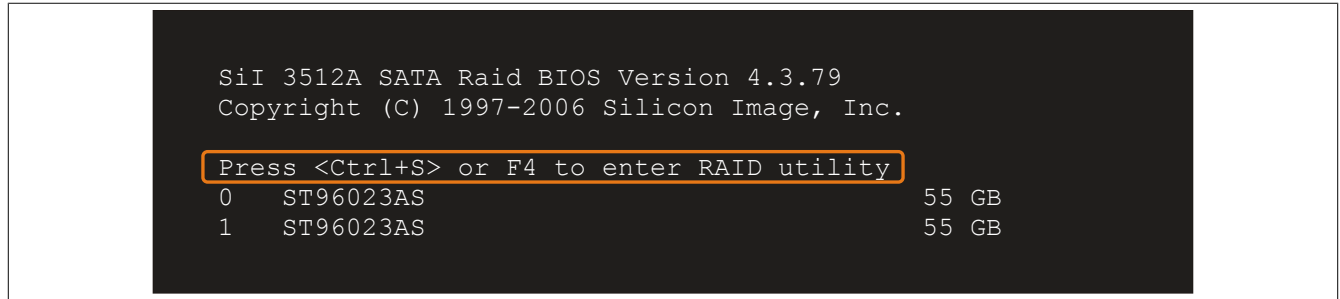


Figure 80: Open the RAID Configuration Utility

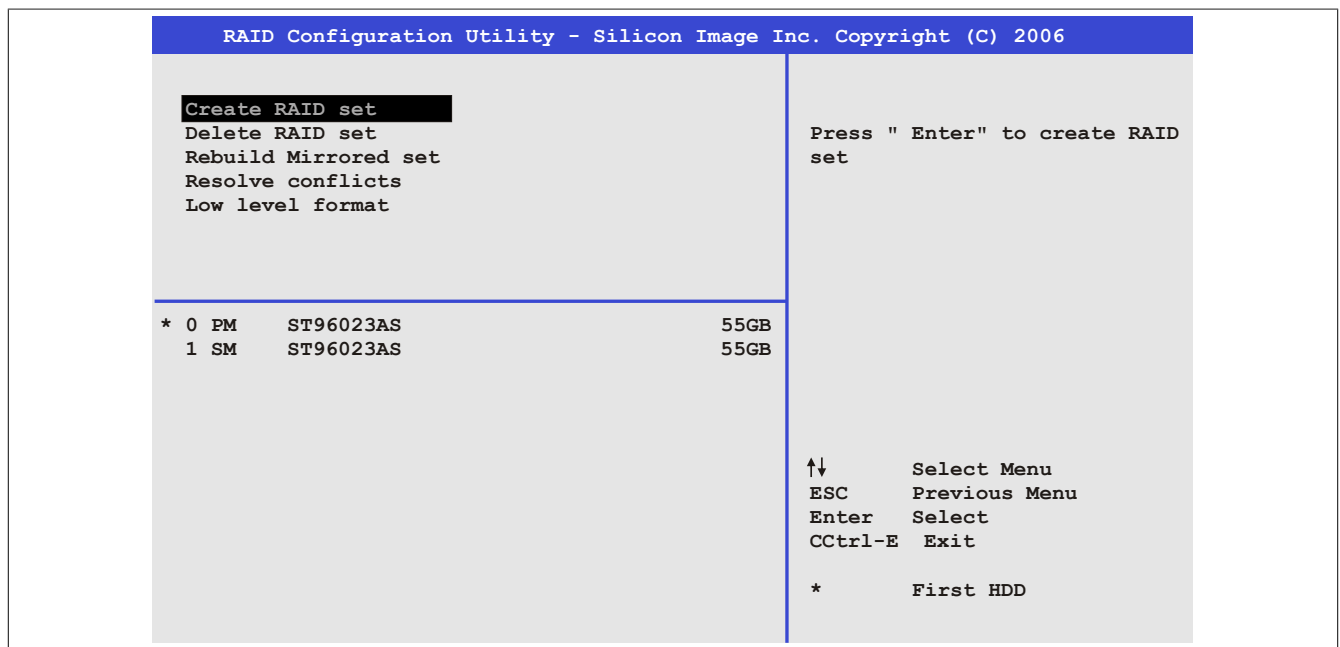


Figure 81: RAID Configuration Utility - Menu

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 168: BIOS-relevant keys in the RAID Configuration Utility

5.1 Create RAID set

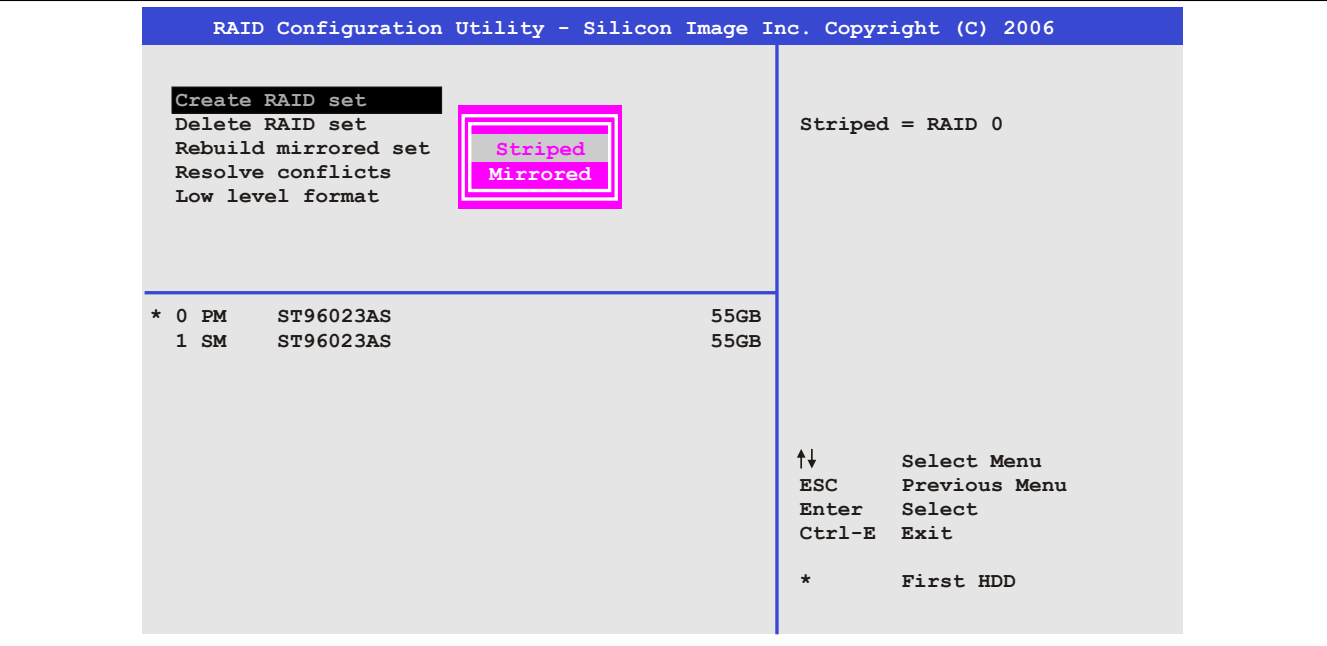


Figure 82: RAID Configuration Utility - Menu

The RAID system can be set up as "Striped" = RAID0 or "Mirrored" = RAID1 using the "Create RAID set" menu option.

5.2 Create RAID set - Striped

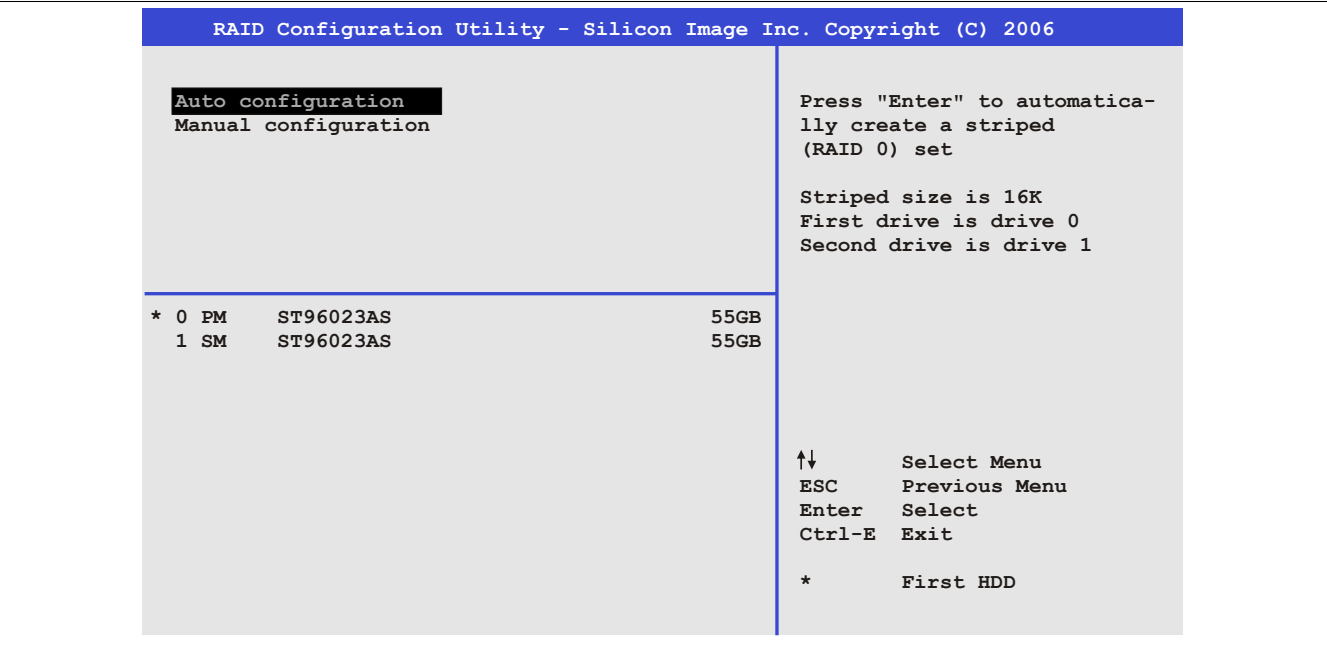


Figure 83: RAID Configuration Utility - Create RAID set - Striped

"Auto configuration"

Auto configuration optimizes all settings.

"Manual configuration"

Allows the first and second HDD to be specified as well as the "Chunk size" (i.e. block size, application-dependent).

5.3 Create RAID set - Mirrored

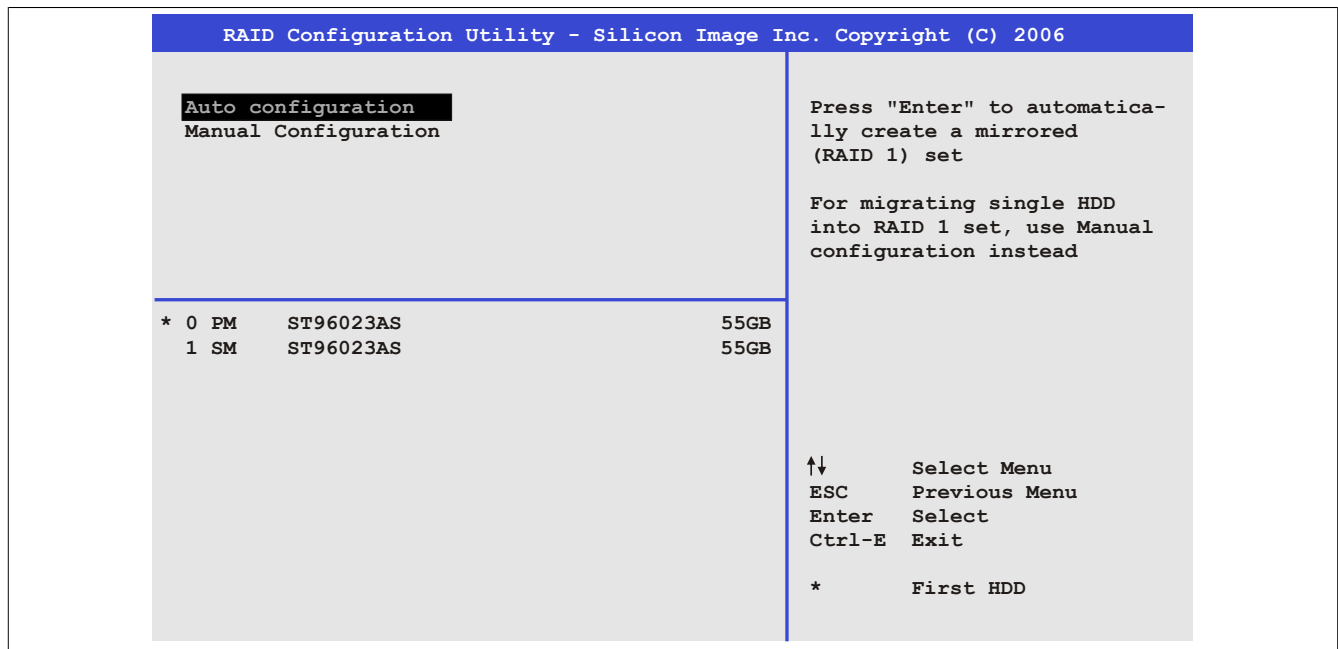


Figure 84: RAID Configuration Utility - Create RAID set - Mirrored

"Auto configuration"

Auto configuration optimizes all settings.

"Manual configuration"

Allows the "Source" and "Target" HDD to be specified as well as whether a rebuild (mirror) should be performed immediately (takes approx. 50 minutes).

5.4 Delete RAID set

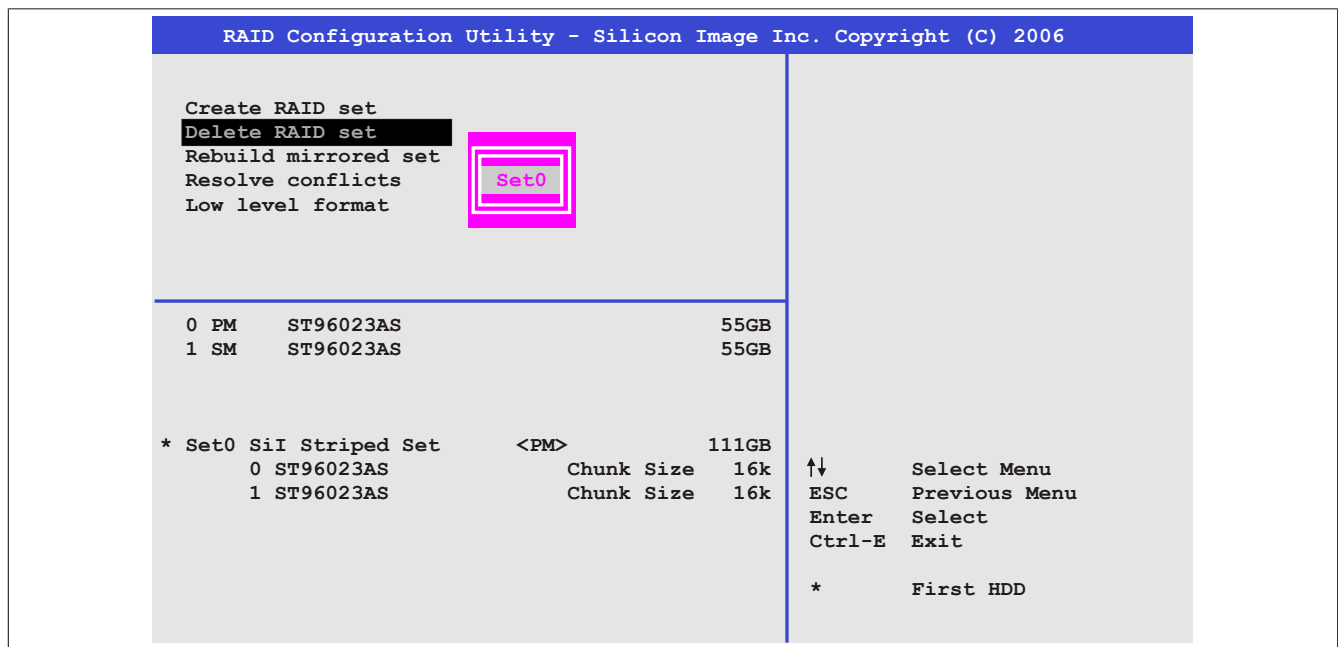


Figure 85: RAID Configuration Utility - Delete RAID set

An existing RAID set can be deleted using the "Delete RAID set" menu option.

5.5 Rebuild mirrored set

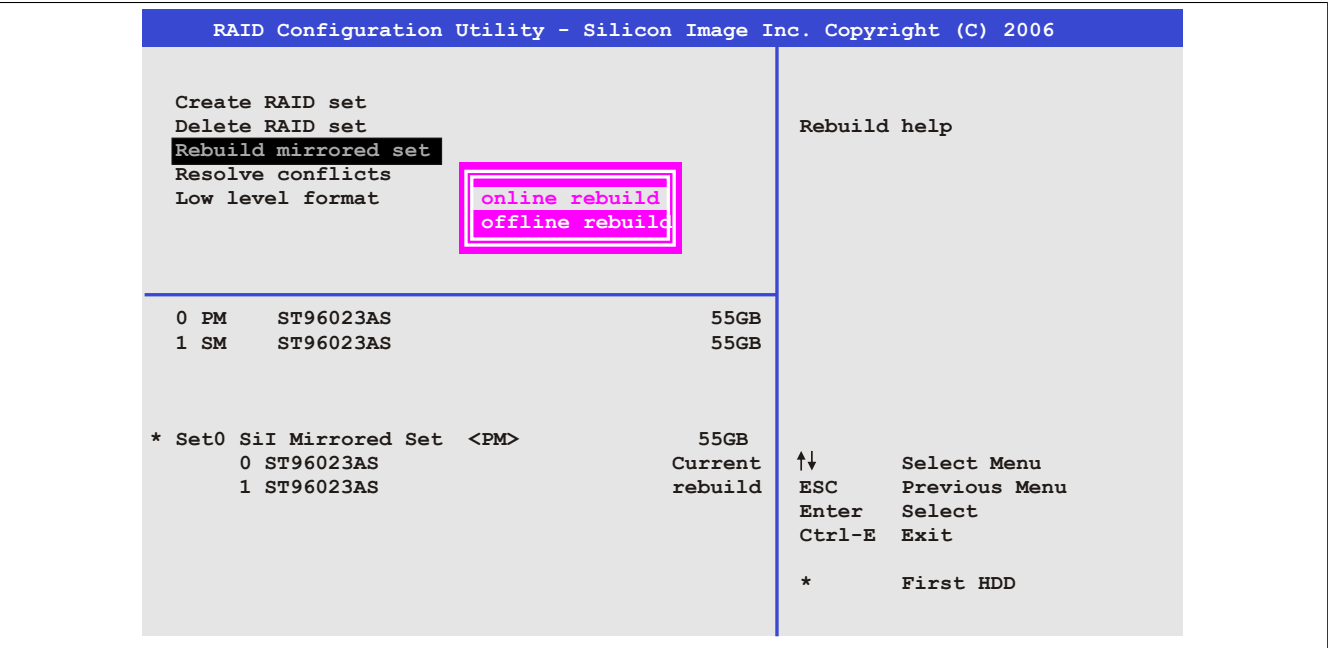


Figure 86: RAID Configuration Utility - Rebuild mirrored set

The "Rebuild mirrored set" menu option can be used to restart a rebuild procedure in a RAID 1 set if an error occurs, if a rebuild procedure was interrupted or if a hard disk was replaced.

If "Online rebuild" is selected, then the rebuild is executed during operation after the system is booted. The installed SATA RAID configuration program may display an event pop-up message: SATA Raid detected a new event before restarting the rebuild. The entire rebuild takes approximately 50 minutes.

If "Offline rebuild" is selected, then a rebuild is performed immediately before the operating system is started (duration depends on the respective memory size).

5.6 Resolve conflicts

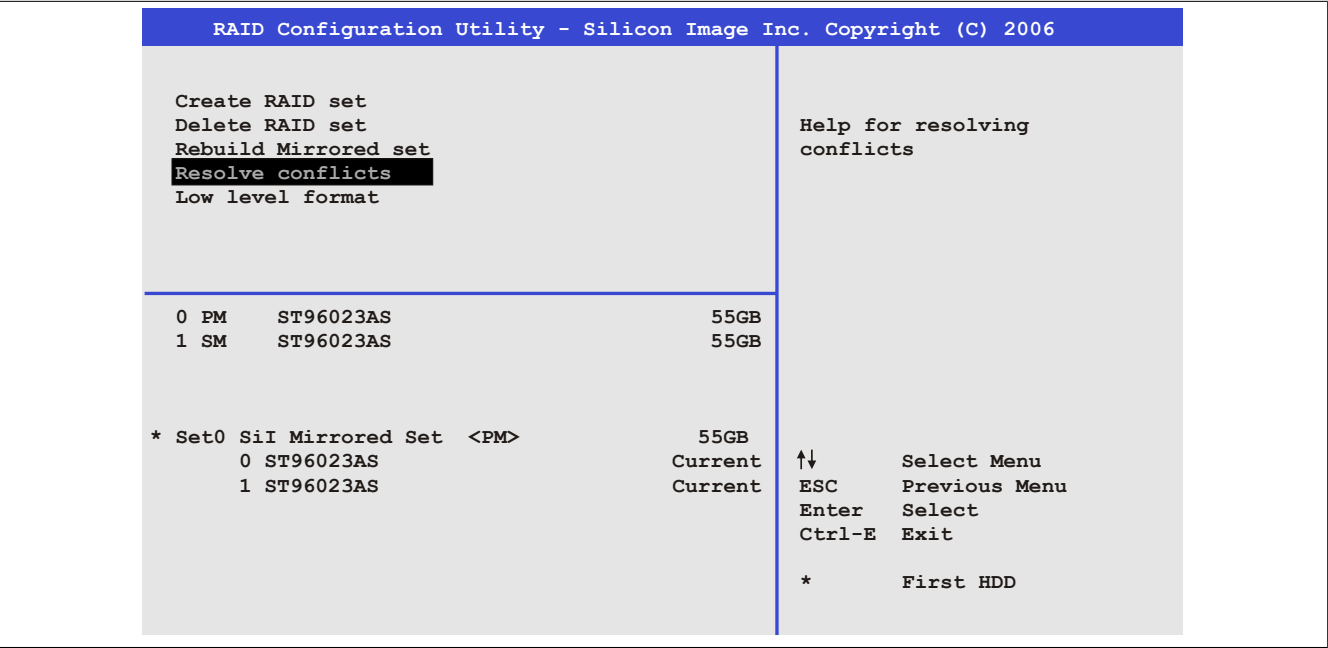


Figure 87: RAID Configuration Utility - Resolve conflicts

Conflicts in a RAID set can be resolved using the "Resolve conflicts" menu option. This function is only available if the status of the hard disk is "Conflict".

5.7 Low level format

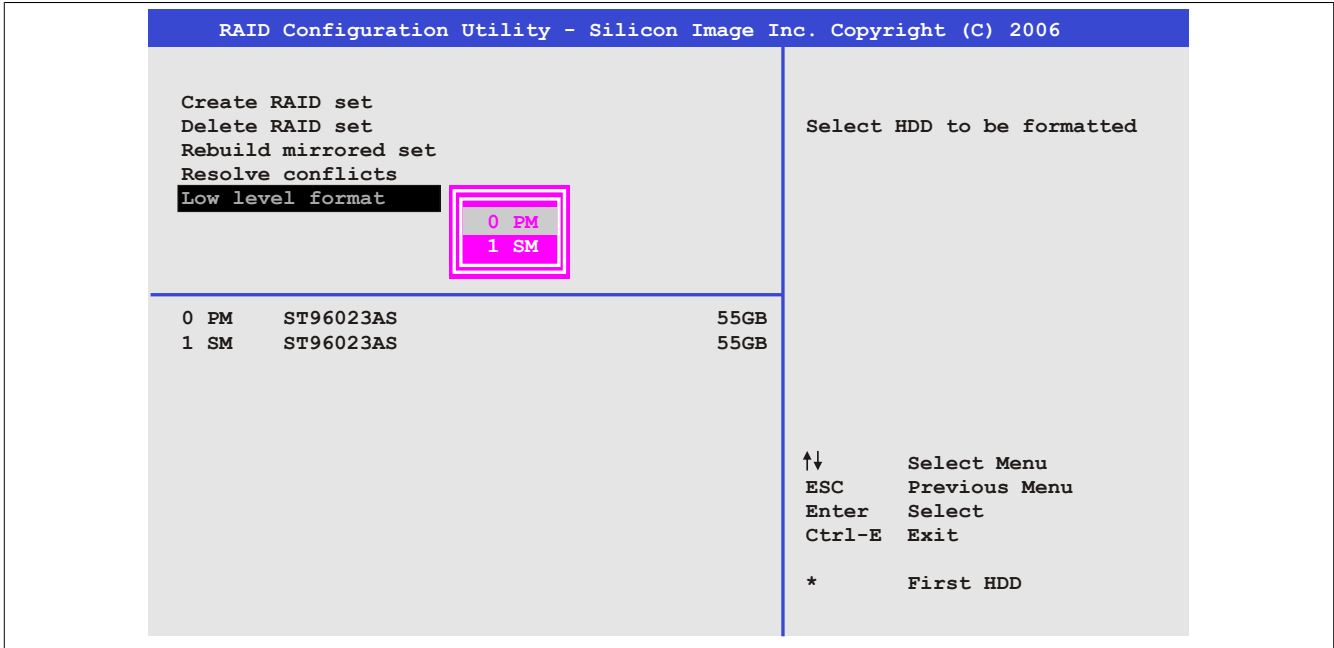


Figure 88: RAID Configuration Utility - Low level format

Individual hard disks can be configured using the "Low level format" menu option. This can only be done if a RAID set is not configured. A low level format of a hard drive takes approx. 40 minutes.

6 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 89: 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 90: 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 169: BIOS-relevant keys in the RAID Configuration Utility

6.1 Create RAID volume

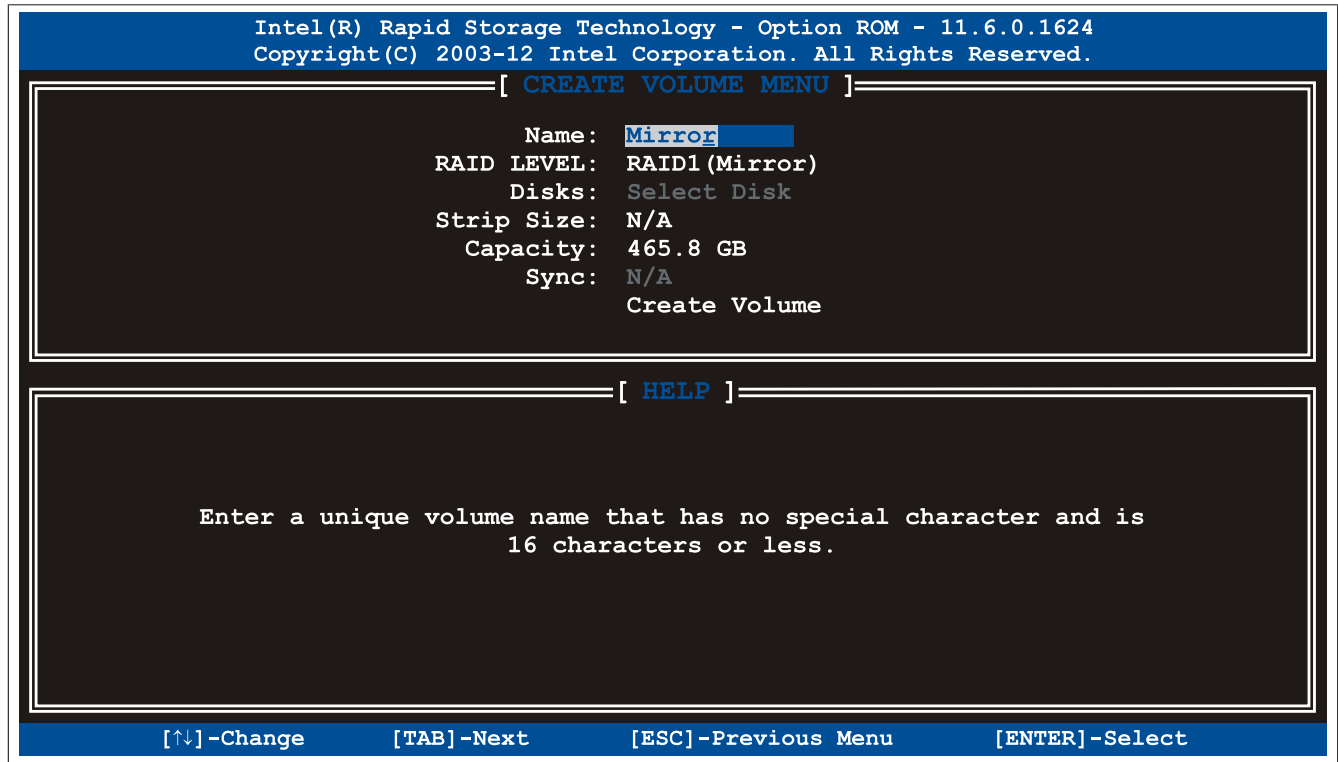


Figure 91: Configuration Utility - Create RAID volume

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 170: 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*.

6.2 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 .

Information:

This option deletes all data on the drive, including the operating system.

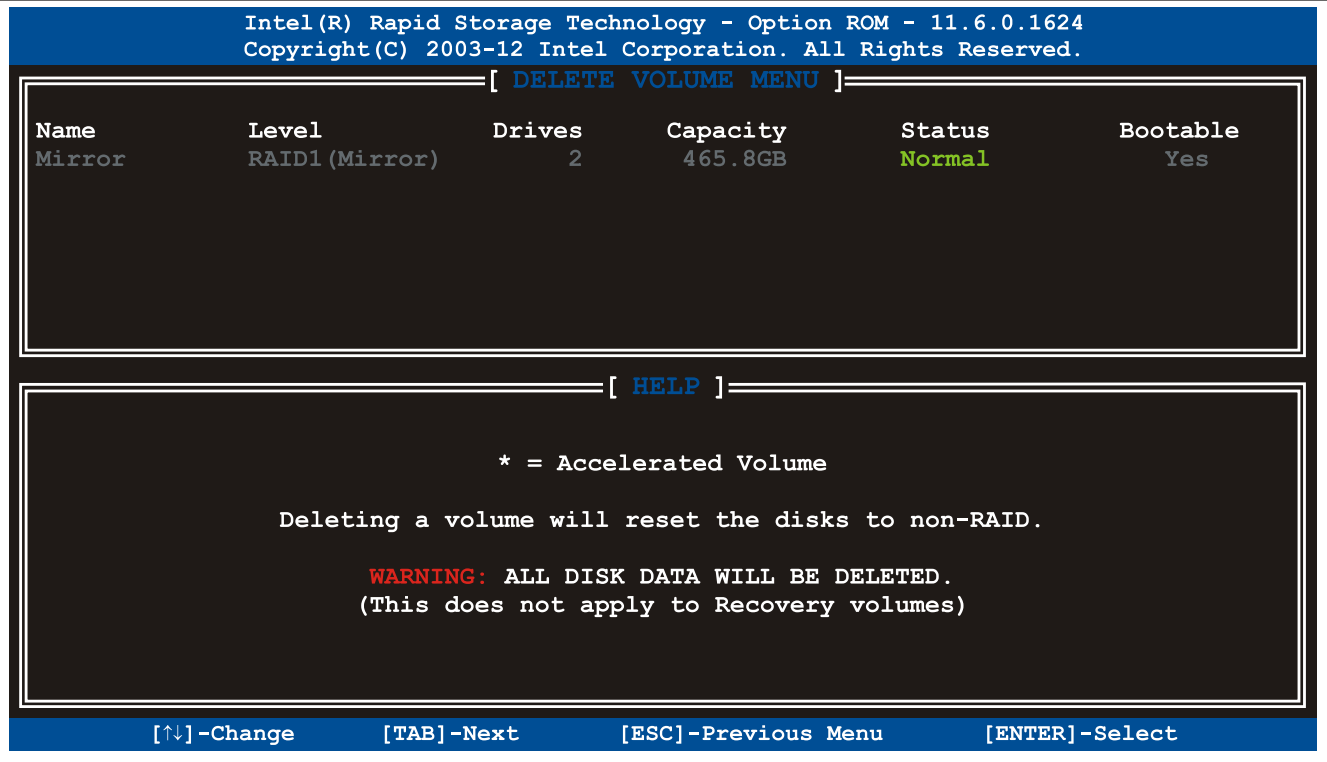


Figure 92: Configuration Utility - Delete RAID volume

6.3 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.

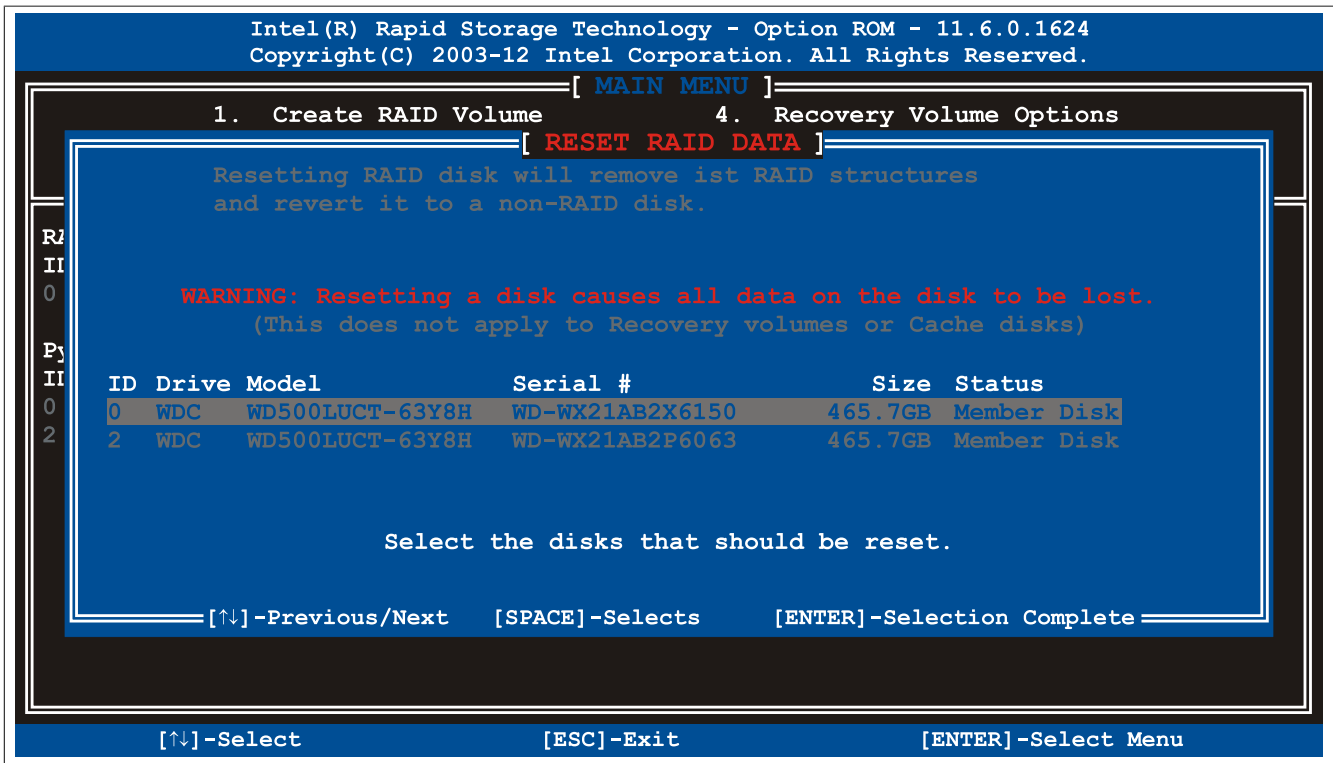


Figure 93: Configuration Utility - Reset disks to non-RAID

6.4 Recovery volume options

The "Recovery volume options" menu option can be used to enable/disable recovery disk and master disk.

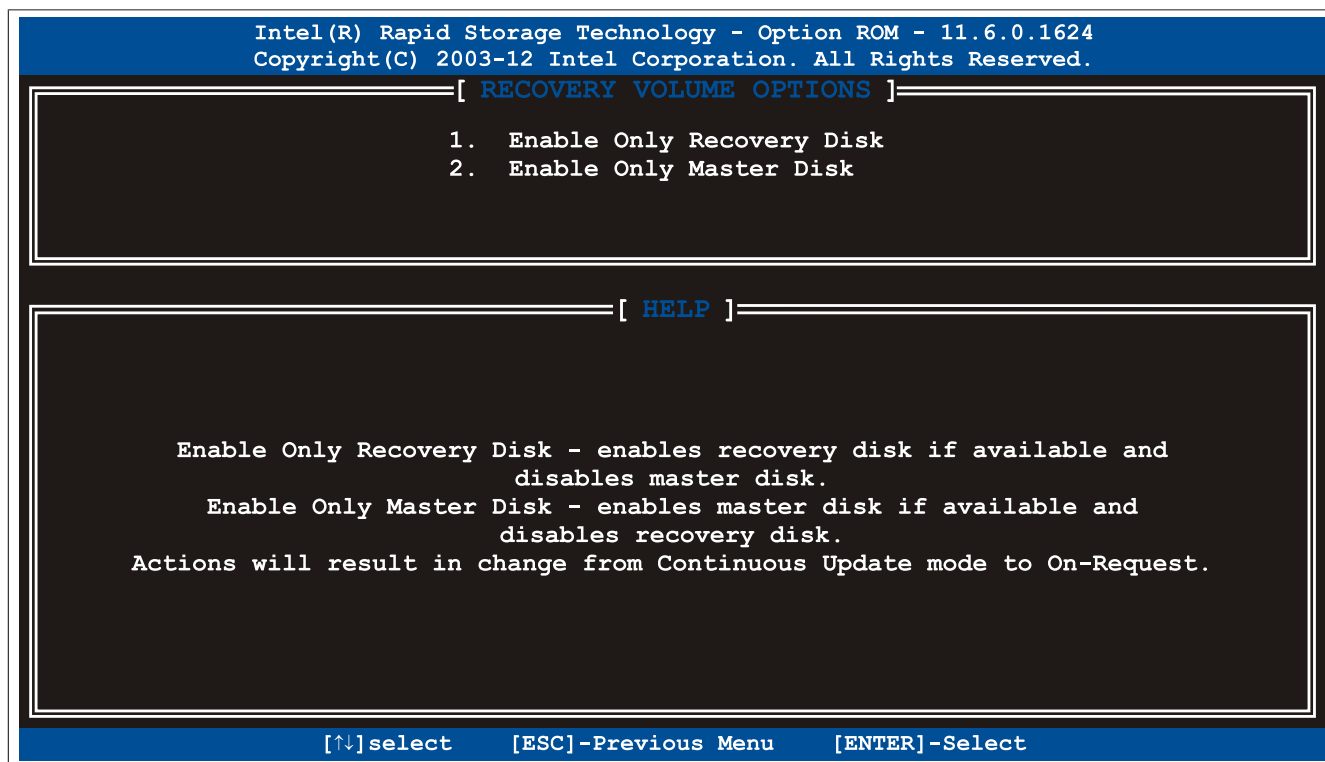


Figure 94: Configuration Utility - Recovery volume options

7 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 no longer supported by PVI V4.2.5 or Windows CAN Driver V3.0 beginning with Windows 7.
- Support for three independent displays is only possible in the following combination:
 - 1x DisplayPort monitor connected directly to the [Automation](#) PC's DisplayPort interface
 - 1x DisplayPort monitor connected via the 5AC901.LDPO-00 monitor/panel option
 - 1x SDL/DVI or RGB connected via the monitor/panel interface
- When using a PCI or PCIe RAID controller, we recommend disabling ASPM or power management for the respective PCI or PCIe slot.
- The USB 2.0 transfer rate is limited to 30 Mbit/s with SDL3.
- The SDL3 transmitter continuously emulates a display using EDID data and hot plugging code, which allows DVI-compatible operation. For this reason, operating multiple displays may result in incorrect graphic representations. This can occur in the following circumstances:
 - No cable connected
 - No connection established between the SDL3 link module and the SDL3 receiver

It is possible to get around these incorrect graphic representations by making suitable settings to BIOS or the graphics driver.

- If problems occur with the ETH1 interface (connection aborted, slow data transfer, etc.), one possible solution is to disable the EEE feature (Energy Efficient Ethernet) in the driver.

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 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 95: 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.

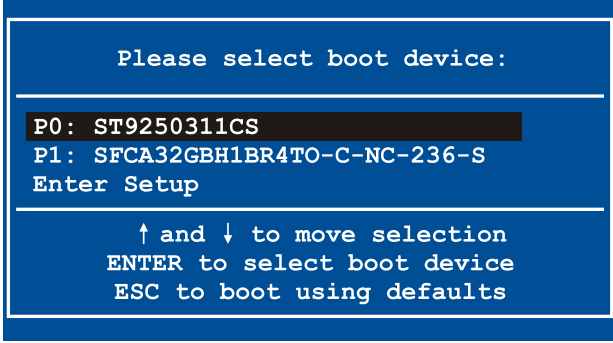
Keys	Function
Del, F2	Opens the main BIOS Setup screen
F12	Network boot
F11	Opens the boot menu. This lists all bootable devices that are connected to the system. Selecting a device with cursor ↑, cursor ↓ and then pressing <ENTER> will boot from that device.
	
<Pause>	Pauses POST. Pressing any other key resumes POST.

Table 171: 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 172: BIOS-relevant keys

1.3 Main

The main BIOS Setup screen appears immediately after the button is pressed during startup.

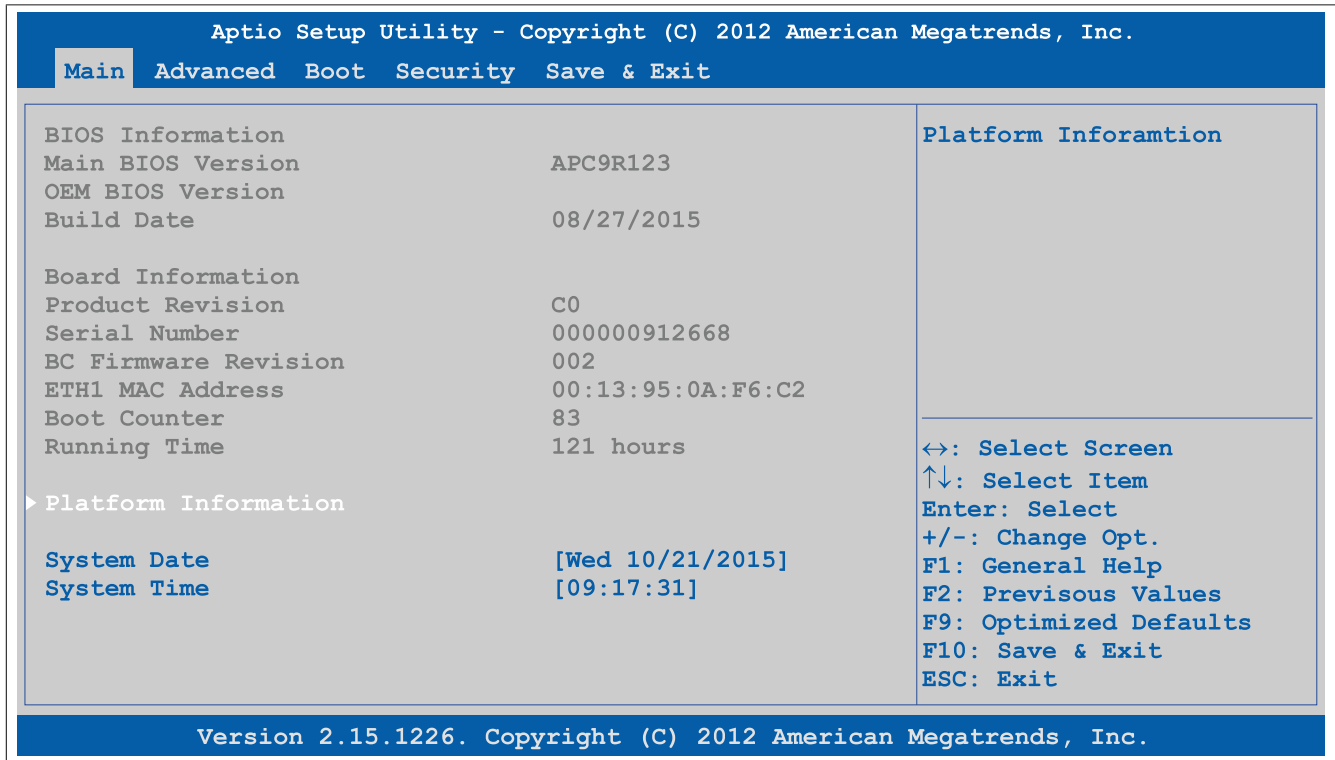


Figure 96: Main

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	-
BC firmware revision	Displays the firmware revision of the CPU board controller	None	-
ETH1 MAC address	Displays the assigned MAC address for the ETH interface	None	-
Boot counter	Displays the boot counter; each restart increases the counter by one (max. 16777215)	None	-
Running time	Displays the runtime in hours (max. 65535)	None	-
Platform information	Displays information about the chipset, CPU board and main memory	Enter	Opens this submenu See "Platform information" on page 207.
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 173: Main - Configuration options

1.3.1 Platform information

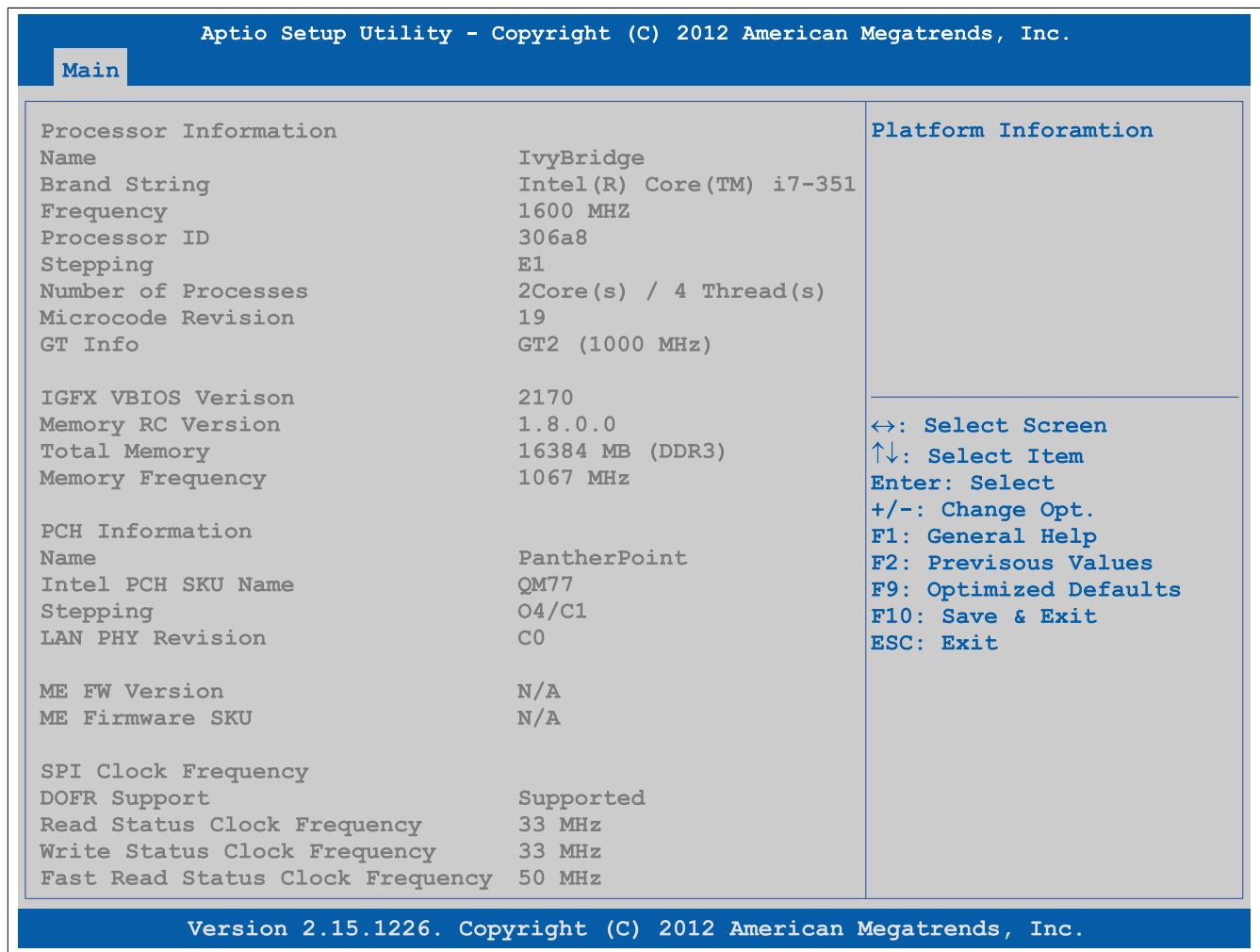


Figure 97: Main - Platform Information

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 174: Main - Platform information - Overview

1.4 Advanced

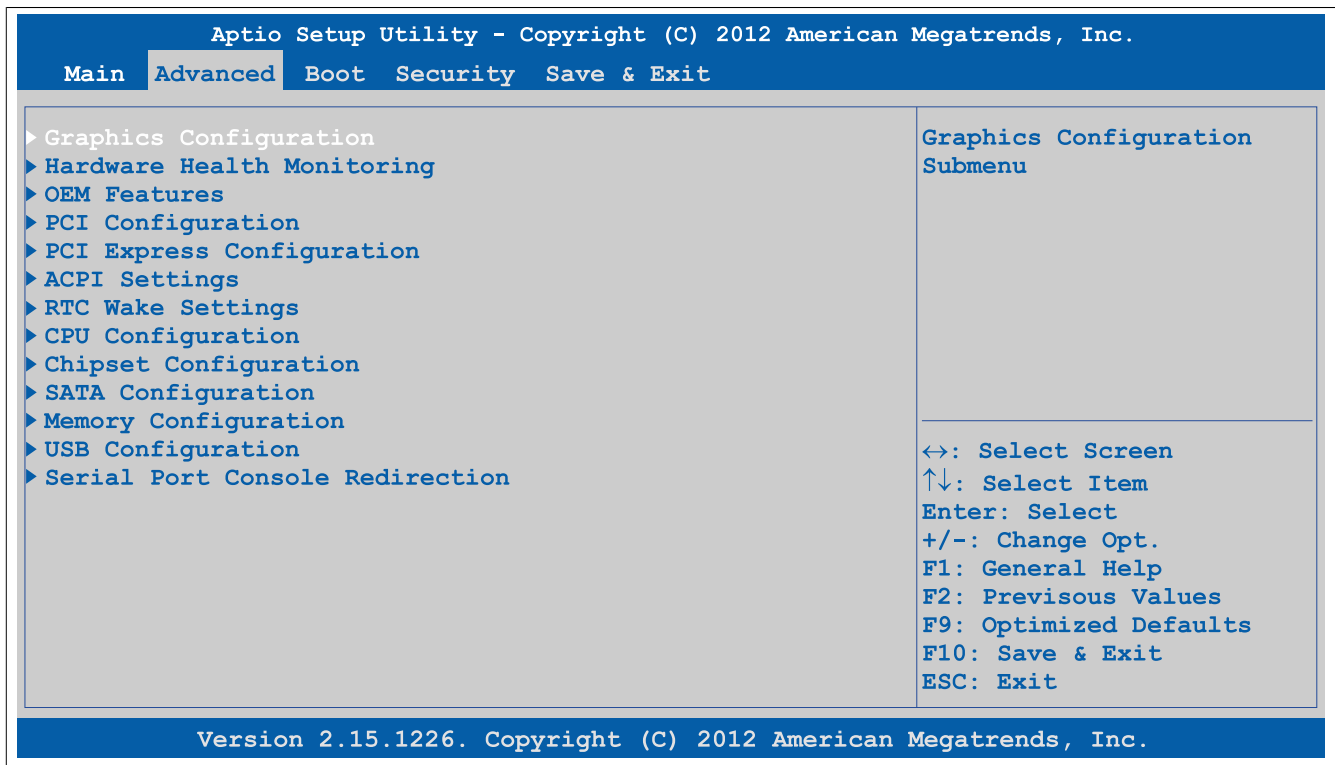


Figure 98: Advanced Übersicht

BIOS setting	Function	Configuration options	Effect
Graphics configuration	Configures graphics settings	Enter	Opens this submenu See "Graphics configuration" on page 209.
Hardware health monitoring	Displays the current voltage levels as well as the CPU and mainboard temperatures	Enter	Opens this submenu See "Hardware health monitoring" on page 211.
OEM features	Configures OEM features	Enter	Opens this submenu See "OEM features" on page 212.
PCI configuration	Configures PCI devices	Enter	Opens this submenu See "PCI configuration" on page 233.
PCI express configuration	Configures PCI Express devices	Enter	Opens this submenu See "PCI express configuration" on page 235.
ACPI settings	Configures ACPI settings	Enter	Opens this submenu See "ACPI settings" on page 241.
RTC wake settings	Configures the start time when switched off	Enter	Opens this submenu See "RTC wake settings" on page 242.
CPU configuration	Configures CPU settings	Enter	Opens this submenu See "CPU configuration" on page 243.
Chipset configuration	Configures chipset settings	Enter	Opens this submenu See "Chipset configuration" on page 246.
SATA configuration	Configures SATA settings	Enter	Opens this submenu See "SATA configuration" on page 248.
Memory configuration	Configures main memory settings	Enter	Opens this submenu See "Memory configuration" on page 251.
USB configuration	Configures USB settings	Enter	Opens this submenu See "USB configuration" on page 254.
Serial port console redirection	Configures the remote console	Enter	Opens this submenu See "Serial port console redirection" on page 257.

Table 175: Advanced - Overview

1.4.1 Graphics configuration

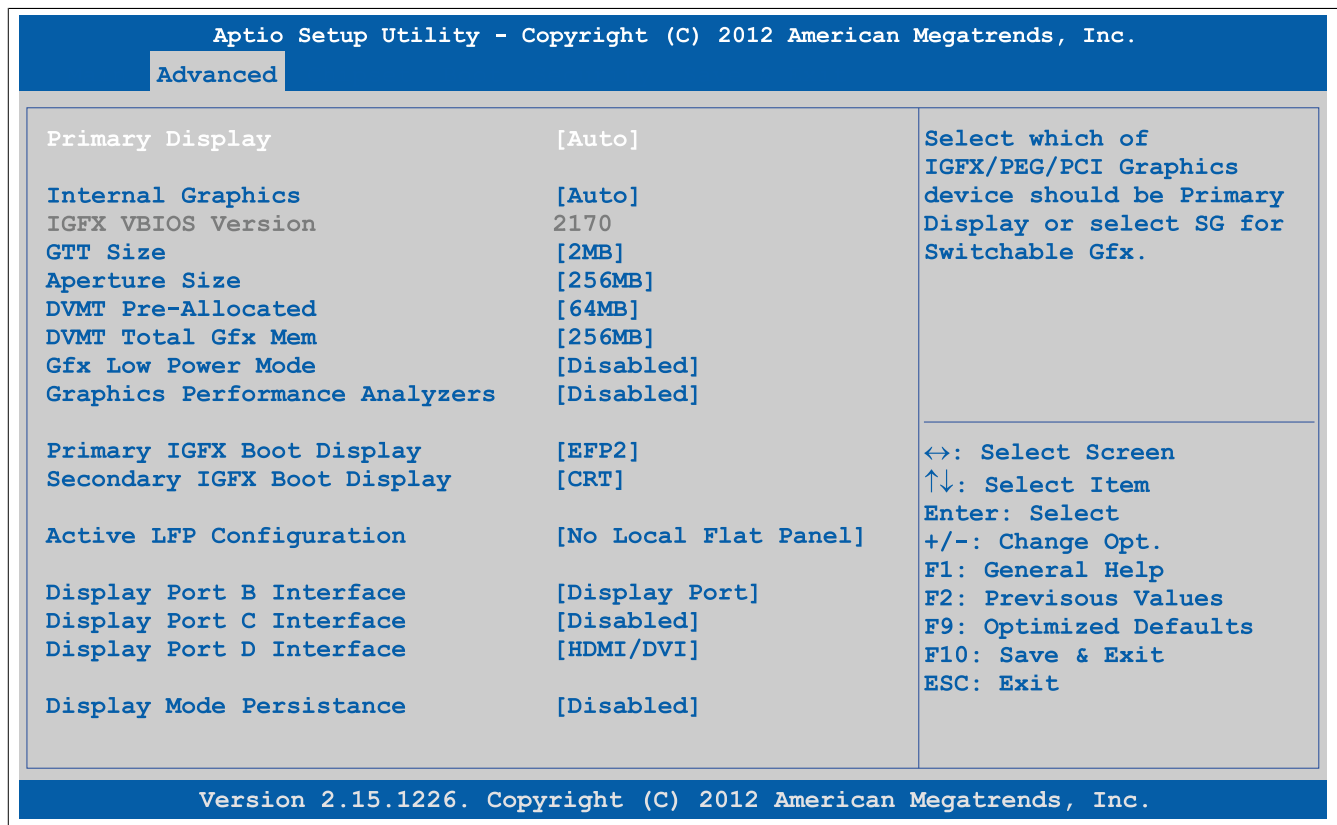


Figure 99: Advanced - Graphics Configuration

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	Enabled	Enables low power mode. The graphics controller does not operate at full speed.
		Disabled	Disables low power mode
	Information: This option can only be used for SFF.		
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 176: 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 Information: This option has no effect on the Automation PC 910.	No local flat panel	Does not use the LVDS channel
		Integrated LVDS	Uses the integrated LVDS channel
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
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: The monitor/panel interface can no longer be used when this setting is selected. This setting is not permitted for 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 remembers and can restore previous display connection 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 176: Advanced - Graphics configuration options

1.4.2 Hardware health monitoring

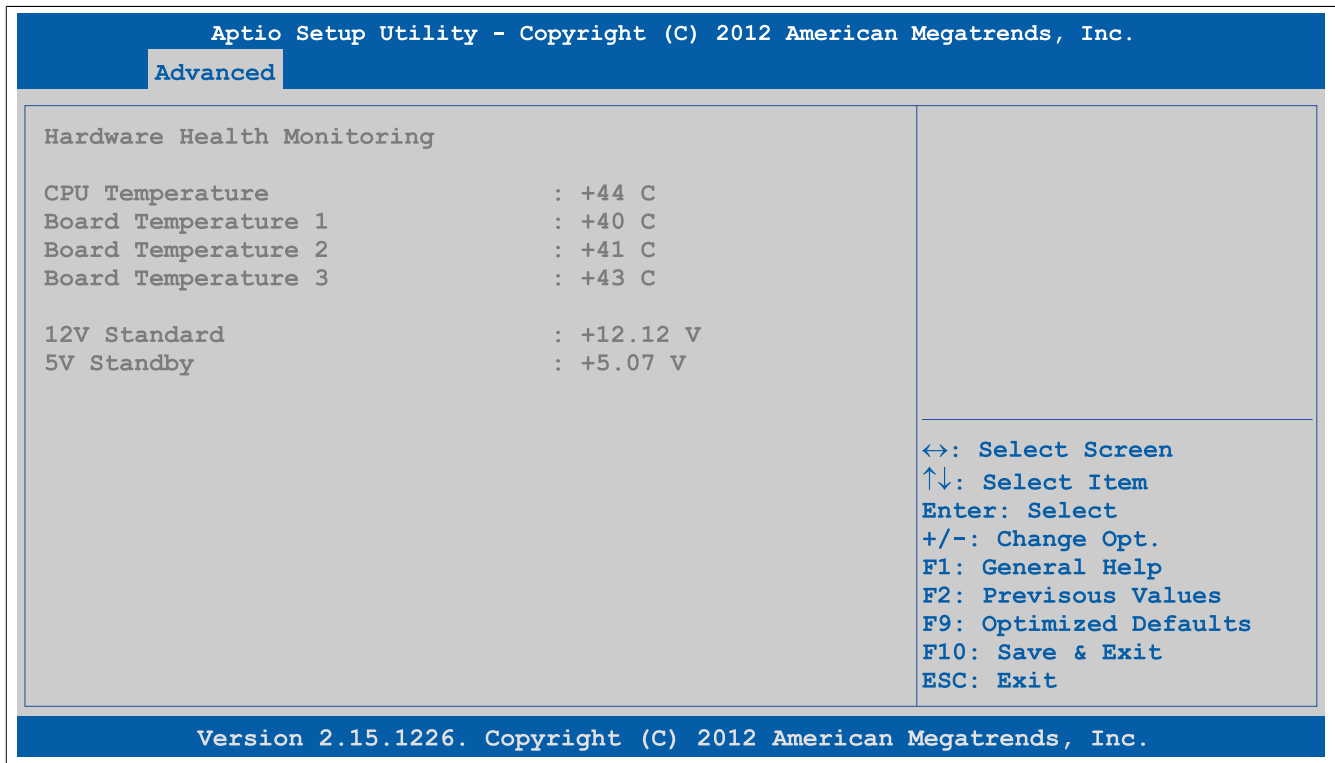


Figure 100: Advanced - Hardware Health Monitoring

BIOS setting	Function	Configuration options	Effect
CPU temperature	Displays the current temperature of the CPU sensor in °C	None	-
Board temperature 1	Displays the current temperature of board sensor 1 in °C	None	-
Board temperature 2	Displays the current temperature of board sensor 2 in °C	None	-
Board temperature 3	Displays the current temperature of board sensor 3 in °C	None	-
12 V (default)	Displays the current voltage of the 12 volt supply	None	-
5 V standby	Displays the current voltage of the 5 volt supply	None	-

Table 177: Advanced - Hardware health monitoring

1.4.3 OEM features

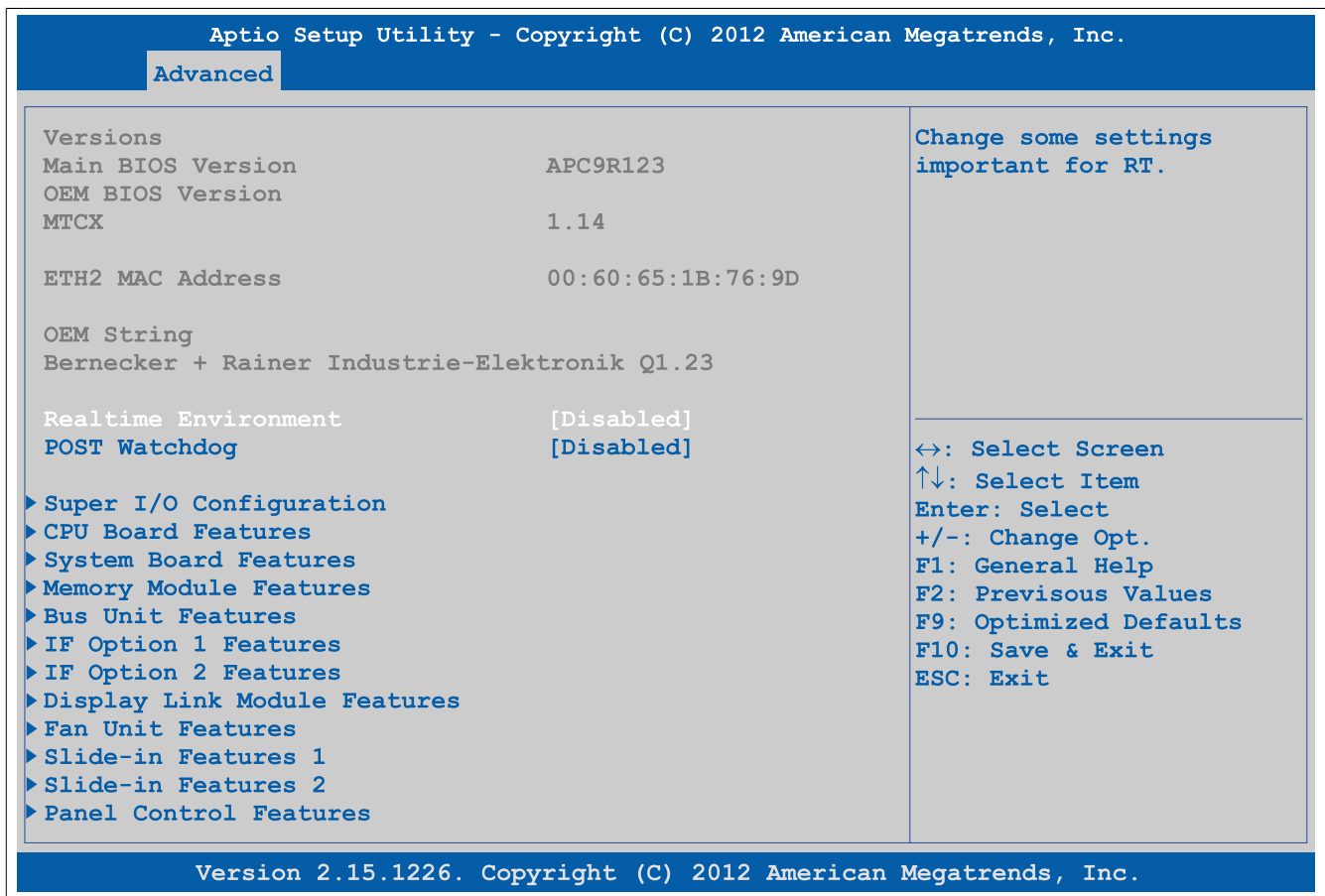


Figure 101: Advanced - OEM Features

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	-
ETH2 MAC address	Displays the assigned MAC address for the ETH2 interface	None	-
Realtime 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.
POST watchdog	Option for configuring the POST watchdog. This starts at the beginning of POST and stops at the end of POST.	Disabled	Disables this option
		30 sec	Delay time until the POST watchdog is active
		1 min	
		2 min	
		5 min	
		10 min	
		30 min	
Super I/O configuration	Configures special interface settings	Enter	Opens this submenu See "Super I/O configuration" on page 213.
CPU board features	Displays device-specific information for the CPU board	Enter	Opens this submenu See "CPU board features" on page 214.
System board features	Displays device-specific information for the system unit	Enter	Opens this submenu See "System board features" on page 216.
Memory module features	Displays device-specific information for the main memory	Enter	Opens this submenu See "Memory module features" on page 219.
Bus unit features	Displays device-specific information for the bus unit	Enter	Opens this submenu See "Bus unit features" on page 220.
IF option 1 features ¹⁾	Displays device-specific information for interface option 1	Enter	Opens this submenu See "IF option 1 features" on page 221.
IF option 2 features ¹⁾	Displays device-specific information for interface option 2	Enter	Opens this submenu See "IF option 2 features" on page 223.
Display link module features ¹⁾	Displays device-specific information for the monitor/panel option	Enter	Opens this submenu See "Display link module features" on page 224.

Table 178: Advanced - OEM features screen

BIOS setting	Function	Configuration options	Effect
Fan unit features ²⁾	Displays device-specific information for the fan kit	Enter	Opens this submenu See "Fan unit features" on page 226.
Slide-in features 1 ³⁾	Displays device-specific information for slide-in drive 1	Enter	Opens this submenu See "Slide-in 1 features" on page 228.
Slide-in features 2 ³⁾	Displays device-specific information for slide-in drive 2	Enter	Opens this submenu See "Slide-in 2 features" on page 230.
Panel control features	Displays device-specific information for the connected panel	Enter	Opens this submenu See "Panel control features" on page 231.

Table 178: Advanced - OEM features screen

- 1) This option is only shown if the corresponding option is installed in the system unit.
 2) This option is only shown if a fan kit is installed in the system unit.
 3) This option is only shown if a slide-in drive is installed in the system unit.

1.4.3.1 Super I/O configuration

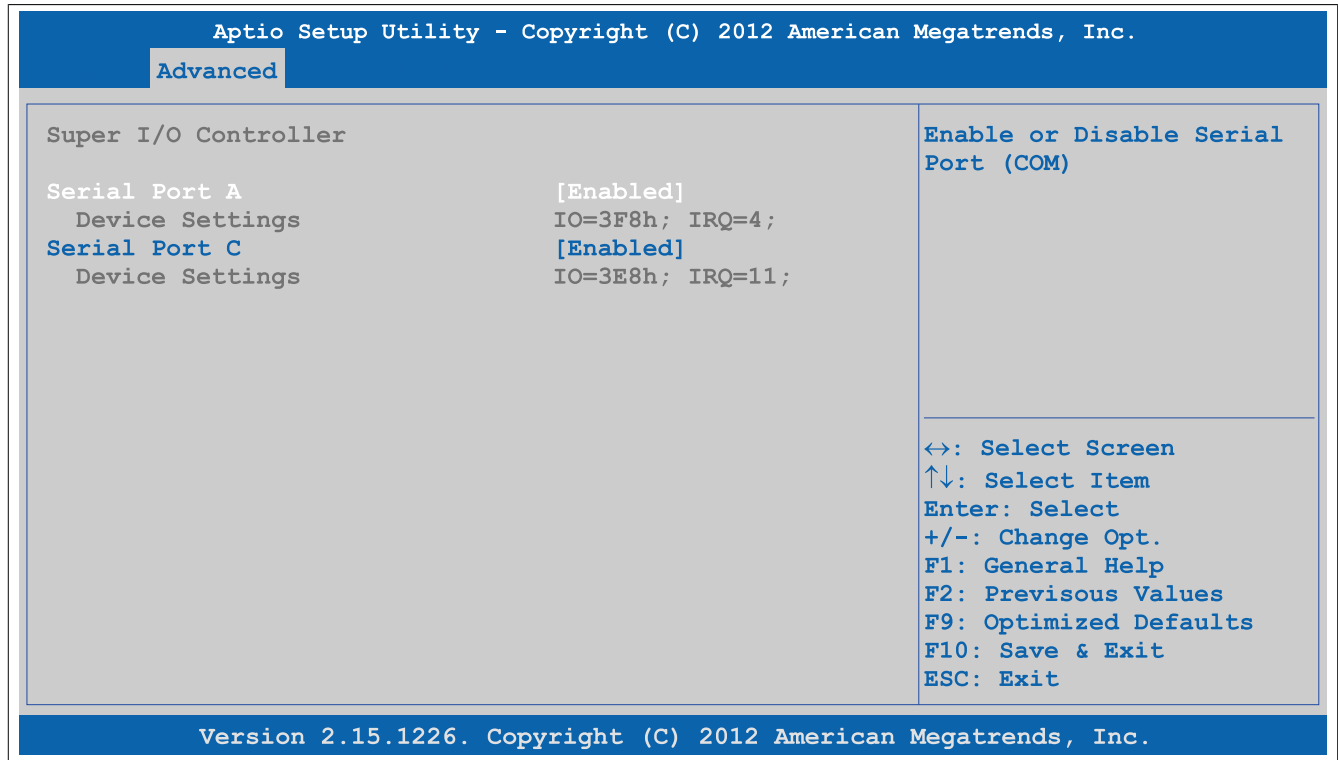


Figure 102: Advanced - OEM Features - Super I/O Configuration

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 ¹⁾	Setting for the monitor/panel option	Enabled	Enables this interface
		Disabled	Disables this interface
Device settings	Displays the I/O address and interrupt for the monitor/panel option	None	-
Serial port C	Setting for the monitor/panel interface	Enabled	Enables this interface
		Disabled	Disables this interface
Device settings	Displays the I/O address and interrupt for the monitor/panel interface	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 179: Advanced - OEM features - Super I/O configuration - Configuration options

- 1) This option is only shown if the corresponding option is installed in the system unit.

1.4.3.2 CPU board features

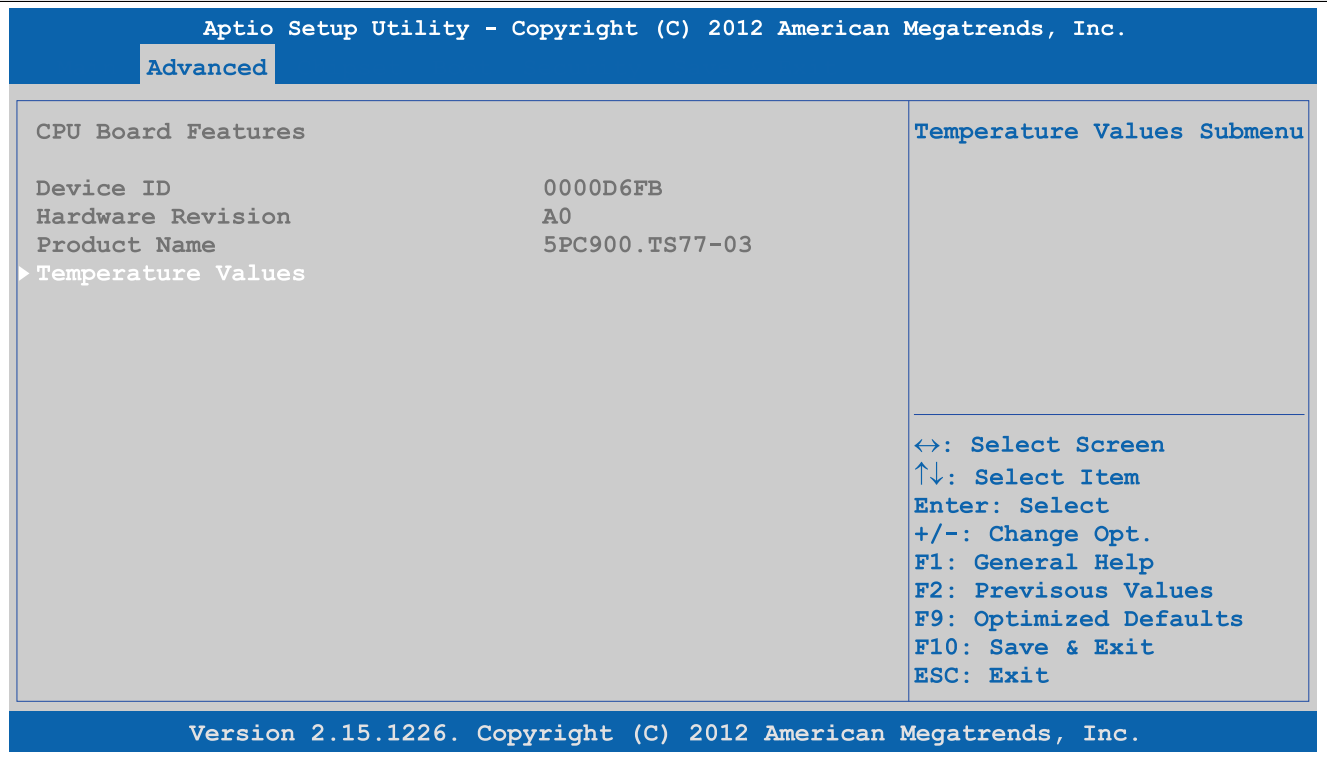


Figure 103: Advanced - OEM Features - CPU Board Features

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 215.

Table 180: Advanced - OEM features - CPU board features

1.4.3.2.1 Temperature values

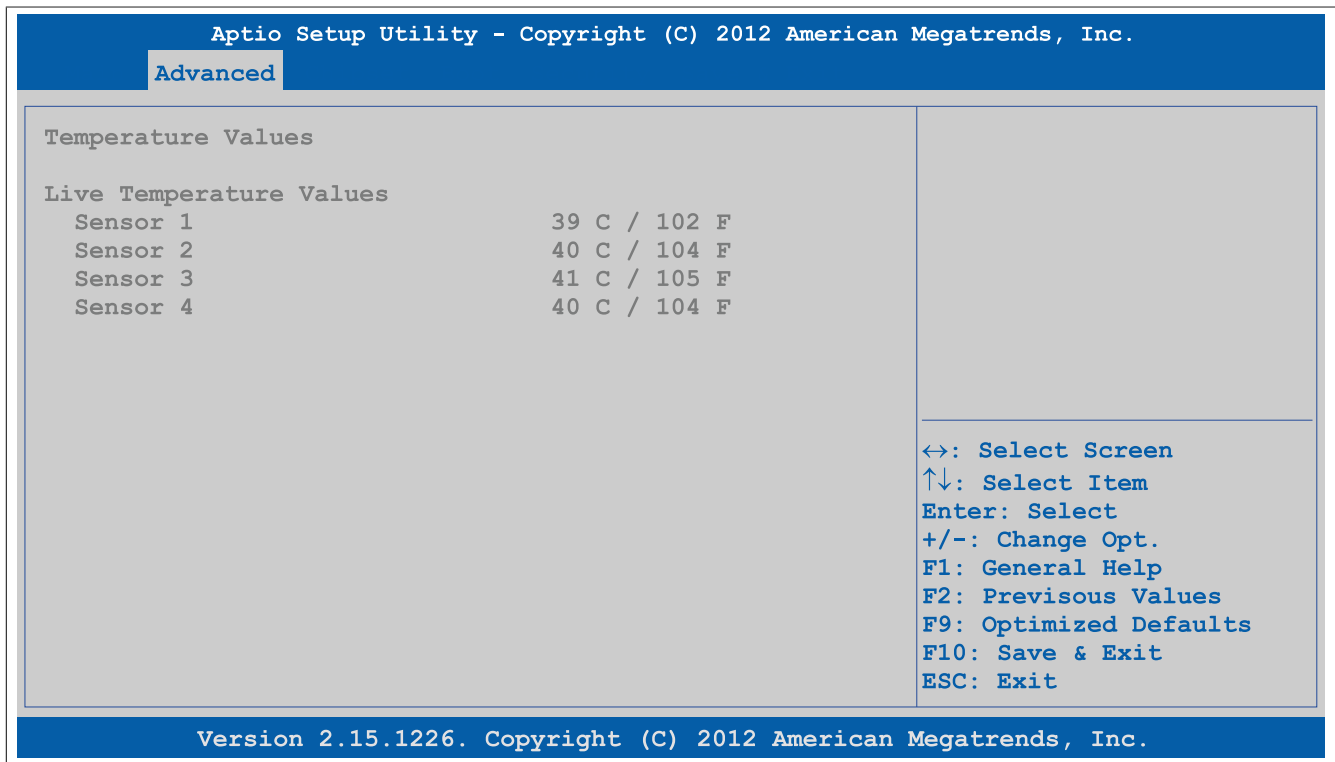


Figure 104: Advanced - OEM Features - CPU Board Features - Temperature Values

BIOS setting	Function	Configuration options	Effect
Sensor 1	Displays the current temperature of sensor 1 (board controller) in °C and °F	None	-
Sensor 2	Displays the current temperature of sensor 2 (CPU) in °C and °F	None	-
Sensor 3	Displays the current temperature of sensor 3 (SO-DIMM 1) in °C and °F ¹⁾	None	-
Sensor 4	Displays the current temperature of sensor 4 (SO-DIMM 2) in °C and °F ¹⁾	None	-

Table 181: Advanced - OEM features - CPU board features - Temperature values

- 1) A valid temperature is only provided if the module is connected and equipped with a temperature sensor. Otherwise, the value 0 is output in the ADI Control Center and BIOS; an alarm is also output in the ADI Control Center.

1.4.3.3 System board features

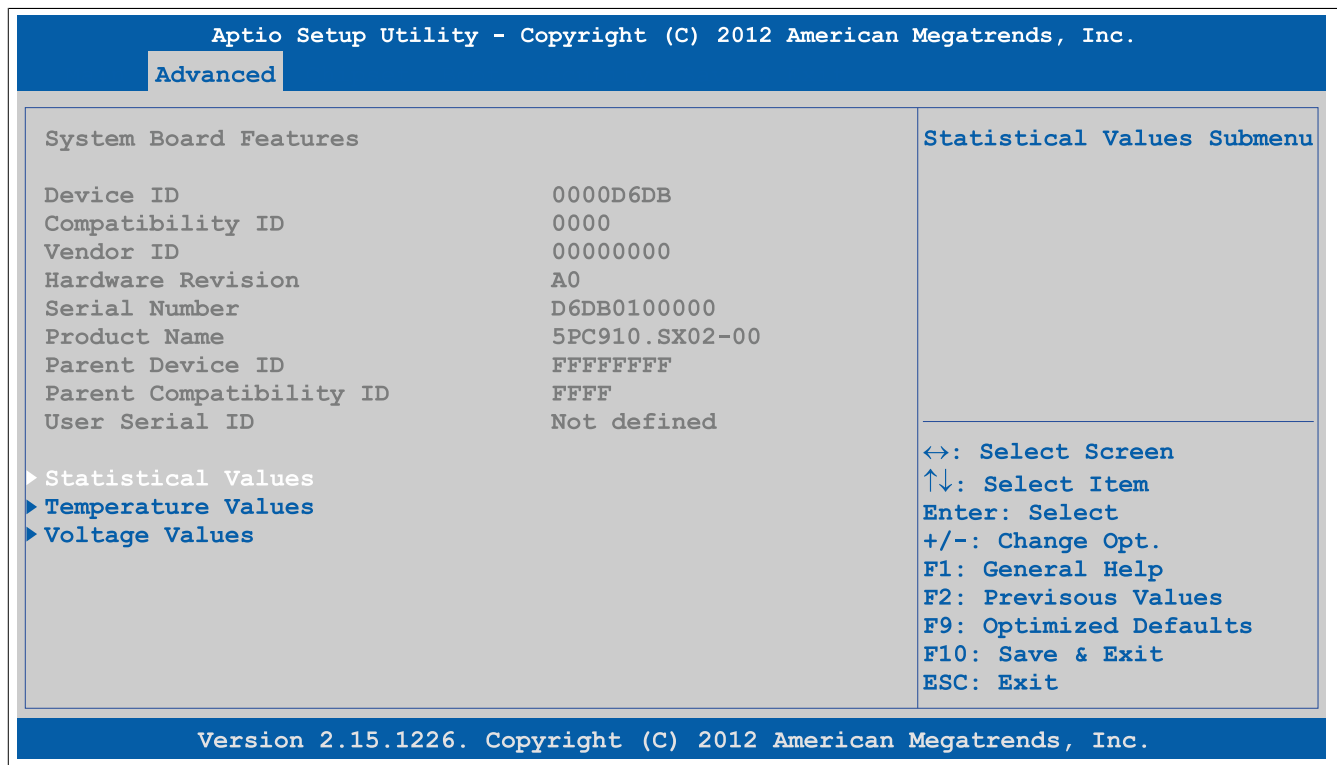


Figure 105: Advanced - OEM Features - System Board Features

BIOS setting	Function	Configuration options	Effect
Device ID	Displays the device ID of the system 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 system 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 217.
Temperature values	Displays current temperature values	Enter	Opens this submenu See "Temperature values" on page 217.
Voltage control	Displays current battery properties	Enter	Opens this submenu See "Voltage values" on page 218.

Table 182: Advanced - OEM features - System board features

1.4.3.3.1 Statistical values

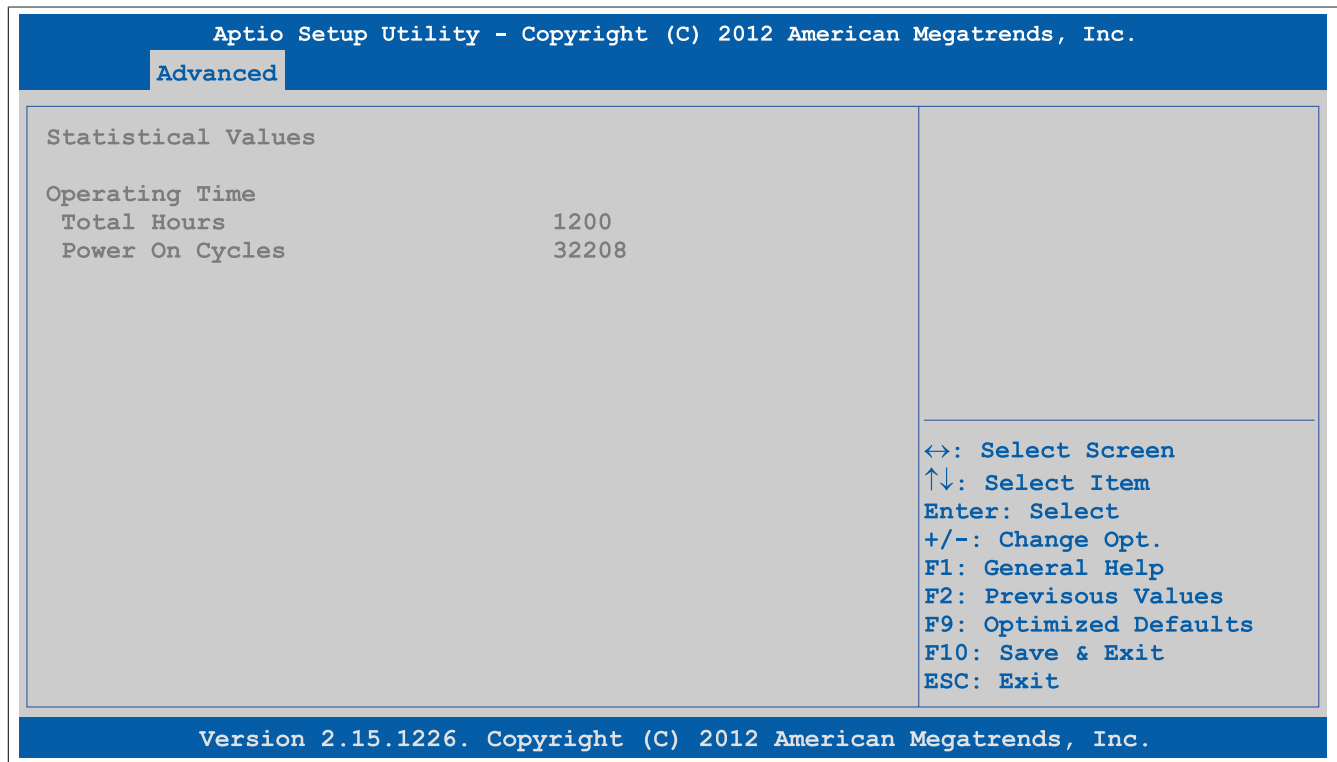


Figure 106: Advanced - OEM Features - System Board Features - Statistical Values

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 183: Advanced - OEM features - System board features - Statistical values

1.4.3.3.2 Temperature values

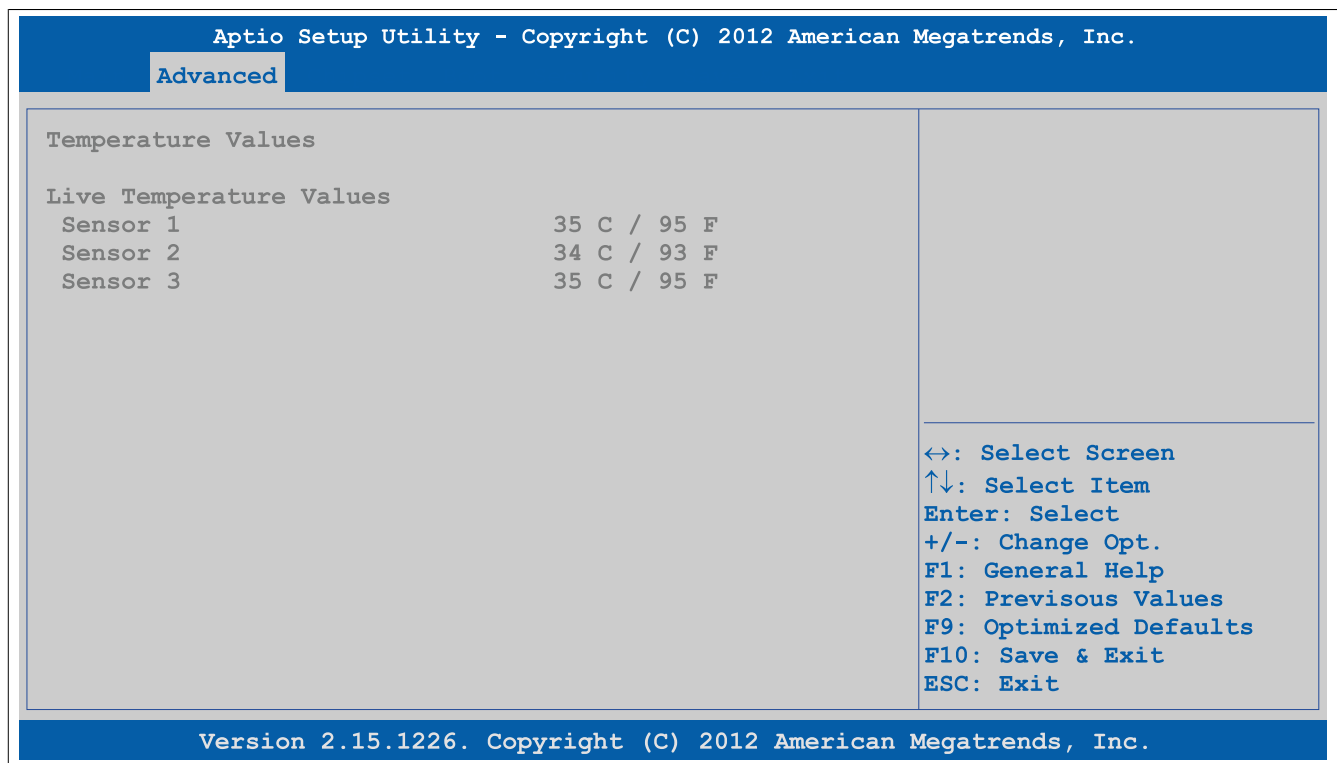


Figure 107: Advanced - OEM Features - System Board Features - Temperature Values

BIOS setting	Function	Configuration options	Effect
Sensor 1	Displays the current temperature of sensor 1 (board power supply) in °C and °F	None	-
Sensor 2	Displays the current temperature of sensor 2 (near slide-in compact slot) in °C and °F	None	-
Sensor 3	Displays the current temperature of sensor 3 (near main memory) in °C and °F	None	-

Table 184: Advanced - OEM features - System board features - Temperature values

1.4.3.3.3 Voltage values

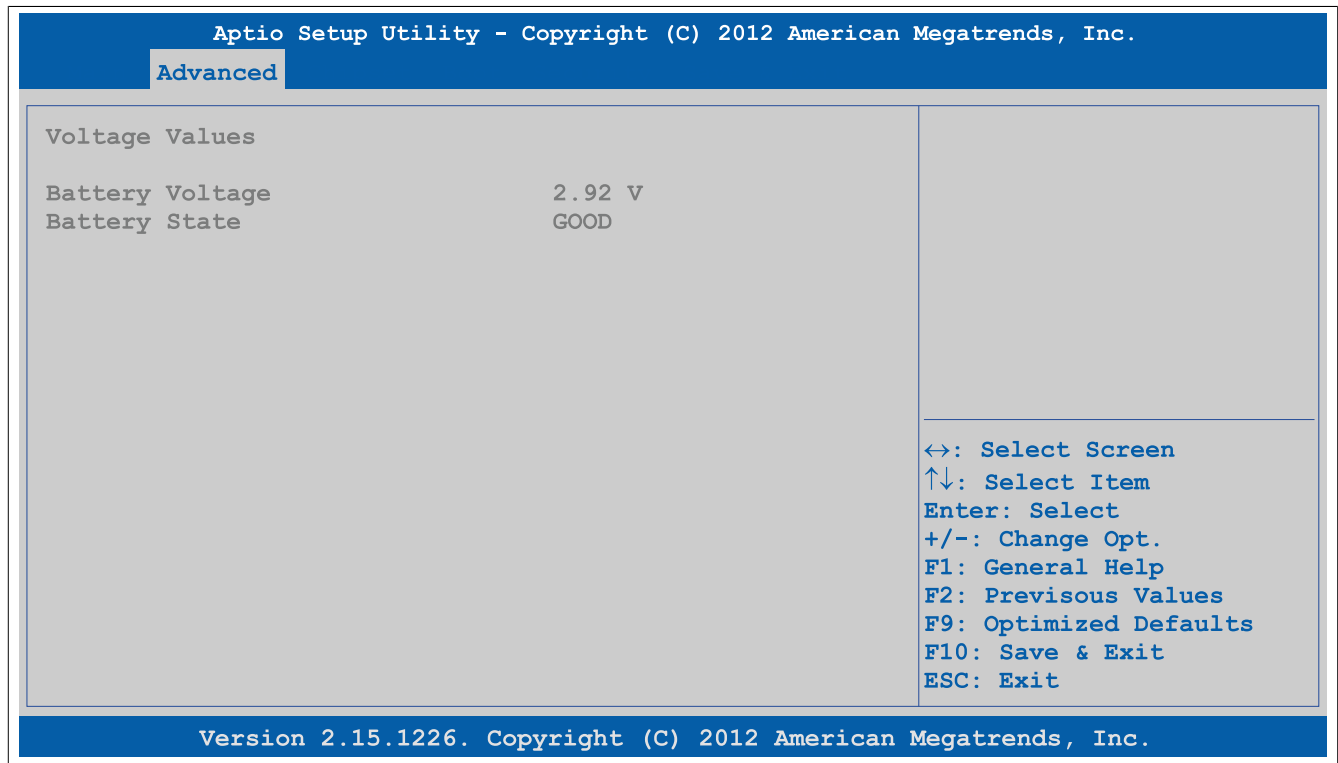


Figure 108: Advanced - OEM Features - System Board Features - Voltage Values

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 185: Advanced - OEM features - System board features - Voltage values

1.4.3.4 Memory module features

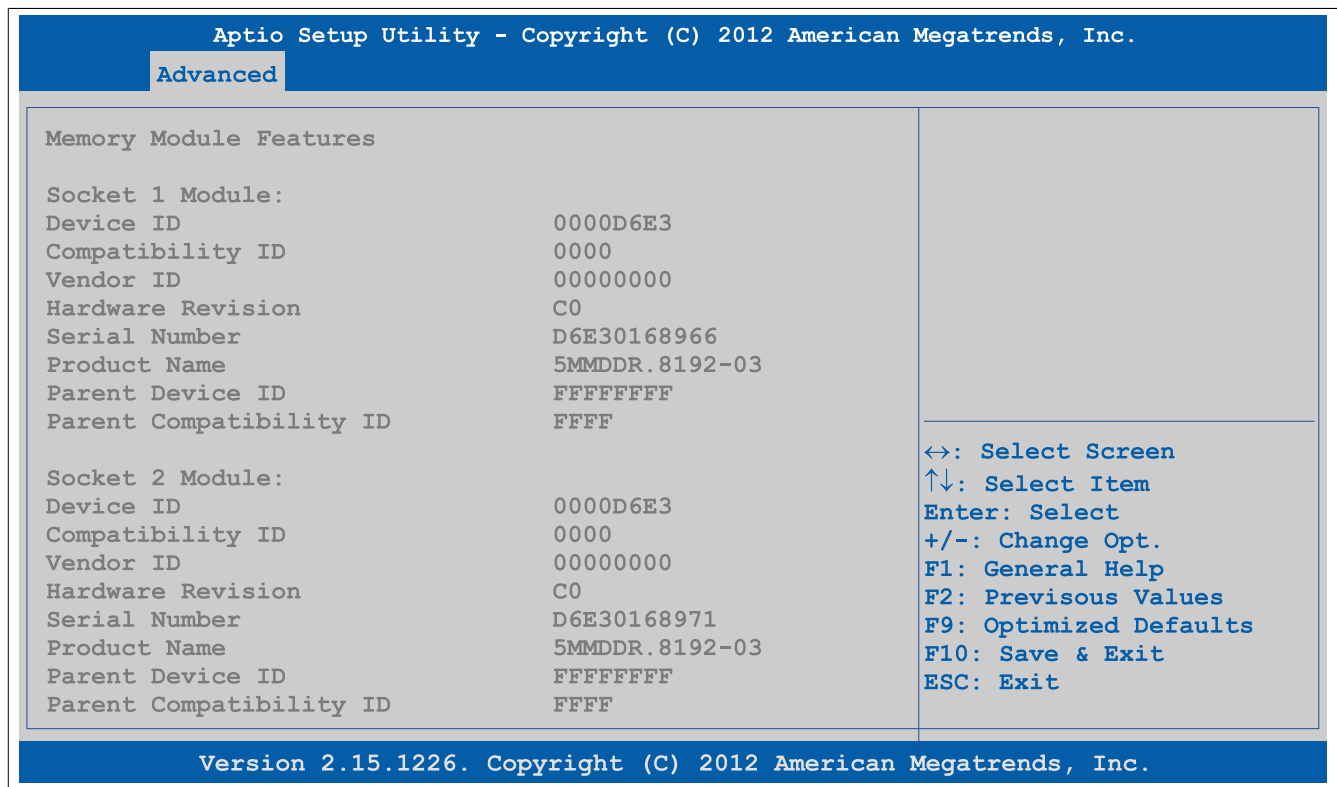


Figure 109: Advanced - OEM Features - Memory Module Features

BIOS setting	Function	Configuration options	Effect
Socket 1 module			
Device ID	Displays the device ID of the memory module	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 memory module	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	-
Socket 2 module			
Device ID	Displays the device ID of the memory module	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 memory module	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	-

Table 186: Advanced - OEM features - Memory module features

1.4.3.5 Bus unit features



Figure 110: 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 221.

Table 187: Advanced - OEM features - Bus unit features

1.4.3.5.1 Statistical values

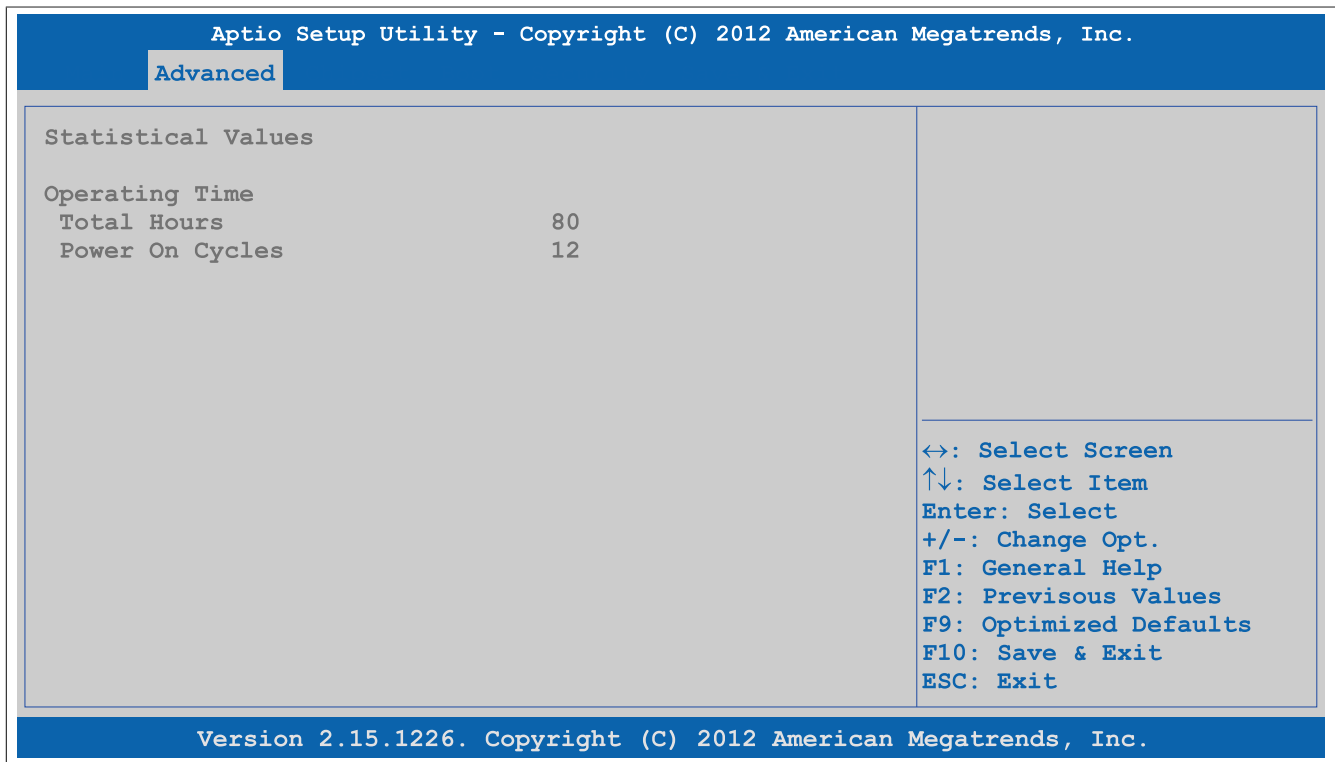


Figure 111: Advanced - OEM Features - Bus Unit Features - Statistical Values

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 188: Advanced - OEM features - Bus unit features - Statistical values

1.4.3.6 IF option 1 features



Figure 112: 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 222.

Table 189: Advanced - OEM features - IF option 1 features

1.4.3.6.1 Statistical values

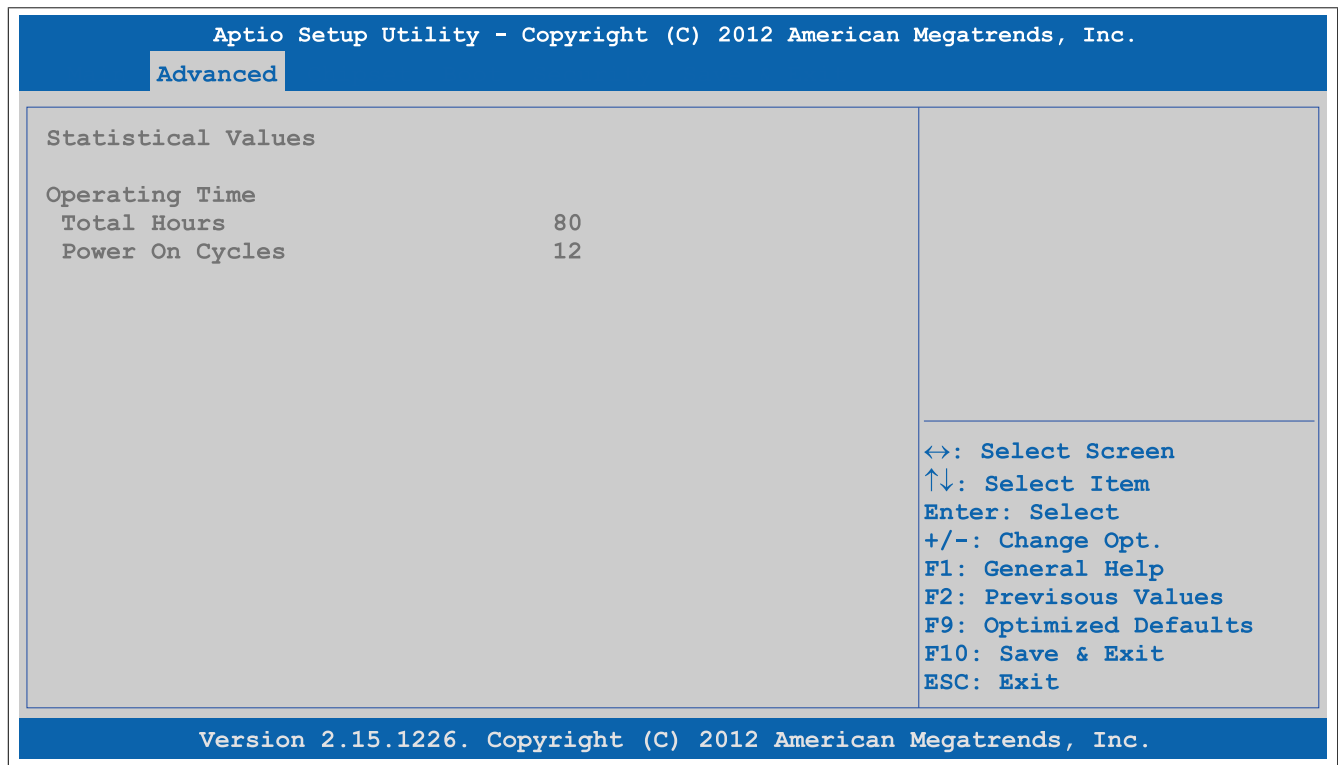


Figure 113: Advanced - OEM features - IF option 1 features - Statistical values

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 190: Advanced - OEM features - IF option 1 features - Statistical values

1.4.3.7 IF option 2 features

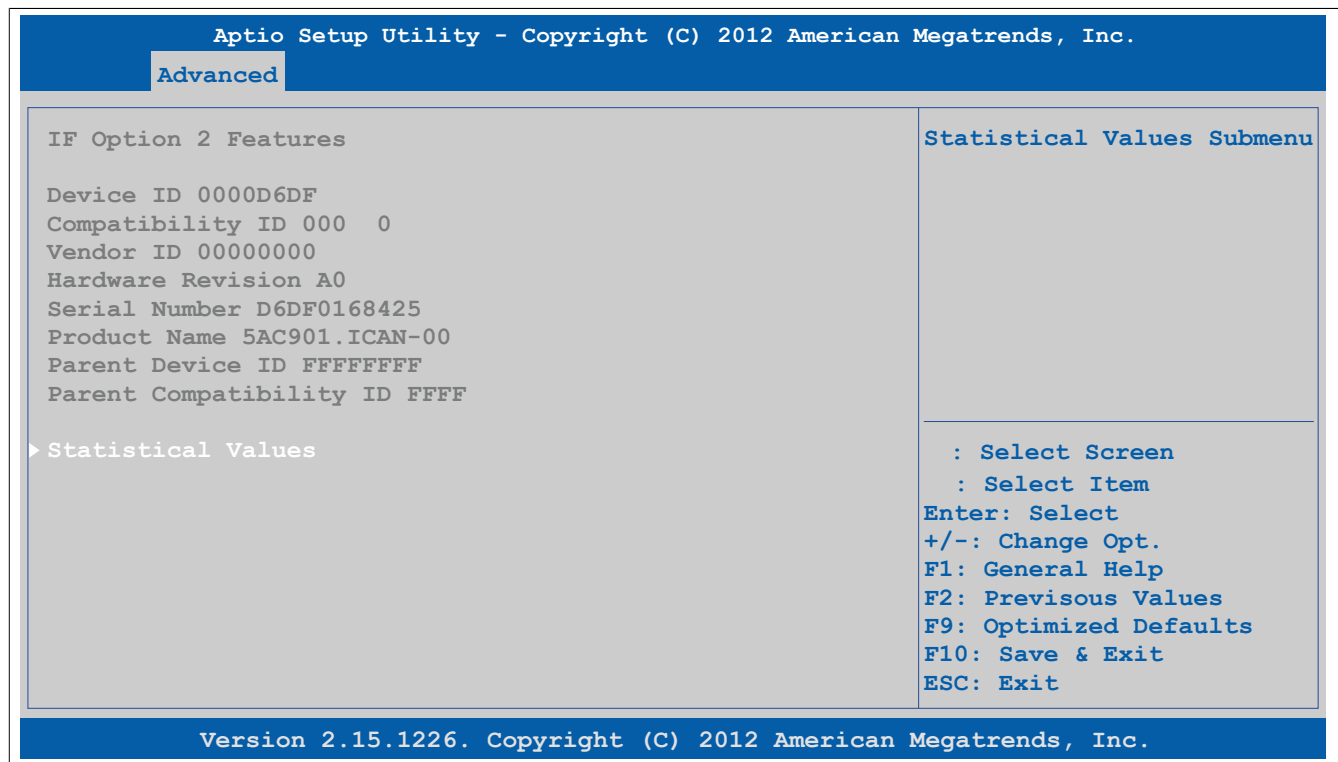


Figure 114: Advanced - OEM features - IF option 2 features

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 224.

Table 191: Advanced - OEM features - IF option 2 features

1.4.3.7.1 Statistical values

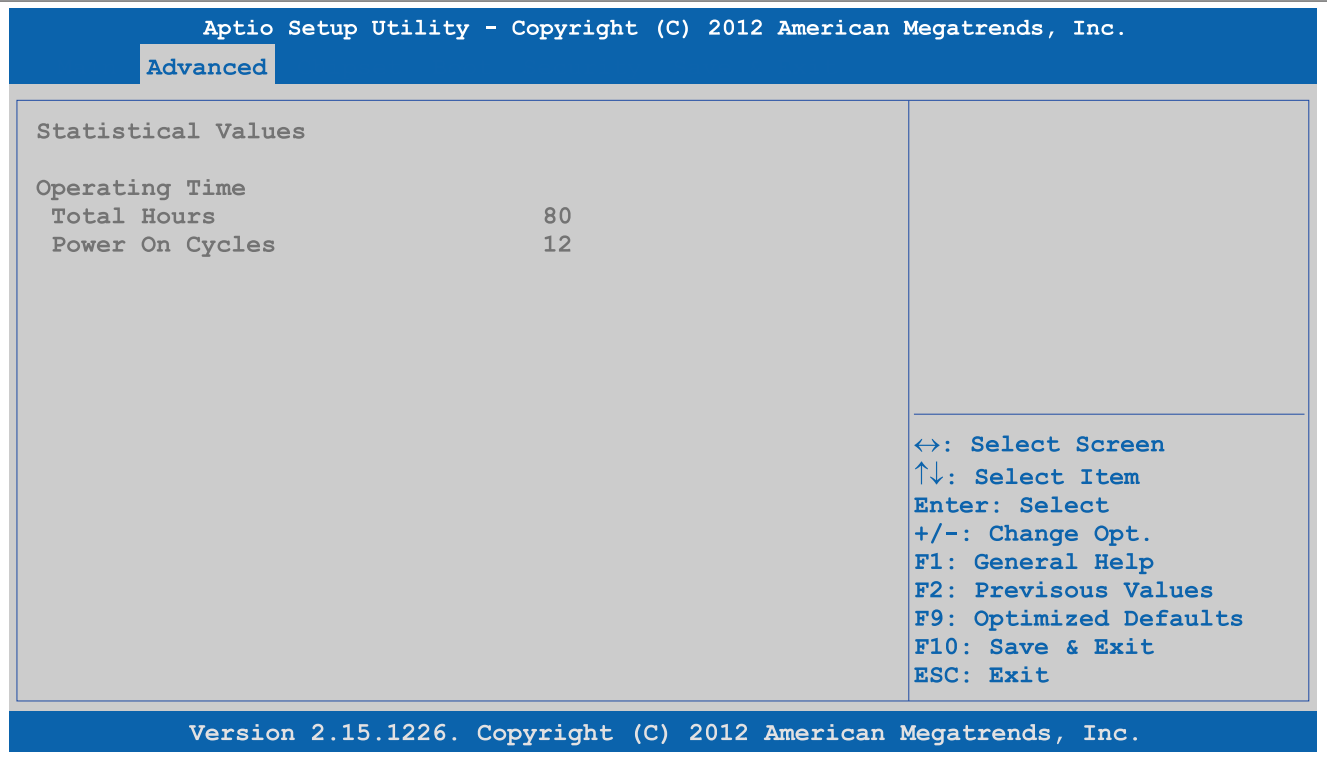


Figure 115: Advanced - OEM features - IF option 2 features - Statistical values

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 192: Advanced - OEM features - IF option 2 features - Statistical values

1.4.3.8 Display link module features

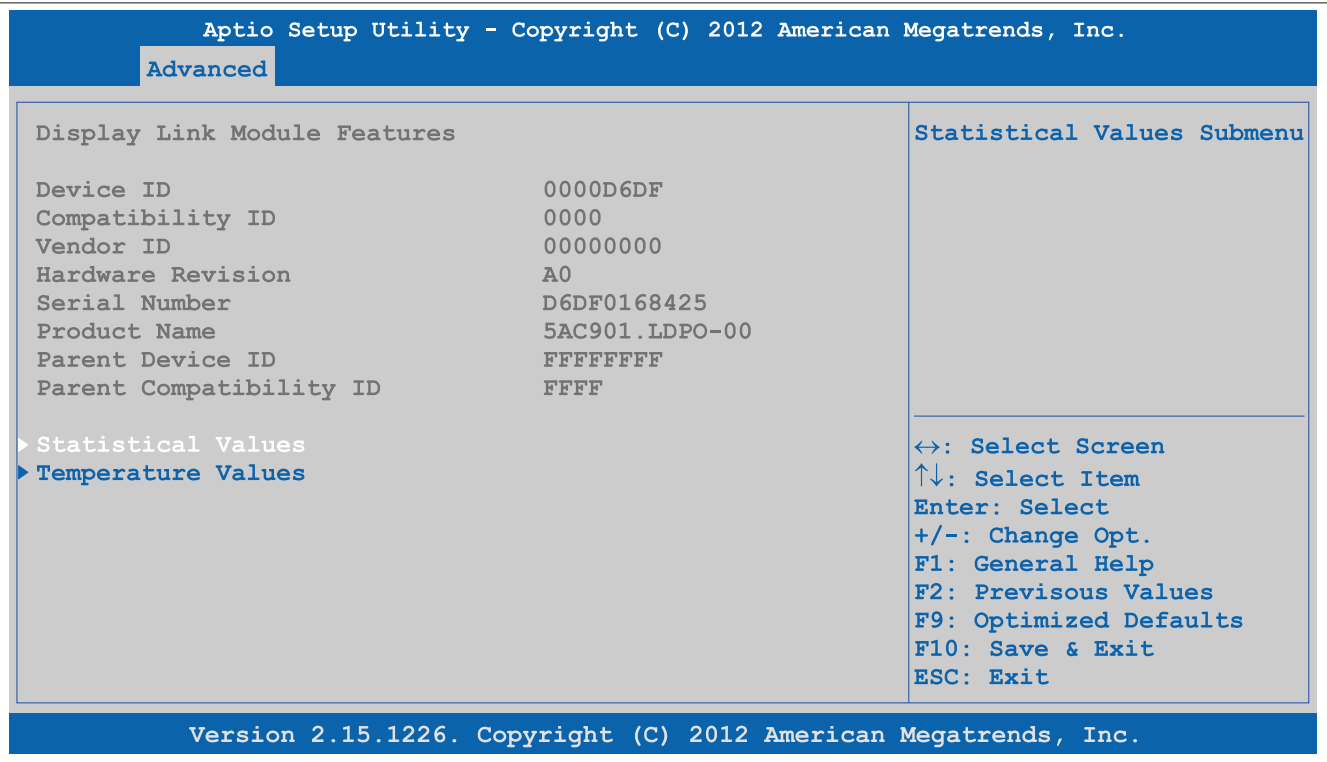


Figure 116: Advanced - OEM features - Display link module features

BIOS setting	Function	Configuration options	Effect
Device ID	Displays the device ID of the monitor/panel option	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 monitor/panel option	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 225.
Temperature values	Displays current temperature values	Enter	Opens this submenu See "Temperature values" on page 226.

Table 193: Advanced - OEM features - Display link module features

1.4.3.8.1 Statistical values

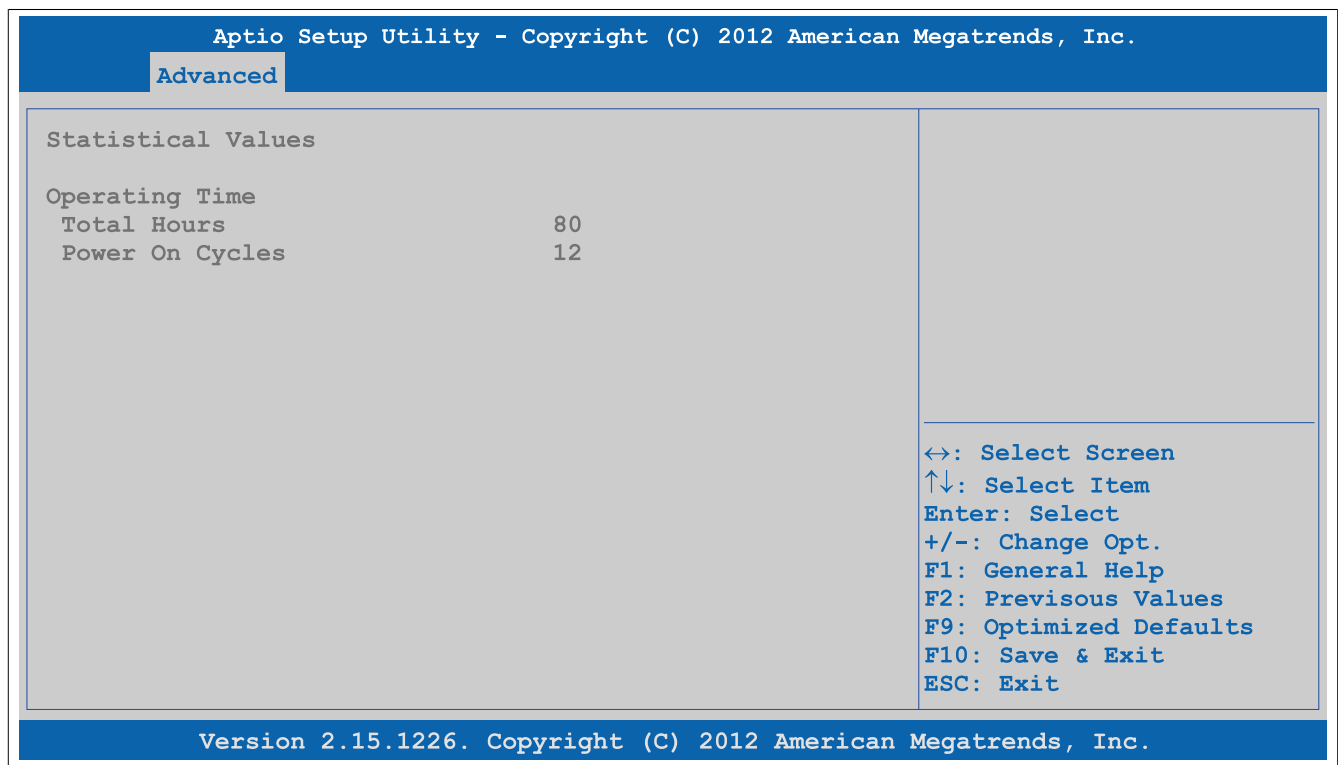


Figure 117: Advanced - OEM features - Display link module features - Statistical values

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 194: Advanced - OEM features - Display link module features - Statistical values

1.4.3.8.2 Temperature values

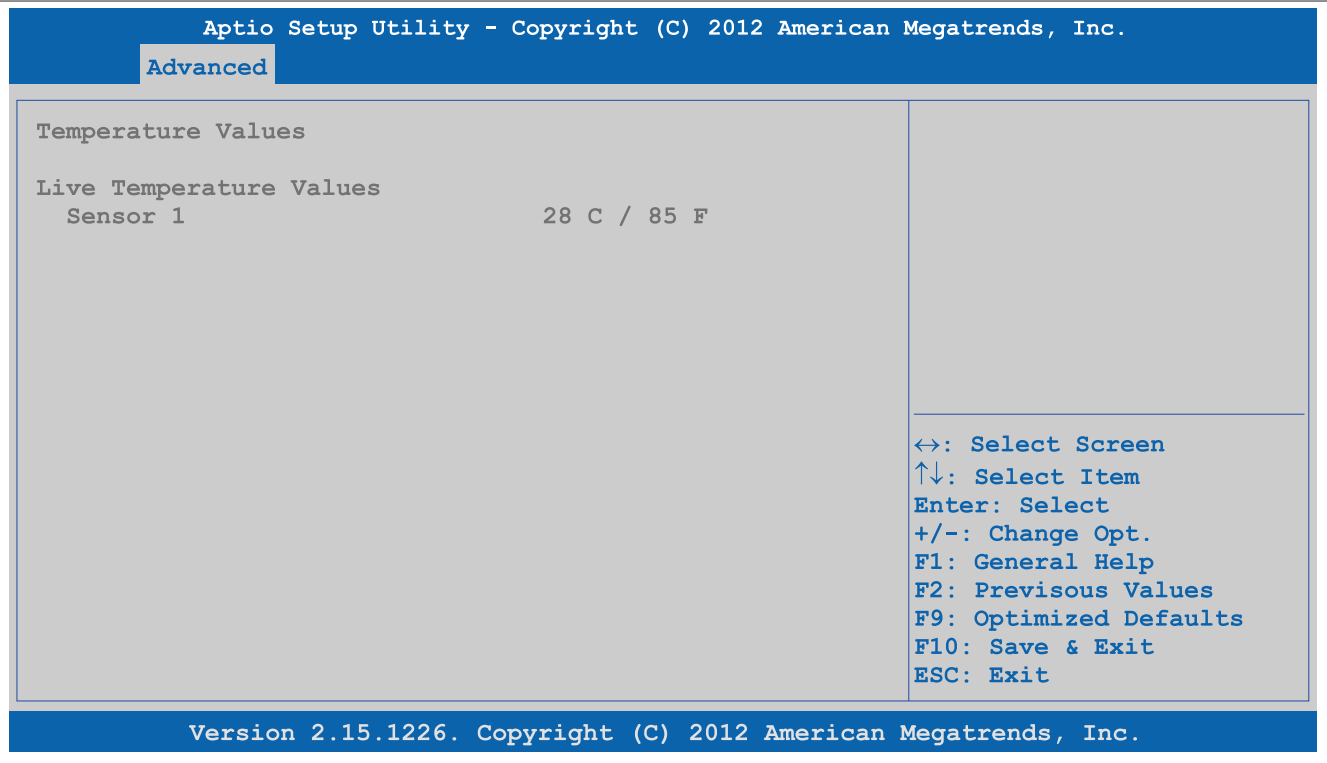


Figure 118: Advanced - OEM features - Display link module features - Temperature values

BIOS setting	Function	Configuration options	Effect
Sensor 1	Displays the current temperature of sensor 1 (monitor/panel option) in °C and °F	None	-

Table 195: Advanced - OEM features - Display link module features - Temperature values

1.4.3.9 Fan unit features

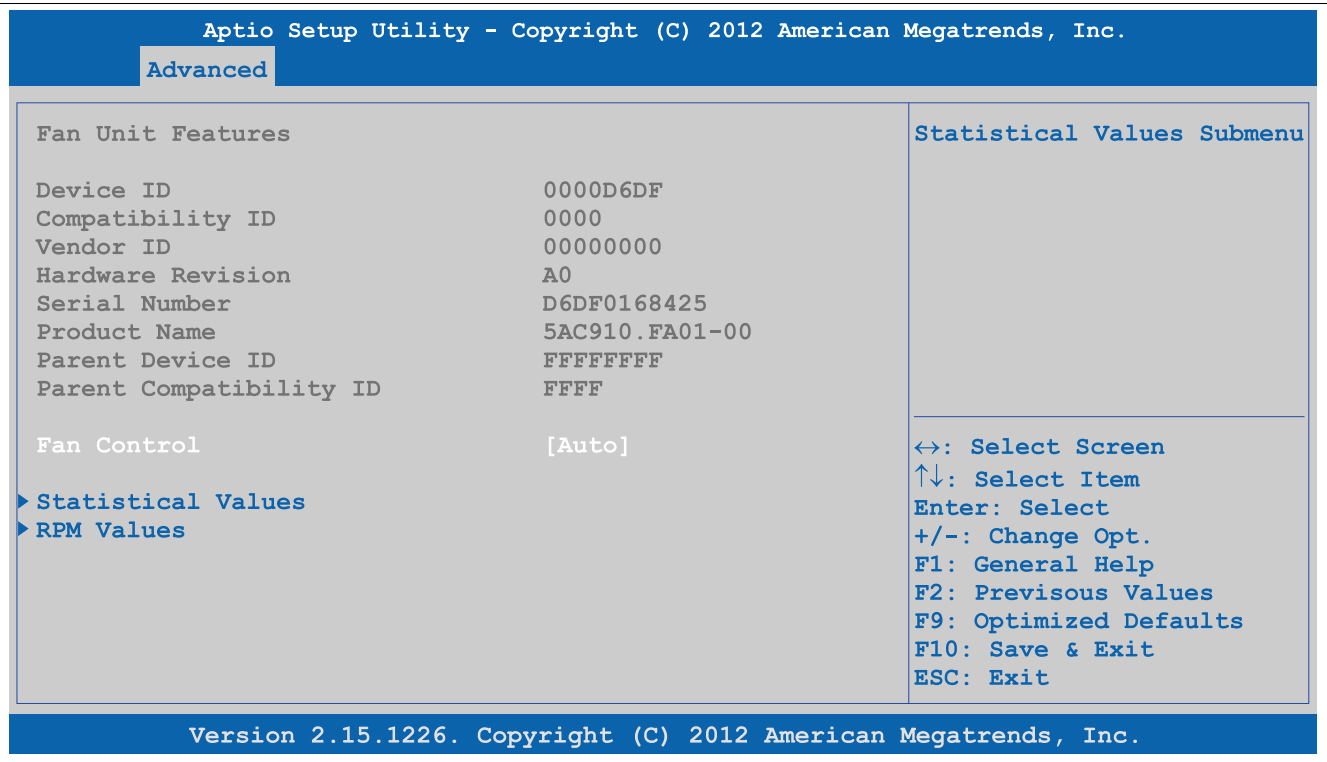


Figure 119: Advanced - OEM features - Fan unit features

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	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 227.
RPM values	Displays the speed (in rpm) of the individual fans in the fan kit	Enter	Opens this submenu See "RPM values" on page 228.

Table 196: Advanced - OEM features - Fan unit features

1.4.3.9.1 Statistical values

Aptio Setup Utility - Copyright (C) 2012 American Megatrends, Inc.	
Advanced	
Statistical Values Fan 1 Total Hours 80 Power On Cycles 12 Fan 2 Total Hours 80 Power On Cycles 12 Fan 3 Total Hours 80 Power On Cycles 12 Fan 4 Total Hours 80 Power On Cycles 12	⇐⇒: Select Screen ↑↓: Select Item Enter: Select +/-: Change Opt. F1: General Help F2: Previous Values F9: Optimized Defaults F10: Save & Exit ESC: Exit
Version 2.15.1226. Copyright (C) 2012 American Megatrends, Inc.	

Figure 120: 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 197: Advanced - OEM features - Fan unit features - Statistical values

1.4.3.9.2 RPM values

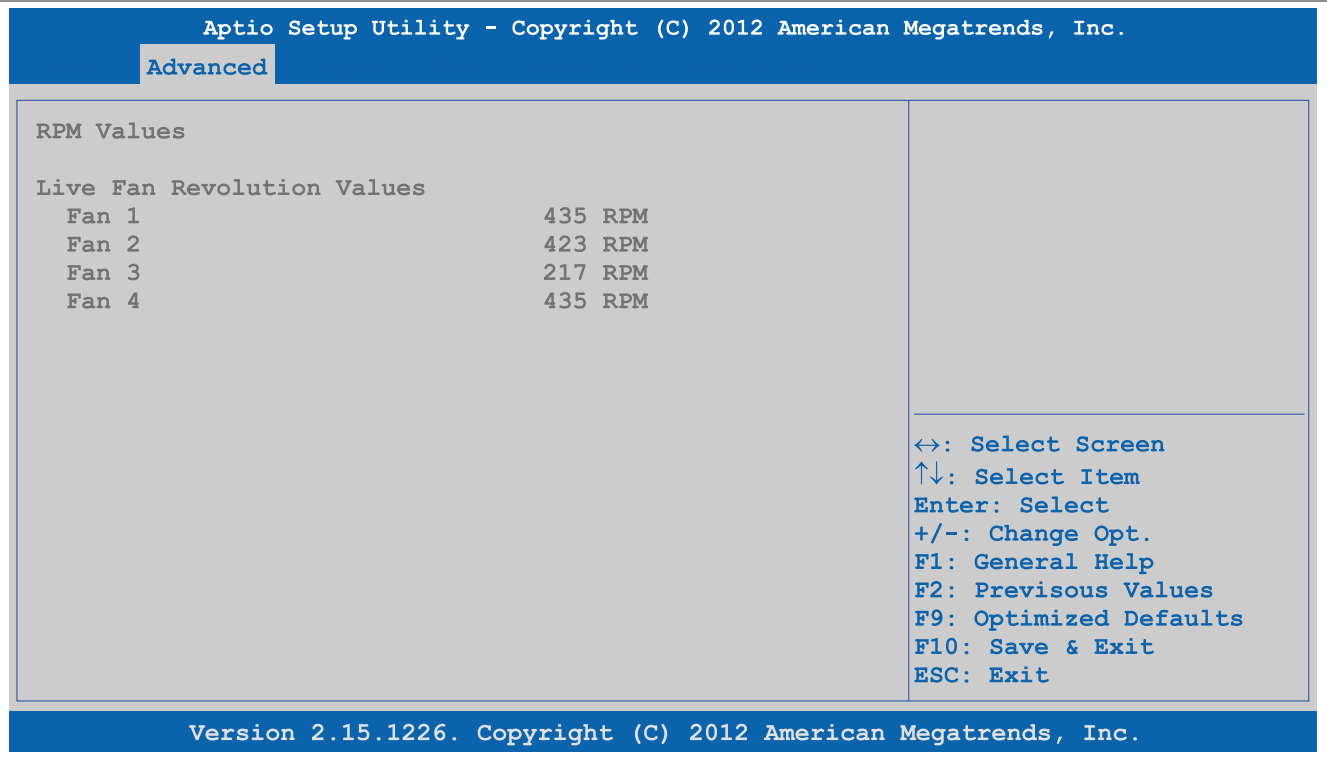


Figure 121: Advanced - OEM features - Fan unit features - RPM values

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 198: Advanced - OEM features - Fan unit features - RPM values

1.4.3.10 Slide-in 1 features

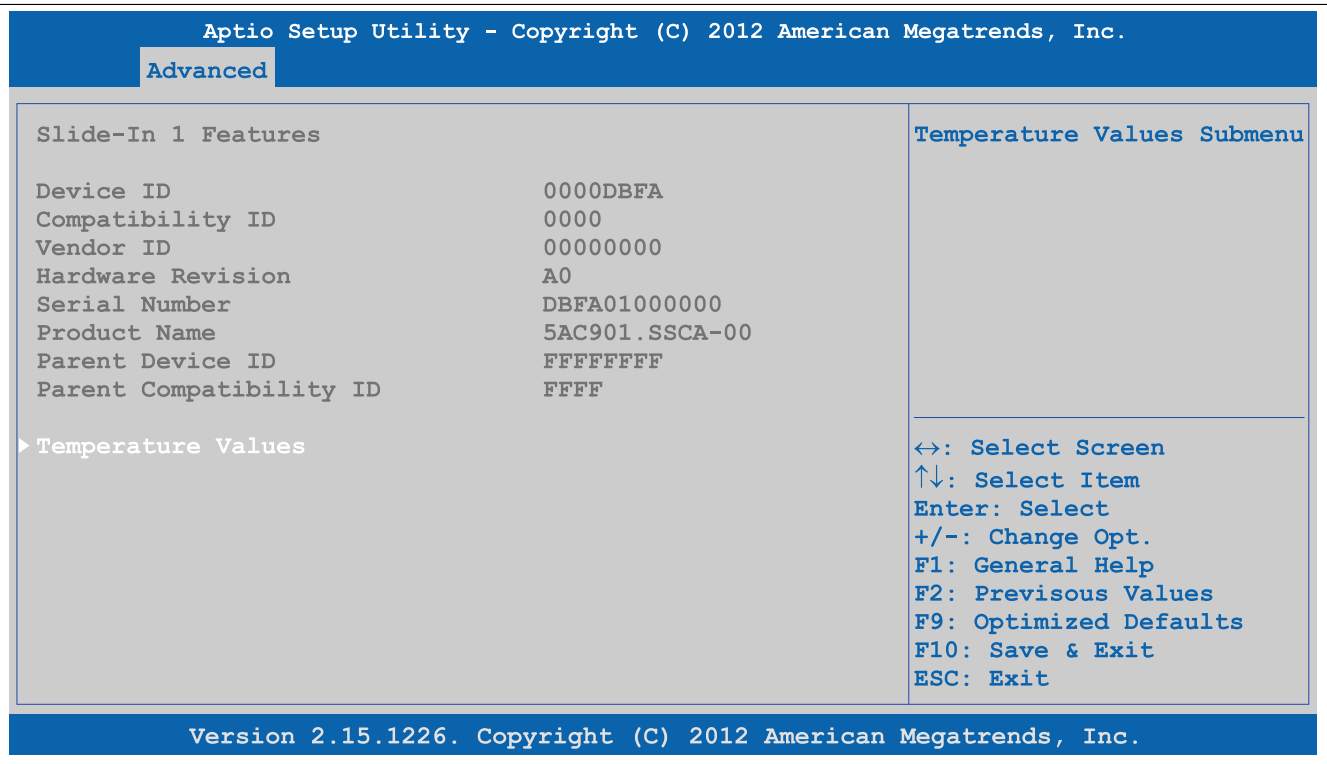


Figure 122: Advanced - OEM features - Slide-in 1 features

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 229.

Table 199: Advanced - OEM features - Slide-in 1 features

1.4.3.10.1 Temperature values

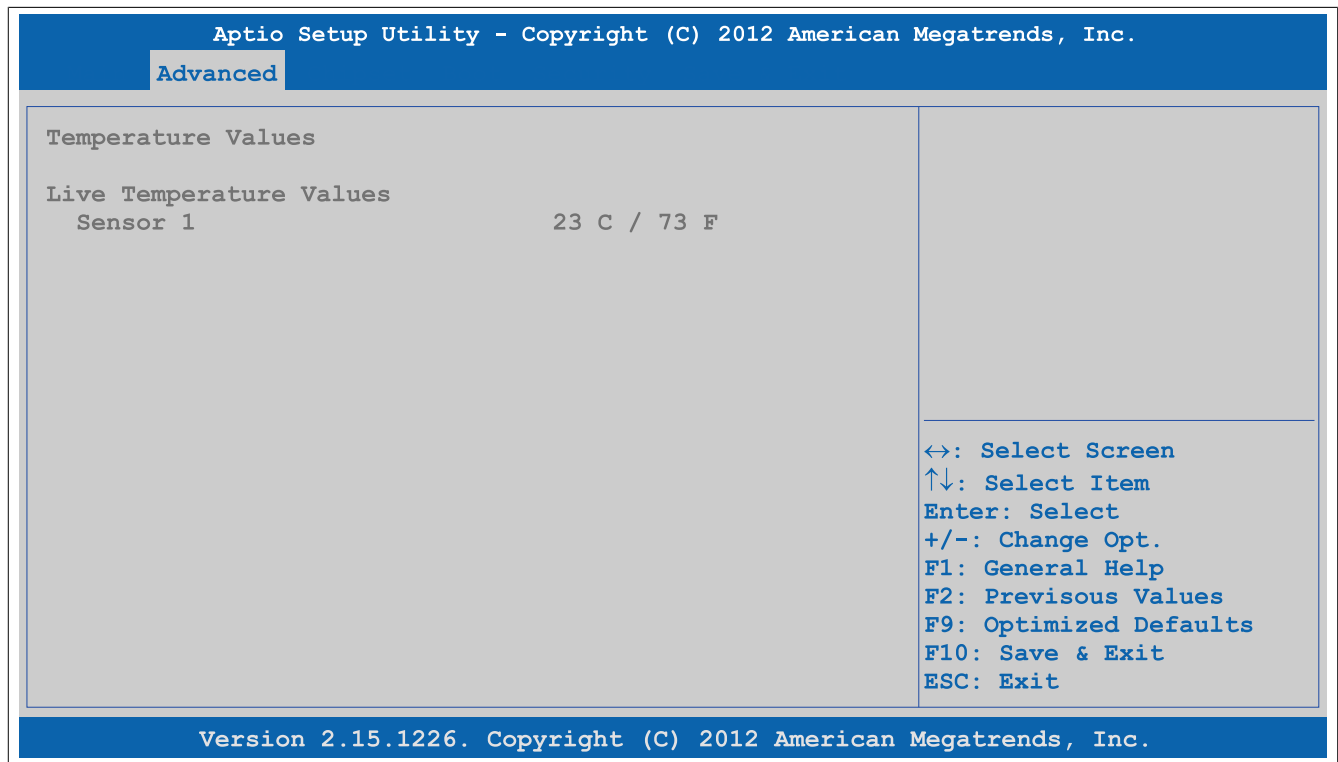


Figure 123: Advanced - OEM features - Slide-in 1 features - Temperature values

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 200: Advanced - OEM features - Slide-in 1 features - Temperature values

1.4.3.11 Slide-in 2 features



Figure 124: Advanced - OEM features - Slide-in 2 features

BIOS setting	Function	Configuration options	Effect
Device ID	Displays the device ID of the slide-in 2 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 slide-in drive 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	-
Temperature values	Displays current temperature values	Enter	Opens this submenu See "Temperature values" on page 231.

Table 201: Advanced - OEM features - Slide-in 2 features

1.4.3.11.1 Temperature values

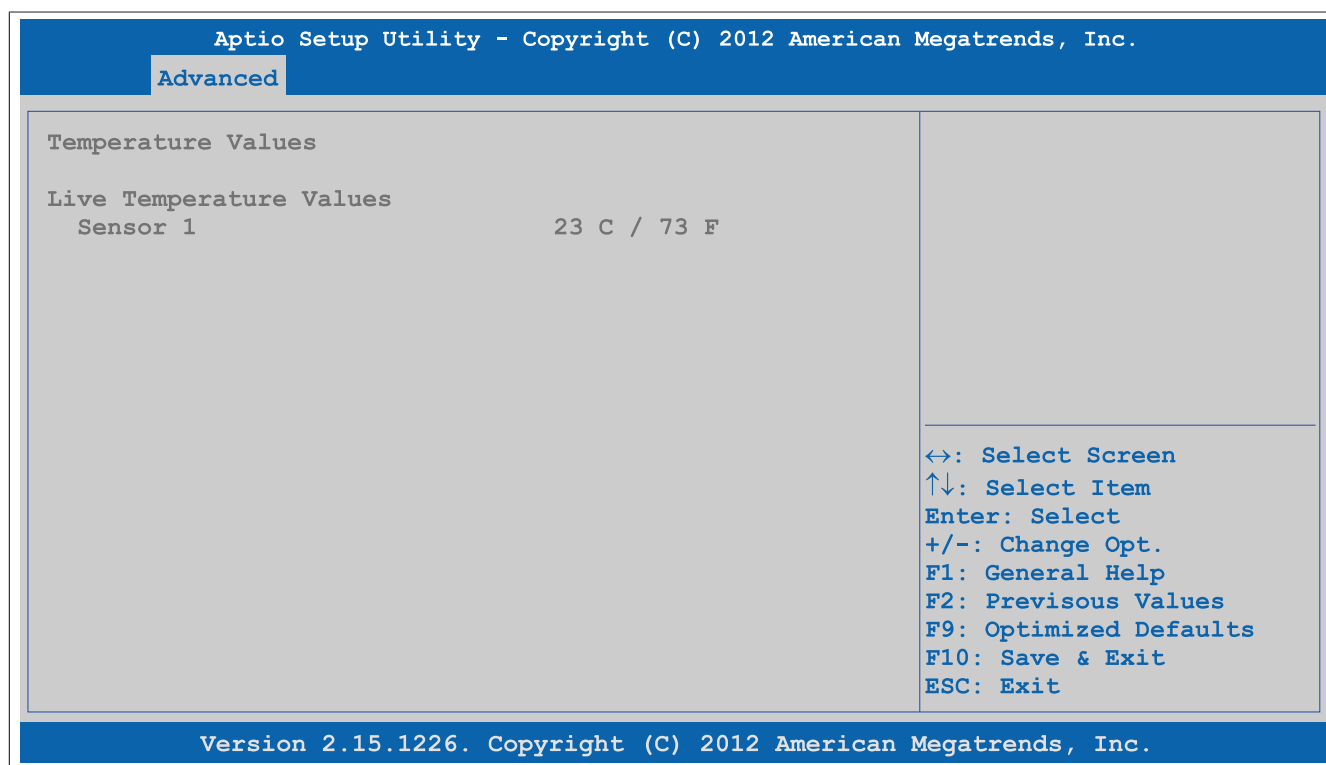


Figure 125: Advanced - OEM features - Slide-in 2 features - Temperature values

BIOS setting	Function	Configuration options	Effect
Sensor 1	Displays the current temperature of sensor 1 (slide-in 2 drive) in °C and °F	None	-

Table 202: Advanced - OEM features - Slide-in 2 features - Temperature values

1.4.3.12 Panel control features

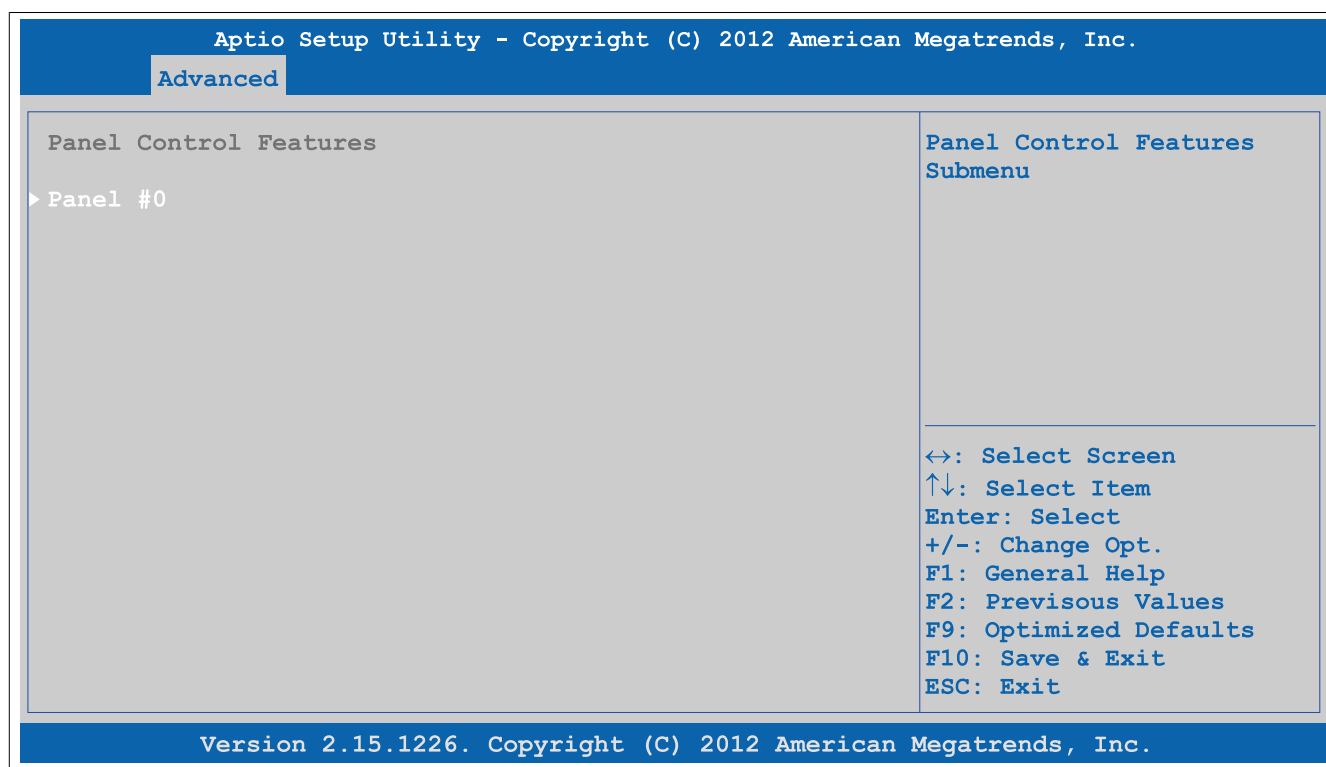


Figure 126: Advanced - OEM Features - Panel Control Features

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 232.

Table 203: Advanced - OEM features - Panel control features

1.4.3.12.1 Panel #X



Figure 127: 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 204: Advanced - OEM features - Panel control features - Panel #X

1.4.4 PCI configuration

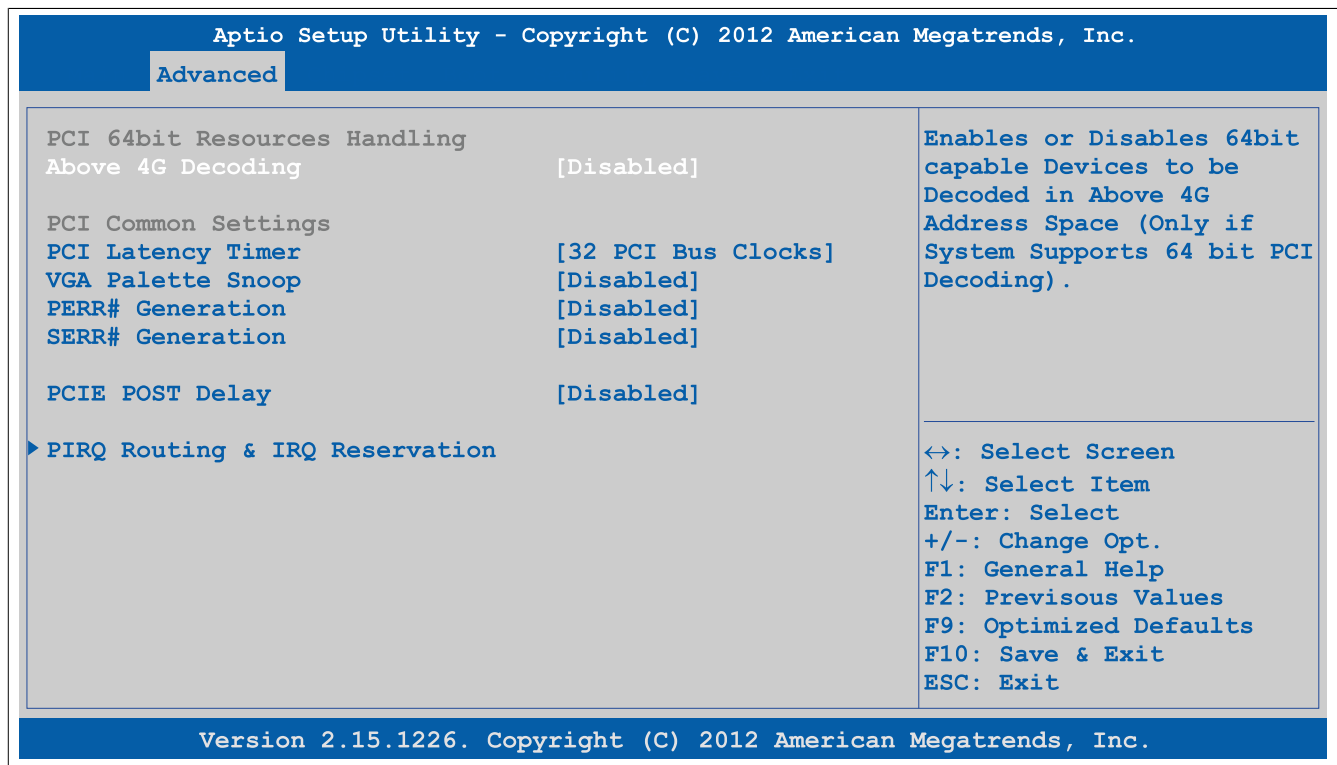


Figure 128: Advanced - PCI Configuration

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 <i>PAR</i> .	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
		4 s	4 s delay before the PCIE bus is scanned
		5 s	5 s delay before the PCIE bus is scanned
PIRQ routing & IRQ reservation	Configures PIRQ routing	10 s	10 s delay before the PCIE bus is scanned
		Enter	Opens this submenu See "PIRQ routing & IRQ reservation" on page 234.

Table 205: Advanced - PCI configuration - Configuration options

1.4.4.1 PIRQ routing & IRQ reservation

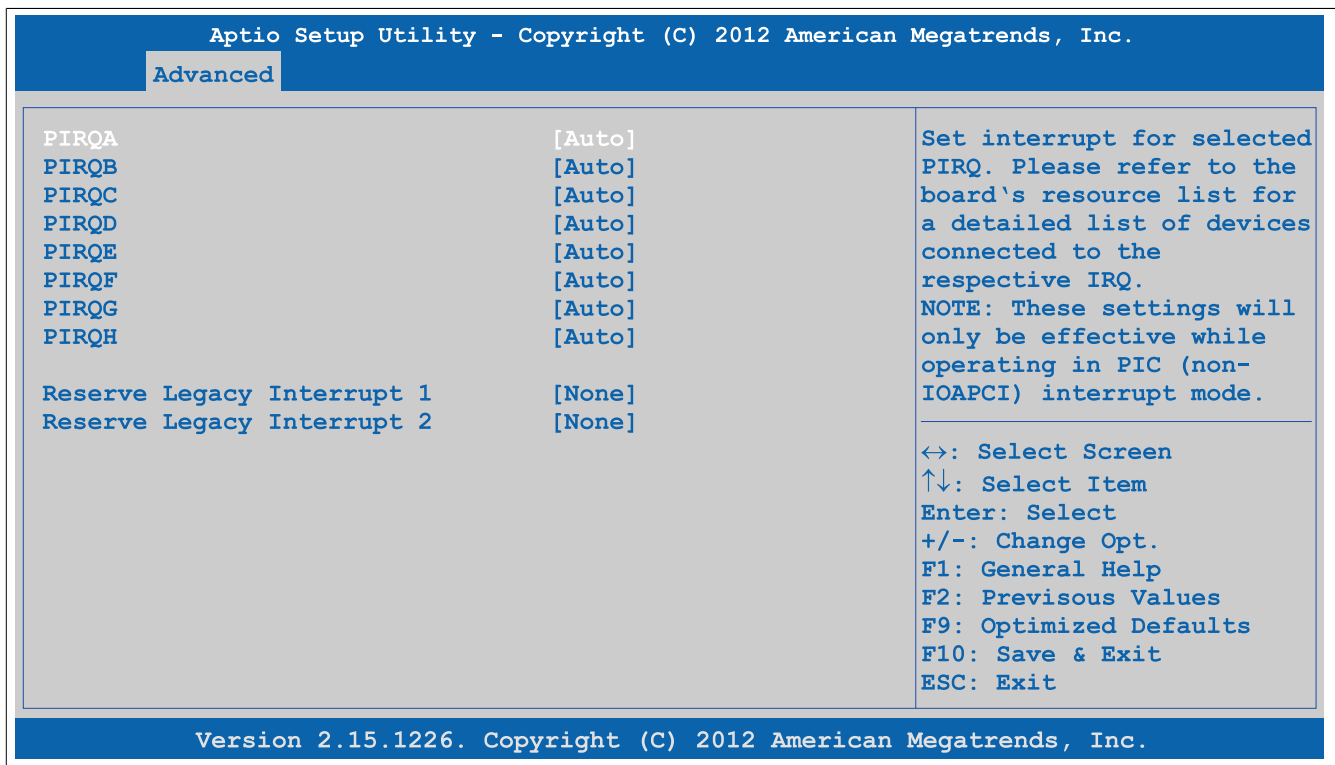


Figure 129: Advanced - PCI Configuration - PIRQ Routing & IRQ Reservation

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
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 206: Advanced - PCI configuration - PIRQ routing & IRQ reservation - Configuration options

1.4.5 PCI express configuration

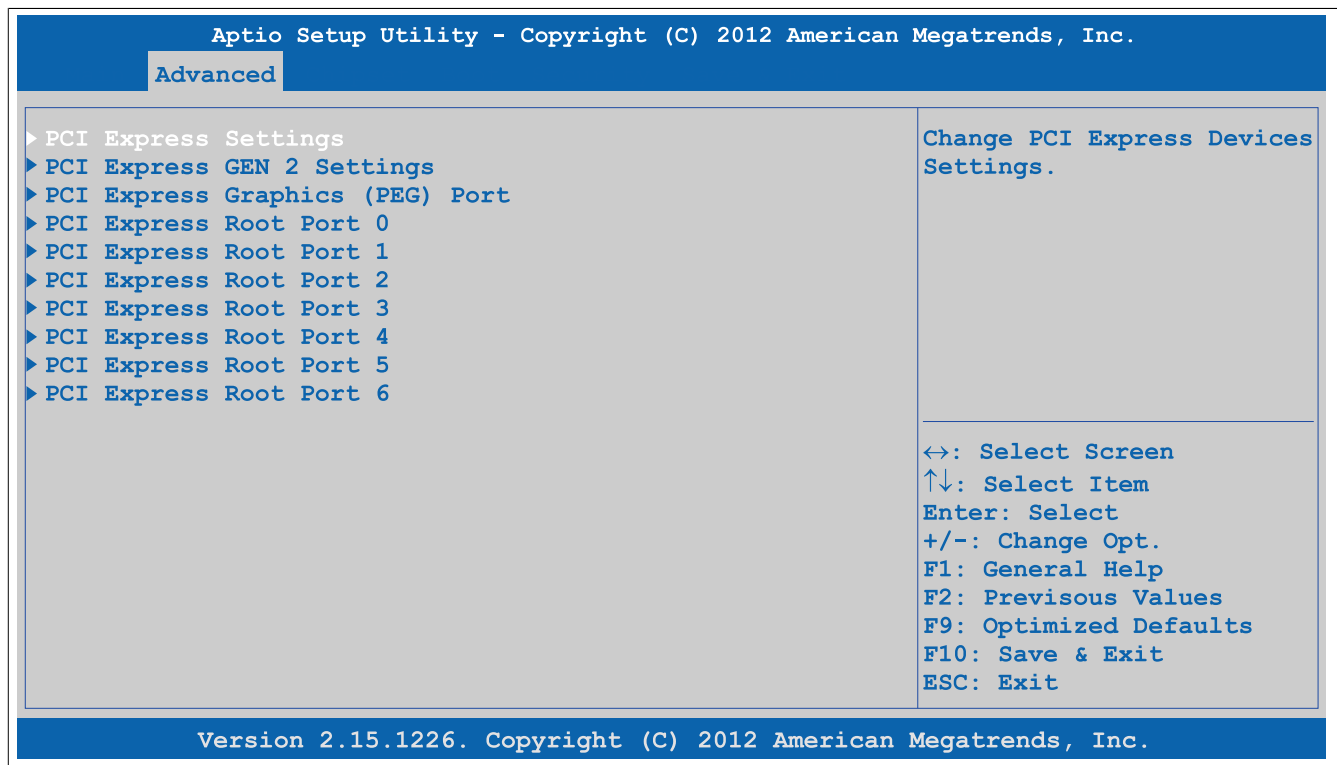


Figure 130: Advanced - PCI Express Configuration

BIOS setting	Function	Configuration options	Effect
PCI Express settings	Configures PCI Express settings	Enter	Opens this submenu See "PCI Express settings" on page 236.
PCI Express GEN 2 settings	Configures PCI Express GEN2 settings	Enter	Opens this submenu See "PCI Express GEN 2 settings" on page 237.
PCI Express graphics (PEG) port	Configures PCI Express graphics settings	Enter	Opens this submenu See "PCI Express graphics (PEG) port" on page 238.
PCI Express root port 0	Configures PCI Express settings on port 0	Enter	Opens this submenu See "PCI Express root port" on page 240.
PCI Express root port 1	Configures PCI Express settings on port 1	Enter	Opens this submenu See "PCI Express root port" on page 240.
PCI Express root port 2	Configures PCI Express settings on port 2	Enter	Opens this submenu See "PCI Express root port" on page 240.
PCI Express root port 3	Configures PCI Express settings on port 3	Enter	Opens this submenu See "PCI Express root port" on page 240.
PCI Express root port 4	Configures PCI Express settings on port 4	Enter	Opens this submenu See "PCI Express root port" on page 240.
PCI Express root port 5	Configures PCI Express settings on port 5	Enter	Opens this submenu See "PCI Express root port" on page 240.
PCI Express root port 6	Configures PCI Express settings on port 6	Enter	Opens this submenu See "PCI Express root port" on page 240.

Table 207: Advanced - PCI Express configuration - Menu

1.4.5.1 PCI Express settings

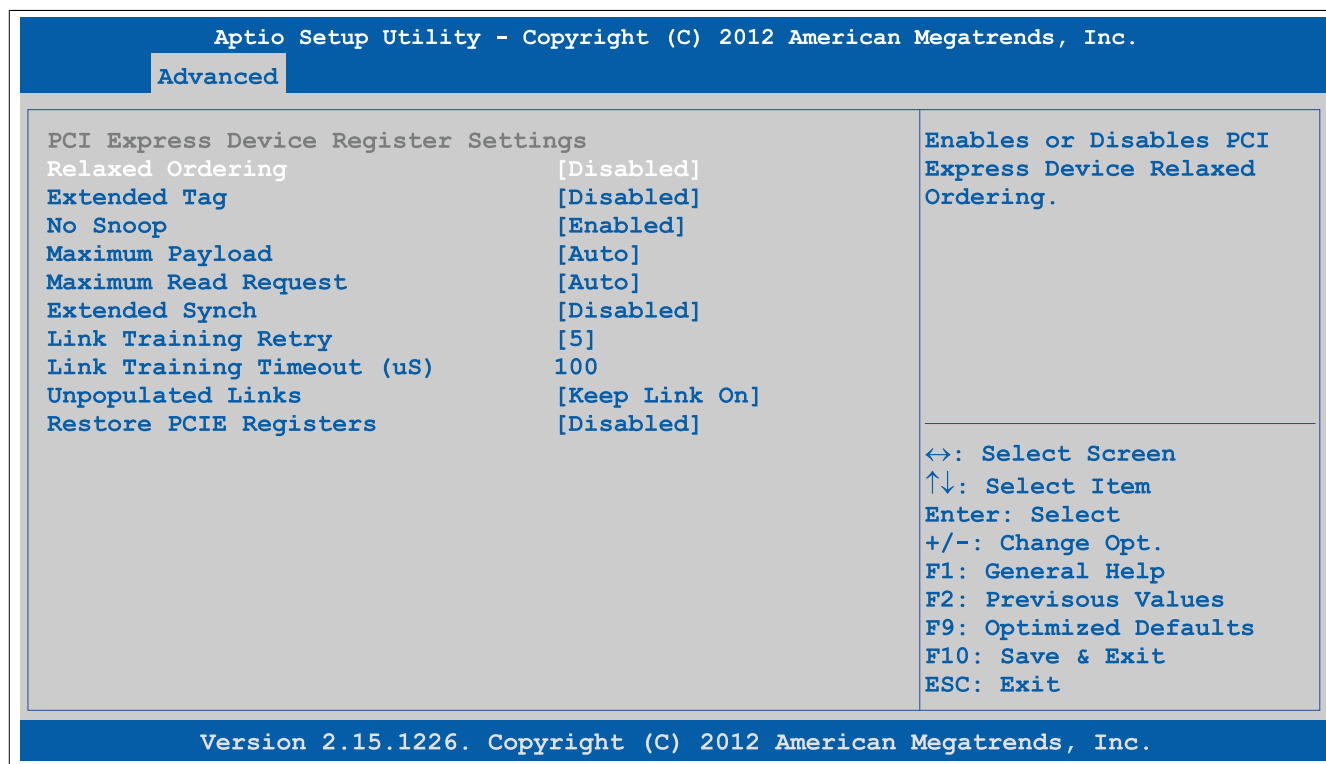


Figure 131: Advanced - PCI Express Configuration - PCI Express Settings

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 208: Advanced - PCI Express configuration - PCI Express settings - Configuration options

1.4.5.2 PCI Express GEN 2 settings

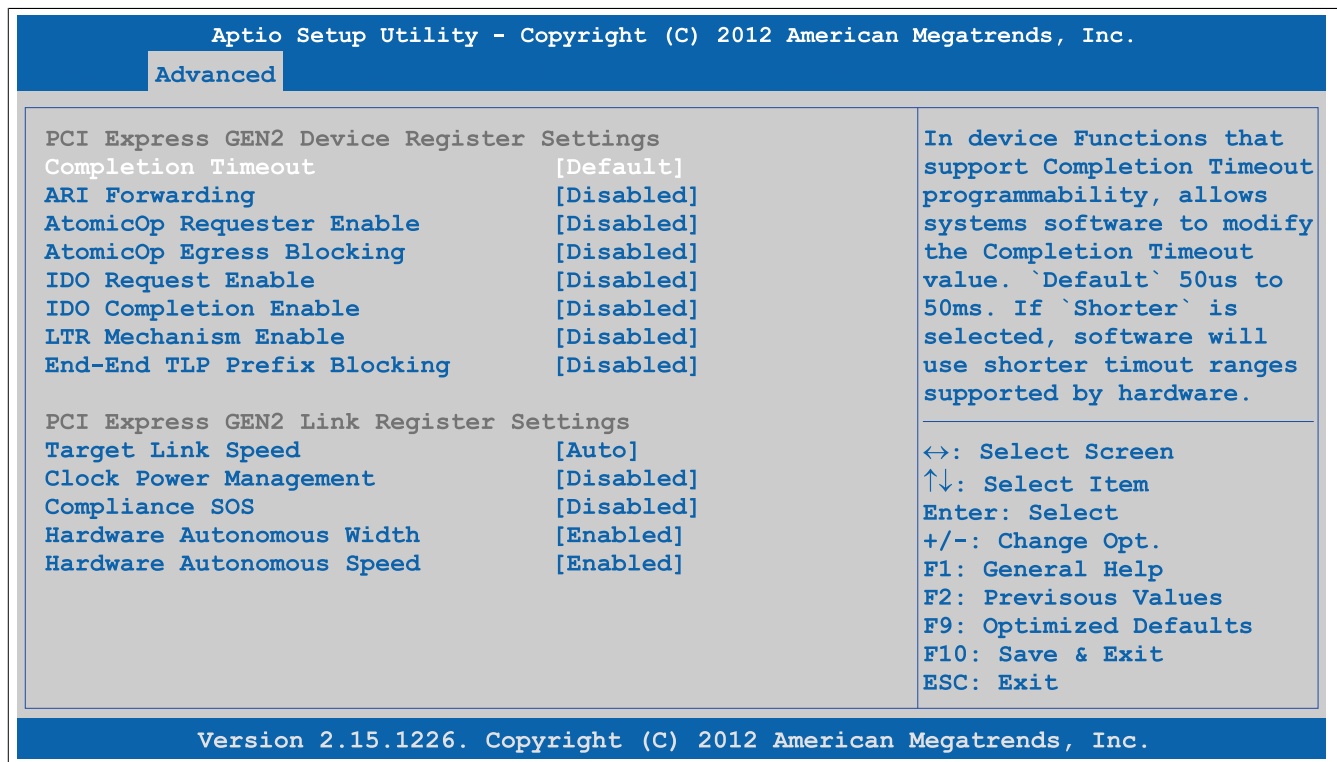


Figure 132: Advanced - PCI Express Configuration - PCI Express GEN 2 Settings

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 μ s - 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 209: 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 209: Advanced - PCI Express configuration - PCI Express GEN 2 settings - Configuration options

1.4.5.3 PCI Express graphics (PEG) port

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Advanced		
PCI Express Graphics (PEG) Port [Auto] PEG Root Port Configuration [1 x8 + 2 x4] PEG0 Not Present PEG0 Speed [Auto] PEG0 ASPM [Disabled] PEG1 Not Present PEG1 Speed [Gen1] PEG1 ASPM [Disabled] PEG2 Not Present PEG2 Speed [Auto] PEG2 ASPM [Disabled] Detected Non-compliant Device [Disabled] De-emphasis Control [-3.5 dB]		Disabled=Disabled internal PEG interface devices and do not detect the devices connected to the PEG port. Enabled=Enable internal PEG interface devices also if no device is detected on PEG port. Auto=Disable internal PEG interface devices ↔: Select Screen ↑↓: Select Item Enter: Select +/-: Change Opt. F1: General Help F2: Previous Values F9: Optimized Defaults F10: Save & Exit ESC: Exit
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Figure 133: 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 210: 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 L0s ²⁾	Option for configuring the L0 power saving function	ASPM L0sL1	Automatic assignment of L0s or L1 power saving function by the PCIe device
		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	-
		Auto	Selects the maximum transfer rate
		Gen1	Maximum transfer rate = 2.5 GT/s
		Gen2	Maximum transfer rate = 5 GT/s
PEG1 speed	Option for setting the maximum transfer rate for the PEG1 port	Gen3	Maximum transfer rate = 8 GT/s
		Disabled	Disables this function
		Auto	Automatic assignment by BIOS and the operating system
		ASPM L0s	Enables the L0 energy saving function
PEG1 ASPM ¹⁾	Option for configuring a power saving function for the PEG1 port if it does not require full power	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
		Disabled	Disables this function
		Root port only	Enables the power saving function for the root port
ASPM L0s ³⁾	Option for configuring the L0 power saving function	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
		None	-
		Auto	Selects the maximum transfer rate
PEG2	Displays the mode in which the device connected to the PEG2 port is being operated	Gen1	Maximum transfer rate = 2.5 GT/s
		Gen2	Maximum transfer rate = 5 GT/s
		Gen3	Maximum transfer rate = 8 GT/s
		Disabled	Disables this function
PEG2 speed	Option for setting the maximum transfer rate for the PEG2 port	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
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
		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
ASPM L0s ⁴⁾	Option for configuring the L0 power saving function	None	-
		Auto	Selects the maximum transfer rate
		Gen1	Maximum transfer rate = 2.5 GT/s
		Gen2	Maximum transfer rate = 5 GT/s
Detect non-compliant device	Option for detecting incompatible PCI Express devices on the PEG port	Gen3	Maximum transfer rate = 8 GT/s
		Disabled	Disables this function
		Enabled	Enables this function. Even incompatible PCI Express devices are detected on the PEG port.
		-6 dB	-6 dB de-emphasis
De-emphasis control	Option for configuring de-emphasis on the PEG port	-3.5 dB	-35 dB de-emphasis

Table 210: 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*.

1.4.5.4 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.

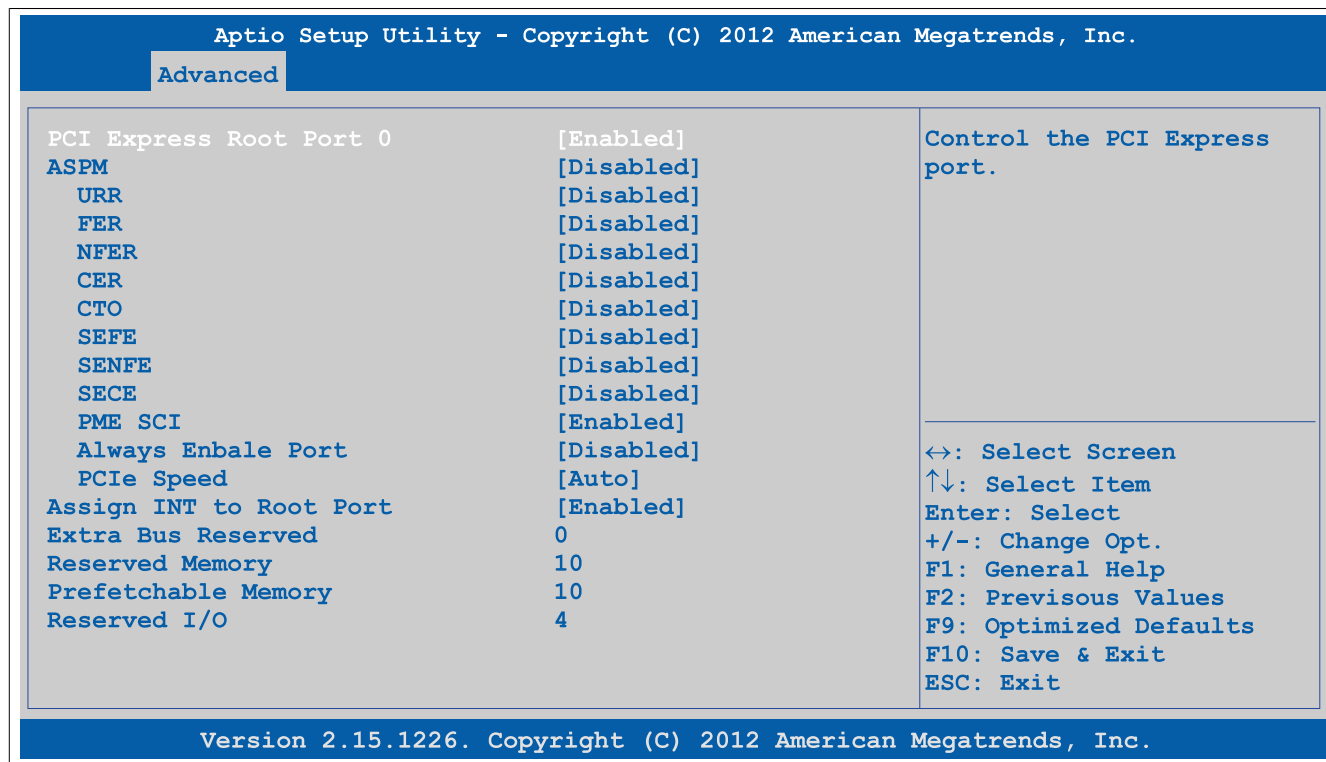


Figure 134: Advanced - PCI Express Configuration - PCI Express Root Port

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	<i>Active State Power Management</i> 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	<i>Unsupported Request (UR) reporting</i> 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	<i>Fatal error reporting</i> 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	<i>Non-fatal error reporting</i> 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	<i>Correctable error reporting</i> 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
CTO	PCI Express completion timer T0	Enabled	Enables this function

Table 211: 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
SENE	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 211: Advanced - PCI Express configuration - PCI Express root port - Configuration options

1.4.6 ACPI settings

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Advanced

ACPI Settings
Enable Hibernation [Enabled]
ACPI Sleep State [Both S1 and S3 ava...]
Lock Legacy Resources [Disabled]
S3 Video Repost [Disabled]

Critical Trip Point [111 C]

Enables or Disables System ability to Hibernate (OS/S4 Sleep State). This option may be not effective with some OS.

↔: Select Screen
↑↓: Select Item
Enter: Select
+/-: Change Opt.
F1: General Help
F2: Previous Values
F9: Optimized Defaults
F10: Save & Exit
ESC: Exit

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Figure 135: 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 212: Advanced - ACPI settings - Configuration options

1.4.7 RTC wake settings

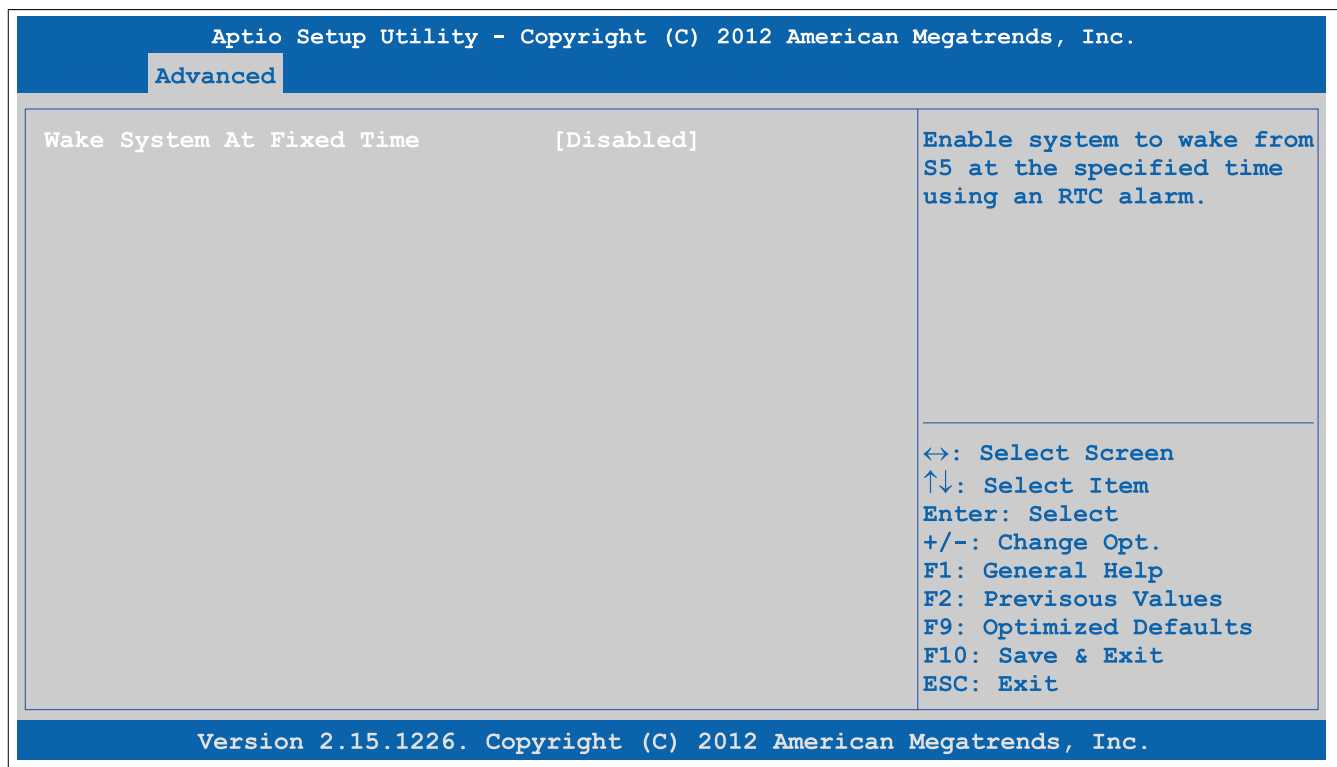


Figure 136: Advanced - RTC Wake Settings

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 213: Advanced - RTC wake settings - Configuration options

1.4.8 CPU configuration

Information:

The settings shown may vary depending on the CPU board being used.

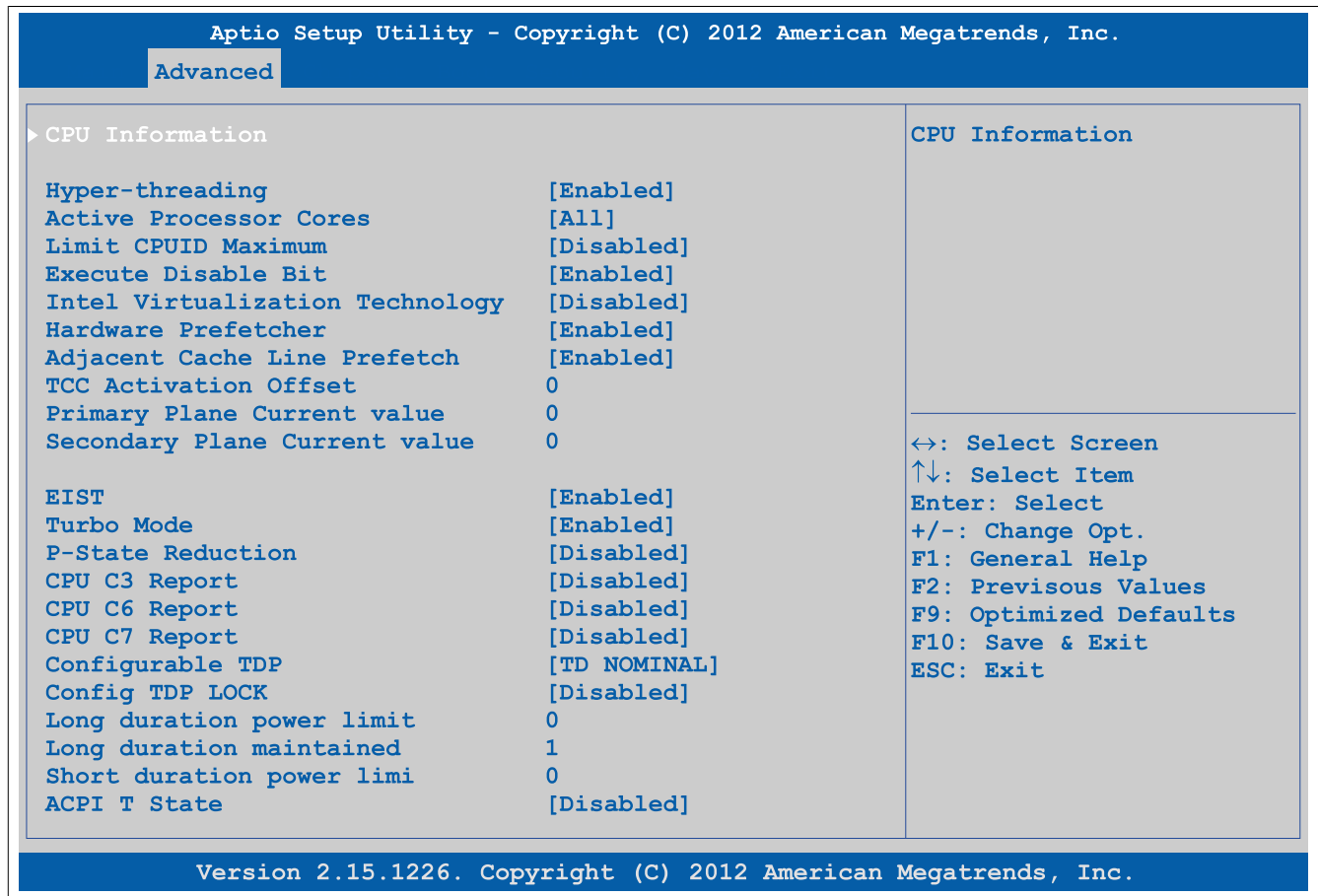


Figure 137: Advanced - CPU Configuration

BIOS setting	Function	Configuration options	Effect
CPU information	Displays CPU properties	Enter	Opens this submenu See "CPU information" on page 245.
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 214: 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 214: Advanced - CPU configuration - Configuration options

- 1) TCC = Thermal control circuit.
2) TDP = Thermal design power.

1.4.8.1 CPU information

Information:

The settings shown may vary depending on the CPU board being used.

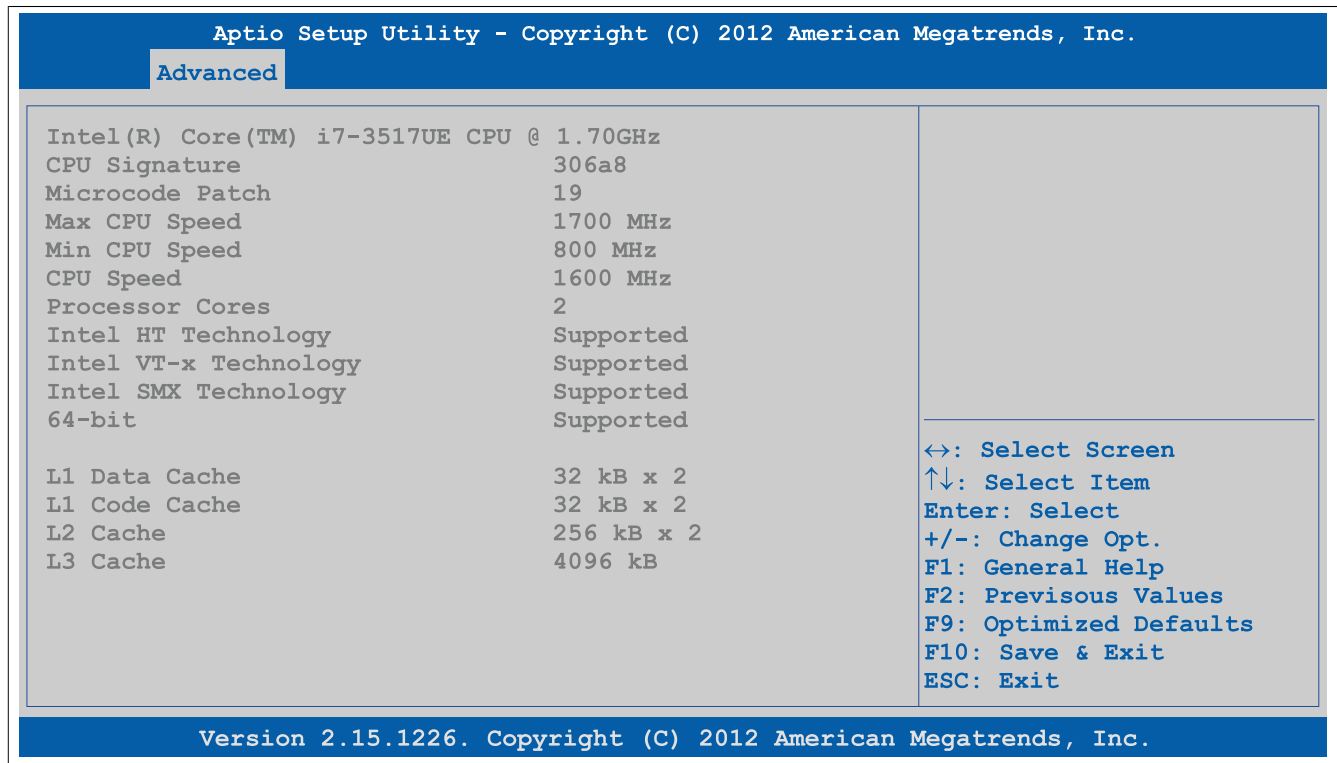


Figure 138: Advanced - CPU Configuration - CPU Information

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 215: Advanced - CPU configuration - CPU information - Configuration options

1.4.9 Chipset configuration

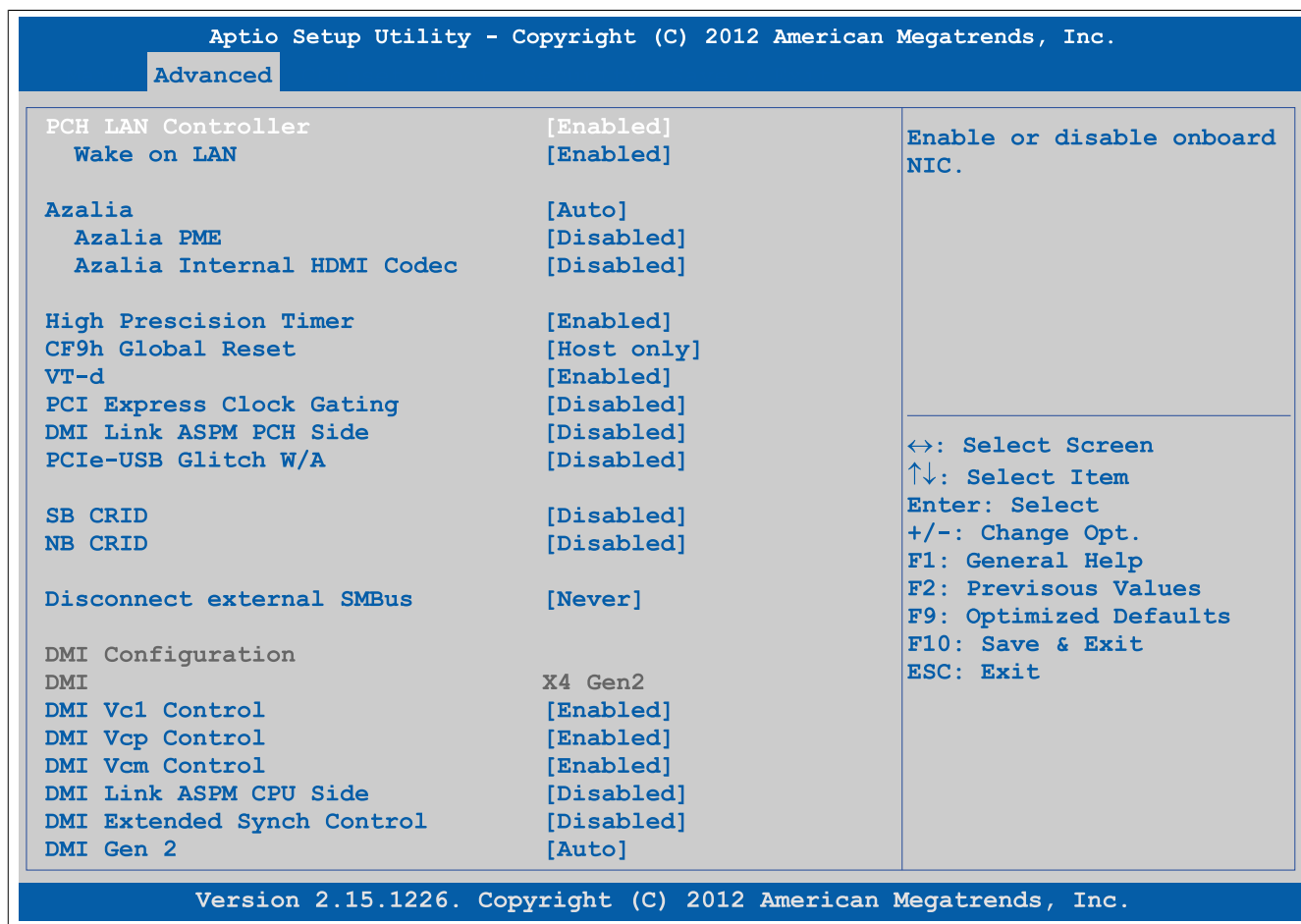


Figure 139: Advanced - Chipset Configuration

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	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 216: 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 SMBus	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 216: Advanced - Chipset configuration - Configuration options

1.4.10 SATA configuration

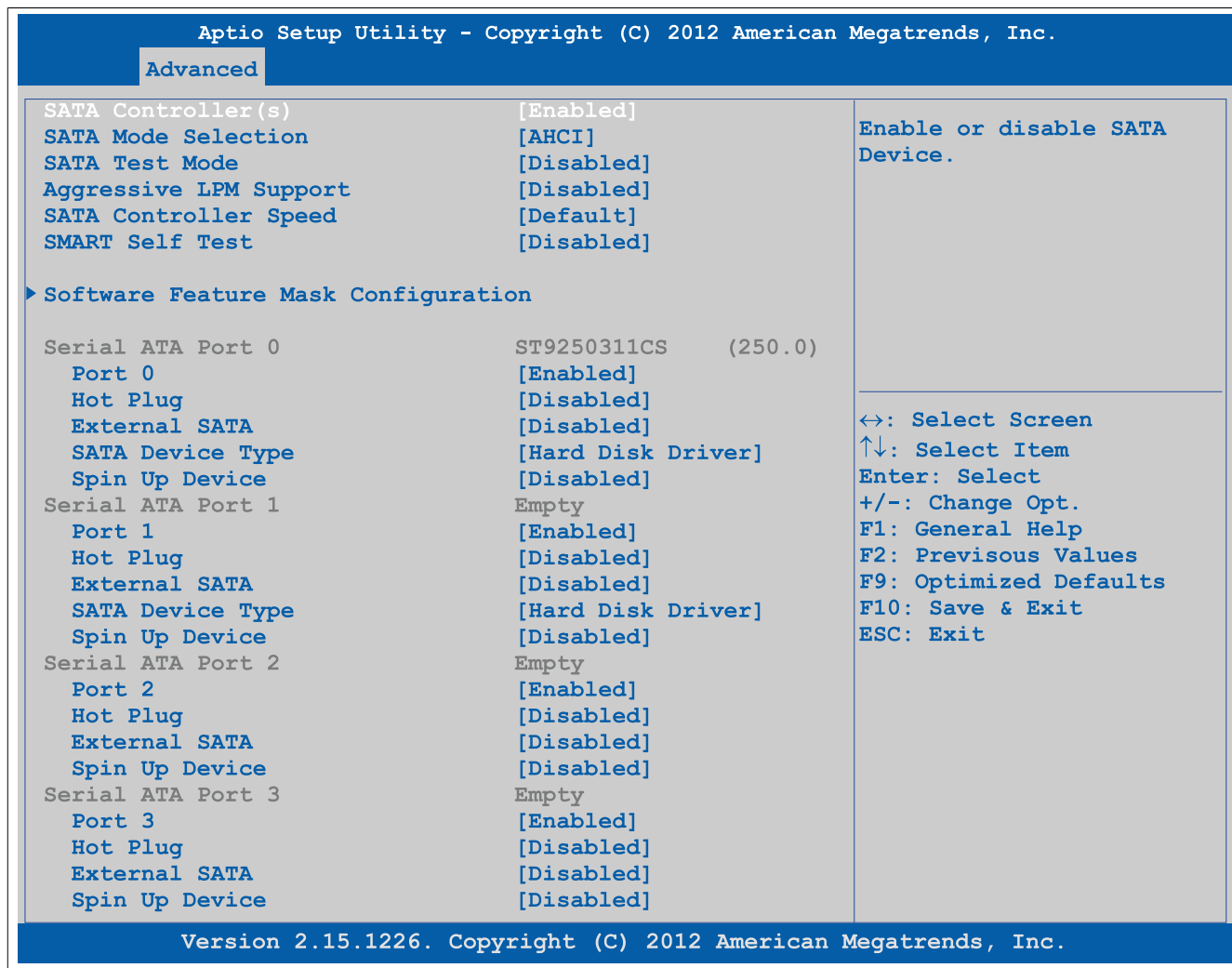


Figure 140: Advanced - SATA Configuration

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 250.

Table 217: 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 interface 0	Disabled	Disables hot plugging for SATA interface 0
		Enabled	Enables hot plugging for SATA interface 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 interface 1	Disabled	Disables hot plugging for SATA interface 1
		Enabled	Enables hot plugging for SATA interface 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 interface 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 interface 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 217: 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*.

1.4.10.1 Software feature mask configuration

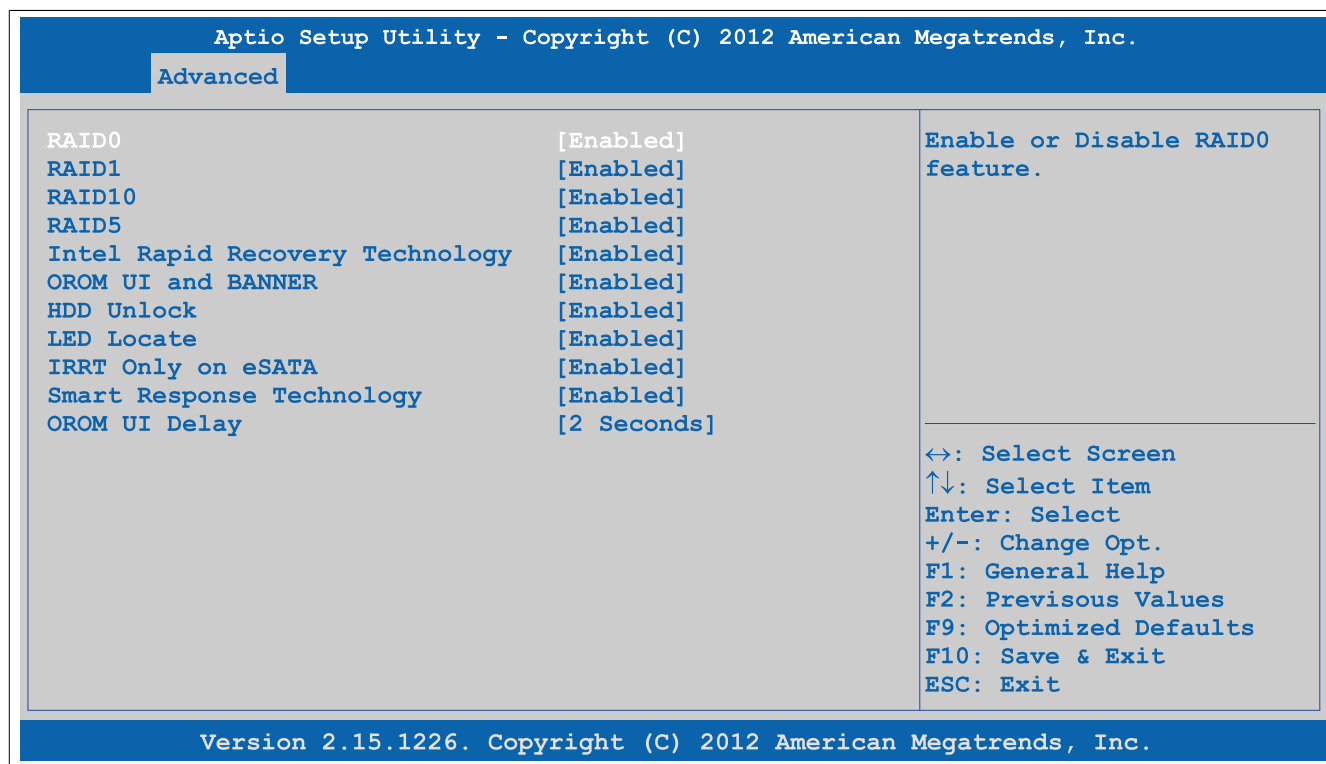


Figure 141: Advanced - SATA Configuration - Software Feature Mask Configuration

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 218: Advanced - SATA configuration - Software feature mask configuration - Configuration options

1) IRRT = Intel Rapid Recovery technology.

1.4.11 Memory configuration

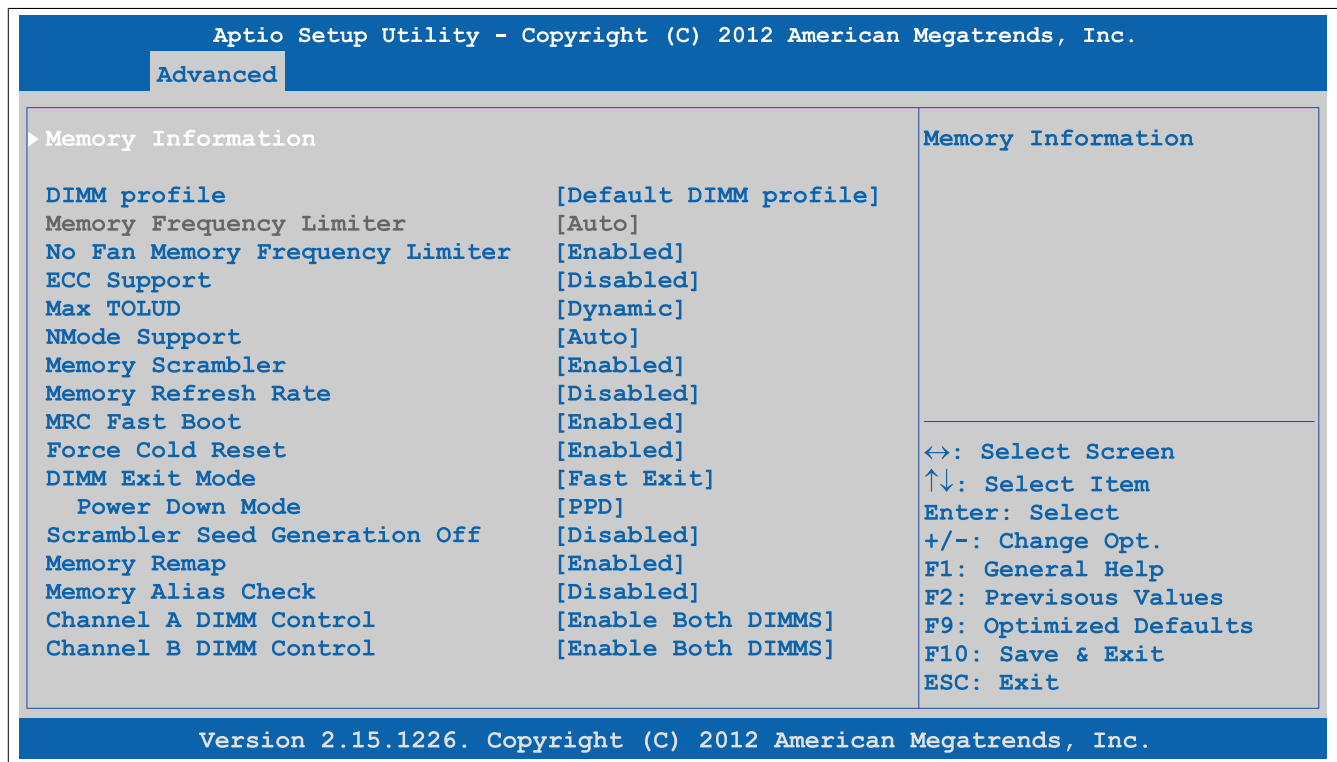


Figure 142: Advanced - Memory Configuration

BIOS setting	Function	Configuration options	Effect
Memory information	Displays main memory properties	Enter	Opens this submenu See "Memory information" on page 252.
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 control¹⁾	Configuration of the main memory timing profile	Enter	Opens this submenu See "Custom profile control" on page 253.
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 219: 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 219: 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.

1.4.11.1 Memory information

Aptio Setup Utility - Copyright (C) 2012 American Megatrends, Inc.			
Advanced			
Memory Information			
Memory RC Version	1.8.0.0		
Memory Frequency	1067 Mhz		
Total Memory	4096 MB (DDR3)		
DIMM#0	2048 MB (DDR3)		
DIMM#1	Not Present		
DIMM#2	2048 MB (DDR3)		
DIMM#3	Not Present		
CAS Latency (tCL)	7		
Minimum delay time			
CAS to RAS (tRCDmin)	7		
Row Precharge (tRPmin)	7		
Active to Precharge (tRASmin)	20		
XMP Profile 1	Not Supported		
XMP Profile 2	Not Supported		
			⇐⇒: Select Screen ↑↓: Select Item Enter: Select +/-: Change Opt. F1: General Help F2: Previous Values F9: Optimized Defaults F10: Save & Exit ESC: Exit
Version 2.15.1226. Copyright (C) 2012 American Megatrends, Inc.			

Figure 143: 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 220: 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 220: Advanced - Memory configuration - Memory information

1.4.11.2 Custom profile control

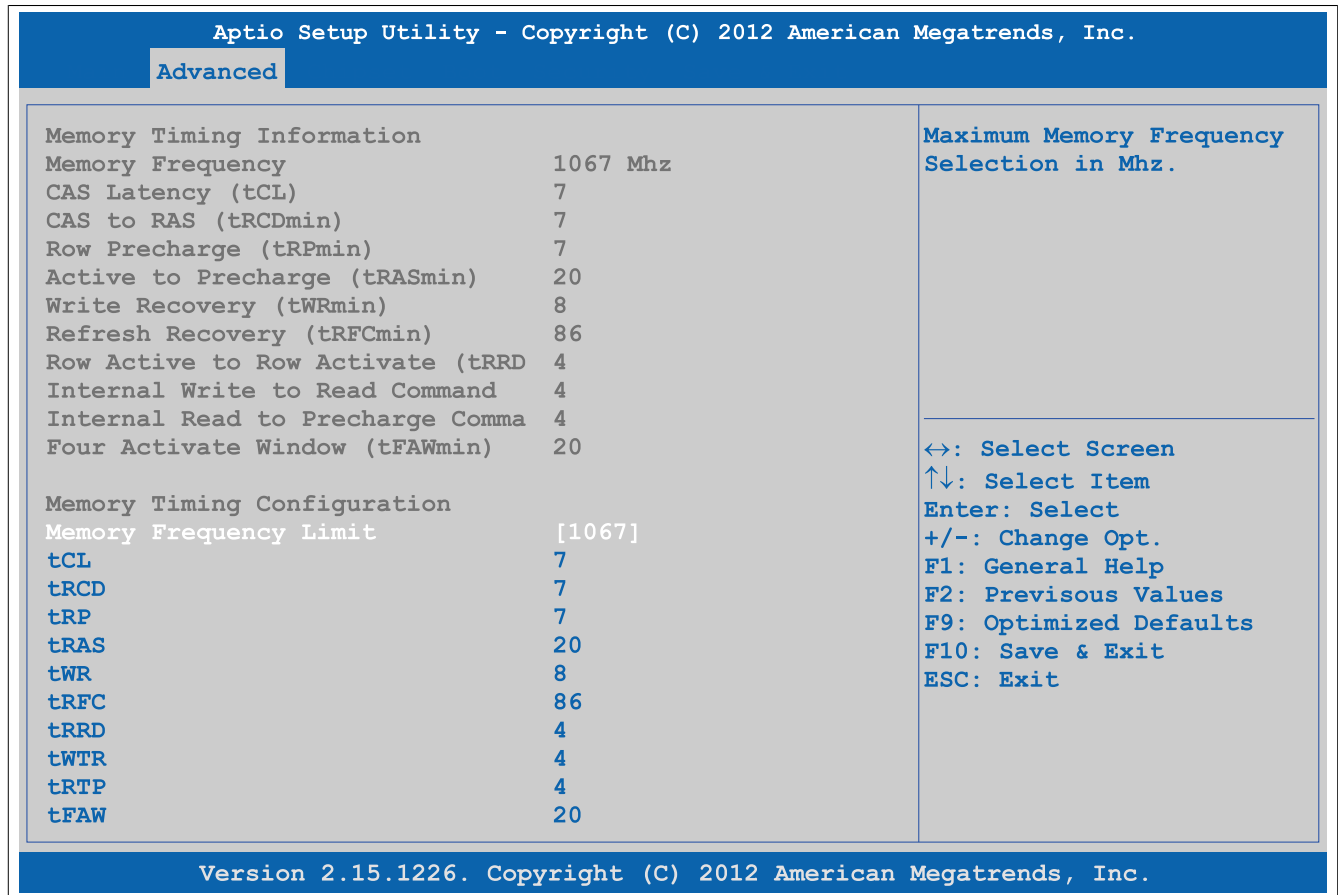


Figure 144: Advanced - Memory Configuration - Custom Profile Control

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 221: Advanced - Memory configuration - Custom profile control - Configuration options

1.4.12 USB configuration

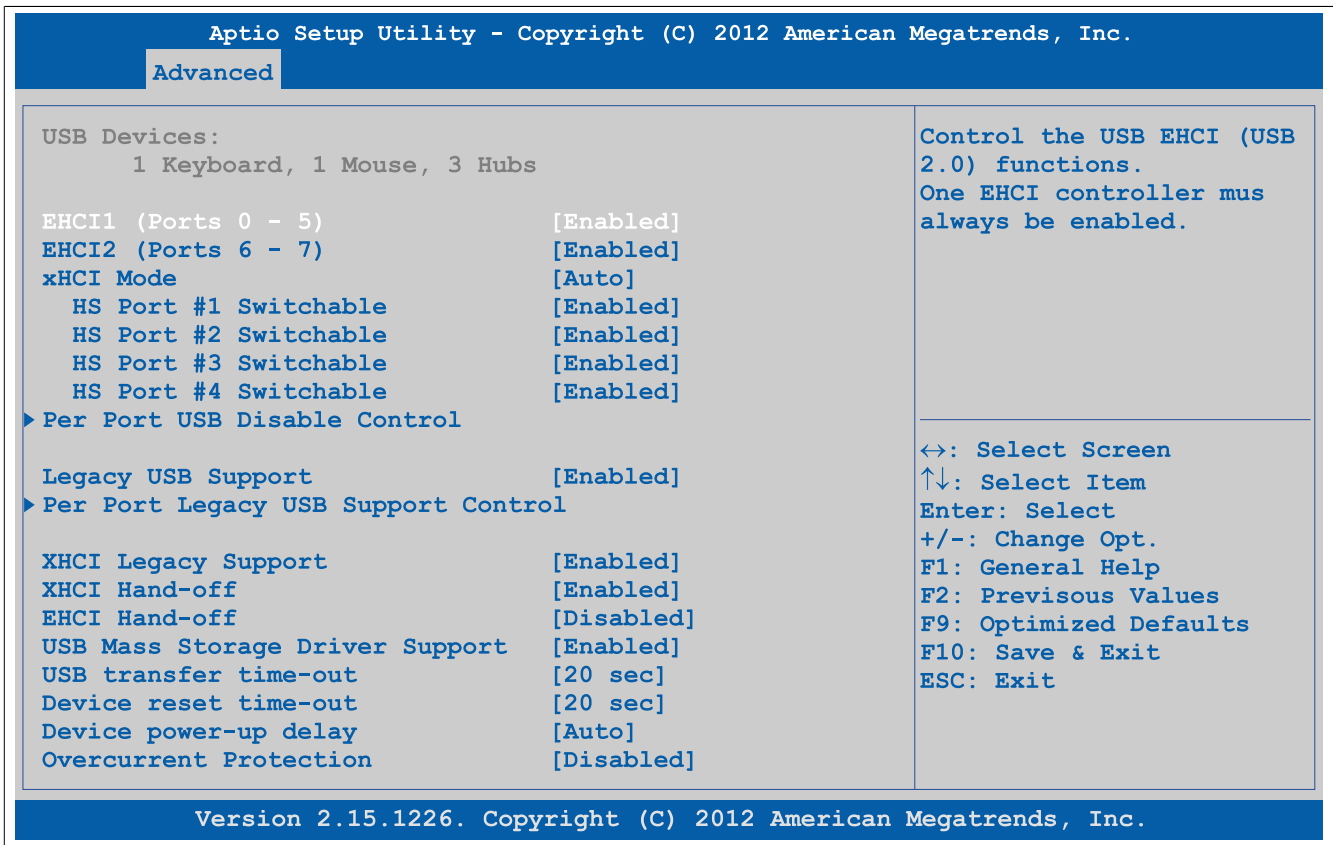


Figure 145: Advanced - USB Configuration

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
EHCI2 (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 255.

Table 222: 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 256.
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 222: Advanced - USB configuration - Configuration options

1) This setting is only possible if *Device power-up delay* is set to *Manual*.

1.4.12.1 Per port USB disable control

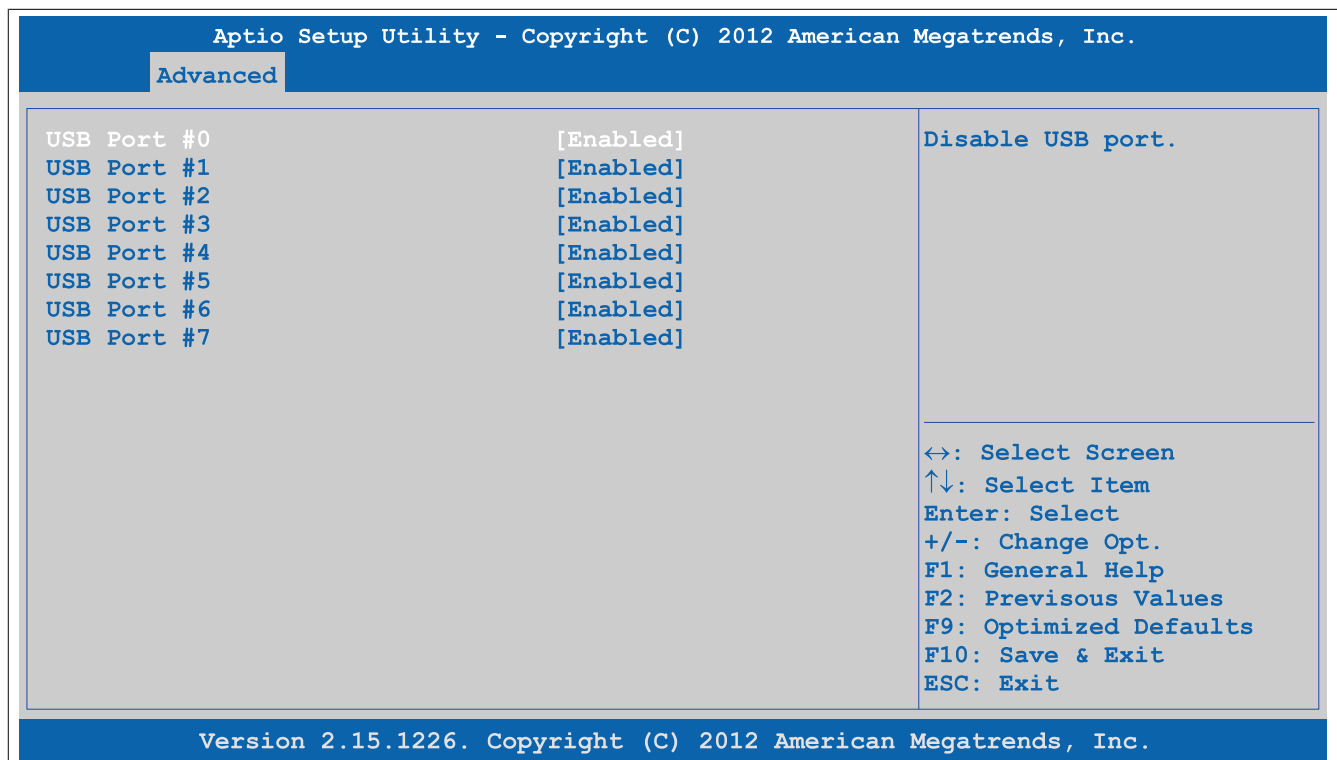


Figure 146: Advanced - USB Configuration - Per Port USB Disable Control

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 223: Advanced - USB configuration - Per port USB disable control - Configuration options

1.4.12.2 Per port legacy USB support control

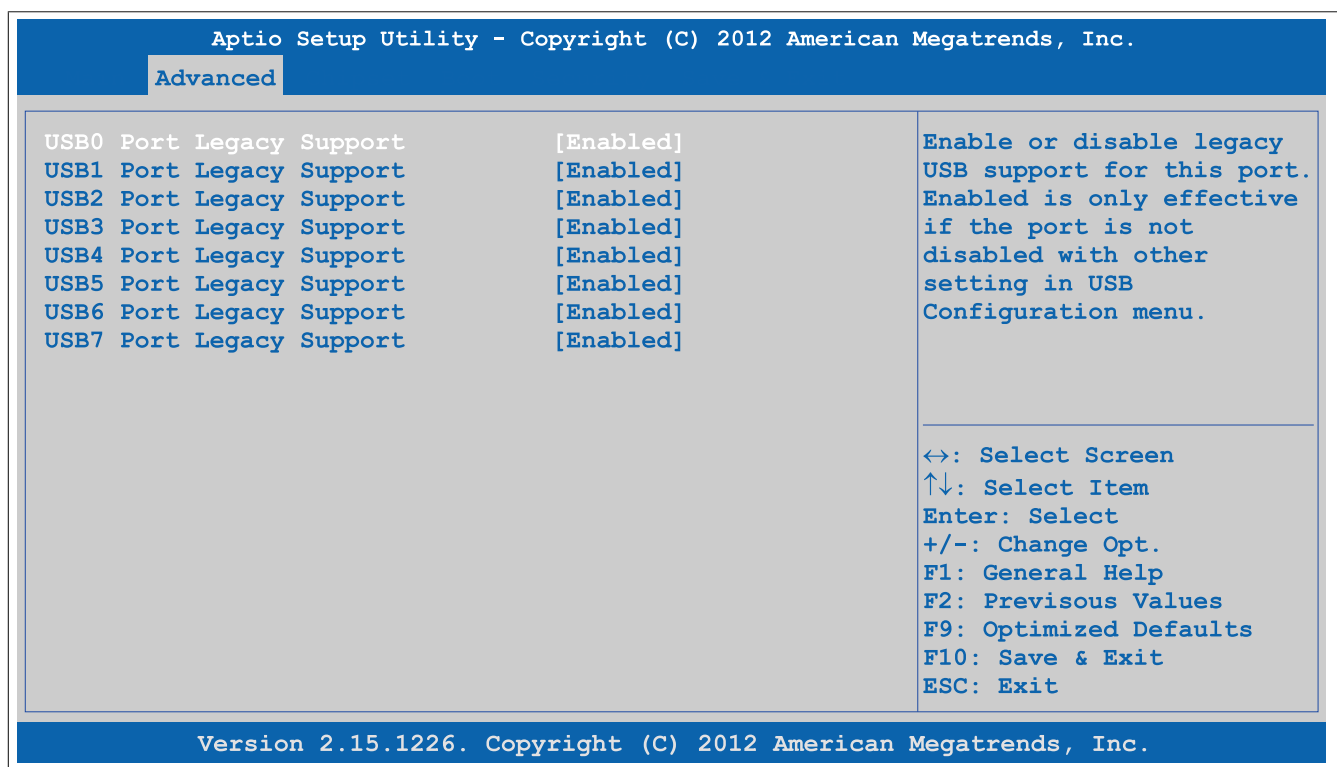


Figure 147: Advanced - USB Configuration - Per Port Legacy USB Support Control

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 224: Advanced - USB configuration - Per port legacy USB support control - Configuration options

1.4.13 Serial port console redirection

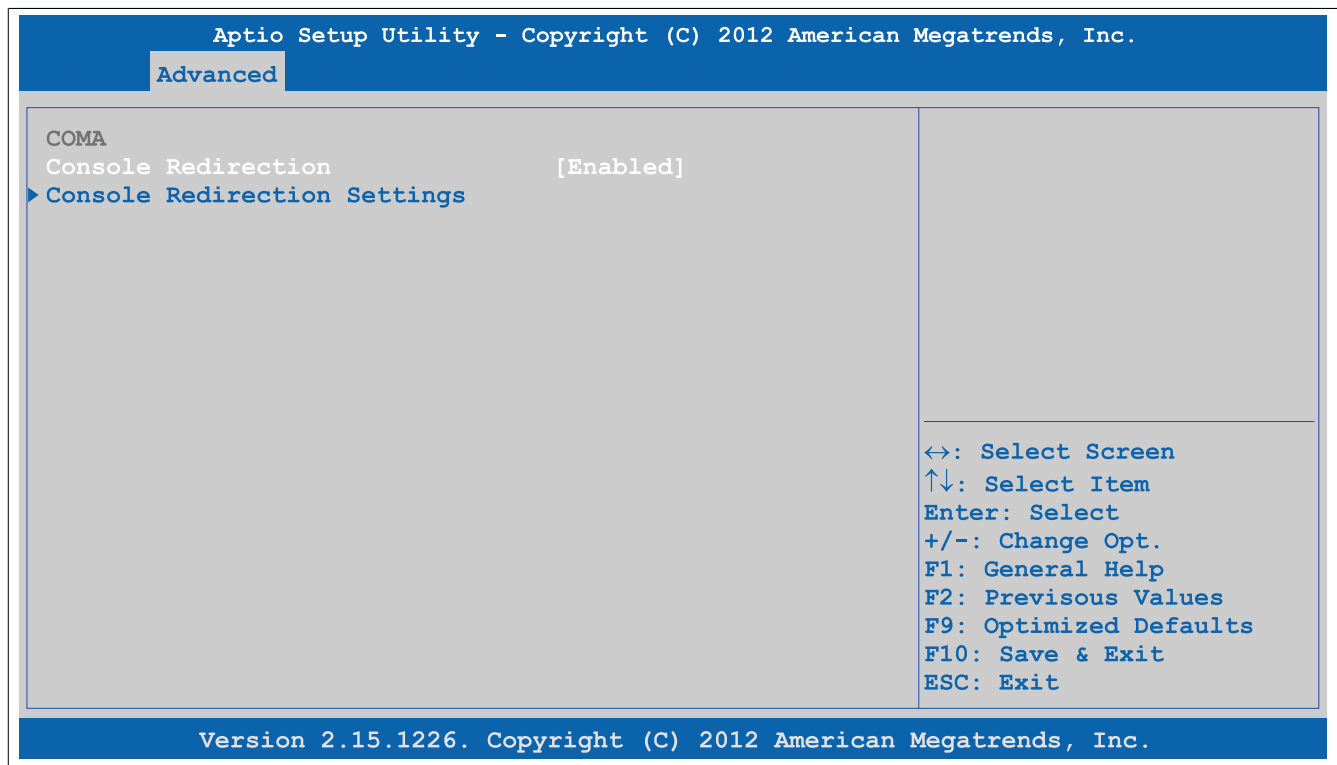


Figure 148: Advanced - Serial Port Console Redirection

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 257.

Table 225: Advanced - Serial port console redirection - Configuration options

1.4.13.1 Console redirection settings

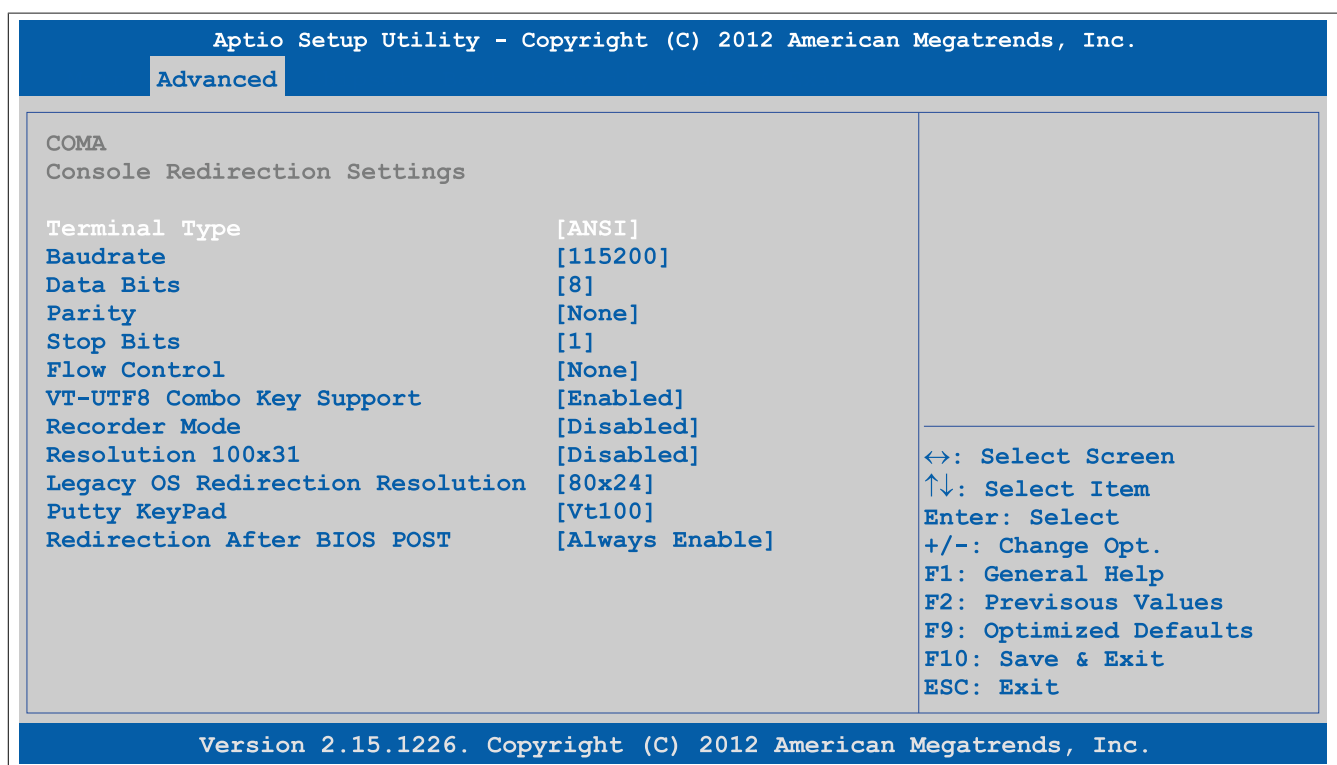


Figure 149: Advanced - Console Redirection - Console Redirection Settings

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 226: Advanced - Console redirection - Console redirection settings - Configuration options

1.5 Boot

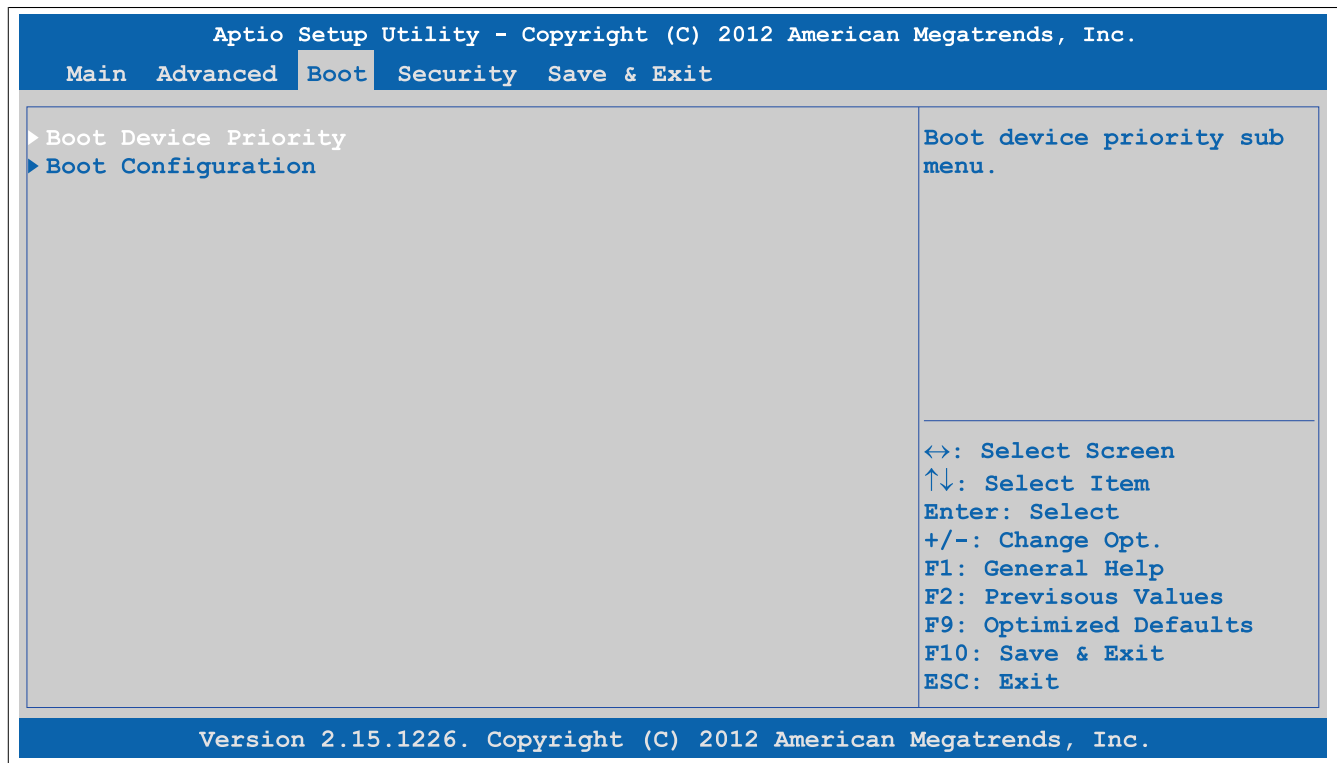


Figure 150: Boot

BIOS setting	Function	Configuration options	Effect
Boot device priority	Configures the boot order	Enter	Opens this submenu See "Boot device priority" on page 259.
Boot configuration	Configures boot properties	Enter	Opens this submenu See "Boot configuration" on page 260.

Table 227: Boot - Overview

1.5.1 Boot device priority

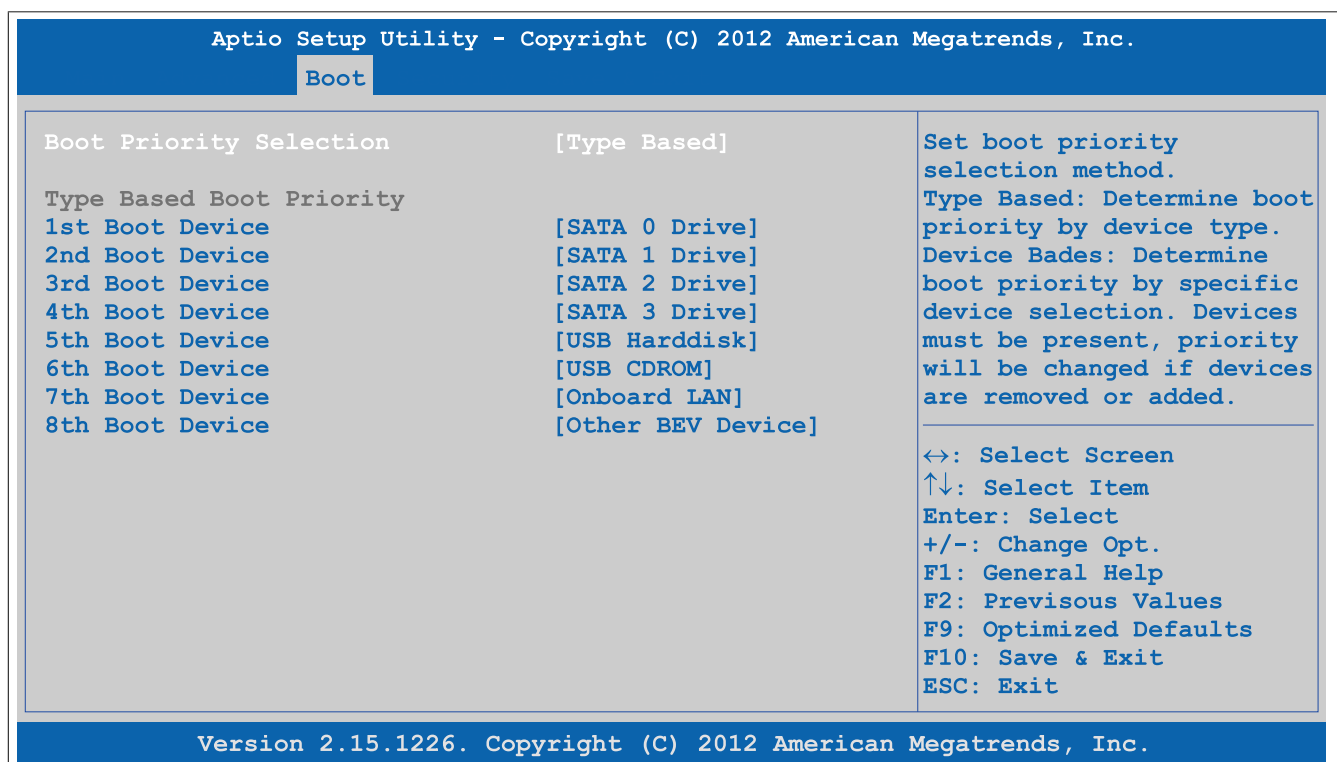


Figure 151: Boot - Boot Device Priority

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	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
2nd boot device			
3rd boot device			
4th boot device			
5th boot device			
6th boot device			
7th boot device			
8th boot device			

Table 228: Boot - Boot device priority - Configuration options

1.5.2 Boot configuration

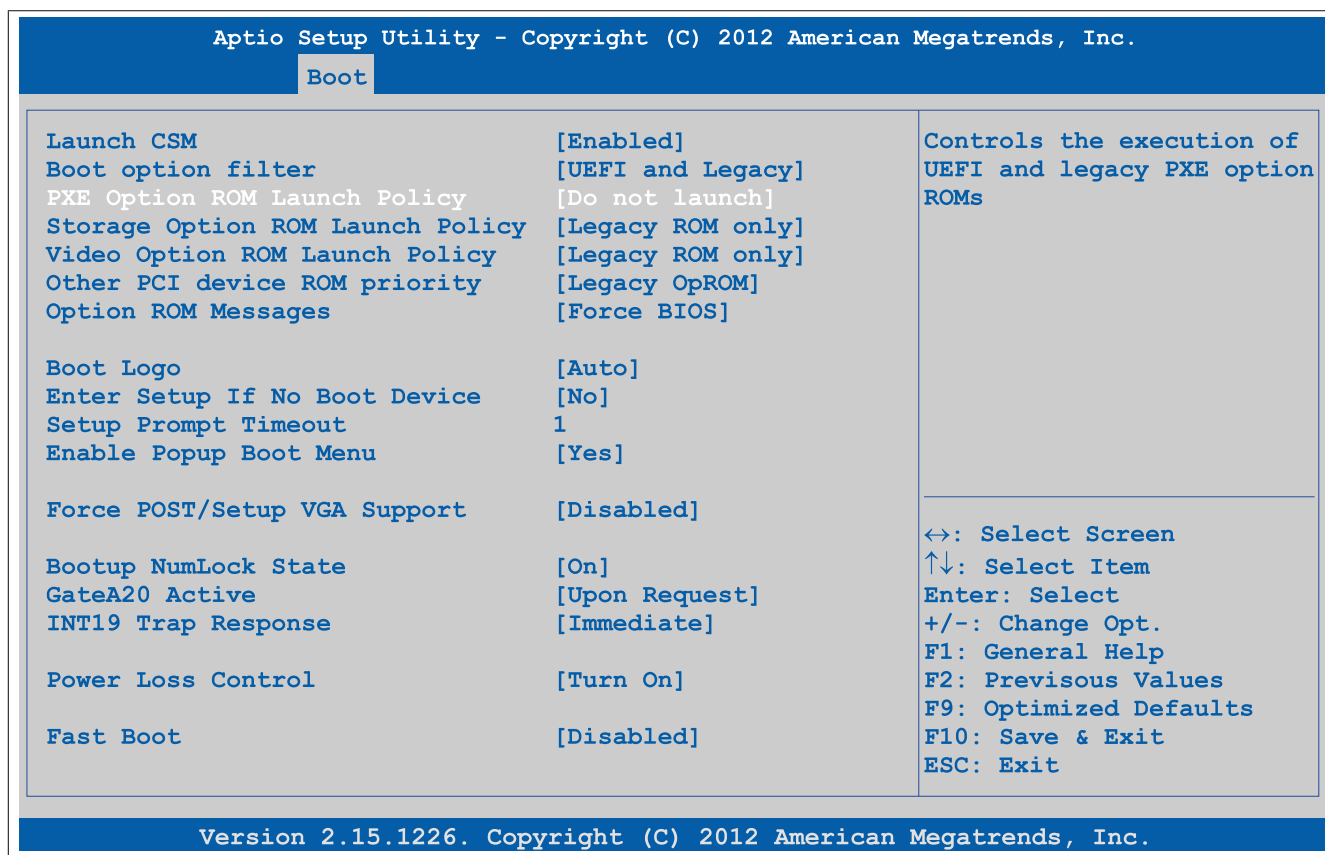


Figure 152: Boot - Boot Configuration

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 229: 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 229: Boot - Boot configuration - Configuration options

1.6 Security

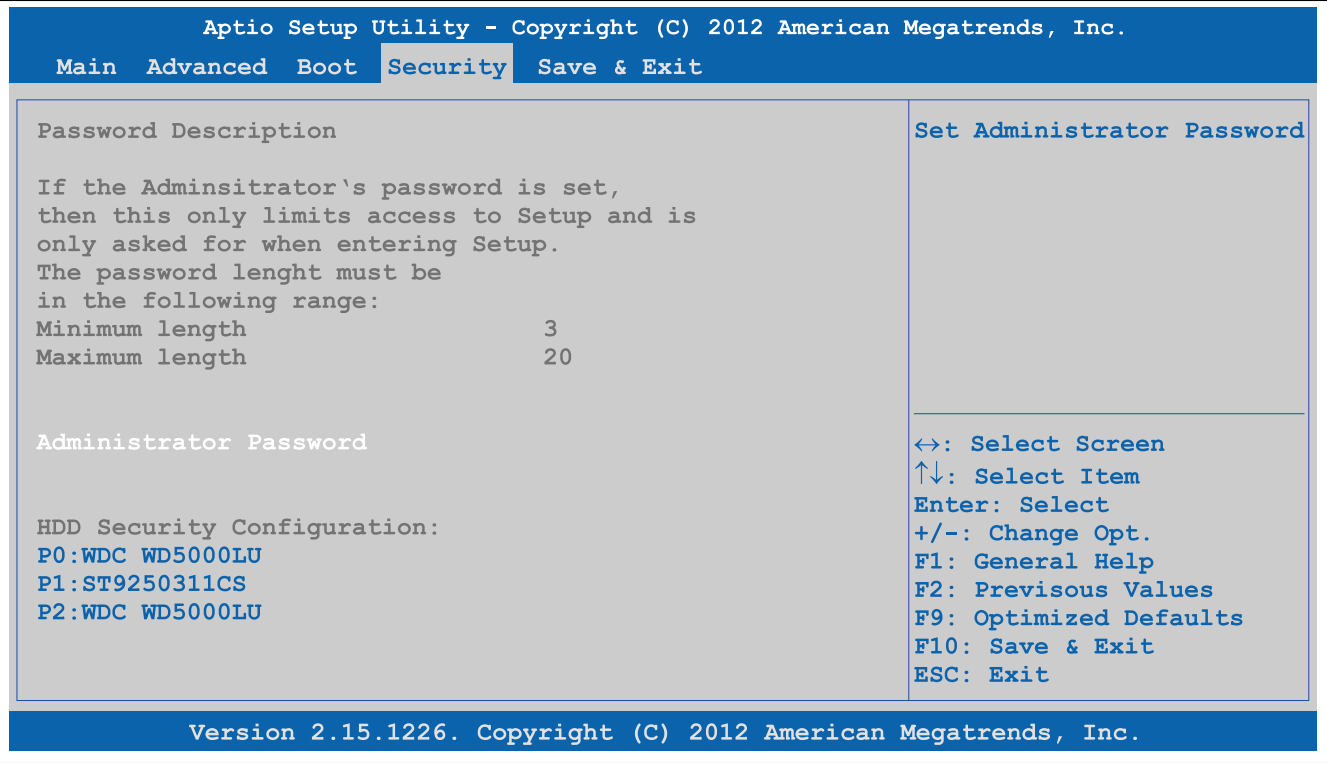


Figure 153: Security

BIOS setting	Function	Configuration options	Effect
Administrator password	Function for entering/changing the administrator password	Enter	Password entry

Table 230: Security menu - Configuration options

1.6.1 HDD user password

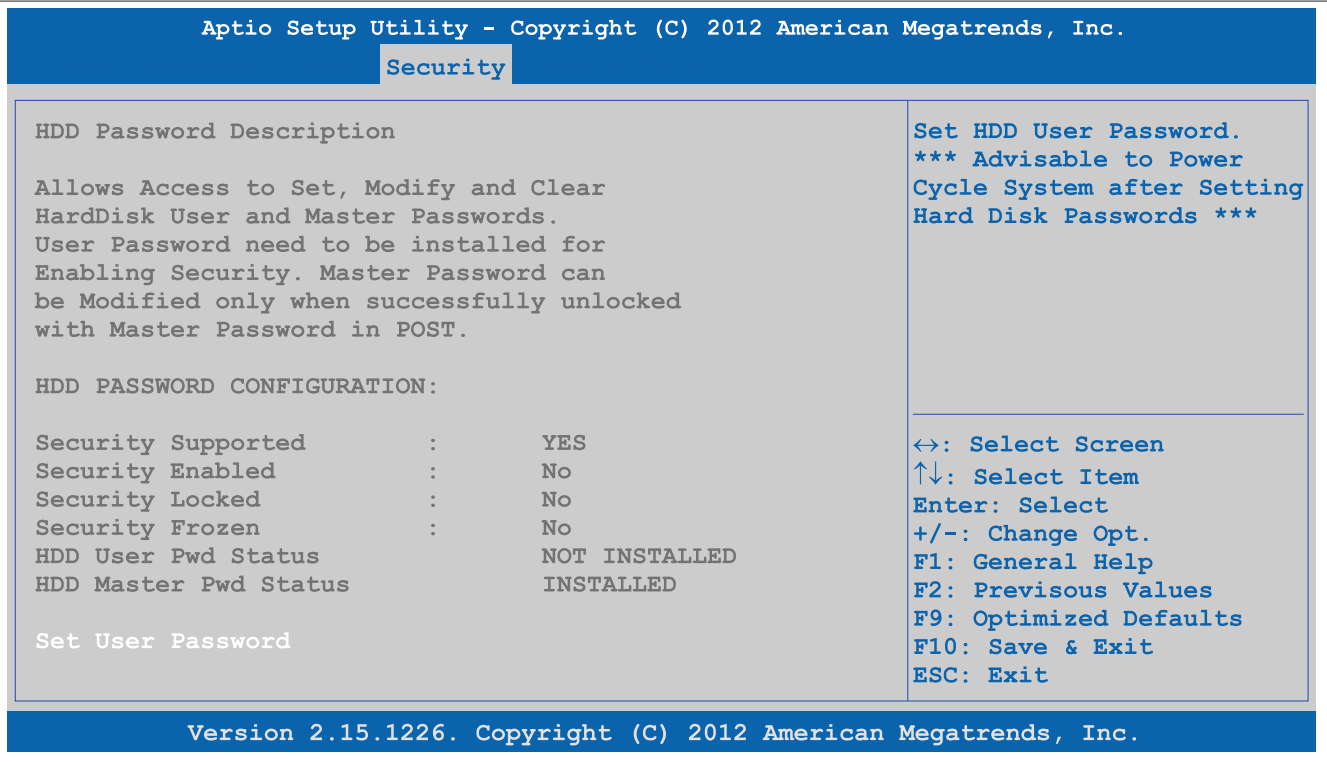


Figure 154: Security - HDD user password

BIOS setting	Function	Configuration options	Effect
User password	Function for entering/changing a user password.	Enter	Password entry

Table 231: Security - HDD user password - Configuration options

1.7 Save & Exit

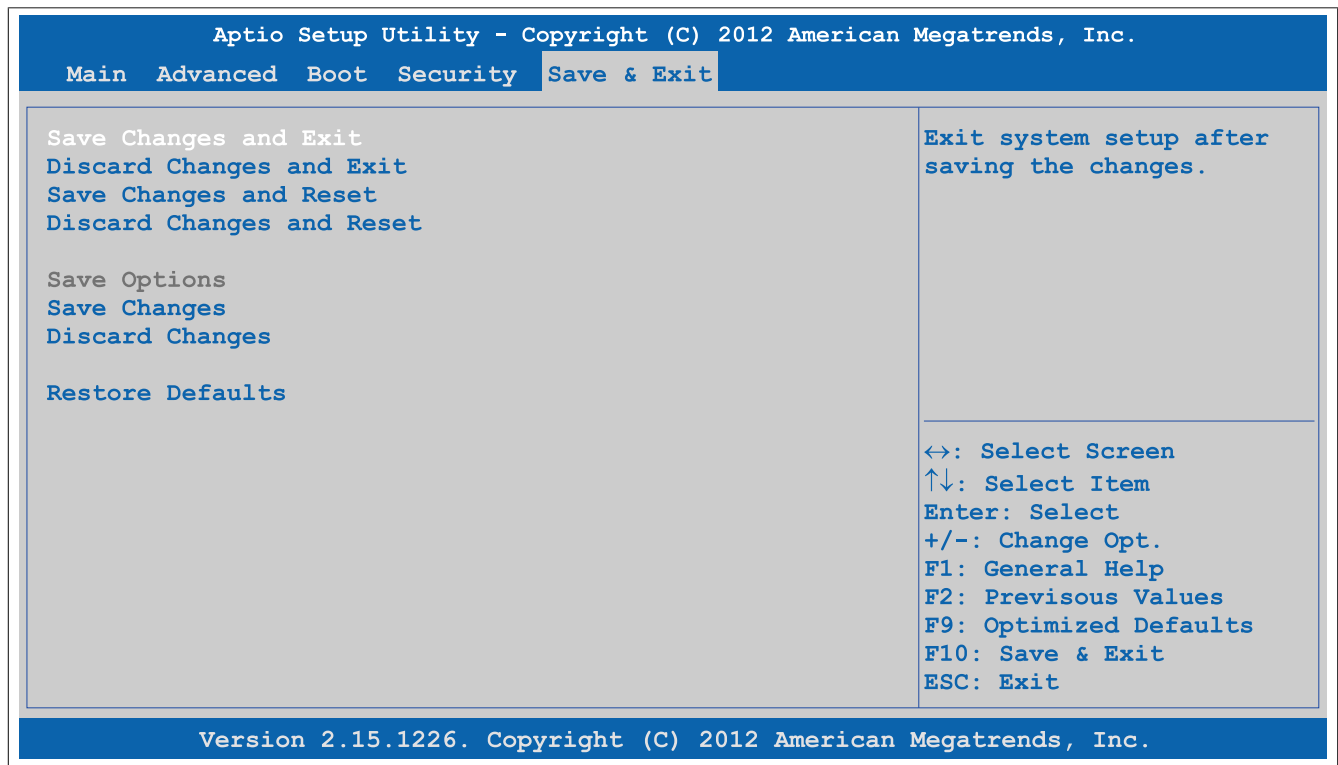


Figure 155: Save & Exit

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 232: 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	EFP2	
Secondary IGFX boot display	CRT	
Active LFP configuration	No local flat panel	
Display port B interface	DisplayPort	
Display Port C interface	Disabled	
Display Port D interface	HDMI/DVI	
Display mode persistence	Disabled	

Table 233: 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 234: 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 C	Enabled	
Device settings	-	

Table 235: 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		
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 236: 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 237: 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 238: 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	Auto	
PEG root port configuration	1 x 8 + 2 x 4	
PEG0	-	
PEG0 speed	Auto	
PEG0 ASPM	Disabled	
PEG1	-	
PEG1 speed	Gen1	
PEG1 ASPM	Disabled	
PEG2	-	
PEG2 speed	Auto	
PEG2 ASPM	Disabled	
Detect non-compliant device	Disabled	
De-emphasis control	-3.5 dB	

Table 239: 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	
SENF	Disabled	
SECE	Disabled	
PME SCI	Enabled	
Always enable port	Disabled	
PCIe speed	Auto	
Assign INT to root port	Enabled	

Table 240: Advanced - PCI Express configuration - PCI Express root port - Overview of profile settings

Setting/Option	Default profile	My setting
Extra bus reserved	0	
Reserved memory	10	
Prefetchable memory	10	
Reserved I/O	4	

Table 240: 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 241: 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 242: 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 243: 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	
DMI Configuration	-	
DMI	-	

Table 244: Advanced - Chipset configuration - Overview of profile settings

Setting/Option	Default profile	My setting
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 244: 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 245: 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	
Power down mode	PPD	
Scrambler seed generation off	Disabled	

Table 246: Advanced - Memory configuration - Overview of profile settings

Setting/Option	Default profile	My setting
Memory remap	Enabled	
Memory alias check	Disabled	
Channel A DIMM control	Enable both DIMMS	
Channel B DIMM control	Enable both DIMMS	

Table 246: 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 247: 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 248: 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 249: 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 250: 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 - 0FFFFFFh	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 251: 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 (SDL link module)
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 252: 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)				○	•	○	○	○			○	○	○				
ACPI ¹⁾									•								
Real-time clock								•									
Co-processor (FPU)														•			
Primary IDE channel															•		
Secondary IDE channel																•	
B&R	COM B (monitor/panel option / SDL Link module)			•	○	○	○	○			○	○	○				
	COM C (onboard SDL)			○	○	○	○	○			○	•	○				
	COM E (IF option 1 / I/O board 1)			○	○	○	○	○			•	○	○				
	COM F (IF option 2 / I/O board 2)			○	○	○	○	•			○	○	○				
	CAN			○	○	○	○	○			•	○	○				

Table 253: IRQ interrupt assignments in PIC mode

1) Advanced Configuration and Power Interface.

- ... 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 Interrupt **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)				○	•	○	○	○			○	○	○												
ACPI ¹⁾									•																
Real-time clock									•																
Co-processor (FPU)														•											
Primary IDE channel															•										
Secondary IDE channel																•									
B&R	COM B (Monitor/Panel option)			•	○	○	○	○			○	○	○												
	COM C (onboard SDL)			○	○	○	○	○			○	•	○												
	COM E (IF option 1)			○	○	○	○	○			•	○	○												
	COM F (IF option 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 254: 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

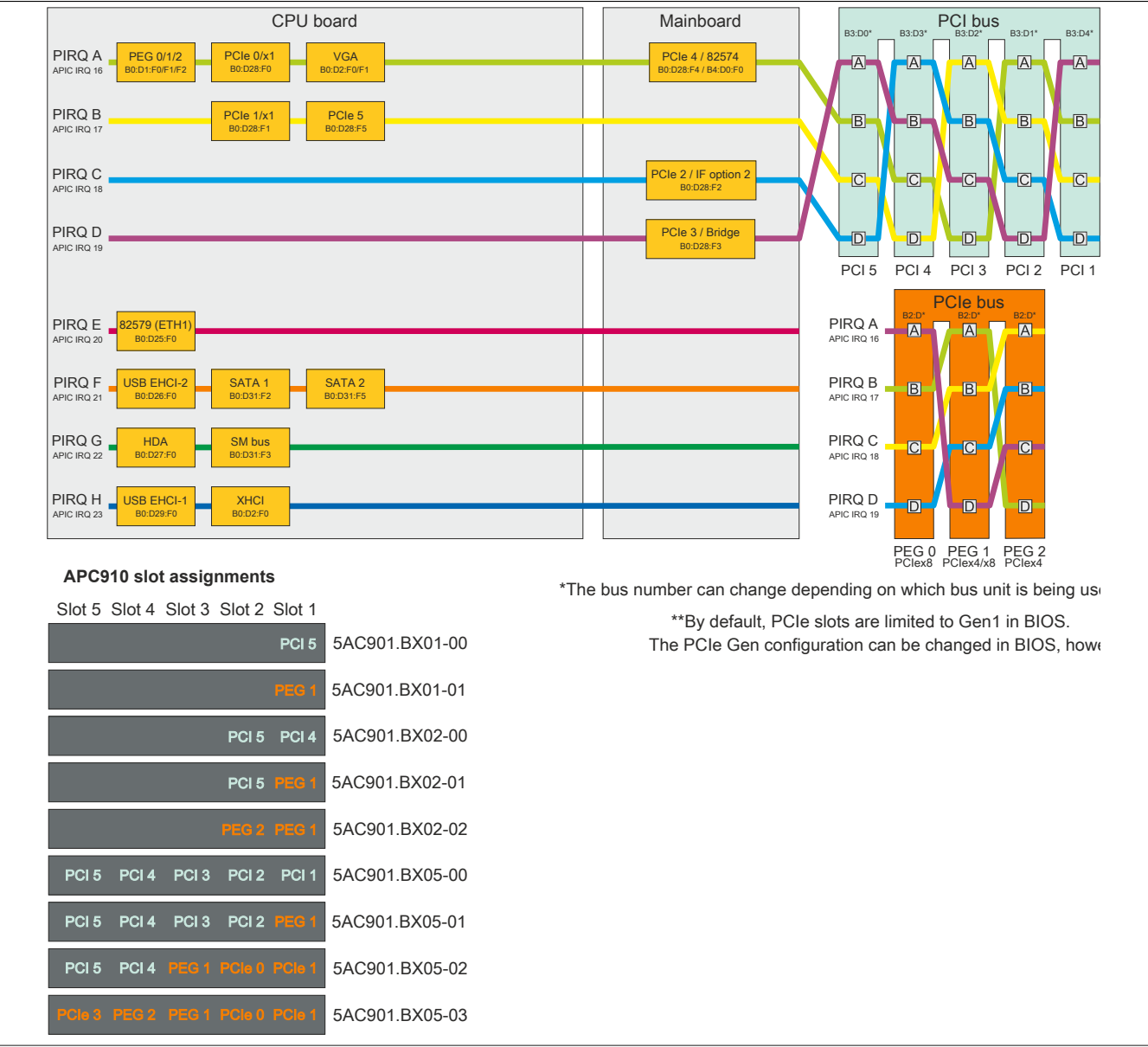


Figure 156: PCI and PCIe routing with enabled APIC for QM77/HM76 CPU boards

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 APC910, BIOS Setup can be accessed by pressing .
- From the "Advanced" menu in BIOS, select "OEM features".

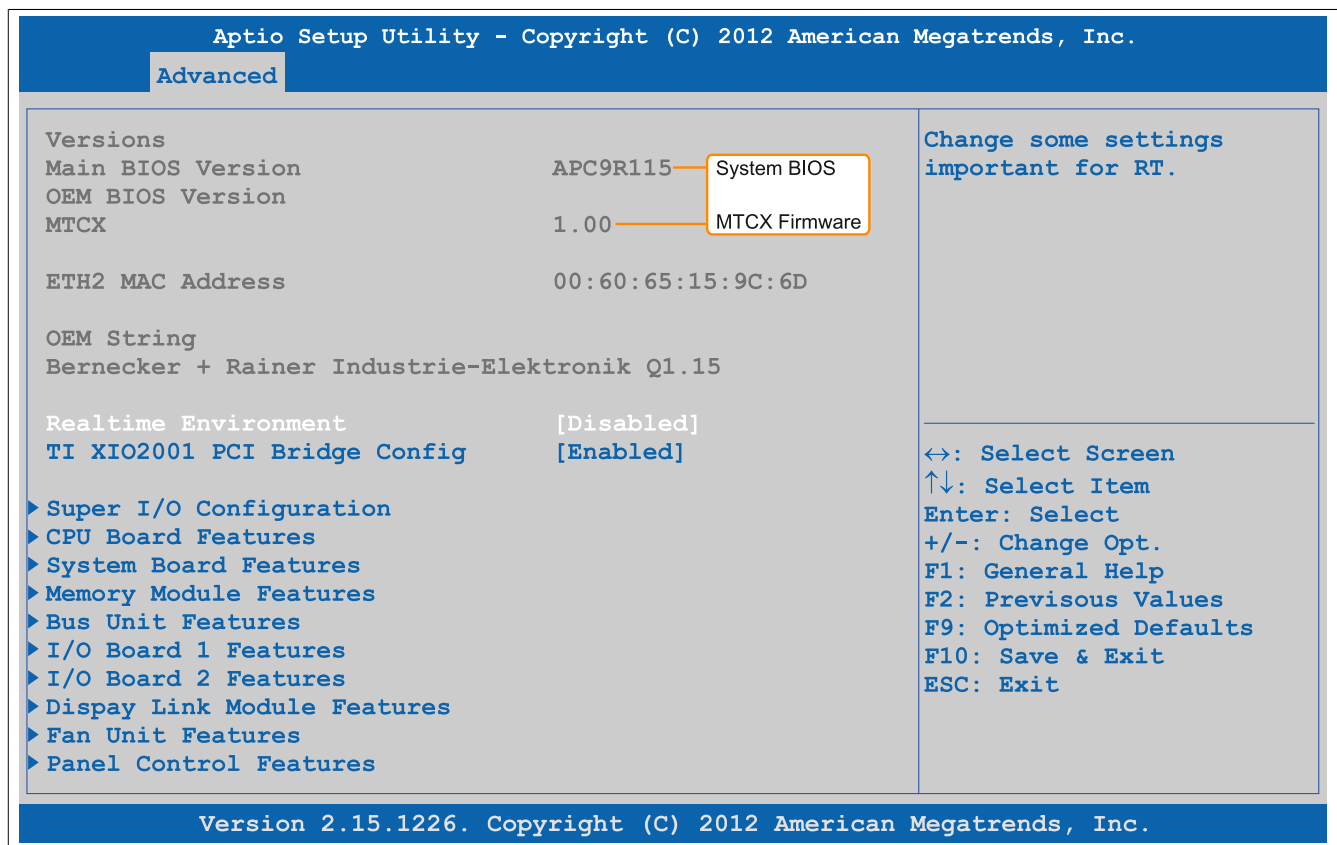


Figure 157: Software version

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 276.

Information about creating a USB flash drive for a B&R upgrade can be found on page 278.

Information about creating a storage device for a B&R upgrade can be found on page 279.

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 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 APC910 system variant.

The latest firmware upgrade is available in the Downloads section of the B&R website (www.br-automation.com).

2.2.1 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:

The PC's power supply must be switched off and then switched back on again in order for the new firmware to take effect and 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".

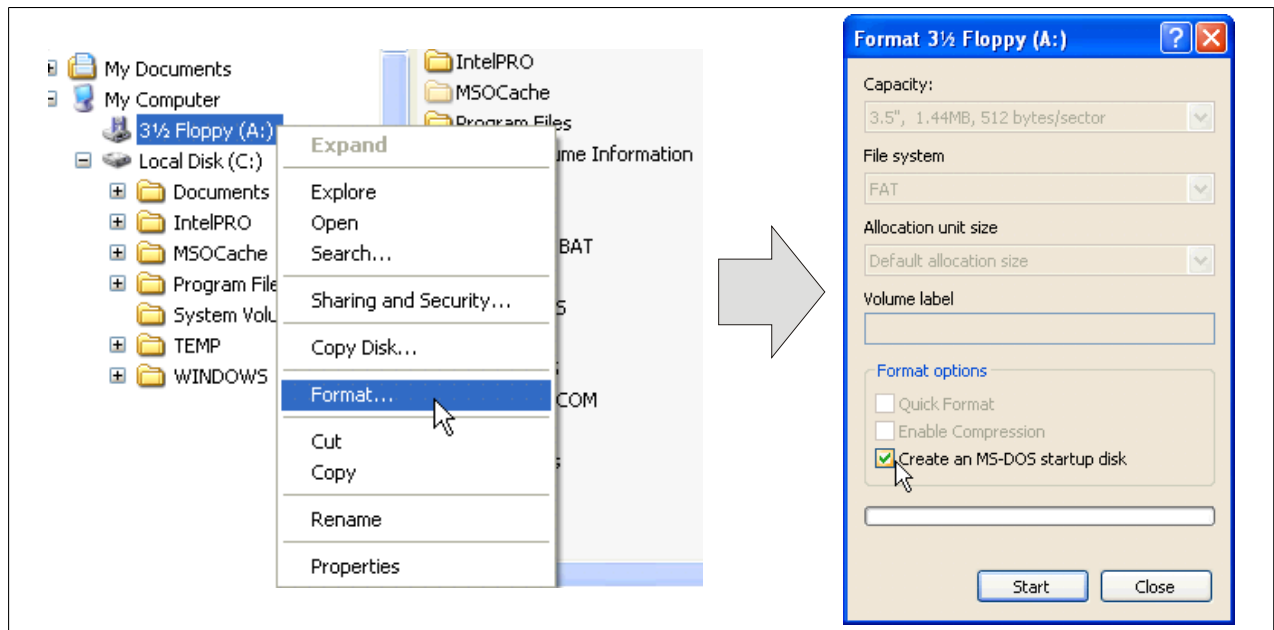


Figure 158: Creating a bootable diskette in Windows XP - Step 1

4. Select the **"Create an MS-DOS startup disk"** option, click on **"Start"** and acknowledge the warning message with "OK".



Figure 159: Creating a bootable diskette in Windows XP - Step 2

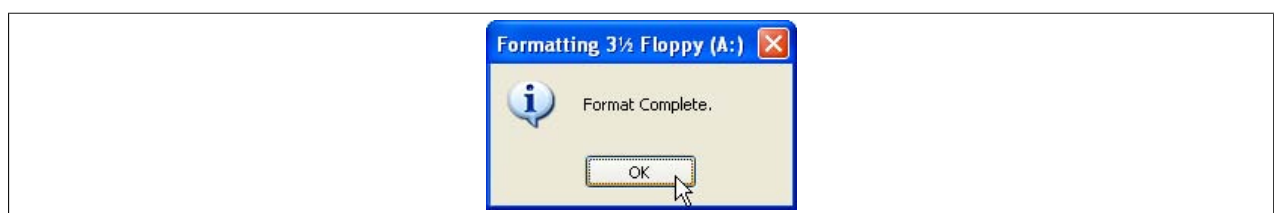


Figure 160: Creating a bootable diskette in Windows XP - Step 3

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".

before				after			
Name	Size	Type	Date Modified	Name	Size	Type	Date Modified
DISPLAY.SYS	17 KB	System file	6/8/2000 5:00 PM	AUTOEXEC.BAT	0 KB	MS-DOS Batch File	3/22/2006 10:08 AM
EGA2.CPI	58 KB	CPI File	6/8/2000 5:00 PM	COMMAND.COM	91 KB	MS-DOS Application	6/8/2000 5:00 PM
EGA3.CPI	58 KB	CPI File	6/8/2000 5:00 PM	CONFIG.SYS	0 KB	System file	3/22/2006 10:08 AM
EGA.CPI	58 KB	CPI File	6/8/2000 5:00 PM	DISPLAY.SYS	17 KB	System file	6/8/2000 5:00 PM
KEYB.COM	22 KB	MS-DOS Application	6/8/2000 5:00 PM	EGA2.CPI	58 KB	CPI File	6/8/2000 5:00 PM
KEYBOARD.SYS	34 KB	System file	6/8/2000 5:00 PM	EGA3.CPI	58 KB	CPI File	6/8/2000 5:00 PM
KEYBRD2.SYS	32 KB	System file	6/8/2000 5:00 PM	EGA.CPI	58 KB	CPI File	6/8/2000 5:00 PM
KEYBRD3.SYS	31 KB	System file	6/8/2000 5:00 PM	IO.SYS	114 KB	System file	5/15/2001 6:57 PM
KEYBRD4.SYS	13 KB	System file	6/8/2000 5:00 PM	KEYB.COM	22 KB	MS-DOS Application	6/8/2000 5:00 PM
MODE.COM	29 KB	MS-DOS Application	6/8/2000 5:00 PM	KEYBOARD.SYS	34 KB	System file	6/8/2000 5:00 PM
				KEYBRD2.SYS	32 KB	System file	6/8/2000 5:00 PM
				KEYBRD3.SYS	31 KB	System file	6/8/2000 5:00 PM
				KEYBRD4.SYS	13 KB	System file	6/8/2000 5:00 PM
				MODE.COM	29 KB	MS-DOS Application	6/8/2000 5:00 PM
				MSDOS.SYS	1 KB	System file	4/7/2001 1:40 PM

Figure 161: Creating a bootable diskette in Windows XP - Step 4

Name	Size	Type	Date Modified
AUTOEXEC.BAT	0 KB	MS-DOS Batch File	3/22/2006 10:08 AM
COMMAND.COM	91 KB	MS-DOS Application	6/8/2000 5:00 PM
CONFIG.SYS	0 KB	System file	3/22/2006 10:08 AM
DISPLAY.SYS	17 KB	System file	6/8/2000 5:00 PM
EGA2.CPI	58 KB	CPI File	6/8/2000 5:00 PM
EGA3.CPI	58 KB	CPI File	6/8/2000 5:00 PM
EGA.CPI	58 KB	CPI File	6/8/2000 5:00 PM
IO.SYS	114 KB	System file	5/15/2001 6:57 PM
KEYB.COM	22 KB	MS-DOS Application	6/8/2000 5:00 PM
KEYBOARD.SYS	34 KB	System file	6/8/2000 5:00 PM
KEYBRD2.SYS	32 KB	System file	6/8/2000 5:00 PM
KEYBRD3.SYS	31 KB	System file	6/8/2000 5:00 PM
KEYBRD4.SYS	13 KB	System file	6/8/2000 5:00 PM
MODE.COM	29 KB	MS-DOS Application	6/8/2000 5:00 PM
MSDOS.SYS	1 KB	System file	4/7/2001 1:40 PM

Figure 162: 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.

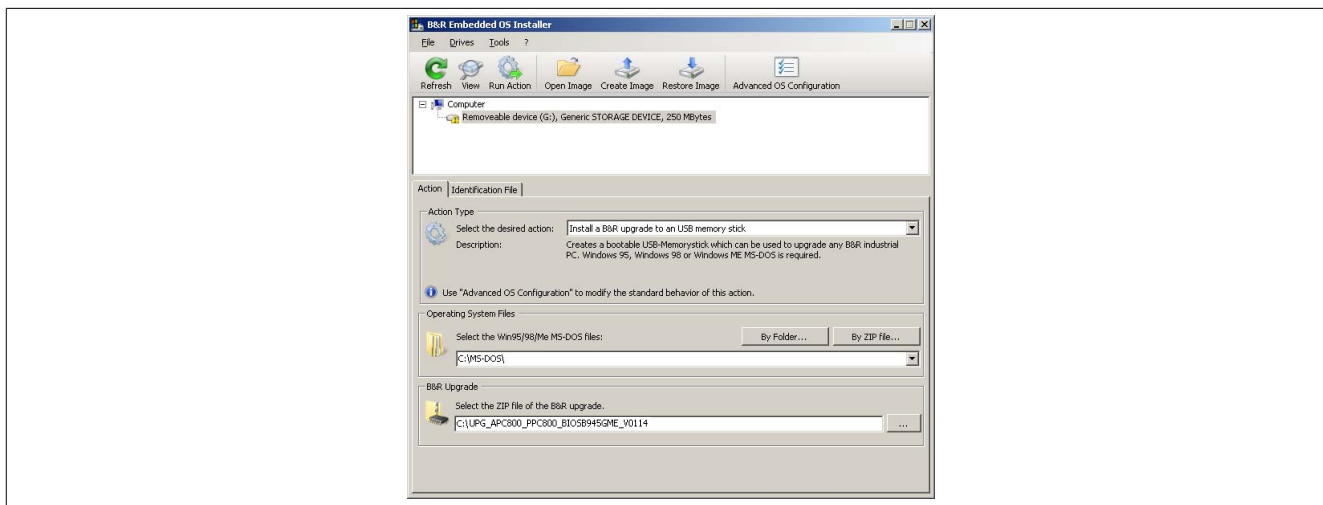


Figure 163: Creating a USB flash drive for B&R upgrade files

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 276. 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.

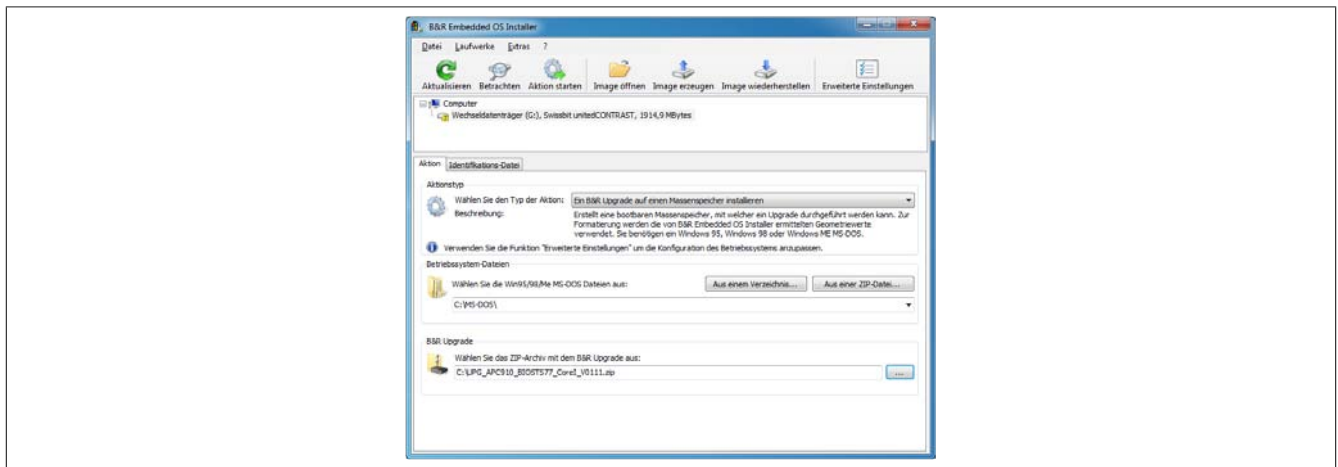


Figure 164: Creating a mass storage device for B&R upgrade files

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 276. The files from the diskette are then copied to the hard drive.

3 Windows 10 IoT Enterprise 2015 LTSB

3.1 General information

Windows 10 IoT Enterprise 2015 LTSB is the successor to Windows Embedded 8.1 Industry and based on new Windows 10 technology. This operating system also provides a high degree of protection for industrial applications with additional lockdown functions. Windows 10 IoT Enterprise 2015 LTSB is a version of Windows 10 Enterprise specifically developed for use in industrial applications (Long-Term Servicing Branch).

3.2 APC910 - Order data

Model number	Short description	Figure
	Windows 10 IoT Enterprise	
5SWW10.0240-MUL	Windows 10 IoT Enterprise 2015 LTSB - 64-bit - Multilingual - APC910 QM77/HM76 chipset - License (without Recovery DVD) - Only available with a new device	
	Optional accessories	
	Windows 10 IoT Enterprise	
5SWW10.0200-MUL	Windows 10 IoT Enterprise 2015 LTSB - 64-Bit - Multilanguage - Recovery DVD	
5SWW10.0400-MUL	Windows 10 IoT Enterprise 2015 LTSB - 64-Bit - Multilanguage DVD	

Table 255: 5SWW10.0240-MUL - Order data

3.3 Overview

Model number	Edition	Target system	Chipset	Architecture	Language	Minimum disk size	Minimum RAM required
5SWW10.0240-MUL	Embedded	APC910	QM77 HM76	64-bit	Multilingual	20 GB ¹⁾	2 GB ²⁾

1) The memory used by additional language packs is not taken into account in the minimum size specified for the disk.

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.

3.4 Features with Windows 10 IoT Enterprise 2015 LTSB

The following list of features shows the most important device functions included in Windows 10 IoT Enterprise 2015 LTSB.

Function	Windows 10 IoT Enterprise 2015 LTSB
Range of functions in Windows 10 Enterprise 2015 LTSB	✓
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
AppLocker	Configurable
Shell launcher	Configurable
Unified Write Filter	✓

Table 256: Features with Windows 10 IoT Enterprise 2015 LTSB.

3.5 Installation

B&R preinstalls Windows 10 IoT Enterprise 2015 LTSB on a suitable data storage device (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.).

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.

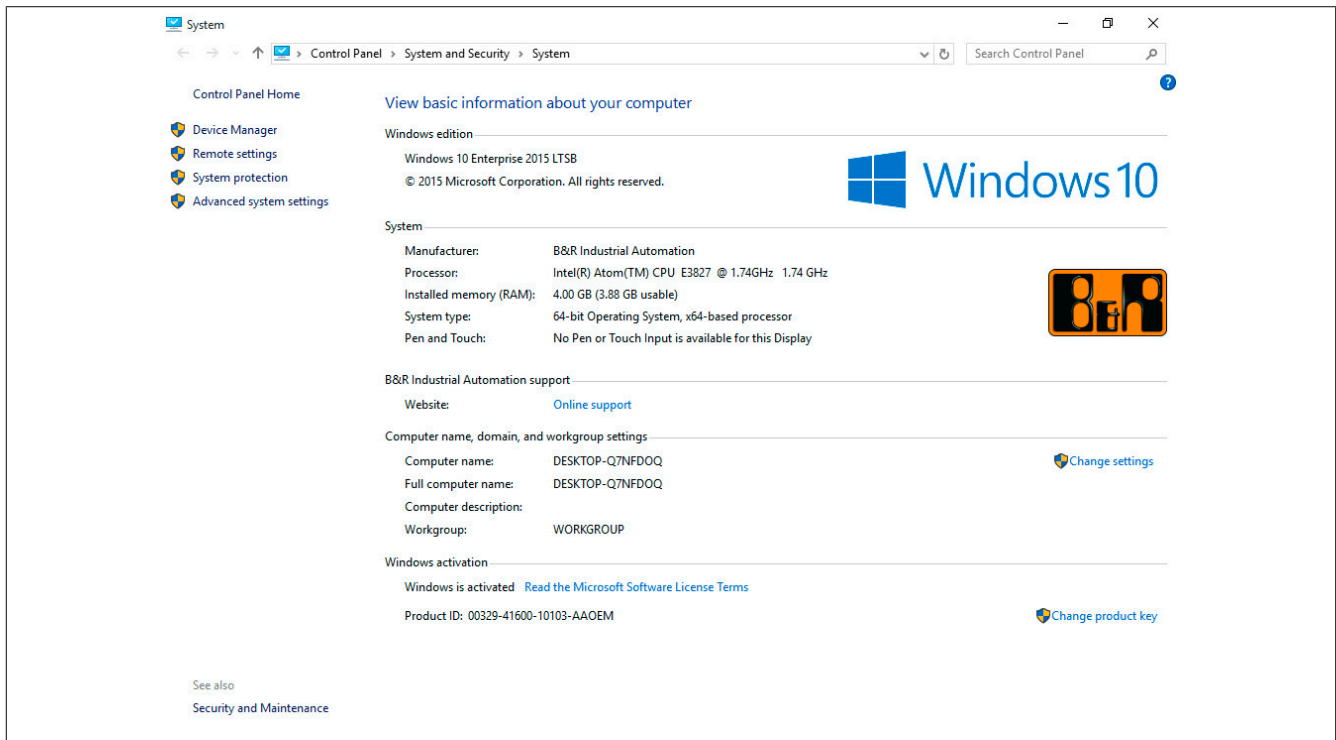
Information:

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

3.7 Activation

Like its predecessor (Windows Embedded 8.1 Industry Professional), Windows 10 IoT Enterprise 2015 LTSP must also 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 10 IoT Enterprise 2015 LTSP 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 in the Windows Control Panel under "Update & Security > Activation".

Information:

The product key never has to be entered for reactivation.

3.8 Contents of the Recovery DVD

The DVD with model number 5SWW10.0200-MUL is only for recovery purposes.

Information:

It is only used to carry out the basic installation of Windows 10 Enterprise 2015 LTSP. 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 Special considerations, limitations

- Unlike the standard Windows 10 Enterprise edition, Windows 10 IoT Enterprise 2015 LTSB does not include Cortana, the Microsoft Edge browser or the Microsoft Store.
- The LTSB version is based on Build 10240 of Windows 10 and does not contain any feature updates.

3.10 Supported display resolutions

In accordance with Microsoft requirements, Windows 10 IoT Enterprise 2015 LTSB 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.

4 Windows Embedded 8.1 Industry Pro

4.1 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.

4.2 Order data

Model number	Short description	Figure
	Windows Embedded 8.1 Industry Professional	
5SWWI8.0340-MUL	Windows Embedded 8.1 Industry Pro - 32-bit - Multilingual - For APC910 QM77/HM76 - License	
5SWWI8.0440-MUL	Windows Embedded 8.1 Industry Pro - 64-bit - Multilingual - For APC910 QM77/HM76 - License	
	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 257: 5SWWI8.0340-MUL, 5SWWI8.0440-MUL - Order data

4.3 Overview

Model number	Edition	Target system	Chipset	Architecture	Language	Minimum disk size	Minimum RAM required
5SWWI8.0340-MUL	Embedded	APC910	QM77 HM76	32-bit	Multilingual	16 GB ¹⁾	1 GB ²⁾
5SWWI8.0440-MUL	Embedded	APC910	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.

4.4 Features with Windows Embedded 8.1 Industry Pro

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
USB filter	Configurable
Unified Write Filter	✓
Windows 8 Application Launcher	Configurable
Gesture filter	Configurable

Table 258: Device functions in Windows Embedded 8.1 Industry Pro

4.5 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".

4.6 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.

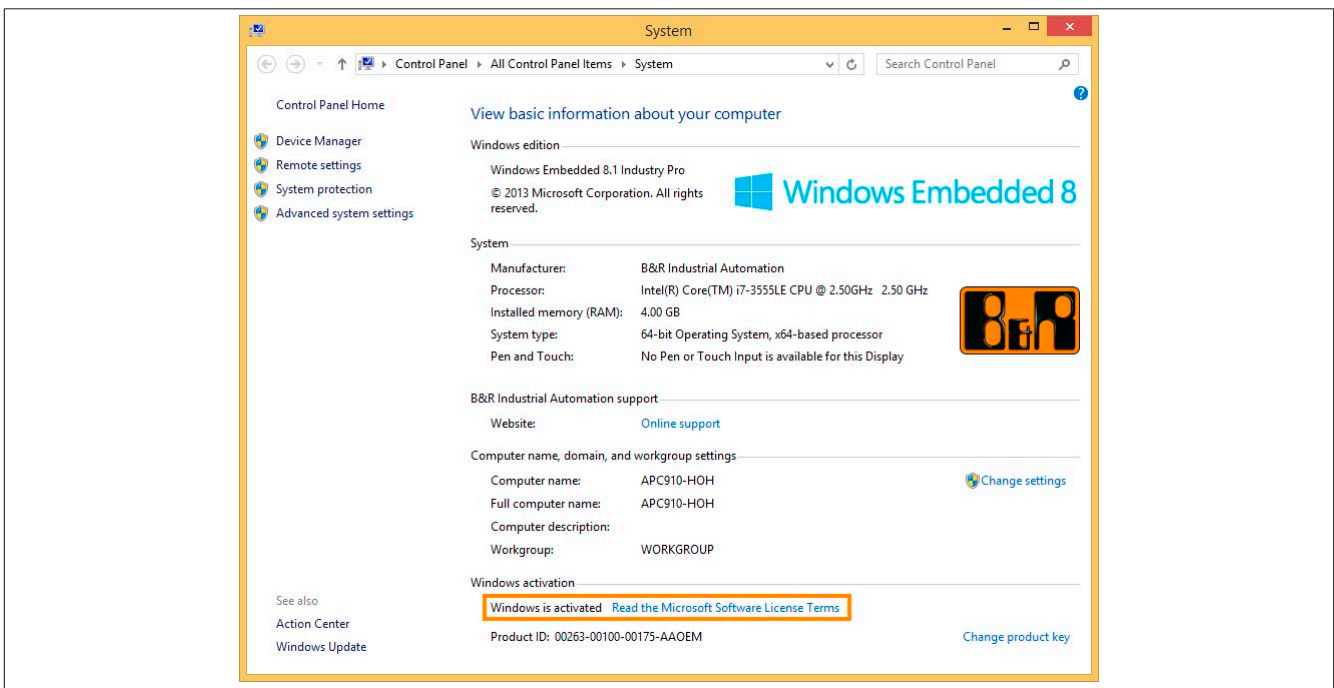
Information:

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

4.7 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.

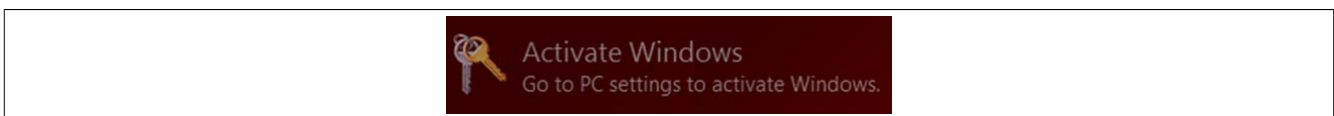
The status of the activation can be viewed in the Control Panel:



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](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](http://msdn.microsoft.com/en-us/library/dn449379(v=winembedded.82).aspx)

Information:

The product key never has to be entered for reactivation.

4.8 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](#)").

4.9 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](http://msdn.microsoft.com/en-us/library/dn449278(v=winembedded.82).aspx)

4.10 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.

5 Windows 7

5.1 General information

Windows 7 offers a wide range of innovative features and performance improvements. The 64-bit variants also exploit the full power of current PC architectures. Faster switching to sleep mode, quicker restores, less memory usage and high-speed detection of USB devices are just a few of the advantages of 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 an enormous advantage for simple logistical procedures relating to machine [automation](#).

All 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.

5.2 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 259: 5SWWI7.1100-GER, 5SWWI7.1100-ENG, 5SWWI7.1200-GER, 5SWWI7.1200-ENG, 5SWWI7.1300-MUL, 5SWWI7.1400-MUL - Order data

5.3 Overview

Model number	Edition	Target sys-tem	Chipset	Service pack	Architec-ture	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 260: 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.

5.4 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.

5.4.1 Installing on the PCI SATA RAID controller - 5ACPCI.RAIC-06

The following steps are necessary to install Windows 7 on the PCI SATA RAID controller:

1. Download the "PCI SATA RAID driver 5ACPCI.RAIC-01, -03, -05, -06" driver for Windows 7 from the B&R website at www.br-automation.com and copy the data to a folder on a USB flash drive.
2. Boot using the Windows 7 DVD.
3. Follow the installation steps until a page appears asking "Where do you want to install Windows?".
4. Connect the USB flash drive with the RAID drivers into an available USB interface.
5. Click on "Load driver" and navigate to the directory containing the RAID drivers. Then click "Next" to continue.
6. Remove the USB flash drive.
7. The Windows 7 installation can now be performed as usual.

5.4.2 Installing on the internal RAID controller (QM77)

The following steps are necessary to install Windows 7 on the internal RAID controller (QM77):

1. Download the "AHCI and RAID driver QM77" driver for Windows 7 from the B&R website at www.br-automation.com and copy the data to a folder on a USB flash drive.
2. Boot using the Windows 7 DVD.
3. Follow the installation steps until a page appears asking "Where do you want to install Windows?".
4. Connect the USB flash drive with the RAID drivers into an available USB interface.
5. Click on "Load driver" and navigate to the directory containing the RAID drivers. Then click "Next" to continue.
6. Remove the USB flash drive.
7. The Windows 7 installation can now be performed as usual.

5.5 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.

5.6 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).

6 Windows Embedded Standard 7

6.1 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 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 version⁶⁾, which ensures that even the most demanding applications have the level of support they need.

6.2 Order data

Model number	Short description	Figure
	Windows Embedded Standard 7	
5SWWI7.1540-ENG	Windows Embedded Standard 7 SP1 - 32-bit - English - For APC910 with QM77/HM76 chipset - License	
5SWWI7.1640-ENG	Windows Embedded Standard 7 SP1 - 64-bit - English - For APC910 with QM77/HM76 chipset - License	
5SWWI7.1740-MUL	Windows Embedded Standard 7 Premium SP1 - 32-bit - Multilingual - For APC910 with QM77/HM76 chipset - License	
5SWWI7.1840-MUL	Windows Embedded Standard 7 Premium SP1 - 64-bit - Multilingual - For APC910 with QM77/HM76 chipset - License	
	Optional accessories	
	Windows Embedded Standard 7	
5SWWI7.1900-MUL	Windows Embedded Standard 7 SP1 - 32-bit - Language Pack DVD	
5SWWI7.2000-MUL	Windows Embedded Standard 7 SP1 - 64-bit - Language Pack DVD	

Table 261: 5SWWI7.1540-ENG, 5SWWI7.1640-ENG, 5SWWI7.1740-MUL, 5SWWI7.1840-MUL - Order data

6.3 Overview

Model number	Edition	Target system	Chipset	Service pack	Architecture	Language	Minimum disk size	Minimum RAM required
5SWWI7.1540-ENG	Embedded	APC910	QM77 HM76	SP1	32-bit	English	16 GB	1 GB ¹⁾
5SWWI7.1640-ENG	Embedded	APC910	QM77 HM76	SP1	64-bit	English	16 GB	2 GB ²⁾
5SWWI7.1740-MUL	Premium	APC910	QM77 HM76	SP1	32-bit	Multilingual	16 GB ³⁾	1 GB ¹⁾
5SWWI7.1840-MUL	Premium	APC910	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.

⁶⁾ 64-bit versions are not supported by all systems.

6.4 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	✓	✓
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 262: Device functions in Windows Embedded Standard 7

6.5 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.

6.6 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.

6.6.1 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.

6.7 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.

7 Windows XP Professional

7.1 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.

7.2 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 263: 5SWWXP.0600-GER, 5SWWXP.0600-ENG, 5SWWXP.0600-MUL - Order data

7.3 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

7.4 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.

7.4.1 Installing on the PCI SATA RAID controller - 5ACPCI.RAIC-06

The following steps are necessary to install Windows XP Professional on a PCI SATA RAID controller:

1. Download the "PCI SATA RAID driver 5ACPCI.RAIC-01, -03, -05, -06" driver for Windows XP from the B&R website at www.br-automation.com and copy the files to a diskette.
2. Connect the media drive (5MD900.USB2-01 or 5MD900.USB2-02) to the USB interface.
3. Insert the diskette and Windows XP Professional CD in the media drive and boot from the CD.
4. Press the F6 key during installation to install a third-party SCSI or driver.
5. Press the "s" key when asked about installing an additional drive. Insert the diskette into the floppy drive. Press "Enter" and select the driver.
6. Follow the installation instructions.
7. The installer will copy the files to the Windows XP Professional folder and restart the B&R Industrial PC.

Information:

- **Not all USB FDD drives are supported by the Windows XP installer (see Microsoft KB 916196).**
- **Depending on the system, the boot order may have to be changed in BIOS.**

7.4.2 Installing on the internal RAID controller (QM77) or in AHCI mode

The following steps are necessary to install Windows XP Professional on the internal RAID controller (QM77) or in AHCI mode:

1. Download the "AHCI and RAID driver QM77" driver for Windows XP from the B&R website at www.br-automation.com and copy the files to a diskette.
2. Connect the media drive (5MD900.USB2-01 or 5MD900.USB2-02) to the USB interface.
3. Insert the diskette and Windows XP Professional CD in the media drive and boot from the CD.
4. Press the F6 key during installation to install a third-party SCSI or driver.
5. Press the "s" key when asked about installing an additional drive. Insert the diskette into the floppy drive. Press "Enter" and select the driver.
6. Follow the installation instructions.
Select "Intel(R) 7 Series Chipset Family SATA AHCI Controller" for AHCI.
Select "Intel(R) Mobile Express Chipset SATA RAID Controller" RAID.
7. The installer will copy the files to the Windows XP Professional folder and restart the B&R Industrial PC.

If the driver is installed while AHCI is enabled, the following message will appear twice: "Software installation has not passed Windows Logo testing to verify its compatibility with Windows XP. Do you want to continue installing the software?" Select "Yes".

Information:

- **Not all USB FDD drives are supported by the Windows XP installer (see Microsoft KB 916196).**
- **Depending on the system, the boot order may have to be changed in BIOS.**

7.5 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.

8 Windows Embedded Standard 2009

8.1 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.

8.2 Order data

Model number	Short description	Figure
	Windows Embedded Standard 2009	
5SWWXP.0740-ENG	Windows Embedded Standard 2009 - English - For PPC900 with QM77/HM76 chipset - License	

Table 264: 5SWWXP.0740-ENG - Order data

8.3 Overview

Model number	Target system	Chipset	Language	Minimum disk size	Minimum RAM required
5SWWXP.0740-ENG	APC910	QM77 HM76	English	2 GB	256 MB

8.4 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 265: Device functions in Windows Embedded Standard 2009

Function	Included?
Media Player 64	✓
DirectX 9.0c	✓
Accessories	✓
Number of fonts	89

Table 265: Device functions in Windows Embedded Standard 2009

8.5 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.

8.6 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.

8.7 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.

9 Automation Runtime

9.1 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.).

9.2 Order data

Model number	Short description	Figure
	Technology Guard	
0TG1000.01	Technology Guard (MSD) is provided in 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 266: 0TG1000.01, 0TG1000.02, 1TG4600.10-5, 1TG4601.06-5 - Order data

9.3 Automation Runtime Windows (ARwin)

System requirements

The following software versions (or higher) are required to operate Automation Runtime Windows on an Automation PC 910:

- ARwin upgrade AR A4.02
- Automation Studio V3.0.90.x or V4.0.14.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)

9.4 Automation Runtime Embedded (ARemb)

System requirements

The following software versions (or higher) are required to operate Automation Runtime Embedded on an Automation PC 910:

- ARemb upgrade AR A4.02
- Automation Studio V3.0.90.x or V4.0.14.x
- Visual Components Runtime (VC) V3.96.0 or V4.05.2
- 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*.

9.5 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 Automation Help.

10 Debian (GNU/Linux)

10.1 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

For more information about Debian, visit <http://www.debian.org>.

10.2 Order data

Model number	Short description	Figure
	Debian 8	
5SWLIN.0540-MUL	Debian 8 - 32-bit - Multilingual - APC910 chipset QM77/HM76 - Installation (without Recovery DVD) - Only available with a new device	
5SWLIN.0640-MUL	Debian 8 - 64-bit - Multilingual - APC910 chipset QM77/HM76 - Installation (without Recovery DVD) - Only available with a new device	
	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 267: 5SWLIN.0540-MUL, 5SWLIN.0640-MUL - Order data

10.3 Overview

Model number	Target system	Chipset	Architecture	Language	Minimum disk size	Minimum RAM required
5SWLIN.0540-MUL	APC910	QM77 HM76	32-bit	Multilingual	4 GB	1 GB
5SWLIN.0640-MUL	APC910	QM77 HM76	64-bit	Multilingual	4 GB	1 GB

10.4 Features

- LXDE desktop
- Touch screen 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).

10.5 Installation

B&R preinstalls Debian 8 on a desired storage device (e.g. CFast 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>). 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 are also available on the B&R website for the necessary B&R modifications (www.br-automation.com).

10.6 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).

11 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.

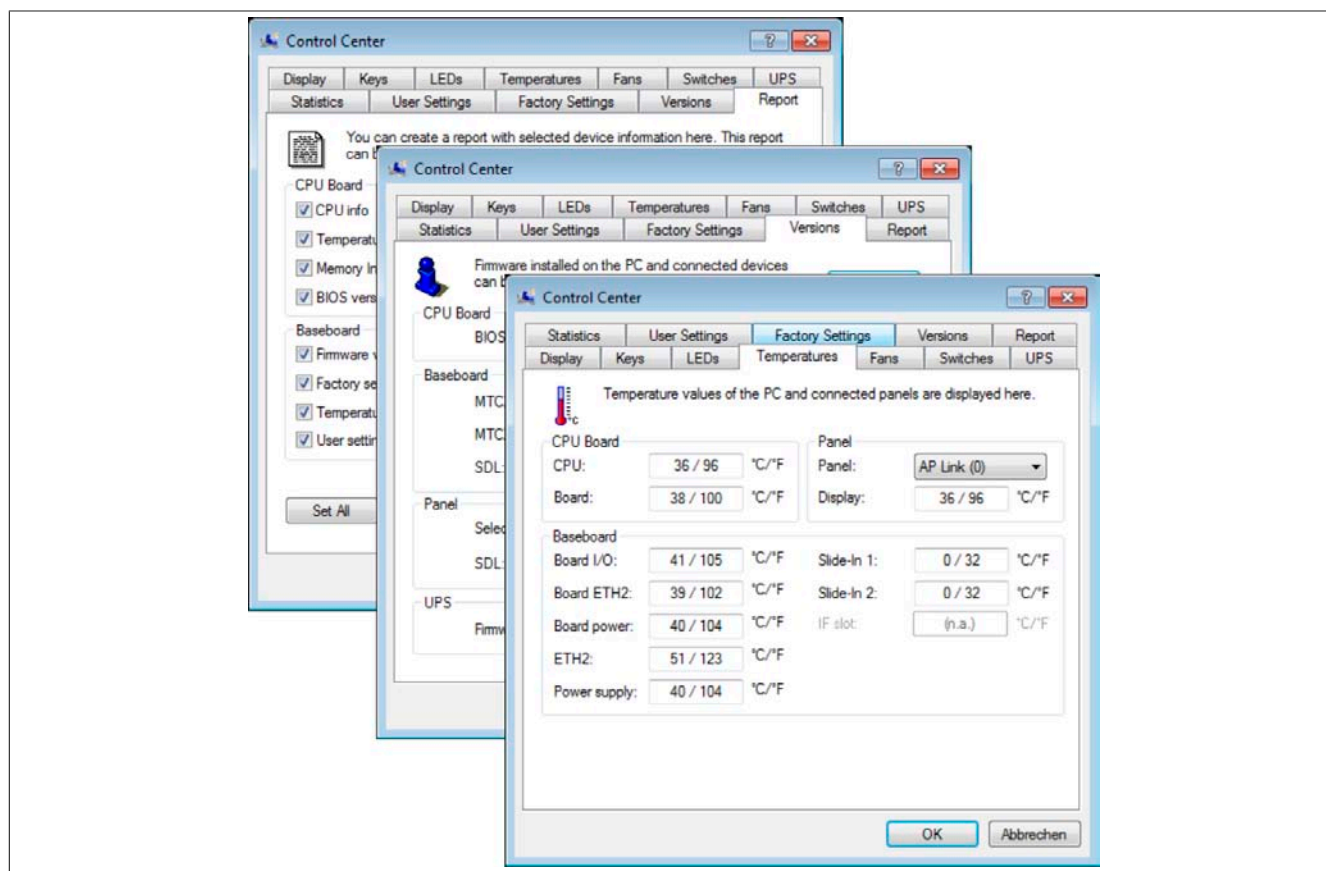


Figure 165: ADI Control Center screenshots - Examples

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.

11.1 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

11.2 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.

12 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)

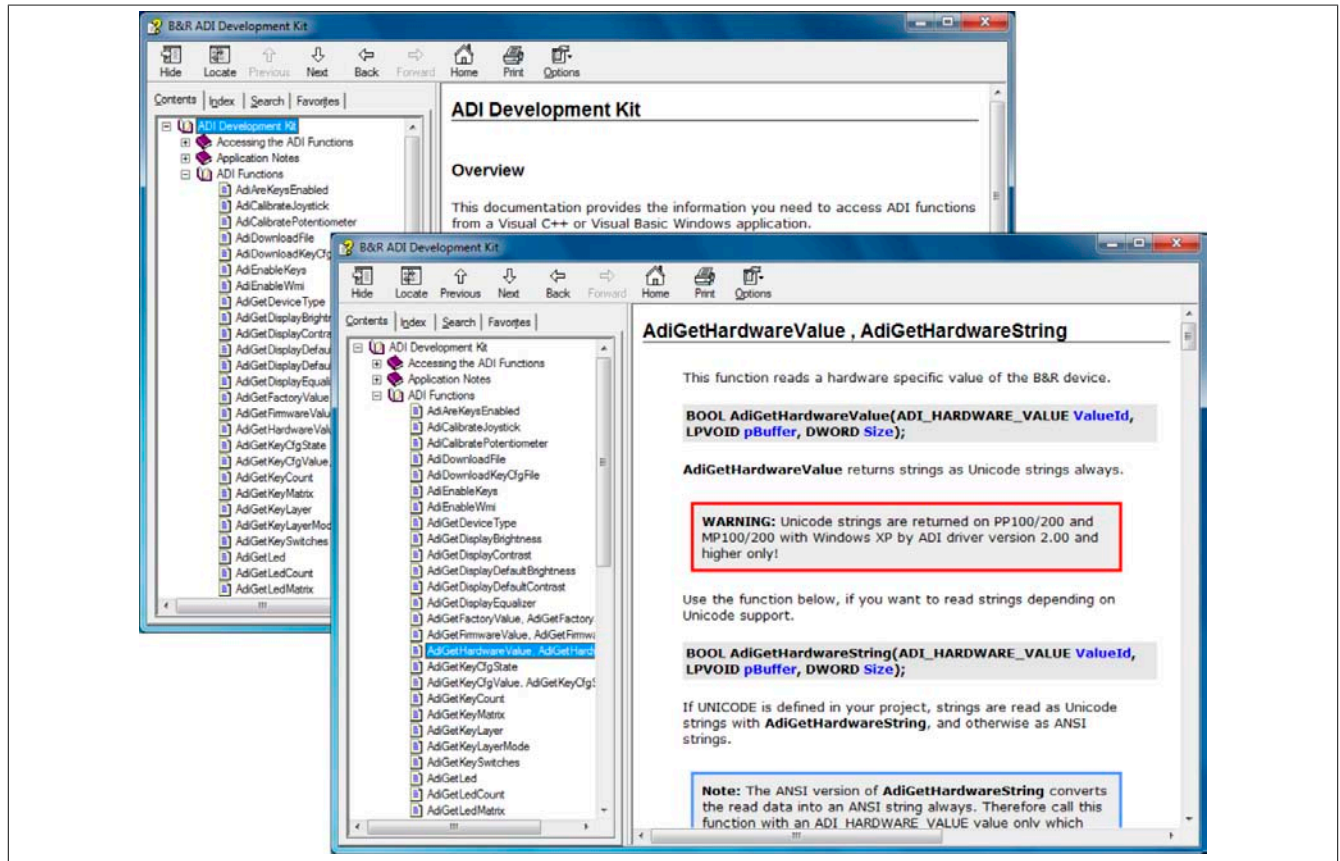


Figure 166: ADI Development Kit Screenshots (Version 3.70)

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).

13 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)

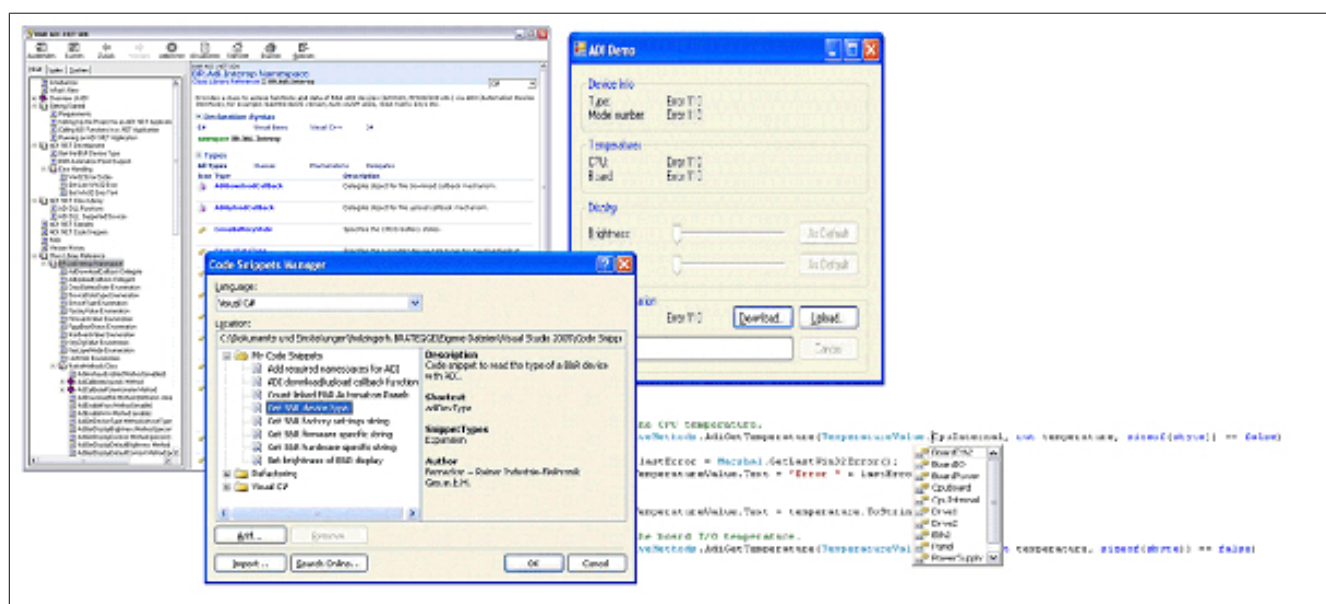


Figure 167: ADI .NET SDK screenshots (version 2.10)

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).

14 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.

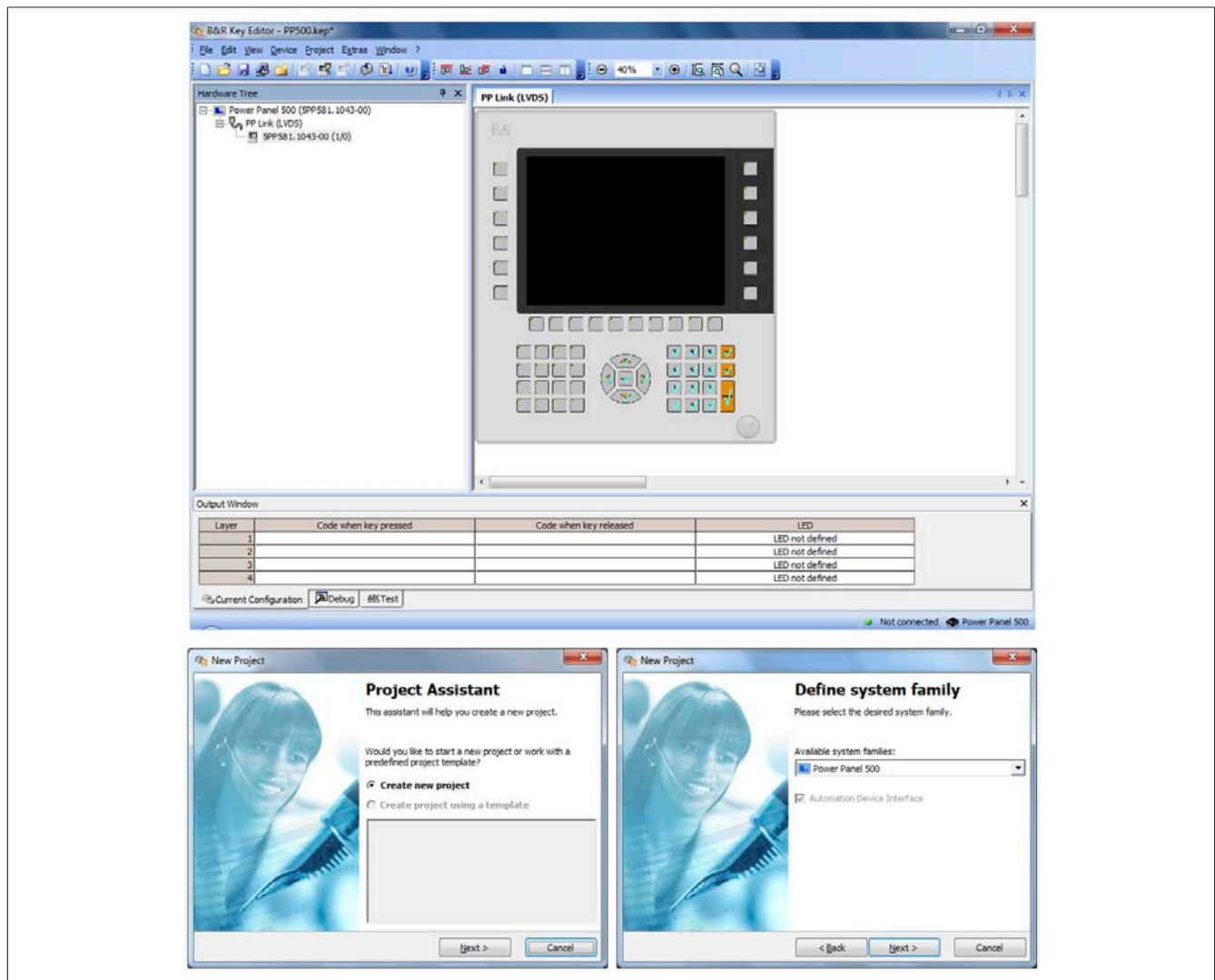


Figure 168: B&R Key Editor screenshots (version 3.60)

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).

15 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.

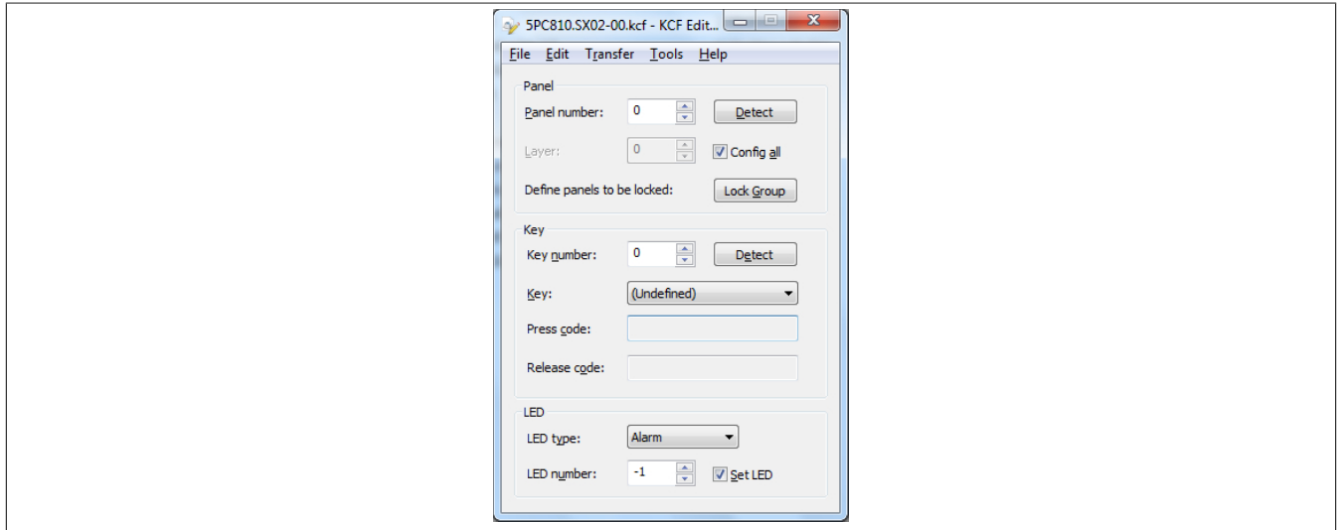


Figure 169: B&R KCF Editor screenshot (version 1.0)

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 device⁷⁾

- 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).

⁷⁾ The ADI driver must be installed on the B&R PC to use these features.

16 HMI Service Center

16.1 5SWUTI.0001-000

16.1.1 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).

16.1.2 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 268: 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

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



Ind.Cont.Eq.
E115267

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 regions.

Underwriters Laboratories (UL) in accordance with the UL508 standard - 17th Edition
Canadian (CSA) standard in accordance with C22.2 No. 142-M1987

2.2 GOST-R



Products with this mark have been tested by an accredited testing laboratory and approved for import to the Russian Federation (based on CE compliance).

2.3 GL certification (Germanischer Lloyd)



Some B&R products have been certified by Germanischer Lloyd and are approved for use in maritime environments. GL certificates (type approval) are generally accepted by other classification societies during ship acceptance procedures.

Germanischer Lloyd (GL) in accordance with standard GL 2012 (Category C EMC 1)

Category C concerns devices that are protected from the effects of weather. EMC 1 defines the radiated and conducted emission limits for devices installed on a ship's bridge.

Devices used on a ship's bridge must be dimmable using software in accordance with the regulations and guidelines from the respective classification society.

Information:

Line filter 5AC804.MFLT-00 is absolutely mandatory in the supply line when used in a maritime environment. For more information, see section ["Connecting to the end device" on page 360](#).

The following table lists the revisions from which GL certification applies to individual components.

Model number	Description	GL beginning with rev.
5PC910.SX01-00	1-slot APC910 system unit	E0
5PC910.SX02-00	2-slot APC910 system unit	G0
5AC901.BX01-00	APC910 1-slot bus - 1 PCI	D0
5AC901.BX01-01	APC910 1-slot bus - 1 PCI Express x8	E0
5AC901.BX02-00	APC910 2-slot bus - 2 PCI	D0
5AC901.BX02-01	APC910 2-slot bus - 1 PCI - 1 PCI Express x8	E0
5AC901.BX02-02	APC910 2-slot bus - 2 PCI Express x4	E0
5PC900.TS77-00	CPU board Intel Core i7 3615QE 2.3 GHz - Quad core - QM77 chipset - For APC910	E0
5PC900.TS77-04	CPU board Intel Core i5 3610ME 2.7 GHz - Dual core - QM77 chipset - For APC910	D0
5PC900.TS77-10	CPU board Intel Celeron 1047UE 1.4 GHz - Dual core - HM76 chipset - For APC910	D0
5MMDDR.1024-03	SO-DIMM DDR3, 1024 MB	D0
5MMDDR.2048-03	SO-DIMM DDR3, 2048 MB	D0
5MMDDR.4096-03	SO-DIMM DDR3, 4096 MB	D0
5MMDDR.8192-03	SO-DIMM DDR3, 8192 MB	D0
5AC901.HS00-00	APC910 heat sink, active	D0
5AC901.FA01-00	APC910 fan kit - For 5PC910.SX01-00	D0
5AC901.FA02-00	APC910 fan kit - For 5PC910.SX02-00	D0
5AC901.I485-00	Interface card - 1x RS232/422/458 interface - For APC910/PPC900	D0
5AC901.ICAN-00	Interface card - 1x CAN interface - For APC910/PPC900	D0
5AC901.IHDA-00	Interface card - 1x audio interface (1x MIC/1x Line In/1x OUT) - For APC910/PPC900	D0
5ACPCI.ETH1-01	PCI Ethernet card 1x 10/100	D0
5ACPCI.ETH3-01	PCI Ethernet card 3x 10/100	D0
5AC804.MFLT-00	Line filter	D0
5AC901.CSSD-03	60 GB SSD MLC - Slide-in compact - SATA	E0
5AC901.CSSD-04	128 GB SSD MLC - Slide-in compact - SATA	F0
5AC901.CSSD-05	256 GB SSD MLC - Slide-in compact - Toshiba - SATA	D0
5AC901.SDVW-00	DVD drive - DVD-R/RW/DVD+R/RW - Slide-in	D0
5AC901.SSCA-00	Slide-in compact adapter - For slide-in compact drives	D0
5CFAST.2048-00	CFast card, 2 GB SLC	D0
5CFAST.4096-00	CFast card, 4 GB SLC	D0
5CFAST.8192-00	CFast card, 8 GB SLC	D0
5CFAST.016G-00	CFast card, 16 GB SLC	D0
5CFAST.032G-00	CFast card, 32 GB SLC	D0
5CFAST.032G-10	CFast card, 32 GB MLC	D0
5CFAST.064G-10	CFast card, 64 GB MLC	D0
5CFAST.128G-10	CFast card, 128 GB MLC	D0
5AC901.FF01-00	Front cover for 1-slot APC910 - Orange	D0
5AC901.FF01-01	Front cover for 1-slot APC910 - Dark gray	D0
5AC901.FF01-02	Front cover for 1-slot APC910 - Dark gray - Without logo	D0
5AC901.FF02-00	Front cover for 2-slot APC910 - Orange	D0
5AC901.FF02-01	Front cover for 2-slot APC910 - Dark gray	D0
5AC901.FF02-02	Front cover for 2-slot APC910 - Dark gray - Without logo	D0
5AC901.LSDL-00	SDL/DVI transmitter	D0
5AC900.1000-00	DVI (male connector) to CRT (female connector) adapter. For connecting a standard monitor to a DVI-I interface.	C0
0TB103.91	Connector 24 VDC - 3-pin female - Cage clamp terminal block 3.31 mm ²	D0
0TB103.9	Connector 24 VDC - 3-pin female - Screw clamps 3.31 mm ²	D0

The certificate for Germanischer Lloyd can be downloaded here:

[GL certificate no.: 61 601 - 13 HH](#)

The certificate for the compass safe distance can be downloaded here:

[BSH certificate no.: 875](#)

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 1-row, 3-pin 0TB103 terminal block is used to connect the power supply.

1.1.2 Order data

Model number	Short description	Figure
	Terminal blocks	
0TB103.9	Connector 24 VDC - 3-pin female - Screw clamp terminal block 3.31 mm ²	
0TB103.91	Connector 24 VDC - 3-pin female - Cage clamp terminal block 3.31 mm ²	

Table 269: 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.

Model number	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 block	Screw clamp terminal block	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 270: 0TB103.9, 0TB103.91 - Technical data

Model number	0TB103.9	0TB103.91
Electrical characteristics		
Nominal voltage	300 V	
Nominal current ⁴⁾	10 A / contact	
Contact resistance	≤5 mΩ	

Table 270: 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.

2 Terminal block ready relay

2.1 0TB2104.8000

2.1.1 General information

The 1-row 4-pin TB2104 terminal block is used 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 mm ²	

Table 271: 0TB2104.8000 - Order data

2.1.3 Technical data

Model number	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 block	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 mm ²
Solid wires	0.2 to 2.5 mm ²
Fine strand wires	0.2 to 1.5 mm ²
With wire end sleeves	0.2 to 1.5 mm ²
Electrical characteristics	
Nominal voltage	300 V
Nominal current ¹⁾	10 A

Table 272: 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 273: 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.

Model number	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 274: 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 are not 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

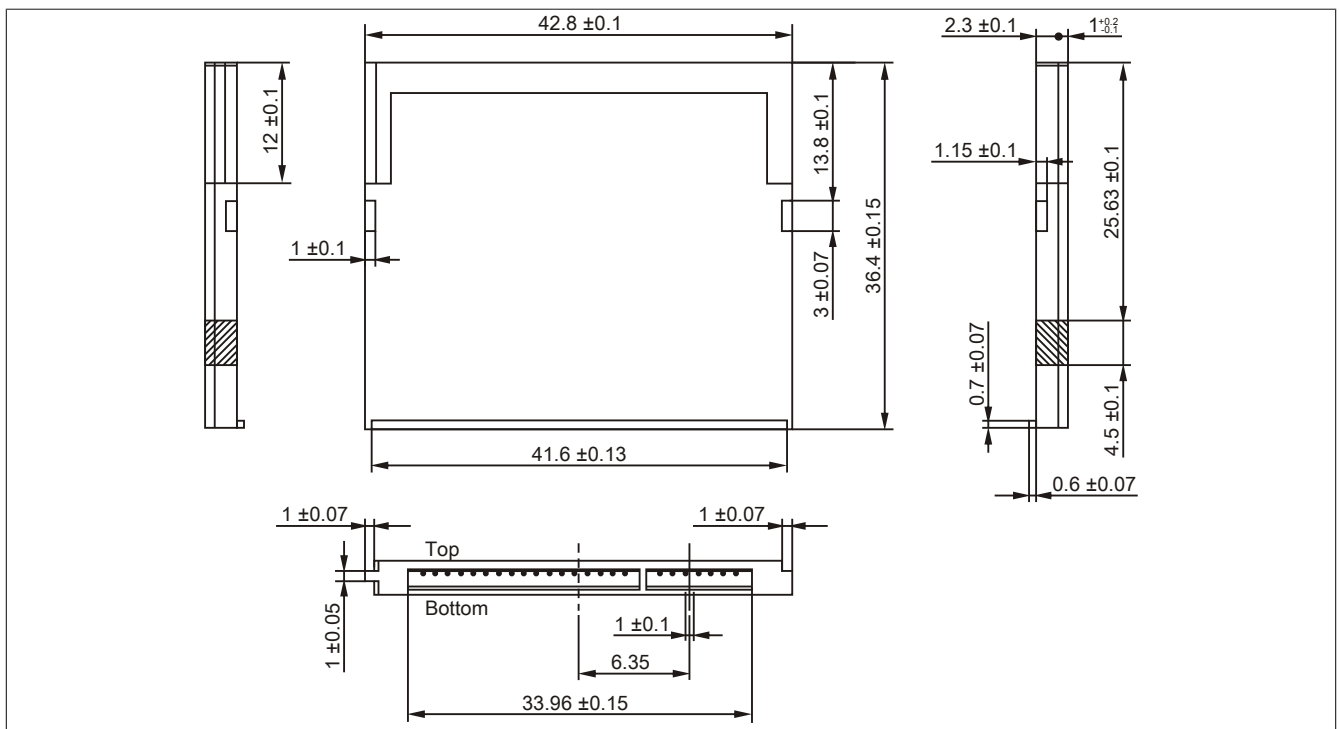


Figure 170: CFast card - Dimensions

4.3 5CFAST.xxxx-00

4.3.1 General information

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 275: 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⁾				

Table 276: 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
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	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 276: 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 277: 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 277: 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

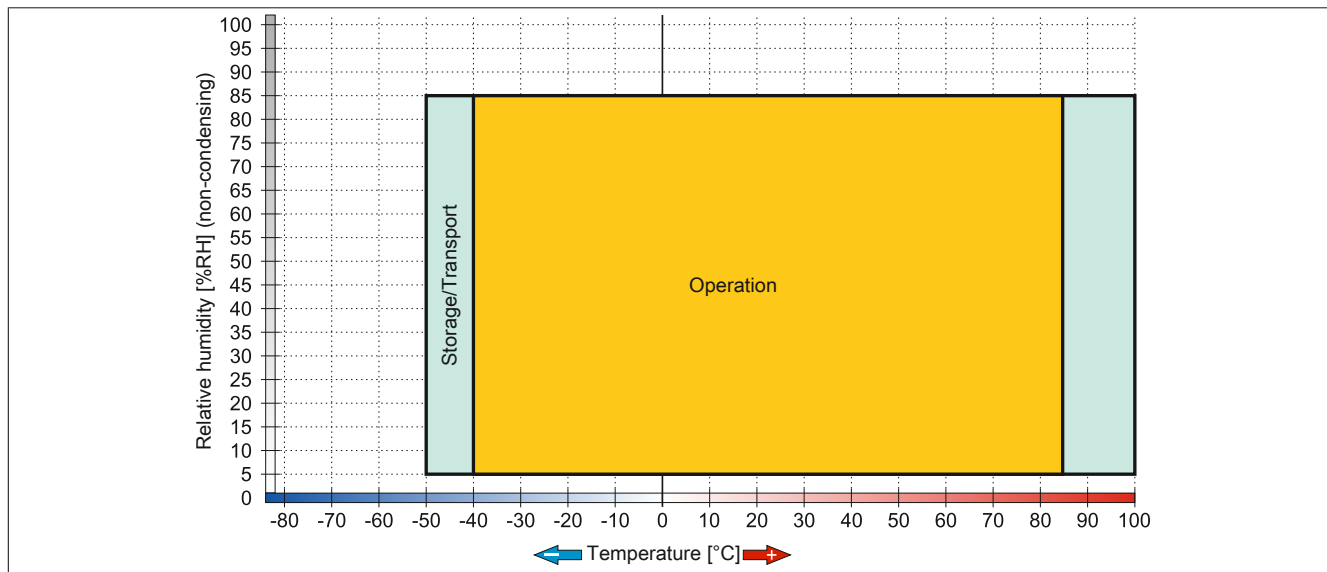


Figure 171: 5CFAST.xxxx-00 ≥ Rev. E0 - Temperature/Humidity diagram

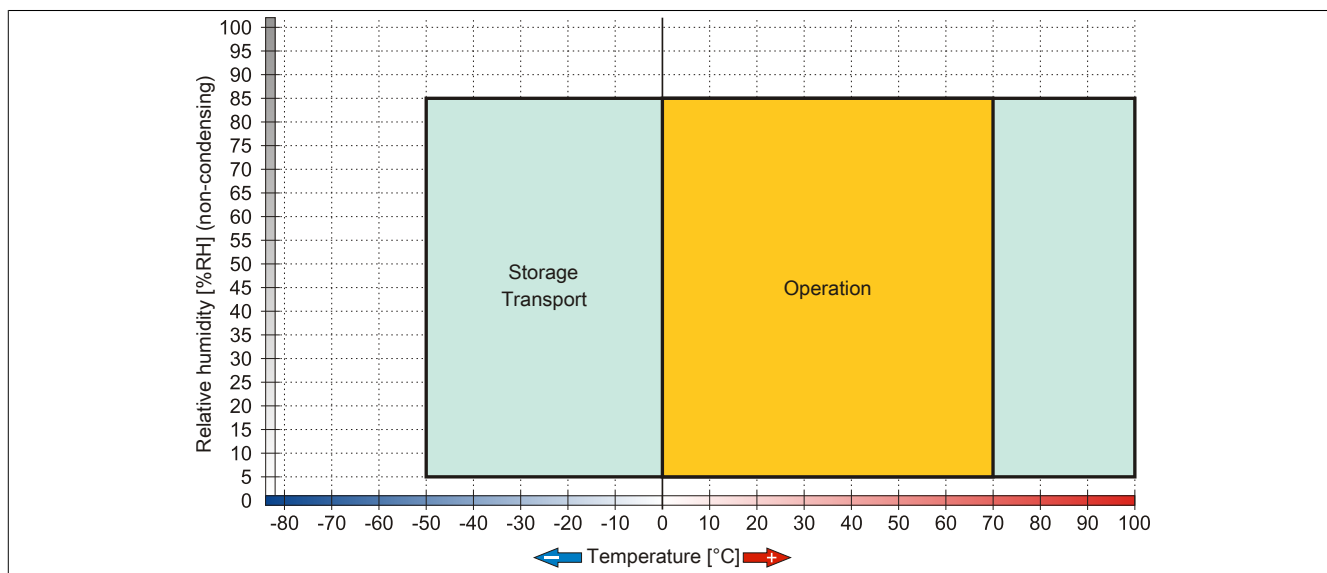


Figure 172: 5CFAST.xxxx-00 ≤ Rev. D0 - Temperature/Humidity diagram

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 278: 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.

Model number	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 279: 5CFAST.032G-10, 5CFAST.064G-10, 5CFAST.128G-10 - Technical data

Model number	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 279: 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

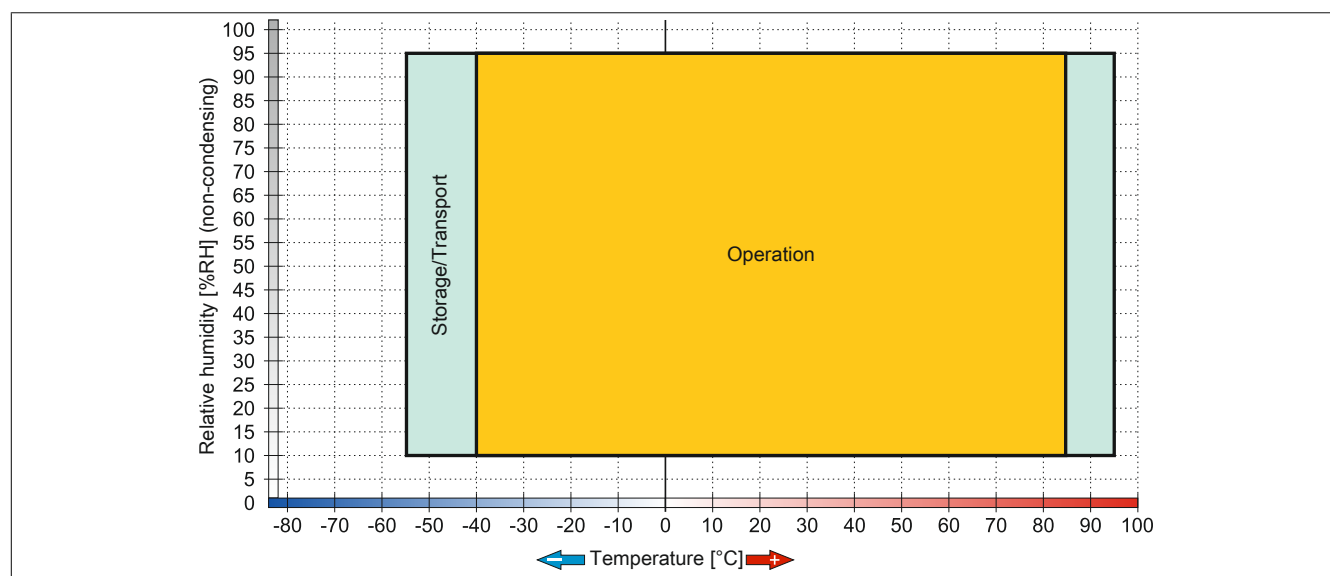


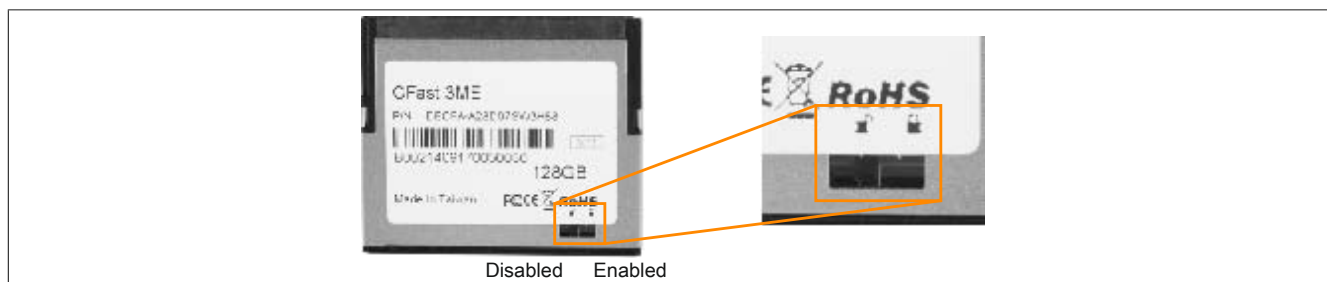
Figure 173: 5CFAST.xxxx-10 - Temperature/Humidity diagram

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.



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 lifecycle, 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 280: 5MMUSB.2048-01, 5MMUSB.4096-01 - Order data

5.1.3 Technical data

Model number	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	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	>1500	
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 281: 5MMUSB.2048-01, 5MMUSB.4096-01 - Technical data

Model number	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 281: 5MMUSB.2048-01, 5MMUSB.4096-01 - Technical data

1) Indicates data being transferred (sending and receiving).

5.1.4 Temperature/Humidity diagram

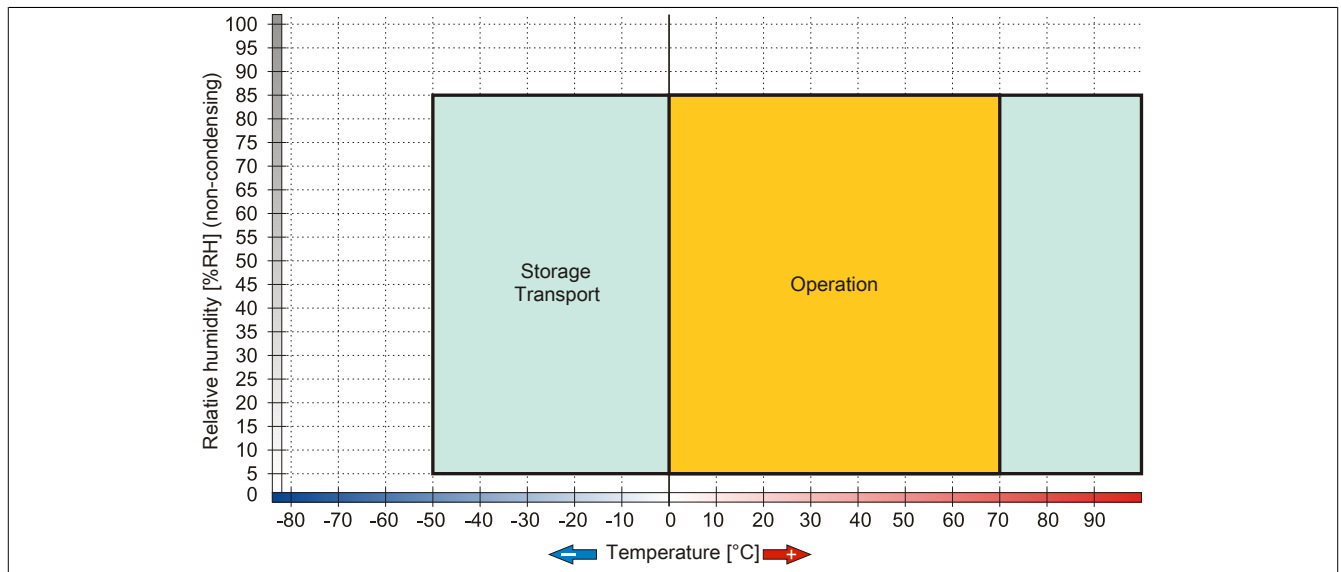


Figure 174: 5MMUSB.xxxx-01 - Temperature/Humidity diagram

6 USB media drive

6.1 5MD900.USB2-02

6.1.1 General information

The USB media drive is equipped with a DVD-R/RW DVD+R/RW drive, CompactFlash slot and one USB interface on both the front and back. It is connected to a USB interface on the B&R Industrial PC.

- Desktop or cabinet-mounted operation (mounting rail brackets)
- Integrated DVD-R/RW DVD+R/RW drive
- Integrated IDE/ATAPI CompactFlash slot (hot pluggable)
- Integrated USB 2.0 connection
- +24 VDC supply (back)
- USB 2.0 connection (back)
- Optional front cover

6.1.2 Order data

Model number	Short description	Figure
	USB accessories	
5MD900.USB2-02	USB 2.0 drive combination - DVD-R/RW, DVD+R/RW - CompactFlash slot	
	Required accessories	
	Accessories	
0TB103.9	Connector 24 VDC - 3-pin female - Screw clamp terminal block 3.31 mm ²	
0TB103.91	Connector 24 VDC - 3-pin female - Cage clamp terminal block 3.31 mm ²	
	Other	
5SWUT1.0000-00	OEM Nero CD-RW Software, only available with a CD writer.	
	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 282: 5MD900.USB2-02 - Order data

6.1.3 Interfaces

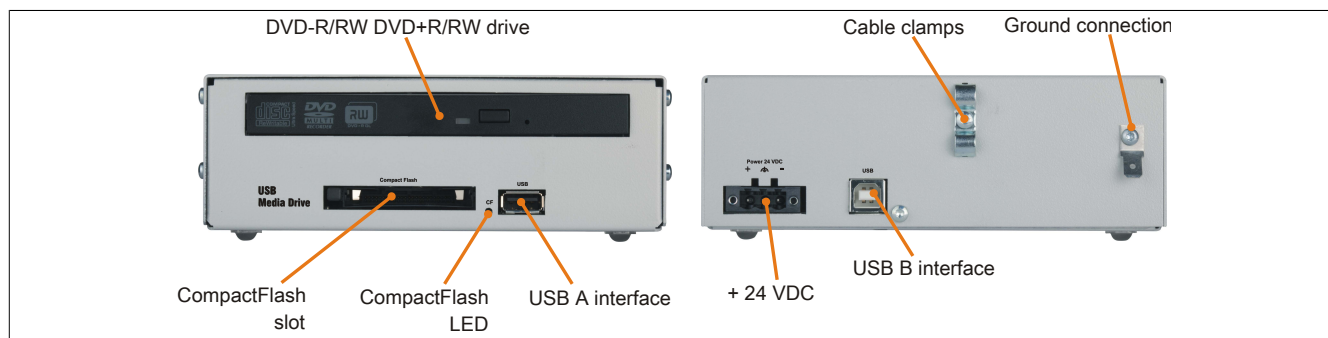


Figure 175: 5MD900.USB2-02 - Interfaces

6.1.4 Technical data

Model number	5MD900.USB2-02
General information	
Max. cable length	5 m (without hub)
Certification	
CE	Yes
cULus	Yes
GOST-R	Yes
Interfaces	
CompactFlash slot 1	
Type	Type I
Connection	IDE/ATAPI
Activity LED	Signals read or write access to an inserted CompactFlash card

Table 283: 5MD900.USB2-02 - Technical data

Model number	5MD900.USB2-02
USB	
Type	USB 2.0
Design	Type A front Type B back
Transfer rate	Low speed (1.5 Mbit/s), full speed (12 Mbit/s), high speed (480 Mbit/s)
Current-carrying capacity	Max. 500 mA
CD / DVD drive	
Data buffer capacity	2 MB
Data transfer rate	Max. 33.3 MB/s
Speed	Max. 5090 rpm $\pm 1\%$
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-RW, DVD-Video DVD-RAM (4.7GB, 2.6GB) DVD+R, DVD+R (dual layer), DVD+RW
Laser class	Class 1 laser
Service life	60000 POH (power-on hours)
Interface	IDE (ATAPI)
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	Typ. 140 ms (24x)
DVD	Typ. 150 ms (8x)
Readable media	
CD	CD/CD-ROM (12 cm, 8 cm), CD-R, CD-RW
DVD	DVD-ROM, DVD-R, DVD-RW, DVD-RAM, DVD+R, DVD+R (dual layer), DVD+RW
Writable media	
CD	CD-R, CD-RW
DVD	DVD-R/RW, DVD-RAM (4.7 GB), DVD+R/RW, DVD+R (dual layer)
Read speed	
CD	24x
DVD	8x
Write speed	
CD-R	10 to 24x
CD-RW	10 to 24x
DVD+R	3.3 to 8x
DVD+R (dual layer)	2.4 to 4x
DVD+RW	3.3 to 8x
DVD-R	2 to 6x
DVD-R (dual layer)	2 to 4x
DVD-RAM	3 to 5x
DVD-RW	2 to 6x
Write methods	
CD	Disk at once, session at once, packet write, track at once
DVD	Disk at once, incremental, overwrite, sequential
Electrical characteristics	
Nominal voltage	24 VDC $\pm 25\%$, SELV ¹⁾
Overvoltage category in accordance with EN 61131-2	II
Operating conditions	
EN 60529 protection	Front: IP65 (only with optional front cover), back: IP20
Environmental conditions	
Temperature ²⁾	
Operation	5 to 45°C
Storage	-20 to 60°C
Transport	-40 to 60°C
Relative humidity	
Operation	20 to 80%
Storage	5 to 90%
Transport	5 to 95%
Vibration	
Operation	5 to 500 Hz: 0.3 g (2.9 m/s ² 0-peak)
Storage	10 to 100 Hz: 2 g (19.6 m/s ² 0-peak)
Transport	10 to 100 Hz: 2 g (19.6 m/s ² 0-peak)
Shock	
Operation	5 g, 11 ms
Storage	60 g, 11 ms
Transport	60 g, 11 ms
Elevation	
Operation	Max. 3000 m

Table 283: 5MD900.USB2-02 - Technical data

Model number	5MD900.USB2-02
Mechanical characteristics	
Dimensions	
Width	156 mm
Height	52 mm
Depth	140 mm
Weight	Approx. 1100 g (without front cover)

Table 283: 5MD900.USB2-02 - Technical data

- 1) EN 60950 requirements must be observed, see section 2.6.1 power supply +24 VDC.
- 2) 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).

6.1.5 Dimensions

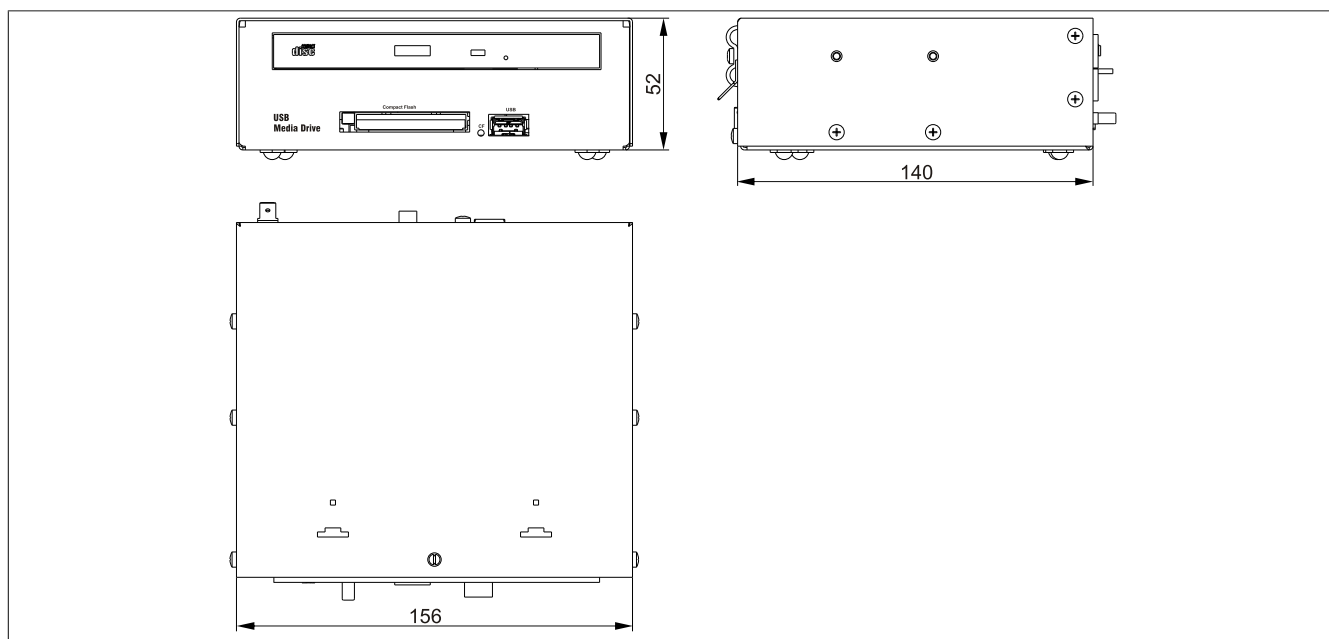


Figure 176: 5MD900.USB2-02 - Dimensions

6.1.6 Dimensions with front cover

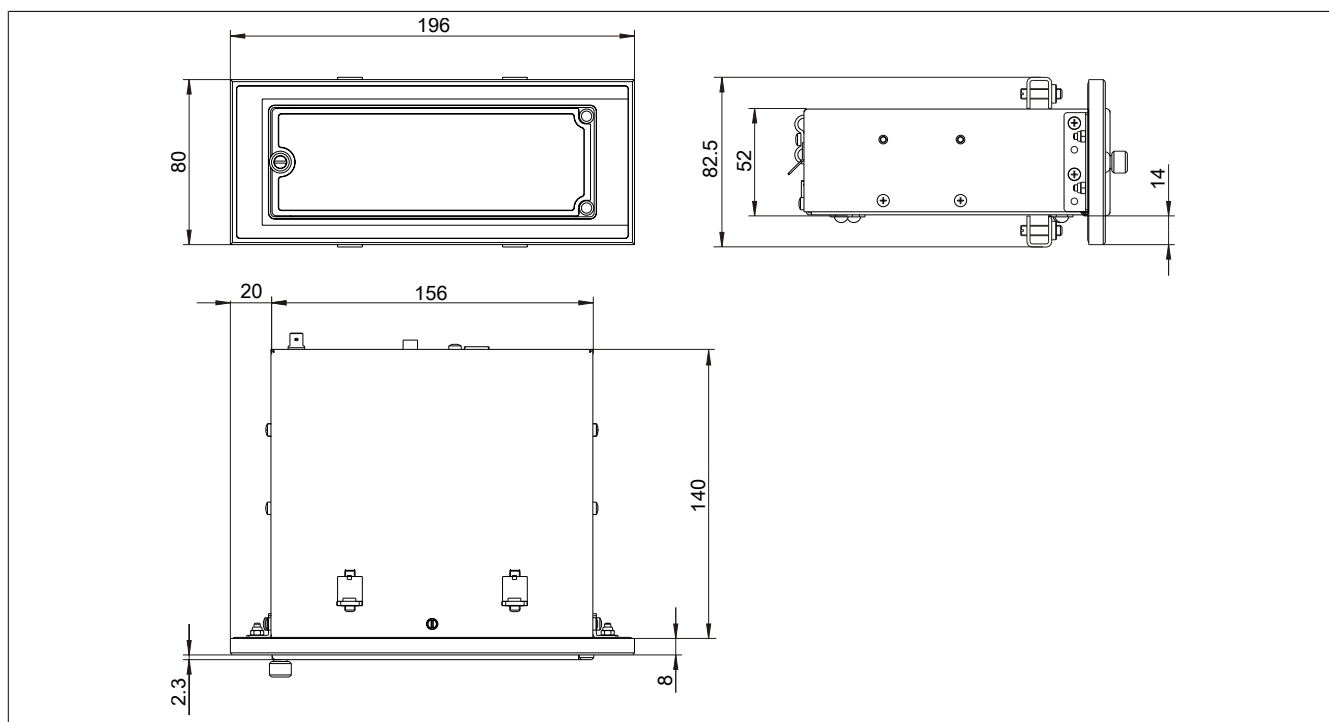


Figure 177: USB media drive with front cover - Dimensions

6.1.7 Cutout installation

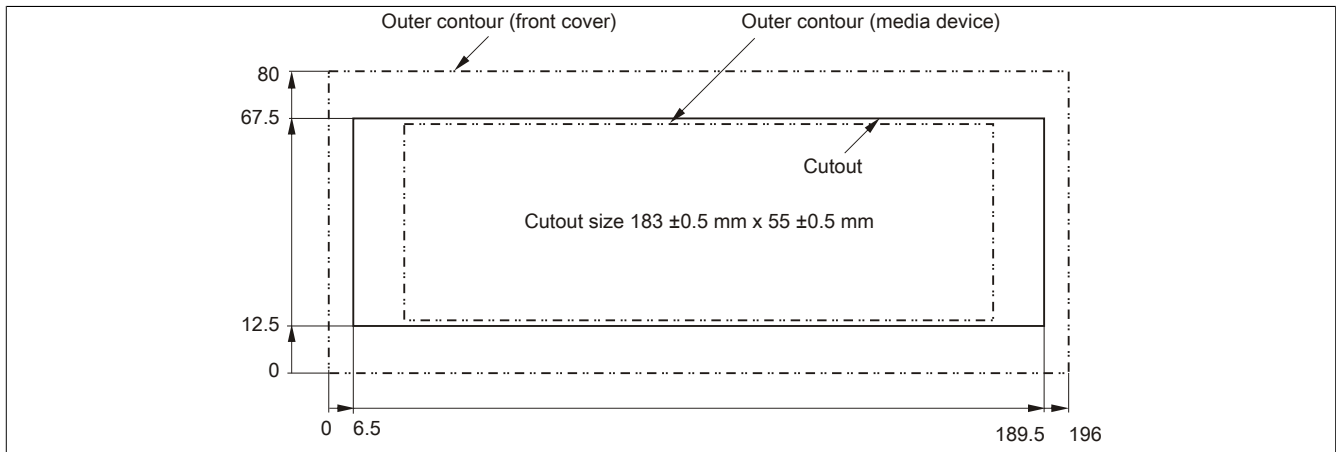


Figure 178: USB media drive with front cover - Installation cutout

6.1.8 Content of delivery

Quantity	Component
1	USB media drive
2	Mounting rail brackets

Table 284: 5MD900.USB2-02 - Content of delivery

6.1.9 Installation

The USB media drive can be operated as a desktop device (rubber feet) or cabinet-mounted device (2 mounting rail brackets included).

6.1.9.1 Mounting orientations

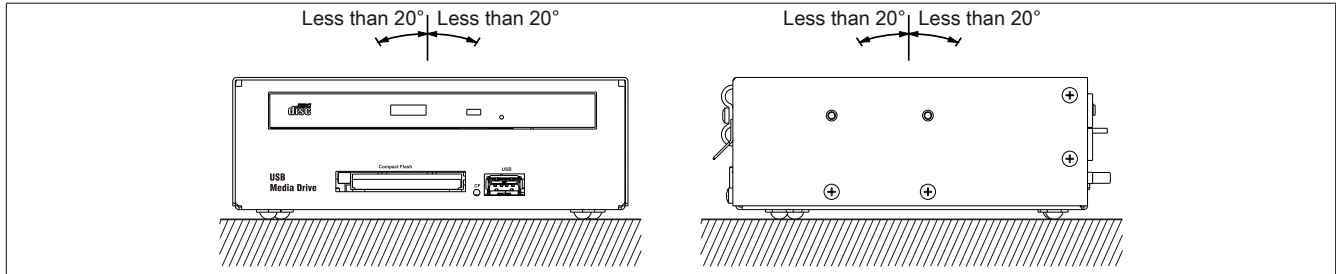


Figure 179: 5MD900.USB2-02 - Mounting orientation

6.2 5A5003.03

6.2.1 General information

This front cover can be mounted on the front of the USB media drive (model number 5MD900.USB2-00, 5MD900.USB2-01 or 5MD900.USB2-02) to protect the interface.

6.2.2 Order data

Model number	Short description	Figure
	USB accessories	
5A5003.03	Front cover for drives - 5A5003.02 - 5MD900.USB2	

Table 285: 5A5003.03 - Order data

6.2.3 Technical data

Model number	5A5003.03
General information	
Certification	
CE	Yes
cULus	Yes
GOST-R	Yes
Mechanical characteristics	
Front	
Panel overlay	
Light background	Similar to Pantone 427CV
Dimensions	
Width	196 mm
Height	80 mm
Depth	8 mm

Table 286: 5A5003.03 - Technical data

6.2.4 Dimensions

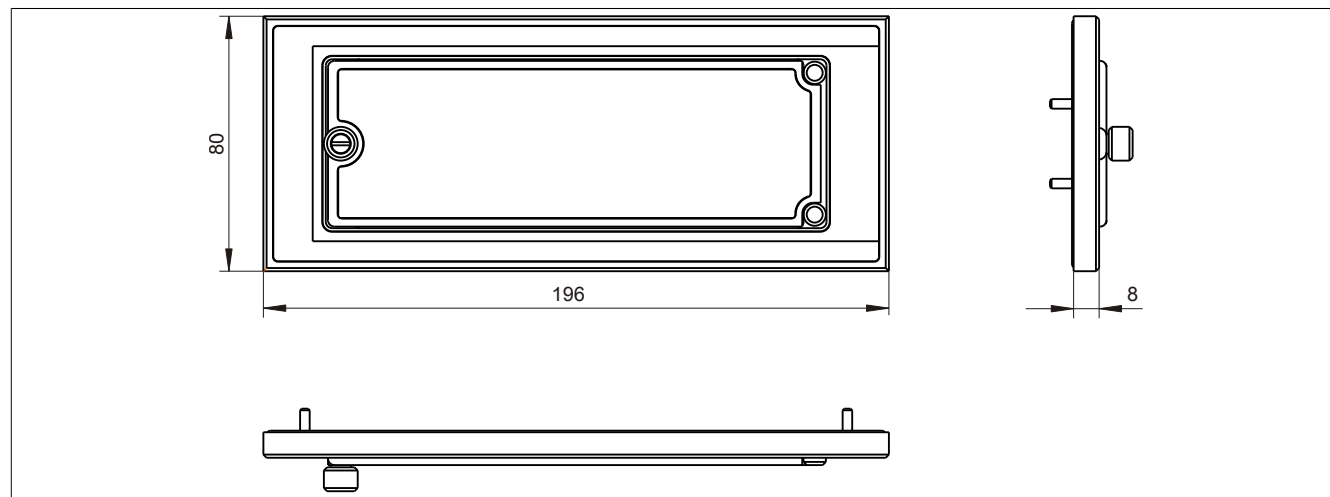


Figure 180: 5A5003.03 - Dimensions

6.2.5 Content of delivery

Quantity	Component
1	Front cover 5A5003.03 for the USB media drive
4	M3 locknut
4	Cover retaining clip

Table 287: 5A5003.03 - Content of delivery

6.2.6 Installation

The front cover is attached with 2 mounting rail brackets (included with the USB media drive) and 4 M3 locknuts. The 4 retaining clips provided can be used to mount the USB media drive and front cover as a whole, for example in a control cabinet door.

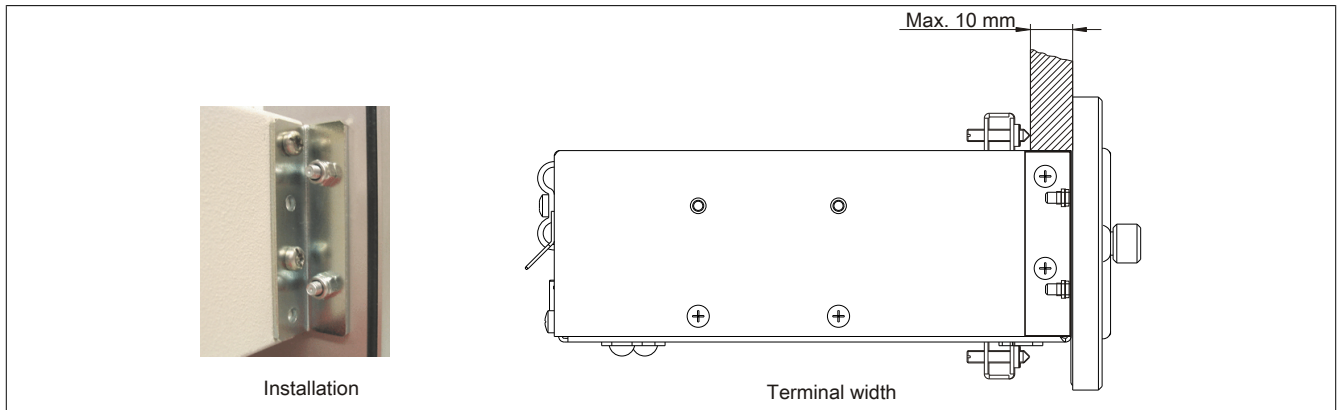


Figure 181: Front cover mounting and installation depth

6.2.6.1 Cutout installation

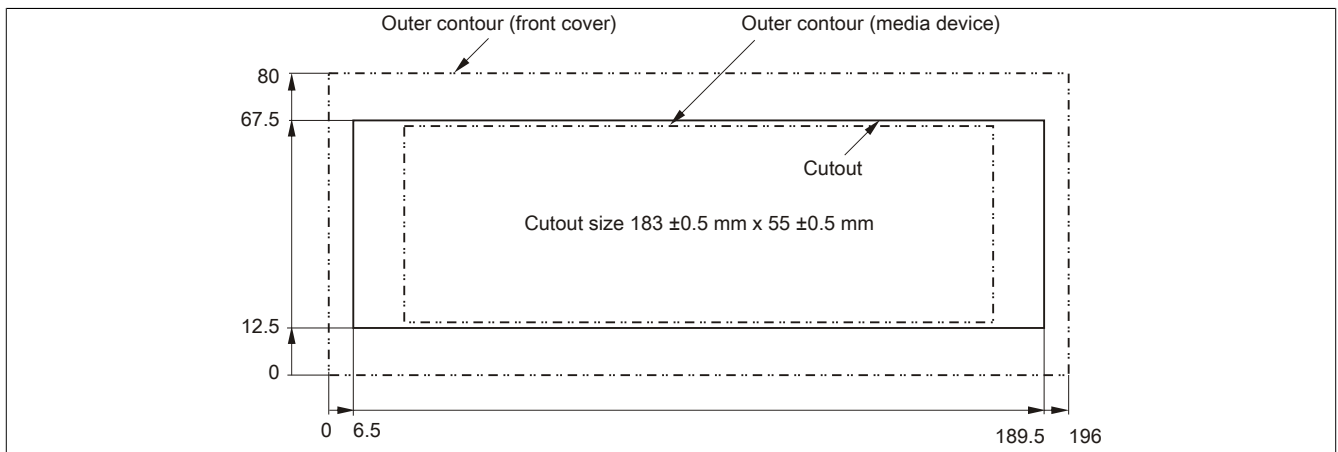


Figure 182: USB media drive with front cover - Installation cutout

7 Replacement disk tray

7.1 5AC901.FRAM-00

7.1.1 General information

The 5AC901.FRAM-00 replacement disk tray can be installed on the APC910 in order to exchange a slide-in compact drive as quickly as possible. It can be used to store the replacement drive.

7.1.2 Order data

Model number	Short description	Figure
5AC901.FRAM-00	Accessories	
	APC910 slide-in compact tray	

Table 288: 5AC901.FRAM-00 - Order data

7.1.3 Technical data

Model number	5AC901.FRAM-00
General information	
Certification	
CE	Yes
Mechanical characteristics	
Dimensions	
Width	117 mm
Height	105.5 mm
Depth	17 mm

Table 289: 5AC901.FRAM-00 - Technical data

7.1.4 Dimensions

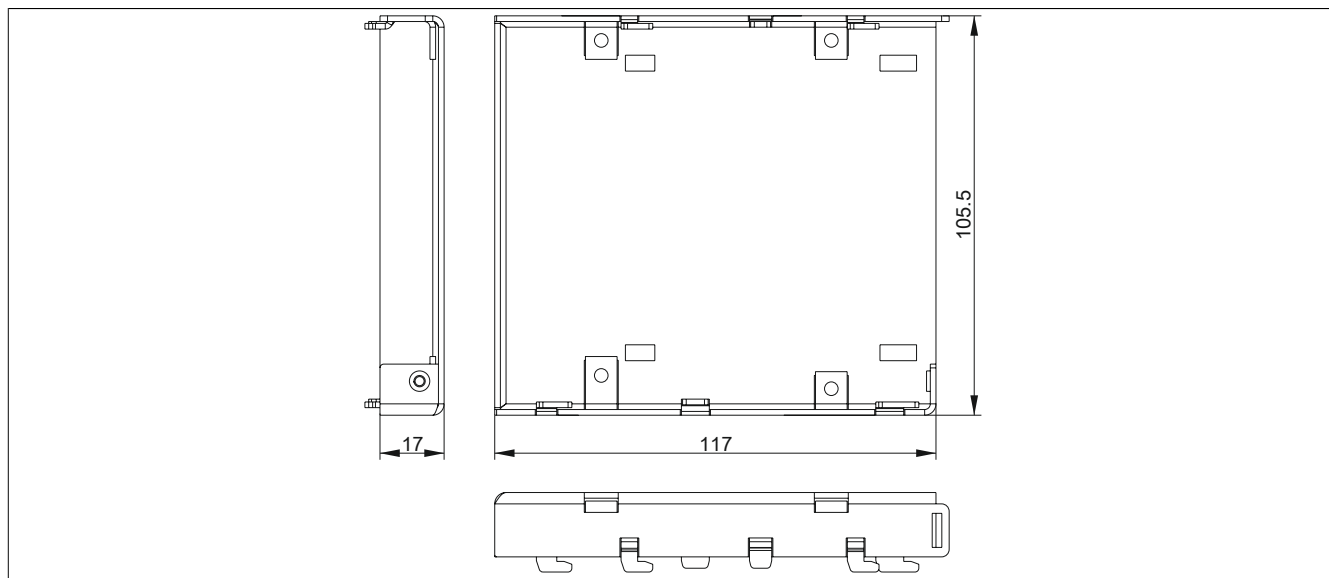


Figure 183: 5AC901.FRAM-00 - Dimensions

8 Cables

8.1 DVI cables

8.1.1 5CADVI.0xxx-00

8.1.1.1 General information

5CADVI.0xxx-00 DVI cables are designed for use in inflexible applications.

Caution!

Power must be disconnected before connecting or disconnecting cables.

8.1.1.2 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 290: 5CADVI.0018-00, 5CADVI.0050-00, 5CADVI.0100-00 - Order data

8.1.1.3 Technical data

Model number	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 291: 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.

8.1.1.4 Bend radius specifications

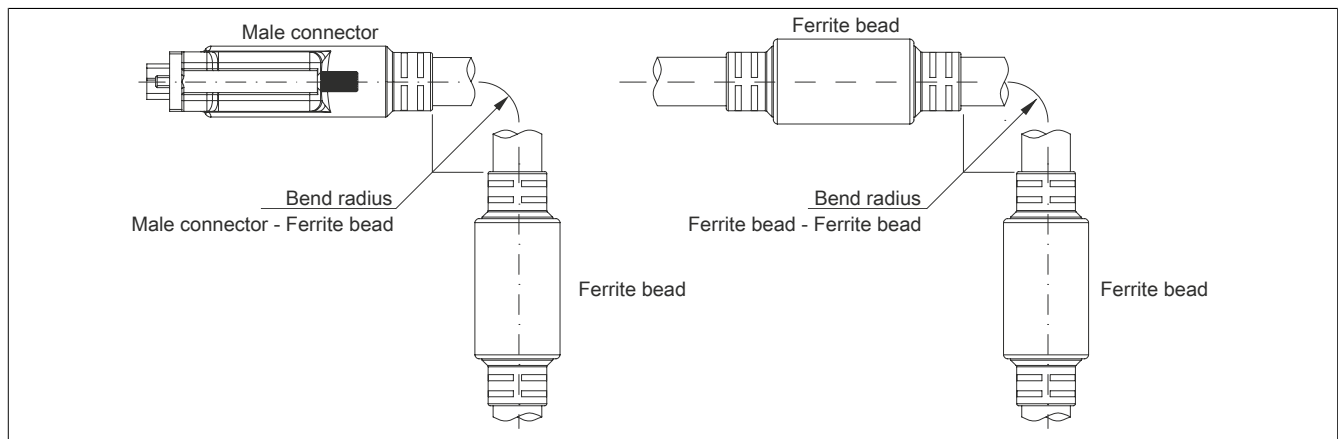


Figure 184: Bend radius specifications

8.1.1.5 Dimensions

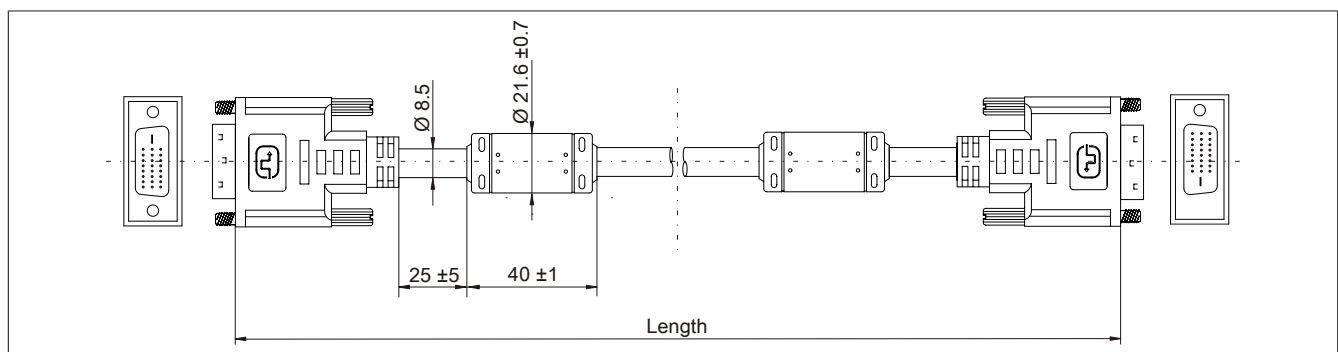


Figure 185: 5CADVI.0xxx-00 - Dimensions

8.1.1.6 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.

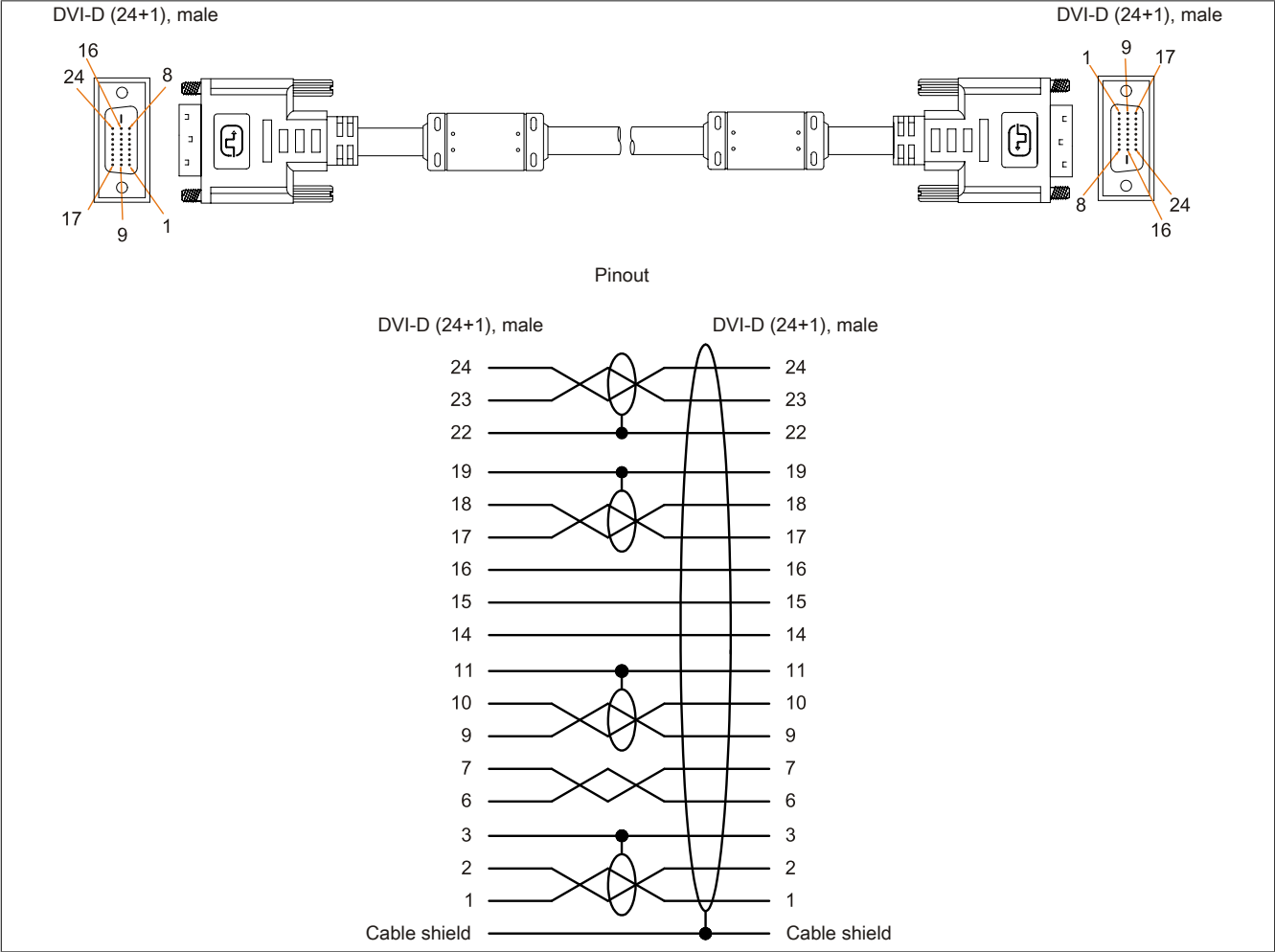


Figure 186: 5CADVI.0xxx-00 - Pinout

8.2 SDL cables

8.2.1 5CASDL.0xxx-00

8.2.1.1 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.

8.2.1.2 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 292: 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

8.2.1.3 Technical data

Model number	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							
GL	Yes ¹⁾							
GOST-R	-	Yes						
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 293: 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.

8.2.1.4 Bend radius specifications

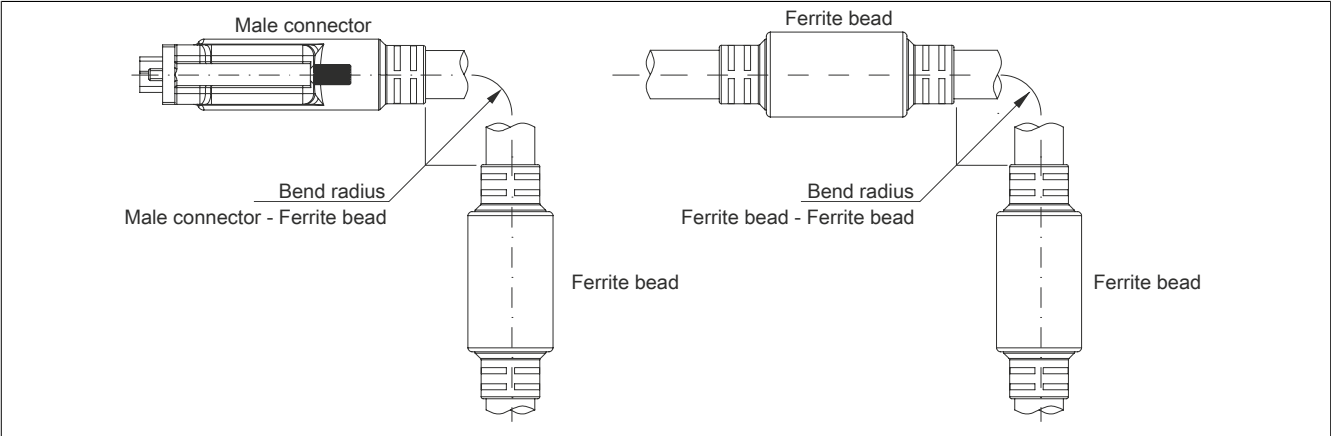


Figure 187: Bend radius specifications

8.2.1.5 Dimensions

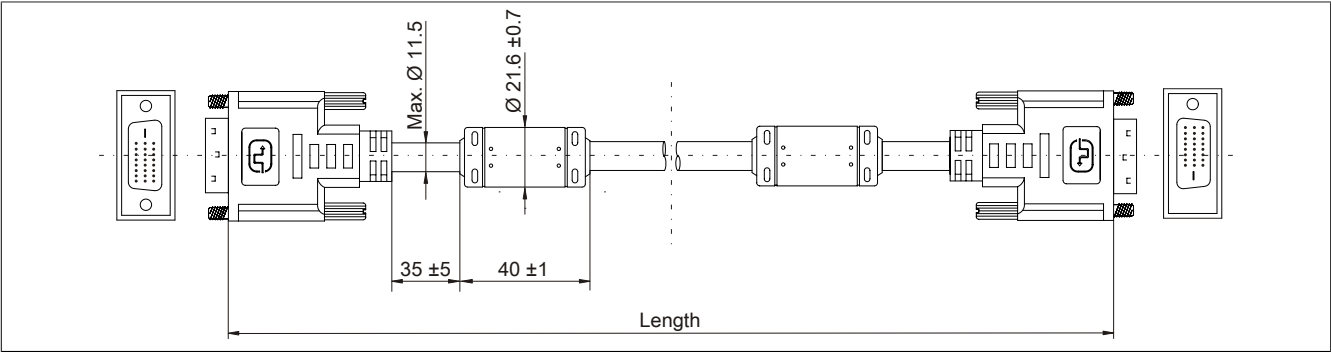


Figure 188: 5CASDL.0xxx-00- Dimensions

8.2.1.6 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.

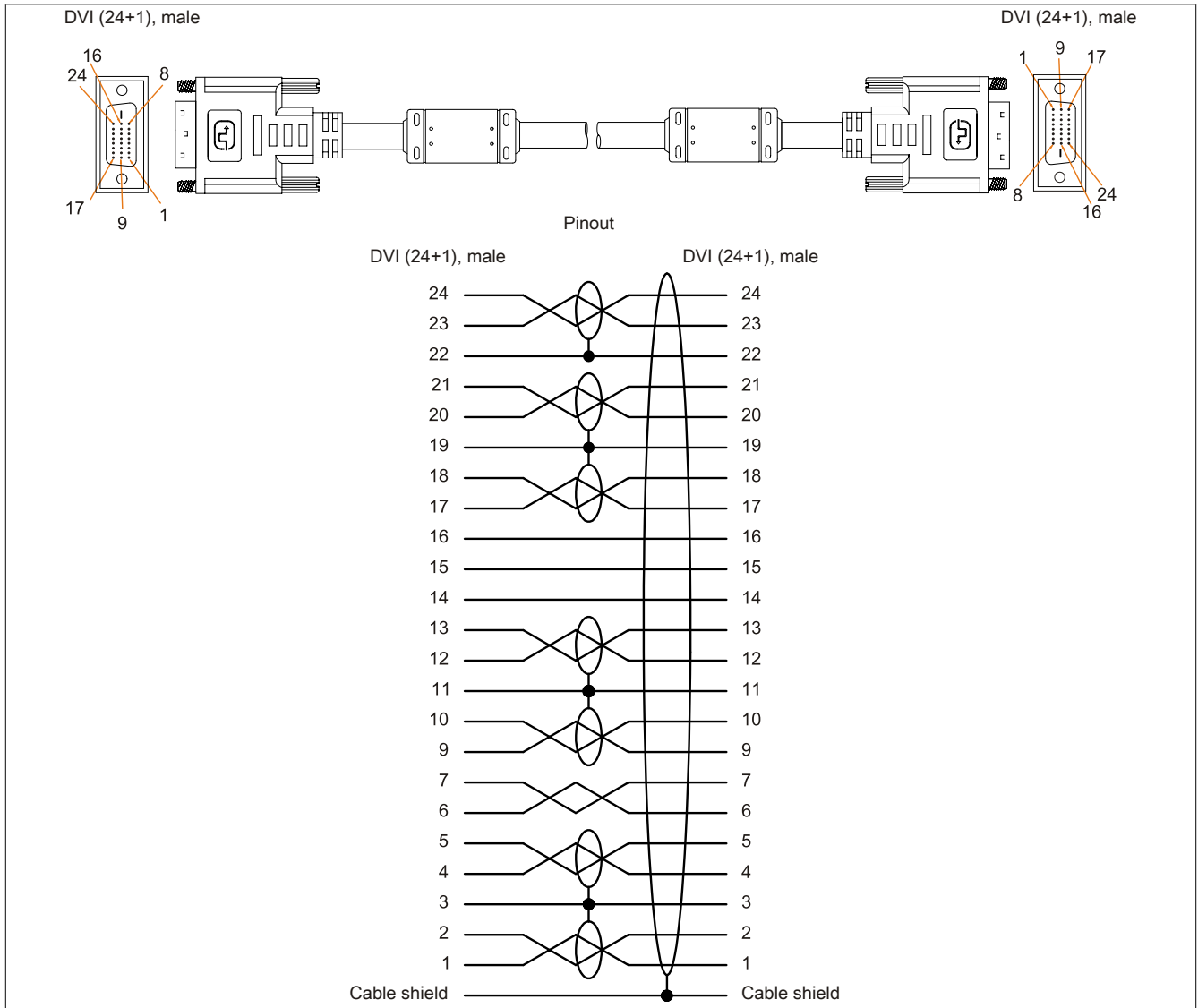


Figure 189: 5CASDL.0xxx-00 - Pinout

8.3 SDL cables with 45° male connector

8.3.1 5CASDL.0xxx-01

8.3.1.1 General information

5CASDL.0xxx-01 SDL cables with 45° connector are designed for use in inflexible applications.

Caution!

Power must be disconnected before connecting or disconnecting cables.

8.3.1.2 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 294: 5CASDL.0018-01, 5CASDL.0050-01, 5CASDL.0100-01, 5CASDL.0150-01 - Order data

8.3.1.3 Technical data

Model number	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 295: 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.

8.3.1.4 Bend radius specifications

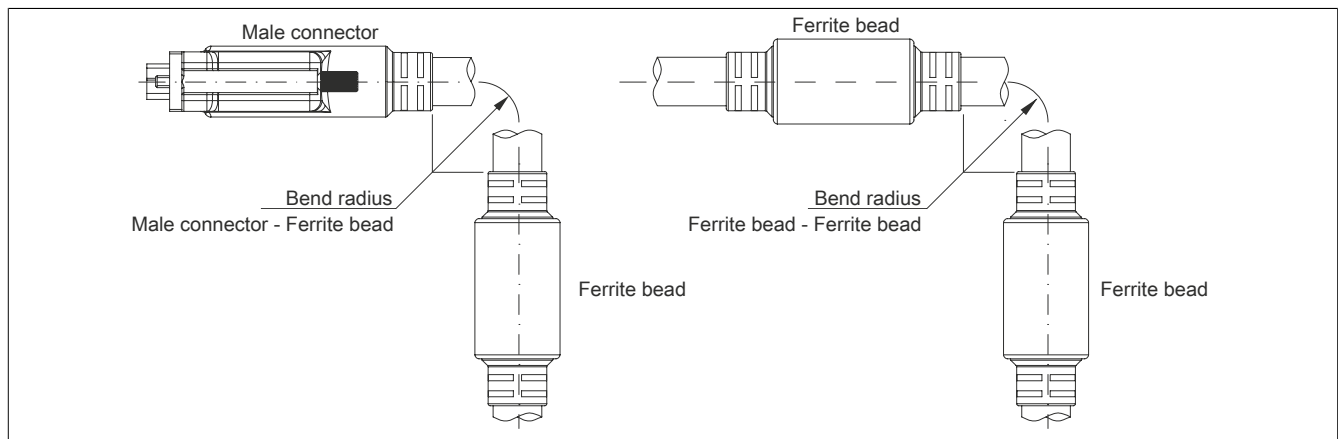


Figure 190: Bend radius specifications

8.3.1.5 Dimensions

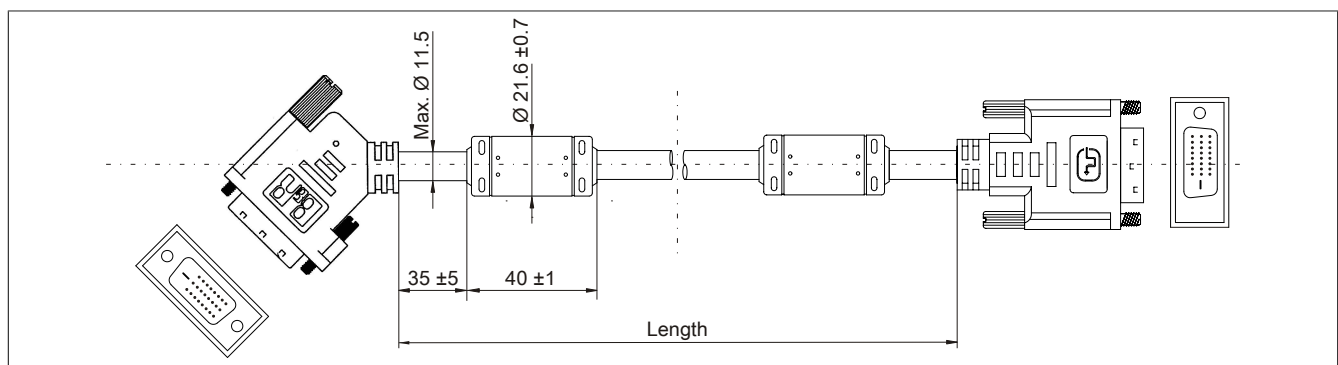


Figure 191: 5CASDL.0xxx-01 - Dimensions

8.3.1.6 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.

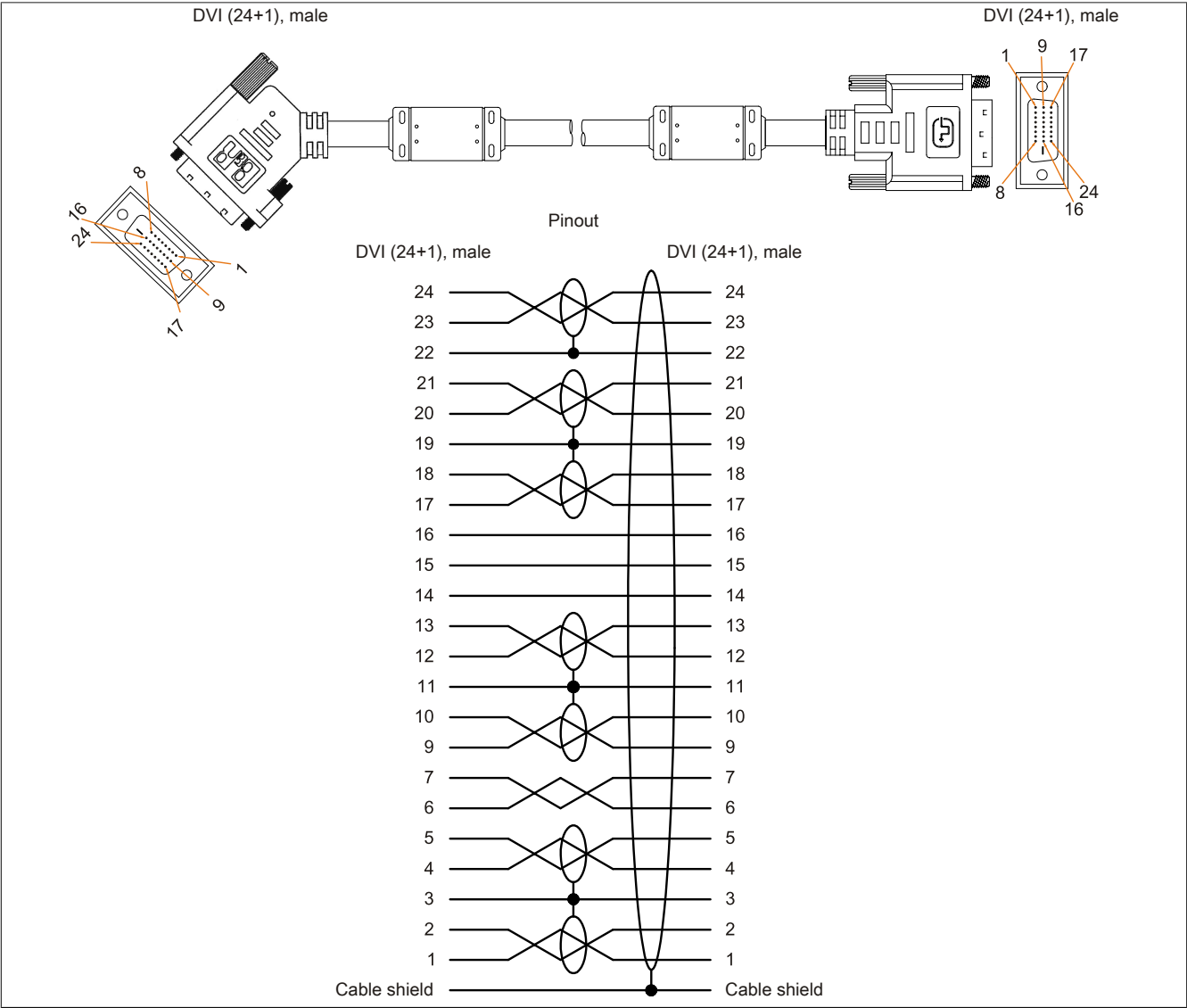


Figure 192: 5CASDL.0xxx-01 - Pinout

8.4 SDL flex cables

8.4.1 5CASDL.0xxx-03

8.4.1.1 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.

8.4.1.2 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 296: 5CASDL.0018-03, 5CASDL.0050-03, 5CASDL.0100-03, 5CASDL.0150-03, 5CASDL.0200-03, 5CASDL.0250-03, 5CASDL.0300-03 - Order data

8.4.1.3 Technical data

Model number	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 TPU						
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 297: 5CASDL.0018-03, 5CASDL.0050-03, 5CASDL.0100-03, 5CASDL.0150-03, 5CASDL.0200-03, 5CASDL.0250-03, 5CASDL.0300-03 - Technical data

Model number	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 297: 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.

8.4.1.4 Bend radius specifications

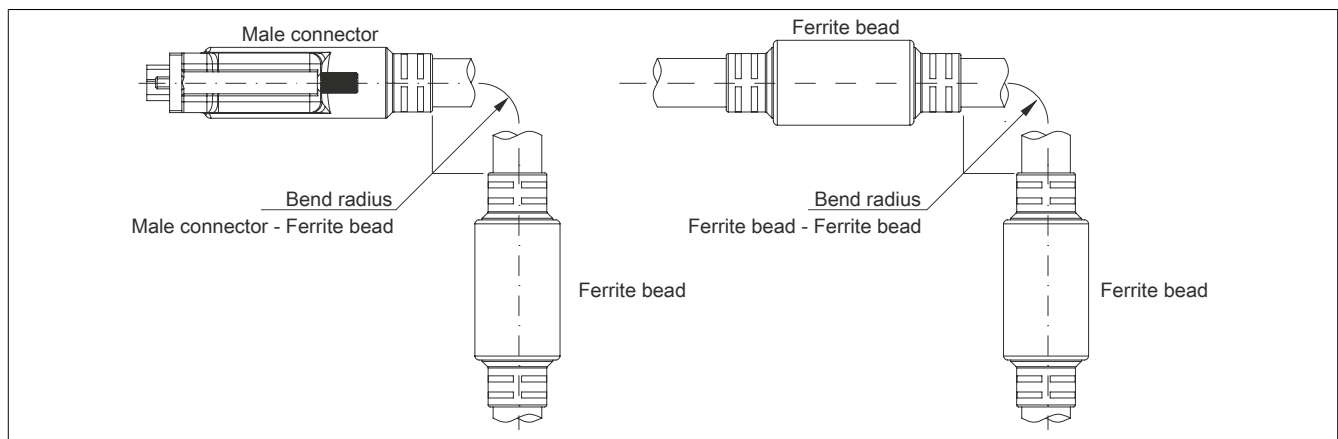


Figure 193: Bend radius specifications

8.4.1.5 Dimensions

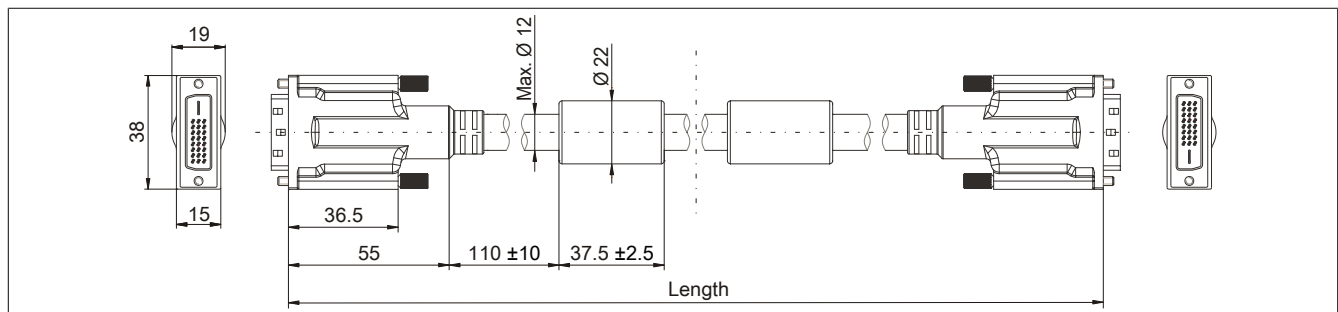


Figure 194: 5CASDL.0xxx-03 - Dimensions

8.4.1.6 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 298: 5CASDL.0xxx-03 SDL flex cables - Structure

8.4.1.7 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.

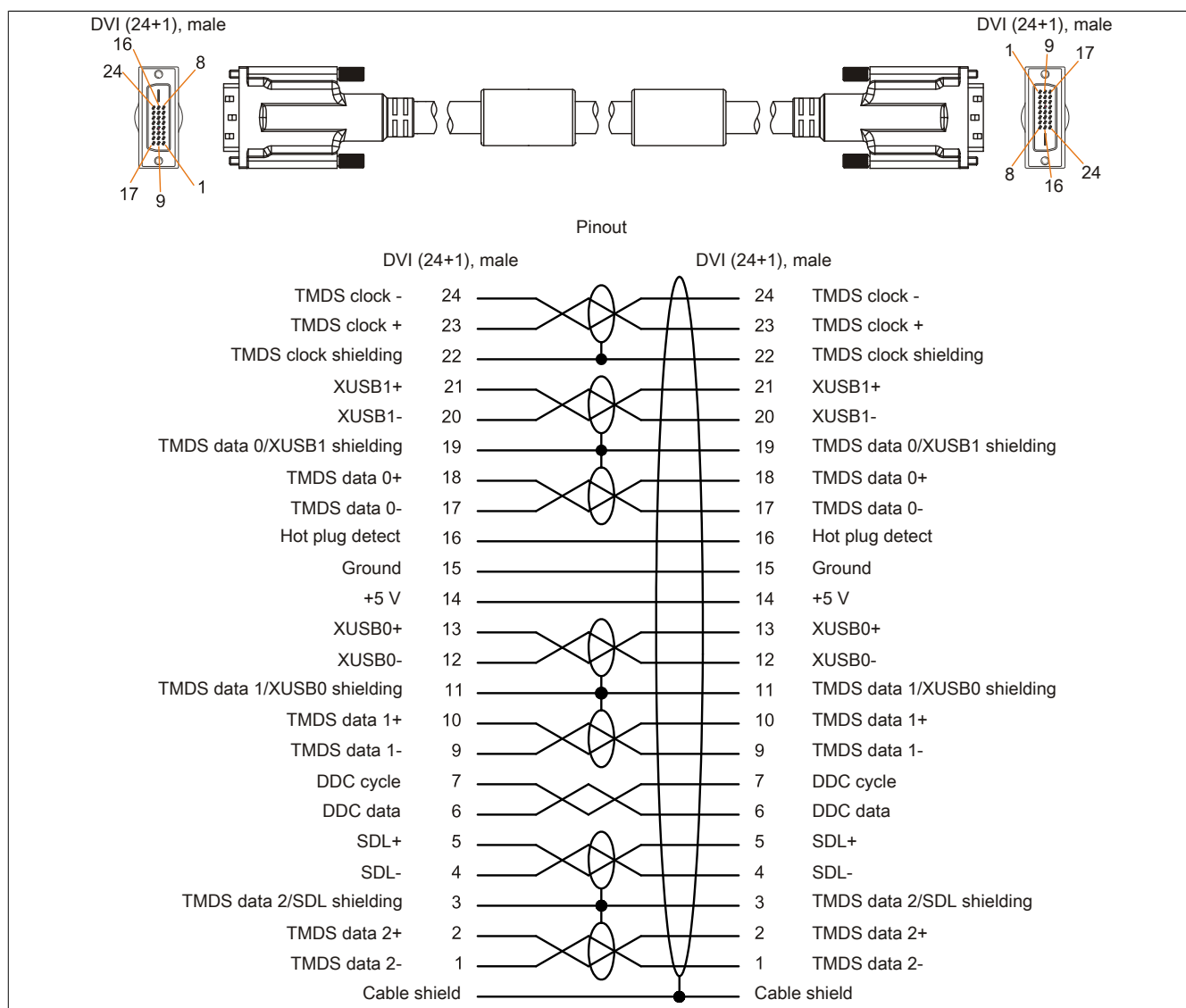


Figure 195: 5CASDL.0xxx-03 - Pinout

8.5 SDL flex cables with extender

8.5.1 5CASDL.0xx0-13

8.5.1.1 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.

8.5.1.2 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 299: 5CASDL.0300-13, 5CASDL.0400-13, 5CASDL.0430-13 - Order data

8.5.1.3 Technical data

Model number	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 300: 5CASDL.0300-13, 5CASDL.0400-13, 5CASDL.0430-13 - Technical data

Model number	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 300: 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.

8.5.1.4 Bend radius specifications

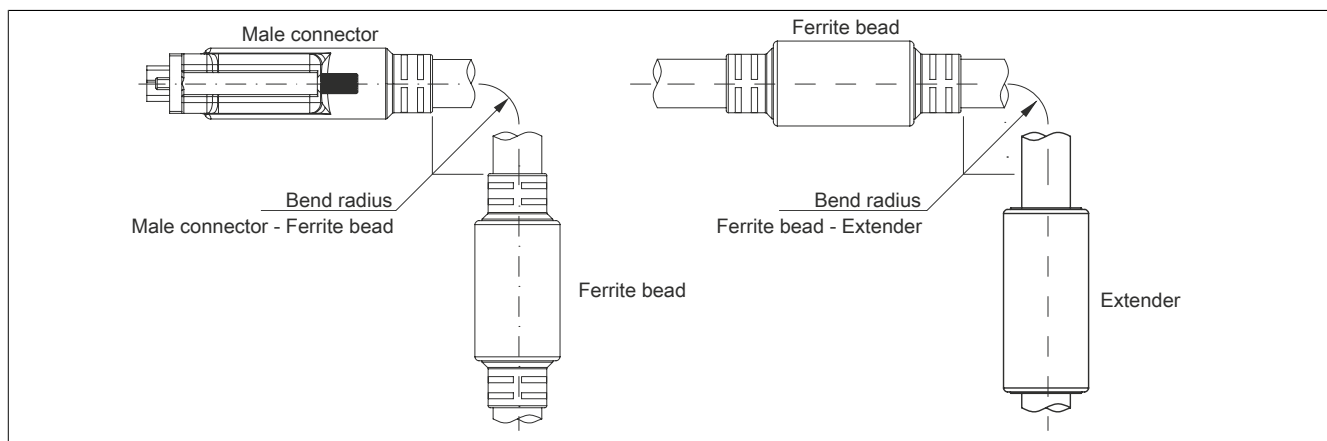


Figure 196: Bend radius specification with extender

8.5.1.5 Dimensions

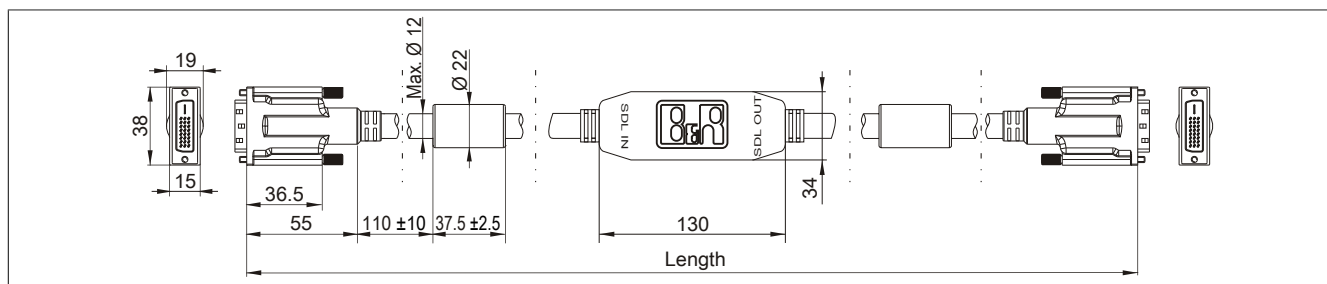


Figure 197: 5CASDL.0xx0-13 - Dimensions

8.5.1.6 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.

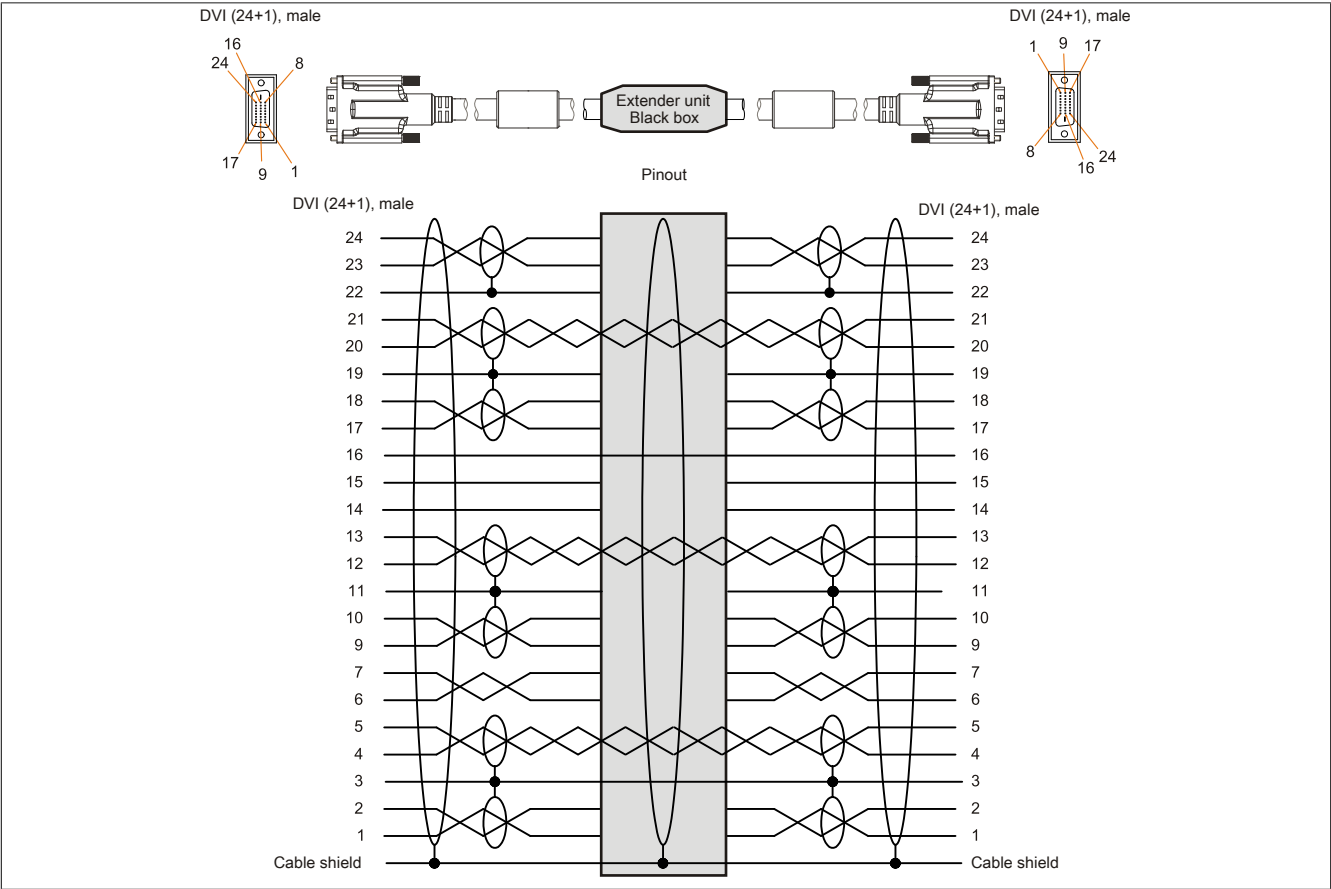


Figure 198: 5CASDL.0xx0-13 - Pinout

8.5.1.7 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.

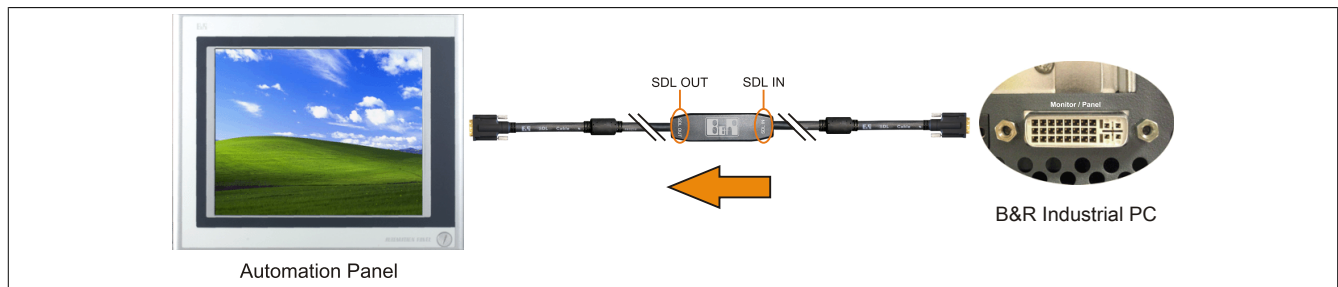


Figure 199: Example of the signal direction for an SDL flex cable with extender

8.6 SDL3 cables

8.6.1 5CASD3.xxxx-00

8.6.1.1 General information

5CASD3.xxxx-00 SDL3 cables are designed to transfer SDL3 data and very easy to install. An RJ45 connector allows these cables to be connected in very narrow spaces, for example in swing arm shafts.

Caution!

Power must be disconnected before connecting or disconnecting cables.

8.6.1.2 Order data

Model number	Short description	Figure
	SDL3 cables	
5CASD3.0030-00	SDL3 cable - 3 m	
5CASD3.0050-00	SDL3 cable - 5 m	
5CASD3.0100-00	SDL3 cable - 10 m	
5CASD3.0150-00	SDL3 cable - 15 m	
5CASD3.0200-00	SDL3 cable - 20 m	
5CASD3.0300-00	SDL3 cable - 30 m	
5CASD3.0500-00	SDL3 cable - 50 m	
5CASD3.1000-00	SDL3 cable - 100 m	

Table 301: 5CASD3.0030-00, 5CASD3.0050-00, 5CASD3.0100-00, 5CASD3.0150-00, 5CASD3.0200-00, 5CASD3.0300-00, 5CASD3.0500-00, 5CASD3.1000-00 - Order data

8.6.1.3 Technical data

Model number	5CASD3. 0030-00	5CASD3. 0050-00	5CASD3. 0100-00	5CASD3. 0150-00	5CASD3. 0200-00	5CASD3. 0300-00	5CASD3. 0500-00	5CASD3. 1000-00
General information								
Certification								
CE	Yes							
cULus	Yes							
Cable construction								
Wire cross section	4x 2x 26/7 AWG					4x 2x 23/1 AWG		
Features	Flame-resistant, halogen-free, lead-free							
Outer sheathing								
Material	Polyurethane (PUR)							
Color	Yellow, RAL 1021							
Labeling	HARTING INDUSTRIAL CABLE S/FTP CAT 6A PUR 4x 2x 26/7 AWG					HARTING INDUSTRIAL INSTALLATION CABLE S/FTP CAT 7 PUR 4x 2x 23/1 AWG		
Lines								
Wire insulation	Polyethylene (PE)							
Wire colors	Green/White-green, orange/white-orange, blue/white-blue, brown/white-brown						Green/ white- green, or- ange/white- orange, blue/white- blue, brown/ white-brown	Green/ White- green, or- ange/white- orange, blue/white- blue, brown/ white-brown
Shield	Aluminum foil and braided wire shield made of tinned copper wires							
Type	Unprotected copper wire, 4x 2x 26/7 AWG					Unprotected copper wire, 4x 2x 23/1 AWG		
Connector								
Type	2x RJ45, male							
Connection cycles	Min. 750							
Contacts	8							
Electrical characteristics ¹⁾								
Operating voltage	≤100 V					≤125 V		
Conductor resistance	≤290 Ω/km					≤75 Ω/km		
Wave impedance	100 ±5 Ω (at 100 MHz)							
Transfer properties	Category 6A / Class EA up to 500 MHz in accordance with ISO/IEC 11801 (EN 50173-1), ISO/IEC 24702 (EN 50173-3)					Category 7 / Class F up to 600 MHz in accordance with ISO/IEC 11801 (EN 50173-1), ISO/IEC 24702 (EN 50173-3)		
Insulation resistance	≥500 MΩ/km	≥ 500 MΩ/km	≥500 MΩ/km		≥ 500 MΩ/km		≥5 GΩ/km	
Operating conditions								
Flame-retardant	IEC 60332-1-2							
Oil and hydrolysis resistance	EN 60811-2-1 (90°C / 7x24 h)							

Table 302: 5CASD3.0030-00, 5CASD3.0050-00, 5CASD3.0100-00, 5CASD3.0150-00, 5CASD3.0200-00, 5CASD3.0300-00, 5CASD3.0500-00, 5CASD3.1000-00 - Technical data

Model number	5CASD3. 0030-00	5CASD3. 0050-00	5CASD3. 0100-00	5CASD3. 0150-00	5CASD3. 0200-00	5CASD3. 0300-00	5CASD3. 0500-00	5CASD3. 1000-00	
EN 60529 protection									
Cables	IP20								
RJ45 connector	IP20, only when connected properly								
Environmental conditions									
Temperature									
Storage	-40 to 70°C								
Fixed installation	-40 to 70°C								
Flexible installation	-40 to 70°C					-10 to 50°C			
Mechanical characteristics									
Dimensions									
Length	5 m	10 m	15 m	20 m	30 m	50 m	100 m		
Diameter	6.7 mm					8.3 mm			
Flex radius									
Fixed installation	≥5x diameter					≥4x diameter			
Flexible installation	≥10x diameter					≥8x diameter			
Weight	250 g	500 g	700 g	950 g	2150 g	3500 g	6950 g		
Tension									
During operation	≤70 N					≤110 N			
During installation	≤70 N					≤110 N			

Table 302: 5CASD3.0030-00, 5CASD3.0050-00, 5CASD3.0100-00, 5CASD3.0150-00, 5CASD3.0200-00, 5CASD3.0300-00, 5CASD3.0500-00, 5CASD3.1000-00 - Technical data

1) At an ambient temperature of 20°C.

8.6.1.4 Bend radius specifications

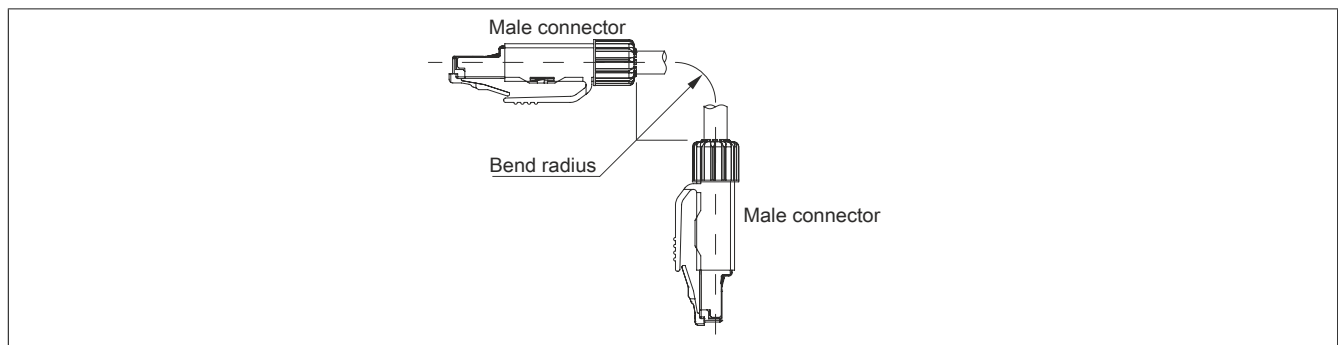


Figure 200: SDL3 - Bend radius specifications

8.6.1.5 Dimensions

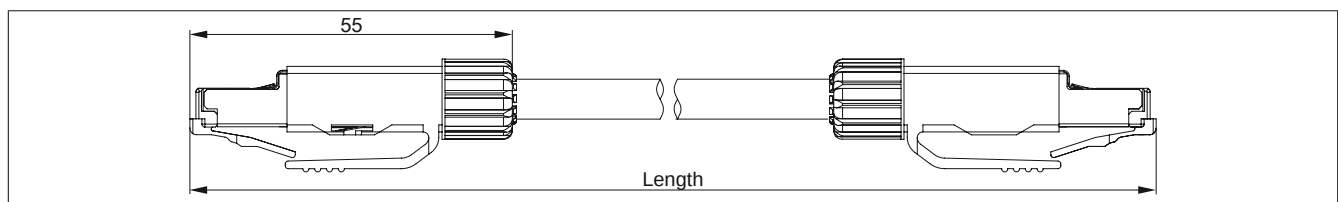


Figure 201: 5CASD3.xxxx-00 - Dimensions

8.6.1.6 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.

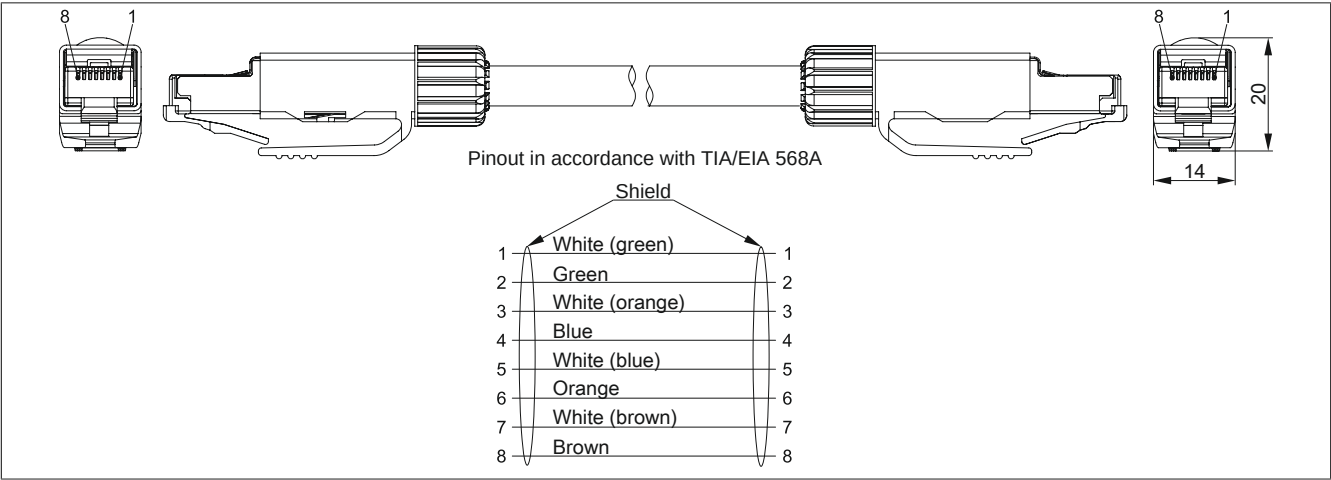


Figure 202: 5CASD3.xxxx-00 - Pinout

8.6.1.7 Cabling

The following information and figure apply when using a field-assembled cable that is not directly connected to a B&R device, but to an RJ45 network interface (e.g. patch panel).

Cables must meet category 6a (Cat6a) or category 7 (Cat7) requirements. Exceeding the maximum total length of 100 m is not permitted.

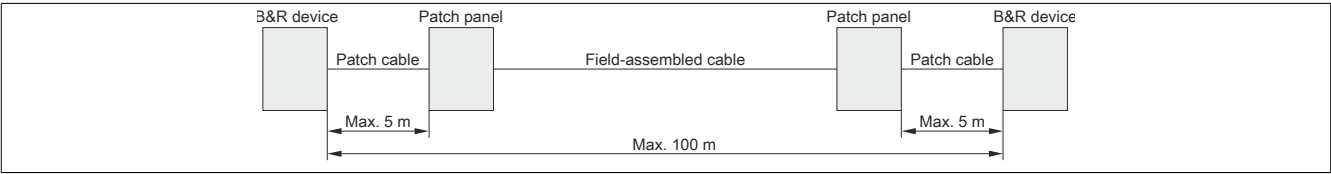


Figure 203: Cabling with a field-assembled cable

8.7 USB cables

8.7.1 5CAUSB.00xx-00

8.7.1.1 General information

USB cables are designed to achieve USB 2.0 transfer speeds.

8.7.1.2 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 303: 5CAUSB.0018-00, 5CAUSB.0050-00 - Order data

8.7.1.3 Technical data

Model number	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 304: 5CAUSB.0018-00, 5CAUSB.0050-00 - Technical data

8.7.1.4 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.

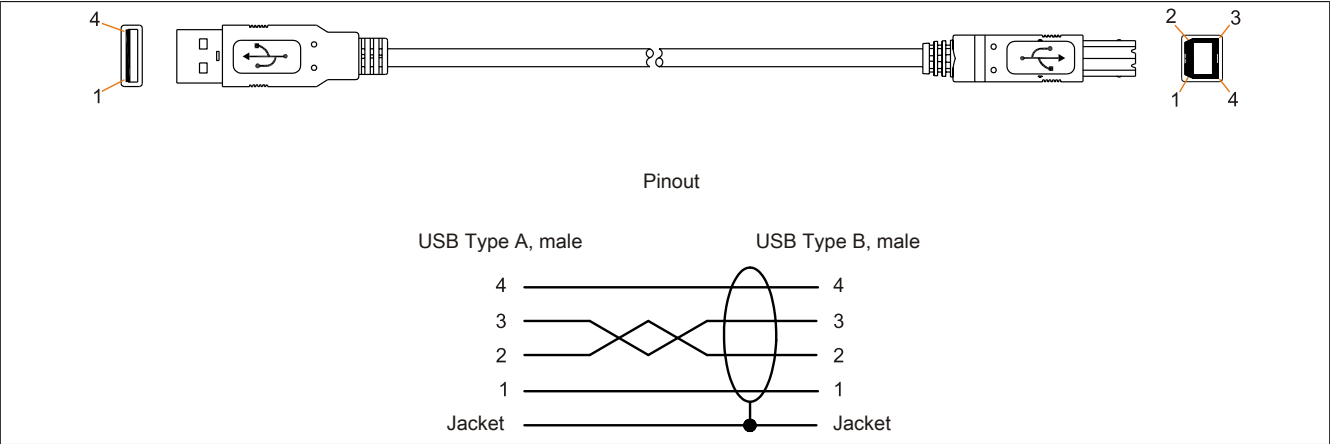


Figure 204: 5CAUSB.00xx-00 USB cables - Pinout

8.8 RS232 cables

8.8.1 9A0014.xx

8.8.1.1 General information

RS232 cables are used as extension cables between two RS232 interfaces.

8.8.1.2 Order data

Model number	Short description	Figure
	RS232 cables	
9A0014.02	RS232 extension cable for remote operation of display unit with touch screen, 1.8 m	
9A0014.05	RS232 extension cable for remote operation of display unit with touch screen, 5 m	
9A0014.10	RS232 extension cable for remote operation of display unit with touch screen, 10 m	

Table 305: 9A0014.02, 9A0014.05, 9A0014.10 - Order data

8.8.1.3 Technical data

Model number	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 D-sub 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 306: 9A0014.02, 9A0014.05, 9A0014.10 - Technical data

8.8.1.4 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.

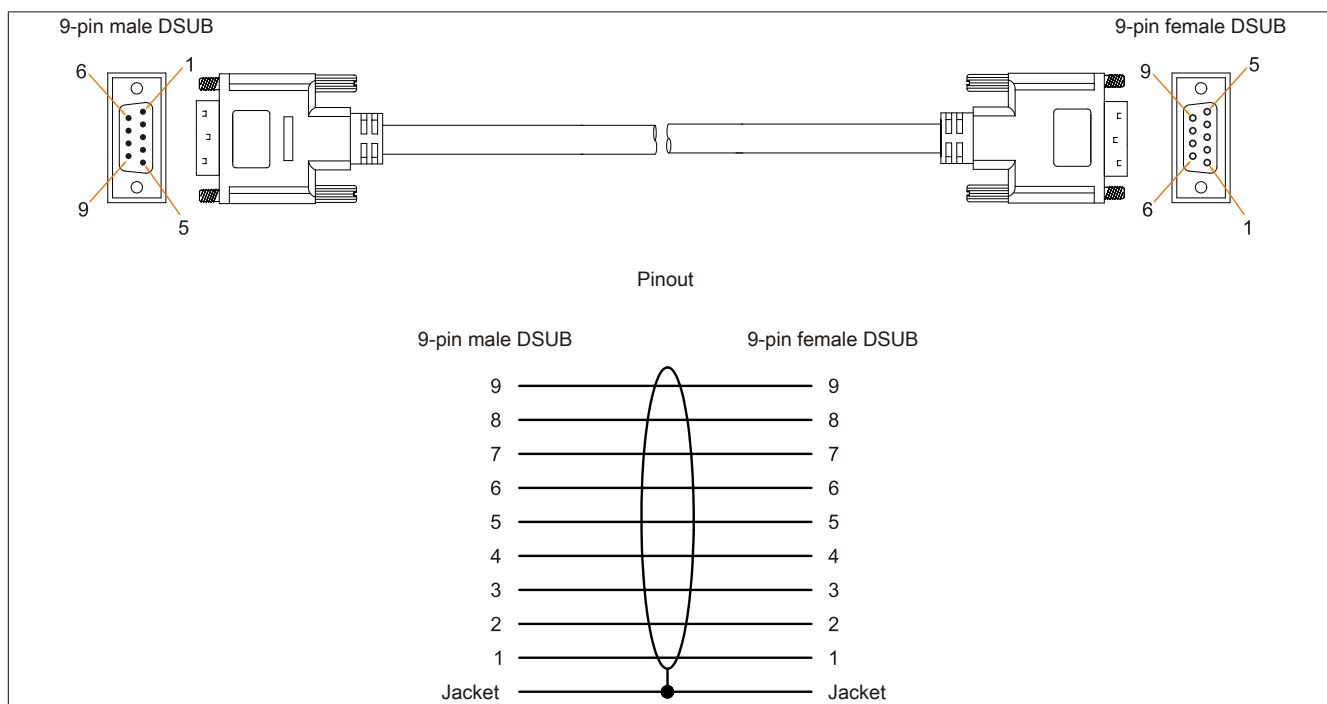


Figure 205: 9A0014.xx RS232 cables - Pinout

8.9 Internal supply cable

8.9.1 5CAMSC.0001-00

8.9.1.1 General information

This supply cable is used internally, for example to provide power to special PCI cards. It is connected to the mainboard.

Caution!

Power must be disconnected before connecting or disconnecting cables.

8.9.1.2 Order data

Model number	Short description	Figure
	Accessories	
5CAMSC.0001-00	Internal supply cable	

Table 307: 5CAMSC.0001-00 - Order data

8.9.1.3 Technical data

Model number	5CAMSC.0001-00
General information	
Certification	
CE	Yes
GOST-R	Yes
Cable construction	
Wire cross section	AWG 22
Connector	
Type	1x 4-pin male disk drive power connector, 1x 4-pin female connector housing
Mechanical characteristics	
Dimensions	
Length	100 mm ±5 mm
Flexibility	Flexible

Table 308: 5CAMSC.0001-00 - Technical data

9 Replacement fan

9.1 5AC901.FI0x-00

9.1.1 General information

Information:

Fan filters are subject to wear and should be checked with appropriate frequency to determine whether the air flow provides sufficient cooling. Replacing or cleaning the fan filter is appropriate at that time.

9.1.2 Order data

Model number	Short description	Figure
Accessories		
5AC901.FI01-00	APC910 air filter - For 1-slot APC910 - 1 pieces	
5AC901.FI02-00	APC910 air filter - For 2-slot APC910 - 1 pieces	
5AC901.FI05-00	APC910 air filter - For 5-slot APC910 - 1 pieces	

Table 309: 5AC901.FI01-00, 5AC901.FI02-00, 5AC901.FI05-00 - Order data

10 Line filter

10.1 5AC804.MFLT-00

10.1.1 General information

The 5AC804.MFLT-00 line filter may be necessary to satisfy requirements regarding conducted disturbances in supply lines in accordance with the 2003 edition of GL EMC1 (Germanischer Lloyd).

The line filter should be installed as close to the end device as possible; the supply line from the end device to the line filter should be kept as short as possible.

10.1.2 Order data

Model number	Short description	Figure
5AC804.MFLT-00	Accessories Line filter	

Table 310: 5AC804.MFLT-00 - Order data

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.

Model number	5AC804.MFLT-00
General information	
Certification	
CE	Yes
cULus	Yes
cULus HazLoc Class 1 Division 2	Yes ¹⁾
GOST-R	Yes
GL	Yes ²⁾
Terminal block	
Connection cross section	
With wire end sleeves	1.5 mm ²
Flexible	0.2 to 1.5 mm ²
Inflexible	0.2 to 2.5 mm ²
Electrical characteristics	
Nominal voltage	24 VDC -25% / +30%, SELV ³⁾
Nominal current	8 A
Overvoltage category in accordance with EN 61131-2	II
Environmental conditions	
Temperature	
Operation	-25 to 65°C
Storage	-25 to 65°C
Transport	-25 to 65°C
Mechanical characteristics	
Housing	
Material	Galvanized steel plate
Dimensions	
Width	54 mm
Length	94 mm
Depth	32.15 mm
Weight	205 g

Table 311: 5AC804.MFLT-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) EN 60950 requirements must be observed, see section 2.6.1 power supply +24 VDC.

10.1.4 Dimensions

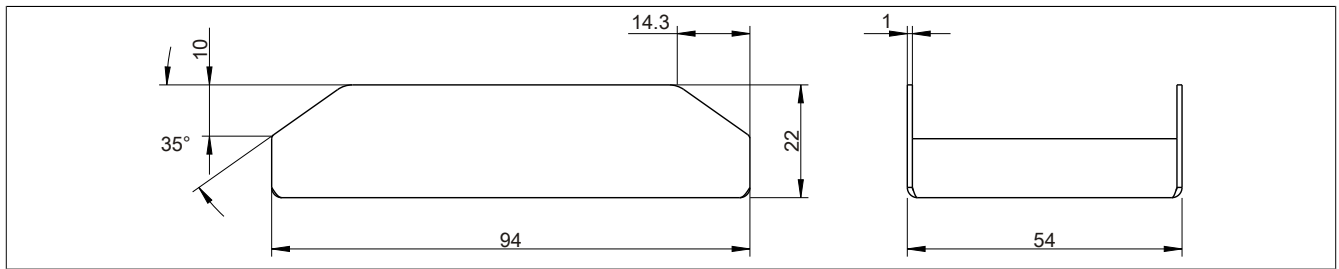


Figure 206: 5AC804.MFLT-00 - Dimensions

10.1.5 Drilling template

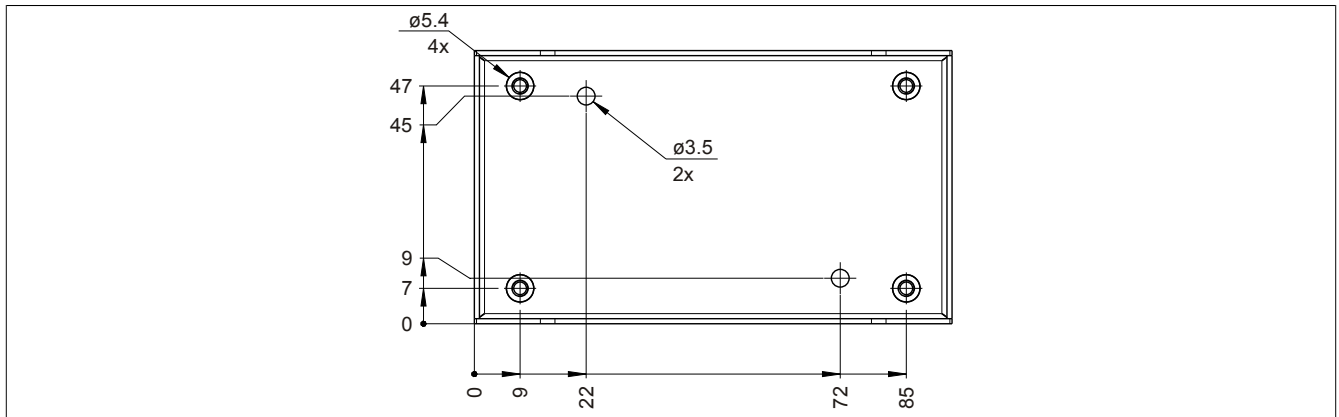


Figure 207: 5AC804.MFLT-00 - Drilling template

10.1.6 Connecting to the end device

The line filter must be connected between the voltage supply and the end device.

The following points must be observed:

- Use shielded, twisted wires.
- Keep the lines as short as possible (voltage supply - line filter - end device).
- The line filter must be installed on an uncoated, oil-free metallic surface.

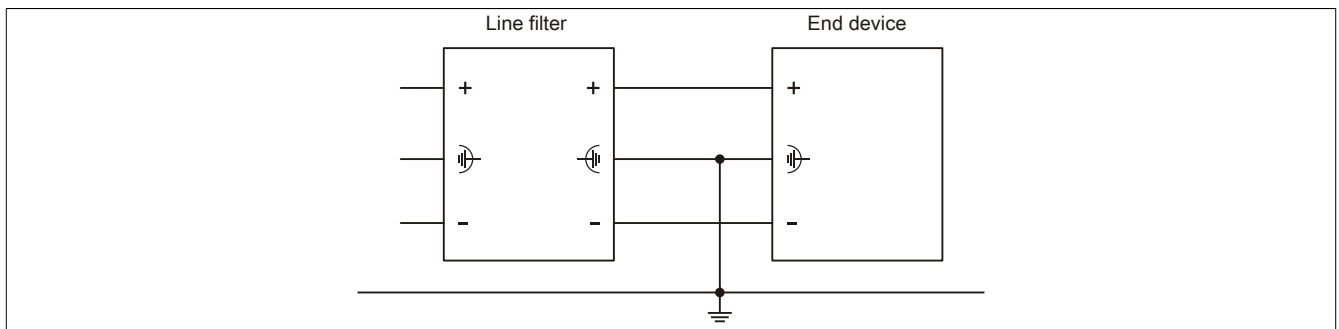


Figure 208: Connection example

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 Evaluating the battery status

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 312: 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.

1.2 Procedure

- Disconnect the power supply to the B&R Industrial PC.
- Touch the housing or ground connection in order to discharge any electrostatic charge from your body.
- Remove the cover from the battery compartment and carefully pull out the battery using the removal strip.
- The battery should not be held by its edges. Insulated tweezers may also be used to insert the battery.

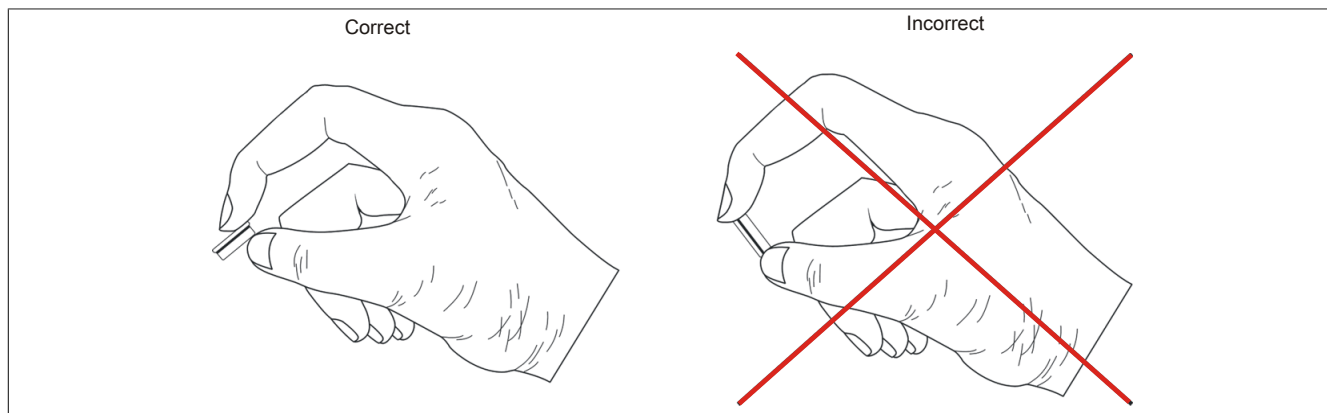


Figure 209: Battery handling

- Insert the new battery with the correct polarity.

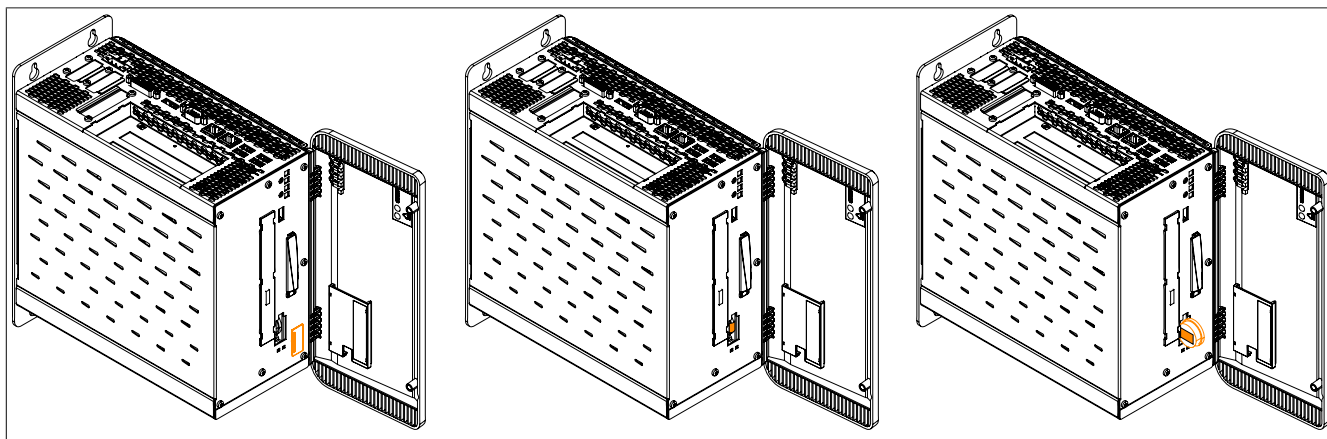


Figure 210: Replacing the battery

- To make the next battery replacement easier, be sure the removal strip is in place when inserting the battery.
- Reconnect the power supply to the B&R Industrial PC (plug in the power cable).
- Reset the date and time in BIOS.

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.

Improper use of the ejection lever (e.g. too much force) may damage the ejection mechanism.

The CFast card can be exchanged quickly and easily by pressing the ejector (see image) with a pointed object such as a pen.

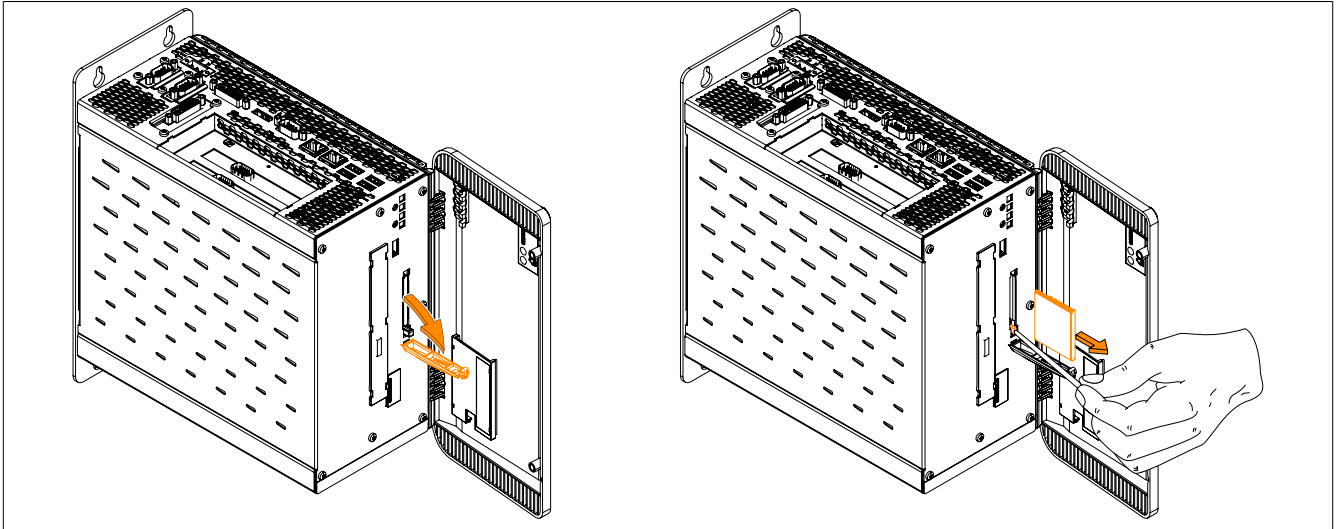


Figure 211: Exchanging a CFast card

3 Installing 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 60](#) and ["IF option 2 slot" on page 60](#).

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 263](#)).

1. Disconnect the power supply to the B&R Industrial PC.
2. Touch the housing or ground connection in order to discharge any electrostatic charge from your body.
3. Open the front cover. The Torx screws (T10) behind the cover that are marked in the image must then be removed. The number of Torx screws can vary depending on the system unit.

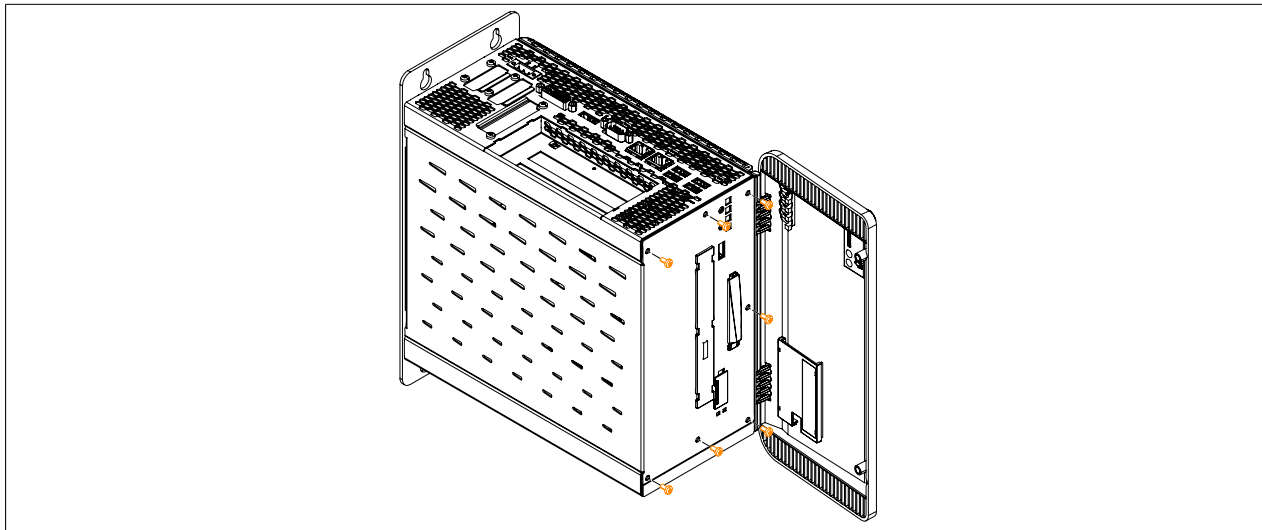


Figure 212: Removing the Torx screws for the side cover

4. After the screws have been removed, the side cover can be removed by sliding it first toward the front and then to the side.

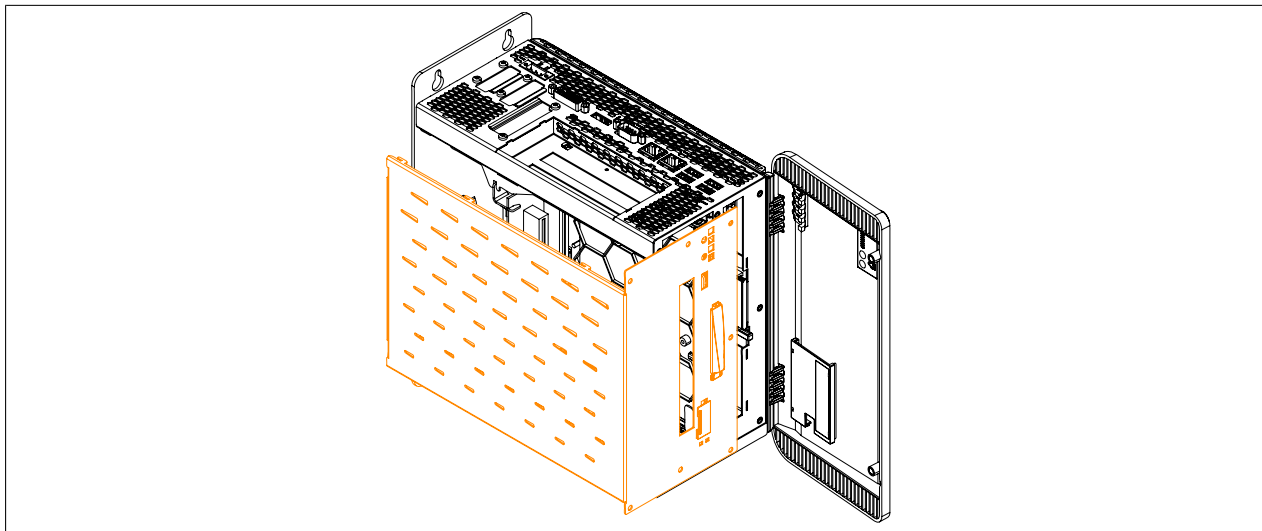


Figure 213: Removing the side cover

5. Remove the plastic slot cover and the marked Torx screws (T10) as well as the metal slot cover.

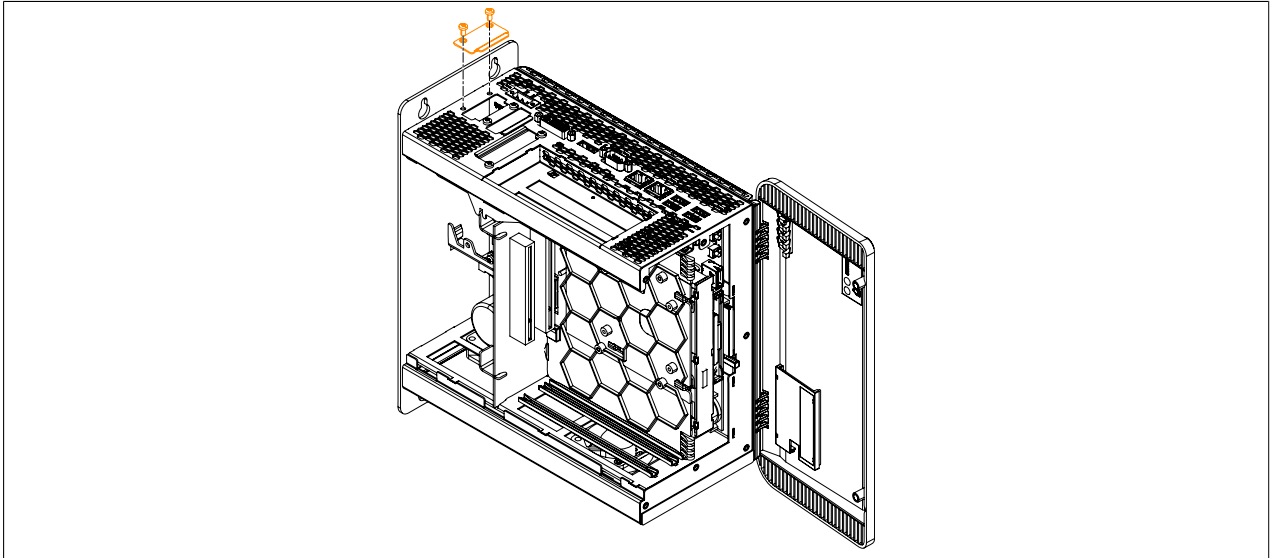


Figure 214: Removing the Torx screws and slot cover

6. Insert the interface option into the slot.

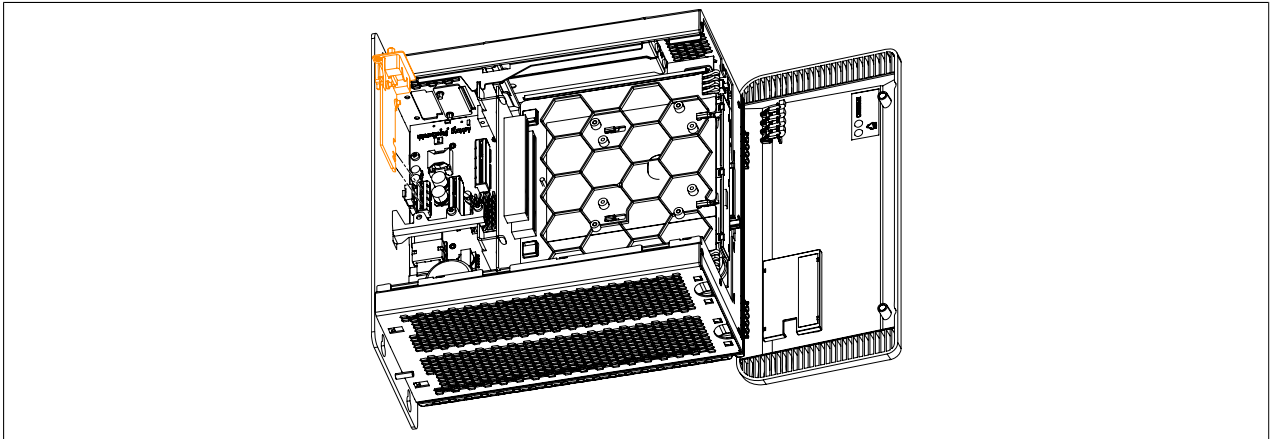


Figure 215: Installing the interface option

7. Secure the interface option to the B&R Industrial PC using the Torx screws (T10).

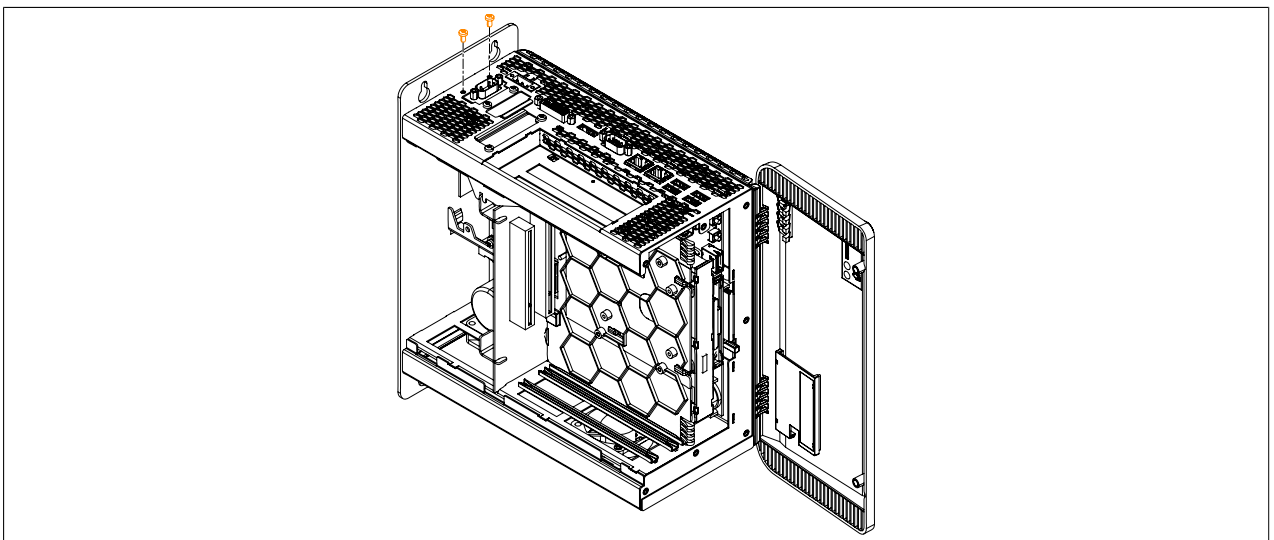


Figure 216: Securing the interface option

8. Attach the side cover.

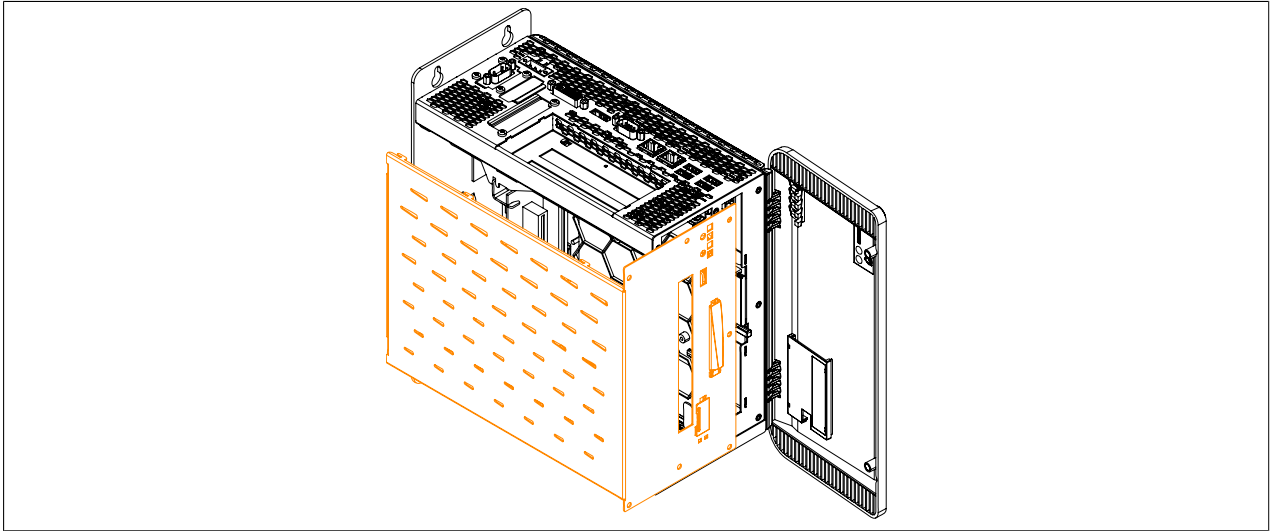


Figure 217: Replacing the side cover

9. Secure the side cover to the B&R Industrial PC using the same Torx screws (T10) as before.

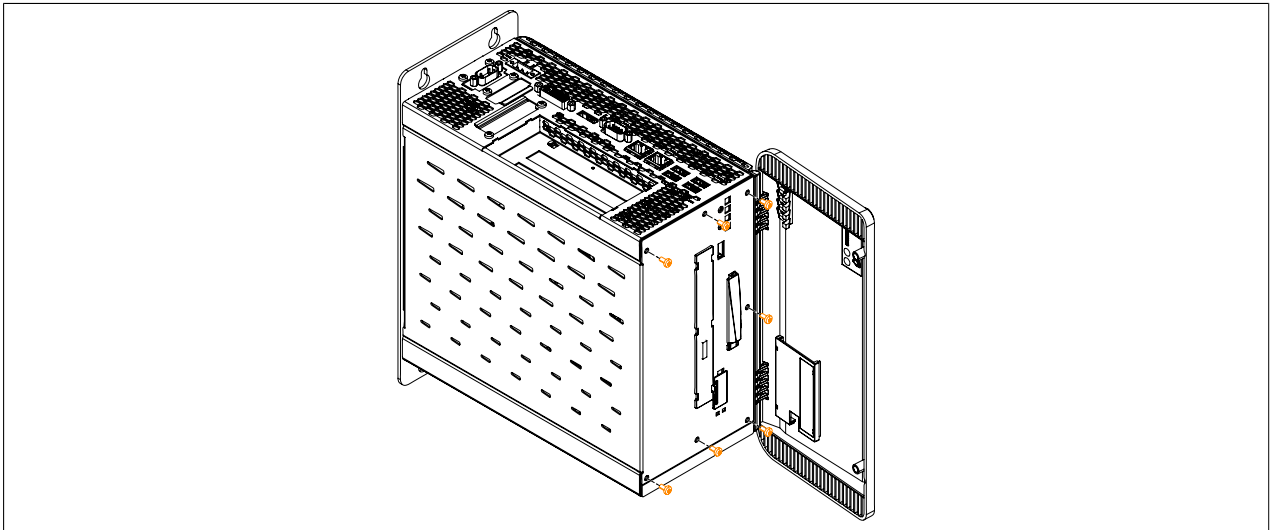


Figure 218: Securing the side cover

10. 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 263](#).

4 Installing monitor/panel options

Information:

After replacement or installation, it may be necessary to load the setup defaults in BIOS (see ["Save & Exit" on page 263](#)).

1. Disconnect the power supply to the B&R Industrial PC.
2. Touch the housing or ground connection in order to discharge any electrostatic charge from your body.
3. Open the front cover. The Torx screws (T10) behind the cover that are marked in the image must then be removed. The number of Torx screws can vary depending on the system unit.

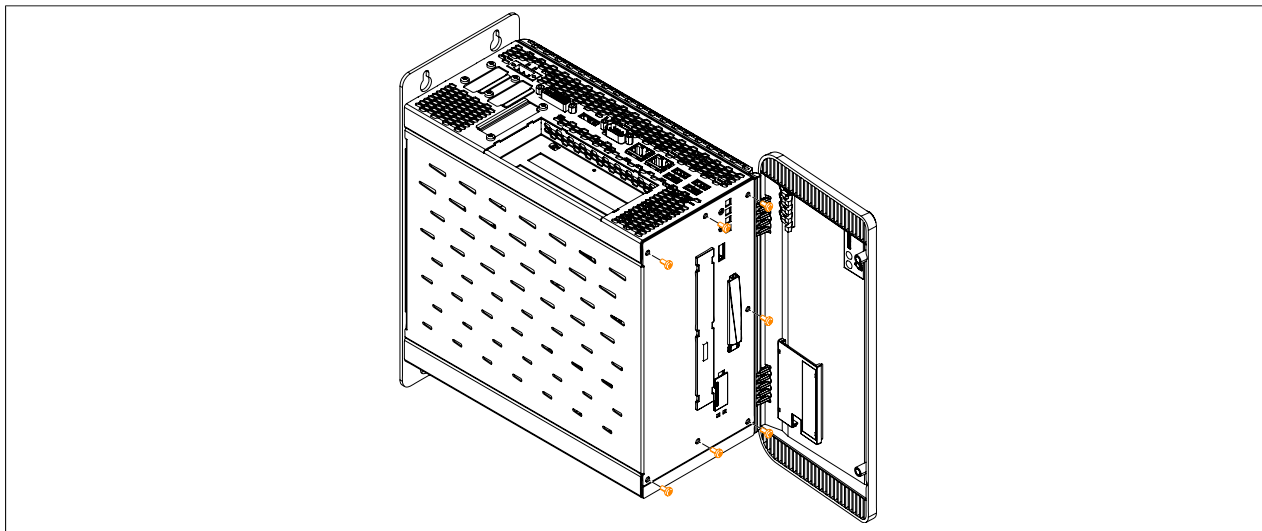


Figure 219: Removing the Torx screws for the side cover

4. After the screws have been removed, the side cover can be removed by sliding it first toward the front and then to the side.

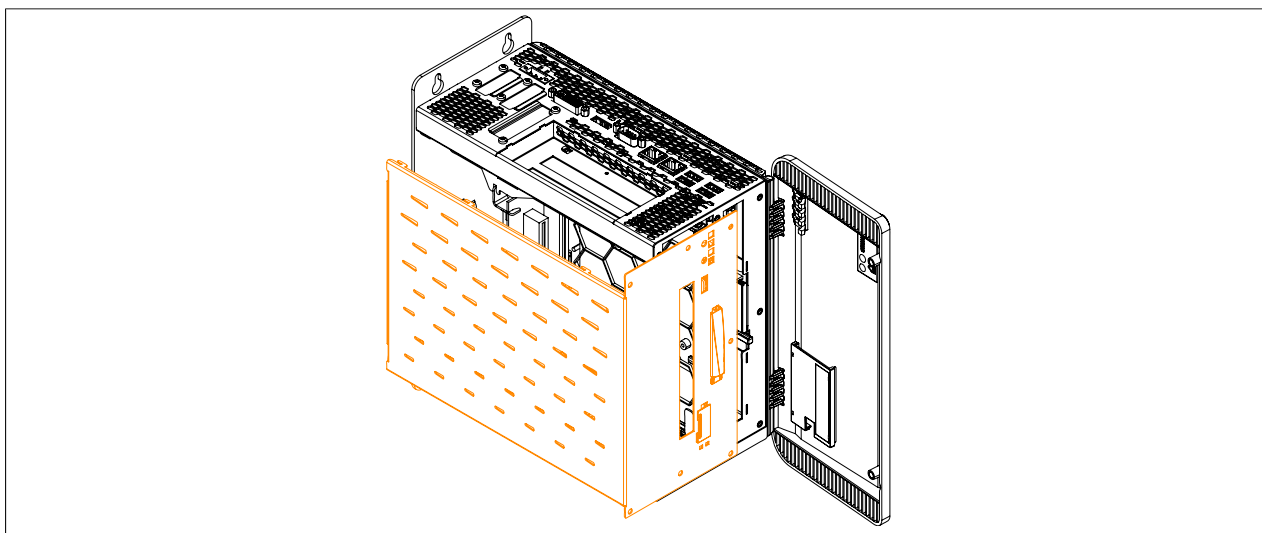


Figure 220: Removing the side cover

5. Remove the plastic slot cover and the marked Torx screws (T10) as well as the metal slot cover.

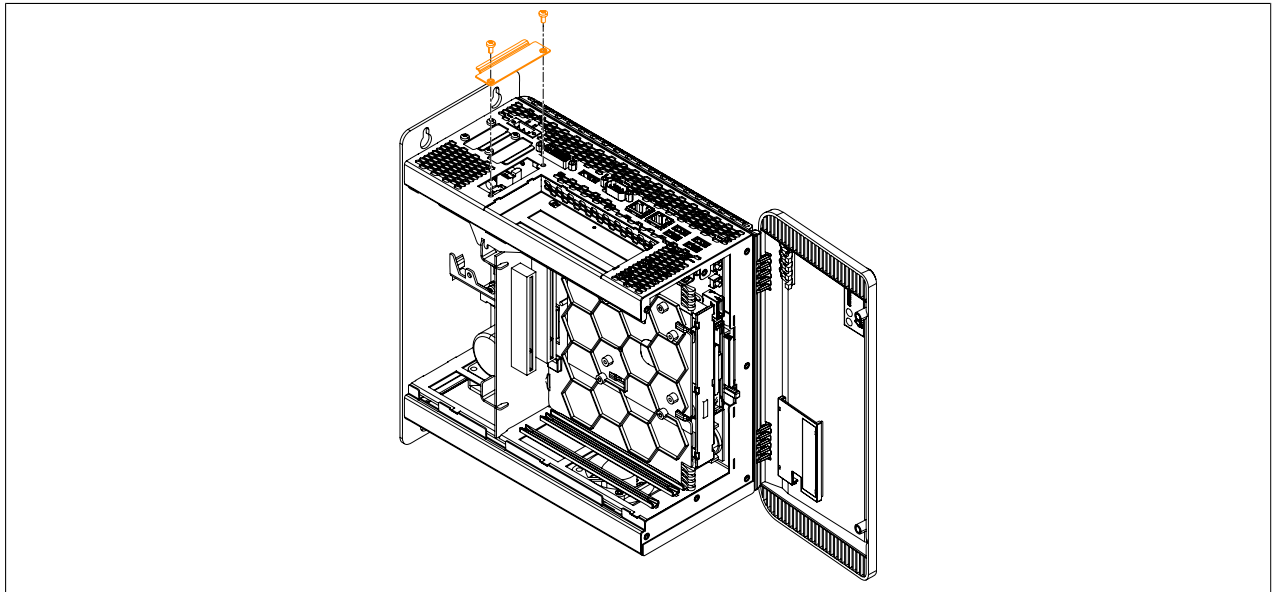


Figure 221: Removing the Torx screws and slot cover

6. Insert the monitor/panel option into the slot.

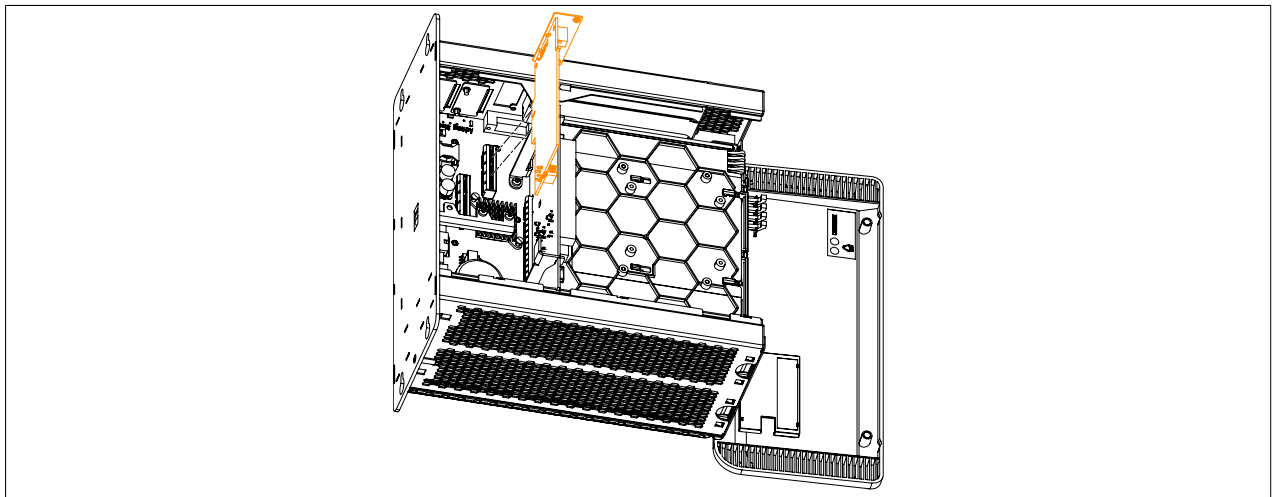


Figure 222: Inserting the monitor/panel option into the APC910

7. Secure the monitor/panel option to the B&R Industrial PC using the Torx screws (T10).

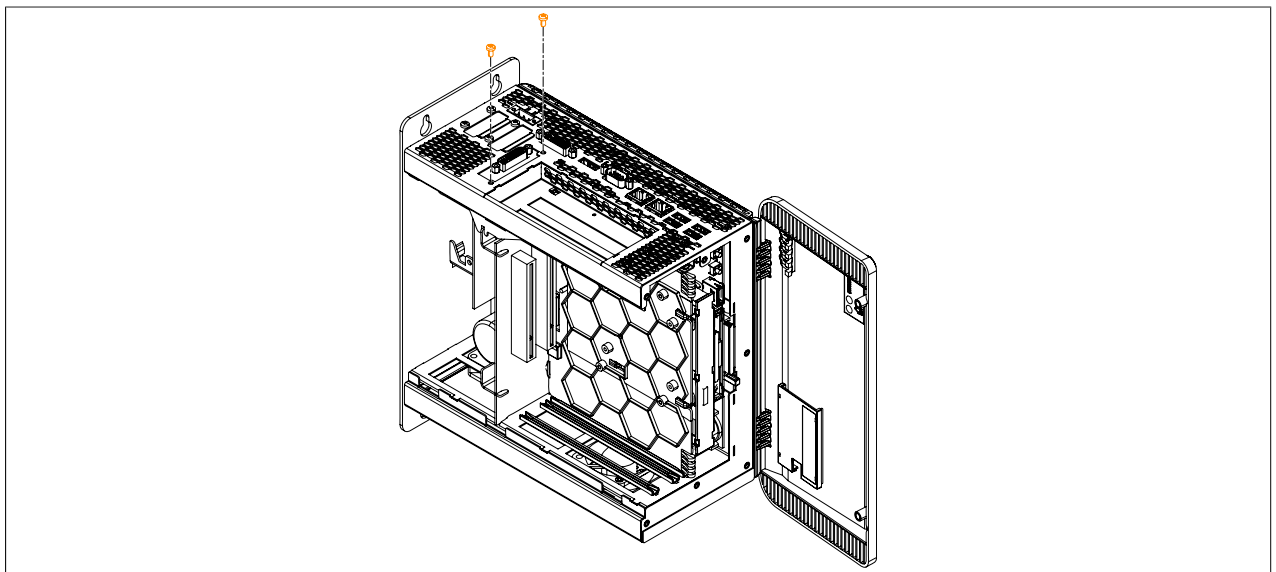


Figure 223: Securing the monitor/panel option using the Torx screws

8. Attach the side cover.

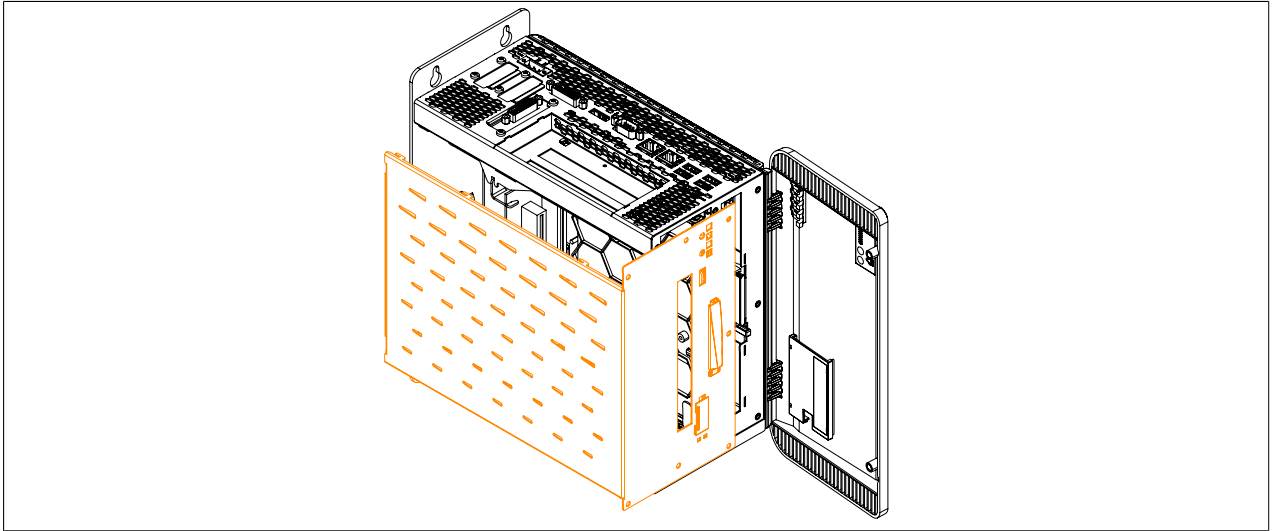


Figure 224: Replacing the side cover

9. Secure the side cover to the B&R Industrial PC using the same Torx screws (T10) as before.

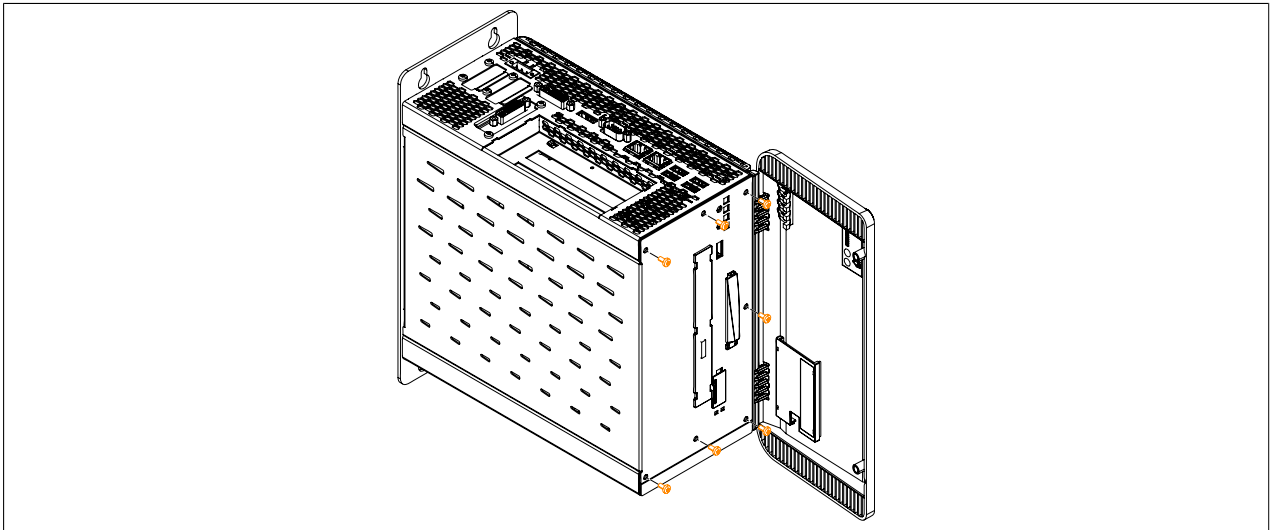


Figure 225: Securing the side cover

10. Once installed successfully, the monitor/panel 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 263](#).

5 Installing and exchanging slide-in compact drives

1. Disconnect the power supply to the B&R Industrial PC.
2. Touch the housing or ground connection in order to discharge any electrostatic charge from your body.
3. Open the front cover. The Torx screws (T10) behind the cover that are marked in the image must then be removed. The number of Torx screws can vary depending on the system unit.

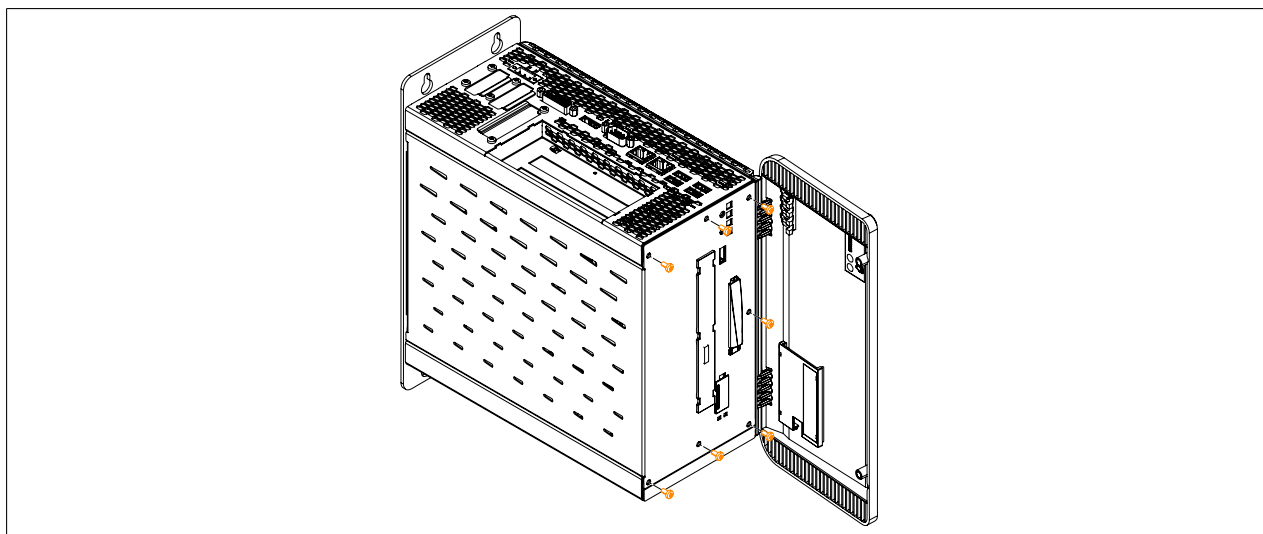


Figure 226: Removing the Torx screws for the side cover

4. After the screws have been removed, the side cover can be removed by sliding it first toward the front and then to the side.

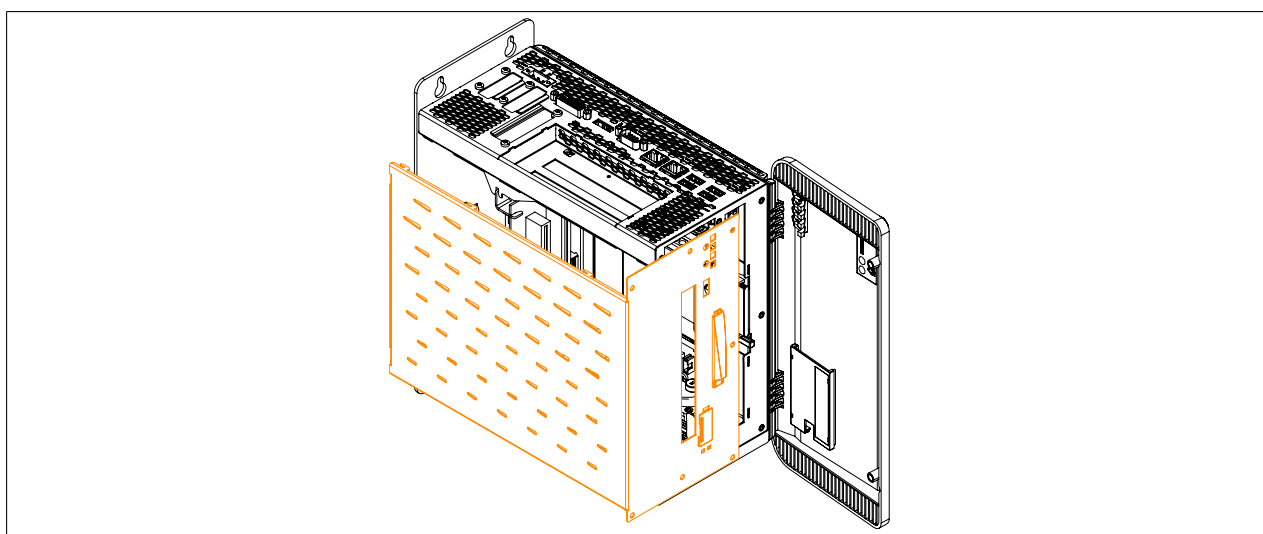


Figure 227: Removing the side cover

5. Free the plastic removal strip fastened to the side of the slide-in compact drive. Remove the slide-in compact drive from the [Automation PC 910](#) by pulling firmly on the removal strip. 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).

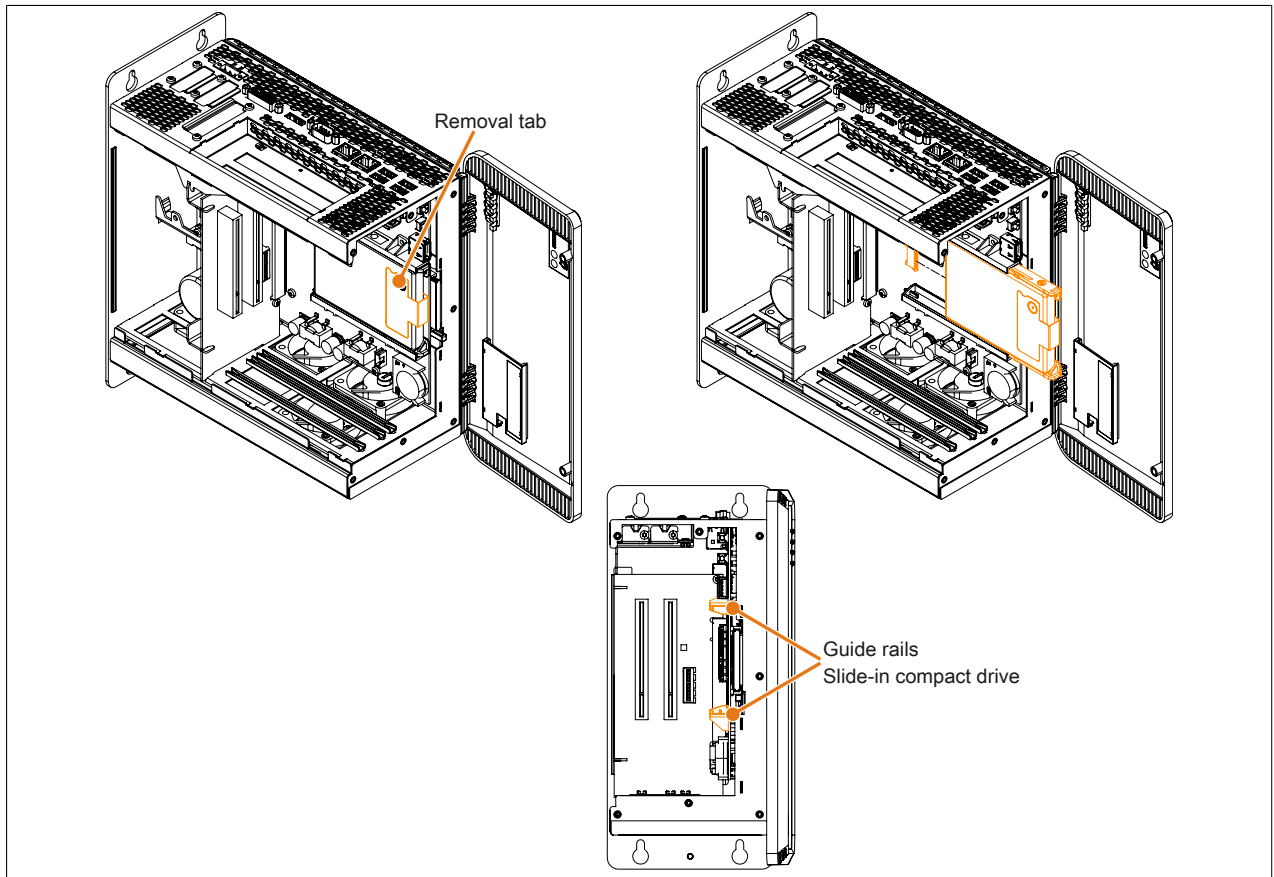


Figure 228: Installing/Exchanging the slide-in compact drive

6. Attach the side cover.

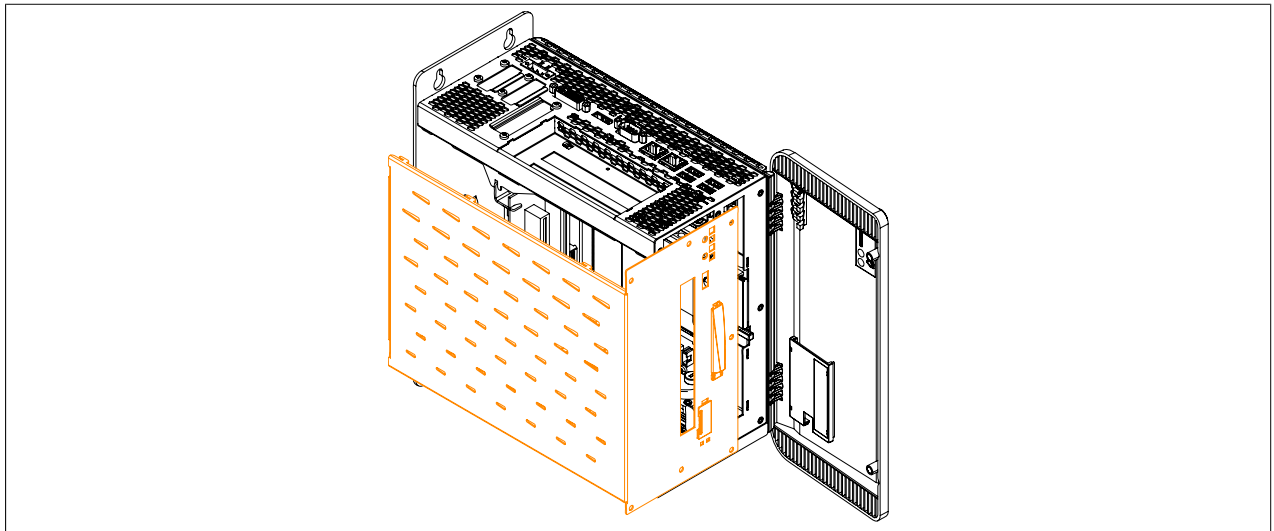


Figure 229: Replacing the side cover

7. Secure the side cover to the B&R Industrial PC using the same Torx screws (T10) as before.

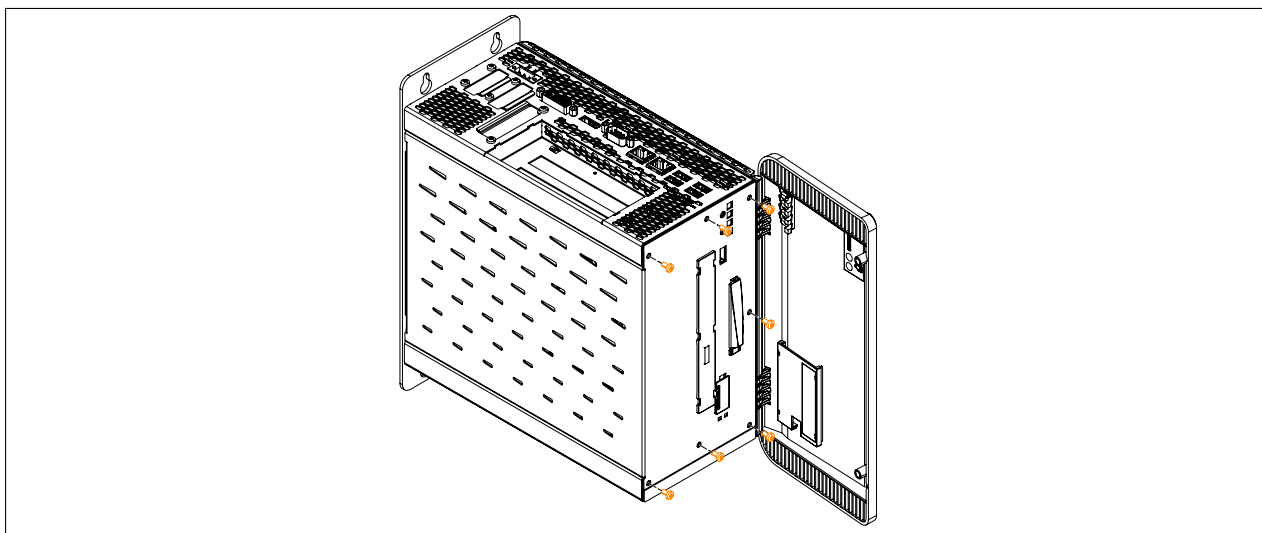


Figure 230: Securing the side cover

6 Installing and exchanging slide-in drives

1. Disconnect the power supply to the B&R Industrial PC.
2. Touch the housing or ground connection in order to discharge any electrostatic charge from your body.
3. Open the front cover. The Torx screws (T10) behind the cover that are marked in the image must then be removed. The number of Torx screws can vary depending on the system unit.

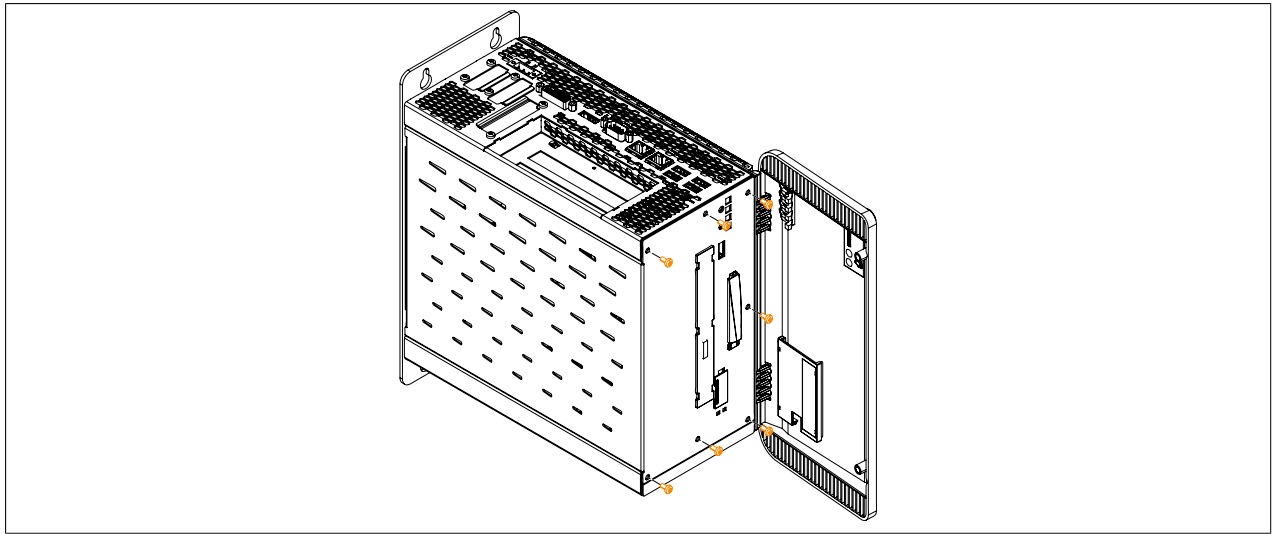


Figure 231: Removing the Torx screws for the side cover

4. After the screws have been removed, the side cover can be removed by sliding it first toward the front and then to the side.

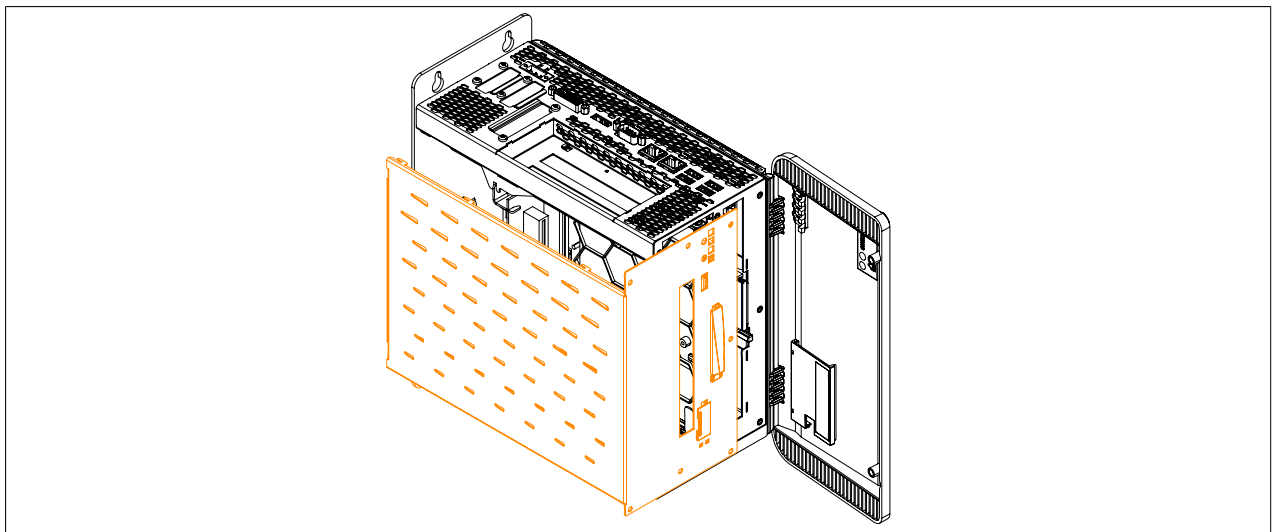


Figure 232: Removing the side cover

5. Install/Exchange the slide-in compact drive. The slide-in compact drive must slide into the guide rails and snap into the connector.

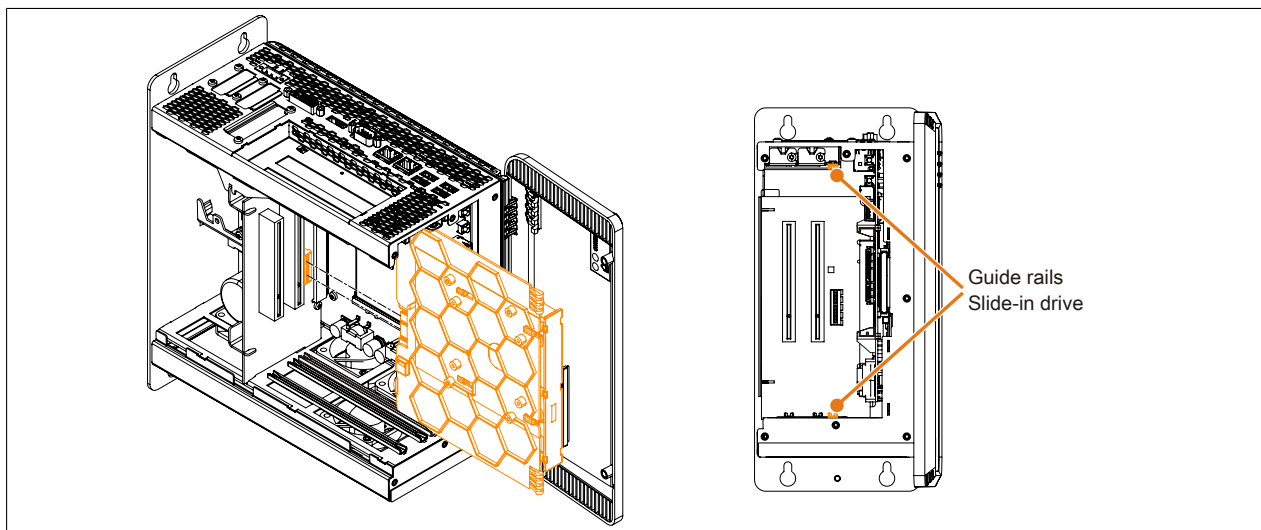


Figure 233: Installing/Exchanging the slide-in drive

6. Attach the side cover.

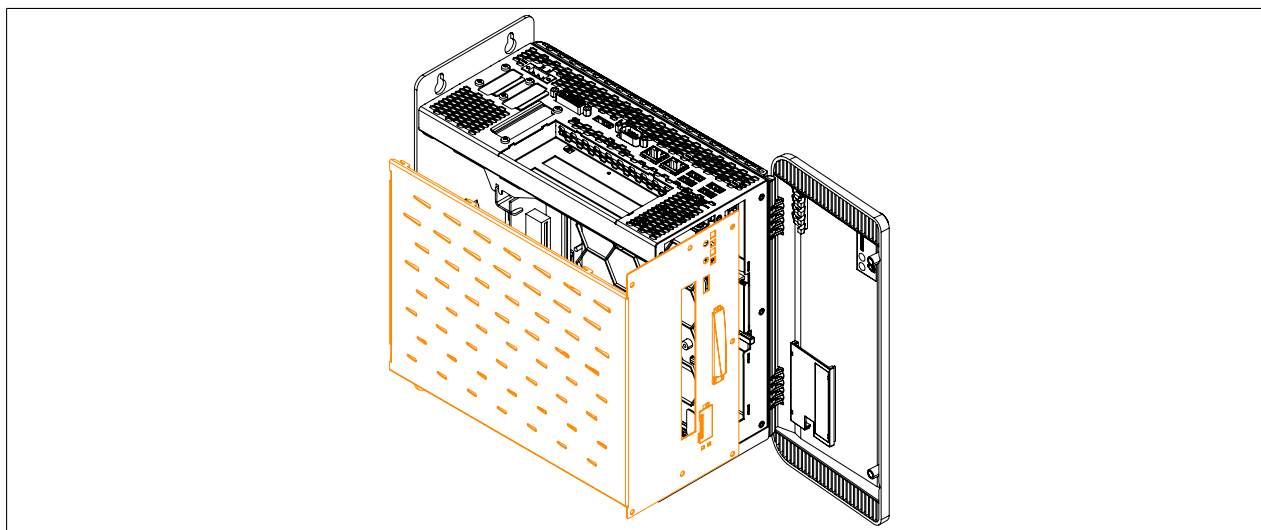


Figure 234: Replacing the side cover

7. Secure the side cover to the B&R Industrial PC using the same Torx screws (T10) as before.
The slide-in slot cover must be installed in order to operate the 5AC901.SSCA-00 slide-in compact adapter.

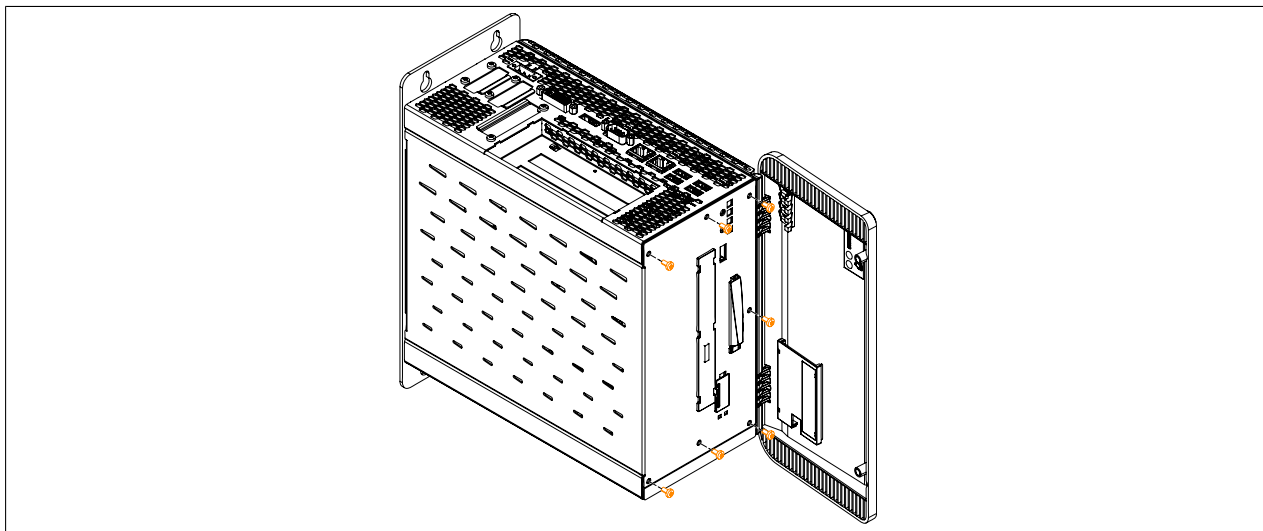


Figure 235: Securing the side cover

7 Installing PCI/PCle cards

1. Disconnect the power supply to the B&R Industrial PC.
2. Touch the housing or ground connection in order to discharge any electrostatic charge from your body.
3. Open the front cover. The Torx screws (T10) behind the cover that are marked in the image must then be removed. The number of Torx screws can vary depending on the system unit.

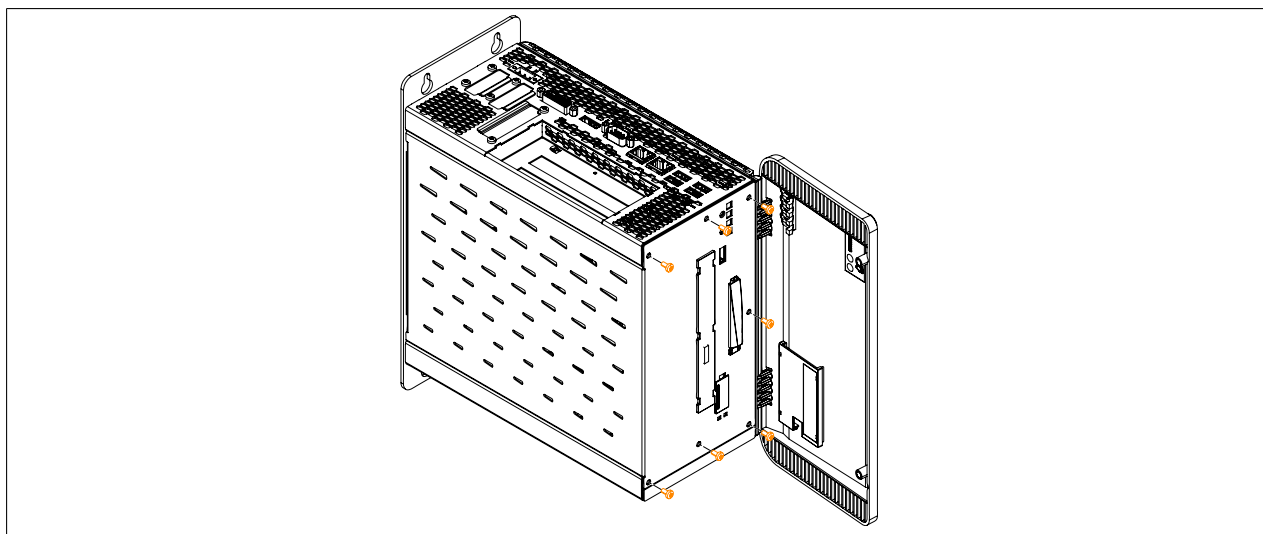


Figure 236: Removing the Torx screws for the side cover

4. After the screws have been removed, the side cover can be removed by sliding it first toward the front and then to the side.

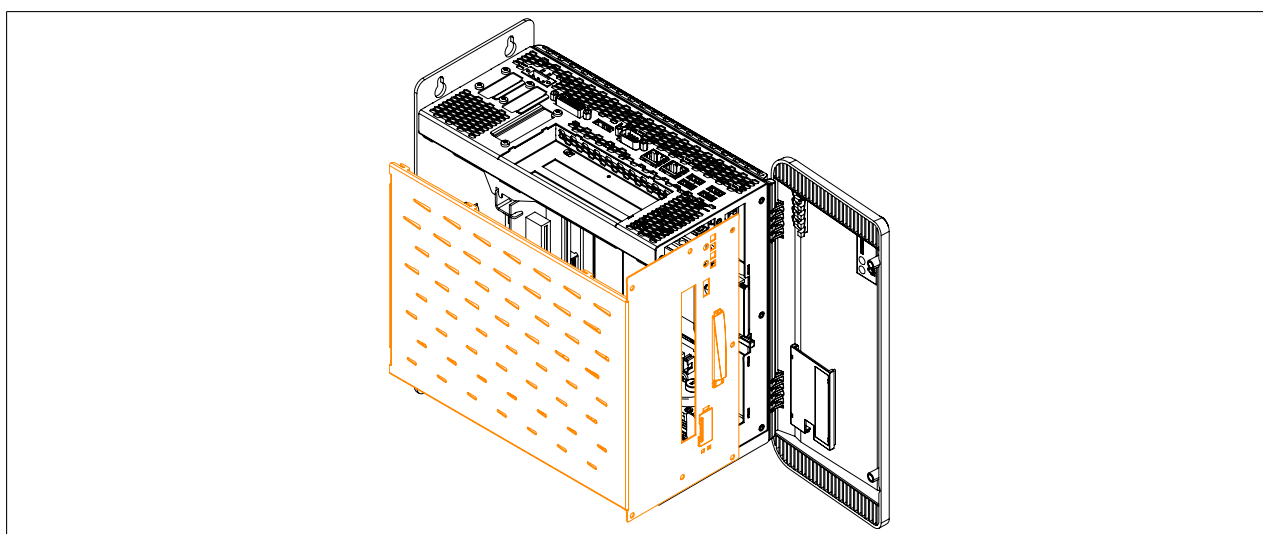


Figure 237: Removing the side cover

5. Remove the PCI slot cover. This is done by first removing the indicated Torx screws (T10) and then removing the cover.

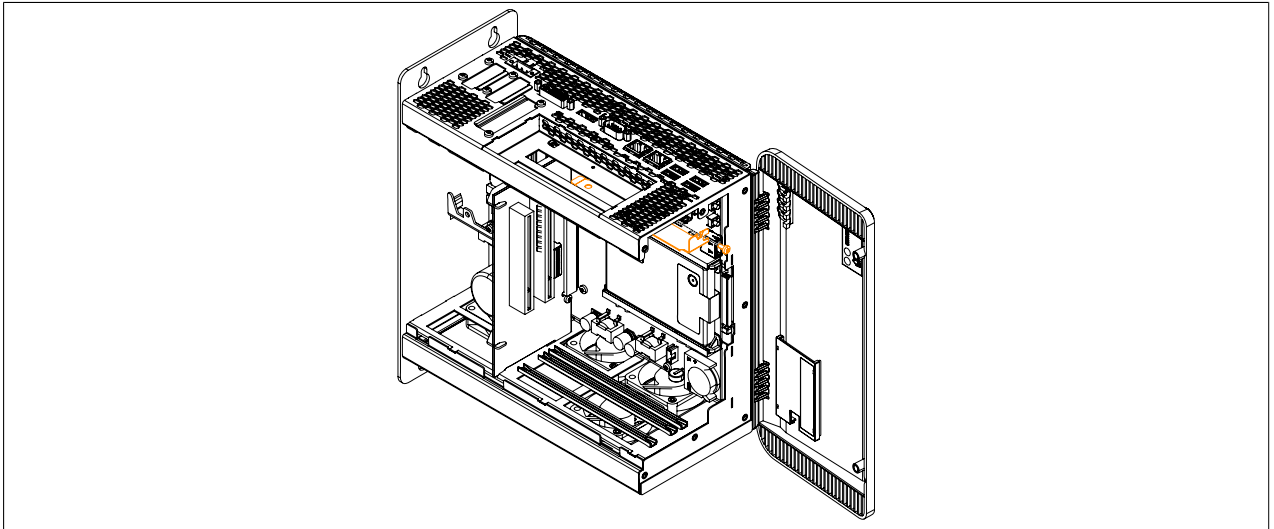


Figure 238: Removing the PCI/PCle slot cover

6. Install or replace the PCI/PCle card. Be sure to insert the PCI/PCle card in the lower black guide rail. Fasten the PCI or PCIe card using the indicated (previously removed) Torx screws (T10).

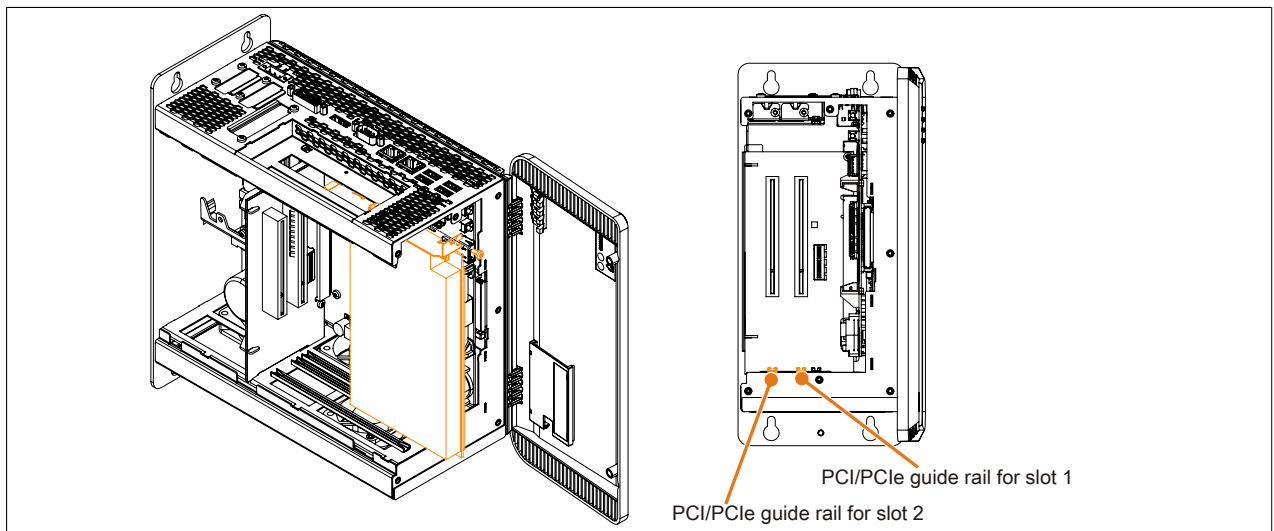


Figure 239: Installing/Replacing the PCI/PCle card

7. Attach the side cover.

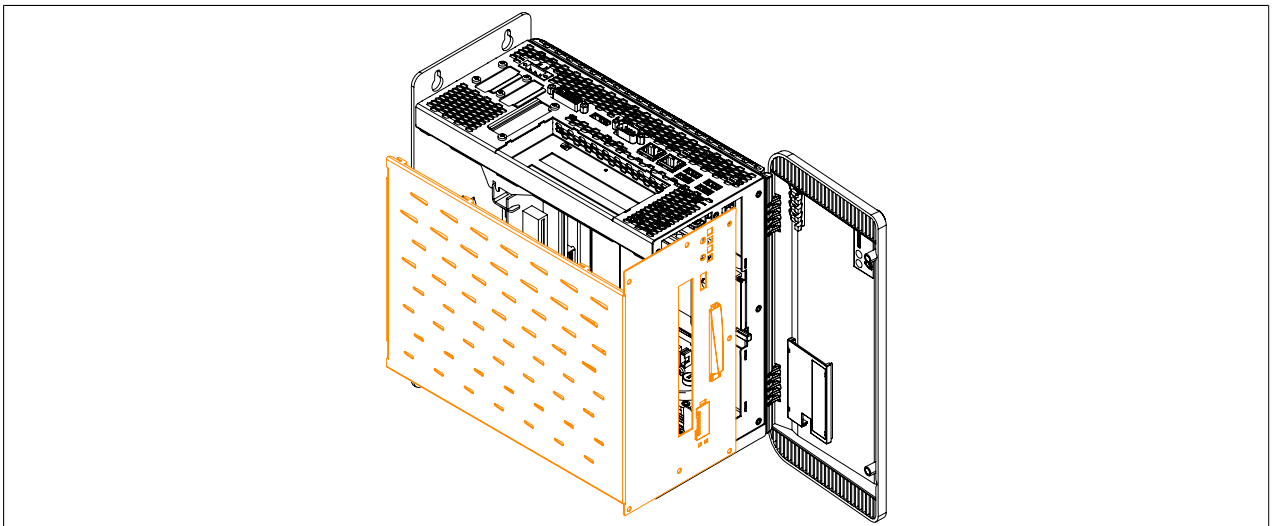


Figure 240: Replacing the side cover

8. Secure the side cover to the B&R Industrial PC using the same Torx screws (T10) as before.

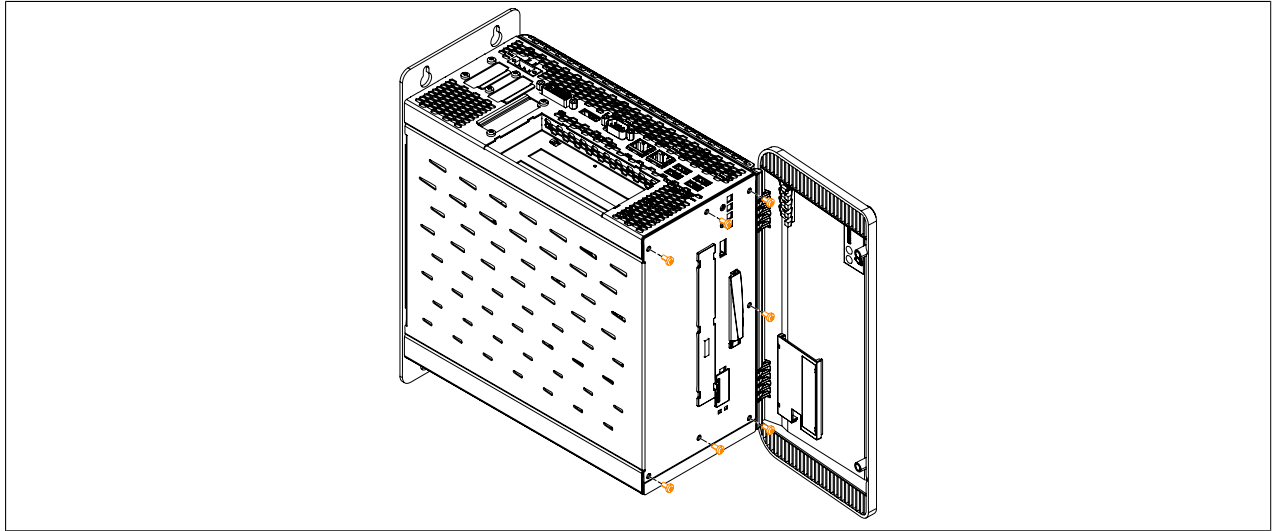


Figure 241: Securing the side cover

8 Installing and connecting the UPS battery unit

Information:

For information about installing the UPS IF option, see ["Installing interface options" on page 364](#).

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 terminal block (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).

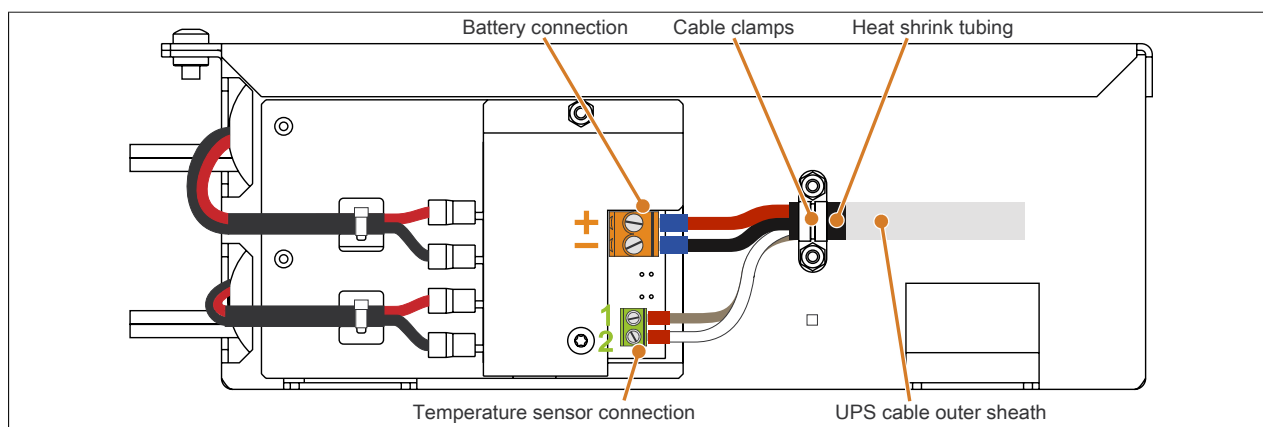


Figure 242: Connecting the UPS cable to the battery

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).

9 Replacing fan filters

1. Disconnect the power supply to the B&R Industrial PC.
2. Touch the housing or ground connection in order to discharge any electrostatic charge from your body.
3. Open the front cover.
4. To remove the fan filter from the B&R Industrial PC, push up on the locking mechanism while pulling the fan filter outward. The number of locking mechanisms may vary depending on the system unit.

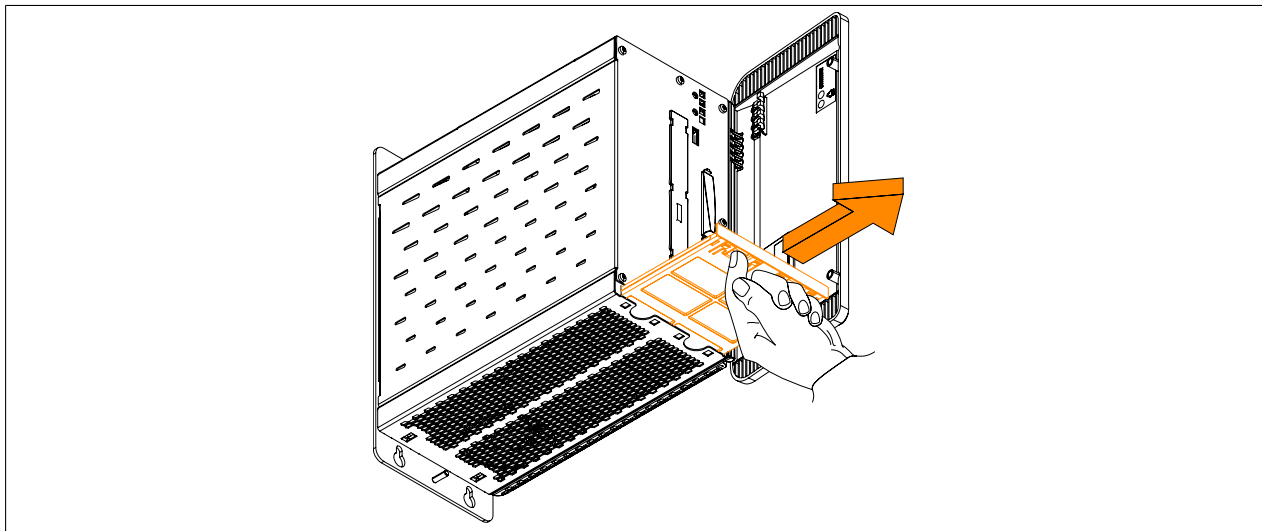


Figure 243: Removing the fan filter from the APC910

Information:

The dust filter must be inspected at regular intervals determined by the amount of dust in the operating environment.

10 Replacing fan kits

1. Disconnect the power supply to the B&R Industrial PC.
2. Touch the housing or ground connection in order to discharge any electrostatic charge from your body.
3. Open and remove the front cover.

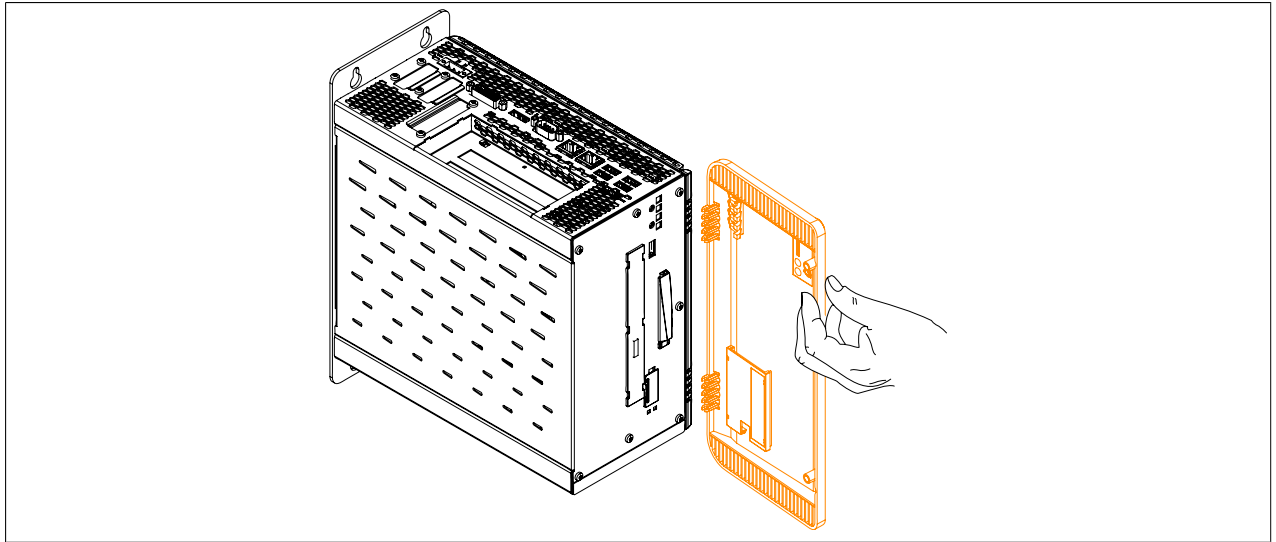


Figure 244: Removing the front cover

4. Remove the heat sink cover. The Torx screws (T15) that are marked in the image must be removed.

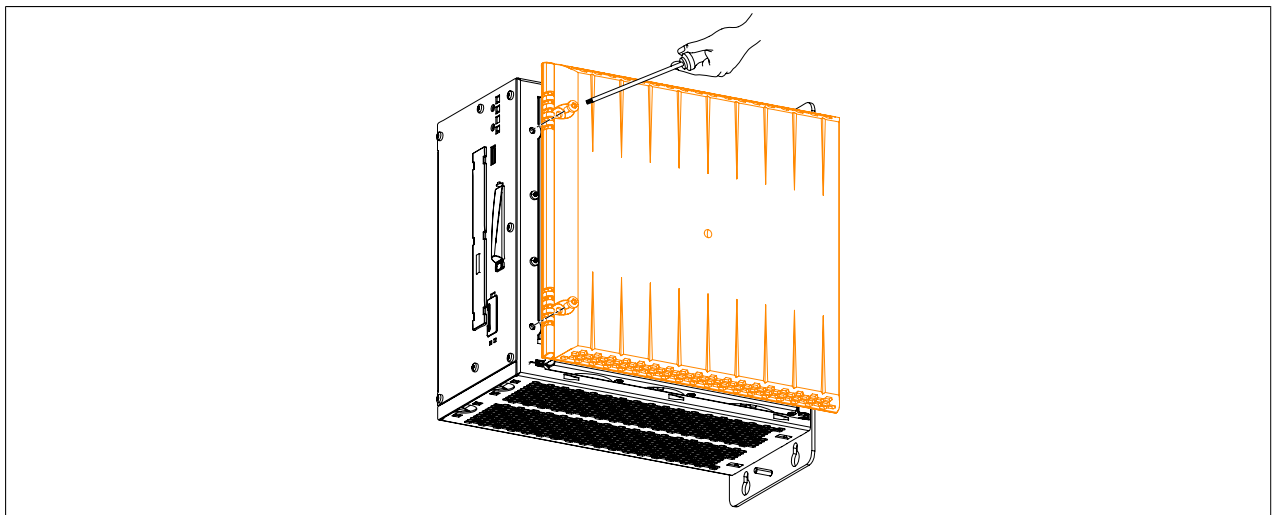


Figure 245: Removing the heat sink cover

- Remove the Torx screws (T10) from the fan kit that are marked in the following image and unplug the fan kit cable from the mainboard.

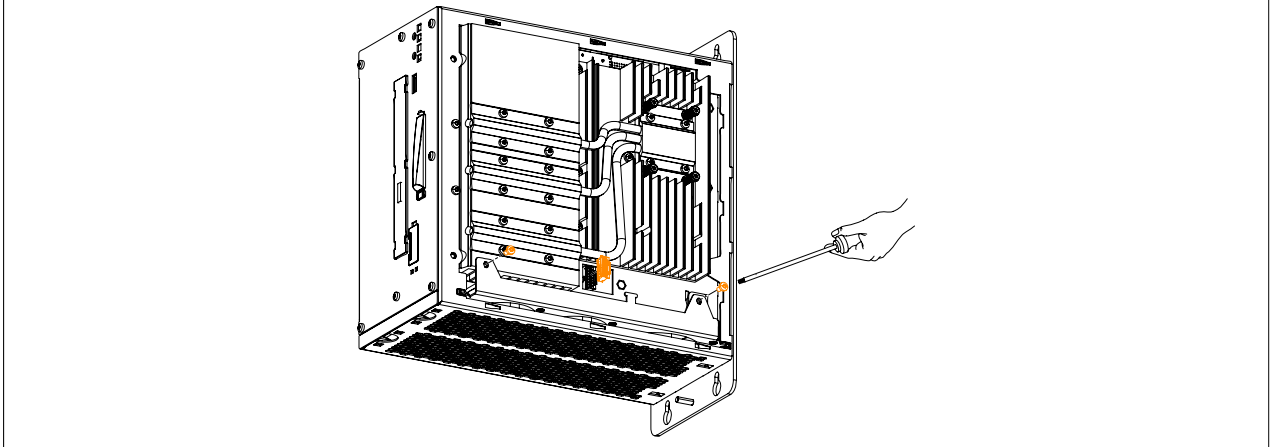


Figure 246: Removing the Torx screws and fan cable

- The fan kit can now be removed from the Automation PC 910.

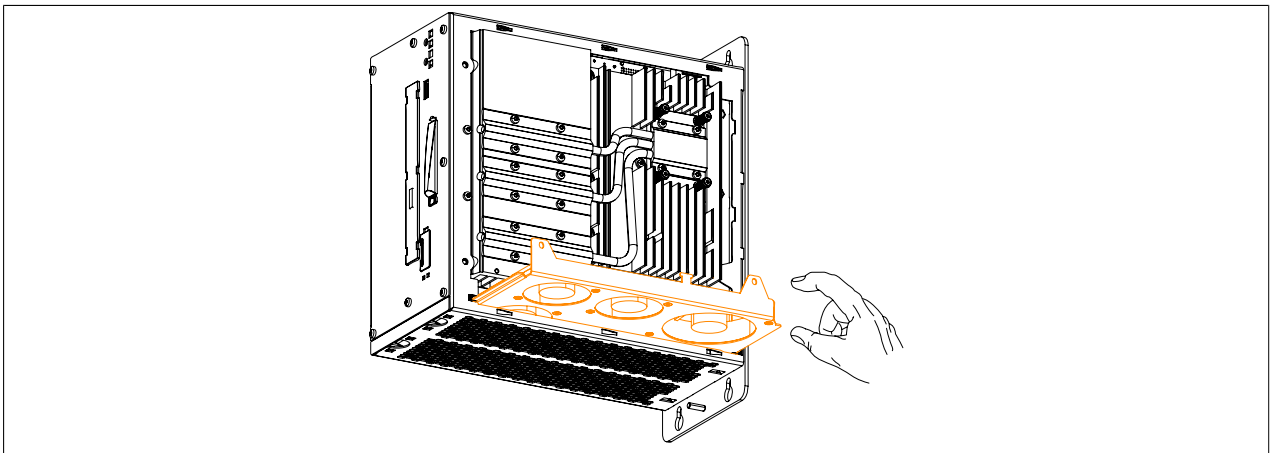


Figure 247: Removing the fan kit from the APC910

- A new fan kit can now be installed.
- The Automation PC 910 can now be re-assembled by carrying out these instructions in reverse.
- 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.

- 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 263.

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.

- 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
- 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

11 Connecting an external device to the mainboard

A male connector on the mainboard allows +5 VDC and +12 VDC to be rerouted in order to provide power to special PCI cards, for example.

This voltage can be accessed using the "Internal supply cable" on page 357. The multi-pin connector is located near the battery and slide-in compact drive.

Multi-pin connector for external devices			
Pin	Assignment	Power	4-pin connector, male 
1	+12 VDC	Max. 10 watts	
2	GND		
3	GND	Max. 5 watts	
4	+5 VDC		

Table 313: Multi-pin connector on the mainboard - Pinout

Connections are protected with a 1 A multi-fuse.

1. Disconnect the power supply to the B&R Industrial PC.
2. Touch the housing or ground connection in order to discharge any electrostatic charge from your body.
3. Open the front cover. The Torx screws (T10) behind the cover that are marked in the image must then be removed. The number of Torx screws can vary depending on the system unit.

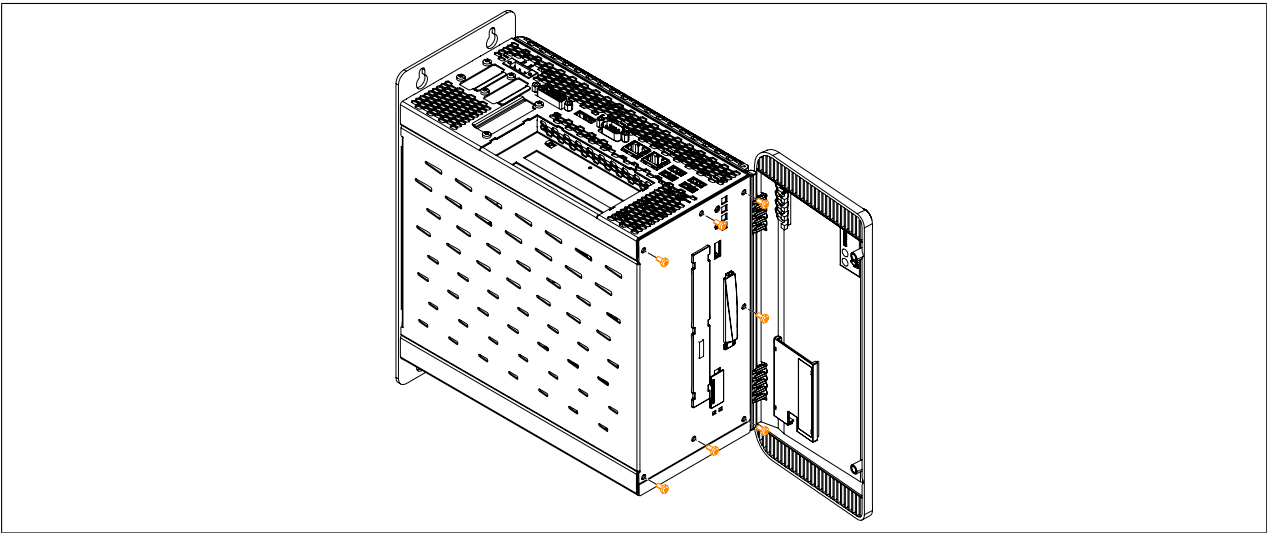


Figure 248: Removing the Torx screws for the side cover

4. After the screws have been removed, the side cover can be removed by sliding it first toward the front and then to the side.

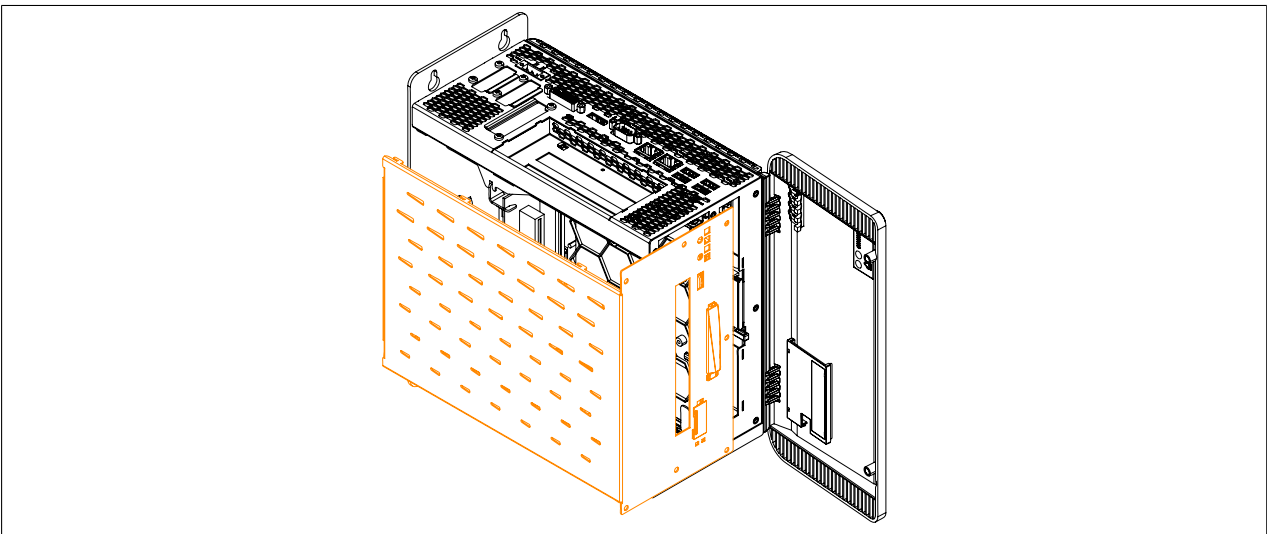


Figure 249: Removing the side cover

5. To access the multi-pin connector for external devices, it may be necessary to first remove any installed slide-in drives.

6. Plug the internal supply cable into the multi-pin connector for external devices on the mainboard. The springs on the supply cable connector must fit into the grooves of the multi-pin connector.

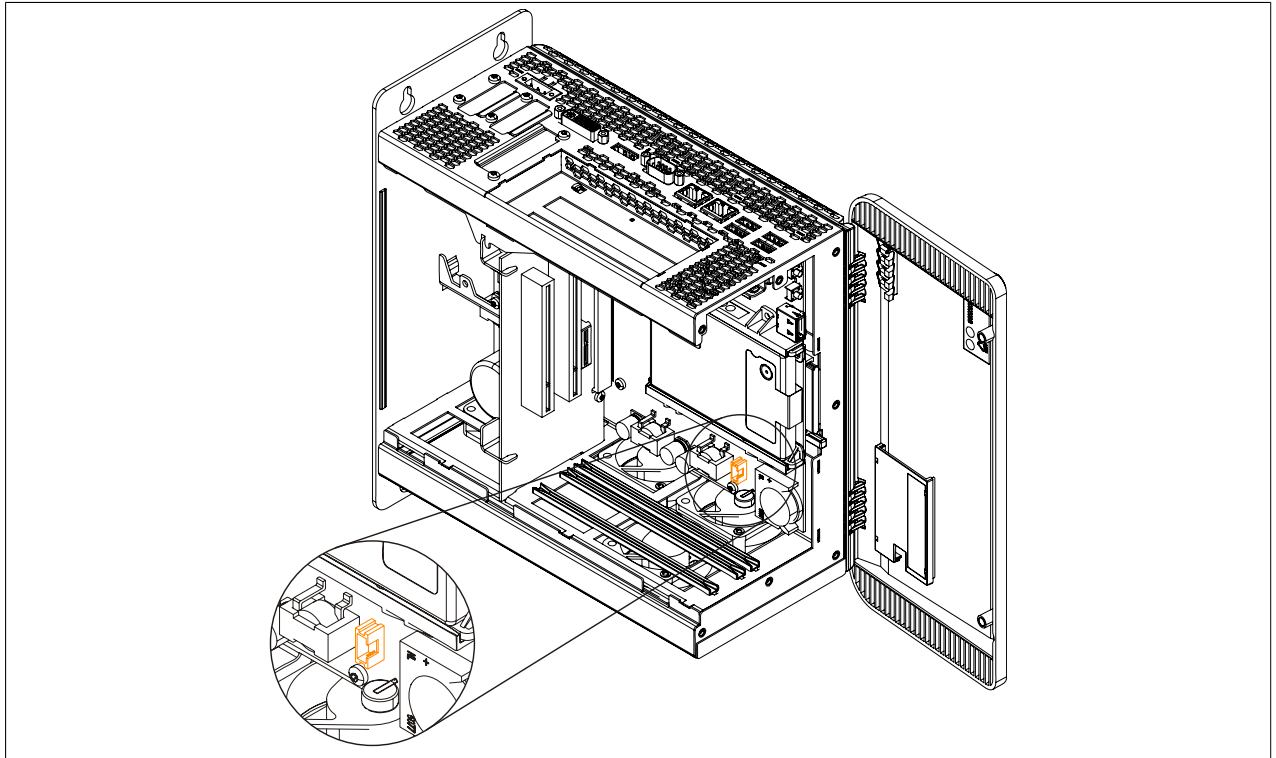


Figure 250: Connector location for external devices

7. Now connect the internal supply cable to the external device and replace any slide-in drives that were removed earlier.
8. Attach the side cover.

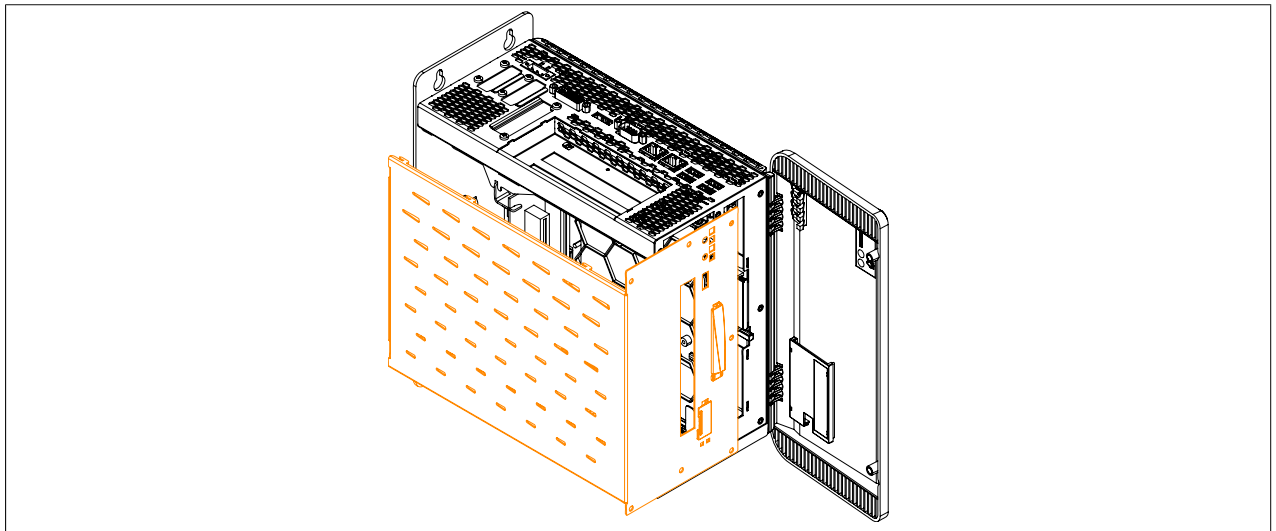


Figure 251: Replacing the side cover

9. Secure the side cover to the B&R Industrial PC using the same Torx screws (T10) as before.

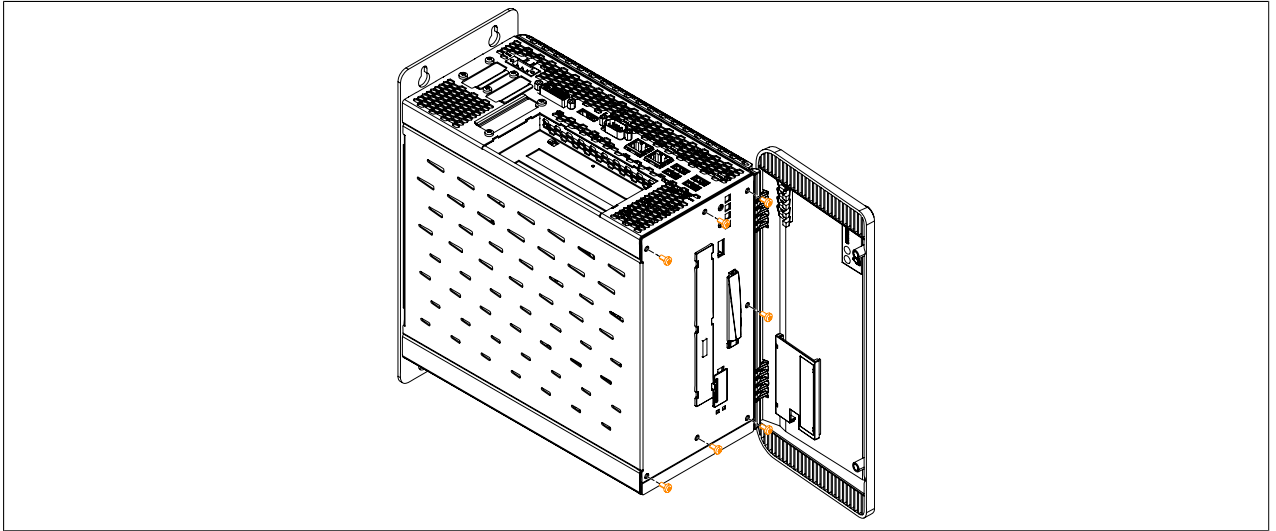


Figure 252: Securing the side cover

12 Replacing a PCI SATA RAID hard disk in a RAID 1 set

This example assumes that the secondary hard disk (HDD1) is defective in a RAID 1 configuration. In such a case, the defective hard disk can be replaced by the replacement drive SATA hard disk.

Model number of PCI SATA RAID controller	Model number of required replacement SATA HDD	Note
5ACPCI.RAIC-01	5ACPCI.RAIC-02	60 GB hard disk
5ACPCI.RAIC-03	5ACPCI.RAIC-04	160 GB hard disk
5ACPCI.RAIC-05	5MMHDD.0250-00	250 GB hard disk
5ACPCI.RAIC-06	5MMHDD.0500-00	500 GB hard disk

Table 314: Overview of required replacement SATA HDD for PCI SATA HDD RAID controller

A size 10 Torx screwdriver is needed to replace the hard disk.

12.1 Procedure

1. Disconnect the power supply.
2. Touch the housing or ground connection in order to discharge any electrostatic charge from your body.
3. Remove the side cover.
4. Remove the SATA RAID insert.
5. Loosen the 4 appropriate fastening screws (M3x5).

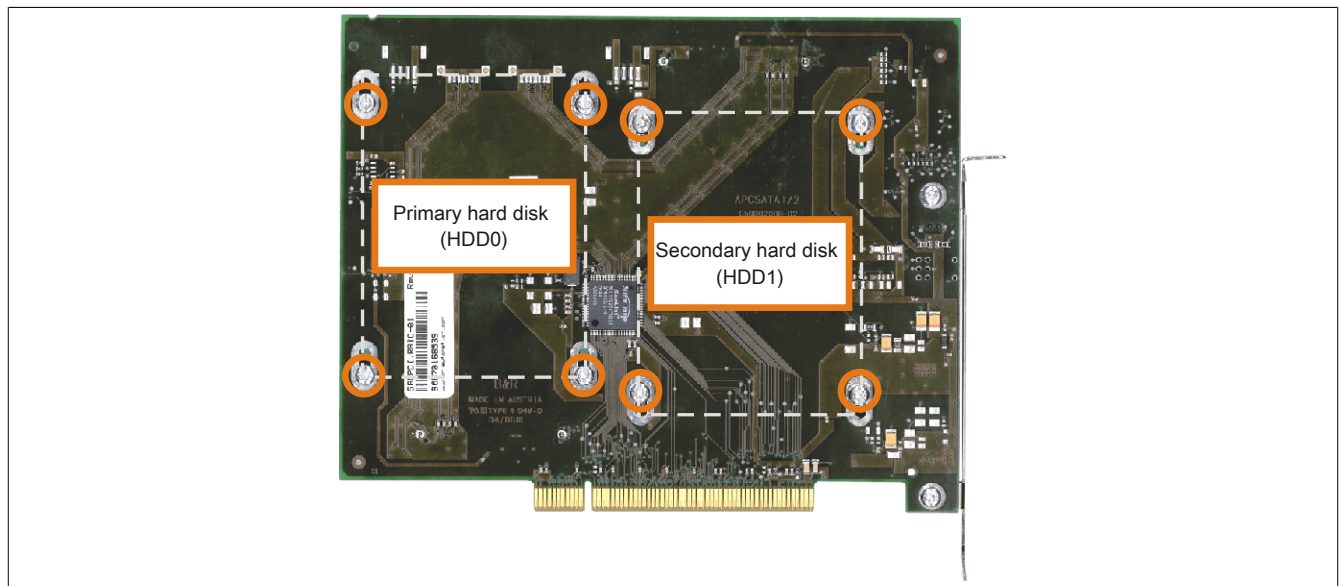


Figure 253: Screw layout on the back of the 5ACPCI.RAIC-03 SATA RAID controller

6. On the front, slide the hard disk down and away ([Exchanging the hard disk - left image](#)).
7. Insert the new hard disk carefully into the connector ([Exchanging the hard disk - right image](#)), being careful to only touch it on the front, not on the top.

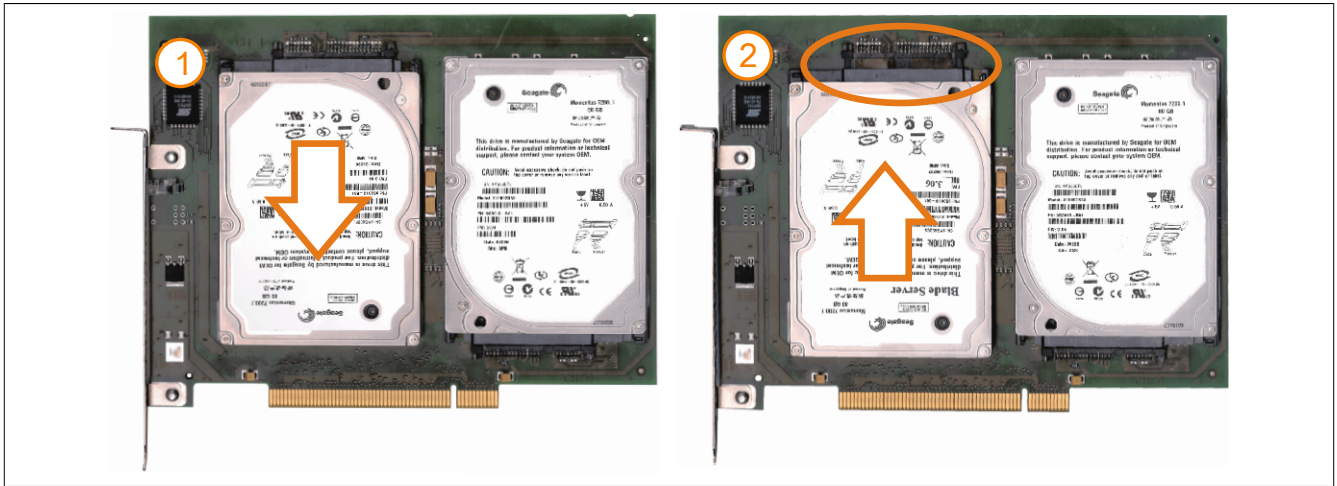


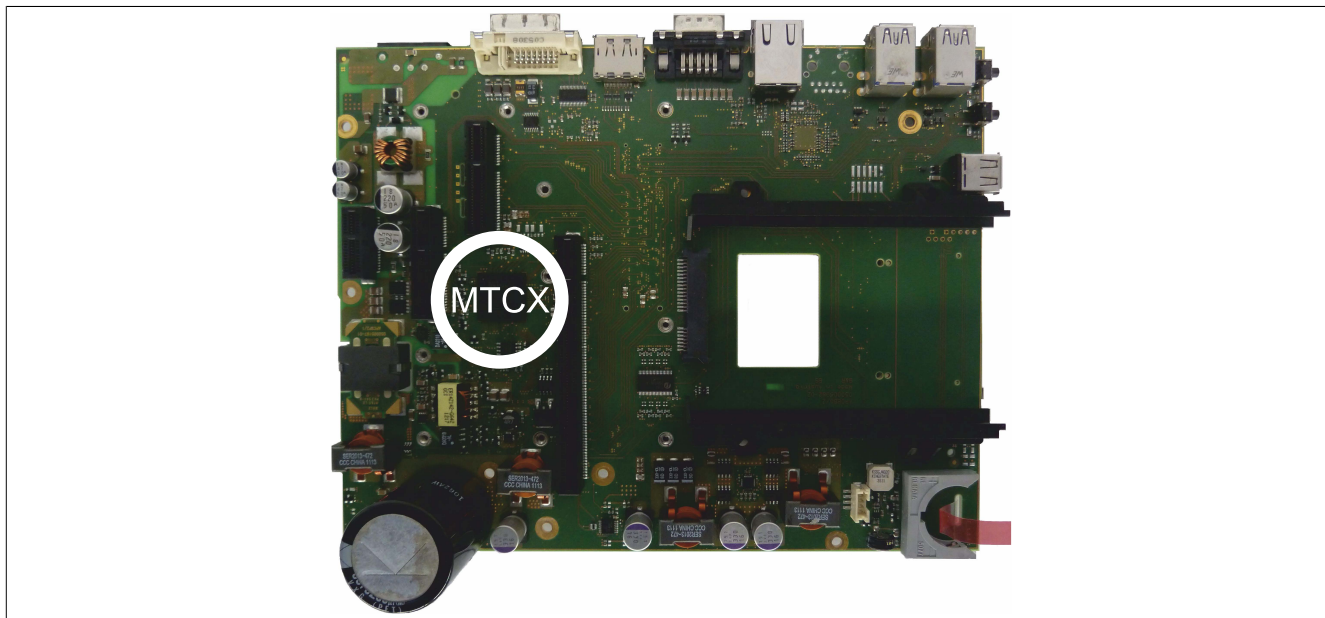
Figure 254: Exchanging the hard disk

8. Re-secure the hard disk using the 4 fastening screws (M3x5) used earlier.
9. Reassemble the device in the reverse order.
10. An error message is output by the RAID BIOS after starting the system: "RAID1 set is in Rebuild status. The rebuild will continue after boot sequence is complete".
11. A rebuild can be performed immediately in SATA RAID BIOS or once the PC has booted - see ["Rebuild mirrored set" on page 196](#).

Appendix A

1 Maintenance Controller Extended (MTCX)

The MTCX controller (FPGA processor) is located on the mainboard (part of every system unit) of the APC910 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 ⁸⁾. The version can be read in BIOS or approved Microsoft Windows operating systems using the B&R Control Center.

⁸⁾ Available in the Downloads section of the B&R website (www.br-automation.com).

2 Abbreviations

Abbreviation	Stands for	Description
NC	Normally closed Not connected.	A normally closed relay contact 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 315: Abbreviations in this user's manual

3 Glossary

Address	An address is a character string for identifying a memory location or a memory area, where data is stored and can be retrieved. It is also a symbol (e.g. with numerical controllers) for identifying a function unit for which subsequent geometrical or technological data are determined by the symbol.
Algorithms	According to DIN 19226: Algorithms are a finite series of well-defined regulations. The desired output quantities are created from permitted system input quantities. It describes how something is to be done. A procedure must at least satisfy the following requirements to be valid as an algorithm in a mathematical context. <i>Discreteness:</i> An algorithm is made up of a finite series of steps. <i>Determinacy:</i> Under the same start conditions, it always creates the same end result. <i>Clearness:</i> The series of steps is clearly defined. <i>Finiteness:</i> It ends after a finite number of steps. From a quantity theory perspective, an algorithm is clearly defined by a set of sizes [input, intermediate and output sizes], a set of elementary operations and also by a regulation, which specifies when and in what sequence certain operations should be carried out. From a functional perspective, it transfers a set of input sizes into a set of output sizes. It can be represented in text form in a natural or artificial formal language or using graphic representations [graph, program flow chart, structured chart, Petri Nets etc.].
Analog Signal	A signal, whose information parameters can accept any number of values, within specific technical limits. Theoretically, they can have an infinitely high resolution. However, in practice it is limited to a range of only 1 to 104. In addition, long-term storage and allocation causes many size problems. Therefore, digital signals are predominantly used in modern automation technology.
ANSI	American National Standards Institute > this organization promotes and manages American industrial standards.
APC	Abbreviation for »Automation PC«
Application software	Software, which is not used for operation by the computer itself, but rather when a computer is used to process a concrete application problem. It sets up the system software and uses this for fulfilling individual tasks. Application software can be accommodated in standard software used by a large number of customers in a wide range of industries. Common examples are Word, Excel, PowerPoint, Paint, Matlab etc. Industrial software tailored to the respective problems of a certain industry and individual software created for solving the particular problems of an individual user.
ASCII	American Standard Code for Information Interchange, used worldwide; numbers, letters, special characters and device controller characters are represented as 7-bit binary combinations. Standard ASCII-characters cover 27 = 128 characters in total. An eighth bit is used as a so-called parity bit for error detection when transferring ASCII files. During even parity checking, this bit is set to 0, when the number of '1s' in the remaining seven bits is an even number. Otherwise, it is set to 1. The expanded ASCII character set does not use parity checking. The highest value bit is used here to switch from the standard character set to the expansion. This allows space for special regional characters e.g. umlauts in the German language. www.asciitable.com
Automation	According to Brockhaus: The application of technical means, using specific programs that (either partially or totally) do not require human intervention to perform operations.
Automation Runtime	A uniform runtime system for all B&R automation components.
Failure	Failure according to IEC 61508: A function unit loses the ability to perform a required function. In regards to safety-oriented systems, a distinction is made between dangerous and safe failures. This depends on whether the status of the system failure is considered dangerous or safe. The cause of the failure may be load related or age-related, and therefore a random failure, or related to a flaw inherent in the system. In this case, it is known as a systematic failure.

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